

# New Agreement Start-up

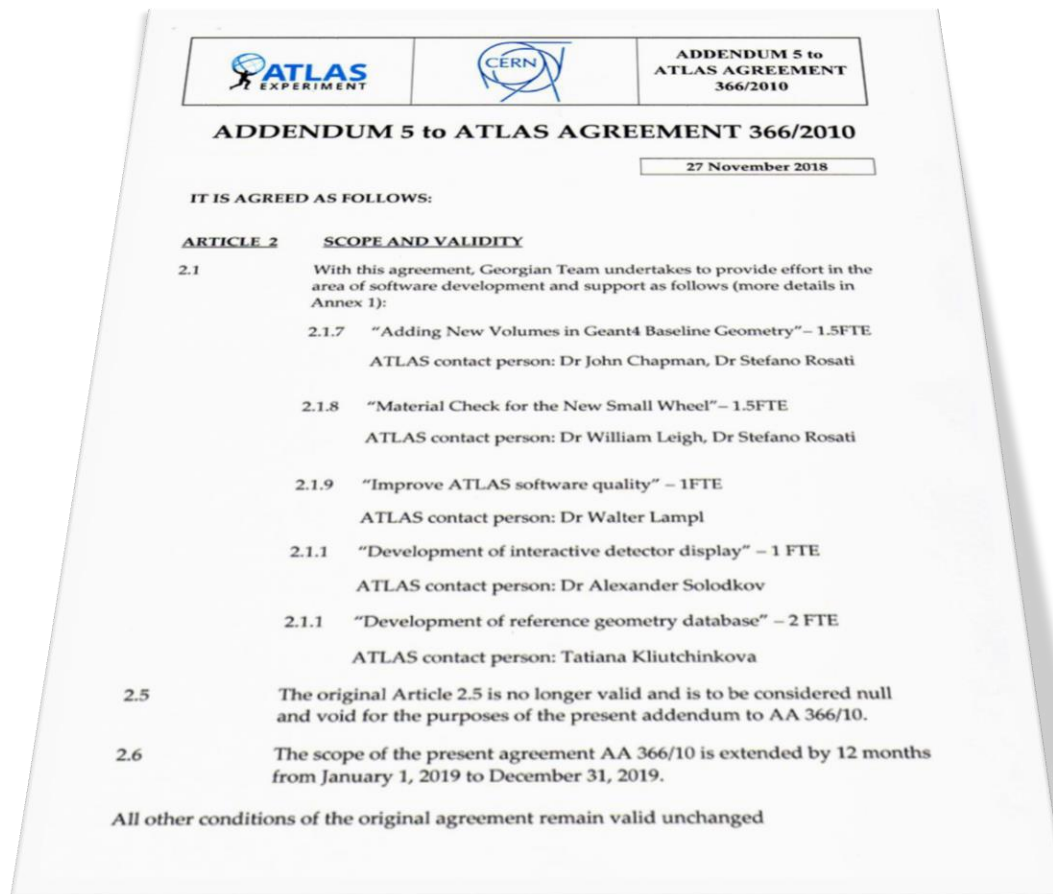
## AA366/10 Addendum-V

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# AA366/10 Addendum-V

- New Agreement has been signed for 2019
- All FTE's are in place and ready for work



- 2019 Agreement has 5 Working Packages. 3 of them concern with Simulation
- WP1: Adding New Volumes in Geant4 Baseline Geometry
- WP2: Material checks for the New Small Wheel
- WP5: Development of Reference Geometry database of ATLAS Detector

# WP1 : Adding New Volumes in G4

27 November 2018

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ATLAS AGREEMENT 366/2010

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## **ANNEX 1 DESCRIPTION OF WORK**

### **WP1: "Adding New Volumes in Geant4 Baseline Geometry"**

There are several regions of the geometry used in the Geant4 simulation where volumes representing service and support structures are missing. The efforts carried out as part of this working package include the implementation of these volumes. Moreover, volumes representing structures which undergo modifications during the detector upgrade will be changed correspondingly. The main objective is to establish a smooth workflow from design engineers to the implementation within the ATLAS athena framework. The design geometry will be extracted from the engineering database and implemented into CATIA by adding absent drawings. Subsequently the derived 3D model will be simplified while paying special attention to preserving the initial volume and weight. A transfer into XML will be performed. The result will be integrated into the simulation geometry with assistance from geometry and simulation experts. During the process the unique simulation loop developed by the Georgian team in cooperation with the ATLAS simulation team will be used. All detector systems will be considered in these studies, starting from the muon spectrometer, and in particular, the new small wheel (NSW) extending to the calorimeter and even the inner detector.

#### **• General list of Packages to be done:**

1. MM Chambers in the NSW
2. JD Services in Sector 13
3. Middle Services in GAP region
4. CALO Services
5. Platforms in missing Sectors

#### **• Deliverables:**

1. Technical reports of Simplification
2. Technical reports of Integration Conflicts Checking
3. XML code
4. Implementation in the simulation geometry

• Manpower in Georgian Team: 1.5FTE /CATIA designers, programmers

• ATLAS contact person: Dr John CHAPMAN, Dr Stefano ROSATI

Final proposal

### **WP2: "Adding New Volumes in Geant4 Baseline Geometry"**

There are several regions of the geometry used in the Geant4 simulation where volumes representing service and support structures are missing. The efforts carried out as part of this working package include the implementation of these volumes. Moreover, volumes representing structures which undergo modifications during the detector upgrade will be changed correspondingly. The main objective is to establish a smooth work flow from design engineers up to the ATLAS simulation team. The design geometry will be extracted from the engineering database and implemented into CATIA by adding absent drawings. Subsequently the derived 3D model will be simplified while paying special attention to preserving the initial volume and weight. A transfer into XML will be performed. This result is sent to the simulation team for an eventual incorporation into the simulation geometry. During the process the unique simulation loop developed by the Georgian team in cooperation with the ATLAS simulation team will be used. All detector systems will be considered in these studies, starting from the muon spectrometer extending to the calorimeter and even the inner detector.

#### **• General list of Packages to be done:**

1. JD Services in Sector 13
2. Middle Services in GAP region
3. CALO Services
4. Platforms in missing Sectors

#### **• Deliverables:**

1. Technical reports of Simplification
2. Technical reports of Integration Conflicts Checking
3. XML codes

• Manpower in Georgian Team: 1.5FTE /CATIA designers, programmers

• ATLAS contact person: Dr John CHAPMAN

Initial proposal

## WP1 : Adding New Volumes in G4

### Role of Jochen :

- Methodology was built in 2010 by Georgian team in cooperation with Laurent Chevalier, Andrea Dell'Acqua and Jochen Meyer
- Since there Jochen was responsible for 2 things: 1/ Integration conflicts checking of new XML; 2/ Modification of XML container on AFS - amdb\_simrec.xx.xx
- Later Georgian team replaced Jochen in conflicts checking
- Also we know where is XML container on AFS and it is possible for us make modifications of amdb\_simrec.xx.xx

## WP1 : Adding New Volumes in G4

So we have 2 options:

- Option #1: We are modifying XML container on AFS (amdb\_simrec.xx.xx) once new XML will be ready, discussed and agreed by simulation team or responsible contact persons
- Option #2: We put new XML on Gitlab and generate Merge request. For this we propose to create special repository on Gitlab for all modified XML's

# WP2 : Materials Checks for New Small Wheel

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## WP2: "Material checks for the New Small Wheel"

The NSW for ATLAS is being installed. It is important to have an accurate description of the passive material of the detector, which was originally implemented by the Georgian team. Starting from the parameter book to the eventual implementation within the athena framework, the Georgian team will check for consistency at each stage.

Deliverables: Monthly reports at the muon software meeting

Manpower in Georgian Team: 1.5FTE

- ATLAS contact person: Dr William LEIGHT, Dr Stefano ROSATI

Final proposal

## WP1: "Checking G4 baseline geometry for Integration conflicts and Conformity with as-built geometry"

Some analyses are showing substantial discrepancies between real data and simulation. The purpose of this working package is to investigate if the differences are caused by an inappropriate geometry representation in Geant4 compared to the design geometry available in CATIA. In case of significant disagreement the geometry used for simulation will be modified accordingly. The realization of the task by the Georgian team comprises the implementation of the CATIA geometry based on SmarTeam information and CDD drawings. Furthermore the team will compare the simulation geometry with CATIA and report the results in suitable meetings. For this step the unique simulation loop on the CATIA platform developed by the Georgian team in cooperation with the ATLAS simulation team will be used. The critical detector regions for which differences in the geometry could introduce MC/data discrepancies will be assessed and prioritized by the ATLAS simulation group. As well a collaboration with the Muon Combined Performance group is envisioned for the first time, as their studies of cavern background hits could identify such detector regions, too.

- General list of Packages to be done:
  1. Services of Magnet System in Sector 7
  2. JD Services in Sectors 7 and 9
  3. Platforms in Sector 5 and 13
  4. CALO Services
- Deliverables: Technical reports of Compare Checking
- Manpower in Georgian Team: 1.5FTE /CATIA designers, programmers
- ATLAS contact person: Dr Heather GRAY

Initial proposal

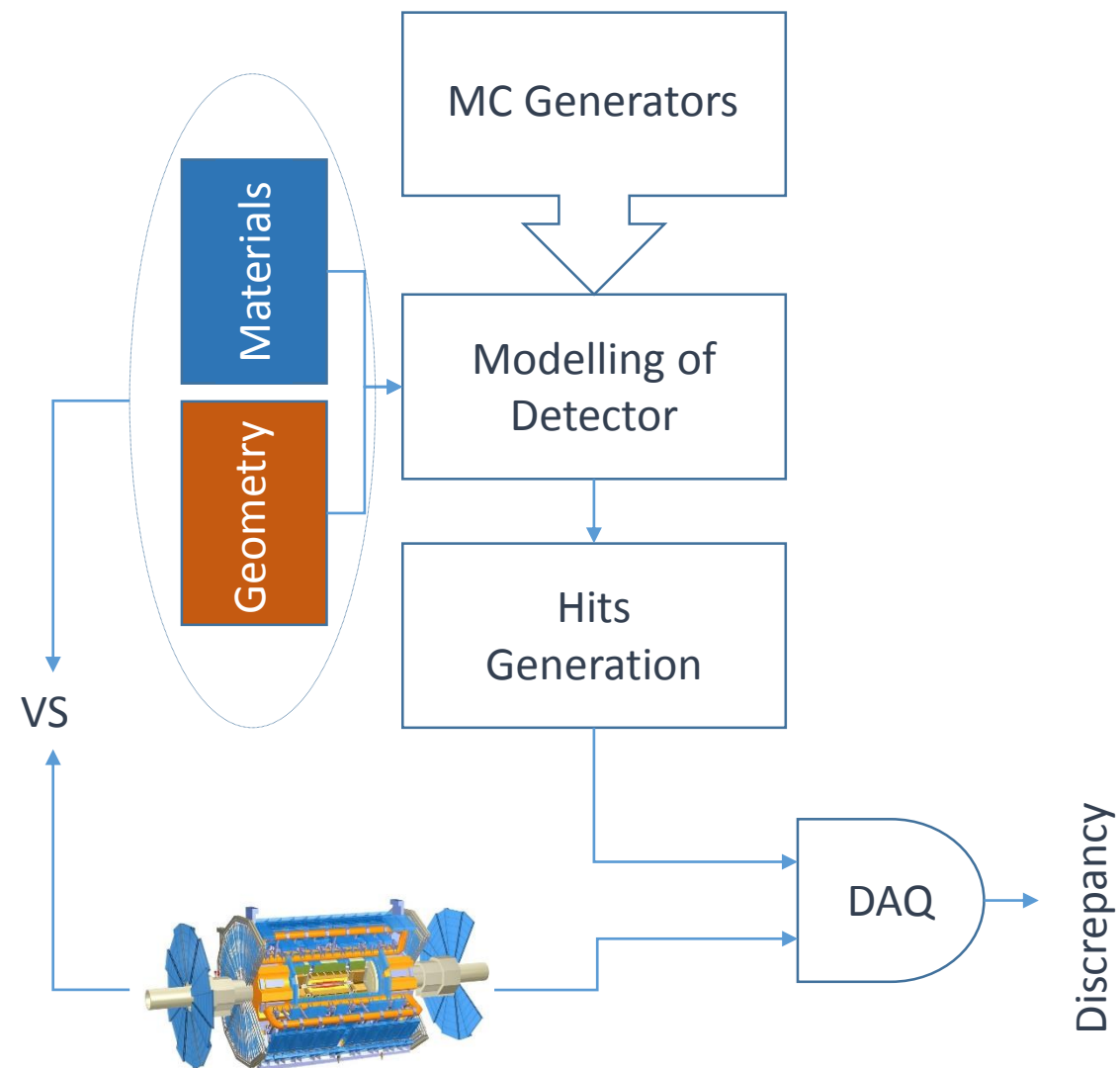
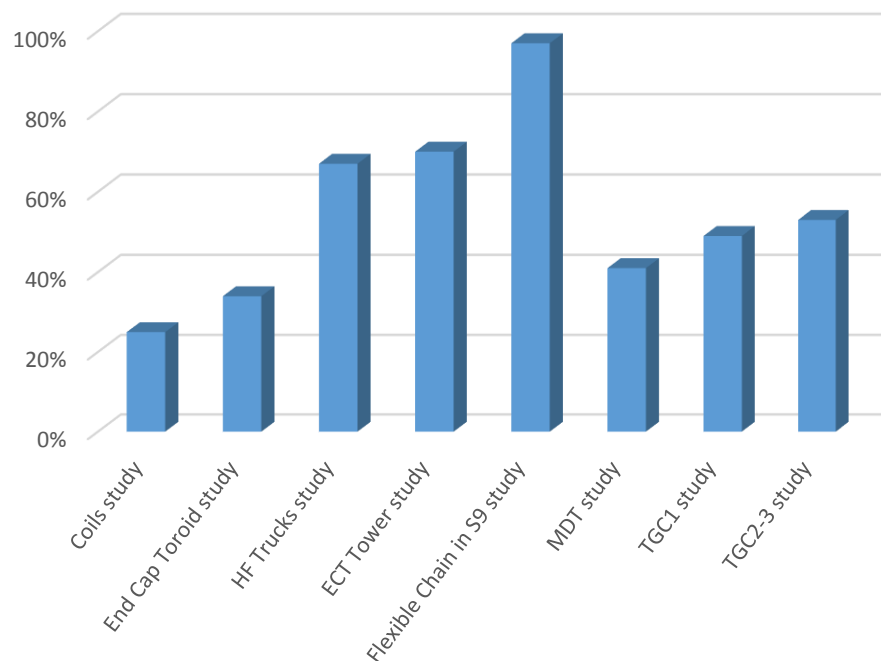
## WP2 : Materials Checks for New Small Wheel

- We appreciate to continue work with Muon software group
- We would like to learn what is the 'Parameter book' and what are the 'stages'
- We need some more explanations for Start-up
- In same time we are surprising and don't understand why simulation team decides to stop Compare checking package for Geant-4
- Did simulation team really thought Geant-4 geometry is ideal for physics analysis? Slide below confirms opposite



## WP2 : Materials Checks for New Small Wheel

- 9 big projects have been done
- Conclusion is that G4 geometry is far away from as-built geometry



# WP5 : Development of Reference Geometry DB

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## WP5: "Development of Reference Geometry database of ATLAS Detector"

Geometry Descriptions (GD) of ATLAS detector have several implementation by various groups and subsystems. Groups developing GD's separately, using their own methods, platforms and tools. Thus, for the moment there are various GD's of the same components of detector and they are not synchronized and not the same.

Difference between GD's of ATLAS detector has direct impact on quality of physics analyses and cause necessity in high financial and high-qualified manpower resources for upgrade and modifications. Compare analyses of Geant-4 vs "as-built" descriptions shows big differences between them, which in some cases cause data-vs-MonteCarlo discrepancies.

Purpose of WP is development of one, central database of geometry descriptions of ATLAS detector, so called Reference Geometry - most detailed and close to "as-built" geometry representation. Various groups and subsystems will use it. Groups will transfer GD's from Reference Geometry into local applications instead of developing own descriptions from the blue prints.

Development of Reference Geometry will foresee steps as follow:

1. Collection of detailed "as-built" descriptions of detector components from groups and their migration into Smarteam database in the form of 3D CATIA models
2. Reproduction of existing descriptions by adding missing parts from the CDD drawings
3. Correction of inaccurateness in existing descriptions and cleaning so called 'dirty' descriptions
4. Transformation of non-editable descriptions into editable state by modification of internal models tree
5. Structuration of descriptions according to ATLAS detector structure and components anatomy.

### Status for today:

1. There are several components which are corresponds to "as-built" descriptions in the engineering database on Smarteam - NSW, etc. For those components links from Reference Geometry will be created
2. Some components are presenting on Smarteam engineering database but do not have enough detalization. For instance services, support structures, etc. Those components will be reproduced from CDD drawings
3. Some components presented on Smarteam engineering database in form of external envelops without internal content. For instance Inner detector, etc. They will be fulfil with the missing parts, reproduced from CDD drawings

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4. 9 components are already reproduced as an "as-built" descriptions by Georgian team during the execution of Geant-4 compare analyses in past years. Coils, EndCap Toroid, HF Trucks, MDT, TGC1, TGC3, ECT Tower and Warm Structure, Flexible chain in sector 9 have been done. They will be inserted directly into Reference Geometry database. Detailed development road map of Reference Geometry (order not corresponds to development sequence)

### I. Main Components

1. Inner Detector/Pixel
2. Inner Detector/SCT
3. Inner Detector/TRT
4. Calorimetry/Lar
5. Calorimetry/Tile
6. Muon Spectrometer/Barrel
7. Muon Spectrometer/EndCap
8. Shielding's
9. Magnet System/Solenoid
10. Magnet System/Toroid
11. Mechanical Structure/Feets and Rails
12. Mechanical Structure/Inner detector
13. Mechanical Structure/Calorimetry
14. Mechanical Structure/Muon system
15. Mechanical Structure/Warm structure
16. Mechanical Structure/Shielding
17. MB Access platforms

### II. Services

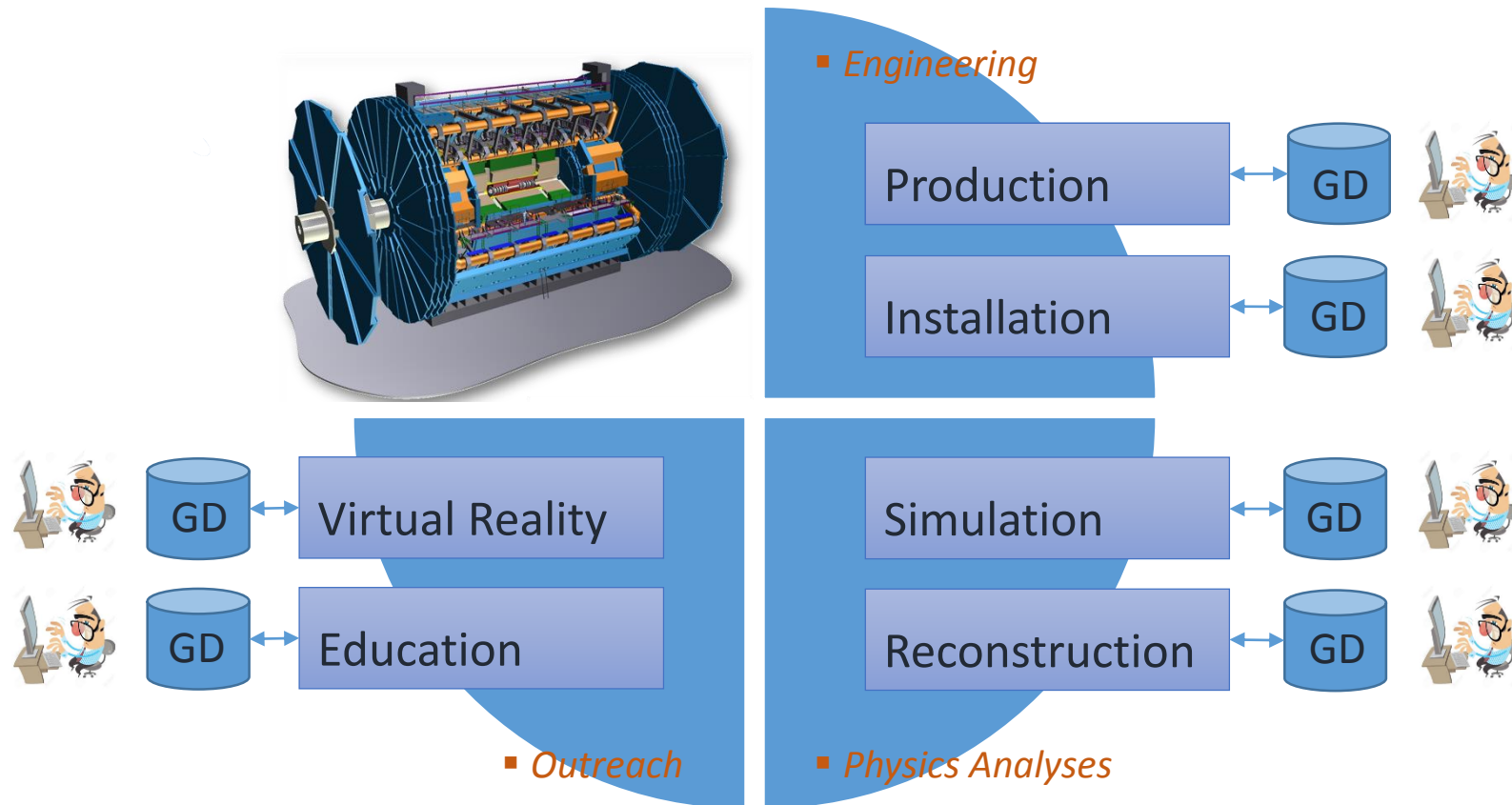
1. Cables
2. Patch panels
3. Tubes and Pipes
4. Services supports

Reference Geometry development process will not be interfer with existing simulation/reconstruction chains.

- Deliverables: 3D CATIA models on Smarteam database
- Manpower in Georgian Team: 2FTE /CATIA designers
- ATLAS contact person: **Tatiana KLIUTCHNIKOVA**

## WP5 : Development of Reference Geometry DB

### ■ Heterogeneous Geometry Modelling



### REASON#01: Requires huge resources

- High qualified manpower, group of experts employed for a long term
- TCn case study for development of CATIA descriptions – 31 months, 13'000man/hour

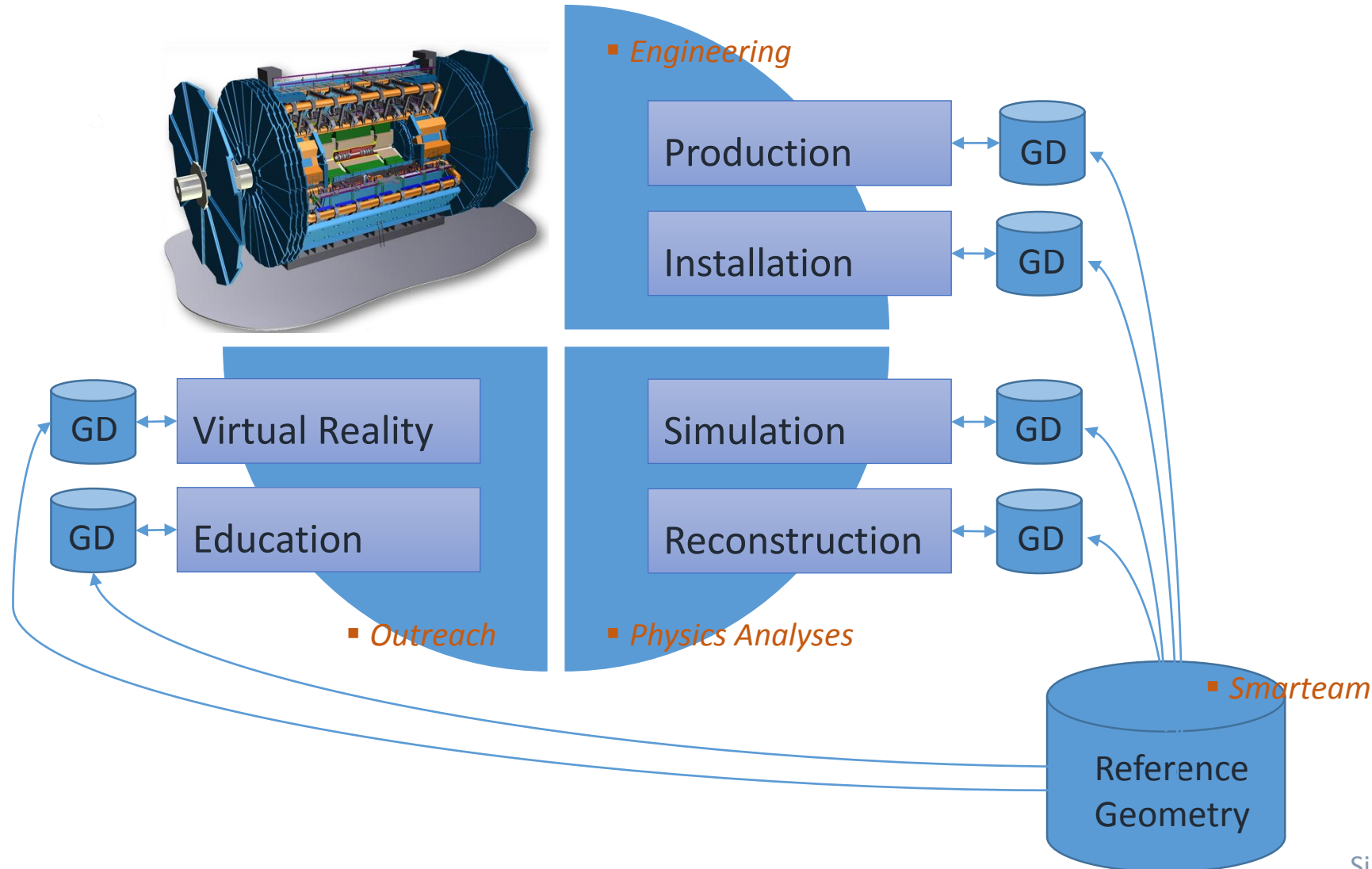
### REASON#02: Inaccurate and non-synchronized

- Data-vs-MC discrepancies. New methodology in 2010 (Laurent Chevalier, Andrea Dell'Acqua, Jochen Meyer) for Geant-4 compare analyses
- 9 volumes have been checked: Coils-12%; ECT-34%; HF Trucks-67%; MDT-41%; TGC1/2-53%; TGC3-45%; ECT Tower-32%

### REASON#03: Hard to update

## WP5 : Development of Reference Geometry DB

### ■ Inherited Geometry Modelling (IGM)



## WP5 : Development of Reference Geometry DB

- Reference Geometry – should be 3D CAD models in the official CERN Database which is Smarteam
- For Simulation & Reconstruction Gitlab repository will be created for XML geometry descriptions. No GeoModel, all descriptions will be on XML
- 1<sup>st</sup> Phase – Development of Reference Geometry (RG) database on Smarteam (~1.5 year)
- 2<sup>nd</sup> Phase – Development of XML repository on Gitlab – includes simplification of RG volumes, integration conflicts checking and XML generation
- 3<sup>rd</sup> Phase – Development tools and procedures for transformation of descriptions from Smarteam database Gitlab/XML



Thanks for attention