



Contribution ID: 150

Type: Oral presentation (in person)

High Power RF Testing of REBCO Samples

Tuesday 9 July 2024 12:20 (15 minutes)

SRF materials such as niobium have been extremely useful for accelerator technology but require low temperature operation $\sim 4\text{K}$. The development of high temperature superconductors (HTS) is promising due to their operating temperatures being closer to that of liquid nitrogen $\sim 77\text{K}$. This work hopes to determine the high-power RF performance of such materials at X-band (11.424 GHz). We have tested two kinds of REBCO coatings, film deposited, and tapes on a copper substrate. Testing was done in a hemispherical TE mode cavity due to its ability to maximize the magnetic field on the sample and minimize electric field. We will report on conductivity vs temperature measurements at low and high power, as well as preliminary tests of a TM01 cavity which could utilize REBCO tapes. We have observed quenching within these REBCO samples and explain the evidence which implies that the quenching is most likely due to reaching the critical current and due to average applied heat load for powers up to 1.6 kW.

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Session Classification: Superconducting RF

Track Classification: Accelerator: Superconducting RF