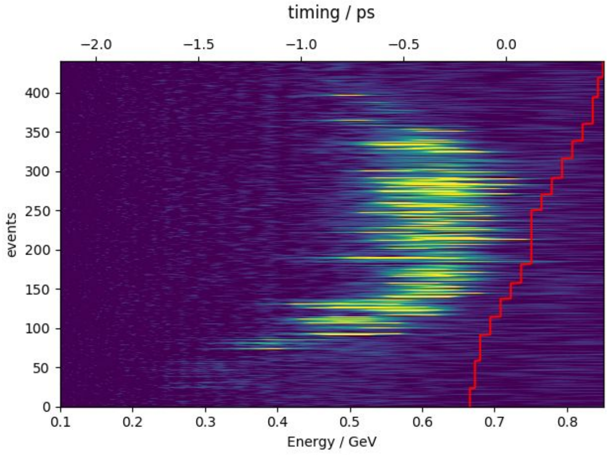
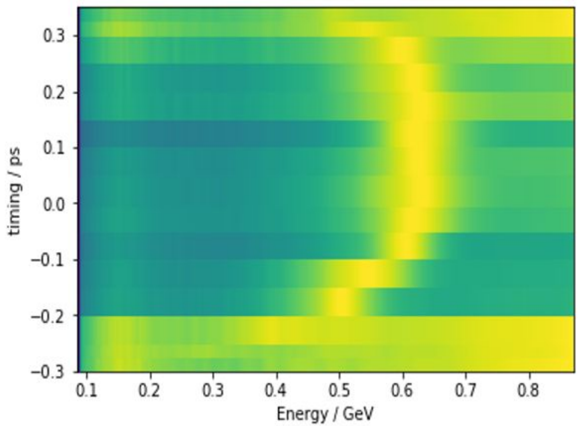
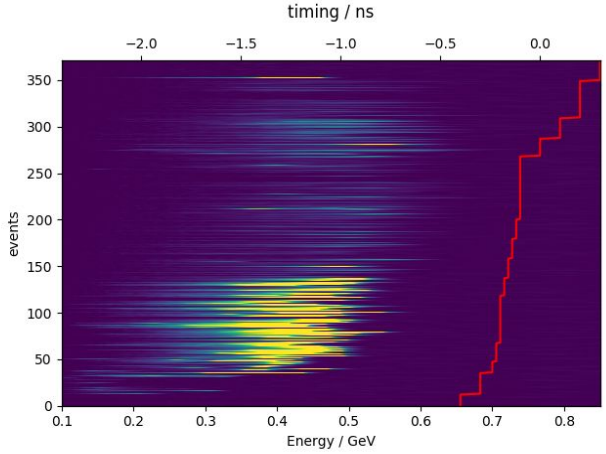
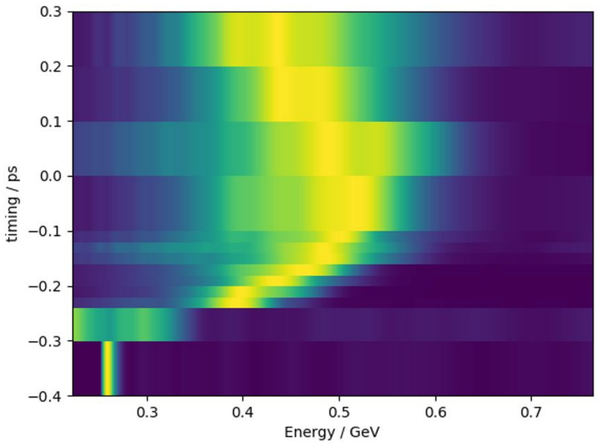
Time delay scans

Summed
waterfall plot









Last time:
I explained that while measured energy trends are rather clear, they are not straightforward to explain.

My strategy:
Understand trends from the wakefield amplitudes along the plasma from simulations

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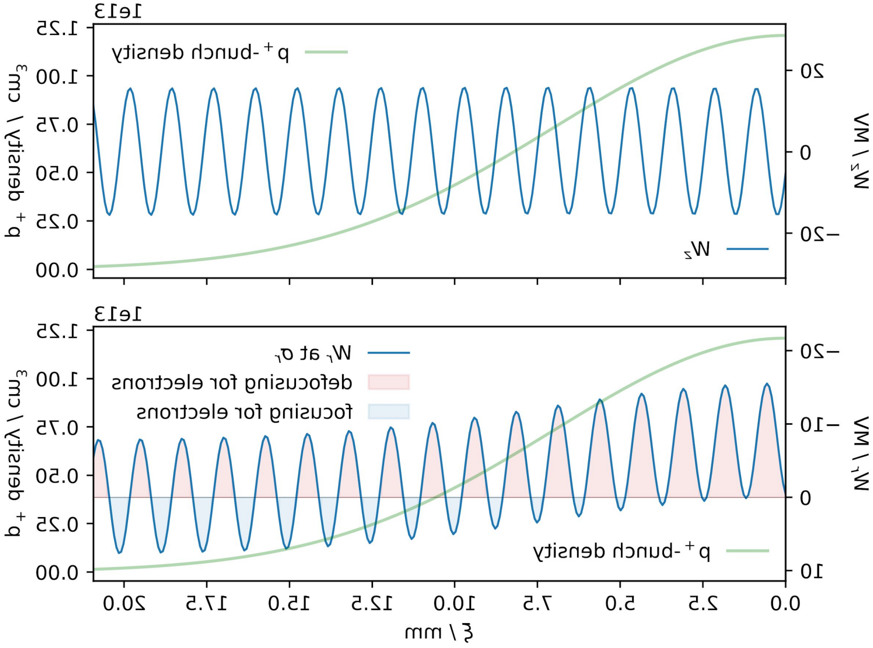
Started LCODE simulations

To verify the simulations, I decided to compare the wakefields after the first step to linear theory calculations.

What do we expect from theory?

Bunch:

- longitudinally and transversely Gaussian
- constant bunch density
- seeded at the center



Longitudinal seed wakefields W_z

Transverse seed wakefields W_r at sigma_r

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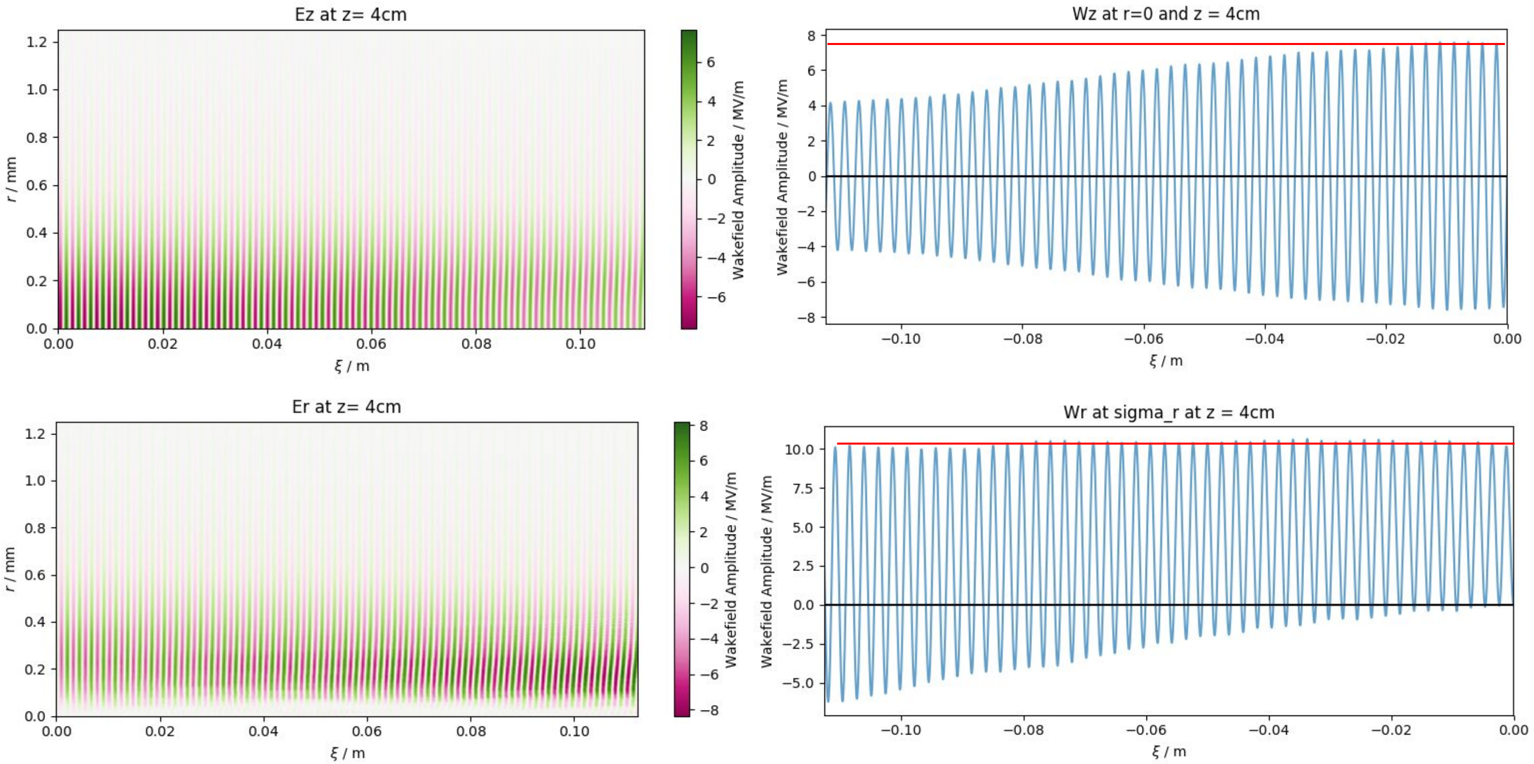
Simulation effort

Simulation parameters:
npe = 2e14/ccm
3e11 protons/bunch
sigma_z = 8 cm
sigma_r = 0.17mm

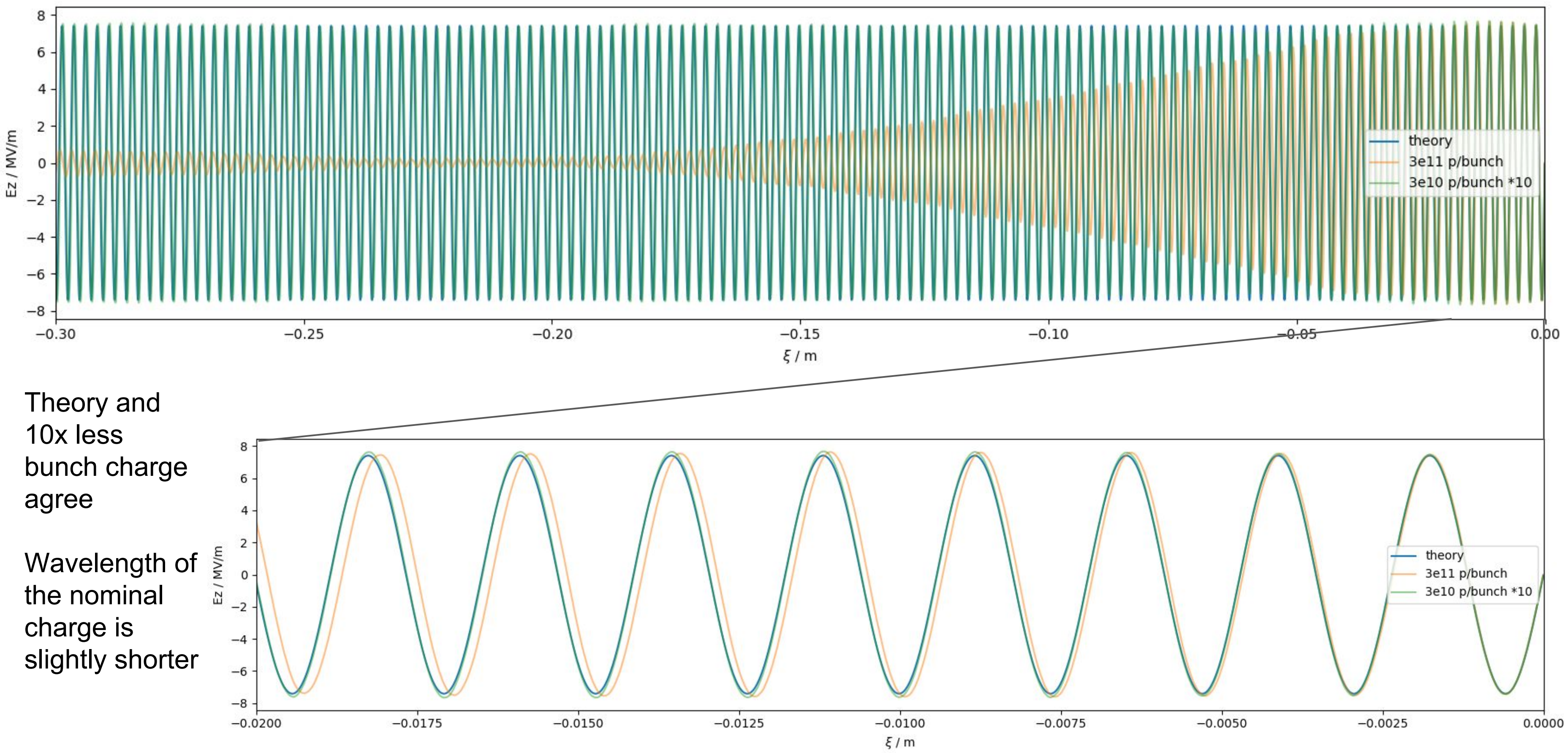


Amplitude decreasing along the bunch?

Amplitude increasing along the bunch?

⇒ tried to change: resolution in r and xi, number of plasma particles and number of beam particles; then I lowered the bunch charge by a factor of 10

Linear Theory / Simulations



Theory and 10x less bunch charge agree

Wavelength of the nominal charge is slightly shorter

Simulations

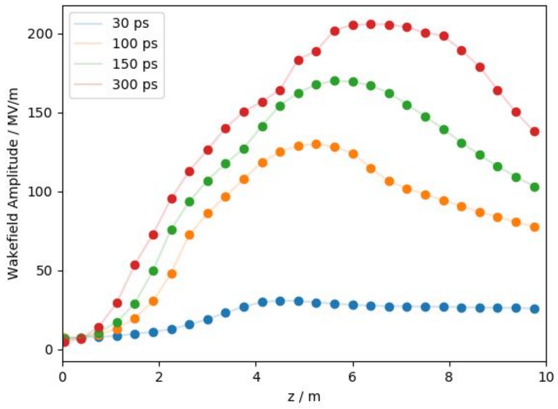
Look at the wakefield amplitudes along the plasma (z) at a given delay (xi) for different seed points

Seed-delay scan

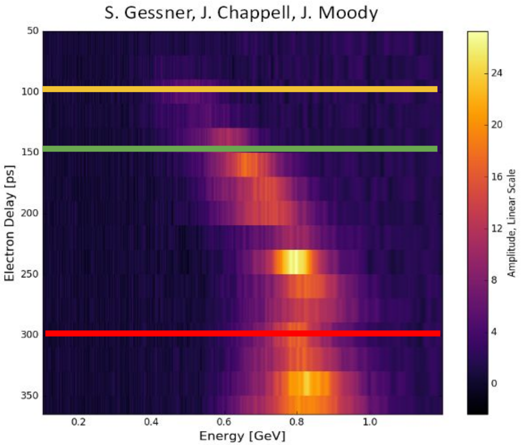
Experimentally we changed the seed point from **~-250ps to ~400ps** and measured with **200 and 600 ps** delay

Simulations for seed: -200, **0**, +200, +400 ps with a 20 cm simulation window

only simulation that is finished so far



Somewhat in agreement (although seed for measurement was slightly ahead of the center)



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