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(Withdrawn) QCD Axion Dark Matter with f_a as Low as 10^8 GeV

The QCD axion elegantly solves the longstanding strong CP problem and is well motivated dark matter candidate. To reproduce the observed dark matter abundance with axions, the decay constant f_a is considered to be around 10^{12} GeV for the misalignment mechanism. On one hand, the late-time entropy production is known to allow larger f_a . On the other hand, the decay of the axion domain walls and strings can generate axion dark matter with f_a around 10^{11} GeV. We propose a new mechanism for QCD axion dark matter with f_a as low as 10^8 GeV, where the axion abundance is produced from parametric resonance of the oscillating Peccei-Quinn symmetry breaking field. Several experimental efforts are currently devoted to axion searches in this range of f_a . Other potential signatures include dark radiation and warmness of dark matter. We realize this framework within various particle physics models, demonstrating complete and viable cosmologies.

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