Geometrical Modeler Status

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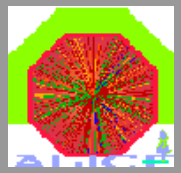
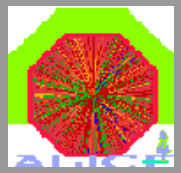
ALICE week - 17.06.02



Outlines

- **Status of the implementation**
- **New visualization features**
- **Benchmarking tests**
- **Development plans**
- **News from RTAG#7 - Detector Geometry & Material Database**

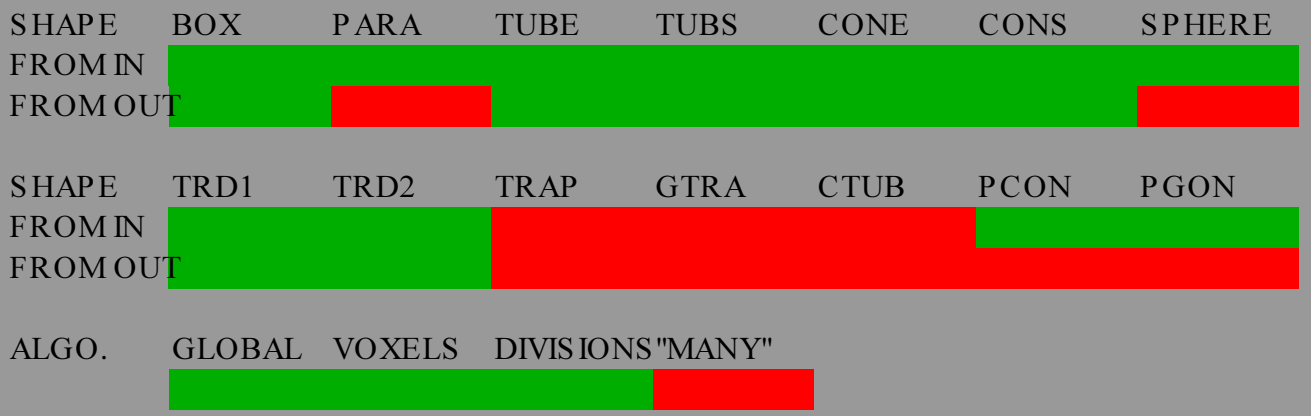


Status of the implementation

- Geant3 geometries - almost fully mapped (still not supporting multiple positioning for volumes having shapes with negative parameters which then are divided - quite seldom topology)
- "Where am I ?" - fully implemented
  - Tested on a dozen of geometries, including all 4 LHC experiments
  - Performance w.r.t GEANT3 - OK. The average gain factor ~1.5-2.0 , increasing for flat-like geometries
  - Consistency vs. GEANT3 response reasonable : still few % differences, but fully understood
  - Still scope for increasing speed, specially for cylindrical symmetries, where the current voxelization algorithm is not efficient enough.

Status of the implementation - gtnext

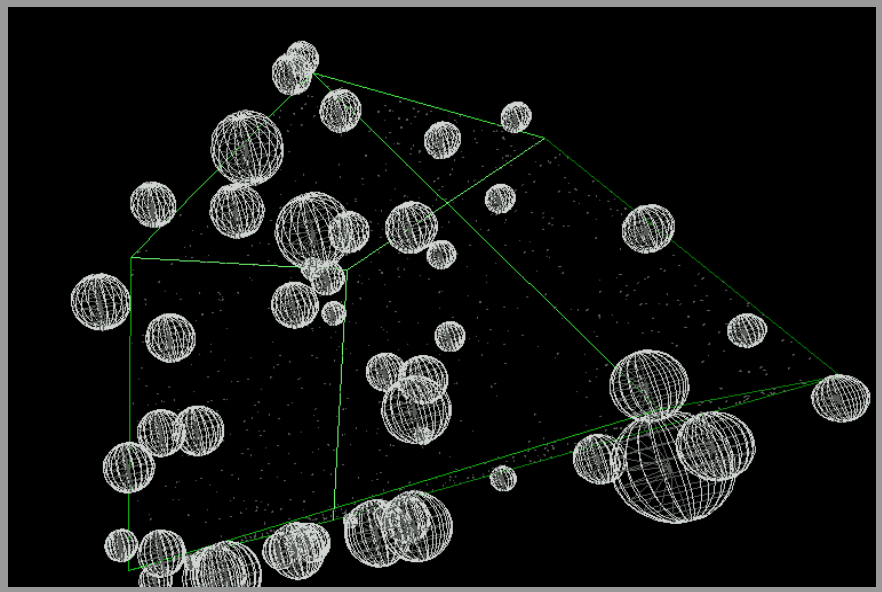
- "Which is the next crossed boundary ?" - about 80% implemented, still a couple of weeks to work on it.

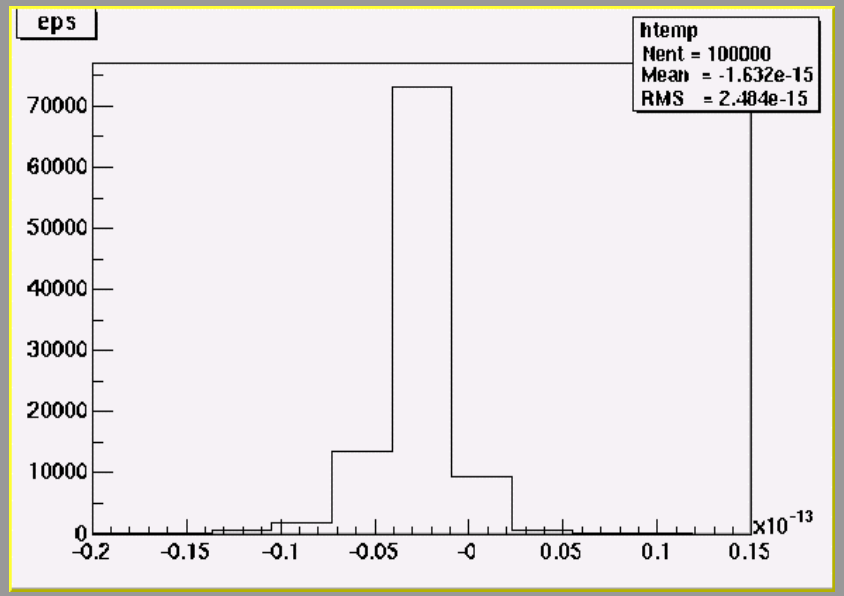


- Algorithms per shape improved w.r.t G3 for some shapes
- New functionalities added : normals to surfaces at crossing points, accurate distance to closest node, direction vector to closest point
- Features for stepping added : flags for entering and exiting

Status of the implementation - test of gtnext

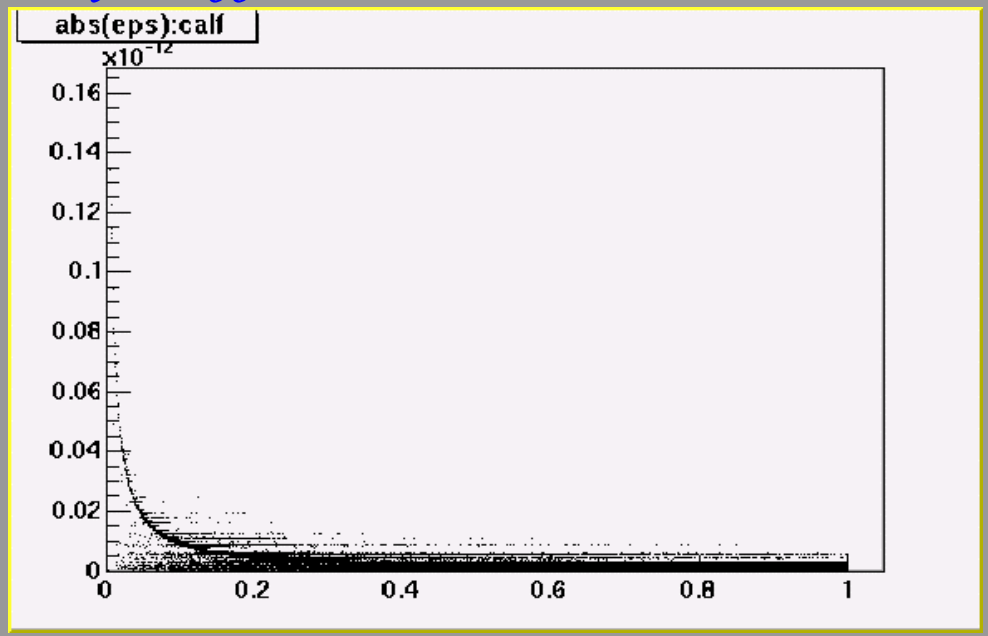
- Visualization - best tool for checking the algorithms
- The "width" of the boundaries due to floating point limitations was determined for some shapes
- This diffusion effect is crucial for fixing stepping actions in order to trigger expected inside/ouside response of the modeler
- The diffusion was defined as the distance between extrapolated point from step and closest point that changes this in/out response.



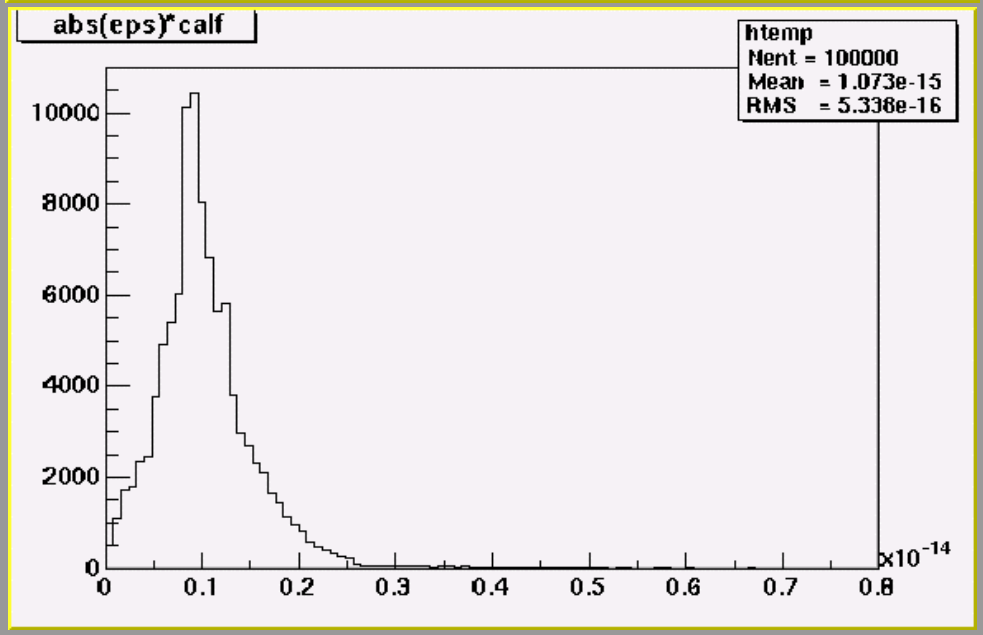


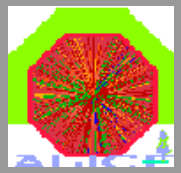
Boundary diffusion

- Strong correlation between boundary diffusion and incident angle



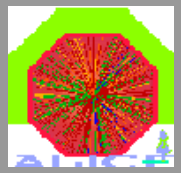
- Absolute boundary "width"





Performance comparisons vs. GEANT3 for "Where am I" task

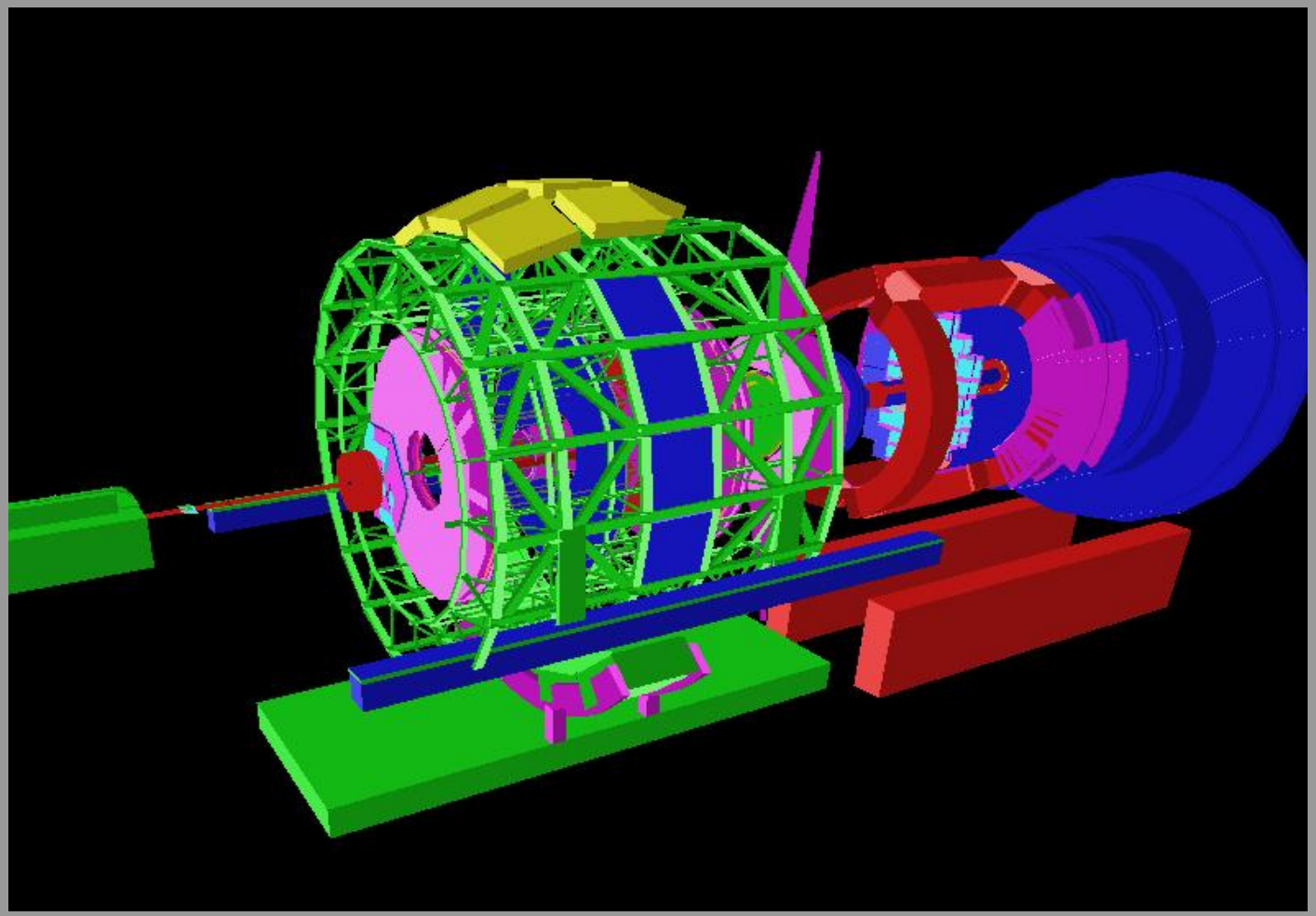
	Number nodes	gtmedi physics	Root physics	Geant3/ Root	gtmedi random	Root random	Geant3/ Root
Gexam1	425	3.08	1.84	1.67	6.60	4.39	1.50
Gexam3	86	2.87	2.15	1.33	3.47	2.50	1.38
Gexam4	12781	2.51	2.20	1.14	12.09	11.18	1.08
Brahms	2649	5.82	3.04	1.91	4.17	1.93	2.16
Tesla	15370	6.56	5.58	1.17	12.95	7.15	1.81
CDF	24422	14.81	4.31	3.43	20.94	5.85	3.57
Minos_near	30988	30.93	20.99	1.47	21.57	13.70	1.57
BTeVEcal	52	1.57	1.08	1.45	1.78	0.73	2.43
BTeV	295310	45.27	25.88	1.75	197.06	26.83	7.34
CMSEcal	251713	5.60	1.81	3.09	5.69	1.74	3.27
CMS	1166310	33.57	8.76	3.83	39.09	24.98	1.56
LHCb	1533488	7.98	6.75	1.18	12.58	2.89	4.35
Alice	3080198	11.50	8.63	1.33	11.45	7.28	1.57
Atlas	29046966	8.90	9.94	0.89	32.48	23.39	1.38



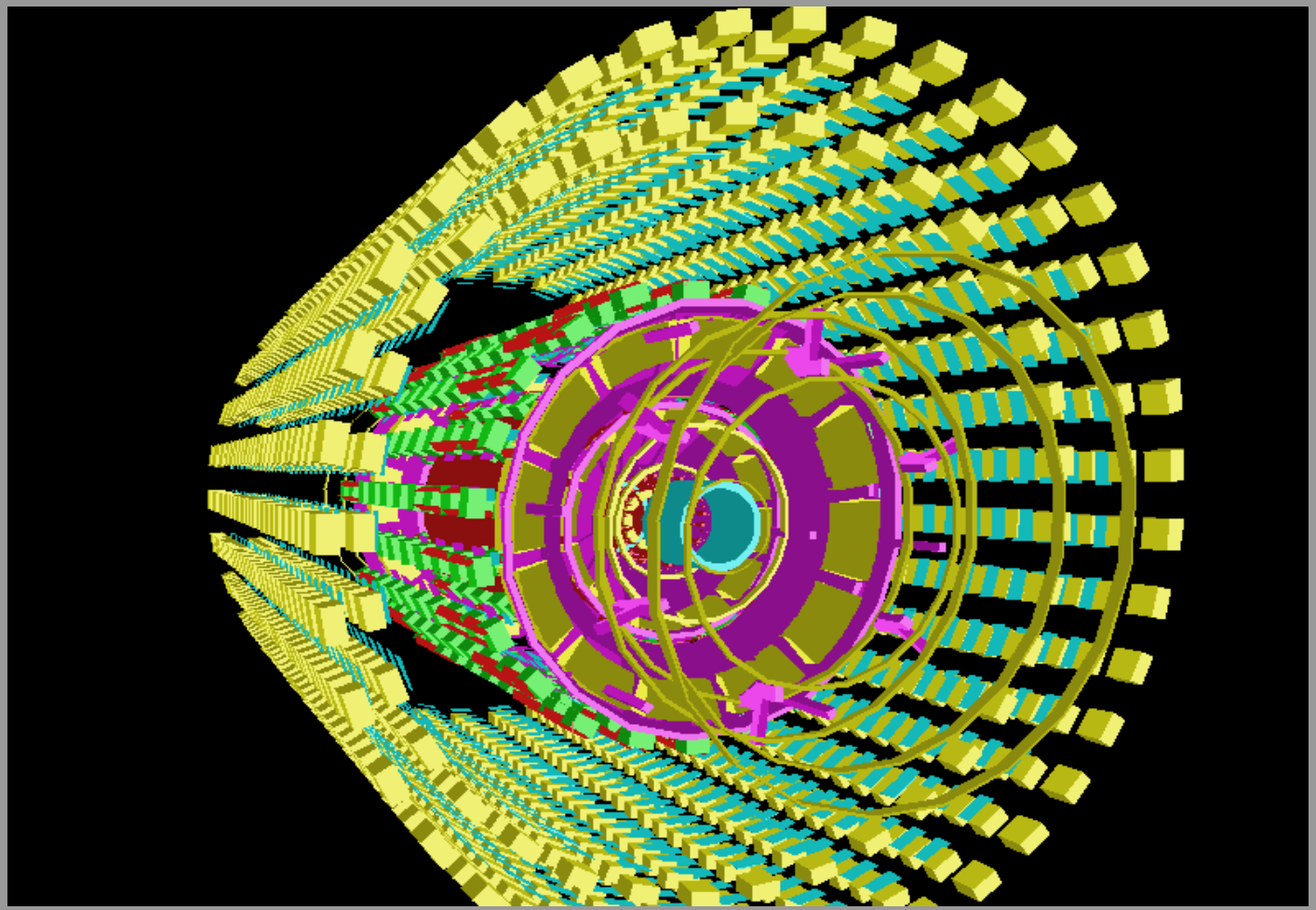
New visualization features

- Exploded views : translations of objects in the current view can be "bombed" in cartesian, cylindrical or spherical coordinates. The bomb factors on each axis can be interactively set.
- Attributes of current view and global settings can be saved in a macro and reloaded in other sessions.
- New drawing mode : "leaves down to given level" implemented

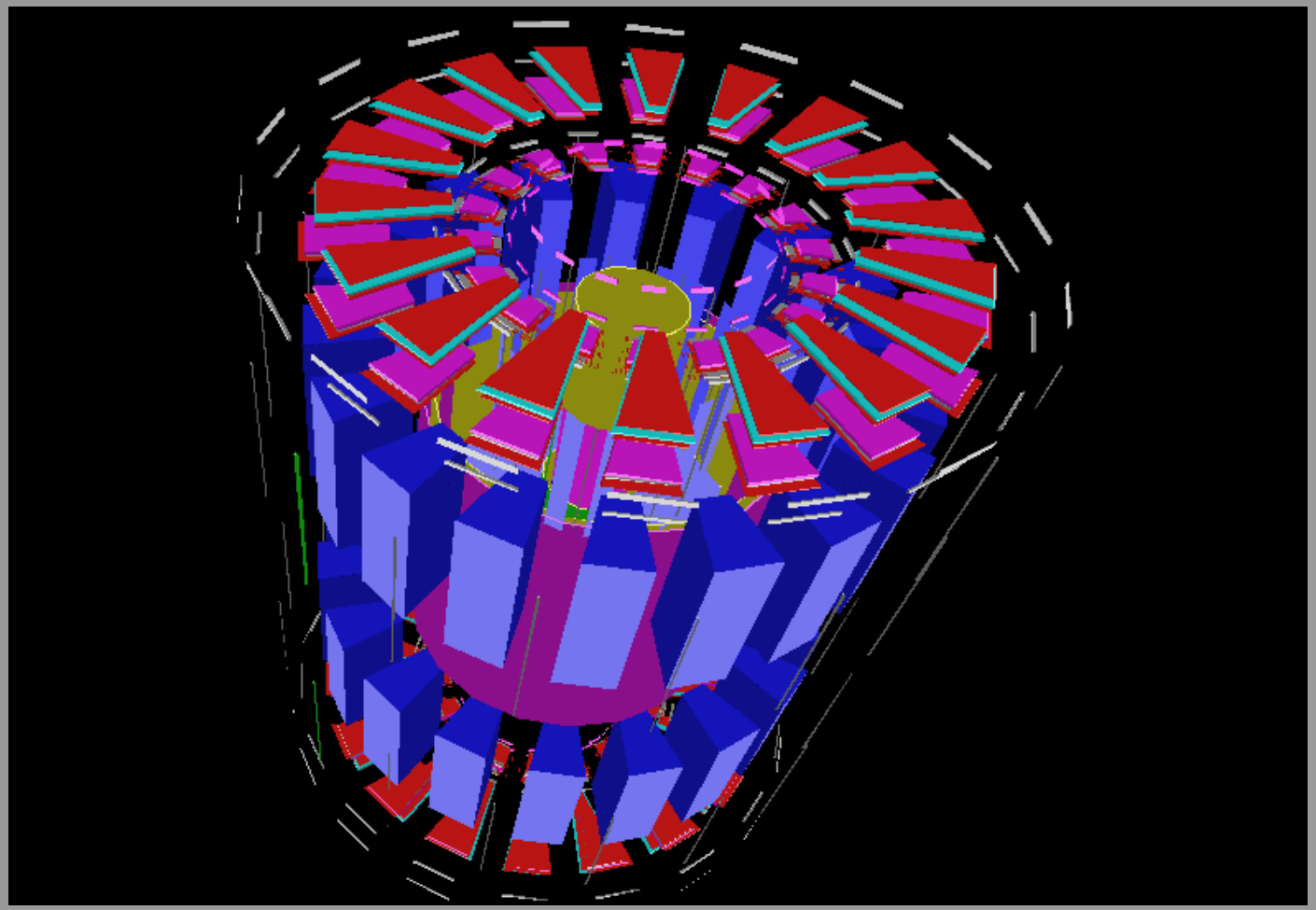
Most of ALICE



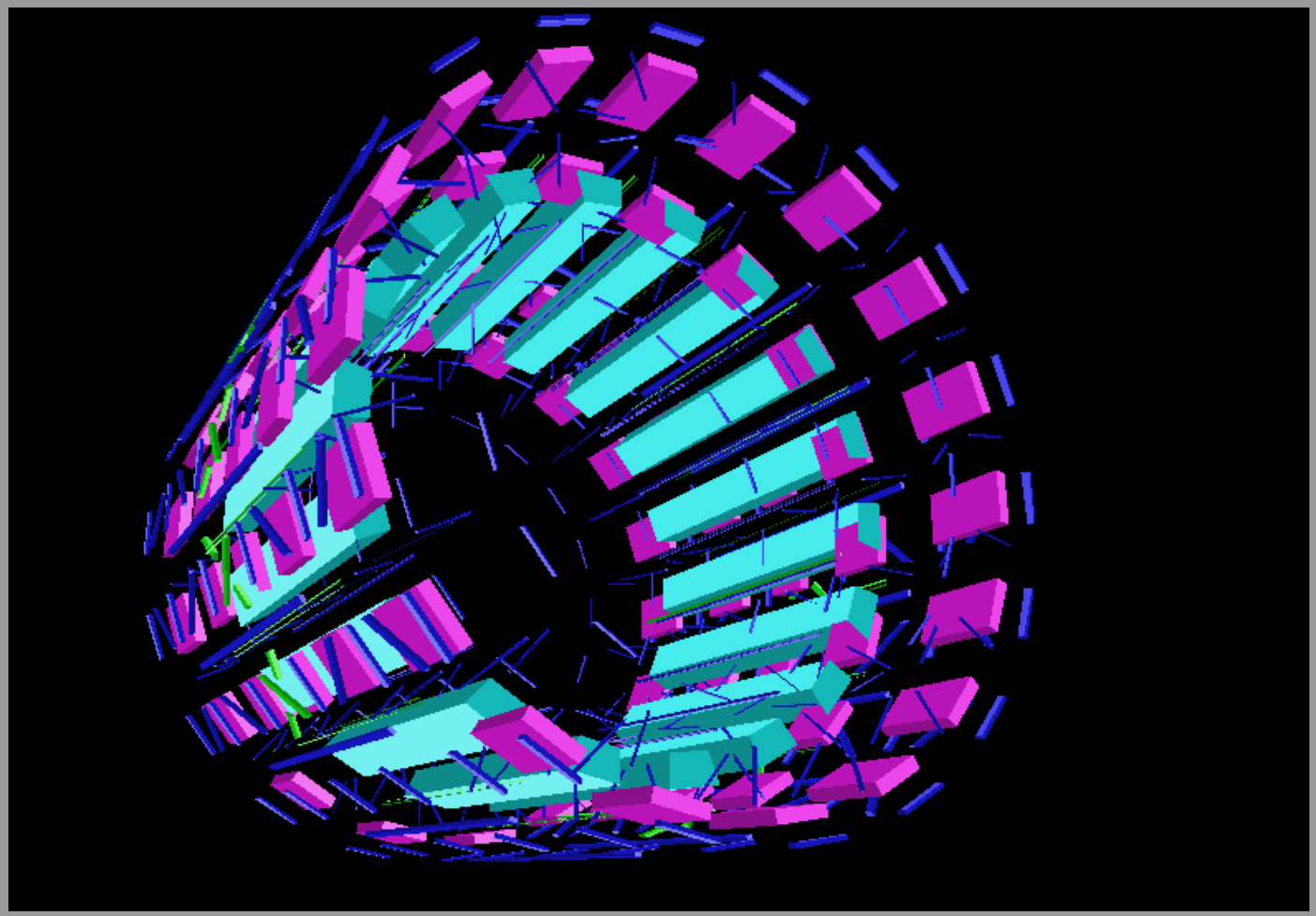
ITS exploded view



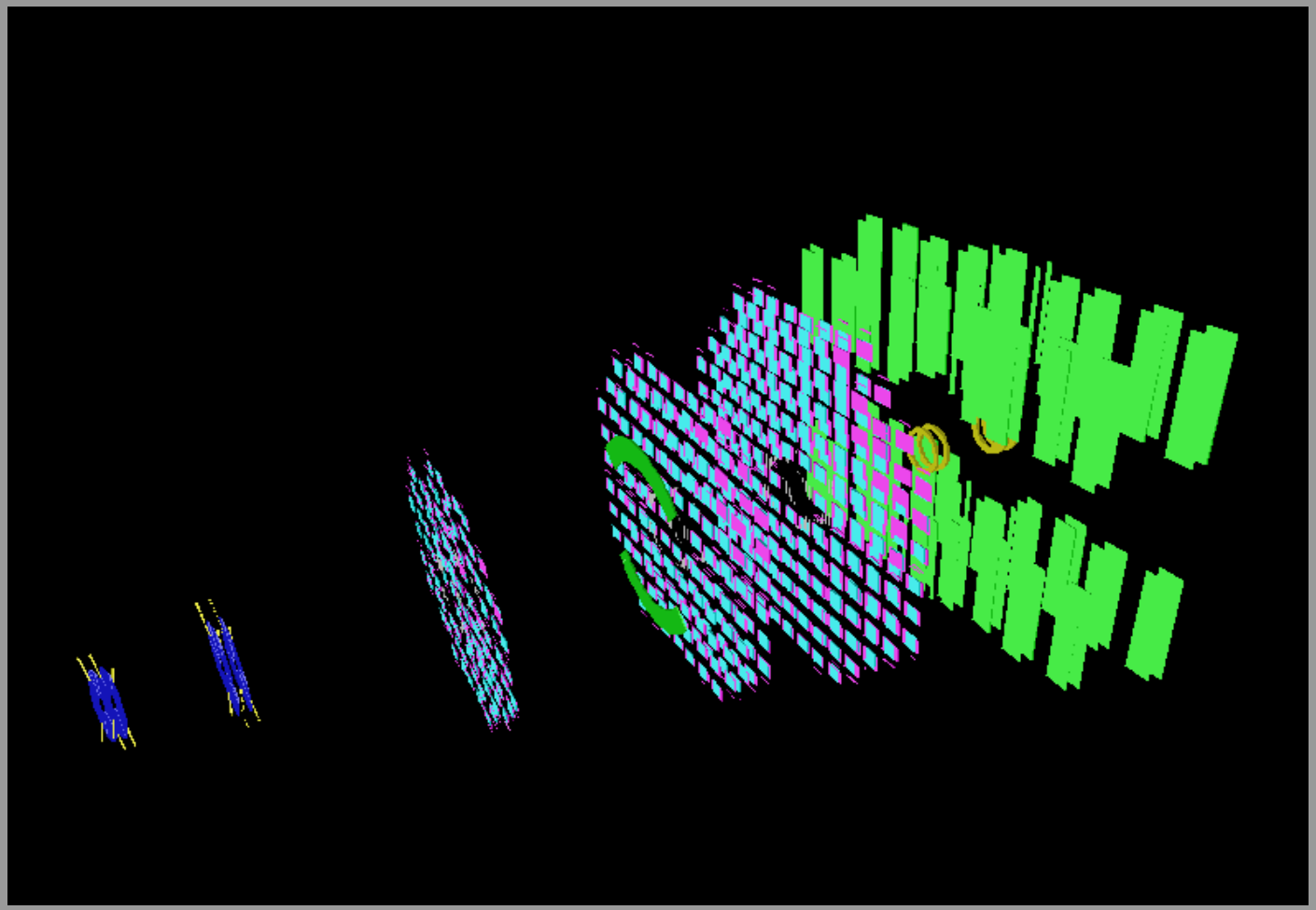
TPC exploded view



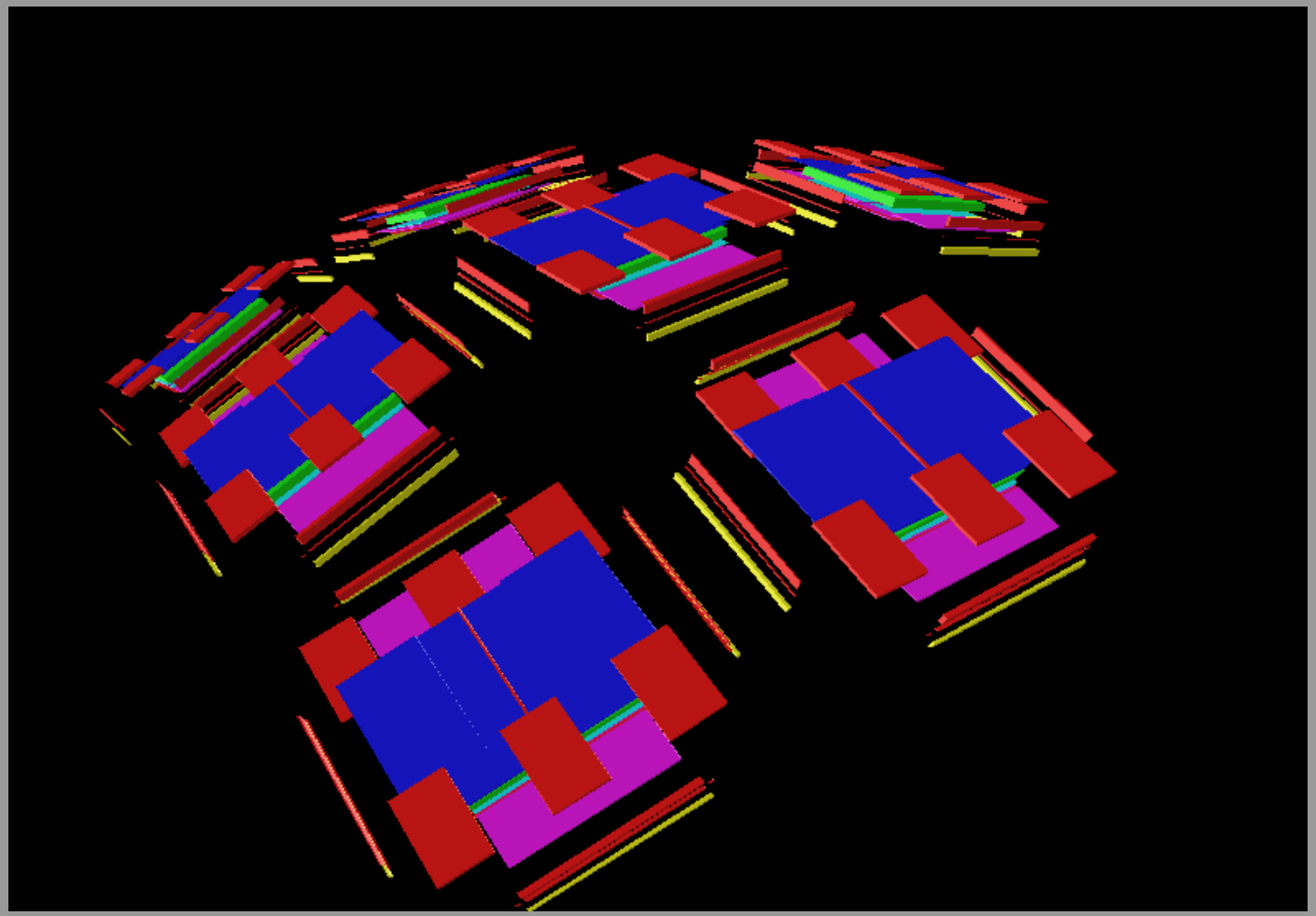
FRAME exploded view

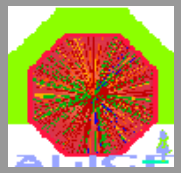


MUON exploded view



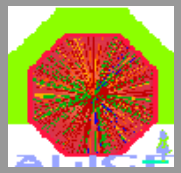
RICH exploded view





Development plans

- A lot of requests to make the modeler public have been made -> alpha release at beginning of July.
- Re-arrangement of the code, review of documentation needed
- From a given point, priorities not so easy to decide :
  - Implementation of the concept of "pluggable module" to cope with multiple versions of a geometry - mostly needed in reconstruction
  - Boolean shapes needed in order to facilitate the geometry description, but current geometry will have to be mapped then to this new feature and might take a while
  - The implementation of MC-specific trackers not a geometrical modeler task, but an interface to tracking will be needed soon
  - Visualization of tracks, hits, digits or any user definable object will be needed for event display



RTAG#7 - ALICE opening statement

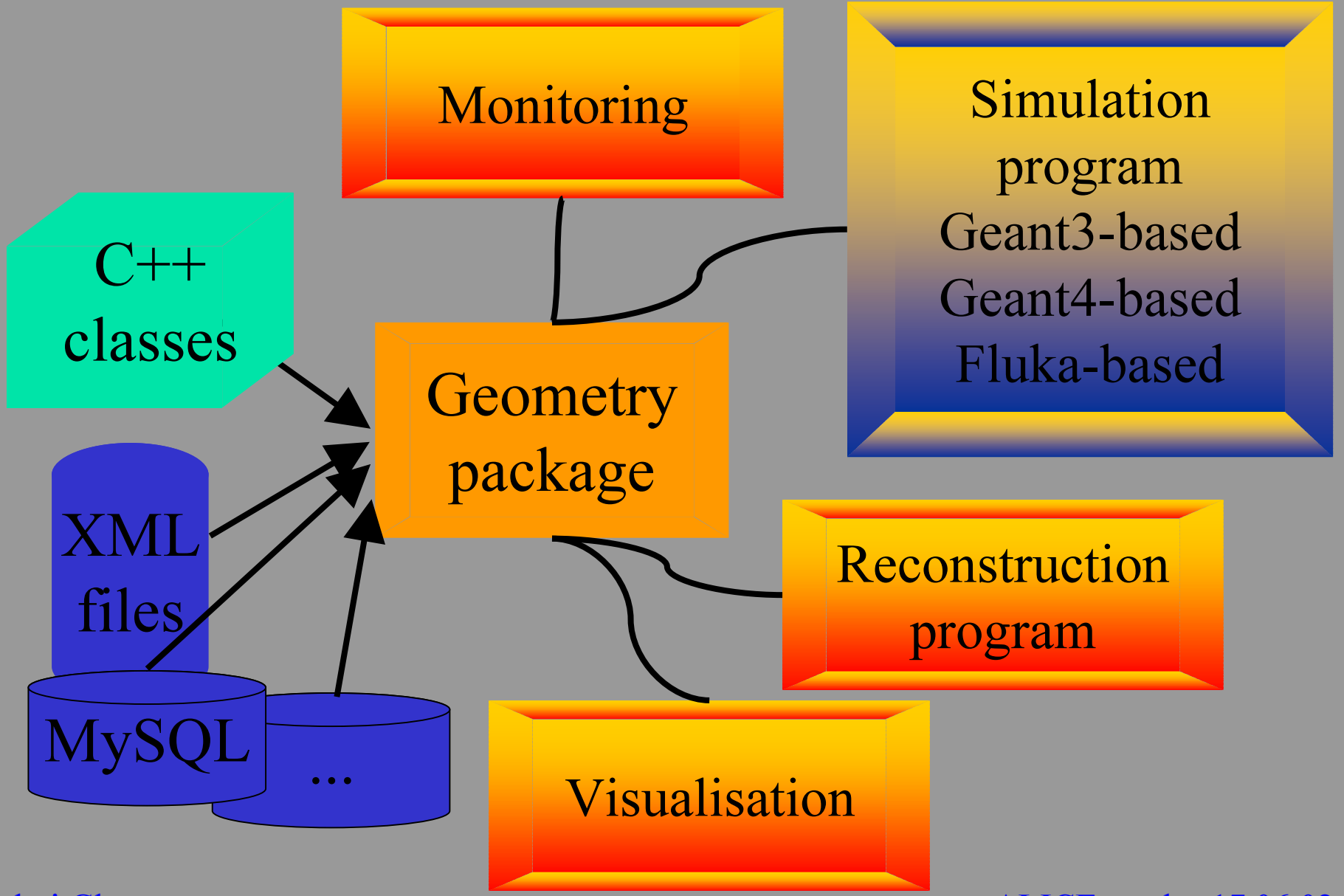
The lack of geometry tools to cope in coherent and independent way with all our needs related to simulation, reconstruction, analysis and event display - long standing issue in ALICE.

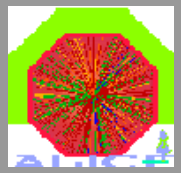
Due to incompatibilities and inconsistencies between the geometry packages of the various simulation tools we are using, we have to work with different geometries for different purposes.

ALICE off-line group decided last year to address this problem by developing a modeler that would be not only simulation independent but would also be responsible of handling all geometrical queries coming from external user code.

At present time we have the prototype of a full solution that is not ALICE dependent and that will have an alpha release within ROOT probably at the beginning of July.

General scheme





RTAG#7 - ALICE position

We have a complete solution for geometrical modeling and we are pursuing it

We think that this RTAG should have included also geometrical modeling, as the discussion will inevitably touch it, but we have accepted this restricted scope

We think we can map our geometry to any (reasonable) external representation, and we will certainly have our internal (ROOT) representation

Our modeler is a joint ROOT/ALICE project and it will be part of ROOT, so everybody will be welcome to use it.