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Constraining neutrino masses with weak lensing peak counts for surveys like Euclid

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Massive neutrinos deeply affect the background evolution of the Universe as well as the evolution of cosmological perturbations and structures formation. Modified gravity models that include massive neutrinos can present a degeneracy with ΛCDM model. Hence, being able to constrain the value of the sum of neutrino masses constitutes one among the key science goals of nowadays cosmology. Weak gravitational lensing by the large-scale structure encodes the evolution of structure growth under the influence of massive neutrinos, representing a promising tool to explore these effects and extract the corresponding cosmological information. Future galaxy surveys as Euclid will use weak lensing as a cosmological probe to test different models and to improve our current knowledge on cosmological parameters. We use the weak lensing convergence maps from the public MassiveNus simulations suite to perform bayesian inference on cosmological parameters for a survey with Euclid-like noise, specifically deriving constraints on the sum of neutrino masses M_ν, the present matter-component density Ω_m and the primordial power spectrum normalization, A_s. We use the power spectrum as second order statistics and the peak counts as higher-order statistics to better appreciate the non gaussian information encoded at small-scales, where neutrinos have the strongest impact. We perform MCMC analysis, combining the two summary statistics and computing the predictions with Gaussian Processes interpolation. We explore the impact on the constraints of different filters techniques to smooth the noise in both single redshift and tomographic configurations for the statistics alone and combined.

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