Fermi National Accelerator Laboratory

Fermilab

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US HL-LHC AUP

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To: HL-LHC AUP Design Criteria Review Committee Members

From: Giorgio Apollinari, HL-LHC AUP Project Manager

Subject: Structural and Electrical Design Criteria Review of the MQXFA Magnets

Dear Colleagues

The High-Luminosity LHC Project at CERN and the HL-LHC Accelerator Upgrade Project (HL-LHC AUP) in the US started their respective execution phases. Specifically, HL-LHC AUP in the US received CD-1/CD-3a approval by the US funding agency, DOE, on October 13th 2017. Preliminary deliverables entertained by the US contribution to HL-LHC include Nb_3Sn-based focusing quadrupoles for the interaction regions called MQXFA.

HL-LHC AUP in the US aims at CD-2 (Baseline)/CD-3b(Magnet Construction) Approval during late FY18/early FY19. In order to show readiness for those reviews, Preliminary (CD-2) and Final (CD-3b) Design Reviews will need to be passed. A precursor to those review is the demonstration that AUP can document and satisfy the Design Criteria used to develop the MQXFA Magnets.

In particular, the HL-LHC AUP MQXFA Magnets can be considered as a stand-alone deliverable from the point of view of Structural Design, and therefore Structural Design Criteria for the MQXFA Magnets are developed by HL-LHC AUP. On the other hand, the MQXFA Magnets will operate within the larger HL-LHC electrical system, and therefore the Electrical Requirements have been developed by CERN and are expected to be implemented in all in-kind contributions.

The HL-LHC AUP team and CERN have developed a design for the MQXFA Magnets that has been proven in several models and prototypes built and successfully tested under the auspices of the LARP Program (LHC Accelerator R&D Program) and by CERN. The decade-long experience acquired in LARP is collected in Structural Design Criteria and in the Electrical Design Criteria that we are asking you to review. Specifically, we are asking the review committee to assess the following:

1. Are the Design Criteria appropriate to specify the design guidelines and develop a methodology to assess components for the MQXFA magnets

2. Do the Structural Design Criteria include an assessment of thermal and power cycles, and allow a determination of tolerable defect, specifically for brittle materials.
3. Are safety factor levels appropriate for the MQXFA Magnets
4. Are data and/or sources of information properly documented in the definition of the Design Criteria.
5. Are the Electrical Design Criteria properly addressing the electrical requirements from CERN.

The Review committee is invited to assess the completeness and finalization of the Structural Design Criteria and the maturity of the Electrical Design Criteria for the MQXFA Magnets.

Preliminary documentation will be provided to the Review Committee by March 2018. Interactions between the Committee and the team members are expected to happen, if necessary, in the March-April 2018 timeframe.

A final *in-person* Review is planned for April 23th-24th 2018 at Fermi National Accelerator Laboratory. A Close-out and an informal report to the HL-LHC AUP Project Management are expected at the end of the *in-person* Review, with a written report provided afterward on a mutually agreed timescale.

Members of the Review Panel:
CHAIR - Prof. Joseph Minervini (MIT)
Prof. Peter Titus (PPPL)
Dr. Arnaud Foussat (CERN)
Dr. Helene Felice (CEA-Saclay)
Prof. Mark Bird (FSU)
Dr. Stephen Gourlay (LBNL)
Prof. Raymond Yee (SJSU)
Prof. David Larbalestier (FSU)

The HL-LHC AUP Project will cover all expenses related to travel, housing and per-diem during the in-person Review of April 23th – 24th 2018. Please communicate with Roberta (Bobbie) Kucharski (kucharski@fnal.gov) prior to initiate your travel arrangements.

Program and Documentation
G. Ambrosio (FNAL) and S. Prestemon (LBNL) will be the linkpersons to propose and finalize the detailed program.

Apollinari Giorgio