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Subject: Re: Position calculations on start/stop scintillators

Posted by [miree](#) on Thu, 09 Apr 2015 13:16:27 GMT

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Hi,

I guess it is not optimally calibrated. The ToF position determination is very dependent on a good calibration of all PMTs.

By PMT calibration I mean position correction, i.e. the dependence of  $\Delta t(\Delta x)$ , where  $\Delta t$  is the time delay between particle hit and PMT signal, and  $\Delta x$  is the distance between the particle hit position and the PMT position.

The calibration goes like this: Plotting  $\Delta t$  over  $\Delta x$  and determine the slope and offset of the resulting structure

How this structure should look like a straight line (see Figure 1 of this GSI report:

<http://repository.gsi.de/record/52088/files/PHN-ENNA-EXP-55.pdf>)

The offset (intersection of the line with y-axis) and slope (of the line) for each PMT have to be copied into the calibration file for the ToF processor "ToFStart.cal"

This calibration might change between experiments (mainly because of differences in PMT voltages, I guess).

In the prespec analysis script, these correlation plots are created in this section:

```
#####  
# Time of flight start detector  
#####  
processor Lycca/ToFStart/Preproc UTILS.MhTdcPreprocessor  
input[0:15] <- LyccaTargetTofCrate.mhtdc0[0:15]  
input[16:31] <- LyccaTargetTofCrate.mhtdc1[16:31]  
# ...  
end  
processor Lycca/ToFStart/Membrane LYCCA.CircularMembraneScintillator  
pmt_time[0:31] <- Lycca/ToFStart/Preproc.output[0:31]  
x_hit <- Frs/S4tracking.xs[5]  
y_hit <- Frs/S4tracking.ys[5]  
#....  
end  
# create the delata_t vs. distance corellation plots for all 32 PMTs  
# Membrane.dist[i] is the distance of PMT_i to the particle impact point  
# Membrane.T_Tp[i] is the time of PMT_i minus the estimated time of particle impact  
for $i in [0:31]  
processor Lycca/ToFStart/Diagnostics/Tdist0$i UTILS.Pair  
first <- Lycca/ToFStart/Membrane.dist[$i]  
second <- Lycca/ToFStart/Membrane.T_Tp[$i]  
display first:second 256,0,300:512,-35,55 in ToFStart_Tdist_correlation  
end  
end
```

Note that the correlation plot depends on the calibration parameters, the complete process is

iterative:

- 1)start with initial values for offsets and slopes in the calibration file: 0 and 0.01 are good starting values
- 2)determine offsets and slopes from the corellation plot
- 3)go to 1)

(2 to 3 iterations are usually enough)

Michael

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