DU2 in-situ calibration

K Melis
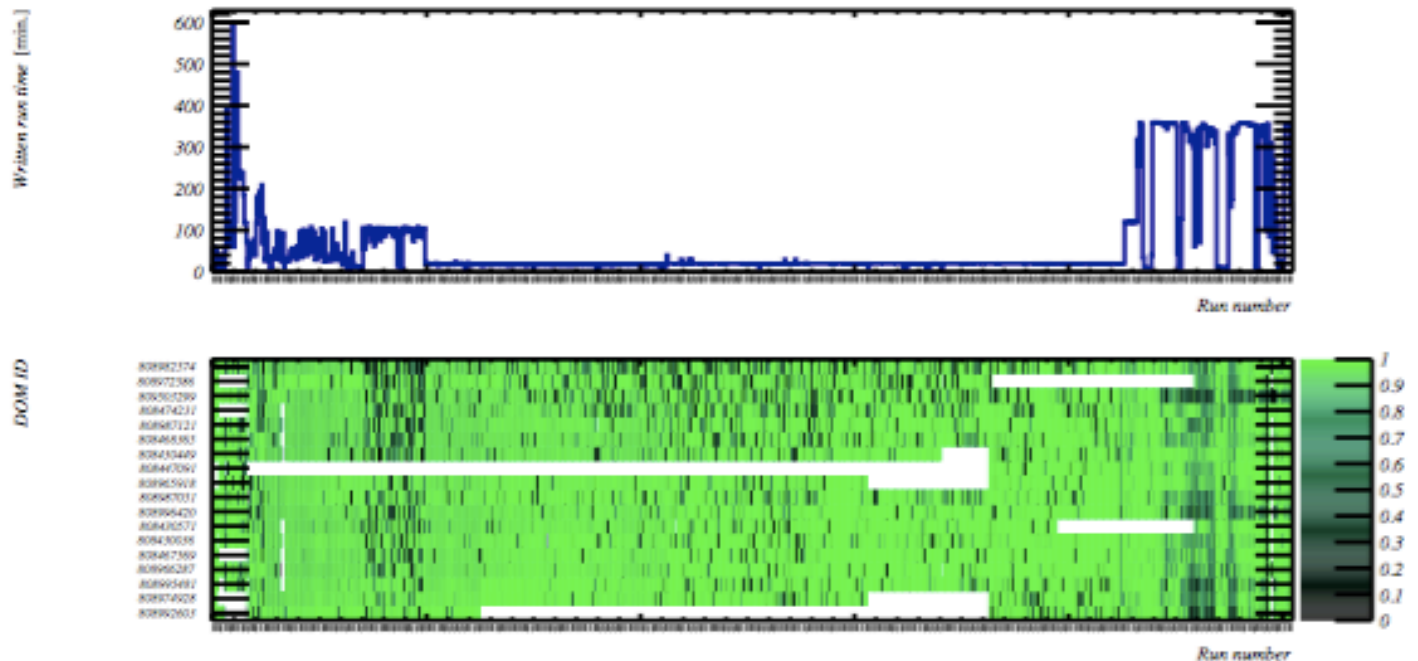
Group meeting 16 feb.

Selected runs

Figure 1: All runs of the first month of data-taking used for this work. The upper plot gives the recorded length of each run. The bottom plot shows which DOMs produced data used in this analysis.
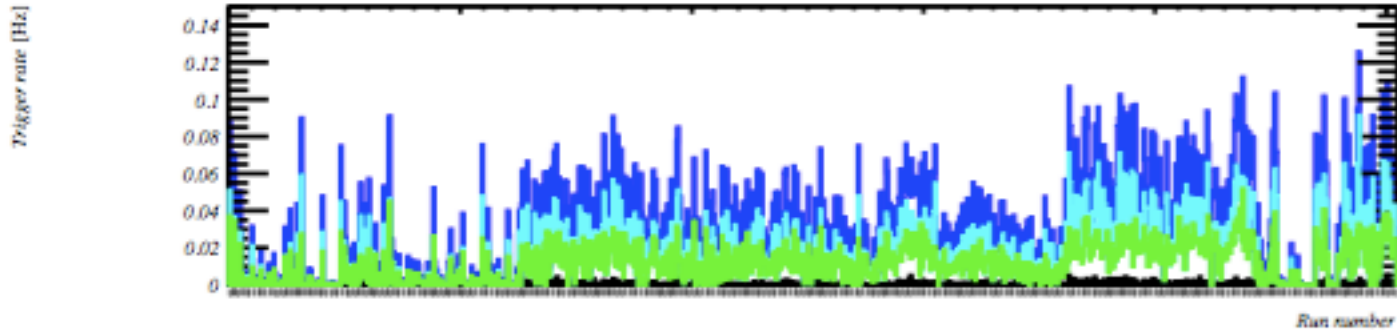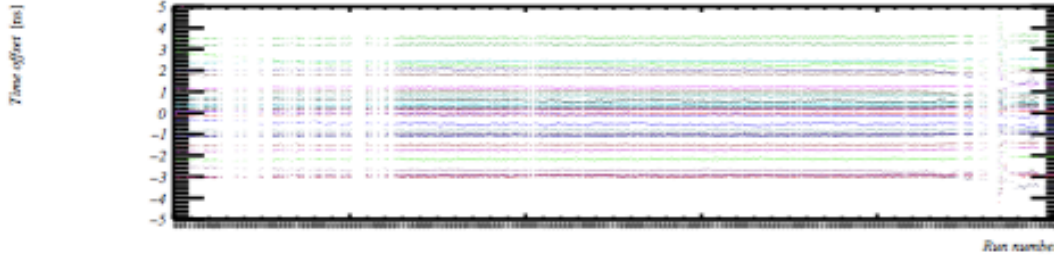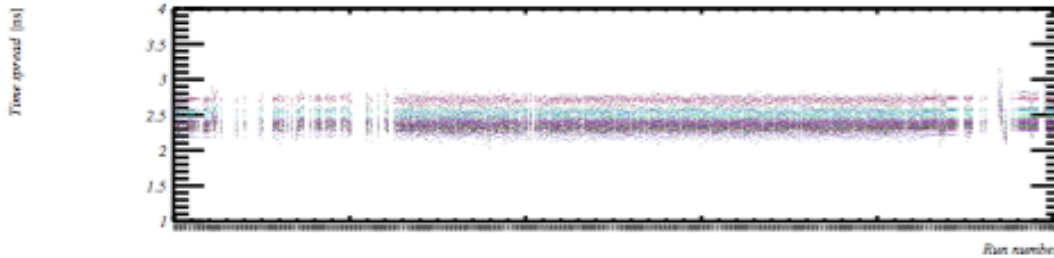
Trigger rate

Figure 2: Rate of triggered events as function run number. Shower trigger in green, muon trigger in black, both triggers for the same event: cyan and total trigger rate in blue.

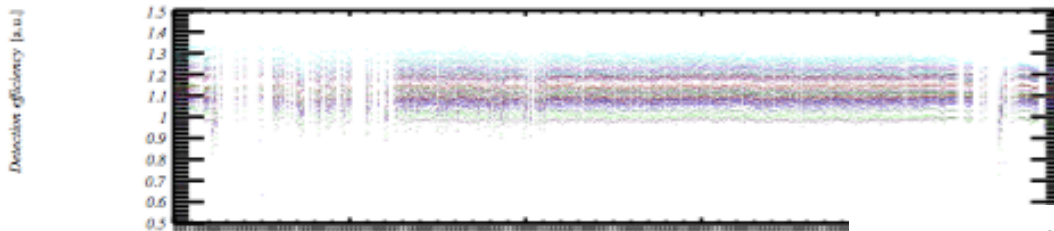Bugs/errors/features/challenges in trigger algorithm

PMT parameters

t0

Time spread

Det. eff.
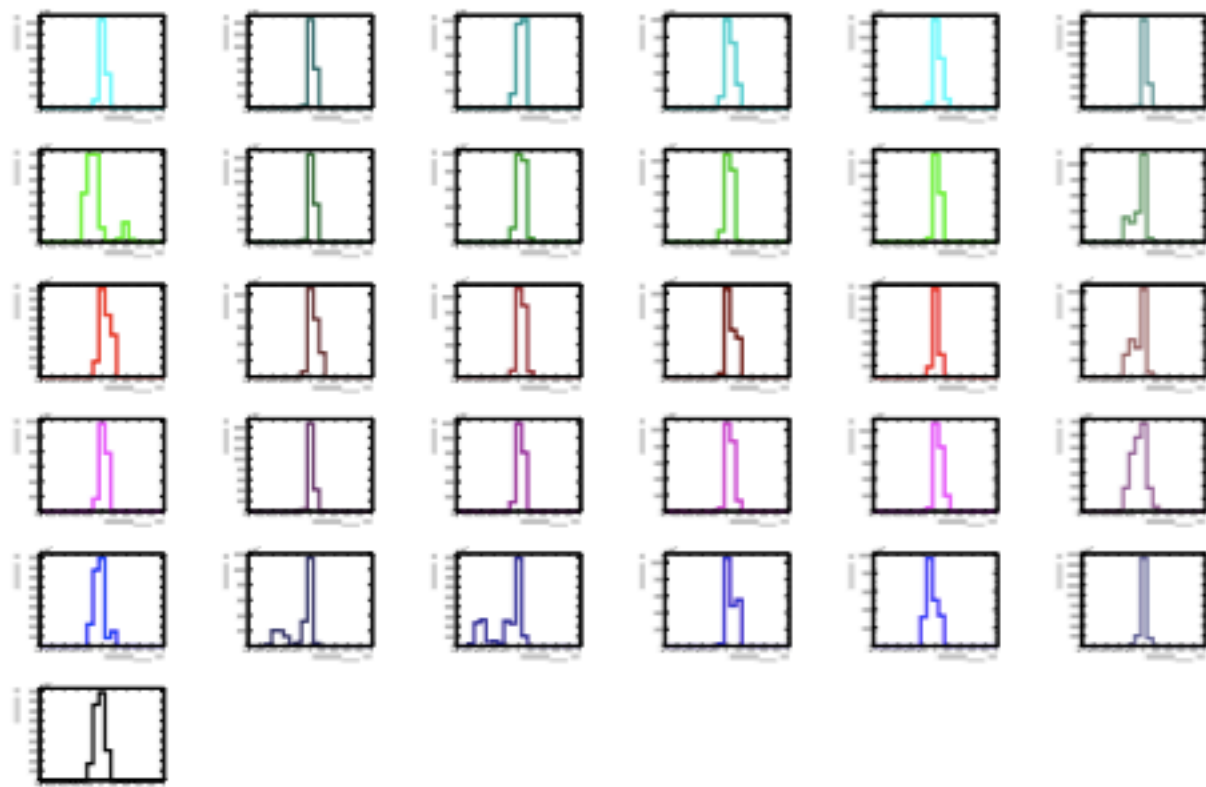
Run number

Figure 4: Fitted PMT time offset distribution of each run with respect to the globally fitted PMT time offset. Each row of plots gives the PMTs of one ring (upper row=ring F, lower ring=ring A). The x-axis ranges from -1 to +1 ns.
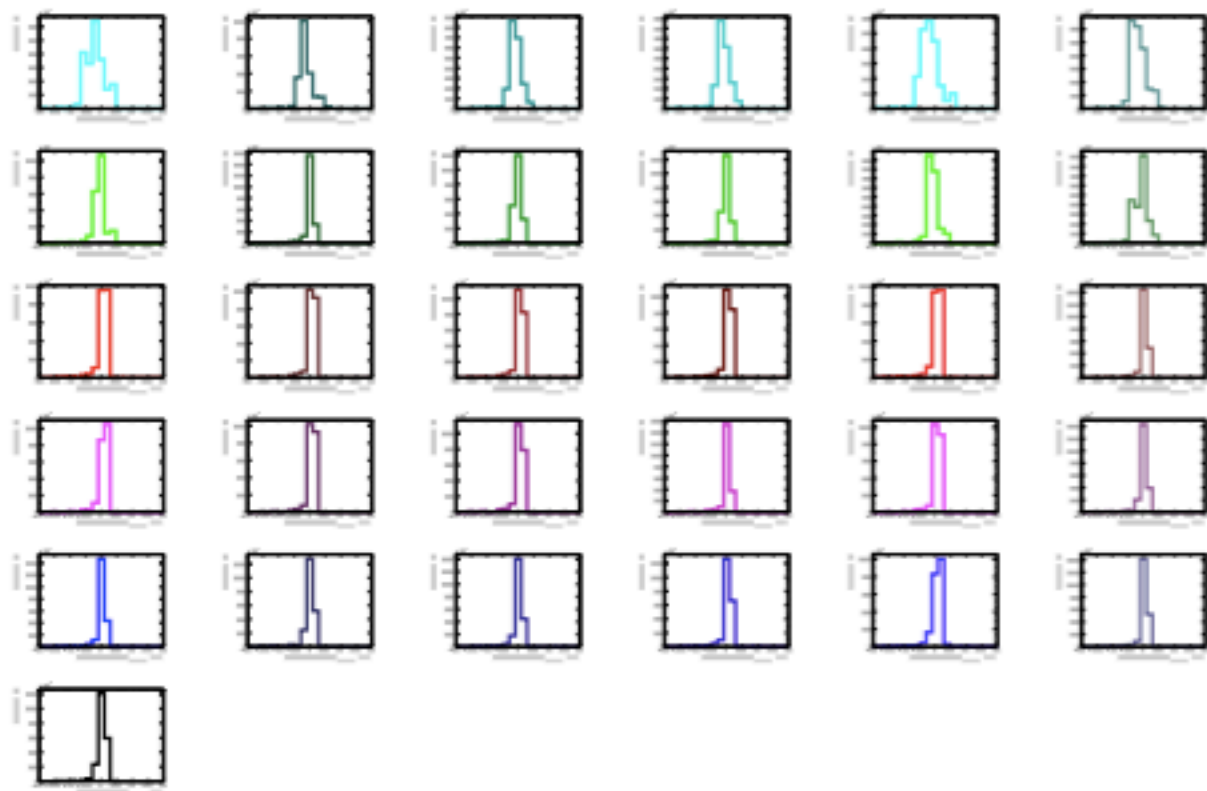
Figure 5: Fitted PMT relative detection efficiency distribution of each run with respect to the globally fitted PMT time offset. Each row of plots gives the PMTs of one ring (upper row=ring F, lower ring=ring A). The x-axis ranges from -0.2 to +0.2
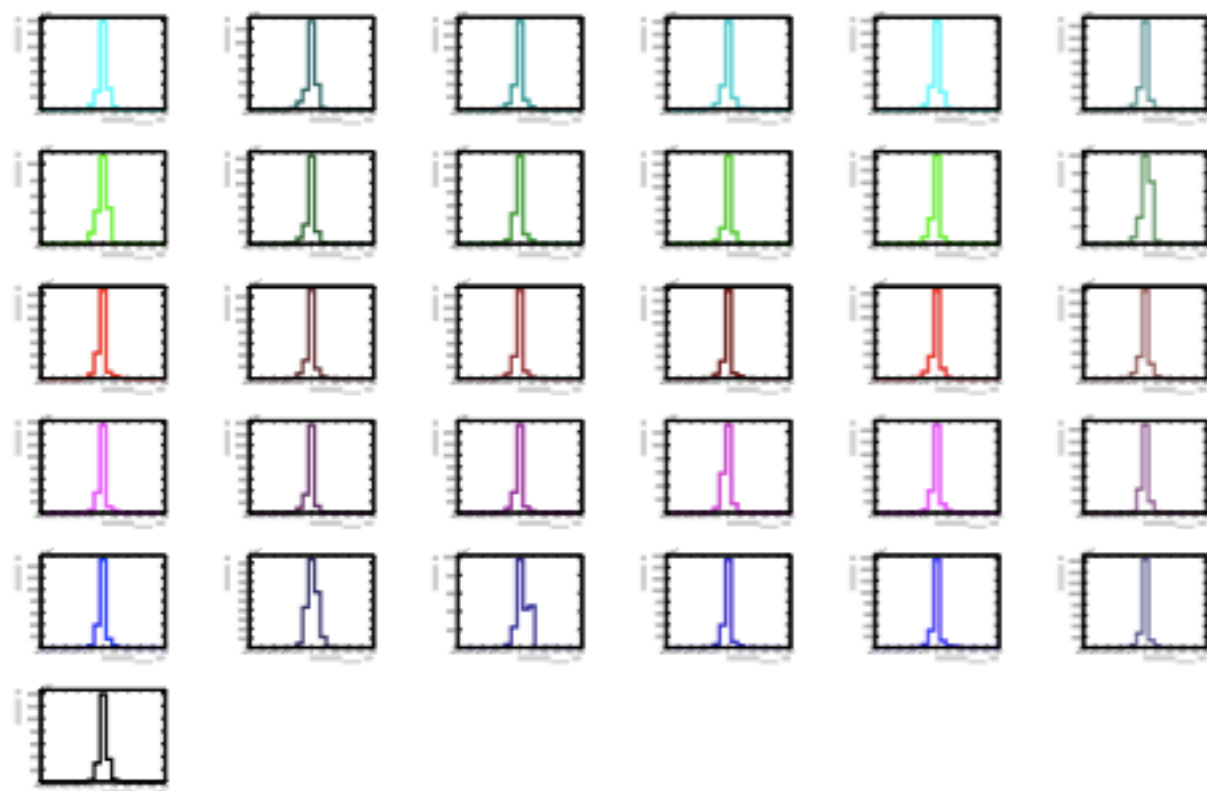
Figure 6: Fitted PMT time spread distribution of each run with respect to the globally fitted PMT time offset. Each row of plots gives the PMTs of one ring (upper row=ring F, lower ring=ring A). The x-axis ranges from -0.5 to +0.5
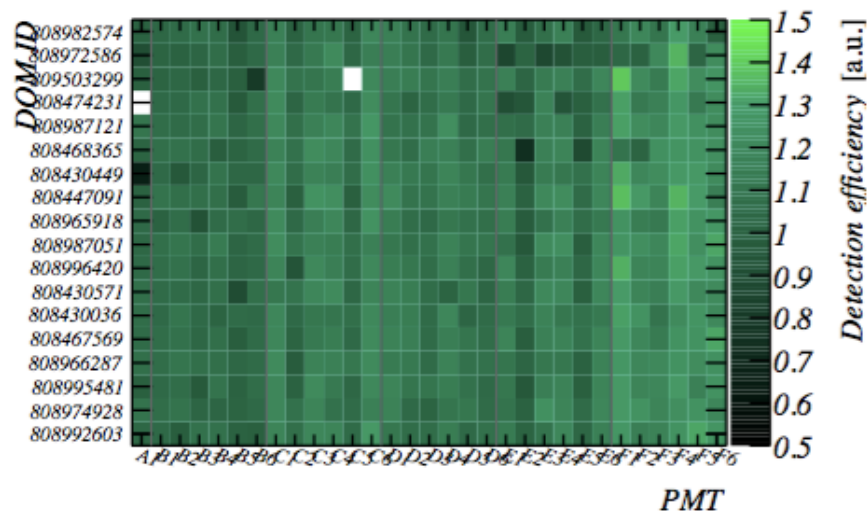
Figure 7: Fitted detection efficiency as function of all PMTs and DOMs.

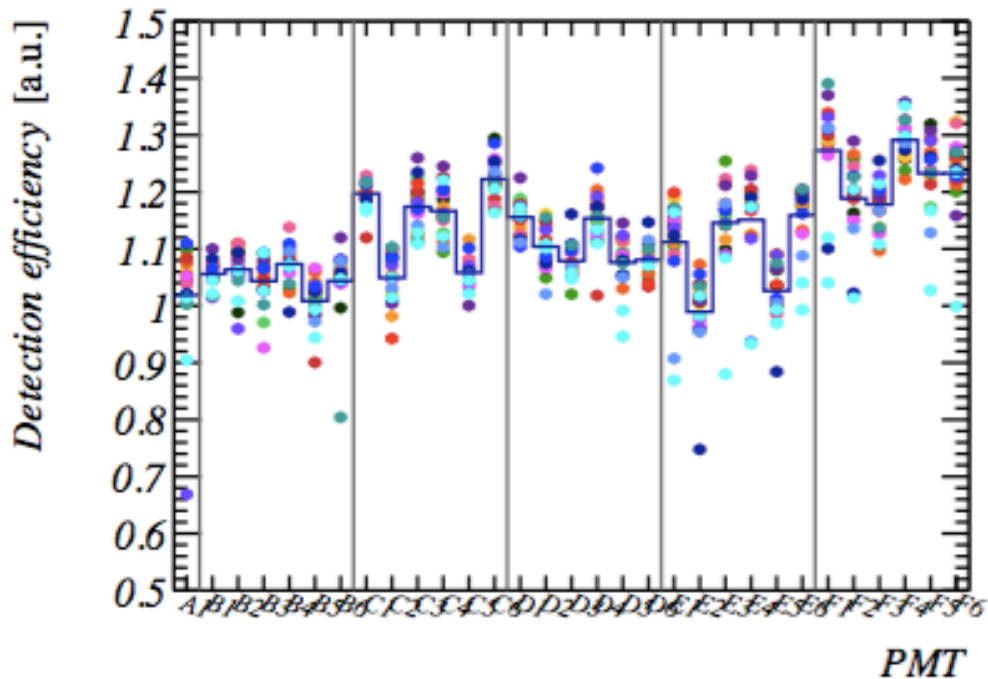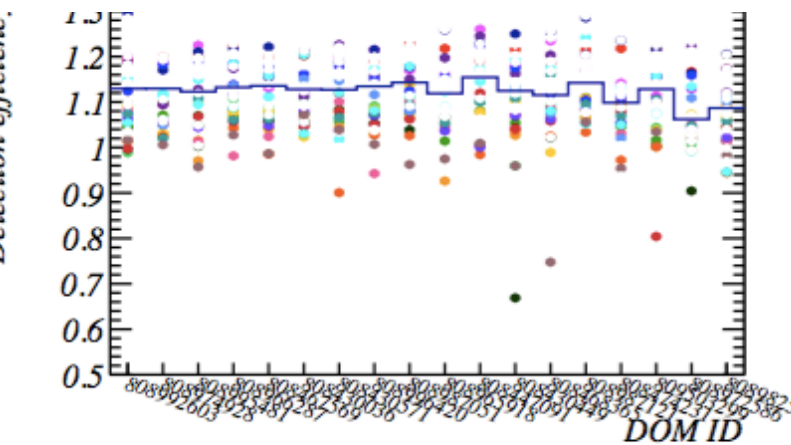Figure 9: Detection efficiency of all PMTs at the same position in all DOM index. The average over all PMTs is given by the blue lines.
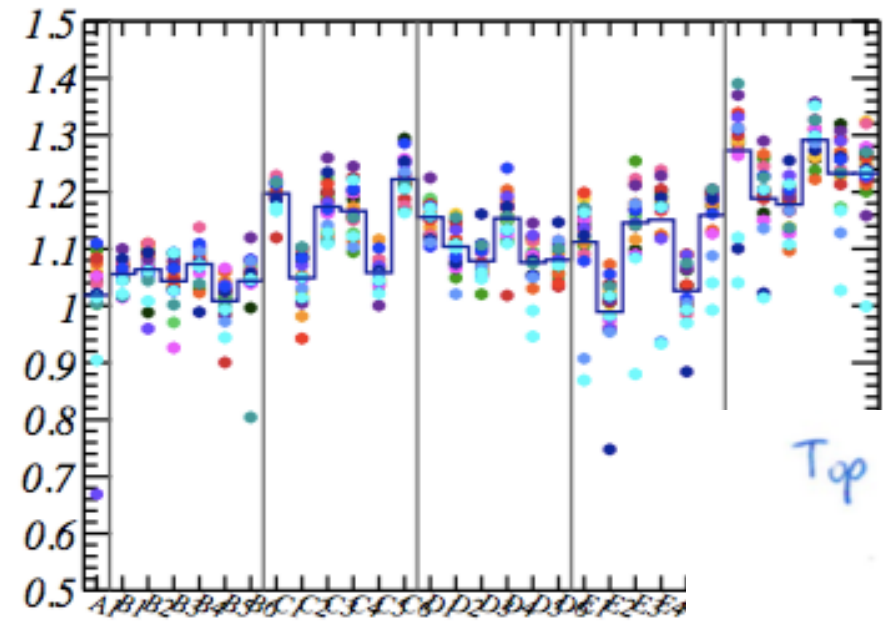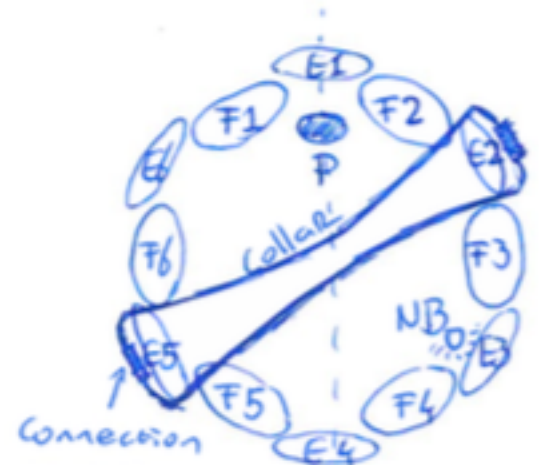
Detection efficiency of all PMTs at the same posit[...]
[...]e average over all PMTs is given by the blue lines.

Singles rates
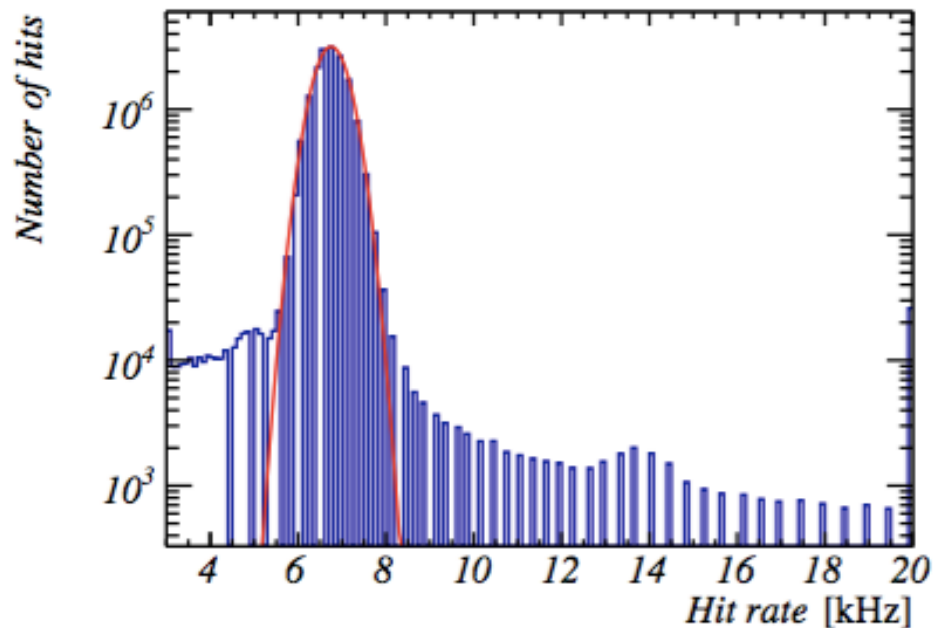
Figure 11: Measured rate distribution of an arbitrarily chosen PMT in DOM 808992603, of which the peak has been fitted with a gaussian distribution.

: Average singles rate of all PMTs at the same position in all DOMs : Average singles rate of all PMTs at the same position in all DOMs average over all PMTs is given by the blue lines.

Det. eff. Vs singles rate
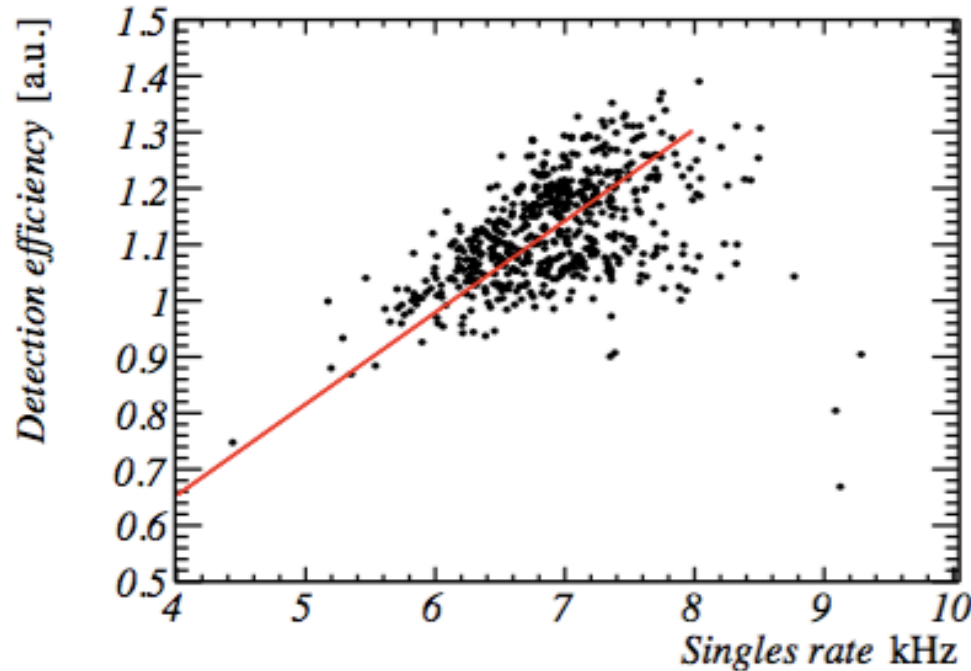
Figure 15: Fitted detection efficiencies of all PMTs plotted versus the average singles rate of the PMT. A linear fit passing through the origin is superimposed.

L1 time difference between DOMs

Figure 16: Upper plot: Time difference between coincident L1-hits on arbitrarily chosen DOMs 808474231 and 809503299, both for data (green) and MC simulated data (blue). Both histograms are normalised to match in integral. Bottom plot: The ..., accompanied by a 2nd order polynomial fit (red line) through the top ± 10 ns.

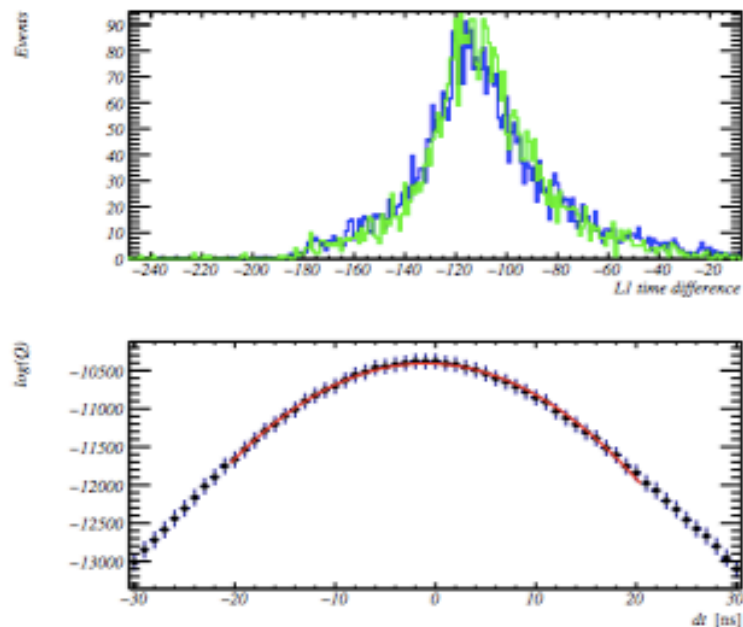| DOM ID #	Est. rel. height [m]	Time offset [ns]	Ref. PMT time offset [ns]	D.R. t0 [ns]
808992603	0	737.914	736.578	744.552
808974928	38.02	934.083	933.715	940.866
808995481	75.87	1136.119	1136.679	1142.0
808966287	112.73	1338.628	1338.959	1342.403
808467569	150.23	1534.619	1536.063	1537.943
808430036	187.53	1743.251	1743.878	1745.707
808430571	224.36	1946.038	1945.993	1947.202
808996420	261.98	2140.262	2138.338	2139.405
808987051	299.36	2337.039	2335.887	2337.662
808965918	336.16	2546.570	2548.372	2552.244
808447091	373.48	2744.514	2743.169	2744.736
808430449	410.64	2939.455	2938.977	2940.523
808468365	447.37	3148.068	3148.952	3145.915
808987121	484.81	3348.588	3350.521	3346.5
808474231	522.09	3548.282	3550.163	3543.48
809503299	558.41	3750.956	3751.257	3742.982
808972586	595.37	3949.984	3949.859	3941.35
808982574	632.17	4151.324	4152.034	4143.923

Table 2: DOM time offsets (third column) compared with the dark room calibration (fifth column) using the time offset of a reference PMT on each DOM (fourth column). The DOM heights have been estimated by E. Berbee.

Outlook

- Time calibration using hit time residuals
- Compare with DR and NB
- Data-MC comparison studies