Cornell University
Laboratory for Elementary-Particle Physics

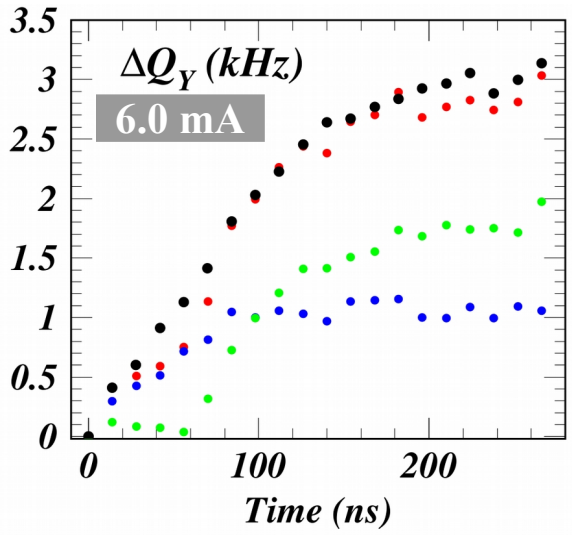
Breakthrough in ECLOUD Model for Photo-electron Production

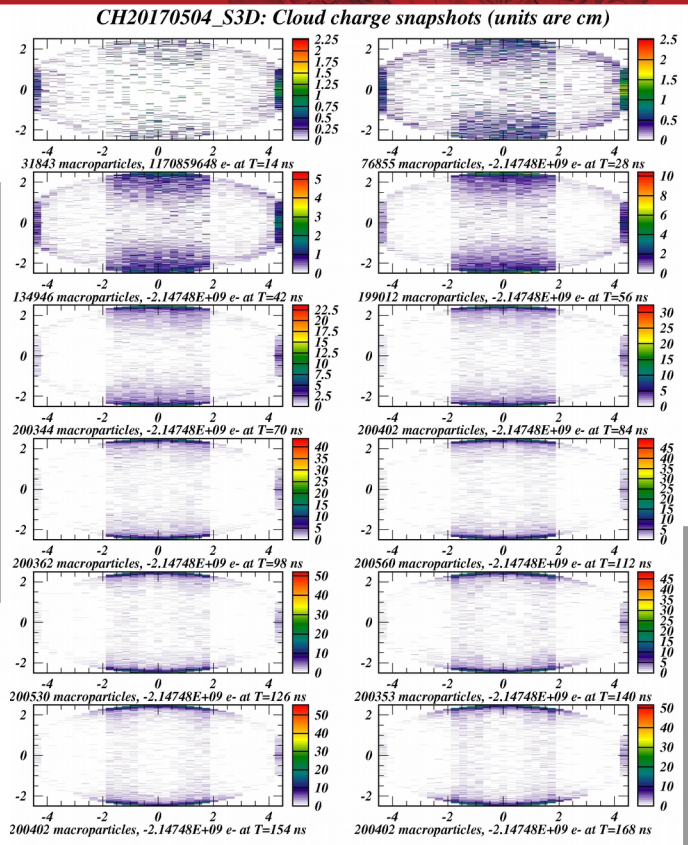
Jim Crittenden for Sean Buechele and Stephen Poprocki

Electron Cloud/Impedance Meeting

2 August 2017

Narrative I





	Nominal	5 GeV, alimit
epeak	310	317
seys	1.54	1.50
rediffused	0.24	0.38
deltamax	1.88	1.65
qesides	0.10	0.049
qeout		
qein		
qetop	0.10	0.24
highedir	0.0	0.20
peakhedir	80	79
semax	1.8	1.80
tpar3	0.7	0.69
alimit	0.015	0.16

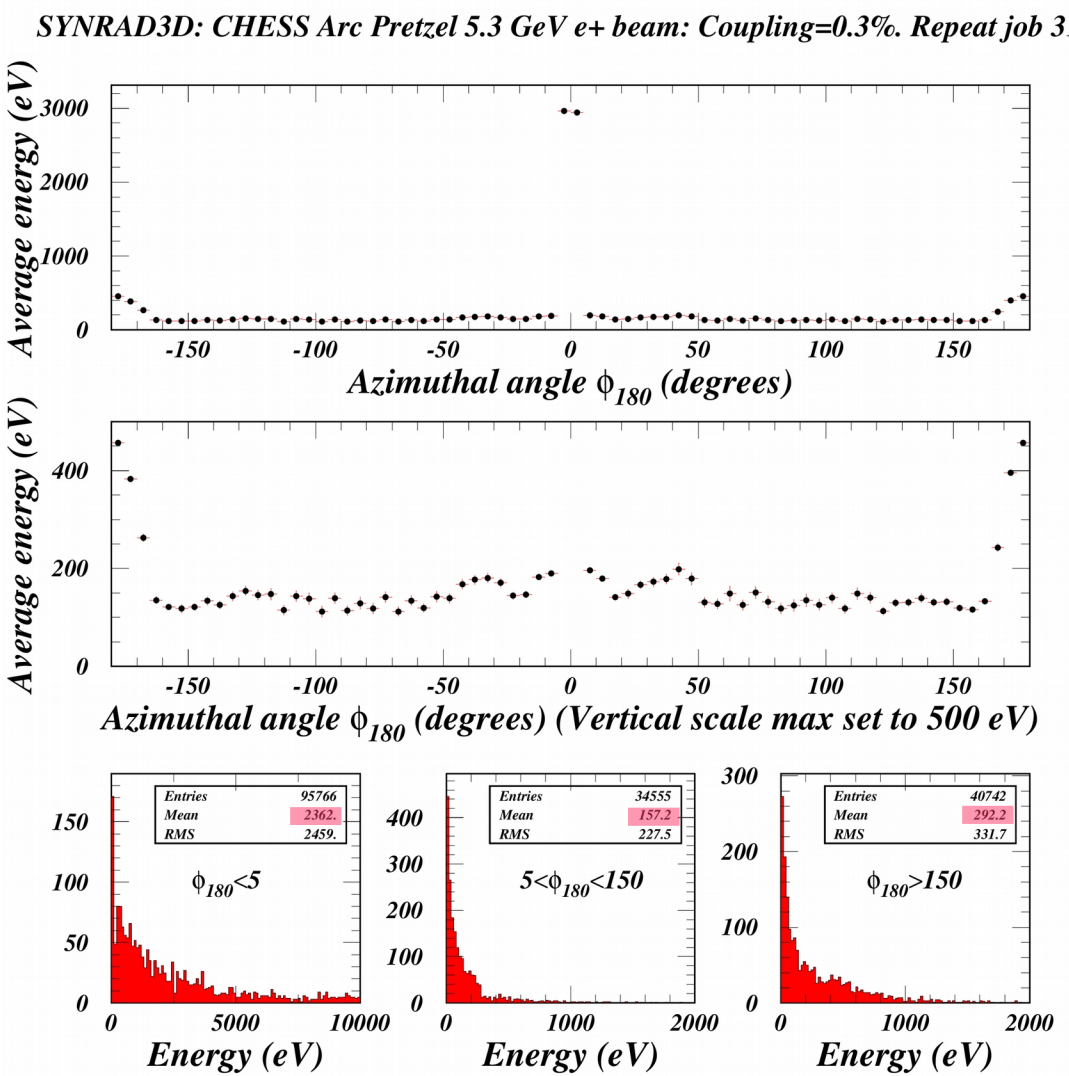
The ECLOUD input parameter ALIMIT determines the phi boundaries of $QE_{top/bottom}$, QE_{inside} and $QE_{outside}$

The increase of ALIMIT from 0.015 to 0.16 restricts $QE_{top/bottom}$ to a narrow region.

The new QE values differ by a factor of 5!

1) Mike Billing asks at the July 19th why the modeled tune shifts in dipoles show such a turn-on after bunch 6 when measurements of other cloud quantities show no such behavior.
2) JAC hammers on SWB to produce pre-bunch cloud snapshots. They look odd.
3) SWB determines via modeling studies that STP's new QE(phi) are the reason.

Narrative II



4) JAC shows that Synrad3D distributions of E_{photon} vs phi show three distinct regions. The band on the inside wall of the vacuum chamber is much wider than that on the outside wall.

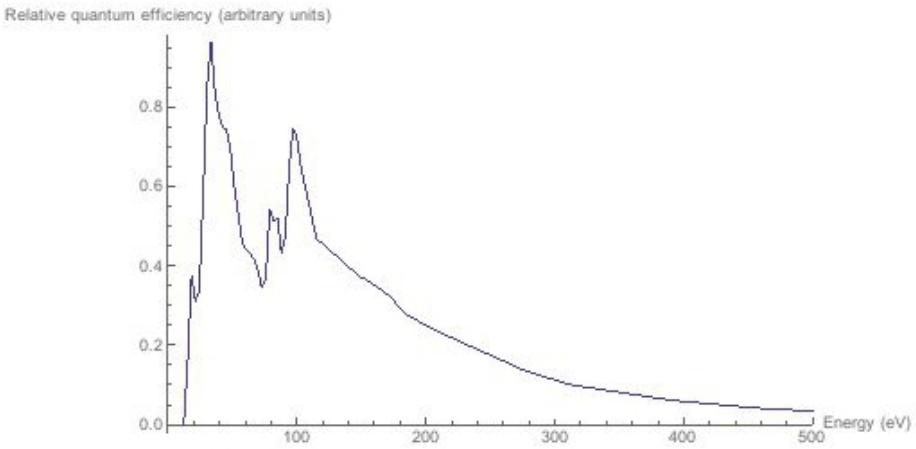
5) SWB generalizes ECLOUD to allow a third interval size for the regions of azimuth for QE.

6) STP re-runs the optimizer, finds QE values consistent with measurement of QE versus photon energy.

We are using tune shift measurements to measure the dependence of QE on photon energy!

Available measurements of QE versus photon energy

```
Plot[qe45[e], {e, 0, emax45}, AxesOrigin → {0, 0}, PlotRange → {{0, 500}, All},
 AxesLabel → {"Energy (eV)", "Relative quantum efficiency (arbitrary units)"}]
```

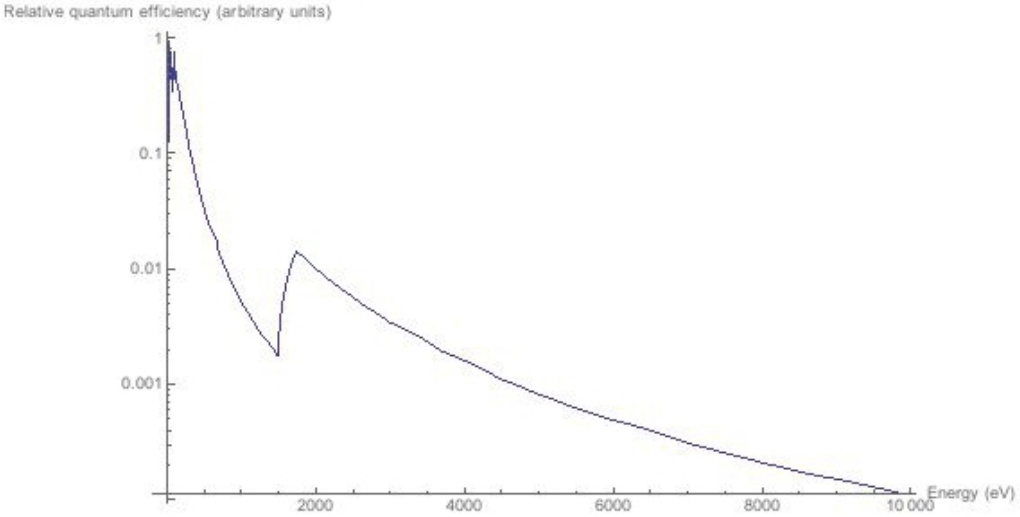


Phase I report (CERN/Cimino) and Laura Boon dissertation (not shown)

STP new optimization with SWB angular regions shows QE similar to those expected from they Synrad3D energy distributions.

QE differ by a factor of 12!

```
LogPlot[qe45[e], {e, 0, emax45}, PlotRange → All, AxesLabel → {"Energy (eV)", "Relative quantum efficiency (
```



	5 GeV, QEin, weights	
epeak	312	
seys	1.40	
rediffused	0.36	
deltamax	1.56	
qesides		
qeout	0.016	2362 eV
qein	0.063	292 eV
qetop	0.19	157 eV
highedir		
peakhedir		
semax		
tpar3		
alimit		