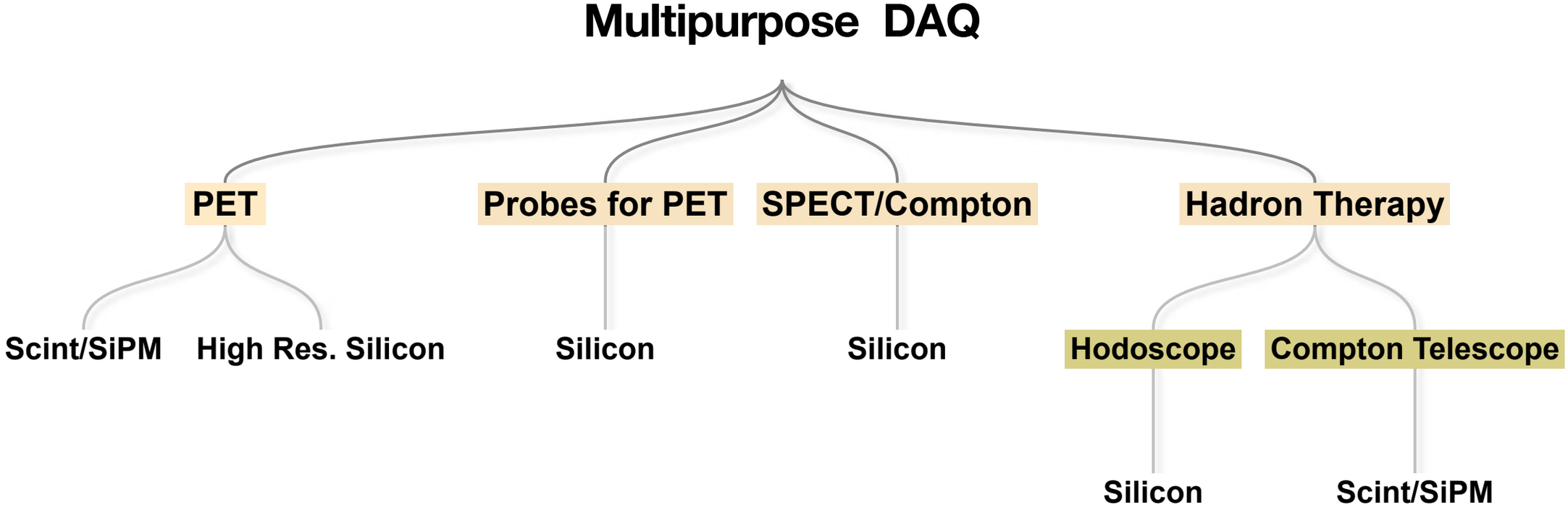
AliVata DAQ System

ALIBAVA
SYSTEMS

The AliVata DAQ System for Spectroscopy

01 Overview

AliVata System is a portable and compact readout system for silicon sensor characterization. AliVata is based on the GPn and HDRn ASCIC families of IDEAS and enables the user to read out or characterize each individual volume of silicon micro-dosimeters, silicon strip or pad sensors as well as SiPM based detector systems.



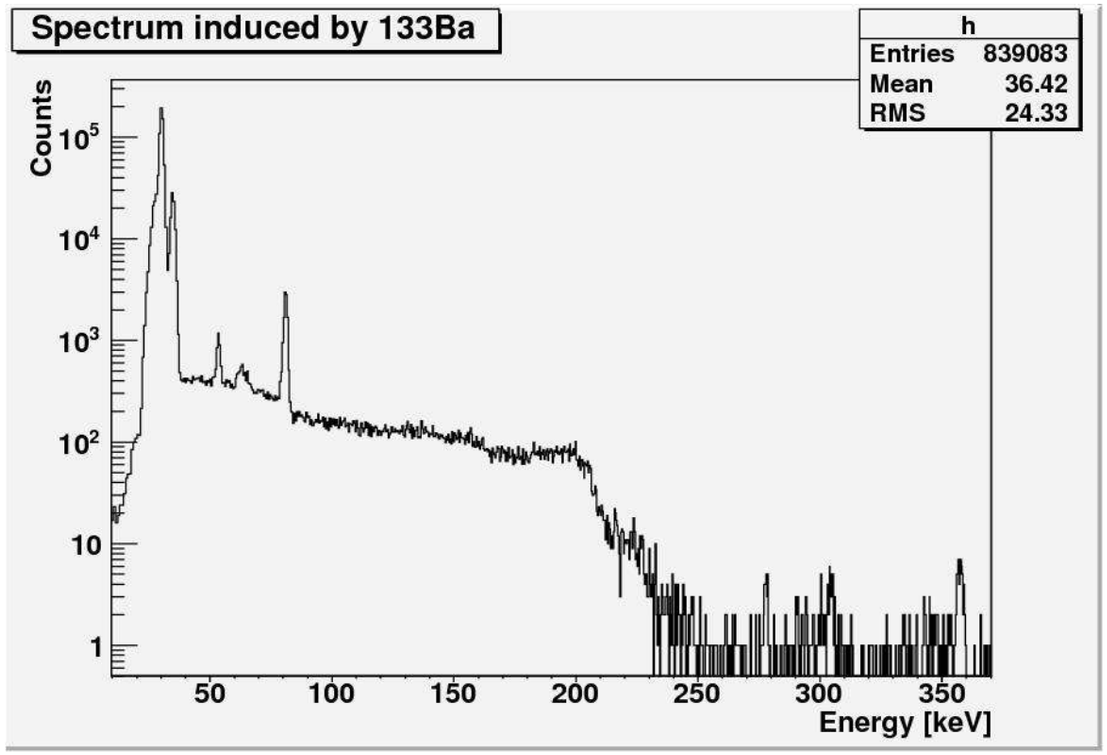
AliVata DAQ System can handle several setups and sensor types.

02 Performance

Main Performances

- 1 keV energy resolution.
- Peaking time depends on the ASIC : 50 ns (fast) 500 ns (slow) for the GP7.
- Up to 4 data streams with a max. of 16 chips on each of the streams.
- Connectivity PC by UDP (Ethernet).
- TDC resolution better than 100ps.
- Autotrigger.
- External trigger.
- Voltage supply: +5 V.
- Data Acquisition Software for Windows, Linux and Mac OSX.

Spectroscopy with silicon

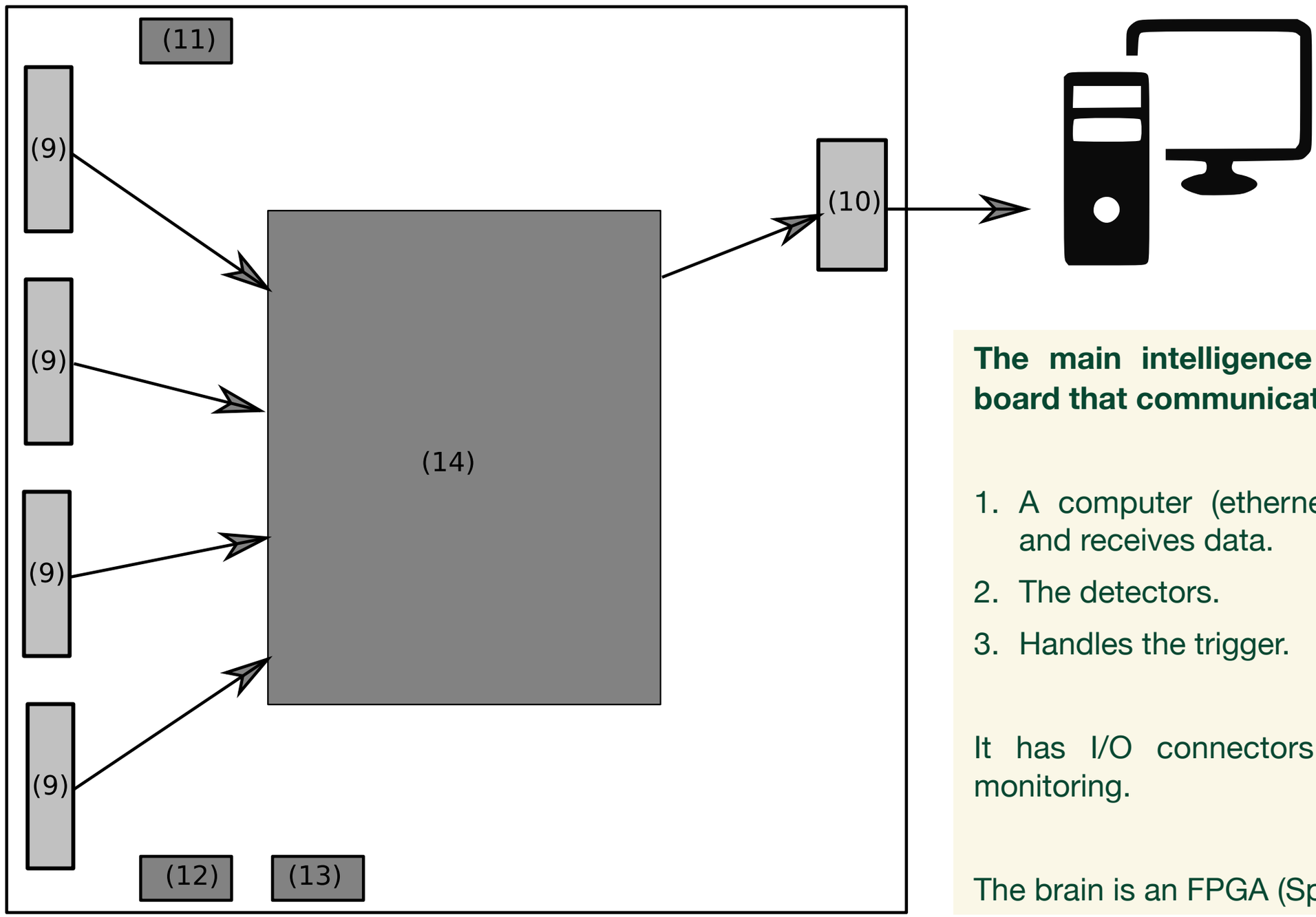


03 The idea behind

What we are after is a system which is

- **Simple and Compact**
- **Multichannel**
- **Modular and Scalable**
- **Can handle different sensor types**

04 The system mother board



The main intelligence is in a mother board that communicates to:

1. A computer (ethernet) that programs and receives data.
2. The detectors.
3. Handles the trigger.

It has I/O connectors for trigger and monitoring.

The brain is an FPGA (Spartan 6).

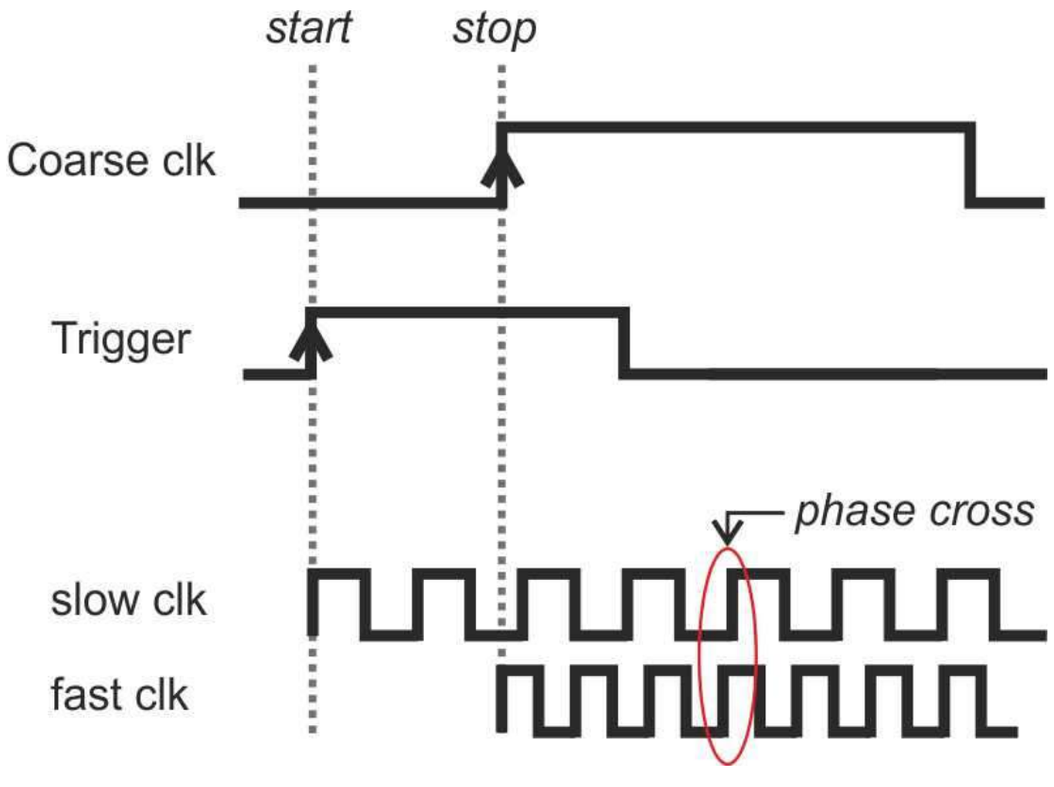
06 The Embedded TDC

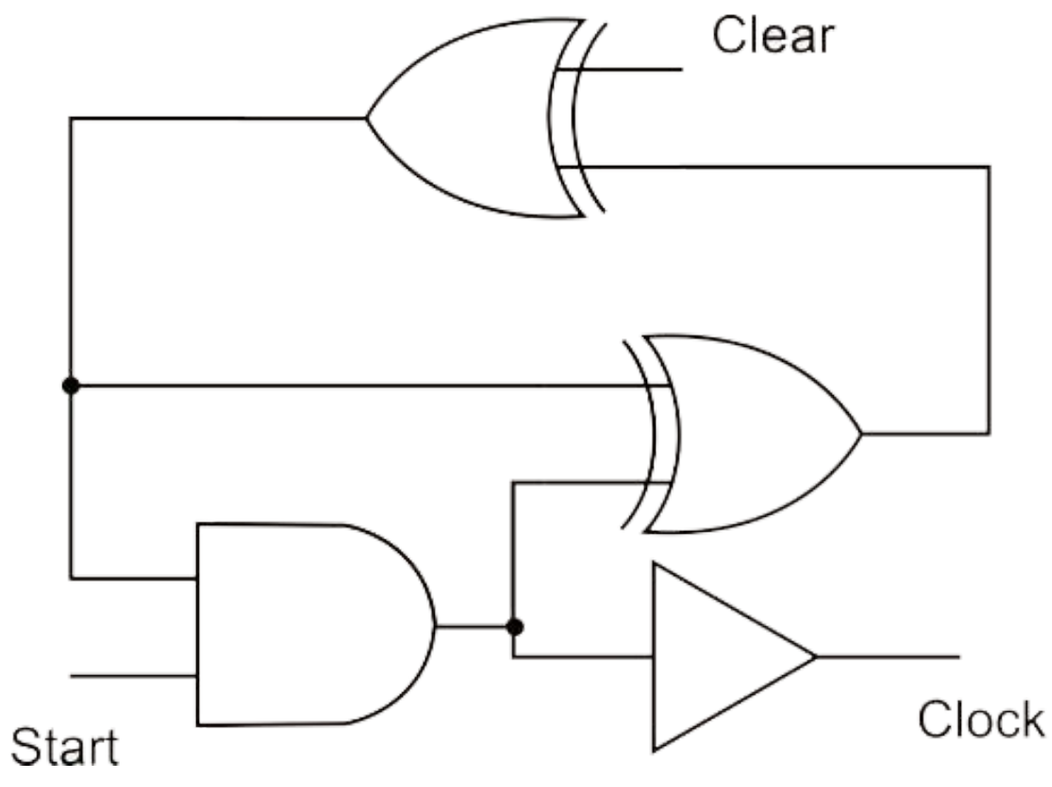
A Vernier TDC embedded in the FPGA

Implemented with 2 fast clocks with very similar frequency. The difference between periods gives the resolution.

Requires manual (and smart) routing in the FPGA.

Same concept on a Spartan 3 gave 250ps resolution. Not yet tested on the Spartan 6 firmware but expect much better timing resolution.





07 The read out ASICs

The system works with the assumption that the ASICs

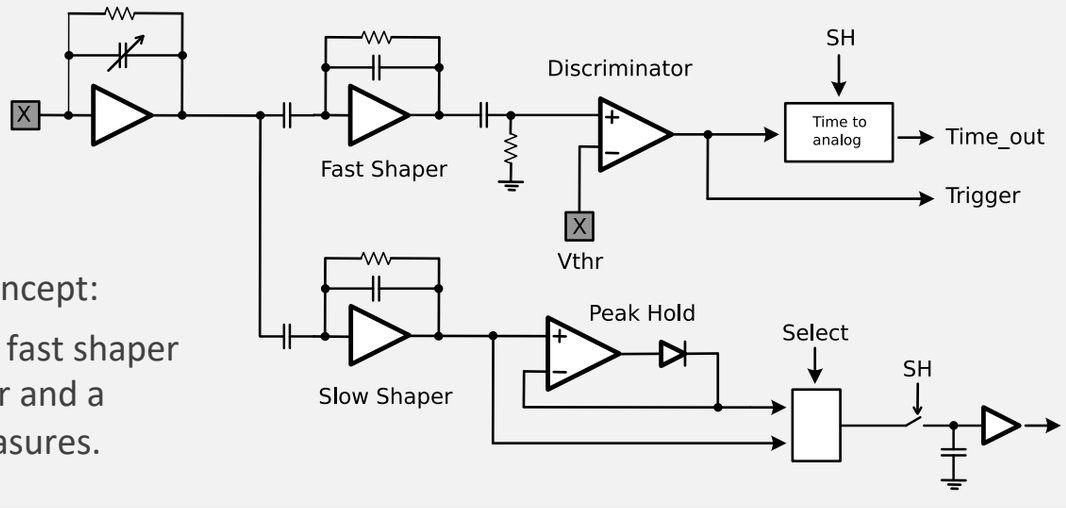
1. Produce a multiplexed output (rather than parallel).
2. Chip I/O can be daisy-chained (3/4).

The IDEAS VATA family work like this and have been used in first prototypes

GP7:
128 ch.
500 ns peak time
Range: ± 30fC

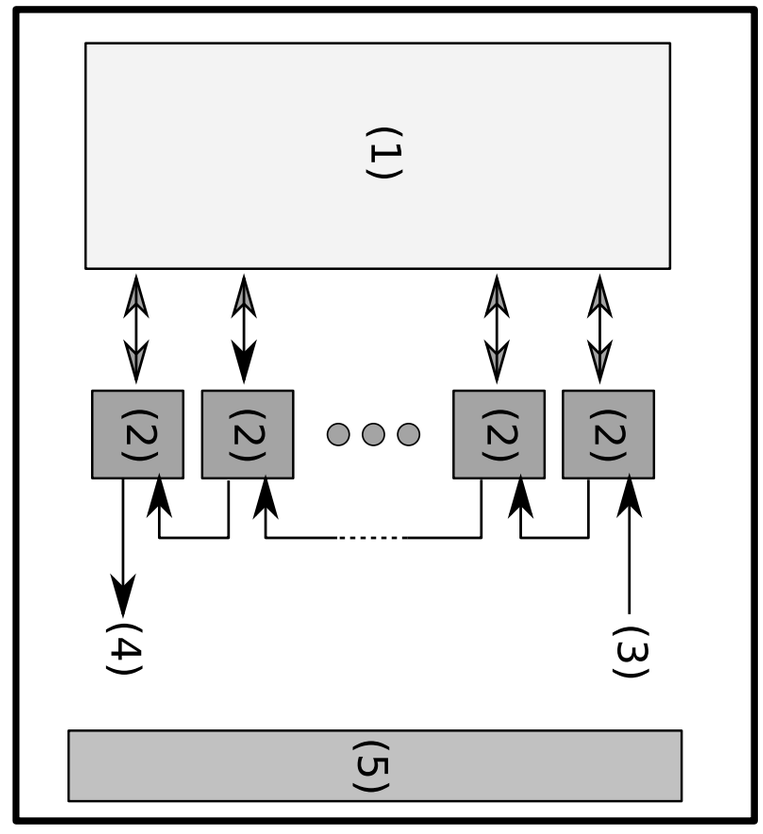
GP8:
128 ch.
500 ns peak time
Range: 1 – 125 fC

HDR16: (SiPM)
64 ch.
100 ns peak time
Range: ~ 20 pC



The VATAGP concept:

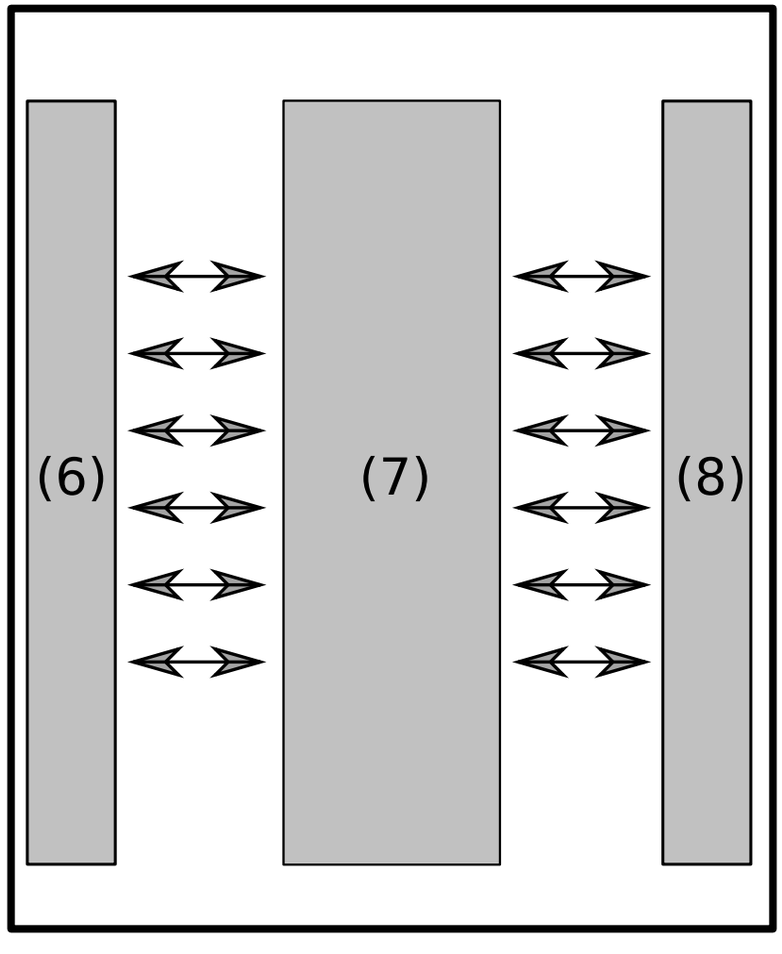
Signal is split. A fast shaper gives the trigger and a slower one measures.



08 The intermediate board

This is an auxiliary board that might be needed to adapt the input/output of the detector and motherboard.

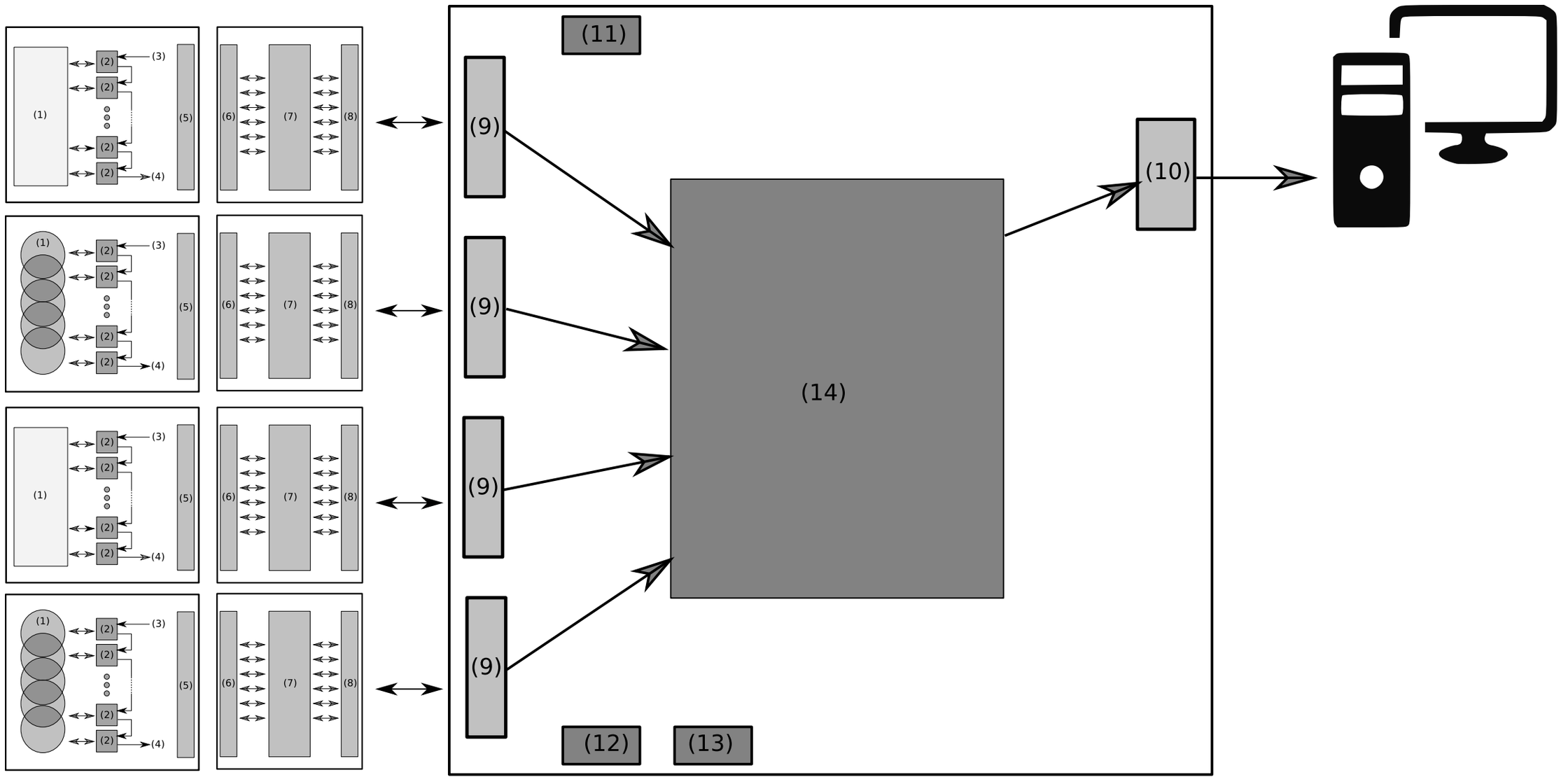
It can be just a passive board or an “intelligent” board, anything you need to connect the detector board to the mother board.



09 The system

The system allows for 4 data streams per MB and up to 16 chips per data stream.

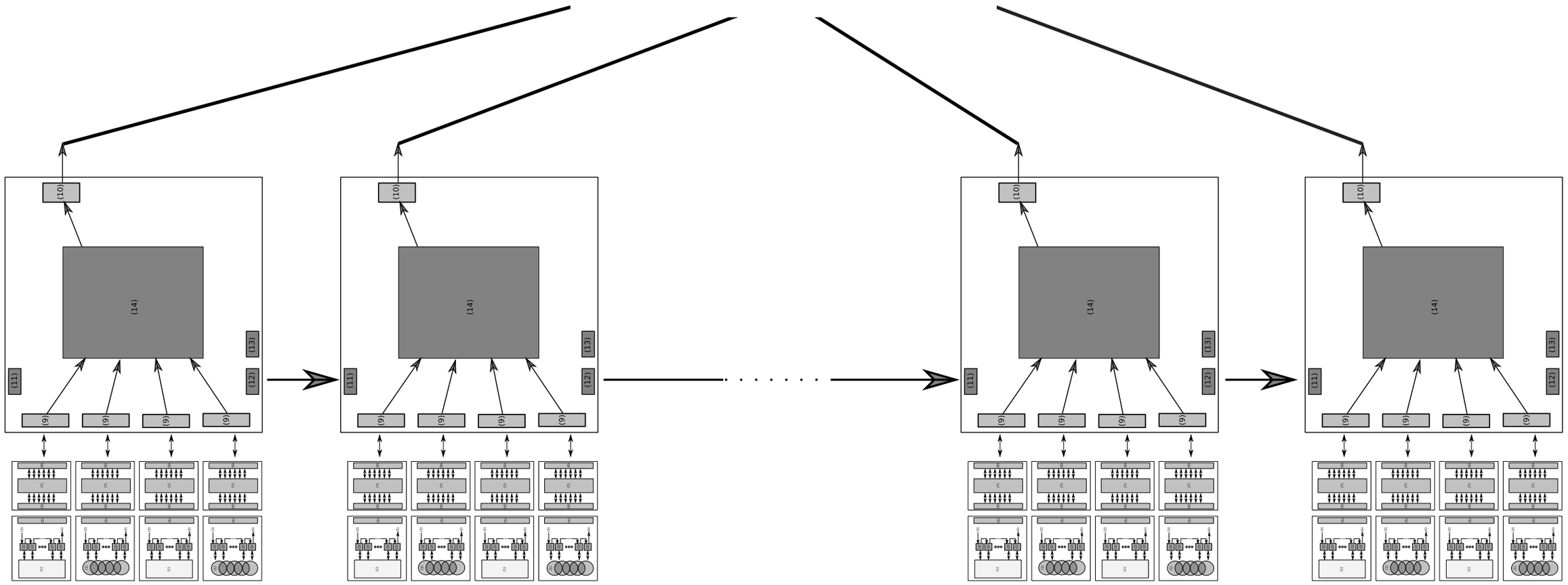
Streams can come from any detector type. Data is time stamped to allow for event building.



10 The whole system

The idea behind is a scalable system. With no limitations in channel number nor number of detector boards or types.

Ethernet Switch



10 The mother board

Application Cases of the AliVata DAQ System

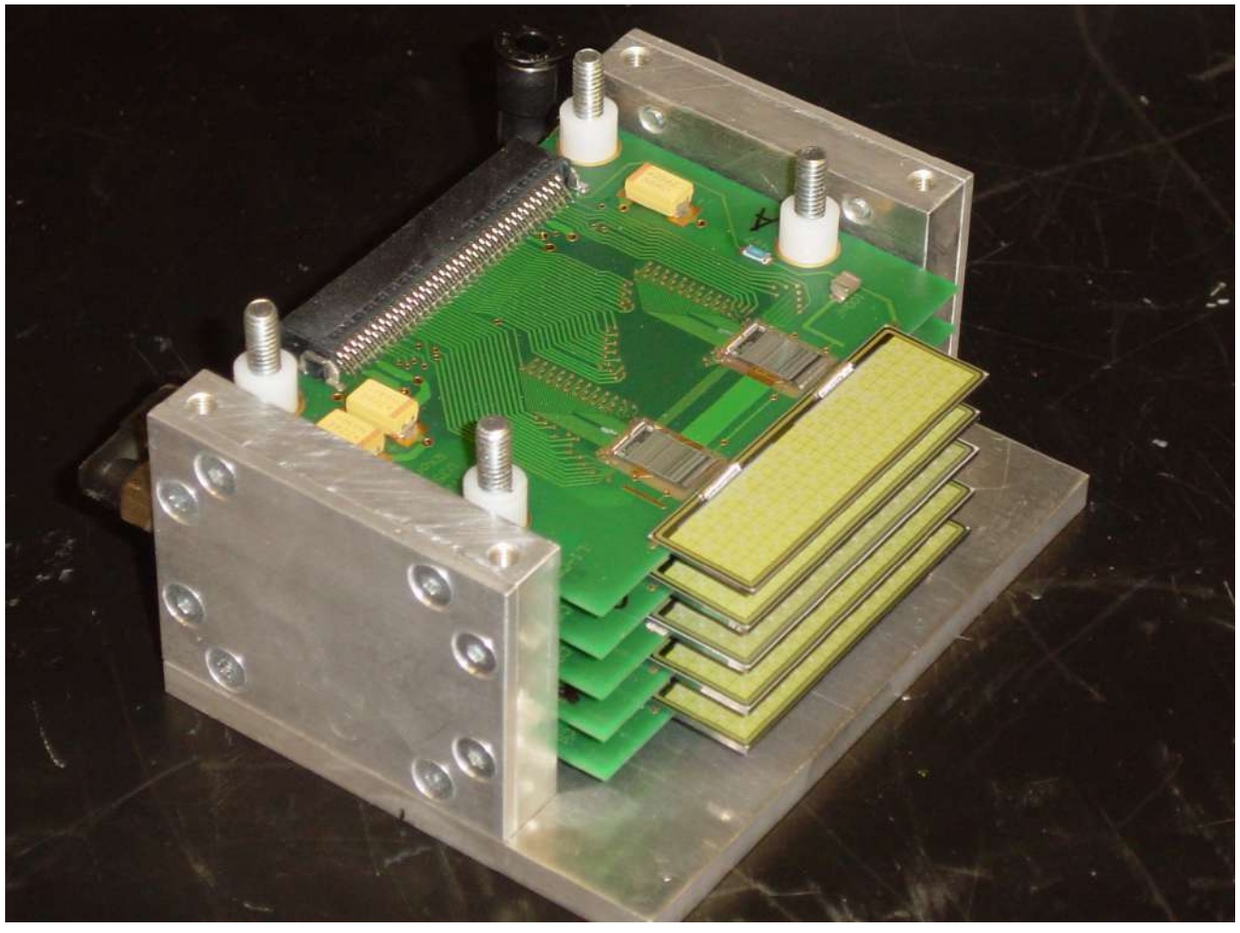
01 SPECT / Compton Camera

Stack of silicon pad detectors for a SPECT/Compton camera

2 ASICS per plane

1 Trigger per plane

1 data stream per plane



Need to

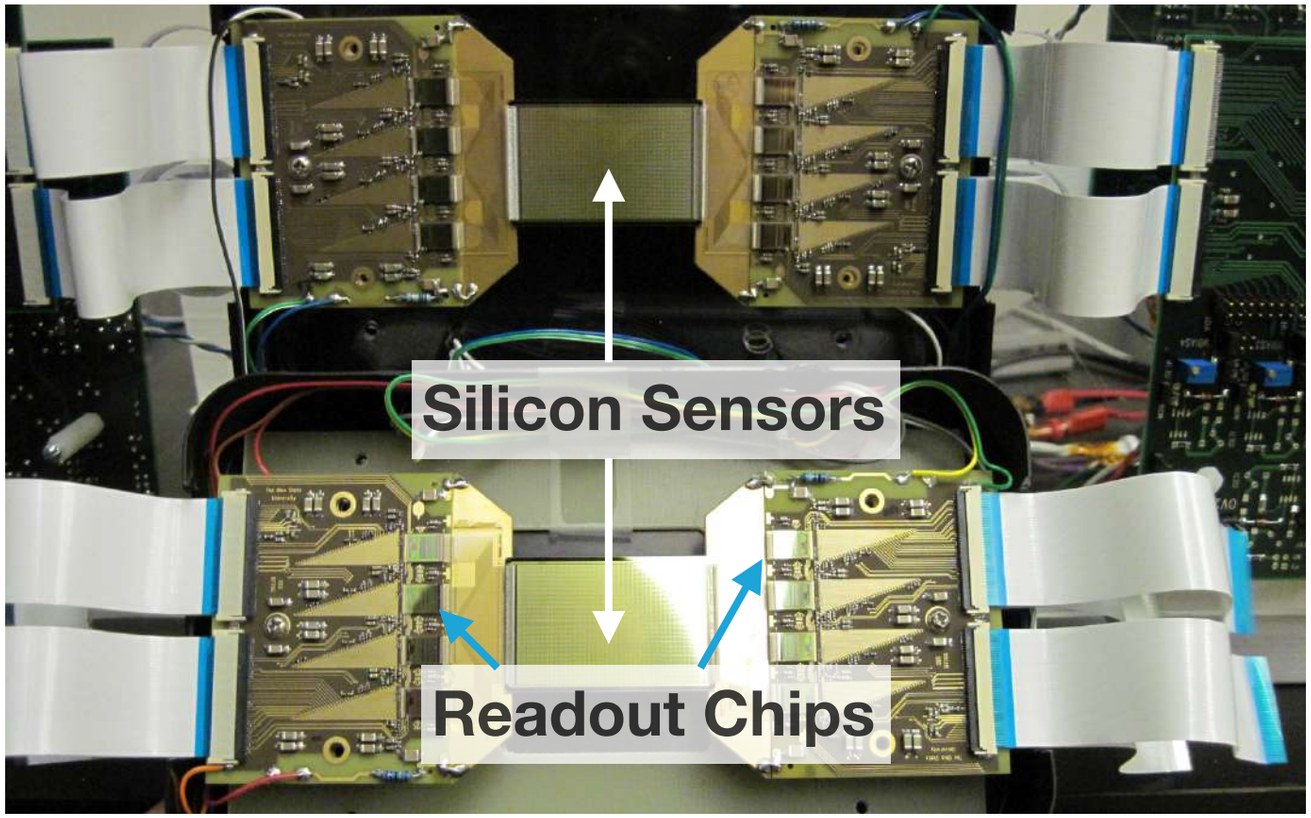
1. Timestamp for event building.
2. Handle multiple data streams.

Stack of silicon pad detectors for a PET probe

8 ASICS per plane

1 Trigger per plane

1 data stream per plane



Need to

1. Timestamp for event building.
2. Handle a large number of chips per data stream.
3. Handle multiple data streams.

03 Hadron therapy monitoring

A stack of Scintillarors + SiPM for a Compton Telescope to monitor hadron therapy

1 ASIC per plane

1 Trigger per plane

1 data stream per plane

Need to

1. Timestamping for coincidence building.

Different Sensor, different range.

Summary

01 Summary

A readout system for spectroscopy

- Several detector types (Silicon strips, pads or pixels, SiPM, etc.).
- Self-trigger.
- Time stamping.
- Really scalable (with the IDEAS GP7 chip, up to 8192 channels per motherboard).

Want To Learn More?

06 Contact Us

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