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Advancements in Axion Research at IBS-CAPP

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IBS-CAPP has established a state-of-the-art axion detector facility in Korea, equipped with multiple dilution refrigerator systems. Currently, four axion detectors operate simultaneously on low-vibration pads. The flagship experiment, CAPP-MAX, utilizes a 12 Tesla Nb3Sn superconducting magnet with a 32 cm bore and a 36-liter ultra-light cavity, enhanced by quantum noise-limited amplifiers. This setup enables the acquisition of axion dark matter physics data at a rate exceeding 1 MHz per day across the 1 GHz axion frequency range, achieving sensitivity comparable to DFSZ levels. This achievement highlights CAPP's commitment to pioneering technologies and innovative R&D in axion dark matter search experiments. Significant efforts have concentrated on developing quantum noise-limited amplifiers and high-temperature superconducting cavities capable of sustaining Q-factors exceeding 10 million, even at 8 Tesla. Currently, we are collecting axion dark matter physics data using quantum amplifiers across frequencies ranging from 1 to 2 GHz. Installation of a superconducting cavity with a Q-factor exceeding 1 million is scheduled for this summer. In my presentation, I will provide an overview of CAPP's ongoing axion research initiatives, R&D endeavors, and future directions.

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