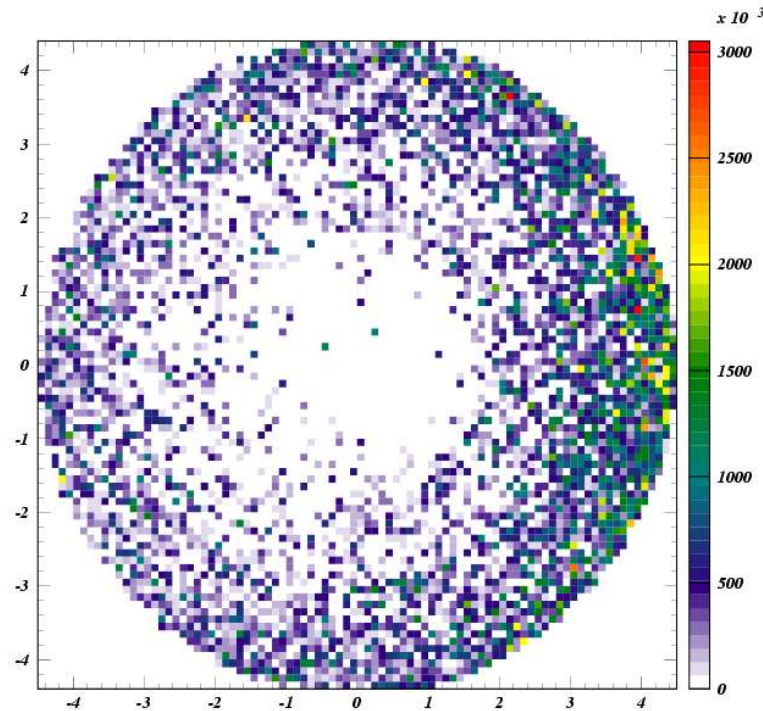




Electron Cloud Simulation Work at Cornell

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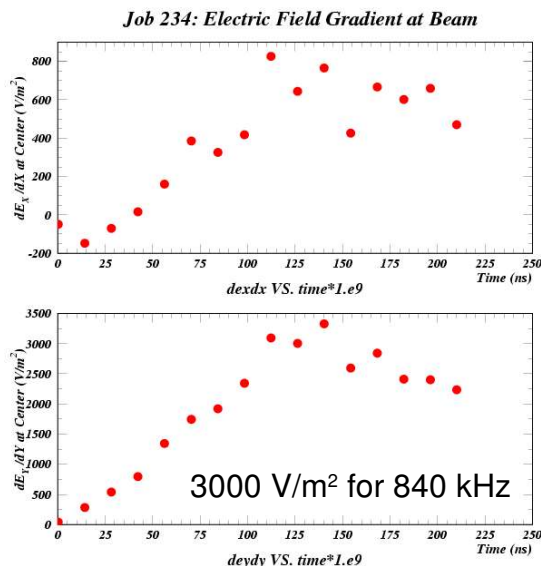
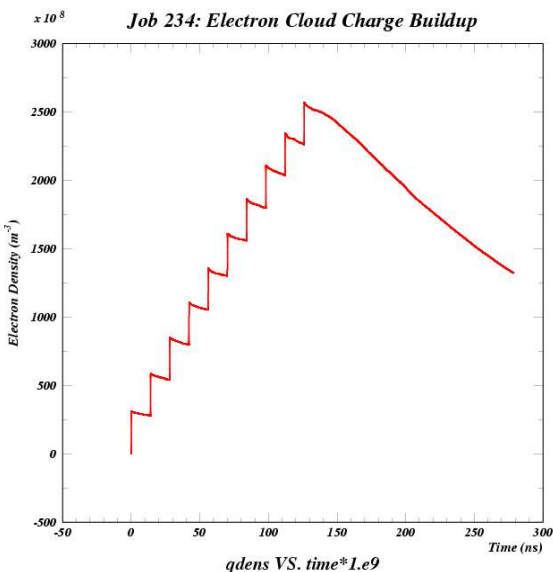
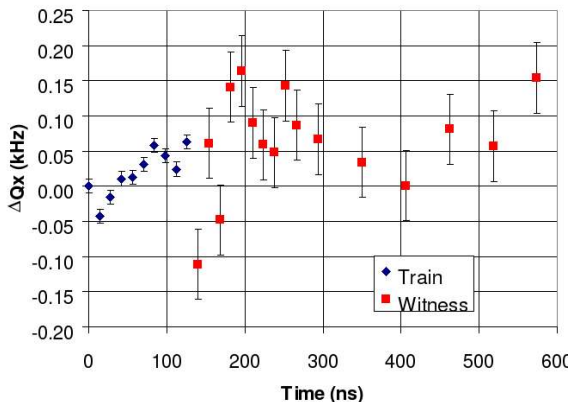
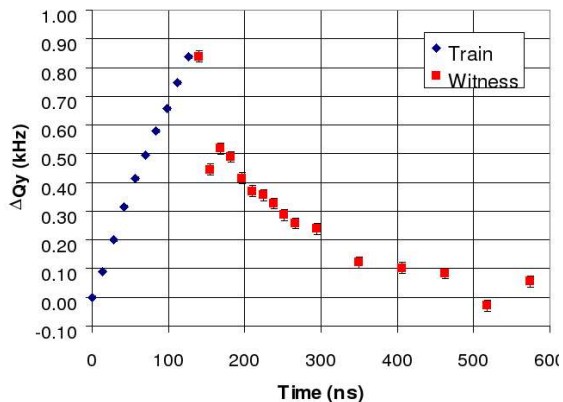
- **ECLLOUD program V3.2** (2D, developed at CERN 1997-2003)
 - Adapted to CestrTA machine studies experiments
 - CESR-c tune shift measurements 2007
 - CestrTA North Area Triple-RFA arrangement
 - Continued development (output info, graphics, field calculations)
- **Standalone RFA modeling** (Previously MatLab, now F90)
 - Compute expected RFA currents incl. tracking & secondary generation
- **Vector Fields OPERA model for RFA detectors**
 - Includes electrostatics calculation with B field superposed
 - Calculates electron trajectories (no energy loss, no secondaries)
 - Electric field map provided to local standalone development
- **POSINST and CLOUDLAND ramping up**
 - Visit to SLAC this week



- Train of ten 1.9 GeV, 0.75 mA positron bunches generates the electron cloud
- Measure tune shift and beamsizes for witness bunches at various spacings

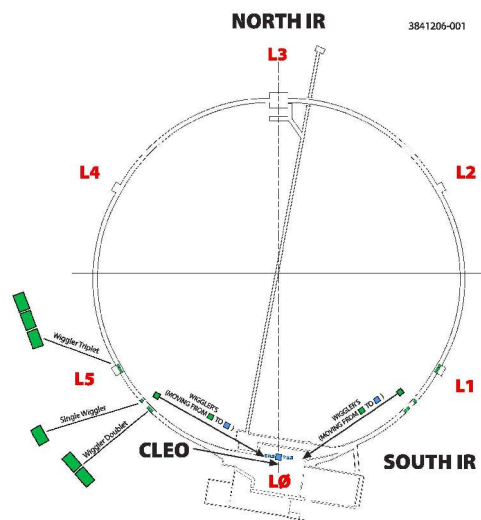
ECLoud points to parameters critical for determining tune shifts:

- **Beam-pipe shape**
 - 4.5 x 2.5 cm elliptical
- **B-field**
 - Field-free rather than 800 G
- **% reflected s.r. photons**
 - Less than 20-30%



Successfully predicts magnitude of vertical tune shift, but predicted horizontal tune shift is too high.

Further investigation of E-field calculation underway.



North Area RFA Setup

3.5-inch round beampipe

5.3 GeV electron beam

Flexible bunch pattern

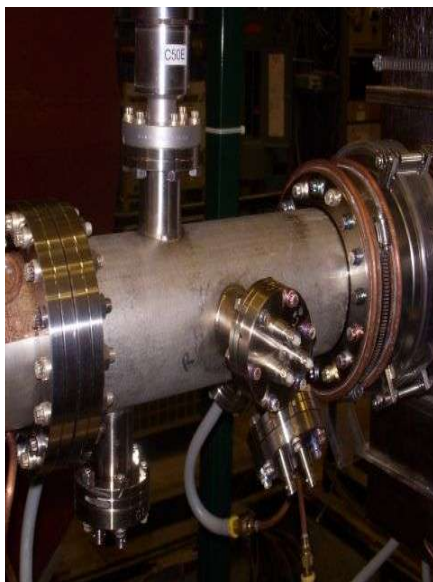
*Now investigating energy
spectrum
and azimuthal dependence*

*Presently no way to calculate
optics distortions in CESR lattice*

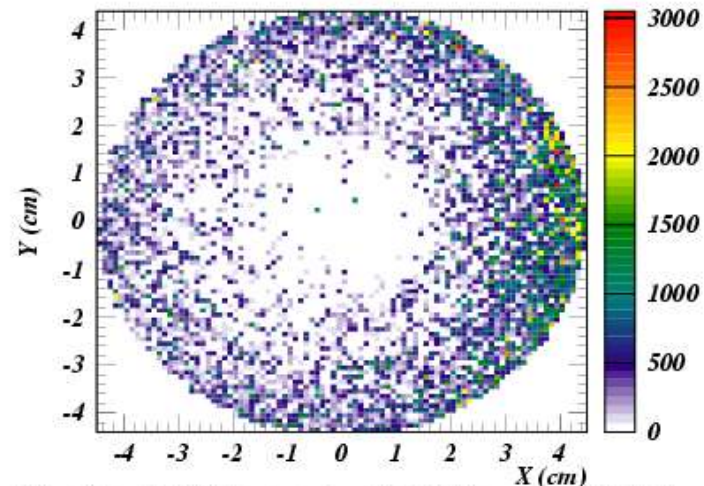
Collaboration welcome

- Two APS-type RFA's
- One CESR-design thin RFA

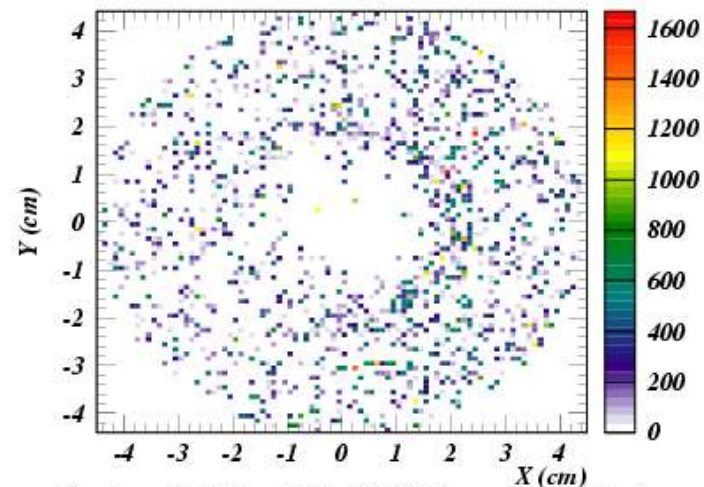
*Now using electron beam owing to
occlusion of e^+ sr photons*



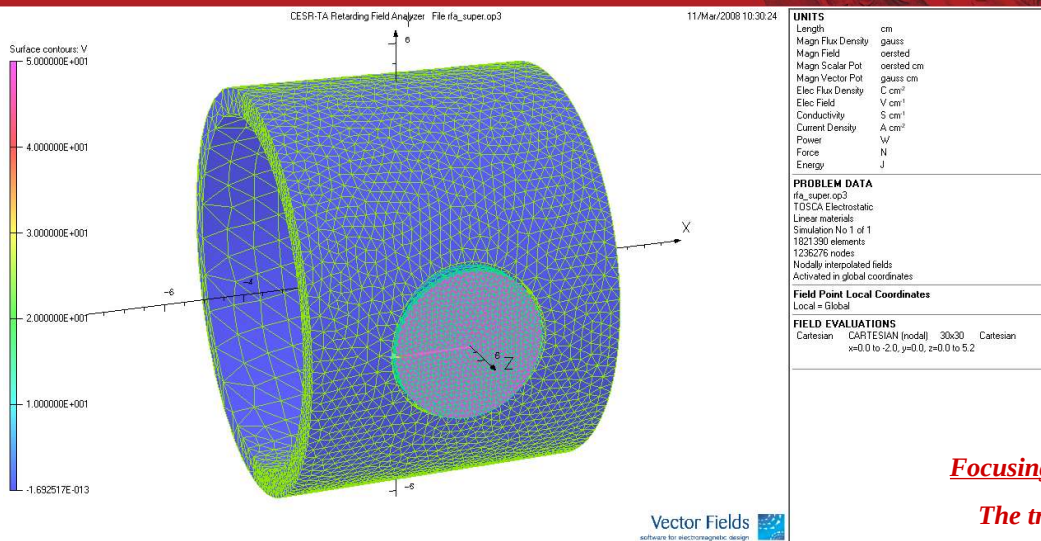
Job 237: Cloud Charge Profile $\times 10^3$



After bunch 45 (No energy cut, 22230 macroparticles) $\times 10^3$



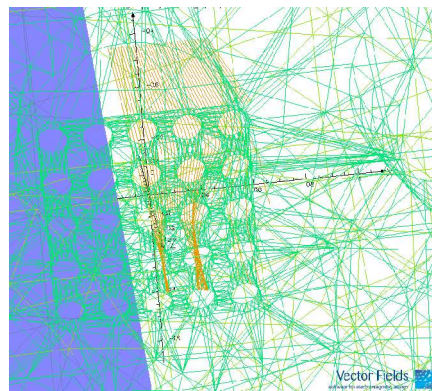
After bunch 45 ($e_{kin} > 10$ eV, 3452 macroparticles)



The Vector Fields OPERA package used to design the CEsR-c superconducting wigglers (c.f. PAC2003/2005) now serving as baseline for the ILC DR wigglers has been used to model the field shaping in the RFA detectors. Tracking in the RFA electric field with an arbitrary superposed magnetic field is possible. Secondary emission in the RFA cannot be modeled in this approach.

Focusing effect of the RFA grid holes

The transmission for electrons is greater than the optical transmission, and depends on the energy spectrum.



Detailed modeling of the grid holes

The sophisticated 3D finite-element mesh algorithm allows calculation of subtle effects in the RFA geometry. An exaggerated example of the effect of etching the grid holes is shown here.

RFA Wiggler Vacuum Chamber

