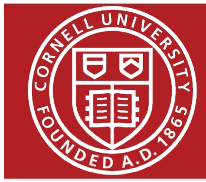


Cornell Laboratory for
Accelerator-based Sciences and
Education (CLASSE)

CESRTA EC Update
March 22, 2011

Mark Palmer

for the CESRTA Collaboration

Introduction

- Update since IWLC2010
- Outline:
  - CESRTA Status
  - December 2010 Run
  - January 2011 Down and Recovery
  - Plans for April 2011 Run
  - CESRTA Phase I Report

CESRTA Status

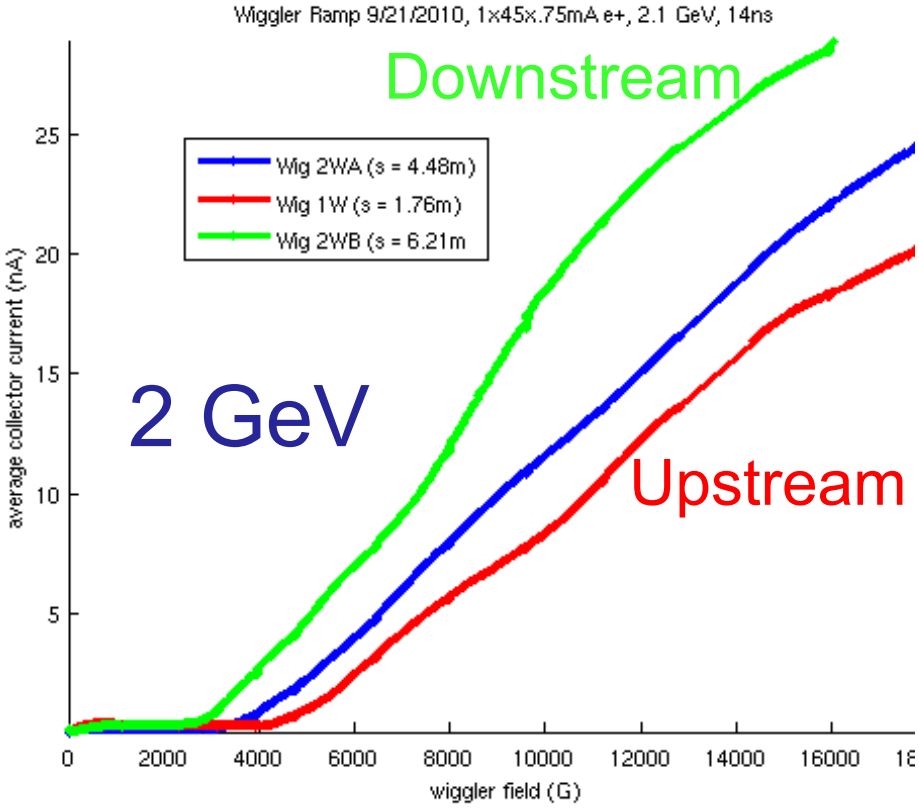
- Formally completed the Phase I program in October 2010
  - Funds available for a December run
  - NSF has approved a 3 year extension for operations at ~½ the level of the Phase I program
    - ~40 running days per year vs ~80+ running days per year
    - Focused more generally on "lepton collider R&D"
  - Major focus at the moment is preparation of a "Phase I Report" which is targeted for mid-year release
- Extended Program (Mar 1, 2011 through 2013)
  - 2011 runs planned: April 1-19, June 10-28, Oct 21 – Nov 8
  - Funding has not yet arrived due to US CR
    - April run will have reduced scope
    - June run tentatively planned, pending arrival of funding
- For EC work, the major focus is presently on the simulation and analysis efforts

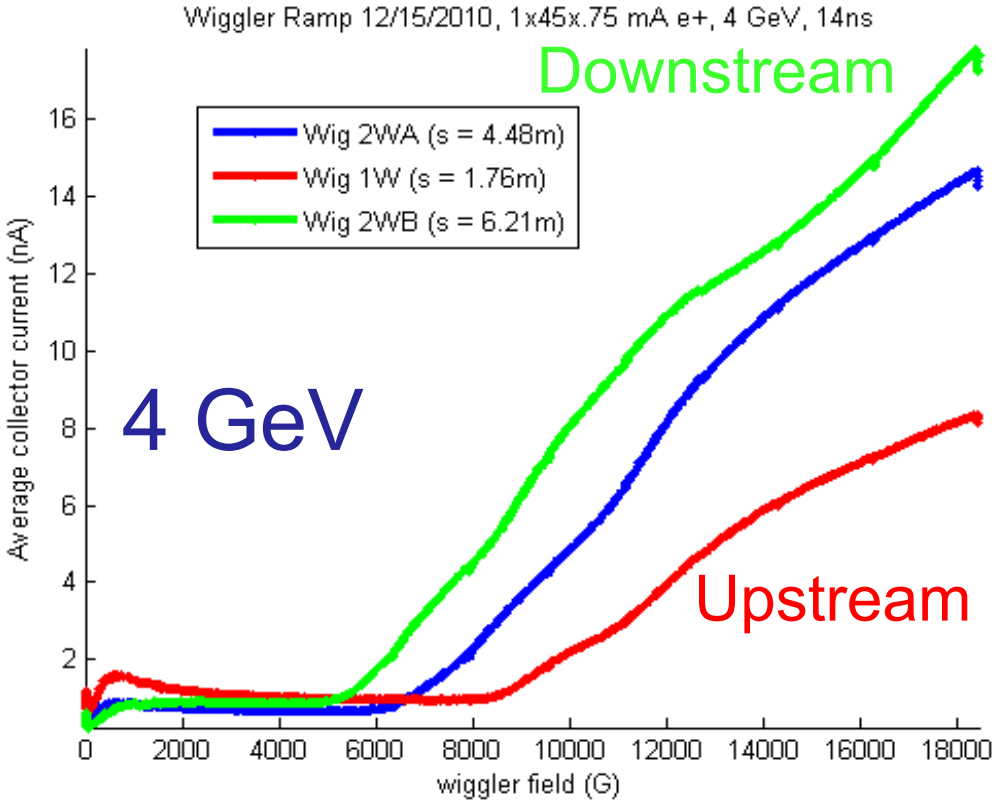
December Run

- A 2.5 week run was carried out Dec 7-24, 2011
  - Major focus on
    - EC Build-Up & Mitigation Studies
    - LET & Instrumentation (D. Rubin Talk Monday)
    - EC Beam Dynamics Studies (G. Dugan Talk Today)
  - EC Build-Up & Mitigation Studies
    - Basic characterizations
    - Photon scattering studies in L0 (“wiggler ramp study”)
    - Bunch spacing studies
    - Shielded Pickup Studies
    - In-situ SEY station measurements

Wiggler Ramp Study

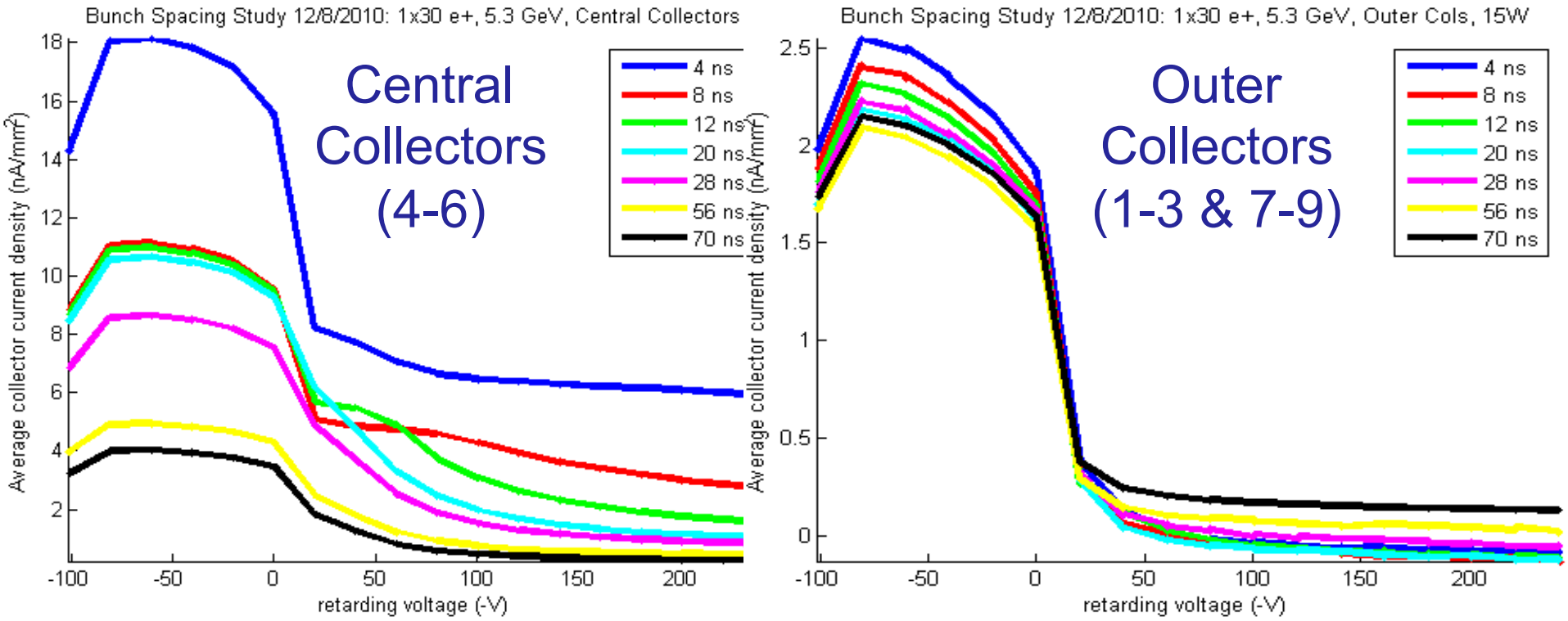
- Experiment:
  - Store beam (1x45x.75mA e+, 14ns for these studies)
  - Ramp L0 wiggler magnets between full field (1.9T) and zero field while maintaining current
  - Monitor RFA and RGA signals throughout ramp
  - Currents found to be too low for good RGA sensitivity





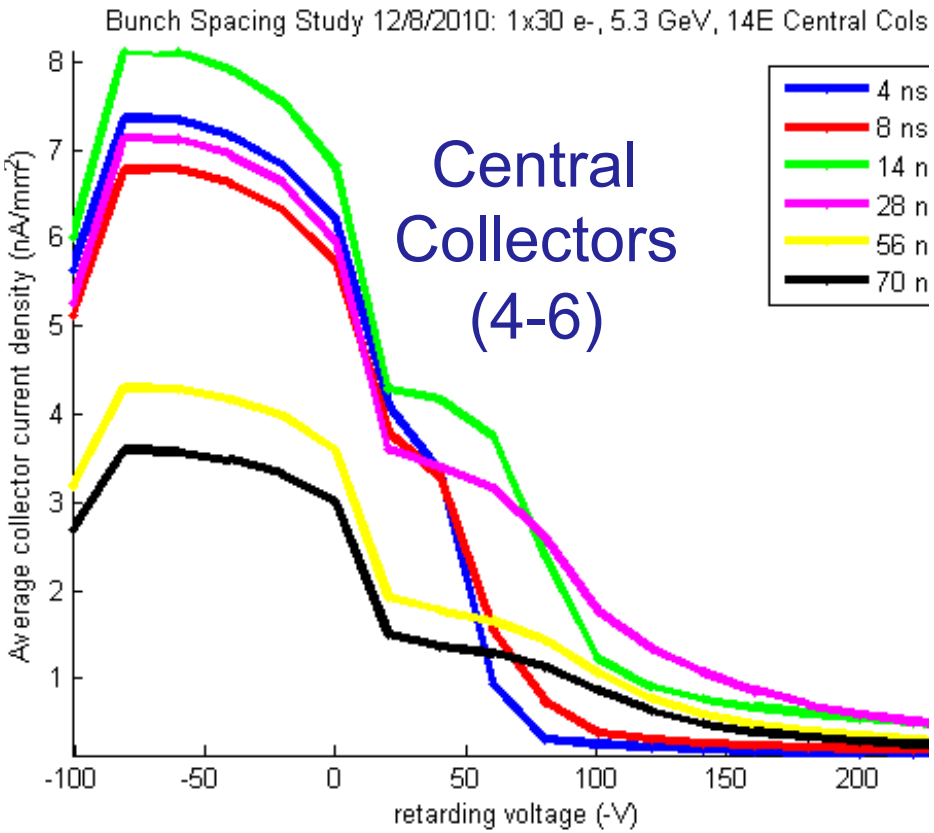
Bunch Spacing Study: Positrons

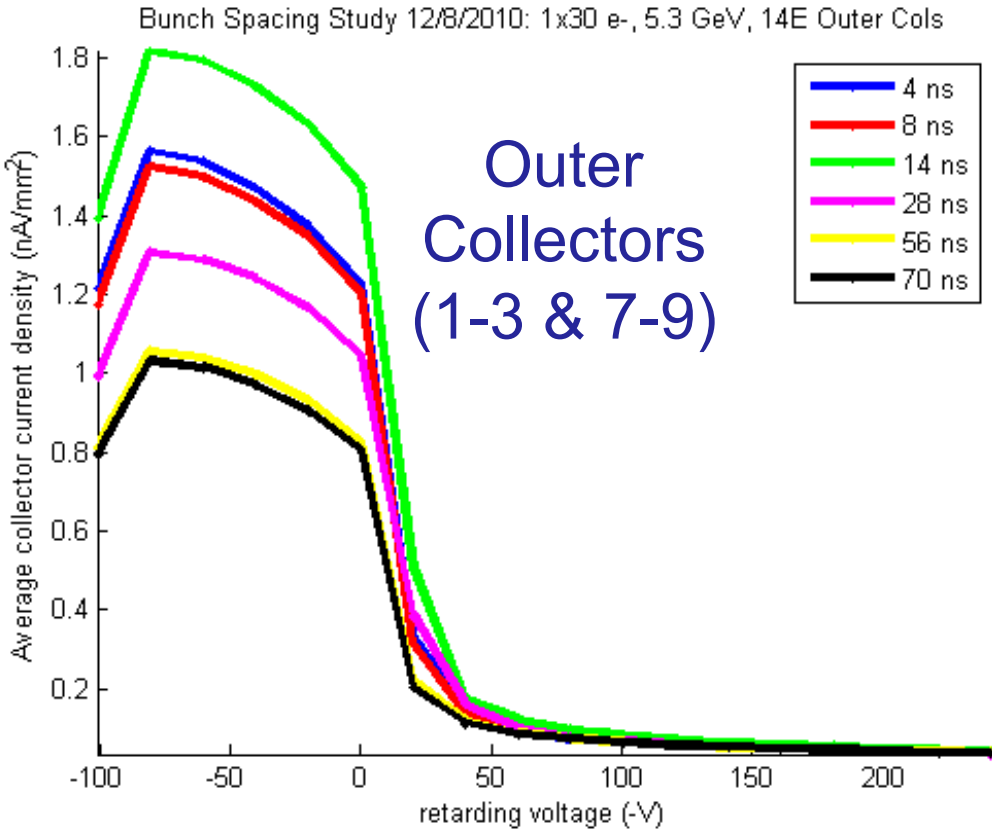
- 1x30x2.5mA e+, 5.3 GeV with various bunch spacings
  - 4, 8, 12, 20, 28, 56, 70ns spacings
- Drift Region RFAs



Bunch Spacing Study: Electrons

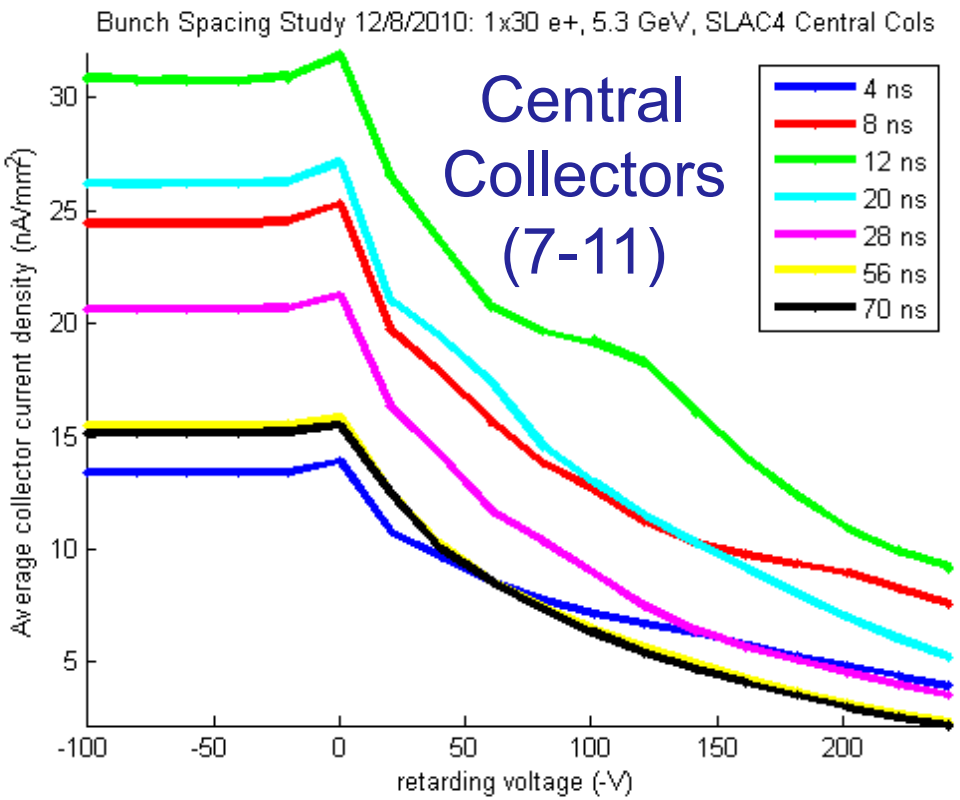
- 1x30x2.5mA e-, 5.3 GeV
  - 4, 8, 14, 20, 56, 70ns spacings
- Drift Region RFAs

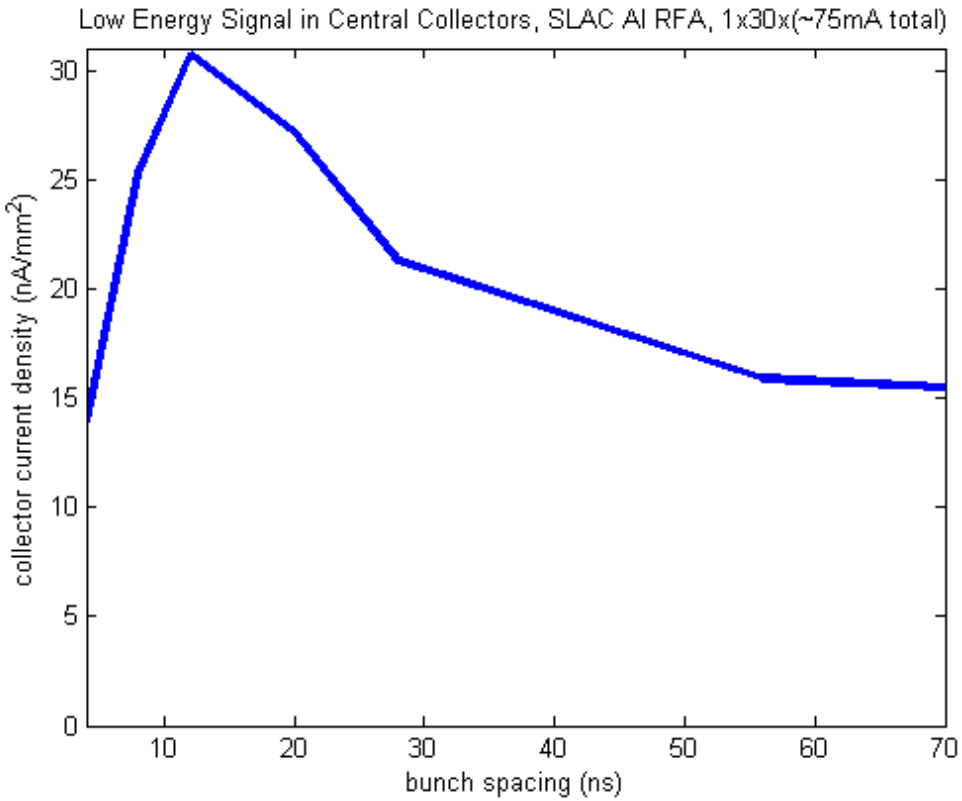




Bunch Spacing Study: Dipole

- 1x30x2.5mA e+, 5.3 GeV with various bunch spacings
  - 4, 8, 12, 20, 28, 56, 70ns spacings
- Chicane Dipole (Al) RFAs

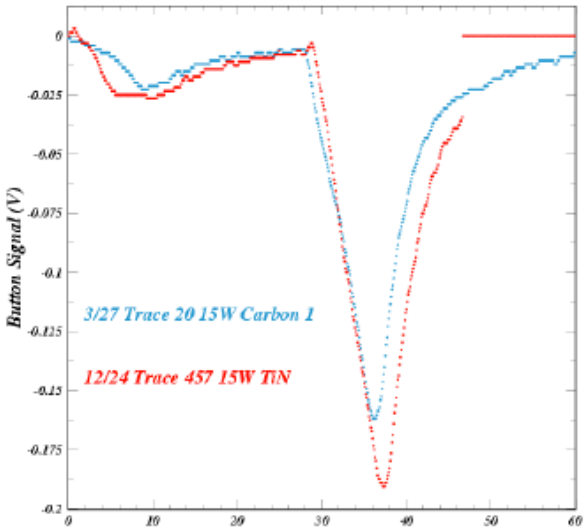


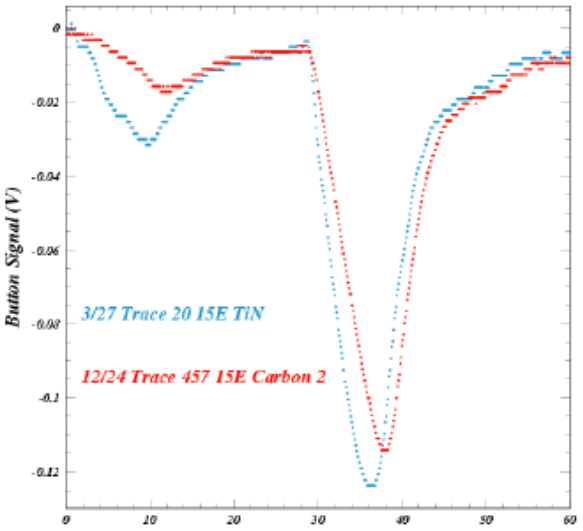


Shielded Pickups: Chamber Comparisons

5.3 GeV

15W | **15E**

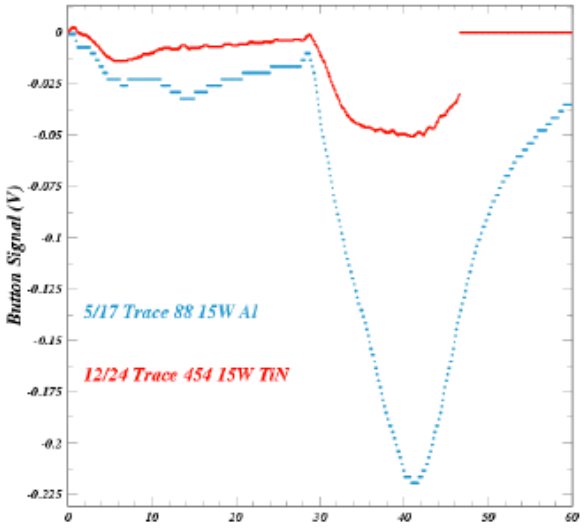


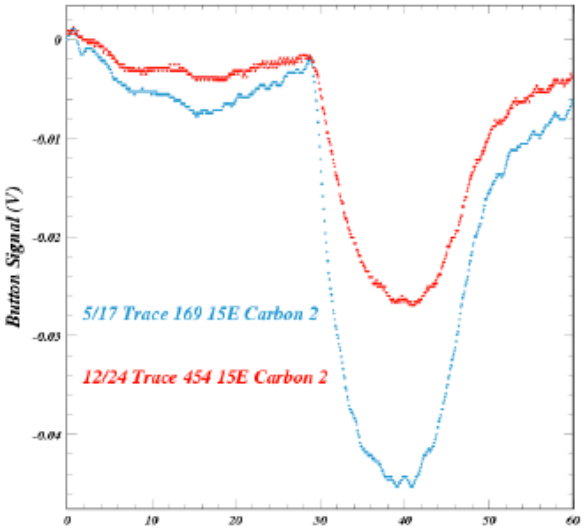


5 mA/bunch

The carbon coating suppresses high-energy photoelectrons compared to the TiN coating.

The results for the second carbon-coated chamber corroborate the high-energy photoelectron suppression relative to TiN observed with the first carbon chamber.





3 mA/bunch

The q.e. for reflected photons and the SEY are both much smaller for TiN compared to Al.

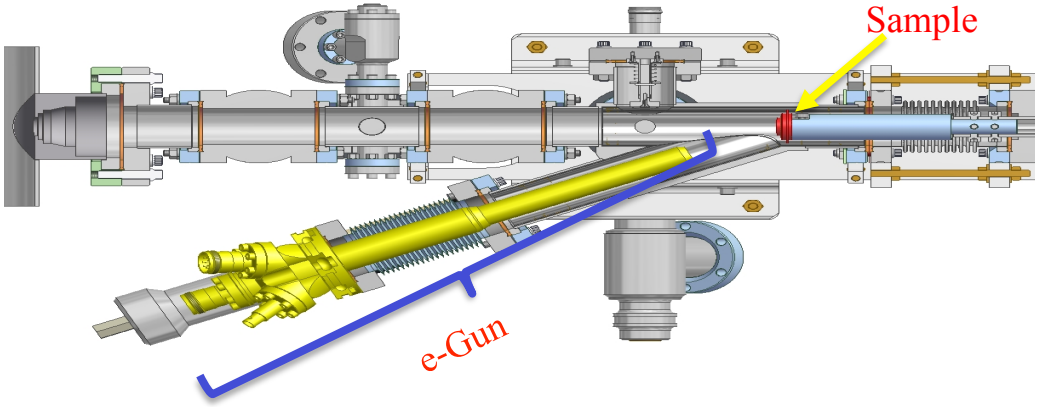
The 3-mA TiN witness signal is a factor of 5 smaller than for 5 mA/bunch. (see slide 5)

The second carbon-coated chamber shows conditioning effects between 5/17 and 12/24, primarily for the quantum efficiency.

- Significant analysis effort underway to characterize photoelectron distribution and $\delta(0)$ information from SPU data

In Situ SEY Measurements

- In Situ SEY Station

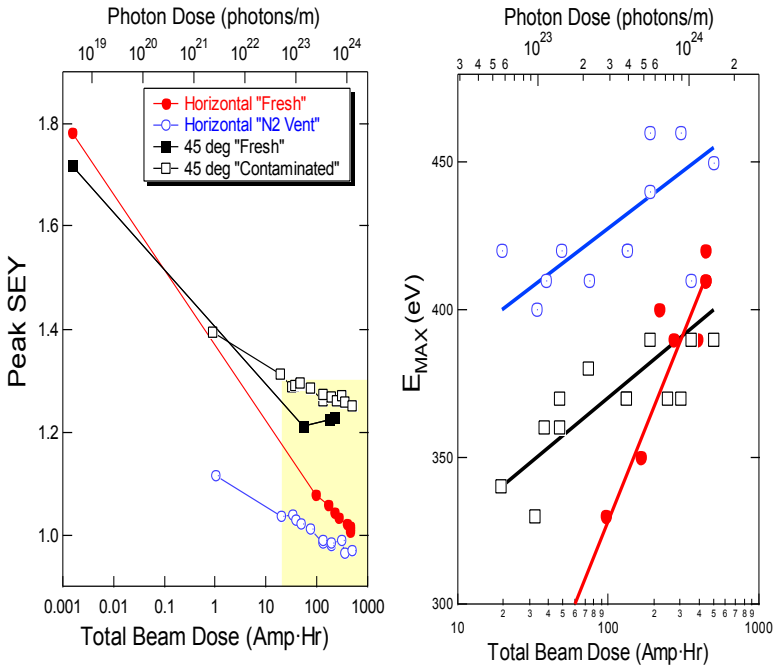


Samples Tested In CESR Beam Line

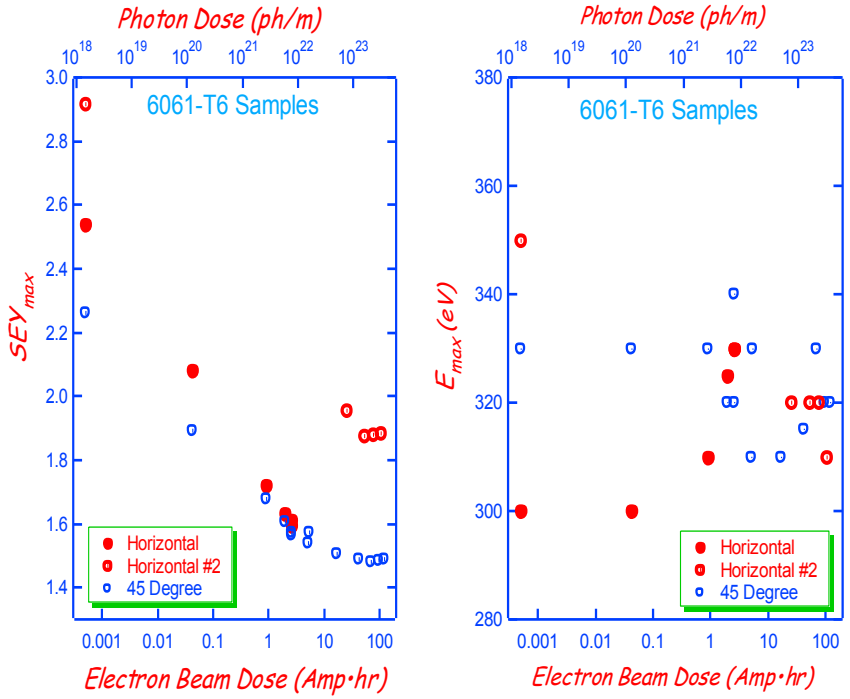
Sample	SEY before Conditioning	SEY after Conditioning	Sample Received from
TIN/Al	1.8	1.04 (<1 after N_2 vent)	SLAC
Al6061	2.55	1.6	Cornell
Al6061	2.9	1.85	Cornell
a-C	1.01	1	CERN
DLC	1.6		KEK

In Situ SEY measurements

- AL-TIN Sample

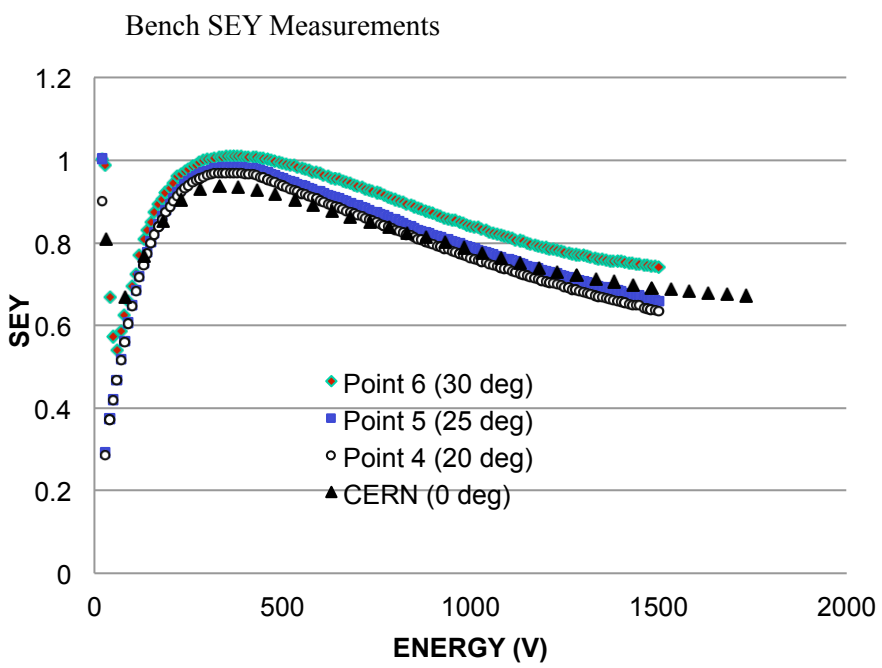


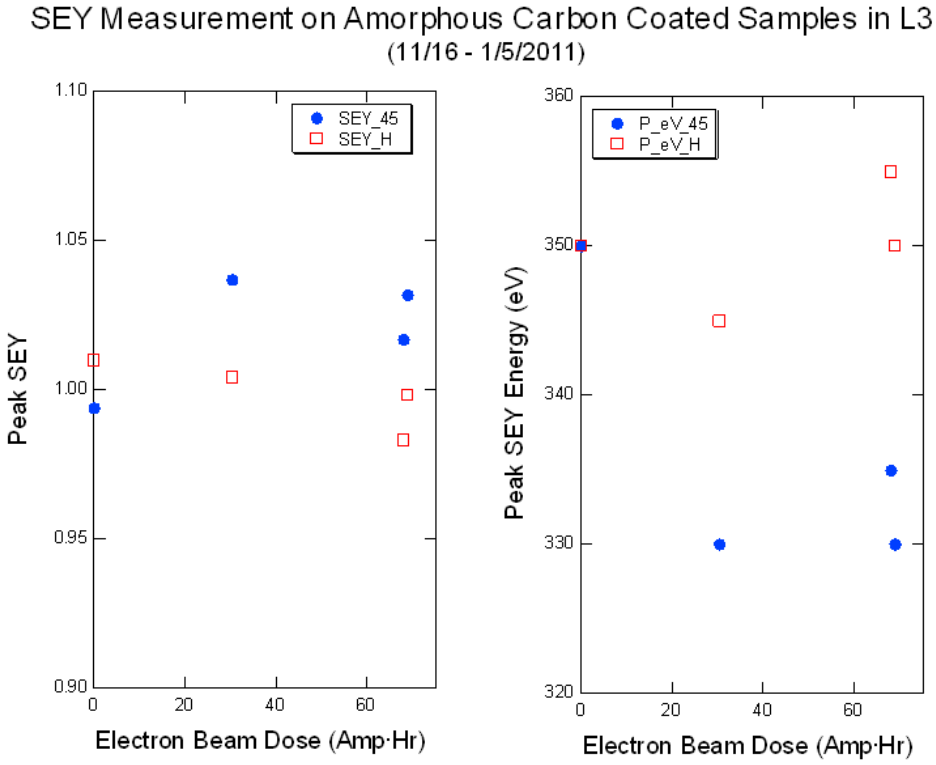
Al 6061-T6 Sample



In Situ SEY Measurements

- Amorphous Carbon samples (CERN)





At Emax. =370V the SEY incident angle dependence Is exp[0.49(1-cosθ)]

January 2011 Down

Mitigation	Drift	Quadrupole	Dipole	Wiggler	Institutions Providing Chambers
Al	✔	✔	✔		CU, SLAC
Cu	✔			✔	CU, KEK, LBNL, SLAC
TiN on Al	✔	✔	✔		CU, SLAC
TiN on Cu	✔			✔	CU, KEK, LBNL, SLAC
Amorphous C on Al	✔				CERN, CU
Diamond-like C on Al	1/2011				CU, KEK
NEG on SS	✔				CU
Solenoid Windings	✔				CU
Fins w/TiN on Al	✔				SLAC
Triangular Grooves on Cu				✔	CU, KEK, LBNL, SLAC
Triangular Grooves w/TiN on Al			✔		CU, SLAC
Triangular Grooves w/TiN on Cu				1/2011	CU, KEK, LBNL, SLAC
Clearing Electrode				✔	CU, KEK, LBNL, SLAC

Successfully deployed and tested

- TiN Wiggler moved to CESR arc to study in different photon environment
- In-situ SEY chamber removed
  - Measurement arm developed vacuum leak at brazed joint

Plans for April

- Reduced running time due to funding situation
  - Planning for
    - 2 approx. half-day setup periods
    - 10 half-day (12 hr) experimental shifts
    - Allow for 4 contingency shifts
  - Key thrusts
    - Understand feedback issue (identified in December run) affecting low emittance multi-bunch studies
    - Instrumentation
      - Upgraded positron xBSM with new 4ns bunch-spacing digitizer and improved preamplifier
    - EC Build-Up
      - Characterize newly deployed vacuum chambers
      - Higher current wiggler ramp studies
      - Bunch-spacing studies for EC-buildup
      - Time-resolved EC build-up measurements
    - Pursue questions that have arisen in study of EC instabilities and emittance growth

CESRTA Phase I Report

- Key 2011 deliverable is the CESRTA Phase I Report
  - ILC Global Design Effort and DOE Milestone
- Organizational Issues
  - In order to smoothly assemble such a large document, we will work in LaTeX
  - Document to be maintained in our SVN repository
  - Presently populating a page on the CESRTA Wiki with guidance/instructions for authors

https://wiki.lepp.cornell.edu/ilc/bin/view/Public/CesrTA/CesrTAPhaseIReport

- Target Schedule
  - Mid-April: Target for initial submissions
  - May 16, 2011: Edited document available for final collaboration review.
  - June 1, 2011: Final day for submitting comments.
  - We then plan to release the "preprint" to the ILC PMs during June
- Coordination of sections
  - Overall coordinators for each chapter
  - Section coordinators for each x.y section
  - Section coordinators will be contacting individuals for specific contributions ASAP