

Positron Ring Measurements

Alessandro Drago¹, Dmitry Teytelman²

¹LNF-INFN, Frascati, Italy

²Dimtel, Inc., San Jose, CA, USA

April 4, 2008

Outline

- 1 Work summary
- 2 Measurements
 - Calibration
 - Grow/damps
 - Tune measurements

Hardware Changes

- Removed Colby delay lines from the clock signals;
- Removed manual delay lines in the output chain;
- Optimized back-end gain to match power amplifier saturation;
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- All iGp systems have been updated to the newest gateware (FPGA code) and software version;
- Added a powerful server in the control room to run user interface.

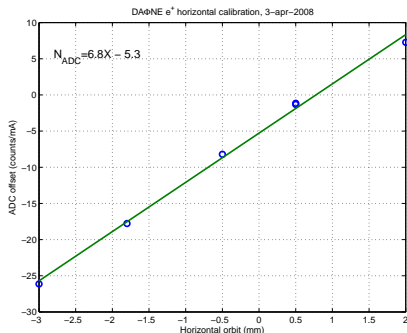
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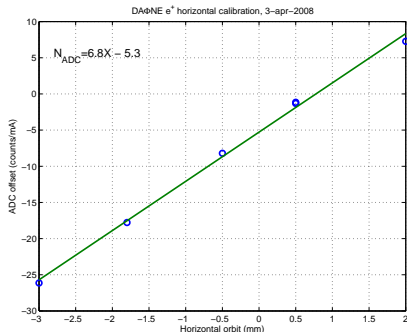
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Positron X



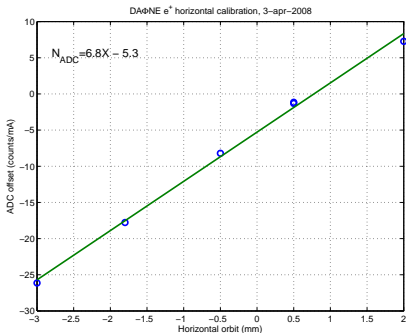
- Used orbit bumps created by Catia to calibrate the feedback input gain;
- Gain is 6.8 counts/mA/mm;
- At 10 mA per bunch ADC LSB is $1/68 = 14.7 \mu\text{m}$;
- Typical residual motion at LSB/3 or $4.9 \mu\text{m}$.

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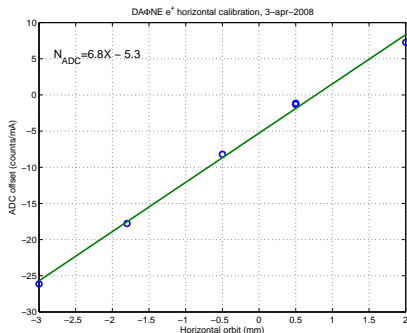
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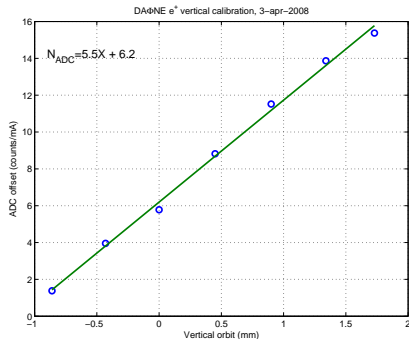
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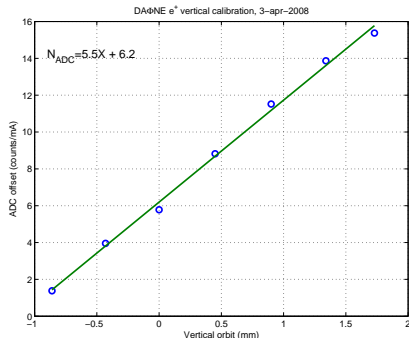
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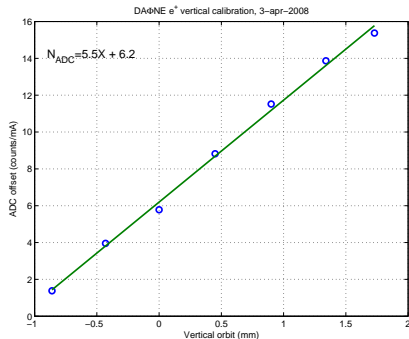
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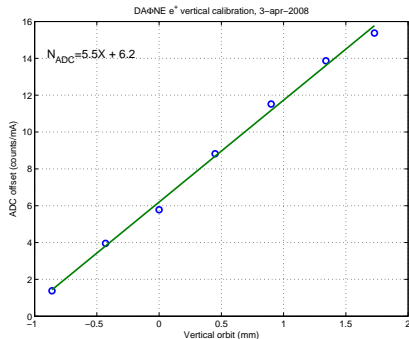
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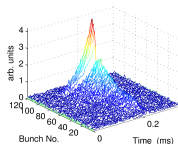
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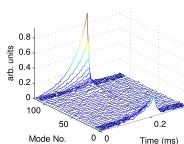
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Horizontal Grow/damp

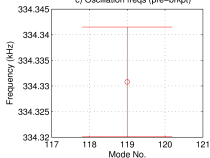
a) Osc. Envelopes in Time Domain



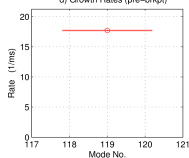
b) Evolution of Modes



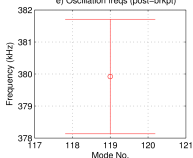
c) Oscillation freqs (pre-brkpt)



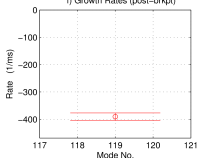
d) Growth Rates (pre-brkpt)



e) Oscillation freqs (post-brkpt)



f) Growth Rates (post-brkpt)

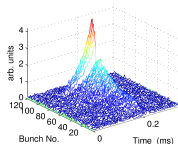


- Horizontal grow/damp at 355 mA;
- Extremely fast damping of 400 ms^{-1} .

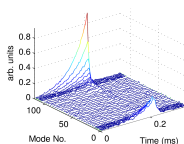
DAFNE E+ (IGp):apr0308/214001: I_o= 355mA, D_{samp}= 1, ShifGain= 3, Nbun= 120,
At Fs: G1= 22.6395, G2= 0, Ph1= 144.2758, Ph2= 0, Brkpt= 659, Callb= 1.

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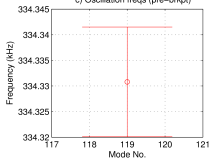
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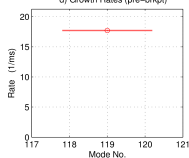
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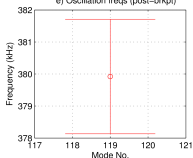
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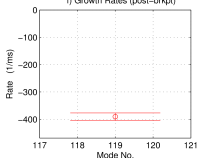
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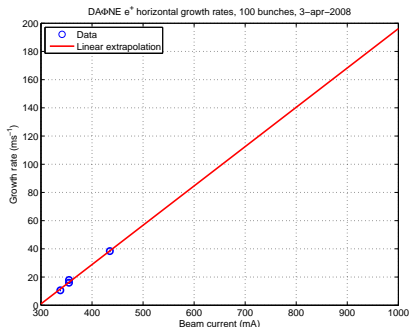


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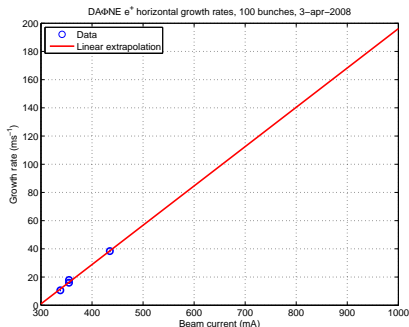
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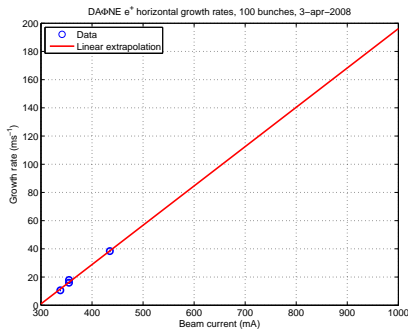
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- With 400 ms⁻¹ achievable damping should be able to support operation to 1 A and beyond;
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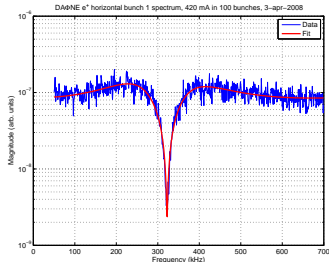


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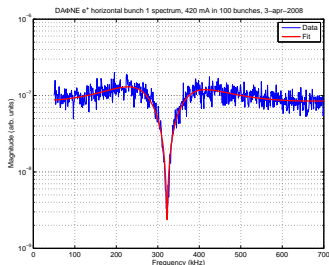
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Bunch-by-bunch Tune



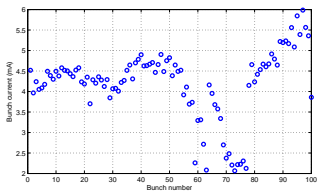
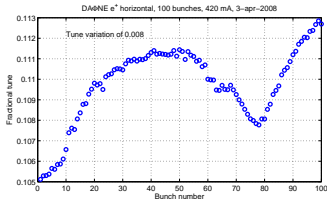
- Record beam data;
- Fit model beam/feedback response to the bunch spectrum;
- Repeat for all filled bunches - large tune shifts along the train in the horizontal plane;
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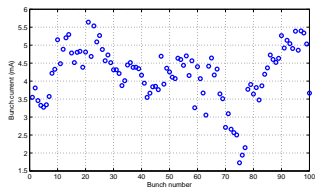
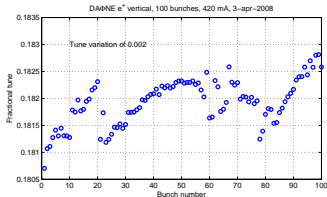
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- Beam current limit in the positron ring is most likely induced by injection transients:
 - Subject of today's study;
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