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Near-Infrared noise in intense electron beams

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Requirements for the noise in electron beams (NEB) have recently approached the Shot-noise level in some new applications. The density fluctuations of intense beams in the near-infrared (NIR) region are being measured at the Fermilab Accelerator Science and Technology (FAST) facility. The main goal of the experiment is to accurately compare the Shot-noise model with the observations of optical transition radiation (OTR) generated by the $\gamma=63$ electron beam transiting an Al metal surface. In addition, evidence for longitudinal-space-charge-induced microbunching for the chicane-compressed beam was obtained with coherent enhancements up to 100 in the various bandwidth-filtered NIR OTR photodiode signals. With micropulse charges up to 1 nC, the beam parameters are close to those proposed for a stage in an Electron-Ion Collider (EIC) with coherent electron cooling (CEC). In this paper we present the current progress of the NEB project and compare the low electron energy measurements with ImpactX simulations.

Footnotes

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