



EDMS: 2427820

HL-LHC BPM Final Design Review

Date: Wednesday November 18th, 2020

Remote only.

The agenda is in: <https://indico.cern.ch/event/965501/>

Zoom Event:

<https://cern.zoom.us/j/98783955779?pwd=M2NDZlZqMDRwMDEvTE9EbDYzSjZlQT09>

Charge to the reviewers

Aim of the Review:

- To confirm that we are ready to hand over the design of the various different BPMs for the HL-LHC Interaction Regions to CERN Internal Manufacturing of fully compliant pre-series and to BINP for preparing the production.
- To freeze the interfaces and integration aspects impacting all of these BPMs

The Review Panel are asked to answer the following questions:

1. **Does each BPM design meet the functional requirements?**

The characteristics to be assessed in particular are: beam position measurement capability, beam coupling impedance, electron cloud mitigation, cooling including temperature and heat-load management, vacuum integrity, collision debris absorption (where applicable).

2. **Is each BPM design sound and optimised for ease of production and cost?**

Design aspects to be assessed in particular are: selected raw materials, machined conflat flanges, synergies with TE/VSC designs (thermal links, RF fingers), coating materials, tooling for BPM alignment, copper inserts, welding lips, cooling capillaries.

3. **Is the BPM integration within each cryo-assembly well defined?**

The integration issues to be assessed in particular are: definition of interfaces to the downstream and upstream components, BPM installation procedure including use of the necessary tooling, routing of the cryogenic cables installed within the cryo-assembly, location of cryostat flanges, mock-up plans.

4. **Does the procurement and mechanics production plan promise a successful delivery?**

Production aspects to be assessed in particular are: selected machining methods, division of



EDMS: 2427820

responsibilities between CERN and BINP, production capabilities at BINP, prototyping plan, quality assurance plan, documentation, coating and assembly procedures, non-conformity treatment.

5. **Are the project budget and schedule clear and in line with the HL-LHC project?**

Parts of the project to be assessed in particular are: alignment with the global HL-LHC schedule, missing expenses, overlooked tasks.

Proposed composition of the Review Panel

1. HL-LHC management: M. Zerlauth (chair)
2. WP12 & TE/VSC: V. Baglin
3. WP15: P. Fessia
4. WP13: T. Lefevre

Scientific secretary: M. Bozzolan

Proposed agenda

Session 1: BPM design, interfaces and integration 9:00 – 10:40

1. **Introduction and summary of the 2018 review** (Rhodri Jones) – 5 min + 5 min
2. **Overview of the HL-LHC BPMs** (Michal Krupa) – 45 + 10 min
 - The three types of BPMs: Q1, Q2a-D1, D2
 - Electrode, feedthrough, button design
 - Summary of beam coupling impedance simulations
 - Summary of thermomechanical simulations
 - Amorphous carbon coating for electron cloud mitigation
 - Tungsten shielding for collision debris absorption
 - Cabling routing overview
3. **Mechanical design, integration and tooling** (Dmitry Gudkov) – 30 + 10 min
 - Mechanical differences between the three types of BPMS: Q1, Q2a-D1, D2
 - Machined conflat flanges: tests done at CERN, M6 screws
 - Design of copper inserts
 - Quasi-symmetric D2 button BPM design
 - Synergies with TE/VSC: tungsten blocks, thermal links



EDMS: 2427820

- Installation situation in cryostats
- Alignment procedure and tooling
- Status of manufacturing drawings

Coffee break: 10:45 – 11:00

4. **Vacuum connections, interfaces and technologies** (Cedric Garion) 35 + 15 min
- Up-date of the implementation of the responsibility share as per Memorandum EDMS No. 2105453
 - Solutions for cooling of the vacuum components
 - Tolerances of the BPM-relevant vacuum components in the Inner Triplet and D2
 - Assembly sequence of the beam screen and vacuum components in the Inner Triplet and D2
 - Overview of the design of welding. Cutting machines situation

Lunch break: 12:00 – 14:00

Session 2: BPM manufacturing, assembly and quality checks: 14:00 - 15:30

5. **Manufacturing Study, Pre-production and Quality** (Dmitry Gudkov) – 20 + 5 min
- Details of components manufacturing
 - BPM Body
 - Machining
 - Coatings
 - Welding
 - Relevant tooling
 - Prototypes and tests at CERN
 - Transitions
 - Electrodes
 - Assembly
 - Amorphous carbon coating
 - Identification of work for BINP and CERN
 - Quality assurance
6. **Manufacturing capabilities and production plans at BINP** (Alexander Krasnov) – 20 + 5 min
- Details of the talk to be agreed with BINP
7. **Budget and schedule** (Michal Krupa) – 15 + 5 min
- Prototype and production planning



EDMS: 2427820

- Delivery plans – needed by date
- Alignment with the global HL-LHC schedule
- Budget overview

Session 3: Closed session and conclusions – 15:00 – 17:00

8. Closed sessions for the reviewers – 2 h. It is proposed to present the conclusions to a future HL-TCC

Other invitees / people to be informed

- HL Management: O. Bruning, B. Di Girolamo, I. Bejar Alonso
- HL WP Leaders & Deputies
- GLs of concerned Groups: TE/VSC, EN/MME, BE/ABP, BE/BI, TE/MSC
- Procurement: H. Garcia Gavela, J. Pierlot
- Planning: M. Barberan
- WP2: B. Salvant (impedance), G. Iadarola (electron cloud)
- WP13: M. Wendt, T. Lefevre
- EN/MME: N. Chritin (design), K. Scibor (workshop), E. Rigutto (workshop), F. Carra (thermomechanical simulations); G. Favre (workshop)