Planned changes during LS1: PS

S. Gilardoni
for PS-LIU
apologies if I forgot something…..
And my thanks to everyone!
Skew sextupoles

Resonance compensation successfully applied with 4 sextupoles in SS02 SS72 SS14 SS52

SS02 and SS72 taken by:
- New Finmet cavity
- New PU for tune meas.

Identified two new SS
- SS58
- SS10

for skew sextupoles
Beam instrumentation: emittance measurement

New cables and electronics to test bunch-by-bunch emittance measurement at injection and extraction.

- Tests to reconstruct emittance from different PBS ring or 1\textsuperscript{st} and 2\textsuperscript{nd} injection

![Graph](fill_2646_atlas.png)

\textit{giulia papotti, MSWG, 2010.06.01}
Beam instrumentation: fast signals

New wall current monitor installed in SS03 to:
- log last turn longitudinal profiles
- Improve detection of “satellites”

New pickup at beginning of TT2 to:
- Improve extraction trajectories
- Improve trajectories in TT2
Finemet® cavity development as longit. kicker

Finemet® wideband cavity (as longit. damper) design based on PSB design (M. Paoluzzi)

- Impedance model (CST® studio) being developed
- Simulation progressing to assess the performances as feedback
Finemet® cavity: shielding the amplifiers
Simulation of coupled bunch: developments during LS1

Comparison with external excitation

**Measurements**

Comparison with 10 MHz RF system mode

**Simulations**

<table>
<thead>
<tr>
<th>Quality factor</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shunt impedance (Ω)</td>
<td>$1.5 \times 10^3$</td>
</tr>
<tr>
<td>Total beam intensity (ppb)</td>
<td>$9 \times 10^{12}$</td>
</tr>
</tbody>
</table>

Simulations:

$$\omega_r = 5\omega_0 \ldots 9\omega_0 \xrightarrow{\text{rise time}} \approx 340 \div 500 \text{ ms}$$

**Measurement results**

<table>
<thead>
<tr>
<th>Mode Number</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rise time</td>
<td>400ms</td>
<td>333ms</td>
<td>1s</td>
</tr>
</tbody>
</table>

LONGITUDINAL COUPLED-BUNCH INSTABILITIES IN THE CERN PS

M. Mehler, GSI, Darmstadt, Germany
New digital 1-turn feedback implementation

Successful proof-of-principle test of new 1-turn feedback on one 10 MHz cavity

Beam induced spectrum on cavity return signal cycle

→ Fully digital
→ Much more flexible and higher gain than operational system
BW bottleneck today is the power amplifier (23 MHz bandwidth at -3 dB). During the LS1 period the specification for the update will be defined from the beam physics requirements. The present specifications are 100 MHz (-3 dB) and 5 kW CW (output matched) per plate (instead of 23 MHz at 800 W CW) which should be fulfilled before the restart of the LHC.

To fully exploit the 100 MHz frequency one could use more DSPU per plane and increase the BW of the PU…
Additional shielding above PS injection region

Improvements of Radiation Level verified by FLUKA

Proposed shielding reduces dose to 0.6 μSv/h for the future upgrades of PSB intensity and energy

→ Future classification of Route Goward as Non-designated area

Works already started.
Rte Goward works when started

Rte Goward works started, first with removal of two transformers

First traffic jams, even if intervention announced well in advance …
Rte Goward: transformer displacement
TRAVAUX DE RENFORCEMENT DU BLINDAGE DU TUNNEL PS SUR LA ROUTE GOWARD


Accès Centre Anneau Selon Plan
Extraction septum shielding increase: technology chosen

- Pillars around the tunnel plus single concrete slab (1.1 m thick)
- Increase of safety margin wrt original project (2-3) by additional factor of 2
- Reduce risk of large stresses on existing structures

Carottage under tunnel showed weakness of molasse excluding other solutions
Electron cloud measurement via electron-photon emission

Electron-photon emission:
The emission of photons from metals bombarded by low-energy electrons

- Electrons in EC has a relatively low energy (~300eV).
- Expected photon wavelength with 300eV electrons: 200nm (UV) – 700nm (visible).
- Expected photon energies: 2eV – 5eV.
- Expected radiation yield: $10^6$ photons/sec.nm.mm².A
**New ecloud monitor in main magnet unit**

Principle: detection of photons generated by electrons

Test stand: Build a complete new permanent system to study Cathodoluminescence of different metals in the lab.

![Diagram showing the components and setup of the ecloud monitor](image)


The measured luminescence intensity is expressed in: number of photons/mm² per sec per nm per Ampere of incident electron beam at a distance of 30 cm from the target.
Conclusions

Thanks to everyone for the impressive 2012 and for all the LS1 activities!

I think we really deserve another vodka bottle....