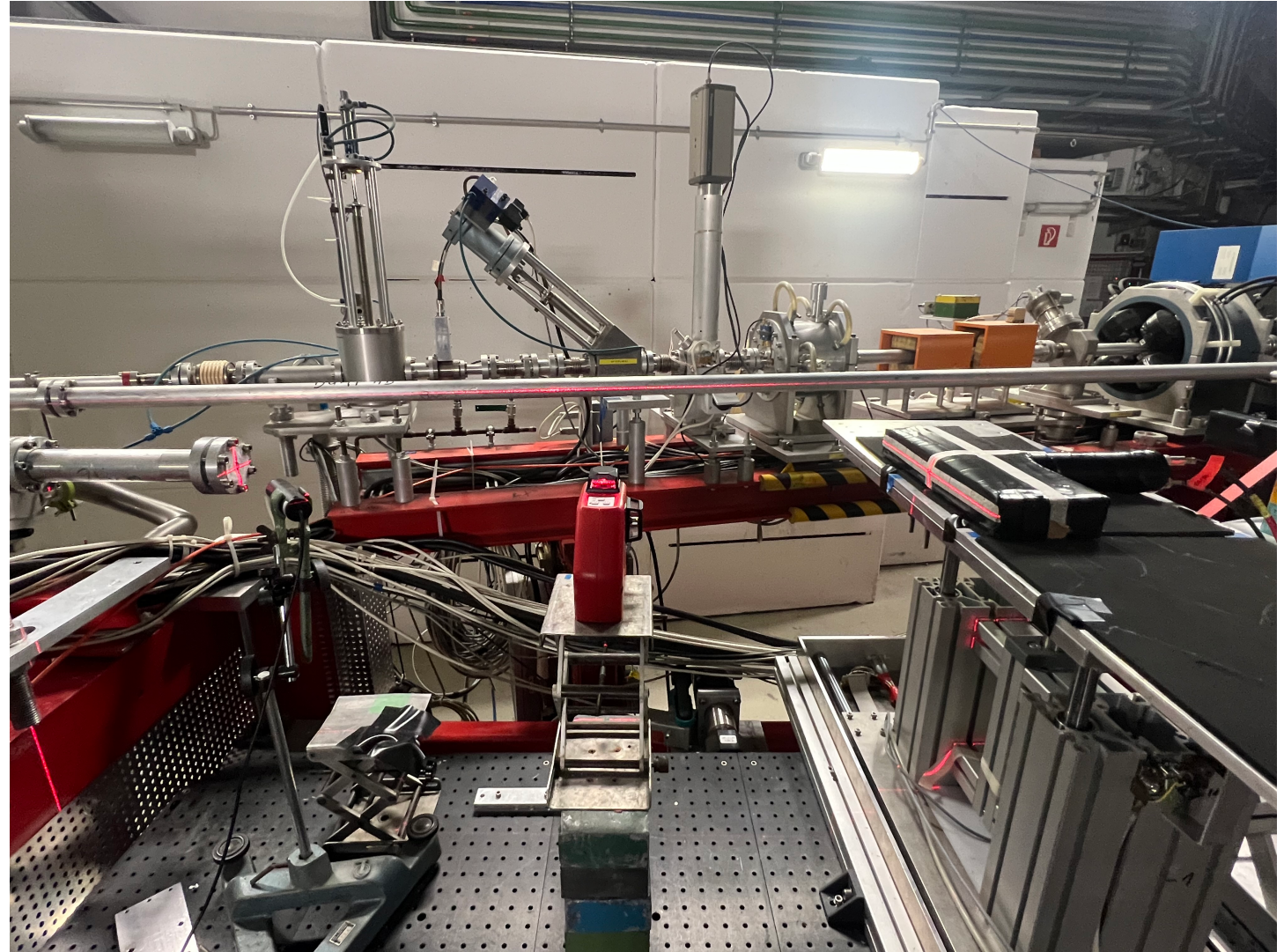
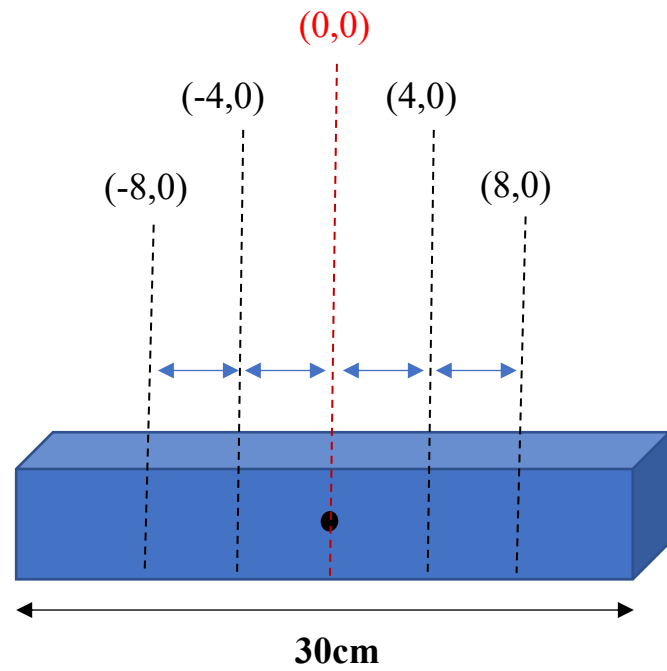
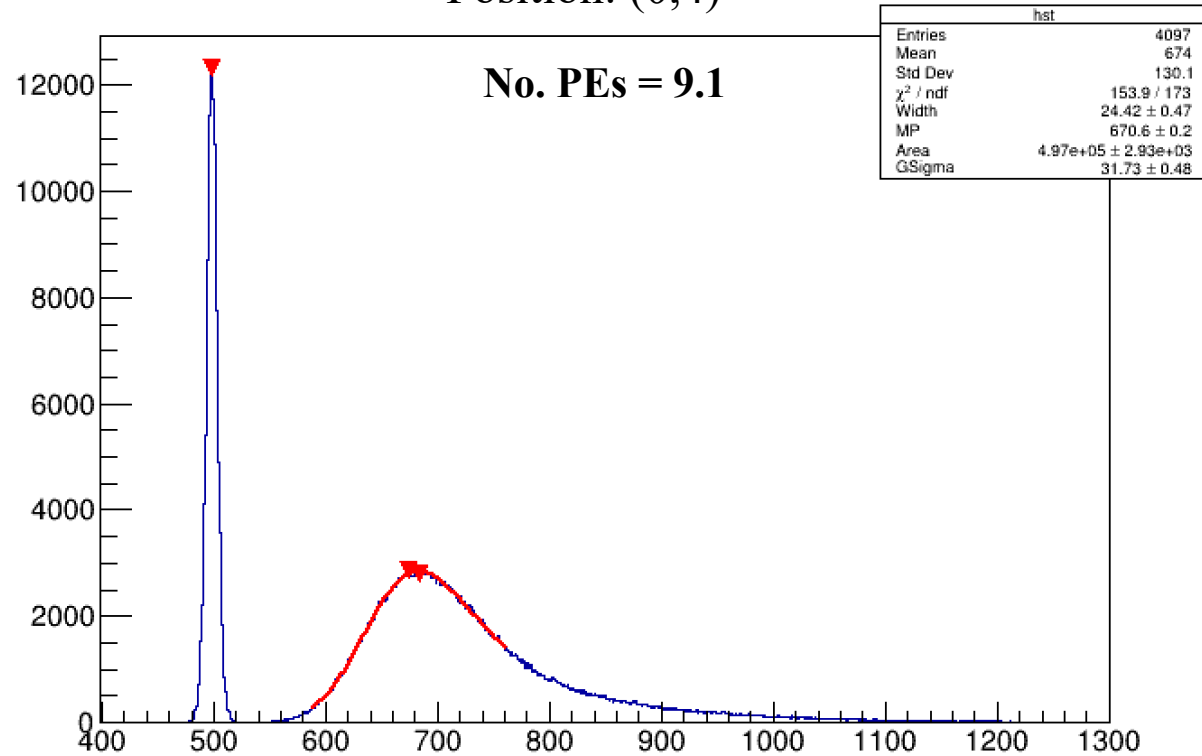


Data Analysis from beam test at Mainz

Configuration (1) – PMT is in the direction of the beam (scanning 4 points (not the center))



Position: (0,4)



Pedestal peak located at 498.5 height = 12314

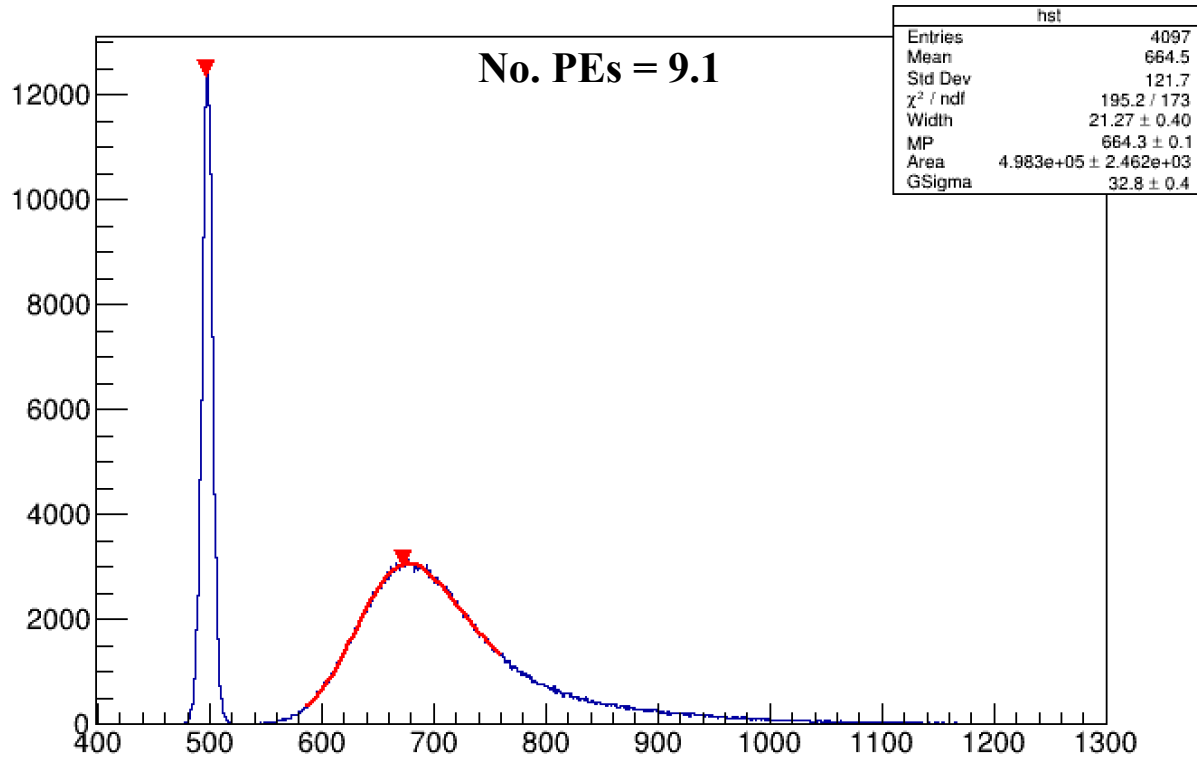
Event peak located at 674.5 height = 2852

Fitting...

FCN=153.877 FROM MIGRAD STATUS=CONVERGED 180 CALLS 181 TOTAL
EDM=2.01002e-07 STRATEGY= 1 ERROR MATRIX ACCURATE

EXT	PARAMETER			STEP	FIRST
NO.	NAME	VALUE	ERROR	SIZE	DERIVATIVE
1	Width	2.44240e+01	4.67938e-01	4.28354e-06	-7.71555e-01
2	MP	6.70615e+02	1.52940e-01	3.78443e-06	-3.62740e-01
3	Area	4.96972e+05	2.92547e+03	3.66448e-06	-7.88999e-01
4	GSigma	3.17267e+01	4.79902e-01	1.51515e-05	1.16719e-01

Position: (0,8)



Pedestal peak located at 497.5 height = 12484

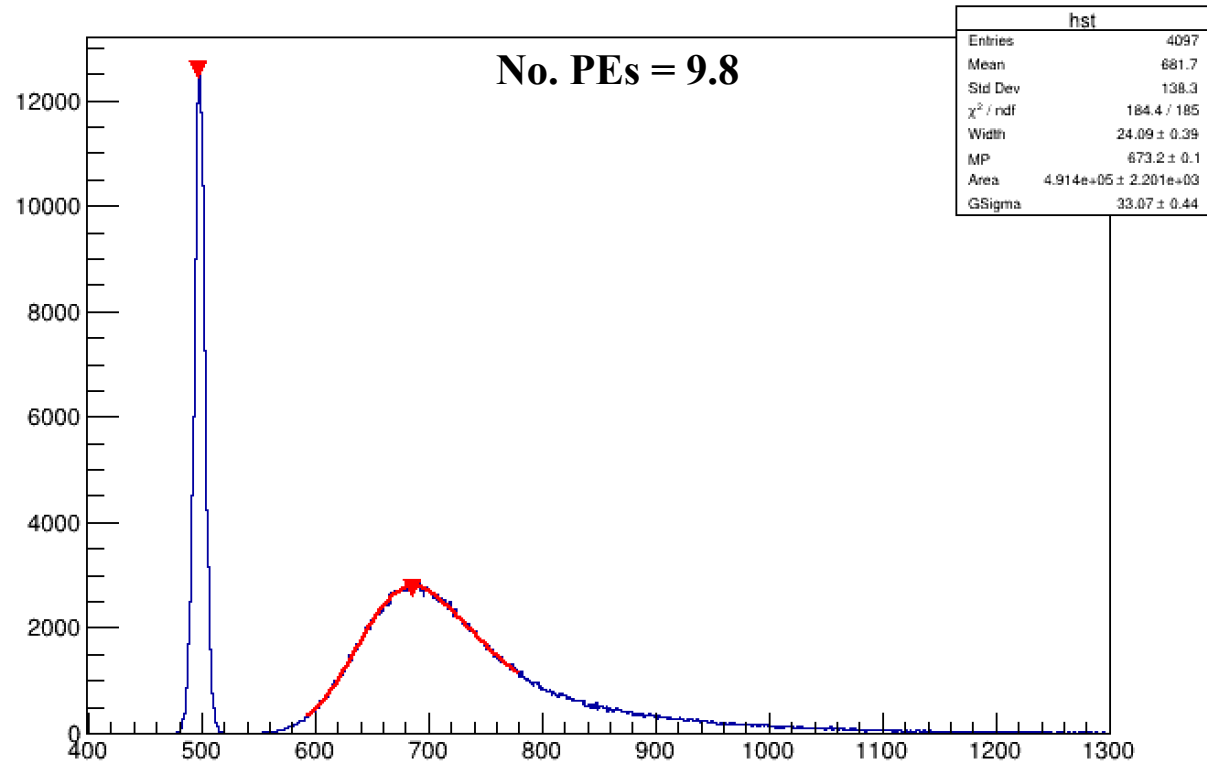
Event peak located at 673.5 height = 3150

Fitting...

FCN=195.194 FROM MIGRAD STATUS=CONVERGED 182 CALLS 183 TOTAL
EDM=1.64885e-08 STRATEGY= 1 ERROR MATRIX ACCURATE

EXT	PARAMETER			STEP	FIRST
NO.	NAME	VALUE	ERROR	SIZE	DERIVATIVE
1	Width	2.12705e+01	3.97741e-01	5.04448e-06	2.00828e-01
2	MP	6.64336e+02	1.15241e-01	4.04209e-06	-4.80158e-02
3	Area	4.98326e+05	2.46177e+03	3.81464e-06	-2.28045e-01
4	GSigma	3.28021e+01	4.12048e-01	1.50059e-05	-6.23224e-02

Position: (0,-4))



Pedestal peak located at 497.5 height = 12574

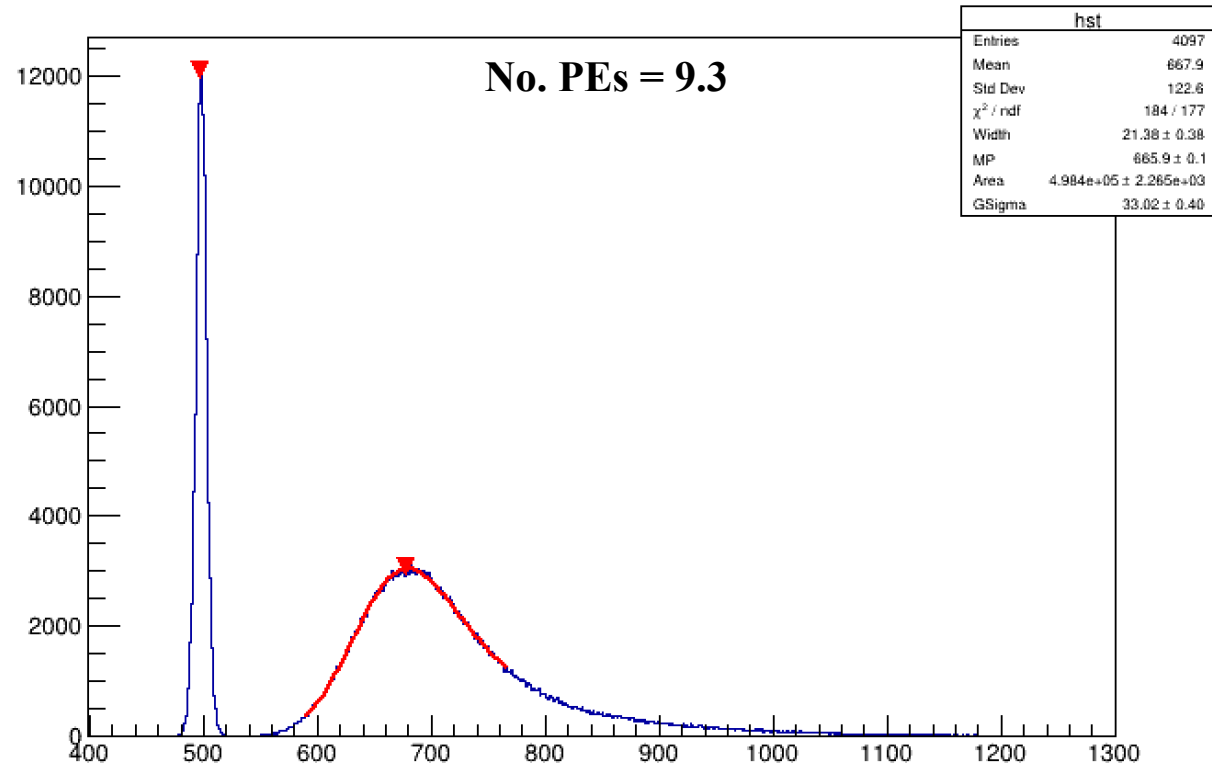
Event peak located at 686.5 height = 2734

Fitting...

FCN=184.351 FROM MIGRAD STATUS=CONVERGED 159 CALLS 160 TOTAL
EDM=9.42913e-08 STRATEGY= 1 ERROR MATRIX ACCURATE

EXT	PARAMETER			STEP	FIRST
NO.	NAME	VALUE	ERROR	SIZE	DERIVATIVE
1	Width	2.40870e+01	3.89661e-01	4.74170e-06	-2.98625e-01
2	MP	6.73155e+02	1.26554e-01	3.96273e-06	5.24916e-01
3	Area	4.91372e+05	2.20143e+03	3.84627e-06	-1.48009e-01
4	GSigma	3.30692e+01	4.43076e-01	1.73148e-05	-1.31247e-01

Position: (0,-8))



Pedestal peak located at 497.5 height = 12099

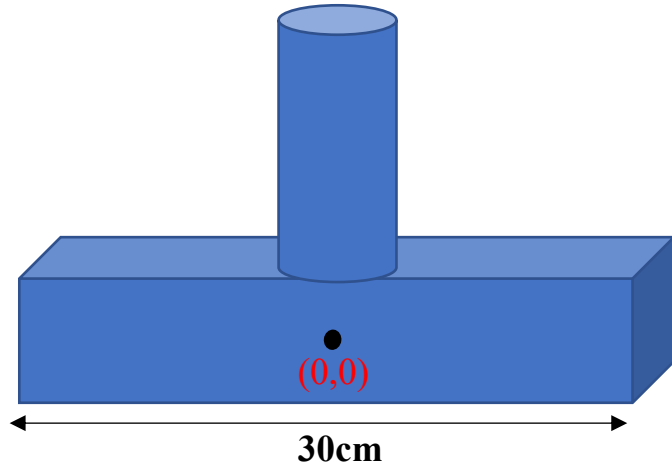
Event peak located at 677.5 height = 3071

Fitting...

FCN=184.017 FROM MIGRAD STATUS=CONVERGED 188 CALLS 189 TOTAL
EDM=4.18274e-08 STRATEGY= 1 ERROR MATRIX ACCURATE

EXT	PARAMETER			STEP	FIRST
NO.	NAME	VALUE	ERROR	SIZE	DERIVATIVE
1	Width	2.13807e+01	3.75285e-01	4.86012e-06	2.14615e-01
2	MP	6.65902e+02	1.13600e-01	3.85936e-06	3.22547e-01
3	Area	4.98426e+05	2.26529e+03	3.68640e-06	-4.14342e-01
4	GSigma	3.30195e+01	4.02166e-01	1.48024e-05	2.68716e-02

Configuration (2) – PMT is perpendicular to the direction of the beam (scanning in both horizontal and vertical directions)



$(0,0)$

$(2.5,0)$ $(-2.5,0)$

$(5,0)$ $(-5,0)$

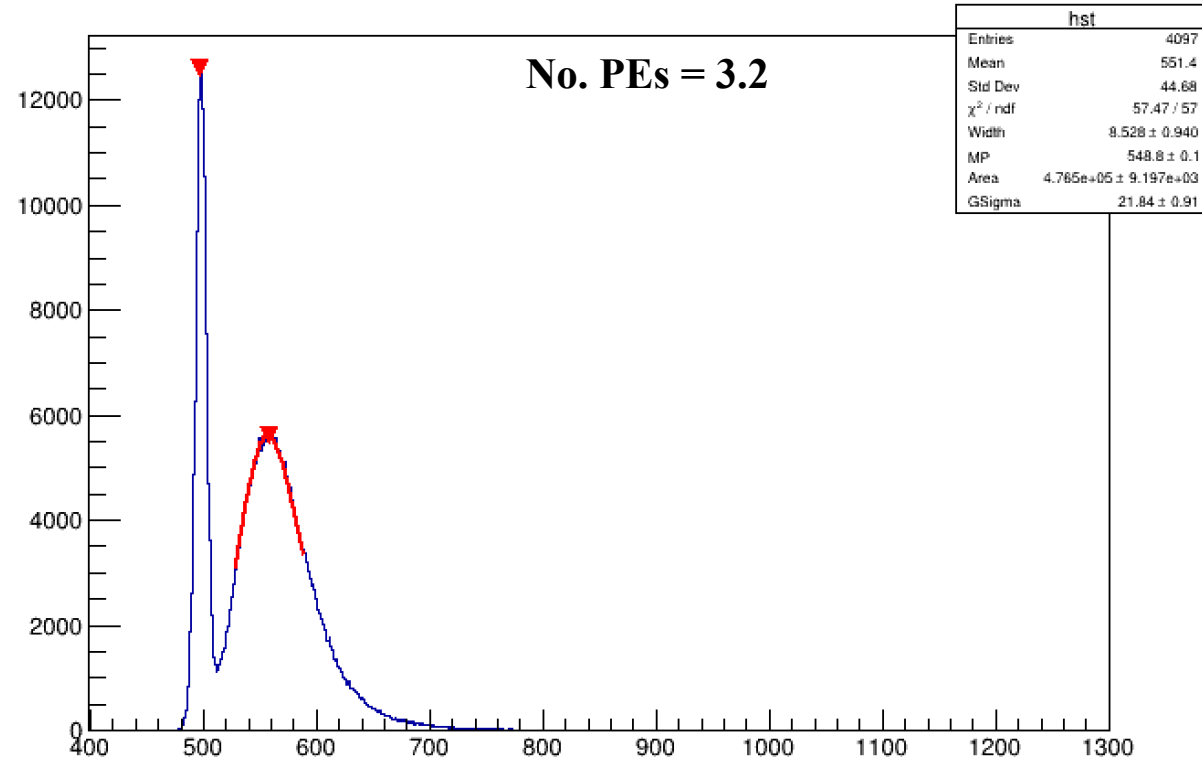
$(7.5,0)$ $(-7.5,0)$

$(10,0)$ $(-10,0)$

$(0, 2.5)$ $(0,-2.5)$



Position: (0,0)



Pedestal peak located at 497.5 height = 12602

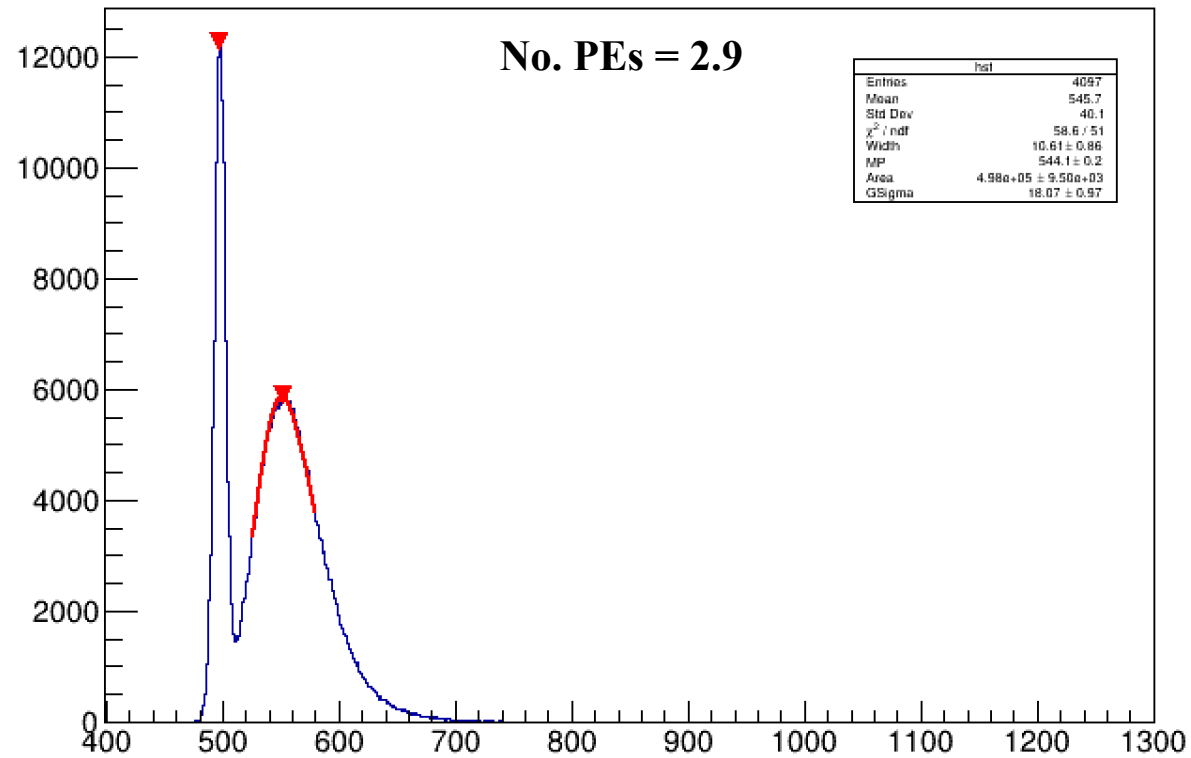
Event peak located at 558.5 height = 5614

Fitting...

FCN=57.4671 FROM MIGRAD STATUS=CONVERGED 389 CALLS 390 TOTAL
EDM=4.16178e-07 STRATEGY= 1 ERROR MATRIX ACCURATE

EXT	PARAMETER			STEP	FIRST
NO.	NAME	VALUE	ERROR	SIZE	DERIVATIVE
1	Width	8.52835e+00	9.39607e-01	4.23483e-06	-1.26774e-01
2	MP	5.48791e+02	1.35664e-01	5.86068e-06	-4.69268e-01
3	Area	4.76546e+05	9.19664e+03	2.91228e-06	-1.82641e-01
4	GSigma	2.18416e+01	9.08184e-01	9.14166e-06	6.95402e-02

Position: (2.5,0)



Pedestal peak located at 497.5 height = 12262

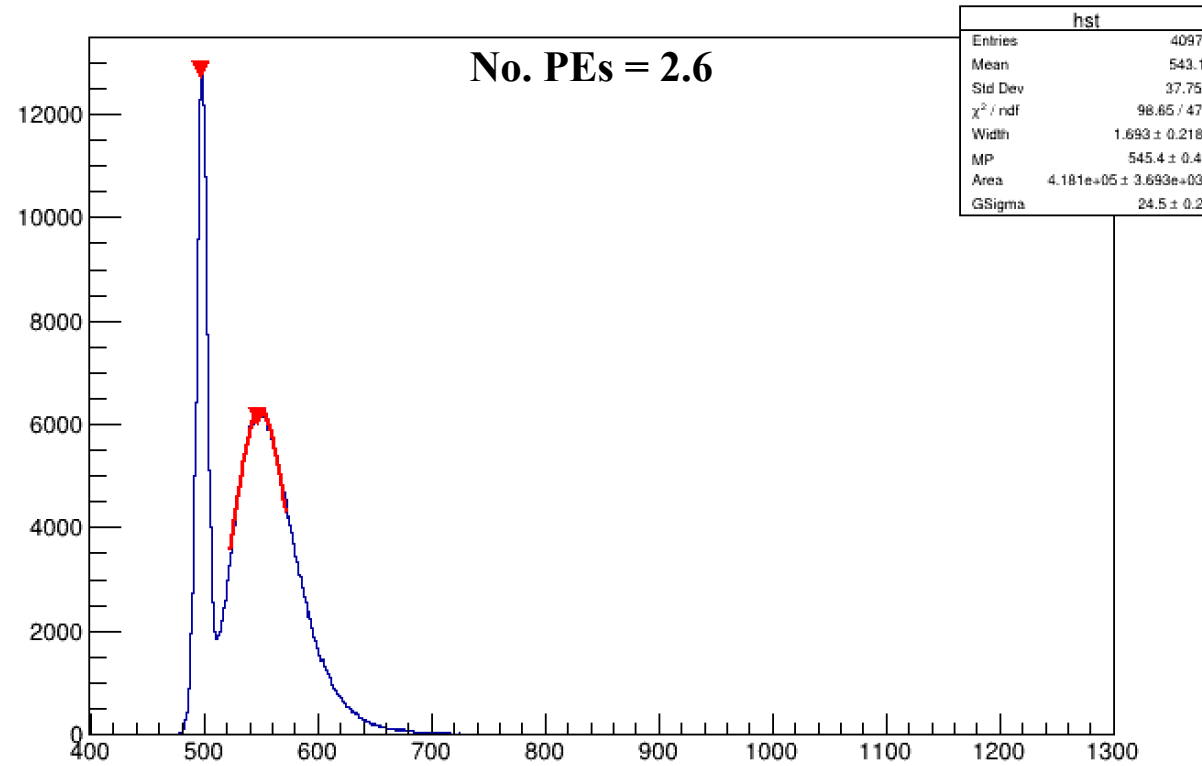
Event peak located at 552.5 height = 5882

Fitting...

FCN=58.5999 FROM MIGRAD STATUS=CONVERGED 390 CALLS 391 TOTAL
EDM=1.43742e-09 STRATEGY= 1 ERROR MATRIX ACCURATE

EXT	PARAMETER			STEP	FIRST
NO.	NAME	VALUE	ERROR	SIZE	DERIVATIVE
1	Width	1.06145e+01	8.62888e-01	3.85252e-06	-1.42708e-02
2	MP	5.44086e+02	2.25221e-01	6.51027e-06	1.38298e-02
3	Area	4.98026e+05	9.49747e+03	3.17828e-06	-3.10771e-02
4	GSigma	1.80750e+01	9.66244e-01	1.16275e-05	2.71734e-03

Position: (5,0)



Pedestal peak located at 497.5 height = 12849

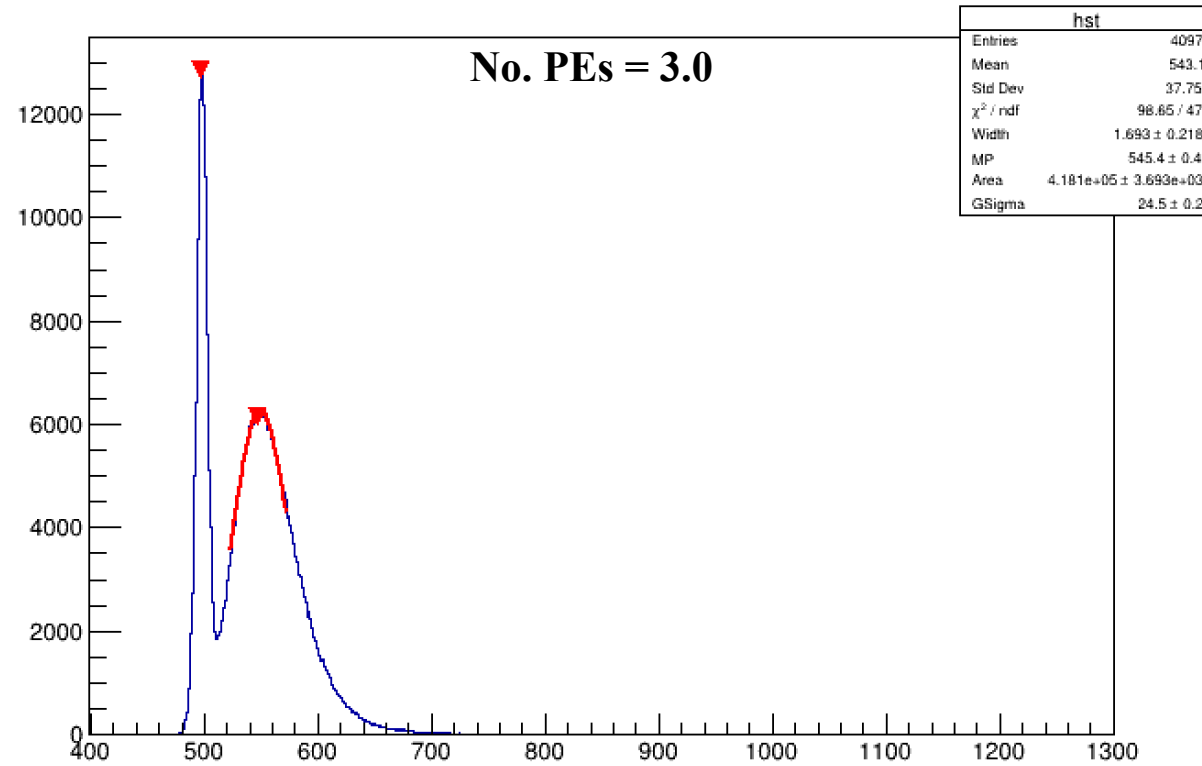
Event peak located at 547.5 height = 6158

Fitting...

FCN=98.6538 FROM MIGRAD STATUS=CONVERGED 186 CALLS 187 TOTAL
EDM=5.42077e-08 STRATEGY= 1 ERROR MATRIX ACCURATE

EXT	PARAMETER			STEP	FIRST
NO.	NAME	VALUE	ERROR	SIZE	DERIVATIVE
1	Width	1.69274e+00	2.17566e-01	1.05506e-05	4.15549e-03
2	MP	5.45353e+02	3.57224e-01	8.76572e-06	-6.97303e-03
3	Area	4.18131e+05	3.69301e+03	3.84650e-06	-5.30622e-02
4	GSigma	2.45049e+01	1.92882e-01	8.86493e-06	5.64231e-02

Position: (0, 2.5)



Pedestal peak located at 497.5 height = 12600

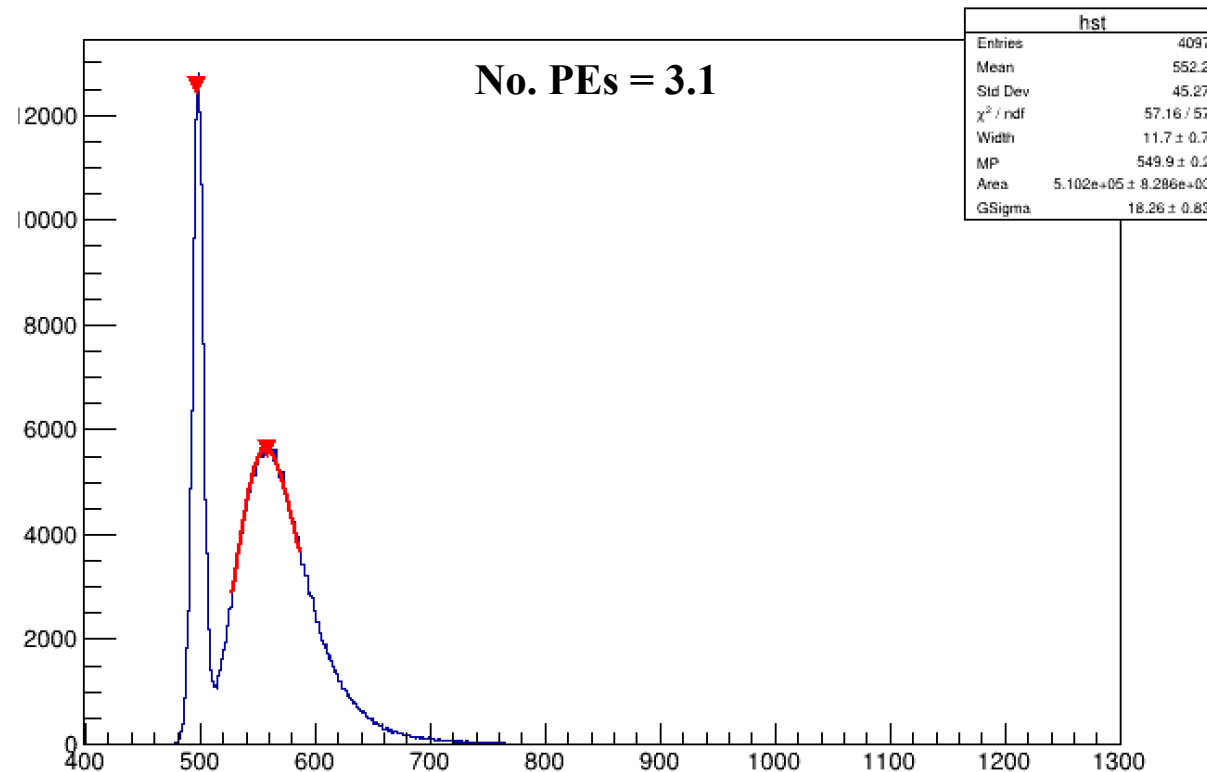
Event peak located at 555.5 height = 5948

Fitting...

FCN=103.648 FROM MIGRAD STATUS=CONVERGED 193 CALLS 194 TOTAL
EDM=8.50997e-07 STRATEGY= 1 ERROR MATRIX ACCURATE

EXT NO.	PARAMETER NAME	VALUE	ERROR	STEP SIZE	FIRST DERIVATIVE
1	Width	1.87626e+00	1.30619e-01	1.01323e-05	-2.06226e-01
2	MP	5.51653e+02	2.15681e-01	7.54005e-06	1.82552e-01
3	Area	4.20307e+05	2.13589e+03	3.61129e-06	-1.08757e+00
4	GSigma	2.62107e+01	1.78254e-01	8.69821e-06	2.98652e-01

Position: (0, -2.5)



Pedestal peak located at 497.5 height = 12547

Event peak located at 557.5 height = 5638

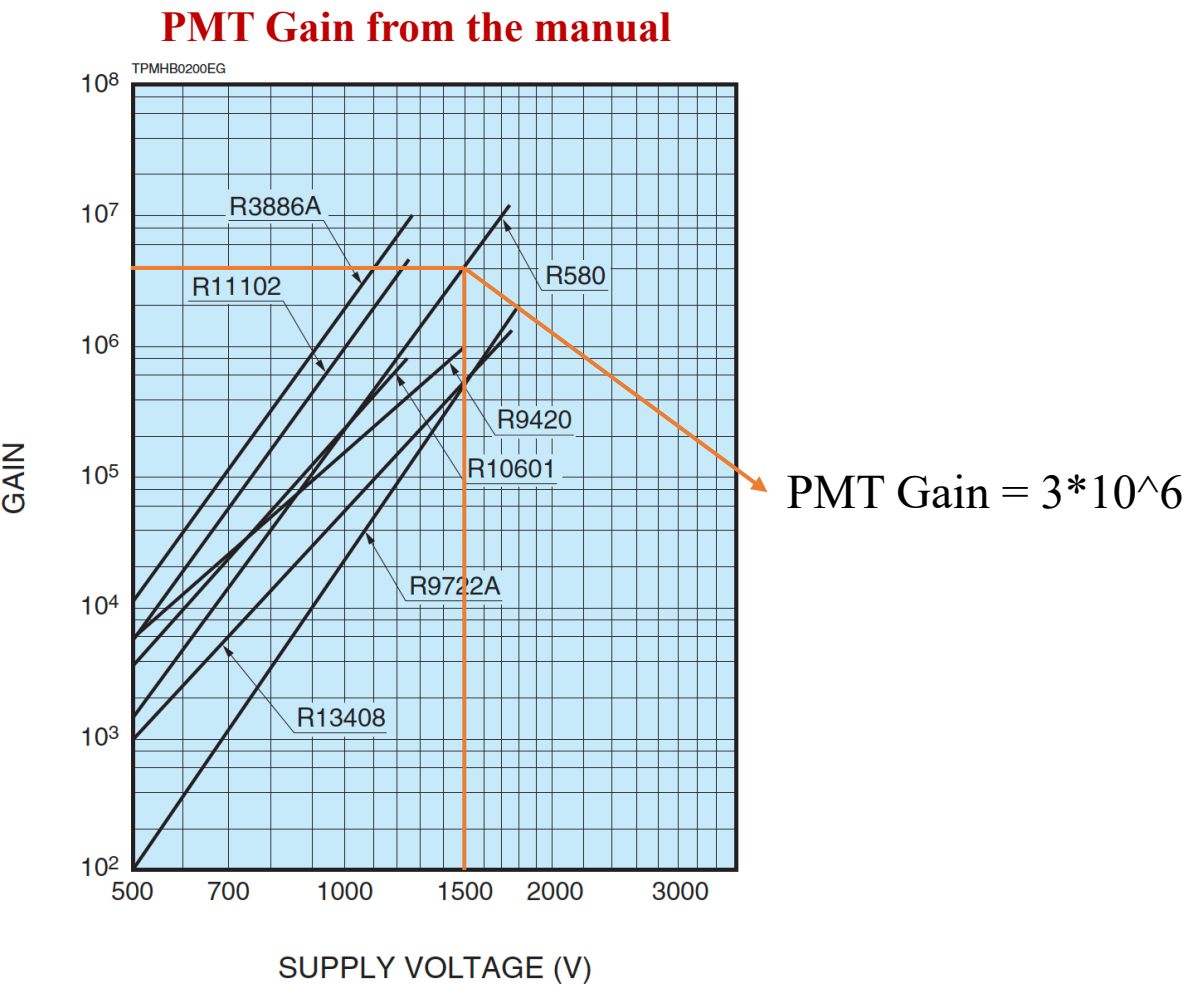
Fitting...

FCN=57.1611 FROM MIGRAD STATUS=CONVERGED 421 CALLS 422 TOTAL
EDM=8.95359e-09 STRATEGY= 1 ERROR MATRIX ACCURATE

EXT	PARAMETER			STEP	FIRST
NO.	NAME	VALUE	ERROR	SIZE	DERIVATIVE
1	Width	1.16956e+01	7.41624e-01	3.60357e-06	1.08774e-01
2	MP	5.49945e+02	2.15776e-01	5.57299e-06	-2.10533e-02
3	Area	5.10172e+05	8.28564e+03	3.02839e-06	1.13476e-01
4	GSigma	1.82573e+01	8.30888e-01	1.19101e-05	-3.83073e-02

The formula to calculate the number of photoelectrons

$$\frac{(\text{Mean value of the signal} - \text{mean value of the pedestal}(\text{number of ADC channels})) \times \text{ADC resolution} \times 10^{-15}}{(\text{PMT gain}) \times 1.6 \times 10^{-19}}$$



Experimental information

Channel	ch00
Run time	100 s
Rate	5 kHz
Scintillator voltage	1700 V
Lucite voltage	1500 V
ADC resolution	25 fC/channel
QCD model	V965

Beam properties

Stage	MAMI B 	MAMI C
Final Energy	855.1 MeV	1508 MeV
Circulations	90	43
Magnetic Field (deflecting magnets)	1.28 T	0.95 - 1.53 T
Mass (deflecting magnets)	2x450 t	4x250 t
Microwave Frequency	2.45 GHz	2.45 / 4.90 GHz
Microwave Power	102 kW	117 / 128 kW
Length (linear accelerator)	8.9 m	8.6 / 10.1 m
Size of the Alignment (L x W)	21 m x 10	30 m x 15 m

Comment: The size only relates to the area covered by the deflecting magnets.