

# Vernier Scan

RIKEN/RBRC

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# Reference

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## PHENIX Documents

### PHENIX Documents for Spin [edit | edit source]

- ZDC Documentation page of PHENIX [link](#)
- R. Bennett, et al., PHENIX Run6 Vanier Scan Analysis Note [pdf](#)
- Paul Kline, et al., PHENIX Run9 Relative Luminosity Analysis Note [pdf](#)
- Gabor David, "PHENIX Zero Degree Calorimeter (ZDC) and Shower Maximum Detector (SMD) Detector Basics" (2020) [pdf](#) (362kB)
- M. Kim, Ph.D Thesis "Nuclear dependence of the transverse-single-spin asymmetry for forward neutron production in polarized p+A collisions at  $\sqrt{s} = 200\text{GeV}$ " (2019) [pdf](#) (9.9MB)
- Mate Csanad, "Online Monitoring System for the PHENIX ZDC and SMD" (2007) [pdf](#) (1.2MB)
- G. Bunce et al. "Analysis Note Measurements of the leading neutron production in at polarized pp collision at  $\sqrt{s}=200\text{GeV}$ " [pdf](#) (2.3MB)
- Jaehee Yoo, SMD Gain matching study [[https://wiki.sphenix.bnl.gov/images/2/21/SMD\\_SouceTest\\_JaeHee\\_150917.pdf](https://wiki.sphenix.bnl.gov/images/2/21/SMD_SouceTest_JaeHee_150917.pdf)] [pdf](#)

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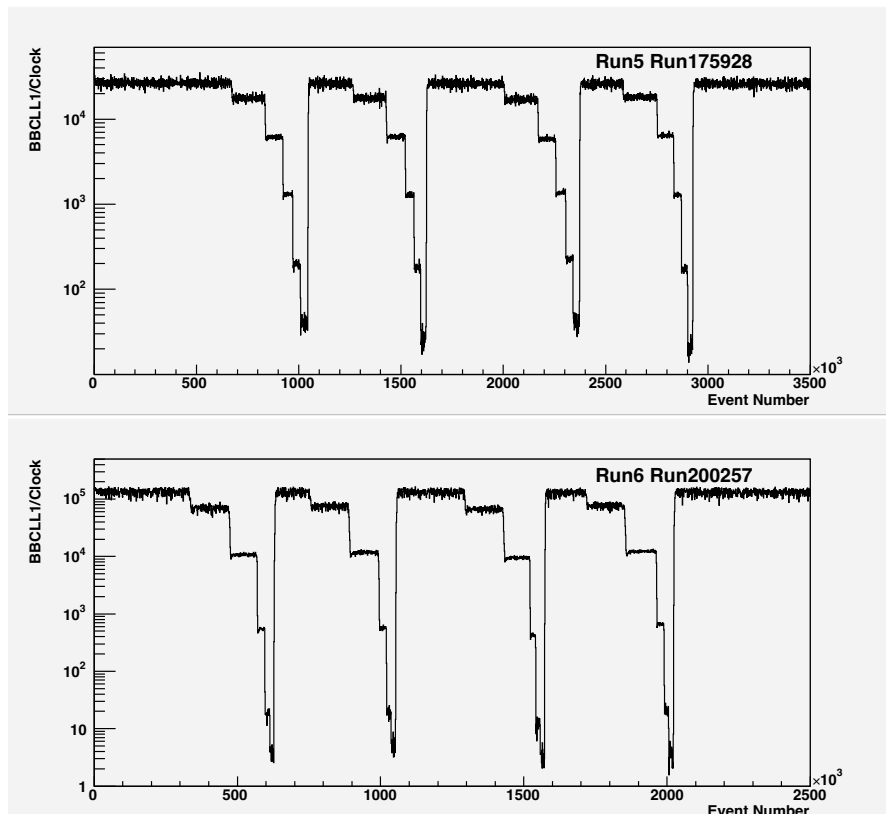
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# Vernier Scan

BBC rate vs Time



Beam position vs time

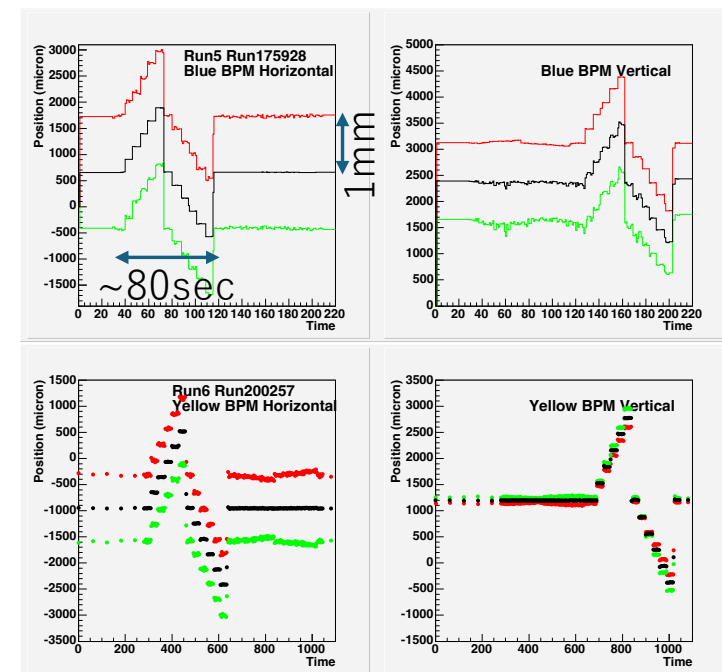


Figure 2: Positions measured by BPM vs time on the south side (7 o'clock) of the IR (Red) the north side (8 o'clock) of the IR (Green) and the mean of the two (Black) for typical two runs in Run5 and Run6. In run5-run175928, the north side measurement shows a unstable behavior and give an unreliable result. The south side measurement is good.

# Vernier Scan DAQ

- Activate only GL1p scalers in the DAQ.
- Start rcdaq.
- Call MCR to start steering the magnets on either side of the sPHENIX IP to step one of the beams (blue or yellow) across the other (Angelika should know the procedure).
- Typically the beam is moved every thirty seconds by a few hundred microns. The decrease and subsequent increase in the rates in the MBD can be monitored by the scaler display.
- Once scan is completed (typically 5 minutes), MCR supposed to give a call to 1008.
- Stop rcdaq. Make an entry to cold-QCD channel (Time, Run#).

## GL1p trigger mapping

• Last updated : 2024/6/6

(Martin - I added the current GL1 trigger numbers as I see them)

Channel	Trigger	GL1 Trigger number
0	MBD NS	10
1	MBD VTX	14
2	MBD +/-10cm VTX	12
3	MBD S	8
4	MBD N	9
5	ZDC NS	3
6	ZDC S	1
7	ZDC N	2
8	CLOCK	0

# Data to be provided from MCR

- Beam Position Monitor (BPM) information (how do we synchronized with sPHENIX data needs to be sorted out) for the beam position during the scan.
- Wall Current Monitor (WCM) and the Direct Current Current Trans- former (DCCT) for the beam current information.

# Analysis

$$(\mathcal{L}_{\text{machine}})_i = \frac{f_{\text{beam}}}{2\pi(\sigma_H)_i(\sigma_V)_i} (N_b \cdot N_y)_i,$$

- $N_b, N_y$  : From WCM
- $\sigma_H, \sigma_V$  : From Gaussian fitting for each bunch

