NEAR-FIELD MICROWAVE MICROSCOPY OF SUPERCONDUCTING MATERIALS

S. M. Anlage, UMD, College Park, Maryland

Abstract

The high-field performance of SRF cavities can be limited by breakdown events below the intrinsic limiting surface fields of Nb, and there is evidence that these breakdown events are localized in space inside the cavity. Also, there is a lack of detailed understanding of the causal links between surface treatments and ultimate RF performance at low temperatures. We have developed a family of near-field 'microwave microscopes' for super-resolution quantitative imaging of materials properties, including superconducting nonlinearities [1]. We propose two specific microscopic approaches to addressing materials issues in Nb. First, a spatially-resolved local microwave probe that operates at SRF frequencies and temperatures would be very helpful to discover the microscopic origins of breakdown. Second, RF Laser Scanning Microscopy (LSM) has allowed visualization of RF current flow and sources of nonlinear RF response in superconducting devices with micro-meter spatial resolution [2]. The LSM can be used in conjunction with surface preparation and characterization techniques to create links between physical and chemical processing steps and ultimate cryogenic microwave performance.

CONTRIBUTION NOT RECEIVED