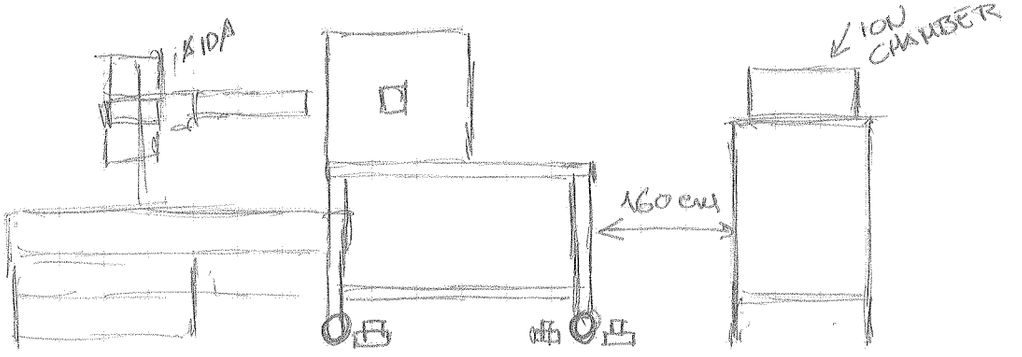
ASSEMBLY OF BRIKEN NEUTRO DETECTOR AND AIDA

4-OCT-2016

People: Kiss Gabor, Phong Vi, Shunji Nishimura, Keishi Matsui, S. Kubono, Chris Griffin, Tom Davinson, Ariel Tarifeño, Jorge Agramunt, Alvaro Tolosa, Jose L. Tain, Nathan Brewer, Shintaro Go, Daniel Stracener

We remove all tubes from BRIKEN detector and put the detector in the fore seen position: front wheels in between the two forward EURICA rails.



In this position the mid of BRIKEN is about 50 cm of the EURIKA "focal plane"

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the height and position is adjusted with the feet. using laser AIDA detector is placed in position and adjusted to fit BRIKE hole.

We place back the missing preamps : Two repaired preamps and two new preamps.
The two new preamps had a strange behaviour : funny signal shape (pulser), one of them strong noise when gain swith to high. In addition we found a strong crosstalk.
After checking many things we realized that the two new preamps are of the differential type.
We decided to mount only unipolar ones using the two coming from US and another two left here with some discharge problems and check the performance.

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We give the HV and check signal amplitudes

TUBE 1	PA 1 (POS):	neutron : 400 mV	pulser : 1.5 V	PULSER 1
TUBE 24	PA 2 (POS) :	neutron : 400 mV	pulser : 1.4 V	
TUBE 38	PA 3 (POS) :	neutron : 400 mV	pulser : 1.0 V	PULSER 2
TUBE 52	PA 4 (POS) :	neutron : 400 mV	pulser : 1.0 V	
TUBE 69	PA 5 (NEG) :	neutron : 600 mV	pulser : 1.5 V	
TUBE 80	PA 6 (NEG) :	neutron : 5000 mV	pulser : 2.4 V	PULSER 1
TUBE 95	PA 7 (NEG) :	neutron : 450 mV	pulser 2.2 V	
TUBE 110	PA 8 (NEG) :	neutron : 550 mV	pulser : 2.4 V	
TUBE 125	PA 9 (NEG) :	neutron : 540 mV	pulser : 2.4 V	
TUBE 140	PA 10 (NEG) :	neutron : 450 mV	pulser : 2.4 V	

Current Pulser amplitudes.

Pulser 1: − 690 mV on scope (50 Ω)

Pulser 2: − 90 mV on scope (50 Ω)

Pulser 1 is saturating the 2V limit in the ADCs: we reduce amplitude to −540 mV so the signal after PA 10 is 1.7 V and after PA 2 is 1.2 V

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(0.200V setting)

We increase Pulser 2 to 100 mV so it is 1.8 V after PA3 and 1.2 after PA4

We make the 1st measurement with the ^{252}Cf source. AIDA is in place and with voltage.

The Cf source is placed at the right height but displaced of center because of AIDA.

All tubes seem to be working OK. Even the calibration is not very different from July.

tmeas : 24 min

Root_file: 161006-2235-252Cf.root

We remove the Cf source and start a background measurement over night.

07/OCT/2016

tstart : 22:42

tstop : 10:45

file: 161007-1045_bck.root

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SLOW FILTER SETTINGS

PA1 & PA2	RIKEN	250 -50
PA3 & PA4	UPC	175 - 50
PA5 **	UPC	250 - 100
PA6	ORNL1	250 -100
PA7 & PA8	ORNL2	350 -100

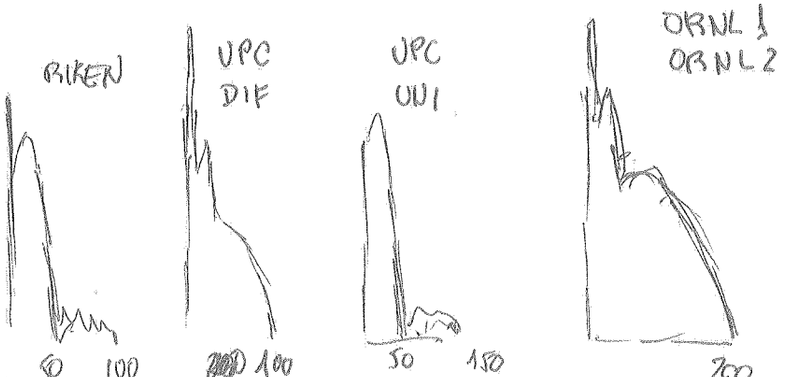
Inspection of faulty channels : Suspicious

V1A4C1 : PA4Ch1

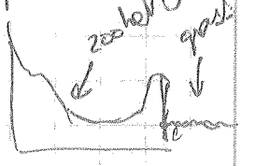
From a visual inspection it looks as the only one.

The noise behaviour is very distinct for example comparing

He020	RIKEN DIFF	BLACK
He044	UPC DIFF	RED
He068	ORNL1 UNI	BLUE
He132	ORNL2 UNI	PINK
He057	UPC UNI	GREEN



The problem is that the accumulation of all noises comes over the photon edge



and we see the grass

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Check threshold effect . Tube 68 (ORNL1) V1A5C1 ?

P	G	THR	
40	20	3000	
40	20	3500 →	← reduction
40	20	4000 →	← no peaks ← but still there

We remove the pulser in this situation where we dont have the veloo energy noise peak and look for the samples associted to the strange noise extending to ~250 keV. The conclusion is that this signals look as real signals. No way to eliminate them!
Anyhow we try to see how the spectra look like when we use a differential preamp with ORNL tubes
We connect all tubes in PA10 (tube 126-140) to one of the new differ. preamps and the output to cmeter card #4. Run ADC #3 ch#9-16 tubes 133-140
We make a run with ^{252}Cf to calibrate and make the settings:

file: 161007-1743-252Cf-ORNL-diffPreamp.root

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Then we measure a background run.

file: 161007_1743_bck_ORNL_DiffPreamp.root

As it happens the strange noise is compressed and reaches only ~100 keV. However we could only use one preamp because we have only one spare converter card. This not going to make an impact and leave the situation as original.

We now investigate if there is some particular problem with any preamplifier channel. We set the HV of the 3He tubes to zero, and let a measurement overnight.

Start: 20:00 7 oct

Stop: 6:42 8 oct.

File: 161008_0642_noHV.root

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8-OCT-2016 General Power shutdown
Due to maintenance operation in the Wahodedical system there is power shutdown alert period from 8 am to 8 pm aprox.

9-OC-2016 Same as the day before

Check of thresholds.
We try to make a better adjustment of thresholds We put the ^{252}Cf source in the center and make a control measurement.

Start:
Stop: 23:55
File: 161009_2355_252Cf_control.root

Then we readjust ADC by ADC the thresholds in order to have a noise that is only a small fraction of the pulser.

New ~~config~~ config. file: 160718Conf_BritenFull_test02_thr.xlsx

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10-Oct-2016

We measure the 252Cf source again to check rates.

Start: 01:55

Stop: 02:09

File: 161010_0209_252Cf_newthr.root

And we leave a background measurement the rest of the night.

Start: 02:12

Stop: 7:12

File: 161010_0712_bck_newthr.root

Asiel prepares a script to integrate the ~~the~~ neutron counts in the 140 tubes and normalize by measuring time (pulser) to compare both runs and see if there is loss of counts. The result is that it is none.

File: ThresholdStudy_10Oct16.xls

(Actually one can observe a very small increas ~‰ in most of the tubes !?)

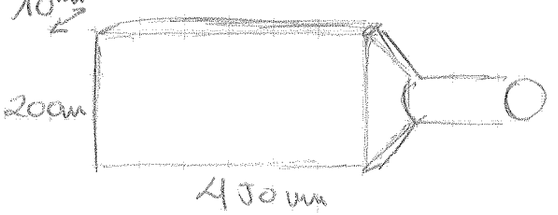
We evaluate the reduction of ~~noise~~ gross noise with the new thresholds.

We integrate the region 900 keV – 1.5 MeV for that. The effect depends on the tubes but on average the reduction is only a factor 2.

Rate before: 0.085 counts per sec per MeV
Rate after: 0.039 counts per sec per MeV

11-OCT-2016

Plastic detectors (x2):

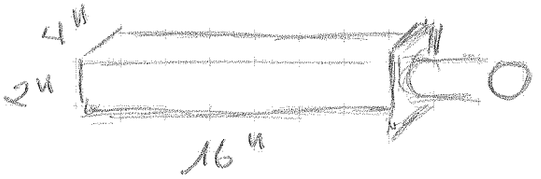


PMT: H1161 (Hamamatsu)

HV: -1200 V

Output: Anode 1, Anode 2, DY ↓ used.

NaI detectors (x4):



PMT:

HV: +800V

Base: 1410 (ORTEC)

Outp: Anode

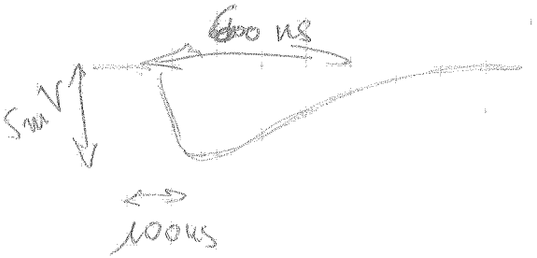
Plastic detector signals:

With a ^{207}Bi source

Using a ORTEC 474 TFA

G: 10 x max τ_I: 200 ns τ_D: 100 ns

NaI detector signals



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Settings of the DACQ : V1A7

Plastic : Ch#1 - Ch#4

Fast : P=2 G=2 TH=80 Prelig=100 Trig Gate=200
Slow : P=2 G=2 T=517 Offset: 11500

EFIR, PEAK-HEIGHT, ACC 1, ACC 2

NaI : Ch#5 - Ch#8

Fast : P=20 G=20 TH=120 Prelig=120 Trig Gate=200
Slow : P=20 G=20 T=517 Offset: 11500

EFIR, PEAK-HEIGHT, ACC 1, ACC 2

File : 161011_2335_PlasticNaI_137Cs.root

File : 161011_2330_PlasticNaI_60Co.root

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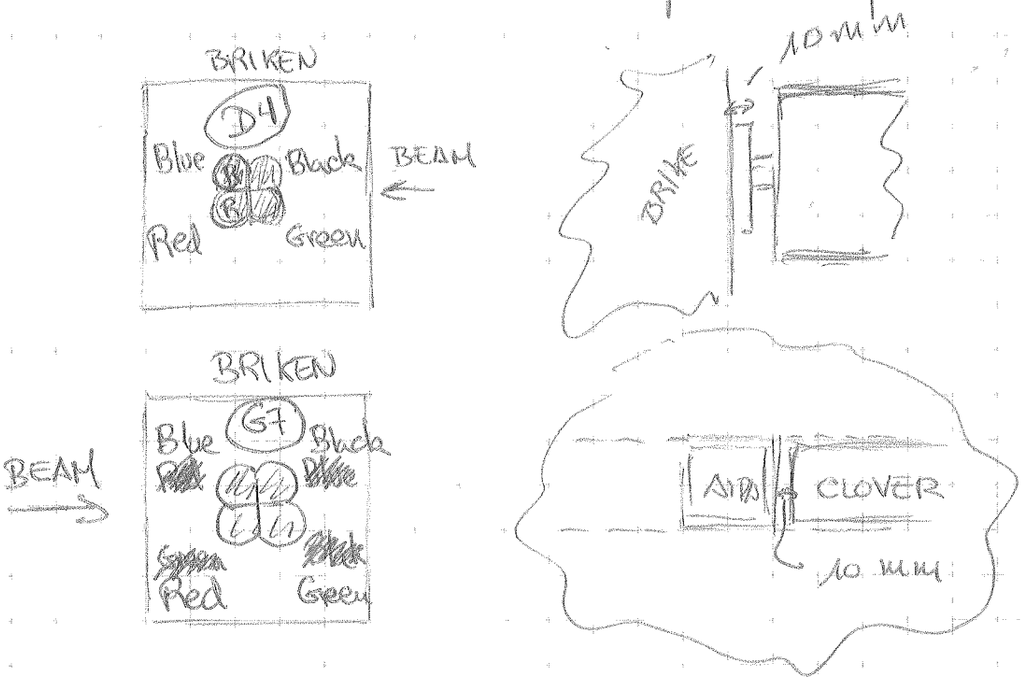
CLOVER detectors are put in position



First measurement with CLOVER detectors after some efforts on noise reduction

Overall the resolution is similar to that on July except for D4 black that the resolution is similar to the rest of the crystals in this detector

File: 16011-1805_CLOVER_CsCo.root.

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12-OCT-2016

Background measurement overnight

Start: 23:45

Stop: 10:56

File: 161012_1056_bck_noise.root

Strong background !?

NO: wrong configuration file and the GLOVER ~~signals~~ were calibrated spectra were mixed with tube spectra.

We now make a test of influence of a γ-ray source in the ORNL 2 tubes

Tube # 136 Source ^{137}Cs (#D 393) Activity:

Background control measurement

File: 161012_1200_bck_control.root

Pulser: 1.163×10^4

Noise:

Total: 8841

① 1–7: 6983

② 8–26: 1463

③ 27–180: 405

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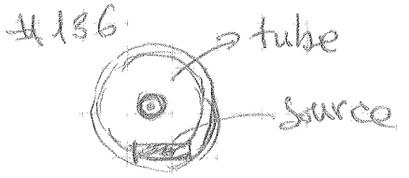
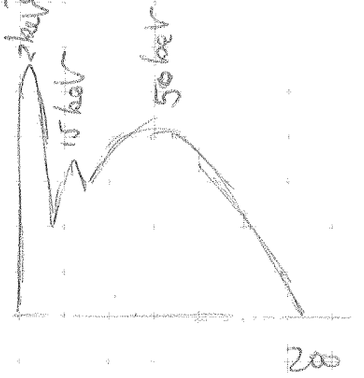
Now we put the ^{137}Cs source in the tube hole close to the tube:



File: 161012_1229_137CsHe136.root.

Peaks: 1.17×10^4

Noise:



Total: 3.264×10^4
① : 6938
② : 2253
③ : 23700

So the γ-induced signals appear in the same energy region the increase of counts is a factor 60
This is a strong hint that the noise in this region is sensitivity to X-rays either external or internal (radioactivity, α/β ?)

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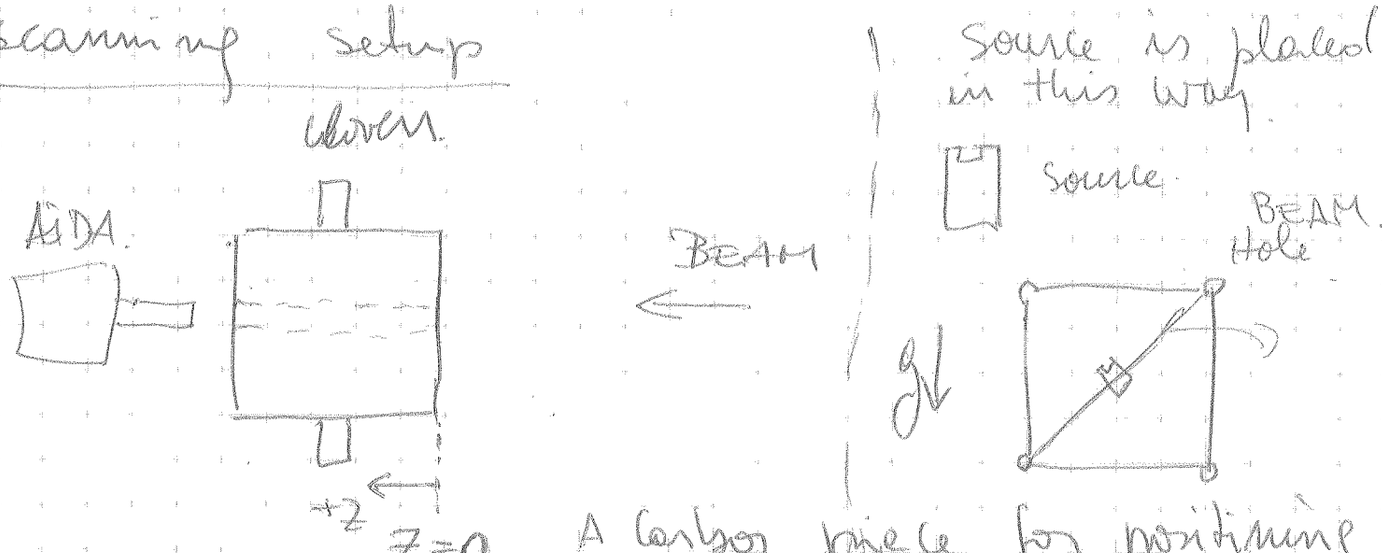
Z-scanning with 252Cf

- Clovers mounted ~ 1cm from the Hole wall.
- Aida is out of the counter, ~ 25cm the of nose.

scanning setup



MEASUREMENTS

- Zscan_Meas01: 5cm source placed at 14:39

Z= ~~xxxxx~~

start 14:42 END: 14:50

file: Zscan_Meas01_000.dat, root (online)

(1", 2")

PBS: Some ORNL tubes should be recalibrated!

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▷ Zscan_Meas02 .

z = -2.5 cm placed at 14:58

start: 15:00 END: 15:06.

file: ~~zscan_Meas02~~. root (online) not saved!

zscan_Meas02 _004.dlt .

▷ Zscan_Meas03:

z = 0 cm placed at 15:09

start: 15:11 END: 15:16

file: zscan_Meas03. root

_002. dlt .

▷ Zscan_Meas04:

z = 2.5 cm (± 0.5 because Marker) placed at: 15:25

start: ~~15:26~~ 15:27 END: 15:32

file: zscan_Meas04_root

_003. dlt.

obs: There were some "Neon shot" power shut down during this Meas.

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▷ zscan_Meas 05:

Z = 5.0 cm
start: 15:38
file: zscan_Meas 05.root
_004.dlt.

placed at 15:36
end: 15:41

▲ small shutdown again.

▷ zscan_Meas 06:

Z = 7.5 cm
start: 15:47
file: zscan_Meas 06.root
_005.dlt.

placed at: 15:45
end: 15:52

▷ zscan_Meas 07:

Z = 10 cm
start: 15:57
file: zscan_Meas 07.root
_006.dlt.

placed at: 15:51
end: 16:02

as: Reset of liquid Nitrogen during this run may introduce a bit of noise!

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▷ zscan_Meas08:

Z = 12.5 cm placed at 16:04

start: 16:06 END: 16:12

file: zscan_Meas08.root_007.dlt.

▷ zscan_Meas09:

Z = 15.0 cm placed at 16:14

start: ~ 16:16 END: 16:21

file: zscan_Meas09.root_008.dlt.

▷ zscan_Meas10:

Z = 17.5 cm placed at 16:23

start: 16:26 END 16:31

file: zscan_Meas10.root_009.dlt.

▷ zscan_Meas11:

Z = 20 cm placed at 16:33

start 16:35 END. 16:41

file: zscan_Meas11.root_010.dlt.

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- zscan_Meas12:
  - z = 22.5 cm — placed at 16:44
  - Start 16:46 — END 16:53 ✓
  - file: zscan_Meas12.root_011.dat
- zscan_Meas13:
  - z = 25.0 cm — placed at 16:52
  - Start 16:57 — END 17:04
  - file: zscan_Meas13.root_012.dat ✓
- zscan_Meas14:
  - z = 27.5 cm — placed at 17:07
  - Start 17:09 — END 17:16
  - file: zscan_Meas14.root_013.dat ✓
- zscan_Meas15:
  - z = 30 cm — placed at 17:18
  - Start 17:19 — END 17:28
  - file: zscan_Meas15.root_014.dat

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Zscan_Meas16

Z = 32.5 cm placed at 17:37

Start 17:38 END 17:48

file: zscan_Meas16.root_015.dat

Zscan_Meas17: Z = 35.0 cm placed at 17:50.

Start 17:52 END 18:07

file: zscan_Meas17.root_016.dat

Zscan_Meas18: Z = 37.5 cm placed at 18:10

start 18:11 end 18:22 ✓

file: zscan_Meas18.root_017.dat

Zscan_Meas19: Z = 40.0 cm placed at 18:25

Start ~~18:27~~ 18:30 END: 18:38 ✓

file: zscan_Meas19.root_018.dat

Zscan_Meas20: ~~Z = 32.5 + 5 cm~~ Z = 42.5 cm placed at 18:40

start 18:43 END 18:52

file: zscan_Meas20.root_019.dat

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OS: From Meas 20, Z is measured as umbrella length + distance	the	Recorded by: to the Z=0.	

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* zscan_Meas21: Z = 37.5 + 7.5 placed at ~ 18:53
  Z = 45 cm
  start 18:55 end 19:03
  file: zscan_Meas21.root_020.dlt ✓

* zscan_Meas22: Z = 45 + 2.5 placed at 19:04
  Z = 47.5
  start 19:05 end 19:11 ✓
  file: zscan_Meas22.root_021.dlt

* zscan_Meas23: Z = 45 + 5 placed at 19:13
  Z = 50 cm
  start 19:14 end 19:19
  file: zscan_Meas23.root_022.dlt

* zscan_Meas24: Z = 45 + 7.5 = 52.5 cm placed at 19:22
  start ~19:24 end 19:28 ✓
  file: zscan_Meas24.root_023.dlt

* zscan_Meas25: Z = 45 + 10 = 55 cm placed at 19:30
  start 19:30 end 19:36
  file: zscan_Meas25.root_024.dlt

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Witnessed & Understood by me,	Date	Invented by:	Date
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zscan_Meas26 : Z = 45+12.5 = 57.5 cm placed at 19:37
start 19:40 End 19:43
file: zscan_Meas26.root
_025.dlt

zscan_Meas27 : Z = 45+15 = 60 cm placed at 1951
start 19:52 END 19:56
file: zscan_Meas27.root
_026.dlt

zscan_Meas28 : Z = 45+17.5 = 62.5 cm placed at 19:59
start ~~20~~:00 END 20:10
file: zscan_Meas28.root
_027.dlt

zscan_Meas29 : Z = 45+20 = 65 cm placed at 20:12
start 20:14 END 20:18
file: zscan_Meas29.root
_028.dlt

zscan_Meas30 : Z = 22.5+45 = 67.5 cm placed at 20:21
start 20:22 END 20:25
file: zscan_Meas30.root
_029.dlt

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▸ zscan_Meas31: Z = 45 + 25 = 70 cm placed at: 20:27

start: 20:29 END 20:32

File: zscan_Meas31.root_030.dlt.

▸ zscan_Meas32: Z = 45 + 27.5 = 72.5 placed at 20:33

start 20:35 end 20:38

file: zscan_Meas32.root_031.dlt

▸ zscan_Meas33: Z = 45 + 30 = 75 cm (+0.5 cm shift) placed at 20:40

start 20:41 end 20:44

file: zscan_Meas33

obs: From AIDA side a shift of ~ 0.5 cm with respect to the mark of the source is seen. This shift can be present in other measurements. Need to be Check!
* Can be present from measure 20 dyp to 33

▸ zscan_Meas34: Z = 75 cm (Again correcting shift from the other side)
placed at 20:48

start: 20:49 END 20:52

File: zscan_Meas34.root_033.dlt.

obs. Check Moderator size on Z-Axis!
* From Here Z = (75 cm) + Distance from Mod the other side.

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▸ zscan_Meas35: Z = 75 + 2.5 = 77.5 mm placed at 20:54
Mod. length.
Start 20:55 END 20:5

file: zscan_Meas35.root
_034.dbt

▸ zscan_Meas36: Z = 75 + 5cm placed at 21:01
start 21:02 END 21:07

file: zscan_Meas36.root
_035.dbt.

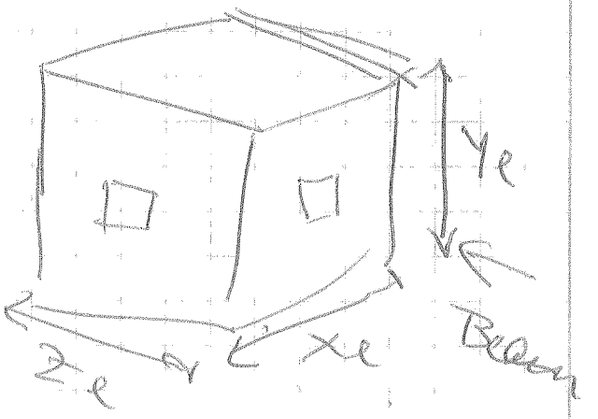
—o— end

▸ Check of Moderator ~~clearance~~ size.

Z_e = 752.5 mm.

x_e = 902 mm

Y_e = 902 mm



▸ Check the anchor positioning piece
-from borde to zero mark. 50cm.
dss: Dimension of this piece are ok!

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13-Oct-2016.

12:40 :

Calibration of the clovers.

Source: 137Cs and 60Co at the center of the moderator.

file: 161013_1240_137Cs60Co.root.

A new calibration was needed after conecting the test input of G7 to the pulser.

Root file: 161013_1518_137Cs60Co.root

Pulser in CLOVERS:

We connect now the pulser to the CLOVERS

We have to replace the original Philips Linear FI/FO by a Lecroy Linear FI/FO because it was introducing a lot of noise. We put the unit in the lower NIM crate

We found that it was not possible to see the pulser (single input) in D4 but in G7 is OK (4 inputs)

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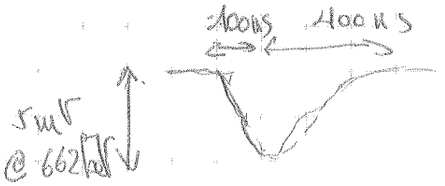
VETO Detectors : all connected to MPOD

NaI detectors: Top, Bottom, Left, Right.



Top: OK, Bottom: has a small high frequency ringing.

During this time suddenly the upper crate NIM lost power (alarm). This was the crate holding the power for CLOVER preamps.
For some reason the crate power supply was damaged (the fan was not turned on!?) and we have to replace it.
The MPOD did not remove the HV from the ~~~~ CLOVERS and was turned down by hand.
We found the CLOVER G7 was damaged: preamp gives no signals. We remove G7 for inspection.

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We add a second TFA for the other plastic detector. We inspect all signals and look OK we feed to the DACQ and looks OK

We make a new calibration in energy of CLOVER

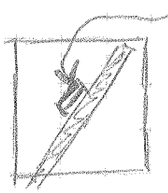
Now we make an efficiency calibration:

File: 161013_2331_137Cs60Co.root

Source: ^{137}Cs CD 393

: ^{60}Co CD 395

^{137}Cs & ^{60}Co source tgether at the center of the moderator



With the ^{152}Eu source (Alone):

File: 161013_2350_152Eu.root.

Source: 09-7011 / 272

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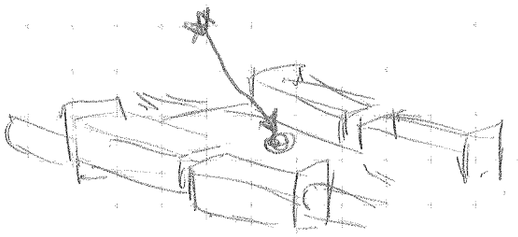
14-OCT-2016

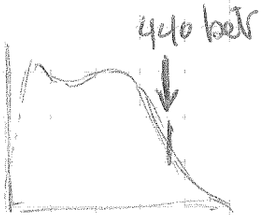
Energy calibration of VETO detectors

^{137}Cs source in the center of the arrangement



File: 161014_0015_137Cs_VetoDetCal.root

Plastic:



		a_1	
Plast T:	370 ch →	1.1891	
Plast B:	400 ch →	~~0.9091~~ 1.1000	

NaJ:

		a_1	
Top:	495 ch	~~0.7477~~	1.3374
Bottom:	525 ch	~~0.7931~~	1.2610
Left:	520 ch	0.7855	1.2731
Right:	670 ch	~~1.0121~~	0.9881

Check of calibration

File: 161014_0038_137Cs_VetoDet.root

File: 161014_0047_60Co_VetoDet.root

Seems calibration is off 1333 ~~keV~~ at 1300 ker → Redo

Witnessed & Understood by me,	Date	Invented by:	Date
		Recorded by:	

Test of BRIKEN calibration with ^{252}Cf source

File: 161014_0105_252Cf.root All OK except 006

→ new calibration

Check: 161014_0103_252Cf.root

New configuration file: 161014Conf_BrikenFull.xlsx

Background measurement:

START : 01:17
STOP : 10:35
File: 161014_1035_bck.root

Shunji suggests to isolate the CLOVER electronics from the rest using a different power line. This is only partially possible since the HPOD is powering all detectors. To test if this has effects on the noise we plug the HPOD

computer and CLOVER preamp supply to a different line and measure
We use the ^{137}Cs - ^{60}Co sources
File: 161014_1241_137Cs60Co.root.

Nathan looks closer into the problem of G7 CLOVER detector and finds out that removing the connection of RED preamp the short circuit dissappears.
Accordingly we decide to mount back the detector in position to run it with only three crystals : Black, Green and Blue
We give HV and they seem to be working fine

Witnessed & Understood by me,	Date	Invented by:	Date
		Recorded by:	

The support for the PE shielding has arrived so we decided to mount it. There are some issues with the pieces but we finally mount it.

The Si detector prepared by Phorx is mounted on the back of the shielding.

In the chaos some cables were unplugged, but it seems we are back to work.

One issue is that with the Si detector in place there is no (easy) way to position a source correctly in the center.

Witnessed & Understood by me,	Date	Invented by:	Date
		Recorded by:	

We now make a run together of AIDA and BRIKEN with CLOVERS.

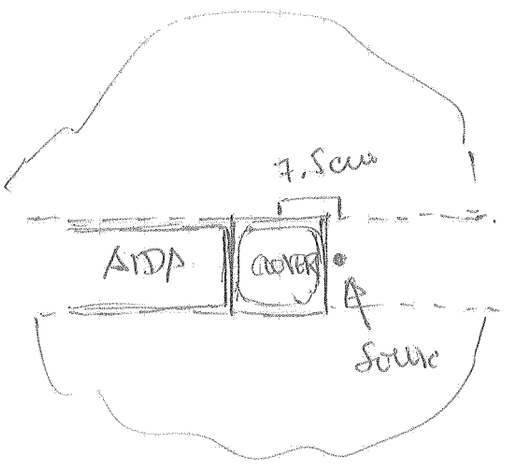
We put the ^{252}Cf source 30 cm from the front BRIKEN matrix, 7.5 cm off center.

AIDA is placed with nose just at the level of the CLOVER hole.

AIDA filename aidas1: /Tape Data/Sept2016/R41 ← Trans

aidas1: /Tape Data/Sept2016/R411 ← Transform
-8
-9

BRIKEN DLT: 252Cf With Aida7J num center_015.dlt
- 016.dlt



BRIKEN wrote 1.18 GByte

AIDA wrote 19 GByte

Witnessed & Understood by me, | Date | Invented by: | Date | Recorded by: