PXIE Ion Source Commissioning Status - Update

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PIP-II (Pr X) Technical Meeting

January 7th, 2014

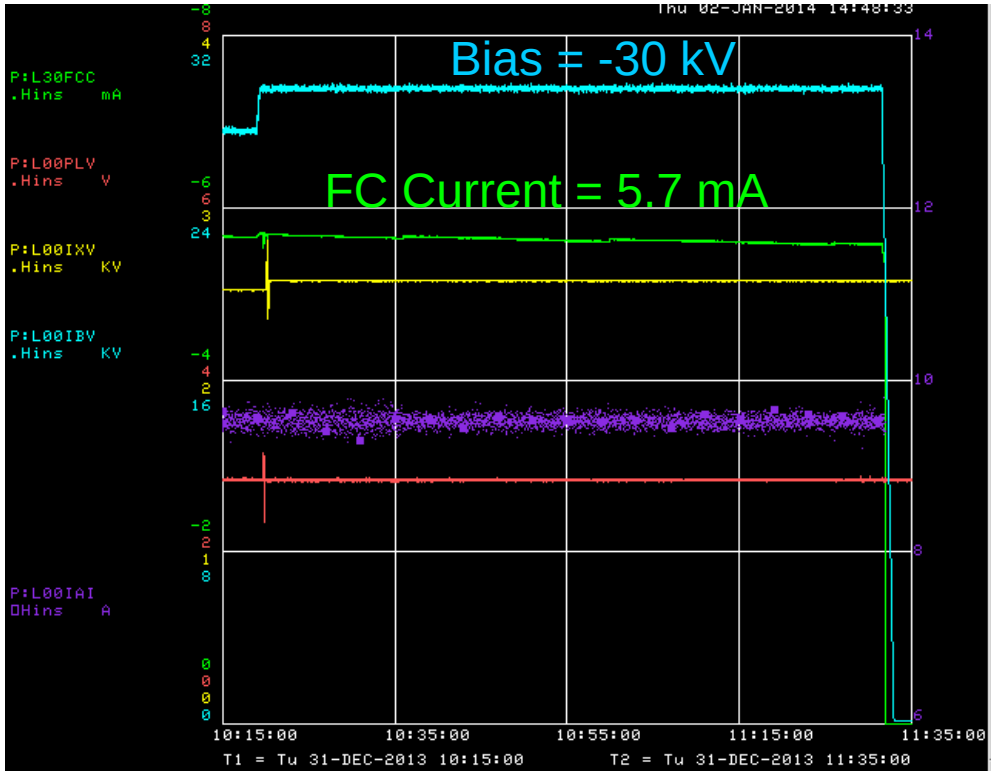
Highlights

- Investigation of the Filament power supply trips
  - Has been the main focus given that it limits how long we can run at a steady-state
  - Bob Brooker & Greg Saewert mostly

- Performance thus-far

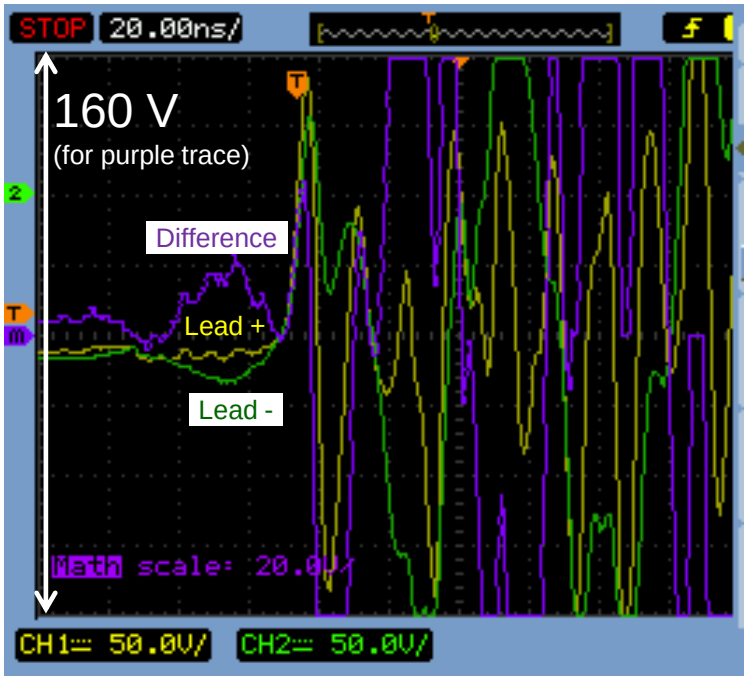
  - ~5 mA at 30 kV for ~1.5 hr without tripping

- Started *systematic* IS characterization measurements



Main issue – Beam stability

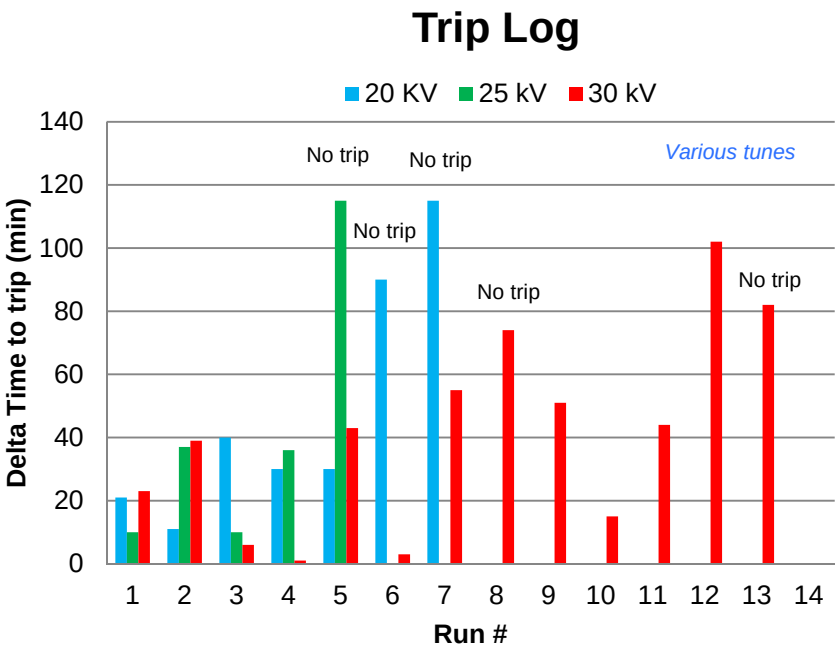
- The filament power supply periodically trips on an over-voltage indication
  - Believed to be related to sparks in the vacuum chamber (between the IS body and the ground electrode i.e. $\Delta V \sim 30$ kV ?) but not understood **<u>why</u>** the filament PS sees a large voltage difference at a high frequency between its leads
    - Over-voltage limit is 12 V while the PS may experience > 160 V during trips

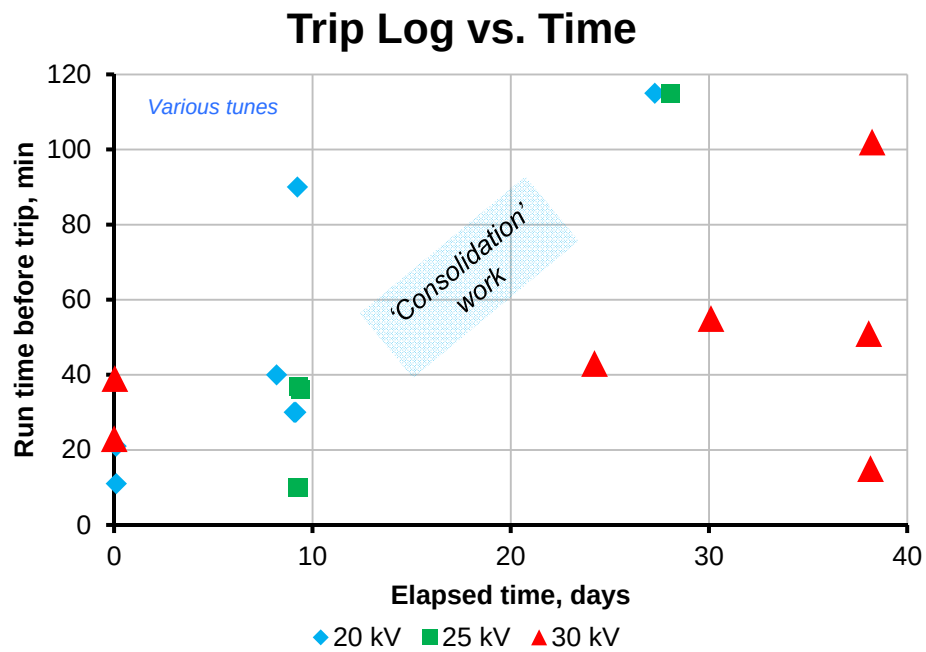


- Several *corrective* actions have been taken
  - Different connection scheme from PS to IS/re-cabling
  - Added protection diodes/'transorbs'
  - Added induction cores

- Helped to greatly reduce the number of trips
  - Plus conditioning probably

High Voltage Trips
with beam





Total HV time for:	20 kV	13hours
	25 kV	15hours
	30 kV	24hours

Runs not ending with a trip are removed from the data above

Other (small) issues

- IS water chiller conductivity sensor is not functioning properly and cannot be relied upon
  - Manufacturer is working on it
- Developed a water leak on the extraction/plasma electrodes water hose
  - Appears to be due to arcing between the tube and the support bracket
    - Located just outside the IS cage, at ground potential
  - Tubes will be changed; Routing of the hose(s) will be modified

Installation progress

- Remote control and/or monitoring of most devices
  - Except for water
  - Will add capability of power cycling IS filament PS remotely
- Added ion and convection gauges in the upstream part of the IS vacuum chamber
- Solenoid PS rack ready to be connected to 480 VAC
  - Controls and correctors PS to be taken out of HINS
- Vacuum and water PLC installed and connected to 120 VAC power source

Upcoming Shutdown

- Planning a shutdown **mid-January** to:
  - Install 1st solenoid
  - Install DCCT
  - Relocate H_2 mass flow controller from outside the cave to inside the IS cage (i.e. at elevated potential)
  - Modify the IS cage in order to accommodate a pulser and additional diagnostics
    - HV resistive divider/spark counter
    - Will need 5-6 110 VAC isolated outlets