Contribution ID: **804** Type: **Poster Presentation**

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

Tuesday 23 July 2019 13:30 (2 hours)

Finite Element Method (FEM) modeling of stability and current sharing in Nb3Sn Rutherford cables was performed. Different values of contact resistances Ra and Rc 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 Ic the current sharing effect was modeled for real values of Ra and Rc 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 Ic for the cable for various values of Ra and Rc, and the temporal evolution of the quench is displayed for a characteristic case.

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Session Classification: M2Po2E - LTS Cables - Fabrication and Characterization