Detector Simulation with Mokka/Geant4

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What is Mokka

- Simulated events
- Persistency abstraction
- Simulation
- Simple Event Display
- CGA- API
- G4 Visualization objects
- G4 Geometry objects
- Geometry Drivers

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New Mokka release: mokka-02-01b (I)

* thanks to Frank Gaede, Mokka is now compatible with LCIO v01-00
* compression of the six Cal hit indices

P S M I J K X Y Z E PID PDG **CELLID**

**FLAG**

in a single word in both ASCII files (**CELLID**) and LCIO files (**CellID0** index of **SIMCALORIMETERHIT**)

The **FLAG** is used by the CGA interface to set the right sensitive detector that will provide the cell center coordinates.

In the LCIO files it is stored in the two user bytes of the collection flag.
New Mokka release: mokka-02-01b (II)

* two new methods of the CGA interface that are used to decode cell center coordinates from the CellID word:

- CGASetSD selects the sensitive detector corresponding to the flag of the LCIO collection or to the FLAG stored at the rightmost in the ASCII hit files

- CGACellIndex uses the CellID0 of the LCIO hit or the CELLID from the ASCII file to calculate the cell center coordinates.

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New Mokka release: mokka-02-02

* Mokka is now compatible with Geant4 release 6.0
  - the standard physics list is part of the standard Geant 4 distribution since the release 6.0.
  - The include and src sub-directories of the Packaging and LHEP directories of Mokka are now symbolic links to the standard Geant4 ones. The GNUmakefile updates these links to provide compatibility with new Geant4 releases.

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For the collaboration on Mokka development (I):

* CVS repository on pollin1.in2p3.fr

* DB on pollin1.in2p3.fr

* simplified the detector-driver developpement procedure

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For the collaboration on Mokka development (II):

* updated the Mokka-MySQL interface- compatibility with MySQL version 3.22 or later. Backwards compatibility ensured.

* documentation included in the standard distribution of Mokka
News from the collaboration on Mokka development

* Aims:
  - improving the framework
  - improving the models of different detector pieces

* first LCD implementation in Mokka (Ties Behnke)
Mokka - future developments

* detailed prototype simulation

* improving detector simulation

* improving the framework

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Detector Simulation

* existing base version
* a more detailed version in development
  - implementation of the Beam Line and of the LAT and LCAL detectors of the mask (Peter Wienemann)
  - muon chambers (to be done)
  - improve the implementation detail of the different detector pieces
* official LCD implementation in Mokka (Ties Behnke)
Improving the framework (I):

TODO list

* implement a scheme for the usage of different physics-lists

* I/O of the run information in LCIO format

* implement « steering-files »

* implement a plug-in scheme for the User Actions
Improving the framework (II): TODO list

* improve the Event Display
  - selection of detector pieces
  - selection of hits, tracks
  - 2D views

* defining materials in the DB
Simulation in the UK

* Compared Geant3-Geant4
  - used Mokka to generate the Fortran description of the prototype

* Compared Mokka-Fluka
  - replacement of part of Mokka code
5 GeV $\mu^-$, $e^-$

![Graphs showing data for ECAL and HCAL for longitudinal and transverse energy distributions for $\mu^-$ and $e^-$ particles.](image)

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5 GeV $\pi^-$

- Distributions as expected
- Encouraging so far

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Fluka with G3/G4

ProtoEcalHcalRPC, 5 GeV $\pi^-$

In these plots, fluka has energy deposited in all material, not just active layers.

Nigel Watson / CCLRC-RAL & Birmingham
Bug fixes in Geant4

* coming from Gheisha

* part of them corrected in Geant 4 4.1

* in release 5.2 « Fixed major bug in G4HadronicProcess, affecting the final state generation in all materials with more than 2 elements »

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