IPAC'23 - 14th International Particle Accelerator Conference



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Photonics-Integrated Photocathodes

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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 spatiotemporal 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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