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Copper Surfaces: Comparative Studies in Cryogenic High Fields

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Recent tests have been carried out in a cryogenic pulsed high-voltage system in the FREIA Laboratory to investigate the aptness of heat-treated (soft) copper and non-treated (hard) copper as a candidate for CLIC accelerating structures. The surface of the soft copper electrodes was exposed to high electric fields in the range from room temperature to cryogenic temperatures. We calculate the saturation field at different temperatures and will show the improvements of the maximum attainable electric field for the sample that underwent conditioning in the cryogenic environment. We will also compare the results for the soft and hard copper at different temperatures, and discuss the ricochet effect of decreasing electric field after saturation. In addition, field emission experiments were conducted at several temperature points, before and after conditioning, where emitted current was measured as a function of ramping voltage. We will present the trends we observed during the analysis of the data using Fowler-Nordheim theory.

Primary author: WAAGAARD, Elias (Uppsala University)

Co-authors: JACEWICZ, Marek (Uppsala University (SE)); RUBER, Roger (Uppsala University (SE))

Presenter: WAAGAARD, Elias (Uppsala University)

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