MTE: PS OPERATION VIEW POINT

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on behalf of the PS operations team

Multi **T**urn **E**xtraction Workshop

24 September, CERN - Geneva

Contents

- First Operational Period
- MTE Specific Tools
- Operational Requirements
- Concluding & Outlook

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Operational Support

- PS-EIC
  - Cycle redevelopment
  - Procedure developed for setting timings for fast extraction elements
  - Follow up of operational issues
  - Follow up of installation of new tools
- PS operations team
  - Beam operation during the period MTE was operationally used
  - Create and maintain operational documentation
  - Many systematic measurement and scans

First Operational Period

Operational Status

- We started the 2010 run with MTE, but prepared also beams with CT extraction as backup
- The beam with MTE was used by the SPS
  - Initially with low intensity for SPS setting up
  - Later also for physics with an intensity of ~2.2x10^{13} per PS extraction
- The periodic fluctuations caused regular radiation alarms and the Op team had little means to act on the beam to avoid them
- However,
  - The Op teams gained valuable experience with the MTE and are motivated to get it working
  - This period was very useful to create the operational web based beam documentation
  - The extracted MTE spill structure is much flatter than the CT, which often contains gaps and spikes
- Radiation issues on SMH16 caused a switch to the CT extraction
- Later the hot spot in TT10 (reason ?) reduced even further the MTE beam to the SPS

First Operational Period

MTE cycle settings corrupted

- Before the INCA deployment an accidental send during YASP testing was done and changed several, mainly GFAS, settings
  - A confirmation button for send was added
- On Thursday 8 July many settings were corrupted, but no traces found in trim history.
  - Either a "Drive" problem or outside INCA values were sent
  - Situation recovered partly with trim history and party with varilog, but time lost
- On Monday 6 September a bug in the ppm copy surfaced and corrupted nearly all the 1 bp PS users including the MTE cycle
  - The situation was recovered using trim history and varilog. However, radial steering could not be recuperated as it was not part of INCA
  - The ppm copy bug was quickly solved, but time lost
  - The radial steering is now fully included in INCA

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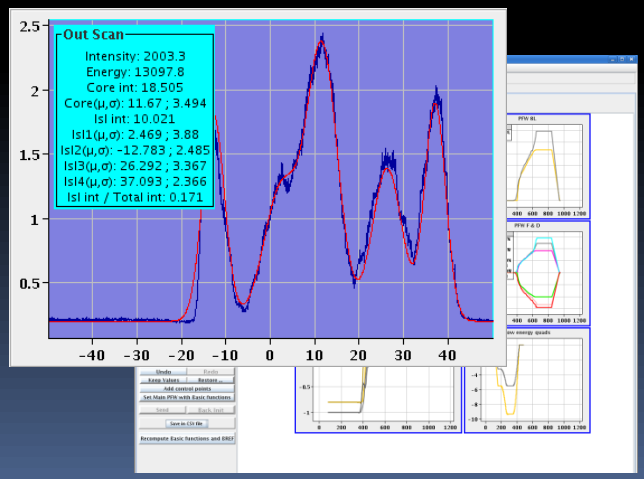
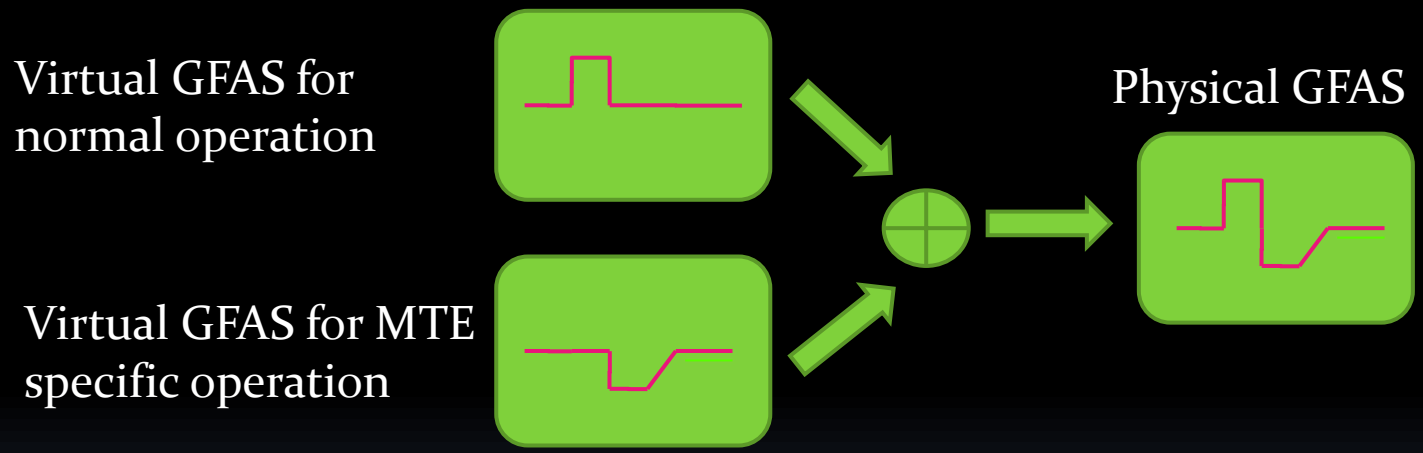


General Aspects

- Commissioning a new beam process or operation:
  - brings on the surface many problems that are not always encountered during normal operation, but solving them contributes to a better control over the machine. However, costly commissioning time is lost
    - Synchronisation of power converter sampler with standard 1 kHz train.
    - Virtual GFASes on PFW's and low energy quadrupoles
  - Requires all diagnostics system to be fully and reliably available

Virtual GFASes

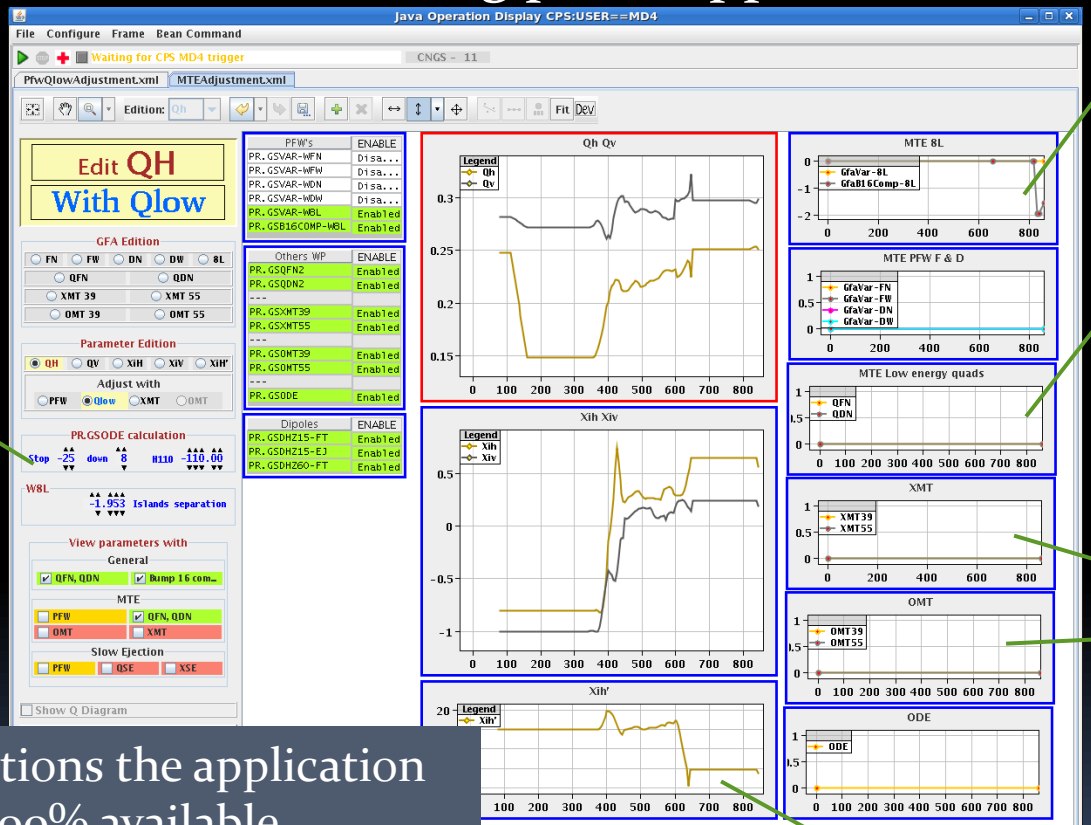
- In order to have better and independent control virtual GFAS were implemented for the PFW's and Low energy quadrupoles



- The working point applications was adapted and the control of other MTE specific equipments was also included

Working Point Control

- A dedicated tab to control all MTE related parameters was added in the working point application



Non-Linear coupling control

Bump tune compensation

Resonance crossing tune control

Non-linear element GFAS

5^{th} parameter Q_h" Special adaptation of 14 geV/c PFW matrix

Due to modifications the application was not always 100% available
Presently numerical settings are being implemented

MTE Specific Tools

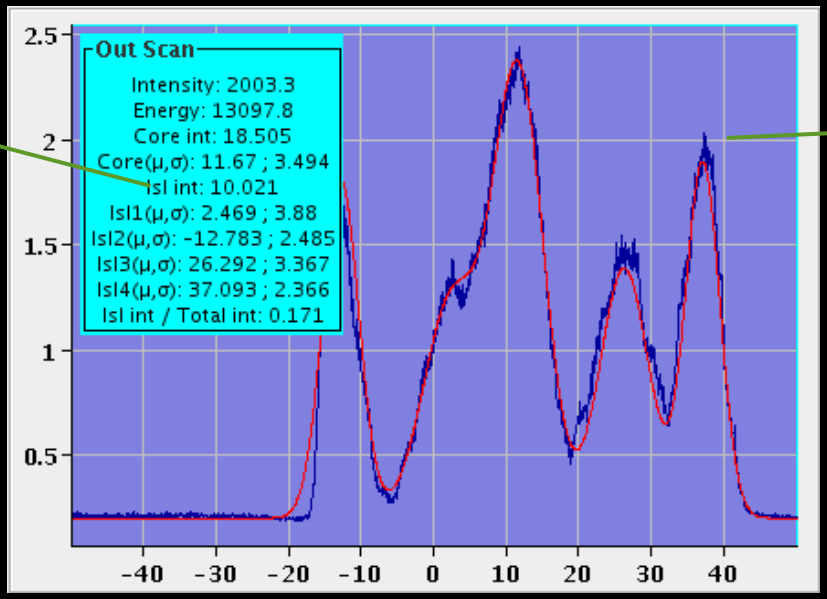
Extraction Bump Control

- The extraction bump for MTE is special and could not be controlled with the simple, but standard control we had (LINC)
- Presently a proto-type (Labview) application is used to create, control and correct the bump and minimize the residual oscillations.
- The application is used routinely, but should be coded in JAVA or, now INCA is deployed, partly implemented in YASP

Fast wire Scanners

- A 5-fold Gaussian fit was implemented

MTE core and islands characterized



Peaks selected manually after measurement

- The old application caused quite some problems and delays.
- A new and simpler, but more reliable application was written recently
- The wire scanner measurement system is vital for MTE as it is the only mean to measure and visualize the islands and their properties
- The wire scanner system is not always stably available

MTE Specific Tools

TT2

- Samplers have been installed:
  - On the fast pulsing extraction elements to be able to adjust them and to diagnose stability issues
  - On the SPS strip line monitors in TT2

- The TT2 pickup signals:
  - Many problems with the ADC's and support issues (supplier side)
  - Signals not easy to interpret. Looks very similar with or without beam
  - Temporary hacks are made to have them available to the PS control system

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PS

- The transverse damper is used to blow up the transverse emittance in a controlled way
  - The damper control is remotely available
  - The excitation function generator is not remotely available
  - The CVORG candidate for this remote control is under development in CO
- The fast bumpers (BFA and DFA) are not fully ppm and cause difficulties and unnecessary fluctuations in beam extraction (CT and MTE)
  - Making them ppm would solve quite some issues

TT2

- As agreed in 2008 the SPS strip lines pick ups in TT2 should become fully part of the PS control and timing system
  - Better control of gain and timing
  - Allowing inclusion in YASP and setting up of 5 turns without using SPS as diagnostic tool
  - However, this can only be done duirng a longer shut down
- The TT2 transformers had some problems and are being renovated.
  - Situation has become more stable now
  - Precision issues were discussed. The present 5% precision is not enough to adjust an extraction with efficiencies in the order of 99%

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Concluding Remarks

- Operational experience with MTE was obtained during the first part of the run
  - Operational procedures and documentation have been made
- There is an important support from the OP side and many measurements have been and are being made
- The MTE specific tools are in place and also contribute to a better control of the other operational beams
  - Due to the evolution they were sometime not 100% available
- Some improvements are required:
  - Full remote control over transverse blow up
  - Make BFA and DFA fully ppm
  - Make TT2 pickups work correctly for 5 turns
  - More precise intensity meaurements
  - YASP for 5 turn steering in TT2

Thank you for your attention