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Calibration of an open dielectric haloscope

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The \textbf{Ma}gnetized \textbf{D}isk and \textbf{M}irror \textbf{A}xion e\textbf{X}periment is a dielectric haloscope that aims to search for axionic dark matter. It utilizes a stack of movable dielectric disks, called a booster, to enhance the weak axion signal. The unique design enables a highly tunable resonator at frequencies inaccessible to traditional cavity haloscopes. However, the added complexity and open boundary conditions pose challenges for full 3D simulations. To gain a better understanding of the setup and identify relevant systematic effects, conducting 3D measurements of the electromagnetic field inside the booster proves to be a promising approach. Furthermore, reciprocity shows that measuring an electromagnetic test field, such as the one excited by a reflection measurement, enables direct calculation of the sensitivity to the axion signal.

In this talk, I will present measurements on the electromagnetic field of a small dielectric booster using non-resonant perturbation theory, commonly known as the bead pull method. This approach provides new insights into the electromagnetic properties of a dielectric haloscope and paves the way for a model-independent signal power calibration.

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