TMDS Test Bench at LLO

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Cooling Bath

See the cooling bath guidance here:
http://www.ncsu.edu/ehs/www99/right/handsMan/factsheet/coolbath.html
(also included as a figure below).
Rai Weiss has used Methanol rather than isopropyl alcohol or glycol ethers.

We want a bath that is well above the condensation temperature for liquid oxygen (90K), but low enough to condense out organic contaminants. The lowest temperature dry ice bath mixture is 14% by volume H2O in MeOH, which produces a bath at -128 C (145 K).

Cooling Baths and Cold Traps

When ice water is not cool enough for use as a bath, salt and ice may be used. For even lower temperatures, dry ice may be used with an organic liquid. An ideal cooling liquid for use with dry ice should have the following characteristics:

Nontoxic vapors
Low viscosity
Nonflammability
Low volatility

Ether, acetone, and butanone are too volatile and flammable. The final choice of a liquid will also depend on the temperature requirements. Although no substance meets all of the above criteria, the following are suggested.

Ethylene glycol or propylene glycol in a 3:2 ratio with water and thinned with isopropyl alcohol
Isopropyl alcohol
Some glycol ethers

Add the dry ice to the liquid, or the liquid to the dry ice in small increments. Wait for the foaming to stop before proceeding with further addition. The rate of addition can be increased gradually as the liquid cools.

Cryogenic coolants should always be used with caution. Cryogenic liquids must be handled in properly vented containers. Be aware that very low temperature coolants, such as liquid nitrogen, may condense oxygen and cause an explosion with combustible materials. Use gloves and face shields, slowly immerse the object to be cooled to avoid too vigorous boiling and overflow of the coolant. Glass Dewar flasks should be of borosilcate glass and protected by covering with cloth-backed friction or duct tape or encased in metal sheath to contain flying pieces in the event of implosion.

Avoid pouring cold liquid onto the edge of a glass Dewar flask when filling because the flask may break and implode, For the same reason do not pour a cryogenic liquid out of a glass Dewar flask; use mild air pressure or a siphon. Metal or plastic Dewar type flasks are preferable and eliminate this problem. Never use a household Thermos bottle in place of a Dewar flask

Do not lower your head into a dry ice chest. Because no oxygen is present, suffocation can result. Do not handle the dry ice with bare hands; if the skin is even slightly moist, severe burns can result. Use dry leather or suitable cryo-gloves. When chipping dry ice, wear goggles.

Photo #1

Regulator attached to the 1” dry air supply line. Note: The SS ball valve is there for a 24 hr. purge of the system prior to connecting the regulator, etc. We check the particle count and dew point at that point and if it’s OK we go ahead with installing

the TMDS components. This was to verify our installation was clean enough and prevent contaminating anything down stream of our new supply line.
The regulator has 3/8" compression fittings and the flexible line from the regulator to the flow meter is a SS braided PFTE hose Harry had brand new in the bag (scrounging for parts).

Photo # 2
Flow meter Rai Weiss provided. Note: We disassembled the meter, cleaned and reassembled. I believe this is also another source of pipe threads we had to adapt to compression. I will provide more info on the flow meter in a separate email.

Photo # 3
PALL filter data sheet housing LINK and filter link
Part number IDL11GN12J7
Note: Pipe thread on the filter housing is a potential particle contamination. This is obvious for all pipe threads and should try to avoid if possible.

Photo # 4
Cold trap/bath. At the time we had dry ice, glycol and methanol in the SS can and insulated the can.

Photo # 5
Note: down stream of the bath we wrapped the 3/8" SS line with a 110V heat tape and controller set to ~ 70F (room temp) to prevent freezing at the ionizer. Based on final dimensions will determine the size heat tape required. Note: Copper line used for flexibility when connecting to the ionizer and allowed for any thermal expansion and contraction.

Photo # 6
Complete set up on bench with the electronics Rai Weiss provided. Note: We added a Bourdon needle gauge Link at the scroll pump for reference down stream of the TMDS vacuum gauge for reference at the scroll pump inlet.

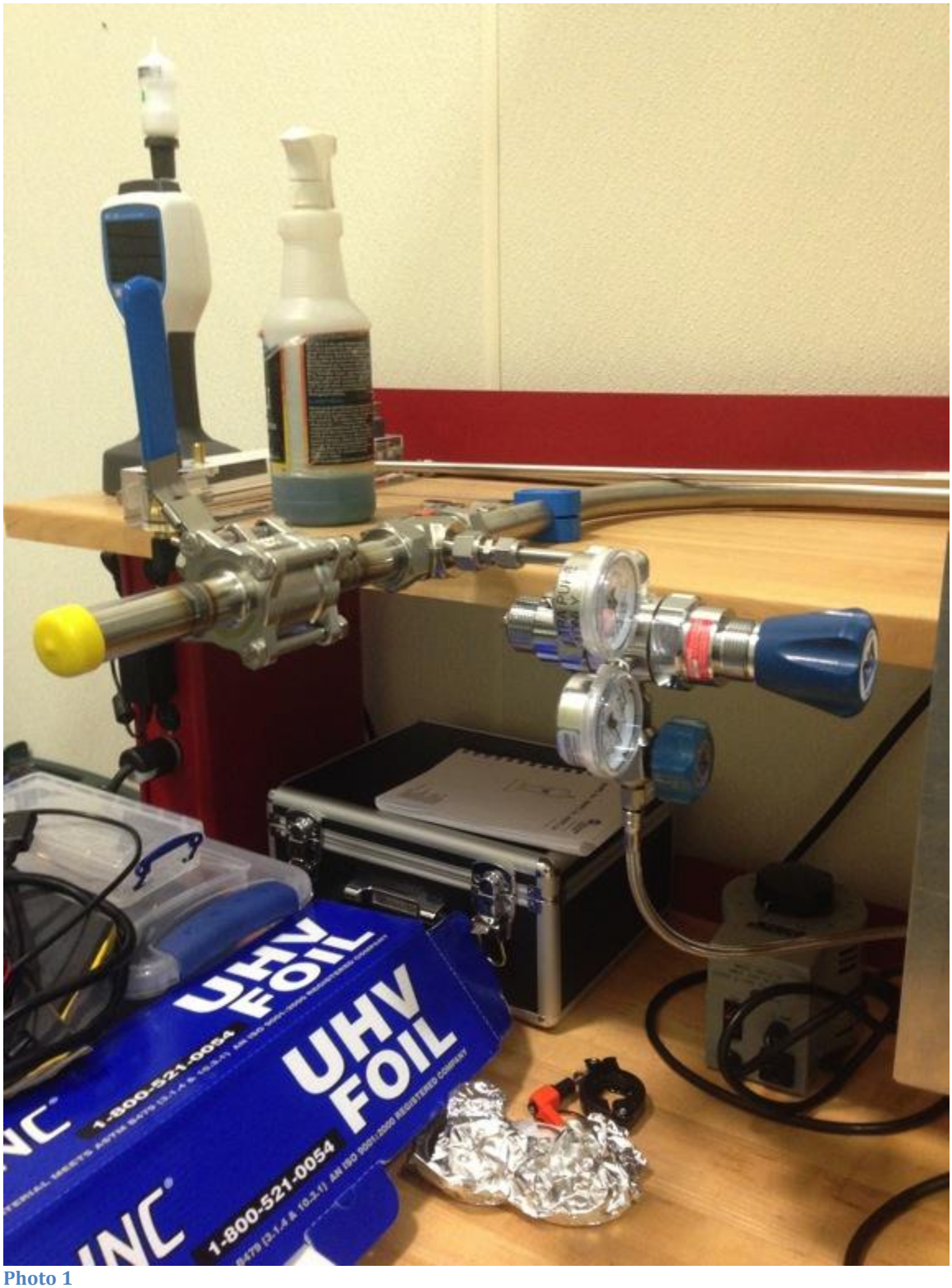

Photo 1

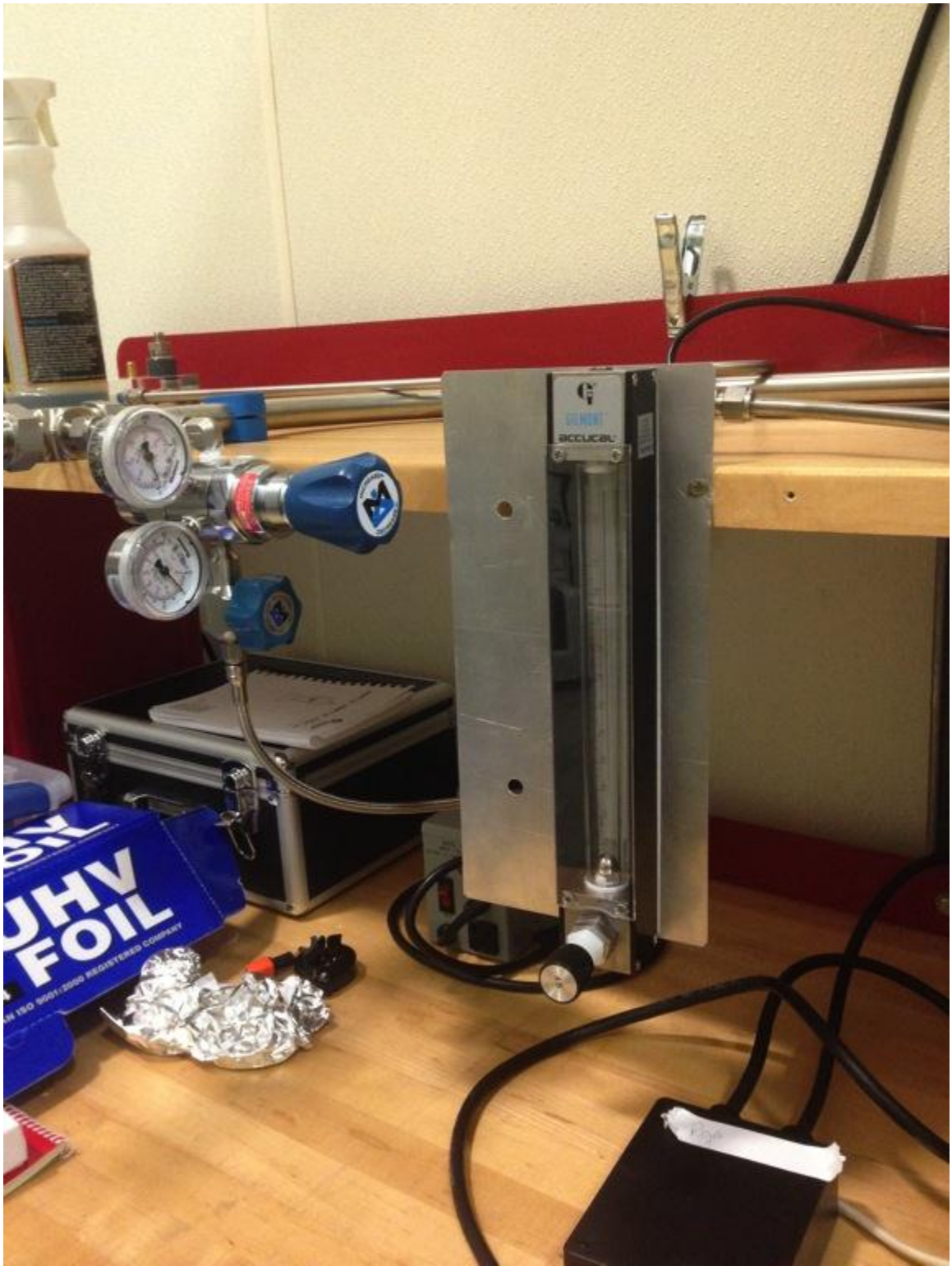

Photo 2

Photo 3

Photo 4

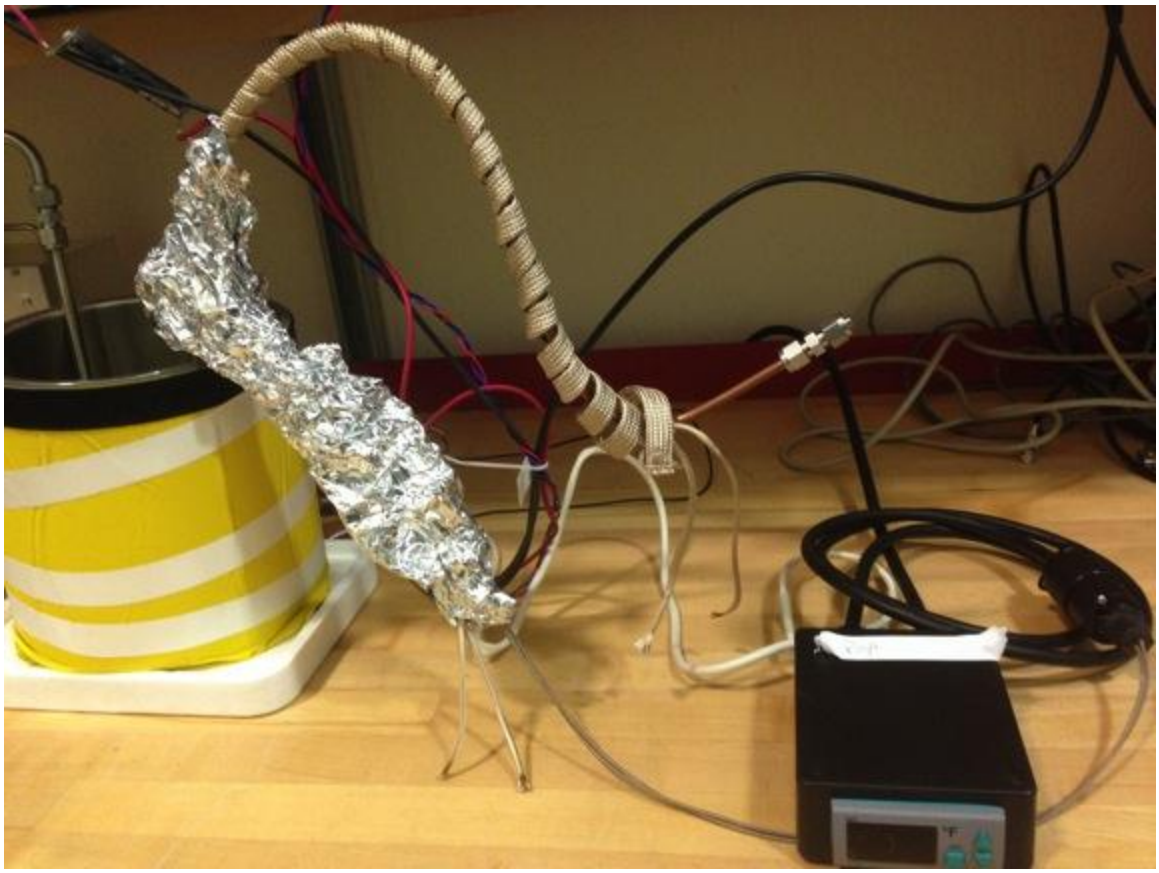

Photo 5

Photo 6