Radio pulsar spin-down stability

J.O. Urama (1,2)

(1) Department of Physics & Astronomy, University of Nigeria, Nsukka; (2) Presently on leave at the Department of Industrial Physics, Ebonyi State University, Abakaliki

Pulsars are assumed to be born with a high rotational frequency and subsequently slow down according to a simple power law. The emitted radio pulses allow us to directly measure the rotation rate of the underlying star. Observations show that almost all pulsars exhibit measurable departures from the cubic law predicted for the slow down. This has been largely attributed to rotational irregularities - timing noise, glitches, and precession. Here, we present an analysis of the ‘most reliable’ spin-down parameters (rotational frequency and its first two derivates) for nearly 400 radio pulsars. The implications of the observed high degree of correlation between the measured frequency second-derivative and the slow-down rate are discussed. Based on this relationship we are able to quantify the stability of radio pulsars and neutron stars, in general.