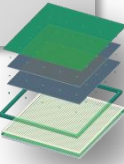


# **PSEC4 System Architecture**

Eric Oberla

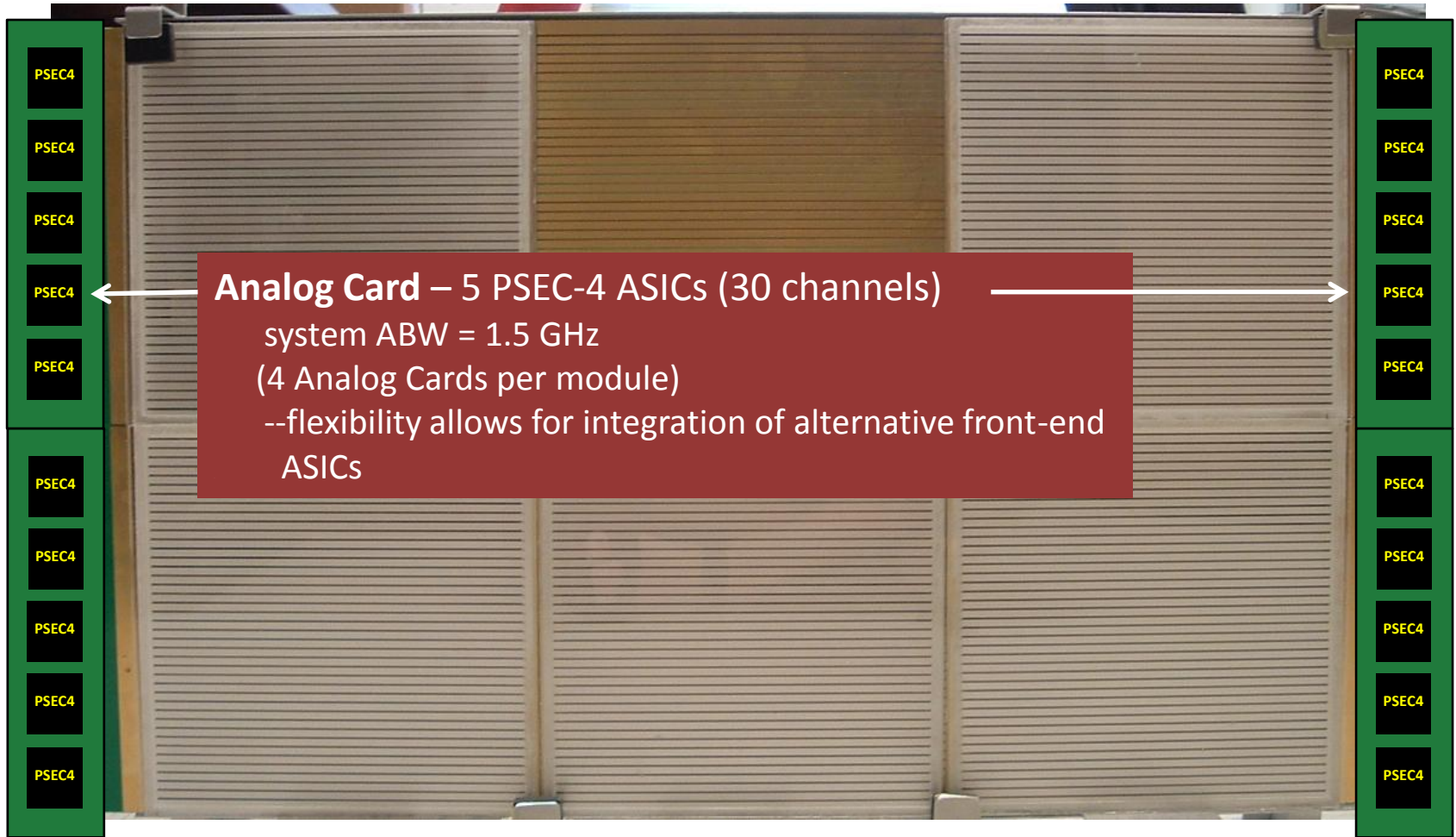
LAPPD2 Electronics Review

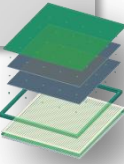
6-April-2013



# DAQ system: original design

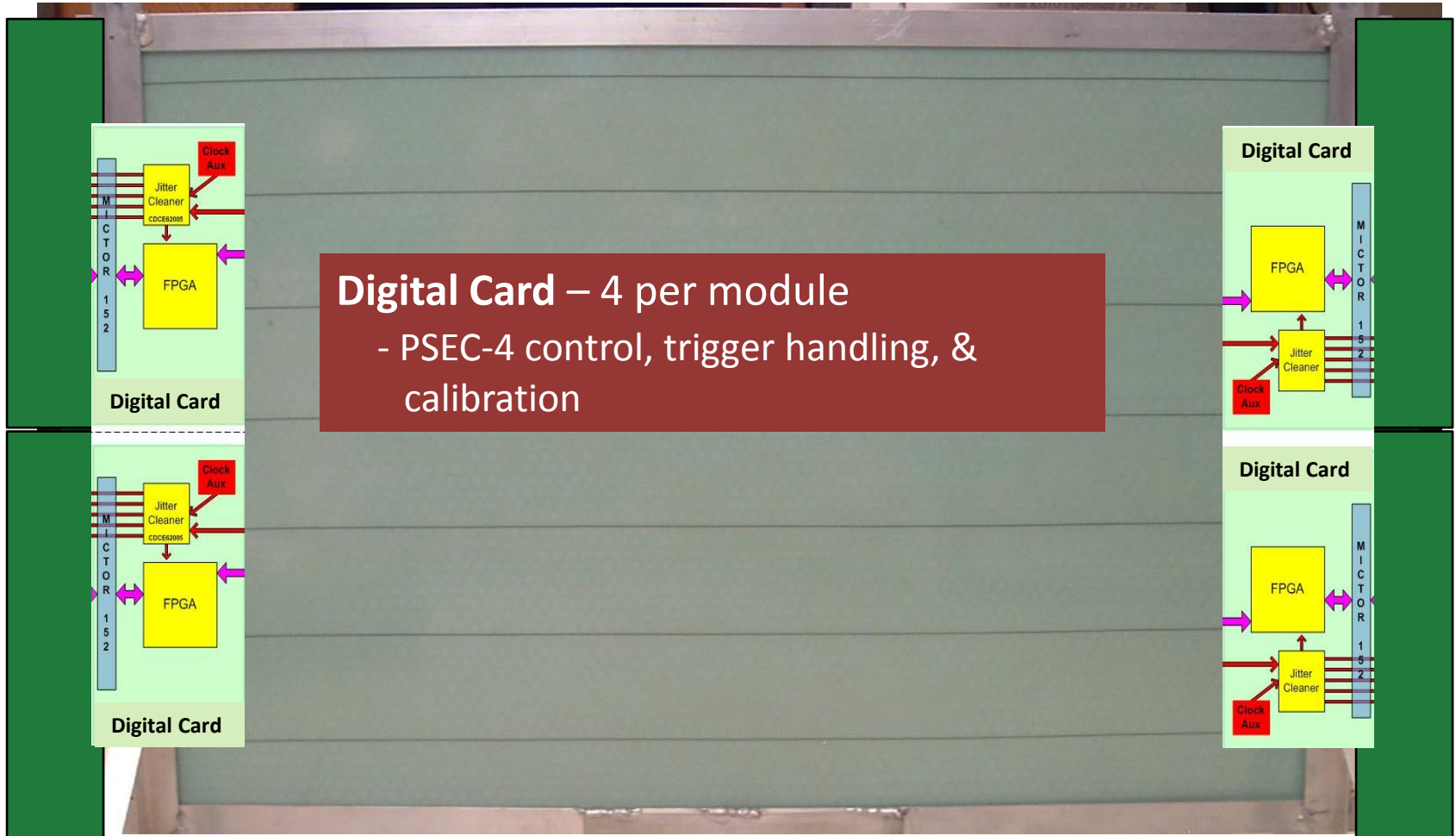
- Targeted to Super Module readout

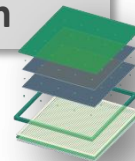




# DAQ system

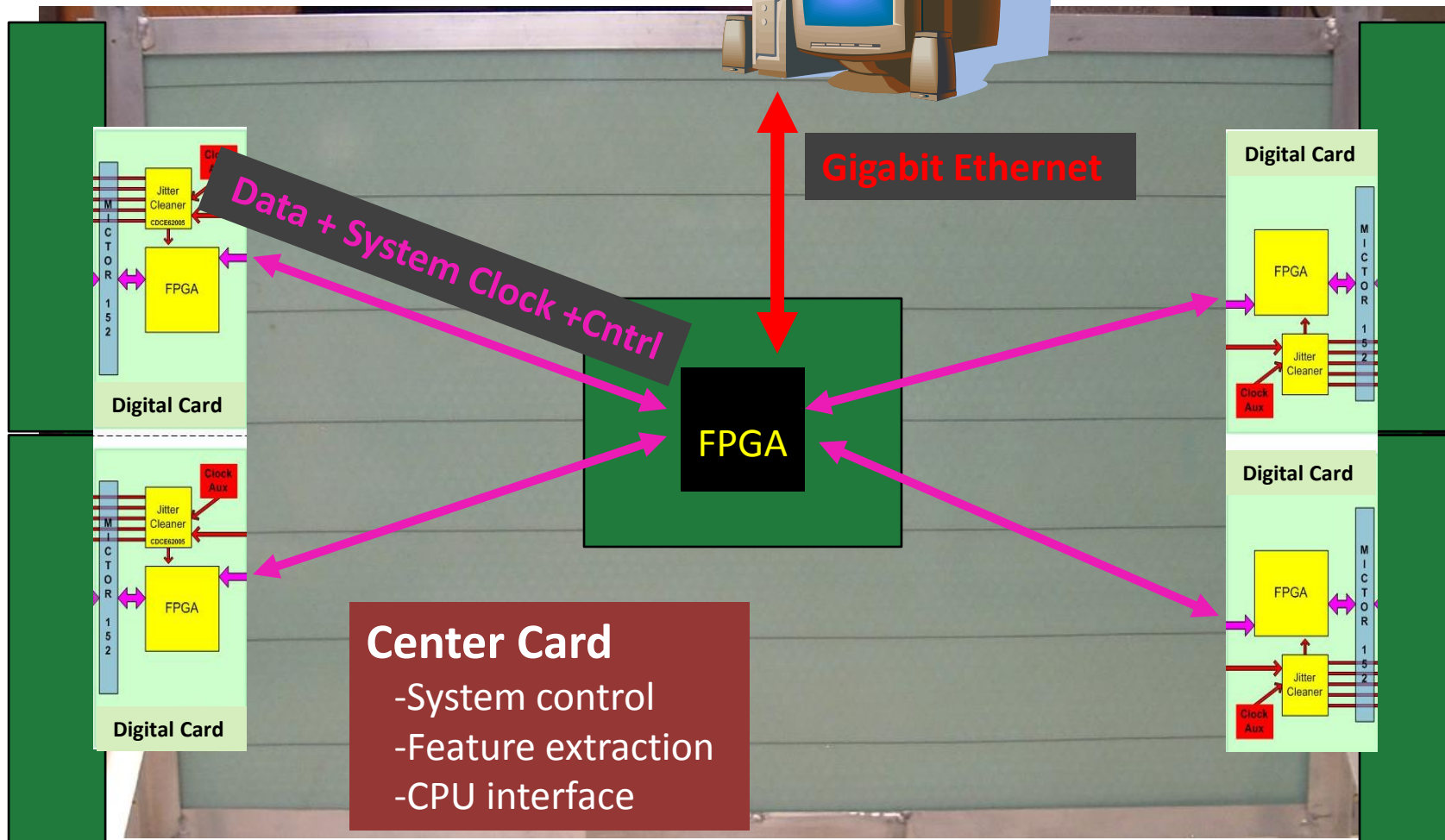
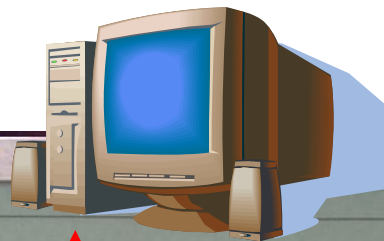
- Backside of Super Module:



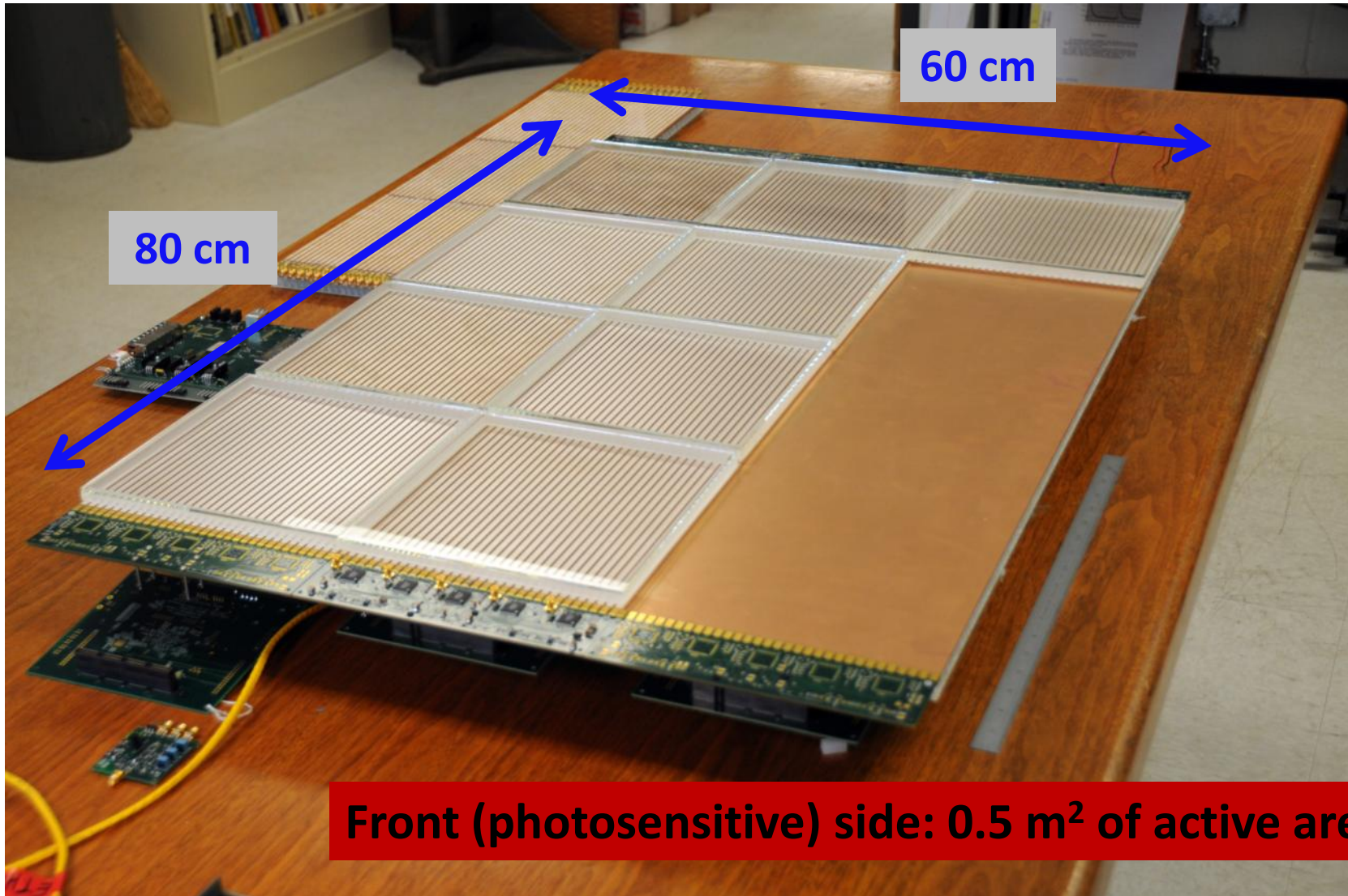


# DAQ system

- Backside of Super Module:

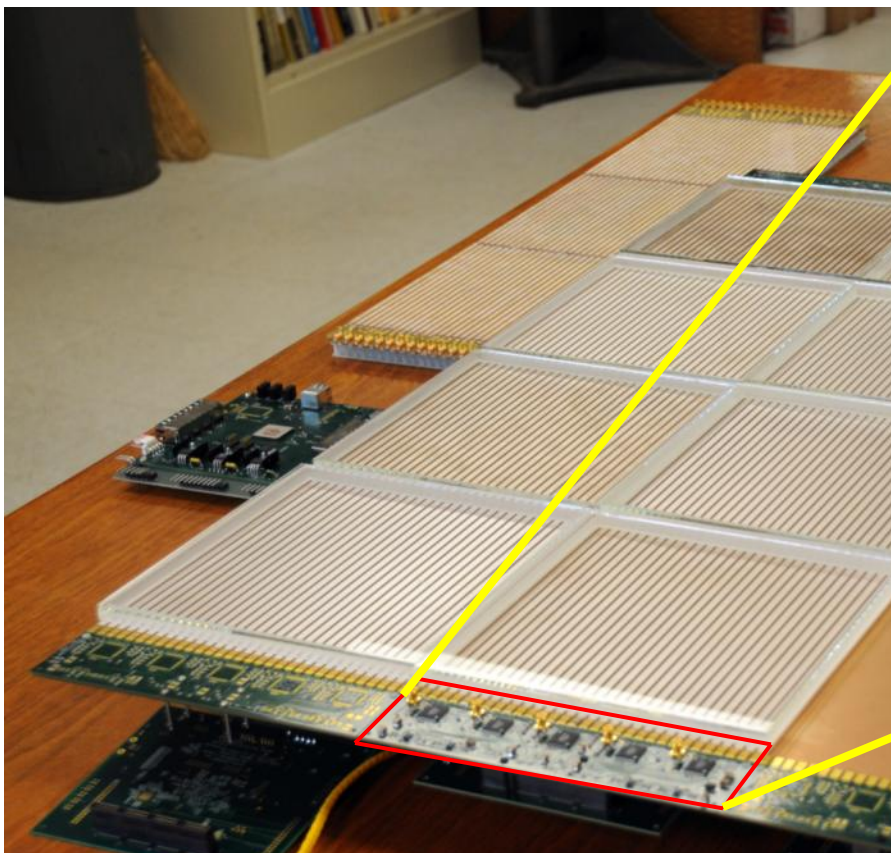
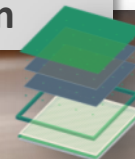
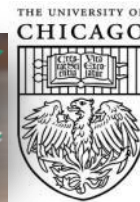


# Super Module DAQ: actual hardware



# Super Module DAQ

LAPPD Collaboration



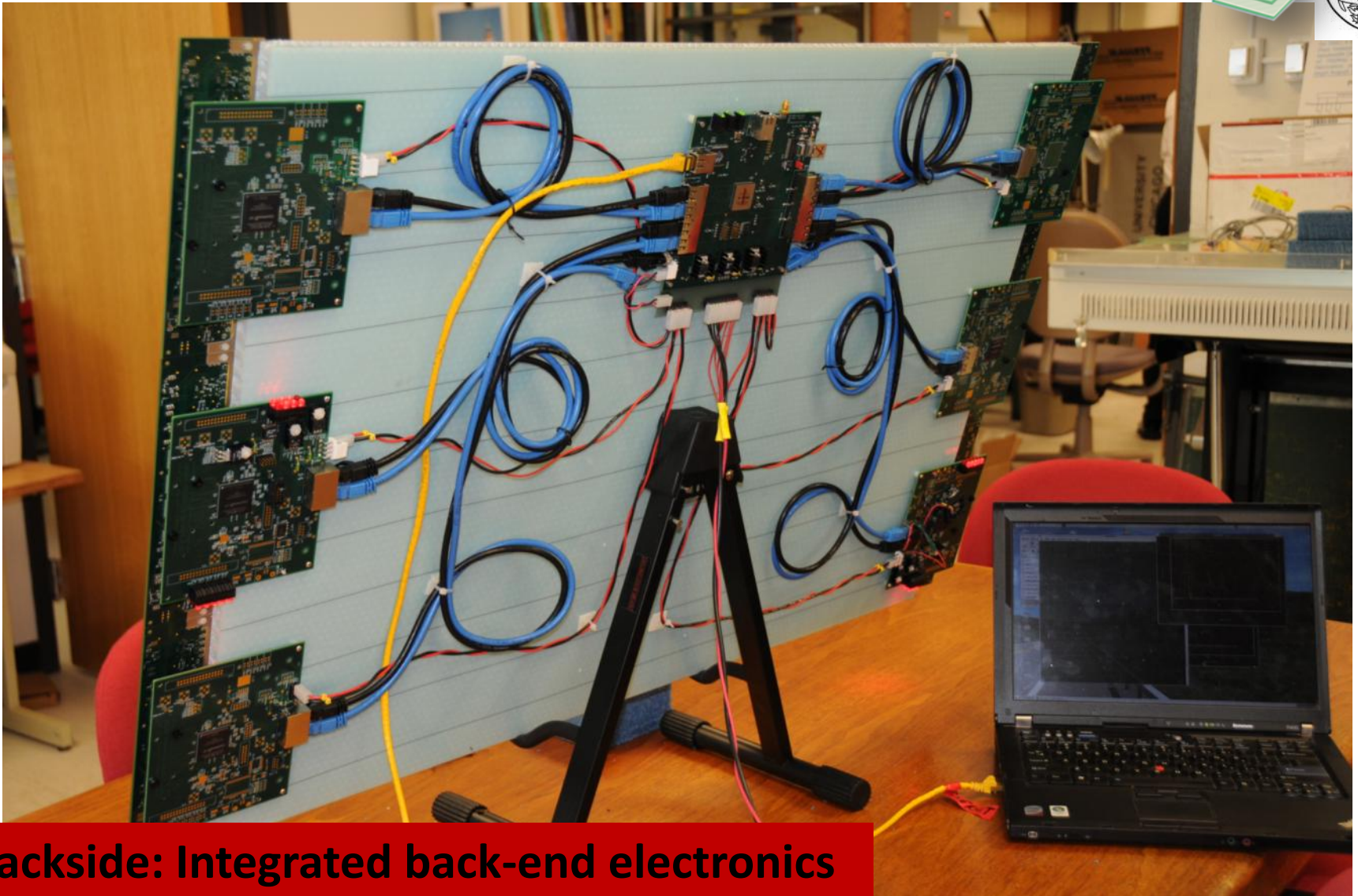
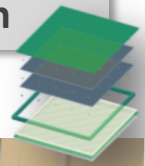
**PSEC-4 is baseline ASIC for system, but back-end electronics may accommodate any waveform sampler with 1.2 or 2.5 V standard**  
*`application specific'.* DRS4 (PSI), IRS/BLAB (Hawai'i), etc.

**Analog Card – 5 PSEC-4 ASICs (30 channels)**  
-6 Analog Cards per SuMo  
-A/D conversion on -chip  
-flexibility allows for integration of **alternative front-end ASICs**



# Super Module DAQ

LAPPD Collaboration



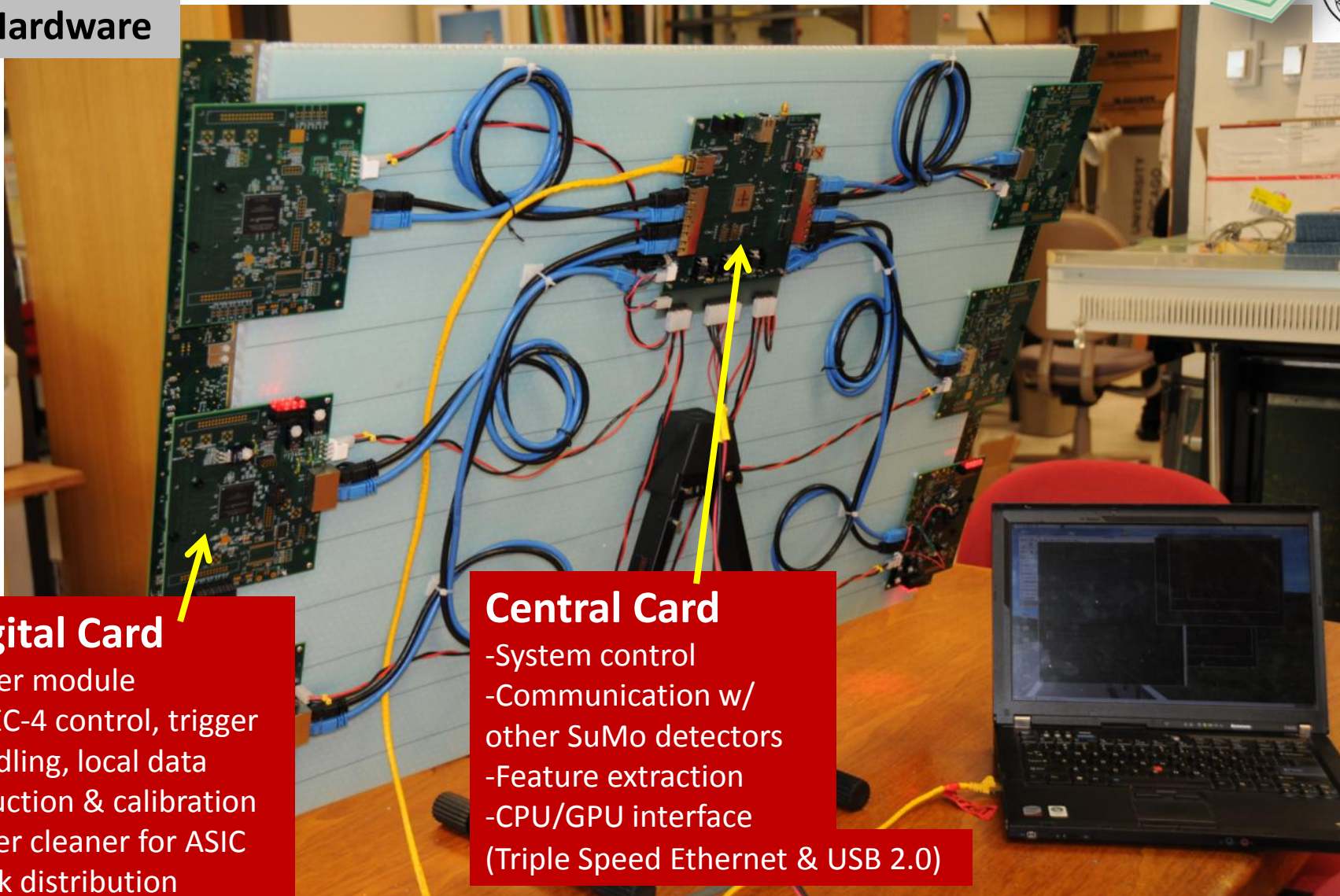
**Backside: Integrated back-end electronics**

# Super Module DAQ

LAPPD Collaboration



## Hardware



### Digital Card

- 6 per module
- PSEC-4 control, trigger handling, local data reduction & calibration
- Jitter cleaner for ASIC clock distribution

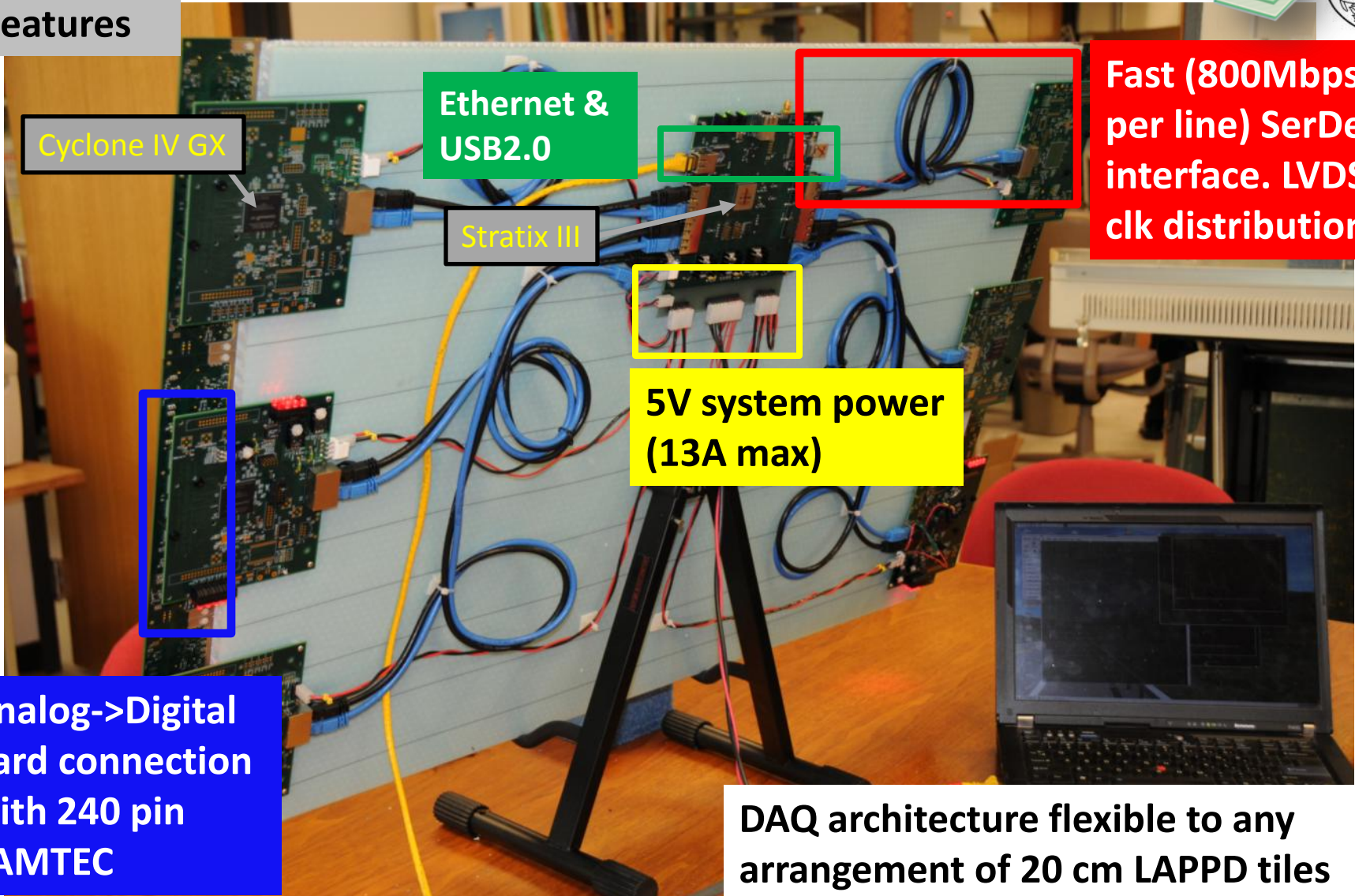
### Central Card

- System control
- Communication w/ other SuMo detectors
- Feature extraction
- CPU/GPU interface
- (Triple Speed Ethernet & USB 2.0)



# Super Module DAQ

## Features

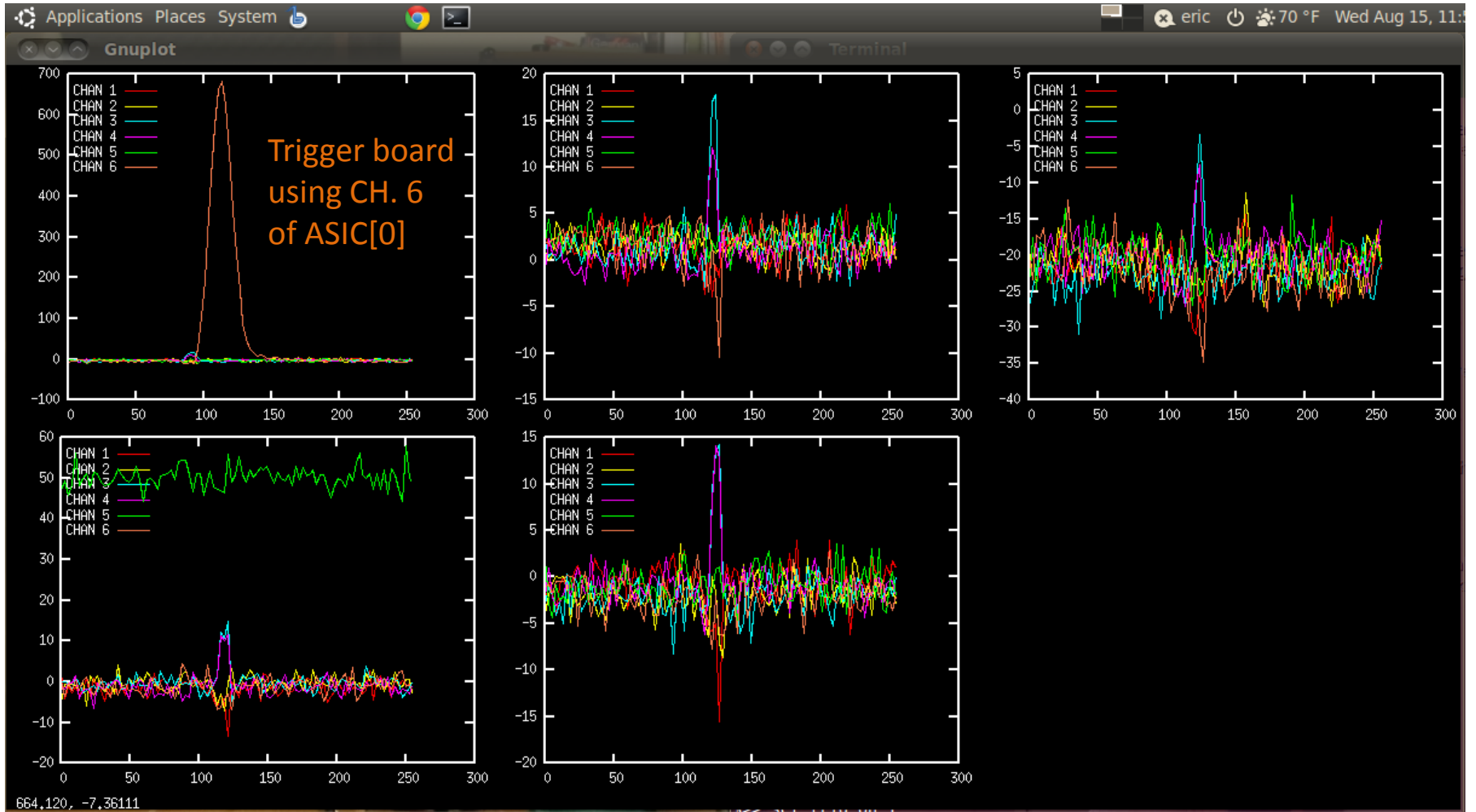


Fast (800Mbps per line) SerDes interface. LVDS clk distribution.

Analog->Digital Card connection with 240 pin SAMTEC

DAQ architecture flexible to any arrangement of 20 cm LAPPD tiles

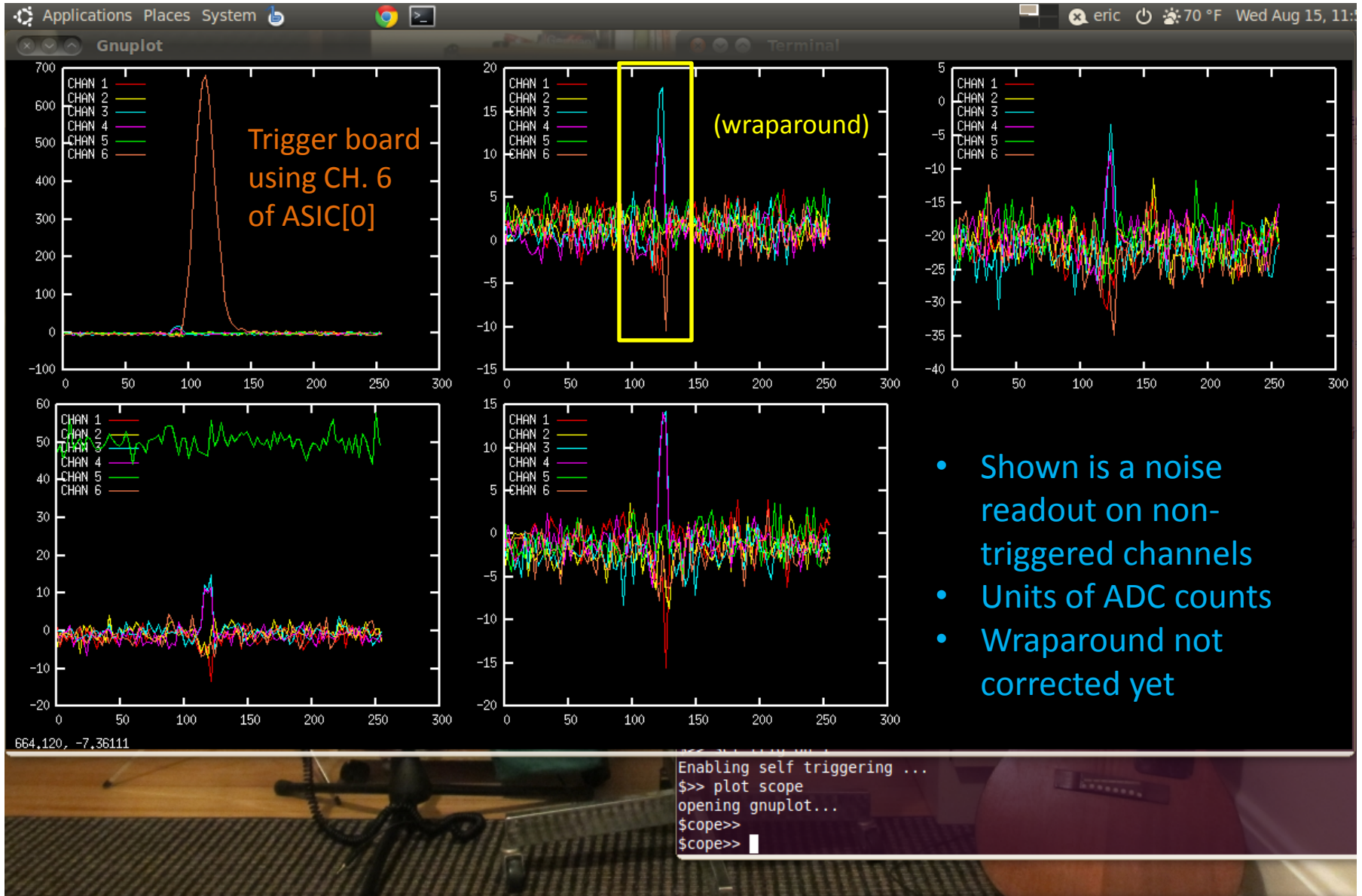
# Analog Card Waveform Viewer:



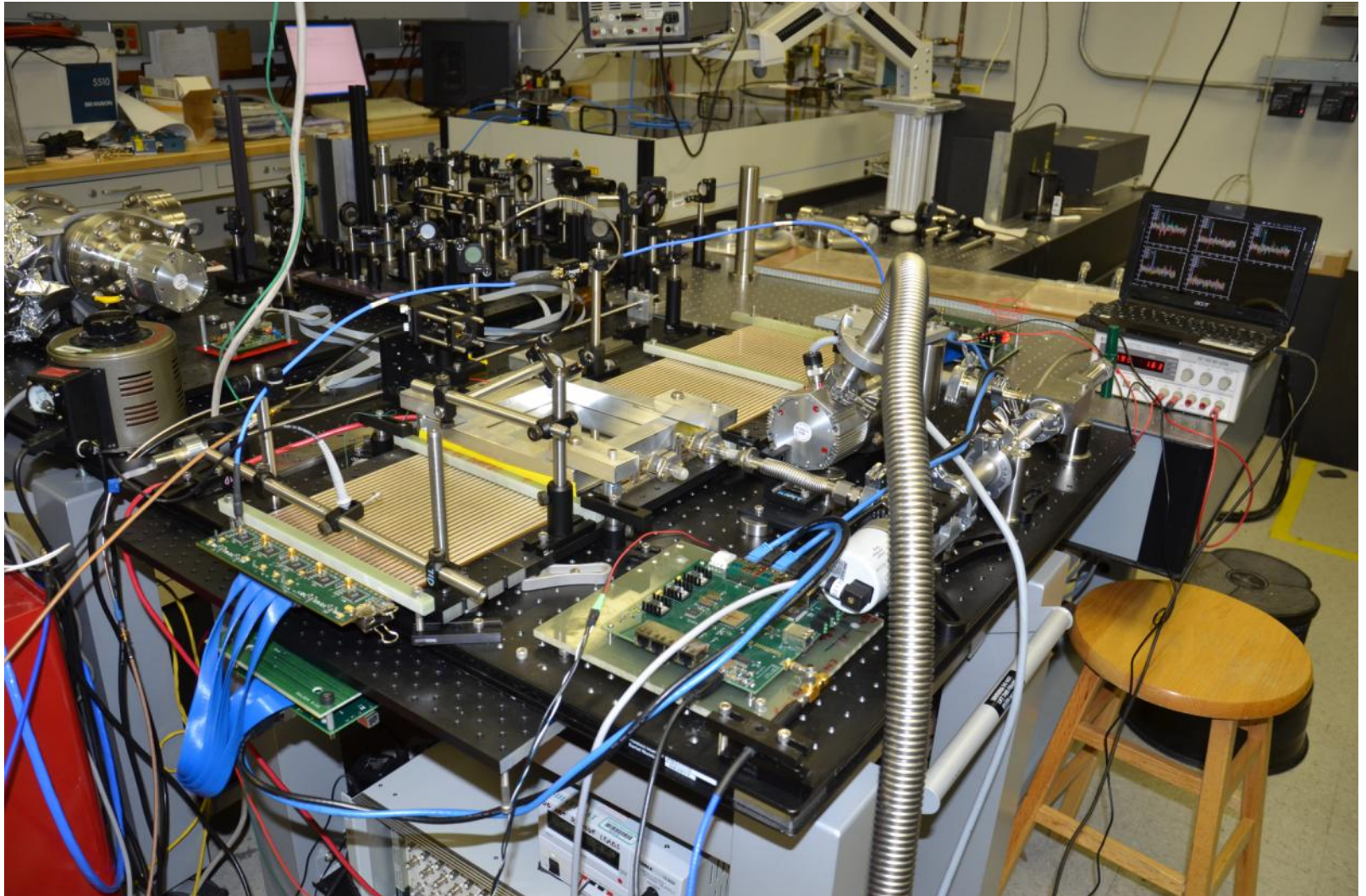
**Open waveform viewer:  
(refreshes on enter)**

```
Enabling self triggering ...  
$>> plot scope  
opening gnuplot...  
$scope>>  
$scope>>
```

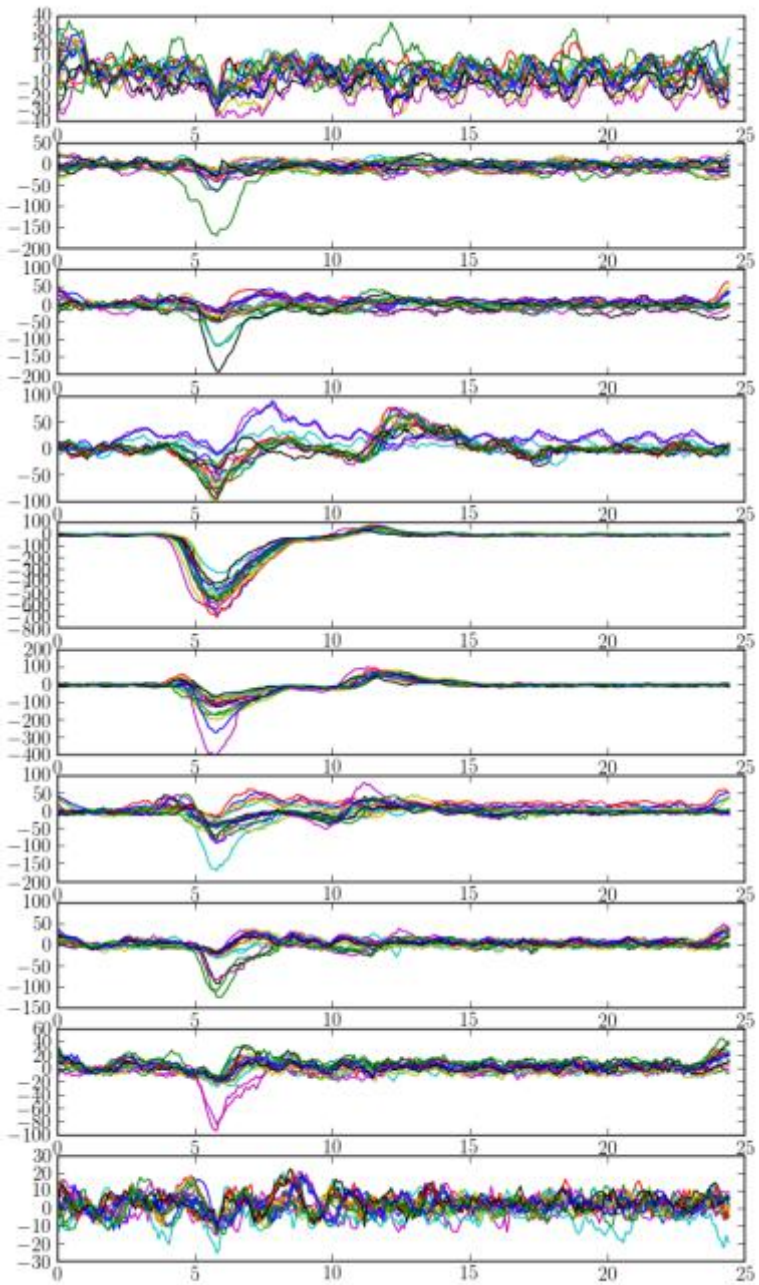
# Analog Card Waveform Viewer:



# Super Module (SuMo) *Vertical Slice* System Testing

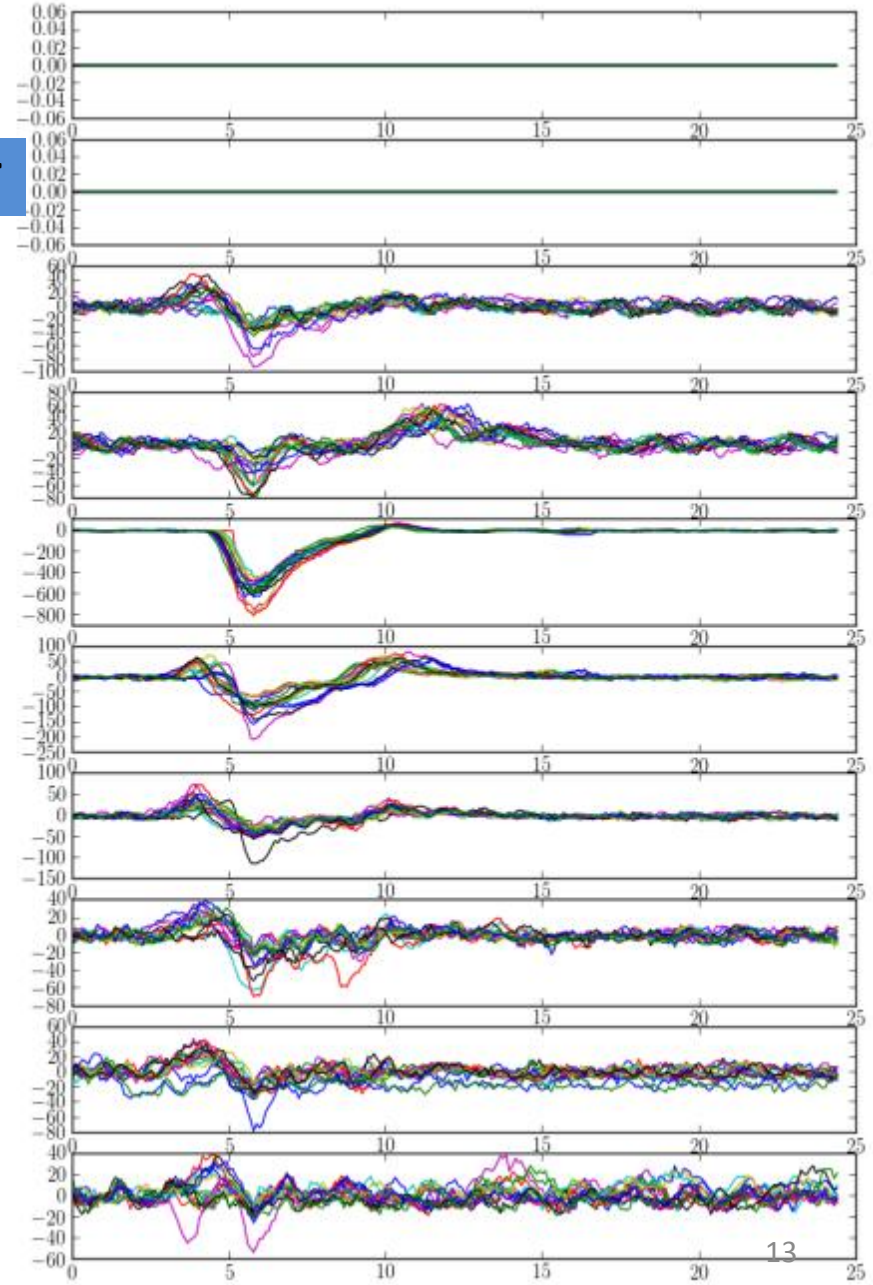


# Dual-end PSEC4 pulse recording (10 strips):



LEFT

RIGHT



# Documentation and Users

Super-Module electronics documentation

*Rev. A\_01*

March 2013

## Introduction

This document gives an overview of the Super-Module (SuMo) DAQ system hardware and acquisition software as a reference for users.

**APS group (Matt,  
Andrey, Sasha, etc.)  
independently  
operating PSEC4  
SuMo DAQ**

## Hardware

assembly:

[empty – assumed already assembled]

power-on order:

1. Turn on Central Card (C.C.). Takes +5 V direct-current power, board will draw 700-800 mA
2. Plug in USB cable between PC and Central Card
3. Turn on Digital Cards (D.C.). Takes +5 V direct-current power, each board will draw 1.6-1.8 A

power-off:

Opposite order of power-on. (turn off D.C.'s first..)

# The End

