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Constraining the dense matter EOS and testing higher-order GR effects with the Double Pulsar

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Mass measurements of binary pulsars have provided significant constraints to the equation of state (EOS) of ultra-dense matter. The measurement of the moment of inertia (MOI) of a binary pulsar, however, would provide important additional constraints. The Double Pulsar, PSR J0737-3039A/B, is the most promising system for the first robust MOI measurement via high-precision pulsar timing. In this talk, I will summarise the current timing results, and present our predictions of the MOI measurement for PSR J0737-3039A by 2030 based on simulated data with the MeerKAT telescope and the upcoming SKA. Furthermore, I will discuss potential constraints on the Lense-Thirring precession and the next-to-leading order gravitational wave damping in the Double Pulsar, under the assumption that the EOS is sufficiently well known by 2030 from other observations, like LIGO/Virgo and NICER.

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