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MTCA.4 Usage in Longitudinal Electron Beam Diagnostics at the European XFEL

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For diagnosing specific longitudinal properties of the ultra-relativistic electron bunches several monitor systems have been implemented at the European XFEL. Various measurement principles are utilised to monitor bunch properties like arrival time and bunch length detected from electro-magnetic field effects in a frequency range of several 10GHz up to THz, partly using electro-optical techniques and spectral detection.
Equally diverse is the range of the utilised MTCA.4 boards which fulfill applications like FPGA implemented fast control loops for laser synchronisation, stepper motor control, control of high-voltage piezo driven delay lines, direct sampling on ADCs with up to 250MSps rate and 800MHz analogue bandwidth, up to 6Gbps optical data links via SFP+, and data readout from a linear array detector with up to 2.7Mfps frame rate. The according MTCA.4 boards for three different specialised diagnostic devices are combined in one common 12-slot crate. Here, we present first results and experience from operation of these systems at the European XFEL.

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