HL-LHC WP13
Follow-up on Responsibility Share between BE-BI, EN-SMM TE-VSC and TE-MSC for Installation of the HL-LHC Cryogenic Beam Position Monitors

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06/02/2019

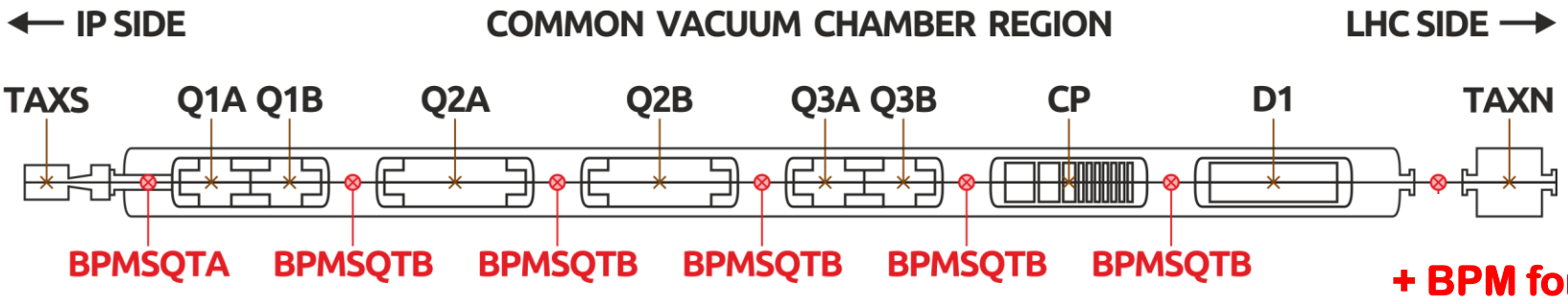
Introduction

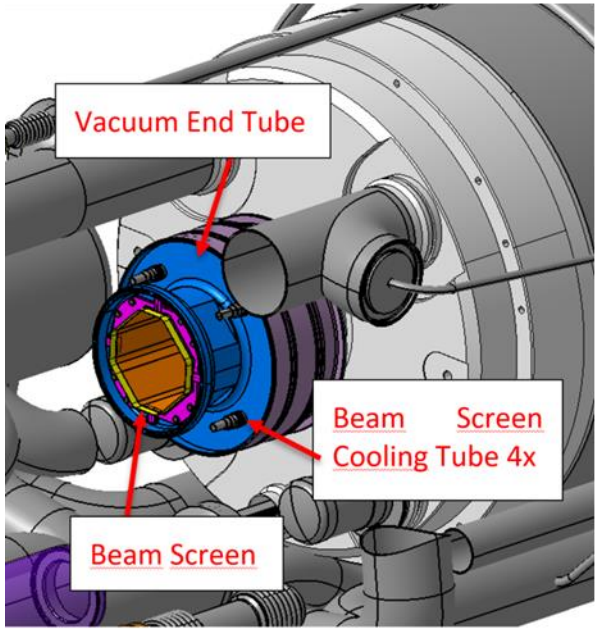
HL-TCC 15th November 2018

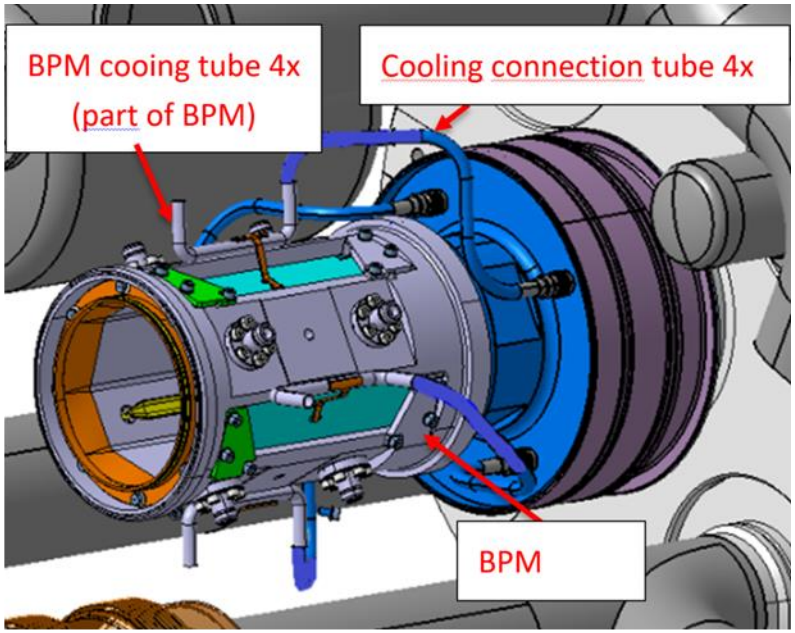
- BI proposal for endorsement by WP12 & HL Management
  - Overall responsibility for the following to be given to WP12 (TE-VSC) for all cold BPMs
    - Design and test of the welding machines
    - Production of necessary welding procedures
    - Welding of the BPM
  - Overall responsibility for the following to be given to WP3 (TE-MSC)
    - Integration of the welding and cutting machines on the drawings
    - Integration of the BPM cabling in the interconnect
    - Supply of an interconnect mock-up

- Memorandum in preparation to detail the responsibility and budget agreement between WP13 (BE-BI), WP12 (TE-VSC), WP3 (TE-MSC) and WP15 (EN-SMM)
  - Thanks to Gerhard Schneider for all his work in putting this together

What Are We Talking About?







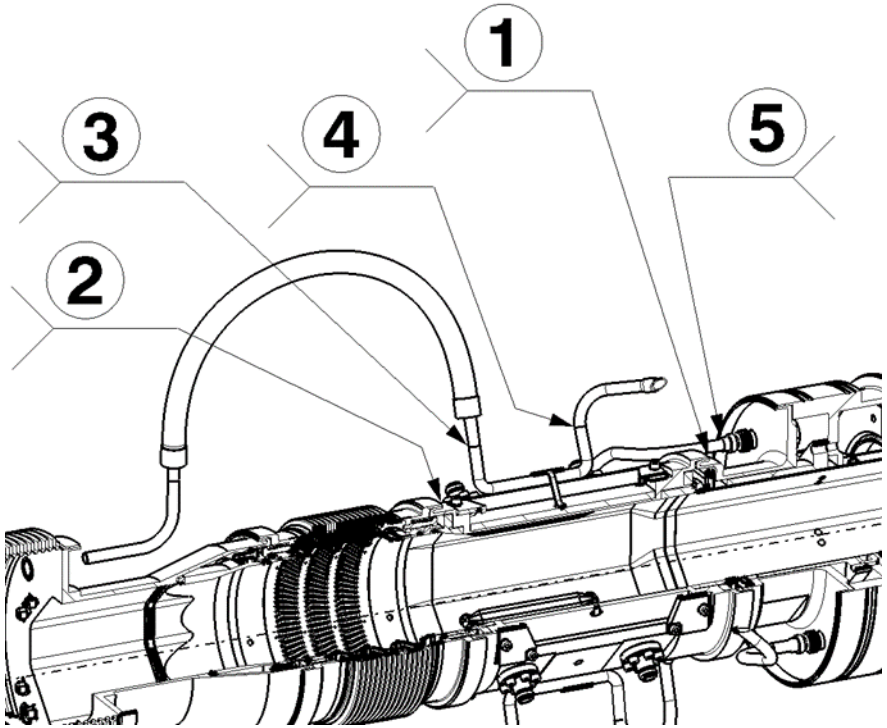
WP13 (BE-BI) Deliverables

- **BPM cable integration**
  - Provide design of pre-bent semi-rigid coaxial BPM cables to WP3
  - Test installation on service module mock-up provided by WP3

- **BPM Installation**
  - Supply a dummy BPM for BPM integration tests
  - Supply of cleaned, copper and aCarbon coated fully tested BPMs
  - Supply of tooling for installation, alignment and BPM leak tests
  - Supply and installation of pre-bent, semi-rigid coaxial cables

WP12 (TE-VSC) Deliverables

- Supply of 4 cooling connection tubes
  - Cost shared 50:50 between WP12 & WP13
- Welds 1 to 5
  - Cost of these welds shared as:
    - Weld 1: as 20% of total orbital V-line welds, i.e. 20% WP13 & 80% WP12
    - Welds 4 & 5: 50% WP12 & 50% WP13
    - Welds 2 & 3: performed in tunnel during magnet connection: 100% WP12
- Welding machines
  - Development costs shared as for Welds
- Stay clear envelopes for welding & cutting machines
- Final leak check
- Final beam vacuum system conditioning



WP3 (TE-MSC) Deliverables

- Integration into the service module 3D CAD environment
  - Pre-bent, semi-rigid cryogenic coaxial cables (design by WP13)
  - Stay clear regions for welding & cutting machines
  - Stay clear regions for the semi-rigid cryogenic coaxial cables
- Mock-up
  - Complete Q2b cryo-assembly prototype with all machine interfaces including its service module and jumper
  - Delivery by July 2020

WP15 (EN-SMM) Deliverables

- Check that the alignment and measurement of the BPM position during installation is feasible
- Supply the necessary equipment for survey measurement (e.g. the mirrors required)
- Perform the alignment in the tunnel

Detailed Installation Sequence Defined

	Task	Resp.	Time (h)	Cost
1	Install BPM installation and alignment tool, see Figure 5.	WP13	1	WP13
2	Install BPM	WP13	1	WP13
3	Align BPM to optimum position with help of screws and level gauges, see Figure 6 and 7. The offset between this aligned BPM location to the nominal position, i.e. the misalignment, must be recorded.	WP15	2	WP15
4	Spot weld the BPM to the vacuum end tube at 8 points. The order of these welds should be such that any movement reduced the misalignment (i.e. starting with the point towards which the BPM should move).	WP12	1	WP13 new
5	Verify and record the position of the upstream end of the BPM after cool-down of the spot welds, see Figure 7. The measurement must be recorded.	WP15	1	WP15
6	Final orbital weld, No 1 as per Table 1. This weld should again start at the point towards which the BPM should move to improve misalignment. This weld is similar to the other 6 welds of the tunnel-installed vacuum system, as well as to the 4 welds of the individual cryomagnet.	WP12	2	WP13 new
7	Verify and record the final position of the upstream end of the BPM after the welding process is complete, see Figure 7. The measurement must be recorded.	WP15	1	WP15
8	Leak check of BPM beam screen weld.	WP12	1	WP12
9	Install and weld the cooling tubes, total 8 welds.	WP12	2	WP12 50% WP13 50% new
10	Leak check of cooling connection tubes, 8 welds.	WP12	1	WP12 50% WP13 50% new
11	Installation and electrical tests of the 8 BPM cables.	WP13	8	WP13
12	Leak check of BPM cable flange.	WP12	1	WP12

Summary

- Draft memorandum in circulation for input & tacit approval by all parties
  - Will be circulated through EDMS for formal approval

- WP3: Minor comments
- WP13: OK
  - Additional costs for unforeseen responsibilities to be presented at next PSM
- WP12: “We agree on the principle of the proposed transfer of responsibilities but we need more time for detailed estimation and iteration with your WP to approve its detailed content”
- WP15: OK in principle