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Electromagnetic compatibility and spurious triggering detection validation of the Coupling Loss Induced Quench units for superconducting magnet protection in the High-Luminosity LHC project

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The Coupling-Loss-Induced-Quench (CLIQ) concept is an integral part of the quench protection system for the High-Luminosity Large Hadron Collider (HL-LHC) Inner Triplet superconducting magnets at CERN. Since the discharge of the CLIQ unit induces a change of the magnetic field in the low beta quadrupoles, a spurious trigger during operation could deflect the beam, potentially causing critical losses and posing a failure risk for the LHC. To ensure reliable and faultless operation and to prove that the units are immune to potential interferences capable of provoking an erratic trigger, several qualification tests were performed, including interference tests with actual LHC equipment and standard Electromagnetic Compatibility (EMC) tests. Furthermore, the precision of the CLIQ monitoring sensors was validated to confirm that, in the unlikely event of a spurious trigger, the particle beam could be dumped in time to prevent damage. The final CLIQ units, with enhanced redundancy, monitoring and safety measures, and robust EMC design, have been completed. This paper details the conducted EMC tests, confirming their resistance to erratic triggers and ability to timely request beam dumps.

Footnotes

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Europe

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