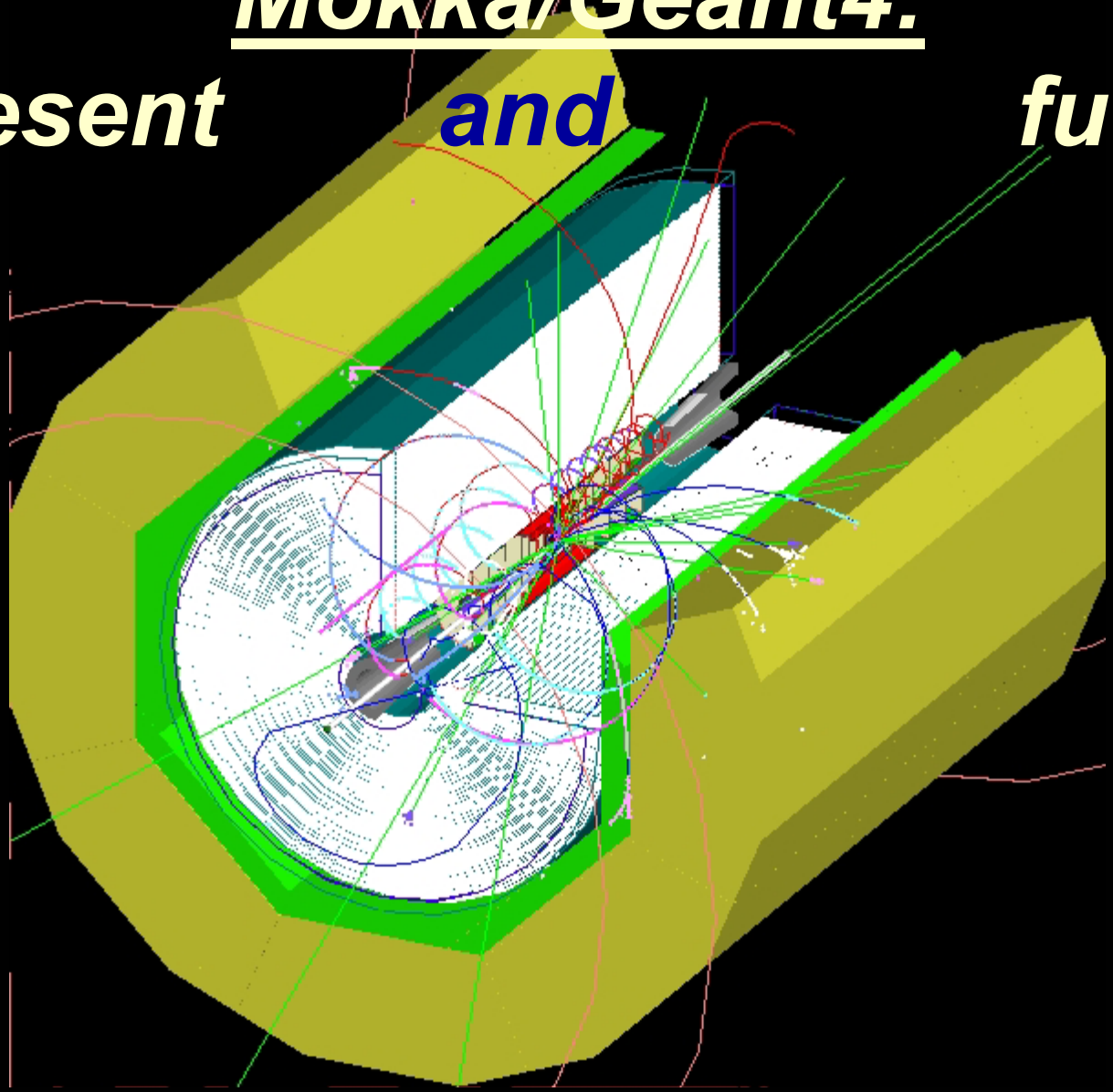
Detector simulation with Mokka/Geant4:

present and future



Paulo Mora de Freitas (presented by Jean-Claude Brient)
L.L.R. – Ecole polytechnique – January 2003

What is MOKKA ?

- A Geant4 full simulation for the Tesla detector calorimeters since December 1999, extensively used for the TESLA T.D.R. calorimeter energy flow studies.
- Able now to simulate any detector or prototype model thanks to its Geometry Database, so able to apply

the same Geant4 simulation machinery and Physics

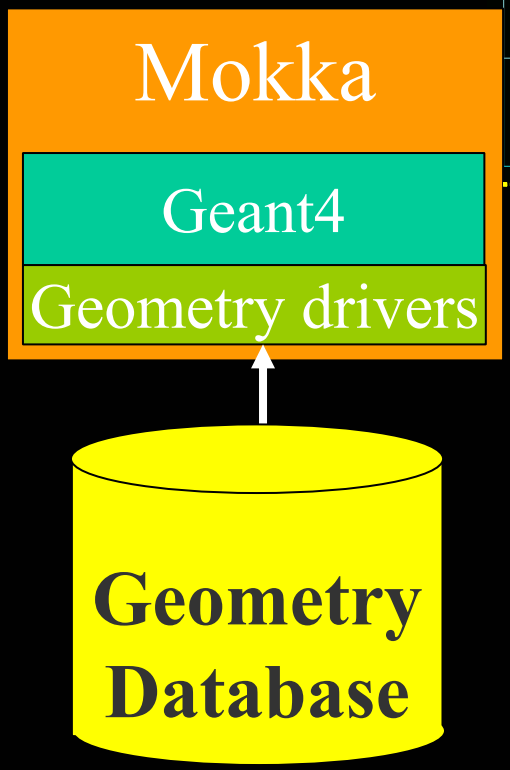
for

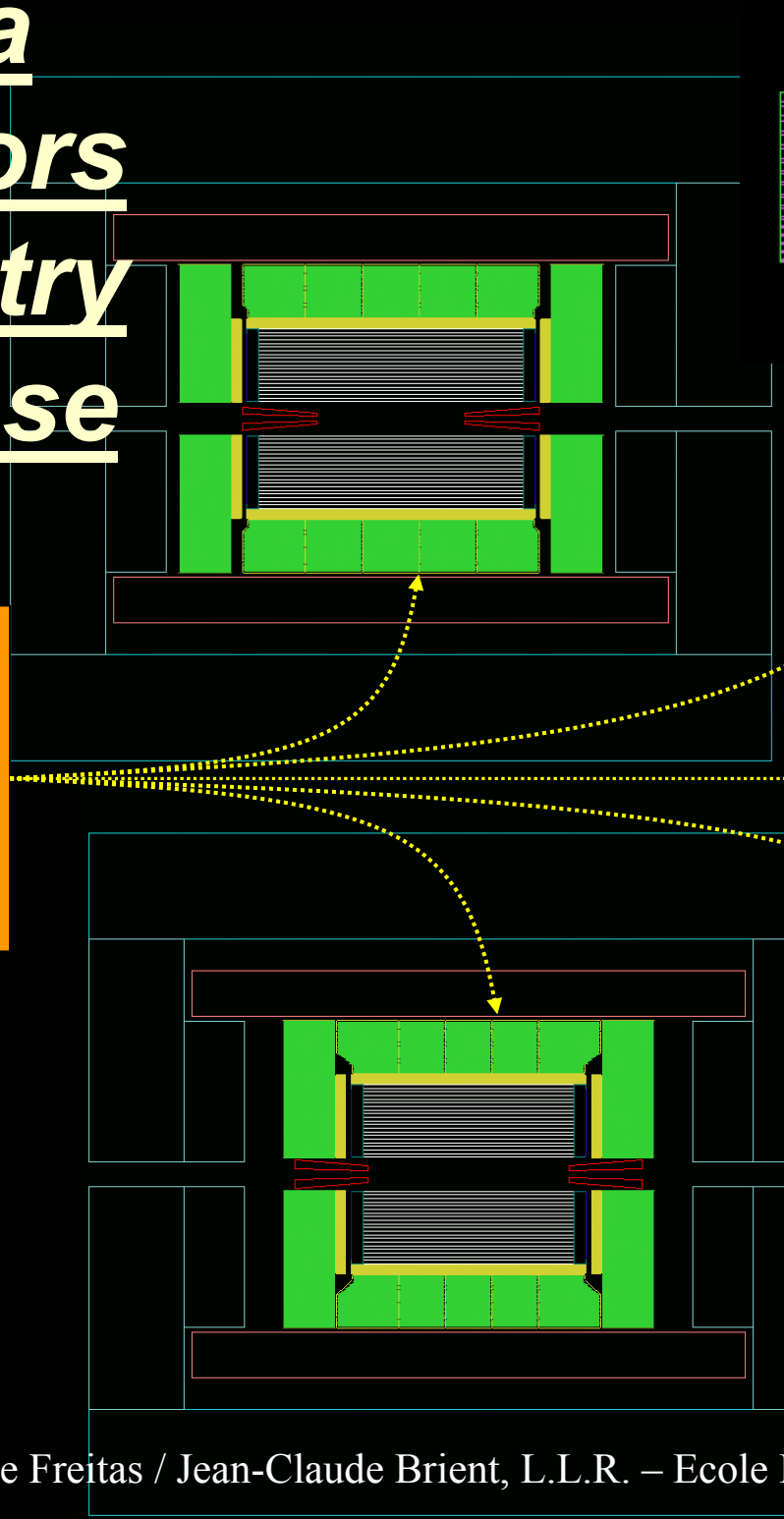
several detector models

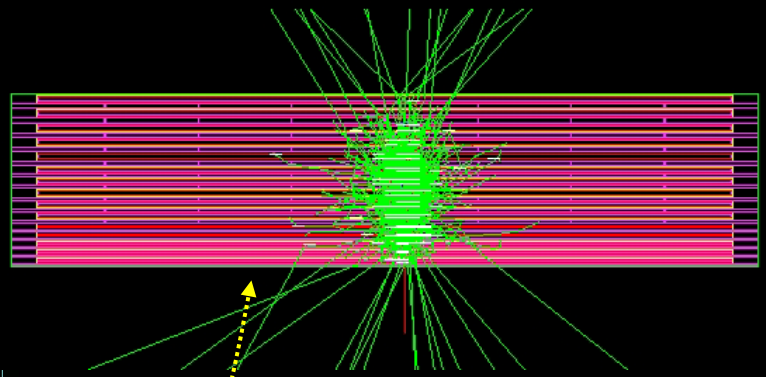
⇒ to compare comparable things⇐

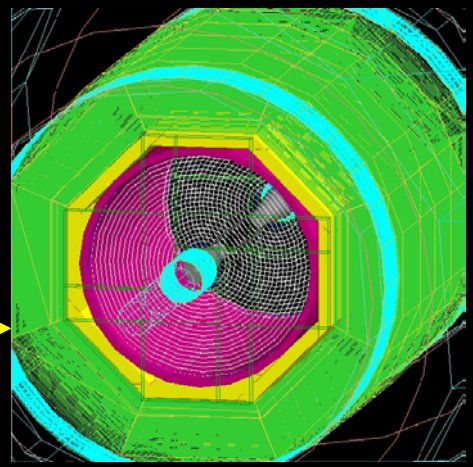
- Work in progress, several new features in its last release

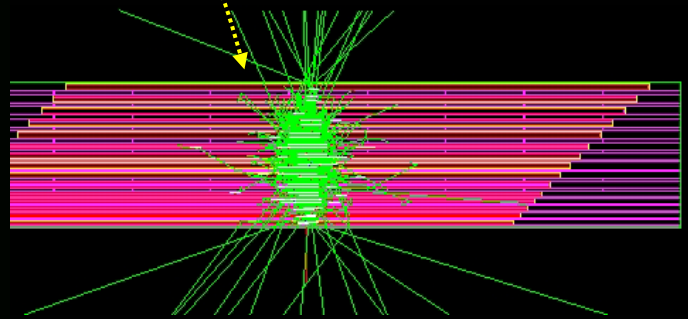
Mokka detectors geometry database











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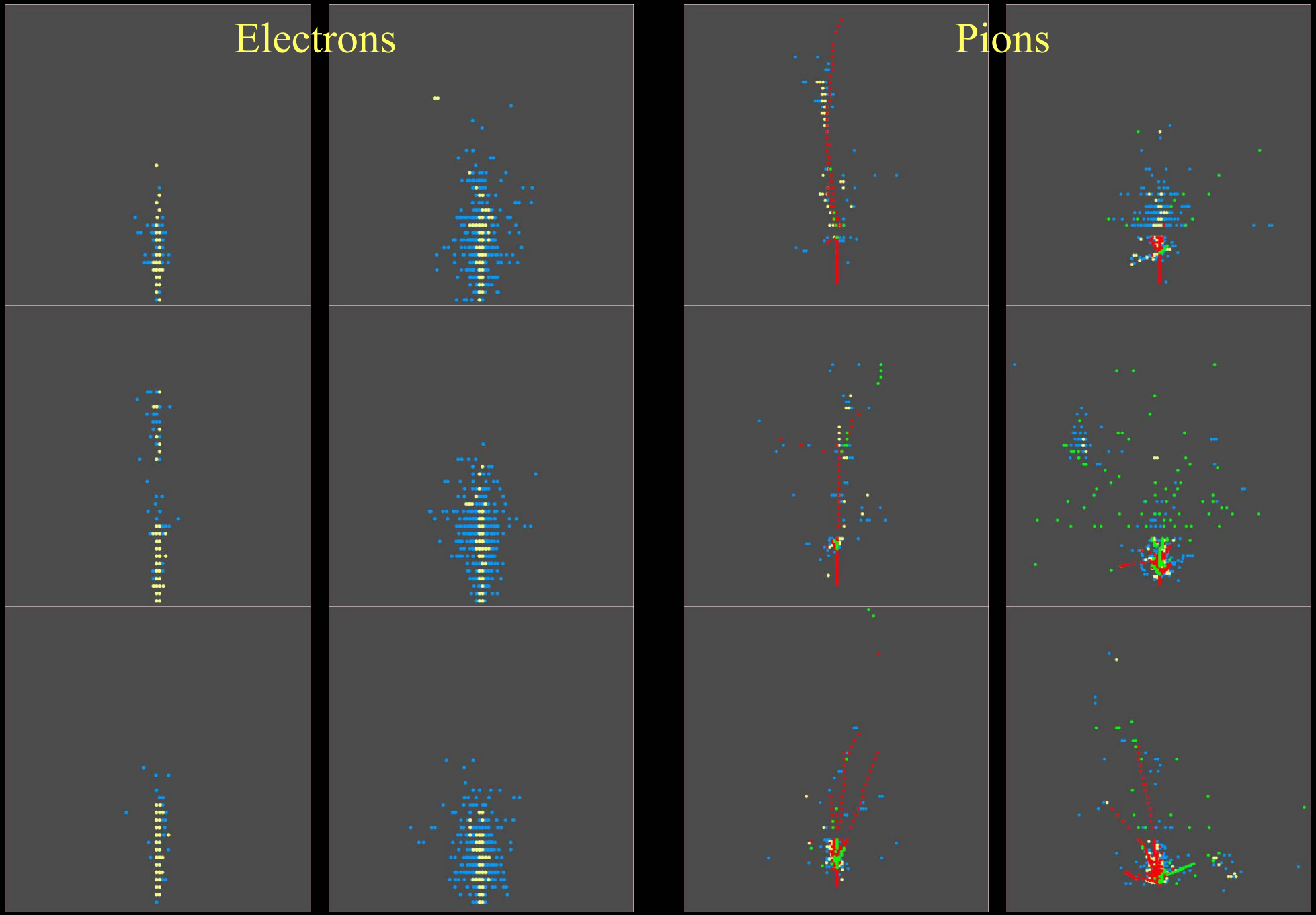
Mokka, impact of the gas in HCAL



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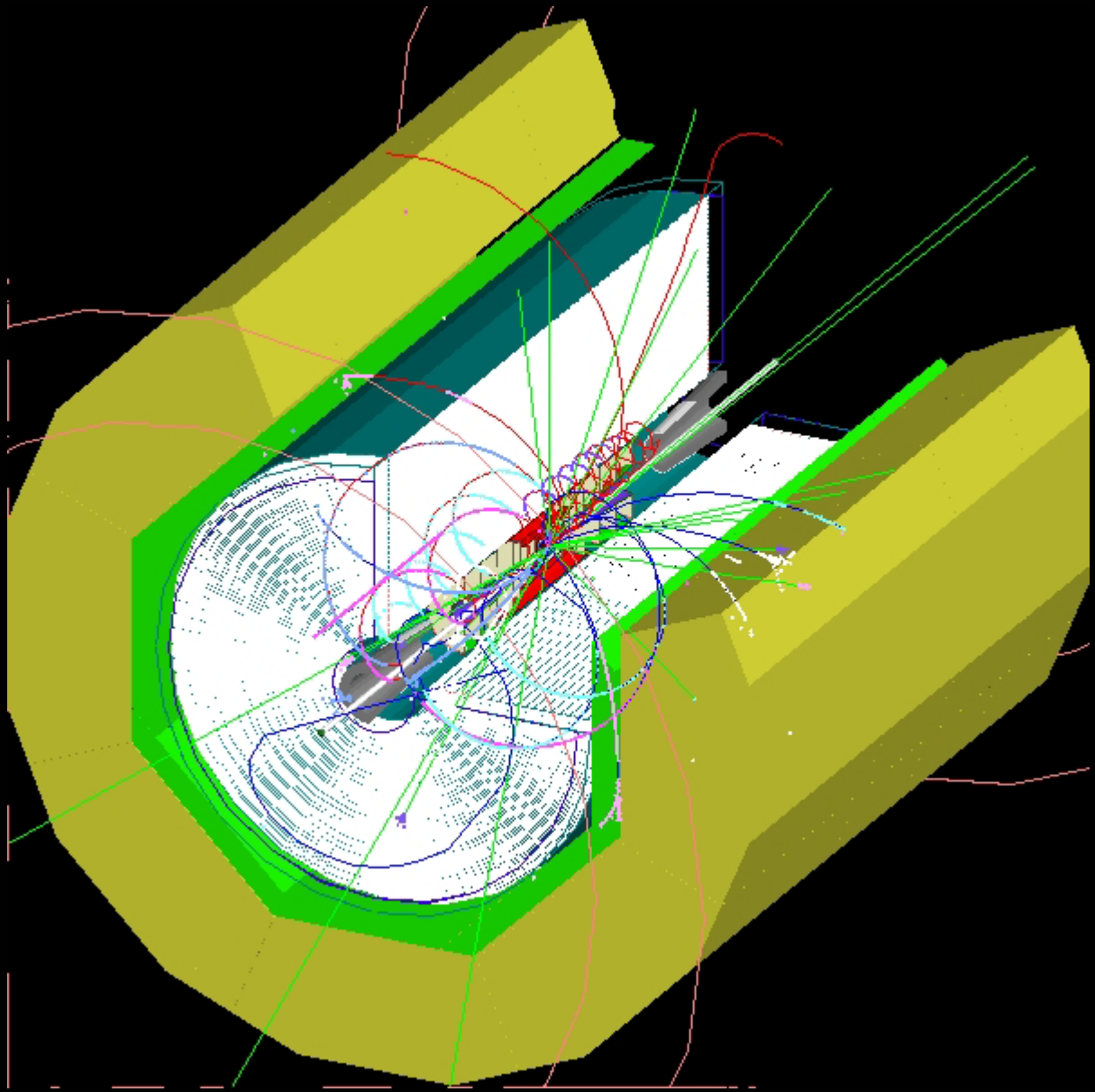
Physics

- Mokka adopts now the recommended “High energy physics calorimetry list (LHEP)’, provided by the Geant4 hadronic working group.
- Almost the same simulation quality as the earlier Mokka releases(*) **BUT** now standard and referenced by the Geant4 team!
- LHEP and the “Physics Packaging library” becomes part of the Mokka standard distribution while it’s not yet officially in the Geant4 one.

(*) Many thanks to Hans-Peter Wellisch (Geant4 team) advices and David Ward (Cambridge) independent tests.

The simulated detector the last version :



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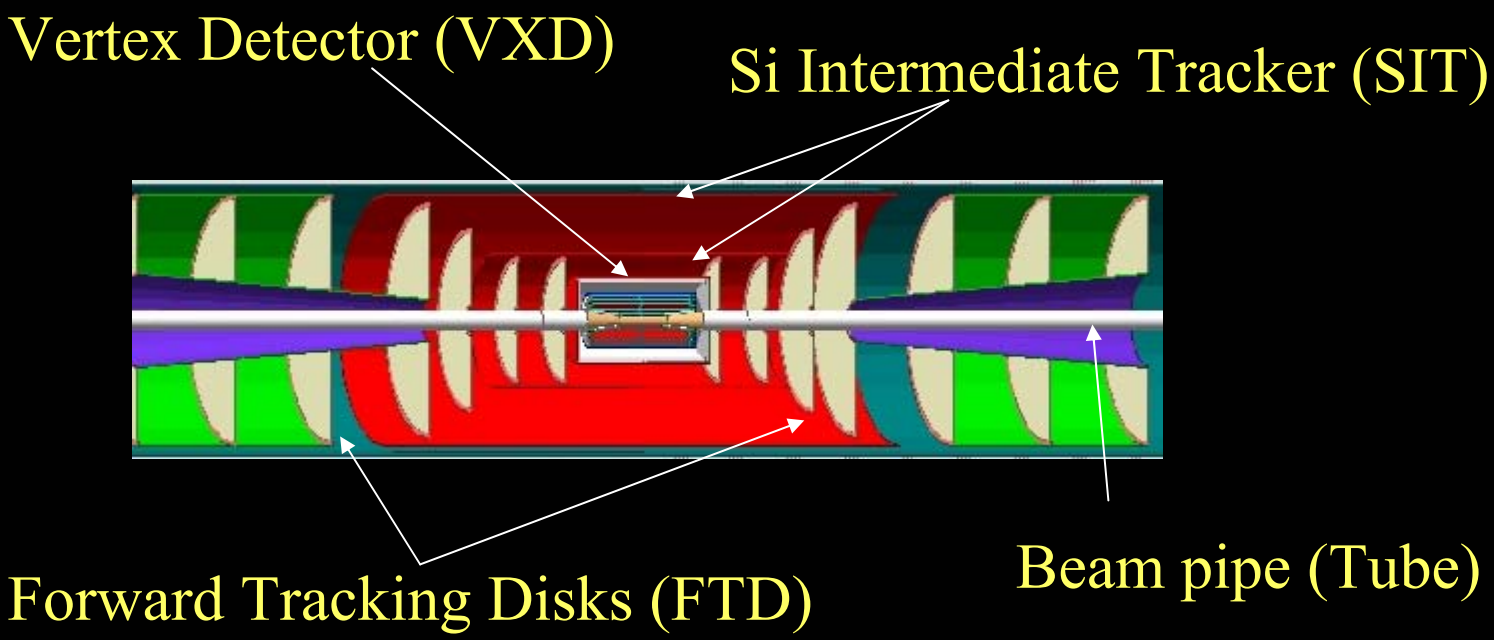
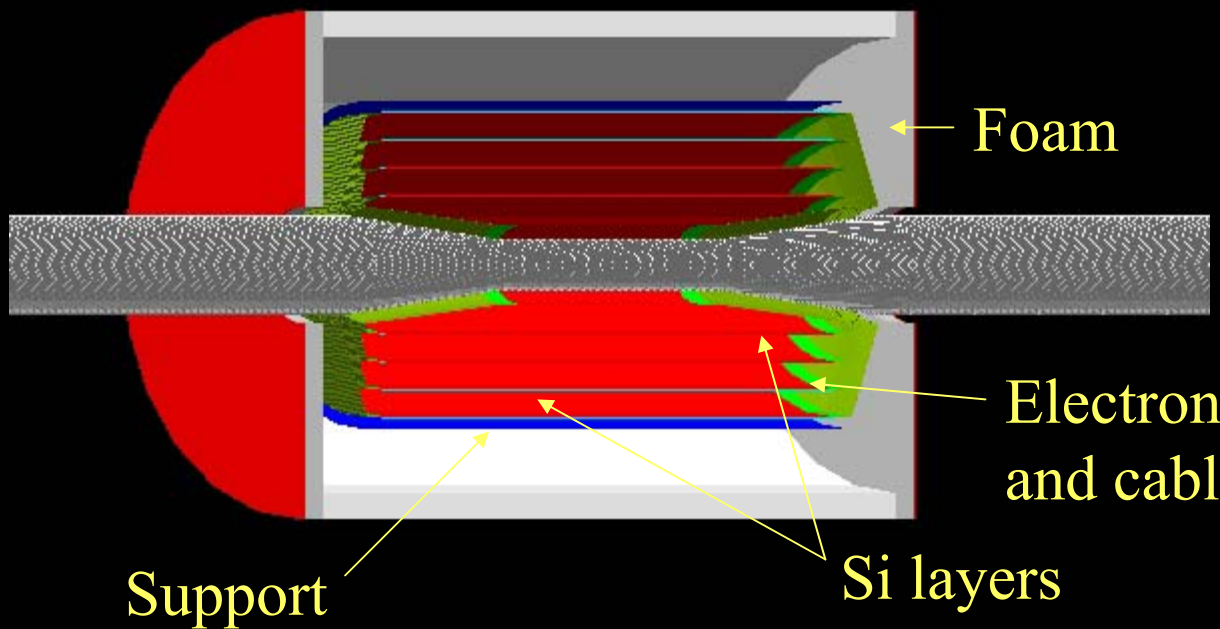
What's new: the inner tracker devices

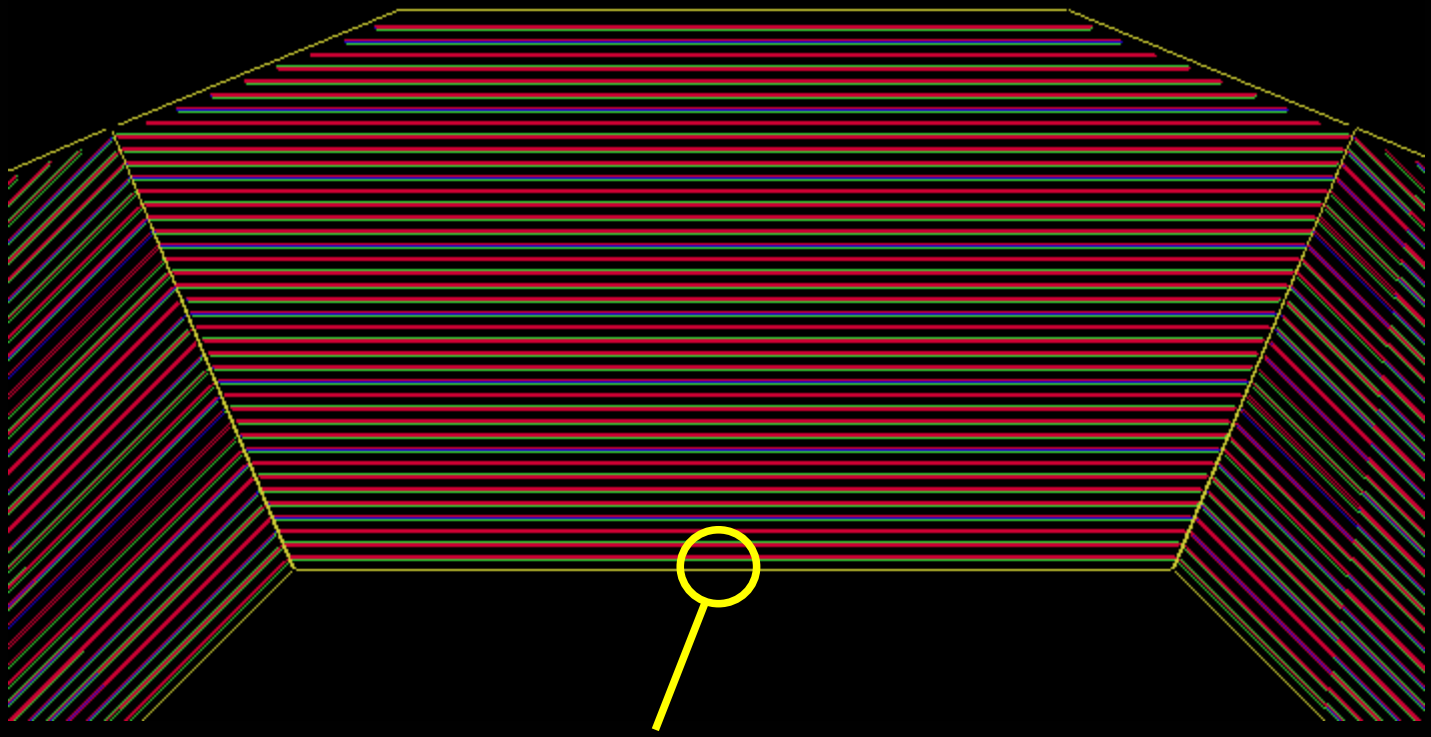


- All the tracking detectors (VXD, SIT, FTD and TPC) collect hits in a new tracking standard hit format
- The tube and inner tracking detector dimensions and materials come from the Brahms release 2.05 geometry.

Zoom on the Vertex Detector



Last news on calorimeters: RPCs in HCAL



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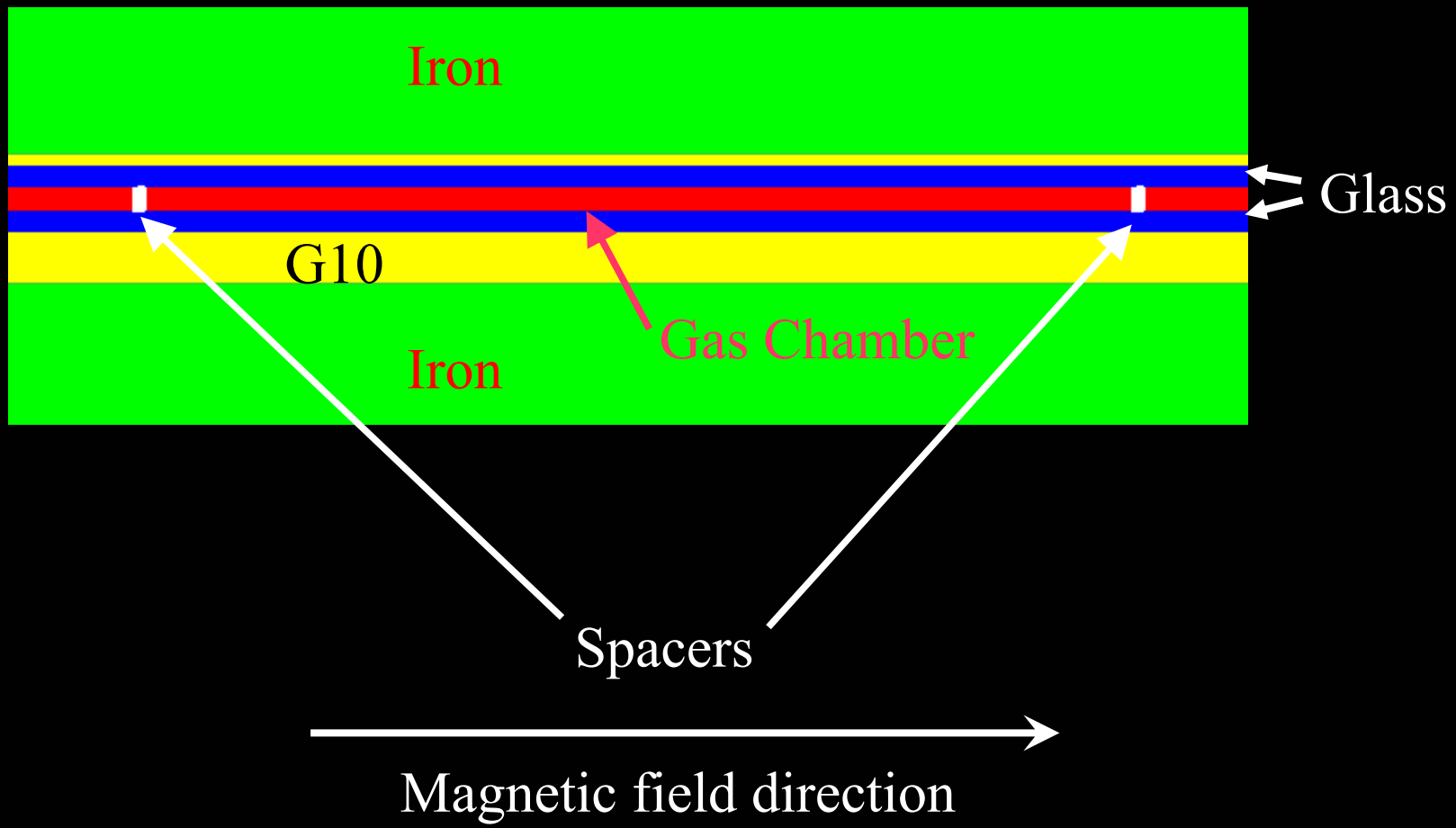
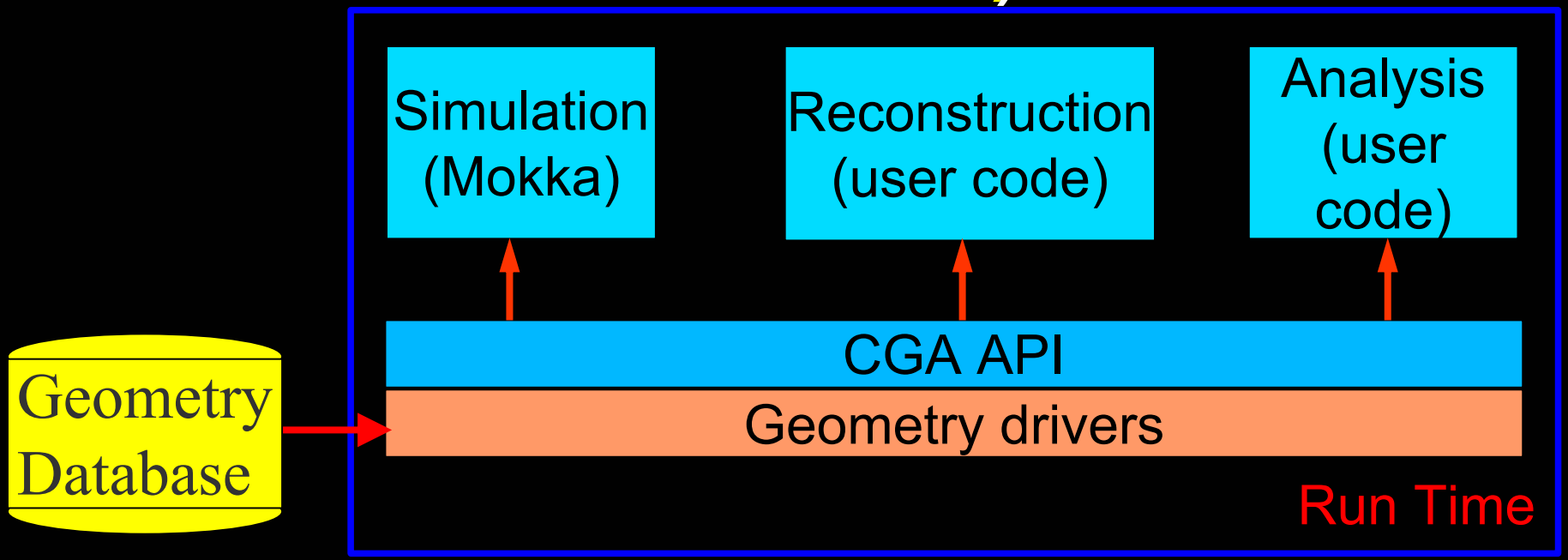
Zoom on RPCs in HCAL

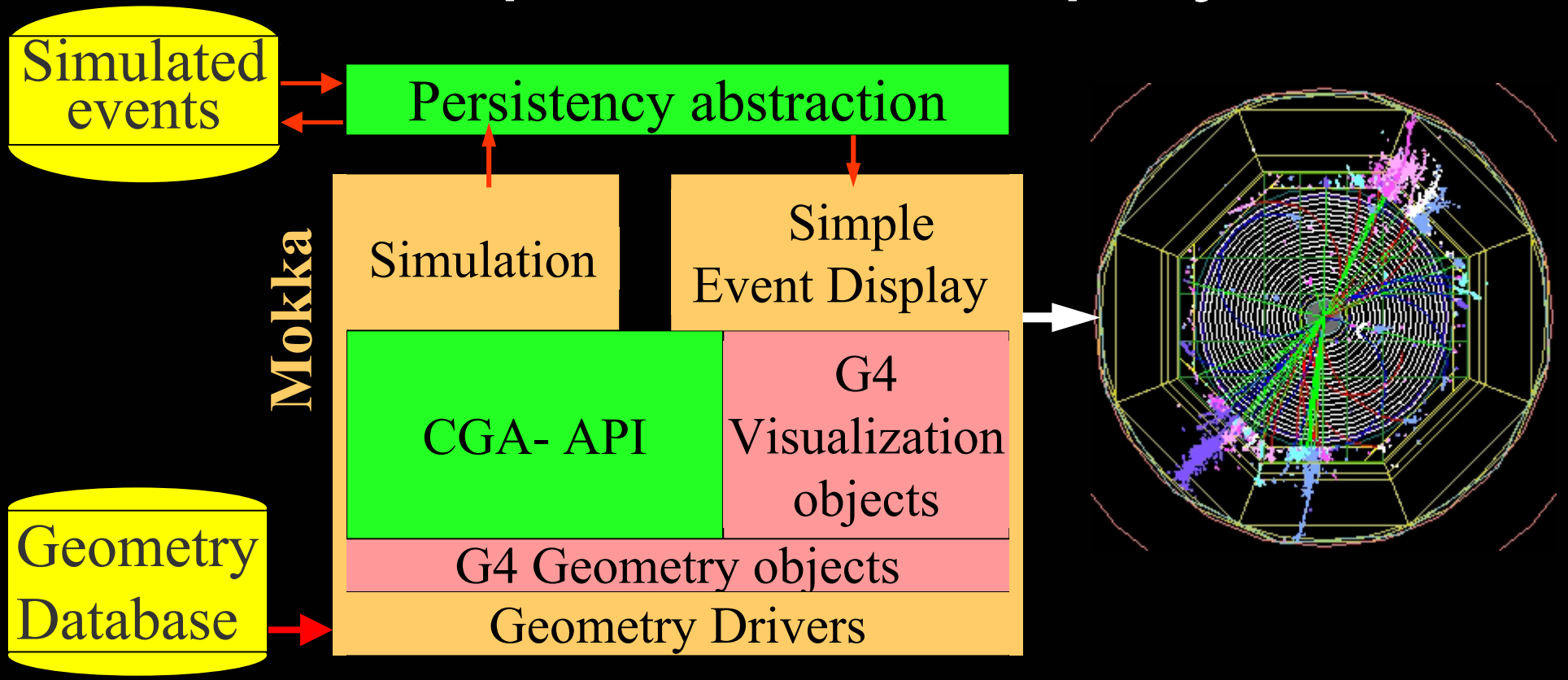


General facilities I: a Common Geometry Access API (F77, C++,C)



- Implements some reconstruction utilities.
- Java API coming soon.
- Written by Gabriel Musat – L.L.R.

General facilities II: a (very) Simple Event Display



- Relies on the Geant4 standard visualisation.
- It's very simple but at least you see something.

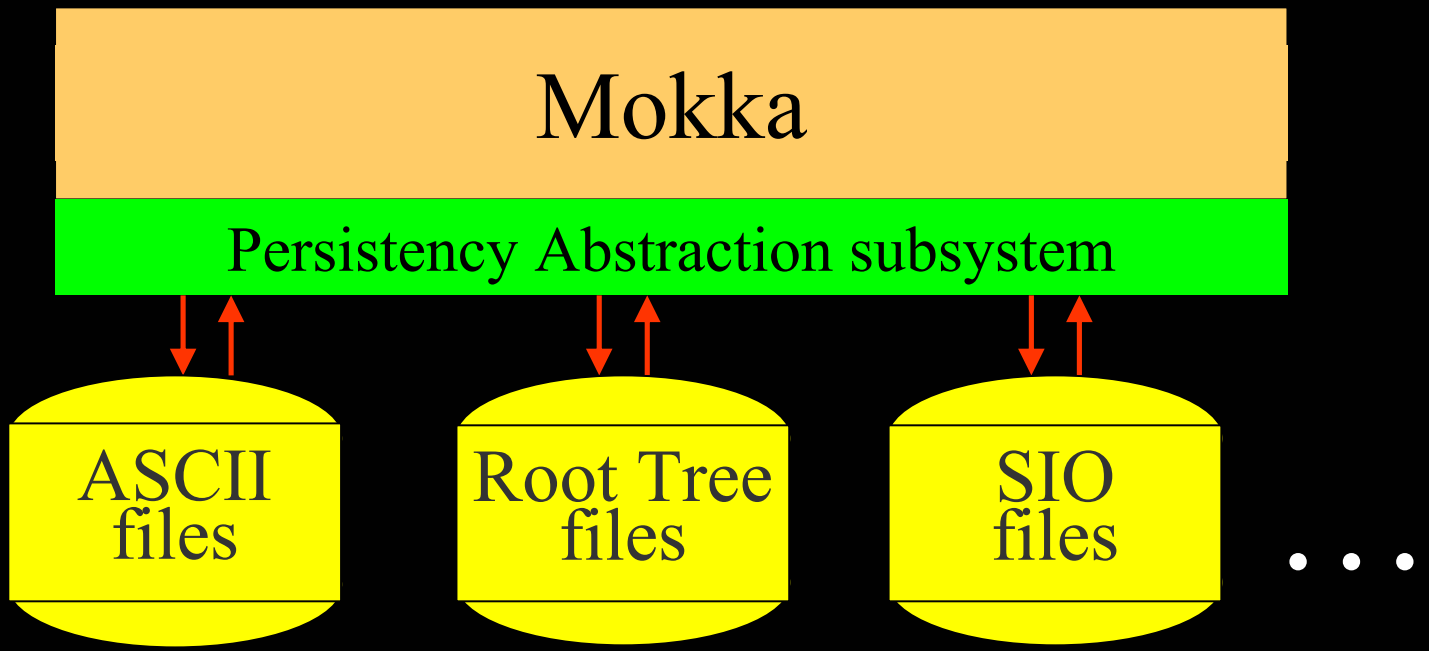
Future developments I: improving the tracking output

- Thanks to **Peter Wienemann** (Aachen and now DESY), to improve the tracking information output :
  - to calculate the number of produced electron/ion pairs from the mean ionization energy;
  - To smear the electrons drifting to implement a basic digitalisation as Mokka TPC output. It can be used for coarse dE/dx studies or similar.
  - To keep in option all information for people concerned by "real" digitalisation for a TPC with some particular kind of readout.

Future developments II: improving the magnetic field map

- Actual field map: the same as in Brahms 2.05 but:
  - a magnetic field of 4 T
  - without taking in account the quadrupoles
- Thanks to Bernard Gastineau (Dapnia/CEA), to improve the magnetic field map:
  - simulating “off-line” the field map taking in account the TDR geometry;
  - implementing it as fast as possible into the field calculations at Mokka run time.

Future developments III: extending the persistency model



- New schemas for data persistency, mainly **LCIO** (collaboration DESY/SLAC/NIU/LLR right now!)

Future developments IV: extending the simple event display

- To implement selection commands to choose:
  - Tracks
  - Hits
  - Sub-detectors

    for display with run time selected colours;
- To implement a graphic friendly interface for the Geant4 visualisation line-oriented commands.

Future developments V: new detector models?

For you!

- It should be an “user job”, some people doing it now:
  - D. Grandjeam (Strasbourg), Venkat (Texas)
- Mokka is open for a wide collaborative use but also development:
  - Sources and documentation available from the Mokka Web Page http://polype.in2p3.fr/geant4/tesla/www/mokka
  - Sources also in CVS repository for collaborative work.
  - The “Geometry drivers plug-in scheme” is very simple, several by default standard features to help developers to deal wi
- Contact: Mora de Freitas at mora@poly.in2p3.fr

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