Status PS Injection

Dispersion Measurements in the PSB-PS Transfert Line and at the PS Injection

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Outline

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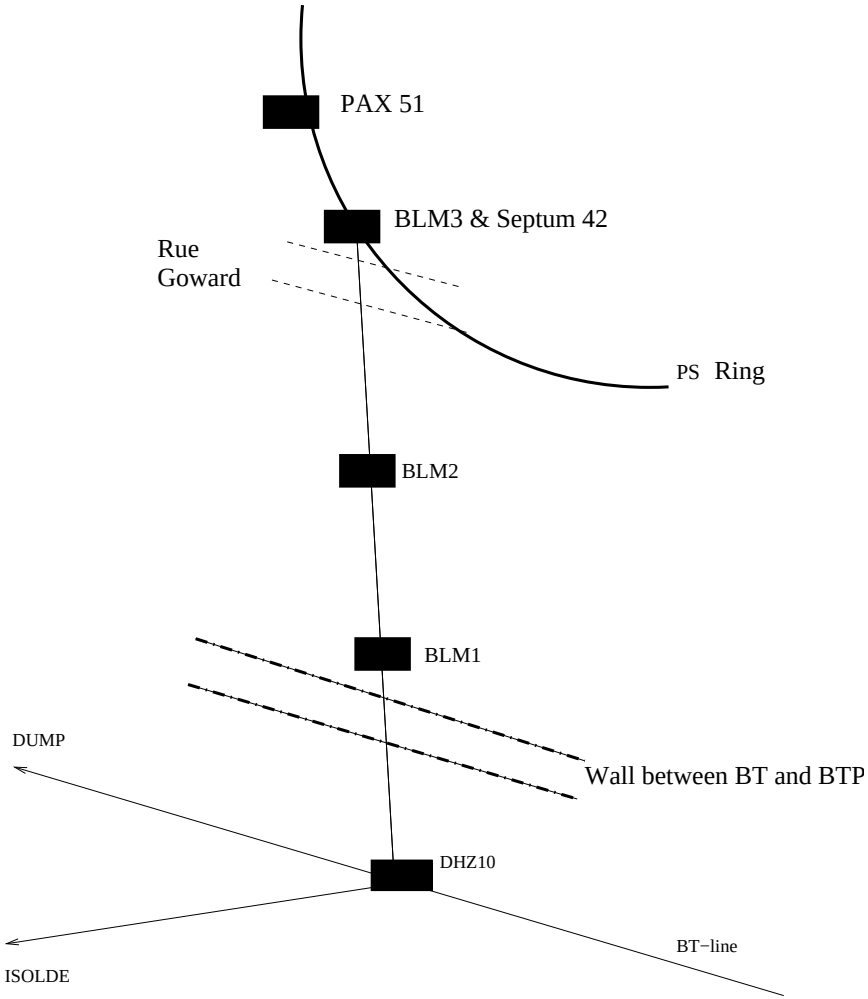
Beam losses at the PS injection

- Understanding of the beam losses at the PS injection which induce high radiation level at Rue Goward.
- Losses are caused before the injection and during the first turn of the injected beam - See Simone's presentation APC 1/02/08
- Work with the optics from C. Carli computed in 2001 to improve the matching in dispersion between BTP and the PS.

Outline

Quick experiments about the radiation level at Rue Goward

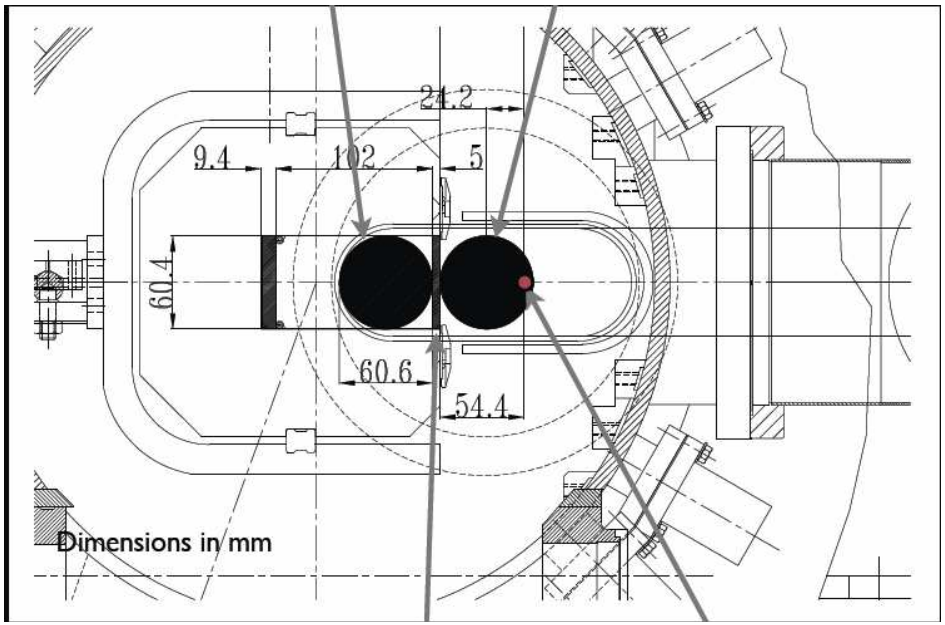


Three BLMs have been installed in the BTP line.

- We force losses in the BTP line (BLM 1 and 2): no increase of the radiation given by the radiation monitor at Rue Goward.
- We force losses on the septum (BLM3): increase of the radiation Rue Goward.
- We turn off the injection kicker in SS45 and the beam is lost in the ring: no increase of the radiation at Rue Goward. To be checked.
- We turn off the septum and put a screen instead: increase of the radiation level but not as much as with the septum turned on.

Irradiation level Rue Goward

Irradiation of Rue Goward caused likely by losses on the injection septum SS42-Aperture limitation.



Losses during the first turn

- Optics Mismatch.
- Working point at the injection, for the moment: $Qx = 6.11$ and Qy=6.25.

Outline

Beam condition.

- MTE beam, single bunch.
- Dispersion measurements in the transfer line PSB (from ring 3)-PS and during the first turn in the PS.
- Dispersion calculated with orbit measurements by changing the beam energy.
- Profile measurements in the nominal conditions at the PS injection with the SEMGrids SS48-52-54, to check the optics according to the method described by G. Arduini and E. Benedetto's papers.
- Emittance measurements H and V.

Outline

Dispersion measurements

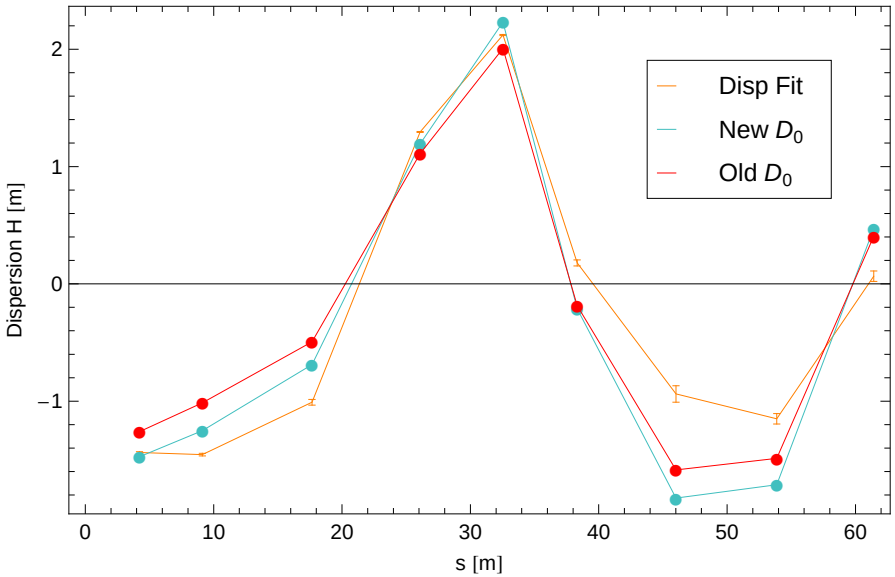


Figure: Horizontal dispersion.

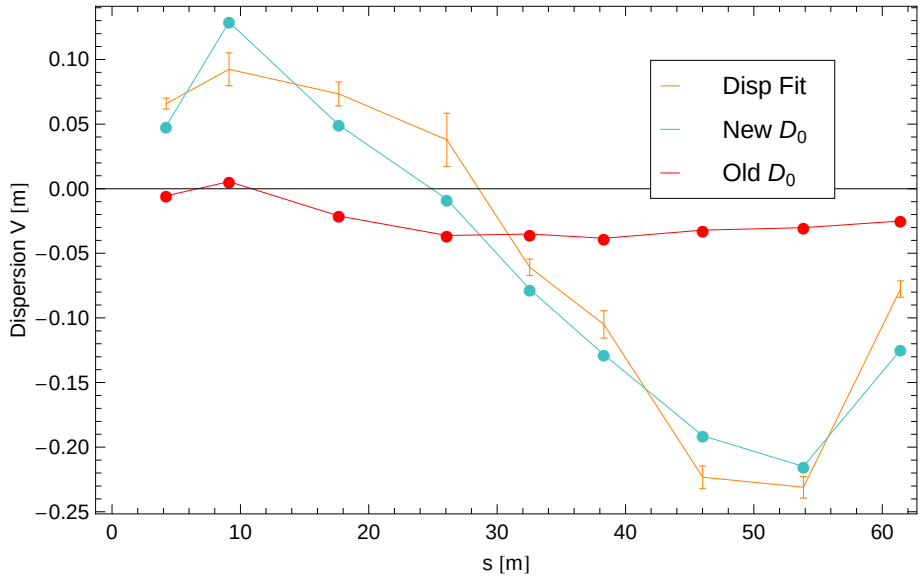
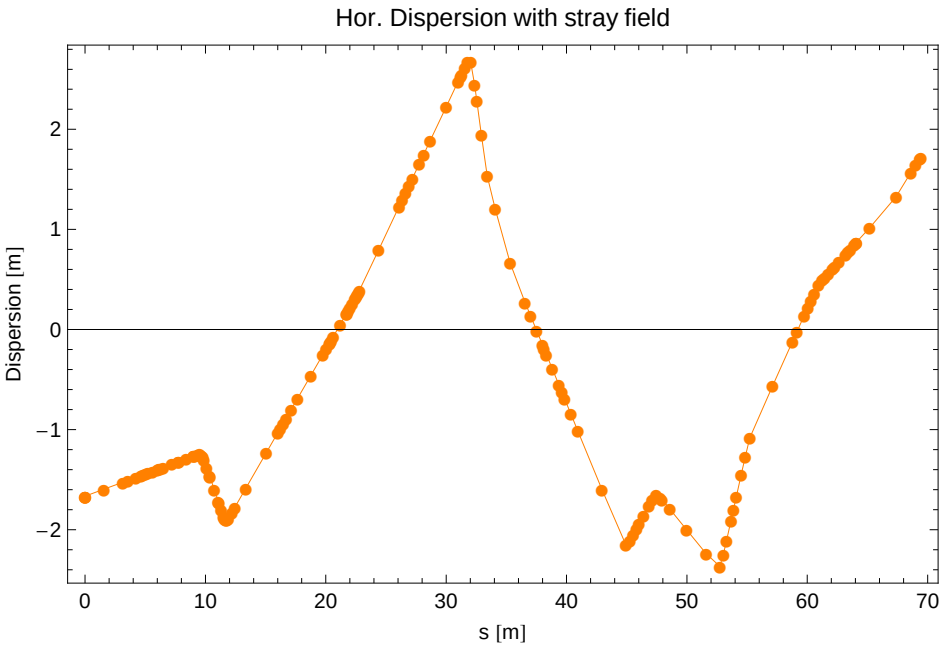
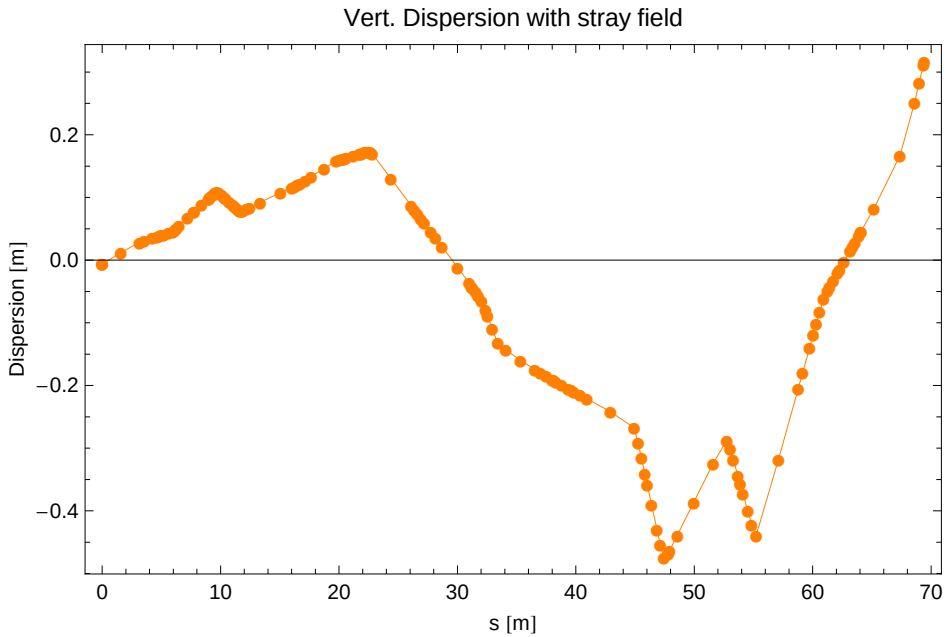


Figure: Vertical dispersion.

Stray field from combined magnet in SS42

Computed Dispersion including the stray field





- Horizontal dispersion at the end of the transfer line: 1.72 m
- Vertical dispersion at the end of the transfer line: 0.32 m. At the limit of the measurement accuracy?

Outline

Benchmark of the Dispersion with MADX

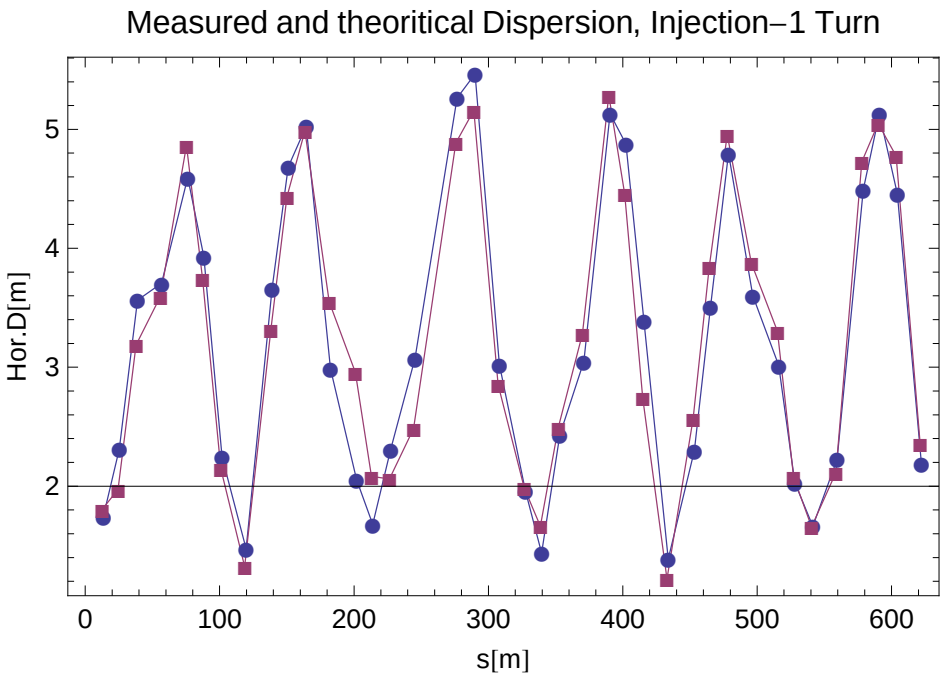


Figure: Horizontal dispersion. In blue: the meas. Dx. In purple: the computed one.

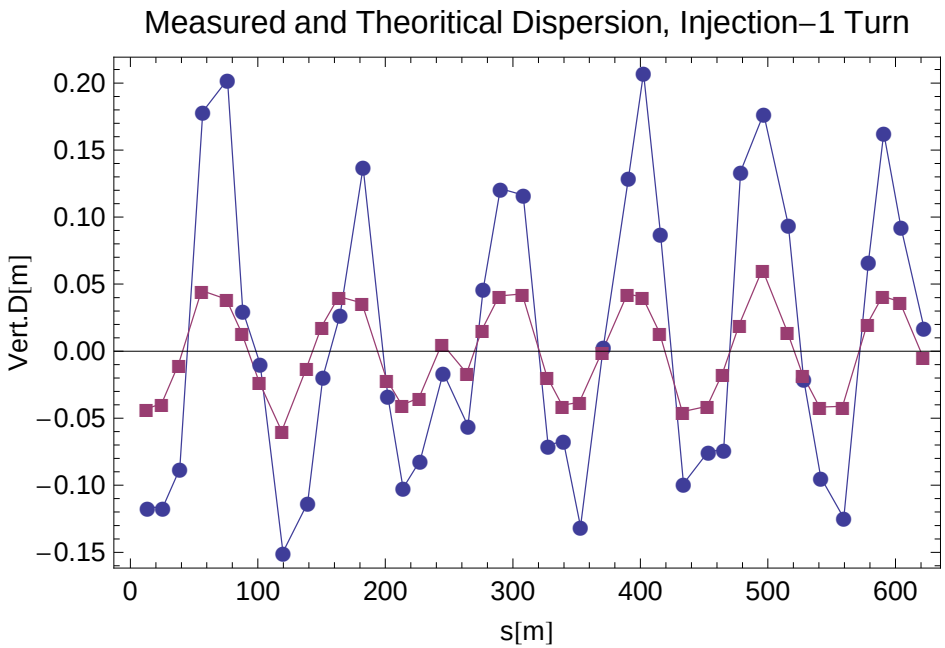
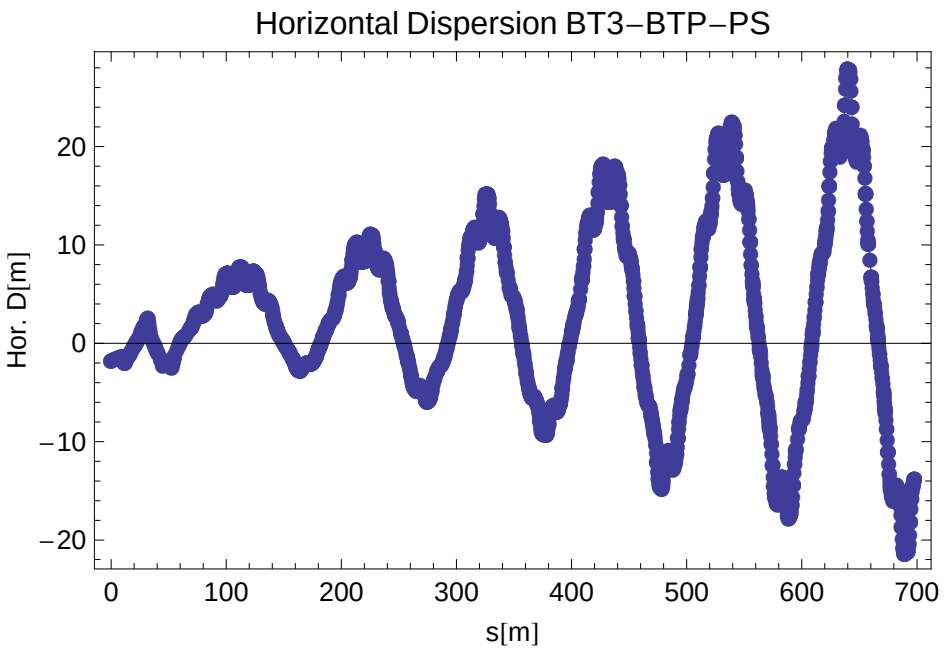


Figure: Vertical dispersion. In blue: the meas. Dy. In purple: the computed one.

- Horizontale Dispersion end BTP = 1.72 m.
- Initial dispersion PS injection = 2.72 m.
- This dispersion is computed just after the septum, from the measurements and with method described in E. Benedetto's note.
- There are still uncertainties about the way the stray field is modelled in MADX. Asked for a 2D-field map of the combined magnet.

BT-BTP and PS as a sequence



- Dispersion calculation considering BTBTP and PS as one sequence.
- Dispersion goes up to 20 m.
- Effect of the dispersion mismatch ?
- Possibility that the particles with high dispersion are lost on the septum.

Summary

- Dispersion mismatch in the horizontal plane.
- More accurate dispersion measurements on Wednesday with the SEMGrid. If there is a dispersion in the vertical plane in the PS, it comes from the transfert line.
- The preliminary results of profile measurements seem good but not presented here and have to be completed on Wednesday.
- However, good agreement between the measured Hor. emittance (2σ) with the FWS and the one calculated from the SEMGrid (2σ): 5.45 *mm.mrad* and 5.53 *mm.mrad*. The β_H at the injection is 11.88 *m*.
- Particles with high dispersion lost on the septum, should be confirmed by tracking.

Outlook

- Optics measurements, particularly beta mismatch should be completed during the MD of Wednesday.
- Need a tracking to check if the particles with high dispersion are lost on the septum.
- If a mismatch is found, a new optics would be needed.
- Ongoing measurements of the working point at injection. Could be an explanation for the losses in the ring during the first turn.

Acknowledgments

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- *New Methods to derive the optical and beam parameters in the transport channels*. G. Arduini, M. Giovannozzi, K. Hanke, D. Manglunki, M. Martini.
- *Optics measurements for the LHC beam in the TT2-TT10 line and effect of the QKE58 suppression.* E. Benedetto.
- *Study of a new PSB-PS transfert line optics with improved Dispersion matching by mean of turn-by-turn beam profile acquisitions.* M. Benedikt, C. Carli, C. Dutriat, M. Giovannozzi, A. Jansson, M. Martini, U. Raich, K. Schindl.