

Testing Primordial Black Holes Dark Matter with Galaxy Catalogs cross-correlations

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Some of the gravitational-wave (GW) events detected by LIGO-Virgo might be black holes of primordial origin. However, unveiling the origin of these events is challenging, notably if no multi-wavelength counterpart is detected.

One important diagnostic tool is the coalescing binary distribution with respect to the large scale structures (LSS) of the universe, which we quantify via the cross-correlation of galaxy catalogs with GW ones. We test the discrimination power of this tool by using both existing and forthcoming galaxy catalogs and using realistic Monte Carlo simulations of GW events. We find that, provided enough observation time, already the current generation of GW detectors has the sensitivity to discriminate between primordial and astrophysical black holes.

The third generation GW detectors such as the Einstein Telescope or the Cosmic Explorer will then allow one to perform precision studies of the coalescing black hole LSS distribution and attain rather advanced model discrimination capabilities.

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