

Cosmological Measurements of Light but Massive Relics

Cosmological data provide a powerful tool in the search for physics beyond the Standard Model (SM). An interesting target are light relics, new degrees of freedom which decoupled from the Standard Model while relativistic. Nearly massless relics contribute to the radiation energy budget, and are commonly searched through variations in the effective number N_{eff} of neutrino species. Additionally, relics with masses on the eV scale (meV-10 eV) become non-relativistic before today, and thus behave as matter instead of radiation. This leaves an imprint in the clustering of the large-scale structure of the universe, as light relics have important streaming motions, mirroring the case of massive neutrinos. Here we forecast how well current and upcoming cosmological surveys can probe light massive relics (LiMRs). We consider minimal extensions to the SM by both fermionic and bosonic relic degrees of freedom. By combining current and upcoming cosmic-microwave-background and large-scale-structure surveys, we forecast the significance at which each LiMR, with different masses and temperatures, can be detected.

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