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First Measurements of a Demonstrator for the Electro-Optical Bunch Arrival-Time Monitor with PCB-based Pickups

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In an ongoing quest to improve beam instrumentation, an update of the established electro-optical bunch arrival-time monitors (EO-BAM) is intended to achieve a sensitivity that enables stable operation of X-ray free-electron lasers with bunches down to a minimum charge of 1 pC or significantly increase the resolution of single-shot measurements in normal operation. In a joint project, the pickup structure and the RF path as well as the electro-optical modulators are being redesigned. The preliminary concept achieved an estimated theoretical jitter charge product of 9 fs pC. To proof feasibility of this concept, in 2023 a first demonstrator of the EO-BAM together with its rf part, comprising of planar pickups with integrated combination network on a printed circuit board and 67-GHz feedthrough, was manufactured and rf measurements were carried out at ELBE.

Summary

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