**Simulation**

- Q=50pC is chosen in the experiment due to the energy modulation feature!

**Simple Model**

- The energy beamlets are formed when the energy gain/loss is small compared to the initial energy spread of the beam Q=50pC

**Experimental Data**

- Large ΔL/λpe less rapid current rise lower initial E Beam slower saturation
- In the experiment, ΔL/λpe <0.3 → E Beam/Q>>0.9 well seeded instability

- Fringes visible when nQ<< E Beam when nQ as desired for the energy modulation to be visible.

- Consistent with linear theory calculation

**Conclusion**

- Simulations show the 50pC ATF beam is subject to periodic energy modulation at 2cm propagation distance, which is an important evidence of SMI seeding
- Simulations show that SMI does not grow significantly over the 2cm plasma for 50pC ATF beam
- Experiment demonstrates the first observation of SMI seeding through energy modulation
- Simulations show well-seeded instability in the experiments

**Seeding of Self modulation Instability of a Long Bunch in a Plasma**

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