EvtGen in LHCb

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on behalf of the LHCb collaboration

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Introduction

- EvtGen generates all B decays in Gauss simulations
  - PYTHIA8 creates initial p-p collisions, EvtGen B (& D) decays; GEANT4 detector simulation
  - EvtGen & DecFiles maintained by Warwick LHCb-EvtGen group
  - DecFiles contains generic DECAY.DEC and user decay files
    - DECAY.DEC semileptonic B & D decay BFs tuned using PDG 2014 (Michal Kreps)

- EvtGen uses external generators:
  - PYTHIA8 (fragmentation of generic quark configurations into hadrons)
    - Default settings with multiplicities "ParticleDecays:multIncreaseWeak = 2.0" & "ParticleDecays:multIncrease = 4.5"
  - TAUOLA (tau decays)
  - PHOTOS (final state radiation)

- Sim09 releases:
  - Gauss package with **same decay & physics models** as HepForge version

- Sim10 releases:
  - Downloads and builds HepForge version (CERN mirror)

Sim09

- LHCb package in Gauss framework: Gen/EvtGen

- Same **decay models** (~130) as HepForge version
  - Doesn't include code modernisation and thread safety updates

- New models or bug fixes proposed by LHCb users
  - Includes models from **Belle II** & **BES III** via LHCb contacts
  - Presentations in Gauss simulation meetings (analysis needs, code changes, QA plots, decay files)
  - Code reviewed by **EvtGen-Warwick team** (gitlab tools & JIRA tasks)
  - Added to **Sim09 Gauss branch** for next release

- Sim09 updates propagated to HepForge repository (for Sim10 etc.)
  - Not automatic, needs to be done manually, with another HepForge code review (& JSON test examples)

- LHCb-only 6 extra models in Gen/EvtGenExtras
  - Using other external software, e.g. GNU Scientific Library
  - Not added to HepForge repository (to minimise external dependencies)

- Will eventually stop adding new models for Sim09
  - Move to Sim10

Sim10 (and beyond)

- Uses gitlab CERN mirror of HepForge repository

- Gen/LbEvtGen Gauss package
  - Downloads mirrored HepForge tag, builds & installs shared library
  - Library used by Gauss **EvtDecayTool** to generate decays
  - HepForge tags currently based on R02-02-00-patches branch
    - Doesn't have JSON test framework nor latest thread safety/modernisation updates
    - Sim09 updates added

- EvtGenExtras models moved to LbEvtGen/src/models
  - Keeps separation of HepForge & extra LHCb decay models

- Will move to future EvtGen version 3 (R03-XX-YY)
  - **Include all thread safety & modernisation updates**
  - Need to enable alternative FSR (& τ decay) generators in Gauss
    - Sherpa's PHOTONS++ etc.
  - Use HepForge and CERN gitlab code review tools for new models etc.