Preliminary Studies of Plasma-Channel-Based Reactor Beam Transport Section

P. LaMarche
T. Brown
P. Heitzenroeder

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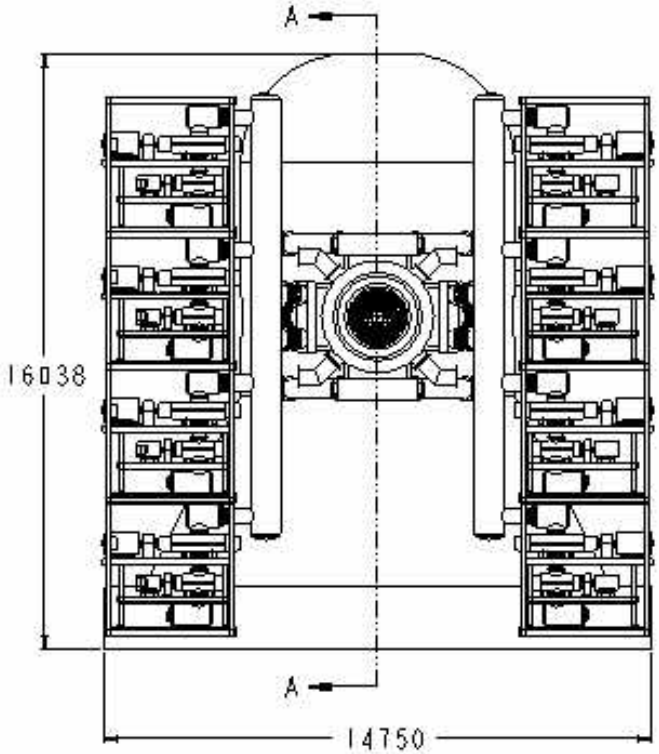
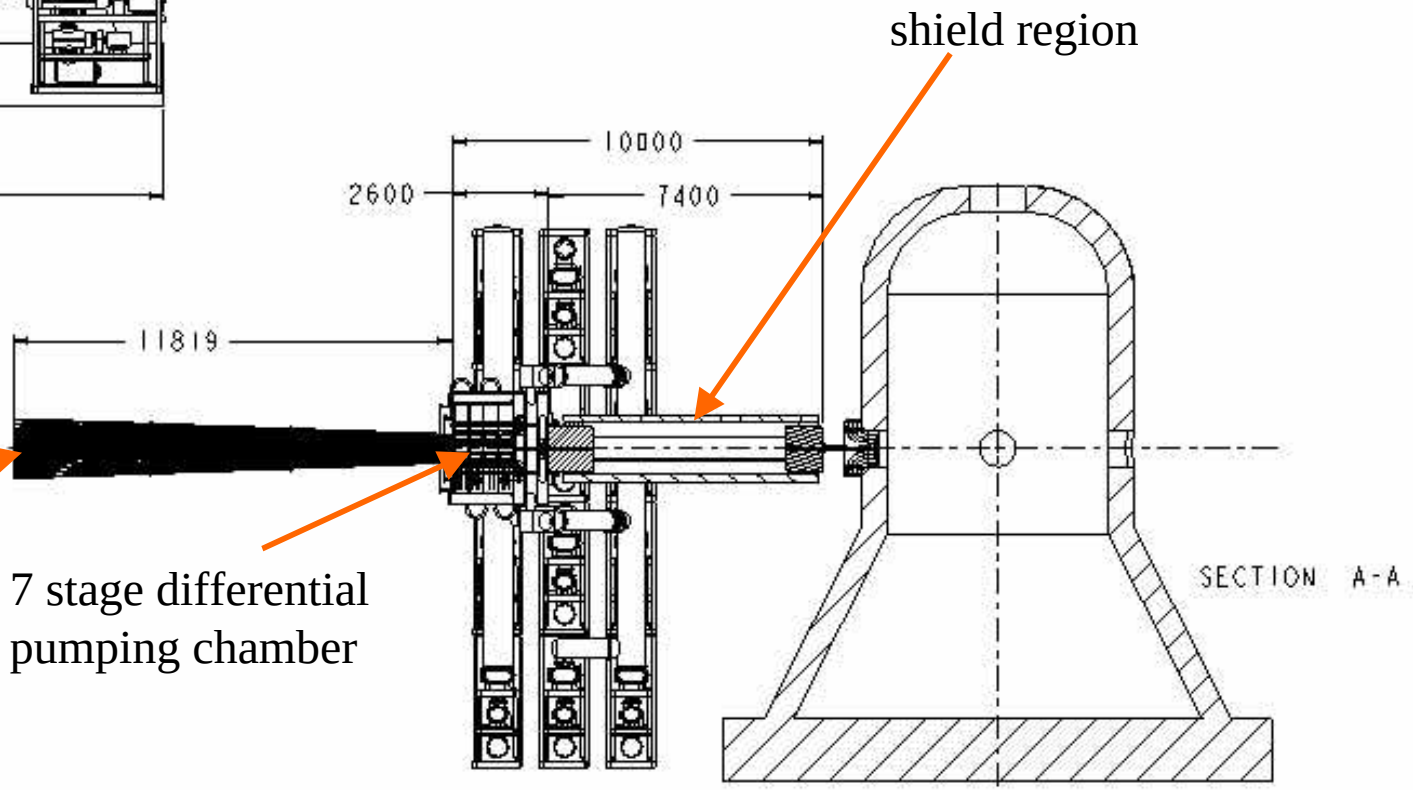
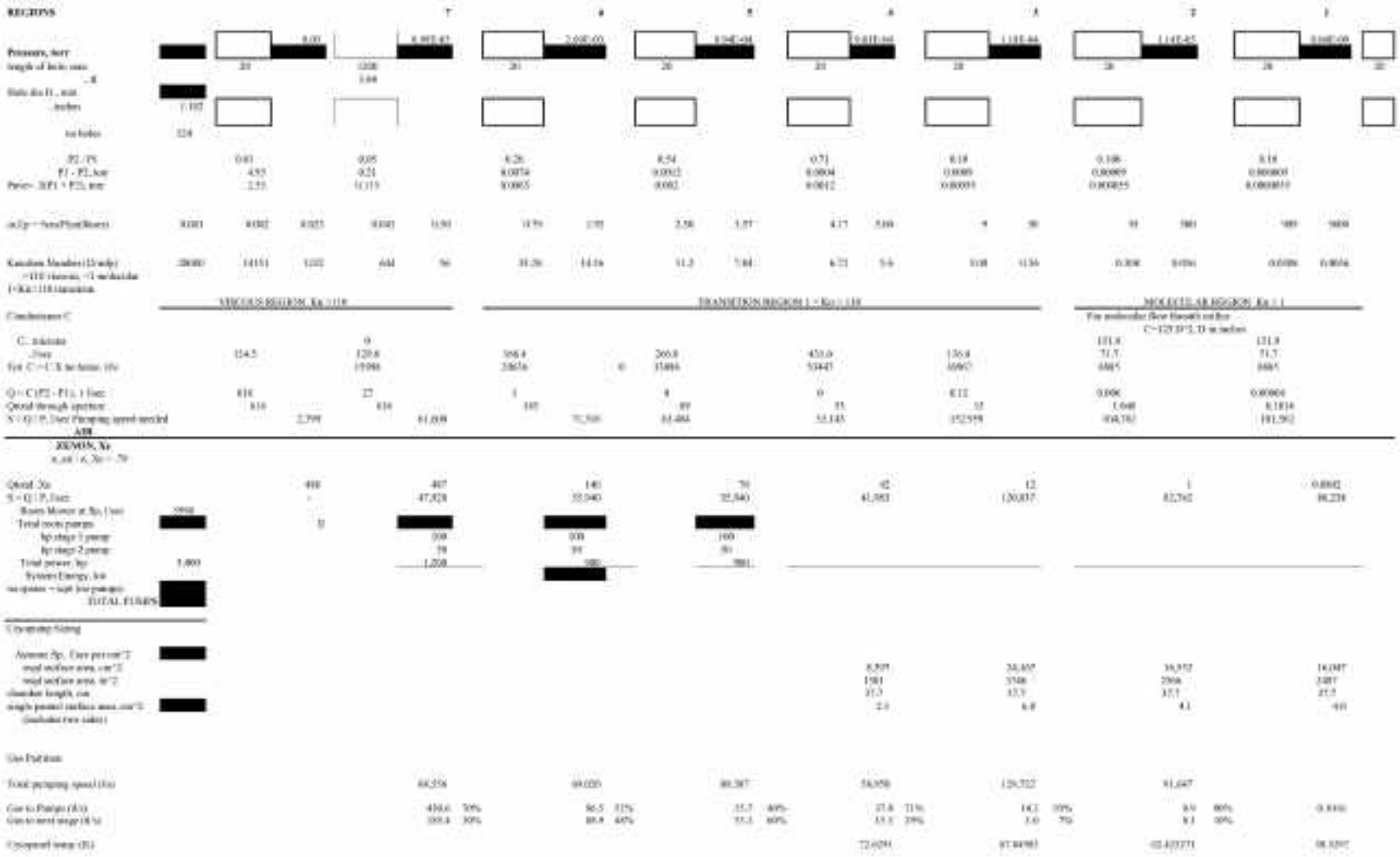
Plasma-channel-based reactor beam transport section

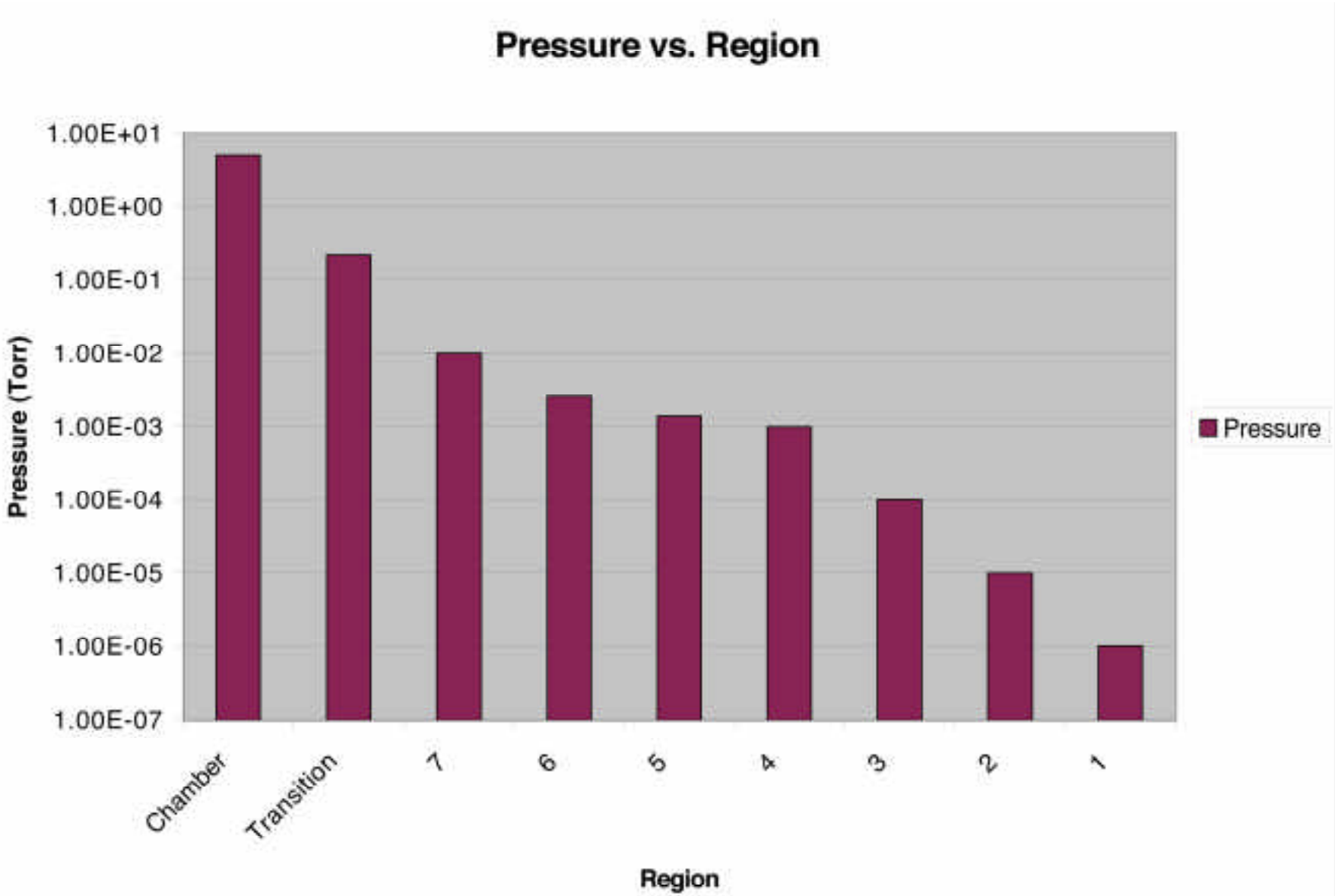


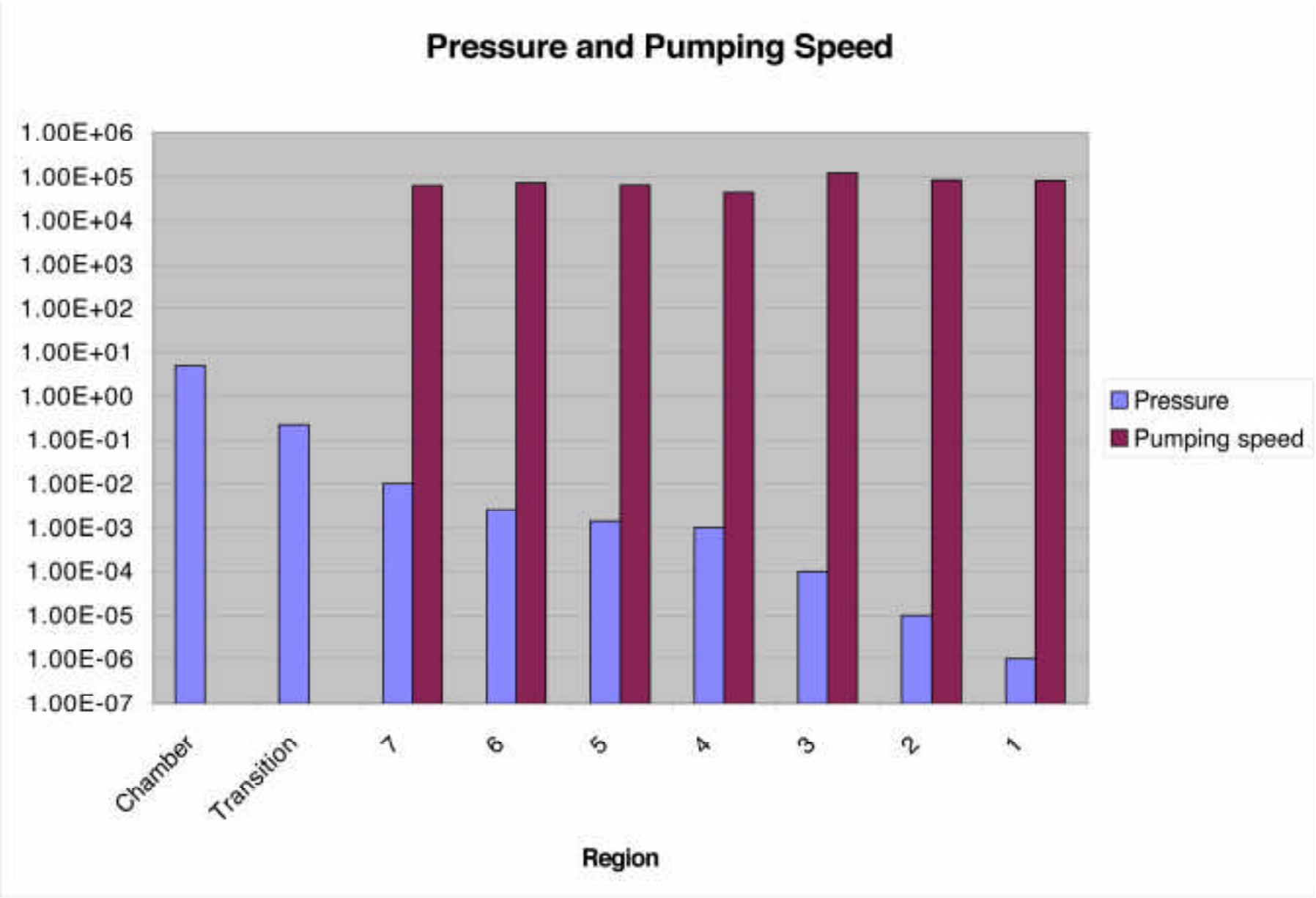
End View

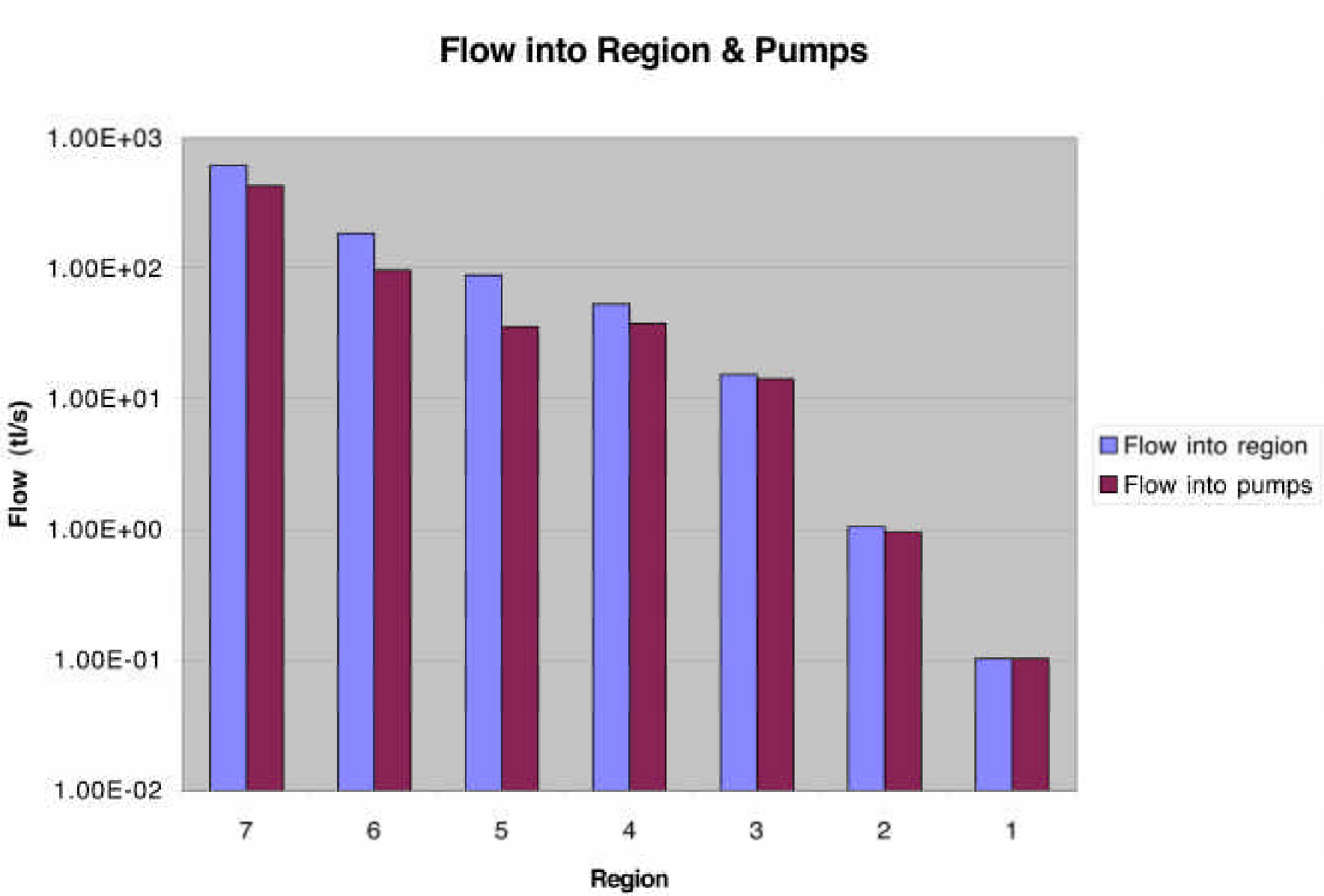


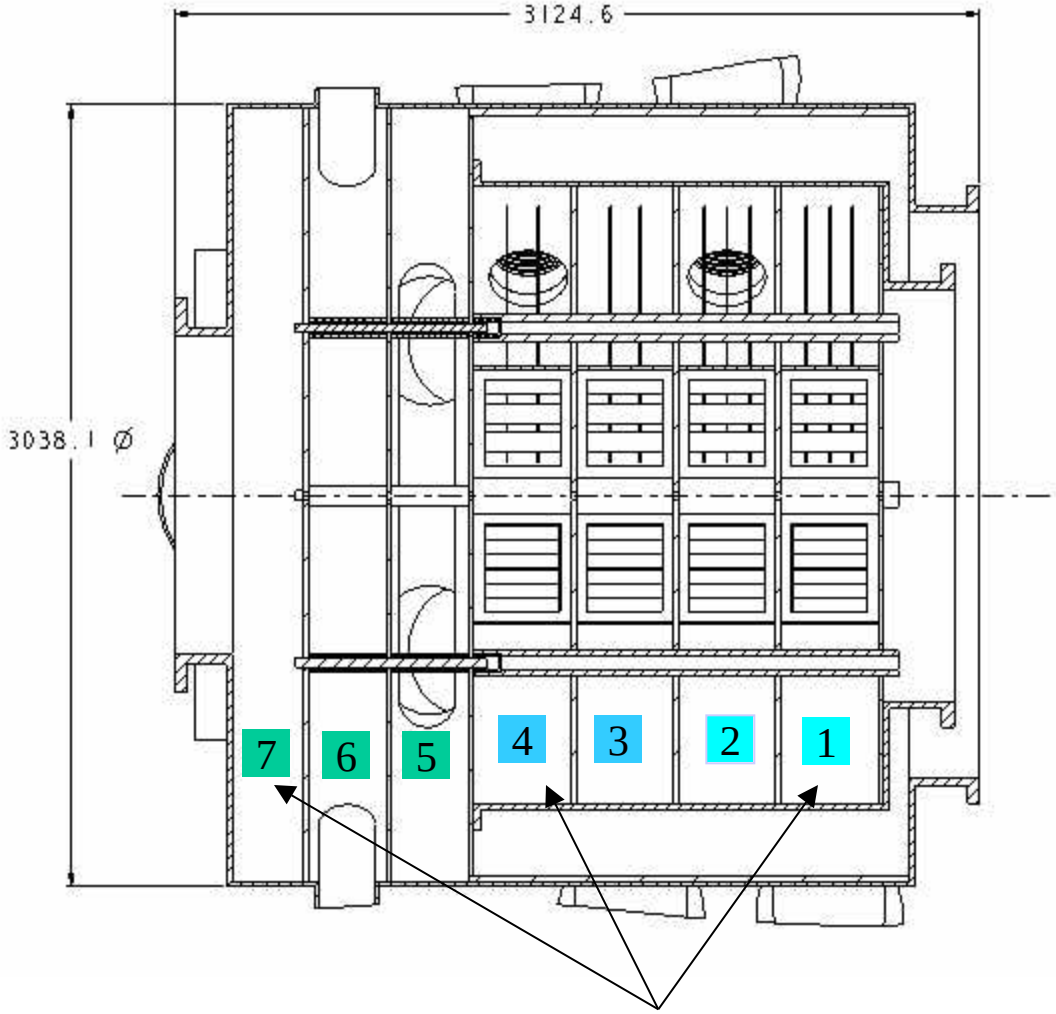
Pumping Calculations




Pressure vs. Region
Pressure (Torr)
1.00E+01
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
1.00E-07
Chamber
Transition
7
6
5
4
3
2
1
Region
Pressure


Pressure and Pumping Speed
1.00E+06
1.00E+05
1.00E+04
1.00E+03
1.00E+02
1.00E+01
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
1.00E-07
Chamber
Transition
7
6
5
4
3
2
1
Region
Pressure
Pumping speed


Flow into Region & Pumps
1.00E+03
1.00E+02
1.00E+01
1.00E+00
1.00E-01
1.00E-02
Flow (tl/s)
7
6
5
4
3
2
1
Region
Flow into region
Flow into pumps



Pumping Regions

7 Stage differential pumping chamber

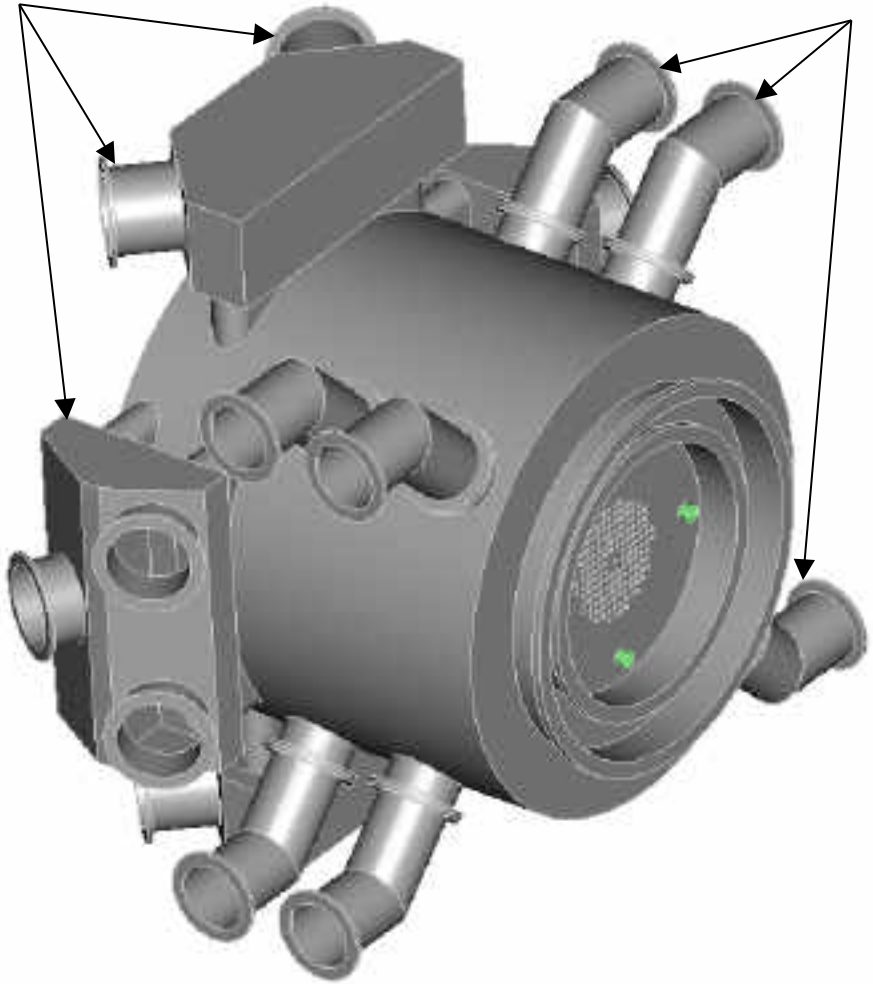
Molecular Region

Transition Region

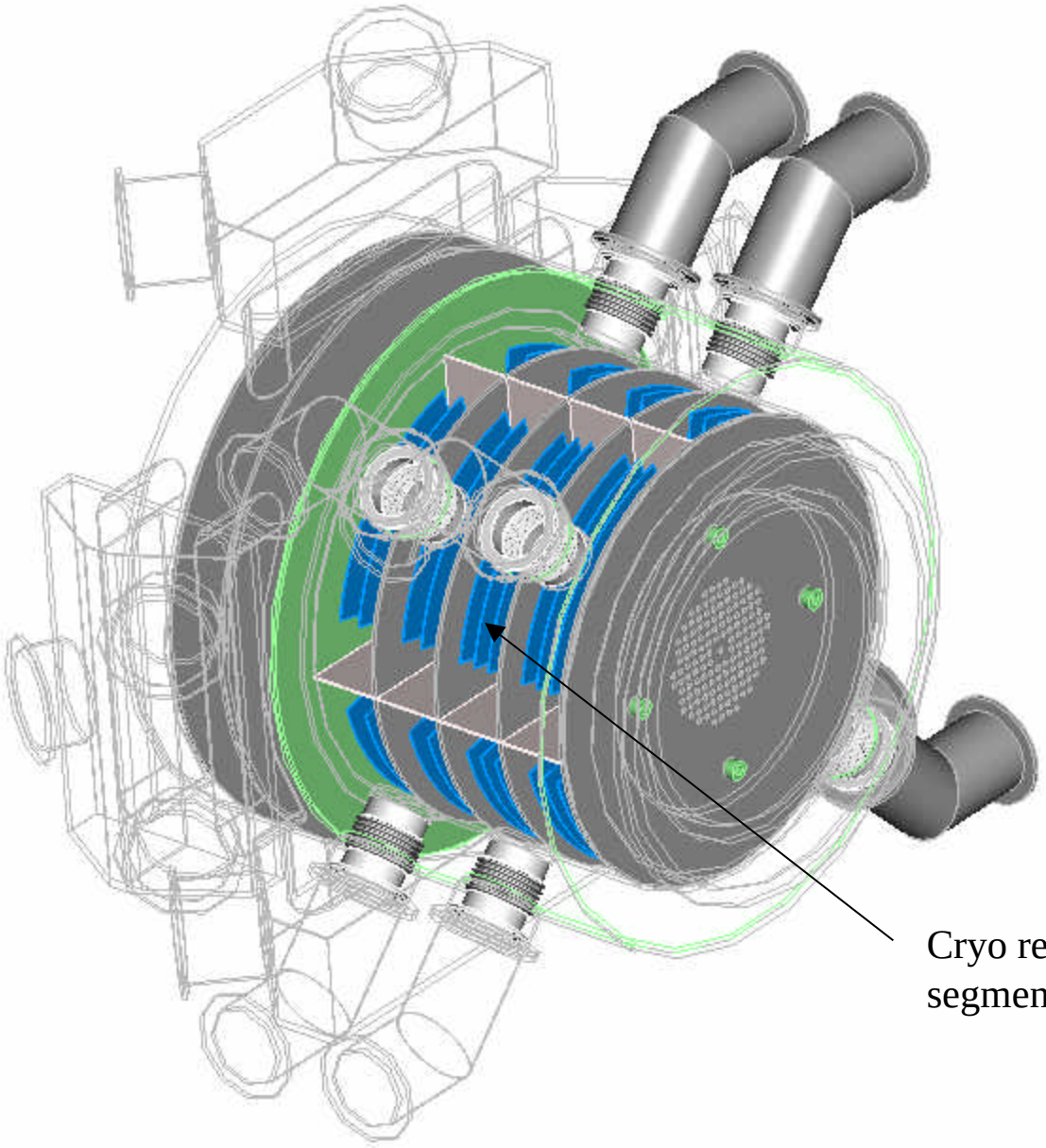
Viscous Region

Routs blower ports
for viscous regions

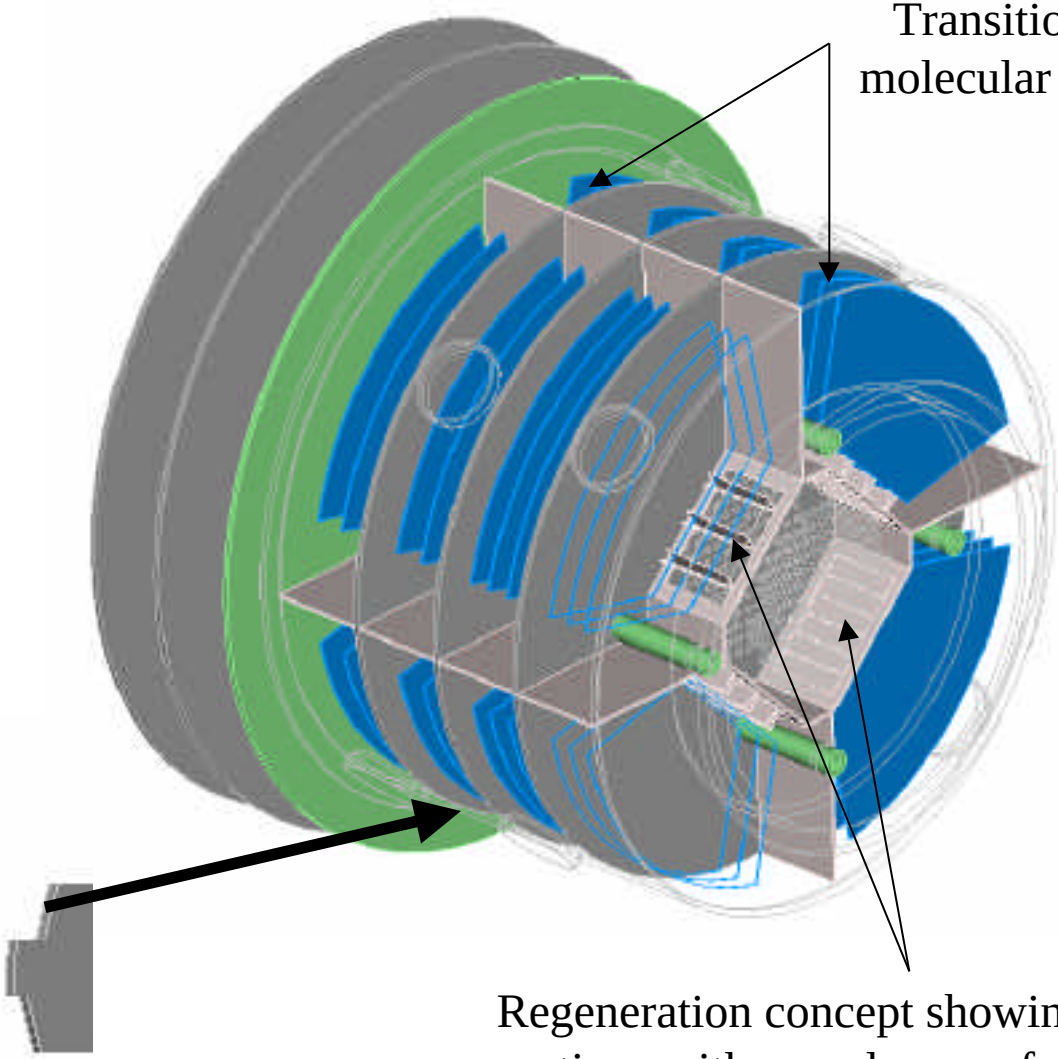
Roughing ports for
cryo region



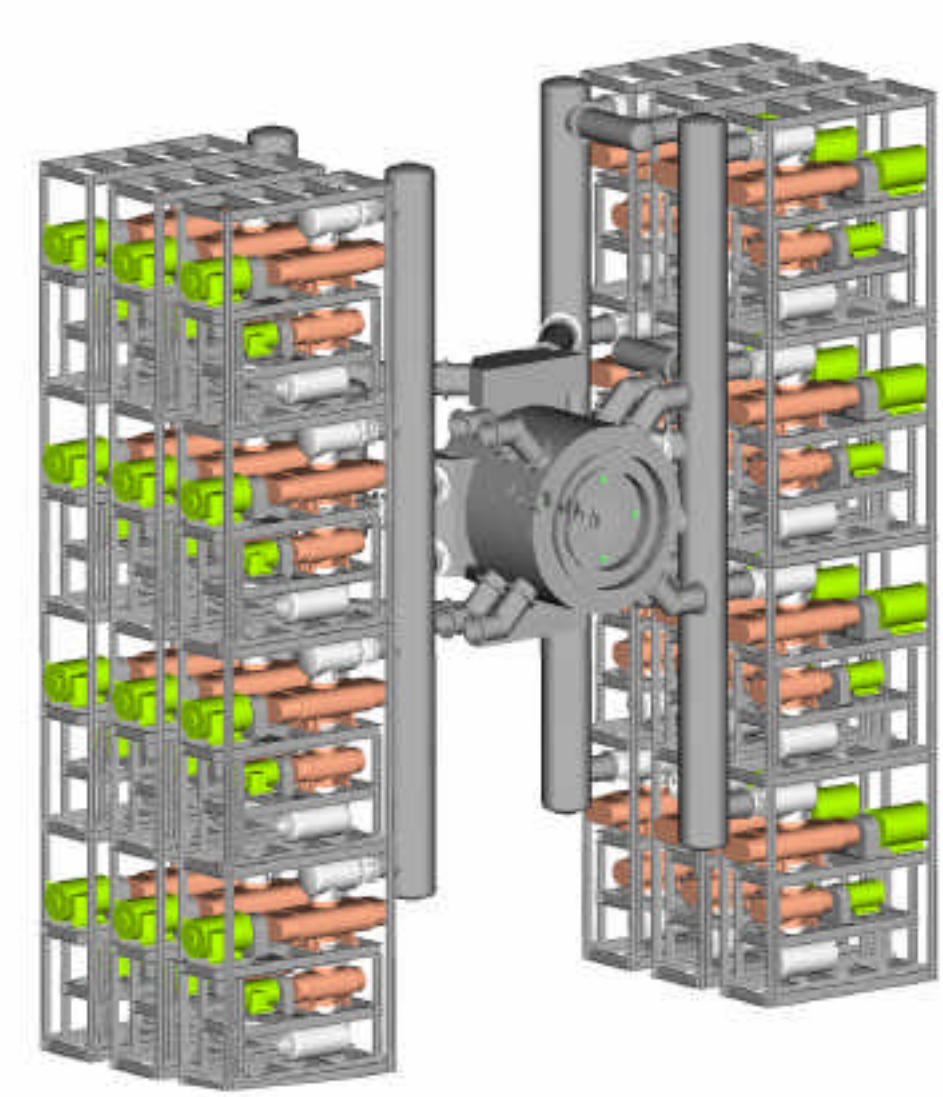
7 Stage differential
pumping chamber



Cryo region
segmentation



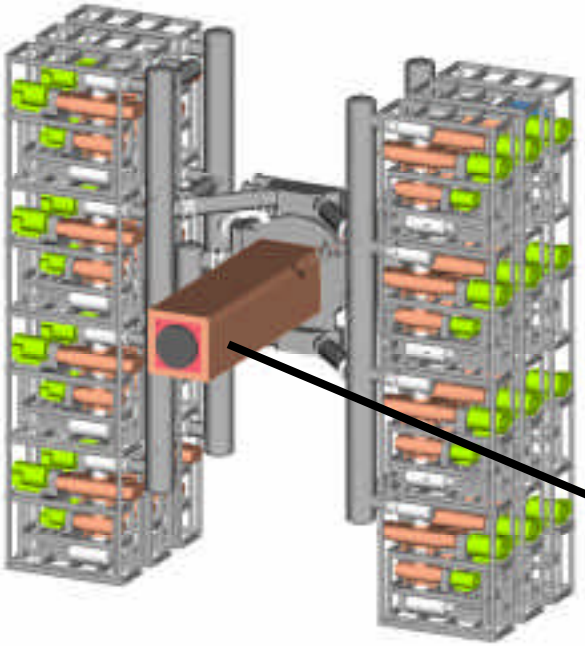
Regeneration concept showing three sections with open louvers for pumping and one section closed for regeneration



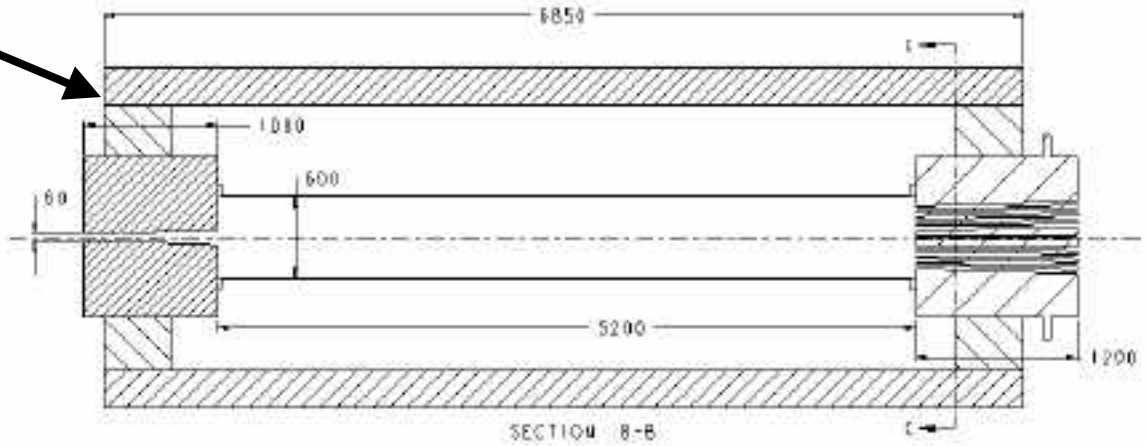
Pumping concept shown provides 24 two stage roots pumps.

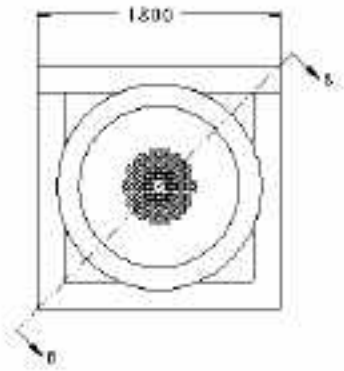
- 21 pumps (including spares) are required with latest pressure distribution.
- Detailed conductance calculations have not been made.
- Roughing pumps for Cryo region are not included.

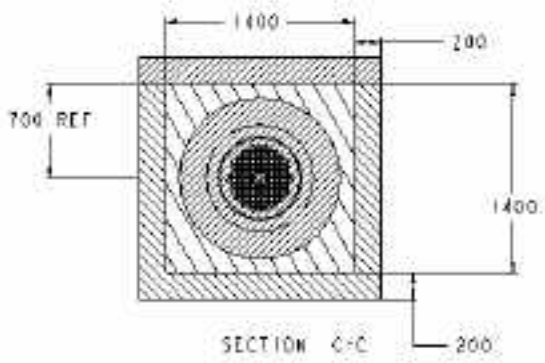
12700 cfm 2 stage roots vacuum system



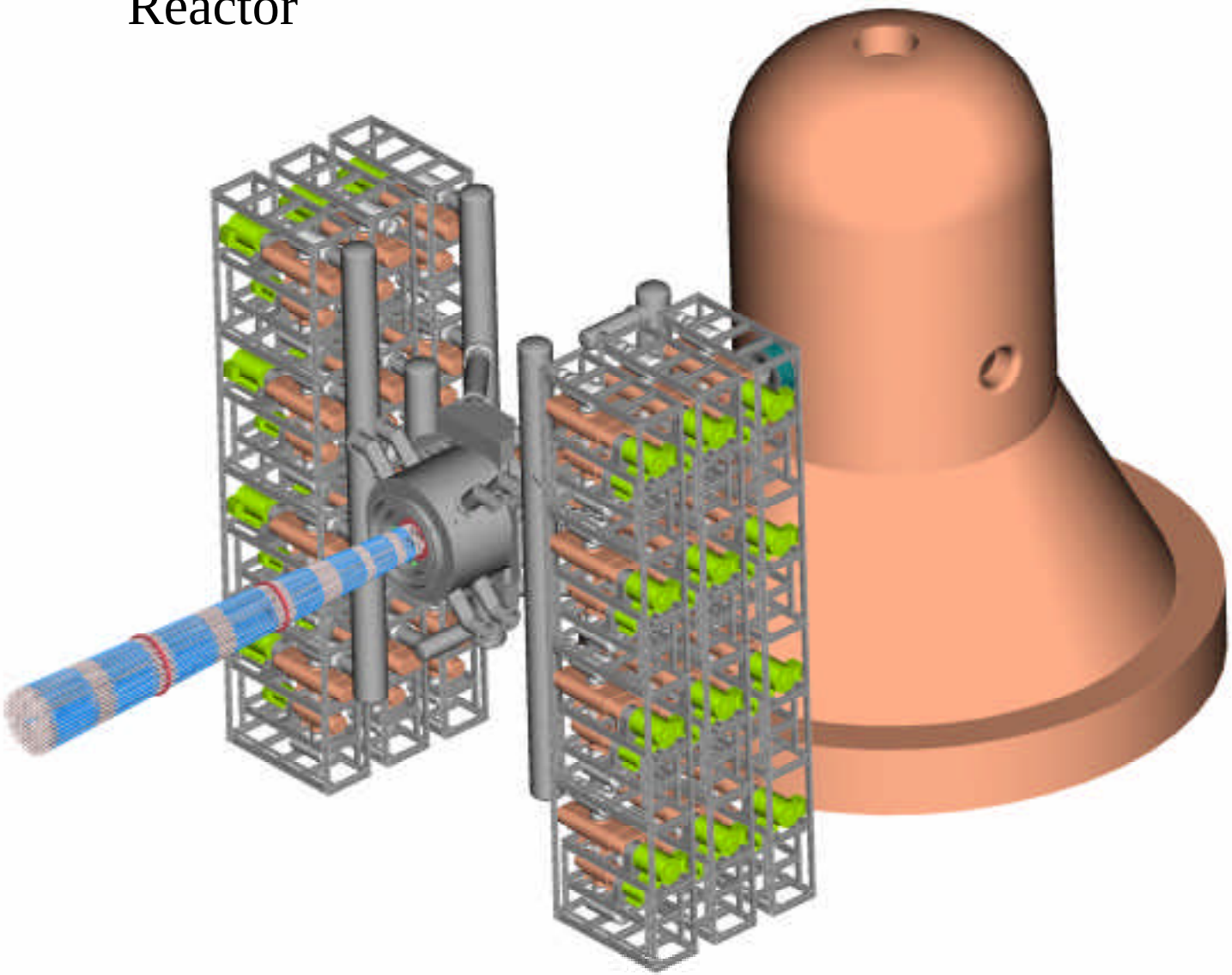
The shield region contains one beam pipe and two shield segments that interfaces with the adiabatic focusing lens on one end and the 7 stage differential pumping chamber at the other.







Plasma-channel-based Reactor



Future Plans

- Unfortunately no budget remains this fiscal year and additional work must await next FY's budget.
- Tentative plans for next FY includes:
  - Refined vacuum calculations using "Degas-II".
  - Continued development of the engineering design details of the focusing magnet region. This includes:
    - Continuing to work with beam physics to develop the beam magnet requirements;
    - Developing focusing magnet engineering and design details in collaboration with MIT. Both high and low temperature superconductors will be considered.
    - Updating the vacuum system details to be consistent with industry available components;
    - Updating interfaces with the target chamber;
    - Developing design concepts for a shutter;
    - Analyzing maintainability.