Space Charge Electric-Field Calculations for Coherent Tune Shift Estimations using the Electron-cloud Modelling Algorithm ECLOUD

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Electron Cloud Simulations Meeting

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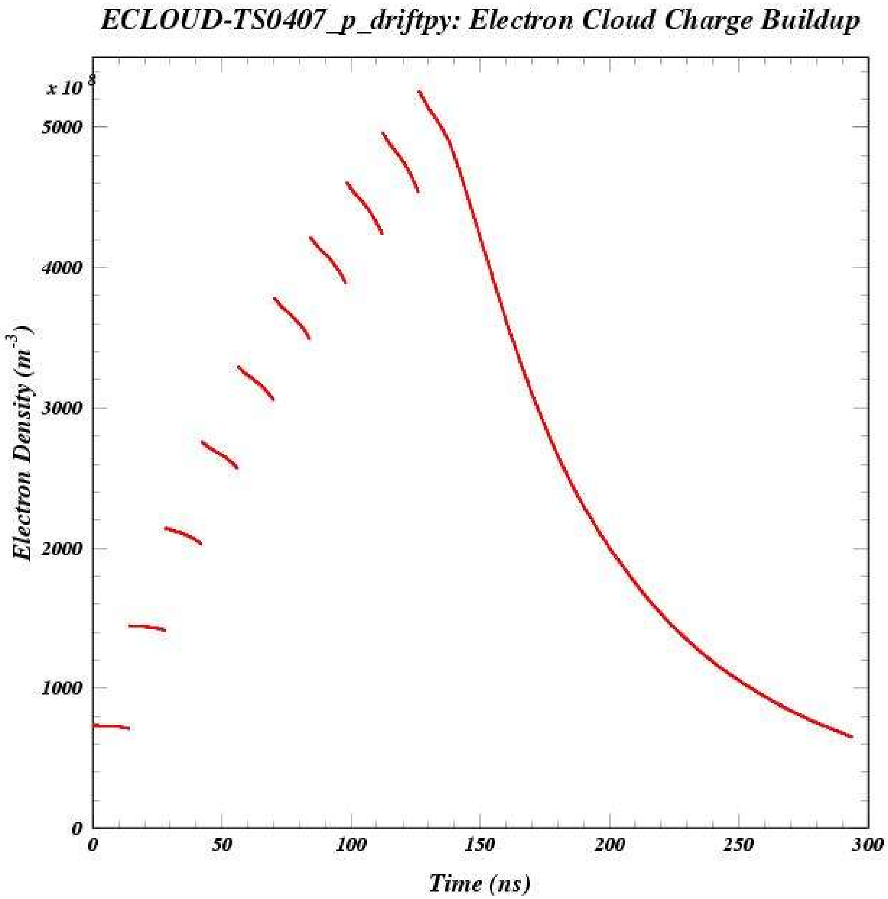
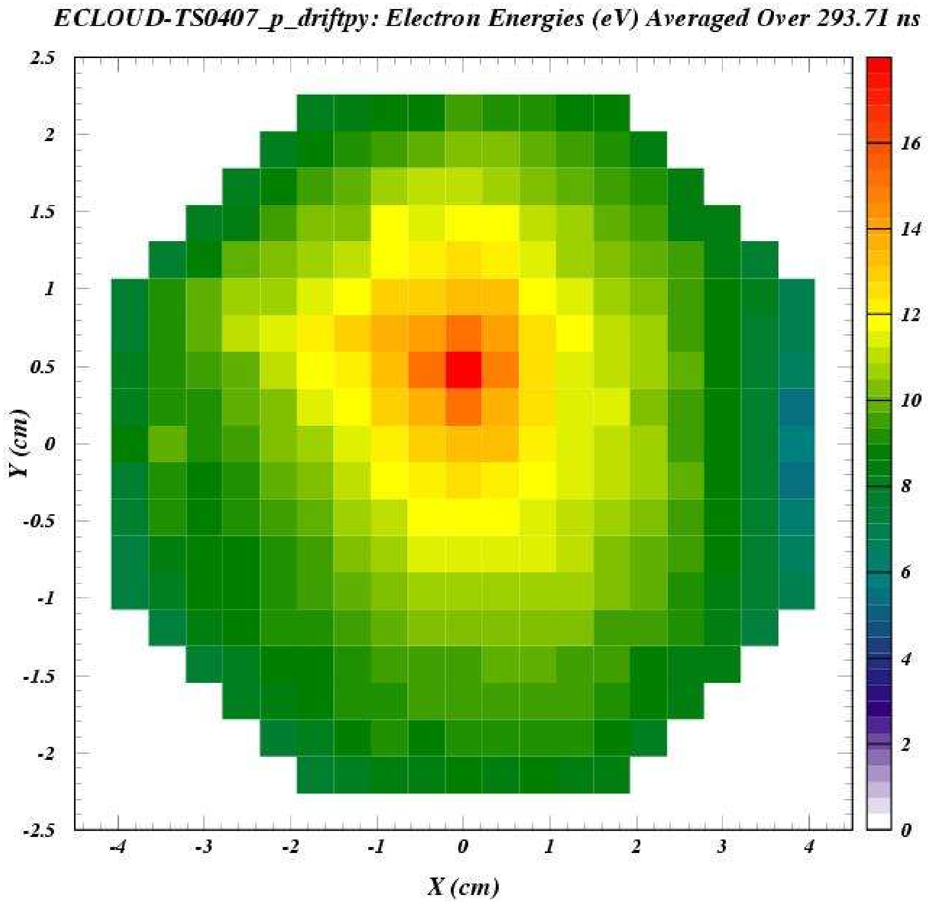
Overview of Modelling Parameters and Data Sets

- **CesrTA Electron Cloud Simulation wiki page: Simulation Guidance Parameters TS0407**
- CESR measurements in CESR-c configuration in April, 2007
- 1.89 GeV - Ten 0.75 mA bunches, followed by ten empty bunches, 14 ns spacing
- Beam RMS size 0.16 x 0.016 x 12.6 mm.
- ECLOUD bunch time +- 3.4 sigma: 0.29 ns
- Elliptical beam pipe 4.5 x 2.5 cm
- QE 10%, 0.23 s.r. photons per beam particle (mistake: should have been 0.53 for dipole)
- 25k macroparticles generated per filled bunch
- SEY parameters: SEY=1.8, Epk = 310 eV
- 150 steps per bunch length, 300 steps between bunches
- 11 field calculations during each of 20 bunches
- Transverse field grid 7x7 spanning +- 3 sigma
- Field calculation includes beampipe image charges, no contribution from beam
- Four data sets: e+ & e-(+- 5mm/grid sources), e+(+-0.5mm/grid sources),e+(+-5mm/cloud sources)
- Ten runs per data set: zero beam offset, +- X and Y beam offsets, each for both drift and 715 G dipole volumes

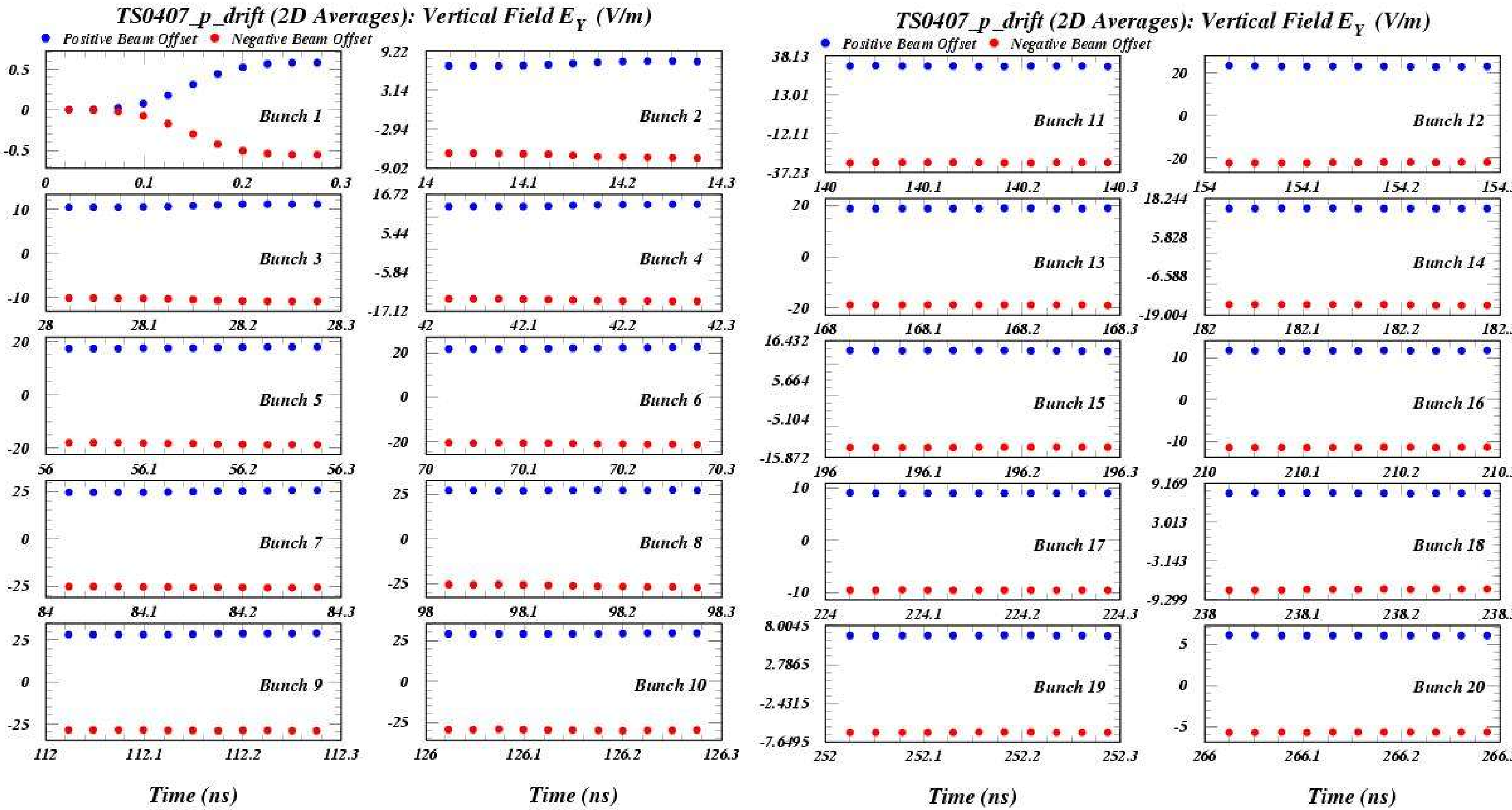
e+, Drift volume, Beam Y + 5 mm





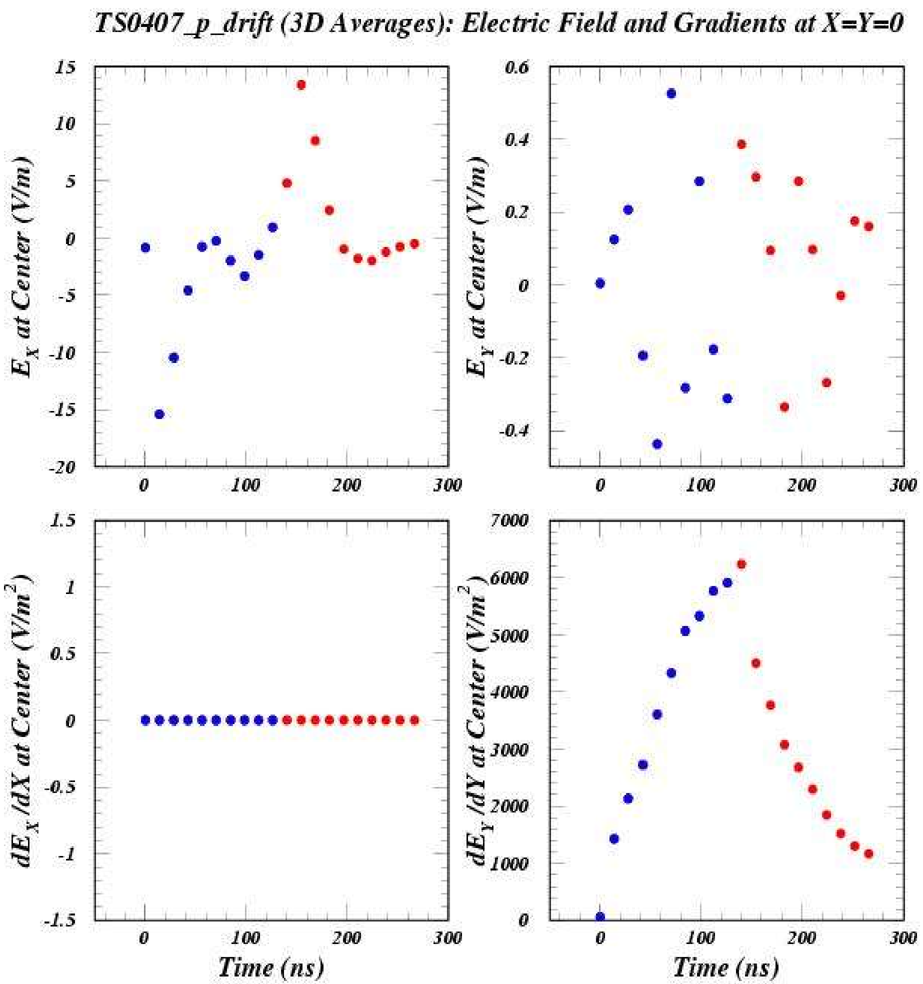
Beam offset observed in cloud particle energies

e+, Vertical Field, Drift, Beam Y +- 5 mm



No pinch effect present

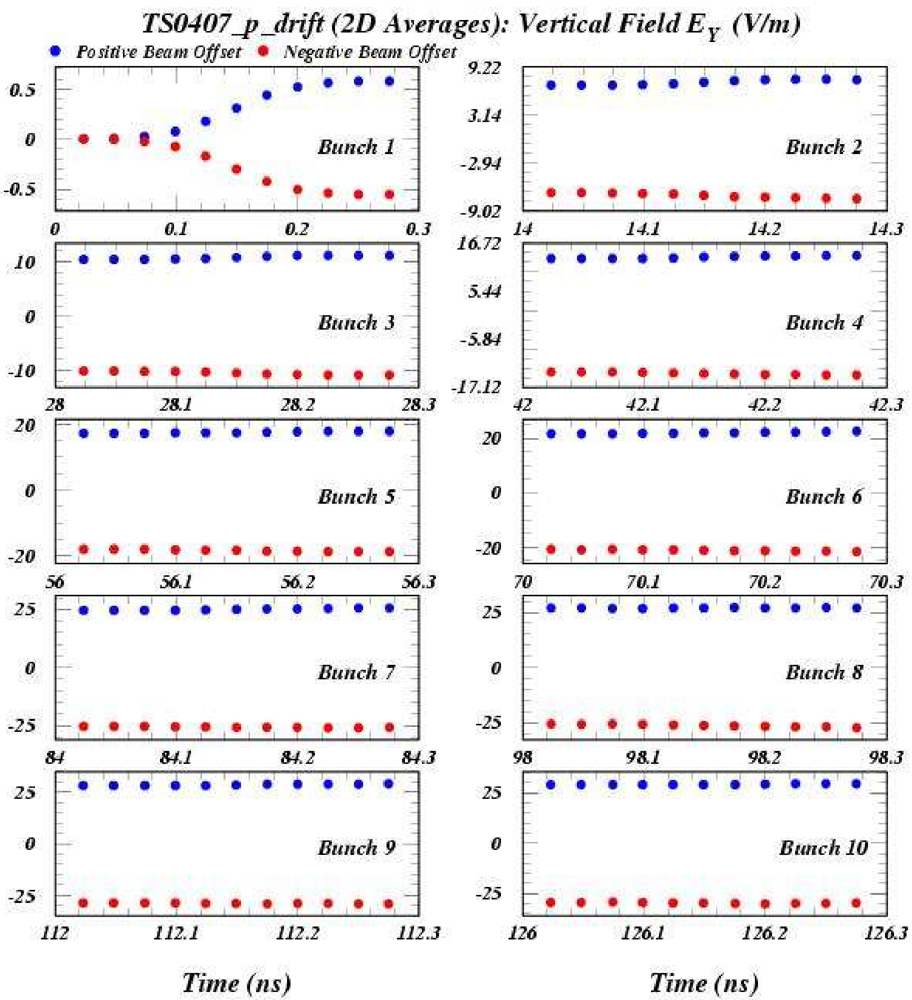
e+, Vertical Field, Drift, Beam Y +- 5 mm



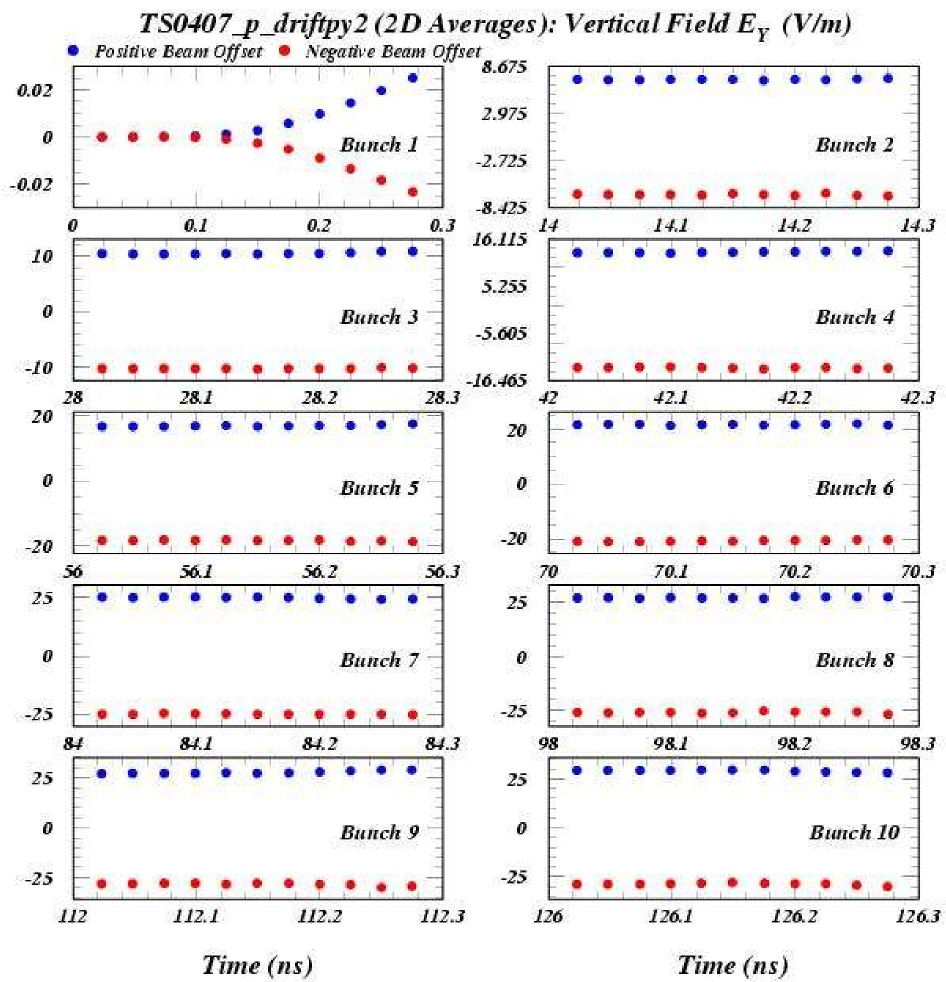
Marco found a gradient about 25% larger for this case

e+, Vertical Field, Drift, Beam Y +- 5 mm

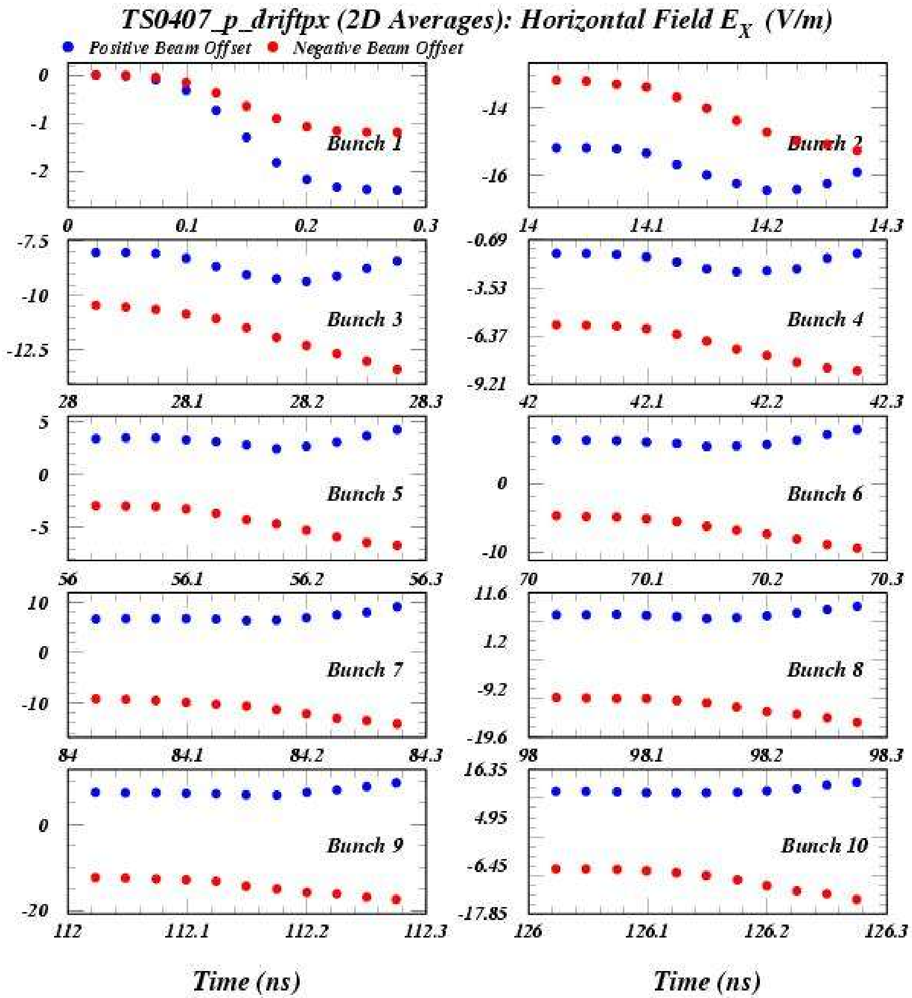
Grid Field Sources (21x21)

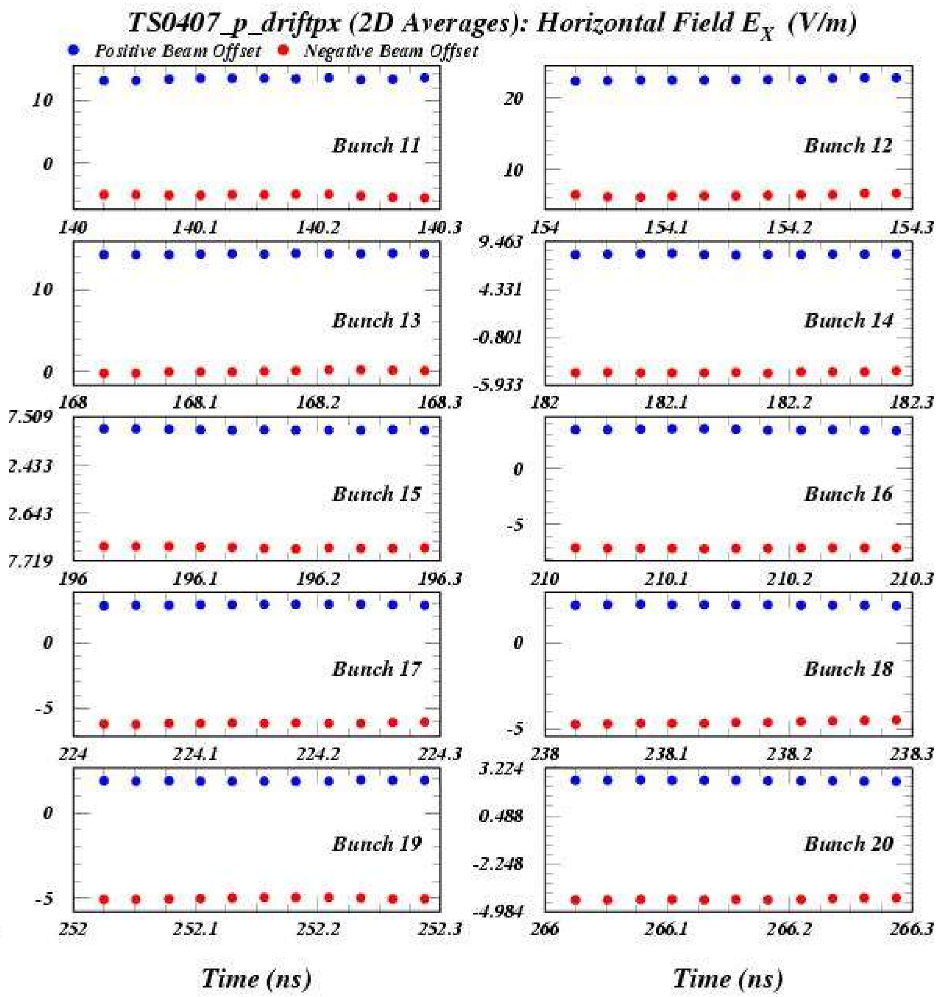


Macroparticle Field Sources



e+, Horizontal Field, Drift, Beam X +- 5 mm





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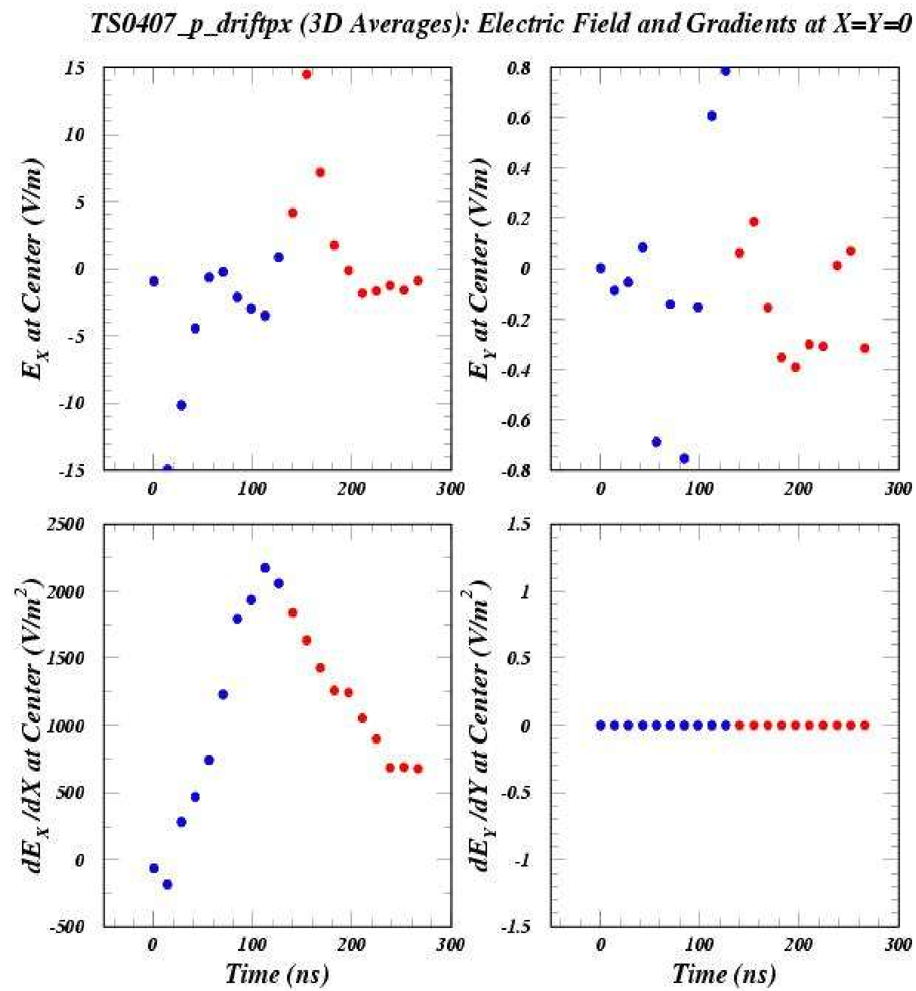
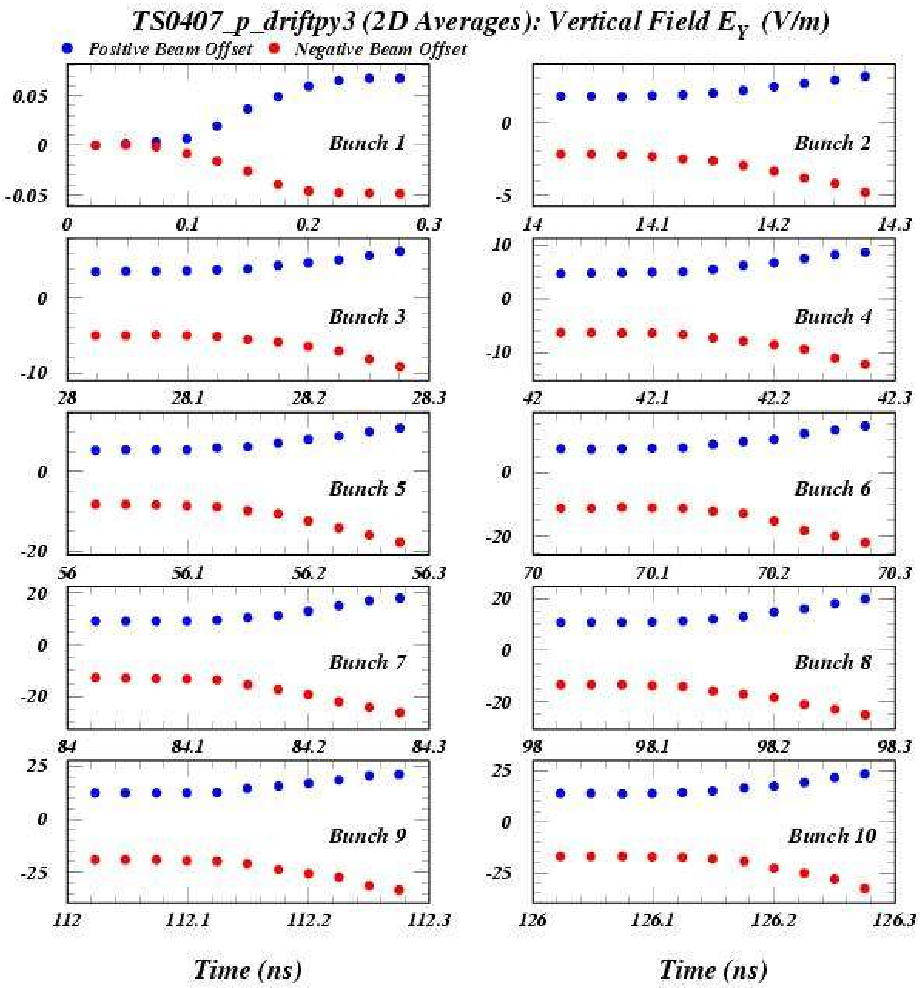
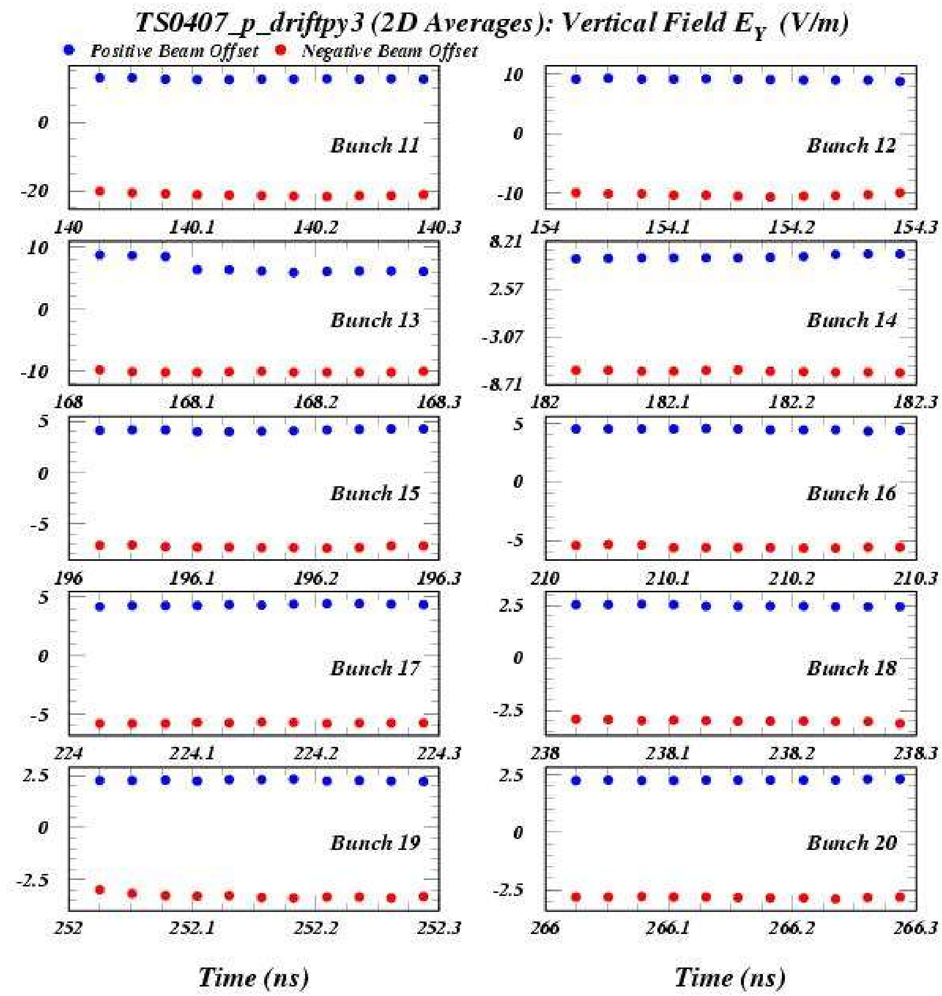
e+, Horizontal Field, Drift, Beam X +- 5 mm



Gradient factor 3 smaller than vertical

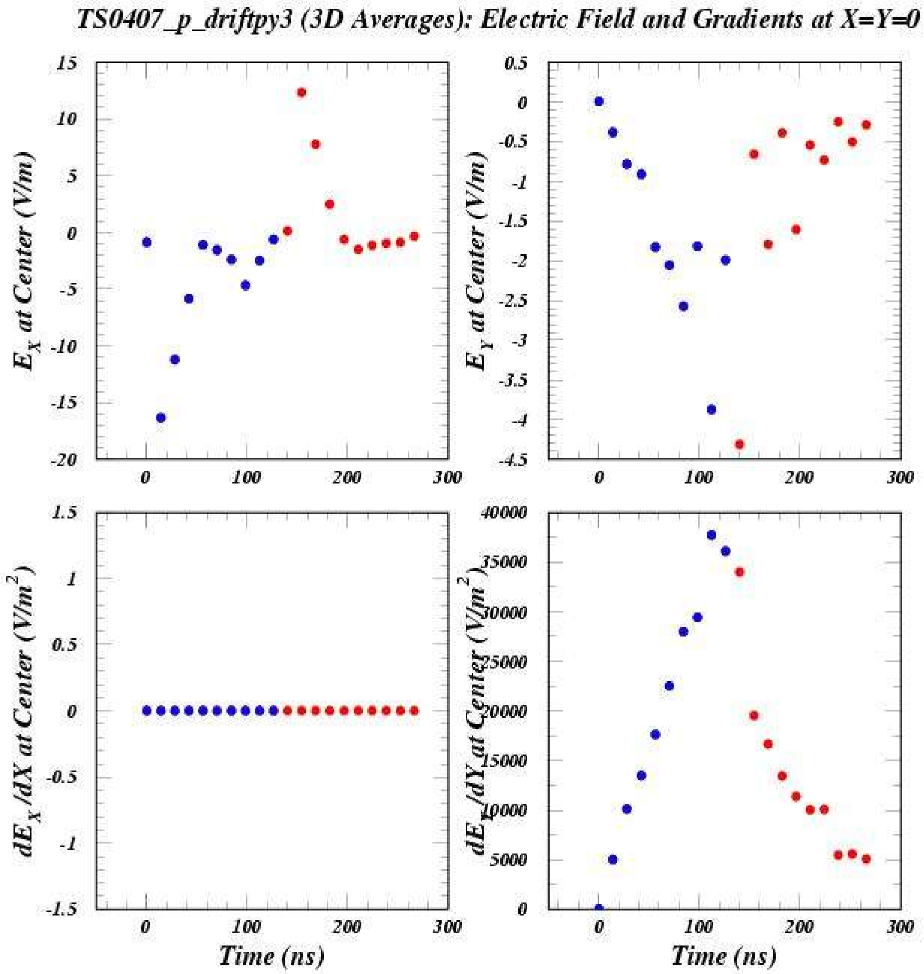
e+, Vertical Field, Drift, Beam Y +- 0.5 mm





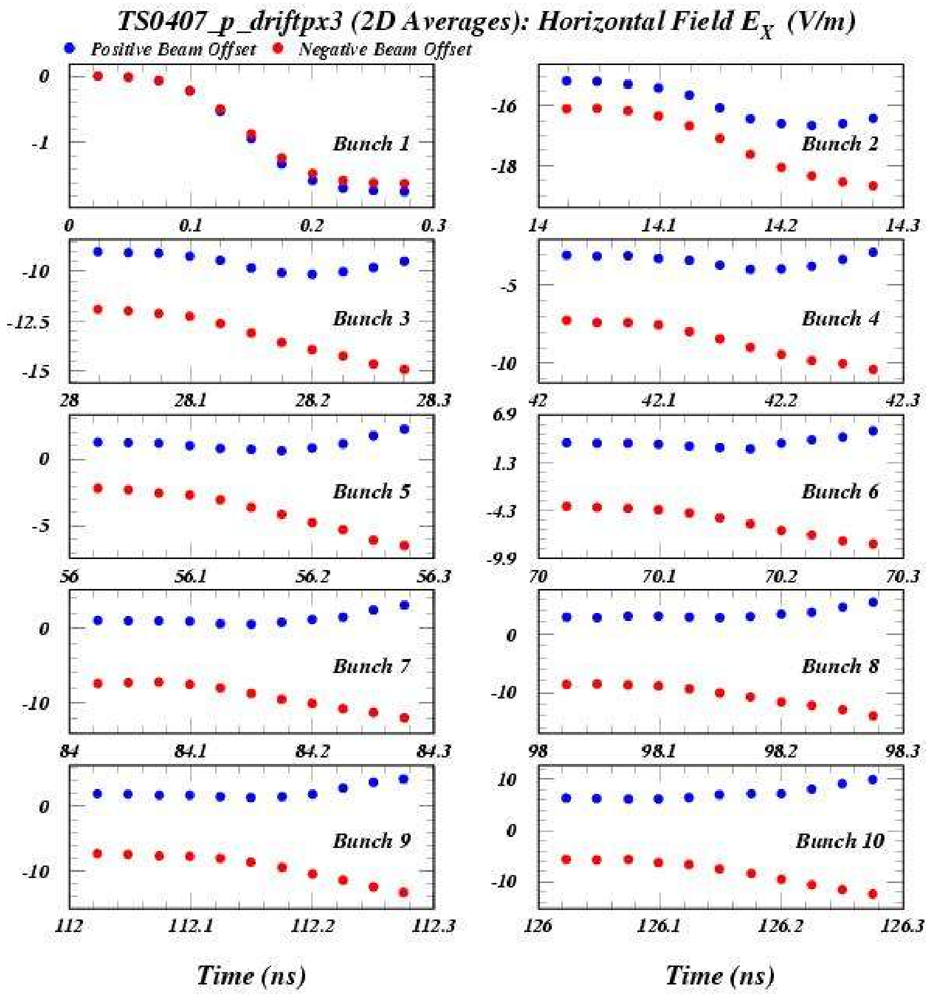
Some "pinch effect" present

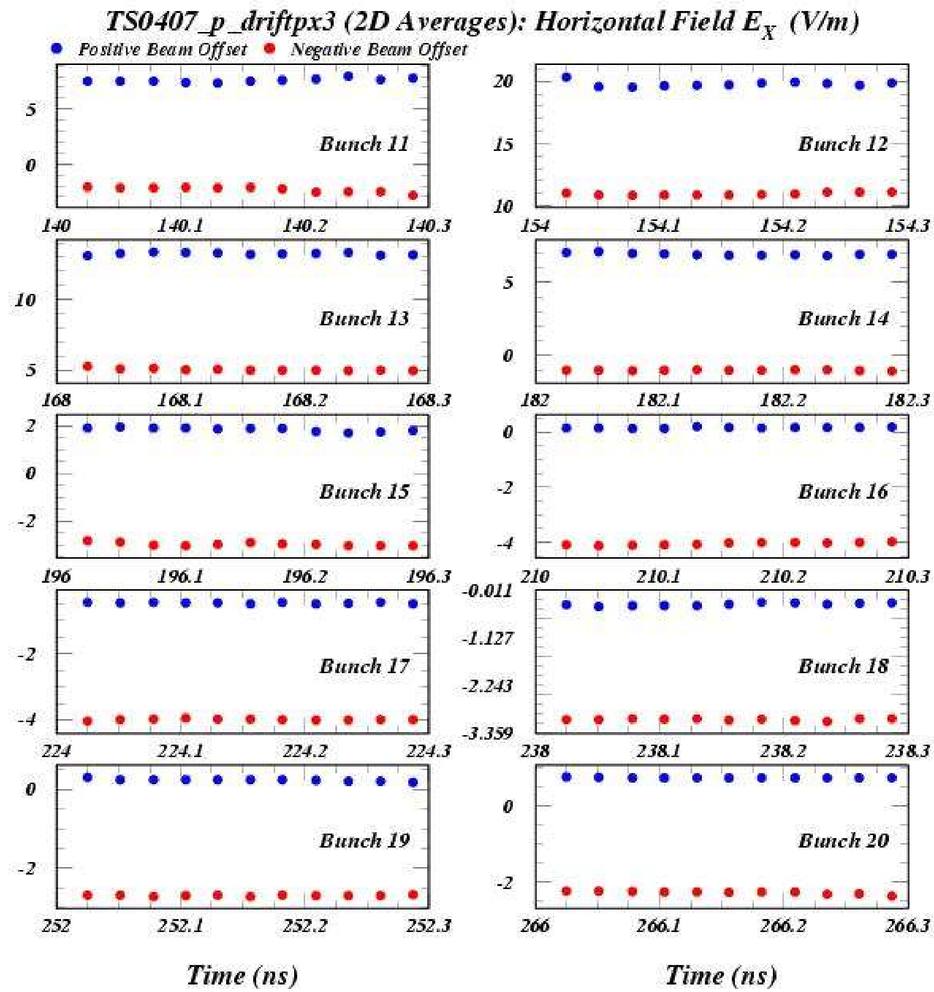
e+, Vertical Field, Drift, Beam Y +- 0.5 mm



Gradient factor 6 larger than for offset +- 5mm (?)

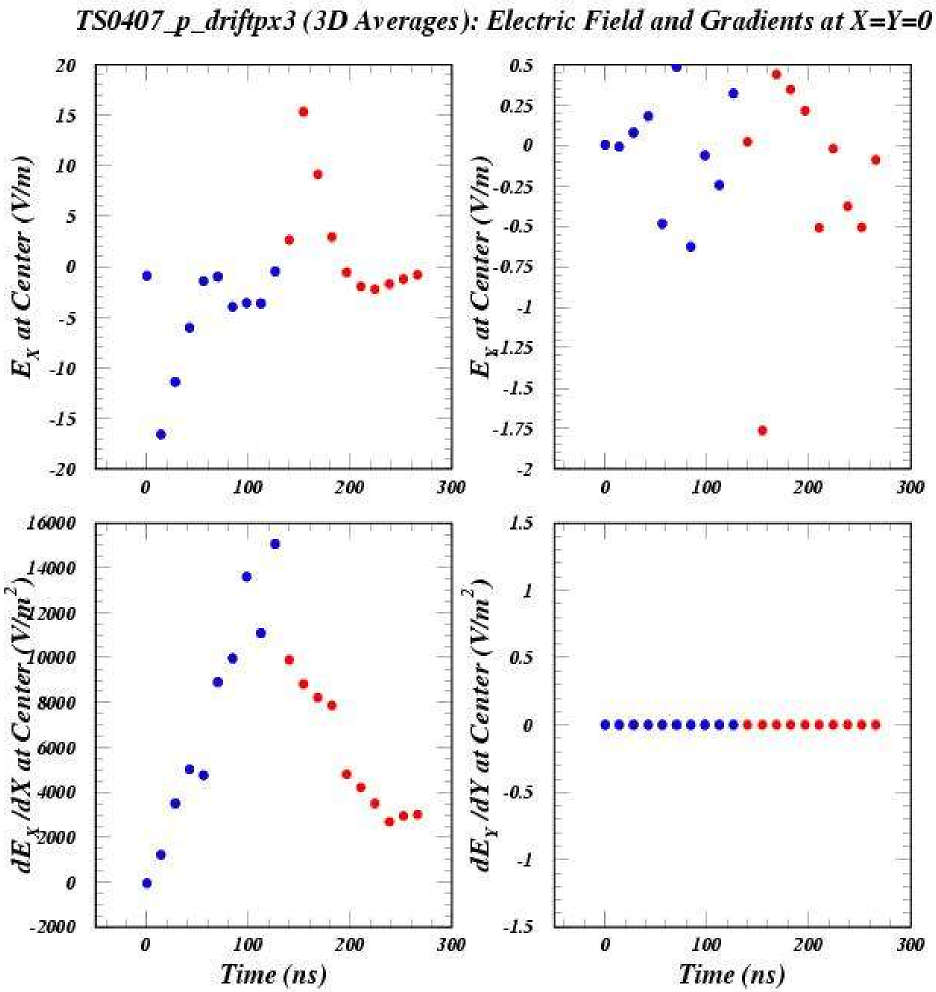
e+, Horizontal Field, Drift, Beam X +- 0.5 mm





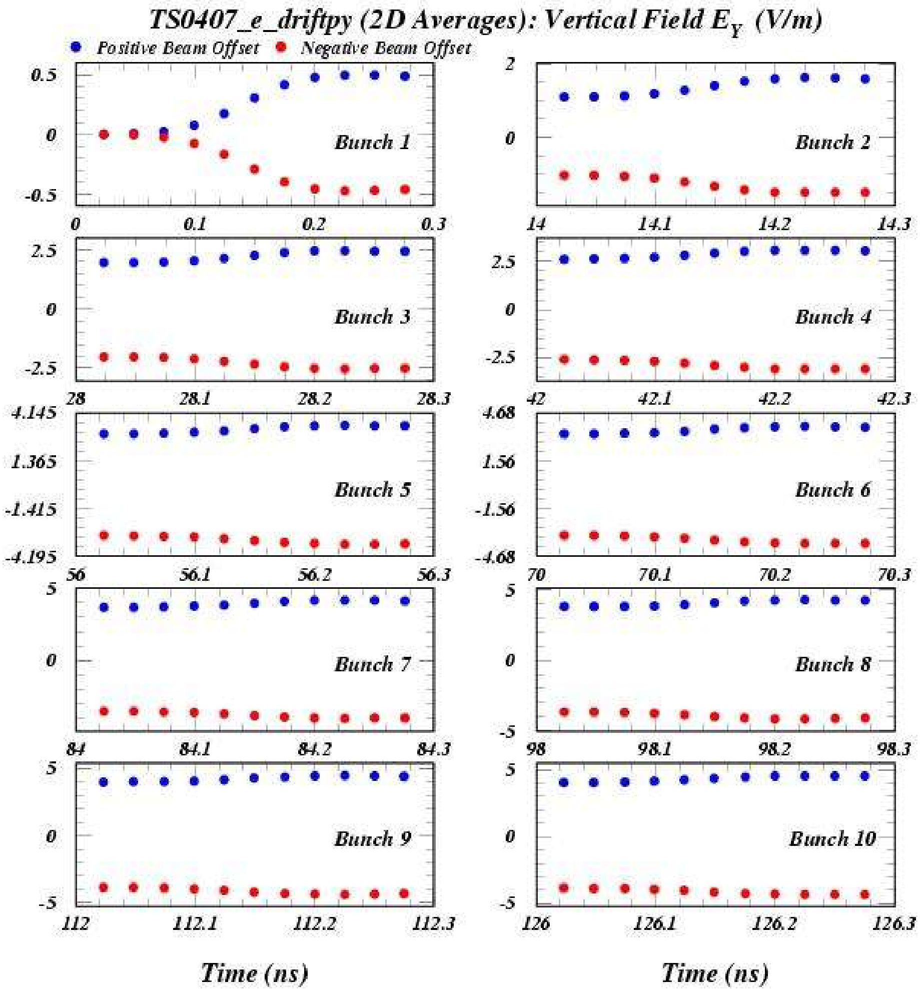
Some "pinch effect" present

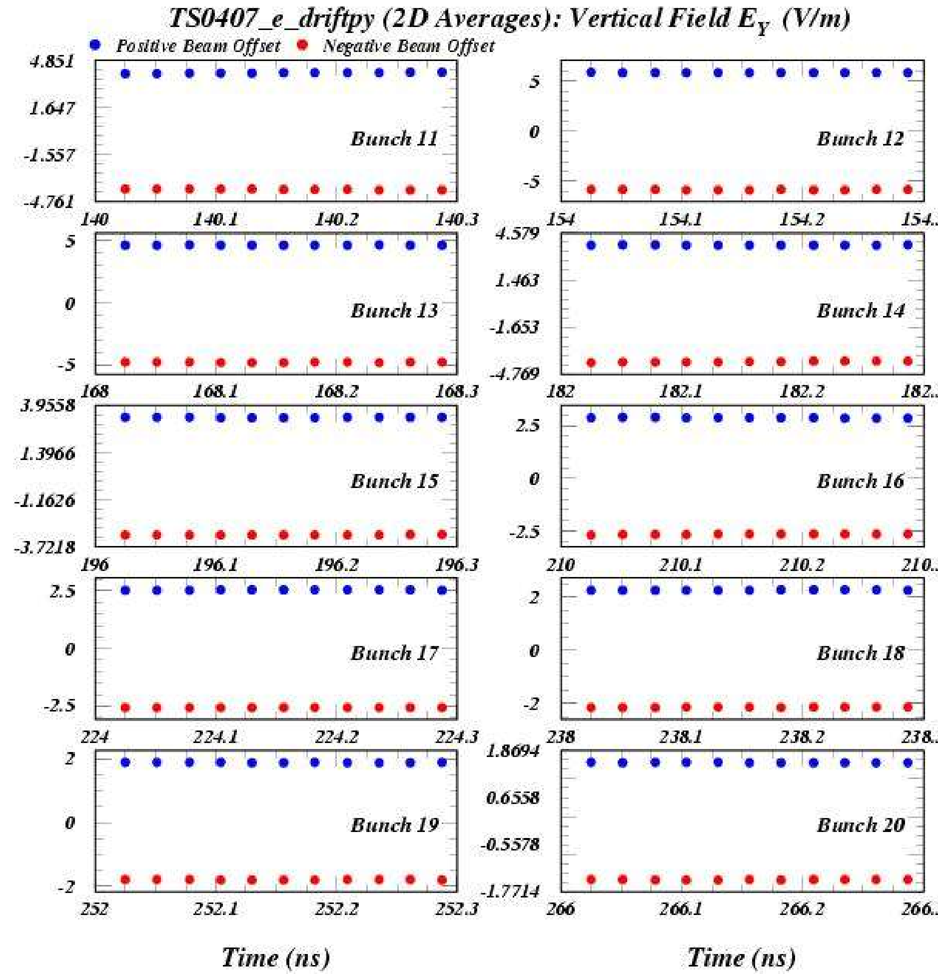
e+, Horizontal Field, Drift, Beam X +- 0.5 mm



Gradient again factor 6 larger than for offset +- 5mm (?)

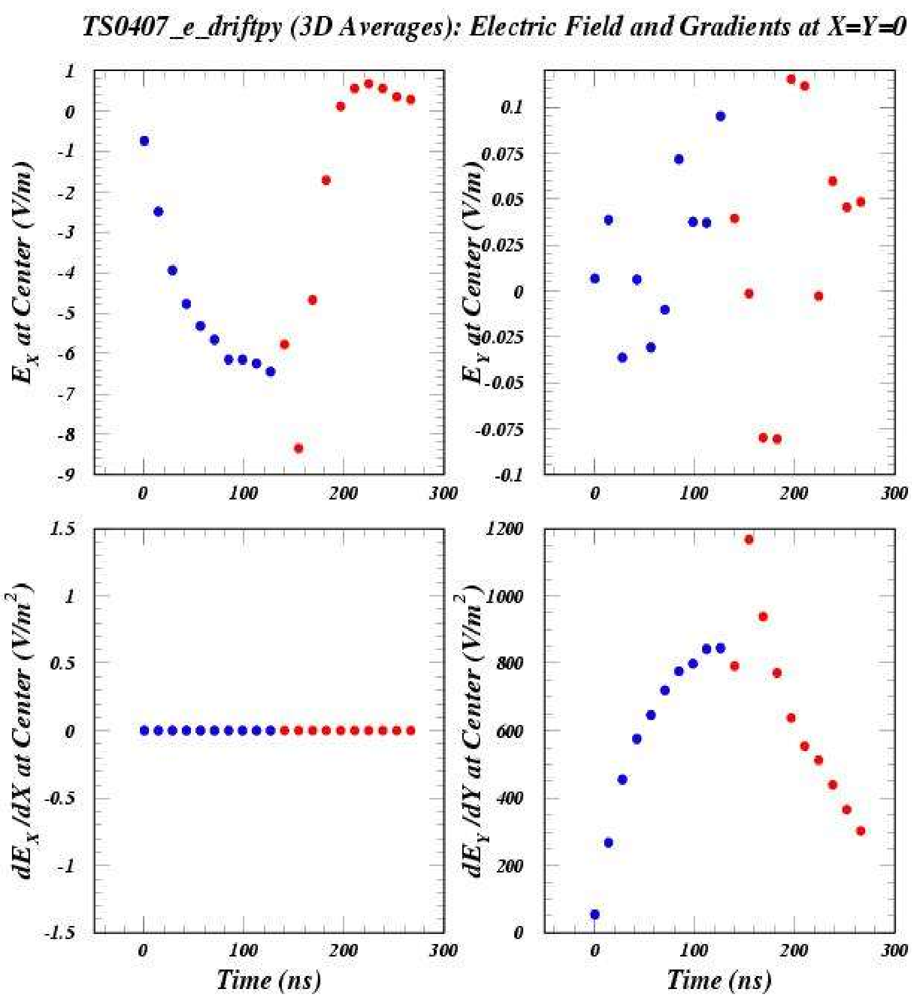
e-, Vertical Field, Drift, Beam Y +- 5 mm





No pinch effect present

e-, Vertical Field, Drift, Beam Y +- 5 mm



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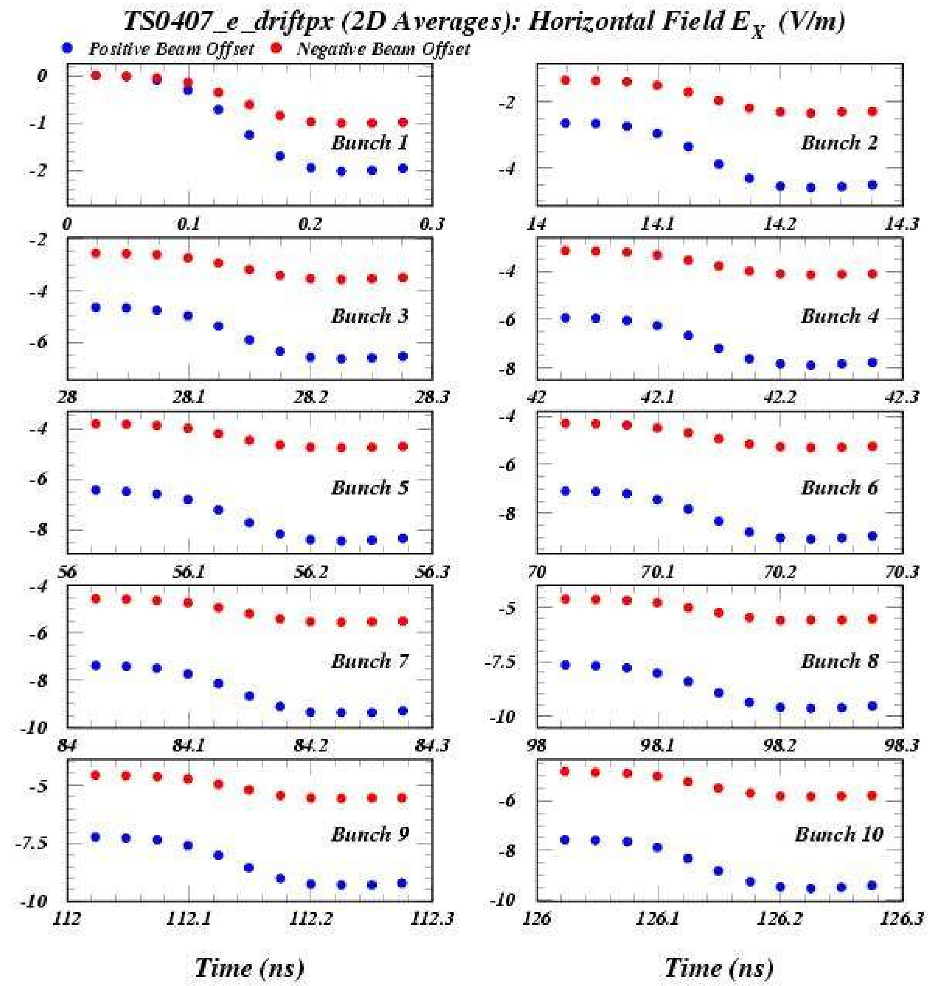

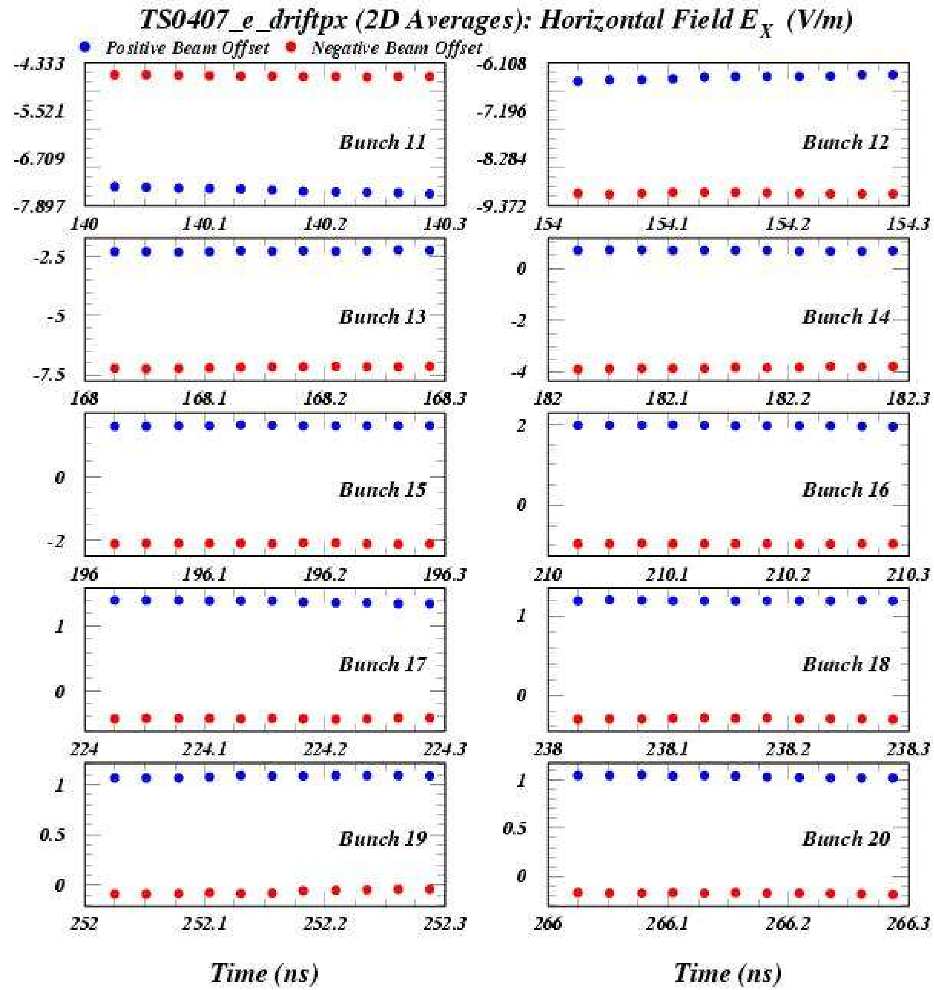

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e-, Horizontal Field, Drift, Beam X +- 5 mm