

# CMS usage of Geant4

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# Calorimeters task force

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- A **task force** has been created at the beginning of 2008 with the mandate **to coordinate and push the efforts for the solution of the residual problems in the comparison of the calorimeters' simulation with the test beam data**
  - Current target: end of spring 2008, CMSSW\_2\_1
  
- Useful interaction with G4 Collaboration
  
- **Part of the results integrated in G4.9.1p02**
  - Adopted as version to be used for CMSSW 2\_1 for massive production for comparisons with first real data
  - QGSP\_BERT\_EMV becomes our default production list

# New features

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- Outputs of the Calo Task Force in G4.9.1p02:
  - correction to the treatment of quasi-elastic scattering in QGS model
  - Incorporation of Coulomb barrier effect in the Bertini model
  
- Fix added by CMS
  - For spurious high  $p_T$  particles in strange baryon interaction with matter
  - We ask to insert it in next G4 releases
    - Taken from development G4 repository

# Performances



## Performance Issues



	Minimum Bias	t-tbar	$Z \rightarrow e^+e^-$
CPU Time (s)			
QGSP_EMV	1.00 (23.01 s)	1.00 (149.5 s)	1.00 (98.16 s)
QGSP	1.16	1.20	1.17
QGSP_BERT_EMV	1.41	1.46	1.36
QGSP_BERT	1.58	1.69	1.53
Event size (Mb)			
QGSP_EMV	1.00 (0.155 Mb)	1.00 (1.01 Mb)	1.00 (0.539 Mb)
QGSP	1.01	1.03	1.00
QGSP_BERT_EMV	1.52	1.77	1.60
QGSP_BERT	1.52	1.72	1.58

- Possible increase by ~40% in CPU time, ~(50-80)% in Event size (depending on physics channel), ~(5-10)% increase in memory usage as a result of moving from QGSP\_EMV to QGSP\_BERT\_EMV

May 30, 2008 Calorimeter Task Force Meeting

Simulation event content

S. Banerjee 2

# Pending issues

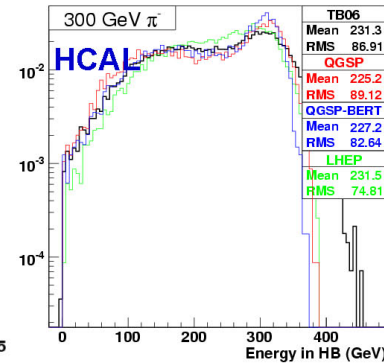
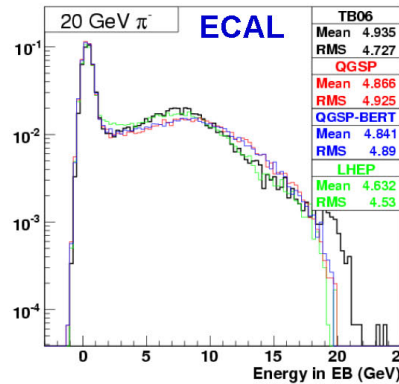
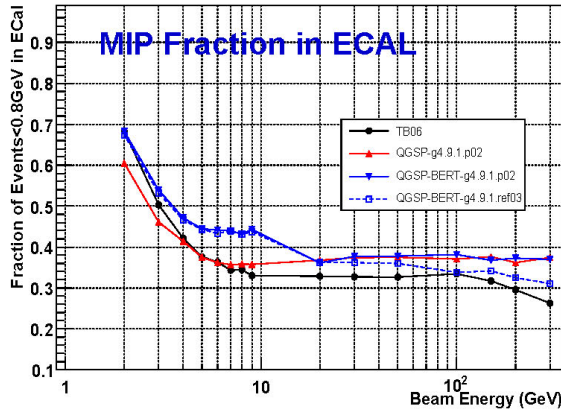
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- Problems tackled by the Calo Task Force not yet inserted in G4:
  - correction to the treatment of quasi-elastic in Bertini model
  - introduction of bremsstrahlung process for hadrons
  
- Other pending issues from the past:
  - visualization of boolean solids (still open last TF)
  - introduction of an hybrid stepper using the field values and the field gradient: this has been requested by Sunanda Banerjee in his report on Nov 7th 2007 and it is not yet addressed as far as we can see
  - QGSP\_BERT\_EMV does not yet seem reproducible

# Open problems

S. Banerjee

## What more is needed



- ❑ MIP Fraction in  $\text{PbWO}_4$  too large at 5-9 GeV. Could be due to treatment of quasi-elastics in Bertini cascade model. The drop at high energy is due to bremsstrahlung of hadrons.
- ❑ Energy deposit in  $\text{PbWO}_4$  well explained at energies below 10 GeV and above 30 GeV. In the intermediate energy region, data agree better with LHEP
- ❑ Energy deposit in HCal (non-interacting in  $\text{PbWO}_4$ ) have a sharper cut off at high energies (above 100 GeV) – causes better energy resolution in G4 predictions

July 2, 2008 G4 Technical Forum

Task Force Input

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