IPAC 2018 Search

ID: 3450 Secondary Ions Dynamics in the JLab GTS 300 keV Beam Line

Presenter Cristhian Alfonso Valerio (ECFM-UAS, Culiacan, Sinaloa)

Authors Cristhian Alfonso Valerio (ECFM-UAS, Culiacan, Sinaloa), Don Bullard, Carlos Hernandez-Garcia, Md Abdullah A Mamun, Matt Poelker, Riad Suleiman, Yan Wang, Shukui Zhang (JLab, Newport News, Virginia)

Abstract The Jefferson Lab (JLab) Gun Test Stand (GTS) consists of an inverted insulator geometry 300kV DC photogun and a 4-meter long diagnostic beamline. By means of a CsK2Sb photocathode grown in a preparation chamber connected to the photogun and using a DC laser operating at 532 nm, electron beam has been generated up the limit of the high voltage power supply at 4.5 mA to study photocathode lifetime. Sustained current at that level is limited to a few minutes due to arcing between the photocathode and the anode. However, operating with a solenoid magnet utilized in a separate experiment to generate magnetized beam, leads to sustain 4.5 mA DC for multiple hours without arcing. It is likely that secondary ions generated in the beamline and trapped by the electron beam migrate to the anode-cathode gap where eventually reach sufficiently high density to induce arcing. We present secondary ions dynamics simulation studies to interpret the experimental observations.

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Type of Presentation Poster

Main Classification 02 Photon Sources and Electron Accelerators

Sub Classification A08 Linear Accelerators

ID: 3879 Generation and Characterization of Magnetized Electron Beam from DC Photogun for JLEIC Cooler

Presenter Md Abdullah A Mamun (JLab, Newport News, Virginia)

Authors Md Abdullah A Mamun, Philip Adderley, Jay Benesch, Don Bullard, Joseph Michael Grames, Jiquan Guo, Fay Elizabeth Hannon, John Hansknecht, Carlos Hernandez-Garcia, Reza Kazimi, Geoffrey Arthur Krafft, Matt Poelker, Riad Suleiman, Yan Wang, Shukui Zhang (JLab, Newport News, Virginia), Sajini Anushika Kumari Wijethunga (ODU, Norfolk, Virginia)

Abstract Magnetized electron beam is required for faster electron cooling of ion beams in the proposed JLEIC magnetized cooler, a critical part of the collider ring, to achieve high luminosity. Magnetized electron beam has been generated from a 300 kV DC high voltage photogun and beam magnetization is calculated from beam size and rotation measurements using slit and viewer image diagnostic tools as a function of magnetic field strength on bialkali antimonide photocathode. The lifetime of the magnetized beam is measured as a function of beam magnetization, beam currents (up to 4.5 mA), and DC gun high voltage. Results will be presented for different laser spot sizes and illumination positions on the photocathode for DC and RF pulsed laser.

Funding Agency This work is supported by the Department of Energy, Laboratory Directed Research and Development funding, under contract DE-AC05-06OR23177

Type of Presentation Poster

Main Classification 02 Photon Sources and Electron Accelerators

Sub Classification T02 Electron Sources

ID: 2783 A Research in Inverted High Voltage DC Gun and CsK2Sb Photocathode

Presenter Yan Wang (JLab, Newport News, Virginia)

Authors Yan Wang, Carlos Hernandez-Garcia, Md Abdullah A Mamun, Matt Poelker, Riad Suleiman, Michael George Tiefenback, Shukui Zhang (JLab, Newport News, Virginia), Geoffrey Arthur Krafft (JLab, Newport News, Virginia; ODU, Norfolk, Virginia)

Abstract A compact inverted high voltage DC gun was designed, built, conditioned, and has been operated reliably at 300kV. A thorough study of CsK2Sb photocathode was performed to characterize how the thickness of the Sb layer or roughness of the photocathode surface affects the electron beam emittance, and the life time and quantum efficiency of the photocathode. The performance of the electron gun and the findings of CsK2Sb photocathode studies will be presented.

Funding Agency

Type of Presentation Poster

Main Classification 02 Photon Sources and Electron Accelerators

Sub Classification T02 Electron Sources

ID: 2562 Simulation Study of Magnetized Electron Beam

Presenter Sajini Anushika Kumari Wijethunga (ODU, Norfolk, Virginia)

Authors Sajini Anushika Kumari Wijethunga, Jean Roger Delayen (ODU, Norfolk, Virginia), Jay Benesch, Fay Elizabeth Hannon, Md Abdullah A Mamun, Riad Suleiman (JLab, Newport News, Virginia), Geoffrey Arthur Krafft (JLab, Newport News, Virginia; ODU, Norfolk, Virginia)

Abstract The proposed Jefferson Lab Electron Ion Collider (JLEIC) is required to obtain ultra-high collision luminosity. Small transverse emittance at the colliding position is one of the key requirements to achieve this goal. Emittance growth in collision is controlled by electron cooling and it can be further improved by using a ¿magnetized electron beam¿ where the cooling process occurs inside a solenoid field. The radial fringe magnetic field at the entrance of the solenoid creates a large additional rotational motion which affects the cooling process. At the electron source, we have created the electron beam inside a similar field but rotating in the opposite direction to compensate this effect and measurements have being taken. Simultaneously, simulations have being developed using ASTRA and GPT software on beam size variations along the beamline, for different solenoid currents, with and without space charges, etc. and the comparison will be presented.

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Type of Presentation Poster

Main Classification 05 Beam Dynamics and EM Fields

Sub Classification D09 Emittance Manipulation, Bunch Compression and Cooling

ID: 3875 A Non-destructive Magnetic Momentum Monitor Using a TE011 Cavity

Presenter Jiquan Guo (JLab, Newport News, Virginia)

Authors Jiquan Guo, Gary Guangfeng Cheng, Fredrik Fors, James Henry, Matt Poelker, Robert Rimmer, Riad Suleiman, Haipeng Wang (JLab, Newport News, Virginia)

Abstract	JLAB is developing a high current magnetized electron source for JLEIC ion ring¿s bunched beam cooler. The non-destructive real time monitoring of the magnetic momentum is highly desired for this beam. The authors propose to use a passive copper RF cavity in TE011 mode as such a monitor. In this paper, we will show the mechanism and scaling law of this device, as well as the design and testing results of the prototype cavity.
Funding Agency	Authored by Jefferson Science Associates, LLC under U.S. DOE Contract No. DE-AC05-06OR23177.
Type of Presentation	Poster
Main Classification	06 Beam Instrumentation, Controls, Feedback, and Operational Aspects
Sub Classification	T03 Beam Diagnostics and Instrumentation

ID: 3911 Secondary Ions Dynamics in the JLab GTS 300kev Beamline

Presenter	Cristhian Alfonso Valerio (ECFM-UAS, Culiacan, Sinaloa)
Authors	Cristhian Alfonso Valerio (ECFM-UAS, Culiacan, Sinaloa), Don Bullard, Carlos Hernandez-Garcia, Md Abdullah A Mamun, Matt Poelker, Riad Suleiman, Yan Wang, Shukui Zhang (JLab, Newport News, Virginia)
Abstract	The Jefferson Lab (JLab) Gun Test Stand (GTS) consists of an inverted insulator geometry 300kV DC photogun and a 4-meter long diagnostic beamline. By means of a CsK2Sb photocathode grown in a preparation chamber connected to the photogun and using a DC laser operating at 532 nm, electron beam has been generated up the limit of the high voltage power supply at 4.5 mA to study photocathode lifetime. Sustained current at that level is limited to a few minutes due to arcing between the photocathode and the anode. However, operating with a solenoid magnet utilized in a separate experiment to generate magnetized beam, leads to sustain 4.5 mA DC for multiple hours without arcing. It is likely that secondary ions generated in the beamline and trapped by the electron beam migrate to the anode-cathode gap where eventually reach sufficiently high density to induce arcing. We present secondary ions dynamics simulation studies to interpret the experimental observations.
Funding Agency	This material is based upon work supported by the U.S. Department of Energy, Office of Science, Office of Nuclear Physics under contract DE-AC05-06OR23177.
Type of Presentation	Poster
Main Classification	06 Beam Instrumentation, Controls, Feedback, and Operational Aspects
Sub Classification	T22 Reliability and Operability

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