IPAC'24 - 15th International Particle Accelerator Conference



Contribution ID: 545 Contribution code: WEPC78

Type: Poster Presentation

High brightness electron source development in Tsinghua university

Wednesday, 22 May 2024 16:00 (2 hours)

High brightness electron source is a key component for accelerator based scientific instruments. The beam brightness can be further improved with the combination of high electric field and low thermal emittance cathode. We develop an ultrahigh vacuum S-band electron gun to accommodate advanced semiconductor photocathodes, which are easily degraded in poor vacuum condition. The high power test of ultrahigh vacuum S-band gun has finished and the axial electric field has reached over 100 MV/m with dark current around 500 pC. The vacuum under operation is 2.08e-8 Pa, which is one of the best vacuum condition with regards to such high gradient operation. The gun has been operated with Cs2Te cathode for 3 months without quantum efficiency (QE) degradation. Advanced photocathode deposition system has been setup in a clean room and the deposited photocathodes are transferred through suitcase to load lock system in ultrahigh vacuum environment. We have deposited K2CsSb cathode in the deposition system. The QE is between 1% and 4.5% with driven laser wavelength of 532 nm. The QE and thermal emittance of the K2CsSb have been measured under high gradient in the gun and results are presented in the paper.

Footnotes

Funding Agency

Work supported by the National Key research and development program of China NO.2022YFA1603400

Paper preparation format

LaTeX

Region represented

Asia

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Session Classification: Wednesday Poster Session

Track Classification: MC2: Photon Sources and Electron Accelerators: MC2.T02 Electron Sources