

Impact of Remanent Magnetic Field on the Heat Load of Original CEBAF Cryomodule

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Abstract— The heat load of the original cryomodules for the CEBAF accelerator is ~50% higher than the target value of 100 W at 2.07 K for refurbished cavities operating at an accelerating gradient of 12.5 MV/m. This issue is due to the quality factor of the cavities being ~50% lower in the cryomodule than when tested in a vertical cryostat, even at low RF field. Previous studies were not conclusive about the origin of the additional losses. We present the results of a systematic study of the additional losses in a five-cell cavity from a de-commissioned cryomodule after attaching components, which are part of the cryomodule, such as the cold tuner, the He tank and the cold magnetic shield, prior to cryogenic testing in a vertical cryostat. Flux-gate magnetometers and temperature sensors are used as diagnostic elements. Different cool-down procedures and tests in different residual magnetic fields were investigated during the study. Three flux-gate magnetometers attached to one of the cavities installed in the refurbished cryomodule C50-12 confirmed the hypothesis of high residual magnetic field as a major cause for the increased RF losses.

Keywords (Index Terms)— Superconducting resonators, magnetic remanence, cryomodules, niobium.

IEEE/CSC & ESAS SUPERCONDUCTIVITY NEWS FORUM (global edition), January 2017 (Preview 2).

Submitted September 24, 2016; Selected November 26, 2016. Reference ST565; Category 6.

This ASC 2016 manuscript 1L0r3B-06 was submitted to *IEEE Trans. Appl. Supercond.* for possible publication.