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Department of Astronomy,

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Abstract Book

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Tuesday, 6th February 2018

Tuesday, February 6th , 2018

Special Lecture -Parameswaran Ajith - Einstein's Messengers

Time: 11:30 - 12:30 Venue: IICT Auditorium

Special Lecture	Parameswaran Ajith	Invited
Einstein's messengers		
Recent gravitational-wave observations by LIGO and Virgo not only confirm the century-old prediction of Einstein, but also herald the beginning of a new branch of astronomy. While the binary black hole observations allow us to test the predictions of Einstein's theory in the regime of extreme gravity and to study the physics and astrophysics of black holes, the binary neutron star observation has announced the dawn of multi messenger astronomy. Based on the observed rate of these events, we expect a large number of binary mergers to be observed in the near future, along with other possible sources. This talk will summarize the current status of gravitational-wave observations, what we learned from them, and prospects for the near future.		

ASI 2018 Parallel Session – Tuesday, 6th February 2018

Time: 14:30 - 16:00 PGRRCDE (Room no: S1)

Stars, ISM and Galaxy I [Chairperson: Devendra Ojha]

ASI2018_522	Lokesh Kumar Dewangan	Invited
Dewangan, L. K.		
Observational Signatures of Cloud-Cloud Collision in the Galactic Star-Forming Regions		

The formation processes of massive OB stars and young stellar clusters are still poorly understood. In recent years, the study of the triggered star formation through the cloud-cloud collision (CCC) process is an interesting and important issue in the star formation research. It has also been suggested that the CCC process can form massive OB stars and young stellar clusters at the junction of molecular clouds. The onset of the CCC process in a given star-forming region could be observationally inferred through the detection of a bridge feature connecting the two clouds in velocity space, the broad CO line wing in the intersection of the two clouds, and the complementary distribution of the two colliding clouds. However, the investigation of observational signatures of star formation (including massive stars) via the CCC mechanism is still rare and very challenging. A multi-wavelength approach has been effectively used as a promising observational tool for understanding the ongoing physical processes in the Galactic star-forming regions. In this talk, new observational results of an analysis of some promising Galactic star-forming regions (such as G35.20-0.74, Sh2-235, bubble N49) will be presented, where the star formation activities (including massive stars) appear to be influenced by the CCC mechanism at the junction.

ASI2018_1739	Manash Samal	Contributed Talk

Wen-Ping Chen (Garduate Institute of Astronomy, National Central University, Taiwan), Yan Sun (Purple Mountain Observatory, Chinese Academy of Sciences, China), Jessy Jose (Indian Institute of Science Education and Research, Tirupati, India)

Understanding star formation in filamentary clouds - a case study on the G182.4+00.3 cloud

Recent Herschel observations have shown that most of the star formation occurs in filaments, yet how fragmentation operates in filaments and why at only some locations of filaments cluster formation happens, are far from being clear. In this talk, I will present observations towards the G182.4+00.3 molecular cloud in the transition of 12CO, 13CO and C18O, along with the deep near-infrared data from CFHT. We find, though the emission from three molecular lines shows different emission areas with their own distinct structures, the 13CO integrated intensity map clearly reveals a filamentary cloud of length ~1 degree (32 pc) with column density greater than 5 x 10^21 cm^-2. The distribution of excitation temperature shows two phases: i) cold gas of ~ 10 K across the large area of the filament, ii) relatively warm gas in the range 15-25 K at one end of the filament. We find that the later part hosts a rich near-infrared cluster. I will discuss the star formation properties of the cluster and compare its characteristics with the galactic embedded clusters. Finally, I will explore the physical conditions and kinematics of the cloud and energy budget of the nearby massive stars to conclude whether the cluster has formed out of the fragmentation of the filament or merger of converging gas flows or compression of the filament by the nearby expanding HII region.

ASI2018_1703	Veena V S	Contributed Talk

Sarita Vig (IIST, Trivandrum) Bhaswati Mookerjea (TIFR, Mumbai) Alvaro Sanchez-Monge (University of Cologne, Germany) Anandmayee Tej (IIST, Trivandrum) C. H. Ishwara-Chandra (NCRA, Pune)

Understanding the structure, evolution and kinematics of the IRDC G333.73+0.37

G333.73+0.37 is a filamentary infrared dark cloud (IRDC) located at a distance of 2.6 kpc. This region contains two mid-infrared bright sources connected by thick lanes of gas and dust. Cold dust emission from this region is investigated using data at far-infrared and millimeter wavelengths. The 4700 solar mass cloud is fragmented further into 10 clumps with temperatures ranging between 14 to 22 K and masses ranging from 87 to 1530 solar mass. The molecular line emission towards central clump show signatures of infall activity. We have also detected a large scale velocity gradient along the filament, likely due to accretion flows rather than rotation. Using low frequency radio observations , we identified 2 HII regions with compact and shell-like morphologies powered by late O or early B type stars. Photometric analysis of near and mid-infrared point sources reveal the YSO population within the cloud. Fragmentation analysis show the supercritical nature of this IRDC. Based on various stimates obtained for objects in different evolutionary stages, we find a lower limit to the age of the cloud.

ASI2018_749	Jessy Jose	Contributed Talk
The CFHT W-band Consortium		
The youngest free-floating planets: A transformative survey of nearby star forming regions with the novel W-band filter at CFHT-WIRCam		
Low mass brown dwarfs and free-floating planets in star-forming regions are vital tracers of the low mass end of the star-formation and key analogues to exoplanets around stars. However, only a handful of objects with masses below 13 MJup are known because they are difficult to distinguish from reddened background stars using traditional methods. An efficient method of searching for these young objects is to identify them via spectral features, such as the 1.45 um H2O absorption band seen in spectra of M-L-T-Y type objects (Allers & Liu 2010). We have acquired a 1.45 um filter (W-band) with specifications appropriate to CFHT and have been using with WIRCam to survey the nearby star forming regions including, Taurus, IC 348 and Serpens, in order to detect the lowest mass components of these regions. By combining imaging from our W-band filter with broad band J and H photometry, we create a reddening-insensitive Q-parameter, which can be used to estimate the spectral types. Because [1.45] is sensitive to H2O absorption, our method of photometric selection greatly reduces contamination by reddened background stars which plague broad-band only surveys. We have pursued spectroscopic follow-up of the W-band selected candidates, combining observations taken with IRTF-SpeX, Palomar-Triplespec, and Gemini-GNIRS. Our survey has already doubled the number of low mass objects known in Taurus, with the latest of these likely to be planetary mass. These observations of new low mass objects will provide an even lower log-g extension to the INT-G / VL-G gravity classification sequence and will constrain the very low mass end of the initial mass function down to masses of 3-5 MJup. Our survey is sensitive down to 5 Mjup objects (and down to 2-3 MJup in non-extincted portions) and is the largest deep near-IR search for young brown dwarfs and free-floating planets conducted to date and will be potentially transformative for this field.		

ASI2018_1101	Mayank Narang	Contributed Talk

Manoj Puravankara TIFR Mumbai, Blesson Mathew Christ College Bangalore, Ravinder Banyal IIA Bangalore, Sivarani Thirupathi IIA Bangalore

Are Exoplanet properties determined by the host star?

The short answer is yes. With the latest Kepler Data release DR25 we now have the largest sample of exoplanet candidates with uniformly determined stellar and planetary properties. Using detailed mathematical prescriptions, we present an unbiased view of the population of planets in the Kepler field. Since we account for all the observational biases and selection effects while calculating the occurrence rate of planets, our results must represent the true demographic of the planets and their correlations with the host star properties. In this study, we examine planets orbiting main sequence stars with orbital periods less than an year. We studied various correlations between the observed properties of the planets (radius, mass & orbital period) and their host stars properties (Teff & metallicity). We show that the radius (or mass) of the exoplanet is tightly correlated with the spectral type of the host star and, therefore, with the mass of the host star : the more massive the star the higher the occurrence rate of giant planets around them; conversely, the occurence rate of small planets is higher around low mass stars.. We also examine the relationship between planet radius or mass and the metallicity of the host star. We find that the metallicity of the host star increases as the radius or mass of the planets increases. Interestingly, for planets with radius greater than 17 R_Earth (or mass greater than 4.4 M_Jupiter) the trend is reversed: host star metallicity drops with increasing planetary radius or planetary mass. We will discuss these results in the context of star and planet formation theories.

ASI 2018 Parallel Session – Tuesday, 6th February 2018

Time: Time: 14:30 - 16:00 PGRRCDE (Room no: S3)

Extragalactic Astronomy I [Chairperson: Resmi Lekshmi]

ASI2018_880	Rupak Roy	Contributed Talk
Not applicable		
The Nuclear-transients		

Recent trend in "time domain astronomy" has found several new kinds of transients which are located very near to the centers of the galaxies. Most of them are much brighter than canonical supernovae and exhibit very broad lightcurves with almost featureless spectra. Most of the times these have been explained as Tidal Disruption Events (TDE) which are probably produced due to complete disruption of massive stars by the supermassive black hole (SMBH) at the center of their hosts. Certainly the proposed mechanism for TDEs is completely different from that of canonical core-collapse supernovae (CCSNe) and also different from that of Superluminous Supernovae (SLSNe) which are supposed to be either powered by shock-interaction or pair-instability processes or by a spin-down magnetar. The improved SN surveys now also discovered that these nuclear-transients can exhibit photometric and spectroscopic properties some-extent similar to both TDEs and CCSNe. They are more energetic with broader and luminous light curves than canonical CCSNe. Here, I shall describe the photometric and spectroscopic properties of such transients and compare their properties with those of TDEs and CCSNe and shall discuss about the possible progenitor scenario.

ASI2018_1685	Agniva Roychowdhury	Contributed Talk

Ritaban Chatterjee, Department of Physics, Presidency University, 86/1 College Street, Kolkata 700073. Sunil Chandra, Centre for Space Research, North-West University, Potchefstroom, 2520, South Africa. Atreyee Sinha, AstroParticule et Cosmologie, Universite Paris Diderot, CNRS/IN2P3, Paris 75013. Gulab C.Dewangan, Inter University Center for Astronomy and Astrophysics, Pune - 411 007, India.

Study of multi-band X-Ray Time Variability of Mrk 421 using ASTROSAT

We analyze a 100 ks Astrosat observation of the blazar Markarian 421. We calculate the broad-band X-ray power spectral density (PSD) using light curves from SXT and LAXPC onboard Astrosat, and archival data from Swift. We find that the X-ray PSD is best fit by a bending power-law model with a break at ~days timescale. In the past, similar break in the X-ray PSD have been found in Galactic X-ray binaries and Seyfert galaxies, where the observed X-ray emission is dominated by those from the accretion disk or corona. This implies the break timescale to be linked with accretion dynamics. However, Mrk 421 is a BL Lac object. Hence, the disk emission is weak and X-rays are mostly from the jet. Our corresponding result of a break in the PSD hence implies a signature of accretion disk dynamics in the jet. This is one of the most direct evidences of an accretion-disk jet connection. We find that the variability of soft and hard X-rays observed by SXT and LAXPC, respectively, are very well-correlated. Presence of correlation implies that the same electron populations are giving rise to emission in both bands. Inter-band time delays arise due to mixed contributions of various timescales like the radiation cooling timescales, light crossing timescale of emission region, or timescale related to acceleration or injection of particles. The cooling and acceleration timescales increase and decrease respectively with the energy of the relativistic electrons. The sign of the lag hence depends on the timescale that is dominating. If the cooling timescale is significantly higher than the acceleration timescale, we see a soft lag, i.e., variation of hard X-rays leading those at the softer energies. When the acceleration timescale is comparable to the cooling timescale of the highest energy particles, hard lags may be seen, i.e. similar changes taking place earlier at lower and later at higher energies. This is just one of the several explanations behind such correlation and lag. The possible contributions due to other timescales, the variation of the PSD break timescale with photon energy and their implications are also discussed.

ASI2018_917	Brajesh Kumar	Contributed Talk

A. Singh, S. Srivastav, D. K. Sahu and G. C. Anupama Indian Institute of Astrophysics, Bangalore

Long term optical monitoring of the transitional Type Ic/BL-Ic supernova ASASSN-16fp (SN 2016coi)

We present results based on intensive optical monitoring of the nearby ($\sim$18 Mpc) Type Ic supernova (SN) ASASSN-16fp (SN 2016coi). The monitoring of this event was initiated a few days after the explosion and covers a period of about 455 days. The observations were performed using the 2-m Himalayan Chandra Telescope and the newly installed 3.6-m Devasthal Optical Telescope. The \textit{UBVRI} light curves of ASASSN-16fp are broad, indicating its slow evolution. The peak absolute magnitude (M_{V} = -17.7 ± 0.2 mag) is fainter than the gamma-ray burst/X-ray flash associated supernovae (SN 1998bw, 2006aj), and comparable to other broad-lined (BL) e.g. SN~2002ap, SN~2012ap and transitional type SN~2004aw. The $B-V$ and $V-R$ colours are significantly redder in comparison to other similar type of events. ASASSN-16fp also shows slow spectral evolution. The expansion velocity of the ejecta near maximum light reached $\sim$16000 km s^{-1} and settled to $\sim$8000 km s^{-1} ($\sim$1 month post-maximum). Analytical modelling of the quasi-bolometric light curve suggests that $\sim$0.1 M$_{\odot}$ of ^{56}Ni was synthesized in the explosion. The kinetic energy and ejecta mass are estimated to be 6.9$^{+1.5}_{-1.3}$ $\times$ 10^{51} erg and $\sim$4.5\,$\pm$\,0.3 M$_{\odot}$, respectively.

ASI2018_868	Prajval Shastri	Contributed Talk

L. Sairam (IIA) J. Murthy (IIA) et al

Multi-wavelength Views of Accreting Supermassive Black Holes using ASTROSAT

Copious emission at all observed frequencies is a hallmark of accreting supermassive black holes (SMBH). Multi-frequency measurements are therefore critical to understand the observed range in their properties. The spectral energy distributions from radio to X-ray frequencies include the contribution from multiple emission mechanisms and contain imprints of the kinetic power of the jets launched by the accreting black hole, and the Eddington rate of the accretion. Discerning the mix of emission mechanisms is key to understanding the physics of these accreting systems. While such a decomposition requires robust SEDs, which in turn requires quasi-simultaneous measurements, measurements such as those from ASTROSAT which has simultaneous multi-wavelength capability, though sparse, can anchor the SEDs. Our results from two representative accreting SMBH observed with ASTROSAT with the instruments LAXPC, SXT and UVIT will be presented.

ASI2018_1188	Pranjupriya Goswami	Contributed Talk

Atreyee Sinha (AstroParticule et Cosmologie, Universite Paris Diderot, Paris), Ranjeev Misra (IUCAA, Pune), Sunder Sahayanathan(BARC, Mumbai), Rupjyoti Gogoi (Tezpur University)

X-ray spectral curvature of high energy blazars with NuSTAR observations

The synchrotron emission from the accelerating electrons in the magnetic field of a jet is responsible for the X-ray emission in high energy peaked blazars. The X-ray spectrum shows a clear curvature, being well modelled by a log parabola model. Empirically fitting the spectra with a log parabola model have shown that the curvature parameter(β) varies from source to source and for different observations of the same source. It has been reported that curvature is correlated with the flux and the local photon index at a fixed energy. In order to find the origin of the X-ray spectral curvature we assumed that in the acceleration region producing the non-thermal electrons, the escape time scale of the electron is energy dependent. We fit the NuSTAR spectra for Mkn 421 and 4 more HBLs along with 2 FSRQs with the prediction that synchrotron spectrum is arising from such a system. Such a synchrotron spectrum can be approximated to be a log parabola over a small range of energy and we naturally find that both models fit the observations equally well. This can have interesting implications regarding the origin of the observed spectral curvatures.

ASI2018_1656	Bindu Rani	Contributed Talk

T. P. Krichbaum, J. Hodgson, A.P. Marscher

Wobbling jets in active super-massive black holes

Powered by accretion onto super-massive black holes (masses up to 10 billion Solar mass), active galactic nuclei (AGN) are strong emitters of electromagnetic radiation over a range spanning more than 20 decades in energy. About 1 in 10 AGN convert a substantial fraction of accretion energy into highly collimated and relativistic outflows of energetic plasma called "JETS". Many AGN jets do wobble, i.e., show temporal variations in their direction on parsec scales. While the causes of "jet wobbling" are not agreed upon, it is a powerful probe of energy extraction from super-massive black holes.

ASI 2018 Parallel Session – Tuesday, 6th February 2018

Time: 14:30 - 16:00 PGRRCDE (Room no: S11)

General Relativity and Cosmology I [Chairperson: Subhabrata Majumdar]

ASI2018_935	pravabati chingangbam	Invited
Stephen Appleby (KIAS), Akanksha Kapahtia (IIA and IISc), Changbom Park (KIAS)		
Probing length and time scales of the EoR using Minkowski Tensors		
We present a new method to probe the characteristic length and time scales of the Epoch of Reionization using Minkowski Tensors (MTs). We demonstrate that the shapes of ionized bubble regions, as encoded in the MTs, provide a very useful method to reconstruct the reionization history, and hence to constrain different reionization models.		

ASI2018_603	Akash Kumar Patwa	Contributed Talk
Shiv Sethi (RRI), K.S. Dwarakanath (RRI)		
On detecting EoR using drift scan data from MWA		
We analyse MWA phase I and II EoR drift scan data at \nu~154 MHz. We test for the efficacy of foreground isolation using delay spectrum approach and the stability of noise properties during multi-hour scans. Using the expected properties of the HI signal we compute weights to calculate the power spectrum of the HI signal from both the data sets.		

ASI2018_1696	Shamik Ghosh	Contributed Talk

Pankaj Jain, IIT Kanpur Prabhakar Tiwari, Technion, IIT

Current status of the radio dipole and its measurement strategy with the SKA

In the observed galaxy distribution field we expect to find a dipole which can arise from 1. local structures (clustering dipole) and 2. our local motion (kinematic dipole). It is expected that the clustering dipole, which arises from local structure inhomogeneities should saturate when we go to cosmological distance scales of few hundred Mpc. However, recent studies with the 2MASS catalog has shown found that the clustering dipole does not converge by 300 Mpc/h. With the SKA, one would hope to map the clustering dipole and find scales by which it saturates. On the other hand we expect a dipole in the radio galaxy catalog due to our local motion. The measurement of the kinematic dipole by several authors with the NVSS catalog have shown a large excess in the measured value of the kinematic dipole when compared with expectations. It is important to compare performance of various estimators used in this measurement with the aim of developing multiple bias-corrected measurement pipelines for the SKA. We have found in our work that the radio continuum surveys have serious systematics for which they need correction. I will discuss the techniques which are used to study and eliminate such systematics and their limitations. I will also discuss how flux calibration errors will effect systematics corrections. Finally I discuss the preparation strategy we should take for measurement of the the clustering dipole and the kinematic dipole from the SKA using better modelling for systematics of the continuum survey and the foreground contaminants.

ASI2018_1638	Debanjan Sarkar	Contributed Talk
Somnath Bharadwaj(Indian Institute of Technology Kharagpur)		
Modelling redshift-space distortion (RSD) in the post-reionization HI 21-cm power spectrum		
The post-reionization HI 21-cm signal, which is expected to be a pristine probe of the large scale structures in the Universe, is an excellent candidate for precision cosmology. This requires accurate and reliable modelling of the expected signal. In an earlier work (Sarkar, Bharadwaj \& Anathpindika; 2016) we have simulated the expected HI 21-cm power spectrum $P_{{\rm HI}}(k)$ in real space (as against redshift space) and used this to model the k dependence of the (possibly complex) bias $\tilde{b}(k)$ over the redshift range $1 \le z \le 6$. Here we have extended the earlier simulations to include the redshift space distortion (RSD) due to the peculiar motion of the HI, and we have used this to model the anisotropy of the redshift space HI 21-cm power spectrum $P^s_{{\rm HI}}(k_{\perp},k_{\parallel})$. We model $P^s_{{\rm HI}}(k_{\perp},k_{\parallel})$ assuming that it is the product of $P_{{\rm HI}}(k)=b^2 P(k)$ with a Kaiser enhancement term and a Finger of God (FoG) damping which has σ_p the pair velocity dispersion as a free parameter. Considering several possibilities for the bias and the damping profile, we find that the models with a scale dependent bias and a Lorentzian damping profile best fit the simulated $P^s_{{\rm HI}}(k_{\perp},k_{\parallel})$ over the entire range $1 \le z \le 6$. The best fit value of σ_p falls approximately as $(1+z)^{-2}$, and the FoG effect is absent at $z \ge 5$. The model predictions are consistent with the simulations for $k < 0.3 \, {\rm Mpc}^{-1}$ over the entire z range for the monopole $P^s_0(k)$, and at $z \le 3$ for the quadrupole $P^s_2(k)$. At $z \ge 4$ the models underpredict $P^s_2(k)$ at large k, and the fit is restricted to $k < 0.15 \, {\rm Mpc}^{-1}$.		

ASI2018_1604	Dinesh V. Raut	Contributed Talk

Supervisor: Tirthankar Roy Choudhury (NCRA-TIFR)

Measuring the reionization 21cm fluctuations using clustering wedges.

Studying the Epoch of Reionization (EoR) is one of the main challenges in modern cosmology. The epoch can be studied by looking at statistical information in the redshifted 21cm line emitted from neutral hydrogen. Ideally one would like to study the epoch and constrain various astrophysical processes from it. Problem is presence of foregrounds which are several orders of magnitude larger than the signal and which render the extraction of cosmological information very very difficult. One way to deal with this is to isolate the foregrounds in k-space where, if spectrally smooth, they are confined to a wedge region. The power spectrum is then obtained by averaging over remaining portion of k-space. Such a procedure biases the measurement of power spectrum with respect to extent of wedge. I would talk about the prescription which can account for this bias. I would also talk about the expansion of the power spectrum in the basis of shifted Legendre Polynomials which is necessary if one seeks to isolate the anisotropic component of the signal from the isotropic one. In the end I would discuss how the prescription mentioned above can act as necessary correction when one wants to do model comparison in presence of the k-space wedge.

ASI 2018 Parallel Session – Tuesday, 6th February 2018

Time: 16.30 - 18.00 PGRRCDE (Room no: S1)

Stars, ISM and Galaxy II [Chairperson: Devendra Ojha]

ASI2018_1721	Saurabh Sharma	Invited
A K Pandey (ARIES) D K Ojha (TIFR)		
Multi-wavelength studies of star forming regions		
Understanding the formation process of stars and their evolution constitute one of the basic problems in astrophysical research. Star forming regions present an unique laboratory for understanding the, process of star formation, the Initial Mass Function (IMF), the early evolution of stars over a wide mass range, and the nature of interactions between young stars and their surrounding interstellar medium. Various efforts have been already made to study these regions but the satisfactory explanation of star formation process is still far from reality. Availability of good quality multi-wavelength data from various telescopes/instruments provides an excellent opportunity to study in detail the physical process going on in these regions which will be very helpful to constrain various star formation scenarios. In this talk, I will be presenting the results of our study related to star formation in several star forming regions.		

ASI2018_1593	Sonu Tabitha Paulson	Contributed Talk

Jagadheep.D.Pandian Indian Institute of Space Science and Technology

Probing Early Phases of High Mass Stars with 6.7 GHz Methanol Masers

Methanol masers at 6.7 GHz are the brightest of class II methanol masers and have been found exclusively towards massive star forming regions. These masers can thus be used as a unique tool to probe the early phases of massive star formation. Modelling spectral energy distributions (SEDs) of masers is one of the most effective methods to study the nature of massive star formation sites. We present here the SED studies of around 300 methanol masers chosen from the MMB catalogue, which falls in the Hi-GAL range ($|l| \leq 60^\circ$, $|b| \leq 1^\circ$). The masers are studied using the ATLASGAL, MIPSGAL and Hi-GAL data at wavelengths ranging from 24 - 870 micrometers. A single grey body component fit was used to model the cold dust emission whereas the emission from the warm dust is modelled by a black body. The clump properties such as isothermal mass, FIR luminosity and MIR luminosity were obtained using the best fit parameters of the SED fits. The clump masses range from few ten to 1000 $M_\odot$. The FIR luminosities of the sources associated with 6.7 GHz maser emission falls in the range 500-8920 $L_\odot$. We discuss the physical properties of the sources and ex- plore the evolutionary stages of the sources having 6.7 GHz maser emission in the timeline of high mass star formation.

ASI2018_1538	Gourav Banerjee	Contributed Talk

Paul K.T, Blesson Mathew; Christ University;Annapurni Subramaniam; IIA, Bangalore

Spectroscopic Studies of Galactic Field Be stars through CaII and FeII emission lines

Be stars provide excellent opportunities to study circumstellar disks. But the disc formation mechanism of classical Be stars, known as 'Be phenomenon', is an open question in stellar astrophysics. The mystery of Be phenomenon can be understood by studying the Classical Be stars (CBe) in various locations. Spectra of Be stars show various interesting emission lines of hydrogen, oxygen, calcium, iron and other elements. Spectroscopic analysis of CaII and FeII emission lines are a less explored area in Be star research. So, we have selected a sample of 118 field CBe stars from the catalogue of Jaschek & Egret (1982) and obtained medium resolution spectra of these stars in the wavelength range 3800 – 9000 Å during December, 2007 to January, 2009 with HFOSC mounted on 2.1-m Himalayan Chandra Telescope, located at Hanle, Ladakh. We have studied the CaII and FeII emission lines for these 118 stars to frame a consolidated picture about Be phenomenon in CBe stars.

ASI2018_701	Avrajit bandyopadhyay	Contributed Talk

T Sivarani, Indian Institute of Astrophysics

Connection between Globular clusters and Galactic halo

Recent progress in studies of globular clusters have shown that they are made of multiple generations of stars rather than being a simple population.They were also found to have different abundances compared to halo stars of similar metallicities indicating the complex evolutionary processes. Understanding of the origin of the abundance pattern is necessary to understand their formation scenario and the progenitor population in the context of hierarchical Galaxy formation models. Study of neutron-capture elements is among the most useful tools to study about the origin of the globular population.It helps in demarcating self enrichment from pre-enrichment.Here we present the abundances of key n-capture elements like Sr and Ba for some of the metal poor globular clusters in the Galactic halo.The star-to-star intra cluster scatter indicate local massive star nucleosynthesis while large inter cluster differences point to a different progenitor population that were formed in different systems and migrated to the Halo.We have used Carbon abundances to constrain its s/r-process origin.The Large spread in C abundance also points towards multiple populations.R-process contributions gives vital information on the original polluters of the birth cloud of GCs.R-process abundances are sensitive to the mass of the Pop-III supernovae and also masses of the subhalos where they have formed. Hence, it is an ideal diagnostic tool to understand their formation scenario in the context of hierarchical Galaxy formation models. We compare r-process abundances along with the light element anomalies to understand the nature of these first polluters. Globular clusters are supposed to have lost a large number of stars during their migration to the Galactic halo by several well studied processes like evaporation, disc shocking and dynamical friction. We have also studied a few stars in the Halo with globular cluster signatures from SDSS in high resolution using HESP to identify former cluster members now residing in the halo.This will tell us about the contribution of the globular clusters to the Halo.

ASI2018_1179	Gaurav Singh	Contributed Talk

R K S Yadav & Aryabhatta Research Institute of observational sciencES (ARIES)

STUDY OF BLUE STRAGGLER STARS IN GALACTIC GLOBULAR CLUSTER NGC 6656

Being one of the oldest stellar systems, Globular clusters (GCs) offer an excellent opportunity to understand the dynamical evolution of the cluster. NGC 6656 is a Galactic globular cluster located at a distance of about 3 Kpc. The nature of its formation and evolution over its entire lifetime has been debatable over the years. The photometric and spectroscopic studies, however, has revealed many interesting clues about its formation history. In this meet, I will present an interesting result based on Blue straggler stars (BSSs) study of the Globular cluster NGC 6656. The projected radial density profile of the cluster show many interesting results i.e, the presence of two intermediate black holes (IMBHs) and its initial formation mechanism. We have also derived new cluster parameters by fitting mono-mass King model to the projected density profile of the cluster. The BSS radial distribution shows a bimodal behaviour, which is consistent with the "empirical dynamical clock" relation defined in Ferraro et al. (2012). Suggesting that NGC 6656 is an intermediate dynamical-aged cluster.

ASI 2018 Parallel Session – Tuesday, 6th February 2018

Time: 16.30 - 18.00 PGRRCDE (Room no: S3)

Extragalactic Astronomy II [Chairperson: Resmi Lekshmi]

ASI2018_1677	Saumyadip Samui	Invited
Kandaswamy Subramanian (IUCAA), Raghunathan Srianand (IUCAA)		
Cosmic Ray driven outflows from high-z galaxies		
Galactic scale outflows are ubiquitous to all star forming galaxies, locally as well as in high redshifts. It is believed that such outflows are responsible for spreading of metals in the intergalactic medium. Here, we present a semi-analytical model of galactic outflows from high redshift galaxies. Both hot gas and cosmic rays generated by supernova are considered in driving the outflow. The presence of cosmic rays makes outflow to escape galactic potential much easily even if the thermal gas loses its energy via radiative cooling. We show that these cosmic ray driven outflows also spread magnetic fields along with the metals in a significant volume of the universe. Further, such outflows have considerable influence on the thermal history of the inter galactic medium.		

ASI2018_1563	Dipanjan Mukherjee	Contributed Talk

Dipanjan Mukherjee, Australian National University; Geoff Bicknell, Australian National University; Alex Wagner University of Tsukuba; Ralph Sutherland, Australian National University

Impact of relativistic jets from AGNs on their host galaxies

Relativistic jets from AGNs are an important driver of feedback in galaxies. Although primarily considered in the context of energy deposition at scales of ~100 kpc to regulate mass inflow, the jets first interact with the host galaxy's ISM before breaking out to larger scales. Our recent 3D relativistic hydrodynamic simulations, performed on scales of several kpc, investigates the interaction of such jets with an inhomogeneous turbulent ISM within the potential of a galaxy. These simulations address the local gas physics, which is often missed in large scale cosmological simulations due to lack of sufficient resolution. The jets are found to couple strongly with the turbulent ISM, driving fast moving lateral outflows of multi-phase gas. The resultant outflows though strong, do not escape the galaxy, supporting a galactic fountain scenario of feedback, rather than a blow out phase as envisaged earlier. We compare the effect of jet power and ISM density on feedback efficiency. We show that low power jets remain confined within the host for a longer time driving shocks through the ISM, potentially quench star formation on a large scale. I will discuss the implications of these results on the evolution of the host galaxy, and the effects on observable diagnostics such as line emission from shocked gas, thermal Xrays and synchrotron emission in radio wavelengths.

ASI2018_1732	Ramij Raja	Contributed Talk

Siddharth Malu, Pritpal Kaur, Abhirup Datta, Arnab Chakraborty (Center of Astronomy, IIT Indore)

Studying merging phenomena of massive clusters through multi-wavelength study of MACSJ0417.5-1154

Diffuse non-thermal radio sources in the cluster of galaxies are found in the form of 'Halo' and 'Relic' depending upon the location of the source in the galaxy cluster. The detection probability of radio halo is rather small (<10%) for all clusters, the probability increases to ~40% for clusters with L_x=⟦10⟧^44 erg s^(-1) (Venturi et al. 2008). MACSJ0417.5-1154 is the most massive and second most luminous merging cluster in the MAssive Cluster Survey sample. This is a high redshift cluster with z = 0.44. Dwarakanath et al. (2011) first detected radio halo at 235 MHz and 610 MHz (GMRT observation) in this cluster which has similar morphology as found in X-ray. Parekh et al. (2016) detected similar diffuse emission at 1575 MHz (VLA observation). We have also analyzed GMRT data at 1387 MHz and found diffuse emission with similar morphology. Apart from that, we have also analyzed 18 GHz ATCA data and found diffuse emission in this cluster. There is a steepening in the spectrum of the MACSJ0417.5-1154 radio halo at ~ 610 MHz (Parekh et al. 2016). We are also investigating the behavior of the spectrum at high frequency. This may provide more insight about the current phase of merging process of this cluster and in turn give us a better understanding of merging process of massive clusters.

ASI2018_1736	Ramya	Contributed Talk

Smitha Subramanian (KIAA-PKU), Luis. C. Ho (KIAA-PKU), Lei Hao (SHAO), Dong Chenxing (Univ. Florida)

Evolving perspectives on the formation and evolution of Giant Low Surface Brightness galaxies

Giant Low Surface Brightness galaxies (GLSBs) are considered to be extreme late-type spiral galaxies with a prominent bulge and very faint but extended disk. The extended disks are sometimes associated with a prominent ring structure around the galaxy. We have photometrically studied a sample of GLSBs to address the issue of formation and evolution of GLSBs. Using Galfit, we decompose 10 GLSBs into a Sersic bulge and an extended exponential disk. The Sersic bulge component is massive, compact and their stellar velocity dispersion is high for their luminosities. These properties puts them at the extreme end of the Kormendy and Fundamental plane scaling relations obeyed by local classical bulges. The sizes of the bulges have an effective radii ~2 kpc with stellar masses M* > 10^10.5 Msun. The bulge component of GLSBs lie on the stellar mass-size relation followed by compact ellipticals at redshift, z ~ 2. Their disks are very extended, having sizes in excess of ~10 kpc and obey the mass-size relation of local late-type galaxies. We hence hypothesize that the bulge component in GLSBs might have formed dissipatively and were already in place at z ≈ 2 while the extended disk has assembled/formed later from z ~ 1 − 0 in many minor merger episodes.

ASI2018_1700	Naslim Neelamkodan	Contributed Talk

K. Tokuda (Osaka Prefecture University, Osaka, Japan) T. Onishi (Osaka Prefecture University, Osaka, Japan) F. Kemper (Academia Sinica Institute of Astronomy and Astrophysics, Taipei, Taiwan) T. Wong (University of Illinois, Urbana, USA) O. Morata(Academia Sinica Institute of Astronomy and Astrophysics, Taipei, Taiwan) S. Takada (Osaka Prefecture University, Osaka, Japan) R. Harada (Osaka Prefecture University, Osaka, Japan) A. Kawamura (National Astronomical Observatory of Japan, Tokyo, Japan) K. Saigo (National Astronomical Observatory of Japan, Tokyo, Japan) R. Indebetouw (National Radio Astronomical Observatory, Charlottesville, USA) S. C. Madden (CEA Saclay, Paris, France) S. Hony (Max Planck Institute for Astronomy, Heidelberg, Germany) M. Meixner (Space Telescope Science Institute, Baltimore, USA)

ALMA reveals molecular cloud N55 in the Large Magellanic Cloud as a site of massive star formation

Most stars form as clusters in Giant Molecular Clouds (GMCs) which encompass cold molecular gas and dust with masses 10^4 - 10^5. Therefore, understanding the evolution of dust and gas in GMCs is important to understand the formation of stars in galaxies. The GMCs are composed of sub-parsec-sized clumps, the size of which is determined by the forces of gravity and magneto-turbulent pressure. Stars form inside these clumps, hence a detailed understanding of the star formation process requires a sub-parsec scale resolution view of GMCs and accurate measurements of the physical parameters of these clumps. Spatially resolved CO observations in large-scale surveys have been carried out in the nearest low-metallicity galaxy, the Large Magellanic Cloud (LMC), with an aim to investigate whether the GMC characteristics and star formation conditions follow universal patterns. There has been high spatial resolution (sub-parsec) mapping of 12CO(2-1) and 13CO(2-1) observations with the Atacama Large Millimeter Array (ALMA) in the active star-forming regions, 30Doradus, N159 west, and N55 of the LMC. We here present the molecular cloud properties of N55 in the LMC using 12CO(1-0) and 13CO(1-0) observations obtained with ALMA. We have done a detailed study of molecular gas properties, to understand how the cloud properties of N55 differ from Galactic clouds. Most CO emission appears clumpy in N55, and molecular cores that have Young stellar objects (YSO) show larger linewidths and masses. We find that massive clumps are associated with high and intermediate mass YSOs. The size-linewidth coefficient shows a linear relation with mass surface density for N55 clumps as in many Milky Way quiescent clouds, indicating that clouds are virialized with negligible external pressure. In addition, the size-linewidth relation shows a power law relation with the index of 0.5+-/0.05. We found a CO-to-H2 conversion factor, Xco, 6.5X10^20 cm^-2 (K km s-1)^-1 at a spatial scale 0.8 pc which is about two times higher than Orion CO-to-H2 conversion factor measured for similar spatial scale. The power law relation of clump mass function in N55 shows similar behavior to the 12CO(2-1) clumps in star-forming region 30Doradus observed with ALMA, and the 13CO(1-0) clumps of Gemini-Augira in the Milky Way observed with 4m Nagoya Telescope. This power-law behavior of clump mass function in N55 is consistent with many Galactic clouds.

Wednesday, 7th February 2018

Wednesday, February 7th , 2018

Plenary Session 1 - TIME DOMAIN ASTRONOMY [Chairperson: Shantanu Rastogi]

Time: 9.30 - 11.00 (Venue: Prof. G. Ram Reddy Centre for Distance Education, Platinum Jubilee Auditorium)

ASI2018_889	G.C. Anupama	Plenary
Indian Institute of Astrophysics		
Studies of Supernovae in the era of future large facilities		
Studies of supernovae (SNe) have played an important role in modern astronomy in the use of these objects as cosmological probes, and also in understanding stellar evolution and formation of extreme objects. The progenitors of SNe are varied, with the type Ib/c and II SNe having massive progenitors that explode on timescales of a few million to several tenths of million years. On the other hand, SNe Ia originate from low and intermediate mass stars, from CO white dwarfs in binary systems.The life timescales of SNe Ia progenitors can range up to a Hubble time or more. The studies of SNe of different types will provide a complete set of information about stellar and galactic evolution. The future large facilities such as the LSST, TMT, SKA, will enable studies of SNe to large distances, in addition to enabling detailed studies of the diversity in these objects. In this talk, I'll discuss the observational properties of supernovae, and also discuss the various aspects of SNe studies that can be addressed with the facilities of the future.		

ASI2018_855	Biswajit Paul	Plenary
Raman Research Institute		
X-ray timing from milliseconds to decades and time resolved spectroscopy/polarimetry		
The most compact astronomical objects are also the most prolific X-ray emitters. X-ray emission from compact objects invariably show intensity variations over a wide range of timescales. We will discuss some important X-ray timing aspects of compact stars at time scales of milliseconds to decades. This will be followed by presentation of some recent examples of time and phase resolved spectroscopy of neutron star X-ray binaries and will mention some key science intersts in time resolved X-ray polarimetry.		

ASI2018_1576	Shabnam Iyyani	Plenary
Inter university centre for astronomy and astrophysics		
Gamma ray burst: A window to the extraordinary and extreme Universe		
Gamma-ray bursts (GRBs) are the most intense and energetic transients occurring in the cosmos at cosmological distances. They are classified into two: short (< 2s) and long (>2s) GRBs, which have different progenitors such as neutron star (NS) - neutron star/ neutron star - black hole (BH) mergers and hypernovae respectively. Short GRBs are the electromagnetic counterparts to the gravity wave detections made for NS -NS mergers and may be even for NS -BH mergers. In my talk, I will give a general overview of the study of GRBs and will particularly focus on one of the long standing questions of what is the radiation mechanism underlying the observed emission - synchrotron emission versus photospheric emission models. In addition, I will also discuss the key role of polarisation measurements in helping to resolve this issue.		

ASI 2018 Parallel Session – Wednesday, 7th February 2018

Time: 11:30 - 13:00 PGRRCDE (Room no: S1)

Stars, ISM and the Galaxy III [Chairperson: Biswajit Paul]

ASI2018_1228	Sabyasachi Pal	Contributed Talk
Soumen Bera (SKBU)		
Low frequency radio emission from extra-solar planets using TIFR GMRT Sky Survey		
All magnetized planets in the solar system emit radio emission through synchrotron and cyclotron maser radiations. Like Jupiter, most of the extra-solar giant planets are probably magnetized and they should also emit radio emission. We have searched for possible radio emission towards all known extra-solar planetary systems using the TIFR GMRT Sky Survey Alternative Data Release at 150 MHz. Radio emission is not detected from most of the extra-solar planets but it is detected from few star systems which harbor Jupiter size extra-solar planet. Strong magnetic field is required for sustained radio emission from planets and magnetic field in planet may be important for life to exist in the surface of the planet as it keeps away effects of energetic particles of cosmic rays, stellar winds and stellar flares. Here we will briefly summarize our findings.		

ASI2018_1635	Bhaswati Bhattacharya	Contributed Talk

Jayanta Roy (NCRA)

Searching for pulsars with GMRT : Fermi-directed search and GHRSS survey

Even though pulsars are frequently getting discovered with ongoing surveys at major telescopes over the world, presently known population is only 1% of prediction. Because of the generally steep spectral nature of pulsars, lower frequencies are an obvious choice for searching for fainter pulsars away from the Galactic plane, where search sensitivity is not severely affected by sky temperature and increased scattering. Pulsar surveys with the GMRT are benefited by its huge collecting area, low frequency coverage and high resolution backends. In this presentation, I will detail on discovery of 21 pulsars using the Giant Metrewave Radio Telescope (GMRT) from targeted (Fermi directed search) and blind surveys (GMRT High Resolution Southern Sky - GHRSS) and results from the follow up studies. With the aid of reduced quantised noise and high time-frequency resolution supported by the GMRT software backend, search sensitivity of GMRT was improved significantly resulting in discovery of 8 millisecond pulsars in Fermi-directed searches, which are the first Galactic millisecond pulsars discovered with the GMRT. The GHRSS survey is an off-Galactic-plane (|b| >5) survey at 322 MHz with complementary target sky (declination range −40 deg to −54 deg) to other ongoing low-frequency surveys by GBT and LOFAR. With ~60% of the survey completed (i.e. 1800 deg^2), we discovered of 13 pulsars, survey including one MSP, one pulsar with LAT pulsation and two mildly recycled pulsars. This is one of the highest pulsar per square degree discovery rate for any off-Galactic plane survey. The simultaneous time-domain and imaging study for localising pulsars and transients and efficient candidate investigation with machine learning are some of the features of the GHRSS survey, which are also finding application in the SKA design methodology. Recently we have embarked on the second phase of the GHRSS survey using the upgraded GMRT at 300-500 MHz.

ASI2018_612	Sushan Konar	Contributed Talk

Uddeepta Deka, Department of Physics & Astrophysics, University of Delhi

The Nulling Pulsars : A statistical study

Radio pulsars are strongly magnetized rotating neutron stars and are characterized by their short spin periods ($P \sim 10^{-3} - 10^2$~s) and large inferred surface magnetic fields ($B \sim 10^8 - 10^{15}$~G). Abrupt cessation of their pulsed radio emission for several pulse periods, observed in some hundred odd pulsars, is known as the phenomenon of nulling. The nature and degree of this nulling varies from pulsar to pulsar. Detailed investigations of the nulling behaviour of individual pulsars and theoretical modeling of the phenomenon have been undertaken by many individuals/groups. However, except for some of the pioneering studies (Rankin 1986; Biggs 19992; Wang, Manchester & Johnston 2007) comprehensive statistical study of nulling has not been given a lot of attention. In view of the existing data it is now possible to find the statistical characteristics of the population of nulling pulsars. We investigate this. In the analysis, we also include the intermittent pulsars and the rotating radio transients (RRAT). Recently, it has been suggested that there may exist a trend for nulling activity, going from ordinary nulling pulsars to intermittents to RRATs. Here we try to quantify the nulling behaviour to check for any difference between these different classes of pulsars. With that aim we find the proximity of a given object to the death-line. We quantify this proximity by a parameter q_d such that, $q_d = \tau_d / \tau_c$. Here τ_d is the time left for a pulsar to reach the death line assuming its magnetic field to remain constant at the present value. And τ_c is the characteristic age of a pulsar given by $P/\dot{P}$. Evidently, the value of τ_d depends on the choice of a particular death-line. We find that for any assumed death-line the statistical distribution of q_d for ordinary nulling pulsars is very different from that of the RRATs. References : 1. Biggs J. D., 1992, ApJ, 394, 574 3. Rankin J., 1986, ApJ, 301, 901 4. Wang N., Manchester R. N., Johnston S., 2007, MNRAS, 377, 1383

ASI2018_1666	Mayur Bhaskar Shende	Contributed Talk

Prasad Subramanian (IISER Pune) Nishtha Sachdeva (IISER Pune)

Formation of Episodic Jets from Black Hole Accretion Disks

Episodic ejection of plasmoids have been observed in many black hole systems. We investigate this phenomenon by drawing analogies with the triggering of coronal mass ejections from the Sun. We envisage a plasmoid as a current carrying flux rope and consider its ejection due to an MHD mechanism called the toroidal instability. We model the velocity and acceleration profiles of the plasma blobs with our model and compare them with observations of well known sources such as 3C120 and some galactic microquasars.

ASI2018_1585	Manoneeta Chakraborty	Contributed Talk

Ersin Gogus (Sabanci University, Istanbul, Turkey) Sinem Sasmaz Mus (Sabanci University, Istanbul, Turkey) Yuki Kaneko (Sabanci University, Istanbul, Turkey) Berk Aydin (Sabanci University, Istanbul, Turkey)

The peculiar bursting behavior of magnetars and its implications

High energetic sudden flares lasting from few fraction of a second to 100s of seconds are observed from magnetars - neutron stars that exhibit the most extreme magnetic fields in the universe. Such bursts are proposed to originate from sudden fracturing of the neutron star crust due to build up magnetic stress or from magnetic reconnection in a highly magnetized environment. The burst properties vary widely from repetitive short bursts to to super-Eddington giant flares. Extended emission phases with intensity clearly above the pre-burst level are observed following the intermediate bursts from a number of magnetar sources. The spectral and temporal properties during these episodes are distinctly different from the magnetar persistent emission. The duration and the energetics of the extended tail phase when compared against that of the burst vary extensively between different events. We detected extended tail emission phases following several bursts from two magnetar sources 4U 0142+61 and SGR J1550-5418. In a number of cases, we observed a sudden enhancement of the pulsation amplitude in conjunction with bursts and a cooling behavior during the tail. We propose that an inefficiently radiating trapped fireball formed during the burst, which can heat up the stellar surface, is able to explain the tail emission properties and its energetics. Transient absorption and emission line features were also detected during the tail episodes. Such lines possibly arise from the proton/ion cyclotron resonance process which can be a valuable tool for probing the complex magnetic field of magnetars.

ASI2018_1182	Shilpa Sarkar	Contributed Talk

Dr. Indranil Chattopadhyay, Scientist-E, Aryabhatta Research Institute of Observational Sciences, Nainital

Two-temperature flows around compact objects

Two-temperature solutions (due to weak Coulomb coupling between electrons and proton lets electron and proton to equilibriate in two different temperatures, hence the name 'two') of rotating flows around black holes is one of the topics in astrophysics which is least understood and worked upon. So we addressed this problem in greater details in the pure general relativistic regime. We found a very big problem while working in two-temperature models. That is two-temperature solutions face a problem of 'degeneracy'. We have three equations : continuity equation, momentum balance equation, and energy equation but 4 unknowns : radius ,velocity, electron temperature (T_e), proton temperature (T_p). So several solutions are possible for a given set of constants of motion (energy, angular momentum and accretion rate). We found a smart way of fixing this problem by using the integrated form of first law of thermodynamics. Given an arbitrary value of entropy it fixes T_e and T_p. And then we follow the law of nature to always prefer a higher entropy solution and choose that solution to be the physical one. Since we have been mainly interested on developing general solutions without using approximations we have neglected here the viscosity part. We have considered Coulomb coupling as the main source of energy transfer from protons to electrons and cooling of electrons through bremsstrahlung, synchrotron and inverse Comptonisation of the soft photons. According to our knowledge no general way of finding the solutions taking into account the degeneracy problem have not been reported so far. This is the first time we have attempted towards obtaining the general picture of the physical solutions in the two-temperature regime.

ASI 2018 Parallel Session – Wednesday, 7th February 2018

Time: 11:30 - 13:00 PGRRCDE (Room no: S3)

Extragalactic Astronomy III [Chairperson: Shabnam Iyyani]

ASI2018_939	Resmi Lekshmi	Invited
Lekshmi Resmi, IIST		
The Gamma Ray Burst from the first binary Neutron Star merger		
I will give a brief overview of GRB170817a, the Gamma Ray Burst associated with the first binary Neutron Star merger. I will then move on to describe our monitoring of the radio afterglow of the GRB using ALMA and GMRT. We constrain the structure of the GRB jet using multi-wavelength afterglow data. We explain the faintness of the burst based on doppler de-boosting at an extreme off-axis viewing angle. Will conclude by summarising future prospects to GRB physics from this watershed event.		

ASI2018_704	Kuntal Misra	Contributed Talk
L. Resmi (IIST, Thiruvanthapuram) K. G. Arun (CMI, Chennai)		
Merger ejecta in short gamma ray bursts		
The most probable progenitors of short duration gamma ray bursts (GRB) are believed to be the merger binary compact object systems comprising of either two neutron stars (BNS) or a neutron star and a black hole (NS-BH). The recent detection of GRB 170817A from the binary neutron star merger GW 170817 has strengthened this progenitor scenario. In addition to the ultra-relativistic jet, which produces the GRB, numerical simulations have indicated other kind of mass ejection during the merger. The mass thrown out with sub-relativistic velocities during the tidal disruption of the neutron star is the most promising observational signature. The tidal ejecta undergoes r-process nucleosynthesis and produces NIR emission resulting in a 'kilonova'. At these velocities, apart from the kilonova emission, the ejecta is also expected to be visible in radio frequencies over a time scale of a few years. The peak of this spectrum lies in MHz frequencies. We present our preliminary results for the search of merger ejecta from two short GRBs with the GMRT at 610 and 325 MHz. Our observations put tight constraints on the magnetar rotation energy.		

ASI2018_430	Debdutta Paul	Contributed Talk

Debdutta Paul, A.R. Rao; Tata Institute of Fundamental Research

Luminosity function of Gamma Ray Bursts

The 'Yonetoku correlation' was first observed for long Gamma Ray Bursts (GRBs), and was used to predict `pseudo-redshifts' of long GRBs detected by BATSE. I have carried out an extensive study of the correlation in both long and short GRBs. In both cases it is shown to predict statistically reliable pseduo-redshift distributions for all the major GRB detectors (BATSE, Fermi and Swift). However, this method does not accurately reproduce the measured redshifts in the case the redshifts are measured, and hence does not permit GRBs to be used as distance-indicators. Using the pseudo-redhifts, we can estimate the luminosities of GRBs without unknown redshifts in a self-consistent manner. This lets one model the `luminosity function' (LF) of GRBs, both for the long and short cases. The models are then used to predict the rate of GRBs detectable by AstroSat-CZTI, and shows that a good fraction of GRBs are still hidden in the data, due to the fact that currently GRB-searches have only been carried out offline, triggered by detection from other satellites. The short GRB LF is used to predict limits on the binary neutron star merger rate detectable by aLIGO/VIRGO. The implications of the study are highlighted in light of the recent detection of GW170817/EM170817. Efforts to make AstroSat-CZTI a major GRB instrument by the next aLIGO/VIRGO observing run are also discussed.

ASI2018_1390	Muhammed saleem	Contributed Talk
L Resmi, Kuntal Misra, Archana Pai and KG Arun		
Short-GRB afterglows in coincidence with gravitational waves from Binary Neutron Star mergers		

The joint detection of GW170817 and GRB170817A gave the first ever direct evidence for the BNS merger as the progenitor of short Gamma Ray Bursts (SGRBs). Due to the beamed gamma ray emission and short duration, a fraction of SGRBs are likely to be not detected. SGRB afterglow emission is due to an interaction of the jet with the surrounding medium. The afterglow is expected to last for several days and months in various electromagnetic (EM) bands. This makes them potential targets for EM follow up observations of observed GW merger events. Assuming a uniform top hat jet model, an afterglow light curve can be characterized by a 8-dimensional afterglow parameter space which includes source and observer dependent parameters. Using BoxFit hydrodynamic simulation package, we construct a population of afterglow light curves in X-ray, optical and radio bands which are representative of the EM counterparts of the BNS mergers detected by 3 and 5-detector networks of ground based GW detectors in their designed sensitivity. With this population, for the current and future EM facilities, we identify parameter space regions which are required to produce various detection/non-detection scenarios. Further, combining with the BNS merger rates estimated from LIGO-Virgo observation runs, we estimate the number of afterglow detections per year and investigate various physical and observational factors which affect the detection rates.

ASI2018_779	Ruchika	Contributed Talk
Somak Raychaudhury, IUCAA		
The group environment in the Coma supercluster		

We carry out an extensive study of the group environment in the Coma supercluster field, and its effect on galaxy evolution. The Coma Supercluster consists of two Abell clusters, namely Abell 1656 (Coma cluster) and Abell 1367, connected with rich filaments of galaxies and groups. Galaxy groups are selected from the Berlind and Yang group catalogue, which are objectively identified from a spectroscopically complete, volume-limited sample of SDSS galaxies. We study the evolution of galaxies in these groups, which themselves are situated in diverse environments, in terms of their star formation and AGN activity. We characterize these groups based on various intrinsic properties like richness, compactness and dynamical state, as well as their local and larger-scale environment. We combine these properties to identify the dominant factors influencing galaxy evolution.

ASI 2018 Parallel Session – Wednesday, 7th February 2018

Time: 11:30 - 13:00 PGRRCDE (Room no: S11)

General Relativity and Cosmology II [Chairperson: Pravabati Chingangbam]

ASI2018_1526	Tuhin Ghosh	Invited
Tuhin Ghosh (on behalf of the Planck and BICEP2/Keck Array collaboration)		
Measurements of Degree-scale B-mode polarization with BICEP2, Keck Array and Planck		
One generic prediction of cosmic inflation is the existence of a background of gravitational waves, which produces a distinct, curl-like, signature in the polarisation of the cosmic microwave background radiation (CMB), referred to as primordial B-mode signal. Planck polarization maps indicates that the foreground Galactic dust polarization signal dominates over the primordial B-mode signal even in the high-latitude sky. The BICEP/Keck Array program comprises a series of telescopes at the South Pole designed to measure CMB polarization on degree angular scale at multiple frequencies (95, 150, 220 and 270 GHz) to separate well the foreground Galactic dust contamination from the primordial B-mode signal. In my talk, I will present the current status of primordial CMB B-mode detection using multifrequency sky observations.		

ASI2018_1743	Kanhaiya Lal Pandey	Contributed Talk
A. Mangalam; IIA, Bangalore.		
Role of primordial black holes in SMBH formation at high z		
We explore the possibility of accreting primordial black holes as the source of heating for the collapsing gas in the context of direct collapse black hole scenario for the formation of super-massive black holes (SMBHs) at high redshifts, $z \simeq 6 -- 7$. An essential requirement for the direct collapse model to work is to maintain the temperature of the infalling gas at 10^4 K to avoid fragmentation and star formation. We show under the existing abundance limits, that the primordial black holes of masses $\geq10^(-2) M_\odot$, can heat the collapsing gas to an extent that the H_2 formation is inhibited. In the absence of H_2 cooling, the temperature of the collapsing gas stays at $\sim 10^4$ K even as it collapses further, and thus the collapse can go on without fragmentation and lead to a formation of a super massive disk ($10^(4--5) M_\odot$). We also discuss the physics of the collapse of the viscous disk into a massive seed black hole ($10^(4--5) M_\odot$) which can grow into a SMBH in due time through Eddington limited accretion of surrounding gas.		

ASI2018_1617	Lankeswar Dey	Contributed Talk

Mauri Valtonen, University of Turku. A. Gopakumar, Tata Institute of Fundamental Research.

Constraining higher order gravitational wave back-reaction in blazar OJ287 black hole binary

The binary black hole (BBH) central engine of OJ287 exhibits large thermal flares at least twice in every 12 years. The times of these flares have been predicted successfully using the simple rule that they are generated at a constant phase angle of a quasi-Keplerian eccentric orbit. In this model a secondary black hole goes around a primary black hole, impacting the accretion disk of the latter twice per orbital period, creating above thermal flares. New measurements of the historical light curve have been combined with the observations of the 2015/2017 season. The 2015 November/December flare went into the phase of rapid flux rise on the centenary of Einstein's General Relativity, namely on November 25, and peaked on December 5. At that time OJ287 was the brightest in over 30 years in optical wavelengths. Using the light curve of this flare and subsequent synchrotron flares, and comparing it with the points in the historical light curve, we are able to identify the impact record since the year 1886, altogether 25 impacts. Out of these, 10 are timed accurately enough to constrain the orbit of the black hole binary. The set of flare timings determines uniquely the 8 parameters of our BBH central engine model: the two masses, the primary spin, the major axis, eccentricity and the phase of the orbit, plus the two parameters of the standard accretion disk. Since the orbit solution is strongly over-determined, its parameters are known very accurately, at better than one percent level for the BH masses and primary BH spin. The orbit solution shows that the period of the orbit, now 12.055 yr, has decreased at the rate of 38 days per century. This corresponds an energy loss to gravitational waves that is 4.4 +/- 1 % greater than the rate predicted by the standard quadrupolar GW emission. We show that the difference is due to the influence of higher order gravitational radiation reaction contributions to the BBH dynamics that includes the dominant order tail contributions and the orbital shrinkage rate agrees within error limits with the rate calculated by Damour, Gopakumar and Iyer (2004). At present, we are using the system to test General Relativity in certain yet to be explored strong field regime. This involves constraining a hypothetical fifth force that arises as a modification of General Relativity in some models of dark matter, dark energy and unification theory.

ASI2018_912	Subhabrata Majumdar	Contributed Talk

Priyanka Singh (RRI/IUCAA) Biman B Nath (RRI) Joseph Silk (IAP)

Cosmological Missing Baryons hidden in CGM

Baryons, dark matter and dark energy are the primary components of the energy budget in our Universe. Unlike dark matter and dark energy, we are luckier with baryons in the sense that we know what it is. Moreover, we can directly observe baryons. However, a census of baryons shows that, even now, around 30% of baryons are unaccounted for, giving rise to the 'missing baryon' problem. Using stacked observations of galaxies from Planck SZ maps and ROSAT XRay maps, we can robustly estimate the amount and profiles of baryons in a cosmological ensemble of circum-galactic medium (CGM) around galaxies. These newly discovered baryons can potentially solve the missing baryon problem.

ASI2018_1701	Prasanta Kumar Das	Contributed Talk

Atanu Guha and Selvaganapathy J Department of Physics, Bits Pilani, K K Birla Goa Campus, NH-17B, Zuarinagar, Goa-403726

Fermionic dark matter and supernova SN1987A cooling

Light dark matter(1 − 30 MeV) particles which can be pair produced in electron-positron annihilation $e - e + \rightarrow \chi \chi$ inside the supernova SN1987A core take away the energy released in the supernova SN1987A explosion. Using the Raffelt's criteria on the energy loss rate and using the optical depth criteria on the free streaming of the dark matter fermion, we find that the lower bound on the scale Λ of the dark matter effective theory to be $\Lambda \sim$ 1.0E+08 TeV for m χ = 30 MeV. We extend our study in q-deformed statistics scenario and study the impact of it on the scale Λ. Journal Ref. Das etal, Phys.Rev.D 95:015001, 2017.

ASI 2018 Parallel Session – Wednesday, 7th February 2018

Time: 14:30 - 16:00 PGRRCDE (Room no: S1)

Stars, ISM and the Galaxy IV [Chairperson: Biswajit Paul]

ASI2018_508	Anindita Mondal	Contributed Talk

Gargi Shaw, UM-DAE Centre for Excellence in Basic Science, Kalina, Santacruz (East), Mumbai 400098. Ramkrishna Das, S. N. Bose National Centre for Basic Sciences, Block-JD, Sector-III, Saltlake, Kolkata 700106. Soumen Mondal, S. N. Bose National Centre for Basic Sciences, Block-JD, Sector-III, Saltlake, Kolkata 700106.

Calculation of H and He emission line fluxes in Novae spectra

Novae provide an astrophysical laboratory in which we can observe the formation and development of exotic emission lines. For a systematic study of novae, a grid model consisting of all the possible parameter sets is considered in order to understand the physical process. From observed spectra, temperature, velocity etc can be calculated. Using the grid model, we can extrapolate the values of other physical parameters, e.g. luminosity, H-density, elemental abundances etc. In this work, we used the photoionization code Cloudy(c17 version) to create a database of line flux ratios of 56 H and He recombination lines (relative to H beta) prominently seen in novae emission spectra, covering a wide wavelength region. Comparing the observed line flux ratios with the modelled one for a set of known observables, we can determine the other parameter values. For the first time, we are able to quantify the observables systematically over a broad range of parameters. We have compared our results for various novae with those found in the literature and the values are well consistent with previously calculated results. We have also used our method to determine the parameters of the novae RS Oph, KT Eri, and V5558 Sgr.

ASI2018_597	Firoza Sutaria	Contributed Talk

A. Ray (TIFR, Mumbai), J. Murthy (IIA, Bangalore), N. K. Rao (IIA, Bangalore)

UV studies of X-ray and optically bright SNRs.

Galactic Supernovae Remnants (SNRs) provide a unique opportunity to study the very late term evolution of the shock-ISM interaction from a supernova explosion. We present here results from our program to image and study a few, well resolved, x-ray and optically bright, SNRs of varying ages ((18000 ± 9000) yr (Vela) to 5000-8000 yr (Cygnus loop) to 1000 yr (Crab)) in the Astrosat/UVIT FUV and NUV bands. The FUV and NUV broad band filters allow mapping of the [C IV] (1550 Ang.), [He II] (1640 Ang.), and [Mg II] (2800 Ang.) emission features, thus identifying and isolating hot (10$^{4-5}$ K) and intermediate (5000- 8000 K) temperature regions in these SNRs. The Astrosat/SXT allows simultaneous mapping of the same regions in the soft x-ray (0.2-10 keV) bands, at temperatures of (10^{6-7}) K. Coupling these observations with high-resolution, soft x-ray, observations of these regions from {\it Chandra} and XMM-{\it Newton}, and cool, optical regions from archival data, we study the temporal evolution of SNRs from different classes of SNe, in a varying range of environments, in the UV.

ASI2018_1597	Barnali Das	Contributed Talk

Poonam Chandra (National Centre for Radio Astrophysics, Tata Institute of Fundamental Research, Pune, India) Gregg A. Wade (Department of Physics, Royal Military College of Canada, Canada)

Discovery of Electron Cyclotron MASER Emission from the magnetic chemically peculiar star HD 133880

In this talk, we present the discovery of coherent radio emission from the magnetic chemically peculiar (MCP) star HD 133880. This young main sequence star is only the second MCP star (after CU Vir, in which the phenomenon was discovered 17 years earlier) to show this phenomenon. We will present observations of HD133880 obtained at 610 MHz with the Giant Metrewave Radio Telescope (GMRT) covering nearly the full rotation cycle of the star. The observations indicate narrow pulses in the light curve, corresponding to an order-of-magnitude flux density enhancement, nearly 100% right circularly polarised, and a brightness temperature in excess of 1E12 K. Using the phase of enhancement and the known longitudinal magnetic field variation, we attribute the enhancement to the Electron Cyclotron MASER Emission (ECME) process. The ECME is an important tool to probe any change in the stellar rotational period. This discovery is important since it shows that ECME is not a phenomenon unique to CU Vir, and if probed at low enough frequencies other MCP stars may show this phenomenon too. Our study emphasizes the need to obtain more observations of MCP stars at low radio frequencies (currently very few observations exist for frequencies below 1420 MHz) so that we can also answer the question of whether ECME is a characteristic of MCP stars, which will significantly improve our understanding of the magnetospheric physics of this class of stars.

ASI2018_562	Subhajeet Karmakar	Contributed Talk

Jeewan C. Pandey Aryabhatta Research Institute of observational Sciences (ARIES), Nainital

A Very Long and Hot X-ray Superflare on an RS CVn type eclipsing binary SZ PSc

We present an analysis of a very large flare from the 3.966-day period RS CVn type eclipsing binary system SZ Psc which triggered the Swift Burst Alert Telescope (BAT) hard X-ray detector at 09:08:42 UT on 15 January 2015. The flare lasts more than 100 ks is the longest duration X-ray flare ever observed as the best of our knowledge. The exponential rise and decay time of the flares were derived to be 2 and 5 hr, respectively. The peak X-ray luminosity in 0.3-10 keV energy band reached to a value of 4.8 x 10^{33} erg s^{−1}, which is 89 times more than that of the observed minimum value.Spectral analysis indicates a presence of one temperature corona, which represents the flare temperature. The temperature is one of the highest observed spectroscopically with a peak at 258 MK, which is ~ 10 times more than the observed minimum value. The peak stellar abundances were derived to be 0.7 times more than solar abundances, which is also 10 times more than that of the minimum abundance observed on SZ Psc. The Emission Measure followed the flare light curve and peaked at a value of 2.53 × 10^{54} cm^{−3}, which is ~17 times more than the quiescent value. The length of the flaring plasma was derived to be 7.3 x 10^{11} cm, whereas the loop apex pressure and the peak density were derived to be 9.1 x 10^{4} dyne/cm^{2} and 5.8 x 10^{11} cm^{-3}, respectively. The total magnetic field estimated to produce the flare is 1.5 kG. Preliminary analysis suggests that the large magnetic field at the coronal height is due to the presence of extended convection zone of the sub-giant and the high orbital velocity.

ASI2018_1297	K. Sriram	Contributed Talk

Sriram K., Malu S., P Vivekananda Rao

Investigating the dynamical instability criterion for asynchronous binary systems

Low mass ratio contact binary systems are potential candidates for merger, thus making their study extremely crucial. In this work we study the dynamical instability criterion in terms of the critical mass ratio of a contact binary system. The merger hypothesis of a binary system requires it to enter into a phase of tidal instability which would then result in the components spiraling in towards an ultimate merger. Rasio (1995) used the Roche lobe limits estimated by Eggleton (1983) to arrive at a critical separation between the two components and it was shown that the minimum mass ratio (qmin) of the contact binary system would depend upon the dimensionless gyration radius (k1) of the primary component, which would vary for convective and radiative systems. In general, to arrive at such a result the system is considered to be synchronous with its orbit and with each other. In the present study, we investigated the dependence of minimum mass ratio of the contact binary system on the dimensionless gyration radii of the components by introducing asynchronocity parameters in the orbital and spin angular momentum of the system. We found that the minimum mass ratio would increase for asynchronous systems depending on the structure of the primary component.

ASI2018_680	Malu S	Contributed Talk

Malu S., Sriram K., P. Vivekananda Rao

Evidence of a tertiary component in Kepler contact binary K2 EPIC 2073314

Contact binary systems, especially those which are of low mass ratio, are considered to be crucial astrophysical sources to understand the merger scenario. Despite their high number density (1/500 FGK dwarf stars) there is a lot of uncertainty relating to their formation and merger. Using a diagnostic tool like the O-C diagram to study the long term behavior of such systems is therefore vital to understand their evolution. We present the photometric study of a low mass ratio deep contact binary system K2 EPIC 2073314 with a mass ratio of ~ 0.15 and a high inclination angle of ~ 77. Based on the high fill-out factor (~ 57 %) obtained from light curve modeling, we find the system to be in significant geometrical contact. O-C study revealed that the system is currently undergoing a period increase with mass being transferred from the secondary to the primary component while previously it is found to be decreasing. Superimposed on the secular increase and decrease of the period, is a systematic sinusoidal variation which we attribute to the LITE effect due to a third companion. Various orbital parameters of the third body companion are consequently determined. The tertiary component is found to have an orbital period of ~ 12 years with an orbital eccentricity of e ~0.5. Based on a conservative mass transfer assumption, we expect the system to meet the critical mass ratio range (0.07-0.09) in 10^7 yrs. The low mass and high fill out factor configuration of the system makes it a promising candidate to understand stellar mergers.

ASI 2018 Parallel Session – Wednesday, 7th February 2018

Time: 14:30 - 16:00 PGRRCDE (Room no: S3)

Instrumentation and Techniques I [Chairperson: K. Sankarasubramanian]

ASI2018_1844	Abhijit Chakraborty	Invited
N/A		
How to achieve sub-1m/s precision Radial Velocity using a Stabilized HR Spectrograph		
The First exoplanet as a Hot Jupiter was discovered in 1996 with of precision of sub-10m/s. Over the last two decades our understanding of spectrograph stability have improved by many times along with new technology developments. These have resulted into precision in Radial Velocity to sub-1m/s. At present there are a few spectrographs that can do 1m/s - 2m/s on bright stars; and HARPS-N and HARPS-S can do sub-1m/s (consistently about 80cm/s) and sometimes 50cm/s or better on the sky on an experimental basis. Going to sub-1m/s have become a necessity in order to determine the mass of exoplanets which are Earth-like or massive Earths (2-10 Earth Mass planets). I will discuss the technology challenge to achieve sub-1m/s precision in my talk.		

ASI2018_1746	Shashi Bhushan Pandey	Contributed Talk
ARIES 4KX4K CCD Imager team		
4KX4K CCD Imager for the 3.6m DOT and first light results		
I will present about the development of the first light instrument called '4KX4K CCD optical Imager', first light instrument for the 3.6m Devasthal Optical Telescope. I will also present brief results based on the data taken during first light tests.		

ASI2018_1174	Archita Rai	Contributed Talk

Shashikiran Ganesh, PRL; A B Shah, PRL; Deekshya Roy Sarkar, PRL; Prashanth Kasarla, PRL; P S Patwal, PRL; S N Mathur, PRL; Hitesh Kumar Adalja, PRL; Sachindra Naik, PRL; K S Baliyan, PRL.

Near-Infrared Imaging Spectro-Polarimeter (NISP) instrument for PRL 2.5-m telescope.

The back-end instruments are backbone of any Astronomical Telescope. We are going to have a 2.5-m telescope at the Mt.Abu Infrared Observatory (MIRO) very soon. There is, therefore, requirement of a set of instruments to extract science from this telescope.In this regard, a Near-Infrared imaging spectro-polarimeter is being designed and developed at the Astronomy & Astrophysics Division of the Physical Research Laboratory, Ahmedabad. The instrument will facilitate different techniques i.e Imaging, Spectroscopy & Polarimetry for the observation. It will operate in the near-IR wavelength range of 0.8 micron – 2.5 micron (Y, J, H, Ks bands). The polarization function will be used in combination with the imaging or spectroscopic mode, in addition to the imaging and spectroscopy operations available. The design will enable rapid switching between the various modes of observations. With all these multi-purpose functions the instrument is expected to serve as a workhorse instrument on the 2.5-m telescope. A large range of science topics (covering solar system to extragalactic astronomy) are proposed to be studied using this instrument. This contribution will cover the basic design goals for the instrument. The necessary technical details and the current status of the design will also be discussed at the conference.

ASI2018_1648	Kaushal Buch	Contributed Talk

Kaushal D. Buch, Atul Ghalame, Bela Dixit, Siddhesh Hande, Priya Hande, Ajithkumar B, Jayaram N. Chengalur Giant Metrewave Radio Telescope, NCRA-TIFR, Pune, India

Initial Developments in the Design and Implementation of FPA Beamformer for the Expanded GMRT

The Expanded GMRT (eGMRT) is a proposal for carrying out a feasibility study for possible expansions to the Giant Metrewave Radio Telescope (GMRT). These expansions would help GMRT retain its status as one of the most sensitive instruments at low radio frequencies. The three possible areas proposed for expansion are to increase the field of view (in the 550-900 MHz band), increase angular resolution and improve sensitivity to the extended radio emission. In this talk, we would focus on increasing the field of view using Focal Plane Array (FPA) and the initial developments for the associated beamformer. Various hardware and software beamformer implementation options for the development of prototype FPA beamformer would be described along with the future plans. We will discuss the computational and cost estimates for a 300 MHz, 30-beam FPA beamformer for the eGMRT. Narrowband and wideband FPA beamformers are being designed using the CASPER* tool-flow and implemented on the FPGA boards (called ROACH), which serve as a backend to the 144-element FPA procured from ASTRON. Both, the narrowband (32 MHz bandwidth) and the wideband (300 MHz bandwidth) beamformers comprise of a single ROACH board receiving inputs from a 64-channel ADC boards and high-speed ADC boards, respectively. Results from a 16-input, 4-beam, 1024 spectral channel, narrowband beamformer would be described. A novel scalable design for packetized wideband beamformer and its testing using multiple ROACH boards is underway. This design carries out cross-correlation on recorded data. To make the design scalable and modular, beamforming for a smaller set of elements is implemented on individual ROACH boards and the final beamforming is carried out in the acquisition computer. In parallel, a software-based approach using CPU-GPU platform is being developed. This would enable raw voltage recording and narrowband beamforming. Various beamforming algorithms are being studied and would be implemented in the software for FPA calibration. The current status, test methodology, and future projections including the initial test results from a free-space test range will be discussed. Also, plans for commissioning the FPA on a dish to carry out experimental observations with these beamformers would be described. *https://casper.berkeley.edu/

ASI2018_861	Yogesh Wadadekar	Contributed Talk

C. H. Ishwara-Chandra (NCRA-TIFR) and Divya Oberoi (NCRA-TIFR)

GMRT Archive Processing Project

The GMRT Online Archive houses over 60 terabytes of interferometric observations obtained with the GMRT since since the observatory began operating as a facility in 2002. The utility of this vast data archive, likely the largest of any Indian telescope, can be significantly enhanced if first look (and where possible, science ready) processed images can be made available to the user community. We have initiated a project to pipeline process GMRT images in the 150, 240, 325 and 610 MHz bands. The SPAM pipeline developed by Huib Intema is being used for this purpose. A prototyping run has been successfully completed and the results are encouraging. The thousands of processed continuum images that we will produce will prove useful in studies of distant galaxy clusters, radio AGN, as well as nearby galaxies and star forming regions. Besides the scientific returns, a uniform data processing pipleine run on a large volume of data can be used in interesting ways. For example, we will be able to measure various performance characteristics of the GMRT telescope and their dependence on waveband, time of day, RFI environment, backend, galactic latitude etc. in a systematic way. Since the SPAM pipeline also carries out direction dependent modeling of ionospheric phase errors, we will also be able to measure differential ionospheric phase delays over thousands of sightlines over the entire solar cycle to better understand the properties of the earth's ionosphere. A variety of data products such as calibrated UVFITS data, sky images, Hierachical Progressive Survey (HiPS) images, PyBDSF catalogs, AIPS processing logs will be delivered to users via the GMRT online archive. Data products will be compatible with standard Virtual Observatory protocols.

Thursday, 8th February 2018

Thursday, February 8th , 2018

Plenary Session 2 - SCIENCE WITH THE UPGRADED GMRT [Chairperson: K. S. Dwarakanath]

Time: 9.30 - 11.00 (Venue: Prof. G. Ram Reddy Centre for Distance Education, Platinum Jubilee Auditorium)

ASI2018_845	Yashwant Gupta	Plenary

National Centre for Radio Astrophysics

The upgraded GMRT : Overview and Prospects for Pulsar Studies

In the 15 years since its inception, the Giant Metrewave Radio Telescope (GMRT) has established itself as a major international Radio Astronomy facility in the low frequency regime of 150 MHz to 1500 MHz. Consisting of 30 fully steerable antennas of 45 metre diameter each, it can be used as an aperture-synthesis array for imaging, as well as a phased array to study compact radio sources such as pulsars, in any of five discrete observing bands, with a maximum bandwidth of 32 MHz. The GMRT is currently undergoing a major upgrade that will improve its sensitivity by a factor of upto three and make it a much more versatile instrument. The goal is to have seamless frequency coverage from about 100 to 1500 MHz, with a maximum instantaneous bandwidth of 400 MHz; improved receiver systems with higher G/Tsys; versatile digital back-end correlator and pulsar receiver using the latest FPGA and GPU technologies; revamped servo system; sophisticated monitor and control system; and matching improvements in infrastructure and computing. This upgrade will keep the GMRT at the forefront as one of the most sensitive facility in the world in the 100 to 1500 MHz range, till the SKA phase I comes along. Most of the sub-systems of the upgraded GMRT (uGMRT) are nearing completion and delivery, and the upgraded observatory is being made available to users in a phased manner from April 2016 onwards, and the full uGMRT is expected to be released by April 2018. An overview of the upgrade activities, their current status and future plans, including specific challenges faced, will be described. The uGMRT will allow much more sensitive observations of pulsars to be carried out. Some of the first science results in this context will be presented, and the future potential for pulsar studies with the uGMRT will be highlighted.

ASI2018_427	Ruta Kale	Plenary
	NCRA-TIFR	

Clusters of galaxies with the Upgraded GMRT

Clusters of galaxies are the largest gravitationally-bound systems in the Universe composed of dark matter, galaxies and diffuse intra-cluster medium (ICM). Fundamental questions of the non-thermal energy content in the ICM and the role of ICM in the evolution of embedded radio sources are still not answered. Extended radio sources associated with cluster galaxies and those associated with the ICM itself are the direct probes of the non-thermal components, namely, the magnetic field and cosmic rays. The feedback at the cluster core and the merging of sub-clusters stir the ICM and drive shocks and turbulence in it. Thus galaxy clusters are ideal laboratories to study the evolution of radio galaxy lobes in dense environments, the acceleration of particles in shocks and turbulence and the amplification of magnetic fields. These phenomena leave imprints on the radio spectra and can be probed by detailed spatial and spectral study in radio bands. The Upgraded Giant Metrewave Radio Telescope (U-GMRT) has key capabilities that are well suited to study radio source evolution in clusters. The broadband spectral coverage and the corresponding enhancement in the sampling of extended sources provide an unprecedented view of the spectral morphology of extended cluster radio sources. I will present results from our application of U-GMRT observations of galaxy clusters to probe the physical conditions in relic radio sources and particle acceleration in the ICM.

ASI2018_1371	Nirupam Roy	Plenary
	IISc	

Spectral line observations with the upgraded GMRT

The Giant Metrewave Radio Telescope, arguably the best low frequency radio telescope in the present era, is currently being upgraded with the aim of significantly improving its capabilities. The upgradation includes better frequency coverage, larger instantaneous bandwidth, improved receiver system, better capabilities of the back-end correlator with more spectral channels and real time flagging option, and matching improvements in other supporting systems. The improved sensitivity, frequency coverage and spectral resolution, much of which has already been implemented, make uGMRT a key low frequency facility for the coming years. With the improved capabilities, it is now possible to use uGMRT more effectively for both continuum and spectral line observations. For example, better frequency coverage opens up the possibility of exploring larger redshift range as well as more spectral line transitions, whereas larger instantaneous bandwidth makes it an ideal instrument for large blind spectral surveys. Furthermore, the higher spectral resolution not only gives us a detailed view of the sources, but also allows for better removal of the interference. In this presentation, I will talk about the potential of the uGMRT for spectral line observations of the local and the high redshift universe. I will present the current status and some of the early results from recent observations. With such unique capabilities, uGMRT is expected to be a proficient pathfinder of the Square Kilometre Array.

Thursday, February 8, 2018

Thesis presentations I [Chairperson: Annapurni Subramanian]

Time: 11:30 - 13:00 (Venue: Prof. G. Ram Reddy Centre for Distance Education, Platinum Jubilee Auditorium)

ASI2018_1580	Rahul Kothari	Thesis

Shamik Ghosh (IIT Kanpur) Pranati Rath (IHEP, China) Pankaj Jain (IIT Kanpur) Gopal Kashyap (Galgotia University Noida)

On the Study of CMB Dipole Modulation and Its Relationship with Spatial Inhomogeneity and Spacetime Noncommutativity

Cosmic Microwave Background Radiation (CMBR) has been an important observational tool for testing cosmological theories since its discovery in 1964. The radiation was predicted as a consequence of the Big Bang Cosmology. CMBR is characterized by angular dependence of its temperature field. Discovery of polarization in 2002 opened new gates to its understanding. Statistical properties of CMBR can be understood by studying correlation of field at two different angular locations. A condition known as cosmological principle states that this correlation should depend only on the angle between the points and be independent of their angular locations. Furthermore, the correlation is measured with a quantity known as power. For a long time the temperature field was assumed to satisfy the cosmological principle. The same principle would imply equal powers in any two given hemispheres. Yet in 2004, different amount of powers was found in different patches of the sky, thereby posing a potential violation of the cosmological principle. This anomaly was termed as Hemispherical Power Asymmetry. Please note that the effect is found only at large angular scales, i.e., the correlation starts to depend upon angular locations only if points are widely separated. The dissertation explores the possibility of studying this isotropy violation by modifying initial cosmological conditions. The basic idea is that universe acquires isotropy during later stages of exponential expansion of universe known as inflation. So it is these anisotropic signatures which are responsible for Power Asymmetry. We studied Power Asymmetry using two models designated as 'anisotropic' and 'inhomogeneous'. The predictions of models were found to be very interesting. The two models suggest complete opposite behaviours. Thus, it will be fascinating to rule out one of the models based on observations. At this stage, the modification of initial conditions and introduction of two models might seem ad hoc. It would be desirable to derive them with the help of fundamental physics. We found an unexpected relation between the anisotropic model and spacetime noncommutativity. Spacetime noncommutativity is the fascinating regime of quantum gravity. Thus our idea relates the Physics happening at quantum gravity scales which are the smallest conceivable scales with Power Asymmetry, observed at largest angular scales. The Power Asymmetry in CMB temperature field can be studied by giving it a preferred direction. This is called as field modulation. Now, it is possible that physics causing power asymmetry in the temperature field can give rise to a similar effect in the polarisation as well. In the dissertation, we studied a specific kind of modulation introduced in the

polarization field. Amazingly, we found that correlations are beautifully related to combinatorics and algebra.

ASI2018_1658	Visweshwar Ram Marthi	Thesis

Visweshwar Ram Marthi, Somnath Bharadwaj, Suman Chatterjee, Jayaram Chengalur

Towards detecting redshifted HI with the Ooty Wide Field Array

The Ooty Radio Telescope (ORT) has been upgraded to operate as the Ooty Wide Field Array (OWFA), one of whose aims is to measure the neutral hydrogen content and structure at z = 3.3. The upgrade results in a highly redundant configuration that is well suited to measuring the power spectrum at large scales with high precision. In my thesis, I have developed redundancy-aware methods and algorithms for calibration and power spectrum estimation. We learn specifically that the most severe limitations would arise from the foregrounds interacting with the instrument. However, given the sensitivity to large scales, OWFA would be able to rapidly map the Galactic foreground emission over large regions of the sky.

ASI2018_1535	Samir Choudhuri	Thesis

Supervisors: Prof. Somnath Bharadwaj (IIT Kharagpur) and Dr. Sk. Saiyad Ali (Jadavpur University)

Visibility-based Power Spectrum Estimation for Low-Frequency Radio Interferometric Observations

The observations of the redshifted 21-cm signal contain a wealth of cosmological and astrophysical information. The study of this signal from high redshift Universe provides an opportunity to learn about the properties of the first galaxies and stars. But, the problem is particularly challenging due to the presence of foregrounds and system noise. In this thesis we present a visibility based estimator namely, the Tapered Gridded Estimator (TGE) to quantify the fluctuations of sky signal statistically. The TGE has three novel features. First, the estimator uses gridded visibilities to estimate the power spectrum which is computationally much faster than individually correlating the visibilities. Second, a positive noise bias is removed by subtracting the auto-correlation of the visibilities which is responsible for the noise bias. Third, the estimator allows us to taper the field of view so as to suppress the contribution from the sources in the outer regions and the sidelobes of the telescope's primary beam. We validate the estimator and its statistical error using realistic simulations of Giant Meterwave Radio Telescope (GMRT) 150 MHz observations. We also show that the TGE successfully suppresses contributions from the outer region of the primary beam. Finally, we have used the TGE to estimate angular power spectrum for two of the fields observed by TIFR GMRT Sky Survey (TGSS). We find that the sky signal, after subtracting the point sources, is dominated by the diffuse Galactic synchrotron radiation across the angular multipole range 200 to 500.

ASI2018_698	Pragati Pradhan	Thesis
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Pulse Profile Studies and Hard X-Ray Properties of Neutron Stars

Neutron stars are known to be strong emitters of electromagnetic waves in a wide band of energy starting from the radio frequency to very high energy gamma-rays. These enigmatic objects show complex emission pattern in a wide energy band and the broad band emission characteristics of such neutron stars is an extremely challenging topic in high energy astrophysics. During the past years, the operation of the present generation X-ray satellites, such as RXTE, XMM-Newton, Chandra, Swift, INTEGRAL and Suzaku has opened a new era in the study of X-ray binaries. A recent X-ray mission ASTROSAT launched by India will now be adding an extra mileage in X-ray astronomy. This thesis mainly is a study of detailed timing and spectral analysis of accreting High Mass X-ray Binaries (HMXBs) and supergiant fast X-ray transients (SFXTs) that host neutron stars as their compact object. Compared to classical systems, SFXTs show a much more pronounced variability, comprising sporadic short X-ray outbursts and fainter flares with fast rise times (tens of minutes) and typical durations of a few hours. Outside these events, the SFXTs have average X-ray luminosities that are 2-3 orders of magnitude lower than the classical systems with similar orbital periods. In the latter half of the thesis, we have also explored the pulse profile evolution of rotation powered pulsars (RPPs) and dicussed the physical significance of the findings. Using archived data from XIS and PIN instruments onboard Suzaku, we have carried out a detailed broadband (0.3-70 keV) spectral analysis of all classical HMXBs and SFXTs by fitting the broadband X-ray spectrum of the sources with a powerlaw model modified with a high energy cut-off, emission lines and cyclotron line feature(s) (where required). Such a comprehensive study covering luminosities spanning five orders of magnitude is the first of its kind so far. We studied the correlation between various spectral parameters and discussed the findings in terms of different properties of the stellar winds and wind accretion mechanisms.Taking a clue from the remarkable distinction in absorption in Suzaku spectra of SFXTs and classical HMXBs (which is further accentuated by rigorous spectral analysis of all archived XMM data till July 2016), we propose that this difference between two classes can be explained either by assuming that the stellar winds in the SFXTs are less powerful than those in classical systems or that the interaction between the compact object and the stellar wind in these two classes is not the same. Further, we also discuss the elaborate timing and spectral analysis of individual NS-HMXBs like OAO 1657-415, SW J2000.6+3210, 4U 0114+65 and map the varied environs around these systems, albeit the same class, using Suzaku, Swift and INTEGRAL data. Lastly, we elaborate on the timing analysis of RPPs like PSR B1509-58 by studying the stability of the pulse profile shape with the Fourier decomposition technique using all available data from RXTE-PCA during the mission lifetime. We explored the usefulness of this pulsar in its use for interplanetary spacecraft navigation and also present a physical interpretation arising from this pulse profile study.

Thursday, February 8, 2018

Thesis presentations II [Chairperson: Annapurni Subramanian]

Time: 14:30 - 16.00 (Venue: Prof. G. Ram Reddy Centre for Distance Education, Platinum Jubilee Auditorium)

ASI2018_1606	Tirtha Pratim Das	Thesis

Tirtha Pratim Das Scientist, Vikram Sarabhai Space Centre, ISRO, Trivandrum

Study of noble gases in lunar exosphere using the CHACE-MIP observation of Chandrayaan-1

Earth's Moon has a surface boundary exosphere (SBE), which is a result of the dynamic equilibrium between several source and sink processes. The lunar exosphere is also known to be highly variable, revealing a strong diurnal cycle and responds promptly to the fluctuations in the solar wind flux. The solar forcing on the Moon in terms of radiation, particles and fields make the sunlit side of the lunar exosphere more dramatic than the night side. On 14 November 2008, the CHandra's Altitudinal Composition Explorer (CHACE) mass spectrometer (mass range: 1 to 100 amu) investigated of the sunlit side of the lunar neutral exosphere aboard the Moon Impact Probe (MIP) in the Chandrayaan-1 mission. The CHACE experiment yielded the first-ever (and till date unique) set of observations of the sunlit lunar exosphere with broad latitudinal (40 deg N to 89 deg S) and altitudinal (98 km to surface) coverage. The lunar exosphere is studied using noble gases (Ar, Ne, He) and H2 as tracers. The important outcomes of the experiment are listed below, which are the first of their kind. 1. Two dimensional (latitude versus altitude) distribution of lunar exospheric Ar, Ne and H2 based in the sunlit lunar exosphere along the plane of the MIP trajectory is established. 2. Results on the spatial heterogeneity and indications of inter-hemispherical asymmetry of radiogenic activity in the lunar interior through the measurement of the 40Ar:36Ar ratio. 3. Empirical formula connecting the surface number density of lunar Ne and the surface temperature is proposed. 4. Upper limit of the He density in the sunlit lunar exosphere under extreme astronomical conditions is proposed. 5. Spatial heterogeneity of H2 in the lunar exosphere is brought out. These results evoked enough scientific curiosity which prompted detailed in-situ investigation of the lunar exosphere from a polar orbiting platform in Chandrayaan-2, and are potential inputs for constraining the lunar exospheric models.

ASI2018_1723	Sowmya Krishnamurthy	Thesis

Nagendra K. N. Indian Institute of Astrophysics, Bangalore.

Scattering polarization with Paschen--Back effect as a tool to diagnose the magnetic structuring of the solar atmosphere

When the magnetic field is sufficiently strong, it produces a splitting whose pattern is very different from that expected for the Zeeman effect. Apart from completely splitting the atomic lines, it also causes the magnetic substates of different atomic states to interfere. Such an effect of the magnetic field is called Paschen--Back effect. It acts in those domains of field strength that are not accessible through the standard techniques based on the Zeeman effect. Due to the different magnetic field strength regimes in which they operate, the Hanle, Zeeman, and Paschen--Back effects complement one another. The role played by the Paschen--Back effect in shaping the polarization profiles of the solar spectral lines needs to be understood in order to explore the possibility of using the Paschen--Back effect as a diagnostic tool for solar magnetic fields. To this end, in my PhD thesis, we developed the scattering theory of Paschen--Back effect in atomic states by accounting for the redistribution in the frequencies of the photons due to Doppler shift and applied it to analyze the polarization profiles of diagnostically important solar spectral lines. This study is an important step forward in understanding the effects of strong magnetic fields and their manifestation in the polarized line radiation emerging from the solar (or stellar) atmosphere. I shall discuss the signatures of Paschen--Back effect in polarization that we identified and their usefulness for studying magnetic fields on the Sun.

ASI2018_931	Krishna Kumar Pandey	Thesis

1. K.M.Hiremath, 2. G. Yellaiah 1. Indian Institute of Astrophysics, Bangaluru,India. 2. Osmania University, Hyderabad, India

Study of solar activity during solar cycles 21-23

1. Dynamics of the Sun, an episode of ~11 years solar cycle, drives the solar activity, space weather and near-Earth space environment which has a greatest impact on human civilization. Solar observations by space-borne instruments, have led 'solar magnetic field and associated flare activity' research in a new horizon to uncover, the evolution of solar magnetic/flare activity and, Solar cycle's varying characteristic. One of the important features, newly emerged, as the Sun's different latitude has vivid characteristics. Thus Sun needs to be studied in segments (North, South hemisphere, low and high latitude) and smaller zones of area like latitude strips of 0-50 or 0-100 to understand the intrinsic nature of solar atmospheric variations. Asymmetry/symmetry pattern, despaired butterfly wing and mysterious evolution of Gnevyshev gap are few more interesting subjects of this study. 2.We emphasize the comparison of the results with traditional solar activity indices. The variations in sunspot area have closest link with the transient energy release in the solar corona. The persistency of asymmetry significantly increases up to 13 Carrington rotations (Joshi et al., 2015). The time evolution of the soft x-ray flare activity confirms the evolution of dual peaks in Gnevyshev gap. The distinctness of the double-peak structure varies between different cycles and activity parameters. 3. We report an interesting indication, that the strength of asymmetry lowers at ~5-6CRs, ~12CRs, and ~18CRs (Pandey et al., 2016) related to Rieger type periodicities. This is conjectured as, while asymmetry evolves with phases of solar cycle, symmetry also emerges probably to counter the excess of asymmetry. The number of significant asymmetry points probably depends upon the solar heights. 4.We have investigated, during 1996–2008 the Solar Cycle 23, an unusually multi-structured maximum with anomalous N-S despaired butterfly wing diagram. Incremental pattern of latitudinal magnetic coupling between consecutive latitude suggested that the anomaly in Cycle 23 (Pandey et al., 2015) was due to M-class flare in southern wing. This anomaly may be considered as precursor of forth coming minima of a weakest solar cycle 24 in ~100 years. 5.We investigated the latitudinal evolution of Gnevyshev gap in different activity parameters and found that magnitude of Gnevyshev gap appears to be increasing and more resolved in the following order. Whole disc < solar atmospheric height < hemisphere < latitude < homogeneity class. On this basis, for the first time, we proposed the time interval determination between two or multiple peaks (Pandey et al., 2017) and reported the formation of Gnevyshev gap at high latitude activity also. This led to conclude that the end phase of low latitude (< 500) activity is linked with Gnevyshev gap formed at high latitude (> 500) activity. During Gnevyshev gap the high energy events are minimized where as very low energy events continue their occurrence. We conjectured that during this gap the activity energy is scattered and absorbed in empowering various functions. Different valley depth indicates the absorption of energy is selective and depends upon energy threshold.

ASI2018_807	Shubham Srivastav	Thesis

G. C. Anupama (Indian Institute of Astrophysics)

Observational Studies of Low Redshift Supernovae

Supernovae (SNe) are explosive transient events that mark the end stages of stellar evolution. This work presents a study of low redshift, hydrogen deficient (Type I) SNe, with emphasis on SNe of type Ia. The data were primarily obtained from the 2-m Himalayan Chandra Telescope (HCT). SNe Ia are caused by thermonuclear disruption of accreting White Dwarfs (WDs). In general, SNe Ia follow the width-luminosity relation, making them valuable cosmic standard candles. However, the nature of the WD companion and the details of the explosion physics remain poorly understood. The homogeneous nature of SNe Ia as a class of events notwithstanding, a substantial diversity is undeniably present. This diversity can be traced ultimately to different progenitor scenarios and explosion mechanisms. `Normal' Ia events constitute $\sim 70 \%$ of all SNe Ia and show minimal scatter in their properties, making them most useful for cosmology. A fraction of SNe Ia, termed as SN 1991T-like events, show slow declining light curves relative to normal events, and are generally overluminous. Another fraction of SNe Ia, the SN 1991bg subclass occupy the other end of the luminosity distribution, with fast declining, narrow light curves, low luminosities and very red intrinsic colours. The diversity in SNe Ia, and in particular the subclass of peculiar events, poses a challenge to theoretical progenitor and explosion models. The normal SNe Ia 2014J, 2014dg and 2011ao are studied in this work. Analytical modelling of their bolometric light curves suggests a total ejected mass of ~ 1.4 M$_{\odot}$, consistent with the Chandrasekhar limit. This is consistent with the notion that normal SNe Ia originate from Chandrasekhar mass WDs, that explains the low scatter in their observed properties. `Transitional' SNe Ia have properties intermediate to normal and extremely fast declining, subluminous 1991bg-like events. Transitional events thus signify a link between normal and subluminous SNe Ia and hold the key to understand the progenitor scenario. Transitional SNe 2015bp, iPTF13ebh and 2003gs are studied in this work. Modelling the bolometric light curves of SNe 2015bp and 2003gs suggests a total ejected mass of ≤ 1 M$_{\odot}$, indicating a sub-Chandrasekhar mass WD progenitor. Stripped envelope core collapse SNe (types Ib and Ic) form a relatively rare subclass of SNe. A study of the type Ib event iPTF13bvn is presented in this work. Fitting analytic models to the bolometric light curve of iPTF13bvn indicates a small ejecta mass, thus ruling out a single, massive Wolf Rayet star as the progenitor. Finally, future prospects in supernova astronomy are discussed in the context of upcoming wide-field, high sensitivity and high cadence surveys, and advanced observational facilities.

ASI 2018 Parallel Session – Thursday, 8th February 2018

Time: 14:30 - 16:00 PGRRCDE (Room no: S1)

Sun and the Solar System I [Chairperson: Nandita Srivastava]

ASI2018_1370	Abhishek Kumar Srivastava	Invited

A.K. Srivastava Department of Physics, Indian Institute of Technology (BHU), Varanasi-221005, India.

On Understanding New Heating Candidates for Sun's Corona

Understanding the existence of the Sun's hot corona and supersonic solar wind is the outstanding problem in solar astrophysics. Although magnetohydrodynamic (MHD) wave modes and dissipation of magnetic energy via direct reconnection process contribute to heating and the mass transport of the solar atmosphere, yet the direct signature of such processes often generates extensive debate. In the present talk, I review the development on understanding the physics of potential heating candidates in the Sun's atmosphere. I also discuss two firstly directly observed physical processes, e.g., high-frequency torsional Alfven waves in the fine structured magnetic tubes (Srivastava et al., 2017, Nature SR, 7, 43147), and pseudo-shock sources in the solar active regions (Srivastava et al., 2017, Nature Astronomy, under-review) as new heating candidates in Sun's corona. I demonstrate that they serve as substantial sources providing sufficient Poynting flux not only to energize the localized inner corona but also to originate the wind.

ASI2018_383	Dipankar Banerjee	Contributed Talk

Dipankar Banerjee and Digitization team, Indian Institute of Astrophysics

Long term study of the sun using Kodaikanal Digitized data

At the Kodaikanal (KKL) observatory we have four sets of data consists of While light photoheliograms since 1904, the Ca-K line spectroheliograms since 1906, Ha spectroheliograms since 1912 to 1998 and K-pr prominences spectroheliograms since 1912 to 1998. All these data are observed with same instruments with no change in their optics throughout the 100 years. Thus these uniform and contiguous images of 100 years are extremely valuable to study the long term variations of the Sun over a century. We have recently digitized al these dataset and made it open to the global community through the portal https://kso.iiap.res.in. In this talk I will present a summary of recent science results from this digitized archive

ASI2018_798	Divya Oberoi	Contributed Talk

Atul Mohan (NCRA-TIFR), Surajit Mondal (NCRA-TIFR), Rohit Sharma (NCRA-TIFR), Akshay Suresh (Cornell University), Leonid Benkevitch (MIT-Haystack Observatory), Iver Cairns (Sydney University), Kamen Kozarev (Bulgarian Academy of Sciences), Colin Lonsdale (MIT Haystack Observatory), Patrick McCauley (Sydney University), John Morgan (Curtin University)

Solar radio astronomy at low radio frequencies: The dawn of a new era

The low radio frequency Sun is much more dynamic than what is observed at higher frequencies. The bulk of this dynamics comes from short-lived narrow-band features arising from non-thermal emission processes. Interestingly, such features are often also seen even during periods of low solar activity. As opposed to emissions at other wavelengths, which are thermal in nature, emissions at these frequencies arise from coherent plasma emission mechanisms. As a consequence, these emissions form a very effective probe of processes involving much lower levels of energy. This is vindicated by the fact that these emissions tend not to have counterparts at higher wavelengths like EUV or X-rays. While these advantages of low-radio frequency observations have been appreciated for a while, their application has been comparatively limited. The most important reason for this has been that tracking the rapid changes in solar emission across time, frequency and morphology required a spectroscopic snapshot imaging capability over a wide band, which, till recently, was beyond the available instrumentation. Riding on the wave of the enormous progress in digital technology, a new class of radio interferometers, much better suited for the needs of solar imaging, have become available comparatively recently. The Murchison Widefield Array (MWA) is one such instrument. It is located in the very radio quiet Western Australia, operates in the 80-300 MHz band and is one of the two precursors to the Square Kilometre Array. With its ability to provide high dynamic range and high fidelity solar images with good time and frequency resolutions across a bandwidth which can be distributed across the entire instrumental band, the MWA provides an exciting opportunity to realise the promise of solar radio physics. Here we briefly describe the recent progress which has been made in using the observations from the MWA, including development of the necessary tools and studies of the weak non-thermal solar emissions. We will also discuss our short and medium term science objectives, spanning applications ranging from investigations of coronal heating to exploring ways of assessing geo-effectiveness of Coronal Mass Ejections. The availability of instruments like the MWA mark the dawn of a new era in using the capability of solar radio observations to address a diverse set of interesting and outstanding problems in solar physics.

ASI2018_649	Rohit	Contributed Talk

Divya Oberoi NCRA-TIFR, Pune

Characterising weak low radio frequency emission from the Sun.

The Sun is very dynamic at metrewavelengths along both frequency and time, even during periods of low solar activity. A possible reason for this observed variability can be the presence of weak energetic events, which are requisite for nanoflare-based theories of coronal and chromospheric heating. High sensitivity data from new generation instruments like the Murchison Widefield Array (MWA) provide an opportunity to study these weak emissions. The MWA, located in Western Australia, is an excellent instrument to study the Sun at metrewavelengths. It is particularly useful for studying the weak extended emission from the solar corona and spanning angular sizes from few arcmins to the solar size. MWA covers a frequency range from 80 to 300 MHz spanning a large range in coronal heights from 0.08 to 0.65 R$_{sun}$ simultaneously. We study the solar emission during a quiet period using MWA data. We report the presence of impulsive components (< 1 MHz and few seconds) riding on a minute scale slowly varying component in the 100-240 MHz band. These impulsive features must be of non-thermal origin and form a significant fraction (17-- 45%) of the total solar emission. We also find that the flux emitted in the impulsive features is comparable to that in the slowly varying component. The non-thermal emissions detected by the non-imaging analysis technique presented here include the weakest non-thermal low radio frequency emissions reported in the literature yet. Further imaging analysis allows us to detect even weaker non-thermal emission features on the solar disk. Quiet Sun brightness temperature maps reveal the variability of the order of ~ 2-5%. The observed variability shows a spatial association with the structures seen at EUV wavelengths. The results from the non-imaging and imaging analysis of quiet Sun observations from the MWA will be presented at this meeting.

ASI2018_793	Ayesha Maryam Mazarbhuiya	Contributed Talk

Prithish Halder(Assam University, Silchar), Himadri Sekhar Das(Assam University) and Biman J. Medhi(Aryabhatta Research Institute of Observational Sciences,Nainital)

Polarimetric study of comet C/2015 V2 (Johnson) at low phase angle

The optical polarimetric observation of comet C/2015 V2 (Johnson) was performed at low phase angle 21.6o using the 1.04-m Sampurnanand telescope of ARIES near Nainital in India on 30th December 2016 by using R photometric band (λ= 630 nm, Δλ=120 nm). We have estimated the average degree of polarization of this comet to be -0.686% at phase angle 21.6o. This result is found to be consistent with other observed comets at this phase angle. The variation of polarization value with the increase of aperture radius from the photocenter has been observed which suggests that the physical properties of the cometary dust of C/2015 V2 (Johnson) differ in both inner and outer region. On the increase of the aperture radius, negative polarization decreases gradually. Also, the decrease in intensity with a gradual increase in distance from the photocenter is being well observed in both the solar and antisolar directions which indicates the variation in dust distribution (as well as the variation/knowledge of physical properties of dust grain) in due times. The intensity is higher in the solar direction as compared to the antisolar direction, and a diffuse coma is observed in the antisolar direction which is due to the sublimation of ice and rocks by solar radiation pressure. The study of negative polarisation at low phase angle gives the idea of the composition feature of the comet which is useful in cometary science. Keywords: negative polarization - cometary dust - diffuse coma.

ASI 2018 Parallel Session – Thursday, 8th February 2018

Time: 16:30 - 18:00 PGRRCDE (Room no: S3)

Extragalactic Astronomy IV [Chairperson: Prajval Shastri]

ASI2018_1026	Dharam Vir Lal	Contributed Talk

Ishwara Chandra C.H. NCRA-TIFR, Pune, India and IDiA, UCT, S.A.

Cluster and radio relic: A sharp view using upgraded GMRT

The GMRT upgrade, an SKA pathfinder instrument is nearing completion and has begun operations. The upgraded facility will complement several other observatories as an essential tool for discovery in several areas of astrophysics. We have used upgraded-GMRT instrument as a testbed to demonstrate the capabilities of wide field, wide band imaging of Coma cluster and Abell 85 at 1050-1450 MHz and 250-500 MHz bands. Here we present first results for these targets, including statistics of sources detected in these fields, detailed radio morphologies and spatially resolved spectral structure of these two, Coma cluster and radio relic sources. We also discuss the importance of multi-wavelength radio imaging and the improvements that will be possible due to upgraded GMRT.

ASI2018_1486	K S Dwarakanath	Contributed Talk

K S Dwarakanath (RRI), Viral Parekh (RRI), Ruta Kale (NCRA), Lijo George (RRI)

Discovery of radio relics in the outskirts of the low-mass galaxy cluster Abell 168

We report the discovery of radio relics in the outskirts of the low-mass merging galaxy cluster Abell 168 (redshift=0.045). These relics were discovered in a cross referencing of the Meta-Catalogue of X-ray detected Clusters (MCXC) of galaxies with the GaLactic and Extragalactic All-sky MWA (GLEAM) survey at 200 MHz carried out by the Murchison Widefield Array. One of the relics is elongated with a linear extent ~ 800 kpc, a thickness ~ 80 kpc and is located ~ 900 kpc from the cluster center. The second relic is torus-shaped with an extent ~ 220 kpc and is located near the inner edge of the elongated relic at a distance of ~ 600 kpc from the cluster center. These radio sources were imaged further at 323 and 608 MHz with the GMRT and at 1520 MHz with the JVLA. The spectra of the elongated and torus-shaped relics are non-thermal with power law indices of -1.08 +/- 0.04, and -1.7 +/- 0.15 respectively. We discuss the origin of this unique "twin relic" system in the context of the ongoing merger in the host cluster.

ASI2018_519	Veeresh Singh	Contributed Talk

C.H. Ishwara-Chandra (NCRA - TIFR, Pune), Preeti Kharb (NCRA - TIFR, Pune).

Unconventional radio-loud AGN with less massive SMBH

Active Galactic Nuclei (AGN) are known to be the manifestation of accretion on to the super-massive black holes (SMBHs) present in the centres of galaxies. Based on the ratio of radio to optical power AGN are divided into two categories named as radio-loud and radio-quiet. In general, radio-loud AGN are found to be hosted in elliptical galaxies with relatively more massive SMBHs (> 10^8 M⊙) and low accretion rates. Contrary to the conventional paradigm we discover several radio-loud AGN hosted in spiral galaxies possessing less massive SMBHs, with high accretion rates. The discovery of these AGN allows to probe the jet production in hitherto unexplored parameter space of the mass of SMBH and accretion rate. In this talk I shall discuss the jet production efficiency in these unconventional AGN.

ASI2018_1539	Bhargav Vaidya	Contributed Talk

Andrea, Mignone (University of Torino); Gianluigi Bodo (Observatory of Torino); Paola Rossi (Observatory of Torino) Silvano Massaglia (University of Torino)

Non-thermal Emission and Polarisation from AGN Jets.

Magnetized and relativistic large scale flows in form of jets are a common observational feature seen for example in active galactic nuclei (AGNs), Gamma-ray bursts and micro-quasars. The dominant emission is originated by non-thermal processes from high energy particles. Multi-wavelength observations covering a wide spectrum from Radio wavelengths to TeV Gamma ray emission provides valuable insights into the micro-physical processes that occur in jets that lead to the observed radiation. The length scales associated with these micro-physical processes are many orders of magnitude smaller than the physical jet scales that can range up to few tens of kilo-parsec. Connecting a bridge between these scales poses a serious challenge to theoretical modeling of the emission from AGN jets. In this talk, I will present our recent hybrid numerical framework developed for PLUTO code to quantitatively connect such disjoint scales by simulating multi-dimensional flow pattern treating small-scale plasma processes in a sub-grid manner. In particular, I will emphasize on the role of magnetized shocks, commonly observed in AGN jets, in accelerating particles and its influence in governing the non-thermal emission and polarisation due to synchrotron and Inverse Compton processes.

ASI2018_1676	Sitha K Jagan	Contributed Talk

S.Sahayanathan; Astrophysical Sciences Division, Bhabha Atomic Research centre, Mumbai-400085, India, R. Misra; Inter-University Centre for Astronomy and Astrophysics, Post Bag4, Ganeshkhind, Pune-411, C. D. Ravikumar; Department of Physics, University of Calicut, Malappuram-673635, India; K. Jeena; Department of Physics, Providence Womens College, Malaparamba, Calicut-673009, India

Interpretating the synchrotron spectral curvature of PKS 2155-304

Blazars are the class of radio loud AGN with their relativistic jets aligned close to the line of sight of the observer. PKS 2155-304 is a BL Lac sub-division of blazars with no emission/absorbtion line features. The low energy emission, extending from radio-to-X-ray energies, are generally attributed to synchrotron radiation from a broken power-law electron distribution losing its energy in the jet magnetic field. We analyse the X-ray observation of PKS 2155-304 by XMM-Newton, spanning over 20 years, and supplement this with simultaneous Optical/UV fluxes of the source from Optical Monitor(OM) observations. The difference in the energy indices of the underlying particle distribution, inferred from these Optical/UV and X-ray spectra, are found to be larger than one. This suggests, the resulting broken power-law distribution cannot be obtained through simple synchrotron cooling of a power-law electron distribution. Here, we show such difference in the photon spectral indices can be naturally obtained through synchrotron cooling of a log-parabola particle distribution. In addition, we interpret this particle distribution as a result of an energy dependent particle escape from the main acceleration region.

ASI2018_624	Sonkamble Satish Shripati	Contributed Talk

Dharam V. Lal NCRA-TIFR, Pune

Metallicity enrichment in hot gas environments via radio jet

We are carrying out a comprehensive study of spatial distribution of metallicity enrichment in hot gas using an X-ray selected sample. The sample is selected to cover a variety of hot gas environments, including galaxy clusters, groups, and individual galaxies. We aim to study the role of the active galactic nucleus and their radio jets in transporting metallicity into the intracluster medium through the uplift of cool, metal-rich, low entropy gas in these sample objects. Here we would present preliminary results from this study, in particular the relationship between the maximum projected distance of the uplifted gas, also called as the `iron radius' and radio jet power.

ASI 2018 Parallel Session – Thursday, 8th February 2018

Time: 16:30 - 18:00 PGRRCDE (Room no: S11)

Instrumentation and Techniques II [Chairperson: TBD]

ASI2018_1672	Ajay Ratheesh	Contributed Talk

Ajay Ratheesh (1), Debdutta Paul (1), A R Rao (1), D. Bhattcahrya (2), Ajay Vibhute (2), S.V. Vadawale (3), V.B. Bhalerao (4) 1-Tata Institute of Fundamental Research, Mumbai 2-Inter Universities Center for Astronomy and Astrophysics, Pune 3-Physical Research Laboratory, Ahmedabad 4-Indian Institute of Technology, Mumbai

Astrosat Cadmium Zinc Telluride Imager as a Short GRB Detector

Detection of a short GRB170817A along side GW170817 from a neutron star (NS) merger has prompted the search for similar short GRBs. Characterizing these short GRBs will not only give insight into the science of NS-NS mergers, but also the rate of occurrence of such events. Searching for these events is difficult as they exist in shorter time scales where fluctuations in the detector data due to Cosmic Ray interactions and other noise events are dominant. Hence characterising and excluding the noise events are important in the search for short GRBs. Cadmium Zinc Telluride Imager onboard Astrosat, being comparatively less prone to charge particle background due to its low inclination orbit, with pixelated detectors, and an open detector above 100 keV, can a be an effective short GRB detector if the noise sources in the detector are understood and eliminated. Here we present the results of an attempt to understand the noise characteristics by developing an algorithm to detect and eliminate various sources of noise in Astrosat CZTI. CZTI consists of pixelated CZT detectors, which are triggered by individual photons, and records each such 'event' separately. However, the detectors are also prone to triggers from other sources, cosmic rays and thermal instabilities being amongst them, termed as 'noise' events. Here we examine the properties of all CZT events, to segregate genuine events by astrophysical photons from noise. We look into the events at different time scales. Since the individual detectors are equipped with fast and sensitive amplifiers to cater to high count rates, they trigger multiple times for large charge deposition from Cosmic Rays. It is found that the heavy charge deposition induces crystal defects in the detector, which can trigger noise events up to 200 ms after a Cosmic Ray interaction. The proposed algorithm eliminates all noise events and hence improves the sensitivity of the instrument to detection of transients like Gamma Ray Bursts, in addition to producing cleaned data of the observed astrophysical sources.

ASI2018_1662	Madhuri Siriprolu	Contributed Talk

Radhakrishna V.(1), Koushal V.(1), Meena.G(1), Monoj Bug(1), Anand Jain(1) 1.Space Astronomy Group, ISRO Satellite Center, Bangalore.

Development and Studies on TPC GEM X-ray Polarimeter

Large number of X-ray sources are expected to emit linearly polarized radiation either due to the emission processes (for example, synchrotron radiation) or due to the interaction of primary (un-polarized) photons with the matter surrounding them. We are developing a Gas Electron Multiplier (GEM) based X-ray polarimeter (E. Costa et.al., Nature 2011), which is an active area of interest for future astronomy missions, due to its higher sensitivity. This polarimeter works in soft X-ray band, and the X-ray photons in this range predominantly interact through photoelectric absorption. In this polarimeter, the aim is to generate an image of electron cloud produced along the photoelectron track and to reconstruct the photoelectron emission direction. We will present the design of GEM based X-ray polarimeter based on Time Projection Chamber (TPC) principle (J.K. Black et.al., NIMA 581 (2007)). In TPC, image of electron cloud produced by photoelectron is deduced from 1D strip readout and time sampling of the arriving electrons. The direction of emission of photoelectron is used to estimate the polarization direction. The emission direction is extracted from the projected 2D electron cloud image. It is observed that, we obtain tracks of varied length, size and distribution for different operating parameters. Hence, a detailed analysis of these tracks is essential in reconstructing the photoelectron emission angle. We adopted three different methods for reconstruction: Method of moments (R. Bellazzini et.al.,SPIE 4843(2003)), Estimating the photon interaction point (Baumgartner et.al.,SPIE 8443(2012)) and Improved method using variance/skewness conditions (Iwakiri et.al.,NIMA 838(2016)). These methods are being compared for different tracks and are analyzed taking into consideration each detailed case study and selection criteria are set. As a result, we propose a hybrid method which combines all these methods and optimizes the reconstruction, which can maximize the sensitivity of the polarimeter.

ASI2018_1260	Shiv Kumar Goyal	Contributed Talk

S. K. Goyal (PRL, Ahmedabad), A. R. Patel (PRL, Ahmedabad), Neeraj K. Tiwari (PRL, Ahmedabad), M. Shanmugam (PRL, Ahmedabad), T. Ladiya (PRL, Ahmedabad), Aaditya Sarada (PRL, Ahmedabad), S. Vadawale (PRL, Ahmedabad), P. Janardhan (PRL, Ahmedabad), D. Chakrabarty (PRL, Ahmedabad), A. Sarkar (PRL, Ahmedabad), Hitesh L. Adalja (PRL, Ahmedabad), A. K. Hait (SAC, Ahmedabad), R. Bhavsar (SAC, Ahmedabad), M. Chauhan (SAC, Ahmedabad), S. B. Banerjee (PRL, Ahmedabad), P. Kumar (PRL, Ahmedabad), K. P. Subramanian (PRL, Ahmedabad), B. Bapat (IISER, Pune), P. R. Adhyaru (PRL, Ahmedabad), Manan Shah (PRL, Ahmedabad) and M. B. Dadhania (PRL, Ahmedabad)

Supra Thermal & Energetic Particle Spectrometer (STEPS), onboard Aditya-L1 mission

Supra Thermal & Energetic Particle Spectrometer (STEPS) is an independent subsystem of the ASPEX experiment. ASPEX (Aditya Solar Wind Particle EXperiment) has been selected as one of the possible experiments onboard the Aditya - L1 mission (forthcoming Indian solar mission), which is to be placed in a halo orbit around the L1 Lagrangian point, lying between the Sun and the Earth at a distance of 1.5 million km from the Earth. Primary objective of the ASPEX experiment is to make in - situ, multi - directional measurements of solar wind supra-thermal and high-energy particles. The ASPEX payload has two independent subsystems: SWIS (Solar Wind Ion Spectrometer), which measures the angular and energy distributions of Solar wind ions in the energy range of 100 eV to 20 keV using the technique of electro-static analysis (ESA) followed by magnetic separation of particles, while STEPS - the another subsystem measures the energy spectrum of high energetic particles from six multiple directions, in the energy range of 20 keV/n to 20 MeV/n. The STEPS instrument has been configured into three packages: viz. the STEPS - 1 package, the STEPS - 2 package and the processing electronics package. The STEPS - 1 detector package has 4 detector units, pointing in 4 different directions: SR (Sun Radial), IM (Intermediate - between Sun and Parker Spiral direction), PS (Parker Spiral direction) and NP (Northward). In this package: 2 detector units (SR & PS) will provide particle species (proton and alpha) differentiated energy spectra while other 2 detector units (IM & NP) will provide particle species integrated energy spectra. Similarly STEPS - 2 detector package has 2 detector units: EP (Earth Pointing) and SP (Southward). EP detector unit provides species differentiated energy spectra, while SP detector unit provides species integrated energy spectra. The species differentiating detector unit uses custom designed dual window Si-PIN detector and plastic Scintillator. Dual window Si-PIN detectors are fabricated on a single package with two different thicknesses of dead layers (0.1 micron and 1.0 micron) of high Z material. The Plastic Scintillator (placed below the Si detector package) provides the identifications of the particles up to very high energy (~20 MeV/n) using ΔE-E mode. The other type of detector unit (species integrated spectra) uses a standard Si-PIN detector. In this talk, overall configuration of the STEPS subsystem and its salient features will be discussed. Developmental status of the with the preliminary results will also be presented.

Thursday, February 8th , 2018

Public Talk - Biman Nath - A dung beetle's view of the Milky Way

Time: 18.30 - 19:30 (Venue: Prof. G. Ram Reddy Centre for Distance Education, Platinum Jubilee Auditorium)

Public Talk	Biman Nath	Plenary

A dung beetle's view of the Milky Way

We share the night sky with numerous other organisms on Earth. It is therefore natural to ask how birds, fishes or even insects view the stars and use them. There have been many surprises in the pursuit of these questions. It now appears that, contrary to expectations from the structure of its eyes, a dung beetle uses the Milky Way, and even polarization of the moonlit sky. In this talk, I will trace the evolution of sight in organisms, the variety of eye designs with regard to celestial navigation, and tell the story of astronomers in the animal kingdom.

Friday, 9th February 2018

Friday, February 9th , 2018

Plenary Session 3 - GALAXIES AND THE IGM [Chairperson: Annapurni Subramanian]

Time: 9.30 - 11.00 (Venue: Prof. G. Ram Reddy Centre for Distance Education, Platinum Jubilee Auditorium)

ASI2018_1725	Aseem Paranjape	Plenary

IUCAA Pune

Recent insights into dark halo assembly and implications for galaxy evolution

The gravitational potential wells of dark matter haloes form the cradles for the formation and evolution of galaxies and the IGM. The assembly history of dark haloes is therefore expected to affect the spatial distribution and properties of galaxies. With the advent of large volume surveys such as the Sloan Digital Sky Survey, this galaxy-halo connection is now being explored in great depth and with high accuracy. Although simple models connecting dark halo mass to observed galaxy properties work quite well in describing many properties of the observed Cosmic Web, some puzzles are yet to be explained. Among these is the observation of `galactic conformity', an effect in which satellite galaxies in groups `know about' the star formation properties of the central galaxy of their group. Potential explanations of this phenomenon that invoke halo mass assembly as the primary driver of group galaxy properties lead to predictions at large spatial scales that are not borne out by the data. In this talk I will introduce the basic phenomenology of halo mass assembly and lessons learnt from numerical simulations and analytical models, highlighting the successes of a dark halo-based model of the distribution of galaxies. I will then discuss the phenomenon of galactic conformity and its possible explanations.

ASI2018_1194	Arunima Banerjee	Plenary
IUCAA, Pune		

Origin of low surface brightness galaxies: A dynamical study

Low Surface Brightness Galaxies (LSBs), inspite of being gas rich, have low star formation rates and are, therefore, low surface brightness in nature. We calculate Q_{RW}, the 2-component disc stability parameter as proposed by Romeo \& Wiegert (2011), as a function of galactocentric radius R for a sample of five LSBs, for which mass models, as obtained from HI 21cm radio-sythesis observations and R-band photometry, were available in the literature. We find that the median value of Q^{min}_{RW}, the minimum of Q_{RW} over R, lies between 2.6 and 3.1 for our sample LSBs, which is higher than the median value of 1.8 ± 0.3 for Q^{min}_{RW} for a sample of high surface brightness galaxies (HSBs) as obtained in earlier studies. This clearly shows that LSBs have more stable discs than HSBs, which could explain their low star formation rates and, possibly, their low surface brightness nature. Interestingly, the calculated values of QRW decrease only slightly (median Q^{min}_{RW} ~ 2.3 - 3) if the discs were taken to respond to the gravitational potential of the dark matter halo only, but reduce by ~ a factor of 2-3 (median Q^{min}_{RW} ~ 0.7 - 1.5) if they respond to their self-gravity alone. This implies that the dark matter halo is crucial in regulating disc stability in LSBs, which may have important implications for models of galaxy formation and evolution.

ASI2018_1769	Biman B. Nath	Invited
N/A		

Galaxies and the intergalactic medium

Galaxies interact with the intergalactic medium (IGM) through a variety of physical process, ranging from gravitation to mechanical processes (jets and outflows), through radiative and particle interactions (cosmic rays). New results from hydrodynamical simulations on the relevance of galactic outflows driven by star formation processes to IGM will be presented, for the mechanical and radiation aspects. We will also present the results of analytical calculations regarding the extent of patchy heating of IGM by cosmic rays arising from star forming galaxies.

ASI 2018 Parallel Session – Friday, 9th February 2018

Time: 11:30 - 13:00 PGRRCDE (Room no: S1)

Sun and the Solar System II [Chairperson: Nandita Srivastava]

ASI2018_1449	Aveek Sarkar	Contributed Talk
Bhargav Vaidya, Soumitra Hazra, Jishnu Bhattacharyya		
Numerical Simulation of active region MHD oscillations and coronal loop implosion		
We simulate a part of the solar active region which is hit by a flare like explosive event. We carefully trace magnetic field lines of the active region and their time evolution. It is found that field lines of the active region demonstrate various compressible MHD modes such as sausage and kink. We also see that following the flare disturbance, such magnetic field structure collapse (formally known as coronal loop implosion) or oscillate vertically depending on the nature of the local plasma beta. Contrary to common believe, the present model shows that loop implosion is an independent ideal magnetohydrodynamic (MHD) effect. It is initiated by variations of the system coordinates arising due to the transmitted disturbance originating at the event site, but otherwise has no connection to the flaring site itself.		

ASI2018_ 1633	Dattaraj Dhuri	Contributed Talk
Shravan Hanasoge, Tata Institute of Fundamental Research, Mumbai, India		
Prediction of solar flares from photospheric magnetic field using machine learning		
Solar flares are eruptions on the surface of Sun caused by the rapid restructuring of magnetic field lines in active regions. The radiation and charged particles released in the process pose a threat to space and ground based communication instruments. Understanding mechanism leading to solar flares and their prediction is an outstanding problem in the field. Helioseismic and Magnetic Imager (onboard NASA's Solar Dynamic Observatory) makes available high resolution solar vector-magnetic-field data with 12 minutes cadence. We use this data to train machine learning algorithms for prediction of solar flares with accuracy greater than 85%. We analyse performance of trained machine learning algorithms to shed light on underlying physics responsible for triggering solar flares.		

ASI2018_665	Jishnu Bhattacharya	Contributed Talk

Shravan M. Hanasoge, Tata Institute of Fundamental Research Aaron C. Birch, Max Planck Institute for Solar System Research, Justus-von-Liebig-Weg 3, 37077 Goettingen, Germany Laurent Gizon, Max Planck Institute for Solar System Research, Justus-von-Liebig-Weg 3, 37077 Goettingen, Germany

Iterative inversion of synthetic travel times successful at recovering sub-surface profiles of supergranular flows

Aims: We develop a helioseismic inversion algorithm that can be used to recover subsurface vertical profiles of two-dimensional supergranular flows from surface measurements of synthetic wave travel times. Methods: We carried out seismic wave-propagation simulations with a two-dimensional section of a flow profile that resembles an average supergranule and a starting model that only has flows at the surface. We assumed that the wave measurements are entirely without realization noise for the purpose of our test. We expanded the vertical profile of the supergranule stream function on a basis of B-splines. We iteratively updated the B-spline coefficients of the supergranule model to reduce the travel-time differences observed between the two simulations. We performed the exercise for four different vertical profiles peaking at different depths below the solar surface. Results: We are able to accurately recover depth profiles of four supergranule models at depths up to $8-10\,\text{Mm}$ below the solar surface using $f-p_4$ modes under the assumption that there is no realization noise. We are able to obtain the peak depth and the depth of the return flow for each model. Conclusions: A basis-resolved inversion performs significantly better than an inversion in which the flow field is inverted at each point in the radial grid. This is an encouraging result and might act as a guide in developing more realistic inversion strategies that can be applied to supergranular flows in the Sun.

ASI2018_416	Nishtha Sachdeva	Contributed Talk

Prasad Subramanian

Proxies for CME acceleration

Sachdeva et al. 2017 showed that the accelerating Lorentz forces peak between 1.65-2.45 solar radii for a sample set of CMEs with speeds ranging between 47-2500 km/s. Since CMEs in white light can be observed only above 2-3 solar radii, which is typically beyond the heights at which the Lorentz forces peak, it leads to an uncertainty in deriving the CME launch speeds. An alternate approach could be estimating these speeds using the X-ray or radio emissions. Using data from LASCO and STEREO coronagraphs for a diverse CME sample and fitting it using the Graduated Cylindrical Shell model technique, we derive the Lorentz force profiles for each event based on the Torus Instability model. We investigate multiwavelength data to find which profile can be used as a good approximation for the observationally derived force profile. This can be used as a preliminary and immediate method of predicting the CME arrival time at the Earth based on the microwave or soft X-ray profiles.

ASI2018_458	K Sasikumar Raja	Contributed Talk

K. Sasikumar Raja, Indian Institute of Science Education and Research, Pashan, Pune - 411 008, India. Prasad Subramanian, Indian Institute of Science Education and Research, Pashan, Pune - 411 008, India. R. Ramesh, Indian Institute of Astrophysics, 2nd Block, Koramangala, Bangalore - 560 034, India. Angelos Vourlidas, Applied Physics Laboratory, Johns Hopkins University, Laurel, Maryland, USA. Madhusudan Ingale, Plot No. 2, Near RSS office, Bamb Colony, Jammer Road, Bhusaval - 425 201, India.

Turbulent density fluctuations and proton heating rate in the solar wind from $9-20~R_{\odot}$

We obtain scatter-broadened images of the Crab Nebula at 80 MHz as it transits through the inner solar wind in June 2016 and 2017. These images are anisotropic, with the major axis oriented perpendicular to the radially outward coronal magnetic field. Using these data, we deduce that the density modulation index ($\delta N_e/N_e$) caused by turbulent density fluctuations in the solar wind ranges from 1.9 $\times 10^{-3}$ to 7.7 $\times 10^{-3}$ between 9 —- 20 $R_{\odot}$. We also find that the heating rate of solar wind protons at these distances ranges from 2.2×10^{-13} to $1.0 \times 10^{-11} ~\rm erg~cm^{-3}~s^{-1}$. On two occasions, the line of sight intercepted a coronal streamer. We find that the presence of the streamer approximately doubles the thickness of the scattering screen.

ASI2018_1080	Debi Prasad Choudhary	Contributed Talk

Christian Beck National Solar Observatory, Boulder

Flows along Super-Penumbral Fibrils of Sunspots

Sunspots are the main ingredient of the solar cycle and the sites of its major eruptive events. Understanding the structure of these objects is an important aspect for studying our nearest star. We observed several sunspots using the Spectropolarimeter for Infrared and Optical Regions at the Dunn Solar Telescope during 29 July to 4 August 2013. The data consist of full Stokes profiles in the Ca II 854.2 nm and Fe I 1.56 micron lines. The inversion of these Stokes spectra provides the magnetic, thermal and velocity structure at photospheric and chromospheric heights of sunspots. In this paper, we present the results on the 3D thermal structure in the superpenumbral canopy of a round sunspot, derived by a novel approach for the inversion of Ca II IR spectra. Tracing individual fibrils in the super-penumbral canopy, we find that about half of them form only short loops of a a few Mm length that return to the photosphere in the close surroundings of the sunspot instead of connecting to more remote magnetic network at the outer end of the moat flow. We also find indications for standing shocks at the inner foot points of the flow channels that are compatible with a supersonic siphon flow scenario.

ASI 2018 Parallel Session – Friday, 9th February 2018

Time: 11:30 - 13:00 PGRRCDE (Room no: S3)

Extragalactic Astronomy V [Chairperson: Dharam Vir Lal]

ASI2018_572	Smriti Mahajan	Contributed Talk

Michael Drinkwater (University of Queensland, Australia); Simon Driver (University of Western Australia)

Blue spheroids: progenitors of spirals or passive ellipticals?

Using multi-wavelength dataset from the GAMA survey we have tested if nearby blue spheroid (BSph) galaxies are the progenitors of star-forming spiral galaxies or passively-evolving elliptical galaxies. We find that BSph galaxies are structurally very similar to their passively-evolving red counterparts. However, their star-formation and other properties such as colour, age and metallicity are more like star-forming spirals than spheroids. We have also used HI data to reveal that some of the BSphs are (further) developing their disks, hence their blue colours. They may eventually become spiral galaxies — if sufficient gas accretion occurs — or more likely fade into low-mass red galaxies.

ASI2018_1702	Kshitija Kelkar	Contributed Talk

K.S. Dwarakanath (Raman Research Institute); A. Aragon-Salamanca (University of Nottingham); M. E. Gray (University of Nottingham) Y. L. Jaffe (ESO Chile)

Evolving galaxies in evolving environments

Upon accretion into clusters, environment is found to have little effect on the main structural properties of the galaxies such as their sizes for a given mass and morphology, and their internal structure but affects the morphological mix and star formation history of galaxies. This suggest that the plausible mechanisms driving this transformation must influence the gas in the galaxies. However when we consider galaxies under the impact of complex environment brought about by cluster merger, gravitational effects may be stronger, and thus alter observed structural and star formation properties of cluster galaxies. This talk will focus on understanding the effect of evolving environment on the star formation history and morphological transformation of galaxies through a detailed analysis of spectroscopic derivatives, morphology, internal galaxy structure and ICM properties. Utilising the cluster sample from the ESO Distant Cluster Survey (EDisCS) at $0.8 > z > 0.4$, I shall present some innovative methods to define galaxy structure beyond the regular framework of Hubble morphologies, and link it with the star-formation history as a function of global (cluster/ field) environment. Further, I will focus on the resulting implications of the structural transformation of galaxies, when affected by the more complex internal cluster environment (through projected phase-space of clusters), on the probable mechanisms leading to the cessation of star formation observed in cluster galaxy population. Next, I will discuss the ramifications of evolving environment brought about by cluster merging phenomenon on the inherent cluster galaxy populations by introducing an ongoing study of a unique merging cluster system A3376 at $z=0.046$. With the aim of understanding how star formation may be influenced in merging clusters, I shall present preliminary results involving star formation properties of member galaxies especially around merger shock front through a multiwavelength approach, and discuss prospective physical mechanisms behind galaxy evolution in dynamic environments.

ASI2018_1537	Kameswara Bharadwaj Mantha	Contributed Talk

Daniel H. McIntosh (UMKC), Cody Ciaschi (UMKC), Rubyet Evan (UMKC), Logan Fries (UMKC), Luther Landry (UMKC), Scott Thompson (UMKC), Ryan Brennan (U. Rutgers), Daniel Ceverino (U. Heidelberg), Joshua S. Cook (UMKC), Christopher J. Conselice (U. Nottingham), Darren J. Croton (U. Berkeley), Avishai Dekel (U. Hebrew), Sandra M. Faber (UCSC), Henry C. Ferguson (STScI), Yicheng Guo (U. Mizzou), Nimish P. Hathi (STScI), Dritan Kodra (U. Pittsburgh), David C. Koo (UCSC), Jennifer M. Lotz (STScI), Jeffrey A. Newman (U. Pittsburgh), Gergo Popping (ESO), Joel Primack (UCSC), Marc Rafelski (STScI), Vicente Rodriguez-Gomez (JHU), Brooke D. Simmons (Oxford), Raymond Simons (JHU), Rachel S. Somerville (U. Rutgers), Amber N. Straughn (NASA-GSFC), Gregory F. Synder (STScI), Stijn Wuyts (U. Bath), Lu Yu (Carnegie Observations), Xianzhong Zheng (PMO).

A Tale of Two Galaxy Merger Identification Techniques: Empirical and Theoretical Investigation of Close-Pairs and Tidal Features

Cosmological simulations predict that the rate of merging between similar-mass massive galaxies should increase towards early cosmic-time. We study the incidence of major (stellar mass ratio SMR<4) close-pairs among log(Mstellar/Msun) > 10.3 galaxies spanning 0<z1.5, which is in strong disagreement with theoretical merger rate predictions. On the other hand, if we compare to a simulation-tuned, evolving timescale prescription from Snyder et al., 2017, we find that the merger rate evolution agrees with theory out to z=3. These results highlight the need for robust calibrations of the complex and presumably redshift-dependent pair-to-merger-rate conversion factors to improve constraints on the empirical merger history. To address this, we use a unique compilation of mock datasets produced by three independent state-of-the-art Semi-Analytic Models (SAMs). We present preliminary calibrations of the close-pair observability timescale and outlier fraction as a function of redshift, stellar-mass, mass-ratio, and local over-density. Furthermore, to verify the hypothesis by previous empirical studies that SMR-selection of major pairs may be biased, we present a new analysis of the baryonic (gas+stars) mass ratios of a subset of close pairs in our sample. For the first time, our preliminary investigation highlights that a noticeable fraction of SMR-selected minor pairs (SMR>4) have major baryonic-mass ratios (BMR<4), which indicate that merger rates based on SMR selection may be under-estimated. Additionally, I will showcase the preliminary results of a novel multi-wavelength approach to extract and quantify tidal features and discuss their calibrations to the intrinsic merger-progenitor properties from VELA zoom-in simulations. Finally, I will present the preliminary results of an automated tidal-feature detection algorithm trained using deep-learning techniques.</z

ASI2018_690	Rubinur Khatun	Contributed Talk

Dr. Mousumi Das (Indian Institute of Astrophysics) Dr. Preeti Kharb (NCRA-TIFR)

Understanding the galaxy merger system with EVLA and UVIT.

Dual Active galactic nuclei (AGN) or supermassive black hole (SMBH) pairs are expected to form during galaxy mergers and minor accretion events. When the SMBHs are accreting, they become dual AGN (DAGN). High-resolution radio or X-ray observations are the best way to confirm their presence. DAGN can help in understanding the galaxy evolution during mergers. We have done observations of such a merger system which shows two cores in optical, infrared and UV wavebands. We have observed this galaxy with the UVIT in the last ASTROSAT cycle. We have also done high-resolution radio observations with the expanded very large array (EVLA) to confirm the presence of DAGN in this system. In this presentation, we will show the preliminary results from our UVIT and radio observations of this DAGN.

ASI2018_713	Niladri Paul	Contributed Talk

Tirthankar Roy Choudhury, NCRA-TIFR, Pune, India Aseem Paranjape, IUCAA, Pune, India

Halo model of HI galaxies and their scaling relations

Halo occupation distribution (HOD) model of HI galaxies is a useful tool in understanding the post re-ionisation history of the universe. This approach allows us to statistically interpret the data of the two-point correlation function of HI galaxies that we have at present and which will soon be available on a larger scale from surveys like SKA etc. The speaker will present a parameterised HOD model which depends only on HI mass and mass of the halos hosting the galaxies. It will be shown that this model can explain the two-point correlation function and the mass function of ALFALFA HI galaxies quite accurately. It is found from our analysis that it is necessary to have HI in satellite galaxies for the low HI mass thresholds whereas, for the high HI mass thresholds, the neutral hydrogen mainly resides in central galaxies. A statistical scaling relation between luminosity, colour and neutral hydrogen content of the galaxies will also be presented. It is found from the scaling analysis, that the neutral hydrogen prefers to reside in the blue galaxies.

ASI2018_1086	Arun Kumar Diwakar	Contributed Talk
D. K. Chakraborty		

Very flat triaxial mass models of elliptical galaxies

deZeeuw and Carollo (1996) presented a simple analytical triaxial mass model which reproduces the observed hotometric properties of ellipticity variation and position angle twist. The potential corresponding to the mass density was also presented. Orbits were calculated in this potential and the underlying numerical distribution as function was shown to exist (Thakur et al 2007). The mass model was used to investigate intrinsic shapes of elliptical galaxies (Thakur & Chakraborty, 2001, Chakraborty et al 2008 and Chakraborty, Diwakar & Pandey, 2011). In spite of all these successes, it is realized that this mass model is more appropriate for rounder models. Is case, we consider flat models by taking very small values of the short to long axial ratio, the model presents several issues which need to be considered. We find that in flatter models the constant density surfaces deviate appreciably from ellipsoidal shapes. Another, more important issue is the appearances of narrow region wherein the mass density is negative. Although the absolute values of the negative densities are quite small but nevertheless, negative density region do appear. We find that negative density does not have appreciable effects on projected properties. Addition of extra density terms in the original deZeeuw – Carollo model improves the situation to some extent.

ASI 2018 Parallel Session – Friday, 9th February 2018

Time: 11:30 - 13:00 PGRRCDE (Room no: S11)

General Relativity and Cosmology III [Chairperson: Tuhin Ghosh]

ASI2018_1630	Shilpa Kastha	Contributed Talk

Shilpa Kastha (Institute of Mathematical Sciences), Anuradha Gupta (Institute of Gravitation and cosmos, Penn State), K G Arun (Chennai Mathematical Institute), B. S. Sathyaprakash (Institute of Gravitation and cosmos, Penn State)

Parametrized test of post-Newtonian multipolar structure of compact binary merger

The present-day parameter estimation schemes of gravitational wave events are based on the waveforms predicted by general relativity (GR). Various astrophysical observations so far have also supported GR with extremely good accuracies. Since chirping signal from compact binary carries signatures of gravity in the strong field regime, detection of these signals gives a wide platform to test the fundamental predictions of GR. Here, we propose a parametrized method to test the post-Newtonian (PN) multipolar structure of compact binary mergers predicted by GR in a model independent way through GW observation. We introduce different free parameters to different GR multipole moments appearing in the PN phasing formula to capture the effect of alternative theories generically. We study how well can these parameters be recovered for an injection of pure GR signal for various detector sensitivities such as advanced Laser Interferometer Gravitational-Wave Observatory (aLIGO), Einstein Telescope (ET), Laser Interferometer Space Antenna (LISA) and Cosmic Explorer (CE).

ASI2018_1531	Mandar Patil	Contributed Talk

Tomohiro Harada (Rikkyo University, Tokyo, Japan), Ken-ichi Nakao (Osaka City University, Osaka, Japan), Pankaj S. Joshi (TIFR, Mumbai), Masashi Kimura (CENTRA IST, Lisbon, Portugal)

Can we use gravity to produce ultra-high energy cosmic rays and neutrinos ?

Origin of ultra-high energy cosmic rays and neutrinos remains an enigma. All proposed mechanisms use electromagnetic interaction to accelerate changed particles. We propose for the first time, a mechanism that exclusively makes use of Gravity, rather than the electromagnetic forces. We show that it is possible to generate ultra-high energy particles in the overspinning Kerr geometry transcending Kerr bound by a small amount via collisional Penrose process with divergent efficiency. We compute spectrum of the ultra-high energy particles and argue that its shape could serve as a powerful probe of particle physics. By solving the constraint equations in numerical relativity we show that the overspinning Kerr geometry could occur in the gravitational collapse scenario. It was also argued by Horava that overspinning spacetimes could be realized in the context of string theory. We also speculate on the other spacetime geometries where a similar acceleration mechanism could be at work. Based on Phys. Rev. D 93, 104015 (2016), Phys. Rev. D 90, 124079 (2014).

ASI2018_1569	Shantanu Desai	Contributed Talk

None

Limit on graviton mass from galaxy cluster Abell 1689

To obtain a limit on the mass of graviton using galaxy clusters, we use dynamical mass models of the Abell 1689 (A1689) galaxy cluster to check their compatibility with a Yukawa gravitational potential. We assume mass models for the gas, dark matter, and galaxies for A1689 from arXiv:1703.10219 and arXiv:1610.01543, who used this cluster to test various alternate gravity theories, which dispense with the need for dark matter. We quantify the deviations in the acceleration profile using these mass models, assuming a Yukawa potential and that obtained assuming a Newtonian potential, by calculating the chi-square residuals between the two profiles. We obtain a 90% cl. upper limit on mass of graviton to be 1.64e-29 eV.

ASI2018_618	Shabbir Shaikh	Contributed Talk

Suvodip Mukherjee (CC A, Flatiron Institute, USA), Santanu Das (University of Wisconsin-Madison, USA), Tarun Souradeep (IUCAA, Pune, India), Benjamin Wandelt (CCA, Flatiron Institute, USA)

Bayesian analysis of hemispherical asymmetry observed in CMB

WMAP and Planck measurements of CMB temperature anisotropies contain the anomalous signature of violation of statistical isotropy called hemispherical asymmetry. This signal is modelled as dipole modulation of otherwise statistically isotropic temperature anisotropy. Current methods in the literature estimate the significance of this signal around three sigmas. We carried out a Bayesian analysis of SMICA CMB temperature anisotropy map provided by Planck mission, taking into account the mask and inhomogeneous noise. We follow the formalism given in Santanu Das et al. JCAP 2015, where the likelihood is defined using harmonic space parameters of the dipole (m1M) in dipole modulation model. To treat the noise, we sample m1M jointly with spherical harmonic coefficients of the CMB map (alm). We use Hamiltonian Monte Carlo (HMC) method to sample the likelihood distribution of these parameters. HMC method allows efficient sampling of the multidimensional joint probability distribution of alms and m1Ms. The magnitude and the direction of the dipole we infer are in agreement with that given in the literature. We also study the aspects of the scale dependence of the hemispherical asymmetry, finding that the signal strength goes down roughly above the multipole of 64.

ASI2018_1765	Vipin Sudevan	Contributed Talk

Pavan K. Aluri, Sarvesh Kumar Yadav, Rajib Saha, Tarun Souradeep

A MEASUREMENT OF CMB ANGULAR POWER SPECTRUM FROM PLANCK & WMAP OBSERVATIONS

The cosmic microwave background (CMB) is one of the important tool available for cosmologists to probe into and understand the physics of the early Universe. The CMB data collected by various balloon and satellite missions are severely contaminated due to the foreground emissions from various astrophysical processes present within and outside our galaxy. These foreground contaminations should be removed properly without disturbing the underlying CMB signal. There exists various techniques in the Literature for the component separation and thereby to estimate the angular power spectrum of the foreground removed CMB signal. One of the author Saha et.al (2008) has obtained Temperature Power Spectra using the Linear Combination Method, which is insensitive to the modelling of the foreground in order to precisely determine the cosmological CMB signal. In the present work, we have made various improvements on this work and the foreground removal of the PLANCK and WMAPS is achieved through a multiphase iterative harmonic space inetrnal-linear-combination (HILC) approach. The new procedure consists of two phases. In phase 1 of foreground removal, a diffuse foreground cleaned map is obtained by performing a usual ILC operation in the harmonic space in a single iteration over the entire portion of the sky. In phase 2, we obtain the final foreground cleaned map using an iterative ILC approach also in the harmonic space, however, now, during each iteration of foreground minimization, some of the regions of the sky that are not being cleaned in the current iteration, are replaced by the corresponding cleaned portions of the phase 1 cleaned map. This method nullifies the leakage which is present in the old and usual iterative HILC method. We have obtained the TT angular power spectrum for the multipole range 2<=l<=2500 from the foreground cleaned CMB map which matches with the power spectrum obtained by Planck Team. We have also validated our method with the aid of Monte Carlo simulations. In this talk, I will discuss about several improvements that we have made over the usual HILC method, which aids in obtaining better cleaned maps. Reference: Sudevan, V., Aluri, P. K., Yadav, S. K., Saha, R., & Souradeep, T. 2017, Astrophys. J., 842, 62

ASI 2018 Poster Presentations

Sun and the Solar System

SSS-1	ASI2018_1118	MAHESH CHANDRA MATHPAL	Poster

Authors: Mahesh Chandra Mathpal, Seema Pande, Raj Kumar, Bimal Pande Department of Physics, D.S.B Campus Kumaun University Nainital

Title: Study of Solar-terrestrial link by Soft Computing technique

Abstract: Solar atmospheric phenomena like sunspot numbers, solar flares (SF), Coronal Mass ejection (CMEs) are directly linked to terrestrial phenomena. Their relationship has been studied by different techniques like statistical methods, soft computing techniques etc. In this work, we have used soft computing artificial neural network techniques to analyse their relationship. We have used solar features as input parameter and geomagnetic indices as target parameter for neural network. We have compared the results of statistical method and neural network techniques from one cycle to another cycle and found that the neural network results are better than statistical results. We have found that this technique provides better results to explain the solar terrestrial link. Therefore, it turns out to be is a more useful technique for prediction of variation in space weather due to solar phenomena.

SSS-2	ASI2018_1124	DEEPAK PANDEY	Poster

Authors: Seema Pande, Bimal Pande, and Mahesh Chandra Mathpal KUMAUN UNIVERSITY NAINITAL

Title: Comparison between Associated and non-Associated type II solar radio bursts during decay phase of solar cycle 23

Abstract: Type III radio bursts are mostly followed by type II radio bursts, however type II radio bursts are not always preceeded by type III radio bursts. In this work we have presented a comparison between the associated and non-associated type II radio bursts during decay phase of solar cycle 23 using statistical analysis and found a correlation between associated and non-associated radio bursts. In our study, we have compared the different parameters of radio bursts such as duration drift rate, shock speed, band width of associatied and non-associated bursts. Our study indicated that the radio bursts parameters almost remain uniform and variation in the parameters is very marginal except in the case of bandwidth for associated and non-associated events.

SSS-3	ASI2018_1239	Sanchita Pal	Poster

Authors: Sanchita Pal1, Nat Gopalswamy2, Dibyendu Nandy1, 3, Sachiko Akiyama2, 4, Seiji Yashiro2, 4, Perti Makela2, 4, and Hong Xie2, 4 1 Center of Excellence in Space Sciences India, Indian Institute of Science Education and Research Kolkata, Mohanpur 741246, West Bengal, India, 2 NASA Goddard Space Flight Center, Greenbelt, MD 20771, USA, 3Department of Physical Sciences, Indian Institute of Science Education and Research Kolkata, Mohanpur 741246, West Bengal, India, 4The Catholic University of America, Washington DC 20064, USA

Title: A SUN-TO-EARTH ANALYSIS OF MAGNETIC HELICITY OF AN INTERPLANETARY CORONAL MASS EJECTION

Abstract: Study of connecting the helicity of magnetic flux ropes through the Sun-Earth system has important implications for the origin of helicity in the interplanetary medium and the topology of interplanetary coronal mass ejection (ICME) flux ropes at 1 AU. Here we calculate and compare the magnetic helicity in the 17-18 March 2013 ICME flux-rope at 1 AU and in its solar source. The associated coronal mass ejection (CME) erupted on 15 March 2013 with an M1.1 flare from NOAA active region 11692. We measure the magnetic helicity of flux rope using its magnetic and geometric properties near the Sun and at 1 AU. We use forward-modeling of white-light CME observations to obtain the geometrical properties of the near-Sun flux rope and combine it with the reconnection flux derived using post-eruption arcade (PEA) method to extract the magnetic properties of the flux rope. To get the magnetic and geometric information of the 1-AU ICME, we use a constant-a force-free cylindrical flux rope model fit to the in situ observations. We find a good correspondence in both amplitude and sign of the helicity between the ICME and the CME assuming a semi-circular ICME flux rope with a length of π AU. We find that about 83% of the total flux rope helicity at 1 AU is injected by the magnetic reconnection in the low corona.

SSS-4	ASI2018_1274	Dr. Vipin K. Yadav	Poster

Authors: None

Title: The magnetic environment study of terrestrial planets – Venus and Mars

Abstract: The magnetism is a universal parameter and an essential component of any planetary body. The magnetic field of a planetary body is the result of its internal movements taken place in the past and present as well as due to its interaction with the solar wind. The magnetic field imposes constraints on the planetary structure, dynamics and evolution. The magnetic field can be used as a potential tool to understand the interiors of a planetary body. Venus and Mars do not possess a global magnetic field unlike Earth. The absence of an intrinsic magnetic field in Venus is due to the lack of dynamo which is responsible for a strong global magnetic field due to the motion of an electrically conducting and convecting fluid inside the planet. It is believed that Mars had an intrinsic magnetic field is the past but the dynamo stops due to various factors. However, Mars does possess a weak magnetic moment due to the crustal magnetic anomalies. In the absence of a global magnetic field, the solar radiation (dominantly EUV) interacts deep into the atmosphere of Venus and Mars and ionizes large number of neutral atoms and molecules to generate the ionosphere. In the ionosphere of these two terrestrial planets a number of plasma phenomena take place. Some of these phenomena lead to the generation of plasma waves. In this paper, the scientific understanding of the magnetic environment of Venus and Mars is presented with proposed studies that can be carried out in a future space mission to these planets.

SSS-5	ASI2018_1290	Surajit Mondal	Poster

Authors: Surajit Mondal (National Centre for Radio Astrophysics), Divya Oberoi (National Centre for Radio Astrophysics), Leonid Benkevitch (MIT Haystack Observatory),Meagan Crowley (University of Massachusetts), Philip Erickson (MIT Haystack Observatory), Colin J. Lonsdale (MIT Haystack Observatory), John Morgan (Curtin University)

Title: Ionospheric Studies Using By-products of a Low-radio Frequency Solar Imaging Pipeline

Abstract: Solar imaging at metre wavelengths has improved dramatically with the advent of new low-frequency radio interferometers like the Murchison Widefield Array (MWA), the Long Wavelength Array (LWA) and the Low-Frequency Array (LOFAR). Now it is possible to image the sun at high temporal and spectral resolution with dynamic ranges at least an order of magnitude higher than what was possible before. This is essential for studying the complex dynamic nature of the solar corona. The traditional approach to radio imaging is however very interactive in nature and is hence very human effort intensive. This is also true for solar radio imaging. To reduce the tedium of generating these images, we have developed an automated imaging pipeline to deliver calibrated science-ready solar radio images. Here, we briefly introduce this pipeline and then focus on the information about the ionosphere which can be extracted from its by-products, namely the antenna based complex gains. Apart from they being interesting in their own right, our interest in ionospheric studies stems from the fact that there is substantial evidence for imaging dynamic range of solar MWA images to be limited by the direction dependent ionospheric effects. Higher dynamic range images of the sun are needed if we want to observe the synchrotron emission from the Coronal Mass Ejection (CME) plasma; and to measure the Faraday rotation due to heliospheric plasma, especially CMEs. Other sensitive radio interferometric measurements, although generally taken during the night, will also benefit from this work. At very low noise levels, the impact of these tiny ionospheric effects might begin to become discernible in the data. It is therefore important to study and understand such ionospheric effects in greater detail. Radar and GPS based ionospheric studies have been conducted for a long time. Radio astronomers have also been developing increasingly sophisticated techniques to measure and remove the impact of ionospheric propagation from radio interferometric data. Our novel method offers a few advantages over all of these techniques. These advantages stem from a confluence of the very high SNR arising from observations of the Sun; the large angular size of the Sun, which translates to illuminating a correspondingly large ionospheric patch; and the compact and dense distribution of MWA elements. This enables us to study the ionosphere at very small temporal and spatial scales than has usually been possible before. Here, we present our initial results from this investigation.

SSS-6	ASI2018_1291	Sharad Chandra Tripathi	Poster

Authors: NA

Title: Enhanced Solar Radiations and their effect on Ionospheric Ionization

Abstract: Solar Flares are solar transients which affect geospace in a number of ways. Effect of the enhanced radiation during these transients has been investigated in the present study. Satellite and Ground based ionospheric observations, alongwith solar X-ray emission, have been used for this investigation. The response of these enhanced radiations has high spatial dependence. A very good almost one to one response, in time, has been observed which depends on local time and position of the measurement station, in terms of zenith angle. This study has been compared with other studies of its nature and found that ionospheric measurements with better resolution can give better estimates of ionoziation and its relation with sudden enhancement in solar radiation. Such responses have been recorded and considered for the comparison, with respect to the strength of the transients, and development of a model for the same.

SSS-7	ASI2018_1399	Rahul Kumar Kushwaha	Poster

Authors: 1. R K KUSHWAHA, PRL, AHMEDABAD. 2. B-M Cheng-NSRRC, TAIWAN. 3. N J MASON,THE OPEN UNIVERSITY, UK. 4. B SIVARAMAN, PRL, AHMEDABAD.

Title: Ozone on Callisto

Abstract: Ozone has been observed in our solar system icy bodies surfaces, surface of Ganymede [1] in the Jovian system and in the icy surfaces of both Dione and Rhea [2] in the Saturnian system. Ozone synthesized in laboratory based experiments in UV apart from IR range [3]. Well-known Hartley band (220 – 300 nm), in the ultraviolet which is characteristics of photoabsorpion spectra of ozone and provides a unique fingerprint of ozone molecule. Which suggest that ozone might be detected in ice mantles of ISM by similar UV observation. The Vacuum UltraViolet (VUV), 110 - 160 nm, photoabsorption spectra of pure solid ozone revealed the absence of Hartley band while ozone concentrations are low [4]. Hartley band is the only wavelength that is available to-date for the identification of ozone elsewhere, which demands sufficient ozone concentration [4]. Here we have performed experiments on SO2 ices which is one of the constituent of the icy Galilean satellites. We performed irradiation experiments in VUV beamline at NSRRC, Taiwan [4]. Temperature commensurate the icy satellite conditions were maintained at LiF substrate. SO2 was deposited at 9 K and then irradiated with photons (at 10 eV) for few hours. After irradiation spectra were recorded in the 220 nm - 320 nm at different temperatures, but are not limited to 9 K, 20 K, 30 K, 50 K, 80 K, 100 K and 120 K. SO2 peak in 240 - 320 nm region was observed to be broader and also to have shifted after irradiation. This is due to Ozone synthesis within SO2 ice upon irradiation. Here we propose the presence of ozone on Callisto by comparing our experimental result with UV spectra of Callisto from the Hubble space Telescope (HST) observation. References: [1] Noll et al. 1996, Science 273, 341. [2] Noll et al. 1997, Nature 388, 45. [3] Sivaraman et al. 2007, ApJ, 669, 1414. [4] Sivaraman et al. 2014, Chem Phys Lett, 603, 33.

SSS-8	ASI2018_1428	Nandita Srivastava	Poster

Authors: NA

Title: Stealth CMEs and problem geomagnetic storms

Abstract: Recent solar observations have shown that some solar eruptions do not display the usual low coronal signatures of CMEs, like solar flares, flows, jets, coronal dimmings or brightenings or filament eruptions. Some of these also lead to what we know as problem geomagnetic storms. During solar cycle 23, with the continuous coverage and improved sensitivity of SOHO/LASCO coronagraphs, many major geomagnetic storms were identified with full or partial halo CMEs close to the Sun. However, for a few CMEs, it was not possible to find the associated low coronal signatures or clear white-light CMEs. Also during the minimum between cycles 23 and 24, STEREO spacecraft observed Earth-directed CMEs, including CMEs with narrow angular widths, which were reported to lack solar signatures and were termed as "Stealth CMEs". The Atmospheric Imaging Assembly (AIA) on SDO which was launched in 2010 is now providing high resolution EUV images of the corona and is capable of revealing weak coronal signatures of CMEs. This improved capability combined with the twin spacecraft STEREO observations from two different vantage points can give a better understanding of Stealth CMEs and their propagation. We examine the solar and interplanetary sources of problem geomagnetic storms in an attempt to understand if the mechanisms during such eruptions are distinctly different from those associated with typical CMEs. This is crucial as eruptions with no coronal signatures can lead to unexpected strong space weather impact, since early warning signs are not present in these events.

SSS-9	ASI2018_1447	Varsha K R	Poster

Authors: Varsha,K. R, Hiremath, K. M and Manjunath Hegde Indian Institute of Astrophysics, Bengaluru-560034, India

Title: Yearly variation of rotation rate of coronal holes.

Abstract: Coronal holes are one of sun's important activity phenomena which can easily be observed in the sun's corona, especially in the x-ray or uv wavelengths. Coronal holes appear to be darker, cooler, and have low density plasma compared to the ambient medium. Genesis of their origin, thermal and dynamical properties and of their feeble magnetic field structure remain a mystery. Aim of present study is to examine whether coronal holes that occur at higher latitudes rotate rigidly or differentially. In order to achieve this goal, nearly one cycle (1997–2006), SOHO/EIT 195 Å calibrated images are used. Using basic morphological operations like erosion and dilation coronal holes are accurately detected from the images. Individual pixel information enclosing coronal holes is obtained. After fixing the heliographic coordinates for these individual pixels, average heliographic coordinates (latitude and longitude) for each coronal hole are computed and rotation rates of coronal holes are estimated. The important results are as follows: For different latitude zones, between 80◦ north and 75◦ south, irrespective of their area, the number of days observed on the solar disk, coronal holes rotate rigidly.

SSS-10	ASI2018_1598	Manisha Pithadia	Poster

Authors: Manisha Pithadia, Rajmal Jain, Arun Kumar Awasthi, Ashish Patel, Kadi Sarva Vishwavidyalaya, Gandhinagar, India

Title: Study of energy build-up and release process in solar storms

Abstract: We study two solar active regions to probe the physical process of energy build up and release in solar storms viz. Flares, CMEs and filament eruptions. We consider the free magnetic field energy in the active region as the major source of energy build-up in the corona, while gradient and rotation angle of the active region as the cause of the solar storms. Therefore we undertake the measurement of magnetic field complexity employing magnetograms from HMI/SDO to constrain the possible mechanisms providing the energy build-up on one hand and triggering on the other hand. Two super active regions observed during march-2012 and may 2013 are selected considering that each has produced minimum 20 flares of ≥C1.0 class and minimum one X-class flare during its passage on the disk. To quantifying the energy build up we measure the magnetic flux from the photospheric observations, which transfers to the corona through magnetic convection in the loops. The magnetic field) of the active region areϕgradient (dH/dz) and rotation angle (measured to quantifying the energy release process in the corona. The magnetic complexity proxies viz. magnetic flux, gradient and rotation angle are found to vary between 9*1024 -2.8*1026 Mx, 1*10-5 – 1.25*10-2 gauss/cm and, -87 – +90 respectively. We compare the variation of the photospheric magnetic complexity (cause) proxies and X-ray flare flux (consequence) as a function of time and find common periodicities in the cause and consequence parameters.

SSS-11	ASI2018_1600	Ashish Patel	Poster

Authors: Manisha Pithadia, Rajmal Jain Kadi Sarva Vishwavidyalaya, Gandhinagar – 382015, Gujarat, India

Title: Estimation of Magnetic Reconnection Rates and its association with Flare and CME's

Abstract: We estimate the magnetic reconnection rates for 50 flares with flare class in the range of B to X based on GOES classification of solar flares observed with Solar Dynamics Observatory (SDO) during a period of 2011 to 2012. Parameters of reconnection namely inflow velocities, outflow velocities and the magnetic reconnection rates have been estimated. In order to calculate the inflow velocities, we analyzed flux measurements from HMI instrument onboard SDO which enables us to derive the dimensional reconnection rate. The outflow velocities are estimated using CME data which is available on the SOHO LASCO CME Catalogue (https://cdaw.gsfc.nasa.gov/CME_list/). Further, the ratio of the inflow and outflow velocities enables us to estimate the non-dimensional magnetic reconnection rate. We obtain the reconnection rates of the order of 10-2 to 10-4 from our observations. We have also attempted to establish a relation between the magnetic reconnection rate and the intensity class (GOES) of the flares.

SSS-12	ASI2018_1616	KAMBHAMPATI SANJEEV KUMAR	Poster

Authors: M.P.Nagasrinivas, Professor.G.Yellaiah

Title: THE STUDY OF NEO'S AND EARTH IMPACT MODELING

Abstract: The celestial objects like asteroids or comets which pass through close to earth's orbits are called NEO's. NEO is considered to have trajectory 0.3au of earth's orbit. These objects impact on the moon, the earth and on other planets have left the craters. Impacts are one of the most fundamental processes shaping planetary surfaces throughout the solar system. A study of NEO between 1917 to 2017 is carried out by taking the parameters like nearest distance of approach with nominal and minimum values, diameter, absolute magnitudes, relative velocities and diurnal variations. The study helps to develop an Earth impact numerical model and also helps us to understanding the gravitational perturbation of planets and NEO's impact threat. In this paper a brief analysis of variations in parameters of NEO during 1917-2017 is given (data from https://cneos.jpl.nasa.gov) based on closest approach and magnitude, potentially Hazardous NEO's study is also presented. Keywords: NEO's, Asteroids, comets, Earth impact, Gravitational perturbation, potentially Hazardous NEO's, CA, diameter, absolute magnitude and relative velocities

SSS-13	ASI2018_1628	Prabir Kumar Mitra	Poster

Authors: Bhuwan Joshi, Physical Research Laboratory

Title: Flux Rope Eruption From a Sigmoid Active Region: Triggering Mechanism and Large-scale Magnetic Reconnection

Abstract: Coronal sigmoids are complex active regions that exhibit enhanced soft X-ray or EUV coronal emission from a system of twisted coronal loops that overall form an S (or inverse S) shaped morphology[1]. It is well established that sigmoidal active regions tend to produce frequent coronal mass ejections (CMEs) over non-sigmoidal ones[2]. Our understanding regarding the formation stages of coronal sigmoids and triggering of eruption from such magnetically complex regions is still very limited. In this paper, we present a comprehensive multi-wavelength investigation of the onset of flux rope eruption and subsequent reconnection-driven large-scale phenomena from sigmoid active region NOAA 12371 on 2015 June 21. For the purpose, we have analyzed solar observations taken from SDO[3], GOES[4], and RHESSI[5]. The SDO/AIA images at 94 A channel reveals that flux rope underwent eruption in two distinct phases that led to two successive, well-separated M-class flares. LASCO CME observations show that the successful eruption of the flux rope eventually produced a large halo CME. The build-up phase of the coronal sigmoid is characterized by striking magnetic activities in the photosphere which includes counter clockwise rotation of a negative polarity region along with adjacent moving magnetic features. The flux rope activation occurred within a compact coronal volume that displayed enhanced EUV emission. Compact brightenings observed in multi-channel EUV images in the vicinity of photospheric neutral line during the activation phase along with flux cancellation suggest tether-cutting[6] reconnection to be the driving mechanism for the eruption onset. The rapid expansion of the flux rope led to the first M-class flare with relatively less spatial extents. The second flare presents extended chromospheric ribbons and larger loop structures. The multi-wavelength observations further suggest interactions of the expanding flux rope with overlying coronal loops at higher altitude caused the second M-class flare.

SSS-14	ASI2018_1637	Priya T G	Poster

Authors: Su Jiangtao(1), Jie chen(1), Deng yuanyong(1) and Debi prasad Choudhury(2). 1. National Astronomical Observatory, Beijing 2. California state university, Cambridge

Title: Statistical analysis on Dynamic fibrils observed from GST/BBSO

Abstract: The dynamic fibrils (DFs) have been observed from halpha observations done at GST/BBSO. These DFs appears to be periodic. Our observations from GST/BBSO shows them to follow a perfect parabolic path. We have done a statistical measure on the parameters like duration, maximum velocity, deceleration. Analysis shows a positive correlation between the maximum velocity and the deceleration which is quite consistent with the numerical simulations done before. Our analysis shows that most of the jet like features in the active regions are caused by the upward propagating shocks in the chromosphere.

SSS-15	ASI2018_1653	Pankaj Kumar	Poster

Authors: NA

Title: Quasi-periodic Radio Bursts Associated with Fast-mode Waves near a Magnetic Null Point

Abstract: We present an observation of quasi-periodic rapidly propagating waves observed in the Atmospheric Image Assembly (AIA) 171/193 Å channels during the rising phase of an M1.9 flare that occurred on 2012 May 7. The instant period was found to decrease from 240 to 120 s, and the speed of the wavefronts was in the range of ˜664-1416 km/s. Almost simultaneously, quasi-periodic bursts with similar instant periods, ˜70 and ˜140 s, occur in the microwave emission and in decimetric type IV and type III radio bursts, and in the soft X-ray emission. The magnetic field configuration of the flare site was consistent with a breakout topology, i.e., a quadrupolar field along with a magnetic null point. The quasi-periodic rapidly propagating wavefronts of the EUV emission are interpreted as a fast magnetoacoustic wave train. The observations suggest that the fast-mode waves are generated during the quasi-periodic magnetic reconnection in the cusp region above the flare arcade loops. For the first time, we provide evidence of a tadpole wavelet signature at about 70-140 s in decimetric (245/610 MHz) radio bursts, along with the direct observation of a coronal fast-mode wave train in EUV. In addition, at AIA 131/193 Å we observed quasi-periodic EUV disturbances with periods of 95 and 240 s propagating downward at apparent speeds of 172-273 km/s. The nature of these downward propagating disturbances is not revealed, but they could be connected to magnetoacoustic waves or periodically shrinking loops.

SSS-16	ASI2018_1682	SUVADIP SINHA	Poster

Authors: 1. Nandita Srivastava, Professor, Udaipur Solar Observatory, PRL. 2. Dibyendu Nandy, Associate Professor, IISER KOLKATA.

Title: Kinematic study of stealth CMEs

Abstract: Coronal Mass Ejections (CMEs) are the most energetic eruptive events on the Sun in which hot coronal plasma is ejected out from the Sun into the interplanetary space. During the eruption process, these CMEs are usually accompanied by various phenomena like, flares, filaments, coronal jets etc. However, stealth CMEs are not associated with any of these low coronal features. This silent behaviour makes it more mysterious and distinguishable from other normal CMEs. The stealth CMEs can only be observed in upper corona with white light coronagraph. We use SECCHI/ STEREO and SOHO/ LASCO coronagraph observations to identify these events. Using the multi- viewpoint data from these instruments, we try to extract different properties of these stealth CMEs including their mass and velocity. We also attempt to compare these properties with that of the regular CMEs. Finally, the kinematic profiles of stealth CMEs will also be examined. This will help us in understanding the possible eruption mechanism that is responsible for these weak CMEs.

SSS-17	ASI2018_1718	Surendra Vikram Singh	Poster

Authors: V S Surendra, K K Rahul, J K Meka, D Utkarsh, B Sivaraman* Physical Research Laboratory, Ahmedabad, 380 009, India

Title: Radiation Induced Chemistry on Icy Satellite Surfaces Embedded in Magnetospheric Plasma Environments - A New Experimental Facility at PRL

Abstract: Icy satellites, such as Io, Europa, Ganymede, Callisto and Rhea etc., are bombarded by energetic particles in the surrounding plasma produced in the Jovian and Saturnian magnetospheres. Plasma-satellite interactions via particles, with energies ranging from keV to MeV, process the icy surfaces of the satellites with varied chemical compositions. Indeed, such interactions also lead to chemical exchange between the satellites whilst altering the chemical composition of the surface ices. Recent findings from the space and ground based observations on the signatures of several new molecules reveal complex chemistry that is yet least understood under the conditions that are unique to the icy satellites of our outer solar system. By performing laboratory based experiments, that simulate conditions prevailing in the icy satellites, chemical pathways that underpin formation of complex molecules on icy satellites can be revealed. The new experimental setup (Figure 1) operated at Ultra High Vacuum (UHV) condition is equipped with a 30 keV electron gun and a ZnSe substrate at ~ 10 K, to form molecular ices, in order to simulate plasma-icy surface interaction. Non-equilibrium reactions initiated by keV particle interactions are probed in the mid-infrared (11000 ◆ 200 cm -1) region using a Fourier Transform InfraRed (FTIR) spectrometer. In this poster preliminary results and their implications to icy satellite surface chemistry will be discussed.

SSS-18	ASI2018_1720	Tejas P	Poster

Authors: Tejas, P ^{1} Hiremath, K.M ^{2} 1. Indian Institute of Technology Hyderabad Sangareddy, Khandi, Telangana 502285 2.Indian Institute of Astrophysics, Bengaluru-560034

Title: Python Code to analyse Sun's white light images from Kodaikanal Observatory

Abstract: By using historical Kodaikanal observatory's white light images, a python code was developed that achieves the following tasks: Detection of edge of the solar disk of the image of the Sun. Fitting a circle to the detected edge, and determining the center and radius of the detected edge. Removing the limb darkening. Computing the heliographic coordinates of all the pixels in the image. Applying a sequence of morphological transformations and thresholding to isolate only the sunspots from the image. Removing the equatorial line from the image. Labeling all the connected components in the image. Separating the sunspots from the image of the Sun. Calculation of average heliographic coordinates of the sunspots. Separation of umbra and penumbra and computation of their areas.

SSS-19	ASI2018_1735	SUMANJIT CHAKRABORTY	Poster

Authors: Abhirup Datta. Center of Astronomy, Indian Institute of Technology Indore,Simrol Campus.

Title: Effects of Ionosphere and Troposphere on Sensitive Radio Observations from 70 MHz to 24 GHz

Abstract: Any electromagnetic signal coming from outside the Earth's atmosphere will get affected by the Ionosphere at centimeter and meter wavelengths while the same will get affected by the Troposphere between centimeter and millimeter wavelengths. In this work, we explore a uniform formalism to understand the highest radio frequencies where ionosphere poses a challenge for sensitive radio observations with upcoming telescopes like the SKA (Square Kilometer Array). We also investigate the lowest radio frequencies where Tropospheric effects are still significant for SKA-like observing capabilities. For a single radiometer, ionospheric effects are also pronounced through refraction, absorption and emission. All-sky averaged cosmological signals get corrupted due to these effects of ionosphere on low-frequency radio waves. It has been demonstrated the need for sensitive ionospheric calibration in order to proceed for deeper radio observations with single antenna. Electron density fluctuations in the ionosphere are affected by the nature of the solar disturbances. The solar activity follows variabilities at different temporal scales. The variability in the dynamical system of the ionosphere is a direct consequence of the forcing action by the solar radiation. It is well known that the various solar activities such as solar radio bursts and even sun-spot index display "1/ f " (flicker noise) characteristics as a function of time. Presence of such corruption term in the single antenna measurement makes it necessary to perform high time resolution calibration for the ionosphere. This makes a strong requirement on signal-to-noise in order to perform a fruitful ionospheric calibration. Similar issues exist with the effect of troposphere on radio signals received between centimeter and milli-meter wavelengths. Requirement of tropospheric calibration will influence the sensitive high frequency observations with radio interferometers like the SKA. In this study, we present a uniform study on the effects of both ionosphere and troposphere on radio observations from 70 MHz – 24 GHz. This study will present relative importance of each of the effects at each frequency bands across this huge range of frequencies. The context of this study is future SKA observations but it is not limited to only SKA and can interpreted for other similar telescopes as well.

SSS-20	ASI2018_1742	Sajal Kumar Dhara	Poster

Authors: Emilia Capozzi, Michele Bianda, Renzo Ramelli Istituto Ricerche Solari Locarno, Switzerland

Title: Narrow-band imaging spectropolarimetric observation of active region at Fe I 6173Å

Abstract: Narrow-band spectropolarimetry is often used to obtain information about the magnetic field structure of the solar atmosphere. Here we present a study of a magnetic field measurement using the imaging spectroplarimeter at Istituto Ricerche Solari Locarno (IRSOL). The imaging spectropolarimeter comprises a tunable narrow band filter, based on two LiNbO3 Fabry-Parot etalons, and Zurich IMaging POLarimeter (ZIMPOL) coupled with a high-resolution grating Czerny-Turner spectrograph. With this instrumental set up, one can carry out imaging spectropolarimetry of any spectral line from 390 to 700 nm, with a spectral resolution of ~30 mÅ at 630 nm. A set of monochromatic images of active region (AR) in a scan of spectral line Fe I 6173Å is obtained. We used ZIMPOL to measure the full Stokes vectors for every pixel of the monochromatic images. The map of the Stokes profiles of an AR has been compared with the data obtained with HMI/SDO. Here we will present the details about the obtained results from our measurements.

SSS-21	ASI2018_1757	Chinmaya S R	Poster

Authors: Adithya H N,Hiremath K. M

Title: PYTHON CODE TO ANALYSE SUN'S CALCIUM IMAGES OF THE KODAIKANAL OBSERVATORY

Abstract: By using historical Kodaikanal observatory calcium images, python code is developed that achieves the following tasks: • Detection of edge of the solar disk of the image of the Sun. • Fitting a circle to the detected edge, and determining the centre and Radius uniquely. • Computing the heliographic coordinates of all the pixels in the image. • We are also planning to detect the chromospheric features of the sun as well as estimating the average heliographic coordinate for the Plages. The results will be presented in the meeting.

SSS-22	ASI2018_1759	Naga Vijaya Deepthi A	Poster

Authors: Sumanjit Chakraborty, Dr.Abhirup Datta, Centre of Astronomy, IIT Indore

Title: IONOSPHERIC TEC AS A PROBE TO STUDY THE SOLAR FLARES

Abstract: The physiochemical model of the ionosphere is very complicated with a multitude of photochemical reactions going on; ions forming and recombining with the availability or scarcity of energetic photons and particles. The existing complicated model of the ionosphere is further complicated during a Sudden Ionospheric Disturbance (SID) which can be caused by a solar flare or a gamma burst. A flare is defined as a sudden, rapid, and intense variation in brightness. A solar flare occurs when magnetic energy that has built up in the solar atmosphere is suddenly released. Flares are classified according to their brightness as C, M and X. The X-ray fluxes during solar flares are known to cause increased ionization in the Earth's ionosphere. During a solar flare, the sun releases energy in the form of electro-magnetic waves, energetic particle and mass motions. Although all of this energy obviously does not reach the earth, a fraction of it reaches the earth and disrupts the normal balance of ion formation and recombination in the ionosphere. This disruption disturbs the propagation models of radio waves transmitted through the ionosphere. This disturbance is responsible for distorted waves which can be a problem for the Global Navigation Satellite System (GNSS) receivers. The development of Global Positioning System (GPS) ground and satellite data for scientific use has opened up new means for high time resolution research on such disturbances. As a part of our research we consider and take in to account the effects of solar flare on ionospheric Total Electron Content (TEC) during pre-flare and post-flare phase of the solar flare including the day of active acceleration of solar flare at different latitude stations of the Indian subcontinent region and consequently examine the ionospheric response during solar activity which could provide a better understanding of the space weather and the Sun.

SSS-23	ASI2018_1778	Muhammed Abdurahman K	Poster

Authors: *1. Muhammed Abdurahman K, *1. Sreelakshmi P, *2.Dr. Muhammed Aslam O.P
*1.Department of Physics, MES Ponnani College, Ponnani South, Kerala, India *2.Department of Physics, AMU Aligarh, U.P, India

Title: Geoeffectiveness of Coronal Mass Ejections

Abstract: Coronal mass ejections (CMEs) consist of large structures containing plasma and magnetic fields that are expelled from the Sun into the heliosphere. CMEs remove built-up magnetic energy and plasma from the solar corona and they are responsible for the most extreme space weather effects at Earth. CMEs originating from close to the disk center significantly perturb the Earth's environment and they directly impact the Earth, Such CMEs are termed as geoeffective and they are the major cause for the severe geomagnetic storms. Nine intense geomagnetic storm events (Disturbance storm time index, Dst < -180 nT) caused by CMEs, occurred during the period 2000–2016 are selected. The geomagnetic response of selected solar events are analyzed and compared, and identified several of their features during their near-Earth passage. Evaluated the hourly data of two geomagnetic indices, Dst, and AE, and the concurrent data of interplanetary plasma and field parameters. Recognized distinct features of these events and solar wind parameters, when the geomagnetic disturbance is at its peak. Also discuss the similarities and differences in the geoeffectiveness of the solar and interplanetary structures in the light of plasma and field variations and physical mechanism(s), which play crucial role in influencing the geomagnetic activity.

SSS-24	ASI2018_389	Urmi Doshi	Poster

Authors: Ramesh,K.B.Formerly with Indian Institute of Astrophysics

Title: Geomagnetic Storms associated with isolated Halo CME's during the period 1996-2014.

Abstract: We have studied 21 isolated geomagnetic storms (GMS) with an intensity of Dst< -50nT, that are associated with isolated front sided Halo Coronal Mass ejections (CME) which occurred during the period 1996–2014. All these GMS's are associated with a Storm Sudden Commencement. The effect of the interplanetary magnetic field as well as the various solar wind plasma parameters on each of these events is analyzed. Analysis of the parameters such as Plasma temperature, the Z component of the interplanetary magnetic field (Bz), Solar wind speed and the Proton density have been found to play a crucial role in producing the GMS and also in the resultant storm strength. However, even though all the storms are associated with isolated Halo CME's of varied initial speeds, the strength of the storm does not necessarily correlate with the initial CME speed and thus it appears to indicate that these events do not fit into the general statistical trends that relate the CME speed and the corresponding geoeffectiveness. We opine that the strength of the storm depends more on the location of the Earth in its orbit around the Sun with respect to the arrival of the solar ejecta at that location and the angular stretch of the ejecta, besides the necessary condition such as southward Bz.

SSS-25	ASI2018_422	Bhupendra Kumar Tiwari	Poster

Authors: Bhupendra Kumar Tiwari Department of Physics A.P.S. University Rewa M.P.

Title: Study of Solar-Interplanetary causes and their Impact on GCR fluxes During Solar Minimum of SC 23/24

Abstract: Abstract Galactic cosmic ray (GCR) flux at earth is modulated by the heliospheric magnetic field. Heliospheric modulation potential during grand solar minimum is observed using an open solar flux (OSF) model, with OSF source based on Sunspot number. The structure of the heliosphere controls by the solar outputs and their variability, produce changes in cosmic ray intensity. Observation based on the data taken from Omniweb data centre for solar- interplanetary data and yearly mean count rate of cosmic ray intensity (CRI) variation data from Oulu(Rc= 0.80 GV) and Moscow (Rc=2.42 GV) neutron monitors during 1996-2016. It is observed that slow decline of solar cycle 23 and slow rise of solar cycle 24 resulted prolonged of low solar activity which lasted about 2006 to 2009 with 2008 and 2009 being sun is remarkably quiet, therefore solar minimum between cycle 23 and 24 was very extended and deep in contrast to previous solar minima's and the strength of the interplanetary magnetic field has been falling off to new low levels, reduces the GCR entering inner- heliosphere and it is high anti-correlation between sunspot number & GCR flux. It is also found that correlation between the count rate of cosmic ray intensity with solar indices and heliospheric parameters. Keywords- Galactic Cosmic ray intensity (GCRI), Interplanetary Coronal mass ejections (ICMEs), Interplanetary magnetic field (IMF), Solar activity (SA)

SSS-26	ASI2018_450	Atul Mohan	Poster

Authors: Divya Oberoi, NCRA-TIFR, Pune

Title: Exploring coronal faint non-thermal emission features using high Dynamic range snapshot-spectroscopic metrewave-imaging

Abstract: Metrewave solar observations are important to study the solar coronal plasma dynamics. This is because this emission originates from larger coronal heights (~ 1.1 - 2 Rsun), where the EUV and X-ray emission becomes increasingly faint or undetectable; and these frequencies are very sensitive to non-thermal emissions which relate to a wide range of interesting solar physics. Metrewave emissions span a very large range in intensity, as well as temporal, spectral and spatial scales. Often multiple processes go on simultaneously at different locations on the Sun, giving rise to emission features with very different strengths. Till recently, one could usually only study the most intense of these, limited by the information gathering capacity of traditional arrays. The new generation of low-frequency interferometric arrays, like the Murchison Widefield Array (MWA), offer high dynamic range snapshot-spectroscopic-imaging capability. This unprecedented capability enables us to track the evolution of coronal brightness as a funtion of time and frequency across the solar disc. To facillitate the studies of emission features which do not dominate the disc-integrated solar flux density, and hence cannot be studied using the conventional dynamic spectrum (DS) based techniques, we introduce a new data product. In analogy with the usual DS, we name it SPatially REsolved Dynamic Spectrum or SPREDS. We use SPREDS derived from the MWA data to demonstrate that radio observations are sensitive to a class of weak features which do not seem to be detected in EUV and X-ray observations.

SSS-27	ASI2018_599	Tomin K James	Poster

Authors: Prasad Subramanian, IISER Pune

Title: Study on energetics of type I bursts using a model independent electron acceleration mechanism.

Abstract: A resolution to the problem of solar coronal heating is still elusive, despite decades of intense research. However, it is now clear that the solution lies in the details of electron acceleration during magnetic reconnection. Specifically, small energy release events like nanoflares are a primary candidate to explain coronal heating. Most studies on electron acceleration have concentrated on analysing X-ray, UV and EUV data while little attention has been paid to small events related to coronal heating at radio wavelengths. The coherent nature of some radio emissions makes it possible to detect radio signatures from much smaller non-thermal electron populations compared to those responsible emissions at other wavelengths (such as X-rays). Radio observations can thus provide a complementary and novel approach to address the problem of coronal heating by nanoflares. We use combined observations of GMRT and NRH on type I radio bursts to study magnetic reconnection rates. This combined observation method developed by Mercier et al.(2014) had found the smallest yet observed source sizes for a radio noise storm. Using this high temporal resolution data we find the acceleration timescales for the events described by Mercier et al.(2014). Following the model-independent approach to estimate the energetics of type I bursts developed by Subramanian et.al(2005) we determine the energy output of these bursts and the non-thermal fraction of electrons generating these bursts.

SSS-28	ASI2018_785	Dr. K. CHENNA REDDY	Poster

Authors: B Premkumar and G Yellaiah Department of Astronomy, Osmania University, Hyderabad - 500 007

Title: A study on variation of meteor count and echo detection heights during solar cycle 23 and24

Abstract: Many meteoroids ablate and form an ionised trail that can be detected by radar techniques. With the wide-beam VHF radar technique, meteor trails can be detected in space and time, and also be possible to determine their mean height distribution precisely. The meteoroid ablation heights are useful in obtaining the information about the seasonal and long term variation of atmospheric density and other parameters. In this study, we examined the relationship between variation of meteor trail detection height and solar activity during the solar cycle 23-24, from the peak altitude of the sporadic meteor echoes observed at two meteor radar stations, Thumba (8.5oN, 77oE), India and Kototabang (0.2oS, 100.3oE), Indonesia. We observed that the solar activity influences the meteor ablating heights, during the solar maxima, meteor peak detection height rise to higher altitudes, of the order to 2 km. Here, we also reported the long term patterns of the meteor count rate at two different latitudes, the long term trend of decreasing meteor count is in good agreement with the sunspot number.

ASI 2018 Poster Presentations

Stars, ISM and the Galaxy

SG-1	ASI2018_1009	Dr. P. Seema	Poster

Authors: P. Seema(1) , B.G.Anandarao(2), V. Venkataraman(2), P.K. Suresh (1), Teja Teppala (1) 1. University of Hyderabad, Hyderabad 2. Physical Research Laboratory, Ahmedabad

Title: Investigation of SPITZER MIR spectra on a sample of Ultra Large/ Large infra- red Galaxies to understand the role of Polycyclic Aromatic Hydrocarbons

Abstract: With the availability of far infra-red data from Infrared Astronomical Satellite (IRAS,1983), it was discovered that there exists a large number of galaxies having luminosities > 10(+12) L⊙ . These galaxies are known as Ultra Luminous Infra-Red Galaxies (ULIRGs). They play an important role in the formation of massive galaxies and Quasars. Their high luminosities were attributed either to starburst activity or to presence of AGNs (Active Galactic Nuclei) activity in these galaxies. The high sensitivity observations of Infra-red Space Observatory (ISO) and SPIZER brought a revolution in the understanding of the ULIRGs. It was found from these observations that the spectra of ULIRGs galaxies contain prominent 'PAH features' (Polycyclic Aromatic Hydrocarbon molecules), while these features were very weak or absent in AGNs. Therefore, these emission features can be used as a diagnostic tool in discriminating Starburst and AGN activity in ULIRGs. Even though there were numerous studies done in the past there was no clear picture about the prominent source of luminosity within these ULIRGs. Therefore more studies were required on a larger sample of galaxies, especially on the role of PAH molecules in contributing to the infrared flux in ULIRGs and have a better understanding of the evolution of these galaxies Our study involves a large sample of ULIRGs galaxies taken from the existing sample catalogues. Data analysis is performed using high resolution SPITZER spectra in mid-IR (3-15μm) region. Fluxes of the prominent PAH molecular features, 6.2μm, 7.7μm, 11.3μm which represent different modes of excitation, are extracted in most of the ULIRGs and their relative strengths are estimated. Preliminary results will be presented.

SG-2	ASI2018_1015	Rishikesh Gokhale	Poster

Authors: Dr. Yogesh Joshi, Scientist D,ARIES Nainital

Title: Photometric and Spectroscopic study of Luminous Blue HS-Variable, in M31

Abstract: This study is aimed at studying photometric and spectroscopic characteristics of an HS-Variable which a Luminous Blue Variable (LBV) star in M31. In this work, we analyzed the trend of the observed LBV and confirmed its characteristics. We analyzed the properties exhibited by the LBVs and found the resemblance to this observed variable star. We confirmed that this star exhibits the LBV nature as it has been in the past using photometric and spectroscopic studies. The photometric data for the study has been obtained using 1.04m Telescope at Manora Peak, Nainital and spectroscopic data has been obtained using 2m HCT, Hanle.

SG-3	ASI2018_1107	Rahul Sharma	Poster

Authors: Abdul Jaleel (Department of Physics & Astrophysics, University of Delhi, Delhi), Chetana Jain (Hans Raj College, University of Delhi, Delhi), Jeewan C. Pandey (ARIES, Nainital) and Anjan Dutta (Department of Physics & Astrophysics, University of Delhi, Delhi)

Title: Spectroscopy of MXB 1658-298 in two accretion states during recent outburst

Abstract: MXB 1658-298 is a transient Low Mass X-ray Binary which shows dips, bursts and eclipses in its light curve. In this work, we report the broadband spectral study of this source with the Swift-XRT & NuSTAR observations made during the latest phase of enhanced X-ray emission which started in 2015. During these observations, MXB 1658-298 showed different spectral states and accretion rates. During the observation of 2015, it was in hard state (island state) while during 2016, source was in soft state (banana state). The persistent flux of 2015 observation is an order of magnitude smaller than the 2016 observation. Total one and seven Type-I X-rays bursts were observed during NuSTAR observations of 2015 and 2016 respectively. We will discuss and compare some interesting features observed during recent outburst of the source.

SG-4	ASI2018_1171	Devarshi Choudhury	Poster

Authors: Devarshi Choudhury, Amith Govind, Blesson Mathew, Manoj P., Paul K.T.

Title: Characterizing Disc Evolution of Pre-Main Sequence Stars in 3 – 50 Myr Open Clusters

Abstract: Pre-Main Sequence (PMS) Stars are a class of Young Stellar Objects which form a crucial stage in the star formation process. Characterised by their masses, T-Tauri Stars (< 2MΘ) and Herbig Ae/Be Stars (2 – 8 MΘ) are observed during the PMS evolutionary phase. The protoplanetary discs of these stars serve as formation sites of planetary systems during this period of stellar evolution. We undertook a programme to find PMS Stars in Young Open Clusters in the Milky Way in the age range 3 – 50 Myr and present a pilot study of those clusters using archival photometric data. Young open clusters serve as excellent probes into the process of star-formation due to their large number of PMS Stars that are characterised by near-infrared (NIR) excess. We obtained optical UBV magnitudes of each cluster from WEBDA database and NIR JHK magnitudes from 2MASS Point Source Catalog. Employing de-reddened optical Colour-Magnitude diagram (CMD) and NIR Colour-Colour Diagram (CCD), we identified possible PMS Stars in each Cluster. In future, we intend to study the identified stars using the optical and IR instruments in the 3.6m Telescope at Devasthal, and the 2m HCT at Hanle, India.

SG-5	ASI2018_1178	Abdul Jaleel PP	Poster

Authors: Sabyasachi Pal (Indian Centre for Space Physics) , Rahul Sharma (University of Delhi) , Anjan Dutta (University of Delhi) , Chetana Jain (Hansraj College, University of Delhi).

Title: Phase resolved spectroscopy of Cyg X-3 using High Resolution Grating Spectra and NuSTAR observations

Abstract: Cyg X-3 is a X-ray binary with a compact object possibly a black hole and Wolf-Rayet star as a companion. We have performed high resolution spectroscopy of Cyg X-3 using five Chandra HETG observations in 1.82–7.5 keV energy range. Cyg X-3 reveals several emission features such as hydrogen-like and Helium-like lines of Fe, S, Si, Mg and Ar. We have also performed spectral analysis using NuSTAR observation of 2015 and 2016. In our analysis, Si XIII, Mg XII, Si XIV, S XV , S XVI, Ar XVII, Ar XVIII, Ca XIX, Fe K and Fe XXV lines are apparent in all spectra. Width of the Si XIV and S XVI lines, indicate electron temperature of plasma, KTe ~ 6 eV. We studied variation of different lines over the orbital phase.

SG-6	ASI2018_1213	Rahul Bandyopadhyay	Poster

Authors: Ramkrishna Das, S. N. Bose National Centre for Basic Sciences; Soumen Mondal, S. N. Bose National Centre for Basic Sciences

Title: Photoionization Modeling of Planetary Nebulae VV28 and M1-11

Abstract: Planetary nebulae (PNe) form around low to intermediate mass stars due to mass loss from their outer layers in their late evolutionary phases. They provide scope of studying several astrophysical processes, such as, the mechanisms involving the later stages of stellar evolution, dust and molecules formation, gas dynamics, morphologies etc. Here we present spectral analysis of two planetary nebulae, VV28 and M1-11. While VV28 depicts a typical PN spectra, M1-11 shows the characteristics of a low excitation one. We perform photoionization modeling of the spectra using photoionization code Cloudy 17.00. Given the input parameters, Cloudy computes the ionization equilibrium inside a nebula and generates synthetic emission line spectra. The modeling parameters are varied until a satisfactory match of the observed and modeled spectra is obtained and finally optimized with $\chi 2$ minimization to get the best fit model. We estimate the nebular abundances and density of the hydrogen cloud, the effective temperature & luminosity of the ionizing central star through the modeling. We also estimate the mass of the central star using theoretical stellar evolution trajectories. Finally, we compare the characteristics of the two PNe from our study.

SG-7	ASI2018_1250	harmeen kaur	Poster

Authors: Dr. Alok Durgapal, kumaun university, Nainital. Dr. Saurabh Sharma, ARIES, Nainital.

Title: Photometric studies of NGC 6910 cluster

Abstract: Open clusters provide information about current star formation processes and play an important role in studying the theories of stellar and galactic evolution. The open cluster consists of two main regions i.e., the core and the corona regions and they have important bearing on studies related with star formation and Galactic evolution as the higher mass stars tends to move towards core region with time due to dynamical evolution. The core of the clusters generally contains relatively bright and massive stars, whereas the corona contain large number of faint and low mass stars. Here, we are presenting our initial results related to the optical photometric study of open cluster NGC 6910 based on the deep and wide field mosaiced images taken from 1.0m Sampurnand telescope of ARIES, India.

SG-8	ASI2018_1316	ARITRA CHAKRABARTY	Poster

Authors: Aritra Chakrabarty, Indian Institute of Astrophysics and Sujan Sengupta, Indian Institute of Astrophysics

Title: Limb Darkening of Brown Dwarfs

Abstract: Apart from interpreting the light curves of eclipsing binary star systems, estimating stellar diameter and stellar rotation rate, limb darkening laws for main sequence stars play crucial role to determine the physical properties of exoplanets and exoplanetary system. The transit light curves of stars hosting planets require the stellar limb darkening law for accurate analysis. While limb darkening laws for main sequence stars with spectral class ranging from O to K are extensively discussed and determined, the same for low mass stars, e.g., M-dwarfs and sub-stellar mass objects such as Brown Dwarfs have not yet been considered. Discovery of a few exoplanets around Brown Dwarfs through Radial velocity methods and gravitational microlensing method clearly implies that Brown Dwarfs should also have planets, albeit of small, rocky type. Therefore, analysis of transit light curve of Brown Dwarfs with planets require appropriate limb darkening laws in order to interpret the planetary properties. In the present work, we, for the first time present limb darkening laws for cloud-less brown dwarfs by fitting the angle dependent intensities derived by solving multi-scattering radiative transfer equations self-consistently. We use the cloudless radiative-convective equilibrium atmosphere model of Ackerman-Marley that reproduces well the observed flux of T-dwarfs with a wide range of effective temperature and surface gravity. A sixteen Gaussian point grid is adopted to calculate the angle-dependent intensity of the radiation for a wide range of wavelengths and a three parameter fitting is presented as the laws of limb darkening for each effective temperature and for different wave-bands ranging from V- to K-band. The surface gravity of the objects is fixed at 1000 m/s2 .

SG-9	ASI2018_1320	ALIK PANJA	Poster

Authors: Alik Panja, Soumen Mondal, Somnath Dutta, S. N. Bose National Centre for Basic Sciences

Title: Insights of stellar evolution in an active star-forming site Sh2-242

Abstract: With an aim to accumulate the observational evidence of triggered star formation by the influence of massive stars, we are studying few molecular environment and young stellar objects surrounded by dense H II regions, using multi-wavelength data in the optical to mid-infrared (MIR) range. Identifying and characterizing the member stars in a given region, harbouring massive stars are key idea to understand the physical processes associated with new generation star formation. In this context, we present here a multi-wavelength analysis of a faint and red nebulosity Sh2-242 (S242), located at a distance of 2.1 kpc in Taurus constellation. S242 is a moderately populated region evolving with low-to-high mass ranges pre-main sequence sources, distributed in an embedded, high extinction region. Using optical and infrared data, we have estimated few critical parameters of the region. From optical to MIR colour-colour, colour-magnitude diagrams, spectral energy distribution, spectral features, and extinction map analysis, we reveal the evolutionary structure of S242.

SG-10	ASI2018_1356	Samrat Ghosh	Poster

Authors: Soumen Mondal, Department of Astrophysics & Cosmology, S. N. Bose National Centre for Basic Sciences, JD Block, Sector 3, Salt Lake, Kolkata 700106

Title: A Search for Photometric Variability of Very Low Mass stars and Brown Dwarfs

Abstract: Photometric variability studies of very-low-mass stars (VLMs) and brown dwarfs (BDs) is a valuable tool to probe the physical nature of their atmospheres and rotational properties. This variability in these dwarfs is generally attributed to the presence of surface features like magnetic spots or dust clouds, which may cause optical modulation as the object rotates, and it's possible to measure the period of rotation of a dwarf. Our main aim is to understand those rotational properties and thus atmospheric dynamics of VLMs and BDs in the young star-forming regions as well as in the galactic field. We will present here our results of optical I-band photometric monitoring of few young BDs and VLMs in IC348, a star-forming region in Perseus Molecular Cloud having an age of few million years, and also few old field BDs having the age of few Gyrs.

SG-11	ASI2018_1357	DHRIMADRI KHATA	Poster

Authors: Dhrimadri Khata, Soumen Mondal, Ramkrishna Das and Supriyo Ghosh; Department of Astrophysics & Cosmology, S.N.Bose National Centre for Basic Sciences, JD Block, Sector - III, Salt Lake, Kolkata 700106

Title: Understanding Physical Properties of Young M-dwarfs: Optical and Near-IR Spectroscopic studies.

Abstract: A large population of M-dwarfs (more than 70% of all stars) is becoming attractive targets as a representative of archaeological record of the chemical evolution, star formation history of the Milky Way and as potential habitable exoplanet host stars. A sample of young M-dwarfs from young moving groups and old population from the galactic field is observed using optical HFOSC and Near-IR TIRSPEC instruments (R=1200) on 2m Himalayan Chandra Telescope (HCT) at Hanle. The main goal is to quantify the changes in the strength of several atomic and molecular absorption features with spectral types and to find the correlation with different fundamental parameters like effective temperature (Teff), surface gravity (logg), metallicity ([M/H]), etc. To complement with observation, the synthetic spectra from PHOENIX (BT-Settl) model grid and moderate resolution NIR(1-2.5 μm) archival observed spectra (IRTF SpeX) for different spectral types (M0V-M9V) is taken to support a qualitative validation of our approach. These will help us to find the best-fit of these parameters as well as to determine radii, ages, and masses, etc., which will provide a roadmap for future target selection of transit search around the young and old population of M dwarfs.

SG-12	ASI2018_1553	PAVAN KUMAR VISHWAKARMA	Poster

Authors: Dr. Prasun Dutta Assistant prof. Department of Physics IIT(BHU), Varanasi ,221005

Title: A survey of galactic HI cold neutral medium power spectrum

Abstract: We use radio-interferometric observations of galactic HI in absorption against bright supernovae remnants spread across different galactic longitudes to probe turbulence in the cold neutral interstellar medium (ISM) at scales of a few parsecs to a few hundred parsecs. We measure the opacity fluctuation power spectrum and access that of the corresponding column density assuming certain physically motivated temperature profiles. We plan to perform GMRT observation with a sample of 10 supernovas distributed along different directions in our Galaxy. At present this exercise is performed for two supernovae remnants the Cassiopeia A and Crab and we shall present the results related to these. We will elaborate on the sample selection and science goal of the overall project in detail.

SG-13	ASI2018_1557	Anjusha Balan	Poster

Authors: Shridharan.B: University of Delhi, Blesson Mathew: Christ University,Bangalore, Manoj.P: TIFR,Mumbai,Paul KT: Christ University, Bangalore

Title: Search for accreting T Tauri stars in nearby young moving groups.

Abstract: Nearby young moving groups (NYMGs) are kinematically associated stellar groups that are very close (within 100 pc) to the Sun and spread over large volumes of space. They are incredibly sparse with stars spread over thousands of cubic parsecs of space. Members of NYMGs are thought to be coeveal and gravitationally unbound (Riedel et al. 2017) with ages ranging from 3-70 Myr. We have analysed the master list of the members of NYMGs from Reidel et al. (2016) in order to identify young stars with relatively long-lived protoplanetary disks. The motivation for this search was the discovery of PDS 11 which is a nearby (114-131 pc), accreting T Tauri (Classical T Tauri star; CTTS) binary sytem of age 10-15 Myr (Mathew et al. 2017). We do not expect such active, dusty disks in these systems because the disk disruption time scale of low mass stars are around 3-6 Myr. How can disk survive in 10-15 Myr old system like PDS 11? To address this question we have initiated a survey program to carry out optical/infrared spectroscopy of young stars with long-lived disks with the major facilities in India, i.e., Devesthal Optical Telescope, Himalayan Chandra telescope and Vainu Bappu telescope. The target list for the program was selected from Riedel et al. (2016) with a focus on M-type stars. We present the initial results from this long term program to identify possible systems like PDS 11.

SG-14	ASI2018_1560	Sajad Ahmad Bhat	Poster

Authors: Sajad A. Bhat(1), P. Char(2), D. Chatterjee(3) and D. Bandyopadhyay(1) 1.Astroparticle Physics and Cosmology Division, Saha Institute of Nuclear Physics, HBNI, 1 / AF Bidhannagar, Kolkata-700064, India 2.Inter-University Centre for Astronomy and Astrophysics, Post Bag-4,Ganeshkhind,Pune, India 3.LPC/ENSICAEN,UMR6534, LPC, F-14050 Caen, France

Title: Role of strong first order hadron-quark phase transition on universality relation

Abstract: We investigate moment of inertia(I), quadrupole moment(Q) of rotating neutron stars using equations of states involving novel phases of dense matter. It is found that I and Q are individually dependent on equation of state(EoS). However, their relation is EoS independent and exhibits a universal relation for different EoSs. It is found that this universal relation might be broken in presence of strong first order hadron-quark phase transition. We discuss the consequences of this finding in this presentation.

SG-15	ASI2018_1583	Abhay Mehta	Poster

Authors: Mayank Narang, TIFR, Mumbai Manoj Puravankara, TIFR, Mumbai

Title: Exploring the mass-radius relationship for exoplanets

Abstract: We investigate the mass-radius relationship for exoplanets orbiting main sequence stars in order to characterize the planetary composition and to study the planet demographics based on compositional diversity. Our sample, compiled from the NASA Exoplanet Archive, contains 403 transits planets that have both masses and radius directly measured from observations. The planet masses have been measured either by radial velocity or by using transit-time-variations. This is the largest sample of exoplanets for which mass-radius relationship analysis have been carried out so far. Our analysis shows that mass-radius relationship for exoplanets deviates from M ∝ R^3. We also find evidence for small (< 4 R_Earth) and giant (> 4 R_Earth) planets occupying different density regimes. Additionally, we also searched for correlations between planetary densities and other observed planet properties (e.g. orbital period) and the host star properties (T_eff, metallicity). In this contribution, we will describe our sample and analysis and present our results.

SG-16	ASI2018_1592	Gaurava K Jaisawal	Poster

Authors: Sachindra Naik (PRL, Ahmedabad) and Jerome Chenevez (Technical University of Denmark, Denmark)

Title: Spectral and timing properties of newly discovered X-ray pulsar Swift J0243.6+6124

Abstract: We present the results obtained from timing and spectral studies of the newly discovered accreting X-ray binary pulsar Swift J0243.6+6124 using a NuSTAR observation in 2017 October at a flux level of ~280 mCrab. The spin period of the neutron star measured to be 9.85423(5) s. Pulse profiles of the pulsar found to be strongly energy dependent. A broad profile at lower energies was found to evolve into a double peaked profile in >30keV. The 3-79 keV continuum spectrum of the pulsar is well described with a negative and positive exponential cutoff or high energy cutoff power law models modified with a hot blackbody at ~3 keV. An iron emission line is also detected at 6.4 keV in the source spectrum. We did not find any signature of cyclotron absorption line in our study. Results obtained from phase-resolved and time-resolved spectroscopy will be discussed in detail.

SG-17	ASI2018_1595	Vaibhav Dixit	Poster

Authors: Vaibhav Dixit Physical Research Laboratory

Title: Deep learning based models for the classification of exoplanetary emission spectra

Abstract: Spectral retrieval of exoplanetary atmospheres often demands preselection of user-defined molecular/atomic opacities. This manual intervention introduces biases in the retrieval process. Moreover high dimensionality of retrieval parameters enhances the computational complexity. Models based on deep learning can overcome these challenges. Deep learning is a subset of Artificial Intelligence which takes inspiration from model of human brain. Deep learning encourages computational models that are built on multiple layers to learn representations of data with multiple levels of abstraction. In recent years Generative Adversarial Network(GAN) has emerged as powerful tool in deep learning. This work is aimed at introducing a GAN based model to accurately identify the molecular signatures for a wide variety of planets, compositions and atmospheric thermal profiles.

SG-18	ASI2018_1599	Nevil Shah	Poster

Authors: Nevi Shah (IISER-M)Annapurni Subramaniam (IIA), Sindhu, N.(VIT, IIA), Samyak Prasad (IISER-M)

Title: A study of Blue Straggler Stars in Intermediate Open Clusters

Abstract: Until now, Blue Straggler Stars found in dense GCs and old OCs (above 1 Gyr) have been extensively studied. However, BSSs present in Intermediate Age OCs (0.5 to 1 Gyr) have been little studied, due to lack of proper motion and sufficiently precise spectrometry data of individual stars. Out of 15 potential Intermediate Age OCs, NGC 2355 was identified as a cluster with some peculiar stars which includes 8 fast rotating stars, 2 stragglers - 1 BSS (KM2) and another potentially evolved BSS (KM1) that needs further study. The GALEX-UV and Optical (Large Binocular Telescope) data were combined together to plot CMDs and the fundamental parameters of the cluster were determined. The fundamental parameters of peculiar stars were determined by fitting their SED. 2 new peculiar stars have been found in our study: a white dwarf and a binary red giant star (KM7). KM1 (evolved blue straggler lying 2.3 mag above the red giant clump) also has two components a hotter component (Teff = 9000 K) and (Teff = 5000 K) which is same as the components obtained for KM7. Other strange results of the study include, unusual FUV excess as compared to the best fit in SED of fast rotating stars. The simulated CMD of the cluster incorporating evolving binaries also predicts the observed number of WD binaries among the evolved stars.

SG-19	ASI2018_1613	Rashi Jain	Poster

Authors: Dr. Sarita Vig, IIST

Title: AstroSat UVIT Investigation of the Globular Cluster NGC2808

Abstract: NGC2808 is a metal poor and massive globular cluster in the southern sky. Contrary to the earlier accepted norm of co-eval stellar population in Globular Clusters, NGC2808 has been found to comprise of multiple stellar populations. We have observed this cluster in a number of UV filters (5 NUV and 2 FUV) using UVIT-AstroSat. Our motivation is to investigate the properties of various UV bright stellar populations such as Horizontal Branch, Red Giant Branch, Post-RGB etc, including their distribution across the cluster. The data from the UVIT-Astrosat observations have been reduced and photometry carried out on the images to obtain the catalog of UV bright stars. In the presentation, we discuss the resultant color-color and color-magnitude diagrams of the cluster with reference to the multiple stellar population observed in this region.

SG-20	ASI2018_1621	Gargi Shaw	Poster

Authors: Gargi Shaw, UM-DAE Centre for Excellence in Basic Sciences, University of Mumbai, Sudip Bhattacharyya, TIFR

Title: Low-mass X-ray binaries (LMXBs)

Abstract: Low-mass X-ray binaries (LMXBs) often show periodic intensity dips in X-ray and spectral change during the dips. 4U1323-62 is one such LMXB dipper with an orbital period of 2.94 hour which shows 1 Hz QPO and frequent thermonuclear bursts. It also shows narrow line absorption of Fe XXV and Fe XXVI at 6.68 ± 0.04 keV and 6.97±0.05 keV respectively. Both the absorptions and equivalent widths change during dips. We use spectroscopic analysis code CLOUDY to model and understand spectral change in Fe XXV and Fe XXVI line absorptions.

SG-21	ASI2018_1624	Neal Titus Thomas	Poster

Authors: Shivappa B. Gudennavar Christ University

Title: Spectro-Timing analysis of neutron star low mass X-ray binaries

Abstract: Weakly magnetized neutron stars in low mass X-ray binaries (which have mass of the companion star ~1 - 2 M⊙), show two patterns of X-ray timing and spectral behaviour. (Hasinger and van der Klis, 1989). They are traditionally divided into two main categories based on their correlated spectral and timing properties and the pattern they trace out in the colour-colour diagram: the so-called Z sources which are further classified as Cyg-like and Sco-like Z source and atoll sources which have 'banana' and 'island' states. However, analysis of certain atoll sources (Aql X-1, 4U 1608-522 and 4U 1705-44) for over a period of 5 years show that some atoll sources that vary by the widest range in X-ray intensity trace a Z pattern in the CD (Muno et al, 2002). Certain other sources like 4U 1820-303 and 4U 1728-34 trace only certain features of the Z track and others like GX-13+1 exhibits both Z and atoll properties. The neutron star transient XTE J1701-462 during, its outburst was seen to move through all the subclasses (Lin et al, 2008). In addition to these, neutron star low mass X-ray binaries also show secular shifts in their colour-colour diagrams (Fridriksson et al, 2015). The exact nature of these deviation of sources from the standard subclasses is not well understood and the physical processes that drive the spectral variability is not well known, although increased mass accretion rate is thought to be one of the causes, it is yet to be established. We intend to identify sources like the ones mentioned above, which do not strictly conform to the Z or atoll subclasses and investigate their spectral and timing properties to establish the physical processes that distinguish the Z and atoll sources and the parameters on which this classification is dependent. We plan to work with data from the publicly available data from the Rossi X-ray Timing Explorer's (RXTE) RXTE's Proportional Counter Array (PCA) and High Energy X-ray Timing Experiment (HEXTE) and with AstroSat's Large Array X-ray Proportional Counter (LAXPC) and Soft X-ray Telescope (SXT). The tools that we would use for extracting spectra, applying background corrections and generating light curves are: HeaSOFT 6.22.1, Xspec and LAXPC.

SG-22	ASI2018_1639	MAHADEVAPPA	Poster

Authors: Ajay Chaudhari Govt. Vidarbha Institute of Science and Humanities VMV Road Amravati - 444604 Maharashtra (India)

Title: Theoretical and observational study of mineralogy in debris disks

Abstract: Debris disks are dusty disks around main sequence stars that are distinguished from proto-planetary disks by their small gas: dust ratios. The present study reports optimized structures of (Mg2SiO4, fused quartz and annealed silica) at different temperatures using the molecular dynamics technique (BOMD or ADMP). The effect of structural change in molecule on infrared and electronic absorption spectra at different temperatures reported. The exact mode identification of structures at different temperatures is possible with vibrational spectroscopy. The rotational, centrifugal distortional constants and electronic absorption spectra of these structures are also reported. All these theoretical calculations performed using Gaussian 09 and Crystal 14 software. Mineralogy of debris disks is important for understanding of their physical properties. This study will compare theoretical infrared spectra at different temperatures with the observational spectra. The temperature and composition dependence of the 69 μm band is thought to be a good tool to study the conditions, but we do not have a firm theoretical basis of the variation, which is needed for correct interpretation of observations. It is clear that significant progress in our understanding of the astronomical 69 μm spectra can only be made by a joint effort of observational and theoretical tools.

SG-23	ASI2018_1641	Ruchi Pandey	Poster

Authors: Dr. Ramkrishna Das, Dr. Soumen Mondal, Deptartment of Astrophysics & Cosmology, S. N. Bose National Centre for Basic Scinces.

Title: Photoionization modelling of dust forming nova V1280 Sco (2007)

Abstract: Out of a large number of novae discovered, only a few (about 20%-25%) have been found to form dust in the ejecta. Study of such novae are of important to understand dust formation process and the physical parameters of the dust forming nova. V1280 Sco (2007) is such a nova that formed optically thick dust. Here we present the results of photoionization modeling of the spectra of V1280 Sco. We used the photoionization code CLOUDY c17.00 for modeling observed optical and near-IR spectra. We generated several spectra by varying associated parameters; the best-fit spectra was chosen by minimization technique. From the best fit model, we estimated various parameters, viz., the temperature and luminosity of the central hot white dwarf, elemental abundances etc. From model output spectra, we also identified the spectral features in more details.

SG-24	ASI2018_1642	Jayanta Roy	Poster

Authors: Paul Ray (NRL) and Bhaswati Bhattacharyya (NCRA-TIFR)

Title: J1227-4853 a transitional millisecond pulsar probing neutron star at crossroad

Abstract: Low-mass X-ray binaries (LMXBs) and radio millisecond pulsars (MSPs) are linked through stellar and binary evolution, where MSPs are end products of an episode of accretion of matter and angular momentum from the binary companion during the LMXB state. Over the last decade, the discovery of three transitional millisecond pulsars (tMSPs) has allowed detailed study of recycling process. Recent studies of PSR J1824−2452I (Papitto et al. 2013) and PSR J1023+0038 (Stappers et al. 2013; Takata et al. 2013; Patruno et al. 2014) have observationally demonstrated the LMXB – MSP evolutionary link. These systems show direct evidence of back-and-forth state switching between radio MSP and accreting X-ray millisecond pulsar regimes and opened a new avenue of research in pulsar astrophysics. Third such tMSP system, J1227-4853, was discovered by us using the GMRT (Roy et al. 2015). I will present the results from the radio and gamma-ray study of this pulsar for last 3 years, while highlighting a broad overview of tMSPs as a class and as laboratories to observationally map the hitherto unexplored evolutionary phase of MSPs. Simultaneous imaging and time-domain analysis for PSR J1227-4853 to directly probe the cause of eclipse will also be discussed. J1227-4853 a 1.69 millisecond pulsar at a dispersion measure of 43.4 pc cm^{-3}, transited into the active radio-MSP phase associated with sudden drop of its X-ray and optical luminosity. Systematic GMRT-Fermi-LAT timing campaigns over the last 3 years have provided detection of gamma-ray pulsations from this tMSP. Extreme orbital perturbations as well as signature of proper motion are revealed from the timing analysis. PSR J1227−4853 is the only transitioning system currently in an active rotation-powered state. With regular monitoring of the system with the GMRT, we are recently observing interesting changes in it's radio properties. We are in the process of understanding changes in radio properties in synergy with X-ray and gamma-ray properties of the source. Detailed study of such systems will help to determine whether these transitional systems will eventually be canonical radio MSPs or whether they will form a new sub-class of MSPs that will continue to transition back- and-forth between the two states. Also, such studies will result in better understanding of the spin evolution of the systems and dynamics of accretion during accretion-powered, propeller stage and rotation-powered phases.

SG-25	ASI2018_1645	R Anusha	Poster

Authors: Vaishnavi R (Christ University), Paul KT(Christ University), Annapurni Subramaniam(Indian Institute of Astrophysics), Blesson Mathew(Christ University).

Title: ULTRAVIOLET STUDIES OF CLASSICAL Be STARS

Abstract: Classical Be stars are B-type stars in the main sequence that exhibit line emission over the photospheric spectrum attributed with a circumstellar gaseous disk. This disc formation is commonly known as the Be phenomenon, is one of the unsolved problems in Be stars. One of the possible solutions can be due to optically invisible companion (Porter and Rivinius, 2003). Population models predict that 20% of Be stars can have White Dwarf (WD) companions whereas 60% can host Helium Sub-Dwarf (sdO). Only a few detections of WD companions to Be stars are confirmed. Henceforth we propose a method of detecting such invisible companions by means of Ultraviolet excess in Spectral Energy Distribution (SED) of such stars. For this study we used a sample of 150 Be stars from Mathew et. al (2010). We obtained UV data from GALEX and found that 82 have UV detections. Further, optical/IR magnitudes of these stars were compiled from archive which was used to construct SED. We quantified UV excess by fitting the SED with appropriate stellar atmospheres corresponding to spectral type of the Be star. The UV excess detected in such fashion is indicative of hot companion such as WD or sdO. This analysis can be followed up with UV observations of Be stars using Ultra Violet Imaging Telescope (UVIT) onboard ASTROSAT.

SG-26	ASI2018_1646	Jayanand Maurya	Poster

Authors: Dr. Yogesh C. Joshi, ARIES-Nainital.

Title: Photometric study of the open cluster NGC 2239

Abstract: Open star clusters are unique test beds to understand stellar-evolution theories because all member stars of a cluster were born from the same giant molecular cloud and have approximately same distance, age, chemical composition, and reddening. By comparing the colour-magnitude diagram (CMD) and Two-colour diagram (TCD) of an open star cluster with the theoretical evolutionary models, one can estimate the values of different physical parameters of the cluster. In this study, we have done UBVRI photometry of stars present in intermediate-age open cluster NGC 2239. The radius of the cluster was estimated by drawing radial density profile (RDP)and fitting a King model. The cluster membership probabilities of stars in the region of cluster were derived through a photometric and kinematic study of the cluster. To estimate the distance, age, and reddening of the cluster NGC 2239, we used stellar isochrones fitting method in the observed (B − V)/V and (V − I)/V CMDs, and TCDs. The detailed photometric study of the cluster shall be presented in the poster.

SG-27	ASI2018_1649	G. Mamatha Rani	Poster

Authors: G Mamatha Rani, Sriram K., Malu S, P. Vivekananda Rao

Title: Variable O'Connell effect and unseen third body in a Kepler binary K2 EPIC 2071279

Abstract: We present a photometric study of Kepler binary K2 EPIC 2071279 based on ASAS, KEPLER K2 EPIC and SuperWasp data. Contact binary systems are effective astrophysical laboratories to understand the magnetic dynamo effect in stellar systems. The light curves of contact binaries exhibit an asymmetry in the maxima termed as the O'Connell effect which is considered to be a direct consequence of the spot activity, thereby the magnetic field cycle of the system. Balaji et al. (2014) performed rigorous studies of spot activity and spot migration based on the O-C analysis of 414 contact binary systems. This study revealed that the primary and secondary minima of few such systems showed anti-correlated behavior which is indicative of the longitudinal motion of starspots over the stellar surface. Based on spot migration they also concluded that ~50% of these are asynchronous with their orbits. Moreover, the O-C analysis of a system can show the secular period change of the system and its residuals can further tell us if there exists a tertiary companion for the binary. Our source presents a varying O' Connell effect along with a long term secular increase in period. The O-C diagram residual further showed the presence of LITE variations indicating the presence of a third body. We have solved the Kepler equations numerically to determine the various orbital parameters of the third body. The longtidunial cycle of the spot activity over a duration of ~13 years is discussed.

SG-28	ASI2018_1683	Aisha Dantuluri	Poster

Authors: Dr. Shantanu Desai Indian Institute of Technology Hyderabad

Title: Examining the Statistical Significance of the Annual Modulation suggested by DAMA/LIBRA

Abstract: The DAMA/LIBRA experiment has suggested the existence of Dark Matter particles in the galactic halo based on a 9 \sigma claim for annual modulation of the event rates. We re-examine the statistical significance of annual modulation by the DAMA collaboration using three independent model comparison techniques: namely Bayesian evidence, Akaike and Bayesian Information criterion. We calculate all these three metrics using the combined DAMA data and present results for the same. We then compare our results with other estimates for significance in the literature.

SG-29	ASI2018_1684	Ritu Ravindra Vyaghrambare	Poster

Authors: Ritu Vyaghrambare, K. Sriram, S. Malu Osmania University, Hyderabad

Title: A STUDY OF THE DYNAMICAL CROSS CORRELATION IN A BLACK HOLE SOURCE GROJ1655-40

Abstract: Accretion disc plays an important role in studying the compact object i.e. black hole (BH) or neutron star (NS). In order to study the geometry of the accretion disk in the source GROJ1655-40, we have carried out a detailed temporal X-Ray study using Rossi X-ray Timing Explorer (RXTE) observations. I have studied the dynamical cross-correlation function using a fast algorithm for 2 input time series i.e. 0-13 and 14-35 keV. The cross-correlation function of the soft and hard X-ray photons can be used for analysing the relation of different energy bands, which is helpful for understanding the radiative and geometrical structure of the accretion disk. We found both soft and hard delays of the order of -5 s to +15 s. The observed delays are relatively higher than the Comptonization time scales and much shorter than the viscous time scales. Based on Spectral studies along with dynamical cross-correlation function, we suggest that the delays are due to small viscous time scale during which the Compton Cloud adjust.

SG-30	ASI2018_1698	RAGHU PRASAD M	Poster

Authors: J Rukmini, Shanti Priya D and Syed Aslam Ahmed Department of Astronomy, University of Science, Osmania University, Hyderabad, Telangana-500007

Title: First photometric analysis of neglected contact binaries from ASAS

Abstract: The First Photometric study of 28 neglected contact binaries taken from All Sky Automated Survey (ASAS) are presented. For the V band data from ASAS, period analysis using PerSea and light curve analysis using PHOEBE (0.31aV) was performed. From the period analysis, the accurate periods were determined and found to be lying in a range of 0.28 to 0.96 day. The basic parameters like mass ratio, inclination, temperature, critical potential and fill out factor were derived through light curve analysis. It is observed that few of the binaries display totality and O'Connell effect showing high activity on those binaries. The absolute parameters are derived and their properties are discussed in comparison to a large database of well studied contact binaries. This work gives preliminary photometric solutions for the binaries in study which will further be analyzed and validated using Wilson-Devinney (WD) method.

SG-31	ASI2018_1705	GOPIKA K	Poster

Authors: A. Tej, Jagadheep D, S. Vig, IIST

Title: Radio continuum mapping of HII regions - IRAS 17009-4042 and IRAS 17008-4040

Abstract: We present low frequency radio continuum maps (GMRT: 610 and 1280 MHz) of two southern Galactic HII regions associated with IRAS 17009-4042 and IRAS 17008-4040, both located at a distance of ~2.0 kpc from the solar system. In this presentation, we investigate the morphology of the ionized gas and study the radio properties of these regions. We also generate the spectral index map to understand the mechanism behind the observed emission. In addition, we have estimated the spectral types of the ionizing source and the dynamical ages of these HII regions. We have also probed the possible nature of the exciting source of the ionized nebulae by identifying the near and mid-infrared counterparts from the 2MASS and Spitzer-GLIMPSE catalogs.

SG-32	ASI2018_1715	SUSOVAN MAITY	Poster

Authors: Tapas K. Das, Pratik Tarafdar

Title: On the Role of Disc Thickness in Influencing the Black Hole Spectrum

Abstract: Observational evidences of astrophysical black holes may be obtained by studying the spectra emitted by the multi-wavelength photons from the matter accreting onto such holes. The characteristic spectra can be constructed by studying the dynamics of the matter flow. For axially symmetric general relativistic accretion of matter onto a rotating black hole, we study how various thickness functions for such flow having a specific geometric configuration (flow in hydro-static equilibrium along the vertical direction) can influence various kinematical and thermodynamic properties of the in-falling material, which, in turn, may shed light on how the features of the black hole characteristic spectra depends on such thickness factor.

SG-33	ASI2018_1730	Rashmi Singh	Poster

Authors: Anju Maurya and Shantanu Rastogi DDU Gorakhpur University,Gorakhpur(UP)-273009

Title: Vibrational transitions in phenyl and vinyl derivatives of polycyclic aromatic hydrocarbons in relation to astrophysical infrared bands

Abstract: The astrophysical observations of mid-infrared emission features at 3.3, 6.2, 7.7, 8.6, 11.2 and 12.7 μm (3030, 1610, 1300, 1160, 890 and 790 cm-1) are attributed to vibrational transitions in polycyclic aromatic hydrocarbon (PAH) molecules. These aromatic infrared bands (AIBs) are ubiquitously observed in a variety of astrophysical objects from star forming regions to late type stars and even in external galaxies. The variation in the profile of these emission features correlates with object type indicating different PAH types and populations in different astrophysical environments. The composite emission spectra from a collection of PAHs show uncertainty in matching the 6.2 μm feature AIB, assigned to aromatic C-C stretching vibration. This suggests that only plain PAHs are not sufficient for emission modeling and other forms of PAHs need to be considered, including derivatives, in emission models. The proposed chemical pathway of the formation of PAH molecules in circumstellar environment shows the presence of vinyl and phenyl derivatives of PAHs as intermediate products. The study of these derivatives may improve the proposed emission models and can give a better insight for the observed AIBs. In the present work, we employ density functional method at DFT/4-31G level of theory to compute the infrared vibrational spectra of PAH molecules with substitution of side groups including Vinyl and Phenyl. The aim is to study their suitability, in terms of intensity, peak position and profile, for explaining the astrophysical AIBs. Theoretical IR spectra of Vinyl and Phenyl Anthracene produce almost similar features but Vinyl PAHs show some improvement towards observational features as compared to phenyl PAHs.

SG-34	ASI2018_1741	Rukmini Jagirdar	Poster

Authors: P.Ravi Raja, M.Raghu Prasad and D.Shanti Priya

Title: First Investigations of fundamental parameters of later spectral type W UMa binaries in OGLE Fields

Abstract: We present the analysis of light curves of the late spectral type contact binaries with short orbital periods i.e. < 0.5 days, using the database of eclipsing binaries from OGLE (Optical Gravitational Lensing Experiment) project. The preliminary analysis was carried out using PHOEBE and the results obtained show that most of the binaries in study are in marginal contact phase in their evolutionary process. The results show that the selected W UMa binaries have high mass ratios and yet low degree of contact. This paper attempts to discuss the physical properties of such late spectral type binaries in view of angular momentum loss (AML) which will shed light on the nature of contact systems with late spectral type unevolved components. Key words: binaries – W UMa - late spectral type, AML, Binaries

SG-35	ASI2018_1748	D.Ram Prasad	Poster

Authors: J.Rukmini, D.Shanti Priya, Department of Astronomy, Osmania University, Hyderabad.

Title: Decrypting Stellar Oscillations

Abstract: The maximum amplitude and frequency separations ($\Delta\upsilon$) in the oscillation data of a stellar object are encoded with parameters that describe its structure and evolution. Fundamental properties like mass, radius, luminosity, age, effective temperature can be extracted using the existing relations between $\Delta\upsilon$ and amplitude. Low amplitude is the signature for solar like oscillations. Such oscillation time series data can be obtained from the KEPLER and COROT space missions. Spectral analysis is performed to the oscillation data using a few mathematical techniques, to derive the $\Delta\upsilon$. The relations among the Astroseismic parameters will be discussed for better insights into stellar interiors. This work is an attempt to experiment with the oscillation data by conducting spectral analysis, in the hope of obtaining the said results using a certain mathematical technique and the results will be displayed in correlation to the available results to discuss the elegance of the technique. Key words: Asteroseismology, Kepler database, Fundamental properties, Oscillation mode frequencies, amplitudes.

SG-36	ASI2018_423	YASHPAL BHULLA	Poster

Authors: S.N.A JAAFRREY, PACIFIC UNIVERSITY UDAIPUR

Title: Timing and Spectral studies of Neutron Star GX 5-1

Abstract: We studied the behavior of Neutron star low mass X-Ray binary source GX 5-1 by using LAXPC and SXT instruments onboards AstroSat. We presents the prominent quasi-periodic oscillations from Normal Branch to Horizontal Branch in the range 30 Hz to 50 Hz. We used a qualitative models to describe the spectral features of GX 5-1. The disk black-body temperature vary in 1.5 keV to 2.0 keV corresponding to apparent disk redii 25 km to 20 km respectively. The observations have shown the absorption column density at 2.7 * 10^22 atoms cm^-2 in the energy range 0.7 to 30 keV by clubbing both of instruments. There are correlations of QPO frequencies with disk black-body and thermal comptonization components and found it has no evidence to existence of an Iron emission line.

SG-37	ASI2018_462	Nayana A J	Poster

Authors: Poonam Chandra NCRA-TIFR

Title: uGMRT observations of a TeV SNR G353.6-0.7

Abstract: Supernova shocks are suggested as probable candidates of cosmic ray acceleration sites, through Diffusive Shock Acceleration. A TeV source associated with Supernova Remnant (SNR) becomes an interesting laboratory in this context. HESS J1731−347 also known as SNR G353.6−0.7 is one of the five known shell-type supernova remnants (SNRs) emitting in the very high energy (VHE, energy > 0.1 TeV) γ -ray domain. SNR G353.6−0.7 is of size ~ 30 arcmin and is an ideal candidate to study the particle acceleration mechanism in SNR shocks. Studying the radio morphology of the remnant and constraining the spectral index is crucial to understand the acceleration mechanism. We present the upgraded Giant Metrewave Radio Telescope (uGMRT) observations of SNR G353.6−0.7 in the 250-500 MHz band. The excellent uv coverage of the uGMRT is critical to see the complete structure of the SNR and to estimate the correct flux. We investigate the spatial structure of the spectral indices over the SNR using the wide-band capability of the uGMRT.

SG-38	ASI2018_582	neelam panwar	Poster

Authors: Jessy Jose (Indian Institute of Science Education and Research, Tirupati), Manash R. Samal (National Central University, Taiwan)

Title: Young stellar population and star formation history of the Pelican Nebula/ IC 5070

Abstract: Star formation in giant molecular clouds is generally a complex interplay between the stellar feedback and the underlying cloud properties. IC 5070, a part of the giant cloud complex North American and Pelican Nebula, is one of the nearby massive star-forming regions in the Galaxy. It is located at the distance of ~ 600 pc and powered by an O5 V star. The presence of several HH objects, molecular outflows, T-Tauri stars, globules and elephant trunk-like structures pointing towards the massive star, suggests that stellar feedback is playing a key role in altering the morphology and evolution of the region. Here, we present the results of a multi-wavelength analysis based on optical photometric observations and sltiless grism Ha observations obtained with the Himalayan Chandra Telescope, infrared data from Two Micron All Sky Survey, UKIDSS, Spitzer Space Telescope, Herschel and X-ray data from Chandra Space Telescope. We detect more than 1000 young stellar candidates within the observed area (~ 30' x 30'). The region is non-uniformly reddened with Av ranges from 3 – 20 mag. Our point source analysis is complete down to the 0.2 Msun and hence is the deepest analysis of the complex for the first time. Using multi-wavelength data sets, we analyze the physical parameters of the member stars, and various stellar aggregates, star formation history and the possible future evolution scenario of the complex will be presented.

SG-39	ASI2018_611	Bhal Chandra Joshi	Poster

Authors: Bhal Chandra Joshi NCRA-TIFR, Pune

Title: Using wide-band multi-frequency capabilities of upgraded-GMRT for single pulse studies and pulsar timing

Abstract: The seamless frequency coverage from 250 to 1500 MHz, distributed over three bands (Band 3,4 and 5), together with provision of four 400 MHz beams and the sub-array nature of the instrument, provides a unique instrument in the world for simultaneous multi-frequency low frequency single pulse studies of radio pulsars, which are bright at these frequency bands due to their steep spectra. Such studies are important to unify the diversity of single pulse phenomena, such as sub-pulse drifting, pulse nulling and sub-pulse related profile mode changes and provide constraints to pulsar emission physics from multiple point of views. Sub-pulse drift probes the electric field in the polar gaps, whereas sub-pulse drift related profile modes, when studied at multiple frequencies simultaneously, probe the magnetospheric configurations and radio emission heights and geometry. Pulsars, such as PSR B0031--07, J1822--2256 and B2319+60, show multiple distinct drift modes and drift mode related profiles (Joshi 2013, Gajjar et al. 2014, Naidu et al. 2017, Joshi et al. 2018, Joshi and Padlekar 2018). Simultaneous multi-frequency observations with Band 3, 4 and 5 of upgraded GMRT for such pulsars are useful to separate beam geometry from emission dynamics. In this presentation, I describe the unique capabilities of uGMRT for such studies and illustrate these capabilities from our recent work based on such observations in Cycle 32 of uGMRT. I will also briefly refer to the capabilities of both legacy GMRT and uGMRT along-with Ooty Radio Telescope for multi-frequency simultaneous high precision timing observations of 9 millisecond pulsars as part of Indian Pulsar Timing Array experiment (InPTA) for detection of nanoHertz gravitational waves and future prospects for such studies.

SG-40	ASI2018_679	Rahul Kumar Anand	Poster

Authors: Shantanu Rastogi^1 and Brijesh Kumar^2 1^D.D.U. Gorakhpur University, Gorakhpur-273009 2^ARIES, Manora Peak, Nainital (Uttarakhand)-263002

Title: Study of correlation between optical and infrared bands in some carbon rich late type stars

Abstract: Observations from space telescopes, particularly infrared telescopes (IRAS, ISO and Spitzer), indicate that the mid infrared emission features at 3.3, 6.2, 7.7, 8.6, 11.2 and 12.7 μm in nebular spectra are of generic nature. These features are attributed to Polycyclic Aromatic Hydrocarbon (PAH) molecules pumped by background UV radiations and are popularly known as Aromatic Infrared Bands (AIBs). It is understood that the circumstellar shells of carbon rich late type stars are the breeding ground for the PAH formation. The AIBs profile varies between objects indicating different PAH populations and different physiochemical environments. In order to get a better understanding of these environments, optical observations are performed to look for correlation, if any, between optical attributes and the AIBs. The optical and near IR observation have been done from ground based Devsthal Optical Telescopes, ARIES, Nainital on some selected carbon rich late type stars in the planetary nebulae (PNe) phase. Various photometric parameters are derived. The mid-infrared data for these objects are obtained from the archival data of Infrared Space Observatory (ISO). There exists a good correlation between object type and mid-infrared features. But there are some objects, which show complex emission profile around certain wavelengths. A detailed study may help to understand PAH formation and the physical and chemical evolution of late type stars.

SG-41	ASI2018_682	NAFISA AFTAB	Poster

Authors: Prof. Biswajit Paul

Title: A study of X-ray reprocessing in low mass X-ray binaries with XMM-Newton

Abstract: In X-ray binaries, primary X-rays originate in regions close to the compact object. Study of reprocessed X-rays can give useful information about the environment of the compact star, i.e. about the characteristics of the accretion disc or wind of the companion. But the difficult aspect of studying reprocessed X-rays is that the reprocessed emission is detected along with the primary emission, which is much brighter. Eclipsing X-ray binaries make an ideal condition to study reprocessed X-rays as the X-rays detected during eclipse are purely reprocessed while the primary X-rays are blocked by the companion star. We have studied 4 low mass X-ray binaries (LMXBs), namely EXO 0748-676, XTE J1710-281, RX J1745.6-2900 and MXB 1659-298 during eclipse and the out-of-eclipse phases with XMM-Newton. Comparison of the eclipse and out-of-eclipse spectra of these sources shows different binary environment in all the 4 LMXBs. For example warps in the accretion disk of EXO 0748-676, tilted or very small accretion disk in XTE J1710-281, a soft X-ray source at least further away from the outer accretion disk in RX J1745.6-2900 etc. have been found. In this first detailed X-ray reprocessing study with eclipsing LMXBs, we try to infer the accretion disk characteristics of these systems which is the main reprocessing agent in LMXB systems.

SG-42	ASI2018_684	Margarita Safonova	Poster

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Title: Pros and Cons of Classification of Exoplanets: in Search for the Right Habitability Metric

Abstract: Humanity always looking for second Earth since anthropically we believe that life can only originate and exist on planets, therefore the most fundamental interest is in finding the Earth twin.This can be broadly classified into looking for planets similar to the Earth (Earth similarity) or looking for the possibility of life (habitability).But is habitability the ability of a planet to beget life, or is it our ability to detect it: a planet may host life as we know it (be not just habitable but inhabited),but we will not detect it unless it evolved sufficiently to change environment on a planetary scale.Full assessment of any planet habitability requires very detailed information about it.With thousands of discovered exoplanets and possibility that stars with planets are a rule rather than an exception,it became necessary to prioritise the planets to look at, develop some sort of a quick screening tool for evaluating habitability perspectives from observed properties. Several scales were introduced:Earth Similarity Index,with Earth the reference frame for habitability;Planetary Habitability Index, based on general requirements of life like water or substrate,etc.We introduced Mars Similarity Index,as well as novel machine-learning-based classification:Cobb-Douglas Habitability Score.We perceive habitability as a probabilistic measure,or a measure with varying degrees of certainty;in contrast to the binary definition of exoplanets being “habitable or non-habitable". The approach requires classification methods that are part of ML techniques and convex optimization.However,this classification strategy has caveats,and some authors reject it entirely on the basis of impossibility to quantitatively compare habitability,and the idea that pretending otherwise can risk damaging the field in the eyes of the community. In addition, ESI is based on the well-known statistical Bray-Curtis scale of quantifying the difference between samples, frequently used by ecologists to quantify differences between samples based on count data. However, most multivariate community analyses are about understanding a complex dataset and not finding the "truth", meant in a sense of "significance". Thus, it may not be enough to understand a complex hierarchy of classification. But since all we know is Earth-based habitability, our search for habitable exoplanets (Earth-like life clearly favoured by Earth-like conditions) is by necessity anthropocentric, and any such indexing has to be centred around finding Earth-like planets, at least initially. We discuss different `habitability' classification metrics,their origins, merits and drawbacks.Despite recent criticism of exoplanetary ranking, we are sure that this field has to continue and evolve to use all available machinery of astroinformatics and ML. It might actually develop into a sort of same scale as stellar types in astronomy. It can be used as a quick tool of screening planets in important characteristics in search for Earth-likeness for follow-up targets.

SG-43	ASI2018_705	Snehalata Sahu	Poster

Authors: Annapurni Subramaniam, Indian Institute of Astrophysics

Title: UVIT Study of Blue Straggler Stars in Globular Cluster NGC 5466

Abstract: NGC 5466 is a metal poor globular cluster ([Fe/H]= -1.98 dex) located in the constellation of Bootes at a distance of 16 Kpc. This cluster has a low central concentration, but contains a large number of Blue Straggler Stars (BSS). The main formation pathways of BSS in the cluster is still not well understood. We present the UVIT observations of NGC 5466 in 4 filters, two in Far-UV (F148W and F169M) and two in Near-UV (N245M and N263M) with fairly large exposure times. We have performed crowded-field photometry on the UVIT images and created the UVIT Color-Magnitude Diagrams. The core of the cluster is resolved and we are able to obtain the full BSS census in this cluster to create the radial distribution of BSS covering the entire cluster region (~11'). We will present the SEDs of the BSS and discuss their formation pathways.

SG-44	ASI2018_718	Tridib Roy	Poster

Authors: Dr. R.T.Gangadhara, Affilation:Professor of Indian Institute of Astrophysics.

Title: Radio emission of pulsar and polarization

Abstract: Pulsars emit beamed electromagnetic radiation in the form of periodic pulses, as it sweeps across the observer. We know from observations that the radio emission of pulsars is coherent and highly polarized. The typical brightness temperature of pulsars range from 10^{25} to 10^{32} K. The mechanism of radio wave emission of pulsars is still an outstanding problem in pulsar astronomy. However, it is generally believed that the coherent curvature radiation mechanism can explain the high brightness temperature and polarization of pulsars in radio band. Physicists have suggested several mechanisms like Plasma antenna mechanism, Maser amplification and Relativistic plasma instabilities. We believe that coherent curvature radiation mechanism can incorporate both relativistic plasma instabilities and antenna mechanism, and worth enough to explain the high brightness temperature of pulsars. Coherent curvature radiation model is being developed by taking into account of detailed viewing geometry and dipolar magnetic field. The relativistic pair plasma (e^{-}, e^{+}) tied to the dipolar magnetic field lines, changes direction in every moment which results in the acceleration and hence emitting radiation. We are trying to develop a theoretical model based on bunch (collective system of plasma particles) acceleration and plasma instabilities process, which is believed to explain the enhanced Intensity, high brightness temperature in radio band as well as polarization characteristics.

SG-45	ASI2018_731	HARIKRISHNA SRIPADA	Poster

Authors: S.HariKrishna, Indranil Chattopadhyay and K. Sriram

Title: Analytical study of shocks in accretion disk and accretion ejection mechanism.

Abstract: Sonic point locations were computed in an adiabatic accreting axisymmetric disk around Schwarzschild black hole using Paczynnski-Witta Pseudo-potential. Various parameters viz. energy, sound speed, temperature and adiabatic index variations were studied along the disk radius. We also study the equation of state for multispecies fluid in the accretion disk given by Chattopadhyay (2008) and Chattopadhyay & Ryu (2009). The outcome of the solutions are discussed in frame of accretion ejection mechanisms in black hole and Neutron star X-ray binary systems which are probably associated with type A to type-B/C QPOs transitions in X-ray binaries

SG-46	ASI2018_740	Priya Hasan	Poster

Authors: Maulana Azad National Urdu University, Hyderabad

Title: The Enigma of Star Formation at High Galactic Latitudes

Abstract: The discovery of high latitude Embedded Clusters is fundamental to our understanding of the Galaxy formation, evolution and dynamics and the role of the halo in the Galactic evolutionary process. We present a study of nine embedded clusters (ECs) reported in recent literature with ages less than 5 Myr and vertical distances from the galactic disc ranging from 1.8 to 5 kpc. We use 2MASS, WISE, Denis, IRAS to study the clusters and the larger areas surrounding these clusters to classify the YSOs and study the progress of star formation in them. We shall explore the possibility of them having formed by the galactic chimmney effect or due to extragalactic processes. Two of these objects will be observed with Astrosat as our proposal has been accepted, so we shall comment on the possible results we expect to get with Astrostat UV and Xray data.

SG-47	ASI2018_844	Dr.D.Shanti Priya	Poster

Authors: J. Rukmini, P. Ravi Raja and V. Monica Department of Astronomy, Osmania University.

Title: Photometric Investigation of ultra-short period M-type eclipsing binaries from OGLE galactic bulge survey

Abstract: First photometric investigation of nine ultra-short period eclipsing binaries detected in OGLE (Optical Gravitational Lensing Experiment) fields present towards the galactic bulge are reported. Binaries of such ultra-short periods have been rarely studied and understanding their existence can infer their formation and evolutionary scenario which can be either due to loss of angular momentum through magnetized winds or due to any other mechanism. The light curve analysis was carried out using PHOEBE, based on Wilson-Devinney program. The best solutions obtained indicate that these binaries are cool high-mass ratio eclipsing systems. The structure and evolutionary state of these short period binaries is discussed in this work, which would pave-way in building new binary models to explore the origin and evolution of such rare class systems that remains poorly understood.
Keywords: Binaries-Eclipsing, Cool, Ultra-short

SG-48	ASI2018_933	Manoj Puravankara	Poster

Authors: Mahathi Chavali (Manipal University), Blesson Mathew (Christ University), Mayank Narang (TIFR)

Title: A comparative analysis of X-ray emission from young stars in Orion and Carina

Abstract: The aim of the work is to investigate the X-ray emission from low mass (<2M⊙) young (< 2 Myr – 10 Myr) stars in the pre-main-sequence phase of stellar evolution, and study the time evolution of the emission. We carried out a comparative study of X-ray emission by picking two young star forming regions: Orion Nebula and Carina. These nebulae have been studied in X-rays using Chandra X-ray telescope, which has an excellent spatial resolution of one 1". The Orion Nebula Cluster is 450 pc away from the earth and has been observed by Chandra in one of the deepest and longest X-ray observation ever made of a young stellar cluster as a part of COUP (Chandra Orion Ultradeep Project). The Carina Nebula is at a distance of 2.3 kpc and X-ray observations of this region were obtained as part of the Chandra Carina Complex Project (CCCP). Making use of the optical photometry and spectroscopy of three star clusters in Carina — Trumpler 16, Trumpler 14, and Collinder 232 — we cross-matched these sources with CCCP to build our data set. Using the spectral types and distances compiled from the literature, we estimated parameters such as bolometric luminosity, effective temperature, stellar radius, rotation period and infrared excess for these sources. We searched for correlations between observed X-ray properties and stellar properties and accretion/disk tracers to study the characteristics of the X-ray emission in both the nebulae. We note the similarities and differences in the X-ray emission in both the nebulae and discuss the causes of differences and the probable origin of X-ray emission in low-mass young stars.

ASI 2018 Poster Presentations

Extragalactic Astronomy

EA-1	ASI2018_1027	Dr Vijayakumar H Doddamani	Poster

Authors: Vedavathi. P Department of Physics, Bangalore University, Bangalore-560056

Title: An intensive monitoring study of Seyfert-1 galaxy NGC 7469 using IUE

Abstract: Active galaxies exhibit continuum and line rapid variabilities over different time-scales ranging from a few minutes in X-rays to several days in UV and optical regions. In this paper, we present our results on the UV variability study of the Seyfert 1 galaxy NGC 7469 observed intensively by IUE satellite during June 10 to July 29, 1996 at nearly regular intervals of time. The minimum interval of observation has been about 3- 4 hours. We have found three major events of flux maxima separated nearly by 14 -16 days and the continuum flux has varied by an factor of 1.5 approximately at 1325 Å, 1475 Å and 1655 Å. The Lya, Si IV C IV, C III] and Mg II lines also exhibited bearing a good correlation with the underlying continuum. We found characteristic period of variability neither in continuum nor in the emission lines from this intense observational campaign of NGC 7469. Lya emission line has been found to have variable intrinsic absorption possible attributable to line of sight gas out flows. We find the CIV / CIII] line ratio to be ~ 2-4, typical of a Seyfert galaxy. The observed relatively higher amplitude variability in C IV than C III] line is indicative of the stratification of BELR region in active galaxies. These observations results provide new constraints on the theoretical photoionization models of the central regions of active galaxies. We explore the possibilities by which these observations can be reconciled with theoretical models. A detailed discussion on the implications of the results and the need for the future observations with higher temporal resolution is presented in this paper. Keywords: Seyfert 1 galaxy, NGC 7469, line flux, continuum flux, variability time-scale ---------- *Corresponding author: drvkdmani@gmail.com

EA-2	ASI2018_1129	Koshy George	Poster

Authors: NIL

Title: Star formation influence the Fundamental Plane of early-type galaxies

Abstract: The passively evolving "red and dead" early-type galaxies fall on a Fundamental Plane in the three dimensional phase space of galaxy size, surface brightness and velocity dispersion. The intrinsic scatter of galaxies on the plane is attributed to variations in the total mass-to-light ratio, which is highly sensitive to the recent/ongoing star formation in the galaxy. We test this hypothesis by constructing the Fundamental Plane of ~5000 early-type galaxies in the local Universe and analysing the position of star forming population of early-type galaxies. The star forming early-type galaxies are found to be deviated from the plane with a dependence on the optical colour of the galaxy. The integrated stellar population analysis using the galaxy spectra reveals that the age of the stellar population dictates the position of galaxies on the Fundamental Plane. The result and its implication in the context of the observed stellar mass growth in early-type galaxies will be discussed.

EA-3	ASI2018_1199	Akanksha Tiwary	Poster

Authors: Akanksha Manojkumar Tiwary(1), Megha Rajoria(1), Viswajith Govinda Rajan(1), Sumanta Kumar Sahoo(1), Lavanya Nemani(1), Sagar Sethi(1), Arpita Misra(1), Mitali Damle(1), Shilpa Dubal(1), Karuna Gamre(1), Pradeepta Mohanty(1), Anjali Amesh(1), Avinash Kumar(1), Gitika Mall(1), Alakananda Patra(1), Charitarth Vyas(1), Aikya Shah(1), Ankit Vaghasiya(1), Ankita Das(1), Ashutosh Sharma(1), Bhargav Reddy(1), Debaiudh Das(1), Devanshu Shrivastava(1), Dwiti Krushna Das(1), Joydeep Naskar(1), Kavil Mehta(1), Raveena Dandona(1), Rohith Sai Shashank(1), Ronaldo Laishram(1), Sushrut Mane(1), Sayali Kulkarni(1), Pratik Dabhade(1), Sravani Vaddi(1,2), Chiranjib Konar(1,3), Ananda Hota(1,4) 1. RAD@home Astronomy Collaboratory, India 2. National Centre for Radio Astrophysics - TIFR, Pune, India 3. Amity University, Noida, India 4. UM-DAE Centre for Excellence in Basic Scieces, Mumbai, India

Title: Recent discoveries using GMRT & the growing community of #RADatHomeIndia e-astronomers leveraging Any BSc/BE Can Do research(#ABCDresearch) approach

Abstract: Launched in the hyperconnected, big data era with the primary motive of tapping into India's growing population of STEM undergraduates, graduates and the freely available GMRT online archive, RAD@home (#RADathomeIndia) has emerged as the nation's first successful citizen-science research platform. This zero-funded, zero-infrastructure collaboratory is leveraging various open access tools such as NASA Skyview, NASA NED, ds9, Hubble Archive, VLA Archive, Google and Facebook (https://www.facebook.com/groups/RADathome/).Adopting Any BSc/BE Can Do research (#ABCDresearch) using GMRT sitting at home anywhere in India approach, there are over 2400 Indian members in the group comprising of students,employed/unemployed individuals

participating in astronomy education and research from home. Since its launching in April 2013, over 100 members have been trained by professionals during RAD@home Discovery Camps (RDC) held across India at various institutes namely Institute of Physics (IOP,Bhubaneshwar), Harishchandra Research Institute (HRI, Allahabad), UM-DAE Centre for Excellence in Basic Sciences (CEBS, Mumbai), Nehru Planetarium-New Delhi, and Vigyan Prasar-DST. These RDC-trained citizen scientists or e-astronomers continue to participate in nation-wide, inter-university multi-wavelength extragalactic astronomy research through online e-class e-research sessions (3hrs/week). The TIFR GMRT Sky Survey (TGSS) is the primary data from which e-astronomers discover exotic black hole galaxy systems for GMRT to follow up. Under the GOOD-RAC (GMRT Observation of Objects Discovered by RAD@home Astronomy Collaboratory) project, the group was awarded observing time by the by GMRT Time Allocation Committee (GTAC), in four different cycles, after going through standard international competition/review process. In GOOD-RAC e-astronomers, as Co-Investigators, collaborate with national/international professional astronomers as a perfect Professional-Amateur (Pro-Am) collaboration. The newly discovered sources, that have been recently imaged by upgraded GMRT, include new Speca-like galaxies, episodic radio galaxies, relic-lobe radio galaxies, a few Z- and X-shaped radio galaxies, intriguing cases of jet-galaxy interaction (labouratory for AGN-feedback), diffuse radio relic/halo in clusters, a few diffuse or bent-lobe radio galaxies tracing cosmic accretion onto clusters through filaments etc. Unlike conventional education programs, those who get involved with RAD@home not only learn but also directly contribute to astronomy research from initial one-week of RDC interaction itself. Over the years, this association has proven to be a powerful catalyst due which over a dozen members of the group have been selected for higher studies in different parts of the world. The wide implications of this innovative citizen-science research collaboratory have been documented in two international publications (Hota et al. 2014, 2016)and multiple national/international conferences. Interested readers can join the Facebook group and participate in foundational e-learning sessions to get selected for the RDC and ODRAW being planned in ICTS-TIFR and IISc, respectively, in Bangalore.

EA-4	ASI2018_1211	Sravani Vaddi	Poster

Authors: Grant Tremblay (Yale University, USA) Chris O'Dea (University of Manitoba, Department of Physics and Astronomy, Manitoba, Canada) Stefi Baum (University of Manitoba, Department of Physics and Astronomy, Manitoba, Canada)

Title: HST COS Spectroscopy of Cooling Flow Filaments in A2597 and Zw3146

Abstract: Heating by AGN through outflows has gained fundamental importance in the study of large-scale structure and galaxy formation and is often invoked to quench the radiative cooling of the hot intracluster medium (ICM) onto the brightest cluster galaxy (BCG). However, in cool-core clusters where the ICM cooling rate is shorter than the age of the cluster, AGN heating does not completely offset radiative losses and significant additional ionization mechanism is necessary to explain the observed temperature and line ratios of the filamentary emission line nebulae around the cool core BCGs. In an effort to find the source of this mysterious ionization, we have obtained deep FUV spectroscopy using the HST cosmic origins spectrograph of the filaments of two cool-core galaxy clusters A2597 and ZW3146. Spectral diagnostics in the FUV are capable of discriminating between various heating models (stellar photoionization, thermal conduction, cosmic ray heating and shock heating). Using photoionization codes MAPPINGS and CLOUDY, different ionizing sources have been simulated and consists of single and hybrid models. We notice that shock heating is more efficient than individual models of AGN/stellar photoionization/Bremmstrahlung or hybrid AGN-Stellar photoionization model in explaining the high ionization state of the BCG.

EA-5	ASI2018_1307	Avni Paresh Parmar	Poster

Authors: Dr. Ilse van Bemmel (JIVE), Dr. Jay Blanchard (JIVE), Dr. Megan Argo (University of Central Lancashire, UK) Avni Parmar (JIVE)

Title: Jet kinematics of NGC 660

Abstract: Nuclear activity in galaxies is currently assumed to occur in cycles. A single galaxy may experience multiple phases of activity, during which the central super-massive black hole grows through accretion. How these phases are triggered or quenched, is still unclear. In 2013, NRAO scientists proclaimed the serendipitous discovery of a radio outburst in NGC 660 galaxy resulting into a new compact source in its core. In the same year, e-MERLIN observations also recorded change in brightness of the source by a factor greater than 1200 as compared to the MERLIN pre-outburst limit. Over a timescale of ~1 decade the brightness and shape of the source has significantly changed. Observations indicate that the most likely cause is a new phase of nuclear activity. This makes NGC 660 an ideal target to study the triggering and early evolution of radio sources. With this motivation, a monitoring project was started using EVN (European VLBI Network) in late 2013 to observe this source at 1.4 GHz. We processed the available four epochs of EVN data (2013 - 2016) using AIPS and Difmap. In this talk, we will present the interesting results obtained from our work. From our data analysis, we find that the EVN observations are consistent with no change in the source over a time of three years. This implies that the source evolved to its current size within the first few years of its appearance, and the expansion since then came to a full stop. We discuss a few possible scenarios and follow-up plans for this study.

EA-6	ASI2018_1349	Susmita Chakravorty	Poster

Authors: Susmita Chakravorty, Martin Elvis, Gary Ferland

Title: Changing look quasars - BLR gone with the stable wind

Abstract: With the unprecedented sky monitoring provided by Sloan Digital Sky Survey (SDSS), it has been possible to discover quasars which "change their look". The broad emission lines (BELs, that are hallmarks of active super-massive black holes) that were present in 10 year old SDSS spectra have been found to diminish or disappear in the latest SDSS spectra (DR12) in at least 3 quasars. There was at least, one more known detection of such an effect since 1976. Given the duty cycle of Active Galactic Nuclei (AGN), any such variability can be detected only with decade long (or longer) systematic surveys. Such surveying was not present before SDSS and hence the convincing results are emerging only now. We propose a hypothesis to explain the changing strength of the BELs in AGN. We have found that broad emission line regions (BELR) exist for high metallicity gas under stringent conditions of pressure equilibrium with warmer outflowing X-ray absorbing gas. The pressure equilibrium works for only a narrow range of gas density. Further, the conditions of the pressure equilibrium is sensitively dependant on the metallicity of the gas and the spectral energy distribution (SED) of the ionizing light. Among the SED parameters, alpha_OX - the optical to X-ray flux ratio, is one of the crucial parameters that destroys the pressure equilibrium if alpha_OX > 1.6! Our systematic analysis will let us design intelligent observational strategies to look for these rare “changing look AGN”.

EA-7	ASI2018_1365	Rekhesh Mohan	Poster

Authors: Koshy George, Indian Institute of Astrophysics

Title: A Deep Imaging Study of Ringed Galaxies using UVIT

Abstract: Ringed Early type galaxies (R-ETGs) form a unique class of extragalactic objects which can provide important clues to investigate a variety of topics ranging from galaxy formation and evolution to dark matter content in the galaxies. The central early-type galaxy hosts evolved stellar population while the ring, abuzz with active star formation is bright in UV. The high resolution FUV/NUV imaging is ideal to study the clumpy ongoing star formation in the ring and the spatial variation of star formation rate. As part of an ongoing deep imaging survey of R-ETGs using the UVIT, we are conducting the deepest and highest spatial resolution UV observations of a selected list of these galaxies using UVIT onbaord ASTROSAT. The analysis and the initial results of the study will be presented.

EA-8	ASI2018_1418	SONALI KISHANRAO KADAM	Poster

Authors: -

Title: ICM properties and Cold front detection in cool core cluster Abell795

Abstract: To understand morphology of intracluster medium in cool core cluster Abell 795 (z=0.135), we performed detailed X-ray analysis using 30 ks Chandra X-ray data. From this analysis we detected a cold front at ~25.8 arcsec in the east direction from the centre of the cluster with mach number ~1.44. The distribution of hot gas in cluster is studied using the surface brightness (SB) profiles drawn along the azimuthal as well as in different directions upto 100 arcsec from centre of the cluster. It shows clear evidence of variations in the SB profiles. The best fitted ? model to azimuthally averaged SB profile resulted into rc = 38 pixels (1") and ? = 0.5. We have also derived physical properties of cluster such as projected gas temperature, electron density, metal abundance profiles. We also obtain two-dimensional temperature, abundance, pressure and electron density maps to reveal structural variations. Residual image shows that Abell 795 exhibit two spiral patterns, one with positive excess and another with negative excess. The temperature of positive excess and negative excess regions are 4.08?0.1 + 0.1 keV and 3.08?0.14 +0.14 keV, respectively. We also found that the abundance, pressure, entropy, electron density values are different in these spiral regions. Positive excess region have more abundance and entropy as compared to negative excess region. The average cooling time is found to be 4.4 ◆ 1010 yr, this is longer than Hubble time. For Abell 795 the average unabsorbed X-ray luminosity is ~ 3.4754 ◆ 10+44 ergs/s.

EA-9	ASI2018_1431	Kyadampure Anil Tejerao	Poster

Authors: Anil T. Kyadampure Sanjeevanee Mahavidyalaya, Chapoli, Latur - 413513, India. Madhav. K. Patil School of Physical Sciences, Swami Ramanand Teerth Marathwada University, Nanded - 431 606, India.

Title: Investigation of a pair of prominent X-ray cavities in Abell 3581 and NGC 1407.

Abstract: We present a detail study of the energetic interaction between the central active galactic nucleus (AGN) and the intra-group medium (IGM) of the galaxy group Abell A3581 and NGC 1407. We made use of currently available Chandra X-ray archival data of group Abell 3581 and NGC 1407, which are known to possess clear pair of X-ray cavities in the inner region. Due to high spatial resolution of the Chandra, 2-d beta model, unsharp masking, surface brightness and temperature profiles techniques, it is possible to detect the cavities in the central region. These cavities are of elliptical shape, exists in pairs. The derived cavity properties like age, power, size and pressure which in turn enable us to understand the mechanism of cavity formation and evolution. Spectroscopic analysis of extended X-ray emission from different regions enable us to examine the variations in derived parameters like X-ray flux, electron density, entropy, metal abundance, temperature and enthalpy. Our result imply that, the cavities are originated due to the AGN outflows associated with the cluster cooling flows.

EA-10	ASI2018_1460	Ankit Singh	Poster

Authors: 1.Mamta Gulati, Thapar University, Patiala, Punjab 2.Jasjeet Singh Bagla, IISER Mohali, Punjab

Title: Ram pressure stripping : An analytical approach

Abstract: The understanding of quenching of star formation of a galaxy in a high-density environment is still a puzzle, which is important for understanding galaxy evolution(Quadri et. al. 2011). Ram pressure stripping(Gunn & Gott 1972), as quenching mechanism is found to be one of the main mechanisms in a cluster environment, but its importance in group and galaxy environments has been a subject of debate for several years. To differentiate between various quenching mechanisms in action along with ram pressure one needs theoretical models for ram pressure stripping (J.A. Hester 2006). We propose an analytical model to study ram pressure stripping as a mechanism of gas removal from galaxy disc in absence of any other process. We vary parameters related to ambient medium and galaxy to get a quantitative idea of their effects on the amount of gas that remains in galaxies. The results act as an upper bound on the amount of stripping that can happen due to ram pressure in various environments and hence the quenching of star formation.

EA-11	ASI2018_1481	Nidhi	Poster

Authors: Patrick Das Gupta and Nidhi Saini Dept. of Physics and Astrophysics, University of Delhi, Delhi

Title: Collapsing Supra-massive neutron stars and FRBs

Abstract: Fast Radio Bursts (FRBs) are observed in GHz frequencies lasting for few milliseconds. They are associated with large dispersion measures at high Galactic latitudes, indicating their extragalactic origin. FRBs can be modeled by invoking gravitational collapse of supra-massive neutron stars when they lose their centrifugal support via magnetic braking (Falcke & Rezzolla 2014). In that case, FRB121102 poses a challenge to such a catastrophic origin, since it is a radio-repeater. In this poster paper, we have modeled the repeating nature of FRB121102 employing two scenarios - (a) Blandford-Znajek process due to the accretion of highly magnetized plasma on to a Kerr black hole or (b) oscillation of surface electrons around a strange quark matter star. In both the scenarios, the compact objects result from the implosion of a supra-massive neutron star. (Reference: Das Gupta, P. and Saini, N., to appear in Jour. Astrophys. Astron.)

EA-12	ASI2018_1534	Priyanka Biradar	Poster

Authors: Prof. M.K.Patil School of physical sciences, SRTM University,Nanded

Title: XRB Population In Dusty Early Type Galaxies

Abstract: "XRBs population in dusty early-type galaxies". We present here results based on sample of early type galaxies that host dust lanes and have retrieved the X-ray observational data from the NASA's Chandra X-ray data archieve. I have cleaned and reduced the raw data using ciao 4.9. After cleaning the raw image I detected point sources within the D25 region, using wavdetect task. Further, I extracted the X-ray counts from individual point source in three different energy bands namely soft (0.3-1 keV), mid (1-2 keV) and hard (2-10 keV) and have derived X-ray colors of the resolved sources. These values of X-ray colors were then used to classify the resolved sources in different classes like, normal low mass XRBs with neutron star as the accretor, soft sources, high mass XRBs, and hard AGNs. For those sources whose X-ray counts are sufficiently high, we have performed spectral analysis of the sources and investigated their emission characteristics.

EA-13	ASI2018_1559	Rukaiya Khatoon	Poster

Authors: Prof. Ranjeev Misra, IUCAA Dr. Sunder Sahayanathan, BARC,Mumbai Dr. Atreyee Sinha, Paris Observatory

Title: Probing the origin of high energy variability in Blazars

Abstract: We study the temporal behaviour of the non-thermal emission from blazars, when the underlying particle acceleration process is time dependent. To model the emission from the blazar jet, we consider a scenario where electrons accelerated at a shock front, escapes into the downstream region and lose their energy through radiative processes. Analogously, we consider two-zones, namely, the acceleration region (AR), the region around the shock front, and the cooling region (CR), the region downstream. The electrons are accelerated in AR, at a rate defined by a characteristic acceleration time scale, and in the cooling region they lose their energy through synchrotron emission mechanism in a constant and homogeneous magnetic field. To study the effect of acceleration process on the observed flux, a Gaussian perturbation on the acceleration time scale is introduced and the evolution of the resultant particle distribution in the cooling region is obtained. We show through the present study that a Gaussian perturbation in the acceleration timescale can give rise to a log-normal particle distribution at high-energies, imitating a multiplicative process. Such log-normal flux distribution are often observed in long duration blazar light curves and are usually attributed to disk-jet coupling akin to disk emission from microquasars. Additionally, our result shows a less skewed distribution(i.e., neither Gaussian nor log-normal) while introducing a Gaussian distribution on the escape time-scale in the acceleration region. In the future work, we propose to compare these theoretical findings with the observational results from different blazars.

EA-14	ASI2018_1564	SANANDA RAYCHAUDHURI	Poster

Authors: Shubhrangshu Ghosh,Department of Astronomy and Astrophysics, Tata Institute of Fundamental Research, Mumbai, Parthasarathi Joarder, CAPSS,Bose Institute, Kolkata

Title: Accretion in five component elliptical galaxy : Multitransonicity, shocks and implications on AGN feedback

Abstract: Isolated massive ellipticals, or that are present at the centre of cool-core clusters, are widely argued to be powered by hot gas accretion directly from their surrounding hot x-ray emitting phase. This leads to a giant Bondi-type spherical or quasi-spherical accretion flow onto the central SMBH, even exceeding hundreds of kpc length-scale, particularly, in context of flows from ICM. We incorporate the entire galactic contribution to the potential considering a five component elliptical galaxy (SMBH + stellar + dark matter + hot gas + Lambda). The adiabatic spherical flow displays a remarkable behaviour, with the appearance of multi-criticality in the flow, indicating significant departure from the classical Bondi solution. More notably, corresponding to moderate to higher values of mass-to-light ratios, we obtain possible Rankine-Hugoniot shocks in the corresponding wind flows, with the global flow topology resembling the x-alpha -type trajectories of advection accretion flows. Galactic contribution to the potential enhances the Bondi accretion rate. Our study reveals that there is a strict lower limit of ambient temperature below which no Bondi-type accretion can occur; which is as high as 9X10^6 K for flows from hot ISM-phase, indicating that for isolated ellipticals, the hot phase tightly regulates the fuelling of host nucleus, enabling a tight feedback to occur between them.

EA-15	ASI2018_1570	Sagnick Mukherjee	Poster

Authors: Suchetana Chatterjee,Arijit Sar - (Department of Physics,Presidency University.) Anirban Bhattacharjee-(Department of Physics and Astronomy, University of Wyoming and Department of Biology, Geology and Physical Sciences, Sul Ross State University) Jeffrey A.Newman-(Department of Physics and Astronomy, University of Pittsburgh and PITT-PACC, University of Pittsburgh) Renbin Yan-(Department of Physics and Astronomy, University of Kentucky) Anirban Bhattacharjee-

Title: X-ray surface brightness profiles of optically selected Active galactic nuclei:Comparison with X-ray AGN

Abstract: Influence of the central black-holes on the growth and evolution of their host galaxies is evident from many earlier investigations (e.g., the black hole mass and galaxy velocity dispersion correlation){Gebhardt et al (2000);Merritt et al (2001),Tremaine et al (2002)}. Also in the cluster scales, observation of X-ray cavities seem to be a direct evidence of the interaction between the gas in the intra-cluster medium and the central black hole. Recently Chatterjee et al.(2015) tried to compare the extended X-ray emission of active and normal galaxies to search for black hole activity in the intergalactic medium using data from the Chandra telescope. Their results were limited by the uncertainty of the Chandra point-spread-function. As a follow-up to that work we have used optically selected (under-luminous in X-ray) active galactic nuclei (AGN) of redshift between 0.3 to 0.6 to search for signatures of black hole activity in the extended emission in high redshift galaxies.Also amongst these AGN the ones belonging to groups or clusters were removed to produce a source list of isolated AGN and galaxies in order to look for the effect of cluster dark matter halo on the extended emission of the individual galaxies. The results suggest that the AGN host galaxies have a lower extended emission compared to the normal galaxies in the vicinity of the central engine.

EA-16	ASI2018_1575	Subhashree Swain	Poster

Authors: K.V.P Latha, Pondicherry University, Puducherry P. Shalima, Regional Institute of Education, Mysore Prajval Shastri, Indian Institute of Astrophysics,Bengaluru

Title: A brief study of the nature of Active Galaxies(AG) through Seyfert Unification Scheme in UV and IR band(8μm)

Abstract: GALEX is a NASA small orbiting telescope, which observes in Ultra-Violet light across 10 billion years of cosmic history. It is conducting several sky surveys, including extra galactic UV sky surveys. It has two bands i.e one is NUV(Near UV) in between 1750-2800Å angst. and other is FUV(Far UV) in between 1350-1750Å with 6-8 arc second resolution. The field of view is 1.27 degree and 1.25 degree for FUV band and NUV bands respectively. For this work, we have usedThe GALEX data extracted from the Nearby Galaxies Survey(NGS) and All Image Sky survey(AIS). Infra-red data is taken from Spitzer Archive of IRAC 8micron-meter band. We have studied 8 Active galaxies of Seyfert 1 type and 8 Active galaxies of Seyfert type 2. As data in two UV bands are available, i.e. NUV and FUV, we have compared the fluxes in these bands with the data in the Mid-IR band for our sample of Seyfert galaxies. From the results, it is noticed that IR flux is greater than the UV flux for both types of galaxies. In addition, the ratio of Mid-IR and NUV luminosities is nearly the same in most of the galaxies. We also find that there is no significant difference in the Mid-IR luminosity between the type 1 and type 2 galaxies. However, we expect that, Seyfert 1s should be brighter in the IR than Seyfert 2s because the torus is a thick structure surrounding the central AGN with its inner edge hotter than the outer edge. The IR radiation emitted by the inner edge is obscured by the torus in Seyfert 2 galaxies. In Seyfert 2s we only observe radiation from the outer edge which is colder than the inner edge of the torus. However in 1s type, we get radiation from the inner edge as well. So therefore in Seyfert 1s, IR should be higher than Seyfert 2s according to the model made by E.A. Pier and J.H. Krolik. Where as in Seyfert type 2 galaxy, we do not see directly into the center of the AGN. We get to see the edge on view where the UV radiation is absorbed by the torus. So we expect lower UV luminosities in this case. However, here we find that both the types of galaxies have similar IR and UV luminosities. This result could contribute to a better understanding of the AGN Unification Scheme. We will be investigating these results more thoroughly with a larger sample in the coming days.

EA-17	ASI2018_1582	Avinash Anand	Poster

Authors: Dr. Nishikanta Khandai, NISER, Bhubaneswar.

Title: Probing the clustering of Lyman-alpha forest using cosmological hydrodynamic simulations

Abstract: Clustering of Lyman-alpha forest is the small-scale distribution of Lyman-alpha absorption lines along the line of sight direction. We used the large cosmological hydrodynamic simulations to study the clustering properties of the Lyman-alpha forest in both real and redshift space. Among the various parameters characterizing the clustering of Lyman-alpha forest that we studied, we will present our result on the large-scale Lyman-alpha clustering dependence on the equation of state of the intergalactic medium, the quasar continuum, and the ionizing ultraviolet background.

EA-18	ASI2018_1584	Katherine Rawlins	Poster

Authors: Gargi Shaw (UM-DAE Centre for Excellence in Basic Sciences, Mumbai), Raghunathan Srianand (Inter-University Centre for Astronomy & Astrophysics, Pune)

Title: The interstellar radiation field of high-redshift damped Lyman-alpha absorbers

Abstract: Intervening clouds of gas along quasar sightlines are studied through their absorption lines in the quasar spectrum. Damped Lyman-alpha absorbers (DLAs) are clouds with very high content of neutral gas. Insight into the structure and dynamics of these systems will improve our understanding of galaxy formation and evolution. We perform numerical simulations of high-redshift H2-bearing DLAs using the spectral synthesis code CLOUDY. The observed column densities of multiple atomic and molecular species allow us to produce well-constrained models, which probe the physical environment of these DLAs. Our models consider ultraviolet radiation from both the metagalactic background and local star formation. We deduce the nature and intensity of the interstellar radiation field. Our study also emphasizes the need for more accurate understanding of the metagalactic background.

EA-19	ASI2018_1588	Anwesh Majumder	Poster

Authors: 1. Anwesh Majumder; Affiliation: Presidency University, Kolkata 2. Ritaban Chatterjee; Affiliation: Presidency University, Kolkata 3. Kaustav Mitra; Affiliation: Presidency University, Kolkata 4. Prantik Nandi; Affiliation: Presidency University, Kolkata(Currently at S.N. Bose National Centre for Basic Sciences)

Title: Gamma-Ray/X-Ray/Optical Time Variability of Fermi Blazars

Abstract: Blazars are a class of active galactic nuclei (AGN) with a prominent relativistic jet pointing within a few degrees of our line of sight. Due to relativistic beaming, apparent jet emission is amplified by a factor of 10-10,000. Hence, the spectral energy distribution (SED) of blazars is dominated by the emission from the jet. Blazar SED has two major components, e.g., a peak at infrared-optical wavebands believed to be due to synchrotron radiation by the relativistic electrons present in the jet, and another at X-ray-gamma-ray energies possibly due to inverse-Compton (IC) scattering of photons —— produced in or outside the jet ——- by the same electrons. In the above scenario, optical synchrotron emission may be produced by electrons of Lorentz factor ~10^4, assuming a magnetic field of ~few Gauss. Emission at ~1 GeV may be produced by electrons at similar energies by up-scatterng infrared photons from the dusty torus. X-rays, on the other hand, may be produced by very high-energy (Lorentz factor ~10^6) electrons through synchrotron radiation or by electrons of lower energy (Lorentz factor ~10^2) through IC processes. Therefore, it is imperative to study the cross-correlation between the variability at optical-X-ray-gamma-ray wave bands in a large sample of blazars and compare with predictions of the above model. Large Area Telescope (LAT) onboard Fermi Gamma-Ray Space Telescope has been observing the gamma-ray sky since its launch in 2008 and have detected ~2000 blazars. Supporting multi-wavelength campaigns have followed Fermi-detected blazars at a range of wavebands all over the electromagnetic spectrum. Therefore, it is now possible to determine the nature of the above cross-correlation for a large sample of blazars. In this work, we collect optical-X-ray-gamma-ray light curves of 30 blazars from the public databases of Fermi, Swift, and Yale-SMARTS blazar monitoring project, and study their cross-correlation. Due to the transient nature of blazars, multi-band cross-correlation for one source is often not representative of the average nature of the entire population. Therefore, we stack the cross-correlation function of multiple blazars such that the spurious peaks average out while the consistent peaks become more significant in the final result. In order to interpret the results obtained from the above cross-correlation study, we have constructed a numerical model of non-thermal emission from blazar jets, which includes emission from a distribution of electrons undergoing energy loss due to synchrotron radiation, IC process, and adiabatic expansion due to the conical geometry of the jet. We generate many simulated light curves at multiple wavelengths from our model and study the nature of their average cross-correlation. We compare our numerical results with those from observed data to provide constraints on the parameters related to the geometry and emission mechanism of blazar jets.

EA-20	ASI2018_1590	Sumanta Kumar Sahoo	Poster

Authors: Co-Authors: Ananda Hota(1,2), Sumanta Ku Sahoo(2,3), Sravani Vaddi(2,4), Pradeepta Mohanty (2), Pratik dabhade(2,5,6), Marek Jamrozy(7), Huib Intema(8), Soo-Chang Rey (9), Ananta Ch. Pradhan(3), Chiranjib Konar(10), C S. Stalin(11), Sagar Sethi(2), Arpita Misra(2) Affiliations: 1. UM-DAE Centre for Excellence in Basic Sciences, Mumbai-98, India 2. RAD@home Astronomy Collaboratory, India 3. National Institute of Technology, Rourkela, Odisha, India 4. National Centre for Radio Astrophysics, TIFR, Pune, India 5. Inter-University Centre for Astronomy & Astrophysics, Pune, India 6. Leiden University, Leiden, The Netherlands 7. Astronomical Observatory, Jagiellonian University, Poland 8. Leiden Observatory, Leiden University, Leiden, The Netherlands 9. Chungnam National University, Daejeon 34134, Korea 10. Amity University, Noida, India 11. Indian Institute of Astrophysics, Bangalore, India

Title: Discoveries from GMRT by RAD@home citizen-scientists: Three intriguing cases of jet-galaxy interaction as laboratory for AGN feedback in galaxy merger

Abstract: AGN-feedback has been a very critical incorporation in the models of merger-driven structure formation and galaxy and black hole co-evolution. Although the negative feedback model of quenching of star formation is highly popular, observational "smoking gun evidence" for such a process is still missing. Positive feedback through wind/jets triggering star formation has clearly been observed, but only in a very few cases. The proper mechanisms of such positive or negative feedback effects through jet-galaxy interactions are still poorly understood. RAD@home citizen-scientists have discovered three intriguing cases where a radio jet is seen to hit the neighbouring interacting/merging galaxy, but no apparent triggered star formation is occurring. The first case is an ongoing dry merger of two ellipticals, showing a unique case of repeated radio jet episodes from one galaxy, where one side of the jet seems to have hit the companion galaxy. The second case is probably an elliptical-elliptical interaction, where a jet from one galaxy seems to be deflected from the outer boundary of the companion elliptical. The final case appears to be an interaction between an elliptical and a spiral galaxy, where the radio jet from the elliptical shows sign of interaction with the spiral.

EA-21	ASI2018_1596	Aditya Manuwal	Poster

Authors: Dr. Anand Narayanan

Title: A Survey of Intervening C IV Absorbers at Low Redshifts

Abstract: We are presenting results from a blind survey for C IV absorbers in intergalactic and circumgalactic medium at low redshifts, with archival UV spectra from HST/Cosmic Origins Spectrograph along 232 QSO sightlines. This is currently the largest survey of such absorbers at low redshifts. This survey of intergalactic medium at different redshifts can be used to examine its chemical evolution across time. We do this by determining statistical constraints on the cosmic distribution and mass density of heavy elements. For some absorption systems, these values might be dominated by surrounding galaxies and have little correspondence to the enrichment of IGM. Such absorbers provide the opportunity to examine physical association of the enriched gas to galaxies. Distribution of absorbers with respect to redshift provides information about the influence of structure formation, galactic outflows and cosmological expansion. At low redshifts, there is still some discrepancy about the properties and distribution of absorption systems in IGM. According to simulations, most of the baryons at these redshifts are supposed to lie within the Warm Hot Intergalactic Medium (WHIM). Earlier studies of absorbers have indicated a diffuse, ionized medium which can be probed using high-ion transitions like C IV, Si IV etc. C IV can be used to trace a large amount of gas present outside the galaxies, including some part of the WHIM. Hence, by assembling a sample of intervening C IV absorbers, we will address the aforementioned points of interest by probing IGM and diffuse galaxy halos. In addition to the derivation of statistical correlations using hydrogen, low ions and C IV, we are also investigating the physical conditions and metallicities of gas traced by this ion along with the possible influence from nearby galaxies on the absorbers to explain their chemical enrichment.

EA-22	ASI2018_1605	Alaxender Panchal	Poster

Authors: Dr. Yogesh C. Joshi Aryabhatta Research Institute of Observational sciences(ARIES)

Title: Extinction map of LMC and SMC using Cepheid variables

Abstract: Cepheid variables are massive He burning stars, with luminosity ranging upto 1000 times of solar luminosity and pulsation periods from one to fifty days. These are an important class of variable stars as their brightness changes in extremely regular fashion. Their period of pulsation depends on its absolute magnitude or its intrinsic brightness which makes them suitable for measuring extragalactic distances. As, SMC (Small Magellanic Cloud) and LMC (Large Magellanic Cloud) are among our closest galaxies, we have used archival data on SMC and LMC in V and I band taken during 3rd phase of OGLE. We have applied well known P-L (Period-Luminosity) relations for V and I band in small regions of LMC and SMC to get extinction in those regions and created a full galaxy extinction map by combining these small regions of LMC and SMC. We have found average E(V-I) value 0.12 and 0.06 for LMC and SMC respectively.

EA-23	ASI2018_1608	Aishrila Mazumder	Poster

Authors: Arnab Chakraborty, Abhirup Datta and Centre of Astronomy, IIT Indore

Title: Cosmic Reionization with SKA1-Low – Simulations

Abstract: Observations of the HI 21 cm transition line promises to be an important probe into the cosmic Dark Ages and Epoch of Reionization. Detection of this redshifted 21 cm signal is one of the key science goal for Square Kilometer Array (SKA-1) low. One of the major challenges for the detection of this signal is the accuracy of the foreground source removal. The foregrounds are composed of the diffuse galactic synchrotron emission and extragalactic compact and extended sources. The flux densities of these sources are 10 4 - 10 5 times stronger that the faint resionziation signal of interest. Here, we investigate the level of accuracy for the calibration and bright source removal algorithms from the reionization data-sets that will be observed with the SKA-1 low. For this, we use the recently developed OSKAR package in order to simulated the response of the tile response from each of the SKA1-low stations. Later, we analyze the data in CASA (NRAO) package.

EA-24	ASI2018_1634	Nilkanth Vagshette	Poster

Authors: M K Patil: School of Physical Sciences, S.R.T.M. University, Nanded 2) Sachindra Naik: Physical Research Laboratory, Ahmedabad

Title: AGN heating versus radiative cooling in the galaxy clusters

Abstract: We present results obtained from the analysis of high resolution Chandra archival data on 3C 444 and ZwCl 2701 galaxy clusters. These clusters are located at redshifts of 0.153 and 0.214, respectively, each hosting a pair of X-ray cavities. A comparison of the surface bright distribution of the X-ray emitting plasma and the diffuse radio emission revealed a good spatial association in both the systems. The detected X-ray cavities allowed us to quantify the mechanical power that has been injected by the central AGN and utilized for heating the surrounding gas. The total estimated powers in these systems were found to be ~6. x 10^44 erg s^-1 and 2.3 x 10^45 erg s^-1, respectively, with cavity ages about 10^7 – 10^8 yr. The measured X-ray luminosity within the cooling radius (~100 kpc) is found to be much smaller than the mechanical power, implying that the injected power is capable enough to compensate the radiative loss. Temperature and density profiles derived from the spatially resolved spectral analysis of the X-ray emission from 3C 444 exhibited presence of a rarely detected elliptical shock surrounding the X-ray cavities. A shock has also been detected in the other system ZwCl 2701. Using the observed density jumps in these system at shock locations, the computed Mach numbers are found to lie between 1.25 – 1.72.

EA-25	ASI2018_1643	KRISHAN CHAND	Poster

Authors: Amitesh Omar & Hum Chand

Title: AGN Reverberation Monitoring (DOT-ARM): Probing AGN Black-hole Masses And Broad Line Regions.

Abstract: Resolving the gas clouds of broad line region (BLR) of AGN, remain even challenge for modern long baseline interferometry. Understanding the gas motion, accretion processes and estimation of BH mass needs intensive spectro-photometric reverberation mapping (RM). However, such emission line RM is expensive, in terms of resources, requiring more than 2m-class telescope. Recently, narrow-band photometry has been proven also a reliable technique to measure the line flux and hence allowing one to do photometric reverberation mapping (PRM) even with a 1-2m class telescope. On the other hand, it is unclear whether low luminous AGNs follow the same M-L and R-L scaling relation as intermediate AGNs. Therefore, to check the feasibility of PRM from ARIES 1.3m Devasthal Fast Optical Telescope (DFOT), we did photometric reverberation mapping of well selected nearby low luminous AGN MCG+09-16-013. For this, we used the narrow band filter SII to measure the reshifted H-alpha emission line flux, while broadband B and V filters for continuum flux measurements. We found that the black hole mass calculated on the basis of PRM is very much consistent with R-L relation and also the errors we got in PRM were very small. Therefore, from our results, we concluded that PRM based black hole mass estimation of low luminous AGNs is feasible from 1.3m DFOT which we will be extending to a statistically large sample based on newly procured sets of redshifted narrow band filters.

EA-26	ASI2018_1664	Bhagorao Tukaram Tate	Poster

Authors: B.T. Tate1 M K Patil2 1Department of Physics, Balbhim Arts, Science and Commerce College, Beed 431 122, India 2School of Physical Sciences, S R T M University, Nanded - 431 606, India

Title: Properties and Fate of Dust in Early type Galaxies

Abstract: This paper presents multiwavelength analysis of a sample of early-type galaxies with an objective to constrain the origin and properties of dust in this class of galaxies employing high resolution data from HST observatory. It is largely believed that the dust in this class of galaxies has an external origin in the sense that the host has acquired it through the merger like episode. However, it is interesting to see its existence over a long time despite the fact that the dust grains are destructed over a very short timescale due to the thermal sputtering particularly when are embedded within a large fraction of hot gas. This paper further demonstrates that the interstellar dust in these galaxies is not alone due to the external accretion but internal origin is also contributing substantially to the reservoir of its host.

EA-27	ASI2018_1671	Aswathy S	Poster

Authors: Ravikumar C. D. Department of Physics, University of Calicut.

Title: Estimation of the masses of super massive black holes in nearby galaxies using central intensity ratio

Abstract: Super massive black holes residing at the centres of nearby galaxies are believed to be closely associated with the evolution of their host galaxies. In the present study, we device a simple method to estimate the masses of super massive black holes (SMBHs) using photometric methods. SEXTRACTOR is used to carry out aperture photometry and the central intensity ratio (CIR) is measured for a sample of 49 nearby galaxies with SMBH mass estimations. We find a strong anti-correlation between the CIR of ellipticals and classical bulges and the mass of the SMBH whereas pseudobulges and ongoing mergers show significant scatter. Also, the CIR is correlated with various properties of the host galaxies such as mass of the spheroid and age of the stellar population. This method can serve as a simple tool to distinguish classical bulges from pseudobulges and also to estimate the mass of the super massive black hole .

EA-28	ASI2018_1674	Blesson Mathew	Poster

Authors: Blesson Mathew (Christ University, Bengaluru), P. Manoj (TIFR, Mumbai), W. A. Reid (Macquarie University, Australia), Mayank N. (TIFR, Mumbai), Paul K. T. (Christ University, Bengaluru)

Title: Discovery of a population of Herbig Be stars in the Large Magellanic Cloud

Abstract: We report the discovery of a population of Herbig Be (HBe) stars in the Large Magellanic Cloud (LMC). This sample of 81 HBe stars were identified from the catalog of emission-line stars from Reid & Parker (2012). The selection was done based on the presence of forbidden SII λλ6717/6731 emission lines and near-IR excess, which are indicative of nebulosity and dusty disc associated with HBe stars. Further, the age and mass of these pre-main sequence stars were estimated from the fit of Padova ischrones and evolutionary tracks in the optical color magnitude diagram. The potential of this study lies in the fact that this is the first time such a large sample of spectroscopicaly confirmed HBe stars is identified in the LMC. We classified the sources as flat disc, flared disc and transition disc candidates from the analysis of spectral energy distribution. We intend to compare and contrast the properties of these HBe candidates with those in our galaxy, thereby providing insights on the role of metallicity in star formation.

EA-29	ASI2018_1681	Arnab Chakraborty	Poster

Authors: Dr.Abhirup Datta,IIT-Indore Dr.Nirupam Roy,IISC Bangalore, Dr.Samir Choudhury, NCRA-TIFR

Title: Recent uGMRT observations of ELAIS-N1 field

Abstract: Detection of the redshifted 21-cm radiation from the large scale distribution of neutral hydrogen against cosmic microwave background is considered as a promising probe for the cosmic Dark ages, Cosmic Dawn and Epoch of Reionization.This radiation appears as a very faint,diffuse background radiation in all low frequency radio observation below 1420 Mhz. At these frequencies the signal is largely dominated by bright foregrounds which are four to five orders of magnitude stronger than the redshifted signal.In addition, the ground based experiment are affected by the human generated RFI , like the FM band, and Earth's ionosphere.The galactic synchrotron emission is expected to be the most dominant foreground at angular scale greater than 10 arcsec. Accuracy of the extraction of the 21-cm signal depends on the ability to characterize and remove the foregrounds from the observed data-sets. There are mainly three techniques used to deal with foregrounds --- foreground avoidance, foreground suppression and foreground removal. These techniques would require the knowledge of spatial and frequency characteristics of foregrounds.Here, we present our attempt to quantify the point source flux density distribution in frequency range 300-500 Mhz with a pilot observation of target field ELAISN1 with uGMRT. We estimate the accuracy of different point source subtraction techniques. With this wide-band observation we use different imaging and calibration methods to understand the relative performance of individual technique to produce the best possible image from the data. This best possible image then serves as a starting point to estimate the foregrounds. This will allow us to converge to few optimal algorithms to characterize and remove foregrounds for upcoming uGMRT 150 MHz band observations as well as international projects like SKA, HERA, etc.

EA-30	ASI2018_1764	Susmita Barman	Poster

Authors: Naslim Neelamkodan(School of Physics,University of Hyderabad,India) Franciska Kemper(Academia sinica Institute of Astronomy Astrophysics,Taipei,Taiwan) Oscar Morata(Academia Sinica Institute of Astronomy Astrophysics,Taipei,Taiwan) Suzanne Madden(CEA Saclay,Paris,France) Sacha Hony(University of Heidelberg,Germany) Frederic Galliano(CEA Saclay,Paris,France) Vianney Lebouteiller(CEA Saclay,Paris,France) Remy Indebetouw(National Radio Astronomical observatory,Charlottesville, USA) Karl Gordon (Space Telescope Science Institute, Baltimore, USA) Margaret Meixner (Space Telescope Science Institute, Baltimore, USA)

Title: A Photodissociation region in a massive star forming region of the Large Magellanic Cloud

Abstract: Photodissociation regions (PDR) are formed in neutral hydrogen clouds where the incident Far Ultraviolet (FUV) radiation highly controls the evolution of dust and gas physical and chemical properties. In starforming regions, FUV radiation from young stars heats the PAHs and eject high energy photoelectrons. These photoelectrons then photodissociate the gas creating stratified layers of partially ionized, neutral and molecular gas. The resulting chemical structure is complex. Some atoms and molecules are highly enhanced in certain layers, while some other are depleted. In metal-poor environments, both gas and dust abundances vary relative to metal-rich environments due to the deficiency of heavy elemental abundances, which lowers the dust-to-gas ratio. Due to the diminished dust shielding, FUV radiation penetrates deeper into the molecular cloud and photodissociate most of the molecules including CO, except H2. The nearby Large Magellanic Cloud (LMC, metallicity Z=0.5 solar) galaxy is an excellent site to look for PDR structure and chemistry in the metal-poor environment due to its proximity. At a distance of 50 kpc, it allows us to resolve stars and ISM small-scale structures. A spectroscopic survey of selected extended sources in the LMC has been carried out as part of the SAGE-spectroscopic program (Kemper et al. 2010) using the Spitzer Spectroscopic capabilities. We present our preliminary work on the study of a spatially resolved edge-on PDR in the LMC using Spitzer and Herschel data.

EA-31	ASI2018_1767	Gayathri Viswanath	Poster

Authors: C.S.Stalin, Indian Institute of Astrophysics, Bangalore S.B.Gudennavar, Christ University, Bangalore

Title: Estimation of Black Hole mass of a sample of narrow line Seyfert 1 galaxies

Abstract: Narrow line Seyfert 1 (NLSy1) galaxies are a peculiar class of active galactic nuclei that are characterised by smaller full width at half maximum (FWHM) of the Hβ emission line compared to typical broad line Seyfert 1 galaxies (BLSy1). They are known to have small back holes (BH) weighing around 10^6 solar mass. Our knowledge of them having low BH mass has gained criticism after the detection of gamma-ray emission from less than a dozen NLSy1 galaxies by the Fermi Gamma-ray Space Telescope. Recent spectropolarimetric observations using the Very Large Telescope of one of the gamma-ray emitting NLSy1 galaxies, PKS 2004−447 gave direct evidence for the presence of broad emission lines in polarization, and consequently led to the estimation of a large BH mass than what was known earlier for this source. This observational finding has brought to focus the shortcomings in the BH masses available for NLSy1 galaxies. We are carrying out a systematic investigation of modelling the broad band spectral energy distribution of a large sample of about 10,000 NLSy1 galaxies to estimate their BH masses. The masses thus determined will be compared with the BH masses known for them based on single epoch spectral fits. The ongoing analysis once completed will be a consistency check on our present knowledge on the low BH mass nature of NLSy1 galaxies. Details of the work will be presented in the meeting.

EA-32	ASI2018_1775	TAPAN KUMAR SASMAL	Poster

Authors: Sabyasachi Pal (ICSP), Soumen Bera (SKBU), Sushanta K. Mondal (SKBU)

Title: Tailed Radio Galaxies from FIRST survey

Abstract: Abstracts: Tailed radio galaxies are classified according to luminosity and the angle between the radio tails. The narrow-angle tail (NAT) radio sources are featured by tails bent in a narrow `V' like shape. The jet bending in case of Wide-angle tail (WAT) radio galaxies are such that, the WATs exhibit wide `C' like morphologies. The relative motion of the host galaxies through inter cluster medium or strong inter cluster wind is believed to cause the bending of the radio jets. Tailed radio galaxies are generally found in rich cluster of galaxies. It is seen that NAT galaxies reside towards the edge whether WAT galaxies are located towards the center of the cluster. It is also found that the relative velocity of the NAT galaxies is greater than that of the WAT galaxies. We are looking for NAT and WAT galaxies from the high resolution FIRST survey at 1400 MHz. We have identified more than hundred new WAT and NAT radio galaxies from our study. Here we will report physical properties of these newly discovered tailed radio galaxies. We will also study various statistical properties of newly discovered galaxies as our findings made the number of known tailed radio galaxies to be more than double of previously known.

EA-33	ASI2018_1776	Soumen Kumar Bera	Poster

Authors: Sabyasachi Pal (ICSP), Tapan Sasmal (SKBU), Sushanta K. Mondal (SKBU)

Title: X-shaped radio galaxies from FIRST survey

Abstract: X-shaped or 'winged' radio galaxies are a small sub-class of extra-galactic radio sources that exhibit pair of low surface brightness radio lobes oriented at an angle to the 'active', or high surface brightness lobes, giving the total source an 'X' like shape. We are looking for X-shaped radio galaxies from the high resolution FIRST survey at 1400 MHz. We have identified more than hundred new X-shaped radio galaxies from our study. Here we will report physical properties of these newly discovered tailed radio galaxies. We will also study various statistical properties of newly discovered galaxies as our findings made the number of known X-shaped radio galaxies to be more than double of previously known.

EA-34	ASI2018_1779	NETAI BHUKTA	Poster

Authors: Sushanta K. Mondal (SKBU), Sabyasachi Pal (ICSP)

Title: Irregular Radio Galaxies from TIFR GMRT Sky Survey

Abstract: Normal radio galaxies are classified by Fanaroff-Riley type I (FR I) or type II (FR II) from the morphology and surface brightness of the radio jets. There are some radio galaxies which can not be classified as FR I or FR II due to various reasons. We are looking for Irregular radio galaxies from the TIFR GMRT Sky Survey (TGSS) at 150 MHz. We have identified more than thousand of new irregular radio galaxies from our study. Here we will report physical properties of these newly discovered irregular radio galaxies. We will also study various statistical properties of newly discovered irregular galaxies as our findings substantially increases number of known irregular radio galaxies.

EA-35	ASI2018_1786	MAJIDUL RAHAMAN	Poster

Authors: Abhirup Datta (IIT Indore) , Jack Burns (Univ. of Colorado Boulder)

Title: Study of Galaxy Cluster Mergers - Lessons from High Fidelity X-ray Temperature Maps

Abstract: Galaxy clusters are assembled through large and small mergers which are the most energetic events since the Big Bang. Cluster mergers stir the ICM creating shocks and turbulence which are illuminated by Mpc-sized radio features called relics and halos. These shocks heat the ICM and are detected in x-rays via thermal emission. Disturbed morphologies in x-ray surface brightness and temperatures are direct evidence for cluster mergers. Here, we present X-ray temperature maps of 12 HIFLUGCS galaxy clusters by creating 2D temperature maps using archival Chandra data. These include cool-core(un-disturbed morphology) as well as non-cool-core clusters (disturbed morphology). These maps allow us to probe the temperature structure of galaxy clusters beyond the usual radial profile methods used in most of the current studies. Analysis techniques including statistical tests and simulations to characterize the radial asymmetry and substructure in temperature have been developed and are being applied to the combined archival data. X-ray flux maps for each cluster also allow for pseudo entropy and pressure maps. This in turn allows for more advanced analysis like asphericity in the temperature and entropy maps.

EA-36	ASI2018_551	Sandeep Kumar Kataria	Poster

Authors: Sandeep Kumar,JAP-IIA Bangalore; Mousumi Das,IIA Bangalore; Benjamin, L'Huillier, KASI, Daejeon

Title: A study of Isolated halos distribution in Large-scale structures of universe

Abstract: We present a study of the mass spectrum and local environmental densities of isolated dark matter halos from high redshifts z~12 to the present universe z~0. For conducting this study we have used Horizon Run 4 (Kim & Changbom et al 2015) data products. Horizon Run 4 is an N-body simulation designed to study the evolutions of galaxies and large-scale structures of the Universe. In this simulation the halo mass resolution scales down to M_s = 2.7 × 10^{11} h^{-1} M_sun within a box size of 3150h^{-1}Mpc. This provides a large sample of isolated halos that can be used for a statistical study of these systems. We have found that isolated halos show a maximum in their probability distribution for over densites which correspond to values ranging from 0.1 to 1 at z~0. Apart from this non-isolated halos show a maximum in their probability distribution for over densities which varies from 1 to 10. We have also shown that masses for which isolated galaxies show maximum probability is more than non-isolated ones at z~0. This implies that most of the satellites of progenitors of isolated halos have merged into progenitors during their evolution. Further study includes merger tree history and the study of the spin evolution of these isolated halos with respect to redshift.

EA-37	ASI2018_601	Pratik Dabhade	Poster

Authors: Huub Rottgering(Leiden Observatory) Joydeep Bagchi(IUCAA) Shishir Sankhyayan(IISER Pune)

Title: Giant Radio Galaxies from LOFAR Two Metre Sky Survey

Abstract: Giant Radio Galaxies (GRGs) are the single largest objects known in the Universe. Their sizes extend from 0.5 Mpc to ~5 Mpc. The 'central engine' is an accreting SMBH of mass 10^8 to 10^10 msun which is responsible for the ejection of the collimated, bipolar relativistic jets orthogonal to an accretion disc. GRGs are believed to be the last stop of radio galaxy evolution owing to their sizes. This helps in imposing constraints on evolutionary models of radio galaxies. GRGs can serve as outstanding probes of the IGM. GRGs can also transport enriched material from the host galaxy to large distances and pollute the IGM with non-thermal particles and magnetic fields. Low frequency surveys are ideal to search for new GRGs as the radio emission is least suppressed by spectral ageing effects in the extended radio lobes and is prone to detect more diffuse relic plasma from lobes of GRGs. We use the new LOFAR Two-metre Sky Survey (LoTSS) which is a deep 120-168 MHz imaging survey and which has a unprecedented sensitivity (~0.1 mJy) and resolution (~5"). This makes it ideal for GRG (re)search. We have found confirmed 150 GRGs from the LoTSS, of which several are hosted by quasars with z >1. This is the biggest sample of GRGs unearthed from any survey of any frequency. Also, about 250 GRG candidates were also identified which most likely to be high (z>1) redshift galaxies. These candidates will be followed with the WEAVE-LOFAR program. This study will allow us to probe powerful high z radio sources and its evolution. We will present all these results in detail along with the future plan.

EA-38	ASI2018_634	GAUTAM SAIKIA	Poster

Authors: Gautam Saikia (Tezpur University), P. Shalima (Regional Institute of Education, Mysore), Rupjyoti Gogoi (Tezpur University), Amit Pathak (Banaras Hindu University)

Title: A study of HII regions in the Large Magellanic Cloud using Spitzer and AKARI observations

Abstract: The Large Magellanic Cloud (LMC) has long served as an ideal, nearby laboratory to study the influence of massive stars on dust properties because of it's nearly face-on orientation, known distance and high latitude allowing us to resolve and study stars in association with the interstellar gas and dust. The distribution of the dust itself is important for understanding the structure and dynamics of the LMC. The highest reddening occurs in the regions of 30 Doradus (Tarantula Nebula) and the supershell LMC 2 where color excess E(B-V) reaches a maximum of 0.29. The HII region N11 also shows a high reddening with E(B-V) up to 0.24. The HII regions provide an opportunity to study the ionized gas component of the ISM and star formation on a galactic scale. 30 Doradus has filamentary structures which suggests the presence of large scale non-uniform magnetic fields with a large group of blue stars at the centre of the nebula. We have compared the diffuse FUV scattering observed by FUSE telescope with the IR diffuse emission observed by the Spitzer Space Telescope and the AKARI satellite for the same HII locations and observed better FUV-IR correlations for N11 (0.8) as compared to 30 Doradus (0.5). In this work, we have initially modelled the FUV scattered emission from the stars in an arbitrary scattering geometry using a Monte-Carlo based model by Shalima & Murthy [1] to study the dust optical parameters: albedo (a) and asymmetry factor (g). We have then used the SKIRT model [2] for our infrared dust emission modelling and the results are presented here. References: [1] Shalima, P. and Murthy, Jayant. Modelling of dust scattering toward the Coalsack. Monthly Notices of the Royal Astronomical Society, Volume 352, Issue 4, pp. 1319-1322, 2004. [2] Baes, Maarten; Davies, Jonathan I.; Dejonghe, Herwig; Sabatini, Sabina; Roberts, Sarah; Evans, Rhodri; Linder, Suzanne M.; Smith, Rodney M.; de Blok, W. J. G. Radiative transfer in disc galaxies - III. The observed kinematics of dusty disc galaxies. Monthly Notice of the Royal Astronomical Society, Volume 343, Issue 4, pp. 1081-1094, 2003.

EA-39	ASI2018_737	Chayan Mondal	Poster

Authors: Annapurni Subramaniam Indian Institute of Astrophysics

Title: UVIT imaging of WLM: How clumpy are the young and hot star distribution in this metal poor galaxy?

Abstract: We present ultra-violet study of the nearby dwarf irregular galaxy WLM with UVIT multi band observation. The galaxy at a distance 995 kpc, was observed in three UVIT filters F148W, N245M and N263M. We created two different color maps (F148W$-$N245M and F148W$-$N263M) to study the temperature morphology of young stellar complexes of the galaxy. We identified several complexes with temperature T $>$ 35000 K with size $\sim$ 10 - 50 pc. These are likely to be the OB associations present in the galaxy. The detected high temperature regions also show good spatial correlation with the Hα emitting regions of the galaxy. The hottest core of each star forming clumps are found to be enveloped by regions with gradually decreasing temperature. The south western part of the galaxy shows many hot star forming regions, high level Hα emission and low column density of H$~$I which altogether signifies a vigorous recent star forming event. The extreme northern part of the galaxy is found to be devoid of hot star forming regions. We also investigated the FUV disk of the galaxy and identified two main star forming complex in the galaxy. We further performed psf photometry to identify possible star clusters present in the galaxy and estimated their masses by using starburst99 SSP model. WLM is likely to have a large fraction of low mass clusters with mass M $< 10^3 M_{\odot}$.

EA-40	ASI2018_748	T Swetha	Poster

Authors: S N Hasan,Maulana Azad National Urdu University Priya Hasan, Maulana Azad National Urdu University

Title: Effect of gas physics on the thickening of disk in multiple minor mergers

Abstract: We study the effect of gas physics on the thickening of the disk during multiple minor mergers. We create the initial conditions with the primary galaxy at the center and three satellite galaxies at different distances using DICE software. The mass ratios of the primary and satellite galaxies is 10:1. We simulate the merger using GADGET2 code which includes both collisionless and hydrodynamical simulations. We simulate three different sets of multiple minor mergers which have 0%, 20% and 40% gas in the disk of primary galaxies. We then study the thickening of the disk in the three sets after each merger and evaluate the effect of gas on this. We find that the presence of gas in the disk of the primary galaxy reduces the disk thickening and the increase in the gas percentage furthur reduces it. We also vary the mass ratios of the primary and satellite galaxies and study it's effect on the disk thickening.

EA-41	ASI2018_788	Venkat Vijendra Punjabi	Poster

Authors: Dr. Surajit Paul Department of Physics, S.P.Pune University

Title: Modeling non-thermal emission from SDSS galaxy groups

Abstract: In the structural hierarchy, galaxy groups are the intermediate link between the field galaxies and the rich galaxy clusters. Unlike clusters that are formed at the crossroads of cosmic filaments, groups reside inside the filaments itself. Groups being denser than the filamentary material while attracted by the nodal clusters, groups experience tremendous shear force and dynamical friction and get stretched along the filaments. This may introduce a large scale turbulence at the surface of group and filamentary medium and enter the group medium before getting dissipated. Squeezing of groups inside the filaments due to elongation, will also increase the rate of collisions among the constituent galaxies and these interactions inject turbulence and shocks inside the group medium. Such turbulence can easily accelerate ambient charged particles through turbulent re-acceleration and Diffusive Shock acceleration. This can also amplify cosmic magnetic fields through shock compression and turbulent dynamo mechanism to as high as sub micro Gauss level. Its consequence is the production of diffuse synchrotron radio emission that can make groups observable through radio halo emission. We have implemented radio synchrotron emission models on SDSS galaxy group data and our findings will be presented in this poster.

EA-42	ASI2018_805	Abhisek Mohapatra	Poster

Authors: Prof. R. Srianand (IUCAA, INDIA), Dr. V. Khaire (UCSB, USA)

Title: Implication of ultraviolet background on physical properties of intervening {\CIII} absorbers in the redshift range 2 $<$ z $<$ 3.

Abstract: We present the evolution of 132 intervening CIII + CIV absorbers at 2.1 $<$ z $<$ 3.4 associated with optically-thin {\HI} absorbers in 19 high-quality spectra. We find a negligible evolution of CIV / CIII in this redshift range. For 32 CIV components tied (aligned) with HI, the gas temperature (log T_b) estimated from photoionization model is 4.4 $\pm$ 0.3 K,with a negligible non-thermal contribution. We use both photoionization equilibrium (PIE) and non-PIE (using a fixed temperature T_b) Cloudy models for the Haardt-Madau QSO+galaxy 2012 \& Khaire-Srianand 2016 UV backgrounds. From our fiducial model, we find that most of the absorbers do not follow Jean's stability and line-of-sight thickness for such absorbers are below 1 kpc. High-metallicity branch absorbers in our sample seem to be originated from extended disks, inner halos or outflowing gas of intervening galaxies, while low-metallicity absorbers are produced by galactic halos or the surrounding IGM filament. Finally, We show pressure-density (P - Δ) relation with power-law index γ = 1.3 which supports adiabatic expansion for these absorbers and provides evidence to one of the major reheating events i.e. {\HeII} reionization during the epoch, 2.4 $<$ z $<$ 3.0.

EA-43	ASI2018_806	Nagamani P.	Poster

Authors: S N Hasan (Dean of science, Department of Mathematics, Maulana Azad National Urdu University, Hyderabad.) Priya Hasan (Department of Physics, Maulana Azad National Urdu University, Hyderabad.)

Title: Correlation between Structural properties of galaxies in coma clusters.

Abstract: In this paper, we present the correlation between structural properties and morphology of galaxies in the central region of Coma Cluster for 221 objects within the apparent magnitude range m < 19.5. The data is taken from the HST/ACS Coma Cluster Treasury Survey and Source Extractor Catalogue compiled by Hammer et. al. 2010. For cluster membership we have used photometric redshifts of Michard et. al. 2008 & Edwards et. al.,2002 and spectroscopic redshifts of SDSS DR9 catalog. We present multiple component decompositions using Galfit. From the investigation of correlations of effective radius, Sersic index, absolute magnitude and bulge to total light ratio, we find that giants constitute 73%, Dwarf galaxies constitute 24% and the remaining 3% are Spirals+Irr+Ring. We observed that multiple component fits are best for giants and the single Sersic fit is best for Dwarfs & Spiral galaxies.

EA-44	ASI2018_818	Ananda Hota	Poster

Authors: Ananda Hota(1,2), Chiranjib Konar(2, 3), Sravani Vaddi(2,4), Pratik dabhade(2,5,6), C S. Stalin(7), Sumanta Ku Sahoo(2), Pradeepta Mohanty (2), Megha Rajoria (2), Sagar Sethi(2), Arpita Misra(2), Alakananda Patra(2), Charitarth Vyas(2), Akanksha Tiwary(2), Viswajith Govinda Rajan(2), Lavanya Nemani(2), Mitali Damle(2), Shilpa Dubal(2), Karuna Gamre(2), Anjali Amesh(2), Avinash Kumar(2), Gitika Mall(2) 1. UM-DAE Centre for Excellence in Basic Sciences, Mumbai-98, India 2. RAD@home Astronomy Collaboratory, India 3. Amity University, Noida, India 4. National Centre for Radio Astrophysics, TIFR, Pune, India 5. Inter-University Centre for Astronomy & Astrophysics, Pune, India 6. Leiden University, Leiden, The Netherlands 7. Indian Institute of Astrophysics, Bangalore, India

Title: Five year report on discoveries using GMRT and RAD@home a nation-wide inter-university collaboratory of 100+ citizen-scientists

Abstract: Objects discovered over last 5 years by the citizen-scientists have been accumulated and sorted in to 5 different manuscripts with different scientific themes. They have been primarily discovered from the TGSS (DR-5/ADR-1) data and followed up with the GMRT/uGMRT through GTAC-approved four proposals acronymed GOOD-RAC. The discoverers and research assistants who helped the training process for creating citizen scientists were included as Co-I in GOOD-RAC proposals, which has gone through standard review process along with other international proposals. These one-week long training camps are called "RAD@home Discovery Camps" and have been hosted by Institute of Physics, Nehru Planetarium (Delhi), Vigyan Prasar, Harischandra Research Institute and Centre for Excellence in Basic Sciences of the University of Mumbai and Department of Atomic Energy of the Govt of India. The next Camp has been planned in ICTS-TIFR (Bangalore). These Camps have created a Nation-wide Inter-University network of over 100 trained-citizen-scientists or what we call e-astronomers. Pre-discovery documentations created by e-astronomers are carried forward by the collaboratory with professionals comprising both Indian and foreign scientists. The original model of this modified citizen-science research initiative has already been published in the special issue of the JApA titled "Science with the SKA: an Indian perspective" with the article titled "Tracking galaxy evolution through low frequency radio continuum observations using SKA and Citizen-science Research using Multi-wavelength data ". We would like to present to the Indian astronomy community brief results from the series of papers being drafted, pre-fixed with "Reporting Discoveries from GMRT by RAD@home citizen-scientists:" and tentatively titled I: New Speca-like large spiral-host radio galaxies. II: Three intriguing cases of external jet-galaxy interaction as laboratory for AGN feedback. III: New episodic radio galaxies with both FR I and FR II structures. IV: Bent lobe radio galaxies as tracers of cosmological accretion on to clusters of galaxies through filaments. V: New candidate radio Phoenix or radio sources revived by cosmological accretion on to clusters of galaxies. We welcome larger public participation as our approach is Any BSc/BE Can Do research (#ABCDresearch) using GMRT sitting @home from anywhere in India by joining RAD@home (#RADatHomeIndia) for free at https://www.facebook.com/groups/RADathome/ . We request support from every planetarium, museums and science centres, Govt and Pvt organisations to host our Discovery Camps, support e-astronomers and help spread citizen-science research in India.

EA-45	ASI2018_821	SUNDAR M N	Poster

Authors: P.Shastri (IIA), M. Dopita (ANU) and the S7 team

Title: Examining AGN feedback using multi-wavelength data

Abstract: Evidence shows that growth of the central supermassive black holes and the growth of their host galaxies go hand in hand, implying that there could be feedback between the accreting supermassive black holes and star formation in their host galaxies. We study this interaction using multi-wavelength data of a sample of nearby AGNs, with reasonable spatial resolution in optical and radio wavelengths. Here we present some of the results from the study.

EA-46	ASI2018_852	Sushma Kurapati	Poster

Authors: Jayaram N Chengalur, NCRA-TIFR.

Title: Angular momentum of dwarf galaxies

Abstract: We present the measurements of baryonic mass (M) and the baryonic specific angular momentum (j) of 11 dwarf galaxies that lie in Lynx-Cancer void based on high-resolution HI observations and the stellar mass profiles. We find that the dwarf galaxies in the void show similar trend in j-M pane as that of the dwarf galaxies in average density environments. However, all the dwarf galaxies have significantly higher specific angular momentum than expected from the relation obtained for the larger spiral galaxies. We find a systematic trend with mass, in that dwarf galaxies with masses lower than 10$^{9.1}$ M$_{\odot}$ have significantly higher baryonic specific angular momentum than expected from the relation found for spiral galaxies . As the mass of the galaxy increases beyond 10$^{9.1}$ M$_{\odot}$, the baryonic specific angular momentum decreases and they tend to follow the relation obtained for the massive galaxies with zero bulge fraction. Interestingly, the mass threshold that we find, viz, 10$^9.1} M$_{\odot}$ is similar to the one at which galaxy disks begin to systematically thicken. We propose that both these effects, viz. the thickening of disks and the increase in specific angular momentum are due to stellar feedback processes. These preferentially remove the low angular momentum gas from the central parts of dwarfs (thus increasing the specific angular momentum of the system) and also inject mechanical energy into the system, leading to thicker discs.

EA-47	ASI2018_857	Biny Sebastian	Poster

Authors: Dharam V Lal, NCRA

Title: uGMRT study of X-shaped radio sources

Abstract: X-shaped radio galaxies are a peculiar class of active galaxies, showing characteristic `X` shape morphology. The formation mechanisms of these radio galaxies are a matter of considerable debate in the literature. Using a GMRT study of 12 X-shaped sources, Lal & Rao (2007) showed that the spectral characteristics of these sources, seem to challenge the currently accepted models for their formation. Therefore, the spectral studies of X-shaped sources is extremely important and wide-bandwidth of upgraded GMRT would play an important role to investigate this. We would present our first results for several of the X-shaped sources using the wide bands of the upgraded GMRT.

EA-48	ASI2018_867	Sumana Nandi	Poster

Authors: Mousumi Das, IIA; Dwarakanath K.S., RRI; Shweta Srivastava, PRL

Title: ULIRGs: the progenitors of the powerful FRII radio galaxies

Abstract: Ultraluminous infrared galaxies (ULIRGs) have enormous bolometric luminosities and are formed through the merging of gas-rich spirals. Multiwavelength observations suggest that the power of ULIRGs is associated with starburst and AGN activity. Therefore ULIRGs provide an excellent opportunity to study the different phases of galaxy evolution as well as the connection between AGN and starburst phenomena. Radio studies of ULIRGs have the potential to provide information on the transitional stage of gas-rich spirals into a dusty quasars. High-resolution radio observations can efficiently detect the highly obscured AGN related emission from ULRGs. Such studies indicate that their radio properties are similar to that of compact steep spectrum (CSS) or Gigahertz peaked spectrum (GPS) radio sources which represent an early stage of FRII radio galaxies. To probe their core jet structures we have started GMRT 1280 MHz radio continuum observations of three ULIRGs. Here we present preliminary results of our observations of these ULIRGs, which are merger remnants and possible progenitors of the powerful FRII radio galaxies.

EA-49	ASI2018_879	Mukul Mhaskey	Poster

Authors: Gopal-Krishna (CEBS, Mumbai), Pratik Dabhade(IUCAA, Pune), Surajit Paul (Department of Physics, University of Pune)

Title: GMRT quasi-simultaneous simultaneous observations of 25 Inverted Spectrum Extragalactic Radio Sources

Abstract: Even for a perfectly homogeneous radio source, inverted spectrum at low frequencies (~100MHz) with a slope a greater than +2.5 cannot arise from self-absorption in synchrotron plasma with the standard (power-law) energy distribution of relativistic electrons. Therefore, any such extreme spectra, if found, would require invoking either a non-standard electron energy distribution (e.g., Maxwellian) or,alternatively, thermal free-free absorption in external medium. As a first step towards examining if such sources exist, we have started a systematic search for extragalactic radio sources having integrated spectrum with a > +2. We present here new GMRT quasi-simultaneous observations of ~25 steeply inverted spectrum sources to define their continuum spectra at sub-GHz frequencies (0.15 to 1.4 GHz).

EA-50	ASI2018_896	Raj Prince	Poster

Authors: Co-Authors: Gayathri Raman{1}, Nayantara Gupta{1}, Pratik Majumdar{2} Affliation: {1} Raman Research Institute, Bangalore {2} Saha Institute of Nuclear Physics,Kolkata

Title: Fermi-LAT Observation of Brightest Gamma-ray Flare ever Detected from CTA 102

Abstract: We present a multi-wavelength study of the FSRQ blazar CTA 102 using Fermi LAT and simultaneous Swift XRT observations. The Fermi LAT telescope detected one of the brightest flares from this object during the observations conducted in December, 2016.In the forty eight days of flaring period the source underwent four major flares. Results of detailed characterization of the temporal and spectral properties of these flares indicate that at MJD 57750.813 the source has a gamma-ray flux of (27.26$\pm$3.30)$\times 10^{-6}$ ph cm^{-2} s^{-1} (from 3 hr binning) in the energy range of 0.1--300 GeV. This has been found to be the highest flux ever detected from the CTA 102. We have also detected a high energy photon of 73 GeV with a probability of 0.99999. The Gamma-ray SEDs are also shown for this brightest flare of CTA 102.

EA-51	ASI2018_921	Sunil	Poster

Authors: Hum Chand (ARIES, Nainital,India) T. R. Seshadri (Department of Physics and Astrophysics, University of Delhi, India)

Title: Probing magnetic field in the intervening galaxies using residual rotation measure (rrm) of the background quasars.

Abstract: A method to probe the magnetic fields of the high-redshift galaxies using the residual rotation measure of the extragalactic sources is presented. To carry out this analysis, a large sample of 970 quasars is compiled for which we have residual rotation measure (rrm) data as well as optical spectra to check the presence/absence of the intervening Mg II absorbers. We have found that the dispersion in RRM (σ-rrm) for 294 sightlines having Mg II intervening systems is 45.91±2.04 rad m −2 as compared to its value of 21.47±1.93 rad m −2 for the 676 sightlines without such absorbers. This lead to significant excess in the standard deviation of 40.57±2.52 rad m −2 among these two subsamples. In this work, we have also shown that subset of sightlines with two Mg II absorbers have more σ-rrm than the subset with one absorber, having values of 35.62±4.63 rad m −2 and 28.28±2.35 rad m −2 , respectively and this sigma rrm has an increasing trend for larger rest frame equivalent width (EW), having values 40.48±2.71 rad m −2 and 55.53±3.18 rad m −2 for EW <1 A and EW > 1 A , respectively. Additionally, we found a strong anti-correlation between σ rrm and fractional polarisation (p) with the Pearson correlation coefficient (ρ) of −0.78 for sightlines with Mg II absorbers which is absent for sightlines without any Mg II absorber. All these observational evidences, allows us to conclude that these intervening galaxies do have magnetic field with strength similar to that in nearby galaxies, and perhaps oriented in random directions leading to a scatter in rrm and hence also causing a reduction in the resultant fractional polarization.

EA-52	ASI2018_936	Preeti Kharb	Poster

Authors: Preeti Kharb (NCRA)

Title: Parsec-scale Nuclear Radio Structures in Seyfert Galaxies

Abstract: I will present results from multi-frequency Very Long Baseline Interferometry (VLBI) observations of Seyfert galaxies. These observations are probing the parsec-scale nuclear structures in these spiral galaxies. They are revealing the presence of weak radio outflows in some galaxies and the tentative presence of dual radio cores which could be dual accreting supermassive black holes in one of them. The influence of these radio features on the emission-line gas regions will be discussed.

EA-53	ASI2018_974	Aditi Vijayan	Poster

Authors: Kartick C. Sarkar, Racah Institute of Physics, Hebrew University of Jerusalem, Jerusalem, Israel, Biman Nath, RRI Prateek Sharma, IISc Yuri Shchekinov, Lebedev Physical Institute of Russian Academy of Sciences, ASC, Moscow 117997, Russia

Title: X-ray emission from disc-wide outflows in spiral galaxies

Abstract: We study the effect of mass and energy injection due to OB associations spread across the rotating disk of a Milky Way-type galaxy, with the help of 3D hydrodynamic simulations. We compare the resulting X-ray emission with the case of injection of mass and energy from a central region. We find that the predicted X-ray image shows a filamentary structure that arises even in the absence of disk gas inhomogeneity. This structure arises because of warm clumps made of disk material being lifted by the injected gas. We show that as much as half of the total X-ray emission comes from regions surrounding warm clumps that are made of a mix of disk and injected gas. We quantify the mass contained in these 'bow-shock' regions. We also show that the top-most region of the outer shock above the central area emits harder X-rays than the rest. Further, we find that mass distribution in different temperature ranges is bimodal, peaking at 10^4 –10^5 K (in warm clumps) and 10^6 –10^7 K (X-ray emitting gas). The mass loading factor is found to decrease with increasing SFR, consistent with previous theoretical estimates and simulations.

ASI 2018 Poster Presentations

Instrumentation and Techniques

IT-1	ASI2018_1219	Jameer Manur	Poster

Authors: Prof. Joydeep Bagchi IUCAA, Pune

Title: Faraday Rotation

Abstract: In physics the polarization of light is studied through "Faraday Rotation Effect" using optical materials like glass, crystals, chemicals etc in the presence of strong magnetic field. The state of polarization is changed in proportion to the magnetic filed strength. The study of polarization of light through rotation of plane of polarized wave when travelling through crystals placed inside solenoid, subjected to a strong axial magnetic field can be a novel approach in communication. Experiment involves conversion of polarization modulated light into intensity-modulated light, and phase shifted demodulated wave with respect to input modulating signal. Insertion of properly matched and tuned circuit before coil and amplifier after demodulation leads to better reception of signal. The baseband signal is an audio signal which is superimposed on the optical carrier. The modulating signal is fed to the solenoid where the audio signal gets modulated in the presence of Faraday material and demodulated by converting polarization modulation into intensity modulation at the photo detector. The power requirement is very low as compare to the existing analog modulation techniques. The system is successfully working over the audio bandwidth.

IT-2	ASI2018_1255	Rengaswamy Sridharan	Poster

Authors: A. Raja Bayanna, Udaipur Solar Observatory, Physical Research Laboratory, P. Venkatakrishanan, IIA, USO/PRL

Title: Diffraction limited imaging with the Multi Application Solar Telescope (MAST)

Abstract: We demonstrate the diffraction limited imaging capability of the MAST by restoring high contrast images. The observing setup included a simple re-imaging system with two achromatic lenses at the back-end of the MAST. Short exposure images of the solar surface in H-alpha and near infrared (700-1100 nm) were recorded with a fast camera. The images were processed with our speckle masking code to retrieve high resolution images with high contrast. We emphasize on the diffraction limited imaging capability of the MAST under typical seeing conditions.

IT-3	ASI2018_1281	Aarthy E	Poster

Authors: E Aarthy (PRL), Archita Rai (PRL), Shashikiran Ganesh (PRL), Santosh V Vadawale (PRL)

Title: Near Infrared Polarimetry – an add on to NICS at MIRO

Abstract: The Near Infrared Camera and Spectrograph (NICS) is one of the back end instruments of the 1.2 m Cassegrain f/13 telescope located at the Mount Abu Infrared Observatory, PRL. NICS is capable of doing both photometry and spectroscopy covering a wide range of 0.8 to 2.5 μm (Y, J, H, Ks) and has been serving as a work horse for the past several years to study diverse objects like AGN, galaxies, supernovae, novae and compact objects etc. In addition to the information obtained from photometry and spectroscopy, polarimetry provides insight into the geometry, magnetic field and even emission mechanisms in such sources. Hence to explore polarimetry in the near IR regime, a 25x25 mm wire grid polarizer has been added to the existing NICS. Preliminary tests for the polarizer have been carried out using 100% polarized and unpolarized lamp standards and polarized and unpolarized stars. Having optical polarization measurement with the 50 cm telescope of PRL, and the polarization capability of AstroSat CZTI, this near IR polarimeter provides a fantastic opportunity for simultaneous polarimetry over a wide range in wavelength. In this contribution the working of the polarimeter along with some initial science results would be discussed.

IT-4	ASI2018_1478	Jayprakash R. Kamble	Poster

Authors: on-behalf of GMRT controol-room and GMRT operations

Title: Post Maintenance Quality Checks: Giant Metrewave Radio Telescope

Abstract: Giant Metrewave Radio Telescope is the world's most sensitive low frequency radio interferometer and it is nearing a major upgrade. It is important to certify the instrument for science readiness at regular intervals. These are post maintenance quality checks (PMQC), at every stage of the GMRT sub-systems, on a regular basis. This is an important exercise to provide GMRT users with a best quality data for their science. We are re-visiting a series of tests, which would fulfill this goal for the upgraded GMRT. In this presentation, we list these tests, namely (i) antenna pointing, (ii) time and frequency stability, (iii) RFI monitoring, (iv) analog LO, (v) antenna deflection, i.e. its sensitivity, etc., and present our methodology and results.

IT-5	ASI2018_1568	Suryarao Bethapudi	Poster

Authors: Shantanu Desai Department of Physics Indian Institute of Technology Hyderabad

Title: Separation of pulsar signals from noise using supervised machine learning algorithms

Abstract: We evaluate the performance of four different machine learning (ML) algorithms: (an Artificial Neural Network Multi-Layer Perceptron (ANN MLP), Adaboost, Gradient Boosting Classifier (GBC), XGBoost, for the separation of pulsars from radio frequency interference (RFI) and other sources of noise, using a dataset obtained from the post-processing of a pul- sar search pipeline. This dataset was previously used for cross-validation of the SPINN-based machine learning engine, used for the reprocessing of HTRU-S survey data. We have used Synthetic Minority Over-sampling Technique (SMOTE) to deal with high class imbalance in the dataset. We report a variety of quality metrics from all four of these algorithms on both the non-SMOTE and SMOTE datasets. For all the above machine learning (ML) methods, we report an accuracy of near 100% for both the non-SMOTE and SMOTE cases. For recall of 100%, the ANN (MLP) reports false positive rates (FPRs) of 7.59e − 4, 6.38e − 4, Ad- aboost FPRs are 2.74e − 2, 4.49e − 2, GBC FPRs are 1.63e − 4, 2.04e − 4, XGBoost FPRs are 4.55e − 4, 8.98e − 4 for the non-SMOTE and SMOTE datasets respectively. We study feature importances using Adaboost, GBC, and XGBoost and also from the minimum Re- dundancy Maximum Relevance approach to report algorithm-agnostic feature ranking. From these methods, we find that the signal to noise of the folded profile

IT-6	ASI2018_1571	Tanya Das	Poster

Authors: Ravinder K. Banyal, S. Kathiravan, T. Sivarani, B. Ravindra; Indian Institute of Astrophysics, Bangalore-560034.

Title: Development of a Fabry-Perot etalon stabilization system for Doppler Spectroscopy

Abstract: Accurate wavelength calibration is an important factor for any measurement with high resolution spectrographs. Stellar spectrum comprises of discrete absorption or emission lines whose position is precisely determined by calibrating the spectrographs using known reference lines generated from laboratory sources. For the spectrograph to measure small variations in Doppler shift, the wavelength calibration must be sufficiently stable during observation time. Instrument instability, mainly due to environmental factors like temperature and pressure variations, and limitations of traditional calibration methods, for example Th-Ar lamps, are the two challenges which bound high precision spectroscopy. Through proper environmental control, by maintaining pressure at 1 mbar and temperature fluctuations at ±0.05 ˚C, Fabry Perot etalon (FP) can yield a velocity precision of 1-10 m/s, when used for wavelength calibration. We aim to develop a FP based wavelength calibrator which is both passively and actively stabilized. The FP etalon, along with the illumination and collection optics will sit inside an evacuated and temperature controlled chamber and this is termed as passive calibration. A stable mounting scheme for holding the FP unit along with related optics is required. For this purpose, we have designed two different mounting schemes, a cage based mounting scheme and a rail based mounting scheme. Enclosure temperature is being controlled using a Proportional-Integral (PI) controller developed in house. Preliminary tests have been conducted to test the pressure and temperature stability achieved by our system. The final wavelength solution model developed, can be used for generation of precise wavelength map and PSF map for the spectrograph.

IT-7	ASI2018_1614	SADHANA SINGH	Poster

Authors: Biman J. Medhi, ARIES Pankaj Sanwal, ARIES Brijesh Kumar, ARIES

Title: Characterization of PyLoN1300 B CCD

Abstract: Charge Couples Devices, or CCDs, have many applications but a remarkable one is their use in modern day astron- omy. In the telescopes they produce amazing astronomical images. The CCD camera is a very important tool in astronomy because of its high quantum efficiency at different wavelength range. Before using any scientific instruments for scientific observation it must be characterized. So, in order to understand the detectors better we need to verify different intrinsic properties of the CCD (how counts vary with temperature and at different combination of R/O Speed, Gain, Binning and also to check linearity of this CCD). CCDs come in various sizes and shapes and are manufactured by a number of companies around the globe. Here we are presenting the characterization of the PyLoN 1300B CCD from Princeton Instrument, USA. The main aim of this work is to characterize this CCD before being installled in the focal plane of 104cm Sampurnanand Telescope at ARIES, Manora Peak, Nainital.

IT-8	ASI2018_1620	Ravindra Pawase	Poster

Authors: K.Sasikumar Raja(1), Ravindra Pawase(2), Tomin James(1), Prasad Subramanian(1), Christian Monstein(3). 1 Indian Institute of Science Education and Research, Pashan, Pune - 411 008, India. 2 Maven Systems Pvt. Ltd., Pune - 411 021, India. 3 Institute for Particle Physics and Astrophysics, ETH Zurich, Switzerland.

Title: Automatic detection and classification of solar radio bursts using machine learning and deep learning techniques

Abstract: The solar radio transient emissions or bursts are powerful diagnostics to probe the dynamical processes that occur in the solar corona. Radio bursts are classified based on their drifting speeds and morphology in the dynamic spectrum. Some of these bursts can be used as proxies for the space weather hazards. Statistical analysis of radio bursts provide clues in resolving the long-standing mysteries in the solar corona. The physical properties and their association with the solar flares and coronal mass ejections have to be studied thoroughly. The e-CALLISTO is the network of radio spectrometers distributed around the globe to monitor radio bursts from the solar corona. Using the archival data (observed 24 hours a day) and by making use of machine learning and deep learning techniques, our aim is to automatically identify and classify the type of radio bursts by pattern recognition and extract their physical properties. A statistical study of such plasma parameters plays a crucial role in addressing the above mentioned issues. We will present the features of the already developed image processing library called 'pycallisto' and demonstrate the developed algorithms with the preliminary results.

IT-9	ASI2018_1665	Jais Kumar	Poster

Authors: Dr. Prasun Dutta; Department of Physics, IIT (BHU) Varanasi;

Title: Polarization calibration and its need in radio astronomy

Abstract: The four stokes parameters that can be inferred from the observed visibilities from an interferometer carry information related to the astrophysical sources. Post observation, first step is to understand and calibrate for the antenna gain and leakages. Most of the science objectives behind the observations require to estimate the stokes I parameter, that gives the total intensity. Generally for the strong sources the leakage from the other parameters into stokes I is very minimal and hence is neglected. However, for observations which requires very high dynamic range in stokes I, such assumptions may give rise to erroneous results. Moreover, if polarized intensity is to be measured, polarization calibration is a necessity and the effect of the leakage is also to be calibrated. In the standard polarization calibration processes we neglect any second order effect of leakage. Though this is apparently a good approximation, for observations like the Hi signal from the Epoch of Reionization (EoR) etc, where the signal visibilities with high amplitudes is comparable to the smaller amplitude visibilities, one need to investigate the applicability of the standard algorithm. In this work we have investigated the limitations of the standard algorithms for the polarization calibration for an interferometer and explored the feasibility of application of higher order polarization calibration algorithms to calibrate the observed visibilities.

IT-10	ASI2018_1669	Atharva	Poster

Authors: Dr. Varun Bhalerao, Dr. G. C. Anupama, Tarun Sharma

Title: GROWTH-India telescope

Abstract: GW170817, the 5th gravitational wave signal to be detected was a milestone discovery in more ways than one. It opened a new window for following up gravitational waves in the more familiar electromagnetic regime which will help us gain more insights into the astrophysical processes involved in the gravitationally cataclysmic events. We present the latest updates from the GROWTH-India telescope: India's first fully robotic optical telescope. The telescope is being set up as a part of the international GROWTH collaboration, a consortium of 15 institutes in seven countries working together to study rapidly evolving transient sources like young supernovae, electromagnetic counterparts to gravitational wave sources, and near-earth objects. The upcoming telescope at Hanle, Ladakh is a 0.7m Planewave CDK telescope with a wide 0.6x0.6 degree FOV and has an Andor iKonXL back-illuminated CCD for high sensitivity and fast readout. Remote override for the robotic telescope is available via a client-server architecture: where the "client" computer at the telescope dome can function autonomously, but yields control to a remote "server" that can provide override commands. The versatile automated client is capable of controlling the observatory instruments in tandem and performing the actual observations. The data are then processed to find transients in real time.

IT-11	ASI2018_1679	Arvind Balasubramanian	Poster

Authors: A. Balasubramanian, S. Mate, V. Bhalerao (IITB), N. P. S. Mithun, E. Aarthy, S. Vadawale (PRL), D. Bhattacharya (IUCAA), A. R. Rao (TIFR)

Title: Calculating the CZTI all-sky sensitivity to transients

Abstract: The Cadmium Zinc Telluride Imager (CZTI) is a hard x-ray coded aperture mask telescope onboard the AstroSAT, sensitive in 20 - 200 keV range. For photons above 100keV, it acts as an open sky detector and can detect transients like Gamma Ray Bursts (GRBs), and the X-ray counterparts to gravitational wave sources, from the entire sky. The spectral response and overall sensitivity of CZTI depend on the direction of the source. To characterise this direction dependance of sensitivity, we have developed a detailed software simulation (called the mass model) of AstroSat. This mass model can be used to calculate the response for any source, shining from any direction in the sky. We can also use the simulation outputs to localise any new transient sources on the sky. For transients with a known position, we can simulate the satellite spectral response to calculate the source spectrum from the detected photons. We present details of the mass model, and a few scientific results derived from its application.

IT-12	ASI2018_1714	Neelam J S S V Prasad	Poster

Authors: Kapil Kumar, Rishikesh Sharma, Abhijit chakraborty Physical Research Laboratory,

Title: PRL 2.5m Telescope

Abstract: Importance and usefulness of small size telescopes in the age of large and extremely large telescopes are still significant. Few sciences which need a significant amount of telescope time can be realized with small telescopes only. "PRL 2.5 m telescope" is going to be installed in Mt Abu by end of 2019. Main science objectives of 2.5 m telescope are • Detection of extrasolar planetary systems, • Infrared photometric and spectroscopic studies of Super-Novae and Novae-like stellar phenomena • Multiwavelength studies of Galactic and extra-galactic compact sources An overview of the telescope subsystems and important specification of the telescope and the backend end instruments that are developing in PRL for the 2.5 m telescope will be presented. (PARAS 2 Stabilized High-Resolution Fiber-fed Spectrograph (380nm – 690nm) For high precision Radial Velocity measurements (~50cm/s) and WFC (Wide Field Camera) 20arcmin x 20 arcmin: For precision photometry at sub-milli-mag accuracy and as well as Faint Object UBVRI photometry)

IT-13	ASI2018_1733	Pramod Tanaji Padwal	Poster

Authors: Santaji N. Katore (NCRA), B.C. Joshi (NCRA)and Yashwant Gupta (NCRA)

Title: uGMRT wideband phasing with automated RFI rejection techniques for pulsar observations.

Abstract: Giant Metrewave Radio Telescope is the world's most sensitive low-frequency radio interferometer and presently, it is undergoing a major upgrade, which would complete before the end of year 2017. One of the key objectives of this upgrade is to improve sensitivity along with obtaining near seamless frequency coverage from 125 MHz to 1450 MHz. This capability is particularly useful for sensitive pulsar observations, where the interferometer is used as a 150-m single dish telescope by phasing the compact array antennas. Unlike legacy GMRT, the wideband phasing faces the challenge of narrowband RFI scattered across the band. This reduces the speed of phasing and sometimes, renders phasing impossible. We are developing a procedure for automatic RFI rejection before computation of instrumental phase for the wideband data for this upgraded system. Here, we present our first results from this ongoing developmental efforts. In particular we outline the steps and discuss the algorithm used to identify RFI affected channels. We illustrate our procedure with several test cases, including use of strong and weak phase calibrator sources for typical pulsar observations.

IT-14	ASI2018_1734	Vinutha C	Poster

Authors: Vinutha Chandrashekar, K. B. Raghavendra Rao, Rahul Kinger, H. A. Aswathappa, P. S. Sasikumar, T. S. Mamatha, Bhawana Bansal*, Harsh Grover**, H. N. Nagaraja, P. Sandhya, Indrajit Barve#, and Avinash A. Deshpande. Raman Research Institute, * IIT Kharagpur, ** BITS Pilani, # Indian Institute of Astrophysics

Title: SWAN (Sky Watch Array Network) Demonstrator: Development & Status.

Abstract: The Indian SWAN (Sky Watch Array Network) initiative, aims significantly to enhance Indian observing capabilities in radio, but importantly, also to sustainably build & nurture future generations of talented radio astronomers in India to take up the challenges and lead in exciting research in astronomy. The SWAN aim is to design, develop and use a wide-band interferometric array of antenna across different parts of India to facilitate and conduct deep searches & studies of fast and slow transient radio radiation from astronomical sources, also enabling high angular resolution (VLBI) imaging of discrete galactic & extragalactic sources at low radio frequencies. It is also aimed to facilitate hands-on experience to a large number of undergraduate/postgraduate students through their direct & active participation, starting from the design stage to competitive research using the array network. The proposed competitive network, with nominally 1000 sq. m array area at each location and operation spanning a decade in frequency (50-500 MHz), is being developed in three phases. As a proof-of-concept/demonstrator system, a 7-station system, using small tiles (based on MWA design) and receiver hardware from RRI-GBT Multiband system, is successfully configured at the Gauribidanur Telescope Field Station, and is being characterized & tested in a tied-array mode. Remote access, to operate this system, is open for students from several institutes to familiarize using the array network. Here, we describe this system in some detail, and present preliminary test results.

IT-15	ASI2018_1745	Jigisha	Poster

Authors: Jigisha V. Patel and Avinash A. Deshpande

Title: The dynamic spectral signatures from Lunar Occulation: A simulation study

Abstract: Lunar occultation, which occurs when moon crosses sight-lines to distant sources, has been studied extensively through apparent intensity pattern resulting from Fresnel diffraction, which depends on the angular size of the source, the frequency of observation and distance to the obstruction. Such Lunar occultation observations have been successfully used to measure angular sizes of extragalactic sources. However, such observations to-date have been mainly over narrow bandwidth, or averaged over the observing band, and the associated intensity pattern in time has never been examined in detail as a function of frequency over a wide range. Here, we revisit the phenomenon of lunar occultation with a view to study the associated intensity pattern as a function of both time and frequency. Through analytical and simulation approach, we examine the variation of intensity across the dynamic spectra, and look for chromatic signatures which could appear as discrete dispersed signal tracks, when the diffraction pattern is adequately smoothed by a finite source size. We particularly explore circumstances in which such diffraction pattern might closely follow the interstellar dispersion law followed by pulsars and transients, such as the FRBs, which remain a mystery even after a decade of their discovery. In this presentation, we describe details of this investigation, relevant to radio frequencies at which FRBs have been detected, and discuss the findings, along with their implications.

IT-16	ASI2018_1760	Deekshya roy sarkar	Poster

Authors: A.B Shah(PRL),Shashikiran Ganesh(PRL),Sachindra Naik(PRL), K S Baliyan(PRL), Archita Rai(PRL)

Title: Near-Infrared Imaging Spectro Polarimeter(NISP) Electronics and Detector Interface Development

Abstract: A Near - Infrared Imaging Spectro- Polarimeter (NISP) backend instrument is being designed and developed for the upcoming 2.5m telescope at Mt Abu Infrared Observatory(MIRO). NISP will be a multi-function instrument and function selection will be made on the fly with the help of controllable optics and electronics. It will operate at 77K over a spectral range of 0.8-2.5 um. CMOS HAWAII-H2RG will be used as Focal Plane Array detector and Sidecar ASIC will be used as front-end electronics. The detector is composed of 2K X 2K pixels and 18 microns in size. The controller can be programmed to read out the H2RG Focal Plane Array(FPA) with 1,4 or 32 modes. Its low read out noise, low dark current, high quantum efficiency and low power makes it different from other detectors. A lot of astronomical objects can be studied using this instrument. The developmental aspects and status of the control electronics will be discussed in this contribution.

IT-17	ASI2018_1763	ARPAN GHOSH	Poster

Authors: Saurabh Sharma (ARIES), D K Ojha (TIFR), Tapas Baug (ARIES), A. K. Pandey (ARIES)

Title: Deep NIR photometry by using TIRCAM2 mounted on 3.6m Devasthal Optical Telescope ---Initial Results

Abstract: Recently, TIFR near-infrared camera (TIRCAM2) has been mounted at the backend of 3.6m ARIES Devasthal Optical Telescope. It is developed by the infra-red astronomy group of TIFR for astronomical observations in the wavelength range of ~1-3.6 microns. The distinct feature of this camera is the presence of PAH and nbL bands which help in mapping the ~3.6 micron emissions. Here, we present the initial results from the TIRCAM2 camera as obtained during its calibration nights of May and October, 2017. We will report the detector parameters, faint magnitude limits obtained in the J, H, K broadbands, the sky brightness, resolution of the images and the minimum seeing as obtained with this detector.

IT-18	ASI2018_441	Rahna P T	Poster

Authors: P. T. Rahna(1), J. Murthy(2), M. Safonova(3), F. Sutaria(2), S. B. Gudennavar(1) and S. G. Bubbly(1) (1) Department of Physics and Electronics, Christ University, Bengaluru 560029, India (2) Indian Institute of Astrophysics, Bengaluru 560034, India (3) M. P. Birla Institute of Fundamental Research, Bengaluru 560001, India

Title: Characterizing the in-flight performance of UVIT instrument and UV properties of a galaxy

Abstract: Ultra Violet Imaging Telescope (UVIT) is one of the instruments on India's first multi wavelength mission, AstroSat, which provides a unique opportunity to observe the UV sky simultaneously in three channels. We have performed an independent characterization of the FUV and NUV detectors of UVIT payload on-board and found that the performance is close to that expected from the ground-based calibration. We have reduced and analysed the data using JUDE software and found that the photometric sensitivity is same as GALEX in the NUV broadband filter and about 35% that of GALEX in the FUV broadband filter. The PSF of the instrument is of the order of 1.2 to 1.6 arcsecs. We derived the distortion correction but recommend that it be applied post processing as part of the astrometric solution. Since the higher angular resolution, higher sensitivity and multiple filters of UVIT are well suited for the study of the detailed features of galaxies, the study of ultraviolet properties of a galaxy using UVIT data is in progress. The details of these studies will be presented during the meeting.

IT-19	ASI2018_553	AMITESH OMAR	Poster

Authors: T.S. Kumar, B. Krishnareddy, Jayshreekar Pant, Manoj Mahto (on behalf of a larger team), ARIES, Nainital.

Title: A FOSC-type spectrograph for 3.6-m Devasthal Optical Telescope

Abstract: An optical imager-cum-spectrograph has been developed and is under commissioning for the 3.6-m Devasthal Optical telescope (DOT), the largest optical-near infrared telescope in India. The spectrograph is similar to Faint Object Spectrograph Camera (FOSC)-type instruments on various 2-m class and larger optical telescopes. The spectrograph weighing nearly 500 Kg is designed and assembled within India. The spectrograph is mounted directly on the Cassegrain focal port of the DOT. This spectrograph can perform low dispersion optical spectroscopy and color photometry in various optical bands using combinations of slits, grisms, and filters. The spectrograph uses a 4Kx4K CCD camera, also developed in ARIES. The spectrograph can also be configured with a fast EMCCD camera, a wedge-prism, and a GPS timing system to perform fast (milli-second) multi-color photometry/spectroscopy for dedicated or coordinated observations with other telescopes. The details of the system along with the images taken using this instrument on the 3.6-m DOT will be presented.

IT-20	ASI2018_733	Nilesh Sadashiv Raskar	Poster

Authors: Sachin S. Sherkar (NCRA-TIFR) Dharam V. Lal (NCRA-TIFR)

Title: Band-2 and Band-4 of Upgraded GMRT: Updates on time-domain and frequency-domain stability

Abstract: The Giant Metrewave Radio Telescope (GMRT) is nearing its upgrade. With this upgrade of GMRT, this instrument remains as the most sensitive interferometer in the world at low radio frequencies. Briefly, among several aspects of the ongoing upgrades, key features are a brand new frond-end and digital back-end, RF receivers, etc. These upgrades provide us with nearly a seamless frequency coverage from 120 MHz to 1450 MHz with bandwidths as large as 400 MHz over 16k spectral channel resolution. Here, we present the status of two new recently deployed bands, Band-2 (120-240 MHz) and Band-4 (550-900 MHz). In particular, we would compare the improvements in the quality of upgraded GMRT data and data from the legacy GMRT system.

IT-21	ASI2018_743	Ajay Vibhute	Poster

Authors: Prof. Dipankar Bhattacharya, IUCAA Prof. A. R. Rao, TIFR, Prof. Santosh Vadawale, PRL

Title: Bayesian spectrum reconstruction technique for Astrosat CZTI

Abstract: Xray sources are highly variable, i.e., their spectrum changes irregularly with time. Thus, the study of the energy spectrum of these sources is of paramount importance. In the direct imaging technique, we can estimate the source spectrum by considering the counts in the region illuminated by the source. However, at high energies, indirect imaging methods such as Coded Mask Imaging (CAM) are often used to help cover a large Field of View (FOV). In this poster, we are presenting conventional method used in indirect imaging to reconstruct the spectrum of the source. Also, we will present limitations of the conventional method and propose a new Bayesian-based technique to overcome the limitations of the conventional method.

IT-22	ASI2018_864	Mohana Krishna.R	Poster

Authors: Sankarasubramanian K

Title: Optimum modulation for coronal field measurements on a space based observatory

Abstract: Many activities in the solar atmosphere are caused due to the presence of magnetic field. The influence of the magnetic fields on dynamic events range from the corona upto the heliosphere. Phenomenon like solar flares, CMEs and coronal loop oscillations are not understood complete. A vector magnetograph of coronal magnetic field provides insight into the configuration of the fields which in-turn helps in understanding the dynamics during such events. There are several theoretical models on coronal field strength and their variation with solar activity and there have been indirect ways of measuring coronal field strength through models of non-linear force free field extrapolation to estimate upper chromosphere and coronal field strength from photospheric field. These results form the basis for expected field strength and estimates of 3-40 G from solar minima to maxima. Though statistical estimates of magnetic field using stokes vector-V have been performed the vector magnetic field measurements of the corona are yet to be done. As the corona is faint with weak fields, such measurements become extremely difficult for a ground based observatory while a higher SNR can be achieved using a space based observatory. Unlike a ground based instrument a space based instrument has several constraints including mass, number of moving parts and shelf life of the components used in it. In order to have minimum mass, less moving parts and high shelf life we choose a single crystal continuously rotating retarder as modulator and a pair of polarizing beam displacers as dual beam analyzer for the polarimeter unit. We present a modulation scheme for the solar corona to measure the vector magnetic field of coronal loops. The design takes into account the crosstalk due to satellite jitter and minimizes the crosstalk from linear into weak circular polarization. A laboratory setup is made to verify the capabilities of the modulation scheme. Typical jitter of a low earth orbit satellite is recreated and linear to circular polarization crosstalk is measured. It is found that the crosstalk reduces with an increase in the number of frames that are averaged according to the curve obtained from simulations.

IT-23	ASI2018_924	Santaji N Katore	Poster

Authors: Biny Sebastian(NCRA), Ruta Kale(NCRA), Dharam V. Lal(NCRA) & Ishwara-Chandra C.H.(NCRA)

Title: Wideband primary beam measurements for the upgraded GMRT

Abstract: Giant Metrewave Radio Telescope is the world's most sensitive low-frequency radio interferometer and it is in the final stage of the upgrade. One of the key objectives of this upgrade is to improve sensitivity along with obtaining near seamless frequency coverage from 100 to 1500 MHz. As a part of this upgrade, new wideband feeds and digital backend with 400 MHz bandwidth capability have been put in place. Correction for the frequency dependent primary beam is fundamental to measure flux densities of sources detected in the images made with the wideband system. Radio images, if not corrected for the primary beam, would show an artificial steepening of the spectrum in addition to the drop in flux levels of sources as one moves away from the phase center. Here, we present our measurements of the frequency dependent primary beam shapes for the new feeds of the band 250-500 MHz. The applications of these measurements to the wideband images are also presented.

IT-24	ASI2018_964	Kumar	Poster

Authors: T. S. Kumar

Title: Demonstration of suitability of observer based velocity estimation in distributed telescope control systems

Abstract: Modern astronomical telescopes are driven by direct drive brushed or brushless DC motors with high resolution rotary encoders directly mounted on the main axes for achieving accurate velocity feedback control. At very low velocities the encoders suffer from errors due to quantization and temporal discontinuities. We present here observer based velocity estimation technique for feedback control of DC motors at very low speeds. A Luenberger proportional integral (PI) observer is designed to estimate the velocity between the discontinuities and validated along with a PI controller, controlling a precision brushed DC motor, on a hardware-in-the-loop platform. This technique could also be utilized for increasing the accuracies of a lower resolution encoder used in smaller telescopes by combining the observer velocity with the velocity estimated from the encoder to offset the exorbitant cost of higher resolution encoders. In case of large telescopes, distributed control system is normally preferred where the sensors, actuators and controllers are distributed over a realtime network. Thus, for practical implementation on such systems the observer and controller are implemented on separate embedded controllers distributed over a controller area network (CAN). The velocity feedback from the observer is provided to the controller over CAN bus and the controller performance at different speeds are evaluated.

ASI 2018 Poster Presentations

General Relativity and Cosmology

GRC-1	ASI2018_1135	ABHIMANYU S	Poster

Authors: Achamveedu Gopakumar (Tata Institute of Fundamental Research, Pune) Bhal Chandra Joshi (National Centre for Radio Astrophysics-TIFR, Pune) Ranjan Kumar (National Institute of Technology, Rourkela)

Title: Improved timing model for binary pulsars with tiny orbital eccentricities.

Abstract: We explore the implications of advance of periastron for binary pulsars having tiny orbital eccentricities. It turns out that certain terms neglected in the widely used timing model for binary pulsars having tiny orbital eccentricities should not be omitted for binaries exhibiting substantial periastron precession. Our investigations reveal that inclusion of these terms may allow one to constrain the apsidal motion constant from long term monitoring of a number of detected binary pulsars.

GRC-2	ASI2018_1209	SAFIQUL ISLAM	Poster

Authors: SATADAL DATTA*, Prof. Tapas Das*. *Harish-Chandra research Institute, Chhatnag Road, Jhunsi, Allahabad-211019, India Homi Bhabha National Institute, Training School Complex, Anushaktinagar, Mumbai - 400094, India

Title: A parametric model to study the mass radius relationship of stars

Abstract: For relativistic charged fluid with the signature of pressure anisotropy, where the anisotropy is defined by the finite non zero difference between the radial and the tangential fluid pressure, the Einstein Maxwell field equations are solved for static spherically symmetric spacetime. Certain functional form of the electric field as well as the effective gravitational potential have been introduced in our model, where such field and potential are characterized by two free parameters a and b, with certain relationships defined between these two parameters, where such relationships are obtained using a particular form of stability criteria. The charge and the mass energy density have been expressed (as a consequence of the interior solution) as a function of the radial distance. From there, we obtain the mass-radius relationship for the interior solution. Once such mass-radius relationship is integrated for a particular limit defined by the radius of the star, one can obtain what will be the mass of the charged fluid considered in our model, embedded within a sphere of radius R. Hence our model here provides the mass M(R) of star of radius R. M(R) in our calculations, however, is characterized by (a,b), and there remains a specific relationship between a and b, which are obtained by using some predefined stability criterion. Various values of a and b provides various [M(R)-R] measurements. For different values of a and b, one can find M(R) for different values of R, and hence using our model, we can study the mass radius relation for different categories of stellar objects located at various regions of the Hertzsprung-Russel diagram. We find that the mass and radius of the considered stars in sub-giants class and blue-giant class are of the same order and that is reflected in a-b parameter space too. Obviously, among the considered stars, this model does not distinguish sub-giants and blue giants. Nevertheless, this difference is prominent and clear for the other classes of the considered stars. The compactness of the star and permissible region in a-b parameter space for the star closely matches with the red dwarf category. Our model clearly distinguishes this brown dwarf from the other stars. Actually, this model is good in categorising the stars depending on their mass and radius. This model clearly classifies stars into two categories, i.e; $0 < n < 0.5$ and $0.5 \leq n < 1$. Given compactness of a star, one of the two above categories for the star is determined. Now one needs an additional input about the star (radius or mass of the star) to determine on which subcategories, i.e; on which type the star fits in if $n < 0.5$ (because all of the stars in H-R diagram have $n < 0.5$).

GRC-3	ASI2018_1268	SATADAL DATTA	Poster

Authors: no-coauthor, only me and Harish-Chandra research Institute, Chhatnag Road, Jhunsi, Allahabad-211019, INDIA

Title: Analogue tachyon in Jeans Cloud

Abstract: We study the linear perturbations in a stable Jeans cloud, i.e; the dimension of the cloud is less than the Jeans length. We find that the linear perturbation of density in such a system obeys a wave equation in acoustic analogue of Minkowski space-time which is similar to Klein-Gordon equation for tachyon field in Minkowski space-time, i.e; Klein-Gordon equation with negative mass-squared term in a flat space time background. We further find the analogy with tachyon field for linear perturbation of density by studying linear perturbations in a stable cloud made of Bose-Einstein condensate as dark matter.

GRC-4	ASI2018_1348	Soumen Mondal	Poster

Authors: Dr. Prasad Basu Cotton University, Guwahati,Assam.

Title: Gravitational wave emission during the coalescence of the black holes in a binary system in the presence of an accretion disc.

Abstract: Gravitational wave signal characteristics from a binary black hole system in which the companion moves through the accretion disc of the primary are studied. We chose the primary to be a super-massive (M = 10^8 x Sun Mass) Kerr black hole and the companion to be a massive black hole (M = 10^5 x Sun Mass) to clearly demonstrate the effects. We show that the drag exerted on the companion by the disc is sufficient to reduce the coalescence time of the binary. The drag is primarily due to the fact that the accretion disc on a black hole deviates from a Keplerian disc and becomes sub-Keplerian due to inner boundary condition on the black hole horizon. We consider two types of accretion rates on to the companion. The companion is deeply immersed inside the disc and it can accrete at the Bondi rate which depends on the instantaneous density of the disc. However, an accretion disc can also form around the smaller black hole and it can accrete at its Eddington rate. Thus, this case is also studied and the results are compared. We find that the effect of the disc will be significant in reducing the coalescence time and one needs to incorporate this while interpreting gravitational wave signals emitted from such a binary system.

GRC-5	ASI2018_1461	Avinash Singh	Poster

Authors: H. K. Jassal Indian Institute of Science Eduction and Research, Mohali

Title: Perturbation in Tachyon Dark Energy and it's Effect on Matter Clustering

Abstract: In search of alternative of cosmological constant model of dark energy we study a non-canonical scalar field model namely the tachyon dark energy model. We first put constraints on the parameters with new data of Supernova Type Ia (union 2.1 data) observational, baryon acoustic oscillation (BAO data) pick measurement and direct measurement of Hubble parameter H(z). We also study the structure formation under this model using linear perturbation theory. We look for the effect of dark energy inhomogeneities on matter clustering comparing it with homogeneous and cosmological constant model. We found that although the order of clustering of dark energy for this model is negligible at short scales, like the scale of a galaxy and galaxy cluster, it is significant at large scales.

GRC-6	ASI2018_1647	Ranbir Sharma	Poster

Authors: H K Jassal; IISER Mohali, Mohali Punjab

Title: Principal Component Analysis and Reconstruction of Dark Energy

Abstract: Observation has confirmed that present Universe is accelerating and this acceleration is driven by dark energy. Dark energy can either be a cosmological constant, which is a simple explantion, or it can be a barotropic fluid or canonical or noncanonical scalar fields. The equation of state of dark energy may, in general, vary with time. Typically, a functional form is assumed for a fluid model of dark energy, and the parameters are constrained using different observations. In this work, using the Principal Component Analysis (PCA), we attempt to reconstruct the Equation of state of Dark Energy using different datasets. For this analysis, we use Supernova types Ia data and direct measurements of Hubble constant data-set. We employ two approaches, one is the direct reconstruction of the equation of state and other is the reconstruction of Hubble parameter or distance modulus which indirectly gives the equation of state parameter of dark energy. We test these approaches with the simulated LCDM model. Our initial results for the SNIa, H(z)-z data shows that the deviation from LCDM model is very small. This result is independent of the datasets.

GRC-7	ASI2018_1670	Rohin Kumar Yeluripati	Poster

Authors: Yeluripati Rohin

Title: Galaxy Clustering in Alternative models

Abstract: Galaxy clustering through two-point correlations from redshift surveys is well-studied in standard cosmology. Constraints on structure growth rate, BAO peak, dark matter, dark energy and nature of geometry etc. can be obtained from two-point statistics of redshift surveys. Galaxy clustering can be quite different in alternative models that lead to interesting features and constraints on alternative gravity and cosmology models. This work focuses on comparison of two-point correlations of popular alternative cosmology models such as $R_h=ct$ and $f(R)$ gravity based cosmologies. Viability of these models is presented as the final result using model-independent Alcock-Packzynski test.

GRC-8	ASI2018_1689	Manvendra Pratap Rajvanshi	Poster

Authors: Jasjeet Singh Bagla IISER, Mohali

Title: Nonlinear Spherical Perturbations in Quintessence Cosmology

Abstract: It is well established that the universe is dominated by dark energy. The cosmological constant is consistent with most of the observational constraints on dark energy. There are numerous models of dynamical dark energy where the cosmological constant is replaced by a field or a fluid. It has been shown using perturbation theory analysis that in most such models the fluctuations in dark energy at small scales are very small, perhaps too small to be detected. We present results of a study where we consider the influence of non-linear perturbations in dark matter on the evolution of fluctuations in dark energy. We use Quintessence models of dark energy in this study. Our analysis is fully relativistic and assumes spherical symmetry. Linear perturbation analysis indicates that perturbations in quintessence models of dark energy do not grow at small length scales. In this study, we look at the response of quintessence dark energy to non-linear perturbations in dark matter. We show that at scales much larger than the virial radii of collapsed halos the fluctuations in dark energy continue to be small. At very small scales within virialized halos, dark energy can develop significant inhomogeneities. We show that dark energy perturbations grow at a faster rate than expected in linear perturbation theory. We find that dark energy perturbation remains localized and does not diffuse out to larger scales. We also find that the equation of state parameter changes in response to perturbations in dark matter.

GRC-9	ASI2018_1694	Madhurima Choudhury	Poster

Authors: Abhirup Datta, Indian Institute of Technology Indore.

Title: Foreground Subtraction in redshifted 21cm Global Signal Experiments using Artificial Neural Networks

Abstract: Observations of HI 21 cm transition line would be an important and promising probe into the cosmic Dark Ages and Epoch of Reionization. Detection of this redshifted 21 cm signal is one of the key science goal for several upcoming and future low frequency radio telescopes like Hydrogen Epoch of Reionization Array (HERA), Square Kilometer Array (SKA) and Dark Ages Radio Explorer (DARE). One of the major challenges for the detection of this signal is the accuracy of the foreground source removal. Several novel techniques have been explored already to remove bright foregrounds from both interferometric as well as total power experiments. Here, we present preliminary results from our investigation on application of Artificial Neural Networks to detect faint 21cm global signal amidst the sea of bright galactic foreground. Following the formalism of representing the global 21cm signal by the tanh model (Mirocha et al. 2015), this study finds that the global 21cm signal parameters can be accurately determined even in the presence of bright foregrounds represented by 3rd order log-polynomial (Harker 2015) or higher. This presentation also deals with results of signal reconstruction and foreground removal in presence of instrumental noise.

GRC-10	ASI2018_1770	Nobleson K	Poster

Authors: Nour Dergham, Osmania University Juhi Parmar, Osmania University

Title: Alternate initial conditions for the big bang cosmological model

Abstract: The aim of this paper is to propose an alternate model to the Big Bang theory's initial conditions. In the existing model, the extrapolation of laws of physics back in time results in a high density regime known as singularity, typically associated with the standard big bang model. The model also describes how the universe expanded from high density, high temperature state while offering explanation of the abundance of light elements, cosmic microwave background radiation (CMBR), large scale structure and Hubble's law. We propose a model for the universe considering the most recent measurements of redshift of Type Ia Supernovae, indicating the accelerating universe and the existence of dark energy and extrapolating the time forward. We also discuss the consequence of this runaway expansion of the universe which may trigger a sequence of events leading to the genesis of another universe at the same time trying to avoid the problems of singularity, inflationary expansion, and asymmetry between the matter and antimatter which are still currently debated in the standard big bang model.

GRC-11	ASI2018_471	Gajanan Dnyaneshwar Harale	Poster

Authors: Reju S. John(pondicherry university) and Surajit Paul(Department Of Physics SP Pune University)

Title: Role Of Fermi I and Fermi II mechanisms in modulating electron energy spectrum responsible for radio emissions in Galaxy clusters

Abstract: Fermi I and Fermi II are the most significant particle acceleration methods working in astrophysical objects. Accelerated electrons that emits radio synchrotron emissions in galaxy clusters are also supposed to be accelerated by either of these mechanisms, but still remained highly debated. In this work, we will try to understand how they compete to each other in case of radio halo and relic emission observed in the clusters. We will discuss how the spectral index of radio emission differ from FERMI I and FERMI II and will find a possible solution to problem of non detection of radio halos in clusters having Mpc sized symmetric relics.

GRC-12	ASI2018_571	Kaustav Mitra	Poster

Authors: Suchetana Chatterjee (Department of Physics, Presidency University), Michael A. DiPompeo (Department of Physics and Astronomy, Dartmouth College, Hanover, NH 03755, USA), Adam D. Myers (Department of Physics and Astronomy, University of Wyoming, Laramie, WY 82071, USA) Zheng Zheng (Department of Physics and Astronomy, University of Utah, Salt Lake City, UT 84112, USA)

Title: Halo Occupation Distribution of Quasars : Revisiting the AGN Unification

Abstract: We model how active galaxies are distributed in the underlying large scale structure of the universe. We use a clustering statistic called the angular two-point correlation function (2PCF) of obscured and unobscured quasars : selected using the Wide-field Infrared Survey Explorer (WISE) and Sloan Digital Sky Survey (SDSS), at a median redshift of z ~ 1. Our theoretical framework is five parameter Halo Occupation Distribution (HOD) model, derived from a cosmological hydrodynamic simulation by Chatterjee et al. (2012). The HOD parameterization was previously used to model the 2PCF of optically selected quasars and X-ray bright active galactic nuclei (AGN) at z ~ 1. The current work shows that a single HOD parameterization can be used to model the population of different kinds of AGN in dark matter halos suggesting the universality in the relationship between AGN and their host dark matter halos. Our results show that the median halo mass of central quasar hosts increases from optically selected and infra-red (IR) bright unobscured populations to obscured quasars, signifying an increase in the degree of clustering. The projected satellite fractions also increase from optically bright to obscured quasars and tend to disfavor a simple orientation-only theory of AGN-unification. Our results also show that future measurements of the small scale clustering of obscured quasars can constrain current theories of AGN - supermassive black hole co-evolution where quasars evolve from an IR- bright obscured phase to the optically bright unobscured phase. Hence, from a cosmological large scale structure perspective we re-evaluate the Active galaxy unification schemes and hint towards prospective and exciting improvements of our understanding of galaxy evolution.

GRC-13	ASI2018_626	Ramkishor Sharma	Poster

Authors: Sandhya Jagannathan (University of Delhi) T. R. Seshadri (University of Delhi) Kandaswamy Subramanian (IUCAA)

Title: A viable $f^2 F^{\mu\nu}F_{\mu\nu}$ model of inflationary magnetogenesis

Abstract: Magnetic fields have been observed in galaxy, galaxy clusters and even in voids. A lower bound of strength 10^{-15} G on Mpc scales has been suggested by gamma ray observation of Blazars. However, the origin of these fields is still an open question. A lot of possible scenario has been suggested in the literature, f^2 F^{\mu\nu}F_{\mu\nu} type model (Ratra model) is one of them. Although the generated magnetic fields of this model satisfies the observed strength, they suffer from strong coupling and back-reaction problem. In our work, we have suggested a scenario that is free from these problems. In this scenario the coupling function, f grows during inflation and transits to a decaying phase post-inflation. By choosing a suitable evolution of coupling function, it has been demonstrated that the above-mentioned difficulties (arising from strong coupling and back-reaction) are avoided. However, to avoid back-reaction post inflation, reheating has to be below $ \approx 1.7 \times 10^4$ GeV. The generated magnetic energy spectrum is blue and it satisfies the gamma-ray bounds.

GRC-14	ASI2018_768	PRATEEK GUPTA	Poster

Authors: Surajit Paul, Dept of Physics, University of Pune (SPPU), Pune. Reju Sam John, P.E.C., Pondicherry University, Puducherry.

Title: Numerical modeling of synchrotron radio emission from large scale structures

Abstract: In hierarchical structure formation, at large scale (>= 10 Mpc) the Universe comprises of complex filamentary structure in which galaxy clusters, filaments, and voids are its major components. Filaments play the major role, eaten up the matter from voids and feed it to their respective galaxy clusters (knots, created at the junction of filaments). Most of the baryonic matter first processed in filaments and then fed to the hot furnace (galaxy cluster) which in gives out the wealth of information (electromagnetic or particle radiation) about the energetics and processes taken place in the system. The kinetic energy released during structure formation dissipates in the intra-cluster-medium (ICM) by shock thermalization and turbulence generation. The cluster merger and accretion of matter during the structure formation results in the shock waves and fluid turbulence in ICM. These shock waves accelerate the significant population of charged particles of the ICM by diffusive shock acceleration (DSA) mechanism. The fluid turbulence produces the Alfven waves which re-accelerates (turbulence re-acceleration (TRA) mechanism) the existing non-thermal electrons to GeV and also amplifies existing cluster magnetic fields by dynamo action, causing the GeV electrons to efficiently lose energy to synchrotron radiation in the GHz band. This synchrotron radio emission could help in tracing back the dynamical history of these structures. In this work, we deployed both of our particle acceleration model (DSA and TRA) for computing synchrotron radio emission from Large Scale Structures (LSS) using Adaptive Mesh Refinement (AMR), grid-based hybrid (N-body + Hydrodynamical) cosmological simulations. Computation is being done on grid parameters and a proper weight has been used to nullify the effect of complicated resolution pattern of an AMR simulation. Finally, we have created the synthetic radio maps, for each above-stated model and also with combining both models. It explained the observed radio relics found at few Megaparsec away from Galaxy cluster as well as predicted some very interesting radio structures, radio halos, and the existence of the complex filamentary network. In work of ours, we also prepared a catalogue of galaxy clusters and groups having the mass range between 10^13 - few 10^15 Solar mass and computed their corresponding radio power and radio flux using above-stated models and clearly predicted the possible detectable sources with the upcoming radio telescope (SKA).

ASI 2018 Poster Presentations

Other

Ot-1	ASI2018_1206	Ashmita Tribedi	Poster

Authors: Gourav Banerjee, Christ University, Bangalore

Title: Citizen Science: Contributing in Professional Astronomy being an Amateur

Abstract: In this golden era of astronomy, making any inference about the structure and evolution of the cosmos through observation is a highly challenging task. Overwhelming data generated from different extremely powerful telescopes and space based satellites are continuously making this challenge even tougher. Thus, now it requires the combined effort of both professional and amateur astronomers to understand various puzzling mysteries of the universe. We have discussed the prospects of Citizen Science programmes, advocated by the International Astronomical Union (IAU), where one can contribute in professional astronomy being an amateur. This initiative helps students and interested persons to participate actively in astronomy research. We have mentioned about few projects under Citizen Science schemes where any interested student or person can participate and start contributing in astronomy.