Revision/Review Log

ATF CO_2 LASER SYSTEM PITER I

operations: turning the system on and off

WARNING: An authorized operator only can operate the ATF CO_2 laser system. A list of qualified ATF CO_2 laser operators is posted in the ATF Control Room and in the ATF CO_2 Laser Room C2, see also on Web http://nslsweb.nsls.bnl.gov/AccTest/Safety/ATF_LAS_010.pdf. Laser safety goggles certified for PITER I laser shall be worn all the time when rooms C1 and C2 are interlocked.

TURNING THE SYSTEM ON

1. Prepare interlock system

1a. Verify that CO_2 rooms are secure by checking a status indicators on the MCR laser interlock panel in room C2. If not secured, follow the search and secure procedures for the rooms as specified in the ATF Handbook section 1.3.4.2.

1b. Obtain the CO2 LASER SHUTTER KEY (#5) and YAG TO CO2 KEY (#3) from the key box in the Control room. Sign out the keys in the key log book.

1c. Insert the keys into the appropriate locks on the MCR laser interlock panel in room C2.

2. Prepare equipment

2a. Fill the preamplifier and booster amplifier discharge cells with gas according to specification, start gas circulation through the oscillator. Fill spark gaps of the amplifier PFN's with synthetic air or SF_6 gas according to the labeling on the gas distribution panels.

2b. Turn alignment HeNe lasers on. Turn the CO_2 oscillator on (see 1.3.2.4.1.). Align the CO_2 oscillator beam path through the system and YAG laser beam on the semiconductor switch according to the CO_2 Laser Alignment Procedure.

2c. Turn AC power switches on control and diagnostic equipment. Allow 10 min to warm up.

3. Turn oscillator on

3a. Make sure that the oscillator main discharge cell is filled with the fresh gas and gas circulates through the smoothing tube at >10 torr pressure.

3b. Turn HV switches on the oscillator control panel on, set the main discharge voltage.

3c. Start pulse/delay generator triggering at the preset repetition rate or use a trigger button.

3d. Monitor the output pulse energy using a joulemeter. Set the energy at the desirable level by adjusting the discharge voltage and intracavity iris opening.

3e. Using a photon drag detector and an oscilloscope observe the shape of the laser pulse. Adjust the PZT voltage to eliminate ripples in the laser pulse envelope.

4. Turn slicer on

4a. Open YAG shutter. Check that the YAG beam overlaps with the HeNe#1 beam on the semiconductor switch.

4b. With turned on CO_2 oscillator, open the CO_2 shutter and observe on the scope position of the CO_2 and YAG pulses. Using delay pulse generator, adjust the oscillator delay for synchronization with the first YAG pulse.

4c. Use IR card to observe spatial overlap between the YAG and CO2 beam just in front of the semiconductor switch. On a scope, observe optical switching at the maximum of the CO_2 pulse.

5. Turn preamplifier on

5a. Make sure that the preamplifier discharge cell is filled with gas and air flows through the PFN and the 100 kV trigger pulser spark gaps.

5b. Turn on krytron box and 100 kV trigger pulser for the UV preionization and main discharge triggering, correspondingly.

5c. Turn on HV power supplies for regenerative Pockels switches.

5d. Turn on DC power supplies for preionizer and main discharge and set the required voltage.

5e. Trigger preamplifier with a push button observing typical scope traces from the prionizer and the main discharge.

5f. With turned on oscillator and slicer observe on a scope a train of laser pulses in the regenerative cavity, a single pulse extracted from the regenerative cavity, and an output pulse. Adjust time delays and iris diaphragms inside the regenerative cavity if necessary.

6. Turn booster amplifier on

6a. Make sure that the amplifier discharge cell is filled with gas, spark gaps are filled with the SF_6 gas, and x-ray preionizer is under vacuum.

6b. Turn on AC power switches for power supplies and pulse generators at the control rack.

6c. Start triggering of the preionizer. Upon observation of a stable preionizer operation and a normal current/ voltage plots (see Fig.), turn on the Marx generator (see 1.3.2.4.4.4.).
6d. Set the working voltage on the Marx generator DC power supply (normally up to 80 kV).
6e. Resume triggering of the pulse/delay generator. Use oscilloscopes to observe the current and voltage signals from the main discharge and preionizer built-in diagnostics. Use circulation pump if necessary.
6f. With turned on oscillator, slicer, and preamplifier, observe the amplified pulse on a diagnostic.

TURNING THE SYSTEM OFF

1. Close shutters

2. Turn booster amplifier off
2a. Stop triggering.
2b. Turn off all sources of HV for the amplifier. (Storage capacitors in the Marx generator and preionizer pulser are discharged automatically upon turning off the AC power switches.)
2c. Turn off circulation pump.
2d. Turn off vacuum pumps of the x-ray tube.

3. Turn preamplifier off
3a. Turn off all sources of HV for the preamplifier system (100-kV pulser, main discharge, krytrons, etc.).
3b. Turn off circulation pump.
3c. Close compressed air flow meters on the air console and leave the lines pressurized.

4. Turn oscillator off
2a. Turn off HV power switch and key.
2b. Turn off smoothing tube power FIRST. Then turn off both "GAS" switches.
2c. Valve off all the gas cylinders.

5. Return the keys to the key box and sign back in