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Subject: ATF Vacuum Work Procedure		Prepared by: Karl Kusche
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ATF VACUUM WORK PROCEDURE

ATF is a laser linac complex that requires high vacuum conditions in all beamlines to maintain optimum performance. The ATF linac and RF gun usually operate at ~10^{-9} Torr or lower. To prevent contamination of the gun/linac system from experimental apparatus and operations, the following procedures should be followed:

General Procedures

1. Only authorized vacuum-trained BNL personnel are permitted to operate ATF vacuum equipment and work on beamline vacuum systems & assemblies;

2. Each beamline must achieve **$5x10^{-8}$ torr** or lower before approval to run an experiment is granted. Special accommodations must be made in advance for experimental chambers that use pressurized gases or otherwise cannot achieve high vacuum;

3. Beamline components & assemblies are not to be installed or removed without prior approval by the ATF Operations Coordinator, beamline spokesperson or beamline physicist;

4. All in-vacuum components and exposed ports/openings must be kept covered with proper end-flanges, clean foil or other vacuum-compatible material to avoid contamination;

5. Handling of and work on any part of the beamline vacuum system requires clean vacuum-compatible tools, gloves and clothing;

6. Whenever possible, vacuum equipment should be checked for possible contamination before being connected to the ATF vacuum system. Typically, this means that a turbopump station should achieve better than 10^{-6} torr within a short period of time;

Bleed-up & Installation

1. Before starting work on the vacuum system, all relevant valves, ion pumps and gauges must be closed and/or turned off. An obvious indicator (Caution tag, red valve cover, etc.) must be used on any closed valve that has one side exposed to atmosphere;

2. ATF beamlines are only to be bled to atmosphere using liquid Nitrogen boil-off gas through the bleed valve of a clean turbo pump. Care must be taken to avoid damage of delicate BPMs, windows and other insertion devices from sudden inrush of gas;

3. Whenever possible, components should be pre-baked and/or leak checked before installation into any part of the linac system or any beamline. Small in-vacuum components can be pre-baked in the ATF vacuum oven;

Pumpdown and Bakeout

1. ATF beamlines are to be pumped out using clean turbo pumps. Care must be taken to avoid damage of delicate BPMs, windows and other insertion devices from sudden initiation of pumping;

2. Bakeout of the affected beamline section should be initiated soon after initial pumpdown. Use only unfrayed, undamaged heater tape with appropriately-rated Variacs. Avoid overheating joints that rely upon rubber-based seals. Use aluminum foil to wrap the entire length of the beamline section as well as the turbopump & hoses to assure even heating. Pay special attention to in-vacuum optics and windows – impurities may condense out on and damage these components if they are not heated to or above the temperature of the surrounding beampipe;

3. Ideally, helium-based leakchecks should be performed both prior to and following bakeout. Leak rates at or above 10^{-9} atm-cc/sec are usually cause for concern;

4. Beamline vacuum should achieve at least 10^{-6} torr prior to switch-over to ion pumps.