Probing the limits of the giant pulse population

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We have carried out the radio observations of three pulsars — B0031−07, B1112+50, and J1752+2359 — with the Robert C. Byrd Green Bank Radio Telescope at 350 MHz using the pulsar SPIGOT backend. These pulsars were reported to manifest giant pulses (GPs) [1, and references therein], the phenomena of extremely bright isolated bursts with unique properties known only for a handful of pulsars [see, e.g., 2, 3]. However, their parameters are very different from those of GP pulsars. They are long-period (0.4–1.6 s), middle-aged (10^5–10^7 yr) pulsars with very low values of magnetic field at the light cylinder (4–770 G) — the parameter supposed to be related with GP activity [4]. Thus, the question whether they are giant pulse emitters or not is crucial to ongoing efforts to constrain the elusive radio pulsar emission mechanism.

Preliminary study of single pulses from two pulsars, B0031−07 and B1112+50, revealed that they do not meet the criteria to be called giant pulses. Being broad (at least a few ms) and clustering preferentially to the center of the average profile, they resemble better the bright "spiky" emission from the pulsar B0656+14 [5]. Their pulse energy distributions do not follow the power-law as for GPs, but, rather, are exponential. We will present the results of our detailed analysis of single pulses, their energy distributions and microstructure. We will also discuss the possibility of strong subpulses being similar to giant micropulses from the Vela pulsar [6] and bursty emission seen in rotating radio transients [7].

References

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