

Multimodal axion emissions from Abelian-Higgs cosmic strings

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We show that axions can be produced from Abelian-Higgs cosmic strings due to the axion-gauge coupling. The strong magnetic field is confined in the string, and the electric field is induced around the moving string, allowing axion productions from the dynamics of cosmic strings. Our simulation on the string network shows multimodal axion emissions in the sense that axions are produced in both the low-energy and high-energy regimes. The former can contribute to the cold dark matter and the latter can be regarded as dark radiation. We found that the axion with sub-GeV mass can explain the current relic dark matter abundance and simultaneously predicts a sizable amount of dark radiation which can be probed by future observations.

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