Betatron motion of electrons with a transverse offset

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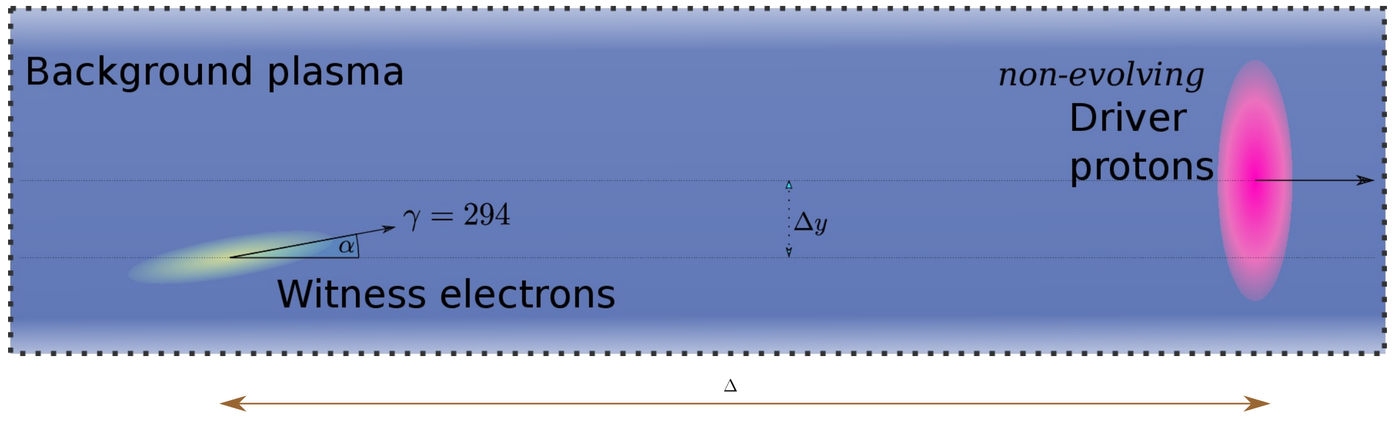
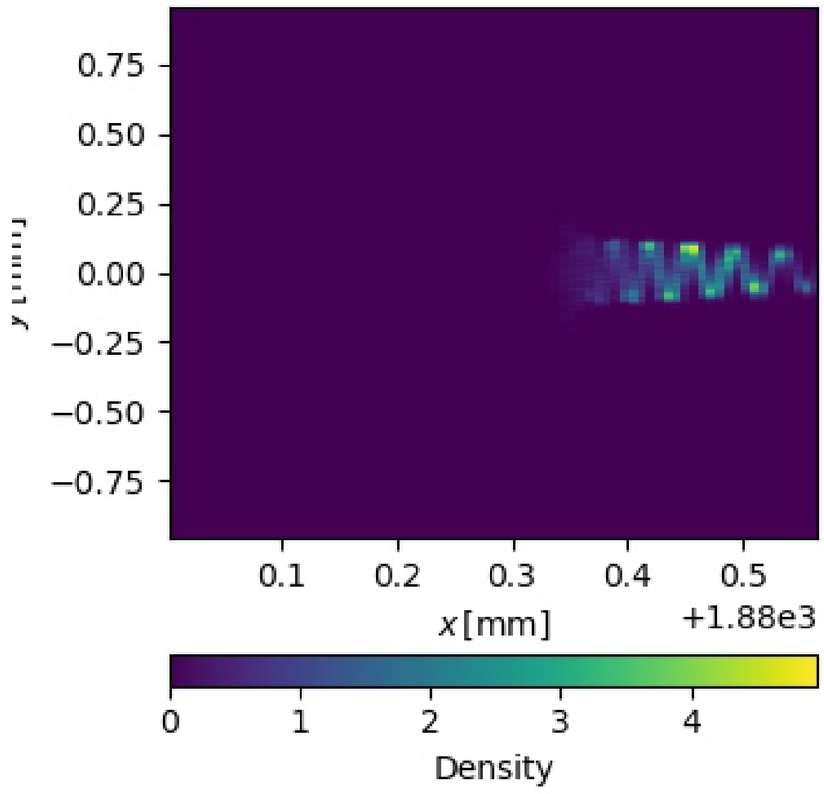
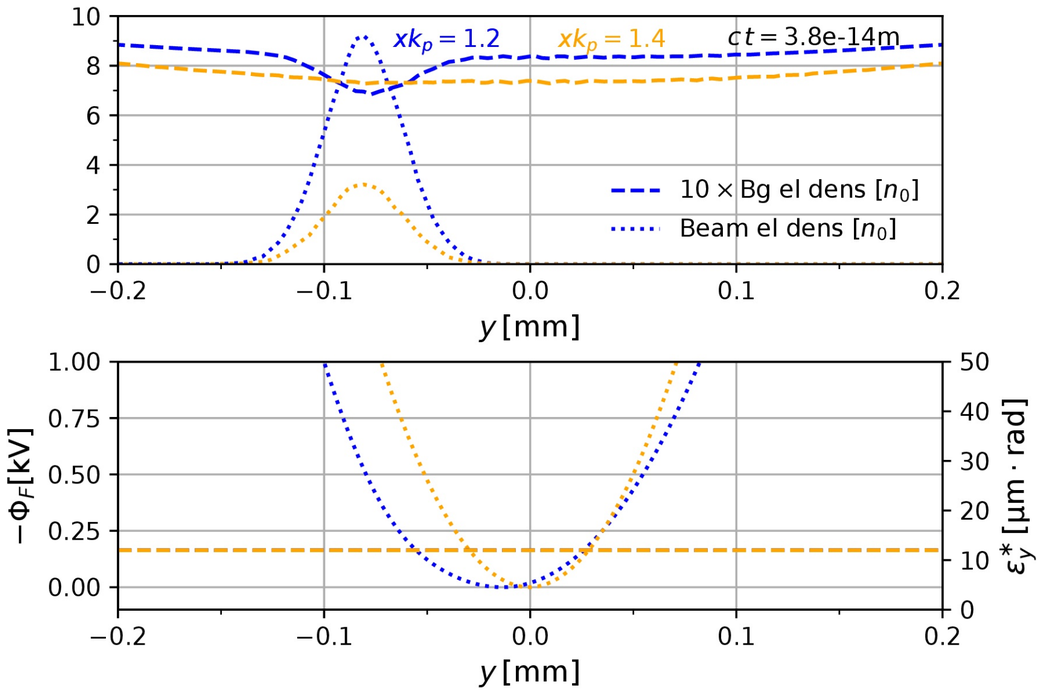


- Quasistatic qv3d simulation with n_e=2.0·10^{14} cm^{-3}
- Monoenergetic proton **driver** with 48nC, γ=426.0, and transverse 1/e length **1.41$\sigma^{(d)}$=269 μm; not evolved** throughout simulation
- **Witness** beam of electrons injected with 102pC, γ=323.0, and normalised emittance ϵ=12.0mm·mrad (Livio's **low-density** scenario)
- Witness beam trails behind driver by Δ (centroid to centroid), displaced **off-axis** by Δy (< 1/e width of driver)

[cf. Olsen et al., PRAB 2018]

Transverse offset: 113 micrometres



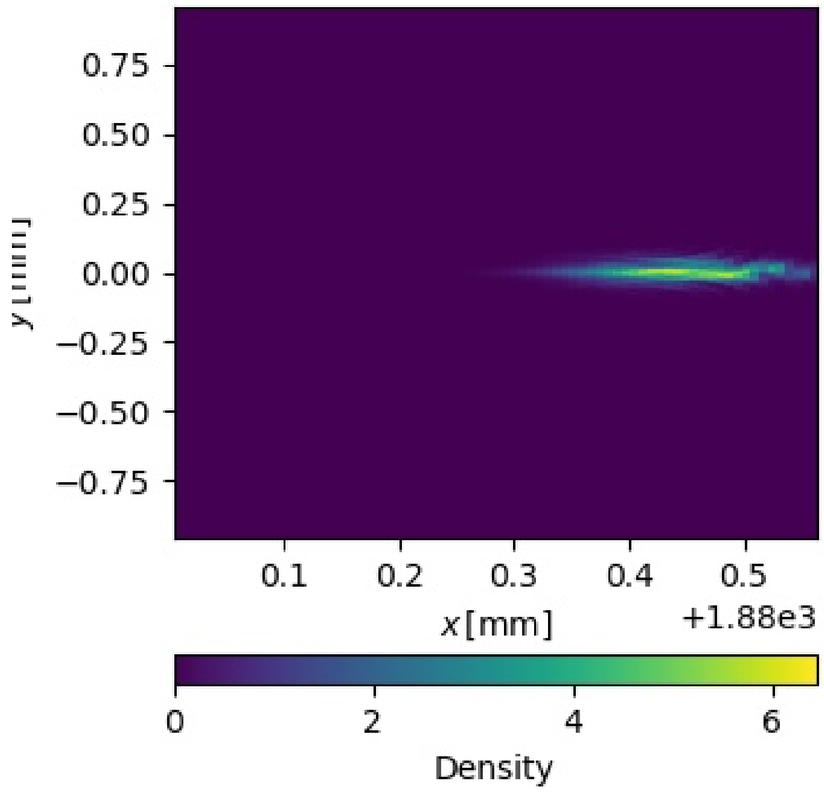


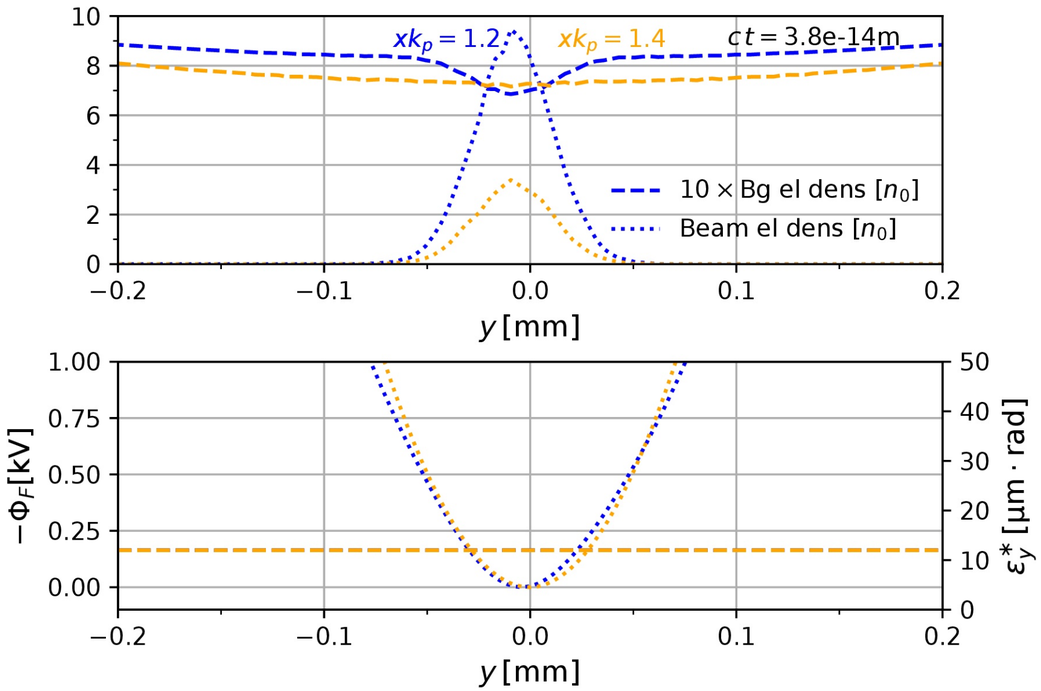
Transverse cut through

Head of witness

Centroid of witness

Transverse offset: 11.3 micrometres



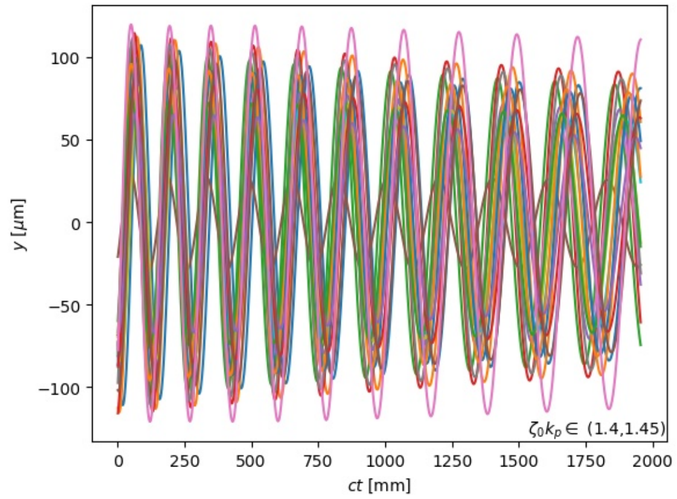


Transverse cut through

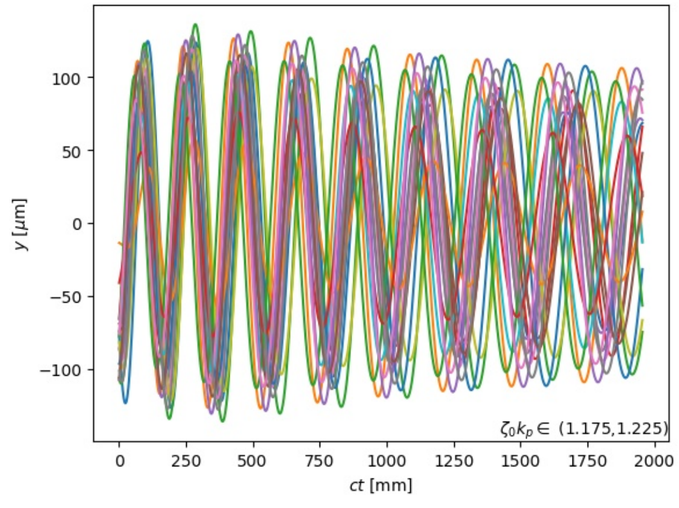
Head of witness

Centroid of witness

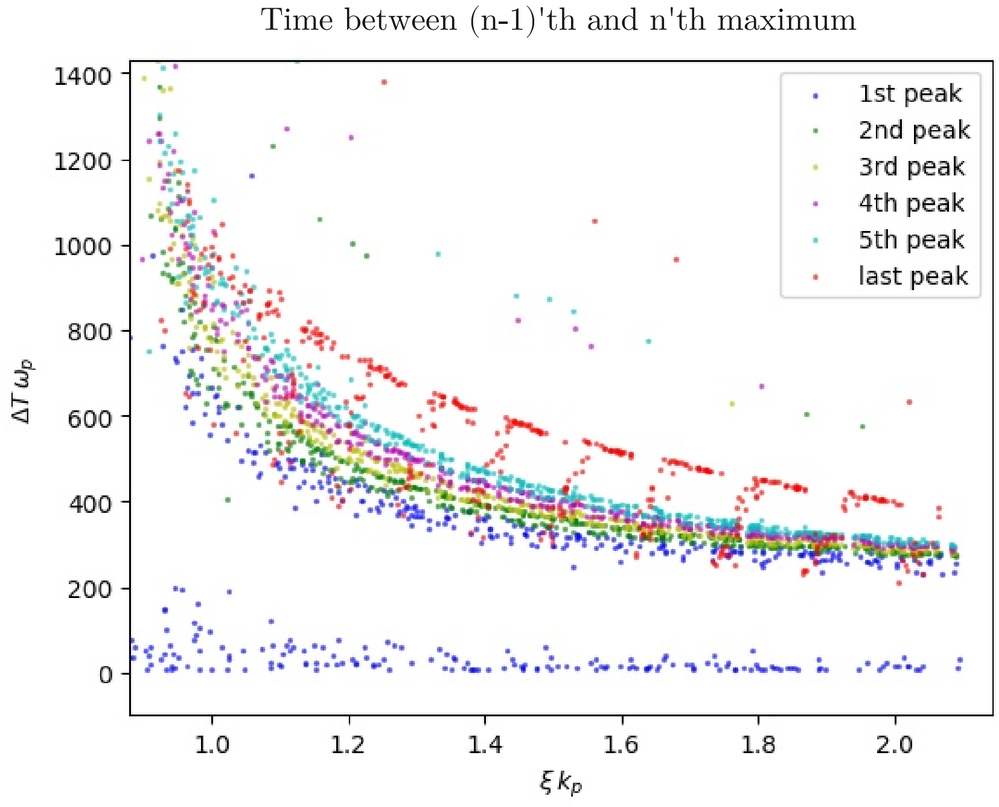
Large-amplitude betatron oscillations



Witness head

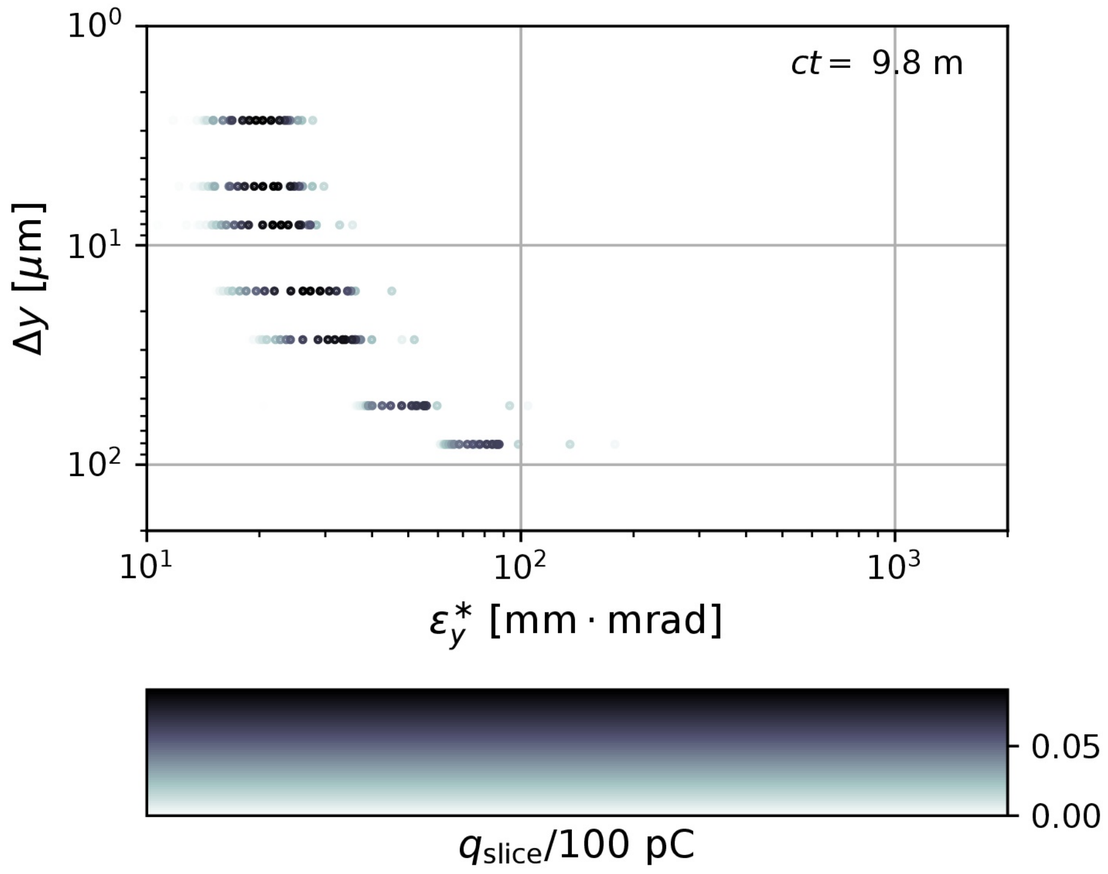


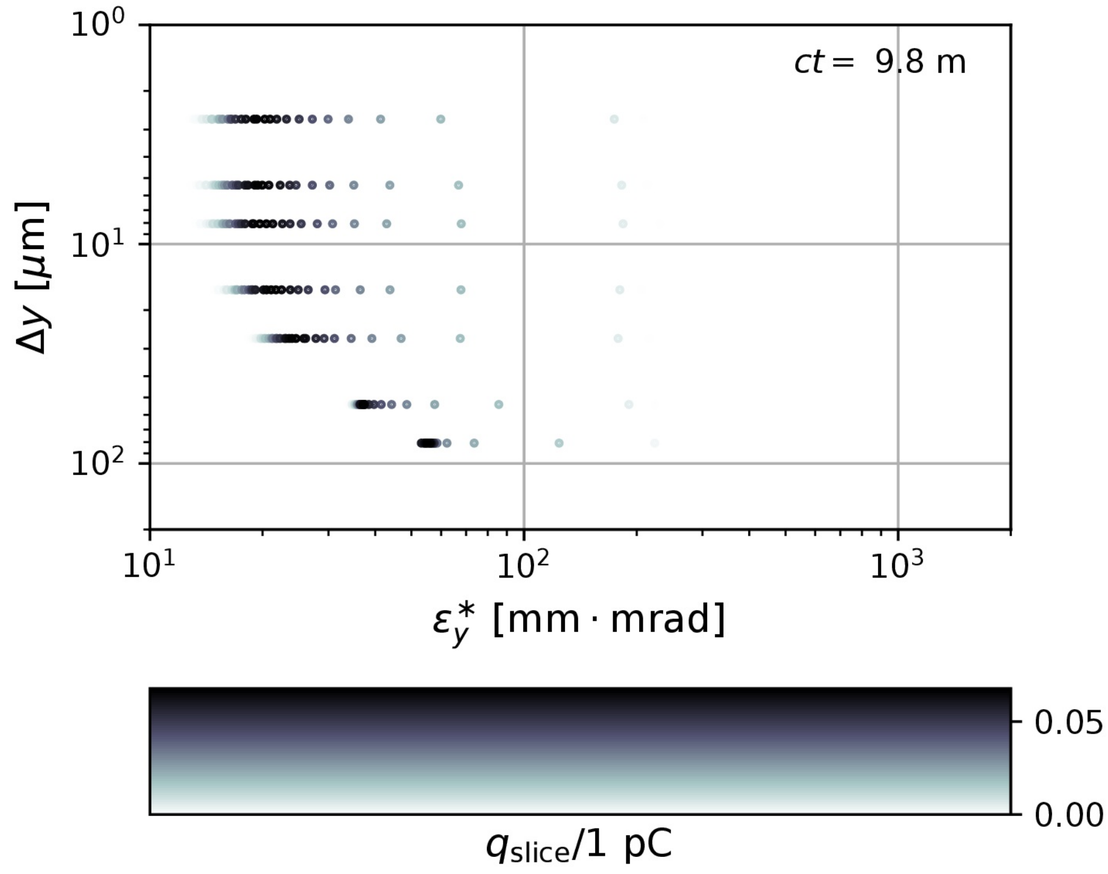
Witness centroid



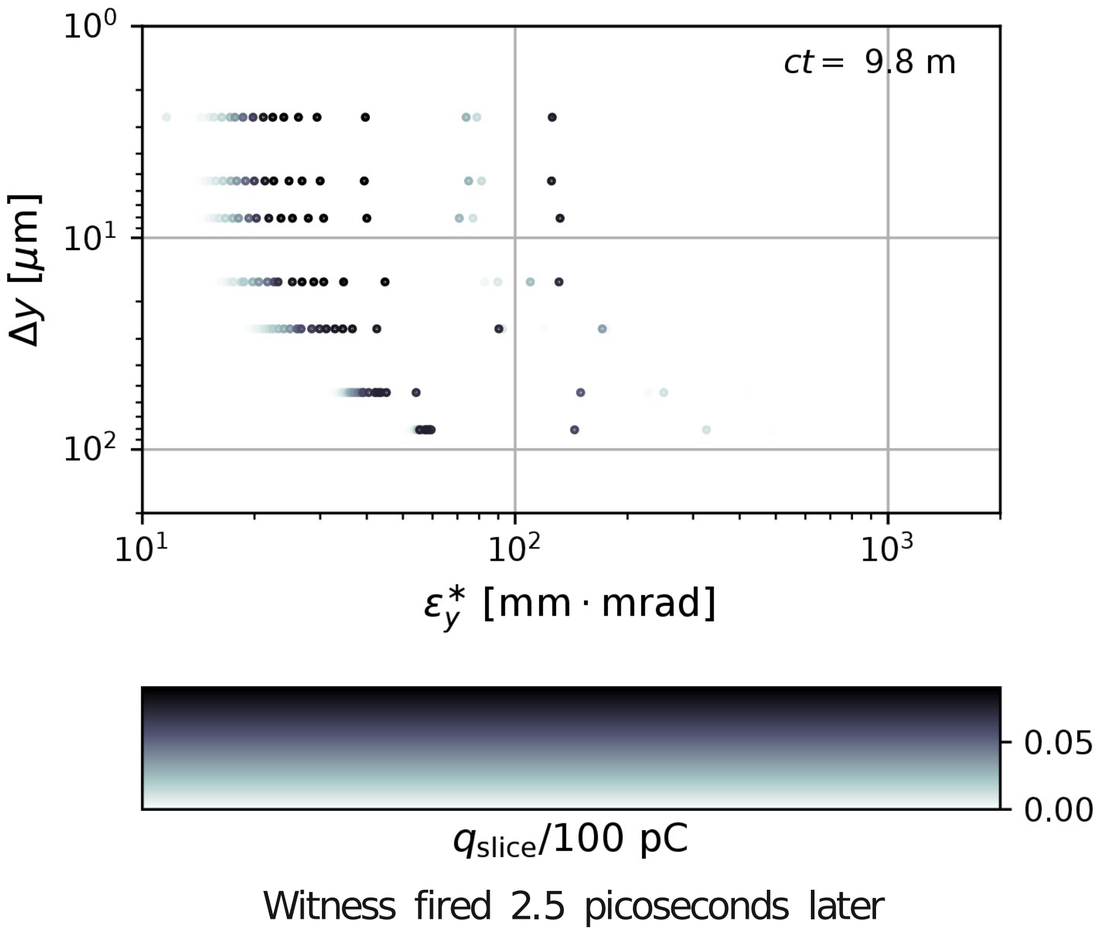
Our focussing device is co-moving with the beam, and the betatron frequency changes along the beam.

No self-fields: very low-charge witness

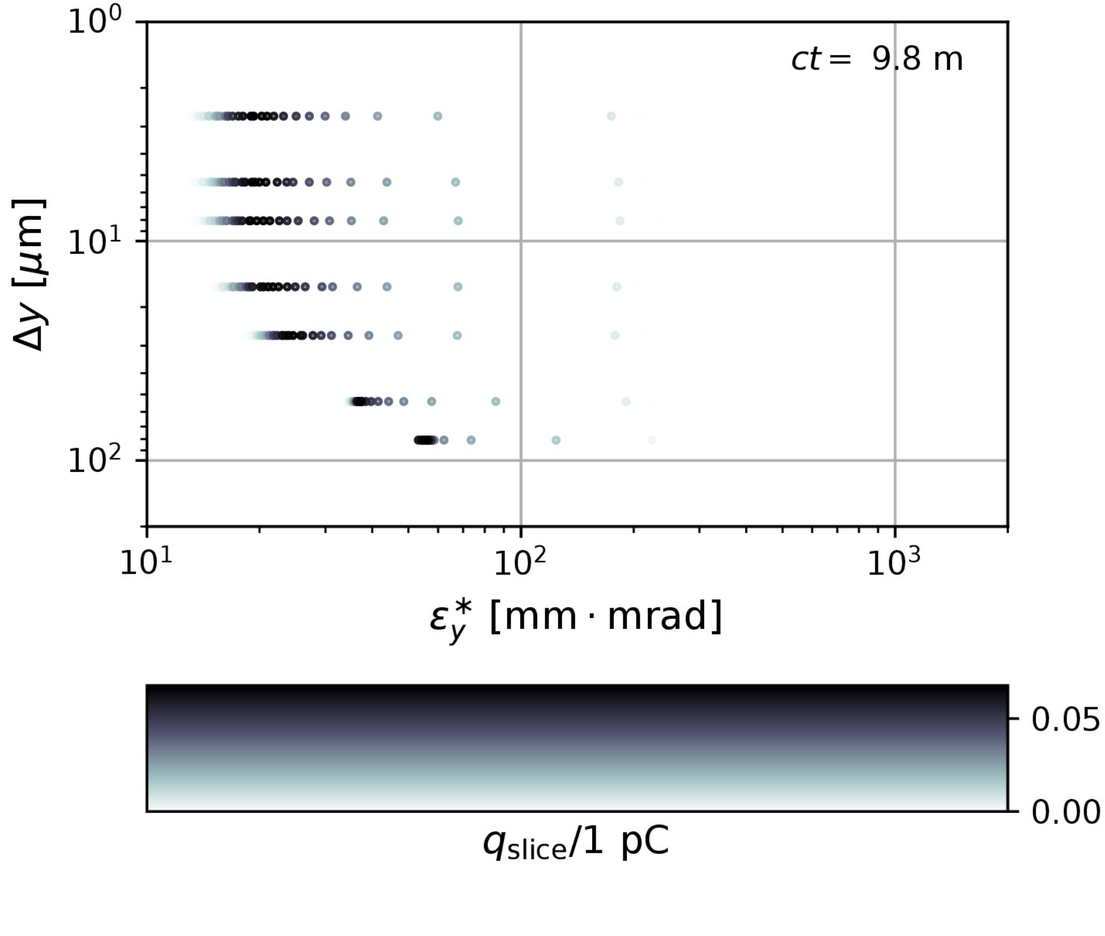


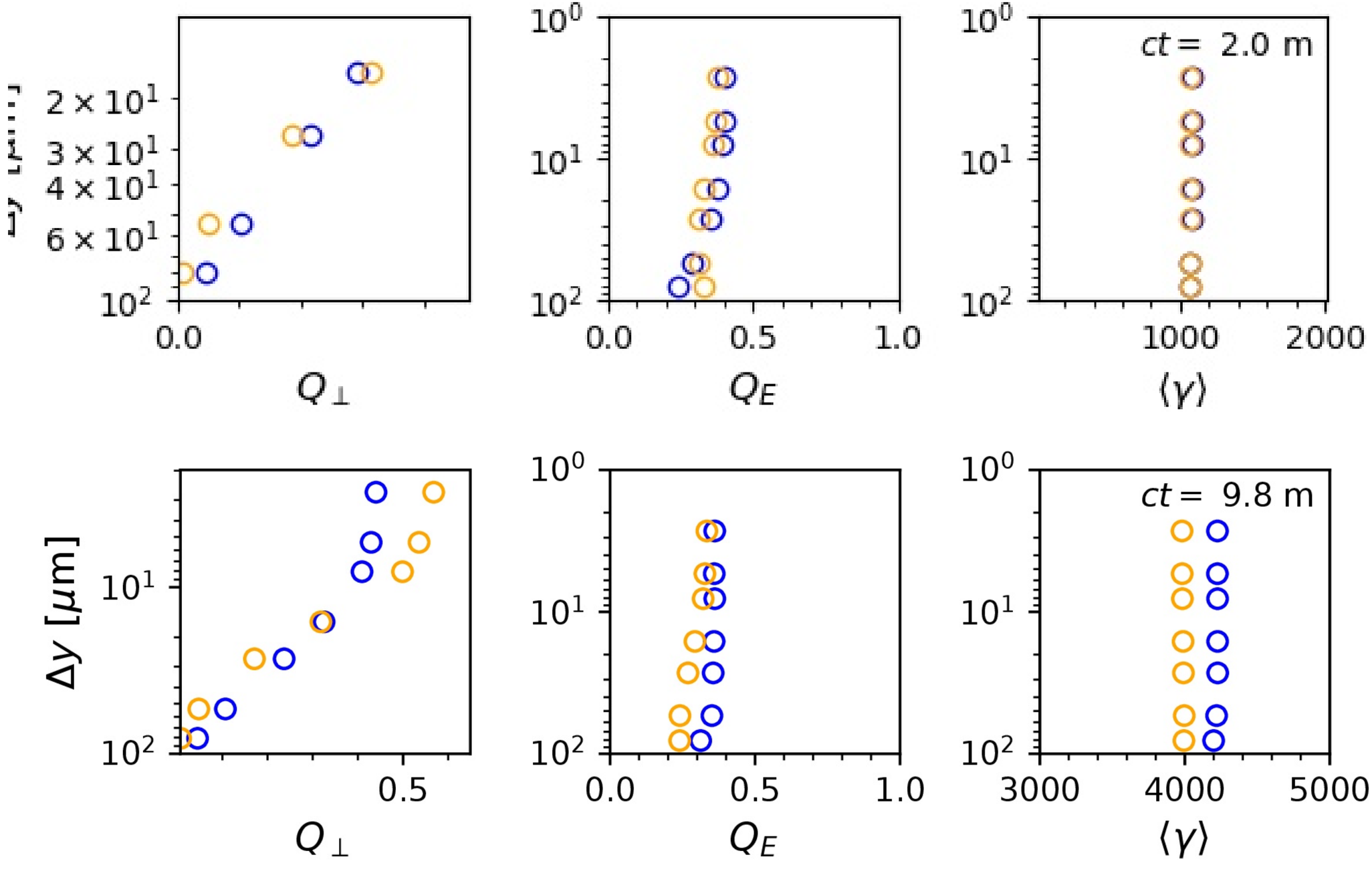


Delaying the witness further



Witness fired 2.5 picoseconds later





Witness fired earlier / later