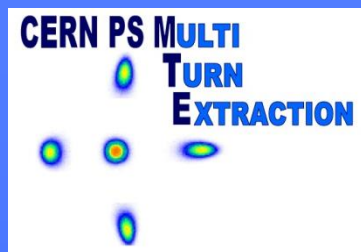


Summaries and conclusions of the MTE Workshop

S. Gilardoni, M. Giovannozzi

- **General comments**
- **Short-term actions**
- **Medium-term actions**
- **Long-term actions**

Acknowledgements: speakers and participants to the MTE Workshop



General comments - I

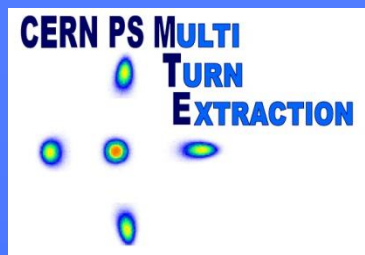
● Goal of the Workshop

- Review current beam status and issues
- Review current hardware issues
- Propose possible mitigation measures
- Define a strategy to have an operational MTE

● Very interesting presentations and fruitful discussions!

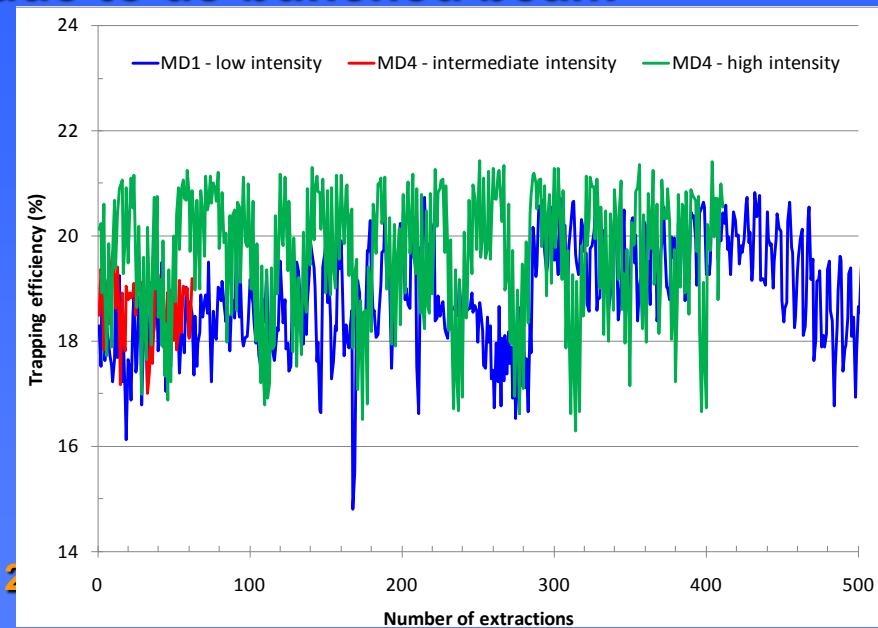
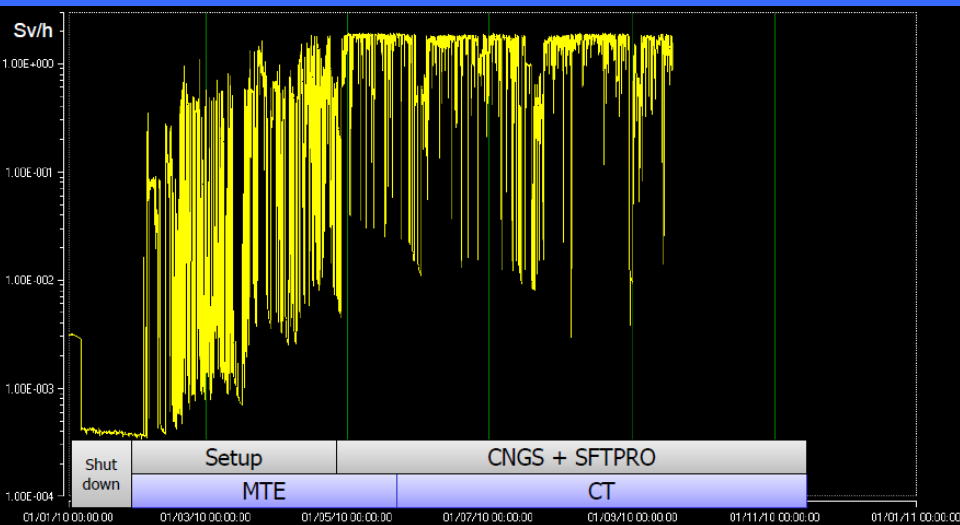
● Actions grouped into:

- **Short-term -> end 2010:** understand fluctuations; put back MTE in operation on one SPS cycle; provide input for longer-term studies (hardware modifications).
- **Medium term -> 2011:** study a new extraction scheme to mitigate activation of septum 16.
- **Long term -> 2012:** make use of the long shut down to implement changes needed for an operational MTE.



General comments - II

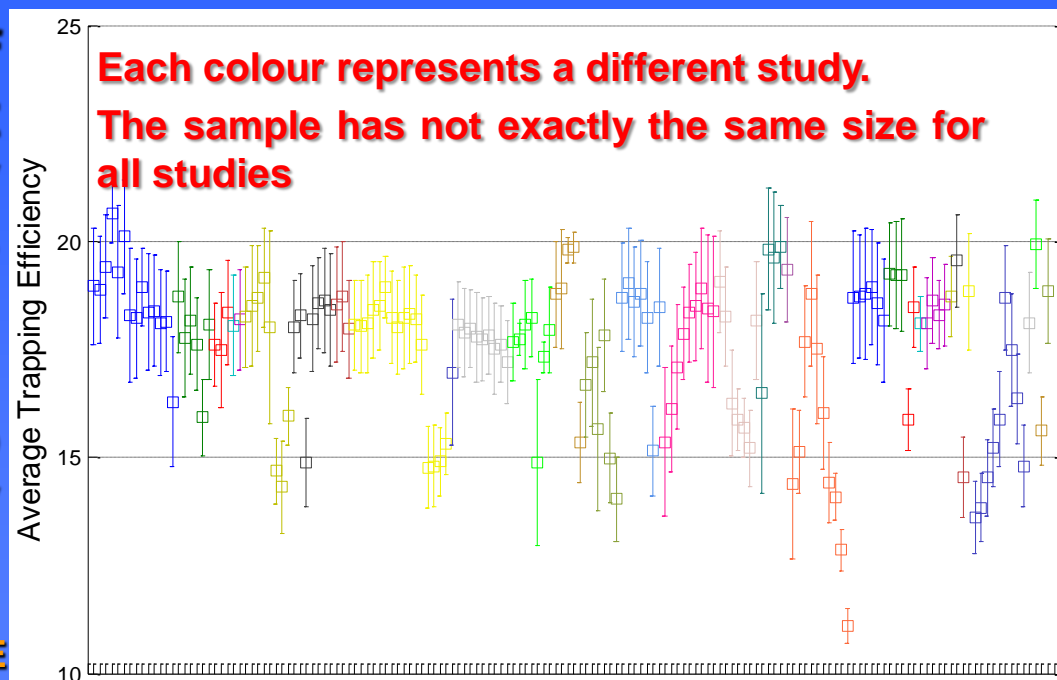
- Review current beam status and issues
 - MTE beam successfully delivered to SPS and used till June.
 - Typical intensities around 2×10^{13} ppp
 - Promising performance in the SPS
 - Issues:
 - Fluctuations in the trapping efficiency
 - Energy fluctuations observed in SPS
 - Activation of magnetic septum due to de-bunched beam



General comments - III

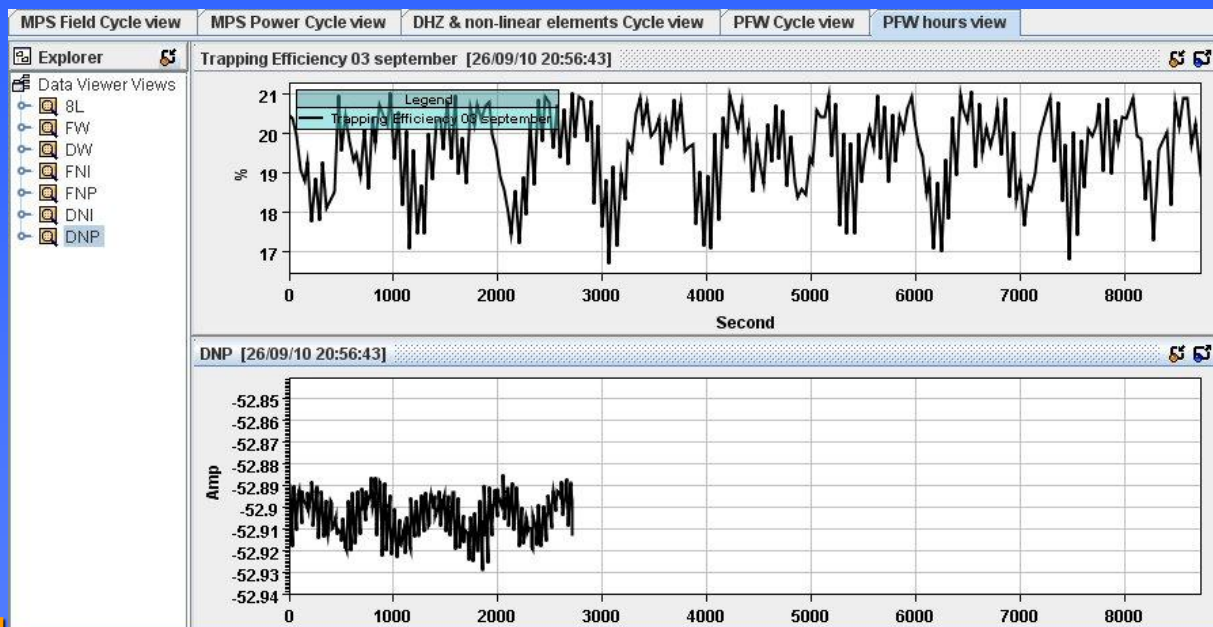
- **Fluctuations in the trapping efficiency**
 - Measurement campaign launched to
 - optimise parameters
 - find correlations
 - uncover source of fluctuations
 - Source of fluctuations not found so far.

- Amplitude of fluctuations not much affected by usual parameters (sextupoles, octupoles, damper).
- Frequency seems to be affected by chromaticity...

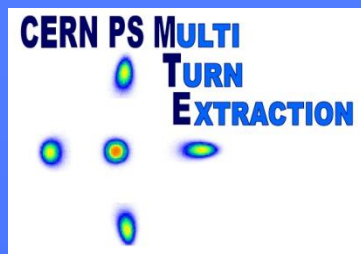


General comments - IV

- **Fluctuations in the trapping efficiency**
 - Measurements of stability of hardware parameters launched as well:
 - Analysis of low-energy quadrupoles to be completed
 - Analysis of: sextupoles, octupoles, bumpers, Figure-of-eight loop showed no oscillations
 - Analysis of pole-face-windings (narrow circuits) showed some oscillations
- **Correlation with trapping to be studied.**



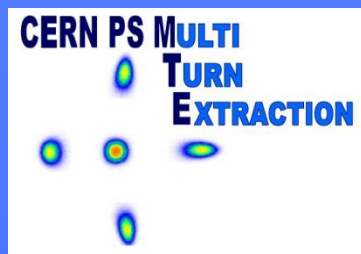
Each point is the average of the extraction plateau (C700 - C820)



Short-term actions - I

● PS

- Complete analysis of hardware data (low-energy quadrupoles)
- Repeat tests of low-energy quadrupole stability with special measurement device.
- Study correlation of PFW-N fluctuations with spill.
- Check performance when crossing resonance from above.
- Check impact of longitudinal parameters on adiabaticity of process.
- Repeat tests with different tune curves.
- Improve functions of OMTs, ODEs.

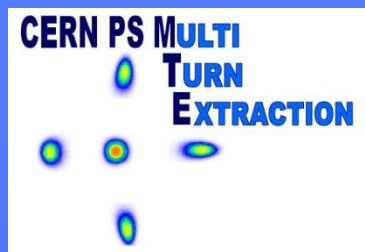


Short-term actions - II

● SPS

- Complete steering of TT10 (including DFAs), improve injection in the SPS, accelerate, etc., i.e. have again an operational MTE beam on one SPS cycle.
- Study fluctuations:
 - Determine which islands is measured in TT10.
 - Compare with corresponding turn in SPS and verify fluctuations.
 - Study systematically fluctuations in SPS for the various injected turns.
 - Correlate with B-field fluctuation in PS (already done, but to be repeated in a more systematic way and even with other beams more suited to this type of measurement).
- Scheduling is difficult (screens and ions not compatible)!
- Also, intensity should be adapted to the actual needs and the use of the PS internal dump should be minimised.

We need a strong support from SPS team!

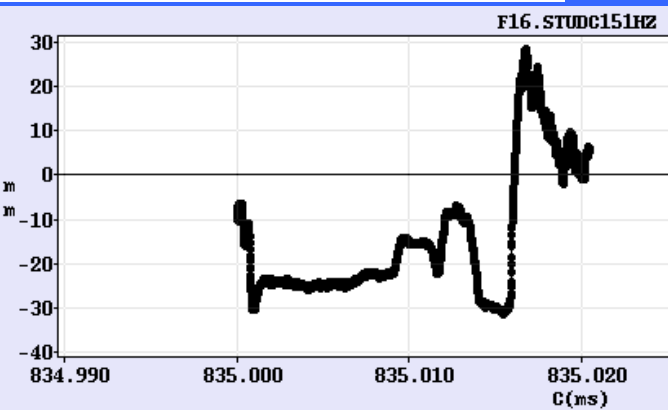


Short-term actions - III

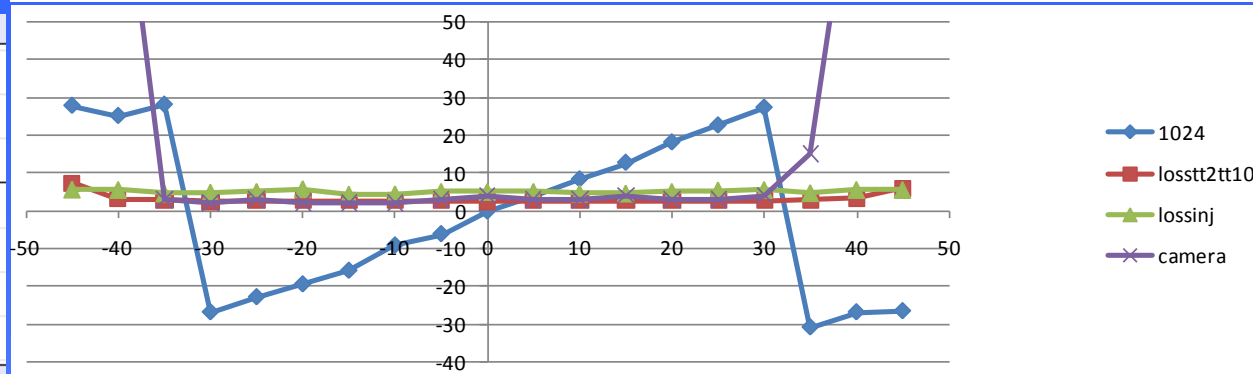
SPS

- NB: to complete the previous studies we need:
 - YASP fixed as it seems that there is a discrepancy between what is sent to the hardware and what is shown...
 - Key assumption: pick-ups in TT10 are to be considered in working conditions!

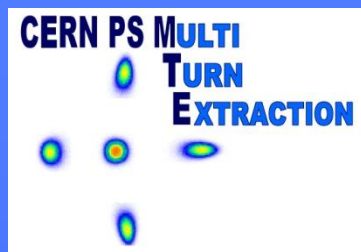
Sampler for TT2 pick-up



Example of aperture scan performed with TT10 pick-ups



● It would be nice to have some TT10 pick-ups on samplers!



Medium-term actions - I

PS-Booster

- Review the generation of the PS beam to reduce vertical emittance.

PS

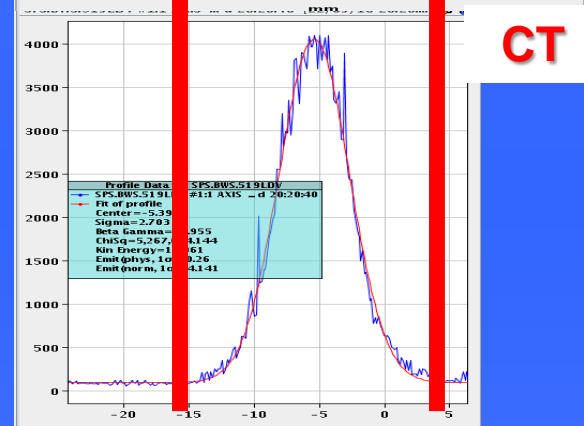
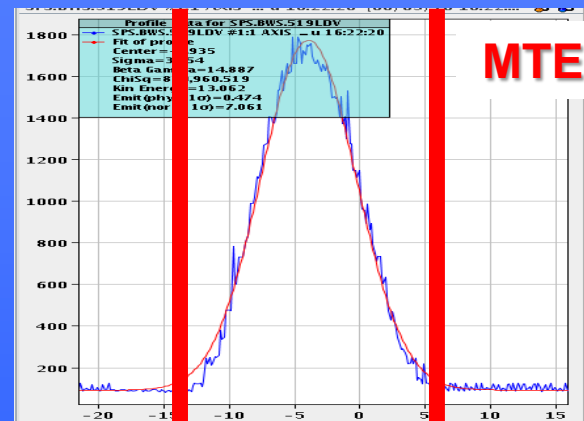
Damper control

- Full remote control over parameters
- New function generation (CVORG)

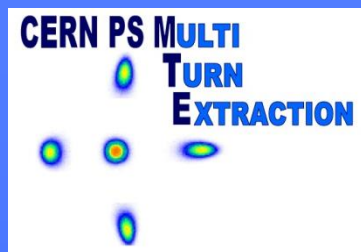
- Ppm control of BFA and DFA (coexistence of CT and MTE). Prioritisation might be applied (BFAP, BFAs, DFAs)

TT2 pick-ups

- Improve performance, operational status
- Make YASP compatible with 5-turn steering in TT2

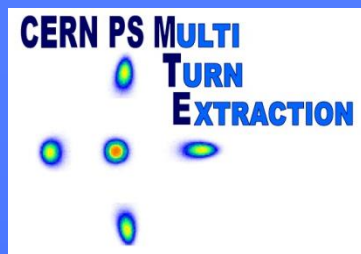


Vertical profiles in SPS



Medium-term actions - II

- **INCA stability: MTE user very sensible to parameters change. It is not an MD user!**
- **Instrumentation**
 - **New wire scanners in preparation (one to be installed during the next winter technical stop): approval process of the new hardware should be launched soon.**
 - **Complete tests of new BLMs: essentials to cross-check BCTs data and extrapolate losses**
 - **Vigorous plan of improvement of the BCTs. This includes cross-calibration of electronic cards, removal of automatic calibration, improvement of the amplifiers. The target is to reach a 1% rms reproducibility shot-to-shot. On the longer-time scale the SPS BCTs should be deployed (depending on resources). Of course, the relative performance is more than enough to set-up the splitting process.**
 - **Limitations preventing orbit measurement at extraction for CNGS/SFTPRO beams should be analysed and possible mitigation measures proposed.**



Long-term actions - I

- **Mitigation measures for extraction losses and magnetic septum activation**
 - Shorter rise time of the extraction kickers: new PFN, magnets, building!
 - Different longitudinal structure: not acceptable for SPS.
 - Thinner magnetic septum: not a real long-term solution.
 - Two possibilities (not mutually exclusive)
 - Install a dummy septum to shadow the blade of the magnetic septum 16 and or install a spoiler in the tank of septum 16
 - Use the electrostatic septum 31

Long-term actions - II

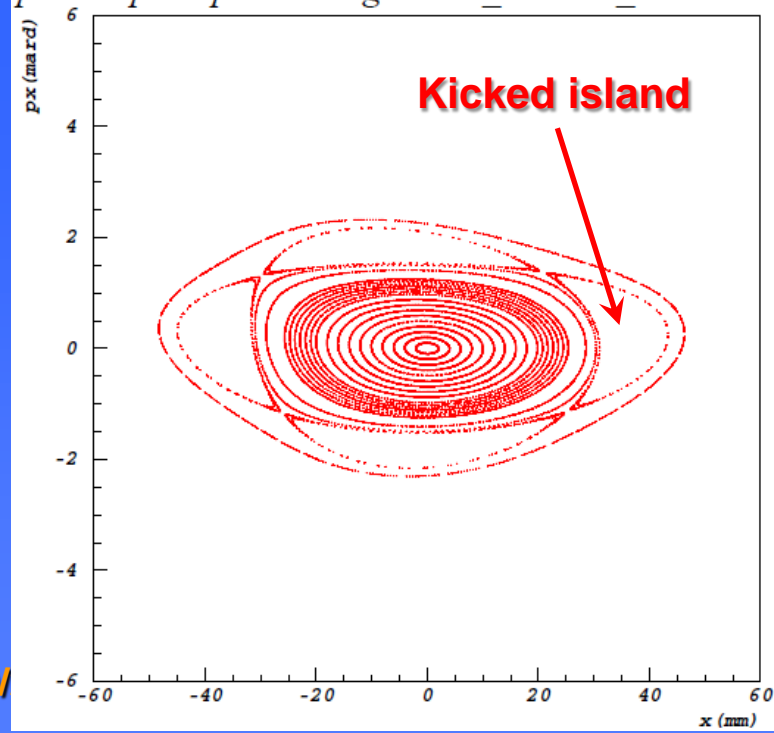
- Install a dummy septum to shadow the blade of the magnetic septum 16
 - The extraction scheme would remain conceptually the same as the current one.
 - SS15 is the only choice for installing the device
 - About 40 cm available
 - DHZ15: dipole for closed orbit distortion correction and MTE slow bump (about 24 cm long)
 - Triplet quadrupole for γ -jump (about 24 cm long)

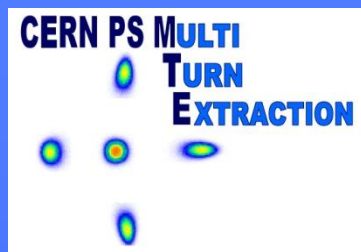


Long-term actions - III

- Use the electrostatic septum 31. The standard MTE scheme is modified as follows:
 - Two slow bumps are used, around SEH31, around SMH16.
 - A single fast bump is generated around SEH31.
 - The split beam will cross the foil of the electrostatic septum (~ 0.2 mm against ~ 3 mm of SMH16).
 - Beam losses will occur only during the rise of the kickers.
 - The SEH31 will kick the island beyond the SMH16.
 - New fast bump generated by:
 - KFA21, BFA21, KFA9, KFA13

phase space potrait begsmh31_000820_6.261000





Long-term actions - IV

- **Paper work needed for both proposal (studies launched immediately):**
 - Dummy septum or spoiler in the tank of septum 16: detailed simulations of beam-septum interaction, layout.
 - New extraction scheme: check trajectories, aperture, possibility of re-using the existing hardware.
- **Experimental tests to be envisaged for second proposal: to be performed at the beginning of 2011. In case of a polarity change is required, implement a system during the winter shutdown.**
- **In the meantime:**
 - No intervention implying dismantling of CT should be performed. Coexistence between CT and MTE should be assumed until 2013.
 - It should be assumed that the magnetic septum is to be replaced during the 2012 shut down.
 - A Phase II for the DFAs is still the option to be pursued.
 - The long-term future of the electrostatic septum will be assessed in the coming months.