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HOD study of emission line galaxies (ELGs) in the Dark Energy Spectroscopic Instrument (DESI) data

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We present the study of the dark matter (DM) halo-galaxy connection of the emission line galaxies (ELGs) in the Dark Energy Spectroscopic Instrument (DESI) survey. We use Halo Occupation Distribution (HOD) models to reproduce the clustering of the DESI survey validation (SV) data. We first present the results of fits to the projected correlation function (wp), and then improvements brought by adding the two-point correlation function monopole and quadrupole to the fit. The projected correlation function has the advantage not to be sensitive to velocities while the monopole and quadrupole are. We add new parameters to the HOD models to take into account the modeling of velocity dispersion when fitting multipoles. Our baseline HOD model, based on previous HOD studies for ELGs, is the Gaussian HOD (GHOD) model which uses a Gaussian function to populate halos with central galaxies and a power law for satellites. We model the NFW (and particle) profiles for satellite positions and study how the concentration definition impacts the modeling of the small scale clustering. We explore other HOD models for central galaxies, such as an asymmetric Gaussian function. For the different models, we give best-fit results for the halo mass functions (HMF), the average mass of the galaxy sample, the satellite fraction, but also the rate between 1 and 2-halo terms. To perform our study, we used the AbacusSummit simulation suite designed for the DESI survey. We use a new and promising HOD fitting method, based on Gaussian processes. This method takes into account the stochasticity of HOD models and allows us to perfom HOD fitting in a reasonable time. The data presented here will be part of the Year 1 (Y1) data release of the DESI collaboration.

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