CMS Analysis Status: Inclusive $b \rightarrow J/\psi X$, $J/\psi \rightarrow \mu\ \mu$

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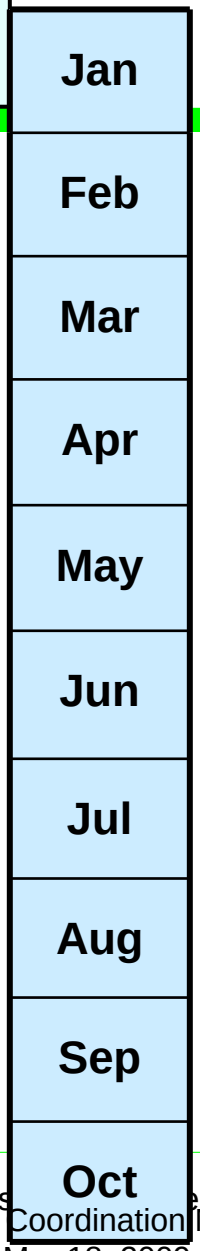
Outline

- CMS schedule & B PAG Special
- Data Samples
- Problems & status
- Outlook

1) Maintenance & Operation

2) Software, Computing & Physics Analysis



Release CMSSW3_0
(limited validation, step towards 3_1)

Install ES1

Install ES2

Deadline for Input for 3_1
CRAFT, Trigger Review (menu), Phys etc.

Release CMSSW3_1 (LHC Startup)

Tracker Cooling Plant Revised

Full validation of 3_1 (incl. production and physics)

Close CMS

Magnet Tests

Start Fullsim production 3_1

CRAFT

Use 3_1 widely
CMS gets familiar with 3_1

CRAFT Contingency & pre-beam maintenance

Start Fastsim production 3_1

CMS READY for Beam

CMS READY for Beam

New schedule

- Plan is to stick to CMSSW_2_2 until late spring
  - Change to 3_1 in ~end May. Version with with we will simulate/reco the "Startup Monte Carlo"
- Closing of 3_1 delayed by 4 weeks
  - This was needed by many (DPGs and POGs). The idea is that 3_1 will be the last time (for a while into the future) with a backwards incompatibility
    - There will certainly be improvements, code fixes, etc
    - But no "programmed" major change
  - 3_1 is the version with which we will simulate the "Startup Monte Carlo" samples
- Thus: move "end of approvals" to end June
  - It is important that each group plans its analyses properly to avoid having late analyzers feeling "rejected by system"
    - The reason for stopping Monte Carlo analyses is to turn everyone to the data and the startup. Conveners: please spread the word

Startup Monte Carlo

- With 3_1 now defined, we have to decide on
  - Startup Monte Carlo composition
    - Born-level: same as Summer08. But we can improve on this. Any lessons learnt? Should we add/subtract samples?
  - 3_1 will also need a very extensive validation
    - There will also be a pre-production of the full samples. And it will be our responsibility to run on them and check them!
    - Perhaps the true "startup samples" do not test all that we want in such an extensive validation?

      ➔ What other special test samples should we request?
  - Please send your changes to the Summer08 list, as well as requests for additional physics-validation samples to Fabian and Roberto (cc JoRoPa). Deadline: 2 weeks (Apr 1)

Early papers: non-exhaustive (?) list

- Charged particle production in pp collisions at 10 TeV
- Minimum-bias events – energy flow
- W and Z production in electrons & muons
- W eta distribution, charge asymmetry and pdfs
- Search for stopped gluinos
- Heavy Stable Charged Particle search
- Dijet production and phi de-correlation
- Inclusive jet production
- Search for dijet resonance
- Search for compositeness?
- Observation of top in dileptons
- J/psi production; Observation of J/psi K (+,*,0), phi?
- Inclusive b cross section from J/psi? Muons?
- Observation of top in lepton+jets
- Search for W', Z' (in leptons)
- Search for ADD monojets

Early papers (II)

- **By the physics week in May:**
  - Define full set of papers. Please send me the papers you think that we will publish with the first 10 pb-1 (up to 50 pb-1) from your group
    - The idea is to prepare our "earliest papers"
  - Identify two people per paper. Again, we should converge by May Physics week
- **Preparing these papers:**
  - Draft 1: June CMS week
  - **Full draft ready: Sep Physics week**

Manpower and analyses

Paula Eerola

- **Action item to us:**
  - **Detailed list of groups/persons vs analyses – in about 1 month (end of April)**
  - **Analyses which need to be strengthened – deadline April 8**
  - **Define first papers (10-50 pb^{-1}): converge by May Physics Week. Identify ~2 persons/paper who are responsable for and committed to getting the paper out. Draft 1 by June CMS week!**
    - J/ψ production – prompt/non-prompt/polarization
    - Upsilon production?
    - Observation of $B_{u,d,s}/\Lambda_b \rightarrow J/\psi + K^+/K^0_S/K^{*0}/\phi/\Lambda$?
    - Inclusive b cross section from $b \rightarrow J/\psi$ X?
    - Inclusive b cross section from μ+jets?
    - Bbbar correlations from $bbbar \rightarrow J/\psi$ X + μX?

Analysis Notes

- **Approvals possible with CMSSW_2_2 until late spring**
- **END OF MONTE CARLO APPROVALS: END OF JUNE 2009!**

CMSSW_2_1_12
CMSSW_2_2_6

pp@10TeV

CMS Summer08 M.C. data samples

b2J/psi

- /BtoJpsiMuMu/Summer08_IDEAL_V9_PAT_v1/USER — CMSSW_2_2_1
  Created 22 Jan 2009, 4817138 events, 137 files, 1 block(s), 139.7GB, located at 1 site
- /BtoJpsiMuMu/Summer08_IDEAL_V11_redigi_v1/GEN-SIM-RECO — CMSSW_2_2_1
  Created 09 Jan 2009, 2453008 events, 1536 files, 16 block(s), 635.7GB, located at 4 sites
- /BtoJpsiMuMu/Summer08_IDEAL_V9_v2/GEN-SIM-RECO — CMSSW_2_1_7
  Created 14 Nov 2008, 2434076 events, 381 files, 5 block(s), 643.2GB, located at 5 sites
  - T2_US_Purdue : dcache.rcac.purdue.edu 2434076 381 643.2GB
  - T2_CH_CSCS : storage01.lcg.cscs.ch
  - T3_US_FNALLPC : cmsdca2.fnal.gov
  - T1_DE_FZK : gridka-dCache.fzk.de
  - T2_CN_Beijing : srm.ihep.ac.cn

Sum08 Incl b: ~100 pb-1

p-J/psi

- /JPsi/Summer08_IDEAL_V11_redigi_v1/GEN-SIM-RECO — CMSSW_2_2_1
  Created 18 Feb 2009, 1941162 events, 382 files, 2 block(s), 394.1GB, located at 1 site
- /JPsi/Summer08_IDEAL_V9_v1/GEN-SIM-RECO — CMSSW_2_1_8
  Created 11 Dec 2008 , 1847135 events, 365 files, 12 block(s), 385.5GB, located at 3 sites
  - T1_TW_ASGC : srm2.grid.sinica.edu.tw 1847135 365 385.5GB
  - T3_US_FNALLPC : cmsdca2.fnal.gov
  - T2_CN_Beijing : srm.ihep.ac.cn

Sum08 pJpsi: ~16 pb-1

QCD

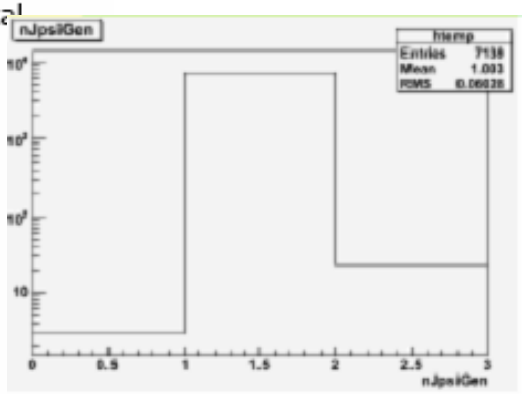
- InclusivePPmuX/Summer08_IDEAL_V9_PAT_v1/USER — CMSSW_2_2_1
  Created 22 Jan 2009, 10345428 events, 312 files, 1 block(s), 304.5GB, located at 3 sites
- /InclusivePPmuX/Summer08_IDEAL_V11_redigi_v1/GEN-SIM-RAW — CMSSW_2_2_1
  Created 18 Dec 2008, 5309035 events, 1702 files, 18 block(s), 1.5TB, located at 9 sites
- /InclusivePPmuX/Summer08_IDEAL_V9_v4/GEN-SIM-RECO — CMSSW_2_1_8
  Created 17 Nov 2008, 5232662 events, 1315 files, 33 block(s), 1.5TB, located at 3 sites
  - T1_ES_PIC : srmcms.pic.es 5232662 1315 1.5TB
  - T2_TW_Taiwan : f-dpm001.grid.sinica.edu.tw
  - T2_EE_Estonia : io.hep.kbfi.ee

Sum08 QCD: ~0.044 pb-1

Inclusive b EvtGen Production

```
filterEfficiency = cms.untracked.double(0.000644)
crossSection = cms.untracked.double(38280000)
```

```
> Evts generated: 10,000,000
> Evts after filter:        7139
> b and jpsi gened @same point /total
> B0                250/  1357
> anti-B0           282/  1480
> B+                  0/  1464
> B-                  0/  1450
> B_s0              192/   383
> anti-B_s0         203/   415
> Lambda_b0           0/   306
> anti-Lambda_b0    0/   304
> ----------------------------
>     > jpsi/evt, total    7159
      > 0,    3
      > 1,7113
      > 2,   23
```



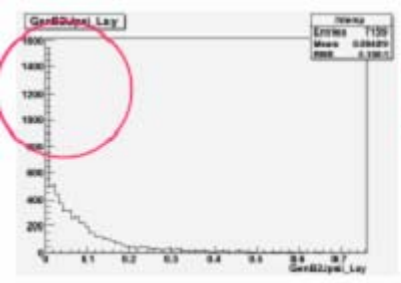
bfilter*oniafilter*mumugenfilter

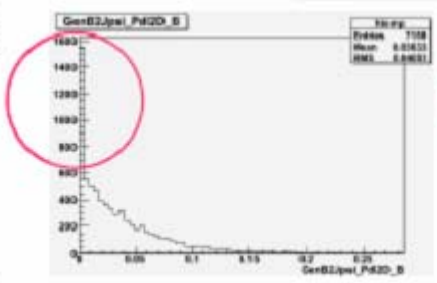
- filterEfficiency = 0.0007139
- CrossSection = σ tot* ε filter*Br
  = 25.36nb

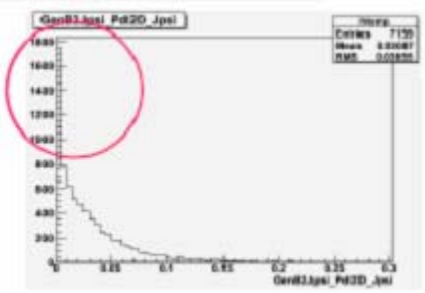
σ tot=51.56mb @10TeV
Br(B-hadron -> J/psi X) = 1.16%
Br(J/psi -> mu mu) = 5.94%

Patrick Robbe LHCb EvtGenLHC
Roberto Covarelli CMS EvtGen
Sarah Dambach CMS EvtGen

This might be due to a convention of EvtGen for mixing. What EvtGen does is a time-dependent calculation of the mixing probability, but when it has decided if the meson has mixed or not (say yes), the flavor is changed just at the ENDING vertex. E.g. B0 -> (flies for ~1.5 ps) -> B0bar -> (immediately) -> J/psi X. Since the only experimental observable is the final flavor this does no affect at all the physics.

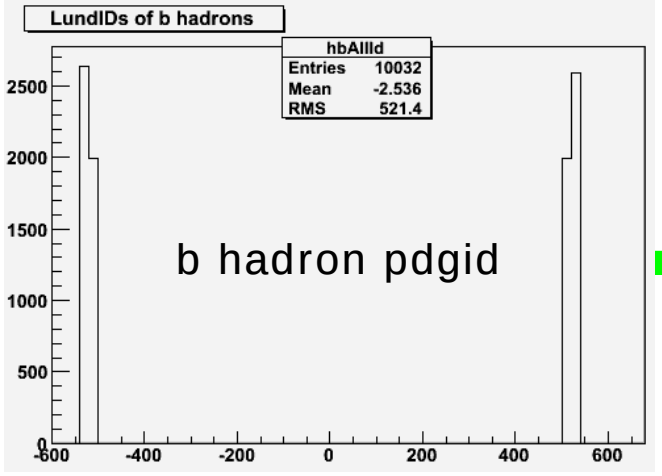


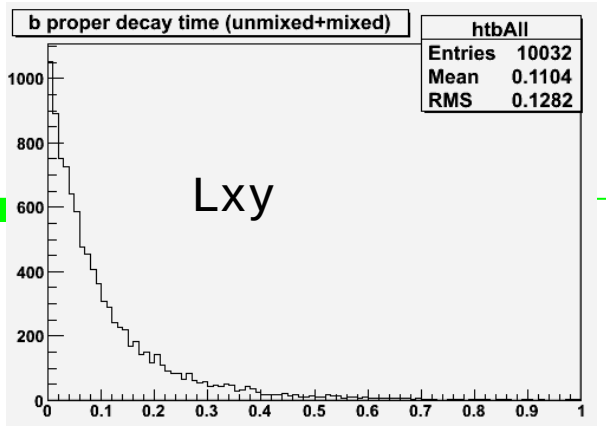




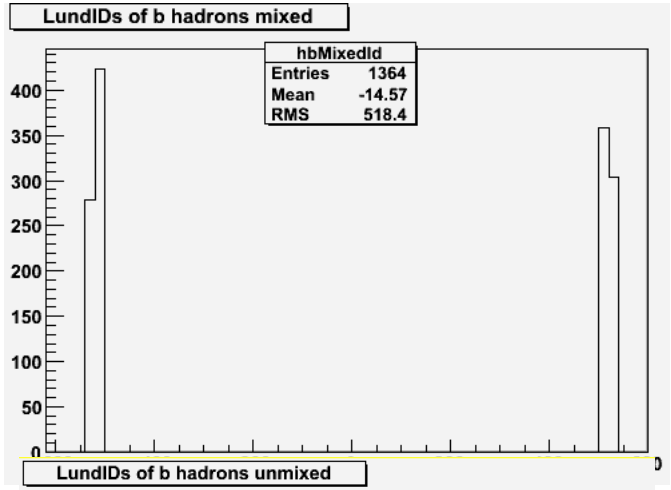
Gen vertex:
GenParticles

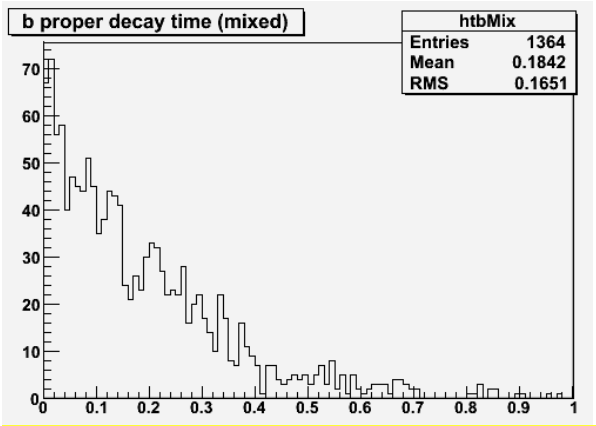
HepMC:
GenEvent
GenVertex
particles_in_const_iterator
particles_out_const_iterator

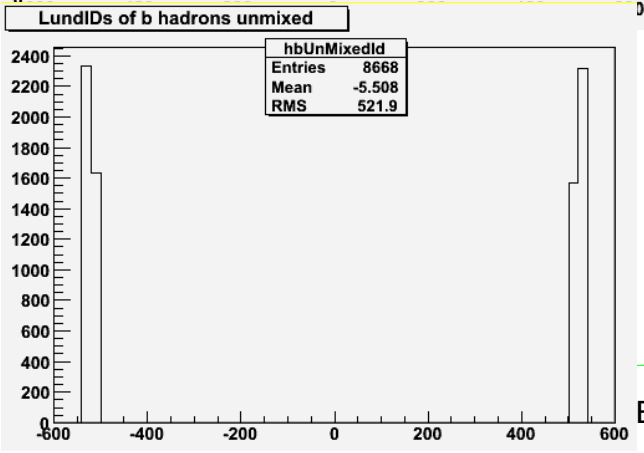


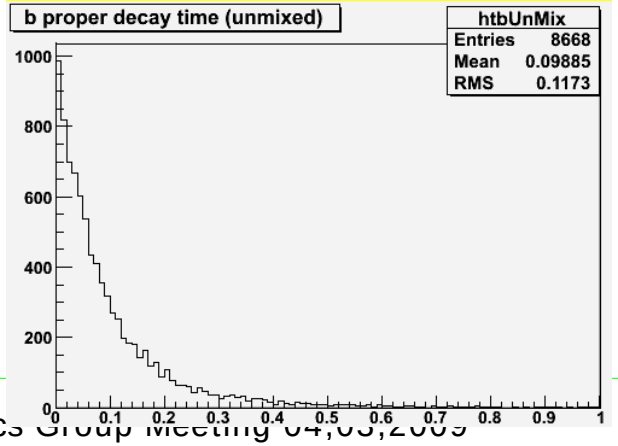


Gen vertex:
GenParticles









To do List

- Nearly finished for anal on CSA07@14TeV first 3pb-1 data: systematic errors
- start anal on Sum08 data @10TeV(already)
  - Efficiency: Accept., Trig & reco. :M.C. & T.P.
  - Comprehensive anal method
    - PdI efficiency
    - Scale factor
- Prepare PAS and Note draft.

backups

Pseudo proper decay length

$$\vec{X} = \vec{x}_B - \vec{x}_{prim}$$

$$L_{xy}^B = \frac{\vec{X} \cdot \vec{p}_T^B}{|\vec{p}_T^B|}$$

$$\lambda^B = \frac{L_{xy}^B}{(\beta\gamma)_T^B} = L_{xy}^B \cdot \frac{M_B}{p_T^B}$$

$$\lambda_\psi = \frac{L_{xy}^\psi}{(\beta\gamma)_T^\psi} = L_{xy}^\psi \cdot \frac{M_\psi}{p_T^\psi}$$

$$\lambda = \frac{\lambda_\psi}{\langle F(p_T^\psi) \rangle} = L_{xy}^\psi \cdot \frac{M_\psi}{p_T^\psi \langle F(p_T^\psi) \rangle} \qquad F(p_T^\psi) = \frac{(\beta\gamma)_T^B}{(\beta\gamma)_T^\psi} = \frac{\lambda_\psi}{\lambda_B}$$

- **Measure the 2-dimensional decay length *Lxy* for the *J/*Ψ **meson sample**
- **pseudo proper decay length distribution**
- **Measure the l distribution of the background under the *J/*Ψ **by studying the** μ **+** μ **- mass sidebands of the *J/*Ψ**
- **Fit the distribution to the sum of background, direct (zero-lifetime) and *B* decay (non-zero lifetime) Contributions and extract the lifetime**