Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Progress towards a Hybrid Superconducting Microwave Cavity for Axion Searches[1] GIANPAOLO CAROSI, Lawrence Livermore National Laboratory, ADMX COLLABORATION, ADMX-HF COLLABORATION — Axions are a well motivated dark matter candidate and can be detected by their resonant conversion into photons using a microwave resonant cavity in an axial magnetic field. This is the basis of both the ADMX and ADMX-HF experiments. The predicted axion-photon conversion power is extremely small ($< 10^{-22}$ W) and is directly related to the quality factor (Q = resonant frequency over bandwidth) of the microwave cavity. To date copper cavities have been used with Q $\sim 10^5$ at frequencies of 1 GHz. As one scales to higher frequencies this Q degrades substantially. Superconducting cavities can regularly be made with Q $> 10^9$ but would in general be driven normal in the high magnetic field of ADMX and ADMX-HF (> 8 T). Here we describe progress of R&D efforts to make and test hybrid cavities with regular copper endcaps and thin-film superconducting barrels, produced with NbTiN RF sputtering, which are designed to maintain RF superconducting properties in the presence of a strong axial magnetic field at low temperatures (< 1 K).

[1]Supported by DOE Grants DE-FG02-97ER41029, DE-FG02-96ER40956, DE-AC52-07NA27344, DE-AC03-76SF00098, NSF Grant 1067242, and the Livermore LDRD program.

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Date submitted: 06 Nov 2015 Electronic form version 1.4