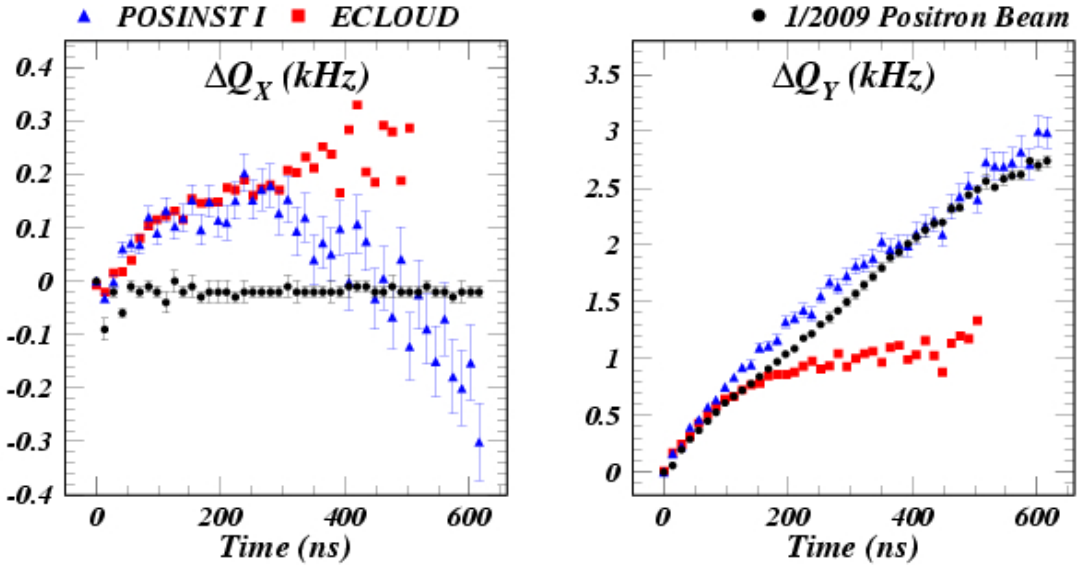
# Resolution of ECLOUD Tune Shift Calculation Instability

***Figure 3 of Studies of the Effects of Electron Cloud Formation at CESRTA PAC 2009***




*See also slides presented on 22 April 2009 in preparation for PAC 2009 and the followup on 20 May 2009*

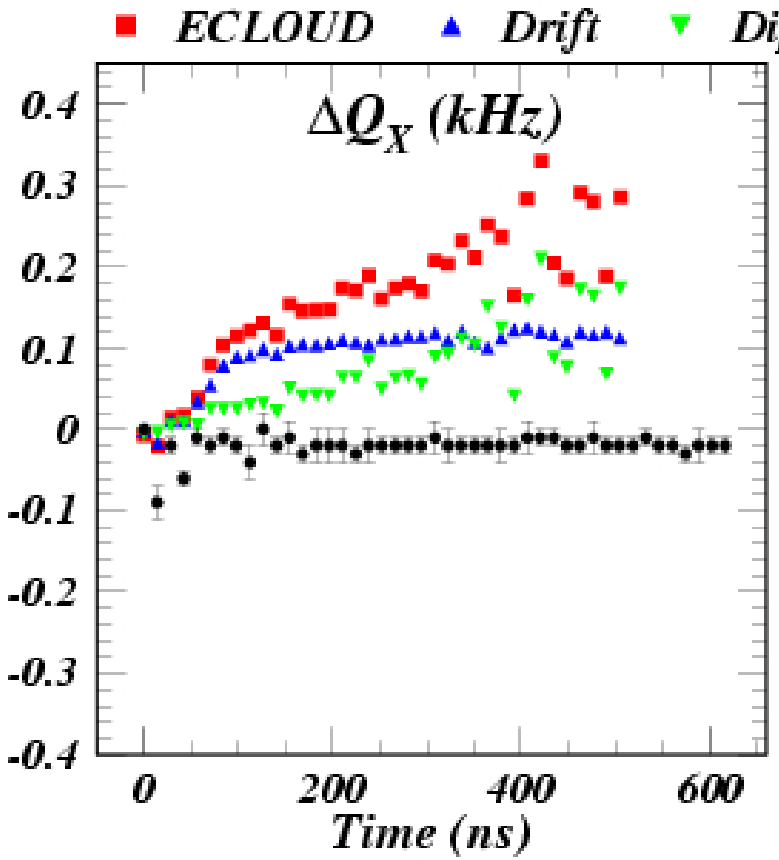
Jim Crittenden

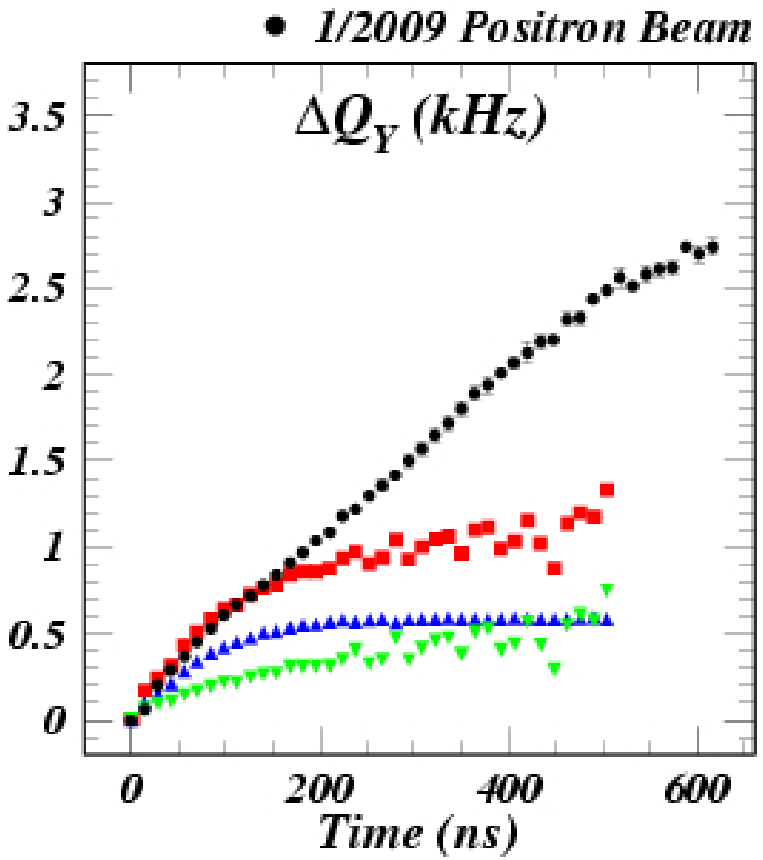
*Cornell Laboratory for Accelerator-Based Sciences and Education*

***Electron Cloud Simulations Meeting***

***2 September 2009***

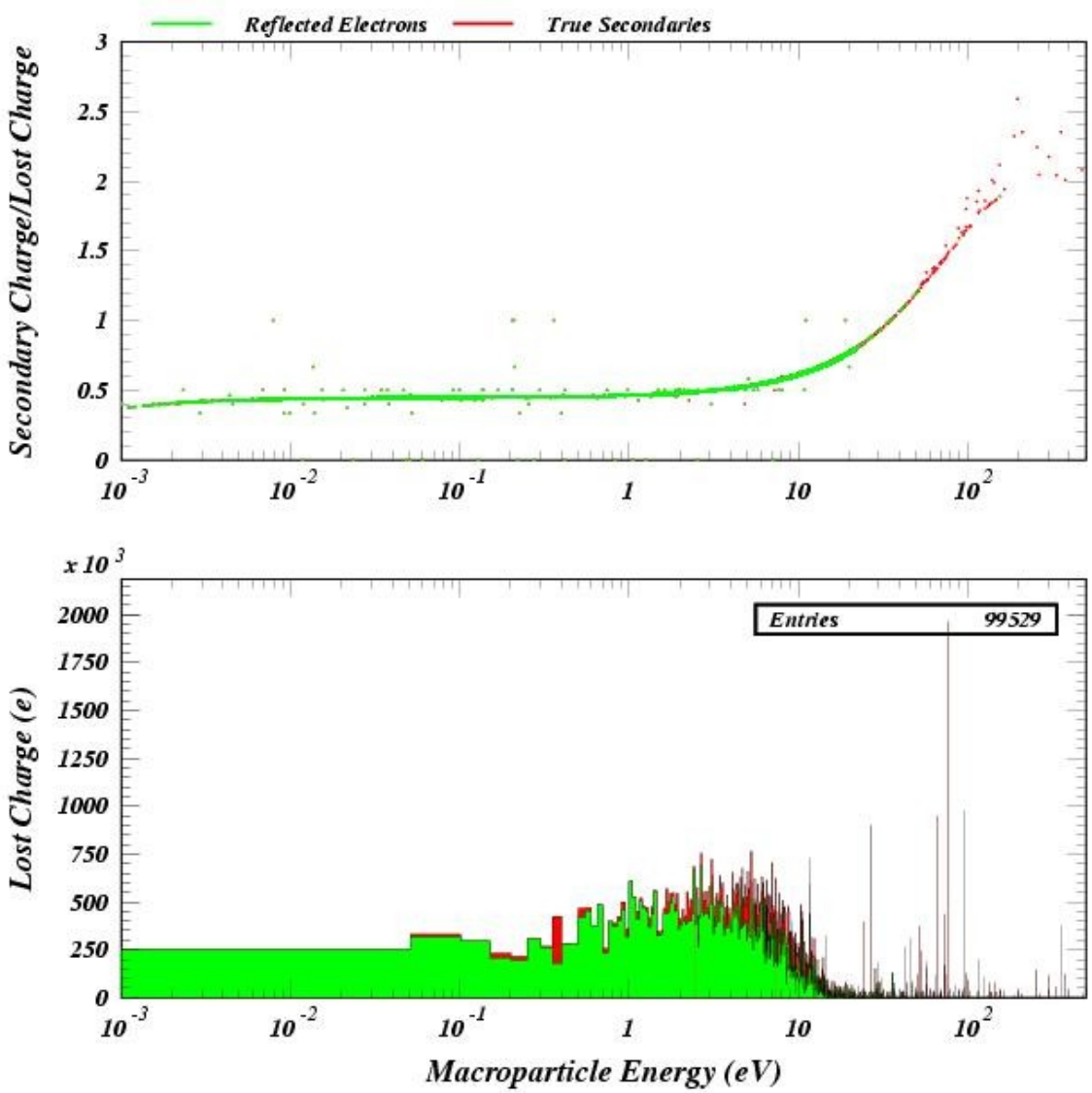
# Relative Drift and Dipole Contributions




***Fluctuations set in for late bunches in long trains in dipole regions.***
***Frank suggested testing numerical approximations.***
***Time step size, field calculation frequency – no help (see 20 May).***

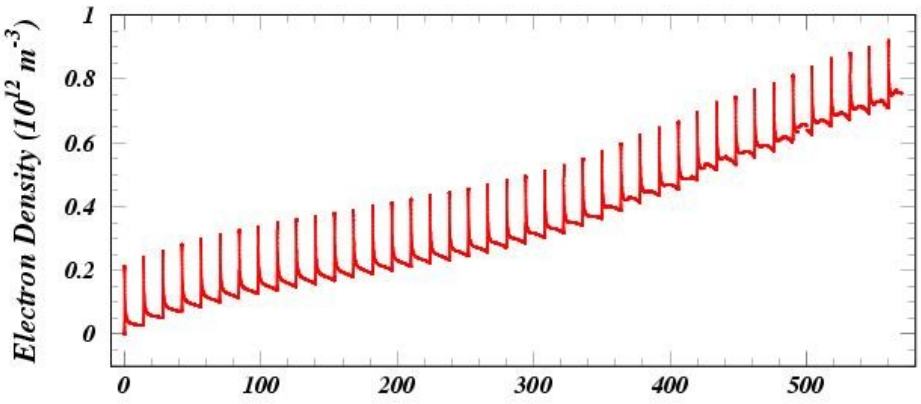
# Clue from SEY Plot

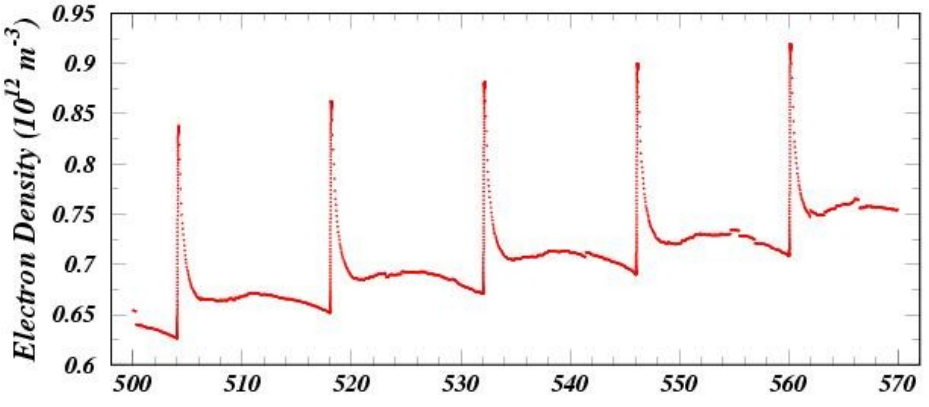


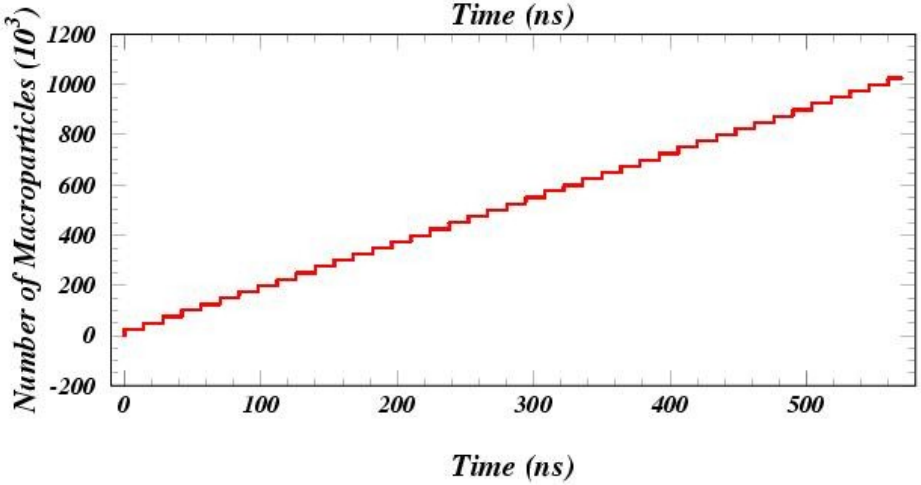

***Charge-weighted energy distribution shows presence of very large individual charges.***

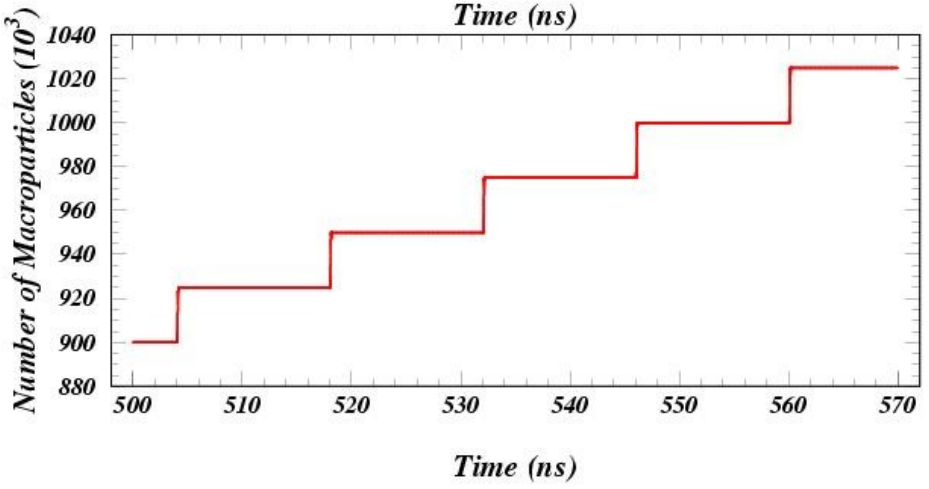
***For comparison, primaries are generated with charge 30k e-.***

# Clues from charge buildup plot



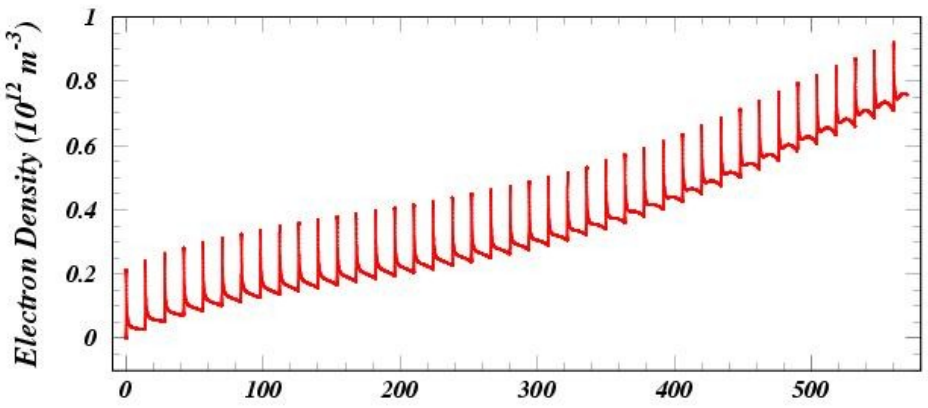



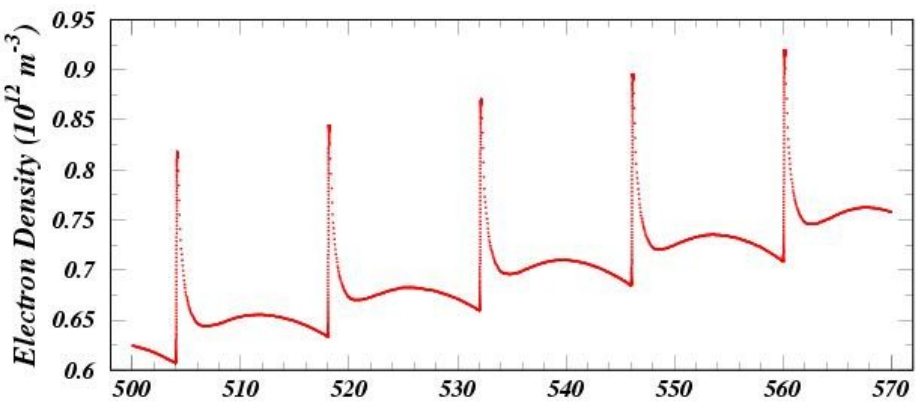



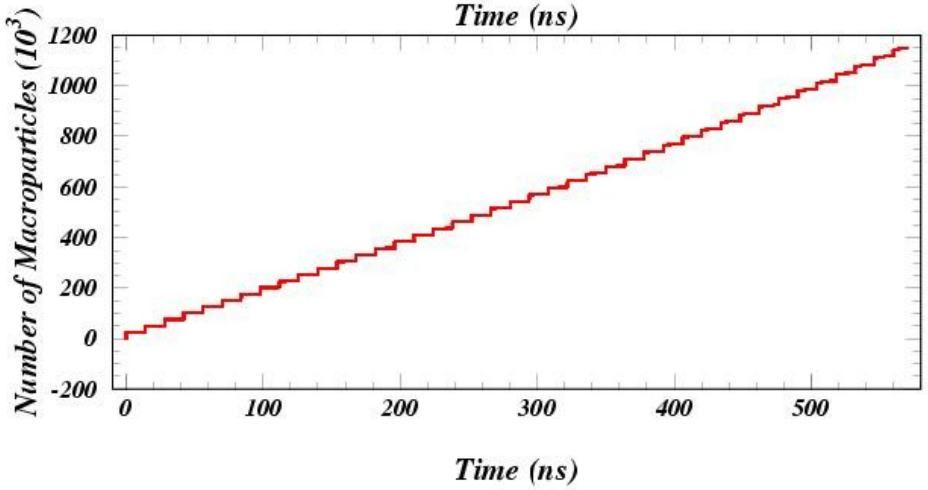



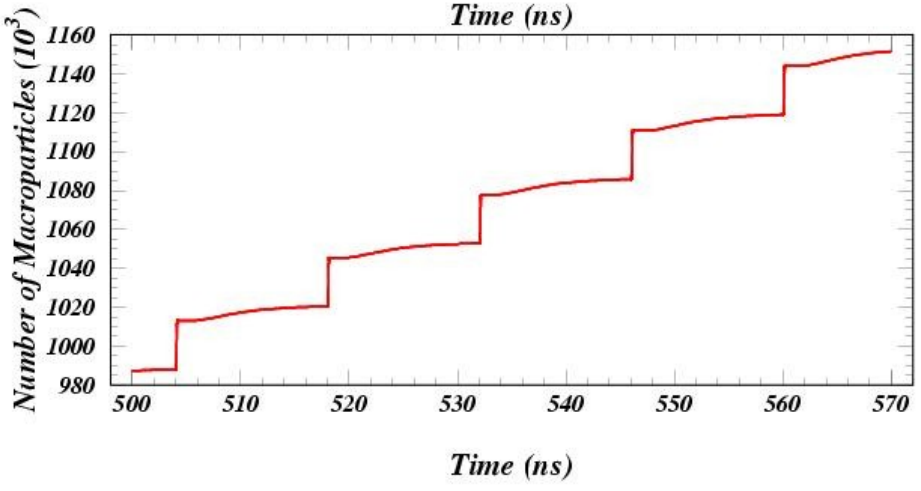

***Single time-step instability can even be seen in the charge buildup plot.***

# After re-enabling interbunch macroparticle generation



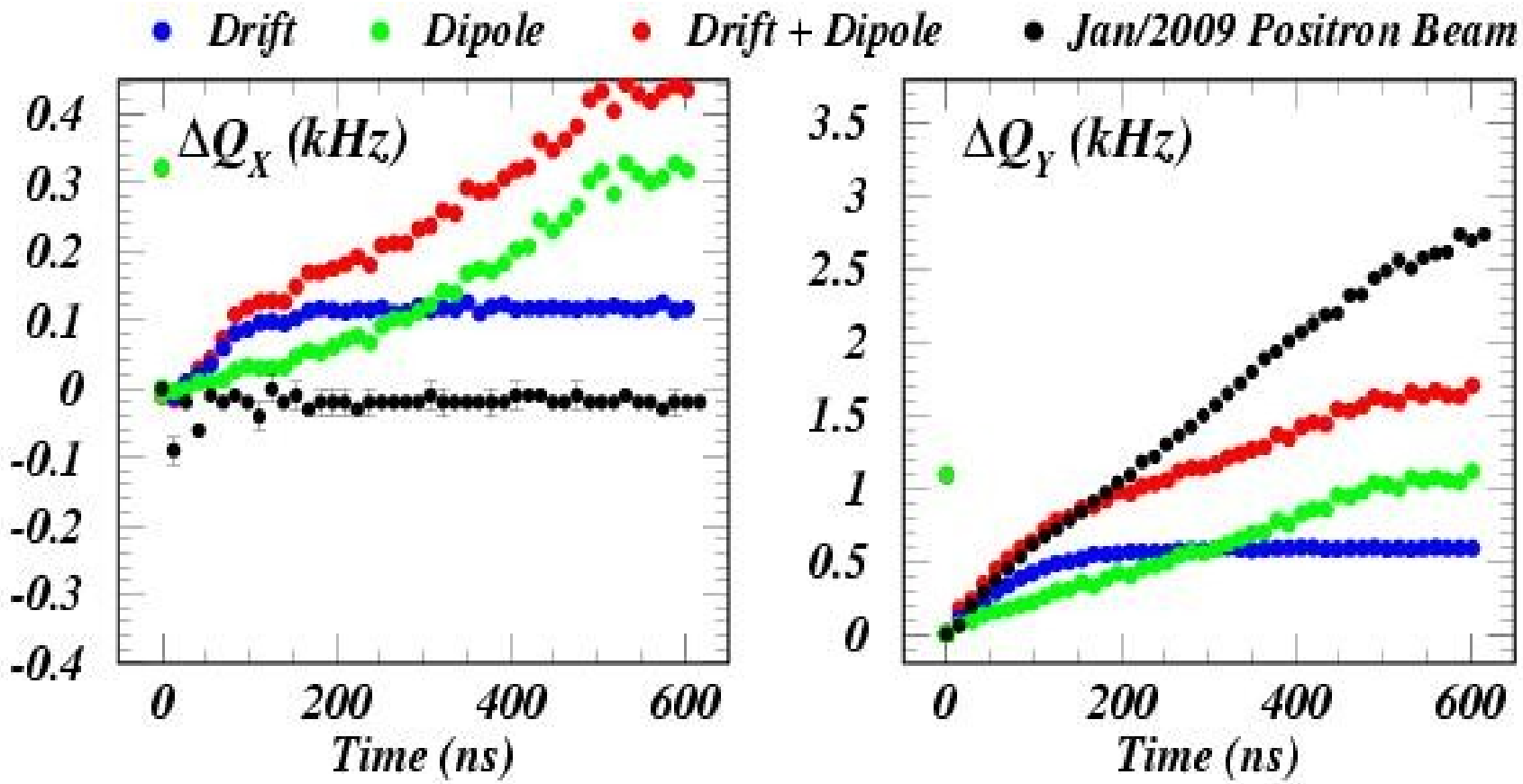




***This type of instability was foreseen and prevented in ECLOUD, but the avoidance of large-charge macroparticles was made to require high photon flux (>100 photons/m/beam particle) in 2002. Lesson: numerical approximations must be adapted to the relevant physical circumstances.***

# Replacement for Figure 3




***Now the investigation of the physical reason for the low dipole contribution in ECLOUD will be much easier. Also, the understanding of the dependence on bunch current shown by David Kreinick last week will benefit from the ECLOUD/POSINST comparison.***