

Test Results of the First 3.7 m Long Nb₃Sn Quadrupole by LARP and Future Plans

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Abstract - In December 2009 during its first cold test, LQS01, the first Long Nb₃Sn Quadrupole made by LARP (LHC Accelerator Research Program, a collaboration of BNL, FNAL, LBNL and SLAC), reached its target field gradient of 200 T/m. This target was set in 2005 by the US Department of Energy, CERN and LARP, as a significant milestone toward the development of Nb₃Sn quadrupoles for possible use in LHC luminosity upgrades.

LQS01 is a 90 mm aperture, 3.7 m long quadrupole using Nb₃Sn coils. The coil layout is equal to the layout used in the LARP Technological Quadrupoles (TQC and TQS models). Pre-stress and support are provided by a segmented aluminum shell pre-loaded using bladders and keys, similarly to the TQS models. After the first test the magnet was disassembled, reassembled with an optimized pre-stress, and reached 222 T/m at 4.5 K.

In this paper we present the results of both tests and the next steps of the Long Quadrupole R&D.

Index Terms - LARP, long magnet, Nb₃Sn, superconducting magnet.

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