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Electroweak axion string and superconductivity

Monday, 5 July 2021 18:00 (20 minutes)

We study the axion strings with the electroweak gauge flux in the DFSZ axion model and show that these strings, called the electroweak axion strings, can exhibit superconductivity without fermionic zero modes. We construct three types of electroweak axion string solutions. Among them, the string with W-flux can be lightest in some parameter space, which leads to a stable superconducting cosmic string. We also show that a large electric current can flow along the string due to the Peccei-Quinn scale much higher than the electroweak scale. This large current induces a net attractive force between the axion strings with the same topological charge, which opens a novel possibility that the axion strings form Y-junctions in the early universe.

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