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Simulation of the ion profile monitors in the Brookhaven AGS

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Ion profile monitors (IPMs) provide a non-destructive means of measuring the transverse beam size of a passing ion beam in a particle accelerator. The Alternating Gradient Synchrotron (AGS) at Brookhaven National Lab is equipped with two types of IPMs: ion-collecting and electron-collecting. While ion-collecting IPMs are susceptible to significant distortions in the measured beam size due to the space charge of the passing beam, electron-collecting IPMs are much less affected. However, in the AGS, electron-collecting IPMs can only be operated periodically to preserve sensor lifespan, leaving ion IPMs as the sole source of consistent, real-time beam size feedback during operation. In this work, WarpX simulations of IPM operation are used to characterize the measured beam size as a function of beam parameters and IPM operating conditions. These simulations are then compared against experimental data collected from both ion and electron IPMs in the AGS. The findings aim to refine correction factors, enabling more accurate beam size estimations from ion IPM measurements, ultimately improving beam diagnostics and operational efficiency.

Footnotes

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