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The Initial Spin Probability Distribution of Primordial Black Holes

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We present the computation of the spin of primordial black holes produced by the collapse of large inhomogeneities in the early universe. Since such primordial black holes originate from overdensity peaks, we resort to peak theory to obtain the probability distribution of the spin at formation. We show that the spin is a first-order effect in perturbation theory: it results from the action of first-order tidal gravitational fields generating first-order torques upon horizon-crossing, and from the asphericity of the collapsing object. The typical value of the dimensionless Kerr parameter takes values which are at the percent level. This is a clear prediction of the primordial formation scenario which can be compared with the astrophysical one in explaining the observation of the effective spin of binary mergers observed with gravitational waves at LIGO.

Primary author: DE LUCA, Valerio (Universite de Geneve (CH))

Presenter: DE LUCA, Valerio (Universite de Geneve (CH))

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