

Readout boards (analog/digital cards for supermodule), architecture overview and plans

The University of Chicago

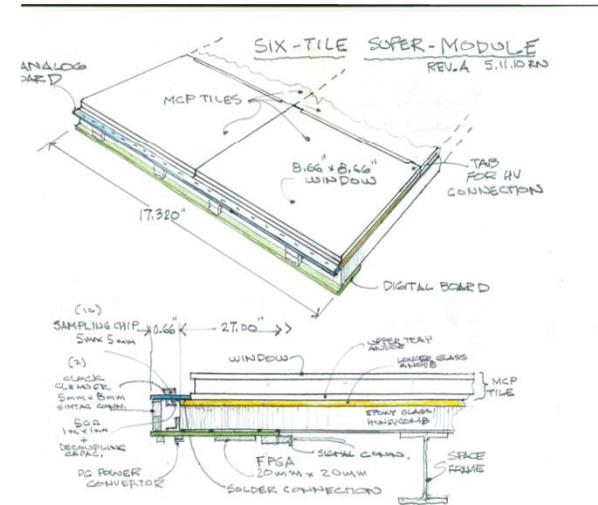
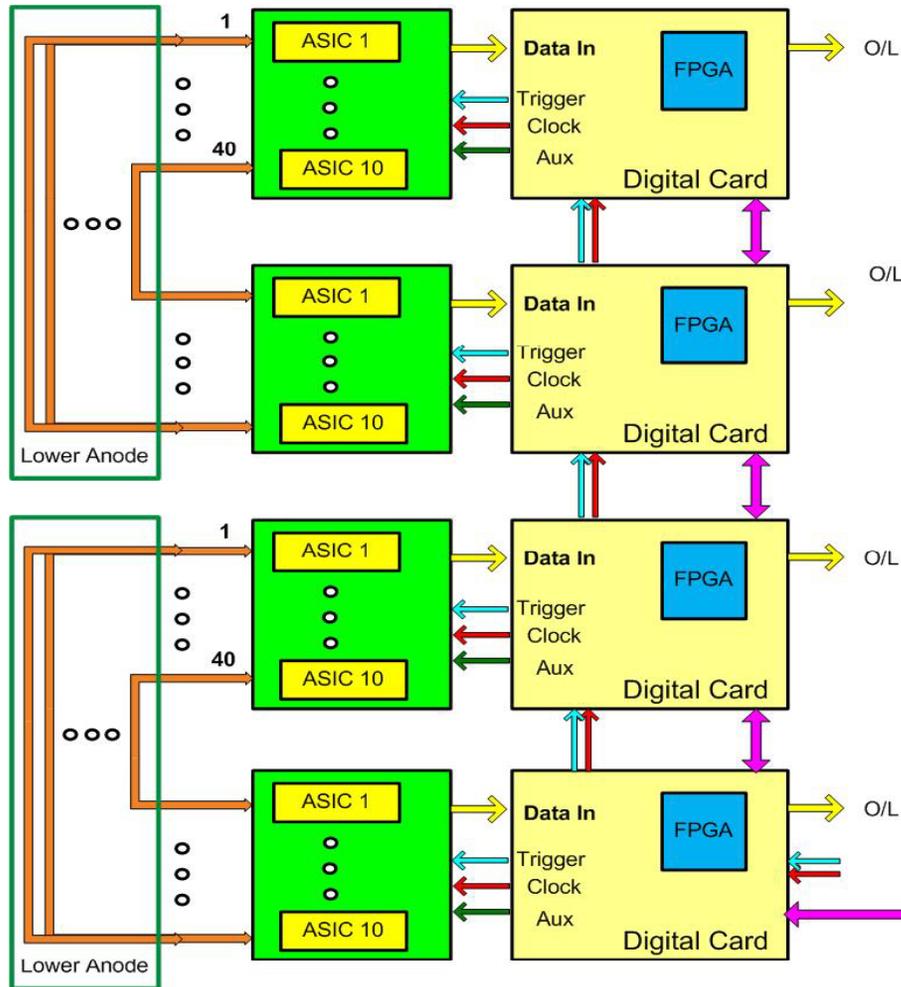
Electronics Godparent Review
October 6th, ANL

Tray Readout Electronics Overview

System Specifications:

- 160 Channel Custom Digitizer System;
 - Sampling rate: 10-20 GS/s;
 - A/D conversion: 12 Bit;
 - Analog Bandwidth: 1-2 GHz;
 - Simultaneous Sampling and Trigger;
 - Switched Capacitor Array readout speed: 30-40 MHz;
 - Real Time Data Processing/Reduction;
 - USB Interface;
 - High Speed Data readout.
-
- Mechanical Architecture: - Custom Tray for the Supermodule (6 Tiles).

Readout Electronics – Block Diagram



- 2 Lower Anode Boards – 3 Tiles each;
- 4 Analog Boards – Front End Chips;
- 4 Digital Boards – Data processing and Interface;

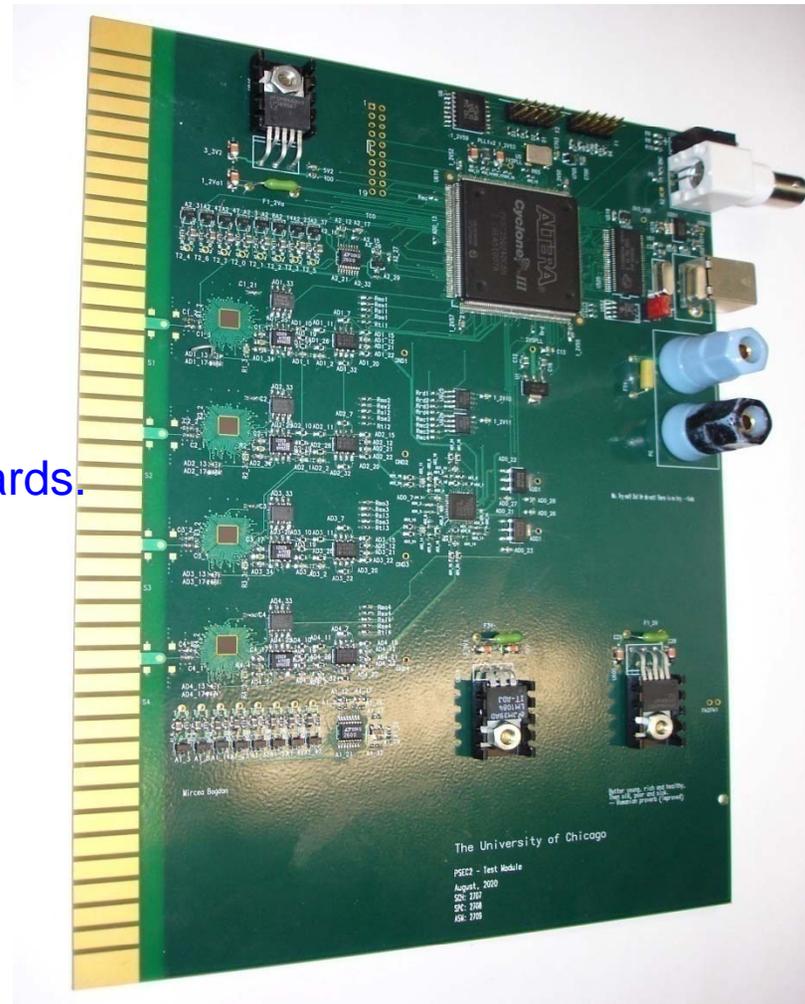
Mircea Bogdan

PSEC2 – Tray ready Flip Chip Tester

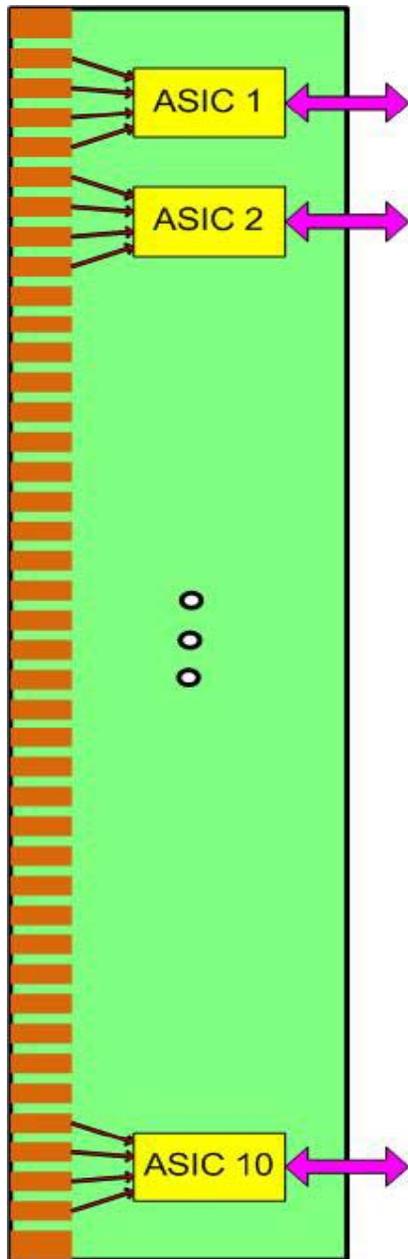
Implemented 4-Channel Digitizer Test Card.
Analog and Digital in one module.

Will stuff 8 pieces PSEC2 Flip Chips on 2 Cards.
Finish testing these cards in 3-4 weeks.
Will show analog bandwidth performance.

Can use this card for a 4-Channel Tray.



Analog Card – Prototype - PSEC 3



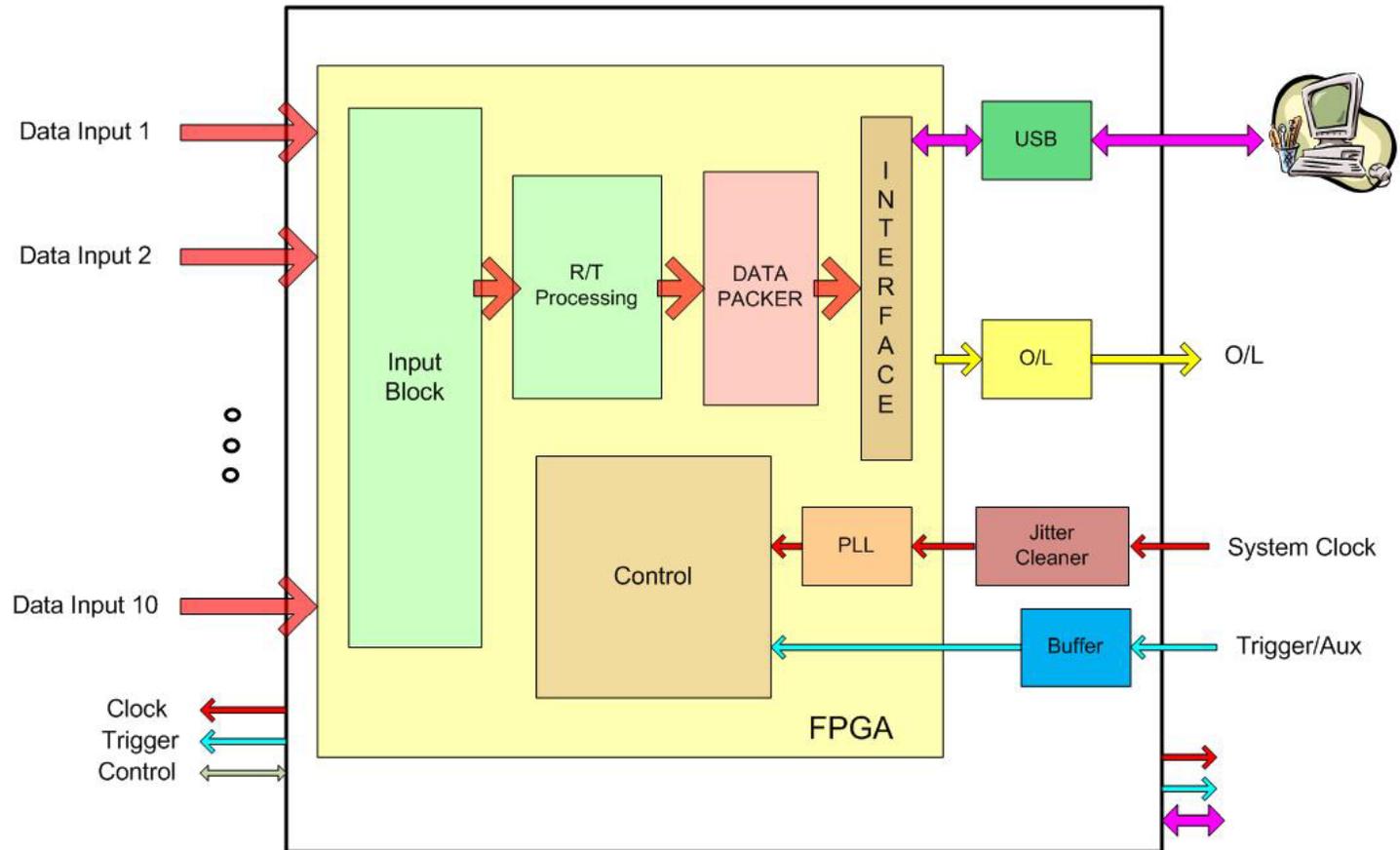
Exact specifications influenced by the PSEC3 test results.

Will start design in January.

High level of design reuse from the PSEC Tester Cards (both QFP and Flip).

Will finish design in ~ 3 months, in parallel with the Digital Card.

Digital Card – Prototype - PSEC 3

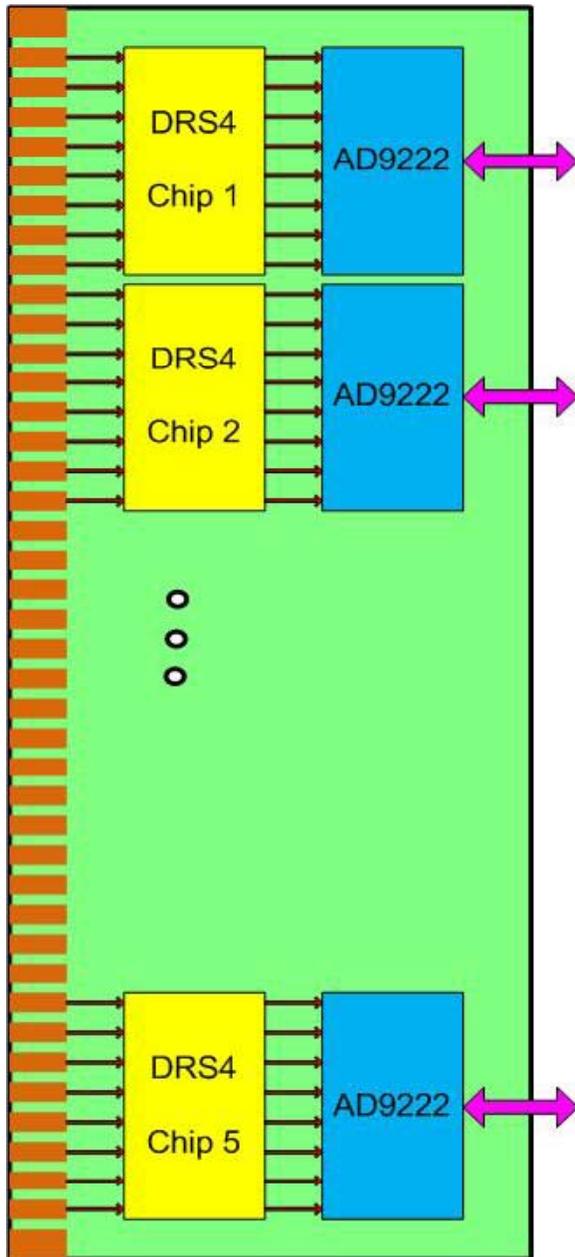


Exact specifications after PSEC3 test results.

Will start design in January. Design is simple and straightforward.

Will finish design in ~ 3 months, in parallel with the Analog Card.

Other Front End Options



Use other Front End Chips, e.g. DRS4 from PSI.

- 8 channels/chip;
- 1,000 capacitors / channel;
- used with external A/D converter (larger Analog Card);
- max 700MHz bandwidth with active preamp;
- max 5 GS/s sampling rate.

Can use available 4-Channel Evaluation Board to build a limited, 4-Channel Tray.

We have experience building a 64-Channel DAQ Module, using this chip.

Conclusions

Design of a Tray Ready Prototype should be finished a few months after the ASIC.

- Engineering time is dependent on the front end option.

Tray Prototype Manufacturing costs will vary, based on options.

Examples:

- 4 pieces Analog Card PCB, with TQFP: \$1,000;
- Assembly Analog Cards with TQFP – in the shop.
- 4 pieces Analog Card PCB, with Flip Chips: \$4,000;
- Assembly Analog Cards with Flip Chips: \$4,000;

- 4 pieces Digital Card: \$2,000;
- Assembly and Parts Digital Cards: \$3,000.

Total cost for the first Tray Electronics Prototype: \$6,000 to \$14,000

Note: Front End Chips not included in this estimate.