

Ongoing efforts to construct a 350 kV dc high voltage photogun with inverted insulator geometry

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New initiatives at Jefferson Lab require photoguns operating at 350 kV bias voltage. These initiatives include the construction of a compact 10 MeV electron accelerator for commissioning new hardware destined for CEBAF, including the polarized target HDice. Proposed experiments such as DarkLight will benefit from the installation of a 350 kV load-locked gun at the Jefferson Lab energy recovery linac. And a 350 kV photogun could be used to study high bunch-charge magnetized beams needed for cooling proton beams at the Electron Ion Collider. Worldwide, a number of groups have made great progress developing photoguns operating at 350 kV and higher. This contribution describes Jefferson Lab's efforts to build such a gun, but with an inverted-insulator geometry. The inverted-insulator geometry offers advantages over gun designs that employ large cylindrical insulators, but it introduces at least one new challenge, namely, how to reliably apply voltage to the cathode electrode via a high voltage cable without breakdown, which sometimes leads to puncture and catastrophic failure of the insulator. In addition, this contribution describes recent studies devoted to improving our understanding of field emission, and methods to eliminate it.

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