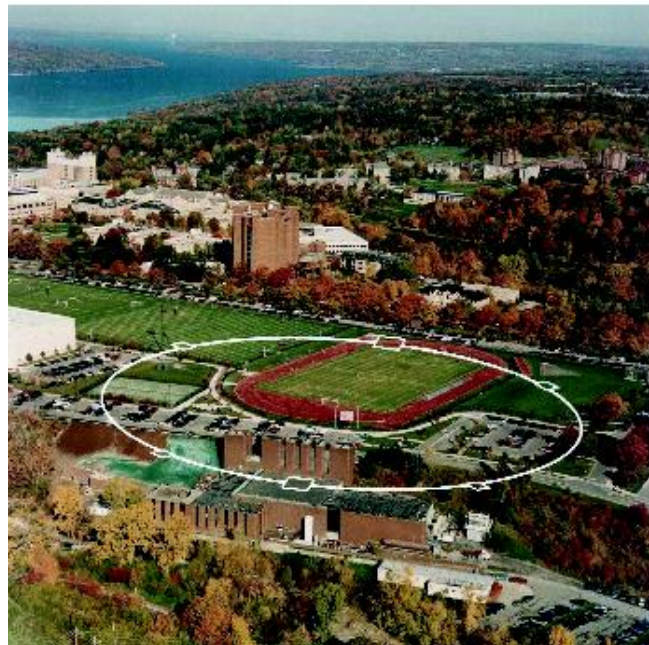




CesrTA Ring-wide RFA Measurements

Jesse Livezey
June 25th, 2009



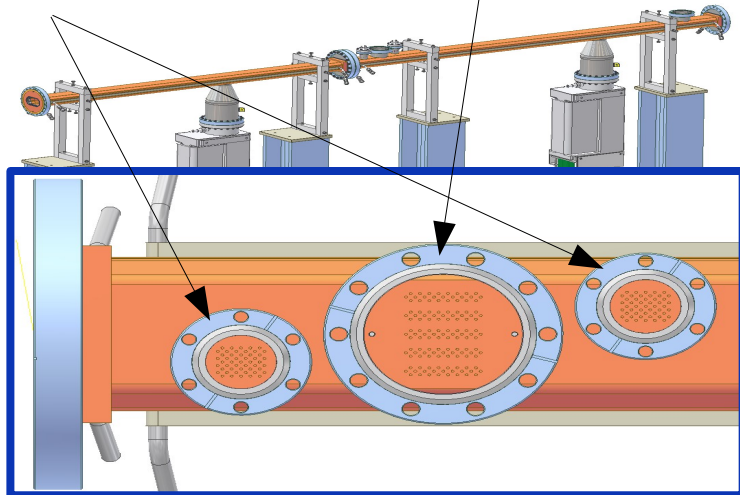


Cornell Style vs. APS

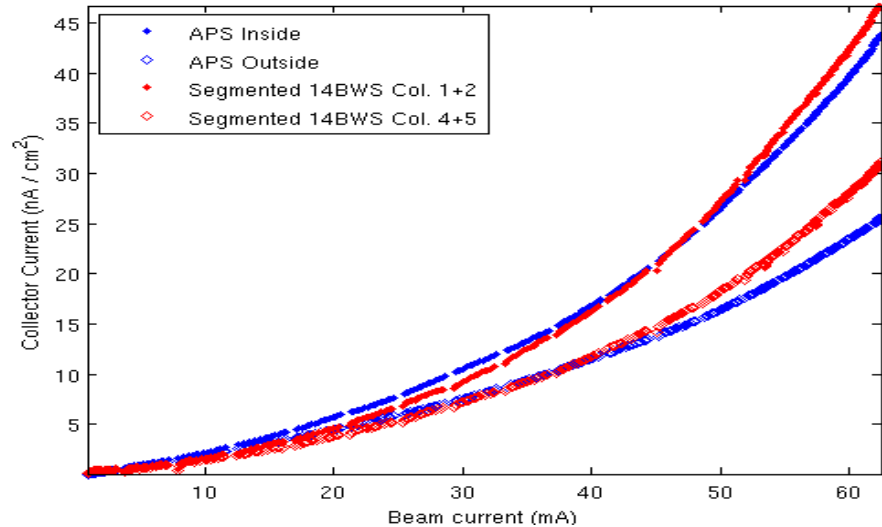
- Need to benchmark performance of new thin RFA design.
- Outer four collector pads of segmented detector overlap APS pads on inside and outside of beam-pipe.
- Comparison of machine current scan and energy scan using these detectors.

Cornell Segmented Detector

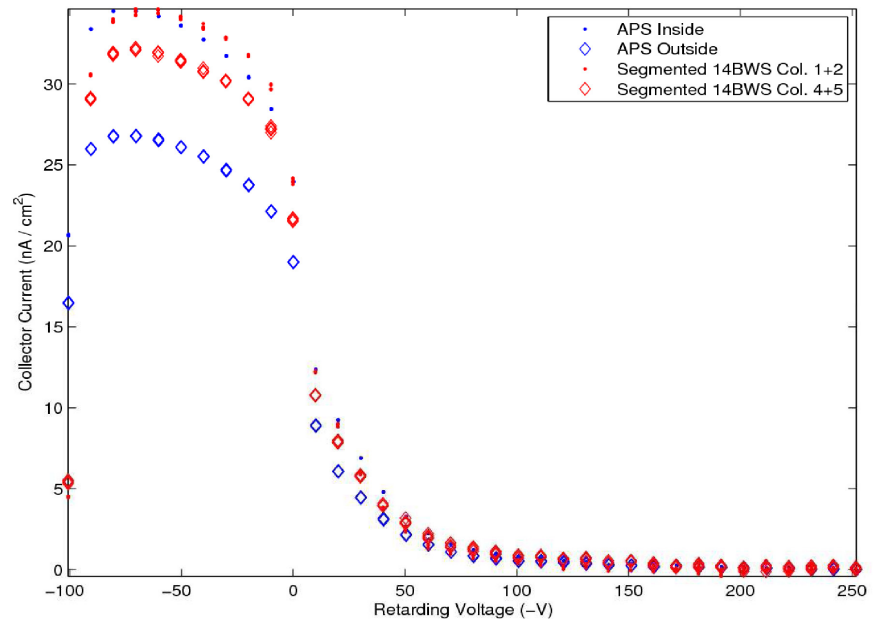
APS Detector



APS vs Segmented Comparison: run 630 (1x38 e+ Current Scan)



APS vs Segmented Comparison: run 675 (1x45x1.2mA e+)





Electrons vs. Positrons

- 2E segmented detector is symmetrically opposite 2W segmented detector.
- 2E should see similar radiation patterns with electrons as 2W does with positrons
- 1 train of 38 bunches, filling all bunches together.

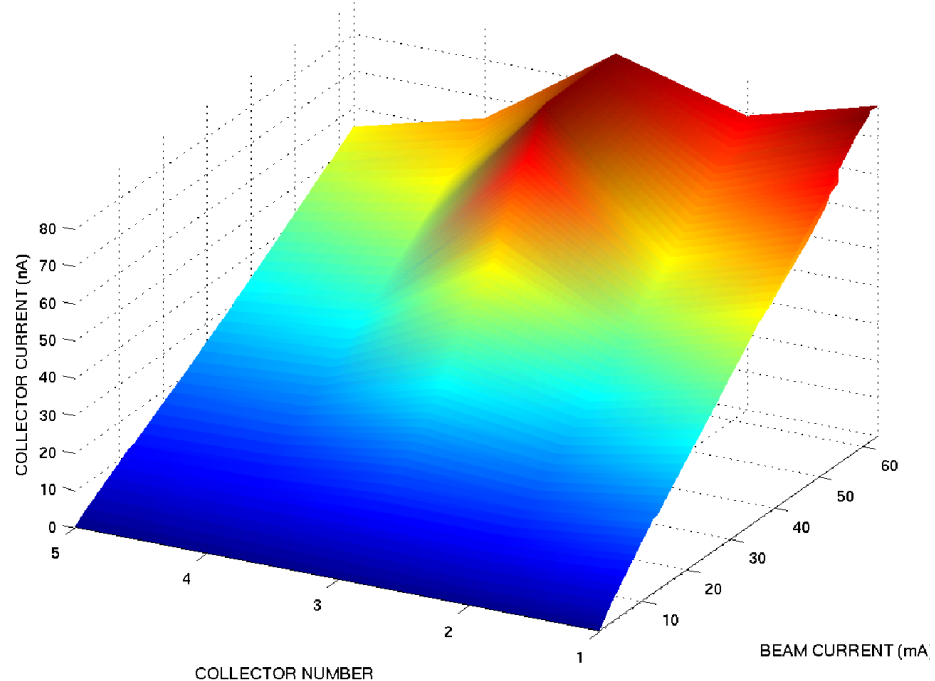
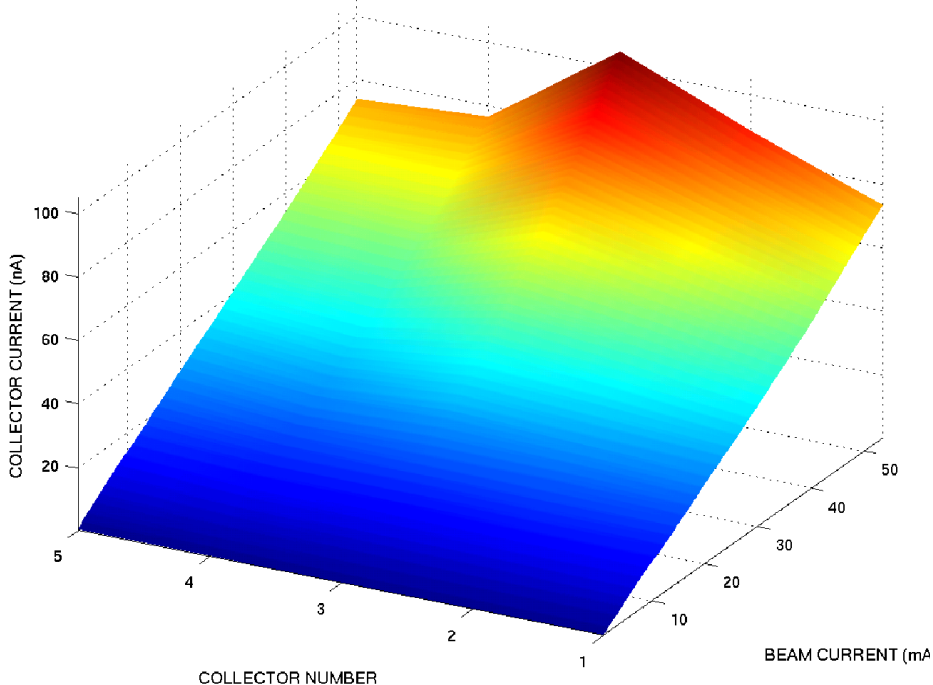
Electrons
2E

5 GeV, 14 ns

Positrons
2W

SEG_RFAQ1WG3_20090129_0622 2E (1x38 current scan e-): Collector Currents

SEG_RFAQ1WG3_20090130_0631 2W (1x38 e+ current scan): Collector Currents



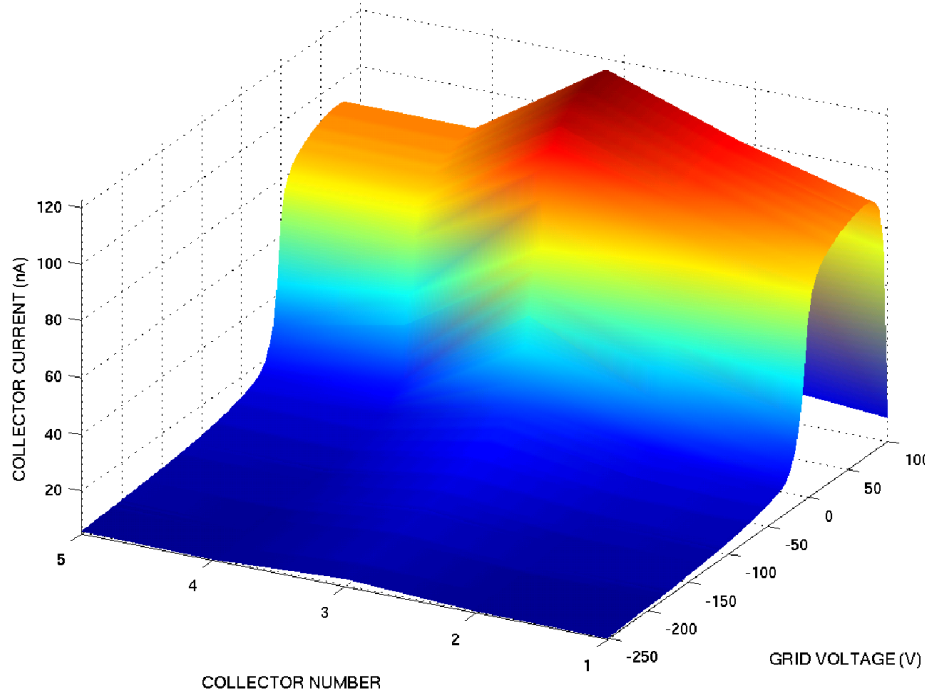


Electrons vs. Positrons

- Energy scan comparing same detectors.
- 1x38x1.3 mA
- 2 GeV, 14 ns
- Wings at similar level, center peak enhanced for positrons.

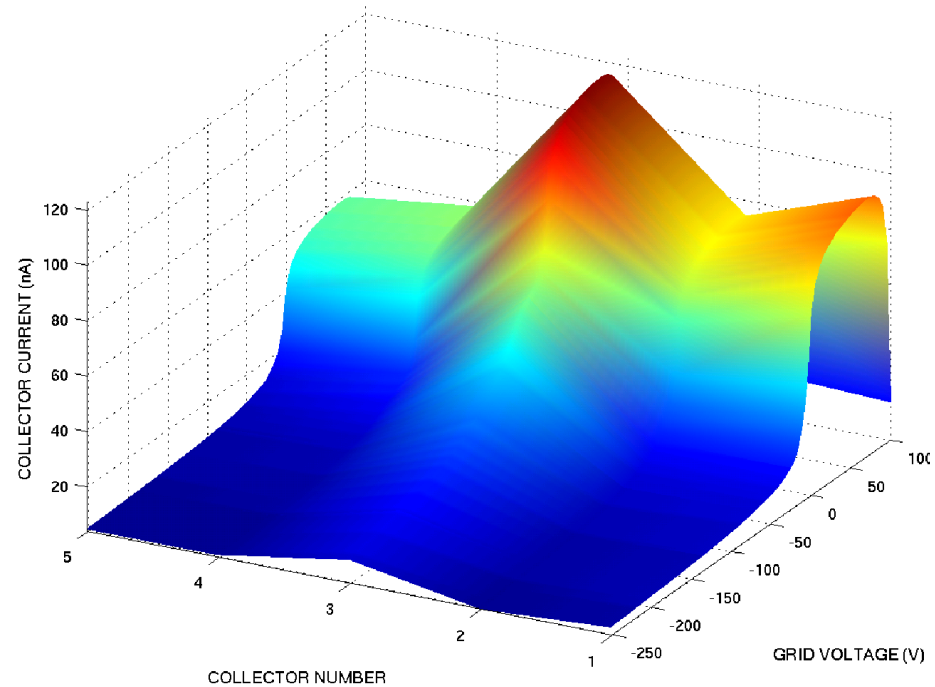
Electrons
2E

SEG_RFAQ1WG3_20090129_0624 2E (1x38x1.3 e-): Collector Currents



Positrons
2W

SEG_RFAQ1WG3_20090130_0646 2W (1x38x1.3mA e+): Collector Currents





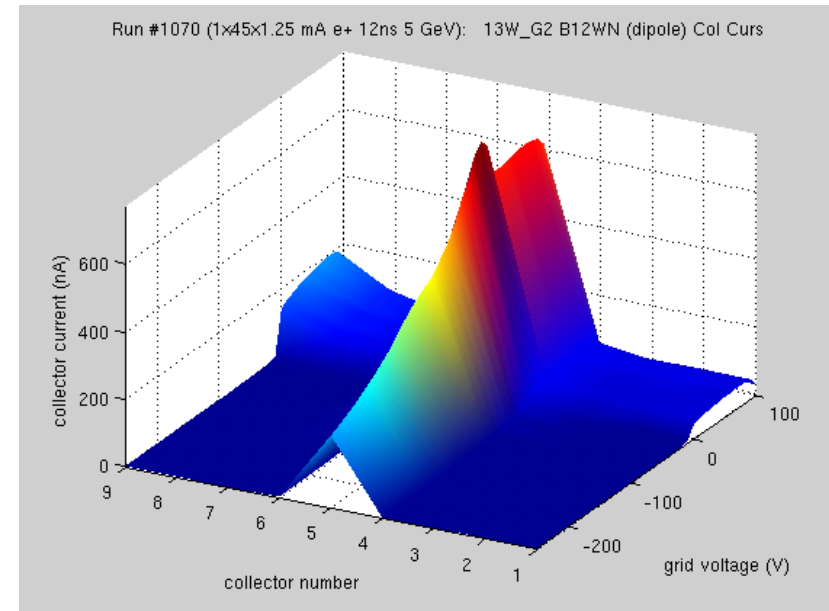
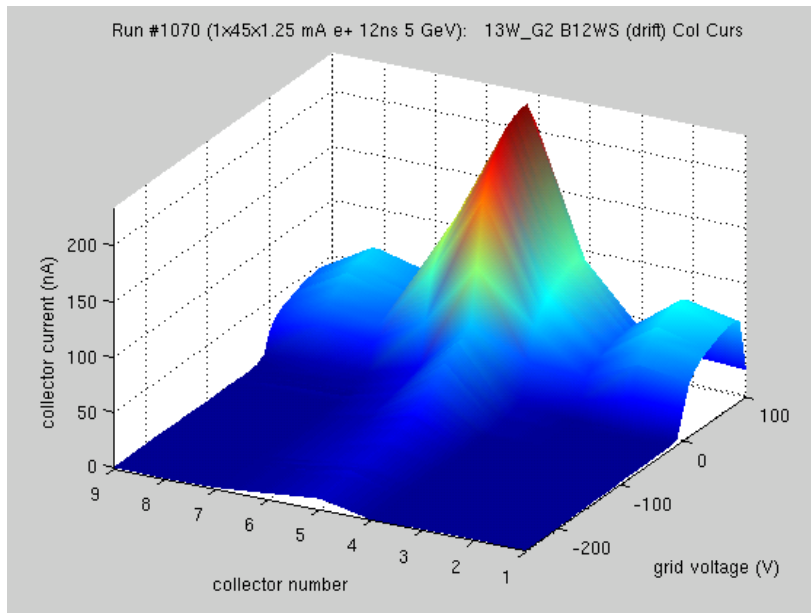
Dipole vs. Fringe Regions

- Neighboring detectors inside and outside B12WN magnet.
- North detector inside of dipole.
- South detector between dipole and sextupole, in fringe field.
- Representative of short drift sections in CESR.
- With large number of dipoles in CESR, cloud in fringe field area may have effects.

Fringe Field
B12WS

Energy scan:
1x45x1.25 mA/bunch
12 ns, 5 GeV positrons

Dipole Field
B12WN





TiN in Drift Region

- Neighboring detectors in drift region at 14E.
- North detector in TiN coated Cu chamber.
- South detector in Cu chamber.
- Linearly normalized by photon flux at RFA location.
- Uncoated chamber sees ~4x more response.

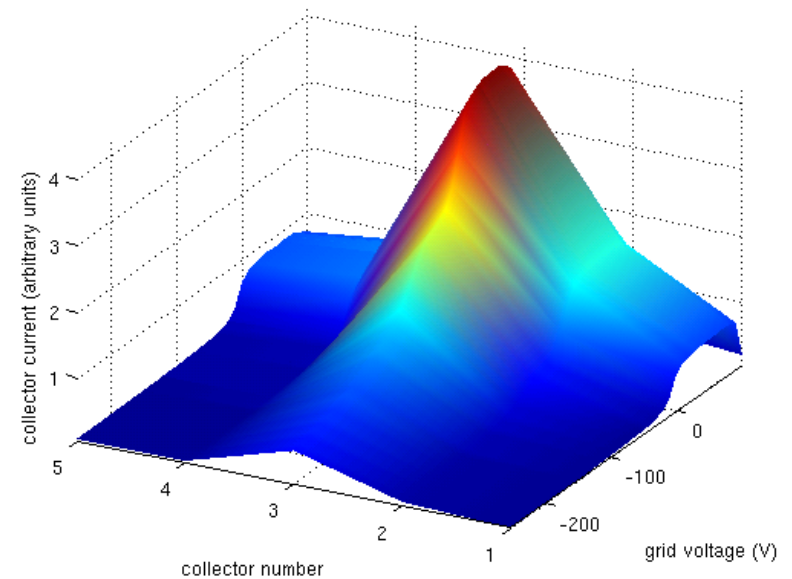
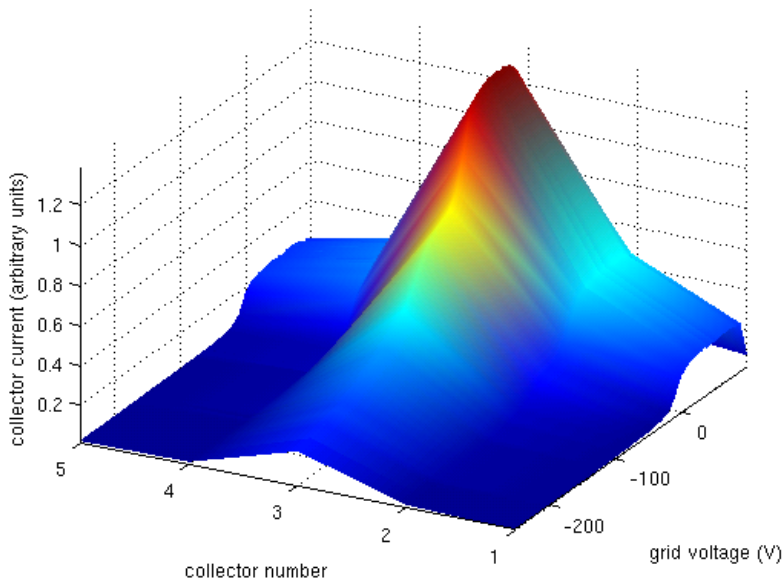
Coated
14EN

Energy scan:
1x45x1.25 mA/bunch
8 ns, 5 GeV positrons

Uncoated
14ES

Run #1030 (1x45x1.25 mA e+, 8ns, 5GeV, normalized): 14E_G1 Segmented 14WN Col Curs

Run #1030 (1x45x1.25 mA e+, 8ns, 5GeV, normalized): 14E_G1 Segmented 14WS Col Curs





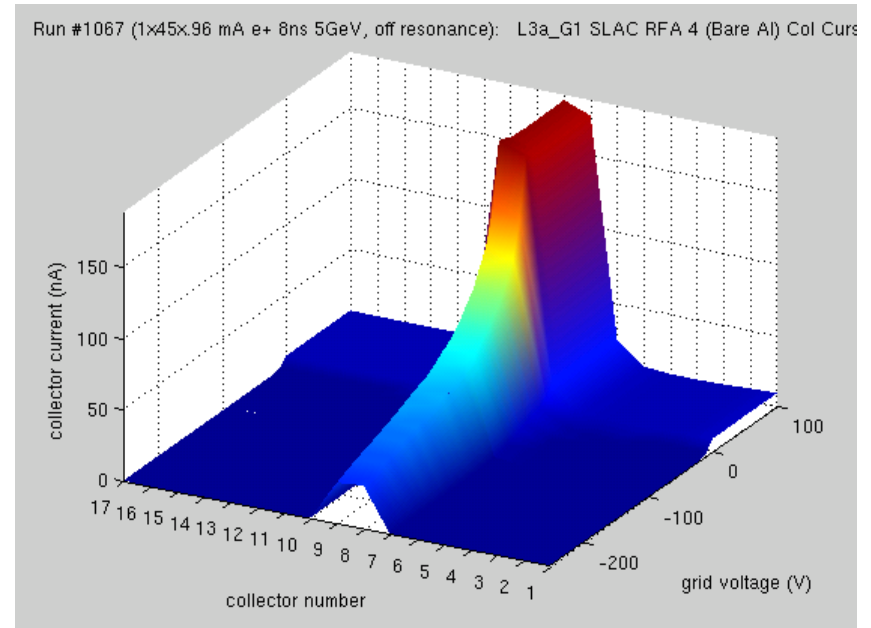
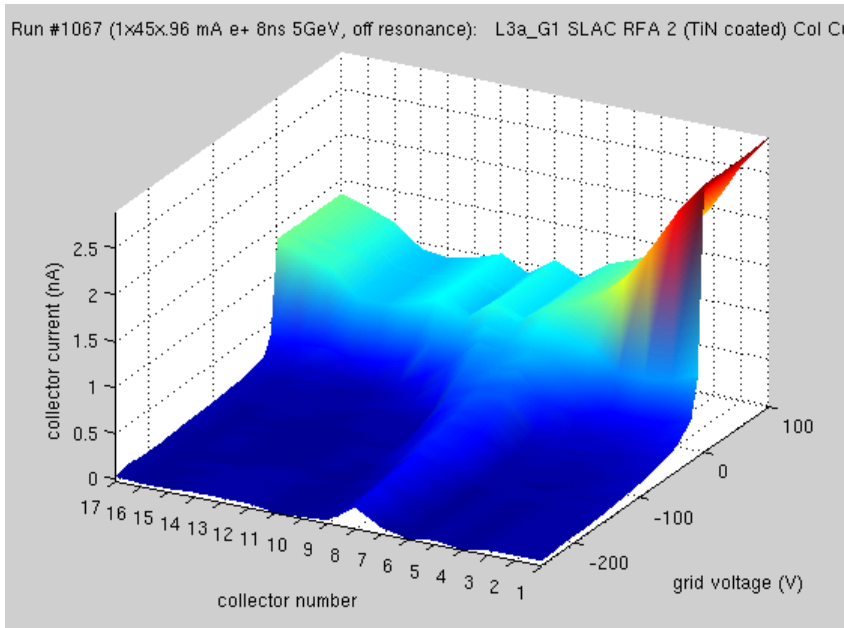
TiN in Dipole Region

- Neighboring detectors in SLAC chicane dipoles.
- RFA 2 in TiN coated Al chamber.
- RFA 4 in uncoated Al chamber.
- Response is reduced by $\sim 150\times$.
- Multipacting peak is suppressed.
- Not on a resonance.

Coated Al
RFA 2

Energy scan:
1x45x.96 mA/bunch
8 ns, 5 GeV positrons

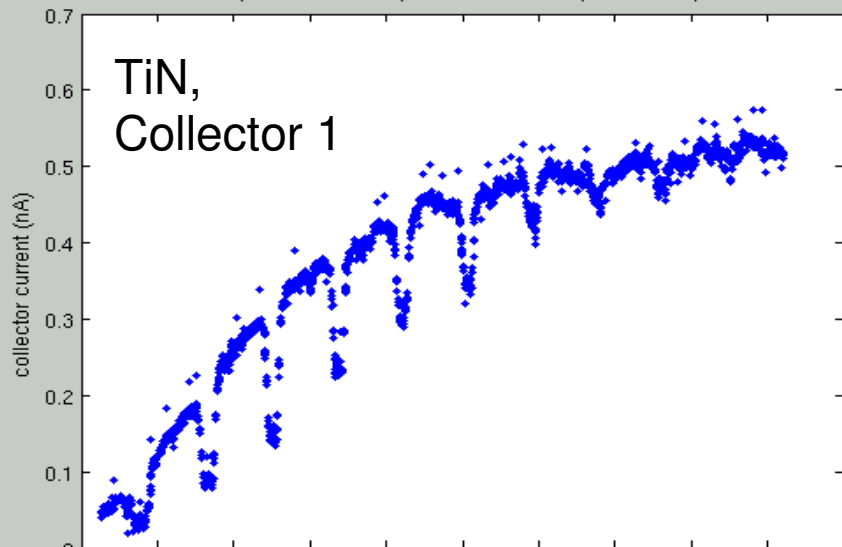
Uncoated Al
RFA 4



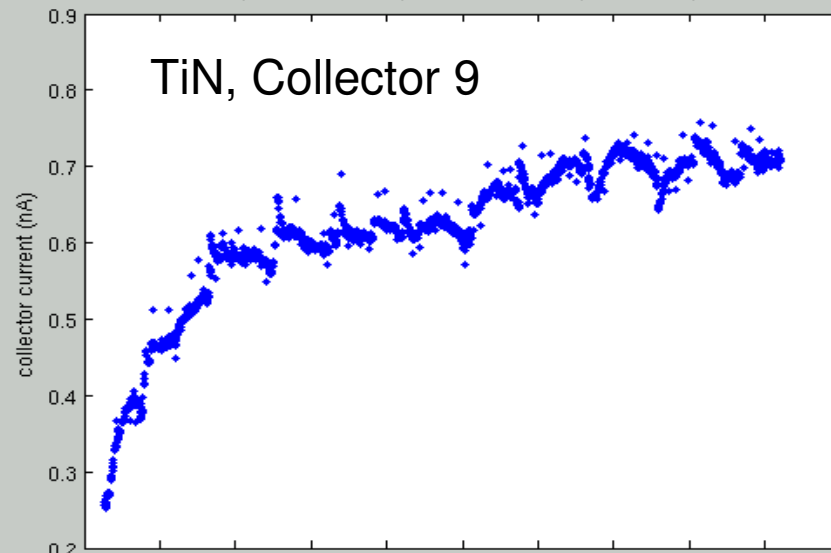


4ns, 2 GeV Chicane Scan

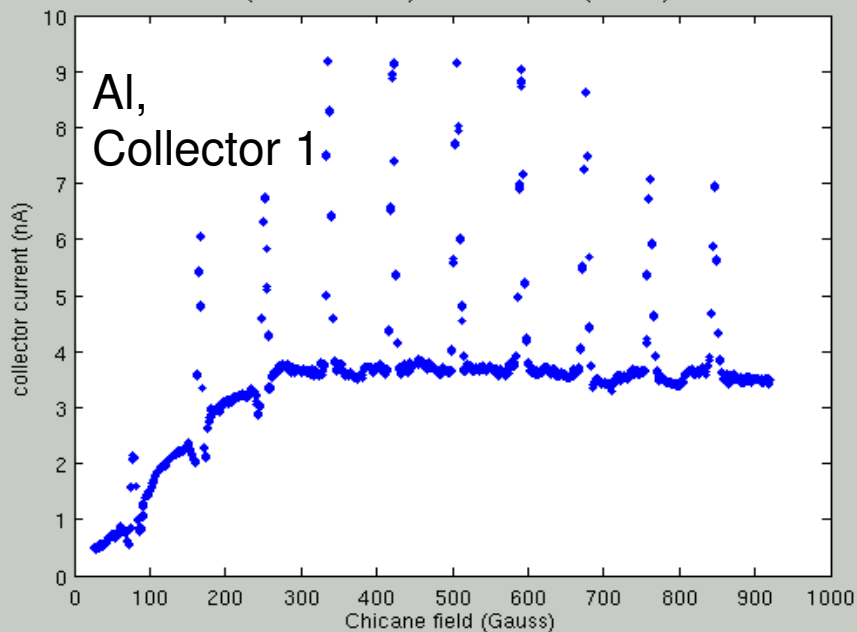
Run #1000 (1x45x.75 mA e+): SLAC RFA 3 (TiN Coated) COL 01



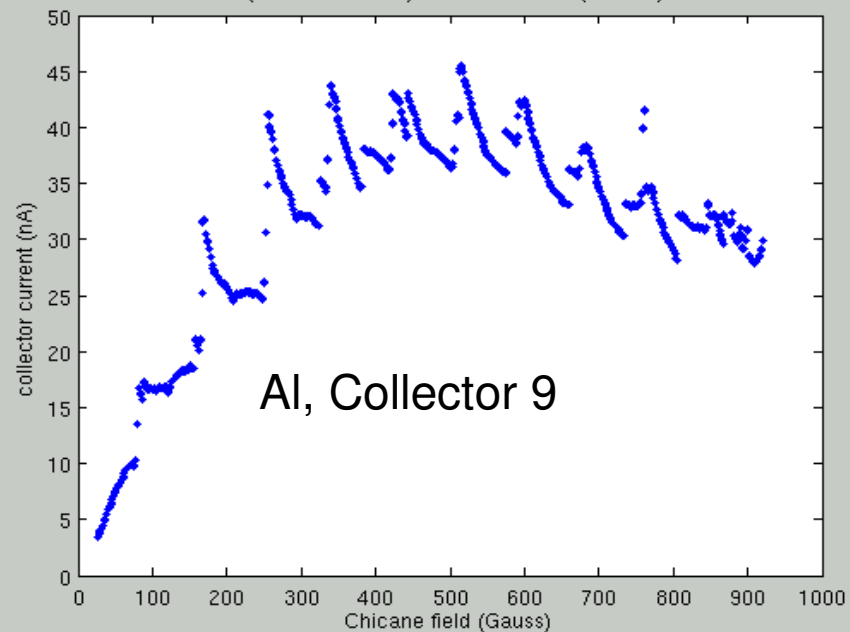
Run #1000 (1x45x.75 mA e+): SLAC RFA 3 (TiN Coated) COL 09



Run #1000 (1x45x.75 mA e+): SLAC RFA 4 (Bare Al) COL 01



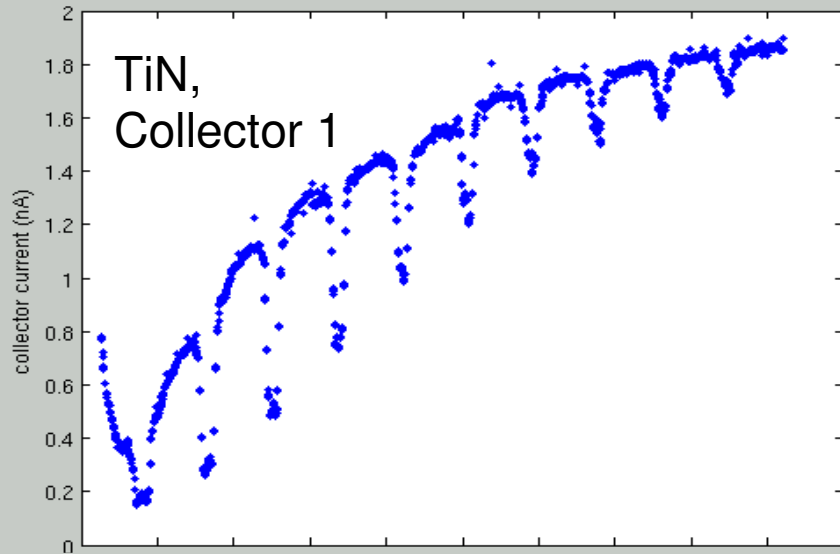
Run #1000 (1x45x.75 mA e+): SLAC RFA 4 (Bare Al) COL 09



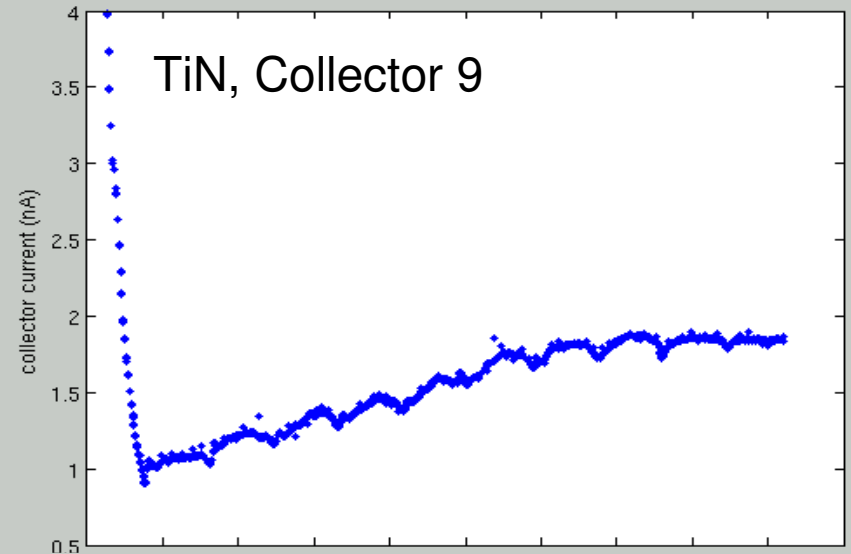


4ns, 5 GeV Chicane Scan

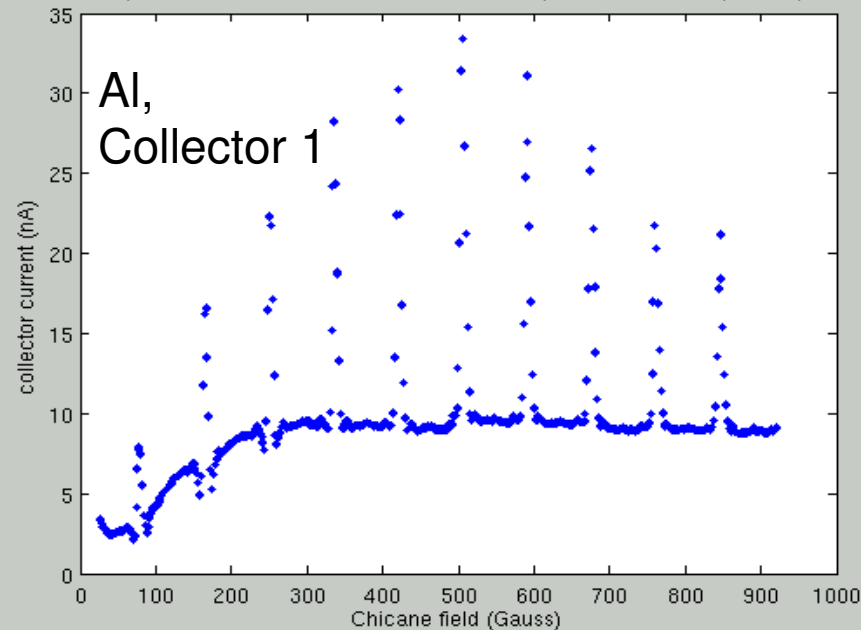
Run #1054 (1x45x.75 mA e+ chicane scan, 4ns, 5GeV): SLAC RFA 3 (TiN Coated) COL



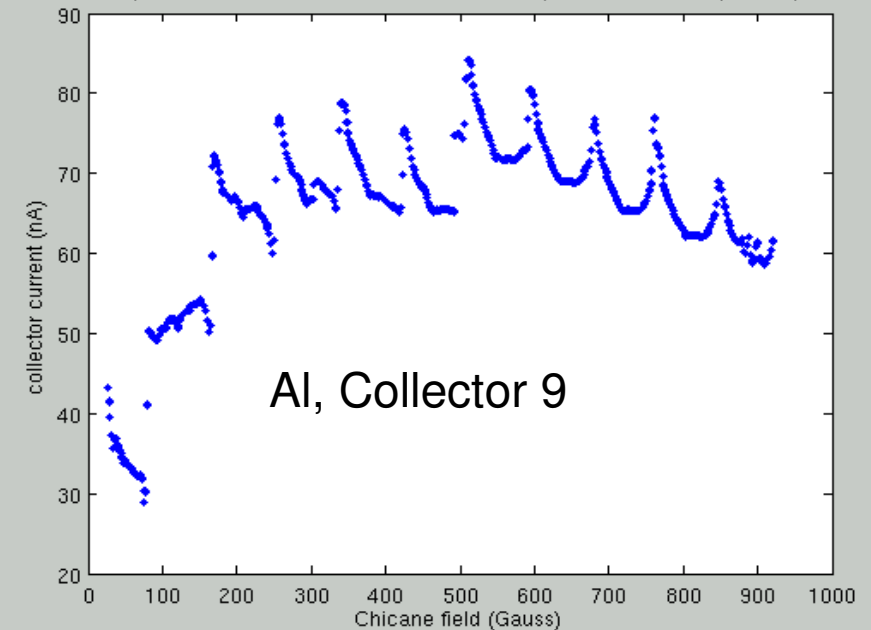
Run #1054 (1x45x.75 mA e+ chicane scan, 4ns, 5GeV): SLAC RFA 3 (TiN Coated) COL 09



Run #1054 (1x45x.75 mA e+ chicane scan, 4ns, 5GeV): SLAC RFA 4 (Bare Al) COL 01



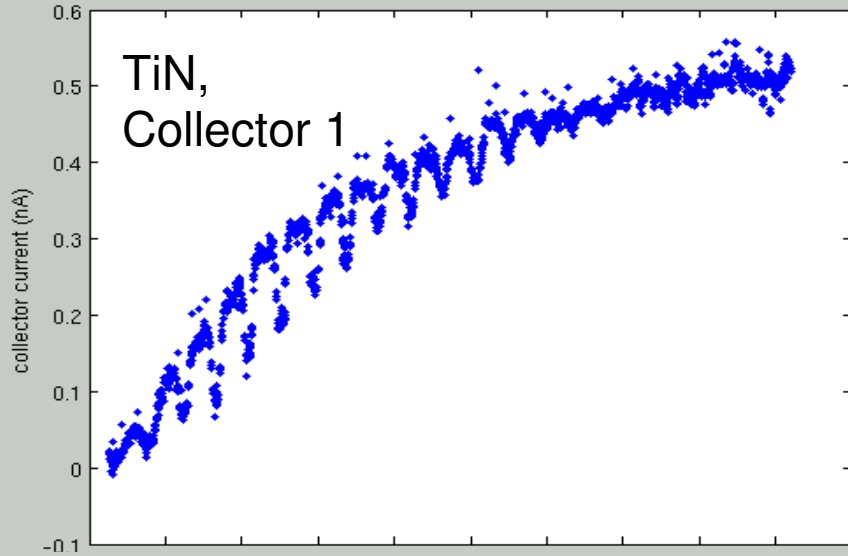
Run #1054 (1x45x.75 mA e+ chicane scan, 4ns, 5GeV): SLAC RFA 4 (Bare Al) COL 09



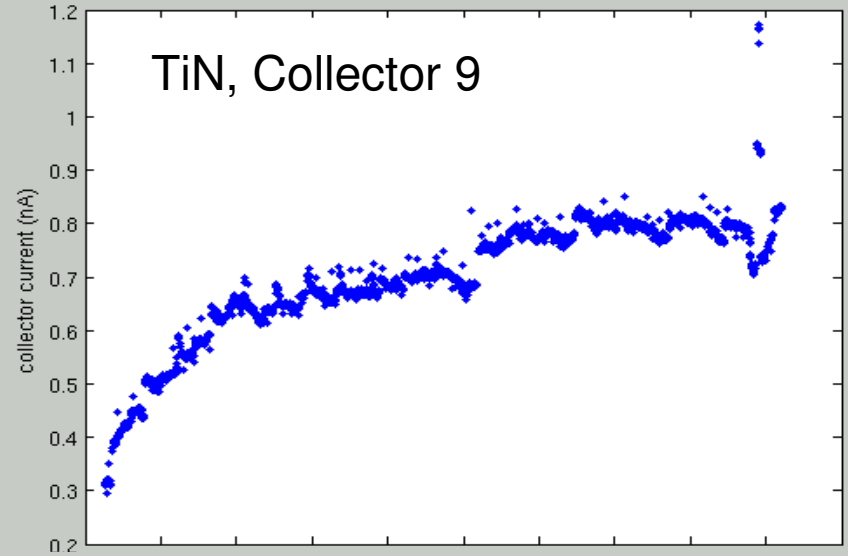


8ns, 2 GeV Chicane Scan

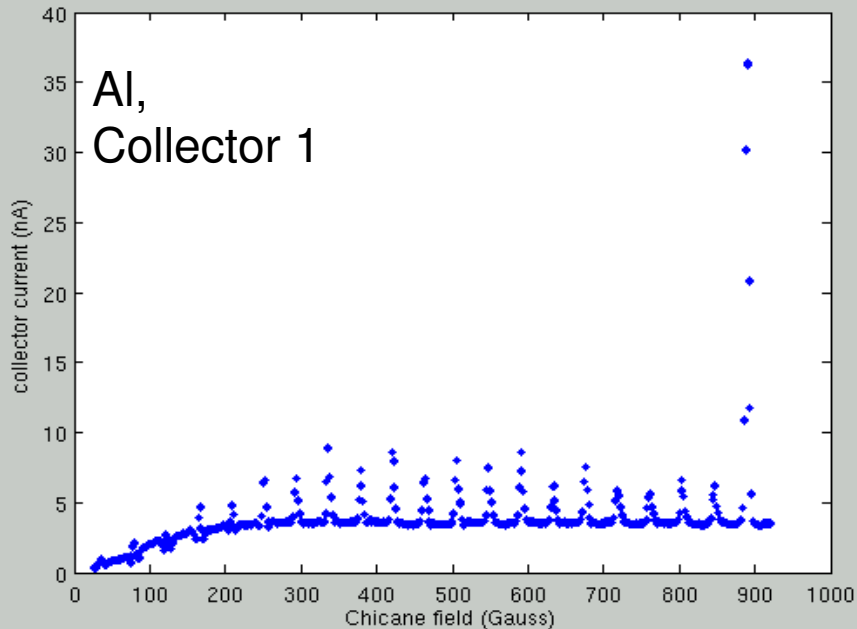
Run #1005 (1x45x.9mA e+ chicane scan, 8ns): SLAC RFA 3 (TiN Coated) COL 01



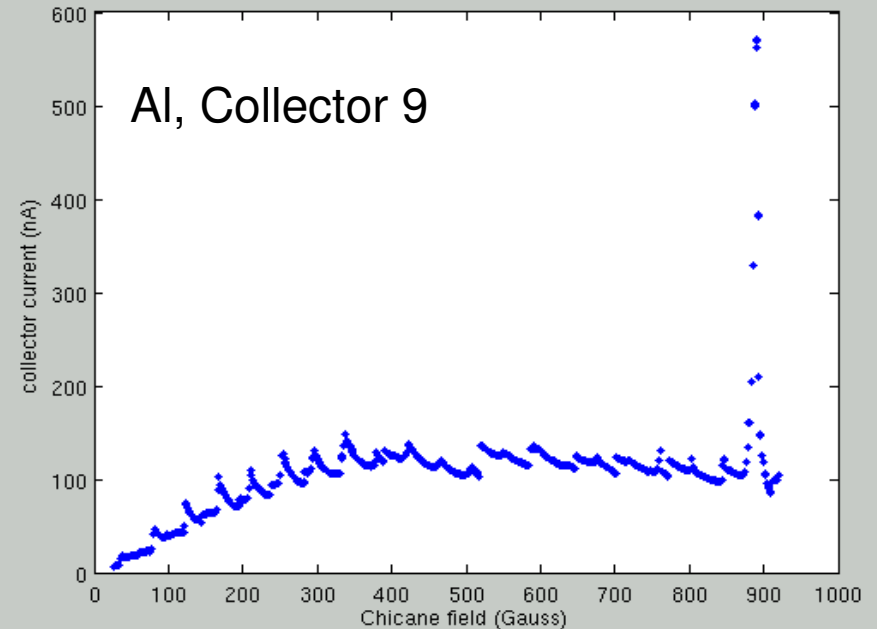
Run #1005 (1x45x.9mA e+ chicane scan, 8ns): SLAC RFA 3 (TiN Coated) COL 09



Run #1005 (1x45x.9mA e+ chicane scan, 8ns): SLAC RFA 4 (Bare Al) COL 01

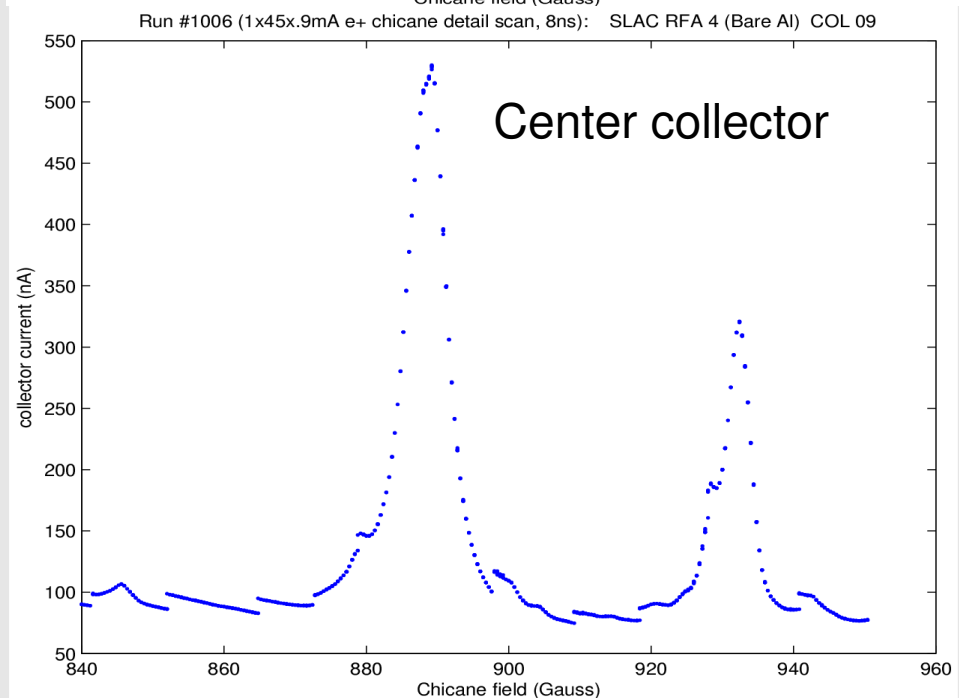
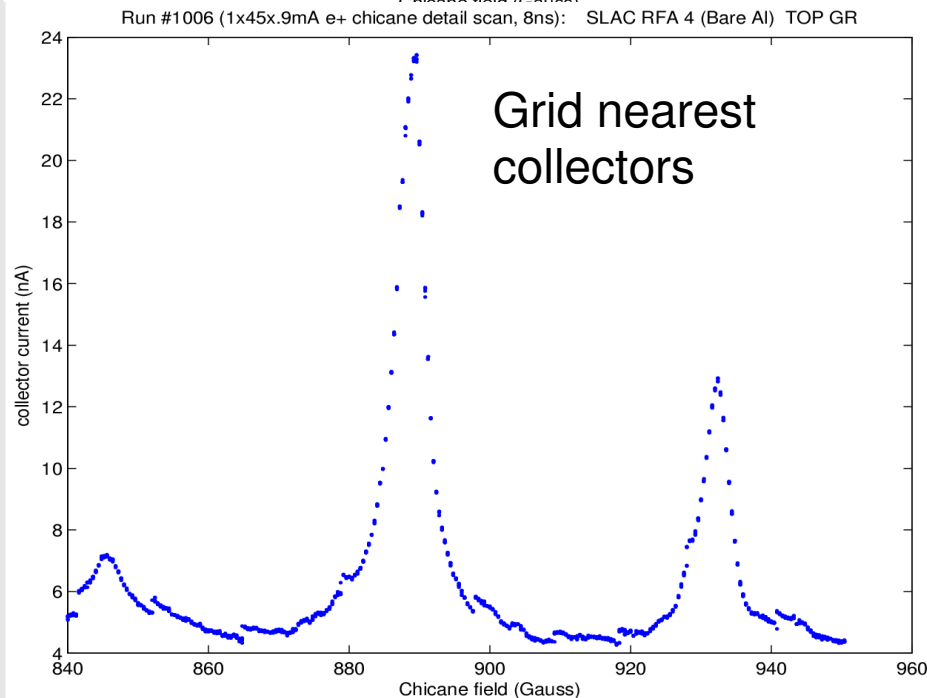
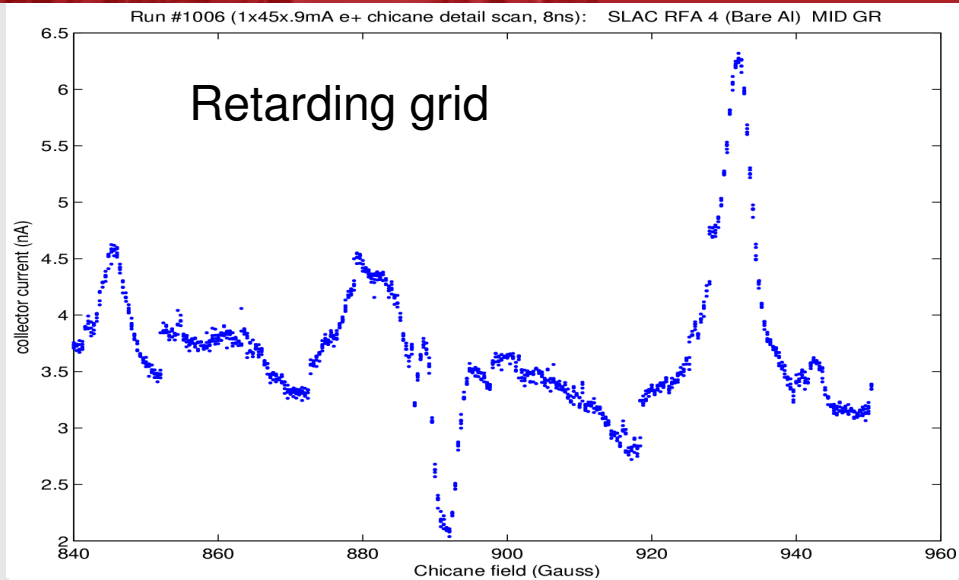
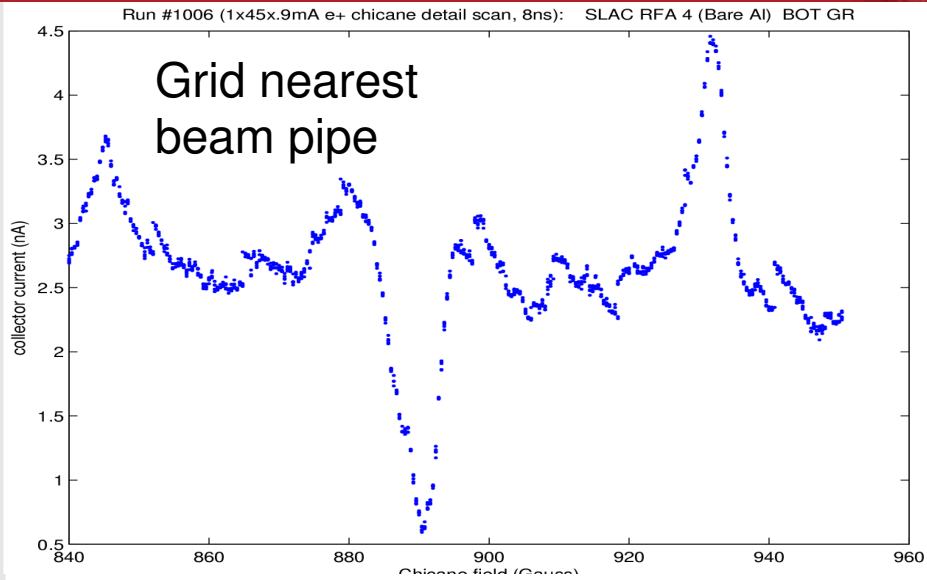


Run #1005 (1x45x.9mA e+ chicane scan, 8ns): SLAC RFA 4 (Bare Al) COL 09





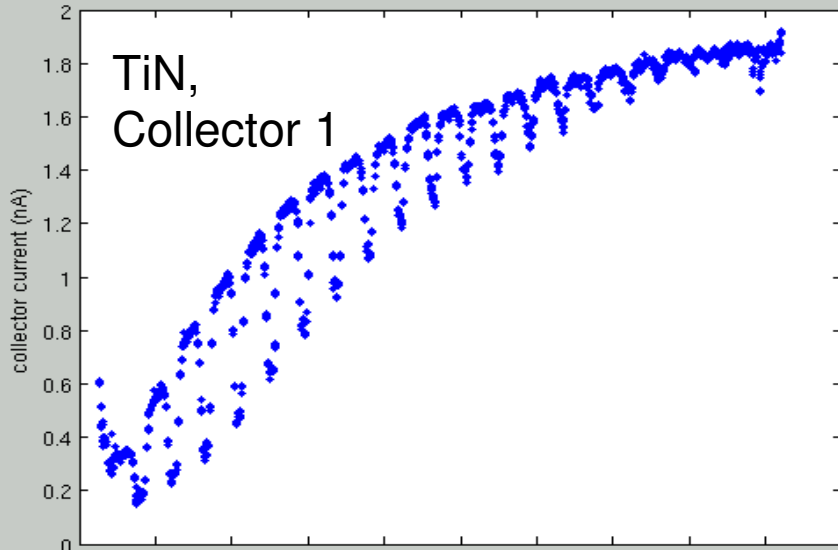
N=20 Resonance



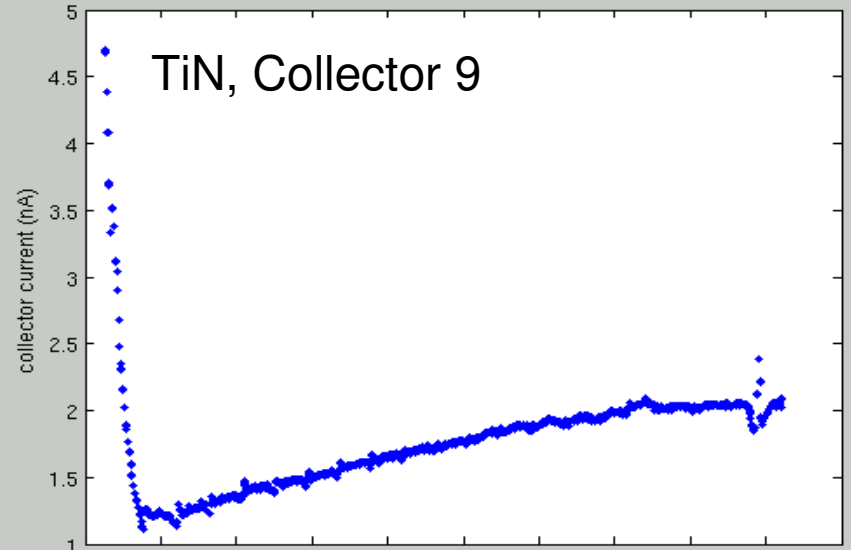


8ns, 5 GeV Chicane Scan

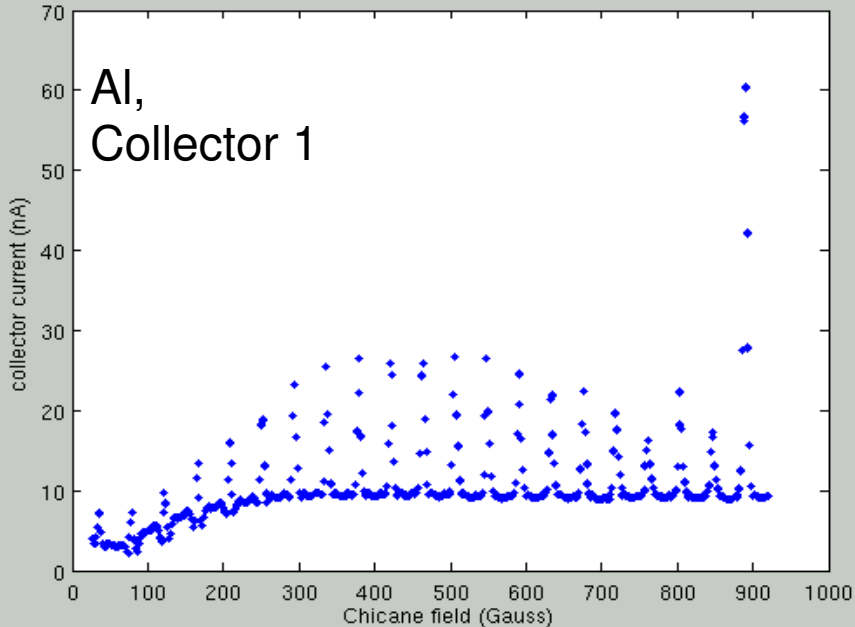
Run #1061 (1x45x1 mA e+ chicane scan, 8ns, 5GeV): SLAC RFA 3 (TiN Coated) COL 01



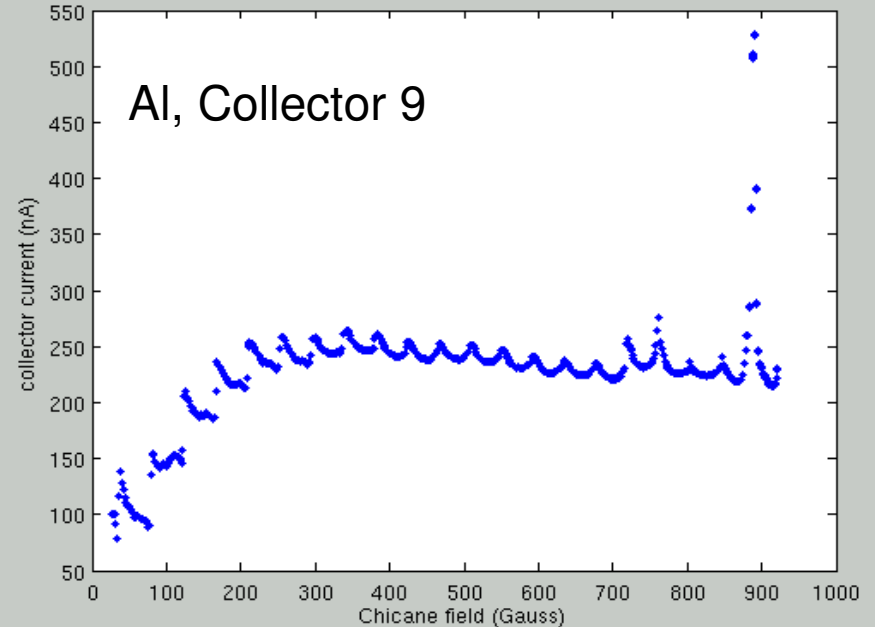
Run #1061 (1x45x1 mA e+ chicane scan, 8ns, 5GeV): SLAC RFA 3 (TiN Coated) COL 09



Run #1061 (1x45x1 mA e+ chicane scan, 8ns, 5GeV): SLAC RFA 4 (Bare Al) COL 01



Run #1061 (1x45x1 mA e+ chicane scan, 8ns, 5GeV): SLAC RFA 4 (Bare Al) COL 09

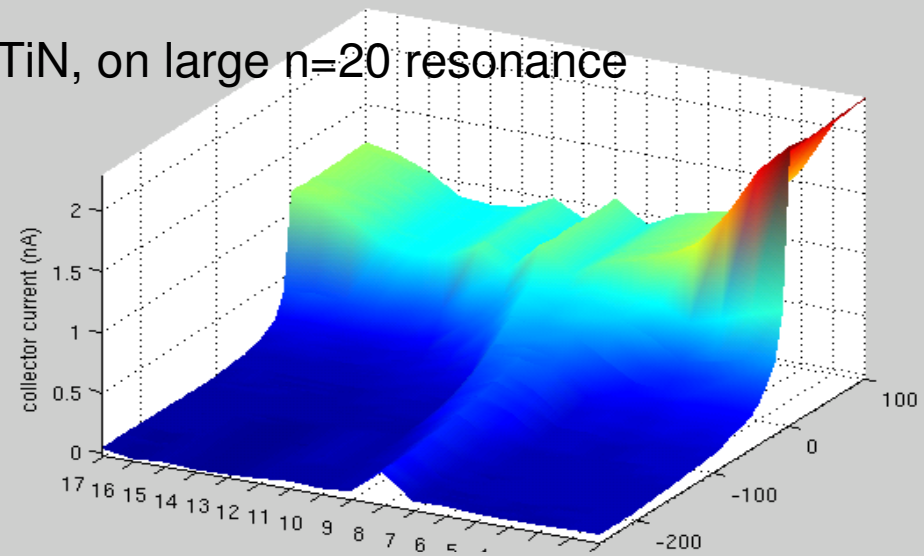




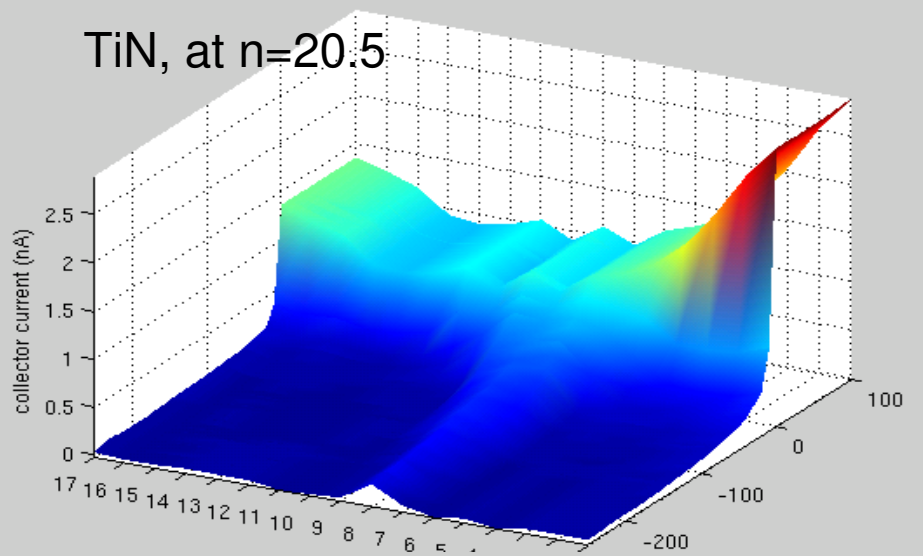
Energy Scan On/Off Resonance

Run #1066 (1x45x.96 mA e+ 8ns 5GeV, big resonance): L3a_G1 SLAC RFA 2 (TiN coated) Col Cur Run #1067 (1x45x.96 mA e+ 8ns 5GeV, off resonance): L3a_G1 SLAC RFA 2 (TiN coated) Col Cur

TiN, on large n=20 resonance

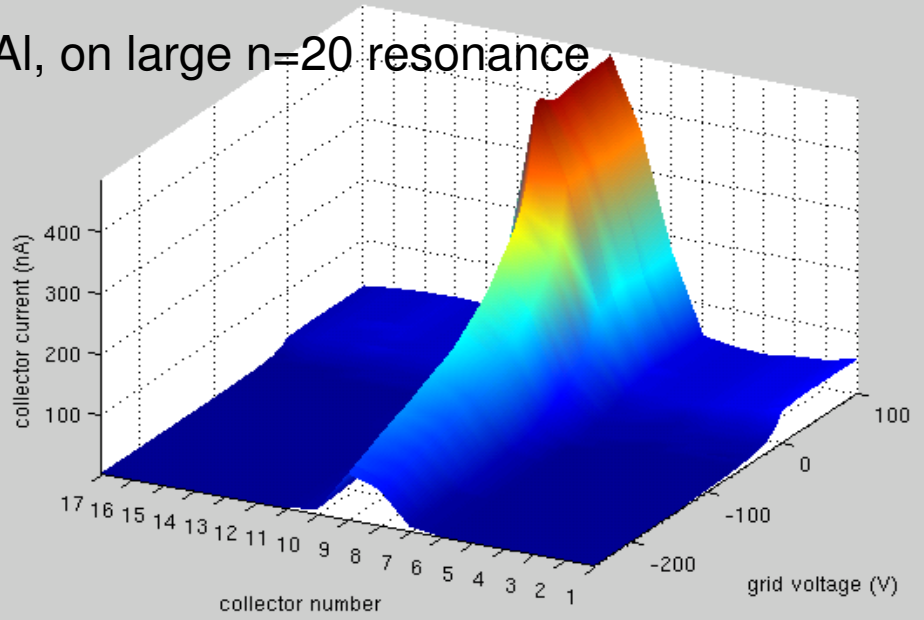


TiN, at n=20.5

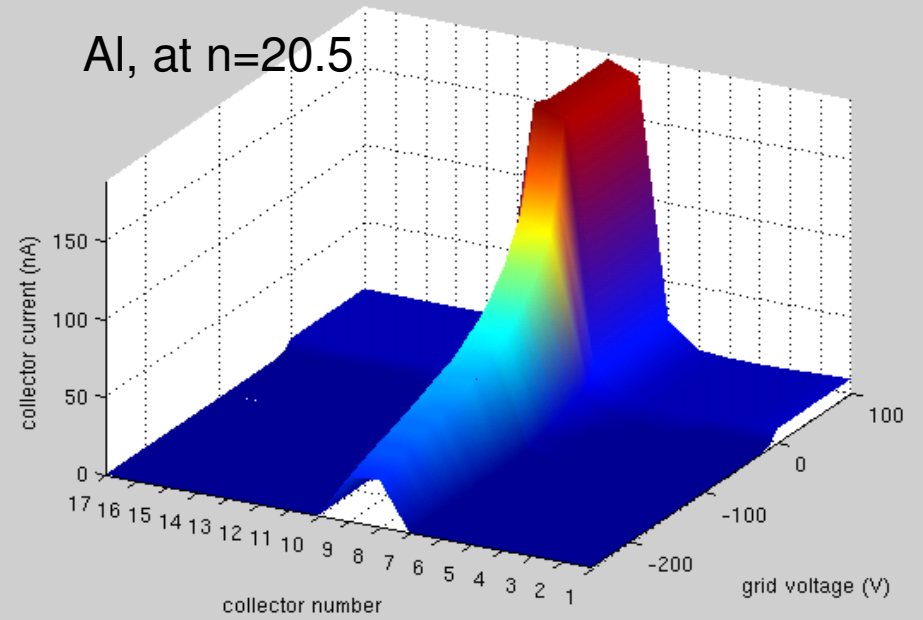


Run #1066 (1x45x.96 mA e+ 8ns 5GeV, big resonance): L3a_G1 SLAC RFA 4 (Bare Al) Col Cur Run #1067 (1x45x.96 mA e+ 8ns 5GeV, off resonance): L3a_G1 SLAC RFA 4 (Bare Al) Col Cur

Al, on large n=20 resonance



Al, at n=20.5

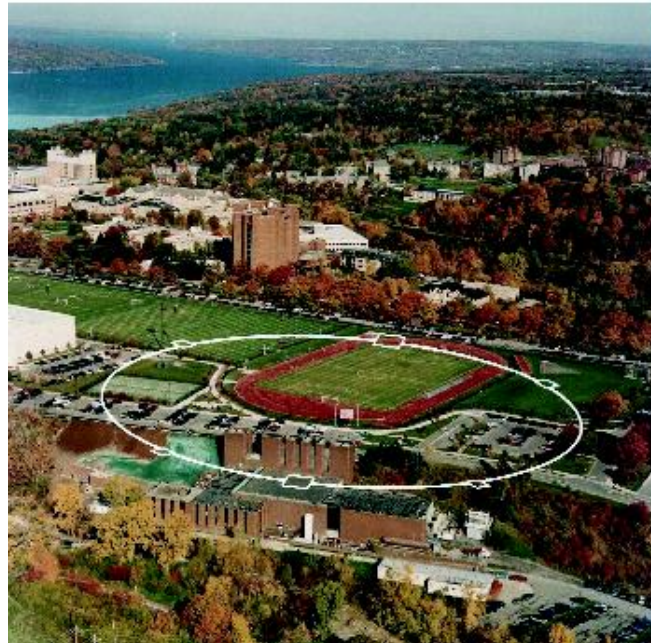




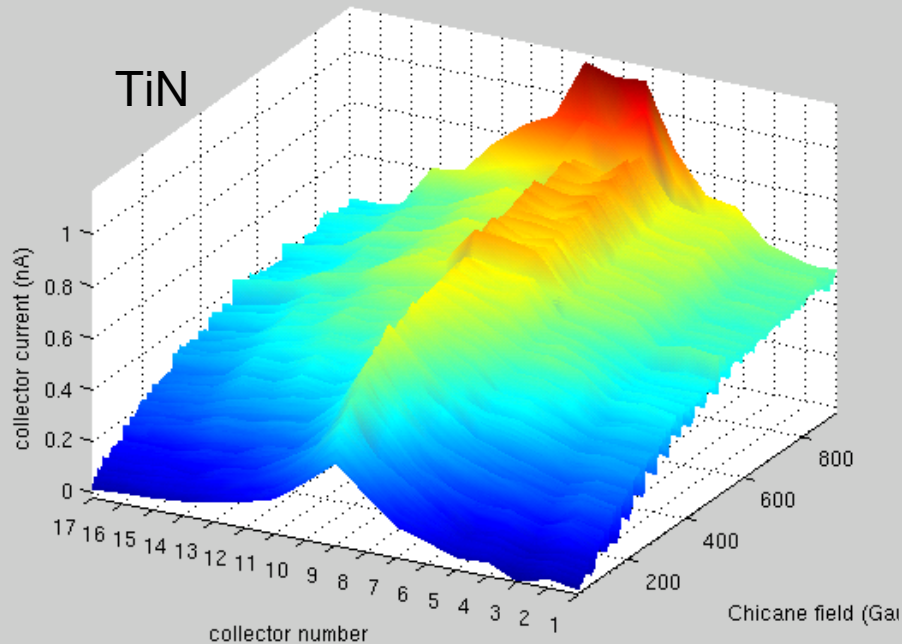
- We have taken data in drifts, dipoles, and wigglers (Joe Calvey).
- We currently have 22 RFA devices installed in CESR, with more to come.
- Commissioning and first data taken with transplanted SLAC chicane.
- More data next run.
- Signs that presence of RFA affects measurements, needs simulation.



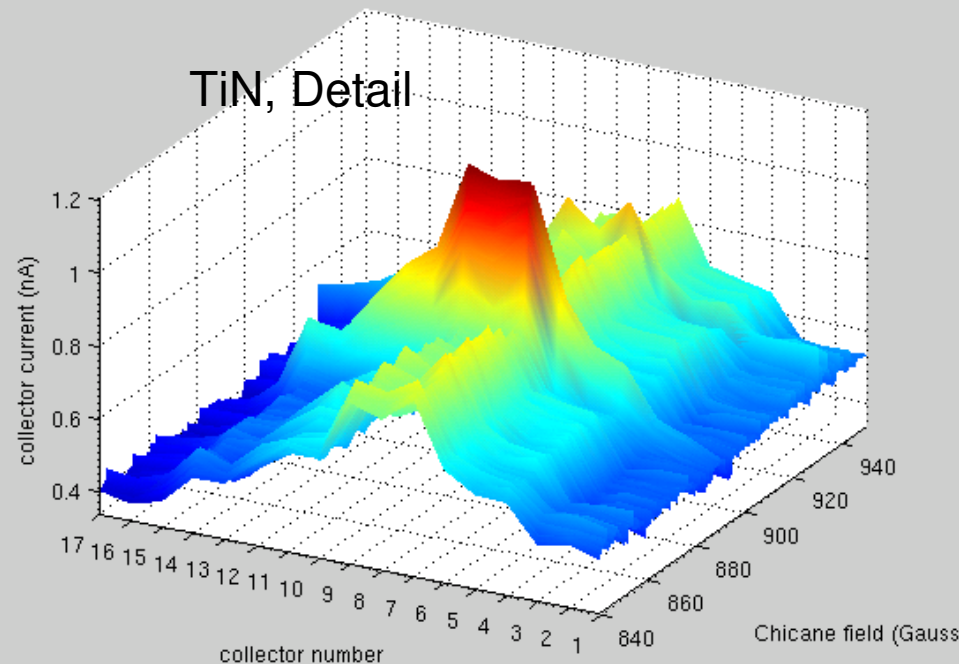
Thank you.



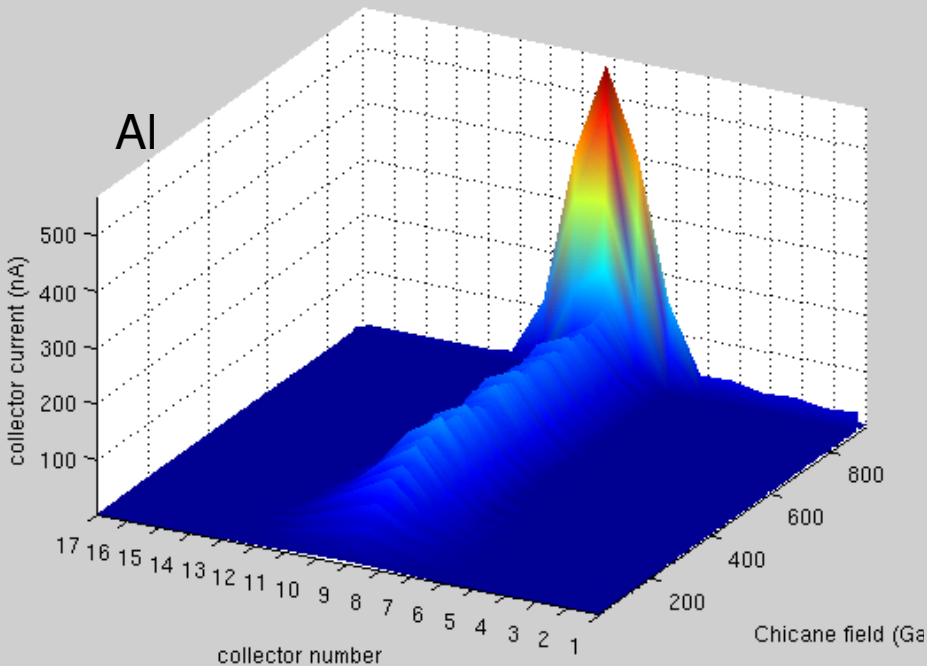
Run #1005 (1x45x.9 mA e+ chicane scan, 8ns): L3a_G1 SLAC RFA 3 (TiN Coated) Col Curs



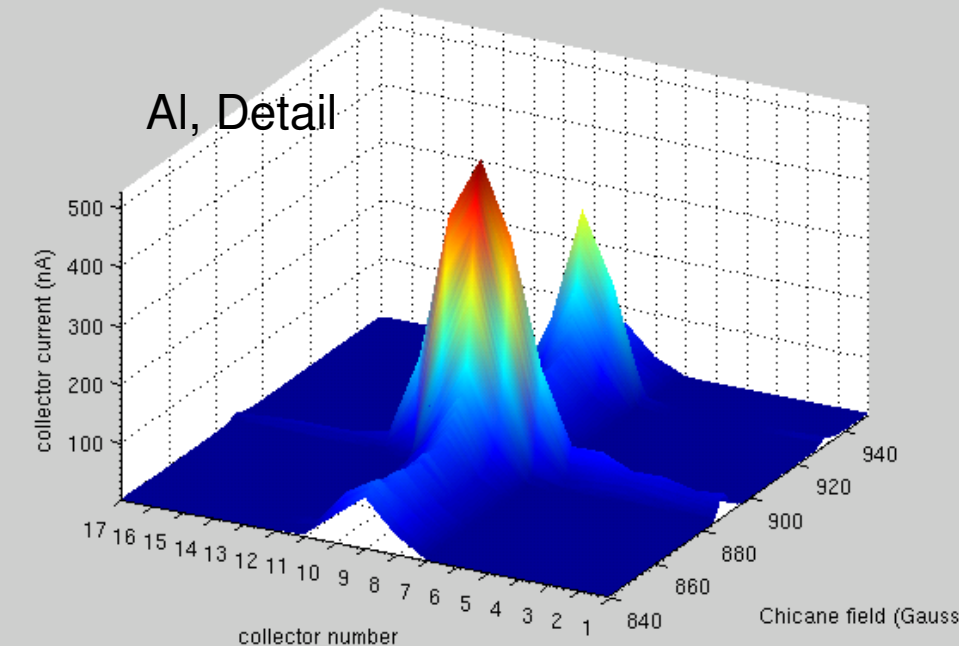
Run #1006 (1x45x.9 mA e+ chicane scan, 8ns): L3a_G1 SLAC RFA 3 (TiN Coated) Col Curs



Run #1005 (1x45x.9 mA e+ chicane scan, 8ns): L3a_G1 SLAC RFA 4 (Bare Al) Col Curs



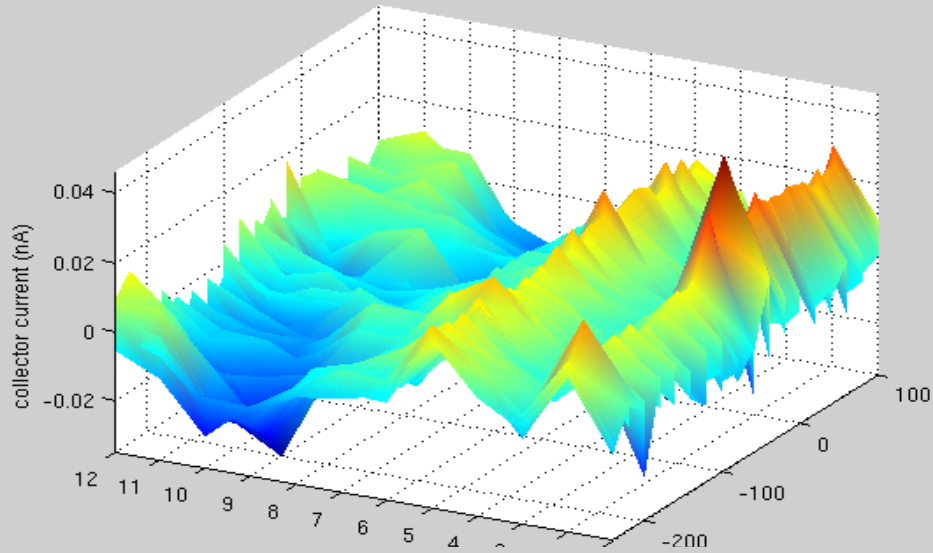
Run #1006 (1x45x.9 mA e+ chicane scan, 8ns): L3a_G1 SLAC RFA 4 (Bare Al) Col Curs



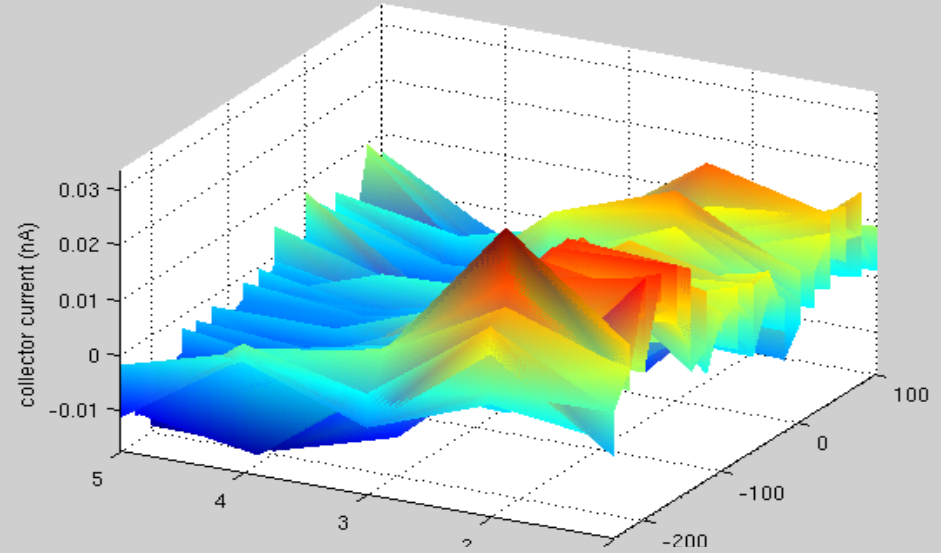


Noise Characterization

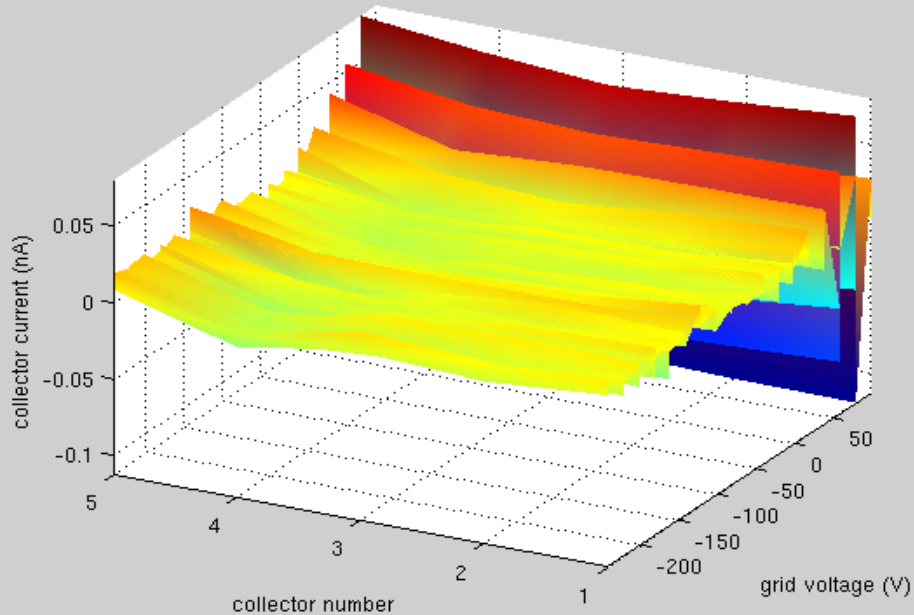
Run #1032 (No beam scan): 01W_G1 Center pole Col Curs



Run #1032 (No beam scan): 13W_G1 Segmented 14WN Col Curs



Run #1032 (No beam scan): 14E_G1 Segmented 14WS Col Curs



Run #1032 (No beam scan): L3a_G1 SLAC RFA 4 (Bare Al) Col Curs

