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# Galaxies in the Epoch of Reionization in Alternative Dark Matter – Insights from the Thesan Simulations

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Many theories of dark matter predict suppression on the linear matter power spectrum at small scales ($k >\sim 10\,\mathrm{h/Mpc}$). The suppression can lower the abundance of low-mass haloes (galaxies) at high redshift ($z > 6$) and significantly alter the assembly histories of galaxies in the Epoch of Reionization (EoR). In this work, we use variants of the recently published Thesan simulations to explore the impact of warm dark matter (WDM), fuzzy dark matter (FDM), and models featuring dark acoustic oscillations (DAO) on the properties of early galaxies. The Thesan simulations incorporate an on-the-fly radiative transfer solver for ionizing photons and a non-equilibrium hydrogen/helium chemistry solver, on top of the well-tested IllustrisTNG galaxy formation model. We studied halo (stellar) mass function, UV luminosity function, scaling relations (e.g. the mass-metallicity relation), star formation & metal enrichment histories of galaxies. We found distinct signatures of alternative dark matter, which can propagate to galaxies more massive than the cut-off scale in halo mass function. We also found a non-trivial interplay between model assumptions for reionization and alternative dark matter physics.

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