

Shielded Button Measurement/ECLOUD Simulation Comparison for 5.3 GeV Beams at 15E/W

All material for this talk may be obtained at www.lepp.cornell.edu/~critten/cesrta/ecloud/1sep10

The measurements of 5/17/2010 are described here: https://webdb.lepp.cornell.edu/elog/CTA+MS/629 See also previous talks on simulations for the shielded button data on 4/21, 4/28, 5/12, 7/7, 7/14, 8/4//2010

Context

The talk on 4 Aug 2010 showed using the 3/16 data how the shielded button signals at 15E are sensitive to the photon energy spectrum and reflectivity for 5.3 GeV e+ and e- beams.

Now we investigate using the 5/17 data how the signals at 15W differ. Since the photon energies and rates at 15W are similar for the opposite-sign beam, we should be able to use the photoelectron energy spectra derived for the 15E data.

Also, by comparing the magnitudes of the e+ and e- signals, we can determine if the reflectivity depends on the direction or species of the beam.

Caveat: The v.c. at 15E was TiN-coated on 3/16. On 5/17, 15E was carbon-coated and 15W was uncoated Al.

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Recall <u>Addendum 2</u> to talk on 7/14/2010 Updated ECLOUD simulation for 3/16 data at 15E

15E (TiN) Shielded Button Measurements (3/16/2010, 5.3 GeV, 8 mA bunch)



The parameterizations of the photoelectron energy distributions have been adapted to reproduce the signal shapes.

Values for the reflectivity of 20% and 33% for the e+ and e- beams respectively provide reasonable estimates of the relative e+ and e- shielded button signal magnitudes.



Electron Beam Photon Rates and Spectrum at 15E/W



The 3 kG dipole is upstream (downstream) of the shielded button detector at 15E (15W). The 2 kG dipole is downstream (upstream) of the shielded button detector at 15E (15W). So the photon energy spectrum is harder for the electron beam at 15E than it is at 15W.



Positron Beam Photon Rates and Spectrum at 15E/W



The 3 kG dipole is downstream (upstream) of the shielded button detector at 15E (15W). The 2 kG dipole is uptream (downstream) of the shielded button detector at 15E (15W). So the photon energy spectrum is harder for the positron beam at 15W than it is at 15E.



ECLOUD simulation for 3/16 e+/e- 3mA/bunch data at 15E



Simulation for e+ 3 mA/bunch shows need for more high energy photoelectrons for the e+ beam. This need was not clear for the 8 mA/bunch data.



Shielded Button Measurements of 5/17/2010 for e+ and e- beams with 3 mA/bunch



The scale of the 8-bit digitizer was determined by the much larger second peak in these two-bunch measurements.

A priori one might have expected the e- signal to turn on more slowly at 15W because the photons come from a weaker B field. This is not obvious in the signals. For the same reason, one might have expected the e+ signal to arrive earlier at 15W. This is also not obvious. Need full simulations to check a priori prejudice was right. Also, the ratio of the direct sr rate for e-/e+ is 3 at 15E and 0.5 at 15W. At 15E we got the right signal ratio by setting the reflectivity to 33% for e- and 20% for e+. The full simulation will show what reflectivity values we need for 15W. I don't really know if we expect the reflectivity to be the opposite or the same at 15E and 15W. I September 2010 Shielded Button Measurement/ECLOUD Simulation Comparison for 5.3 GeV Beams at 15E/W / J.A.Crittenden 6/6



The work continues ...

