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State Machine Operation of the MICE Cooling Channel

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The Muon Ionization Cooling Experiment (MICE) is a demonstration experiment to prove the feasibility of cooling a beam of muons for use in a Neutrino Factory and/or Muon Collider. The MICE cooling channel is a section of a modified Study II cooling channel in which we will measure a 10% reduction in beam emittance. In order to ensure a reliable measurement, MICE will measure the beam emittance before and after the cooling channel at the level of 1%, or an absolute measurement of 0.001. This renders MICE a precision experiment which requires strict controls and monitoring of all experimental parameters in order to control systematic errors. The MICE Controls and Monitoring system is based on EPICS and integrates with the DAQ, Data monitoring systems, and a configuration database. The cooling channel for MICE has between 12 and 18 superconductnig solenoid coils in 3 to 7 magnets, depending on the staged development of the experiment. The magnets are coaxial and in close proximity, thus requiring coordinated operation of magnets when ramping, responding to quench conditions, and quench recovery. To reliably manage the operation of the magnets, MICE is implementing state machines for each magnet and an over arching state machine for the magnets integrated in the cooling channel. The state machine transitions and operating parameters are stored/restored to/from the configuration database and coupled with MICE Run Control. Proper implementation of the state machines will not only ensure safe operation of the magnets, but will help ensure reliable data quality. A description of MICE, details of the state machines, and lessons learned from use of the state machines in recent magnet training tests will be discussed.

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