Converting the PMT Container Testing Raw Data to ROOT File Format

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Outline

1. Motivation
2. Summary

motivation

1. The Raw data of PMT testing is significant for the evaluation of PMT performance.
2. **While,Currently, the raw data of container system is not well organized and it is not convinent for people to get a quikly access.**
3. It is useful to convert all the testing raw data to ROOT format.
   - decrease the file size
   - easy to analysis and manage.
   - shadow the hardware details.

requirements

1. sotre the raw waveform data(.1pe, 1pe, TTS).
2. store the auxilary testing information(container , mass, HV, DCR. etc).
3. easy to manage (create, modify and update) and analyze.
4. one ane acquire almost all the data needed for analysis(of one PMT) from only one file rather than collecting the details from server.

beloew is the figure about

prliminary file structure and stretages

- each PMT have one root file named in ”SN_rawdata.root”
- In a specific root file, we have several trees and a auxilary data class
- if one PMT go through several tests in the container, all the data will be saved still in only one root file but with different name of trees[1].

[1] distiguished by a unique tag

results

current file path: the folder MCP contains all the MCP PMT data files;
the folder HAMAMATSU contains all the HAMAMATSU data files;

example C++ code of reading the file

listing

summary

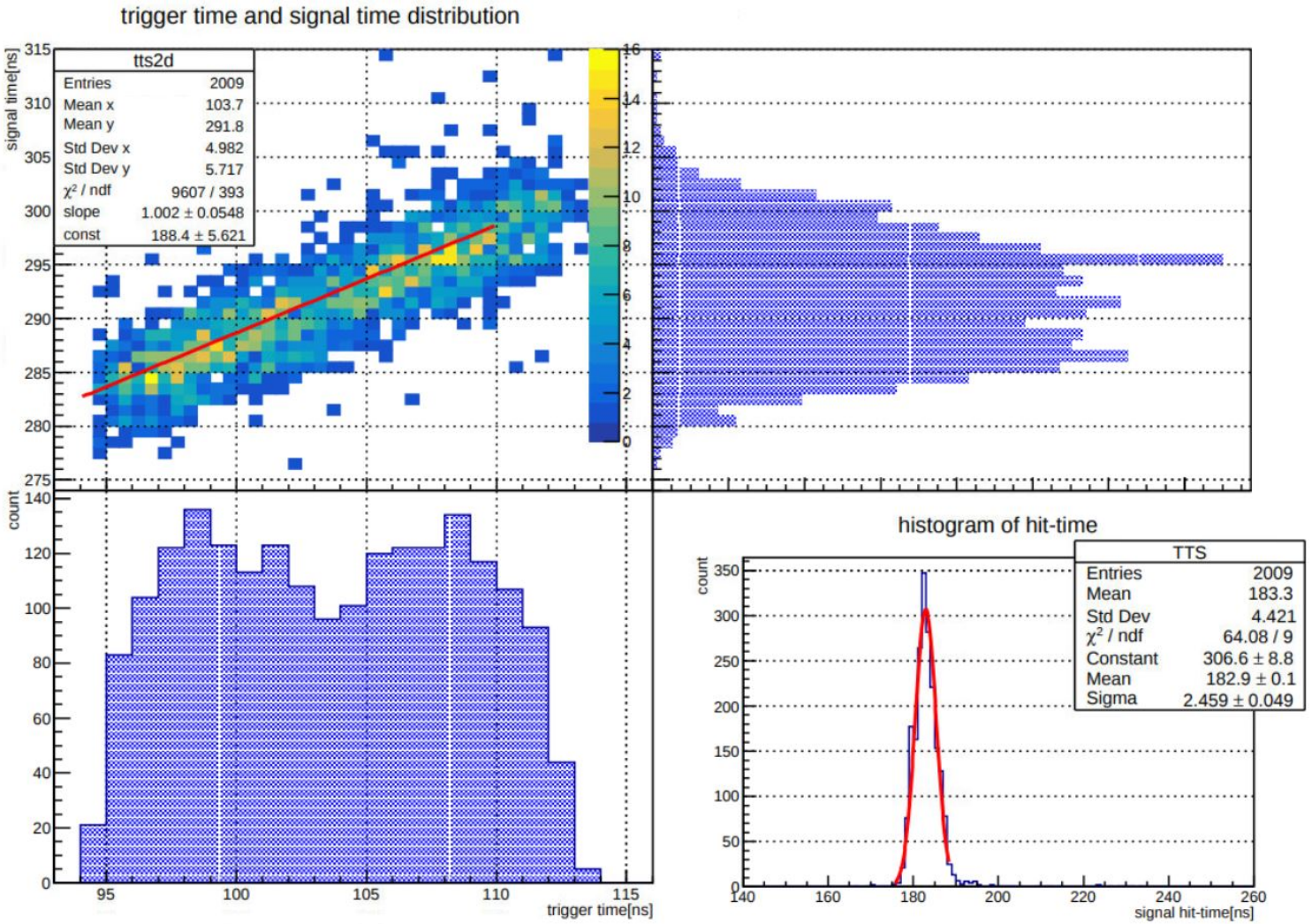
- the charge and amplitude stability of HAMAMATSU PMT is better.
- ∼6k NNVT PMTs and 5k HAMAMATSU PMTs has been tested in container system, test results and test reports are avaliable from PMTDataBase[2].
- we reject or accept one PMT according to its perfomance test results from container and scanning station.
- we need to study the ”delay signal” of HAMAMATSU PMT and ”big signal” of NNVT PMT[3] in detail[4].
- the expected mean PDE value is 30.4% and mean DCR value is ∼34kHz[5] in CD.

[2] pmtdb.juno.ihep.ac.cn
[3] especially when PMT working in the multi-photon case
[4] one option is to transport several PMTs to SYSU for detailed study
[5] will decrease after installation

THANKS

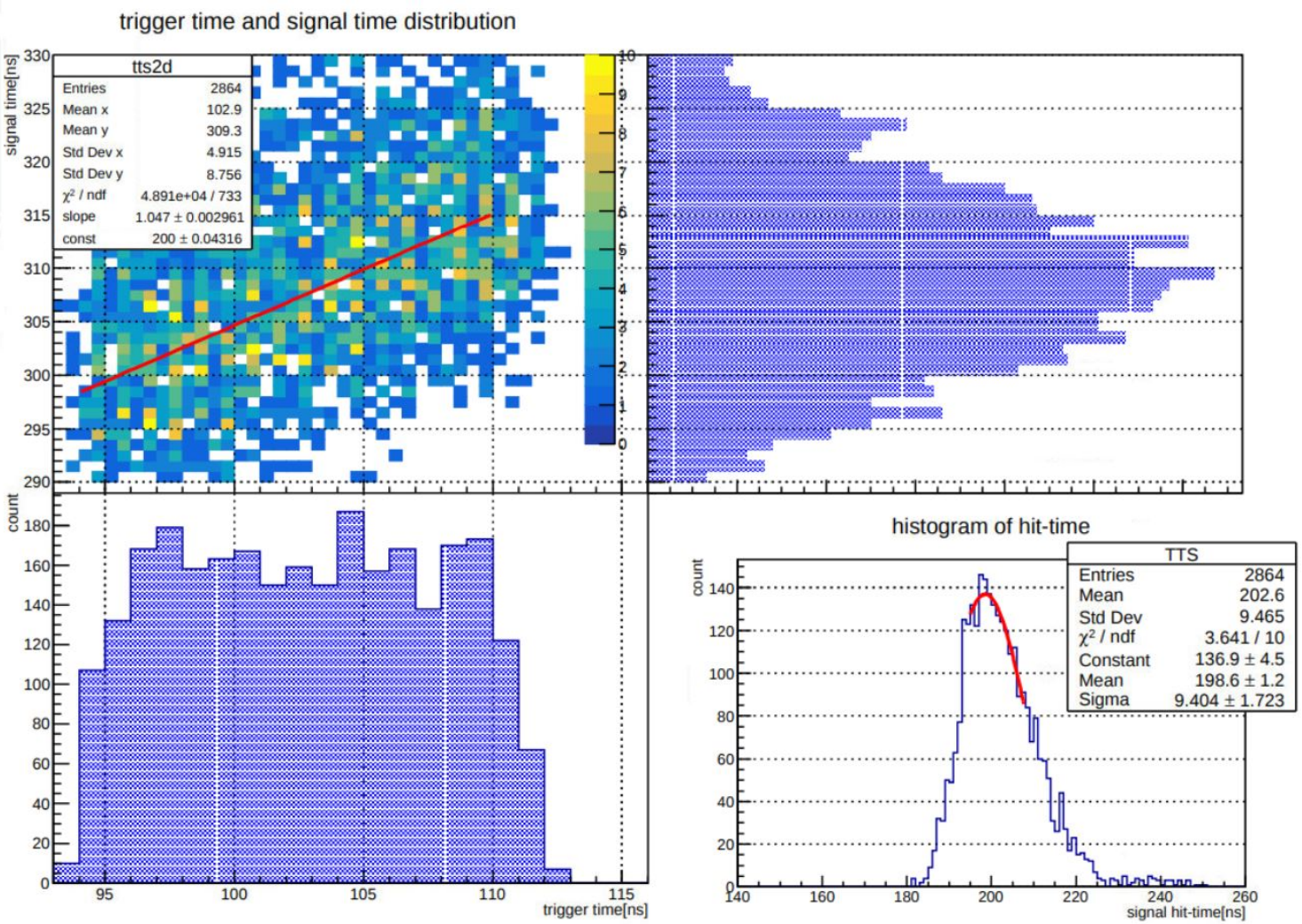
BACK-UP

TTS of HAMAMATSU PMT



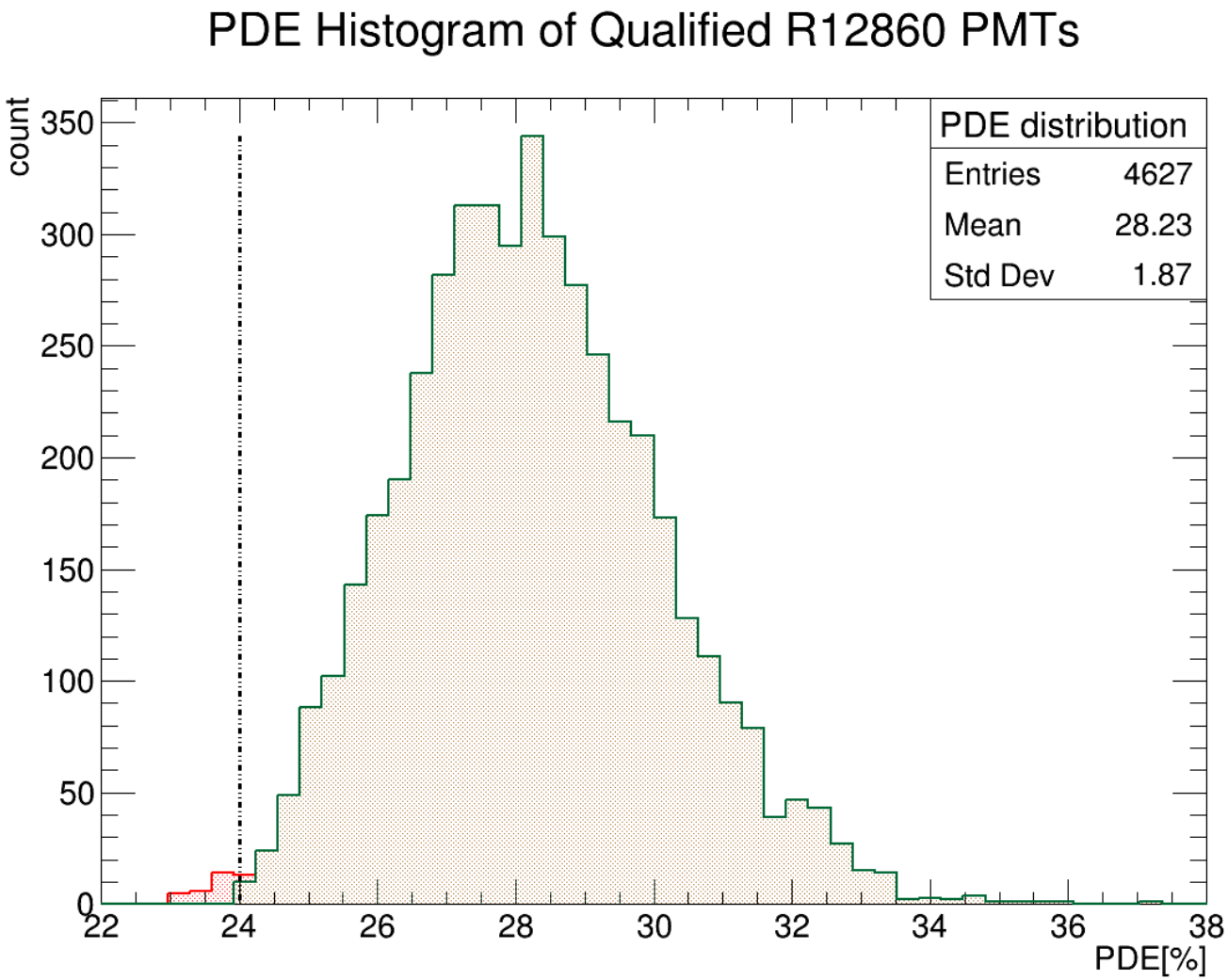
图：hittime and trigger time

TTS calculation of NNVT PMT



图· hittime and trigger time

各个参数的统计结果-PDE



PDE 计算结果的初步对比

对所有测试的 PMT 的 PDE 和测试现场的分析结果进行对比，发现存在少数 PMT 差别较大，需要进一步查找原因。

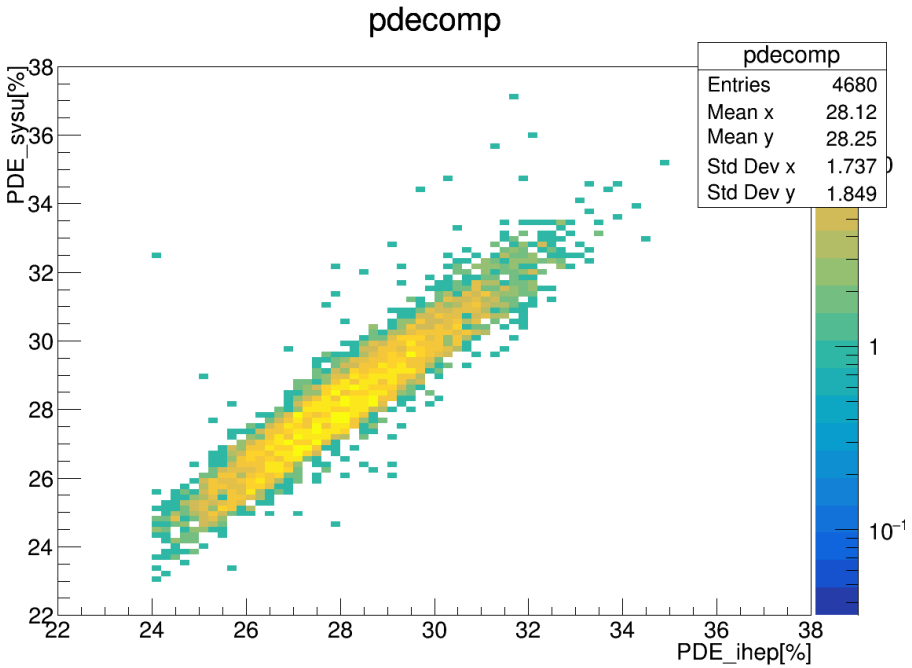


图: PDE 结果的关联对比

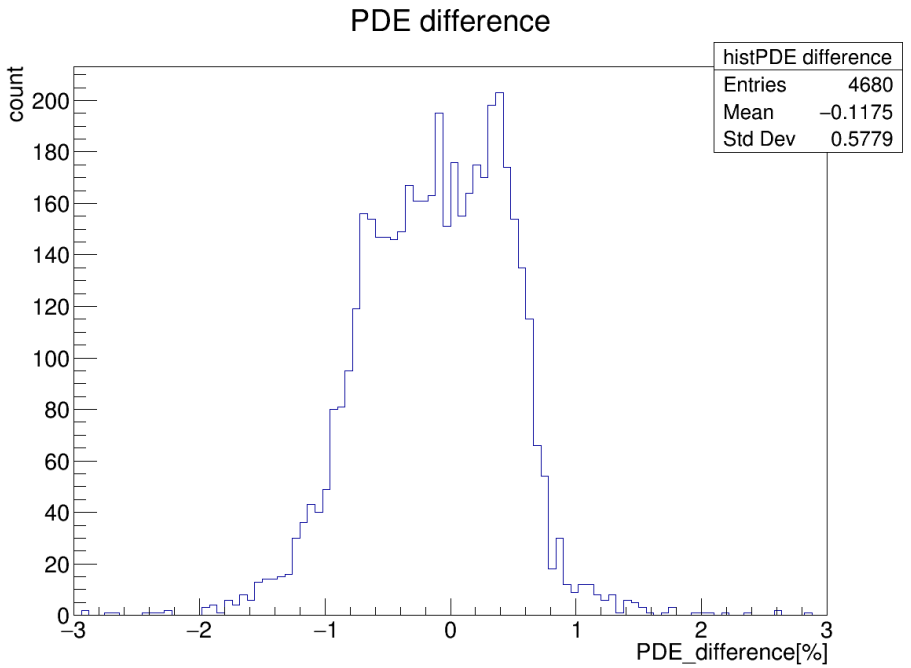
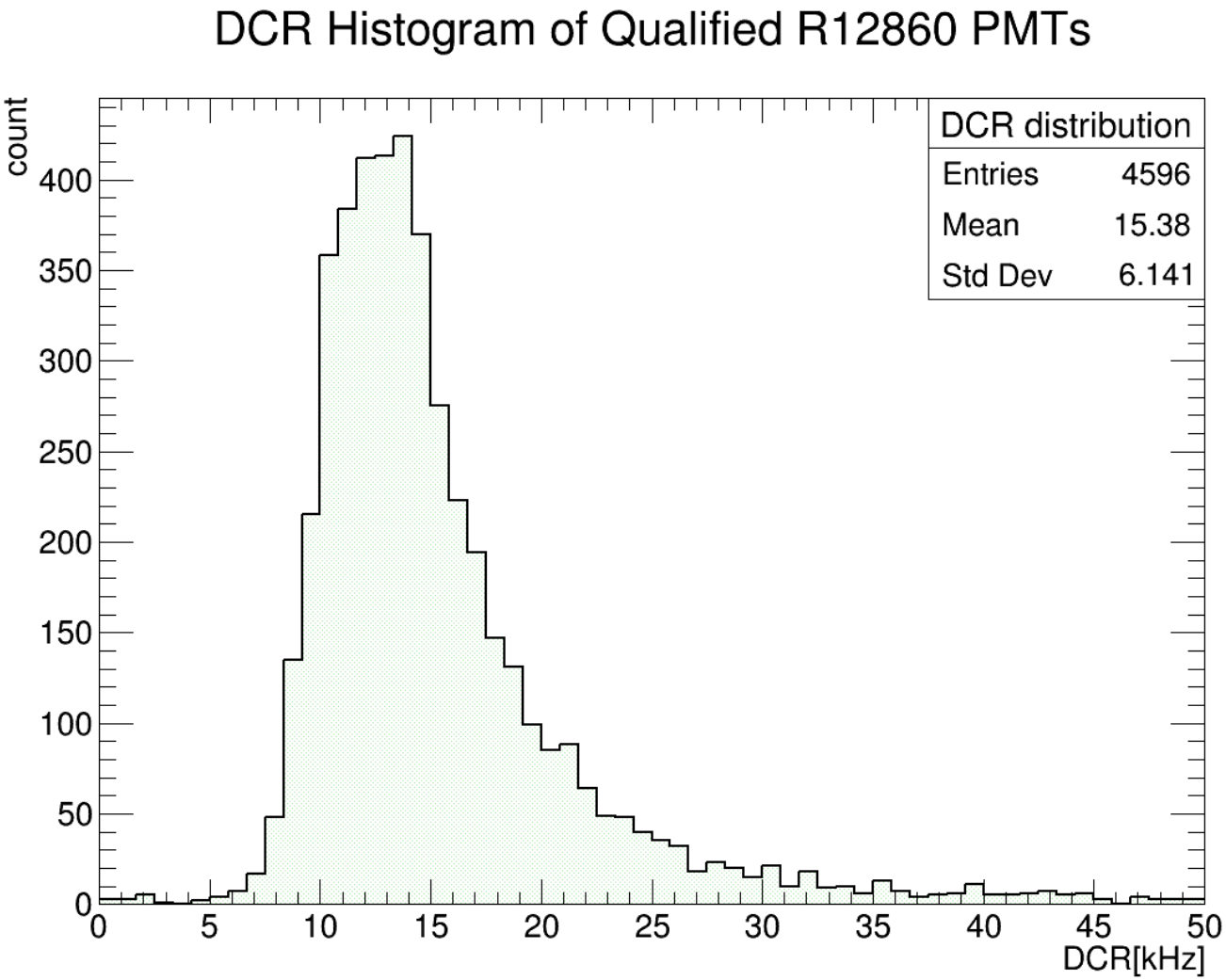
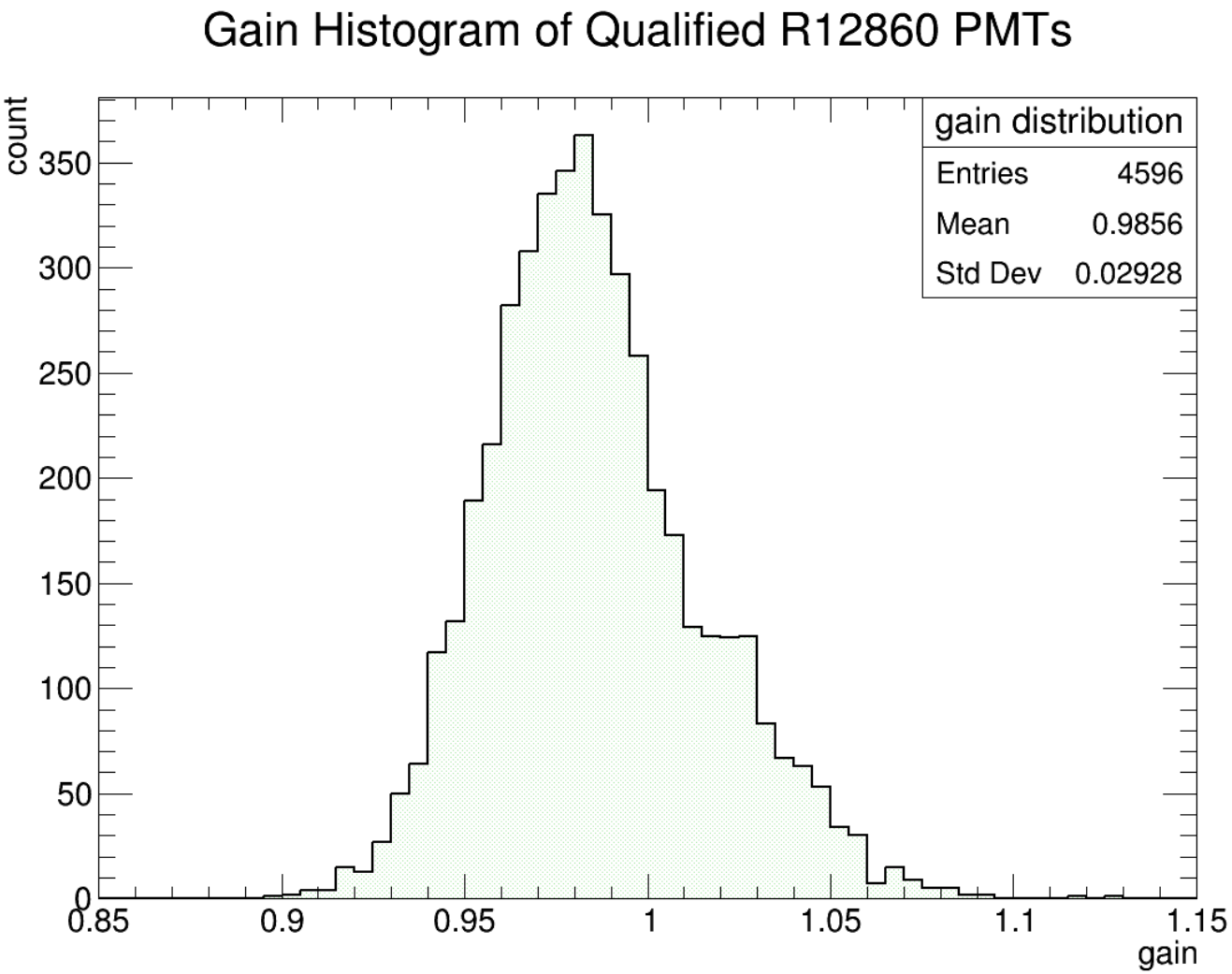


图: 两种分析的差值分布

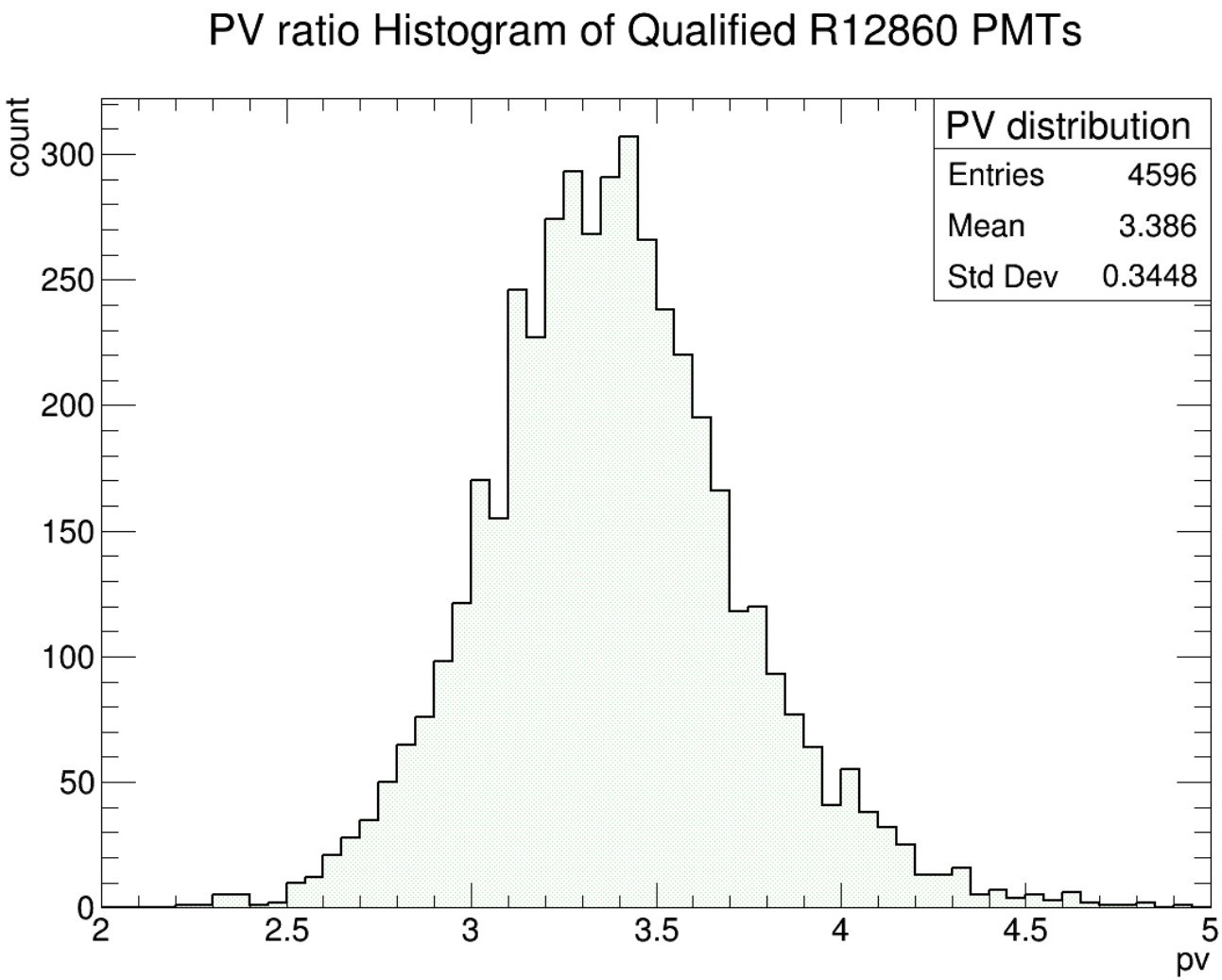
各个参数的统计结果-DCR



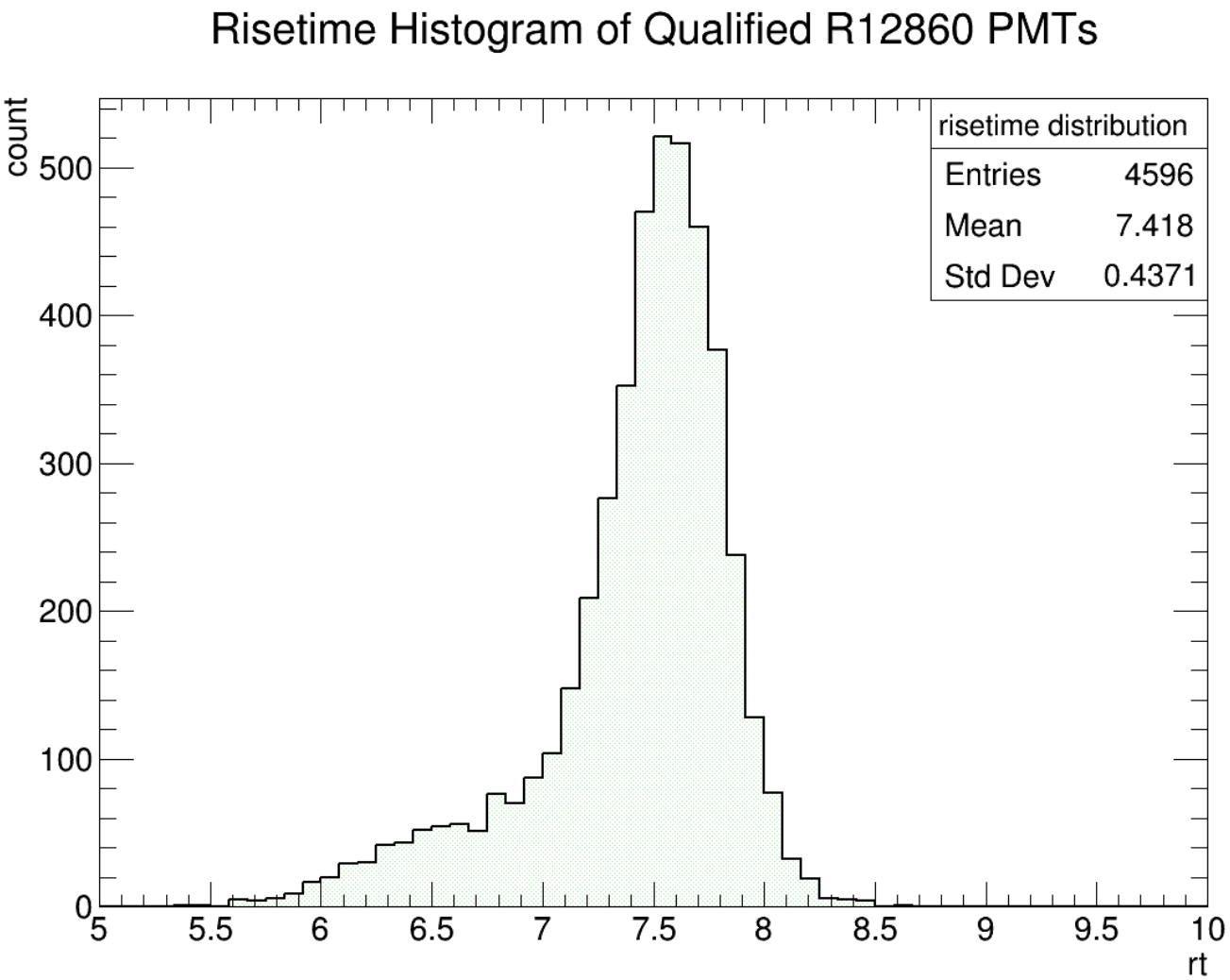
各个参数的统计结果-Gain



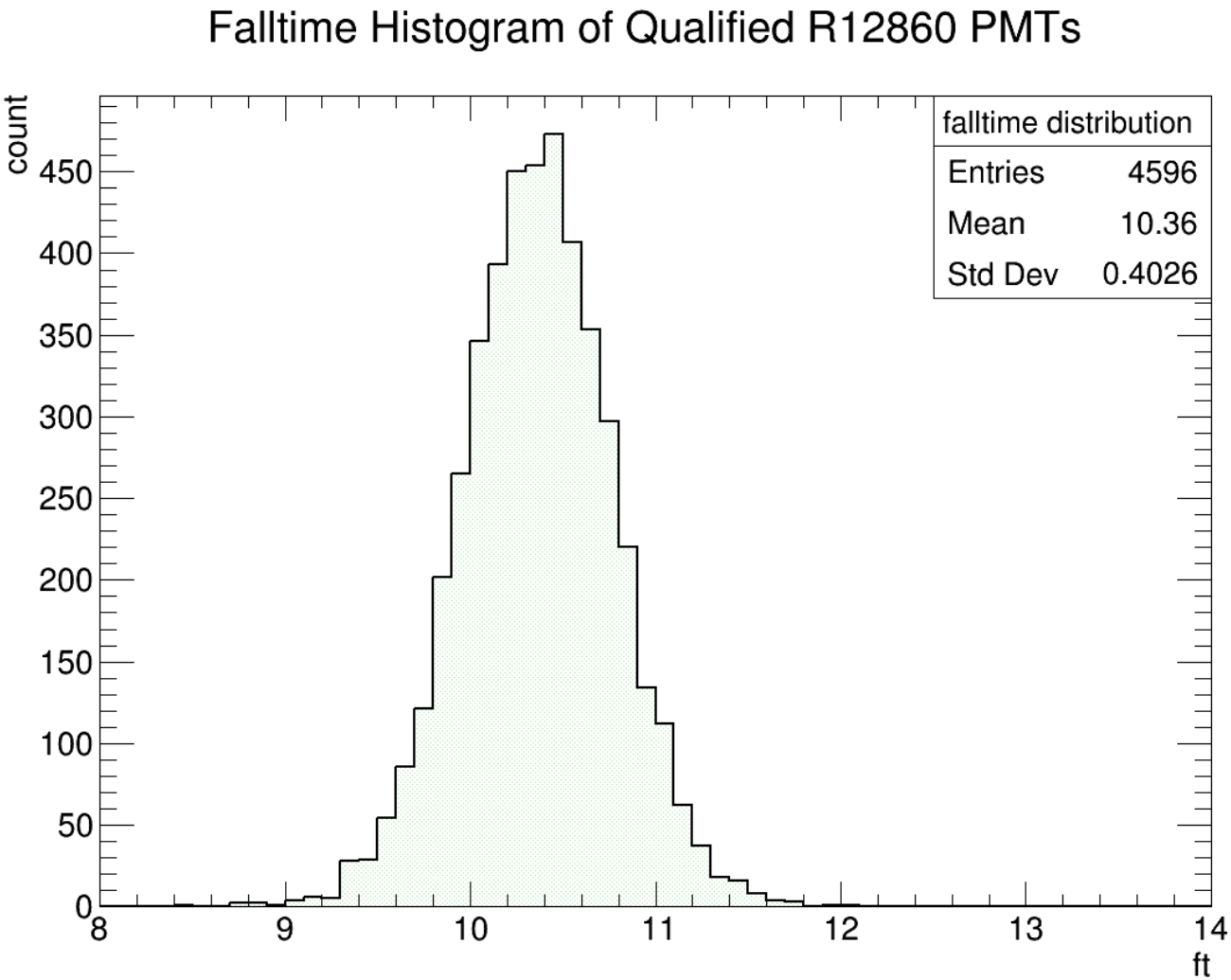
各个参数的统计结果-P/V



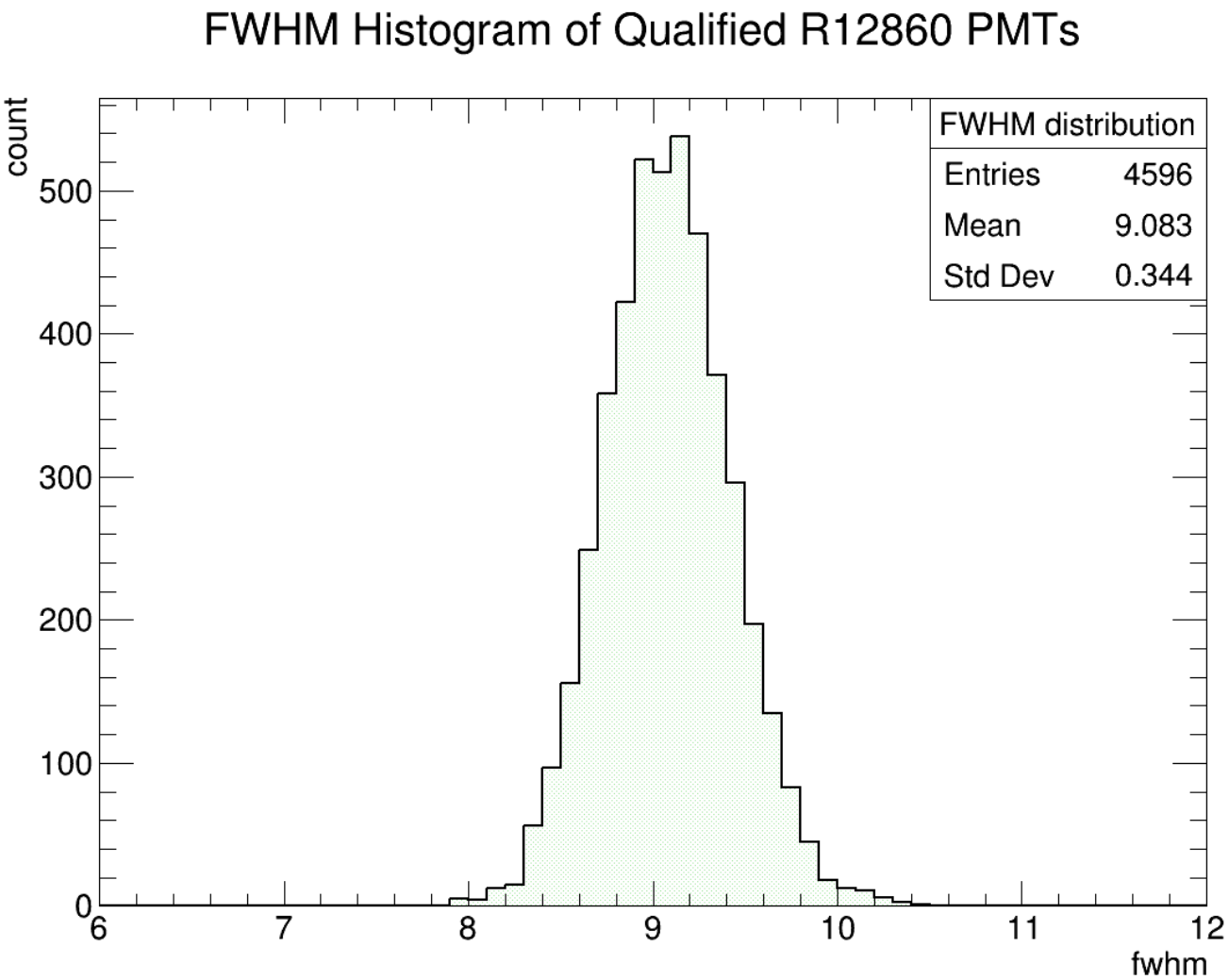
各个参数的统计结果-rise time



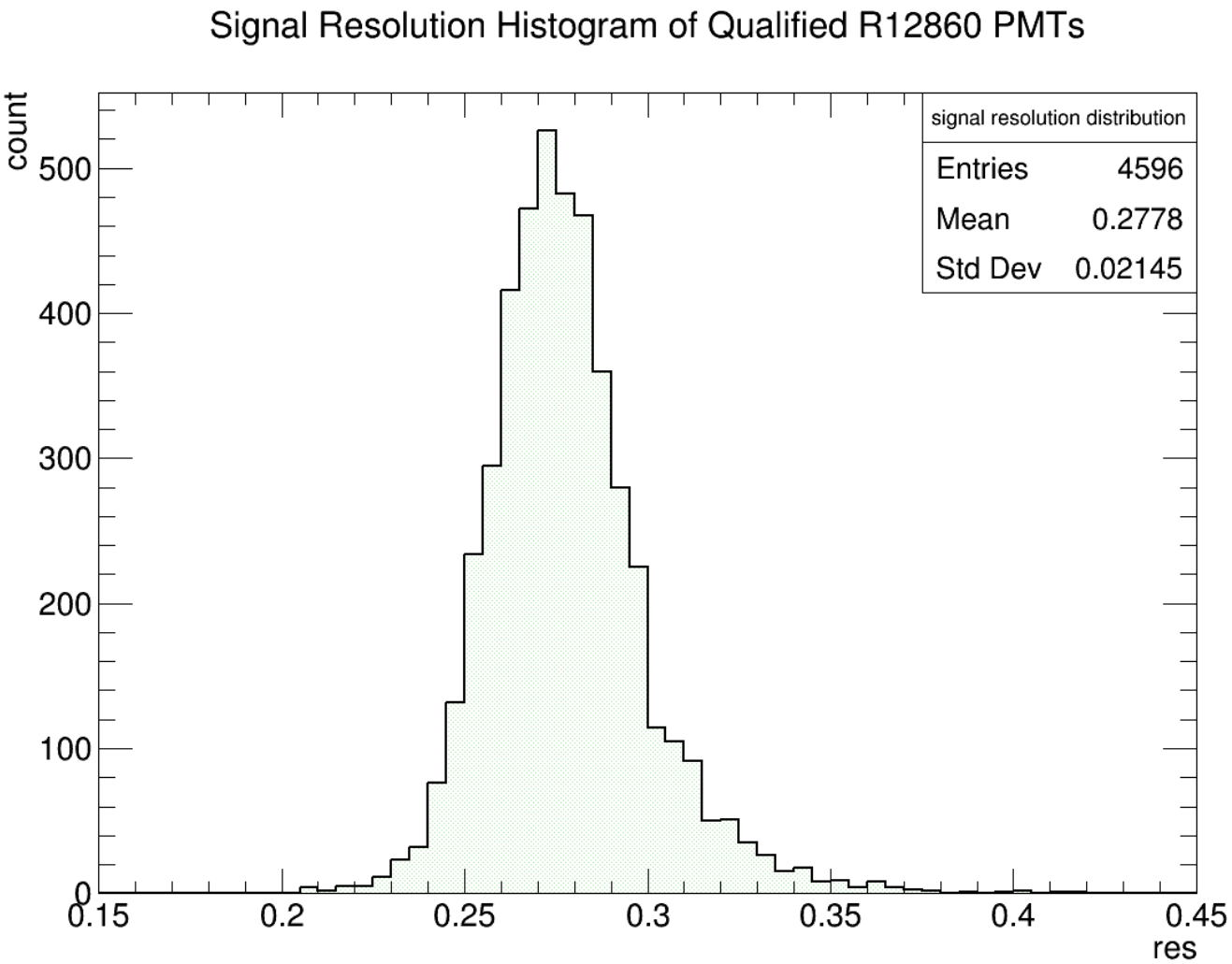
各个参数的统计结果-fall time



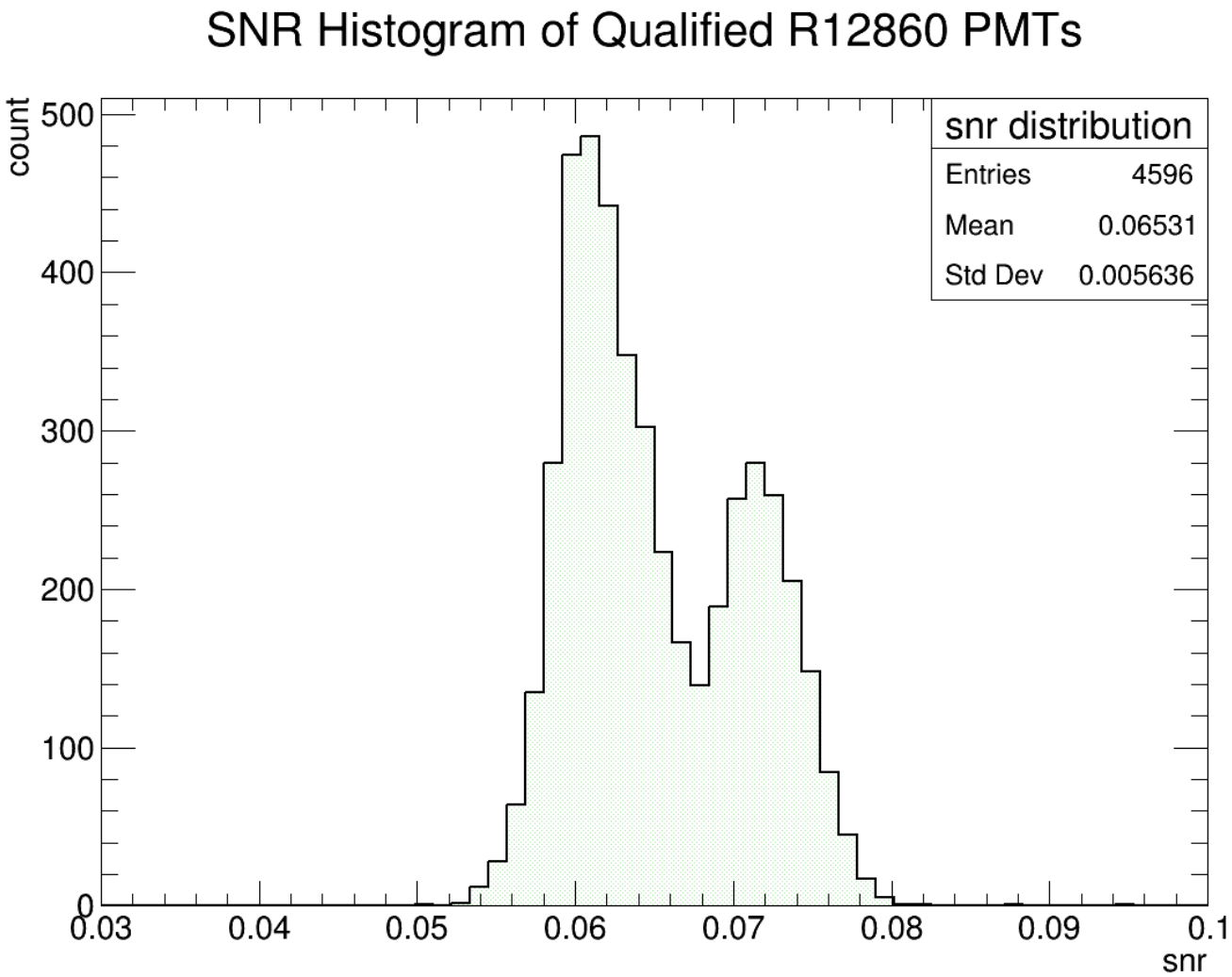
各个参数的统计结果-FWHM



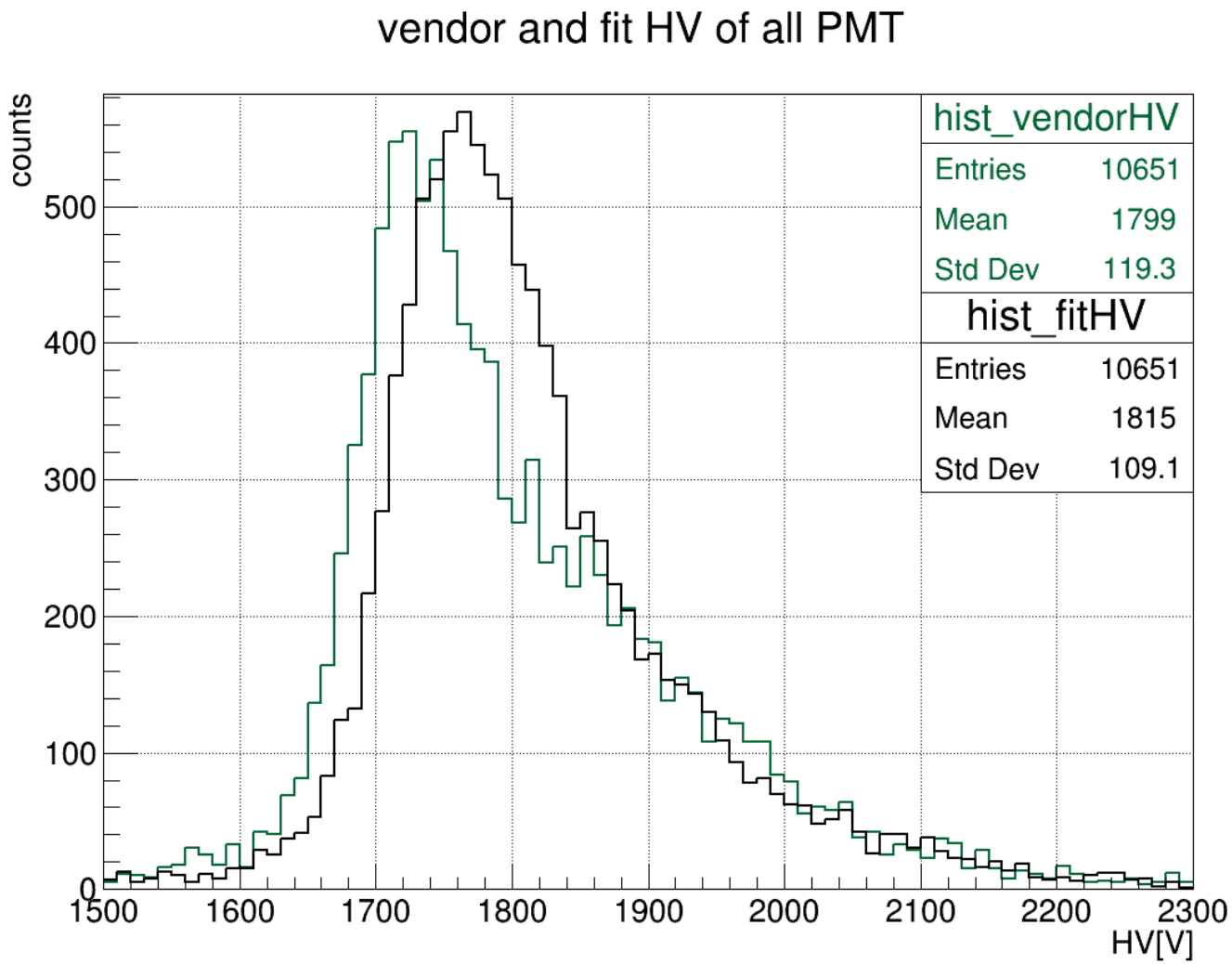
各个参数的统计结果-Resolution



各个参数的统计结果-S/N



各个参数的统计结果-HV



抽屉因子的比较

factor_1 是我的结果，factor_2 是张海琼的结果。$y = 1.148x + 0.998$

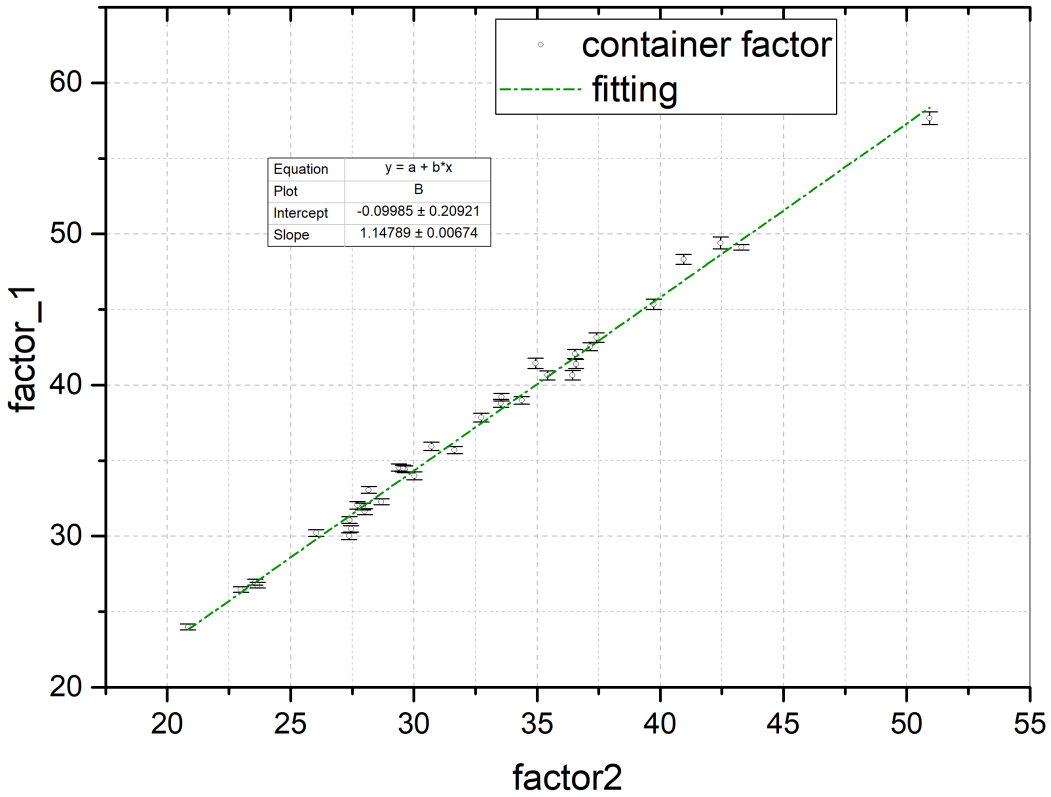
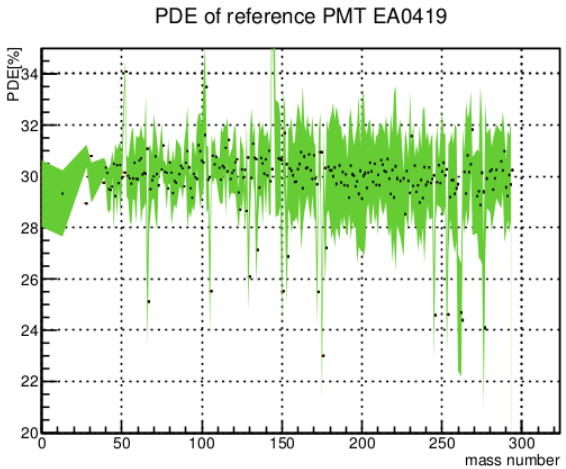
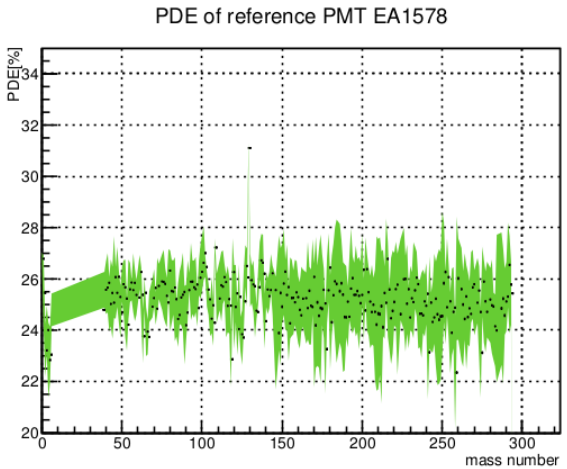
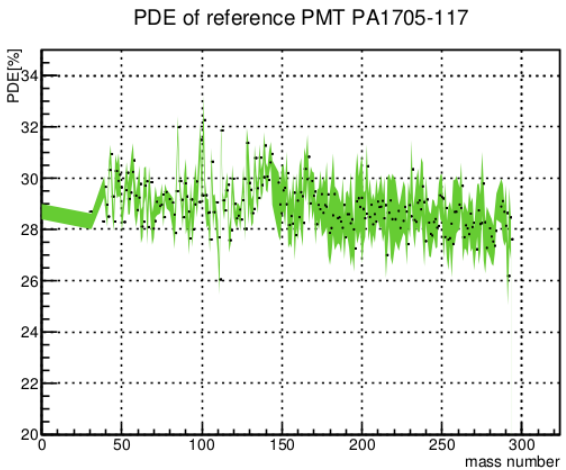


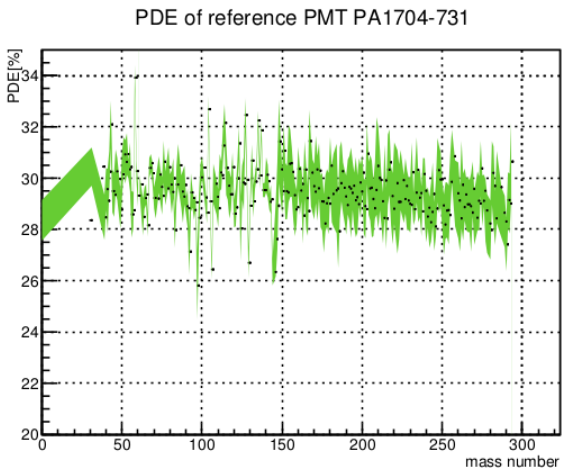
图: 抽屉因子和现场使用值的对比

参考管稳定性


PDE of reference PMT EA0419
PDE[%]
mass number

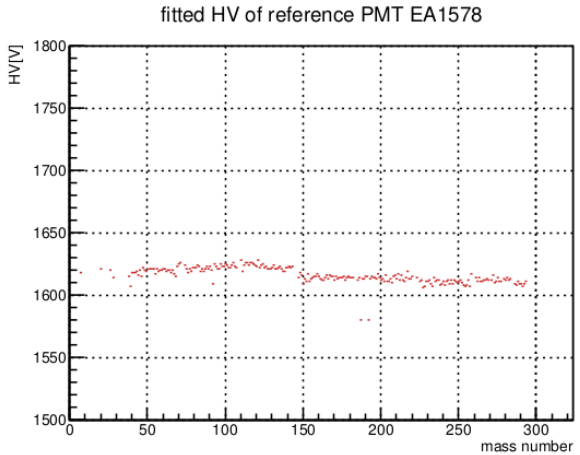

PDE of reference PMT EA1578
PDE[%]
mass number

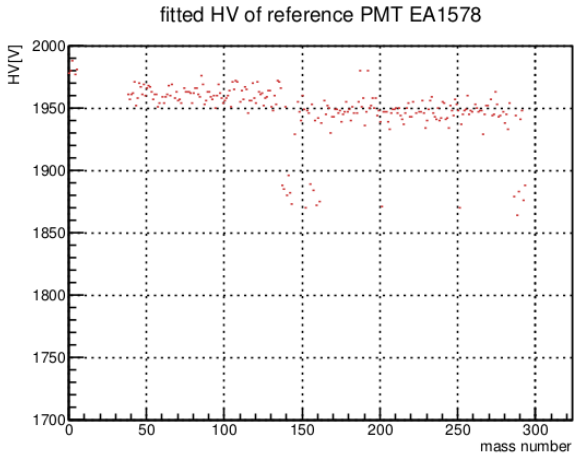

PDE of reference PMT PA1705-117
PDE[%]
mass number

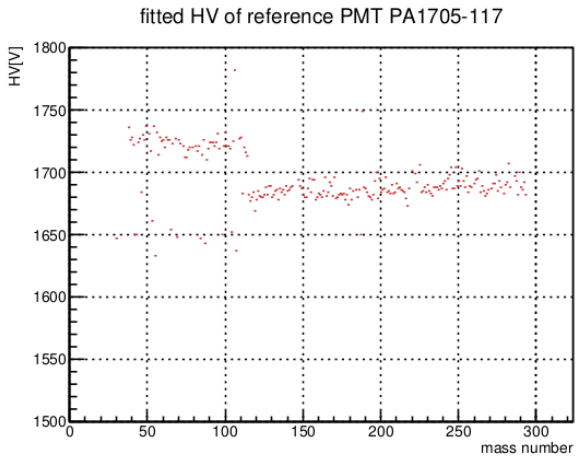

PDE of reference PMT PA1704-731
PDE[%]
mass number

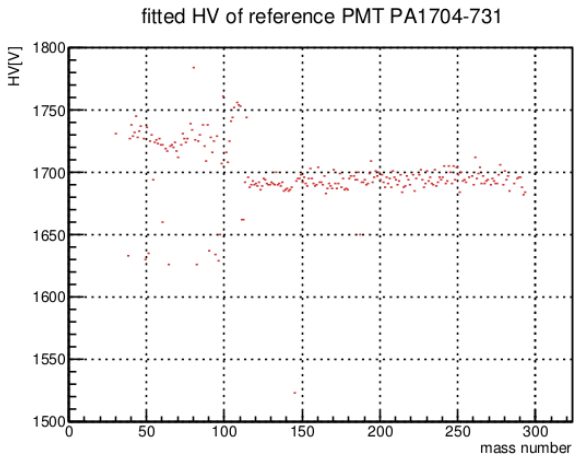
参考管电压稳定性

新 DAQ 对系统的性能产生了影响，高压平均值发生了变化：

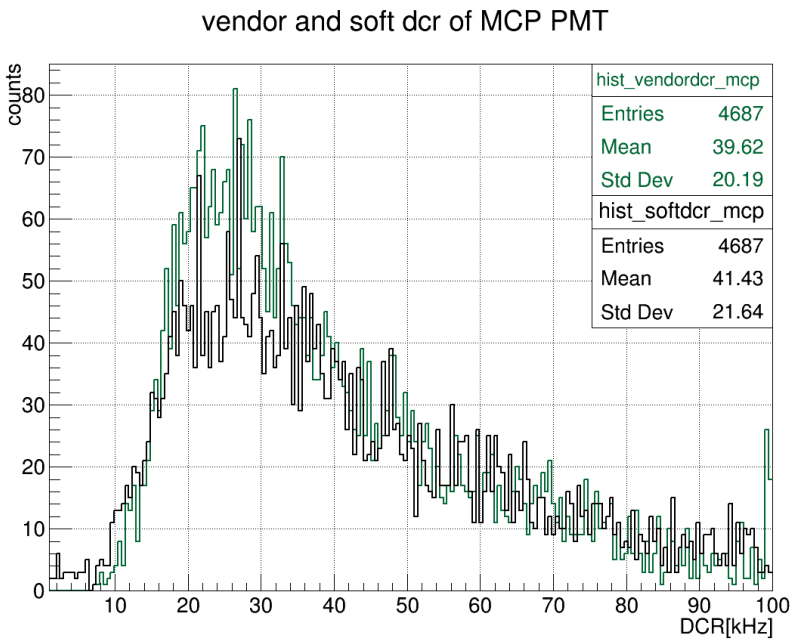


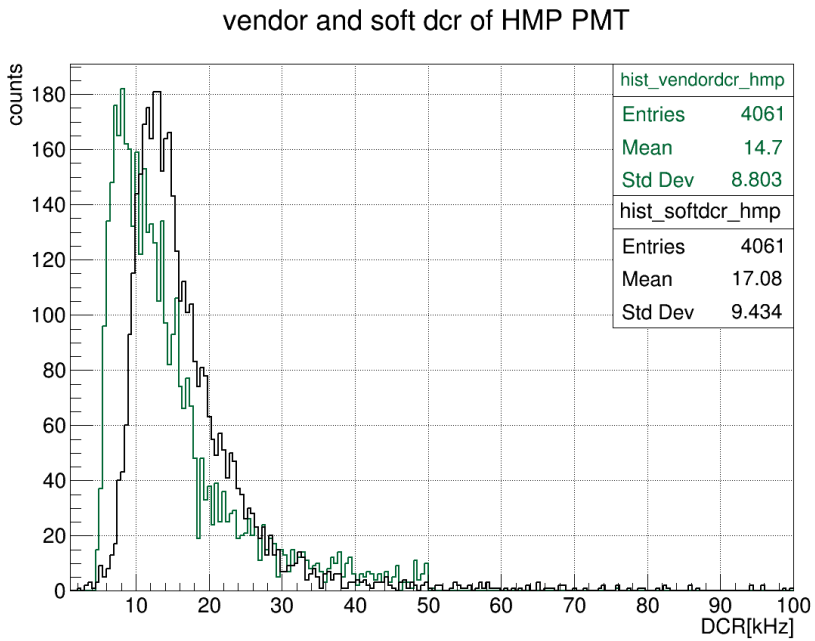
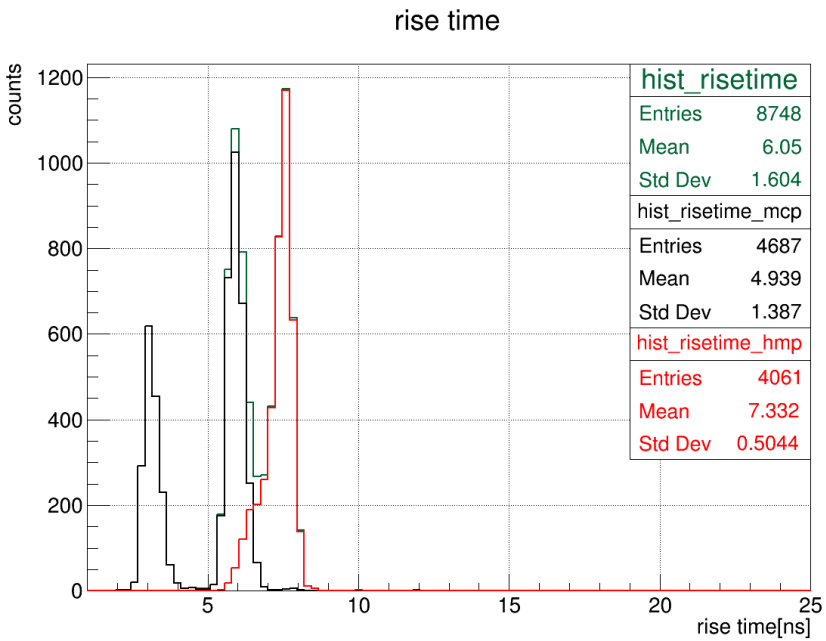
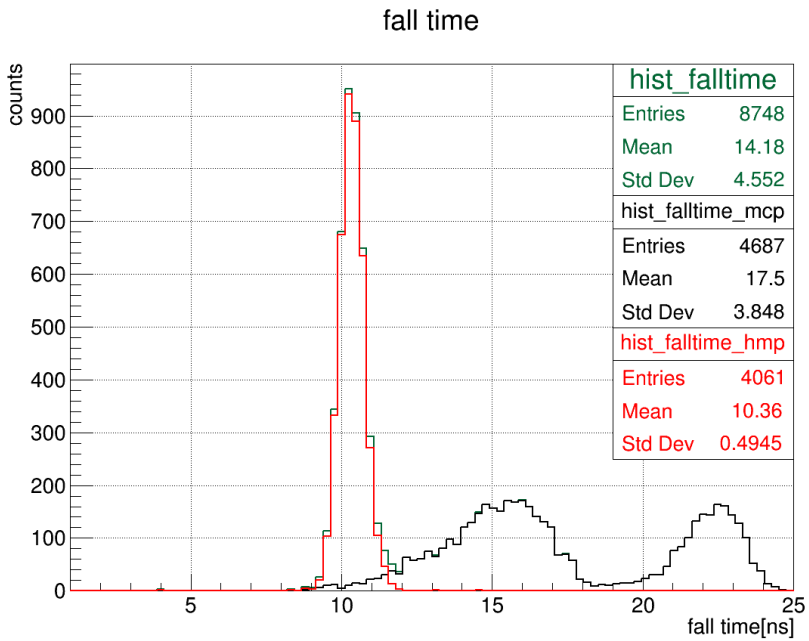






暗计数


vendor and soft dcr of MCP PMT
counts
DCR[kHz]
hist_vendordcr_mcp
Entries 4687
Mean 39.62
Std Dev 20.19
hist_softdcr_mcp
Entries 4687
Mean 41.43
Std Dev 21.64


vendor and soft dcr of HMP PMT
counts
DCR[kHz]
hist_vendordcr_hmp
Entries 4061
Mean 14.7
Std Dev 8.803
hist_softdcr_hmp
Entries 4061
Mean 17.08
Std Dev 9.434

上升时间和下降时间分布