Trigger Plan for Run-6 Polarized Proton-Proton

DC Meeting
January 11, 2006

J. Nagle, Trigger Coordinator
University of Colorado, Boulder

We start from a positive Trigger/DAQ experience with Run-5 proton-proton collisions.

Start 04-19-05 Run Number ~168915
End 05-31-05 Run Number ~176123
Trigger Configurations PPRun5 (40) - (47)

ERT and MUID LL1 successfully commissioned and used for physics triggering.

Last year's maximum interaction rate ~ 250 kHz, which yields a BBCLL1 rate of ~125 kHz. The typical rates even for good stores were lower.

Model for Run-6:

- Expect reasonable maximum BBCLL1 rate of ~250 kHz.
- Expect to be able to trigger and archive at 5-6 kHz.
- Expect to run trigger filtering, but not Level-2 triggering.

- Desire to maximize sampling of lowest threshold ERT4x4 for A_LL pizero measurements.
- Desire to keep ERT2x2 threshold low for electron physics (see Akiba's email) and also keep J/Psi physics.
- Desire to sample more single muon and all dimuon physics.
- Desire to add MPC related triggers.

Name	Bit Mask	Scale Down	State	Raw Trigger Count	Live Trigger Count	Scaled Trigger Count
Clock	0x00000002	9999999	Enabled	793725459	-1687500929	1978
BBCLL1(>0 tubes)	0x00000004	11	Enabled	90811576	80687748	6723979
BBCLL1(noVertexCut)	0x00000008	800	Enabled	225764302	199953454	249629
ZDCLL1wide	0x00000010	8	Enabled	5385509	4818506	535389
ZDCLL1narrow	0x00000020	900	Enabled	2181957	1951758	2166
BBCLL1&(ZDCN|ZDCS)	0x00000040	19	Enabled	12940711	11575220	578761
ERTBLT_4x4c	0x00000080	9999999	Enabled	529120370	449061497	44
ERTLL1_2x2&BBCLL1	0x00000100	9999999	Enabled	58759034	52695216	5
ERTLL1_4x4a&BBCLL1	0x00000200	0	Enabled	174695	154528	154528
ERTLL1_4x4c	0x00000400	3500	Enabled	572058055	487933450	139369
ERTLL1_4x4b&BBCLL1	0x00000800	0	Enabled	50638	43311	43311
ERTLL1_4x4c&BBCLL1	0x00001000	0	Enabled	2207449	2002663	2002663
ERTLL1_E&BBCLL1	0x00002000	0	Enabled	406298	365908	365908
MUIDLL1_N1D&BBCLL1	0x00004000	0	Enabled	302716	270428	270428
MUIDLL1_S1D&BBCLL1	0x00008000	0	Enabled	178630	159656	159656
MUIDLL1_N1S&BBCLL1	0x00010000	9999999	Enabled	1347208	1204804	0
MUIDLL1_S1S&BBCLL1	0x00020000	9999999	Enabled	1102754	985836	0
MUIDLL1_N1D1S&BBCLL1	0x00040000	0	Enabled	23751	21218	21218
MUIDLL1_S1D1S&BBCLL1	0x00080000	0	Enabled	6347	5655	5655
MUIDN_1D&BBCLL1	0x00100000	9999999	Enabled	346693	309959	0
MUIDS_1D&BBCLL1	0x00200000	9999999	Enabled	297346	265773	0
(Y+B+ + Y+B-)	0x00400000	9999999	Disabled	42926898	0	0
ZDCN||ZDCS	0x00800000	308	Enabled	80146550	71686973	231996
ZDCNS	0x01000000	8	Enabled	3492624	3105323	345035
RPC1&RPC2	0x02000000	0	Enabled	1456	1278	1278
RPC1||RPC2||SCINT_FWD	0x04000000	1250	Enabled	1401885	1243629	994

```
 The rejection factor can be seen in
http://www.phenix.bnl.gov/WWW/trigger/pp/c-arm/Run3/run5_pp/performance.
html
Though they varied (depend on warm channel?), rough values are
 4x4c (1.4GeV) : ~60
 4x4a (2.1GeV) : ~500
 4x4b (2.8GeV) : ~1800
 4x4b wo bbcll1 : ~600
 electron (0.4GeV) : ~200

Best regards,
Kensuke
```

If we allocate up to 1/2 the bandwidth for ERT4x4c, we can run that without prescale up to BBCLL1 rate ~ 150 kHz. After that it requires factor of prescale=1 (loss of 50%).

If we allocate up to 1/4 the bandwidth for ERT Electron with threshold low (0.4 GeV), we can run that without prescale up to BBCLL1 up to BBCLL1 ~ 250 kHz.
We will need to weigh this against other physics.
Also it can be sensitive to the dead channel map!

Dimuons triggers have lots of rejection.

Single muon triggers need more input on physics output. In particular, shallow MUID triggers are mostly for composition studies and we need guidance on how much data is sufficient.

MPC triggers will be added. Estimates for rejections are underway.

Discussion of possible different physics priorities for transverse and lower energy running are needed.

Trigger Page for Run 6:

http://www.phenix.bnl.gov/WWW/trigger/run6pptrig

New link to first draft Excel spreadsheet trigger map.
Link to first trigger meeting and minutes.

Abhay and I will decide on a regular trigger meeting time. We will get reports on trigger hardware/monitoring plans and more discussion on physics/trigger priorities.