Orbit distortion at transition crossing with a new pick-up in ss76 in the CERN PS

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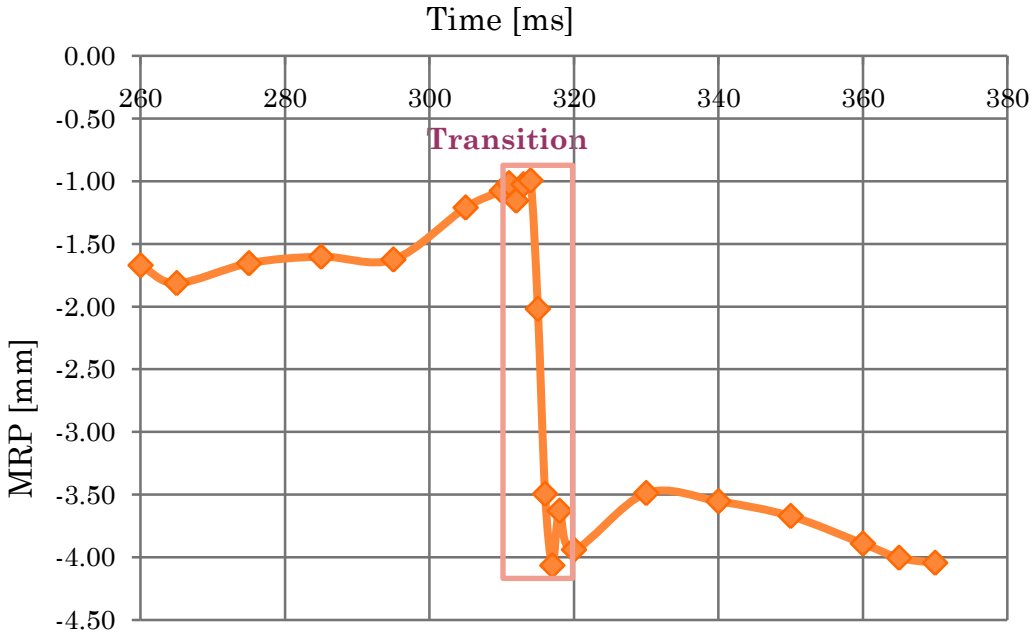
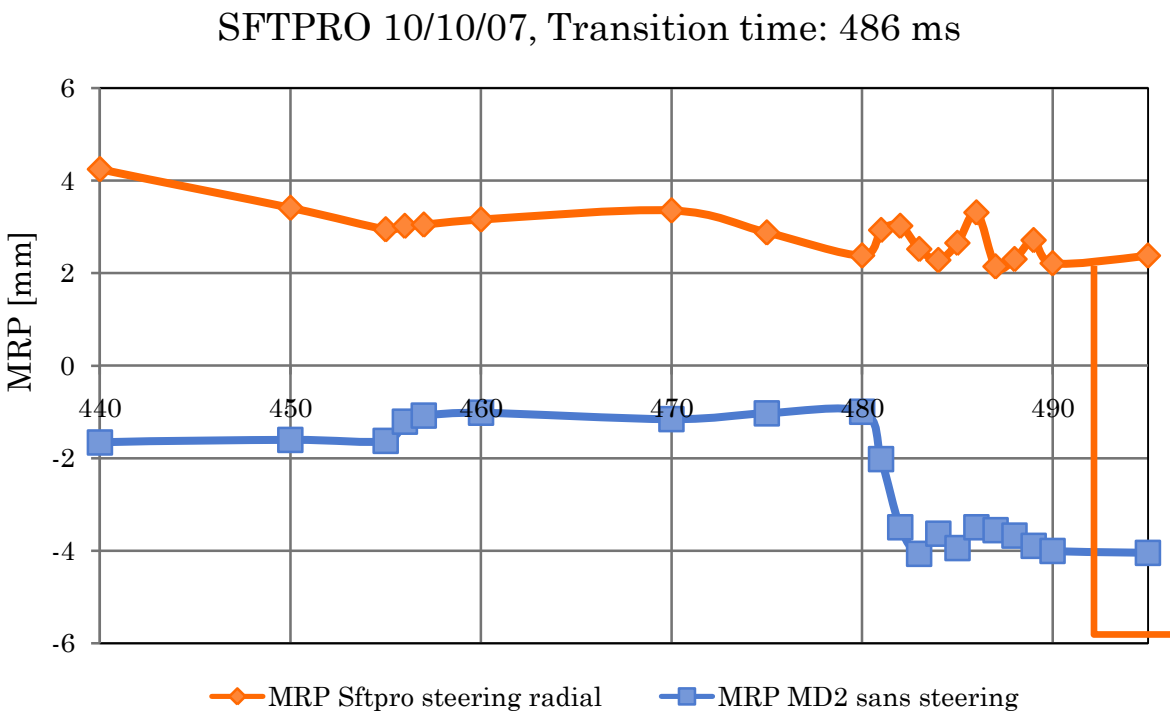
Mean radial position @ transition (2007)

Mean Radial Position (MRP) computed with the 40 PUs of the orbit measurement system (CODD) with an AD beam



- MRP-jump due to the doublets inversion of the Gammajump.
- 1-2 mm of the jump is explained by the fact that the orbit doesn't pass by the center of the GJ quadrupoles
- However, 2mm are left.

MRP WITH A RADIAL STEERING



- Radial steering of +3.5mm along the Gammajump
- Triplets of the Gammajump are debalanced

Beam passes by the center of the quadrupoles

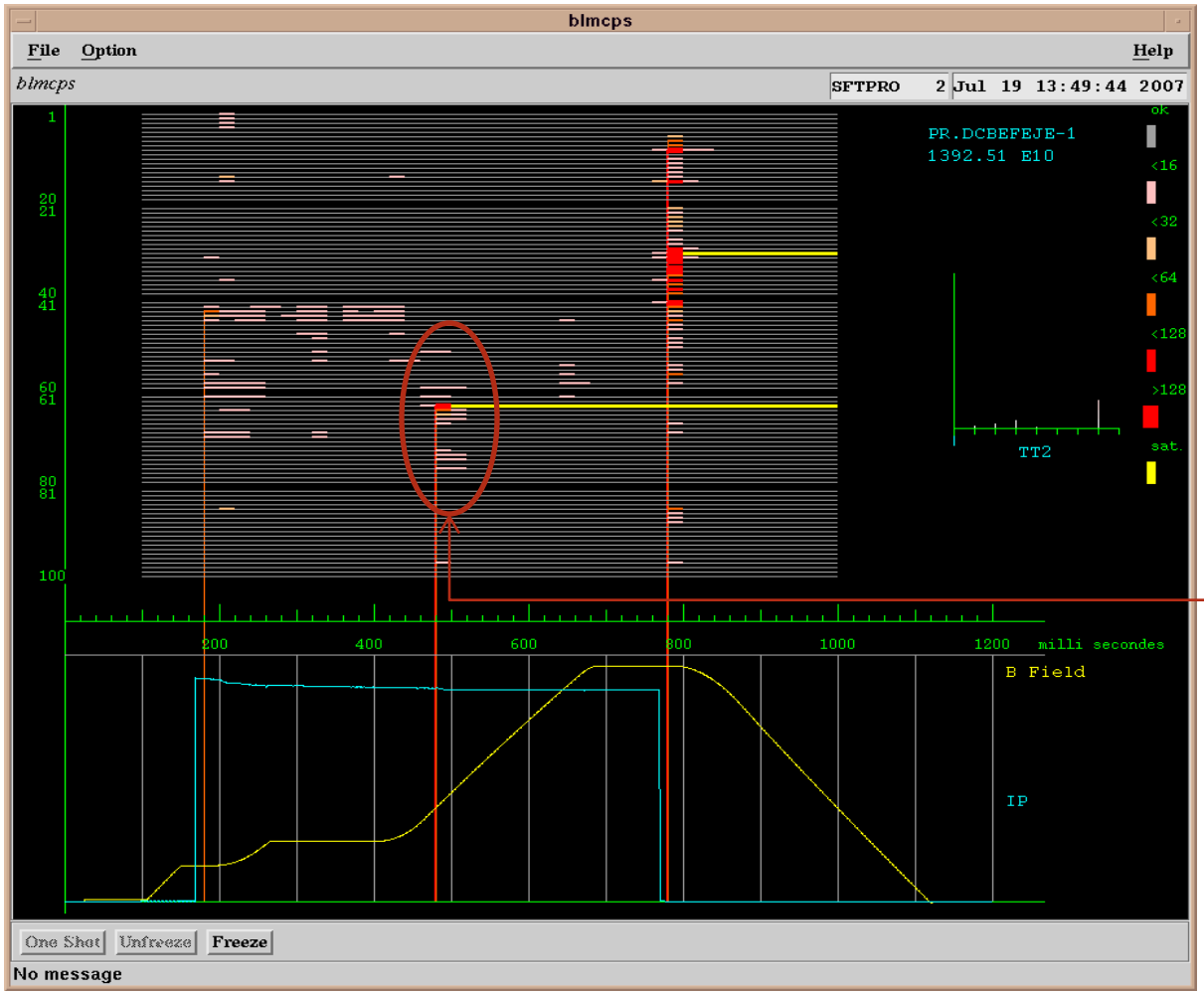
With the radial steering:

- Less losses.
- No MRP jump at transition

MRP WITH A RADIAL STEERING

- BLM SFTPRO 2 Juillet 2007 – sans correction

SFTPRO: 1392 e10 part



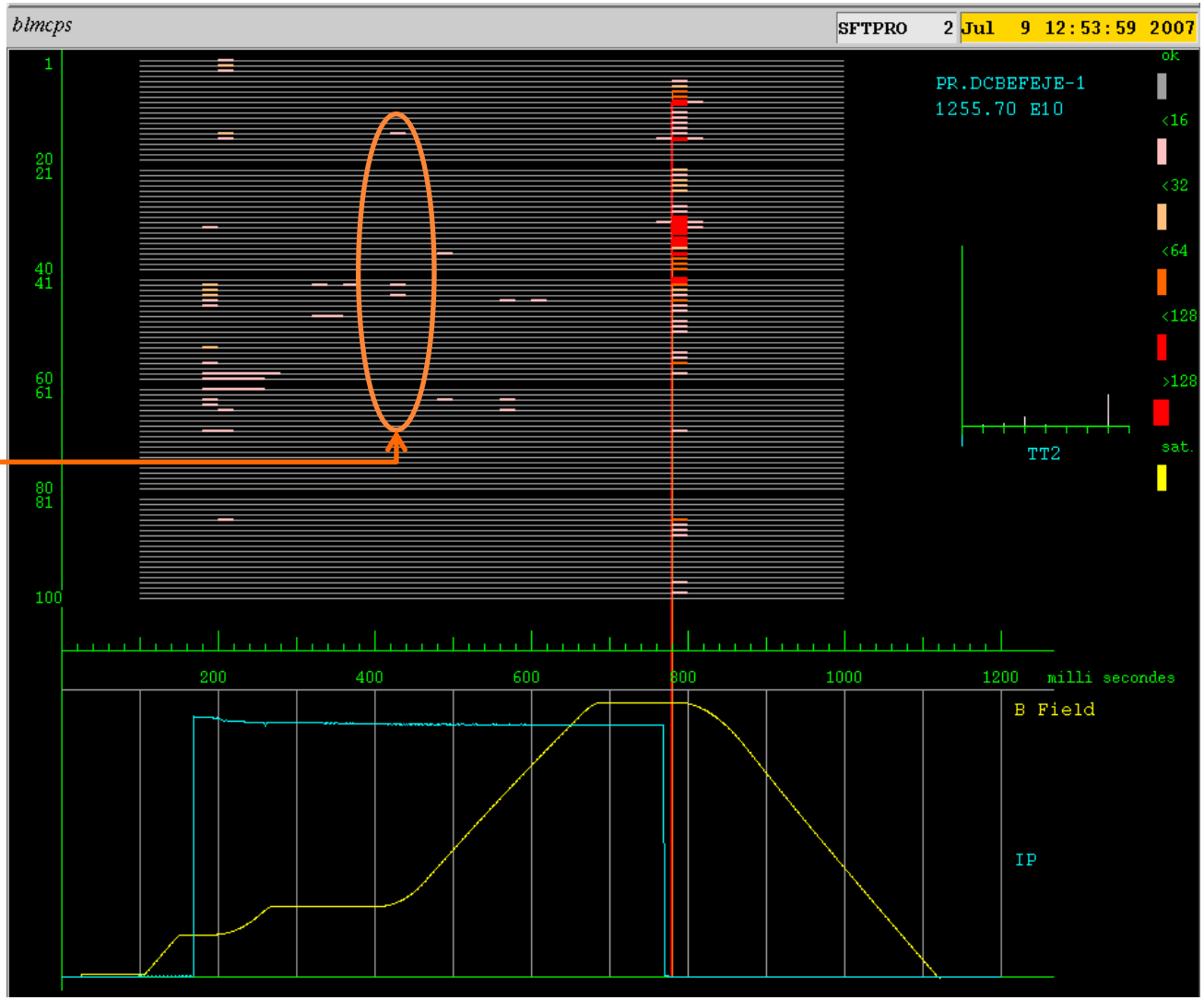
Environ 1-2% du faisceau est perdu
~ 10-20 e10 part.
~ faisceau EAST

Transition

MRP WITH A RADIAL STEERING

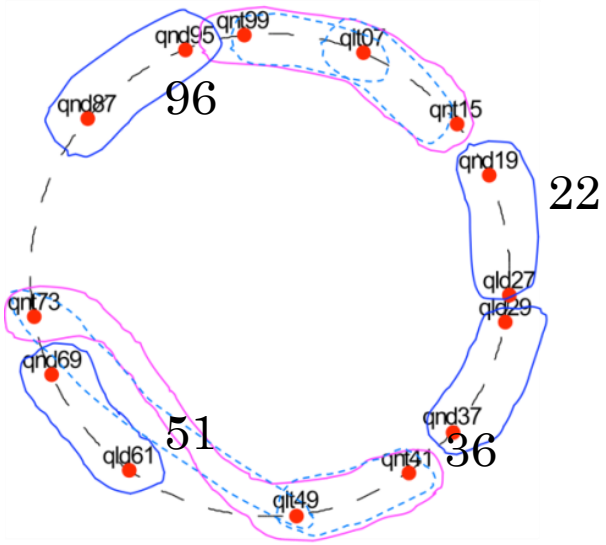
Transition

0.2% de perte, avec la correction

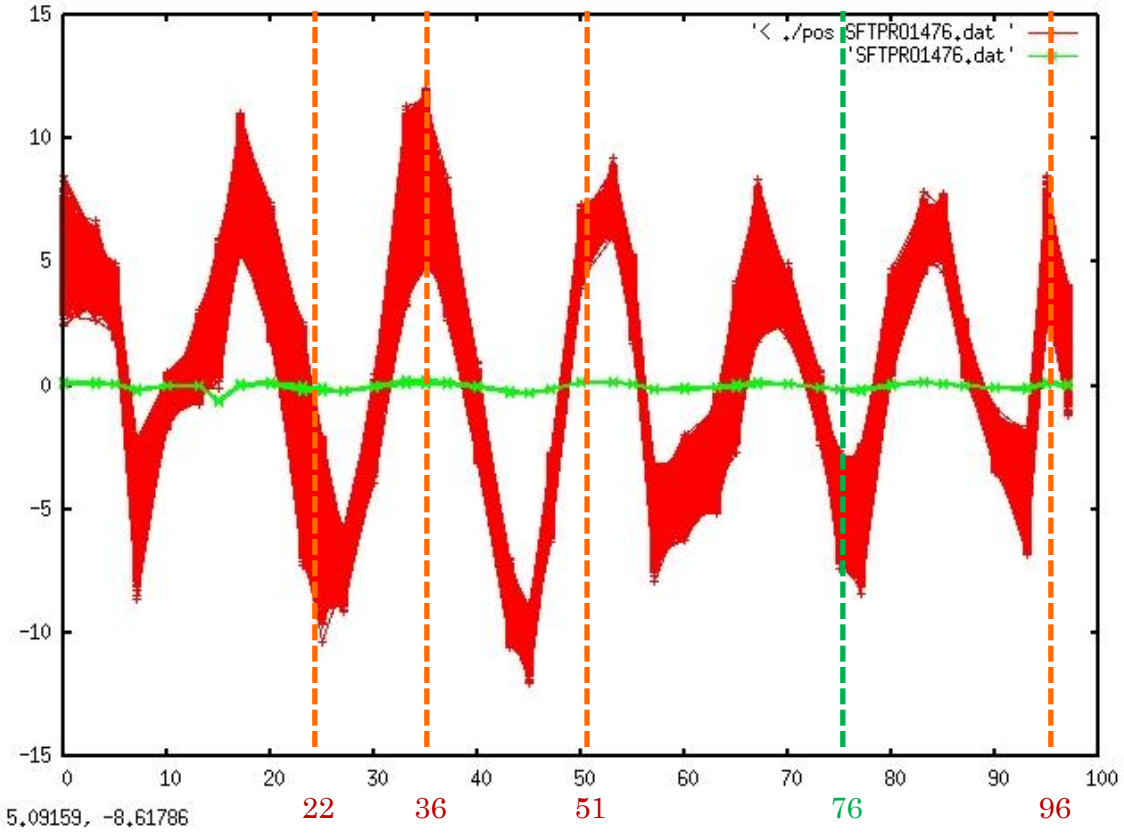


Radial loop system

- The radial loop system controls the MRP with initially 3 PUs in section 22-51-96. The PU 36 was included in 2008.
- It is working jointly with the phase loop.



TRAJECTORY THROUGH TRANSITION



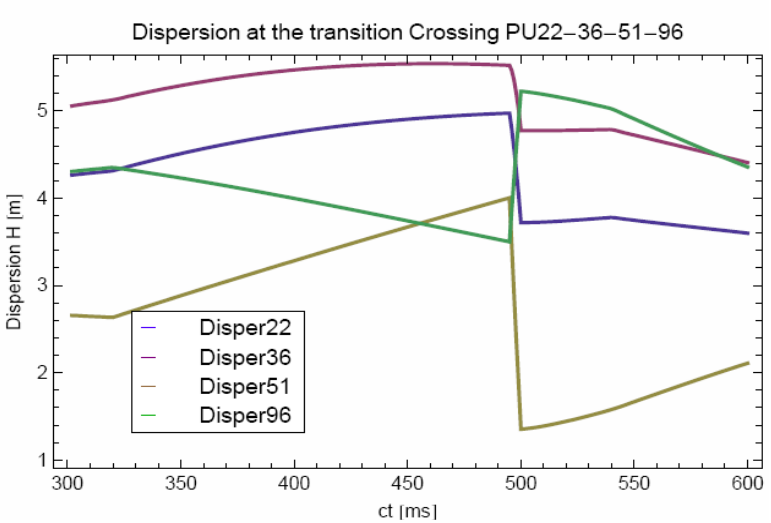
Phase advance not suitable

Data taken with the new orbit measurements system (10000 trajectories through transition)

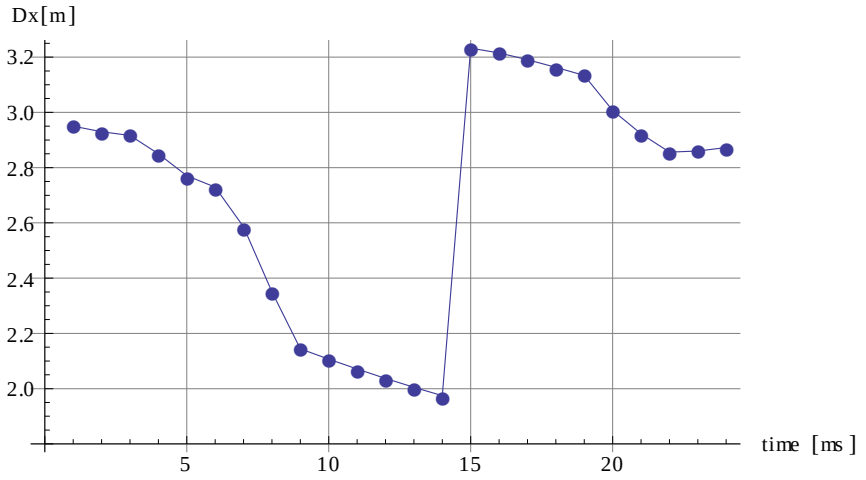
From J. Bellemann

DISPERSIONS THROUGH TRANSITION

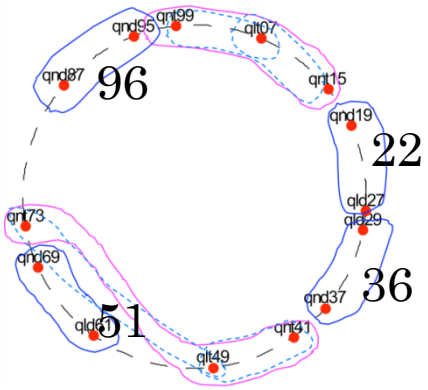
Dispersion at 4 PUs



Mean Dispersion in the PS



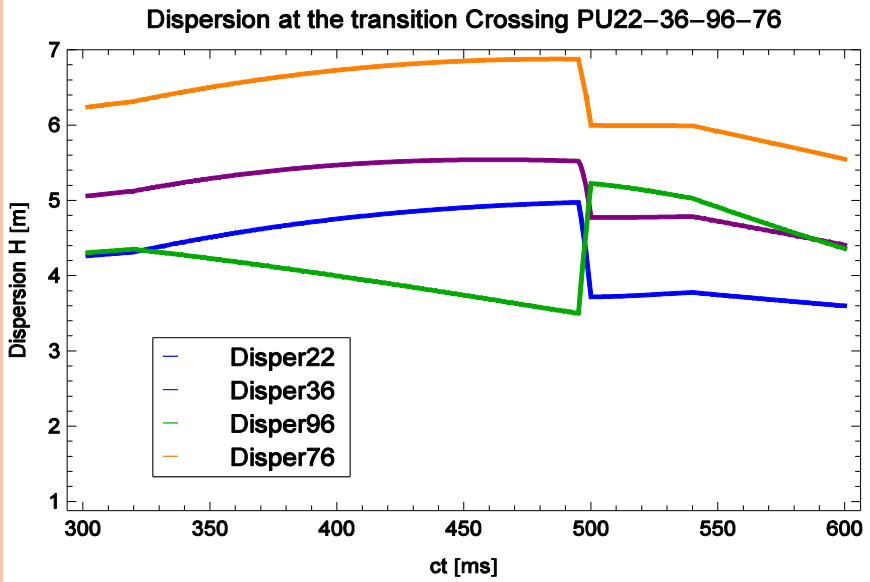
- The PU51 might be less sensitive to changes in trajectory due to dispersion.
- Dispersion computed with MADX

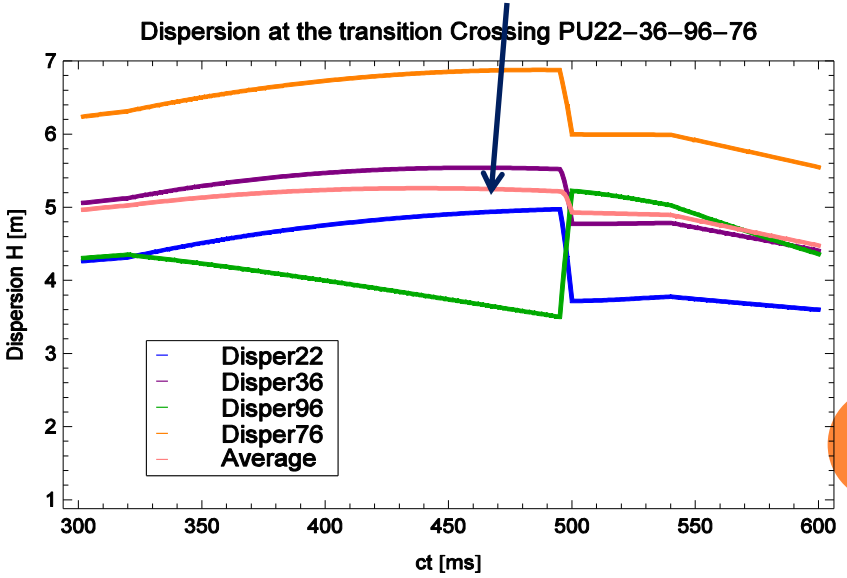


Problems with the current system

- PU51 is less sensitive to changes in trajectory due to its low dispersion during the Gammajump.
- Not optimal phase advance between the PU51 and 96 and PU36.
- Proposal to include the PU76 in the radial loop system

With dispersion average @ the Pus 22-36-96-76

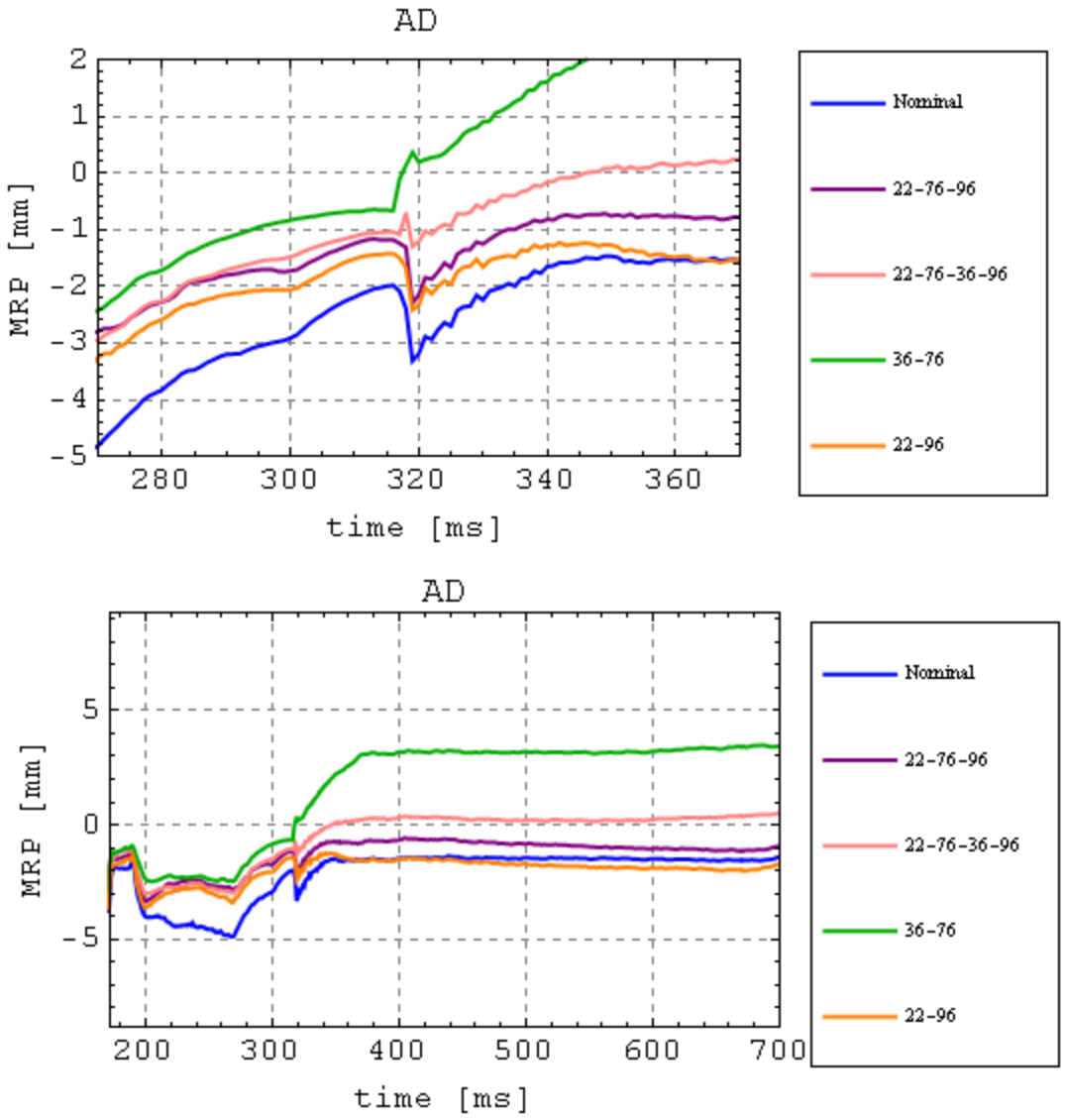




MRP MEASUREMENTS WITH THE PU76

- The PU76 was connected to the radial loop control system.
- MRP measurements on the AD, SFTPRO and ToF beams with several PUs combinations (PU22, 36, 76, 96 and the current configuration)
- Trajectories turn by turn thanks to the new orbit measurements system.

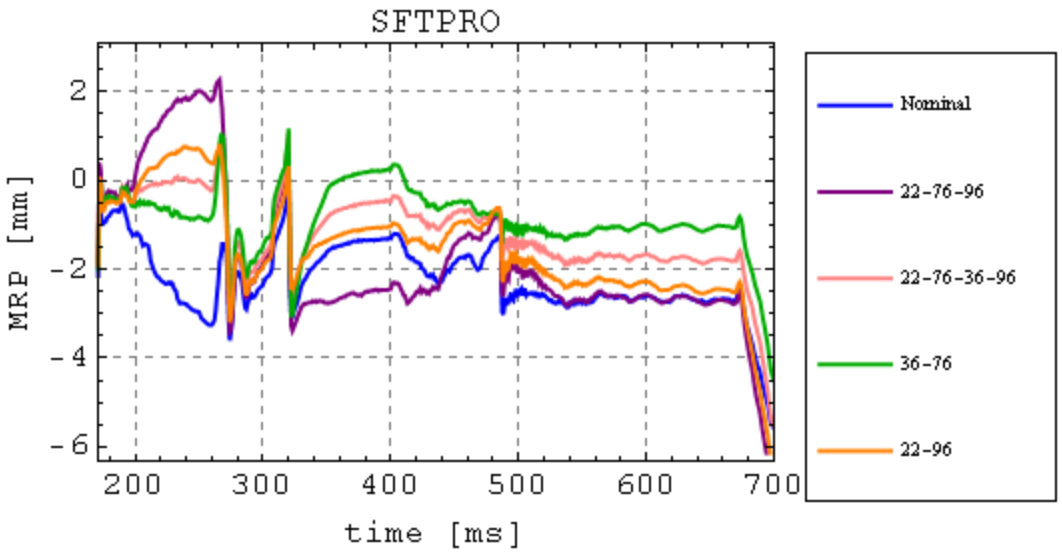
Results MD – AD beam

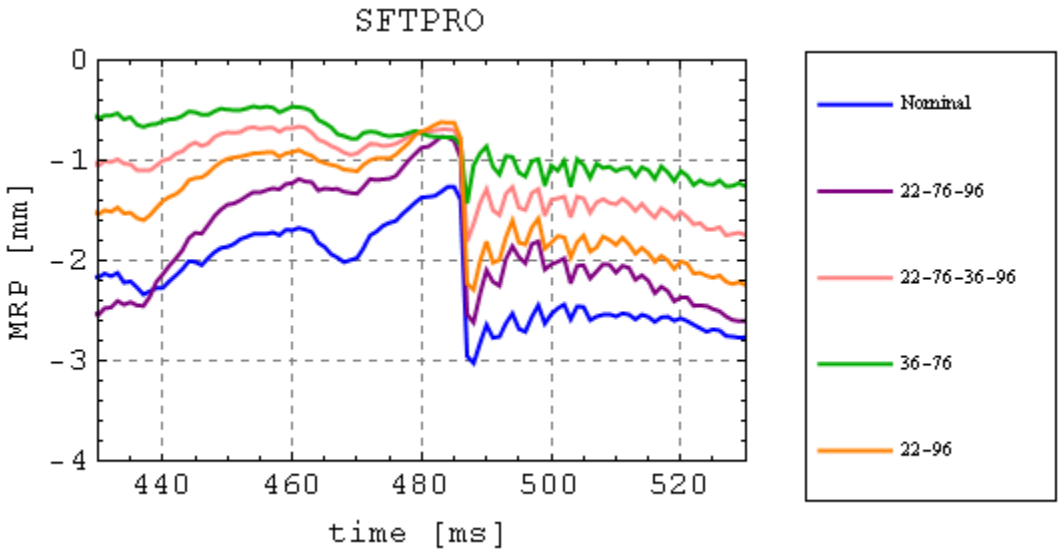


MRP @ transition and along the cycle.

- Beam well centered for 22-36-76-96
- Almost no MRP jump
- Mean center of the GJ quadrupoles around -1mm

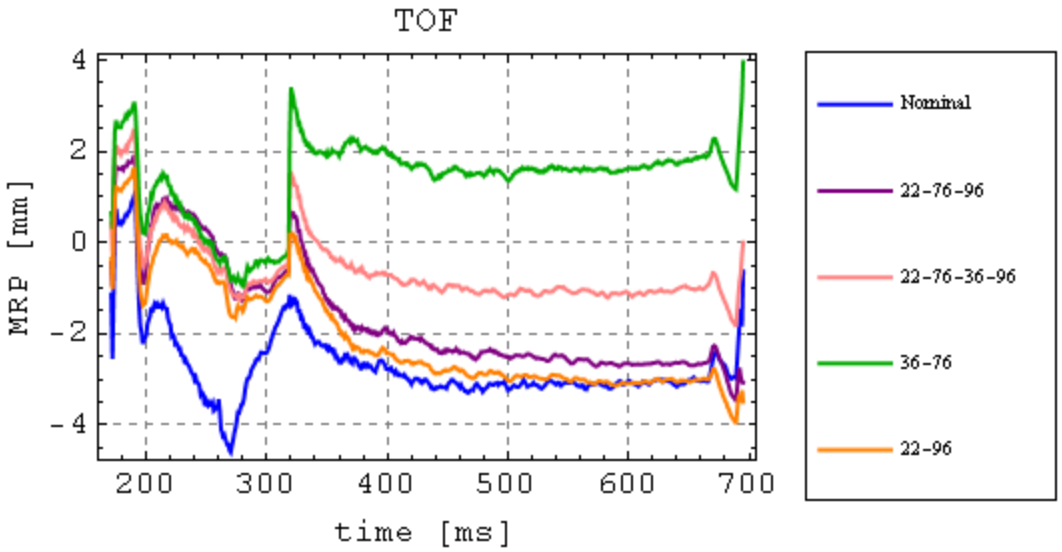
RESULTS MD – SFTPRO BEAM

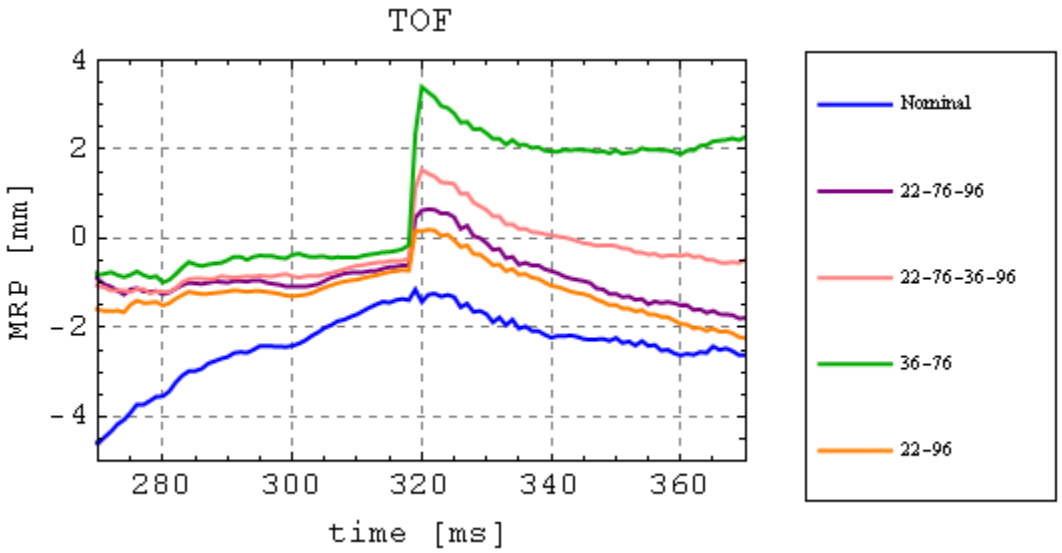




MRP @ transition and along the cycle.

Results MD – TOF beam





MRP @ transition and along the cycle.

- Mean center of the beam of the GJ quads ~-1mm.
- The direction of the jump is inversed.

CONCLUSIONS-OUTLOOKS

- In 2007, the center of the GJ quads seemed to be around +3.5mm. This year, the center seems to be around -1mm.
- Measurements with radial steering to check the transition crossing of the MRP.
- Launch orbit simulations with the new alignment of the GJ quads.

- The steering of the beam had been improved by using the new PU76: the radial loop system is more sensitive to energy error and the Pus have a better advance.
- MRP-jump due to:
  - steering of the beam at the GJ quads (inversion of the doublet @ transition)
  - The radial loop system can not correct quick deviation (doublets inversion ~500µs.), the system is inactive for several ms. This is what we observed