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Thu-Mo-Or16-02: Assembly of MQXFBP1 prototype, the Nb3Sn Q2 quadrupole for HL-LHC

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Abstract—The High Luminosity LHC Project target is to reach an integrated luminosity of the LHC of 3000 fb⁻¹, corresponding to a factor 10 increase in collisions with respect to the current accelerator. One major improvement foreseen is the reduction of the beam size at the collision points. This requires the development of 150 mm single aperture quadrupoles for the interaction regions. These quadrupoles are under development in a joint collaboration between CERN and the US-LHC Accelerator Research Program (LARP). The chosen approach for achieving a nominal quadrupole field gradient of 132.6 T/m is based on Nb3Sn technology. In 2019, the first prototype magnet based on 7-m-long coils has been assembled. The necessary tooling has been validated in 2018 during an assembly based on copper and low-grade Nb3Sn conductor coils. This paper will summarize the assembly of the first MQXFB prototype magnet including geometrical and electrical quality control, and reproducibility of the assembly based on magnetic measurements carried out at room temperature. The measurements taken during the final pre-loading, based on the bladder and key technique, is compared to the knowledge gained throughout the MQXFB short model program and the full length test assembly.

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