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Thu-Mo-Po4.10-04 [72]: Finite Element Analysis and Experimental test of current leads with parallel HTS tapes

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The design, analysis and experimental test of a High Temperature Superconductor (HTS) current leads with parallel HTS tapes is presented. Two HTS tapes are electrically shunted in parallel in each positive and negative lead respectively to increase its current-carrying capability. It is essential to enable balanced current sharing between the parallel HTS tapes to prevent potential overload and quench of each HTS tape. Finite Element Analysis has been conducted to investigate the current distribution of parallel HTS tapes under the impact of various design parameters, including the geometry of copper terminals, solder interface length/thickness and solder resistivity. Analysis concludes that the electrical resistance from copper terminal to each of the parallel HTS tapes need to be relatively close to balance the current sharing between two tapes. Making the copper terminal electrical resistance dominantly greater than the solder interface resistance would result in a robust current leads design with least negative impact caused by soldering process. The FEA simulation meets well with prototype HTS leads test results.

Primary authors: Dr WU, Anbo (GE Global Research); MINE, Susumu (GE Global Research); Dr BAI, ye (GE Global Research Center); Dr XU, Minfeng (GE Global Research); LI, Anfeng (GE Healthcare)

Presenter: Dr WU, Anbo (GE Global Research)

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