

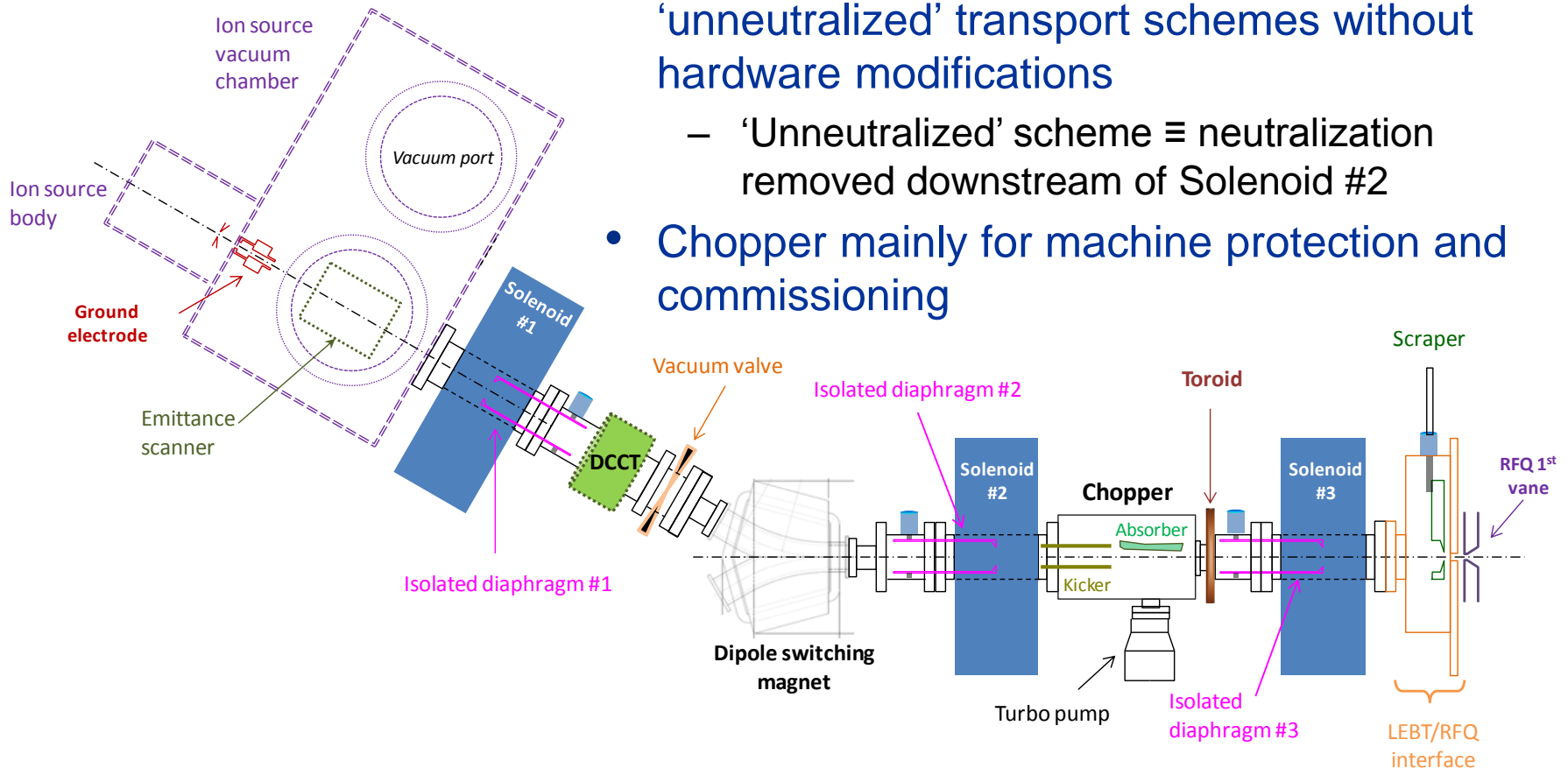
# **PXIE Ion Source and LEBT Installation Status**

L. Prost

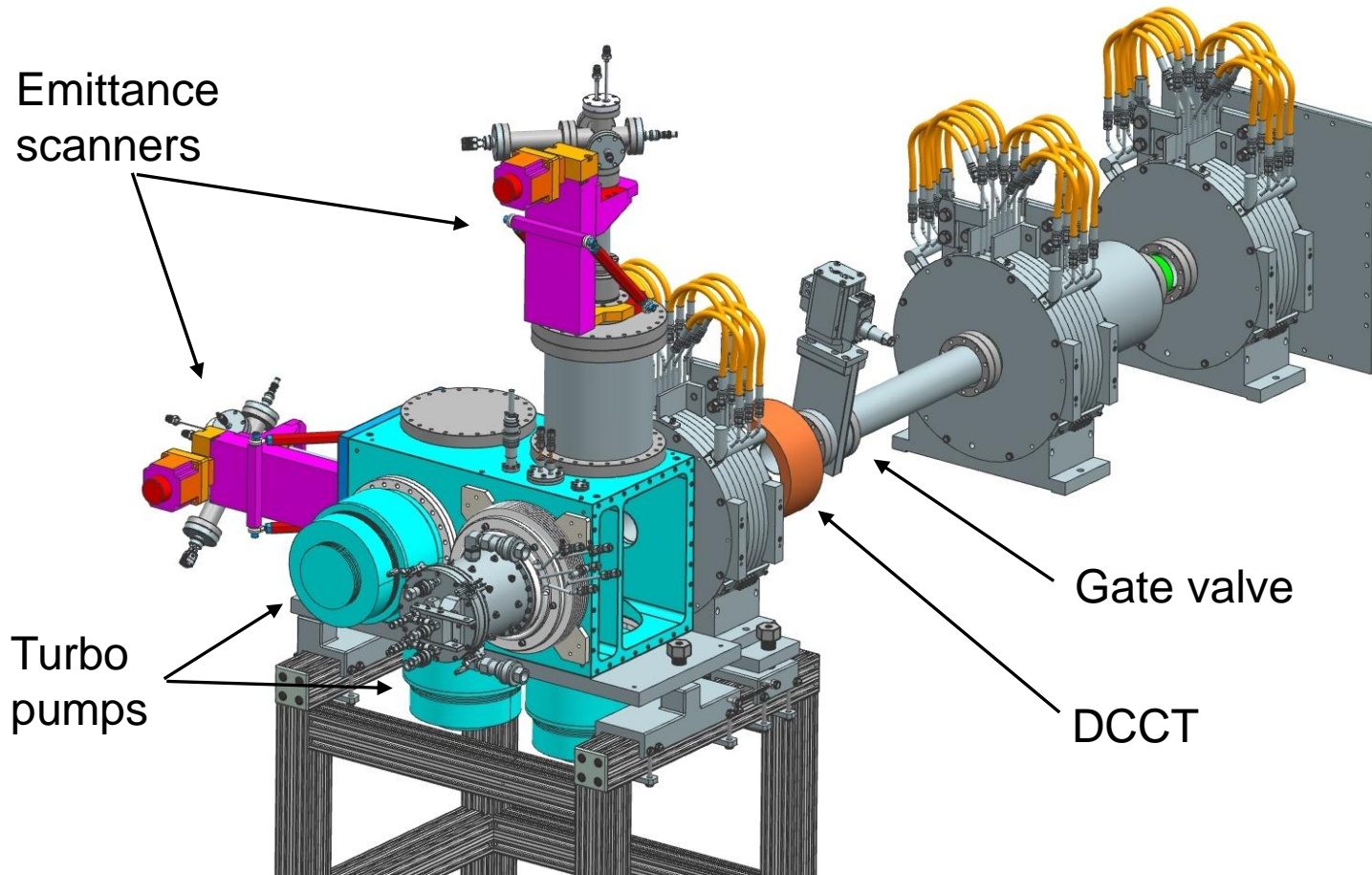
Project X Friday Meeting

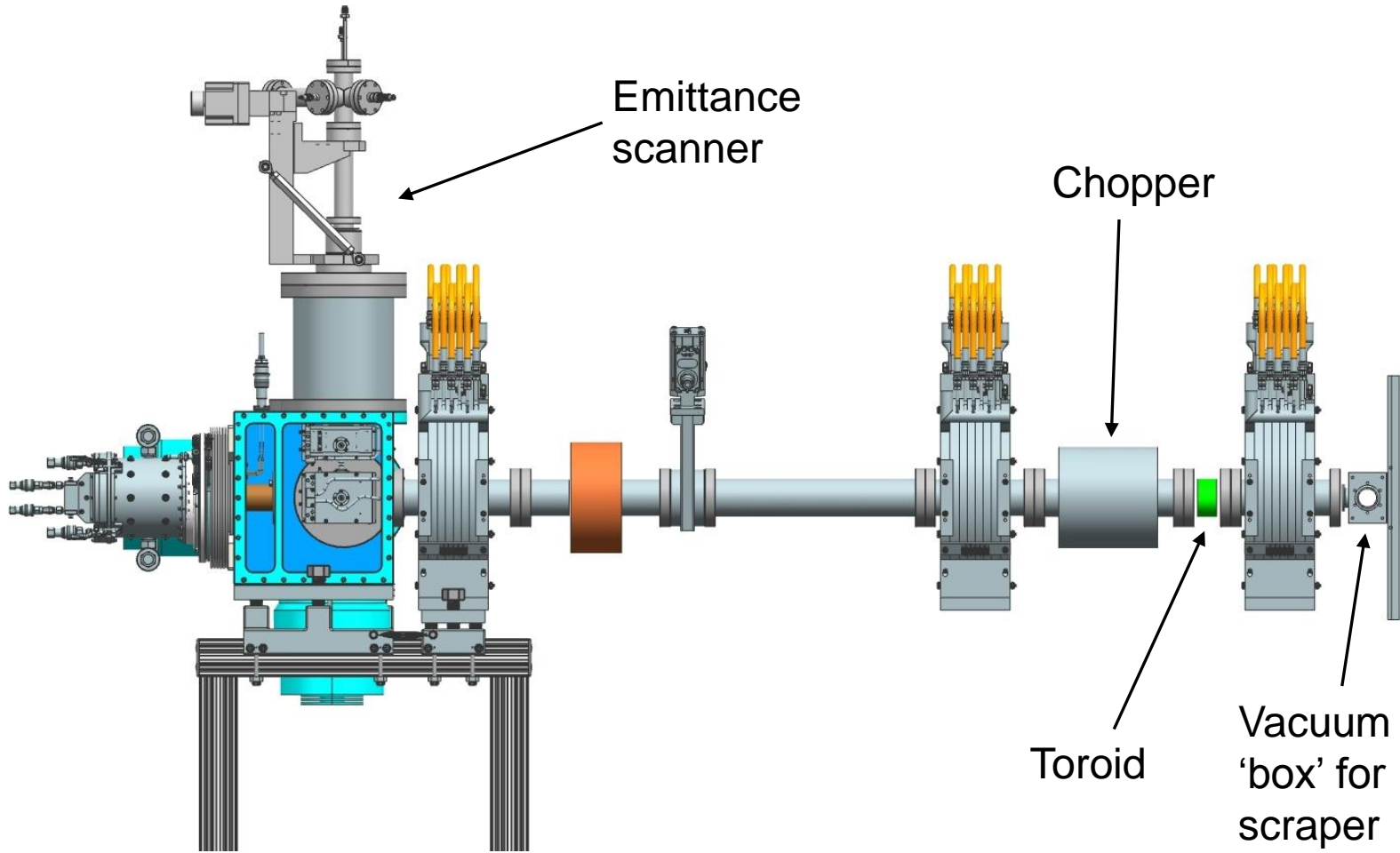
May 24, 2013

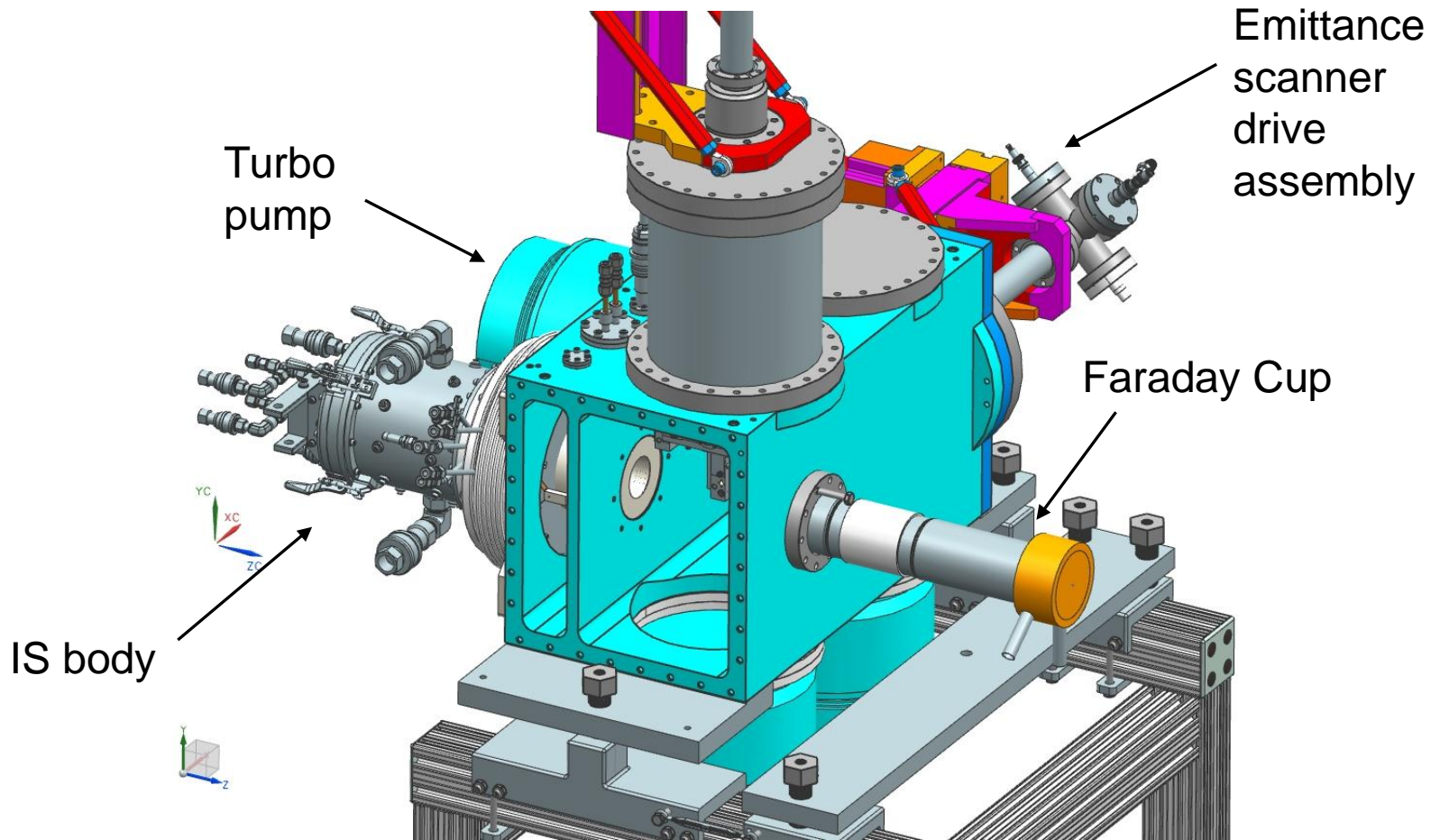
# 3-solenoid layout

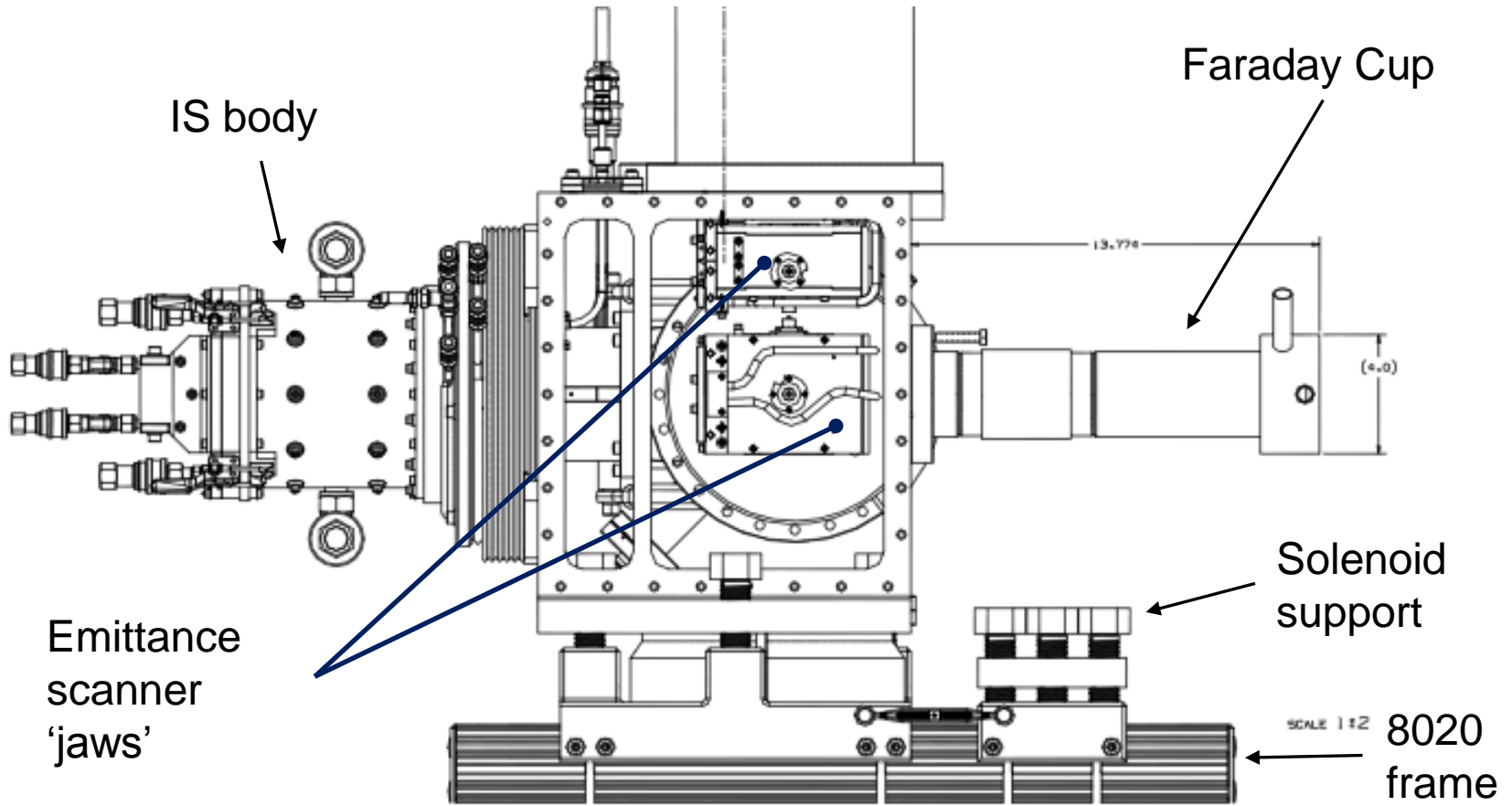


- Accommodate both neutralized and ‘unneutralized’ transport schemes without hardware modifications
  - ‘Unneutralized’ scheme  $\equiv$  neutralization removed downstream of Solenoid #2
- Chopper mainly for machine protection and commissioning





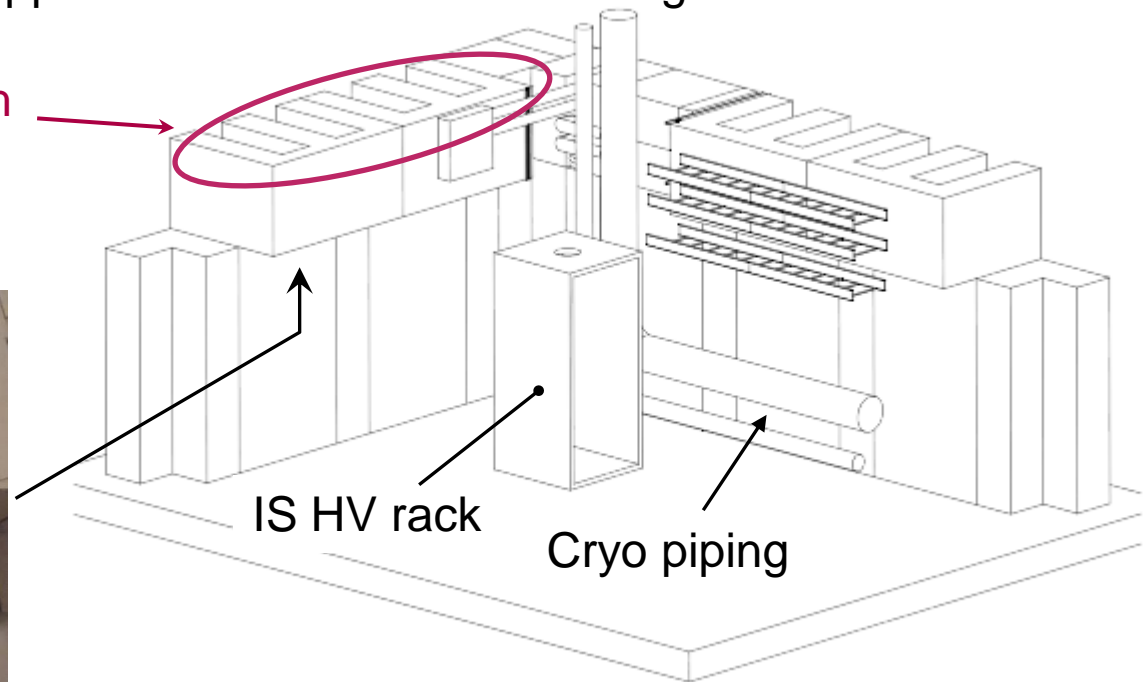
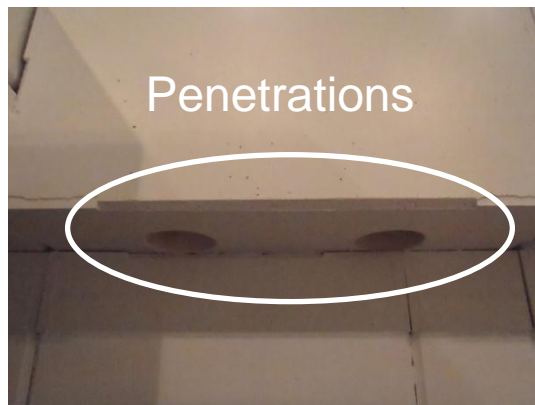







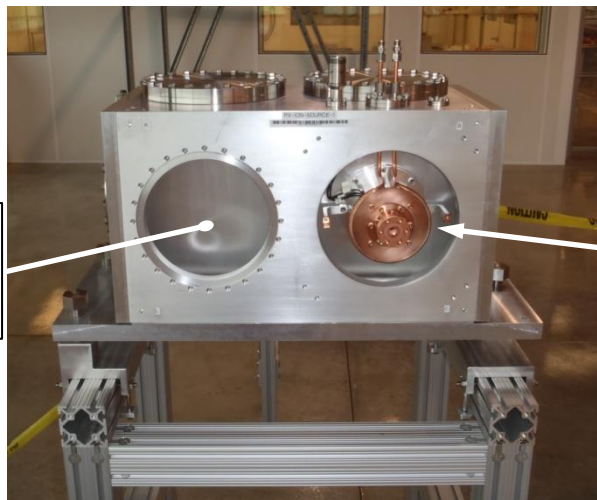
- Radiation safety issues recently raised
  - Shielding blocks will have to be moved
  - Electrical installation on hold
  - Not much can happen before the cave is reconfigured

Not enough shielding





- IS proper delivered to Fermilab on 4/11/13
- Ground electrode assembly mounted on the 'new' vacuum chamber
- Awaiting manpower to move turbo pumps from MDB to CMTF
  - End of June ??
  - Installation and leak check next
- High voltage racks almost complete 





# IS-related infrastructure

## Mostly idle



- Hydrogen bottle 'enclosure' constructed and installed
- LCW ready to be installed (self-contained system)
- Controls:
  - PLC limited to H<sub>2</sub> flow controller at first
  - Awaiting for racks to be wired and powered up + lack of manpower
- Electrical:
  - Hold-up until cave reconfiguration complete + lack of manpower

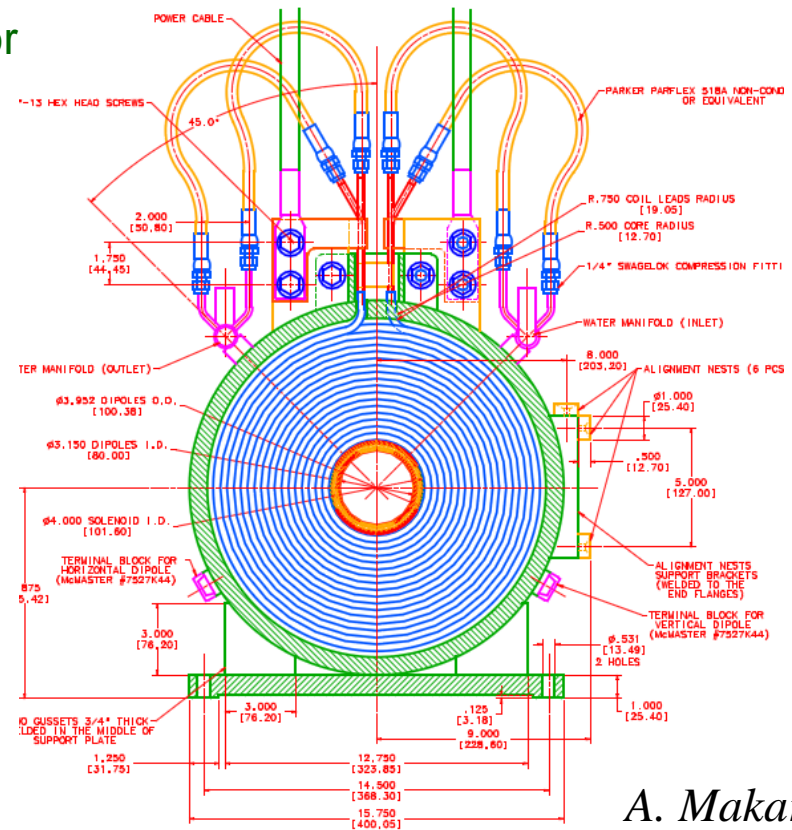




- 
- Mechanical:
    - Supports for remaining of the beam line not designed yet
      - But very similar to what has been done for the IS
  - LCW:
    - Needs chilled water from NML  $\Rightarrow$  Big job
  - Controls:
    - Not quite defined yet
    - Less 'involved' than for the IS
  - Electrical:
    - PS identified on site
      - Would be preferable to buy new ones with the right specs



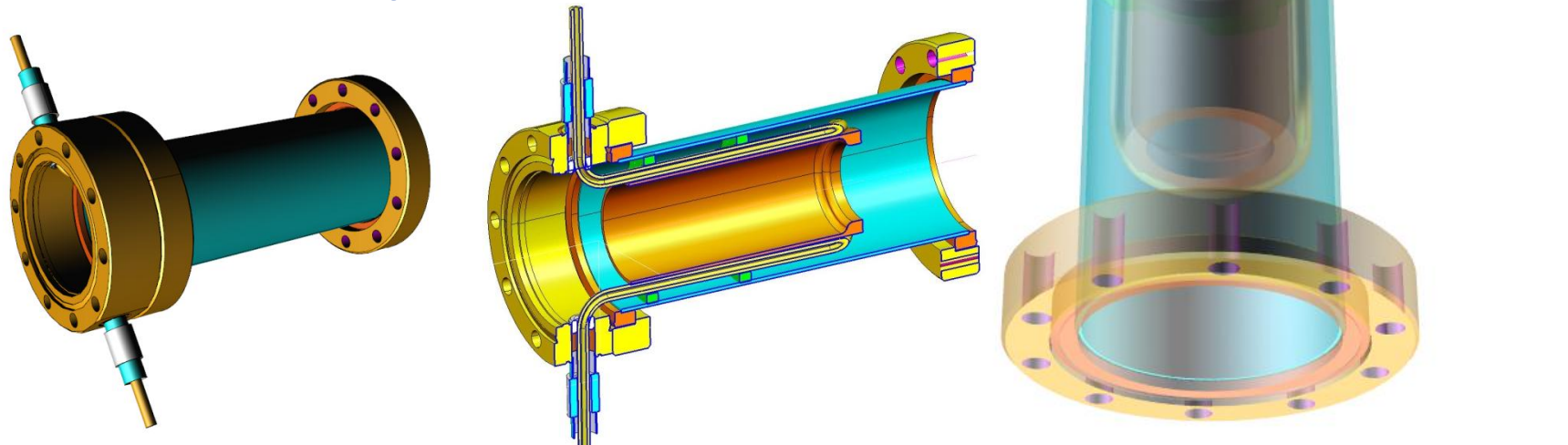
- Delayed due to difficulties with the final design of the dipole correctors
  - Should be removable
    - Reached agreement with vendor
  - First solenoid expected July-August
    - ~3 months delay w.r.t. initial delivery schedule



A. Makarov

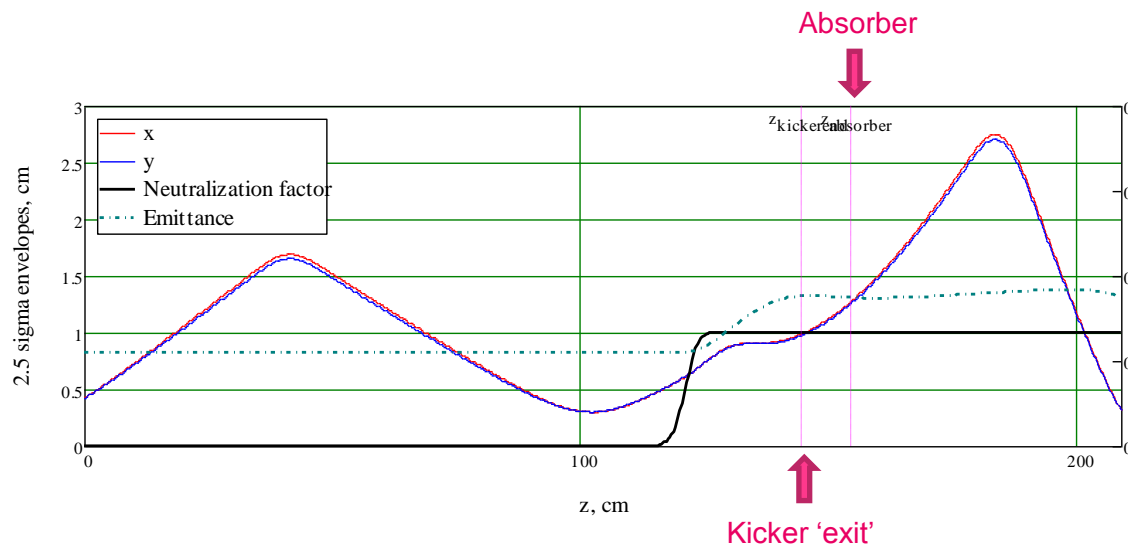


- Aperture that intercepts the beam tails
  - Located within each solenoid
  - Will be used as beam size/position diagnostics during tuning
  - Might ‘clean’ the beam’s halo during operation
  - Can be biased  $\Rightarrow$  clearing/stopping ions
- Preliminary design complete

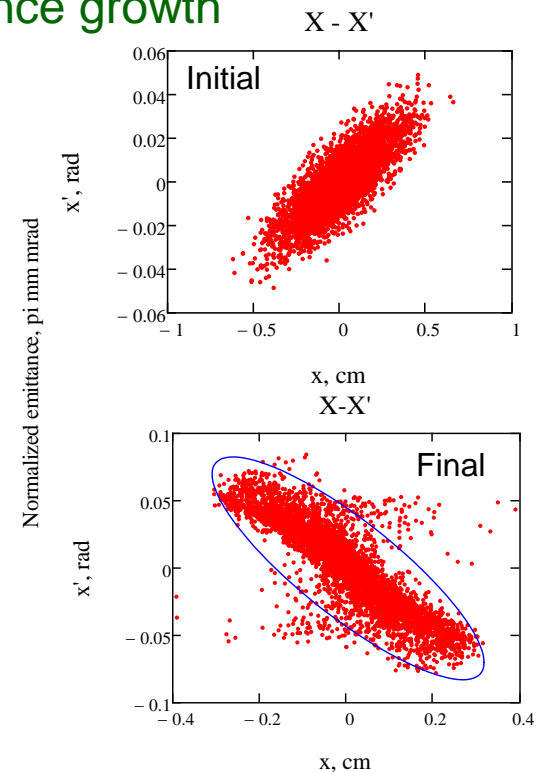




- Found a HV (5 kV) switch capable of 1 MHz pulse rate (Behlke)
  - Relaxes beam size requirements at absorber i.e. larger beam
    - Review optics/beam transport to limit emittance growth

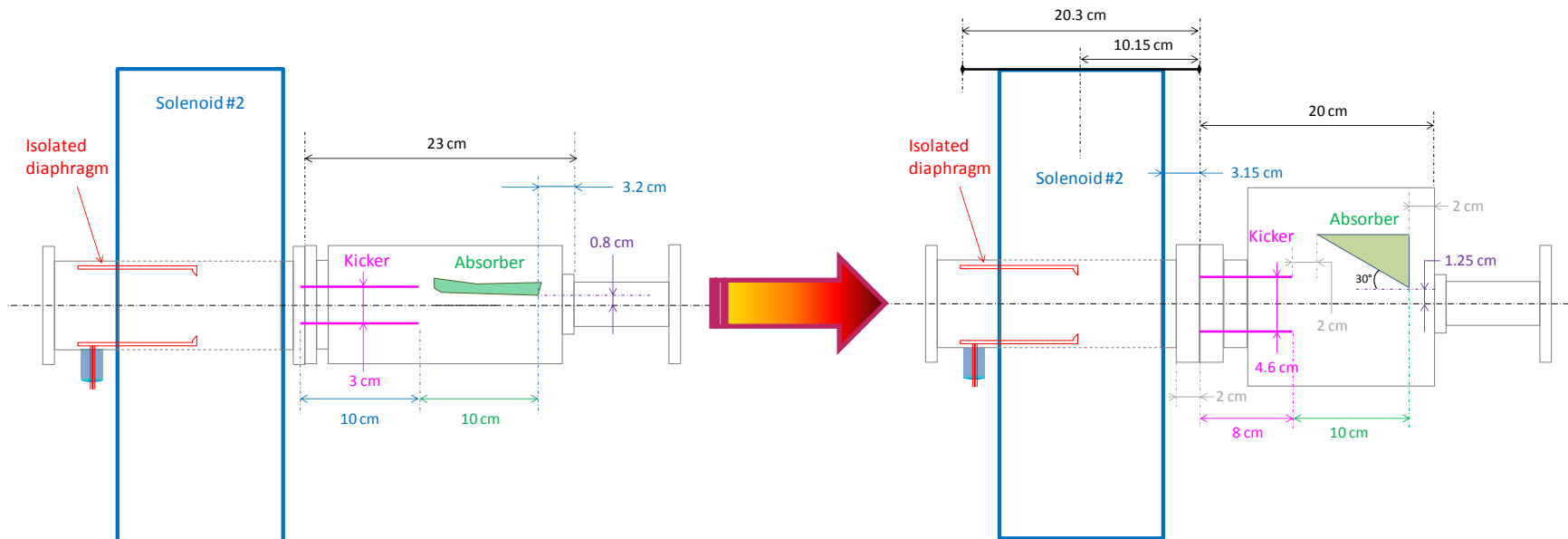


60% emittance increase  
(however  $\varepsilon_{x,final} = 0.18 \pi \text{ mm mrad} < 0.25 \pi \text{ mm mrad}$  from FRS)



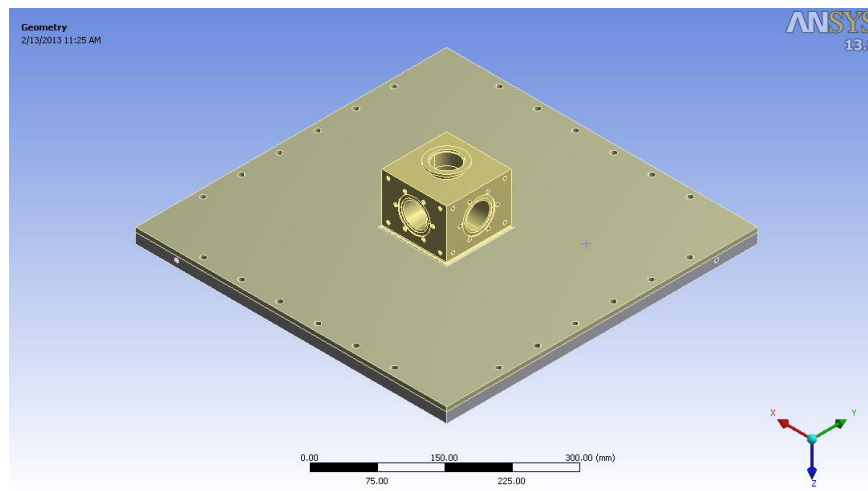


- Found a HV (5 kV) switch capable of 1 MHz pulse rate (Behlke)
  - Also allows for more flexibility for the design of the chopper proper
    - Larger kicker gap; shorter kicker electrodes; no need for grazing incidence intercept with the absorber...

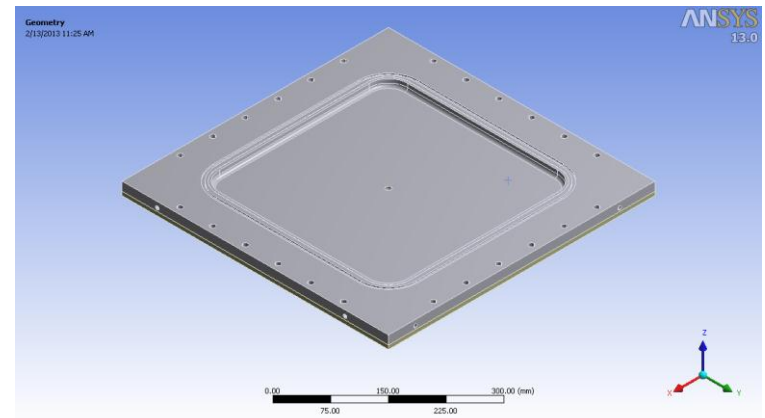




- Design has not changed much for the past 6 months but quite thorough analyses have been carried on (thermal, mechanical...)
  - Main 'change': Final machining of the copper side of the interface (RFQ) done by Berkeley while tuning
- FRS/TRS has been written and agreed upon
  - ... but not signed

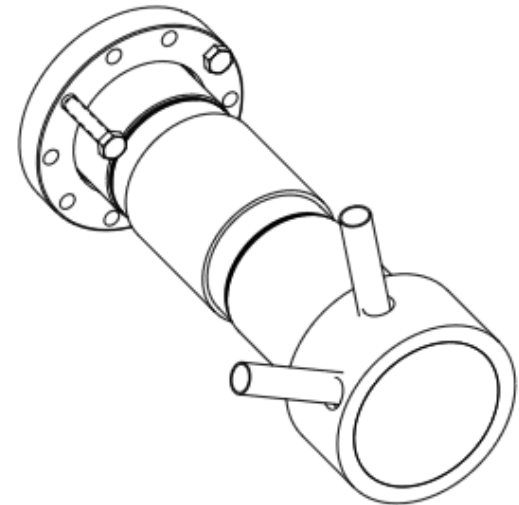
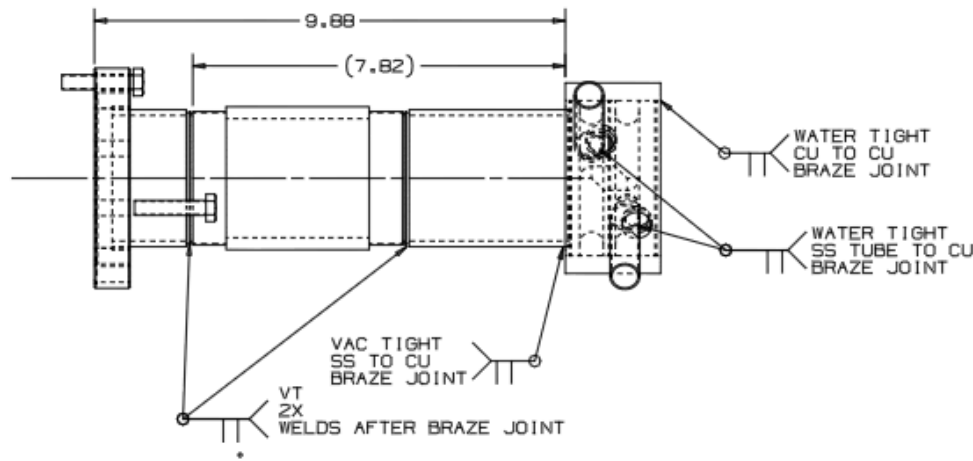


ANSYS Workbench structural model used by Andrew Lambert (LBNL)





- First option was to use the 'SNS dump' from HINS
  - Quite cumbersome
  - Still a viable option
- Proceeded with the design of our *own* Faraday Cup as an alternative (more attractive in the long term) solution

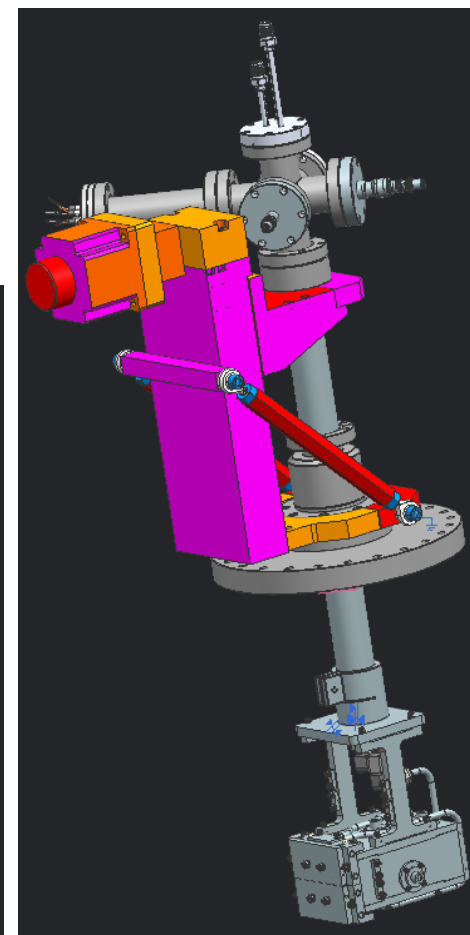
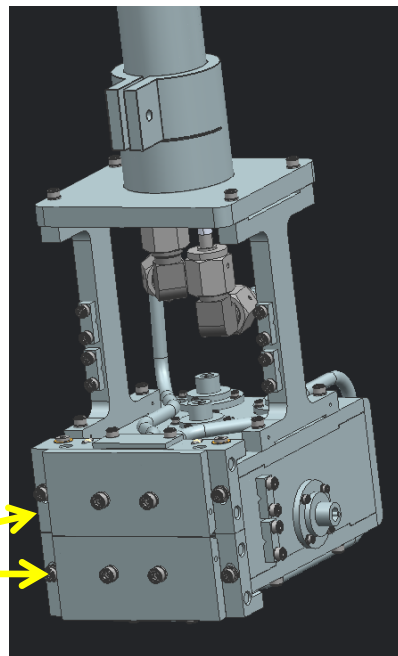






- Design complete – Engineering drawing almost complete
  - One last review by SNS folks before construction
- Significantly delayed w.r.t. to ‘some earlier plan’
  - Drafters have been pulled out several times
  - Delivered by the end of the fiscal year ?
- Started thinking about a ‘quick and dirty’ way to modify HINS’ emittance scanner

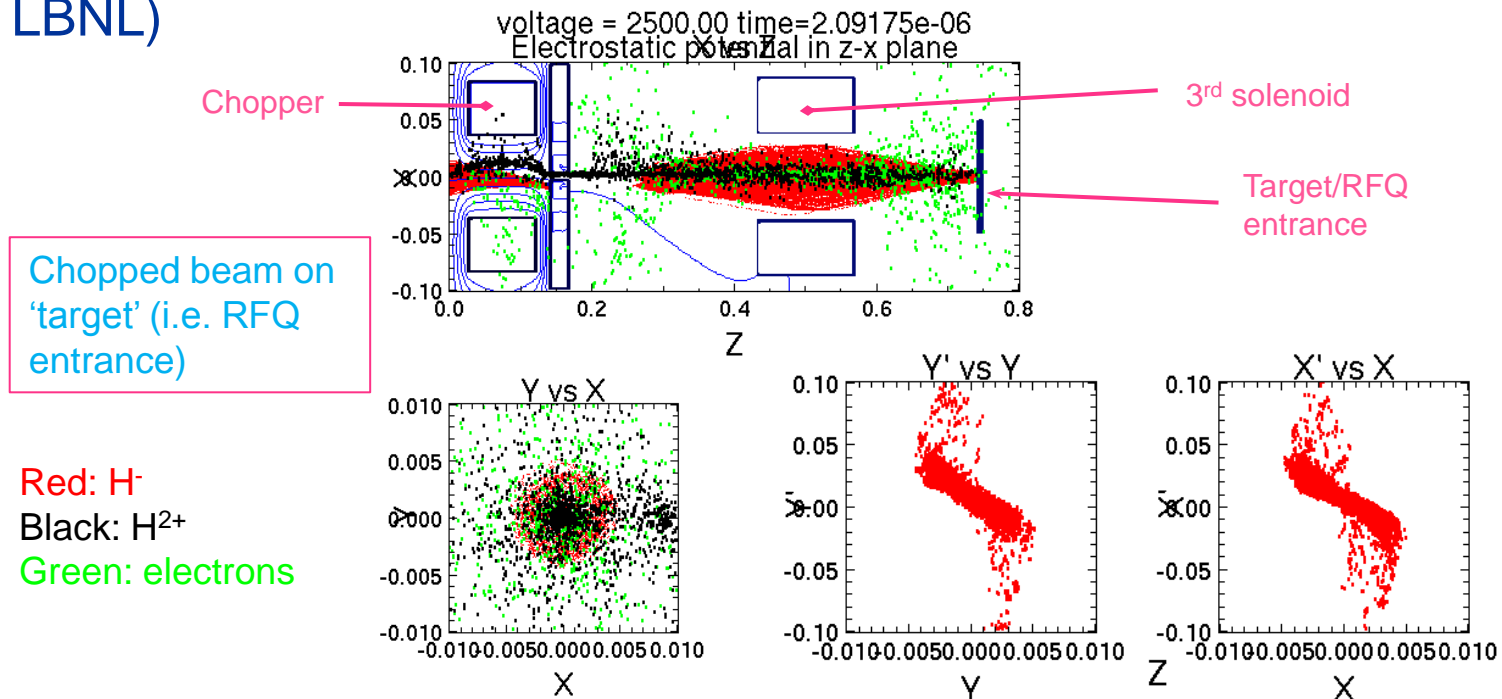
TZM Adjustable Front Slit



# Simulations effort continues



- Model LEBT transport for 'realistic' input to RFQ simulations
  - TraceWin, CST...
- Time-dependent, multi-species simulations with WARP (Qing Ji, LBNL)





- 
- First beam: **Late August**
    - At best