Run-8 Trigger Projections (p-p @ 200 GeV)

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Table 2: Maximum luminosities that can be reached after a sufficiently long running period. All numbers are given for operation at an energy of 100 GeV/nucleon.

Mode	No of bunches	Ions/bunch [10^9]	β^* [m]	Emittance [μm]	$\mathcal{L}_{peak}$ [$cm^{-2}s^{-1}$]	$\mathcal{L}_{store\ avg}$ [$cm^{-2}s^{-1}$]	L_{week}
Au-Au	103	1.1	0.85	17-35	30×10^{26}	12×10^{26}	350 μb^{-1}
Cu-Cu	111	6	0.9	15-30	12×10^{28}	4×10^{28}	14 nb^{-1}
Si-Si	111	12.5	0.9	15-30	50×10^{28}	17×10^{28}	60 nb^{-1}
d-Au	83	120d/1.1Au	1.0	15-30	30×10^{28}	14×10^{28}	40 nb^{-1}
p↑-p↑ *	111	175	0.9	20-25	70×10^{30}	40×10^{30}	14 pb^{-1}

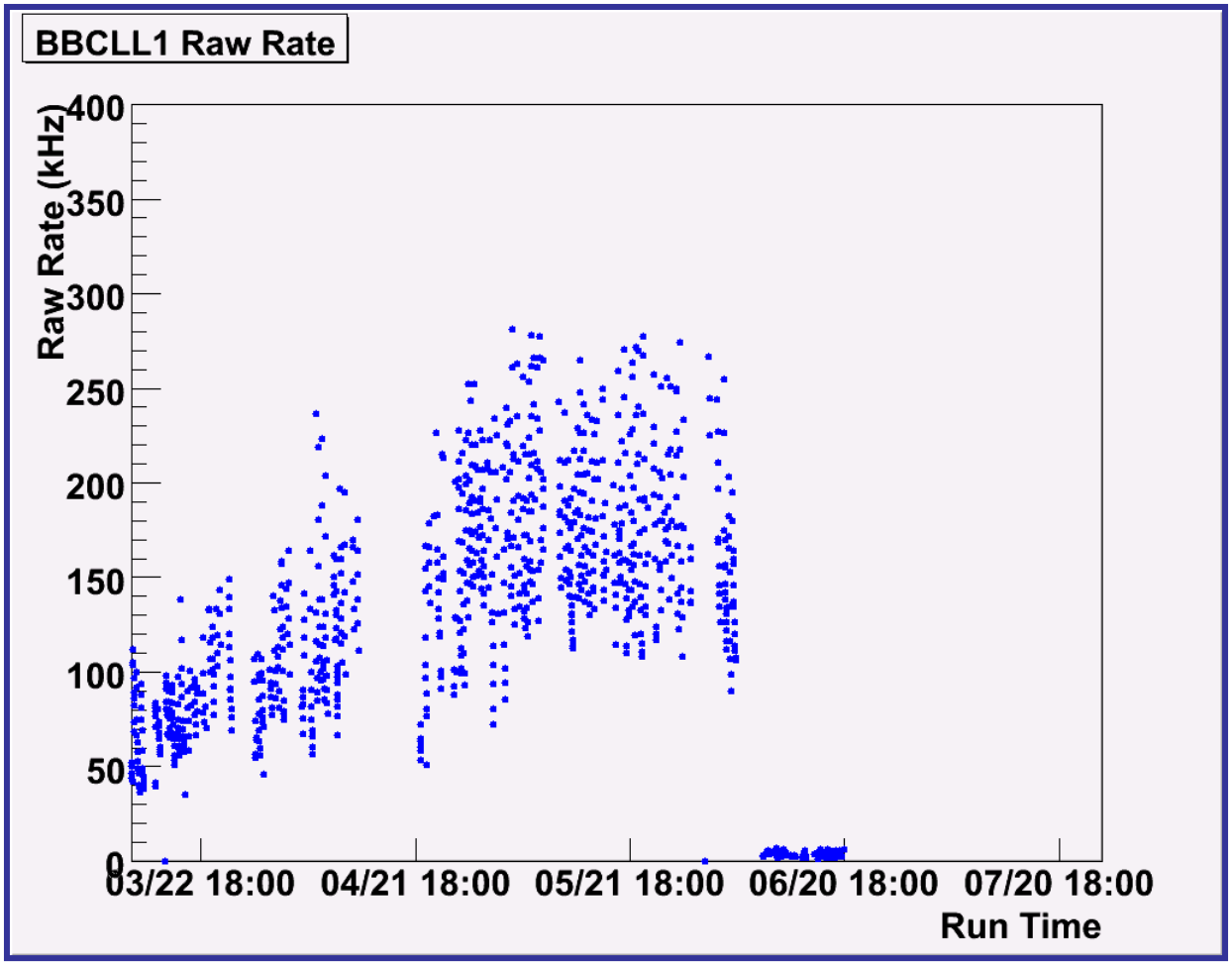
*We expect that an average store polarization of 65% can be reached. If both STAR and PHENIX elect again to have 9 non-colliding bunches, the luminosity is reduced by 9% compared to the numbers stated in the table.

Assume 43 milli-barn p-p inelastic cross section, BBCLL1 firing on 50%, and |zvtx| < 30 cm on 50%....

→ Peak = 750 kHz → Average = 430 kHz

Note that these projections were for a longer run. However, plan trigger and DAQ throughput based on maximum peak rate.

Run-6 pp results for BBCLL1 raw rate versus time.



The highest BBCLL1 rates from Run-6 were of order 250 kHz.

That was at the very limit of what we could take with no prescale on the ERT 4x4 (with threshold ~ 1.4 GeV).

Physics Issues for PWGs to think about….

1. **Highest priority last run was ERT 4x4 with lowest threshold (~ 1.4 GeV) At the highest rates in Run-6 (~250 kHz), this trigger was using ~ 3kHz of DAQ bandwidth.**

   For running at higher rates, this trigger will be prescaled.

   Topic for discussion, is there an issue with masking a lot of the PbGl for this lowest threshold (not the higher ones)?

2. **Run-6 electron 2x2 threshold at 400 MeV. Clearly this has physics impact for low mass dileptons. Proposal is to raise to 600 MeV, otherwise we need a prescale at the higher luminosities (even at 200-250 kHz).**

   What do people think?

3. **Change MUID shallow triggers into new "hadron triggers" as in d-Au?**

4. **I have defined an MPC4x4 and (MPC4x4 & BBCLL1). Do we need more defined trigger slots for different thresholds?**

5. **Other spin related polarimeter needs?**

Excel spread sheet draft is posted.

Below one can see that at 500 kHz BBCLL1 rate, ERT4x4 (threshold ~ 1.4 GeV) has a prescale of 2 (meaning only taking 1/3 of these triggers). We also need to check these rejection factors carefully at the start of the run.

3		Assume up to 6 kHz bandwidth through DAQ (spreadsheet ignores trigger correlations)															
4																	
5																	
6																	
7						BBCLL1			BBCLL1			BBCLL1			BBCLL1		
8						500000			450000			350000			250000		
9																	
10		Trigger		Rejection	Raw	Prescale	Rate	Raw	Prescale	Rate	Raw	Prescale	Rate	Raw	Prescale	Rate	
11																	
12	0	available		1.0	500000	9999999	0	450000	9999999	0	350000	9999999	0	250000	9999999	0	
13	1	Clock			10000000	999999	10	10000000	999999	10	10000000	999999	10	10000000	999999	10	
14	2	BBCLL1		1.0	500000	2500	200	450000	2200	204	350000	1800	194	250000	1400	178	
15	3	BBCLL1 (noVertexCut)		0.5	1000000	10000	100	900000	9000	100	700000	6000	117	500000	5000	100	
16	4	ZDCLL1Wide		25.0	20000	400	50	18000	350	51	14000	300	47	10000	200	50	
17	5	ZDCLL1Narrow		10.0	50000	1100	45	45000	1000	45	35000	1000	35	25000	900	28	
18	6	(BBCLL1>=1 & (ZDCN || ZDCS)) Local_Polarimeter		9.0	55556	250	221	50000	220	226	38889	160	242	27778	160	173	
19	7	ERTLL1_4x4a		11.0	45455	9999999	0	40909	9999999	0	31818	9999999	0	22727	9999999	0	
20	8	ERTLL1_2x2 & BBCLL1		50.0	10000	9999999	0	9000	9999999	0	7000	9999999	0	5000	9999999	0	
21	9	ERTLL1_4x4a & BBCLL1 [~2.1 GeV]		354.0	1412	0	1412	1271	0	1271	989	0	989	706	0	706	
22	10	ERTLL1_4x4c [1.4 GeV]		3.6	138889	600	231	125000	600	208	97222	600	162	69444	600	116	
23	11	ERTLL1_4x4b & BBCLL1 [~2.8 GeV]		1000.0	500	0	500	450	0	450	350	0	350	250	0	250	
24	12	ERTLL1_4x4c & BBCLL1 [~1.4 GeV]		75.0	6667	2	2222	6000	2	2000	4667	1	2333	3333	0	3333	
25	13	ERTLL1_Electron & BBCLL1 [~600 MeV]		500.0	1000	0	1000	900	0	900	700	0	700	500	0	500	
26	14	MUID_LL1_N_1Deep & BBCLL1		400.0	1250	12	96	1125	10	102	875	8	97	625	7	78	
27	15	MUID_LL1_S_1Deep & BBCLL1		400.0	1250	12	96	1125	10	102	875	8	97	625	7	78	
28	16	MUID_LL1_N_1ShallowHadron & BBCLL1		60.0	8333	90	92	7500	80	93	5833	70	82	4167	60	68	
29	17	MUID_LL1_S_1ShallowHadron & BBCLL1		60.0	8333	90	92	7500	80	93	5833	70	82	4167	60	68	
30	18	MUID_LL1_N_1D1S & BBCLL1		3700.0	135	0	135	122	0	122	95	0	95	68	0	68	
31	19	MUID_LL1_S_1D1S & BBCLL1		18000.0	28	0	28	25	0	25	19	0	19	14	0	14	
32	20	MuID_LL1_N_1D & S_1D & BBCLL1		114000.0	4	0	4	4	0	4	3	0	3	2	0	2	
33	21	(MUIDLL1_N2D || S2D) & BBCLL1		20000.0	25	0	25	23	0	23	18	0	18	13	0	13	
34	22	(Y+B++Y-B-) : GL1P check		OFF													
35	23	ZDCN||ZDCS		1.3	384615	3000	128	346154	2700	128	269231	2500	108	192308	2500	77	
36	24	ZDCNS		10.0	50000	1300	38	45000	1200	37	35000	1100	32	25000	1100	23	
37	25	MPC 4x4a		1000.0	500	0	500	450	0	450	350	0	350	250	0	250	
38	26	MPC 4x4a & BBCLL1		2000.0	250	0	250	225	0	225	175	0	175	125	0	125	
39	27	ERTLL1_4x4b		700.0	714	0	714	643	0	643	500	0	500	357	0	357	
40	28	PPG(Pedestal)				0	1		0	1		0	1		0	1	
41	29	PPG(Test Pulse)				0	1		0	1		0	1		0	1	
42	30	PPG(Laser)				0	1		0	1		0	1		0	1	
43	31	Noise		OFF			0			0			0			0	
44							8194			7515			6839			6667	
45																	