

Anomalous frequency shifts near T_c of fundamental and higher-order modes in medium-velocity 644 MHz superconducting elliptical cavities

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Recent studies indicate the magnitude of an anomalous decrease in the resonant frequency, so-called frequency dip, near critical temperature of superconducting niobium cavities, T_c , correlates to the cavity quality factor, Q_0 , and impurities introduced into the superconducting niobium surfaces, such as nitrogen or oxygen. We measured frequency dips in both 644 MHz fundamental mode (FM) and 1.45 GHz higher-order mode (HOM) of single-cell elliptical cavities for FRIB energy upgrade (FRIB400) R&D. These measurements were performed in cavities with the following surface treatments: 1) electropolished (EP) only, 2) nitrogen-doped (N-doping), 3) medium-temperature (mid-T) baked and then hydrofluoric (HF) acid rinsed. We will present measured frequency dips and compare them to cavity Q_0 performance in the FM. Frequency-dependent behavior of frequency dips with various surface treatments will also be discussed as our experimental setup has a unique feature compared to previous studies, which allows for measurement of frequency dips in different modes within the same cavity, in other word, on the same surfaces.

Footnotes

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