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The unique white dwarf pulsar J1912-4410

Abstract

The recent discovery of J191213.72-441045.1 (J1912-4410 hereafter) as the second white dwarf pulsar has firmly established white dwarf pulsars in compact binary systems as a separate class of objects, supporting formation models of white dwarf pulsars and offering new insights into the evolution of magnetic cataclysmic variables. J1912-4410 harbours a rapidly rotating magnetic white dwarf with a spin period of 5.30 min in a 4.03-hr compact binary. The radio pulse profile of J1912-4410 is narrow and well-defined, similar to pulse profiles in neutron star pulsars, suggesting a favourable geometry whereby the white dwarf pulses can be seen directly. This is unique amongst the newly established population of white dwarf pulsars. We propose to observe J1912-4410 with MeerKAT in fast imaging mode (UHF band, 2-second time resolution) and fast timing mode (PTUSE) to study the nature of pulsed radio emission in white dwarf pulsars in unprecedented detail for the first time and to track the spin evolution of the source and determine the period derivative of this unique white dwarf pulsar.