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Mon-Mo-Po1.04-15 [47]: Mechanical analysis and measurements of MQXFS6, the fifth short model of the Nb₃Sn Low- β Quadrupole for the Hi-Lumi LHC

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MQXF is the Nb₃Sn Low- β Quadrupole magnet that the HL-LHC project is planning to install in the LHC interaction regions in 2026 to increase the LHC integrated luminosity by about a factor of ten. The magnet will be fabricated in two different lengths: 4.2 m for MQXFA, built in the US by the Accelerator Upgrade Project (AUP), and 7.15 m for MQXFB, fabricated by CERN. In order to qualify the magnet design and characterize its performance with different conductors, cable geometries and pre-load configuration, five short model magnets, called MQXFS, were fabricated, assembled and tested. The last model, MQXFS6, used a new PIT superconductor, featuring a bundle barrier surrounding the filaments. The coil and the support structure were equipped with strain gauges and optical fibers to monitor strain during assembly, cool-down and excitation. We describe in this paper the mechanical performance of MQXFS6, analysed through experimental data and numerical models, and we compare it with the one of the previous short model magnets.

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