

Superconductivity: Its Role, Its Success and Its Setback in the Large Hadron Collider (LHC) of CERN

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Abstract - The Large Hadron Collider - LHC, the particle accelerator at CERN, Geneva, is the largest and probably the most complex scientific instrument ever built. Superconductivity plays a key role because the accelerator is based on the reliable operation of almost 10,000 superconducting magnets cooled by 130 tonnes of helium at 1.9 and 4.2 K and containing a total stored magnetic energy of about 15,000 MJ (including detector magnets). The characteristics of the 1200 tonnes of high quality Nb-Ti cables have met the severe requests in terms of critical currents, magnetization and inter-strand resistance; the magnets are built with an unprecedented uniformity, about 0.01% of variation in field quality among the 1232 main dipoles which are 15 m in length and 30 tonnes in weight. The results of this 20 year long enterprise will be discussed together with problems faced during construction and commissioning and their remedies. Particular reference is made to the severe incident which occurred nine days after the spectacular start-up of the machine on 10th September 2008. The status of repair and the plan for the physics program in 2010 are also presented.

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