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Development of Bi-Alkali antimonide photocathodes for a 1.3 GHz superconducting rf photo-injector

Tuesday 27 August 2024 16:00 (2 hours)

Superconducting Radio Frequency (SRF) photo-injectors offer the possibility of producing low-emittance electron beams in continuous wave operation. Among the various photo-emissive materials, bi-alkali antimonide is favored for its high quantum efficiency (QE) at visible light wavelengths. A development effort at FRIB is oriented toward the integration of advanced photocathodes into an SRF photo-injector. This paper describes improvements to the cathode preparation chamber, first cathode depositions, and characterization trials. A K2CsSb film was produced with a notably extended dark lifetime, albeit with a modest QE of approximately 5% at 530nm. Extensive spectral response analyses of the layer were conducted, along with thorough assessments of measurement procedures and hardware. This presentation offers insights into the factors contributing to the measured QE and describes plans for improving the cathode preparation chamber and the experimental procedures.

Footnotes

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