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Abstract

Multimessenger Probes for New Physics in the Light of A. Sakharov's Legacy in Cosmoparticle Physics †

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Abstract: The modern, standard cosmological scenario, which reflects, to a large extent, the development of A. D. Sakharov's legacy in cosmoparticle physics, involves inflation, baryosynthesis and dark matter/energy. The physics of all these elements of the cosmological paradigm lays beyond the standard model (BSM) of elementary particles and involves, in its turn, cosmological probes for its study. To specify this physics, the idea of multimessenger probes of new physics is proposed, involving the set of additional model-dependent consequences of physical models for inflation, baryosynthesis and dark matter. After brief review of the cosmophenomenology of new physics, we concentrate on probes for mechanisms of baryosynthesis—first proposed by A. D. Sakharov—which are of special interest in this context. Antimatter domains formed in the early universe can reflect possible strong nonhomogeneity of baryosynthesis. In the homogeneous and isotropic universe, such nonhomogeneity is determined by specific model-dependent choices of mechanisms of inflation and baryosynthesis. These mechanisms provide tests for the physics, underlying modern cosmology. Constraints on macroscopic antimatter objects or cosmic fluxes of antinuclei provide probes for the corresponding models. Positive evidence for macroscopic antimatter existence leads beyond the standard paradigm of the cosmological scenario and specifies with high precision the parameters of BSM physics.

Keywords: cosmoparticle physics; inflation; baryosynthesis; antibaryon excess; BSM physics

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