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High Power RF Breakdown Test for Cryo-cooled Reentrant C-Band Copper Structure

High gradient RF structures capable of maintaining gradients in excess of 250 MV/m are critical in several concepts for future electron accelerators. Concepts such as the ultra-compact free electron laser (UC-XFEL) and the Cool Copper Collider (C3) plan to obtain these gradients through the cryogenic operation ($<77\text{K}$) of normal conducting copper cavities. Breakdown rates, the most significant gradient limitation, are significantly reduced at these low temperatures but the precise physics is complex and involves many interacting effects. High-power RF breakdown measurements at cryogenic temperatures are needed at the less explored C-band frequency (5.712 GHz) which is of great interest for the aforementioned concepts. On behalf of a large collaboration of UCLA, SLAC, LANL, and INFN the first C-band cryogenic breakdown measurements will be made using LANL RF test infrastructure. The 2-cell geometry designed for testing will be modifications of the distributed coupled reentrant design used to efficiently power the cells while staying below the limiting values of peak surface electric and magnetic fields.

Topic

Experiments and Diagnostics

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