中央研究院

HSG5 studies for Run2 trigger menus

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HSG5

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Timescales

Mini menu Workshop on 20th of November.
Need to provide a first feedback the 15th of November to Catrin.
Plan to give a first set of results in next HSG5 meeting the 14th of November.

Samples T status

Spread sheet samples : link

```
##############################
# mu=80, 25ns bunch spacing -> 10k entries except bAbbMA400TB20 30k
##############################

mc12_14TeV.161805.Pythia8_AU2CTEQ6L1_WH125_lnubb.merge.NTUP_COMMON.e1337_s1682_s1691_r4712_r4643_p1591/

mc12_14TeV.161827.Pythia8_AU2CTEQ6L1_ZH125_llbb.merge.NTUP_COMMON.e1337_s1682_s1691_r4712_r4643_p1591/

mc12_14TeV.161849.Pythia8_AU2CTEQ6L1_ZH125_nunubb.merge.NTUP_COMMON.e2103_s1682_s1691_r4712_r4643_p1591/

mc12_14TeV.161893.Pythia8_AU2CTEQ6L1_ttH125_allhadbb.merge.NTUP_COMMON.e2103_s1682_s1691_r4712_r4643_p1591/

mc12_14TeV.161882.Pythia8_AU2CTEQ6L1_ttH125_semilepbb.merge.NTUP_COMMON.e2238_s1682_s1691_r4712_r4643_p1591/

mc12_14TeV.161871.Pythia8_AU2CTEQ6L1_ttH125_dilepbb.merge.NTUP_COMMON.e2103_s1682_s1691_r4712_r4643_p1591/

mc12_14TeV.161305.Pythia8_AU2CTEQ6L1_ttH125_WWinclusive.merge.NTUP_COMMON.e2024_s1682_s1691_r4712_r4643_p1591/

mc12_14TeV.169723.PowhegPythia8_AU2CT10_VBFH125_bb.merge.NTUP_COMMON.e2238_s1682_s1691_r4712_r4643_p1591/

mc12_14TeV.181124.MadgraphPythia_AUET2B_CTEQ6L1_bAbbMA400TB20.merge.NTUP_COMMON.e2293_s1682_s1691_r4712_r4643_p1591/

##############################
# mu=30, 50ns bunch spacing -> 10k entries except bAbbMA400TB20 30k
##############################

mc12_14TeV.161805.Pythia8_AU2CTEQ6L1_WH125_lnubb.merge.AOD.e1337_s1682_s1691_r4845_r4643/

mc12_14TeV.161827.Pythia8_AU2CTEQ6L1_ZH125_llbb.merge.AOD.e1337_s1682_s1691_r4845_r4643/

mc12_14TeV.161849.Pythia8_AU2CTEQ6L1_ZH125_nunubb.merge.AOD.e2103_s1682_s1691_r4845_r4643/

mc12_14TeV.161893.Pythia8_AU2CTEQ6L1_ttH125_allhadbb.merge.AOD.e2103_s1682_s1691_r4845_r4643/

mc12_14TeV.161882.Pythia8_AU2CTEQ6L1_ttH125_semilepbb.merge.AOD.e2238_s1682_s1691_r4845_r4643/

mc12_14TeV.161871.Pythia8_AU2CTEQ6L1_ttH125_dilepbb.merge.AOD.e2103_s1682_s1691_r4845_r4643/

mc12_14TeV.161305.Pythia8_AU2CTEQ6L1_ttH125_WWinclusive.merge.AOD.e2024_s1682_s1691_r4845_r4643/

mc12_14TeV.169723.PowhegPythia8_AU2CT10_VBFH125_bb.merge.AOD.e2238_s1682_s1691_r4845_r4643/

mc12_14TeV.181124.MadgraphPythia_AUET2B_CTEQ6L1_bAbbMA400TB20.merge.AOD.e2293_s1682_s1691_r4845_r4643/
```

Proposed L1 menus link

Current L1 Menu

This table should be the same for 500Hz/1kHz options at the moment

New items shown in red

XE50_J40_dPhi1(dPhi cut by L1Topo)
For ZH→nunubb, 92% efficiency (79% with XE70)

Still a bit of space for other items:
3MU4, Jpsi L1 topo triggers,
Bphys L1 topo triggers, prescaled jets
Others

But not too much!

	Rate	Unique Rate
MU20 (incl.TGC+Tile)	21	19
2MU10 (incl. OverlapR)	3.5	2.1
EM15VH_MU10	2.2	0.4
2EM8VH_MU10	1.0	0.2
EM8VH_2MU6	1.0	0.2
EM24VHI	21.7	15.7
2EM15VH	6.2	2.2
EM50	8.4	1.0
J100	5.8	0.6
3J50	1.1	0
4J20	4.5	1.4
5J15_ETA25	3.1	1.6
HT200	4.8	0.1
XE70	6.3	0.5
J75_XE40	5.9	0.2
J40_XE50_DPHI1	4.3	0.8 (?)
FJ100	0.1?	0.1?
TAU items	39.1	19.2
Total	93.1	

8 TeV

L1_XE40 — ZHvv

L1_EM18VH
L1_EM30
L1_MU15 — WHlv

L1_2EM10VH
L1_2MU10 — ZHll

More on e/mu

Reminder: Strawman proposal of trigger menus for Run 2

- Benchmark
  - 2×10^{34} cm^{-2} s^{-1}, 25 ns bunch spacing (pileup ~50)
- 1KHz average rate option (~1500Hz at peak)
  - Includes single lepton triggers (e28vhi_tight and mu24i_tight)
- 500Hz average rate option (~750Hz at peak)
  - No single lepton triggers around p_T ~ 25 GeV. Instead, combined leptons + (jet/mEt…) triggers.
  - 500 Hz option A
    - At L1, single electron below W mass, EM24VHI, with isolation.
    - The suite of e28i + jets is seeded from L1 EM24VHI.
  - 500Hz option B
    - At L1 single electron above W mass, EM40H, without isolation.
    - The suite of em24i/45i + jets is seeded from combined L1 items, L1 EM20H_3J15 etc.
- Analysis which can not survive without single lepton triggers

Menus HLT MET/jets

HLT Jets/MET

L1 item	HLT item	Rate	Unique rate
J100	j420	11	3
	3j175	3	0
	j200_xe80	17	3
	2b60_j175	17	6
	b70_j175_xe70	11	3
3J50	4j100	14	3
4J20	5j70_eta25	28	9
	6j70	6	0
	2b55_4j55	6	0
	b75_4j75	19	14
	6j45_2j280_a10	0	0
XE70	xe100	28	14
J75_XE40	j150_xe90	20	3
	b120_xe70	8	0.1
HT200	j460_a10	8	0
5J15_ETA25	6j45_eta25	27	11
J40_XE50_dPhi1	j80_xe80_dphi1	?	?
FJ100	fj220	0?	0?
Total(Allocation)		**118(167)**	

These are peak rates, but for offline objets!

There are still many prescaled items missing

Rates are very uncertain

Proposal

In a first time doing for each proposed trigger :
- signal acceptance from ntuples sample T ready
- sensitivity on full analysis from normal samples and emulate new menu with offline variables cuts (as done in previous Ben's 1-lepton study).

In a second time if needed : try to solve loss with L1topo variable, we are free to do what we want here.
Already studied by Imma : j40_XE50_dphi1 link

Manpower ?
VH 0-lepton : David J.
VH 1-lepton : Ben
VH 2 leptons : Kevin
bH : Katie
VBF : Elisa

Fix to run on NTUP_COMMON

The variables to use to run on Zhvv125 sample T sample :

jet_AntiKt4LCTopo_nTrk_pv0_500MeV
jet_AntiKt4LCTopo_sumPtTrk_pv0_500MeV
jet_AntiKt4TopoEM_nTrk_pv0_500MeV
jet_AntiKt4TopoEM_sumPtTrk_pv0_500MeV

Any other though about what is needed to be changed in a physics point of view ?