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Probing neutrino self-interactions with JWST data

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James Webb Space Telescope (JWST) has revealed a surprisingly high number of UV-bright galax- ies at $z \geq 10$. The UV luminosity function at these high redshifts is an excellent probe for studying structure formation on small scales and at high redshifts. Neutrino self-interaction, mediated by a new beyond the Standard Model particle is a well motivated model, that has been tested by a vari- ety of laboratory, astrophysical, and cosmological probes. These interactions suppress the matter power spectrum at small scales through collisional damping and free streaming. We aim to use these JWST observations of high-redshift galaxies as a new probe of neutrino self-interactions. Changes in the power spectrum aided by neutrino self-interactions will influence the halo mass function, which characterizes the distribution of dark matter halo masses. We will probe the un- derlying particle physics parameter and test the viability of this model. Our work highlights the potential of JWST as a powerful tool for providing insights into cosmic structures and offering a pathway to novel discoveries in the Beyond Standard Model sector.

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