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News and views regarding PSR J1757-1854, a highly-relativistic binary pulsar

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We provide an update on the ongoing monitoring and study of the highly-relativistic double neutron star binary system, PSR J1757-1854, a 21.5-ms pulsar in a highly eccentric, 4.4-hour orbit. The extreme nature of this pulsar's orbit allows it to probe a parameter space largely unexplored by other relativistic binary pulsars. For example, it displays one of the highest gravitational wave (GW) luminosities of any known binary pulsar, as well as the highest rate of orbital decay due to GW damping. PSR J1757-1854 is also notable in that it is an excellent candidate for exploring new tests of GR and other gravitational theories, with possible measurements of both Lense-Thirring precession and relativistic orbital deformation (through the Post-Keplerian parameter δ_θ) anticipated within the next 7-10 years.

Here we present the latest interim results from the ongoing monitoring of this pulsar as part of an international, multi-telescope campaign. This includes an update of the pulsar's long-term timing and Post-Keplerian parameters, new constraints on the pulsar's proper motion and corresponding Shklovski kinematic correction, and new limits on the pulsar's geodetic precession as determined by monitoring for secular changes in the pulse profile. We also highlight prospects for future work, including an updated timeline on new relativistic tests following the introduction of MeerKAT observations, as well as a brief discussion of the pulsar's potential detectability within the LISA band.

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