

OSC Updates

- Undulator-as-quadrupole
- Dispersion in lens

Undulator as Quadrupole

- Give kicks:

$$\Delta x' = -(eB_0/(\bar{v}ym))^2 L/2 \Delta x_0$$

$$\Delta y' = -(eB_0/(\bar{v}ym))^2 L/2 \Delta y_0$$

- Use quadrupole formulas with effective $K1$ of $1/2 (eB_0/(\bar{v}ym))^2$ (for simplicity)
- Incorporated as custom tracking and custom `make_mat6` routines

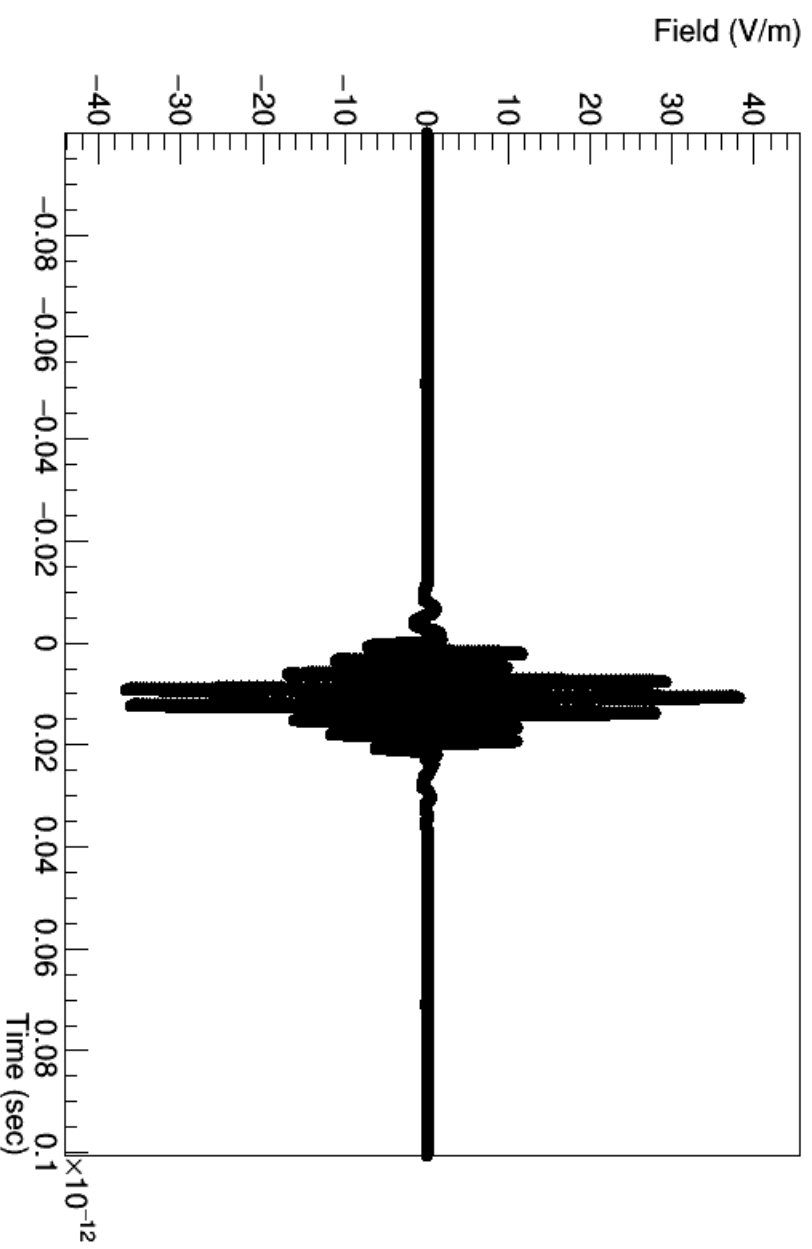
Undulator as Quadrupole

- Has proper focusing
- Internal tracking and radiation integrals almost certainly incorrect
- Dispersion?
- Still need to at least simulate ADTS

Dispersion in Lens

- Various frequencies strike lens, seeing different indices of refraction – dispersion potentially important

$E(t)$ Without Dispersion

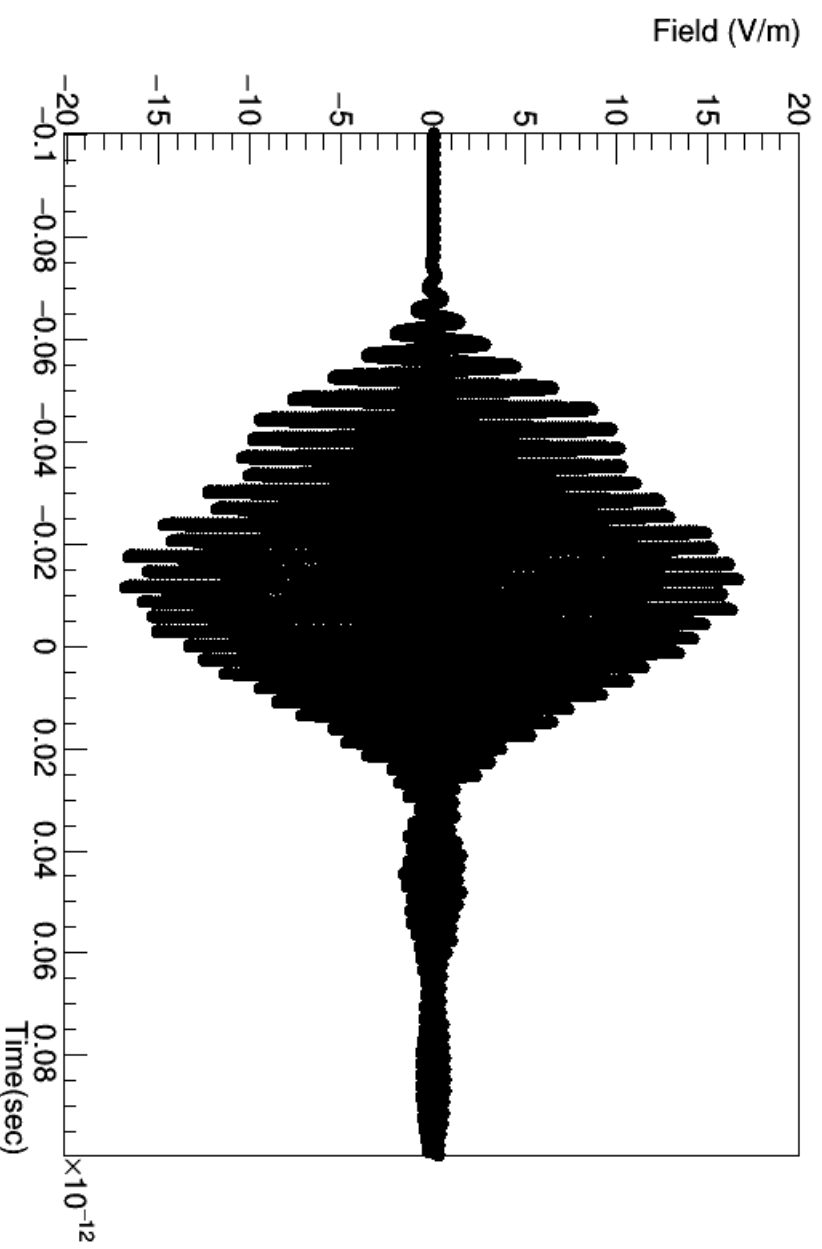


2.6 m undulator, 8 x 32.5 cm periods, $K = 4.23$

MgF₂ lens, 5.3 mm thick, 14.5 mm radius

(Values chosen to match Matt's simulations)

E(t) With Dispersion



2.6 m undulator, 8 x 32.5 cm periods

MgF₂ lens, 5.3 mm thick, 14.5 mm radius

Recentered $t=0$ due to different group velocity

Comparison of Energy Transfer

- Without dispersion, 170 meV energy transfer
- With dispersion, only 63 meV
- Have not compared the energy kicks, but plots on previous two slides agree with Matt's results

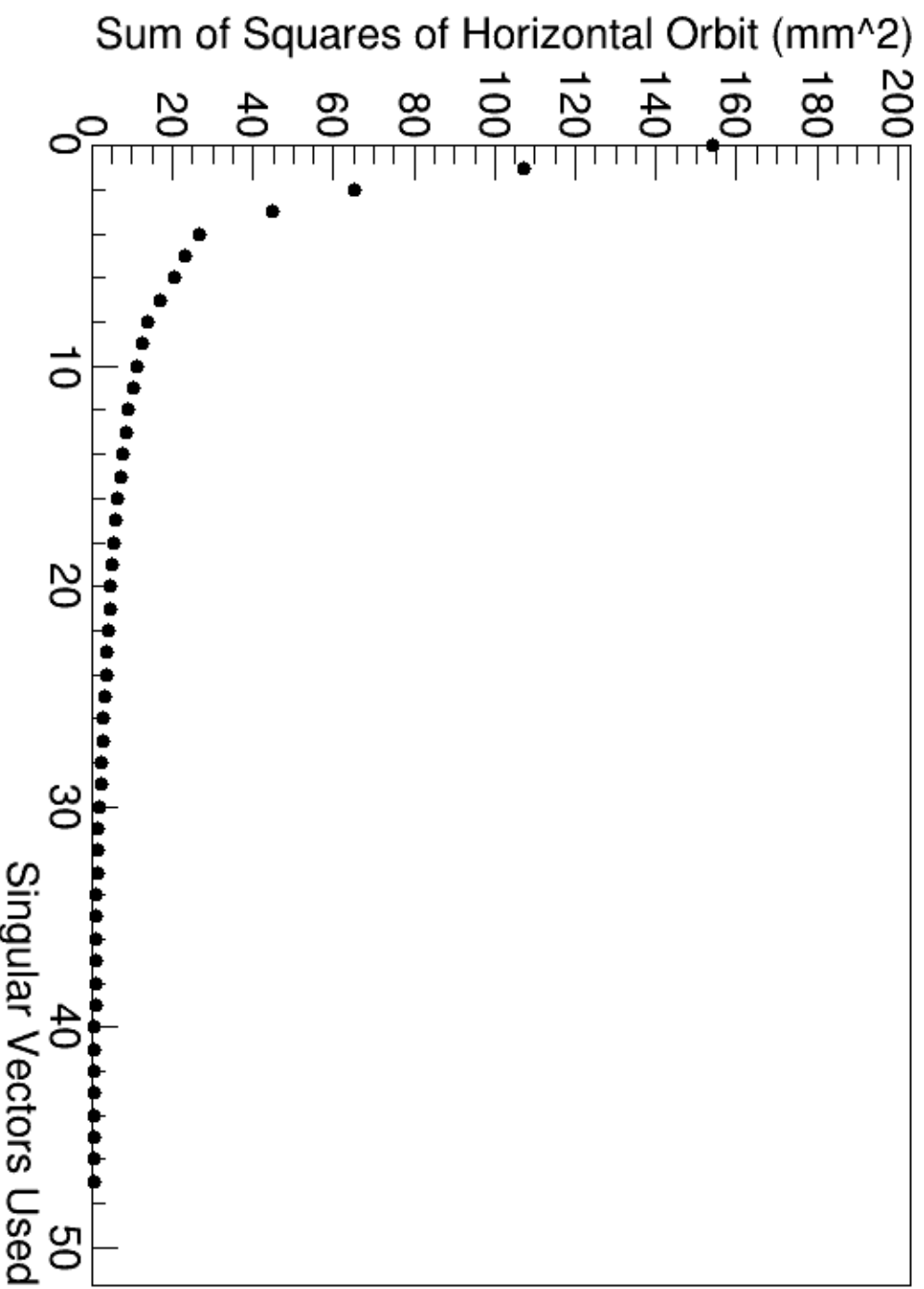
Funny-Shaped Lens?

- Attempted shaping lens to take into account effects of dispersion
- So far, not helpful

Sloppy Models Update

- Fix horizontal orbit at 1 meter intervals with errors due to g_err in dipoles - this avoids any bias due to BPM placement

Effectiveness of Knobs



Error Source Not quite Right?

- <https://cesrwww.lepp.cornell.edu/docs/magnets/synch/synmag.html> notes that there are remnant fields in dipoles
- Article goes on to note: “However, in view of ... *much larger orbit distortions due to other sources*, the orbit error caused by the difference in B_{rem} may not appear very important.” (emphasis mine) – these “other sources” are not identified
- Also troubling: “Revision Date: Jun. 14, 2003”

Future

- Determine proper error source
- Fix orbit at injection point separately