Detection of giant pulses in the pulsar J1752+2359

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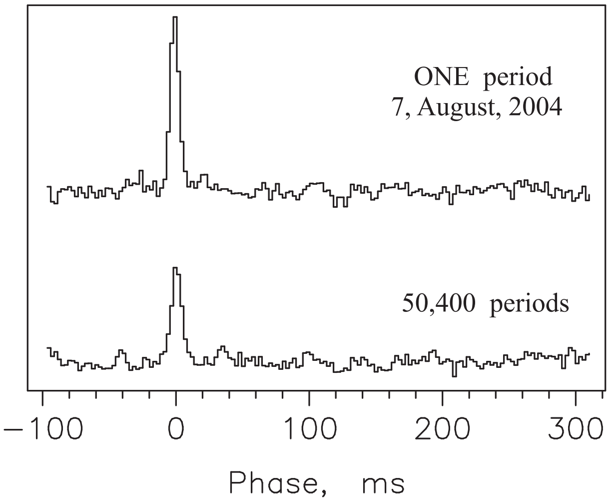

Figure 1: **(Top)** The strongest observed giant pulse. **(Bottom)** The average pulse profile containing 50 400 pulsar periods. The intensity of the profiles is shown in arbitrary units.

Giant pulses (GPs) are short duration burst-like increases of an intensity of individual pulses from pulsars. We report the detection of GPs from the pulsar PSR J1752+2359.

Observations were performed from December 24, 2003 to October 04, 2004 with the Large Phase Array (BSA) Radio Telescope at Pushchino Radio Astronomy Observatory at a frequency of 111 MHz. We used a 128-channel receiver with channel bandwidth 20 kHz. The duration of each observation session was about 3 min (420 pulsar periods). A total of 120 observations containing 50 400 pulsar periods were carried out in the mode of recording single pulses.

The 187 pulses (1 pulse for 270 observed periods) with $S/N \geq 5$ were selected and analyzed. About one pulse in 270 has peak flux density more than 40 times the peak flux density of an average pulse (AP), and the strongest GP was as large as 260 (see Fig. 1). The energy of the strongest GP exceeds the energy of the AP by a factor of 200 in which it differs from other pulsars with GPs. A pulse whose energy exceeded an energy of the AP by more than a factor of 100 is encountered approximately once in 3000 observed periods. Cumulative distribution is fit by a power-law with the index -3.0 ± 0.4.

The detection and first searches of GPs were performed in pulsars with extremely high magnetic field at the light cylinder, $B_{\rm LC} = 10^4 - 10^5$ G. The detection of GPs in the pulsars PSR B1112+50 [1], PSR B0031–07 [2, 3] and presently reported PSR J1752+2359 have revealed that GPs exist also in pulsars with ordinary magnetic field at the light cylinder, $B_{\rm LC} = 1 - 100$ G. These GPs may be associated with the inner gap emission region.

References

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