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Time-of-flight beam loss monitor for the Advanced Photon Source upgrade booster to storage-ring transport line

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We present initial results from the booster-to-storage-ring beam-loss monitor (BTSBLM) employing time-of-flight analysis to localize and minimize losses along the BTS line. The BTSBLM utilizes a pair of high-purity, fused silica fiber optic cables running in parallel along the 65-m BTS transport line. Photomultipliers located at both upstream and downstream ends of each fiber monitor Cherenkov radiation generated by lost electrons. The downstream detectors receive temporally-compressed, higher-intensity, spatially-inverted signals, while the upstream waveforms are temporally expanded with lower intensity allowing finer time resolution; both upstream and downstream effects owing to the refractive index in the fiber glass. Each radiation-hard optical fiber is composed of 600, 660, and 710-micron-diameter core, cladding, and buffer and is similar to those used in the newly commissioned LCLS-II superconducting linac BLM system. Realtime waveforms are recorded on a fast oscilloscope and available for diagnostic observation through EPICS waveform records. Remote controlled high-voltage power supplies provide gain adjustment. Data from booster and storage-ring commissioning are presented.

Footnotes

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