



Cornell University
Laboratory for Elementary-Particle Physics



Quadrupole Shielded-Pickup Data

Initial Results from ECLLOUD Modeling for 10- and 20-Bunch Trains in Q48W 5.3 GeV 8 mA/bunch

Chris Shill, Jim Crittenden & John Sikora

Cornell Laboratory for Accelerator-Based Sciences and Education

Electron Cloud Meeting

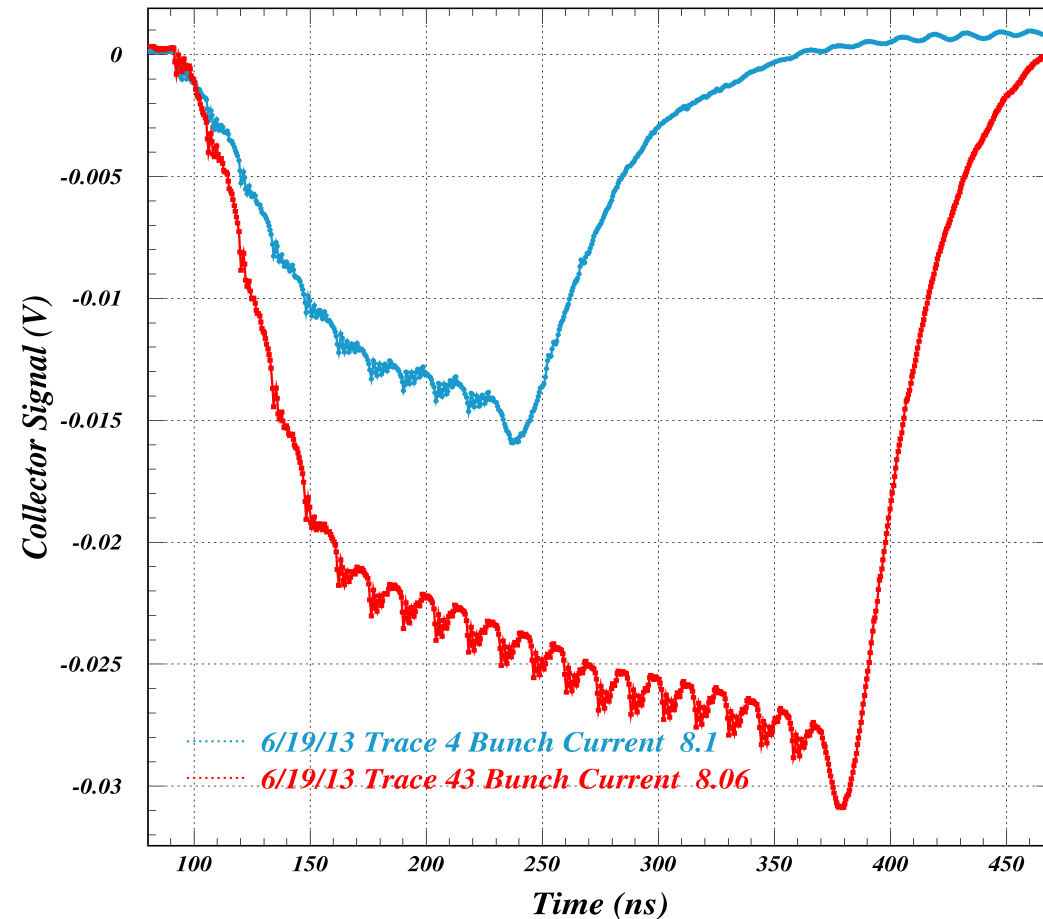
7 August 2013





10- and 20-Bunch Data

QSPU in Q48W: 5.3 GeV e+ 8.1 mA/bunch

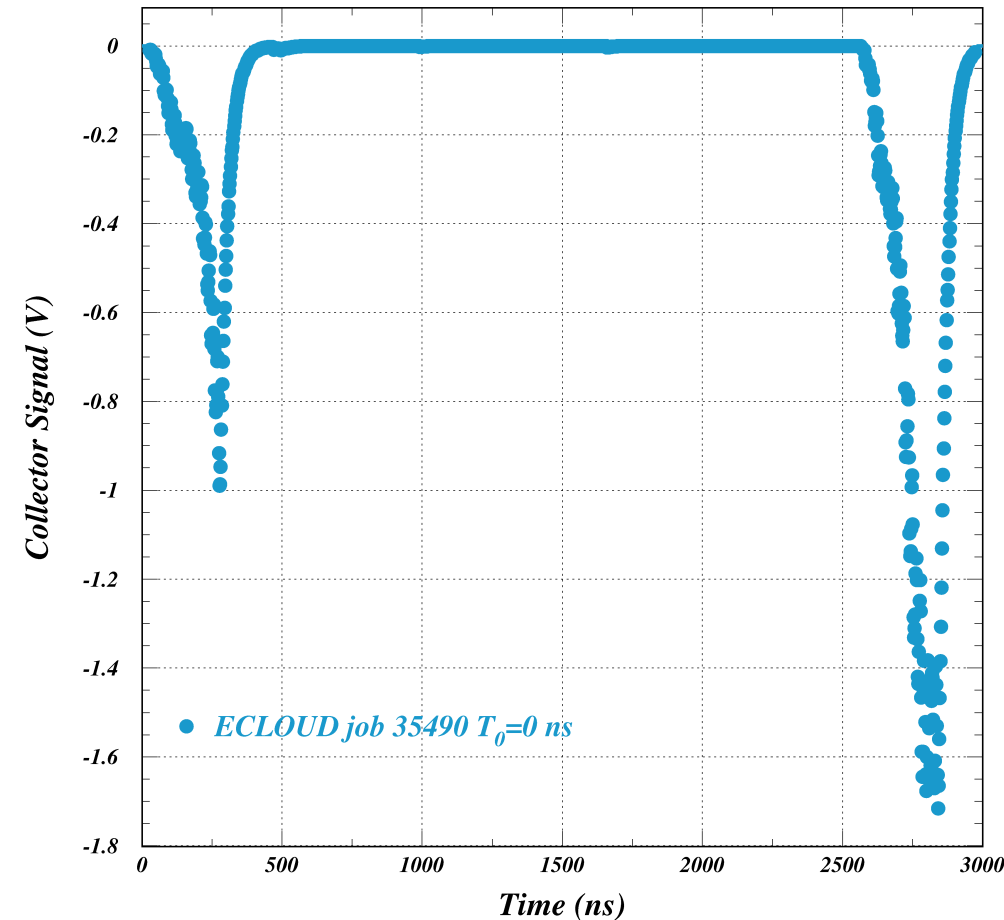


Evidence of trapping and a “charge reservoir” is seen in the data.

Does the model predict the trapping phenomenon?



QSPU in Q48W: : 0 GeV σπεησπ 0 mA/bunch

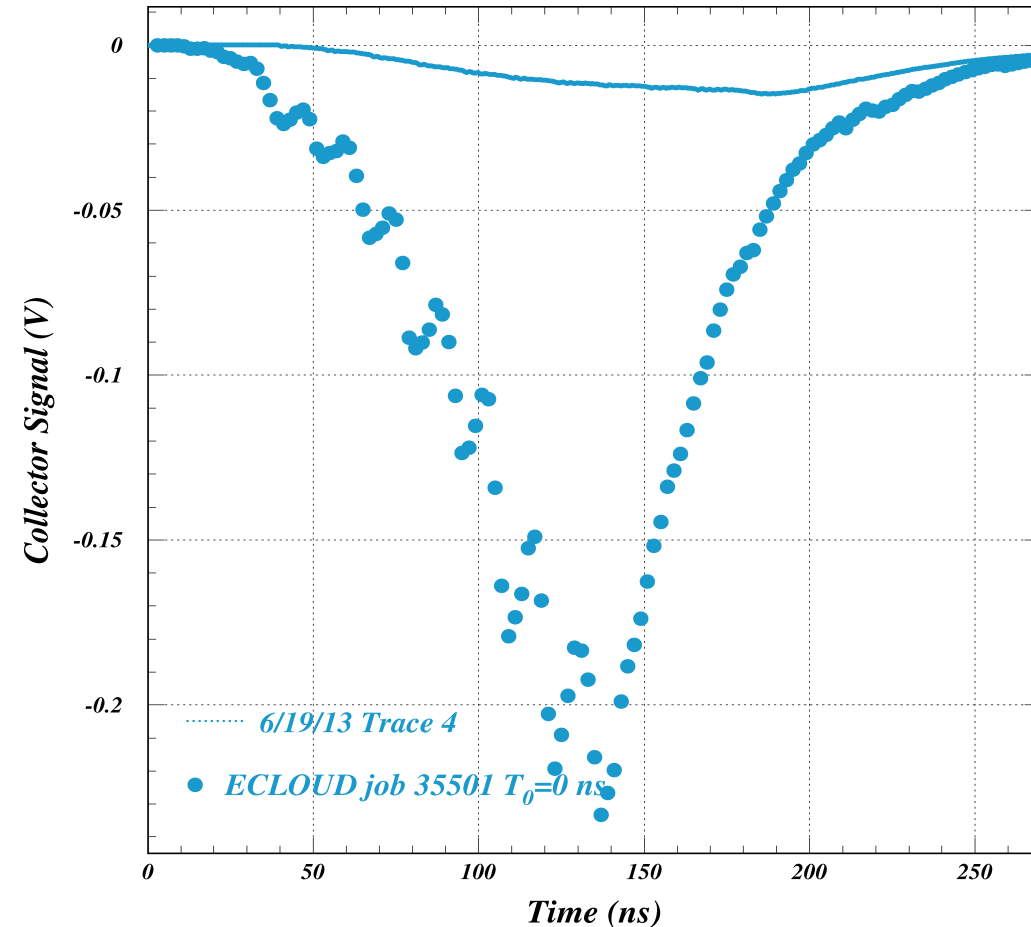


Model is 80% larger in the second turn.

This is a result of EC trapping in the model.



QSPU in Q48W: : 5.3 GeV e^+ 8.1 mA/bunch



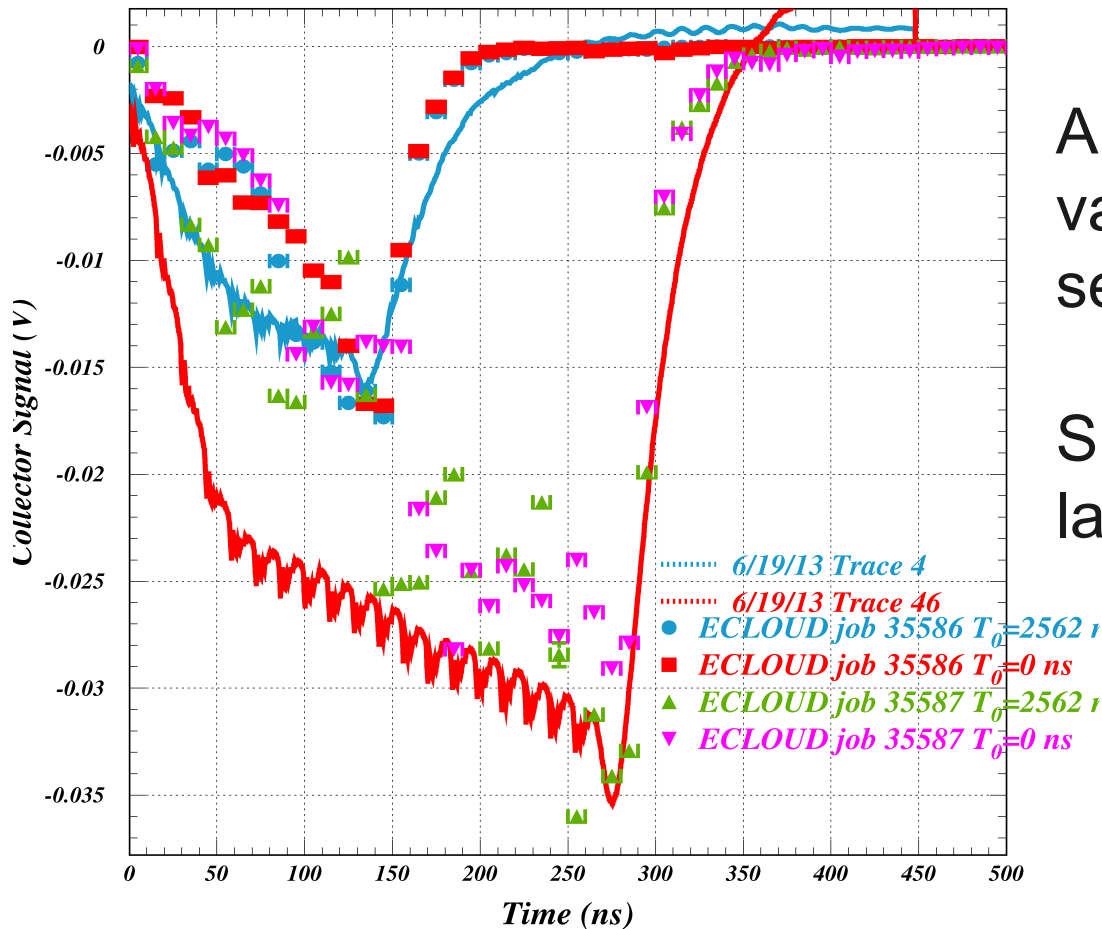
Model is much too large.

Need to account for an altered acceptance due to quadrupole field.



Altering *SEY* Value

QSPU in Q48W: : 5.3 GeV e+ 8.1 mA/bunch

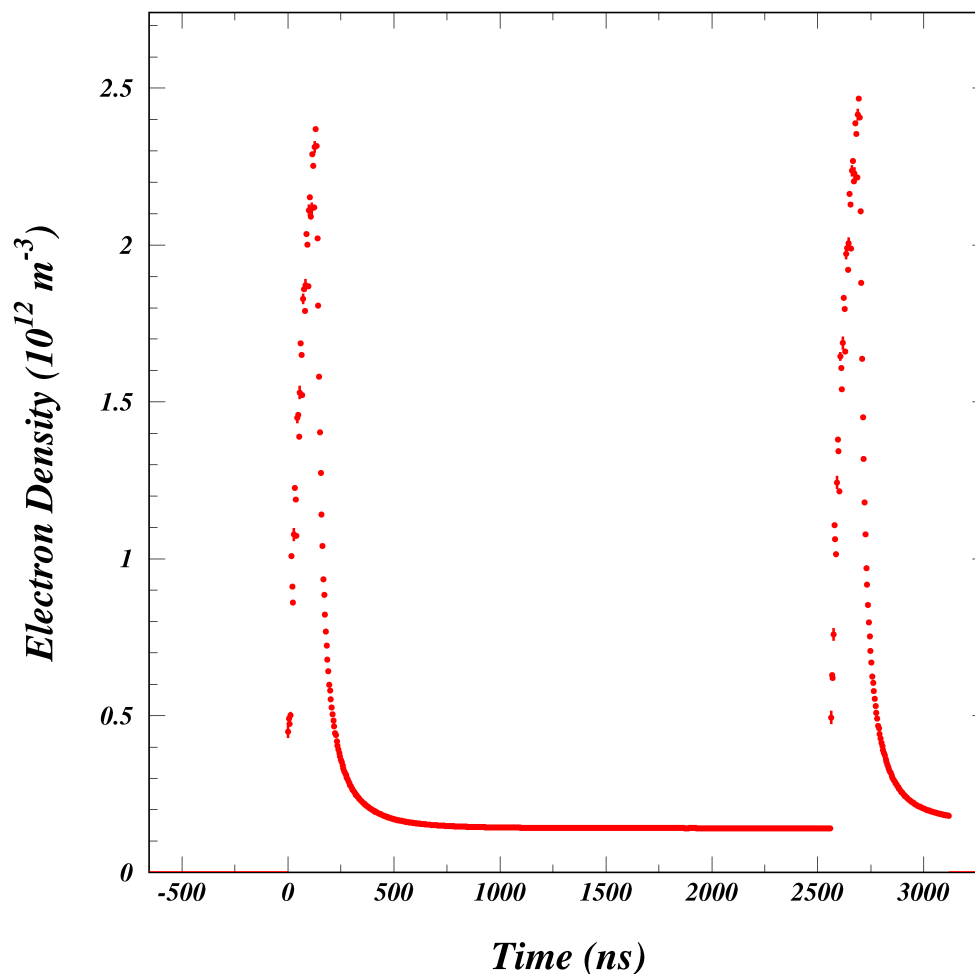


Altering the re-diffused SEY value from 0.7 to 0.2 severely reduces model size.

Small changes in SEY have large impacts on the model.



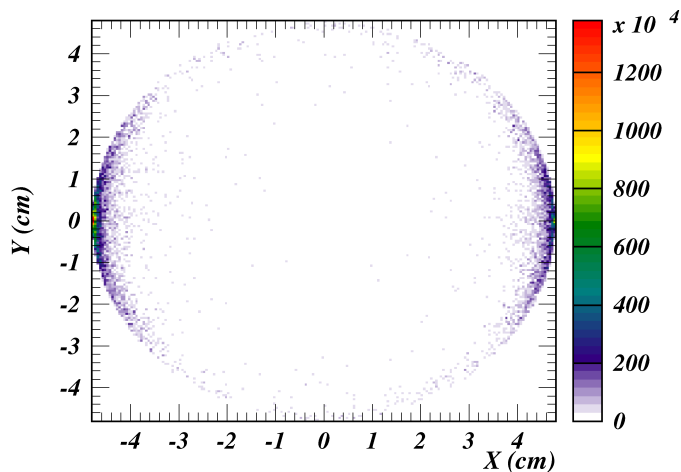
Job 35610: Beampipe-averaged Cloud Density (10^{12} m^{-3})





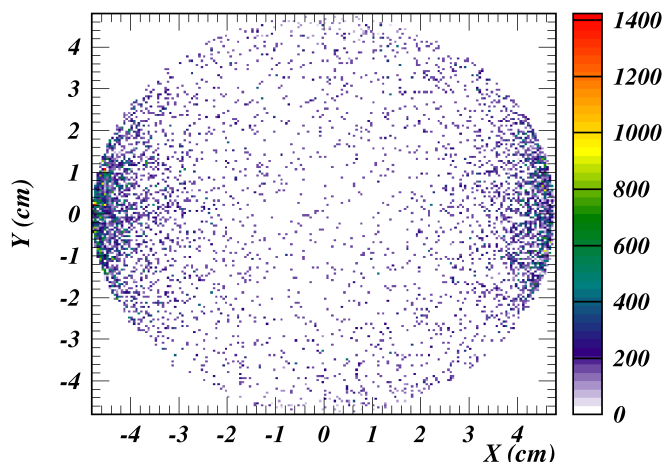
Prior to Turn 1 Bunch 2

Cloud charge snapshot after bunch 1 at time = 14 ns



No E_e selection

No energy cut: 54160 macroparticles, $3.13895 \times 10^9 e^-$



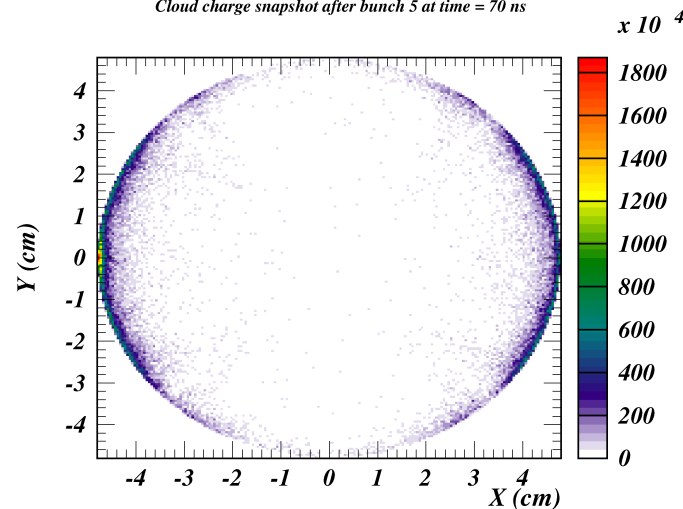
$E_{kin} > 10$ eV: 6710 macroparticles, $889138176 e^-$

$E_e > 10$ eV

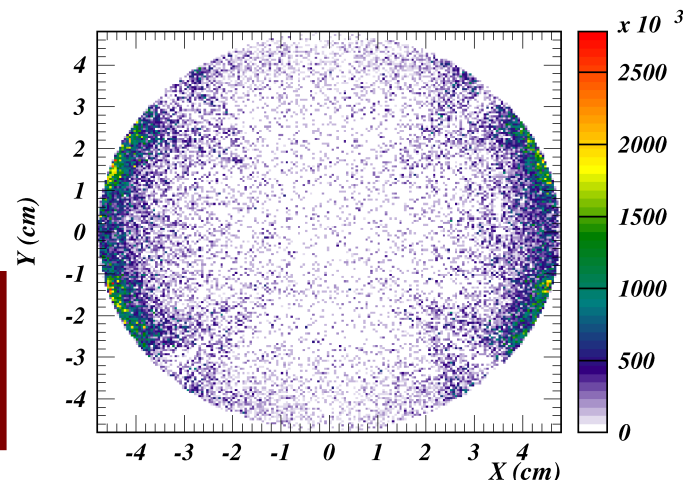
Escape zones appear
Buildup on inner and
outer surfaces

Prior to Turn 1 Bunch 6

Cloud charge snapshot after bunch 5 at time = 70 ns



No energy cut: 189394 macroparticles, $1.00406 \times 10^{10} e^-$

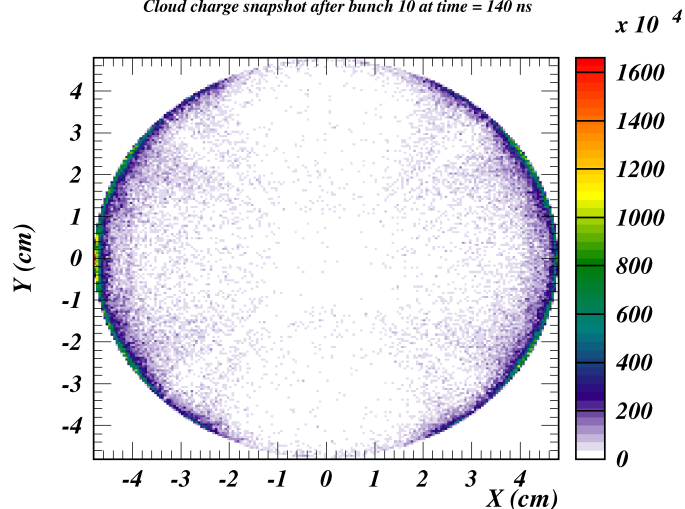


$E_{kin} > 10$ eV: 48634 macroparticles, $4.18799 \times 10^9 e^-$

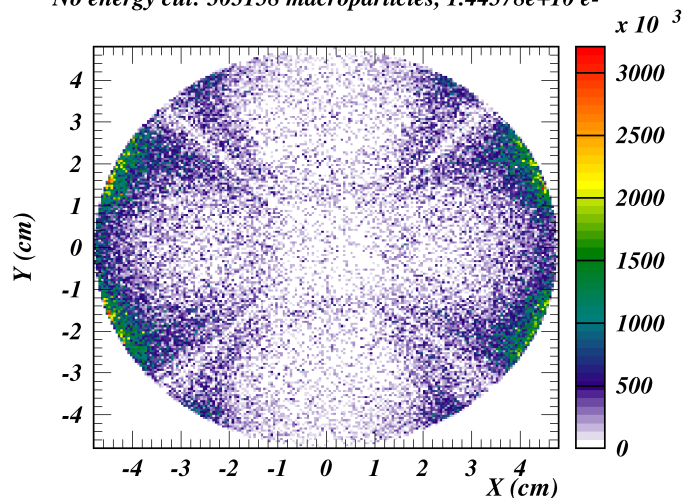


Prior to Turn 1 Bunch “11”

Cloud charge snapshot after bunch 10 at time = 140 ns



No energy cut: 303158 macroparticles, $1.44578e+10 e^-$



$E_{kin} > 10$ eV: 99371 macroparticles, $6.77648e+09 e^-$

No E_e selection

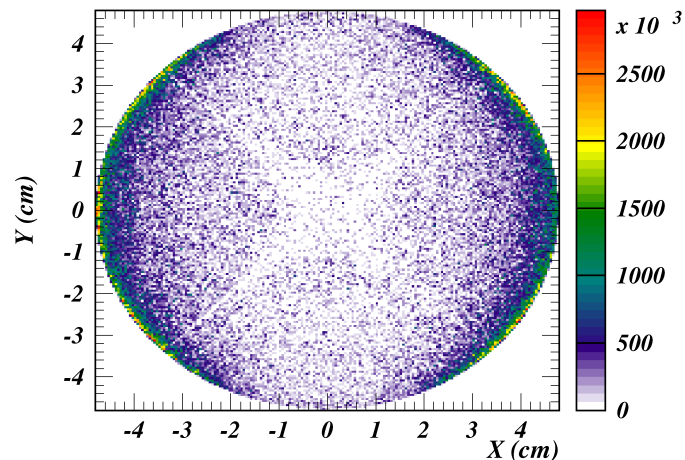
$E_e > 10$ eV

Cloud migrates
away from walls

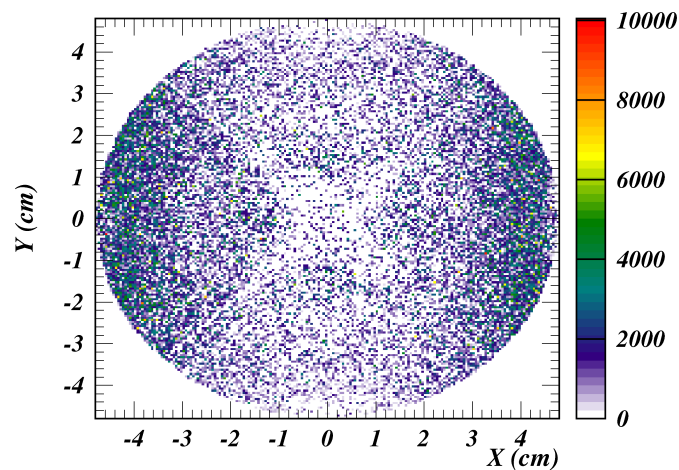
Energy decreases

Prior to Turn 1 Bunch “13”

Cloud charge snapshot after bunch 12 at time = 168 ns



No energy cut: 196197 macroparticles, $6.6736e+09 e^-$ $x 10^2$

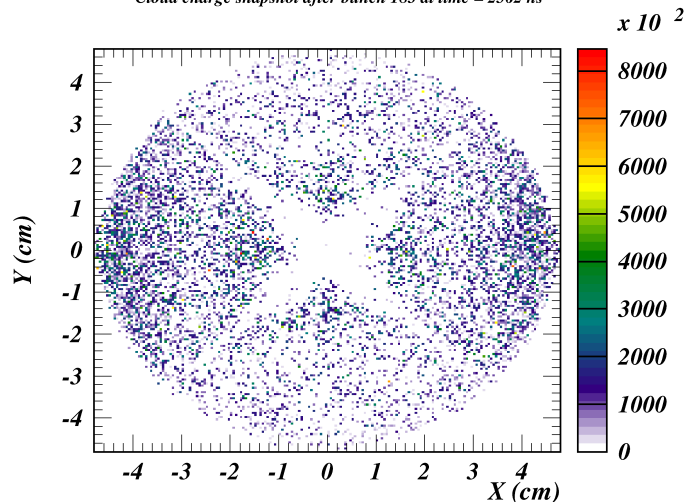


$E_{kin} > 10$ eV: 43757 macroparticles, $2.64701e+09 e^-$

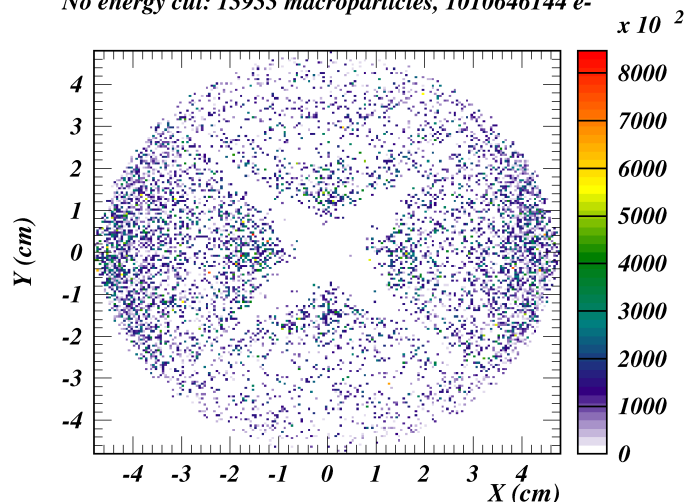


Prior to Turn 2 Bunch 1

Cloud charge snapshot after bunch 183 at time = 2562 ns



No energy cut: 13933 macroparticles, 1010646144 e-



$E_{kin} > 10 \text{ eV}$: 10674 macroparticles, 873396928 e-

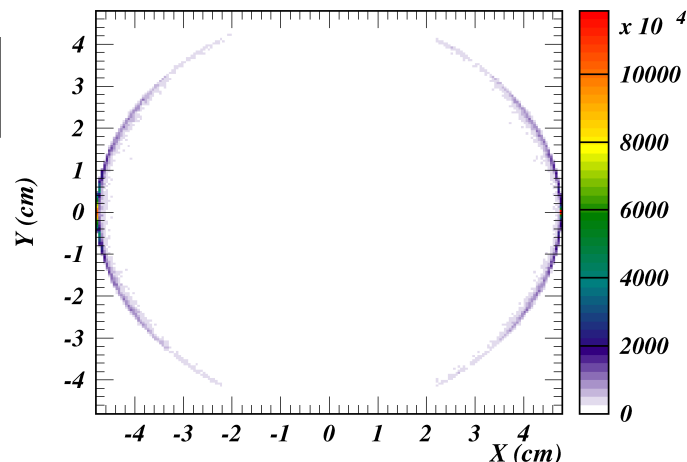
No E_e selection

$E_e > 10 \text{ eV}$

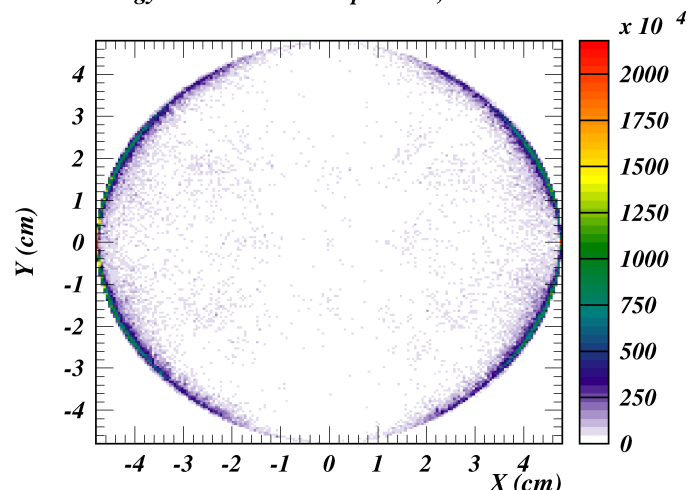
Cloud trapped
near beam
Energies
90% > 10 eV (!)

Prior to Turn 2 Bunch "11"

Cloud charge snapshot after bunch 193 at time = 2688.4 ns



No energy cut: 316074 macroparticles, 1.90314e+10 e-



$E_{kin} > 10 \text{ eV}$: 191459 macroparticles, 1.31319e+10 e-