

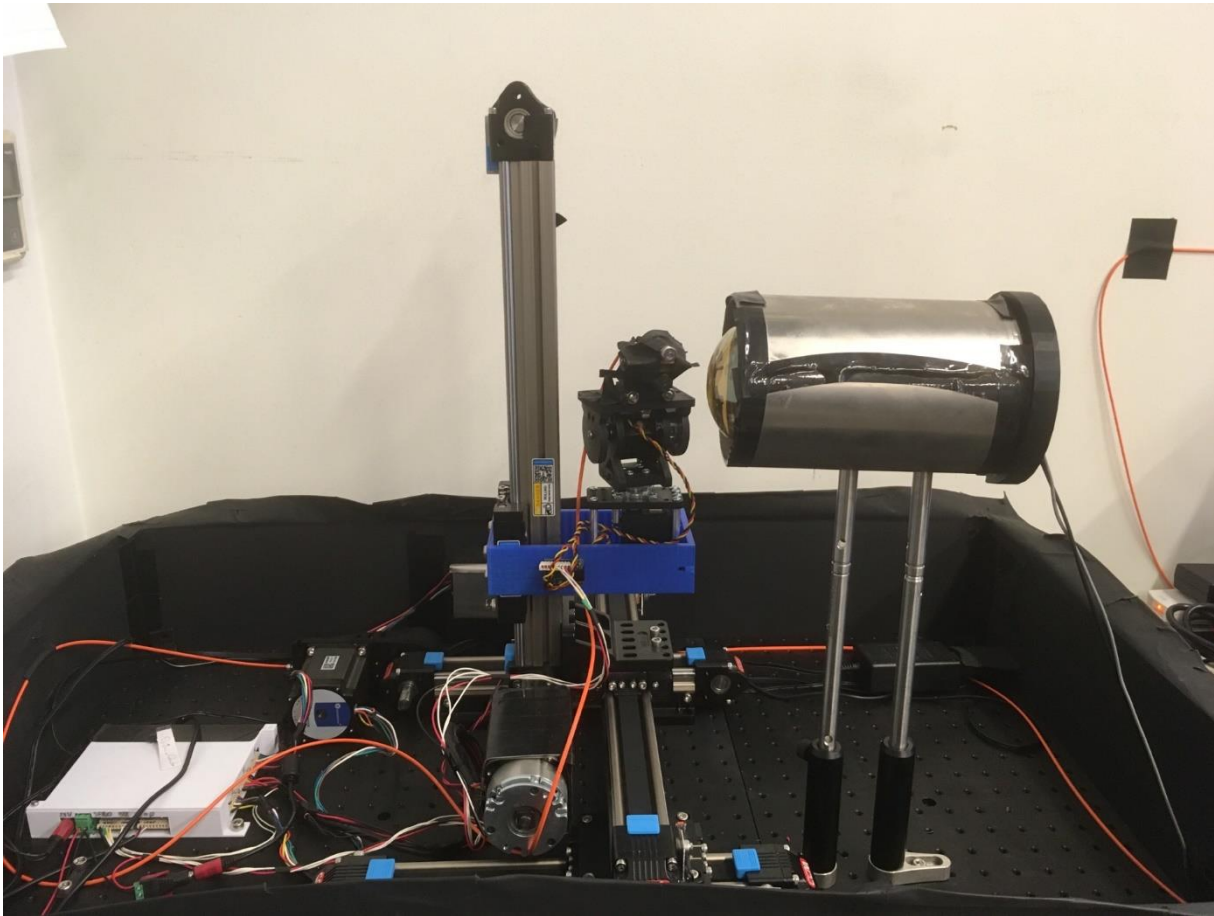
Status Update

04/05/2019

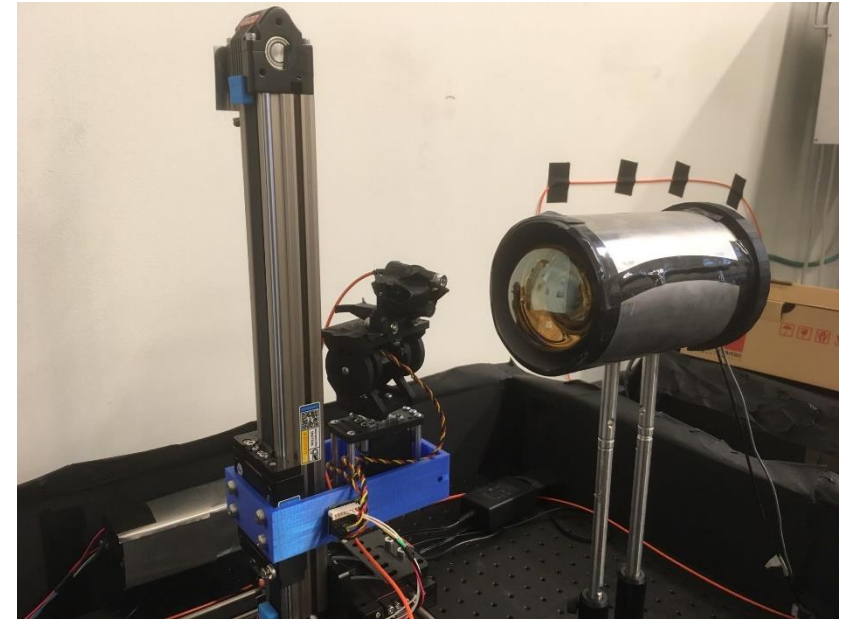
TUS Nao Izumi

More angle measurements

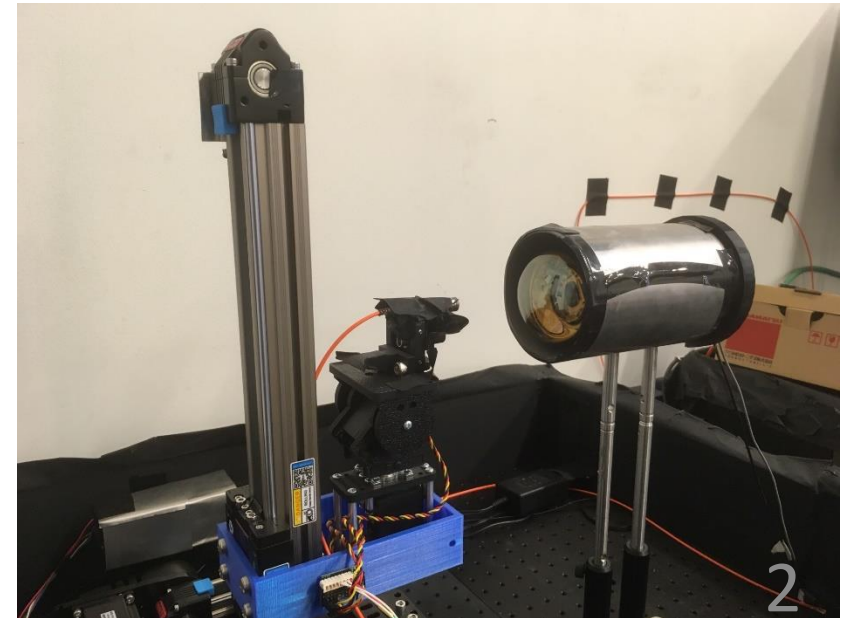
-75°



-75°

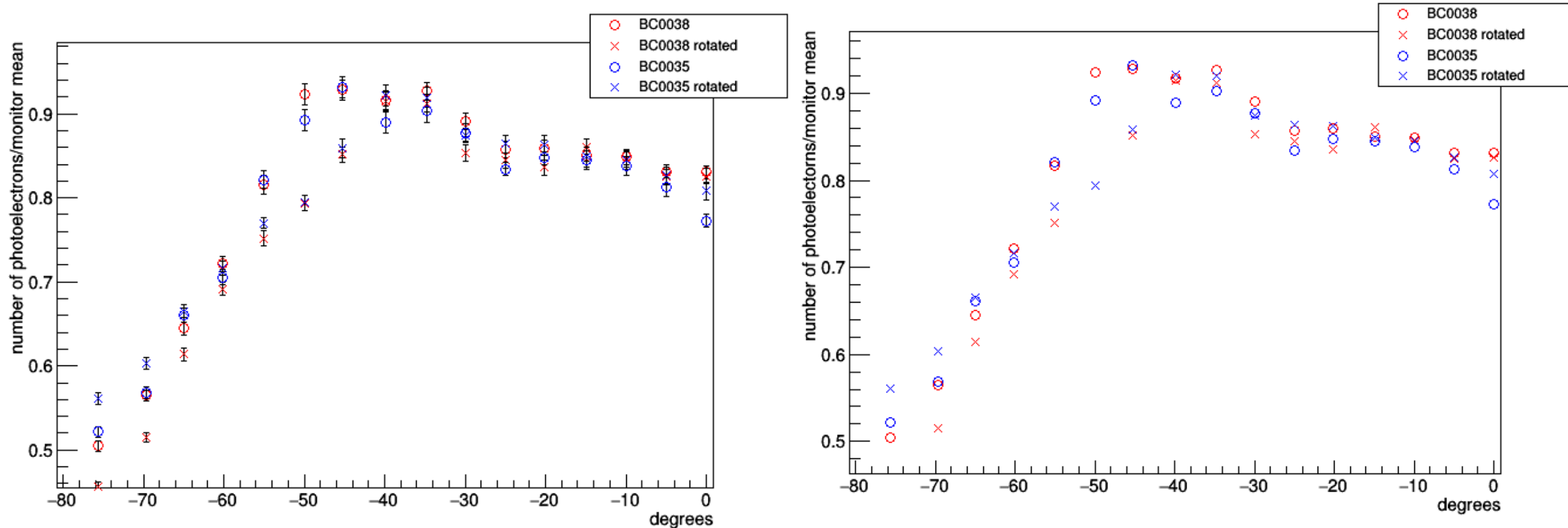


0°



Efficiency

The efficiency drops as the angle becomes larger.
To be specific, the efficiency drops rapidly at around -50 degrees.



Total reflection

GENERAL

Parameter		R12199	R14374	R14689	Unit
Spectral response		300 to 650			nm
Wavelength of maximum response		420			nm
Window material		Borosilicate glass			—
Photocathode	Material	Bialkali			—
	Minimum effective area	φ72	φ72	φ81	mm
Dynode	Structure	Circular and linear-focused			—
	Number of stages	10			—
Base		JEDEC No. B14-38			—
Operating ambient temperature		-30 to +50			°C
Storage temperature		-30 to +50			°C
Suitable socket		E678-14W (Sold separately)			—

MAXIMUM RATINGS (Absolute maximum values)

Parameter		R12199	R14374	R14689	Unit
Supply voltage	Between anode and cathode	1500			V
	Between anode and last dynode	300			V
Average anode current		0.1			mA

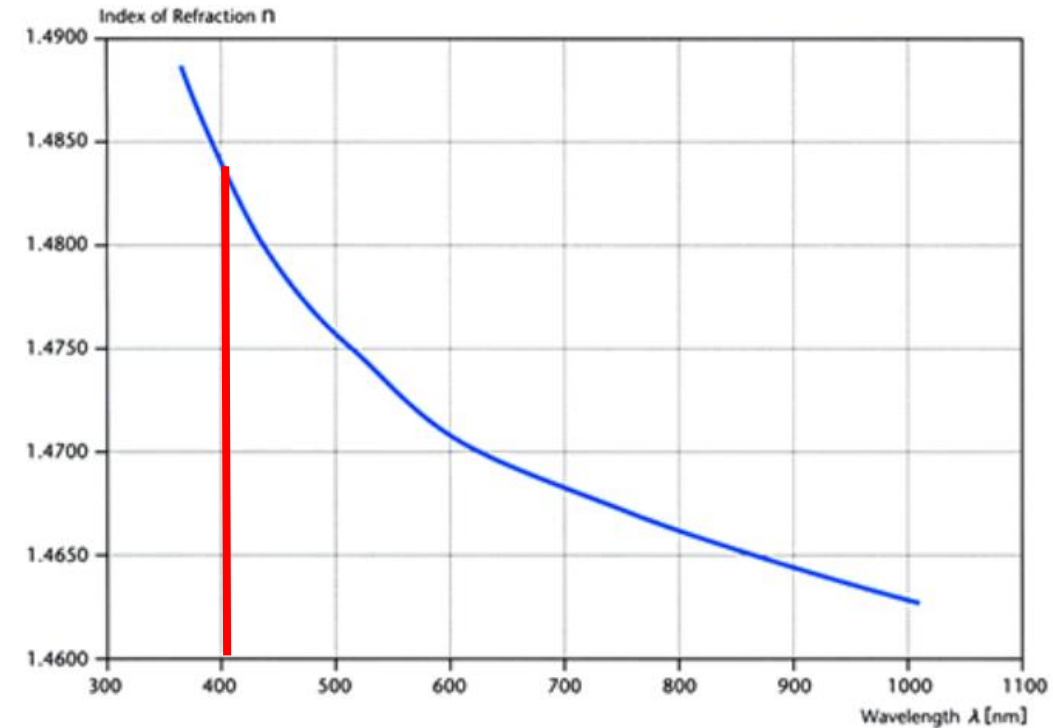
Wavelength of laser: 402 nm

Index of reflection: about 1.485

Critical angle α :

$$\sin \alpha = \frac{n_2}{n_1} = \frac{1}{1.485} \sim 0.6734$$

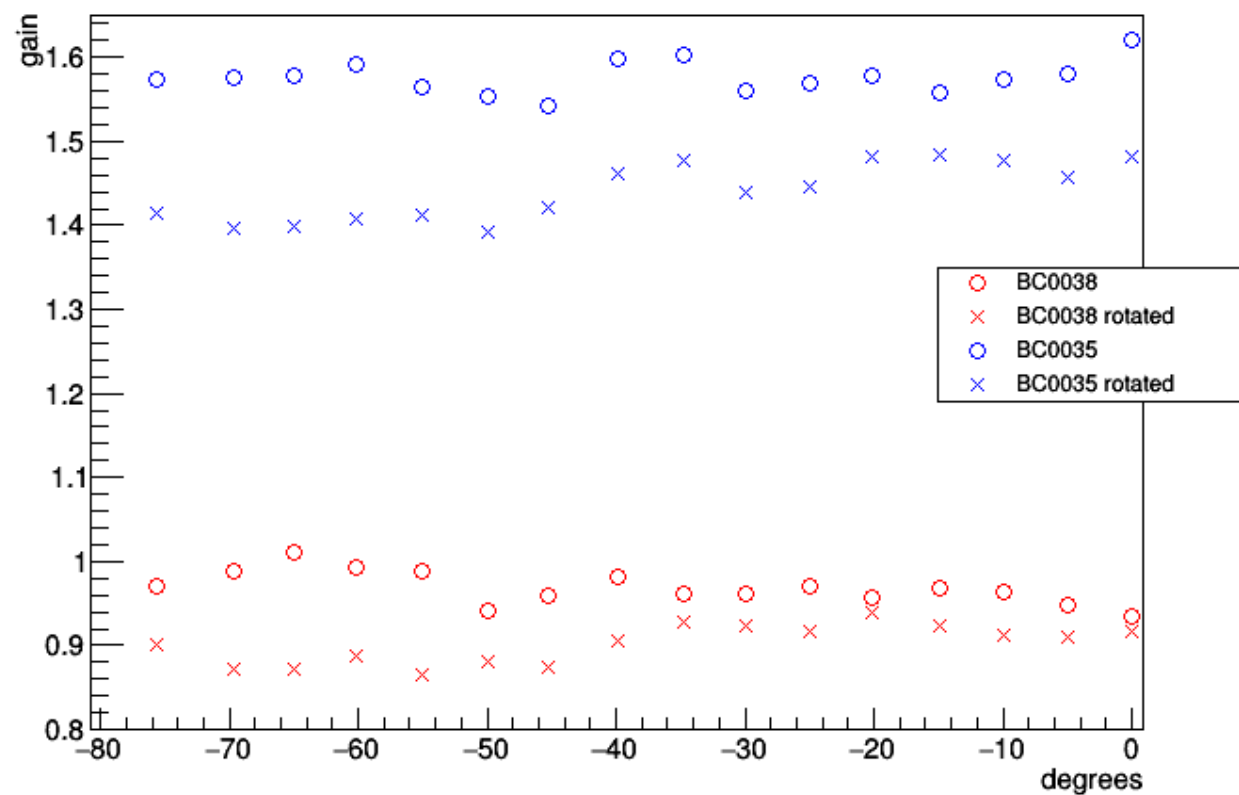
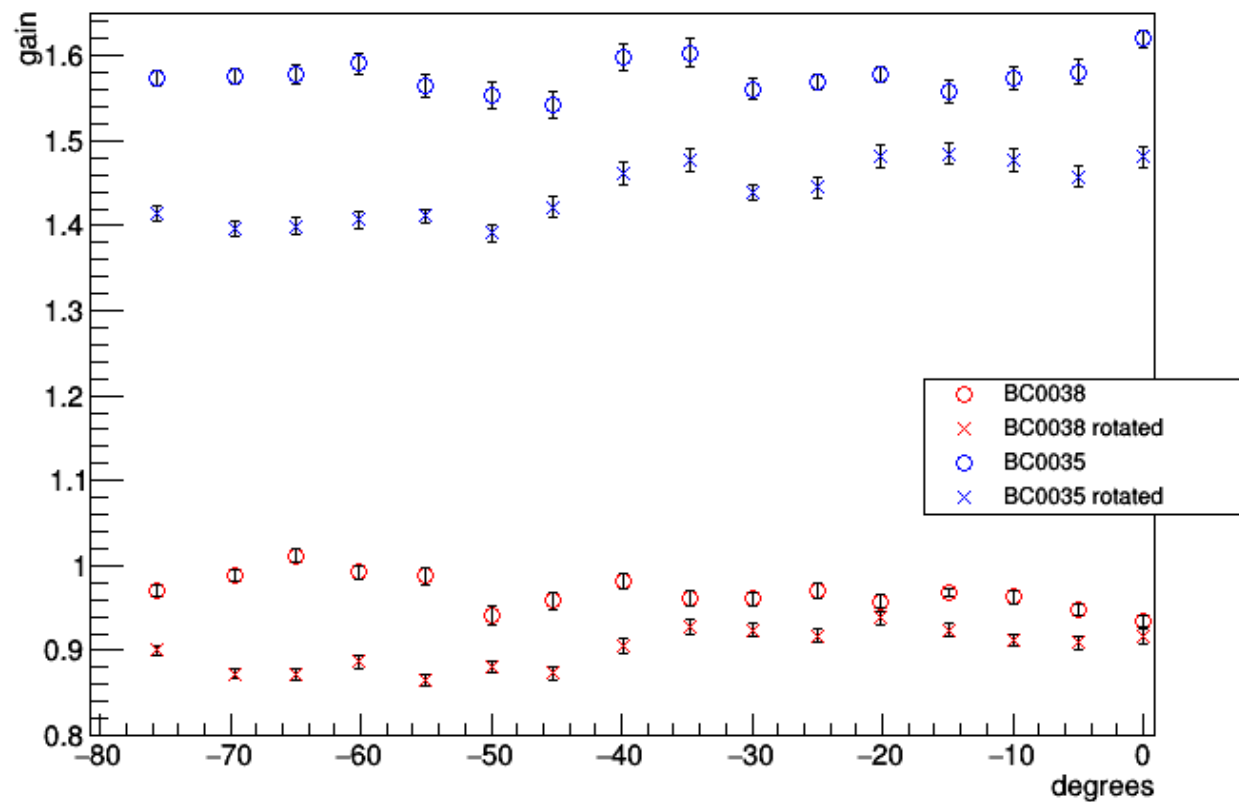
$$\alpha \sim 42.33^\circ$$

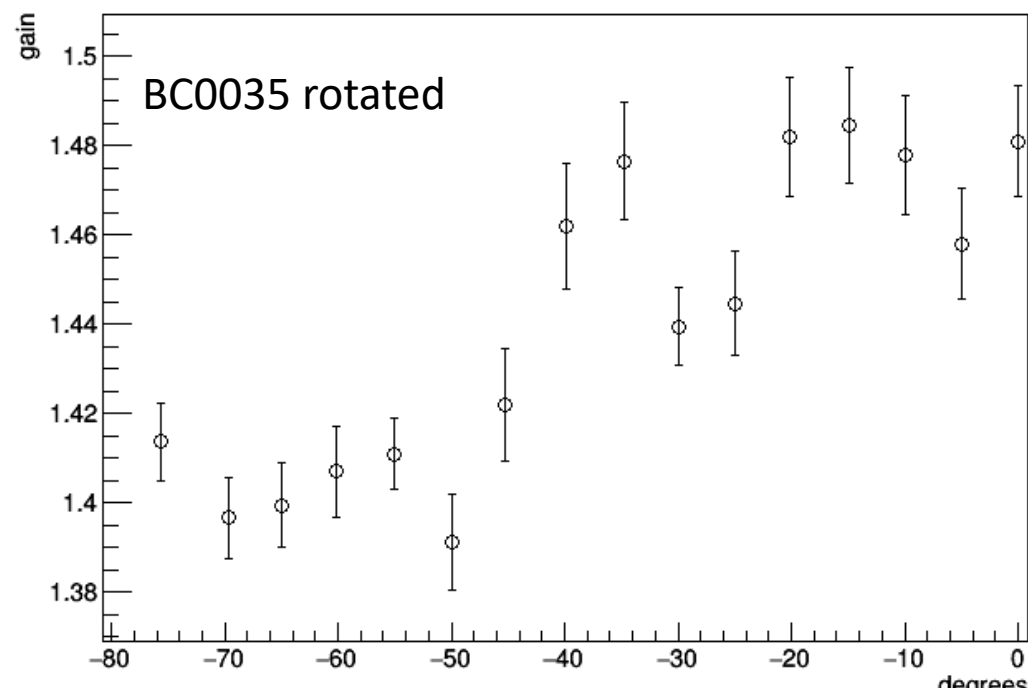
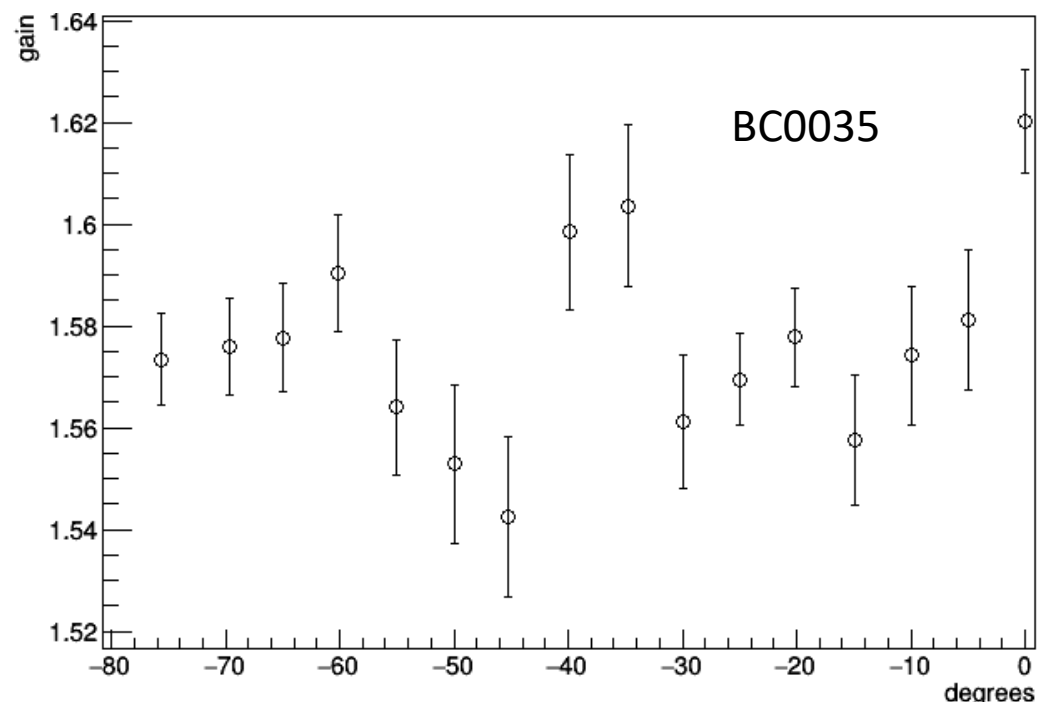
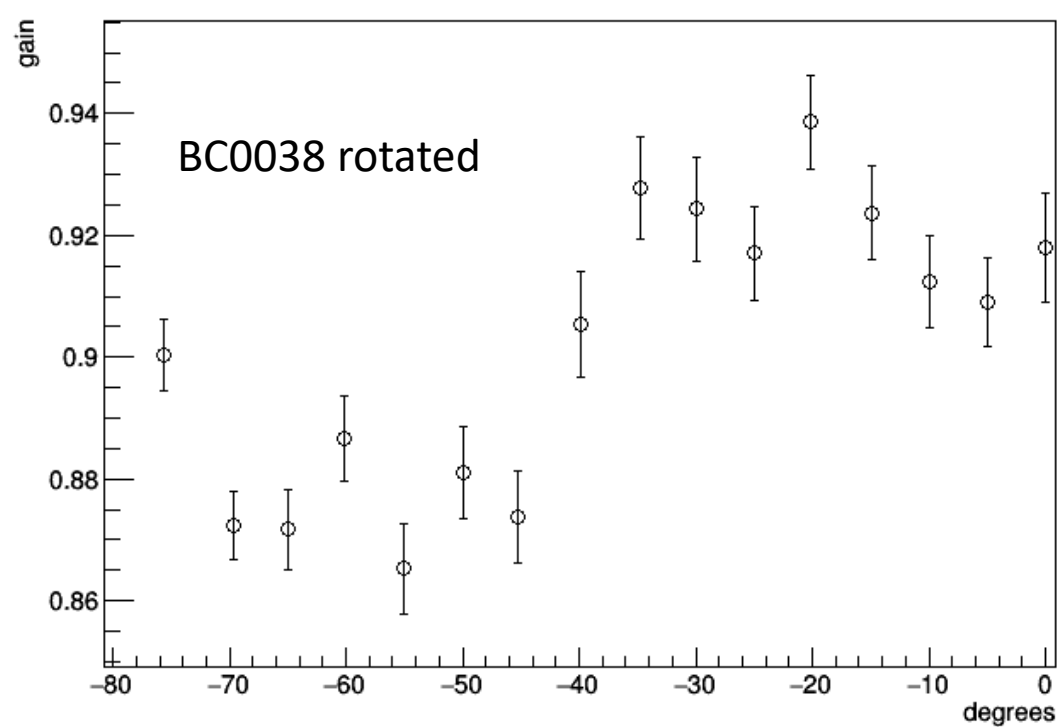
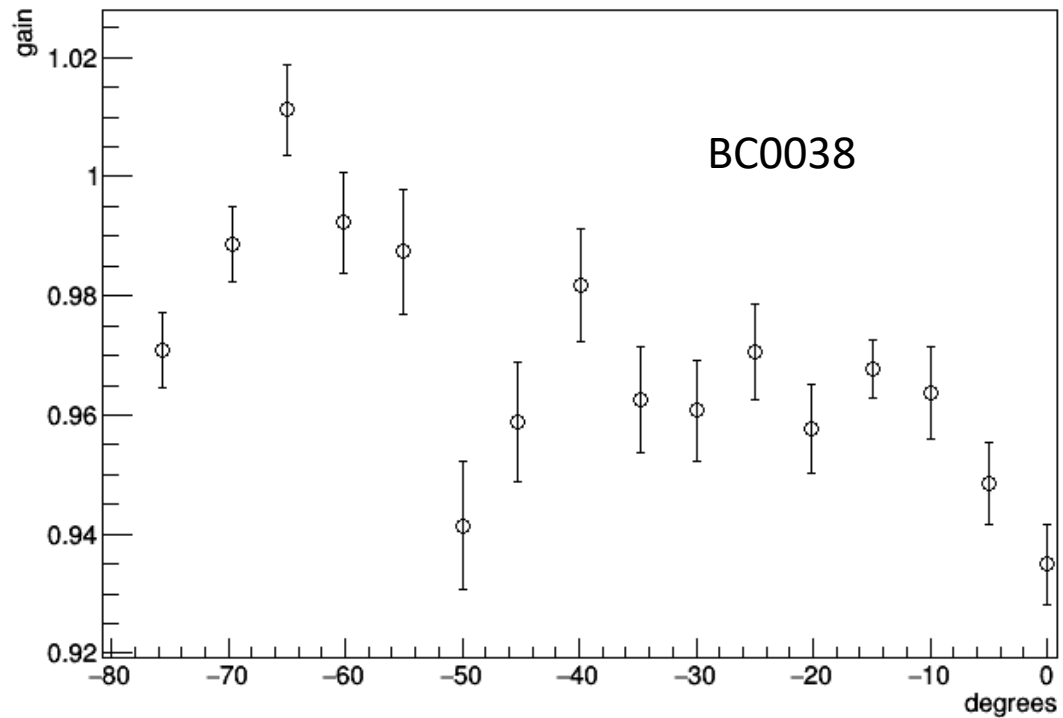


gain

Gain is fairly uniform.

BC0035 has larger gain than BC0038.



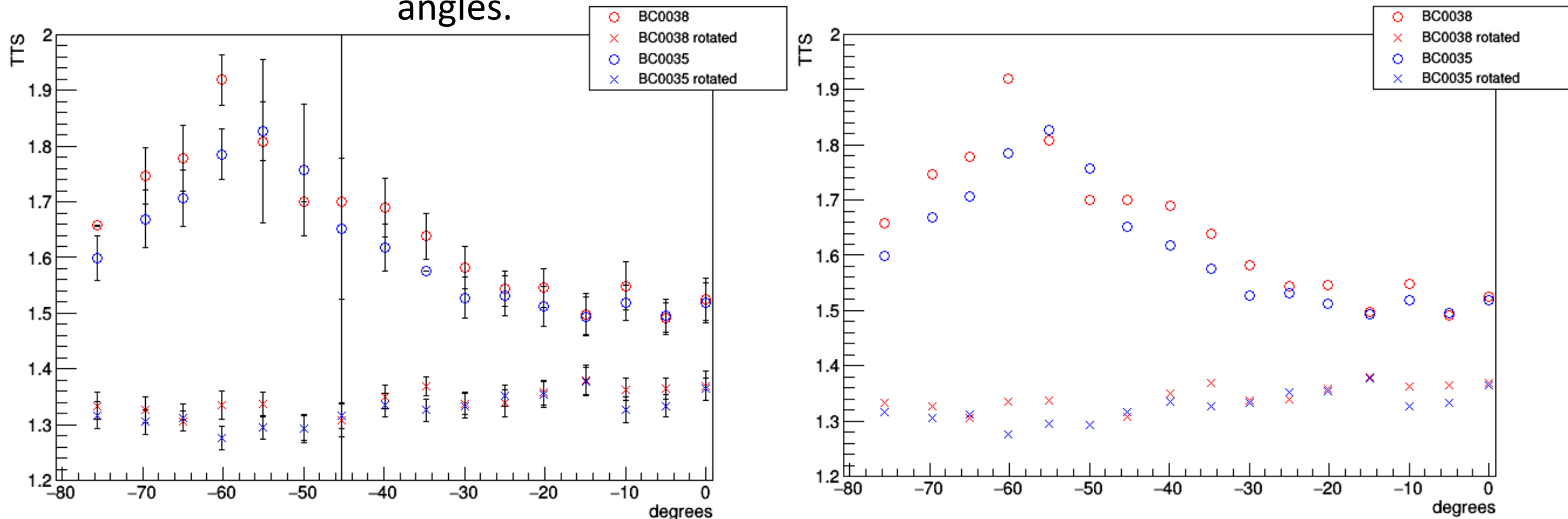


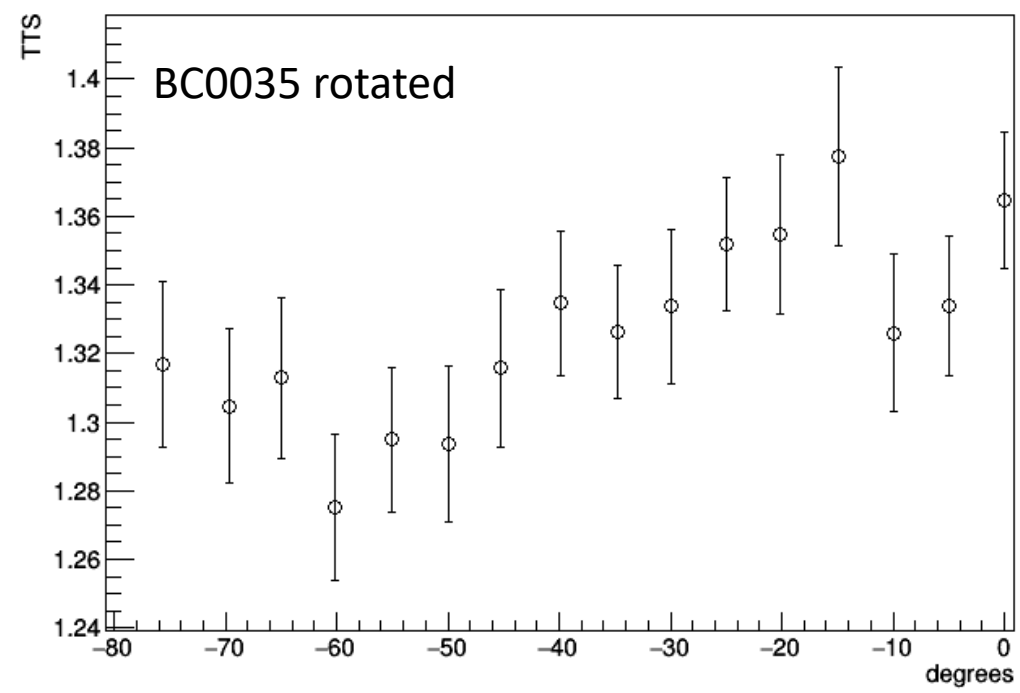
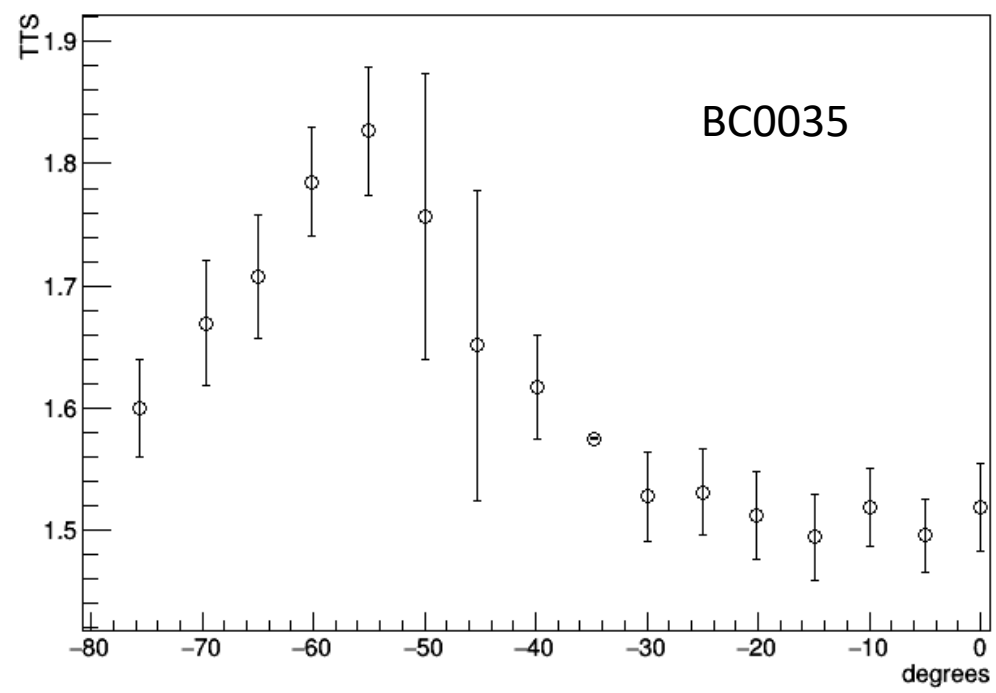
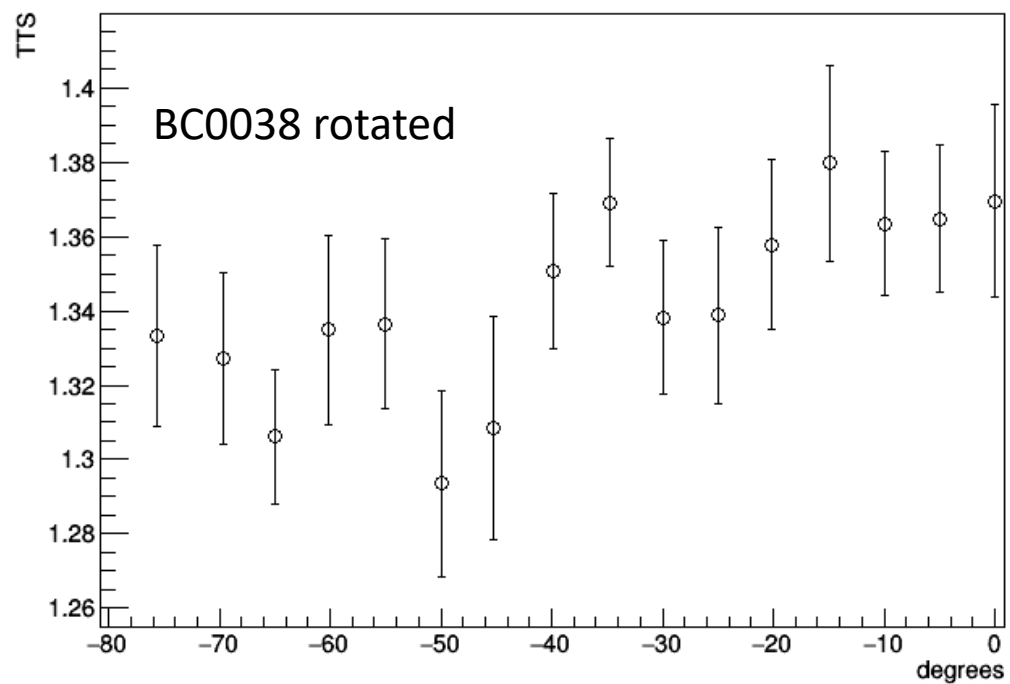
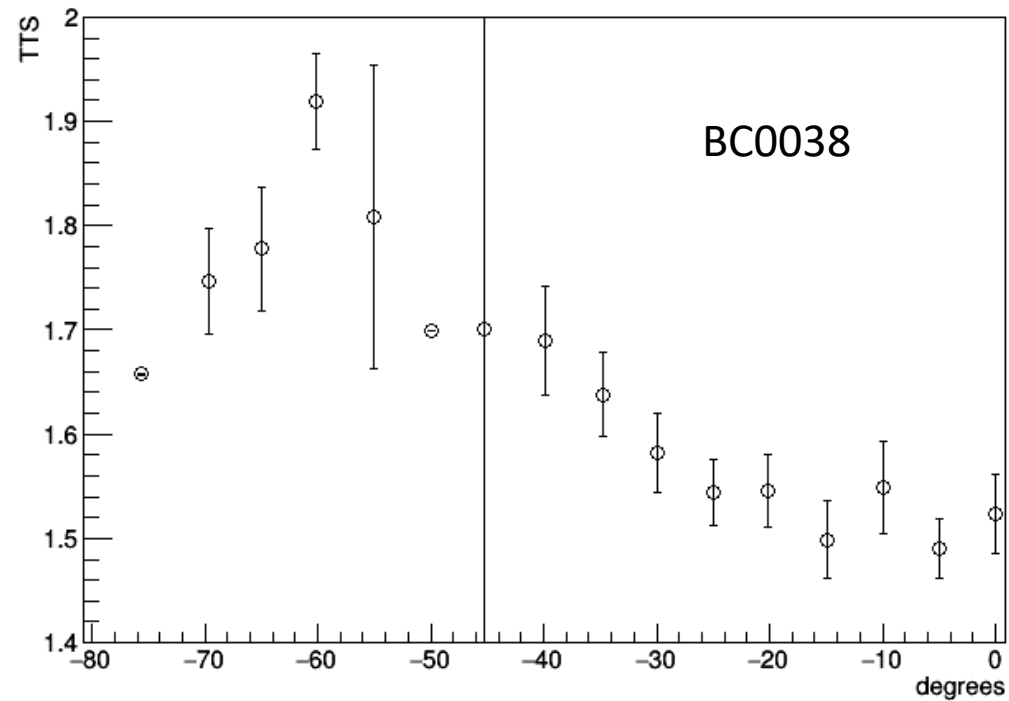
TTS

You can recognize a different trend depending on whether the PMT is rotated or not (the direction of dynode)

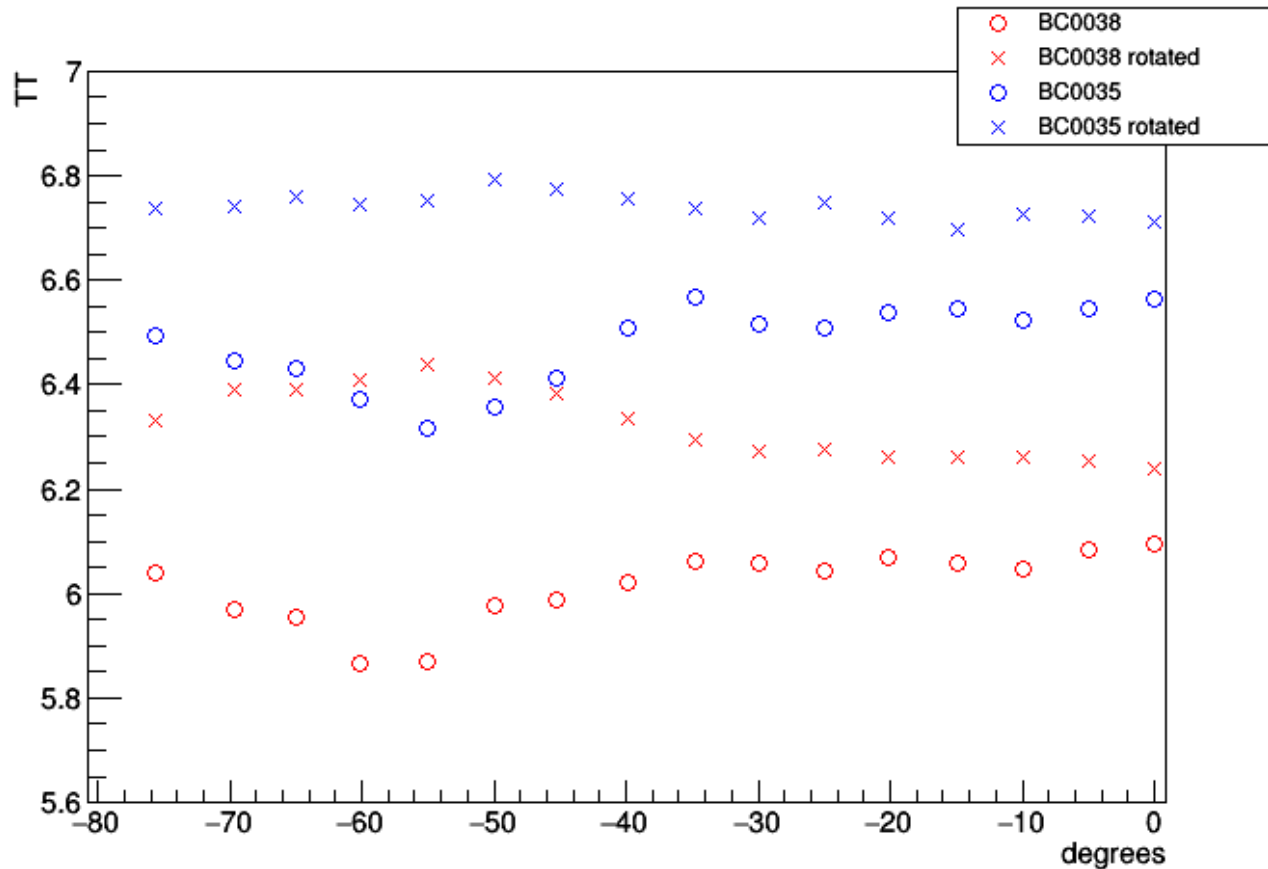
Before rotation: TTS and the variation of TTS are larger.

After rotation: TTS is fairly uniform. Slightly larger at smaller angles.





TT



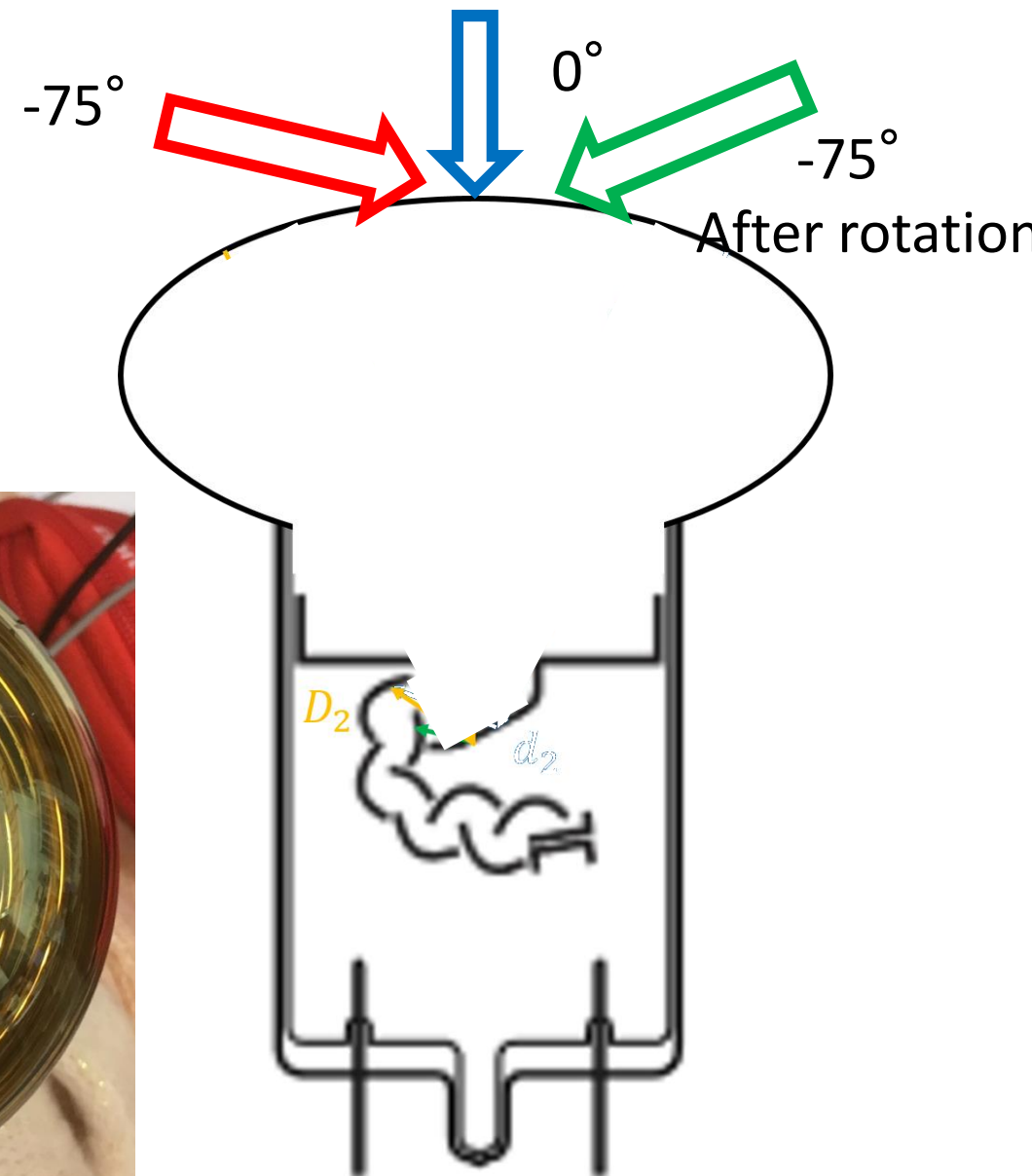
PMT BC0035 tends to have larger TT .
Similar trend for 2 measurements after rotation.

Direction of dynode

BC0035



BC0038

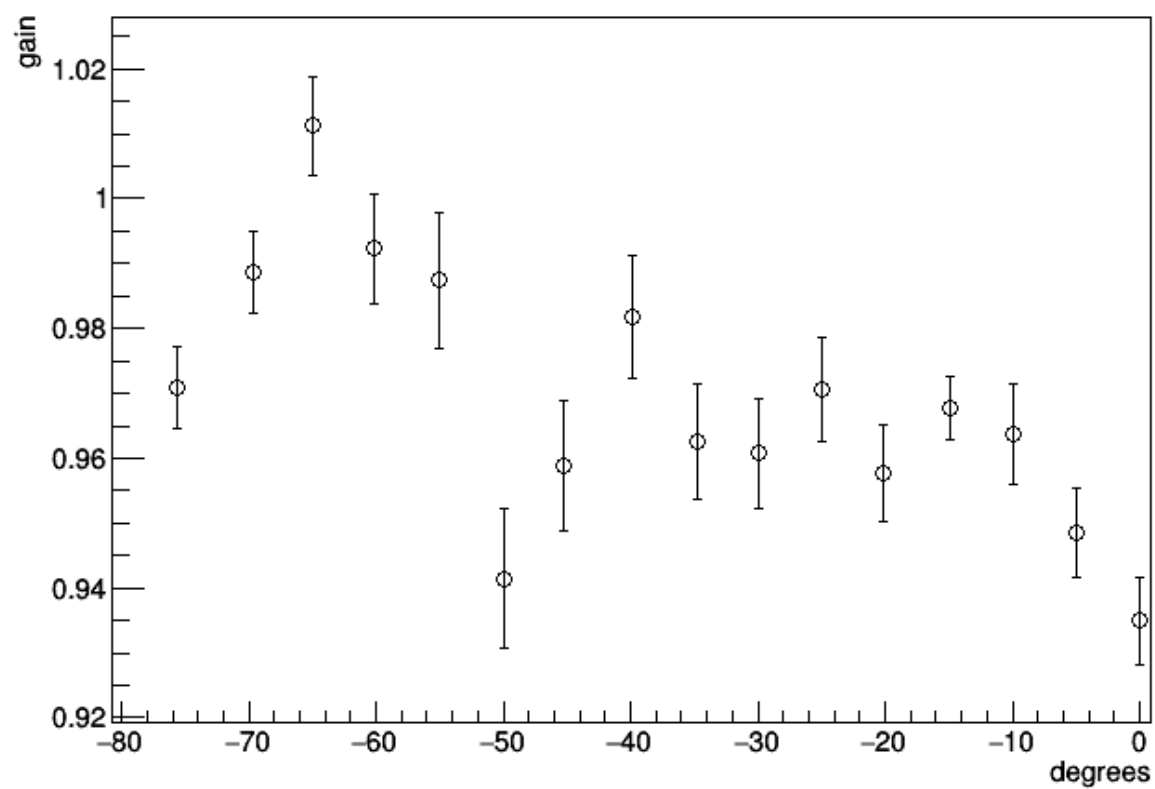
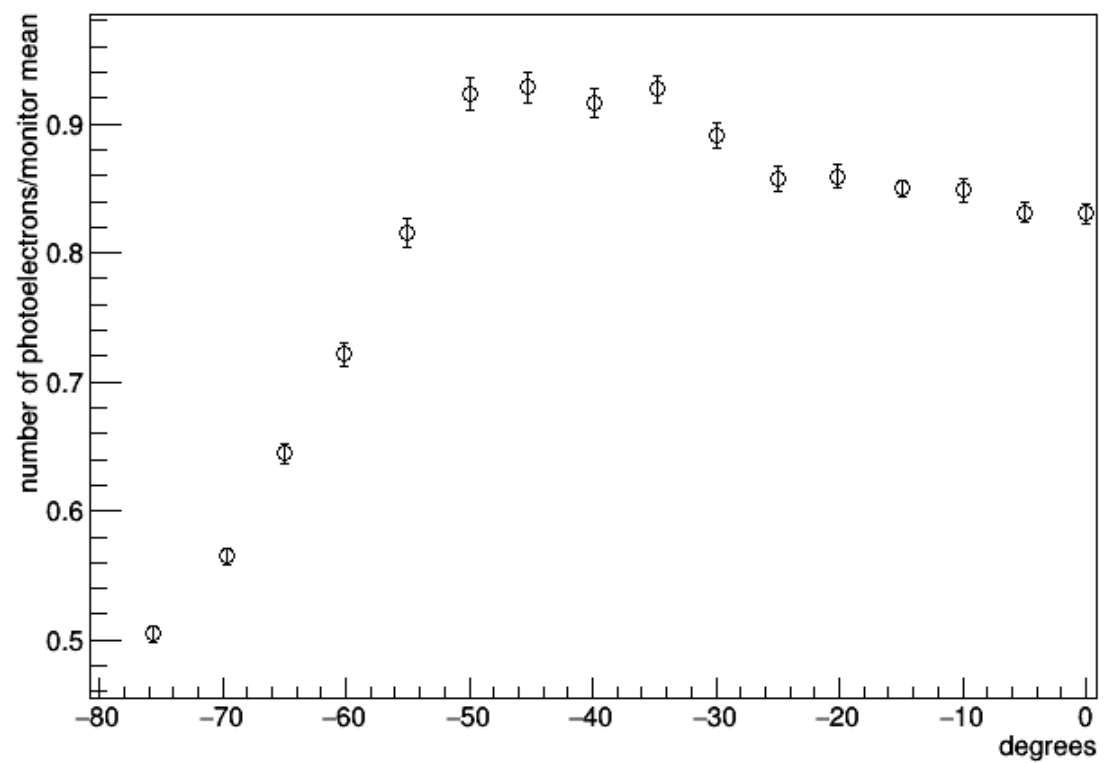


Conclusion

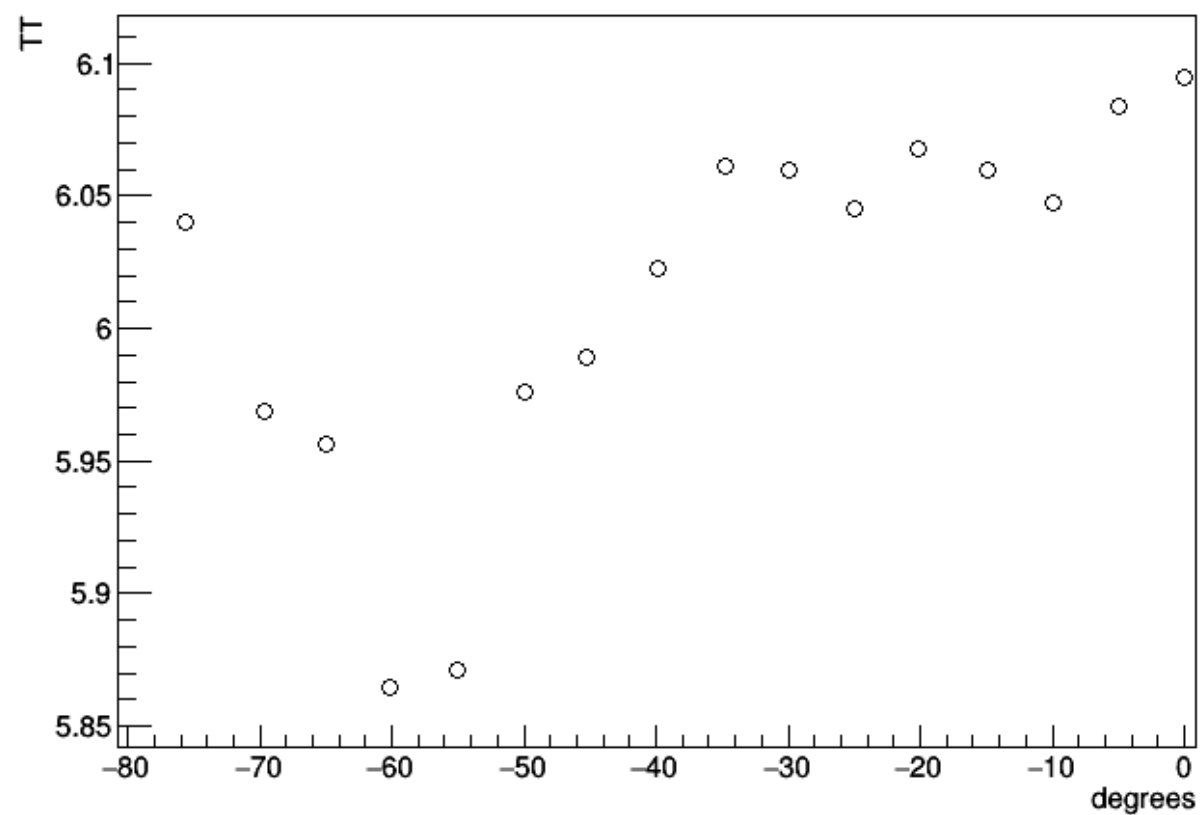
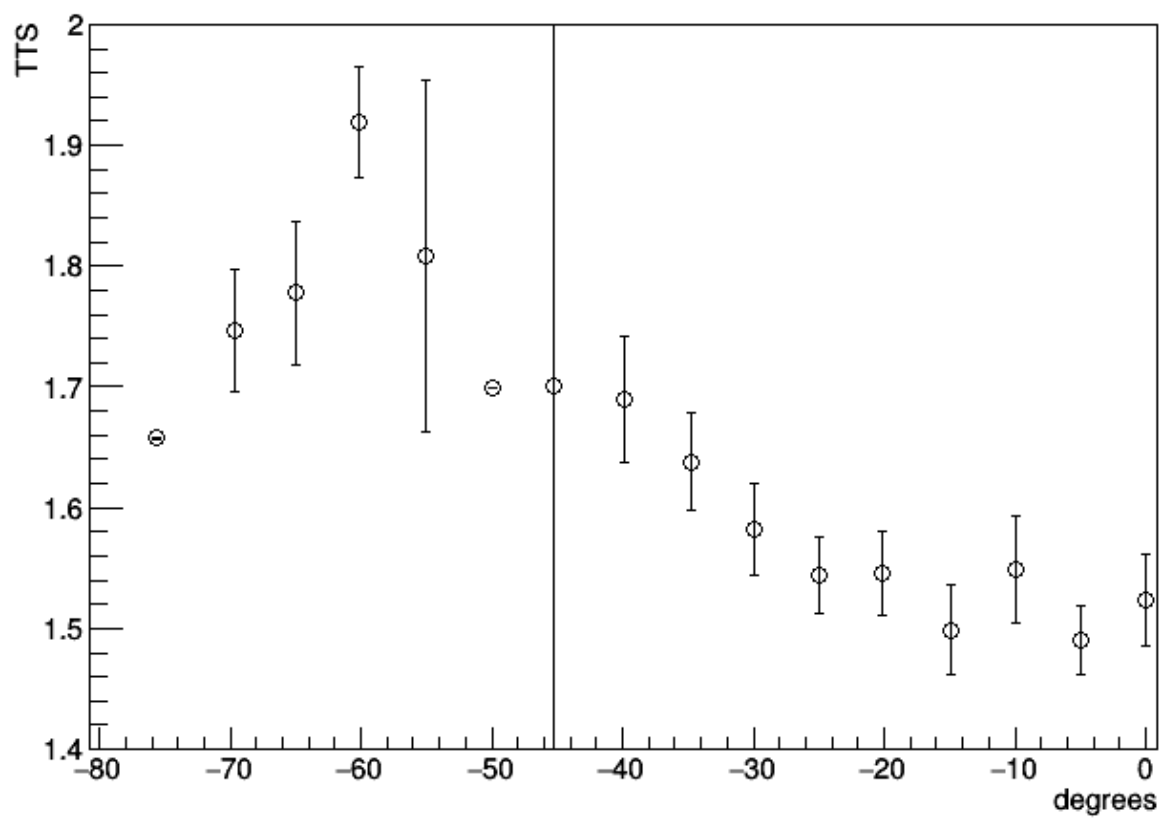
- Efficiency drops at around -50 degrees.
 - Gain is uniform at all angles. (small trend?)
 - There is a difference in TTS between before and after rotation.
- why?

Back up

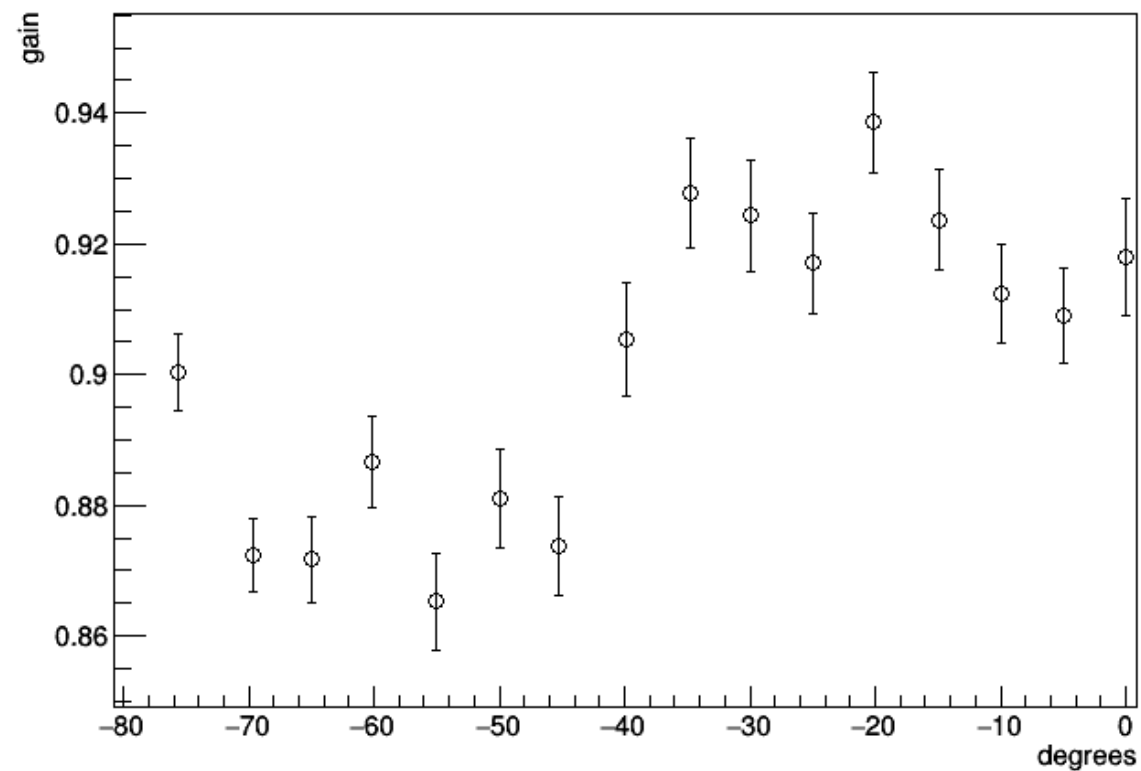
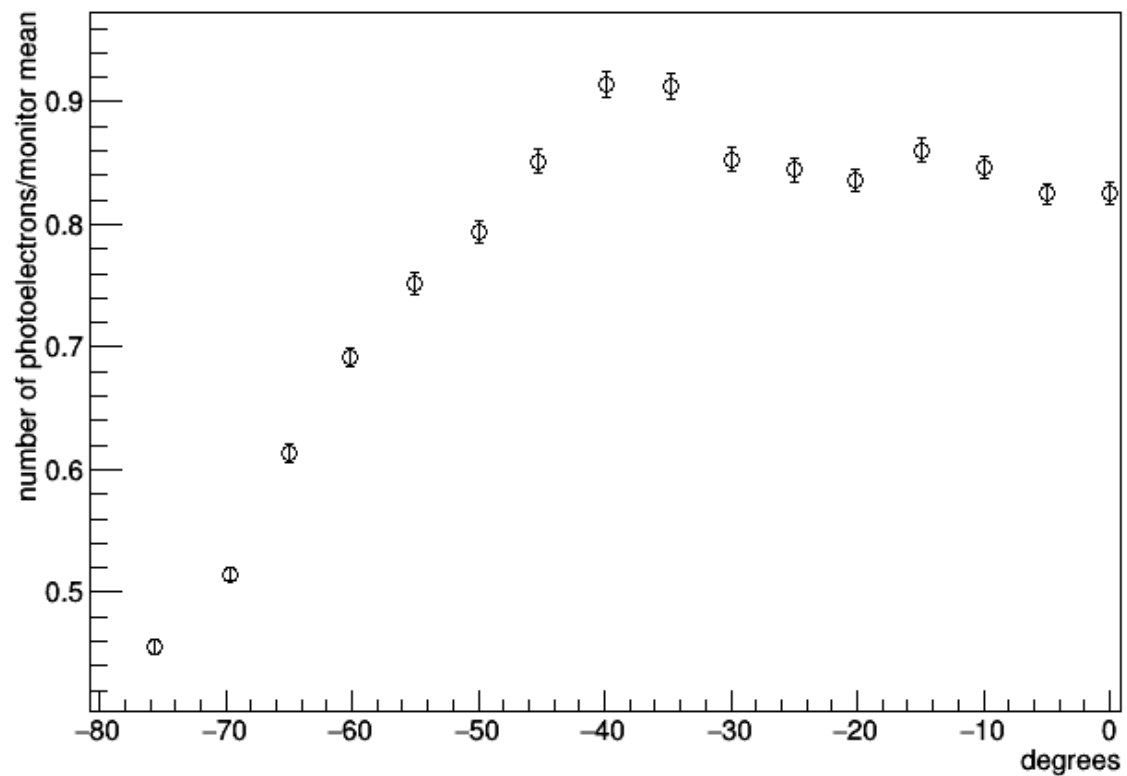
BC0038



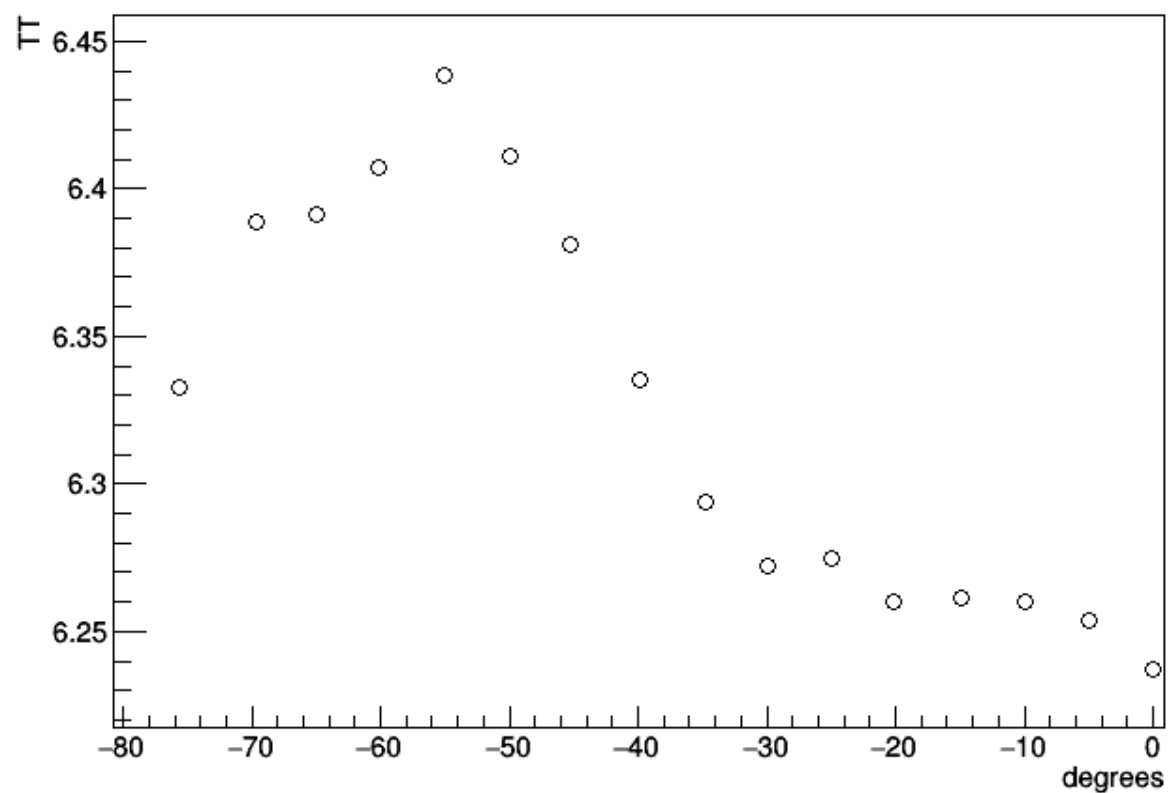
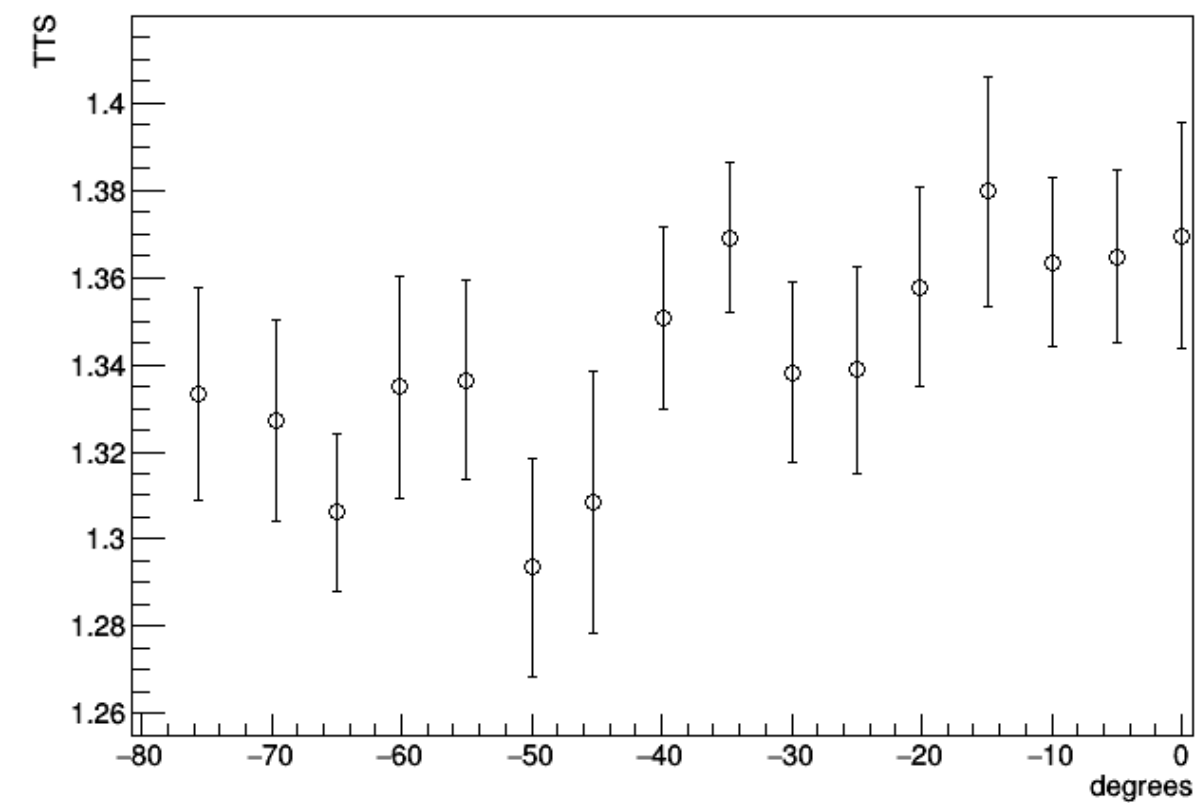
BC0038



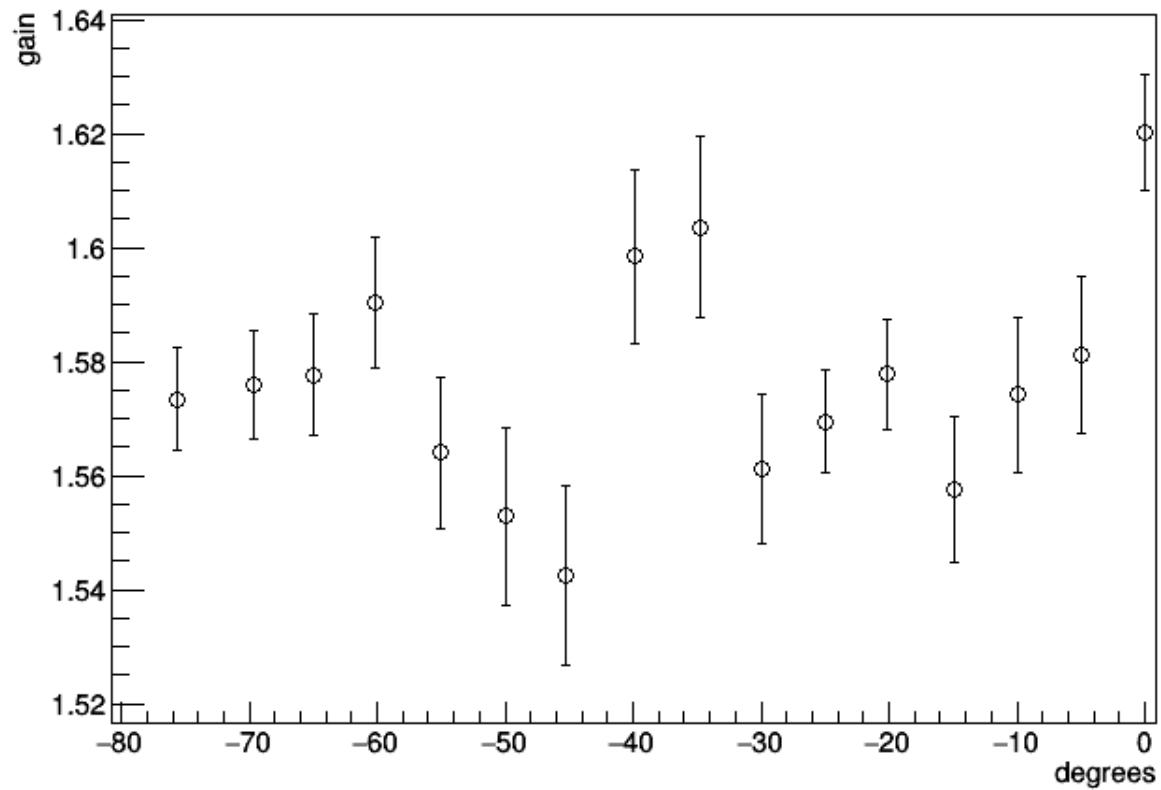
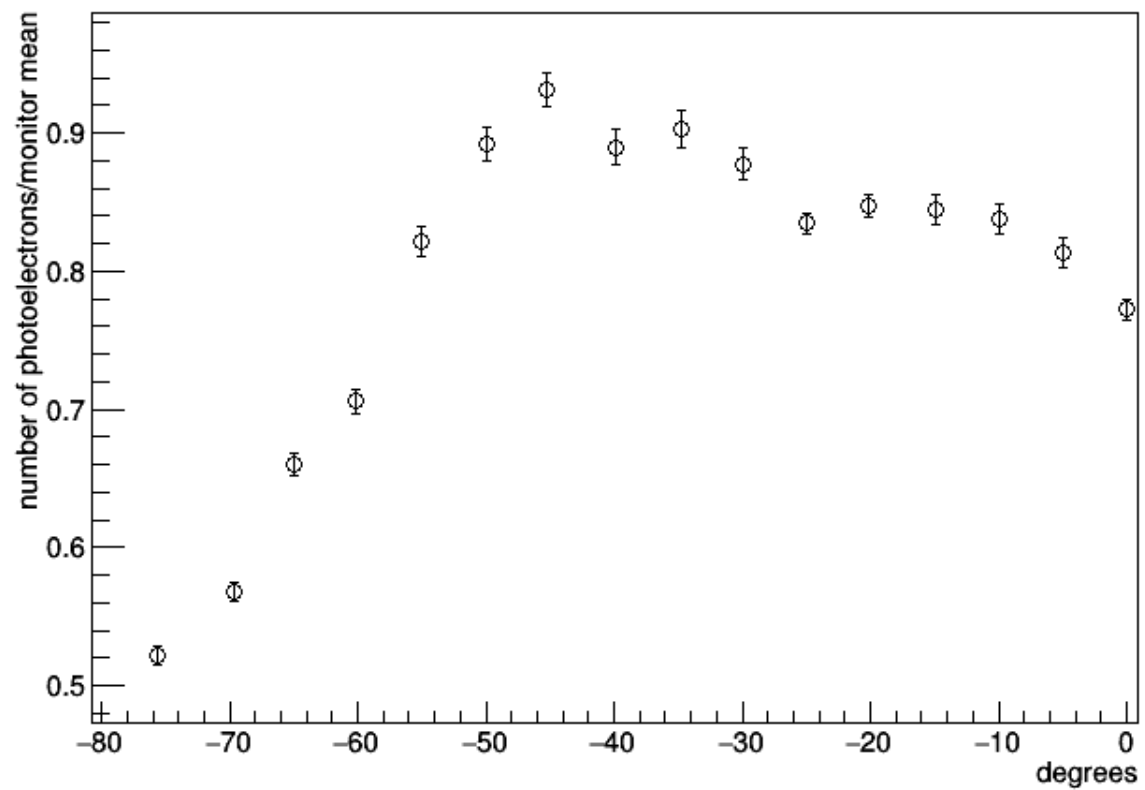
BC0038 rotated



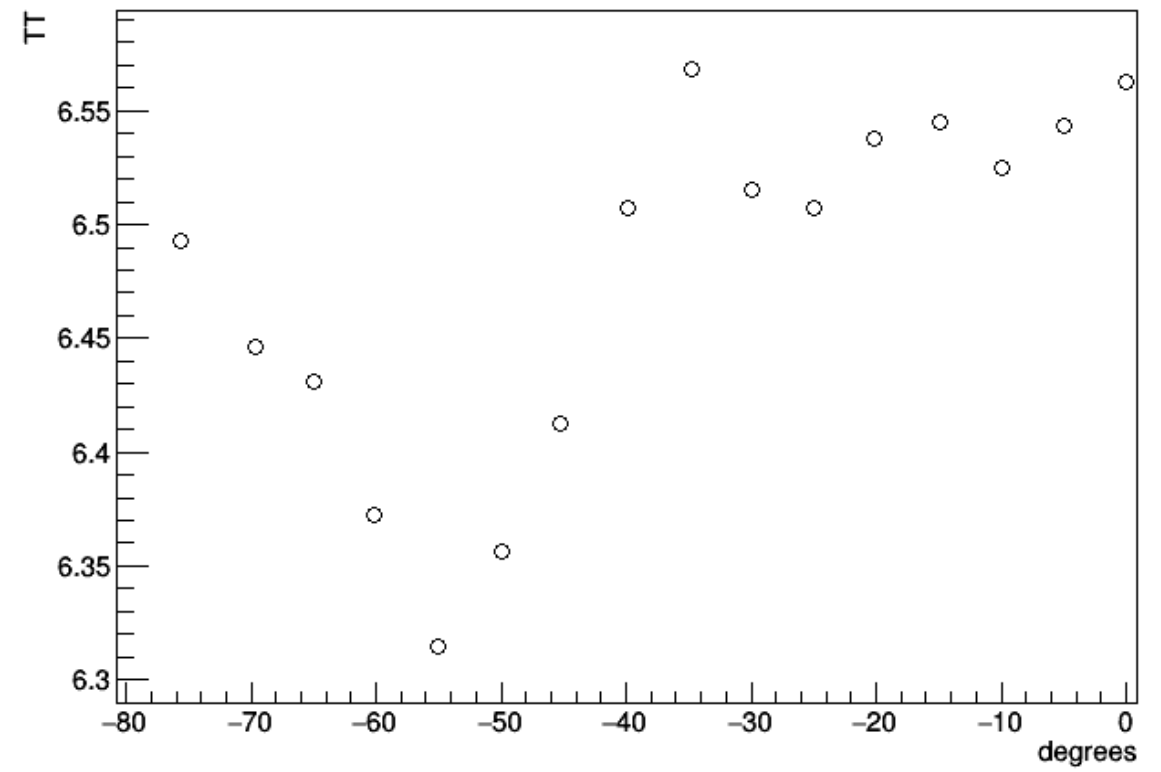
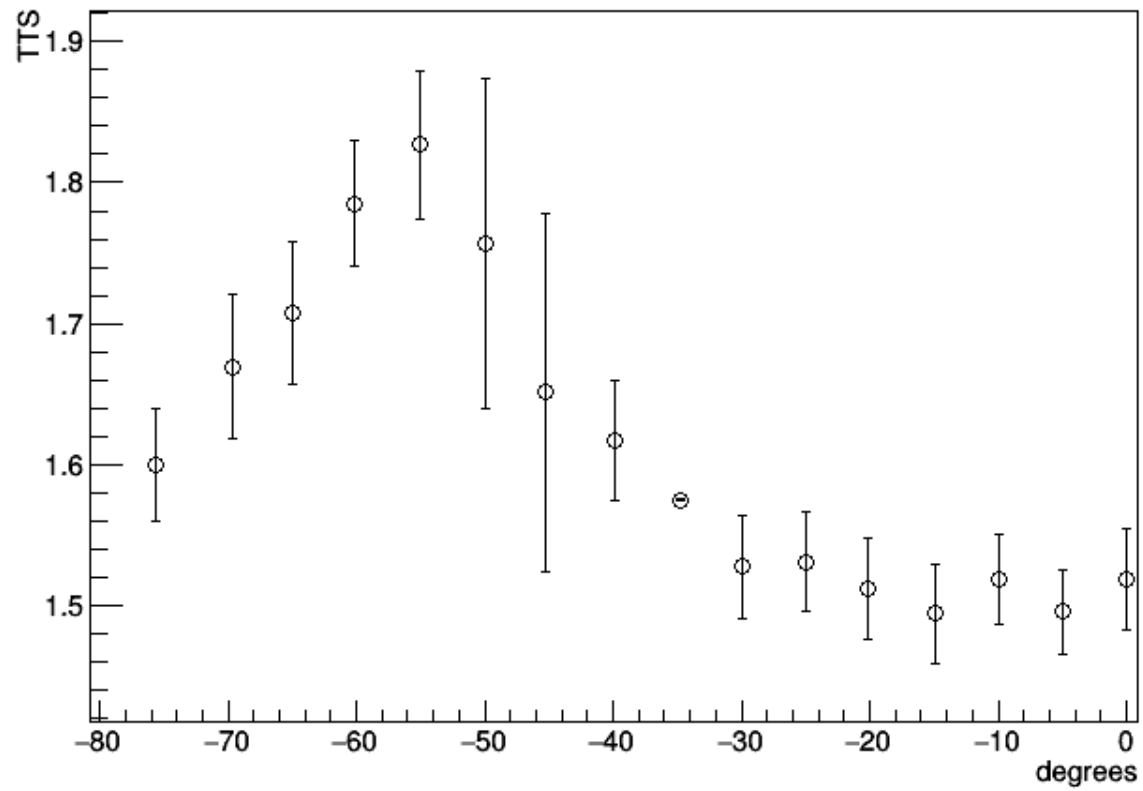
BC0038 rotated



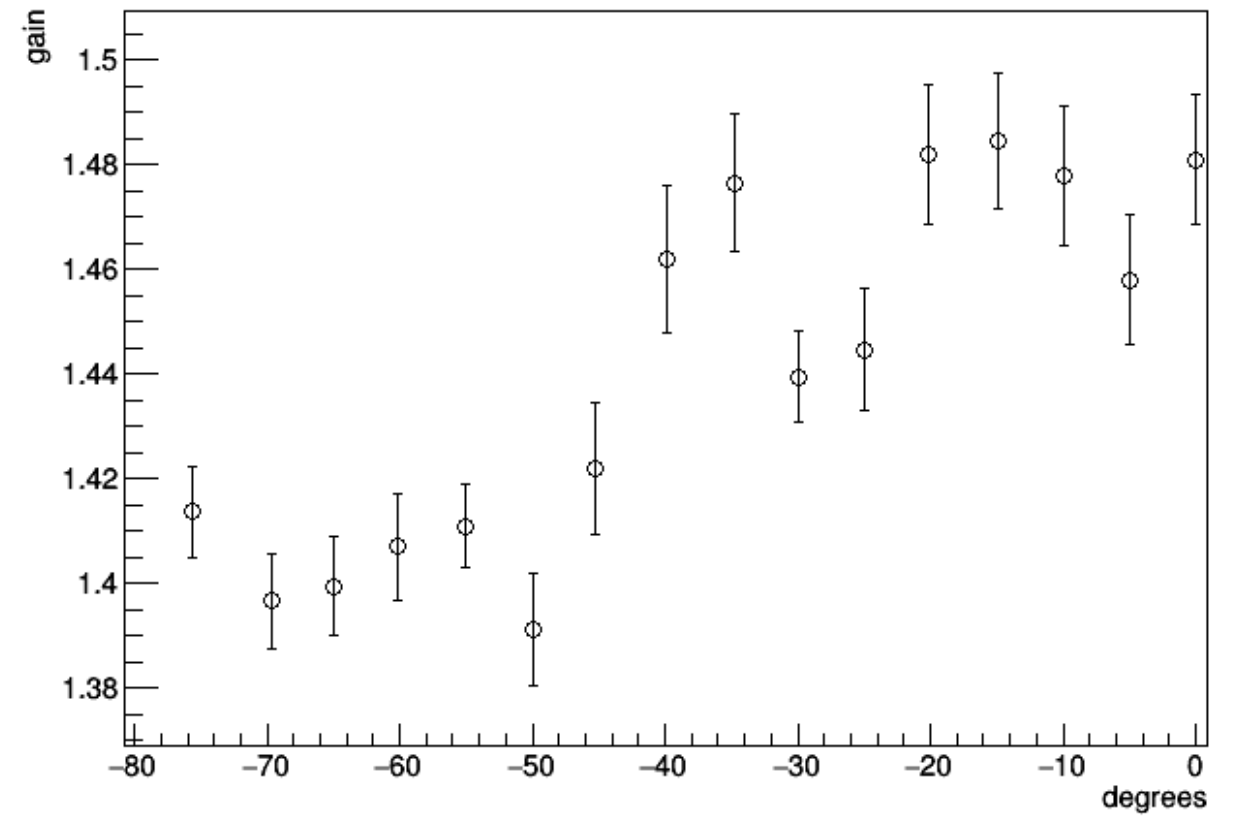
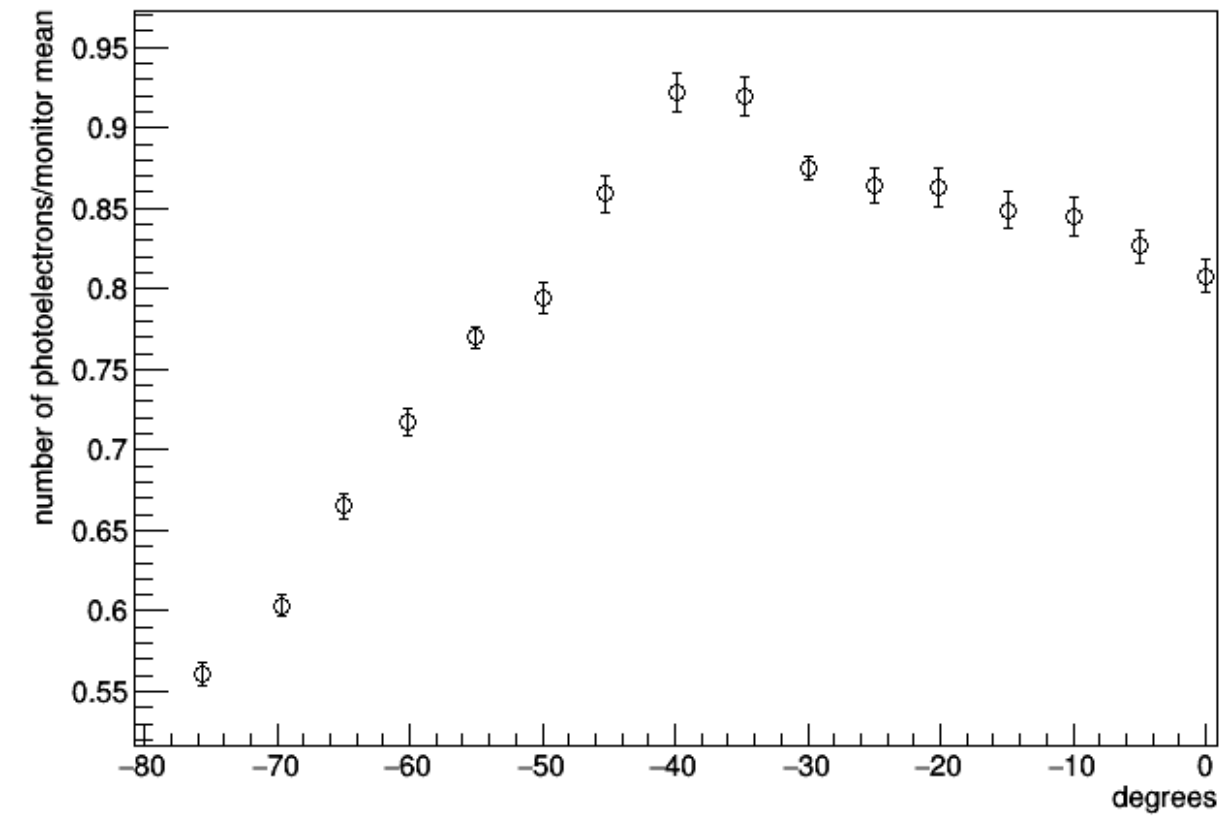
BC0035



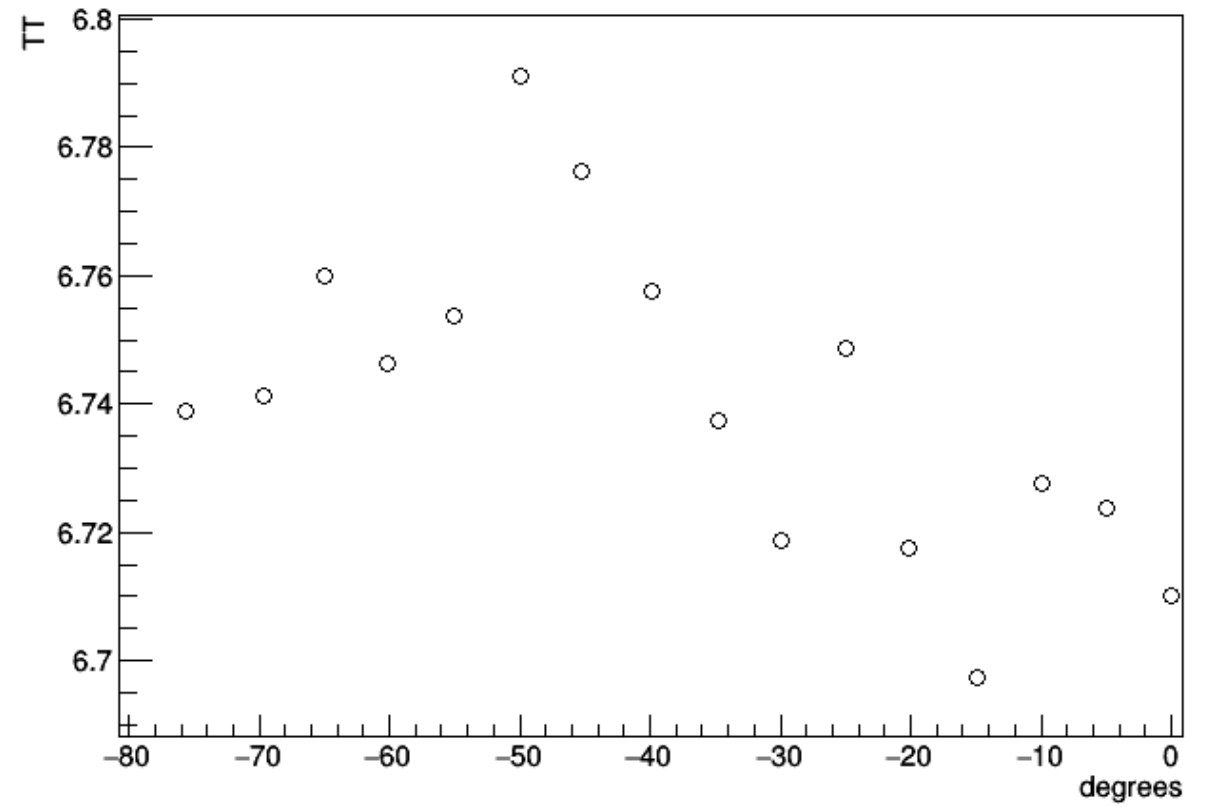
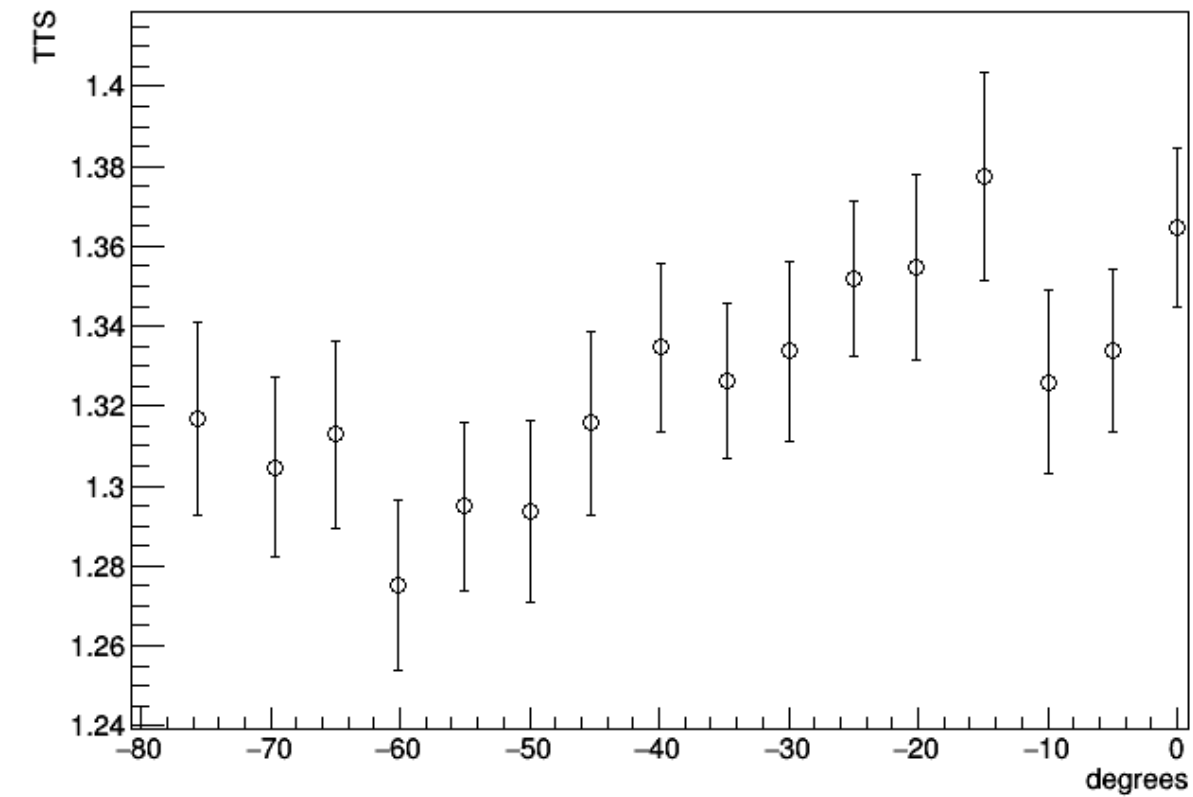
BC0035



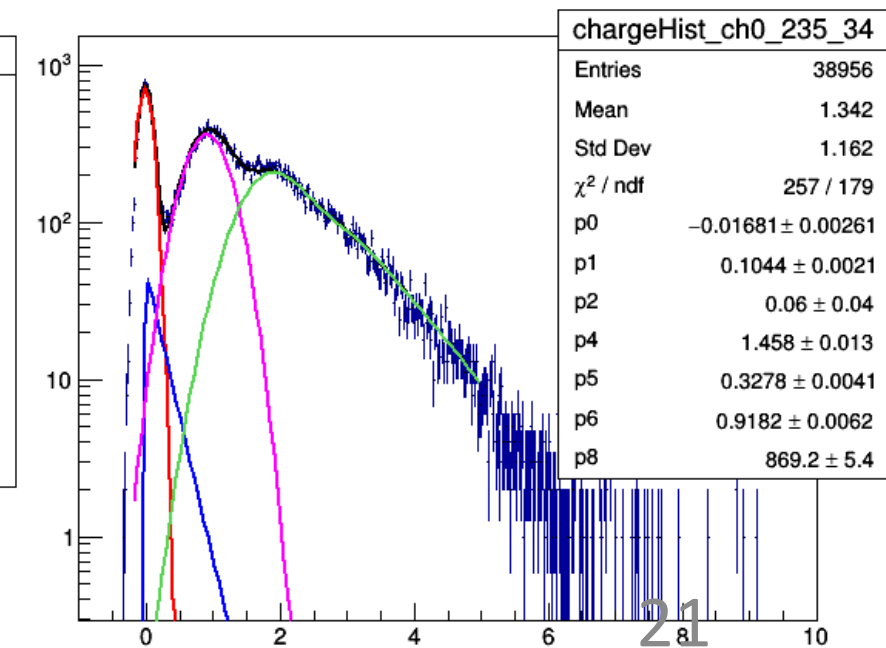
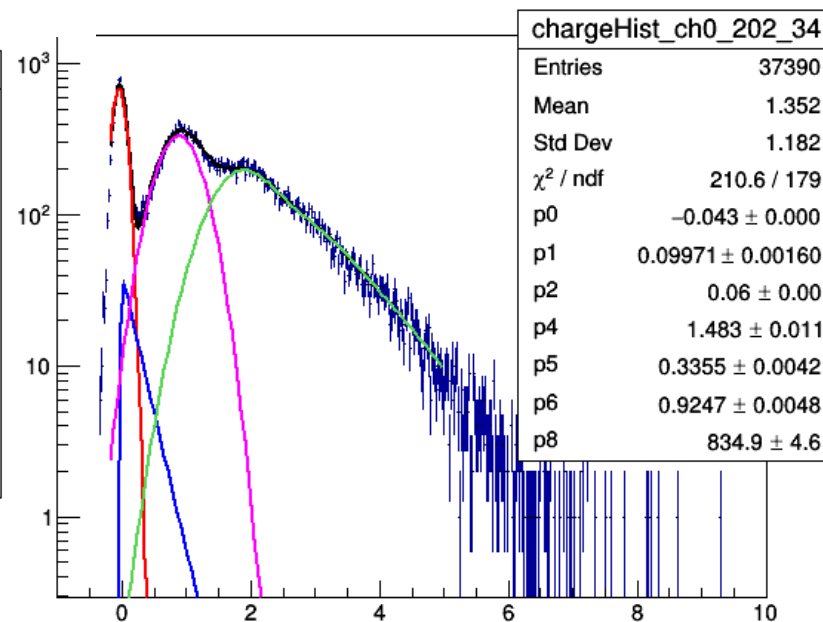
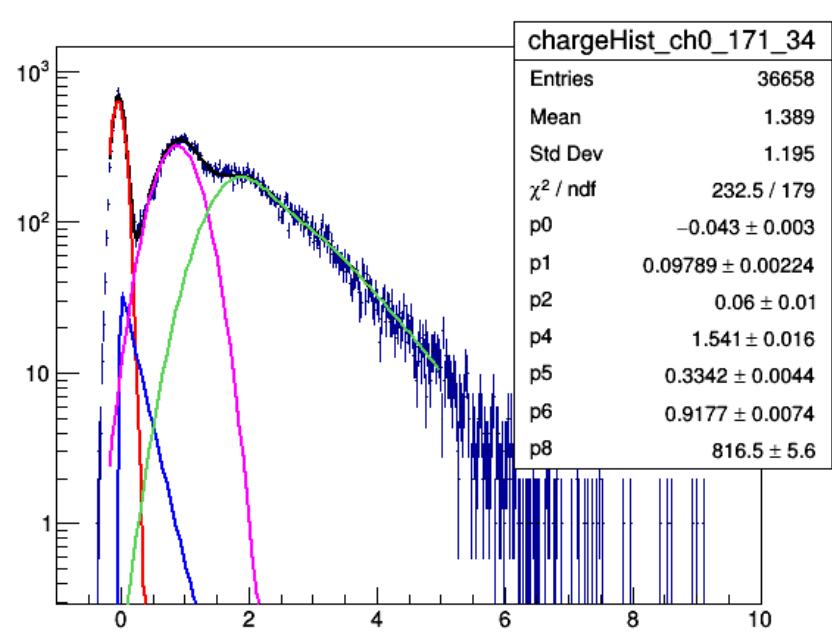
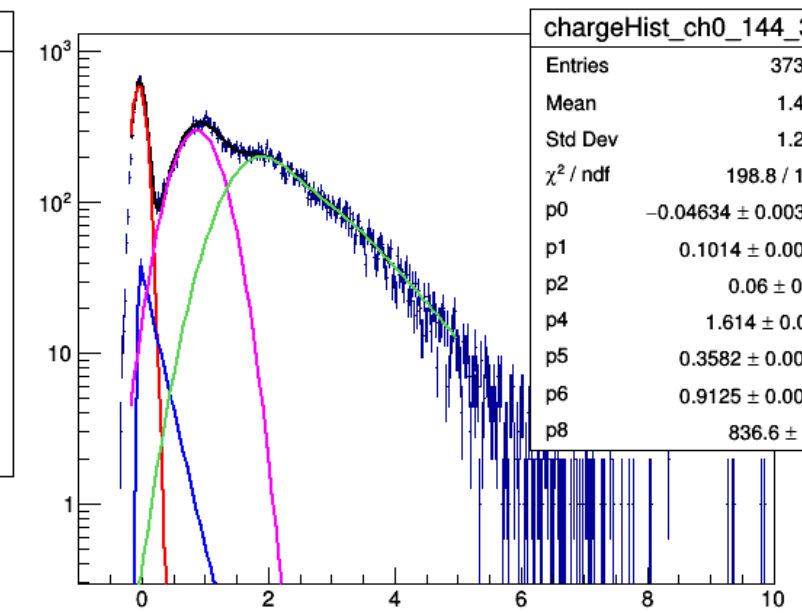
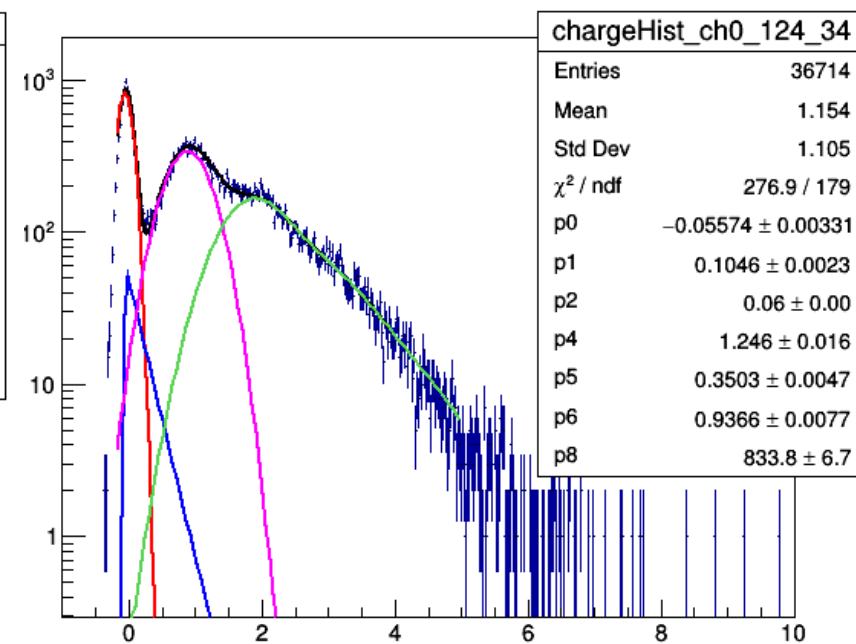
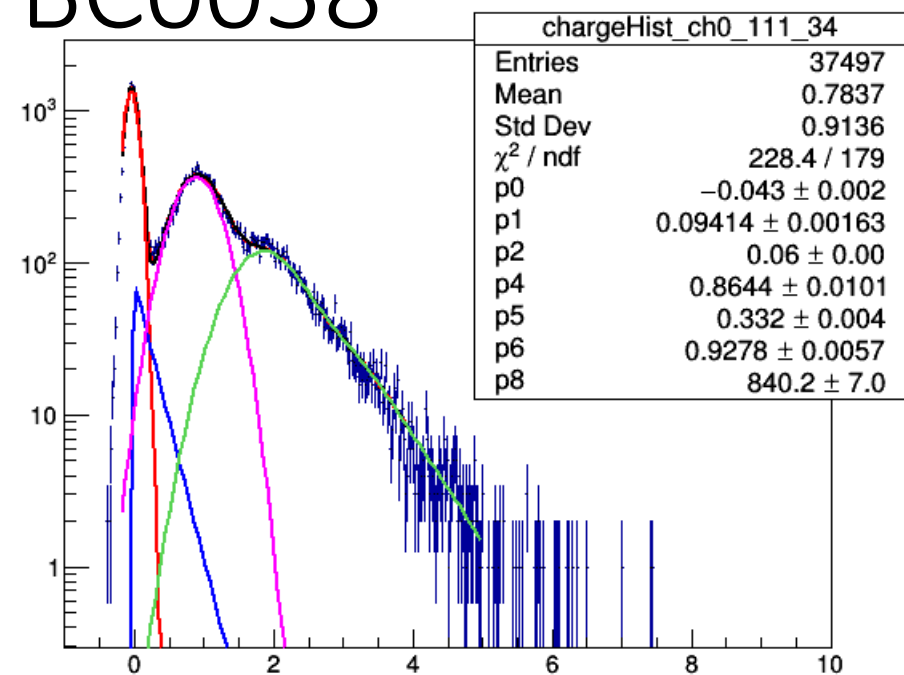
BC0035 rotated



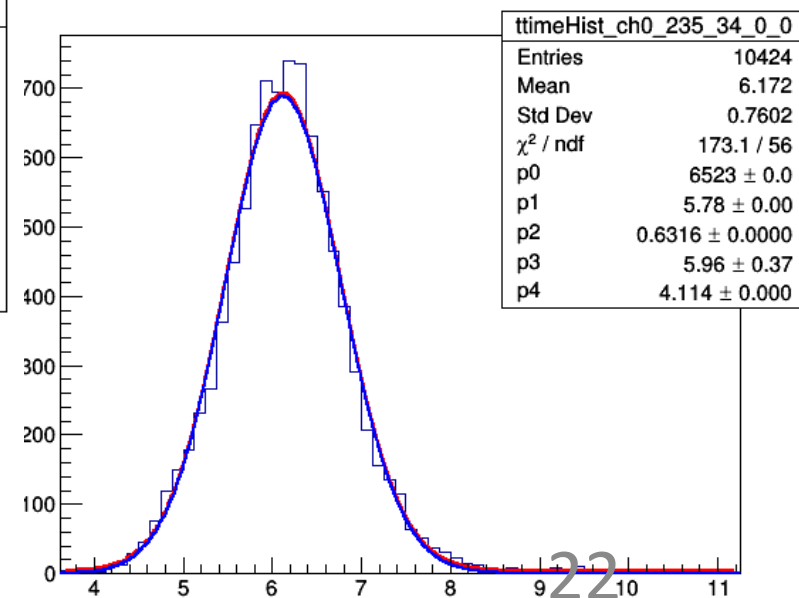
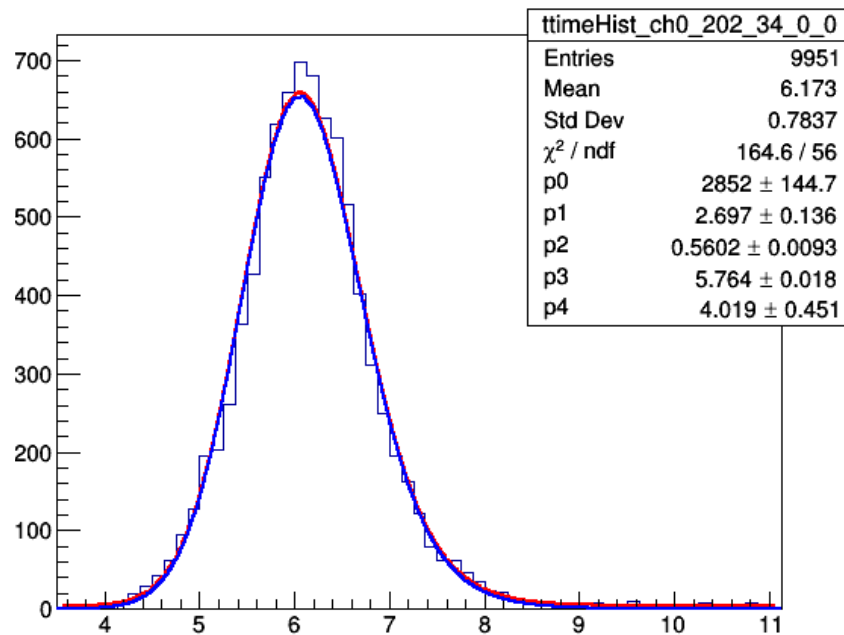
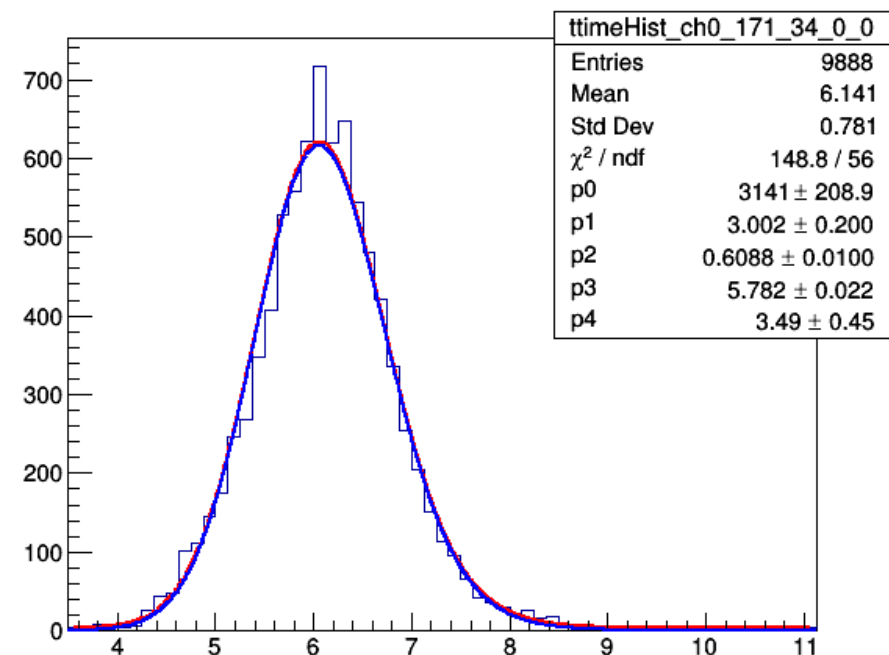
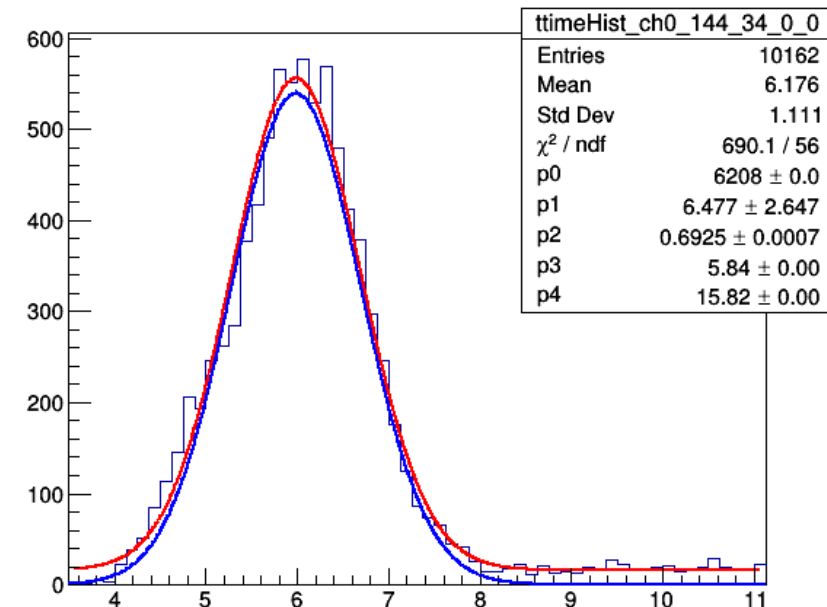
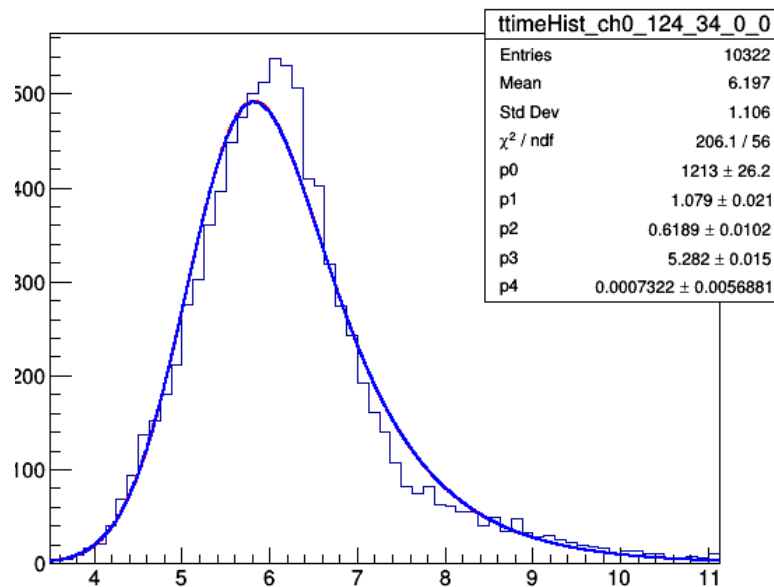
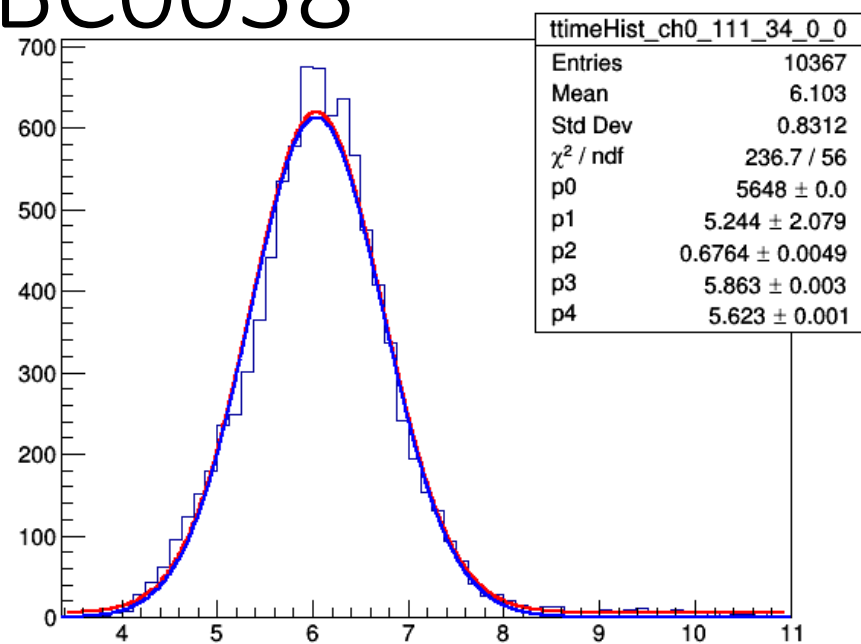
BC0035 rotated



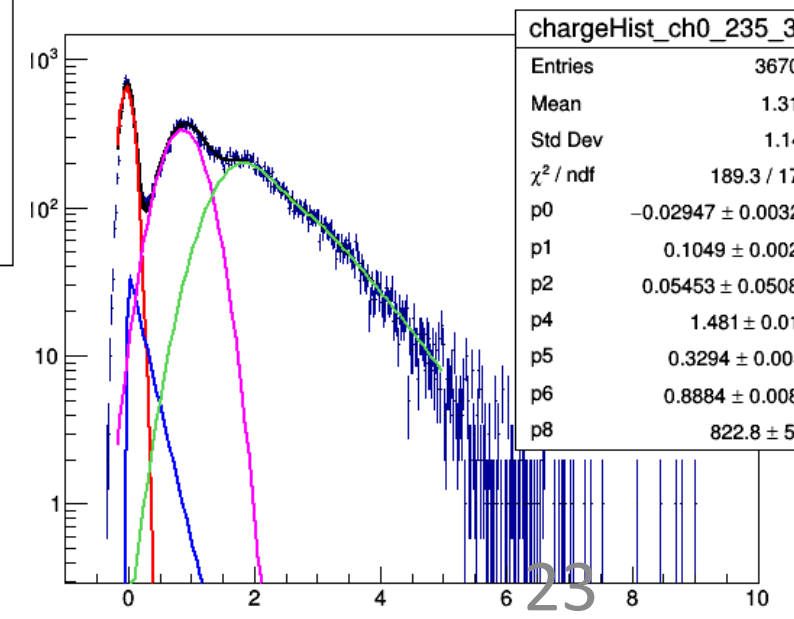
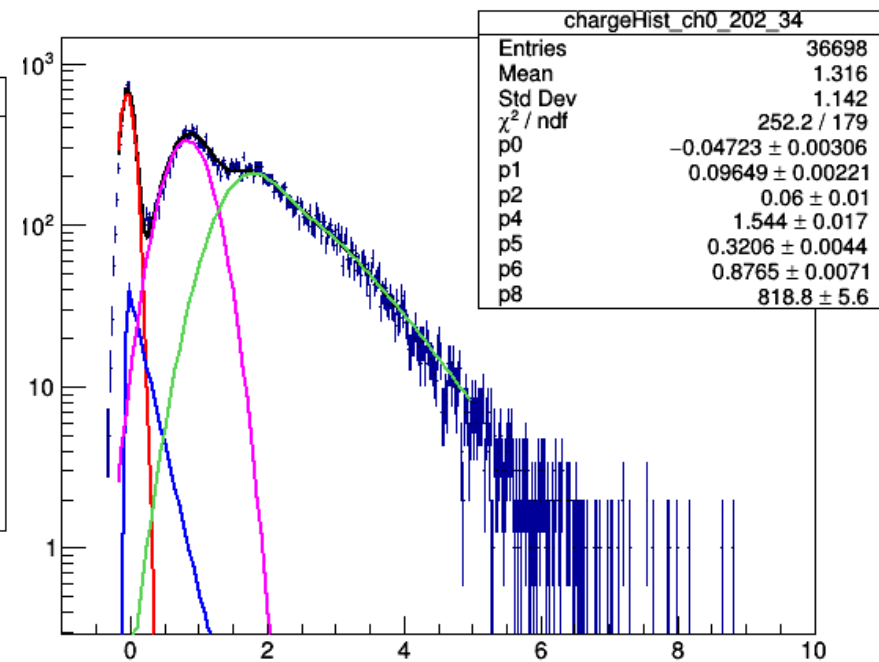
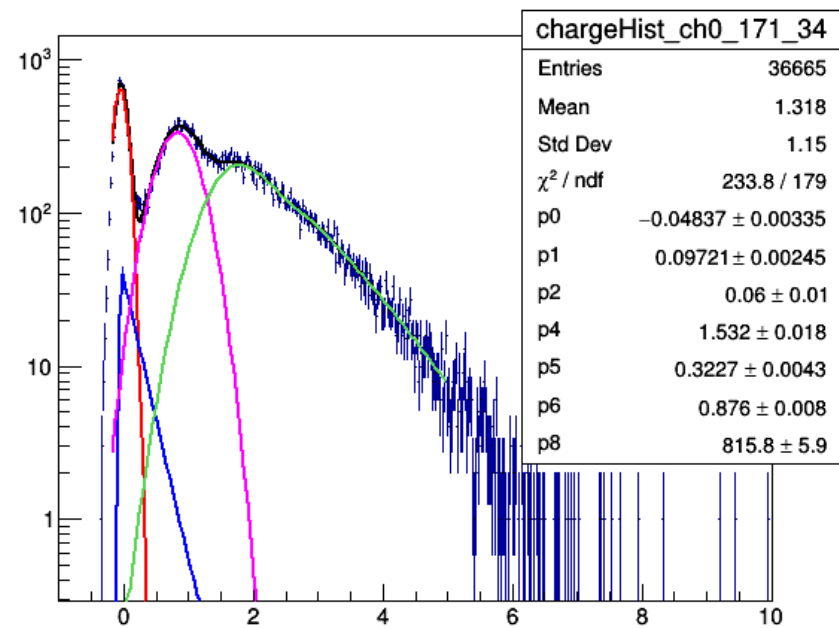
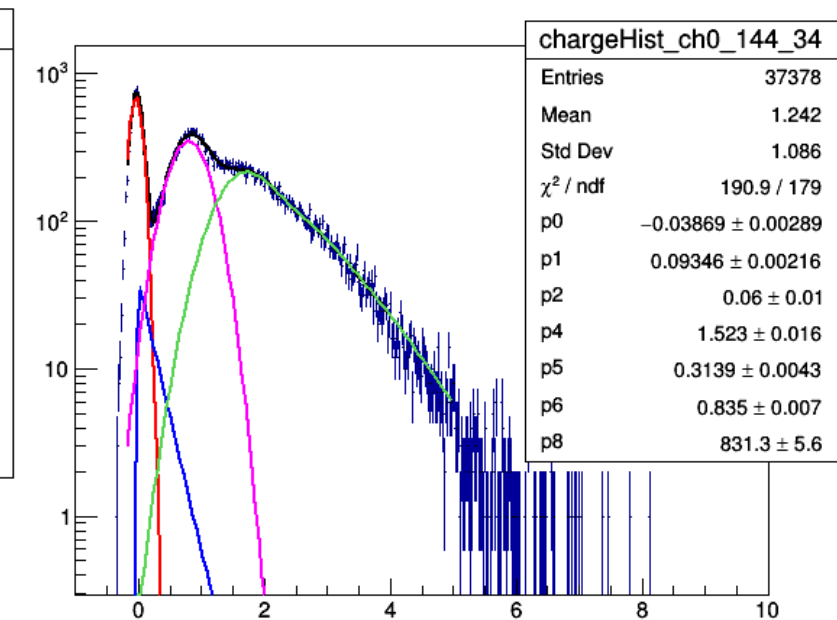
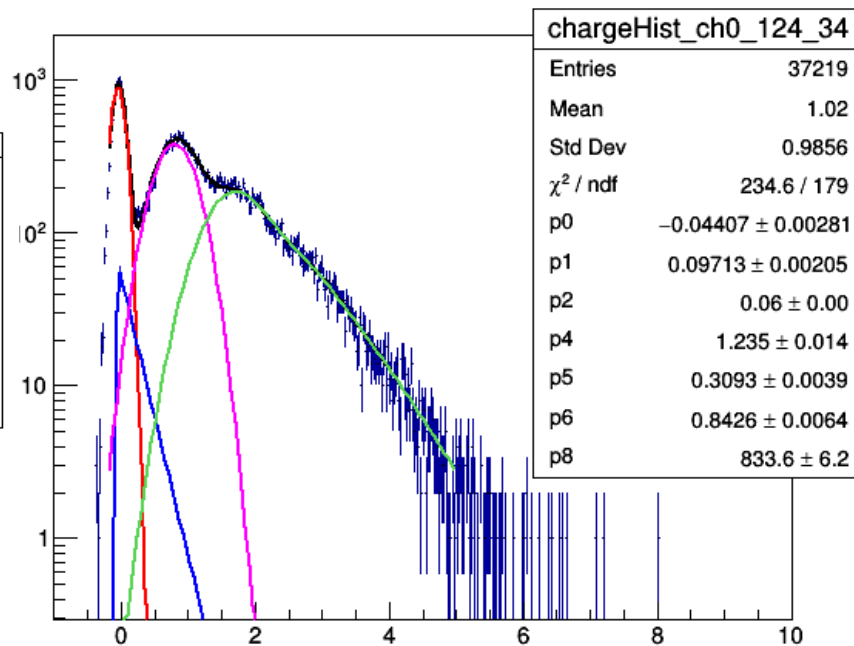
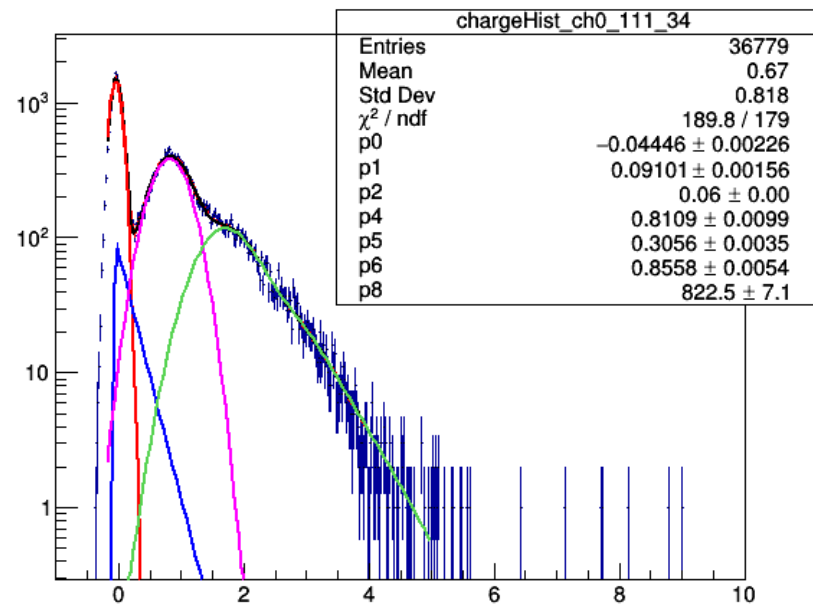
BC0038



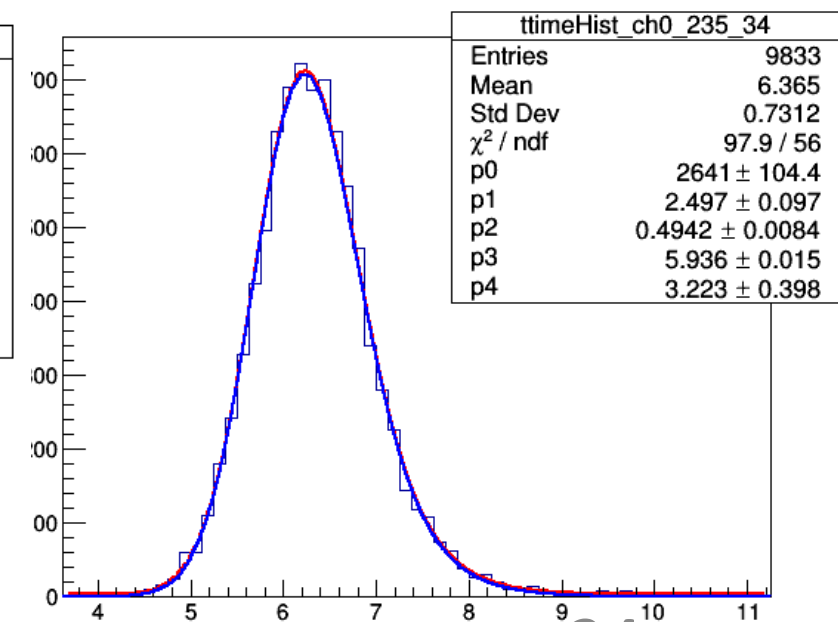
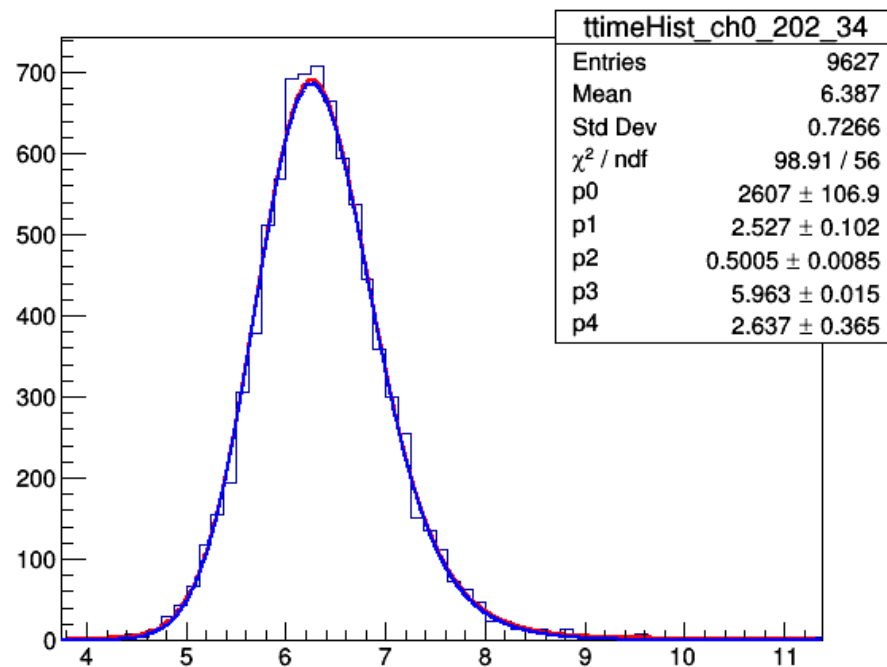
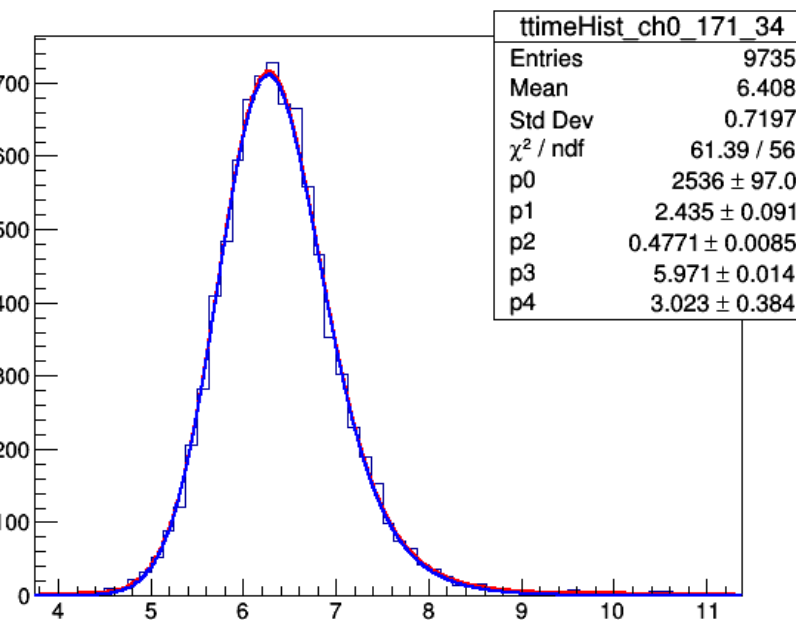
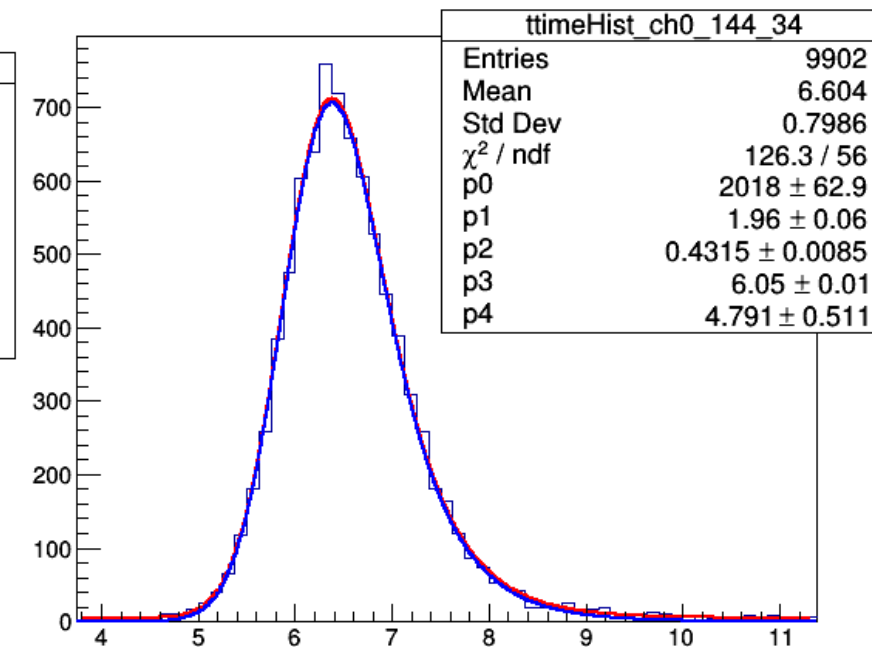
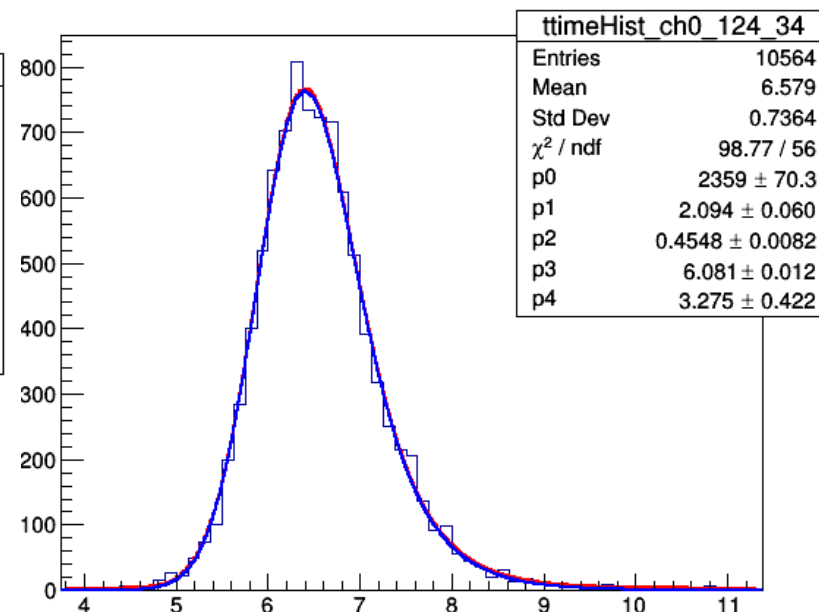
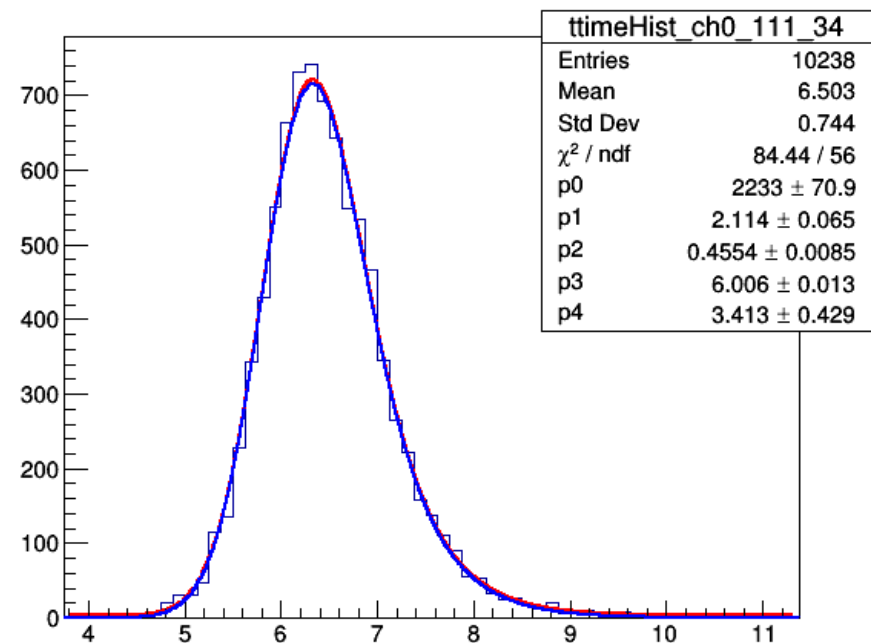
BC0038



BC0038 rotated

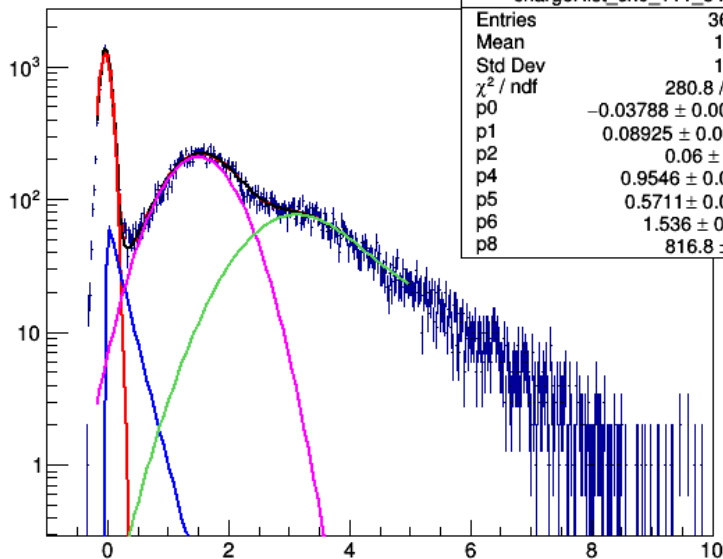


BC0038 rotated

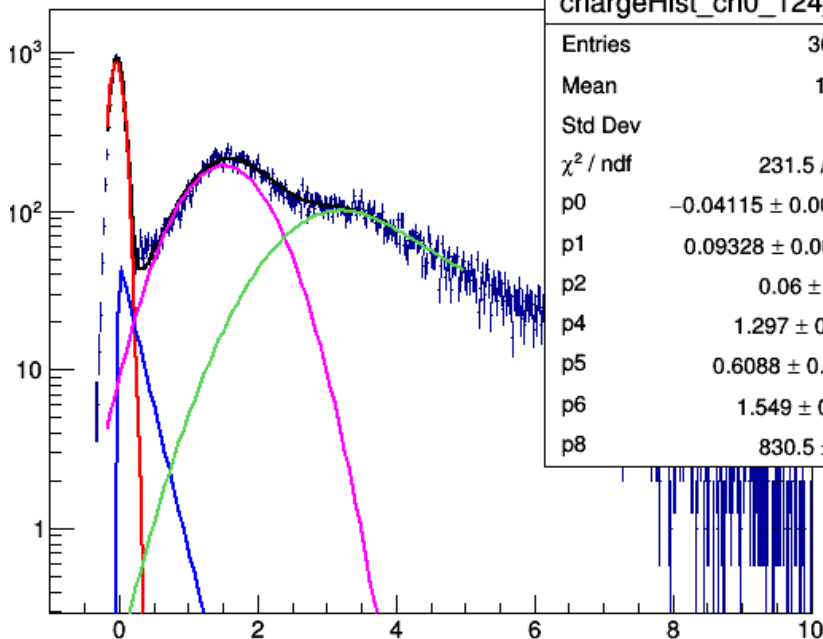


BC0035

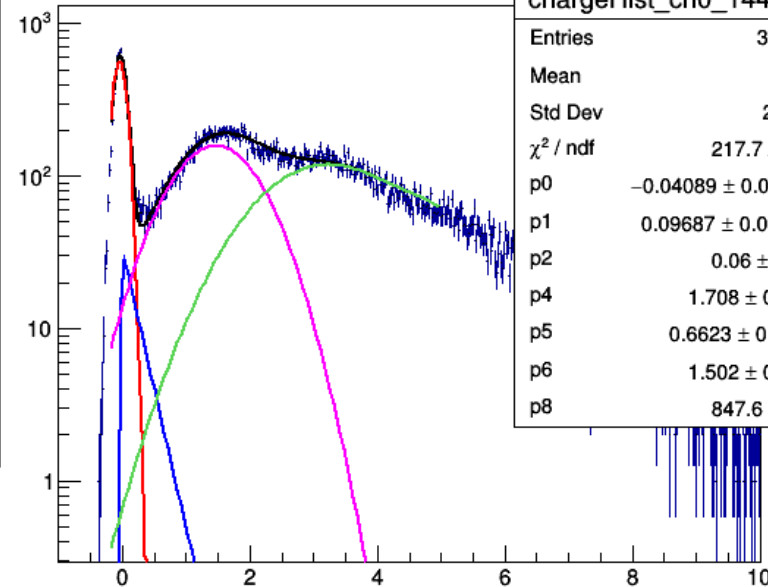
chargeHist_ch0_111_34	
Entries	36630
Mean	1.439
Std Dev	1.576
χ^2 / ndf	280.8 / 179
p0	-0.03788 ± 0.00216
p1	0.08925 ± 0.00151
p2	0.06 ± 0.00
p4	0.9546 ± 0.0113
p5	0.5711 ± 0.0068
p6	1.536 ± 0.009
p8	816.8 ± 6.3



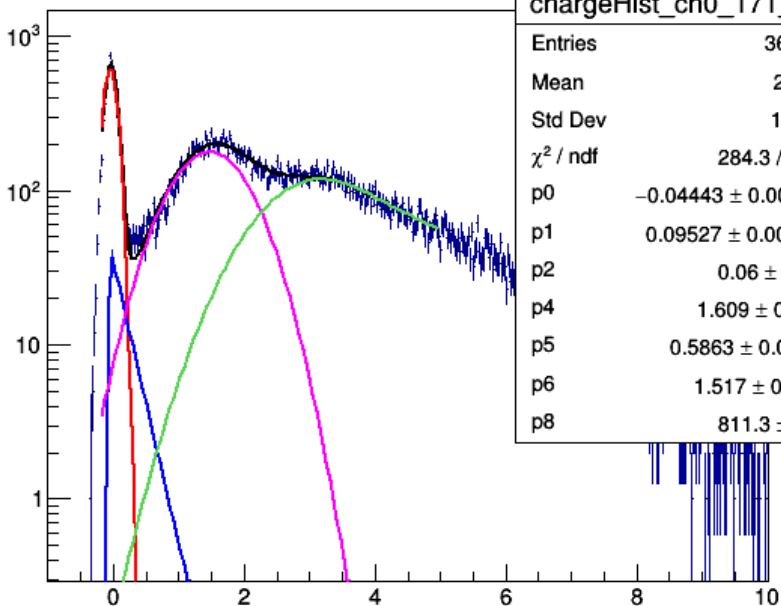
chargeHist_ch0_124_34	
Entries	36894
Mean	1.989
Std Dev	1.85
χ^2 / ndf	231.5 / 179
p0	-0.04115 ± 0.00278
p1	0.09328 ± 0.00189
p2	0.06 ± 0.00
p4	1.297 ± 0.016
p5	0.6088 ± 0.0081
p6	1.549 ± 0.011
p8	830.5 ± 6.5



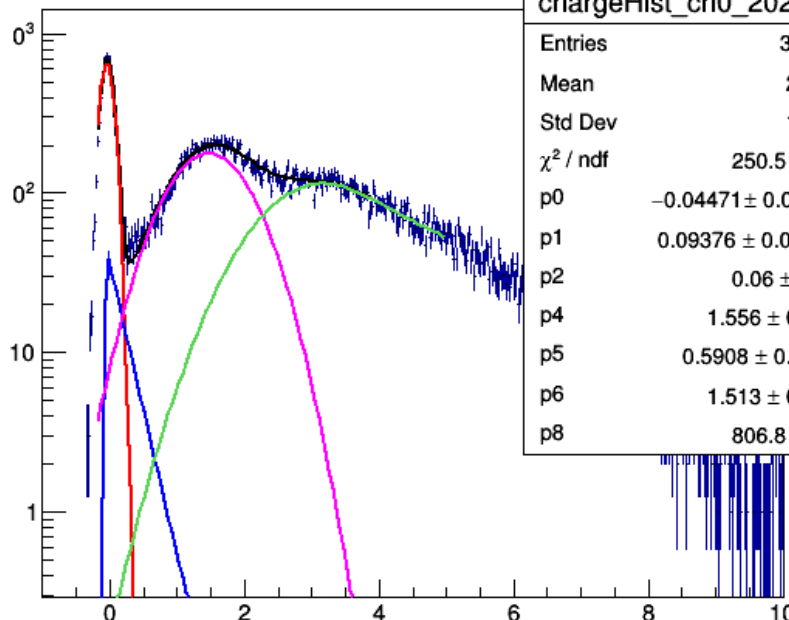
chargeHist_ch0_144_34	
Entries	37028
Mean	2.44
Std Dev	2.003
χ^2 / ndf	217.7 / 179
p0	-0.04089 ± 0.00349
p1	0.09687 ± 0.00256
p2	0.06 ± 0.00
p4	1.708 ± 0.023
p5	0.6623 ± 0.0121
p6	1.502 ± 0.015
p8	847.6 ± 7.8



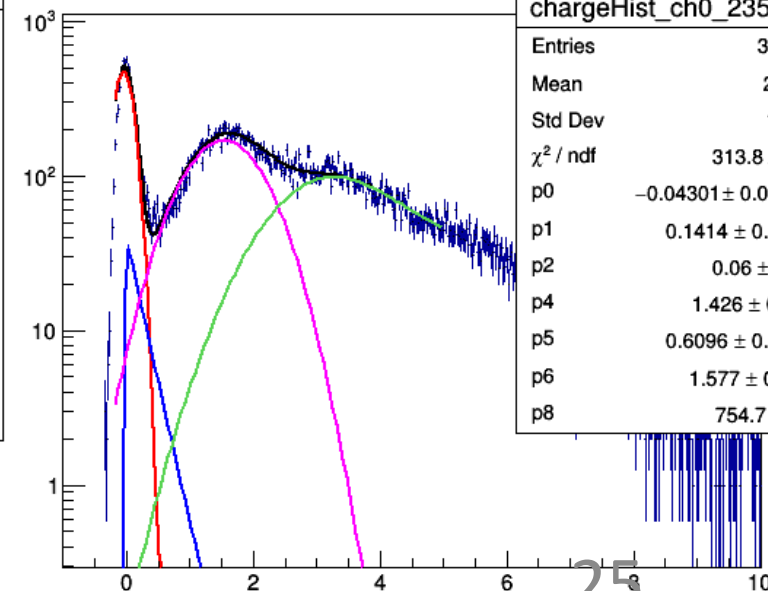
chargeHist_ch0_171_34	
Entries	36189
Mean	2.381
Std Dev	1.978
χ^2 / ndf	284.3 / 179
p0	-0.04443 ± 0.00339
p1	0.09527 ± 0.00238
p2	0.06 ± 0.00
p4	1.609 ± 0.021
p5	0.5863 ± 0.0086
p6	1.517 ± 0.013
p8	811.3 ± 6.8



chargeHist_ch0_202_34	
Entries	36199
Mean	2.314
Std Dev	1.963
χ^2 / ndf	250.5 / 179
p0	-0.04471 ± 0.00320
p1	0.09376 ± 0.00218
p2	0.06 ± 0.00
p4	1.556 ± 0.020
p5	0.5908 ± 0.0086
p6	1.513 ± 0.012
p8	806.8 ± 6.7

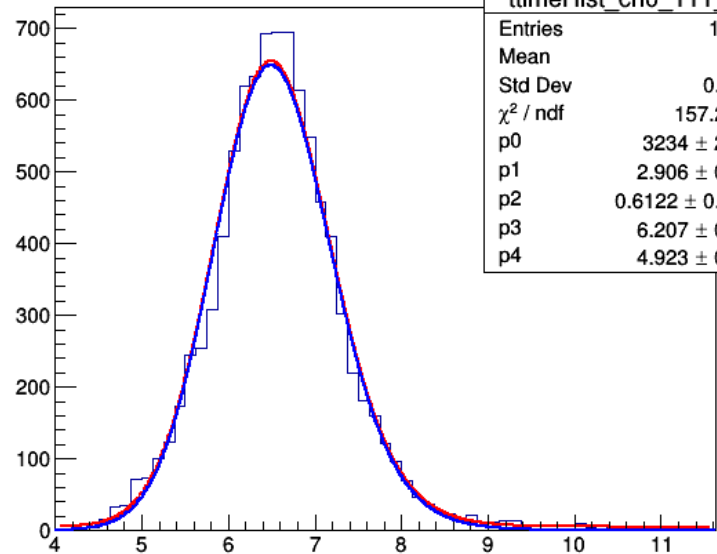


chargeHist_ch0_235_34	
Entries	32902
Mean	2.308
Std Dev	1.951
χ^2 / ndf	313.8 / 179
p0	-0.04301 ± 0.00514
p1	0.1414 ± 0.0036
p2	0.06 ± 0.00
p4	1.426 ± 0.021
p5	0.6096 ± 0.0102
p6	1.577 ± 0.015
p8	754.7 ± 7.1

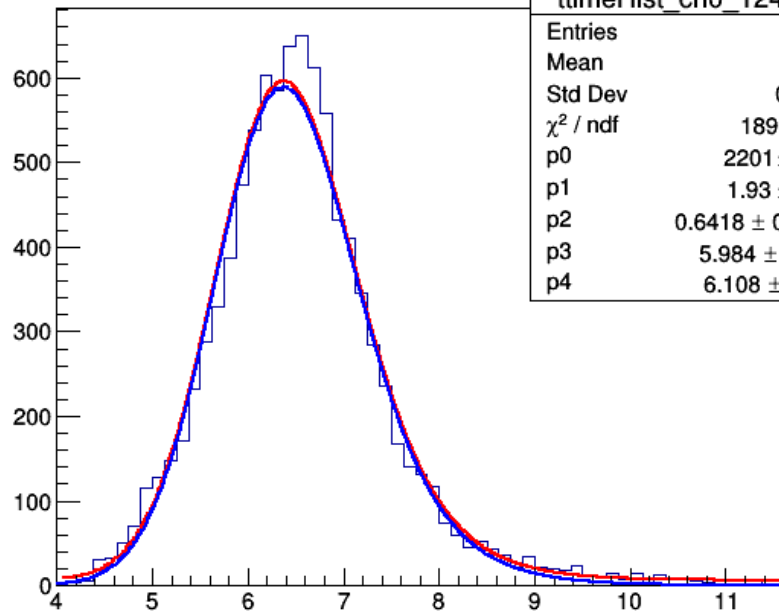


BC0035

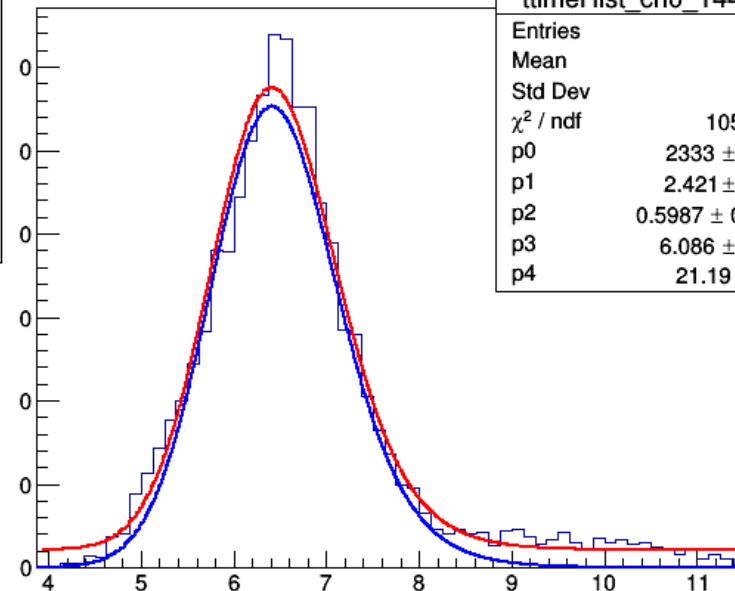
ttimeHist_ch0_111_34	
Entries	10377
Mean	6.591
Std Dev	0.8162
χ^2 / ndf	157.2 / 56
p0	3234 ± 219.2
p1	2.906 ± 0.199
p2	0.6122 ± 0.0102
p3	6.207 ± 0.022
p4	4.923 ± 0.539



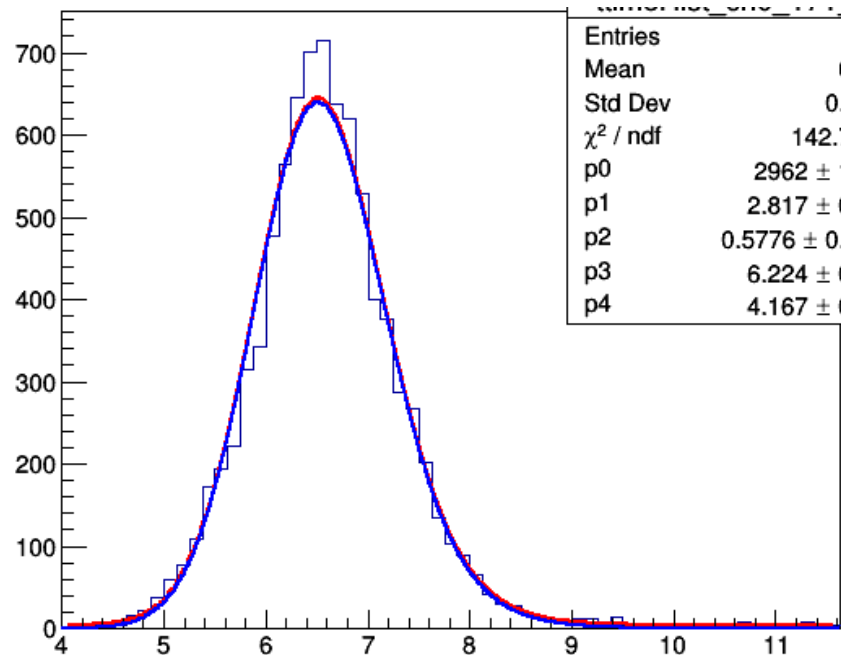
ttimeHist_ch0_124_34	
Entries	10599
Mean	6.552
Std Dev	0.9421
χ^2 / ndf	189.2 / 56
p0	2201 ± 95.0
p1	1.93 ± 0.09
p2	0.6418 ± 0.0104
p3	5.984 ± 0.020
p4	6.108 ± 0.761



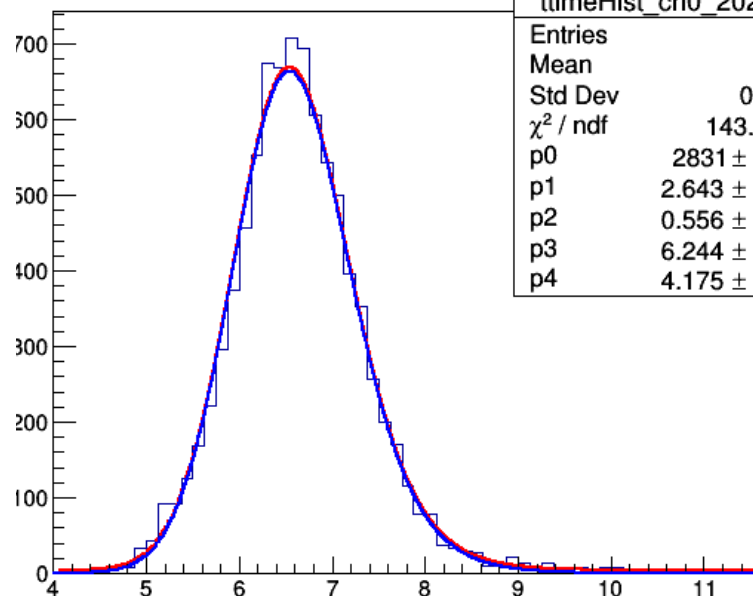
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Entries	10141
Mean	6.712
Std Dev	1.137
χ^2 / ndf	1056 / 56
p0	2333 ± 190.7
p1	2.421 ± 0.208
p2	0.5987 ± 0.0124
p3	6.086 ± 0.029
p4	21.19 ± 1.11



ttimeHist_ch0_171_34	
Entries	9757
Mean	6.615
Std Dev	0.7874
χ^2 / ndf	142.7 / 56
p0	2962 ± 177.0
p1	2.817 ± 0.169
p2	0.5776 ± 0.0098
p3	6.224 ± 0.020
p4	4.167 ± 0.477



ttimeHist_ch0_202_34	
Entries	9827
Mean	6.662
Std Dev	0.7829
χ^2 / ndf	143.7 / 56
p0	2831 ± 149.3
p1	2.643 ± 0.140
p2	0.556 ± 0.009
p3	6.244 ± 0.019
p4	4.175 ± 0.484



ttimeHist_ch0_235_34	
Entries	9198
Mean	6.621
Std Dev	0.7313
χ^2 / ndf	118.1 / 56
p0	3719 ± 369.0
p1	3.677 ± 0.365
p2	0.5985 ± 0.0110
p3	6.324 ± 0.027
p4	2.293 ± 0.330

