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Asymmetric Reheating by Primordial Black Holes[1] BARMAK SHAMS ES HAGHI, PEARL SANDICK, University of Utah, KUVER SINHA, University of Oklahoma — We investigate Hawking evaporation of a population of primordial black holes (PBHs) prior to Big Bang Nucleosynthesis (BBN) as a mechanism to achieve asymmetric reheating of two sectors coupled solely by gravity. While the visible sector is reheated by the inflaton or a modulus, the dark sector is reheated by PBHs. Compared to inflationary or modular reheating of both sectors, there are two advantages: (*i*) inflaton or moduli mediated operators that can subsequently thermalize the dark sector with the visible sector are not relevant to the asymmetric reheating process; (*ii*) the mass and abundance of the PBHs provide parametric control of the thermal history of the dark sector, and in particular the ratio of the temperatures of the two sectors. Asymmetric reheating with PBHs turns out to have a particularly rich dark sector phenomenology, which we explore using a single self-interacting real scalar field in the dark sector as a template. Four thermal histories, involving non-relativistic and relativistic dark matter (DM) at chemical equilibrium, followed by the presence or absence of cannibalism, are explored. These histories are then constrained by the observed relic abundance in the current Universe and the Bullet Cluster.

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