Longitudinal Feedback Commissioning at BEPC-II

Preliminary Summary

Yue Jun-Hui[1], M. Tobiyama[2], Zhou Zhe-Ran[3], Sui Yan-Feng[1], D. Teytelman[4], et. al.

[1]IHEP, Beijing, China
[2]KEK, Tsukuba, Japan
[3]NSRL, Hefei, Anhui, China
[4]Dimtel, Inc., San Jose, CA, USA

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Overall Status

- All Dimtel hardware is installed:
  - Two FBE-500L longitudinal front/back end units;
  - Two iGp-396F bunch-by-bunch processors;
- Other accessories: power amplifier monitoring, fiducial conversion, RF reference distribution.
- On Tuesday (January 5th) we have configured and timed both systems.
- On Tuesday and Wednesday spent part of the day on a tutorial and practical training on system operation and setup.

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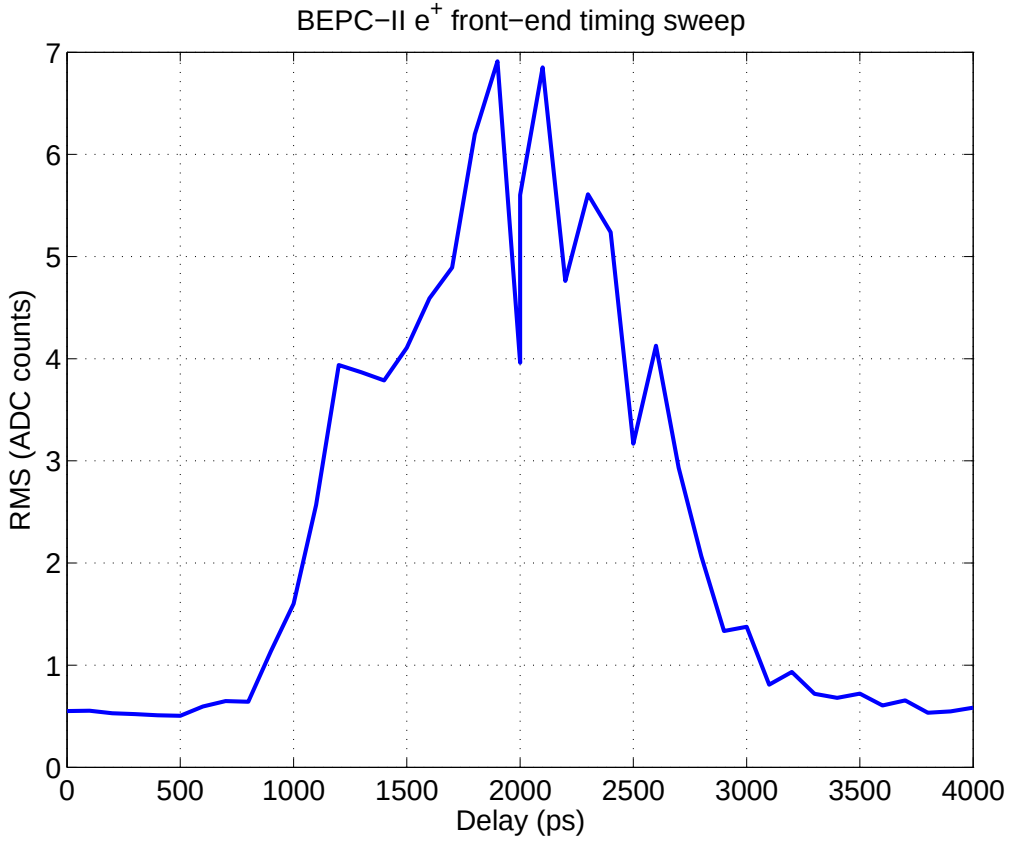
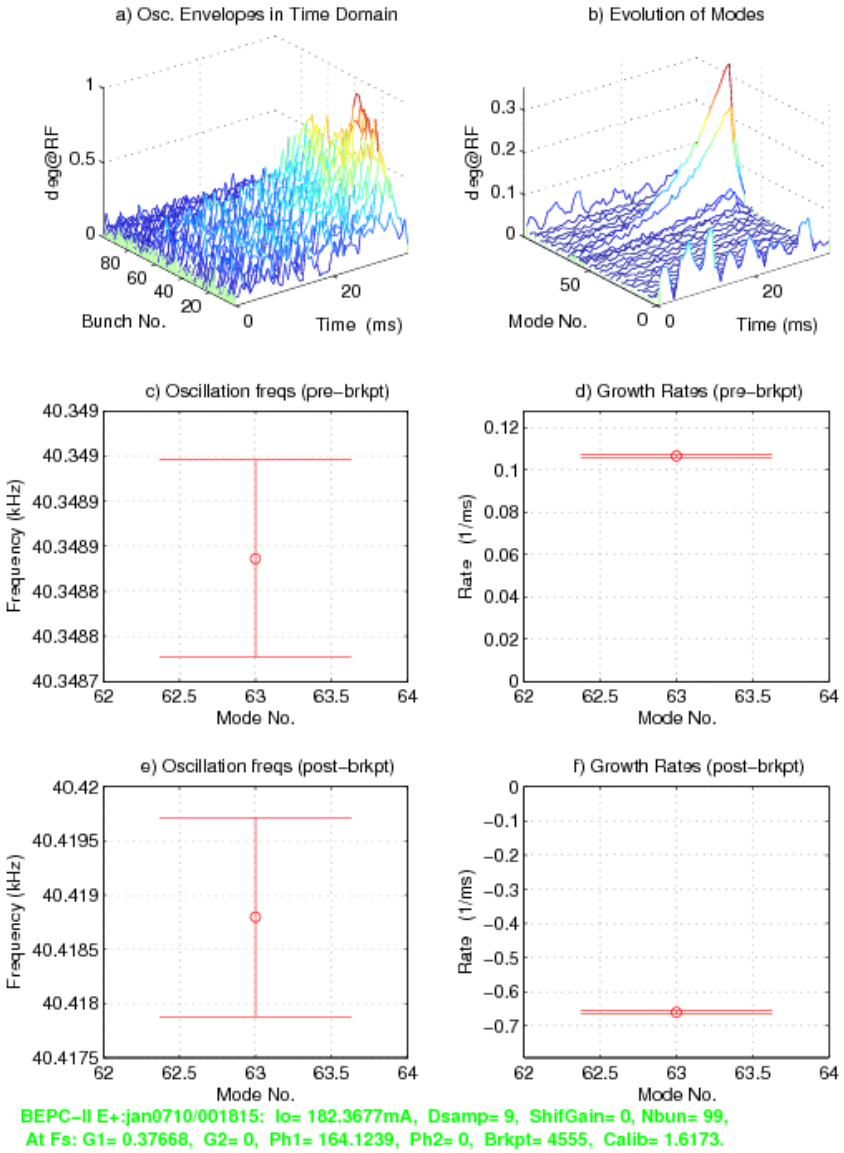
Front-end Timing: e^+



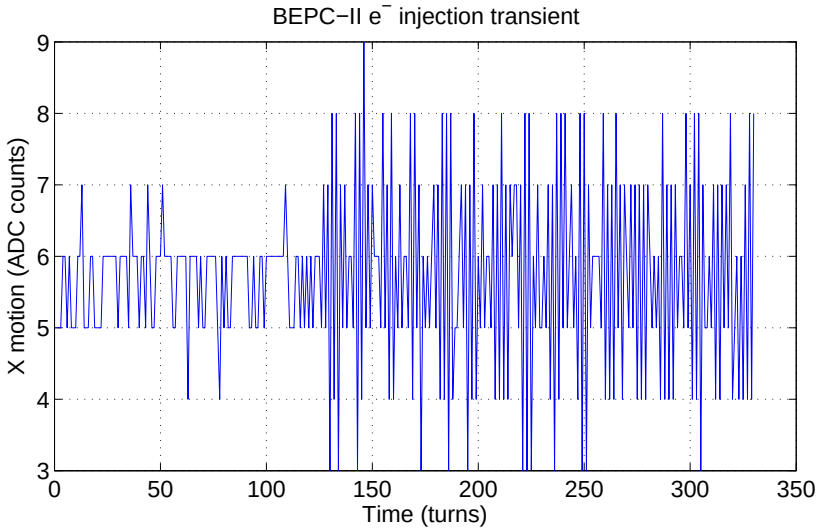
- Move ADC clock in 100 ps steps;
- Record single-bunch RMS over 1200 turns;
- From this sweep we determine optimal front-end timing;
- Sweep shows good bunch-to-bunch isolation.

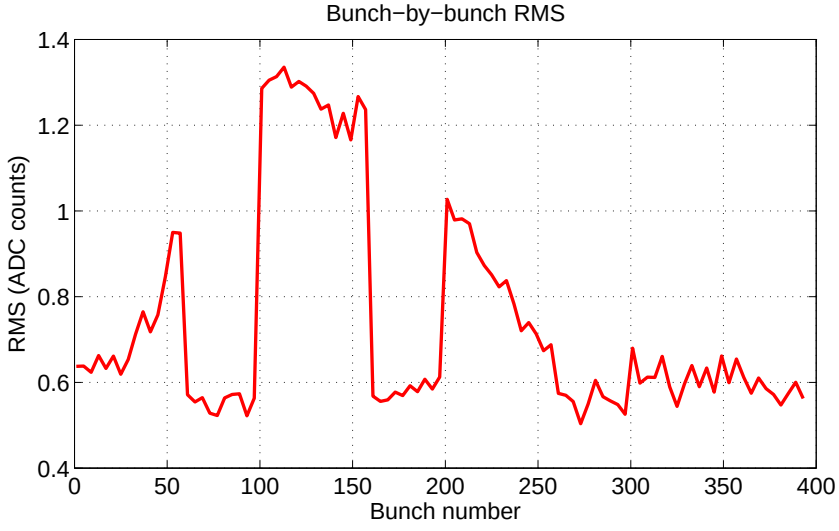
Longitudinal Grow/Damp: Positrons



- Grow/damp at 182.4 mA;
- Growth rate of 0.1 ms^{-1} — growth time of 10 ms;
- Fast damping of 0.66 ms^{-1} (1.5 ms damping time);
- Eigenmode 63 is unstable;
- 50+ data sets to analyze at currents from 135 to 182 mA.

Injection in e^-





- Single BPM connected to the front-end;
- Acquisition is triggered by injection clock;
- Injection kickers fire, no beam from linac;
- Stripchart with the measured RMS makes kicker balancing very simple.

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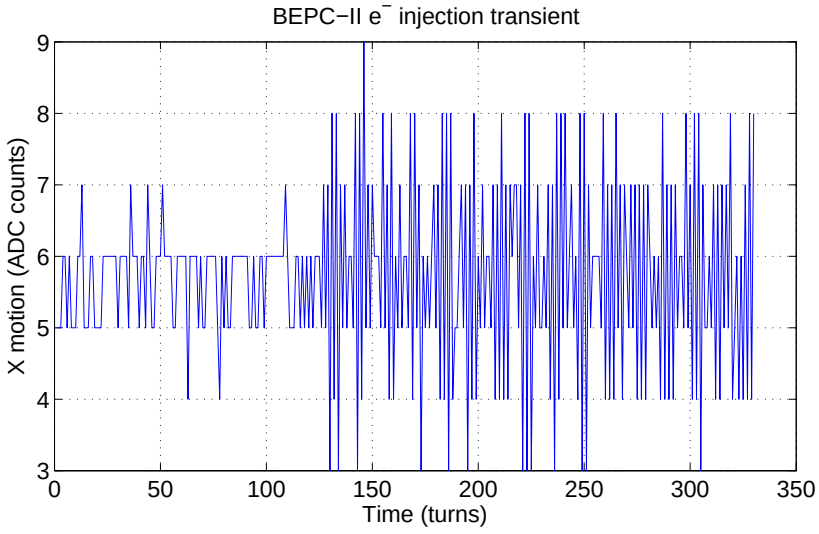

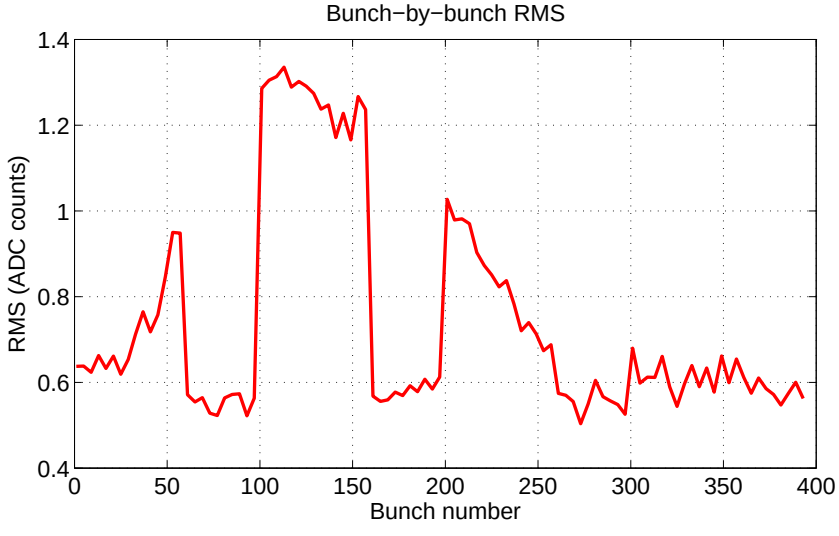

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Instability Thresholds

- Positrons:
  - Horizontal threshold around 100 mA;
  - Longitudinal threshold at 133 mA;
  - Vertical threshold around 170 mA.
- Electrons:
  - Beam longitudinally stable to 270 mA;
  - See a bit of mode 63 getting close to the threshold.

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Summary

- Commissioning is proceeding quite well;
- Need more beam current in the electron ring to measure the longitudinal growth rates;
- Power amplifiers and kickers are very strong - easy to achieve fast damping rates and strong disturbance rejection;
- Timing stability: revolution clock reference seems to move frequently (every day so far);
- Need a plan to maintaining feedback timing and phasing (use the same reference as the RF systems in respective rings?);
- Temperature management in the LFB room.

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