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QCD axion dark matter with Peccei-Quinn symmetry breaking by a light scalar field

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QCD axion can explain the strong CP problem and dark matter (DM) simultaneously. If the Peccei-Quinn (PQ) symmetry is spontaneously broken after inflation, string-wall network would dominate the energy density in the Universe. In this talk, we consider a mixing coupling of the PQ scalar with a light scalar field which induces an extra axion potential. When the PQ scalar is mixed nonlinearly, the axion oscillation around the extra potential triggers the formation of stable domain wall. However, the system collapses due to the QCD effect as a bias, resulting in a large amount of dark matter. In addition, by estimating the misalignment production modified by the extra potential, we clarify the total abundance of axion dark matter.

Primary author(s) : Dr SUZUKI, Motoo; NAKAGAWA, Shota (Tsung-Dao Lee Institute); Ms HAO, Yu Xuan; NAKAI, Yuichiro

Presenter(s) : NAKAGAWA, Shota (Tsung-Dao Lee Institute)

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