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High voltage DC gun using Super lattice GaAs photocathode for EIC polarized electron source

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The high-intensity, polarized electron source is a critical component for the electron-ion collider, requiring a polarized electron gun with higher voltage and higher bunch charge than any existing polarized electron source. At Brookhaven National Laboratory, we have built and successfully conditioned an inverted HVDC photoemission gun up to 350 kV. In this study, we report on the performance of a GaAs photocathode in generating 70 μA average current and up to 16 nC bunch charge with a long lifetime using a circularly polarized laser at a wavelength of 780 nm. We discuss the performance and limitations of the Distributed Bragg Reflector GaAs/GaAsP Super Lattice photocathode in the DC gun. We will also show the impact of anode bias and voltage on the lifetime of the superlattice GaAs. The gun is equipped with an integrated cathode cooling system, which has potential applications in high-current electron sources. Various novel features have been implemented and demonstrated in this polarized HVDC.

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