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Explaining the PTA signal and dark matter with a conformal dark sector

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Strong first-order phase transitions offer a compelling explanation for the stochastic gravitational wave background in the nano-Hertz range measured by pulsar timing arrays (PTA). In this talk, I will consider a classically conformal dark sector in which the breaking of a dark $U(1)$ gauge symmetry gives rise to a gravitational wave background that can fit the PTA data and additionally sources the mass of a stable fermionic sub-GeV dark matter candidate. The model is coupled to the Standard Model via a dark photon mediator which is tightly constrained by laboratory searches. I will discuss these accelerator constraints as well as cosmological constraints coming from the decay of dark Higgs bosons after the phase transition. Finally, I will present the results of a global fit and show that the model has viable parameter space where it fits the PTA data, reproduces the observed relic abundance and avoids all relevant constraints.

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