

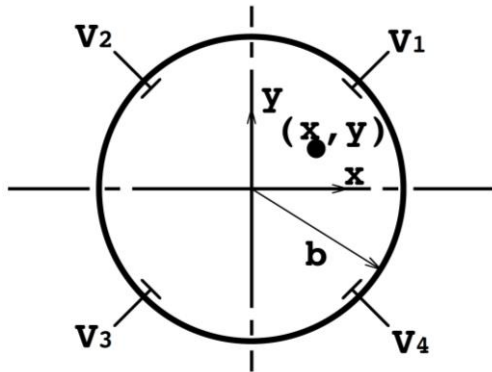
Measurement of the BPM Electrical Center

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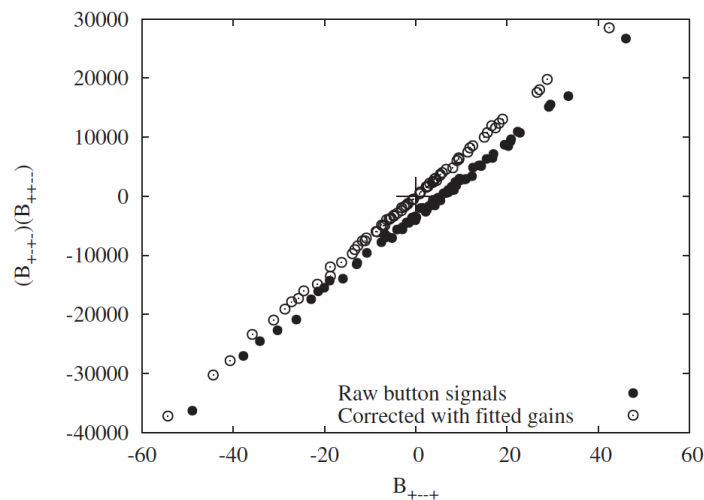
Introduction

In an ideal dual-plane beam position monitor beam placed in the center of vacuum chamber will excite signals of equal amplitudes on all four pick-up electrodes (electrical center is in the center). Due to the unequal gains/losses in the signal pass the electrical center will not be in the middle of the chamber.



The method was proposed by K. Satoh and M. Tejima for BPM with known function to calculate button signal in the round pipe “Recalibration of Position Monitors with Beams” (PAC’95, MPQ14 and PAC’97 9PO96).

The approach received further development in paper by D. Rubin, M. Billing and others “Beam based measurement of beam position monitor electrode gains” (PRST-AB **13**, 092802 (2010)).



$$F_1(x, y) \approx 1 + c_1x + c_2y + c_3x^2 + c_4y^2 + c_5xy$$

$$B_q = k(V_1 - V_2 + V_3 - V_4) = 4kc_5xy$$

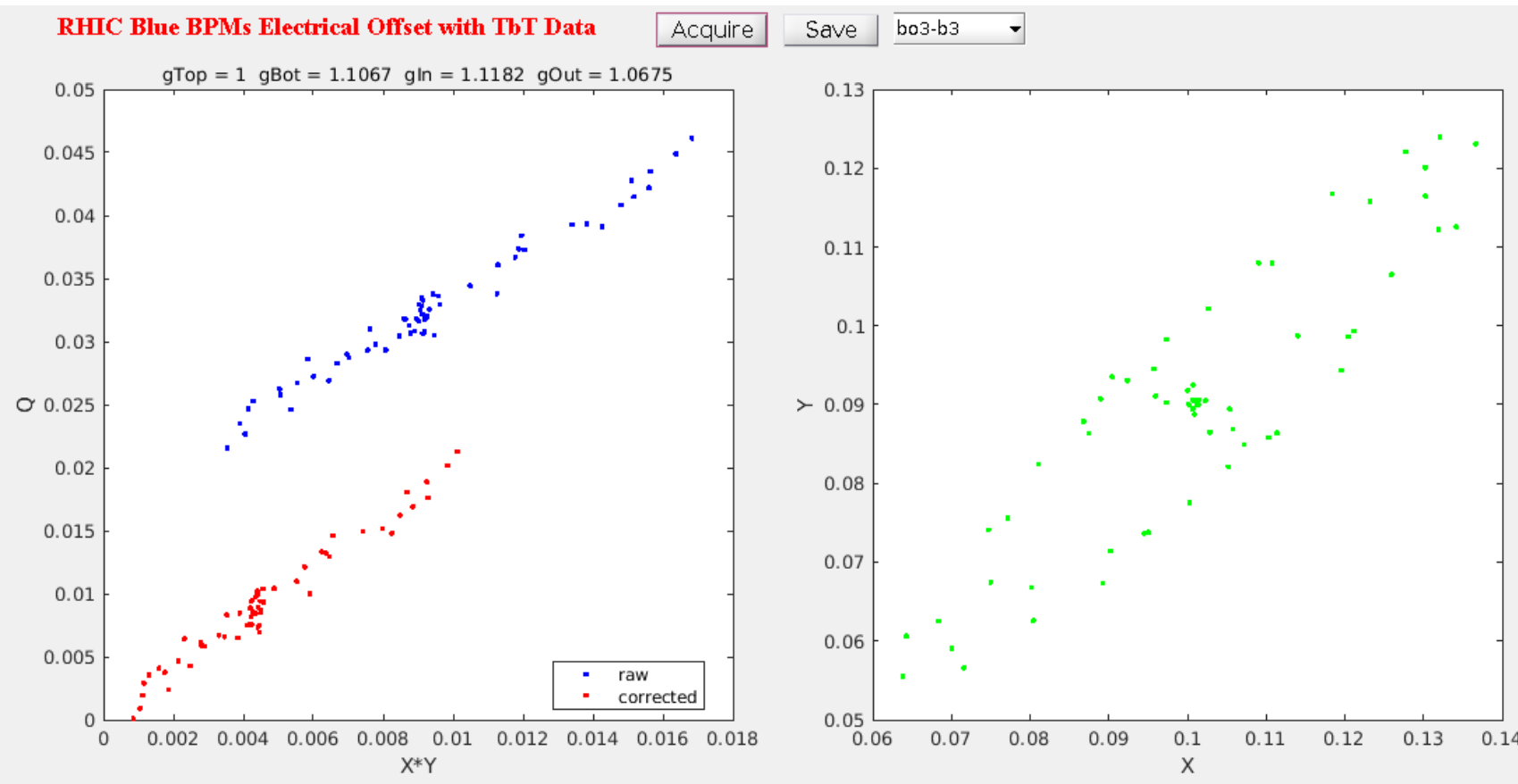
$$B_x = k(V_1 - V_2 - V_3 + V_4) = 4kc_1x$$

$$B_y = k(V_1 + V_2 - V_3 - V_4) = 4kc_2y$$

For round pipe

$$B_q = 2B_xB_y$$

Experiment Set-up



Beam was excited with Artus kickers in both planes and data were saved into the data server.

Special MATLAB script was reading the data from server, processing it, and saving data for post-processing.

Initially we tried to kick both planes simultaneously, but it was found that beam is oscillating just diagonally, since the tunes are close. The delay between kickers was increased by 12 turns to provide the phase shift between planes (elliptical motion in XY plane). Data from the first 60 turns were analyzed (1k saved).

from other measurement $g_{Bot}=1.12$ and $g_{In}=1.15$ (value for g_{Out} was masked)

Yellow ring

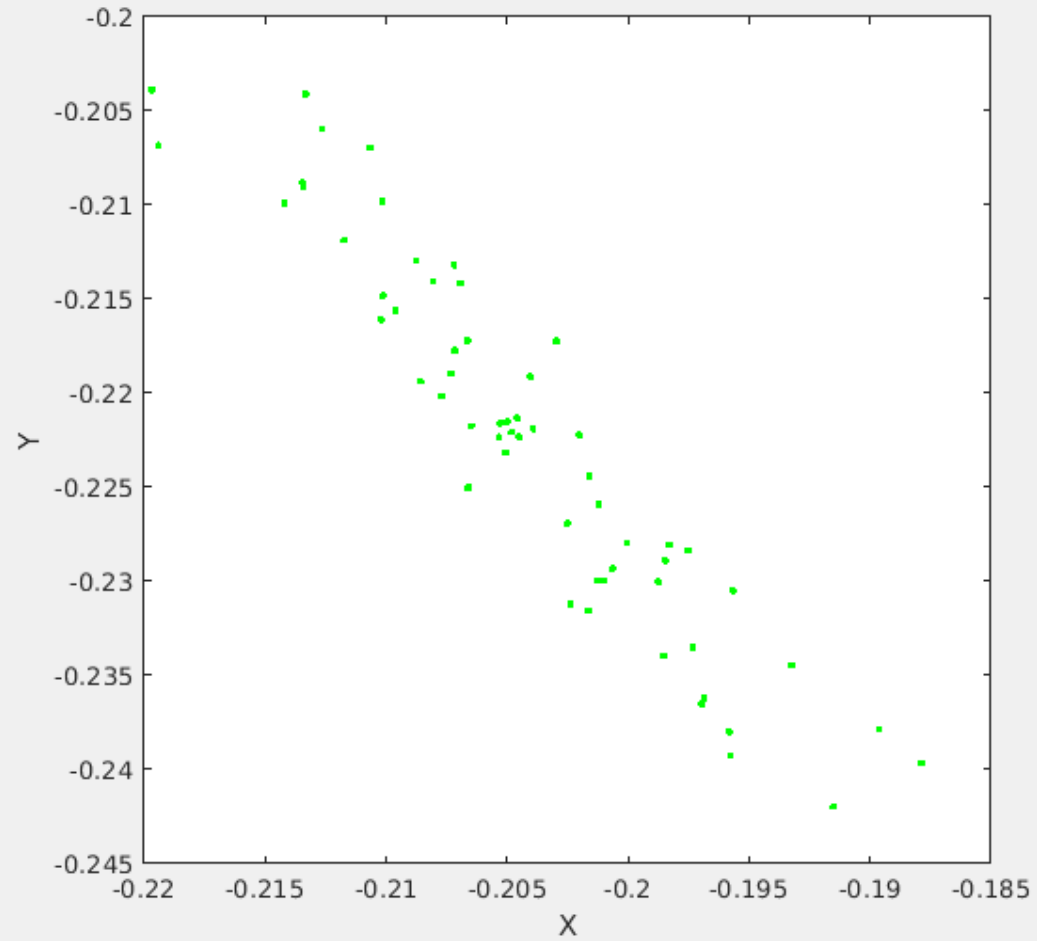
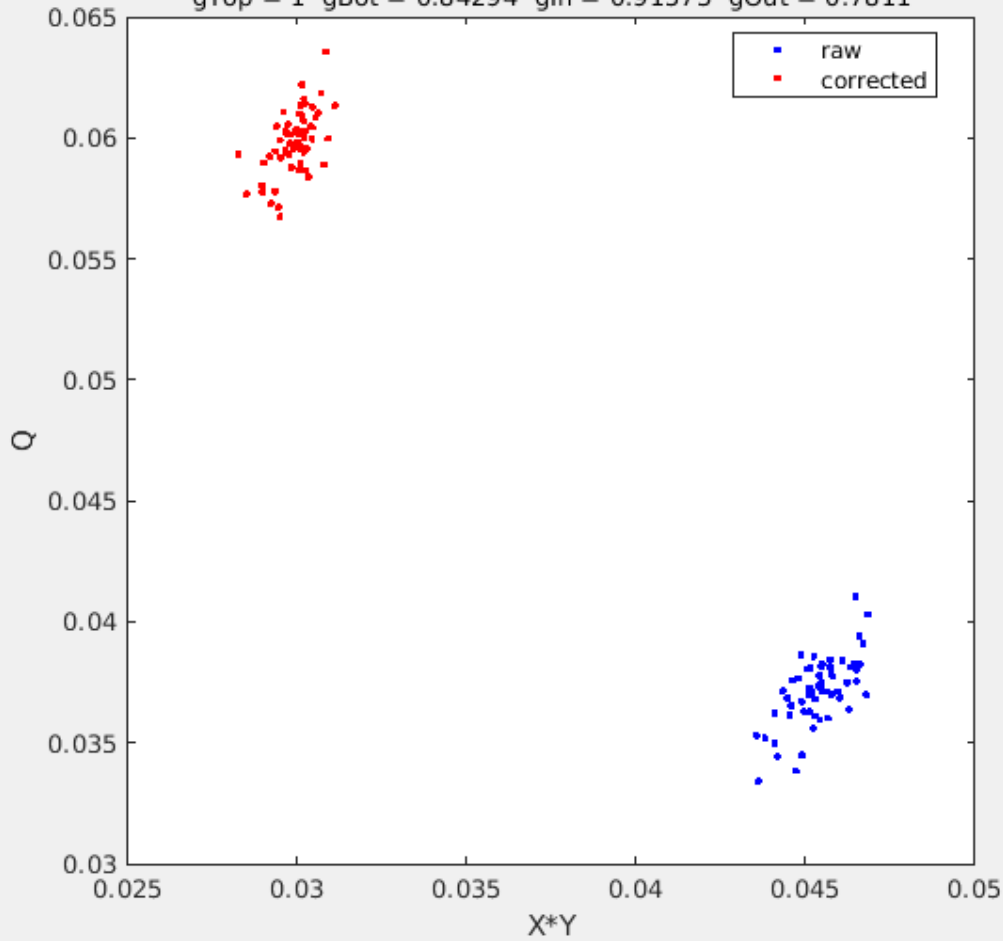
RHIC Yellow BPMs Electrical Offset with TbT Data

Acquire

Save

yi3-b8

gTop = 1 gBot = 0.84294 gIn = 0.91573 gOut = 0.7811



measurements
for yellow beam
were performed
in the last few
minutes

Conclusion

- The measurements were performed with both yellow and blue rings
- We need more thorough study on the delay between kickers
- The data will be re-processed, and analyses optimized (number of turns to process)
- We can take another 1-hour slot during next APEX session