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Development and validation of an absolute Frequency Scanning Interferometry network

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Summary

One of the tasks of PACMAN is to transfer the position of the functional axes of CLIC components to external reference marks also known as fiducials in order to facilitate their alignment in the tunnel. Project 1.2 seeks to develop an alternative solution of coordinate measurement using Frequency Scanning Interferometry (FSI), an absolute distance measurement technique. Etalon's Absolute Multiline Technology; an implementation of FSI, will provide distance measurements with sub-micron precision that are traceable to the SI meter. These distances will be combined with the technique of multilateration, a coordinate determination technique based on distances only to provide a highly accurate coordinate measurement system. As part of this project, we shall modify the fiber end housing to enable absolute distances between two points to be measured. In order to build a self-calibrating multilateration network we shall develop a new mount to enable several distances to be made from a single point. Additionally, in order to produce precise coordinates with multilateration it is essential to have good geometry which is limited by narrow viewing angle retroreflectors. To this end we are conducting tests with targets that can provide a viewing angle of up to 360°. Simulations will be conducted using LGC++, to determine the most precise network configuration and the optimum number of channels within existing constraints.

Presenter: Mr KAMUGASA, Solomon William (CERN)

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