

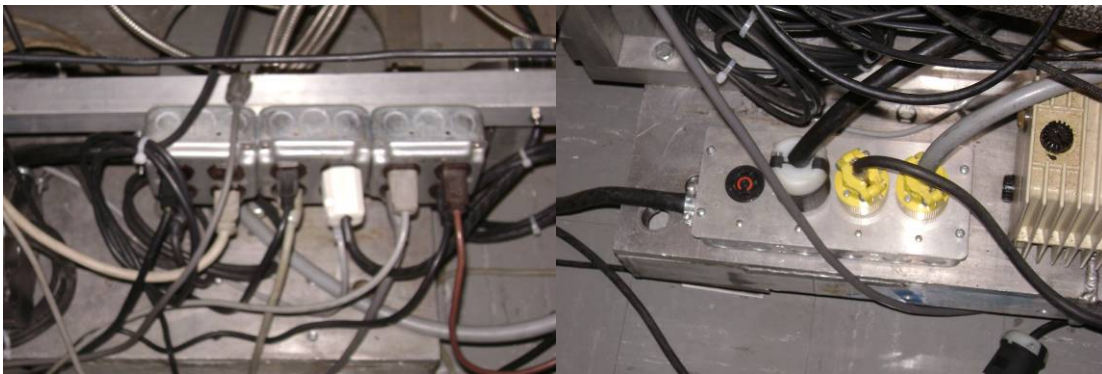
Accelerator Instruction Manual

1. Check that the water in the system is turned on.

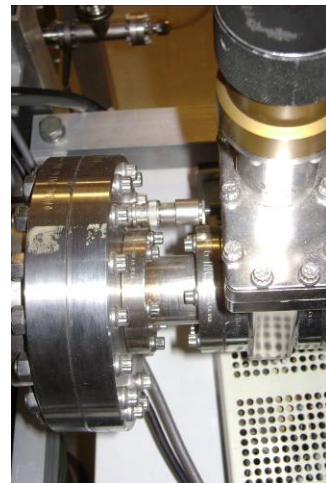
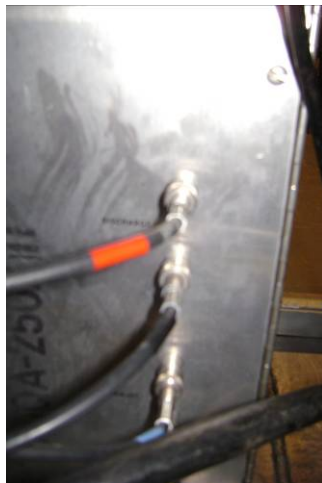


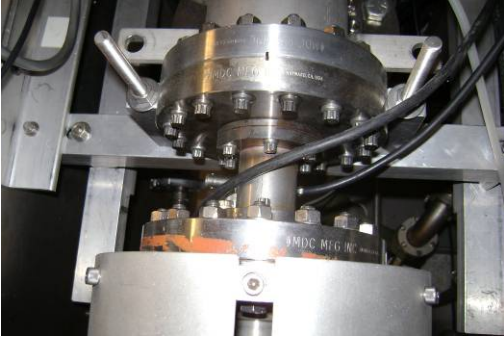
Left: water has been turned on.
Right: water has not been turned on.

2. Check that everything, except for the diffusion pump, is plugged in.



3. Check that all BNC connectors are connected.





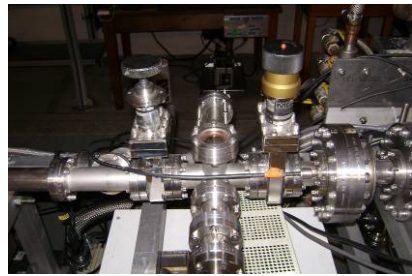
4. Check that all mechanical pumps are connected to the correct pipe.



5. Check that all beamline valves are open, including the main pump valve.



Left: Main chamber valve in open position.
Right and down: beamline valves.



6. Check that the TG-70 reads less than 100 mTorr.



Left: Pressure gauge. Right: Pressure gauge connection, circled.



7. Check that the needle valve is closed. Turn it SOFTLY, this is a fragile valve.



8. Fill cold trap by pumping LN2 into it until it squirts out the opening.



9. Plug in the diffusion pump.

10. WAIT 25 minutes! The pump needs time to bring the chamber pressure down to about 10^{-5} Torr. Once the chamber pressure is this low, it is safe to turn on the pressure gauge. Doing this before reaching the appropriate pressure will burn out the filament on the pressure gauge.

11. Pump out the gas system while you wait:



- a. Check that all the gas bottle and regulator release valves are closed, and that the regulator valves are completely decreased.



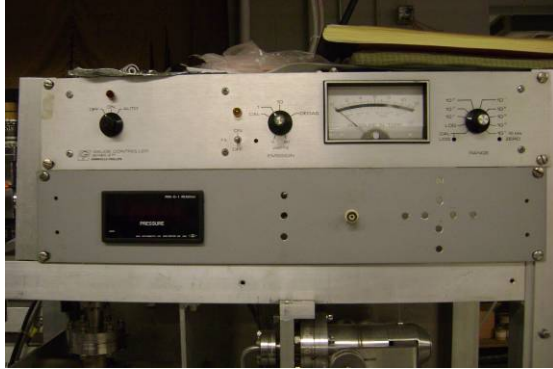
- b. Open all four gas system valves and close the leak valve. This pumps out the gas system.



Gas system valves. The top row: valves that connect the gas system to the pump. Bottom right is the gas manifold valve. Bottom left is the leak valve. Read the note below before operating the leak valve.

Note: when closing the leak valve, do so lightly. Cranking the leak valve closed will break it. A good way of doing this is by slightly pinching the leak valve. When turning the valve clockwise requires a tighter pinch, the valve is closed.

- c. Wait for the PDR-D-1 to read less than .02



Top gauge, Gauge Series 271, shows main chamber pressure. Bottom gauge, PDR-D-1, reads primary gas chamber pressure

- d. Close all gas system valves.
e. Decide which gas to use and open the bottle valve only slightly.
f. Increase the regulator valve until the left scale reads 5 psi.
g. Open regulator release valve and gas manifold valve.
h. Close the bottle valve and regulator release valve, and put the regulator on decrease.
i. Open leak valve until PDR-D-1 reads 3.3 ± 0.3 . The leak valve will need to be monitored throughout the use of the mini accelerator. The leak valve controls the flow of gas from the high pressure chamber to the low pressure chamber. As time goes on, the pressure in the high pressure chamber will decrease, thus making it necessary to open the leak valve slightly more to maintain pressure in the small pressure chamber.

12. Make sure that 25 minutes have passed since step 9.

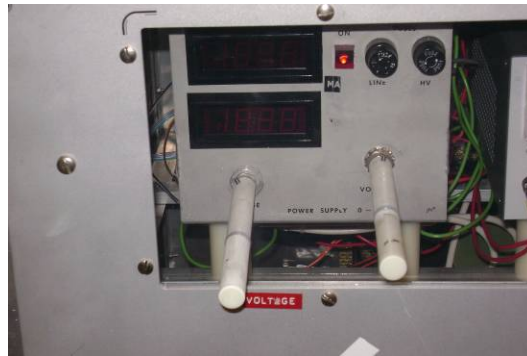
13. Turn Gauge Series 271 on. Turn filament power on. It should read less than 10^{-5} Torr. If it reads more than 10^{-4} Torr, turn off the filament immediately!



Location of gauge series 271 filament.

14. Open the needle valve until the Gauge Series 271 pressure gauge reads $3.0 \cdot 10^{-5} \pm 0.4 \cdot 10^{-5}$ Torr.

15. Turn on the power supply for the ion source.



16. Turn the right knob for the holding voltage on max (should read about 850 V). Do not turn the left knob!

17. Turn the holding B-field up very slowly, until the source current jumps to approximately 1 mA. You have just turned on the ion source.



18. Turn on the extractor voltage and turn the knob SLOWLY to 5 kV.



Extractor power supply.



Interesting note: looking down the window to the left, you should be able to see a blue glow. That glow is the Helium plasma generated in the ion source.

19. Turn on the power supplies for the einzel lenses.



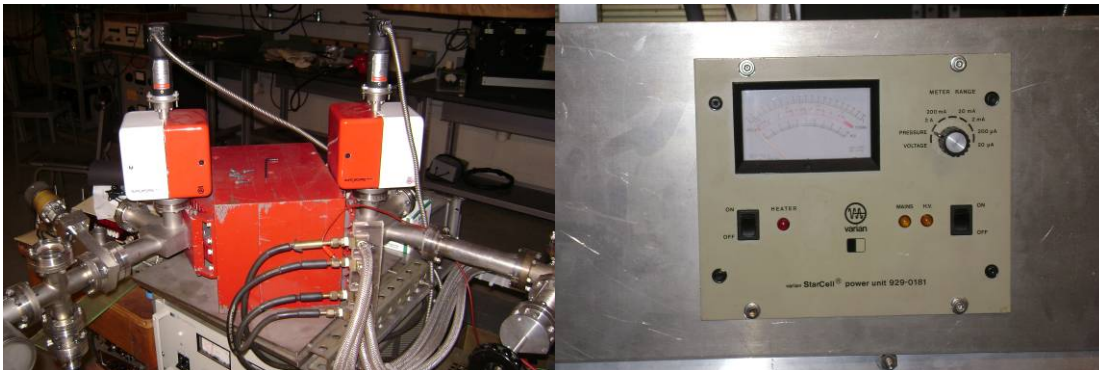
20. Check that the first viewer is inserted.



21. Choose the einzel lens voltages so that you see a bright spot on the screen. You can now perform measurement 1 for the ion optics portion of this lab setup.

Performing measurement 2 on charge states:

22. Turn on the ion pumps. Check that the heater is off.



23. Wait until the Varian gauges read less than 10^{-5} Torr. If the ion pumps become warm to the touch during the experiment, turn them off for a few minutes.

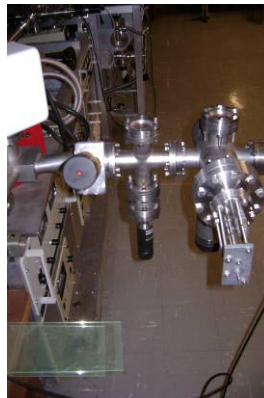
24. Turn on the voltage for the spectrometer magnet.



25. Connect multimeter to the positive and negative terminals on the back of the magnet power supply and calibrate the magnet with a gaussmeter.



26. Remove all viewers from the beamline and insert the last one.



27. Change spectrometer magnet voltage and watch the intensity change on the last screen.

28. Now perform experiment 2 on the charge states using the sensitive ammeter connected to the Faraday cup at the end of the beamline.