

Workshop on Radiation Effects in Superconducting Magnet Materials 2015 (RESMM'15)

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Roadmap to Determine the Damage Limit of Superconducting Magnets for Instantaneous Beam Losses

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Content :

The damage mechanisms of superconducting magnets due to the direct impact of high intensity particle beams are not fully understood. Obvious candidates for upper bounds on the damage limit are overheating of the insulation and local melting of the conductor. A lower bound is obtained by the limits of elasticity in the conductor, taking into account dynamic effects (elastic stress waves). The plastic regime in between these two bounds leads to differential thermal contraction and eventually permanent degradation of the magnet performance. An improved understanding of these mechanisms is required especially in view of the planned increase in brightness of the beams injected into the LHC and of the future High Luminosity LHC and Future Circular Collider.

In this contribution a roadmap to perform damage tests with the insulating polyimide tape, superconducting strands and cables at room temperature is presented. Ultimately a test of superconducting coils and cable samples at 4.3 K is foreseen in the HiRadMat facility at CERN, which uses the 440 GeV proton beam generated by the Super Proton Synchrotron (SPS). A preliminary experimental setup for this test will be presented.

Primary authors : Dr. WOLLMANN, Daniel (CERN)

Co-authors : Dr. AUCHMANN, Bernhard (CERN) ; Dr. VERWEIJ, Arjan (CERN) ; Mr. RAGINEL, Vivien (CERN)

Presenter : Dr. WOLLMANN, Daniel (CERN)

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