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Simulation study on optimization of cavity design for axion search experiments using COMSOL multiphysics

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A conventional axion search experiment utilizes microwave resonant cavities, where axions are converted into photons under a strong magnetic field. Optimal cavity dimension is important to enhance signal power from the axion-to-photon coupling, to broaden the scan range, to minimize mode crossings, etc. An extensive study has been performed to optimize the dimensions of cylindrical cavities and frequency tuning systems using the COMSOL multiphysics simulation software. We introduce a figure of merit for this purpose, and present the results from the simulation study.

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