Contribution ID: **2740** Contribution code: **SUPM066** Type: **Poster Presentation**

A 5 MeV Compton transmission polarimeter designed for a SRF photogun

Sunday, 7 May 2023 16:00 (2 hours)

The production of high-current and intense spin polarized electron beams is of great importance in electron-based facilities. Tests are planned to produce such beams in 2023 using GaAs-based photocathodes installed in the Brookhaven National Lab RHIC Coherent electron Cooling superconducting radiofrequency (SRF) photogun [1]. A fast and efficient electron polarimeter operating in the MeV energy range is required to measure the beam spin polarization.

While Mott polarimeters provide larger measured asymmetries, a Compton Transmission polarimeter is well suited in the few MeV energy range. In this work, we report on a relatively compact and cost-effective Compton transmission polarimeter which has been built and calibrated at Jefferson Lab (JLab). First, we present the design of the polarimeter radiator, polarized target analyzing magnet, BGO detector assembly and data acquisition system. Next, results of a two-week commissioning study performed at the JLab Upgraded Injector Test Facility will be described. Here, a well-known polarized electron beam produced from a bulk GaAs photocathode in a dc high-voltage photogun was first measured in a 180 keV Mott scattering polarimeter, then used to characterize and calibrate the Compton transmission polarimeter as a function of the polarized target magnetization and beam properties. Finally, we report an effective analyzing power of the Compton polarimeter and compare experimental results with those produced via Geant4 simulations.

Funding Agency

This material is based upon work funded by U.S. Department of Energy FOA Number LAB 20-2310. It is part of a project that has received support from the DOE under contract DE-AC05-06OR23177.

Footnotes

[1] I. Petrushina et al., "High-Brightness Continuous-Wave Electron Beams from Superconducting Radio-Frequency Photoemission Gun"Phys. Rev. Lett. 124, 244801 (2020)

I have read and accept the Privacy Policy Statement

Yes

Primary author: BLUME, Greg (Thomas Jefferson National Accelerator Facility)

Co-authors: MOFFIT, B. (Thomas Jefferson National Accelerator Facility); FERNANDES NERES, Benjamin (Université Paris-Saclay, CNRS/IN2P3, IJCLab); CUEVAS, Chris (Thomas Jefferson National Accelerator Facility); LE GALLIARD, Christine (Université Paris-Saclay, CNRS/IN2P3, IJCLab); VOUTIER, Eric (Université Paris-Saclay, CNRS/IN2P3, IJCLab); DONG, Hai (Thomas Jefferson National Accelerator Facility); GRAMES, Joseph (Thomas Jefferson National Accelerator Facility); POELKER, Matt (Thomas Jefferson National Accelerator Facility); BRUKER,

Max (Thomas Jefferson National Accelerator Facility); GHOSHAL, Probir (Thomas Jefferson National Accelerator Facility); SULEIMAN, Riad (Thomas Jefferson National Accelerator Facility); MARSILLAC, Sylvain (Old Dominion University); NGUYEN TRUNG, Thi (Université Paris-Saclay, CNRS/IN2P3, IJCLab); ZHANG, Shukui (Thomas Jefferson National Accelerator Facility); GOPINATH, Sandesh (Jefferson Lab)

Presenter: BLUME, Greg (Thomas Jefferson National Accelerator Facility)

Session Classification: Student Poster Session

Track Classification: MC6: Beam Instrumentation, Controls, Feedback and Operational Aspects: MC6.T03: Beam Diagnostics and Instrumentation