**Summary and analysis of the strain gauge data from the coils of the MQXFA magnets during the vertical test in liquid helium**

L. Garcia Fajardo, G. Ambrosio, A. Ben Yahia, D.W. Cheng, P. Ferracin, S. Izquierdo Bermudez, P, Joshi, F. Kurian, S. Prestemon, G. Vallone

The MQXFA quadrupoles of the U.S High Luminosity LHC Accelerator Upgrade Project are being assembled at the Lawrence Berkeley National Laboratory, and then tested vertically in liquid helium (LHe) at the Brookhaven National Laboratory. Three magnets initially did not pass the vertical test due to lack of coil support at the end region. These magnets were re-assembled with increased azimuthal preload, and re-tested. Their test was successful, and one of these magnets did not even train during the re-test. Given that the coils are typically thinner at the ends, a decision was made to insert tapered shims at one of the coils ends, in order to provide better support during the test. This modification was implemented in the last two tested magnets and their test was successful. In total, twelve magnets plus five rebuilds have been tested so far. This work presents a summary of the strain gauge data of the tested magnets, with a focus on the rebuilds with increased preload, and on the magnets that had tapered shims inserted.

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