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Ruling out QCD phase transition as a PBH origin of LIGO/Virgo events

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The best-motivated scenario for a sizable primordial black hole (PBH) contribution to the LIGO/Virgo binary black hole mergers invokes the QCD phase transition, which naturally enhances the probability to form PBH around the stellar mass scale. We reconsider the expected mass function associated not only to the QCD phase transition proper, but also the following particle antiparticle annihilation processes, and analyse the constraints on this scenario from a number of observations: The specific pattern in CMB anisotropies induced by accretion onto PBHs, CMB spectral distortions, gravitational wave searches, and direct counts of super-massive black holes at high redshift. We find that the scenario is not viable, unless an ad hoc mass evolution for the PBH mass function and a cutoff in power-spectrum very close to the QCD scale are introduced by hand. The required fine-tunings thus severely question the ‘naturalness’ appeal of this scenario.

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