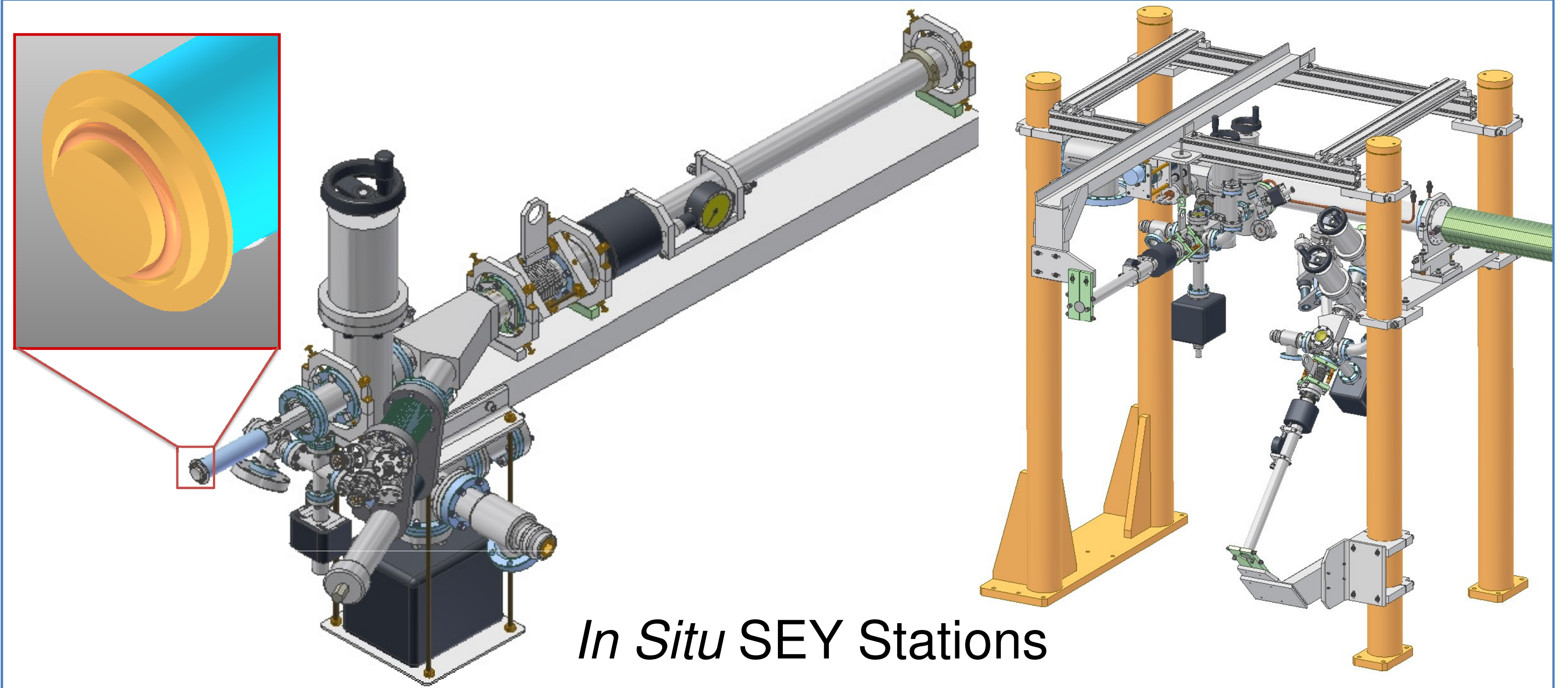


In Situ SEY Measurements at CEsrTA

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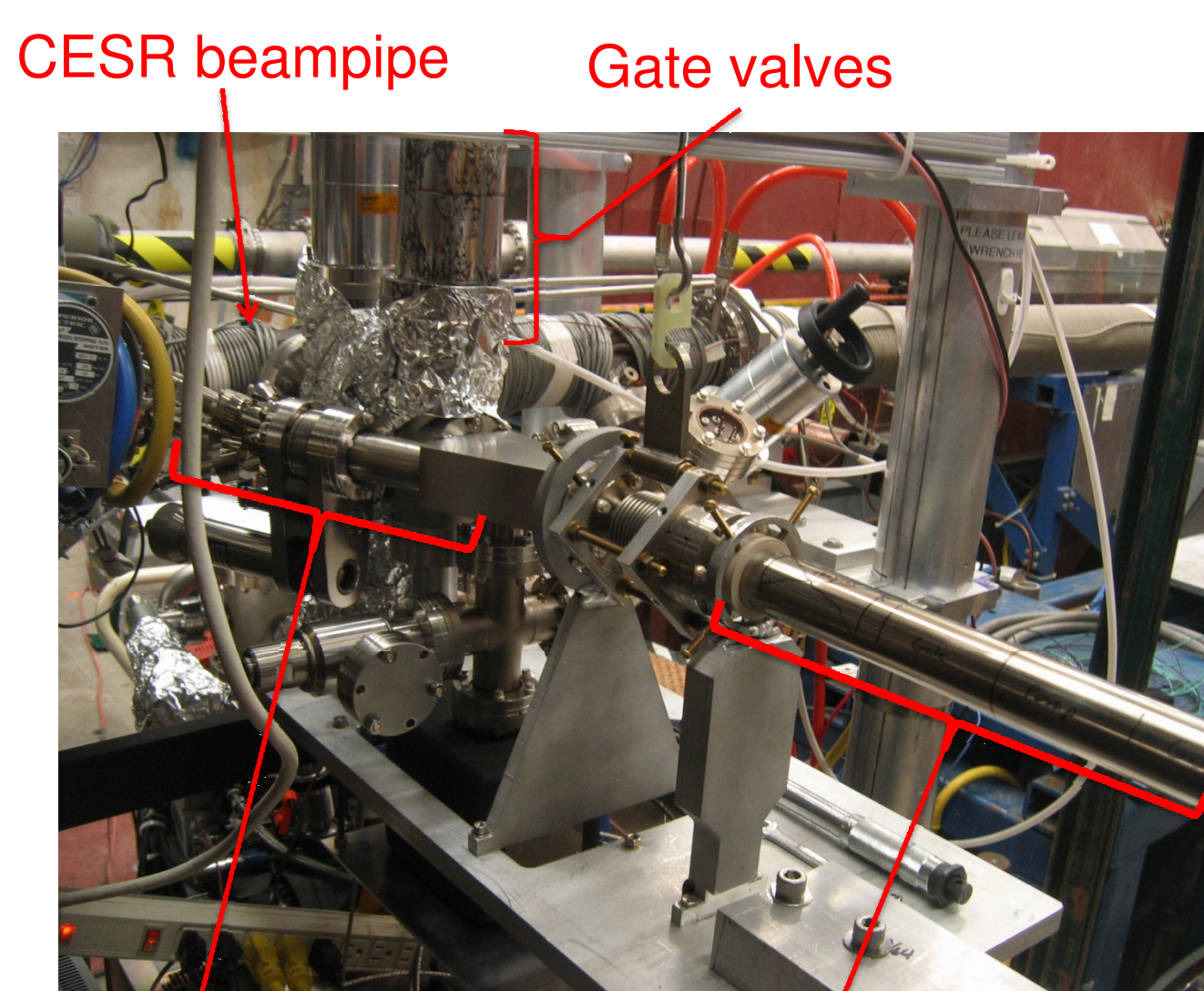
Introduction

Measuring secondary electron yields (SEYs) on technical surfaces in accelerator vacuum systems provides essential information for many accelerator R&D projects, such as the ILC Damping Rings, regarding to electron cloud growth and suppression. As a part of CEsrTA research program, we developed and deployed SEY in-situ measurement systems. Two such SEY systems were installed to expose samples with direct and scattered synchrotron radiation (SR), and the SEYs of the samples were measured as a function of SR dosages. In this poster, we describe the in-situ SEY measurement systems and the initial results on bare aluminum (6061-T6) and TiN-coated aluminum samples.



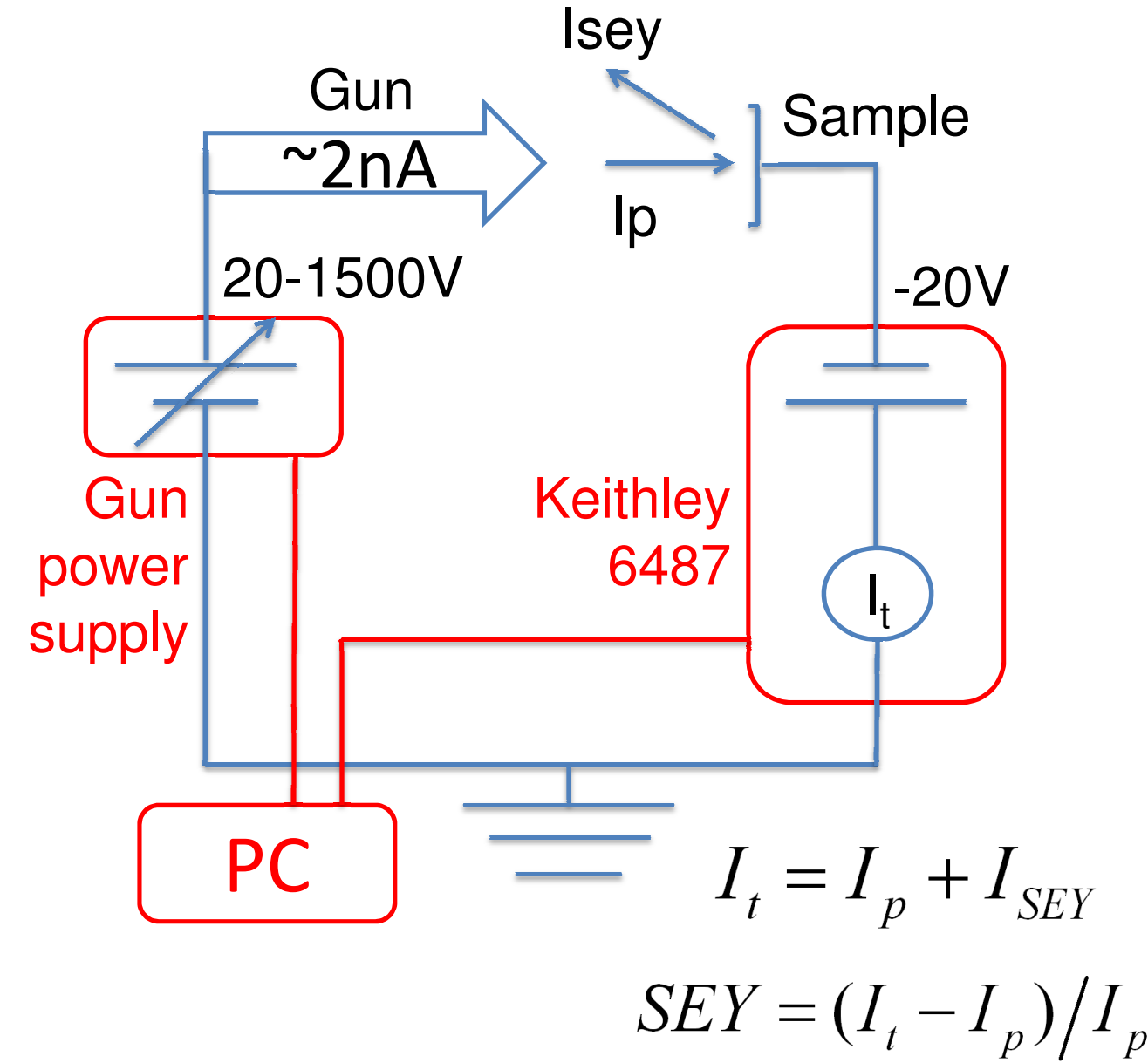
In Situ SEY Stations

Horizontal In Situ SEY Station in L3 of CEsrTA

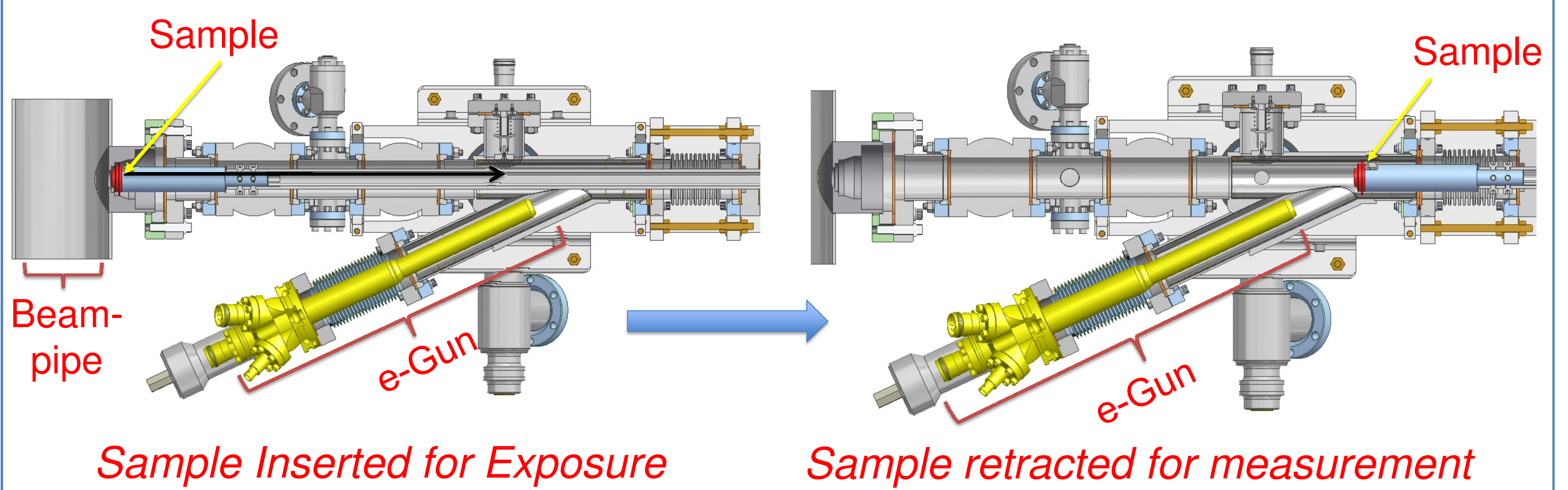


Electron gun (inside crotch) Magnetic manipulator (electrically insulated from crotch)

System Schematic



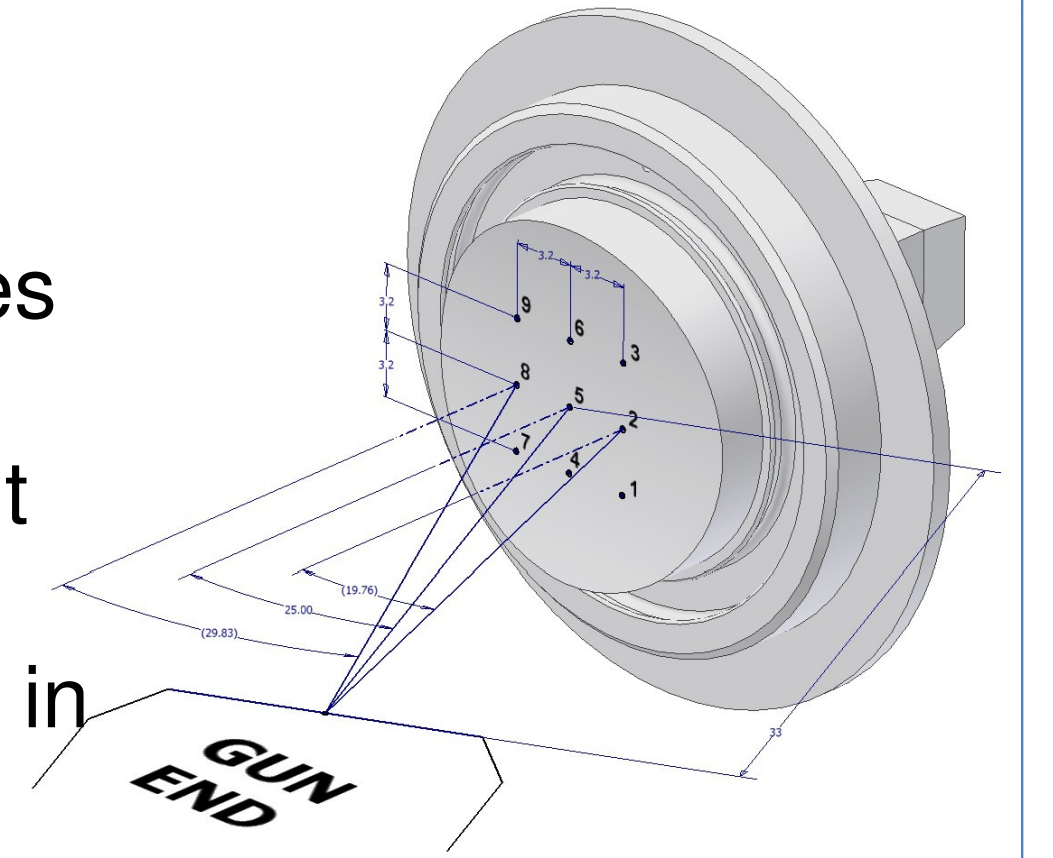
- Hardware components controlled remotely via LabVIEW software on PC
- Gun energy cycled from 20-1500eV with current $\sim 2nA$ and beam size $\sim 0.5mm$
- I_p is measured with 150V bias before and after I_t is measured
- I_t measured with -20V bias



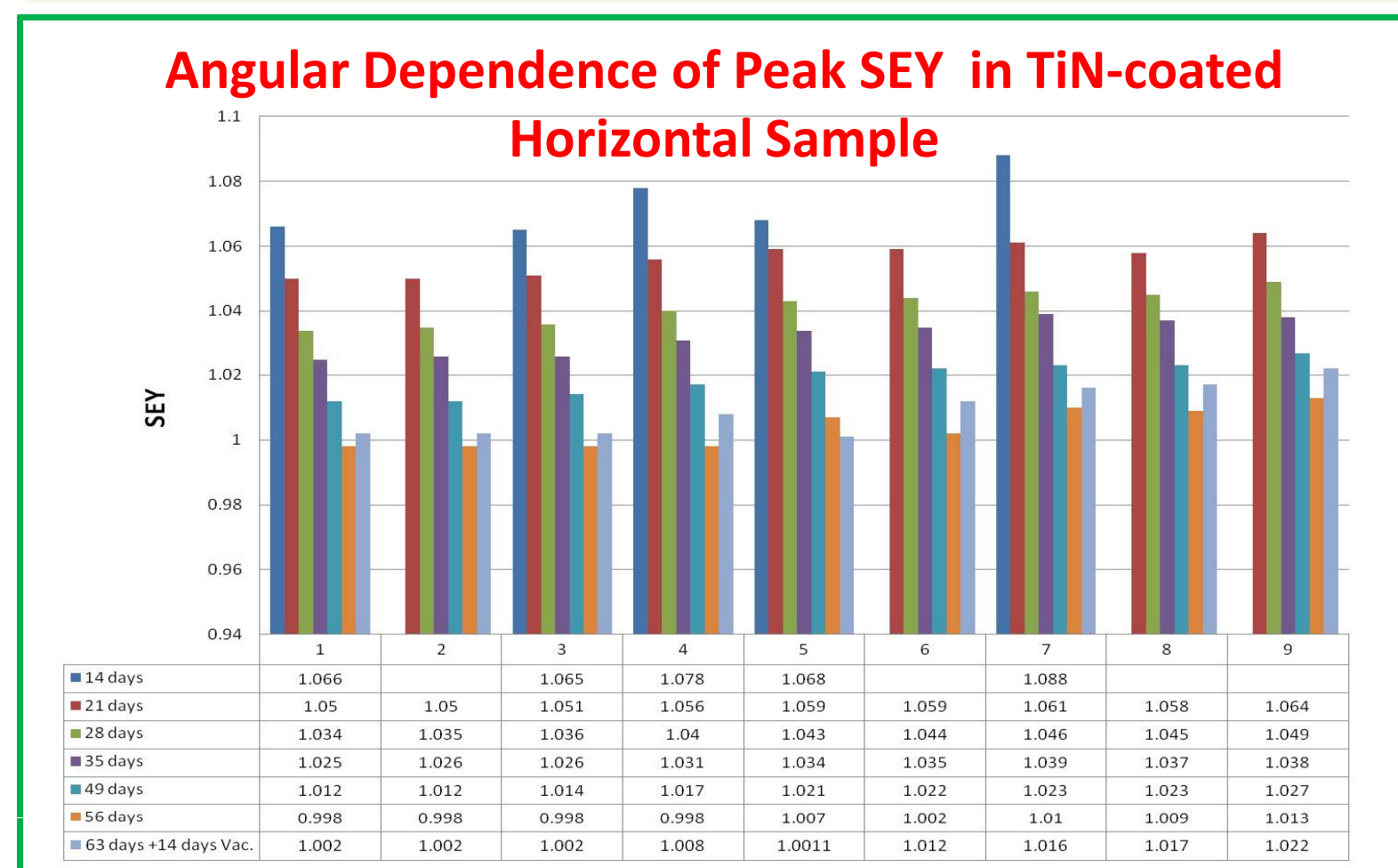
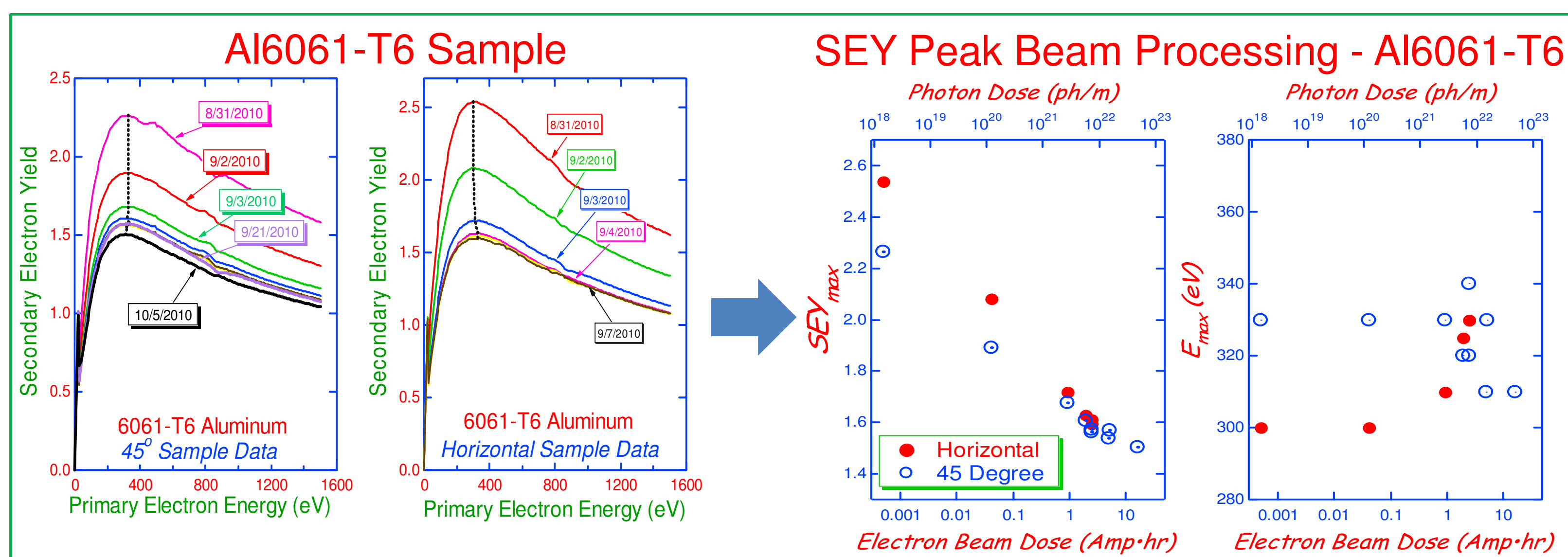
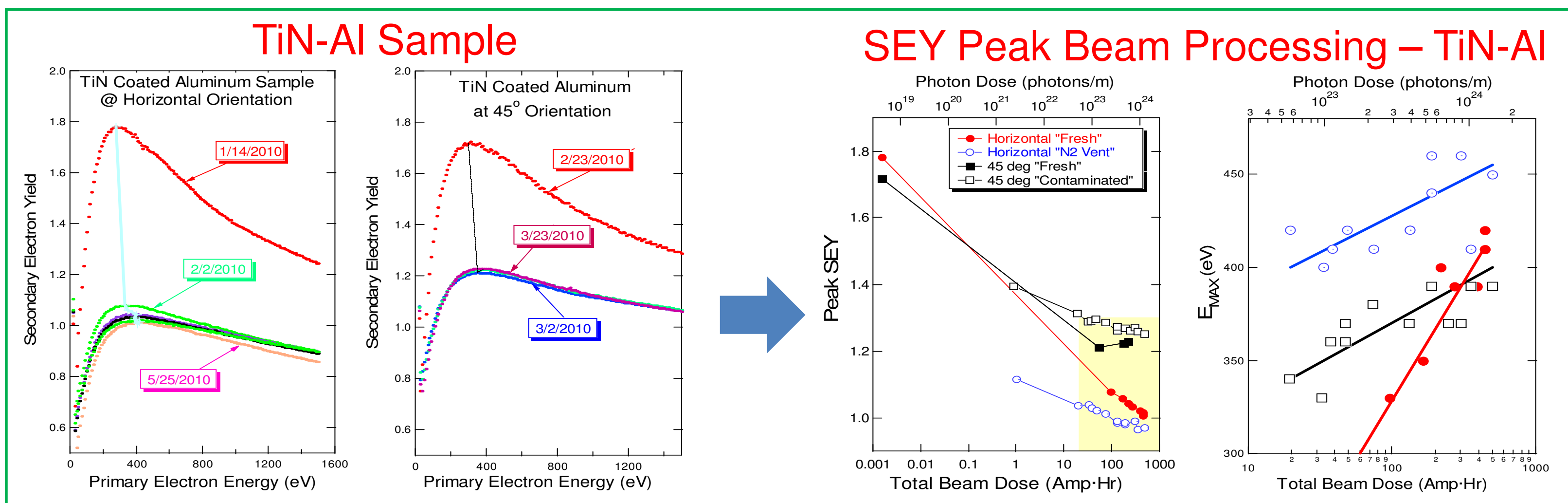
Sample Inserted for Exposure

Sample retracted for measurement

- 2 samples in beam pipe, one horizontal in the radiation strip, one at 45° beneath radiation strip.
- Samples are retracted periodically during accelerator accesses and their SEYs measured *in situ*.
- SEY at 9 grid points on sample measured (right), with incident angles 20° (pts. 1, 2, 3), 25° (pts. 4, 5, 6), & 30° (pts. 7, 8, 9).
- A typical measurement (~ 1.5 -hr) can be easily accomplished in a normal accelerator access, to minimize disruption to CESR operations.

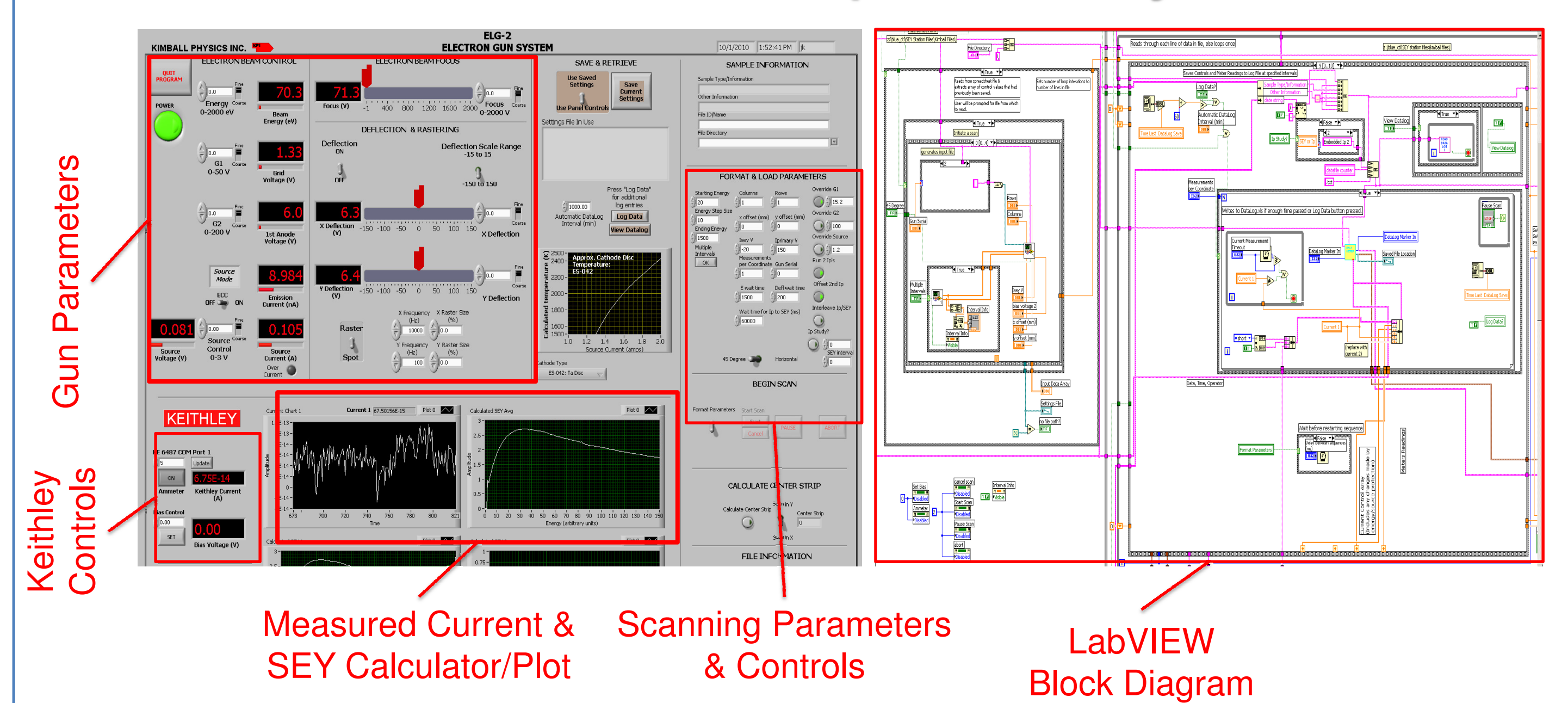


Initial Results – SEY vs. Beam Doses



- Data shows a steady ($\sim D^{-0.030}$) decrease in SEY peak with increased beam dosage (D) for both types of samples
- 45° system has a consistently higher SEY than the horizontal system for TiN-coated sample
- Measured SEY peak is dependent on incident angle (left figure).

Control & Data Acquisition System



- Hardware is controlled by LabVIEW GUI developed at Wilson Lab, incorporating existing Kimball Physics Electron Gun and Keithley 6487 Picoammeter software.
- Developed software includes:
 - Synchronizing gun power supply voltages and bias voltages
 - Automating electron beam energy scanning and raster scan subroutine while recording current from ammeter
 - Automating SEY calculation and plotting subroutine

Conclusions & Future Work

- Measured the SEYs from 6061 alloy are much lower than reported values from 6063 alloy. We plan to do comparison using our *in situ* systems
- Measure the SEY of a sample cut from an extruded aged (30+ years) 6063 aluminum CESR chamber
- Comparing SEY while suppressing E-cloud with solenoid magnetic field generated.
- Measuring *in situ* various coated samples (such as NEG thin film, amorphous/diamond-like carbon, etc) provided by collaborators
- Building and testing *in situ* SEY systems for the FNAL Main Injector

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