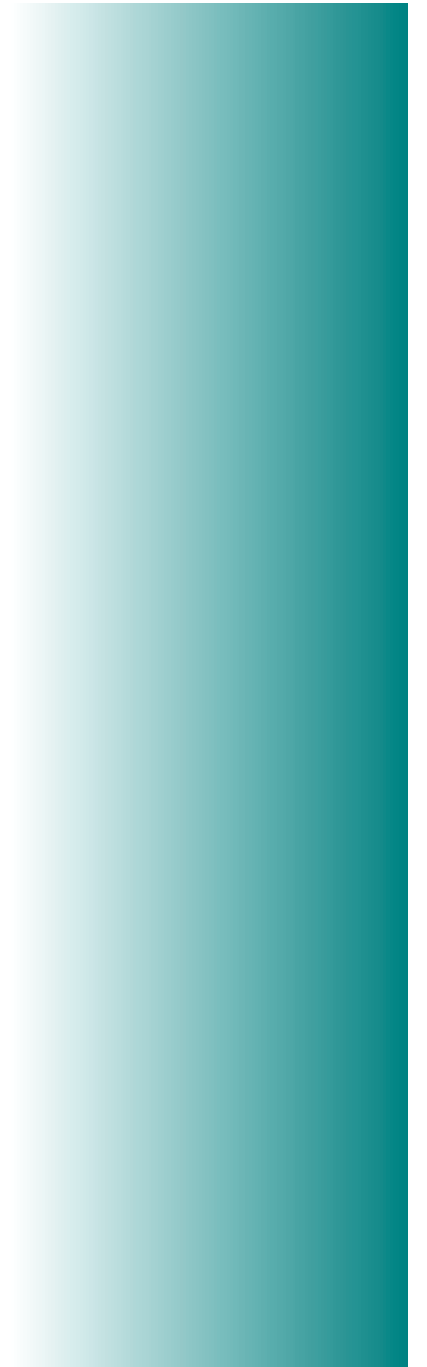




Logiciel offline d'ATLAS et de son calorimètre à argon liquide

Johann collot

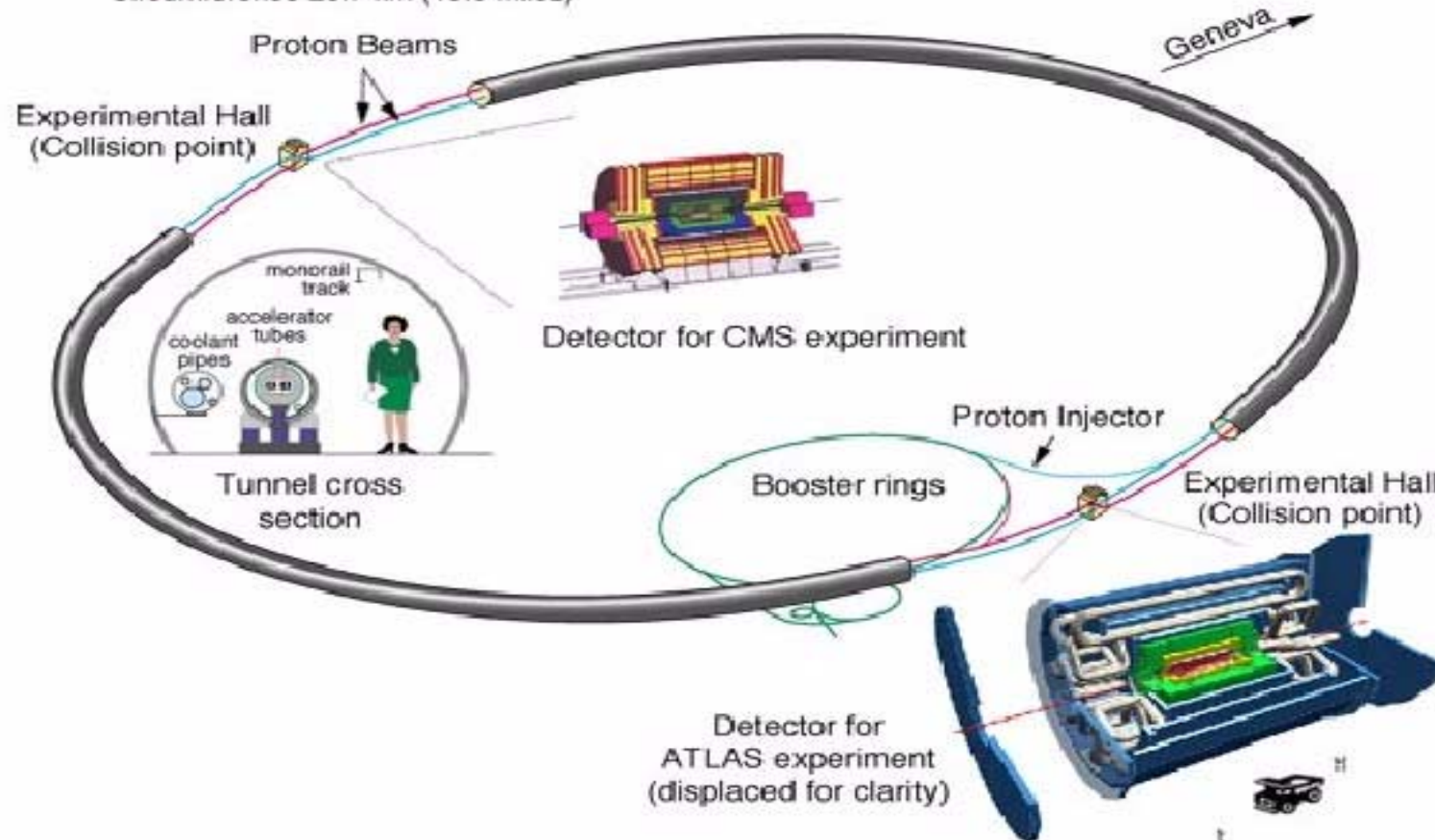
26 juillet 2001

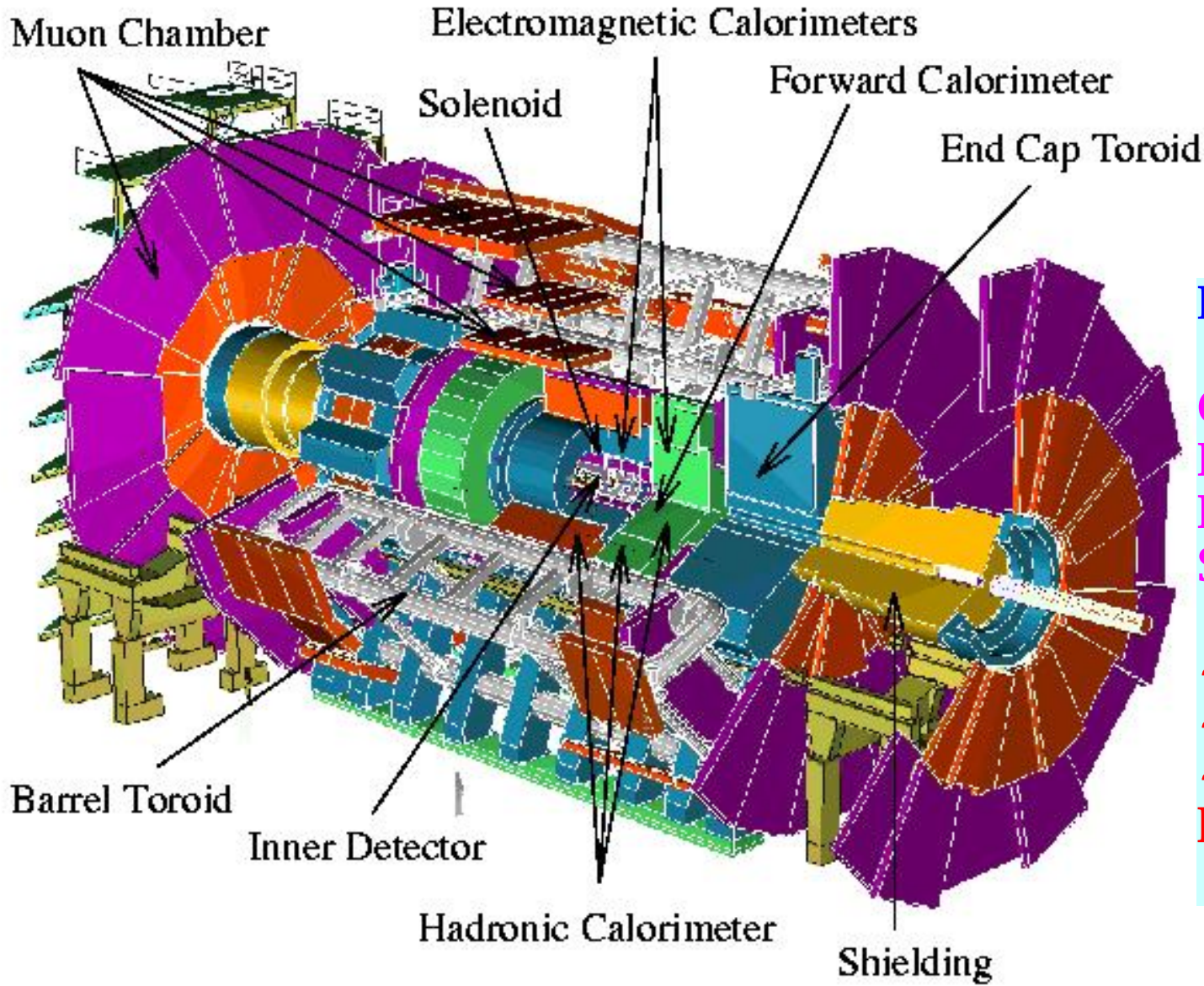


ATLAS au LHC

Large Hadron Collider at CERN

Circumference 26.7 km (16.6 miles)



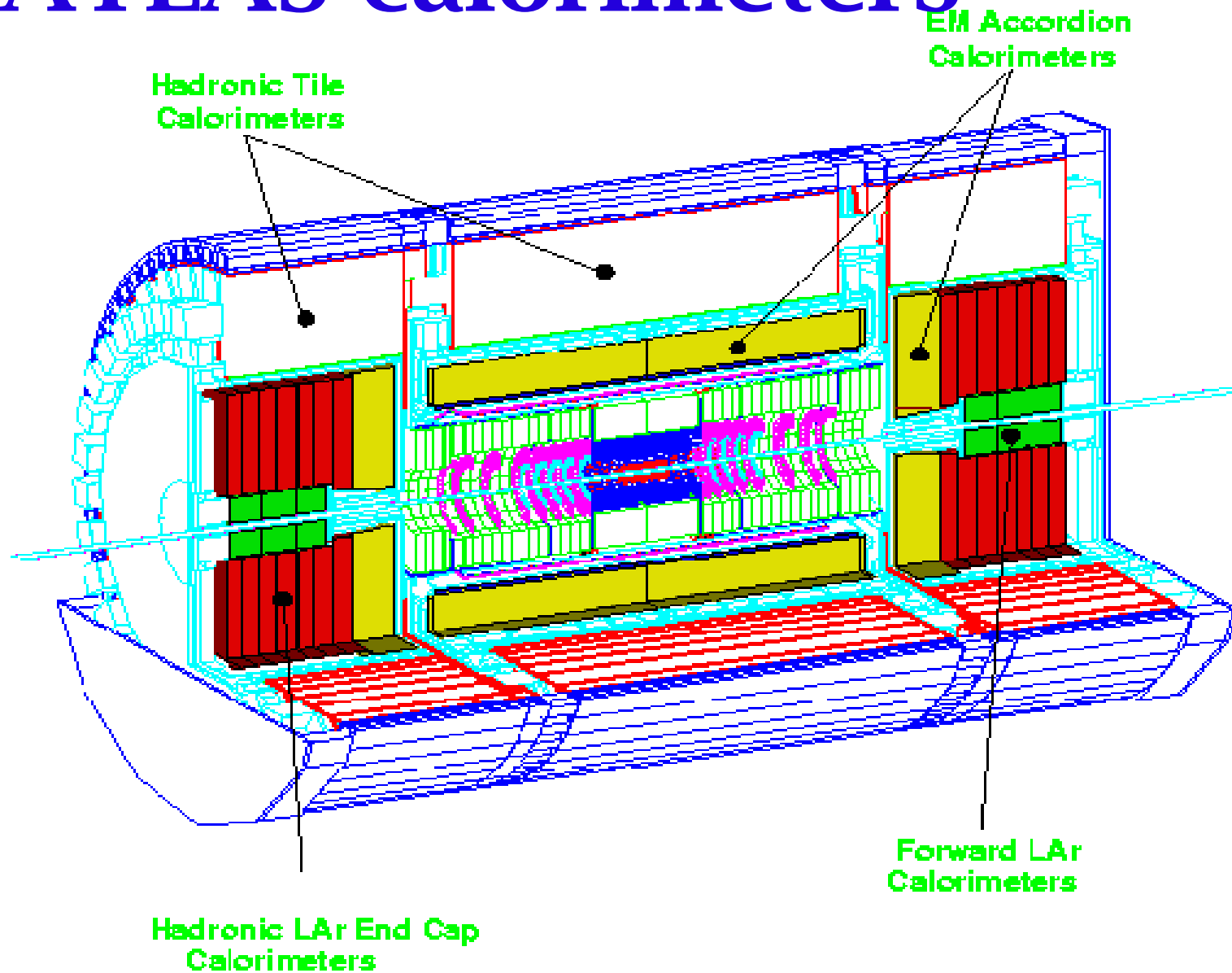


Participation française :

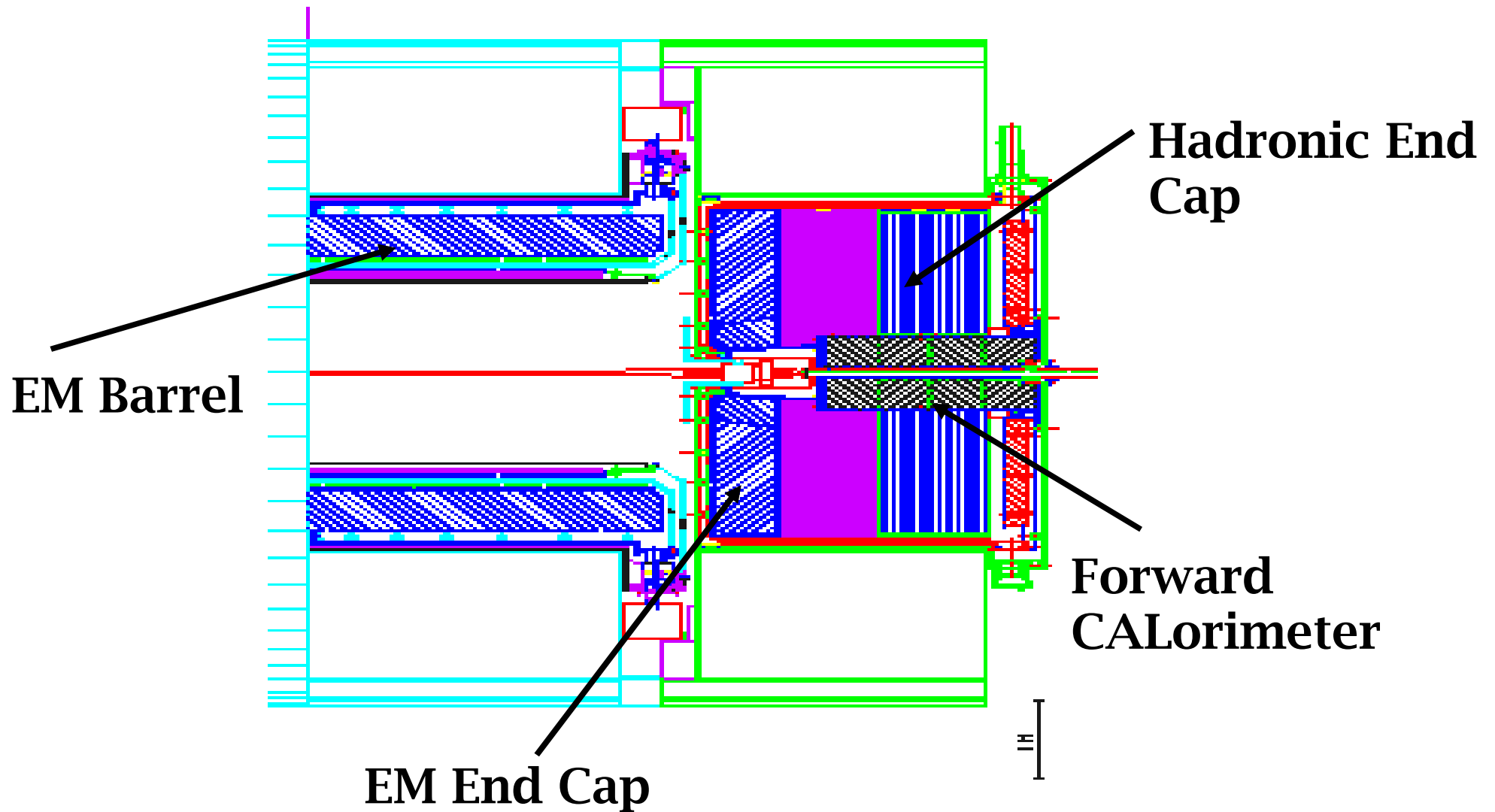
Calorimètre
Détecteur interne
Filtre d'événements
Spectromètre à Muons

~10% du coût
~200 participants dont
~25 personnes dans le logiciel

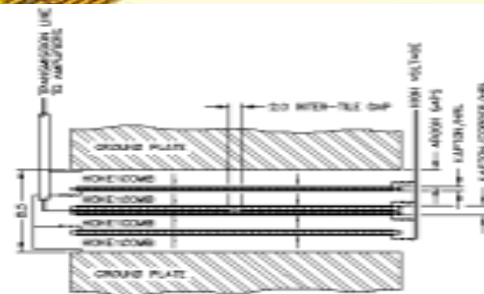
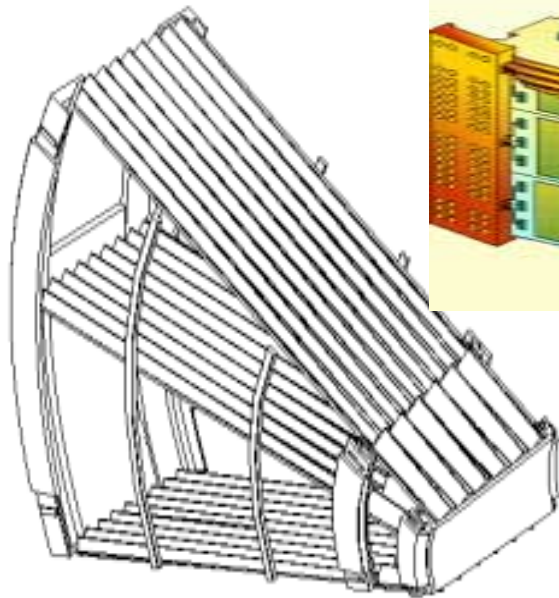
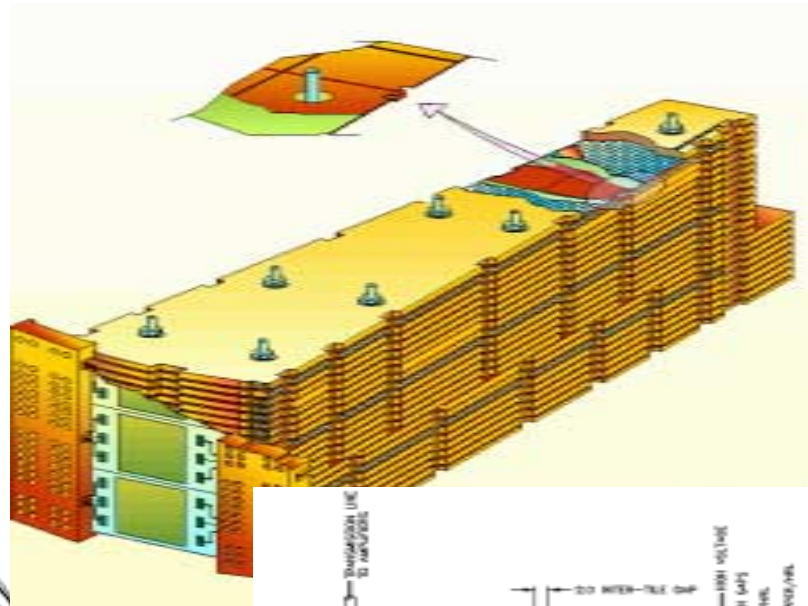
ATLAS calorimeters



ATLAS LAr calorimeters



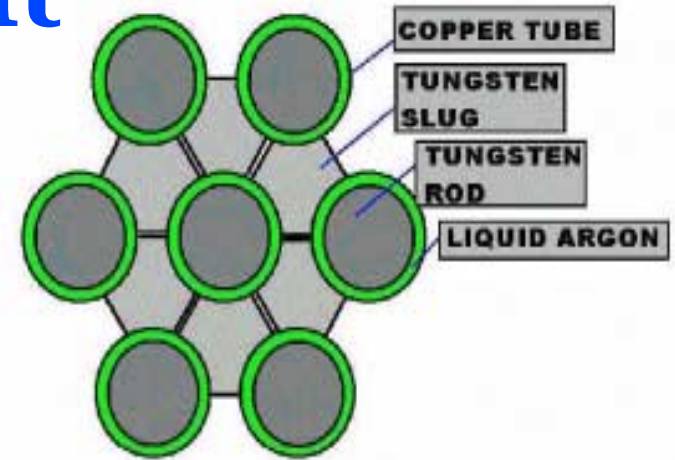
Close-up : 3 different structures !



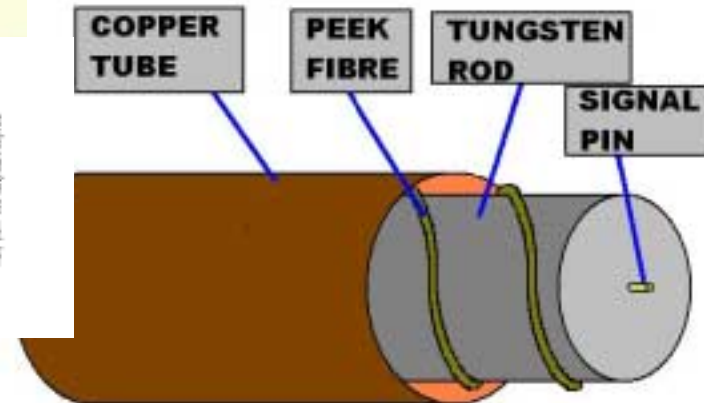
HEC Gap 2 mm
8.5 mm between absorbers

EM gap 0.9 mm - 2.7 mm
twice between absorbers

FCAL3 MATRIX



FCAL3 TUBE-ROD UNIT



FCAL gap thickness 0.25 - 0.4 mm

ATLAS : la mission

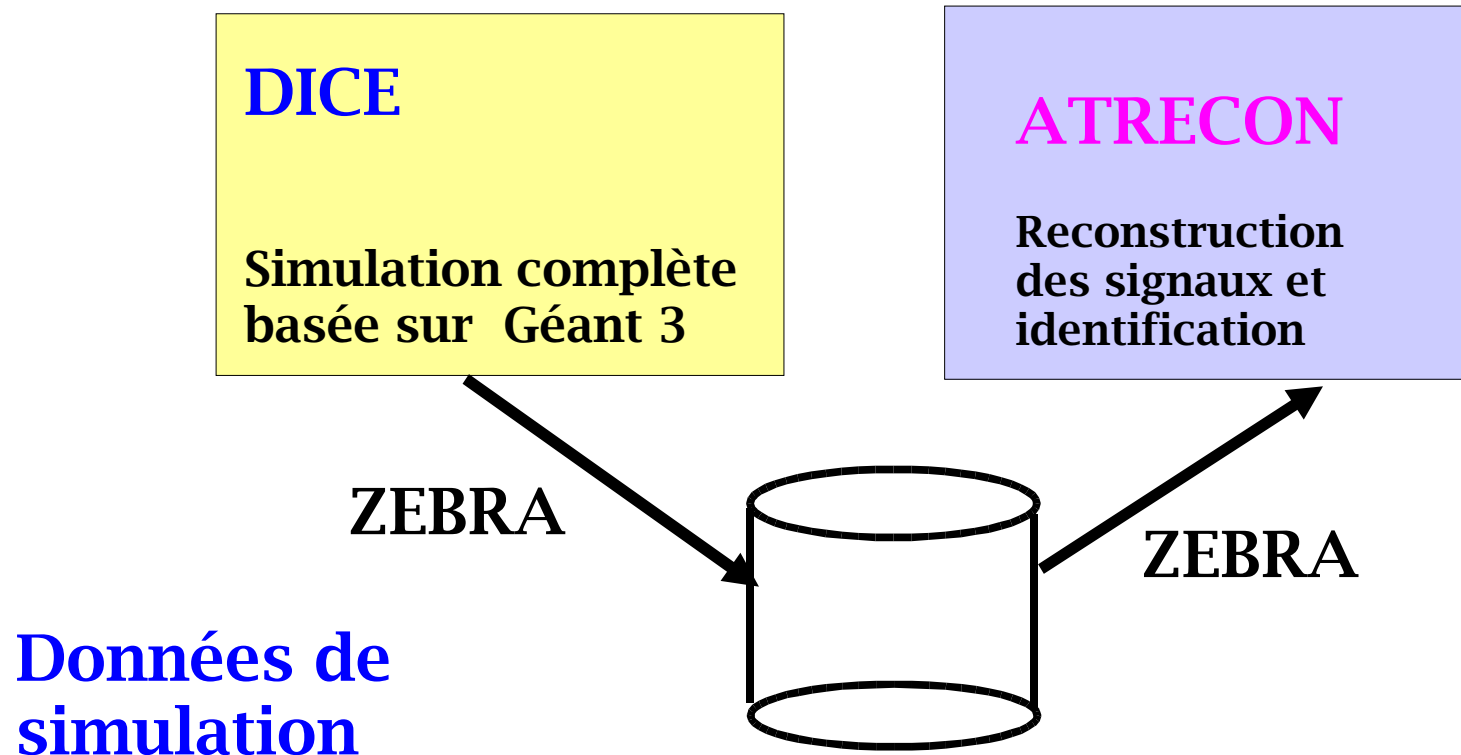


- **Physique** : Higgs ? , Supersymétrie ? , physique de précision (B , m_{top} , m_{w} ...) , phénomènes exotiques : extra-dimensions ? , neutrinos lourds
- **Données** : Plus de 150 M canaux , 100–200 Hz de déclenchement , 2 MO de données brutes par evt => 2,5 à 5 PO par an
- **Flexibilité et Performance**

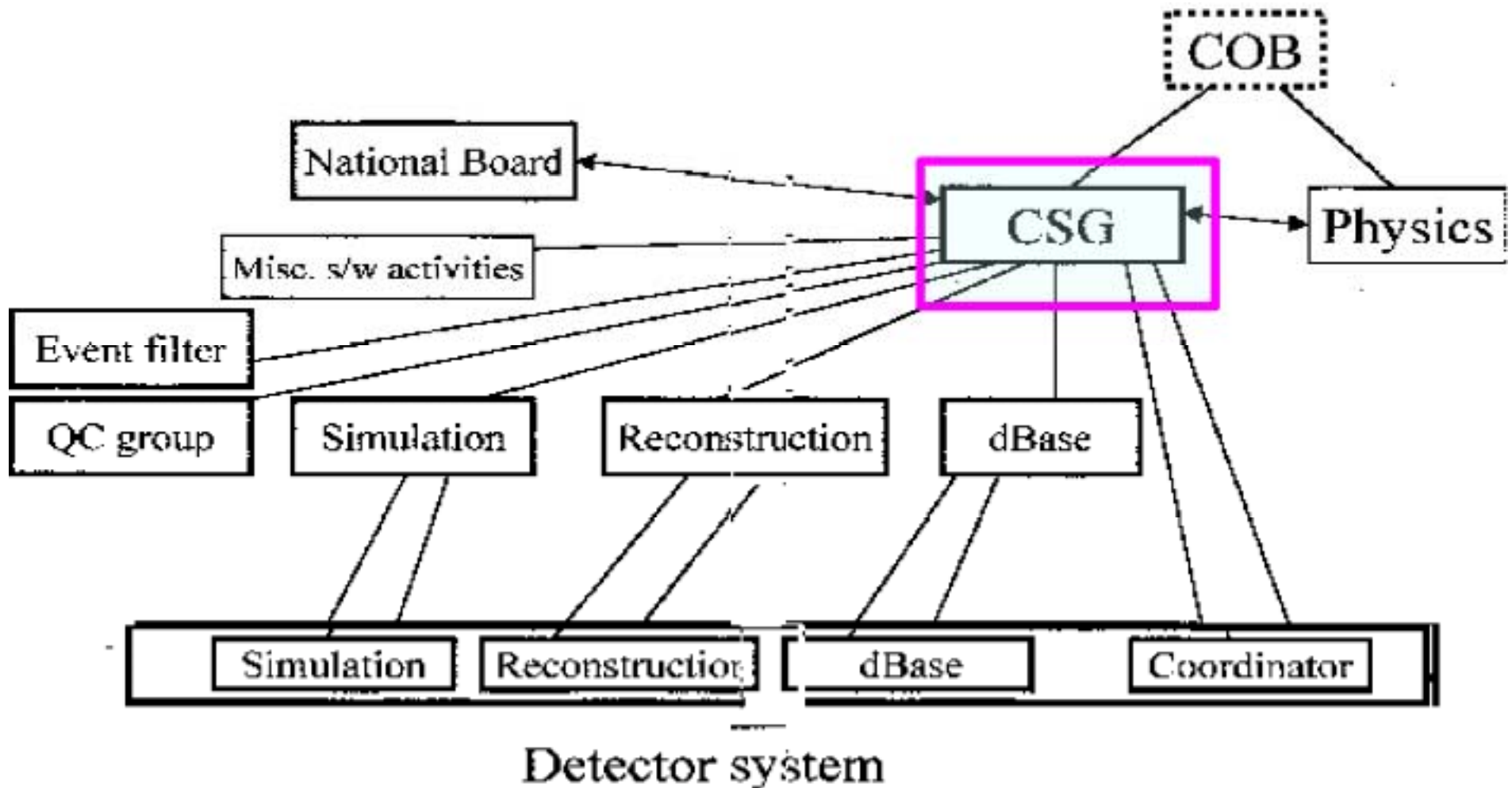
Chaîne complète d'analyse FORTRAN



Développée jusqu'en 1999
pour le TDR de physique



ATLAS computing organization



Organization of ATLAS software

Since June 1999

	<i>Offline Coordinator</i>	<i>Reconstruction</i>	<i>Simulation</i>	<i>Data Base</i>	<i>Test beam</i>
Chair	N. Mc Cubbin	D. Rousseau	K. Amako	D. Malon R.D. Schaffer	
ID	D. Barberis	D. Rousseau	F. Luehring	J. Pater	
LAr	J. Collot	S. Rajagopalan	M. Leltchouk	R. Sobie	Ph. Ghez
Tile	A. Solodkov	F. Merritt	A. Solodkov	T. Lecompte	
Muon	G. Poulard	J.F. Laporte	A. Rimoldi	S. Goldfarb	
Level 2		S. Tapprogge			
Trigger/DAQ	S. George		T Hansl-Kozanecki	A. Amorin	
Event Filter	V. Vercesi	M. Bosman		F. Touchard	

LAr Performance studies : e/γ : **J. Beck-Hansen**
jet/Et miss : **J. Pinfeld**

Architecture team composition



- Katsuya Amako (**KEK**)
- Paulo Calafiura (**LBNL**)
- Gilbert Poulard (**CERN**)
- David Quarrie (**LBNL**)
- David Rousseau (**Orsay**)
- RD Schaffer (**Orsay**)
- Graig Tull (**LBNL**)

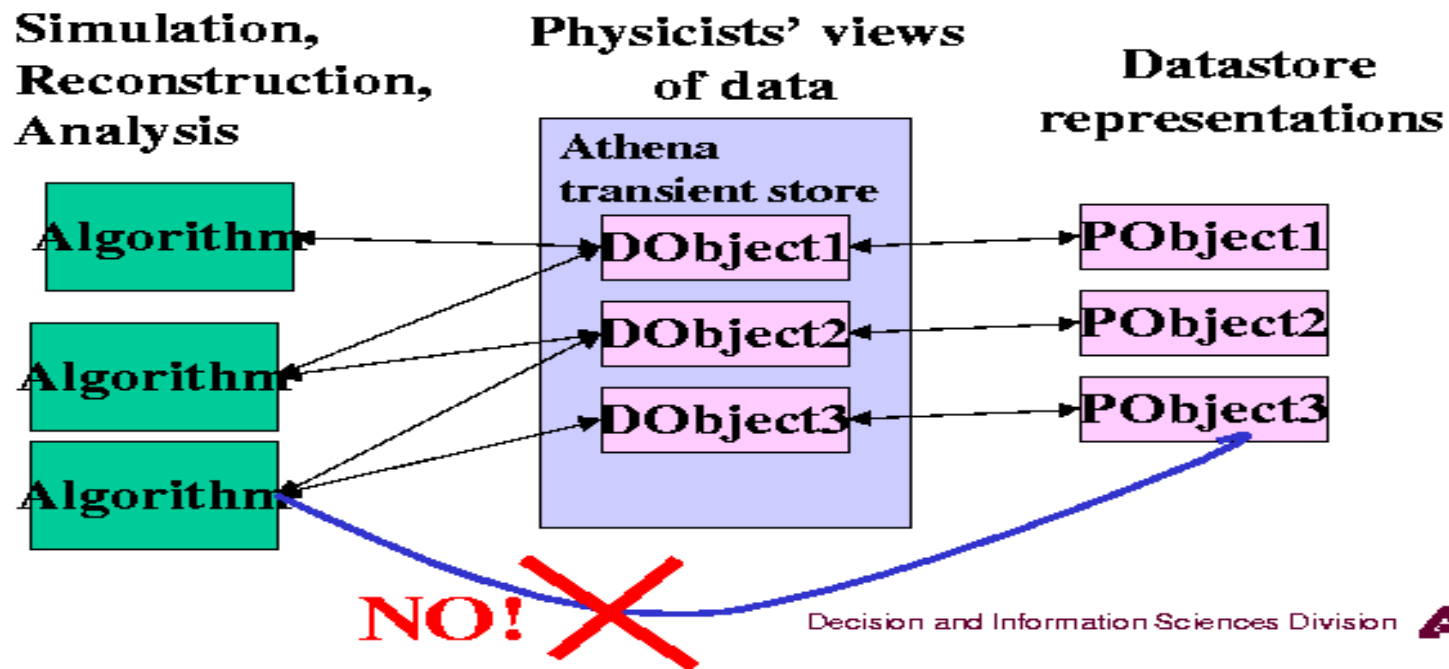
Directives



- Utilisation d'un langage objet : C++ , ouverture sur Java
- Méthodologie objet : USDP
- Séparation des états transitoires et persistants des objects
- Séparation des données et des algorithmes
- Tirer partie de l'acquis de la chaîne FORTRAN
 - intégration de modules FORTAN dans l'immédiat (F77 , F90–95) si seule solution
 - ré-écriture d'algorithmes semblables en C++

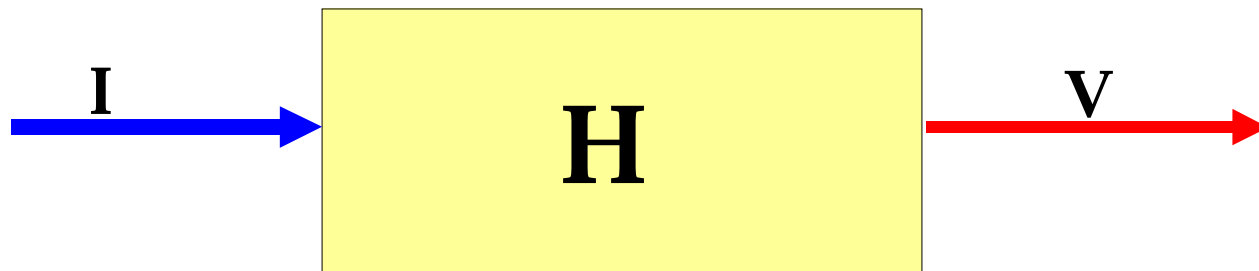
Séparation des états transitoires

Data access in Athena



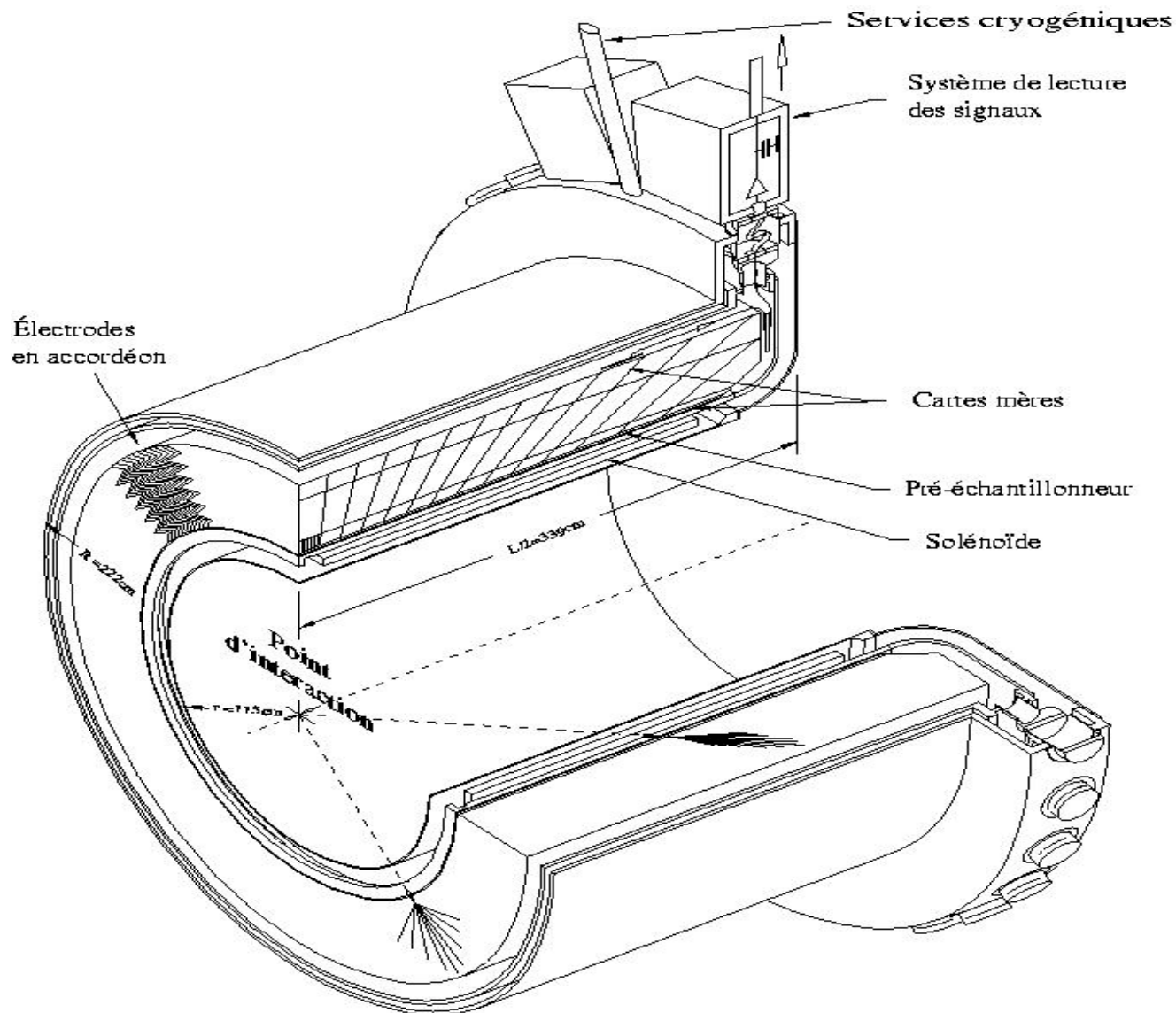
Séparation données - algorithmes

Traitement du signal : $V = H I$

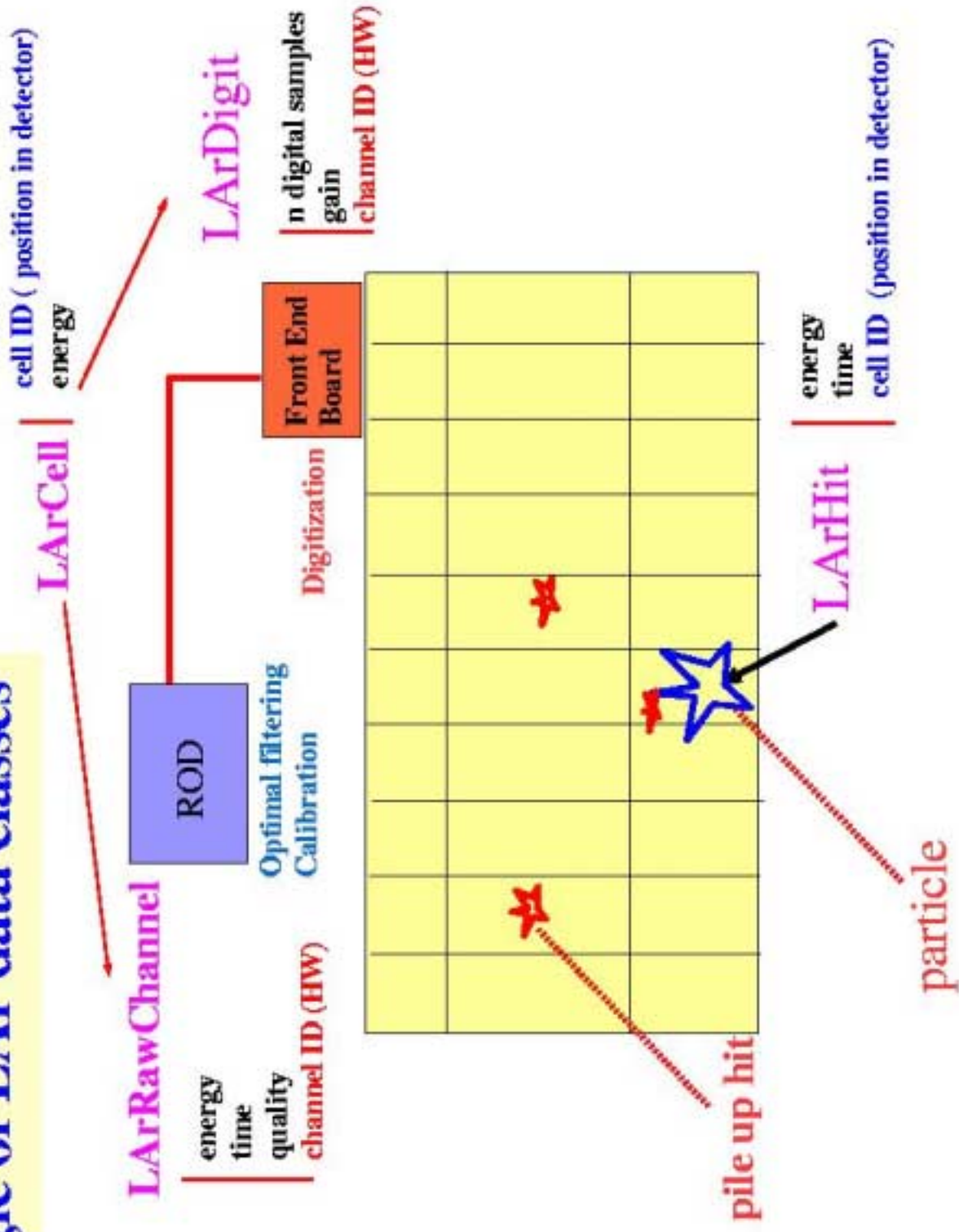


Gaudi - Architecture

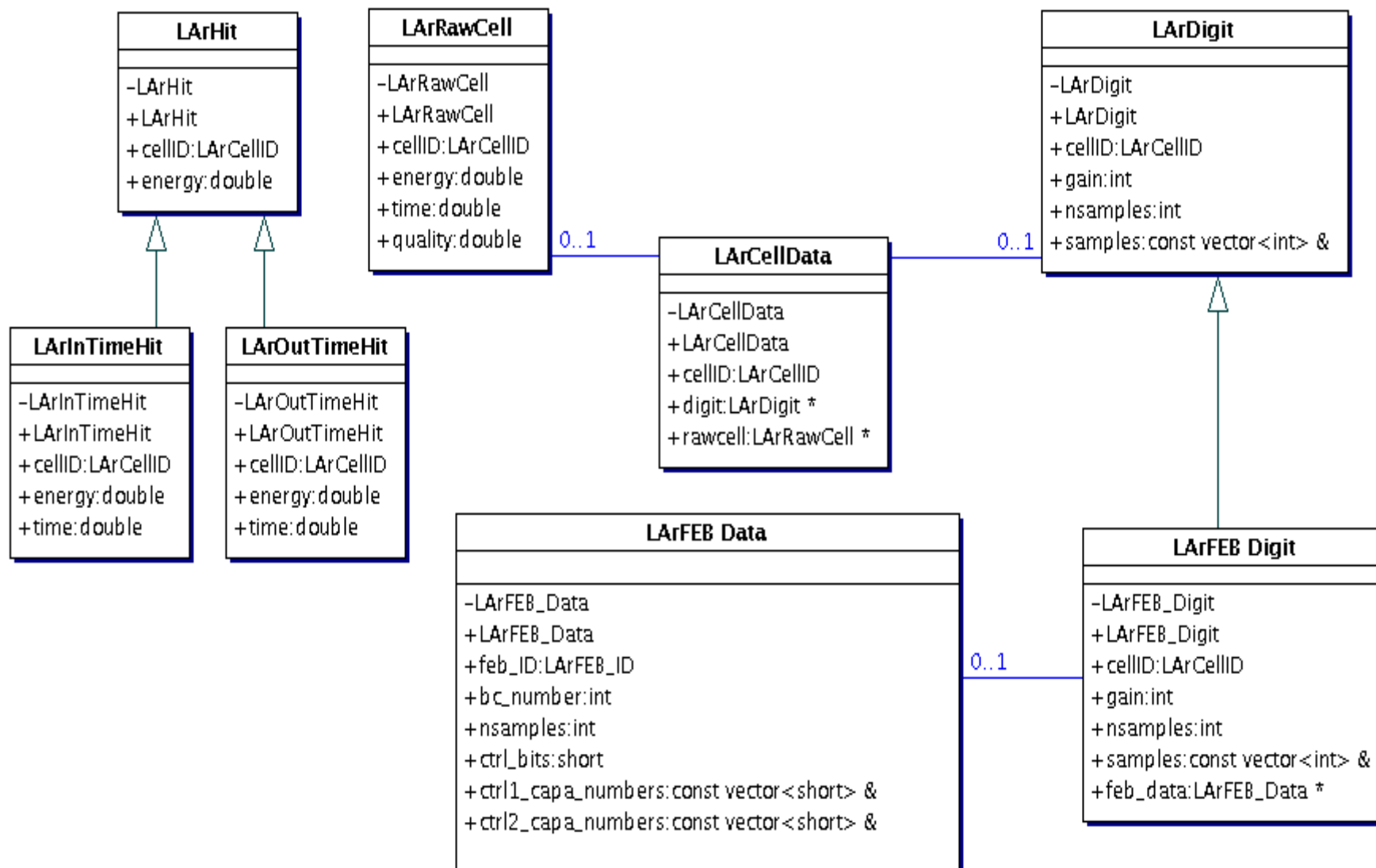
Calorimètre électromagnétique central



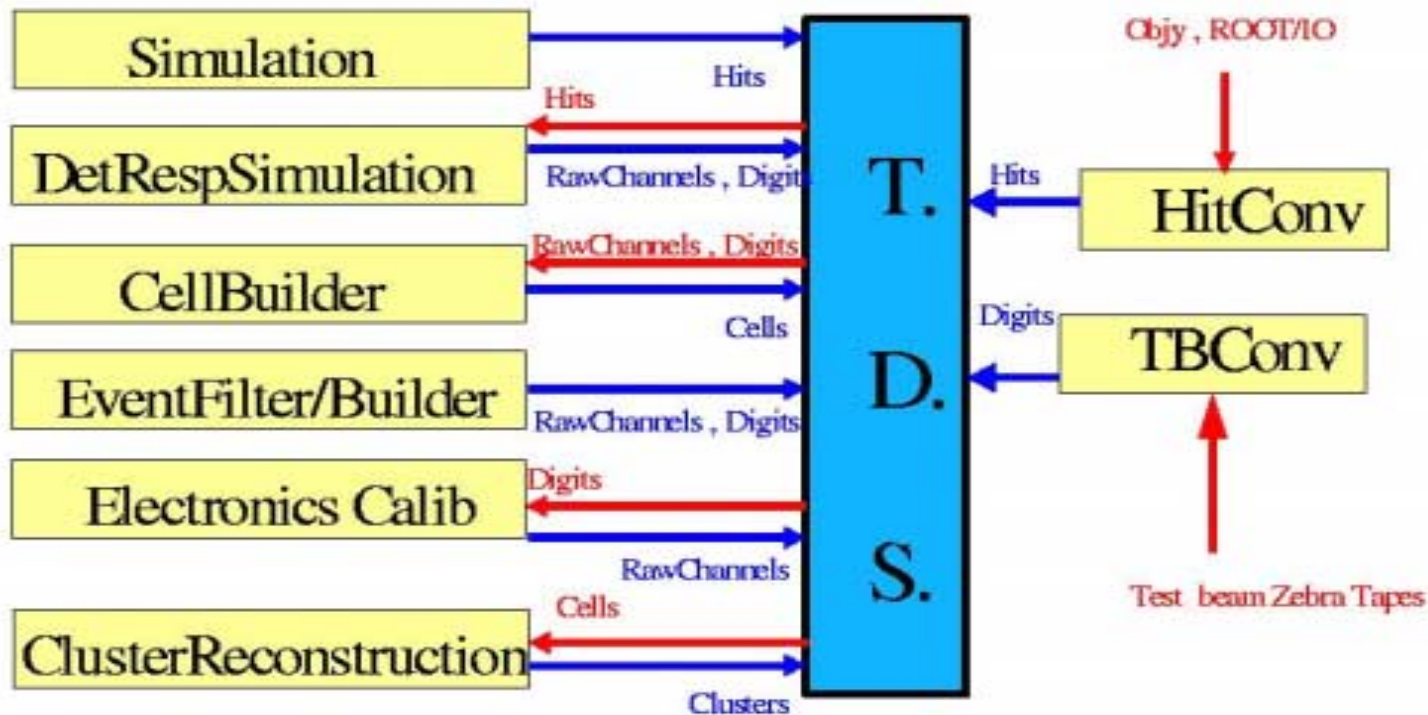
logic of LAr data classes



LAr data classes

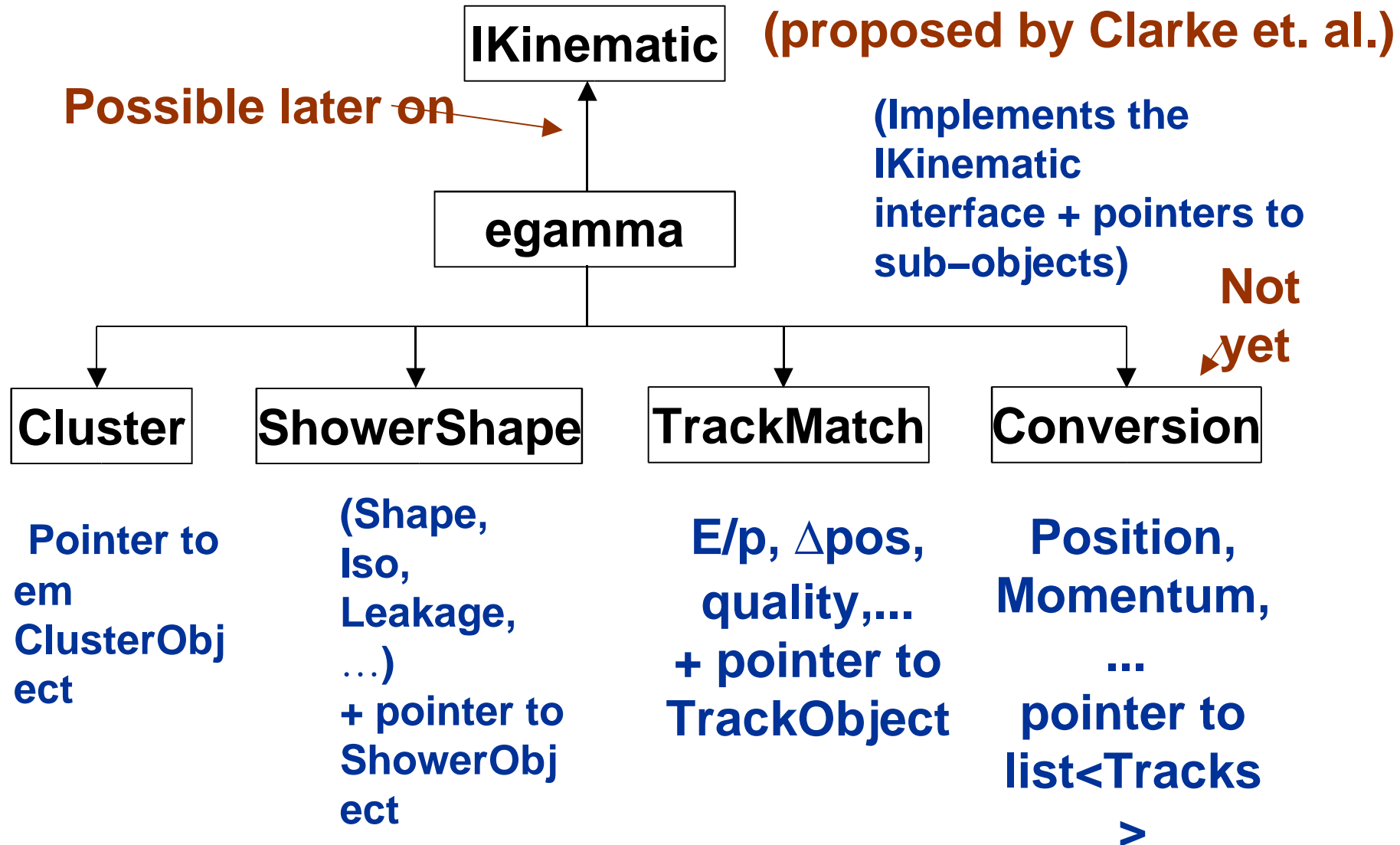


GAUDI/ATHENA algorithms and LAr data classes

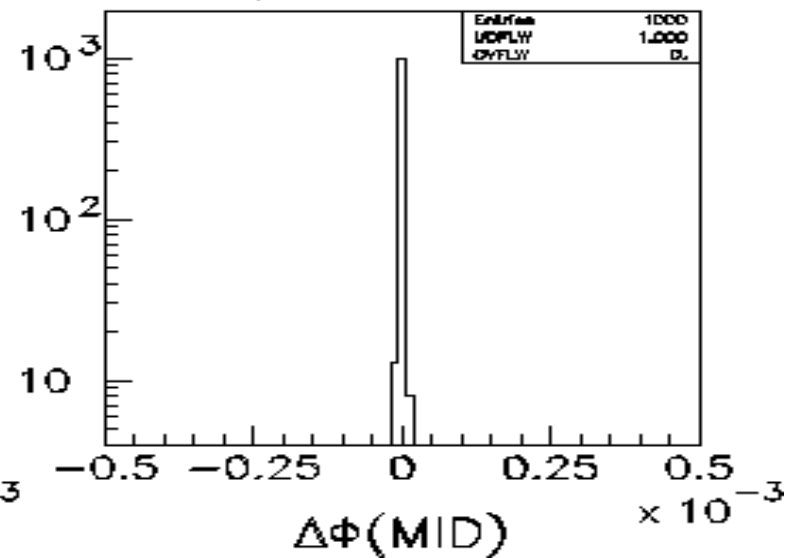
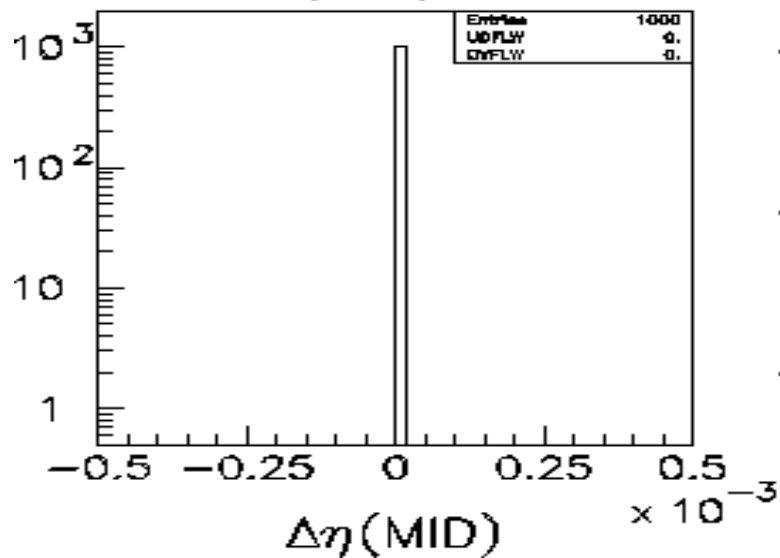
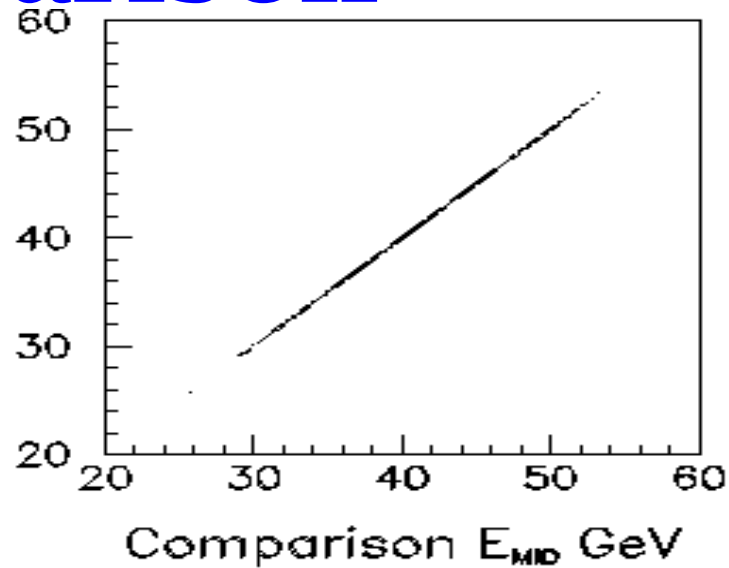
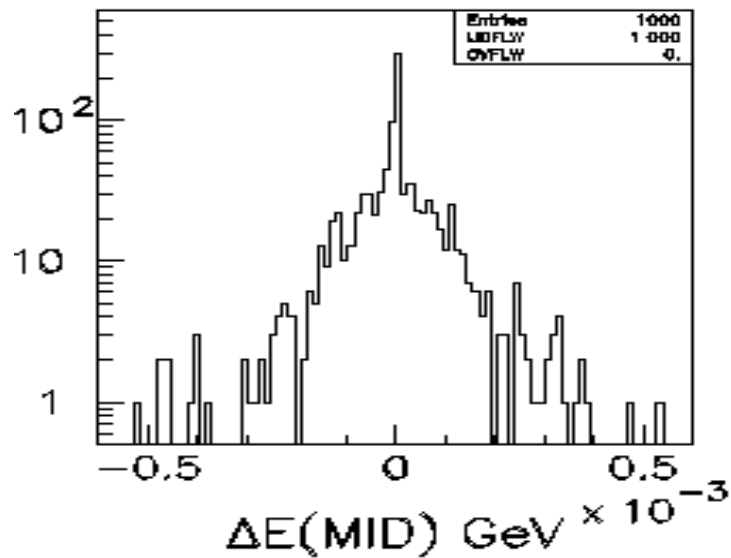


TDS = Transient Data Store

egamma Data Class



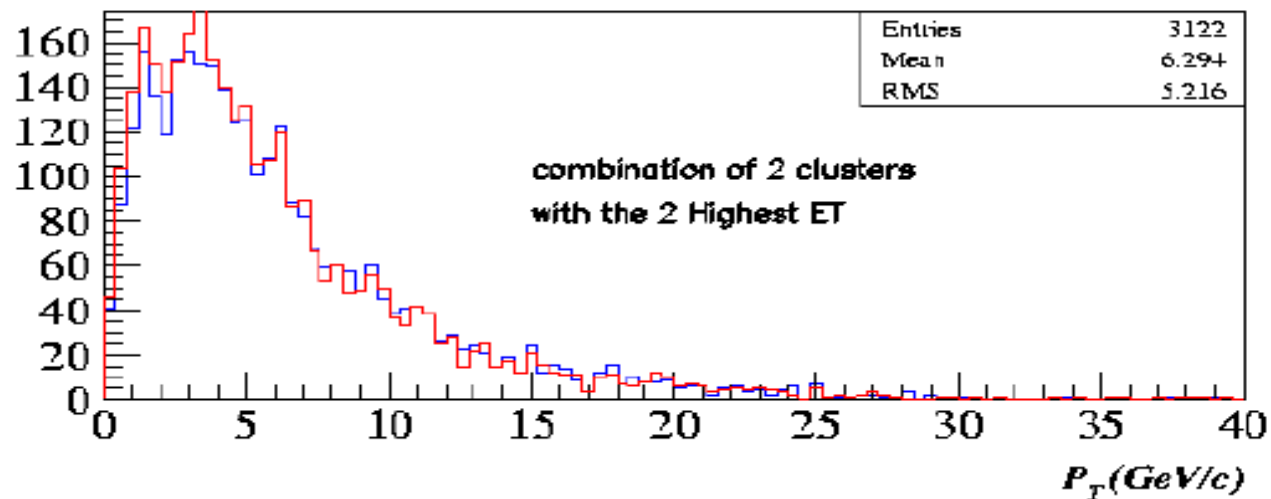
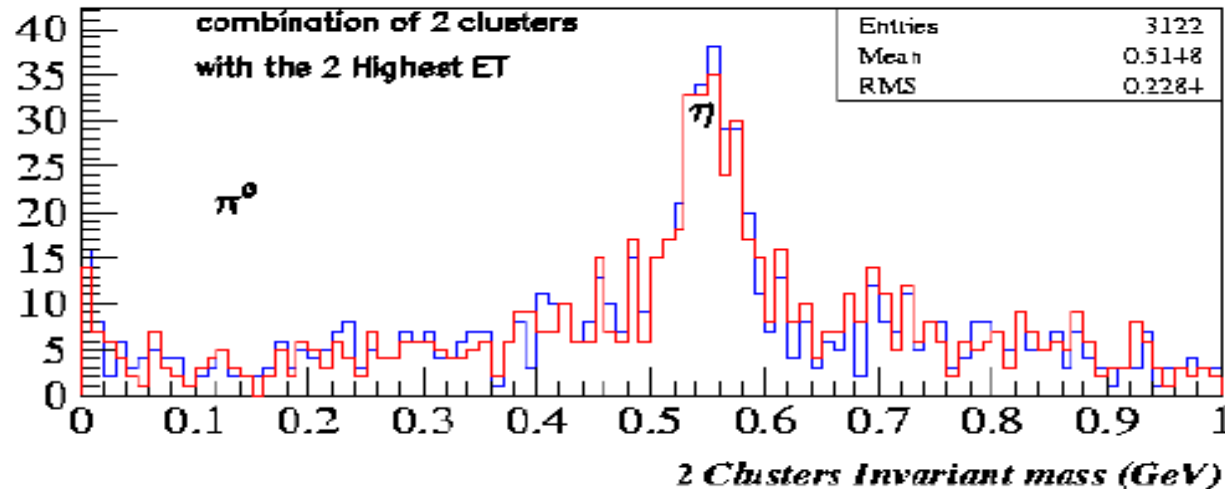
ATHENA/ATRECON comparison



ATRECON/ATHENA

F. Malek

$B_s \rightarrow J/\Psi \eta(\rightarrow \gamma\gamma)$ - comparing atrecon to athena srt 1.3.0

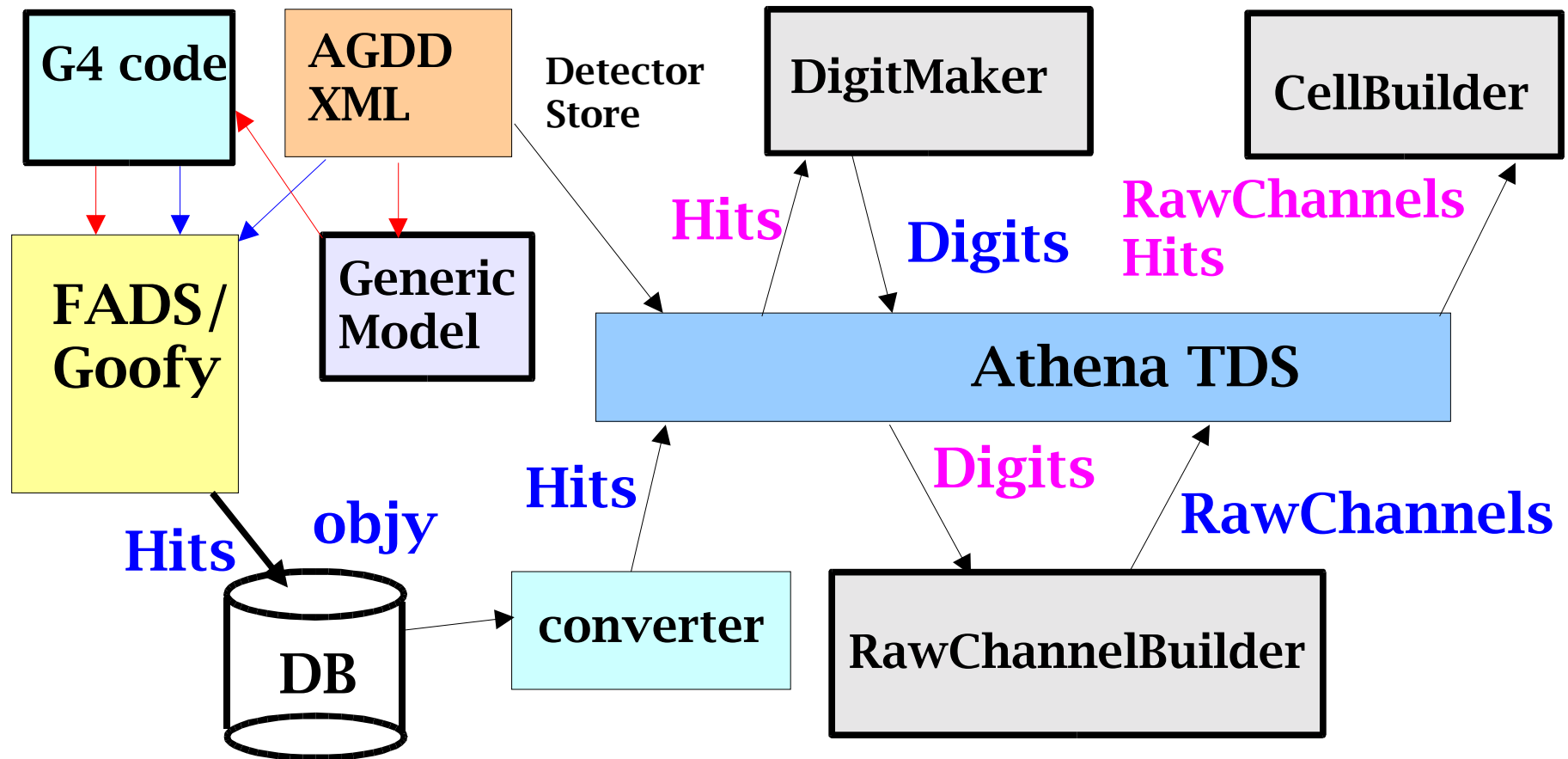


Simulation



- Geant 4
 - tests en cours
 - produit pour l'avenir
- Geant 3 (DICE , ATLSIM)
 - seul programme capable de simuler le détecteur complet
 - sera maintenu sur 2 à 3 ans

G4 ATLAS simulation



AGDD / G4Builder



**Test on the barrel presampler
Casablanca / Grenoble**

**fundamental
geometric
parameters**

PS_Param.xml

G4 application

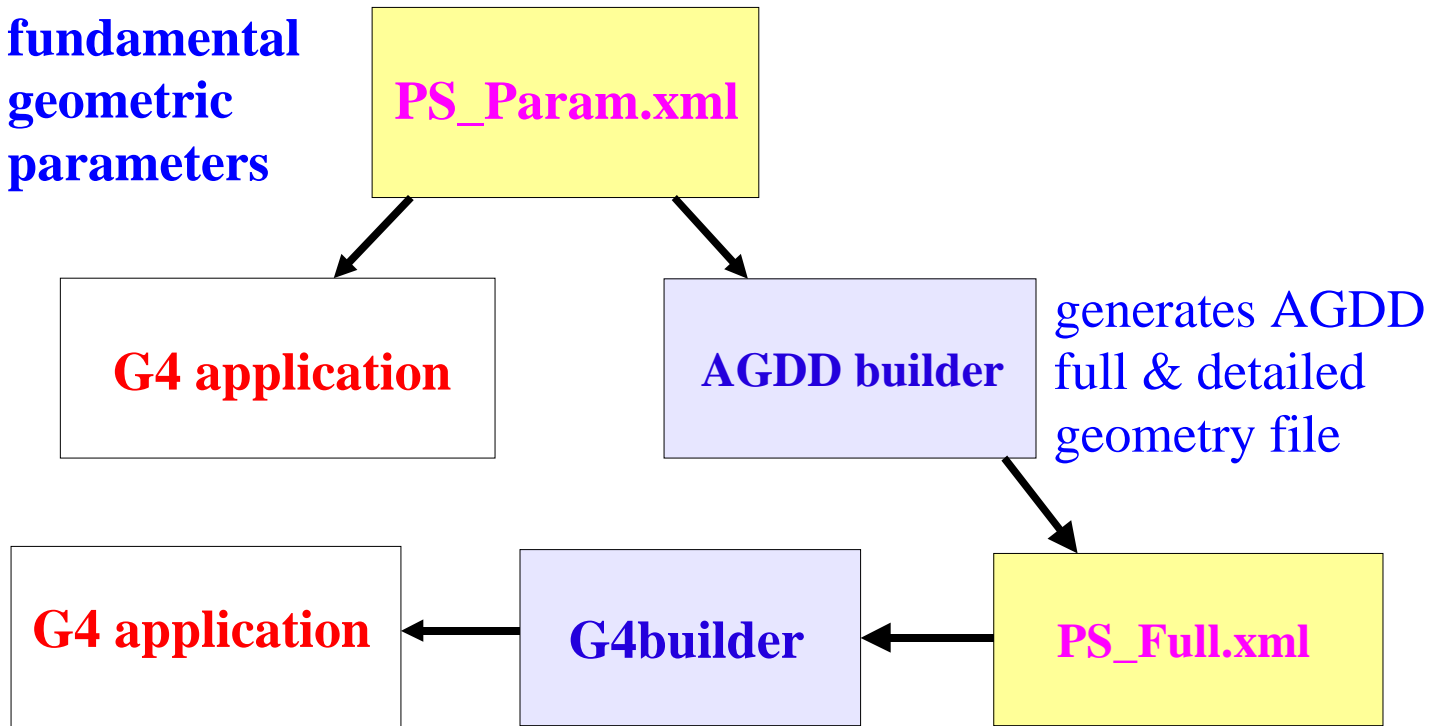
AGDD builder

generates AGDD
full & detailed
geometry file

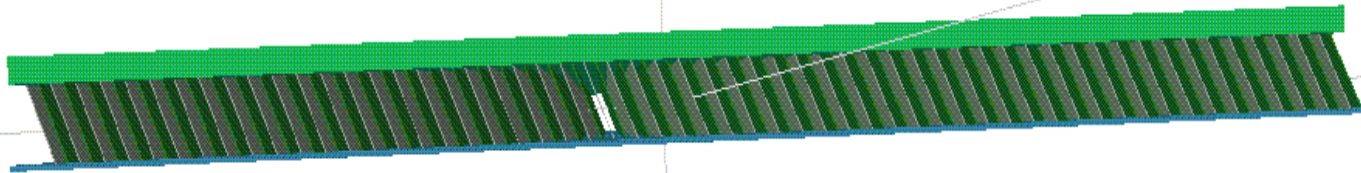
G4 application

G4builder

PS_Full.xml

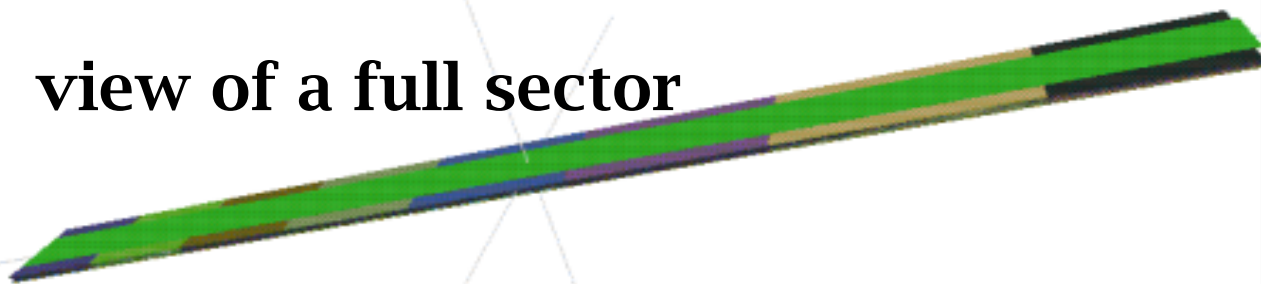


AGDD presampler Gallery



view of a Module produced by gra XML

view of a full sector

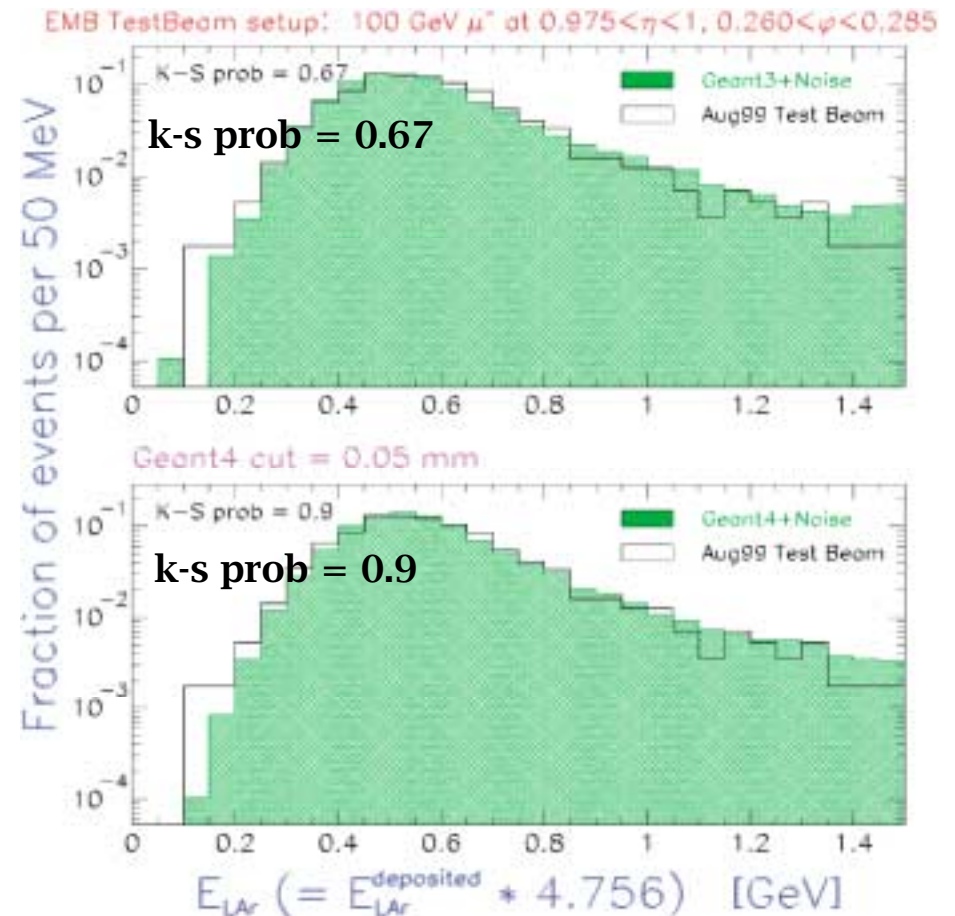
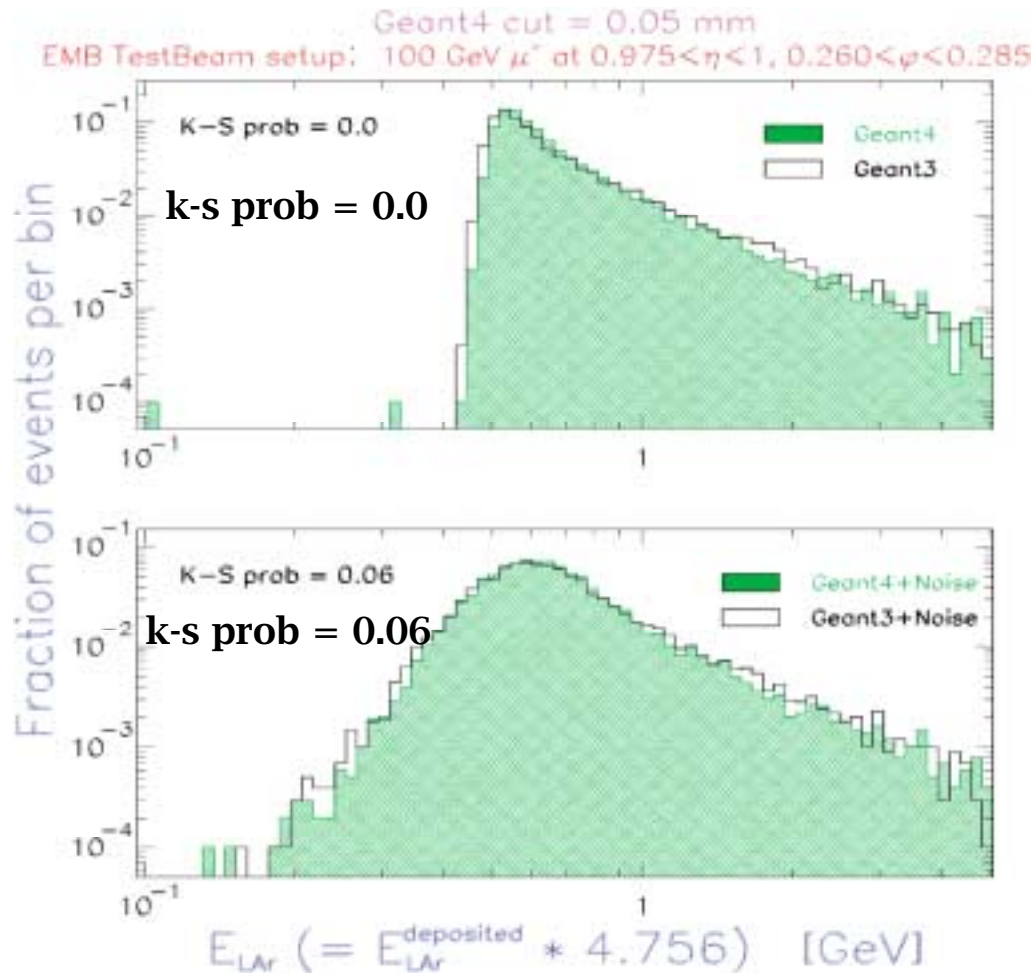


G4 picture of
PS detail



Muons in EMB

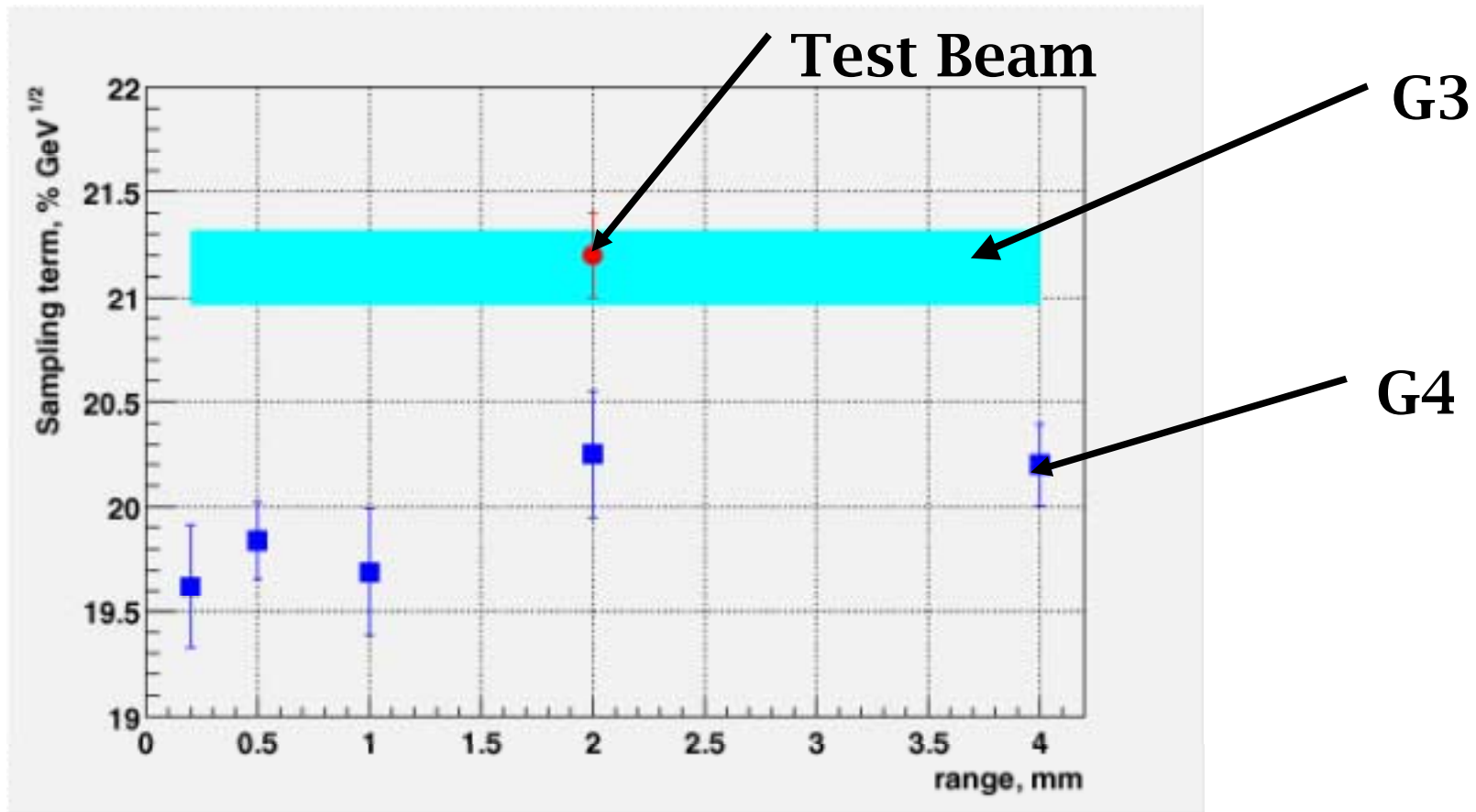
G4.3.0R1



G3/G4 distributions statistically incompatible - K-S tests fail

incompatibility washed out because of the limited size of the test beam sample - More muons in the analysis pipe line .

Electron energy resolution in HEC



G4 EM resolution looks a bit too good

Programme

- Data challenge 0 (DC0) : Dec 2001
 - infrastructure DB
 - chaîne de reconstruction complète
 - simulation DICE
- DC1 : mi 2002
 - production : 10^7 Z+jets , ~ 10 TO
 - Partiellement fait avec G4
- DC2 : 2003 ?
 - Geant4 complet
 - 50% de la complexité (DB , PC's , Grid ...)

G4 activities

- **Activities have started in all sectors : **very positive improvement slope****
- **lots of the initial technical difficulties have been overcome**
- **tests of physics (G4/G3 , TB/G4) have started**
- **Use of AGDD/G4Builder is being evaluated**
 - **to read the geometry parameters**
 - **to automatically generate the G4 geometry code**
- **Preliminary results already there**
 - **presented at CHEP2000 and at CALOR2000 (4 talks)**

Conclusion



- **Transition FORTRAN/procédurale → C++/Objet tjs en cours**
- **Nouveau programme de reconstruction pratiquement au même niveau que l'équivalent FORTRAN (ATRECON)**
- **Geant3 → Geant4 : ce sera long ... (2 ans encore ..)**
- **Data Base : des problèmes énormes à résoudre (25 à 50 PO sur 160 instituts , 40 pays)**
- **Nous avons besoin de plus en plus d'ingénieurs et de techniciens en informatique**
- **Également pas assez de physiciens**
- **travail d'équipes**