Cornell University
Laboratory for Elementary-Particle Physics

Discovery and Fix of an Error in the Spatial Distribution of Secondary Electrons in the ECLOUD Quadrupole Simulations

Followup to talks of 9 and 16 Dec 2009 and 3 Mar 2010

See also the ILC DR Working Group Meeting of 10 Mar 2010

All material for this talk, including full sets of the analysis plots, may be obtained at www.lepp.cornell.edu/~critten/cesrta/ecloud/17mar10

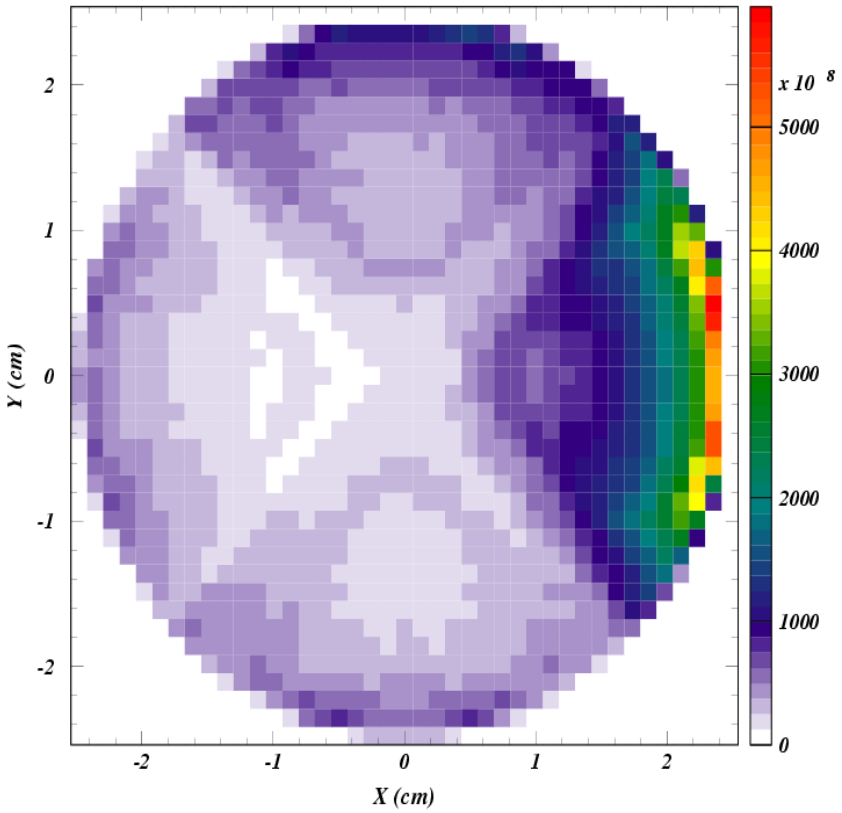
Jim Crittenden

Cornell Laboratory for Accelerator-Based Sciences and Education

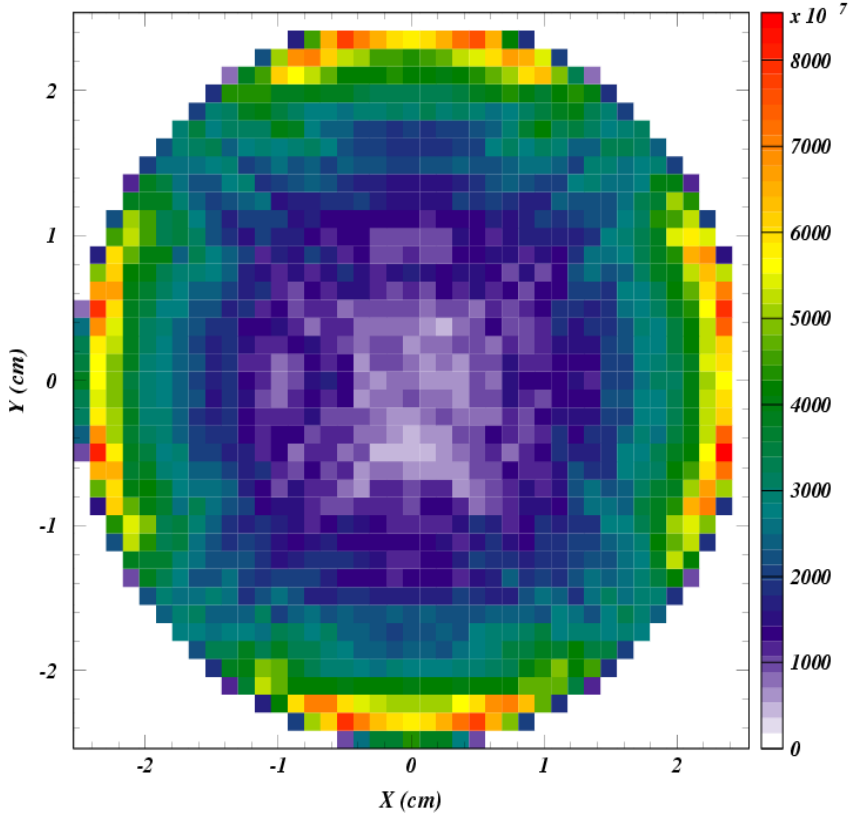
Electron Cloud Meeting

17 March 2010

Before fix



After fix

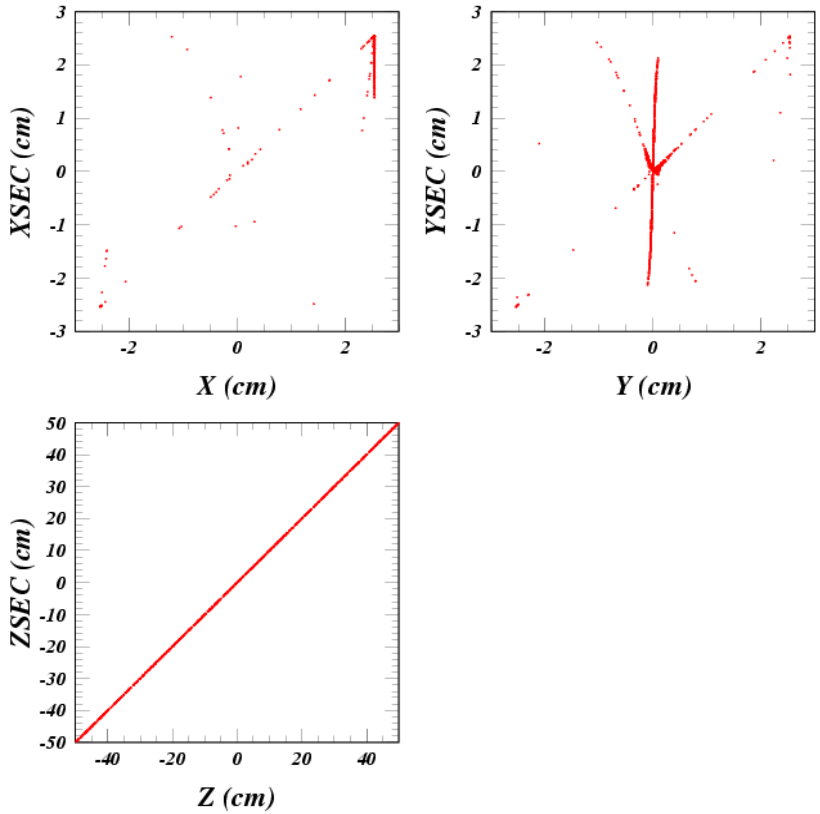


A branch on quadrupole case in the routine for generating secondary electrons erroneously backwards-extrapolated macroparticles outside the v.c. back to the wrong place on the wall.

Compare locations of incident and generated secondary macroparticles

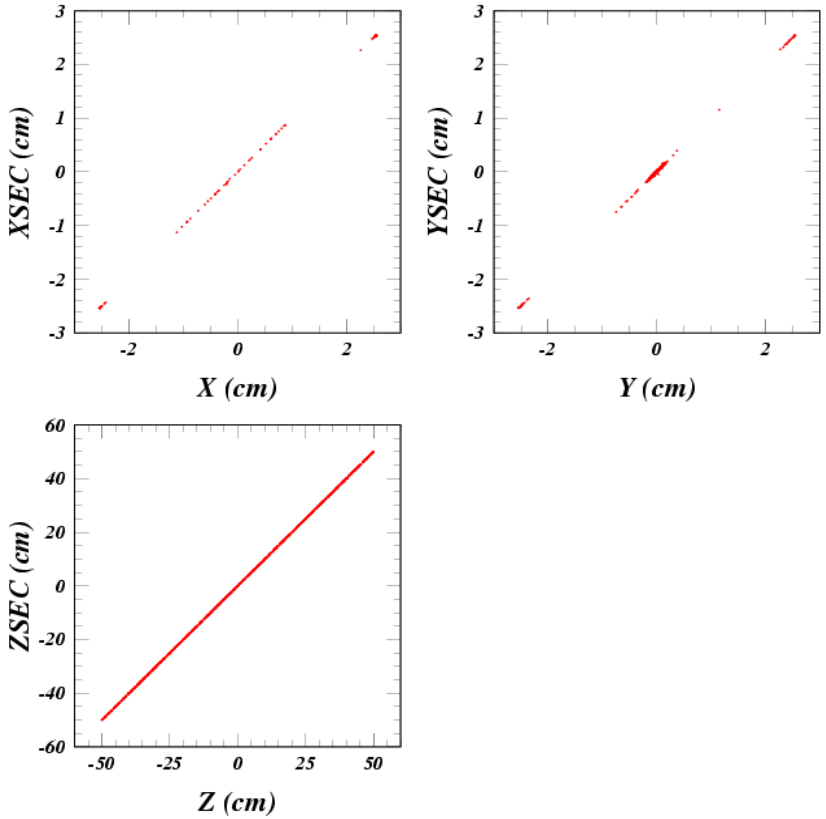
Before fix

Job 14759: Incident and Secondary Locations



After fix

Job 14806: Incident and Secondary Locations

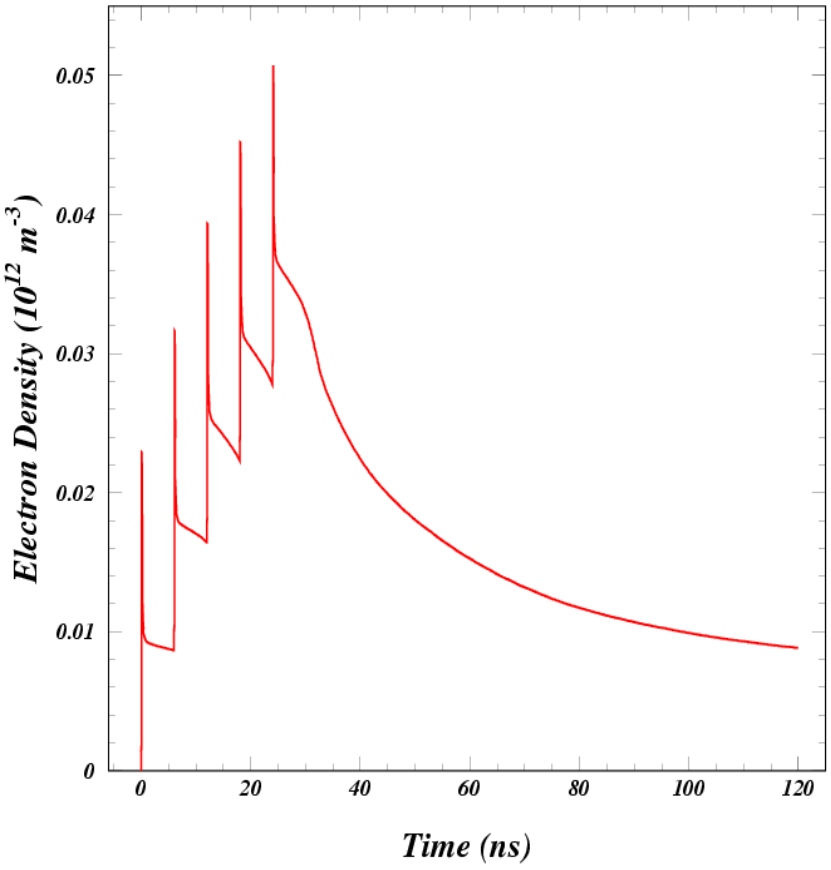


Algebraic mistakes were made.

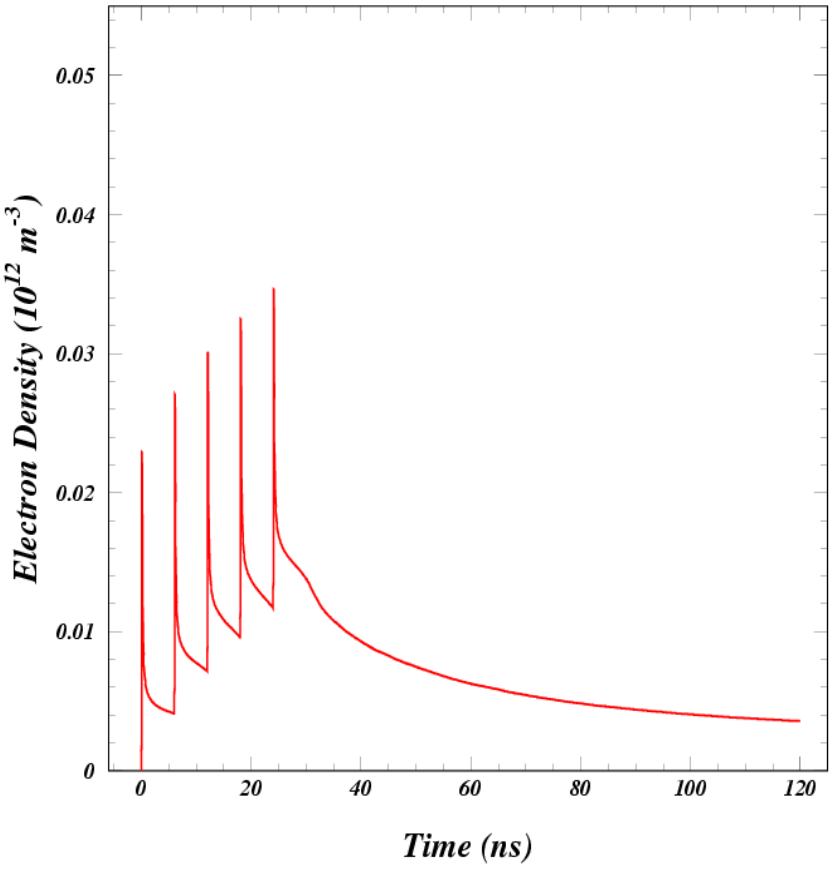
I had replaced the code for the dipole case with my own calculation. Now I apply it for all cases.

Beam-pipe-averaged Cloud Density

Before fix



After fix

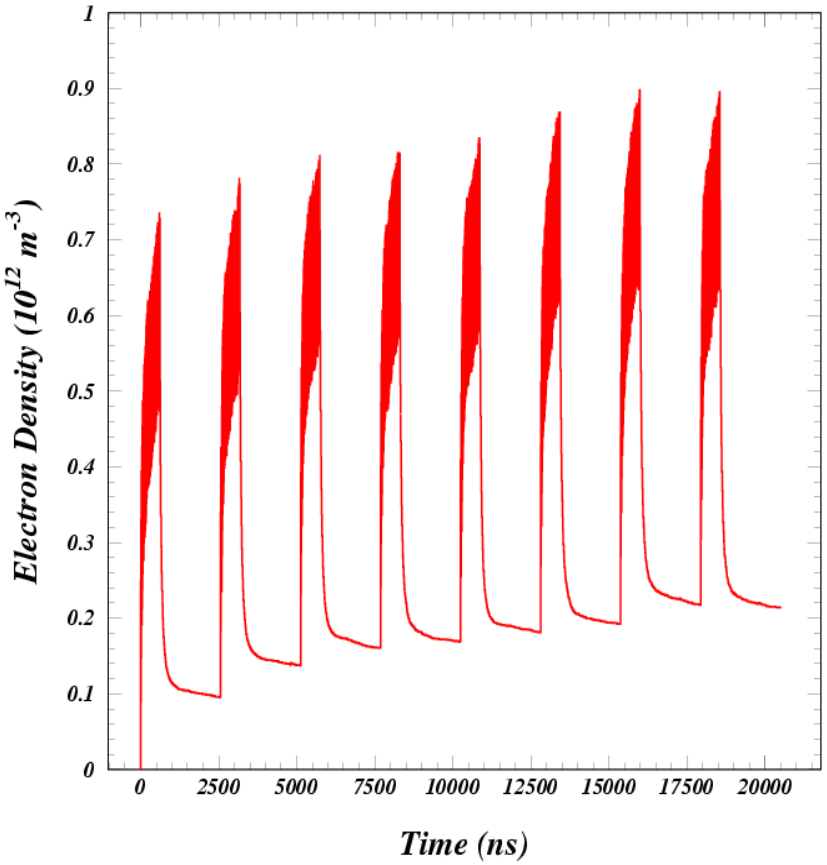


Complete updated results will be presented at the ILC DR working group meeting 23 Mar 10.

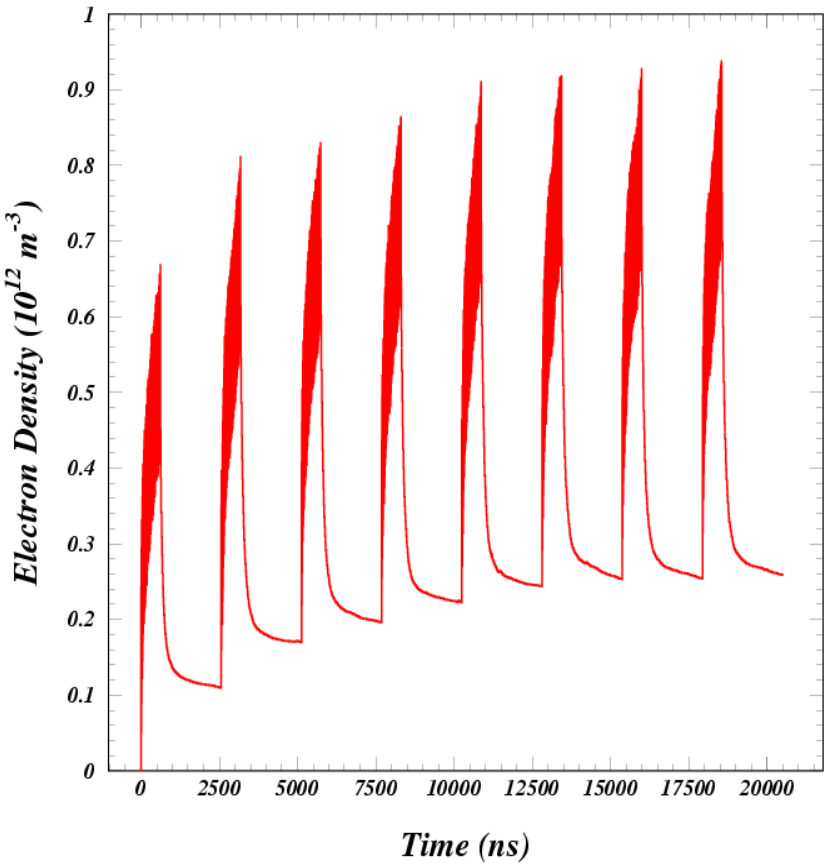
Consequences for the CesrTA quadrupole simulations

Beam-pipe-averaged Cloud Density

Before bug fix



After bug fix



The difference in the cloud snapshots and profiles was much less obvious than in the ILC DR case.

Consequences for the CesrTA quadrupole simulations

Tune shifts from field gradients at the center of the v.c. over 8 turns

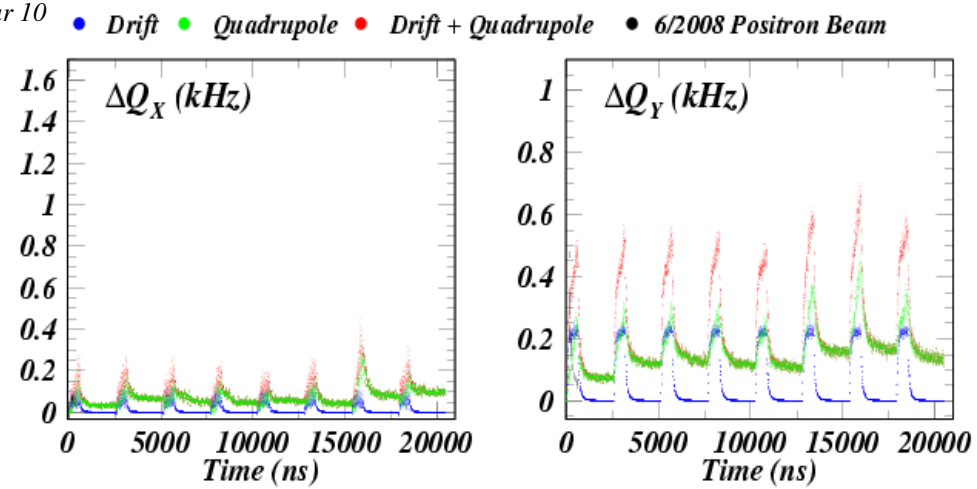
Conditions of June, 2008 tune shift measurements & simulations

Compare to slides 4&5 of the talk on 3 Mar 10

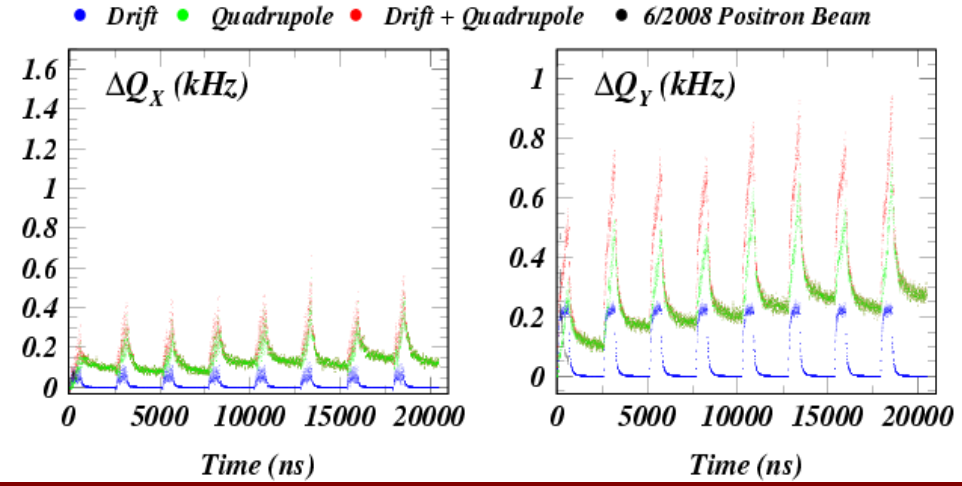
Fig 2. of PAC2009 FR5RFP044

5.3 GeV, e+ 0.75 mA/bunch

Before fix



After fix



The tune shifts are greater by about 50%.

Fluctuations somewhat reduced, allowing a preliminary conclusion that saturation is not yet reached.

More work on statistics is needed.