Contribution ID: **198** Type: **not specified**

Secondary Tau Neutrino Probes of Heavy Dark Matter Decays

Tuesday 10 May 2022 16:30 (15 minutes)

Dark matter particles can be gravitationally trapped by celestial bodies, motivating searches for localized annihilation or decay. We compute the secondary tau neutrino spectrum at the surface from decays within the Earth and examine the reach of the IceCube high-energy starting event (HESE) sample in the dark matter model parameter space, using numerical simulations along with updated modelling of dark matter capture and thermalization. We find that the parameter space probed by IceCube searches would require dark matter cross-sections in tension with existing direct-detection bounds.

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Session Classification: DM VI