**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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