



Local magnetic field evolution in shielded SRF cavities during thermal cycling in a cryomodule-like configuration

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At FREIA, Uppsala (Sweden), an investigation of the Magnetic Field (MF) evolution during cool-down / warm-up cycles of 352 MHz single spoke cavities for the MINERVA proton linac (Phase I of the MYRRHA project) has been carried out: bulk-Nb SRF cavities equipped each with a dedicated MINERVA cavity magnetic shield (MGS) made of CRYOPHY® material have been measured during their testing in the horizontal cryostat HNOSS.

The MF was monitored by multiple fluxgate sensors placed at various positions around the cavities during the cool-down and warm-up cycles. Note that HNOSS is equipped by design with a global mu-metal magnetic shield covering the inner walls of the cryostat vessel (at room temperature) to provide a reduction of the Earth's magnetic field to around 2 uT at lateral cavity test positions (otherwise higher). Together with the cavity-individual shields, this allowed to perform precise measurements of the remnant field.

Upon cool down, a change in the surrounding MF was observed due to the interplay of the Seebeck and Meissner effects, which directly correlates to the cavity's temperature profile.

The estimated influence of these MF dynamics on SRF cavity performance are discussed, while proposing optimized cool-down sequences aimed at minimizing trapped flux and enhancing the performance and reliability of SRF cavities for future accelerator applications.

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Yes

Footnotes

Funding Agency

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