




BROOKHAVEN NATIONAL LABORATORY		Number: PO-P-ATF-0026	Revision: 0
PHYSICS DEPARTMENT		Effective: 08/17/2011	Page: 1 of 3
Subject: ATF gun bakeout procedure		Prepared by: Karl Kusche	
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ATF gun bakeout procedure

- Choose clean turbopump station, turn on at least one day in advance, bakeout out turbo & hose if unable to achieve $P < 9 \times 10^{-9}$ torr.
- Avoid connecting turbo, leakcheck station or Variacs/heaters to same electrical circuits.
- Connect turbo hose to gun pumpout port via Conflat flange (do not use quick-flanges).
- Perform helium leakcheck on turbo & hose, must achieve leak rate $< 1 \times 10^{-9}$ atm-cc/sec.
- Open clamshell (shielding permit).
- Close Gun-Linac pneumatic beamline valve. Record all pressure readings.
- Open gun pumpout port to turbo.
- Turn off 3 ion pumps (75lps under gun, dual 20lps at pumpout port) and 2 ion gauges.
- Perform leakcheck of all fittings (including Gun-Linac valve, gun seal, laser window, etc).
- Leak rates of $> 5 \times 10^{-10}$ atm-cc/sec generally require attention if repeatable. To help locate leaks, open gun area walls/fence, turn off AC unit and move turbo station away from gun.
- Purge gun water chiller lines and disconnect hoses.
- Remove water hoses, temperature monitors, cameras/optics, etc., far enough away from gun to avoid overheating damage.
- Wrap separate heater tapes around each "zone" (each zone should have its own Variac):
 - o Cathode & both gun cells (upstream of solenoid)
 - o Gun-Linac valve
 - o 75lps ion pump, gun ion gauge, connecting hoses (incl. laser window)
 - o Gun waveguide (horizontal)
 - o Gun waveguide (vertical), dual ion pumps, waveguide ion gauge, pumpout port
 - o Turbopump station & hose
- Attach thermocouples (using metalized tape) to:
 - o Gun body
 - o Laser window
 - o Camera window

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- Horizontal waveguide
- Gradually raise heat on all components to 60C over ~4 hours. Record all values.
- Perform leakcheck.
- Cover all components with Aluminum foil, then cover gun with heat blanket.
- Gradually raise heat over ~4 hours:
 - Gun 120C
 - **Laser window and camera window not to exceed 100C**
 - All other components ~90-110C (ion pumps not to exceed 250C)
- If higher gun temperature is desired, gradually raise heat over ~4 hours:
 - Gun 150-160C
 - **Laser window and camera window not to exceed 100C**
 - All other components ~120-140C (ion pumps not to exceed 250C)
- Perform leakcheck.
- Maintain bake until turbo pressure has leveled off to <6e-8 torr (required 5 days).
- Perform leakcheck.
- Gradually lower temperature over ~4 hours:
 - Gun 100-120C
 - All other components ~80-100C
- Gradually lower temperature over ~4 hours:
 - Gun 80-100C
 - All other components ~50-80C
- Perform leakcheck.
- Burp 3 ion pumps and 2 ion gauges.
- Continue temperature ramp-down and monitor pumps/gauges. Remove heat blanket.
- As temperature approaches ambient, should observe:
 - Gun ion gauge ~2e-9 torr
 - Waveguide ion gauge ~3e-9 torr
 - 75lps pump <1e-8 torr
 - 20lps pumps ~4e-9 torr
 - Turbo <1e-8 torr
- Torque pumpout port closed to same value as last recorded. Leave turbopump connected & running. If gun pressures are stable or slowly falling, then prepare for conditioning.
- Reinstall water lines (refresh heatsink on cathode) and check for leaks.
- Reinstall temperature sensors and camera/mirror.
- Heater tape and foil may be left in place..
- Close clamshell. Restore gun area AC, walls, fence and chiller.

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When finished with turbopump:

- Torque gun pumpout port to 1 ft-lb higher than last value. Record new value & date on valve tag.
- Close turbo valve & slowly vent hose with dry nitrogen gas.
- Confirm that ion gauges and pumps remain stable.
- Disconnect turbopump hose from gun pumpout port.
- Install protective cap onto gun pumpout port.
- If turbopump ultimate pressure is no longer $<1e-8$ torr, rebake the station & hose.