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CW SRF gun generating beam parameters sufficient for CW hard-X-ray FEL

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SRF CW accelerator constructed for Coherent electron Cooling project at Brookhaven National Laboratory frequently demonstrated record parameters using 1.5 nC 350 psec long electron bunches, typically compressed to FWHM of 30 psec using ballistic compression. In this paper we report experimental demonstration of CW electron beam with parameters fully satisfying all requirements for hard-X-ray FEL and significantly exceeding those demonstrated by APEX LCLS II electron gun. The most remarkable part of this achievement in this experiment that we used 10-years old SRF gun with modest accelerating gradient ~ 15 MV/m, a bunching cavity followed by basisc compression to generate 50 pC, 15 psec electron bunches with normalized emittance of 0.15 mm mrad and normalized project emittance of 0.2 mm mrad. In other words, we are presenting alternative method of generating CW electron beams needed for hard-X-ray FELs using existing and proven accelerator technology. We present description of the accelerator system setting, details of projected and slice emittance measurements as well as relevant beam dynamics simulations.

Footnotes

Paper preparation format

Word

Region represented

America

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Author: LITVINENKO, Vladimir (Stony Brook University)

Co-author: BACHHAWAT, Nikhil (Stony Brook University)

Presenter: LITVINENKO, Vladimir (Stony Brook University)

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