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# SRS Status and Lessons Learnt

Sorin Martoiu, CERN

# Outline

## ■ New Front-Ends

- VFAT Hybrid
- Beetle Hybrid *11:00 Lorne Levinson, "SRS Beetle chip carrier design at WIS"*
- MAMMA-BNL *16:40 (Tue) Ken Johns, "First data with the AZ-SRS adapter for BNL chip"*
- Timepix *09:50 Michael LUPBERGER, "Timepix adapter for SRS"*
- other ??

## ■ SRS upgrades and new features

- SRU upgrade
- FEC upgrade *10:30 Jose Toledo, "Update on SRS for the NEXT experiment"*
- Synchronization
- APV zero-suppression

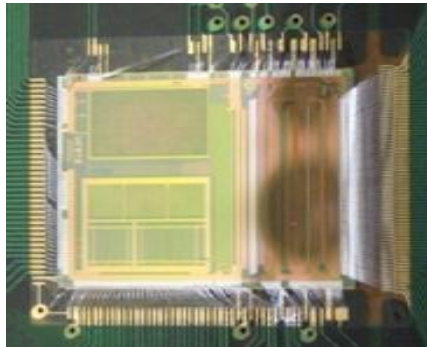
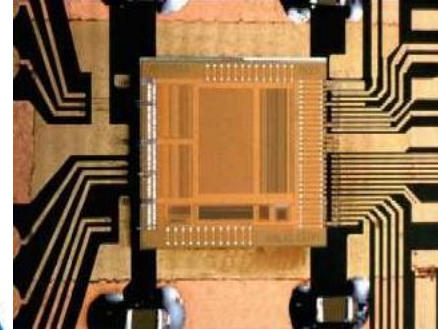
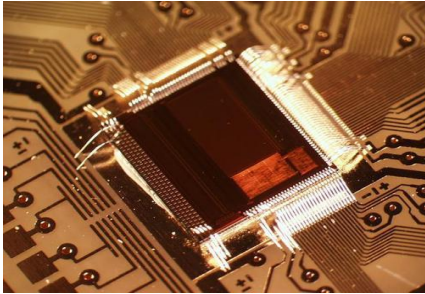
## ■ Lessons

- I want an SRS system for my experiment. What front-end do I choose?
- My SRS system arrived. What do I do next?
- Raw data is no good for me. How can I reduce it?
- I want a bigger system. What are my options?

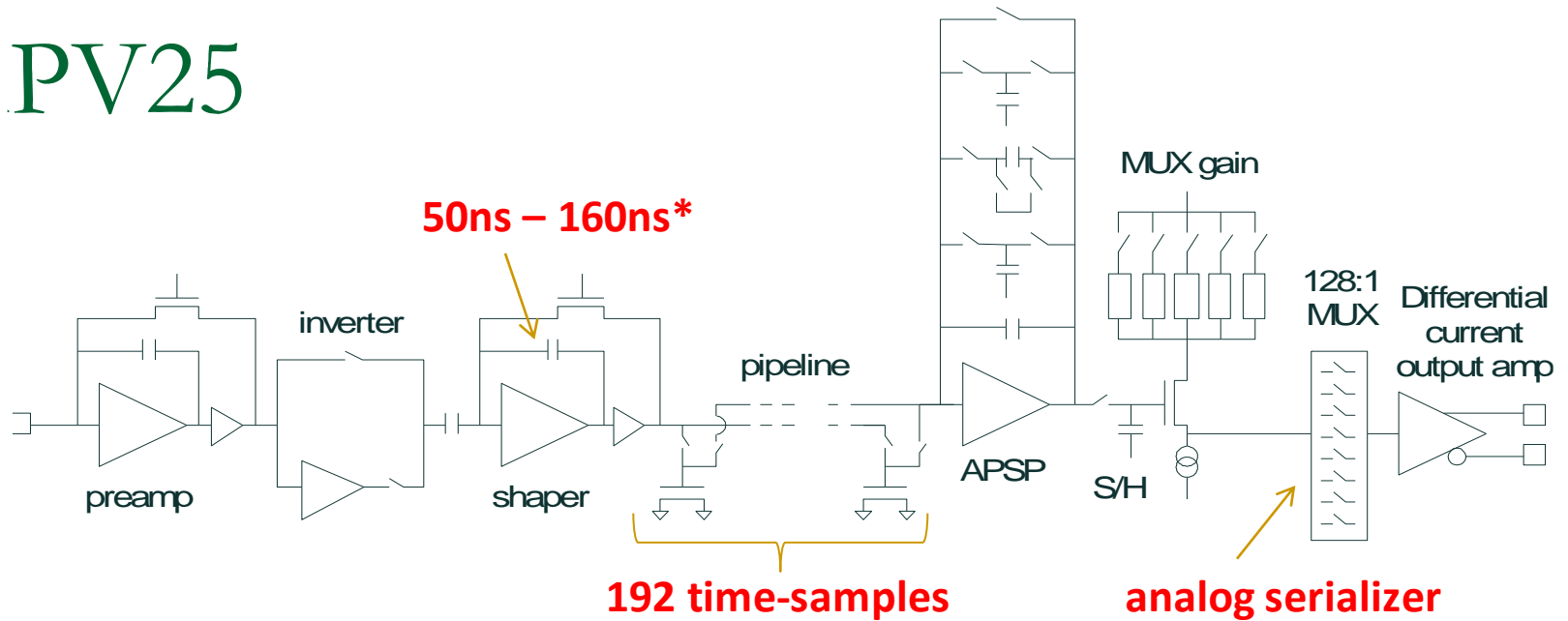
# Outline

- I want an SRS system for my experiment. What front-end do I choose?
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  - other ??
- My SRS system arrived. What do I do next?
  - DAQ software
  - Slow-controls
  - Common issues
- Raw data is no good for me. How can I reduce it?
  - APV zero-suppression
  - FEC upgrade *10:30 Jose Toledo, "Update on SRS for the NEXT experiment"*
- I want a bigger system. What are my options?
  - SRU upgrade
  - Synchronization

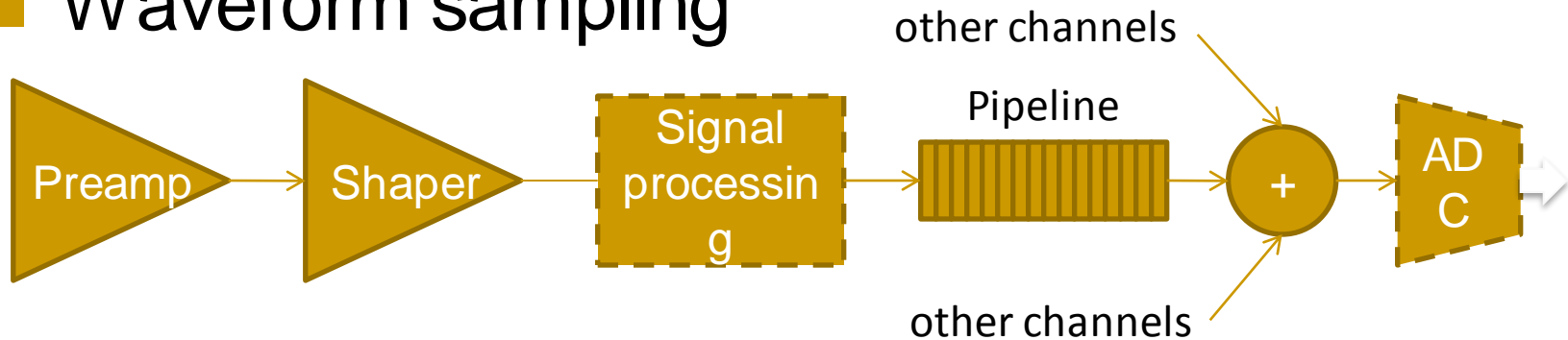
# What front-end do I choose?



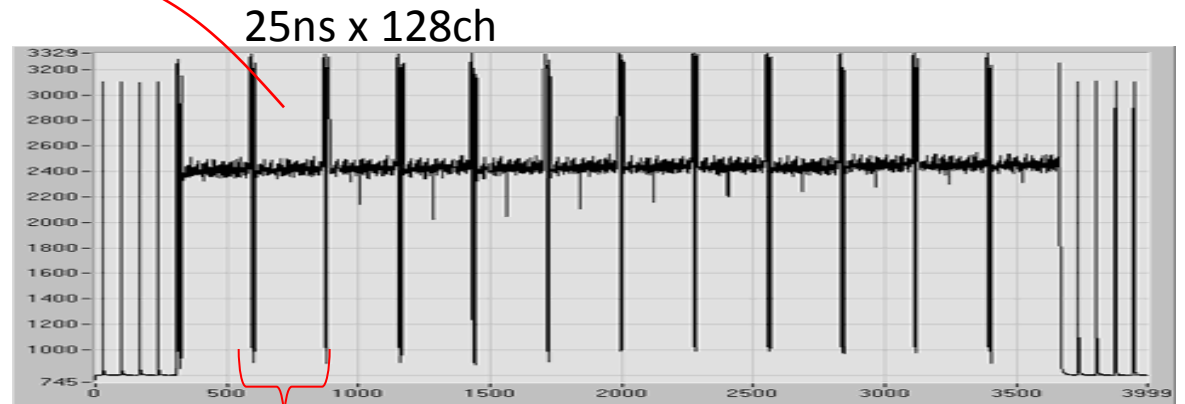
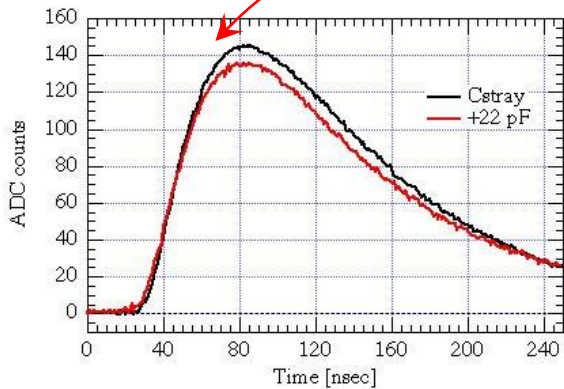
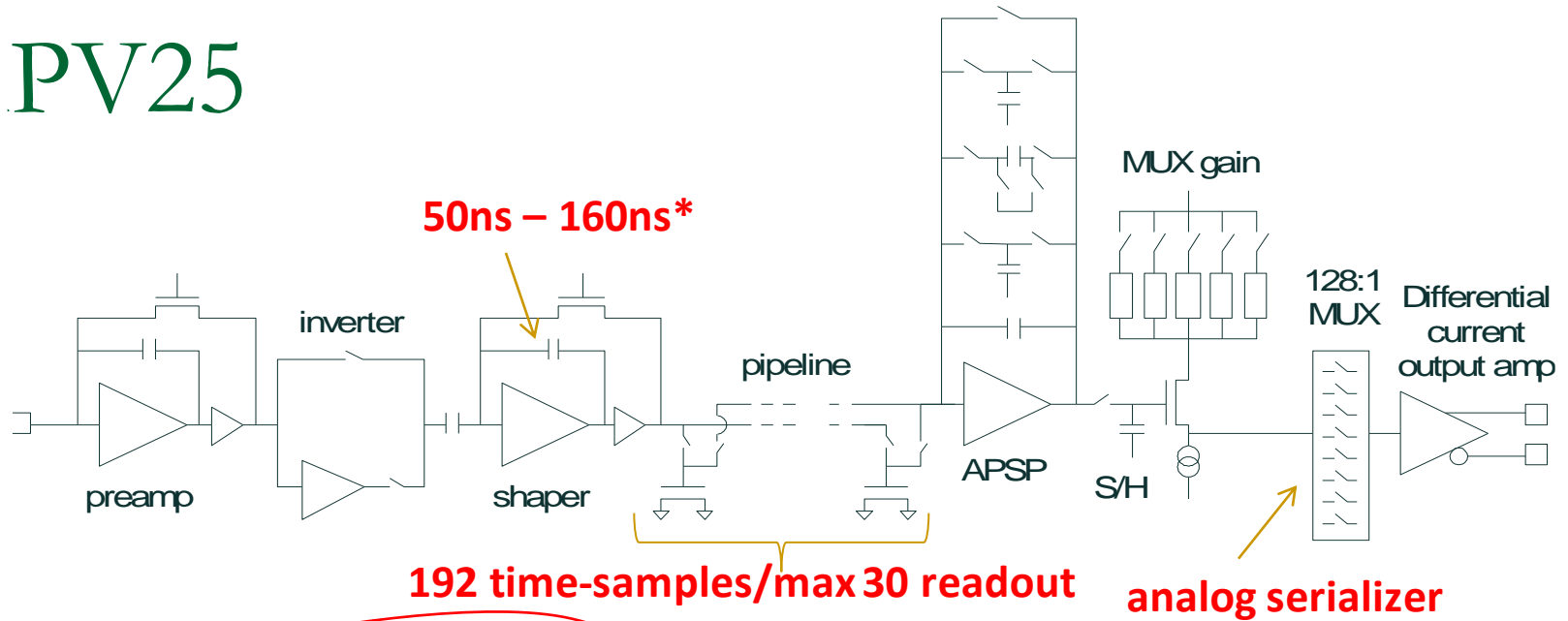
# APV25



## ■ Waveform sampling



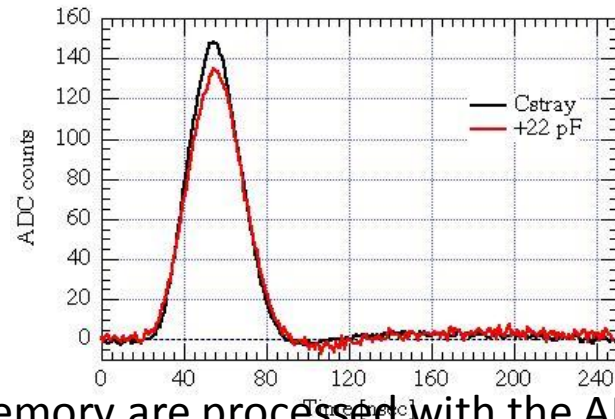
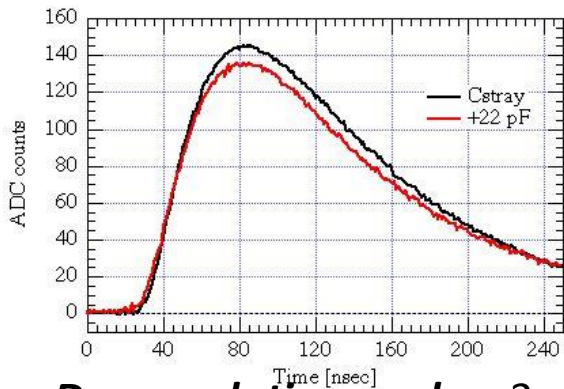
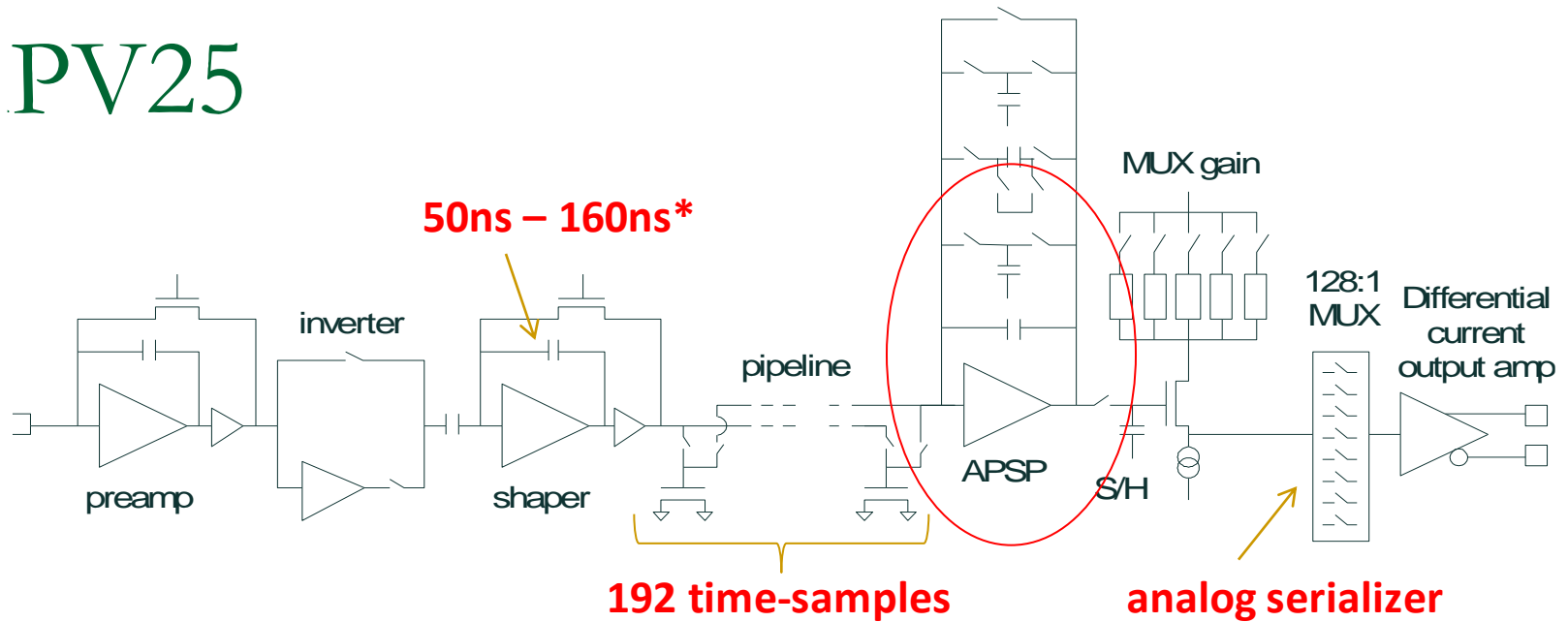
# APV25



3.5us → Max periodic rate = 280kHz (th)

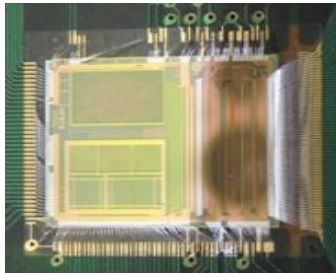
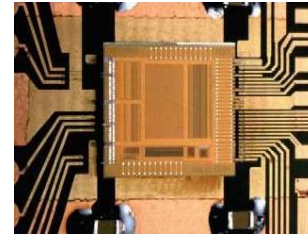
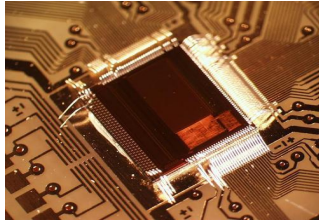
**Peak mode** – there is **NO PEAK FINDER** in the APV25

# APV25



**Deconvolution mode** – 3 samples from the memory are processed with the APSP deconvolution filter which re-filters the data with a shorter time constant

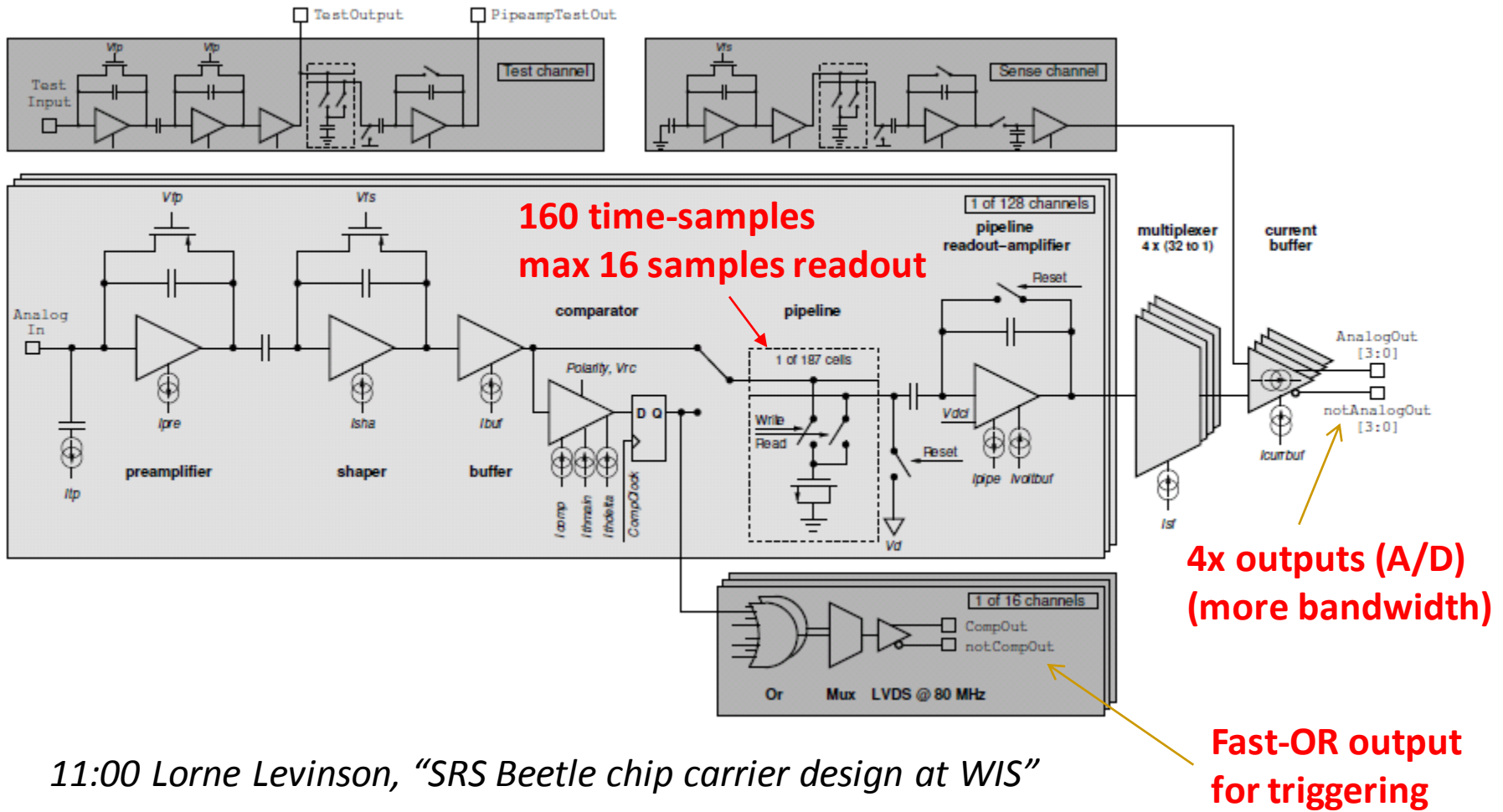
# What front-end do I choose?



What if I need a little more bandwidth or trigger capability?

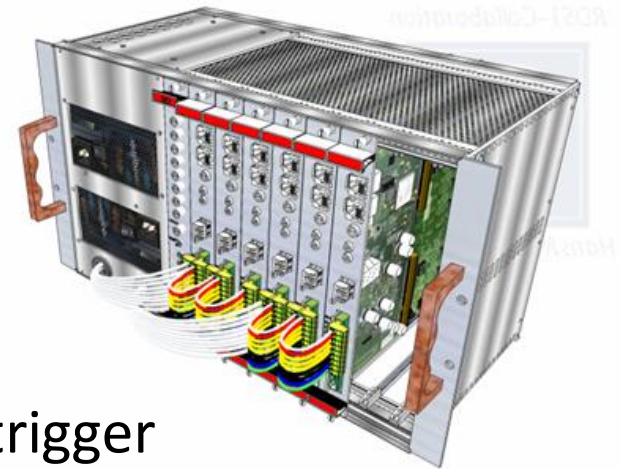
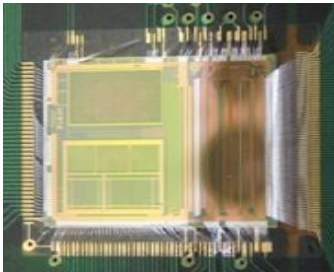
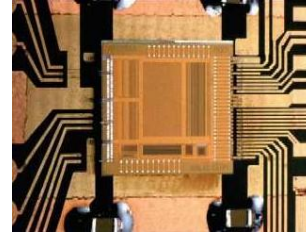
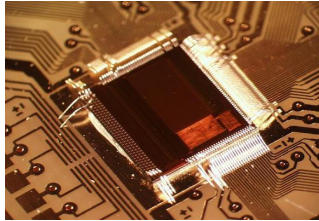


# BEEBLE



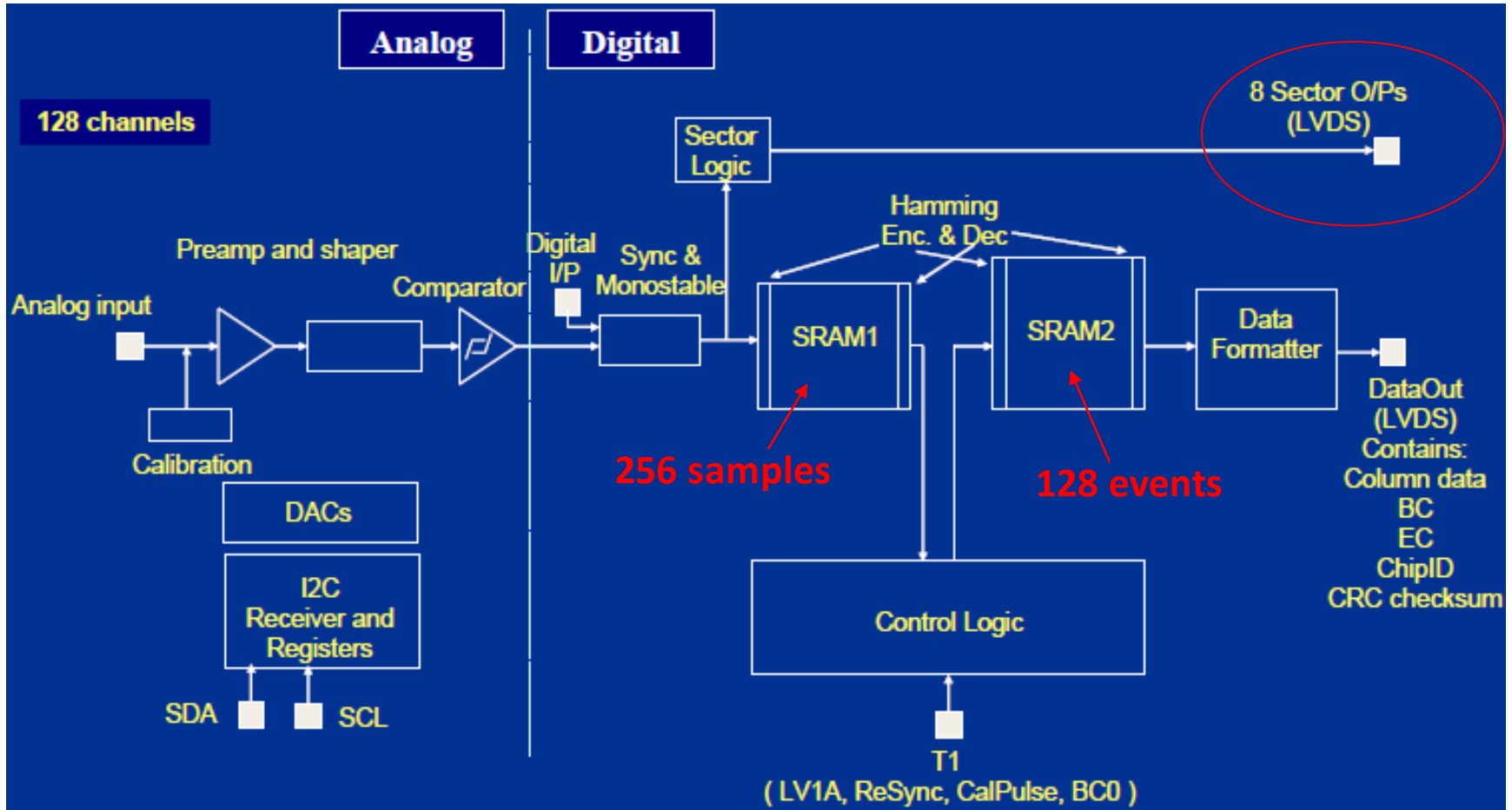
11:00 Lorne Levinson, "SRS Beetle chip carrier design at WIS"

# What front-end do I choose?

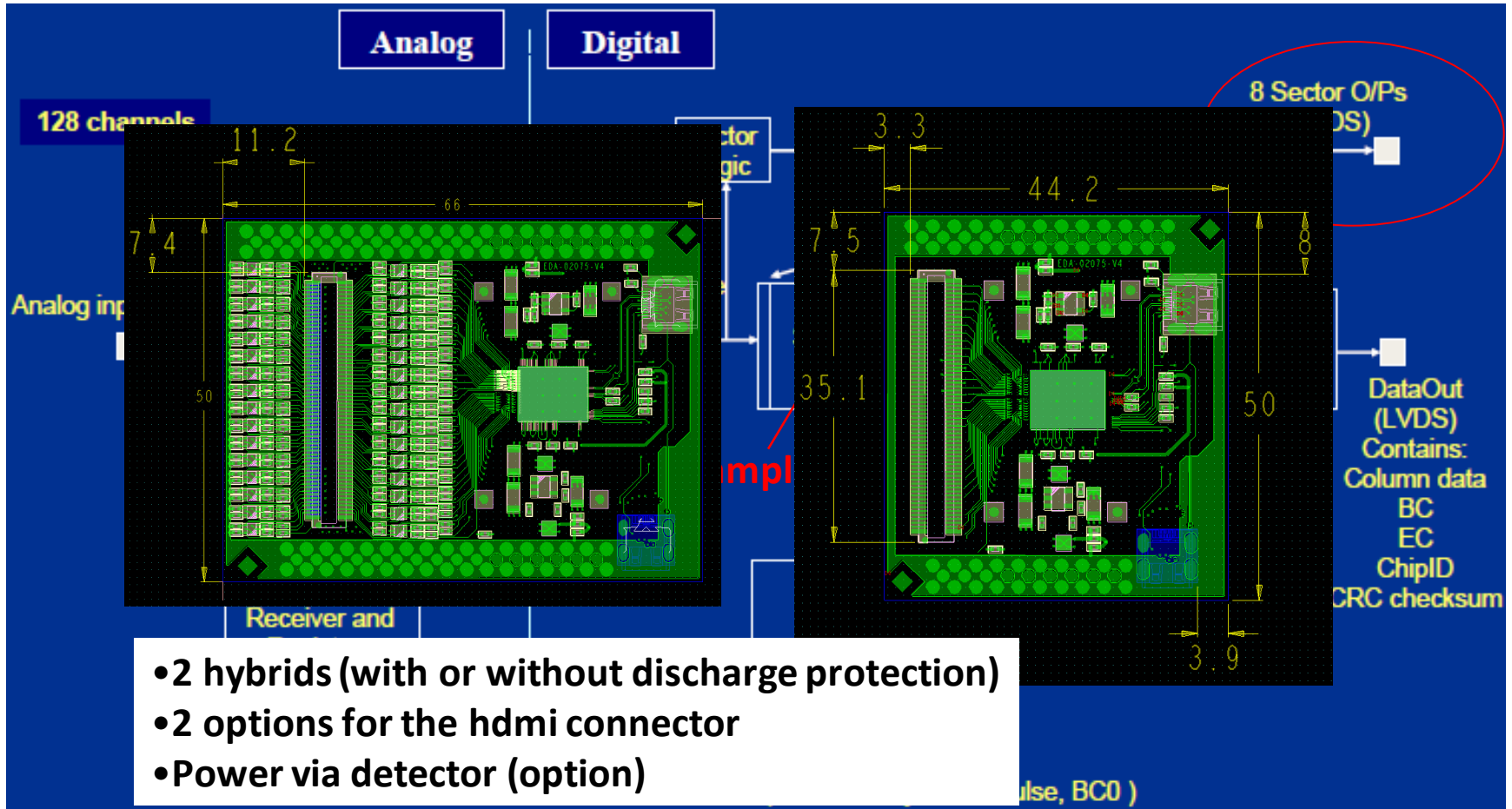


What if I need even faster readout with trigger capability?

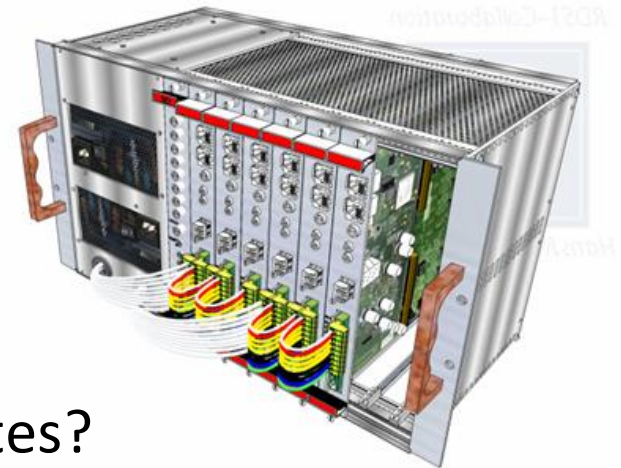
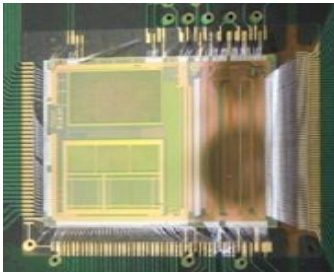
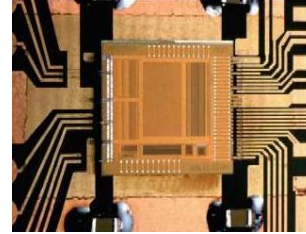
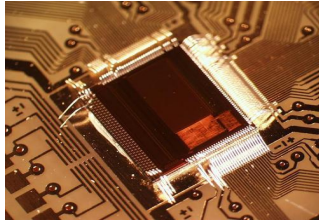
# VFAT



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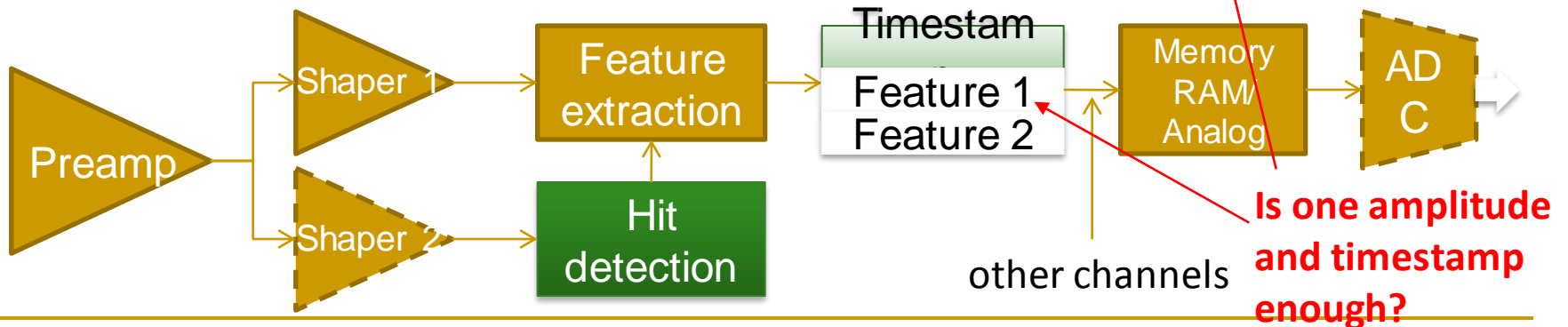
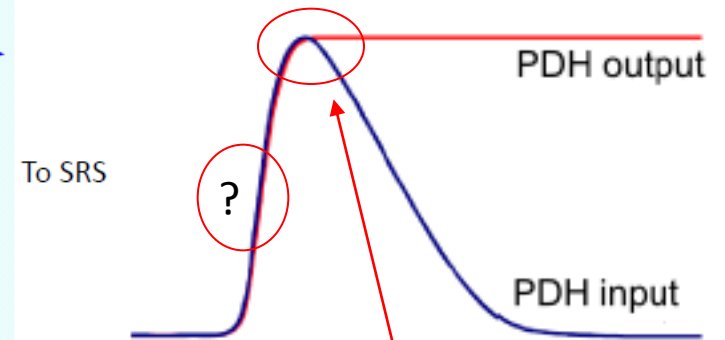
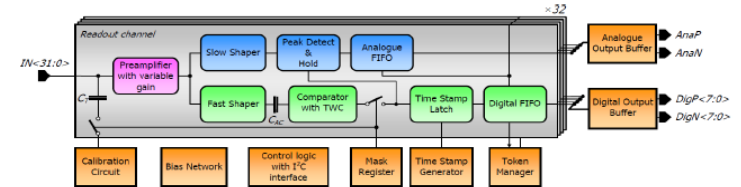
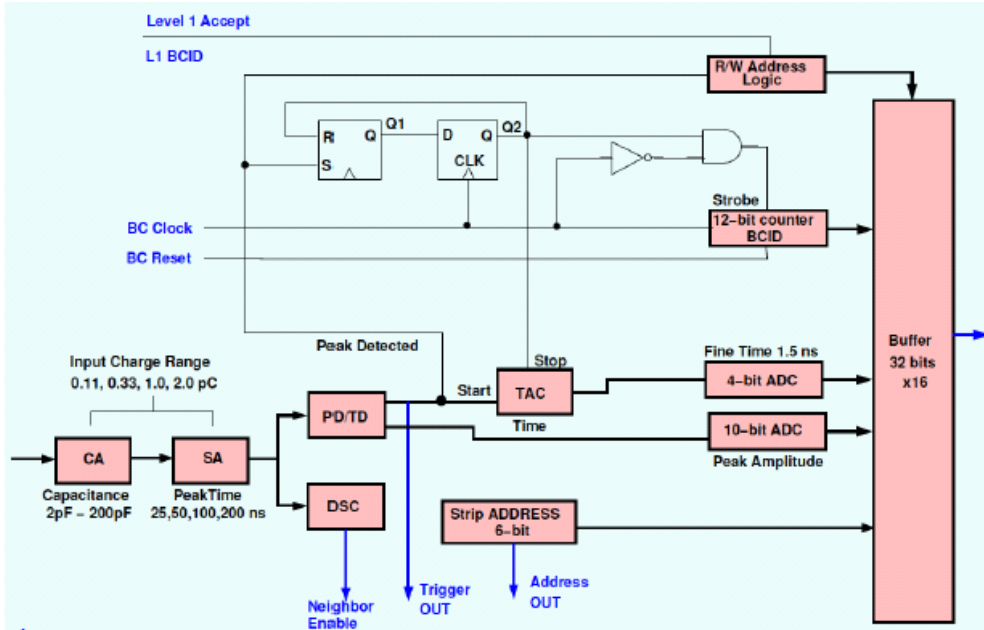


# What front-end do I choose?



What do I do if I have extreme events rates?

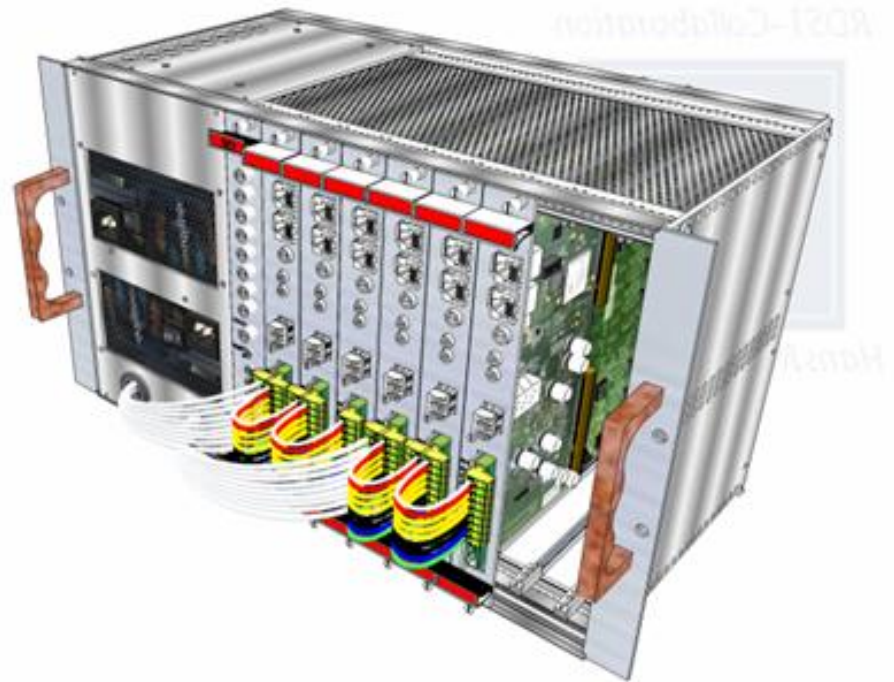
# MAMMA BNL Chip



# Front-End Summary

<b>Hybrid/FE</b>	<b>Status</b>
APV25	Production
Beetle	Prototypin
VFAT	Design
MAMMA-BNL (VMM1)	Chip under design
Timepix	Prototype platform
Other?	Any MPGD general-purpose FE ASIC?

# My SRS system arrived. What do I do next?





# My SRS system arrived. What do I do next?

## Software Options

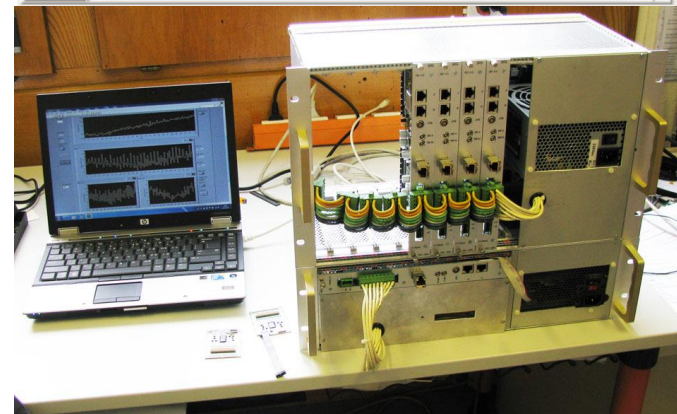
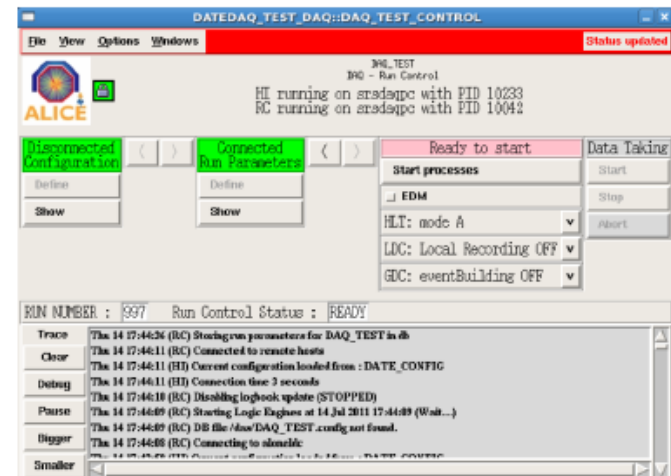
### ■ DATE

- ❑ Linux
- ❑ Complete DAQ package designed for ALICE
- ❑ Allow the integration of many FEC boards (large systems)

### ■ Labview

- ❑ Any platform (?)
- ❑ Under development (09:05 – Riccaro De Asmundis)

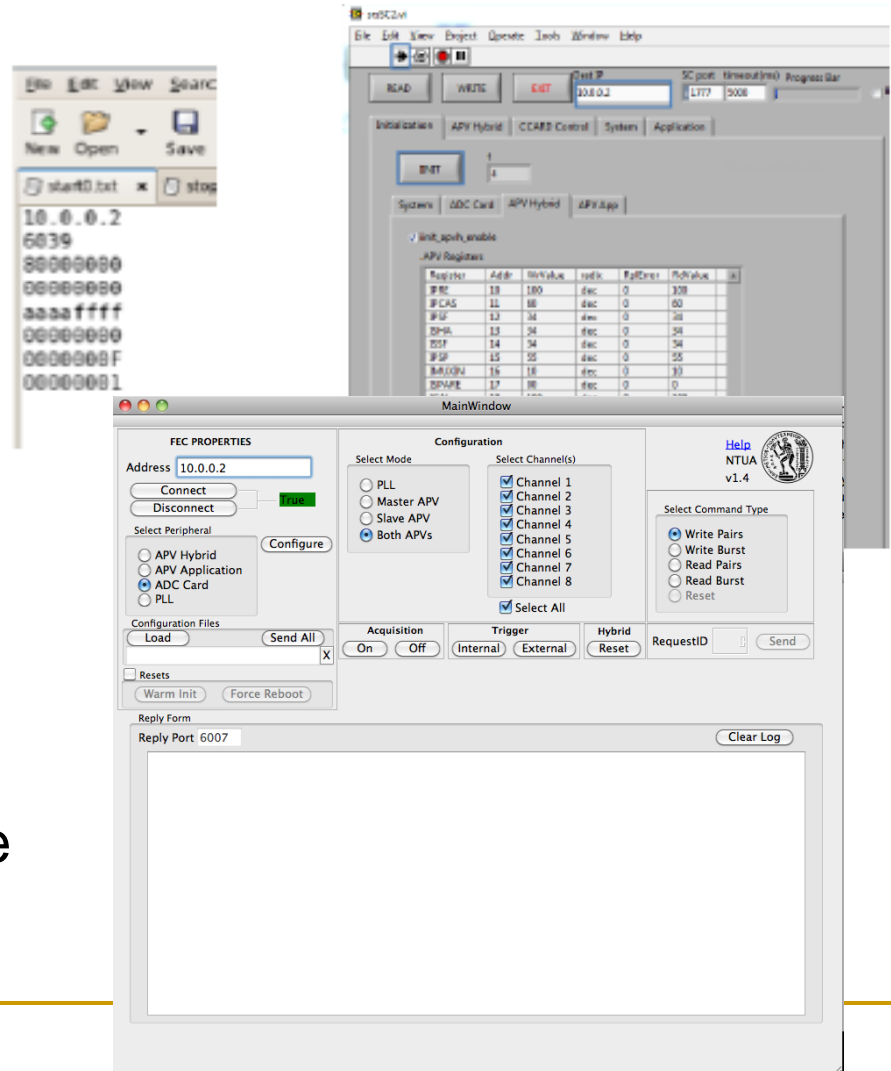
### ■ Other (mmDAQ,...)



# My SRS system arrived. What do I do next?

## Slow-Control Software

- Script (used with DATE)
  - Linux
- SDC (ATLAS-RD51)
  - Any platform
- Labview
  - Any platform



Documentation on the website

# My SRS system arrived. What do I do next?

<b>Common issues</b>	<b>Resolution</b>
I cannot connect to the system	Disable all firewalls and security systems
What is the right configuration?	<ul style="list-style-type: none"><li>■ <i>Safe start-up configuration package</i></li><li>■ Documentation -&gt; SRS website</li></ul>
I cannot find my signals	Trigger latency scan: <i>(semi-) automatic signal finding routine (with zero-suppression code)</i>
I am loosing triggers	Synchronization issues under investigation Sufficient trigger width (> 50ns)
Need more help	SRS website (documentation, support discussion board, common issues)

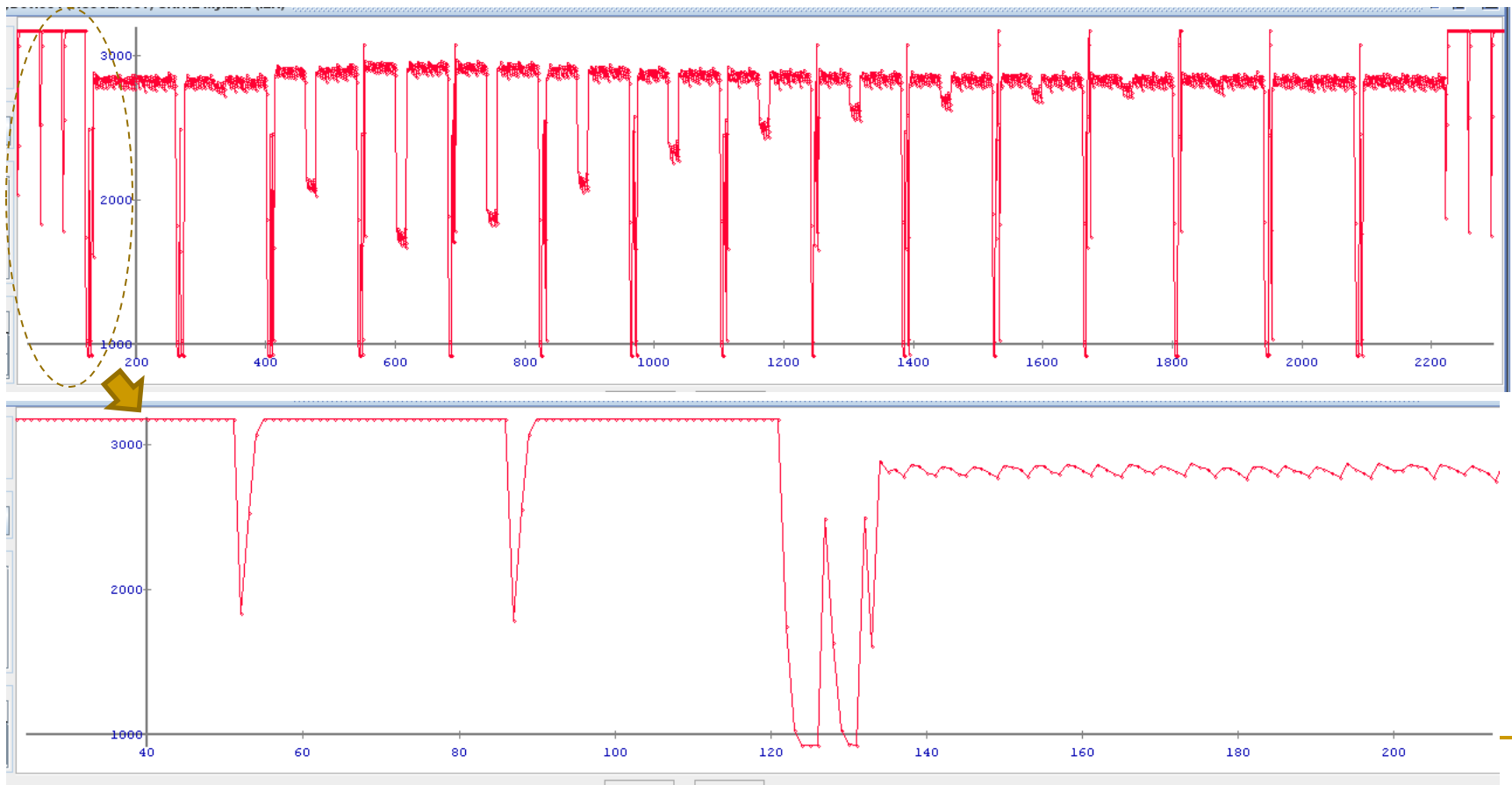
# Raw event size is too big

Zero-suppression code (under development/test  
– Raffaele Giordano, INFN Napoli)

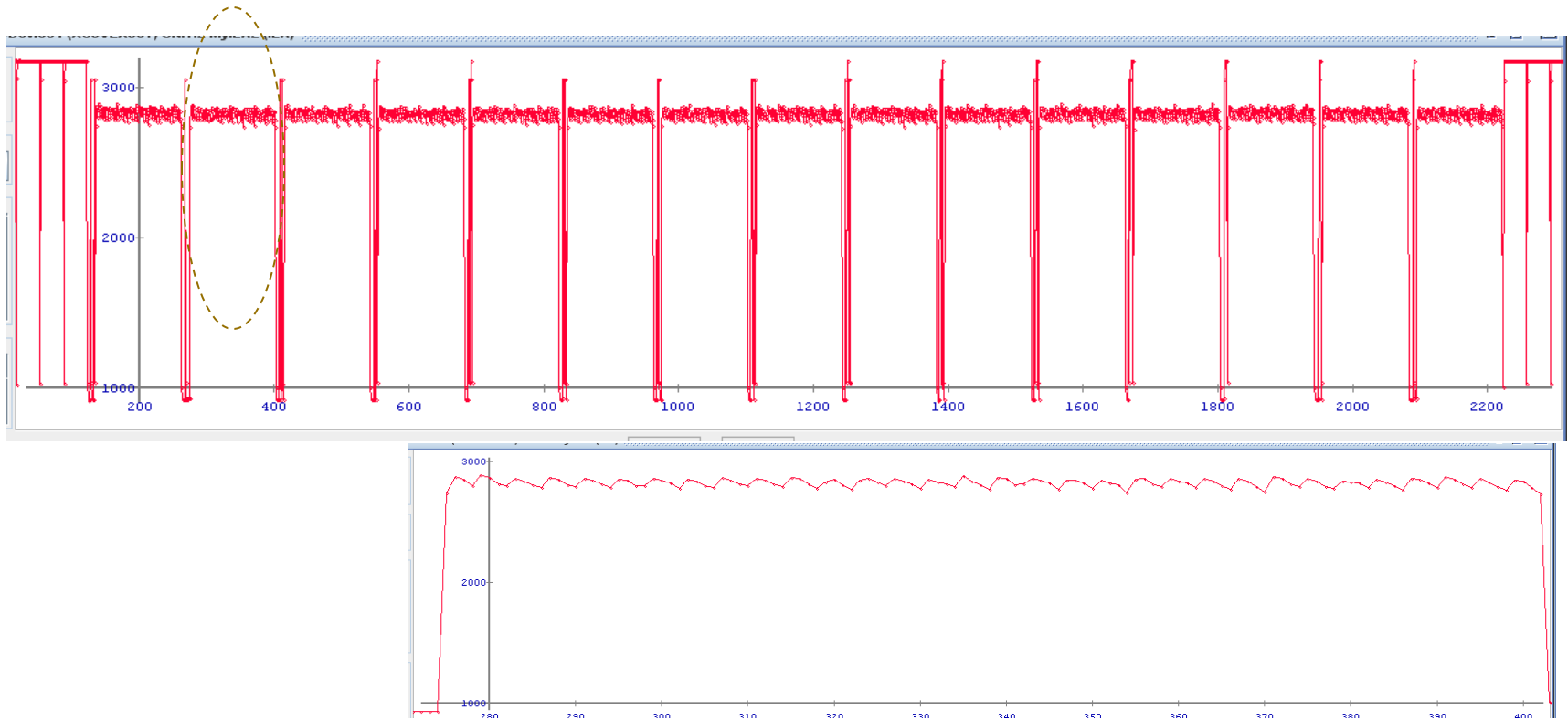
- Readout synchronization
  - Clock skew adjustment
  - Pedestal and noise acquisition
  - (common-mode correction)
  - ... and finally zero-suppression
- 
- FPGA resources -> limited to 15 time-samples
  - FEC upgrade (10:30 – Jose Toledo Alarcon)

# Clock fine adjustment

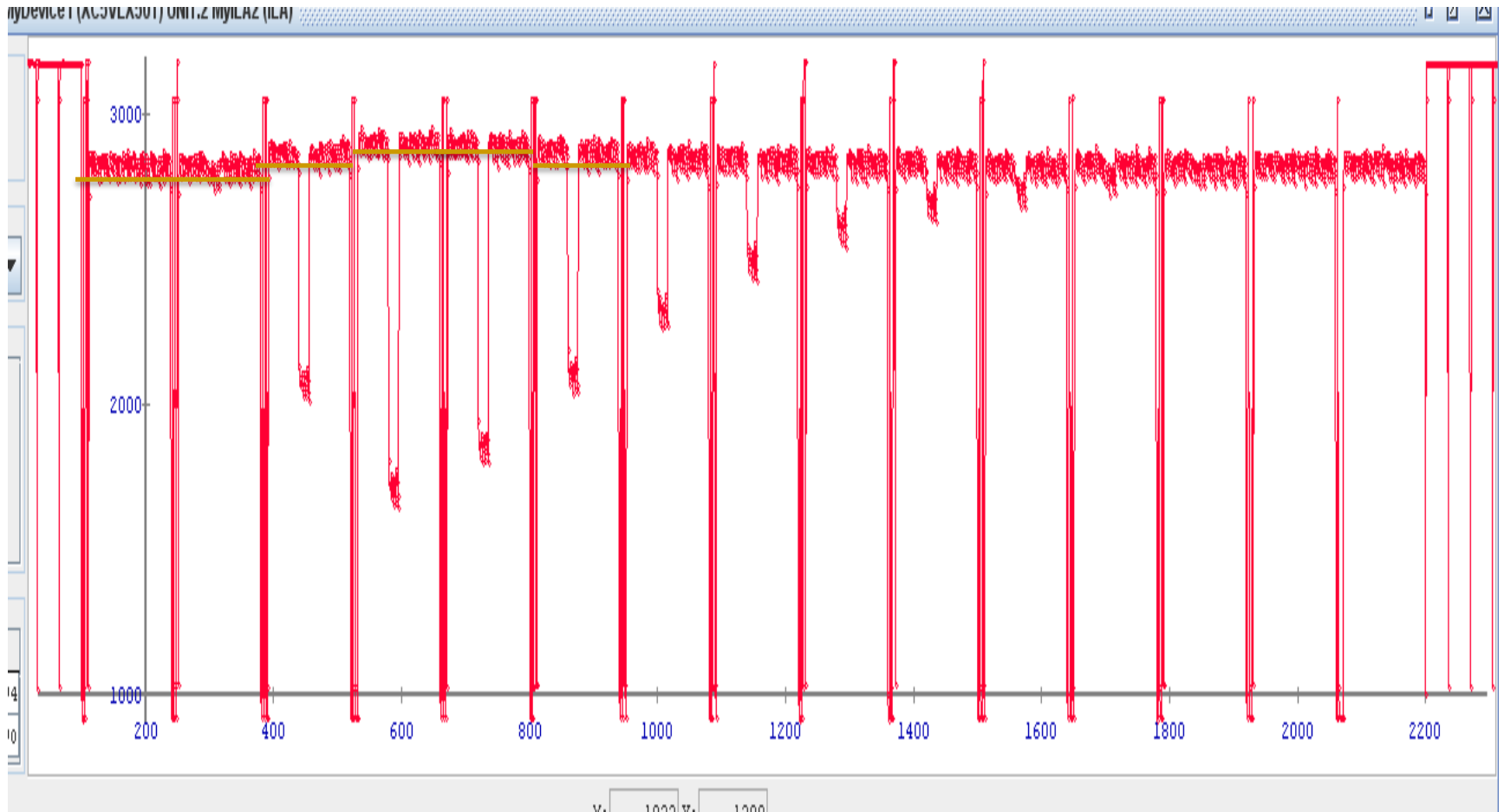
## ■ Wrong clock-edge sampling



# Pedestal correction

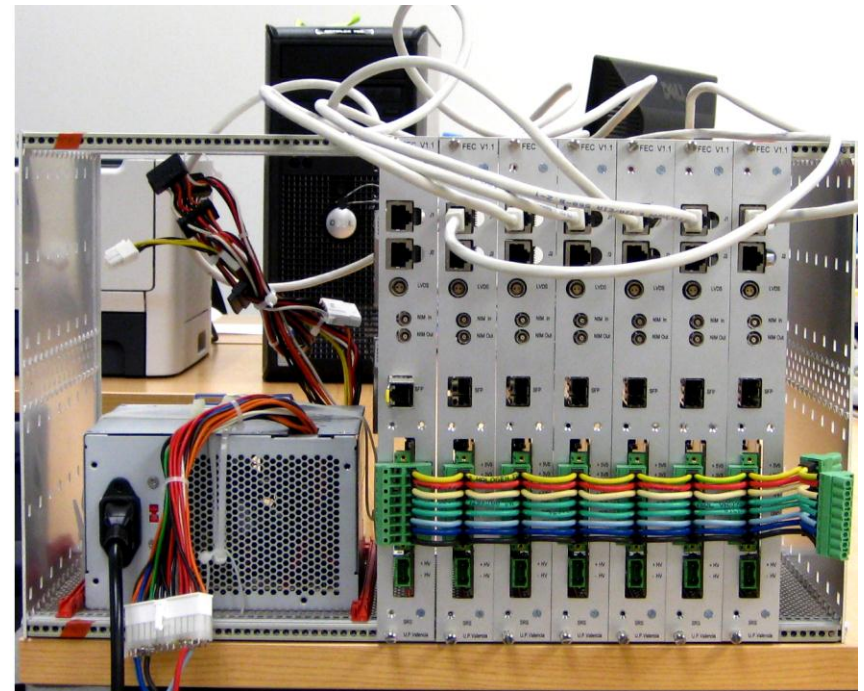


# Common-mode correction



# I need a bigger system

- Network switch
  - Medium-size system
  - Synchronization
- SRU
  - Medium and large systems
  - Builtin synchronization
  - Firmware under development



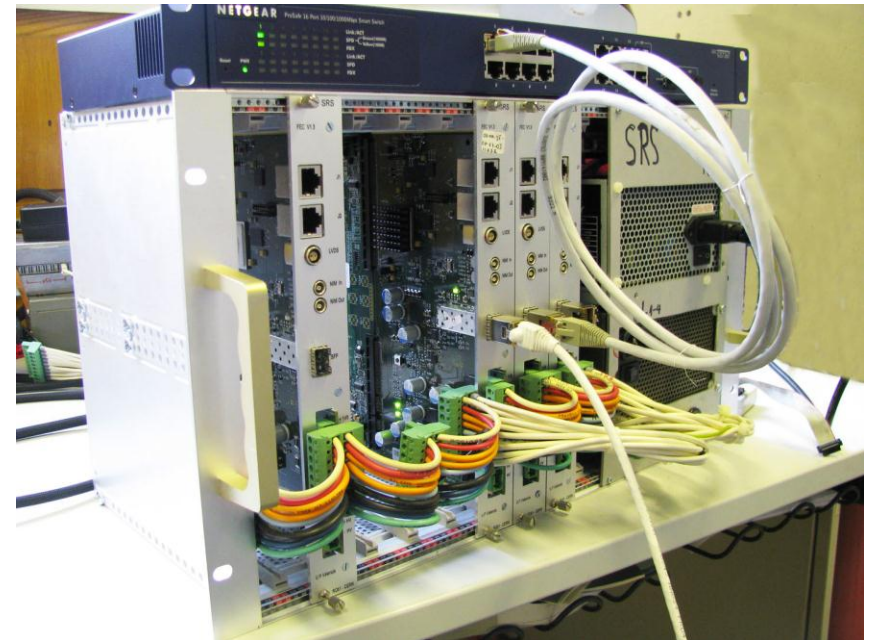


# I need a bigger system

## Network Switch

### Synchronization issues

- Clock
  - Free-running (timestamp-based checks in DAQ)
  - Ethernet clock
  - C&T distribution card
- Trigger
  - NIM distribution
  - C&T distribution card



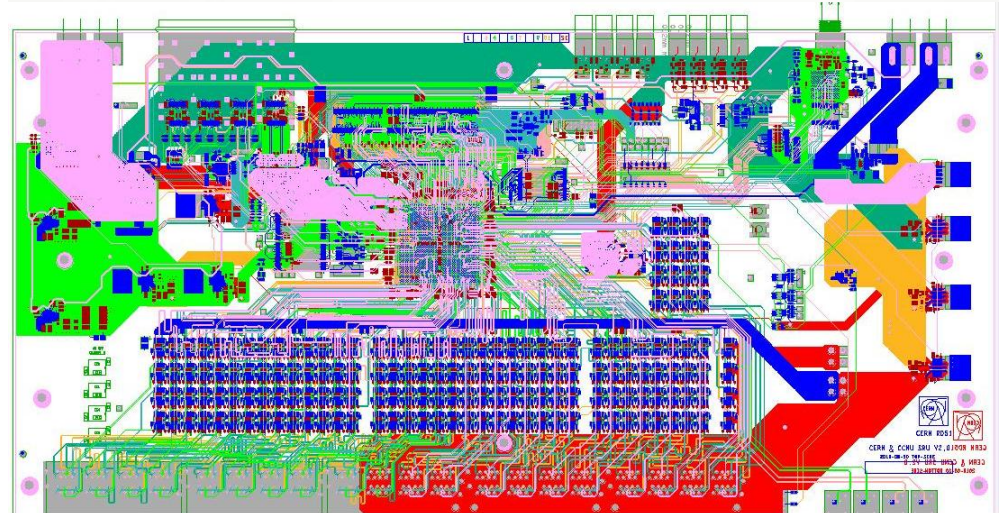
# SRU Upgrade

## SRU revision 1 tests:

- ✓GbETH
- ✓ALICE DDL (2Gbs)
- ✓SO-DIMM DDR3 (2GB)
- ✓TTC
- ✓DTC (ALICE version)
- ✓Remote configuration (BPI Flash)

## SRU revision 2 upgrades:

- 10 GbE PHY
- Jitter-cleaner PLL for TTCrx clock
- minor bug fixes



# Summary. Things to be done

- New front-ends
  - Hardware under design
  - *Firmware, software,...*
  - *Common data format?*
- Small and medium size SRS systems
  - Some hardware issues (trigger, synchronization)
  - DAQ traffic control (busy, packet scheduling...)
- Firmware
  - APV zero-suppression under development
  - Automation tools (signal processing, gain calibration, trigger latency adjustment,...)
  - Remote configuration (dynamic with current FEC version/static with next version)
  - SRU firmware
- Software
  - Documentation and user support (SRS website, etc.)
  - Different DAQ packages. Common software platform?

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Thank you!

# SRS Website

https://espace.cern.ch/rd51-wg5/srs/

The screenshot shows a web browser window displaying the SRS User Support page. The browser's address bar shows the URL `https://espace.cern.ch/rd51-wg5/srs/`. The page header includes the CERN logo and the text "Scalable Readout System (SRS)". A search bar contains the text "This List: SRS User Support". The main navigation menu includes "Home", "Chip Matrix", "SRS", and "wiki". The page title is "SRS User Support". On the left side, there is a sidebar with categories: "View All Site Content", "Surveys", "Documents", "Discussions", and "Pictures". Under "Documents", "Documentation" is circled in red. Under "Discussions", "SRS User Support" and "SRS Documentation Feedback" are circled in red. The main content area displays a table of support topics with columns for "Subject", "Created By", "Replies", and "Last Updated". The "View" dropdown is set to "Subject".

Subject	Created By	Replies	Last Updated
No data from Channels 4,5,6,7 of the FEC card	Sorin Martoiu	0	14/11/2011 11:51 AM
No data from Channels 4,5,6,7 of the FEC card	Sorin Martoiu	0	03/11/2011 09:13 PM
No data from Channels 4,5,6,7 of the FEC card	Sorin Martoiu	0	03/11/2011 04:49 PM
byte order	Sorin Martoiu	1	03/11/2011 03:02 PM
FEC card still mute	Sorin Martoiu	1	03/11/2011 03:27 PM
FEC card still mute	Sorin Martoiu	3	03/11/2011 12:42 PM
Nothing from wireshark	Sorin Martoiu	8	03/11/2011 12:34 PM
need your help on that one ...	Sorin Martoiu	3	03/11/2011 12:19 PM