

Status report on the germanium activities in Mainz

Marcell Steinen

Helmholtz-Institut Mainz, Germany



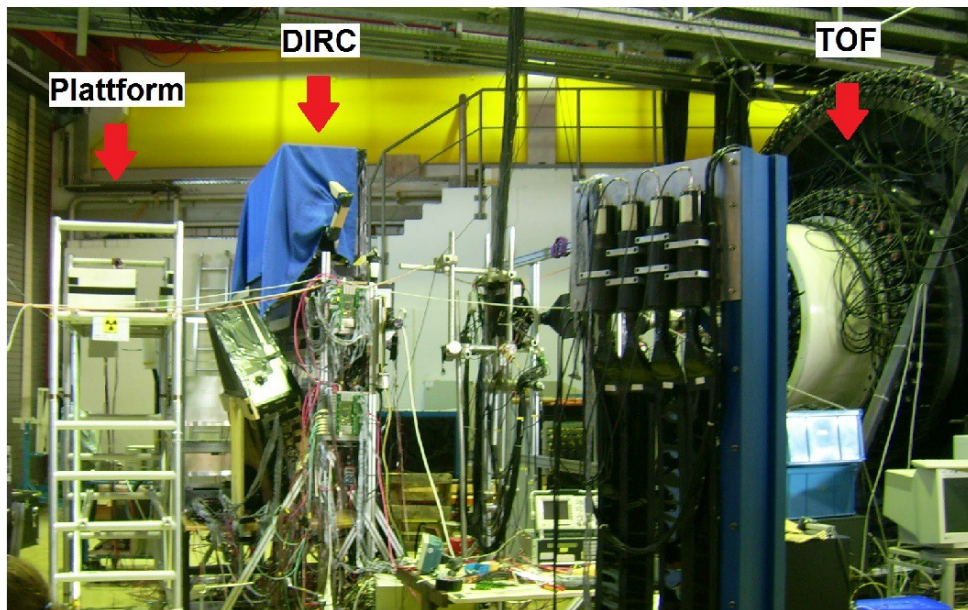
Collaboration Meeting XLVIII, GSI, 03/11/13



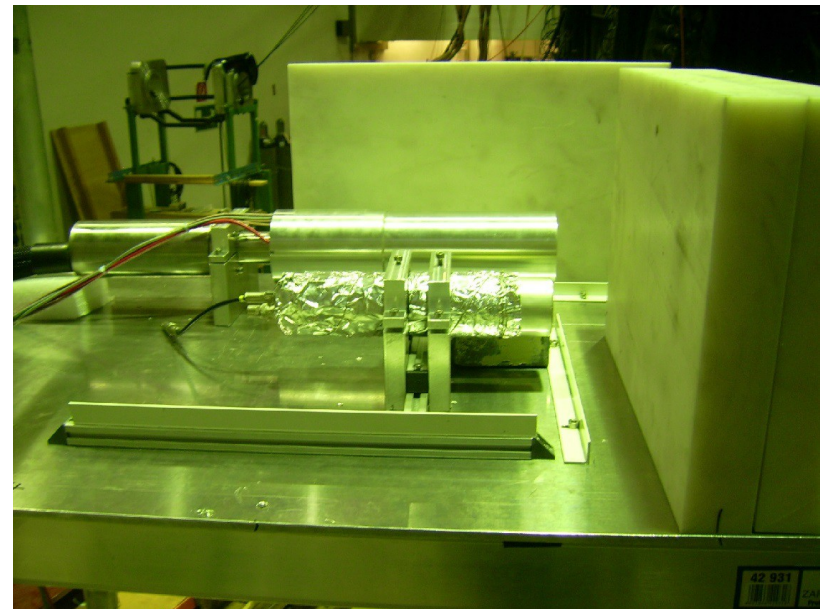
Outline

- Beam test in Jülich
- Cost predictions of the detector

Setup in Jülich



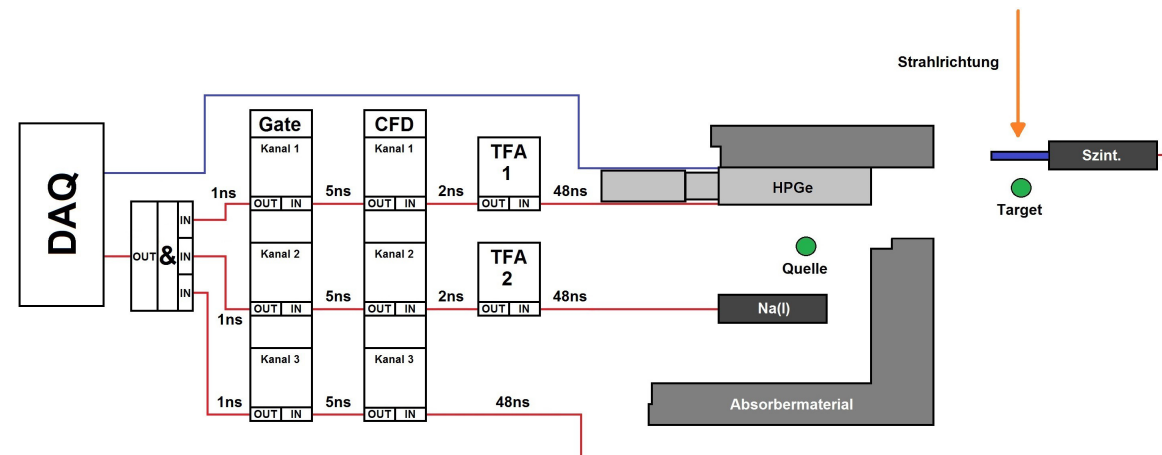
Setup in TOF hall



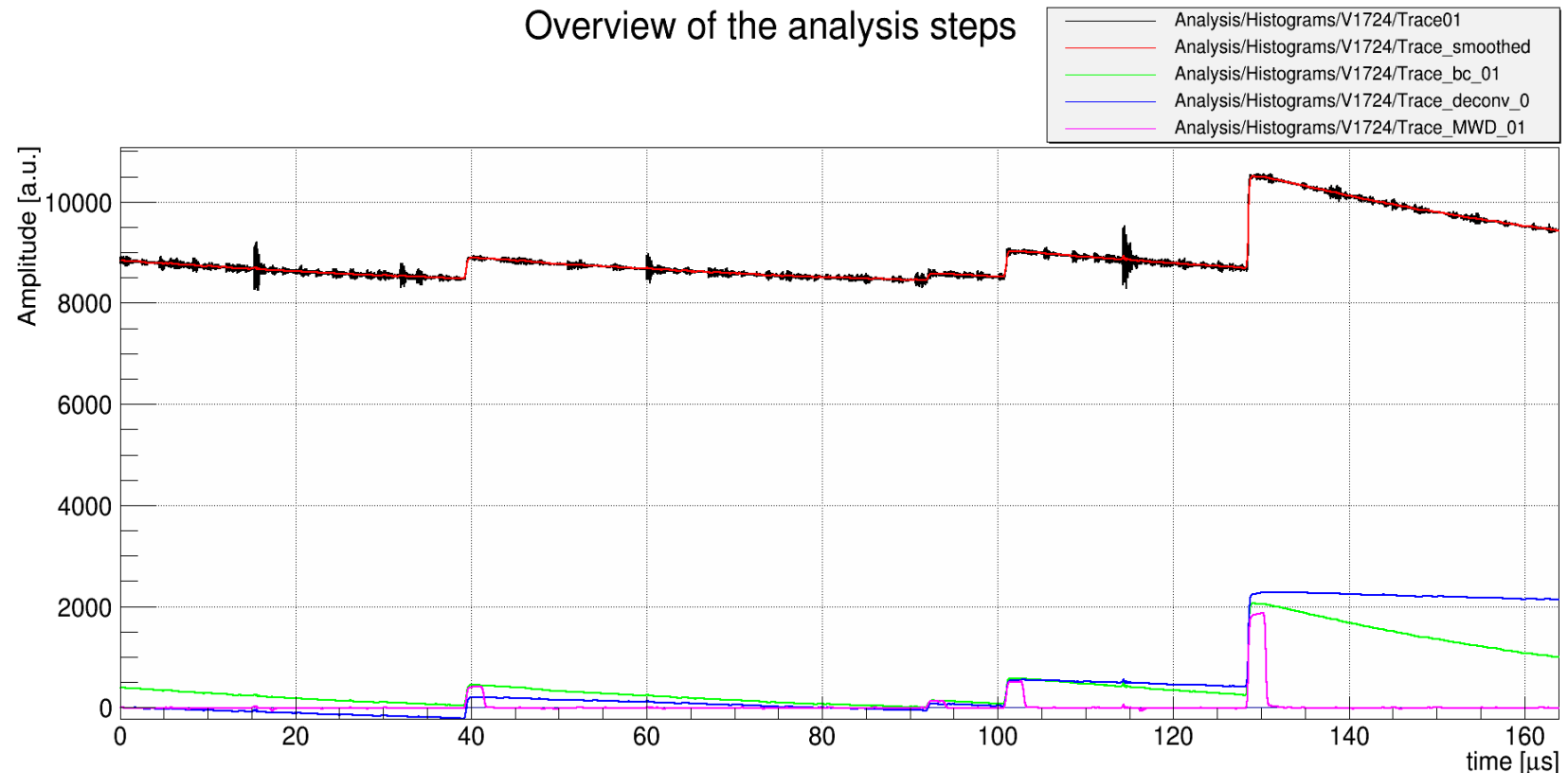
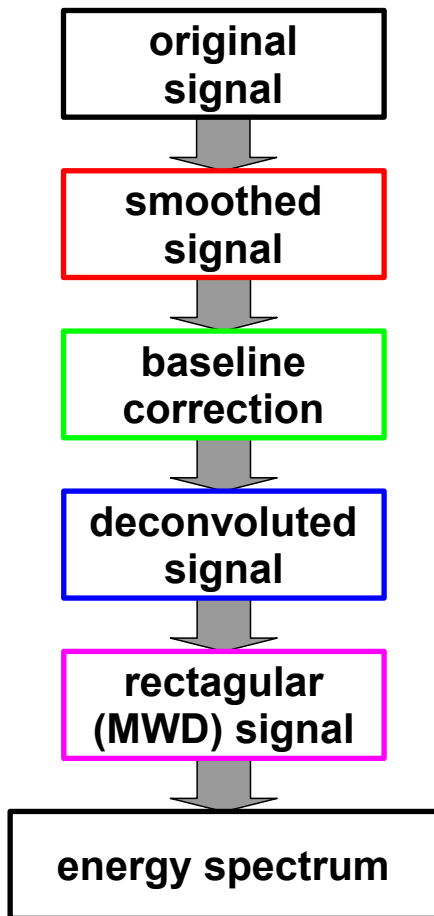
Detectors on platform

Data

- triple coincidence
- ^{60}Co source
- 106 GB (~ 3 mio traces)
- long traces ($\sim 160 \mu\text{s}$)
- dist target – detector: 90 cm
- max p flux: $\sim 10^7/\text{s}$



Analysis procedure



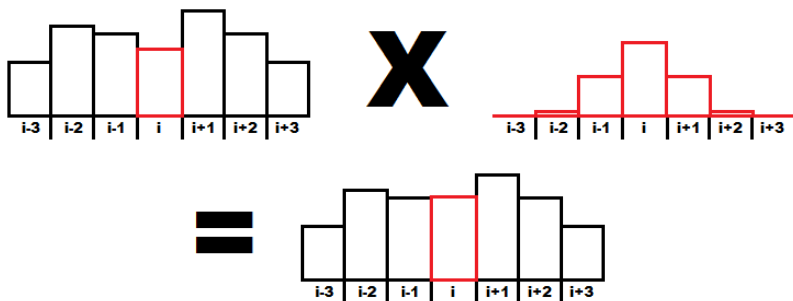
Analysis done in diploma thesis of Kai Rittgen

Smoothing filters

Gaussian filter

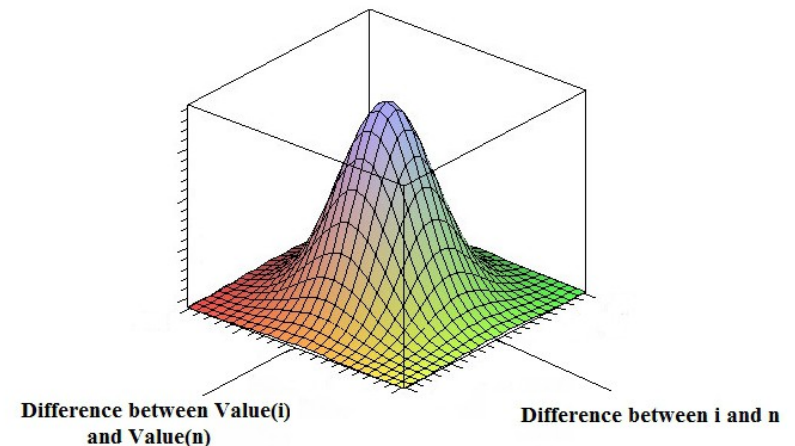
- + linear low pass filter
- + fast
- + - only 1 parameter
- real signals heavily influenced

$$f_c = \frac{\sqrt{\ln 2}}{2\pi\sigma}$$



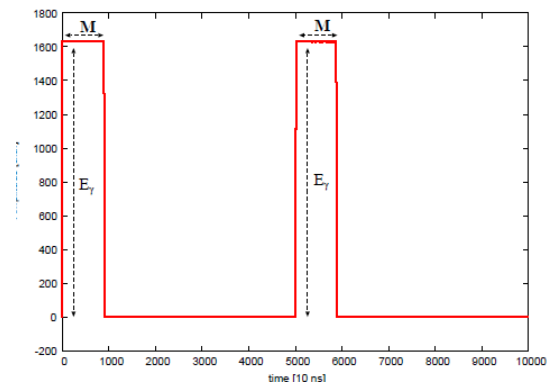
Bilateral filter

- + particle signals less affected
- + - 2 parameters
- slow
- non-linear



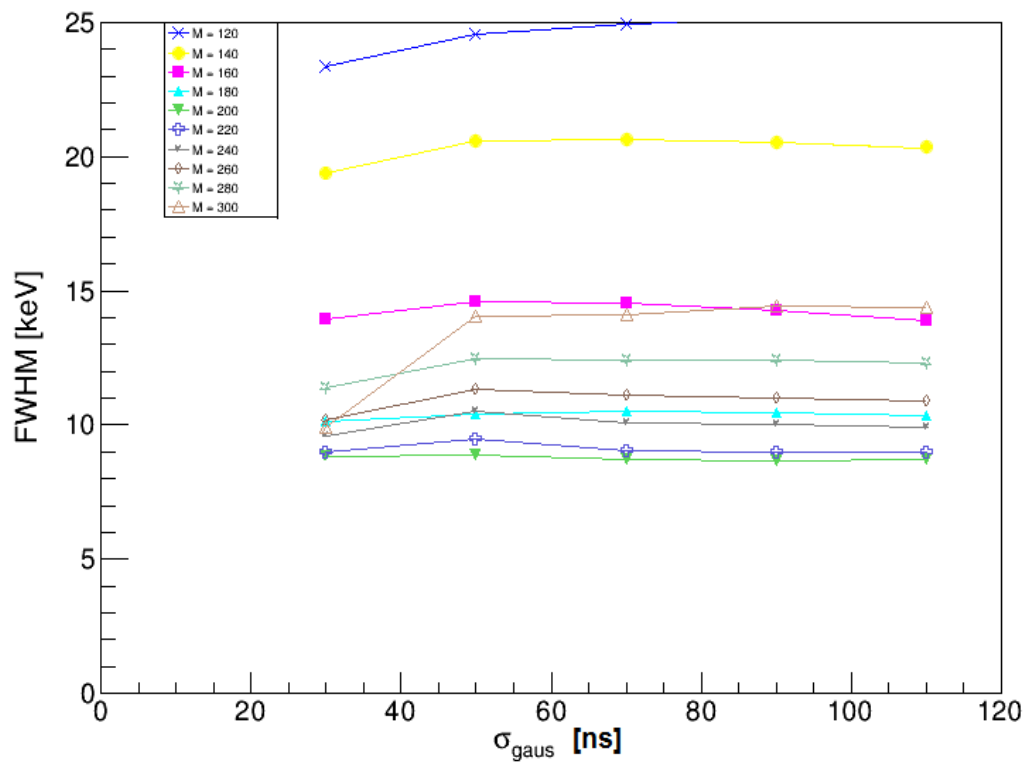
Analysis Parameters

- Variation of 2 (3) parameters for gaussian (bilateral) filter
- 1 (2) smooting parameter:
 - σ_{gaus} : 10 ns – 110 ns (2 ns steps)
 - σ_{bil} : 100 - 2100 (200 steps)
- width of rectangular filter:
 - M : 1.2 μs – 3 μs (0.2 μs steps)

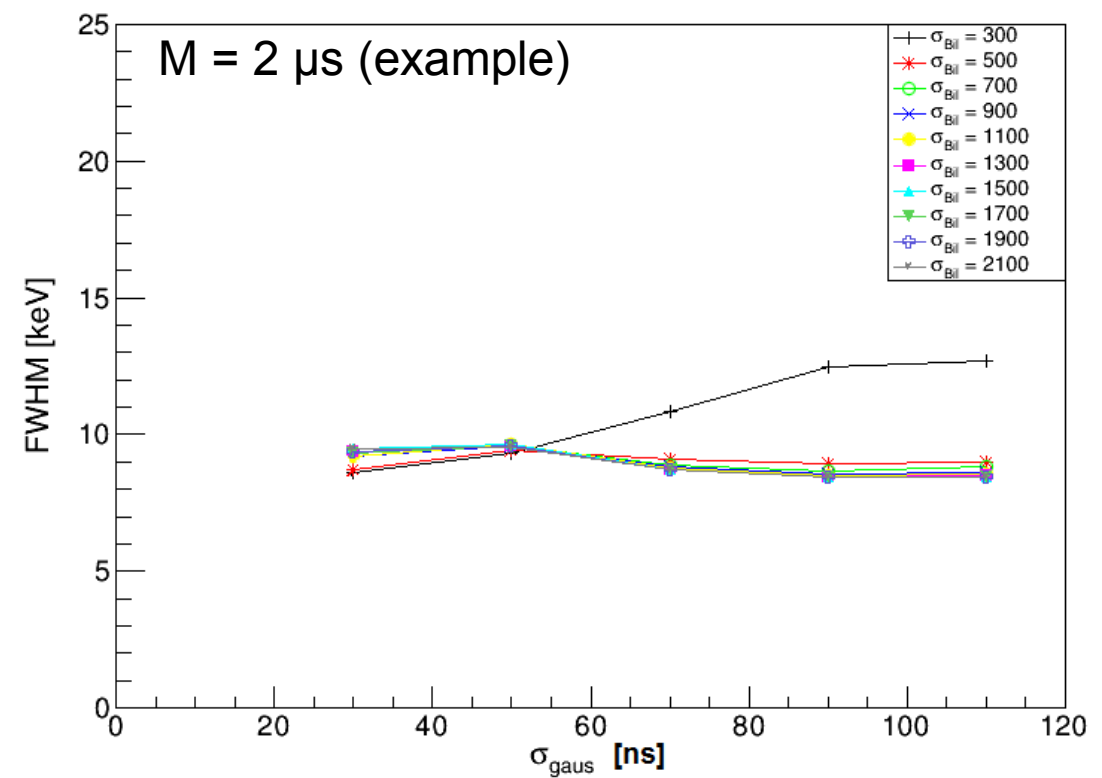


Results

Gaussian filter

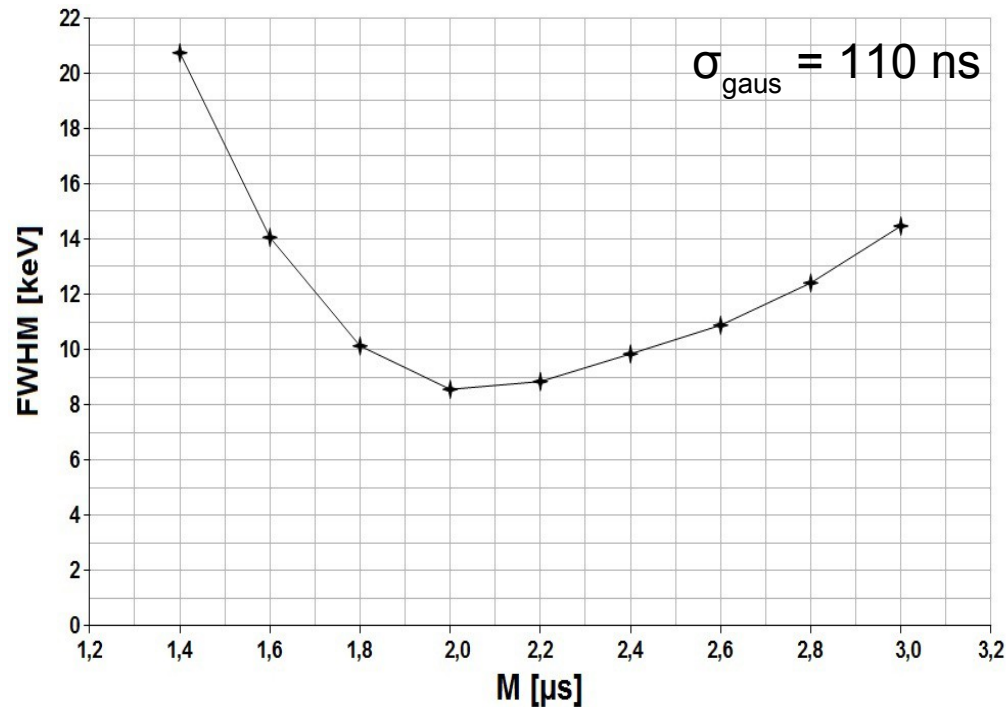


Bilateral filter

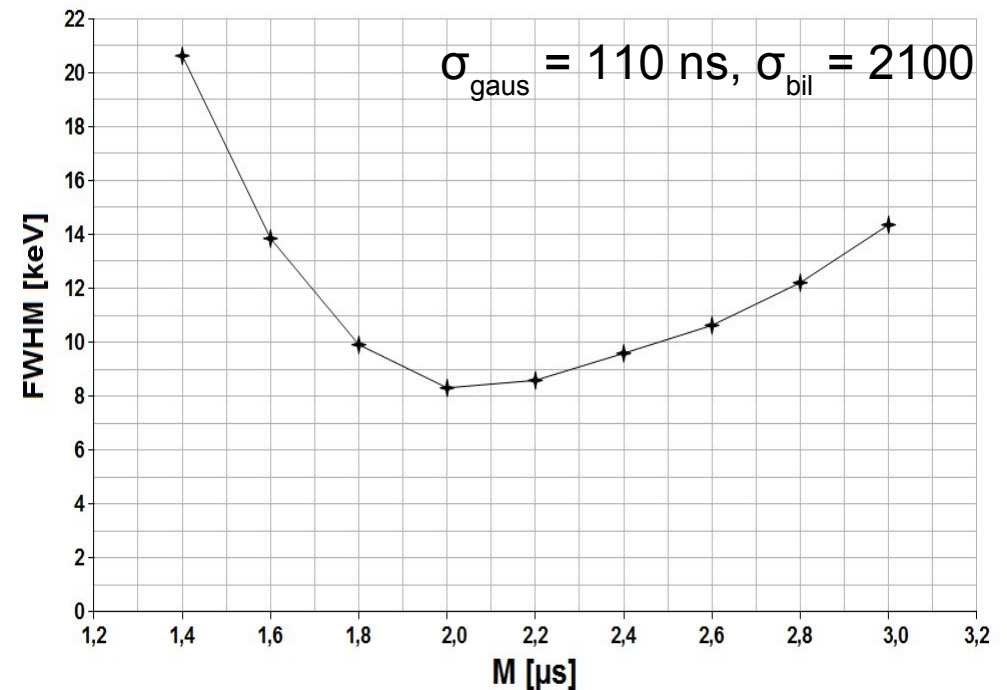


Results

Gaussian filter



Bilateral filter



noise too strong to achieve good resolution (2.25 keV)!

Cost predictions - prototype

Year 2014/2015

	price per unit	units	full price
Prototype	100.000 €	1	100.000 €

Data Concentrator Boards	1.800 €	1	1.800 €
isolation transformer	2.000 €	1	2.000 €
Annealing Ofen	15.000 €	1	15.000 €

Total	118.800 €
--------------	------------------

Cost predictions

Cost estimation	Stand	07.03.2014			
		price per unit	units	full price	When?
detector					
	detector (full)	50.000 €	15	750.000 €	2016 - 2019
	cryostat cap		15	- €	
	cryostat (other)		15	- €	
	cold finger		15	- €	
	fixing labyrinth		15	- €	
	cold frame		15	- €	
	pre amps		45	- €	
	hv modules		45	- €	
	hv filter		45	- €	
	readout modules		45	- €	
Cooler					
	X-cooler 2 / 3	14.000 €	15	210.000 €	2016 - 2019
	radiator to dissipate the heat of	10.000 €	1	10.000 €	2019
others:					
Electronics					
	LV	1.000 €	1	1.000 €	2016
	optical cable	30 €	16	480 €	2016 - 2019
	LV cable	5 €	16	80 €	2016 - 2019
	isolation transformer	2.000 €	1	2.000 €	2018
	Data Concentrator Boards (TRI	1.800 €	2	3.600 €	2018
	Slow Control	1.000 €	1	1.000 €	2016
Mechanics					
	holding frame germanium array	50.000 €	1	50.000 €	2018
	frame for coolers	2.000 €	1	2.000 €	2019

Total	1.030.160 €
-------	-------------

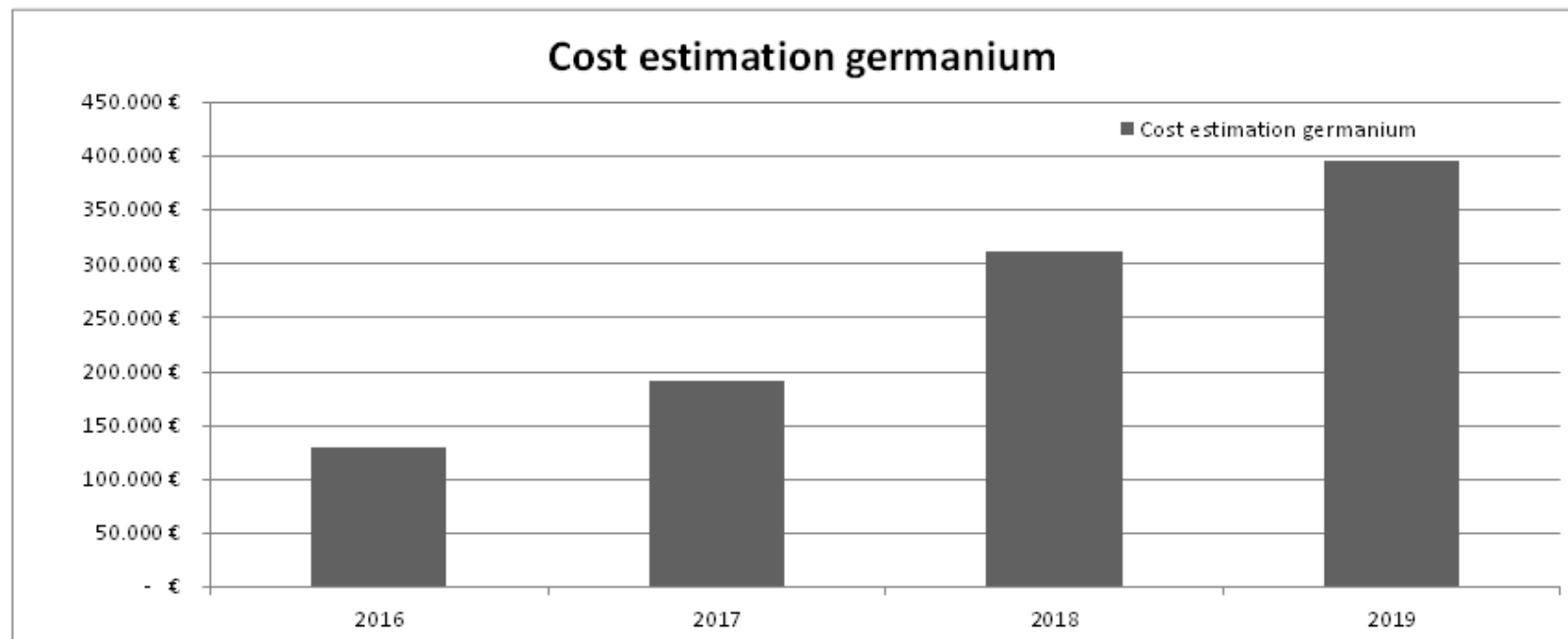
Cost predictions – spending profile

Spending profile

Det + cooler 64.000,00 €

Year	Detectors	Costs detectors	Cost others	Cost total
2016	2	128.000 €	2.280 €	130.280 €
2017	3	192.000 €	- €	192.000 €
2018	4	256.000 €	55.600 €	311.600 €
2019	6	384.000 €	12.280 €	396.280 €

Total	1.030.160,00 €
-------	----------------

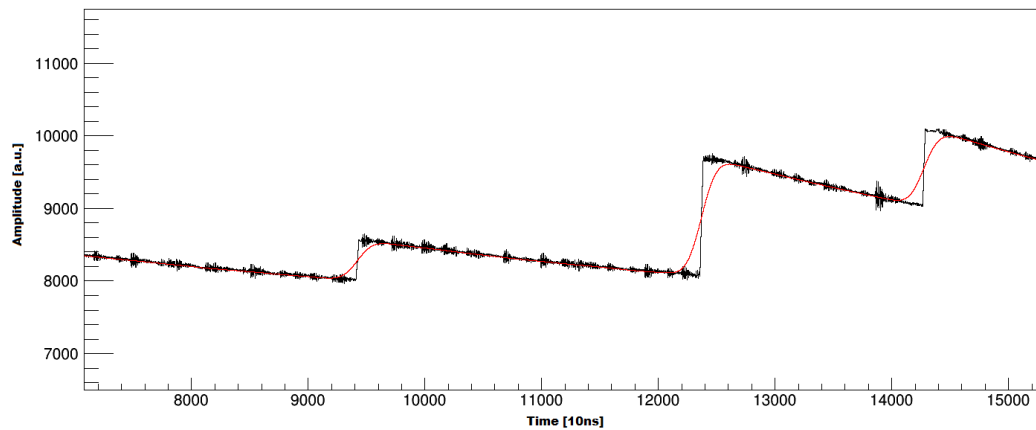


Summary / Outlook

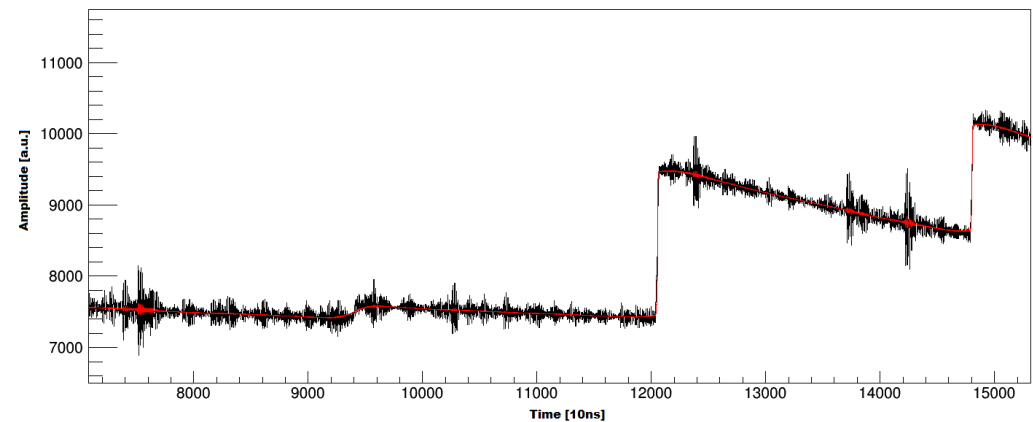
- Detector resolution of test data is limited by noise
- Analysis will be tested with new data taken in the lab
- next beam time in Jülich is applied (not 7 finally scheduled)
- Cost of detector array as expected (~ 1 mio €)
- possible to stretch the cost over several years (2016 – 2019)

Smoothing filters

Gaussian filter

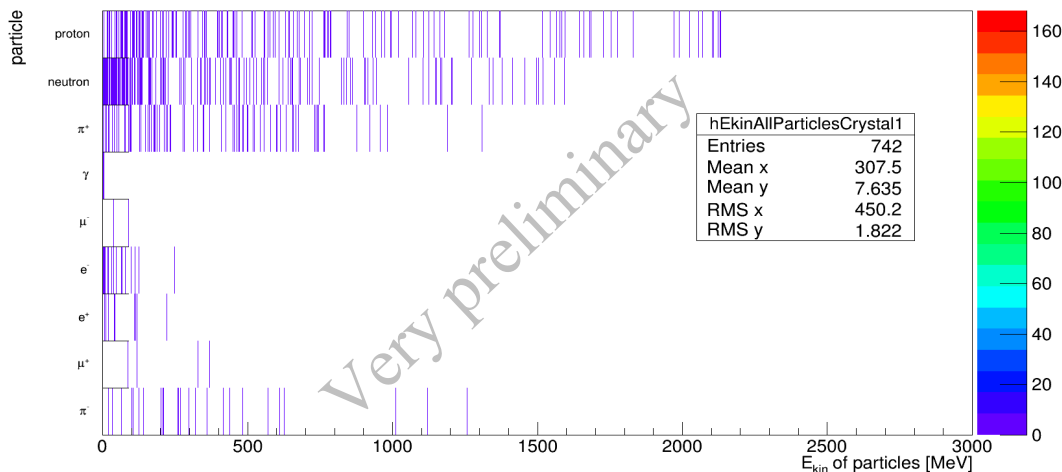


Bilateral filter

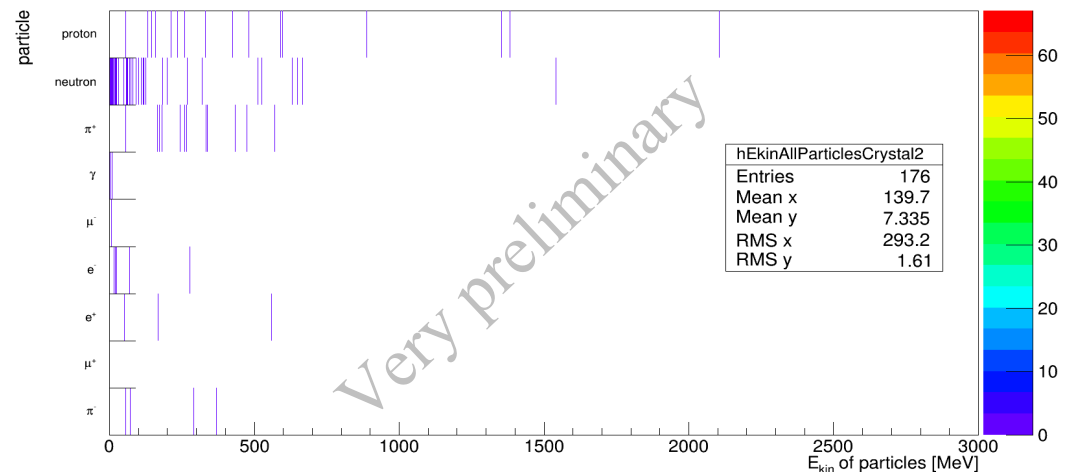


Simulation of beam time

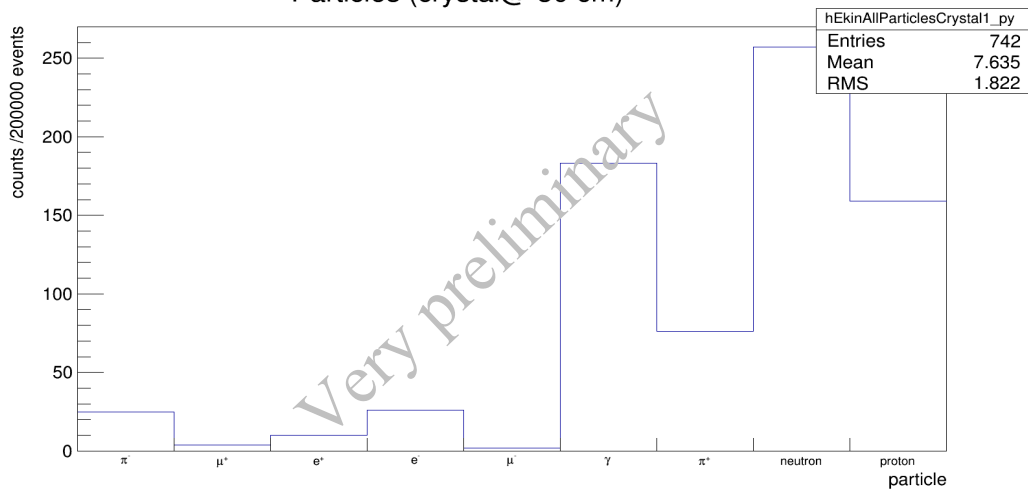
E_{kin} - Particle - Correlation (crystal@30 cm)



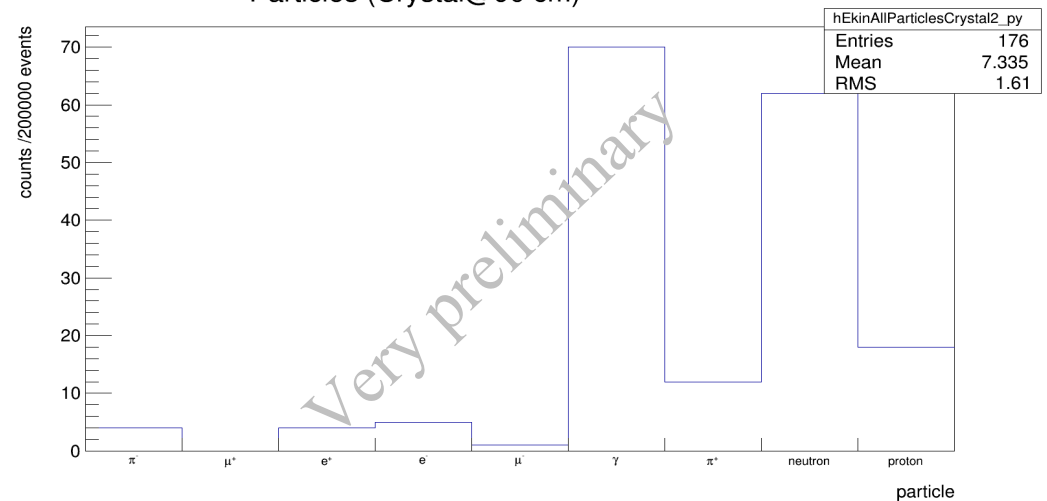
E_{kin} - Particle - Correlation (Crystal@90 cm)



Particles (crystal@ 30 cm)



Particles (Crystal@90 cm)



12.85 kHz neutron rate in position 1

3.1 kHz neutron rate in position 2

accumulated: $\sim 2 \cdot 10^8$ neutrons on the crystal ($\sim 6.6 \cdot 10^6$ n/cm²) ==> no effect on resolution expected