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REFERENCE
LHC-VC1JX-EC-0001

LHC

Date: 2014-07-23

ENGINEERING CHANGE REQUEST

Material Change ATLAS VJ Chambers

BRIEF DESCRIPTION OF THE PROPOSED CHANGE:

This Engineering Change Request (ECR) is concerned with the change of material of the ATLAS VJ chambers from stainless steel to aluminium AA2219. The machine aperture remains unchanged.

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DISTRIBUTION LIST:

LMC participants.

SUMMARY OF ACTIONS TO BE UNDERTAKEN:

1. EXISTING SITUATION AND INTRODUCTION

The ATLAS experiment consists of a central vacuum chamber in beryllium at the IP and previously forward chambers in stainless steel. One pair of forward chambers are known as the VJ chambers. These chambers (two in total) are situated symmetrically around the IP in ATLAS. The chambers are situated in the slot between IP1 +/-13207 to +/-18499. They are manufactured in stainless steel to drawing LHCVC1J_0003. Externally to the chambers is the LUCID detector, which surrounds the chamber in an annular fashion. These chambers interface to the ATLAS VJ extension on one side and to the ATLAS VT chamber on the other side. The chamber is 5292 mm in length, between 80 mm and 120 mm diameter with two stainless steel bellows for flexibility during bake-out to activate the inner NEG coating. Figure 1 shows one half of the ATLAS layout with the location of the VJ and other chambers.

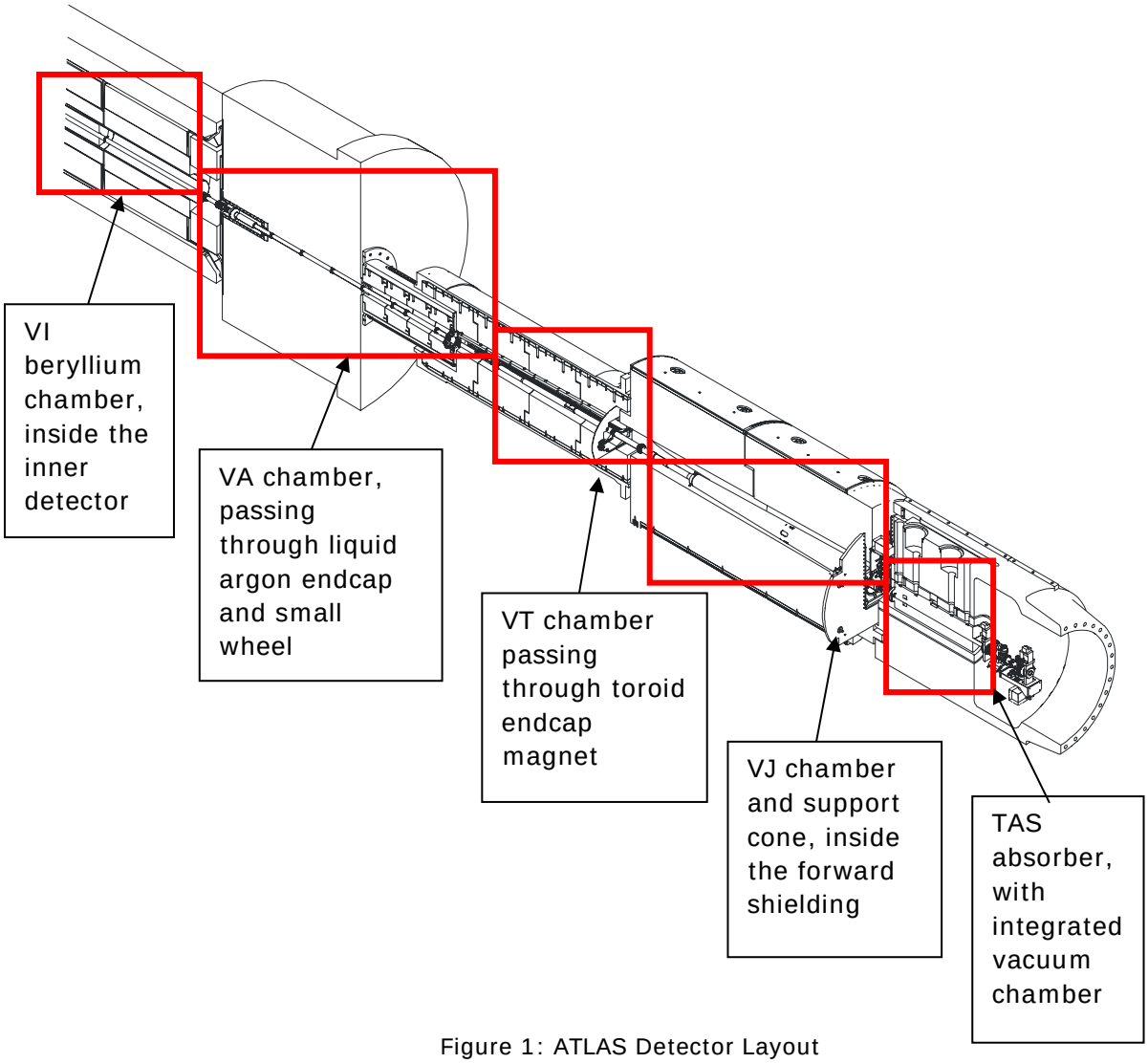

Figure 1: ATLAS Detector Layout

2. REASON FOR THE CHANGE

These chambers will be replaced, mostly for ALARA reasons. A change from stainless steel to aluminium will significantly reduce the activation of the chambers for reasons of personnel working in their proximity. Failure to make the change would expose personnel to more radiation dose in the future and risk being unable to access the zone.

3. DETAILED DESCRIPTION

In addition to LHC-VC1-EC-0002, EDMS 1230225, it is requested to install two new VJ vacuum chambers in the ATLAS detector during LS1. These new chambers will consist of two VJ chambers. The difference between these two new chambers and the ones currently installed is that the new chambers will be manufactured from aluminium alloy AA 2219.

4. IMPACT ON OTHER ITEMS

4.1 IMPACT ON ITEMS/SYSTEMS

	No impact on other systems. The new chambers occupy the same slot and space envelope.

4.2 IMPACT ON UTILITIES AND SERVICES

Raw water:	None
Demineralized water:	None
Compressed air:	None
Electricity, cable pulling:	None
Vacuum (bake outs, sectorisation…):	Chamber is NEG coated and bakeout uses currently installed cabling
Special transport/ handling:	None
Temporary storage of conventional/radioactive components:	None
Survey:	None
Scaffolding:	None
Controls:	None
Cryogenics:	None
Contractor(s):	The chamber will be installed by CERN personnel
Others:	

5. IMPACT ON COST, SCHEDULE AND PERFORMANCE

5.1 IMPACT ON COST

<table>
<tr><td>Detailed breakdown of the change cost:</td><td>
<table>
<tr><td>Component</td><td>Approx cost (CHF)</td></tr>
<tr><td>CF-160 & CF-100 bi-metallic flanges</td><td>20,000</td></tr>
<tr><td>Tecasint material VA/VJ</td><td>30,000</td></tr>
<tr><td>Aluminium Material for VJ</td><td>44,000</td></tr>
<tr><td>Aluminium Bellow 5083 dia 80 mm</td><td>37,000</td></tr>
<tr><td>Machined tube segments</td><td>31,500</td></tr>
<tr><td>VJ Aluminium assembly at CERN manufacture</td><td>61,500</td></tr>
<tr><td>Heating elements</td><td>17,000</td></tr>
<tr><td>Machined components</td><td>19,500</td></tr>
</table>
Total cost ~260 kCHF for change. This is a “real” cost as components are manufactured.
</td></tr>
<tr><td>Budget code:</td><td>T552000 (ATLAS) paid for change</td></tr>
</table>

5.2 IMPACT ON SCHEDULE

Proposed installation schedule:	15 - 22 September 2014
Proposed test schedule (if applicable):	
Estimated duration:	~5 to 6 working days to install in the ATLAS cavern
Urgency:	High priority because next possible change is LS2 when components will be much more activated
Flexibility of scheduling:	Depends on ATLAS installation schedule

5.3 IMPACT ON PERFORMANCE

Chamber same dimensions and NEG coated as previous VJ. Vacuum acceptance will be to LHC baseline so no impact on vacuum performance. Mechanical aperture will remain the same.

The impedance has been calculated by BE/ABP-ICE and can be found in CDS (http://cds.cern.ch/record/1637142?ln=en).

6. IMPACT ON OPERATIONAL SAFETY

This chapter aims at assessing the impact of the modification on people safety, on the environment, and on the safety of operations, including maintenance, access, egress, circulation and evacuation.

6.1 ELEMENT IMPORTANT DE SECURITE

Indicate if the change will have an impact on an Elément Important de Sécurité (EIS). The list of EIS components is available in EDMS document: 1182293 – ‘Définition et Inventaire des EIS-Faisceau et EIS-Machine en Opération’

Requirement	Yes	No	Comments
EIS-Access		X	Provide further details on the impacted EIS.
EIS-Beam		X	
EIS-Machine		X	

6.2 OTHER OPERATIONAL SAFETY ASPECTS

Have new hazards been created or changed?	No
Could the change affect existing risk control measures?	No
What risk controls have to be put in place?	The existing vacuum gauges in PT1 will verify the operation of the chamber
Safety documentation to update after the modification	No
Define the need for training or information after the change	The installation of the vacuum chamber will be included in the ATLAS installation procedure.

7. WORKSITE SAFETY

Refer to EDMS document: 1155899 – “Contractors working on the CERN site”.

Following the implementation of the change, the Safety File of the facility shall be updated. In the temporary absence of the Safety File, the hazards inventory and risk analysis of the concerned installation shall be established.

7.1 ORGANISATION

Requirement	Yes	No	Comments
IMPACT – VIC:	X		IMPACT will be foreseen for mid-September
Operational radiation protection (surveys, DIMR…):	X		The work-dose-planning is still being prepared. During the removal, work was ALARA level I. The same level is expected during installation.
Radioactive storage of material:	X		The old chambers will be stored in building 954.
Radioactive waste:		X	Unless the old chambers are scrapped
Fire risk/permit (IS41) (welding, grinding…):		X	
Alarms deactivation/activation (IS37):		X	

Others:			

7.2 REGULATORY TESTS

Requirement	Yes	No	Responsible Group	Comments
Pressure/leak tests:	X		TE/VSC	Chambers will be fully leak tested and acceptance tested for NEG before installation
Electrical tests:	X		TE/VSC	Bakeout system will be tested during the acceptance test
Others:				

7.3 PARTICULAR RISKS

Requirement	Yes	No	Comments
Hazardous substances (chemicals, gas, asbestos…):		X	
Work at height:	X		For installation in the cavern. This will only be done by personnel trained to work at heights
Confined space working:		X	
Noise:		X	
Cryogenic risks:		X	
Industrial X-ray (*tirs radio*):		X	
Ionizing radiation risks (radioactive components):	X		The chamber will become radioactive during the running of the LHC and must therefore be traced by TREC during any future removal phase
Others:			

8. FOLLOW-UP OF ACTIONS

BY THE TECHNICAL COORDINATION

Action	Done	Date	Comments
Carry out site activities:			
Carry out tests:			
Update layout drawings:			
Update equipment drawings:			
Update layout database:			
Update naming database:			

Update optics (MADX)			
Update procedures for maintenance and operations			
Update Safety File according to EDMS document 1177755:			
Others:			