



CMS Requirements

Geant4 Technical Forum
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for
CMS

General Remarks



- Geant3 based production is stopped!
- Geant4 based OSCAR production (Geant4 5.2.p02 + some fixes that went into 6.0)
 - Full detector
 - 12 million events produced out of currently 18 million requested events:
 - $TT\bar{b}/Z/ZZ/ZW/W/WW$ -jets, signal+bkgd, jets up to 2.2 TeV, 10 M events
 - QCD jets, up to 4 TeV, 3 M events.
 - $qqH \rightarrow ZZ \rightarrow ll\nu\nu$, various masses, 500K events
 - higgs background, 2.3 M events
 - Crash rate: ~ order of 1/5000 events
 - Have 3 heavy ion events fully simulated (50k-70k primary particles!!)
- Hunting down of new & old problems (new G4 6.0 release under test!):
 - hadronics
 - Tracking in magnetic field
 - Some geometry issues (shape parameters, visualization, regions)
- The following requirements have to be seen more in the light of the application developer – to ease debugging



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**All this was only possible because of
an excellent collaboration with the Geant4 team
and a highly motivated CMS OSCAR & production team!
Thanks to all who have contributed!!**

- Some geometry issues (shape parameters, visualization, regions)

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Req.: Storage retrieval of cuts/physics-tables

retrieval fails if the geometry is not built in exactly the same order as at storage

Example:

- build detector (tracker, calos ,muons), save tables - OK
- build (part of) detector in different order: calos, tracker, no muons - table loading fails

related to A8 of previous TF and or bug 527?
(527: ascii and binary format problems; inadequate information with default verbosity - any news?)

Req.: Region settings in reflected geometries

If a region is assigned to a logical-volume and the volume is placed n-times in the detector, the region cuts are applied to all n-regions (valid for all daughter volumes recursively).
If the same volume is reflected m-times, the region settings are not applied to the reflected volumes.

Example:

when reflecting a whole endcap of a subdetector, we need to have the same region cuts applied to the reflected volume hierarchy (same physics in both endcaps)

Req: Solid parameters checking (sorry, a last minute Req.)



- * issues with 0 sized dimensions (Trap that is a pyramid, ...)
- * Geant4 should either reject the instantiation of solids with parameters violating the valid parameter range and provide a usefull error message or extend the functionality of the affected solids or introduce new solids.
- * Improvements already built into G4 6.0

Unresolved issues

- * G4Transportation is killing track that is looping or stuck.
This track has 6.38239 MeV energy.
> 4000 times in 50 minbias events, amounting to some ~0(GeV) loss
- * G4ChordFinder::FindNextChord and G4ChordFinder::AdvanceChordLimited
from G4PropagatorInField::ComputeStep
~25-30% (1000 high pT QCD jet events) job crash rate
since Geant4 6.0
- G4KineticTrack::Decay from G4DecayStrongResonances::Propagate
~5-10% (1000 high pT QCD jet events) job crash rate
since Geant4 6.0
- * Reproducible resuming of runs at event n, n>1
- * Many problems with the boolean processor in visualization