Training Behaviour of the Main Dipoles in the Large Hadron Collider

E. Todesco, B. Auchmann, M. Bajko, L. Bottura, O. Bruning, G. De Rijk, P. Fessia, P. Hagen, S. Le Naour, M. Modena, J. C. Perez, L. Rossi, R. Schmidt, A. Siemko, J. Ph. Tock, D. Tommasini, A. Verweij, G. Willering

CERN, TE Department, Geneva 23 1211 Switzerland

Email: Ezio.todesco@cern.gov

***Abstract*— In 2015, the 1232 Nb-Ti dipole magnets in the Large Hadron Collider have been commissioned to 7.8 T operational field, with 172 quenches. More than 80% of these quenches occurred in the magnets of one of the three cold mass assemblers (3000 series), confirming what already observed in 2008. In this paper, the recent analysis carried out on the quench performance of the LHC dipole magnets is reported, including the individual reception tests and the 2008 and 2015 commissioning campaigns, to better understand the above-mentioned anomaly and give an outlook for future operation and possible increase of the operational field. The lower part of the quench probability spectrum is compatible with Gaussian distributions; therefore the training curve can be fit through error functions. An essential ingredient in this analysis is the estimate of the error to be associated to the training data due to sampling of rare events, allowing to test different hypothesis. Using this approach, an estimate of the number of quenches required to reach 8.3 T (corresponding to the 7 TeV nominal energy) is given, and we propose to have two LHC sectors trained towards this target before the next warm up of the LHC.**

***Keywords (Index Terms)*— Superconducting magnets, Niobium-tin, Type II superconductors, superconducting coils.**

IEEE/CSC & ESAS SUPERCONDUCTIVITY NEWS FORUM (global edition), January 2017 (Preview 2).
Submitted September 24, 2016; Selected November 26, 2016. Reference ST563; Category 6.
This ASC 2016 manuscript 1LOr2B-02 was submitted to *IEEE Trans. Appl. Supercond.* for possible publication.