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Novel designs and schemes for high-mass axion haloscopes

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The axion is a hypothetical particle resulting from the PQ mechanism that resolves the strong CP problem, and is one of the strong candidates for dark matter. The cavity haloscope is a highly sensitive method for detecting dark matter axions. The Center for Axion and Precision Physics Research of the Institute for Basic Science (IBS-CAPP) has recently developed various detector designs suitable for high-mass dark matter axion searches, such as multiple-cell cavities, wheel tuning mechanism, and photonic crystal cavities. In addition, we have developed a new detection scheme based on heterodyne interferometry that amplifies and detects the variance of weak signals with known coherence. This presentation reviews the newly developed detector designs and introduces the proposed variance detection method. We also discuss CAPP's plans for high-mass axion searches using these detectors.

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