Young Neutron Stars and Their Environments
IAU Symposium, Vol. 218, 2004
F. Camilo and B. M. Gaensler, eds.

MRT Observations of the MSP J0437–4715 at 150 MHz

Nalini H. Issur

University of Mauritius, Reduit, Mauritius

Avinash A. Deshpande

Raman Research Institute (on leave at NAIC, USA), *Bangalore, India*

Abstract. We report some results based on 150 MHz observations of the millisecond pulsar J0437–4715 carried out using the Mauritius Radio Telescope (MRT). For the single pulse properties we also consider 327 MHz data from the Ooty Radio Telescope.

1. MRT Observations

Observations were done at the Mauritius Radio Telescope mainly between 1996 Jul and Dec. We have used an incoherent dedispersion scheme to process the data from our "direct recording" system (Deshpande, Ramkumar & Chandrasekaran 1996; Issur 2002a). The pulsar data could be recorded for 4 or 8 minutes per transit. The average properties at 150 MHz are summarized in Table 1 (Issur 2002b). Comparison with higher frequency data indicates a possible low frequency turn-over. We attribute this to a frequency dependent pulsar-beam direction based on the "shifts" noted in the pulse peaks.

Table 1. Average properties of J0437–4715 at 150 MHz.

Peak flux density (highest peak)	2.5 ± 1.0 Jy
Average flux density	600 ± 100 mJy
Separation of main peaks	55 ± 5 deg
Rel. intensity of left peak w.r.t. "highest" peak	0.7 to ≈ 1
Pulse width at outer 50% level	120 ± 10 deg
Pulse width at outer 10% level	170 ± 10 deg
Estimated half-width of main ("core") component	≈ 35 deg

2. Scintillation Decorrelation Bandwidth at 150 MHz

Using software-spectrometer data over 256 spectral channels produced from 4 minutes of data, we estimate a scintillation decorrelation bandwidth of 500 ± 100 kHz at 150 MHz (Fig. 1), larger than what might be expected, considering either the pulsar distance or a $\nu^{4.4}$ scaling of the 436 MHz (Nicastro & Johnston 1995) and 660 MHz (Johnston, Nicastro & Koribalski 1998) values. Our value

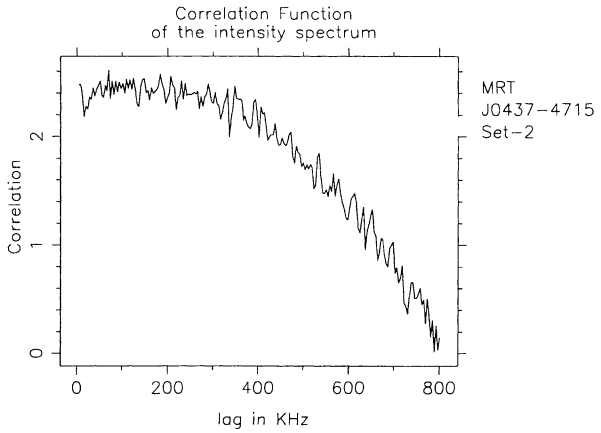

Figure 1. Autocorrelation of the spectral intensity variation.

is however consistent with the high decorrelation bandwidth found by Hirano, Gwinn & Boldyrev (2002) near 330 MHz.

3. Single-pulse Properties

Single-pulse analysis attempted on MRT data did not give conclusive results due to the poor signal-to-noise ratio. A similar analysis was tried on 327 MHz data from the Ooty Radio Telescope (Issur 2002b). The longitude-resolved fluctuation spectrum shows a somewhat longitude-dependent broad feature near $0.25c/P$ associated with the range $\approx -40°$ to $\approx -80°$. The distribution of intensities with longitude at 327 MHz appears compatible with the microstructure found by Ables et al. (1997). Rare "spikes" of emission occur mainly in the central peak and also in the conal region at earlier longitude. The "spikes" could have a common origin, considering the weak correlation we observe between the "core" beam and the conal region. The broad fluctuation feature is also related to this conal region where the modulation index shows a peak.

Acknowledgments. MRT is an Indo-Mauritian facility operated by the University of Mauritius and the Raman Research Institute, India.

References

Ables, J. G., McConnell, D., Deshpande, A. A., & Vivekanand, M. 1997, ApJ, 475, L33

Deshpande, A. A., Ramkumar, P. S., & Chandrasekaran, S. 1996, PPR manual

Hirano, C., Gwinn, C. R., & Boldyrev, S. 2002, preprint (astro-ph/0204367)

Issur, N. H. 2002a, Ap&SS, 282, 77

— 2002b, Ap&SS, 282, 69

Johnston, S., Nicastro, L., & Koribalski, B. 1998, MNRAS, 297, 108

Nicastro, L., & Johnston, S. 1995, MNRAS, 273, 122