Weekly report

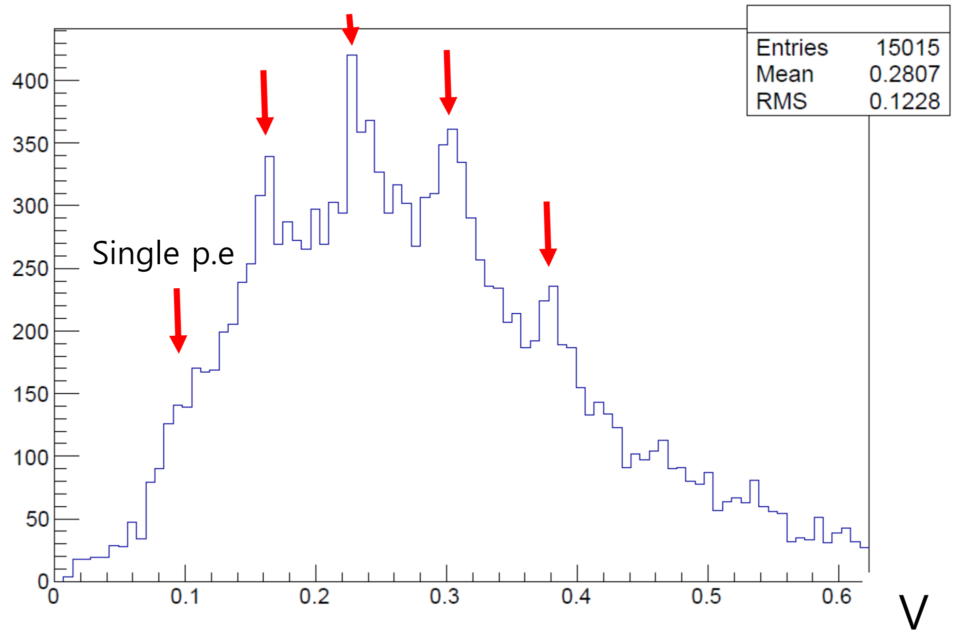
SNU

BongHo Kim

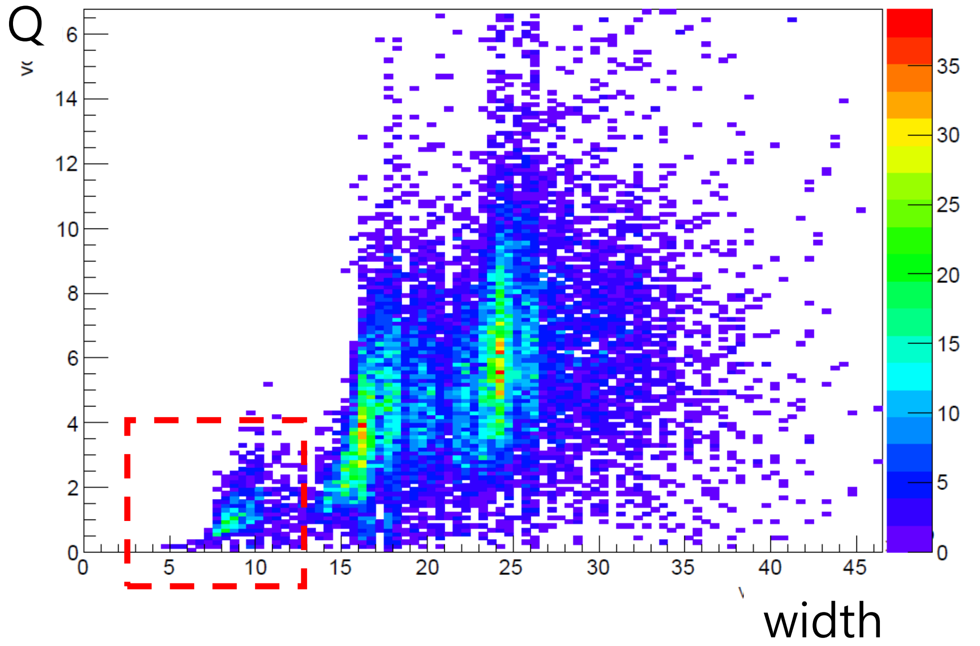
At last year

Data modeling : single photo-electron

Signal height distribution

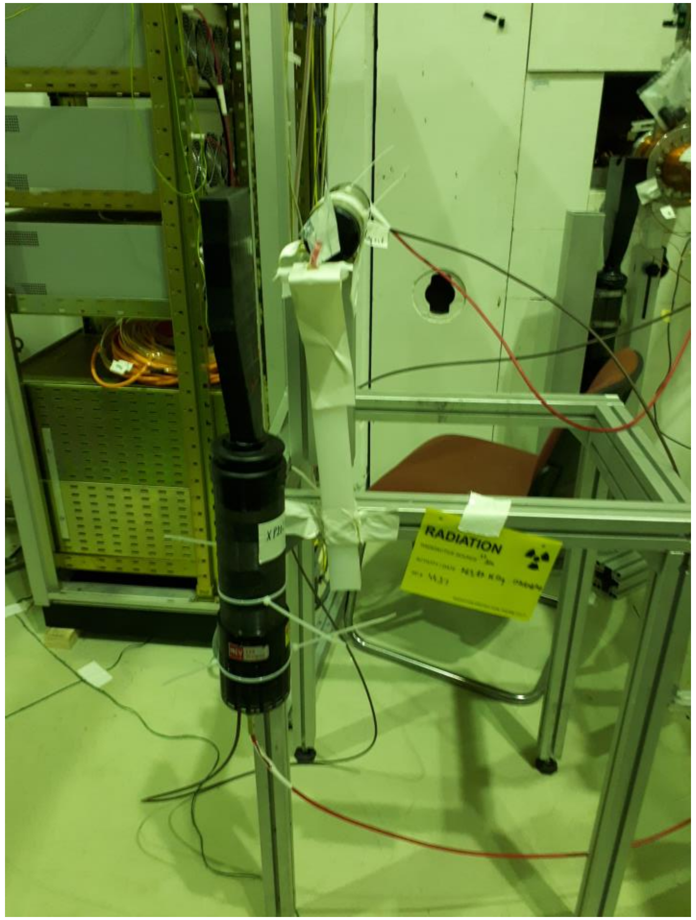


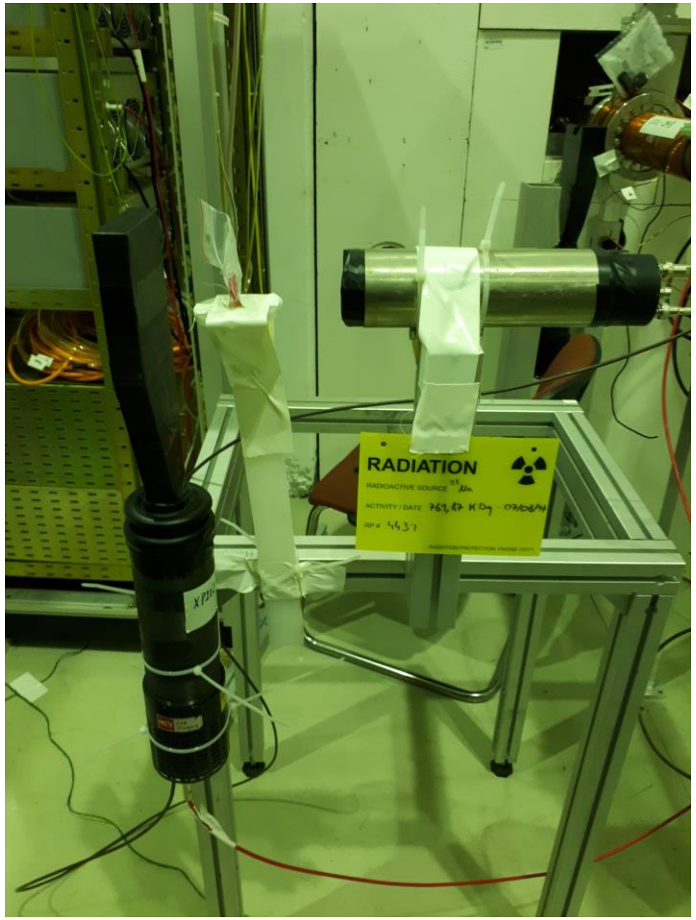
Width vs total Q



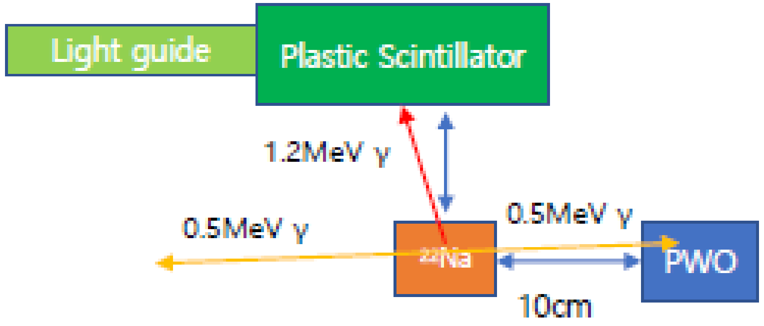
- Single photo-electron is shown and well distinguished with noise
- Rough photoelectron number for 0.5MeV is about 5# only.
- Poisson function is used for photo-electron. ($= {a^n e^{-a}}/{n!}$)

PWO test in CERN

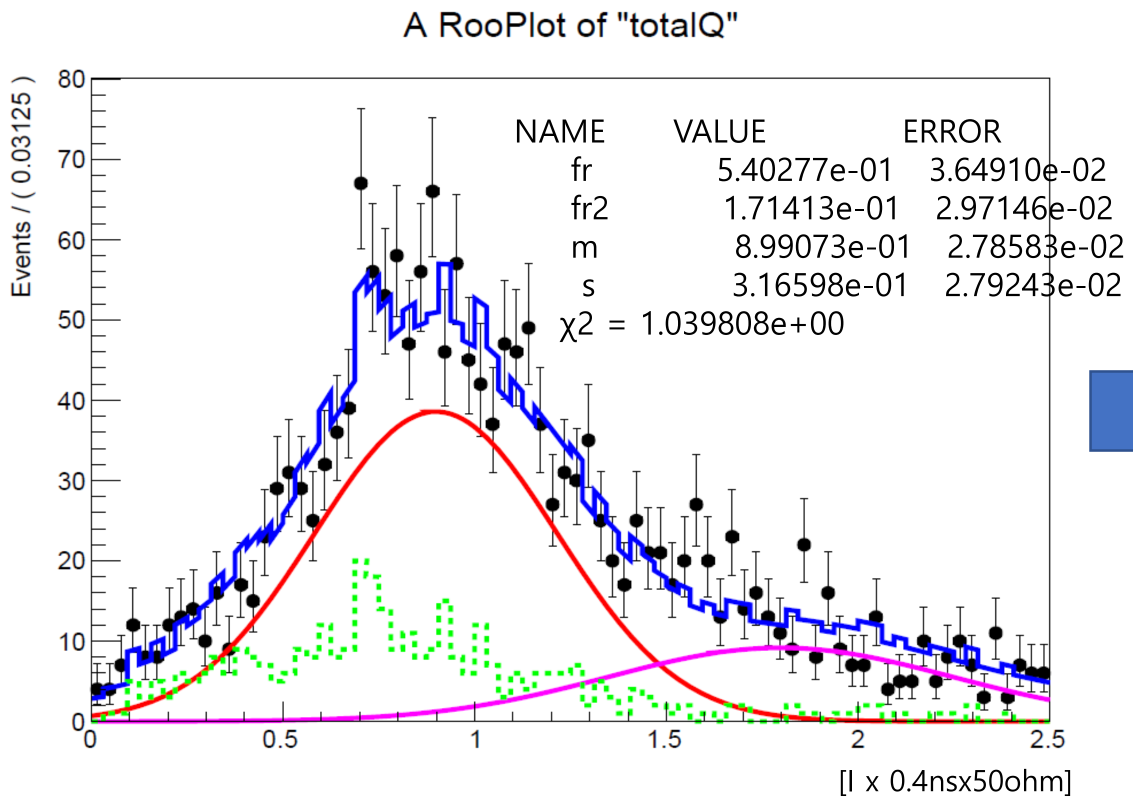


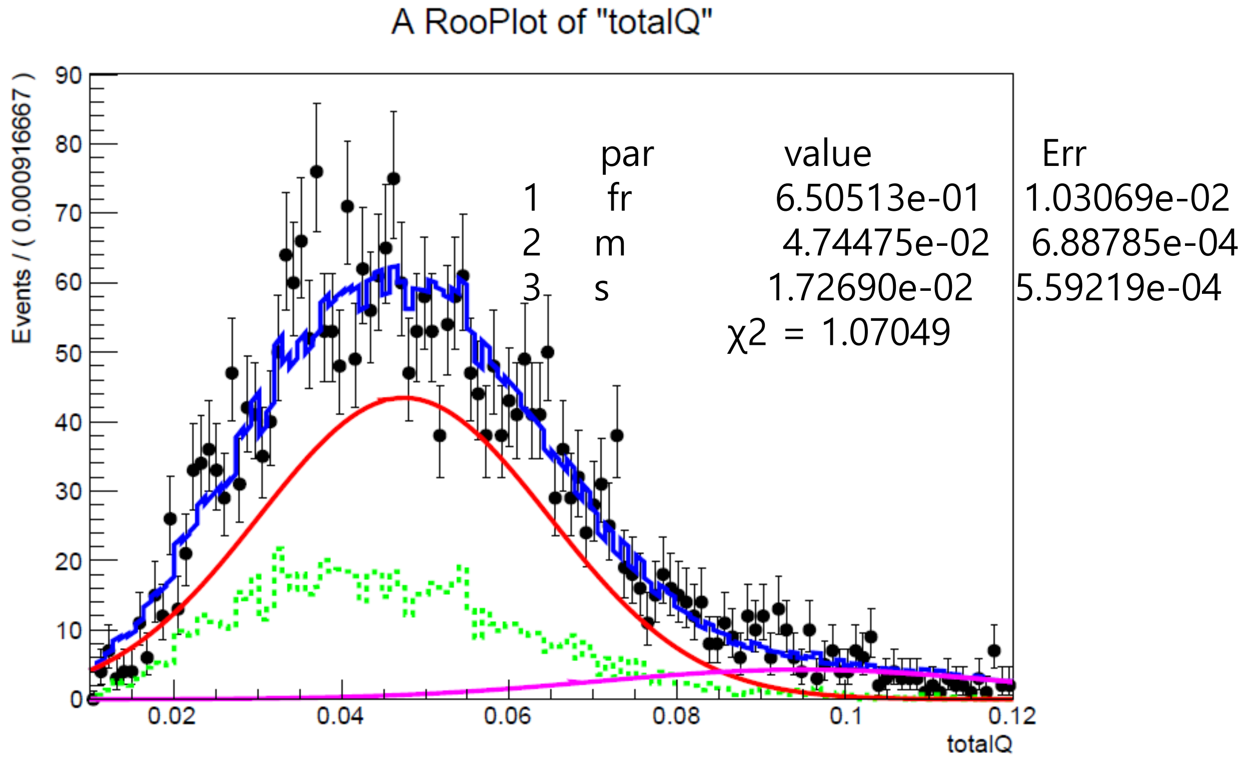


- 90deg setup (left)
- Back to back setup (right)



PWO test in CERN (1800V)

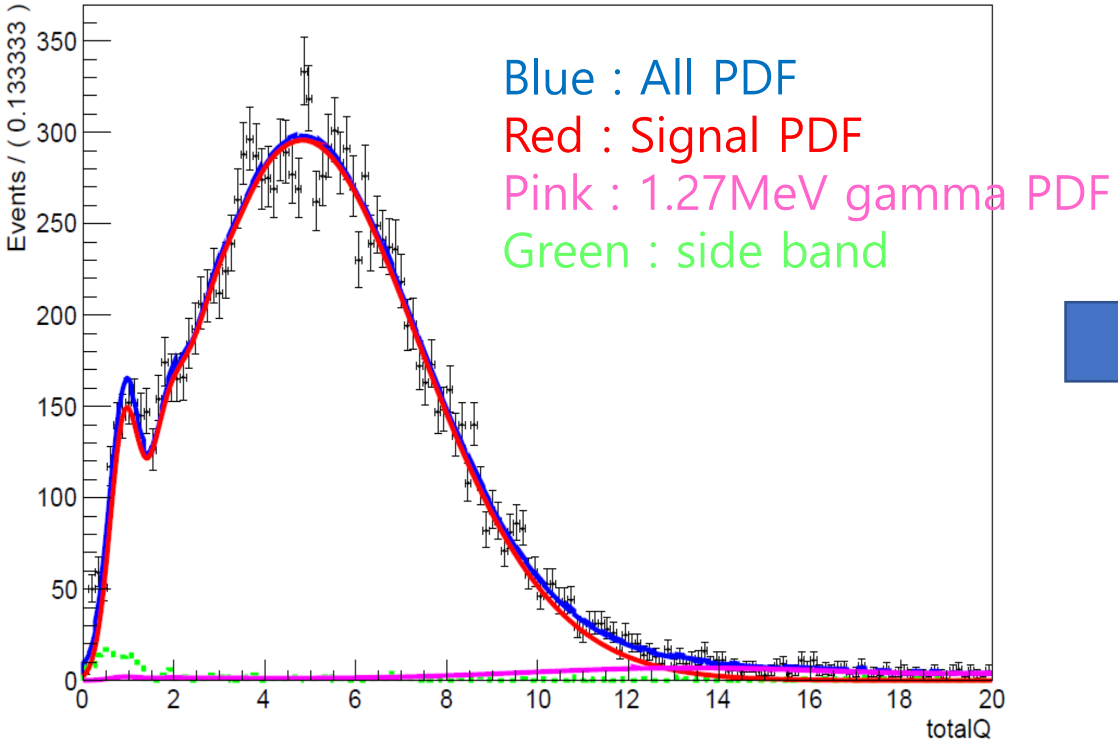




- Single p.e's total Q distribution
- 2300V(left), 1800V(right)

Fitting results (back to back)

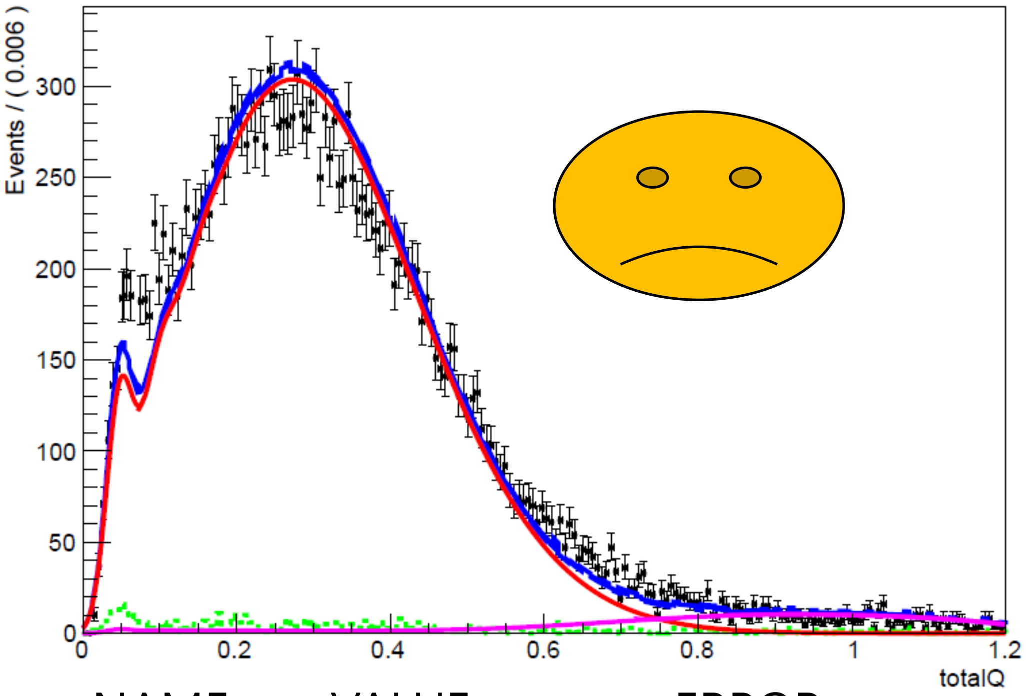
PWO Back to back (2300V)



NAME	VALUE	ERROR
a	6.25207e+00	3.00571e-02
fr12	3.51832e-02	2.44627e-03

$\chi 2$ = 9.542727e-01

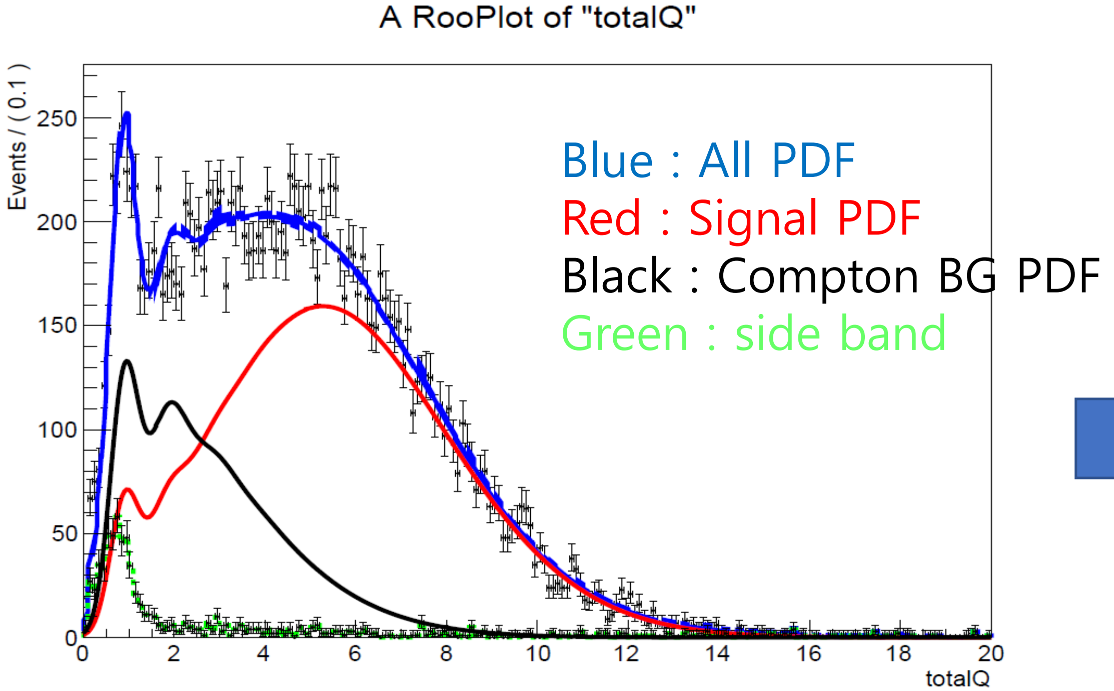
PWO Back to back (1800V)

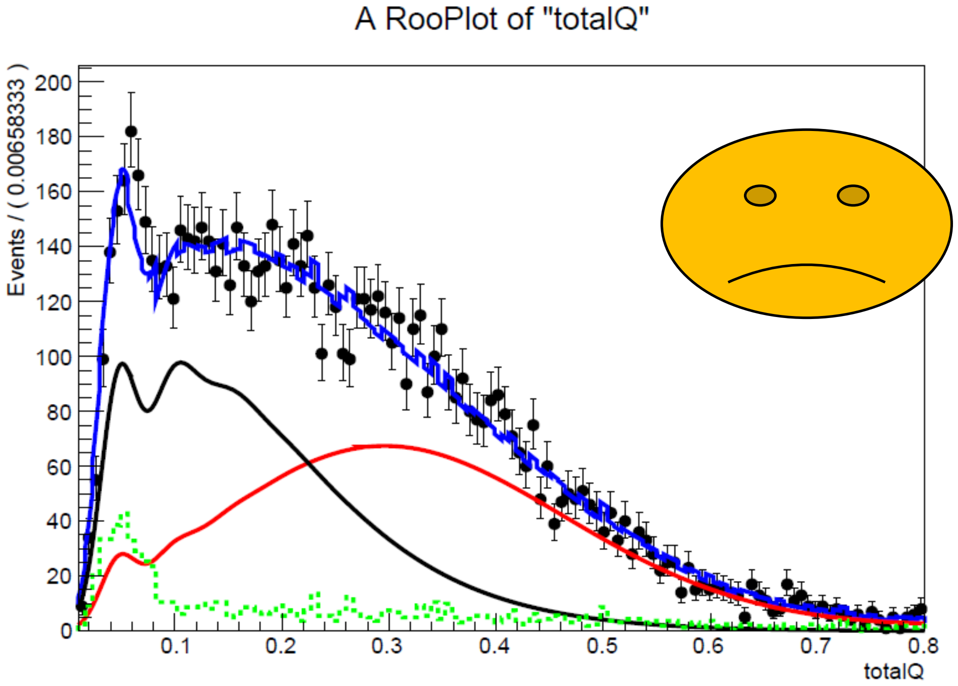


NAME	VALUE	ERROR
a	8.04096e+00	3.62184e-02
fr12	4.59403e-02	2.17213e-03

$\chi 2$ = 1.94685

Fitting results (10cm)





NAME	VALUE	ERROR
a	6.77117e+00	5.33251e-02
sf	6.73642e-01	1.21379e-02

- Efficiency = 8.422419e-01

$\chi 2$ = 1.190825e+00

NAME	VALUE	ERROR
a	8.72203e+00	1.63897e-01
ssf	4.85142e-01	2.69876e-02

- $\chi 2$ = 1.02291

So..

- Try to check simulation
- Take data with 2300V again in CERN.

Status at CERN

- Linac restarted from yesterday without problem.
- New linac part will come beginning of Febrary.

BACKUP

At last year

Data fitting

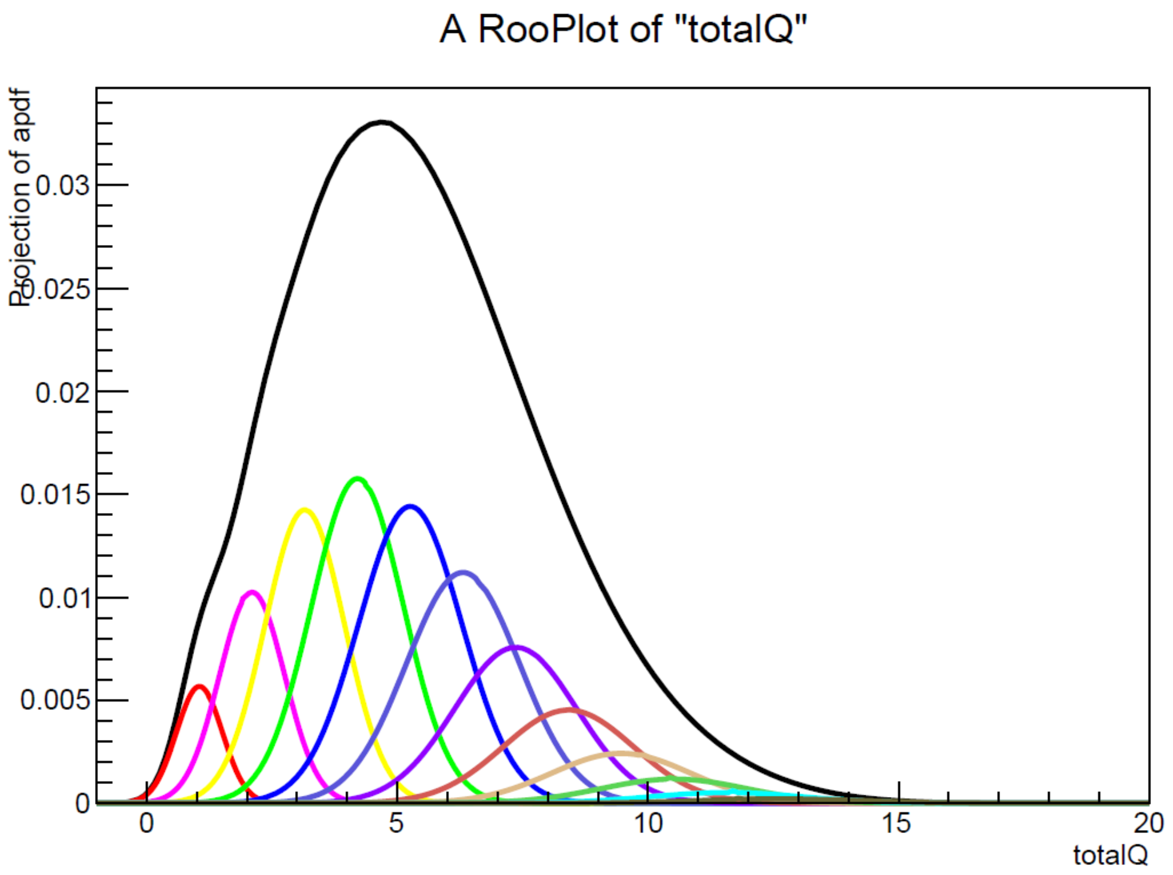
- Poisson distribution for p.e
- Gaussian distribution for PMT gain by fitting Gaussian to single p.e distribution.
- Photo-electron is discrete numbers and give each Gaussian distribution for # of photo-electrons.
- Give fraction to p.e by simulation result for signal and Compton BG.

At last year

Task : simulation with detector resolution

1. Fitting single photoelectron by Gaussian PDf and decide mean and sigma of total charge.
2. Then →$gaus_1(q,m,s)$, $gaus_2(q,2m,\sqrt{2}\sigma)$, $gaus_3(q,3m,\sqrt{3}\sigma)$
3. Giving weight to each gaussian by poisson distribution ($= {a^n e^{-a}}/{n!}$)
4. With assumption of linearity, making function for several ΔE (divided bin)
5. Fraction of each ΔE is decided by simulation
6. Fitting with real data by signal function + bg function.
7. Measure efficiency with real signal fraction and Compton BG estimation.

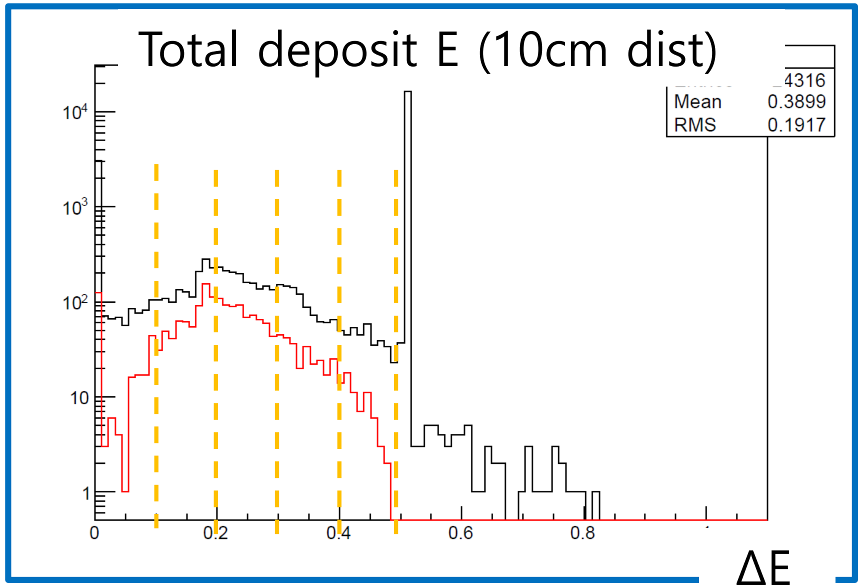
2&3 Gaussian with poisson weight

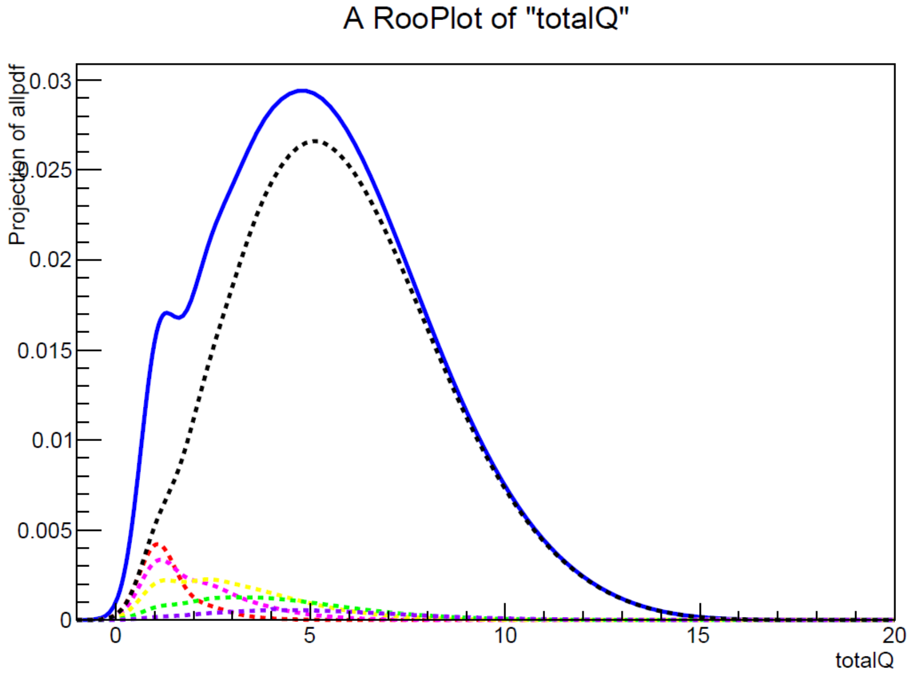


- $Poisson\ PDF = \frac{a^n e^{-a}}{n!}$ ← a : mean photoelectron number
- Left plot shows example at a = 5.11, from red line, each pdf shows single, double,…,12th photoelectron gaussian
- Weight by poisson PDF is given.

At last year

4&5. ΔE correction by simulation





- Back to back(no Compton), 10cm distance measurement(with Compton)
- At right plot (back to back case), each line shows each ΔE bin

: Red (0<ΔE<0.1), pink(0.1<ΔE<0.2), yellow(0.2<ΔE<0.3), green(0.3<ΔE<0.4), violet(0.4<ΔE<0.5), and black(>0.5(signal))