

Probing Light Dark Matter with Cosmic Gravitational Focusing

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We investigate the possibility of using the cosmic gravitational focusing (CGF) to probe the minor light dark matter (DM) component whose mass is in the range of $(0.1 \sim 100) \text{ eV}$. Being a purely gravitational effect, the CGF offers a mode-independent probe that is complementary to the existing ways such as Lyman- α and ΔN_{eff} . Such effect finally leads to a dipole density distribution that would affect the galaxy formation and hence can be reconstructed with galaxy surveys such as DESI. Both the free-streaming and clustering limits have been studied with analytical formulas while the region in between is bridged with interpolation. We show the projected sensitivity at DESI with the typical phase space distribution of a freeze-in DM scenario as illustration.

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