# K8 - gamma coincidence measurement with Hytec 1331 and go4

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## 1 Workstation(s) - tachyon

Log in with the account 'k8'.[1]

## 2 DAQ computer - f5-pc117

To start the data acquisition (DAQ) (only done by one group), from the workstation:

```
ssh daq@f5-pc117.fy.chalmers.se
screen -ls
```

If there is already a session 'DAQ', then you should not have to do anything. To view it, do:

```
screen -x DAQ
```

To leave the session again, press Ctrl-A Ctrl-D.

If the session is not running, do:

```
screen -S DAQ
```

To start the DAQ, do:

```
cd mwpclab/gammadaq
./daqserver.sh
```

The DAQ program writes the data to stdout, which is piped into another program (ucesb) that acts as an event (stream) server, which other clients can connect to. The stream server will flush the data every 5 seconds, to avoid data buildup even in the case of small event rates.

If a running DAQ/stream server was just killed, an immediate attempt at restarting it may fail, in case there were clients connected. The error will be 'broken pipe', and 'Failure binding server to port' before that. If so, you may have to wait for about a minute to restart successfully.

### 2.1 Storing data to a file (not needed for K8)

Although one could just dump the output of 'gammadaq' into a file, retrieving the data from the server is just as easy. On e.g. a workstation:

```
/net/home/daq/unpacker/empty/empty \
--stream=f5-pc117 --output=\
/net/data1/daq/test1/file.lmd
```

Some data files with various sources are available: /net/data1/daq/gamma

### 2.2 Making an ROOT *tree* of the data from a file (not needed for K8)

By using:

```
/net/home/daq/unpacker/gamma_k8/gamma_k8 \
long-input-filename.lmd \
--ntuple=RAW,EA,EB,T,outfile.root
```

To instead get calibrated values, fill out a file cal.txt[2], and use the options:

```
--calib=cal.txt \
--ntuple=CAL,EA,EB,T,outfile.root
```

[1] If the keyboard / mouse do not work after machine reboot / X restart, re-plug the USB connectors.

[2] Use /net/home/daq/unpacker/gamma_k8/cal1.txt as templete, caution: the offset is added to the raw value, and thus must be $-$channel_0 as compared to the go4 parameters.

# 3 On-line gamma spectra

The on-line analysis tool `go4`[3] is based on the `root` system[4].

## 3.1 Terminal

The workstation (f2-pc49) is used as a X-terminal, while the work is being done remotely:

```
go4
```

## 3.2 Starting an 'analysis client'

Menu: `Analysis` → `Launch Analysis`... Vital settings for the '`Start Client`' dialog:

Host: `localhost`
Dir: `/net/home/daq/go4/gamma_go4_5.3.2`
Lib: `libGo4UserAnalysis`
Mode: `exec`

Press '`start`' (green check-mark). The program will flicker for some seconds, and should successfully connect. If connection is not successful, inspect the terminal from which go4 was started, if it asks for a password, the ssh-keys did not work... A new dialog '`Analysis Configuration`' is opened. We want to retrieve data from the running DAQ:

Event source: `MBS Stream Server`
Name: `f5-pc117.fy.chalmers.se`

Click '`Submit+Start`'. In the left panel, a tree of objects is available - double-click '`Analysis`' (item below '`Workspace`'). The branches `Analysis/Histograms` and `Analysis/Parameters` are of interest to us. Double-click e.g. `Analysis/Histograms/Raw/ADC1` display the raw spectrum of the first ADC channel.

To make the spectra automatically update as new data arrives, right-click on `Analysis/Histograms` and choose the item '`Monitor item(s)`'. Then change in the far left part of the toolbar the `monitoring interval` from '`2 s`' to e.g. '`10 s`', and finally press the green "triple-play" button.

## 3.3 Analysing data from a file (non-K8)

Menu: `Analysis` → `Configuration`...

Within the '`Analysis Configuration`' dialog, select

Event source: `MBS File`
Name: `path-to-data-file.lmd`

Click '`Submit+Start`'

## 3.4 Fitting peaks

Menu: `Tools` → `Fit panel`...

For the fitter to successfully work, the background in the part of the spectrum considered must be reasonably flat. First zoom in on the x-axis on the desired spectrum. This is done by placing the cursor on the x-axis tick-marks (cursor will show as a hand with a pointing finger). Press the left button and drag left or right over the wanted range. To unzoom, right-click in the tick-mark area and select '`Unzoom`'.

Now select '`Use pad`' in the '`Fit panel`'. Then click '`Peak Finder`' and select the '`ROOT (2)`' tab. Click '`Find`' at the bottom of the 'Fit panel'. appears, as well as red indicators of the found peaks.

Click '`Fit`' (next to '`Find`'). The fitted function is draw in the spectrum. To see the parameter values, press '`Pars`'. Clicking '`Fit`' again may improve the determined values a bit by doing some more iterations. Selecting the '`lines`' check-box simplifies the output.

## 3.5 Entering calibration parameters into the analysis

The spectra in the `Analysis/Histograms/Cal` folder are filled only when calibration parameters for the detectors have been supplied. The parameters can be modified as the objects `Analysis/Parameters/Cal_Det1` etc... For a simple calibration, enter the raw spectrum location of two peaks as `pt1x` and `pt2x`, with their associated energy (in keV) as `pt1y` and `pt2y`. The values are committed to the analysis by pressing the second blue arrow, pointing to the left! By setting `use_2pt` to 1 before committing the values, the analysis will calculate the intercept and gain automatically.

Please note: the filled histograms are not recalculated when calibration parameters are changed. To get rid of old data, right-click on `Analysis/Histograms` and choose the item '`Clear (Reset to 0)`'.

[3] http://www-win.gsi.de/go4/
[4] http://root.cern.ch/