ZDO User guide

1 Startup

1.1 Setting the High voltage

1. Start the Esone server (have a look into
   http://www-kp3.gsi.de/www/doc/s117/daq/daq_esone.html)

2. Run the Setup–PAW

   ```
   @REF_S117:HVPAW.COM
   ```

3. Initialize the data base

   ```
   DATA_INIT [SFRITZ.S117.beamfeb]S117_NEW.BASE
   ```

4. Check wether other Photomultiplier systems, which use the LeCroy (Time of Flight, Jopl, Horizontal slats), have settings

   ```
   HVGET 8PACK *
   HVGET HORSLAT *
   ```

   Their value can be set to zero (or any other value) with the kumacs

   ```
   [BEGEMANN.ALADIN.S117.HV_MACRO]TOF_HV_START.KUMAC 0 0
   ```

   (for Kathode and 1. Dynode) and

   ```
   [BEGEMANN.ALADIN.S117.HV_MACRO]HOR_HV_START.KUMAC 0
   ```

   respectively.

5. Set the High voltage

   ```
   EXEC [SFRITZ.S117.beamfeb]ZDO_HV.KUMAC#SET lay=all val=-1500
   ```

   The parameter [val] is a common value for all bases and schould not be higher than 1500 V. The parameter [lay] is one of [I,M,A,all].

6. Switch the High voltage on

   ```
   HVON 1440 1
   ```

   and off

   ```
   HVOFF 1440 1
   ```

2 What should be checked

2.1 Starting the online PAW

```
RUN REF_S117:PAW_S117_X11
```

Book the ntuples or histogramms

```
cz/anal/n_raw; cz/anal/h_raw ...
```

get some events

```
get_event [number]
```

2.2 Online spectra

There are actually two kumacs which can be used as monitors for the ZDO.

```
[SFRITZ.S117.APRIL]ZDO_CHECK.KUMAC [1] [2]
```

fills the online histograms (`cz/anal/h_raw`) [1] times with [2] events plots them on screen and clears them again.

```
[SFRITZ.S117.APRIL]ZDO_UPDATE.KUMAC [1] [2]
```

fills the online histograms and the Hit-Ntuple (`cz/anal/n_hit`) [1] times with [2] events and plots the updated spectra every [2] events. Alternatively one can use the SOA kumac to check the ZDO.

```
EXEC REF_S117:SOA#INIT
GET_EVENT 500
EXEC REF_S117#PLOT CZDH0
```

2.3 High voltage

The high voltage should be checked frequently. During the testrun in February some channels sparked which resulted in a large difference between demand and measured high voltage.

3 Troubleshooting

1. No signal in one channel
   ⇒ Check the High voltage

   ```
   HVGET PMT_ZDO ZDO_[DETNUM]
   ```

   If the measured value is much smaller than the demand value, the tube might spark. One should then decrease the voltage to the measured value with

```
HVSET PMT_ZDO ZDO_[DETNUM]
```

and increase it in small steps (100 V) until the default value is reached.

2. One channel is noisy. This can be seen as a channel with a very high count rate in the Hit pattern (`cz/anal/h_raw` Histogramm 4110)
   ⇒ Check/increase the threshold of the Leading Edge discriminator in the Setup–PAW

   ```
   CNAF 0 8 [20,21,22] [0-15] 0
   ```

   to read the value ($0 = -1.0$ V — $2047 = 0.0$ V)

   ```
   CNAF 0 8 [20,21,22] [0-15] 16 [VALUE]
   ```

   to set a new value

4 Miscallenous

The signal path is shown in `http://www-kp3.gsi.de/www/doc/s117/zdo/zdocable.html` The ZDO uses the TOF Splitter 31 (inner layer), 32 (middle layer) and 33 (outer layer). If You want to know it more concise, You can have the complete signal and trigger path in the ZDO logbook on p. 148/149. Keep in mind that the signals ar mixed on the TOF splitter. Input 1,2,3,.. will got to output 1,3,5,.. input 8,9,10,... will go to output 2,4,6,...

4.1 Trigger

The multiplicity of the trigger is adjusted via the threshold of the dicriminator which is connected with the LINEAR FAN IN / FAN OUT. The value for multiplicity n is $n \times 80$ mV. This multiplicity has a logic NAND with the HALO detector.
A second trigger line is the cosmics trigger which requires a Multiplicity greater or equal to 2 (AND with offspill signal).

4.2 Gate

The ZDO need two gates for the QDCs and a Common Stop for the TDC. The short gate has a width of 100 ns, the long gate is delayed by 150 ns to the leading edge of the short gate ans has a width of 1 μs.
The TDC has a dynamic range of 400 ns (resolution 100 ps). The Common Stop is typically 100-200 ns after the dicriminated signal.

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