Overview of the JRA1 activities at JRC-IRMM

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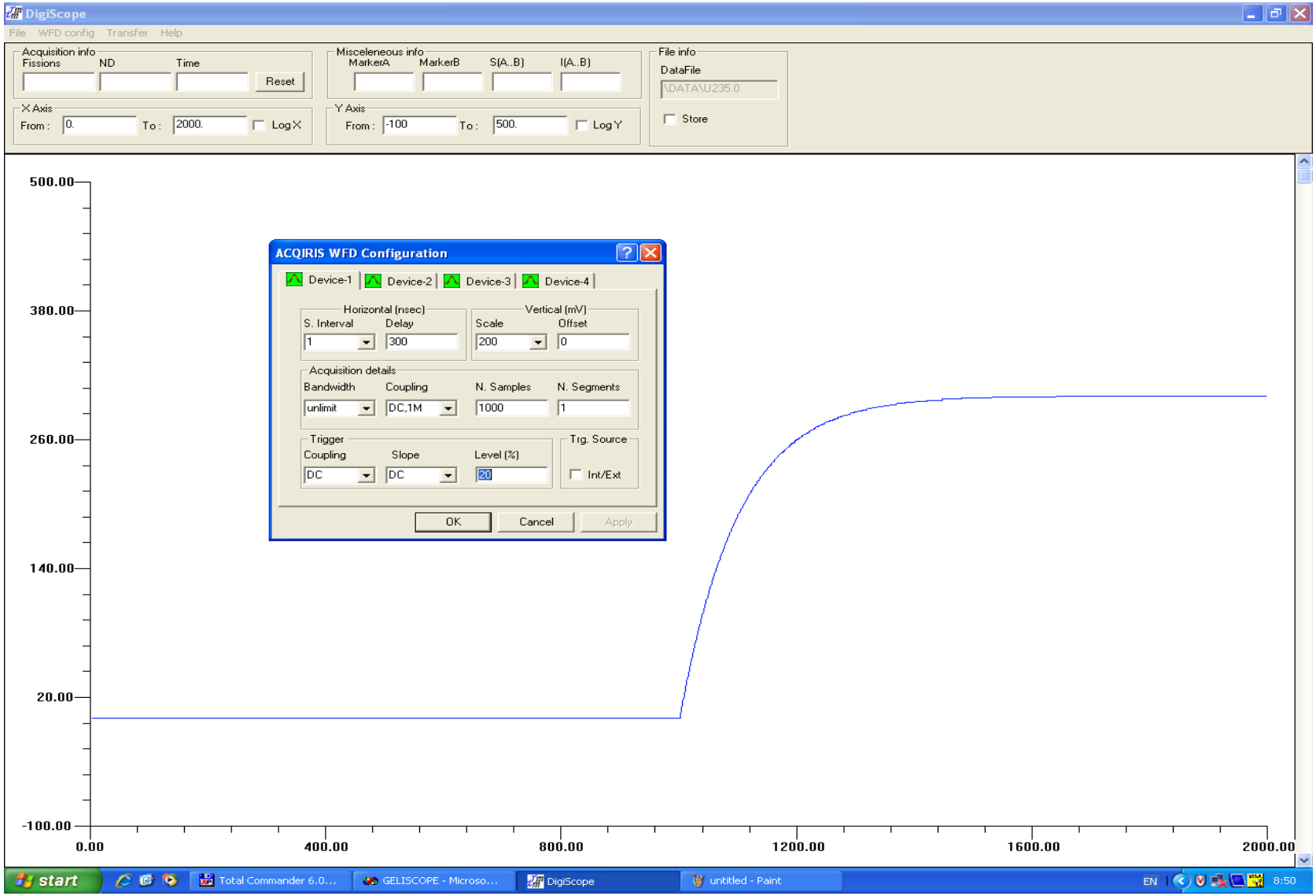
IRMM - Institute for Reference Materials and Measurements
Geel - Belgium

http://irmm.jrc.ec.europa.eu/
http://www.jrc.ec.europa.eu/

Achievements

- Digital signal acquisition software adapted to use heterogeneous digitizers (Acqiris and Spectrum)
- GENDARC data acquisition and analysis system (both running under LINUX and SUN Solaris)
- Dedicated software solutions for different experiments
- Signal processing subroutines written in C++
- Application to different Nuclear Physics experiments

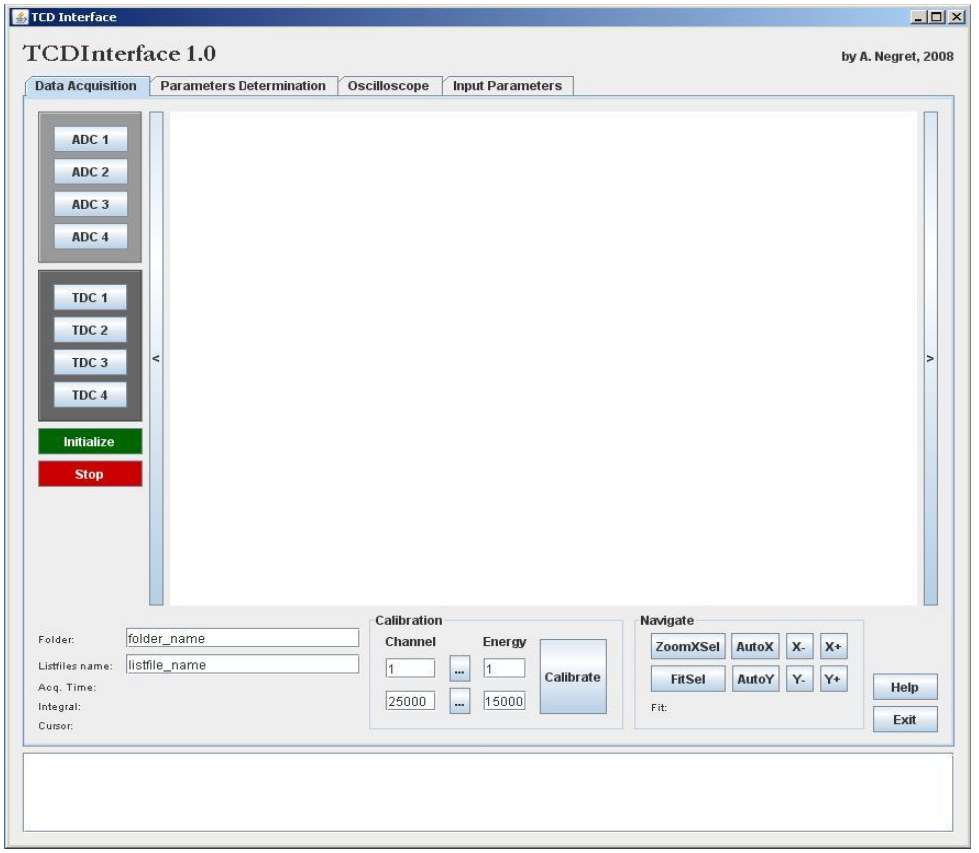
Screenshot from GELISCOPE data acquisition program



TwoCardsDigitizer v 1.0

by Alexandru NEGRET

1. JAVA Graphical User Interface
   - 4 panels
   - starts, stops, exchanges information with the the C++ program
2. C++ program
   - the backbone of the software package
   - 3 running modes



- Dedicated to GAINS; runs on each computer controlling 4 detectors
- Based on structures that can be easily re-used

GENDARC Look and Feel

GENDARC provides numerous additional features:

Modern GUI for program control, start, stop, changing display, zooming, etc. for 1D/2D data visualisation

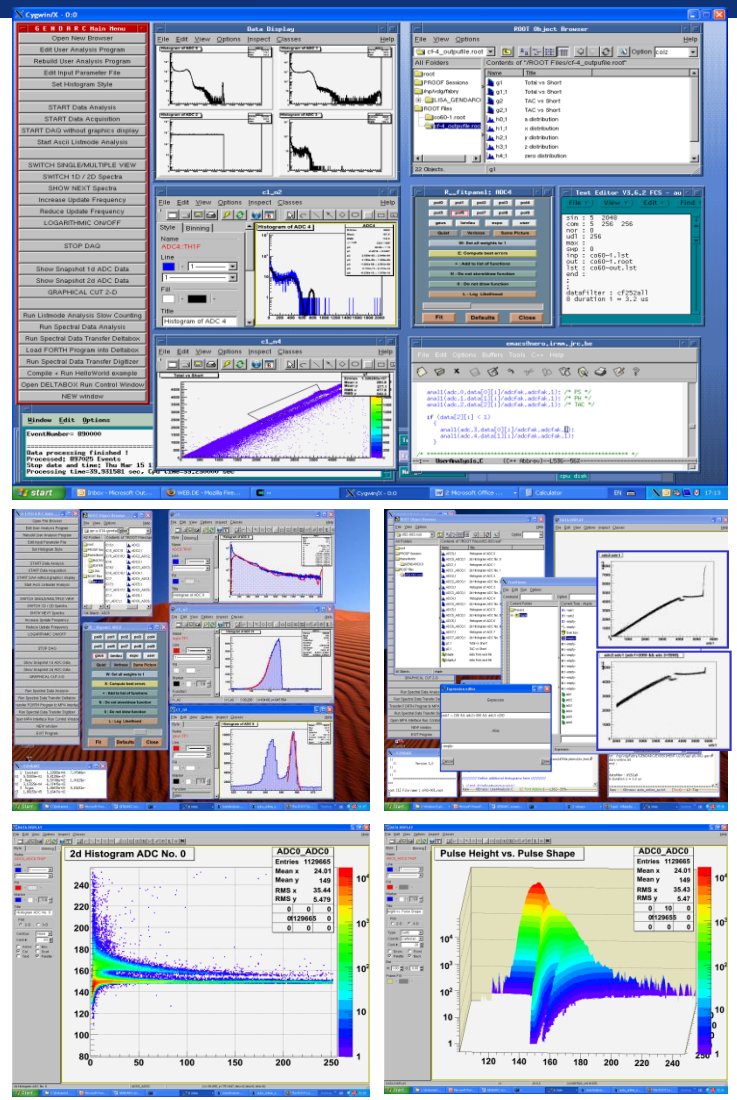
Use of *NTUPLEs* data objects:

- **Complicated n-dimensional analytical cuts possible**
- **Raw Data Reduction (factor 2 !)**

Graphical cuts in 2D – data

Tools for fitting functions (polynomials, gauss, landau, etc.) to spectra

Publication-quality output in numerous formats (jpg, pdf, eps, ps, gif,..)
First successful tests online/offline within our ^{235}U PFNS experiment



GENDARC Attributes: Controlling the program

Starting up:

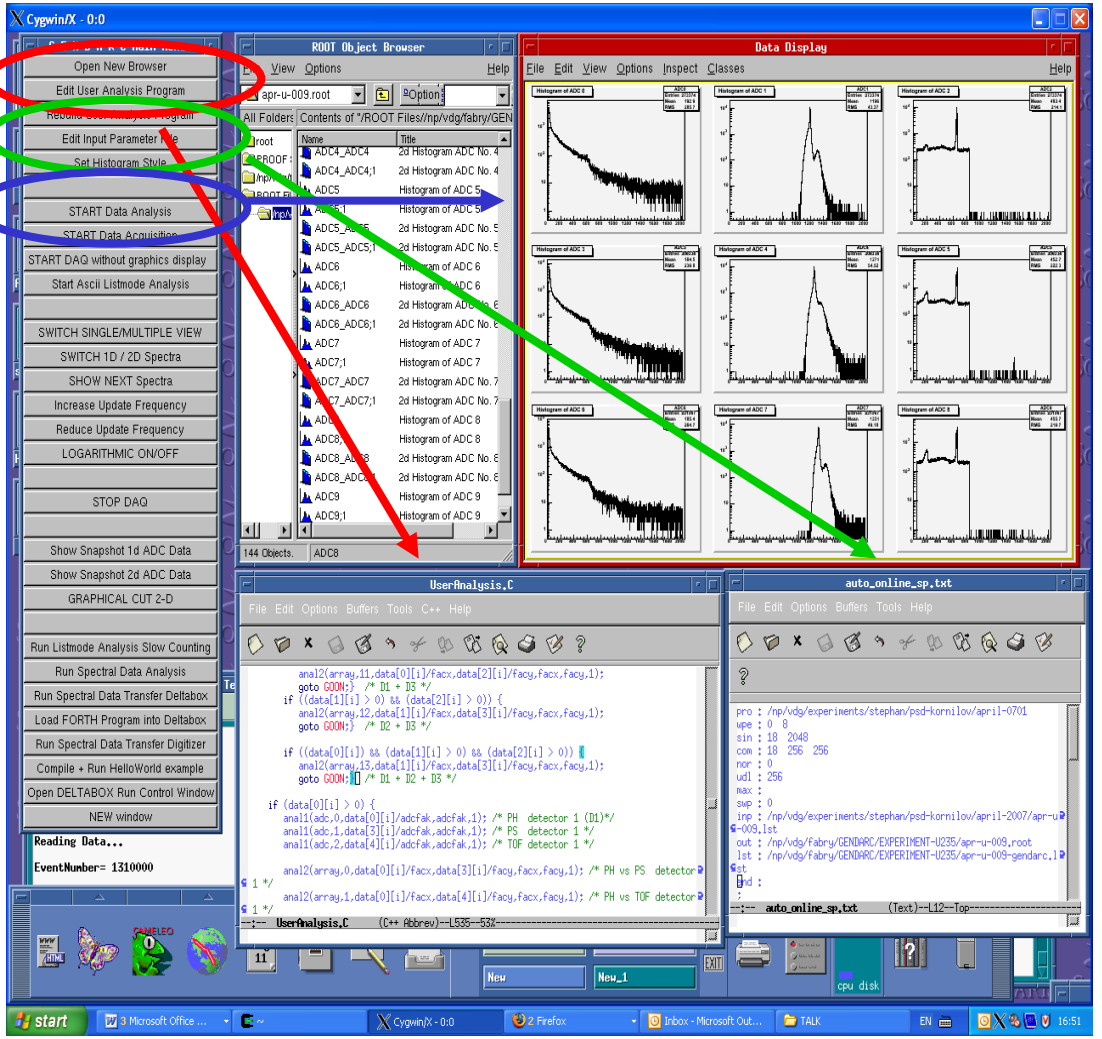
New program modules are
detected, compiled, linked
System Endean checked
automatically

Setting up & starting Experiment/
DAA (press buttons)

Create/edit User DAQ /DAA
Program

System Configuration
By default 1D and 2D histograms
defined

Starting a DAQ or DAA process:
Press button START DAA or DAQ



Example here on UNIX SOLARIS 9

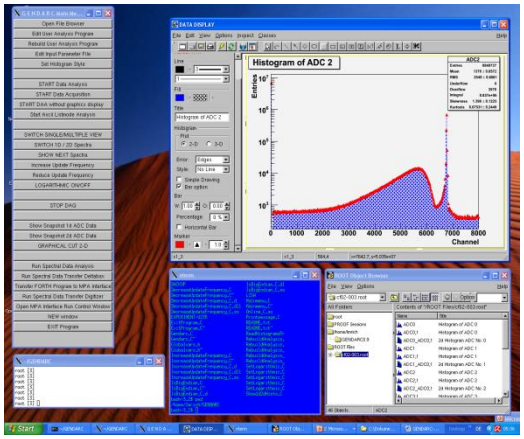
GUI & Display (Graphics Editor)

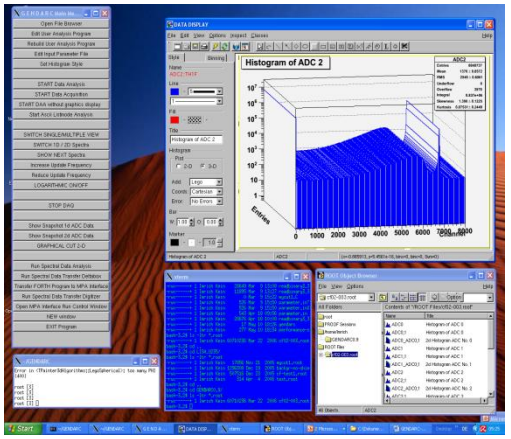
Switching between 1D/2D view possible

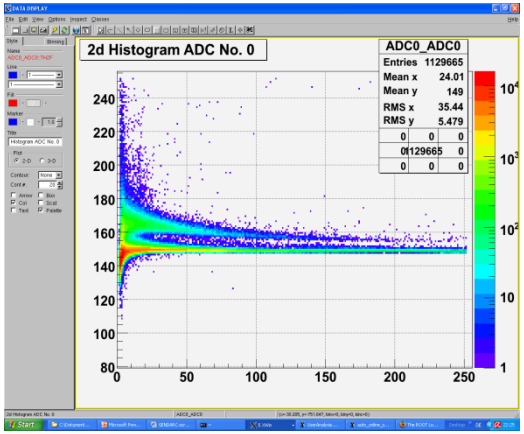
2D histograms: Same features as for 1D exist

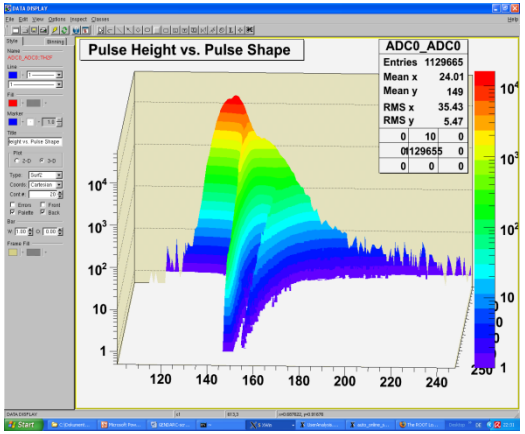
Useful for publication quality graphs

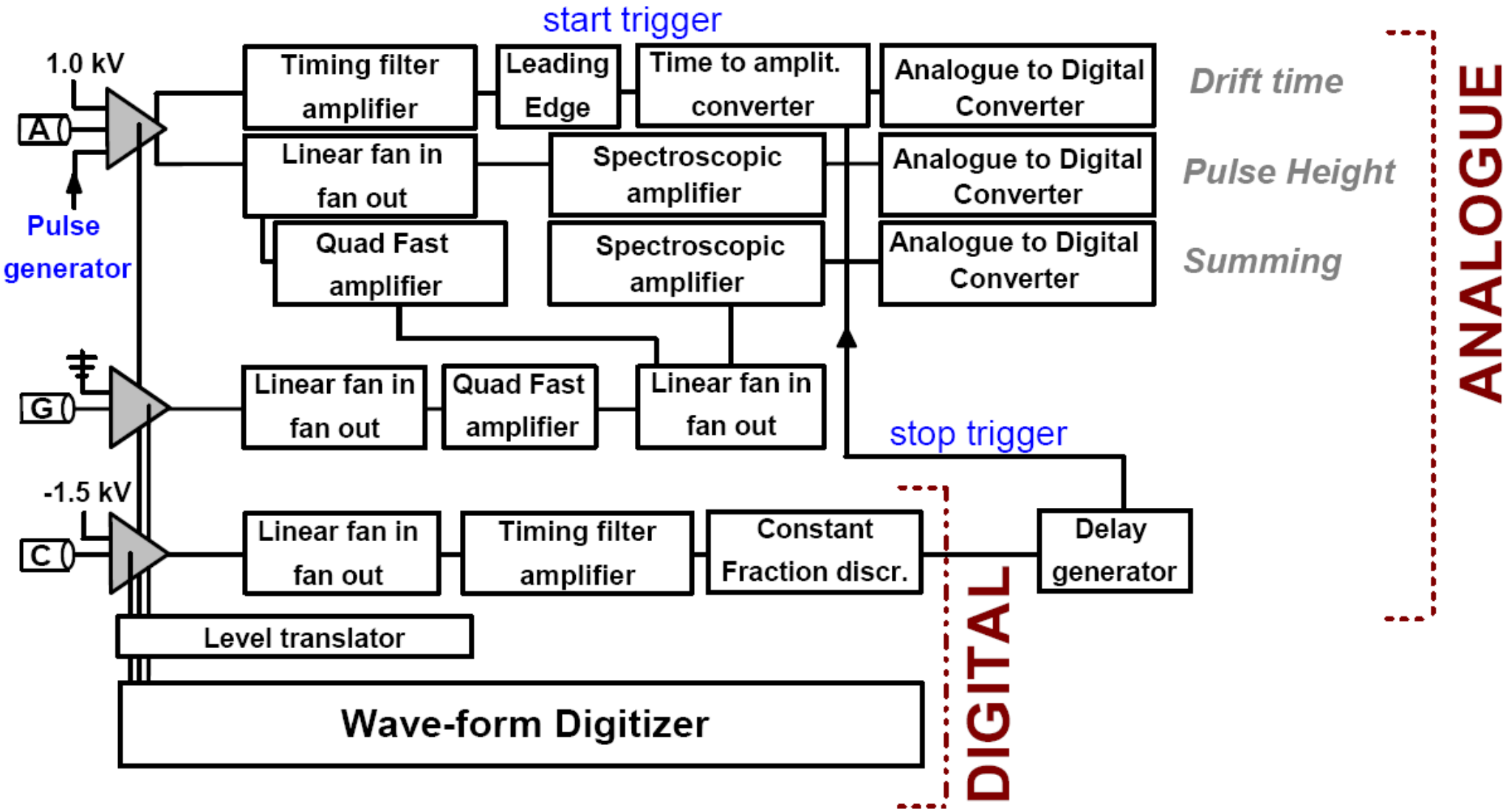
Saving & printing pictures in numerous formats (jpg, pdf, ps, eps, gif..)



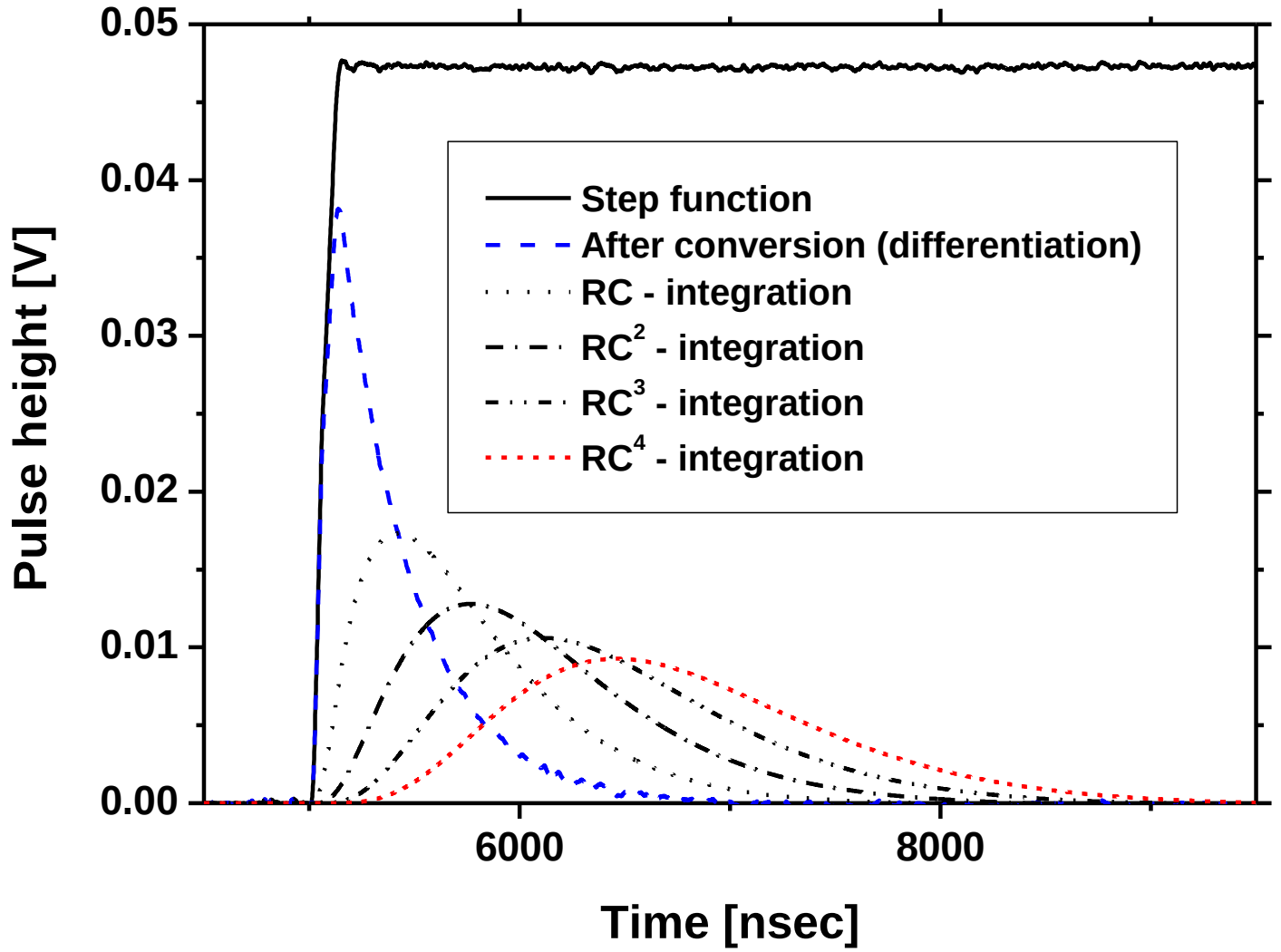




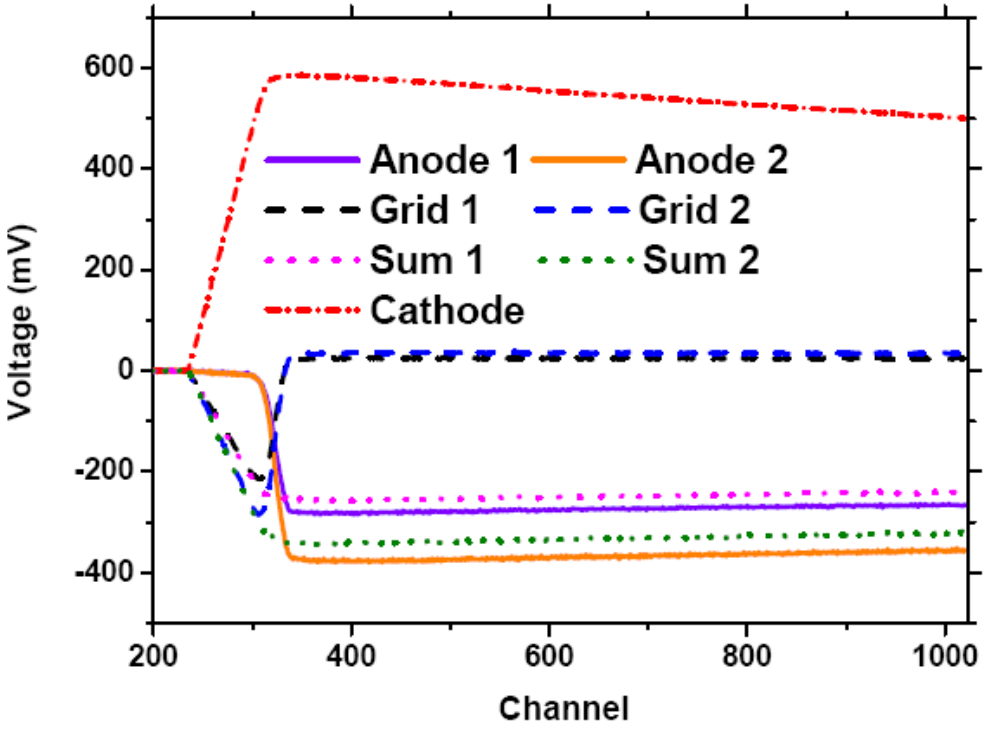


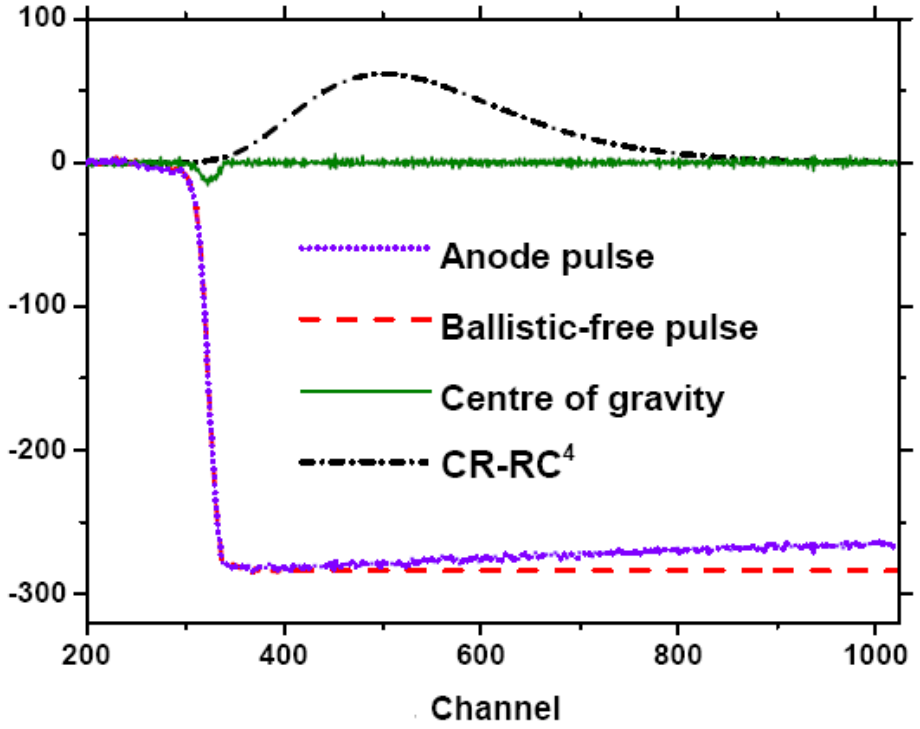

start trigger
1.0 kV
A
Pulse generator
Timing filter amplifier
Leading Edge
Time to amplit. converter
Analogue to Digital Converter
Linear fan in fan out
Spectroscopic amplifier
Analogue to Digital Converter
Quad Fast amplifier
Spectroscopic amplifier
Analogue to Digital Converter
Drift time
Pulse Height
Summing
ANALOGUE
G
Linear fan in fan out
Quad Fast amplifier
Linear fan in fan out
stop trigger
-1.5 kV
C
Linear fan in fan out
Timing filter amplifier
Constant Fraction discr.
Delay generator
Level translator
Wave-form Digitizer
DIGITAL

Passage of a step like function through an CR-RC^4 filter

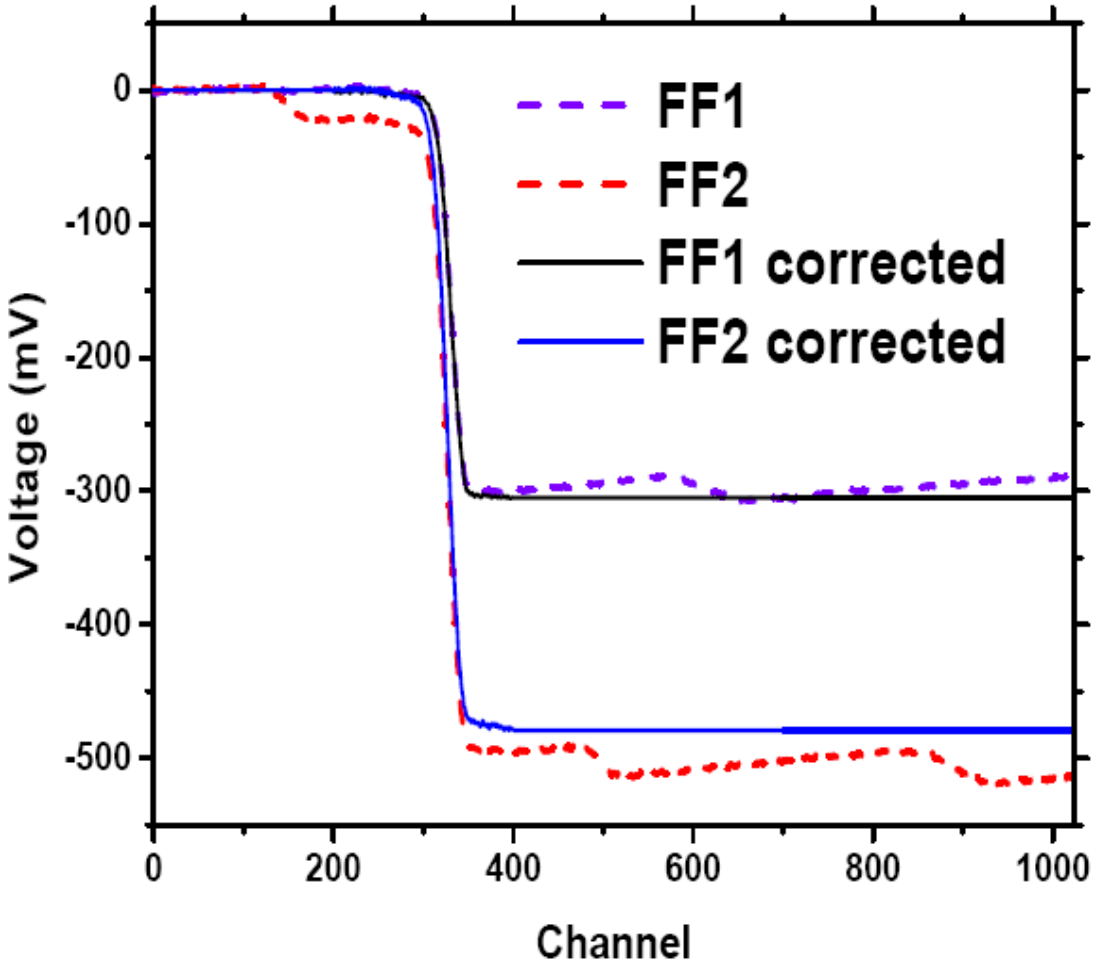


Typical signal shapes

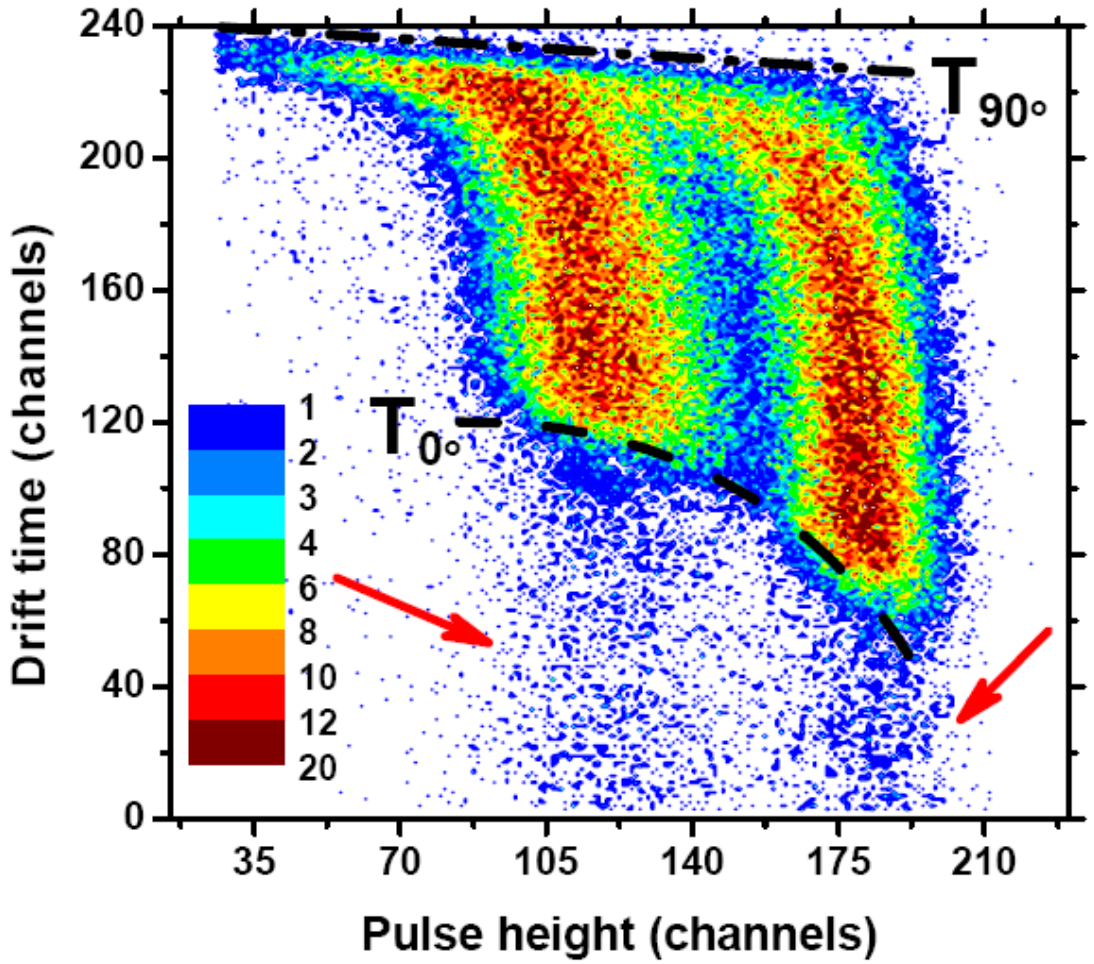




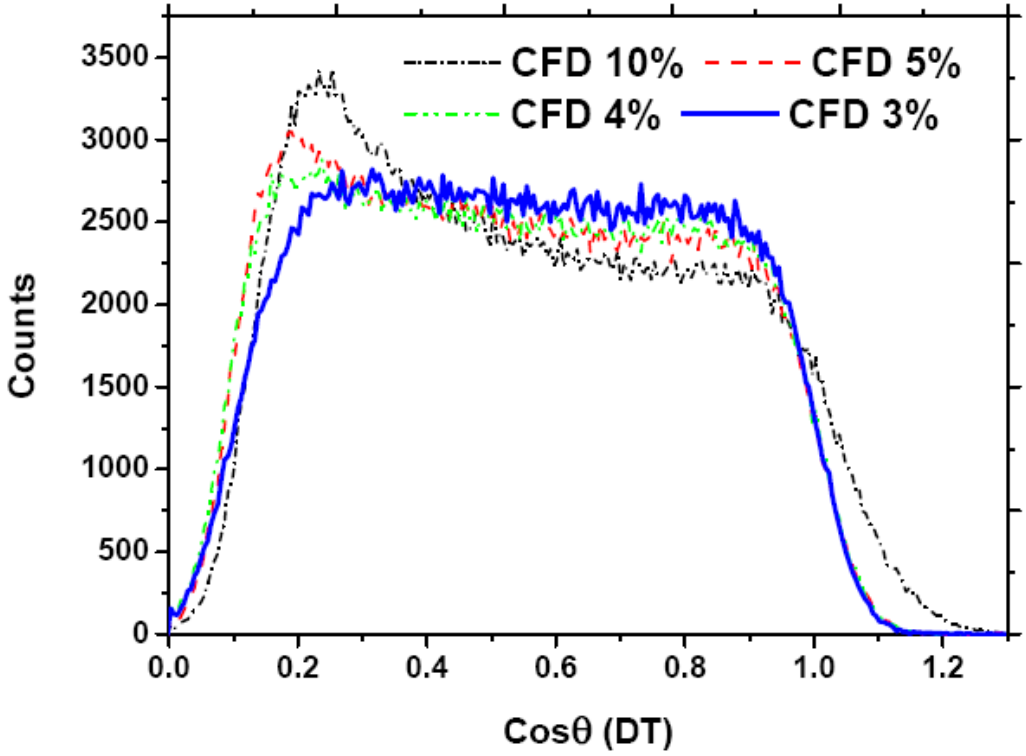
Pile up correction

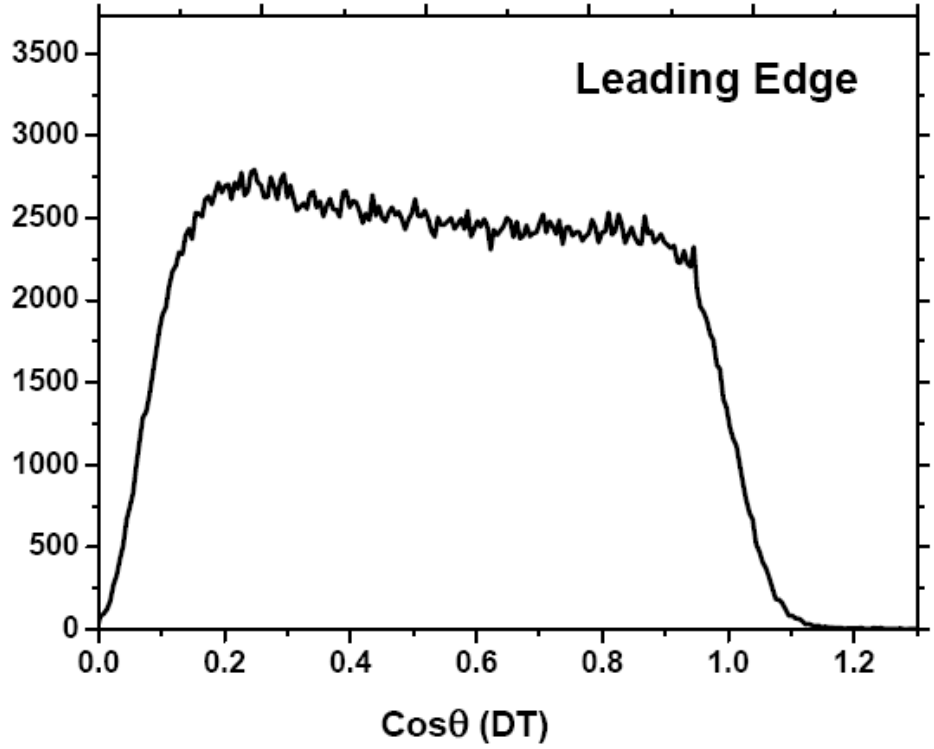


Timing mismatch

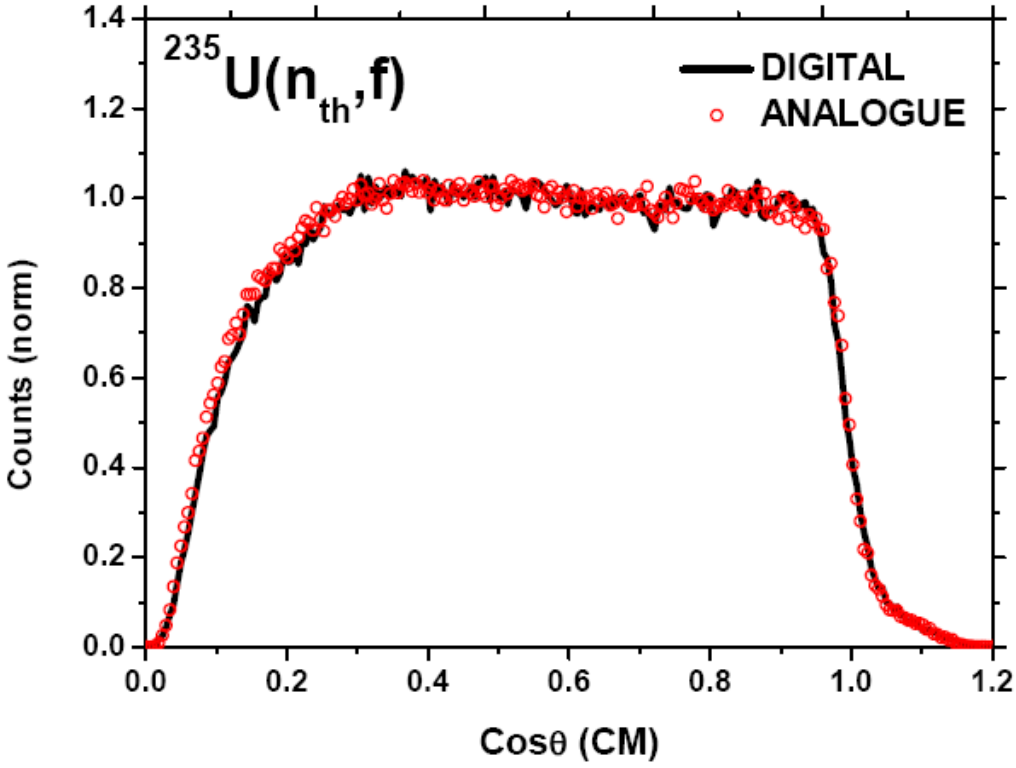


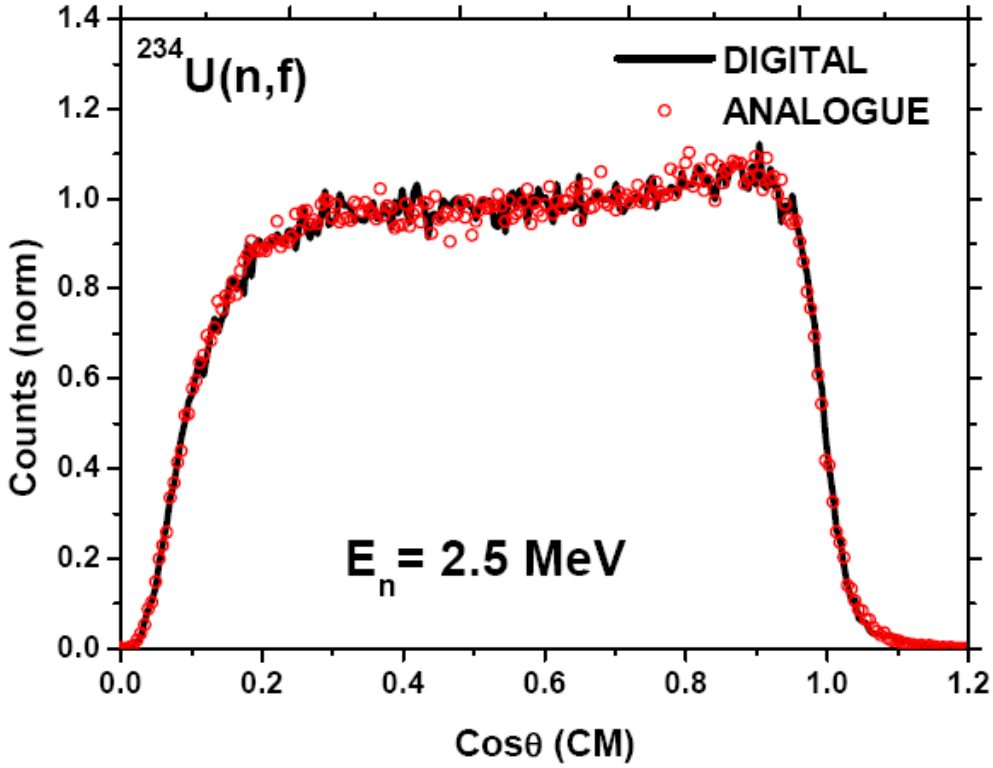
CFD and Leading Edge techniques





Comparison Analogue-Digital





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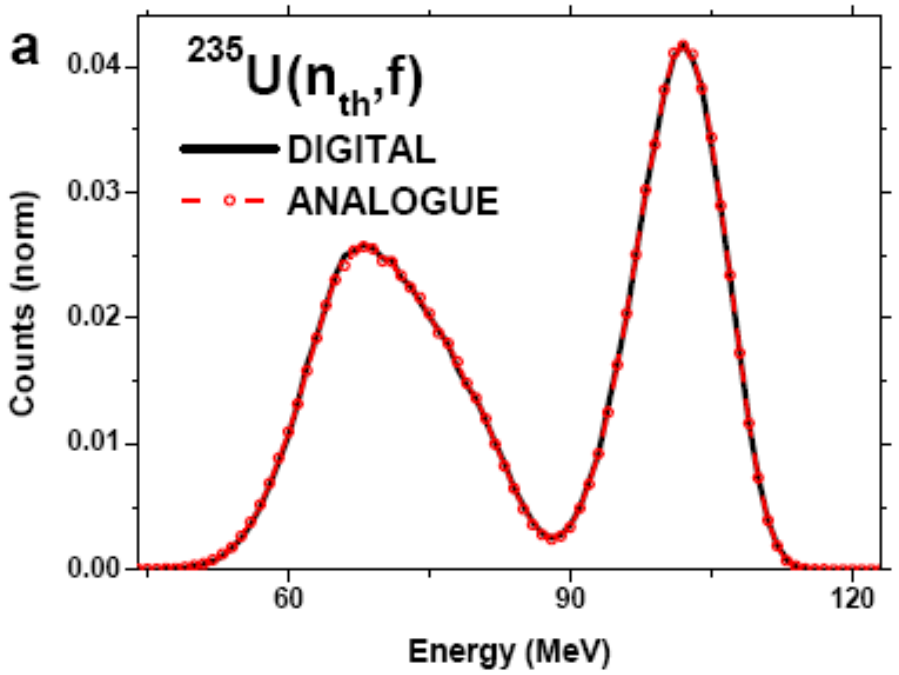
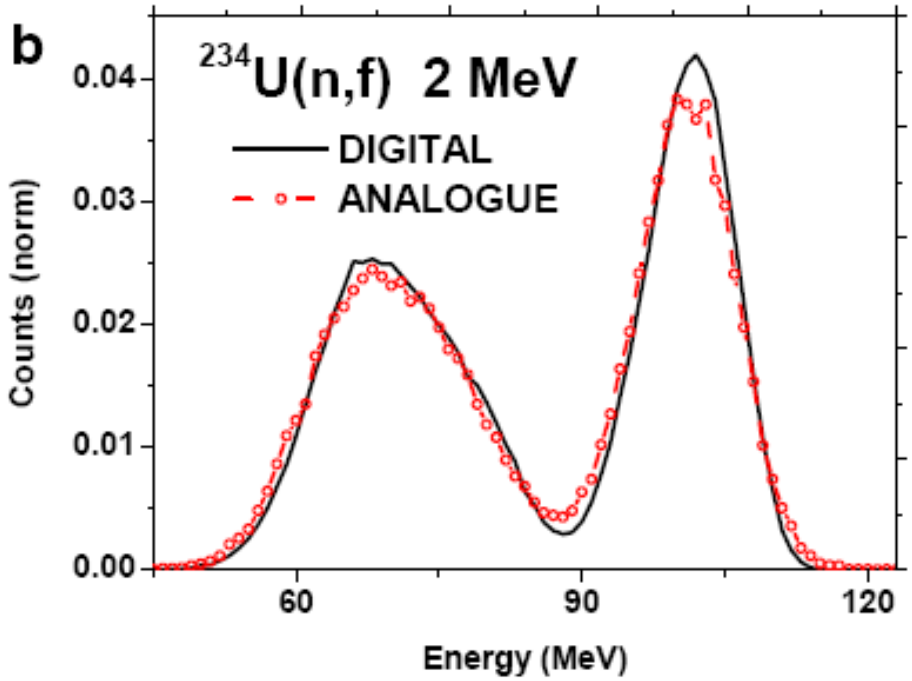
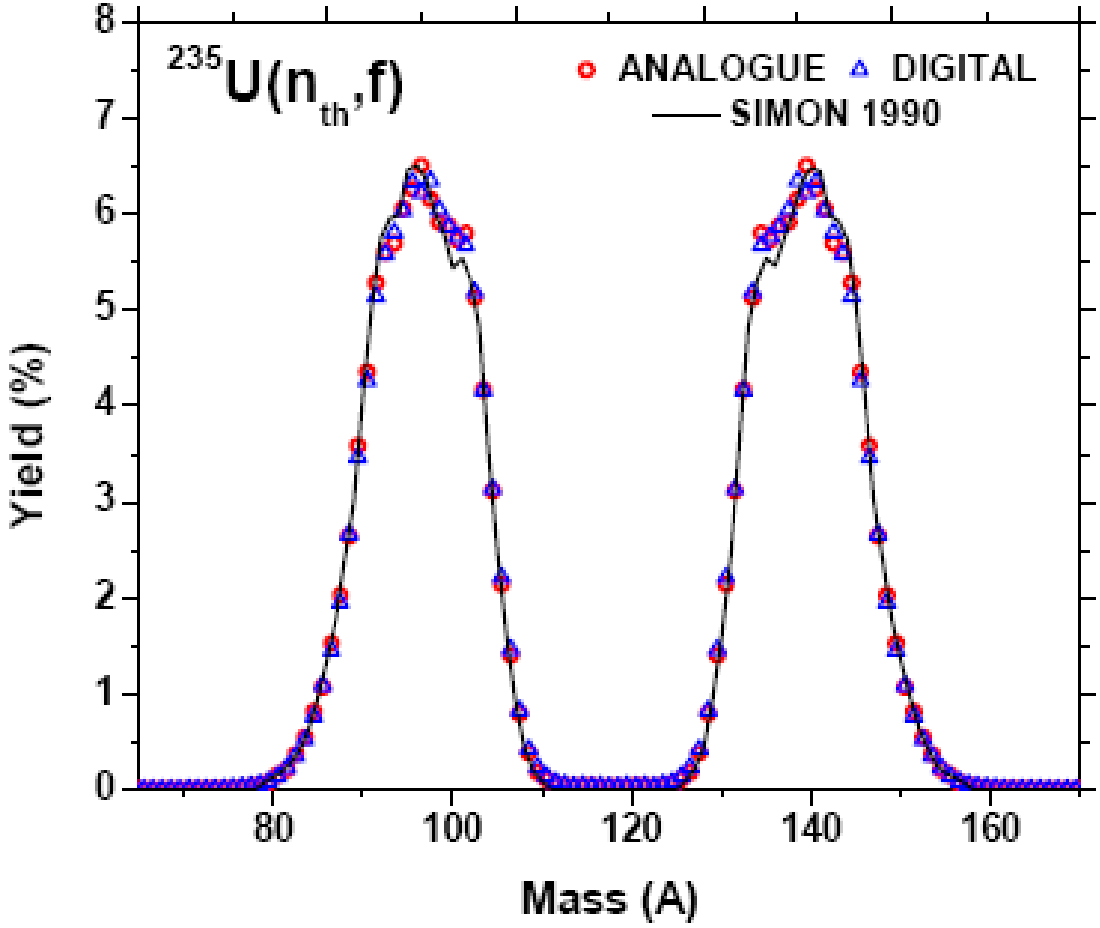
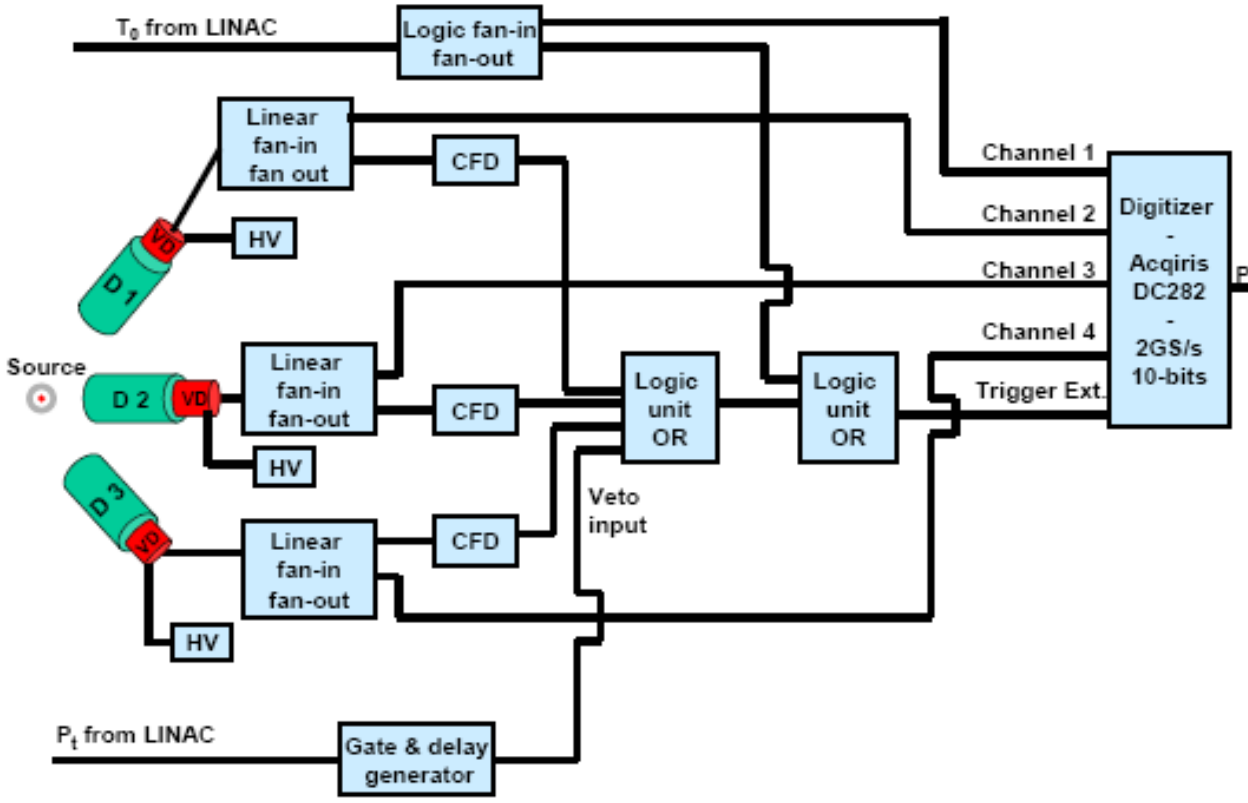




Comparison Analogue-Digital



Digitizers for capture measurements



C6D6 detectors

Capture measurements

DC282 (10b, 0.5ns/s)

SMART option

Segmented mode

350 ns deadtime, rearming

5000 cps, full throughput

CAEN N1728B (14b, 10ns/s)

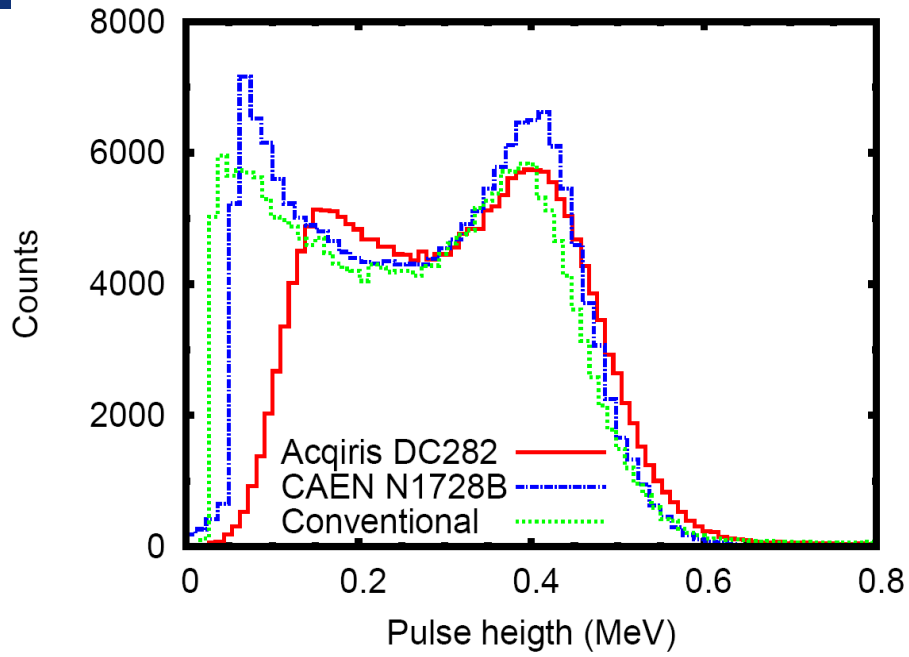
PH+time-stamp: FPGA

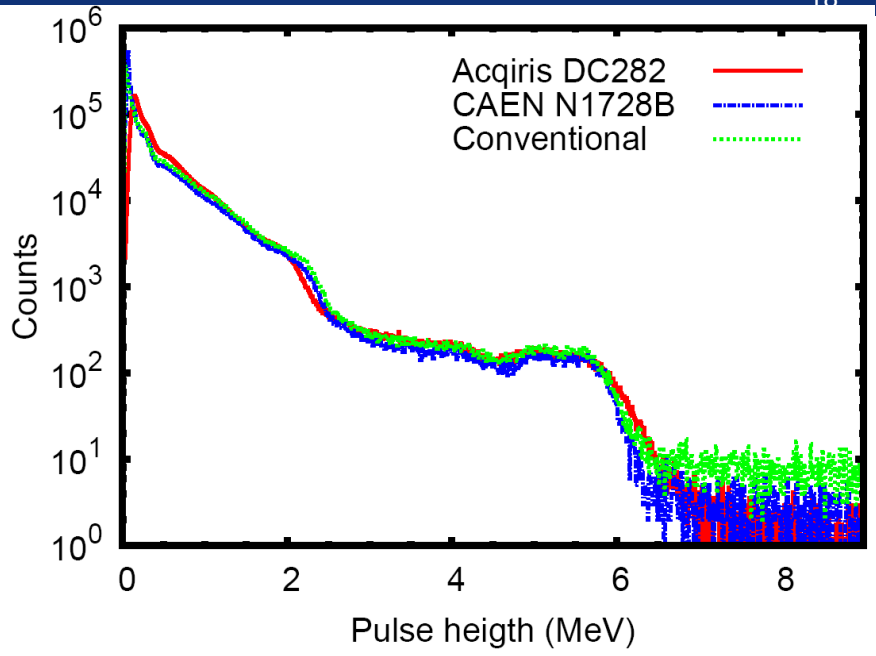
Firmware parameter setting

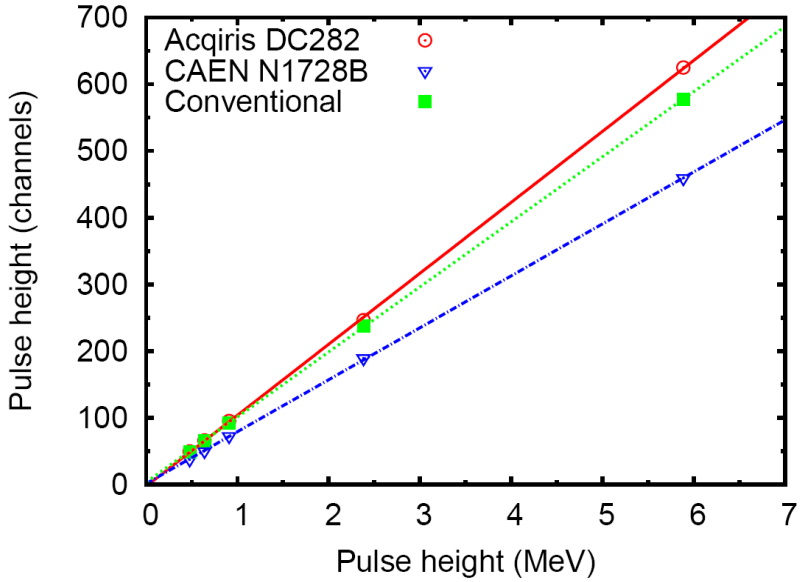
No further electronics

Cristian Mihailescu

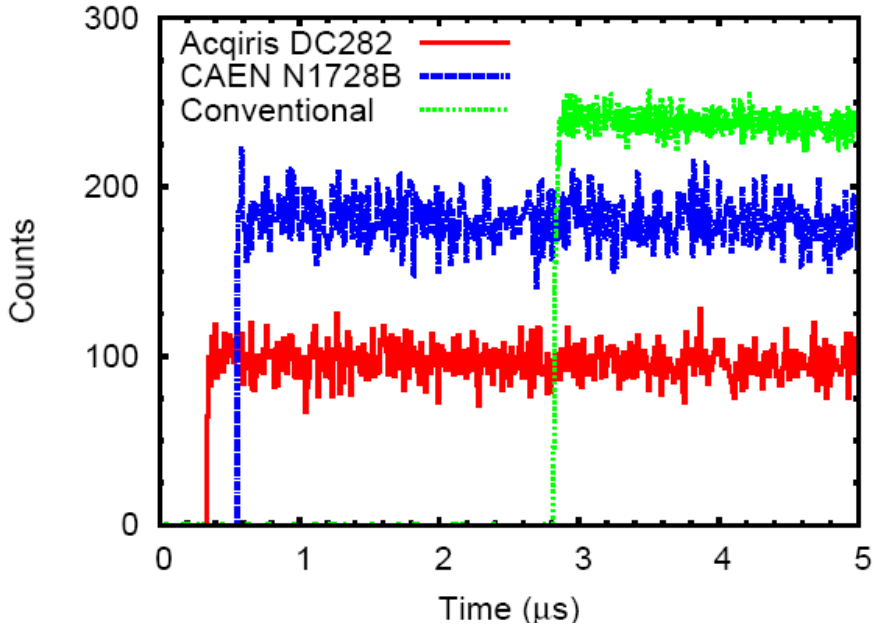
PH response and linearity

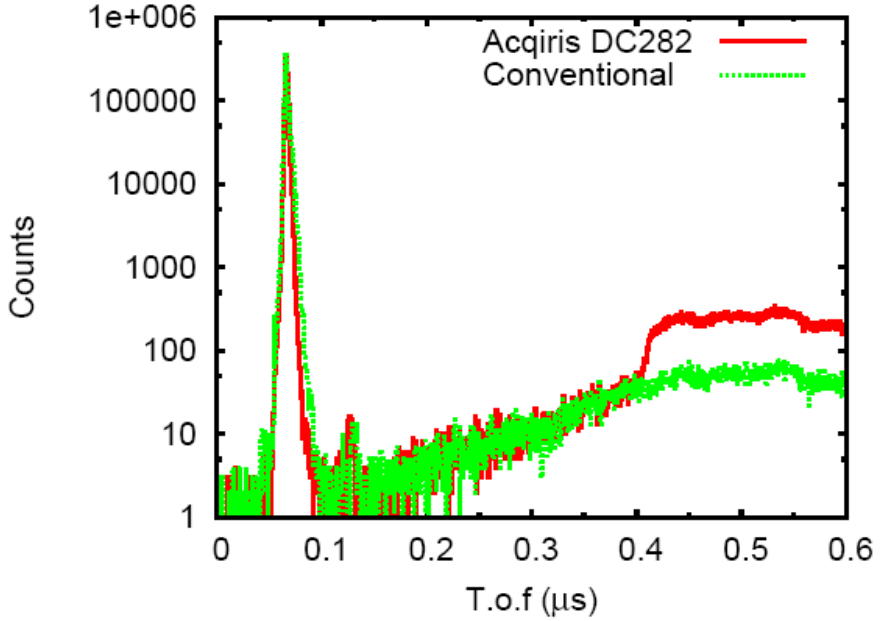


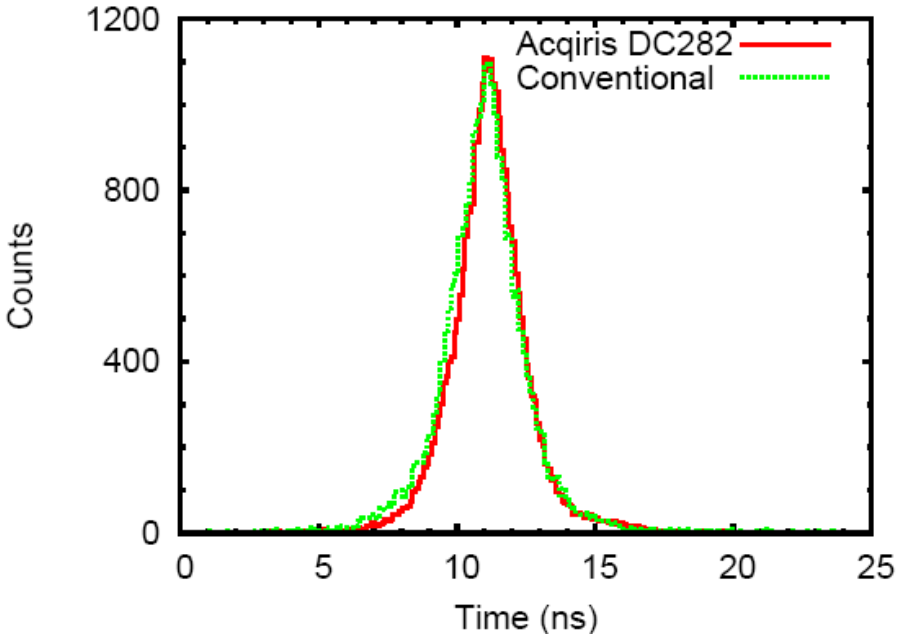


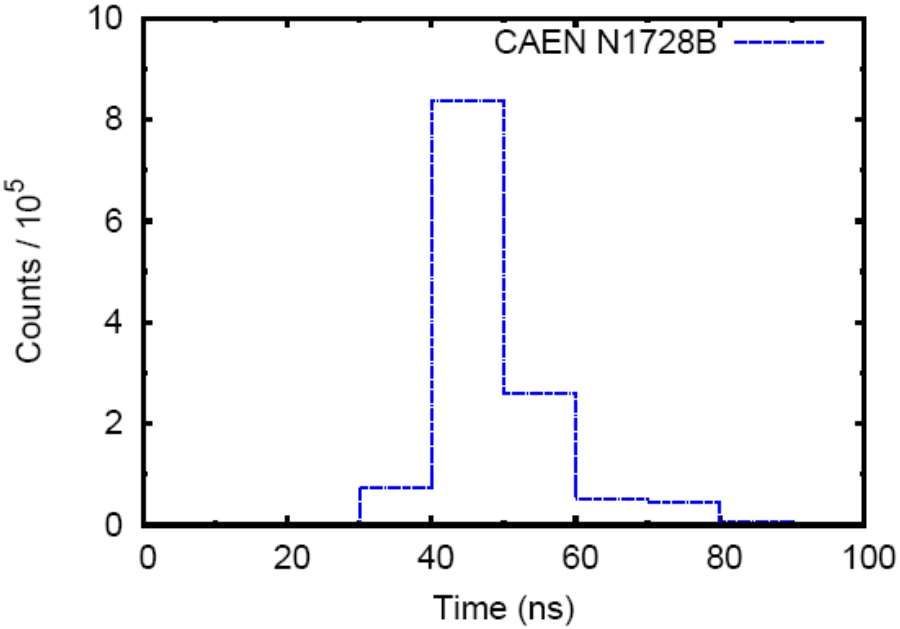


Dead time and time resolution

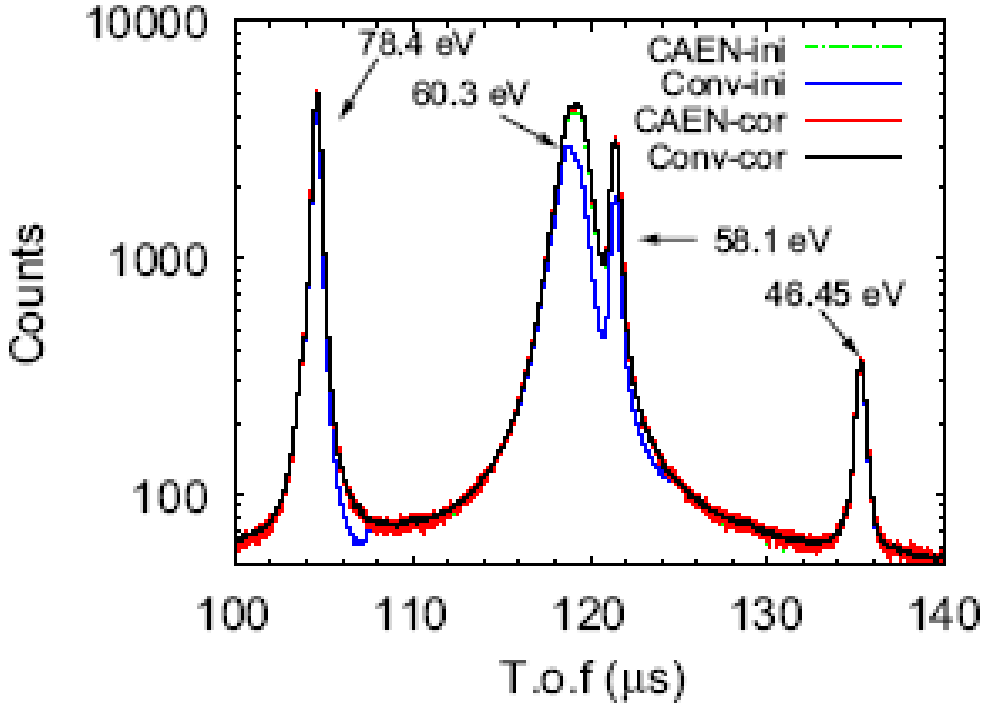


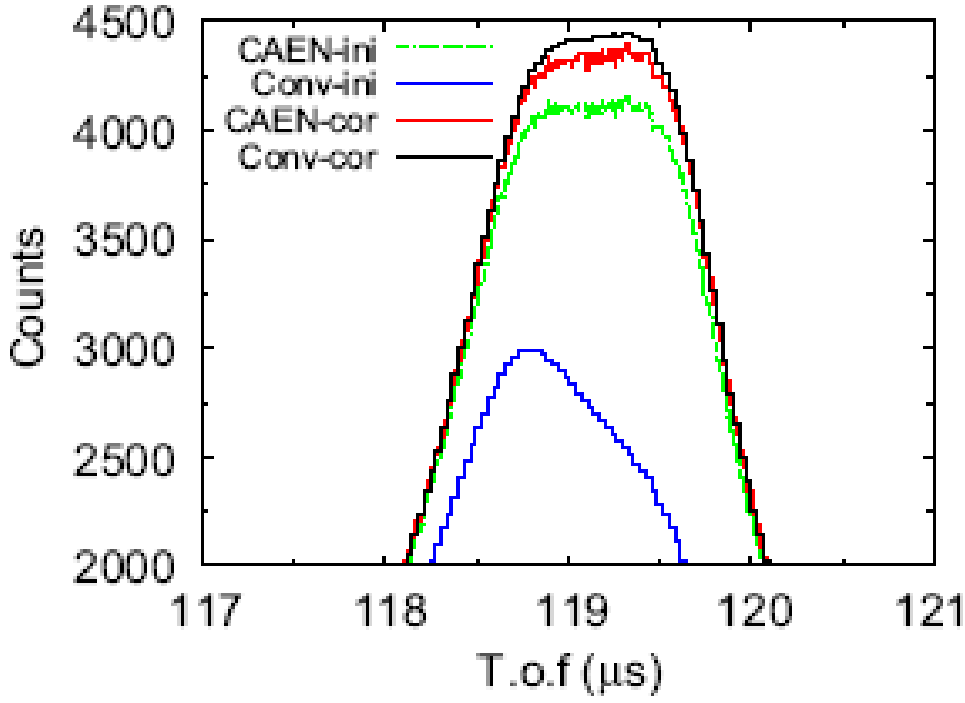




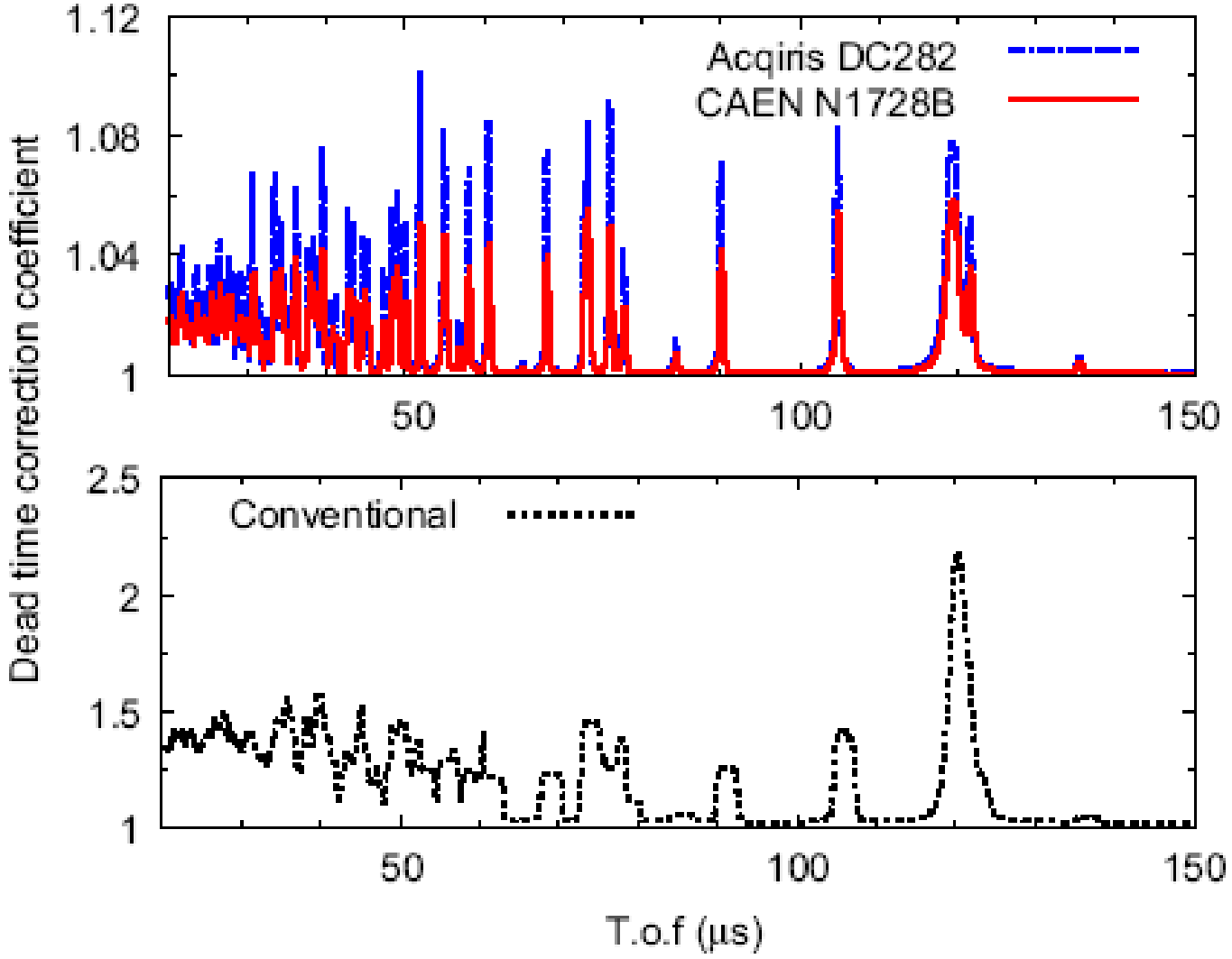


^{197}Au capture experiment



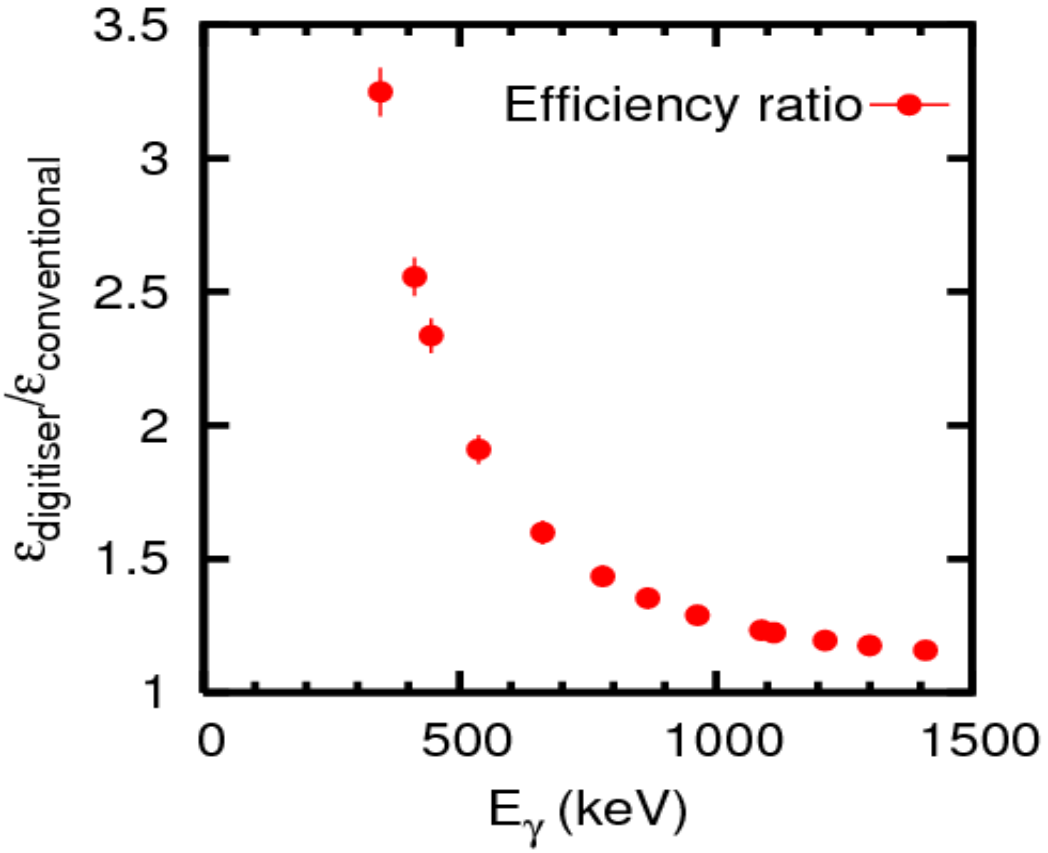


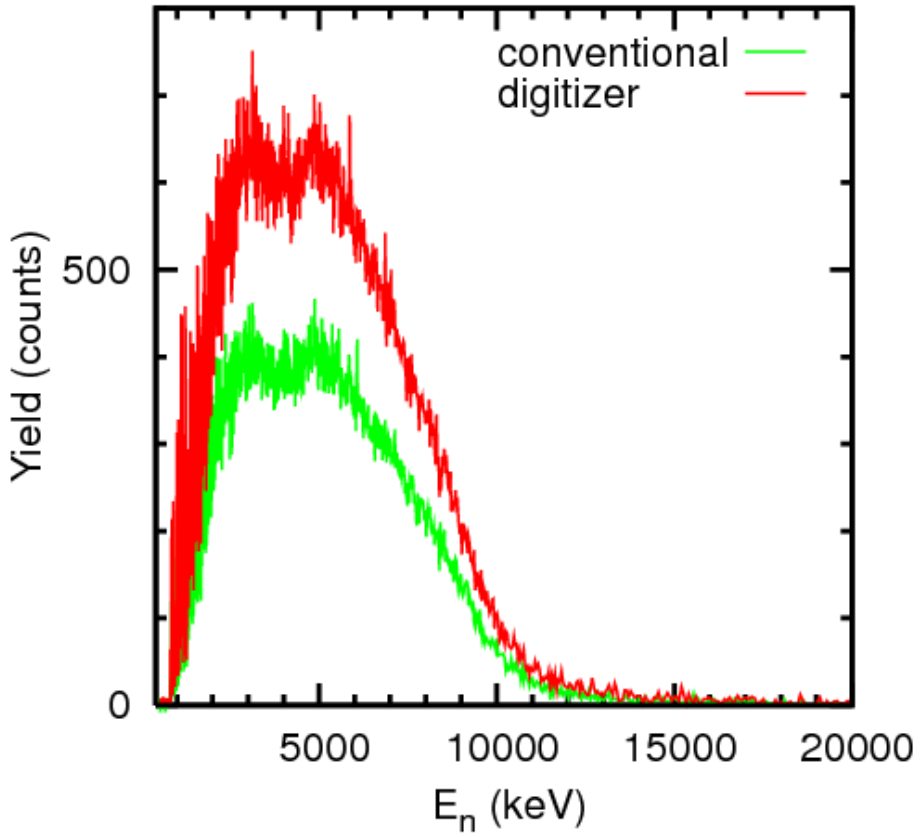
Dead time correction coefficients



Ge: Efficiency

Higher efficiency in particular at low energies as a result of improved handling of slow pulses.
Higher efficiency since we can avoid gamma-flash rejection





803 keV, 206Pb(n,n')

Conclusion

DSP algorithm are superior to analogue technique

Treatment of data in several ways to find optimum

More time consuming

Needs more resources in terms of computing power and disk capacity