



Contribution ID: 309

Type: **Talk**

Multimessenger searches for WIMPs with suppressed interactions

Tuesday, 8 December 2015 14:42 (21 minutes)

WIMPs with suppressed interactions can present observational challenges at lowest order. We study Majorana DM interacting via an axial-vector Z' , where both the self-annihilation rate and WIMP-nucleon scattering rate are suppressed. By including loop diagrams in the calculation of the self-annihilation rate, we find that the self-annihilation rate is notably enhanced relative to the tree-level rate, and that the branching ratios to gauge-boson final states become non-negligible. We show that the former leads to enhanced constraints on the gamma-ray flux from Fermi and HESS, and the latter leads to stronger constraints on the spin-dependent WIMP-nucleon scattering rate derived from IceCube observations of the neutrino flux from the Sun.

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Session Classification: 05 - Dark matter