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Experimental Efforts to Search for Dark Matter Axions at Stockholm University

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The axion is a hypothetical particle emerging from the Peccei-Quinn mechanism, which was proposed to solve the strong CP problem in quantum chromodynamics. With a mass below the electron-volt range, axions interact feebly with Standard Model particles, making them a strong candidate for dark matter. One of the most sensitive methods for dark matter axion detection is the cavity haloscope. This approach utilizes a microwave cavity in a strong magnetic field, where axions can convert into photons when the cavity's resonant frequency matches the axion mass. At Stockholm University, we are part of the ALPHA collaboration, working to develop a tunable wire metamaterial cavity to enhance sensitivity to high-mass axions. This talk will present our plans to design a cavity tuning system and build a weak microwave photon detection system.

Summary

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