Contribution ID: **131**   Type: **not specified**

Scattering Amplitudes and Unitarity for Gravitationally Mediated Dark Matter in Extra Dimensions

Wednesday 8 June 2022 16:00 (15 minutes)

Interactions of Dark Matter with the Standard Model may be mediated through gravitons alone. While this coupling is Planck suppressed in 4 dimensions, in extra dimensional models the coupling can be large and dark matter can be wimp like. Calculating amplitudes for the annihilation of Dark Matter to a tower of massive spin-2 particles in such models is challenging. As a first step, we examine the behavior of amplitudes in a warped extra dimensional model, derive sum rules to show how the apparent bad high energy behavior is curbed and discuss implications for unitarity in such models.

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Session Classification: Parallel