

Overview PMT analysis programs

important					
program	type	short description	characteristics	call	description
get_baseline_cuts_gaus_2.cpp	root macro	determine baseline cuts and apply them	generate root tree with applied cuts	.x get_baseline_cuts_gaus_2.cpp (in root active environment)	reads not one big datatree but from every run directory the tree with exactly 900000 entries puts them into histogram and fits a gaussian to baseline distribution then calculates different cuts to n=3 sigma and determines the average of one temperature, cuts are applied to the big datatree and results are stored in different fit_tree_n_sigma.root trees
fit_1pe_w_cuts_res_mod.py	python script	test fit for one run	test of different limits	python --file /home/vault/capm/sn0xxx/folder/filename.root	reads filename.root file and stores integrals into (virtual) histogram, defines background and multigaussian functions and fits them with the defined parameters within their given limits to the histogram, fits 40 times, end parameters are starting ones for next fit, calculates residual from data and fit, saves histogram with fits as pdf (pmt_1pe_w_cuts_res_mod_temp.pdf) and saves fit parameters with their error to parameters.txt
fit_1pe_single_1sig_cut_mod_ufin.py	python script	1pe fit for one run	called by fit_1pe_all_1sig_cut_mod_ufin.py	implemented in fit_1pe_all_1sig_cut_mod_ufin.py	in principle like fit_1pe_w_cuts_res_mod.py, but also saves histogram data, function values in sampling and residual in textfiles for plotting
fit_1pe_all_1sig_cut_mod_ufin.py	python script	1 pe fit for all runs for 1 cut and 1 fit model	1pe fit, loop over all runs, saving of all important parameters and fit curves	python fit_1pe_all_1sig_cut_mod_ufin.py	loop over all runs, best limits for Q1 and sigma1 are in list and handed over to fit_1pe_single_1sig_cut_mod_ufin.py, each run is fitted and parameters and function values etc saved, copied to global folder, you have to generate additional folders „residuals“, „histogram_data“, „fit_data“
plot_fit_param.py	python script	plots all fit parameter depending on mu for all sigma cuts and no cuts	check fit parameter dependencies	python plot_fit_param.py (type „enter“ to produce next plot until all plots are plotted ^^)	reads parameterfiles for all temperatures and sigmas, plots all parameters, chi2 and entries for different temperatures in one plot, for every sigma one plot, also plots all parameters depending on mu for different sigmas in one plot, for every temperature one plot
calc_w_mean_pde_one_cut.py	python script	calculates weighted mean, extrapolates to -100C, calculates PDE	determine Q1 for PDE calculation	python calc_w_mean_pde_one_cut.py (type „enter“ to produce next plot until all plots are plotted ^^, comment what you don't need)	reads for both fitting formulas the corresponding parameterfiles (generated e.g. in fit_1pe_one_cut_get_param.py) for every temperature, changes it to numpy arrays and then picks mu and Q1 and their corresponding error in lists, then calculates weighted mean for every temperature, fits curves in root, plots it in python, extrapolates to -100C, then calculates PDE with this Q1 value

additional					
program	type	short description	characteristics	call	description
fit_1pe_w_cuts.py	python script	fits convoluted gaussian spec and background	test limits for one run (modified model)	python fit_1pe_w_cuts.py --file /home/vault/capm/sn0xxx/folder/filename.root	reads tree with 1sigma cut, fills it in histogram, fits convoluted spectrum but no residual, saves pdf, all for one run!, gets no parameters in call
fit_1pe_w_cuts_res.py	python script	fits single spectrum and also plots residual,	test limits for one run (modified model)	python fit_1pe_w_cuts_res.py --file /home/vault/capm/sn0xxx/folder/filename.root	reads tree with 1sigma cut, fills it in histogram, fits convoluted spectrum and residual, saves pdf and histogram, fit function and convolutions in txt file, so you can later plot it with another plot program, all for one run!, gets no parameters in call, calculates also residual
calc_weighted_mean.py	python script	calculates weighted mean, extrapolates to -100C, calculates PDE for different sigma and temperatures	compare different cuts, but no parameters saved	python calc_weighted_mean.py (type „enter“ to produce next plot until all plots are plotted ^^, comment what you don't need)	reads parameterfiles for all temperatures and sigmas, calculates weighted mean, fits in ROOT straight lines for every sigma, plots them with datapoints in python, calculates Q1 for -100C for every sigma, calculates deviation from Q1 of 0sigma cut and plots it, calculates PDE vs Uover for every cut in one plot (without errors), loop over all sigma

not so important					
program	type	short description	characteristics	call	description
write_Tree.cpp	root macro	produces tree out of integral textfile	unnecessary	.x write_Tree.cpp (in root active environment)	needs to be run in same folder where Run folders are, reads list_runs.txt with all runs, then takes textfile peak_integral.dat and stores it in tree hist.root
get_minimum.cpp	root macro	finds minimum of datafile with 4 columns (4th column minimised) and prints it to screen	unnecessary	.x get_minimum.cpp (in root active environment)	reads file with alpha, omega, Q1 and std(Q1) and searches for minimum of standard deviation of Q1, prints then all variables for final minimum to screen
draw_waveform.cpp	root macro	plots waveforms out of tree	maybe nice to try and look at waveforms	.x draw_waveform.cpp (in root active environment)	Reads 2 trees, input.root tree to get waveform data and datatree.root to get baseline_rms, fits gaussian to baseline_rms, condition to plot only waveform if baseline_rms has certain value
plot_histogram.py	python script	plots histogram out of tree	exactly first reading part of fit_1pe.py scripts and print to pdf, only without fit	pyhton plot_histogram.py --file /home/vault/capm/sn0xxx/folder/filename.root	takes root tree and plots baseline_rms in histogram and saves it as pdf
plot_datatree.cpp	root macro	plots histogram out of tree	exactly first reading part of fit_1pe.py scripts, only in root macro	.x plot_datatree.cpp (in root active environment)	takes root tree and plots peak integral branch in histogram
DrawHisto.cpp	root macro	plots branch of tree in histogram	no storage, only displayment	.x DrawHisto.cpp (in root active environment)	defines tree and draws a certain branch of the tree in a histogram
get_baseline_cuts.cpp	root macro	determine baseline cut for binmax	calculate baseline cuts	.x get_baseline_cuts.cpp (in root active environment)	takes big datatree with all runs after each other, calculates maximum of baseline_rms distribution and and displays it terminal, in combination with apply_cuts.cpp needed
apply_cuts.cpp	root macro	apply cuts from get_baseline_cuts.cpp	apply cuts to tree	.x apply_cuts.cpp (in root active environment)	one has to write all cuts from get_baseline_cuts.cpp in an array, then cuts are applied and stored in fit_tree.root

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baseline_cut.cpp	root macro	fit gaussian to baseline and applies cut to datatree	no storage, only displayment in terminal	.x baseline_cut.cpp (in root active environment)	loop over all runs, takes datatree with 900000 entries and fits gaussian to baseline_rms; calculates cut and takes mean for one temperature; then applies cuts to big datatree rootfiles and stores it in different tree; actually same as get_baseline_cuts_gaus_2.cpp, but only for one cut
fit_1pe_get_param_w_cuts.py	python script	calls fit_1pe_w_cuts_param_res.py, loop over all runs, no parameter storage	upper limit of sigma1, lower limit of Q1 can be adjusted; no storage of any!!! parameters or pdf files	python fit_1pe_get_param_w_cuts.py	Loop over all runs, calls fit_1pe_w_cuts_param.py via system command, hands lower limit of Q1 and upper limit of sigma1 over, just fitting and no storage of fit parameters
fit_1pe_w_cuts_res.py	python script	fits single spectrum and also plots residual,	test limits for one run	pyhton fit_1pe_w_cuts_res.py --file /home/vault/capm/sn0xxx/folder/filename.root	reads tree with 1sigma cut, fills it in histogram, fits convoluted spectrum and residual, saves pdf and histogram, fit function and convolutions in txt file, so you can later plot it with another plot program, all for one run!, gets no parameters in call
fit_1pe_single_res.py	python script	fit single spectrum and also plot residual, gets lower Q1 and upper sigma_1 limit in call	seems to be missing in program folder	called by fit_1pe_diff_cuts.py	reads tree with 1sigma cut, fills it in histogram, fits convoluted spectrum and residual, stores all fitting parameters in one temporary file parameters.txt, also chi2red in chisquare.txt, saves pdf, all for one run!, gets upper limit of sigma1, lower limit for Q1 as parameters in call, uses n_sigma.root file
fit_1pe_diff_cuts.py	python script	calls fit_1pe_single_res.py, loop over all runs and sigmas (except no cut)	upper limit of sigma1, lower limit of Q1 can be adjusted; tries given (sigma1 limit) ± 2 and takes the one with best chi2	python fit_1pe_diff_cuts.py	loop over all runs, calling fit_1pe_single_res.p, handing over upper sigma1 limit, llower Q1 limitf or each run to single program, saving all parameters for one temperature in one file and stores pdf in Auswertung_diff_cuts, this is done for every sigma
fit_1pe_single_res_no_cut.py	python script	fit of one spectrum, gets lower Q1 and upper sigma_1 limit in call	apparently not in program folder	called by fit_1pe_no_cut_get_param.py	reads tree with 1sigma cut, fills it in histogram, fits convoluted spectrum and residual, stores all fitting parameters in one temporary file parameters.txt, also chi2red in chisquare.txt, saves pdf, all for one run!, gets upper limit of sigma1, lower limit for Q1 as parameters in call, uses datatree root file (no cuts applied)
fit_1pe_no_cut_get_param.py	python script	calls fit_1pe_single_res_no_cut.py, loop over all runs, only tree with no cuts	upper limit of sigma1, lower limit of Q1 can be adjusted	python fit_1pe_no_cut_get_param.py	loop over all runs, calling fit_1pe_single_res_no_cut.p, handing over upper sigma1 limit, llower Q1 limitfor each run to single program, saving all parameters for one temperature in one file and stores pdf of run in same of the one for different cuts for comparison with it
fit_1pe_1sigma_res_free.py	python script	calls fit_1pe_single_res_free.py	fitting range can be adjusted	python fit_1pe_1sigma_res_free.py	loop over all runs, calling fit_1pe_single_res_free.py, handing over upper sigma1 limit, left and right bounds for fit range for each run to single program, saving all parameters for one temperature in one file and stores pdf of run in given path
fit_1pe_single_res_free.py	python script	mostly free fitting, using sig1 cut; called by fit_1pe_single_res_free.py	normal model, storage of fit parameters	called by fit_1pe_1sigma_res_free.py	reads tree with 1sigma cut, fills it in histogram, fits convoluted spectrum and residual, stores all fitting parameters in one temporary file parameters.txt, also chi2red in chisquare.txt, saves pdf, all for one run!, gets upper limit of sigma1, left and right bin for fitrange as parameters in call
fit_1pe_1sigma_res_mod.py	python script	calls fit_1pe_single_res_mod.py, loop over all runs	only upper limit of sigma1 handed as parameter	python fit_1pe_1sigma_res_mod.py	loop over all runs, calling fit_1pe_single_res_mod.py, handing over lower Q1 limit and upper sigma1 limit for each run to single program, saving all parameters for one temperature in one file and copies generated pdf of fit_1pe_single_res_mod.py of run to given path
fit_1pe_single_res_mod.py	python script	considering also sig0 for 1pe width, using 1sig cut; called by fit_1pe_1sigma_res_mod.py	modified model, storage of fit parameters	called by fit_1pe_1sigma_res_mod.py	reads tree with 1sigma cut, fills it in histogram, fits convoluted spectrum with also taking into account that sigma0 also influences width of signal (compared to fit_1pe_w_cuts_res.py) and residual, stores all fitting parameters in one temporary file parameters.txt, also chi2red in chisquare.txt, saves pdf, all for one run!
fit_1pe_single_res_one_cut.py	python script	fit of one spectrum, gets lower Q1 and upper sigma_1 limit in call	normal model, storage of fit parameters, residual ist plotted	called by fit_1pe_one_cut_get_param.py	reads tree with 1sigma cut, fills it in histogram, fits convoluted spectrum and residual, stores all fitting parameters in one temporary file parameters.txt, also chi2red in chisquare.txt, saves pdf, all for one run!, gets upper limit of sigma1, lower limit for Q1 as parameters in call, uses 1sigma cut root file
fit_1pe_one_cut_get_param.py	python script	calls fit_1pe_single_res_one_cut.py, loop over all runs	Q1, sigma1 are handed over	python fit_1pe_one_cut_get_param.py	loop over all runs, calling fit_1pe_single_res_one_cut.py, handing over upper sigma1 limit, lower Q1 limit for each run to single program, saving all parameters for one temperature in one file (copies together parameters.txt and chisquare.txt from it_1pe_single_res_one_cut.py) and copies generated pdf of fit_1pe_single_res_one_cut.py of run to given path
fit_1pe_get_param.py	python script	fits specs for one temperature	predecessor of fit_1pe_get_param_w_cut s.py, loop over one temperature, normal model, not sure if good idea to use	python fit_1pe_get_param.py --file /home/vault/capm/sn0xxx/folder/datatree.root	loop over one temperature, calls function to fit single specs, only runnumber is handed over, parameters are stored in textfile, but has same problem as fit_1pe_get_param_w_cuts.py that root remembers fits from before

does not make so much sense to use					
program	type	short description	characteristics	call	description
get_baseline_cuts_gaus.cpp	root macro	determine baseline cuts and apply them	does not work	.x get_baseline_cuts_gaus.cpp (in root active environment)	needs 1 root tree in same directory with all runs after each other all runs must have 900000 entries should fit gaussian distribution to baseline distribution and then determine different cuts in multiplicity of sigma, applies cuts to big root tree doesn't work properly reading of histogram seems to not work properly

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fit_1pe_w_cuts_param_res.py	python script	fit single spectrum and also plot residual, gets lower Q1 and upper sigma_1 limit in call	normal model, no storage of fit parameters	called by it_1pe_get_param_w_cuts.p	called by fit_1pe_get_param_w_cuts.p,y reads, fills it in histogram, fits convoluted spectrum and residual, saves pdf, all for one run!, gets parametersin call
fit_1pe_get_parameters_w_cuts.py	python script	should do in theory same as e.g. fit_1pe_single_res_one_cut.py fit_1pe_one_cut_get_param.py Ttoether, but fit does not work	doesn't work	python fit_1pe_get_parameters_w_cuts.py	loop over all runs, calling function in same script to fit single histograms, handing over Q1 lower and sigma1 upper limit, writing parameters in textfile, but root seems to remember parameters of fit before, other results for next fits, mostly fits not working any more
fit_1pe_datatree.py	python script	fits convoluted gaussian spec and background	very old version of fit function, not so correct	python --file /home/vault/capm/sn0xxx/folder/datatree.root	like fit_1pe.p, but with datatree.root as file to read, not hist.root ()different tree/ branch names
fit_1pe_get_a_w_2.py	python script	fits convoluted gaussian spec and background for several omega and alphas one temperature	like fit_1pe_get_a_w_2.py, but issue with 0 fixed, nevertheless not physically motivated!!! don't use	python fit_1pe_get_a_w_2.py	loop over one temperature, several omega and alpha, one can variate step size and bounds for each alpha and omega, Q1, Q1err and chi2 are returned for one call in the loop, if chi2 larger than certain value then 0 is written, weighted Q1 ist calculated (zeros are excluded in calculation), together with alpha, omega, normal mean and the std's stored in textfile (has to be plotted 3d over omega and alpha)
fit_1pe_get_a_w.py	python script	fits convoluted gaussian spec and background for several omega and alphas one temperature	find optimal omega and alpha for one temperature in order to get minimal variation for Q1 for one temperature, but not physically motivated!!!	python fit_1pe_get_a_w.py	loop over one temperature, several omega and alpha, one can variate step size and bounds for each alpha and omega, Q1, Q1err and chi2 are returned for one call in the loop, if chi2 larger than certain value then 0 is written (wrong technique, use fit_1pe_get_a_w_2.py), weighted Q1 ist calculated, together with alpha, omega, normal mean and the std's stored in textfile (has to be plotted 3d over omega and alpha)
fit_1pe_get_omega.py	python script	fits convoluted gaussian spec and background for several omega (fixed) for one temperature	find optimal omega (for one temperature), but does not make sense	python fit_1pe_get_omega.py	loop over one temperature and several omega (step size and range variable), in each step the histogram is fitted, Q1 and its error are returned, stored in list, then mean and std calculated for each omega and stored in textfile (needs omega to find minimum std)
fit_1pe.py	python script	fits convoluted gaussian spec and background	original script from Ako, fit formula has errors, don't use!!!	python fit_1pe.py --file /home/vault/capm/sn0xxx/folder/hist.root	needs root tree with integrals as branch as input, fills them in histogram, fits background and signal functions in root several times, the final parameters of one fit are the starting ones for the next, plots histogram with total fit curve and also single deconvoluted pe (15 pe are always fitted, fixed number), background gaussian and exponential function, saves it as pdf in given path