

Detector Sim~~u~~lation activities in ATLAS

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Aims of the CHAOS project

- Exploit Geant4 :)
- OO Analysis, design and implementation of the future Atlas detector simulation facilities
- Embark new people:
 - on Geant4
 - on C++
 - on OO

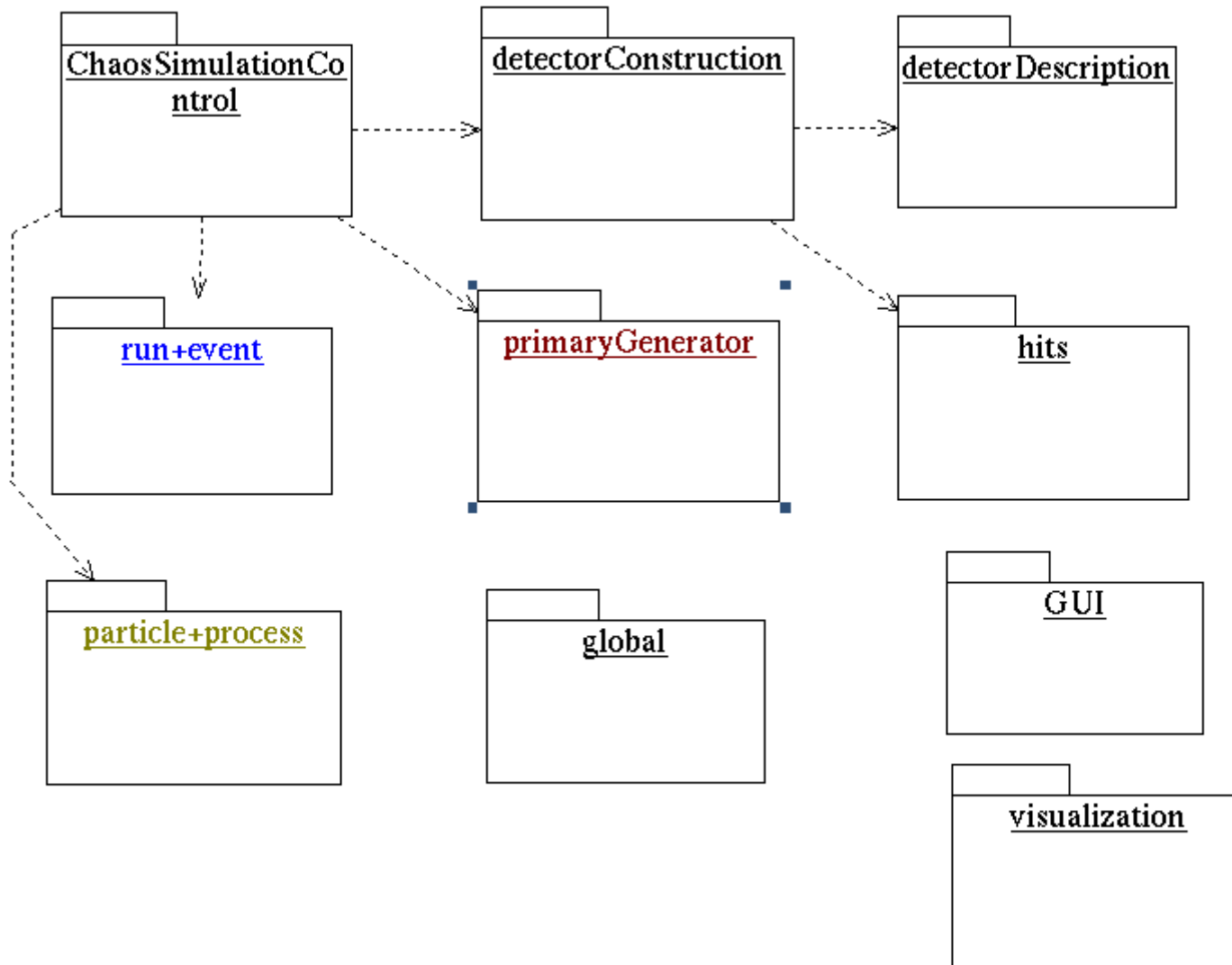
Is there order in Chaos?

- Start with a core group
 - former Geant4 members, now working for ATLAS
 - follow a formal procedure (was it called software process?)
 - Categories, OO design, Implementation, iterate
- Prototypes
 - get people from the detector communities to work on their examples, make up experience
 - exploit Geant4 on a wide spectrum of activities
 - gradually introduce Chaos elements into people's programs
 - veer to OO

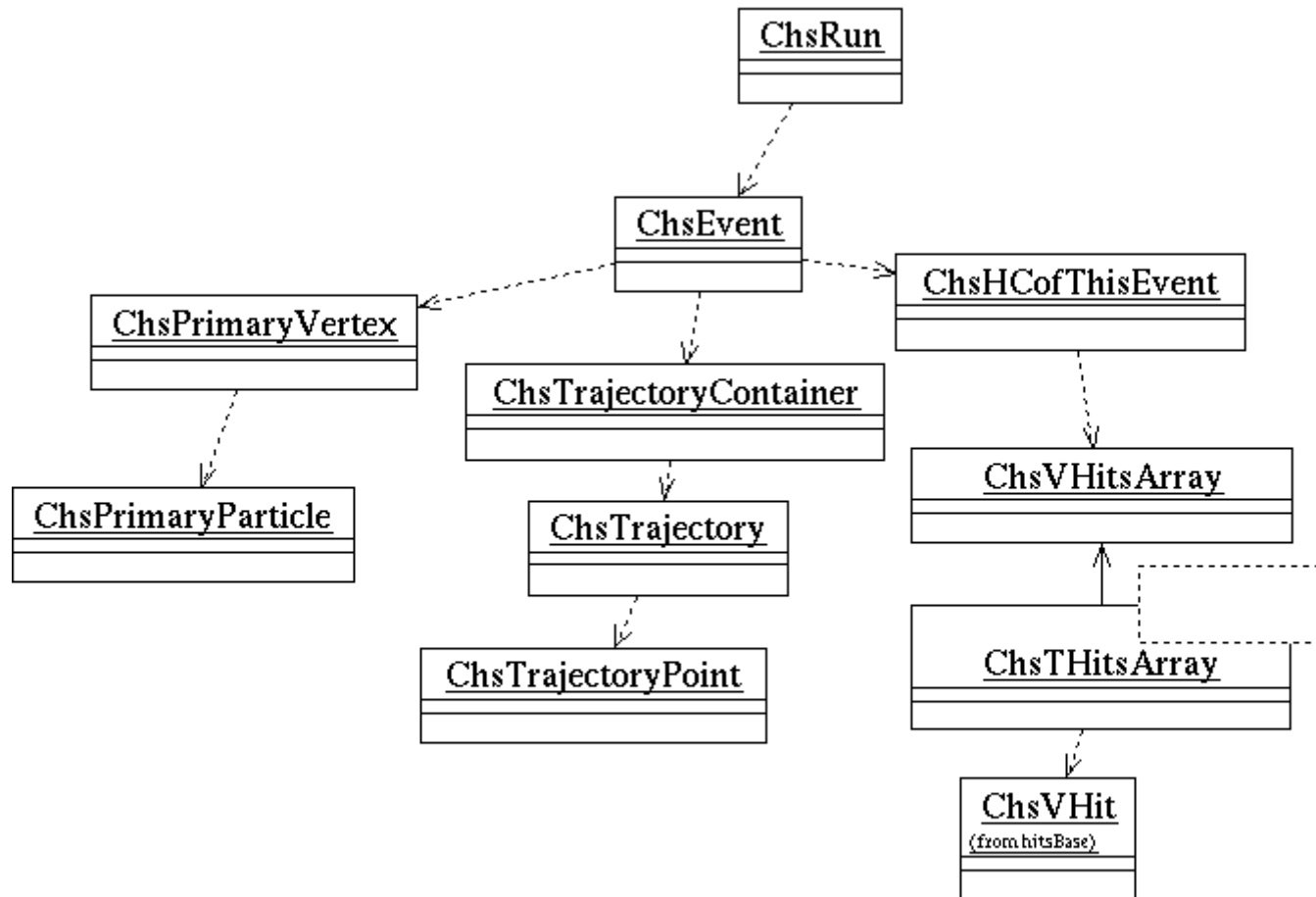
Is there order in Chaos? (2)

- Training programme
- Re-constitute a simulation group
- Merge things together into a simulation program which must at least have the same functionality as DICE
 - ... and be maintainable
 - ... that we can develop
 - ... which works a bit better

CHAOS categories



CHAOS design

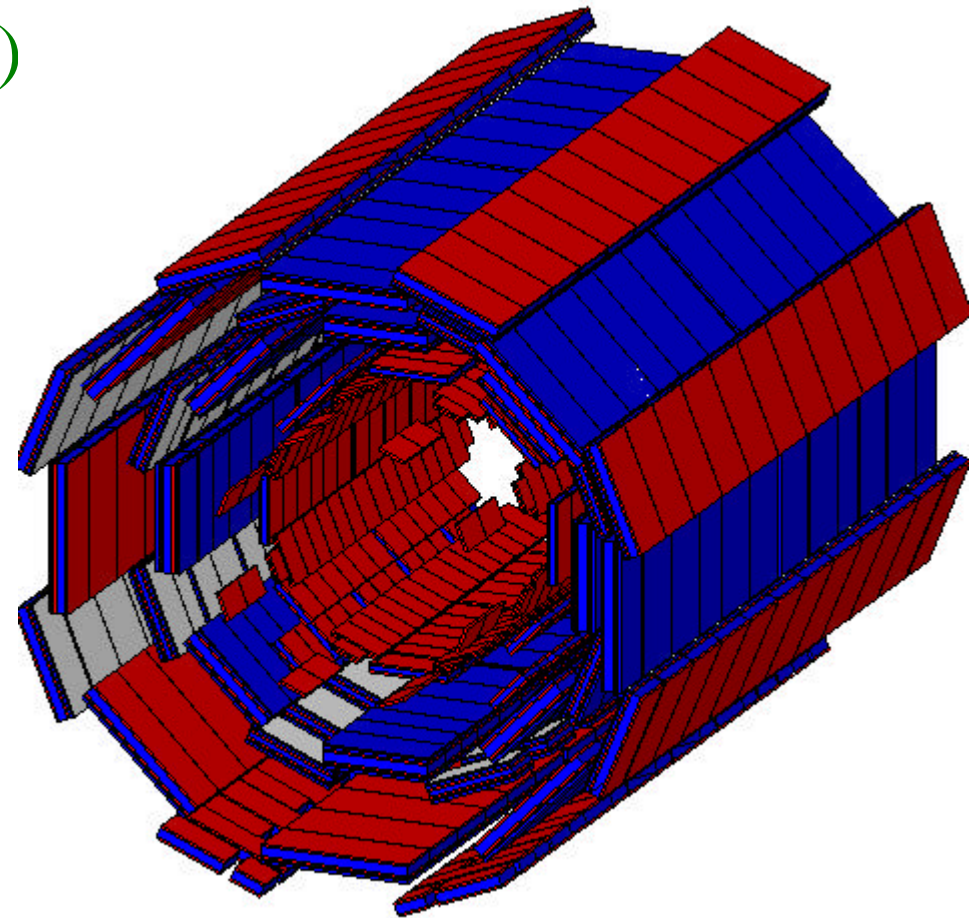


Prototyping

- Working practically on all sub-detector systems
- Exploiting new Geant4 features
- Finding bugs and problems
- Setting up test beam simulation facilities

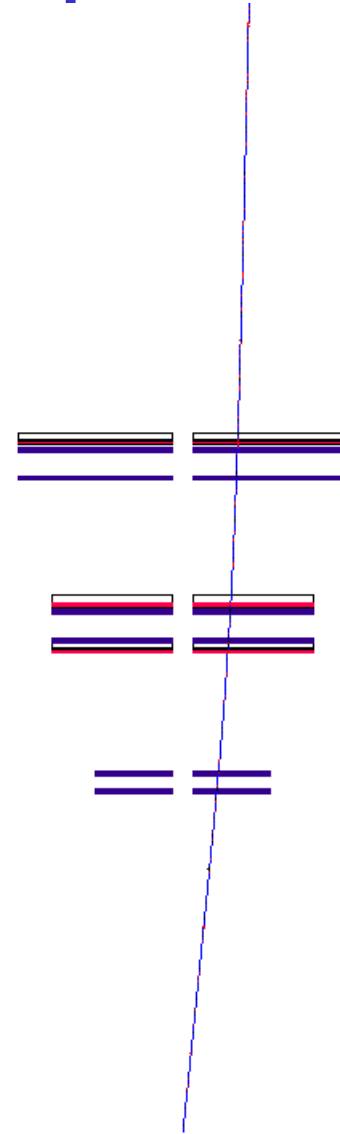
Muon system

- by A. Rimoldi (Pavia/CERN)
- Big chunk of the whole detector
- Detector description (from AMDB)
- Integration of the ATLAS field classes (from L.Chevalier)
- Tracking in magnetic field



Are muon chambers transparent?

- A bug in G4 has been stopping us for some time
 - muons were not going through the muon chambers
 - finally traced to a typo in a coordinate transformation
- now using a non-standard, fixed version of Geant4
- potential problems with the magnetic field

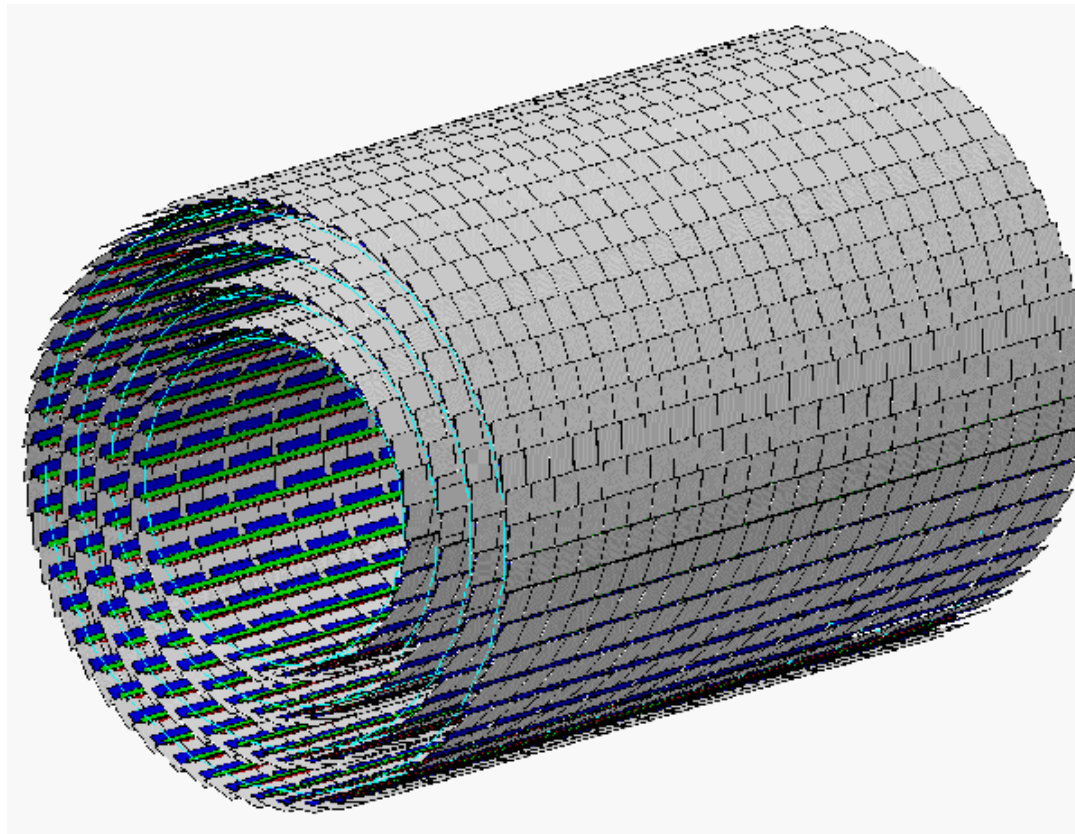


Muon system (2)

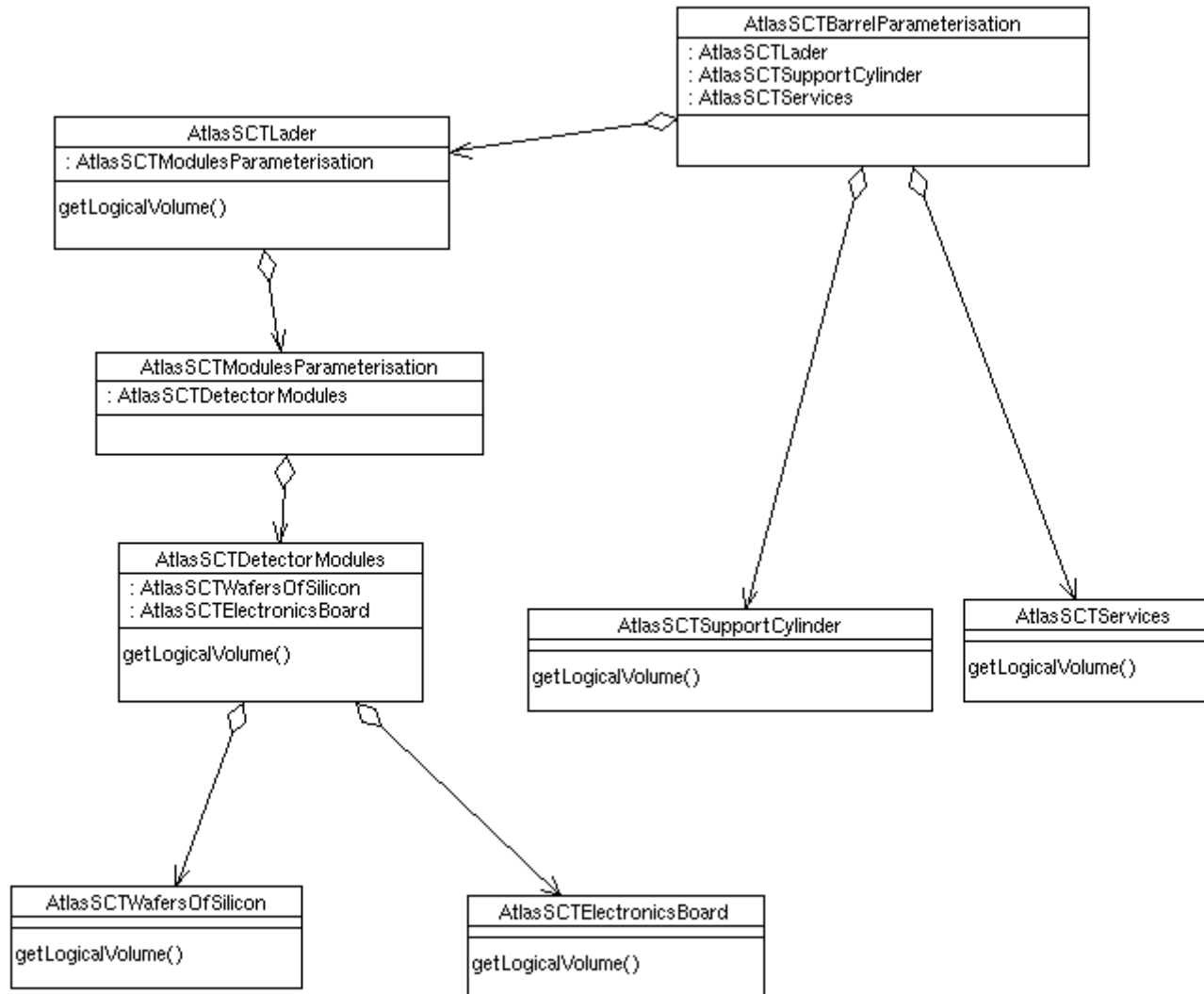
- Geometry almost complete (no TGCs yet, toroids being worked on)
- Hits being implemented
- Try RD Schaffer's Detector Description Scheme (whenever ready)
- Implement direct reading of AMDB
- Acceptance studies
- Interface to the reconstruction (medium term)

Silicon tracker

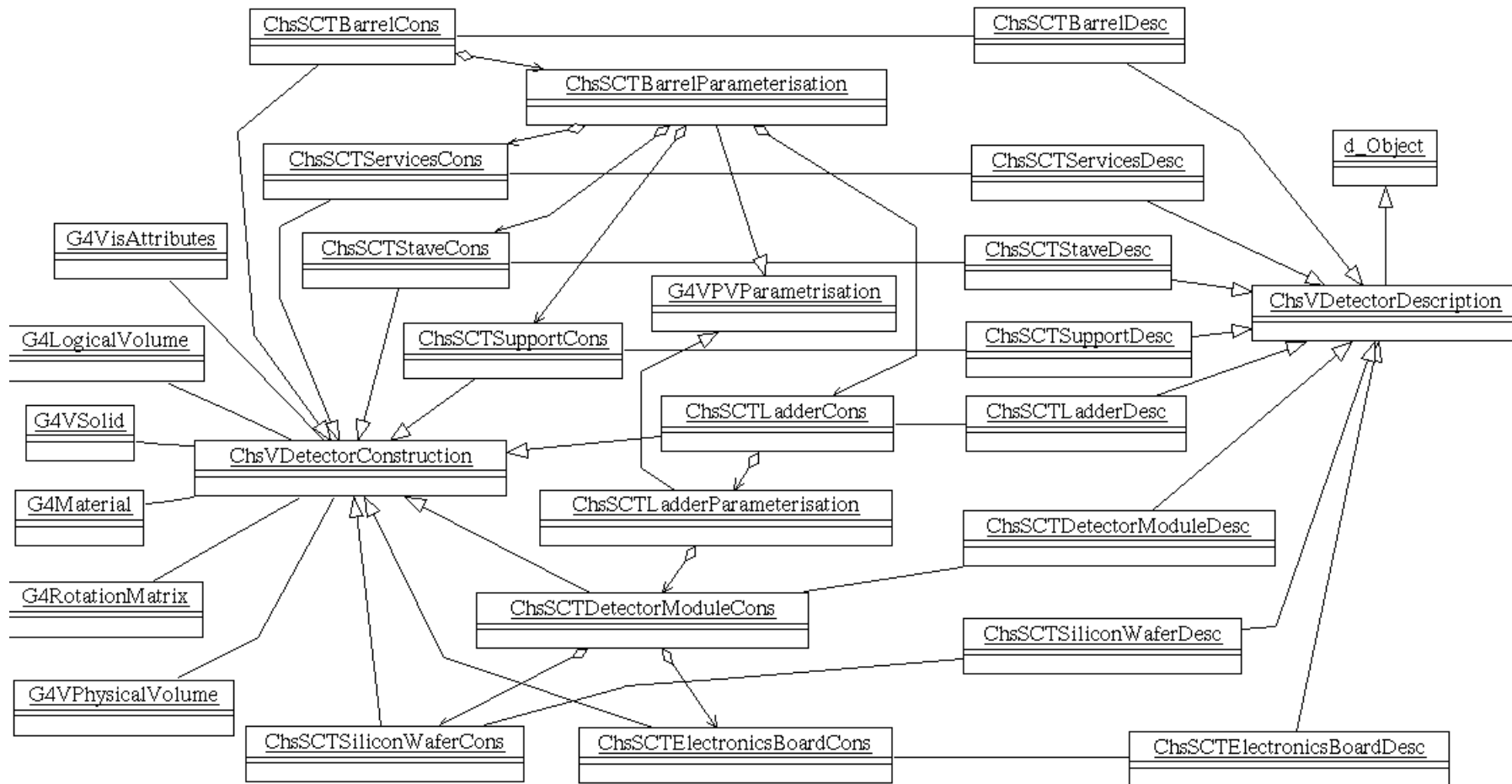
- by Makoto Asai (Hiroshima)
- Following a formal approach (OO design)
- Exploiting G4 parameterisation to its limits



Silicon tracker design

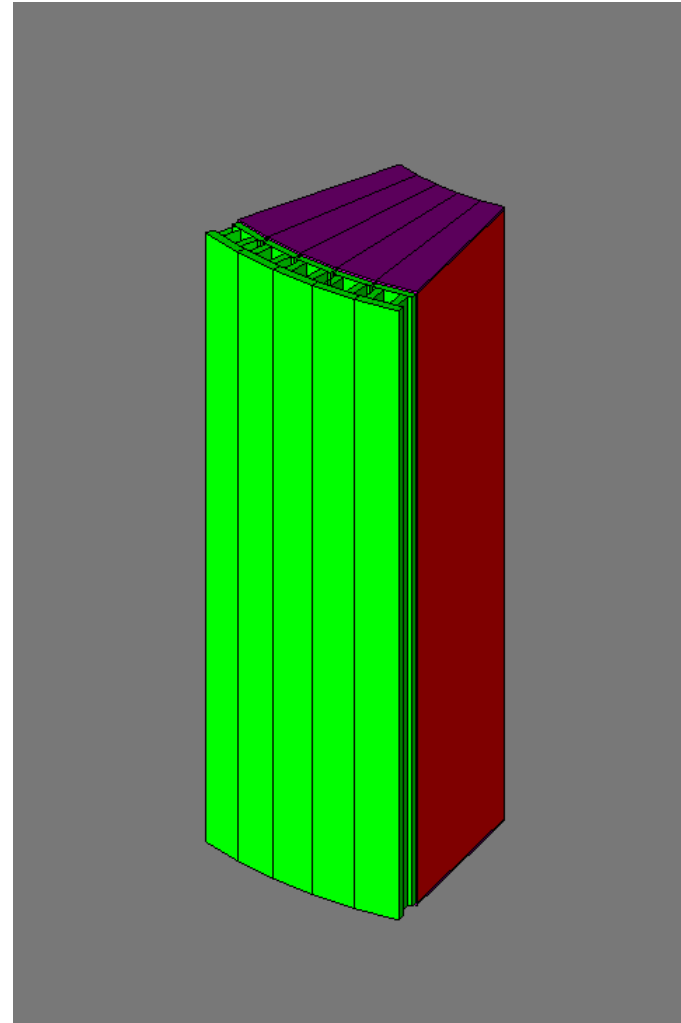


... but life is tough (sometimes)



Tile calorimeter

- Code written for the Tile G4 course
 - not very well structured
 - somewhat simplified geometry
 - missing facilities
- Now being transformed into the module-0 testbeam simulation program



Tile Calorimeter (2)

- Have been running the program intensively in the last couple of months
 - lots of problems with Geant4
 - am I cursed or what?
- Adding Hits, Digits, N-tuple facilities etc...
- G4 framework, MOMO GUI, some Chaos additions
- To be released asap
 - Vs. 00.-01
 - to be confronted with the existing G3 simulation program
 - Start improving it...

Tile/Module0 and MOMO

The screenshot displays the GAG (Geant4 Application Generator) environment. The main window has a menu bar with options: Function, control, units, tracking, event, run, particle, process, beam, gun, vis, vis~, hits. The terminal window shows the following commands and output:

```
Idle>/hits/list
/
/TileCal *** Active
Idle>/beam/print
*****
Beam conditions at this moment:
Particle type:      e-
Beam energy:       1e+03
Vertex position:   (0.0, 0)
Beam direction:    (0.0, 1)
*****
Idle>/beam/particle geantino
Idle>/beam/particle geantino
Idle>/beam/particle geantino
Idle>
```

Below the terminal, a file browser window titled "File Chouser" is open, showing the current directory as "Linux-g++" and a "Directory" field.

A "Command" dialog box is also open, showing the following parameters:

Parameter	particleName	Value	geantino	Candidate
particleName		geantino		e-
Type	s			lambda_c+
Guidance				nu_c
Range				

The terminal window also shows a list of files in the current directory:

```
./
.DARN.history
.DARN.default
GNUmakefile
GNUmakefile~
History
g4.prim
include/
index.html
last.kumar
last.kumacold
part_change.in
src/
tile05.cc
tile05.lbook
tile05.in
g4.ops
```


... and more

- Maya and co. working on TRT simulation
 - New TR facilities in G4
 - Test beam setup (actually producing results)
 - Parameterised physics
- Rachid Mazini working on Hadron Endcap and forward calorimeter
 - comparison with test beams
 - Full geometry
- Hisaya Kurasige working on TGCs
 - trigger simulation

What are we missing?

- er... the EM calorimeters, of course...
 - the (two) tricks we were using for building the accordion geometry in DICE would not work in G4
 - we must explore new routes (boolean operations between solids, parameterised geometries) and see if they are suitable (essentially in terms of performance)
 - ask for new concepts to be implemented in G4 asap (“capsule”)
- We badly need people from the EM community

Training

- First course on G4 given on Feb. 16th-19th
 - 3.5 days
 - Limited to the Tile community
 - ~20 people (a couple of “outsiders”)
 - Examples tailored on the tile calorimeter
 - no C++, OOA&D experience requested
- Rather positive feedback
 - the course was too short!!!
- Loads of experience gathered by the teacher (yours truly...)

Training (2)

- Second course will take place at CERN at the end of June
 - Organized by A. Rimoldi for the Muon community
 - Open to Inner Detector people
 - List of participants is filling up
- More general examples (still tailored on the audience, though)
- Aiming for a 5-day course this time
- Other courses will be given (on request!)

Future plans

- All bits and pieces are falling in place (IMHO)
- we can start assembling a mock-up geometry for the whole detector quite soon
- we must push for more test beam simulations (that's where the physics models will be exploited)
- we must give Lassi Tuura's Component Model a try
- we must set up a web page (mea culpa...)

Future plans (2)

- Interface with other categories of the ATLAS OO software
 - Event, database
- Detector Description (and DDDB) is becoming out 1st priority!!!
 - Please, get the newly appointed coordinators to work on this very item!!!
- Work on generators (fortran wrapping) needed, changes in TruthEvent
- Hope to have a simulation Jamboree sometime in summer (with the new coordinators)