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REBCO sample testing for a HTS high Q cavity

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Superconducting materials such as niobium have been extremely useful for rf accelerator technology but require low temperatures for operation $\sim 2-4$ K. The development of high temperature superconductors (HTS) is promising due to their transition temperature in excess of 80 K. In this work we are exploring the high-power RF performance of such materials at X-band (11.424 GHz). We are testing two kinds of REBCO coatings, deposition and tapes, on a copper substrate. Testing was done in a hemispherical cavity with a TE mode due to its ability to maximize the magnetic field on the sample and minimize electric field. We will report on the performance in terms of conductivity vs temperature at low and high power. These measurements will then be compared to the design performance of a full 3D cavity that is coated with REBCO. This cavity will utilize the TM₀₁₀ mode, and we are targeting a Q of $\sim 10^6$ at 80 K. Such a cavity could be useful for high power rf accelerator applications. In one example, a cryogenic copper linac operating at liquid nitrogen temperature (77 K) could utilize such a high-Q cavity in its superconducting state for pulse compression.

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Footnotes

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Yes

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