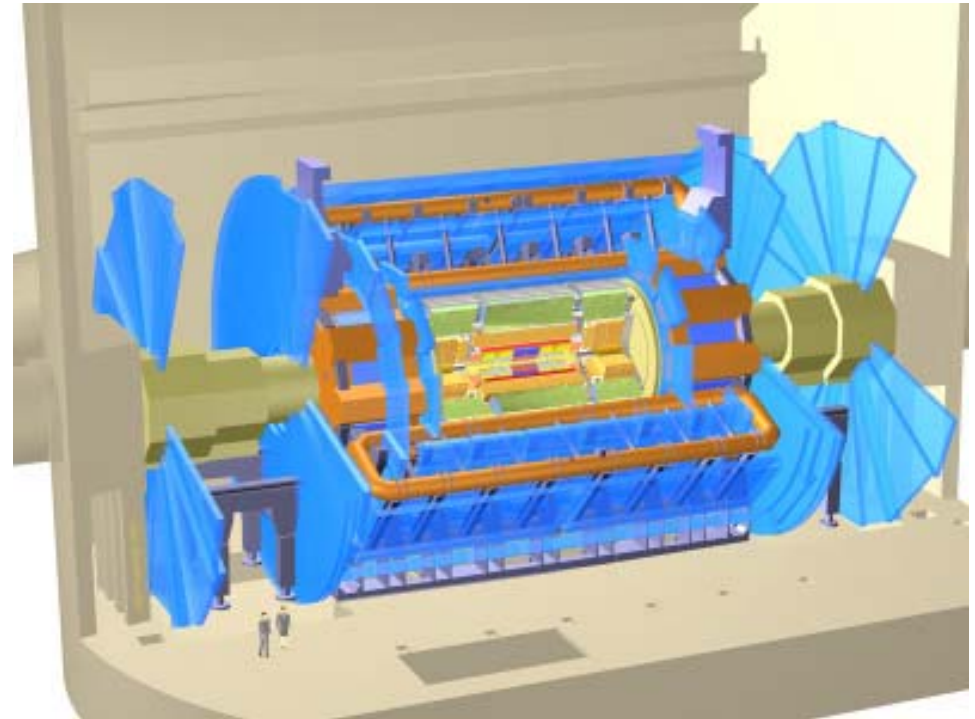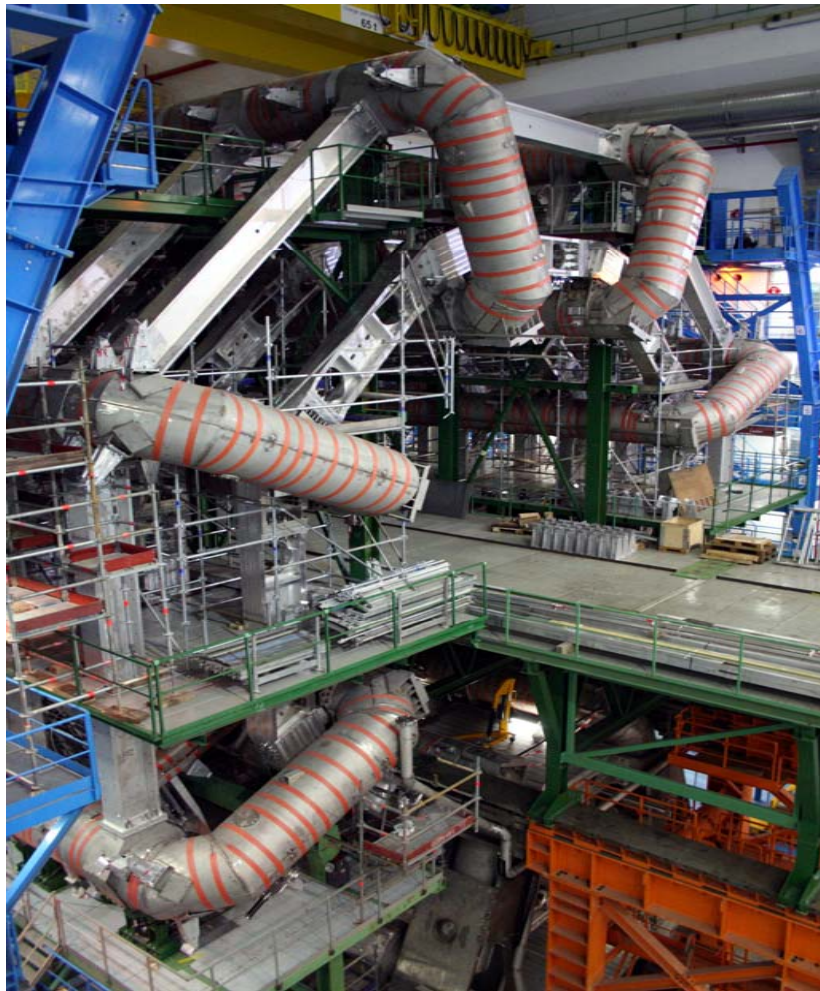# ATLAS Software Status and Plans

ATLAS Software Release 11.0.X

- ❏ **Current production release**
  - ❏ Clients are physics validation, detector commissioning, CTB, HLT
- ❏ 11.0.0 built on 21 Oct 2005
  - ❏ 11.0.1 (11 Nov), 11.0.2 (25 Nov), 11.0.3 (15 Dec), 11.0.4 (21 Jan 2006)
  - ❏ 11.0.41 (10 Feb), 11.0.42 (17 Mar)
    - ❏ Late discovery of calorimetry and Geant4 problems
  - ❏ 11.0.5 (21 Apr)
  - ❏ 11.0.6 will remain open for HLT
  - ❏ Some pressure to built it, but HLT still finding problems
- ❏ Long, slow convergence to production quality
  - ❏ Late discovery of problems
  - ❏ Stress the importance of early and repeated validation
  - ❏ Users cannot just wait until production quality achieved - they need to be actively involved in validation

ATLAS Software Release 12

❑ **Primary goals**

    ❑ Complete implementation of as-built geometry for all detectors

    ❑ Conditions DB infrastructure in place and significant usage of COOL

        ❑ Includes new COOL functionality (requires ROOT5)

    ❑ Trigger AOD EDM in place

    ❑ Implementation of MC Truth Task Force Recommendations

    ❑ Implementation of Event Tag Working Group Recommendations

    ❑ New Tracking validated and performance equal or better than alternatives

    ❑ Backwards compatibility support in place for simulated data

ATLAS Software Releases 13 Onwards

- ❑ Initially scheduled for mid-July 2006 **BUT**

- ❑ Proposal from Physics community

- ❑ Announce now that 13 is delayed to 1 December and that it will be the release used for data

- ❑ Pressure the trigger people to get their stuff into 12.0.2 (or better 12.0.1)
  - ❑ not wait for 12.0.3 as they said at the T/P week
- ❑ Identify other critical deliverables that must be put in 12.0.x. like:
  - ❑ the stuff needed for the streaming test to be proposed by the streaming task force

- ❑ Announce that 12 will be used for CSC notes
  - ❑ Primary release for CSC reconstruction and analysis tests
  - ❑ Primary release for ATLAS commissioning phase 2
  - ❑ Full support for time varying calibrations and misalignment
    - ❑ Calibration & alignment challenge (CDC) in second half 2006
  - ❑ Backwards compatibility support in place for reconstructed data
  - ❑ Preliminary support for 64-bit platforms
- ❑ Abandon release 14

News from core G4 Simulation

❑ AtlasSimulation-1.5.0 was rebuilt against G4.8.0.patch01.atlas01(improved hadronic shower)
     ❑ It is available for testing

```
tag g4.8 1.5.0 AtlasSimulation prependProject
macro PREPEND_PROJECT_AREA \
/afs/cern.ch/atlas/software/dist/trials/v-a/G4_test/
```

❑ **From G4.7.1.p01 to G4.8.0.p01**
     ❑ new implementation of the multiple scattering process. This is expected to improve physics performance, allowing to obtain reliable results while working with larger range cuts However, if the range cuts are not revised, the migration is expected to cause a big CPU time overhead (about a factor 2)

❑ G4.8.0 was tested with several different configurations:
     ❑ Default: with the new msc and ATLAS standard cuts
     ❑ Special cuts: new msc and 1mm cut for all volumes
     ❑ Msc71: plugging in g4.8.0 the msc implementation from g4.7.1
     ❑ # step length: same as "Default" but inhibiting the step limitation by the msc

❑ Setting all the production cuts to 1mm does not help in reducing the processing time

❑ The increase is due to about 180MBytes which are allocated during the G4Init step
❑ Detailed tests showed that this allocation is not due to the geometry, and is indeed closely related to the choice of the physics list

❑ Moreover, it is found that the increase is clearly correlated to the amount of material-cut couples defined in the simulation: changing this number (for example switching off some subdetectors), showed that the increase is about 1MByte per material-cut couple

❑ Further investigations will be done in close collaboration with the Geant4 developers, leading to a fix to the G4 code which will be included in the next G4 release
   ❑ MS will try it out!

❑ Truth for ionization and hadronic interactions in the beam pipe **is missing** since 11.5.0
- ❑ basically means that conversions and brems in the beam pipe are not stored and the information is NOT available to analysis
- ❑ Note: the truth info is missing, the physics is ok
- ❑ Fixed in 12.0.1

❑ Detailed study of the contribution of the beam pipe to the size of the MCTruth

© A. Di Simone

Size/evt (kB)	
Brem	0.4
Conv	4.5
Decay	3.1
Ion.	0.3
Had.	52.86

- ◆ Using rel 12.0.0
- ◆ Numbers obtained averaging on 100 Ztautau events
- ◆ Huge contribution from hadronic interactions
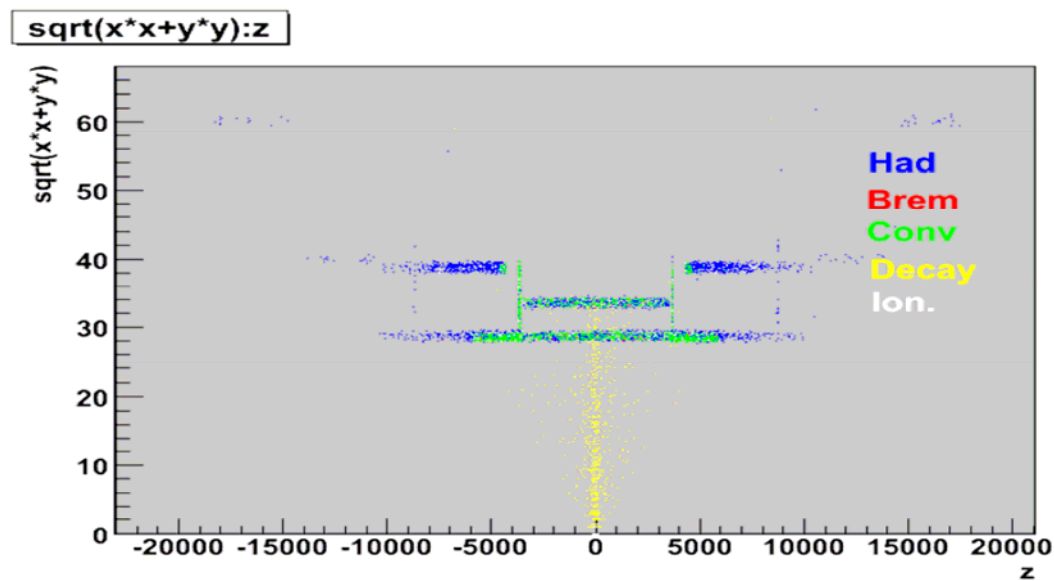
- RZ plot of MCTruth vertices from the same events used in the previous table
- Most of the hadronic interactions are in the very forward regions

Nectarios Benekos[1] , Daniela Rebuzzi[2]

[1] MPI fur Physik , [2] INFN Pavia and Pavia University

*Muon Validation Group
(G. Dedes, L. Kashif, M. Schott)*

Muon Layouts   *© in collaboration with the Muon DD people*

- **MuonSpectrometer-R.01.01.Initial.Light (R)**
  - Nominal geometry, symmetric description
  - w.r.t layout Q.02 (Rome layout): inert material description
  - Muon default database in DetDescrVersion='ATLAS-DC3-05'
  - **Validation : OK**

- **MuonSpectrometer-R.01.01.Initial.Light_Egg (R')**
  - egg shape description (7mm maximum for sector 5)
 - No mirroring
  - **Validation: Pending**

    the last measurement in the cavern about the asymmetry of the toroid barrel (7mm in the database) seems much better (<4mm?) + physics studies on Z→μμ show no big distortion of the physics observables

    Light *means small corrections to avoid clashes between:*
    - ✓ *chamber - chamber for EI*
    - ✓ *BIS - cryostat*

Muon Layouts

- MuonSpectrometer-R.01.01.Initial.Light_Egg_Rndm (R")

  - egg shape + chambers shifted ($<\sigma>$=1mm) & tilted ($<\sigma>$= 1mrd) randomly
    $\rightarrow$ first use of "A-lines" alignment information
  - but NO: small & big wheel, saddle, MDT support, CSC support, services
  - No mirroring
  - **Validation:**
    - Problem of asymmetry between Z+/Z- (solved)
    - Accuracy level of primary numbers (AMDB vs Oracle):
      still ~50 microns mis-positioning
    - Checks on hits and digits ongoing (see later)
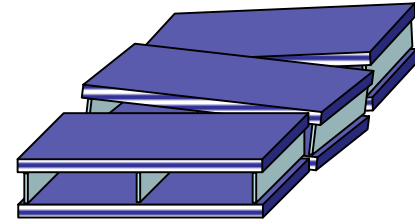
To run the **simulation** with the **as-built detector**, include in the jobO:

SimFlags.GeoModelMuonVersion.set_Value(
 'MuonSpectrometer R.01.01.Initial.Light_Egg') for R'
SimFlags.GeoModelMuonVersion.set_Value(
 'MuonSpectrometer-R.01.01.Initial.Light_Egg_Rndm') for R"

Other databases under preparation but not yet in Oracle
See L. Chevalier's talk @http://agenda.cern.ch/fullAgenda.php?ida=a062703

Clash Status for R and R"

- Recursive test on R_light and R''_light with 12.1.0 nigthlies and MuonGeoModel-00-02-66 (last tag)

	R_light	R''_light
Overlappings	1359	1470
Overshootings	1773	1789

- Few known remaining clashes, pending general GeoModel functionality
  - Details @ http://agenda.cern.ch/fullAgenda.php?ida=a062703
- RTT for the recursive test foreseen (at chamber level?)

Where we started from	Q02	R-01-01.Initial
GeomTest Errors	260020	272439
Overlapping daughter volumes	16852	266673
Overshooting daughter volume	6450	5763
SolidProblems	236718	3

Clash busting documentation @https://twiki.cern.ch/twiki/bin/view/Atlas/MuonGeometryDC3

Muon Hit and Digit Validation
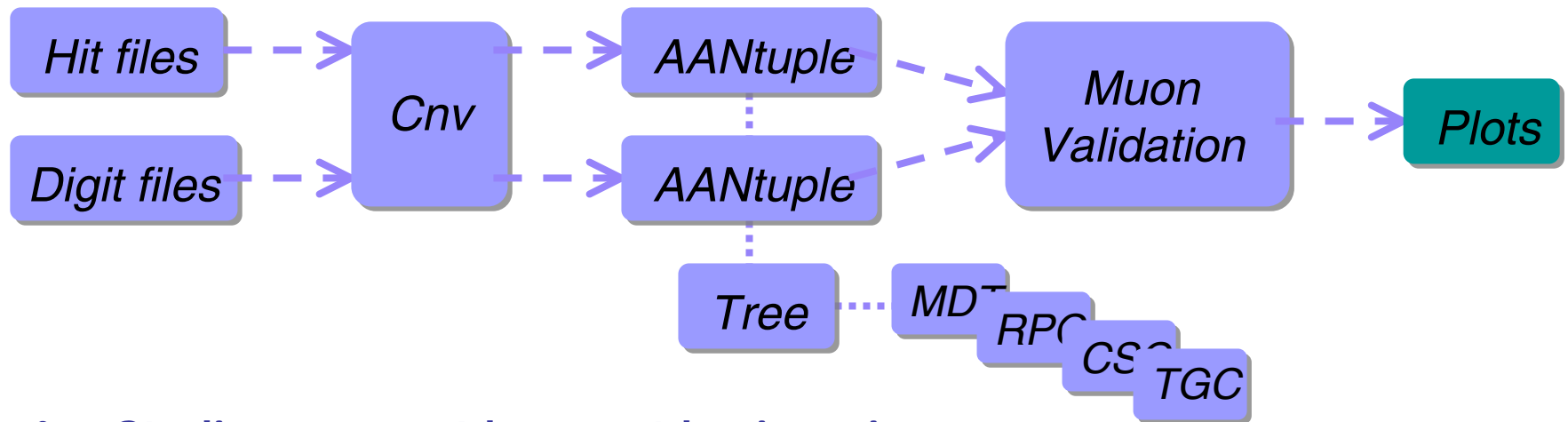
- **Studies on event by event basis, using**
  - # of hits/digits as a function of eta, phi, stationName, etc.
  - Hits/digits tube by tube
  - Hits/digits residuals (radius from digits – drift radius from hits)
  - Zoom on a given chamber selectable via jobO
  - ...

- **Motivations (some of)**
  - Validate the "step" between Simulation and Digitization
  - Check for regions with inefficiencies at Simulation or Digitization level, using small standardized single muon samples
 - Compare different databases and/or releases

© G. Dedes

comparison of MDT_hits in R and R" - single muons Pt=10GeV

Before the fix on the z+/z- asymmetry
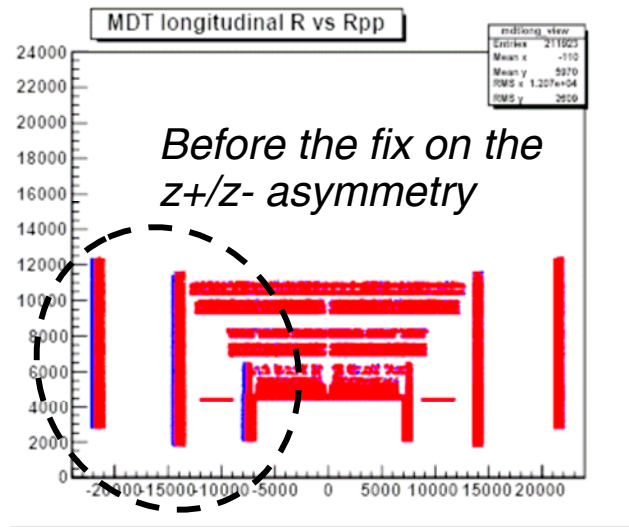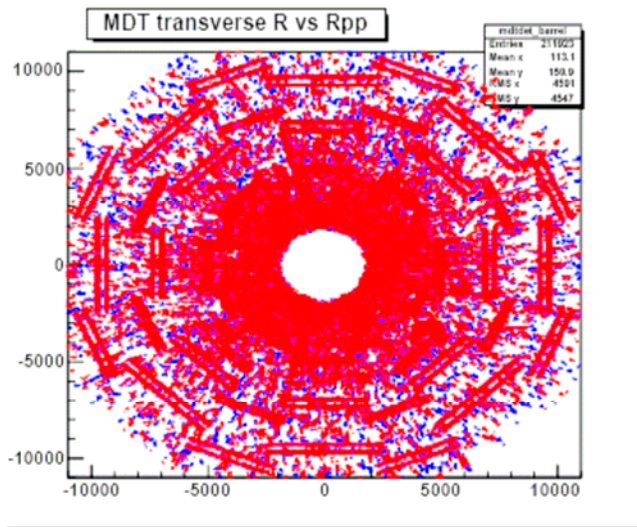
It is really possible to track down problems or inefficiencies in simulation and digitization and if necessary to point down to single tubes or even hit positions

comparison of TGC_hits in R and R" - single muons Pt=10GeV

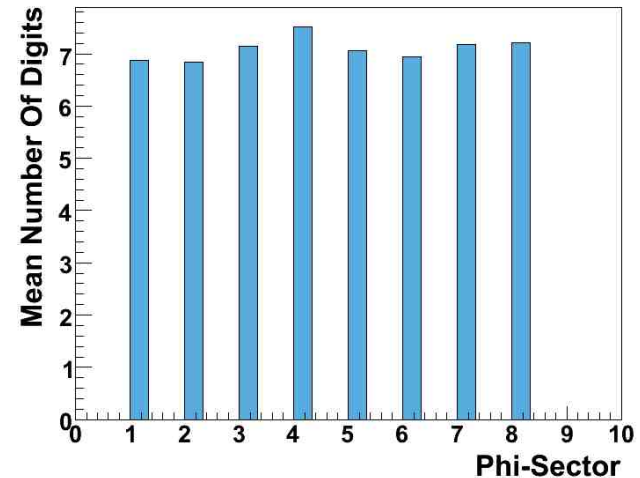*TGCs in R" have an area of inactivity – under investigation*

© M. Schott

$R - R"$

$R - R"$
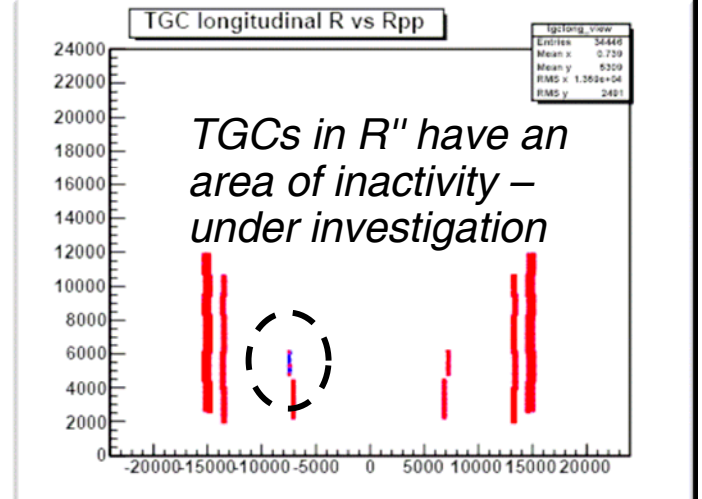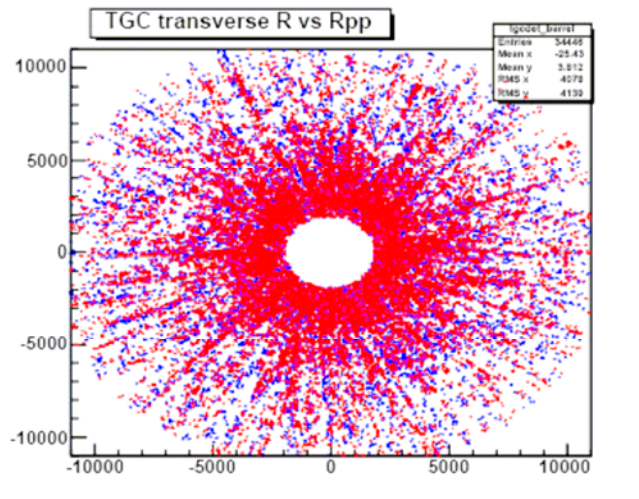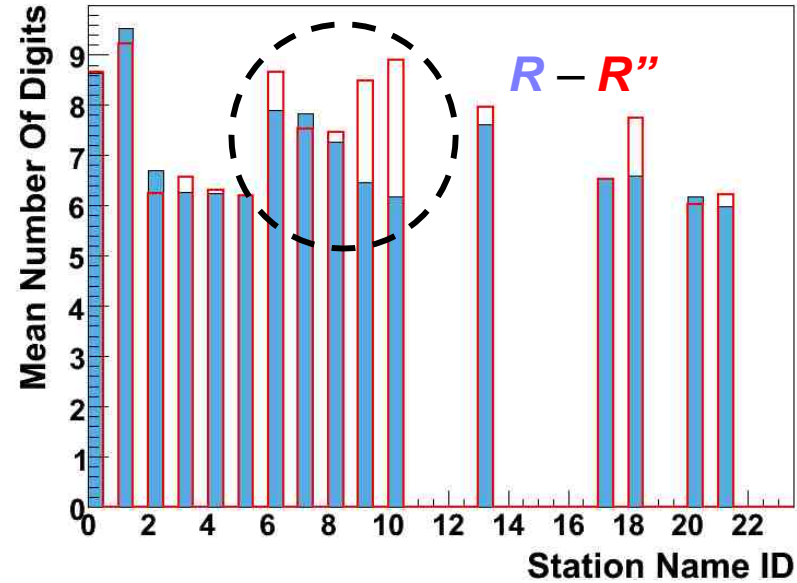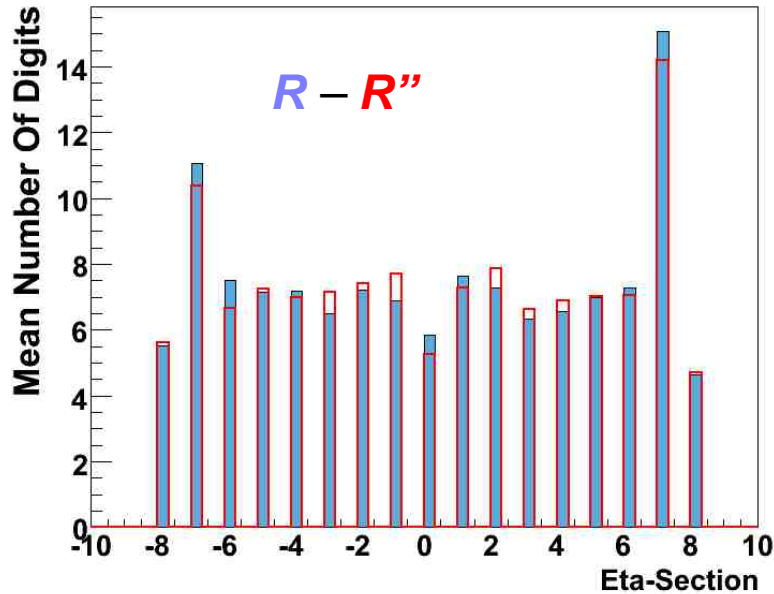
PRELIMINARY!

There could be a problem on BOF-BOG

- but we do not have yet error bars (next step in the implementation)

© *L. Kashif*

- **Chamber vertex (eight corners)**
  - For each multilayer of each chamber, extract the dimensions and global coordinates of the center from MuonGeoModel
  - Determine coordinates of multilayer corners for desired geometry version (in global coordinates)
  - ✓ Geometry version and muon station can be specified in jobOption

- **Motivations**
  - Direct comparison of MuonGeoModel against amdb description: the eight corner ASCII file can be passed to PERSINT
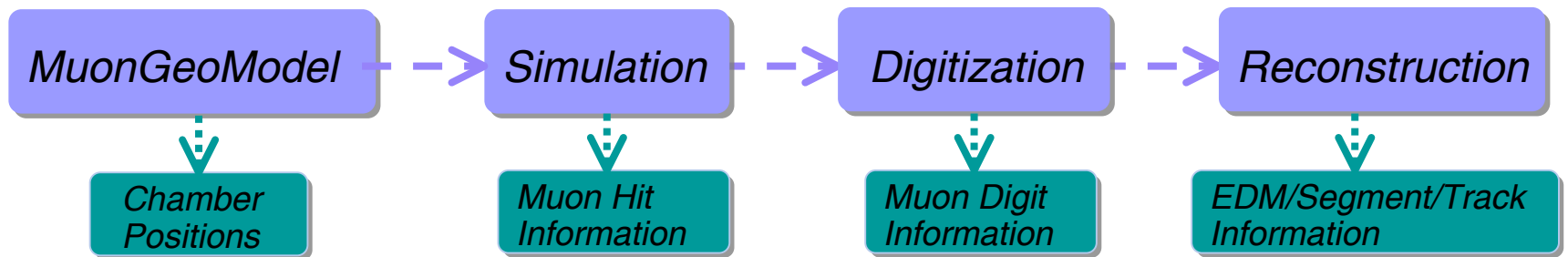
  amdb ┈▶ Oracle ┈▶ MGM ┈▶ geant4
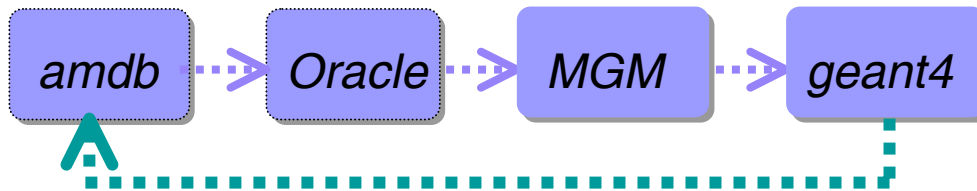
  - From visual inspection of the numbers, translations and chamber shape, distortions O(few mm) in R''_light with respect to R_ligth can be observed and checked

IP

1

2

4

3

BOS multilayer

z

5

8

7
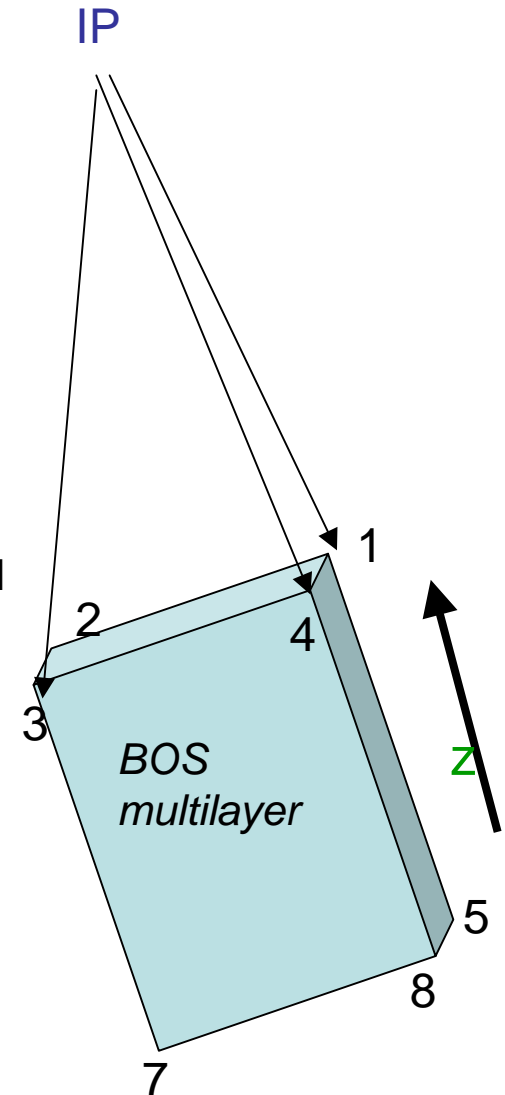
Muon Validation

- **Status of the Muon Hits/Digit and chamber position validation**
  - Validation tests ongoing on R and R″ layout
  - Code under final revision, to be commited in cvs under MuonSpectrometer/ MuonValidation by the end of June
  - RTT will be implemented immediately after (mid July)

- Using the same approach, **PrePrawData and track segment validation** under preparation
  - To complete the full chain validation
  - Code under developement

MuonGeoModel	→	*Simulation*	→	*Digitization*	→	*Reconstruction*

| *Chamber Positions*	*Muon Hit Information*	*Muon Digit Information*	*EDM/Segment/Track Information*

- **Documentation**
  - *http://atlas-sw.cern.ch/cgi-bin/viewcvs-atlas.cgi/offline/MuonSpectrometer/MuonValidation/*
  - *Weekly reports at the MuonSW meeting and after each athena update/release*

Muon Cosmic Simulation

© in collaboration with R. Nicolaidou and C. Guyot

- **T0 Svc by Rob McPherson** *which*

  - *defines a common time reference for all detectors: virtual trigger point record of the first particle that enters the ATLAS Cavern (for cosmic muons, the TTR record) on the yz plane that can be recovered during digitization and reconstruction*

- **To be implemented by us:**

  - *Retrieving of the T0 Svc at the simulation level (in dedicated SD classes)*

  - *Using it to calculate the tof w.r.t. the trigger counter point*
    - *We should manage extrapolations backward in time*

- **Timescale:** *end of June implementation and first validation*

SURFACE

CAVERN BOUNDARY

TTR SURFACE

RPC

TILE

Real

Monte Carlo
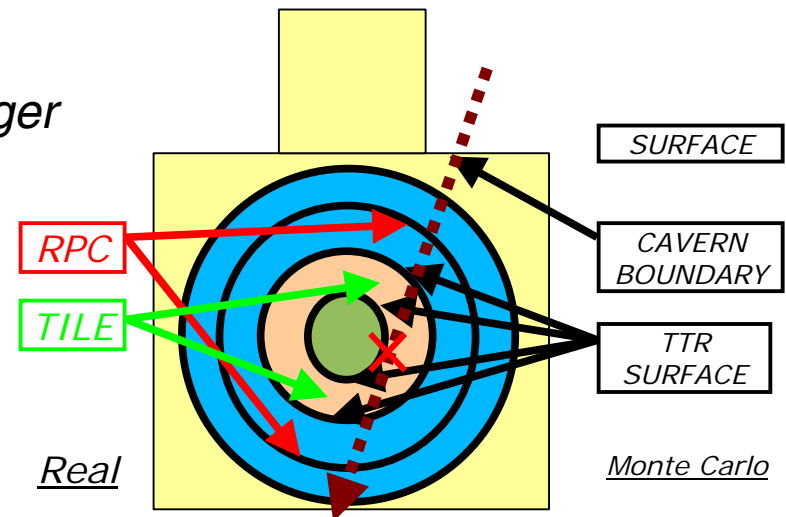
Summary and Plans

- A lot of validation work ongoing on the current Muon layouts
  - Hits and digits
  - Chamber position
  - PrepRawData and Track segments in preparation

- Towards a Realistic Detector Simulation
  - Mis-align at Simulation, but not only: Wire-Sag
    - First Implementation in Digitization for the endcaps
      http://agenda.cern.ch/fullAgenda.php?ida=a062703

Ability to simulate a realistic, misaligned (at simulation level), detector
  – No crashes seen when simulating with misalignments

- Many areas of activity for the Muon Simulation
  - Cosmic simulation
  - Cavern background simulation

- **Major Muon Simulation tasks for the summer**
  - Continued Muon Simulation (and Software) validation
  - CB simulation and support to the cosmic commissioning
  - Continued validation of the realistic Simulation and of Mis-Calibration Effects
    - Wire-Sag Validation, B-Field Effects, etc.

Thanks to the good collaboration work of all the muon group!

Cosmic data taking last week

Sector 13: Last week very successful (see E. Pasqualucci's talk on DAQ DCS online meeting)

Experimental setup:

3 BML's and 3 BOL's, side A connected and flushed since a few days with fresh gas.

RPC's of the BML's and BOL's equipped as well.

Runs taken:

- 1 run with external trigger a scintillator (rate ~1 Hz) 2040 events
- 1 run triggering on RPCs (rate ~50 Hz) big statistics
- Standalone RPC cosmic runs (see F. Pastore's talk)

Reconstruction of these runs was done very quickly (MuonByteStream package updated)

Next step: Waiting for a combined RPC+MDT runs in the next couple of weeks.

viel Gluck

Nektarios Benekos MPI