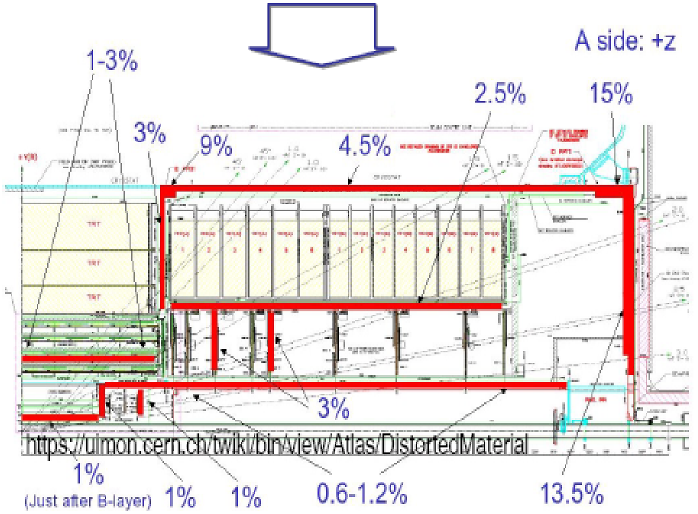
ATLAS Physics S/W Validation

- **ATLAS Software Release 12 major ingredient of CSC exercise**
  - Will be used to simulate and reconstruction 20M Physics events + 15M single particle events
  - Input data for CSC Notes
  - Production exercises computing system
  - Note that last large scale production with extensive physics use was 'Rome' about 1.5 years ago.
- **What is new in Rel12**
  - Improved detector description (more realism)
  - Improved reconstruction: dealing with more realistic detector description & general improvements in reconstruction algorithms
  - Separation of database information from software infrastructure for geometry
  - We can now change the detector geometry in simulation & reconstruction without deploying a new software release.
  - We can run multiple configuration simultaneously.
  - **Complete trigger information**
    - Enables trigger aware analysis

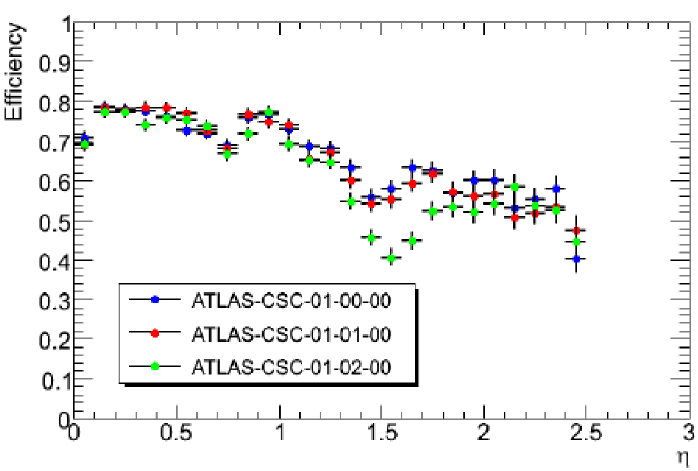
- Databases:
  - ATLAS-CSC-01-00-00 → new mag field, nominal geometry
  - ATLAS-CSC-01-01-00 → new mag field, misaligned geometry
  - ATLAS-CSC-01-02-00 → new mag field, misaligned geometry, Inner Detector additional materials

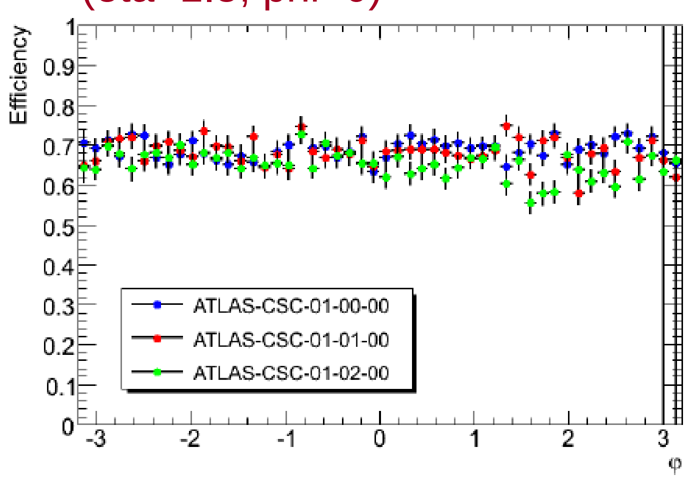


Additional materials

- *in phi>0 only*
- *not symmetric in z*
- *up to 15% additional X_0*

Efficiency drops in ATLAS-CSC-01-02-00 in the regions where additional material is (eta~1.5, phi>0)



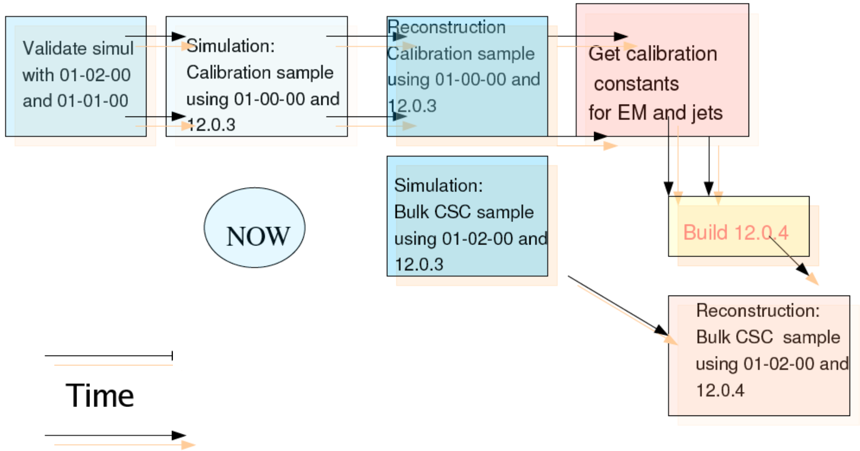


- Reconstruction efficiency for the three different layouts

Validation of Rel12 Timeline

- Before we spend ~1000 CPU-years simulating & reconstructing events we first need to carefully check that output is sensible & useful for physics studies
- Overall plan – Staged approach
  - First validate simulation, produce release 12.0.X
  - Start bulk simulation production (takes most time by far)
  - Meanwhile validate reconstruction, produce release 12.0.X+n
  - Start bulk reconstruction

Where are here now



  - Calibration constants used in 12.0.4 processing obtained from simulation with ideal geometry / no distortions
    but applied to reconstruction data with misalignment / material distortions

Physics Validation Procedure

- Typical timeline between release build and start of physics validation
  - Day 0 – Release X.0.Y is built
  - Day 2 – Kit for release X.0.Y is built
  - Day 3 – Cache (1) for release is built
    - Contains latest version of production scripts etc…
  - Day 4 – Deploy release & cache on all grid sites
  - Day 5 – Start 'validation sample' jobs.
    - Selection of small samples (150Kevt in total) that aims to probe all detector issues
  - Day 7 – First results from validation sample run. Announce that sample are available.
  - Day 8 – People from combined performance groups start analyzing analyze data
  - Day 12 – Reports at biweekly validation meeting. Feedback any problems to SW community
  - Day 15 – SW Make produce patches as necessary
- Full cycle time = 2-3 weeks.
- First low-level feedback from production (crashes / ERRORS) after 1 week

Production of Release 12.0.6 (Reco)

- Reconstruction software is essentially ready now (modulo few days) from production
- Time of availability of CSC samples according to production capacity
- Reconstruction priority is higher than simulation (evgen is highest)
- Reconstruction of existing simulation would take 12 days if we were limited by CPU. This will be a very good test of data access
- Severe problems with storage on grid
- Total ESD data volume comparable to total RDO volume.
- AOD ~25% of ESD, but they will be replicated
- Total amount of CSC data will triple in the next few weeks

Release 13 Primary Goals & Deliverables

- Primary goals
  - Conclusion of CSC Physics Studies that can't be done with release 12
  - Phase II Calibration Data Challenge (CDC) Studies
  - Validation of Geant 4.8 and Fast Shower Parameterization
  - ATLAS Combined Cosmics
  - Initial Stages of Final Dress Rehearsal (FDR)
- Primary deliverables
  - Geant 4.8
  - Full EDM backwards compatibility (schema evolution)
    - "Transient/persistent separation"
  - End-user Analysis Model
  - Flexible/hierarchical job configuration ("Configurables"; Gaudi v19)
  - Distributed Conditions DB support (LCG_50)
  - Enhanced ByteStream Support (lumi blocks etc.)
  - Support for SLC4

Data Preparation and Validation

Assessing the global quality of our data is crucial for commissioning and operating the ATLAS detector.

- Overview of data quality at ATLAS
- Monitoring data at Tier 0
- Monitoring at Point 1
- Upcoming tests and goals
- Access to DQ assessments in Athena

Offline monitoring is needed for many processes in many environments:

- Use a portable, lightweight common infrastructure
- Standardize Athena-based histogram production
- Run anywhere, from computing tier to laptop
- Provide easy storage/retrieval of references and results

The data-quality (DQ) group is a forum for joint discussion and validation of subdetectors, combined performance, and physics.

- Arrive at global definitions of data quality
- Share expertise, tools, and ideas
- Identify gaps in monitoring and knowledge (*e.g.*, at system boundaries)

❑In this scope a MuonDataValidation package is developed
❑(G.Dedes - M.Schott - NB)

The general purpose of the this package is to validate the muon reconstruction in different ways:
- **The first approach is based on MC_Truth information and determines efficiencies, fake-rates and resolution for different muon reconstruction algorithms,**
- **The second approach does not depend on MC but uses the Z-Boson → $\mu\mu$ to determine the MS Performance within data**

- Talk given on Muon Validation & Performance / Data Quality Assessment meeting of last Muonweek

Muon spectrometer alignment:

Alignment with tracks algorithms exercised with cosmics data and CDC simulation samples with "as-built" geometry:

- Reference geometry from cosmics and toroid field off runs
- **Studies on Muon Spectro/ID are in progress (Tony Liss, NB)**
  - ✓First results expected soon

ARTEMIS-RTN

Main authors:
Rosy Nikolaidou, Nikos Konstantinidis,NB

http://artemis.web.cern.ch/artemis/

- Duration 4 years
  - From 1/10/2006 to 1/10/2010
- 13 persons will be financed from the project
  - 7 post-docs for 2 years and 6 PhD students for 3 years
- Overall cost ~2.7 M Euros
  - 70% of it corresponds to the salaries of the 13 persons that will be financed from the project
  - **At MPI : ~ 400K Euros**
    - **2 posts (1PhD, 1 Post-Doc) have already advertised at various sites**
- Scientific and training aspects of the project equally important

Scientific aspects of ARTEMIS

Research plan divided in 3 work packages:

- **1st work package: Optimization of ATLAS performance**
  - **1.a Trigger Performance**
  - **1.b Calorimetry and jet calibration**
  - **1.c muon identification**

- **2nd work package: Measurement of Standard Model cross sections**

- **3rd work package: Direct/indirect Higgs searches and interpretation**
  - **3.a ttH**
  - **3.b WBF**
  - **3.c H$\rightarrow$4leptons**
  - **3.d Longitudinal WW boson scattering**
  - **3.e Higgs properties and interpretation of results**

Deliverables: breakdown per Institute

Project-year	Deliverable	Contractors involved
1	1.a.1	UCL
1	1.b.1	USFD, FisicaPisa
1	1.c.1	CEA
1	1.c.3	CEA,AUTH ,MPS
Project-year	**Deliverable**	**Contractors involved**
2	1.a.2	UCL, FisicaPisa,CEA,AUTH
2	1.b.2	CEA, USFD, FisicaPisa ,MPS
2	1.c.2	CEA, MPS
2	1.c.4	CEA, AUTH, MPS
2	2.1	CEA, AUTH, USFD, FisicaPisa, MPS
2	2.2	CEA, UCL, UDUR
3	1.b.3	USFD, FisicaPisa, MPS
3	3.c.1	CEA, USFD ,AUTH, MPS
3	2.3	CEA, AUTH, USFD, UDUR
3	3.a.1	UCL, UDUR
3	3.b.1	FisicaPisa, MPS
3	3.d.1	UCL, AUTH, UDUR
4	3.a.2	UCL, UDUR
4	3.b.2	FisicaPisa, UDUR
4	3.c.2	CEA, AUTH, USFD, MPS, UDUR
4	3.d.2	UCL, AUTH, UDUR
4	3.e.1	All
4	3.e.2	All

Organizational issues of ARTEMIS

IB

Name	Network partner institute
Dr. R. Nikolaidou	Saclay
Dr. C. Guyot	Saclay
Prof. J. Butterworth	UCL
Prof. C. Petridou	Thessaloniki
Dr. S. Paganis	Sheffield
Prof. V. Cavasinni	Pisa
Prof. S. Bethke	MPI
Prof. E.W.N. Glover	Durham

Responsibilities:

- ❑In charge of the implementation of the network’s scientific and training program
- ❑Revise the milestones if necessary and control the completion of deliverables
- ❑In charge of reviewing the scientific publications and appointing conference speakers (priority to ESR’s and ER’s)
- ❑Provide the reports on the activity of RTN once per year

MB

Role	Name	Network partner institute
Network Coordinator	Dr. R. Nikolaidou*	Saclay
Work Package 1	Dr. C. Roda * Dr. S. Paganis	Pisa Sheffield
Work Package 2	Dr. M. Boonekamp Prof. C. Petridou *	Saclay Thessaloniki
Work Package 3	Dr. N. Konstantinidis Dr. G. Weiglein	UCL Durham
Training **&Software**	Dr. N. Benekos	MPI