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Challenging the ultralight dark matter paradigm

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Pulsar Timing Array experiments probe the presence of possible scalar/pseudoscalar ultralight dark matter particles through decade-long timing of an ensemble of galactic millisecond radio pulsars. With the second data release of the European Pulsar Timing Array, we focus on the most robust scenario, in which dark matter interacts only gravitationally with ordinary baryonic matter. Our results show that ultralight particles with masses $10^{-24.0} \text{ eV} \lesssim m \lesssim 10^{-23.2} \text{ eV}$ cannot constitute 100% of the measured local dark matter density, but can have at most local density $\rho \lesssim 0.15 \text{ GeV/cm}^3$.

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