Testing dark matter interactions with CMB spectral distortions

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Possible interactions of dark matter (DM) with Standard Model (SM) particles can be tested with spectral distortions of the cosmic microwave background (CMB). In particular, a non-relativistic DM particle that scatters elastically with photons, electrons or nuclei imprints a negative chemical potential $\mu$ to the CMB spectrum, as I will explain in this talk. I will show how this effect can be used to derive upper bounds to the DM-SM elastic-scattering cross section for DM masses $m_{\chi} \lesssim 0.1$ MeV, from the non-detection of $\mu$-distortions by FIRAS, and forecast the sensitivity of future spectral distortion measurements. As a specific example, I will discuss the sensitivity of spectral distortions to the electric and magnetic dipole moments of DM.

Primary author: ALI-HAIMOUD, Yacine (New York University)
Presenter: ALI-HAIMOUD, Yacine (New York University)
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