

Status on geodetic studies and alignment perspectives for the CERN Future Circular Collider

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The ongoing feasibility study for the Future Circular Collider (FCC-ee) planned to be built at CERN raises survey and geodetic challenges. Developing an alignment strategy for the 8832 magnets within the 91.2 km circular tunnel, associated transfer lines, and the 2 or 4 experiments is critical. A robust geodetic infrastructure, including the definition of coordinate reference systems and the implementation of associated reference frames must be created together with the development of a local geoid model. Concurrently, automated methods for the fiducialisation of equipment and their precise alignment in the tunnel and experimental caverns must be devised. Furthermore, the maintenance of the alignment must be anticipated over the 20 years of foreseen operation with permanent or periodic monitoring and readjustment systems. The new methods will have to respect strict alignment tolerances for the different parts of the accelerator, such as the straight sections, interaction regions, and machine-detector interfaces. Given the size of the machine, these methods should also enable survey operations to be completed within a reasonable timeframe and with minimal human workforce.

This paper presents the current status of the study and gives perspectives and plans for additional research and development that will be carried out in the coming years to prepare the final feasibility study report and the technical design report.

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