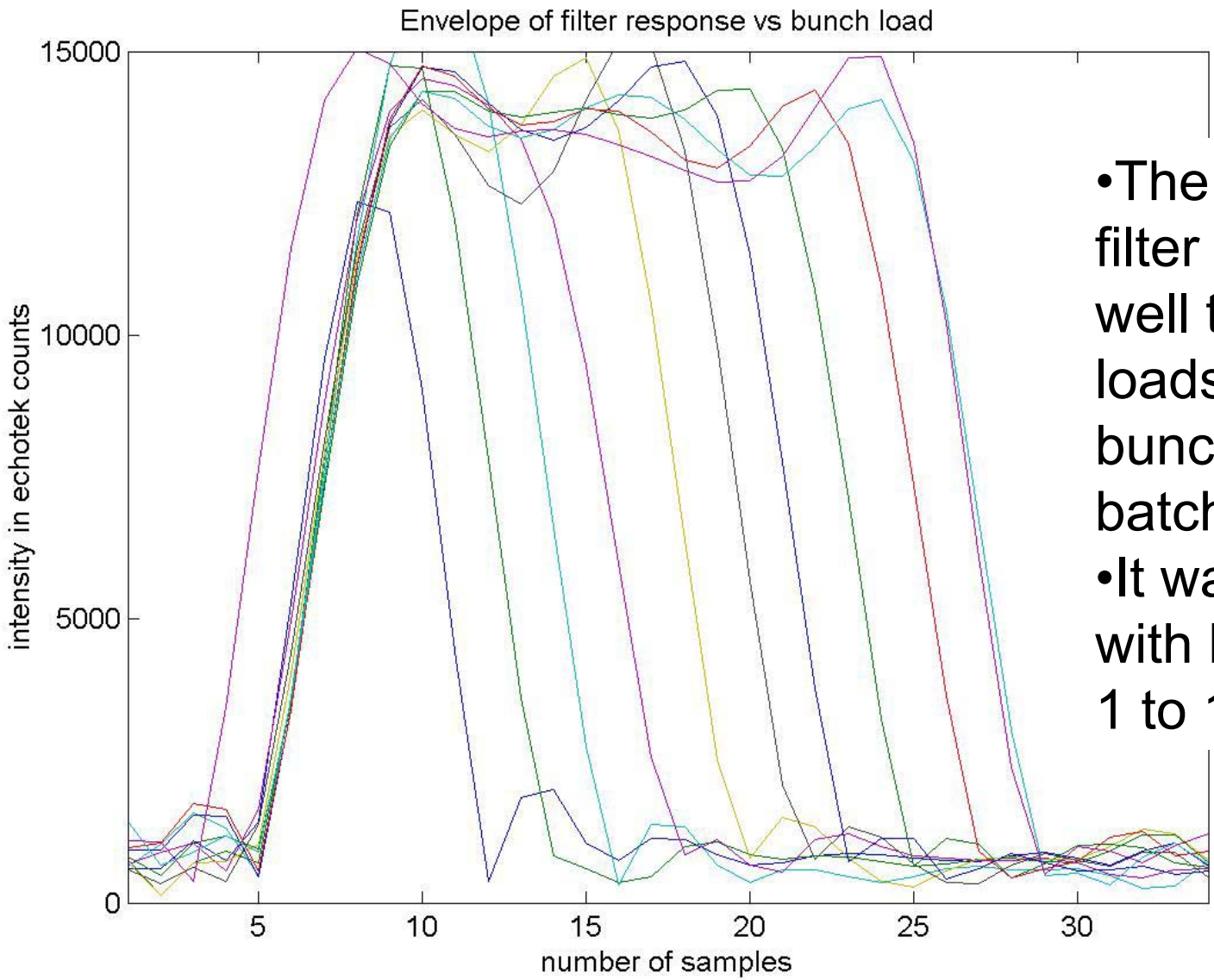
Envelope filter update

BPM project

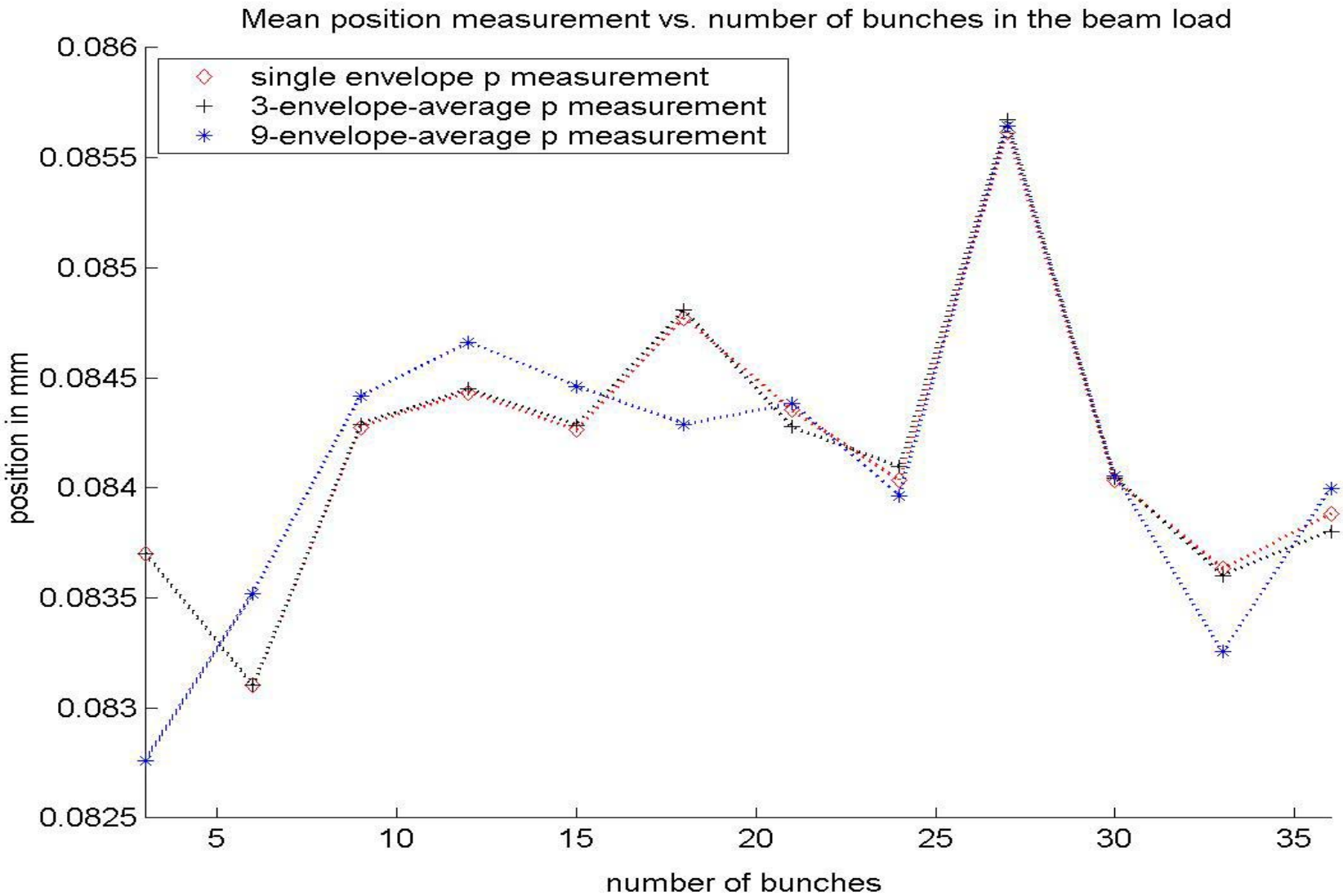
Envelope filter update

- The envelope filter was run using Jim's test stand data.
- Test runs varied the number of bunches from 1 to 12 per batch (i.e. 3 to 36 total beam load)
- We studied intensities, I, Q, position.

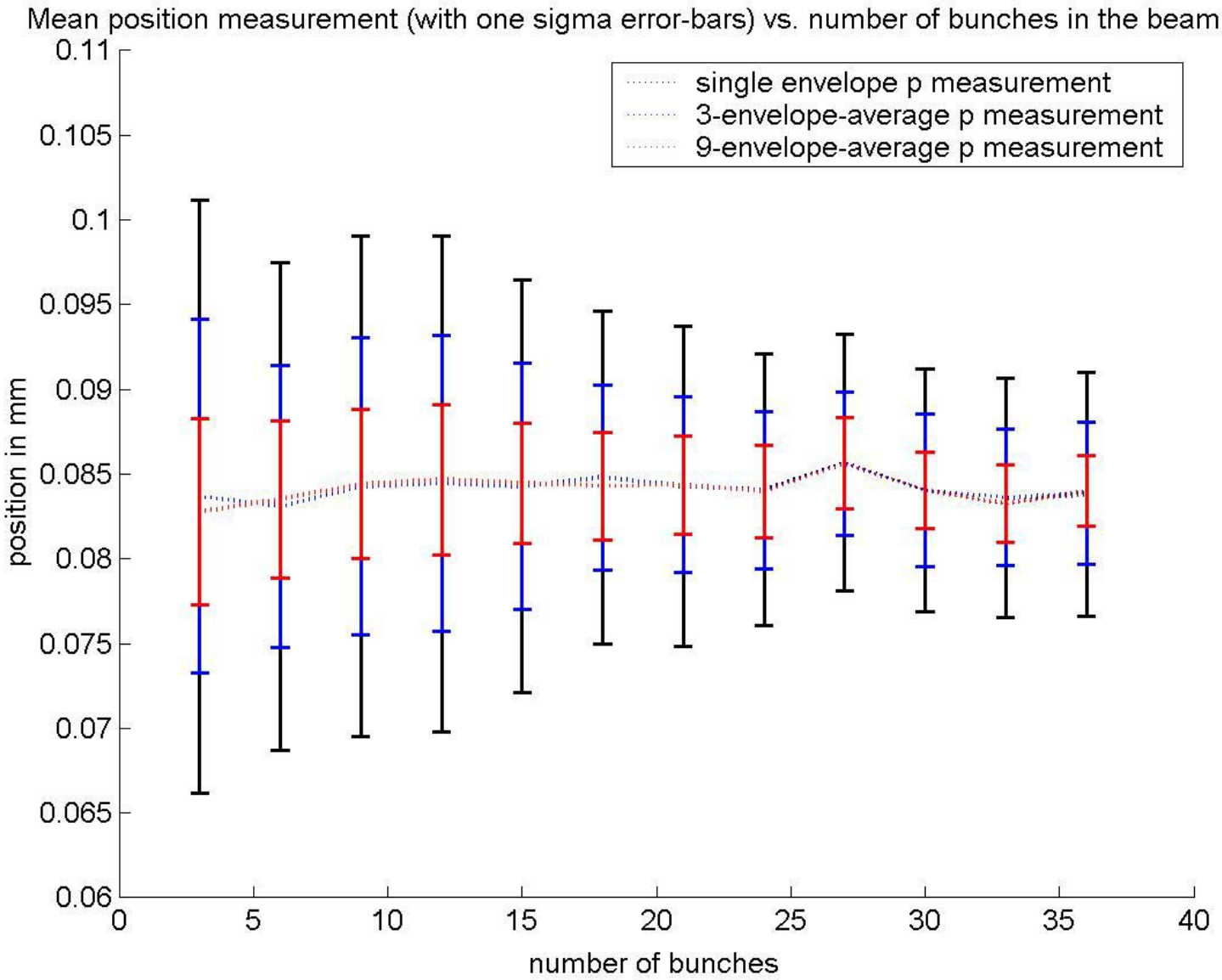
Envelope filter response



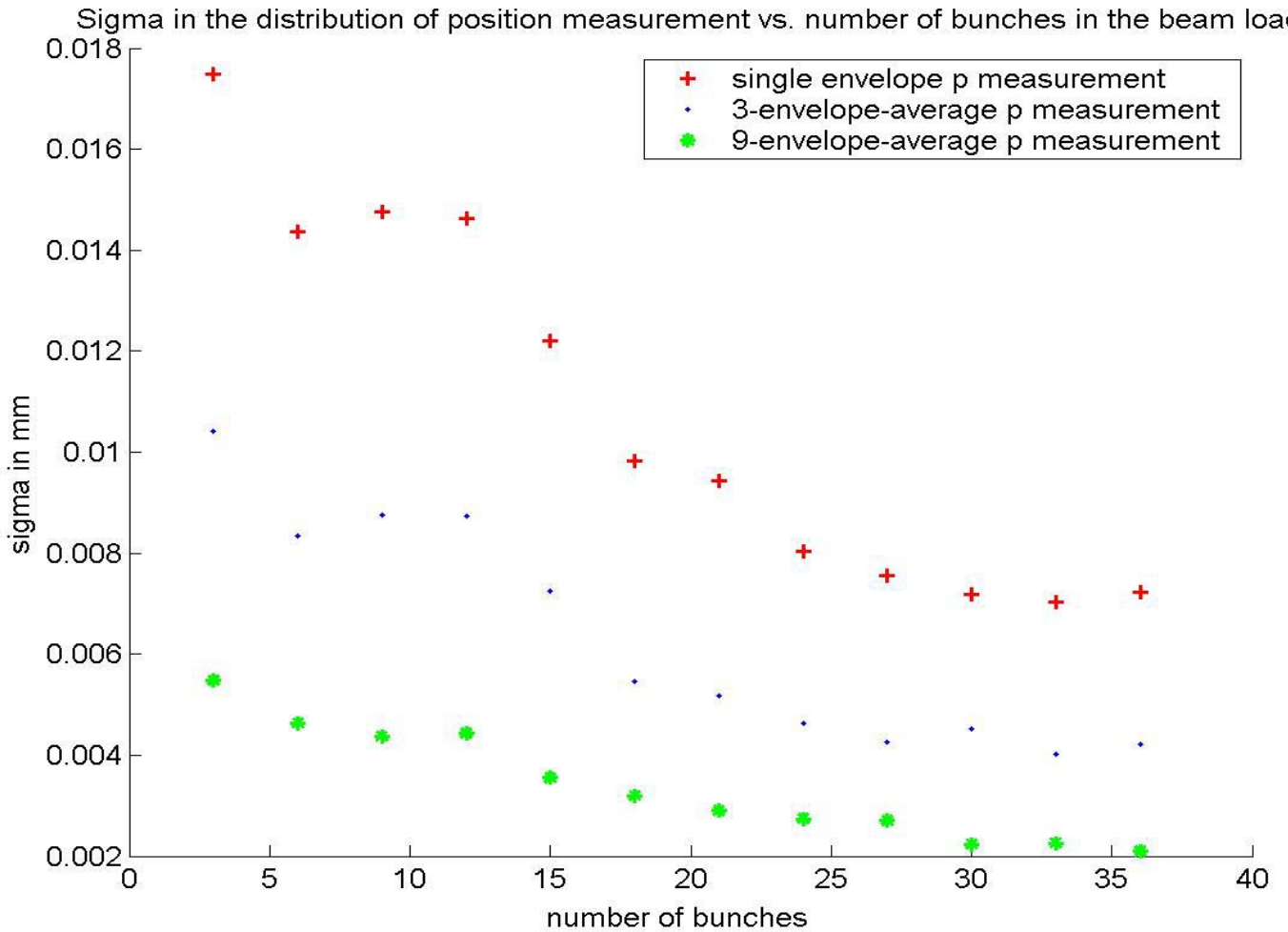
- The envelope filter responds well to beam loads with few bunches per batch.
- It was tested with batches of 1 to 12 bunches



- Single envelope p measurements = one I-Q pair ~ every 7usec (~142KHz)
- 3-envelope avrg. P measurements = one I-Q pair per lap, ~21usec (~45KHz)
- 9-envelope avrg. P measurements = one I-Q pair per lap, ~63usec (~18KHz)



•This is the same position measurement plot of last slide but including the error bars. Note that as more envelopes are considered to calculate the position measurement the error bars get smaller.



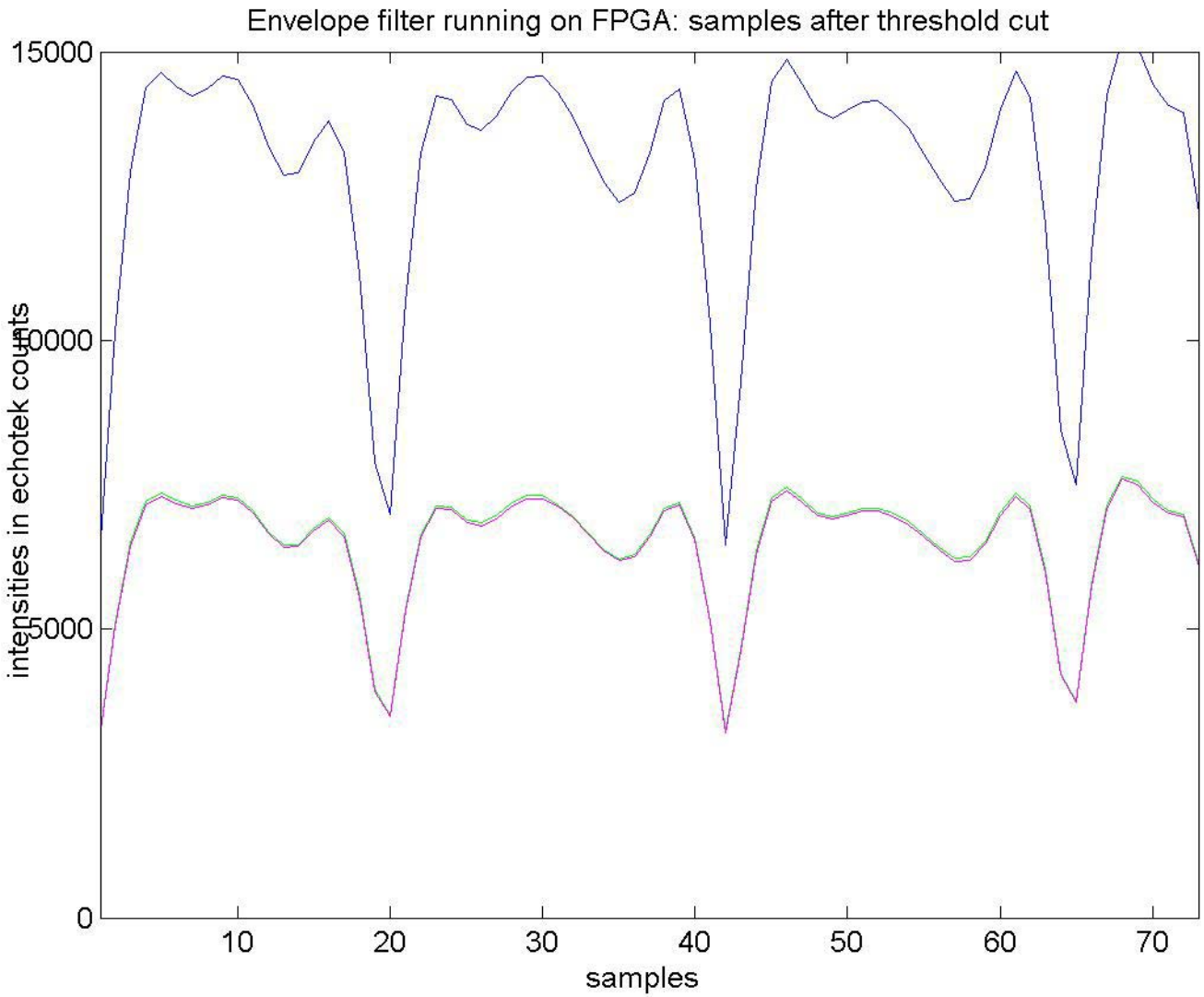
•The sigmas of position measurements shown in the last plot are plotted again to show the effect of more bunches in the beam load (i.e. better signal to noise ratio).

•All 3 sigma trends should be monotonic. The few point that fail to achieve that are probably due to the some non-Gaussian noise in the test-stand or we may need longer data runs.

FPGA implementation

- The FPGA filters I's and Q's with sample intensity below threshold and keeps the ones above threshold.
- Then, those I's and Q's are written into the Echotek memory.
- When we read and plot intensities based on those data they should look like chopped envelopes put together.

Plot of FPGA data



FPGA data

- The envelope filter has been tested in the FPGA with similar performance results.