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Design and deployment of an in-vacuum Electro-Optic BPM at the CERN SPS

Tuesday, 10 September 2024 16:00 (1h 30m)

Accurate monitoring and control of charged particle beams at the HL-LHC demands the development of new beam diagnostics tools. This poster provides an overview of the electro-optic beam position monitor (EO-BPM), currently taking measurements at CERN's SPS. This device uses the Pockels effect to monitor the transverse position and instabilities in the particle beam. Comprising of a laser source, electro-optic crystal, optical system, and a fast photodetector, the EO-BPM operates by generating a modulated optical signal directly linked to the propagating electric field of the beam.

The EO-BPM is designed as a self containing button with fibre-coupled laser connected to the crystal inside and a fibre coupled Mach-Zehnder interferometer yielding sum and difference signals on the outside. A segment of the SPS beam pipe is fitted with a mount to connect the button, allowing the electric field induced by the particle beam to be captured and transferred to the electro-optic crystal.
The goal is to gain insight into the transverse position along the bunch and the identification of intra-bunch instabilities, contributing to precision in beam monitoring and control.

Footnotes

Funding Agency

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Yes

Primary author: BOSMAN, Max (Royal Holloway, University of London)

Co-authors: GIBSON, Stephen (Royal Holloway, University of London); LEFEVRE, Thibaut (European Organization for Nuclear Research); LEVENS, Thomas (European Organization for Nuclear Research)

Presenter: BOSMAN, Max (Royal Holloway, University of London)

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