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Performance of the cold powered diodes and diode leads in the main magnets of the LHC

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During quench tests in 2010 variations in resistance of an order of magnitude were found in the diode bypass circuit of main LHC magnets. An investigation campaign was started to understand the source, the occurrence and the impact of the high resistances. Many tests were performed offline in the SM18 test facility with a focus on the contact resistance of the diode to heat sink contact and the diode wafer temperature. In 2014 the performance of the diodes and diode leads of the main dipole bypass systems in the LHC was assessed during the so-called CSCM test. In the test a current cycle similar to a magnet circuit discharge from 11 kA with a time constant of 100 s is performed. Resistances of up to 400 $\mu\Omega$ have been found in the diode leads at intermediate current, but in general the high resistances decrease at higher current levels and no signs of overheating of diodes have been seen and the bypass circuit passed the test. In this report the performance of the diodes and in particular the contact resistances in the diode lead are analysed with available data acquired over more than 10 years from acceptance test until the CSCM test in the LHC.

Primary author: Dr WILLERING, Gerard (CERN)

Co-authors: VERWEIJ, Arjan (CERN); GILOUX, Christian (CERN); DIB, Gaelle (CERN); BAJKO, Marta (CERN); BEDNAREK, Mateusz Jakub (CERN); ROWAN, Scott (University of Glasgow (GB)); ROGER, Vincent (CERN); Mr CHARIFOULLINE, Zinur (CERN)

Presenter: Dr WILLERING, Gerard (CERN)

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