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Axion-Mediated Dark Matter

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We consider the axion-mediated scattering processes between dark matter (DM) and nucleus. The substantial contributions are made via the CP-odd gluonic current which induces the spin-dependent process. Since the QCD axion is too feebly coupled to the visible particles, non-QCD axions are necessary for the current DM experiments to accomplish the ample sensitivity. In the case of multi-component DM models, the inelastic scattering processes also make sizable contributions to the direct detection. The supersymmetry (SUSY) and clockwork (CW) mechanism provide a realistic model for the QCD and non-QCD axions and the axion-mediated DM scattering processes. In the SUSY CW axion model, the lightest axino is the DM particle and the axions mediate the elastic and inelastic scattering processes. We show that the current and future XENONnT can produce relevant constraints for some parameter space of the model.

Presenter: Prof. BAE, Kyu Jung (Kyungpook NU)

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