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High Luminosity Large Hadron Collider

The Large Hadron Collider (LHC) is the largest scientific instrument ever built. It has been exploring the new energy frontier since 2009, gathering a global user community of 7,000 scientists. It will remain the most powerful accelerator in the world for at least two decades, and its full exploitation is the highest priority in the European Strategy for Particle Physics, adopted by the CERN Council and integrated into the ESFRI Roadmap. To extend its discovery potential, the LHC will need a major upgrade around 2020 to increase its luminosity (rate of collisions) by a factor of 10 beyond its design value. As a highly complex and optimized machine, such an upgrade of the LHC must be carefully studied and requires about 10 years to implement. The novel machine configuration, called High Luminosity LHC (HL-LHC), will rely on a number of key innovative technologies, representing exceptional technological challenges, such as cutting-edge 13 tesla superconducting magnets, very compact and ultra-precise superconducting cavities for beam rotation, new technology for beam collimation and 300-metre-long high-power superconducting links with zero energy dissipation.

HL-LHC federates efforts and R&D of a large community towards the ambitious HL-LHC objectives and contributes establishing the European Research Area (ERA) as a focal point of global research cooperation and a leader in frontier knowledge and technologies. However, it relies on a strong participation from outside the (ERA), in particular leading US and Japanese laboratories, which will facilitate the implementation of the construction phase as a global project. The proposed governance model is tailored accordingly and may pave the way for the organization of other global research infrastructures.

Primary authors: Prof. ROSSI, Lucio (CERN); BRUNING, Oliver (CERN)

Co-authors: BALLARINO, Amalia (CERN); Dr JENSEN, Erk (CERN); Dr TODESCO, Ezio (CERN); Dr ZIMMERMANN, Frank (CERN); MANGANO, Michelangelo (CERN); Dr REDAELLI, Stefano (CERN); FARTOUKH, Stephane (CERN)