2012 MD#3 BI RESULTS (preliminary)

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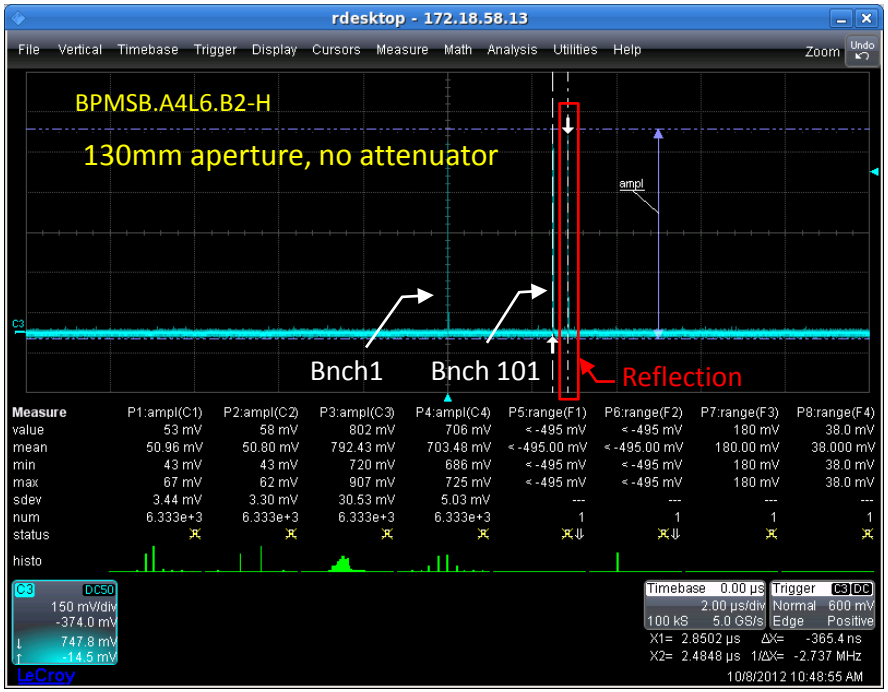
Plan

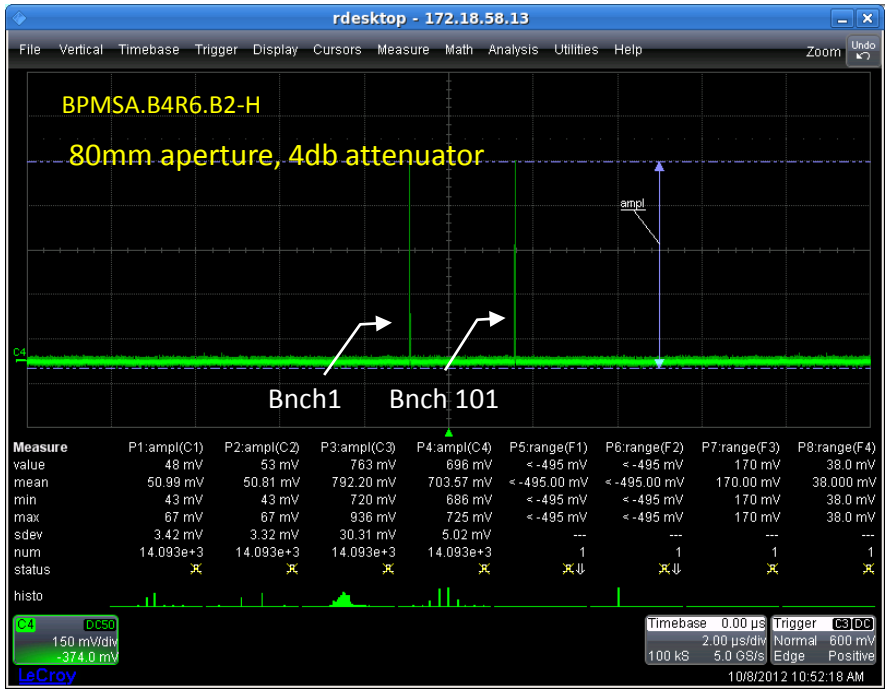
Period	Monitor(s)	Time	Beam Type		Comments
1	BSRT vs WS Schottky WS PM saturation	4h	**B1** (driven by BSRT): Pilot + 12 INDIV bunches >=1.1e11 p/bunch **B2** (driven by WS PM studies): Pilot + trains 50ns (from 6 to 72 bunches	450 GeV + 4 TeV	**BSRT** **B1:** Small emittance (<1.5um) from SPS Bumps 450 GeV Blow-up with ADT single bunches Ramp Bumps 4TeV Blow-up remaining small bunches **B2**: likely bumps ---------- **SCHOTTKY:** **B1**: meas chroma with pilot vs standard method Meas. Chroma nominal bunches **B2**: Response to bumps (in parallel to BSRT) ---------- **WS PM (B2 only)** Scan PM voltages with different filter settings
2	BGI Gated BBQ BSRT temperatures	2h	50ns trains, minimum 600 bunches	450GeV	**BG**I: Small emittance (<=1.5um) form SPS, blow up Batches with ADT Bumps B2 +- 3 mm with 0.1mm steps **BBQ**: study gating with ADT off on some bunches NO BEAM
3	BPMs	2h	Fat pilots or scraped INDIV I<=2e10	450GeV	Scraping Next Slides
4	Matching	1h	Probe from 1 to 5e10	450 GeV	Inj, circulate (~100turns) and Dump NO BEAM

Only partially done:
-BSRT B1 calibration 450GeV, compromised by focusing stage fault
-small bunches from SPS not available

BPMs

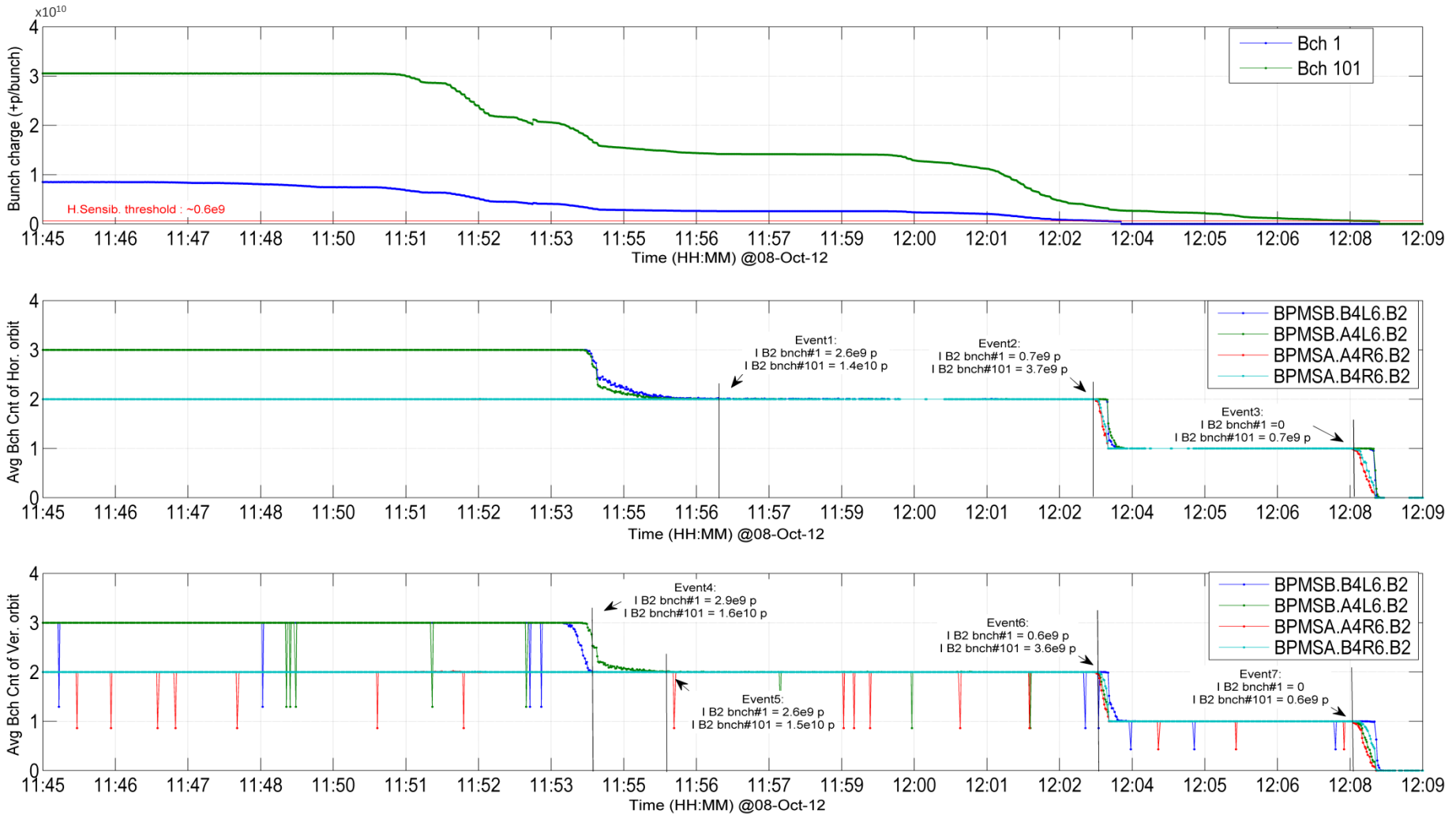
MD Objective : Investigate the cause of the issues found with the Pt6 interlocked BPMs during the P-Pb MD.
History: During the p-Pb (on 14 Sept) the BPMSA.A4L6.B1-V showed additional triggers with probes above ~1e10p^{+}/b. Problems were observed mainly in the vertical plane (sometimes also in the BPMSB.B4R6.B1).
During BI-BPM MD : two bunches were injected on B2 : 9e9p (bnch 1) and 3.06e10p (bnch 1001). (Unfortunately B1 was not available.) and then scrapped. Signals were logged and monitored with an oscilloscope.
Results: Reflections were confirmed in the two **BPMSB** type monitors of B2, **but not seen in the BPMSA type**. They started disappear when the fat pilot was scrapped to ~1.4e10p.





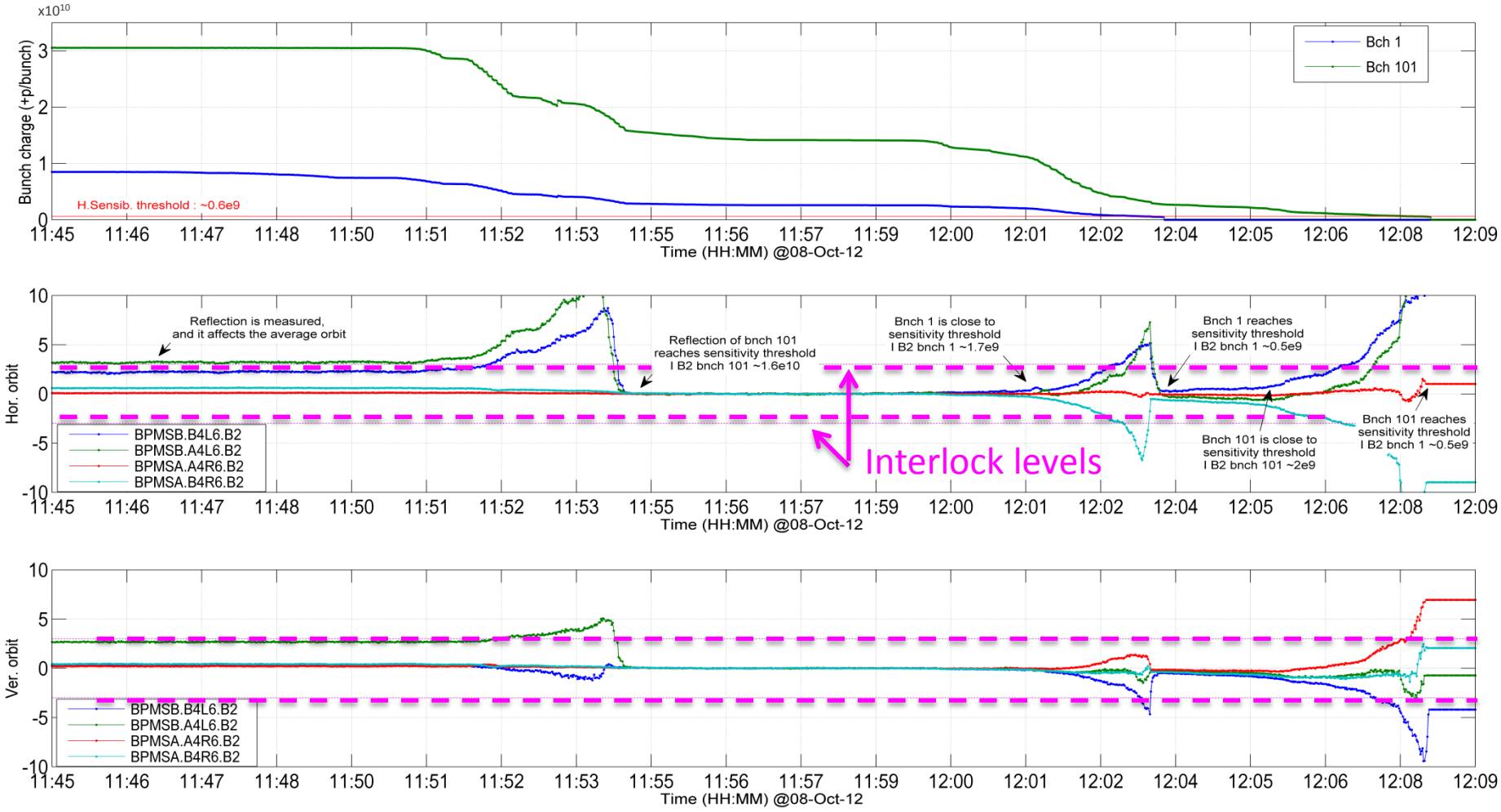
BPMs

- The **BPMSB channels acquired 3 bunches when there were only 2 present**. The reason is that it exists a reflection (attenuated by ~ 27dB) that can be detected by the system if it is working in high sensitivity mode.
- **B2 vertical seemed to have glitches along all the range.** This is not compatible with a reflection problem. There should be an additional issue that seems to affect only the vertical planes.



BPMs

- Even when the reflection is within the dynamic range, the **reflections** from different cables are not perfectly balanced, and this **leads to an offset that is taking into account in the average position (reducing the interlock margins).**
- Between **~2e9p/bunch up to 0.5e9p/bunch**, the bunch signals are acquired, but **electronics works in a non-linear region**, leading to a diverging measurement.



BPMs Conclusion

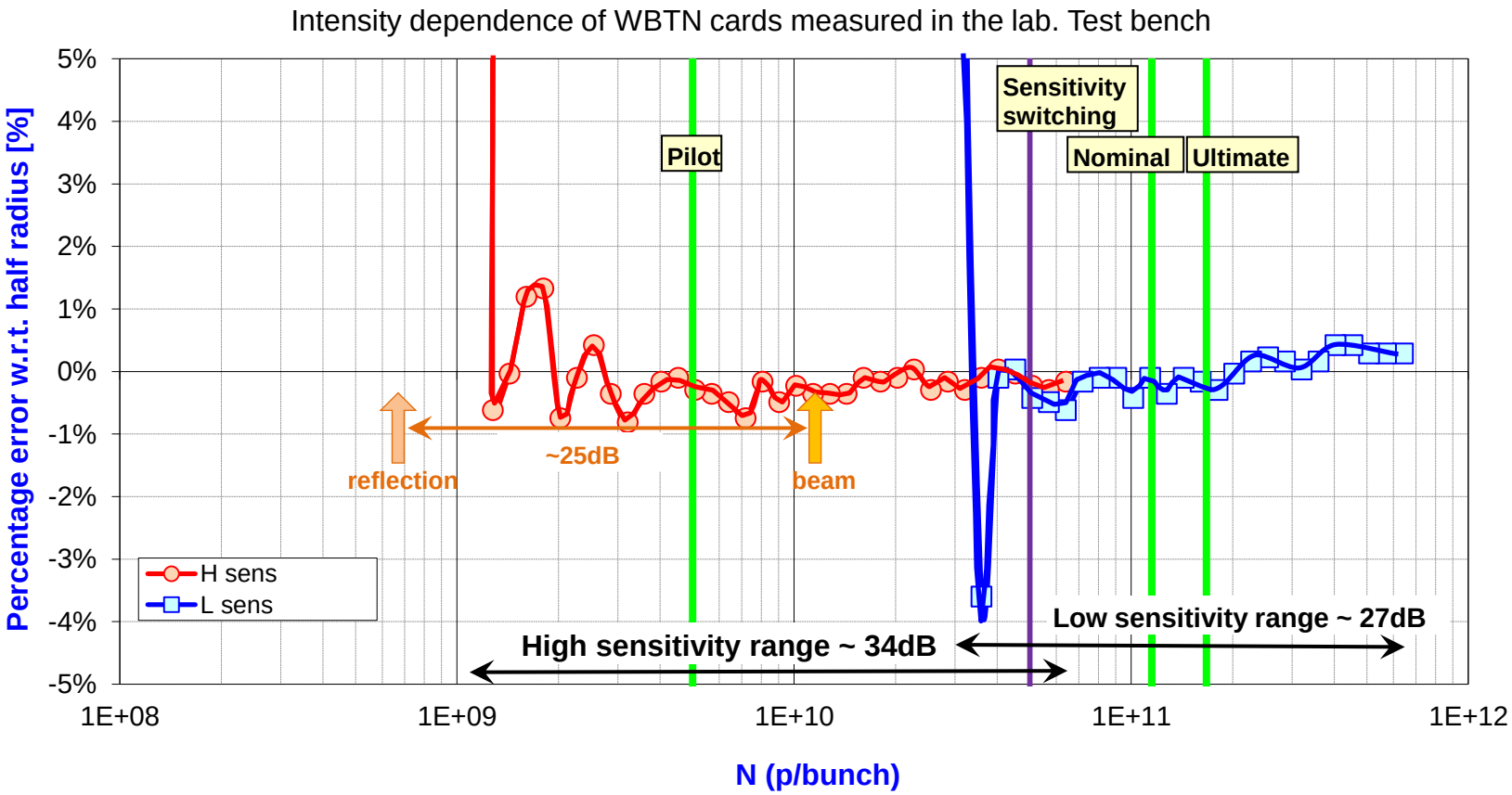
- Spurious signals compromise measurements in high sensitivity mode
  - interlocks triggering when not needed

- Solutions for proton-ion run
  - Modify/remove attenuators
  - Manage to understand and/or filter out reflections

Spares

WBTN intensity dependence

- Current installation BPMSA (80mm ap.) have 4dB and BPMSB (130mm ap.) have 0 dB
- The orbit system uses different type of monitors (buttons and strip-lines) with different apertures. Fixed attenuators are calculated for each monitor type and cable length, so the signal amplitudes are similar, and the sensitivity ranges can be switched simultaneously at all the channels.
- Unfortunately during the proton-ion MD (~6e9p/b in B2, and ~1.3e10 p/b in B1) the proton beam was dumped several times.
  - Hypothesis was that while the current setup works reliably when BPM are working in low sensitivity range, it makes the system too vulnerable to reflections when working in high sensitivity.



Note: 1% ~ 130 um for LHC arc
~220um for BPMSA and ~330um for BPMSB buttons

Attenuator were changed during TS#2

- Aim: To align the Pt6 interlock low sensitivity threshold at 2e10p/bunch.
- Scrapping performed on 29/6/2012 in low sensitivity range: it confirmed that all the channels were aligned correctly.