Physics and Applications of High Brightness Beams



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A high-field X-band photoinjector for low-emittance electron-beam generation

A path to producing bright electron beams consists of low mean-transverse-energy photocathodes subjected to a high electric field. Such an approach is currently being explored at the AWA facility where a proof-of-principle experiment recently demonstrated the reliable operation of an X-band radiofrequency (XRF) gun with ~ 0.4 -GV/m electric field on the photocathode surface. *This paper discusses the short term activities to fully characterize the physics associated with photoemission from a copper photocathode in a high-field regime. We also describe the development and optimization of an integrated photoinjector coupling the available XRF gun to a compact X-band booster linac. Simulations of the beam dynamics and expected performances are presented along with the opportunities enabled by introducing low-MTE photocathodes in the XRF gun.W.H. Tan et al., Phys. Rev. Accel. Beams 25, 083402 (2022).*

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