Contribution ID: **14**   Type: **Regular Talk (20' + 5')**

Phenomenology of pion dark matter in a θ-Vacuum

Wednesday 16 July 2025 17:35 (25 minutes)

We revisit a recently proposed framework in which dark matter (DM) consists of pions originating from a strongly interacting hidden sector analogous to QCD. A non-vanishing topological theta angle plays a central role by inducing resonant number-changing interactions that can account for the observed DM relic abundance and yield velocity-dependent DM self-interactions. We investigate the coupling between the dark and visible sectors via a massive dark photon. This connection is crucial for understanding the thermal equilibrium, DM stability, and constraints from indirect detection. Our findings confirm this framework is a consistent and predictive model for DM.

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Track Classification: Dark Matter