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Towards 16 T dipole magnets for Future Circular Colliders

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The construction of new particle accelerators, more powerful and larger than ever, requires the design and development of high-field superconducting magnets made of Nb₃Sn conductor. Beyond obvious challenges pertaining to the size of such machines and consequently, the financial endeavour, the production of superconducting magnets of accelerator quality, which develop fields much higher than nowadays, calls for a number of design innovations and technological pushes. The Nb₃Sn magnets for the High Luminosity LHC, namely the 11T dipole magnet for the upgrade of the LHC collimation system, and the large aperture quadrupole for the new triplets, are a big step forward. The installation in LHC of four 11T dipole magnets is foreseen during the long shut down 2 of the machine that is scheduled in years 2019-2020. It will be the first Nb₃Sn magnet ever installed in a particle accelerator. This paper presents the progress at CERN on the development activities relating to the 11 T dipole magnet, with an overview of the technological challenges. The FRESKA II magnet, a 13 T dipole with a 100 mm aperture that will be used to upgrade the CERN cable test facility FRESKA, will be briefly presented, as another step towards higher fields. Finally, an overview of the 16 T dipole magnet programme currently conducted jointly in Europe and in the US will be given, with focus on the design and technology developments.

Experimental Collaboration

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