Reduced Model Bunch Dynamics - Part II

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SLAC - BNL - LBNL

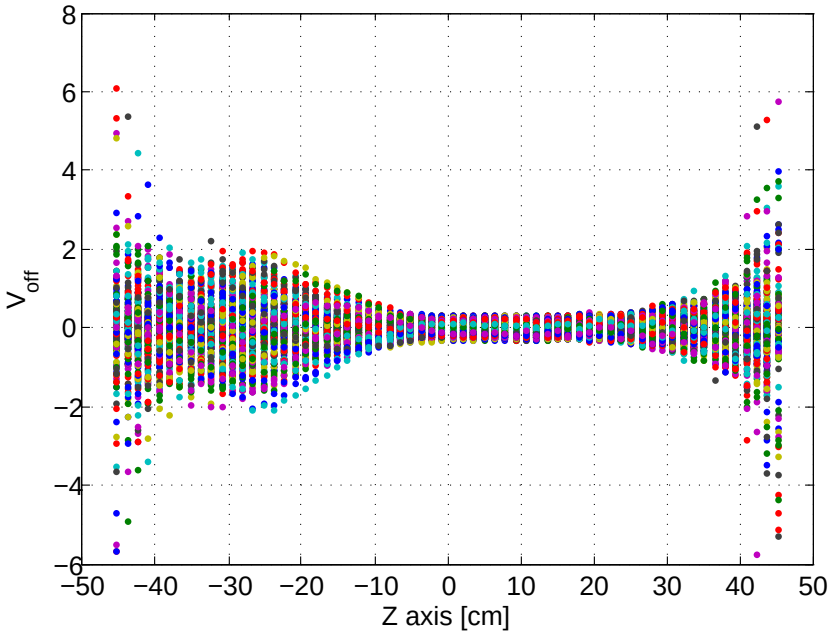
Introduction

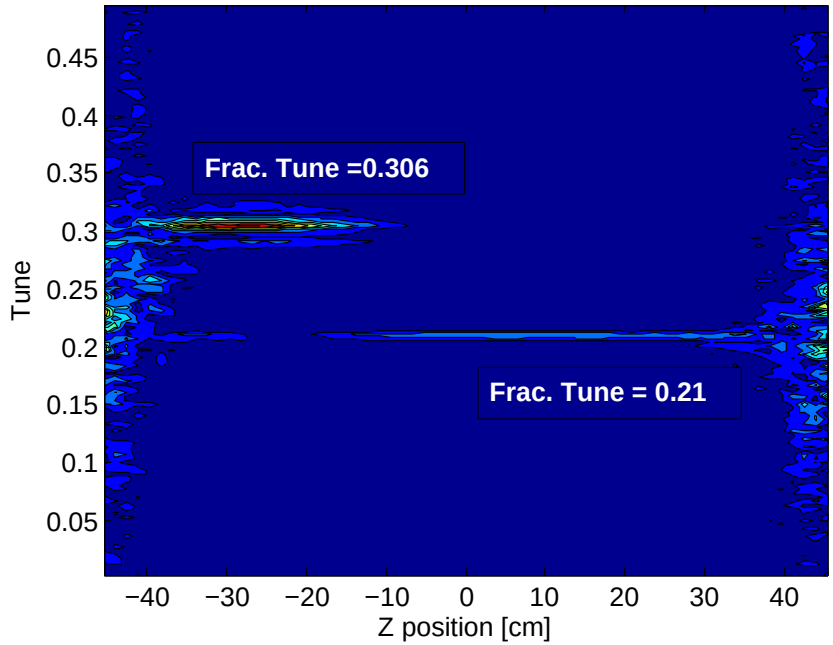
Summary & Questions

- Agreement between simulation codes
  - Why do we (SLAC) see big tune differences, structure differences between WARP and Head-Tail data? Is there agreement and we are considering something wrong?
- Comparison MEASURED DATA vs SIMULATION Outputs
  - We need to look at the SPS data from June 2008 using same sliding window technique (need to get the TeK scope data in matlab form). What does it look like?
- Reduced Model progress
  - We need to improve eigenvalue estimation method, so that the reduced model is a better representation of the actual dynamics.
- Discuss/Prepare material for LARP CM18 meeting

Introduction

Previous Meeting

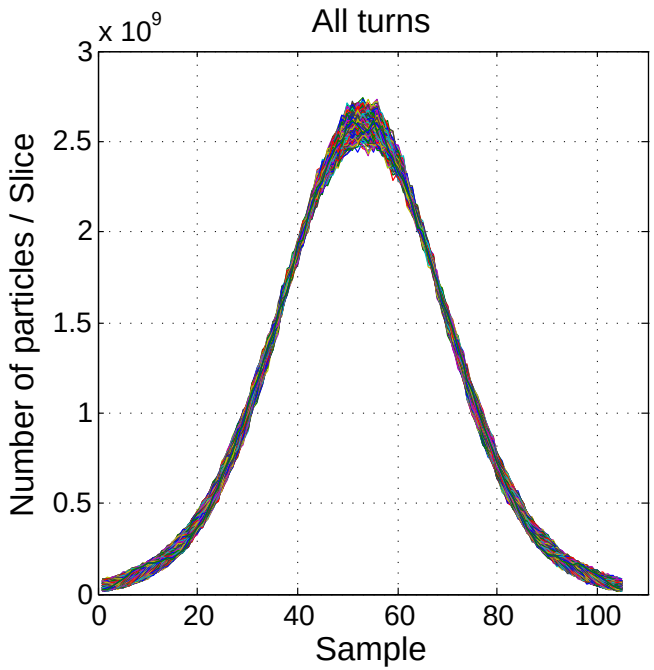


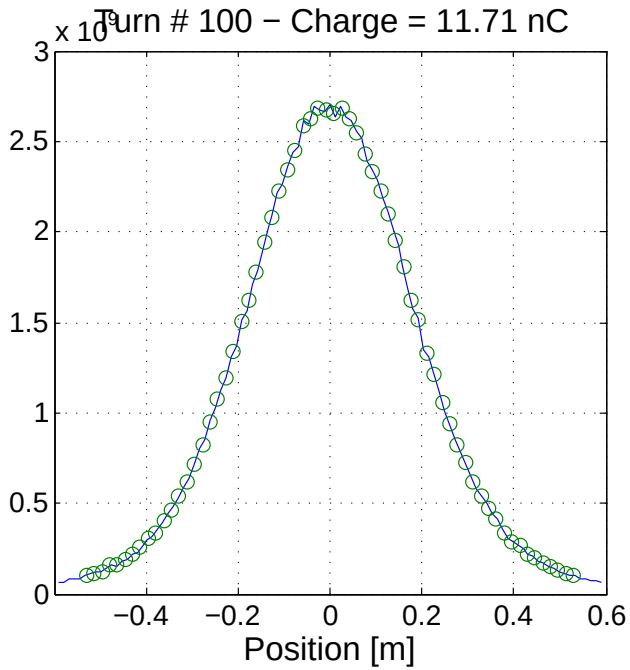


- Vertical displacement and tune analyzing data extracted from 'WARP' code.
- Same analysis will be presented using data extracted from 'Head-Tail' code.

Intrinsic Bunch Dynamics - E-clouds

Data extracted from 'Head-Tail' code

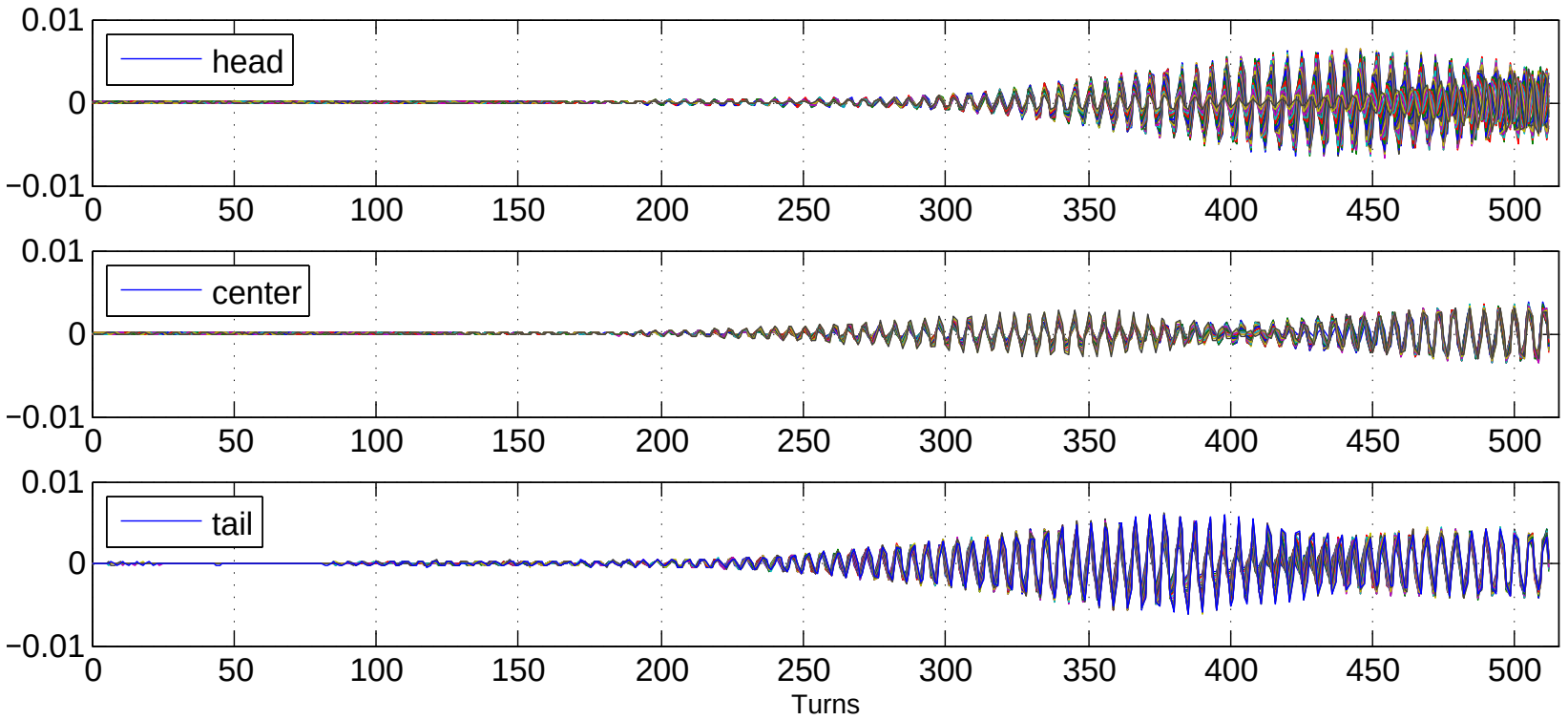




- In the 'Head-Tail' code, the bunch is divided in 105 slices. The data is re-sampled uniformly before analyzing. We used 64 samples per bunch (128-256 samples, same results).

Intrinsic Bunch Dynamics - E-Clouds

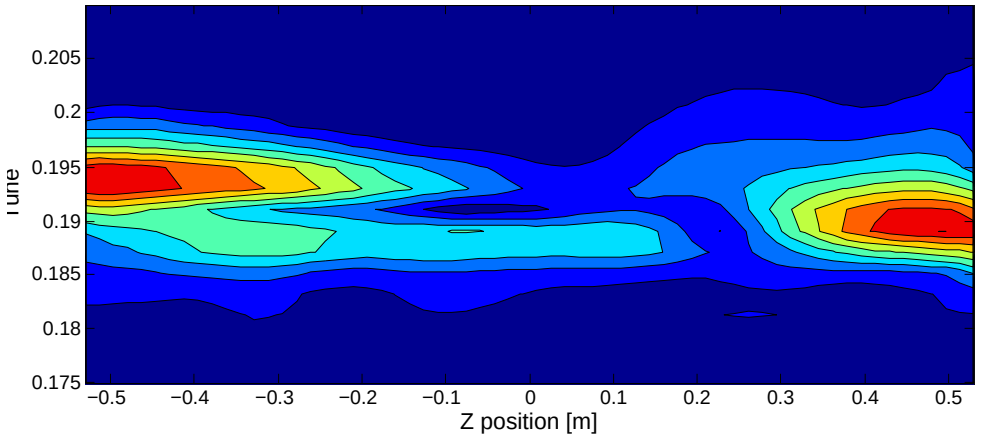
Data extracted from 'Head-Tail' code

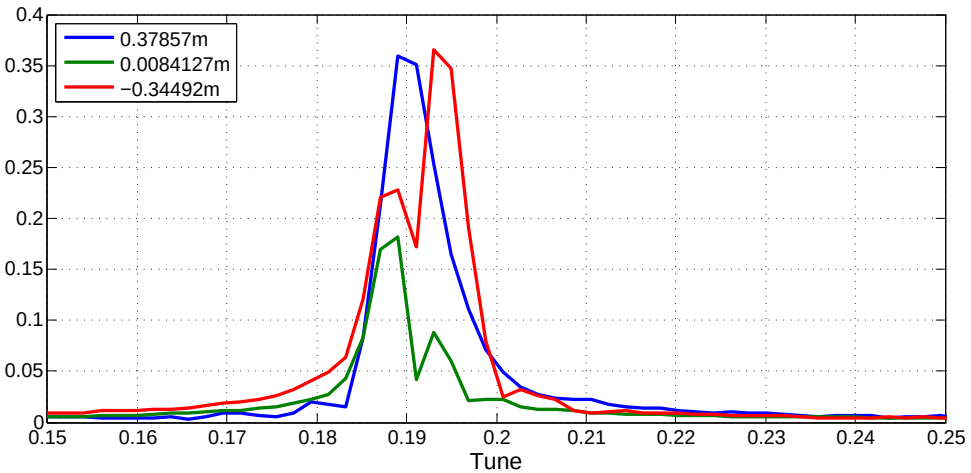


- View of time-domain oscillations of different slices located in the Tail-Center-Head of the bunch.

Intrinsic Bunch Dynamics - E-Clouds

Tunes



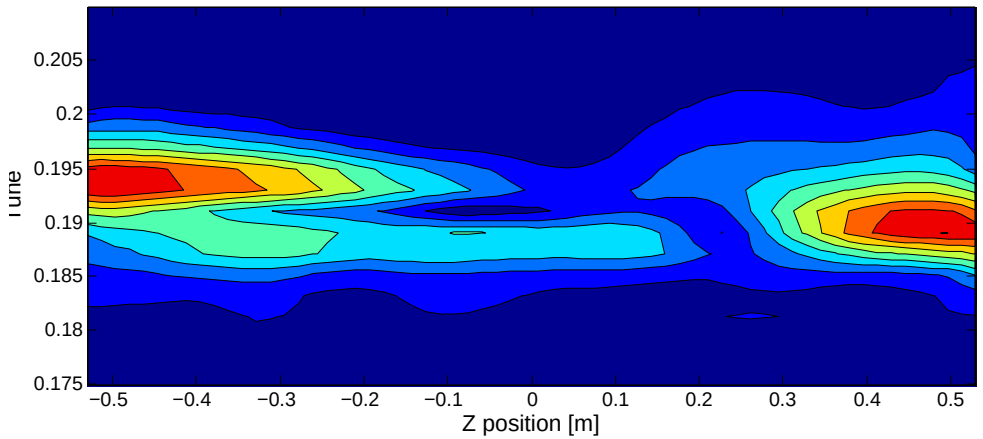


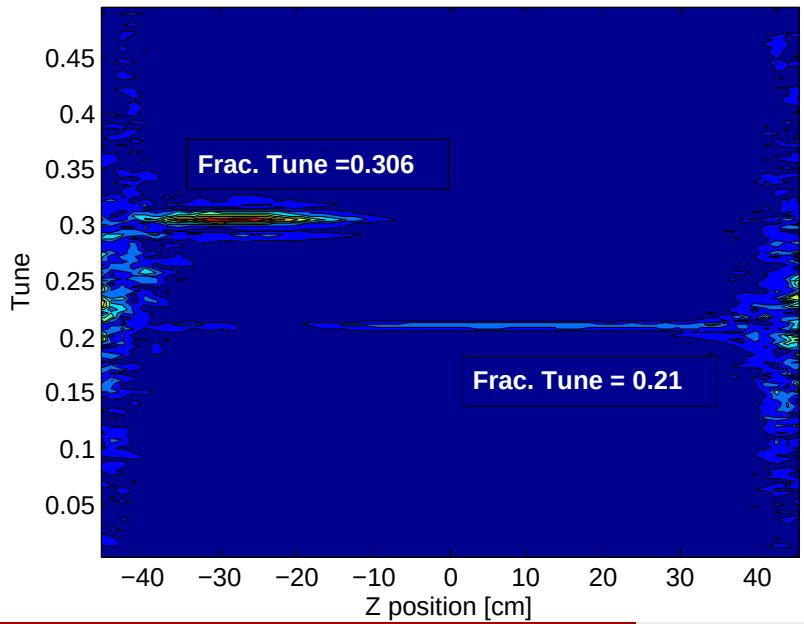
- The fractional tune of the 'Tail' is 0.194
- The fractional tune of the 'Head' is 0.190

Intrinsic Bunch Dynamics - E-Clouds

Intrinsic Bunch Dynamics - E-Clouds

Comparison of Results





'Head - Tail' code (120GeV)

- The fractional tune of the 'Tail' is 0.194
- The fractional tune of the 'Head' is 0.190

'Warp' code (26GeV)

- The fractional tune of the 'Tail' is 0.306
- The fractional tune of the 'Head' is 0.21
- 'Natural frac. tune = 0.185

Intrinsic Bunch Dynamics - E-Clouds

Comparison of Results

Dominant Unstable Eigenmodes - Estimated by fitting a linear model to the data generated by the dynamic simulations (not final numbers)

'Head-Tail' Code

$\lambda_i = 0.0186 \pm i2\pi 0.192\ (1/turn)$
$\lambda_i = 0.0152 \pm i2\pi 0.188\ (1/turn)$
$\lambda_i = 0.0041 \pm i2\pi 0.183\ (1/turn)$

'Warp' Code

$\lambda_i = 0.0166 \pm i2\pi 0.305\ (1/turn)$

Near Term Plans

- Continue with the validation of dynamic simulation results
- Compare simulation results with data from June 2008. Requires some consistent data format, some coding.
- Use linear model, estimate reduced models, set the bandwidth and complexity of feedback controller.
- Estimate sytem performance and implementation limitations (position measurement, kicker design and performance, etc.)