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# Reconstruction of cosmic neutrino background anisotropies from the distribution of galaxies

*Friday, 21 June 2024 17:30 (2 hours)*

The Cosmic Neutrino Background (CNB) encodes a wealth of information, but has not yet been observed directly. To determine the prospects of detection and to study its information content, we reconstruct the phase-space distribution of local relic neutrinos from the three-dimensional distribution of matter within 200 Mpc/h of the Milky Way. Our analysis relies on constrained realization cosmological simulations and forward modelling of the 2M++ galaxy catalogue. We find that the angular distribution of neutrinos is anti-correlated with the projected matter density, due to the capture and deflection of neutrinos by massive structures along the line of sight. Of relevance to tritium capture experiments, we find that the gravitational clustering effect of the large-scale structure on the local number density of neutrinos is more important than that of the Milky Way for neutrino masses less than 0.1 eV. Nevertheless, we predict that the density of relic neutrinos is close to the cosmic average, with a suppression or enhancement over the mean of (-0.3%, +7%, +27%) for masses of (0.01, 0.05, 0.1) eV. This implies no more than a marginal increase in the event rate for tritium capture experiments like PTOLEMY. We also predict that the CNB and CMB rest frames coincide for 0.01 eV neutrinos, but that neutrino velocities are significantly perturbed for masses larger than 0.05 eV. Regardless of mass, we find that the angle between the neutrino dipole and the ecliptic plane is small, implying a near-maximal annual modulation in the bulk velocity.

## Poster prize

Yes


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