



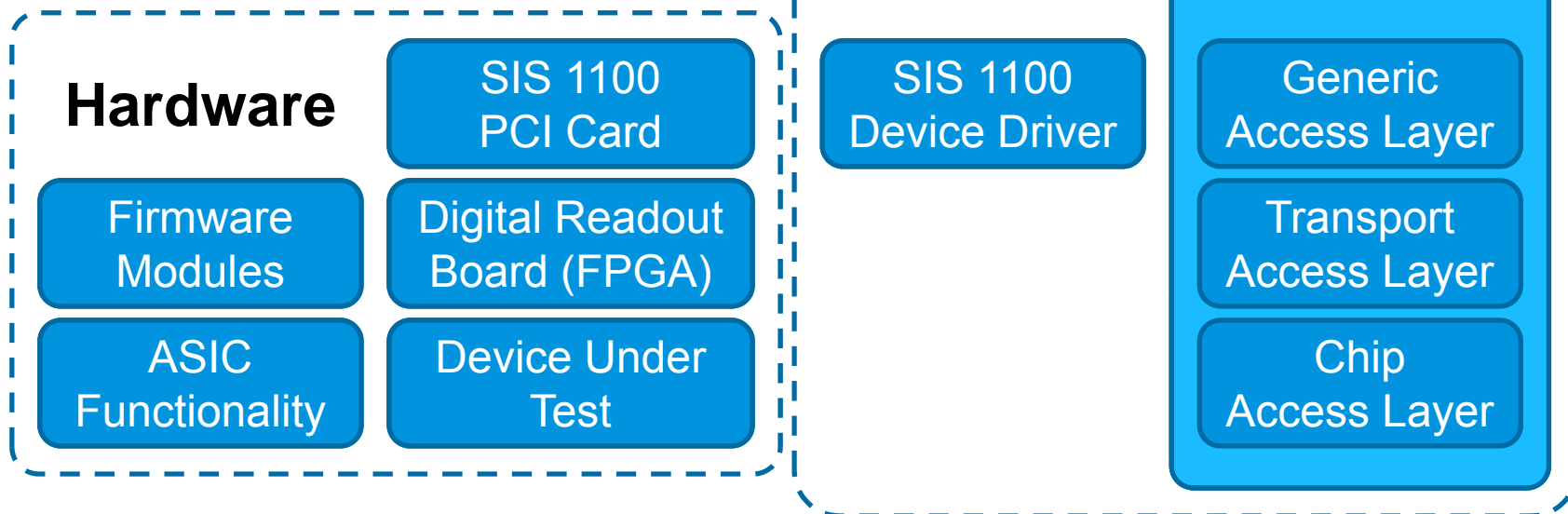
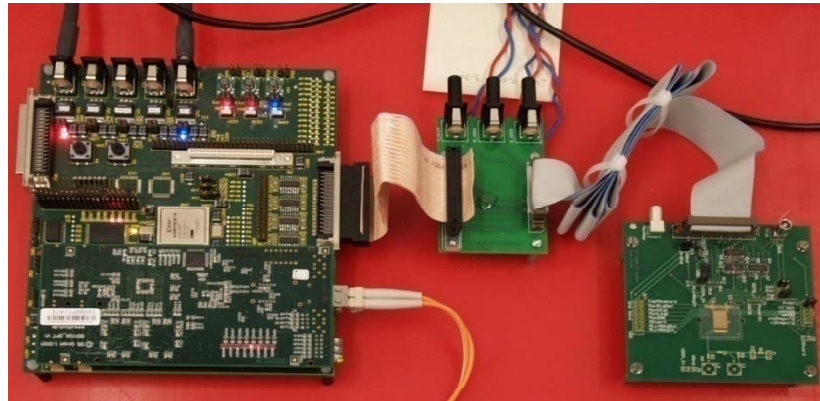
Digital Readout System

Torino, 16.6.2009 Marius C. Mertens

Outline

- **Digital Readout System** Overview
 - *Hardware Components*
 - *Software Framework*
- **Atlas FE-I3** Readout Results
 - *Silicon Pixel Detector Characterization*
 - *Performance Testing*
- **ToPiX** Connection Status
- Digital Readout System **Setup at Dresden**
- Summary

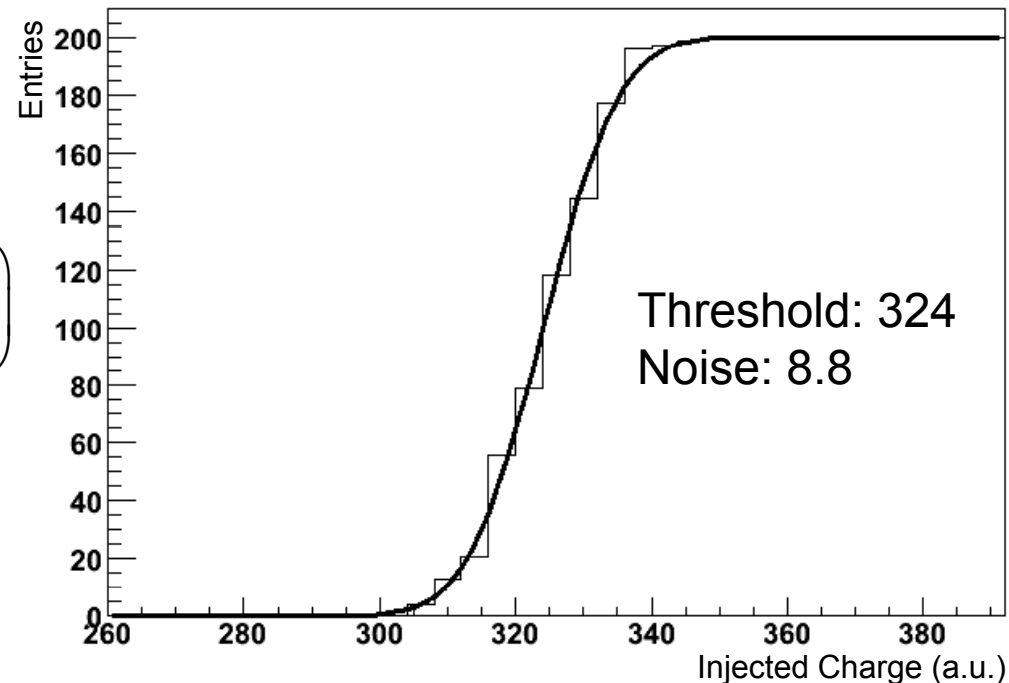
Digital Readout System Overview



Silicon Pixel Detector Characterization

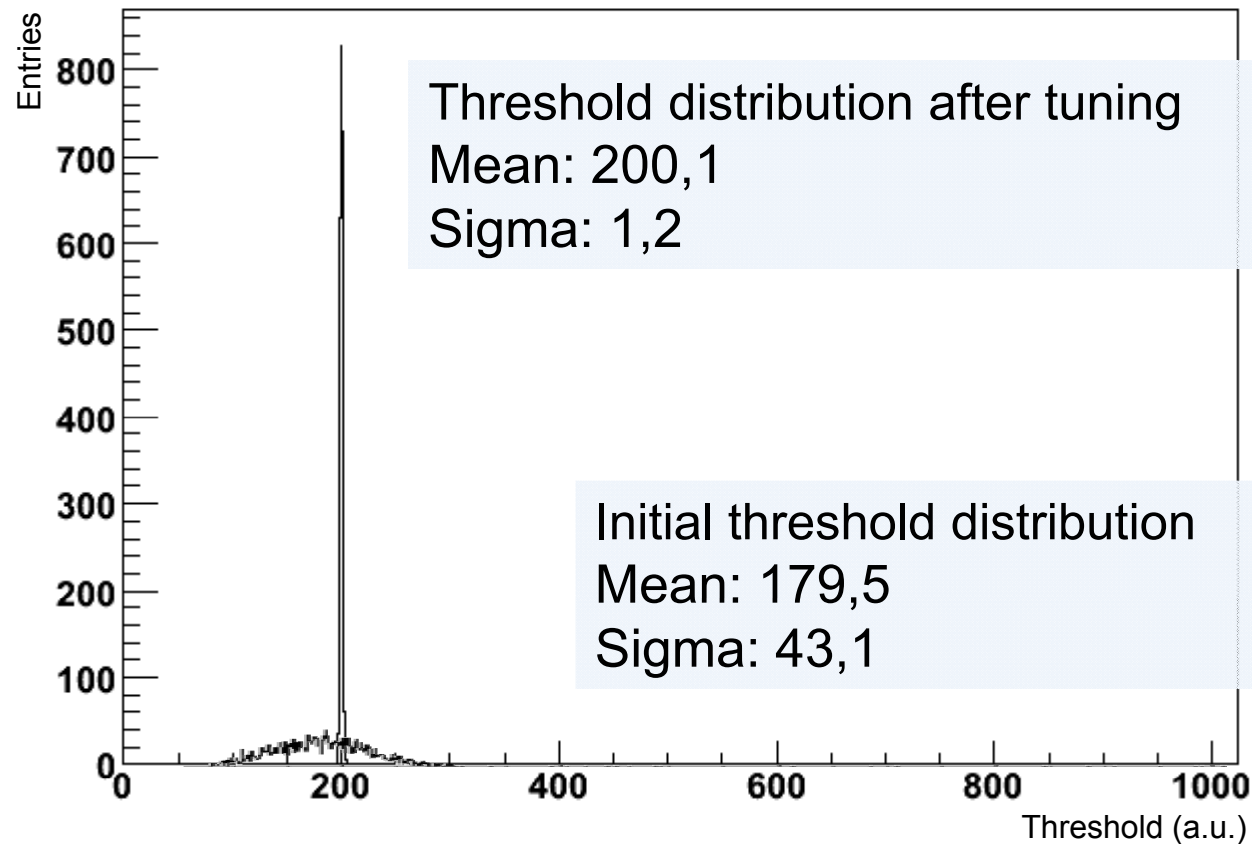
- **Noise σ** and **Threshold μ**
- Characteristics determination → **Threshold scan**
 - *Repeated injection of a set of known charges*
 - *Record response % as function of injected charge*

$$f(x) = \frac{A}{2} \cdot \left(1 + \operatorname{erfc} \left(\frac{x - \mu}{\sigma \cdot \sqrt{2}} \right) \right)$$

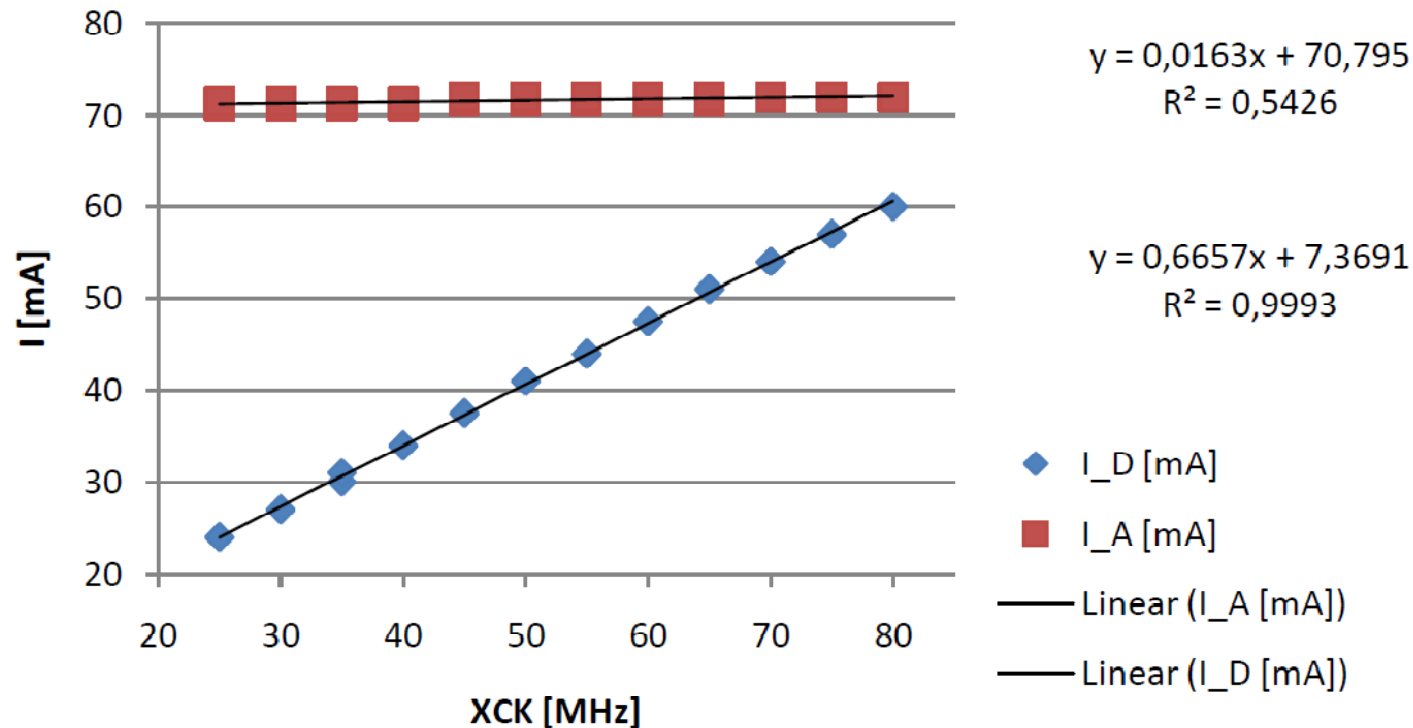


FE-I3 Threshold Distribution (Before and After Tuning)

- Determination of each individual pixel's threshold before and after tuning

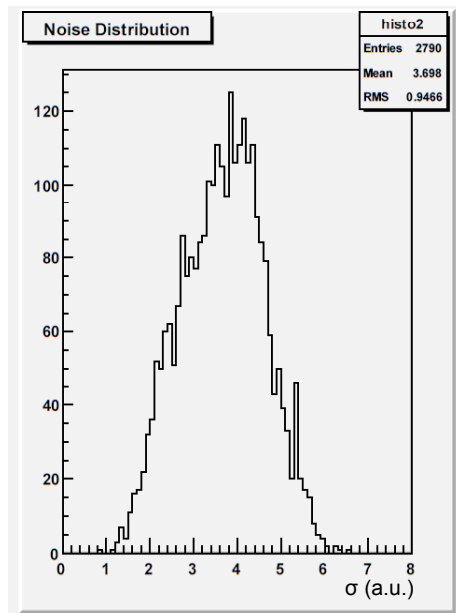


Atlas FE-I3 Power Consumption

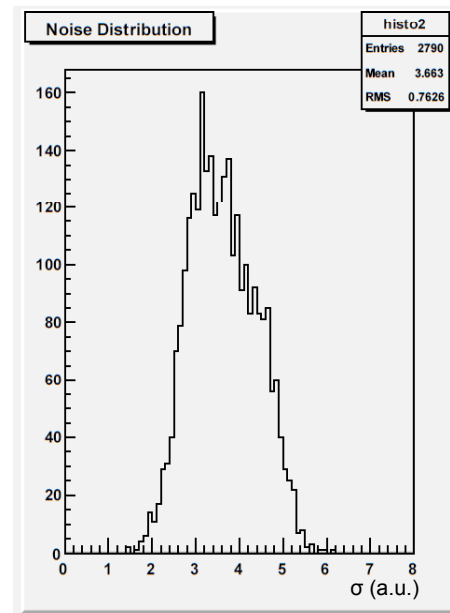


- Measurement of FE **power consumption** at different clock speeds
- Digital readout system allows **on-the-fly change** of core clock speed

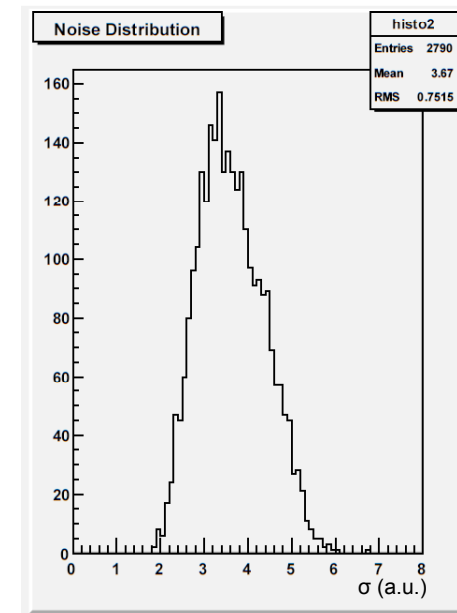
Atlas FE-I3 Pixel Noise Distribution



40 MHz



60 MHz



80 MHz

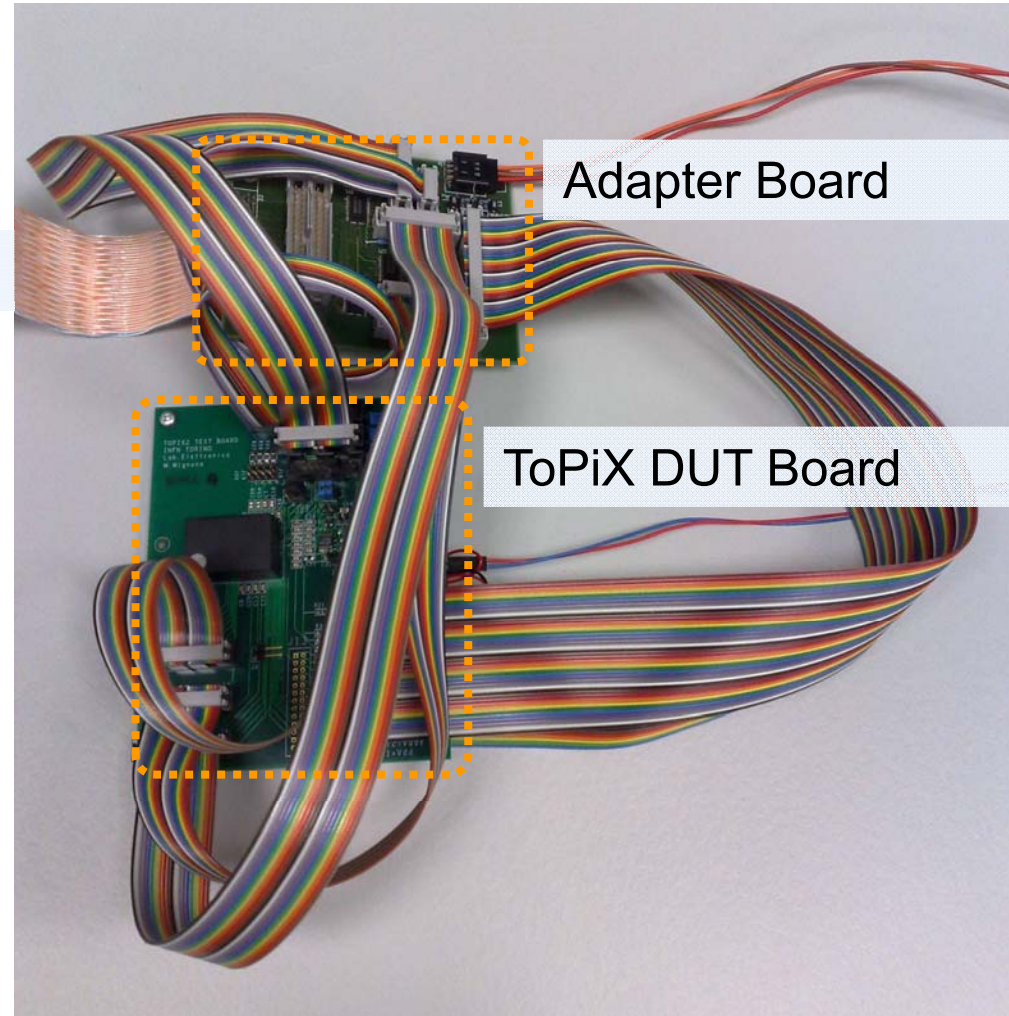
Noise measurement:

- Very low influence of clock speed on pixel noise

ToPiX Connection Status

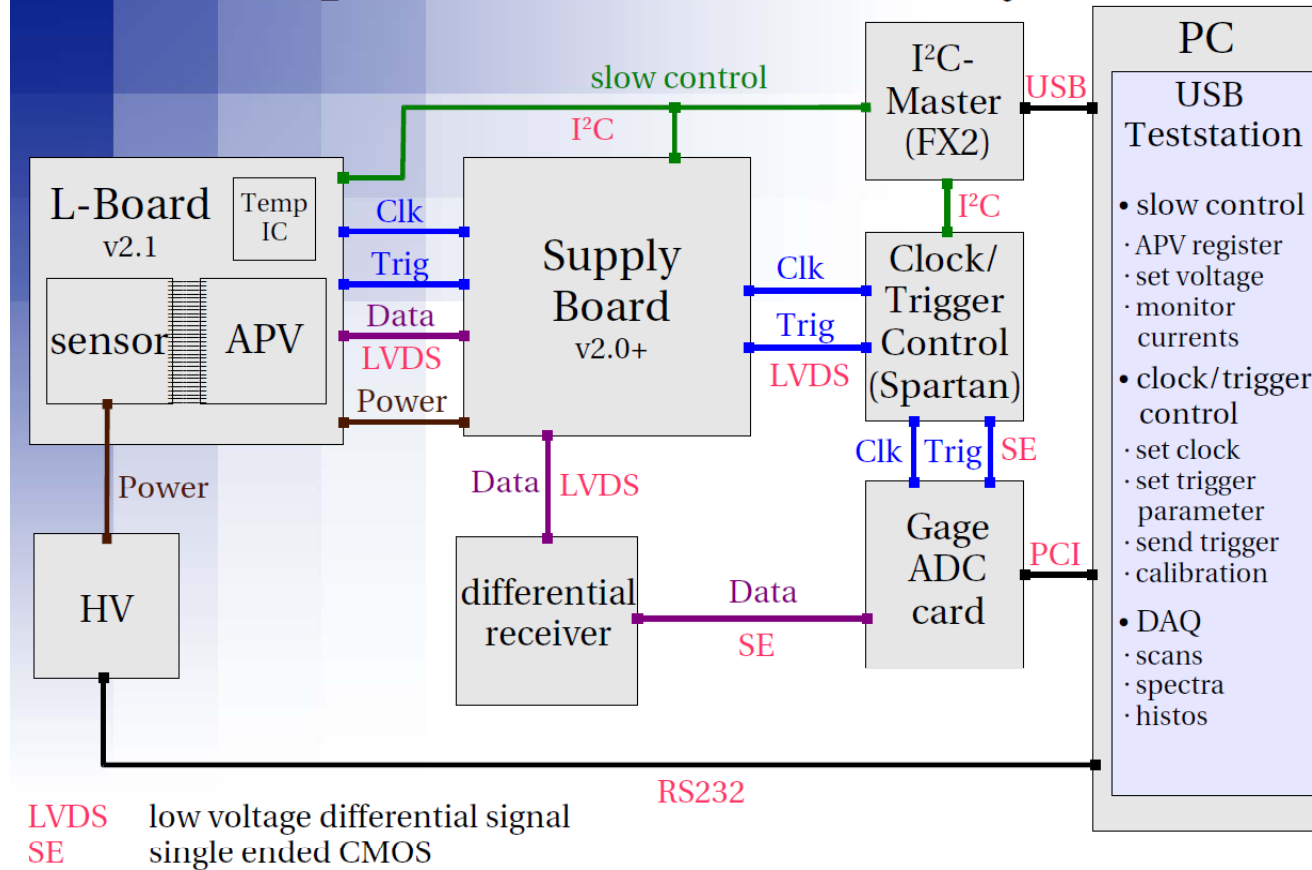
To Digital Readout Board ←

- Physical connection done!
- Adapter board ready and connected
- First data module ready: LTC2620 DAC
- Todo: Implementation of ToPiX protocol



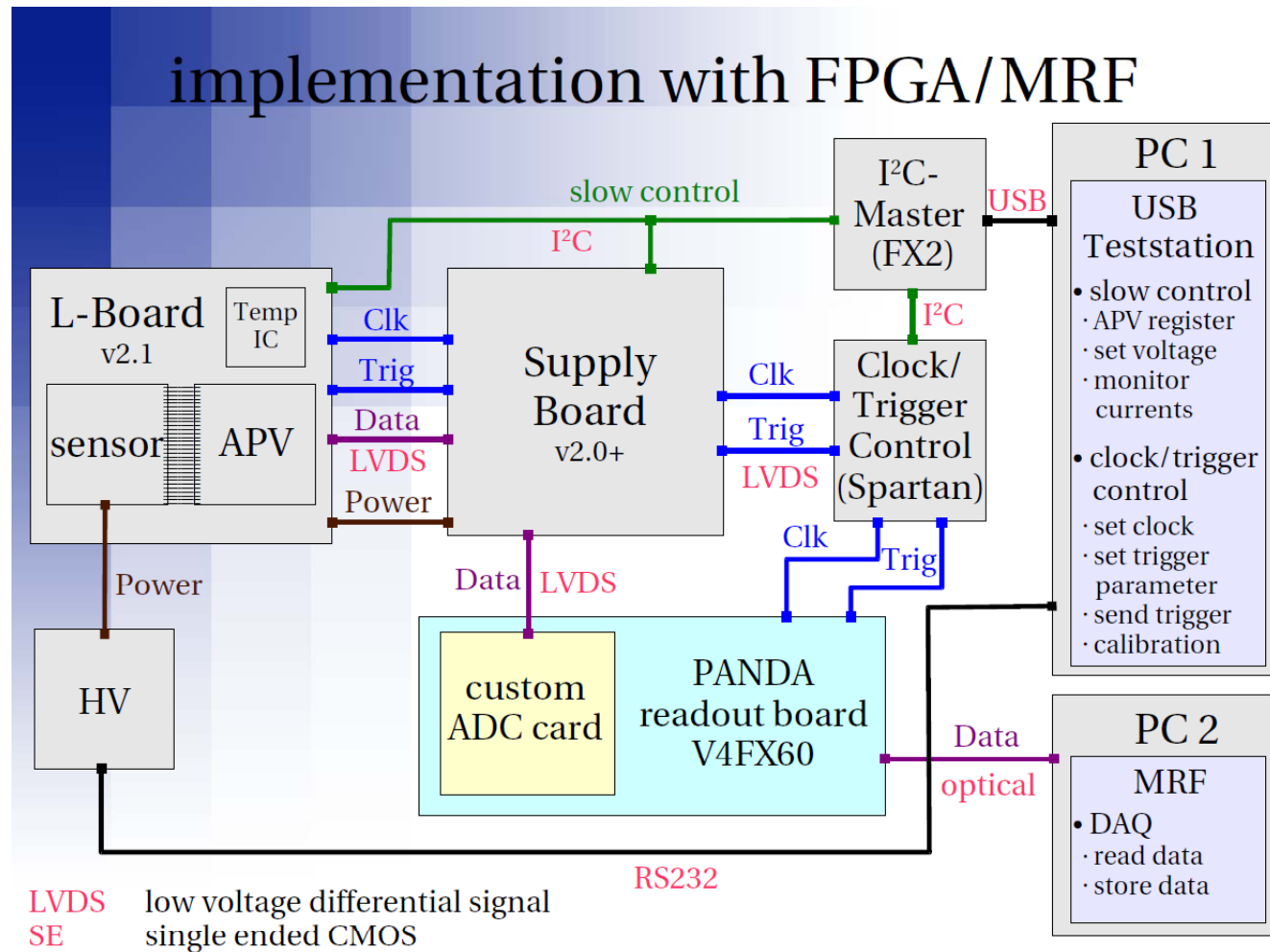
Digital Readout System Setup at Dresden

implementation as at may 09



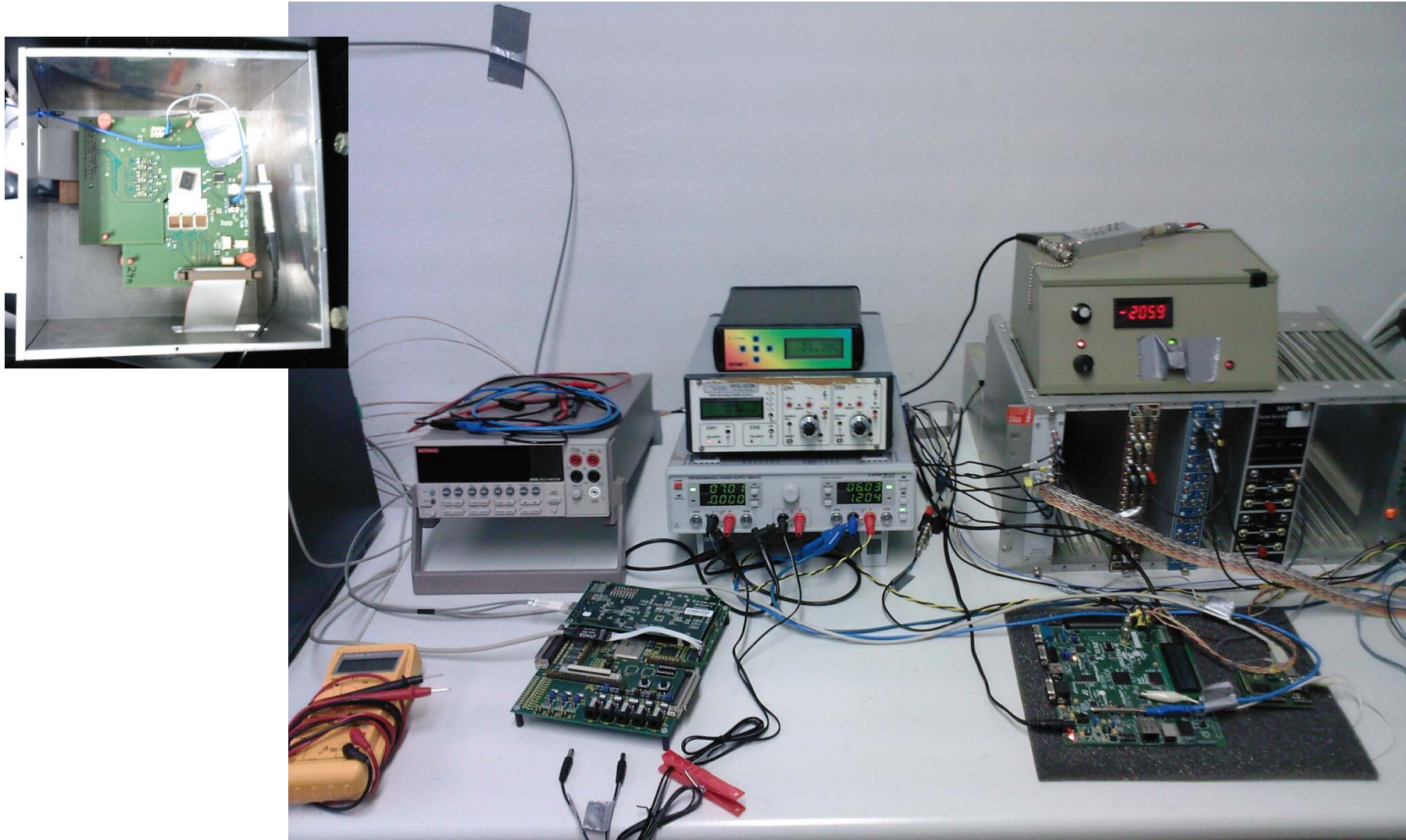
Slide: Robert Schnell

Digital Readout System Setup at Dresden

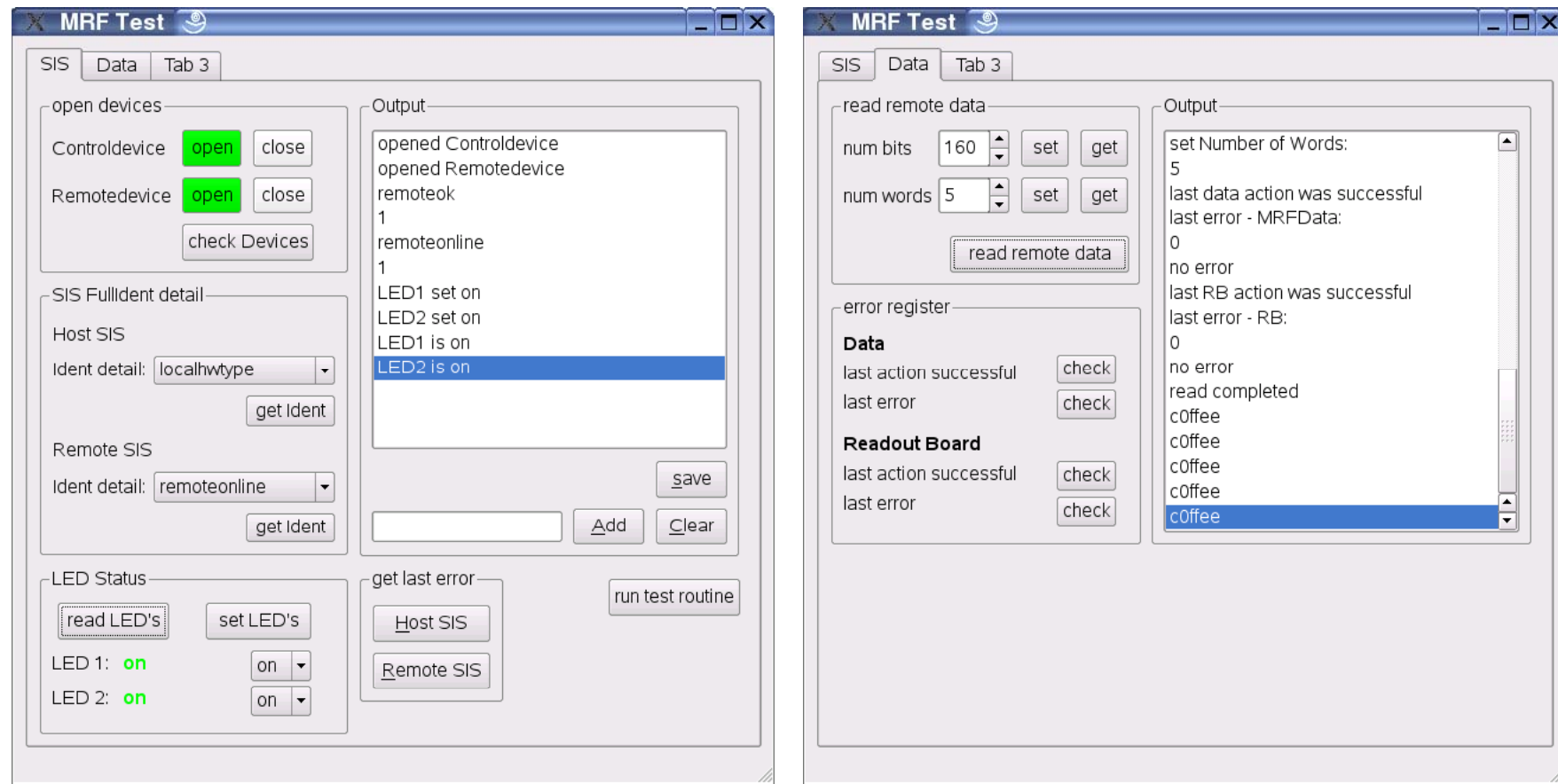


Slide: Robert Schnell

Digital Readout System Setup at Dresden



Digital Readout System Setup at Dresden



- Status: Hardware and driver installed, first functions using MRF implemented

Summary

- **Atlas FE-I3** Readout Results:
 - *Threshold* determination, *noise* determination using digital readout system
 - *First results of tests beyond original FE-I3*

Thank you for your attention

- *Work on software/firmware ongoing: Communication protocol needs to be implemented*
- Digital Readout System **Setup at Dresden**
 - *Base installation done*
 - *First communication between digital readout system and PC working*