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M2Po2E-05 [53]: Numerical modeling of stability and current sharing in Nb₃Sn Rutherford cables

Tuesday, July 23, 2019 1:30 PM (2 hours)

Finite Element Method (FEM) modeling of stability and current sharing in Nb₃Sn Rutherford cables was performed. Different values of contact resistances R_a and R_c were selected based on previous values extracted from loss measurements, as well as a set of design values. Current sharing was then projected for these cases. FEM models which mimic the QXF1055z-D cable (here named Q6 cable) and the HQ1020ZB (here named H1 cable) were set up. A defect in the central strand, 1 mm long, was created. It was assumed that this defect can carry 50 % of the strand's critical current. At the cable current of $0.85 I_c$ the current sharing effect was modeled for real values of R_a and R_c of the cables. Superconducting properties of the strands were modeled via a power law E-J curve. Power generated in the cable defect was calculated and its influence on cable quench was analyzed. MQE was estimated as a function of I_c for the cable for various values of R_a and R_c , and the temporal evolution of the quench is displayed for a characteristic case.

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