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## Test results of the short models MQXFS3 and MQXFS5 for the HL-LHC upgrade

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For the luminosity upgrade of the Large Hadron Collider at CERN, the installation of new generation of lower beta\* quadrupole magnets is foreseen on each side of the ATLAS and CMS experiment insertions zones. The new magnets are based on Nb3Sn technology and designed to achieve a field gradient of 132.6 T/m within a 150-mm aperture reaching a peak field of 11.4 T at the conductor level. In 2016 and 2017, the first two 1.5 m long magnet models, called MQXFS3 and MQXFS5, have been successfully tested at 4.2 K and 1.9 K in the two new High Field Magnet (HFM) test benches designed to respond to the HL-LHC magnets new requirements in terms of size and magnet performance.

This paper first presents in details the main features of the tested magnets in terms of conductors, magnet instrumentations and magnet integration in the SM18 HMF facilities. A second part is then dedicated to the magnet training behaviour and to the investigation on the quench location which may limit the magnet final performance. The last part describes the specific tests performed to validate the magnet protection schemes (quench detection, Quench Heater and CLIQ systems) and the main outcome of the test results.

## **Submitters Country**

Swtzerland

**Authors:** CHIUCHIOLO, Antonella (CERN); CHENG, Daniel (LBNL); RAVAIOLI, Emmanuele (LBNL); TODE-SCO, Ezio (CERN); LACKNER, Friedrich (CERN); SABBI, GianLuca (LBNL); VALLONE, Giorgio (CERN); CHLACHIDZE, Guram (Fermilab); BAJAS, Hugo (CERN); PEREZ, Juan Carlos (CERN); COOLEY, Lance (Fermilab); BOTTURA, Luca (CERN); BAJKO, Marta (CERN); YU, Miao (Fermilab); FERRACIN, Paolo (CERN); IZQUIERDO BERMUDEZ, Susana (CERN); WANG, Xiaorong (Lawrence Berkeley National Laboratory)

Presenter: BAJAS, Hugo (CERN)

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