**Performance upgrade of the CEBAF polarized electron source**

**for parity violation experiments**

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**Abstract**

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**Introduction**

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**Increased Gun High Voltage**

* Motivation
  + High transmission for PQB
  + Less sensitivity between high (180uA) and low (10uA) beams for multi-user
* Description
  + Inverted gun w/ SS electrode and 150kV PS
  + Floating anode and radiation monitors
* Results
  + HV commissioning
  + Operation at 130kV
* Status
  + 200kV upgrade

**Highest CEBAF Current Polarized Operation**

* Motivation
  + QWeak beam requirements (180uA and 85% polarization)
* Description
  + SSL photocathode + fiber laser
  + Increased laser spot size
* Results
  + Charge delivered per day
  + Polarization vs. QE
  + Photocathode lifetime
* Status
  + Operation w/ higher bias to improve lifetime

**Faster 960Hz Laser Helicity Reversal**

* Motivation
  + Mitigate HC target boiling in highest power cryo-target ever built
  + HC statistical widths necessary to achieve ultimate precision
* Description
  + Laser table layout w/ Pockels cell
  + Fast PC/HV switch assembly
  + Helicity control card + schemes (quartet, pseudo-random, etc)
* Results
  + Scope measurement of HV and photodiode for response
  + HC widths @ 960Hz vs. 30Hz
* Status
  + Upgrade to 2 kHz for Moller

**4pi Double-Wien Spin Rotator**

* Motivation
  + Slow reversal to suppress unmeasureable HC spot size correlation
  + Spin alignment – precision alignment into x,y,z
* Description
  + Wien filter and Solenoid spin rotations
  + Implementation for rotations about X, Z, Y
* Results
  + QWeak and PREX reversal
  + Spin calibration
  + Phase/energy sensitivity
* Status
  + Asymmetry voltage
  + Compatibility w/ upgraded gun voltage

**Beamline**

* Motivation
  + Adapt fixed length polarized source for slow reversal
  + Minimize focusing and manage double-Wien optics
  + Maintain good vacuum and isolation
* Description
  + Optical layout with functional regions (flip, bunch, precess, emit)
  + Elegant model w/ double-Wien optics included
* Results
  + High transmission and good vacuum OK
  + Prebuncher/Wien sensitivity problematic
  + Operational results limited because line not “driven” like design
* Status
  + Rework line for 200kV upgrade into new booster

**Conclusions**

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