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THE YOUNG, RELATIVISTIC BINARY PULSAR J1906+0746

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PSR J1906+0746 is a young pulsar in the relativistic binary with the second-shortest known orbit, of 3.98 hours. We will present a timing study based on five years of observations, conducted with the 5 largest radio telescopes in the world, aimed at determining the companion nature (van Leeuwen et al. 2015). Through the measurement of three post-Keplerian orbital parameters we find the pulsar and companion masses to be $1.323(11)M_{\odot}$ and $1.290(11)M_{\odot}$ respectively. These masses are compatible with a neutron star companion, but also fit well in the known mass distribution of white dwarfs around young pulsars such as J1906+0746. Neither radio pulsations nor any dispersion-inducing outflows that could have established the companion nature were detected. We derive an HI-absorption distance, which indicates an optical confirmation of a white dwarf companion is very challenging. The pulsar is fading fast due to geodetic precession, limiting future timing improvements. We conclude that young pulsar J1906+0746 is either part of a binary neutron star, or is orbited by an older white dwarf, in an exotic system formed through two stages of mass transfer.

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