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# European XFEL Detector and DAQ related hardware and firmware developments

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The European X-Ray Free-Electron Laser facility (European XFEL) will generate intense ultra short coherent X-Ray flashes spaced by 220 ns and each with a width of less than 100 femtoseconds. They are group into trains of up to 2700 pulses within 600 us with a 10 Hz repetition rate. Bandwidths of 10 GBytes of data per second are expected from upcoming 2D pixel detectors, while other detector types, like systems based on fast digitizing analog-to-digital converters, can go up to 60 MBytes per channel.

To meet these requirements, the European XFEL Advance Electronics group is developing, in-house or in collaboration with external institutes, solutions within the MicroTCA.4 and AdvancedTCA standard. Advances are being made in a wide range of fields including guidelines for FPGA development, assemble and process of data from large-area 2D image detectors, fast digitizing of pulse signals with algorithms for peak and energy detection, low latency communication protocol for VETO systems, to a high-level FPGA programming framework for users unfamiliar with HDL.

In this contribution, a summary of all developments that have been taken place in the European XFEL is presented together with the future steps and objectives.

## Summary

The presentation will give an overview of all FPGA hardware/firmware related developments in the European XFEL Advance Electronics group. This covers custom ATCA boards, special developed modules, for signal processing, low latency communication and precise trigger measurement, implemented in HDL and in the XFEL's high level FPGA framework (based on Simulink/Matlab software) and guidelines for Hardware API. Future developments and other platforms/boards currently being considered will also be discuss.

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