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Searching for axion-like dark matter with precision NMR: the Cosmic Axion Spin Precession Experiments

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The dark matter puzzle is one of the most important open problems in modern physics. The axion is a compelling dark matter candidate, since it resolves the strong-CP problem of quantum chromodynamics. I will focus on the Cosmic Axion Spin Precession Experiments (CASPEr-electric, CASPEr-gradient) that use nuclear magnetic resonance to search for the EDM and the gradient interactions of axion-like dark matter. Recent prototype CASPEr experiments have achieved design sensitivity in the nano-electronvolt mass range. We are now developing the next-generation searches, with the goal of achieving, and possibly circumventing, the quantum limits on their sensitivity. Our objective is to develop the experimental search that is sensitive to the QCD axion dark matter over a broad range of masses.

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