The Future Circular Collider (FCC) Study, hosted by CERN, is an international collaboration of more than 70 institutes from all over the world. The FCC is a proposed next-generation circular collider with a circumference of 100 km and its goal is to push the energy and intensity frontiers of particle colliders in the search for new physics.

The CERN Survey team is implicated in all stages of the assembly and installation of accelerator beamlines and experiment detector components for any new project. Our studies are concentrated on those aspects which present new challenges: the need of extensive areas of Permanent Monitoring and Alignment Systems, a potential remote maintenance system, development of new methods and instrumentation in order to meet the high alignment precision requirements and the extension of the geoid model and reference systems used at CERN.

FCC project:
- Hosted and coordinated by CERN
- Carried out with partners worldwide
- Launched in 2014
- Conceptual Design Report by the end of 2018

The final FCC layout is yet to be determined and it is continuously changing, trying to find the best agreement between feasibility and cost on those aspects which present new challenges: the need of extensive areas of Permanent Monitoring and Alignment Systems, a potential remote maintenance system, development of new methods and instrumentation in order to meet the high alignment precision requirements and the extension of the geoid model and reference systems used at CERN.

Location and Potential Layout
- Tunnel infrastructure in Geneva area
- Linked to CERN accelerators complex
- The final FCC layout is yet to be determined and it is continuously changing, trying to find the best agreement between feasibility and cost of the tunnelling works and machine configuration.

One of the latest potential FCC layouts is the 100 km ‘intersecting’ option.

- 7.8 km tunnelling through Jura limestone
- 300-400 m deep shafts and caverns in molasse

Underground Infrastructure
Two different infrastructures are under consideration: a single and a twin tunnel design.

- 100 km machine tunnel
- 2 x ~4 km Injection tunnels
- 2 x ~2 km Beam Dump tunnels
- Bypass tunnels (RF/transport)
- Widened tunnel at FCC-ee IPs

Machines
Three different types of machines are currently under study:
- FCC-hh is a 100 TeV proton-proton collider -> Defines infrastructure needs. Alignment precision requirement: ~ 150 μm
- FCC-ee is a high-luminosity, high-precision electron-positron collider -> Potential intermediate step. Alignment precision requirement: ~ 17 μm
- FCC-eh combines the intense hadron (proton and ion) beams of the LHC and the possible FCC-hh with the LinC, a new potential electron accelerator at CERN -> Integration aspects.

The FCC-ee is a 100 TeV proton-proton collider, which is potential intermediate step. Alignment precision requirement: ~ 17 μm. It combines the intense hadron (proton and ion) beams of the LHC and the possible FCC-hh with the LinC, a new potential electron accelerator at CERN for integration aspects.

Footnotes:
- Conceptual Design Report by the end of 2018
- Permanent Monitoring and Alignment Systems
- Remote Maintenance
- New Alignment Instruments and Methods
- Conclusion and Future Steps
- Geoid model
- Surface Network
- Alignment Methods
- Conclusions
- Next Steps

FCC-ee is a high-luminosity, high-precision electron-positron collider. It is a potential intermediate step with alignment precision requirement: ~ 17 μm. It combines the intense hadron (proton and ion) beams of the LHC and the possible FCC-hh with the LinC, a new potential electron accelerator at CERN for integration aspects.