Progress Report

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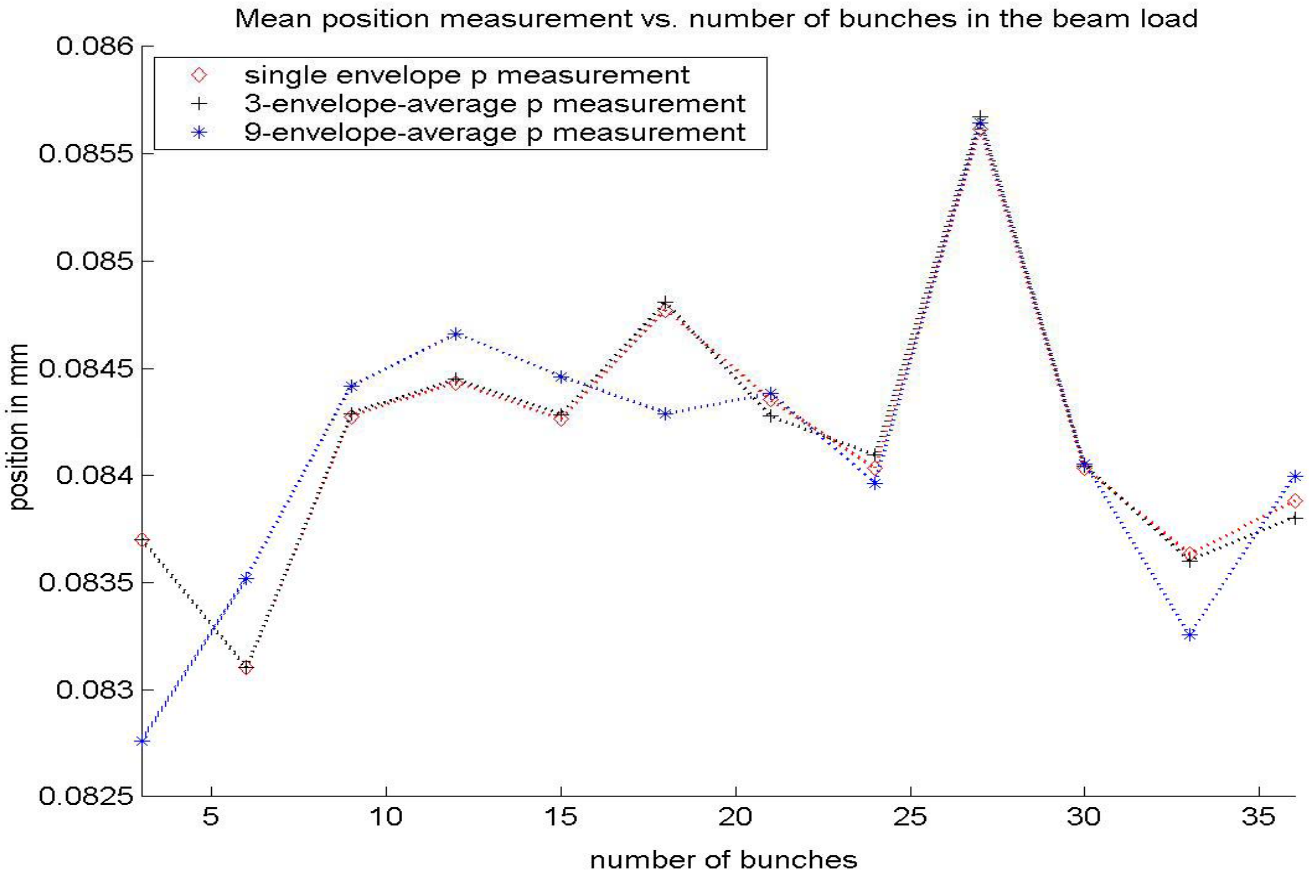
Tevatron BPM Meeting

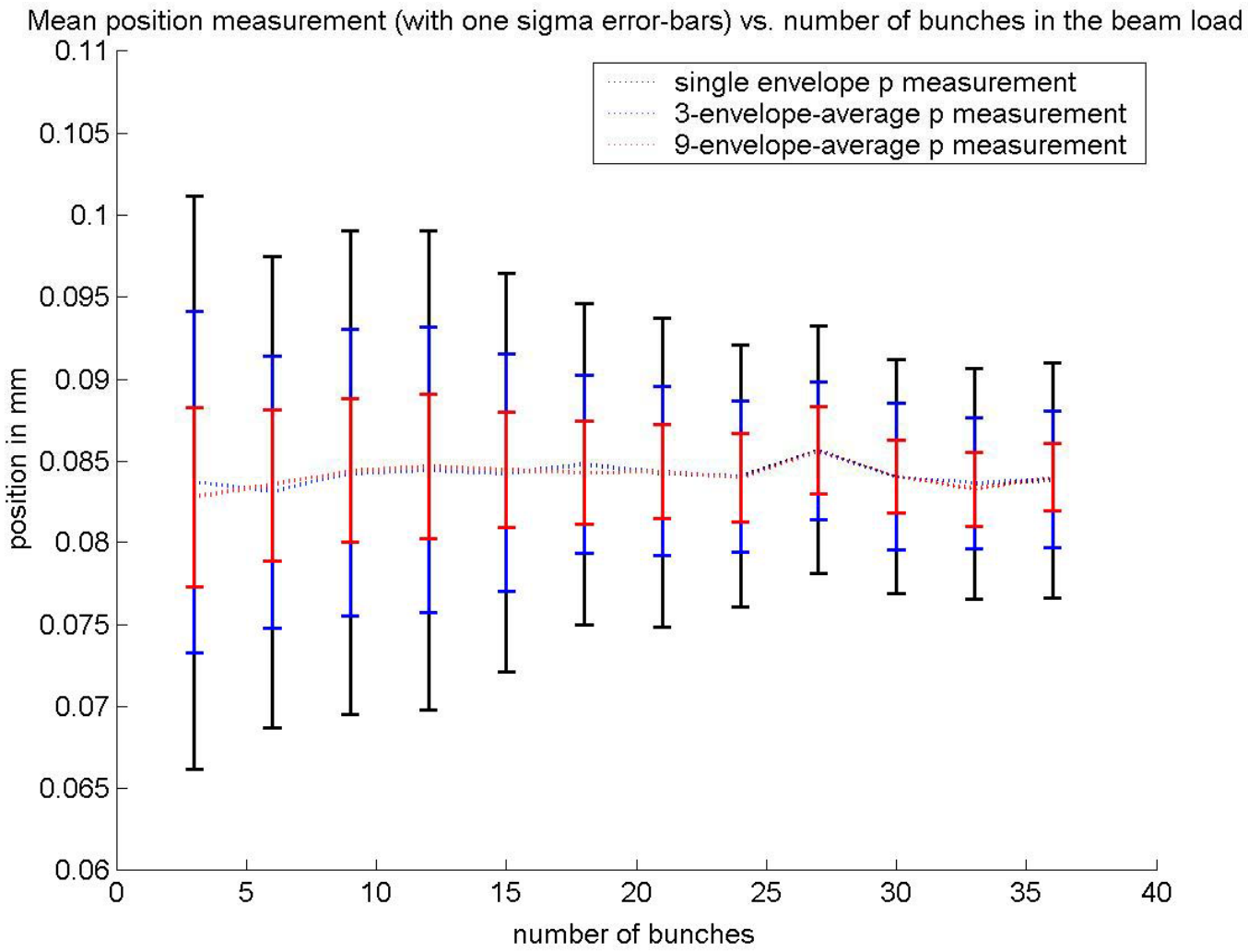
Last Presentation

- Gustavo showed results of closed orbit measurement on test stand using the “envelope” filter configuration.
- These results were obtained from data collected using the standard FPGA design but processed offline to simulate removal of data points outside of beam envelopes.
- Gustavo observed improved position resolution and less dependence on intensity.

Last Presentation



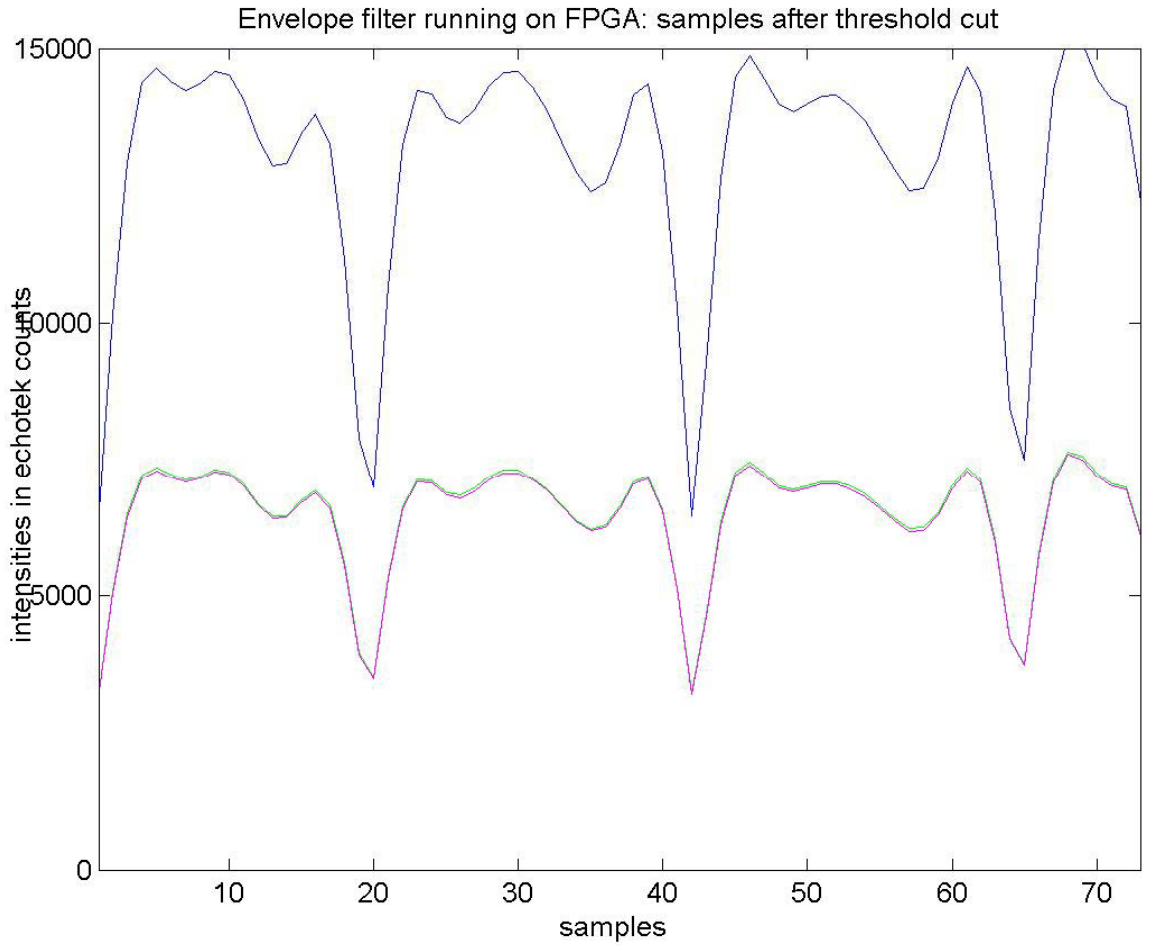
Last Presentation



Also at the Last Presentation

- Gustavo showed preliminary data obtained from a modified FPGA design which threw out filtered I and Q grey chip outputs for which the magnitude ($I^2 + Q^2$) was below a settable threshold.

Also at Last Presentation



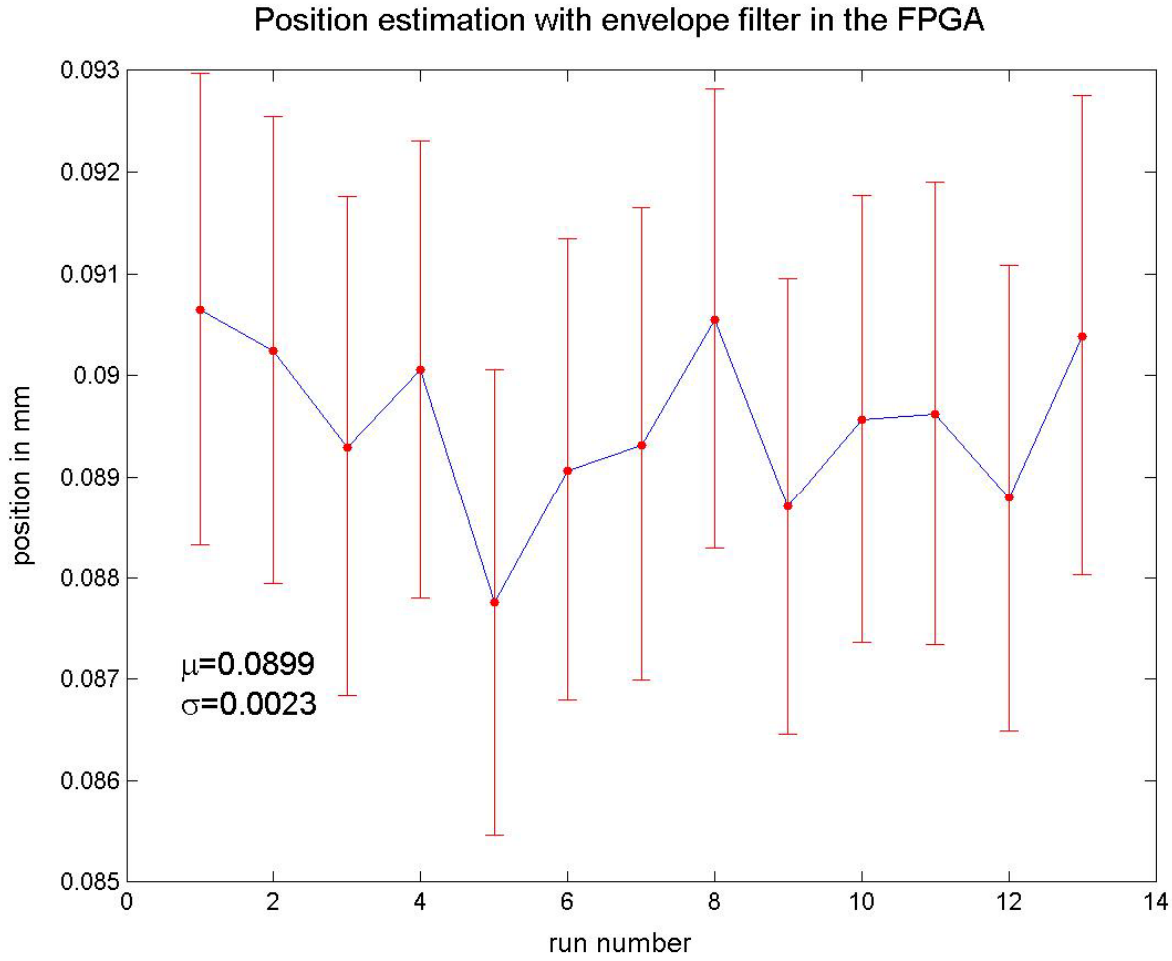
Since the Last Presentation

- A second modified FPGA design which averages the saved I and Q outputs over a time period consistent with the current closed orbit measurement and outputs the averaged values to memory at the closed orbit rate was successfully tested.
- In the first attempt, we were only able to collect 4-5 valid points for the maximum burst count setting (1024).

Since the Last Presentation

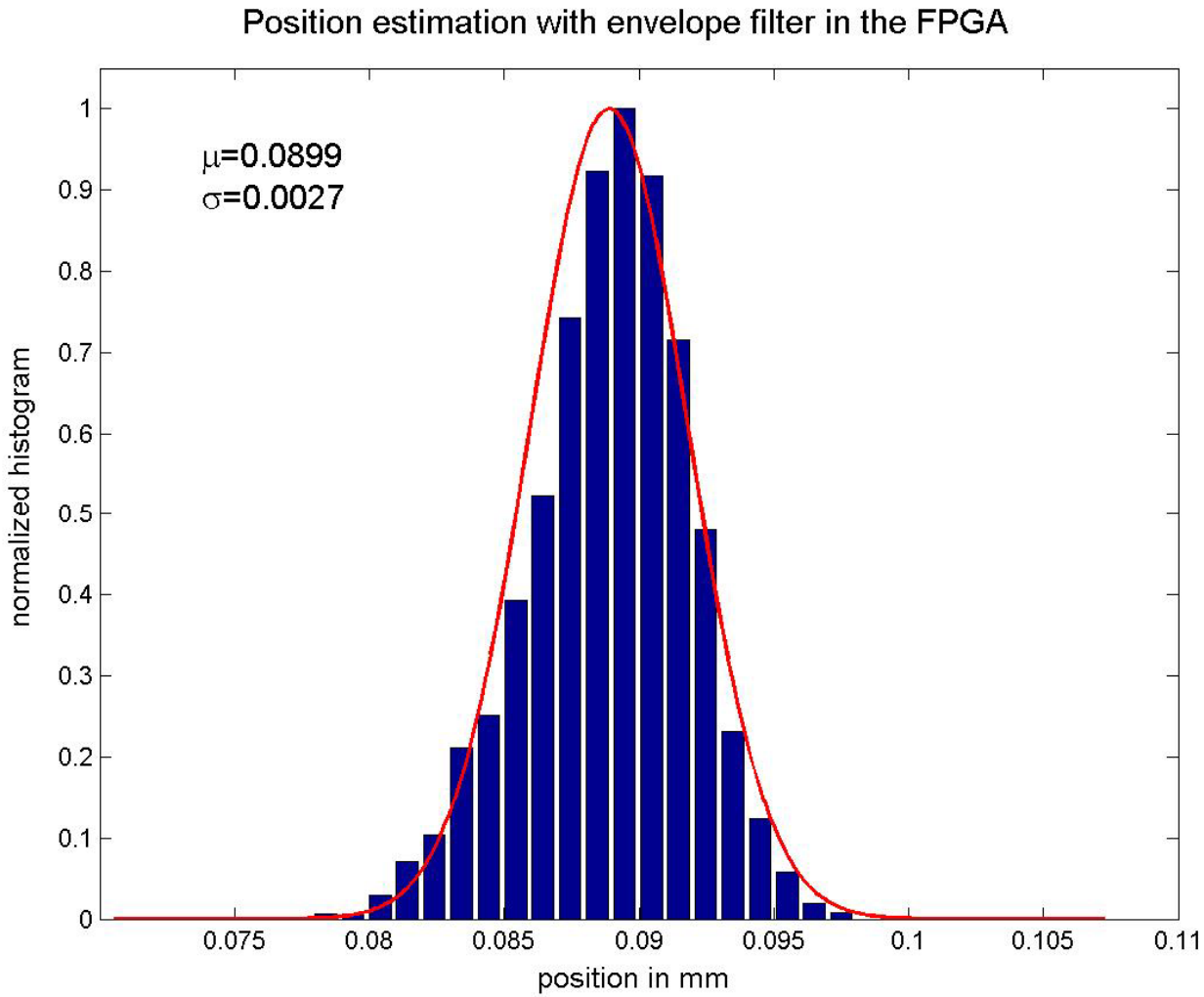
- However, Ted Zmuda found a settable register within the FPGA design that allowed him to increase the number of averaged values written to memory for a given burst count/grey chip decimation setting.
- In the final test run before we lost access to the test crate, we were able to record (burst count)/2 averaged I and Q outputs.

Latest Results



~500 points per run

Latest Results



Current Status

- We have in place grey chip settings and a modified FPGA design that allow us to implement Gustavo's "envelope" filter design for closed orbit measurements without any modifications to the front-end software.
- We do need to make one additional tweak to the FPGA settable register in order to obtain the correct number of output points for a given burst count.

Current Status

- One additional feature of this system is the internal FPGA threshold value for the quantity $I^2 + Q^2$.
- Question for accelerator experts: Can we assume minimum single bunch intensities for closed orbit measurement? Also, are these minimums different for other types of measurements?

Current Status

- Note that Ted and Gustavo have a design for an additional FPGA circuit that would automatically adjust the $I^2 + Q^2$ threshold based on recently received input data.
- However, we have not yet tested this part of the design, and we need to ensure that a mechanism exists to return the threshold to its minimum for each new beam injection.

Plans

- The first step is to re-establish the test stand at FCC.
- We checked out a new processor (tbpmb3) and obtained a new ip address for it. Brian H. added the new processor node into ACNET so in principal it can be accessed on the W25 page.

Plans

- Installed processor yesterday but am waiting for D. Finstrom to add access permission for tbpmb3 to boot node.
- Hope is to have the test stand up and running again by the end of the week.
- May require some assistance from Jim et al. to understand how to set things up in updated configuration (without using old timing module).

Plans

- Performance comparison of three potential closed orbit measurement configurations on test stand.
  - Current closed orbit filter.
  - “envelope” filter that outputs averaged I and Q values at the nominal closed orbit rate.
  - “envelope” filter that outputs an averaged $I^2 + Q^2$ value at the nominal closed orbit rate.

Potential Advantages of New Filter

- Improved measurement resolution.
- Less fluctuation in measured position as a function of beam intensity.
- Complete flexibility in determining closed orbit measurement data output rate to memory (fixed using current closed orbit configuration).
- Minimal or no changes required for front-end software.

Longer Term Plans

- Complete and evaluate performance of “envelope” filter configuration for closed orbit measurement.
- Evaluate potential configurations for turn-by-turn measurements.
  - Current configuration.
  - Modified “envelope” filter configuration (using equivalent grey chip settings).
  - Minimum decimation configuration.

Longer Term Plans

- If “envelope” filter configuration works for both closed orbit and turn-by-turn measurements, investigate whether FPGA can be modified to handle both simultaneously.
- If a different filter configuration works better for turn-by-turn measurements, investigate if the different filters can co-exist in grey chip.