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Supermassive primordial black holes for nano-Hertz gravitational waves

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We investigate the formation of primordial black holes (PBHs) during the inflation by nucleation of supercritical bubbles in a multiverse scenario. We find that when the inflaton slowly passes by a neighboring vacuum, the nucleating rate of supercritical bubbles would inevitably attain a peak, so the mass distribution of multiverse PBHs, and the mass of peak can be up to $10^{18} M_{\odot}$. We also present a mechanism for the origin of initial clustering of such supermassive PBHs (SMPBHs), which can significantly magnify the merger rate of SMPBH binaries, and show the possibility that the merging of such SMPBH binaries explains recent NANOGrav signal.

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