

Future Circular Collider Study - FCC

Context and Scope

Context

A conceptual design study of options for a future high-energy frontier circular collider at CERN for the post-LHC era shall be carried out, implementing the request in the 2013 update of the European Strategy for Particle Physics (CERN-Council-S/106), which states, inter alia, that:

“..., Europe needs to be in a position to propose an ambitious post-LHC accelerator project at CERN by the time of the next Strategy update, when physics results from the LHC running at 14 TeV will be available.” and that “CERN should undertake design studies for accelerator projects in a global context, with emphasis on proton-proton and electron-positron high-energy frontier machines. These design studies should be coupled to a vigorous accelerator R&D programme, including high-field magnets and high-gradient accelerating structures, in collaboration with national institutes, laboratories and universities worldwide.”

(<http://cds.cern.ch/record/1567258/files/esc-e-106.pdf>)

This design study shall be organised on a world-wide international collaboration basis under the auspices of the European Committee for Future Accelerators (ECFA) and shall be available in time for the next update of the European Strategy for Particle Physics, foreseen by 2018.

Scope

The main emphasis of the conceptual design study shall be the long-term goal of a hadron collider with a centre-of-mass energy of the order of 100 TeV (FCC-hh) in a new tunnel of 80-100 km circumference for the purposes of studying physics at the highest energies. The hadron collider and its detectors shall determine the basic requirements for the tunnel, surface and technical infrastructures. The corresponding hadron injector chain shall be included in the study, taking into account the existing CERN accelerator infrastructure and long-term accelerator operation plans. The performance and cost of the hadron collider shall be compared to a high-energy LHC based on the same high-field magnet technology and housed in the LHC tunnel.

The conceptual design study shall also include a lepton collider and its detectors (FCC-ee), as a potential intermediate step towards realization of the hadron facility. The design of the lepton collider complex shall be based on the hadron collider infrastructure and any substantial incompatibilities with respect to the hadron collider infrastructure requirements shall be analysed and quantified. Potential synergies with linear collider detector designs should be considered.

Options for e-p scenarios (FCC-he) and their impact on the infrastructure shall be examined at conceptual level.

The study shall include cost and energy optimisation, industrialisation aspects and provide implementation scenarios, including schedule and cost profiles.