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A multichannel Frequency Scanning Interferometry system for large scale metrology of accelerator components

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In the frame of the High-Luminosity LHC (HL-LHC) project at CERN, a series of sensor solutions based on Frequency Scanning Interferometry (FSI) has been proposed for the alignment and monitoring of accelerator components along a total length of more than 800 m. The adoption of FSI technology reduces the overall cost of alignment installations, mitigates the impact of environmental noise, and limits the space required for signal cables. A development strategy for multi-channel interferometers, covering over 500 diverse FSI sensors has been put in place.
This paper deals with the development and testing of the FSI interferometer. Initially, a prototype with 16 channels was installed and qualified. Following successful qualification tests, larger-scale implementations with 32 and 64 channels were deployed, enabling comprehensive tests with the entire spectrum of FSI sensors installed on a movable component. This process prepares for the deployment of the final 256-channel interferometer for the HL-LHC. This contribution presents details of the interferometer solution, encompassing optics, electronics, and software design, along with the results and analysis of the system tests.

Footnotes

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Author: SOSIN, Mateusz (European Organization for Nuclear Research)

Co-authors: MARQUET, Alexis (European Organization for Nuclear Research); SCHOFIELD, Brad (European Organization for Nuclear Research); FRANCO, Clara Cala (European Organization for Nuclear Research); BLANCO VINUELA, Enrique (European Organization for Nuclear Research); DURAND, Helene Mainaud (European Organization for Nuclear Research); GONZALEZ COBAS, Juan (European Organization for Nuclear Research); LIPINSKI,

Maciej (European Organization for Nuclear Research); FERNANDEZ CRUCHAGA, Miguel (European Organization for Nuclear Research); PERONNARD, Paul (European Organization for Nuclear Research); WLOSTOWSKI, Tomasz (European Organization for Nuclear Research)

Presenter: SOSIN, Mateusz (European Organization for Nuclear Research)

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