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Tunability of Superconducting Split-Ring Resonators With dc And rf Magnetic Fields MICHAEL RICCI, HUA XU, STEVEN ANLAGE, University of Maryland, College Park, RUSLAN PROZOROV, Iowa State University, ALEXANDER ZHURAVEL, National Academy of Sciences of Ukraine, ALEXEY USTINOV, University of Erlangen-Nuremberg, Germany — Superconducting split-ring resonators (SRRs) have lower metallic losses at microwave frequencies than do normal metal SRRs. However, they are very susceptible to slight perturbations in the electromagnetic fields due to nearby wires, SRRs, or even a conducting surface. These perturbations cause shifts in the SRR resonant frequency and degrade the Q. Superconducting SRRs may also experience a slight frequency shift, and large suppression of the Q, due to variations of the power of the applied electromagnetic wave. Data is shown for a single superconducting SRR in an applied dc magnetic field, and for rf power variations. In the former case, hysteresis was observed in both the resonant frequency and the Q, while in the latter case there was no hysteresis, however a large suppression of the Q was observed at high power. Magneto-optical imaging was used to observe locations of vortex entry into the superconducting film, and a laser scanning microscopy measurement was performed to determine the current density profile in the SRR. The results presented may be used to tune the resonant frequency (and permeability) of the SRR to a desired frequency. This work was supported by the NSF, NASU, and DFG.

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