

FIR Laser Startup Procedure

Cooling

- Check coolant level in each FIR chiller. Make up coolant with a 10% solution of Optishield Plus, or other manufacturer approved heat transfer fluid, and distilled water.
- Turn on chillers for FIR #1 and FIR #2.
- Ensure water flow by observing the visual flow meters on the back of each *SFIR-50 System Controller*.
- Confirm adequate water flow rate by observing green *Water* LED on the front panel of each *SFIR-50 System Controller*.

Gas Pressure

- Ensure *External Gas Source Valve* is closed (CW soft-seat).
- Ensure slight positive pressure in gas system ($0 < \text{Gas Pressure} < 5\text{psi}$) by observing reading on gas pressure gauge on regulator assembly.
- If no positive pressure then it is possible the gas line is at atmospheric pressure and may be contaminated with air. **Stop. Do not continue with startup.** Proceed to the *FIR Laser Pumpout Procedure*. Complete pump-out and return to the beginning of this procedure.
- Ensure *THz Vacuum Valve* is open (CCW) and the *THz Cell Pressure Gauge* reads < 3 mTorr.
- If *THz Vacuum Valve* is closed or *THz Cell Pressure Gauge* reads > 3 mTorr then the THz cell may be contaminated with air. **Stop. Do not continue with startup.** Proceed to the *FIR Laser Pumpout Procedure*. Complete pump-out and return to the beginning of this procedure.
- From this point in the procedure it is assumed that there are no vacuum problems and no air contamination in the THz cell or gas system.
- Close the *THz Vacuum Valve* (CW soft-seat).
- Very slowly open the *External Gas Source Valve* (CCW) while observing the *THz Cell Pressure Gauge*.
- When the *THz Cell Pressure Gauge* reads 700mTorr of gas close *External Gas Source Valve*.
- Ensure this pressure is stable to within 1 mTorr.

Pump Laser

- Ensure *THz Laser Control -Pump Shutter* closed.
- Ensure *Loop Control* in *Reset* position.
- Turn *Meter Select* to *PZT*.
- Set *Manual PZT* to *20 Volts*.
- Toggle *RF Switch* to the *On* position.
- After a delay of up to 40 seconds the *Laser On* lamp should light. The *SWR* LED may turn on for several seconds during the delay.
- Allow the pump laser to operate in this mode for about half an hour.
- Turn *Meter Select* to *Loop Error*.
- Note the meter is configured to be zero in the middle of the range and is able to swing to either side of zero during the tuning process.
- Adjust Frequency Offset control until the meter swings wide in one direction or the other. Continue moving the control in this direction and note the meter begin to swing back towards zero.
- Continue slowly moving the control in the same direction as the reading swings back through zero towards another peak in the opposite direction.
- Once you have past this second peak move the control slowly until the meter reads almost zero.
- At this moment move the *Loop Control* to *Closed*.
- The pump laser should be locked at its frequency.

THz Laser

- Ensure *THz Cell Pressure Gauge* reads within manufacturer limits (~700mTorr).
- Ensure pump laser remains locked and the *Pump Laser- Loop Control* is in the *Closed* position and the pump laser is locked.
- Toggle the Meter Select Switch to Power position.
- Toggle the *Pump Shutter* to the *Open* position.
- THz power should deflect the meter.
- Optimize THz power by alternately adjusting the *Pump Laser- Frequency Offset* control and the *THz Laser- Manual PZT*.