



U.S. Muon Accelerator Program Memorandum

November 13, 2015

From: Mark Palmer, MAP Director

To: MICE Spectrometer Solenoid Review Committee

Subject: Charge for the MICE Spectrometer Solenoid Recovery Review to be held December 3-4, 2015 at Fermilab

One of the principal deliverables of the U.S. Muon Accelerator Program to the International Muon Ionization Cooling Experiment (MICE) hosted by Rutherford Appleton Laboratory (RAL) is a pair of Spectrometer Solenoid (SS) Magnets. Each of these magnets incorporates 5 individual solenoid coils. Three of these coils provide a highly uniform field region for the operation of a Scintillating Fiber Tracker, which provides the muon momentum measurements required for the experiment. Two additional coils provide optics matching into the guide field of the remainder of the muon cooling channel. These magnets are presently installed in the MICE experiment at RAL, which is in the commissioning process to conduct the MICE Step IV data runs.

On September 13, 2015, a failure occurred in one of the match coils on the downstream magnet while the magnet was being trained to full field. Through the remainder of September and early October, diagnostics were carried out on the magnet in an attempt to understand the precise state of the magnet post-failure and an analysis of the failure sequence was carried out. The results of these efforts were presented at a DOE-requested review, chaired by James Kerby (Argonne National Laboratory) on October 26, 2015 at RAL. The presentations and closeout slides from that review can be found at:

<https://indico.fnal.gov/conferenceDisplay.py?confId=10651>

A range of supporting information about the magnet design and previous issues encountered during the construction and initial testing of these magnets is available at:

https://web.fnal.gov/project/map/reviews/MICE-SpectrometerSolenoidMagnets-Review/_layouts/15/start.aspx#/SitePages/Home.aspx

At the time of the October 26th review, a preliminary overview of several potential paths forward to complete the MICE Demonstration of Ionization Cooling was presented. Furthermore, options for improving the operational safety of the existing magnet functionality were discussed. Due to the preliminary nature of these presentations, it was premature to evaluate the technical details of a path forward at that meeting. The goal of the present review is to provide a more detailed technical evaluation of the plans for operating the SS magnets in MICE Step IV and the plans to recover the required optics functionality for the MICE Cooling Demonstration.

With the above introduction, the charge for the current review is as follows:

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1. Evaluate the existing SS magnet power supply and quench protection scheme in light of the failure event. Examine modifications to the power and quench protection systems being proposed by the SS magnet group and assess the ability of the MICE experiment to safely operate the magnets in the Step IV configuration as well as the Cooling Demonstration configuration.
2. Evaluate the technical details of the magnet recovery plan as presented by the SS magnet team. In particular, please address the robustness of each of the presented modifications and repair steps. Also consider the degree of operational safety that will be provided by executing the recovery option as presented.
3. Evaluate the balance of costs, schedule impact and risks associated with the recovery option based on the initial cost, schedule and risk analysis provided by the SS magnet team. Identify any elements of the plan that require further attention by the SS magnet group before finalizing the proposed recovery option.
4. Based on the overview and analysis presented by the SS magnet team, confirm whether the recovery option presented will provide a viable path forward for the MICE Experiment. Also, please identify any other magnet recovery options that should be evaluated prior to presenting the magnet recovery proposal to the MICE Collaboration and the funding agencies.

In order to move forward effectively with preparations for MICE Step IV operations as well as a longer-term repair strategy, I would appreciate the committee's final written report to be delivered by Friday, December 18. This report will inform further decisions by the collaboration and funding agencies with respect to plans for moving forward with the MICE Demonstration of Ionization Cooling.

Thank you for your willingness to serve on this committee and the time commitment it requires.

Sincerely,



Mark A. Palmer

cc: Kenneth Long, MICE Spokesperson, Imperial College London
Colin Whyte, MICE Project Manager, Rutherford Appleton Laboratory
Alan Bross, MICE-US Construction Manager, Fermilab
Peter Garbincius, MAP PMO Head, Fermilab
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