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Revisiting the merger rate of primordial black holes

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The merger rate of binary black holes inferred by the LIGO-Virgo-KAGRA (LVK) collaboration is potentially compatible with primordial black holes (PBHs). Reexamining the latest merger rate calculations for Poisson-distributed PBHs, we find that they did not fully implement the binary formation conditions required for PBH pairs to decouple from the Hubble flow. Once these conditions are properly taken into account, the predicted merger rate becomes comparable to, or even inconsistent with, current observational constraints from the cosmic microwave background (CMB). Motivated by this, we revisit the binary formation criteria in a more realistic framework and extend the calculation to scenarios with primordial clustering. With these improvements, we show that PBHs can still account for the LVK merger rate.

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