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Thu-Mo-Or16-01 [Invited]: Status and Plans of the MQXFA Low Beta Quadrupoles for HL-LHC

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The final development and demonstration of the US made low beta quadrupoles for HL-LHC is in full swing. CERN is planning to start the upgrade of Large Hadron Collider during the Long Shutdown III, which is scheduled to start in 2024. The US is planning to contribute to this upgrade by providing the Q1 and Q3 Inner Triplet elements plus other components. The first iteration of the magnet design was completed by LARP (the US LHC Accelerator Research Program) in collaboration with CERN, which is planning to make the Q2a/b elements. The magnets in Q1/Q3 (MQXFA) and those in Q2a/b (MQXFB) have identical cross-sections and different lengths. During this phase LARP fabricated and assembled two prototypes. Subsequently, in collaboration with CERN, the US HL-LHC Accelerator Upgrade Project (AUP) finalized the design and QC procedures following the Design Criteria set by AUP and CERN. The most significant changes introduced in the final design are larger radii at shell cut-outs, and use of reduced values for heater-to-coil warm high-voltage tests after helium exposure. AUP is planning to fabricate, assemble and test three pre-series magnets with final design in order to demonstrate readiness for production. AUP has also reassembled the first prototype with a new coil and tested it.

Test results and analyses of the first two MQXFA prototypes, of the re-assembled one, and of the first pre-series magnet are compared and discussed in this paper together with the changes introduced in the final design. Plans for MQXFA magnet production are also presented and discussed.

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