



Gauss Status

reminder of what is in MC09 and what is still expected
development for first data

} short summary

generators status

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validation infrastructure and tuning of the simulation

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Gauss and MC09

➤ Gauss v37r* series

- ❑ v35r1 [2008-10-10] →v37r0 [2009-04-08] →v37r2 [2009-06-03]
- ❑ **Few starts and stops**
 - hick-ups from new EvtGen
 - geometry
- ❑ **Teething problems in production**
 - huge amount of jobs stalling and (less) failing with Gauss v37r0
 - greatly reduced with latest version
 - very few jobs failing (not all Gauss), several % stalled
 - reports of private productions with higher nu failing
 - some problems still there
 - event lost (G4Exception) or particle lost
 - report exists in log files → investigation to be carried out
- ❑ **Few tens of millions of events already produced**

Gauss v37r* series: highlights (in production)



- **Many many many many changes since DC06**
 - No parts left untouched !

- **New versions of (almost) all generators packages with respect to DC06**
 - **HepMC 2.03.09**
 - CLHEP free
 - **Pythia 4.18.2**
 - tuned to reproduce particle multiplicities
 - higher c and b cross sections
 - charmonia and bottomonia production
 - **Photos 215.2**
 - same as DC06
 - **LHAPDF 5.3.1**
 - no differences for PDF used, but more available
 - **EvtGen (April 2009)**
 - merging of changes/developments since 2003 from BaBar, CDF, D0, CLEO, LHCb
 - CP violation under study – not yet validated for production
 - **Hijng 1.383bs.2**
 - same as DC06
 - some issues with 64-bit and support
 - **Particle Properties and Decay tables**
 - updated to PDG2008

see Patrick's talk



Gauss v37r* series: highlights (in production)

- **New version of Geant4 – 9.1.0p03**
 - ❑ in DC06 it was 7.1.p01a
 - ❑ EM physics completely re-written
 - ❑ Hadronic physics extended
 - ❑ Physics lists provided as integral part

- **New algorithms to perform the handling of MCTruth**
 - ❑ Pass from generator to Geant4 only particles which will interact with detector, that is to say particles with non-zero travel length.
 - All other particles are saved directly in MCParticle container, and the decay chains are restored at the end of the processing by Geant4.
 - only special particles (quarks, strings...) are not saved in MCTruth
 - Not necessary to make known to Geant4 all possible particles
 - only those not yet known and that travel in LHCb (e.g. B_c , neutralino)
 - ❑ Possible to save all particles as MCParticles and by-pass Simulation phase



Gauss v37r* series: highlights (in production)

➤ Simulation settings

- ❑ Gauss sets appropriate tags in DDDDB and SIMCOND for a production
 - Choice of contents/Deployment for production in AppConfig (use v2r*)
- ❑ But this is a big list of combination
 - VELO position
 - field on/off
- ❑ Beam parameters sets as properties of algorithms/tools
 - Beam energy, v (i.e. luminosity/bunch), luminous region, bunch structure (spill-over)
- ❑ Pass arguments separately to gaudirun.py

```
> gaudirun.py $APPCONFIGOPTS/Gauss/MC09-b5TeV-md100.py  
$APPCONFIGOPTS/Conditions/MC09-20090602-vc-md100.py  
$DECFILESROOT/options/30000000.opts  
$LBPYTHIAROOT/options/Pythia.opts  
$GAUSSOPTS/Gauss-Job.py
```



Gauss validation and tuning

- **Many tools introduced to check, test, validate and tune the simulation**
 - ❑ **Essential at all stages**
 - regression tests
 - checking production
 - porting to a new platform
 - validating a new version (or a new) generator
 - ❑ **Visualization of geometry and overlaps as seen by Geant4**
 - geometry not quite the same as what in DDDDB+SIMCOND
 - dedicated Gauss job with different visualization options
 - graphical representation of overlaps (but not all are seen)
 - available from Gauss twiki
 - ❑ **Scans of radiation length as seen by Geant4 with publication on web page**
 - ❑ **QMTests in nightly builds and SAM tests to check installation**
 - ❑ **Reference tests to check histograms and log files for generator and simulation with publication on web page exist**
 - ❑ **Reference samples indentified**
 - particle guns, min bias and b inclusive
 - review signal reference samples
 - ❑ **Framework to unify tools and checks under development**

see Silvia's talk



Gauss development: MC09

- **Put back or validate additional generators to the main stream**
 - only those that are (will be) requested or that have clear support
 - ❑ SUSY production with Pythia
 - ❑ BcVegPy
 - ❑ Pythia 8 - C++ generator to eventually replace Pythia6
 - ❑ HiddenValley
 - ❑ AlpGen
 - } to be validated, Gauss v37r3
 - } For Higgs and exotica: requested for Gauss v37r*?
 - ❑ Herwig (with Jimmy and MCatNLO) - In the past by Cambridge, still wanted ?
 - ❑ SHERPA - C++ generator alternative to Pythia, huge work by Dortmund students with help from authors

- **Spill-over**
 - ❑ Generate spill-over in a single file and a single job
 - ❑ Multiple generator sequences (one per bunch crossing) followed by corresponding simulation sequences
 - ❑ Prototype exists and is working
 - Boole can read the events
 - ❑ Commission it for production in Gauss v37r3 release
 - generalize it to any simulation settings (beam, geometry, phase)
 - ❑ Cannot yet be used for signals not extracted from min bias (eg. Higgs, W, Z, SUSY)



Gauss development (post-)MC09

- **Setting and access of beam parameters**
 - ❑ At the moment only small number of parameters available in data (related to collision/bunch) and parameters are set as options of various tools
 - ❑ New class will be introduced `BeamParameters` with all basic data set by a unique algorithm and derived methods to be used by tools.

- **Gauss de-optsing**
 - ❑ At the moment rather trivial
 - use `LHCbApp()` but mostly python functions
 - ❑ Go all the way to `Gauss()` configurable
 - split generator and simulation phases
 - find optimal way of configuring it for various cases
 - Generator stand alone
 - Reading back
 - pythonize production of configuration for `EventTypes` from decfiles

- **Migrate to new `ParticlePropertySvc`**



Gauss development post-MC09

- **Move (again) to latest versions of external software**
 - ❑ **Pythia 6.4.20.2, LHAPDF 5.7.0**
 - ❑ **GEANT4 9.2.p01 (9.3 beta release is out but...)**
 - ❑ **HepMC 2.05 ?**
 - **to be discussed/synchronized with other LHC experiments**

- **Move to new platform and compiler**
 - ❑ **slc5 and gcc43**
 - ❑ **MacOS**
 - ❑ **Finish porting to Windows (at least partial? FORTRAN issues)**

- **Generators statistics and FSR**
 - ❑ **see Friday discussion**

- **Modify how to pass geometry from LHCb TDS to Gean4 geometry**
 - **To take into account information from “alignment” in SIMCOND for all detectors**
 - **To allow use of parallel geometry for scoring**
 - **To enable possibility to check overlaps at construction**
 - ❑ **Major work, complete re- engineering of GiGa geometry conversion**
 - ❑ **On hold until Marco Pappagallo is back unless new volunteers**