

Second LPCC Detector Simulation Workshop

Introduction

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Goal of the workshop

- second LPCC Detector Simulation workshop following the one in October 2011 ([agenda](#))
- update the assessment of the status of LHC detector simulations, including the validation against data
- define the future needs for analysis work and for upgrade R&D studies
- review progress in the development of the tools

Preview of utilised code

We have asked the experiments:

1. which version(s) of Geant4 you have used to produce the plots that would be shown during the workshop
2. which version of Geant4 is the one your experiment is using now in production
3. which version of Geant4 you are validating/ planning to move to

ALICE

Ad 1)

- we will **not show any physics results**, so no version of Geant4 to be listed

Ad 2)

- last central Geant4 productions were run for the validation tests in 2011
- now Geant4 installation (**9.6.p02**) is available on Grid for users individual tests
- 9.6.p02 was used for computing time studies in 2013

Ad 3)

- planning to use **9.6.p02** for physics validation
- **10.00.p01** for performance and multi-threading tests

ATLAS (short answer...)

- MC samples produced with `Geant4 9.4.patch01.atlas01`, `Geant4 9.4.patch04.atlas01`, `Geant4 9.4.patch04.atlas07`
- DC14 validation samples use `Geant4 9.6.patch02.atlas02`
- will either use `Geant4 9.6.patch02.atlas03` or more likely `Geant4 9.6.patch03.atlas01`
- investigating `Geant4 10` including the multi-threaded version, but it is unclear when we will move to using this G4 release

ATLAS (long answer...)

MC11c samples use Geant4 9.4.patch01.atlas01

(as Geant4 9.4.patch01, except for the addition of the AtlasRK4 stepper)

MC12b samples use Geant4 9.4.patch04.atlas01

(as Geant4 9.4.patch04, except for the addition of the AtlasRK4 stepper; G4DecayProducts.h: Increase maximum number of decay products; [G4EmStandardPhysics.cc](#): Switch from using [WentzelVI](#) to [Urban90](#) for muon multiple scattering.)

MC11d and MC12c samples use Geant4 9.4.patch04.atlas07 (as patch04.atlas01, except: Urban93 patch from Vladimir Ivantchenko dated 29th Jan 2013; Fix in G4MultiNavigator - to avoid Fatal Exception for unavailable normal (dot<0); Changes in IsSameLine method on [G4ExtrudedSolid.cc](#); Fixes in (original) CHIPS quasi-elastic; [Additional models for electrons/gammas ported from Geant4 9.5: Msc95: New tuning Urban95 for e-/e+, Bremsstrahlung for e-/e+ : improved cross-section and model](#). Requires G4EMLOW6.23 data set, Gamma conversion: corrected cross section and improved model - only above 80 GeV; New physics lists enabling each alternative model: QGSP_BERT_Msc95: Using Urban95 for e-/e+, QGSP_BERT_Conv95: Uses improved gamma conversion, QGSP_BERT_Brem95: New Bremsstrahlung for e-/e+, QGSP_BERT_95: Uses *all* 95 options, Msc95, Brem, Conv.)

DC14 validation samples use Geant4 9.6.patch02.atlas02 (as Geant4 9.6.patch02 except for the addition of the AtlasRK4 stepper; G4NucleiModel fix for rare reproducibility problem (backport from patch03); G4NavigationHistory stop use of G4EnhancedVecAllocator - based on version of 9.4p04).

We are also testing out Geant4 9.6.patch02.atlas03 which includes a further fix for wrong global time for secondaries in case that the primary track stops during along step (http://bugzilla-geant4.kek.jp/show_bug.cgi?id=1555).

We will either use Geant4 9.6.patch02.atlas03 or more likely Geant4 9.6.patch03.atlas01 (i.e. patch03 + AtlaRK4 stepper) for DC14 and MC15.

We are investigating Geant4 10 including the multi-threaded version, but it is unclear when we will move to using this G4 release.

CMS

- **Legacy FullSim (re-production for 7 - 8 TeV data analysis):**
 - Geant4 9.4p03 (+ few fixes)
 - slc5_amd64_gcc462
 - About 7 B events produced
- **2013 production version of CMSSW :**
 - Geant4 9.6p02 (+ fix of G4Decay)
 - slc5_amd64_gcc481
 - slc6_amd64_gcc481
 - Used for production for CMS validations and for upgrade studies
 - About 500 M events already produced
 - No serious problems ,warnings in production (after fix of G4Decay)
- **2014 production version (will be used for 2015 run):**
 - Geant4 10.0p01
 - slc6_amd64_gcc481
 - **Sequential** mode for start of production
- **Physics List QGSP_FTFP_BERT_EML**
 - Used since 2011
 - No current plan to migrate to alternative one

LHCb

For LHCb, we are **using 9.5.p02** for production and this is also the version we will show for most plots during the workshop.

We are **validating 9.6.p02** and will move to this before summer 2014 and use this to generate samples for 2015 running.

10.0 we will start setting up ~now, but do not expect this to be used for production during 2014.

CALICE

- our earliest paper on comparisons of hadronic showers with Geant4 use 9.3 To study evolution with version, we also have some results with 9.2.
- The more recent papers and the results currently being prepared for release are based on 9.6
- We always strive to implement the most recent versions and are also open to test beta versions.

Enjoy the workshop...