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The production of Axion-like particles via primordial magnetic fields

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Primordial magnetic fields (PMFs) can be an important ingredient in the early and even the present Universe, which might explain the present magnetic fields in the galaxies and intergalactic magnetic fields suggested by blazar observations. We discuss the production of axion-like particles (ALPs) through the photon-axion conversion through the PMFs. We identify the conditions in which the ALPs produced by this mechanism are responsible for the dark matter of the Universe. ALP dark matter by this mechanism does not suffer from large isocurvature perturbations unlike the misalignment mechanism. Since it has relatively long free streaming length, it might solve the core-cusp problem or the missing satellite problem. We also identify the parameter spaces that are ruled out by the warm/hot dark matter constraint.

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