

Minutes of BGV meeting #1, 30/10/2012

Agenda page:

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❖ BGI/IPM

- It was pointed out that the BGI chambers have to come out during LS1
- It was agreed to investigate the possibility to modify the chambers such as to make it compatible with the beam-gas vertexing method
- Note: At the position of the IPMs, β_x is about 350 m, and β_y about 90 m
- Mariusz (with Plamen, Massi): follow up on this. Contact Ray Veness
 - Can the chamber be modified? Thinner wall? Al instead of SS?
 - Angle of the wall? (WF suppression!), etc.
 - Which of the two chambers (V or H)? Which side of it?
 - Other option: displace one pump and insert a new chamber?
- Giuseppe: provide pressure profile at BGIs (with gas injection)

❖ Prototype system

- It was agreed that one should try to focus on a minimal setup and a specific use-case that could prove the value of such a device. This will help in the request for funds to build a full-scale device
- It was suggested for example that the ability to measure the absolute beam sizes at all energies/intensities, and in particular during the ramp (even if averaged over all bunches) would be a strong addition to the existing transverse profile monitors
- This prototype setup could be limited to a single ring and to a reduced acceptance
- NB: the ramp will take about 15 min to 6.5 TeV
- Tasks:
 - Bernd, Rhodri: specify more exactly the goals of the prototype system
 - Massi: investigate availability of prototype detectors
 - Plamen: simulate prototype detector with modified BGI, evaluate performance.
 - Toy MC: estimate the expected vertex resolution at 0.45 and 6.5 TeV

❖ Full scale system

- We need a specification. Attempt made in slides by MFL. This needs to be reviewed and corrected. What emittance range? What statistical accuracy at which time intervals? Which absolute precision?
 - BI/Plamen: specify more exactly the goals of the full scale system for LHC
- Location
 - Must find the place with the smallest inner radius and largest beam size
 - We need about 3-4 meters long space for the gas target and detectors
 - Must consider the uncertainties on β (optics) during the various beam modes. Until recently β was determined from “nominal” LHC optics. Later moved to β -beat measurements. Currently, uncertainty on emittance due to optics is about 10%. Effort ongoing to measure β with K-modulation which gives 10-20% difference

- wrt the results from β -beat. It is believed that the β -beat BPM-based method is limited by the local layout/properties of the BPMs
- The beam-gas vertexing device should not be a "global aperture restriction". At IR4: $d_{\text{pipe}} = 80$ mm, β up to 400 m, but BSRT mirror is at 20 mm. The standard tolerance is $\sim 15\sigma$ at injection. Discuss possible solution for best place with collimation team (Stefano Redaelli)
 - An idea was suggested to increase β during ramp so that the beam width does not decrease as much. A possible place allowing such conditions would be near the IP of an experiment
 - Another idea suggested: inject the gas in a dipole magnet and install the vertexing detector further downstream, so that the dipole field bends the charged particles out of the beam-pipe ... Complicates vertex reconstruction. To be thought through
 - ABP/Gianluigi: Study of best location in the rings for final setup
- Gas target
 - Cooling surfaces inside a vacuum chamber to increase the target thickness was used in various experiments (Hermes at HERA, many others at NIKHEF AmPS) and should be studied
 - TE-VSC/Giuseppe & Adam Jeff: start thinking about possible target designs
 - Detector
 - Two strategies could be followed: (a) recycle an existing detector (e.g. LHCb IT/TT in LS2) or (b) make a brand new detector
 - * Massi: investigate further the two options
 - Question on detector sensors: is cooling to 0 C really necessary? Depends on radiation damage and on Signal/Noise one wants to achieve
 - * Plamen: Check leakage current and full-depletion voltage vs irradiation. Estimate irradiation from beam-gas at IR4

❖ Suggested presentations for next iteration

- Outcome of investigations of BGI layout modifications in LS1 (Mariusz)
- Performance simulation of modified BGI layout with prototype detector (Plamen)
- Study of best location in the rings for final setup (Gianluigi)
 - wish smallest inner radius and largest beam size
 - need 3-4 meters long space for the gas target and detectors
 - how well is the β -function controlled/measured in the given location (in the various beam modes)?

❖ Organization

- Next meeting date proposed: Friday morning 7 December
- A nickname must be found for this new device!
- Egroup: for the time being, keep informal list of email of interested people, no egroup. If someone wants to join, please, tell us
- Bernd, Rhodri, Massi: meet to sort out administrative issues