



HL-LHC WP13

Summary of Internal HL-LHC Inner triplet BPM conceptual design Review

Rhodri Jones (BE-BI)



15/11/2018

Introduction

- Review held on the 17th May 2018
 - Organised by G. Schneider (BE-BI)
 - <https://indico.cern.ch/event/725045/>
- Reviewers
 - R. Jones (BE-BI) - Chair
 - M. Garlasche (EN-MME-FS)
 - M. Modena (ATS-DO)
- Summary & Actions – Presented for approval today
 - Documented in LHC-BPMSQTB-ER-0001
 - <https://edms.cern.ch/document/LHC-BPMSQTB-ER-0001>

Charge

■ Function

- Do the following aspects meet requirements?
 - Absorption of particle debris, cooling, impedance
- Is the electro-magnetic design of the BPM sound?

■ Integration

- Are the alignment references and precision required agreed?
- Is the integration of the BPMs possible?
- Are the interfaces to other systems agreed and clear?

■ Engineering

- Is Beam Screen & BPM design optimised to reduce cost, risk & duplication?
- Is material selection & fabrication procedure as expected
- Is the BPM design sound and ready for detailed drawings?
- Is the documentation adequate for the project at this stage?

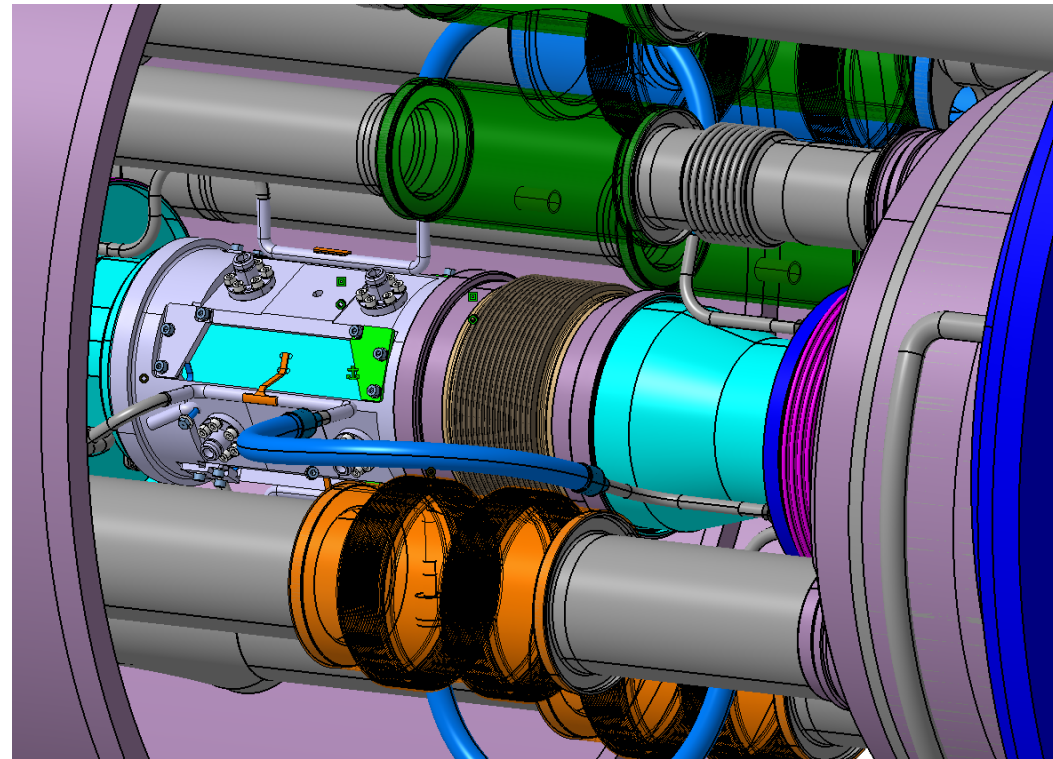
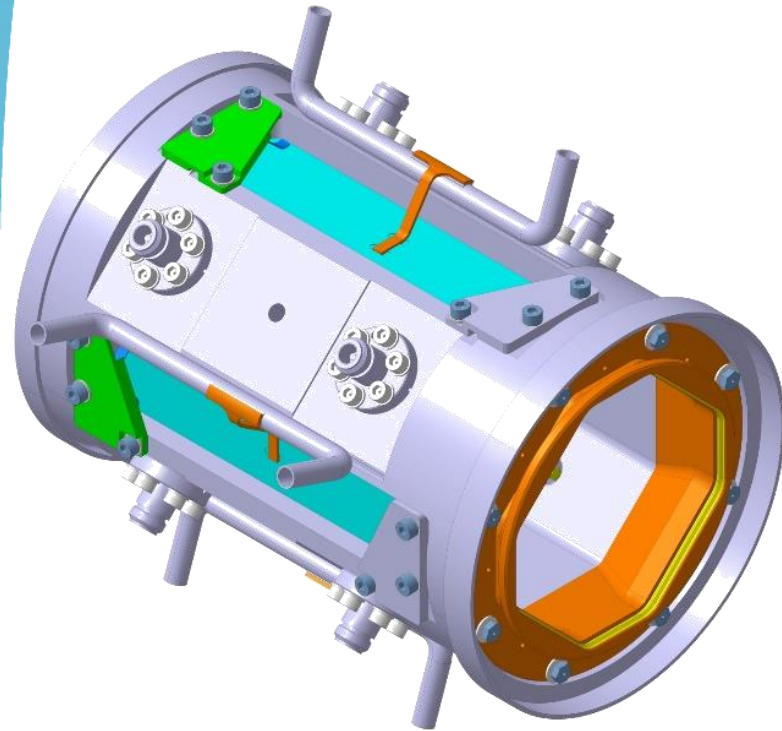
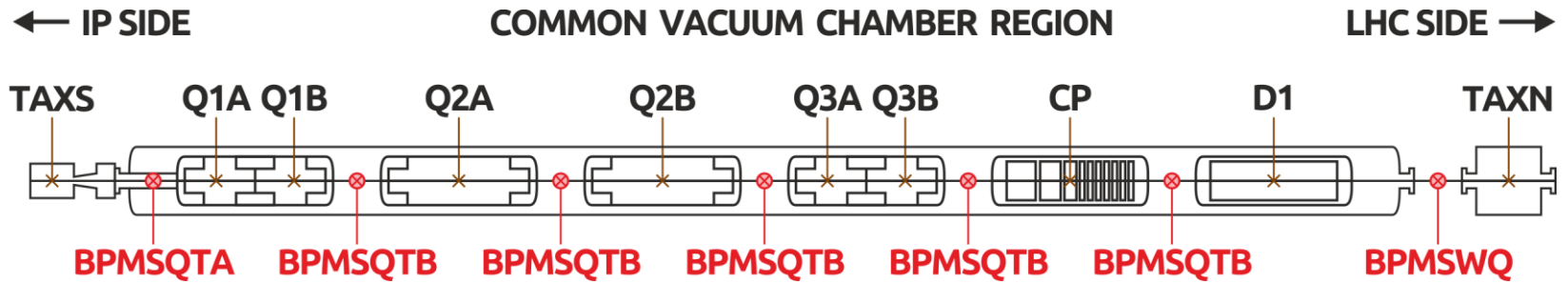
■ Planning

- Is the planning in agreement with the global schedule?
- Is the deliverable to the IT String test agreed?
- Is the prototyping strategy clear?

Presentations

- Cryostating and integration
 - Delio Duarte Ramos (TE-MSD & WP3)
- Beam screen design
 - Cedric Garion (TE-VSC & WP12)
- Inner Triplet String Test
 - Marta Bajko (TE-MSD & WP16)
- Summary of calculations for absorption of debris, cooling requirements and electrode design
 - Michal Krupa (BE-BI & WP13)
- BPM design, integration, alignment and planning
 - Gerhard Schneider (BE-BI & WP13)

What Are We Talking About?



Charge Outcome

■ Function

- Do the following aspects meet requirements?
 - Absorption of particle debris, cooling, impedance
- Is the electro-magnetic design of the BPM sound?

■ Integration

- Are the alignment references and precision required agreed?
- Is the integration of the BPMs possible?
- Are the interfaces to other systems agreed and clear?

■ Engineering

- Is Beam Screen & BPM design optimised to reduce cost, risk & duplication?
- Is material selection & fabrication procedure as expected
- Is the BPM design sound and ready for detailed drawings?
- Is the documentation adequate for the project at this stage?

■ Planning

- Is the planning in agreement with the global schedule?
- Is the deliverable to the IT String test agreed?
- Is the prototyping strategy clear?

Recommendations

- Strong recommendation to install two full beam screen assemblies in String
 - Allows qualification of full BPM/beam screen assembly & alignment
 - Minimum: two beam screen interfaces required
- Maintain octagonal design for Q1 BPM to keep same electromagnetic design for all cold, directional BPMs
- Use same materials & if possible procurement contracts, for the common beam screen & BPM components
 - E.g. Tungsten blocks & cooling tubes
- Split series production planning to keep enough contingency to react in case of input from prototype test & STRING results
 - Ensure early procurement of key material & components
 - Identify & qualify potential manufacturers
 - Implement a reasonable numbers of milestones for safe project tracking & follow-up

Main ACTIONS & Follow-up

- 20 ACTIONS identified with main ones summarised below
- Significant advancement on many fronts since the review in May

	ACTION	ON	FOLLOW-UP
1	<p><u>Decision on the assembly option</u> Ensure baseline of BPM & beam screen assembly after completion of other service module work is feasible. Produce clear roadmap for taking this decision, with dates for the design of the tooling and the tests on mock-ups.</p>	<p>BE-BI TE-MSc</p>	<p>The necessity of building mock-ups is agreed by all parties. Detailed integration studies ongoing. Formal roadmap remains to be produced.</p>
2	<p><u>Overall responsibility for interconnection, assembly, design of tooling & welding procedures</u> Clarify responsibility & roles of WP holder, cryostat designer & Cryostat Interface Meetings</p>	<p>TE-MSc HL Management</p>	<p>To be done. Formal decision needed on responsibility for welding/cutting tooling space reservation, procurement of machines, and assembly procedures. (BE-BI or TE/VSC)</p>
3	<p>Investigate possibility of attaching BPM to beam screen before installation to reduce number of welds & simplify alignment</p>	<p>BE-BI TE-VSC</p>	<p>It is not possible to install a complete assembly as the beam screen must be pushed in further than its final position to bend the cooling tubes on the opposite end.</p>

Main ACTIONS & Follow-up

	ACTION	On	Follow-up
4	Produce a document showing the global alignment requirements & consequences if not met for the beam screen, BPM and Tungsten blocks	BE-BI TE-VSC Alignment WG	Initial BPM alignment specification presented to WGA in June. Updated specification will be presented at a future WGA meeting.
11	Define the alignment tolerances for tungsten shielding with respect to the beam screen shielding to maintain their effectiveness for reducing the total dose on the front-face of the magnets concerned.	BE-BI EN-STI	EN-STI simulations show that precise alignment of tungsten shielding is not necessary. BPM tungsten will be moved by 1 mm to simplify manufacturing.
5	Investigate if aC-coating of beam screen can be done before installing the BPM to reduce risk of damage	BE-BI TE-VSC	Seems feasible but formal decision requires complete and final installation procedure.
6	Provide necessary information to TE-VSC to be part of ongoing procurement process for the tungsten blocks	BE-BI TE-VSC	All necessary documentation shared with TE-VSC, & is now part of procurement process
8	Provide a document giving a full description of the BPM aspects to be checked in the String test	BE-BI TE-VSC	Document was prepared and distributed. Summary presented at the String review.

Main ACTIONS & Follow-up

	ACTION	On	Follow-up
18	Prepare the procurement plan for the electrical feedthroughs.	BE-BI HL Management IPT-PI	The procurement strategy was agreed upon by all parties. All necessary administrative work already under preparation. The procurement process will be started before end 2018.
19	Update the HL baseline planning to include the “needed by” date for each BPM assembly.	BE-BI TE-MS HL Planning	To be done.
20	Put in place a planning for BPM procurement and production that meets the “needed by” date for each BPM assembly.	BE-BI HL Planning	To date done only for the RF feedthroughs. To be done for the remaining BPM components. Awaiting completion of new baseline (Action 19).

Summary

- Approval requested for
 - Formal release of Review Summary
 - Documented in LHC-BPMSQTB-ER-0001
 - <https://edms.cern.ch/document/LHC-BPMSQTB-ER-0001>
- BI proposal for endorsement by WP12 & HL Management
 - Overall responsibility for the following to be given to WP12 (TE-VSC) for all cold BPMs
 - Design and test of the welding machines
 - Production of necessary welding procedures
 - Welding of the BPM
 - Overall responsibility for the following to be given to WP3 (TE-MSD)
 - Integration of the welding and cutting machines on the drawings
 - Integration of the BPM cabling in the interconnect
 - Supply of an interconnect mock-up