Shielded-Pickup Measurements in June and Update on Modeling Results

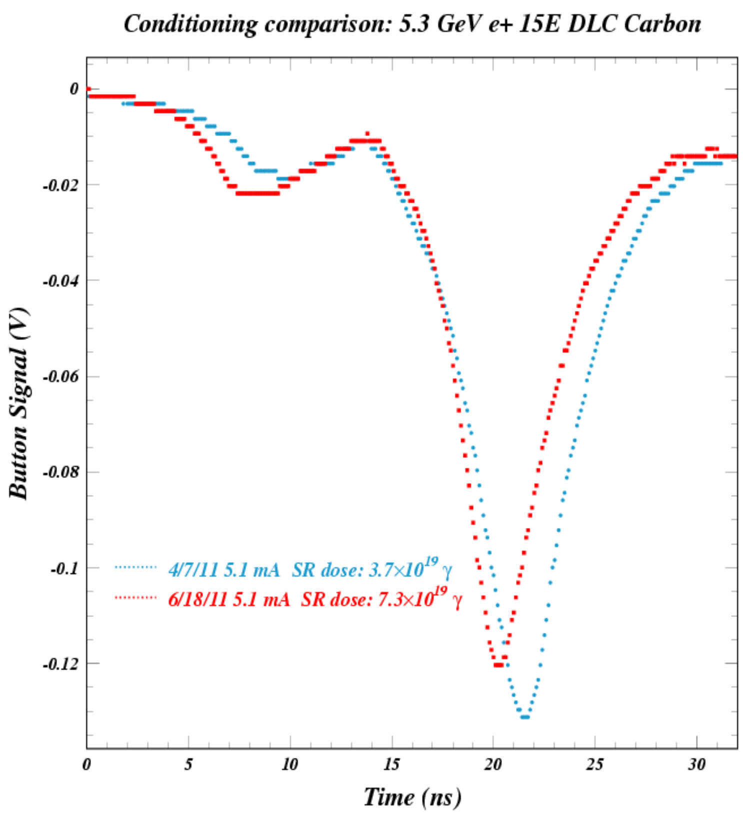
The TiN-coated vacuum chamber at 15W was installed in September, 2010.

The diamond-like-carbon-coated (DLC) chamber at 15E was installed in January, 2011.

Therefore, our standard data sets (solenoidal-field, witness-bunch, and bunch-current scans)

at 2.1 and 5.3 GeV in June provided primarily information on conditioning (the first such info for DLC).

We also took the first standard data sets at 4.0 GeV, as well as bias voltage scan data.



Preliminary assessment of conditioning effects in the diamond-like carbon-coated chamber based on modeling studies

The quantum efficiency for photoelectrons produced by reflected s.r. photons has increased slightly, and the photoelectron energy spectrum has a higher energy tail.

The secondary yield has decreased.

Vacuum Chamber Comparisons Under the Same Beam Conditions
5.3 GeV Positron Beam

Electron Cloud Modeling Results for
Time-Resolved Shielded Pickup Measurements at CesrTA
WEP142, PAC'11, 3/28-4/1/2011, New York City, NY
ECLOUD 2010, 9/8-12, Ithaca, NY

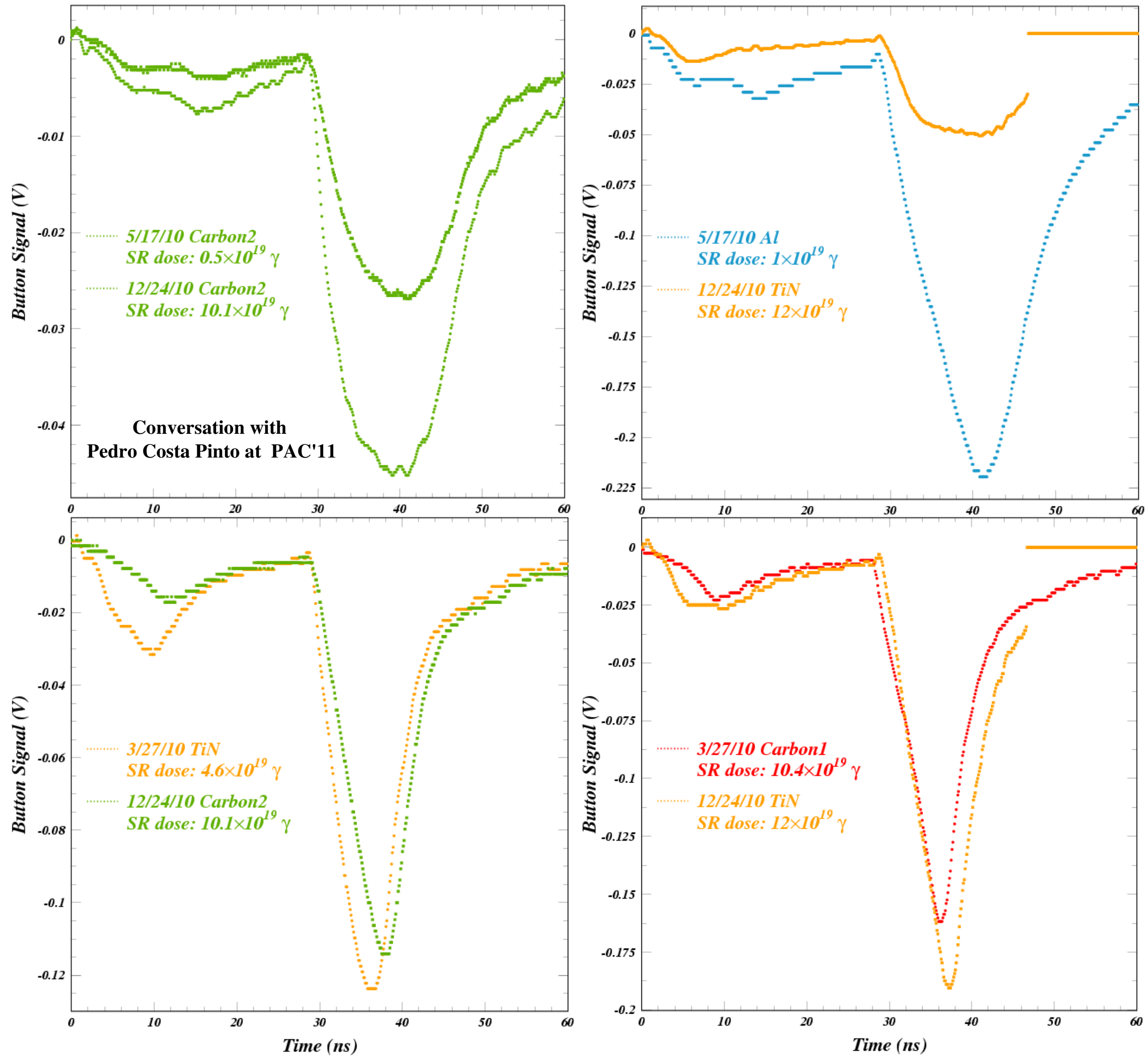
Vacuum chamber color code

Second amorphous carbon coating
Titanium-nitride
Uncoated aluminum
First amorphous carbon coating

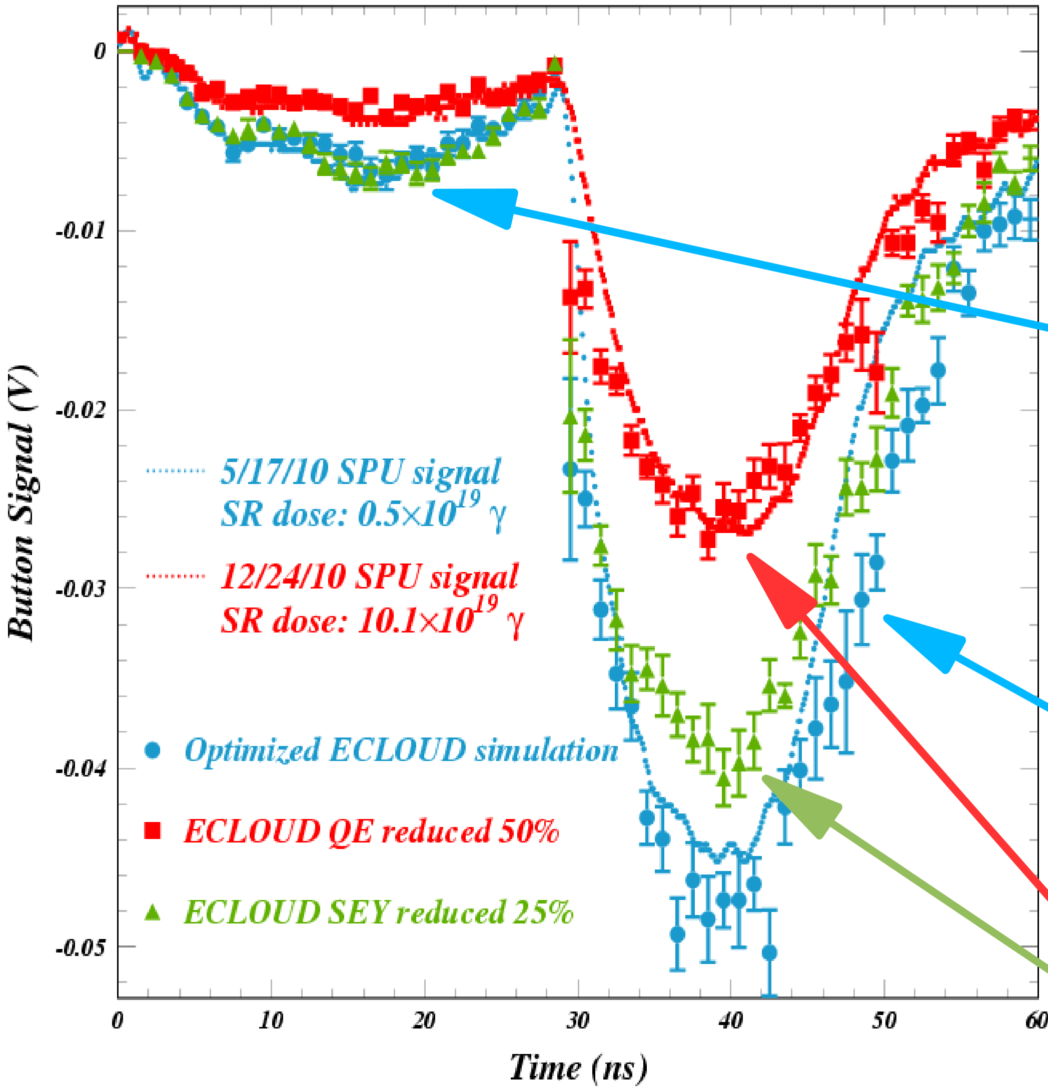
15E **15W**

3 mA/bunch

5 mA/bunch



Recent Developments in Modeling for Time-Resolved Measurements of Electron Cloud Buildup at CesrTA
WEPC135, IPAC'11, 9/26-30/2011, San Sebastian, Spain



Optimization of the modeled photoelectron energy distribution and quantum efficiencies for direct and reflected photons, of the secondary yield components, and of the energy distribution of secondary electrons provides a good description of the shielded-pickup signals measured on 5/17/2010.

The modeled SPU signal from the leading positron bunch is dominated by photoelectrons produced on the bottom of the vacuum chamber. Its size and shape result from the photoelectron production kinetic energies and the attractive beam kick, which combine to determine the arrival times of cloud particles contributing to the signal.

The modeled SPU signal from the witness bunch includes in addition the cloud electrons accelerated by the beam into the detector. Many of these are secondaries produced by photoelectrons from the leading bunch, so the witness bunch signal is sensitive to the secondary yield and production kinematics.

Consequently, the ratio of the leading and witness-bunch signals discriminates between photoelectron production and secondary electron production. In this case of the DLC coating conditioning effect, the measured signals are consistent with a 50% change in quantum efficiency and inconsistent with a 25% change in secondary yield.

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5.3 GeV Positron Beam

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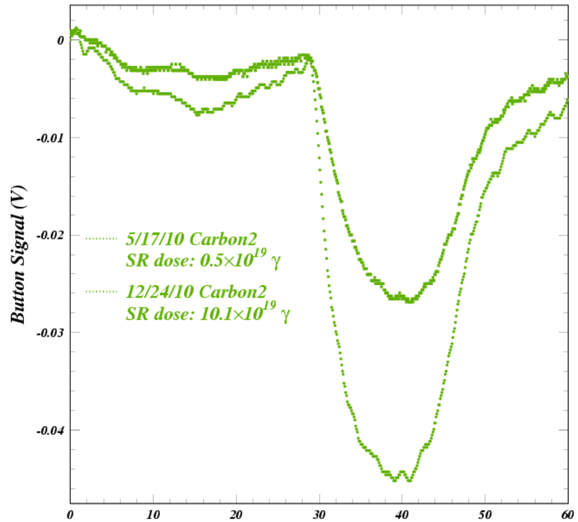
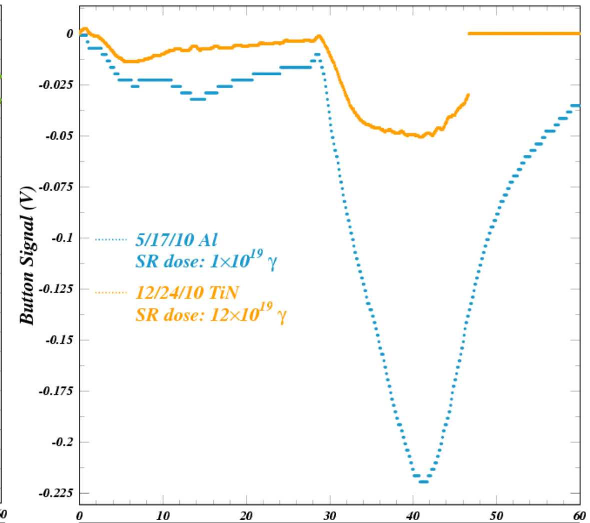
15E | 15W

3 mA/bunch

The second carbon-coated chamber shows conditioning effects between 5/17 and 12/24, a period during which the s.r. dose increased by a factor of 20. The effect is primarily on the quantum efficiency.

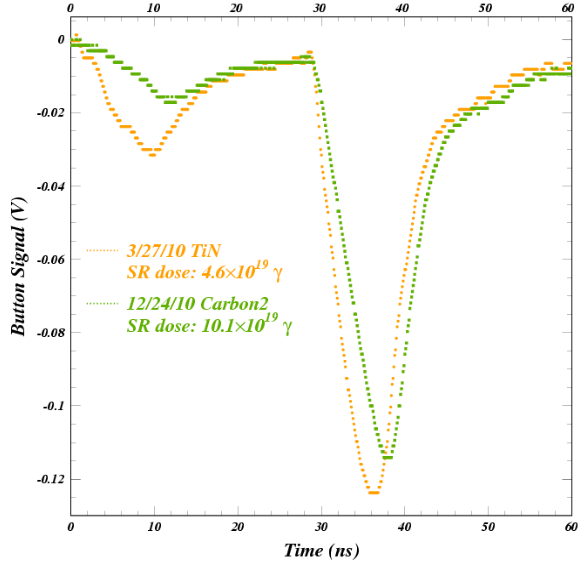


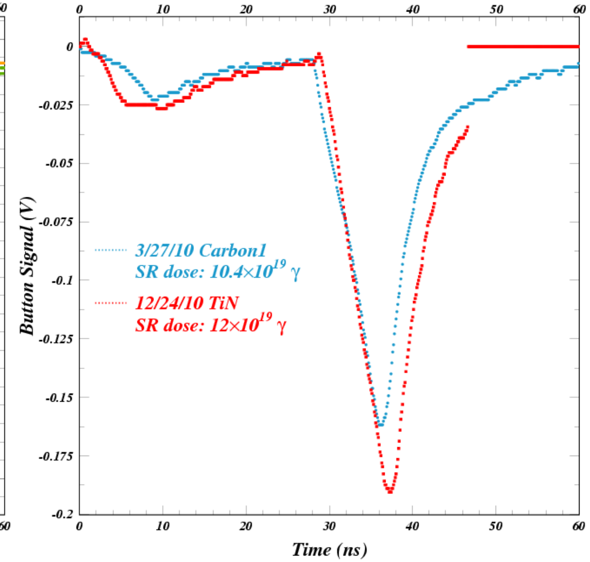


The quantum efficiency for reflected photons and the SEY are both smaller for conditioned TiN compared to relatively unconditioned Al.

5 mA/bunch

The results for the second carbon-coated chamber corroborate the suppression of high-energy photoelectrons relative to TiN observed with the first carbon chamber under different beam conditions.





The carbon coating suppresses high-energy photoelectrons compared to the TiN coating. The SEY for the carbon coating is somewhat lower for a similar conditioning dose.