

Picosecond Sampling Electronics for Terahertz Synchrotron Radiation

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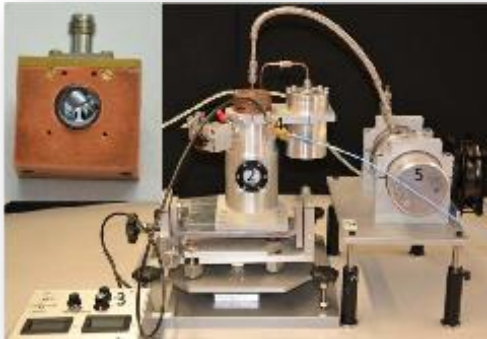


KAPTURE SYSTEM

Terahertz Detectors with picosecond time resolution

To detect and study of the emission characteristics of CSR in the THz range several detectors system have been developed.

Cryogenic YBCO detector



response time: down to 1 ps

Cryogenic HEB detector

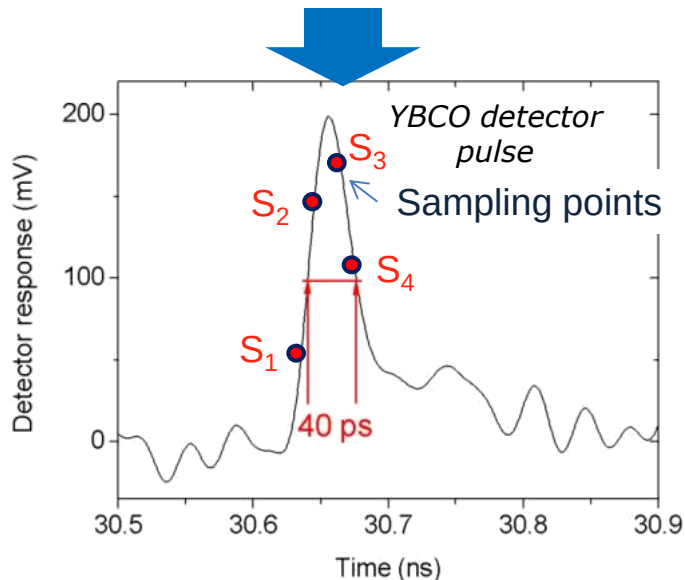


response time < 160 ps

Room temperature zero-bias Schottky diode

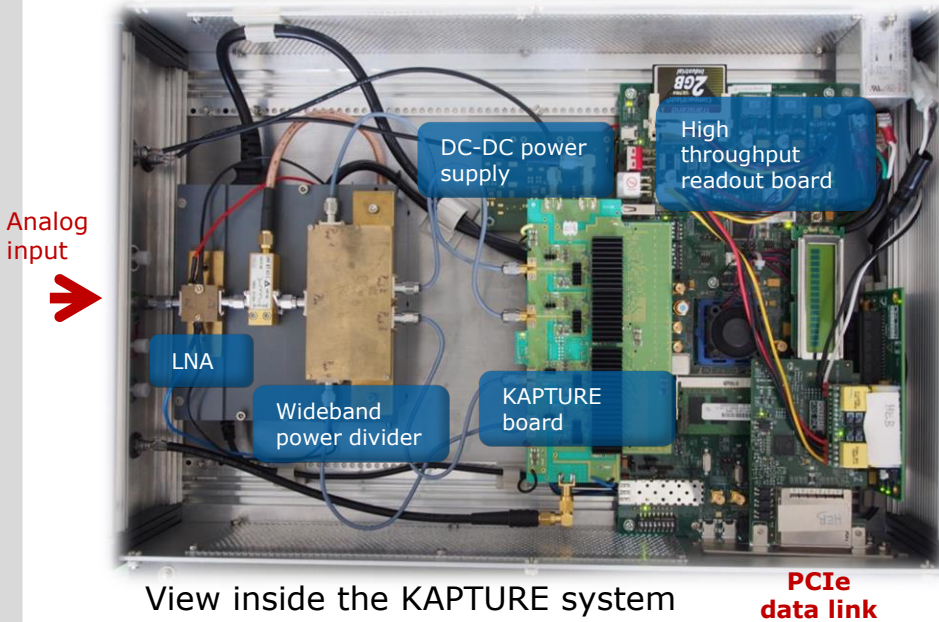


response time < 100 ps



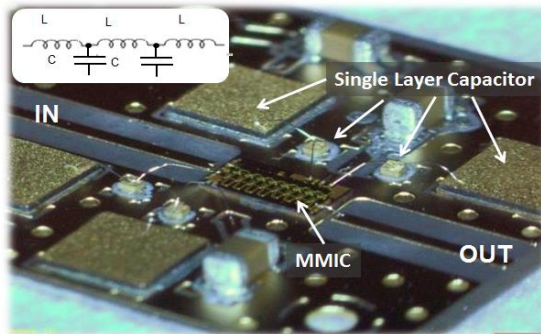
KAPTURE - basic concept:

- 1. Sampling:** each pulse with 4 samples
- 2. Data transfer:** digital samples transferred to high-end GPU (Graphics Processing Units) by a PCIe-DMA architecture
- 3. Real-time GPU data elaboration:** pulses reconstruct, and on-line data analysis

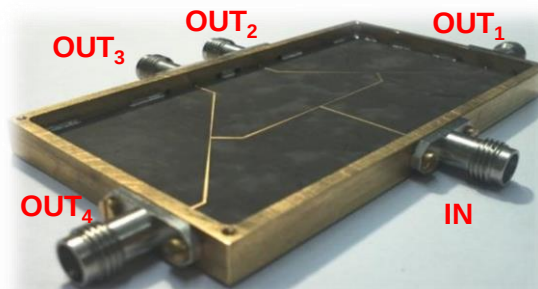


KAPTURE - performance

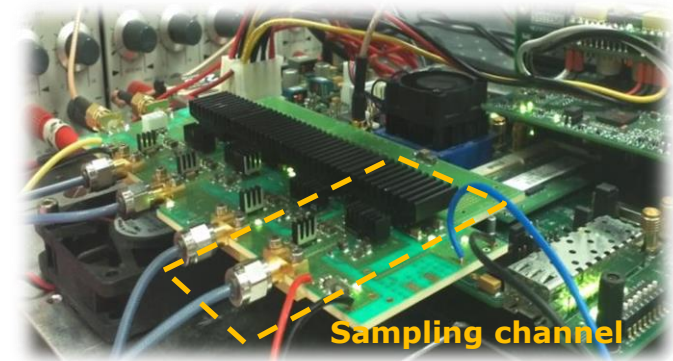
1. Minimum sampling time: **3 psec** => equivalent time sampling > 300 GS/s
2. Low noise design: time jitter RMS < **1.7 psec**
3. Analog bandwidth: **DC- 50 GHz**



Wideband Low Noise Amplifier
(DC – 50 GHz)

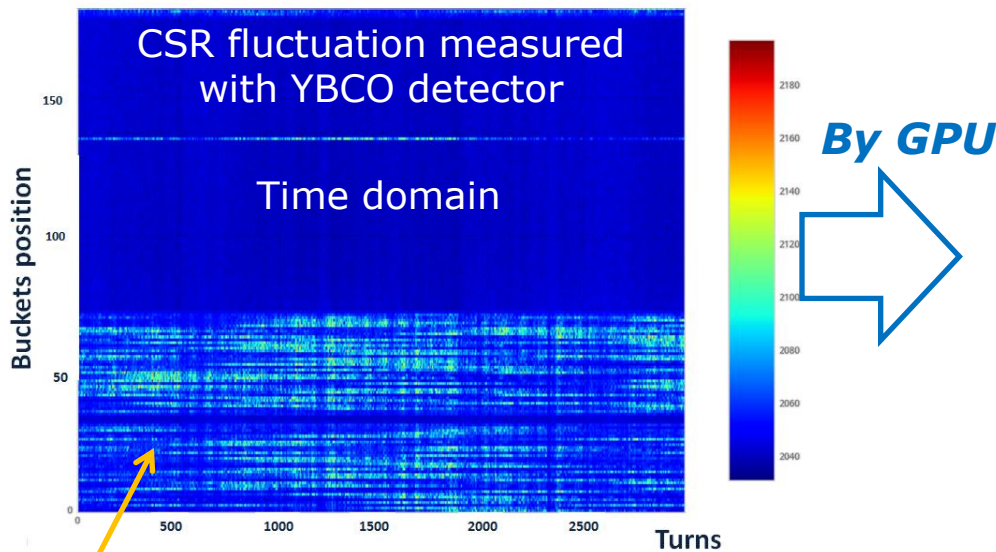


Power divider 1:4 outputs
(DC – 60 GHz)



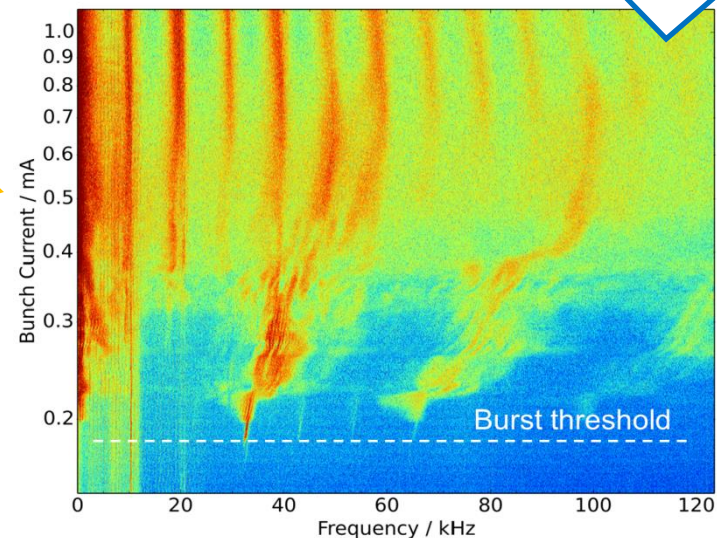
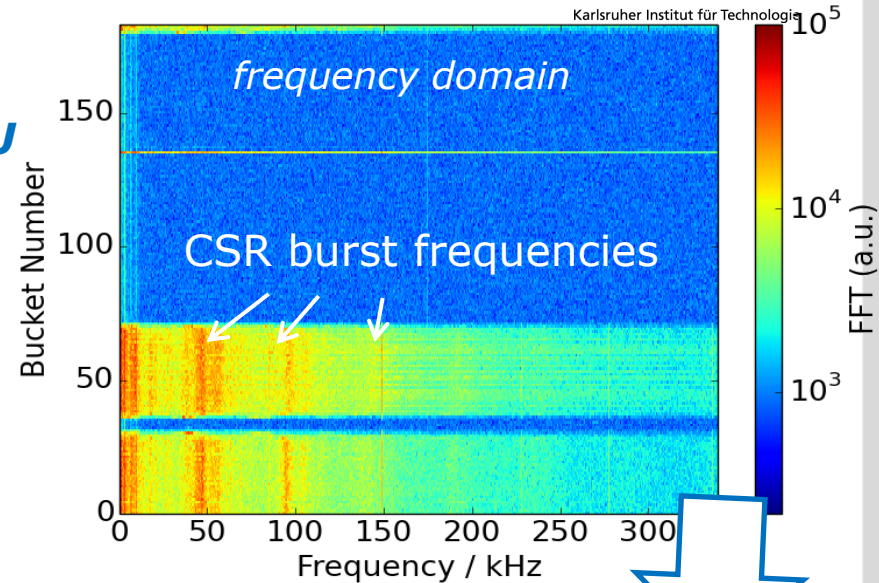
KAPTURE picosecond sampling board

Results: ANKA beam characteristics



Simultaneous monitoring of all 184 buckets, resolving single bunch fluctuation in a multi-bunch filling scheme.

Spectrogram of a single bucket at different bunch currents.
(available for each bucket number)



Conclusion

KAPTURE system opens up new analysis and diagnostics possibilities for electron storage rings operating at short bunch lengths.