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Sat-Mo-Po.06-03: Evaluation of the room temperature field quality measurements of HL-LHC MQXFA magnet assemblies

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As a member of the multi-lab U.S. High Luminosity LHC Accelerator Upgrade Project (HL-LHC AUP), Lawrence Berkeley National Laboratory (LBNL) is assembling high-field Nb₃Sn low-beta MQXFA quadrupole magnets for eventual installation at CERN as part of the HL-LHC upgrade. Each magnet undergoes room temperature magnetic measurements at two points during the assembly process: once after completion of the coil pack sub-assembly and once after the magnet is fully assembled and pre-loaded. Beyond its use to verify that each magnet assembly can meet operational requirements, the data from this two-stage measurement process allow for investigation into the impact of the pre-loading operation on field quality. Furthermore, recent measurements on magnet rebuilds as well as exploratory coil pack reconfigurations provide an opportunity to see in isolation the effects of changes to a magnet's coil selection or coil layout. In this work, we present the magnetic measurement results of MQXFA magnets assembled or currently in process, focusing particularly on magnets with data corresponding to multiple builds, and discuss trends and insights which may be beneficial for the remaining MQXFA magnet production or for future Nb₃Sn accelerator magnets.

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