

Cosmology of Axion Rotation

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We will introduce new cosmological dynamics of the QCD axion, where the axion field rotates in field space. Axion dark matter may be produced from the kinetic energy of the rotation and the required axion decay constant is much below the prediction of the conventional evolutions. The angular momentum of the rotation is transferred into baryon asymmetry through baryon number violating interactions. We discuss the electroweak sphaleron process, Majorana neutrino mass, and R-parity violation and predictions on the parameters of each theory. In some of the parameter space the rotation dominates the energy density of the universe. The resultant kination-dominated era modifies primordial gravitational wave spectra.

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