



Contribution ID: 936

Type: **Poster Presentation of 1h45m**

Comparison of Measured and Simulated Quench Behaviors of Superconducting Magnets for Jefferson Lab's 11 GeV Super High Momentum Spectrometer

Monday 28 August 2017 13:15 (1h 45m)

Super High Momentum Spectrometer (SHMS) of Hall C, part of 12 GeV Upgrade at Jefferson Lab, is tested and complete. We will present the measured quench data and the simulated ones of the Q2/3, and Dipole superconducting magnets using the quench code of Vector Fields'Opera-3D. A multi-channel Tektronix DPO is used to record the signals of the current, voltage of the dump resistor, and other voltages of interest for the Q2/3 and Dipole; the sampling rate used in the tests is $1.0\text{E-}4$ s. The energy balance method is employed to figure out the energy deposited into the coil during the quench. The deposited energy is correlated with the measured temperatures of the coil. Opera-3D 18.0 is used to model and analyze the quench behaviors of the Q2/3 and Dipole. Material properties of the coils are updated with the real manufacturing data. The measured current decay and measured temperatures of the coil during real quenches will be compared with the simulated quenches from Opera-3D. The differences between the measured and simulated behaviors will be discussed to provide guidance for design of similar superconducting magnets in the future. The training curves of three magnets will be presented also.

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Session Classification: Mon-Af-Po1.10

Track Classification: G2 - Quench and Normal-Zone Behavior