



Gauss Status

... in random order
... in fact status of the issues raised in June
in view of readiness for first data (“DC08”)
+ a few new developments

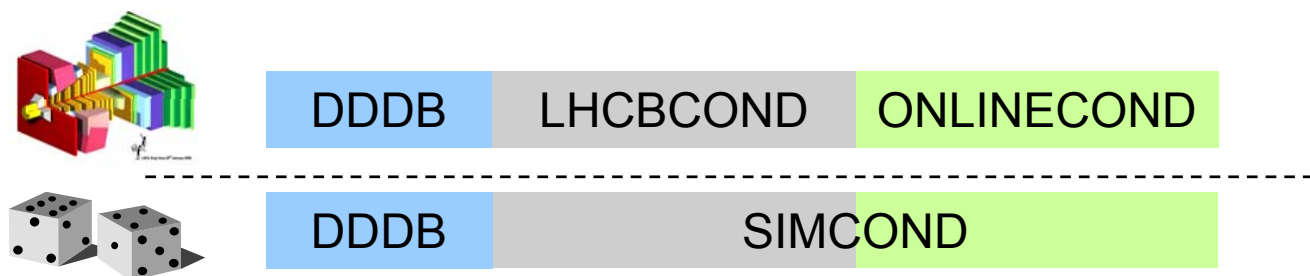
G.Corti

LHCb Software Week - 16 September 2008

Simulation and SimCond DataBase



- **Simulation (and reconstruction of simulated data) gets a copy of the necessary online conditions from a SIMCOND database.**
 - ❑ **Directory structure identical to that of ONLINECOND**
- **Does not see LHCBCOND directly. SIMCOND contains a copy of the relevant offline conditions from LHCBCOND**
 - ❑ **inventory of these conditions and SIMCOND populated**
 - ❑ **not all LHCBCOND is replicated into SIMCOND**



Simulation and SimCond DataBase



- **First implementation available** (M.Clemencic)
 - ❑ **First implementation with Nominal Geometry + online Magnetic Field related conditions and VELO motor position**
 - ❑ **Copy mechanism from OnlineCond&LHCbCond to SimCond**
 - ❑ **Missing: beam conditions, to be put when available in Online**
- **Appropriate tags and validity for productions**
 - ❑ **Gauss should only tell SimCond which tag to use**
 - **Introducing new tags: who can do it?**
 - ❑ **Choice of contents/Deployment for production**
 - ❑ **SQLite shapshots**
 - **for production on Tier2**
 - **private productions**
- **Brunel and DaVinci know tag to use from event BUT must access SimCond and not LHCbCond for simulated data**
 - ❑ **Done manually**
- **ParticleProperty table**
 - ❑ **it is a condition, but should not change a lot → DDDB: to be commissioned in next version of Gauss**

Simulation and (survey) geometry



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Validation of 2008 geometry for simulation



- **Geant4 does not like overlapping volumes**
 - **See “dark matter” or abort event**
 - 0.5 – 1% events aborted in DC06!
 - **Any geometry given to Gauss should be thoroughly checked for overlaps**
 - **Responsibility of sub-detectors to make the 2008 geometry(ies) to simulate overlap free**
 - **Also for not sub-detector specific such as beam pipe, magnet**
 - also addition and changes need to be integrated
 - **Need to do it in Geant4 in ADDITION to using LHCb tools**
 - **DAVID and DAWN, redeployment in progress by Marco Pappagallo**
 - **Grid sampling**
 - **At construction with latest Geant4, to be investigated and if possible deployed**
 - Stop execution when positioning volume with problem

Generators Event record: HepMC 2.0



➤ HEP common event record

- ❑ interface to FORTRAN generator common blocks (HEPEVT) provided for Pythia6 & Herwig by HepMC itself
- ❑ next generation C++ generators (will) provide interface to their event record
- ❑ support and further development by LCG Generator Services project

➤ GenEvent class in LHCb is a wrapper around HepMC

- ❑ used to pass data between generators (Pythia → EvtGen)
- ❑ persistified and available on DSTs

➤ Migration from HepMC 1.26 → HepMC 2.0x

G.Corti, P.Robbe, L.Sonnenchein (LGC), P.Canal (ROOT), M.Memminger (Gaudi)

- ❑ Development only in latest version
- ❑ CLHEP no longer used for three and four-vectors
- ❑ Migration of LHCb code
 - Minimal version of Gauss can write and read with HepMC 2.0
- ❑ Readability of DC06 code with the same DaVinci code that can read new data
 - Schema evolution with ROOT for these specific classes
 - Special GenReflex dictionary
 - Stand-alone test code work with head revision of ROOT
 - To be tested with minimal version requires Gaudi with head of ROOT
 - Will need to be back-ported to be version of ROOT we are using to have it for summer

Done and tested
Gauss v35r0

Generators new features



- **Adopt latest version of Pythia6 418.2**
- **Introduce Color Octed Model for Quarkonia production**
 - ❑ currently causes a problem (crash in Gauss v34r0 after few hundreds events), put back DC06 settings but still problems for few thousands generic b events
- **Put back generators extending Pythia**
 - ❑ BcVegPy, HiddenValley, AlpGen
 - ❑ in progress but will require some restructuring of our GENSER interface package
- **New development by Neil Gueissaz for SUSY production**
- **New development by Tobias Brambach, Julian Wishahi to use SHERPA as production and decay tool**
 - ❑ see latest Gauss meeting
- **Proposal by Vanya Belyaev to modify code to pass generators record to Geant4**
 - ❑ tricky point, Patrick and Gloria will look at it but ...
- **Commissioning of generators in Gauss on windows in progress by Karl Harrison and Ying Ying**

Geant4 versions and known issues



- **Gauss freezes Geant4 version for a production**
 - ❑ **G4 7.1.p01 for DC06**
 - issue of timing and non negligible migration changes for 8.0 that was released just before
 - **Known problems in that version:**
 - dE/dx in thin layers and for different particle types (M. Needham)
 - multiple scattering in trackers and muon system (J.vanTilburg and S.Vecchi)
- **Gauss development for 2008 (v30r5 → v31r2) based on G4 8.3(.p01/p02)**
 - ❑ **some improvement in dE/dx**
 - see presentation by M.Needham last week, D.Hutchcroft yesterday
 - ❑ **still problem of MS in Muon system**
 - more recent version should have possibility of choosing more accurate step limitation algorithm when no magnetic field is present
- **Gauss 2008 production (from Gauss v34r0) based on very latest release: G4 9.1.p02**
 - ❑ **reproducibility of events**
 - ❑ **improvement in physics (EM, Hadronic)**
 - ❑ **further development, bug fixes, longer term support requested**
 - ❑ **should be checked again**

Simulation validation and tuning



- **Gauss for “DC08” with latest versions of Generators (Pythia6, LHAPDF, etc.) and of Geant4**
 - ❑ may be quite different from last major validation (DC06)
 - some studies last year for Pythia
 - some studies for Geant4 8.2 and 8.3
- **Are our settings still appropriate with latest versions?**
 - ❑ Are some problem fixed or are there settings allowing them to be fixed?
 - ❑ **dE/dx tuning for mass resolution** (see S. Hansmann-Menzemer yesterday talk)
 - ❑ **Calorimeters calibration** (V.Romanovski last year calorimeter meeting)
 - ❑ **Track multiplicity on target** (see J.Panman at P&D WG meeting)
 - **LHEP or GQSP or _BIC or _BERT ...**
 - ❑ **Do we want delta rays production switched on?** (see M.Needham presentations)
 - ❑ **Do we need different setting in different detectors?**
 - ❑ **Influence on CPU?**
 - ❑ **Need tools with references to check and decide consistently** (see next page)
 - ❑ **Necessary to discuss studies/options coordinate tests**
 - Should be main topic of Gauss meetings in next months
- **Applies also to generators**
 - ❑ **J/Psi production?**
- **and once we have data we need to redo it comparing with what we see**
 - ❑ **not only once!**

Reference tests



- **Histograms exists for all sub-detectors, generators and simulation**
 - ❑ **Reference event samples (various particle guns at different energies) have been defined**
 - **list on Gauss twiki:**
https://twiki.cern.ch/twiki/bin/view/LHCb/LHCbSimulation#Samples_for_validation
 - **Request for a subset sent to production team**
 - options to be setup for non-DC06 physics settings
 - and then experts need to look at them

- **Reference test package for Generators exist (P.Robbe)**
 - ❑ **package with reference histograms**
 - ❑ **options for various jobs**
 - ❑ **publishing results on the web**
 - ❑ **uses histograms and log files**
 - **counters in special file?**
 - ❑ **someone should look at it for 5 TeV conditions,**
 - **initial options set up in Gauss v35r0**

Generator examples



GAUSS Generator Plots - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

file:///home/robbe/cmtuser/Gen/C

Red Hat, Inc. Red Hat Network Support Shop Proc

Generator plots for

Generator reference plots for different versions of Gauss

Version numbers

Event type	Gauss Version	Pythia Version	Gauss reference v
30000000	v30r4	6.411	v26r0



Generator plots for Gauss version v30r4

Comparison of Gauss v30r4 (Pythia 6.411) with v26r0 (Pythia 6.325) for event type 30000000

Version numbers

Current Reference

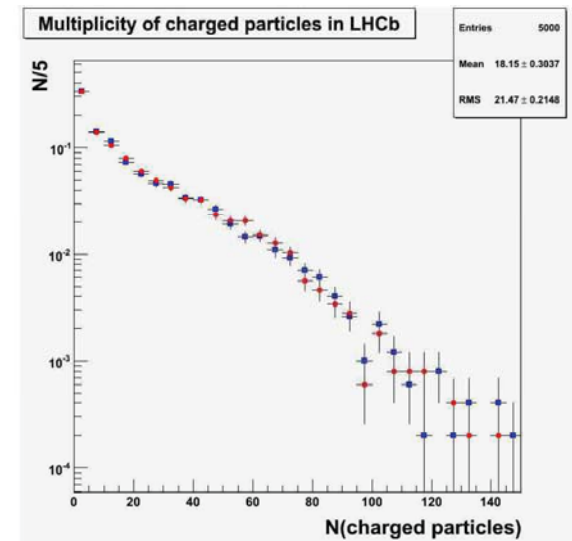
Gauss v30r4 v26r0
 Pythia 6.411 6.325

Basic quantities

	Current	Reference
c cross-section	3.65277939454	3.26746216531
Total cross-section	103.3	103.0
Processing time per event	None	None
Signal process cross-section	0	0
Generator level cut efficiency	0	0
b cross-section	0.841792782305	0.989231664726
Prompt charm cross-section	1.95416181637	1.63373108265

Plots

	Current	Reference	Superimposed
Number of primary interactions per bunch	X	X	X
Process	X	X	X



...and



- **Gauss is being pythonized**
 - ❑ **At the moment trivial configurable**
 - quite a bit of work to go all the way
 - ❑ **Gauss v35r0 being tested in production**
 - ❑ **Find optimal way of configuring it for various conditions**
 - **SIMCOND tags**
 - **event type choice**

- **Will need to invest in documentation BUT**

at the moment most of the people working on Gauss are busier at the Pit!