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Novel method for measuring surface resistivity during conditioning

Currently, the cryogenic HV DC pulsing system located at FREIA laboratory is used to investigate the conditioning process for different materials both at cryogenic and at room temperature. In order to understand the mechanisms that determine the increase in resistance to vacuum arcing during the conditioning process, new novel methods are needed to obtain as much information about the state of the system as possible.

Currently, we are developing a surface characterization method that consists in measuring the surface resistivity of the metal surface during the conditioning process. The surface resistivity will be measured by inducing, in addition to the HV DC pulses, a low-power, high-frequency (8.8 GHz) radio-frequency current in a parallel plate system. The system will act as a resonant cavity, and by measuring the quality factor of a resonant mode, we can obtain information about the surface resistivity. An increase in surface resistivity could indicate the formation of dislocation underneath the metal surface. It has been speculated that it plays a role in the conditioning process. The measurements need to be done at cryogenic temperature in order for the measurement to be sensitive to the resistivity given by the dislocations, and they need to be done at high frequency in order to measure the changes near the surface and not in the bulk.

In this poster session, I will report on our progress in implementing this method into our system.

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Experiments and diagnostics

Authors: COMAN, Mircea-George; JACEWICZ, Marek (Uppsala University (SE)); Dr DANCILA, Dragos; PRO-FATILOVA, Iaroslava

Presenter: COMAN, Mircea-George

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