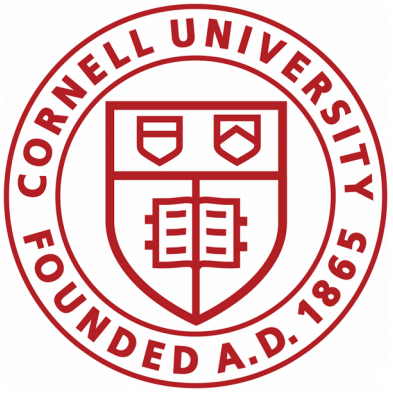

On the turn-by-turn resolution

Antoine

CBPM meeting

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Previously on turn-by-turn resolution

We have learned previously from measurements and simulation about the vertical turn-by-turn resolution:

Geometric factors used for all the estimations: kx = 25.9 ky = 19.8

Design		Noise [ADU]	Digitized amplitude [ADU]	Un-correlated timing jitter [ps]				Timing offset [ps]				Vertical precision [micron]	Vertical accuracy [micron]
				inner top	inner bottom	outter bottom	outter top	inner top	inner bottom	outter bottom	outter top		
Current	Ideal	9	32,768	10	10	10	10	0	0	0	0	8.5	0
	Best	9	24,576	10	10	10	10	0	0	0	0	8.9	0
	Realistic	9	16,384	10	10	10	10	10	0	0	10	12.7	5.7
	Realistic	9	16,384	10	10	10	10	10	10	10	10	15	0
	Realistic	9	8,192	10	10	10	10	10	10	10	10	17.6	0
Future	1	5	65,536	0	0	0	0	0	0	0	0	0.8	0
	2	5	65,536	1	1	1	1	1	1	1	1	0.8	0
	3	9	65,536	0	0	0	0	0	0	0	0	1.4	0
	4	9	65,536	2	2	2	2	2	2	2	2	1.5	0
	5	9	65,536	2	2	2	2	0	0	0	0	1.4	0
	6	9	65,536	8	8	8	8	10	10	10	10	10.6	0
	7	5	32,768	1	1	1	1	1	1	1	1	1.5	0
	8	9	32,768	1	1	1	1	1	1	1	1	2.7	0
	9	9	32,768	2	2	2	2	10	10	10	10	3.6	0
	10	9	32,768	2	2	2	2	2	2	2	2	2.8	0
	11	9	32,768	5	5	5	5	5	5	5	5	4.4	0
	12	9	32,768	5	5	5	5	10	10	10	10	6.6	0
	13	9	32,768	5	5	5	5	1	1	1	1	3.4	0
	14	9	32,768	10	10	10	10	1	1	1	1	8.6	0

Geometric factor

I have used throughout my resolution studies for the North Arc CBPM:

- ✗ k_x = 25.9 mm
- ✗ k_y = 19.8 mm

Instead of what CESRV uses:

- ✗ k_x = 28.8 mm
- ✗ k_y = 22.3 mm

Which means the resolution increases (worsens) by 10% horizontally and 13% vertically…

BUT: While studying the impact of instrumental errors on the CESRV nonlin_bpm accuracy, it became very clear (should have been obvious) that all this time only the North Arc CBPMs were concerned

South Arc (CHESS-U) CBPM

The situation is actually much better because the geometric factors are:

- k_x = 10.2 mm
- k_y = 10.4 mm

Which means that with respect to the North Arc, the turn-by-turn resolution in the South Arc decreases (improves) by a factor **70%** horizontally and **50%** vertically!

													"Old" North Arc ky = 19.8 mm	North Arc ky = 22.3 mm	South Arc ky = 10.4 mm
Design		Noise [ADU]	Digitized amplitude [ADU]	Un-correlated timing jitter [ps]				Timing offset [ps]					Vertical precision [micron]	Vertical precision [micron]	Vertical precision [micron]
				inner top	inner bottom	outter bottom	outter top	inner top	inner bottom	outter bottom	outter top				
Current	Ideal	9	32,768	10	10	10	10	0	0	0	0		8.5	9.6	4.5
	Best	9	24,576	10	10	10	10	0	0	0	0		8.9	10.0	4.7
	Realistic	9	16,384	10	10	10	10	10	0	0	10		12.7	14.3	6.7
	Realistic	9	16,384	10	10	10	10	10	10	10	10		15	16.9	7.9
	Realistic	9	8,192	10	10	10	10	10	10	10	10		17.6	19.8	9.2
Future	1	5	65,536	0	0	0	0	0	0	0	0		0.8	0.9	0.4
	2	5	65,536	1	1	1	1	1	1	1	1		0.8	0.9	0.4
	3	9	65,536	0	0	0	0	0	0	0	0		1.4	1.6	0.7
	4	9	65,536	2	2	2	2	2	2	2	2		1.5	1.7	0.8
	5	9	65,536	2	2	2	2	0	0	0	0		1.4	1.6	0.7
	6	9	65,536	8	8	8	8	10	10	10	10		10.6	11.9	5.6
	7	5	32,768	1	1	1	1	1	1	1	1		1.5	1.7	0.8
	8	9	32,768	1	1	1	1	1	1	1	1		2.7	3.0	1.4
	9	9	32,768	2	2	2	2	10	10	10	10		3.6	4.1	1.9
	10	9	32,768	2	2	2	2	2	2	2	2		2.8	3.2	1.5
	11	9	32,768	5	5	5	5	5	5	5	5		4.4	5.0	2.3
	12	9	32,768	5	5	5	5	10	10	10	10		6.6	7.4	3.5
	13	9	32,768	5	5	5	5	1	1	1	1		3.4	3.8	1.8
	14	9	32,768	10	10	10	10	1	1	1	1		8.6	9.7	4.5

https://docs.google.com/spreadsheets/d/1J_CoiINyVV0tr0kwNhGepiCcPhAw7kMNpi-UiOlSaxY/edit?pli=1#gid=2145145041

Additional materials