First Look at Data from New Frascati Phase Monitor

Jack Roberts

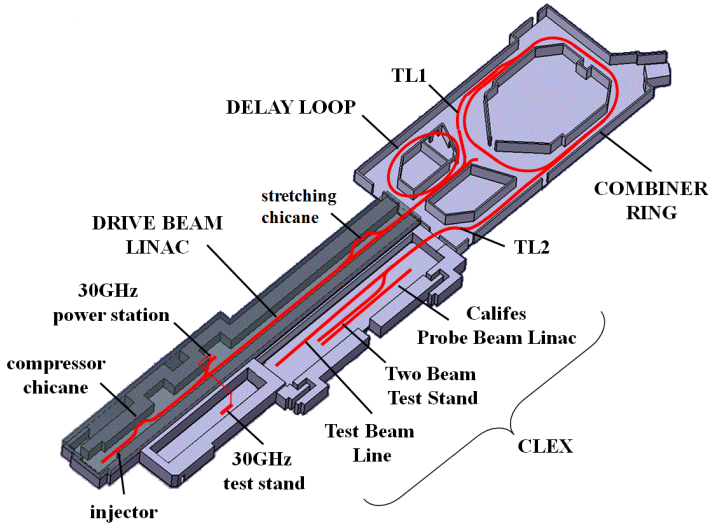
Intro

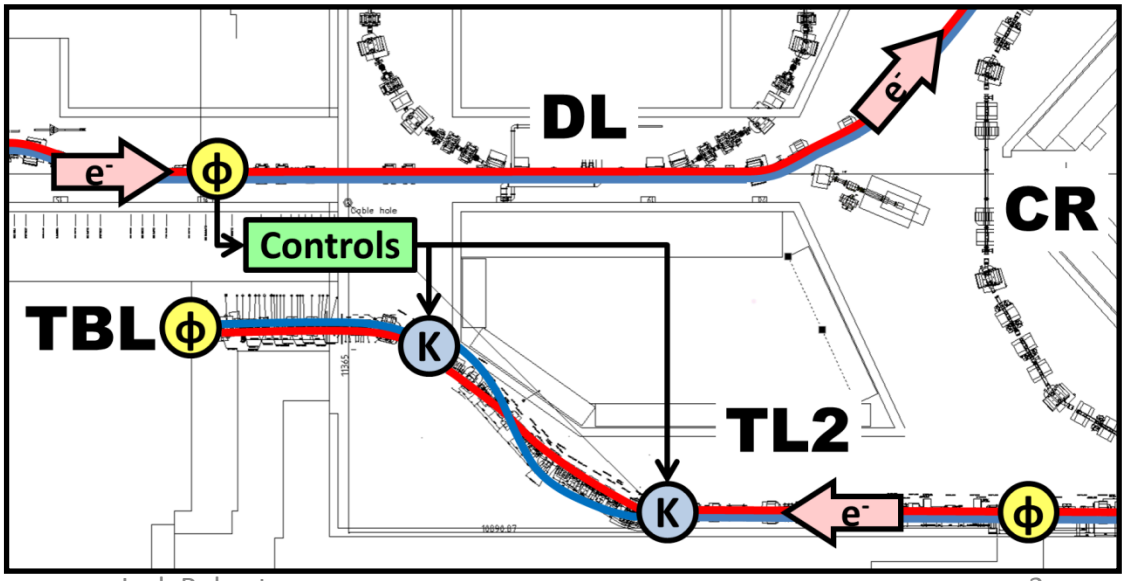
- 2 new Frascati monitors have been installed:
  - 1 upstream at the end of the linac (neighbouring the old monitor).
  - One downstream of TL2 in TBL.

- We took some with the two upstream monitors (new and old) a couple of weeks ago to perform initial cross checks, calibrations etc.

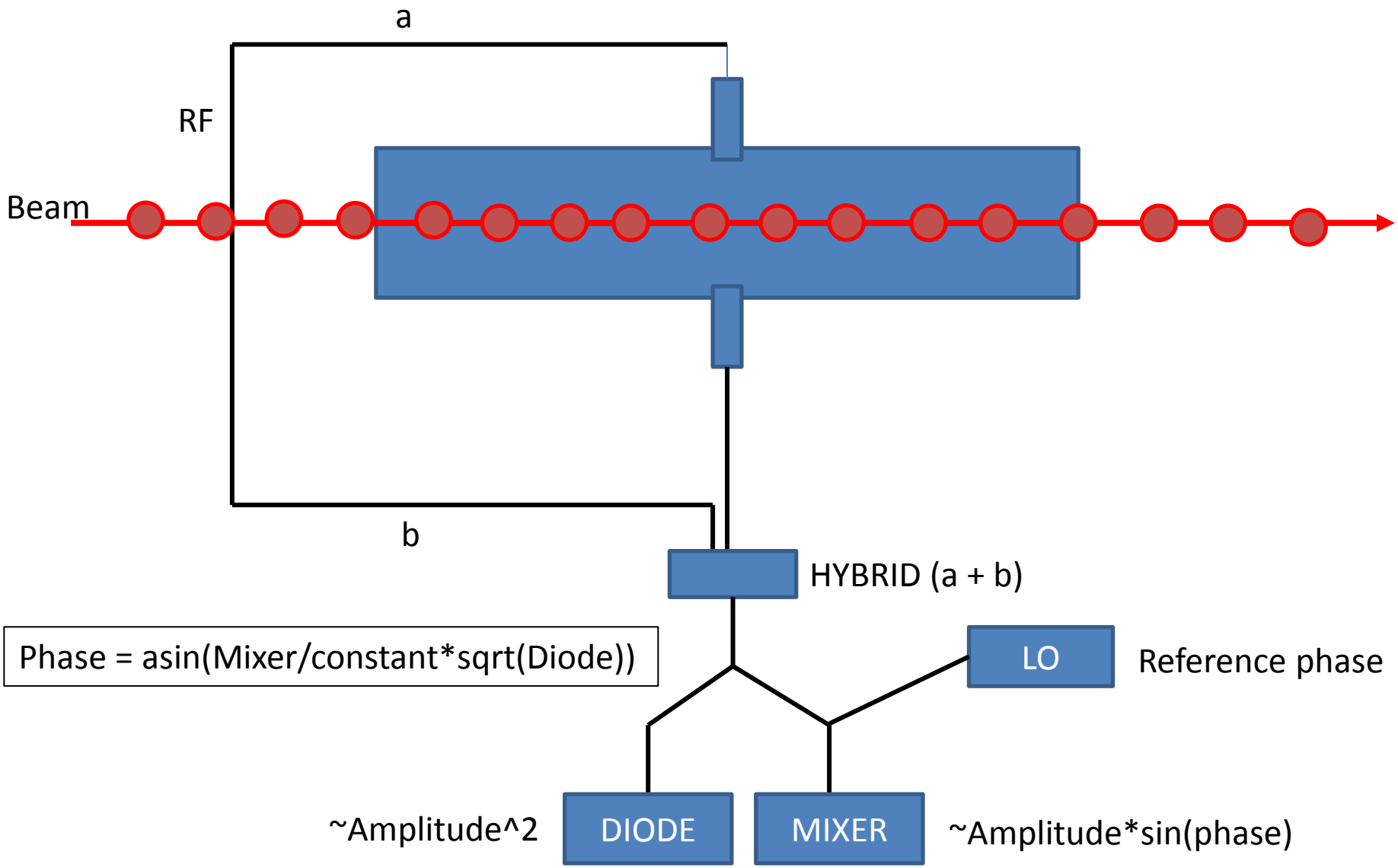
Phase Feedforward Prototype at CTF3

- Phase = difference between time of arrival of bunch and expected/ideal time of arrival
- Phase feedforward system: stabilise phase to 0.2 degrees of 12 GHz (~50fs).
- Correct phase by varying path length of beam through chicane.

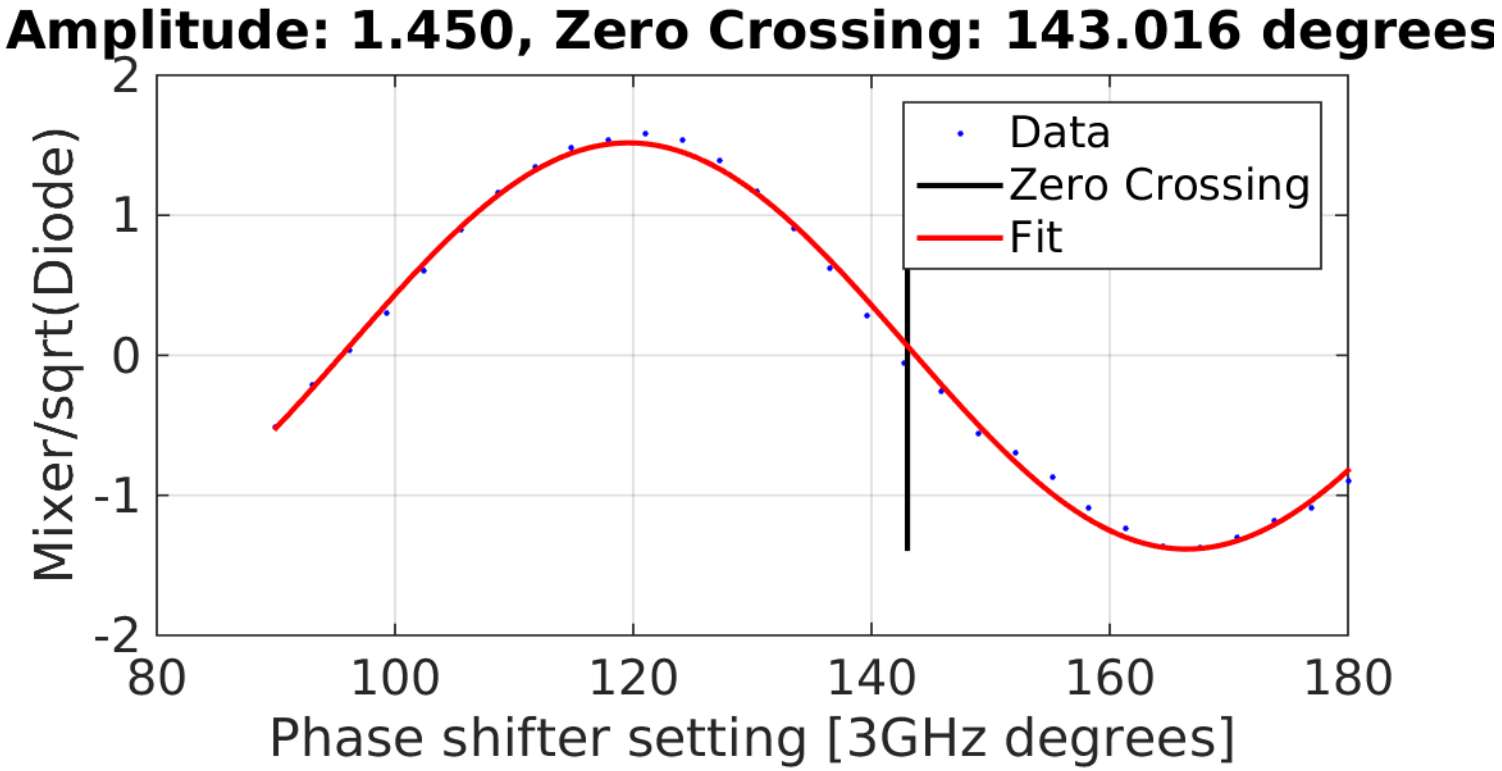




Phase monitors

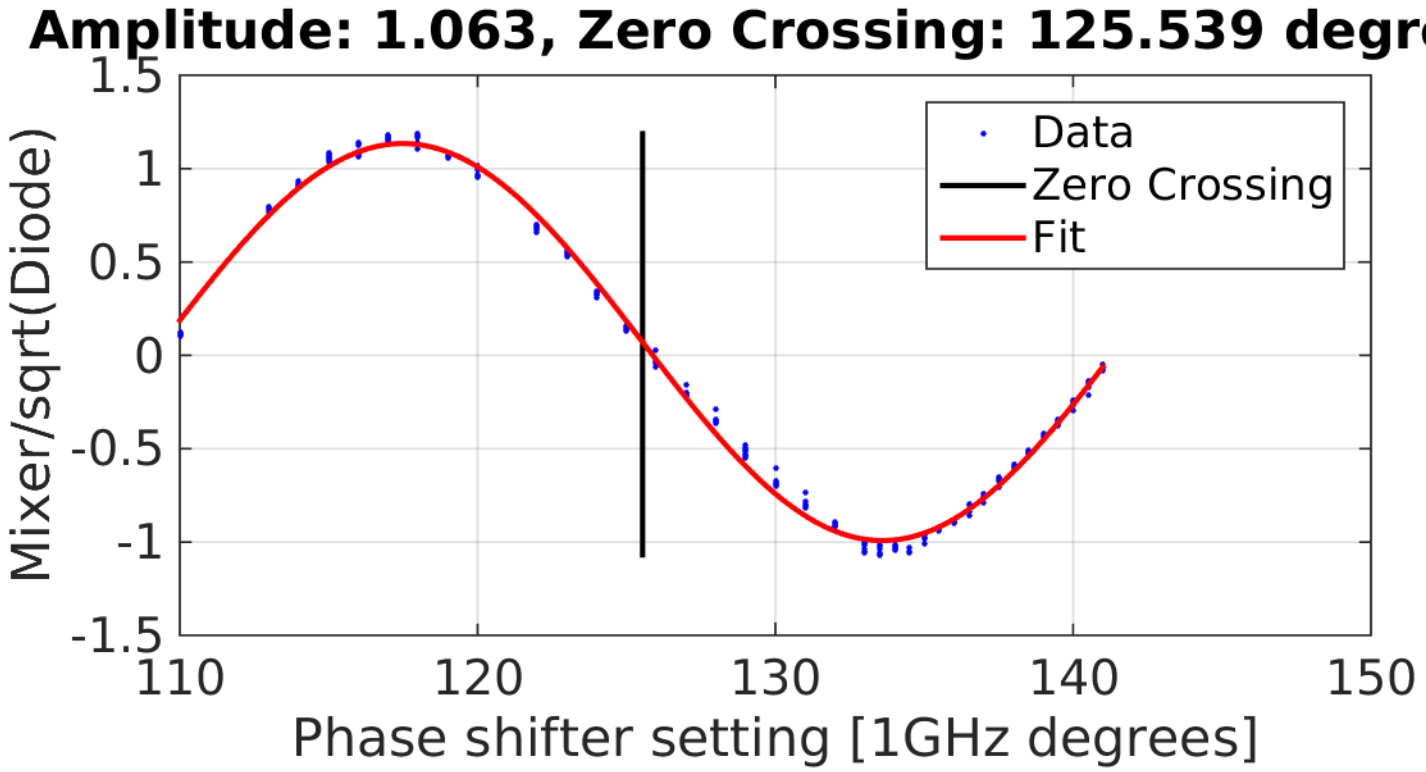


Old Monitor - Calibration



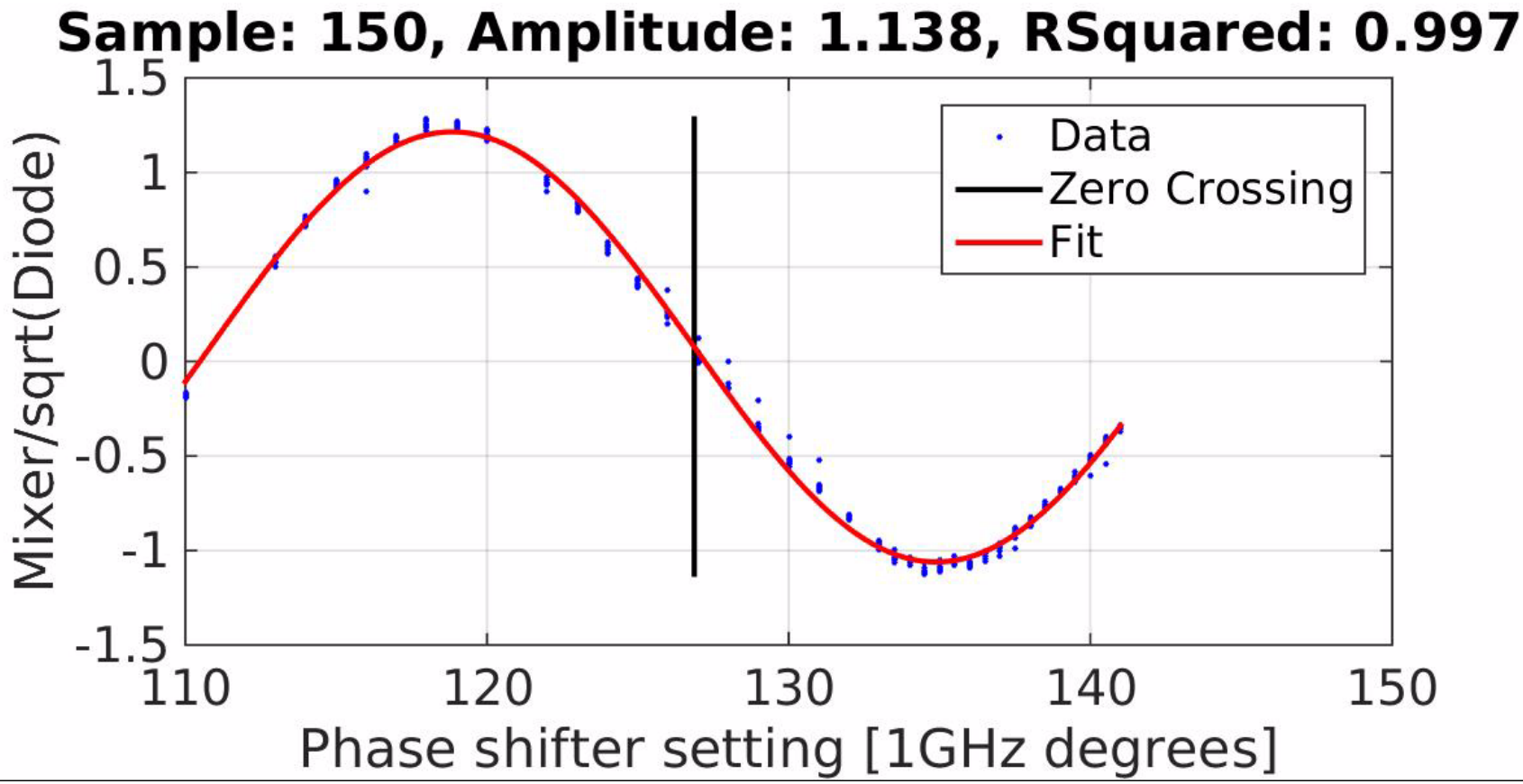
- LO scan
- Connected to remote phase shifter.

New Monitor – Calibration (Mean)

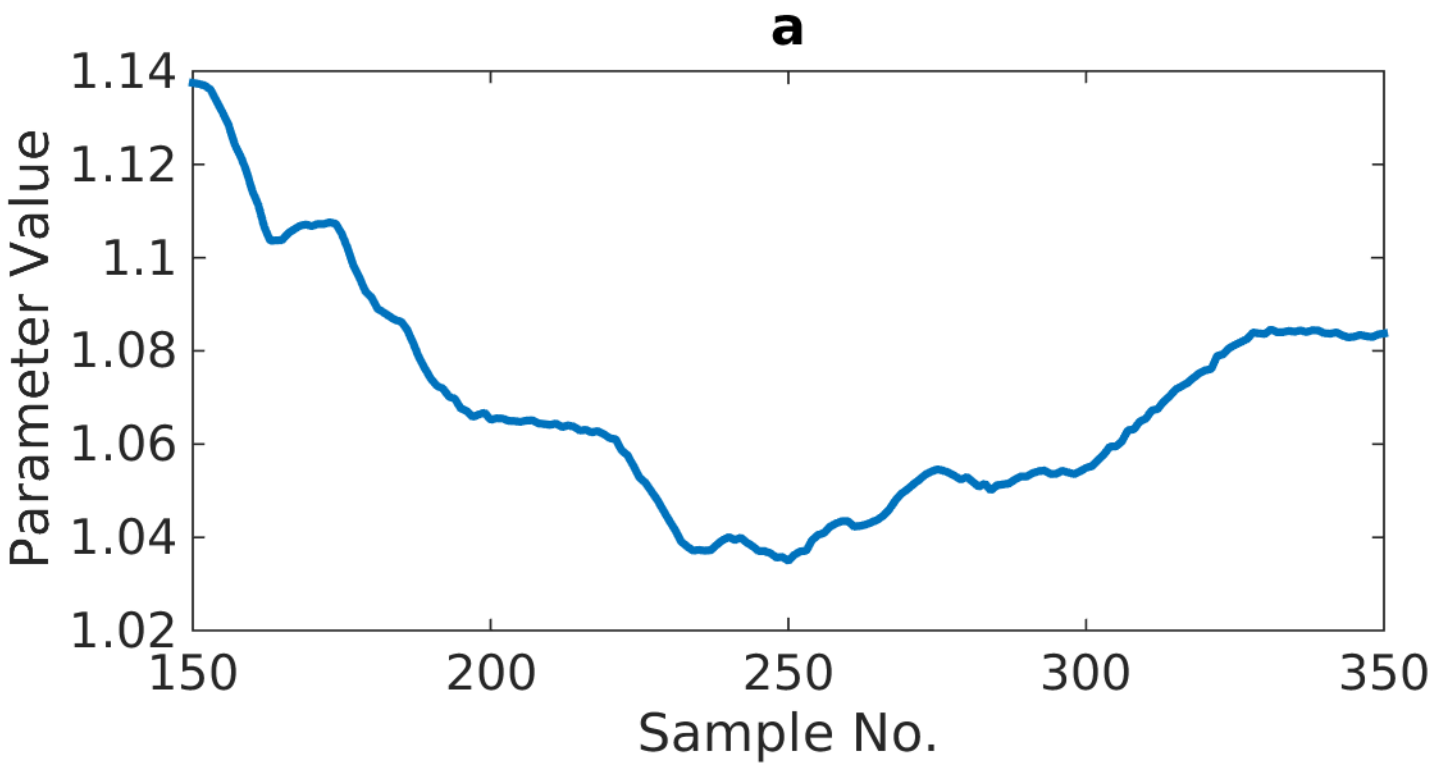


- Connected to manual phase shifter.

New Monitor Calibration (Per Sample)



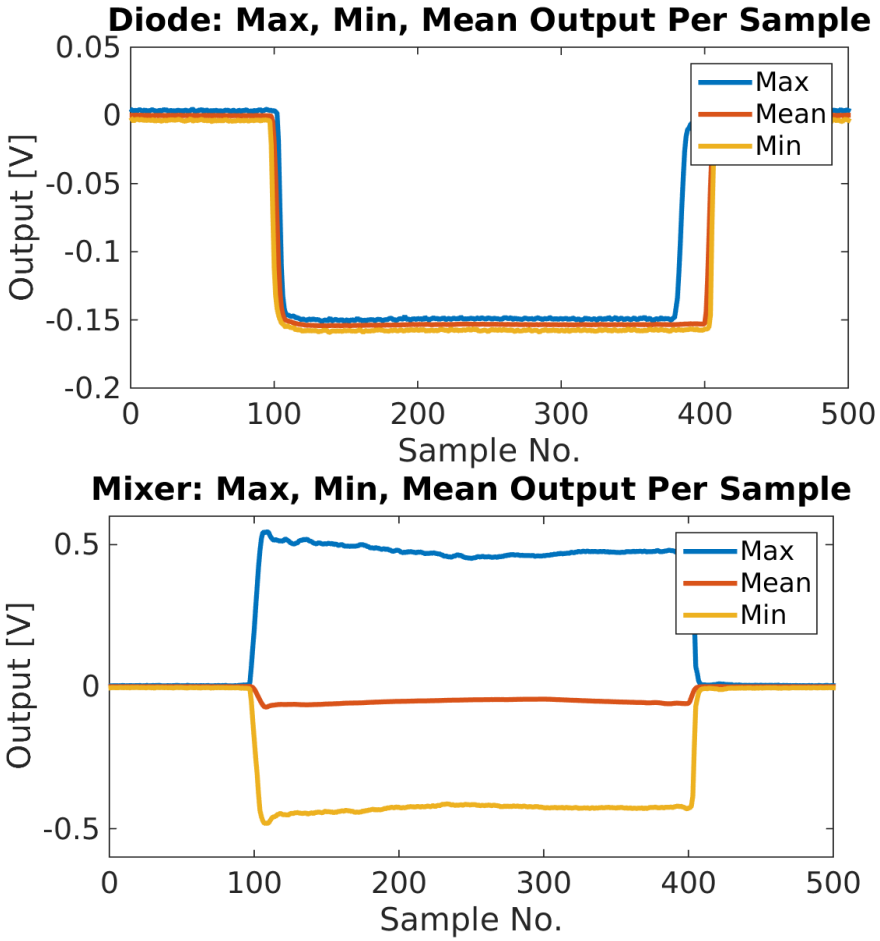
New Monitor Calibration (Per Sample)



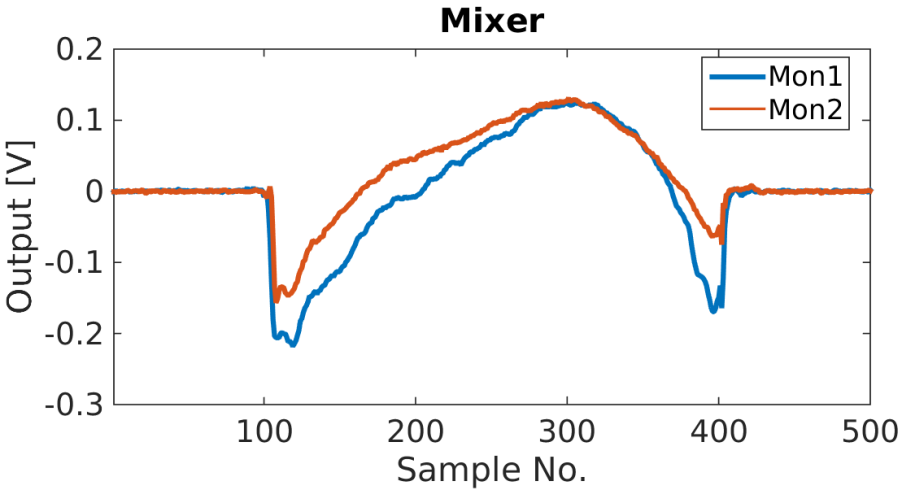
- Varying bunch length along pulse?

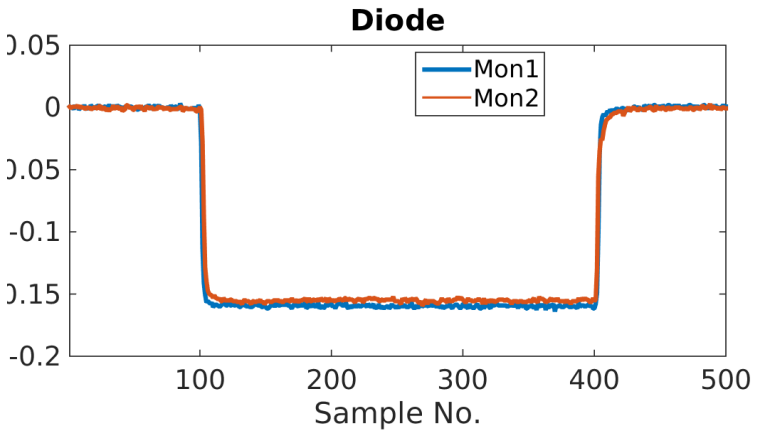
New Monitor Calibration (Per Sample)

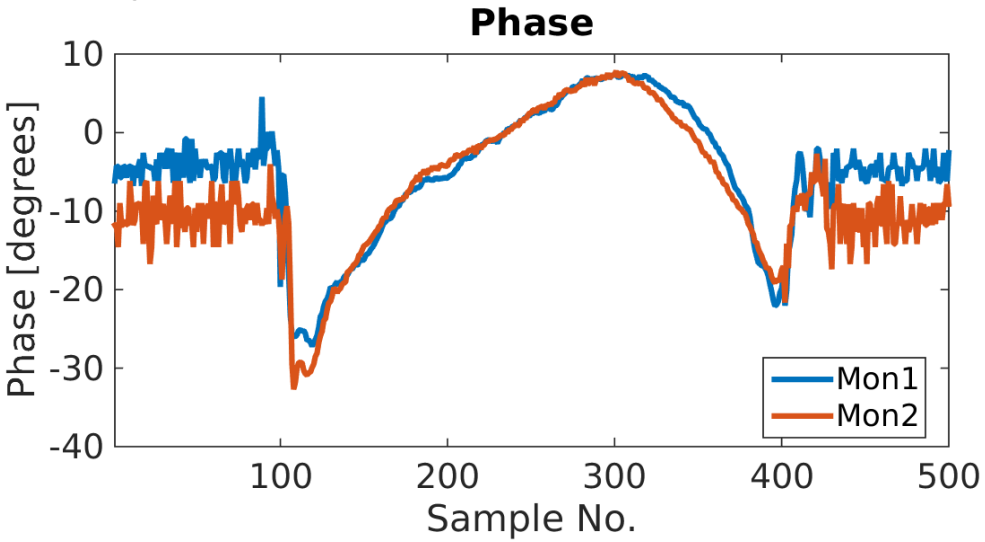
- Sanity check that showing max amplitude does vary with sample no.



Signal Comparisons – few examples







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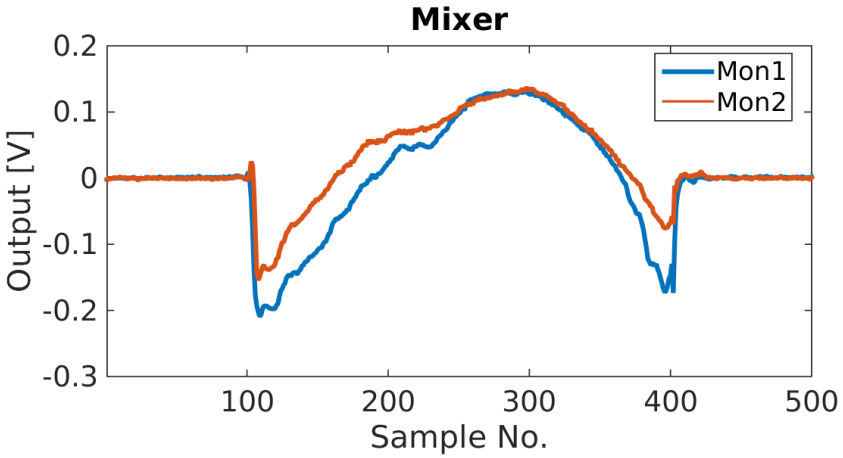

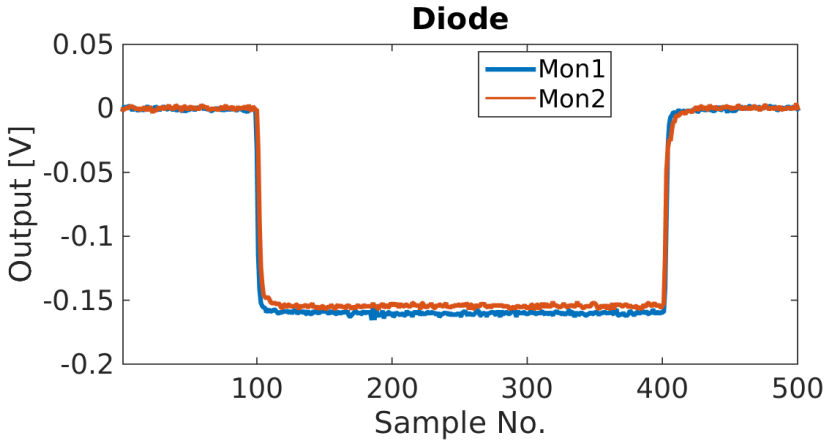

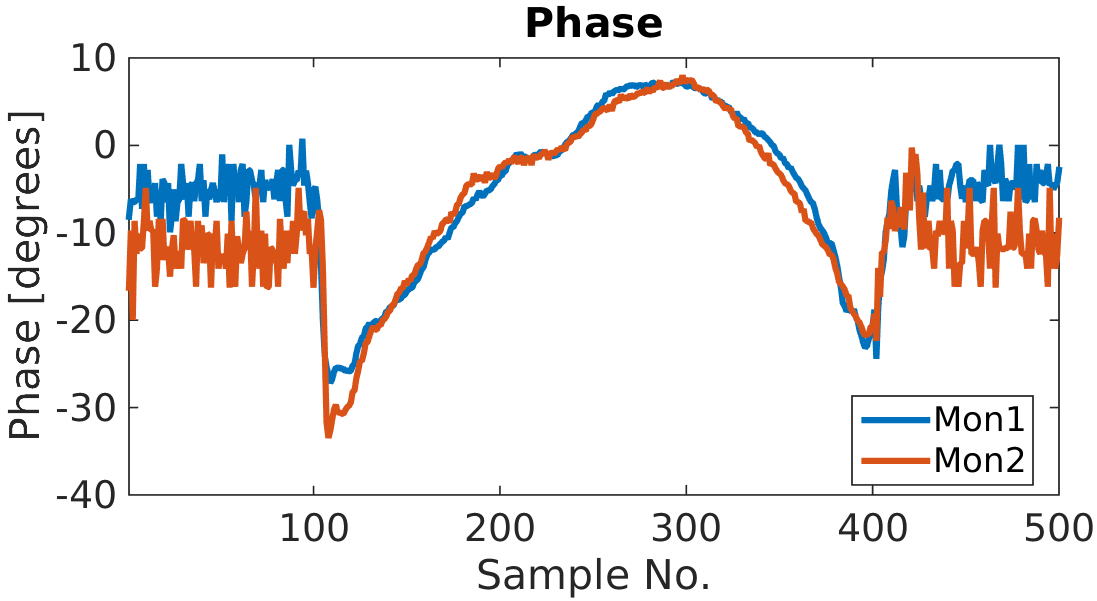

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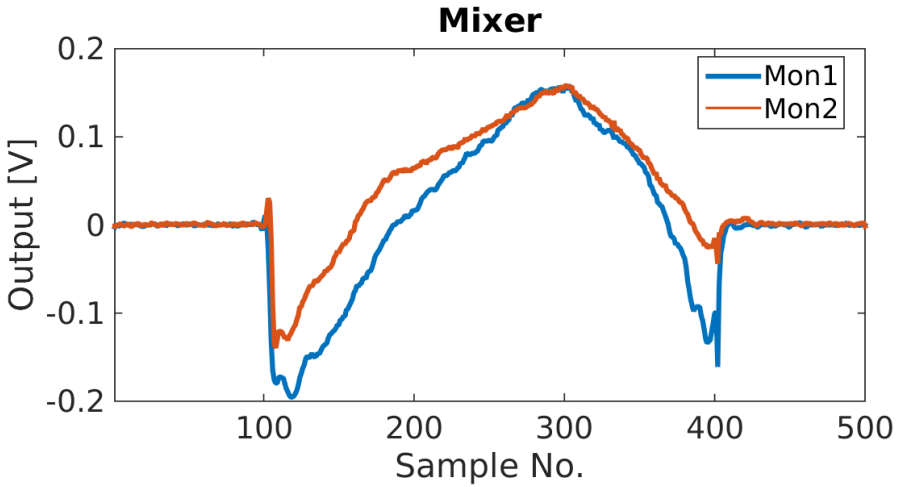

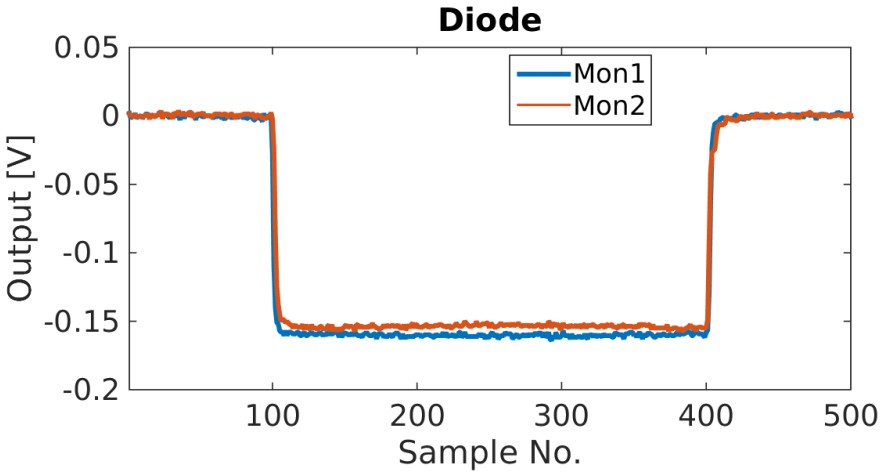

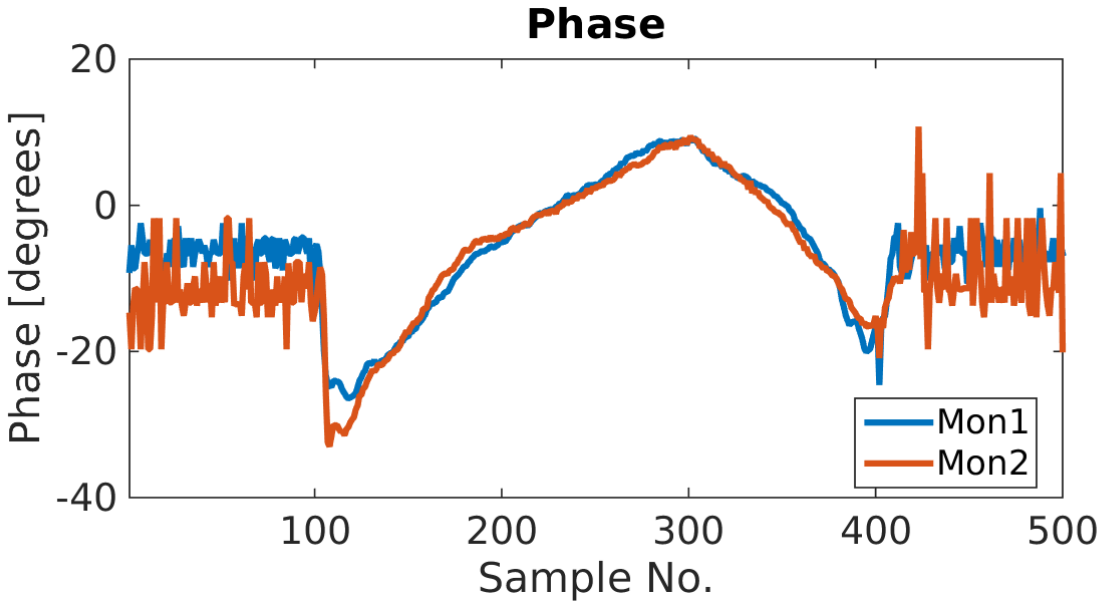

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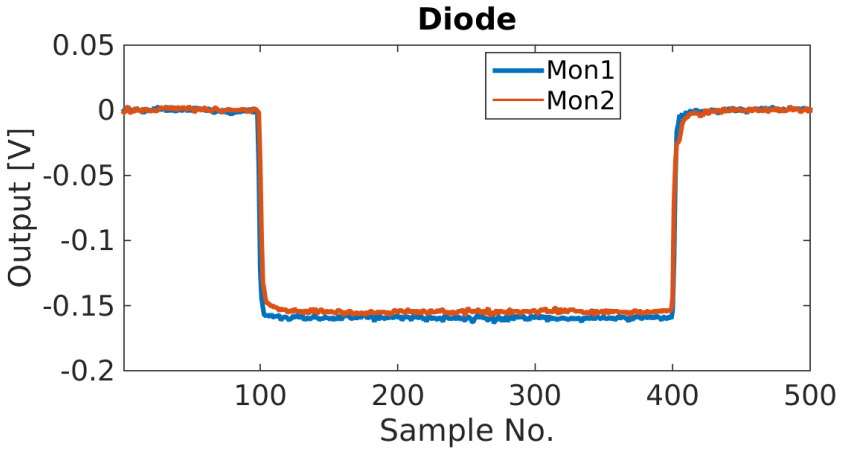
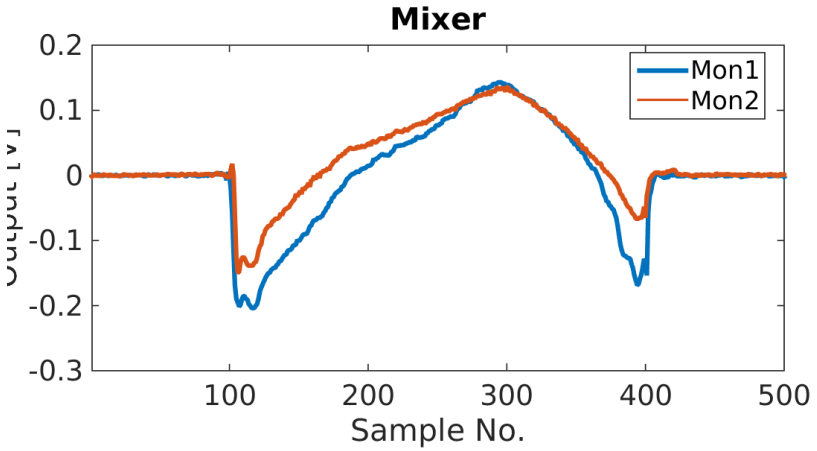
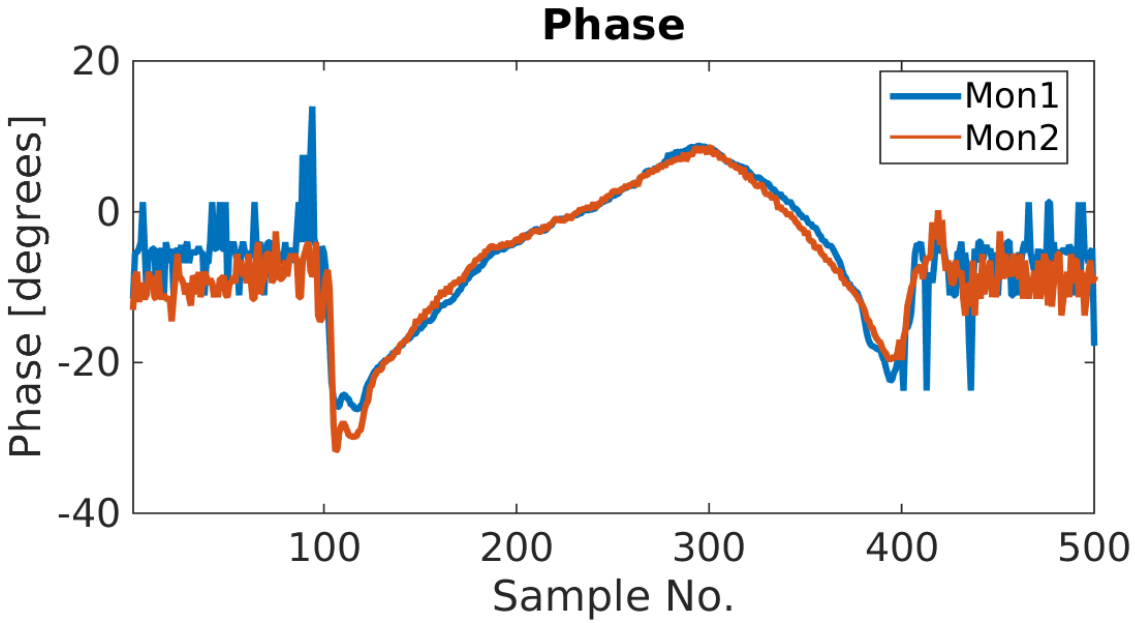
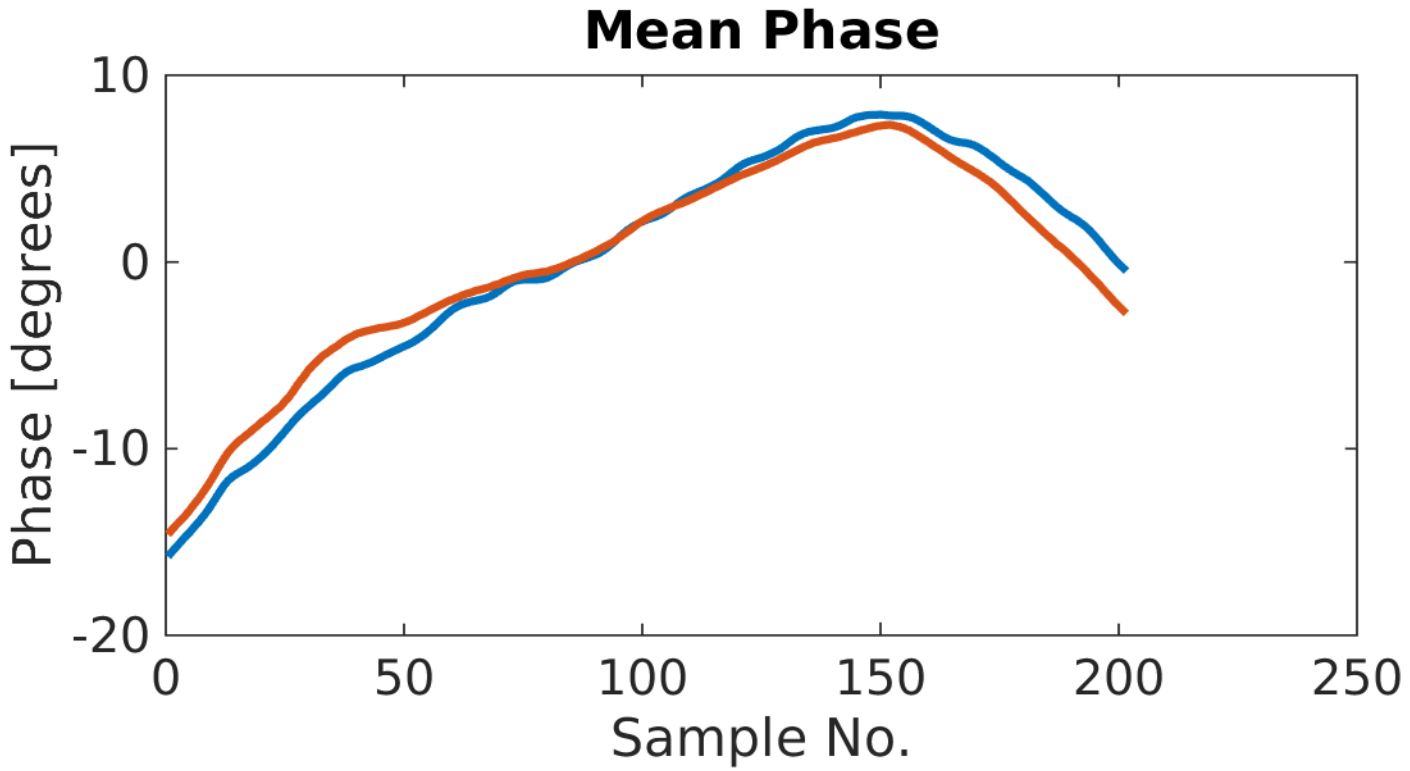


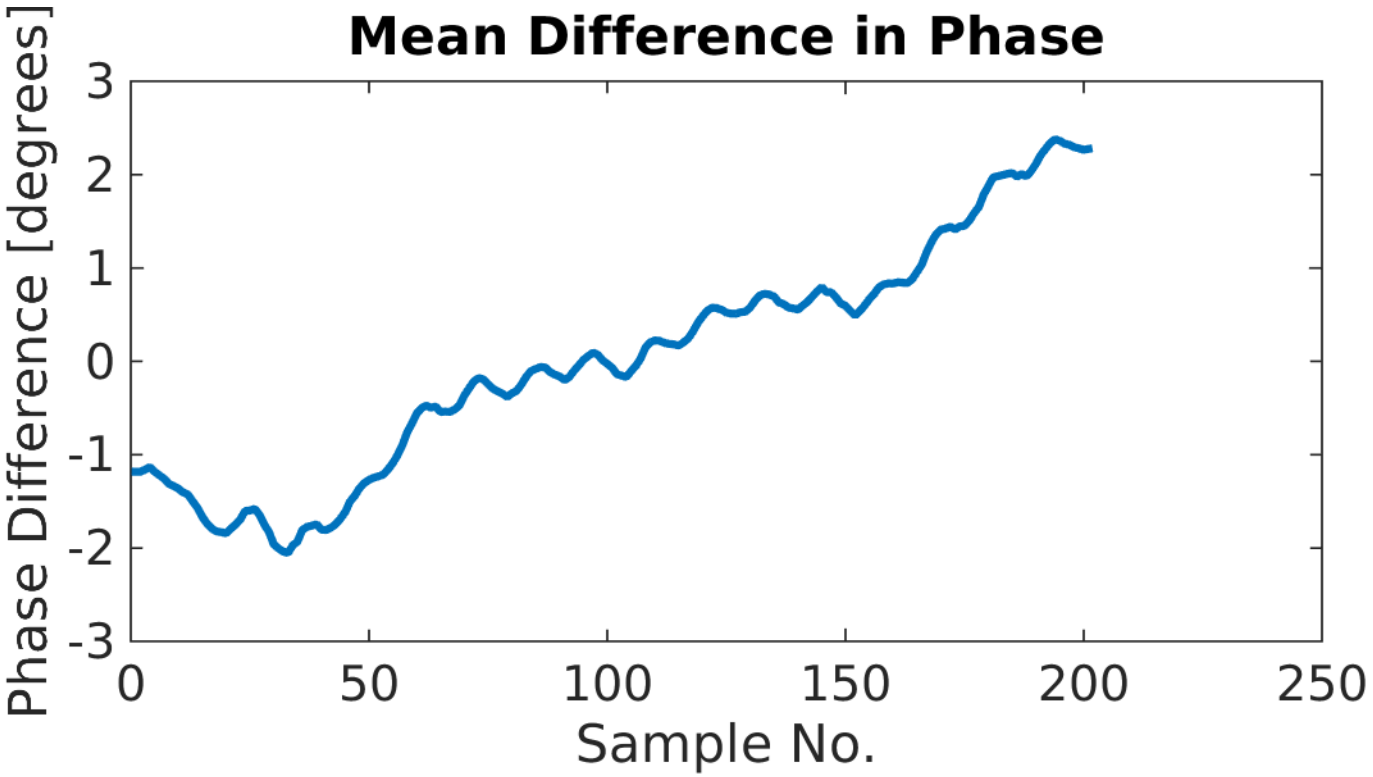




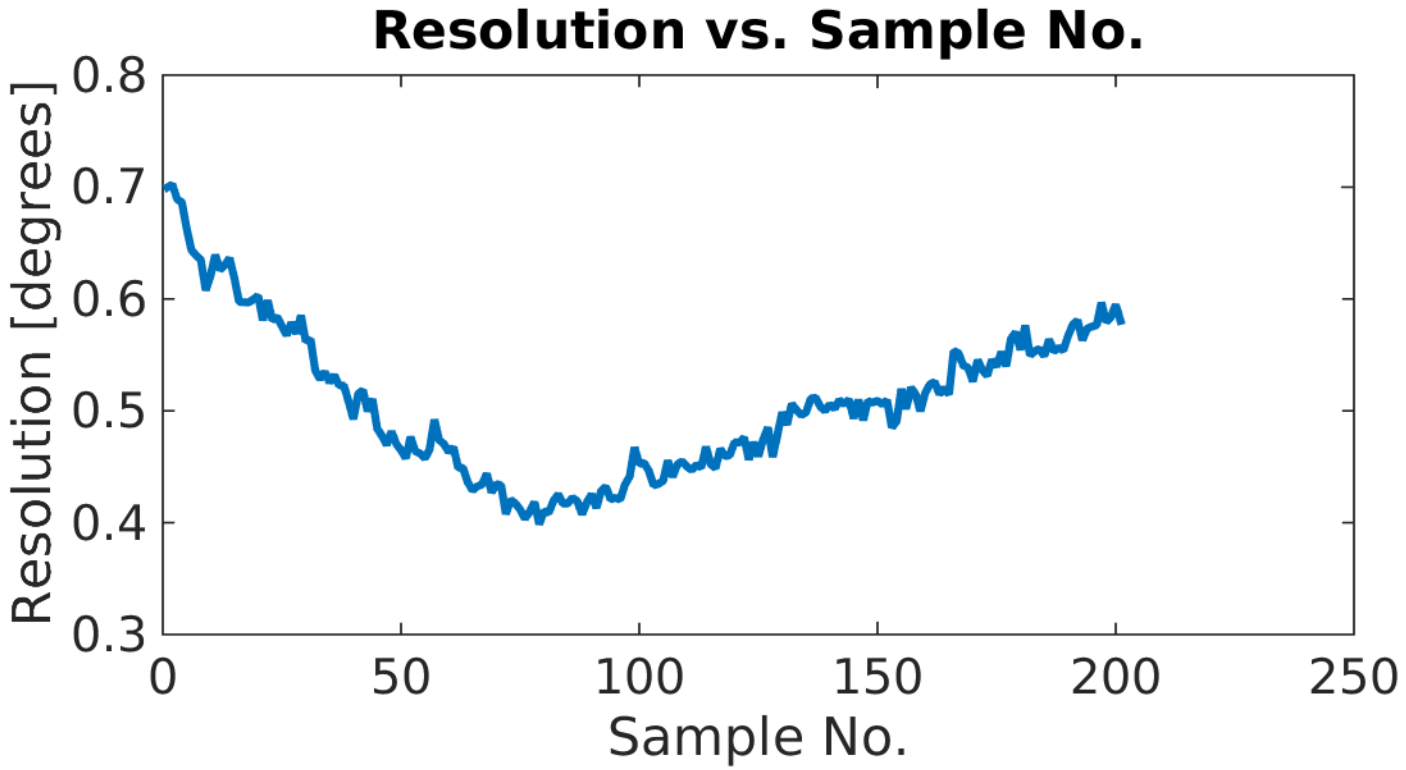
Mean Phase Comparison



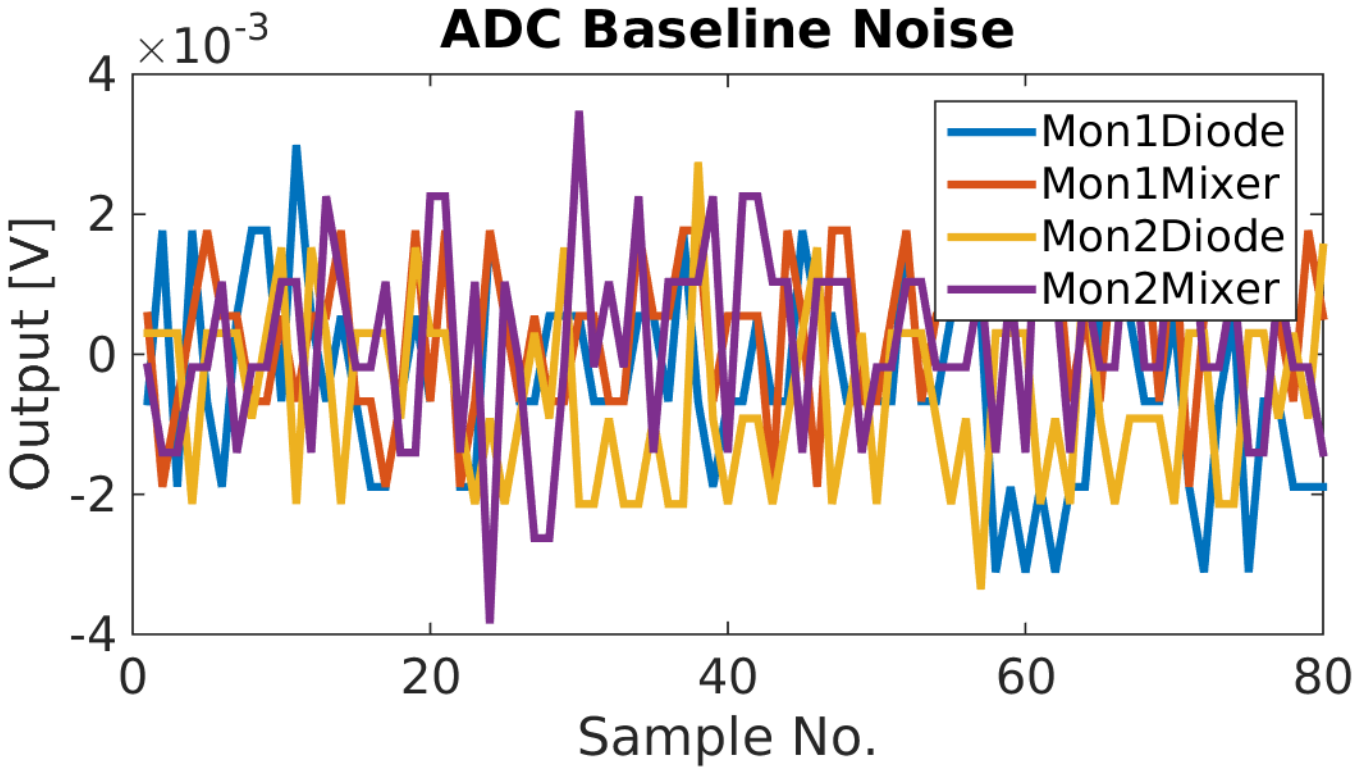
Difference in Phase



Resolution


Resolution vs. Sample No.
Resolution [degrees]
0.8
0.7
0.6
0.5
0.4
0.3
0
50
100
150
200
250
Sample No.

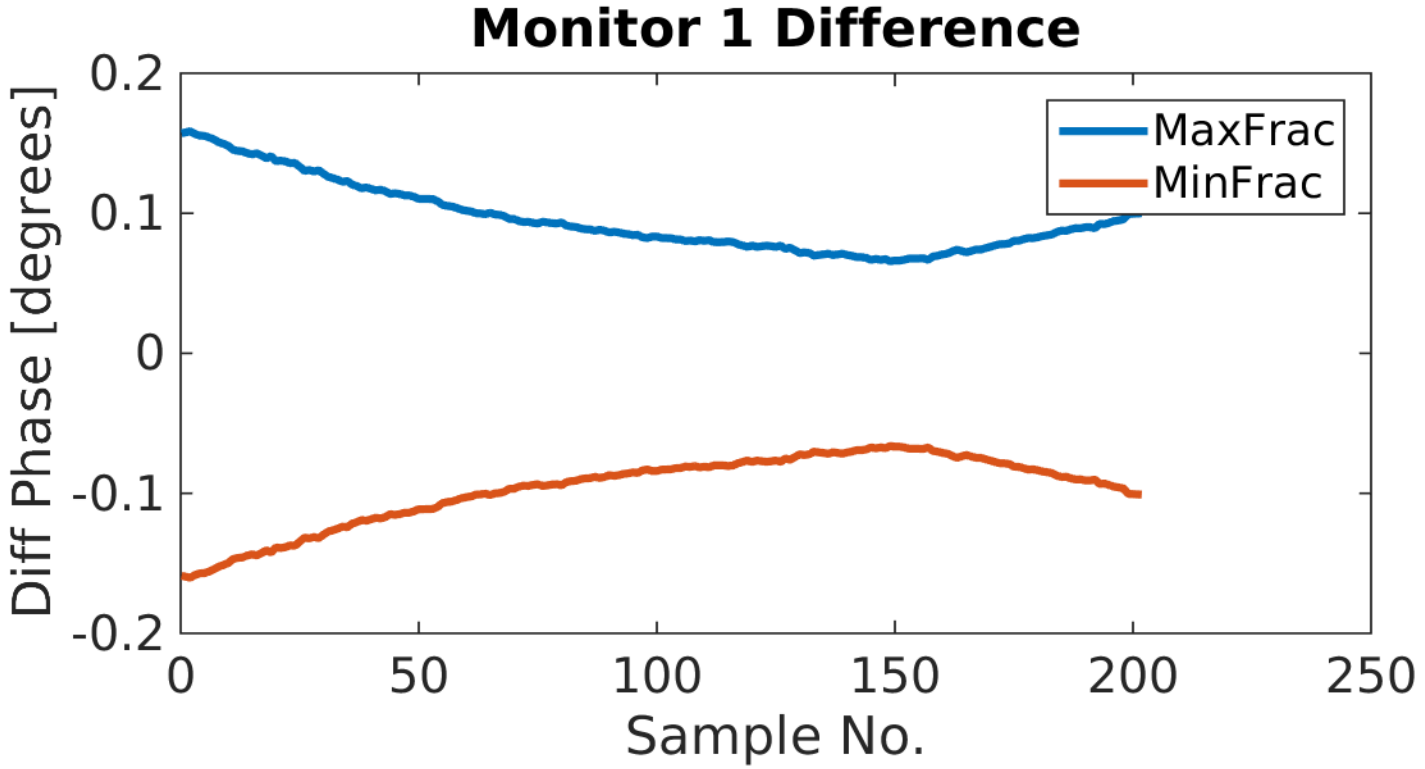
ADC Baseline Noise



ADC Baseline Noise

- Difference in phase caused by:

(Mixer +/- ADCNoise)/(cal*sqrt(Diode +/- ADCNoise))



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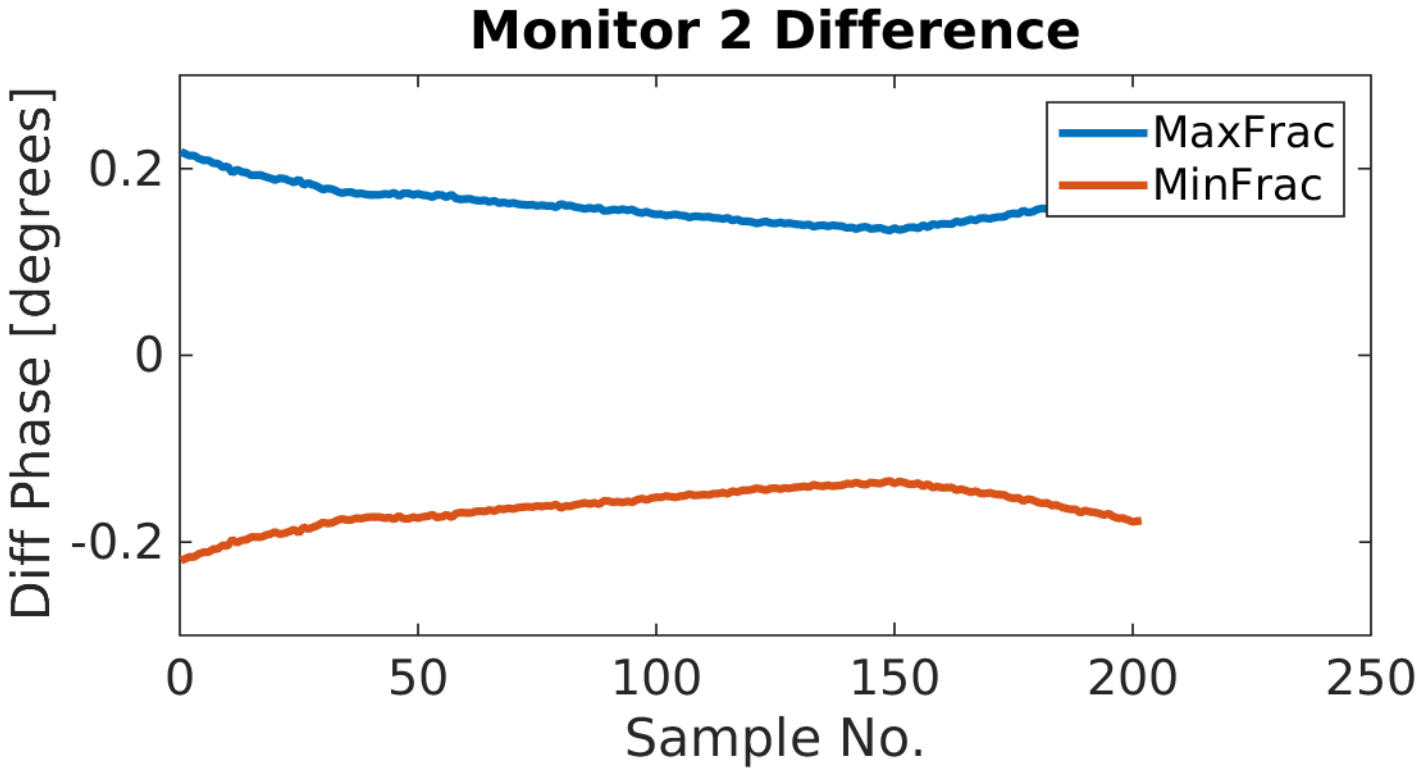

Summary

- Two new phase monitors installed, one proven to be operational!
- Only one remote phase shifter at the moment.
- Difference in phase slope of around +/- 2 degrees between the two monitors.
- Resolution minimum of 0.4 degrees with contribution from ADCs of maybe up to 0.2 degrees roughly in agreement with previous measurements.
- Calibration constant varies with sample number.
  - Want to see the effect of using variable calibration constant across pulse rather than just mean.
- More detailed studies to be done on response to different diode signal levels etc.