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Pseudo-goldstones as light Dark Matter and First Order Phase Transitions

Monday, 11 December 2023 15:05 (15 minutes)

We explore the possibility that light Dark Matter (DM) existence is related to first order phase transitions (FOPTs) in the early Universe. In particular, DM particles may be pseudo-Goldstone bosons of spontaneously broken global symmetries beyond the Standard Model. In this case, a new scalar field can interact with the Higgs boson and it can be related to a first order electroweak phase transition. We show the case of Majoron DM from a L or B-L global U(1) spontaneous symmetry breaking, generating a Majorana mass for neutrino. We will show FOPTs related to Majoron DM can generate a GW stochastic background signal that can be tested in future space-based interferometers such as LISA, TAIJI and Tianqing projects.

We discuss the complementarity of GW physics with colliders and neutrinoless double-beta-decays searches of Majorons.

We also mention the possibility of relating light DM to FOPTs below the electroweak energy scale as a possible explanation of NANOGrav 15yrs anomaly.

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