Contribution ID: **186** Type: **not specified**

Freezing In with Lepton Flavored Fermions

Thursday, 26 August 2021 14:30 (20 minutes)

Dark, chiral fermions carrying lepton flavor quantum numbers are natural candidates for freeze-in. Small couplings with the Standard Model fermions of the order of lepton Yukawas are 'automatic'in the limit of Minimal Flavor Violation. In the absence of total lepton number violating interactions, particles with certain representations under the flavor group remain absolutely stable. For masses in the GeV-TeV range, the simplest model with three flavors, leads to signals at future direct detection experiments like DARWIN. Interestingly, freeze-in with a smaller flavor group such as SU (2) is already being probed by XENON1T.

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Session Classification: Dark Matter and Astroparticle Physics

Track Classification: Dark Matter and Astroparticle Physics