

Wastewater & Booster Commissioning Runs (May – Sep, 2021)

Prepare source to provide 100 nA cw reliably, >10 uA for pulsed beam modes

~2 mo. to investigate and perform corrective actions (May, Jun)

Area	Issue	Corrective Actions
Pucks	ID too small (5 of 9 pucks)	Shop widening/repairing (job 330347) 5 pucks Pucks 6, 8, 22 installed w/ new bulk
Long Manip.	Mis-aligned to cathode Likely due to “bad” pucks	Replace Ag plate schneedle w/ Nitronic low gall 2 nd 316L fabricated, spare and for fit-up tests
Cathode	Field emission 150-200 kV Mis-alignment uncertainty	Install and operate Nb electrode at 200 kV HV gas conditioning to reasonable voltage Located cathode 1.6 mm right wrt gun chamber
Insulator	Insulator punctured Grease sucked to chamber	Successive bakes required to eliminate grease Should not run with excessive field emisson
Anode	Mis-aligned 3 mm beam left relative to cathode	Aligned to cathode within about 100 um, awaiting finals
Gun Table	Grossly mis-aligned to beam line	Surveyed Y-chamber, align cath-anode to y- chamber, then table laser to cath-anode
Mask	Screw holes didn't line up	Tube hole drilled, set screw now fits Mask aligned to puck #8 (elog 3881085)
Laser	Low power <3 mW	Restore settings to provide ~30 mW to cave

~1 mo. to test rebuilt gun (Jul)

- leak check, bake, activate negs
- Find and repair (small) SF6 leak in HVPS tank
- high voltage test, soak
- activate GaAs, dark lifetime
- evaluate beam orbit

~2 mo. support LDRD and Booster Commissioning (Aug, Sep)

- Make source ready
- CIS on-call during LDRD & Booster tests
- Participate in Booster characterization measurements, i.e. specific deliverables

Resources

- CIS (8 pw)
- S&A (2 pw)
- DC power (2 day)
- I&C (2 day)
- Machine shop (pucks, manipulator “schneedles”)

Reliable 200 kV Gun for CEBAF & then UITF (Jul 2021 - Mar 2022)

14" gun chamber geometry suffers from FE >150 kV (gradients marginally too high)

Take approach to build larger 18" gun chamber, like GTS operated w/o FE @ 200 kV reliably

~3 mo. mainly gun assembly, some fabrication (Jul, Aug, Sep)

- vacuum – NEG coated 18" chamber, isolated NEG, **symmetric ground screen**, new over-board IP, Kr leak valve line, no RGA, check UITF/CEBAF mate to Prep and NEG tube
- cathode – R30 alumina insulator, new fiducialized degassed flange ready, ball & shed electrodes polished, puck cage on-hand, two styles rear cathode rings on-hand
- anode – anode fabricated, **polish**, feed-through on-hand, **evaluate offset anode hole (at GTS and by simulation)**, **fabricate off-set anode if needed.**

~3 mo. to test (Oct, Nov, Dec)

- Fiducialize insulator flange to gun chamber
- Assemble gun in 1137
- Replace 14" gun R350 – R28 cable with 18" gun R350 – R30 cable
- Swap guns at UITF, align table
- Leak check, bake gun
- high voltage test, soak
- activate GaAs, dark lifetime
- evaluate beam orbit
- evaluate operating lifetime biased v. grounded bulk, SSL?
- **Green or Red light for CEBAF...**
- Might be used for the Cornell activation studies

~6 mo. to build reliable 200 kV gun for UITF (Oct 2021 – Mar 2022)

Resources

- CIS (8 pw)
- Designer (4 pw)
- S&A (2 pw)
- DC power (2 day)
- I&C (2 day)
- Machine shop (2 jobs)
- **M&S (\$150k for spare HV chamber)**

Photocathode R&D with Cornell (May 2021 – Sep 2022)

**Accelerator Stewardship FOA (NCE to Sep. 1 2022) to study “robust” activation of GaAs
Compare QE, lifetime and polarization w/ and w/o Sb in the activation**

200 kV gun and Sb depo chamber (Oct 2021 – Mar 2022)

- photocathodes – use bulk (maybe SSL from Cornell, add Sb source, use O2)
- laser power – boost to >30 mW (assumes 6 mA/W/%)
- gun – use 18” 300 kV gun chamber initially, after that upgrade chamber, spare to CEBAF

Install Wien filter (Jan – Mar 2022)

- 3rd vacuum chamber on hand
- **Polish new non-brazed style electrodes (6)**
- HV PS exist, functional work, but **firmware needed for EPICS polarity control**
- Magnet core re-worked, Ni plates exist, **map magnet at MMF.**
- DC PS exists.
- Wien quad crosses & viewers, ready
- Assemble and **S&A align electrodes, Ni plates**
- **ME designer finalize design, fabricate fixture for UITF 80/20 install, S&A install**

Mott polarimeter (Jan – Mar 2022)

- scattering chamber – dump, windows, detectors, pump on-hand
- collimators – **ME design?, and fab large acceptance**
- target ladder – ladder, controller on-hand; **order new foils**

Data acquisition (on-going, should wrap up by Jan)

- hardware – VXS crate, ADC's, Server installed. **Install NIM crate, signal amplifiers**
- firmware – ADC firmware and CODA are ready
- analysis – **write software “decoder” and “analyzer”**

~3 mo. support LDRD and Booster Commissioning (Apr – Jun 2022)

- Setup/test high current to cup, Mott dump (thru) and w/ chopping aperture
- Commission Wien filter and polarimeter
- ~6 wks Lifetime w/ polarization study (1 baseline, 4 Sb, 1 SL cathode x 1 week/test)

Resources (Robust AWP)

- CIS (12 pw)
- Designer (3.4 pw)
- S&A (1 pw)
- DC power (0.5 pw)
- I&C (0.5 pw)
- MMF (1 pw)
- Fast electronics group (2 pw)
- Machine shop (~5 jobs)
- M&S \$50k