

Testing ERL BPM

Igor Pinayev

June 16, 2023

Motivation

- To test idea for utilizing phase information of BPM pick-up signals for simultaneous measurement of two beams in the same vacuum chamber
- Aim of the current APEX was to collect data for offline analyses (achieved)

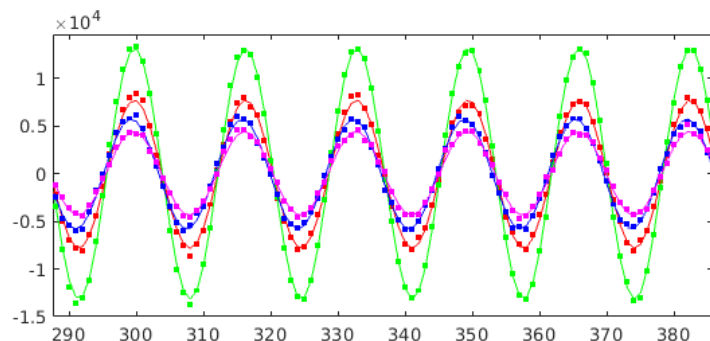
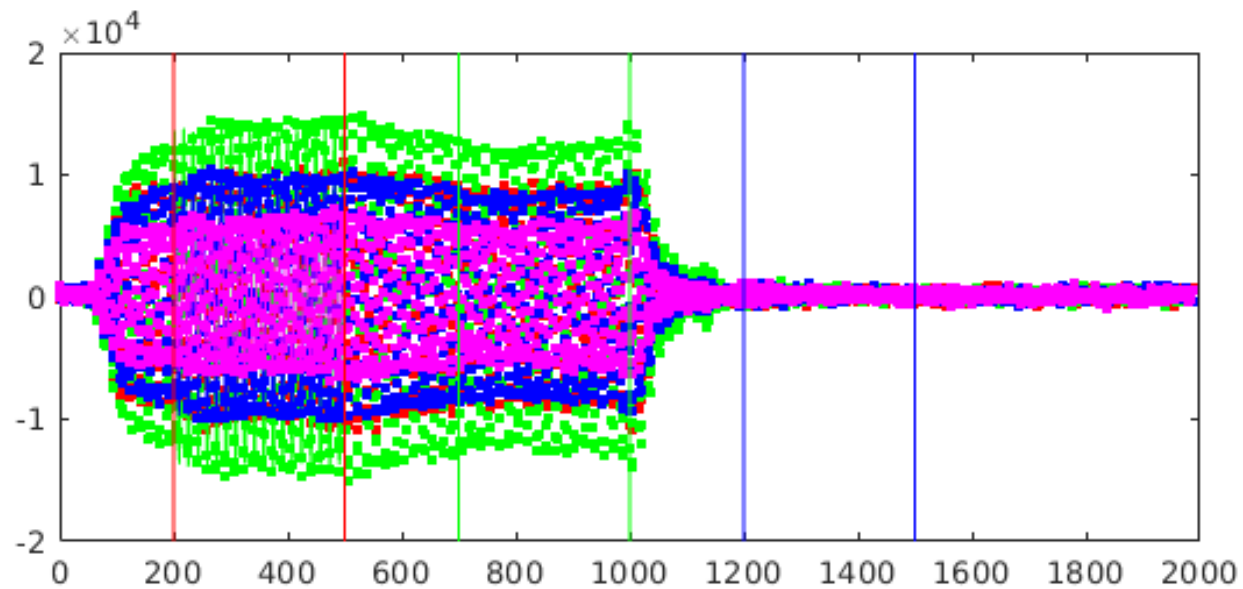
Individual Fills

Collect Data from Hadron BPM

Collect Data

gc2-mod.bb...

N samples	Ngap	Yellow L	Yellow R	Green L	Green R	Blue L	Blue R
32	1	200	500	700	1000	1200	1500



	X (mm)	Y (mm)
blue S2	-0.2800	4.9300
yellow S2	-0.0080	-5.0760
blue S1	-0.0900	0.5940
yellow S1	0.0190	-4.9250

	Phase A-C	Phase B-D
B mod	0.7786	-1.0349
Y mod	0.0892	-0.3087
G mod	0.0827	-0.3010
B amp	-0.3467	-0.2242
Y amp	-0.1827	-0.0530
G amp	-0.1938	-0.0278
B kck	-1.0640	-0.6543
Y kck	-0.2466	-0.2153
G kck	-0.2729	-0.2125

	X (mm)	X* (mm)	Y (mm)	Y* (mm)
B gc2-mod.bb1-y	0.1692	-2.4287	7.7351	11.2030
Y gc2-mod.bb1-y	0.3120	3.5016	8.2754	4.9418
B gc1-amp.bb2-y	0.8837	-0.2590	7.1794	5.1336
Y gc1-amp.bb2-y	3.1735	6.8196	10.6879	16.1838
B gc1-kck.bb2-y	0.6929	-1.9054	8.6620	6.2566
Y gc1-kck.bb2-y	0.9860	4.5510	8.0281	10.0102

Yellow and blue rings were filled with 56 bunches (blue ring is shown). CeC hadron BPM data are saved for the fitting of phase advance per ADC clock and phase shifts between two channels.

Data Collection

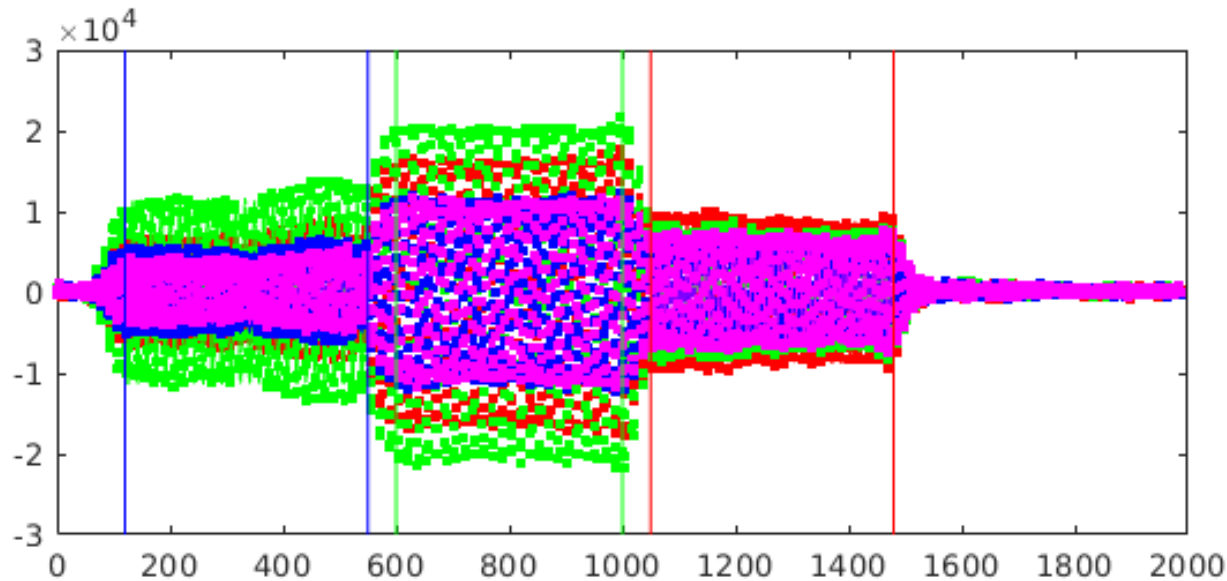
Collect Data from Hadron BPM

Collect Data

Save Data

gc1-amp.bb...

N samples	Ngap	Yellow L	Yellow R	Green L	Green R	Blue L	Blue R
100	1	1050	1480	600	1000	120	550



	X (mm)	Y (mm)
blue S2	-0.0360	4.9720
yellow S2	0.0510	-5.0650
blue S1	-0.3690	0.5940
yellow S1	-0.0410	-5.0610

	Phase A-C	Phase B-D
B mod	0.0763	-0.3223
Y mod	0.0844	-0.3454
G mod	0.1564	-1.5829
B amp	-0.1700	-0.0286
Y amp	-0.1759	-0.0195
G amp	-0.1863	0.0709
B kck	-0.2247	-0.2092
Y kck	-0.2065	-0.2552
G kck	-0.2861	-5.0876

	X (mm)	X* (mm)	Y (mm)	Y* (mm)
B gc2-mod.bb1-y	0.4859	1.2968	7.8345	-4.6087
Y gc2-mod.bb1-y	1.2157	0.0113	-1.9933	16.4807
B gc1-amp.bb2-y	3.0018	4.5365	10.6847	1.7285
Y gc1-amp.bb2-y	5.0085	3.2115	1.2105	11.2008
B gc1-kck.bb2-y	0.7659	2.5968	7.6080	45.4326
Y gc1-kck.bb2-y	1.6364	1.4056	-2.2275	-36.5488

Blue ring was filled in buckets 1-56

Yellow ring was filled in buckets 29-84 (RHIC BPM timing was adjusted)

One turn data are shown. Region 120-550 will be used for blue ring position, region 1050-1480 for yellow beam position. Region 600-1000 has both rings, and its information will be used for analysis.

We have 3 BPMs for tests.

Data are collected for three different positions of the beams

What next

- Find phase advance per ADC clock (might be different for different BPMs)
- Find phase offsets in the channels
- Find phase shift between two beams (the same channel in the same BPM). This phase shift is different for different BPMs (beam counter propagate).
- Adjust calculations if needed
- If everything looks correct repeat the measurements with changing cogging phase (phase shift between two beams).