

Synchronous Phase Transient in BEPC2

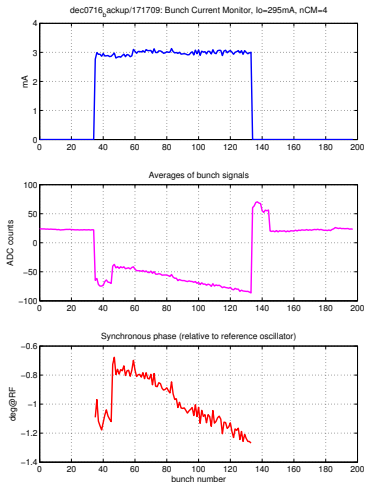
D. Teytelman¹, et. al.

Dimtel, Inc., San Jose, CA, USA

December 8, 2016



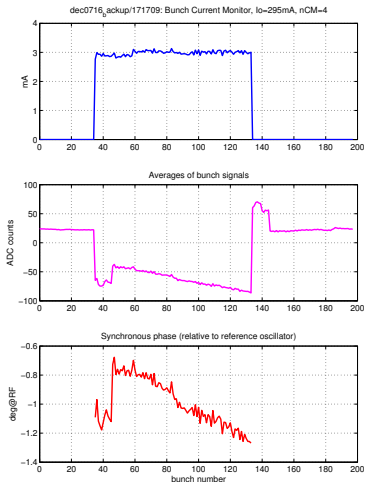
Measuring the Gap Transient



- Use data acquisition in the longitudinal bunch-by-bunch feedback system;
- From a single measurement can estimate bunch-by-bunch currents and phases;
- An HOM affects 22 RF buckets at the beginning and the end of the train;
 - Generated 6.6 m downstream;
 - Damps out in a few buckets;
- Corrected in post-processing.



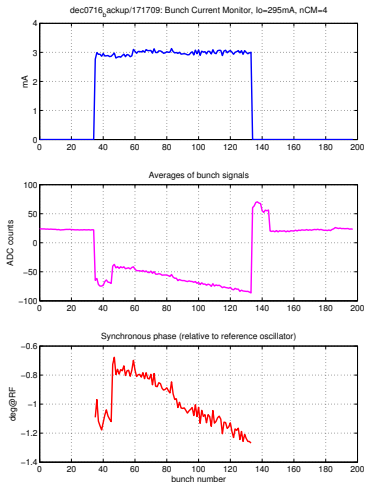
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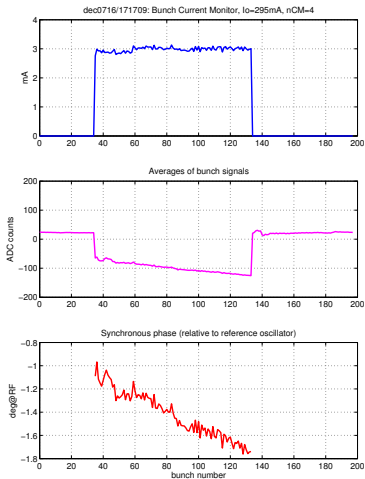
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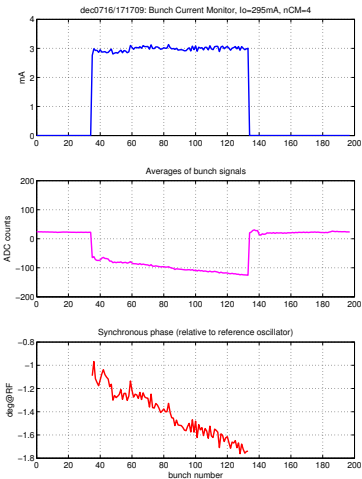
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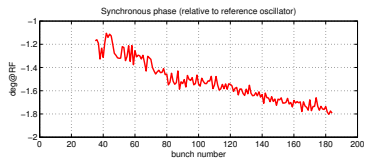
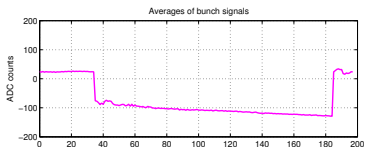
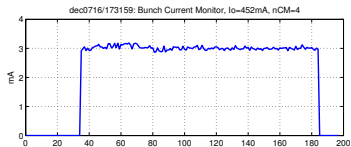
Changing the Gap Size



- Half the ring (99 bunches in 4 ns spacing);
- 150 bunches;
- 173 bunches;
- 198 bunches;
- All transients on one plot;



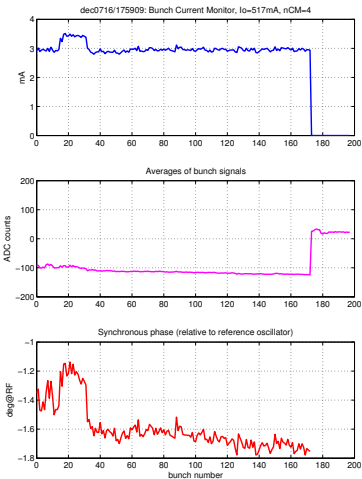
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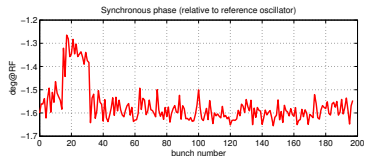
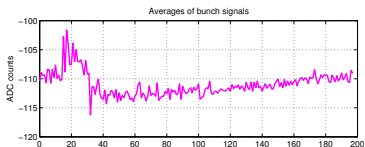
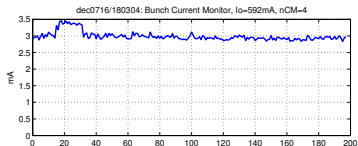
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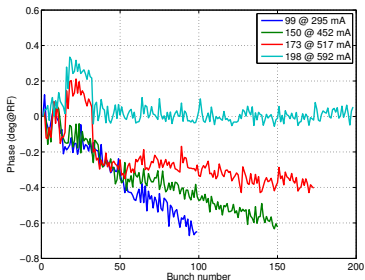
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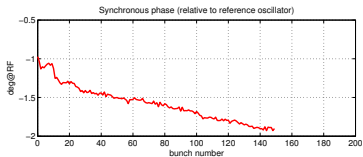
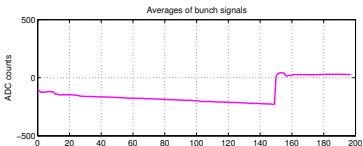
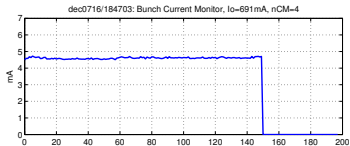
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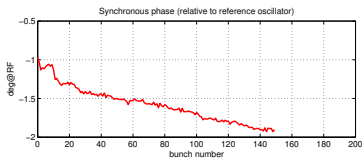
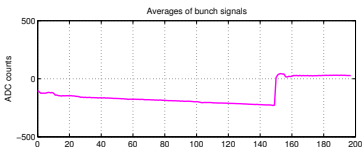
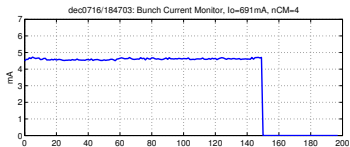
Bunch Current Modulation



- Place the charge removed from the gap at the edges of bunch train;
- 150 bunches (25% gap) in a uniform train, 4.6 mA per bunch, 690 mA total;
- 150 bunches in sequence: 24 at 6 mA, 102 at 3 mA, 24 at 6 mA, 603 mA total;
- Roughly as expected, flat in the middle, same peak-to-peak transient;
- Had some issues with high charge saturating the front-end, redo?



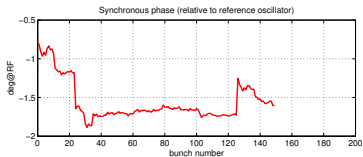
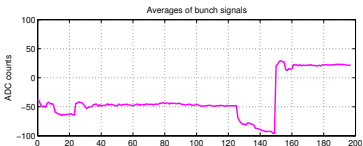
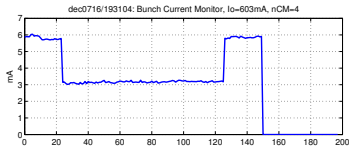
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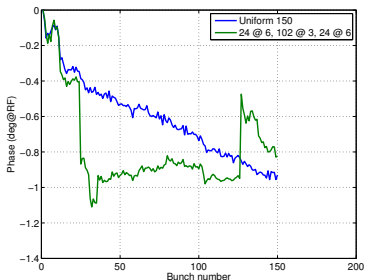
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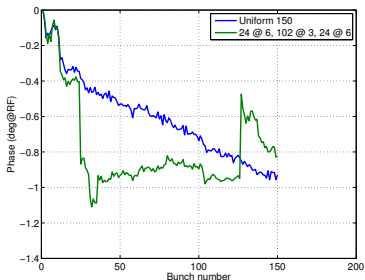
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Summary

- Phase transients in BEPC2 are small — expected due to the combination of SRF and ring circumference;
- Bunch-by-bunch transients can be measured fairly accurately by the LFB;
- Charge/density modulation seems to work, need to check more carefully.



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