INFLUENCE OF SPACE CHARGE EFFECTS ON LANDAU DAMPING IN HIGH-INTENSITY HADRON SYNCHROTRONS

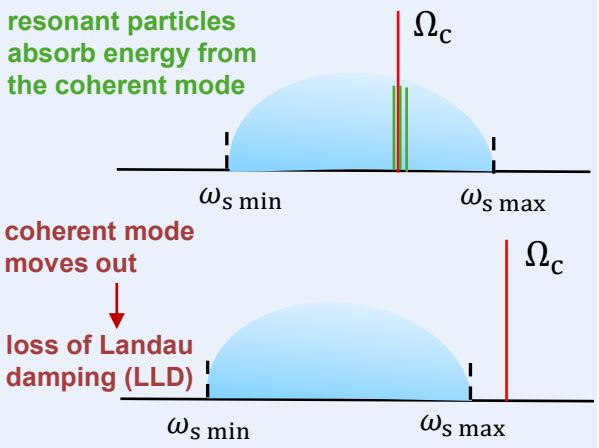
Poster overview | CSNS-RCS | Hofmann-Pedersen model, tracking program, and PIC simulation

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Research question

How does longitudinal space charge influence Landau damping?

Physical picture



How the work is built

1

Hofmann-Pedersen model

- Synchrotron frequencies for **sinusoidal rf cavity**
- Coherent dipole frequency from a rigid model

2

Tracking program and Benchmark

- **FFT-based** longitudinal space-charge solver
- Matched beam dynamics

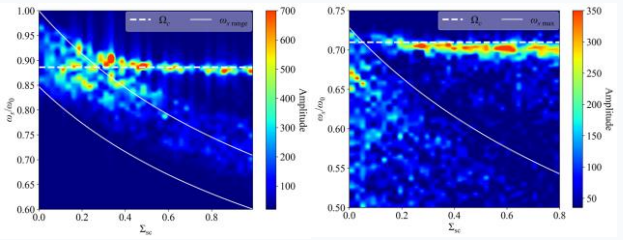
3

PIC simulation

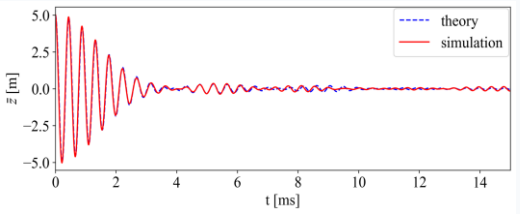
- Noise spectrum from centroid-motion extraction
- Apply an **initial offset** and **rf phase modulation**

Core results

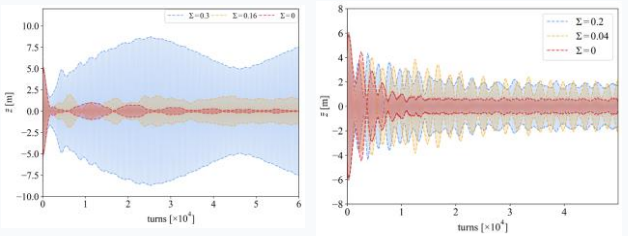
Noise spectrum



Decoherence baseline



Threshold validation



Takeaway: Space charge modifies the incoherent frequency spectrum, thereby affecting the Landau-damping threshold.