

# Conceptual Design of the Multi-Bunch Feedback for the Synchrotron Radiation Source PETRA IV based on the Xilinx Zynq UltraScale+ RFSoc

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PETRA IV will be a new, fourth-generation, high-brilliance synchrotron radiation source in the hard X-ray range. To keep the emittance low at high beam current an active feedback system to damp transverse multi-bunch instabilities is required. The particular challenge to the system is the very low-noise, while maintaining high bandwidth, which is defined by the 2 ns bunch spacing.

We present the conceptual design of the transverse multi-bunch feedback (T-MBFB) system. An overview is given on the hardware, which is based on the MicroTCA.4 standard. Using high-speed Zynq UltraScale+ RFSoc RF data converter enables direct sampling of pulses from beam pick-ups, which removes the necessity for down-converters. Powerful digital signal processing in the FPGA allows not only for the effective feedback implementation, but also for developing versatile tools for the machine diagnostics.

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