

Summary of the rolling review of the MICE controls and monitoring system

Background

A rolling review of the Controls and Monitoring system was initiated in December 2016 following an incident in which a single power supply serving one coil on the downstream spectrometer solenoid started to ramp to current without a command from an operator having been issued. The rolling review was convened to determine the cause of such an “autonomous ramp” and oversee the implementation of measures that remove the risk of a recurrence. Or, if it was not possible to determine the cause of the autonomous ramp, to oversee the implementation of appropriate measures such that there is sufficient assurance that the system will be stable in future operation.

The terms of reference for the review, the membership of the review panel, the material presented to the reviewers and the notes on the various review meetings are collected in [?].

Conclusions

In November 2016 it was possible for “stale values” to be left in the “SET VALUE” register such that a subsequent “RAMP” command would generate a ramp to an “unsolicited” current. This could have caused the autonomous ramp.

Several mitigations were implemented in the course of the review:

- The command set was reduced;
- The system was configured such that the “SET CURRENT” and the “SET VOLTAGE” are set to 0 A and 0 V respectively whenever contactors are opened or closed; and
- The power-on sequence was modified such that the set current must be entered and confirmed before, finally, a command to ramp to the set current can be issued. I.e., no single action can enable a ramp, three commands being required.

In addition, through the course of the rolling review, with the mitigations listed above, further operation of the magnets was carried out without a further autonomous ramp.

The review panel therefore concluded that the cause of the autonomous ramp had been identified with a reasonable degree of certainty and appropriate mitigations had been introduced to render the probability of a recurrence sufficiently low that the system was safe to operate.