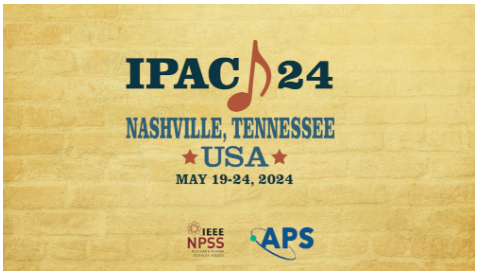

Contribution ID: **879** Contribution code: **WEPC63** Type: **Poster Presentation**

Dark current reduction for NSRRC photoinjector system by collimation

Wednesday, 22 May 2024 16:00 (2 hours)

NSRRC THz facility provides MW-level superradiant radiation with wavelengths ranging from 100–500 μm from a U100 planar undulator. An S-band laser-driven photocathode radio-frequency (RF) gun has been used in its 25 MeV linac system to generate a sub-picosecond high brightness relativistic electron beam for coherent emission of undulator radiation. However, the high accelerating field in the gun cavity is found to be the main cause of electron field emission that generates the non-negligible background current (dark current) in the system. A portion of the field-emitted electrons with launching conditions close to that of the main beam can be accelerated to high energies in the booster linac structure located downstream. Collision of these unwanted high energy electrons with the vacuum vessel in the system becomes the main source of excessive radiation dosage. In order to limit the transportation of these unwanted electrons to the booster linac, a collimation system will be implemented upstream of the linac. In this work, a model of the drive linac system has been setup with 3D space charge tracking code –IMPACT-T for main beam and dark current simulation. Particle trajectories under various launching conditions are also analyzed. Best location of the collimator has been chosen for dark current reduction.

Footnotes

Funding Agency

Paper preparation format

Region represented

Asia

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Session Classification: Wednesday Poster Session

Track Classification: MC2: Photon Sources and Electron Accelerators: MC2.T02 Electron Sources