BARYOGENESIS IN THE EARLY MATTER DOMINATED EPOCH

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While thermal dark matter is created in the early Universe, non-thermal dark matter can be generated through Hawking radiation from primordial black hole (PBH). If the re-annihilation process of the non-thermal dark matter violates B-number and CP-symmetry, successful baryogenesis can be obtained in the early Universe. Consequently, this model can explain both the correct relic density of dark matter and the observed relic density of baryon asymmetry in the Universe by employing an ultra-light mass for PBH and a larger total annihilation cross section for TeV dark matter. This corresponding large annihilation cross section of dark matter would open the opportunity to search for them and to test this model in the indirect detection of dark matter.

Keywords: non-thermal dark matter, baryogenesis, primordial black hole, early universe.

1. Introduction. In the Standard Model (SM), no particle can serve as a candidate for dark matter (DM), which is observed through gravitational effects. Specifically, it comprises approximately 27% of the current Universe's energy density, as indicated by observations such as $\Omega_{\rm DM}h^2 = 0.120 \pm 0.001$ at 68% Confidence Level [1]. Dark matter could be generated thermally in the early Universe and its observed relic density could be determined by thermal freezeout process. One of the leading candidates of thermal dark matter is a weakly interaction massive particle (WIMP), which is massive, stable, and neutral, interacting with the SM particles weakly...

Поступила в редакцию 7 мая 2024 г.
После доработки 2 сентября 2024 г.
Принята к публикации 4 сентября 2024 г.

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