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Analysis of Field Emission Effect on RAON Half-Wave Resonator (HWR) Superconducting Cavities

The field emission effect is a serious problem that degrades the performance of superconducting cavities. Metallic contaminants, surface curvature, and insufficient surface cleaning can cause electron emission. Field emission typically occurs at the GeV-scale, but it can be also observed within the MeV-scale electric field of superconducting cavities. This is because metallic contaminants can locally enhance the electric field, which can be quantified as a field enhancement factor. In this research, the quality factor and X-ray measurements were performed through a vertical test. Field enhancement factors were obtained by fitting the X-ray data using the Fowler-Nordheim tunneling current equation. A lower field enhancement factor indicates better field emission conditioning. As the field enhancement factor increases, the quality factor decreases.

Collaboration / Activity

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