HL-LHC/LARP International Review of the Superconducting Cable for the HL-LHC Inner Triples Quadrupoles (MQXF)

CERN, Switzerland – 5th to 6th November, 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. The US-LARP program has worked steadily for ten years to reach the present maturity in cable and quadrupole for the LHC upgrade.

As it is well known the SC cable is the component with the longest design, validation and procurement time for SC magnets. This characteristic is even more accentuated with a complex conductor such as Nb_3Sn. In particular the Nb_3Sn cable for the HiLumi (LARP) magnets has unique characteristics: a J_c about three times the one specified by ITER; limited degradation and high stability despite strong plastic cabling and deformation. Therefore, this relatively large size procurement (approximately 20 metric tons including prototypes and production magnets) will be the real test of Nb_3Sn industrial maturity for collider magnets.

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

1. Are the Functional or Technical Specifications for conductor strand and cable adequate to the scope of the MQXF? Are they sufficiently developed and reasonably finalized?
2. Does the design of strand and cable meet the specifications in terms of minimun I_c, maximum allowed degradation, minimum RRR, maximum D_{eff}, stability request, cable size, and unit length ?
3. Assess the feasibility of meeting – with adequate margin – the chosen specifications and requirements based on the decade long experience acquired by LARP in cables and magnet construction and the most recent experience in Europe.
4. Is the plan for two types of strand architecture (RRP and PIT) correctly managed inside the program?
5. Is the procurement schedule, with associated QA and test plan, credible and adequate for the prototyping phase (where applicable) and for the construction phase?

The review is scheduled on 5th-6th November at CERN.

We would appreciate a presentation with the main comments and recommendations at the close-out on 6th November, with a written report a few weeks later.