



Libera Photon Project at SOLEIL

Nicolas HUBERT

Synchrotron SOLEIL

On behalf of Diagnostics group

- Synchrotron SOLEIL:

- 3rd generation light source delivering photons since January 2007
- 2.75 GeV
- 20 Beamlines in operation
- Top-Up operation since March 2009
- Current:
 - 400 mA for users operation,
 - 500 mA already achieved during machine tests (operation-> 2011).



Orbit Monitoring

- BPM system
 - Transfer line 1
 - 1 stripline -> Libera Electron
 - Booster
 - 22 pick-up BPMs -> Libera Electron
 - Transfer Line 2
 - 3 striplines -> Libera Electron
 - Storage Ring
 - 120 pick-up BPMs -> Libera Electron



In operation since 2005

- XBPM system
 - Bending Magnets beamlines
 - 10 Copper blade XBPMs -> Locum device
 - Insertion devices beamlines
 - 15 Tungsten blade XBPMs -> Locum device



Analog device

Orbit Control

- Slow and Fast Orbit Feedback
 - Based on BPMs data only
 - Slow Acquisition data (@ 10 Hz) for SOFB
 - Fast Acquisition data (@ 10 kHz) for FOFB
 - Fast Acquisition data distributed on a dedicated network
 - Point to point links between Libera Rocket I/O ports
 - Diamond Communication Controller
- Integration of X-BPMs into Orbit Feedback
 - On bending magnets BL only (no ID gap/phase dependence)
 - Has to be integrated into the dedicated network for data distribution

- Locum devices:
 - Digitization at FA rate
 - Synchronization with Libera Electrons
 - Integration into dedicated network
 - Integration into control command



- Libera photons:
 - Same data rates as Libera Electron
 - Same synchronization mechanism
 - Diamond Communication controller embeded
 - Re use of Libera Tango device (a part of)

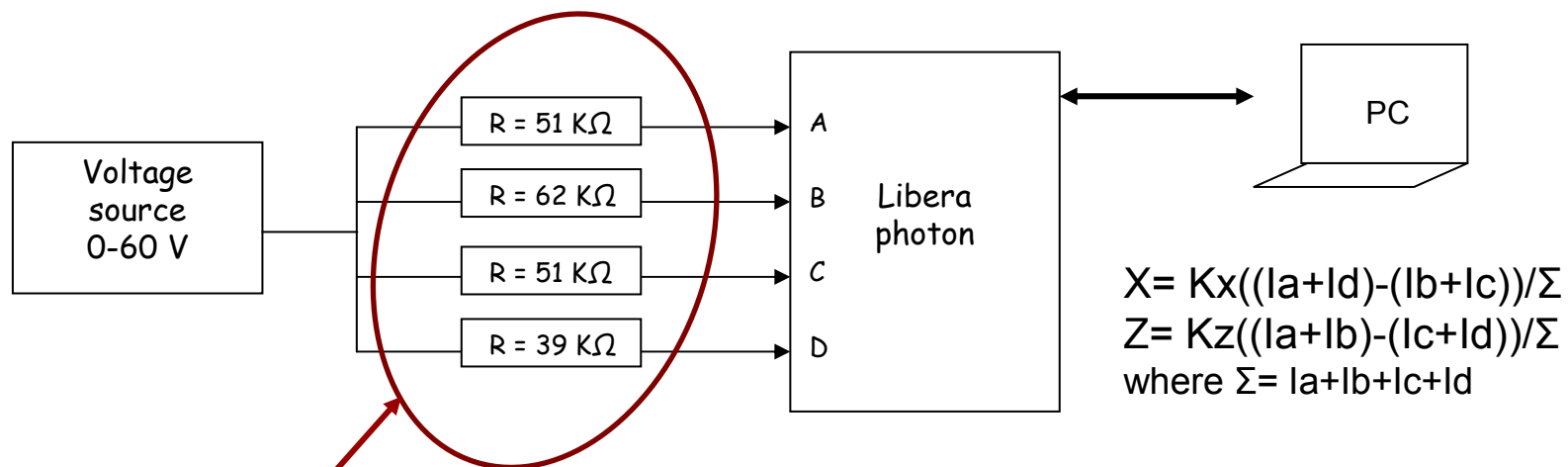


Libera Photon Project at Soleil

- History:
 - October 2009: Test of a Libera Photon prototype on beam
 - January 2010: Delivery of 2 modules
 - Tests in the Lab*
 - April 2010: Tests on beam revealed HW problem (High voltage source)
 - Units have to be sent back to I-Tech for diagnostic and repair
 - July 2010: Return of one module
 - Test on beam
 - Tests in the lab
 - Hardware validated
 - Software has not been tested so far:
 - Tango device server is under development
 - When the software is validated, order for five more modules
- In the next slides: hardware tests results

Hardware tests results (lab)

- Lab set-up:



Simulated off-centered beam:

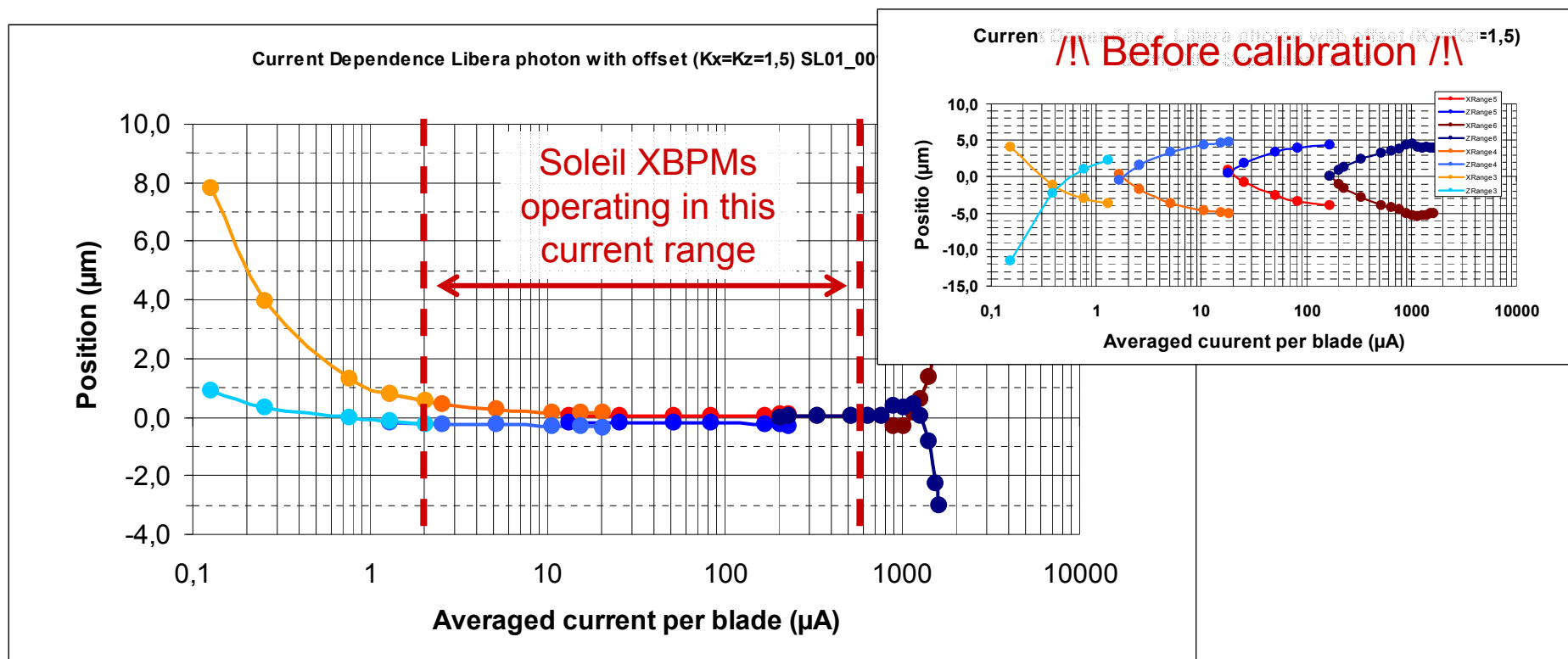
$$X \approx -180 \mu\text{m for } K_x = 1,5\text{mm}$$

$$z \approx +180 \mu\text{m for } K_z = 1,5\text{mm}$$

- All the measurement done in the lab are with a simulated off-centered beam.

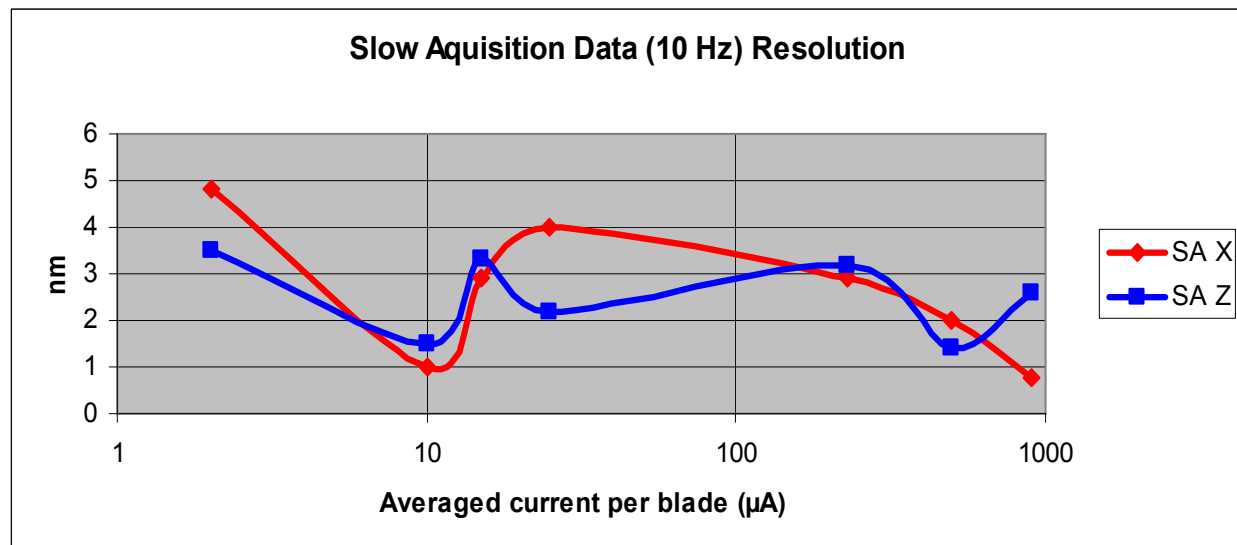
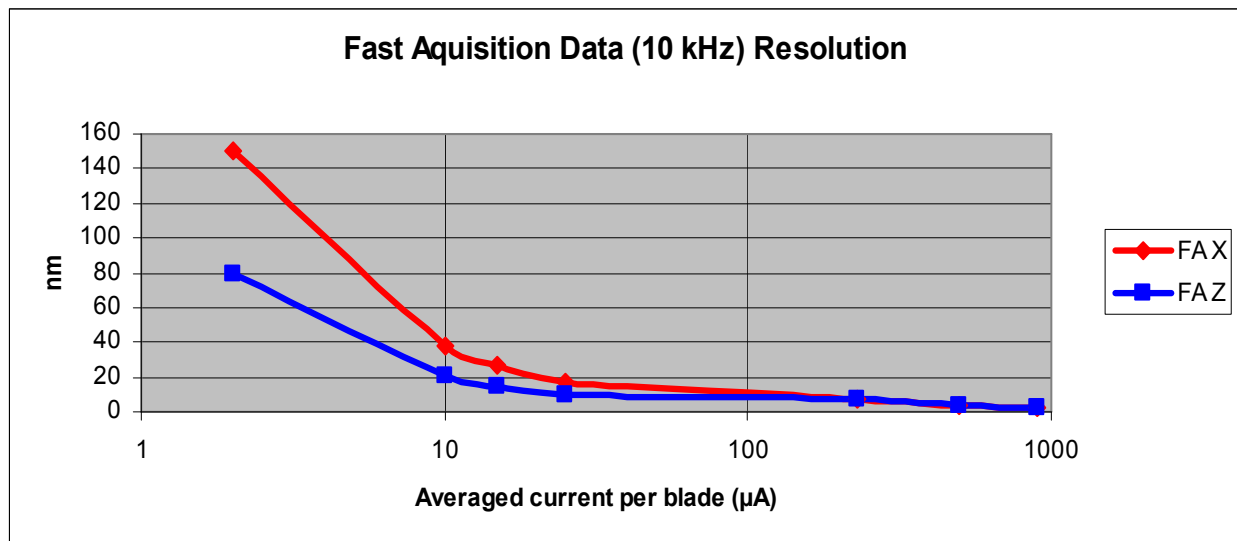
Hardware tests results (lab)

- Beam Current Dependence:
 - Soleil current range on the blades: 2-600 μA
 - Specification: $\pm 1\mu\text{m}$
 - Before HW upgrade, BCD was around 10 μm
 - After HW upgrade BCD is within specifications



Hardware tests results (lab)

- Resolution (off-centered simulated beam):

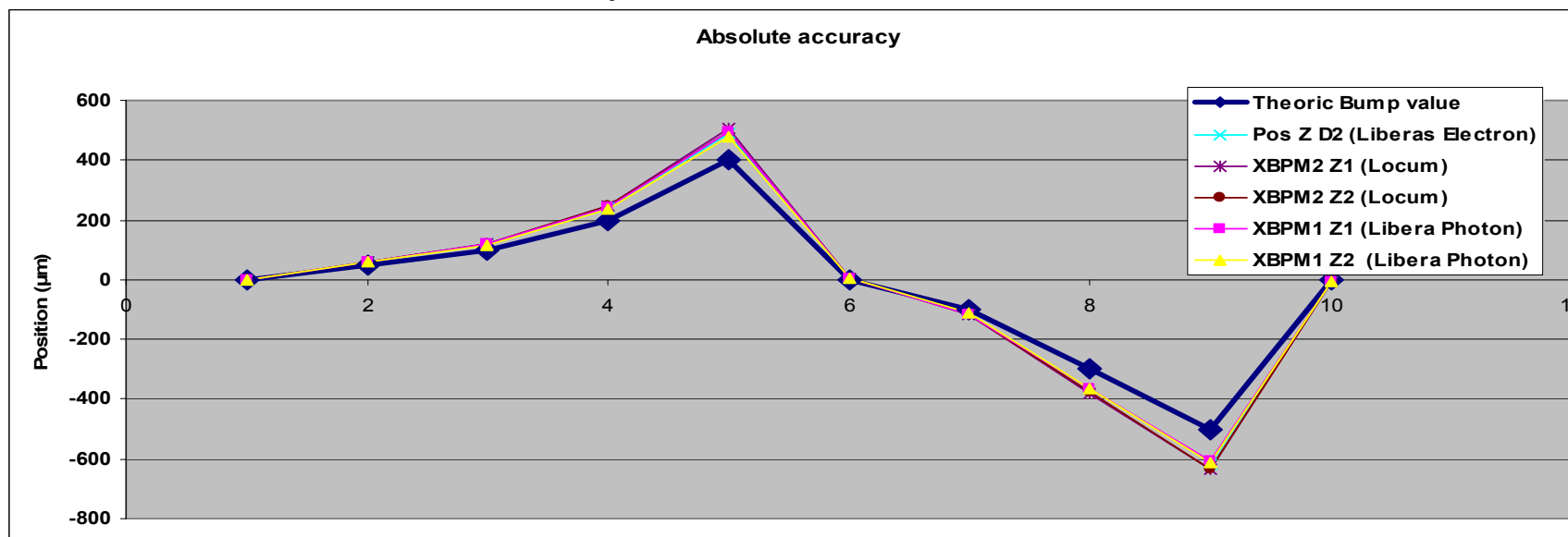
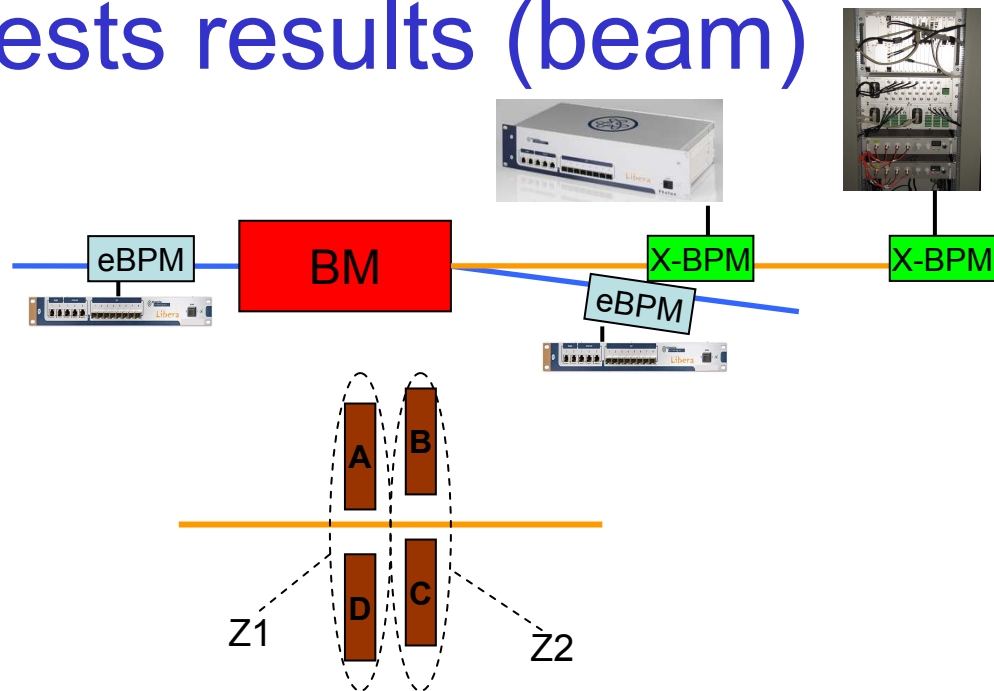


Hardware tests results (beam)

- Set-up:
 - Bending Magnet Beamline
 - XBPM n°1 -> Libera Photon
 - X-BPM n°2 -> LOCUM

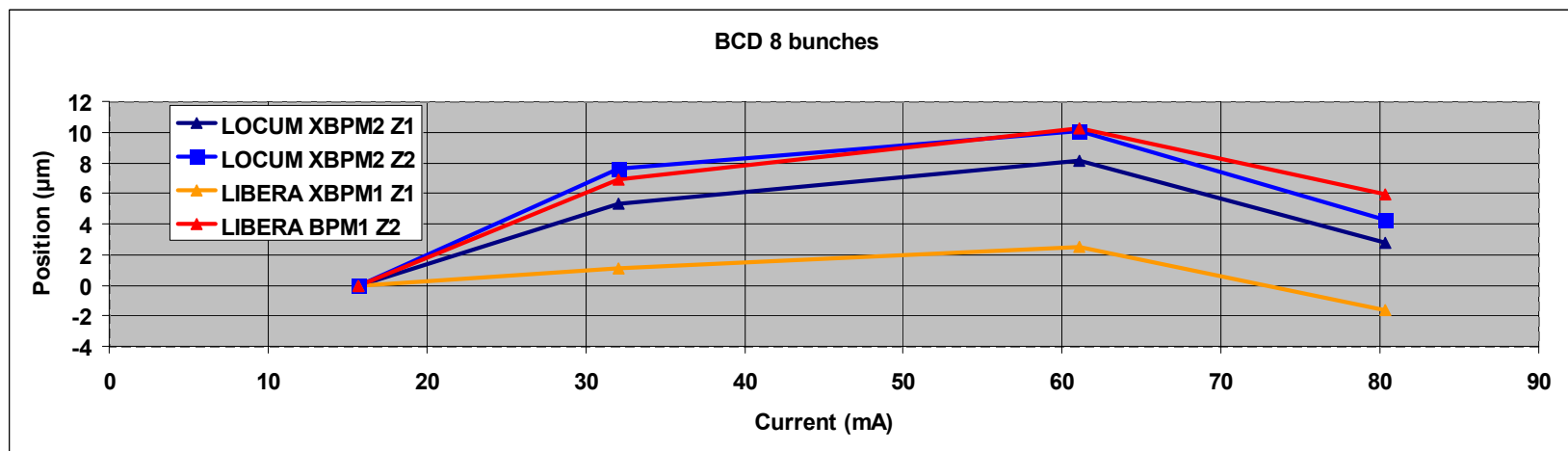
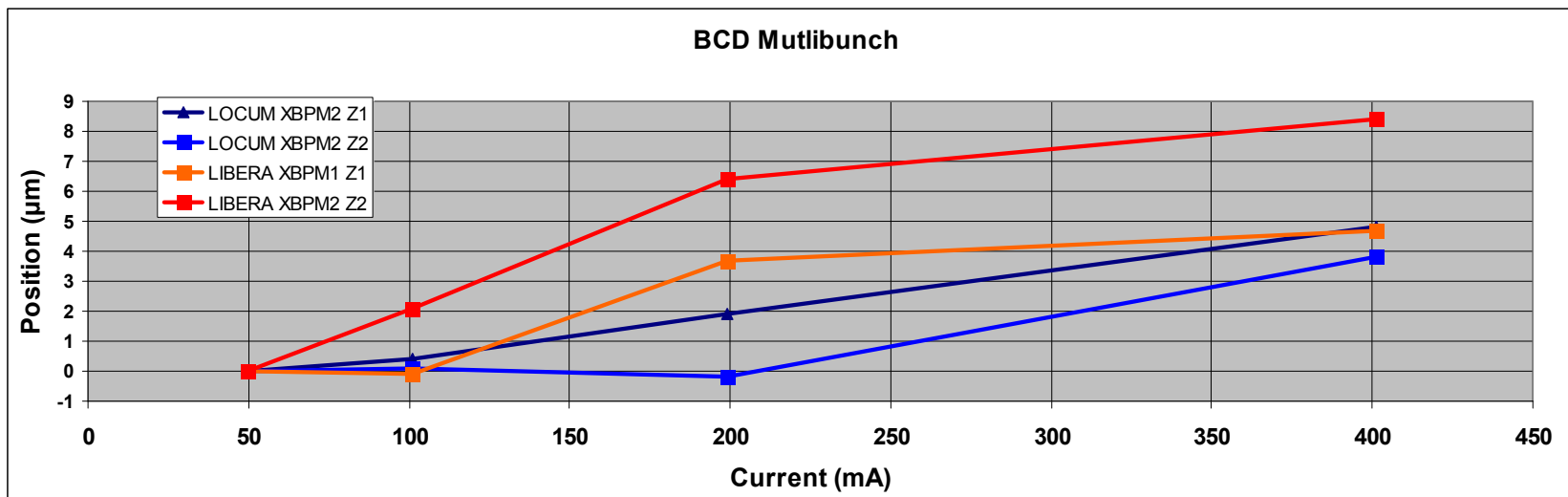
- Only vertical position is measured
 - 2 pairs of blades per X-BPM
 - > 2 measurement per X-BPM

- Absolute accuracy:
 - Electron beam is bumped



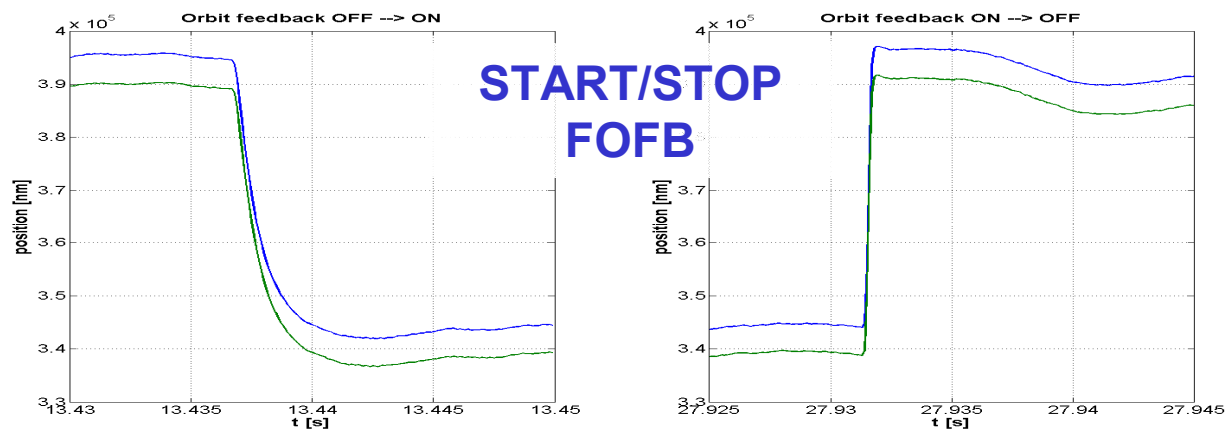
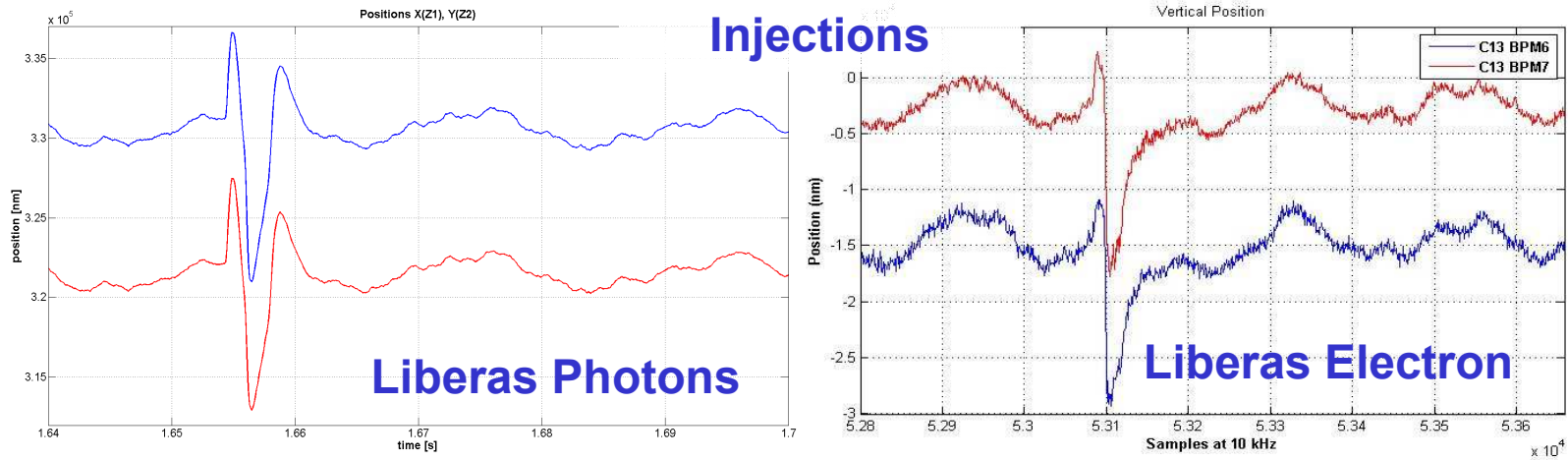
Hardware tests results (beam)

- Beam current dependence:



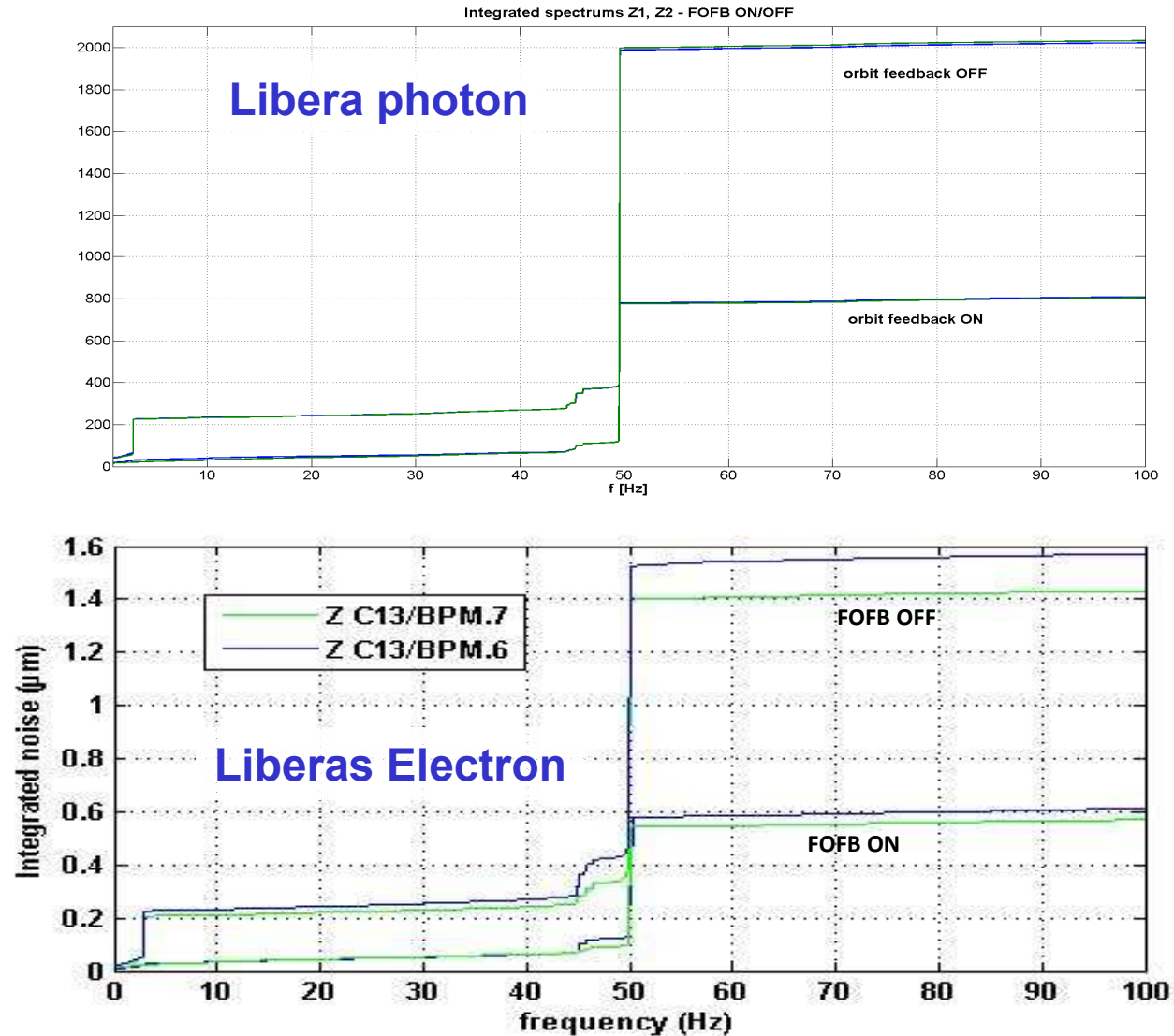
Hardware tests results (beam)

- Synchronized event detection:



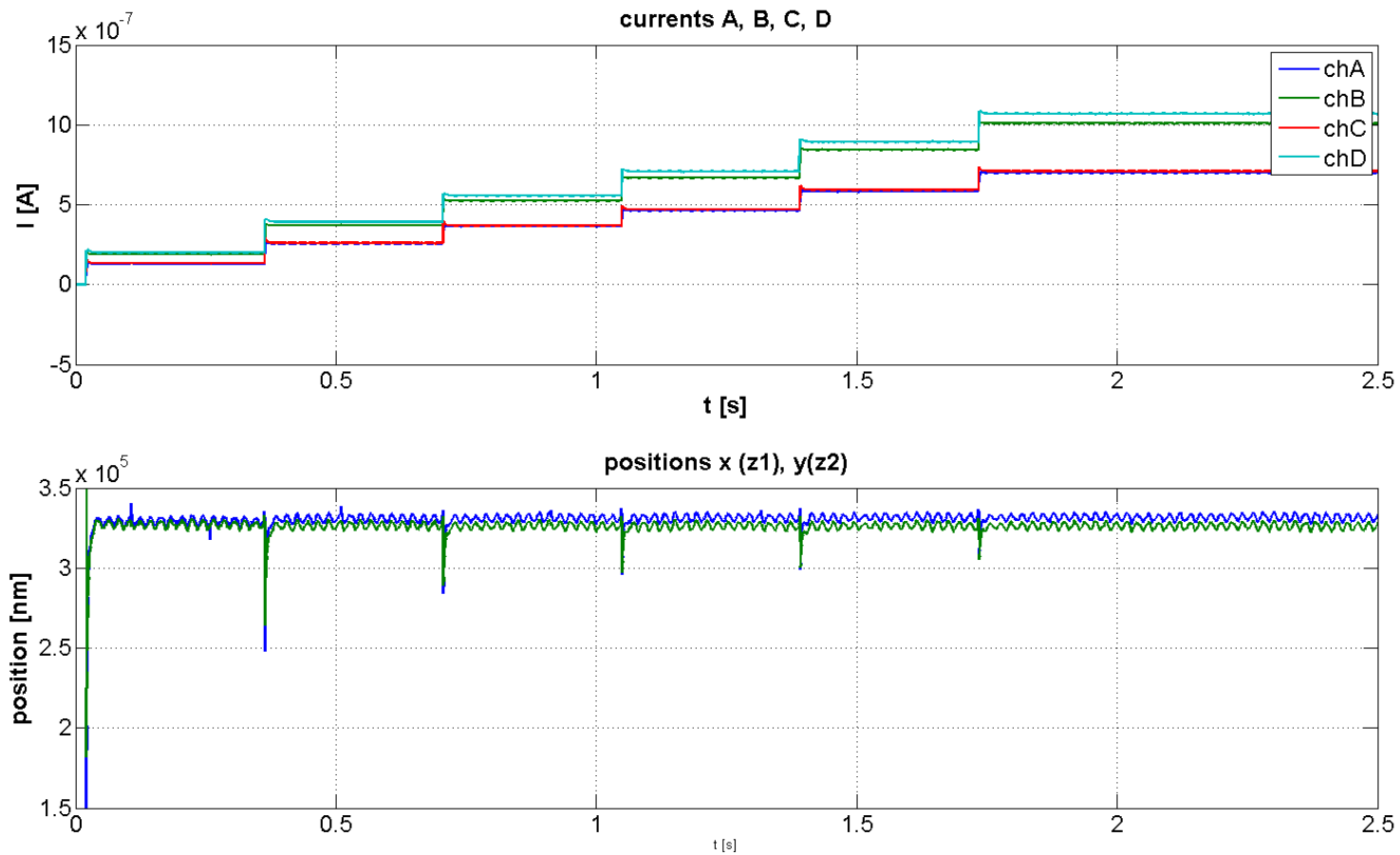
Hardware tests results (beam)

- Spectrum measurements:



Hardware tests results (beam)

- Dark current compensation:



Conclusion

- Hardware is validated
- Software has to be tested (October/November)
 - Final specification for the end of November
 - Soleil will gather feedback/ request from other Libera photons users in November to write a common wish-list.
 - Contact me if you are interested: nicolas.hubert@synchrotron-soleil.fr

Thank you for your attention