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DMRadio: Searching for Axion Dark Matter Below 1 ueV

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The particle nature of Dark Matter (DM) is one of the most important open questions in particle physics today. Axions, and axion like particles (ALPs), more generally, have emerged as one of the leading candidates to explain the DM abundance of the universe. Experimental searches for axion DM (aDM) have traditionally searched in a narrow mass band between 1-100 ueV using microwave cavity detectors. However, recent work has demonstrated a powerful new approach to search for aDM with mass $<1\text{ueV}$ using a lumped element detector. DMRadio is a multiphase program to search for aDM with mass below 1 ueV. The first stage, DMRadio-50L is a toroidal detector with a 0.1-1 T magnetic field that will be able to probe aDM over the range $20\text{ peV} < m_a < 20\text{ neV}$ down to $g_{a\gamma\gamma} \sim 5 \times 10^{-15} \text{ GeV}^{-1}$. The second stage, DMRadio-m3, will have a $\sim 4\text{ T}$ field and will be sensitive to aDM in the QCD axion band from $20\text{ neV} < m_a < 0.8\text{ueV}$. In this talk, I will give an overview of the DMRadio program, design considerations, and challenges.

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