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The Preparatory Phase of the Large Hadron Collider upgrade (SLHC-PP) is a project co-funded by the European Commission in its 7th Framework Programme under the Grant Agreement n° 212114. SLHC-PP began in April 2008 and will run for 3 years.

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1. EXECUTIVE SUMMARY


The upgraded ATLAS detector is described with a set of technical documentation, drawings and CAD information. The currently used tools for CAD drawings are CATIA and SmarTeam, while the standard tool used during the initial construction of the experiment was Euclid. The technical documentation is stored in the EDMS system at CERN. A large effort has been needed to convert the existing drawings and make them compatible and suitable as the basis of documentation of the existing experiment and the upgraded elements. This work has now been completed with 8000 models used and new projects related to the upgrade are made in CATIA. The technical documentation for the major upgrade work in the 2013-14 shutdown is in place or in preparation.

2. INTRODUCTION

The ATLAS detector was constructed during the time frame of 1996-2008 and the Technical documentation and drawings, at CERN or held by collaborating institutes, represent the legacy and complete documentation of the project as built. Upgrading the detector in the future will need a similar set of documentation, while the tools available have developed and changed. As a result it was decided to move central existing drawings to the new tools and a formidable conversion work was initiated. This work was not only important for keeping access to the as built system, but the upgrade implementation could only be made efficiently if the existing detector systems and future upgraded systems could be made accessible from the same set of software tools.

3. CAD DRAWINGS.

The work is now completed in two important aspects. 8000 models are converted to CATIA and accessible from the ATLAS WEB pages (figure 1). Archiving, control and approval of drawings happens with the help of the CDD system. [The ATLAS upgrade drawings](#) are available in this system.



ATLAS TCn Applications

CAD WEB NAVIGATOR (CWN)

It is a web application that allows access to CAD data (Drawings, 3D models) hosted at CERN. This web application is a very useful tool for the project and design team, for project engineers and coordinators, for external institutes and collaborators. CWN provides an easy and quick navigation features through the CERN CAD database structure: SmarTeam. CWN allows the visualization and exportation of document like 3D geometry, 2D drawings or any other engineering document to different formats. CWN has a user friendly web interface allowing the possibility to use it without prior knowledge of CERN's PLM product (SmarTeam).

ATLAS project includes

- ATLAS 2009 – contains CAD models reflecting ATLAS geometry in 2009
- ATLAS UPGRADE – contains CAD model in development for the upgrade projects

Help in using CWN

Profile Card : - shows information about the document (number, description, revision, date of last modification...)

Composed Of : - shows components (sub-assemblies and parts) for 3D assemblies

Where Used : - defines in which products the selected document is used

Projects : - shows the links to Projects

ITEM : - one of basic elements in SmarTeam and CWN. This is a virtual entity that allows to group together all information about a real product (3D model, drawing, calculations...)

Specifications : - shows the list of documents in the selected ITEM - shows the list of documents in the selected ITEM


Visualize : - allows to visualize selected objects. Right-click in the view zone makes visible a command bar (zoom, rotate, print...)

Export : - allows to export the selected document (3D geometry, drawings, ...) Use right-click menu and choose "Export As" command

For the information concerning 3D and 2D visualization as well as the list of compatible browsers – see the description on the CWN Desktop.

For the access right participants of the IBL pilot project can contact [Raphael Vuillemet](#)

[Go to CAD Web Navigator](#)



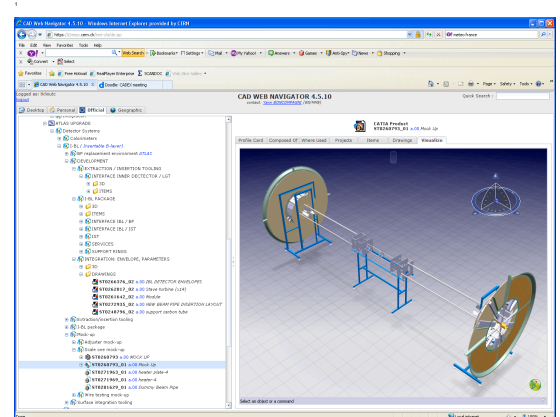


Figure 1: Left: WEB access to the ATLAS CAD drawings, split into two main groups, the detector in 2009, and the drawings related to the upgrade project. Right: The upgrade drawing repository.

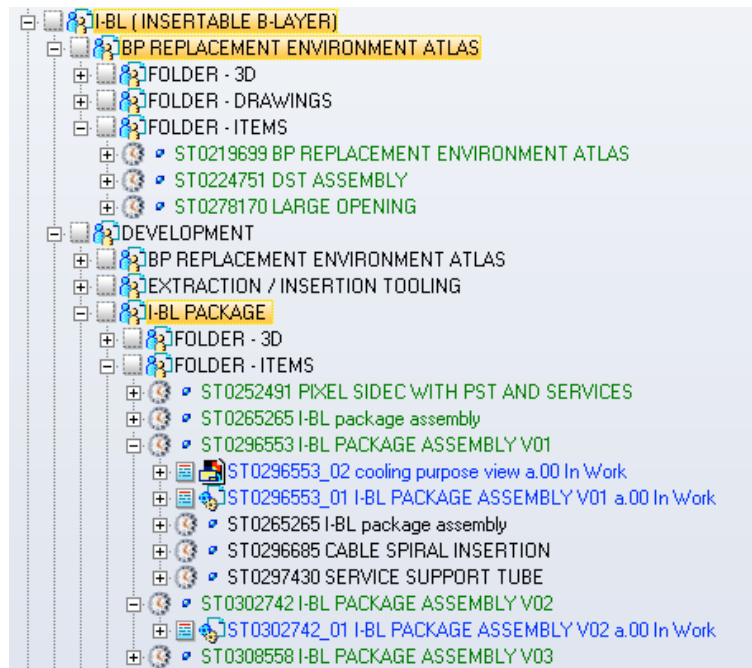
Among the drawings first entered with the tools are:

- a study of EE chambers installation, design of tooling, frames, support structures
- modification of access platforms needed for the EE installation
- design of survey tunnel protection frames and TAS cover
- routing of ventilation pipes in sector 5
- access to TE pumps
- the IBL project including mock-up for the replacement environment, extraction/insertion tooling
- layout integration of the PAD-MAD-radiation portique in UPX15 and ULX16.

This initial phase was followed by further work on:

- study and design of Buffer Zone,
- study of additional shieldings (on TE face, in USA15)
- the IBL and Pixel project : study of services
- access platforms for TB pumps, for muon electronics
- design of a new bridge access structure
- routing of additional ventilation pipes in sector 13
- reinforcement of TE top platform

The folder structure for the PIXEL upgrade (IBL) is shown below:



4. TECHNICAL DOCUMENTS

The technical documentation for the ATLAS upgrade is put into the EDMS repository:

The screenshot shows the ATLAS A Toroidal LHC Apparatus EDMS interface. On the left is a tree view of the project structure, with 'Organization' highlighted. The main area displays document details for 'ATU-ORG-MG-0002 v.1 FTK upgrade project initial implementation for approval' (Released-for info), 'ATU-ORG-MG-0003 v.1 ATLAS Inner Tracker Upgrade Layout sub-committee' (In Work), 'ATU-ORG-MG-0004 v.1 Phase-I Trigger Compatibility Taskforce/Sub-committee' (In Work), and 'ATU-ORG-MM-0001 v.3 ATLAS upgrade organization definition' (Released-for info). Each document entry includes its EDMS ID, description, document types (doc, pdf), sizes, and version information.

Figure 2: An extract from the technical documentation for the ATLAS upgrade.

The structure follows the structure of the upgrade project and as example the entire [Technical Design Report for the Insertable B-Layer](#) can be found in this system:

This screenshot shows a list of documents in the EDMS system. The node contains 21 documents. The list includes items like 'ATU-GE-MR-0007 v.1 Draft for INTERNAL review' (In Work), 'ATU-GE-MR-0008 v.1 Draft sent to IBL Collaboration and USG- August 16 2010' (In Work), and 'ATU-GE-MR-0018 v.1 FILES SENT TO PRINT' (In Work). The interface includes sorting options (Number, Ascending) and display settings (Compact, Obsolete: Hide).

Another example is the documentation for a complete new Inner Tracker:

This screenshot shows a list of documents for a new Inner Tracker. The node contains 3 documents: 'ATC-P-ES-0001 v.1 Atlas Tracker Upgrade engineering specifications - LAYOUT' (In Work), 'ATL-P-EP-0001 v.2 Layout Requirements and Options for a new Inner Tracker for the ATLAS Upgrade' (In Work), and 'ATU-SYS-EP-0001 v.1 Layout parameter book for Utopia simulations: layout UtopiaV1.00' (In Work). The interface includes sorting options (Number, Ascending) and display settings (Compact, Obsolete: Hide).



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5. CONCLUSIONS

Technical documentation, drawing and CAD information for the existing experiment and the upgraded elements are available and organized in repositories that are now fully available for the collaboration. The information for the phase I upgrade parts is already entered in these systems.