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Photonics-Integrated Photocathodes

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

Integrating the advances made in photonics with efficient electron emitters can result in the development of next generation photocathodes for various accelerator applications.
In such photonics-integrated photocathodes, light can be directed using waveguides and other photonic components on the substrate underneath a thin (<100 nm) photoemissive film to generate electron emission from specific locations at sub-micron scales and at specific times at 100 femtosecond scales along with triggering novel photoemission mechanisms resulting in brighter electron beams and enabling unprecedented spatio-temporal shaping of the emitted electrons. In this work we have demonstrated photoemission confined in the transverse direction using a nanofabricated Si3N4 waveguide under a ~20 nm thick cesium antimonide (Cs3Sb) photoemissive film. This work demonstrates a proof of principle feasibility of such photonics-integrated photocathodes and paves the way to integrate the advances in the field of photonics and nanofabrication with photocathodes to develop next-generation high-brightness electron sources for various accelerator applications.

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