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Validation of micro-triangulation with direct wire measurements in the LHC tunnel

In the past few years, we developed the micro-triangulation method with direct wire measurements for magnet fiducialisation applications. The method was previously validated in metrology laboratory conditions and on close range measurements of a few meters, where uncertainties of a few tens of micrometres were achieved, in comparison with a coordinate measurement machine. Here, we attempt to validate the method for alignment applications on field, by organising and executing a test measurement in the LHC tunnel, with observations up to 25 m, in an elongated network of about 80 m. The paper describes the simulation, the instrumentation used and the methodology of the measurement, as well as the advantages and the limitations of the method, in general and in relation with the conditions and constraints imposed by the tunnel environment. Finally, we evaluate the uncertainty of the measurement in comparison with the standard ecartometry method which is used for the LHC alignment.

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