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Unique Radio Pulsar Geminga

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Abstract. This pulsar has unique properties of radio emission, the most steep spectrum, the largest changes of pulse widths and phases and the presence of giant pulses.

We are continuing Geminga observations and present some new data. The measurements were performed with the Large Phased Array at 102 MHz and cross-type Radio Telescope at lower frequencies (Pushchino). The examples of mean profiles at 87, 59 and 39 MHz are shown at Fig.1. We present evidence of the frequency dispersion of Geminga integrated pulses at 40.7 MHz with $DM \approx 2.9\,\mathrm{pc} \cdot \mathrm{cm}^{-3}$ (Fig.1). All observations showed the temporal changes of the form, width and the pulse phase (Malofeev & Malov 1997, 2000 a, b). This phenomenon can be explained by the presence a few giant pulses during $\sim 0.1\%$ of observing time, when the flux density can be $10 - 20\,Jy$ (Fig.2).

Geminga showed the steepest spectrum not only among pulsars, but among all radio sources. The estimated spectral index is greater than 5. Spectrum has sharp low-frequency turnover with a maximum about 60 MHz. The data from the lowest frequencies is from Ul'yanov (private communication) at 25 MHz; Ramachandran et al. 1998 at 35 and 318 MHz; our measurements at 39, 59, 87 and 102 MHz; Xilouris (privat comm.) at 47 MHz; Lazio, Kassim, 2000 at 74 MHz; Kuzmin et al. 1997; Shitov et al. 1997, Vats et al. 1999 at 103 MHz; Burderi et al. 1999 at 317, 410 and 1400 MHz.

The absence of pulsar signal at few frequencies (47 and 74 MHz) can be explained by a short-time observations during a few hours, take into account the strong changes of Geminga's flux density from day to day (Malofeev & Malov 1997).

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References

Malofeev V.M., Malov O.I. 1997, Nature, 389, 697.

Malofeev V.M., Malov O.I. 2000a, Astron. Rep., in press.

Malofeev V.M., Malov O.I. 2000b, Pulsar Astronomy -2000 and Beyond. ASP Conference Series (M.Kramer, N.Wex and R.Wielebinski eds.), in press.

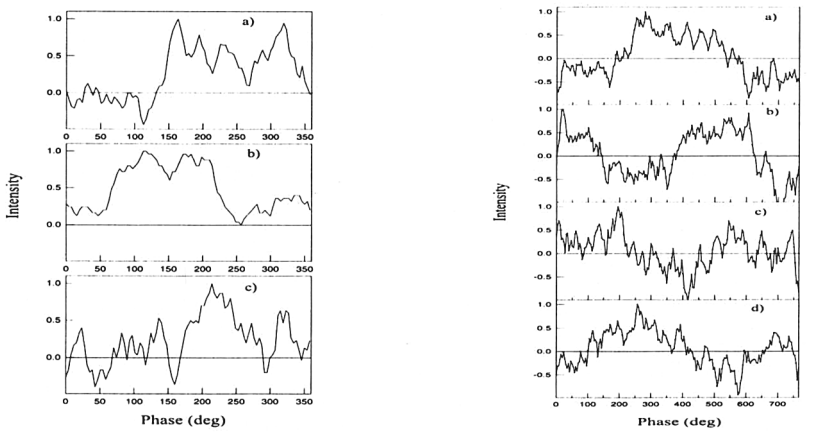

Figure 1. Left panel: Examples of mean pulse profiles at three frequencies: a) 87 MHz, 2744 individual pulses, 27.01.98; b) 58.7 MHz, 9472 pulses, 5 days; c) 39.05 MHz, 9920 pulses, 4 days. Right panel: Examples of mean pulse profiles dispersion at 40.977 - a); 40.817 - b); 40.657 - c) and 40.497 MHz - d). Sum of 318 individual pulses (21.08.97).

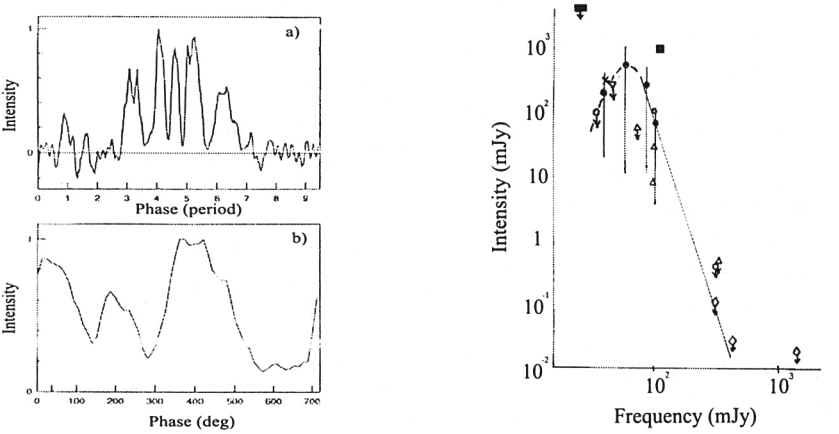

Figure 2. Left panel: Examples of group of very strong pulses at 87 MHz (12.05.98): a) 10 pulsar periods; b) 2 periods. Right panel: Compiled spectrum of Geminga.

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