Contribution ID: **2549** Contribution code: **TUPA064** Type: **Poster Presentation**

Simulations and experimental studies for an X-band short-pulse ultra-high gradient photoinjector

Tuesday, 9 May 2023 16:30 (2 hours)

A program is under way at the Argonne Wakefield Accelerator (AWA) facility, in collaboration with Euclid Techlabs and Northern Illinois University (NIU) to develop a GV/m-scale photocathode gun, with the goal of producing bright electron bunches. The novel X-band (11.7 GHz) photo-gun (Xgun) is powered by high-power, short rf pulses (9 ns), which are generated by the AWA drive beam in a wakefield structure. In the first series of experiments, the Xgun produced ˜400 MV/m peak field on the photocathode surface. The Xgun has also shown exceptional robustness, with no noticeable breakdown observed after being fully conditioned. As a first step towards achieving a complete understanding of the Xgun's performance, we aim to investigate the fundamentals of photoemission in the high-gradient regime. Systematic simulations will be presented for the near-future photocathode thermal emittance measurements.

Funding Agency

This work is supported by the U.S. DOE, under award No. DE-SC0022010 to NIU, DOE SBIR grant No. DE-SC0018709 at Euclid Techlabs, and contract No. DE-AC02-06CH11357 with ANL partially supported by LDRD

Footnotes

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Session Classification: Tuesday Poster Session

Track Classification: MC3: Novel Particle Sources and Acceleration Techniques: MC3.A16: Advanced Concepts