Reference Cell and Cooling Jet Systems

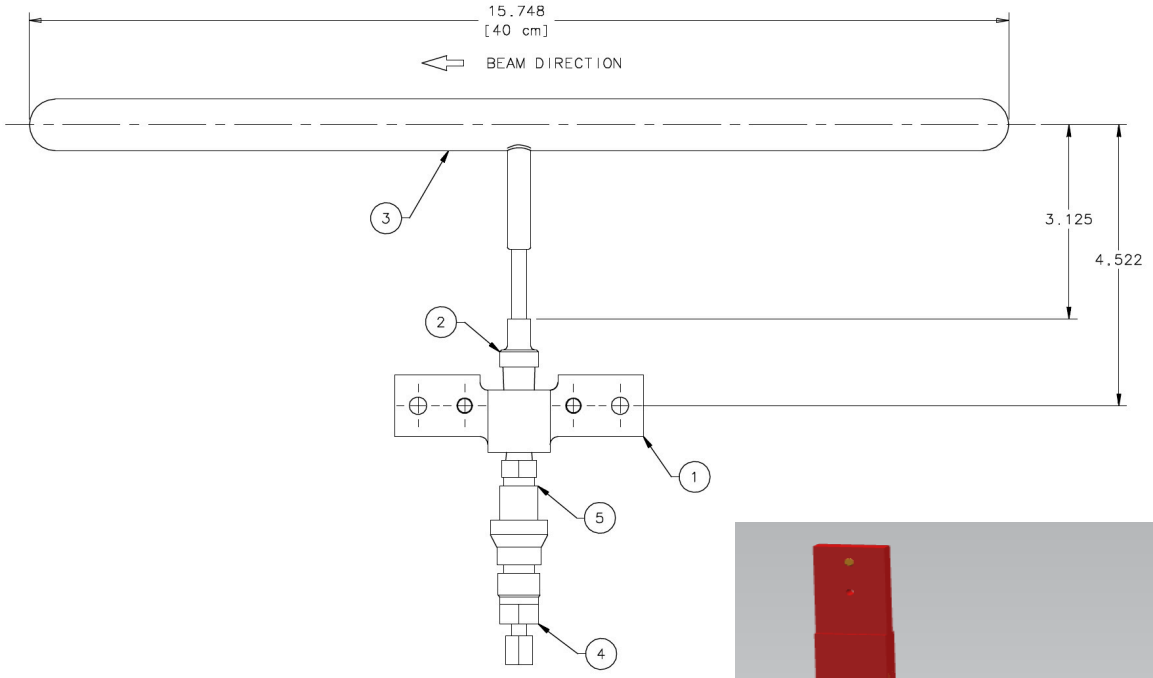
A_1^n and d_2^n collaboration meeting

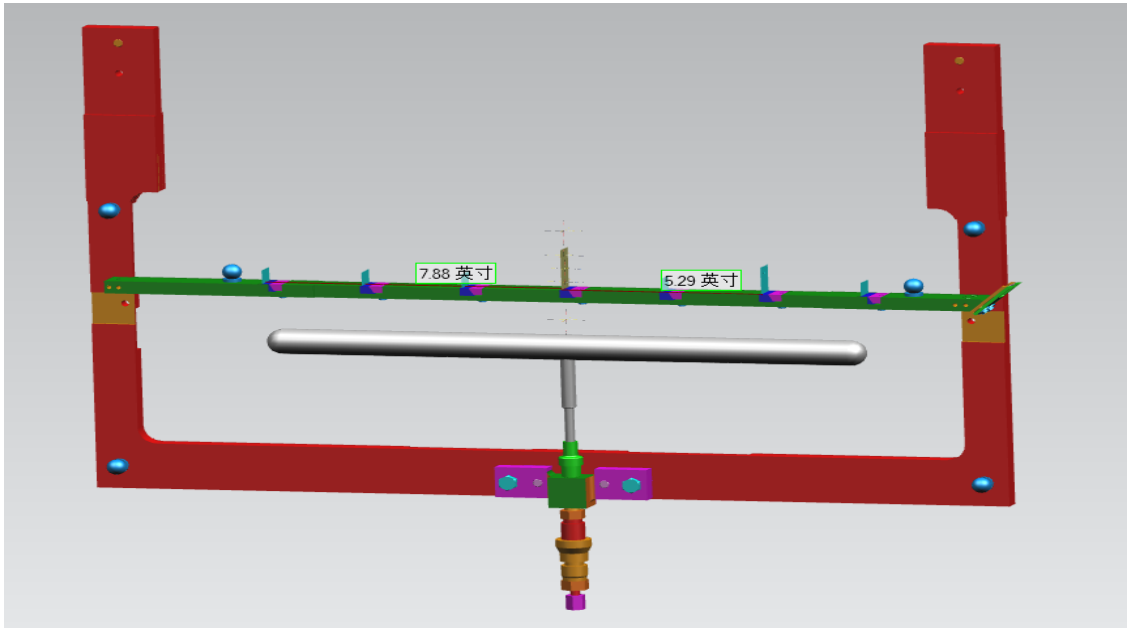
T. Averett, William and Mary, 24-Jul-2019

- Reference Cell = Glass cell identical to target cell with no pumping chamber
- Can be filled up to 150 psig with:
  - H_2 for p(*e,e'*)
  - N_2 for nitrogen dilution studies
  - ^{3}He for unpolarized cross section measurements
  - vacuum for glass window background

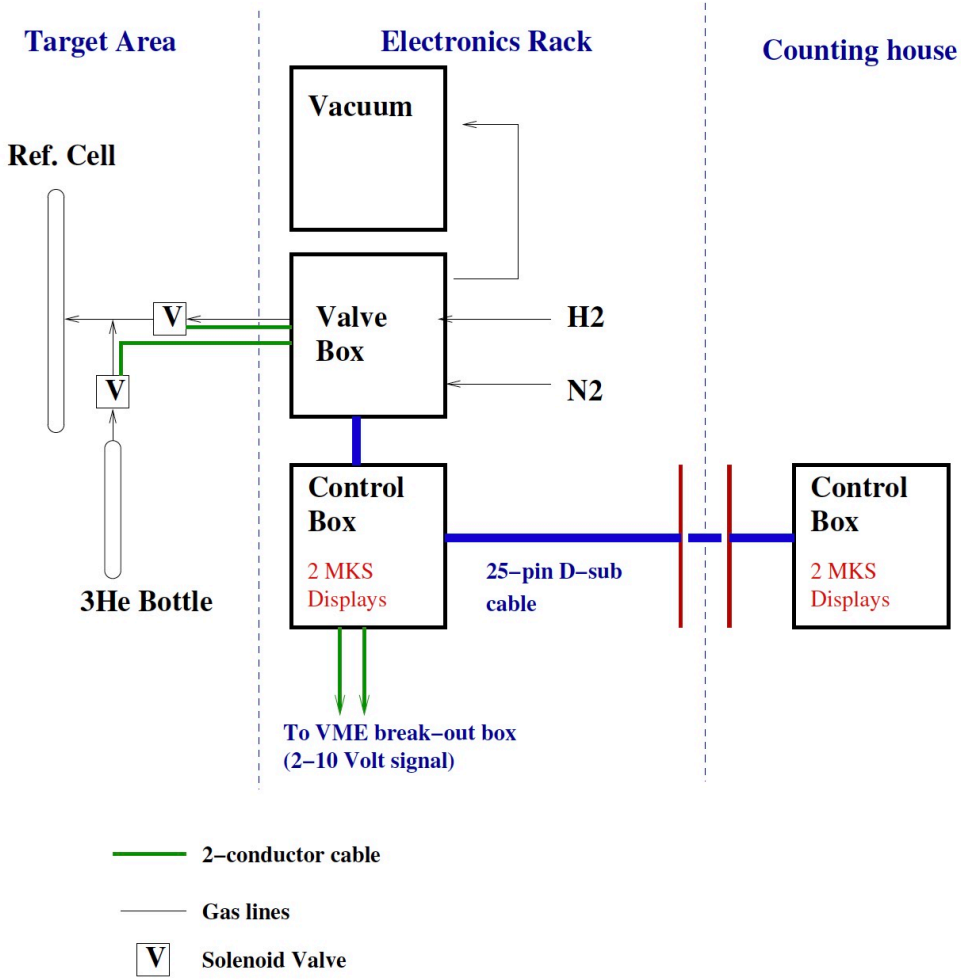
- One cell assembled, two more to come

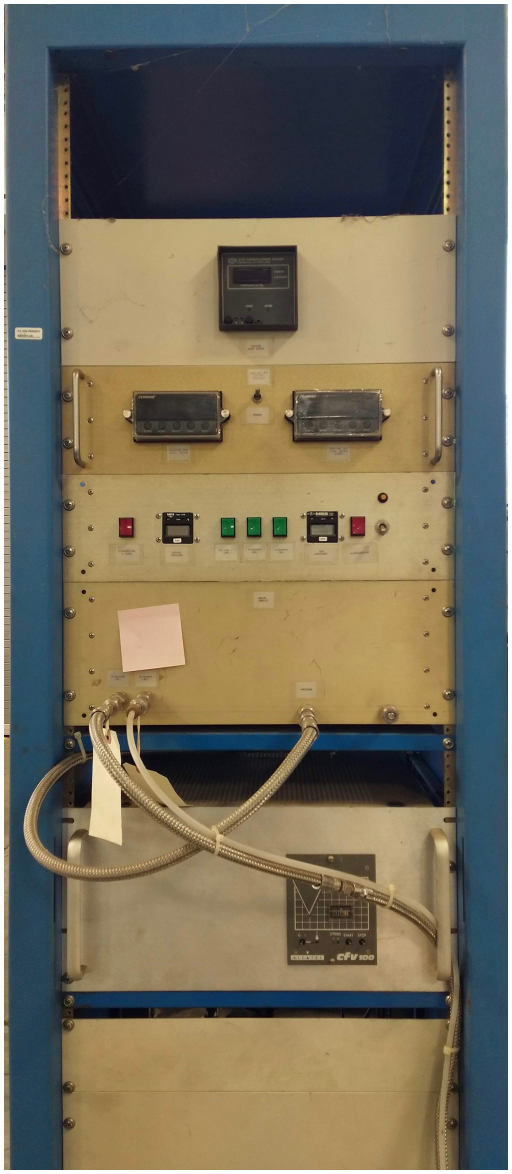
- Cooling Jets: hardware and simulation (Silviu)


15.748
[40 cm]
BEAM DIRECTION
3.125
4.522
3
2
1
5
4


7.88 英寸
5.29 英寸

Reference Cell System

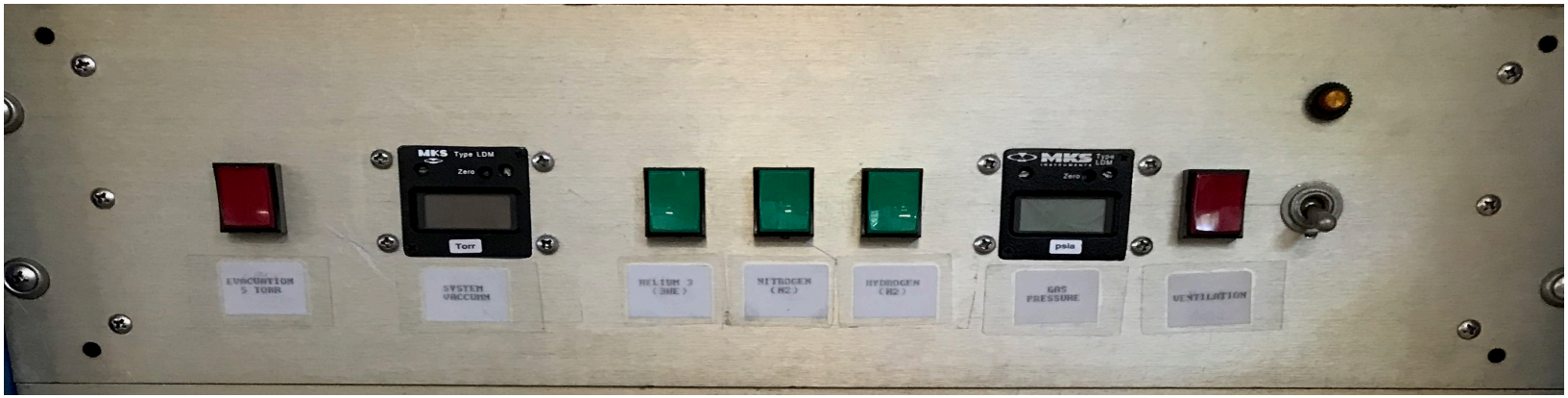


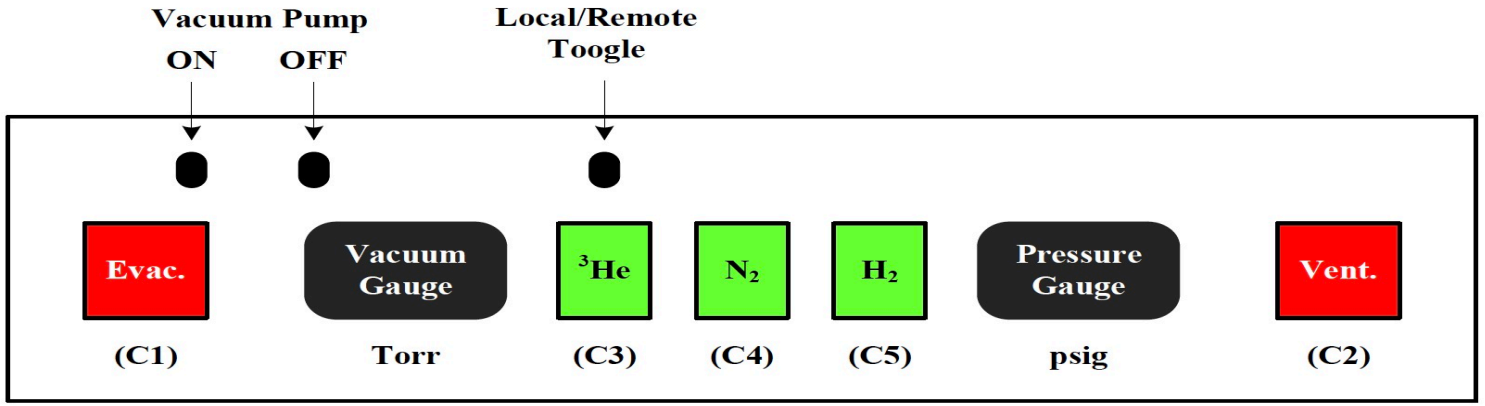


Reference Cell Gas System

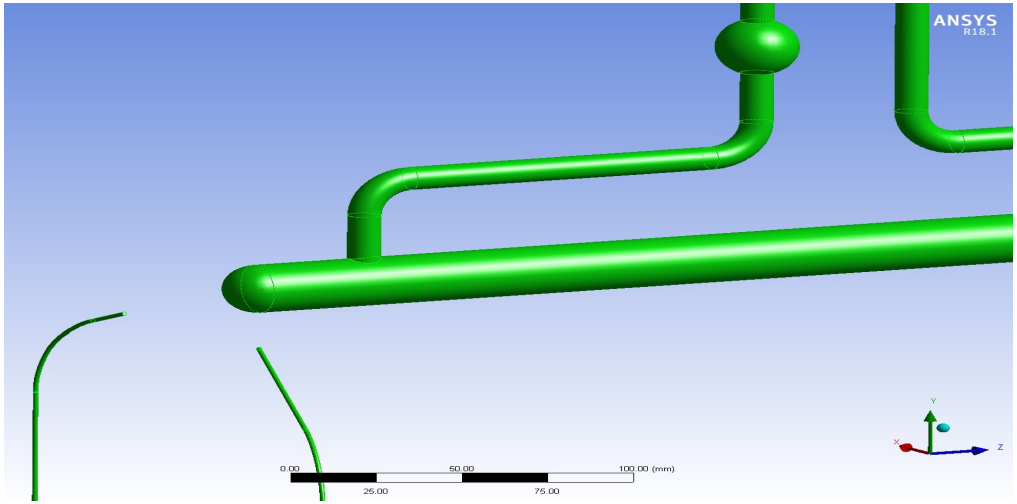
- Main rack near pivot, remote panel in counting house
  - Cleaned, repaired, tested, inspected by DA (S. Lassiter) Mechanical pump oil changed, spare turbo pump procured
  - Pressure gauge calibrated to 0.5 psi, recalibrate in the hall
  - Note: no EPICS readout of pressure but could be possible I think
  - FSD cables identified
- To do
  - Make patch cable from CHC to Hall C - Segal/Mahlon
  - Procure N_2 and H_2 gases − Segal
  - Plumbing to pivot − Kellner
  - Provide compressed air at ~70 psig for pneumatic valves - Kellner

Ref. Cell Control Panel in Counting House





Target Cooling Jets



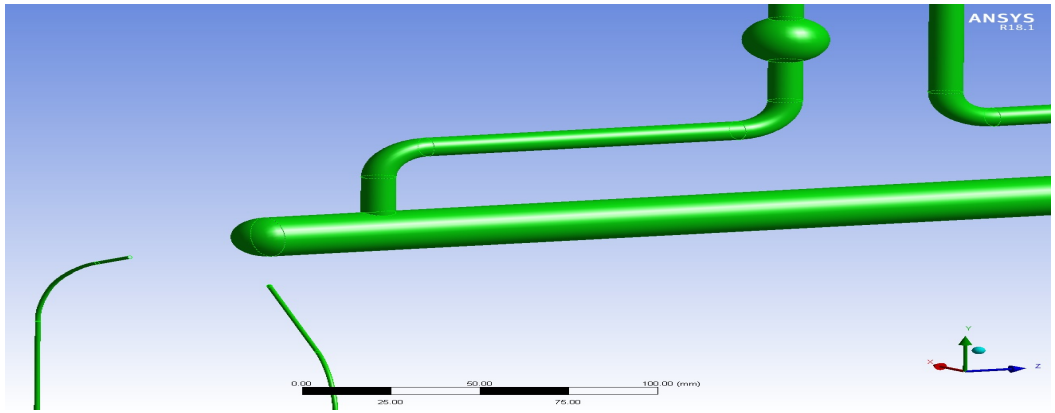
- 1 or 2 helium gas jets through 1/8” tubing pointed towards windows
- Flow meters in Reference Cell Rack
  - Set flow by manual valve, monitor flow meter by camera
- To do:
  - Video cable and monitor − Segal/Mahlon
  - Repair flow meter cable - Mahlon
  - Plumbing, flow meter in hall - Kellner

Thermal Simulations-Silviu Kovrig (sp?)

- Study window cooling under different conditions
- Bottom line − two jets pointed symmetrically toward window not as efficient as single jet incident at angle.
- Caveats:
  - Simulation based on location of jets in design drawings.
  - Actual location of jets not precise, just bending tubes
- Need to provide optimized position of jet(s) by simulation.

Cooling Jet Simulation Results – Silviu Covrig Dusa

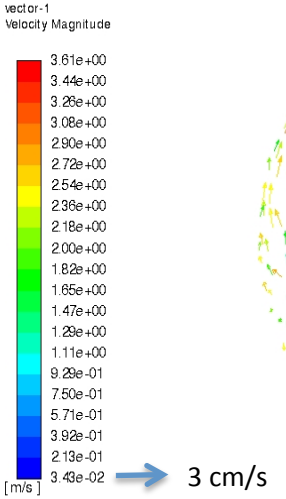
Based on geometry in design CAD



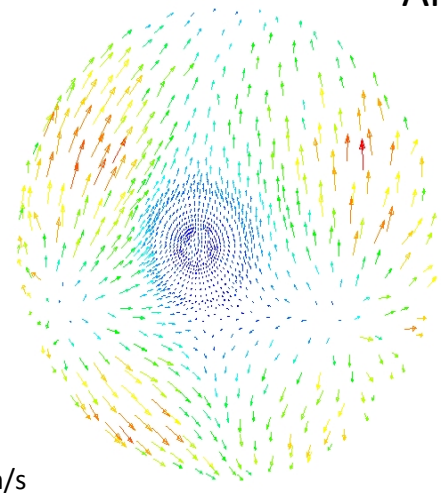
Velocity distribution two jets

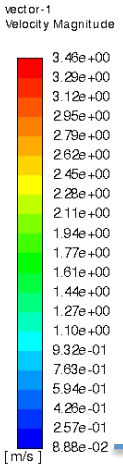
Velocity distribution single jet

Arrows = flow parallel to surface

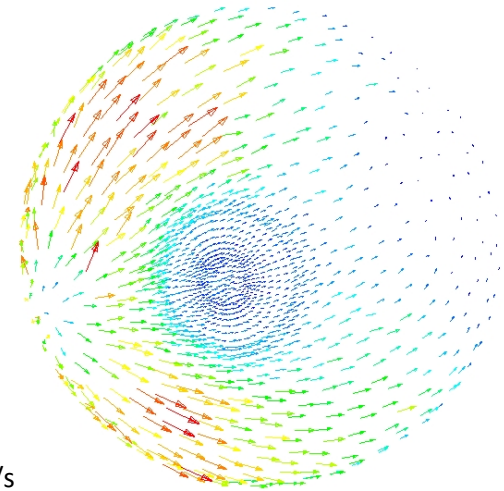


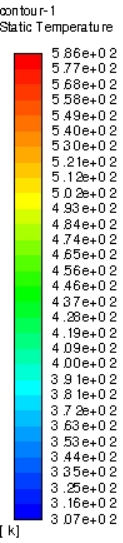
3 cm/s



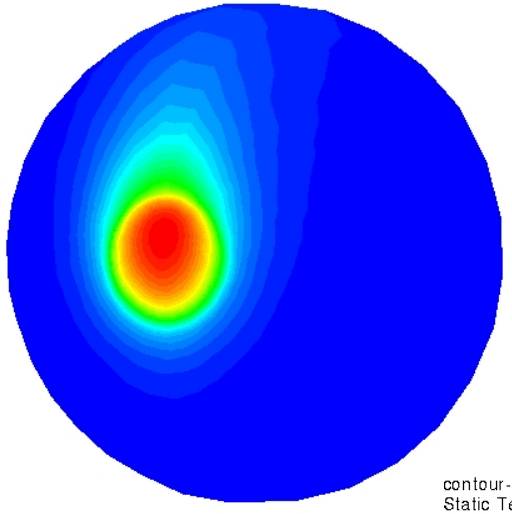


9 cm/s



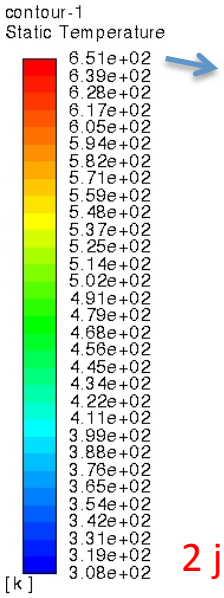


313 °C

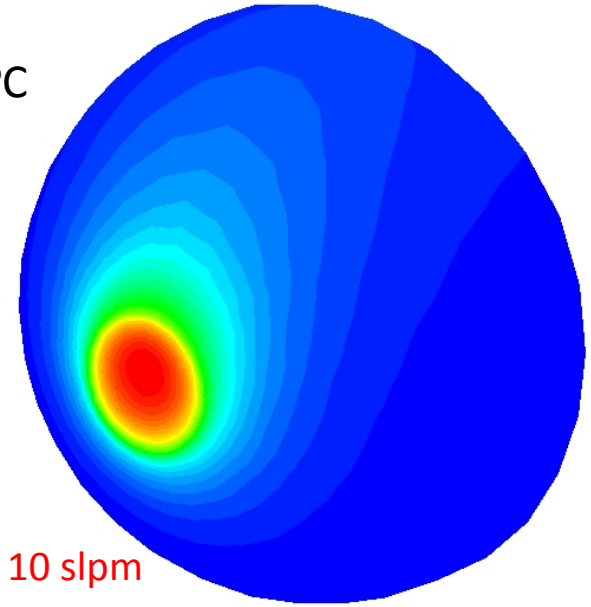


2 jets @ 20 slpm

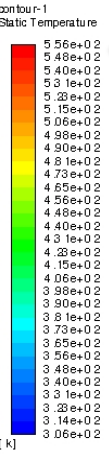
Red/Yellow Temperatures are raster area
30 uA, diameter 5mm



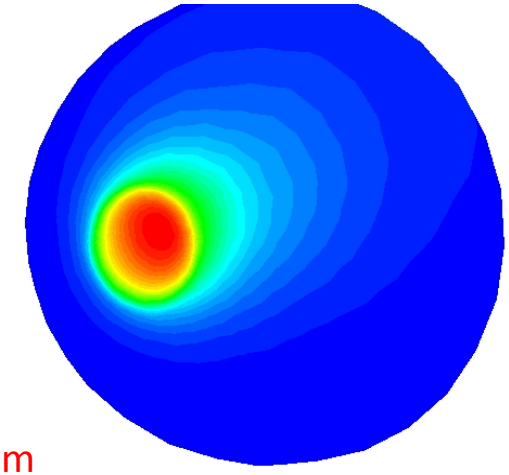
378°C



2 jets @ 10 slpm

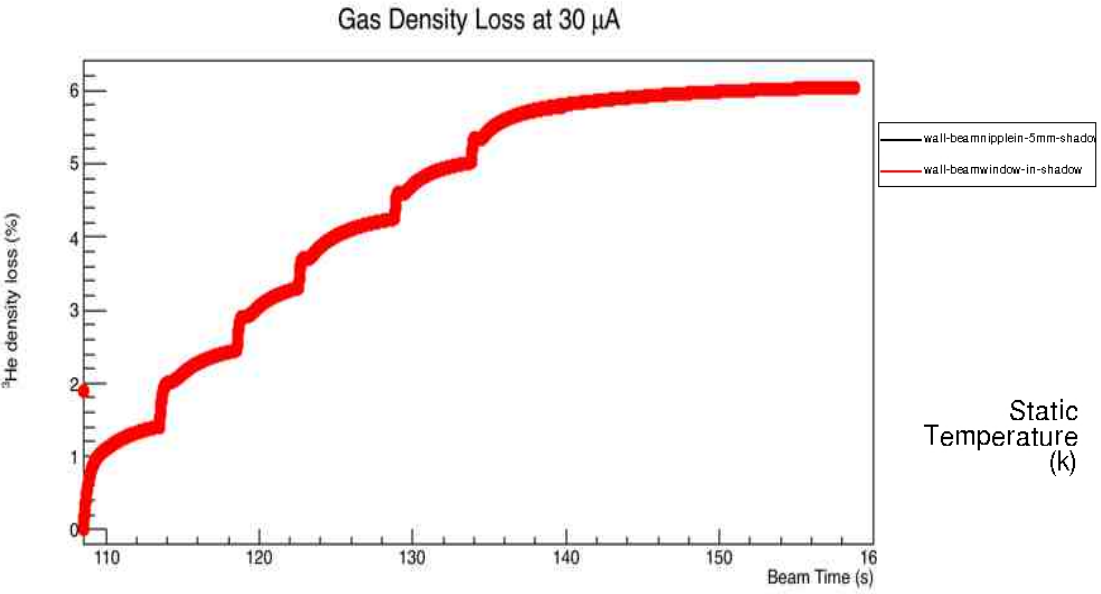


283°C

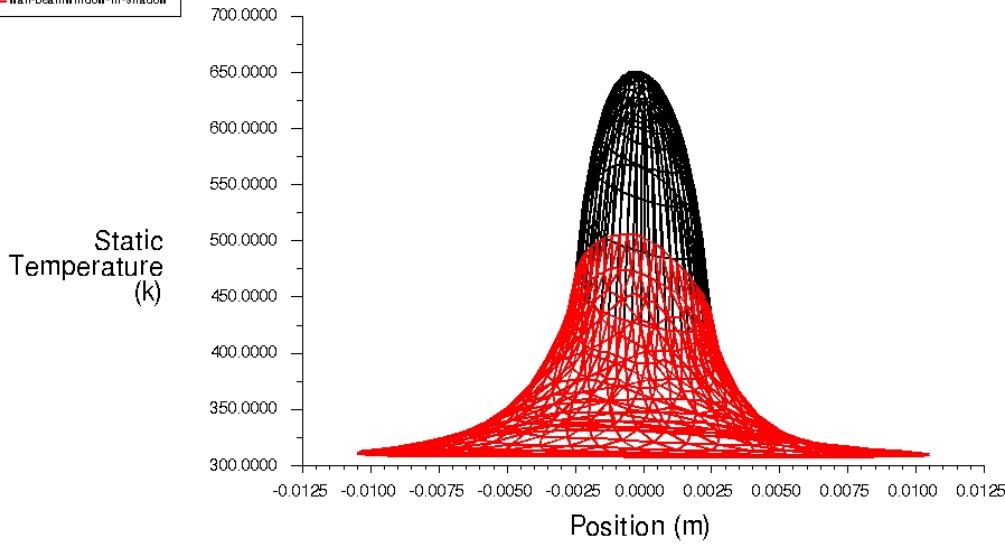


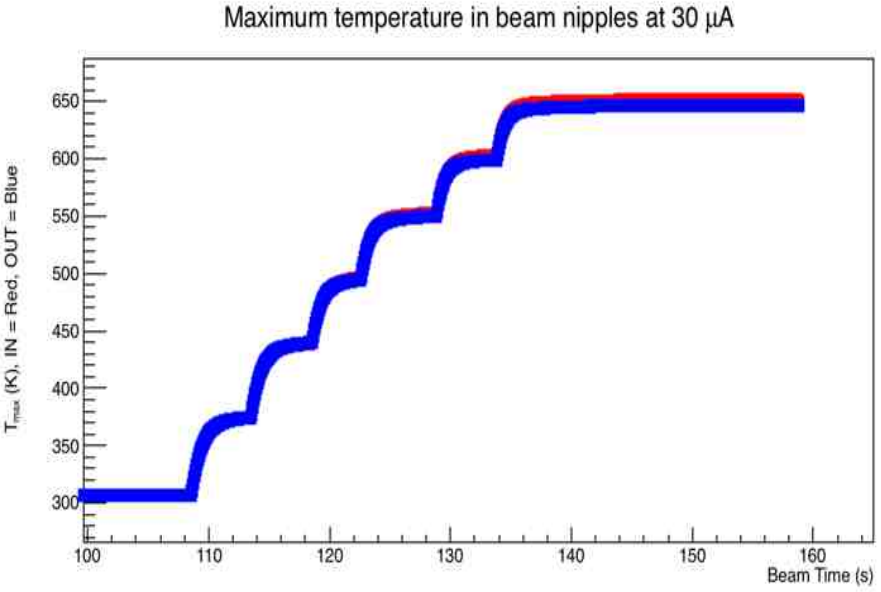
1 jet @ 20 slpm

Plots for 2 jets @ 10 slpm



Black = raster region
Red = outside raster region





- Simulations based on design location of jets
- Jets provided by bendable 1/8” tubing
- Positioned by hand/eye
- Need simulation to provide optimum geometry/ flow