

The Large Hadron Collider (LHC), the Higgs boson and Superconductivity for next generation accelerators at CERN

Speaker: Prof. Lucio Rossi, CERN, High Luminosity Project Coordinator

Abstract:

LHC is the largest scientific instrument: based on more than 1700 large superconducting magnets, it is the summit of thirty years of technology advance in particle accelerators. After the Higgs discovery, to extend the discovery reach an upgrade of LHC is envisaged, requiring new and more advanced technologies: superconducting magnets capable of 11-13 tesla, superconducting cables capable of 150 kA and special SCRF cavities able of beam manipulation on femtosecond scale. The upgraded machine, called High Luminosity LHC should be able to deliver ten times more collision than LHC. The plan for a new large project aimed at increase up to 100 TeV the collision energy will be described, as well as a few spin off of our technology in our daily life.

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Lucio Rossi became **doctor in Physics** at the University of Milan in 1980 with a thesis on plasma physics. Then he carried out his research on applied superconductivity for particle accelerators in the Physics dept. of the University of Milan, becoming **Professor of Experimental Physics** in 1992. His main activities have been the design and construction of Superconducting Cyclotron (5 tesla, 40 MJ coils), now operating at the INFN-LNS in Catania, I; the design of the Al-stabilized thin SC (superconducting) solenoid of the ZEUS detector (HERA at Desy, Hamburg); the development in 1998 of record J_c Nb₃Sn superconductor with Europa Metalli, the construction of the first prototype of the LHC 9 T magnet dipole for CERN; the development of the super-stabilized superconductor and the first 25 m long superconducting coils for the Barrel Toroid SC magnet of LHC experiment ATLAS.

From 2001 he joined CERN where he has led until June 2011 the **Magnet, Superconductor and Cryostat Group for the LHC Project**, (about 1700 large superconducting magnets operating in superfluid helium). The Magnet system is the main part of the LHC (worth of 1200 M€, more than 50% of the total LHC material budget) and its most complex and technological advanced system. It is the largest enterprise in superconductivity ever attempted.

From 2010 he is **the leader of the High Luminosity LHC**, a project aimed at increasing by a factor 10 the luminosity performance of the LHC above its nominal value. The project includes the development of 13 T High Field SC Magnets, special SC RF Cavities (crab cavities), high current (200 kA) SC links and also the R&D for 16-20 T class dipoles in view of the High Energy LHC.

He has received the **IEEE Council of Superconductivity Award** for sustained contribution to Applied Superconductivity in August 2007 in Philadelphia, and has been nominated IEEE-CSC Distinguished Lecture for Superconductivity for 2013. He is author of more than 140 publications on international journals and reviews.

He is active in public outreach: he is founding member from 1985 of "Euresis", an association for the promotion of scientific culture established in Milan, and he frequently gives talks to general public and in cultural events on science and relation between science, technology, certainty and truth.

