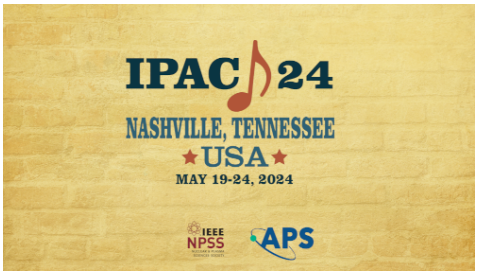

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Toward a long-lifetime polarized photoelectron gun for the Ce+BAF positron source

Monday, 20 May 2024 16:00 (2 hours)

The addition of spin-polarized, continuous-wave (c.w.) positron beams to the 12 GeV Continuous Electron Beam Accelerator Facility (CEBAF) would provide a significant capability to the experimental nuclear physics program at Jefferson Lab. Based on bremsstrahlung and pair-production in a high-Z target, a 120 MeV spin-polarized c.w. electron beam of several milliamperes is required. While the beam dynamics of the high-current electron beam are tenable, sustaining this current for weeks of user operations requires an unprecedented charge lifetime from a high-polarization GaAs-based photocathode. A promising approach to exceed the kilocoulomb charge lifetime barrier is reducing the ion back-bombardment fluence at the photocathode. By increasing the laser size and managing the emittance growth with an adequate cathode/anode design, significantly enhanced charge lifetime may be achieved. Based upon a new simulation model that qualitatively explains the lifetime data previously measured at different spot sizes, we describe the practical implications on the parameter space available for a kilocoulomb-lifetime polarized photogun design.

Footnotes

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