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Low-charge, high-resolution beamline preparation for the nanopatterned microbunching experiment at Argonne Wakefield Accelerator

Monday 11 August 2025 16:00 (2 hours)

The emittance exchange (EEX) beamline at the Argonne Wakefield Accelerator (AWA) is designed to transfer properties of an electron beam phase space between the transverse and longitudinal planes. Recently, it has been proposed this beamline could be used to convert a microscale transverse modulation created by a TEM grid into a microbunch train in the longitudinal plane.*Such a technique would be useful for obtaining nano-scale microbunching that does not rely on the sensitive process of FEL gain. This new approach has been proposed to enable development of a compact free-electron laser at Arizona State, greatly reducing size and cost compared with existing short wavelength FELs. To perform an exploratory demonstration of this concept at AWA, this experiment requires low normalized emittance (˜50 nm*rad), low charge (˜1pC) electron bunches, and transverse diagnostics with high-resolution (1-3 microns) and high-light-collection to resolve the modulation on the electron beam. This report will give a progress update on preparing the necessary beams and diagnostics at AWA for an emittance exchange experiment that would produce 100s of nm scale microbunches.

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No

Would you like to submit this poster in student poster session on Sunday (August 10th)

No

Footnotes

*G. Ha et al., "Coherent radiation from initially modulated beams using emittance exchange at the Argonne Wakefield Accelerator,"Nucl. Inst. and Methods A, vol. 1075, p. 170387, Jun. 2025.

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