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Conceptual Design of the Transverse Multi-Bunch Feedback for the Synchrotron Radiation Source PIV

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 and technical challenges to fulfill the performance requirements. An overview is given on the hardware and the method for detecting and damping the coupled-bunch oscillations. Using modern high-speed ADCs enables direct sampling of pulses from beam pick-ups, which removes the necessity for down-converters. Powerful digital signal processing allows not only for the effective feedback implementation, but also for developing versatile tools for the machine diagnostics.

Summary

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