4 ns Feedback Commissioning Progress

M. Billing[1], M. Forster[1], R. Meller[1], M. Palmer[1], J. Sikora[1],
D. Teytelman[2], et al.

[1]Cornell University, Ithaca, NY 14850, USA
[2]Dimtel, Inc., San Jose, CA, 95124, USA

May 21, 2009

Overall Status

- All Dimtel hardware is installed:
  - One FBE-500L longitudinal front/back end unit;
  - Three iGp-1281F bunch-by-bunch processors;
  - Prototype front-end (vertical).
- Chassis built and installed for reference distribution and BPM signal pre-processing;
- On 5/20/09 we have configured and tested all three feedback systems for both positrons and electrons.

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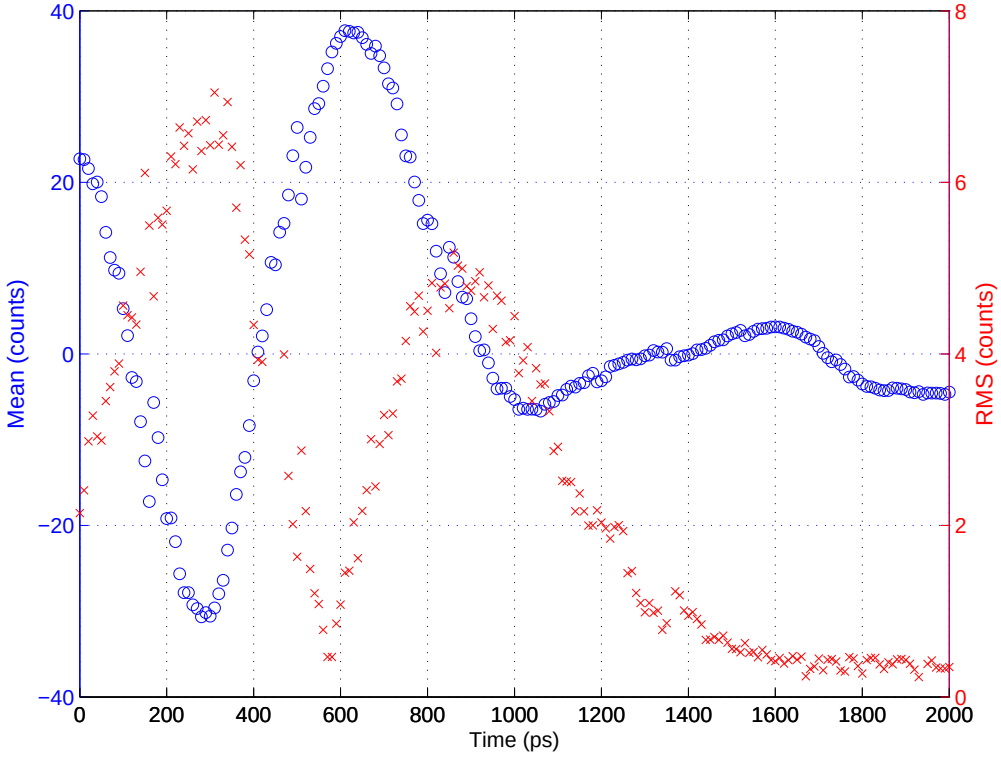
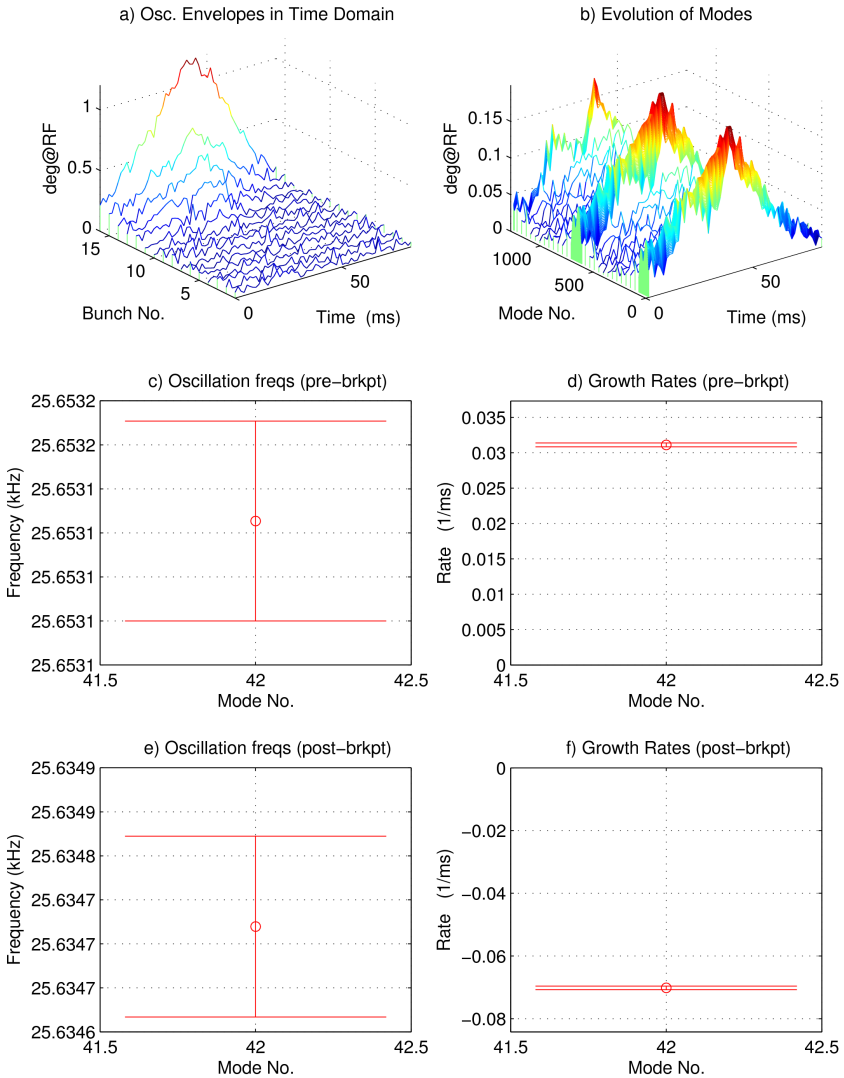
Front-end Timing: Horizontal



- Move ADC clock in 10 ps steps;
- Record single-bunch mean and RMS over 100 turns;
- Two RMS peaks - opposite detection signs.

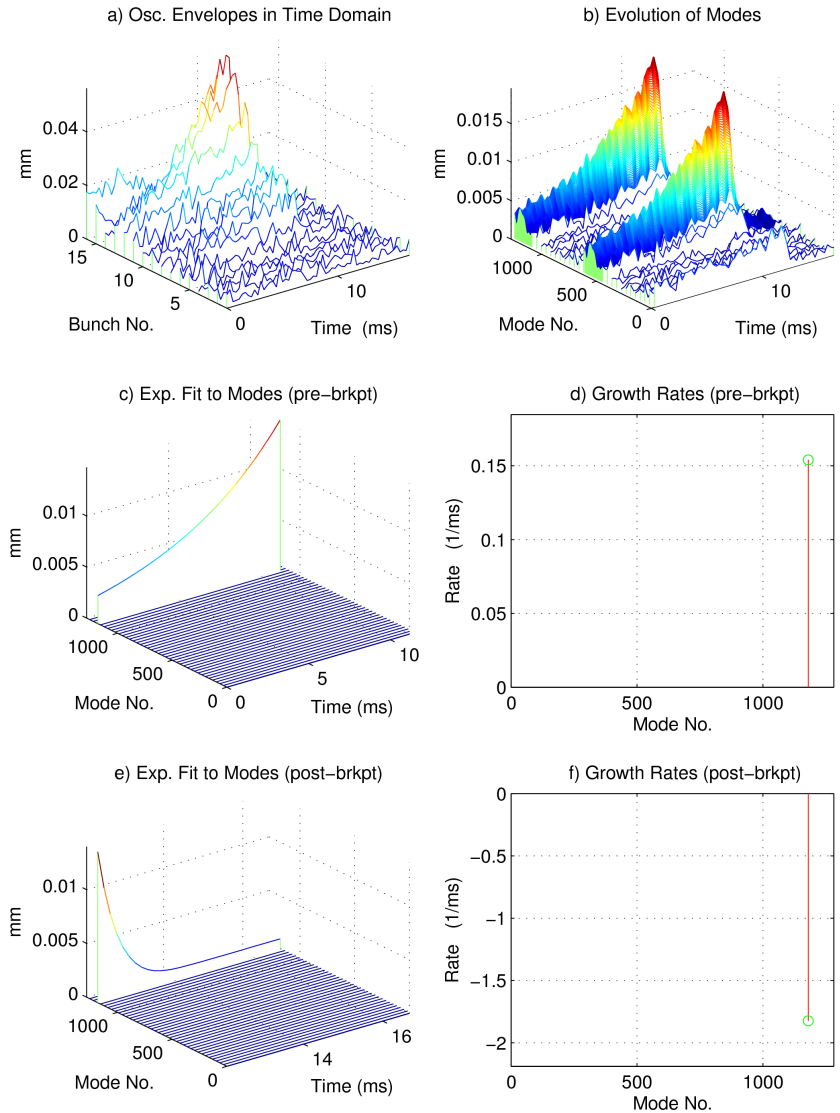
Longitudinal Grow/Damp: Positrons



CESR TA:may1909/002019: Io= 9.17mA, Dsamp= 5, ShifGain= 3, Nbun= 16,
At Fs: G1= 1.9364, G2= 0, Ph1= 132.4771, Ph2= 0, Brkpt= 3800, Calib= 10.3952.

- Grow/damp at 9.2 mA;
- Growth rate of 0.03 ms^{-1} — growth time of 33 ms.
- Fast damping of 0.07 ms^{-1} (14 ms damping time).
- Both species go longitudinally unstable at around 8 mA in 16 bunches.

Vertical Grow/Damp: Electrons



CESR TA:may2009/235030: Io= 12mA, Dsamp= 1, ShifGain= 2, Nbun= 16,
At Fs: G1= 25.7922, G2= 0, Ph1= −46.7132, Ph2= 0, Brkpt= 4700, Calib= 80.4.

- Not resistive wall - central mode -101;
- Fitting to RMS averaged growth envelopes due to beating;
- Relatively low gain, moderate damping;
- In the horizontal plane we have measured feedback damping time of 15 turns!

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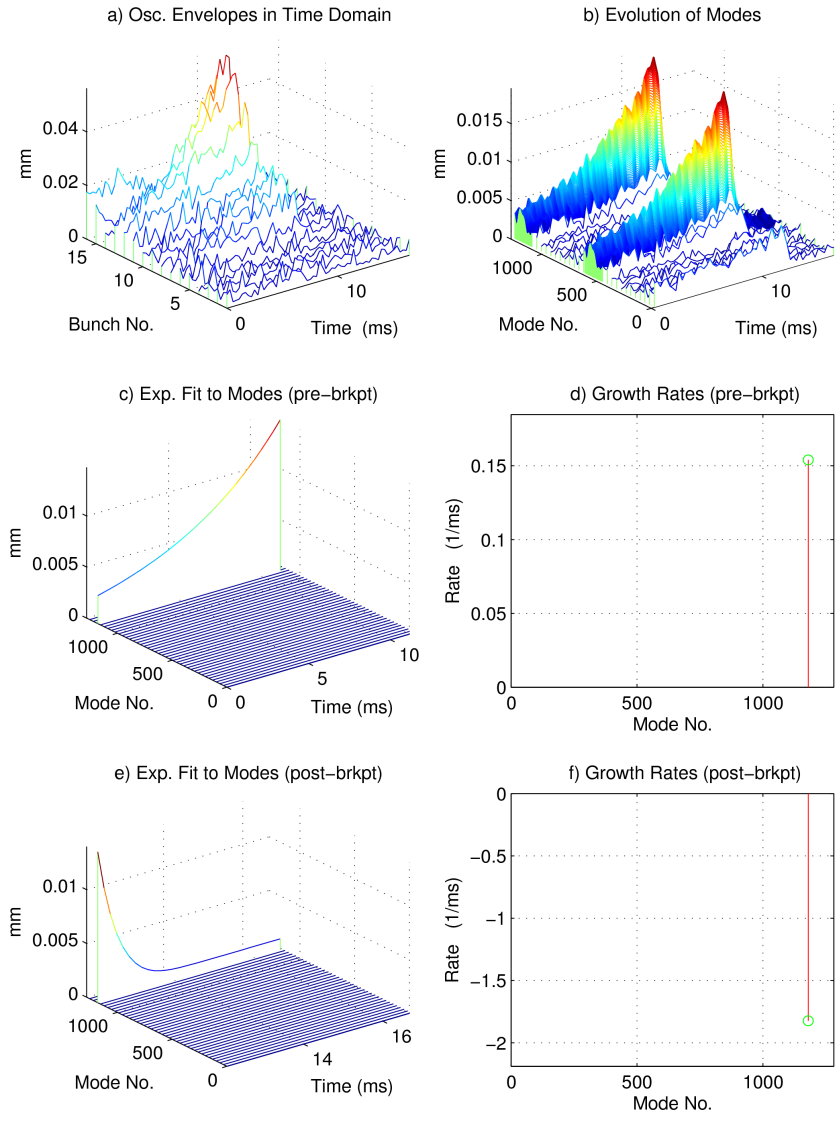

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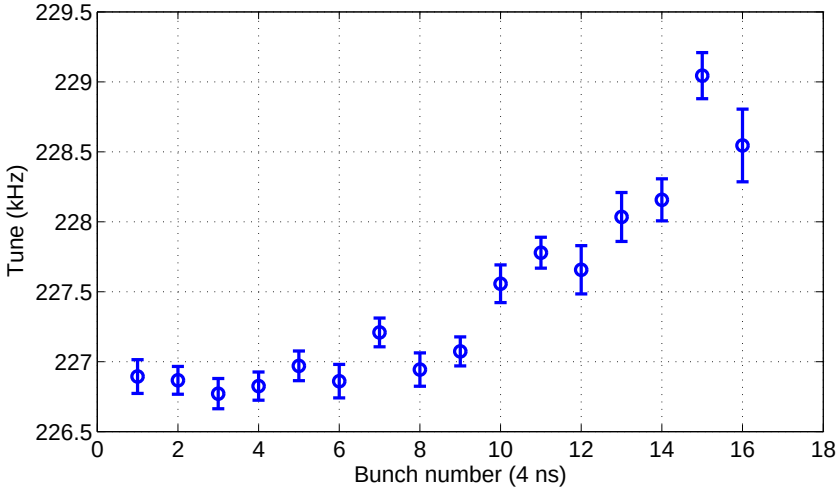

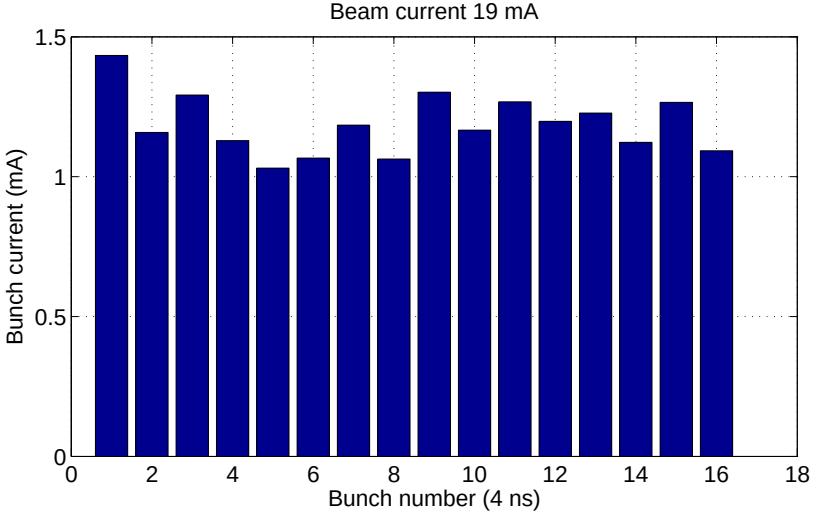

- Horizontal plane, positrons;
- Automatic tools to acquire a number of snapshots (6 in this case), post-process, and plot;
- The user is still responsible for "appropriate" system setup.

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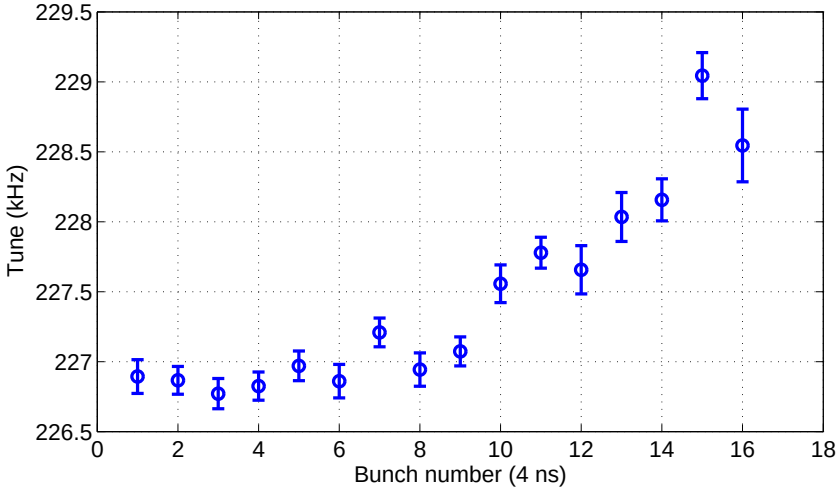

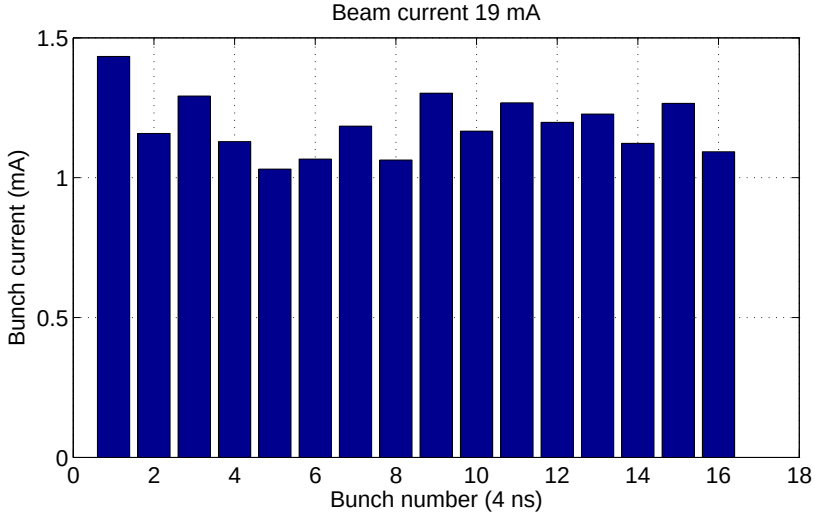

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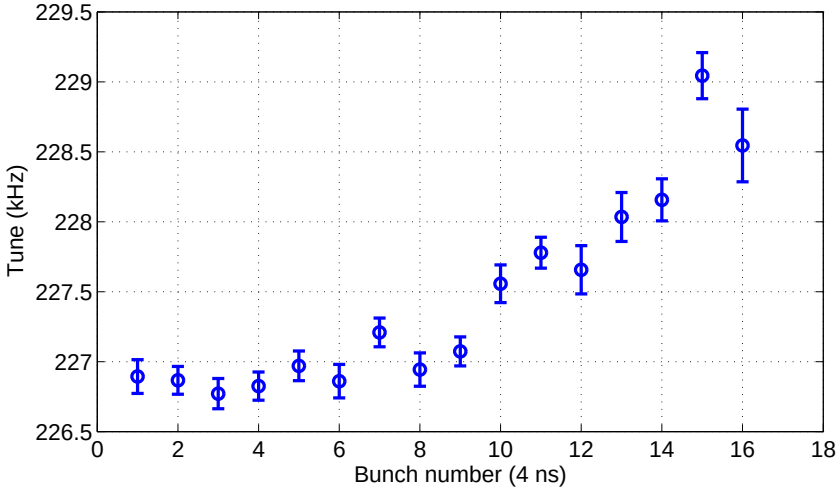

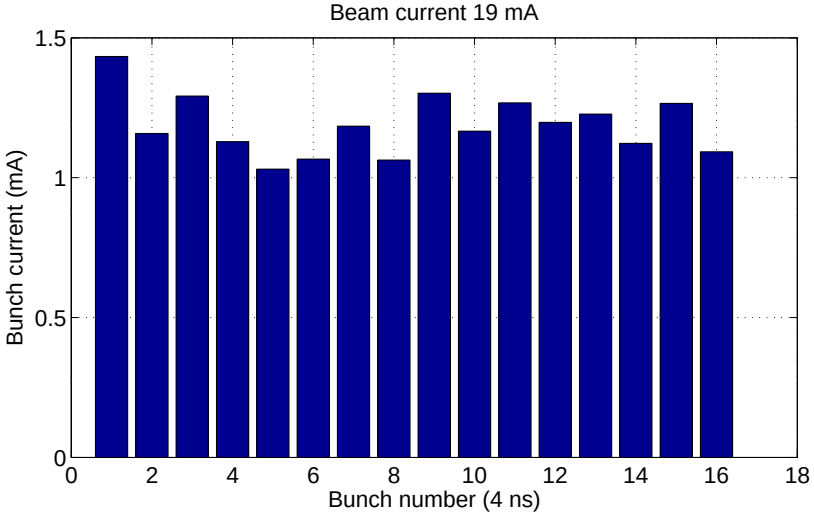

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Instability Thresholds

- All thresholds for a train of 16 bunches;
- Positrons:
  - Longitudinal threshold at 8 mA;
  - Vertically stable to 20 mA;
  - Horizontal threshold around 10 mA.
- Electrons:
  - Longitudinal threshold at 8 mA;
  - Vertical instabilities at 12 mA (fairly fast);
  - Horizontal threshold around 12–13 mA.

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