Libera

Electron Beam Position Processors

Peter Leban, Libera Workshop, Solkan, 14 October 2010

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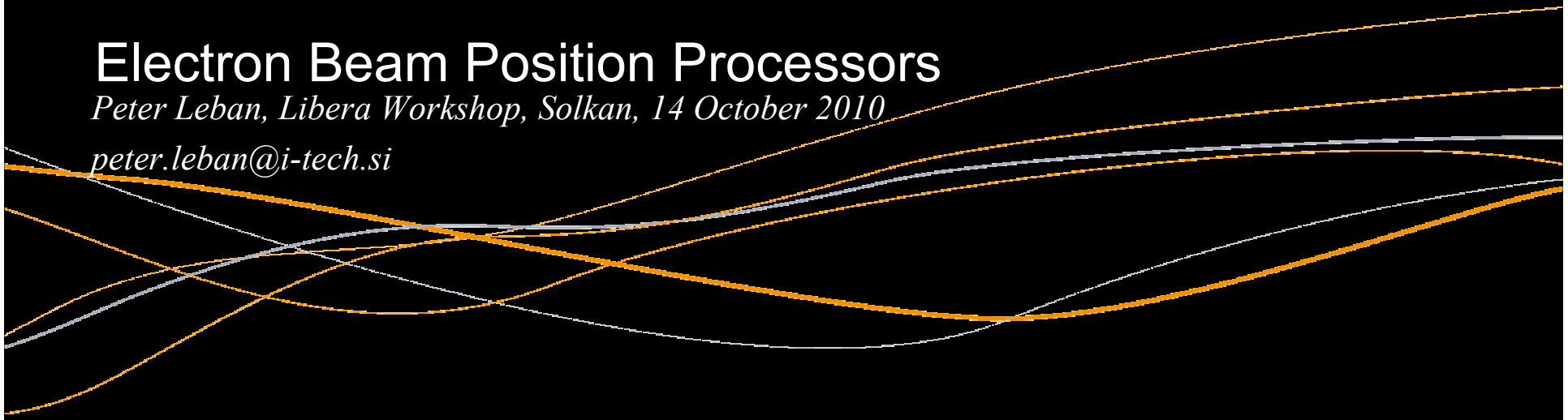

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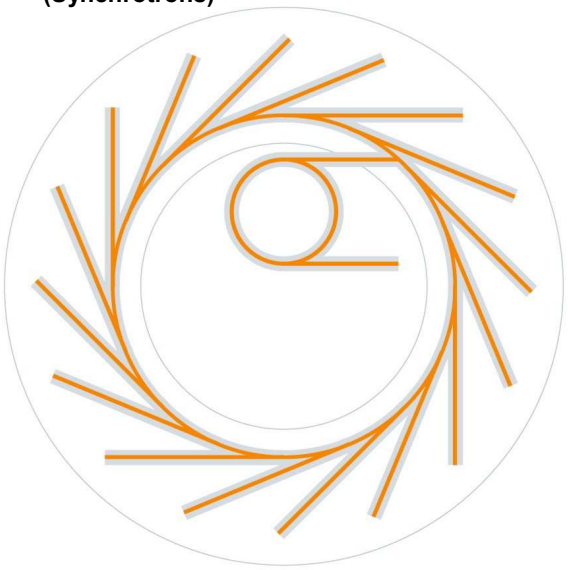
Libera

Electron Beam Position Processor – Requirements

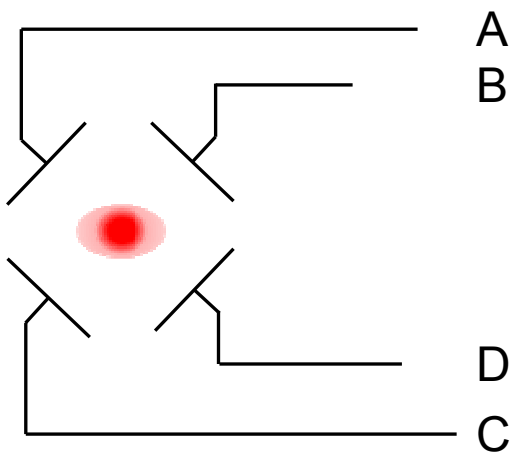
3rd Generation Light Sources (Synchrotrons)



- **High performance**
- **Parallel data paths with different bandwidths**
- **Synchronization**
- **Various connectivity alternatives**

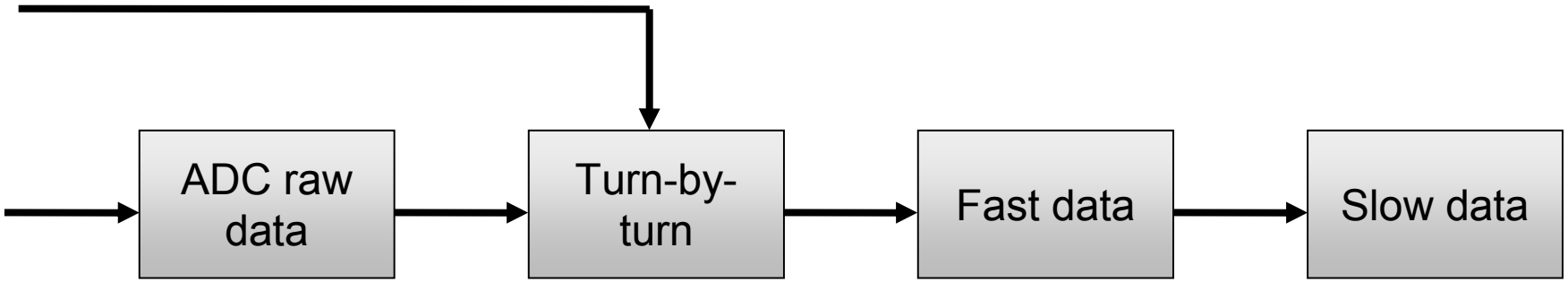
Instrumentation Technologies

High Performance



- **Digital signal processing**
- **Calibration**
- **Machine studies: ~ µm RMS**
- **Fast orbit data: 0,3 µm RMS**
- **Slow orbit monitoring: 20 nm RMS**
- **Beam current dependence: 1 µm**
- **High data throughput**

Data Paths



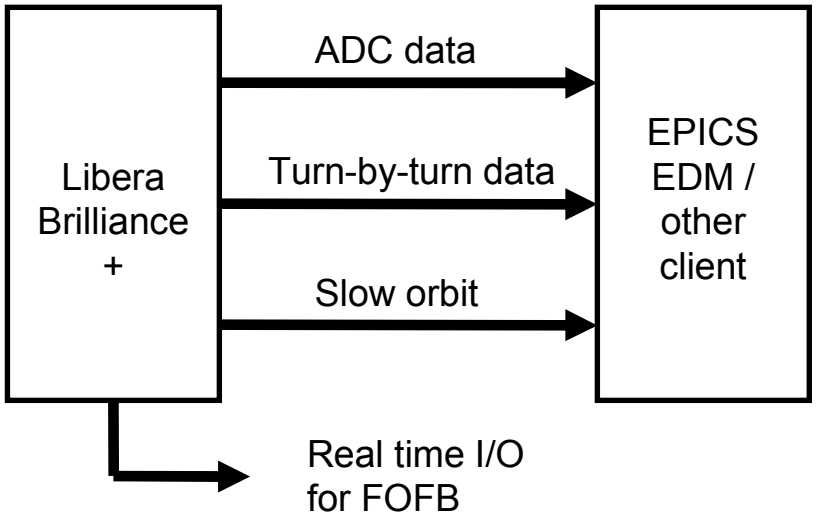
- Sampling: ~ 117 MHz
- Bandwidth: ~ 19 MHz
- Data on demand/trigger
- Raw values

- Data rate: revolution freq
- Bandwidth: ~ 35% rev.freq.
- Data on demand/trigger
- Raw and synthetic values

- Data rate: ~ 10 kHz
- Bandwidth: = 2 kHz
- Streaming data
- Position, status

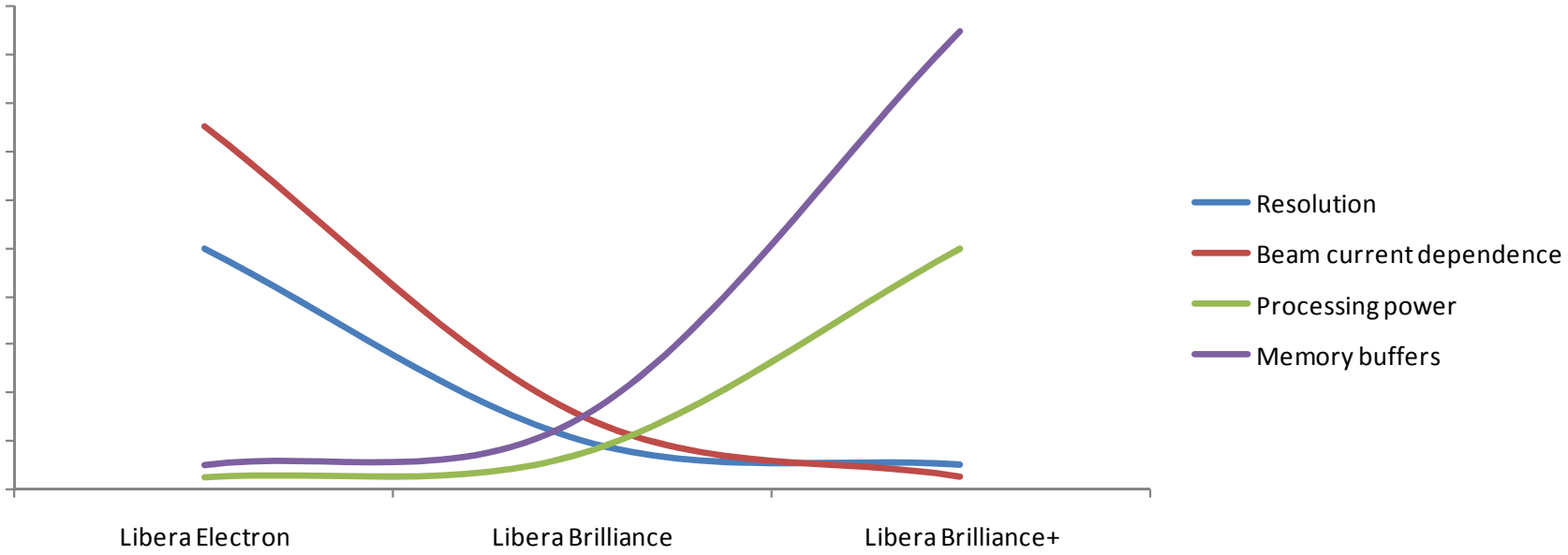
- Data rate: ~ 10 Hz
- Bandwidth: ~ 4 Hz
- Streaming data
- Position, status

Data Paths



- **Raw ADC data @ sampling rate**
- **Turn-by-turn data @ revolution freq**
- **Slow monitoring @ 10 Hz**
- **Real-time I/O data stream @ 10 kHz**

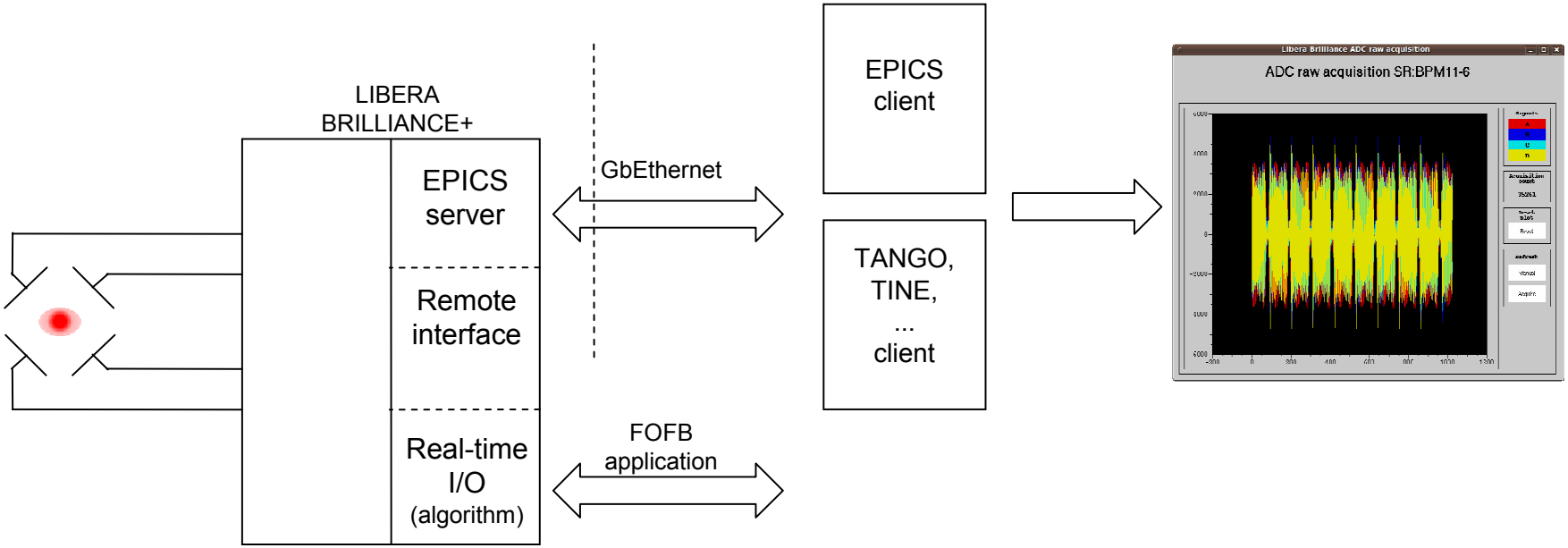
Performance and Capabilities



Libera Brilliance+

- **BPM processors modules (up to 4)**
- **Common sync and timing interfaces**
- **Real-time I/O with dedicated FPGA and memory**
- **Intel Core2Duo processor and latest Linux OS**

Software Interfaces



Fields of Use (some examples)

- **Advanced machine studies (DIAMOND Light Source)**

  Measurement of lattice parameters without visible disturbance to user beam at Diamond Light Source (Rehm G., Beam Instrumentation Workshop 2010)

- **FOFB correction calculation (Synchrotron SOLEIL)**

  Commissioning of SOLEIL fast orbit feedback system (Hubert N. et al, EPAC 2008)

- **Beam life-time measurement (ESRF)**

  Beam lifetime measurements with Libera Brilliance (Scheidt K.B., Beam Instrumentation Technologies 2010)

- **Performance comparison between different BPM systems**

  Comparative studies of RF beam position monitor technologies for NSLS-II (Singh O., Decker G. et al, DIPAC 2009)

Software Release 2.20 (announced)

Statistics calculation (mean, RMS) on SA and DD data

Reduces the data transfer and provides instant overview

Monitoring DSC coefficients

The amplitude coefficients for currently active Level are displayed

ADC underflow detection

Interlock is masked until the signal is above the certain value

Beam life-time calculation based on SA SUM decay

Continuous calculation on the latest SA SUM data (moving window)

SA data stream counter

Incremental counter on SA data stream is reset at synchronization procedure

Graphical User Interface

Graphical windows, supporting latest Libera Brilliance features. EPICS EDM.

Libera Services

Installation and commissioning of Libera instruments

Connecting and health checking

Setting up, installation of software

EPICS EDM panels for Control System integration

Customized panels, based on users' request

Premium support

Priority support, on-site support, remote access support

One-to-one training

Specific topics in individual training

Fast orbit feedback installation & assistance

Installation and cabling, configuration files, customized software receiver

Conclusion

Libera Electron
(Diamond, Soleil, Elettra, SSRF, Australian Synchrotron,,...)

Libera Brilliance
(ESRF, Petra-III, TLS, PLS, ALBA, SSRF...)

Libera Brilliance+
(Available Dec 2010)

Choose the one that meets your needs!