

Gamma Factory PoP cost and scheduling workshop

24-25/10/2022

<https://indico.cern.ch/event/1205247>

Present : G. Arduini, J. Bieron, C. Carli, Y. Dutheil, L. Esposito, S. Evrard, F. Galleazzi, E. Granados, W. Hofle, W. Krasny, P.M. Kruyt, T. Lefevre, J.M. Loughlin, B. Marsh, A. Martens, G. Mazzola, K. Pal, C. Pasquino. W. Placzek, R.L. Ramjiawan, J. Woolley

Gamma Factory (W. Krasny)

- Powerful and wide physics program with strong prospects at near (SPS) and far (LHC) timescales
- Critical milestone on the demonstration of production and acceleration of partially stripped ions in the LHC chain
- The development of necessary software tools to is completed
- The **building of physics cases is ongoing**
- The PoP in the SPS started with a Lol in September 2019 which was positively reviewed by the SPSC in October 2020

Physics Beyond Colliders and the Gamma Factory (G. Arduini)

- The WG should focus on the following revision of the cost & resources estimate
 - Main milestones/deliverables and their timeline
 - **Material and personnel required**
 - What are the installation activities that require a long shut-down (LS)?
 - What can be done during end of year stops ?
- What is the expected duration of the beam tests in order to have a possible demonstration of the concept in time for possible application during Run 5 for ALICE3?
 - **Action (W. Krasny & G. Arduini): investigate the interest of ALICE3 for cooled ion beams**
- Financing
 - PBC cannot finance the full PoP experiment
 - EU grant possibility in the INFRA-DEV grant with CERN support, submission early 24

Safety considerations, and potential solutions (J.M. Laughlin)

- Safety inputs
 - Access to tunnel beyond the door at the back of the tunnel
 - Laser safety
 - Access and fire safety
 - Rack fire prevention and extinguishing measures

- Question of safety measures to be taken during alignment
 - In AWAKE there is a laser patrol that blocks access during alignment
 - May need special access mode to ensure only laser expert access Maybe similar to magnet patrols
 - **Action (B. Marsh): Identify the potential safety laser officer and discuss the required measures**
- Question from RF on the type and requirements of the fire-proof electronic racks
 - **Action (J.M. Laughlin): Provide example of such systems**

R2E (G. Mazzola)

- Uses a beam-gas interaction based source term
 - Model is many orders of magnitude below measurements
 - But rescaling based on measurement allows model to get close to measurement
 - **During proton Run environment is not safe for electronics**
 - **Cumulative events are acceptable** for electronics (no degradation)
 - Need to check the effect of radiation on the motors and piezo
 - **Action (Y. Dutheil & A. Martens) : Identity and review stepper motors used elsewhere at CERN**
 - Radiation effect on other equipment
 - **Action (all groups): Each group need to check the compatibility of their equipment**
 - Installation of additional monitors around the PoP location is needed to benchmark the ion losses model
 - Luigi and Giuseppe are making the request to R2E, to be seen if that can be done during this YETS
 - **Action (L. Esposito & G. Mazzola): Request the installation and verify it can be done during this YETS**
 - Need to consider remote reset functionality to all the electronics for single event effects
 - **Action (G. Mazzola): predict the radiation environment during ion and PSI operation**
- Action(L. Esposito & G. Mazzola): provide expected radiation during the ion run, and during PSI cycles, needs to be evaluated**

Instrumentation (T. Lefevre)

- BPMs & electronics could possibly be scavenged from the Crab cavity setup, but this is not considered in the current cost estimate
- **The screen & camera should be installed already during Run3**
 - in particular to measure the background induced by direct hits from the beam halo, around the screen hole

RF & Synchronisation (W. Hofle)

- SY-RF tested a commercial frequency generator
 - **Aurelien agreed that the measured performances are suitable to the laser system**
- Question on the uncertainty/tuning range needed on the 40MHz
 - **Action (Y. Dutheil & A. Martens) : Discuss and agree on the maximum frequency range that may be requested, for and beyond the current PoP scope**
- What activities can be done before & during LS3 ?
 - **Possibly fiber reservation could be done early**
- Compatibility with radiation environment

- **All the equipment needs remote control, and remote reset capability**

Cooling and Ventilation Infrastructure (S. Evrard)

- Air-Air and Air-Water units were investigated
 - Air-Air is too large for integration in the tunnel with the required
 - **Air-Water is smaller and would fit in the side of T118**
- Question of operation in radiation environment,
 - **Action (S. Evrard): Verify the compatibility of the system with operation in the radiation environment of the SPS**
- CV could provide reviewed cost estimate based on market survey early next year
- Only 1.2m left for passage for the space reservation of the Air Handling Unit (AHU) considered now,
 - **Action (Y. Dutheil): Check with transport and all groups the compatibility of this narrow passage**
- Uncertainties remain on the environment within the T118 tunnel
 - **Action (K. Pal): Verify the environmental conditions in the side tunnel and possibly organize a visit of the tunnel if possible**

Laser (A. Martens)

- **Complete planning showed, with discussion on responsibilities**
 - Question of re-evaluation of costs under current market volatility
- Dedicated discussion between ICJLab and STI/LP will need to take place to agree on the interfaces and responsibilities
 - **Action (A. Martens, E. Granados & B. Marsh): Dedicated discussion to establish a joined schedule and splitting of responsibilities**
- If VSC is taking care of the procurement of the cavity, then dedicated discussion on cleaning should take part between VSC & ICJLab
 - **Action (A Martens & C. Pasquino): Agree on the group building the cavity housing and the VSC process for cleaning but also validating equipment**
- Cavity design
 - **Action (Y. Dutheil) : Contact impedance team to review the cavity design since their first comments in 2019**
 - **Will require some iterations between Laser, vacuum and impedance constraints**
 - Impedance estimate needs to include the whole vacuum design in the region

Laser (E. Granados)

- Laser transport line
 - Is it an analogue feedback loop for the pointing ?
 - **Action (E. Granados & A. Martens) : investigate the possible requirement of an analogue feedback loop for the laser pointing to the cavity**
 - To date the strategy has been to avoid vibrations through using a large and heavy marble for the cavity support
 - Laser room could contain amode matching and steering section
 - Project of the box would be a great TECH project, in synergy with AWAKE
 - **Action (E. Granados and B. Marsh): Establish and request support for a generic laser matching box design**
 - Laser transport line question to be **filled with controlled atmosphere or with vacuum**

- Vibrations
 - In the case of AWAKE, coupling to the vacuum is a problem
 - We do not have a number on this
 - Strategy in the past was to decouple the cavity from the beam pipe and support the mirror from the granite table, for ThomX it is a 3t granite table
 - To investigate the possibility for a vibration measurement, HIE Isolde developed
 - Action (Y. Dutheil and STI): Check the possibility for measurement in-situ during the 2023 heat run of the SPS
 - Biggest problem for AWAKE is slow drift during the day

Vacuum (C. Pasquino)

- All new 160mm vacuum chambers should be carbon coated,
 - This is a concern to laser experts which require a high cleanliness of the mirrors
 - There has not been seen any increase in the particle counting from past measurements
 - Maybe some synergy with Crab Cavity, which is also concerned by contamination
- VSC prefers to locate their equipment in the tunnel than in the laser room since access is simpler
- What activities can be done before & during LS3?
 - The ring could be sectorized in advance
- Question of the desorption with the Xray flux
 - Action (Y. Dutheil and C. Pasquino) : to provide the expected maximum photon flux and deduce the effect on the vacuum levels