

Title: Performance of the LHC Arc Superconducting Quadrupoles towards the End of their Series Fabrication

Authors: Theodor Tortschanoff, Per Hagen, Michele Modena, Lucio Rossi, Stephane Sanfilippo, Karl Martin Schirm, Ezio Todesco, Elena Wildner (CERN, Geneva), Rolf Burgmer, Hans-Udo Klein, Detlef Kirschel, Bernd Schellong, Paul Schmidt (ACCEL, Bergisch Gladbach), Maria Durante, Alain Payn, Fabrice Simon (CEA, Gif-sur-Yvette)

The fabrication of the 408 main arc quadrupole magnets and their cold masses will come to an end in summer 2006. A rich collection of measurement and test data has been accumulated and their analysis is presented in this paper. These data cover the fabrication and the efficiency in the use of the main components, the geometrical measurements and the achieved dimensional precision, the warm magnetic measurements in the factory and the performance at cold conditions, especially the training behaviour. The scrap rate of the NbTi/Cu conductor as well as that of other components turned out to be acceptably low and the quench performance measured was in general very good. Most quadrupoles measured so far exceeded the operating field gradient with one or no quench. The multipole content at cold was measured for a limited numbers of quadrupoles as far as needed for verifying the warm-to-cold correlation. From the point of view of field quality, all quadrupoles could be accepted for the machine and the measures taken to overcome the problem of a too high permeability of a batch of collars are discussed.