



## International Review of the HL-LHC 11 T Dipole for DS Collimation

CERN, Switzerland – 8<sup>th</sup> to 10<sup>th</sup> December, 2014

The High Luminosity LHC (HL-LHC) project was approved as first priority by the special CERN Council held in Brussels on 30<sup>th</sup> 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 of 2016.

In the project, a particular place is given to the 11 T dipole to make room for collimators in the dispersion suppressor (DS) region as part of the LHC continuous cryostat. The 11 T project started at the end of 2010 as a joint effort between Fermilab and CERN. Fermilab has taken a strong lead in the first R&D phase, from 2011 to 2014, and is now reducing the effort due to certain budgetary conditions. A series of 2 m and 1 m long model magnets have been built and tested at Fermilab while CERN is in the process of testing its first 2 m long model magnet.

The first two full 15 m long complete magnet assemblies must be installed in 2019, to allow the collimation of increased ions collision at the LHC P2. The need for up to four more assemblies in P7 can be assessed only in 2015-16. It is therefore now the right time to review the design and the construction plan of the 11 T dipoles, assessing the results of the first R&D phase in view of the actual needs and targets for the machine, and the proposed prototyping and construction phase that should respond the needs of the LHC.

The HL-LHC Project Leader and the CERN TE-MSG Group Leader call an International Review with the following aims:

1. To review the basic design of the 11 T dipole, taking into account magnetic, mechanical and thermal operating conditions in the LHC P2: is the design meeting the targets with sufficient margin? Does the experience of the first R&D phase at Fermilab and CERN (and of ten years of LARP & USA magnet basic programs) support the chosen specifications and the feasibility of meeting them with adequate margin?
2. Is the engineering design including the 3D interfaces to other systems, namely the cold-warm-cold by-pass lodging the collimation system, sufficiently developed to assess that there be no show stoppers in the construction of the magnetic part, the cold mass assembly, the cryostating, and the installation and integration in the machine? Is the protection and circuit integration sufficiently analysed?
3. Is the final design taking stock of the best features demonstrated in the two development lines, i.e. FNAL and CERN?
4. Is the plan for models and prototypes well thought? Is the preliminary construction plan credible?



5. Are the design and manufacturing plans sufficiently well developed to engage in the upcoming significant procurements, i.e. Nb<sub>3</sub>Sn strand and cable procurement and production, and magnet components procurement (collars, yoke, shells, etc.)?
6. Is there any specific area in which the project is running important technical or managerial risks?

The proposed dates for the review are 8<sup>th</sup> to 10<sup>th</sup> December at CERN.

Reviewers:

Akira Yamamoto, KEK-CERN, (Chair)

Joe Minervini, MIT (Co-Chair)

Giorgio Apollinari, FNAL

Jim Kerby, ANL

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