# The challenges and solutions of meeting the assembly specifications for the 4.5 m long MQXFA magnets for the Hi-Luminosity LHC

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The U.S. High-Luminosity LHC Accelerator Upgrade Project (HL-LHC AUP) has, in the recent years, developed assembly specifications for the 4.5 m long MQXFA magnets, which are 150 mm aperture high-field Nb3Sn low-β quadrupole magnets that are being built for the CERN Hi-Luminosity LHC (HL-LHC) upgrade. While the specifications were based on lessons learned from the LHC Accelerator Research Program (LARP) effort and the MQXFS and MQXFA prototype magnets, the experience gained from having both MQXFA07 and MQXFA08 magnets not meeting performance specifications during cold testing actually catalyzed a better understanding of the impact of the target assembly specifications and a subsequent refinement of the same. This paper summarizes the body of assembly data from the Pre-Series (MQXFA03-MQXFA07) and Series magnets (MQXFA08-MQXFA11) that have been built to date, and discusses the processes employed to successfully face the challenge of ensuring that the assembly specifications are met for the duration of the project.

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