HL-LHC/LARP International Review of the Inner Triples Quadrupoles (MQXF) Design

CERN, Switzerland – 10th to 12th December, 2014

Charges

The High Luminosity LHC (HL-LHC) project was approved as first priority by the special CERN Council held in Brussels on 30th May 2013. In May 2014, HL-LHC was rated among the next decade top priorities of the US HEP by the P5 committee, and in June 2014 the CERN Council approved its financing for the years 2015-2025.

HL-LHC is entering the final stage of design and prototyping: all technologies for the hardware upgrade must be fully proven by end 2016.

The replacement of the present inner triplet (IT) quadrupole magnets by new quadrupoles (MQXF), featuring much larger aperture and higher peak field, is the cornerstone of the upgrade plan. Tests of the short models of final design, foreseen in 2015 and 2016, and of the long prototypes, planned for end 2016, are on the critical path.

LARP has successfully built a series of quadrupoles of enhanced size and peak field; now LARP and CERN are engaged in a common program to build the first 1 m long demonstrator magnets, to be tested in 2015; testing of the first long prototypes is foreseen to start in 2016. While the assessment of the final design is foreseen in 2016-17, at this stage it is important to thoroughly review the magnet design and main manufacturing steps, because the CERN-USA collaboration needs to launch procurement of large size tooling and freeze key parameters for the prototyping phase. This will be the first independent assessment of the MQXF design.

The HL-LHC Project Leader and the LARP Director call an International Review with the following goals:

1. Are the Functional and Technical Specifications for the 3 MQXF magnets (Q1, Q2 and Q3) properly developed and reasonably finalized? Do the 10-year long LARP experience on cables and magnets and the more recent experience in Europe support the chosen specifications?
2. Does the basic design of the MQXF in terms of the magnetic and mechanical structure, quench protection and thermal operative conditions meet the Specifications with sufficient margin? Based on the LARP and European experiences, what is the likelihood of meeting the Specifications?
3. Is the engineering design (including the 3D modeling and the interfacing with other systems) sufficiently developed to assess that there are no show-stoppers in the construction of magnet parts, cold mass assemblies and cryostat, including installation and integration in the machine? Is the magnet and circuit protection adequate?
4. Is the plan for models and prototypes well thought? Is the preliminary construction plan credible?

5. Is the envisaged work share, between CERN and US-LARP the best to maximize the chances of success while minimizing the cost and interfaces?
6. Is there any area or particular field where important technical or managerial risks are under evaluated or ignored?

The review is scheduled on 10th - 11th December with the close-out on 12th December at CERN.

Reviewers:

Akira Yamamoto (KEK/CERN) Chair

Joe Minervini, MIT (Co-Chair)

Jim Kerby, ANL

Shlomo Caspi, LBNL

Alexander Zlobin, FNAL