Contribution ID: **347** Type: **not specified**

Probing Dark Matter Energy Injection in the Cosmic Dawn with the 21-cm Power Spectrum

Thursday 16 May 2024 16:00 (15 minutes)

The 21-cm signal provides a novel avenue to measure the thermal state of the universe during cosmic dawn and reionization, and thus a probe of exotic energy injection such as those from decaying or annihilating dark matter (DM). These DM processes are inherently inhomogeneous: both decay and annihilation are density dependent, and furthermore the fraction of injected energy that is deposited at each point depends on the gas ionization and density, leading to further inhomogeneities in absorption and propagation.

In this talk, I will present a new framework for modeling the impact of spatially inhomogeneous energy injection and deposition, accounting for ionization and baryon density dependence, as well as the attenuation of propagating photons. Our simulation code, DM21cm, is the first complete inhomogeneous treatment of the effects on the 21-cm power spectrum under exotic energy injection. With our pipeline, I will present the sensitivity forecast of the upcoming HERA 21-cm power spectrum measurements to DM decays to photons and electron/positron pairs.

Mini Symposia (Invited Talks Only)

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Session Classification: Astro-particle Physics

Track Classification: Astro-particle Physics