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## Gun Startup and Extinction Ratio Test

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**Technical Custodian:** R. Legg

**Estimated Time to Perform:**

### Procedure Overview

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This describes the steps to check the drive laser extinction ratio and gun dark current prior to commissioning.

### Prerequisites

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Pulse Rep. Rate	60 Hz, 50 microseconds, at 4.68 MHz
S/N:	>10 to 1
Current, microamps:	0.84 @ 60 pC/bunch
Solenoid, G:	280 G

### Procedure Steps

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1. Set the rotational polarizer to a minimum by watching the Spiricon image from the cave with the gun vacuum valve, VBV0F01, shut.
2. Download saved settings \*\*\*\*\*. Cycle hysteresis all solenoids and dipoles.
3. Open the gun vacuum valve. Cycle the lightbox harp, IHA0F01. The peak amplitude of the harp should be less than 30 pA. If not, reduce the pulse width until it is less than 30 pA peak.
4. Insert the first viewer, ITV0F02.
5. Determine if the beam is centered in the first solenoid by “wobbling” solenoid current and observing beam motion on first viewer, ITV0F02. If beam centroid moves more than 0.5 mm for a change of +/- 30 G, then re-center the beam in the solenoid using the picomotor controls for the lenses in the optical telescope. After wobbling the solenoid, put it back to its original setting and put it back on hysteresis. Retract the viewer.
6. Close the laser shutter. Enter the solenoid setting for the charge per bunch to be tested from “Pre-Req’s” section above. Cycle it through hysteresis. Reset the pulse format to the values in the “Pre-Reqs” section above.



7. Open the laser shutter. Cycle the light box harp, IHA0F01. Adjust the rotational polarizer until the peak intercepted current on the harp is 380 pA. Make a hard-copy of the plot showing harp signal amplitude. Record the peak intercepted current here \_\_\_\_\_.
8. Reduce the pulse width from 50 usec to 10 usec and cycle the light box harp, IHA0F01. Make a hardcopy of the plot showing harp signal amplitude. Record the peak intercepted current here \_\_\_\_\_.
9. Reduce the pulse width from 10 usec to 1 usec and record the peak intercepted current here \_\_\_\_\_.
10. Close the drive laser shutter. Cycle the light box harp, IHA0F01. Make a hard-copy of the plot showing harp signal amplitude. Record the peak intercepted current here \_\_\_\_\_.
11. Reset the pulse width to 50 usec. The Signal to noise ratio is calculated using the formula:  

$$\frac{(9 * (I_{50 \text{ usec}} - I_{\text{no laser}}))}{(10 * (I_{1 \text{ usec}} - I_{\text{no laser}}) - (I_{10 \text{ usec}} - I_{\text{no laser}}))}$$
12. The extinction ratio for the drive laser is the signal to noise divided by the duty factor of the drive laser.  

$$(S/N \text{ ratio}) / ((\text{pulse rep rate})(\text{laser pulse freq})(\text{laser pulse width}) / (74.85 \text{ MHz}))$$

