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The Dark Matter Radio Suite of Experiments

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DMRadio searches for QCD axions over a broad mass (frequency) range: 0.4neV to 0.8ueV (0.1MHz to 200MHz), with sensitivity down to the DFSZ model. To achieve this ambitious goal, DMRadio includes three axion detection experiments: DMRadio-50L is under construction and will begin operation in early 2024. It consists of a toroidal magnet with a superconducting sheath and solenoidal resonator pickup operating from 5kHz to 5MHz. The design of DMRadio-m3 is nearing completion. It consists of a solenoidal magnet with a copper coaxial resonant pickup, and will reach DFSZ from 30 MHz to 200 MHz. DMRadio-GUT is a future experiment to build on experience from both DMRadio-50L and DMRadio-m3. It uses a large detector volume with quantum enhancement to reach DFSZ from 0.1 MHz to 30 MHz. While readout with dc SQUIDS is sufficient for DMRadio-m3, quantum enhanced measurement through radio frequency quantum upconverters will be needed for DMRadio-GUT. To this end, quantum upconverters will be deployed on DMRadio-50L as a testbed for quantum enhancement. Experimental design and projected sensitivities for the DMRadio suite will be presented.

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