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How Binary-Pulsar Orbital Period Measurements Constrain Baryon Dark Decays

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There are numerous motives (e.g., the baryon asymmetry problem) for considering baryon number violation (BNV) in extensions to the Standard Model. Given our current stringent constraints on BNV from certain experiments (e.g., SuperK), it is natural to examine the consequences of BNV in extreme conditions that are not realized terrestrially. In this talk, I show how the particle physics of BNV within a neutron star can be constrained by baryon-loss limits inferred from anomalous binary-pulsar period lengthening. I then map these limits onto specific models with baryon decays to dark particles for cases in which the produced dark particles do not survive to influence the response of the star to BNV effects. I show how limits on in-vacuum baryon dark decays can be extracted employing the techniques of relativistic mean-field theory, which are appropriate for studying in-medium effects in the dense nuclear medium found at the core of a neutron star. I conclude by noting the implications of our results for models of dark-sector-enabled baryogenesis.

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