



Progress in Preparation of LIMITS

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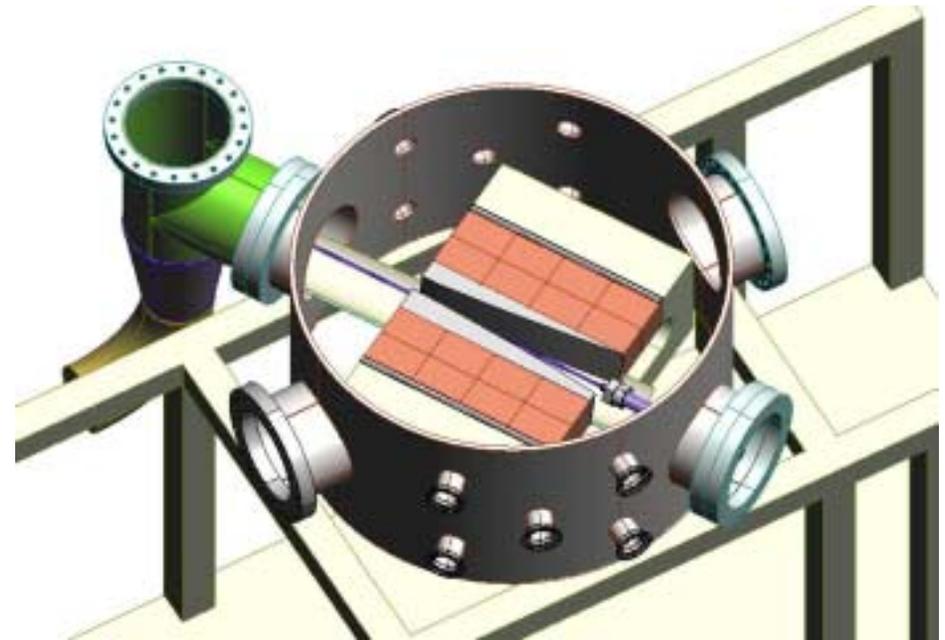
November 7, 2002

ALPS meeting



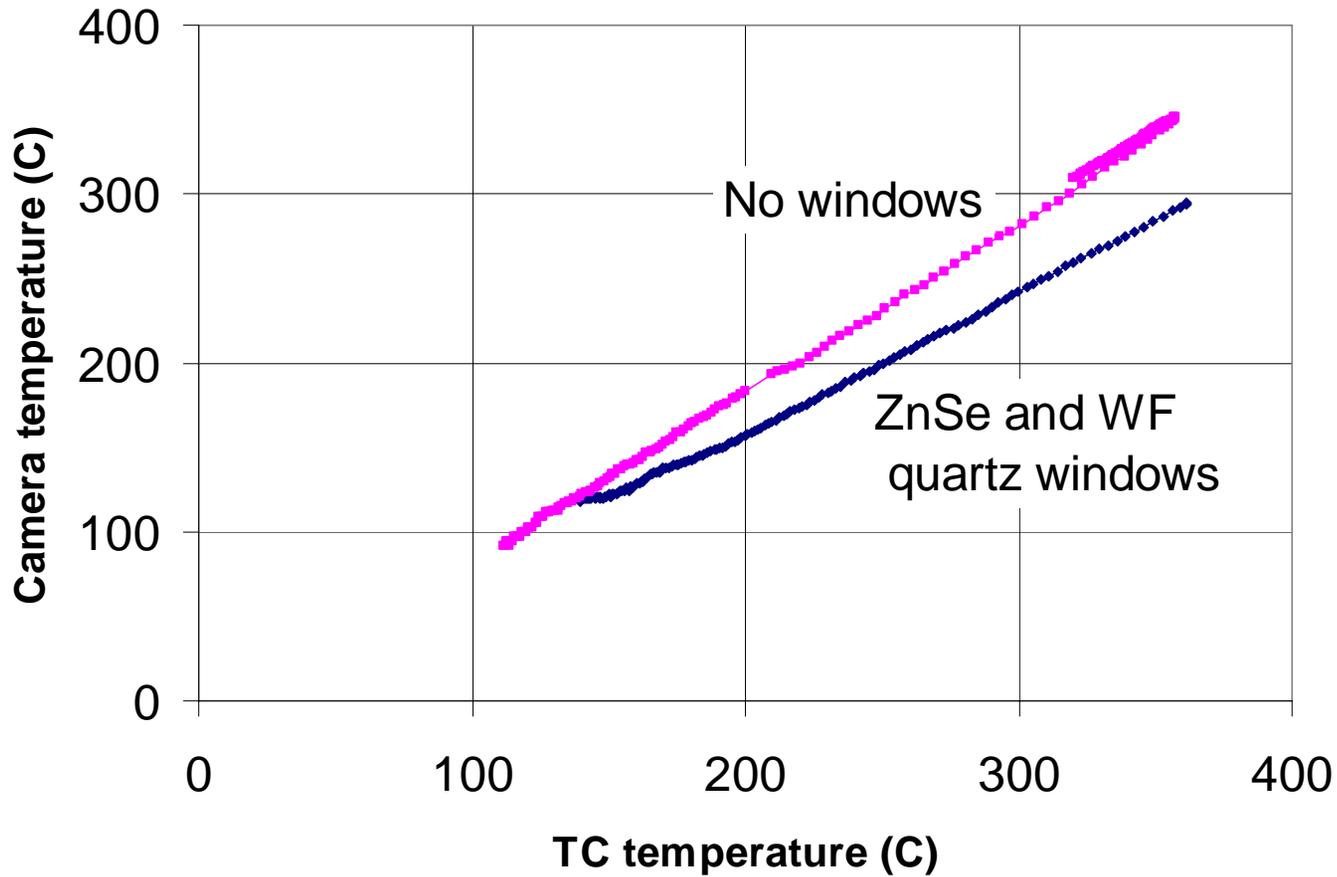
Outline

- **Progress in the last 6 months**
 - **LIMITS pre-flow testing**
 - **Magnet**
 - **Heating**
 - **Li transfer**
 - **Li flow**
 - **Installation of E-gun**
- **Flow video**
- **Upcoming schedule**





IR Window Transmission Measurements



Measured with a blackened crucible

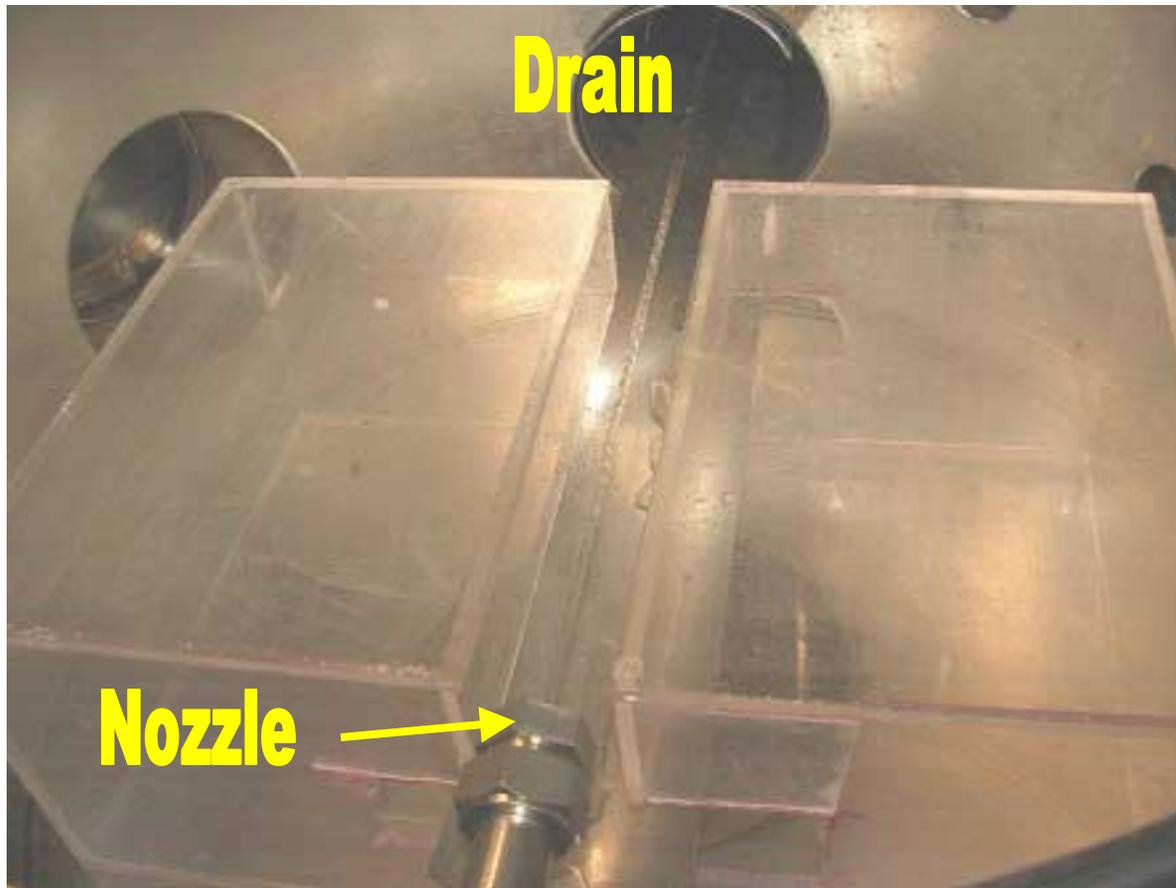


Pressure, Water, and Vacuum testing

- **All components on LIMITS were tested to 225 psi (100 psi would be adequate)**
- **Water transfer from furnace to transfer chamber 6/20/02, 10 psi, takes place in 3 minutes**
- **Low pump pressure problem was resolved with a baffle to direct the return flow away from pump intake. Now pump generates 11 psi with water and 1" tubing from inlet to outlet.**
- **System was leak checked before adding Li**



Water Pumped with Graphite Impeller

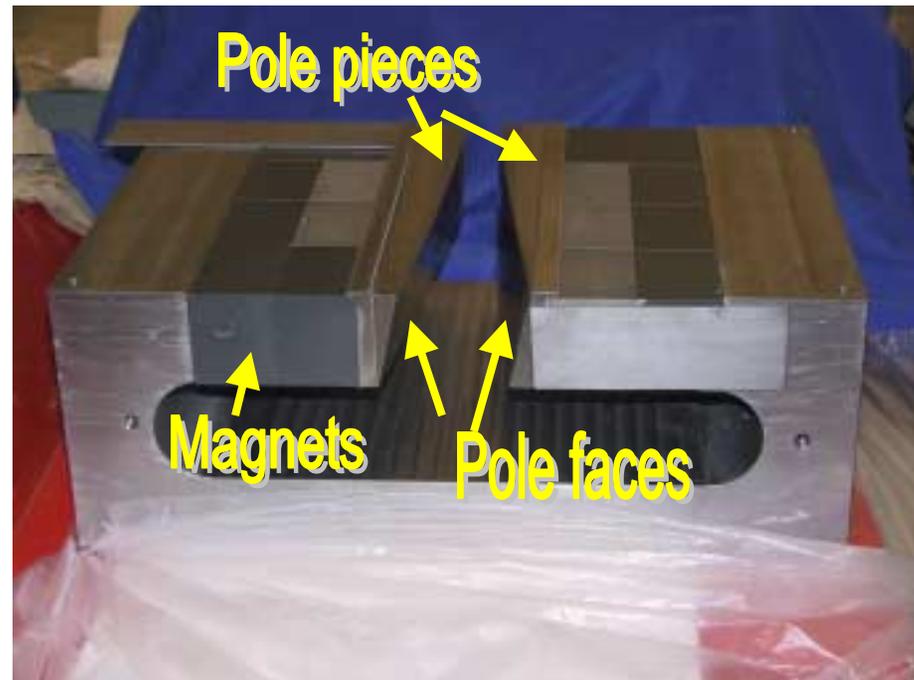


Lexan model of magnet to check fit with water stream



Magnet

- Magnet assembled for NSTX config.
 - Special assembly fixtures to save fingers!
- Magnet placed in LIMITS to check fit and mark positions
 - Stand added to hold lid while moving magnet
 - Magnet removed for zero B-field flow





Some Heating Stats

- Furnace takes 24 hours to heat to 200 deg C with a full load of Li (60 l)
- Transfer chamber takes ½ day to heat to 200 deg with load of Li (30 l)
- Furnace takes 48 hours to cool down to 50 deg C
- Loop has ~ 20 TCs in various places on the loop
- The furnace, 1” tubing, 4” ball valve, 1” ball valve, transfer chamber, etc have separate heating controllers, 6 in all.



Loading Li into Transfer Chamber

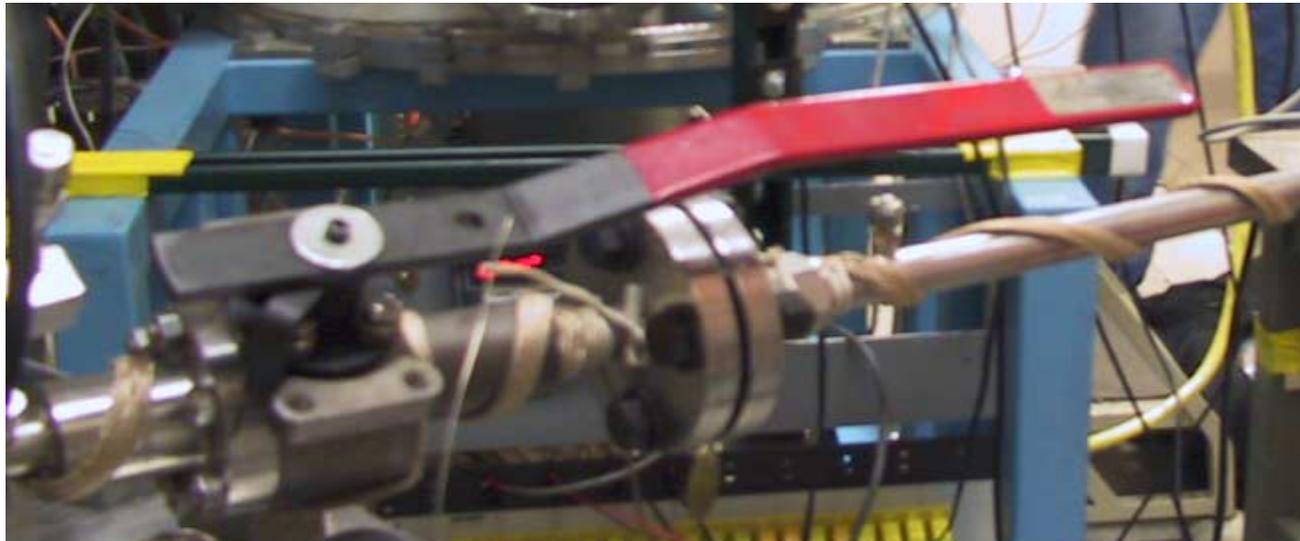
- Argon purge from liquid Dewar
- 1 hour to load transfer chamber
- Oxygen level 50 ppm before operation started
- After each bag was opened, the Oxygen level increased to 600-800 ppm (Source unknown)
- The metal ingots were shiny so our glove box has a lower oxygen level than the shipping bags





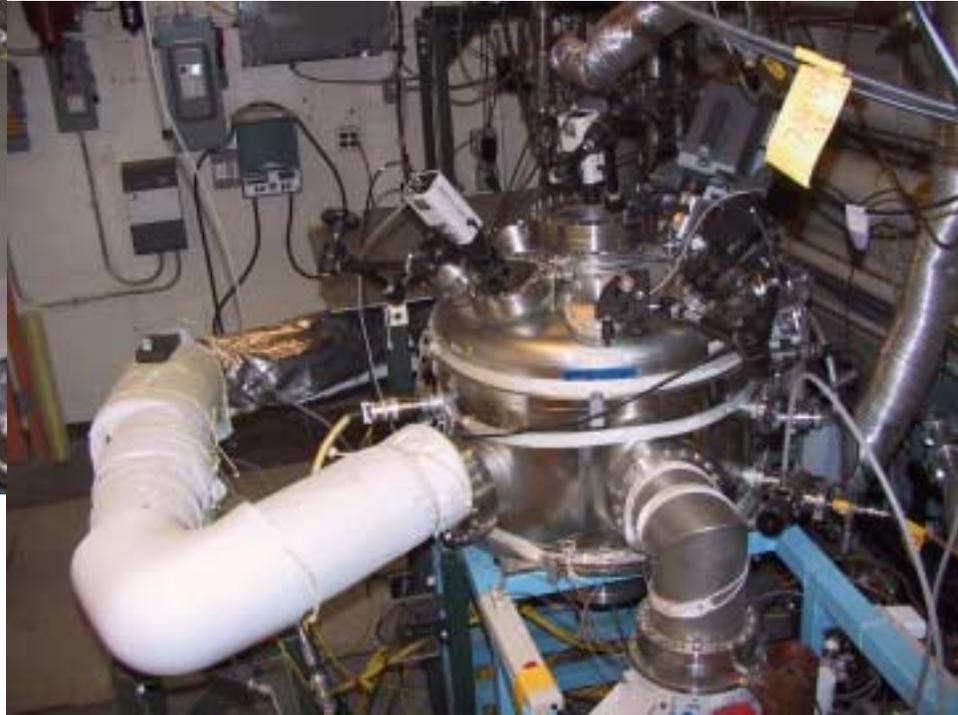
Transfer of Lithium to Furnace

- Ar gas pressure used to transfer the molten Li
- One of most difficult problems, too many cold spots because of different cross sections
 - 1 month between first transfer and second
 - Fire occurred during transfer attempt (later talk)





Final Configuration





Initial Flow Testing

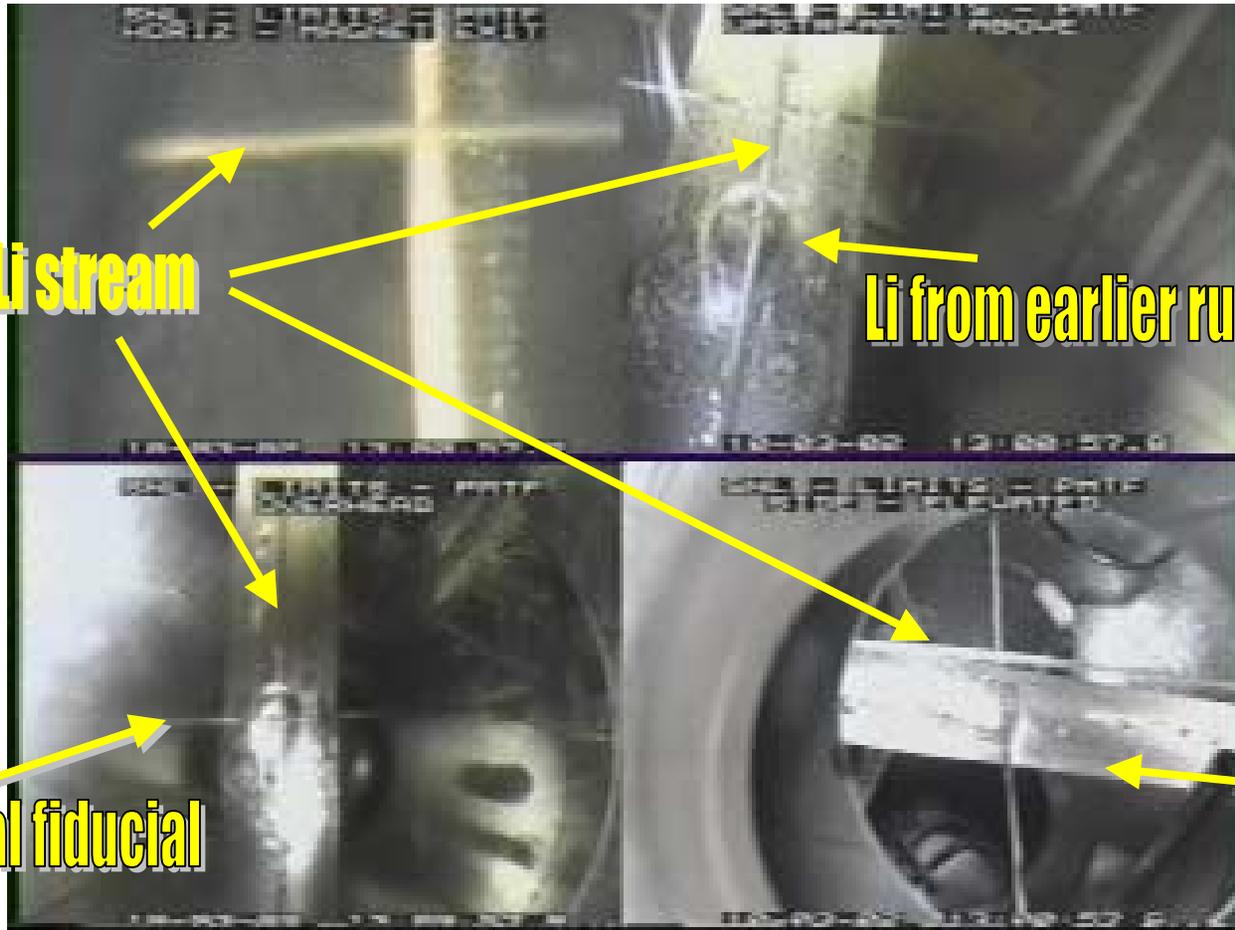
- **Objective to fill supply line to calibrate flowmeter and measure flow path without magnetic field**
- **Pump was started**
- **Opened flow valve**
- **When flow started, flow valve was closed to calibrate flowmeter**
- **Tried to restart pump and open flow valve, but motor would stall and impeller sounded like it was grinding against housing**



Hardware Descriptions for Flow Video

Horiz magnet exit

Upstream above



Li stream

Li from earlier run

Horizontal fiducial

Drip pan

Overhead wide angle

Side elevated



Flow in Chamber Video



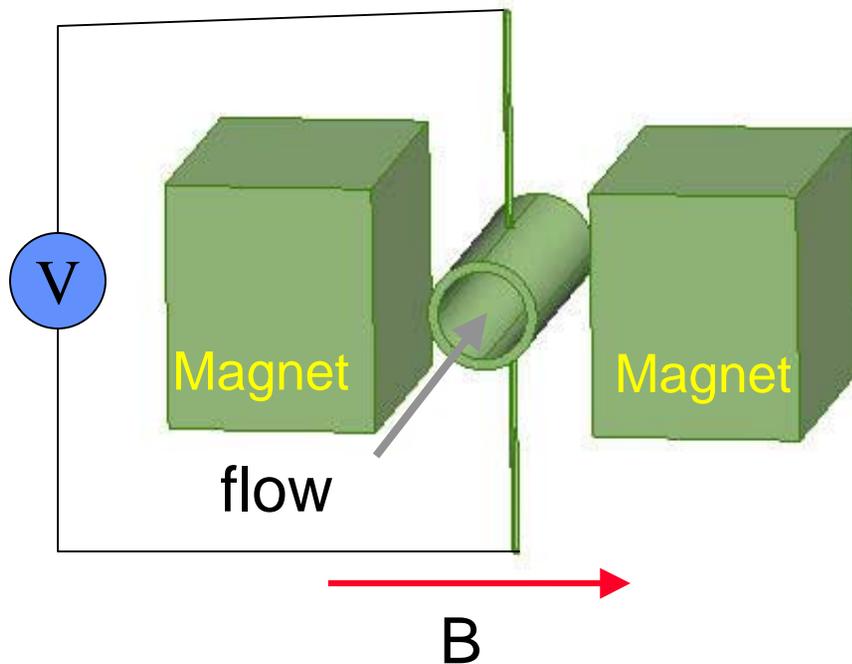


Modifications

- **Pump impeller grinding—proposing to coat SS impeller with Mo to reduce friction**
- **Cold spots in loop—purchase different heaters and more controllers**
- **Helicoflex gaskets not reusable—changing to high pressure gaskets, they are cheaper**
- **Sight glasses cracked—solid blocks installed**
- **Incorrect flowmeter readings—plan to build an electromagnetic flowmeter**



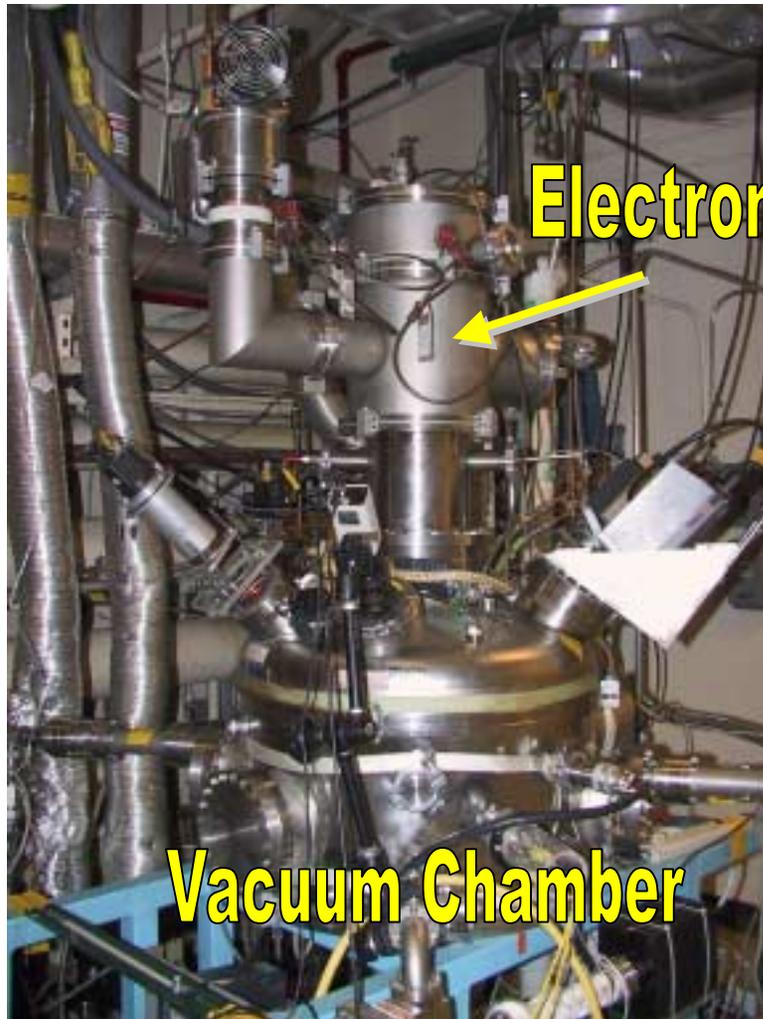
Electromagnetic Flowmeter



- ~3 mV output from 10 m/s flow out of nozzle
- Stainless steel pipe and stainless steel electrodes
- Corrections due to conductive pipe, heating of magnet, and end effects



Electron Gun Mounted on LIMITS



- LIMITS vacuum chamber converted from Li to water flow
- Electron gun successfully mounted on LIMITS
- Round robin tests of CFCs last 2 weeks
- New vacuum chamber provides easier sample mounting



Schedule

Milestone	Date	Status
Magnet manufacturing and field measurement	July, Aug, 2002	Complete
Final assembly of Pump with LIMITS	August 27, 2002	Complete
Lithium transfer to pump chamber	Sept 26, 2002	Complete
Initial Li flow	Oct 2, 2002	Complete
Installation of EBTS gun on LIMITS chamber	October 21, 2002	Complete



Schedule

Milestone	Projection	Status
Repair pump	Nov 30, 2002 (?)	Negotiating
Flow without magnet	Early Dec	Depends on pump
Tests with Li flow between magnets	Dec	See above
High heat flux test on Li	Feb 2003	
Magnet testing	March-April 2003	