New Stripline Kicker Commissioning in SPEAR3

D. Teytelman

Dimtel, Inc., San Jose, CA, USA

October 5, 2017

Day Summary

- Started at 11 am from matching power amplifier delays.
- Adjusted amplifier gains:
  - Blue amplifier 1 dB into saturation.
  - White amplifier at maximum gain is 0.6 dB saturated.
- Checked individual amplifiers with single bunch, found delays matched within 30 ps.
- Adjusted DAC timing and shaper coefficients to increase back-end bunch-to-bunch isolation from 11 to 19 dB.
- Loops closed by 3 pm.
- Studies of BL15 vertical instability till 5 pm.

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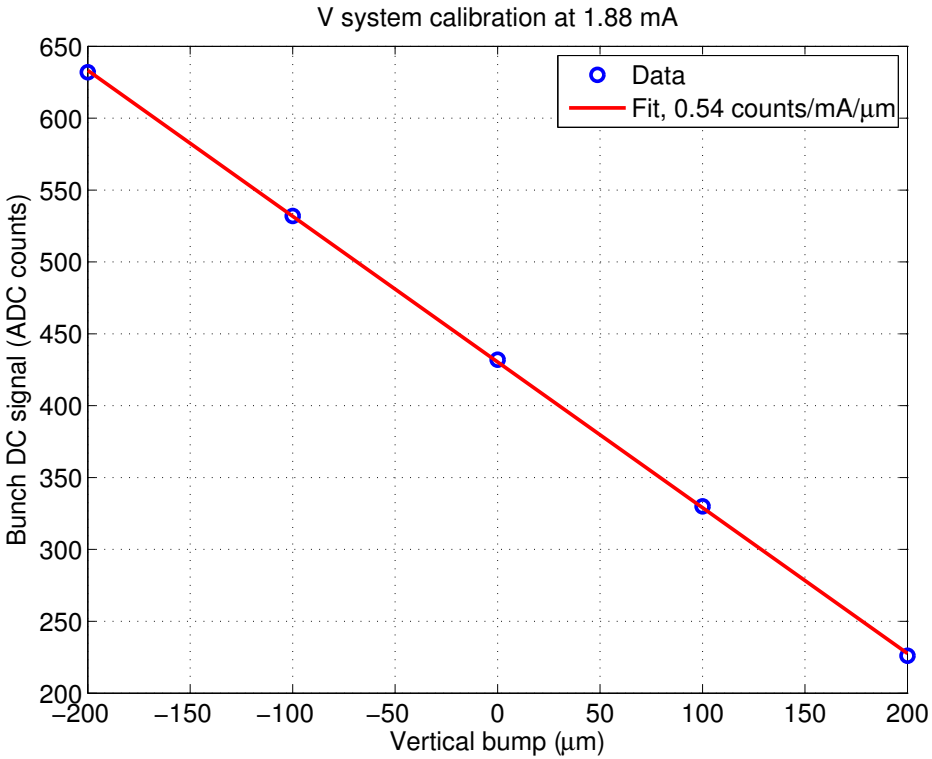

- Analysis tools use the calibration factor to extract physical oscillation amplitudes.
- Some errors due to assumptions of fill pattern (fully uniform, uniformly filled subset of bunches).
- Front-end calibration from November 15, 2016.
- Calibration factor is 0.54 counts/µm/mA.

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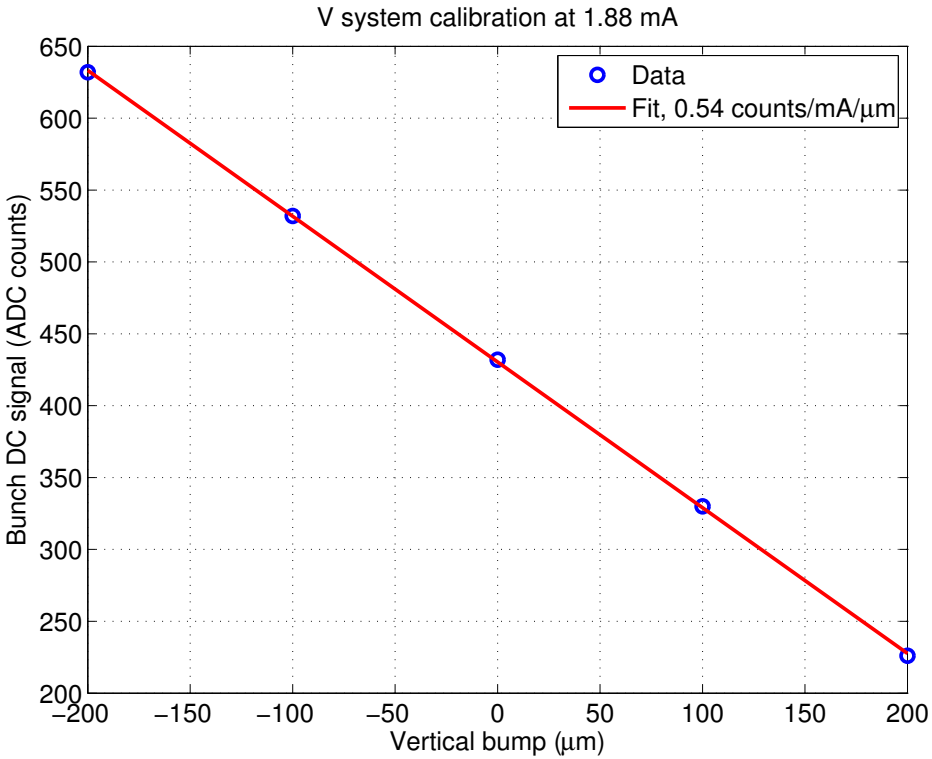

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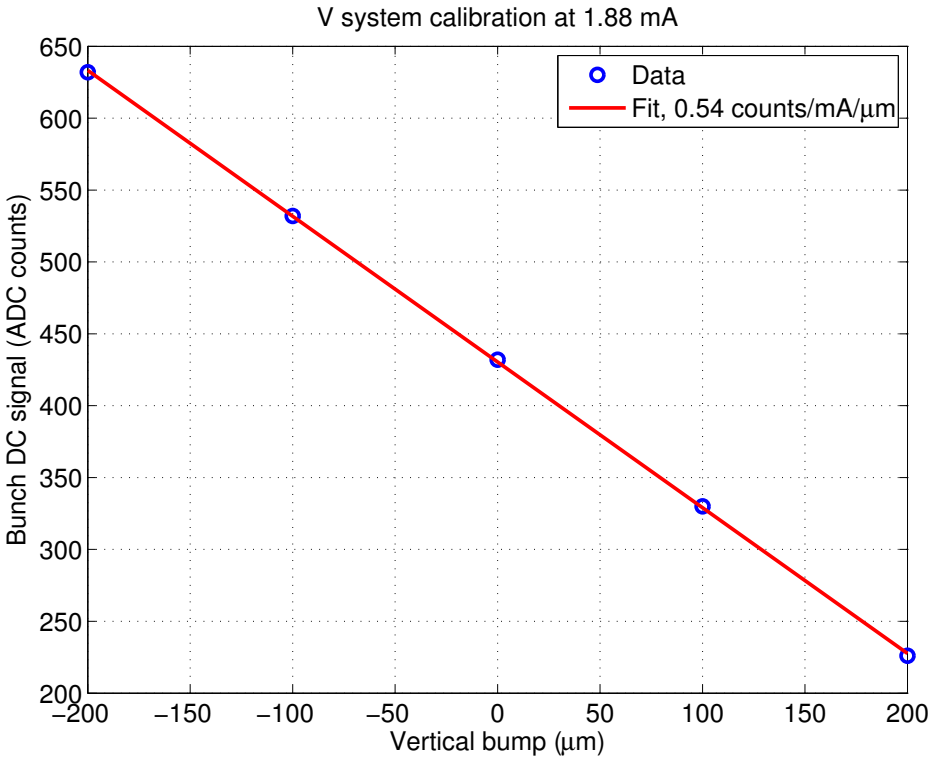

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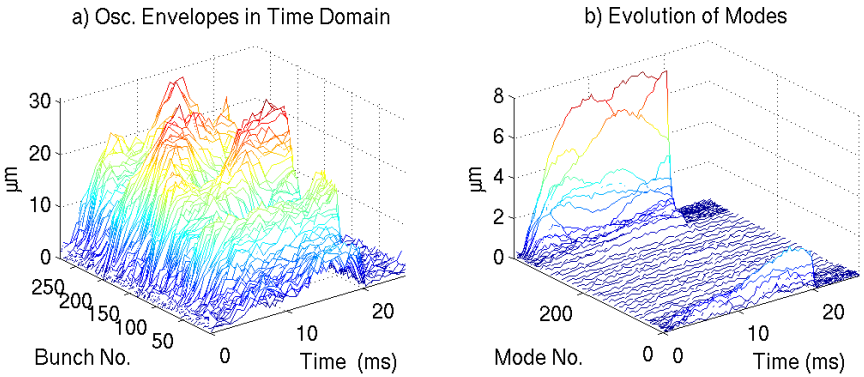

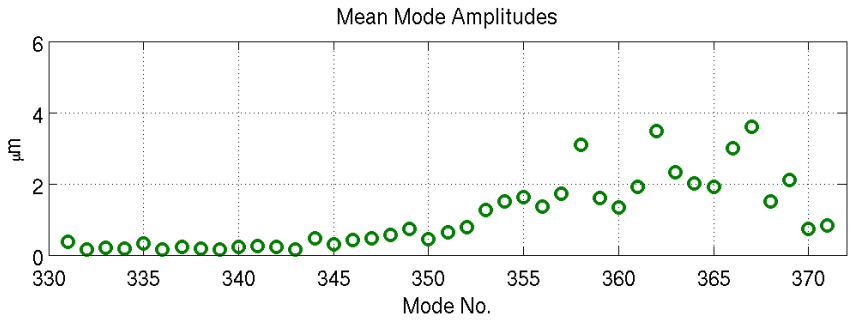

- With ID gaps open observed only ion-driven instabilities:
  - Low-frequency modes excited;
  - Non-exponential growth;
  - Low saturation amplitude.
- Average bunch amplitudes in time domain.
- Fast damping, closed-loop residual is at the noise floor.
- Grow/damp with shift gain reduced from 4 to 1.
- Significant residual motion.

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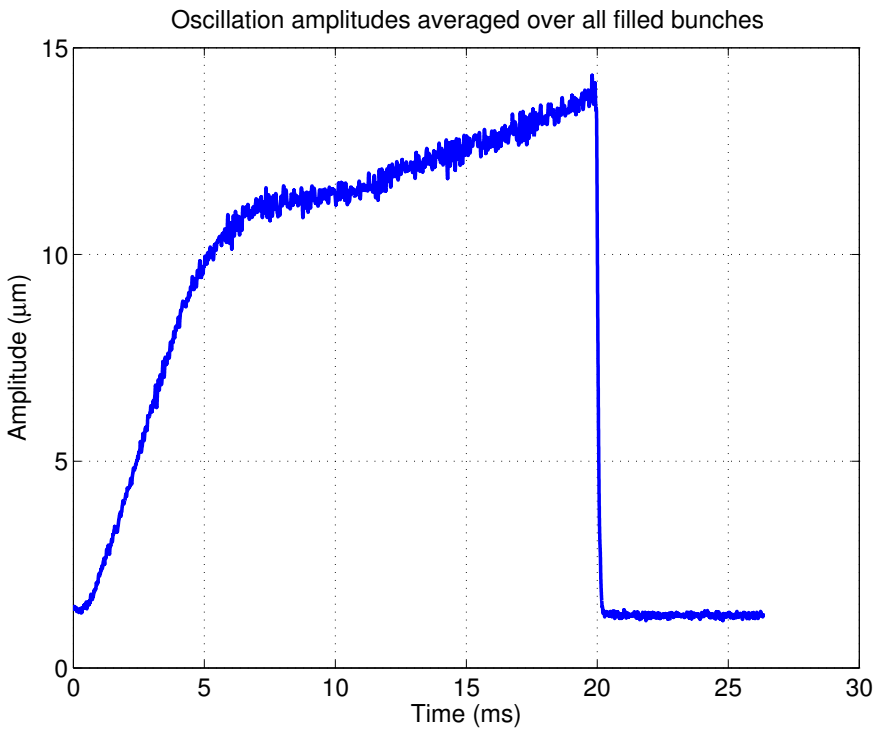

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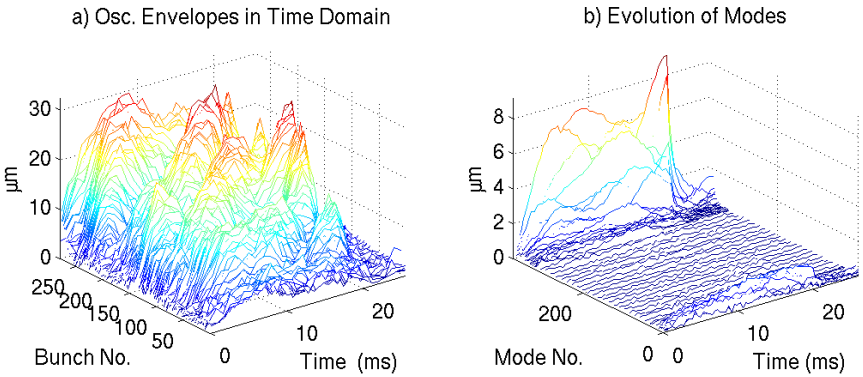

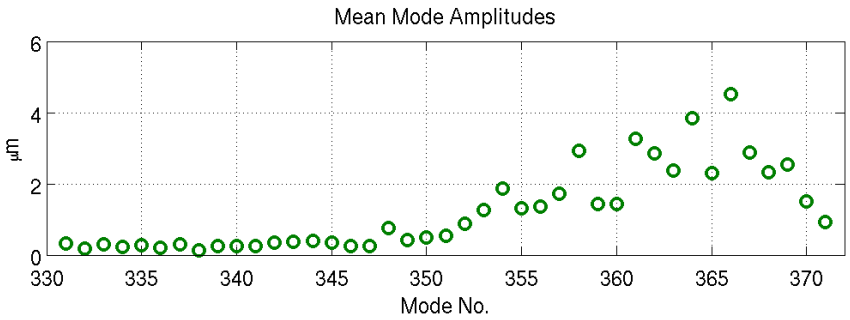

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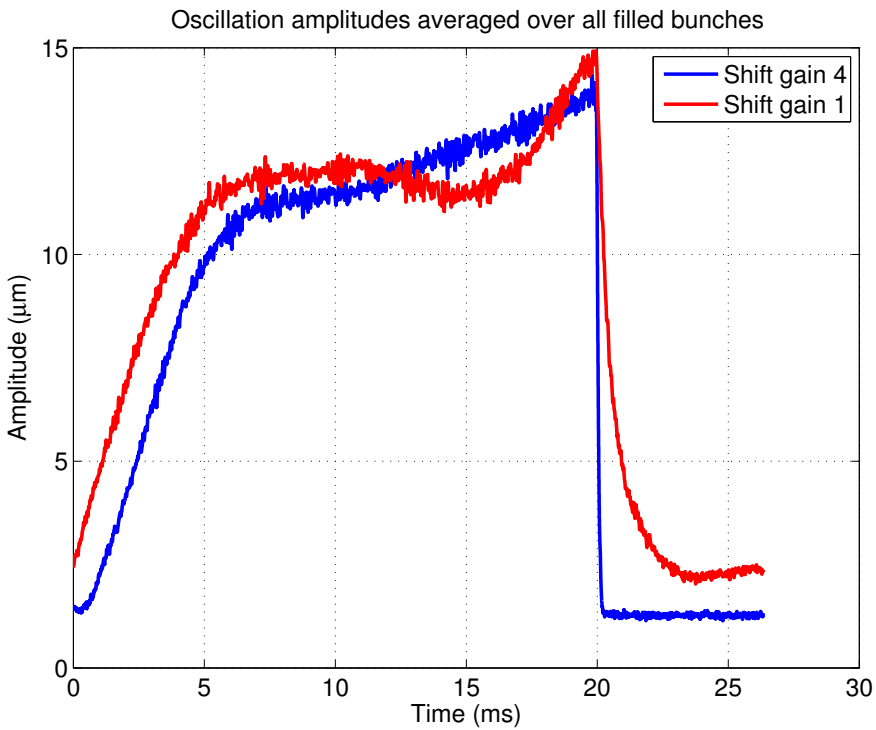

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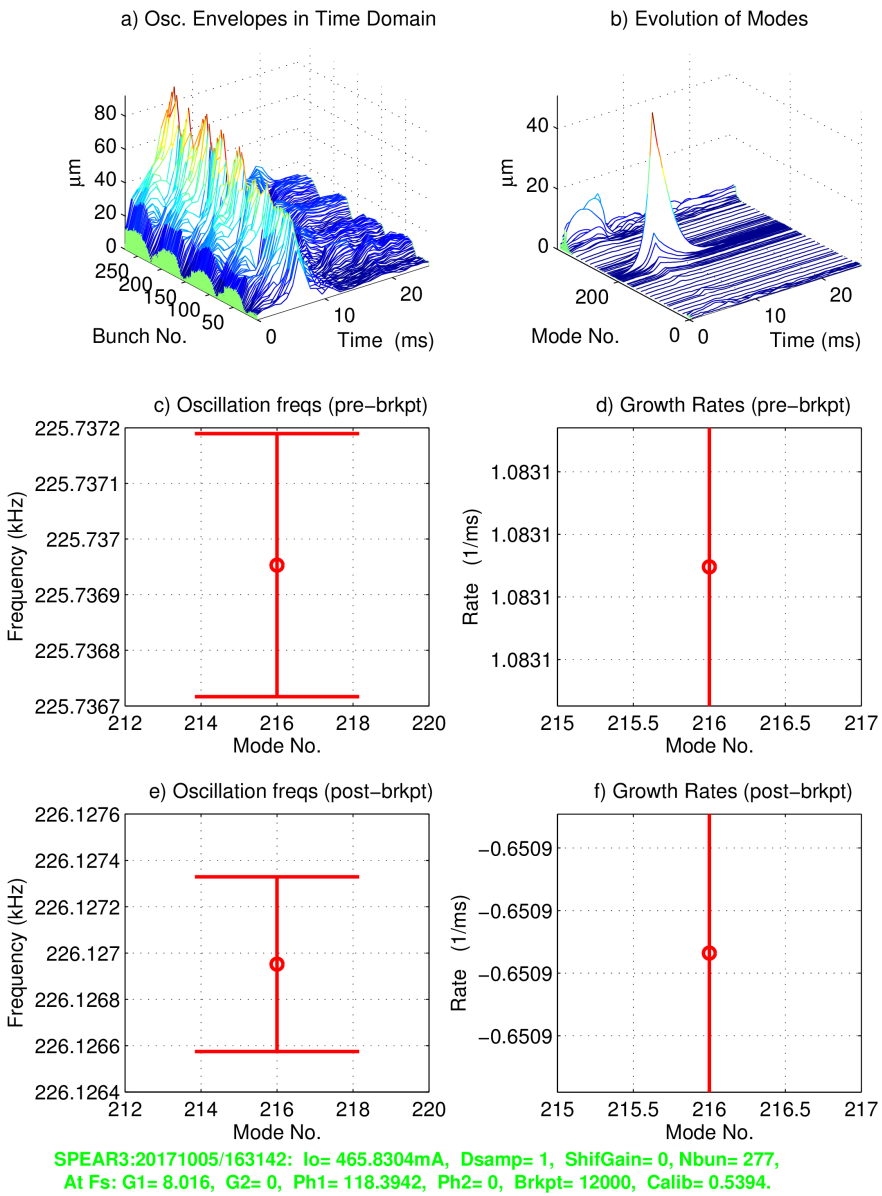

- BL15 gaps at 6.84 mm.
- Mode 216 (199.4 MHz) grows and damps.
- Damping fit is a bit suspect — beating with neighboring modes due to a non-uniform fill.

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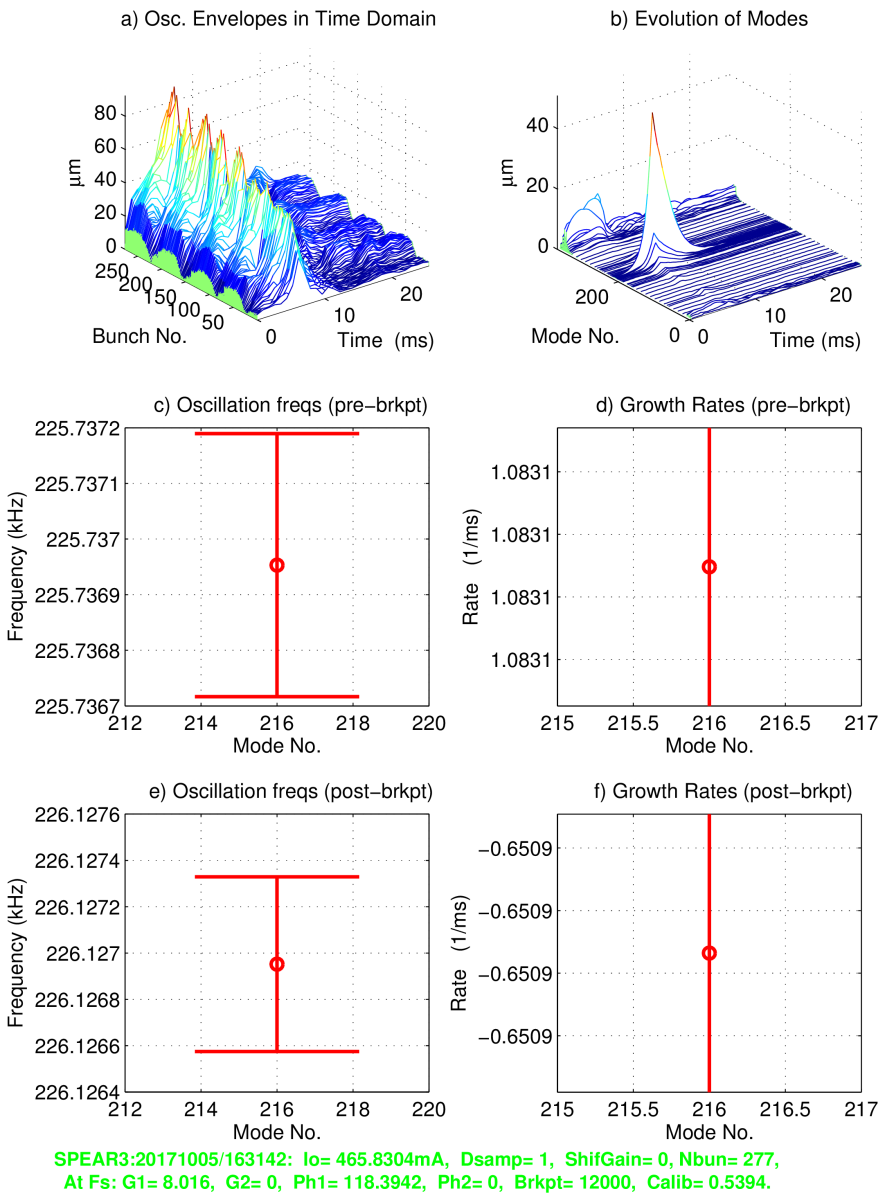

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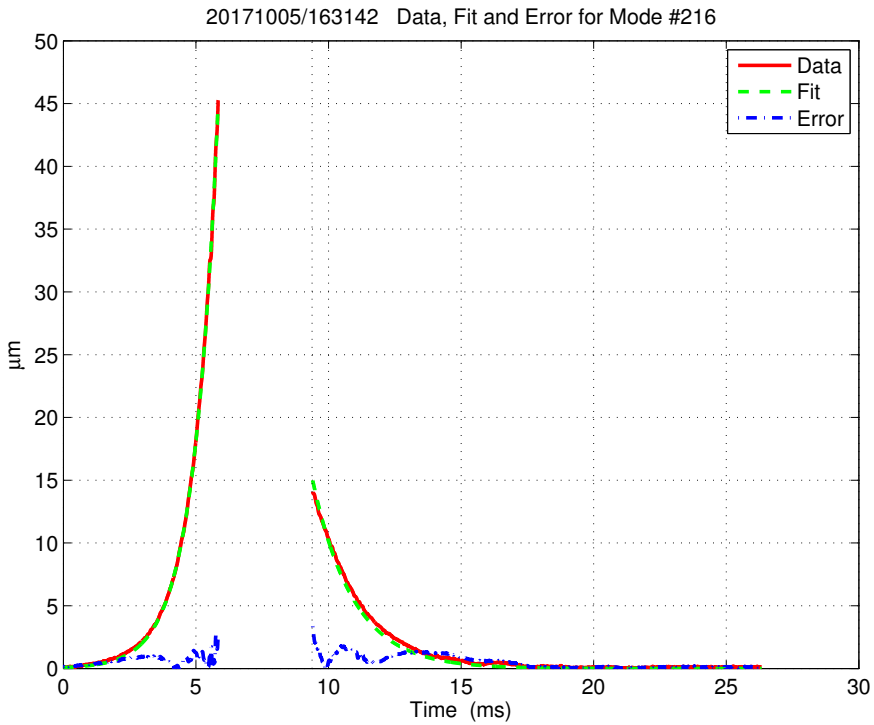

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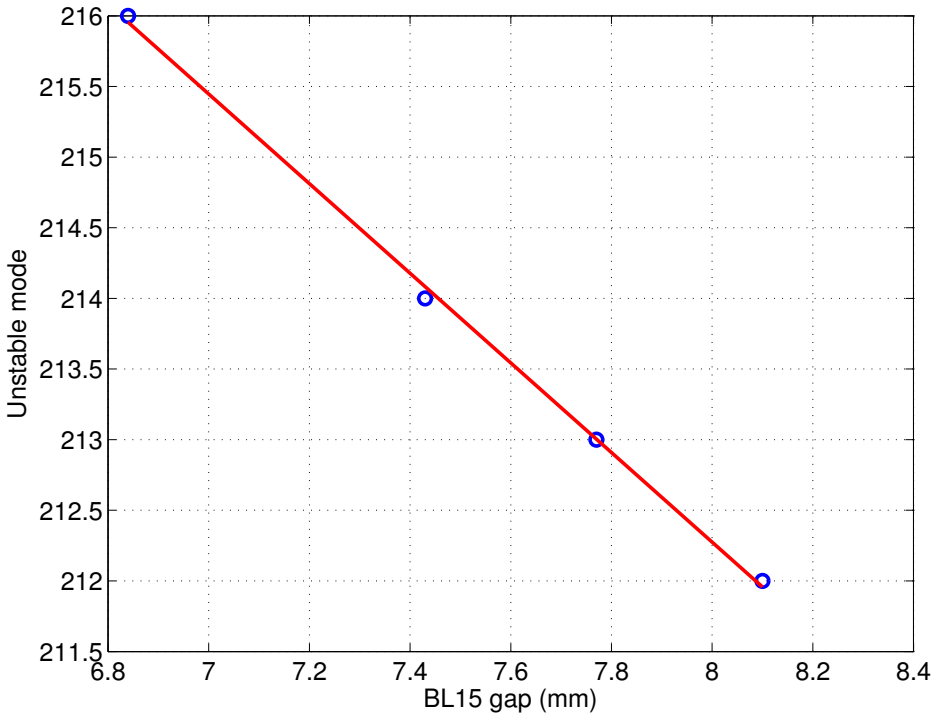

- Pretty close to linear.
- To get better accuracy need to measure more points and fit individual resonances.
- Tuning coefficient is $4.06\ \mathrm{MHz\,mm^{-1}}$.
- At 6 mm gap center frequency would be 218.6 MHz.
- Australian Synchrotron IVU5: $4.8\ \mathrm{MHz\,mm^{-1}}$, 186.4 MHz at 6 mm.

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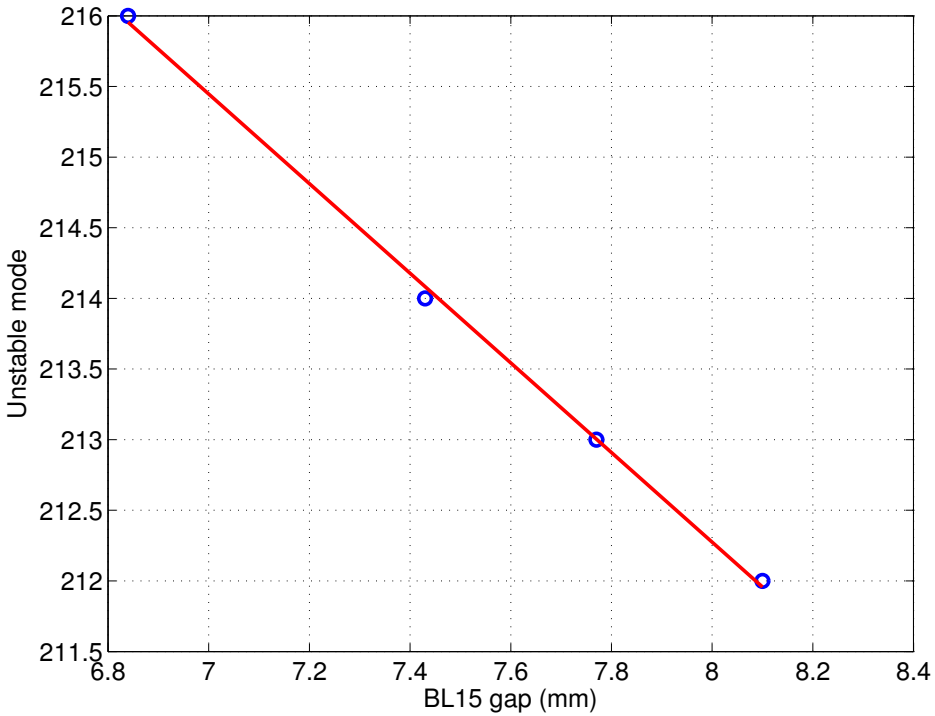

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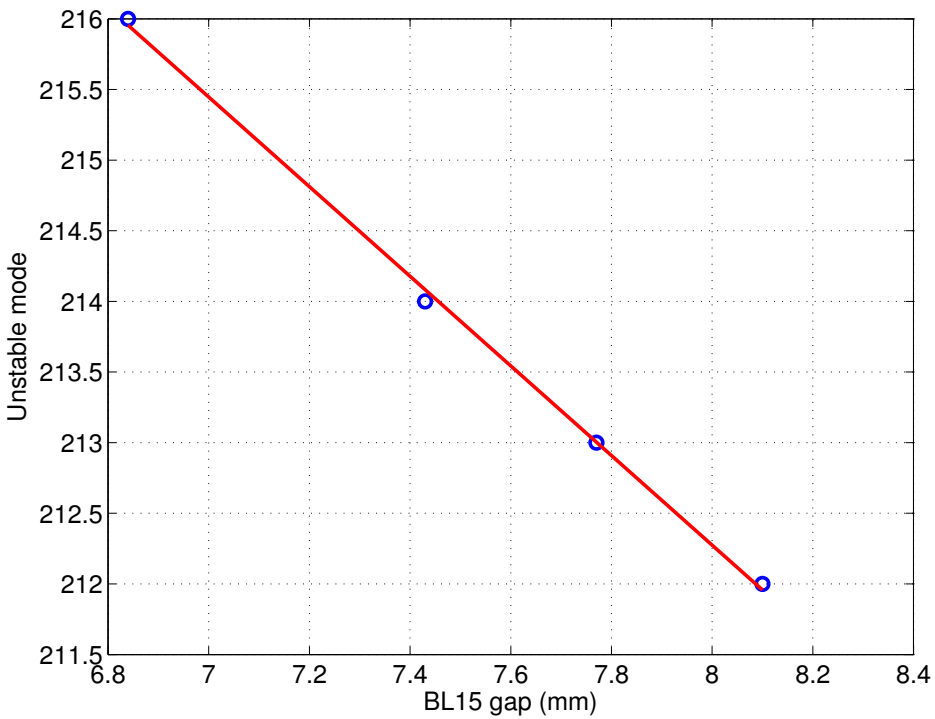

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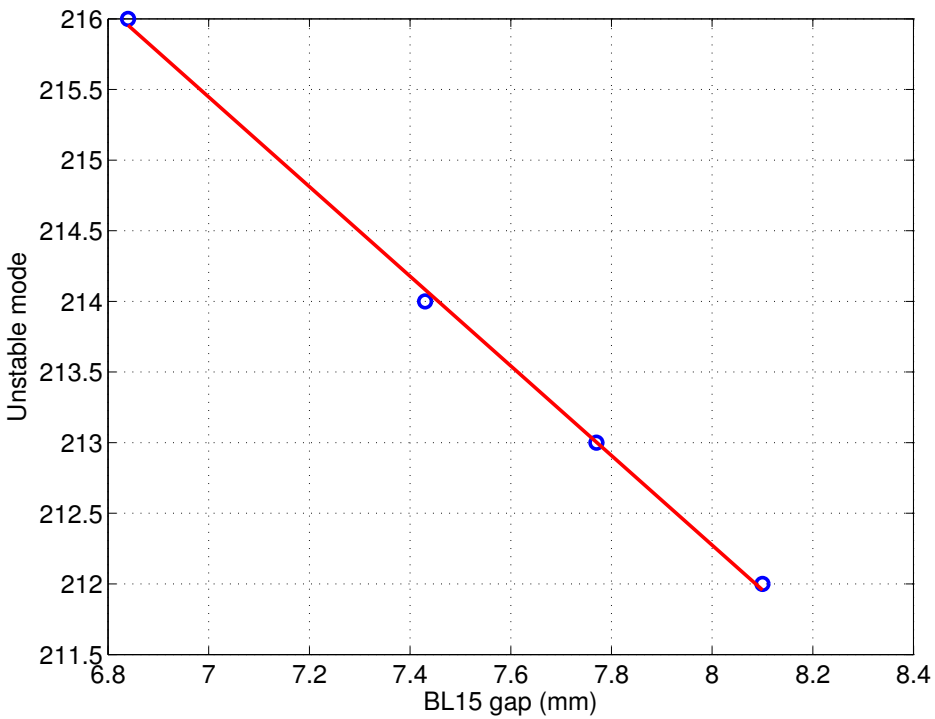

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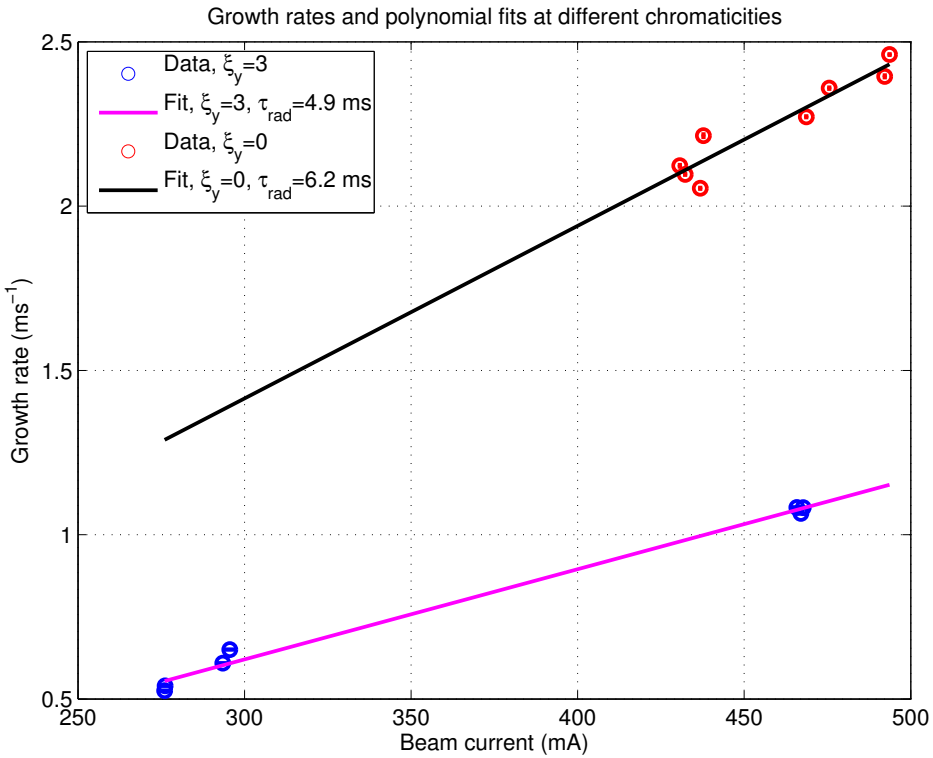

- BL15 gaps at 6.84 mm.
- Two different chromaticity settings: 3 and 0.
- Zero crossing (radiation damping) estimates a bit suspect due to long lever arm.
- Values are consistent with expected $\tau_y = 5.3$ ms.
- Replace polynomial fits with linear.
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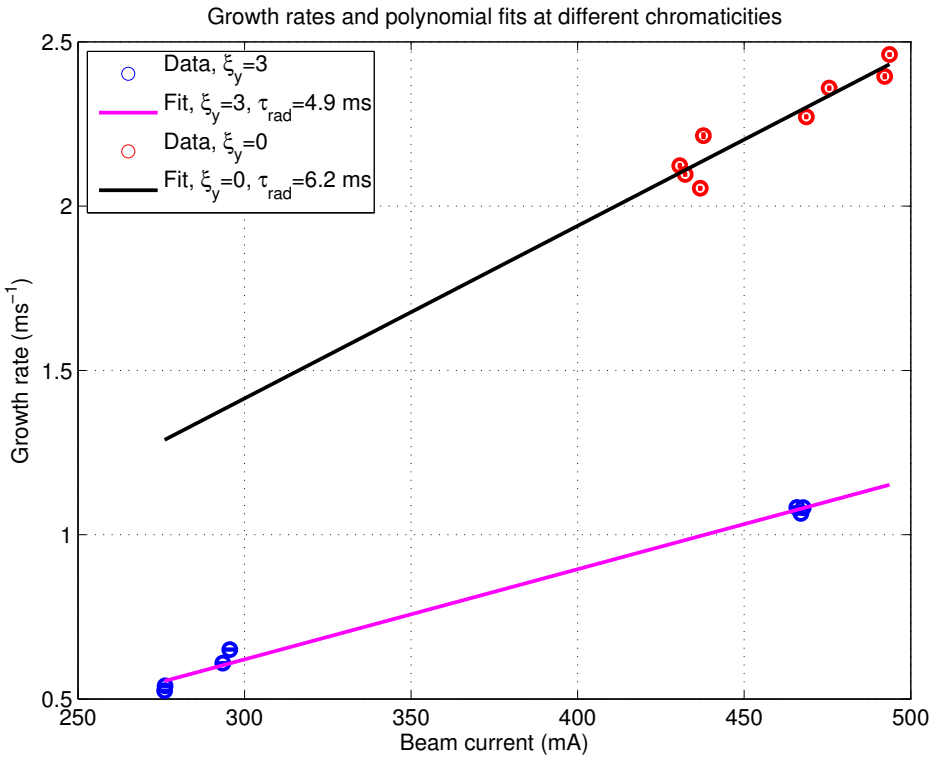

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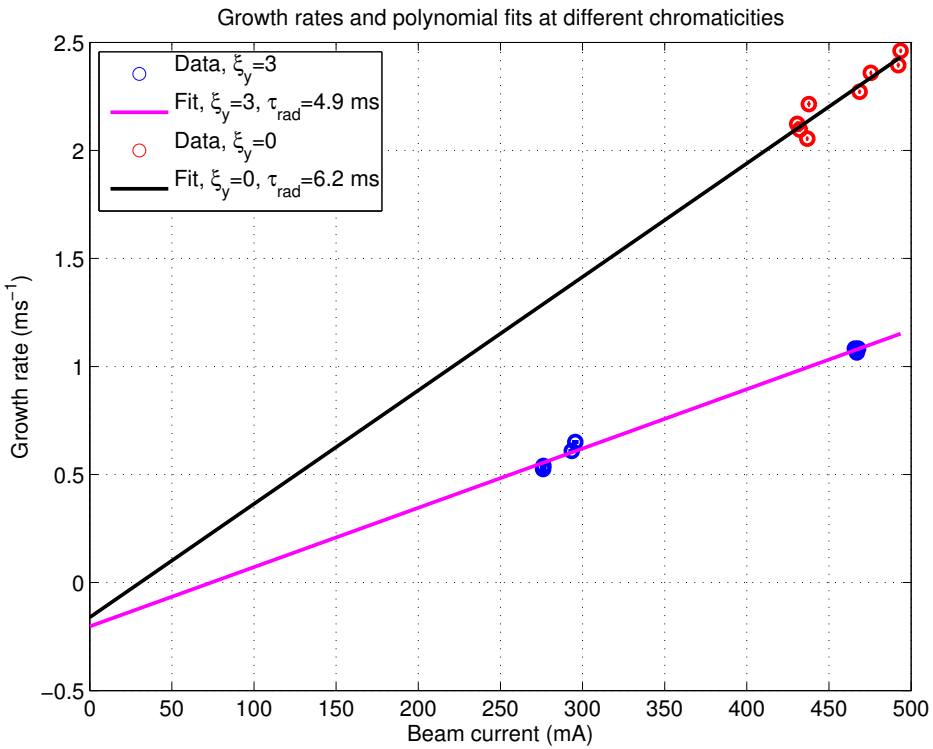

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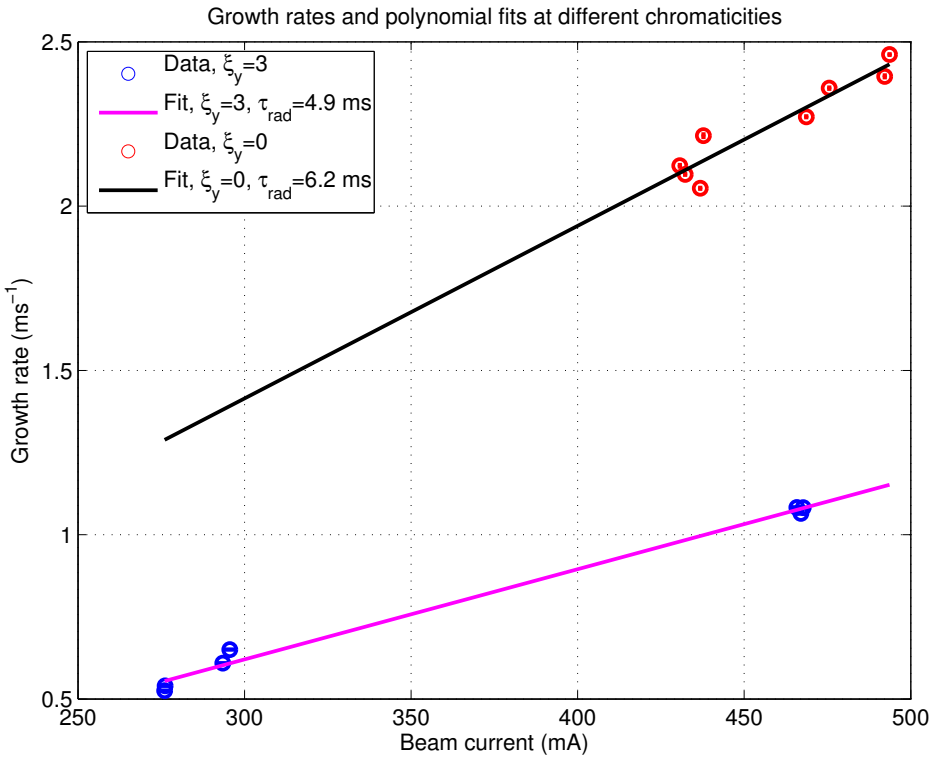

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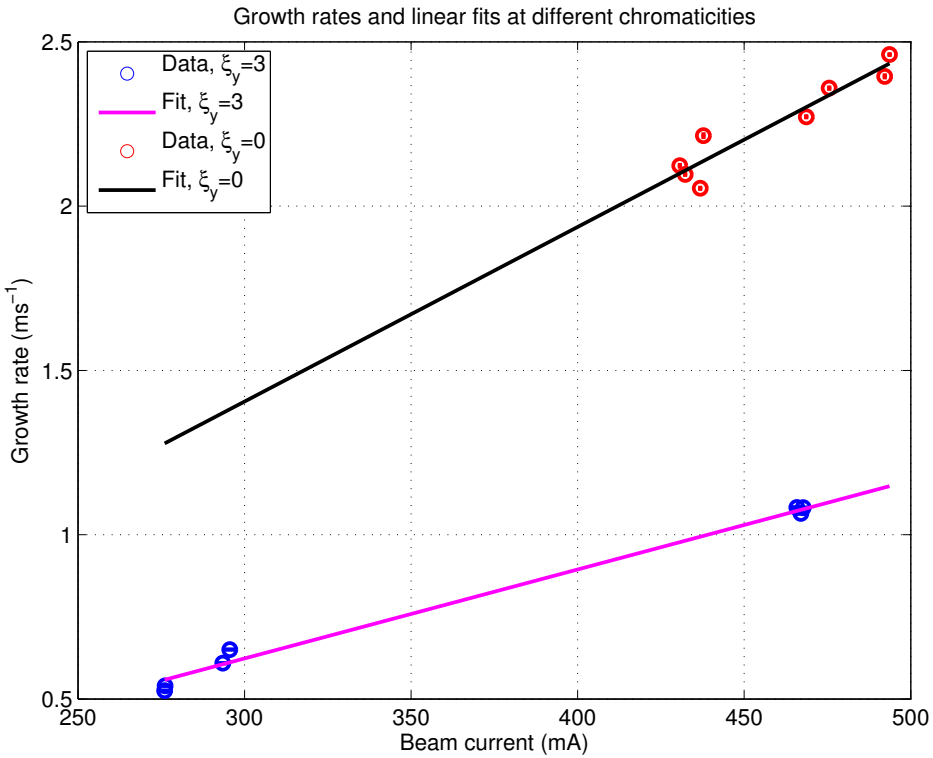

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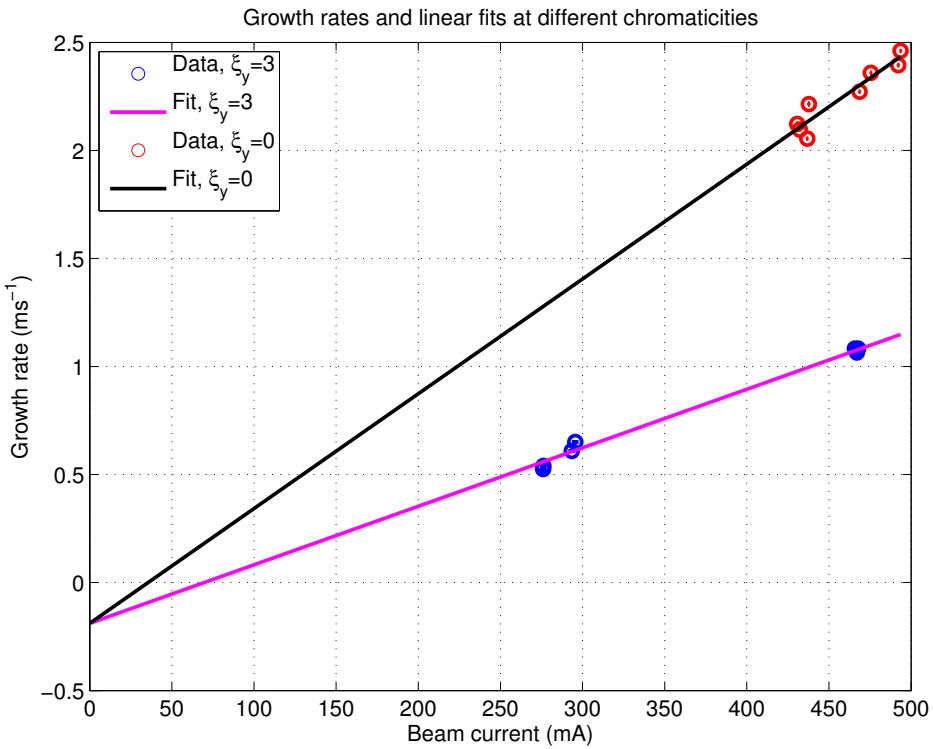

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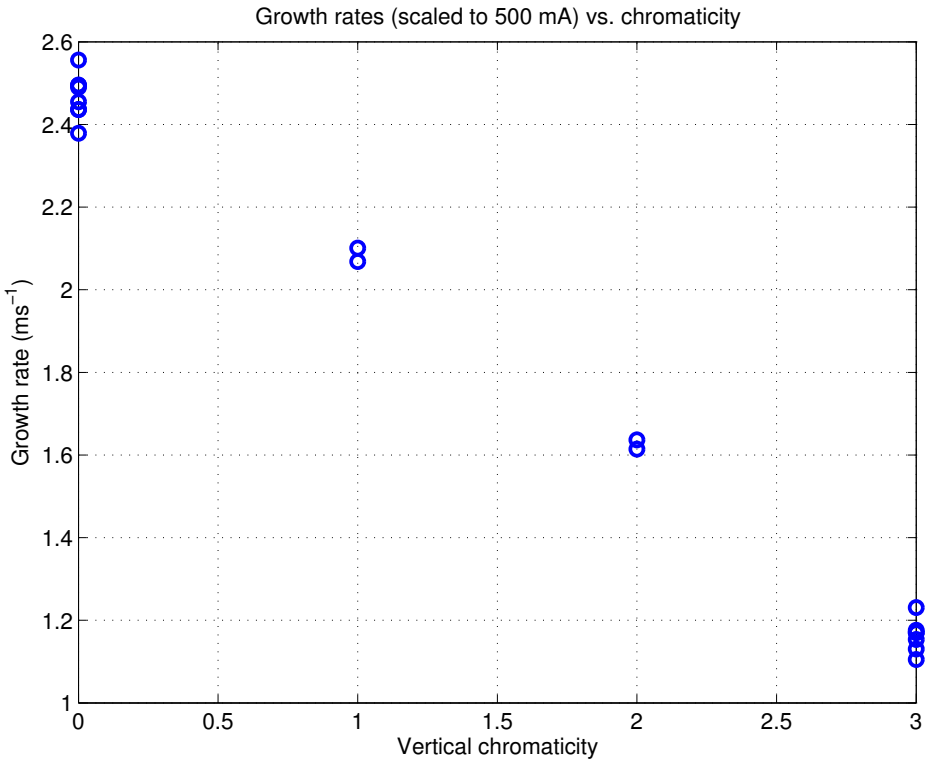

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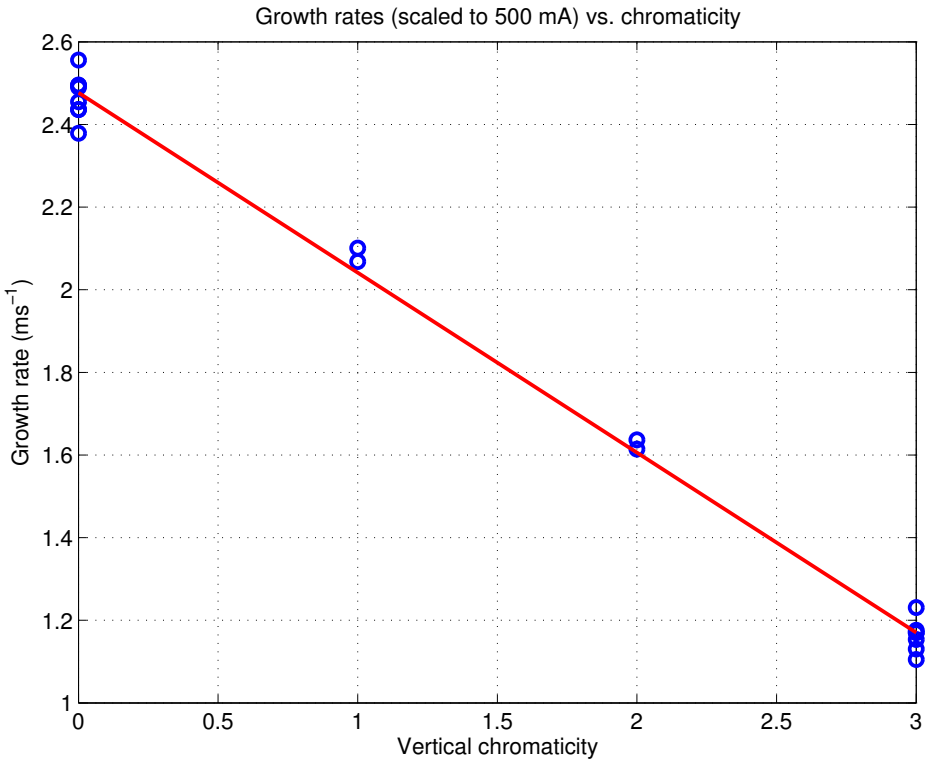

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- Feedback can easily control vertical instabilities at zero chromaticity and all tested BL15 gap settings.
- Insufficient voltage for bunch cleaning, doable during AP shifts (scrapers?).
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