GANTT

2012

23/01/2012

- Booker NDE202 modules from Legnaro s/n 10 , s/n 30 placed in free crate channels 14 and 15 connected to s/n 10 , s/n 30 respectively
- HV checked and set for all modules det #6 HV channel 0.06 is set to 1303V , noise: 1370

Determination of photo e⁻/MeV

Gain	Centroid	FWHM	pulser input e⁻	Centroid	FWHM	
2K	7005	43	3 mV	466	467	spe
50	132	9	3 mV	1744	1632	2125 C edge
50	1026	9.5	20 mV			
50	2083	8	40 mV			
50	4255	7	80 mV	Centroid =		
50	5575	6	100 mV	= 55.084 [mV] - 71.08		
50	7104	6	131 mV	R^2 = 0.9992		

DC offset: -71.08 ch

↳ 203.08

$G \sim \frac{7276.08}{203.08}$

Gain	Centroid	Pulser input
2K	6560	2.9 mV
	4700	2 mV
	2430	0.9 mV

$G = \frac{7005 - 601}{132 + 71} = 32$!

$N_{pe} = \frac{2125 + 71}{466 - 601} \times \frac{53}{40} \times \frac{503}{380}$

→ negative value ! *

→ no correction of the DC offset. $G = \frac{7005}{132}$ (2)

$G = \frac{7005 + 71}{132 + 71} = 34.8$ | DC offset is the same for 2K or 50 gain

$N_{pe} = \frac{(2125 + 34.8) \times 34.8}{(466 + 34.8)}$

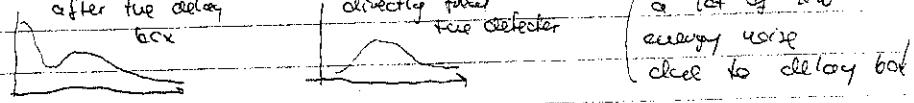
$N_{pe} = \left(\frac{2125 + 71}{466 + 71}\right) \times \frac{34.8}{0.48} = 296$

* with values measured in the previous page we got negative value... this is obviously not correct.

A clear conclusion is that the DC offset extracted from the 2K gain is delicate to extract. We need the 2K to observe the spe. With this 2K gain, we need to inject ~ 2mV from the pulser. This lead to error in the estimation of the input → big error on the DC offset.

24/01/2012

det #0 looking at the SPE peak, gain 2K



24/01/2012 24/01/2012 (4)

Gain	channel numb.	FWHM
2K	497	
att. 10x	~~110~~ 101	
2K spe	484	466
50 Cedge	2300	
50	1841	750

pulser att		Ampl Gain
100	139	50
50	295	50
20	765	50
10	1550	50
5	3121	50
2	7837	50

offset = -20.

$Y = 15712x - 19.96$ (channel / 1/att)

500	1254	2k
200	3142	2k
100	6301	2k
1000	622	2k
400	1568	2k

offset = -9.3

$Y = 630906x - 9.3$

90% of 2300

$N_{phe} = \frac{1841 + 20}{484 + 9} \cdot \frac{48.3}{0.48} = 396$

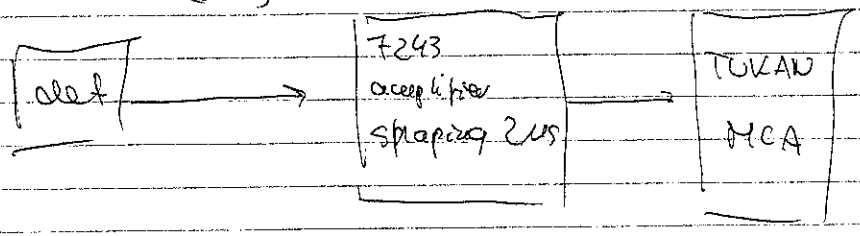
$G = \frac{6300}{139} = 45.3 \quad \left(\frac{6310}{119} = 48.3\right)$

90% of 0.48

att	channel	Ampl Gain
100	6300	2k
100	139	50

Activity of the ^{137}Cs source 31 kBq on 7/10/2011.

The measurements of SPE and ^{137}Cs Compton in the following two (four) pages were done with the setup:



i.e. no preamplifier

^{137}Cs is 31 kBq and it is placed at the detector face (with Pb absorber), in the center of each triple-detector hexagon, or five-detector pentagon.

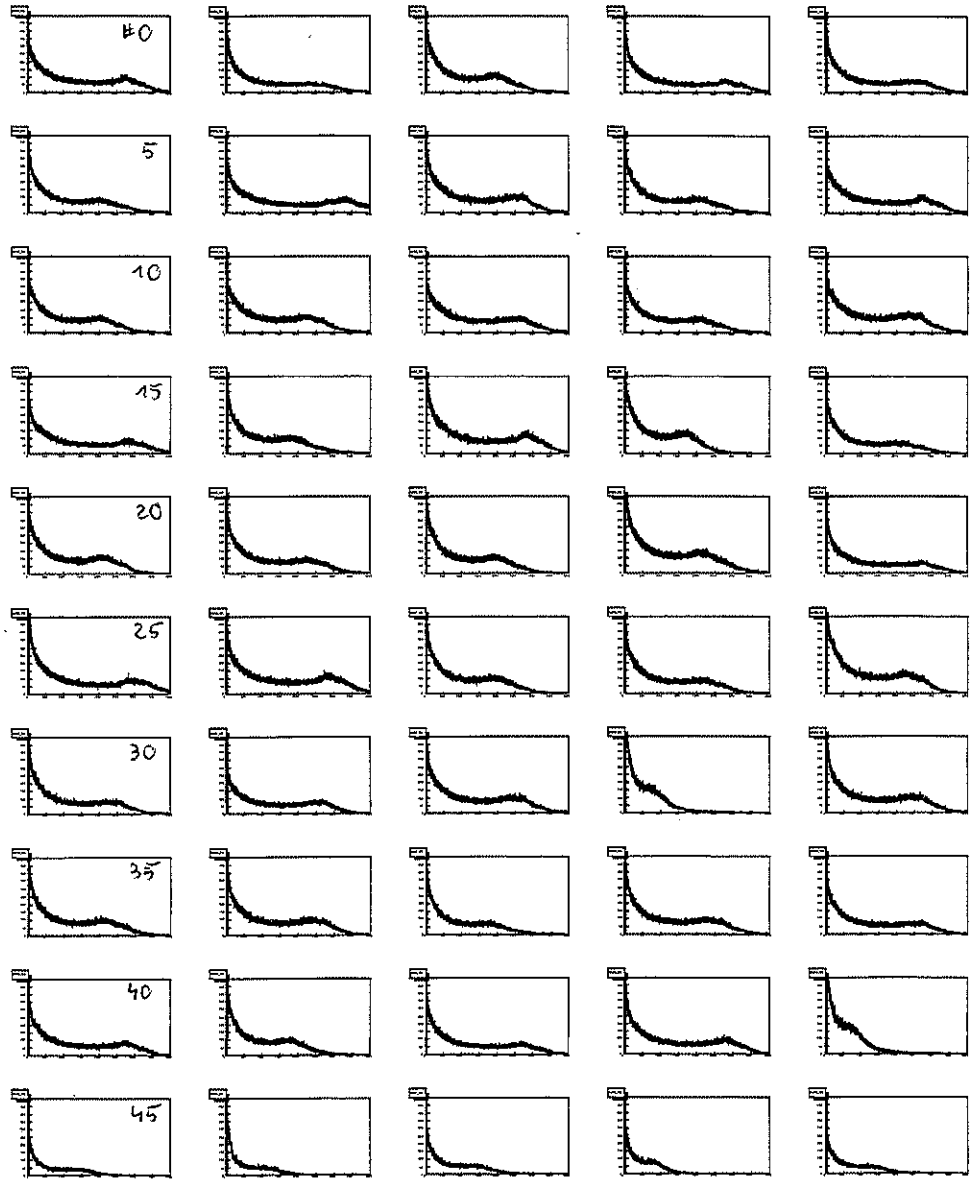
Signals for the measurements (^{137}Cs 1 Phe) in the following 4 pages are taken at the input of the delay boxes.

det #	SPE chan.num	# counts	comments	Amplifier gain 2K G = 45.3 / GOs per det. — peak (Cs edge)	(*) Compton edge	data taking 120 s if not marked otherwise — spectrum file name
0	498			1761 ~~1837~~	2224 2335	det 0_CE
1	688			2736 2686	3145 3174	det 1_CE double bump
2	524			2014 2046	2575 2580	det 2_CE
3	642			2849 2878	3349 3407	det 3_CE
4	493			2754 2711 ~~3000~~	3268 ~~3307~~ 2784	det 4_CE
5	473		Cs spec	~~2115~~ ~~2146~~ 2136	~~2702~~ 2702	det 5_CE
6	701			3391 3445	3959 3953	det 6_CE
7	445			2748 2759	3135 3096	det 7_CE
8	594			2177 2114	2766 2647	det 8_CE
9	557	40000		2756	3235	det 9_CE
10	379	106000		2052	2524	det 10_CE
11	395	50000		2248	2783	det 11_CE
12	609	29.000		2658	3110	det 12_CE
13	428	82,000		2113	2663	det 13_CE
14	615	103,000		2599	2982	det 14_CE broad CE bump
15	646	75,000	lots of low energy counts	2827	3384	det 15_CE
16	454	446,000		1859	2436	det 16_CE
17	517	49.000		2838	3287	det 17_CE 160 sek.
18	334	346,000		1721	2174	det 18_CE
19	397	184,000		2144	2737	det 19_CE
20	485	164,000		2159	2671	det 20_CE
21	420	151,000		2260	2871	det 21_CE
22	349	251,000		1982	2516	det 22_CE
23	601	202,000		2136	2848	det 23_CE 140 sek
24	747	294,000		2729	3319	det 24_CE
25	683	30,000		2589	3577	det 25_CE 160 sek
26	665	38.200		2990/2866	3560/3476	det 26_CE
27	500	52,800	lots of low E counts	1995	2532	det 27_CE
28	446	60160		2210	2810	det 28_CE
29	449	35300		2321	2836	det 29_CE 160 sek
30	591	29850		2522	2981	det 30_CE 130 sek

(*) i.e position of half height

(6)

137Cs 25/01/2012



Amplifier gain 2000 G = 45.3 60 sec per det

	SPE ch n.	# counts	comments	peak edge	Gaussian edge	spectrum file name
31	508	43500		2687	3089	det31_CE
32	601	41900		2622	3105	det32_CE
33	928	77150	lots of low E counts	784	1152	det33_CE very low gain
34	536	734000	nice	2618	3066	det34_CE
35	512	42700		2166	2704	det35_CE
36	449	69150		2581	3074	det36_CE
37	494	44500	lots of low E noise	1810	2378	det37_CE
38	605	122400		2499	3014	det38_CE
39	487	65600		2678	3131	det39_CE
40	411	96700		2760	3196	det40_CE
41	418	49000		1830	2330	det41_CE
42	518	55100	low E noise	2754	3229	det42_CE
43	534	175400		2877	~~3303~~	det43_CE
44	945	30600	low E noise	763	1104	det44_CE
45	662	82100		1535	1900	det45_CE
46	641	157500		1200	1553	det46-CE
47	806	80000		1502	1934	det47_CE
48	483	40000		853	1134	det48=CE
49	293	144000		1308	1703	det49-CE

42 test of det42_CE signal after with the delay box ~~DelayBox~~

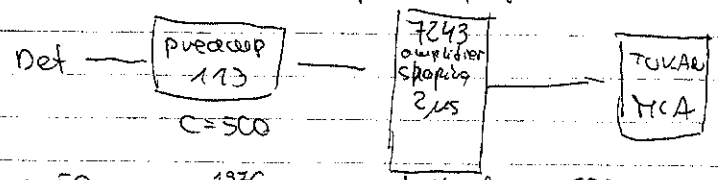
CFD Threshold (mV) 24/1/12 AD/EC

Nwall alone (no exos)

PSD Unit	2009	2012		2009	2012
0, 1	-12.3	-11.1	26, 27	-7.8 mV	-10.5 mV
2, 3	-10.7	-12.3	28, 29	-9.4 mV	-9.4 mV
4, 5	-10.4	-9.1	30, 31	-7.9 mV	-12 mV
6, 7	-12.1	-12	32, 33	-17.3 mV	~~-12.8 mV~~
8, 9	-5.5	-7.2	34, 35	-11.4 mV	-11.4
10, 11	-6.8 mV	-9.2 mV	36, 37	-9.7 mV	-9.7 mV
12, 13	-9.5 mV	-10.1 mV	38, 39	-11.8 mV	-11.8
14, 15	-7 mV	11.5 mV	40, 41	-11.7 mV	-7.6 mV
16, 17	-9.8 mV	-13.2 mV	42, 43	-7.7 mV	-10.8 mV
18, 19	-8.5 mV	-8.5 mV	~~44~~	-16.5 mV	-13.1 mV
20, 21	-8.9 mV	-10.1 mV	46, 47	-6 mV	-6.7 mV
22, 23	-12.3 mV	-12.8 mV	48, 49	-9.7 mV	-9.7 mV
~~24~~ 45	-7.1 mV	-8.3 mV			
24, 25	-11.7 mV	-10.7 mV			

24/11/2012 (10)

check with a preamplifier



~~no gain 50~~	^{137}Cs peak	half-edge	SPE
default	2795	3574	700
	fit (2849) (gain 50)		gain 2k

dependence of G (and offset) with pulser signal inserted to the input of preamp:

~~gain 2000~~ att	gain 2000	gain 50	G	gain 100	G_2
100	6118	82.4	74.2		
200	3e21				
400	1478				
500	1172				
1000	553				
input pulser signal increased					
100	7739	122.4	63.2	316.5	24.5
200	3830			121	31.7

$G = 21739 \cdot dac - 40.732$

$NPHE = \frac{2795+40}{700+41} \cdot 40 \cdot \frac{1}{0.43} \quad 356$

Summary of G measurements (attempts of) for the amplifier gain change 2000 → 50 we've got 3 different G values: 45.3 (without preamplifier), 74.2 and 63.2 (with preamplifier)

Conclusion: we can't measure G value properly.

HV checked and set on 23/01/2012
we ~~change~~ difference comparing to this list from 2009,
↓ except det#6 for which the list says 1330, but the value at the HV module was 1303
— we keep 1303 ✓

4.30 1330
4.40

Settings at GANIL

Detector segment number	Segment ID	Detector number	Detector type	r (mm)	θ (deg)
0	01B8	1	H1	510	44.830
1	01F7	1	H1	510	57.210
2	01DD	1	H1	510	47.200
3	11BC	11	H2	510	46.784
4	11AF	11	H2	510	47.210
5	02B8	2	H1	510	44.830
6	02F7	2	H1	510	57.210
7	02DD	2	H1	510	47.200
8	12BC	12	H2	510	46.784
9	12AF	12	H2	510	47.210
10	03B8	3	H1	510	44.830
11	03F7	3	H1	510	57.210
12	03DD	3	H1	510	47.200
13	13BC	13	H2	510	46.784
14	13AF	13	H2	510	47.210
15	04B8	4	H1	510	44.830
16	04F7	4	H1	510	57.210
17	04DD	4	H1	510	47.200
18	14BC	14	H2	510	46.784
19	14AF	14	H2	510	47.210
20	05B8	5	H1	510	44.830
21	05F7	5	H1	510	57.210
22	05DD	5	H1	510	47.200
23	15BC	15	H2	510	46.784
24	15AF	15	H2	510	47.210
25	06DD	6	H1	510	30.301
26	11DE	11	H2	510	34.846
27	07DD	7	H1	510	30.301
28	12DE	12	H2	510	34.846
29	08DD	8	H1	510	30.301
30	13DE	13	H2	510	34.846
31	09DD	9	H1	510	30.301
32	14DE	14	H2	510	34.846

NOT CORRECT

25/01/2012 ^{252}Cf source placed ~at the target position, ~51 cm distance from the detectors.
probably 25 μCi (C4.193 LEA P52C)

26/01/2012 data taken over night with the DAQ, but detector numbering - cabling unclear.

NDE 202 unit selected for ZCO checks with the MCA analyzer: S/N 29 (used for det #10 and #11)

• we collect spectra for all ~~unit~~ detectors and S/N 29
spectra names: det NN_ZCO 90 secs for each detector.
see plots on page this_one + 5

26/01/2012
cable connections ZCO-TACs → ADC put in order (detector number):

ADC #1
channel #0 - det #0
⋮
#27 - det #27
#28 broken
#29 - det #28
#30 - det #29
#31 - det #30

ADC #2
channel #0 - det #31
⋮
channel #18 - det #49

17:45 collecting ZCO data with ^{252}Cf

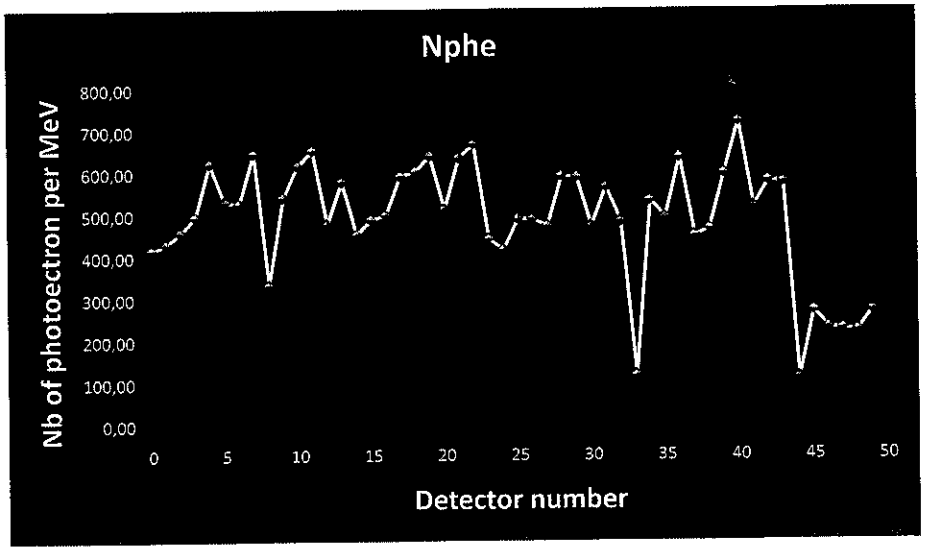
23:30 stopped (i.e. source removed - I don't know how to stop the DAQ)

January 24, 2012

Compton edge 137Cs:		0,48 MeV	0,432	MeV
G facti	45,3			
Offset	-9,3			
Offset	-20			Note:

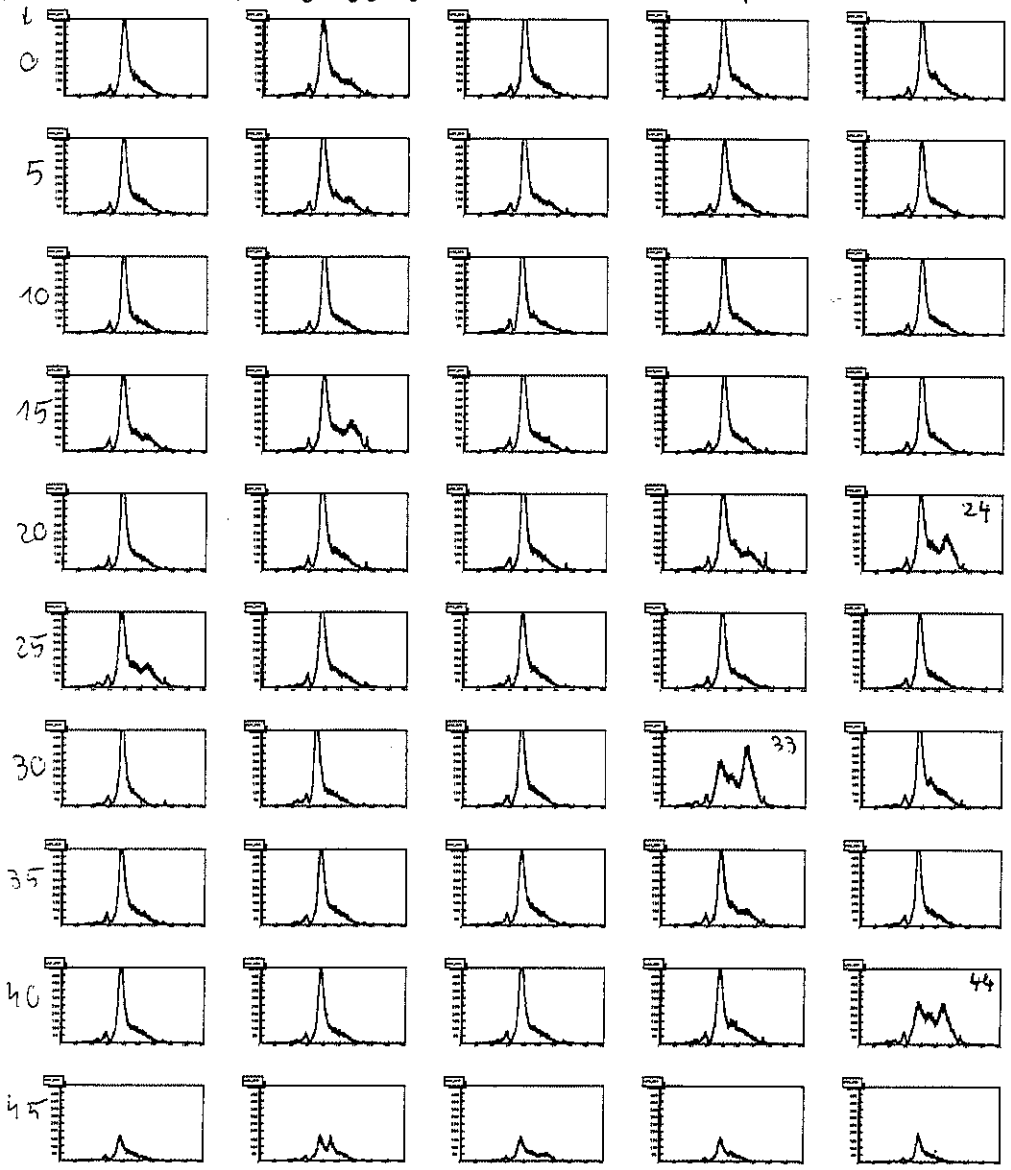
Measuring time: 60 s for single photoelectron peak
120 s for Compton edge (unless indicated)

Det.	No source: Single e_phot Peak position	137Cs source: Peak position	Nb of e_phot/MeV: Using Compton edge:	Using 90% of pos. Of peak: Nphe
0	498	1761		368,14
1	688	2586		391,89
2	524	2046		406,23
3	642	2878		466,59
4	493	2711		570,13
5	473	2136		468,76
6	701	3445		511,54
7	445	2759		641,45
8	594	[illegible]		[illegible]
9	557	2756		514,03
10	379	2052		559,55
11	395	2248		588,24
12	609	2658		454,18
13	428	2113		511,48
14	615	2589		438,22
15	648	2827		454,19
16	454	1859		425,28
17	517	2838		569,43
18	334	1721		531,79
19	397	2144		558,50
20	485	2159		462,25
21	420	2260		556,91
22	349	1982		585,91
23	601	2136		370,44
24	747	2729		381,15
25	683	2889		440,62
26	665	2866		448,80
27	500	1995		414,87
28	446	2210		513,60
29	449	2321		535,63
30	591	2522		444,04
31	509	2687		547,67
32	601	2622		453,95
[illegible]				
34	536	2618		507,29
35	512	2166		439,72
36	449	2581		595,12
37	494	1810		381,28
38	605	2499		429,99
39	487	2678		570,05
40	411	2760		693,59
41	418	1830		454,00
42	518	2754		551,65
43	534	2877		559,14
[illegible]				
Pentagon 45	662	1535		242,90
46	641	1200		196,73
47	806	1502		195,75
48	483	853		185,95
49	593	1308		231,21

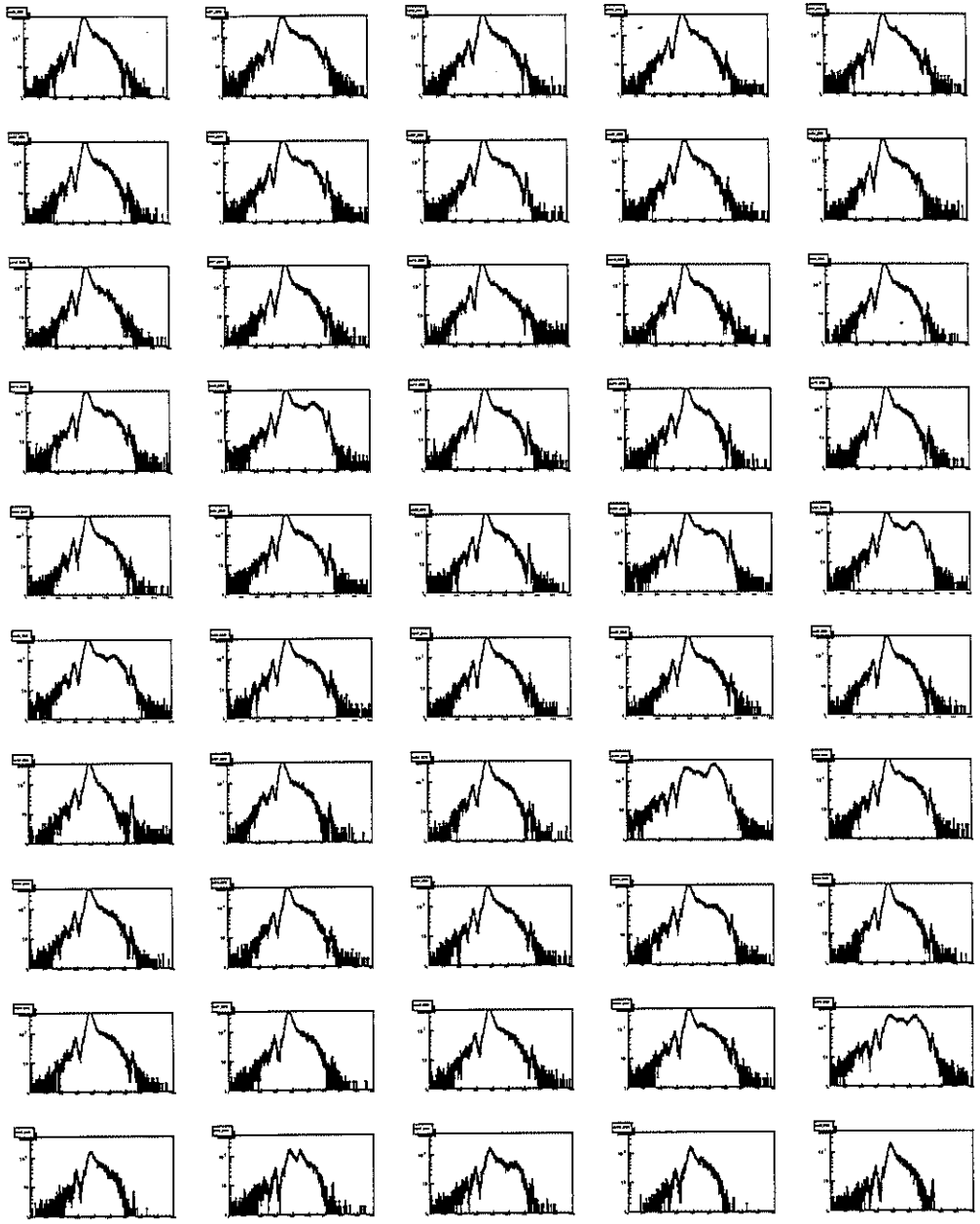


26/01/2012 ^{252}Cf, all detectors with NDE202 S/N 29

same vertical scale on all the plots



same as on the opposite page, but log scale



30.01.2012

^{137}Cs , 40 kBq , measuring QVC → check threshold

ADC	#CELL (= number of detector)	noise	signal	
1	0	350	400	
2	1	650		, one big peak
3	2	800		, "
4	3	700		, nicer distributed than #1, #2
5	4	270	200	
6	5	140		
7	6	300		
8	7	140		
9	8	300	150	
10	9	250		+ a small peak
11	10	190	120	
12	11	270		+ a small peak
13	12	500		
14	13	200		
15	14	330	100	
16	15	100		
17	16	80	140	
18	17	(20)	90	
19	18	200	100	
20	19		140	
21	20	200	100	
22	21		200	
23	22		140	
24	23			no separation with the pedestal
25	24	BAD		
26	25	BAD		
27	26	250	300	
28	27		120	
29		empty one		

2012-01-30

(18)

ADC	#CELL (= number of detector)	noise	signal	
30	28	100	120	
31	29		100	
32 = ADC2_0	30		50	↑ ADC1
33 = ADC2_1	31		100	, pedestral very close ↓ ADC2
34 = ADC2_2	32		180	
35 = ADC2_3	33		1000	, high!
36 = ADC2_4	34	120	120	
37 = ADC2_5	35		100	
38 = ADC2_6	36	180	120	
39 = ADC2_7	37		150	
40 = ADC2_8	38		100	
41 = ADC2_9	39	100	100	
42 = ADC2_10	40	60	140	
43 = ADC2_11	41	160	150	
44 = ADC2_12	42	180	120	
45 = ADC2_13	43		~~140~~ 1400	, pedestral very close
46 = ADC2_14	44		300	
47 = ADC2_15	45		140	, pedestral very close
48 = ADC2_16	46		1400	, high!
49 = ADC2_17	47		450	
50 = ADC2_18	48		60	, pedestral very close
51 = ADC2_19	49		60	
52	50	just noise		
53	51			

cables one next

Saved spectra : cs137-30112012a.root

we changed the threshold from detector 45 and 47 : from 6.6 mV to 9.6 mV

now: detector 46 : 40 120 (it was 1400 before)

detector 47 : 70 (it was 450 before)

changed threshold from detector 32 and 33 : 12.3 mV to 13.4 mV

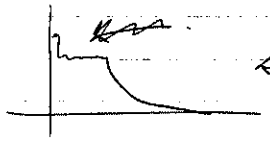
detector 33: 600

detector 34: 120 120

2012-01-30

problem with detector 24+25: baseline & QVC signal very unstable, switching power off/on solved the problem

Bad spectra at low energy the same issue with the crate power. Power cycle solved the issue



← looked like this.

	noise	signal
detector 24:	250	80
detector 25:		90

2012-01-30

(20)

TO DO LIST

1. measure TOF vs. zero crossover
2. measure QVC spectra with ^{137}Cs, ^{60}Co, ^{207}Bi, ^{241}Am (energy calibration)
3. Measure time resolution with ^{60}Co and BaF_2.
4. time alignment

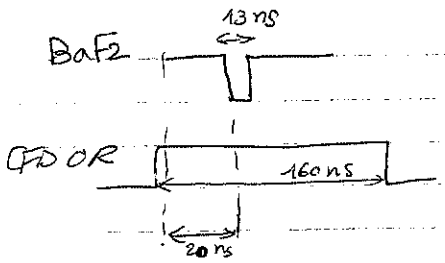
Sources used:

^{252}Cf # c4-193 925 kBq 2005-04-01

^{60}Co 1 µCi march 2007

^{60}Co ? now 10-15 kBq ?

2012-01-30



We increased the width to 70 ns

42 ns cable was connected to Tref we removed that and added 50 ns. all together 58 ns added

Setting BaF2 and CFD_OR in Coincidence.

measure TOF
^{252}Cf, change all detectors from QVC to CFD.TAC
(no BaF$_2$ in trigger)

problem: online analysis detector 19 onwards were strange
dressed the module in the crate, crate power off/on
→ problem solved

need to switch coincidences on, nearly no counting rate

→ detector 31 was at the edge
make time reference signal shorter, we removed 42 ns

add ZCO signal

estimating the number of neutrons and looking at the neutron bump of the spectrum: Looks almost ok.

2012-01-30

(22)

TOF vs. Z/C from ADC2
take all cables and connect them to the Z/C of detector 0-30,
leave a blank cable at ~~detector 29~~ ADC ch 30 (ADC chs are counted from 1)

ADC2 channel 29 dead, detector 28 → at ADC2_cell 28
ADC1 " 28 " " 28 → at ADC1_cell 29

→ Trigger (Wall CFD OR) AND (BaF$_2$ CFD), source: ^{252}Cf at target pos. (≈ 51 cm)

15:51 DAQ started, written on disk run #3
~~17:54~~ 18:31 stopped
run_0003_dat.30Jan12_15h51m28s
in directory /data/oreo6amX/Bidon/acquisition/run

cable all detectors from 31 to ~~50~~ 49 in ADC chs 1-19.
detector 31: some problem in ADC1_cell 0 (ADC ch 1)
switch to another channel in ADC1 (ADC ch 20)
moved to ADC1_cell 19 and ADC2_cell 19 (ADC ch 20)
=> 1 channel at ADC1 doesn't work

Run 4 was just testing

19:09 start run 5 ^{252}Cf, trigger (CFD-OR) AND (BaF$_2$ CFD)
detectors # 31-49 in ADC chs 20, 2-19 (det 30, 31-49) with
ADC1 = TOF, ADC2 = ZCO.
~~Note: ZCO TOF was for det #~~
Note: signals from detectors 24-30 are still connected to ADC chs 25-32 in run 5.

20:51 Stop run 5 file run_0005_dat.30Jan12_19h09m41s
Saved histograms ~/NWall2012/spectra/252Cf_tof_zco_det_31to49.ra

Note: Runs 3-5 had wrong Tref (=CFD-OR)

31-01-2012

9:00 changed the gate to ~1.6 µs

yesterdays problem with the channel 1 from ADC1 (1 neutron)
might be due to wrong zoom
→ switched detector 31 back on channel 1 in both ADC1 and ADC2
(check always the analog signal on the oscilloskop!!!)

root, offline analysis
gate on g and n

run5 : detector 31 to 49

ADC channel	detector	#(gate n)	#(gate g)
0	empty		
1	31	~~1.15·10^4~~ 1.175·10^4	5.68·10^4

→ stopped with the gate and getting the $\frac{n}{g}$ number of events in the gate

problem: a lot of self-triggering, something fixed in the trigger
thus: better g-n ratio

new labeling: ADC 1 (channel 28 broken) - TOF
ADC 2 (" 29 broken) - ZCO

in both ADC's channel 28 and 29 left blank
→ see detector 0-29, and detector 28 ≙ channel 30
detector 29 ≙ " 31

13:03 start run6
14:26 stop run6 · file ... run_0006.dat; 31 Jan 12 - 1340 1m53s

15.16 start run 7 detectors 30-49 in ADC 0-19
15:50 stop run7 file run_0007.dat ....

2012-01-31

(24)

Installing one more ADC (Emmanuel)

ADC configuration is the following (chs labelled from 0!)

ADC6	0-31	:	TOF 0-31	(5 moved to ADC7 ch 23)
ADC7	32-23	:	TOF 32-55	
ADC7	24-31	:	ZCO 0-7	(5 moved to ADC9 ch 15)
ADC8	0-31	:	ZCO 8-39	
ADC9	0-15	:	ZCO 40-55	

17:34 Start run 8. 252Cf source, trigger: (CFD-OR AND Tref) AND (BaF2 CFD)
Tref = trigger

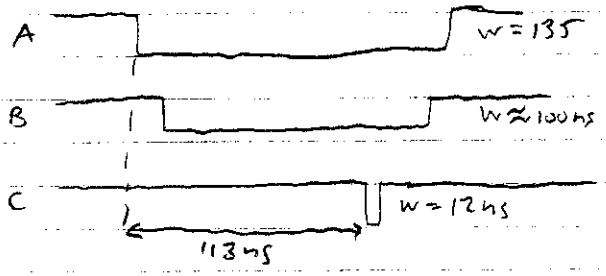
18:43 stop run 8. file run_0008.dat ...

Tried to run with neutron trigger (N-OR) but noticed that the timing of the 465 AND unit with A = CFD-OR B = N-OR and C = BaF2 CFD was not set ok yet (N-OR was too early). Fixed the problem and started a new run. Note: Tref probably slightly moved ⇒ TOF spectra shifted a little again.

19:44 Start run 9, ^{252}Cf, trigger: (CFD-OR) AND (N-OR) AND (BaF_2)

19:45 Stop run 9 we skip this run checking the neutron threshold on N-OR signal before we start. The thr. was OK: set to ≥1 neutrons (that is "N-OR")

19:50 Start run 10 ^{252}Cf
trigger: (CFD-OR) AND (N-OR) AND (BaF_2) } No!! see comment next page
(and tref) A B C



21:08 Stopped run 10

21:11 Start run 11, ^{252}Cf.
trigger: (CFD-OR) AND (BaF_2) ← No! See comment next page

22:15 Stopped run 11.

22:19 Start run 12: 2x ^{60}Co trigger as for run 11. trigger: (CFD-OR) AND (BaF_2) and tref

2012-02-01

10:25 Stop run 12. file: run_0012.... (5 files)

Removed 10ns from Tref to make time calib of TOF TACs.

There is no run 13!?

10:28 Start run 14 Re-Time Calibration of TOF TACs.

2x ^{60}Co, trigger: (CFD-OR) AND (BaF_2) and tref ← No! See comment below!

12:00 Stop run 14 file: .../run_0014.det.01Feb12_10h29m47s.
Spectra /NWall2012/tof_run14.root

- Removed det segm #0 from CFD-OR
- Changed to trigger CFD-OR and Tref = CFD-OR

12:25 Start run 15 2x ^{60}Co, trigger: CFD-OR and tref

13:46 Stop run 15 file .../run_0015.det* (3 files)
Spectra /tofNwall_run15.root
Quick analysis of TAC #0 ⇒ FWHM ≈ 4-5 ns

~14 → 20:00

- Found that by mistake the CFD-OR was not included in the runs 10-14. This will give rise to large nr of events with no Nwall data (only BaF_2) in runs 11-14 and some extra randoms due to too high Tref rate.

- Found 3 bad detector signals:
  → #12 & 30: grounding problem of signal cable (shield) at the PMT output. Fixed by attaching some additional grounding "cable"
  → # 24: grounding problem of delay box (8ns del) before PSD. Fixed by using 8ns cable instead

2012-02-02

Time Alignment: add 10 ns to stop ← using external ortec TAC connected to ADC9 ch 14

calibration:

cal	peak 1 [ch]	σ [ch]	peak 2 [ch]	σ [ch]	Δ [ch]
54	352.3	3.3	375,8	3.4	23
0					
1					
2					

reference 2x2 detectors

peak [ch]	σ [ch]
374.4	3.1
375.8	

15:45 good statistics and only ^{60}Co

566 (Range 10 µs)

Included an external ortec TAC which is started by the trigger and stopped by the CFD-OR. Connected to ADC9 ch 14 (of ch 0-15)
⇒ param. zc054. Within ADC
To fit the TAC output signal to the gate, the gate width of ADC9 ch 0-15 was increased from ~1.6 µs to 3 µs. The other ADC gate widths are all 1.6 µs.

FWHM [ch]	resolution [ns]
= σ x 2.35	= FWHM · 10 ns / Δ [ch]
2.2	3.2

+1 ns peak moved to 376 →

new HV module ↓

~19:00 252Cf + 2x ^{60}Co ↓ ~16:00 ↓

# det	(just 1 detector) peak [ch]		σ [ch]
0	374.1		3.4
1	374.1		3.7
2	373.3	376,5	3.3
3 →	372.8	376.8	3.3
4	374.6		3.1
5	373.0		3.1
6	373.1		3.2
7	373.4		3.3
8	376.2		3.1
9	375.2		3.5
10	374.1		3.0
11	374.3		2.9
12 →	371.8	374,8	3.2
13	373.1		3.1
14	373.8		3.0
15	373.0		3.3
16	375.0		2.9
17	374.6		3.0
18	375.3		2.7
19	374.7		3.0
20 →	376.1	378.7	2.9
21	374.0		3.2
22	375.6		2.9
23	375.3		3.2
24	374.0		3.0
25	375.3		3.3
26	375.4		3.7
27	374.3		3.4
28	375.4		3.3
29	375.2		3.1

2012-02-02

30

# det	peak [ch]		σ [ch]	
30	✓ 377.0	379.9	3.0	← peak moved to 375.5, -1.5 ns (-1 ns)
31	373.2		3.1	
32	375.3		3.3	↓ reset HV module
33	376.0		3.5	
34	375.1		3.0	
35	375.0		3.0	
36	375.3		3.3	
37	374.1		3.2	
38	375.8		3.2	
39	376.3		3.4	
40	✓ 376.8	379	3.2	peak moved to 376 -1 ns
41	✓ 376.6	378.7	3.2	-0.5 ns, 376.9 (≈-0.96) (-1 ns)
42	✓ 377.6	379.5	3.2	← drifted -1.4 ns ≈ -1.5 ns peak at 376.5
43	375.2		3.3	
44	376.2		3.8	↓
45	✓ 377.3	379.5	3.3	376.3, -1.5 ns (-1 ns)
46	375.4		3.0	
47	375.0		3.4	
48	376.2		3.1	
49	376.2		3.1	

after alignment: one shot run with all detectors on
⇒ FWHM = 3.0 ns
Better statistics of this in run 21

2/2/2012 14.40 The ADC of CFD #28 is broken
⇒ we move the CFD to #53
and also the ZCO to #53 for coincidence

14:55 Start run 16 $^{60}_{2\times}Co$ CFD OR and BaF

Spare channels: 53 → det # 28
55 → det # 5
54 → TAC between: BaF (START) and CFD (STOP)

15:38 Stop run 16 file: run_0016.dat @2Feb12_14h55m28s
root file: run16.root

15:40 Now adjusting time alignment...

~ 17:00 trigger: only CFD-OR

2012-02-02

Neutron trigger adjustment

#det.	SD before [mV]	SD after [mV]	
0	-1606	-1621	
1	-1626	-1626	weak neutron bump in ZCO
2	-1620	-1620	
3	-1629	-1636	weak neutron bump
4	-1644	-1658	
5	-1655	-1655	
6	-1608	-1616	
7	-1638	-1645	
8	~~-1622~~ -1656	-1656	
9	-1618	-1625	
10	-1632	-1632	
11	-1665	-1665	
12	-1613	-1613	
13	-1602	-1609	
14	-1623	-1638	
15	-1598	-1615	
16	-1610	-1616	
17	-1626	-1626	
18	-1617	-1624	
19	-1609	-1614	
20	-1633	-1633	
21	-1614	-1620	
22	-1628	-1633	
23	-1623	-1623	
24	-1670	-1620	
25	-1634	-1634	
26	-1648	-1664	
27	-1634	-1634	
28	-1581	-1590	
29	-1601	-1608	

many other detectors also have a weak neutron bump in it but is clearly visible valley between neutrons & gamma

#det	SD before [mV]	SD after [mV]
30	-1607	-1607
31	-1628	-1640
32	-1625	-1625
33	-1603	-1609
34	-1642	-1648
35	-1633	-1633
36	-1606	-1612
37	-1636	~~-1642~~ -1642
38	-1623	-1640
39	-1629	-1640
40	-1631	-1638
41	-1632	-1632
42	-1677	-1667
43	-1661	-1654
44	-1631	-1637
45	-1616	-1636
46	-1623	-1638
47	-1616	-1637
48	-1621	-1634
49	-1626	-1639

20:05 ^{252}Cf source at 51 cm. Rates

CFD-OR	50 kHz
N-OR	6,6 kHz
BaF_2 CFD	1.2 kHz
CFD-OR x BaF_2	340 Hz
CFD-OR x N-OR-BaF_2	140 Hz
N-OR x BaF_2	140 Hz
ndet #0 CFD	2,1 kHz

2012-02-07

20:10 Start run 17

^{252}Cf source at 51 cm.

Trigger: CFD-OR × N-OR × BaF_2

21:46 Stop run 17

Start run 18 @ 21:54 Stop it — ignore this run!!

~~and coincidences also should be ignored.~~

Start run 20 Trigger CFD-OR / BaF_2 / ^{252}Cf source.

22:01

23:30 Stop run 20.

23:34 Start run 21 ^{60}Co source + trigger as for run 20.

2012-02-03

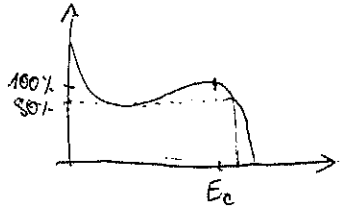
9:01 Stop run 21 file: run_0021.dat 02feb12_23h35m22s

root: ~~root~~ run21.root

Energy calibration ≈ 10:00 → 17:00

~~^{137}Cs~~, $E_\gamma = 662$ keV, $E_{Compton\ edge} = 477$ keV

^{60}Co, $E_\gamma = 1173$ keV, $E_\gamma = 1333$ keV, $\bar{E}_{Co} = 1041$ keV



write down channel number at 80% of Compton edge peak

~~"^{241}Am"~~ source: ^{241}Am, ^{239}Pu, ^{244}Cm, NB433

activity 3 kBq each

^{137}Cs source: 22408, activity 28.02.1998 42.5 kBq

^{60}Co source: ^{60}Co no. 1

Energy calibration with ^{137}Cs, Compton edge 480 keV

detector triplet / pentagon: 2CO switched to QVC

source glued to triplet/pentagon ~~→ change trm to 8~~

det: 0, 1, 2 – ~~calib~~ /scratch/NWall2012/calib_test.root

glue ^{137}Cs / ^{60}Co source on one triplet (pentagon) at a time

turn off HV from all other detectors except the triplet in question

save spectra in ~~vigne~~ to /NWall2012/calib_triplet_x.root (x = # of triplet)

measure for ≈ 2 minutes

triplet 1: det 0, 1, 2

triplet 11:

triplet 2: one short run + one long run (bunch) [det 5 in ADC channel 55]

triplet 12: [det 28 in ADC channel ~~53~~]

triplet 3:

triplet 13:

triplet 4:

triplet 14:

triplet 5:

triplet 15:

triplet 6

" 8

" 9

" 10

pentagon

2012-02-03

17:30 → 18:00

Tried to fix #27 which has an excess of γ counts in the 2D ToF-ZCO neutron gates. It seems this detector counts a lot at low energy, but it is not triggering on noise. Tried another PSD unit but Boks was not happy with that. Decided to not change anything concerning #27. We can use it as it is...

On the following pages is a summary of the results obtained during the last 2 weeks.

To Do (possibly):

- Change liquid of #33 & #44. Use new liquid from unopened bottle bought by Andres Gadea in 2009.

Printed by Johan Nyberg

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```
Things to do while at GANIL 29/1-4/2 2012
==========================================

!! DONE
1. Check and adjust time alignment of CFD-OR signal.
   o 252Cf + 2x60Co sources.
   o Trigger CFD-OR x BaF2 (leading edge determined by BaF2).
   o External TAC (start trigger, stop CFD-OR).
   o Make a time calib of the external TAC.
   o Measure a 'total' TOF spectrum with HV on for all detectors;
     evaluate FWHM, FWTM, FWFM; save the spectrum.
   o Measure TOF spectra for each detector separately (HV off
     for all except for one detector).
   o Perform the time alignment.
   o Measure a 'total' TOF spectrum with HV on for all detectors;
     evaluate FWHM, FWTM, FWFM; save the spectrum.

!! DONE
2. Check and adjust separation delay of all segments.
   o 252Cf source.
   o Trigger CFD-OR.
   o HV on one detector at a time.

!! DONE
3. TOF time resolution measurement
   o 252Cf + 2x60Co sources.
   o Trigger CFD-OR x BaF2.
   o Save event data and root file.

!! DONE all except d)
4. TOF vs ZCO measurements:
   a) 252Cf source, trigger CFD-OR x BaF2.
   b) 252Cf source, trigger CFD-OR x N-OR x BaF2.
   c) 2x60Co sources and trigger CFD-OR x BaF2.
   d) 252Cf and 2x60Co sources and trigger CFD-OR x BaF2.

!! Done
5. Energy calibration of QVC.
   o 137Cs, 207Bi; one source at a time placed close to each detector.
   o Trigger CFD-OR.
   o Save all spectra.

!! DONE: a) b) c) d) e) f)
6. Plots:
   a) NPE vs segment nr for 2005, 2009, 2012
   b) TOF time resolution vs segment from measurement 3.
   c) Counts in neutron 2D TOF-ZCO gate vs segment nr for measurments in 4.
      (4 plots).
   d) Counts in gamma 2D TOF-ZCO gate vs segment nr for measurments in 4.
      (4 plots).
   e) Ratio neutron/gamma counts 2D TOF-ZCO gates vs segment nr for
      measurments in 4. (4 plots).
   f) Energy threshold in keV vs segment nr.

!! DONE
7. Update settings file with present HV, CFD, SD, etc values.

!! Not decided yet
8. Find out why segments 33, 44 (and 8) have small NPE. Possible reasons:
   o Photocathode bad giving smaller quantum efficiency.
   o Liquid is bad and producing small number of scintillation photons.
   o Liquid is non-transparent which leads to absorption of
     scintillation photons.
   o Liquid container lost the white paint which leads to absorption of
     scintillation photons.
   o Glass window is less transparent which leads to absorption of
     scintillation photons.
   o Optical coupling within glass window and PMT is bad which leads to
     loss of scintillation photons.
```

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```
   o ...

!! Done
9. Scan the logbook or bring it to Uppsala for scanning.

10 Post all files with settings and results and on the Neutron Wall
   web site. Post also BaF2 elec diag, all results obtained (plots of
   NPE, Tres, neutron counts etc), histograms, scanned logbooks, ...

11 Ask Gilles, Emmanuel, Marcin to send all histograms measured during
   the SPIRAL2 week in Jan 2012.

!! DONE. JN copied tgz:s of .../NWall2012/ and .../NWall2012offline/ to Uppsala.
   NOTE: Run files not copied!
12 Make backup of all data collected with GANIL DAQ and all the code used.

!! DONE
13 Cleanup all equipment in G2. VME crate in Aluminum boxes or in a rack?

Things to do when back to Uppsala
=================================

1. Find and read through Neutron Wall logbook from 2009.

2. Put all stuff on the Neutron Wall web site
```

2012-02-03 (36)

JN's To Do List

2012-02-03 (38)

Current (2012-02-03) settings

Detector							Photomultiplier tube			PSD unit settings							
				Detector segment position			PMT ID	High voltage [V]		Serial number					CFD threshold [mV]	Separation Delay (SD) [mV]	
Detector segment number	Segment ID	Detector number	Detector type	r [mm]	θ[deg]	φ[deg]	2009	Channel on Caen HV unit	2012-01-23	2012-01-31	Rack	Crate	Position in crate	Channel	2012-01-30	2012-02-02 after adjustment	
															H	G	
0	01BB	1	H1	510	46.830	352.843	9335	0.00	-1850	22	Left	Upper	01	Upper	-11.1	-1621	
1	01FF	1	H1	510	57.210	359.593	9312	0.01	-1480	22	Left	Upper	01	Lower	-11.1	-1626	
2	01DD	1	H1	510	47.200	7.061	9351	0.02	-1740	12	Left	Upper	02	Upper	-12.3	-1620	
3	11BC	11	H2	510	46.784	27.087	9303	0.03	-1440	12	Left	Upper	02	Lower	-12.3	-1636	
4	11AF	11	H2	510	47.210	44.824	9318	0.04	-1520	24	Left	Upper	03	Upper	-9.1	-1658	
5	02BB	2	H1	510	46.830	64.843	9346	0.05	-1615	24	Left	Upper	03	Lower	-9.1	-1655	
6	02FF	2	H1	510	57.210	71.593	9333	0.06	-1303	4	Left	Upper	04	Upper	-12.0	-1616	
7	02DD	2	H1	510	47.200	79.061	9334	0.07	-1445	4	Left	Upper	04	Lower	-12.0	-1645	
8	12BC	12	H2	510	46.784	99.087	9343	0.08	-1540	26	Left	Upper	08	Upper	-7.2	-1658	
9	12AF	12	H2	510	47.210	116.824	9337	0.09	-1540	26	Left	Upper	08	Lower	-7.2	-1635	
10	03BB	3	H1	510	46.830	136.843	9342	0.10	-1725	28	Left	Upper	09	Upper	-9.2	-1632	
11	03FF	3	H1	510	57.210	143.593	9328	0.11	-1645	28	Left	Upper	09	Upper	-9.2	-1665	
12	03DD	3	H1	510	47.200	151.061	9289	0.12	-1510	25	Left	Upper	00	Upper	-10.1	-1619	
13	13BC	13	H2	510	46.784	171.087	9341	0.13	-1590	25	Left	Upper	00	Lower	-10.1	-1609	
14	13AF	13	H2	510	47.210	188.824	9294	0.14	-1445	10	Left	Upper	11	Upper	-11.5	-1638	
15	04BB	4	H1	510	46.830	208.843	9320	0.15	-1420	10	Left	Upper	11	Lower	-11.5	-1615	
16	04FF	4	H1	510	57.210	215.593	9340	2.00	-2070	13	Left	Middle	00	Upper	-13.2	-1616	
17	04DD	4	H1	510	47.200	223.061	9313	2.01	-1340	13	Left	Middle	00	Lower	-13.2	-1626	
18	14BC	14	H2	510	46.784	243.087	9345	2.02	-1705	14	Left	Middle	01	Upper	-8.5	-1624	
19	14AF	14	H2	510	47.210	260.824	9338	2.03	-1650	14	Left	Middle	01	Lower	-8.5	-1614	
20	05BB	5	H1	510	46.830	280.843	9301	2.04	-1630	27	Left	Middle	02	Upper	-10.1	-1633	
21	05FF	5	H1	510	57.210	287.593	9285	2.05	-1550	27	Left	Middle	02	Lower	-10.1	-1620	
22	05DD	5	H1	510	47.200	295.061	9349	2.06	-1700	16	Left	Middle	03	Upper	-12.8	-1633	
23	15BC	15	H2	510	46.784	315.087	9314	2.07	-1515	16	Left	Middle	03	Lower	-12.8	-1622	
24	15AF	15	H2	510	47.210	332.824	9300	2.08	-1465	17	Left	Middle	08	Upper	-10.7	-1620	
25	06DD	6	H1	510	30.301	0.000	9321	2.09	-1435	17	Left	Middle	08	Lower	-10.7	-1634	
26	11DE	11	H2	510	34.866	36.000	9305	2.10	-1360	18	Left	Middle	09	Upper	-10.5	-1664	
27	07DD	7	H1	510	30.301	72.000	9350	2.11	-1560	18	Left	Middle	09	Lower	-10.5	-1634	
28	12DE	12	H2	510	34.866	108.000	9327	2.12	-1575	20	Left	Middle	10	Upper	-9.4	-1590	
29	08DD	8	H1	510	30.301	144.000	9330	2.13	-1555	20	Left	Middle	10	Lower	-9.4	-1606	
30	13DE	13	H2	510	34.866	180.000	9304	2.14	-1520	21	Left	Middle	11	Upper	-12.0	-1607	
31	09DD	9	H1	510	30.301	216.000	9286	2.15	-1677	21	Left	Middle	11	Lower	-12.0	-1640	
32	14DE	14	H2	510	34.866	252.000	9288	4.00	-1380	1	Left	Lower	00	Upper	-13.4	-1625	
				510	30.301	288.000	9296	4.01	-1720	1	Left	Lower	00	Lower	-13.4	-1609	
34	15DE	15	H2	510	34.866	324.000	9352	4.02	-1690	2	Left	Lower	01	Upper	-11.4	-1648	
35	08FF	8	H1	510	18.540	344.737	9299	4.03	-1650	2	Left	Lower	01	Lower	-11.4	-1633	
36	08BB	8	H1	510	18.540	15.268	9339	4.04	-1660	3	Left	Lower	02	Upper	-9.7	-1612	
37	07FF	7	H1	510	18.540	56.732	9324	4.05	-1825	3	Left	Lower	02	Lower	-9.7	-1642	
38	07BB	7	H1	510	18.540	87.268	9290	4.06	-1950	5	Left	Lower	03	Upper	-11.8	-1640	
39	08FF	8	H1	510	18.540	128.732	9293	4.07	-1665	5	Left	Lower	03	Lower	-11.8	-1640	
40	08BB	8	H1	510	18.540	159.268	9306	4.08	-1570	6	Left	Lower	07	Upper	-7.6	-1638	
41	09FF	9	H1	510	18.540	200.732	9295	4.09	-1550	6	Left	Lower	07	Lower	-7.6	-1632	
42	09BB	9	H1	510	18.540	231.268	9284	4.10	-1540	7	Left	Lower	08	Upper	-10.8	-1667	
43	10FF	10	H1	510	18.540	272.732	9307	4.11	-1510	7	Left	Lower	08	Lower	-10.8	-1654	
				510	18.540	303.268	9323	4.12	-1700	8	Left	Lower	09	Upper	-13.1	-1637	
45	E	1	P	510	6.897	324.000	5957	6.00	-2350	15	Left	Middle	07	Lower	-8.3	-1696	
46	A	1	P	510	6.897	36.000	6093	6.01	-2400	9	Left	Lower	10	Lower	-9.6	-1638	
47	B	1	P	510	6.897	108.000	0603	6.02	-2400	9	Left	Lower	10	Upper	-9.6	-1637	
48	C	1	P	510	6.897	180.000	6030	6.03	-2400	11	Left	Lower	11	Lower	-9.7	-1634	
49	D	1	P	510	6.897	252.000	5977	6.04	-2320	11	Left	Lower	11	Upper	-9.7	-1639	
SUM	50	50	50	50	50	50	50		50	50	50	50	50	50	50	50	
AVG				510	35	180			-1665						-11		
STDEV				0	18	105			280						2		
MAX		15		510	57.21	359.59	9352		-1303						-7.2	-1590	

Comments:

Cells marked grey: changed since previous date

Cells marked yellow: minimum values

Z2: Each PSD unit has two channels labelled Upper and Lower. NOTE: There is crosstalk of signals between the channels in the same PSD unit!

AA2: These values were written down 18 May 2006 before any changes were done for the 57Se experiment. These were the settings since middle of Oct 2005 when Darek Wolski visited GANIL and changed the values from the settings of 2005-07-16.

AJ2: This is the setting for the separation of neutrons and gamma rays, which affect the N and G sumbuses and logic output signals.

AH3: These values were noted by Aurore 2012-01-24 – see Nwall logbook.

AI3: These values were noted by Aurore 2012-01-24 – see Nwall logbook.

AC4: The CFD thresholds were set as low as possible, just above noise. Note that because the CFD threshold setting is common for the two channels of each PSD unit, the value of the threshold is dictated by the channel in each unit that requires the higher threshold value. In the Neutron Wall logbook the optimal values for each individual channel are listed, but the ones shown here are the final ones applied for the experiment in May 2006.

AD4: Check of thresholds done 2006-06-07 14:00, before 103Sn experiment.

AM4: These should be checked as I am not sure the values in the logbook, which are the ones listed here, are the final ones!

AO4: Check of thresholds done 2006-06-07 14:00, before 103Sn experiment.

S11: The HV value for #6 was -1303 V in Jan 2012 when HV supply was switched on. The value -1330 V is probably a typo and it was likely -1303 V also in 2009.

V19: This unit was s/n 10 when we arrived to GANIL for the tests in Jan 2012. It was probably changed sometimes during the 2009 campaign, without this file being updated.

AM27: It said 1928 in the logbook, it should probably be 1628!

AI37: Threshold changed from -12.3 to -13.4 by Alla and Johan 2012-01-30. Slightly too high count rate before.

I38: The PM tube of this detector segment was most likely changed from 9319 to 9296 during the change of scintillator liquid done in Oct 2007. At least this is the information JN got from Sten Leven after the repair. Note: The label on the PM tube holder on the segment still says 9319!

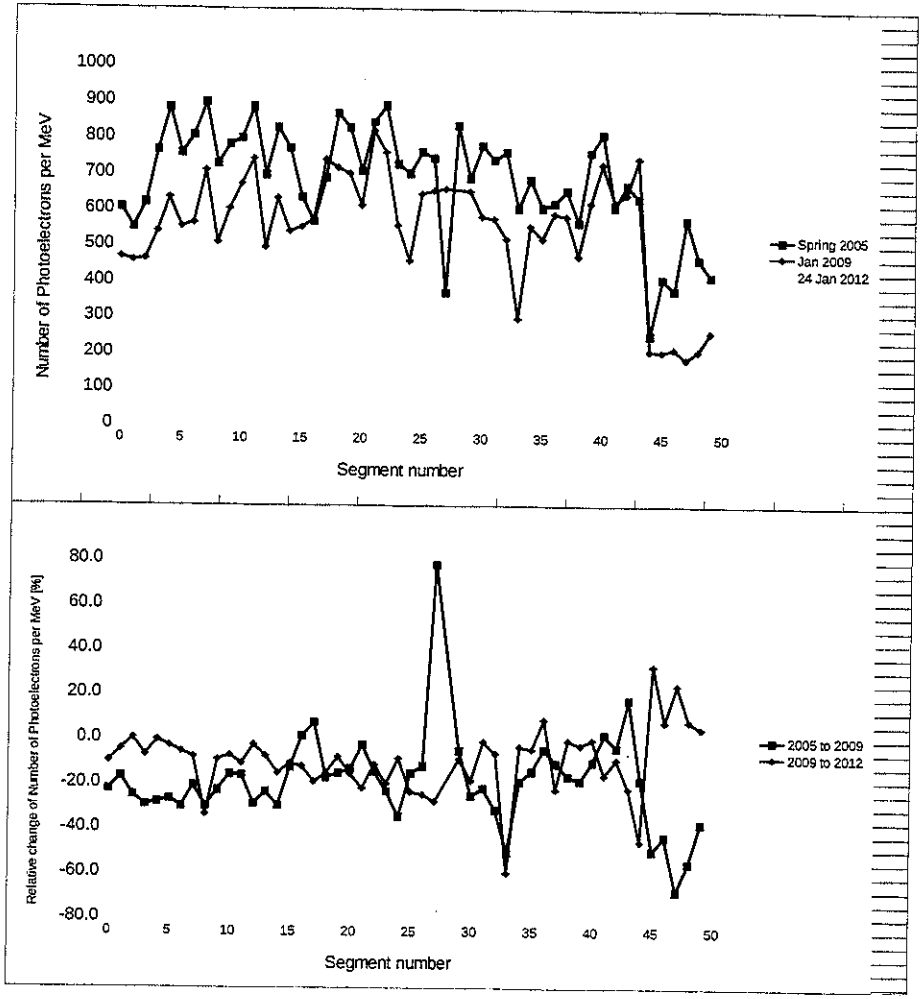
AM38: This value might be wrong. Probably changed after HV was changed around 2005-05-20.

V50: The units for the pentagons were the ones indicated in this column when we arrived to GANIL for the tests in Jan 2012. The were most likely used during the 2009 campaign, without this file being updated.

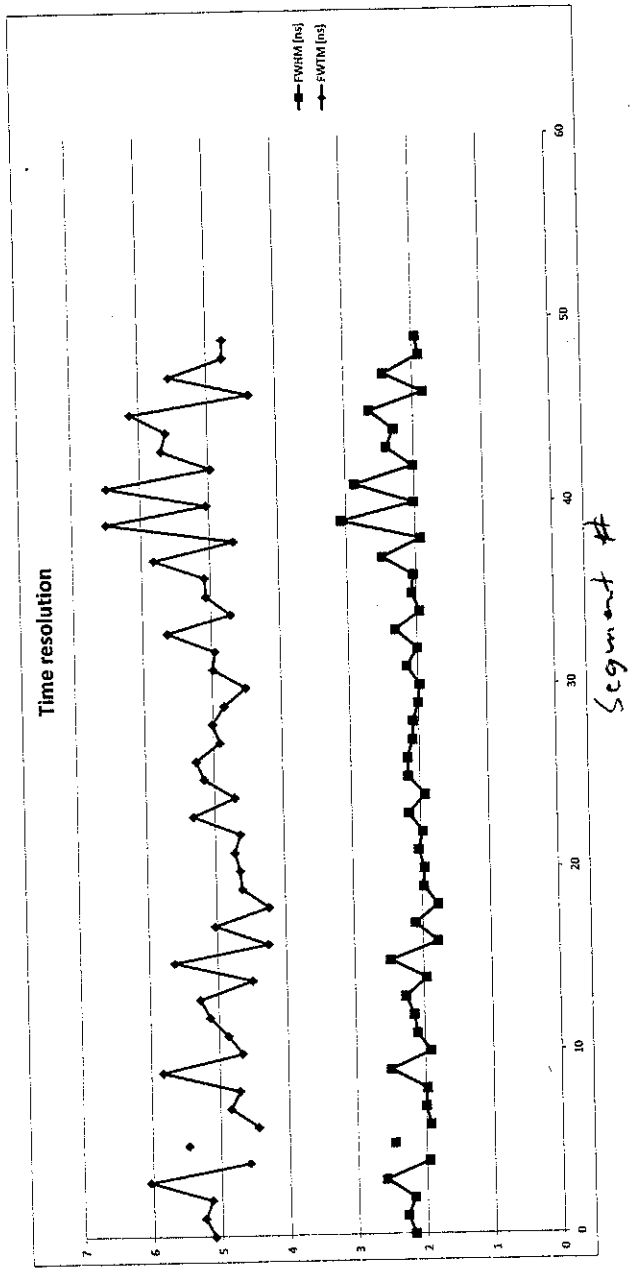
AI51: Threshold changed from -6.6 to -9.6 by Alla and Johan 2012-01-30. Slightly too high count rate before.

2012-02-03 (38)

	Number of photoelectrons per MeV			Number of photoelectrons per MeV in % (values relative to the average for the HEX segments nr 0-44; pentagon values scaled with the volume ratio HEX/PENT)			Number of photoelectrons per MeV changes in % since previous measurement	
Segment nr	Spring 2005	Jan 2009	24 Jan 2012	Spring 2005	Jan 2009	24 Jan 2012	2005 to 2009	2009 to 2012
0	604	466	417	85	79	81	-22.8	-10.4
1	550	456	432	77	78	84	-17.1	-5.2
2	618	461	460	87	78	89	-25.4	-0.2
3	764	538	497	108	91	96	-29.6	-7.7
4	881	631	624	124	107	121	-28.4	-1.1
5	756	552	533	106	94	103	-27.0	-3.5
6	806	562	528	113	96	102	-30.3	-6.1
7		707	647	126	120	125	-21.1	-8.4
8	726	507	334	102	86	65	-30.2	-34.2
9	781	601	542	110	102	105	-23.0	-9.7
10	798	670	618	112	114	120	-16.0	-7.7
11	884	739	654	124	126	127	-16.4	-11.5
12	696	493	478	98	84	92	-29.2	-3.1
13	826	630	579	116	107	112	-23.7	-8.1
14	770	538	454	108	91	88	-30.1	-15.6
15	633	551	489	89	94	95	-13.0	-11.3
16	567	573	500	80	97	97	1.1	-12.7
17	689	737	593	97	125	115	7.0	-19.5
18	866	715	603	122	122	117	-17.4	-15.6
19	826	699	640	116	119	124	-15.4	-8.4
20	707	611	514	100	104	99	-13.6	-15.9
21	843		636	119		123	-3.0	-22.3
22	889	758	668	125	129	129	-14.7	-11.9
23	727	556	444	102	95	86	-23.5	-20.2
24	702	458	417	99	78	81	-34.8	-9.0
25	761	644	490	107	109	95	-15.4	-23.9
26	744	653	489	105	111	95	-12.2	-25.1
27	370	658	473	52	112	91		-28.1
28	835	-	593	118	-	115	-	-
29	688	651	590	97	111	114	-5.4	-9.3
30	779	581	472	110	99	91	-25.4	-18.8
31	739	575	566	104	98	109	-22.2	-1.5
32	761	519	483	107	88	93	-31.8	-6.9
33	604	297	118	85	50	23	-50.8	
34	686	555	534	97	94	103	-19.1	-3.8
35	607	519	493	85	88	95	-14.5	-5.0
36	619	589	637	87	100	123	-4.8	8.2
37	654	582	450	92	99	87	-11.0	-22.7
38	566	471	466	80	80	90	-16.8	-1.0
39	761	619	599	107	105	116	-18.7	-3.2
40	811	727		114	124	140	-10.4	-0.7
41	610	621	519	86	106	100	1.8	-16.4
42	670	643	582	94	109	112	-4.0	-9.6
43	634	743	577	89	126	112	17.2	-22.3
44		206					-18.3	-46.0
45	409	204	270	174	105	158	-50.1	
46	378	213	228	161	109	133	-43.7	7.2
47	575		226		94	132		23.6
48	465	206	221	198	106	129	-55.7	7.4
49	416	259	270	177	133		-37.7	4.2
Average	684.0	549.9	489.6	109.1	101.0	104.2	-19.1	-10.2
Std dev	147.7	159.8	140.5	33.8	19.5	25.6	21.1	15.0
Hex volume	3.23							
Pent volume	1.07							

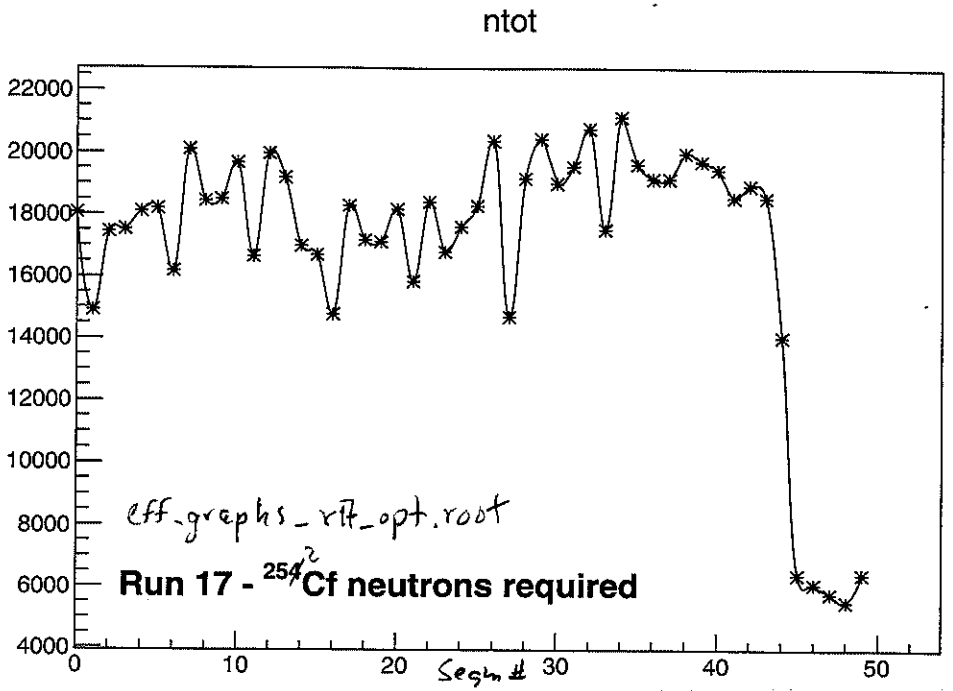


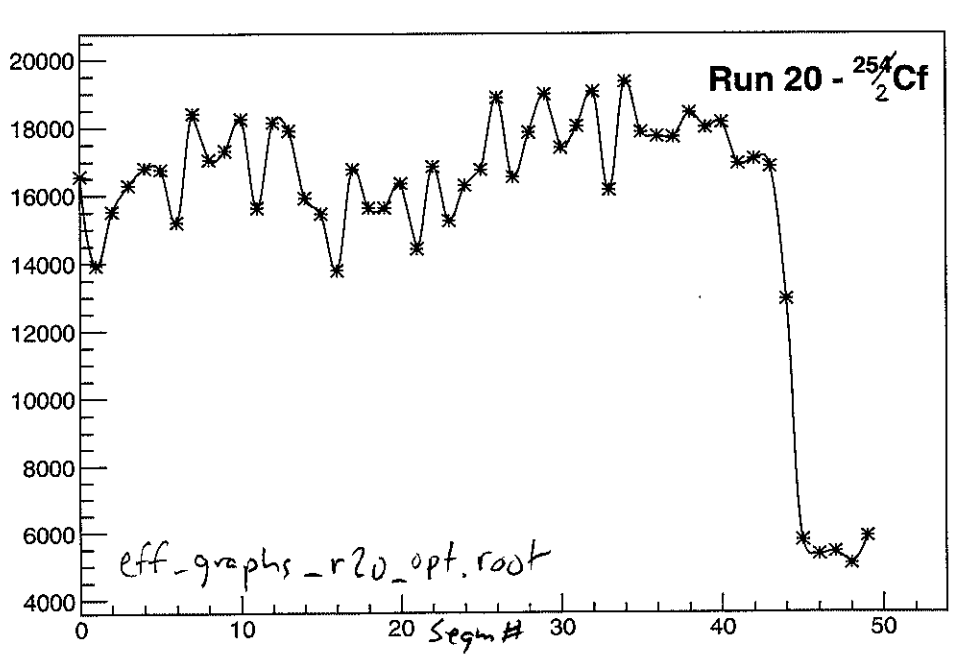
TOF tres. extracted by F. Recchia from run15 2012-02-01, see file time_res.xlsx



ntot =
Counts inside optimized 2D neutron gates:

2012-02-03 (40)

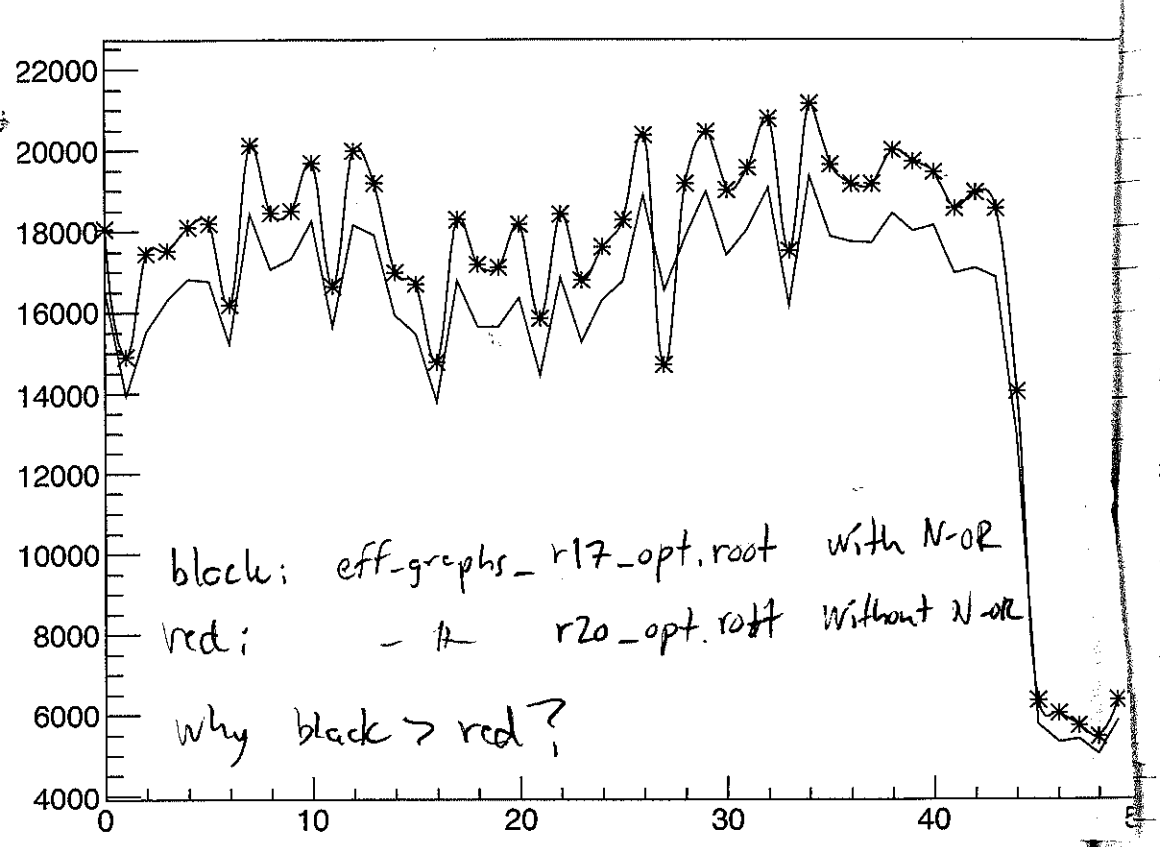


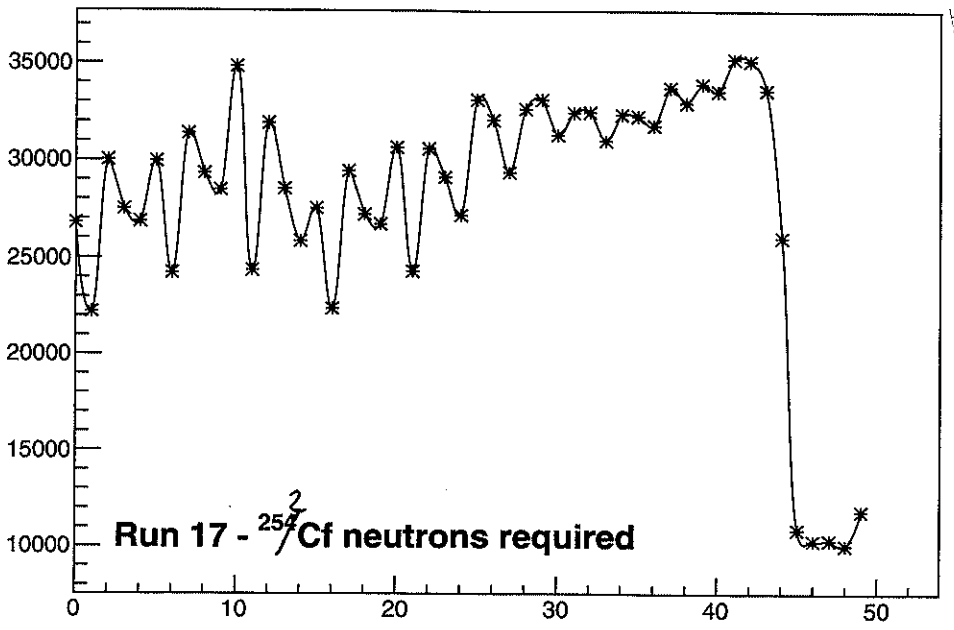


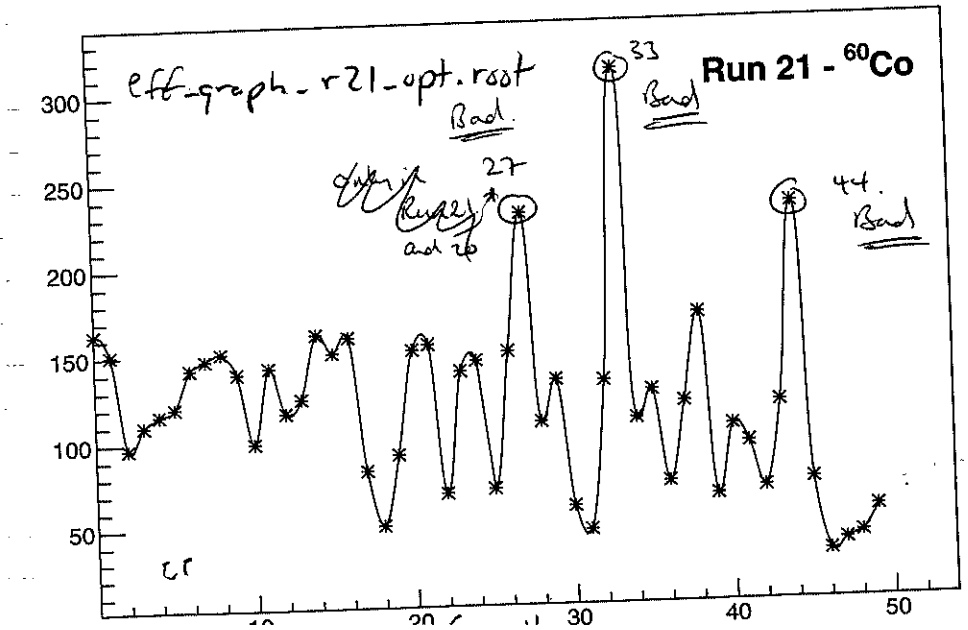
2012-02-03

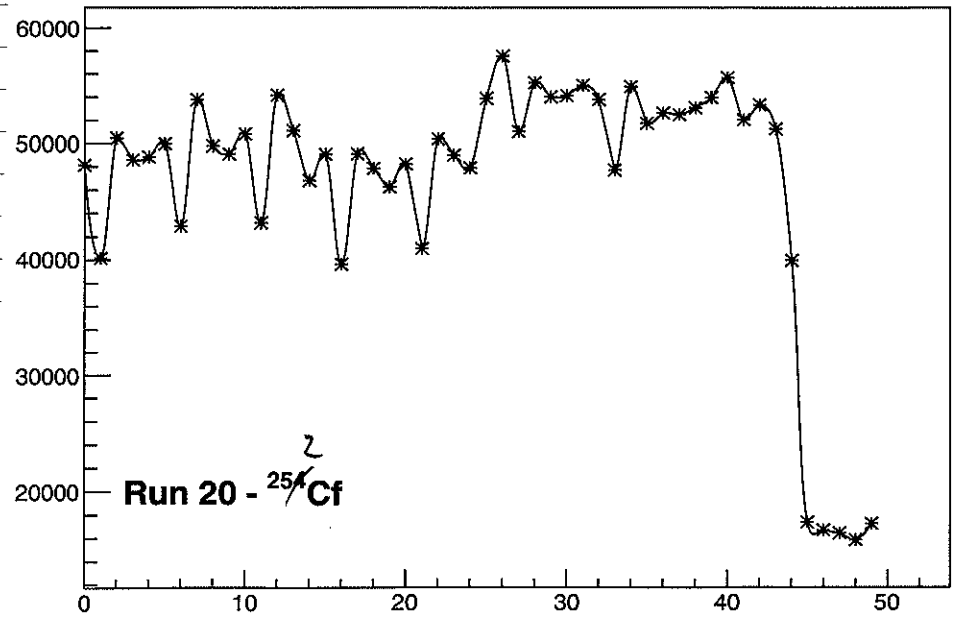
gtot = counts inside 2D gamma gates

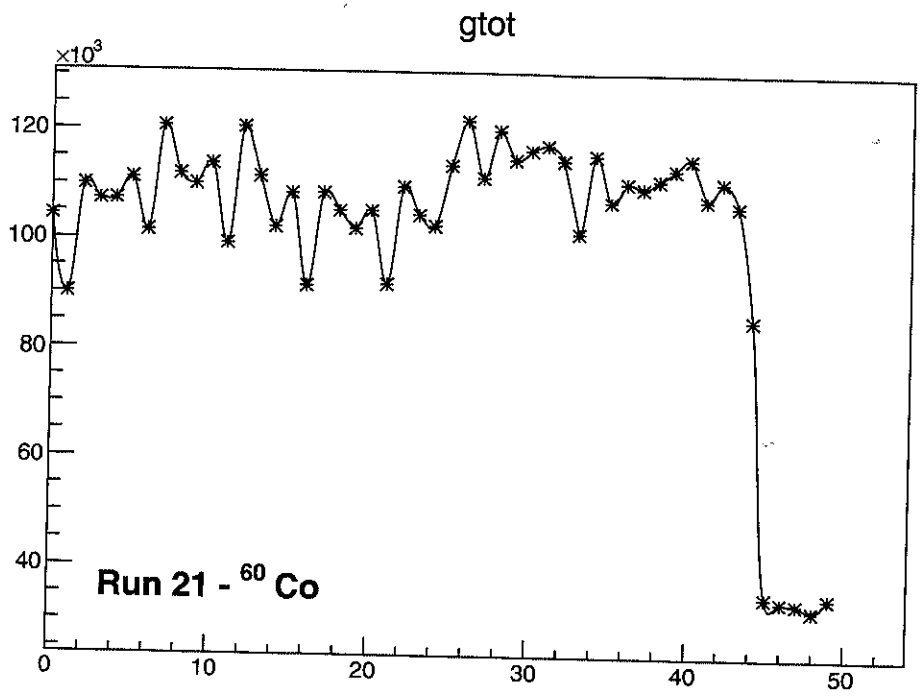
same root files as for ntot plots

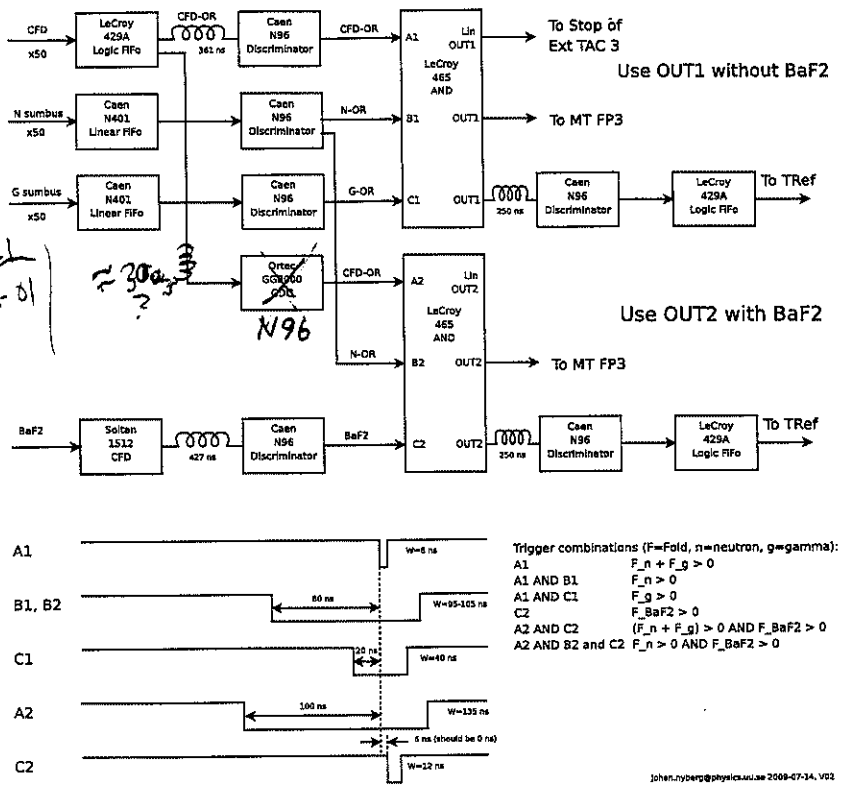












Modified ≈ 2012-02-01

The external ORTEC TAC is not included here!

See new diagram made by JN "a few days" later