

Consideration of ATLAS 3D CATIA Geometry for Geant4 Entities



Georgian CAD/CAM Engineering
Center (GCCEC), Tbilisi, Georgia

<http://www.cadcam.ge>

Alexander SHARMAZANASHVILI – coordinator

CERN, PH/UAT 26/2-002, 79 889

Archil SURMAVA – CATIA designer/programmer

Tbilisi, Georgia 0108, 00995 32 344937

Besik KEKELIA – CATIA designer/programmer

Tbilisi, Georgia 0108, 00995 32 344937

Introduction

- There is a Database of 3D CATIA models of ATLAS detector
- It contains detailed Geometry of detector parts + all services, supports and infrastructure
- It was built by GCCEC (3 years activity) by demand of ATLAS TCn and now is using for integration conflict checking and installation modeling

- GCCEC have expertise on that database, CATIA designing and C++ programming, bit in Geant4 also and wants to cooperate with Cavern background simulation team

Description of ATLAS CATIA DB

- 3'705 big subassemblies
- More than 10'000'000 functional features
- 2 type of models: facet-based (.cgr) models for the integration study; natives (.catpart/.catproduct) – solids for editing
- 1.28 Gb of facet models
- 13.5 Gb of native models

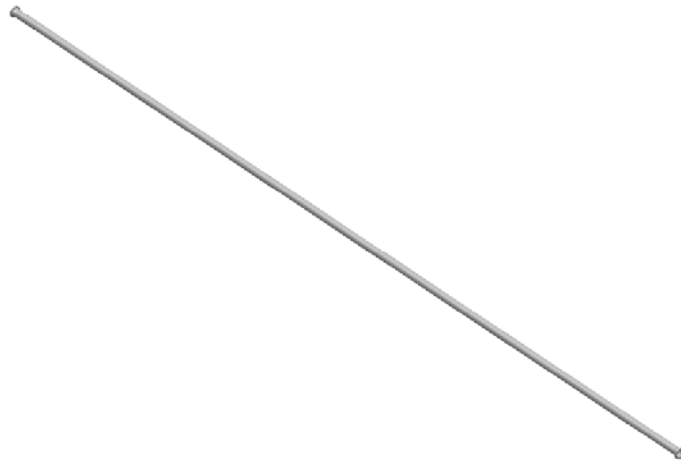
- Models are distributed into the structure which has 11 main unites and 40 subunits

B - Beam Vacuum	AB - LArg Barrel Cryostat	
I - Inner Detector	AE - LArg End-Cap Cryostat	
A - LArg Calorimeter	LB - Tile Barrel Calorimeter	
L - Tile Calorimeter	LE - Tile Extended Calorimeter	
T - Toroid Magnets	TB - Barrel Toroid	
M - Muon Spectrometer	TE - End-Cap Toroid	
J - Sheildings	MB - Barrel Brackets & Rails	
S - Services	MC - Chambers	
H - Support Structure	MA - Alignment	
P - Temporary Structure	SB - Barrel Calorimeter	
F - Infrastructure	SE - Extended Calorimeter	
	SM - Muon Spectrometer	
	SR - Racks, Cable Trays	
	SG - Gas	
	SO - Cooling	
	HX - Access Structure	
	HB - Feet and Rails	
	HT - Truck	
	HM - Structure	
	FC - Cavern Cranes	
	FB - Civil Engineering	
	FV - Heating & Ventilation	
	FX - Cryogenics	
	FE - Electrical Distribution	
	FH - Structures	
	FO - Others	
		TBC - Cryoring
		TBW - Warm Structure
		TBV - Vacuum Vessels
		MCB - Muon Barrel Chambers
		MCE - Muon EC Chambers
		MAB - Barrel Alignment
		MAE - EC Alignment
		MAR - Reference Alignment
		HTR - Run Position
		HTA - Access Position
		FHO - HO Structure
		FHS - HS Structure
		FHT - Central Trench Structure
		FHM - HM Structure

ATLAS Cavern CATIA Structure

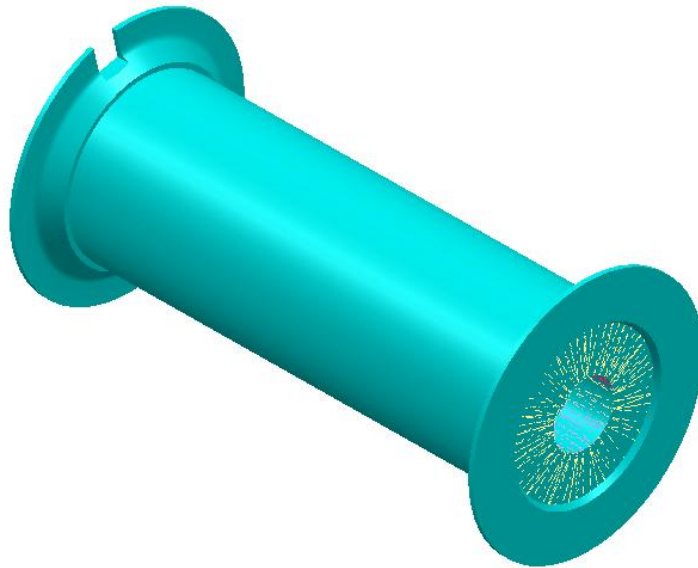
Description of ATLAS CATIA DB

Unit B - Beam Vacuum



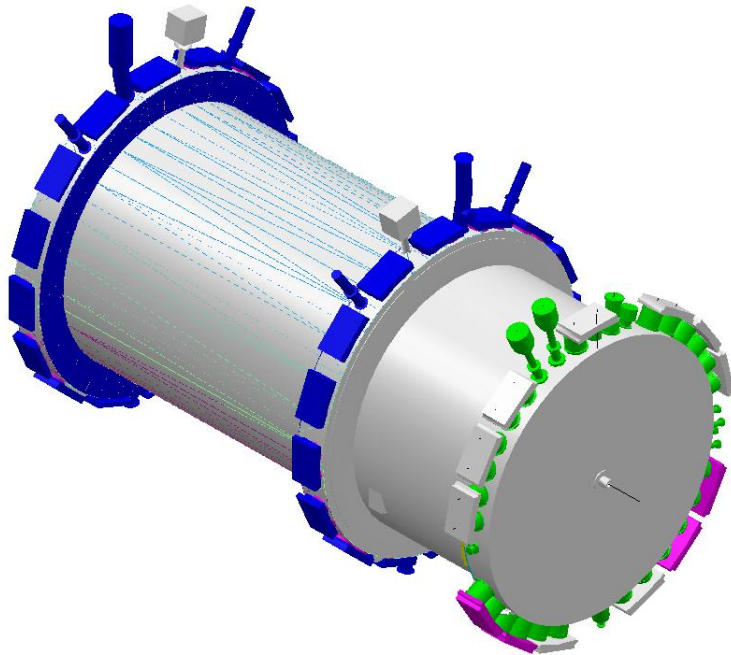
Description of ATLAS CATIA DB

Unit I - Inner Detector



Description of ATLAS CATIA DB

Unit **A** - LArg Calorimeter

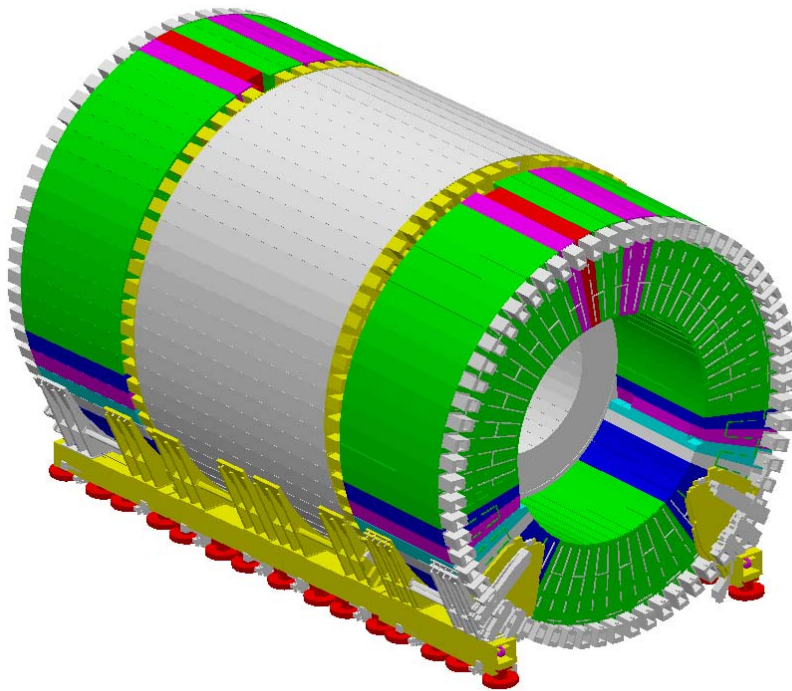


AB - LArg Barrel Cryostat

AE - LArg End-Cap Cryostat

Description of ATLAS CATIA DB

Unit L - Tile Calorimeter

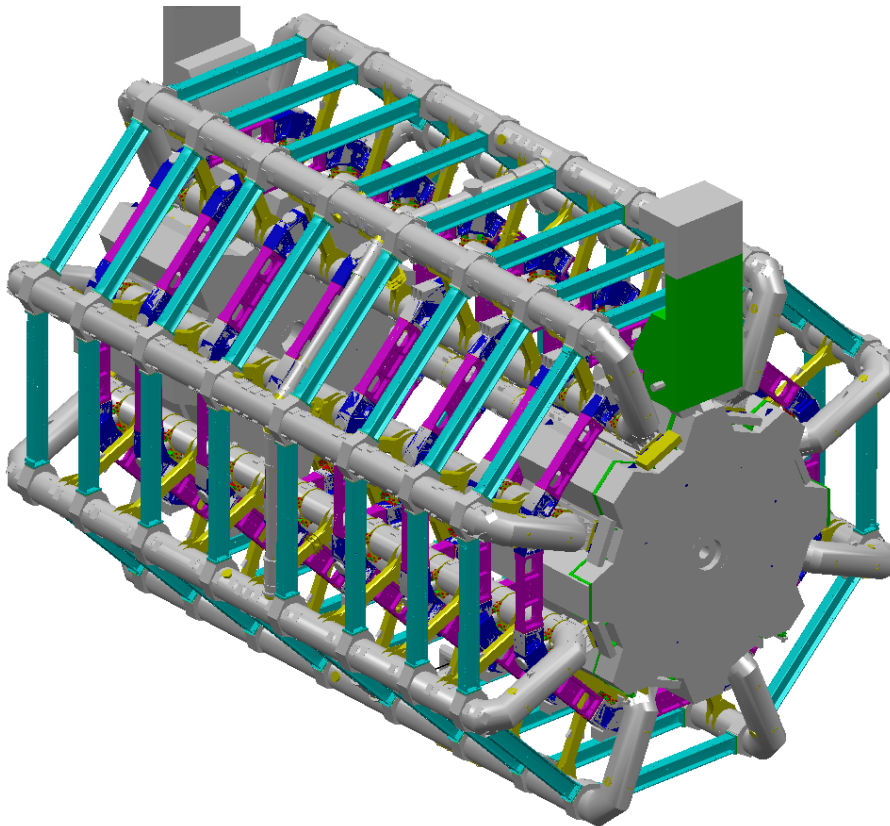


LB - Tile Barrel Calorimeter

LE - Tile Extended Calorimeter

Description of ATLAS CATIA DB

Unit **T** - Toroid Magnets



TB - Barrel Toroid

TE - End-Cap Toroid

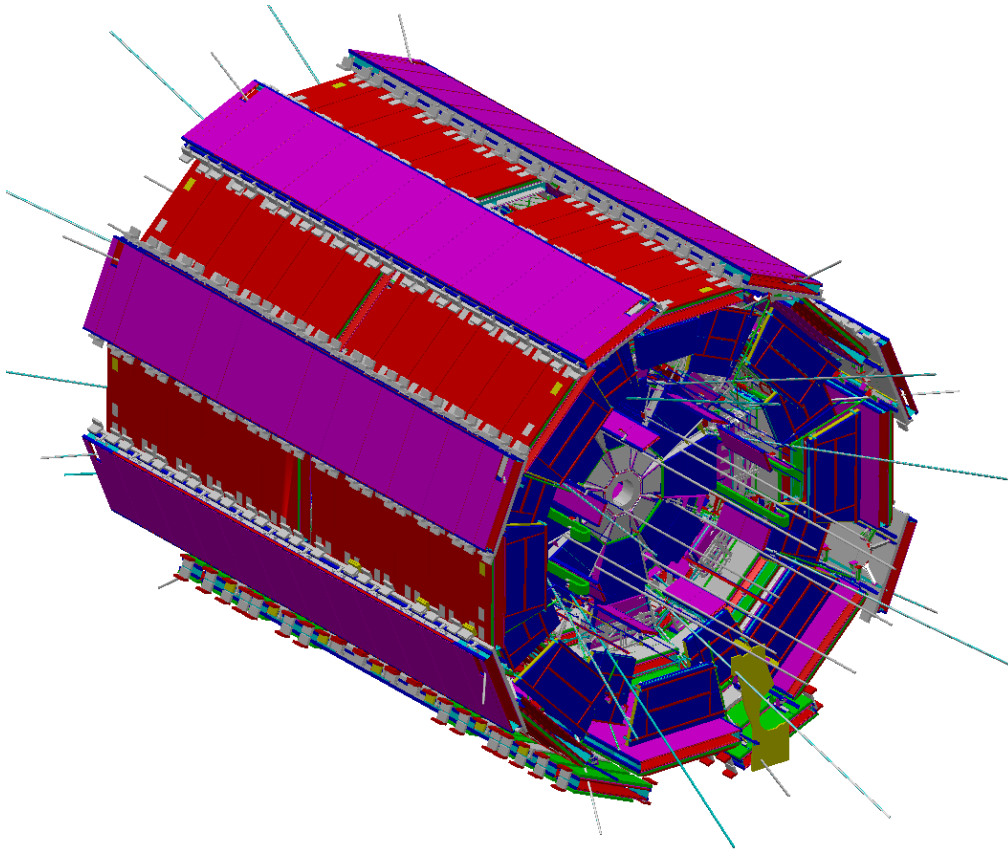
TBC - Cryoring

TBW - Warm Structure

TBW - Vacuum Vessels

Description of ATLAS CATIA DB

Unit **M** - Muon Spectrometer



MB - Barrel Brackets & Rails

MC - Chambers

MA - Alignment

MCB - Muon Barrel Chambers

MCE - Muon EC Chambers

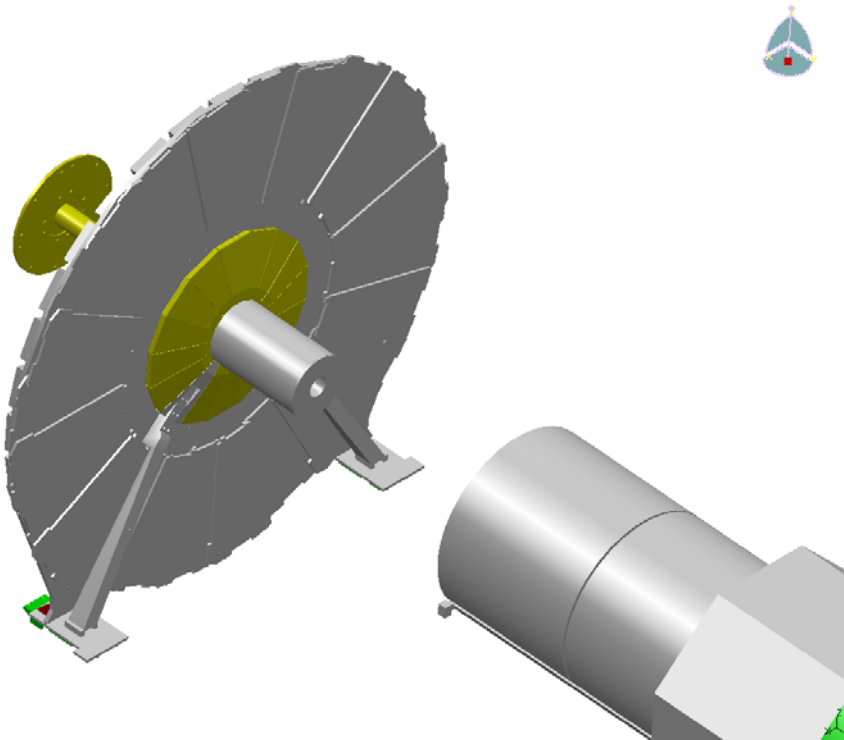
MAB - Barrel Alignment

MAE - EC Alignment

MAR - Reference Alignment

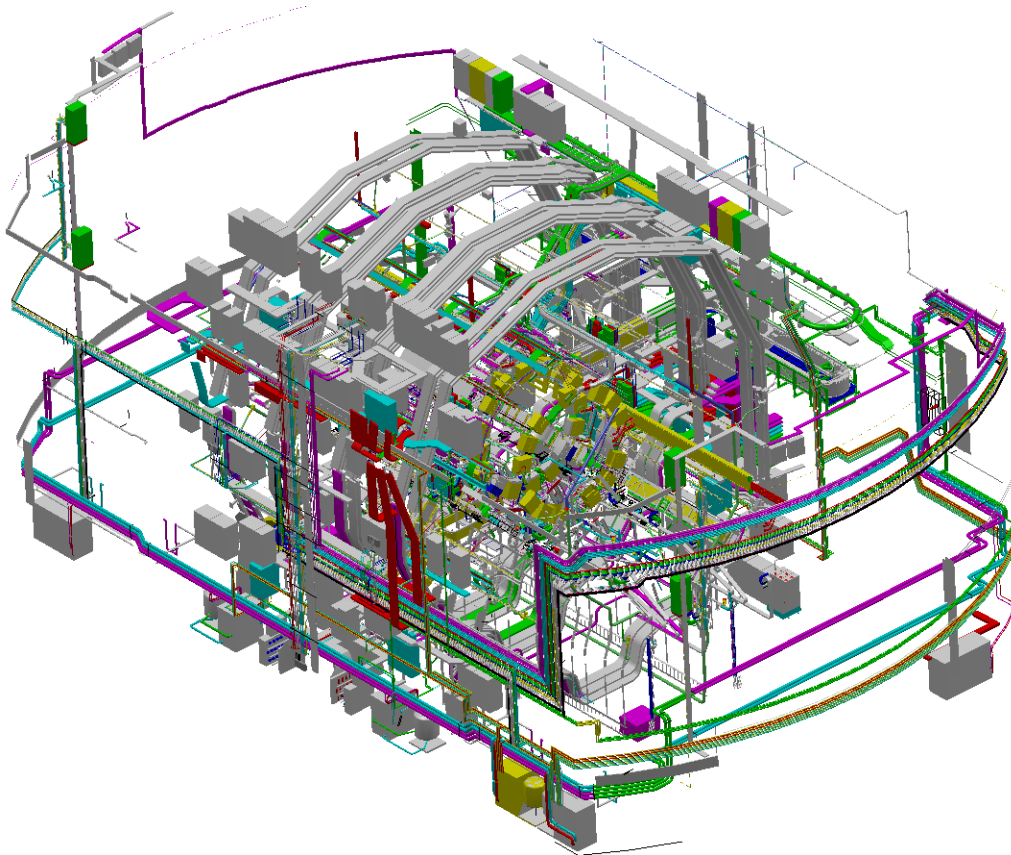
Description of ATLAS CATIA DB

Unit J - Shielding



Description of ATLAS CATIA DB

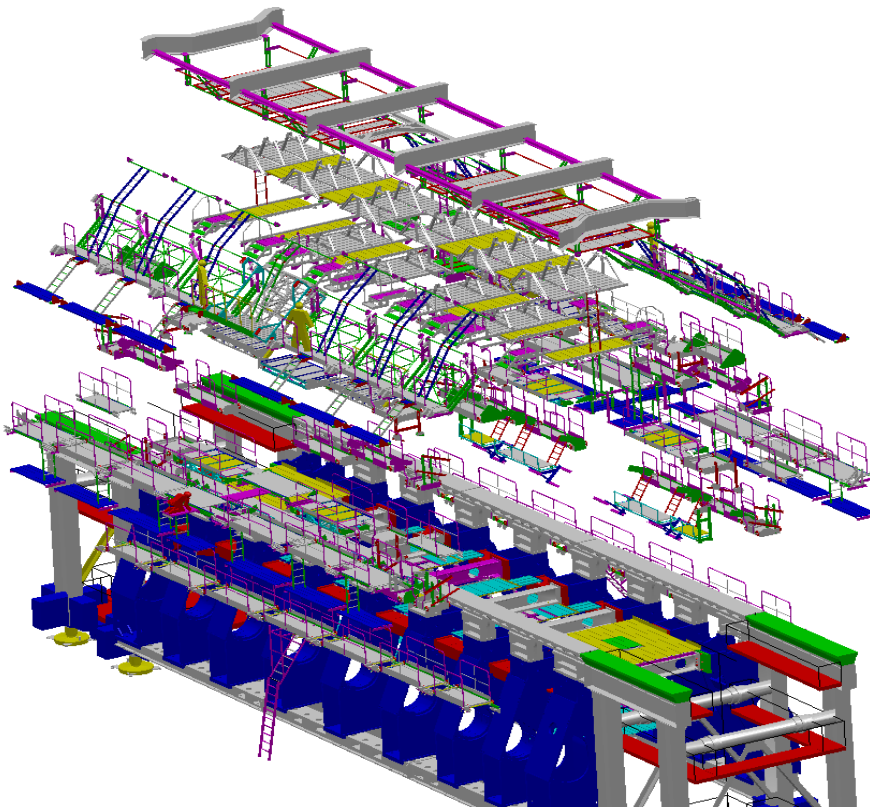
Unit **S** - Services



- SB** - Barrel Calorimeter
- SE** - Extended Calorimeter
- SM** - Muon Spectrometer
- SR** - Racks, Cable Trays
- SG** - Gas
- S0** - Cooling

Description of ATLAS CATIA DB

Unit H - Support Structure



HX - Access Structure

HB - Feet and Rails

HT - Truck

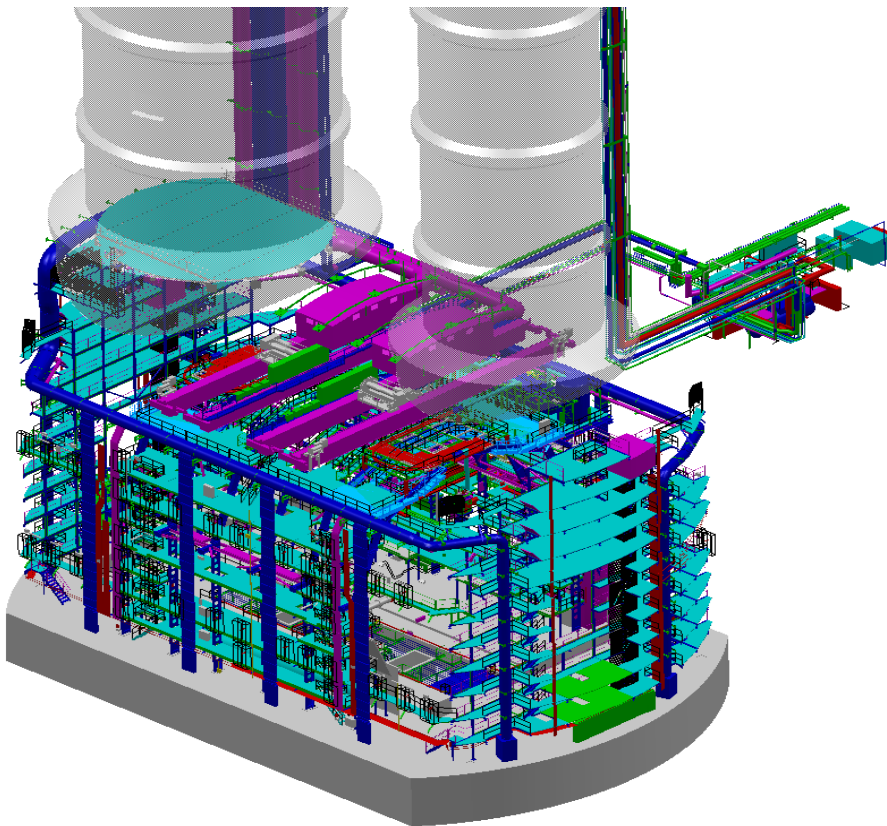
HM - Structure

HTR - Run Position

HTA - Access Position

Description of ATLAS CATIA DB

Unit F - Infrastructure



- FC** - Cavern Cranes
- FB** - Civil Engineering
- FV** - Heating & Ventilation
- FX** - Cryogenics
- FE** - Electrical Distribution
- FH** - Structures
- FO** - Others

GCCEC Contribution

- 3 main advantages of collaboration with GCCEC are expected:
 1. GCCEC has expertise on CATIA tool
 2. GCCEC has expertise in above described DB of 3D's
 3. GCCEC has expertise in C++ programming and familiar also with Geant4
- GCCEC can contribute in models *Selection*, *Modification*, *Geant4 Convertation* and *Checking* stages

Models Selection

- Identification of models list belonging to the considering region
- Checking all modifications of identified models on SmarTeam
- Generation of 3D pdf files for consideration with others

Models Modification

- Extraction CATIA natives for chosen models and checking their status
- Simplification of geometry
- Reposition of models according to Geant4 axis system
- Generation of triangles-representation and profile sketches for Geant4

Geant4 Convertation

- Generation Geant4 code description of geometry
- Test compilation
- Generation facet model from the Geant4 code of geometry

CATIA Checking

- Upload facet model from Geant4 into CATIA
- Reposition the model according to 1102 axis system
- Compare analyses of Geant4 geometry with initial CATIA geometry
- Preparation of HTML report with results of compare analyses