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New Method for Determining the Quality Factor and Resonance Frequency of Superconducting Micro-resonators from Sonnet Simulation DAVID WISBEY, ALEXANDER REINISCH, WESLEY GARDNER, JACOB BREWSTER, Saint Louis University, JIANSONG GAO, National Institute of Standards and Technology — Lithographed superconducting microwave resonators (micro-resonators) are useful in a number of important applications including microwave kinetic inductance detectors (MKIDs), as a memory element in quantum information, and readout of qubits and nanomechanical resonators. One of the major tasks in designing these devices is to find the resonance frequency (f_r) and quality factor (Q) for these microwave circuits using EM simulation software such as Sonnet. The traditional method iteratively sweeps and zooms in frequency to fit simulated S_{21} data, which is often time consuming. In this work, we show a new—and much faster—method for determining f_r and Q by adding an internal (virtual) port in the Sonnet model and examining the input impedance through the added port. Accurate f_r and Q values can be retrieved from a single simulation with a wide frequency sweep. This is a robust method that works on many types of resonance circuits and eclipses the speed with which Q is traditionally extracted by eliminating the need for multiple frequency sweeps using Sonnet.

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