



## Searches for pulsars and transients at decameter wavelengths

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**Abstract.** Given the expected widening of the pulsar emission beams at low radio frequencies, searches at decameter wavelengths may particularly be advantageous for pulsars whose narrow (high radio frequency) beams miss the line-of-sight towards earth. This article briefly summarizes the results of searches for decameter wavelength counterparts of several *radio-quiet* gamma-ray pulsars carried out with the above view, and presents preliminary details of a serendipitous discovery of a nearby pulsar.

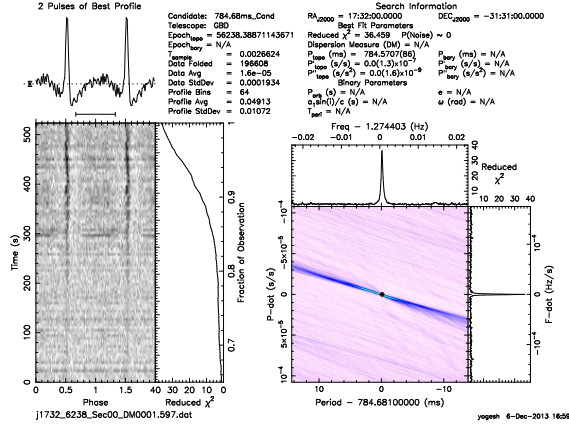
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### 1. Radio counterparts of LAT-discovered pulsars

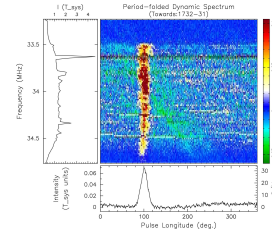
Searches for decameter-wavelength counterparts of several of the recently discovered gamma-ray pulsars (by the Large Area Telescope (LAT) onboard Fermi-satellite) were carried out using the data obtained from Gauribidanur radio telescope. These searches used the archival data and subsequent follow-up observations obtained from the same telescope, and resulted in (1) an intriguing detection of periodic as well as transient signal from the LAT-discovered pulsar J1732–3131 at a dispersion measure (DM) of  $15.44 \text{ pc cm}^{-3}$ , (2) a subsequent detection of average profile of J1732–3131 that is consistent with that from the original detection, but with a very low signal to noise ratio ( $\sim 4\sigma$ ), and (3) stringent upper limits (typically a few 10s of mJy, despite the bright sky background) on the decameter wavelength flux densities of several other target gamma-ray pulsars. While more details on these results can be found in Maan et al. (2012) and Maan & Aswathappa (2014), in the following section we provide preliminary details of a pulsar that was discovered serendipitously during the above searches.

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**Figure 1.** Diagnostic plots prepared using the pulsar search and analysis software PRESTO: “Left-side set of plots” shows the average profile at the top, an image-plot of intensity vs. time in the main panel, and accumulated  $\chi^2$  vs. time in the side-panel. “Right-side set of plots” shows reduced- $\chi^2$  as a function of  $P$  &  $\dot{P}$  in the main-panel (image plot), and horizontal and vertical cuts through the maximum in the image plot in the top and left panels, respectively.



**Figure 2.** The main panel shows the dedispersed dynamic spectrum folded over the candidate period, and the left and bottom panels show the average spectrum computed from off-pulse region and the average pulse profile, respectively.

## 2. Discovery of a nearby pulsar

A very low DM ( $1.6 \pm 0.1 \text{ pc cm}^{-3}$ , implying a distance of the order of 150 pc) pulsar was discovered (period  $\approx 785 \text{ ms}$ ) in one of the observing sessions towards the general direction of RA,Dec(J2000)=17:32:30,−31.5° (see Figure 1 & 2). Even within the session, signal is detectable only for about 5 minutes towards the end. No significant periodic signal was found in other 124 sessions in this direction. Scintillation parameters (Cordes & Lazio 2002) suggest the intensity variations to be intrinsic to the source (i.e., possibly an intermittent pulsar). Possibility of the pulsar being in a binary system also cannot be ruled out. There is large uncertainty in position (specially in declination, corresponding to  $\sim 35^\circ$  beam-width in declination) of the source.

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## References

- Cordes J. M., Lazio T. J. W., 2002, arXiv:astro-ph/0207156  
 Maan Y., Aswathappa H. A., Deshpande A. A., 2012, MNRAS, 425, 2  
 Maan Y., Aswathappa H. A., 2014, Submitted to MNRAS