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Primordial Black Hole formation from power spectrum with finite width

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Primordial black holes (PBHs) can form from gravitational collapse of large over-
densities in the early Universe, giving rise to rich phenomena in astrophysics and cosmology. We develop a novel, general, and systematic method based on theory of density contrast peaks to calculate the abundance of PBHs for a broad power spectrum of curvature perturbations with Gaussian statistics. We introduce a window function to account for the relevant perturbation scales associated with PBHs of different masses, along with a filter function that removes unphysical contributions from super-horizon-scale overdensities. While some uncertainties remain due to the limited understanding of the nonlinear collapse process, our approach substantially reduces the discrepancy previously observed between peaks theory and the Press–Schechter formalism.

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Session Classification: Contributed talks