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The low-frequency radio emission in blazar PKS2155–304

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Abstract. PKS 2155−304 is one of the brightest BL Lac object in the sky and a very well studied target from radio to TeV bands. We present a study of low frequency radio monitoring on this source during one of its flaring episode in this poster. The high resolution low frequency radio data detected a kpc-scale diffuse jet feature around PKS 2155−304. Further, the analysis of monitoring data at various time scales of the flux evolution at different radio frequencies confirms the variability in this source and supports synchrotron emission mechanism. At lower frequencies enhanced emission from diffuse jet structures dominates the spectra, followed by power−law decay at higher frequencies. Clearly, these results give an interesting insight of the emission mechanisms in blazars. Finally we highlight the importance of contributions from LOFAR and SKA in studying such objects.

Keywords : Radio continuum:galaxies−galaxies:radio galaxies−jets:variability

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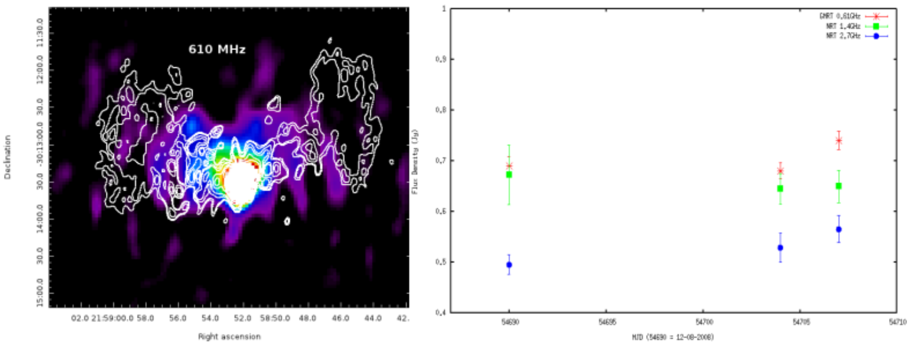

Figure 1. *Left Panel:* GMRT contours at 610 MHz overlaid on 235 MHz grey scale image. *Right Panel:* Radio light curve of 2008 flare in PKS 2155−304 (Pandey−Pommier et al. 2014)

1. Summary

We present results from low frequency Giant Meterwave Radio Telescope (GMRT) monitoring of most distant blazar PKS 2155−304 (z = 0.117) (Chadwick et al. 1999) and confirm the presence of (> 350) kpc−scale jet structure, thanks to our deep images with high sensitivity and arcsec-scale resolution (rsee Fig. 1(*Left Panel*)). The diffuse radio emission of different scales (few 10s of kpc) were already detected in less deeper maps in the past in PKS 2155−304 at different locations (Beuchert et al. 2010; Liuzzo et al. 2013). Further, the spectral index analysis between 610 and 235 MHz GMRT data suggests that the emission in the radio lobe is steepest near the outer edge with $\alpha = -1.5$ and gets less steep near the center ($-1 < \alpha < 0$). The core region shows flatter spectral index with ($\alpha = -0.2$) in agreement with VLA observations. Detailed discussion on the jet energetics is being written up for publication (Pandey−Pommier et al. 2014).

The source is also known to exhibit significant variability, both on long-term (months) and short-term (days to hours) time scales from radio up to gamma-ray wavelengths. The radio monitoring observations were performed following the bright flare detected at gamma-rays with High Energy Spectroscopic System (H.E.S.S.) instrument (Aharonian et al. 2005). The radio light curve derived from our simultaneous data available at 0.61 GHz with the GMRT and at 1.4 and 2.7 GHz with Nancay Radio Telescope (NRT) (see Fig. 1 *Right Panel*) clearly suggests that the emission from diffuse jet structure dominates at lower frequencies and shows variability of the compact core component in agreement with that at higher frequencies. Thus radio monitoring on blazars along with multi wavelength data provides an important constraint on their Synchrotron Self Compton (SSC) emission models (Aharonian et al. 2009, Band and Grindlay 1985). Thanks to upcoming radio facilities with high sensitivity and resolutions like LOFAR (10−240 MHz) and SKA (70 MHz − 10 GHz), operating at low frequencies, it will be possible to detect many more such faint jet structures in blazars.

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