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Cogenesis of baryon and dark matter from ultra-light PBH

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We discuss the possibility of producing the observed baryon asymmetry of the Universe (BAU) and dark matter (DM) from evaporating primordial black holes (PBH) incorporating semi-classical regime and memory burden regime. In the simplest scenario of baryogenesis via vanilla leptogenesis with hierarchical right handed neutrino (RHN), it is possible to generate the observed BAU with PBH being sole contributor to the production of RHN. While it is not possible to achieve cogenesis in this minimal setup due to structure formation constraints on relic allowed DM parameter space, we show the viability of successful cogenesis in the resonant leptogenesis regime. We also show that successful cogenesis can be achieved in a simple baryogenesis model without taking the leptogenesis route. Due to the possibility of generating asymmetry even below the sphaleron decoupling era, the direct baryogenesis route opens up new parameter space of memory-burdened PBH. The two scenarios of successful cogenesis can also be distinguished by observations of stochastic gravitational waves produced from PBH density fluctuations.

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