PHYSICS DATASETS FOR STARTUP AND EVOLUTION TO HIGHER LUMINOSITIES

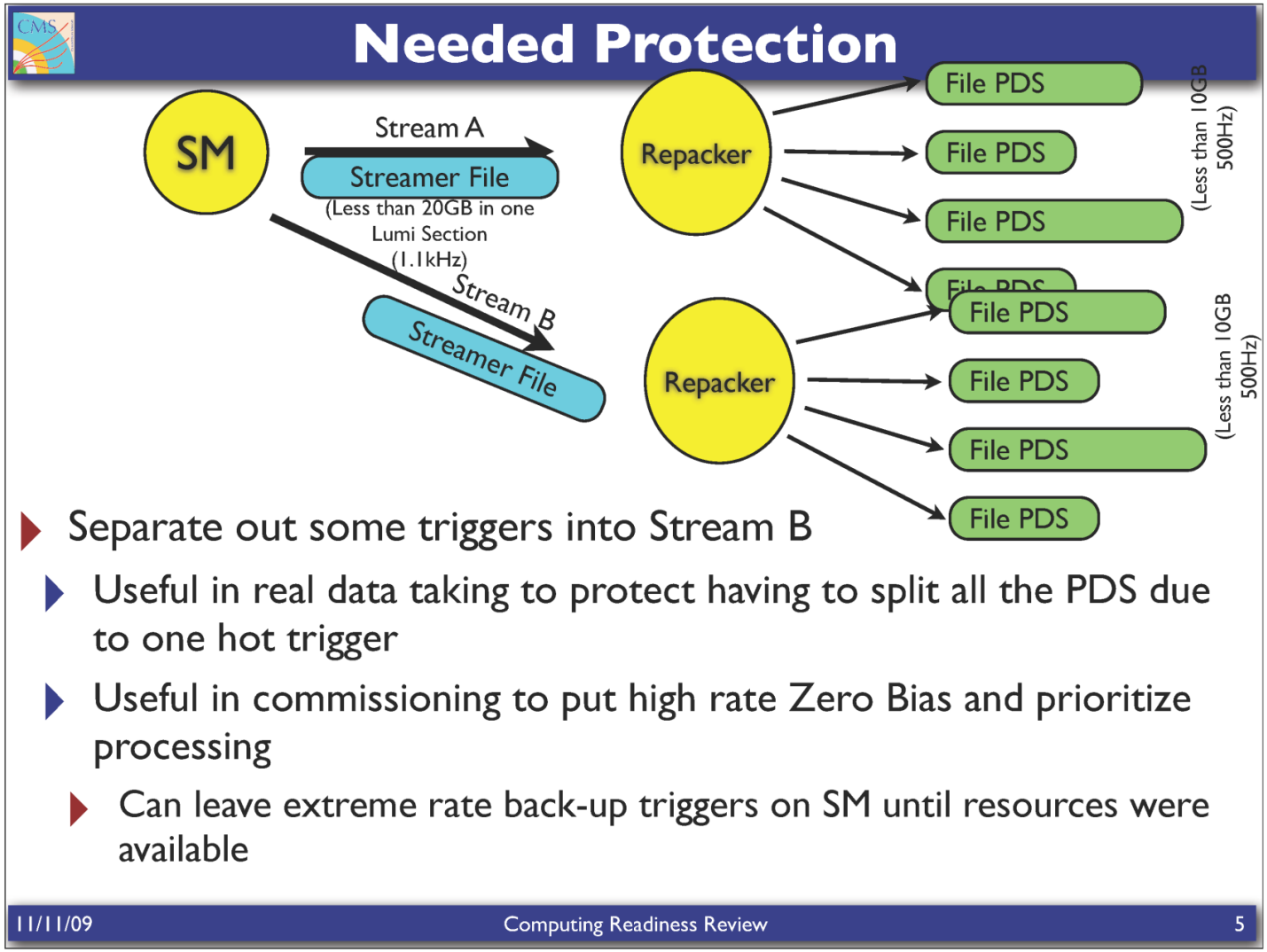
TSG Meeting
November 16, 2009

Joe Incandela & Roberto Rossin
UC Santa Barbara

Overview of issues

- Now have a draft plan for first collisions
  - Draft of Stream A Physics datasets discussed here
- Have draft 8E29 trigger menu, PDs and SDs
  - Need to integrate OCT X experience, PAG/POG needs, into SD design
  - Need to prepare how we'll modify datasets (with changes to the triggers) for the reality of real data
- Higher luminosities
  - We'll design higher lumi trigger menus based on existing MC-based menus (1E31, 1E32) and experience with data
  - How will we evolve PDs, SDs, and add Central Skims (CS)?
    - Need to think about this now - from simple things like naming conventions… to how and where we will produce, validate, distribute, re-reco…

Scenario for Startup*
Stream A (standard), Stream B (backup)



*Ian Fisk – Computing Readiness Review Nov.11, 2009
http://indico.cern.ch/conferenceDisplay.py?confId=73524

Stream A Physics Datasets: 900 GeV (2.2 TeV) Considerations

- Content is driven by the (very limited) physics
  - O(1 Hz) interesting events (8E29 menu, no L3 rejection)
  - O(100 Hz) Min Bias (no prescale)
  - O(10,000 Hz) Zero Bias (most as backup in Stream B)
- Observe general guidelines (as used for 8E29)
  - Reasonably similar sizes for PDs & not too much overlap
  - No PD too large to be distributed to 3rd largest T1

Draft startup plan

- Primary Datasets - O(200 Hz)
  1. Min Bias - O(100 Hz) – currently est. to be 100% of these triggers
  2. Zero Bias - O(100 Hz) – roughly 1 % of these triggers
  3. "Startup Physics" - O(20 Hz)
     - O(1Hz) all "interesting events"
     - O(10 Hz) of Min Bias (~10%)
     - O(10 Hz) of Zero Bias (~0.1 %)
       - Rates/fractions of min & zero bias are not fixed in stone yet, but PD#3 should be "portable"
  - NB: May need tweaking when we see real trigger rates (but the basic idea will remain same).
- Physics Secondary Dataset - O(few Hz)
  1. All of the interesting events O(1 Hz) (and O(1 Hz) of Min + Zero bias?)
- Physics Express Stream (ES) - O(20 Hz)
  - PD#3 above – Startup Physics
- Why these choices?
  - PD#1 is all the min bias and not unreasonable in size (events are small)
  - PD#2 is arbitrarily chosen to be similar in size to PD#1
  - **PD#3** has the most interesting events + plenty of min & zero bias
    - Adequate for most studies and to setup the others for running on higher stats min & zero bias
  - **ES=PD#3**= the most comprehensive and versatile sample
    - Rate comparable to our target for higher Lumi
  - **SD#1** pulls out all of the "very interesting" events while remaining "laptopable"
    - e.g. 24 hours of recorded collisions with 300 kB/event at 2 Hz = 52 GB
    - Allows experience with prompt skimming.

Evolution

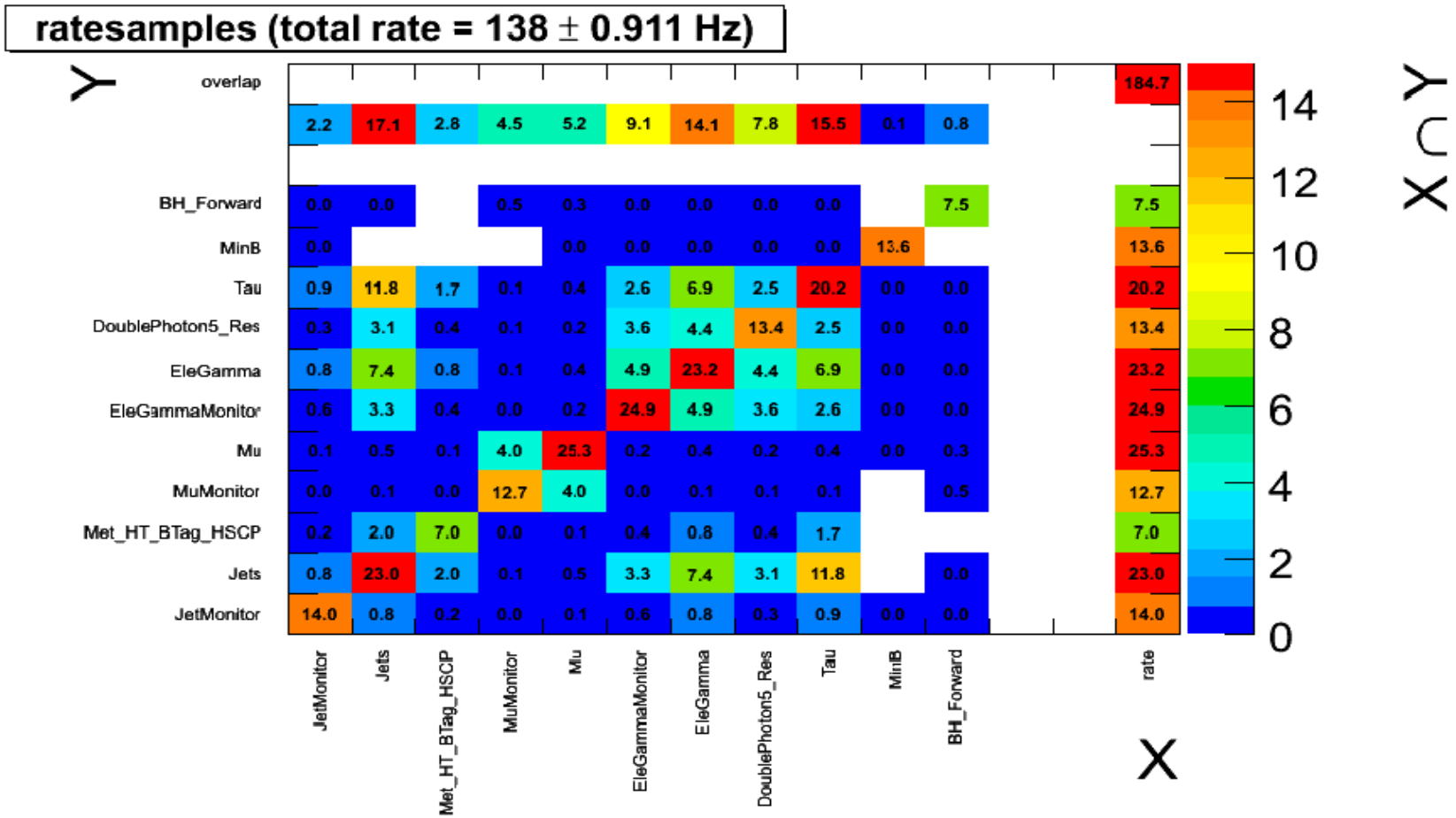
- First stage: getting to 8E29
  - Have a draft of 8E29 PDs and SDs (see additional info slides)
    - PD design: 11 (for physics) defined for the moment
    - SD design: 31 SDs (for physics) used in OCT X $\Rightarrow$ 1st iteration.
  - Will need modifications once we see real data
    - Will we have all 11 (31) PD (SD) from day 1 of 7 TeV running?
    - Or do we want intermediate subsets?
  - Once we get all 11 (31) PD (SD) launched, we will need to evolve them for higher luminosities as the triggers evolve.
- We will start planning/preparing
  - Organize dataset working meetings (1st hour of TSG)
    - Feedback from all DPG-POG and PAG about the 31 SDs
      - Modify them, but keep initially to a minimum number of SDs that can be used by wide number of groups
    - Develop an overall framework for evolution
    - Assure that we have the tools and people in place to do the job when data comes..

Additional Info

PD summary @ L=8E29

Dataset	Rate (Hz)
JetMonitor	14.04
Jets	22.97
Met_HT_BTag_HSCP	8
MuMonitor	12.74
Mu	25.34
EleGammaMonitor	24.87
EleGamma	23.19
DoublePhoton5_Res	13.35
Tau	20.17
MinB	13.59
BH_Forward	7.48
TOTAL TABLE RATE	139.2
TOTAL DATA ON DISK	185.74
TOTAL OVERLAP	34%

PD correlation @ L=8E29



The total overlap among all the PDs is 34%

8e29 SD's: First iteration as used in OCT X

Sample ID	Sample	# events	Xsec	Equivalent Lumi (pb-1)	JetMonitor			Jets			Met_HT_BTag_	MuMonitor		Mu					EGMonitor			EleGamma				DoubleEleGamm			Tau		MinB			BH_Forward	TOT
1000000	/MinBias	3.00E+07	7.53E+10	0.00040	1	1	1				1		1	1																1	1	1	1	11
1002010	/QCD_Pt15	5.00E+06	1.46E+09	0.00343	1	1	1				1		1	1	1				1	1	1	1	1	1	1	1	1							18
1002020	/QCD_Pt30	2.00E+06	1.09E+08	0.01835				1	1	1	1			1	1							1	1		1	1	1	1	1					13
1002030	/QCD_Pt80	2.00E+06	1.94E+06	1.03306				1	1	1	1											1	1											6
1011010	/QCD_EMEnriched_Pt20to30	3.00E+07	3.20E+06	9.37500																		1	1						1	1					4
1011020	/QCD_EMEnriched_Pt30to80	4.00E+07	4.70E+06	8.51064																		1	1						1	1					4
1011030	/QCD_EMEnriched_Pt80to170	5.00E+06	2.85E+05	17.54386																		1	1						1	1					4
1089000	/ppMuMuX	1.00E+06	1.10E+06	0.90560										1		1			1																3
1088000	/ppMuX	1.00E+07	1.19E+08	0.08426										1		1			1																3
1023010	/InclusiveMu5_Pt50	5.00E+06	3.64E+05	13.73626							1				1		1	1																4
1023020	/InclusiveMu5_Pt150	5.00E+05	6.78E+03	73.74631							1				1																			2
1012010	/QCD_BCtoE_Pt20to30	2.00E+06	1.92E+05	10.41667																		1	1						1	1					4
1012020	/QCD_BCtoE_Pt30to80	2.00E+06	2.40E+05	8.33333																		1	1						1	1					4
1012030	/QCD_BCtoE_Pt80to170	1.00E+06	2.28E+04	43.85965																		1	1						1	1					4
1040000	/Ttbar	5.00E+05	4.14E+02	1207.72947												1	1	1				1	1	1	1										7
1054000	/Wenu	2.00E+06	1.18E+04	168.91892																		1	1	1	1										4
1053000	/Wmunu	2.00E+06	1.18E+04	168.91892												1	1																		2
1071010	/Zee	2.00E+06	1.94E+03	1028.80658																		1	1	1	1			1							5
1071020	/Zmumu	2.00E+06	1.94E+03	1028.80658												1	1	1																	3
					2	2	2	2	2	2	4	2	2	2	2	2	4	3	2	1	1	1	7	7	3	3	2		2	2	7	7	1	1	1	1	105
					SD_L1Jet6	SD_Jet15U	CS_DiJetAve15	SD_Jet30U_Quad_Fwd	SD_Jet50U	CS_DiJetAve30	SD_MET	SD_BTag_HSCP	SD_L1MuOpen	SD_L1Mu	PD_Mu → HLT_Mu3	PD_Mu → HLT_Mu5	SD_Mu3	SD_Mu9	SD_L1_L2_Mu	SD_DoubleMu	SD_L1SingleEG5	SD_L1DoubleEG5	SD_Photon10_L1R	SD_Ele10_LW_EleId_L1R	SD_Ele15_LW_L1R	SD_Photon15	SD_Photon20	SD_DoubleEG5	SD_DoublePhoton5_JPsi_Upsilon	SD_DoublePhoton10	SD_SingleLooseTau25	SD_DoubleLooseTau15	SD_ZeroBias	SD_MinBiasCal	SD_MinBiasPixel	SD_BH_Forward	TOT

Legend: a "1" in the cell of X label SD_L1Mu and Y label /MinBias indicates that the sample /MinBias will be used to populate the SD_L1Mu. The rightmost yellow columns shows how many time we will have to run on a sample, the orange line indicates how many samples populate an SD (signals excluded).

Note that wrt previous presentations we added 5 highPt lepton/dilepton samples to the Ele and Mu SDs. These will available with an equivalent integrated lumi of O(10)pb-1

Roberto Rossin – Wed. Plenary meeting Oct. 23
http://indico.cern.ch/conferenceDisplay.py?confId=68686

Plugging in the numbers with a step in energy

Month	OP scenario	Max number bunch	Protons per bunch	Min beta*	Peak Lumi	Integrated	% nominal
1	Beam commissioning						
2	Pilot physics combined with commissioning	43	3×10^{10}	4	8.6×10^{29}	~200 nb^{-1}	
3		43	5×10^{10}	4	2.4×10^{30}	~1 pb^{-1}	
4		156	5×10^{10}	2	1.7×10^{31}	~9 pb^{-1}	2.5
5a	No crossing angle	156	7×10^{10}	2	3.4×10^{31}	~18 pb^{-1}	3.4
5b	No crossing angle – pushing bunch intensity	156	1×10^{11}	2	6.9×10^{31}	~36 pb^{-1}	4.8
6	Shift to higher energy: approx 4 weeks	Would aim for physics without crossing angle in the first instance with a gentle ramp back up in intensity					
7	4 – 5 TeV (5 TeV luminosity numbers quoted)	156	7×10^{10}	2	4.9×10^{31}	~26 pb^{-1}	3.4
8	50 ns – nominal Xing angle	144	7×10^{10}	2	4.4×10^{31}	~23 pb^{-1}	3.1
9	50 ns	288	7×10^{10}	2	8.8×10^{31}	~46 pb^{-1}	6.2
10	50 ns	432	7×10^{10}	2	1.3×10^{32}	~69 pb^{-1}	9.4
11	50 ns	432	9×10^{10}	2	2.1×10^{32}	~110 pb^{-1}	12

OCT X SD's pertain to earliest data

Candidate Menu for First Collisions

From /online/cosmic/week44/CMSSW_3_3_0/override/HLT/V1

L3 paths

HLT_BTagIP_Jet50U
HLT_BTagMu_Jet10U
HLT_DoubleEle5_SW_L1R
HLT_DoubleMu0
HLT_DoubleMu3
HLT_Ele10_LW_L1R
HLT_Ele10_LW_EleId_L1R
HLT_Ele15_SC10_LW_L1R
HLT_Ele15_LW_L1R
HLT_Ele15_SiStrip_L1R
HLT_Ele20_LW_L1R
HLT_IsoMu3
HLT_Mu3
HLT_Mu5
HLT_Mu9
HLT_IsoTrack_8E29
HLT_Photon15_TrackIso_L1R
HLT_TkMu3_NoVertex

HLT_L1Jet6U
HLT_Jet15U
HLT_Jet30U
HLT_Jet50U
HLT_FwdJet20U
HLT_DiJetAve15U_8E29
HLT_DiJetAve30U_8E29
HLT_QuadJet15U
HLT_L1MET20
HLT_MET45
HLT_MET100
HLT_HT100U
HLT_L1MuOpen
HLT_L1Mu
HLT_L1Mu20
HLT_L2Mu9
HLT_L2Mu11
HLT_L1DoubleMuOpen
HLT_L1SingleEG5
HLT_L1SingleEG8
HLT_L1DoubleEG5
HLT_DoublePhoton5_eeRes_L1R
HLT_DoublePhoton5_Jpsi_L1R
HLT_DoublePhoton5_Upsilon_L1R

L1 and L2 paths

HLT_Photon10_L1R
HLT_Photon15_L1R
HLT_Photon15_LooseEcalIso_L1R
HLT_Photon20_L1R
HLT_Photon30_L1R_8E29
HLT_DoublePhoton10_L1R
HLT_SingleLooseIsoTau20
HLT_DoubleLooseIsoTau15
HLT_StoppedHSCP_8E29
HLT_L1Mu14_L1SingleEG10
HLT_L1Mu14_L1SingleJet6U
HLT_L1Mu14_L1ETM30
HLT_ZeroBias
HLT_ZeroBiasPrescaled
HLT_MinBias
HLT_MinBiasPixel
HLT_MinBiasPixel_Trk5
HLT_MinBiasHcal
HLT_MinBiasEcal
HLT_CSCBeamHalo
HLT_CSCBeamHaloOverlapRing1
HLT_CSCBeamHaloOverlapRing2
HLT_CSCBeamHaloRing2or3
HLT_BackwardBSC
HLT_ForwardBSC

HLT_HcalPhiSym
HLT_HcalNZS_8E29
AlCa_EcalPhiSym
AlCa_EcalPi0_8E29
AlCa_EcalEta_8E29
AlCa_RPCMuonNoHits
AlCa_RPCMuonNormalisation
AlCa_DTErrors
HLT_Calibration
HLT_EcalCalibration
HLT_HcalCalibration
HLT_Random
HLT_Physics
HLT_PhysicsNoMuon
HLT_PhysicsNoMuonPrescaled
HLT_PixelFEDSize
HLT_HFThreshold
HLT_GlobalRunHPDNoise
HLT_TechTrigHCALNoise
HLT_L1_BPTX
HLT_L1_BSC
HLT_L1_HFtech
HLT_L2Muo_NoVertex
HLT_EgammaSuperClusterOnly_L1R
HLTriggerFinalPath

L3 paths prescaled away in /user/apana/332_noL3/CosmicWeek44/override/V4
Need to check CPU performance of HLT_L2Muo_NoVertex before deployment