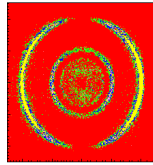


The fADC4 fast sampling ADC units



RoentDek
Handels GmbH
Supersonic Gas Jets
Detection Techniques
Data Acquisition Systems
Multifragment Imaging Systems

The **RoentDek fADC4** is a product series of fast sampling 4 channel 10 bit ADC modules with 1.25 to 5 GS/s (10 bits) or with 250MS/s (14 bits) sampling rate per channel. Depending on the **fADC4** version and the number of ADC modules (up to 8 interlinked units with up to 4 channels each) a wide application range can be covered. Due to an on-board TDC and very elaborate memory structure with **zero-suppression** functionality and **single pulse trace recognition** it is an ideal tool especially for applications with single or multiple AC pulse signal tracking/analysis, for example in advanced read-out of single particle counting detectors.

A special firmware is optimized for the signal analysis of the **RoentDek DLD** and **HEX** delay-line detectors with micro-channel plates. The main application is advanced multi-hit recovery with the **HEX75/100/120** detectors at high event rate throughput. For this application the **CFD8c/TDC8HP** modules are replaced by 2 **fADC4** units, ideally in combination with a **MixA2** for improved system flexibility. Signals from detectors must be amplified (e.g. with **RoentDek FAMP** units) to bring the detector's pulse height distribution into the linear input range. They **MUST NOT** exceed the specified input range.

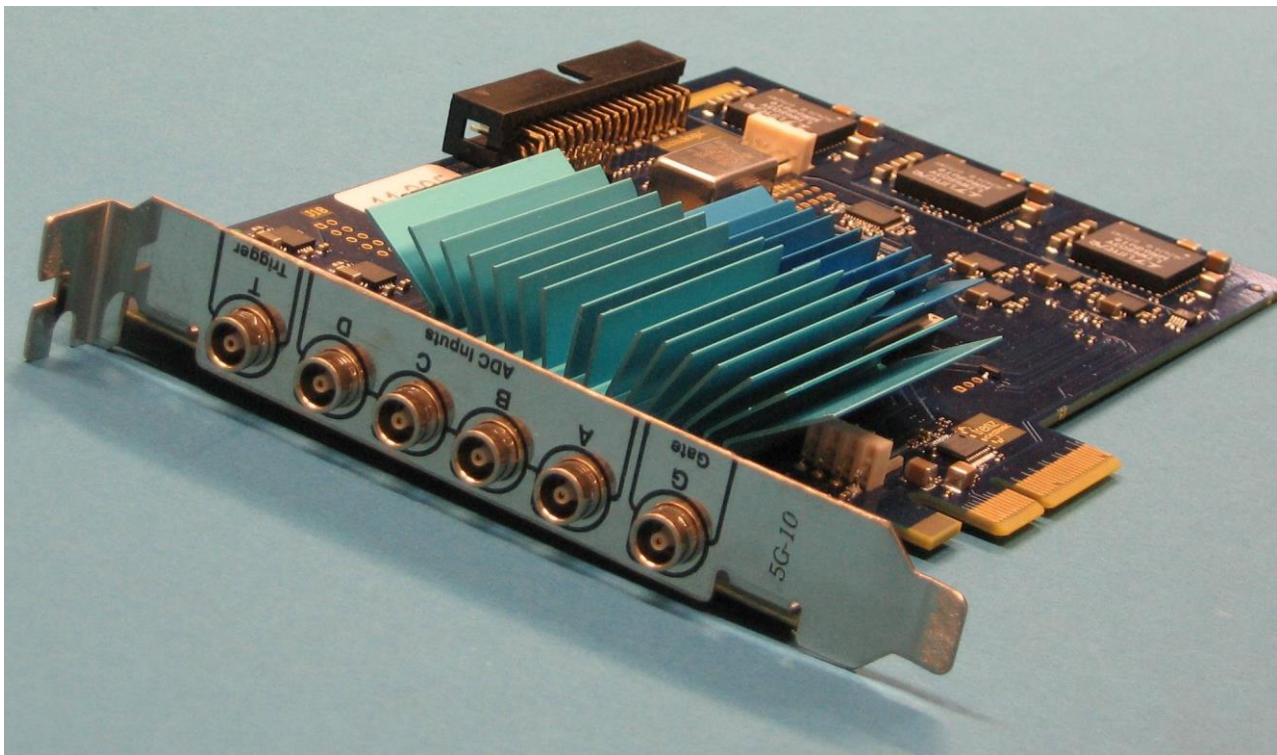


Figure 1: the **RoentDek fADC4** module

Fast signal analysis: width, amplitude, shape

In contrast to conventional ADCs which measure a voltage only in one point the **fADC4** samples the **complete signal trace** similar to a digital oscilloscope. With this information the software can not only analyse the amplitude but also the integral/width/shape of a signal.

Synchronization:

Up to 8 **fADC4** modules can be used in combination as one synchronized instrument. The driver also allows for a seamless synchronization with our 8 channel TDCs (www link: [TDC8HP](#)). If not enough PCIe slots are available inside the PC then a crate solution can be used.



*Figure 2: the PCIe-extension crate can house up to 8 **RoentDek fADC4** modules (4 **fADC4** are displayed in this picture). An alternative version linking up to 5 **fADC4** and up to 2 **TDC8HP** is in development*

Software:

The **fADC** systems are provided with a complete software solution for the data readout and offline data analysis. Simple example programs and LabView-drivers are provided which allow for a very flexible development of customized data readout schemes. The software extracts the timing information and amplitude/width of each signal. Plug-ins for the position computation of particle detectors are available.

Comparison to the **fADC8**: [\(link to the fADC8 description sheet\)](#)

Form factor:

The **fADC4** is a PCIe-card (with 4 ADC-channels and one TDC-channel) which can be placed directly into a PC or into a PCIe-crate.

The **fADC8** is a VME-module with 8 ADC-channels and one TDC-channel. The VME crate can be read out via USB or “optical link”

Data readout:

Each **fADC4**-card provides a data transfer speed of 300 Mb/s net. The internal memory is large enough to buffer up to 40 μ s of signal traces. The **fADC8**-crate-controller has a maximum data transfer speed of 120Mb/s but the internal memory is 2 Gb in each module. Thus the **fADC4** is well suited for applications with a continuous high data rate. The **fADC8** is especially well suited for applications with extremely high data rates during short time intervals (e.g. measurements with particle traps).

Summary of fADC4 features:**5GS/s version:**

- Input range: 0.5V, adjustable offset, 10 bit ADC, AC-50 Ohm impedance, bandwidth 3GHz, additional TDC channel with < 100 ps resolution and veto input
- Channel configurations: Each 4 channel ADC module can be individually addressed as 4x1.25GS/s, 2x2.5GS/s or 1x5GS/s.

250MS/s version:

- Input range: 0.5V, adjustable offset, 14 bit ADC, DC-50 Ohm impedance, bandwidth 450MHz, additional TDC channel with < 100 ps resolution and veto input.

Features common to both versions:

- On-board *Zero-Suppression Functionality* for selective read-out of pulse traces with high signal transfer rates. No dead time between pulses. No dead time between trigger groups.
- Trigger range: not limited
- Connector type: Lemo00
- I/O interface: PCIe (300Mbytes/s net data transfer rate, 800Mbytes/s nominal)
- External trigger input includes one TDC channel for generation of timestamp information (<100 ps resolution)
- VETO-input: Enables fast gating of signal acquisition

Included software: read-out of pulse-traces to PC RAM and harddrive (for Windows only)

Drivers: Vista (32/64 bit), Win7, 8, 10 (32/64bit),

Free firmware upgrades (in-system via flash software)

PC not included.