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Wed-Af-Po3.20-07 [60]: Vertical Magnetic Field Measurements of Full-Length Prototype MQXFAP Quadrupoles at Cryogenic Temperatures for Hi-Lumi LHC

Wednesday, 25 September 2019 14:00 (2 hours)

The U.S. HL LHC Accelerator Upgrade Project (AUP) (previously LARP) collaboration and CERN have joined efforts to develop high field quadrupoles for the Hi-Lumi LHC upgrade at CERN. The US national laboratories in the AUP program will deliver 10 cryostatted magnets and each cryostat has two 4.2 m long Nb₃Sn quadrupoles with 150 mm aperture. The vertical magnet testing facility of the Superconducting Magnet Division (SMD) at Brookhaven National Laboratory (BNL) has been significantly upgraded to perform testing in superfluid He at 1.9 K. Magnetic measurement is an essential step in the AUP magnet to monitor production process and to ensure that the magnetic fields meet the functional requirements and acceptance criteria. We have successfully performed magnetic measurements on the MQXFAP2 magnet in 2018 and the measured field data has provided information on the mechanical assembly and integration. The MQXFAP1b magnet is a magnet reassembled from three coils used in MQXFAP1 and one new coil and it will be tested at BNL beginning in April 2019. This paper will report further magnetic field analysis on the MQXFAP2 and recent measurement activities on MQXFAP1b. The paper will include warm measurement at room temperature, comparison between BNL and Lawrence Berkeley National Laboratory (LBNL) warm measurements, cold measurements at 1.9 K, detailed field analysis and the relationship between the field harmonics and the geometric asymmetries along the axial direction. In addition, recent developments of the magnetic field measurement systems at SMD/BNL will be reported.

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