

Coherent Tune Shift Measurements in CHESS Arc Pretzel Conditions

Jim Crittenden, Stephen Poprocki, John San Soucie

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Coherent tune shifts from field gradients 5.289 GeV 45 e+ bunches



Tune shifts calculated from horizontal and vertical electric field gradients at the center of the beam pipe. Longitudinal time-slice charge-weighted average is uses the six time slices per bunch. Lots of information here. Simulation will be challenging.



Measurement and ECLOUD modeling for Feb/2009 tune shift measurements with 45-bunch 2.1 GeV positron trains (Slide 4 of talk on 11 Nov 2009)



Remarkably successful modeling of vertical tune shift along 45-bunch positron trains showing the relative contributions of the drift (23%) and dipole (62%) regions.

By the way, one point in this talk was that there was a significant dependence of the model on the vertical beam size, the tune shifts increasing for larger beam size.



Pinch effect Transverse cloud charge distributions for 11 time slices during bunch 20 in a 2 mm x 2 mm area

Drift region

800 G dipole field





Content of the second second

Horizontal







Pinch effect Beam-weighted cloud densities for bunches 11-20



We don't yet know which cloud characteristic will describe the emittance blowup. If the density averaged over the beam region varying along the bunch length is important, a dependence on train length would indicate the relative contribution of the drift regions.



Pinch effect Effect of quadrupling the bunch current for the 800-G dipole case

1.2e10 e+/bunch

4.8e10 e+/bunch

-0.05

0.05

-0.05

-0.05

-0.05

-0.1

-0.1

No energy cut: 0k macroparticles, 4 10⁶ e-

No energy cut: 1k macroparticles, 5 10

No energy cut: 2k macroparticles, 10 10⁶ e

No energy cut: 3k macroparticles, 16 10⁶ e-

No energy cut: 3k macroparticles, 16 10⁶ e-

0.05

0.05

0.05

0.05

0.1

0.



0.035

0.03 0.025

0.023 0.02 0.015 0.01

0.005

 $0.05 \\ 0.04$

0.03

0.01

0.08 0.06

0.04

0.02

0.08

0.06

0.04

0.02