

An Ultrafast Linear Array Detector for Single-Shot Electro-Optical Bunch Profile Measurements

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Initial Motivation

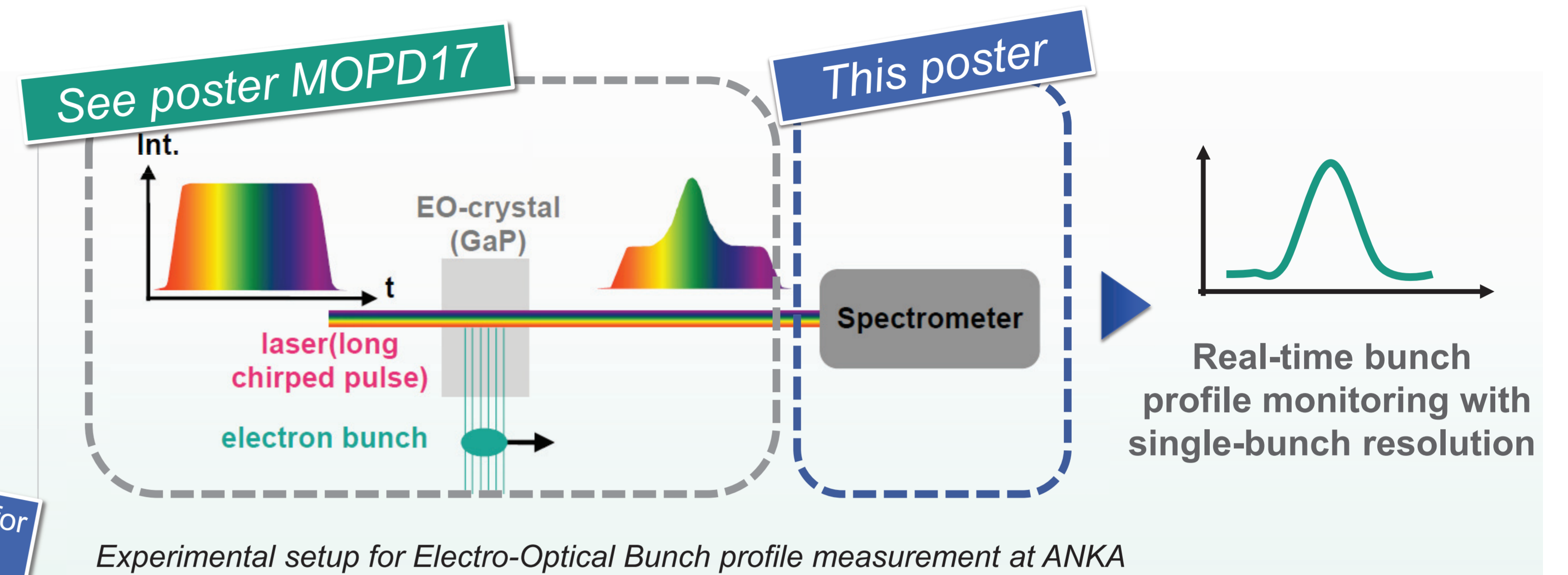
The acquisition rate of the commercial InGaAs line arrays is limited to the low kHz range. It is not possible to monitor fast dynamic changes of the longitudinal bunch profile. **For this reason a fast spectrometer is being designed at KIT with a minimum frame-rate of 5 Mfps.**

Requirements:

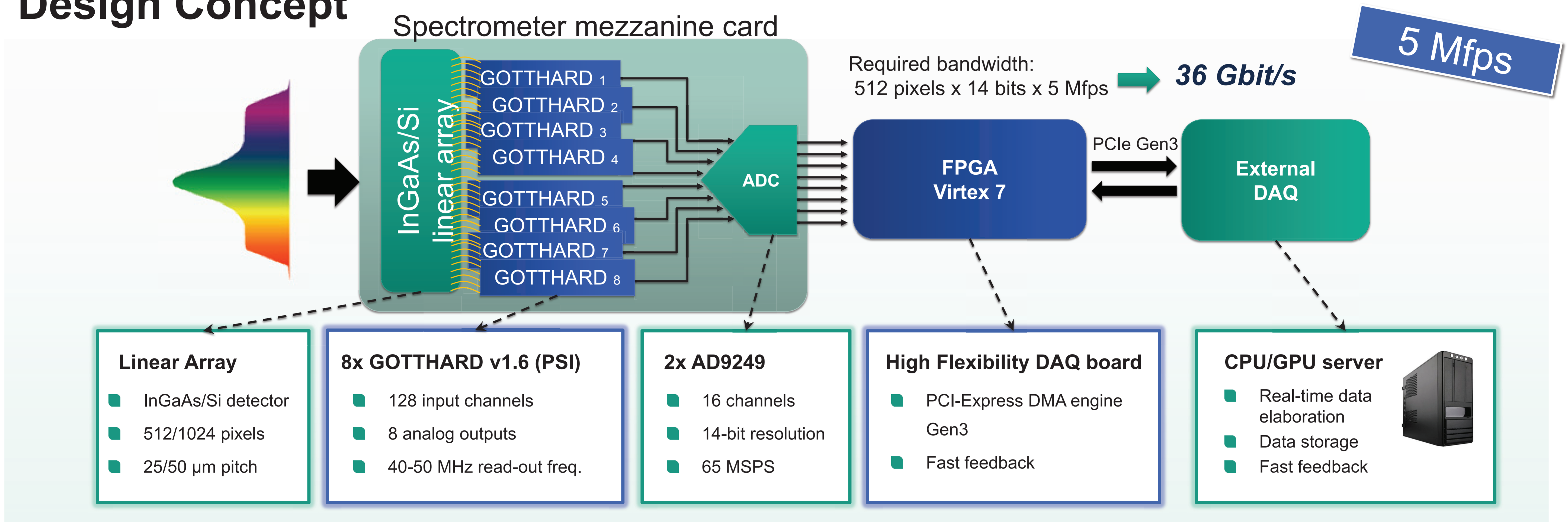
- Continuous data acquisition over long observation periods
- High-throughput for real-time data analysis
- InGaAs and Si linear array detector

A Si version foreseen for SRM

Synchrotron facilities: ANKA, XFEL, ELBE

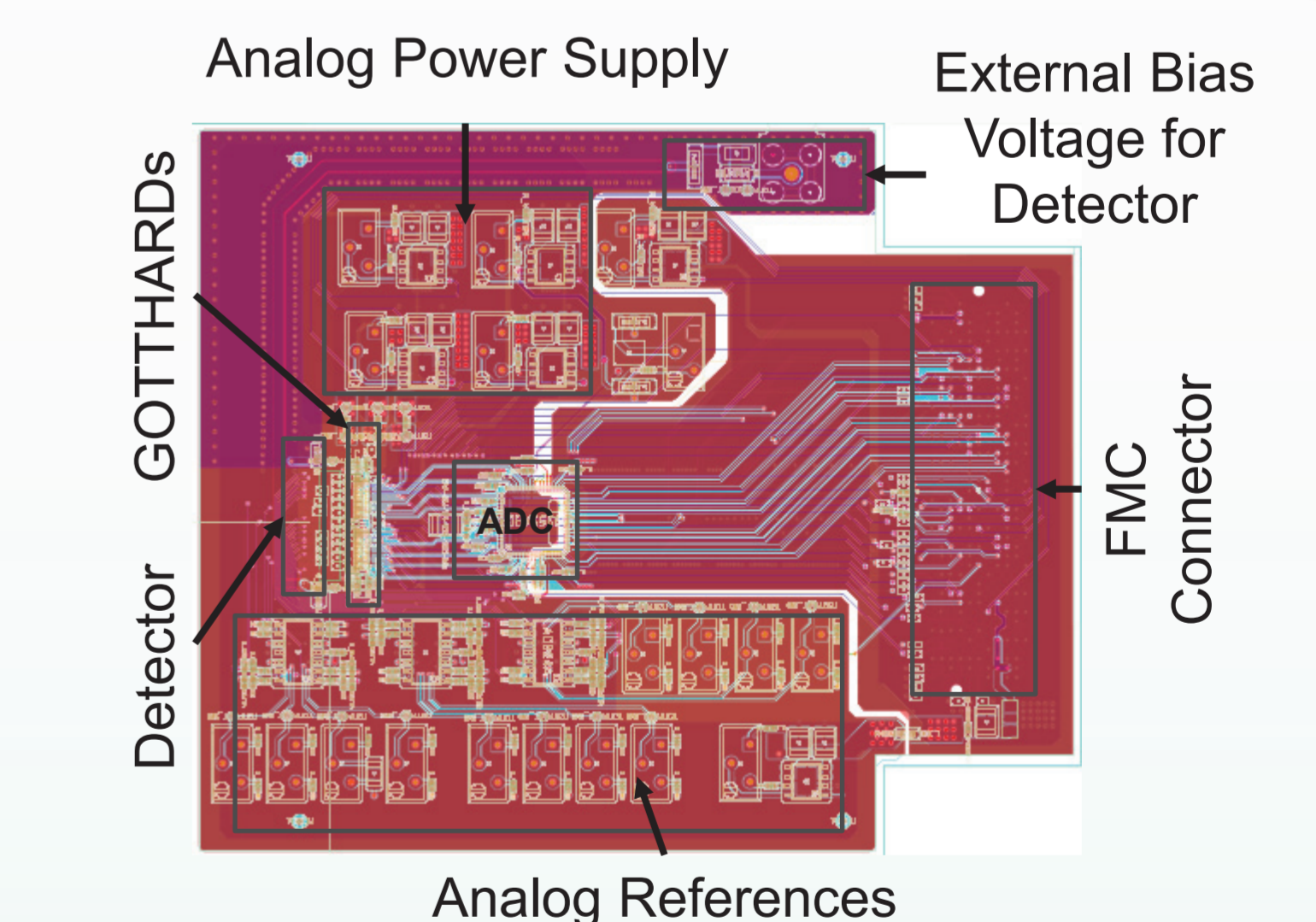
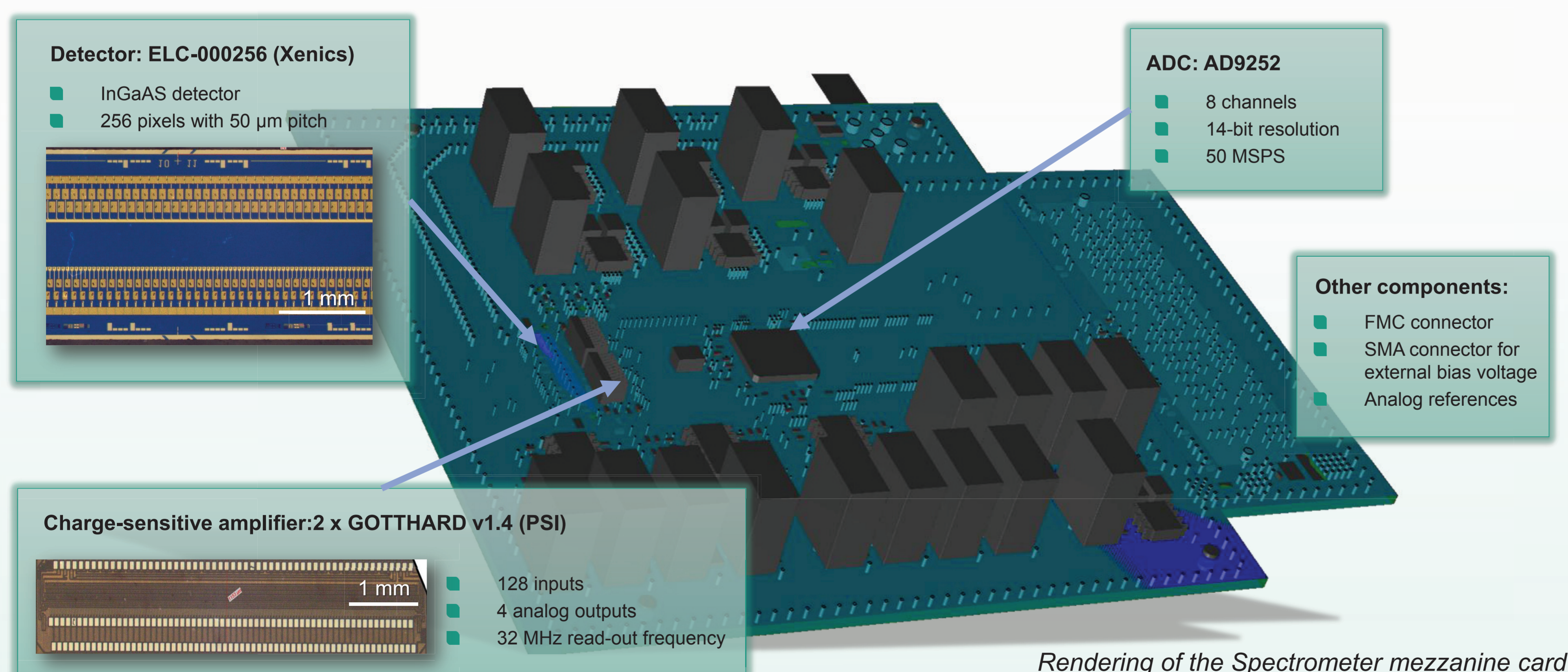


Design Concept



First prototype of the Spectrometer mezzanine card

A first prototype of the spectrometer mezzanine card with a target frame rate of 1 Mfps is being developed to study the most critical aspects of the system.



Several low-noise layout design practices have been used in order to achieve the best noise performance and reduce electromagnetic interference (EMI): separated analog and digital grounds, via guard fences, impedance-controlled transmission lines, etc.

Acknowledgments

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Outlook

The board will be integrated in the novel EO setup currently under development at ANKA. The new spectrometer is fundamental for a better understanding of the fast dynamic changes of the bunch conditions for ANKA, XFEL and ELBE.