

Date: 2012-07-11

Engineering Change Request – Class I

CMS central chamber diameter reduction

Brief description of the proposed change(s) :

This Engineering Change Request (ECR) is concerned with the reduction in diameter of the CMS central beryllium chamber. The request is for a reduction in inner diameter from 58 mm to 43.4 mm.

This change has been studied in depth from an engineering perspective, and approved by both the LEB Working Group, and the LHC Machine Committee. This document summarises the effects of this change.

<p>Equipment concerned : CMS Central Beampipe Assembly</p>	<p>Drawings concerned : LHCVC5C 0001 LHCVC5C 0028</p>	<p>Documents concerned : Layout Database</p>
<p>PE in charge of the item : M. Gallilee</p>	<p>PE in charge of parent item in PBS : J.M. Jimenez</p>	
<p>Decision of the Project Engineer :</p> <ul style="list-style-type: none"> ☒ Rejected. Accepted by Project Engineer, no impact on other items. <i>Actions identified by Project Engineer</i> ☒ Accepted by Project Engineer, but impact on other items. <i>Comments from other Project Engineers required</i> <i>Final decision & actions by Project Management</i> 	<p>Decision of the PLO for Class I changes :</p> <ul style="list-style-type: none"> <input type="radio"/> Not requested. <input type="radio"/> Rejected. <input type="radio"/> Accepted by the Project Leader Office. <i>Actions identified by Project Leader Office</i> 	
<p>Date of Approval :</p>	<p>Date of Approval :</p>	
<p style="text-align: center;">Actions to be undertaken :</p>		
<p>Date of Completion :</p>	<p>Visa of QA Officer :</p>	
<p><i>Note : when approved, an Engineering Change Request becomes an Engineering Change Order/Notification.</i></p>		

1. DETAILED DESCRIPTION

by M. Gallilee

A new 6.24 m long central beryllium vacuum chamber will be installed in CMS during LS1. This new central vacuum chamber will reduce the current aperture of 58 mm down to an aperture of 43.4 mm over the central length of 2.915 m.

2. REASONS FOR CHANGE

by M. Gallilee

The new reduced aperture central beryllium chamber shall allow space to accommodate an extra PIXEL layer (Figure 1), taking the total number of layers from three to four. This extra PIXEL layer will allow for significant improvement to the physics performance of the CMS detector.

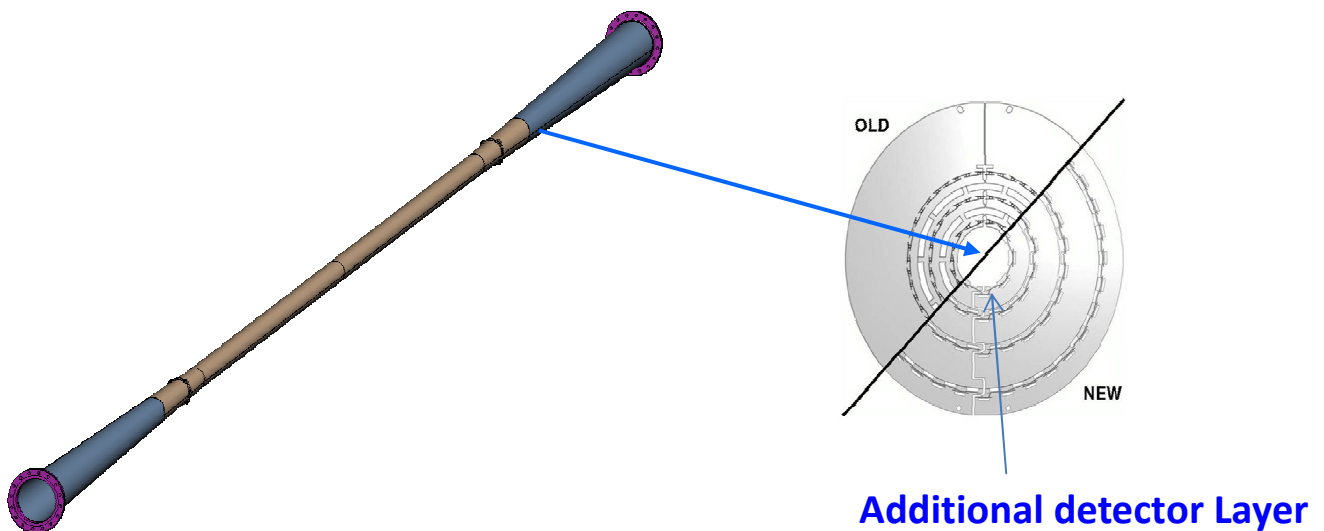


Figure 1: CMS Detector Change – picture provided by CMS

3. IMPACT ON COST, SCHEDULE & PERFORMANCE

by M. Gallilee

The installed hardware cost is in the region of 1.3 MCHF. The new central chamber is scheduled to be installed around November 2013, during LS1. This will have no impact on machine consolidation activities.

The impacts on performance have been assessed by both the LHC Experimental Beampipes and the LHC Machine Committees, with approval granted in August 2011. No impacts were identified with respect to the stable running of the LHC machine.

4. IMPACT ON OTHER ITEMS

by M. Gallilee

No impact on other items.

5. CHANGE CLASS

by M. Gallilee

This is a class I change.

6. COMMENTS (COMPULSORY)**by M. Gallilee**

This change has been assessed and approved by both the LEB Working Group and LMC committee. No impact has been identified for machine performance. This change will significantly improve the Physics performance of the CMS detector.

7. COMMENTS (IF REQUIRED)**by other Project Engineers**

On 20 August 2012, Benoit Salvant accepted the change from BE/ABP and added the following comments:

"The power loss is expected to increase by about 30% if the inner Be pipe radius of 29mm is reduced to 21.7mm.

The longitudinal and transverse effective impedances of the central pipe is expected to increase significantly with the radius decrease but for both current and future situations they are estimated to be negligible with respect to the rest of the ring.

From the drawing, the taper angle is 1.7deg and its impact on the imaginary impedance is considered negligible.

Finally, initial studies on the impact of this change on CMS higher order modes showed no showstopper."

8. COMMENTS (IF ANY)**by PLO appropriate Committees**