Contribution ID: **9** Type: **not specified**

Capability and Future Ideas of Polarized Beams from GaAs in DC HV Photo-guns

Thursday, 17 February 2022 10:30 (25 minutes)

The landscape of high energy particle physics experiments requiring polarized electron beams was forever changed by the introduction of the GaAs-based electron source to particle accelerators. Introduced in the 1970's to the SLAC accelerator, such a source was used to help establish the Standard Model. Since then DC high voltage polarized electron sources based on GaAs photocathodes were developed and operated at a number laboratories including Nagoya University, the Mainz Microtron, the MIT-Bates Laboratory, NIKHEF, Bonn University, and CEBAF at Jefferson Lab. The prospects continue, with new or upgraded polarized electron sources planned or imagined world-wide including at EIC, MESA, KEK, ILC, and CERN. In this presentation, I will begin with a brief summary of the basic requirements for constructing a DC high voltage polarized electron source and summarize demonstrated and expected performance of various facilities. Next, I will explore the evolution GaAs-source performance leading up to what we describe today as state-of-the-art. I will conclude describing prospects for performance improvement, paying special attention to capability improvements in the areas which may offer to generate higher beam intensities and with longer operating lifetimes.

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Session Classification: Guns