



BI IMPROVEMENTS ACROSS THE COMPLEX

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Presentation Overview

This presentation will give the **status of the ongoing activities** and discuss what has been **identified as additional possibilities for upgrades** on the different machines.

n.b.: Despite the fact we are in the MTE session, this presentation will cover all our activities over the entire injector chain. I tried to highlight MTE related activity in yellow boxes.

Foreword

Our Activities per Type of Instrument

A Word on Specifications

Conclusions

Foreword: Consolidation vs Upgrade

- BE-BI started a consolidation program for the beam instrumentation of the LHC injector chain several years ago.
- The target was to replace obsolete parts (mainly acquisition chain, including SW) with new up-to-date developments to ensure the availability of our systems in the coming years.
- These developments were not directly linked to performance issues or improvement requests but our secondary objective was of course to get the best performance with the remaining parts (i.e. the monitor itself).

Foreword: Consolidation vs Upgrade

- The recent MTE and now LIU projects add new requirements, which now will have to be taken into account.
- Some of these new requirements can be incorporated in our ongoing consolidations but some others will require significantly new developments and/or extensions.
- While most of our consolidation program is already funded by Simon over the coming years, these upgrades are not and they will have to be supported by the corresponding projects.



OUR ACTIVITIES PER TYPE OF INSTRUMENT

- SEM, Wire Scanners, BLM, BCT , BPM, Tune and others

SEM

- SEM Grid acquisition chain consolidation is approved for PSB and PS under the existing consolidation project.
- It will be based on developments done for Linac4 and deployed for 2014 start-up.
- The Grids themselves are not part of this and will stay as they are. The resolution of these systems will remain as they are now. Any performance improvement requirement will have to be analysed in details and integrated into the plans.

Wire Scanners (1/2)

- The ongoing consolidation of the PSB and PS wire scanners aims to exploit as well as possible the existing mechanics with new acquisition chain. The current consolidation budget covers this.
 - On PSB, new electronics and PM have already been installed.
 - On PS,
 - new electronics has been deployed,
 - new PM is currently under test on one wire
 - New large aperture tanks have been developed for MTE. One will be installed soon, hopefully next technical stop
 - On SPS, the LHC type electronics (including 40 MHz acquisition) is currently tested on one wire and will be deployed on all wires next Christmas stop.

Wire Scanners (2/2)

- The production of a prototype for a new fast and more accurate wire scanner is also covered by our current consolidation budget.
- We will assess the performance we could reach with this laboratory prototype before the end of the year.
- The exact specifications and number of these to be installed in PSB, PS and SPS (& whether they replace the old ones) are still to be defined (and funded) as part of LIU.
- We could install one of these new scanners for assessment in one ring for the 2014 start-up

BEAM LOSS MONITORS

- The replacement of the PSB and PS BLM acquisition chain and detectors (in sync with Linac4 connection) is covered by the existing consolidation project with the initial assumptions that we keep the same locations and cables.
- But:
 - Recent aging /radiation issues force us to review these assumptions and include the renewal of the cables.
 - Extra fast monitors are now requested in several places
- For this, extra funding from LIU (and consolidation?) is requested
- The SPS BLM upgrade has still to be specified and funding from LIU should then also be granted.

BEAM Current Transformers

- The consolidation of the PSB and PS fast beam current transformers is covered by the existing consolidation project.
 - The acquisition chain has already been renovated.
 - The replacement of our toroids is currently under study with the aim to replace them during coming long shutdown.
- DCCT in PSB and PS will need new electronics to cope with the upgrade. This is not yet funded.
- SPS Fast and DC BCT monitors are being upgraded (for North Hall interlock) and are planned to be installed during the Christmas shutdown.

BEAM Orbit & Trajectories (1/2)

- PS Orbit and Trajectory system has just been renovated.
- The implementation of such a system on PSB has been studied and estimated (based on the existing monitors). **We just wait for the green light and budget from LIU** to start the project with 2014 start up as possible target.

BEAM Orbit & Trajectories (2/2)

- The TT₂/TT₁₀ BPM acquisition chain renovation (including MTE '5 turn requirement') is funded and in progress. Target: 2012 start up.
- The SPS MOPOS acquisition chain renovation is also funded and ongoing (based on the same monitors) with 2014 start up as target.
- New SPS MOPOS functional specifications are currently in preparation. Any extension (number of BPMs, dual-plane BPMs) would have to be integrated into LIU budget.

Tune & Chroma

- A new PU for tune measurement on low intensity beam in the PS is under study. We should have it installed for next start-up.
- On the SPS, the existing Head-Tail set up can survive up to the long shut-down with increased attenuator but long term availability requires a new PU to be designed and installed in 2014. This should be covered by LIU.

Other Goodies

■ SPS Ionisation Profile Monitors

- We plan to renovate the optics and cameras of the existing SPS IPMs during Christmas shutdown to **assess their performance in 2012**
- **If such a device is also needed in the PS, it should be specified and properly included into LIU.**

■ SPS Matching Monitor

- We should be able to evaluate during the second half of the year our new development on the LHC. **If needed and adequate, this could then be duplicated into the SPS.**

■ SPS LDM

- We will assess during the year the feasibility of such an instrument based on SPS synchrotron light.



A WORD ON SPECIFICATIONS

Upgrade & Functional Specifications

- It is important to agree that, while we could live with 'Do at Least as Well' functional specifications for a consolidation, this is not possible for an upgrade.
- **For an upgrade, we need clear, complete and agreed specifications** in order to:
 - Check if it can be covered by the existing consolidation program
 - Properly estimate cost and planning
 - **Get what we need in the end.**



CONCLUSIONS

Conclusions

A lot of activities are already ongoing in the different machines.

A large part of them are already funded by consolidation project but several 'extensions' will have to be supported by the LIU project.

What we need now is:

- a proper and agreed specification of the expected results based on your needs to achieve your targets and not only on what seems feasible from our side.
- to define together with OP and CO deployment strategies for the renovated systems critical for machine operation and safety.