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# Simulation Validation

This pages is intended to held the information needed for validation of the simulation, from MC samples to generator and reconstructed distributions and reference/documentation to tools.

## Validation Tests

|    | Analysis                           | Gauss                            | cmt | CMake | Who      | Geant4  | cmt | CMake | Who | LHCbPR2  |
|----|------------------------------------|----------------------------------|-----|-------|----------|---------|-----|-------|-----|--|
| 1  | Hadronic cross-section             | -                                | -   | -     |          | hadr00  | Y   | Y     |     | Analysis Module - work in progress                                       |
| 2  | Hadronic interaction probability   | Sim/SimChecks<br>Target          | Y   | N     | Kristian | -       |     |       |     | Handler exist, work in progress  |
| 3  | Hadronic Multiplicity              | Sim/SimChecks<br>Target          | Y   | N     | Kristian | -       | -   | -     |     | Handler exist, work in progress  |
| 4  | ECAL                               | -                                |     |       |          | TestEm3 | Y   | Y     | Tim | Analysis Module exists   |
| 5  | Multiple scattering in thin layers | -                                |     |       |          | TestEm5 | Y   | Y     | Tim | Analysis Module exists   |
| 6  | Multiple Scattering in MUON        | Muon/MuonMoniSim                 | ?   | ?     | Ryan     | -       | -   |       |     |  |
| 7  | Bremsstrahlung                     | (Sim/SimChecks<br>EmValidation)  | Y   | N     | Georgios | -       | -   |       |     |  |
| 8  | dE/dex in thin layers              | (Sim/SimChecks<br>EmValidation)  | Y   | N     | Georgios | -       | -   |       |     |  |
| 9  | Rad length monitoring              | Sim/SimChecks<br>rad_length_scan | Y   | Y     | Kristian | -       | -   |       |     | <b>CMT version run in LHCbPR nightlies (merge request #63 for cmake)</b> |
| 10 | Sajan Cherenkov tests              |                                  |     |       |          |         |     |       |     |  |
| 11 | Marco A RIVET tests                |                                  |     |       |          |         |     |       |     |  |
| 12 | Alessio's tests                    |                                  | Y   | Y     |          |         |     |       |     | <b>Run in LHCbPR nightlies</b>   |
| 13 | Detailed Timing Tests              |                                  |     |       |          |         |     |       |     |  |

## Samples for validation

A set of samples are necessary for validating a new production version, new versions of Geant4 and of generators. The production of these samples should become automated and the results published on a dedicated web page. These samples are produced by the production system, so that the all chain is exercised.

Two different macro-sets are produced depending on what need to be validated:

- particle-gun, min bias and inclusive samples (sim+digi)
- physics samples (dst files)

The **list of samples to be produced** routinely should be populated by the MC physics working groups contacts, the detectors, trigger and reconstruction software contacts. The list of sample produced for MC09 can be found here.

## Distributions for validation

- The **list of distributions to be verified** provided by the physics working groups and by the detectors.
- Generators: plots comparing different generators and Gauss versions can be found here [↗](#)
- Validation of simulation phase, **⚠ May-Be-Not-Up-To-Date** plots comparing different Geant4 and Gauss versions can be found here [↗](#)
  - ◆ Selected recent studies of:
    - ◇ hadronic cross-sections, pure G4 study [↗](#), and updated using FTFP\_BERT patch in Geant4 v95r1 [↗](#), adding Al, Be, Si materials [↗](#)
    - ◇ hadronic cross-sections and multiplicities using Gaussv43r3 [↗](#), updated to include asymmetries, Gauss v43r3 [↗](#), using Gauss v45r0, with corrected FTFP\_BERT cross-sections [↗](#)
    - ◇ electromagnetic physics lists [↗](#)
- Radiation Length Scans using G4 [↗](#), **🚧 Work-In-Progress**

## Tools for validation and tuning

### MC production histograms: monitoring tools

Instructions to use of the Online Tools (OnlineHistDB [↗](#), Presenter [↗](#)) for monitoring the MC histograms can be found here. **🚧 May-Be-Not-Up-To-Date**

### Rivet and Professor

A dedicated package called GenTune is available from Gauss v42r2 for tuning of generators against published data, using Rivet. Instructions and documentation are available from this page.

-- GloriaCorti - 24-May-2011

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