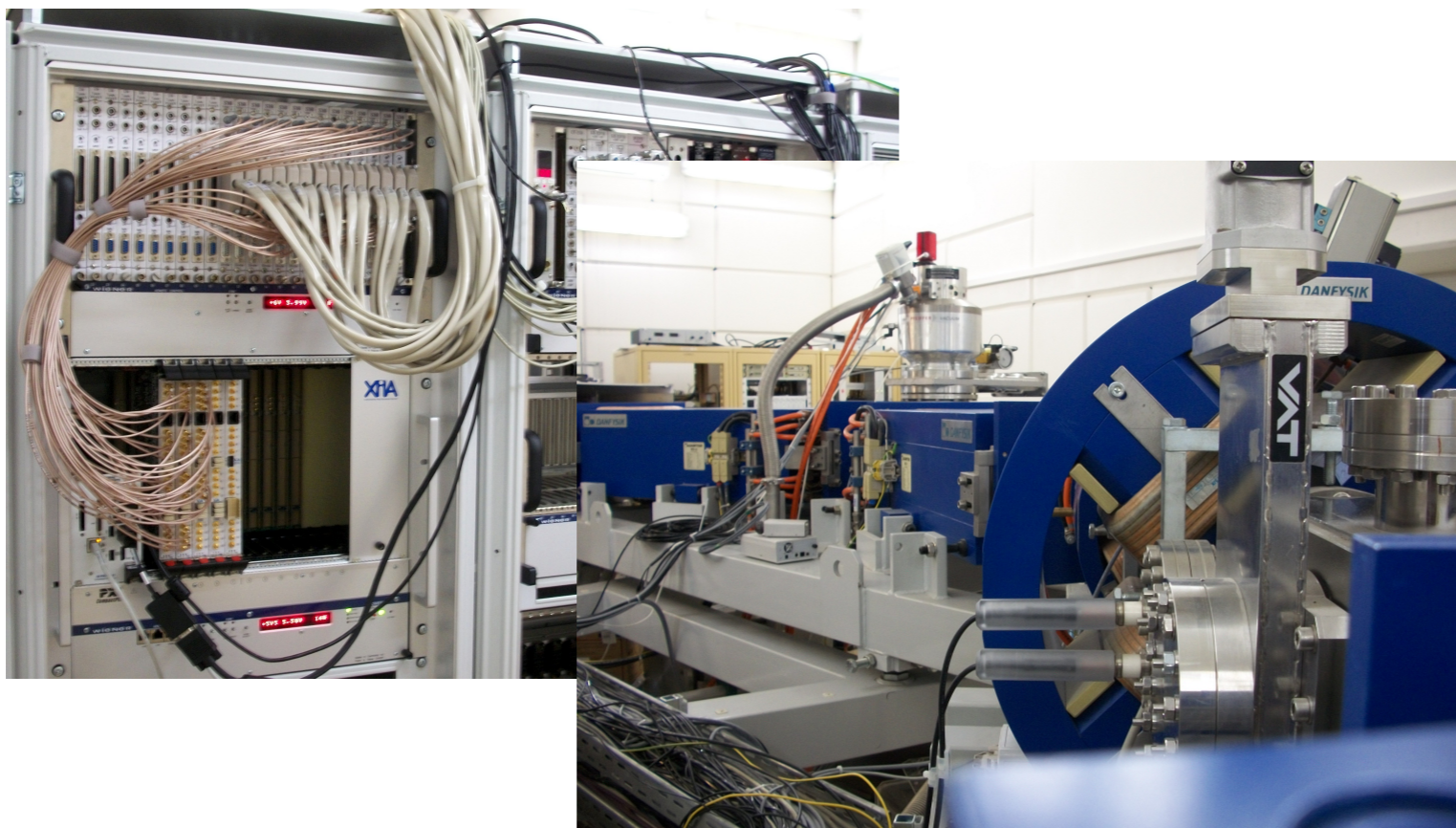


Joint institute for nuclear research Flerov laboratory of nuclear reactions

Data acquisition system for focal plane detector of mass separator MASHA



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NEC'2015

Content

- Introduction
- Logical scheme
- Hardware
 - Detector
 - PreAmp & MUXAmp
 - NI PXI
 - LAN
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 - front end
- Summary

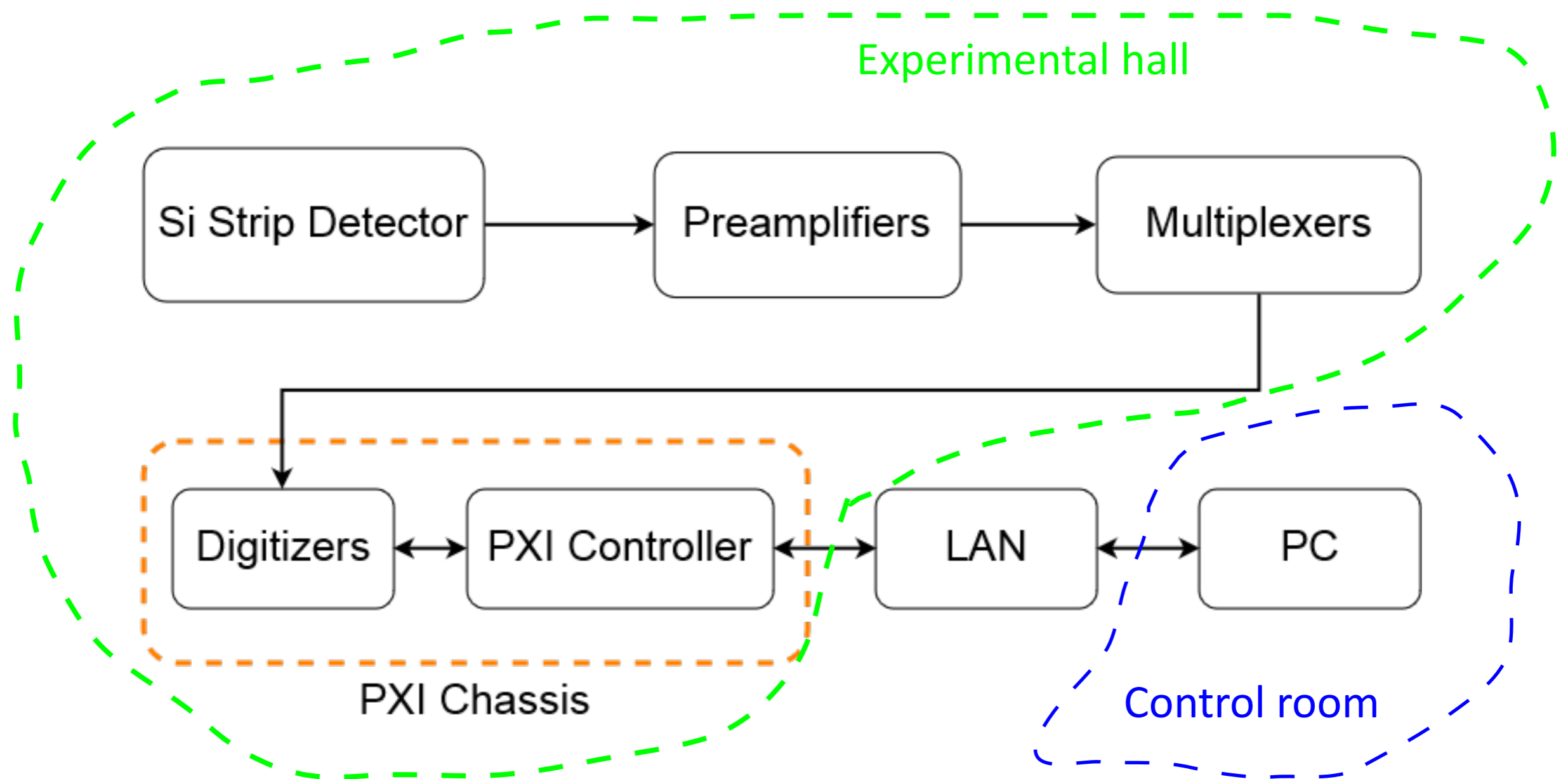


Introduction

- Old CAMAC DAQ → Modern PXI DAQ



Logical scheme



Hardware - Detector

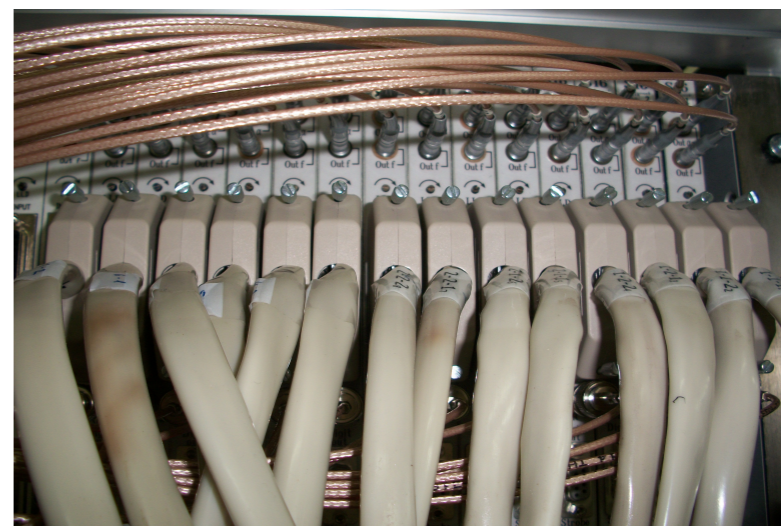
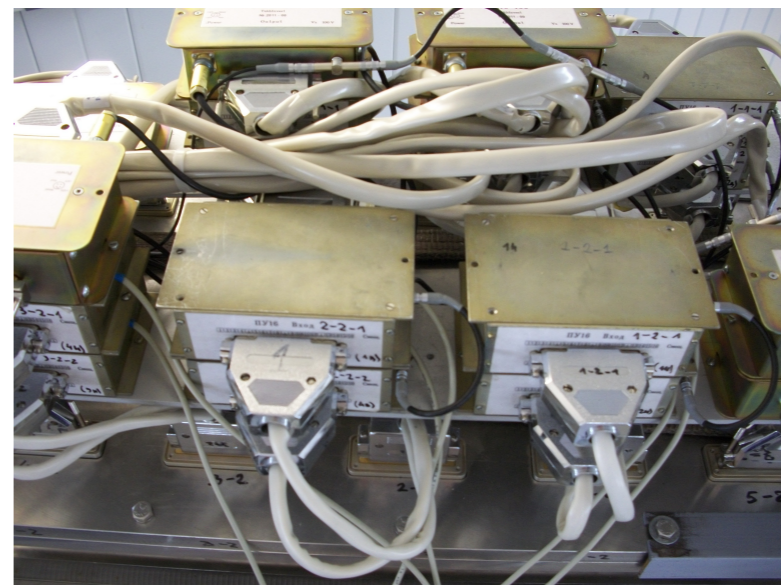
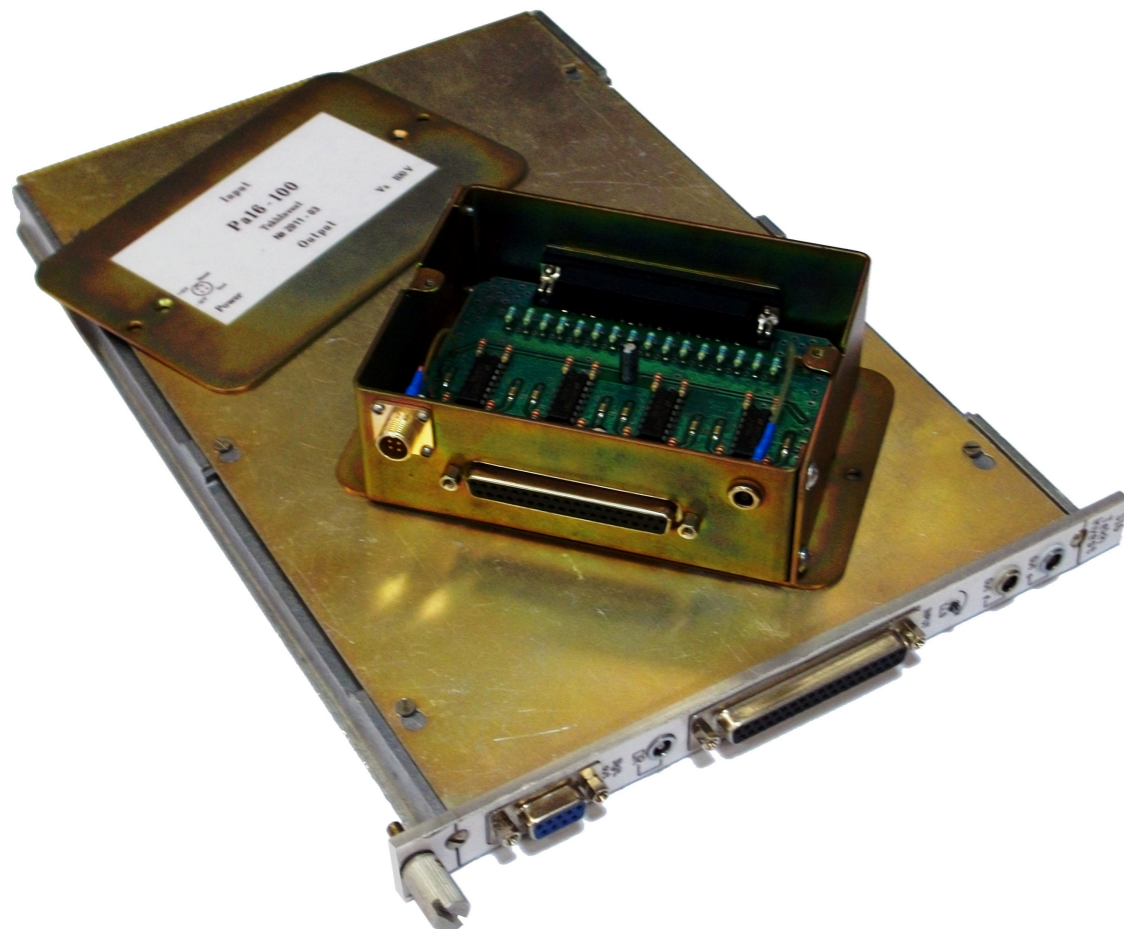
- Si strip detector of well type



- 448 spectrometric channels
- Load balance connection way at front panel
- E resolution for α particles from ^{226}Ra source ~ 30 keV

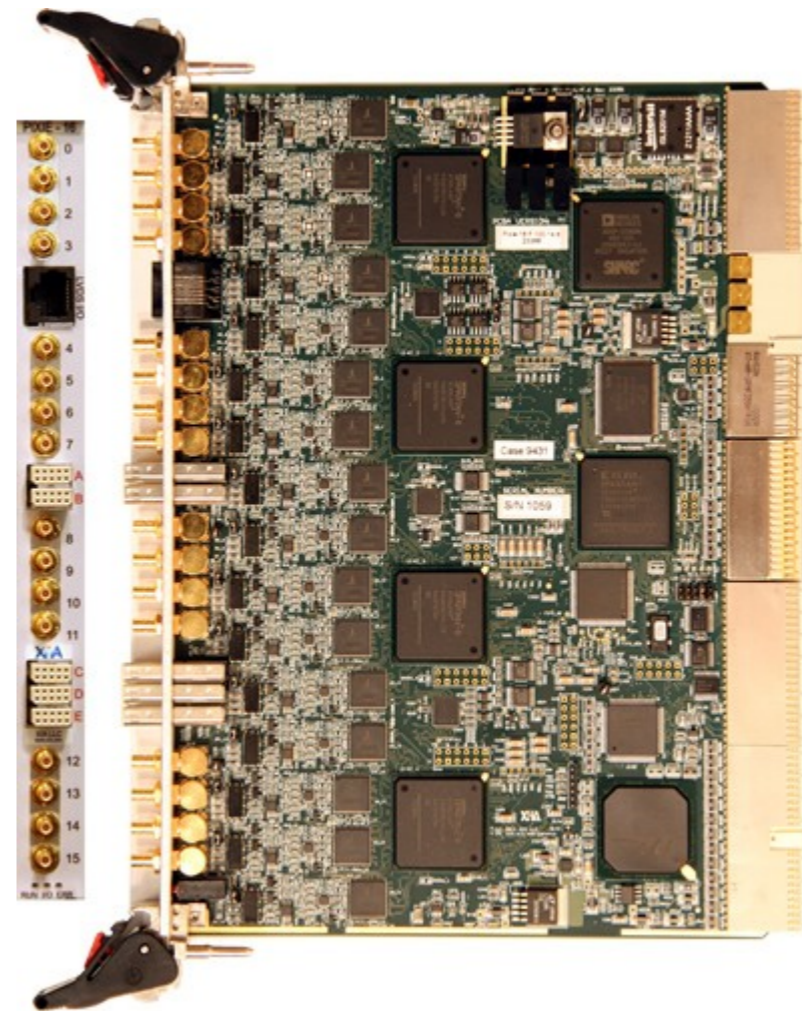
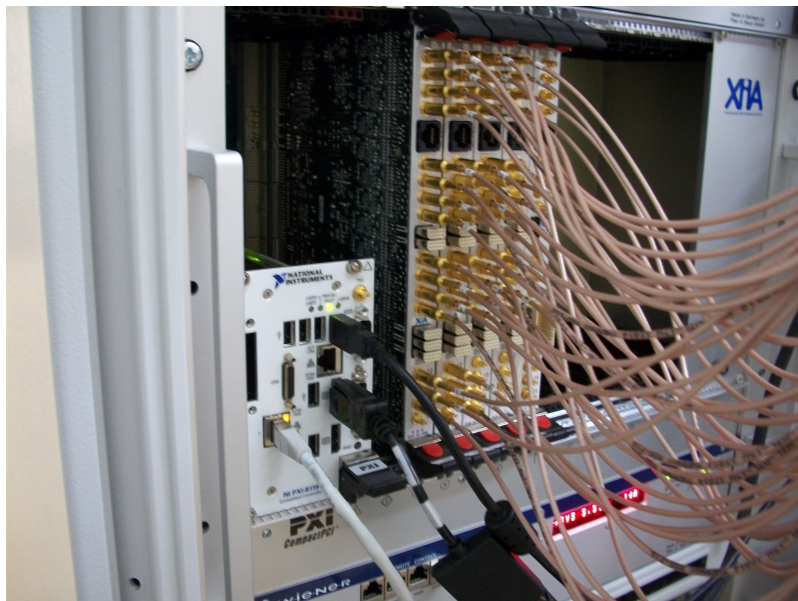
Hardware — PreAmp & MUXAmp

- 16 channel preamplifier
- 16 channel multiplexer amplifier (CAMAC std)

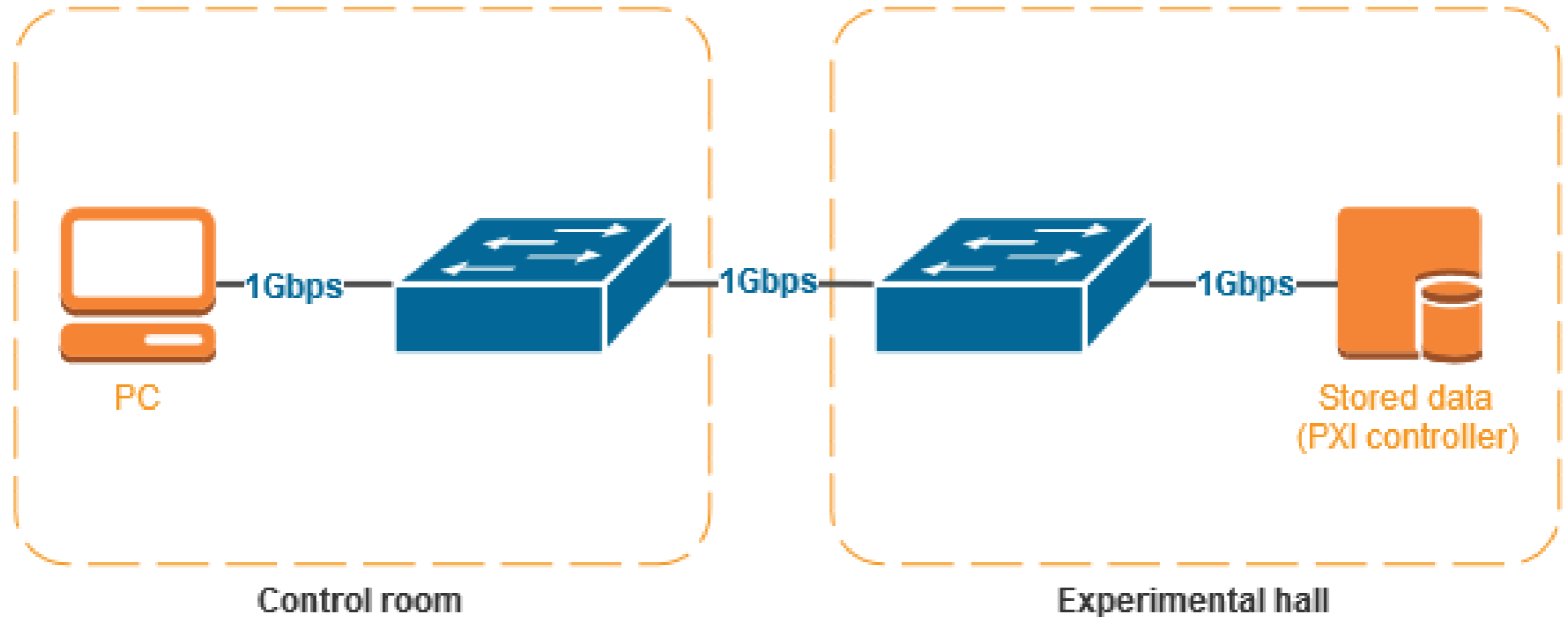


Hardware — NI PXI platform

- Digitizer (16 channel 250MHz 12 bit XIA)
- National Instruments PXI Controller (PXI-8119)



Local Area Network



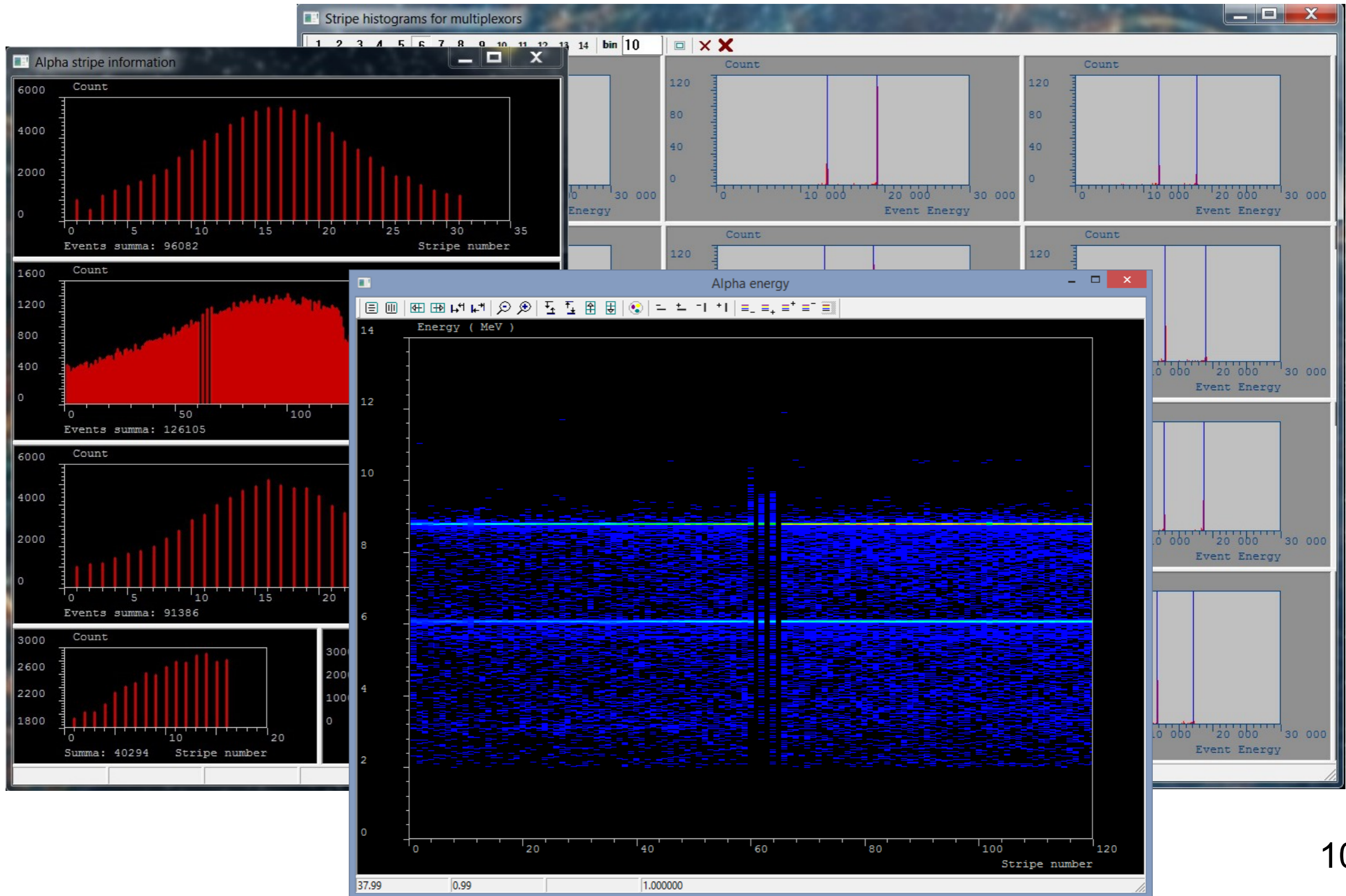
Link speed — up to 1Gbps

line between switches can be expanded by LACP

Software

- Written in C++, running on MS Windows
- back end (PXI controller at experimental hall)
 - digitizer params set
 - run or stop of acquisition
 - storing the data
- front end (PC at control room)
 - reading stored data from PXI controller through LAN
 - calibration
 - graphical representation
 - watchdog

Software — GUI images



Software - Filter

Filter for Signal View

Position Alpha Fragment Mux: 3 Alone Stripe: 0

More then time (s) > 0 Less then time (s) < 0

More then Energy (KeV) > 5000 Less then Energy (KeV) < 0

More then Amplitude > 0 Less then Amplitude < 32000

Max Limited row 10000

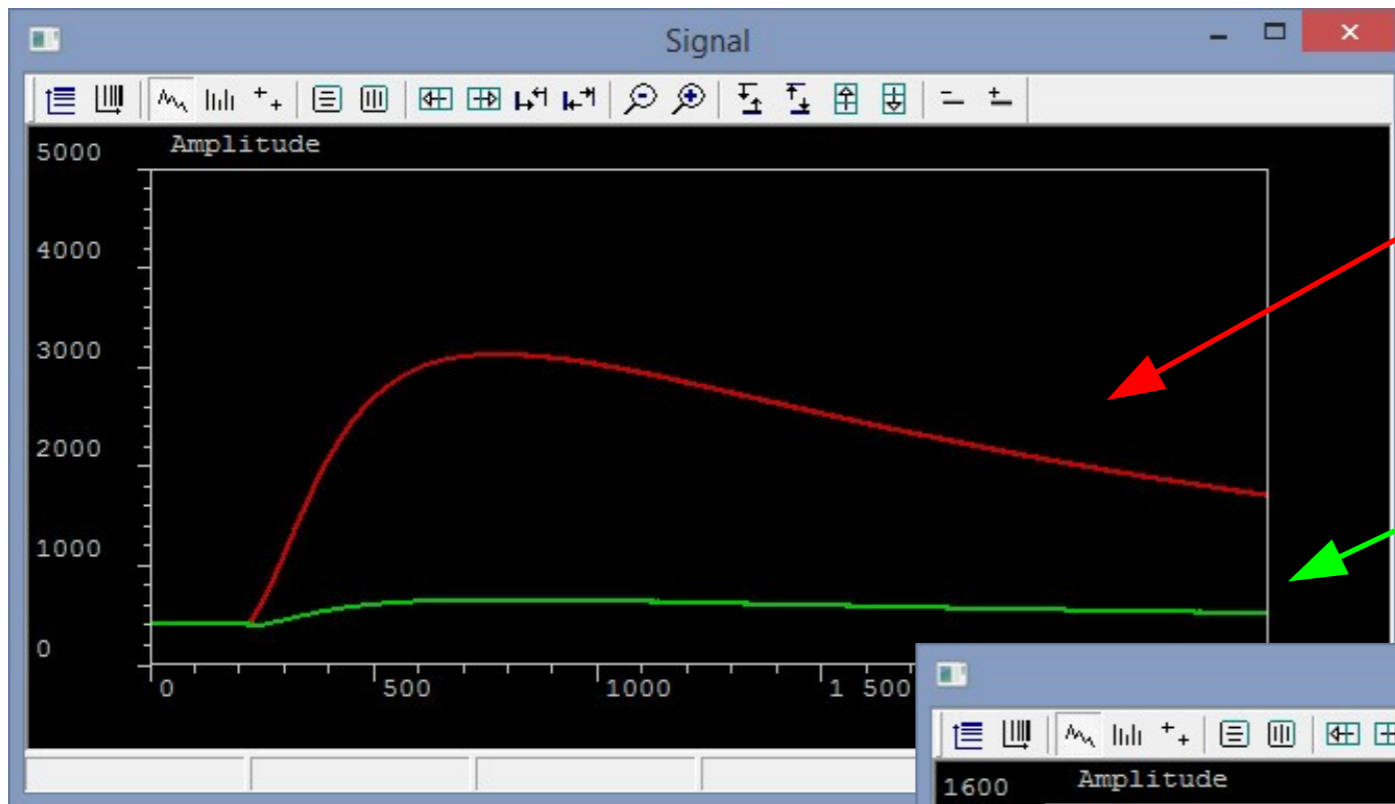
| Time (s) | T. | Energy (...) | DE | M... | Stripe | Amplitude | Clock | ID | IDA |
|------------------|----|--------------|-----|------|------------|-----------|-----------|----|-----|
| 15474.2960340880 | A | 6.055 | 144 | 6 | 9 [F 80] | 15577 | 283 | 0 | |
| 15474.2960342880 | F | 6.199 | 144 | 6 | 9 [F 80] | 1344 | 308 | 0 | |
| 15474.4427918960 | P | | | 2 | 1 [F 32] | | 282 & 310 | 0 | 0 |
| 15474.4427941520 | A | 6.067 | 194 | 2 | 1 [F 32] | 15979 | 282 | 0 | |
| 15474.4427943760 | F | 6.261 | 194 | 2 | 1 [F 32] | 1454 | 310 | 0 | |
| 15474.6275051840 | P | | | 3 | 15 [F ...] | | 281 & 315 | 0 | 0 |
| 15474.6275074320 | A | 8.771 | 156 | 3 | 15 [F ...] | 19152 | 281 | 0 | |
| 15474.6275077040 | F | 8.927 | 156 | 3 | 15 [F ...] | 1707 | 315 | 0 | |
| 15474.7403523600 | P | | | 2 | 3 [F 28] | | 272 & 300 | 1 | 1 |
| 15474.7403545360 | A | 8.802 | 116 | 2 | 3 [F 28] | 18124 | 272 | 1 | |
| 15474.7403547600 | F | 8.918 | 116 | 2 | 3 [F 28] | 1638 | 300 | 1 | |
| 15474.9367350960 | P | | | 3 | 5 [F 55] | | 278 & 310 | 1 | 1 |
| 15474.9367373200 | A | 8.800 | 109 | 3 | 5 [F 55] | 23049 | 278 | 1 | |
| 15474.9367375760 | F | 8.909 | 109 | 3 | 5 [F 55] | 2040 | 310 | 1 | |
| 15474.9392222222 | | | | 1 | 2 [F 62] | | 27 & 44 | 0 | 0 |
| 15474.9392222222 | | | | 1 | 2 [F 62] | 17854 | 27 | 0 | |
| | | | | | | | 44 | 0 | |



Table with filtering results

- Filtering events by
- energy
 - time
 - amplitude
 - multiplexer number
 - strip number

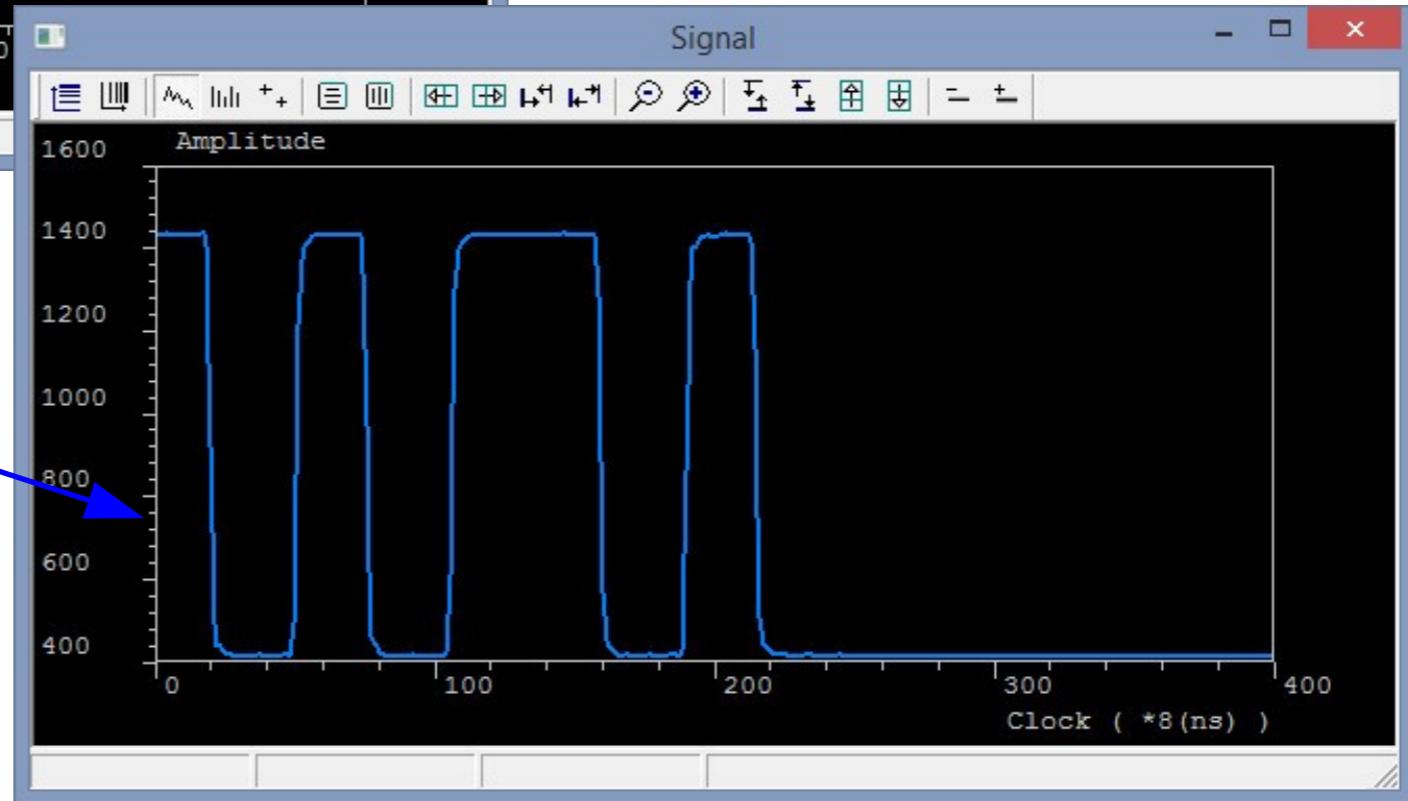
Software — Signal view



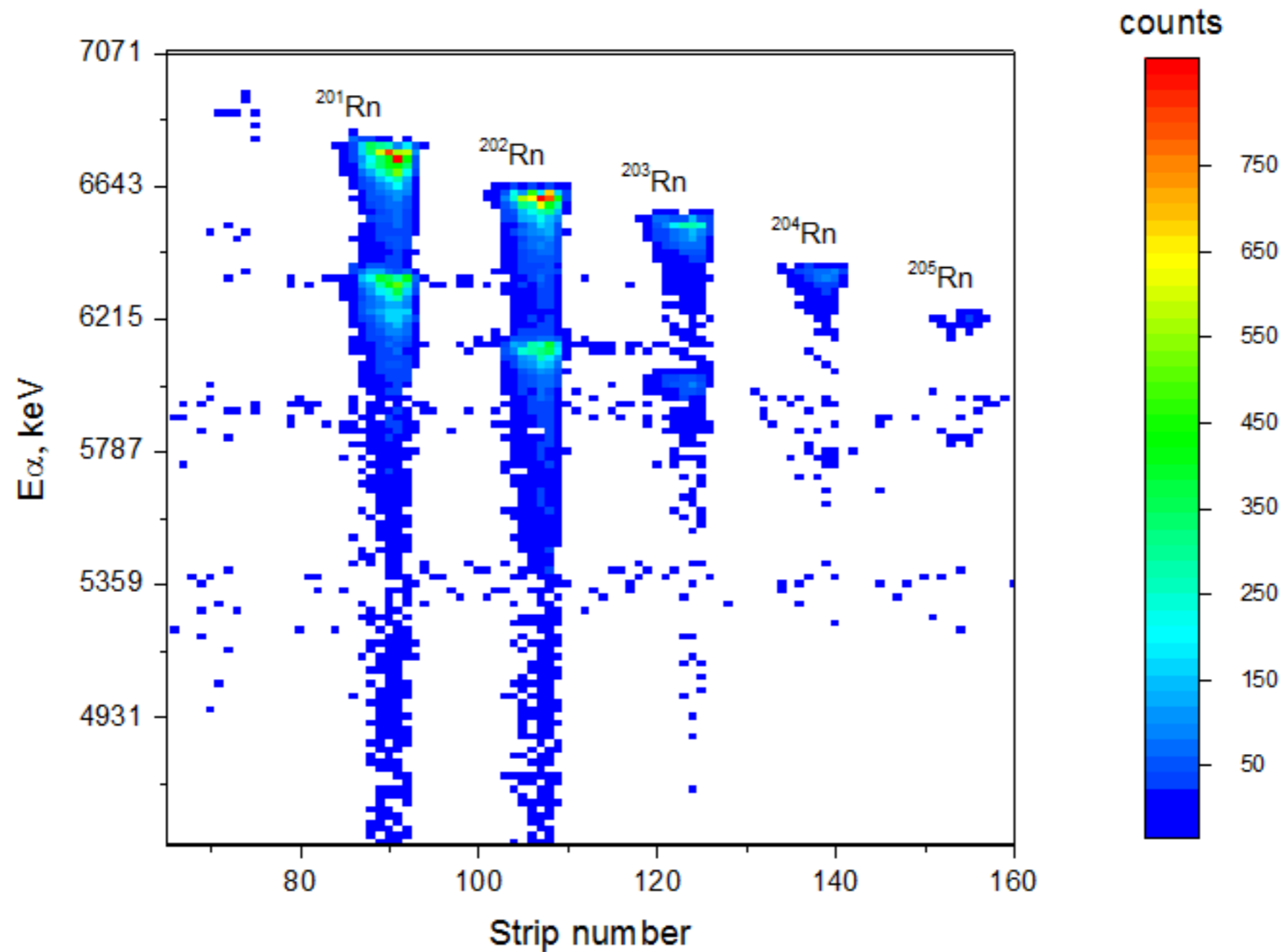
Alpha channel

Fragment channel

Position channel



Isotopes heat map $^{40}\text{Ar} + ^{166}\text{Er} \rightarrow ^{206-xn}\text{Rn} + xn$



Summary

New DAQ system expands precision measuring capabilities of alpha decays and spontaneous fission at focal plane position sensitive silicon strip detector what in turn increases capabilities of the setup in such field as low yield elements registration.

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A.S. Novoselov, A.M. Rodin, S. Motycak, A.V. Podshibyakin, L. Krupa, A.V. Belozerov, V.Yu. Vedeneyev, A.V. Gulyaev, A.V. Gulyaeva, J. Kliman, V.S. Salamatin, S.V. Stepantsov, E.V. Chernysheva, S.A. Yuchimchuk, A.B. Komarov, D. Kamas

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