

Hot dark matter in N-body simulations

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We generalise the SuperEasy linear response method, originally developed to describe massive neutrinos in cosmological N-body simulations, to any hot dark matter (HDM) species with arbitrary momentum distributions. The method, implemented in a Particle-Mesh simulation code, is able to predict the total matter spectrum to sub-percent level accuracy relative to particle HDM (neutrino) simulations. Applying the method to cosmologies with mixed neutrinos+thermal QCD axions and neutrinos+generic thermal bosons, we find that non-standard HDM cosmologies have no intrinsically different non-linear signature in the total matter power spectrum from standard neutrino cosmologies. However, because they predict different time dependencies even at the linear level and the differences are augmented by non-linear evolution, it remains a possibility that observations at multiple redshifts may help distinguish between them.

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Session Classification: Dark Matter