MIDAS Electronic Logbook	Experiment "trinat"

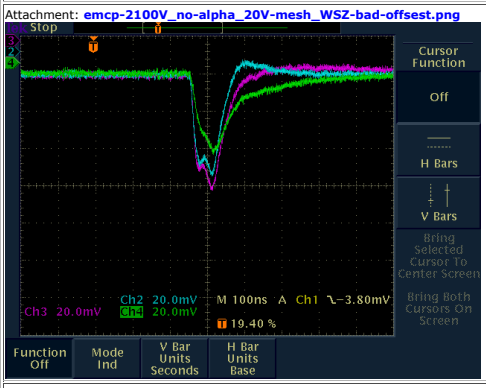
Query | Last | Status

Query result between September 1 2020 and September 15 2020

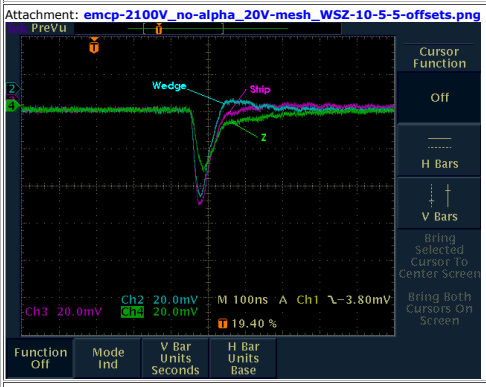
Date	Run	Author	Type	System	Subject
Tue Sep 1 16:05:50 2020	2594	AG@trinatdaq.triumf.ca	Routine	General	buddy log, repair of eMCP

```
13:50 AG is IN
Read what Lames and John left in Elog.

Plan:
1. check voltages in the crate with 428F with fans in-out
2. chech offsets og WSZ pulses at the scope inputs
3. check pulse height of WSA
4. try to set eMCP signals to QDC

15:15
go for 1:  all bin voltage are OK.

from LeCroy 428F manual:
No. of Outputs: 4 per channel; reverse-terminated; direct-coupled; for
optimum output shape, three outputs must be terminated into 50 ohm. For
proper operation, at least 2 outputs must be terminated on each channel
used.
Added to WSZ outputs of 428F loads to have all 4 outputs of each channels
being terminated into 50Ω.

Biasing detector to check offsets.
Vmesh  =-20V
Vfemcp =  0V
Vge=Vwsa=Vbemcp+100V

found following offsets
Vbemcp IbeMCP        (W;S;Z) offsets
[V]     [μA]          [mV]
600     14.7       -10.3;-18.5; -8.2
800     19.8       -10.3;-18.5; -8.2      It looks like offsets do not
1000    25.0       -10.5;-18.3; -8.6      depend on eMCP bias voltage. But
1200    30.4       -10.7;-18.3; -8.4      offsets themselves are found being
1400    35.8       -10.6;-18.4; -8.3      quite different from James' set
1600    41.6       -10.6;-18.5; -8.3      WSZ=(-10;-5;-5)mV
1800    47.8       -10.6;-18.4; -8.3 => some pulses appeared without source
2000    54.5        30-40Hz on visual scaler without source
2100    57.8        60-70Hz on visual scaler without source
Typical pulse traces are attached (200901_175459_emcp-2100V_no-alpha_20V-mesh_WSZ-bad-offsest.png)

17:40
Adjusting offsets to what James decided WSZ=(-10;-5;-5)mV
pulse traces are attached (200901_181146_emcp-2100V_no-alpha_20V-mesh_WSZ-10-5-5-offsets.png)
The shape of the pulses became much better compare to that with initial
offsets. It looks Strip pulses have slightly higher amplitude compare to
Wedge ones. Wedge pulses have some overshoot. Shall check is it enough or
not -10mV offset for Wedge fot big pulses from source.

18:20 source is IN => 2800Hz count rate on visual scaler.
It looks like -10mV offset is enough for Wedge
(file 200901_183140_emcp-2100V_alpha_20V-mesh_wedge_right-offsets.png)

Taking some data:
Run #2595 Start: Tue Sep 1 18:34:27 2020,  1673.9 events/s
          Stop: Tue Sep 1 18:53:02 2020, about 1.8M events.
```

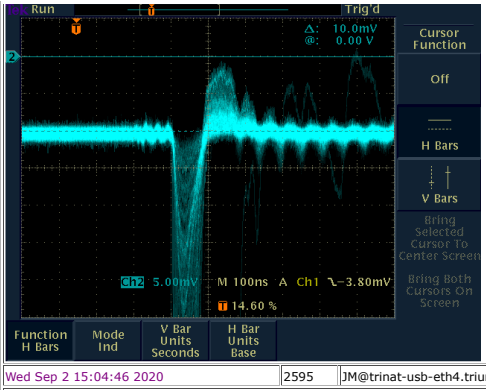
Attachment: **emcp-2100V_no-alpha_20V-mesh_WSZ-bad-offsest.png**



Attachment: **emcp-2100V_no-alpha_20V-mesh_WSZ-10-5-5-offsets.png**



Attachment: **emcp-2100V_alpha_20V-mesh_wedge_right-offsets.png**



Wed Sep 2 15:04:46 2020	2595	JM@trinat-usb-eth4.triumf.ca	Routine	eMCP	buddy log, tests of eMCP

3:00pm James in lab

Vacuum: 4.6kV, 12uA, <1e-8 torr

Vmesh = 0
VFeMCP = 0
VGe=VWSA=VBeMCP+200V

VBeMCP IBeMCP
[V] [μA]
200 4.9
400 9.8
600 14.8
800 19.9
1000 25.2
1200 30.4
1400 36.0
1600 42.5
1800 48.4
2000 55.0
2100 58.6

Without source: 540Hz on scalar.
With source: 8.2kHz on scalar.
Biasing Mesh: VMesh = -20V gives 2.8kHz and supression of the fraction of events with low pulse height near 15mV in pulse-height amplitude.

After John's fix for the linear fan yesterday the pulse-heights look much better. The pulses were nominally 200mV on the WS channels and 150mV on the Z channel.

So I split the output of the linear fan imeadiately after the eMCP signal from the preamp, with only one 50ohm terminator remaining on the output channels of the linear fan. I then feed a second linear fan with output through roughly 250ns of cable delay into the scope. The linear fan was terminated at 50ohm along with the scope. I adjusted the linear fan to try to reduce the positive overshoot of the eMCP pulse so we can send it to the QDC. The maximum negative DC offset I can apply though is 25mV. Even with the linear fan DC offset maxed we can still have 50mV positive overshoot which is bad.

Instead we took one of the outputs from the eMCP linear fan and fed it into the Ortec amplifier with integration capabilities to smooth out the pulse and remove the positive overshoot. The minimum integration time of 100ns was chosen and output taken from the unipolar output terminal which yields positive pulses and a DC offset. There is a built in DC offset adjustment that has some adjust-ability, but too large an offset did distort the output pulses. The gain was set around 20x or 50x to reduce the DC level fluctuations compared to the integrated pulse distribution. The intention was to send these signals to an attenuater first, then a linear fan with inverter. However, the crate containing the linear fans may have a power supply problem as the -24V read only -6.68V. The crate was likely dragging the output potential of the linear fans down too far as was evident in the suppressed WSA channel and integrated eMCP channel voltage. John was planning to move the linear fans to the above crate tomorrow. I set up part of the delay to the QDC connecting to its pins (~12 ns) to a T for the scope and is close to the coresponding ~13ns delay of the WSA channels to the QDC for simplicity. I placed the delay opposite to the power supplies for the

hoops.

8:22pm Leaving

****
Th 05:30 JB
Crate above, on back, says it can supply
+6V 10A, -6V 10A, total +_6V possible is 12 A.
+12V 3A, -12V 3A, total +-12V possible is 4 A.
+24V 1.5A, -24V 1.5A, total +-24V possible is 2A.

428F:
Power Requirements: 80 mA at +24 V, 80 mA at -24 V, 160 mA at +12 V, 160 mA at -12 V.
I.e. two of these is 640 mA total +-12, 16% of bin total. Should be fine.

I moved both 428F fan-in/outs, and a Lecroy LRS222, to the other bin.
(Replaced LRS222 top channel start LEMO cable, fed from NIMIO output 15, which supplies the gamma-ray QDC gate.)
(I moved the research pulser, which does not use NIM crate power, to the bad bin.)
All bin voltages are fine.
****

Sat Sep 5 13:38:01 2020	2595	AG, JB@trinat-usb-eth4.triumf.ca	Routine	eMCP	buddy log, tests of eMCP

13:01 AG is IN.
In ODB set channel 1 on ADC1 for eMCP.
Pressure 1e-8 Torr
Biasing eMCP
Vmesh=0
Vge=Vwsa=Vbemcp+100V
No α-source

VBeMCP IBeMCP
[V] [μA]
200 4.8
400 9.8
600 14.7
800 19.7
1000 25.0
1200 30.3
1400 35.9
1600 41.9
1800 48.4 => first pulses
2000 55.0
2100 58.4
Count rate on visual scaler 2 kHz
Vmesh=-20V => 60-70 Hz

Inverting a eMCP shaped signal wit 428F:
In order to get pulses through 428F I adjusted output DC offset of ORTEC 450 minimum value. Replaced 8ns cable with 32ns one to adjust delays. Put attenuator x0.2 after 428F. Adjusted offsets WSZ=-(10;5;5)mv. For some reason they were about as twice as high. Scope traces are attached (200905_170635_emcp-2100V_no-alpha-20V-mesh_ws+shaped-emcp.png).

Again I cannot properly attach image. But I have to say that base line

of eMCP shaped pulse is not stable at all and is jumping withi 10mV.

trinatdaq:/home/trinat/iaeg/emcp-2100V_no-alpha-20V-mesh_ws+shaped-emcp.jpg

MAKE THE TITLE SHORTER

inserting source: pulses are much bigger. Make attenuator x0.1 Count
rate 2.5kHz. As the base line of eMCP signal is not stable, do not expect
good spectrum for eMCP.

taking data
Run #2596 Start: Sat Sep 5 17:10:30 2020, 1670 events/s
Stopped because forgot to put eMCP to ADC => connected.

Run #2597 Start: Sat Sep 5 17:19:32 2020, 1700 events/s
Stop: Sat Sep 5 17:24:51 2020, taken about 500k events

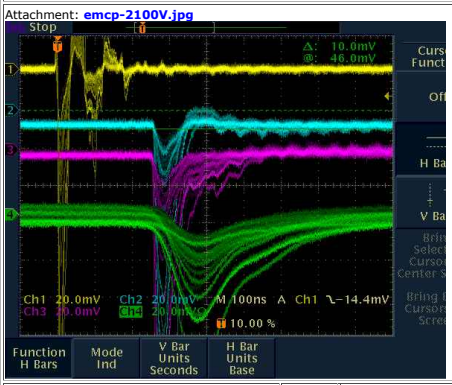
in QDC folder QDC_eMCP histogram has counts in channels 95-99.

Sat Sep 5 17:41:33 2020:
All is OFF, leaving.

Sun Sep 6 0600 JB
* 10-pin header was plugged into wrong QDC
(unused channels of ADC0, the scintillator QDC.)
See Sunday Aug 16 elog for a picture of the true configuration.
I have restored this 10-pin header to the correct slots on ADC1.
Note Alexandre has modified ODB to account for the location of eMCP's QDC.
(channel 1 of ADC1).

** The Ortec 450 has many useful options on front-panel knobs:
*You can set the Unipolar output to be negative instead of positive, (maybe skipping the Fan-in/out to invert);
*You can pick its maximum amplitude to be 3 V rather than 10V;
*There's a "BLR" (BaseLine Restore) knob, set now at "Medium." This might
be better set to "Out" for a unipolar signal.
*I guess I'm surprised you find the best setting to be 0 integration, relying on the inherent time constants to average out that ringing.
Is this deliberate?

Attachment: **emcp-2100V.jpg**



Mon Sep 7 13:51:10 2020	2597	JM@d108-172-196-211.bchsia.telus.net	Routine	General	buddy log, tests of eMCP

1:50pm James in lab

Vacuum: 11uA, 4.7kV, ~1e-8 torr

Vmesh = 0
VFeMCP = 0
VGe=VWSA=VBeMCP+200V

VBeMCP IBeMCP
[V] [µA]
200 4.9
400 9.8
600 14.9
800 20.0
1000 25.2
1200 30.6
1400 36.3
1600 42.2
1800 48.4
2000 51.1
2100 59.1

Plan for today will be to:
1) Tune attenuator such that eMCP qdc does not saturate QDC
2) Look at QDCeMCP vs. WSZ_Sum to see if the correlated distribution widens
depending on the VGe-VBeMCP bias.
3) Re-look at if VGe-VBeMCP significantly influences the mask visibility

Set output unipolar signal at -10V scale. Adjusting the BLR from MED to HI
seemed to reduce the fluctuations in the DC level. Wit BLR at LOW
fluctuations were probably 8mV, while on HI fluctuations were probably half
that around 4mV. Reseting the scale at -3V output also seemed to reduce the
DC fluctuations on the output, but also the signal amplitude. I reduced the
attenuator from 0.1 to 0.2 and replaced the 32ns delay with 8ns. Even less
delay would be helpful, but I think the Ortec amplifier internal delay is
the main limitation now. I had to increase the QDC gate length from 400 to
550ns to integrate over the entire alpha eMCP pulse.

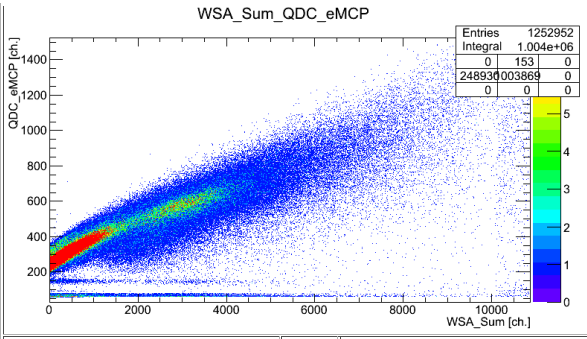
With source (VMesh = 0 -> -20V: 10kHz -> 2.8kHz)

Run# Vmesh VBeMCP VGe=VWSA Scalar Events Note
2601 -20V 2100V 2300V 2.8kHz 200k -Slight saturation of eMCP qdc
-QDC_Z is now ~delta func ??????
-QDC_Z had a +4mV offset... bad
2603 -20V 2100V 2300V 2.8kHz 210k -eMCP Attenuator from 0.2 -> 0.1
-WSZ offsets (-10,-5,-5)mV.
2604 -20V 2100V 2300V 2.8kHz 520k -Mask not resolved(int.noise?)
2606 -20V 2100V 2300V 2.8kHz 510k -QDC_Gate = 550ns -> 400ns
-Beter res. mask (less int.noise)
2608 -20V 2100V 2300V 2.8kHz 560k -QDC_Gate = 400ns -> 300ns
-Clipping the Z-channel now
-Int 6/10ths of QDC_eMCP peak
-Further improvement in mask res.
2610 -20V 2100V 2300V 2.8kHz 600k -QDC_Gate = 300ns -> 250ns
-Int 5/10ths of QDC_eMCP peak
-Further improvement in mask res.
2611 -20V 2100V 2300V 2.8kHz 1.25M -QDC_Gate = 250ns
2612 -20V 2100V 2300V 40Hz 61k -QDC_Gate = 250ns, SOURCE OUT

It appears that fluctuations in the long tails of the WSZ channels,
particularly the ringing on the S channel may have been limiting our spatial
resolution in the timing output. The cost however has been integrating less
of the QDC_eMCP. Due to the internal delay of the Ortec amplifier if one
could delay the gate to the QDC, along with the WSZ channels say by 60ns
then more of the QDC_eMCP could be integrated with these smaller QDC_Gate
lengths.

8:00pm Leaving

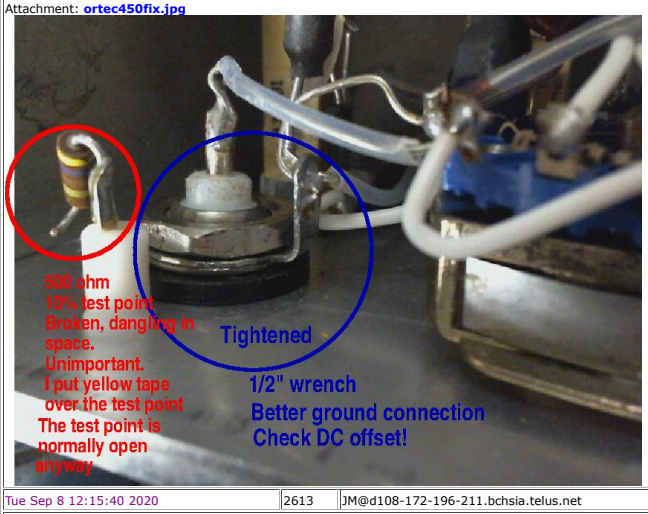
Attachment: **QDC_eMCP_WSA_Sum_2611.png**



Tue Sep 8 07:49:27 2020	2613	JB@trinat-usb-eth4.triumf.ca	Fix	eMCP	Ortec 450 input ground connection fix

I opened the 450 Ortec (used for eMCP QDC) and threaded the nut on
holding the input BNC. Ground connection was likely poor, so
DC offset should be checked. See photo for details.

Attachment: **ortec450fix.jpg**



Tue Sep 8 12:15:40 2020	2613	JM@d108-172-196-211.bchsia.telus.net	Routine	General	buddy log, tests of emcp

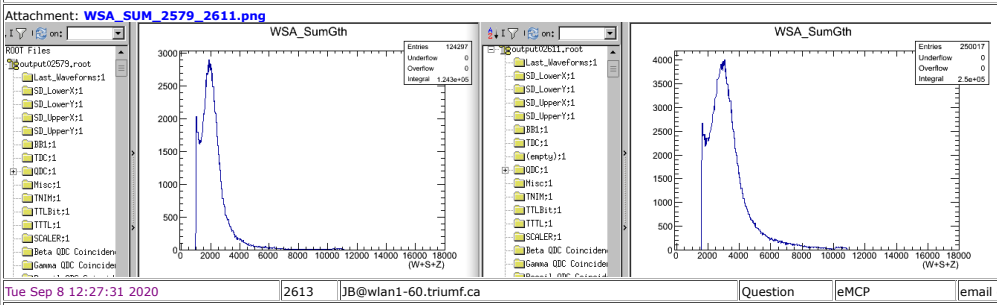
I agree with Alexandre there have been some changes in the pulse-height
spectrua compared to before the failure of the crate -24V power supply and
replacement. Attached are the WSZ_QDC spectra comparing run 2579 (last good
run) with the latest run 2611 at identical bias's on the eMCP.

W: The noise on the DC baseline has probably increased by ~ x1.5, but the
amplitude of pulse distribution has increased from
400(800-400ch)   -> 700(1000 - 300)
S: The noise on the DC baseline has probably increased by ~ x2.0, but the
amplitude of pulse distribution has increased from
800(1400-600ch) -> 1300(1700 - 400)
Z: The noise on the DC baseline has probably increased by ~ x1.5, but the
amplitude of pulse distribution has increased from
600(860-260ch)   -> 850(1600 - 750)

I claim there generally has been an increase in amplitude on each of the WSZ
channels (for whatever reason), but the noise levels have also increased on
the DC baseline, which will hurt our resolution. Any chance we could get a
crate with ultra-stable power supplies??

The corresponding increase in WSA_Sum is also evident in the attachment with
the alpha peak being shifted up from channel 1900 to 3000.

Attachment: **WSA_SUM_2579_2611.png**



Tue Sep 8 12:27:31 2020	2613	JB@wlan1-60.triumf.ca	Question	eMCP	email discussion of crate voltages

*What's the actual position resolution now?

* Put the voltage from the crate on the AC part of the DVM and
measure the ripple. Do this for all voltages and elog it.

*Do the same with the old crate-- it's still sitting there-- on the
several supplies that are working. The old crate
probably needs a load-- you could plug that extra fan-in into it.

I would be very surprised if the DC power supply stability or ripple is to
blame. In any case, before buying random crates we need to know if the
supplies are meeting their specs.

E.g. you had a floating ground on the eMCP signal that I think I just
fixed. When we added that signal to the QDC, we could have been writing
electronic noise onto all the QDC grounds-- it depends on the design.

On Tue, 8 Sep 2020, James McNeil wrote:

> Hi Alexandre,
>

> Ya, I agree there have been some changes in the pulse-height spectrum before
> the faiilure of the crate -24V power supply. Attached are the WSZ_QDC
> spectra comparing run 2579 (last good run) with the latest run 2611 at
> identical bias's on the eMCP.
>
> W: The noise on the DC baseline has probably increased by ~ x1.5, but the
> amplitude of pulse distribution has increased from 400(800-400ch)   ->
> 700(1000 - 300)
> S: The noise on the DC baseline has probably increased by ~ x2.0, but the
> amplitude of pulse distribution has increased from 800(1400-600ch) ->
> 1300(1700 - 400)
> Z: The noise on the DC baseline has probably increased by ~ x1.5, but the
> amplitude of pulse distribution has increased from 600(860-260ch)   ->
> 850(1600 - 750)
>
> So I claim there generally has been an increase in amplitude on each of the
> WSZ channels (for whatever reason), but the noise levels have also increased
> on the DC baseline, which will hurt our resolution. Any chance we could get
> a crate with ultra-stable power supplies??
>
> James
>

Tue Sep 8 14:56:33 2020	2613	JM@trinatdaq.triumf.ca	Routine	General	buddy log, tests of emcp

2:56pm James in lab

Vacuum: 10uA, 4.8kV, <1e-8 torr

Measured the mean AC amplitude on the power supply of the old ortec crate
(#03115) and all voltages +24,+12,+6,-6,-12,-24V read amplitudes of
maximally 5mV. I used the LeCroy linear fan on the desk as the load on the
old crate. When I checked the present crate (#10436) containing
our linear fans for WSZ and eMCP QDC's I measure for +24,+12,+6,-6,-12,-24V
rms amplitudes of 23,5,5,5,5,5mV. The DC coupled readings on the new crate
are stable at their respective voltages.

There is some odd noise evident on each channel (1,2,3,4) of the scope
(eMCP,W,S,Z). See attachment. There is a good chance that such periodic
fluctuations in the baseline voltage may be limiting our resolution.

AG: Is GRIFFIN running or something else and makes 15-16 kHz noise to
ground?

Vmesh = 0
VFeMCP = 0
VGe=VWSA=VBeMCP+200V

VBeMCP IBeMCP
 [V]   [µA]
200   4.9
400   9.8
600   14.8
800   19.9
1000   25.1
1200   30.5
1400   36.3
1600   41.9
1800   48.8
2000   54.7
2100   58.2 (SOURCE IN: VMesh = 0 -> -20V gives scalar 10kHz -> 2.8kHz)

Disconnecting the eMCP Ortec amplifier did not change the fluctuations on
the baseline of WSZ and eMCP signal. Also reducing the number of terminators
on each of the linear fans to 3 (two on input, one on output) had no effect.
Changing the W linear fan to the adjacent box also had no effect. I checked
the above crate (#03379) and all its DC coupled voltages are correct, and AC
coupled signals show maximally 5mV rms fluctuations.

I will power down the eMCP and the WSZ preamps before turning this crate off
to insert our linear fans. Linear fans were successfully integrated into
crate (#03379) and there is no sign of the noise present when in the crate
(#10436).

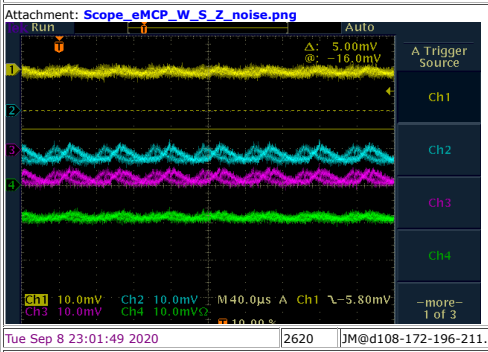
WSZ DC offsets were adjusted to (-10,-10,-5) mV. Additional offset on the S
was needed from large pulse tale which sometimes went positive at -5 V DC
originally on this channel. The DC level on the eMCP signal from the Ortec
amplifier is quite stable, but not sure if it has improved since the
tightening of the ground on the input.

WSZ QDC attenuators set at (0.2,0.2,0.2)

Run#	Vmesh	VBeMCP	VGe=VWSA	Scalar	Events	Note
2615	-20V	2100V	2300V	2.8kHz	550k	-QDC_Gate = 250ns
2617	-20V	2100V	2300V	2.8kHz	570k	-QDC_Gate = 550ns -Integrate over entire eMCP pulse -Some saturation of S channel
2618	-20V	2100V	2300V	2.8kHz	590k	-QDC_Gate = 550ns -WSZ atten. set at (0.1,0.1,0.1)
2619	-20V	2100V	2300V	2.8kHz	1.1M	-QDC_Gate = 550ns -WSZ atten. set at (0.1,0.1,0.1)
2620	-20V	2100V	2300V	60Hz	54k	-QDC_Gate = 550ns -WSZ atten. set at (0.1,0.1,0.1) -SOURCE OUT

Everything off
8:07pm Leaving

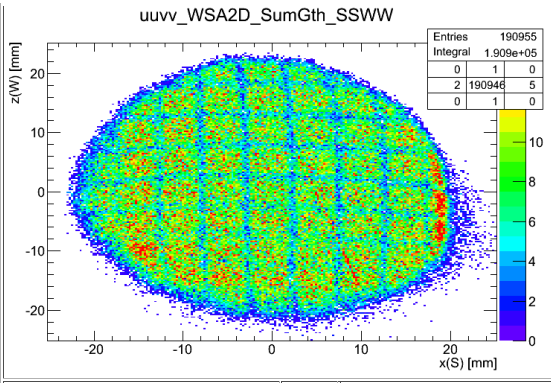
Attachment: **Scope_eMCP_W_S_Z_noise.png**



Tue Sep 8 23:01:49 2020	2620	JM@d108-172-196-211.bchsia.telus.net	Routine	General	buddy log, tests of emcp

Attached is corrected 2D histogram for run 2619. I claim we have effectively
recovered our results from before we began having problems with crate power
supplies. Although the vertical mask lines have good contrast (~50%), the
horizontal lines are still not well resolved, particularly for z<0 mm (W-
channel). This may be related to the slight positive overshoot on W-channel on
it's tail who's magnitude seems to be correlated with large pulse height. This
would have the effect of both reducing the W channel pulse height and
introducing noise which may be spoiling the channel vertical resolution. If
such fluctuations are our limitation, there may only be marginal improvements
in mask contrast by adjusting VGe.

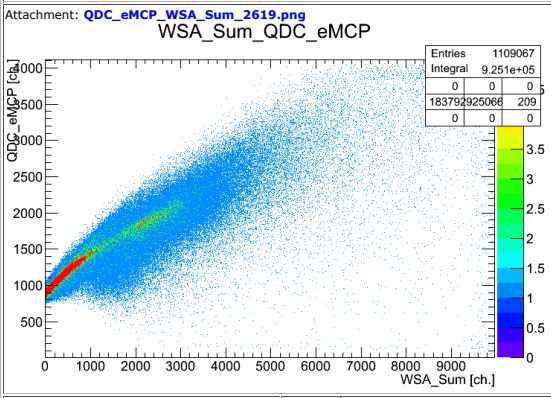
Attachment: **WSA_2D_sumWSA_G1600_2619.png**



Tue Sep 8 23:12:00 2020	2620	JM@d108-172-196-211.bchsia.telus.net	Routine	General	buddy log, tests of emcp

Attached is the eMCP_QDC vs. WSZ_Sum pulse-height showing some separation
between the low pulse-height events, and the alpha events in the low amplitude
"blob" at WSA_Sum > 1600. Maybe we will have some pulse-height discrimination
to reject some background in these correlated plots.

Attachment: **QDC_eMCP_WSA_Sum_2619.png**



Wed Sep 9 14:49:20 2020	2620	AG@trinatdaq.triumf.ca	Routine	eMCP	buddy log, tests of eMCP

14:05 AG is in lab.
Reading previous entries in elog.

Pressure is <1e-8 Torr.

1. check voltages on crate again ±24V, ±12V, ±6V : OK
2. after disonnecting/reconnecting inputs of scope from/to 428F found that
   nonstability of base line at the level of 0.1mV is due to these devices.
   This is, probably, not very important, but ORTEC 450 better to switch to
   NEGATIVE output and bypass a 428F.
   offsets without bias: WSZ=-(14.6;15.2;17.2)mV instead what James had
   installed: -(10;5;5) mV. It is not clear why they are drifting.
   shaped eMCP: -9 mV
   Observed very unstable eMCP gate offset. It was jumping from 0.7mV to
   40mV. Touching of scope input (ch1) sometimes changed offset.
   Something WRONG with input of Ch1 on scope or bad connectors/cables.

I think that the reason is in the flaky 50Ω termination in the gate input
of V792 ADC: when I touched this input, offset was jumping between 0.7mV
and 40nV.

   Installed correct offsets to WSZ=-(10;5;5)mV

Turned ON VME crate: observed an about doubling of noise amplitude in the scope inputs.

3. biasing detector.
Vmesh=0
VFeMCP = 0
Vge=VWSA=Vbemcp+100V

VBeMCP IBeMCP
 [V]   [uA]
400   9.8
800   19.8
1200 30.4
1600 41.2
2000 54.8

check offsets: WSZ=-(10;5;5)mV stable.
Withouth source pulse amplitudes are on attachment 1.
Second attachment is the same with alpha source and Vmesgh=-20V. 2kHzs
count rate.

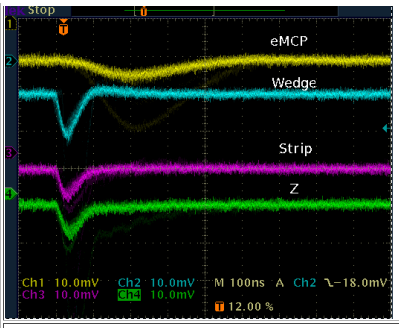
Run #2622 1.2kHz.
Start: Wed Sep 9 18:49:38 2020, taking data @ Vbemcp=2000V
Stop : Wed Sep 9 18:57:51 2020
Third attachment shows WSZ pulses with gate to QDC.
Question is when really such a gate opens QDC?

19:05 WSZ=(-8.8;-4.8;-3.2)mV
In two hours offsets drifted. => remove 428F ????

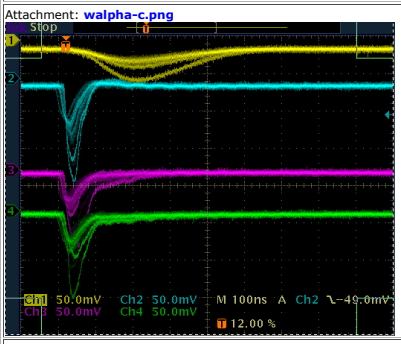
19:10 All is off.
leaving.

Later on: Long gate (550 ns makes large pulse height for Z channel as this pulse has a long negative tail.

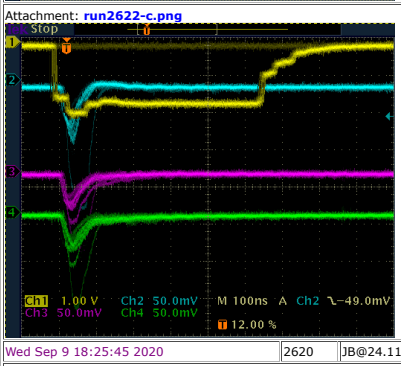
Attachment: **nalpha-c.png**



Attachment: **walpha-c.png**



Attachment: **run2622-c.png**



Wed Sep 9 18:25:45 2020	2620	JB@24.114.38.56	Info	eMCP	50 ohm splitters

It is pretty easy to make a 50 ohm splitter. See attached. We have at least
one of these, handmade. It's easy enough for me to make more.

But I think you're telling me that the KATSA preamps have a positive DC
offset, so you must have the Fan-out to adjust the DC level.
So we can't replace the fan-out with something passive to have less noise.

I went ahead and ordered
commercial 50 ohm DC-high frequency resistive splitters from Minicircuits.
They should be at TRIUMF Friday, so I plan to pick them up Monday morning.

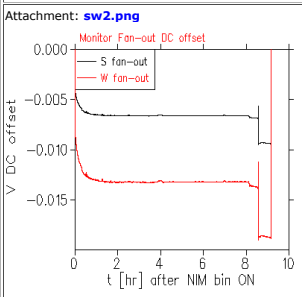
****
Below is a log of offset voltages after NIM bin turned on.
The last drop coincides with
Alexandre turning on other devices in the next log--
it would have been nice to know which devices changed the DC offset,
though I would guess it's likely the VME crate.
(The scope read very close to -5mV for S and -10 mV for W when
the computer ADC read -6.5 and -13 mV.)

I believe this suggests
the drifts Alexandre logged yesterday are not coming from the NIM bin,
but instead from some other device without an adjustment possible.

****
The first dip near 8 hrs for 20 minutes is what happened when the VME crate and other NIM bins were turned on. The large dip is Alexandre adjusting DC offsets.

The ADC displayed is the difference between the fan-out ground and the fan-out signal. That didn't change all day, but Alexandre reports in the next log that the scope signal did... which means the fan-out ground is somehow drifting or changing.

Attachment: **sw2.png**



Thu Sep 10 15:45:36 2020	2622	AG@trinat-usb-eth4.triumf.ca	Routine	eMCP	buddy log, tests of eMCP

15:05
AG is in, turned ON all MIN bins, VME crate
Measured offsets: WSZ=-(7.8;4;1;5.2) mV this contradicts to John's plot of
USB ADCs data where stable reading was Wedge= ~13.0mV and Strip= ~6.5 mV.

15:45 Put WSZ=-(10;5;5) mV => shall remeasure it later
Biasing detector
Vmesh=-20
VFeMCP = 0
Vge=VWSA=Vbemcp+200V

VBeMCP IBeMCP
 [V]   [µA]
1800   48.3

Stared run to check a gate shape, no data recorded
Attachment 1: pulses with gate without QDC and 50Ω termination on scope
Attachment 2: pulses with gate without QDC and 1MΩ termination on scope
Attachment 3: pulses with gate and with QDC and 1MΩ termination on scope

I can't see any difference between Att2 and Att3 while there is an evidence of not very good termination comparing to Att1 - long cable matters.

But when I "shaked" 10 pin connector to QDC inputs, I observed very big
changes in gate shape for case 3.

This input connector has to be redone and fixed firmly on V792 input.

17:05 set QDC gate to 250ns.
17:10 check offsets: WSZ=-(10;5;0) mV => set WSZ= -(10;5;5) mV

VBeMCP IBeMCP
 [V]   [µA]
2000   55.8

take some data
Run #2624
Start: Thu Sep 10 17:18:04 2020 1150 Events/s, 2kHz on visual scaler.
Stop: Thu Sep 10 17:25:39 2020 509019 Events

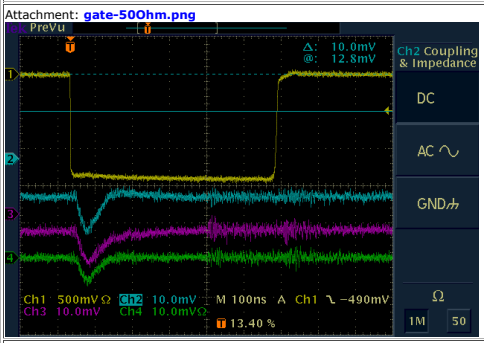
Looked into E-out of Catsa. Pulses are positive, about 1µs full width.
At Vbemcp=1900V did not see saturation on Strip. Base line is stable.
Maximum is abou at 200 ns. After 250 ns shape of some pulses is distorted.
I think, E-out can be used with pulse-sensitive ADC only.

check offsets
18:10 WSZ=-(-10;5;5) mV, stable.
18:30 WSZ=-(-10;5;6) mV

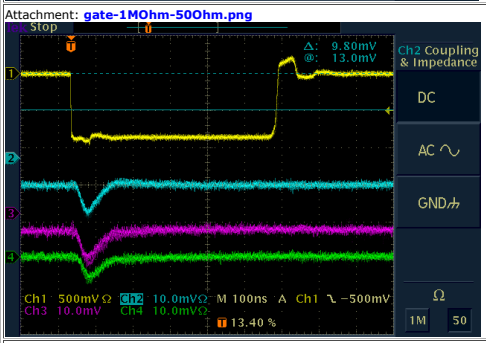
18:45
After swithing OFF all but NIM bin got offsets WSZ=-(-15;8;8) mV

Leaving
Sunday Sep 13 06:30 WSZ=-(14; 8; 9) mV on scope.
Recorded ADC as well (outa4) and then disconnected it.

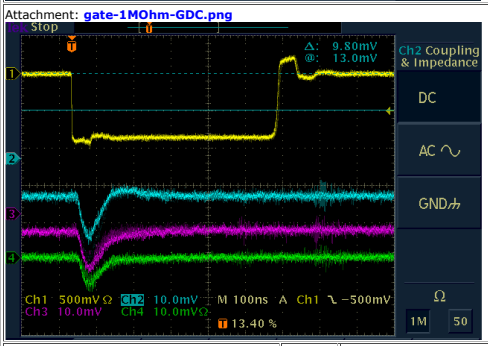
Attachment: **gate-50Ohm.png**



Attachment: **gate-1MOhm-50Ohm.png**



Attachment: **gate-1MOhm-GDC.png**



Sun Sep 13 06:37:39 2020	2624	JB@72.143.226.238	Test	Scintillators	GAGG tests

Sun Sep 13 0630
Plans for 5x5cm GAGG (EPIC crystal) tests.
Note the 1x1x1cm cube of GAGG is mounted on the first SiPM test board, which can only hold a 2.5x2.5 cylinder. So I can't use this to try new GAGG timing on a smaller SiPM. Probably best to not start this setup.

Plan:
Mount GAGG 5x5 cm cylinder in the BGO#1 Al can (Thorlabs optics) and test
it with those electronics.
Move the 428A fan-in/fan-out to the bin with the working power supplies and low ripple.

Diassembled BGO1. Replaced with 50x50 mm cylinder GAGG from EPIC Crystal.
Ends are polished, circular part of cylinder is rough. (BGO1 and 2 are all polished.)
As Tine Valencic's report says, there is
1/4" Teflon, then SM2CP1 (he says this is 0.6mm Al) cap, then 3mm of Teflon directly on the crystal. There is the dielectric n-matching gel between the SiPM and the crystal. The SiPM is 4 SENSL squares in about a 1" square.
BGO1 cylinder was surrounded by dielectric mirror film, except the thin plastic protective layer was left on.
I took off the plastic layer and put the dielectric mirror film back.
The rest of the back surface not covered by SiPM was TiO2 for BGO1:
I cut a square hole in a circle of dielectric mirror film.
This should be ready to bias tomorrow.

Mon Sep 14. Plan
bias GAGG detector (double-check log, though V is on the SiPM dedicated supply), look at pulses on OWAN 200 MHz scope.
Set up near the detection chamber.
137Cs and 60Co spectra:
Measure risetime, adjust "BGO1" CF delay. Done
* Turn on Tektronix scope and check DC offsets are < 0 before and after
turning on acquisition, both sets of gates just in case. Done
Edit fevme.c.. and start reading "BGO1" and BGO2 QDC.
Plan to adjust ODB to use the gamma-ray gate, then put it back.

Supply 0.95*32 = 30.4 V, 0.135*2= 0.27 mA, light tight, risetime 230 ns
Present CF delay is 32+128= 160 ns
Adjust fraction higher, maybe 0.7 or 0.8,
Walk +6 change to -7 mV.
Threshold lower from 300 to 130 mV, maybe 50 keV. Not sure why this isn't
entirely stable.

Adjust NIM -> LRS222-> length = 1.2 microsec. Gate comes about 50 ns late
at the moment (probably the CF adjustment I made.)

Run 2625 1.3 KHz CF count rate, Trigger H (and former D), 964 events/sec read, 137Cs.
5 min 6 sec, 273877 events. 662 keV peak is probably offscale.

Run 2626 1.6Khz 133Ba lots of peaks, not sure what's going on.
****
Run 2627 add attenuation set to 0.2
along with the existing 50/50 splitter already there,
137Cs.
Peak and Compton are there, lower than I would have guessed,
a negative offset must also be attenuated? 662 keV about channel 660

Run 2628 same setting, 0.2 atten (plus the attenuator),
60Co, just resolve the peaks, chs 1430 and 1670 for 1172 and 1333 keV.
Odd peak below, that I think we've seen before from this source?
source is quite close. Maybe I can see the sum peak.

Run 2629 same 60Co source, pulled much farther away. No surprise, all 3 peaks weaker.

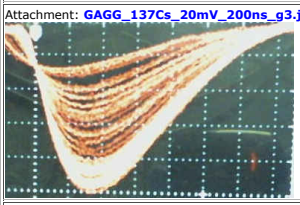
Run 2630 natural bkg, 9 minutes.

This looks pretty good for a start. Will determine the 60Co resolution.
We can replace the dielectric mirror file with TiO2 paint, or I've talked to Steve about a teflon insert.

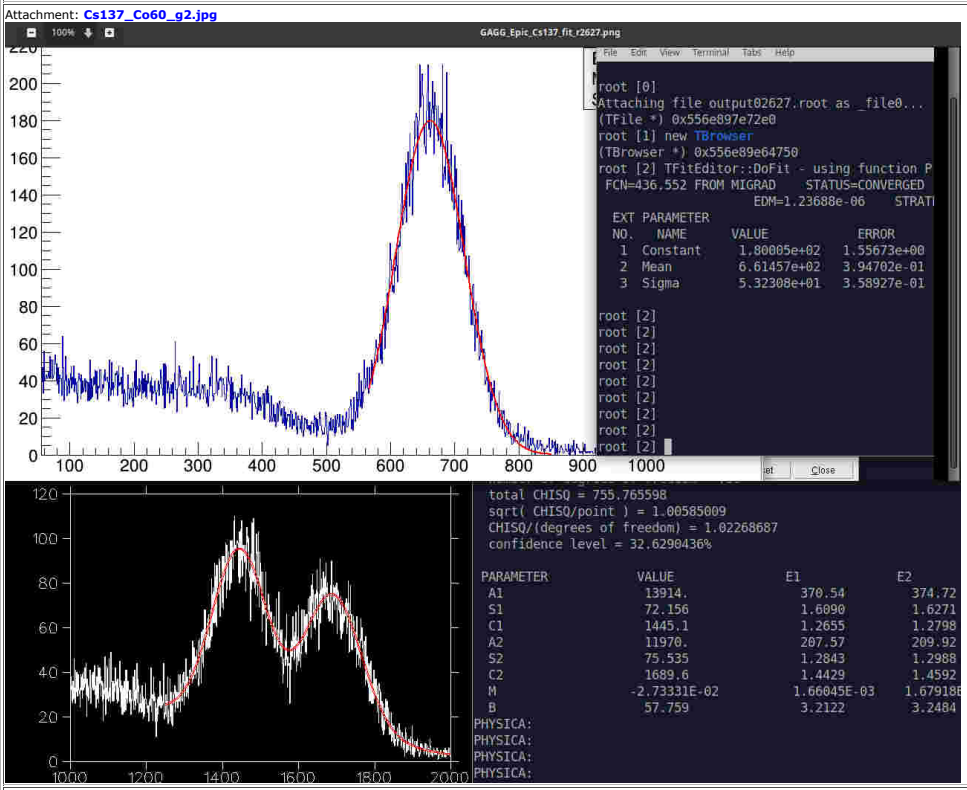
Debias SiPM, but left DAQ and crates on. JB leaves 10:40

Analysis of 137Cs and 60Co spectra:
pretty poor energy resolution so far (manufacturer measure 7.6% at 662) but
there are things to improve with the back surface of the GAGG. Linearity is good with a 61% confidence level. Plus, 137Cs looks better even on the scope by eye, so this must be electronic noise
Tomorrow plan is to turn off the CAMAC crate, then cheat by decreasing the attenuation.

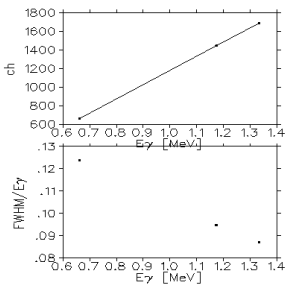
Attachment: **GAGG_137Cs_20mV_200ns_g3.jpg**



Attachment: **Cs137_Co60_g2.jpg**



Attachment: **fitcal.png**



Sun Sep 13 07:05:10 2020	2624	JB@trinatdaq.triumf.ca	Info	eMCP	pulse heights

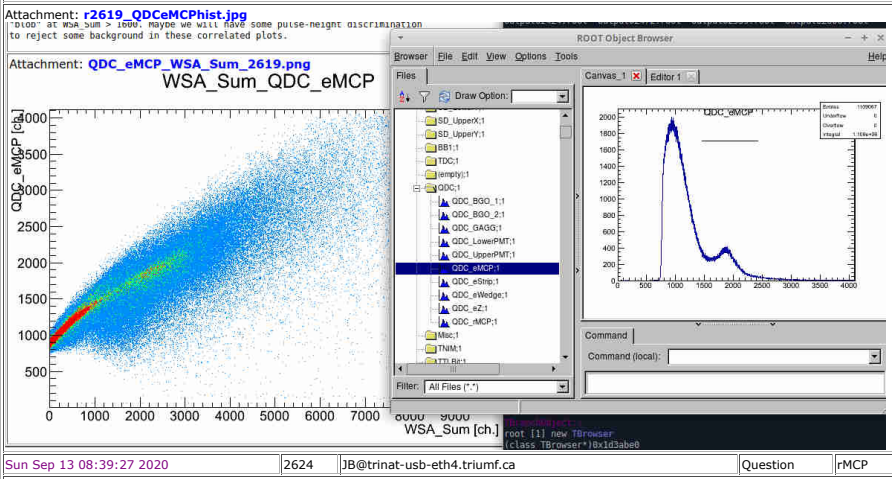
The QDC_eMCP histogram suggests another, wider peak at lower pulseheight.
Maybe that's 1 electron, and the higher alpha-induced pulseheight we've
been working with is 2 electron?

Maybe the threshold on WAS means this peak is cut off?

James already has a position 2D showing these lower pulse heights have
poorer resolution. (Can you see the MCP circle in that plot? Any mask in
any region?)

It would be good to find out if these are usable, because this is probably
the pulse heights we will get with photoelectrons.
One could find that out by raising MCP bias voltage to move that peak in
QDC_eMCP up to where the higher peak is now.
Then electronic noise will be the same.
One would want to make cuts on the QDC_eMCP spectrum to eliminate events
that saturate any of the WAS channels.

Attachment: r2619_QDCeMCPhist.jpg



Sun Sep 13 08:39:27 2020	2624	JB@trinat-usb-eth4.triumf.ca	Question	rMCP	4 dangling or destroyed cables

(* I cleaned up the 1x1x1cm GAGG test, since it's unlikely to be used again.)

* I found 4 very disturbing dangling cables:

a) Leading into TDC6 hard input
(which ODB tells me is TDC_ION_MCP, TDC0 #59)
 there was a white 8 nsec cable to 16 nsec lemo,
but destroyed at the far end:
whether it was BNC or LEMO is hard to be certain, more likely BNC.

b) About 100 nsec of RG58 cable with a destroyed BNC-lemo connector,
wrapped underneath the southern rack.

Maybe b) was torn off of a)?
a) and b) are sitting on my chair.

c) A dangling white LEMO cable, adapted to BNC, coming from very specific delays leading back to an ION MCP discriminator output. I labelled this and left it dangling. Maybe this is associated with a) and b)??

d) NIM IO #5 has a lemo to BNC cable dangling in space, unlabelled. I draped it by the Tectronix scope. Maybe you use it? It's very odd to be not connected to anything. I would expect a NIM IO to be doing something, not just a diagnostic.

Mon Sep 14 12:25:21 2020	2630	John@72.143.226.238	Info	eMCP	Ground loop or jitter

The Tektronix scope voltage offsets for WAS were normal when I arrived.

I turned on the NIM bin with the 429A's

Then when I turned on the VME crate, jitter of maybe 2 mV appeared on those
WAS DC levels. I did not track it down. Is this new?

(The gamma-ray detectors are not referenced to ground at the beamline... putting them in the same NIM bin should not be an issue.)

Mon Sep 14 13:03:17 2020	2630	AG@72.143.226.238	Reply	eMCP	Re: Ground loop or jitter

> The Tektronix scope voltage offsets for WAS were normal when I arrived.
>
> I turned on the NIM bin with the 429A's
>
> Then when I turned on the VME crate, jitter of maybe 2 mV appeared on those
> WAS DC levels. I did not track it down. Is this new?

No, I saw this effect already and, I think, reported it verbally.

>
> (The gamma-ray detectors are not referenced to ground at the beamline... putting them in the same NIM bin should not be an issue.)

>> Good, I didn't realize "jitter".

Mon Sep 14 14:03:40 2020	2630	AG@trinatdaq.triumf.ca	Routine	eMCP	buddy log, tests of eMCP

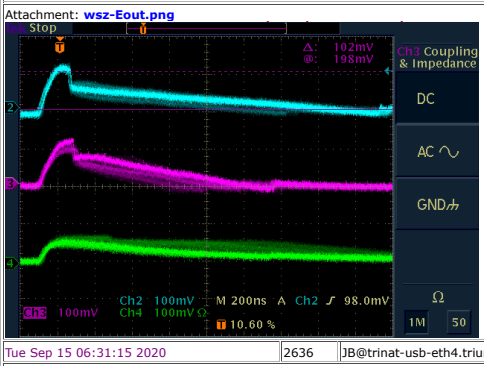
12:40
AG is in lab.
All crates are ON as John left them.
As John reported, it was about 2 mV jitter in offsets. When I turned VMV
 crate OFF, jitter even increased. I clearly see two base lines.

By switching bins/crates OFF I found that CAMAC crate is responsible for
this effect! After conversation with John and James decided to turn it
OFF.

Measuring offsets without VME crate: WSZ=-(13.4;7.4;9.0) mV
Turning VME crate ON
Measuring offsets with   VME crate: WSZ=-(11.0;5.2;6.0) mV

```
Put correction to WSZ offset =>      WSZ=-(10.0;5.0;5.0) mV

Note: To more accurately adjust offsets, use Cursors and set scope to
highest intensity. In this case the cursor line is well visible.

Plan:
Rising Vbemcp try to resolve single electron peak from pedestal. Saturation
of CATSA can be removed in analysis.

To take data shall set the QDC gate width to 500ns.
Biasing detector to 2100 V
Vmesh  = -20
VFeMCP =  0
Vge=VWSA=Vbemcp+200V
----------------------
VBeMCP IBeMCP
 [V]   [µA]
2100   58.9

without source 60Hz on visual scaler
QDC gate set to 500 ns

Run #2632 Vemcp=2100V, Iemcp=58.9µA
     Start: Mon Sep 14 15:00:21 2020, 2.7kHz/1670ev/s
     Stop : Mon Sep 14 15:07:33 2020, 700K events
     raw QDC Wedge max1= 450 max2=1100
              eMCP max1= 900 max2=1950

Run #2633 Vemcp=2150V, Iemcp=62.1µA
     Start: Mon Sep 14 15:13:32 2020, 2.9kHz/1730ev/s, some satur. in CATSA
     Stop : Mon Sep 14 15:20:58 2020, 768K events
     raw QDC: Wedge max1= 510 max2=1500.
              eMCP  max1=1150 max2=2300

Run #2634 Vemcp=2200V, Iemcp=64.2µA
     Start: Mon Sep 14 16:03:31 2020, 2.9kHz/1780ev/s, some satur. in CATSA
     Stop : Mon Sep 14 16:10:24 2020, 724K events
     raw QDC: Wedge max1= 650 max2=2010
              eMCP  max1=1400 max2=2700 Is there a pedestal in channel 66?

Run #2635 Vemcp=2250V, Iemcp=66.2µA
     Start: Mon Sep 14 16:26:26 2020, 3.0kHz/1800ev/s, some satur. in CATSA
     Stop : Mon Sep 14 16:34:12 2020, 825K events
     raw QDC: Wedge max1= 800 max2=2500
              eMCP  max1=1700 max2=2800

Run #2636 Vemcp=2300V, Iemcp=68.4µA
     Start: Mon Sep 14 16:47:41 2020, 3.1kHz/1800ev/s, some satur. in CATSA
     Stop : Mon Sep 14 16:54:30 2020, 729K events
     raw QDC: Wedge max1=1050 max2=2700
              eMCP  max1=1700 max2=2700? max2 is almost gone


Set Vemcp=1900V to record traces of E-out pules of CATSA
Attachment shows traces of WSZ E-out of CATSA
Pulses reach maximum at about 200ns but have very long tails about 1.8µs.
In my opinion they are unusable directly with our DAQ.

check DC offsets: WSZ=-(10;5;5) mV with WME crate ON.
All is OFF.
leaving at 17:55
```

Attachment: **wsz-Eout.png**



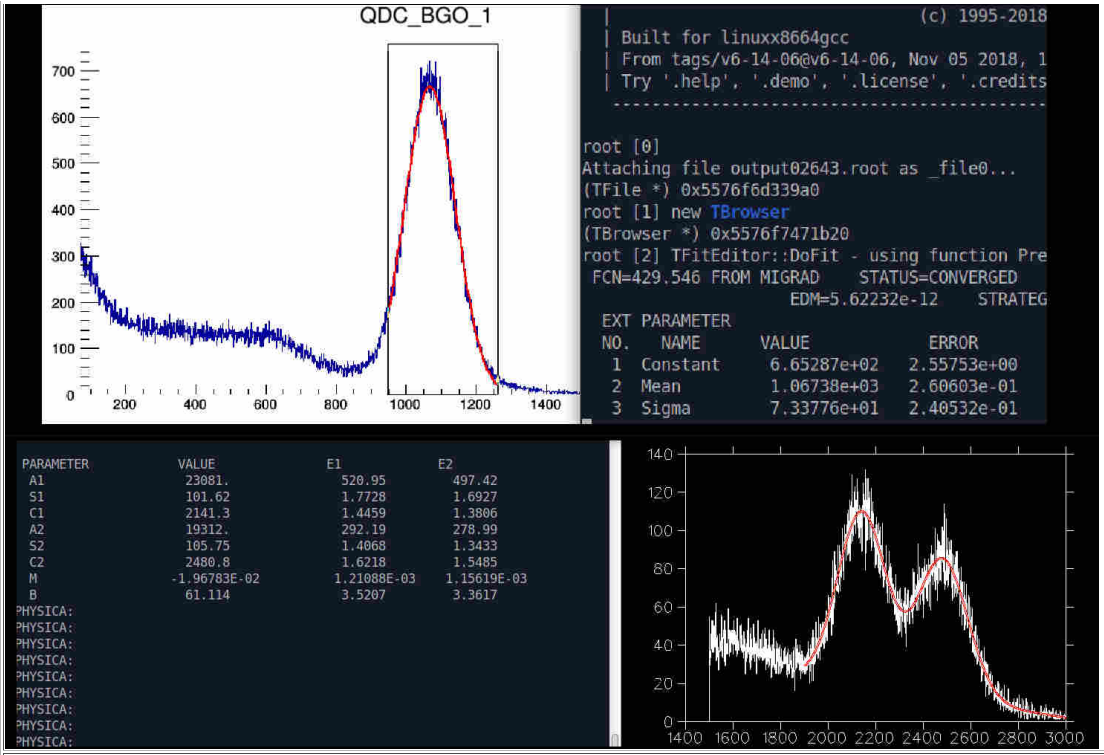
Tue Sep 15 06:31:15 2020	2636	JB@trinat-usb-eth4.triumf.ca	Info	DAQ	CAMAC logic conversion

```
LC5170 Level Convert Nim-ECL:

Lemo cables to them:

Rightmost module:
*NaI diagnostics:
NaI coincidence, NaI 1, NaI upstream-- these are just scalers.
  These first 3 are used for RIB tuning diagnostics.
The upsteam one has a direct connection to an EPICS scaler and is casually used as a monitor that beam is in the room: it is not needed in the data stream.
It's likely these are only needed for setup, not for data taking.

**Lemo cables 8 and 9 and connected to NIMIO 3 and 9 of the top of that module. These are likely vital.

The ribbon cable from this one goes to the left-hand VME logic module.
This is to the left of what I usually call "NIMIO". There are certainly trap logic inputs going to this, which are critical for event timing.
This is likely e.g. what determines our Optical Pumping times, along with our atpm transfer times.


_____________
next NIM-to-ECL unit, 2nd from right:
 no lemo inputs, so it seems doubtful this unit is doing anything. Ribbon cable out goes to the 2nd NIMIO logic module.

I think I should look for a single NIM-powered NIM-to-ECL converter, for a straight swap? LeCroy 4616
Or maybe just figure out how to put in the ECL standard?

CAMAC V's:
 DC fine. AC shows 4 mV, but with CAMAC crate on or off.
```

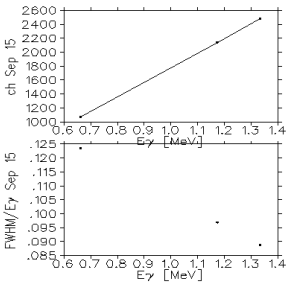
Tue Sep 15 06:45:58 2020	2637	JB@24.114.38.6	Test	Scintillators	GAGG tests, EPIC 2nd day

```
CAMAC crate off.
50 ohm splitter and 0.4 atten.
Same 0.950V and 0.126 current as yesterday.

Run 2637, 137Cs, 20 cm to front face

Run 2638, 60Co, at Al edge of viewport holder
  (The 1332 keV peak upper tail saturates QDC.)

Run 2639, 0.3 atten, 60Co,
Run 2640, 137Cs,
Run 2641, natural background

Add delay to QDC analog signal, about 200 ns, so comes about 100 nsec after
gate. Increase gate width 1.2 to 1.5 microsec.

Run 2643 137Cs
Run 2644 60Co
Run 2645 natural bkg  324,000 events
Run 2646 natural bkg p beam off start 08:31:36; 19 min 40 sec, 366,000 events, noticed count rate change from 100 to 600 Hz towards end. Maybe I'm running threshold too close to electronic noise.

The net is the same resolution as yesterday.
```

Attachment: **GAGGEpicCs137Co60_Sep15.jpg**



Attachment: **fitcalSep15.png**



Tue Sep 15 14:23:02 2020	2646	JM@trinatdaq.triumf.ca	Routine	General	buddy log, tests of eMCP

2:22pm James in lab

Plan:
1)Re-check the 2D histograms for eMCP bias above 2100V. Alexandre did this yesterday, but the QDC was saturating and may have lead to the considerably lower spatial resolution with mask barely vissible.
2)With stablized DC-offsets re-investigate mask visibility and resolution as a function of VGe.

Vmesh = 0
VFeMCP = 0
VGe=VWSA=VBeMCP+200V

VBeMCP [V]	IBeMCP [uA]	
200	4.9	
400	9.9	V_WSZ=(-8.0,4.0,4.0)+-(0.5,0.5,1.0)mV (Z has DC-transient)
600	15.0	
800	20.1	
1000	25.4	
1200	30.8	
1400	36.5	I fiddled with wires and the transient disapeared on us scale.
1600	42.7	
1800	48.5	V_WSZ=(-8.0,4.0,4.0)+-(1.0,1.0,1.0)mV (WSZ DC-trans on 4us scl)
2000	55.1	
2100	58.9	V_WSZ=(-10.0,5.0,5.0)+-(0.5,0.5,0.5)mV (WSZ DC -stable 4us scl)

880 Hz on eMCP scalar without source. With source in 8.8kHz. meshV = -21V gives 2.5kHz.

-Noticed that with the scope triggering on the eMCP signal at 5mV threshold seems to be triggering on the ringing tale of the initial pulse. I don't recall having this issue before with this normal bias. Oh, I needed to adjust the delay time between triggers on the scope to > 200ns. But what is happening with aquisition then? If it is trggering on the tail of the eMCP pulse 100ns late this would destroy our resolution. The gate presented to the QDC being ~500ns long may prevent such false triggering, correct? Ok, triggering on QDC gate signal yields nice pulses, no truncations, so all is good.

Attenuators were not set at nominal settings.
WSZ QDC attenuators now set at (0.1,0.1,0.1).

Run#	Vmesh	VBeMCP	VGe=VWSA	WSZ-Atten.	Scalar	Events	Note
2649	-20V	2100V	2300V	(0.1,0.1,0.1)	2.6kHz	570k	-QDC_Gate = 500ns
2650	-20V	2100V	2300V	(0.2,0.2,0.2)	2.6kHz	560k	-QDC_Gate = 500ns -Barely res. mask?
2652	-20V	2100V	2300V	(0.2,0.2,0.2)	2.6kHz	570k	-QDC_Gate = 550ns -Barely res. mask? -S lin fan output had bad connection
2654	-20V	2100V	2300V	(0.2,0.2,0.2)	2.6kHz	530k	-QDC_Gate = 550ns -Barely res. mask?
2656	-20V	2100V	2300V	(0.2,0.2,0.2)	2.6kHz	550k	-QDC_Gate = 400ns -A few mask lines vis. in X and Z

```
2658  -20V  2100V  2300V    (0.2,0.2,0.2) 2.6kHz  550k   -QDC_Gate = 300ns
                                                        -Highly distorted
                                                         2D hist for
                                                         emcp_QDC < 1500?
2660  -20V  2100V  2300V    (0.2,0.2,0.2) 2.6kHz  670k   -QDC_Gate = 600ns
                                                        -Barely res. mask?
2662  -20V  2150V  2350V    (0.2,0.2,0.2) 2.8kHz  550k   -QDC_Gate = 550ns
2663  -20V  2200V  2400V    (0.2,0.2,0.2) 2.8kHz  550k   -QDC_Gate = 550ns
2664  -20V  2250V  2450V    (0.2,0.2,0.2) 2.8kHz  2.5M   -QDC_Gate = 550ns
2665  -20V  2300V  2500V    (0.2,0.2,0.2) 2.8kHz  560M   -QDC_Gate = 550ns

Everything off
7:45pm leaving
```