

Analysis of the medium field Q-slope in superconducting cavities made of bulk niobium

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Abstract

The quality factor of superconducting radio-frequency cavities made of high purity niobium is observed to decrease for increasing rf field in the medium field range (peak surface magnetic field between 20 and 80 mT). The causes for this effect are not clear yet. The dependence of the surface resistance from the peak surface magnetic field is often observed to be linear and quadratic.

This paper will present an analysis of the medium field Q-slope data measured on cavities treated with buffered chemical polishing (BCP) at Jefferson Lab, as function of different treatments such as post-purification and low temperature baking. The data have been compared with a model involving a combination of the thermal feedback effect and of hysteresis losses due to “strong-links” formed on the niobium surface during oxidation.