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Heat Transfer through Cable Insulation of Nb-Ti Superconducting Magnets Operating in He II

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The operation of superconducting magnets with Nb-Ti conductors in helium II allows profiting of superfluidity to efficiently transfer heat from cable to helium bath. In wrapped cable insulations, like the ones used for the main magnets of the Large Hadron Collider particle accelerator, part of heat is transferred through the bulk of the dielectric insulation and part through micro-channels between the insulation layers.
In this paper, available experimental data of polyimide insulation schemes are analyzed in terms of the relevant wrapping parameters, to compare their heat transfer efficiency. The path of the heat fluxes in the superconducting coil cross-section is determined, and the corresponding steady-state temperature distribution is evaluated.

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