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Recording two-beam LHC BPM signals to validate a technique for extracting individual beam positions

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As part of the High Luminosity upgrade for the Large Hadron Collider, several new directive-coupler (stripline) BPMs will be installed near the ATLAS and CMS detectors where the two counter-rotating beams exist within a single beampipe. In the worst case scenario, the bunches of the second beam arrive at the BPM location just 4 ns after those of the first and the BPM signals from the two beams overlap significantly. Using simulations of the expected BPM output, a novel scheme for digitally processing these two-beam signals in order to extract the true position of each beam has been developed. The offline validation of this technique requires genuine two-beam signals. In October 2022, suitable signals were gathered using an early proof-of-concept digital BPM processor connected to an existing room-temperature stripline BPM close to the CMS detector. During this period of data acquisition, RF cogging was used to vary the difference in arrival time of the two beam at the BPM location and orbit bumps were used to vary the beam-beam displacement in order to ultimately be able to determine the performance of the digital processing scheme.

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Footnotes

I have read and accept the Privacy Policy Statement

Yes

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