

Future Circular Colliders

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The global Future Circular Collider (FCC) study is developing a 100-TeV hadron collider (FCC-hh) in a new 100 km long tunnel, i.e. about four times larger than the operating Large Hadron Collider (LHC). The FCC study also includes the design of a high-luminosity electron-positron collider (FCC-ee), which could be installed in the same tunnel as a potential intermediate step, a lepton-hadron collider option (FCC-he), as well as an energy upgrade of the LHC using the FCC-hh technology (HE-LHC).

The scope of the FCC study comprises accelerators, technology, infrastructure, detector, physics, concepts for worldwide data services, international governance models, and implementation scenarios. Among the FCC core technologies figure 16 T dipole magnets, based on Nb3Sn superconductor, and new detector technology, e.g. to handle higher-energy hadron collisions with large pile up or short bunch spacing, as well as highly efficient superconducting radiofrequency systems for all collider scenarios.

The international FCC study is hosted at CERN and mandated to deliver a Conceptual Design Report together with a preliminary cost estimate by 2018/19. Since February 2014, more than 70 institutes from 26 countries and four continents have joined the FCC collaboration. Part of the FCC study is co-funded by the European Commission under a HORIZON 2020 grant ("EuroCirCol"), which addresses the core aspects of the hadron collider design.

A parallel design effort centred at IHEP Beijing aims at designing and constructing circular lepton and hadron colliders in China, following a similar concept with somewhat smaller circumference of about 54 km, called CEPC/SPPC.

In this seminar, we will report the motivation and the present status of the Future Circular Collider study, the major design challenges, R&D topics, and the emerging global collaboration.