



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

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

Charges

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

HL-LHC is entering in the final stage of design and prototyping: all technologies for the hardware upgrade must be fully proven by end 2016 (COMMENT give only one target date). The replacement of the present Inner triplet (IT) quadrupole magnets with 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 launching procurement of large size tooling and freezing key parameters for the prototyping phase. This will be the first independent assessment of the MQXF design.

The HiLumi 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? Is the 10-year long LARP experience on cables and magnets and the more recent experience in Europe supporting the chosen Specifications?
2. Does the basic design of the MQXF in term 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 Specification?
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 any area or particular field where important technical or managerial risks are under evaluated or ignored?

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

Reviewers:

Akira Yamamoto (KEK/CERN) Chair

Joe Minervini, MIT (Co-Chair)

Jim Kerby, ANL

Shlomo Caspi, LBNL

Alexander Zlobin, FNAL