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# Surface heating in HTS-based high field pulsed RF cavities

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"Recent technological advances allow the use of HTS Coated Conductors in RF devices by soldering the tape onto an appropriately shaped substrate. This opens up the possibility of manufacturing entire RF accelerating cavities using this technology. A collaboration between CERN, ICMAB, KIT and SLAC aims at assessing the performance attainable by RF components produced with this technology by applying HTS tapes on a part of a special demountable cavity, tested in pulsed regime up to extremely high RF surface currents, equivalent to an RF accelerating field of the order of 100 MV/m if scaled to a standard elliptical cavity.
In this frame, one of the possible problems arising is the superconductor surface temperature increase due to the high deposited RF power. Because of the strong temperature dependence of the superconductor surface resistance Rs, at constant RF field amplitude, a temperature increase would lead to an increase of the deposited RF power, through the relation: P_rf=1/2R_s 〖(T)H〗_rf^2. This process can induce a thermal runaway, driving the superconductor into the normal state (cavity quench).
In this talk, following Wilson [1], by solving the heat equation for the system under consideration, we discuss the conditions leading to thermal runaway. In particular, we estimate the upper limit for the HTS tapes transverse thermal conductivity to safely achieve RF accelerating fields corresponding to an order of 100 MV/m. Measurements of the tapes thermal conductivity are in progress within the collaboration.

[1] I. Wilson, "Surface heating of the CLIC main linac structure", CLIC note 52, https://cds.cern.ch/record/255087"

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