



Libera

Libera Spark – Compact eBPM solution

Manuel Cargnelutti, Libera Workshop 2014, 10.04.2014

Outline

- What is Libera Spark?
- The driver for the development
- Steps towards a new platform
- The electron BPM application
- Conclusions

What is Libera Spark?



- Latest product of the *Libera* family
- Electron Beam position monitor
- Result of a collaboration with the European Synchrotron Radiation Facility (ESRF)
- Base for many other developments

The driver: a well specified customer request



Development of a booster BPM that, compared to the state of the art of the existing BPMs, has:

- Lower performance
- Lower price
- No maintenance required

The driver: a well specified customer request



A good opportunity to:

- Take advantage of emerging technologies
- Optimize the existing solutions towards simplicity
- Improve the test & development process
(e.g. test-driven development is possible)

What are the key points in the development?

Latest advances in the SoC
technology provide FPGA and
CPU embedded in the same chip



High level of HW/SW integration
Lower power consumption

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Identify application-specific components and make them reconfigurable



Reconfigurable RF front-end

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Reconfigurable RF front-end

Simple and straightforward access to the instrument, with minimum number of interfaces

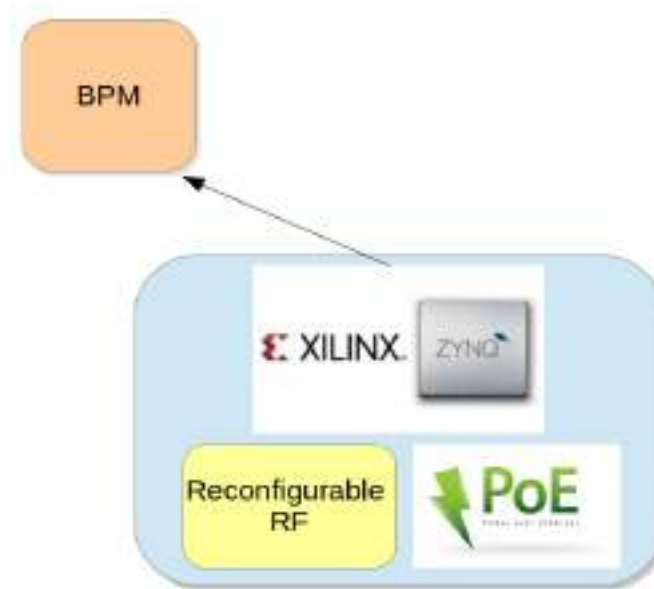


Low cost and no maintenance required, PoE power supply

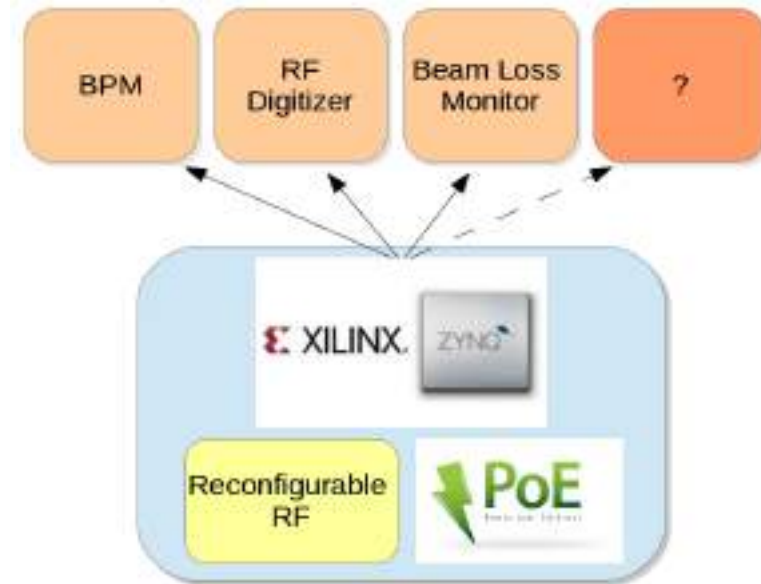
Moving towards a new platform



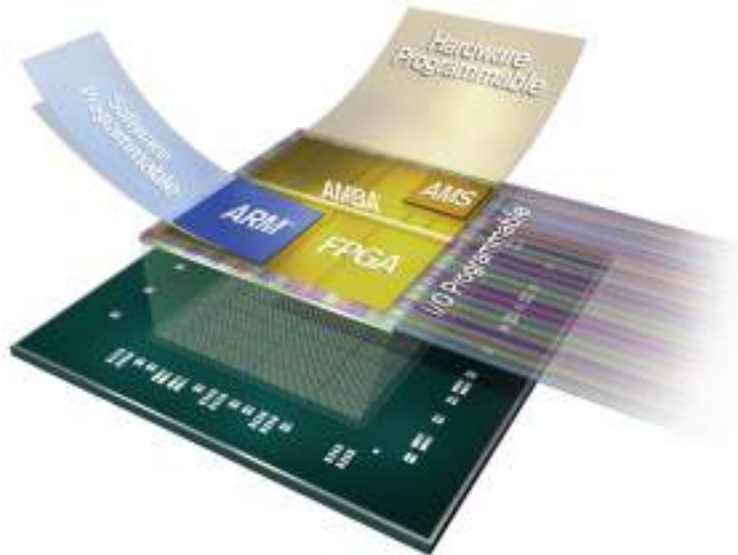
Moving towards a new platform



Moving towards a new platform

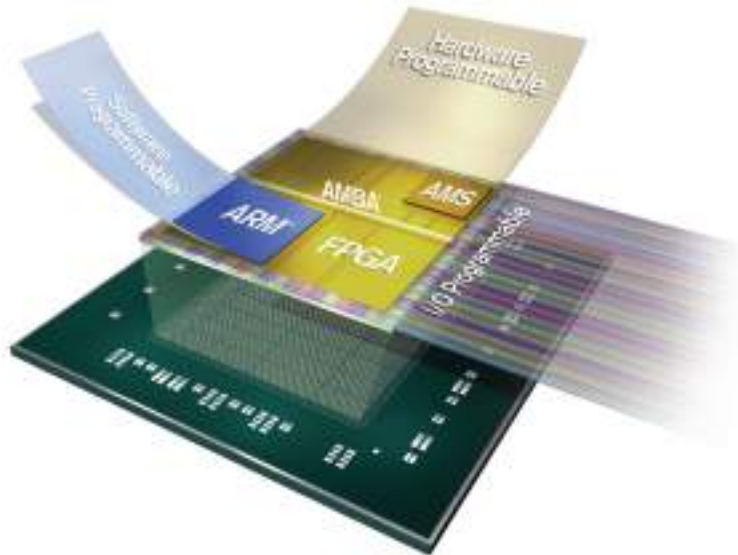


HW & SW integration



- Xilinx ZYNQ provides FPGA and CPU in the same chip
- Data exchange through shared memory

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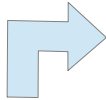


No data copy, no communication protocols

Low power instrument

1. SoC requires less power
2. Proper selection of RF components

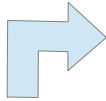
Low power instrument



Less heat to treat

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Low power instrument

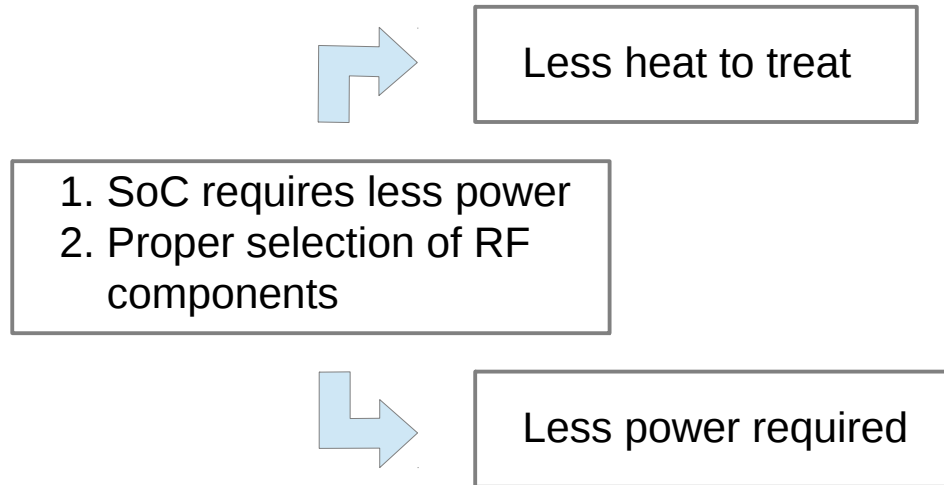


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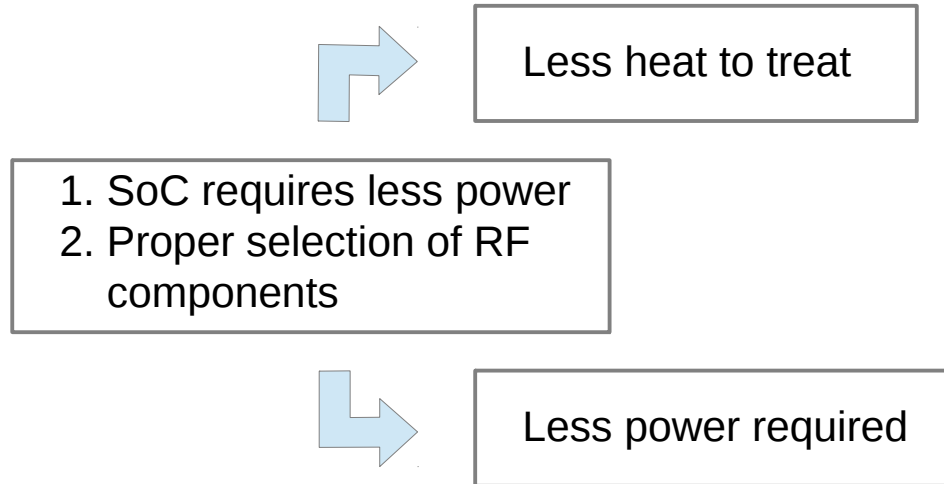
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- Fans no longer needed
- No maintenance required
- No fans-induced noise

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- PoE power supply

Easy SW maintenance

- No SW is installed in the device memory
- SW is loaded when the unit boots up, from an image:
 1. stored in the SD-card
 2. downloaded from a server which can be common for all the units

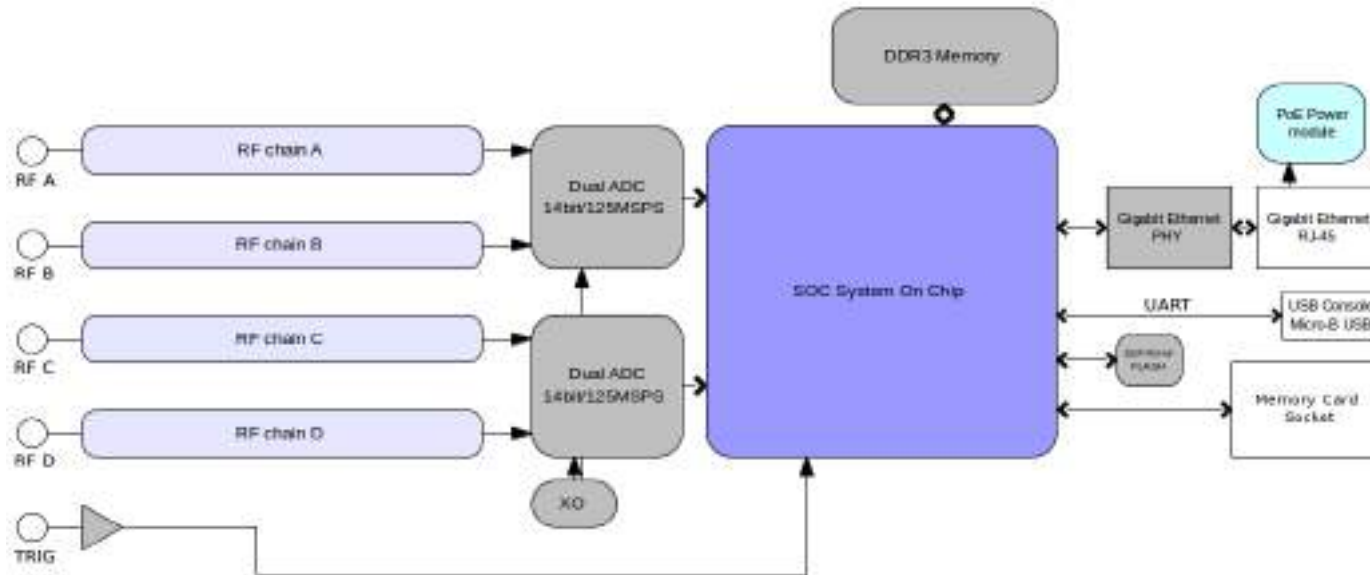
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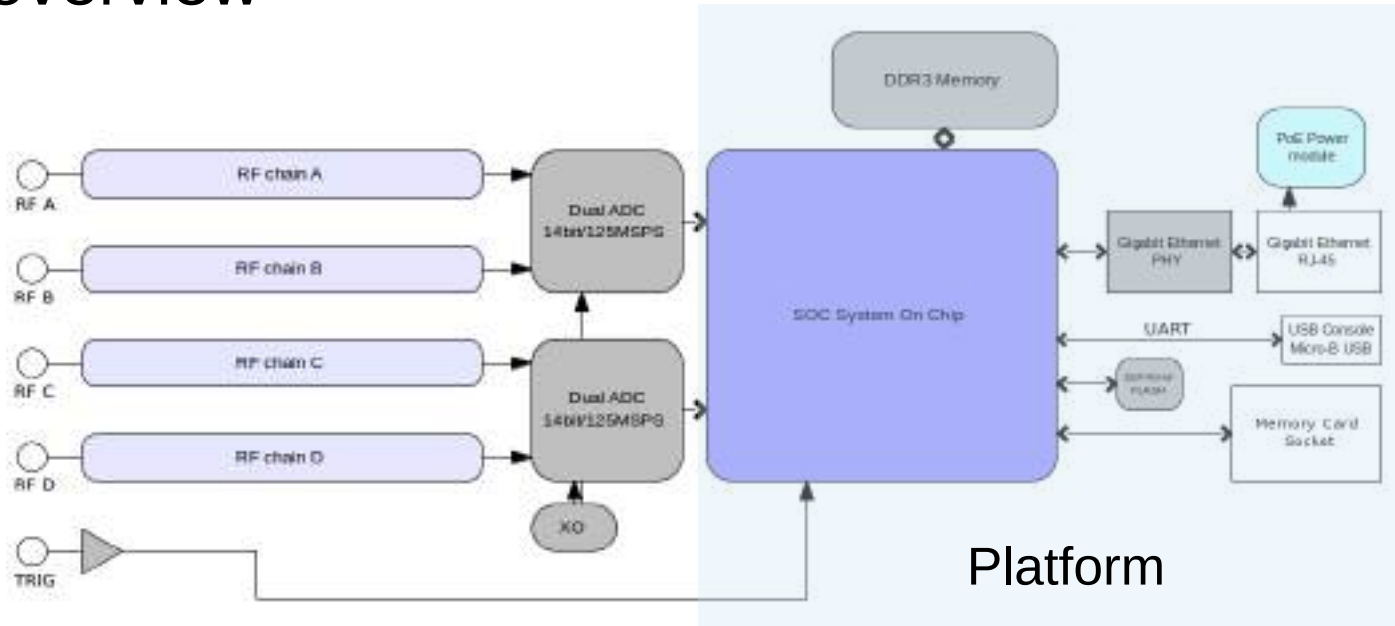
Upgrade of the SW of all units possible changing only one image

The electron BPM application

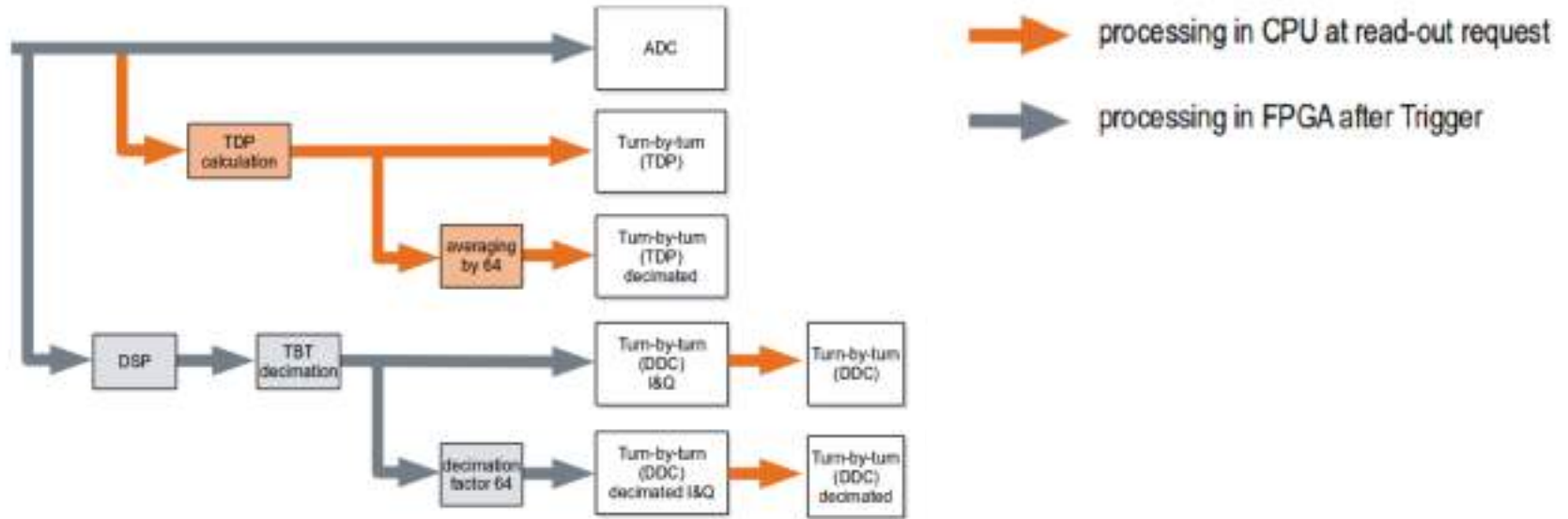
HW overview



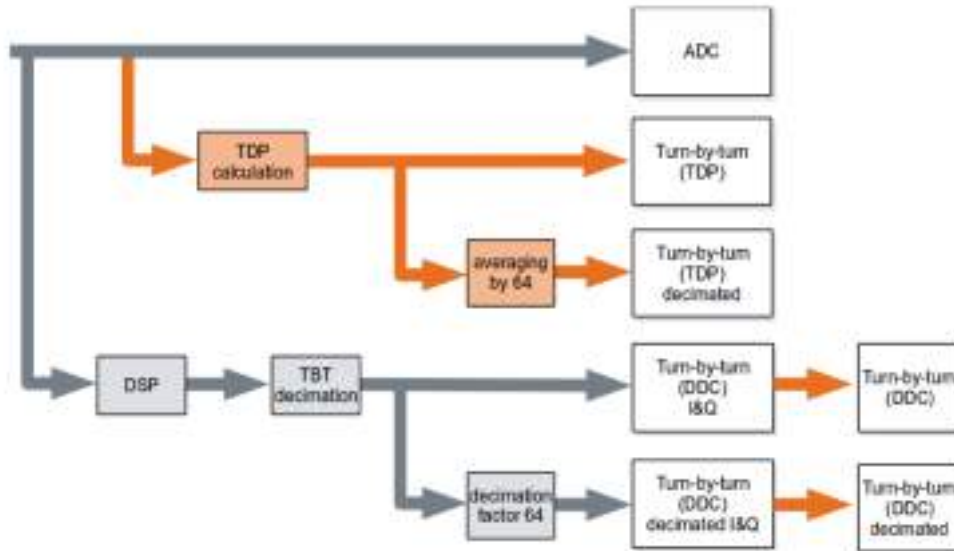
HW overview



Delivered signals



Delivered signals

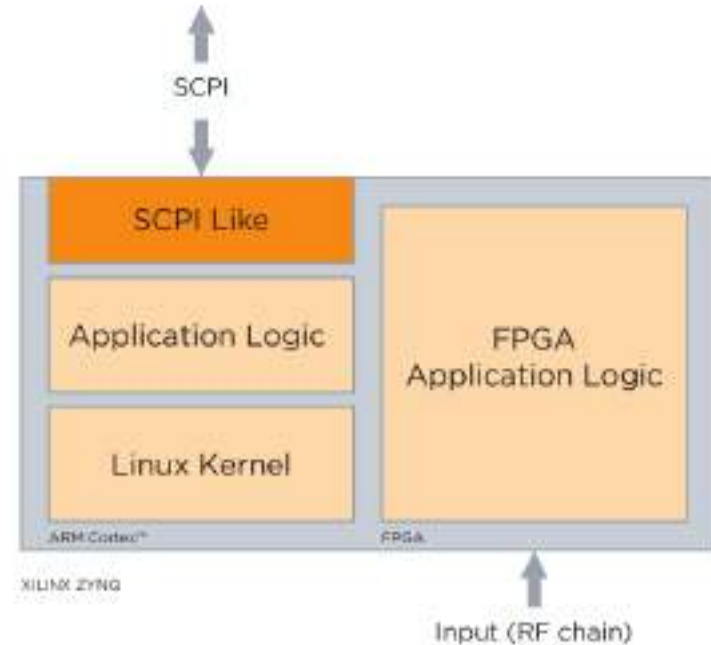


→ processing in CPU at read-out request
→ processing in FPGA after Trigger

First example on how the user can easily extend or optimize the existing functionalities

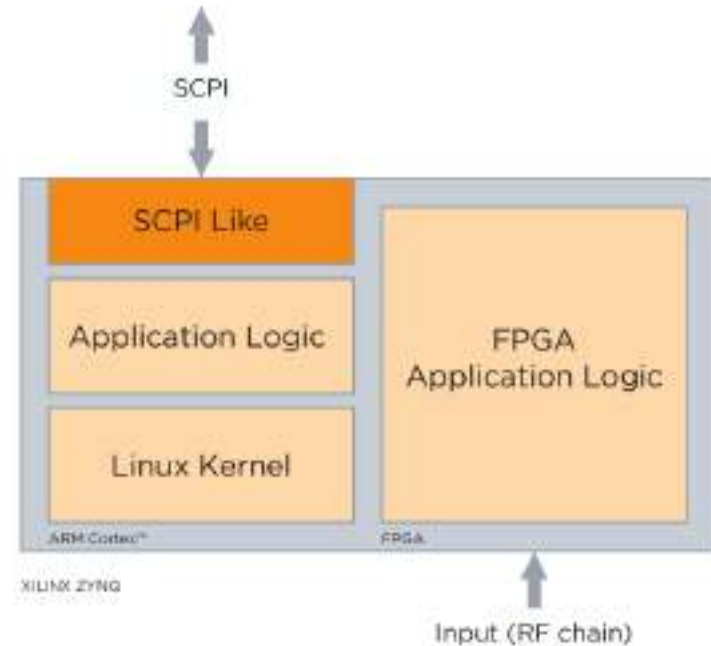
Software interface

- The SCPI-like interface enables a straightforward communication with the instrument



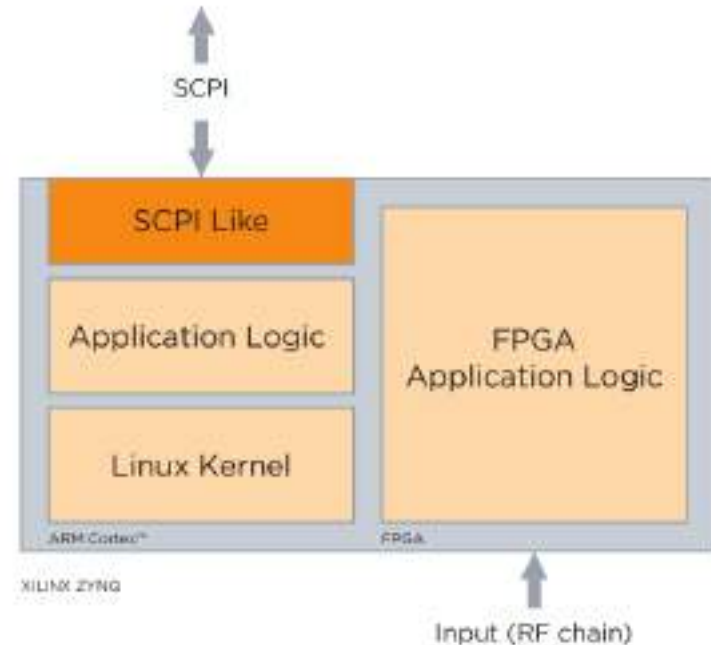
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- The interface is based on an essential set of commands (few tens)
- Possibility to support EPICS/TANGO device servers for an easy integration in the control system



Let's try it!

Conclusions

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...Provides everything needed from a simple electron BPM instrument

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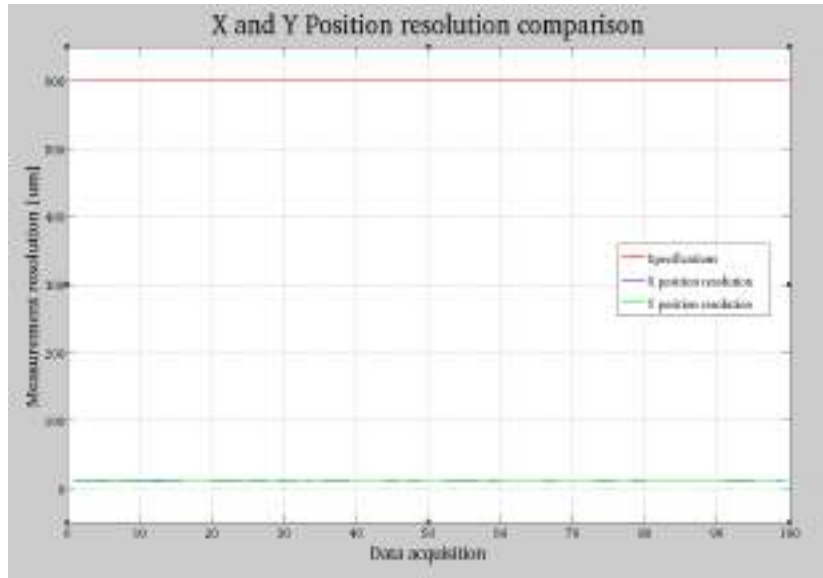
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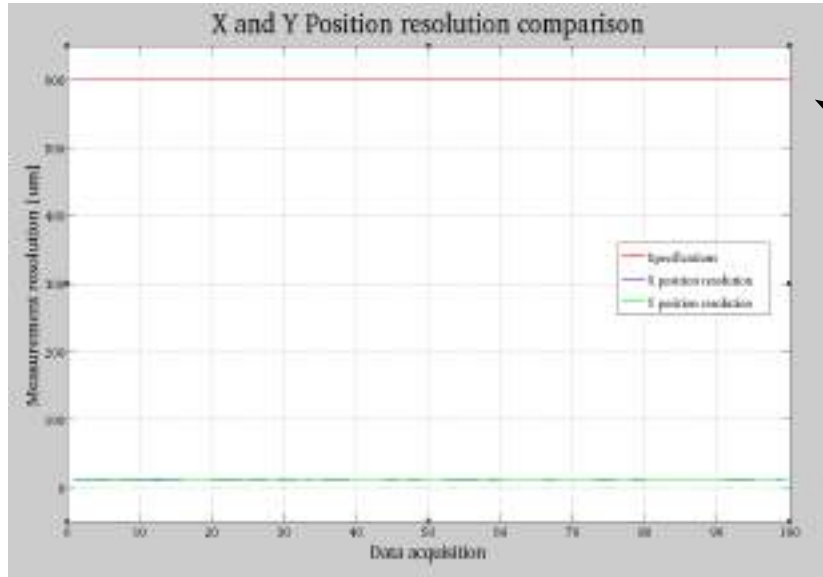
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- Low power consumption (PoE supply)
- Immediate SW interface and GUI
- Low price

...and the performance?



Let's consider X and Y signals delivered from the unit at 1Msample/s

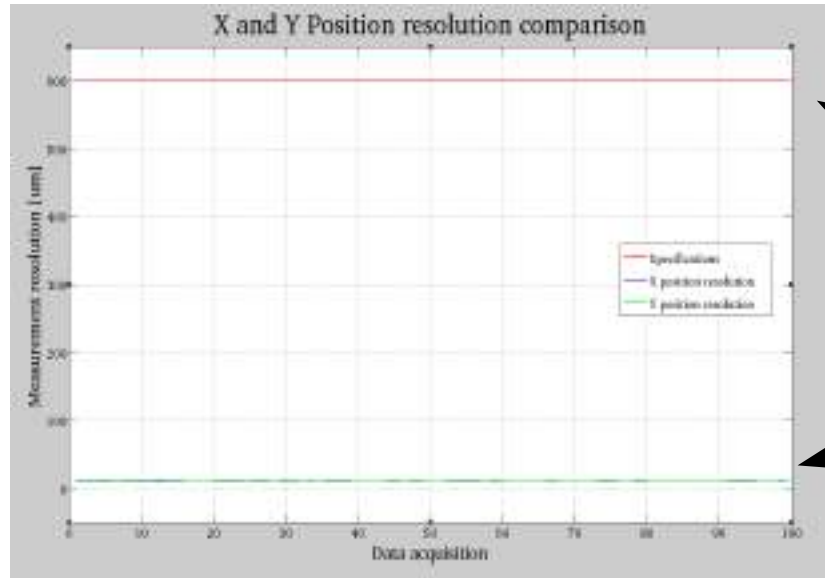
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Libera Spark has X and Y resolution below 20 µm

Thank you for your attention!

Any question?