PXIE Ion Source Commissioning and LEBT Installation Update

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on behalf of K. Carlson, B. Brooker, G. Saewert, V. Scarpine, R. D'Arcy, T. Zuchnik, M. Kucera, S. Hays, J. Czajkowski, D. Snee, W. Johnson, mechanical, electrical and other technical support

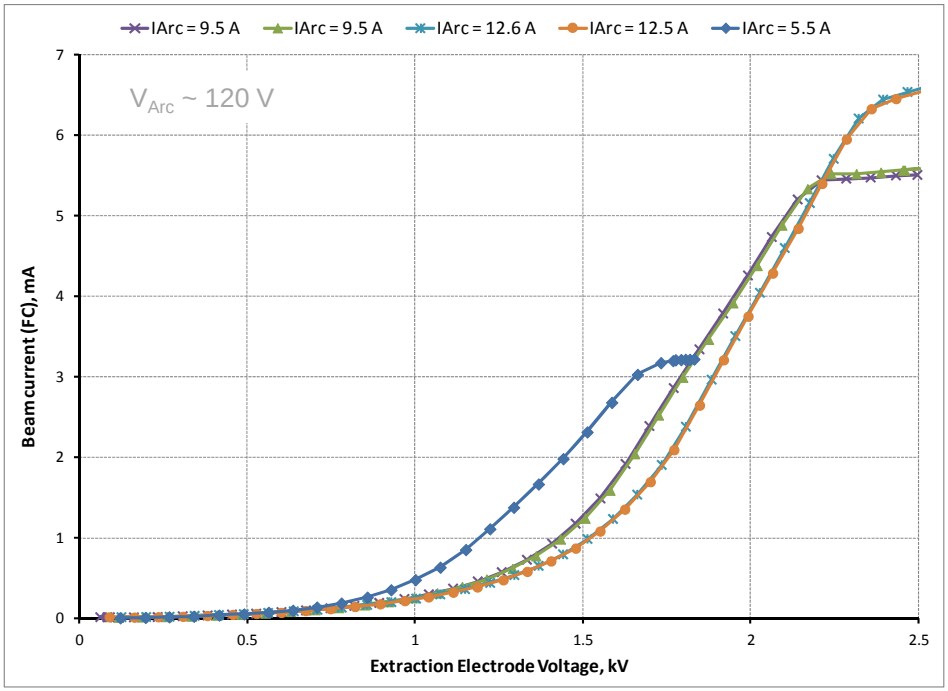
PIP-II Technical Meeting

February 4th, 2014

Fermilab

Highlights

- Reliability of the source improved dramatically (*since the last update*)
  - Run a *full* day without Filament power supply trips
    - Thanks to the efforts from Bob Brooker and Greg Saewert
- Ion Source performance consistent with operation at TRIUMF and LBNL
  - Up to ~10 mA (*administrative limit*) at 30 kV
  - *However*, the beam proper was **not** characterized
    - Need the emittance scanner…



Beam current as a function of the extraction voltage for several arc power settings

Highlights (*cont'*)

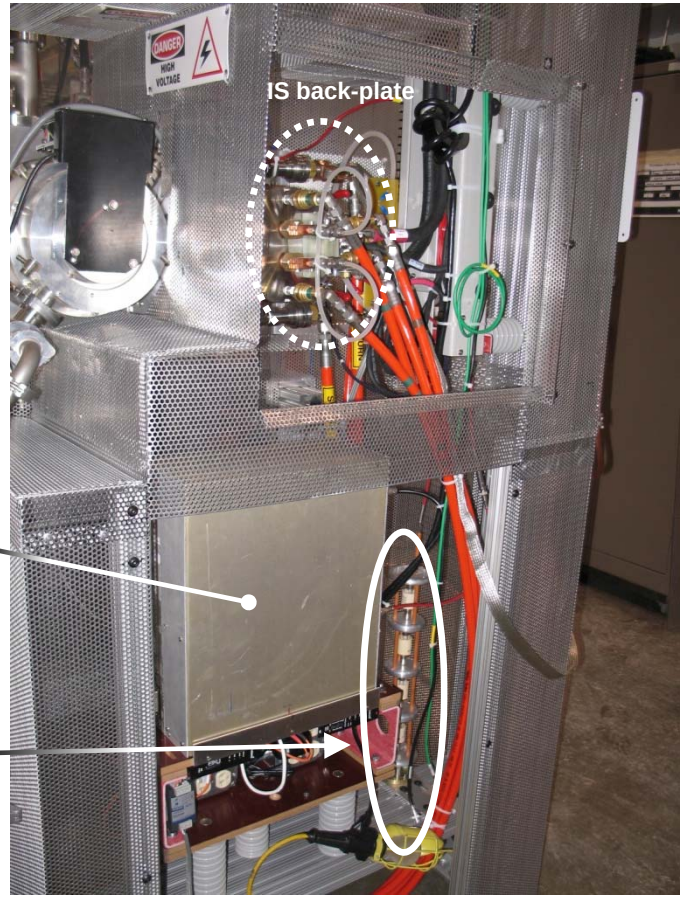
- One isolation transformer failed just before the *planned* shutdown
  - Limited HV-reach to ~15 kV for a couple of days
  - Believed to be a manufacturing error
    - Replacement (*free*) should be delivered by the end of the week
    - Ordered one spare

- Nearing the end of a 3-week shutdown to reconfigure the beam line
  - i.e. start installation of the LEBT

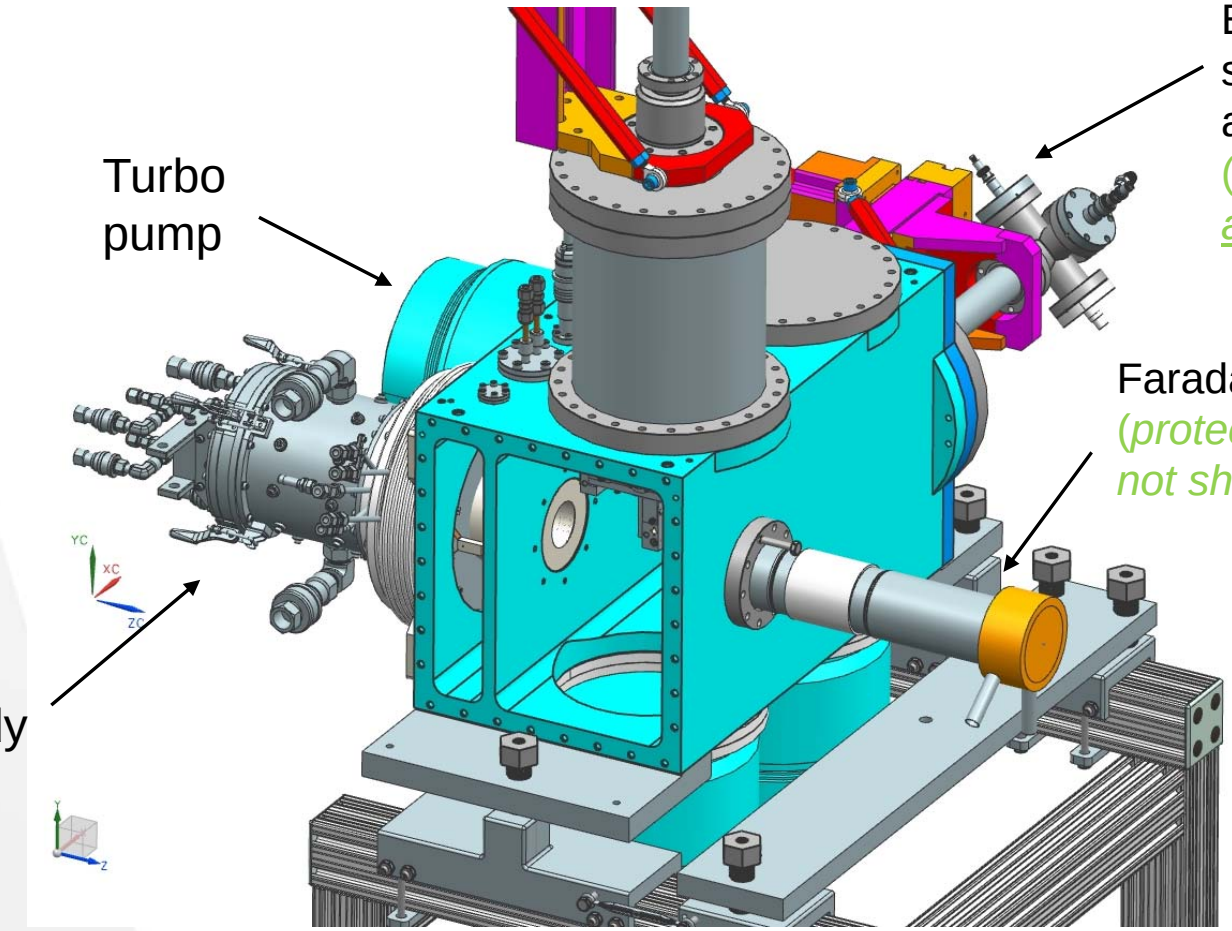
Main modifications and additions

- Added 1st solenoid
  - Includes isolated diaphragm
- Added DCCT
  - Cross 'calibration' of the beam current with Faraday cup
- Installed H_2 mass flow *controller* inside the ion source 'cage' at the elevated potential
  - Only had a flow *meter* previously (and at ground, near the H_2 bottle)
    - Meter remains
- Installed pulser on the extraction electrode
  - Modified ecool modulator
  - Pulse beam operation tests
    - Note: the source is not designed for being pulsed *a priori*
- Installed HV resistive divider and transient recorder
  - Sparks investigation/counter

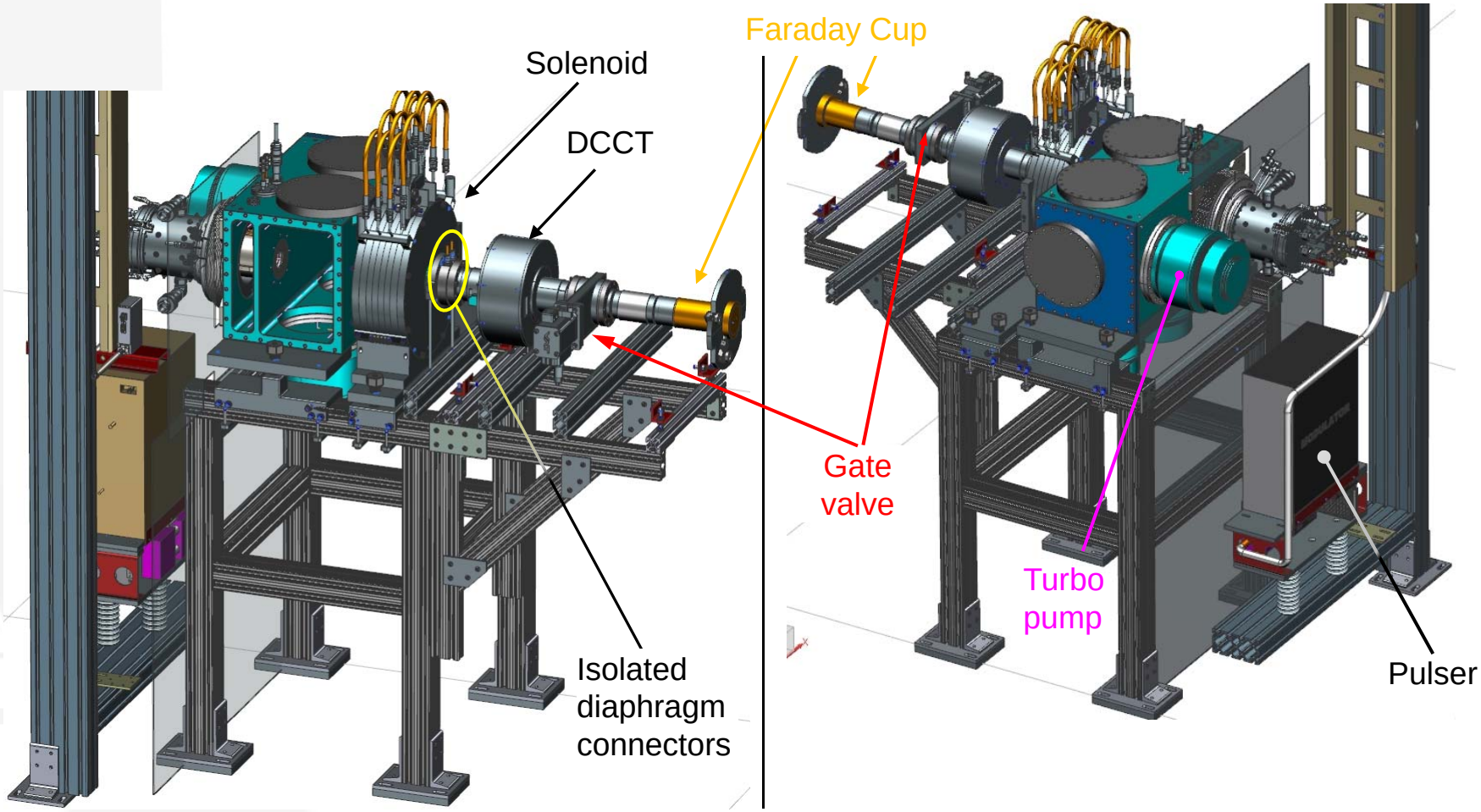
Ion source cage area (*upstream*)



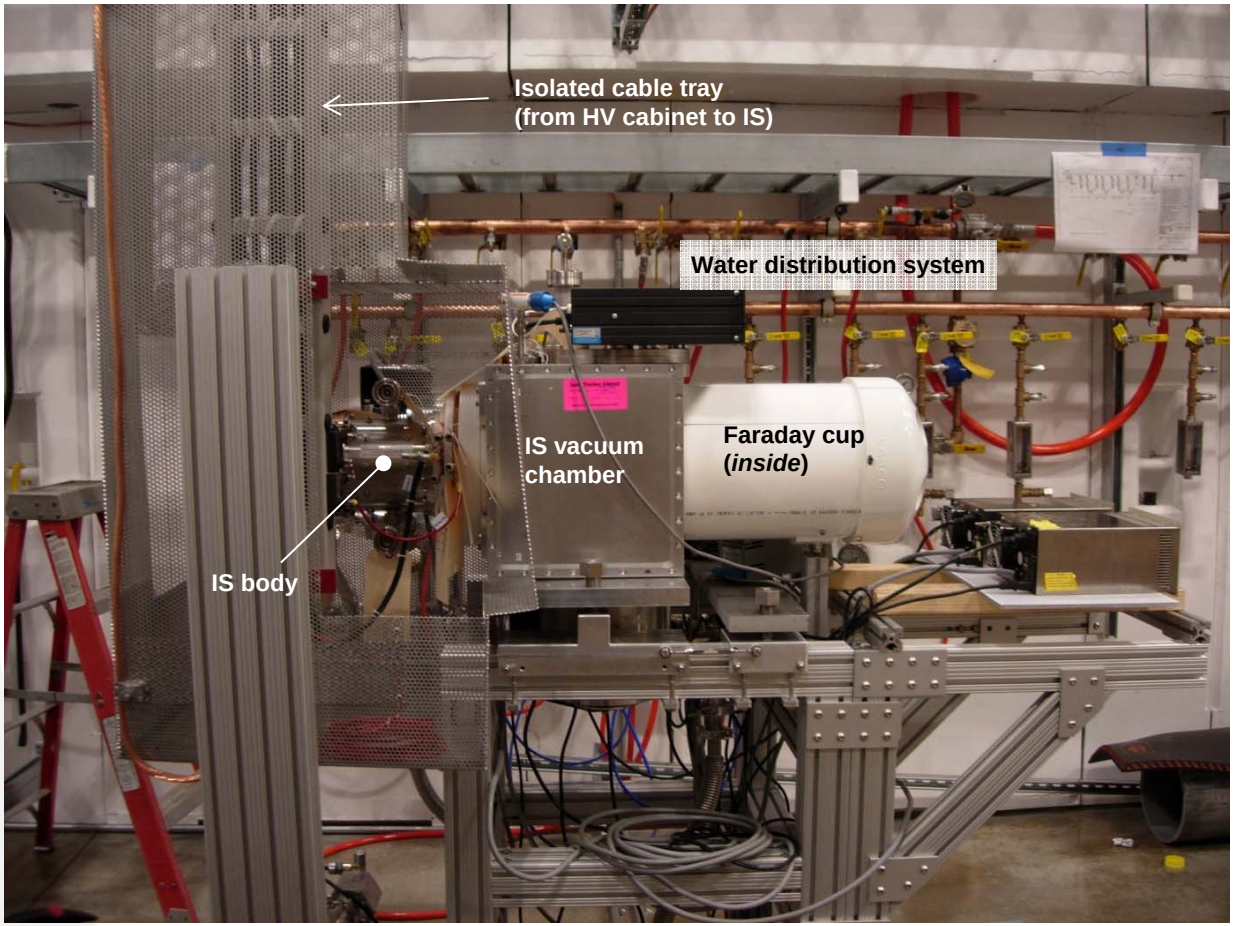
Beam line reconfiguration from…



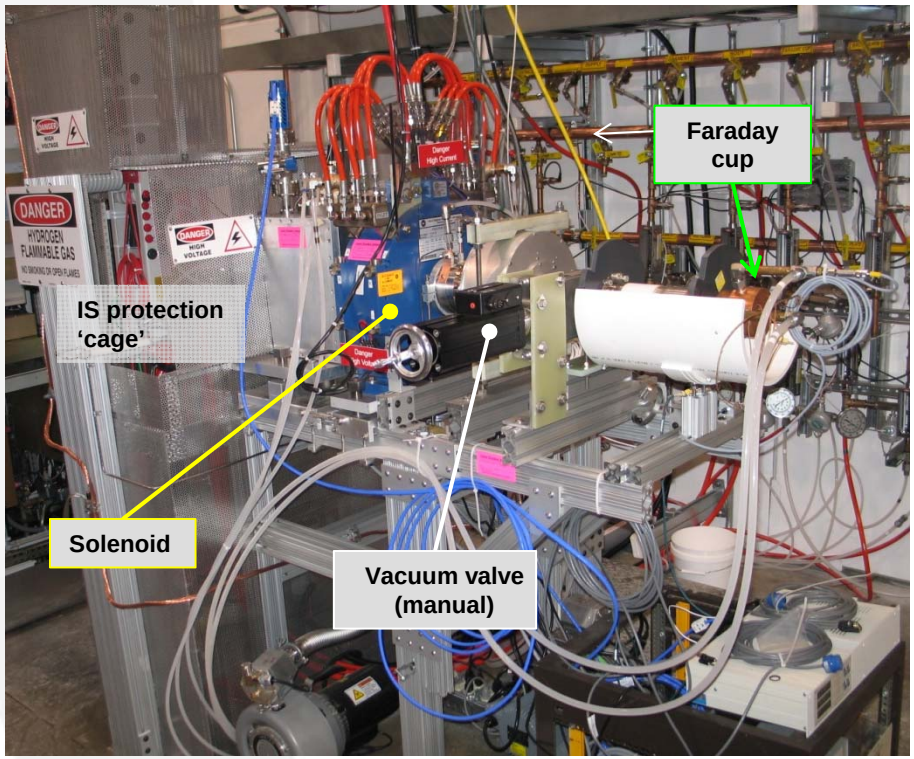
…To


Solenoid
DCCT
Faraday Cup
Gate valve
Turbo pump
Isolated diaphragm connectors
Pulser

Reconfiguration in pictures From…

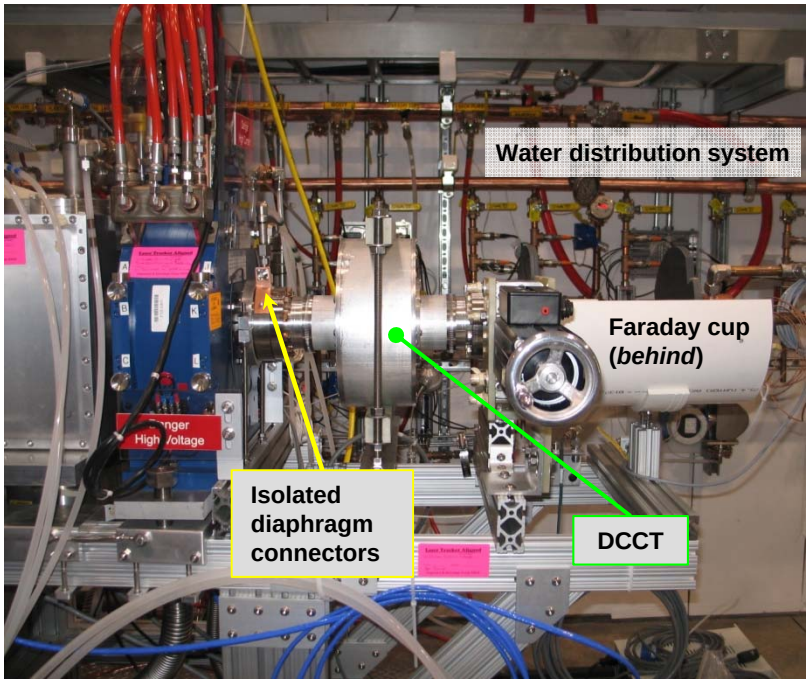


Reconfiguration in pictures …To



'Quarter' view (looking upstream)

Side view (looking east)



Next…

- Safety walk-through Thursday
- Start commissioning the new setup
  - Can start checking out sub-systems without the replacement isolation transformer and/or at *low* HV (up to ~15 kV) with the failed transformer
  - HV-ready (i.e. 30 kV) by next Monday?
    - i.e. HV isolation transformer delivered
- Next solenoids (*2 out of 3*) to be delivered soon
  - TD is aware…
- Install 'diagnostics box' with emittance scanner
  - Planning on assembling the emittance scanner at FNAL (*as opposed to SNS as it was initially planned*)
  - Commission emittance scanner and first beam parameters measurements