



Interaction Point for GammaFactory POP

2019 06 04

Kevin Cassou on behalf of the LAL group + help from several other GF members

Since the last meeting (29/03/19)

- > Updated and consolidated YELLOW REPORT... please read and ask questions
 - > Still single pass option needs some written, will do in the coming days.
 - > Several discussions with Yann about synchro, YR related section written waiting for comments from Synchro group. Phasing procedure needs clarification.
- > Non Disclosure Agreements for all the electronics parts still under preparation
- > Iteration and meetings with laser manufacturers to freeze a possible design
 - > Will be finished in the coming weeks.
- > **Radiation / EEE : risk of damage during proton operation : installation of laser and electronics in 24hours slot.**
- > SPS visit : crab cavity pumping system close to LSS6.616 ... bad news for vibration / **BUT** : visiting the downstream part a section MBB62150 and QF62210 is close to (~5-8m laser transport line) the old TI18 tunnel with a potential more radiation safe place for the laser see next slides...

Mechanical integration

- > From the march meeting, list of actions still pending:
 - > 2 BPMs will be added to the IP module => **if have model please send it** (80mm aperture possible rescaling at 150mm aperture ?)
 - > Update design to ease mirror change
 - > The inner shape of the shielding will be modified following Aaron suggestion => updated drawing will be send with asymmetric section and RF coper finger
 - > Then iterate with CERN about impedance, etc.
 - > Add a laser transport line (not the top priority)
 - > Design a rough optical room in LEP side tunnel

Location update

- LSS621 new location ... with « radiation protected » laser area !!
- Relax **A LOT** the constraints on the laser integration in the SPS tunnel. Anyway estimation of the radiation level has to be estimated.
- New design for the optical transport of the beam must be considered
- All the sensitive diagnostics and electronics for the PDH locking of the FP cavity can be installed in the laser clean room
- Updated of the optical cavity is required to fit beam impedance constraints.
 1. Fit the inner diameter (vertical) of MBB.62150 to a smaller BPM for the input in the IP section
 2. Additional BPM at the output
 3. Cancel any symmetry in the mirror chamber
 4. RF finger
 5. SPS bellows
- First x-ray photons detection station can be fitted in the vertical reduction of MPSH.6199 (<https://layout.web.cern.ch/default.aspx?version=study&id=2582808>)

SPS visit

Questions are:

- Beam sizes ?
- Radiation level?
- Any issue being after extraction for LHC ?
- Or other reason if I well remember Valentine mentioned this place in January



SPS visit

LSS6 621

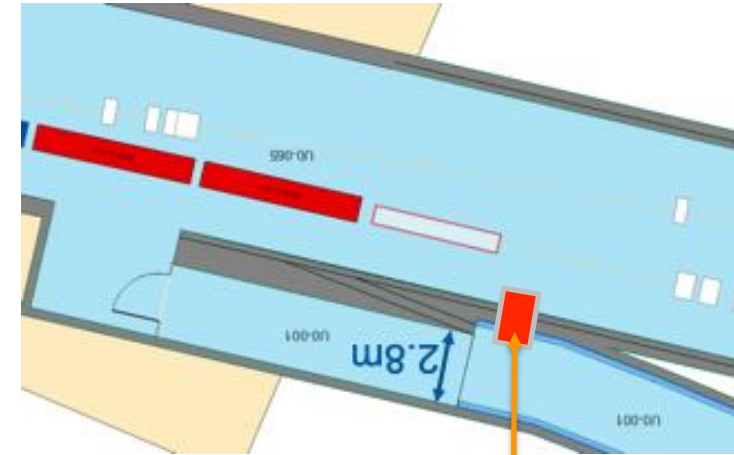


LSS6 616

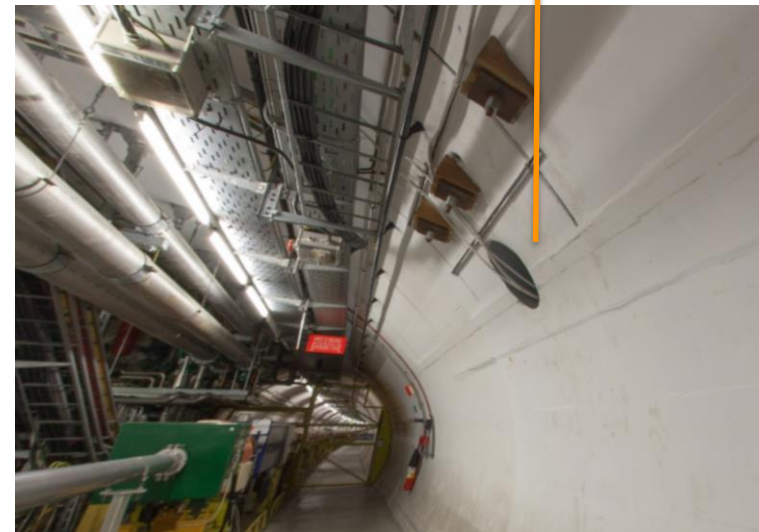
Vacuum group of the crab cavity



LSS6 621 new location



- > Exact position of the penetration
- > Laser clean room installation ?
- > Heat dissipation in the clean room ?



Next steps

- > Continue updating the YR
- > Typical laser system procurement time is 9/12 months...but need project approval first
- > Experimental tests are required to be ready in time (winter 2021-2022)
- 1. Low power tests
 - > test of 2-mirror optical cavity with « large » waist size at theoretical IP
 - > Implement telescope for matching of input beam
 - > Prepare electronics
 - > Test several meters of transport between laser source and cavity
 - > R&D Laser spectral control
- 2. Upgrade system for higher power if we have time)
 - > high reflectivity and high laser damage threshold mirrors
 - > Test high power stability in the cavity (thermally induced instabilities in optical cavity may appear at few 100kW)
 - > Spectral control at high power.

Development of a 62 MHz test cavity for GFPop @ LAL

- > The 75 MHz PLIC cavity can be upgraded: 2 new mirror HR (<1k€) @ 1030nm + 40cm CF tube (<1k€)
 - > Laser system : One five low phase noise oscillator + CFBG (TEC) + Mighty laser 50 W YDFA + (CVBG ?). On going quotation for the CPA elements.
 - > Diagnostic : HR spectrometer (18k€)
- => Demonstrate low power operations first and upgrade to high power.**

