Prototype Instrumentation and Testing of Møller Coil 3

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The note presents the test and the its results of the acceptance test performed on the prototype coil #3 of the Møller magnets.

For the Measurement of a Lepton-Lepton Electroweak Reaction (MOLLER) experiment, there are five toroidal magnets, one upstream and four downstream. Each of these magnets has seven coils, which are being fabricated. As part of the acceptance testing for the first prototype, coil 3, a low current, 700 A, test was performed.

An Allen-Bradley CompactLogix PLC controller was used for readback. The sensor types planned to be read back were RTD, thermistor, pressure, flow, voltage, and current. The two temperature sensor types, RTD and thermistor, were to be used to compare their readback values. However, without any PLC module to read the thermistors, readback proved problematic, so these were removed. The pressure sensors were on the LCW supply and return lines while the flow meter measured the LCW supply. Both the voltage and current were from the magnet power supply. Figure 1 shows the setup.

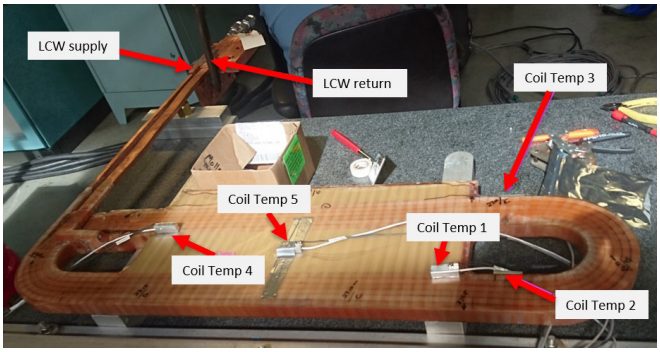

FIG. 1. Prototype coil 3 with temperature sensors.

The instrumentation shown in Fig. 2 will be used in the final design. Some documentation did not match the in-situ wiring and minor modifications were needed, such as swapping wiring in the terminal blocks for the flow meter and mapping the temperature sensor locations with the physical PLC channels. Several channels needed to have their scaling modified.

The main goal of the test was to stop the flow of LCW coolant to allow the coil to heat, then restore the flow. This would provide values that could be used for scaling the heating and cooling of the coil, as well as look for any mechanical defects in the epoxy.

After all instrumentation was verified to be correct, the magnet was powered on and the current increased in 100 A steps from 0 to 700 A (orange line in Fig. 3). The LCW supply was then restricted in an attempt to increase the coil temperature. After closing a manifold valve the coil began increasing

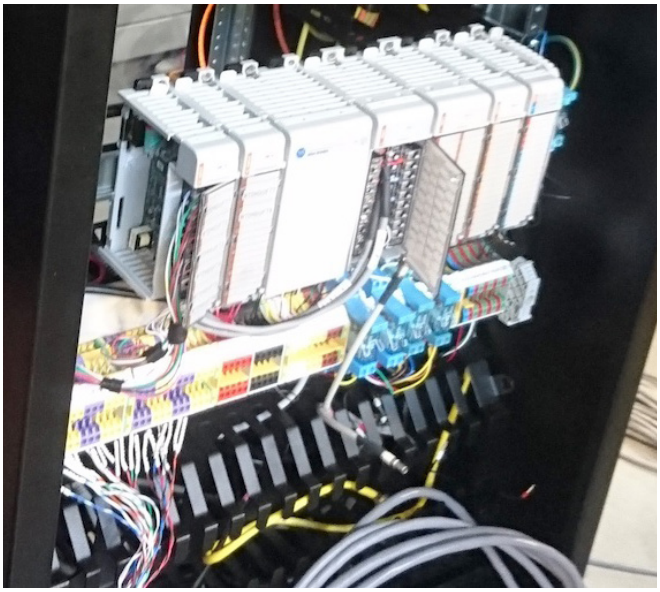

FIG. 2. Allen-Bradley CompactLogix PLC setup installation.

in temperature until ~65°C, curves with peaks in Fig. 3; then the flow was restored and the coil cooled down.

Shown in Fig. 3 is the data from the initial test. The data from the test run is currently being analyzed. No mechanical issues have been observed.

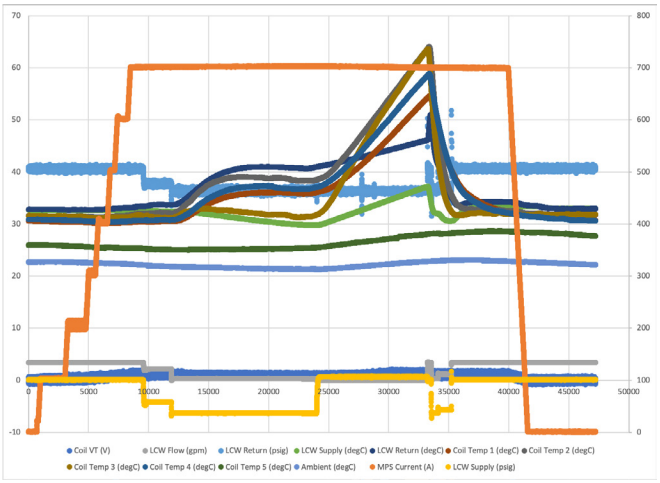

FIG. 3. Data from initial test; MPS current and LCW supply on right axis, all others on left.