

SLHC-PP

DELIVERABLE REPORT

EU DELIVERABLE: 3.1.2

Document identifier:	SLHC-PP-3.1.2-1133533-v1.0						
Contractual Date of Delivery to the EC	End of Month 36 (March 2011)						
Actual Date of Delivery to the EC	20/4/2011						
Document date:	12/4/2011						
Deliverable Title:	Establish the initial Memorandum of Understanding for the upgrade						
Work package:	WP3: Coordination for the S-ATLAS experiment implementation						
Lead Beneficiary:	CERN						
Authors:	S.Stapnes						
Document status:	Released						
Document link:	https://edms.cern.ch/document/1133533/1						



History of Changes

Version	Date	Comment	Authors
1.0	27.3.2011	First version created for comments	Steinar Stapnes
1.1	14.4.2011	Released version	Steinar Stapnes

Copyright notice:

Copyright © Members of the SLHC-PP Collaboration, 2009.

For more information on SLHC-PP, its partners and contributors please see www.cern.ch/SLHC-PP/

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.

The information contained in this document reflects only the author's views and the Community is not liable for any use that may be made of the information contained therein.



DELIVERABLE REPORT

TABLE OF CONTENTS

1.	EXECUTIVE SUMMARY	.4
2.	UPGRADE PROJECTS AND THE FORMAL STEPS TOWARDS IMOU AND COSTBOOKS	.4
3.	COSTBOOKS	.5
4.	INTERIM MEMORANDUM OF UNDERSTANDING (IMOU)	.6
5.	CONCLUSIONS	.7
6.	REFERENCES	.7



1. EXECUTIVE SUMMARY

The ATLAS upgrade plans are implemented as closely coordinated projects. These projects undergo three phases; first the R&D phase and feasibility/performance studies, then the prototype phase developing the project into a construction project, and ultimately the construction phase where the project execution is carried out within a defined scope, technical specifications, cost-estimates and schedule. In the ATLAS experiment the upgrade project definition and approval process is now agreed and established (ref 1), and the main upgrade project that is scheduled for installation during the LHC shutdown in 2013-14 is already in the construction phase, namely the Insertable B-Layer (IBL) project (ref 2). Several other smaller projects are also being studied but the IBL project remains the reference project for the initial upgrade, and the main topic of this report. An Interim MoU and costbooks for the phase I pixel system upgrades foreseen for this shutdown (IBL) have been produced (ref 3), and have been presented to and agreed by the Collaboration.

2. UPGRADE PROJECTS AND THE FORMAL STEPS TOWARDS IMOU AND COSTBOOKS

The first significant LHC machine shutdown is currently foreseen for 2013-14 and the major upgrade the ATLAS collaboration has foreseen for this shutdown is the insertion of a new PIXEL layer including replacement of the current central beampipe (IBL). Other upgrade projects considered are: <u>FTK (Fast Track Trigger)</u> (ref 4), new small muon wheels, new topological trigger at L1, possibly new calorimeter electronics and possibly a new warm FC. Among these the largest and most significant project, the IBL, has prepared a Technical Design Report, an Interim Memorandum of Understanding and a detailed Cost Book, including the installation work. The FTK project has the similar steps in progress, while the other projects mentioned is being considered.

The organization of the ATLAS upgrade projects is shown in figure 1. Note that the establishment of key parts of this organization is described in <u>milestone report 3.2</u>.



Figure 1: The ATLAS upgrade organization, showing the various bodies that are involved in setting up, costing, defining and approving the cost estimates and Interim Memorandum of Understanding for the upgrade projects (from ref 1).

Every major project that is intended as a part of the ATLAS upgrade has to pass through several steps. The process is illustrated in figure 2 (from ref 1) below where the steps are numbered from 1 to 6:



Fig. 2: Stages in Upgrade Project approval process

The key scientific, technical and resource documentation is a Technical Design Report (TDR), written by the main responsible groups in the upgrade project. The <u>Technical Design</u> Report for the IBL upgrade project was written in the Spring 2010. It is a 200 page document containing a full technical description of the project, a cost estimate (table 43, page 200), the organization structure, and a list of the participating institutes (see table 1 below). The schedule and detailed planning are also included in the document.

The ATLAS CB (Collaboration Board) consisting of one member per institute of the collaboration provides the final approval of the upgrade plans for the experiment – based on the TDR, before it is presented the LHC Committee (LHCC). LHCC is the external scientific programme committee installed by CERN to review the LHC experiments at regular intervals, and also major upgrade projects are reviewed by this committee. The IBL TDR was presented to the LHC Committee (LHCC) in 2010 at two occasions, once initially and the second time to provide answers to a list of the questions by the review committee.

The Interim Memorandum of Understanding, included a detailed cost estimate, was prepared in parallel (August 2010), and presented the Resource Review Board (RRB) in October 2010. The Resources Review Board (RRB) comprises the representatives of each Experiment's Funding Agencies and the managements of CERN and of each Experiment's Collaboration. It is chaired by the CERN Director for Research and Computing.

The role of the RRB includes:

- reaching agreement on the Memorandum of Understanding
- monitoring the Common Projects and the use of the Common Funds
- monitoring the general financial and manpower support
- reaching agreement on a maintenance and operation procedure and monitoring its functioning
- endorsing the annual construction and maintenance and operation budgets of the detector.

The management of the Collaboration reports regularly to the RRB on technical, managerial, financial and administrative matters, and on the composition of the Collaboration.

3. COSTBOOKS

The costbook for the IBL project is an annex of the Interim Memorandum of Understanding (ref 3) and is discussed in deliverable report 3.1.3: <u>https://edms.cern.ch/document/1133534/1</u>



4. INTERIM MEMORANDUM OF UNDERSTANDING (IMOU)

The Interim Memorandum of Understanding for the IBL upgrade project consists of three parts:

- 1) A first part outlining the partners of the agreement, the purpose, the scope, the cost and the cost oversight, the cost sharing and procedures. This is the most formal part of the Interim Memorandum of Understanding that the partners have to sign.
- 2) Part two is the costbook as referred to in chapter 3 above. The key work-sharing can also be illustrated as shown in table 1 below from the TDR (ref 2).

Institutions in one IBL construction 1 2 3 4 5 6 7 8 9 10 11 Institution Country by by by by by by by by by by by by by b	Institutions in t	he IBL Construction			I	BL M	loU	Deli	ver	able	s		
InstitutionCountrybb <th colspan="2">Institutions in the IBL Construction</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> <th>11</th>	Institutions in the IBL Construction		1	2	3	4	5	6	7	8	9	10	11
Annecy LAPP France 1 1 3 2 Bergen Norway 1 </th <th>Institution</th> <th>Country</th> <th>Sensor</th> <th>FE-14</th> <th>Bump-bonding</th> <th>Stave</th> <th>Mod.Load</th> <th>R/O Chain</th> <th>PS Chain</th> <th>Integration</th> <th>Cooling plant</th> <th>BP & Interfaces</th> <th>Installation</th>	Institution	Country	Sensor	FE-14	Bump-bonding	Stave	Mod.Load	R/O Chain	PS Chain	Integration	Cooling plant	BP & Interfaces	Installation
Barcelona Spain 1 1 3 2 Bergen Norway 1 1 1 1 1 Berkeley LBNL United States of America 1 1 1 1 1 Berlgen Norway 1 1 1 1 1 1 1 Berlgen Germany 1 <td>Annecy LAPP</td> <td>France</td> <td></td> <td></td> <td></td> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>_</td> <td></td>	Annecy LAPP	France				1						_	
Bergen Norway 1 <th1< th=""> 1 <th1< td=""><td>Barcelona</td><td>Spain</td><td>1</td><td></td><td>1</td><td></td><td></td><td></td><td>3</td><td>2</td><td></td><td></td><td></td></th1<></th1<>	Barcelona	Spain	1		1				3	2			
Berkeley LBNL United States of America 1 1 1 Bologna Italy 1 1 1 1 1 Bonn Germany 1	Bergen	Norway	1										
Berlin HU Germany I I I I Bologna Italy I I I I I Bonn Germany I I I I I I I Brandeis United States of America I	Berkeley LBNL	United States of America		1				1				1	
Bologna Italy 1 1 1 2 Bonn Germany 1 1 1 2 1 Brandeis United States of America 1 1 1 1 2 1 CERN Switzerland 1 1 1 1 1 1 2 1 DeSY Germany 1 <t< td=""><td>Berlin HU</td><td>Germany</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	Berlin HU	Germany											
Bonn Germany 1 <th1< td=""><td>Bologna</td><td>Italy</td><td></td><td></td><td></td><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td></th1<>	Bologna	Italy						1					
Brandeis United States of America 1	Bonn	Germany	1	1	1		1			2			
CERN Switzerland 1	Brandeis	United States of America										1	
DESY Germany 1 1 1 1 1 Dortmund Germany 1<	CERN	Switzerland	1		1	1	1			1	2		
Dortmund Germany 1	DESY	Germany						1	1				
Geneva Switzerland 1	Dortmund	Germany	1										
GenovaItaly1133GlasqowUnited Kingdom1133GöttingenGermany2121Grenoble LPSCFrance1121Heidelberg ZITIGermany11121IowaUnited States of America11211LiverpoolUnited Kingdom11111LiverpoolUnited Kingdom12111LybljanaSlovenia12111LiverpoolUnited Kingdom11111ManchesterUnited Kingdom11111Marseille CPPMFrance11111Munich MPIGermany22221New MexicoUnited States of America12222Ohio State UniversityUnited States of America12222Oklahoma SUUnited States of America122222Orsay LALFrance1122222SidegenGermany1122222Stata Cruz UCUnited States of America112222SidegenGermany1122222<	Geneva	Switzerland		1			1			1		1	
Glasgow United Kingdom 1 I	Genova	Italy		1			1	3	3				
GöttingenGermany21211Grenoble LPSCFrance11111Heidelberg ZITIGermany11111IowaUnited States of America11111KEKJapan111111LiverpoolUnited Kingdom11111LjubljanaSlovenia12111LphtE ParisFrance12111ManchesterUnited Kingdom11111MilanoItaly111111Munich MPIGermany21111New MexicoUnited States of America1221OklahomaUnited States of America1221OklahomaUnited States of America1221OklahomaUnited States of America1221OsloNorway12221Santa Cruz UCUnited States of America1122SiegenGermany12221SiadaTaiwan12221SiegenGermany11222SiegenGermany11111Siada	Glasgow	United Kingdom	1										
Grenoble LPSCFranceImage: state	Göttingen	Germany		2				1		2			
Heidelberg ZITIGermanyImage: Constraint of the states of AmericaImage: Constraint of the states of AmericaIowaUnited States of AmericaImage: Constraint of the states of AmericaImage: Constraint of the states of AmericaImage: Constraint of the states of AmericaKEKJapanImage: Constraint of the states of AmericaImage: Constraint of the states of AmericaImage: Constraint of the states of AmericaImage: Constraint of the states of AmericaLiverpoolUnited KingdomImage: Constraint of the states of AmericaImage: Constraint of the states of AmericaImage: Constraint of the states of AmericaImage: Constraint of the states of AmericaNew MexicoUnited States of AmericaImage: Constraint of the states of AmericaImag	Grenoble LPSC	France										1	1
IowaUnited States of America11121KEKJapan1111111LiverpoolUnited Kingdom111111LjubljanaSlovenia121111LPNHE ParisFrance121111ManchesterUnited Kingdom111111Marseille CPPMFrance111111MilanoItaly111111Munich MPIGermany211111New MexicoUnited States of America12211OklahomaUnited States of America12211Oklahoma SUUnited States of America11211OsloNorway122211Prague ASCzech Republic111221SiegenGermany112221SLACUnited States of America11111State States of America111111State Curu UCUnited States of America11111State States of America1111111State Curu U	Heidelberg ZITI	Germany											
KEKJapan1111LiverpoolUnited Kinqdom1111LjubljanaSlovenia1111LPNHE ParisFrance1211ManchesterUnited Kinqdom1111Marseille CPPMFrance1111Marseille CPPMFrance1111Munich MPIGermany2111Munich MPIGermany2222New MexicoUnited States of America122Ohio State UniversityUnited States of America122OklahomaUnited States of America122Oklahoma SUUnited States of America122OsloNorway1222Prague ASCzech Republic1122Santa Cruz UCUnited States of America122StaccUnited States of America122StaccUnited States of America122StaccUnited States of America122Stach Cruz UCUnited States of America122StaccUnited States of America1122StaccUnited States of America1222StaccUnited States of America1222 </td <td>Iowa</td> <td>United States of America</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>1</td> <td>2</td> <td></td> <td></td> <td></td>	Iowa	United States of America							1	2			
LiverpoolUnited Kingdom1II <th< td=""><td>KEK</td><td>Japan</td><td>1</td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<>	KEK	Japan	1		1								
LjubljanaSlovenia1212LPNHE ParisFrance1211ManchesterUnited Kingdom1111Marseille CPPMFrance1111MilanoItaly11111Munich MPIGermany21111New MexicoUnited States of America1221Ohio State UniversityUnited States of America1221OklahomaUnited States of America11211Oklahoma SUUnited States of America11111Orsay LALFrance111111OsloNorway122111Santa Cruz UCUnited States of America11111SiegenGermany12221SLACUnited States of America11111SLACUnited States of America12221State STaiwan1111111TorontoCanada111111UdineItaly111111UdineItaly111111	Liverpool	United Kingdom	1										
LPNHE ParisFrance1211ManchesterUnited Kingdom1111Marseille CPPMFrance11111MilanoItaly111111Munich MPIGermany211111New MexicoUnited States of America12221NikhefNetherlands122211OklahomaUnited States of America11211Oklahoma SUUnited States of America11111Orsay LALFrance11221OsloNorway12221Prague ASCzech Republic11211SlacCUnited States of America1222SiegenGermany11222Stata Cruz UCUnited States of America1222SiegenGermany11222Stata Cruz UCUnited States of America1222SiegenGermany11222Stata Cruz UCUnited States of America1222Stata Cruz UCUnited States of America1222United States of America122	Ljubljana	Slovenia	1										
ManchesterUnited Kingdom1II <t< td=""><td>LPNHE Paris</td><td>France</td><td>1</td><td></td><td></td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	LPNHE Paris	France	1			2							
Marseille CPPMFrance1111111MilanoItaly111111111Munich MPIGermany211111111New MexicoUnited States of America12021111NikhefNetherlands1202111111Ohio State UniversityUnited States of America1112111 </td <td>Manchester</td> <td>United Kingdom</td> <td>1</td> <td></td>	Manchester	United Kingdom	1										
MilanoItaly111	Marseille CPPM	France		1		1	1						
Munich MPIGermany21211New MexicoUnited States of America1221NikhefNetherlands1221Ohio State UniversityUnited States of America1121OklahomaUnited States of America1212Oklahoma SUUnited States of America1121Orsay LALFrance1221OsloNorway12211Prague ASCzech Republic1121Santa Cruz UCUnited States of America1121SiegenGermany11211SLACUnited States of America1221State STaiwan12211TorontoCanada11111UdineItaly11111WuppertalGermany11111	Milano	Italy			1	1			1				
New MexicoUnited States of America122NikhefNetherlands122Ohio State UniversityUnited States of America112OklahomaUnited States of America1122Oklahoma SUUnited States of America1122Orsay LALFrance1222OsloNorway12221Prague ASCzech Republic11221Santa Cruz UCUnited States of America11221SiegenGermany112211SLACUnited States of America12111State States of America12211SugenGermany11221State States of America12221Sugen States States of America12221Sugen States States of America12221State States of America122211Sugen States States of America12221Sugen States States of America12221State States States of America12221United States of America12221United States of Ame	Munich MPI	Germany	2										
NikhefNetherlands122Ohio State UniversityUnited States of America111OklahomaUnited States of America112Oklahoma SUUnited States of America112Orsay LALFrance122OsloNorway122Prague ASCzech Republic112Santa Cruz UCUnited States of America112SiegenGermany122Stony BrookUnited States of America122Taipei ASTaiwan122TorontoCanada112UdineItaly111WuppertalGermany111ATLAS TCWorld Wide111	New Mexico	United States of America	1										
Ohio State UniversityUnited States of America112OklahomaUnited States of America1121Oklahoma SUUnited States of America1121Orsay LALFrance1122OsloNorway1222Prague ASCzech Republic1122Santa Cruz UCUnited States of America1122SiegenGermany12122Stato BrookUnited States of America1222Stato BrookUnited States of America1222Stony BrookUnited States of America1222Taipei ASTaiwan11221TorontoCanada11121UdineItaly11111MuppertalGermany11111ATLAS TCWorld Wide11111	Nikhef	Netherlands		1		2					2		
OklahomaUnited States of America121Oklahoma SUUnited States of America1111Orsay LALFrance11221OsloNorway12221Prague ASCzech Republic11221Santa Cruz UCUnited States of America11221SiegenGermany12221StACUnited States of America12221Stony BrookUnited States of America12221Taipei ASTaiwan111111TorontoCanada111111WuppertalGermany111111ATLAS TCWorld Wide111111	Ohio State University	United States of America	1					1					
Oklahoma SUUnited States of America11111Orsay LALFrance11221OsloNorway12221Prague ASCzech Republic11221Santa Cruz UCUnited States of America11221SiegenGermany121221StACUnited States of America121221Stony BrookUnited States of America12221Taipei ASTaiwan111111TorontoCanada111111WuppertalGermany111111ATLAS TCWorld Wide111111	Oklahoma	United States of America						1		2			
Orsay LALFrance1III<	Oklahoma SU	United States of America						1					
OsloNorway1221Prague ASCzech Republic1121Santa Cruz UCUnited States of America1121SiegenGermany1222Story BrookUnited States of America1222Stony BrookUnited States of America1222Taipei ASTaiwan11221TorontoCanada11111UdineItaly11112ATLAS TCWorld Wide11111	Orsay LAL	France	1										
Prague ASCzech Republic1II <th< td=""><td>Oslo</td><td>Norway</td><td>1</td><td></td><td></td><td></td><td>2</td><td></td><td></td><td>2</td><td></td><td></td><td></td></th<>	Oslo	Norway	1				2			2			
Santa Cruz UCUnited States of America112SiegenGermany1111SLACUnited States of America1212Stony BrookUnited States of America1222Taipei ASTaiwan11111TorontoCanada11111UdineItaly11111WuppertalGermany11111ATLAS TCWorld Wide11111	Prague AS	Czech Republic	1										
Siegen Germany 1 <t< td=""><td>Santa Cruz UC</td><td>United States of America</td><td>1</td><td></td><td></td><td></td><td>1</td><td></td><td></td><td>2</td><td></td><td></td><td></td></t<>	Santa Cruz UC	United States of America	1				1			2			
SLAC United States of America 1 2 1 2 <th2< td=""><td>Siegen</td><td>Germany</td><td></td><td></td><td></td><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td></th2<>	Siegen	Germany						1					
Stony Brook United States of America 1 2 2 2 1 Taipei AS Taiwan 1	SLAC	United States of America	1			2	1	2		2	2		
Taipei AS Taiwan 1 <th< td=""><td>Stony Brook</td><td>United States of America</td><td>1</td><td></td><td></td><td></td><td></td><td>2</td><td></td><td>2</td><td></td><td></td><td></td></th<>	Stony Brook	United States of America	1					2		2			
Toronto Canada 1 I <t< td=""><td>Taipei AS</td><td>Taiwan</td><td></td><td></td><td></td><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td></t<>	Taipei AS	Taiwan						1					
Udine Italy 1 I	Toronto	Canada	1										
Wuppertal Germany 1 1 2 1 1 2 1	Udine	Italy	1										
ATLAS TC World Wide 1 1 1	Wuppertal	Germany				1		1	1	2			
	ATLAS TC	World Wide									1	1	1

Table 1: The responsibilities of the various partners of the IBL upgrade projects. The numbers illustrate various levels of commitment, 1) material + personnel, 2) personnel only, 3) additional resources.



3) A description of the IBL organisation, including the management, the organisation of work, the institute board, the role of the partners. As an example the organisational structure is shown below in figure 5.



Figure 5: The organizational structure of the IBL projects, from an annex of the IMoU.

5. CONCLUSIONS

The procedure for agreeing on, approving and initiating upgrade projects in ATLAS is set up. The first of these projects and the main project foreseen for the installation in the shutdown in 2013-14, the Insertable B-Layer, has produced its Technical Design Report, and has a signed IMoU including a detailed costbook. Other projects will follow in the same path.

6. REFERENCES

- 1) ATLAS upgrade organization definition: <u>https://edms.cern.ch/document/1093133/3</u>
- CERN-LHCC-2010-013, ATLAS-TDR-019 ATLAS Insertable B-Layer Technical Design Report: <u>http://cdsweb.cern.ch/record/1291633</u>
- Interim Memorandum of Understanding including costbook as annex (CERN-RRB-2010-118)
- 4) Proposal to prepare a technical design report for FTK, a hardware track finder upgrade to the ATLAS trigger: https://edms.cern.ch/document/903426/1