Implementation of an FPGA-based DAQ and Processing system for Neutron-Diagnostics using NDS, OpenCL and MTCA

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HIGHLIGHTS

- Neutron flux measurement is a good use case to test the implementation of hardware in FPGA using OpenCL-based tools. The algorithm is well-known, and benefits from high sampling rate devices.
- A database of pulses is created, generating the waveforms either by a signal generator or using the DAC in the FMC module. The acquired signal by ADC in FMC module are processed in an IntelFPGA Arria10 FPGA.
- With the FPGA, the algorithm is divided into Kernels, which are synthesized to be executed in parallel.
- The solution is implemented using MTCA.4 standard platform

METHOD

The methodology to is described in contribution ID 490. Thursday session at 9.00! And poster in the afternoon!

HARDWARE

MTCA chassis with a carrier hub, which provides an **optical PCIe interface**. The processing device is the N.A.T (AMC) module **NAMC-Arria10-FMC** board. This board consists of an **IntelFPGA ARRIA10** and includes an FMC (FPGA Mezzanine Card) connector where the **AD-DAQ2FMC-EBZ modu**le providing two **1GS/s ADC channels** together with two **1GS/s DAC channels.**
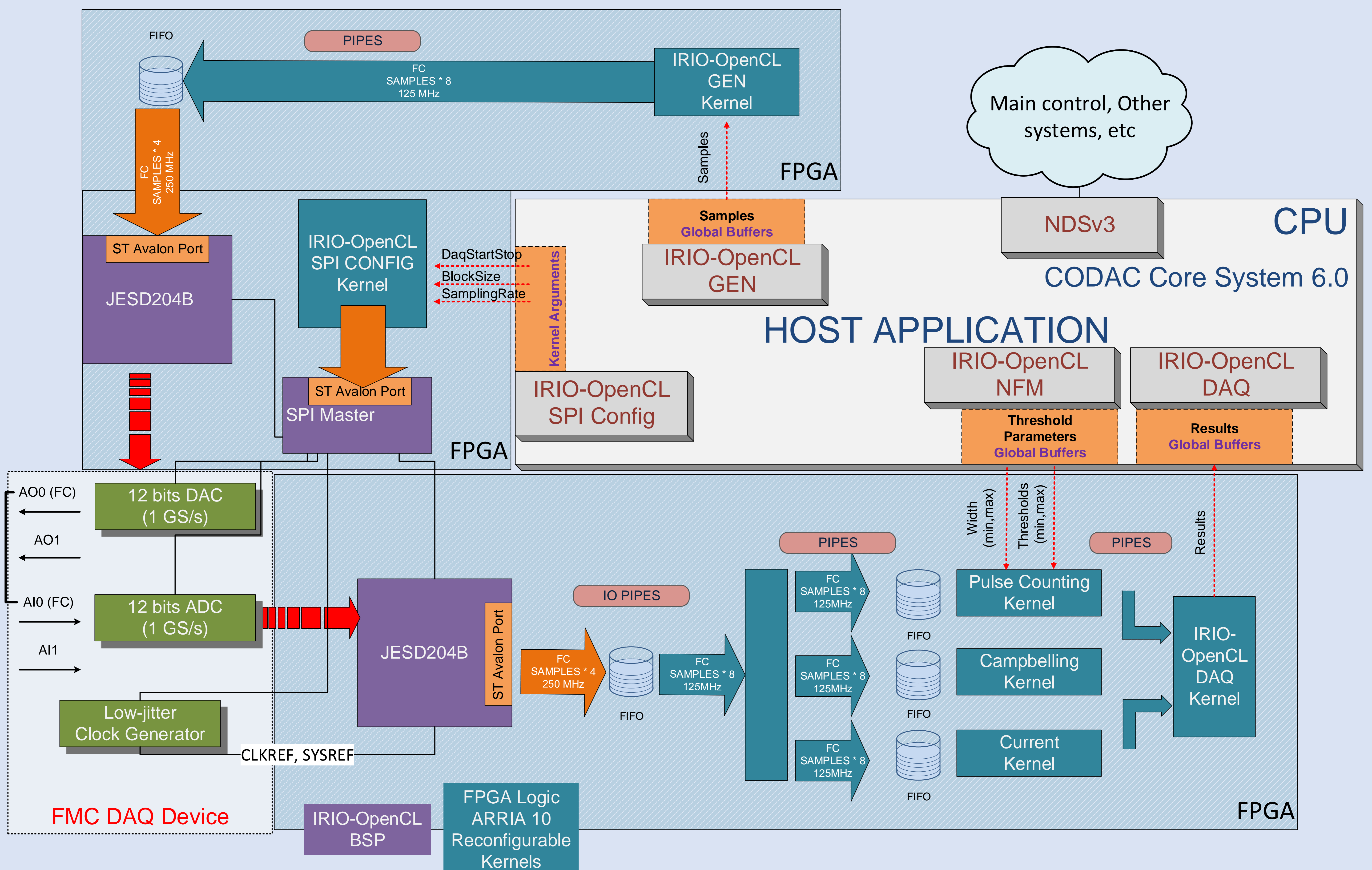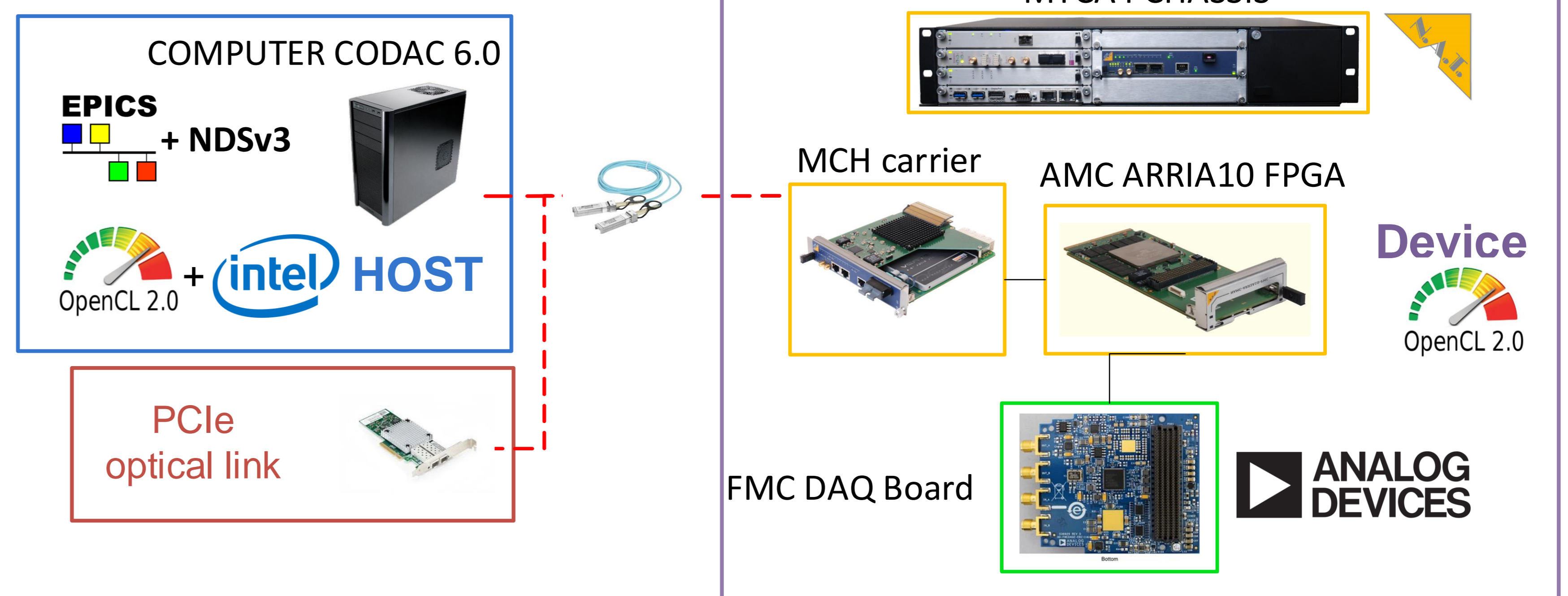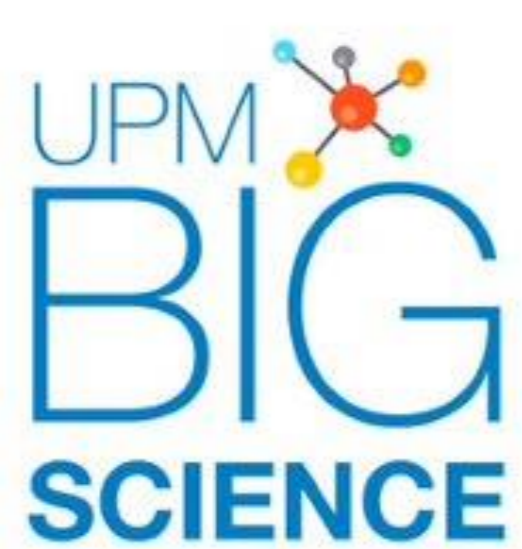

ACKNOWLEDGEMENTS

CONCLUSION

- The Intel OpenCL compiler generates an efficient pipeline to process data at very high throughput. HW is described using OpenCL language.
- FPGA resource utilization with all the IRIO-OpenCL functionality is less than 50%.
- The hardware is managed using NDSv3 allowing an easy connection to EPICS.
- The complete platform is integrated in ITER CODAC Core System.