

Abstract Submitted
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Study of RF flux penetration on Nb for SRF Applications¹

BAKHROM ORIPOV, STEVEN ANLAGE, Univ of Maryland-College Park — Superconducting Radio Frequency (SRF) cavities are being widely used in new generation particle accelerators. Based on the needs of the SRF community to identify defects on Nb surfaces, a novel near-field magnetic field microwave microscope was successfully built using a magnetic writer from a conventional perpendicular magnetic recording hard-disk drive¹. Using our probe, we performed microwave measurement of both third $P_{3f}(P_f, T)$ and fifth $P_{5f}(P_f, T)$ harmonic responses and its dependence on temperature and rf input power by applying a strong and localized RF magnetic field on high quality Nb films. Our preliminary results show significant difference in low-field and high-field harmonic responses. Above a temperature-dependent onset field H_1 periodic structures in the harmonic response vs rf field amplitude data emerges. Similar behavior is observed in both bulk Nb and thin film Nb samples. We attribute this periodic response to vortex nonlinearity. Using our microscope, we are able to measure a local lower critical field for vortex formation $H_{c,v}$ (in arbitrary units), and compare the $H_{c,v}$'s of samples produced with different techniques and chemical treatments. ¹Tamin Tai, B. G. Ghamsari, T. Bieler, Steven M. Anlage, “Nanoscale Nonlinear Radio Frequency Properties of Bulk Nb: Origins of Extrinsic Nonlinear Effects,” Phys. Rev. B 92, 134513 (2015).

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