Contribution ID: **5** Type: **not specified**

Studying generalized dark matter interactionswith extended halo-independent methods

Monday, 12 December 2016 14:30 (25 minutes)

Abstract: The interpretation of dark matter direct detection experiments is complicated by the fact that neither the astrophysical distribution of dark matter nor the properties of its particle physics interactions with nuclei are known in detail. I will present a new framework that combines the full formalism of non-relativistic effective interactions with state-of-the-art halo-independent methods to deal with both of these issues in a very general way. This approach makes it possible to analyze direct detection experiments for arbitrary DM interactions independent of astrophysical uncertainties. I will demonstrate that the degeneracy between astrophysical uncertainties and particle physics unknowns is not complete and therefore future direct detection experiments will be able to infer at least some information on the coupling structure of dark matter without the need to make assumptions on its astrophysical distribution.

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Session Classification: Nature of Dark Matter