Contribution ID: **38** Type: **not specified**

High frequency solutions to electron beam position measurements in the AWAKE common beamline

Wednesday 12 June 2024 13:20 (15 minutes)

In AWAKE, the Advanced WAKefield Experiment, relativistic proton bunches produced by the CERN Super Proton Synchrotron (SPS) are used to drive high gradient plasma wakefields for the acceleration of short-pulse electron bunches to 2 GeV in a 10 m plasma cell. Precise control of the injected electrons is vital for operation of the seeding of the self modulation of the proton bunch, therefore the position of both beams must be monitored simultaneously. The monitoring of 2 diverse beam types necessitates an electron beam position monitor (BPM) working in a frequency regime of tens of GHz. A high frequency conical button-style BPM and a BPM utilising Cherenkov Diffraction Radiation (ChDR) have been developed and installed in the AWAKE common beamline. This work presents the results from extensive beam tests carried out in the last beam year to assess the suitability and performance of each device in a range of beam conditions.

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Session Classification: Parallel talks