Status Report

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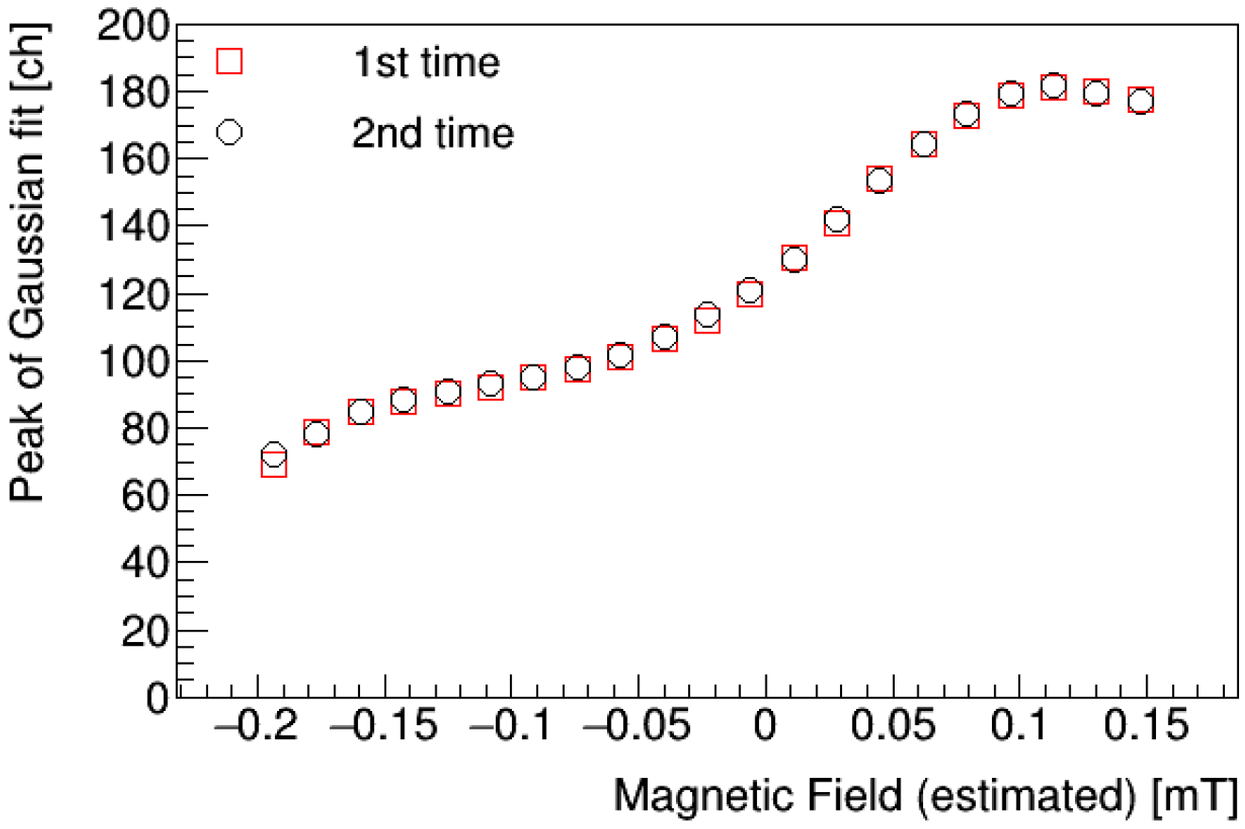
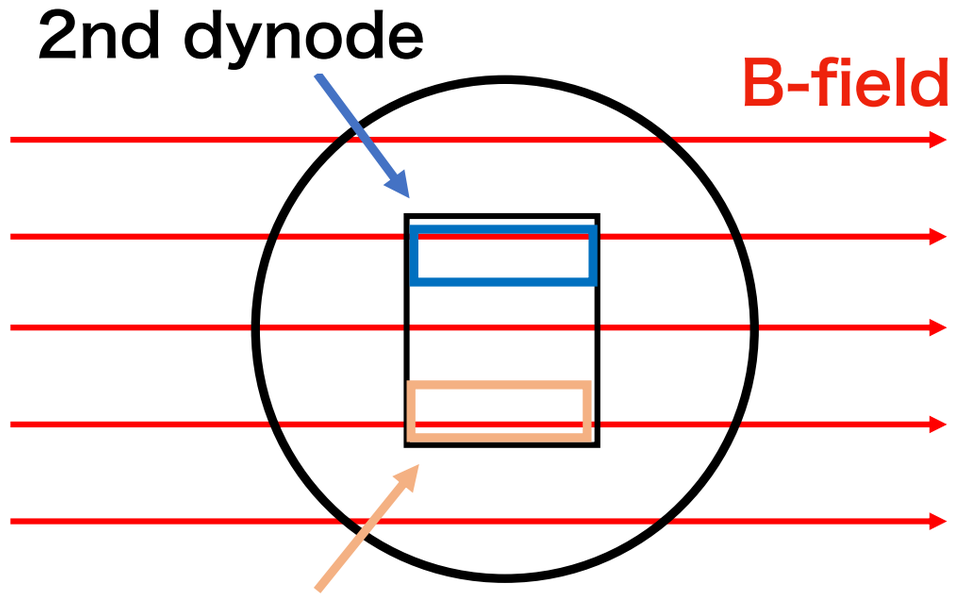
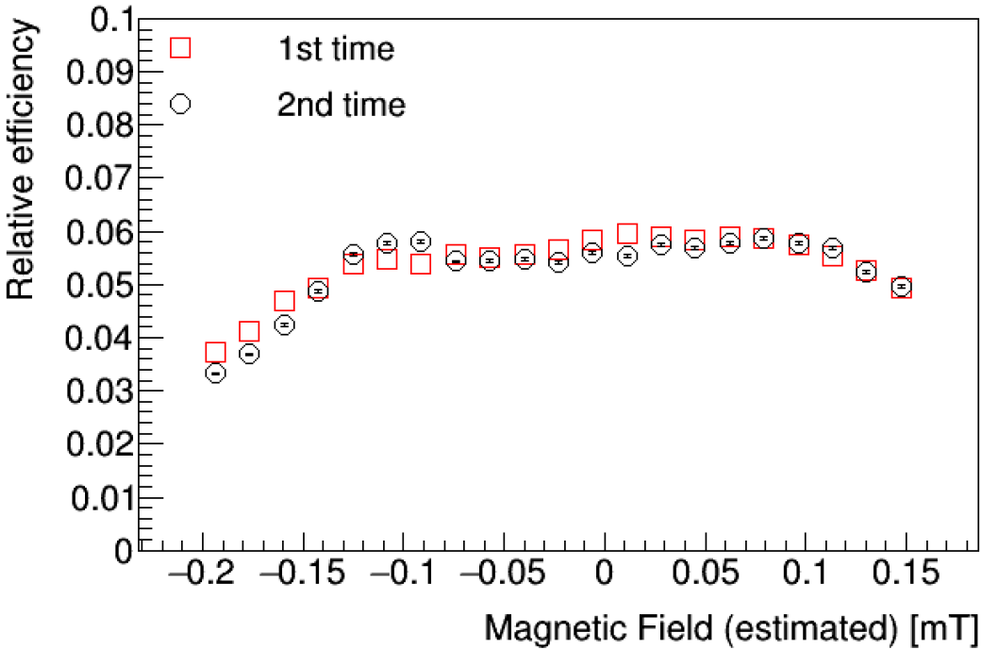
Dynode Structure

- I set the PMT so that 1st dynode was at the bottom.
- I checked the gain of the non-HA coated PMT.



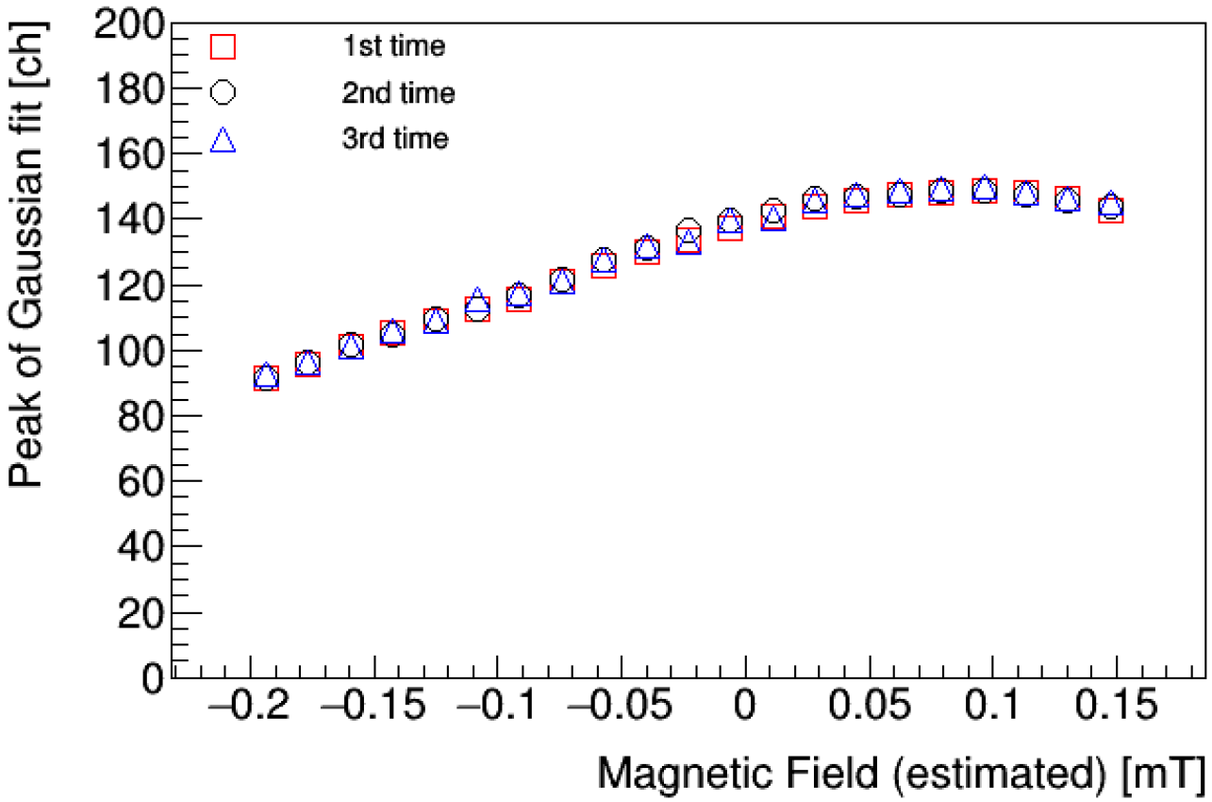


- As B-field increases, the gain increases.

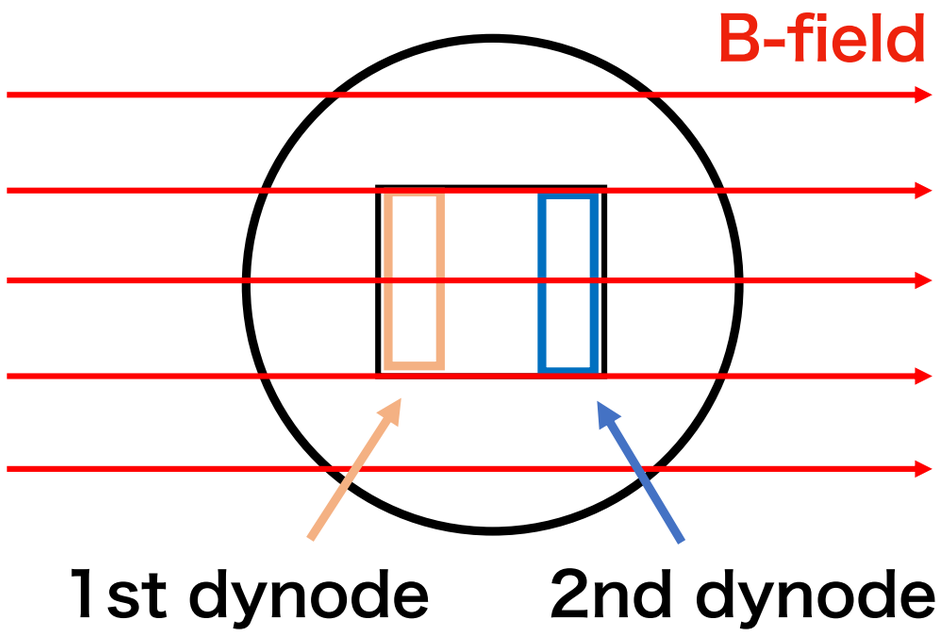


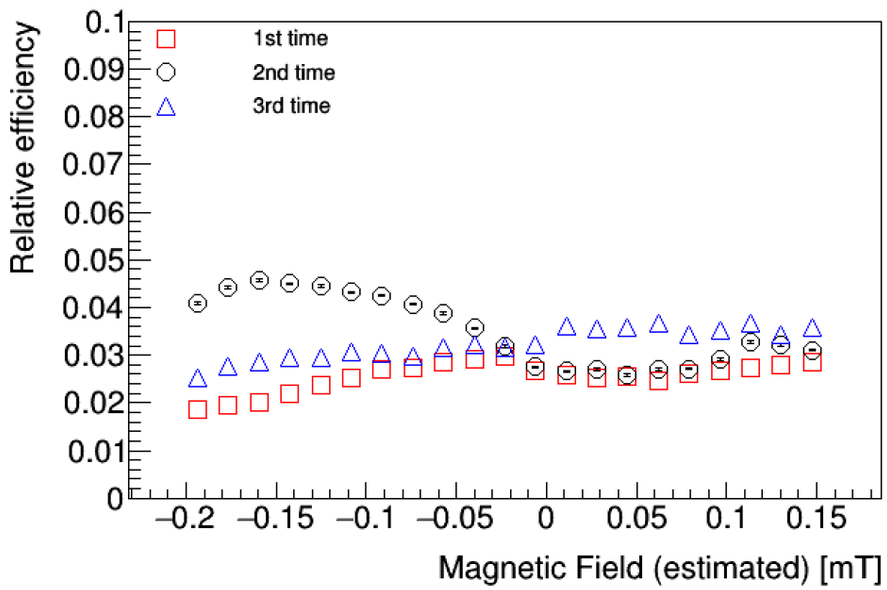
Dynode Structure

- I set the PMT so that B-field went from the 1st dynode to the 2nd dynode.
- I checked the gain.



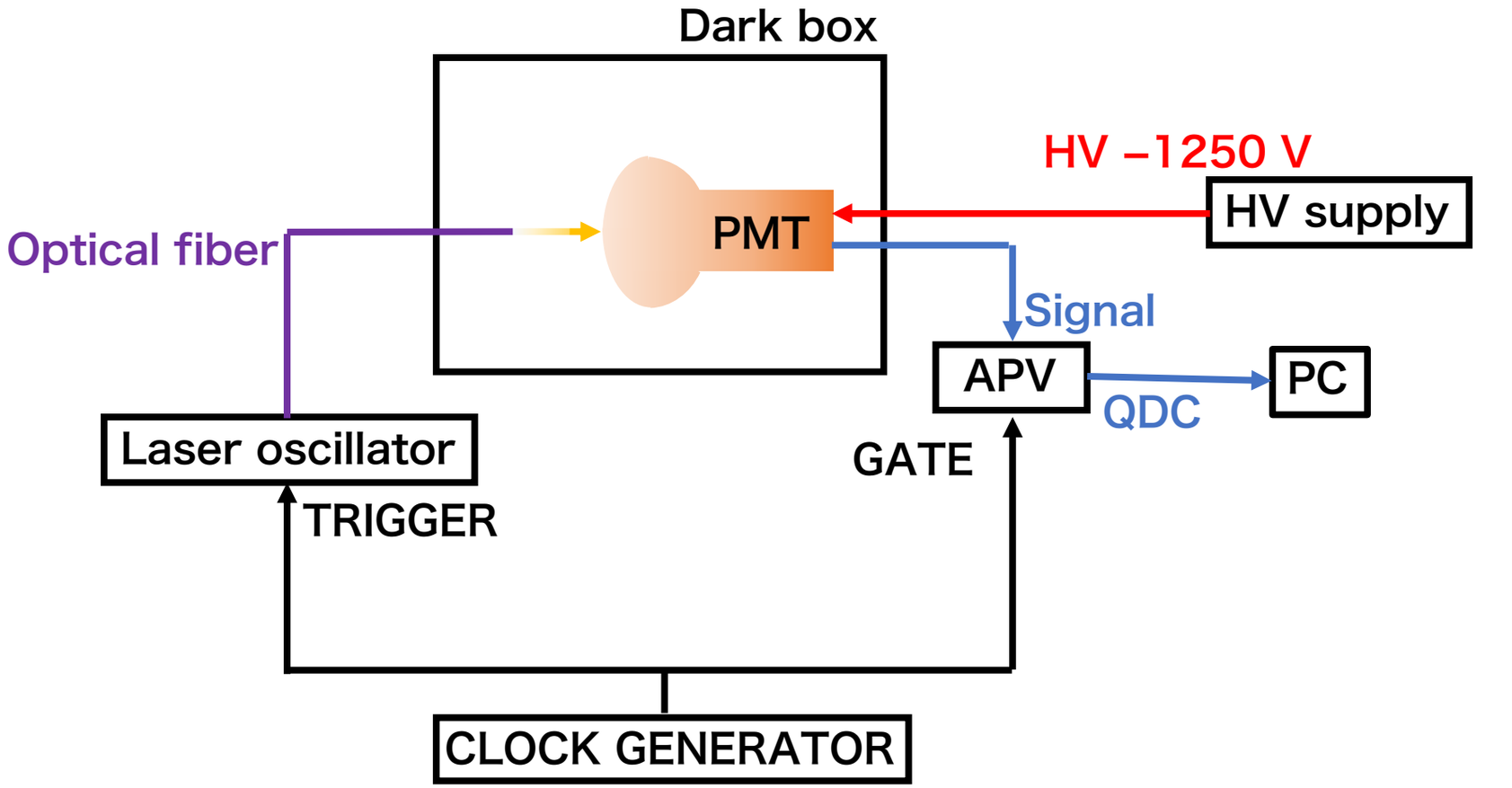
- As B-field increases, the gain increases.



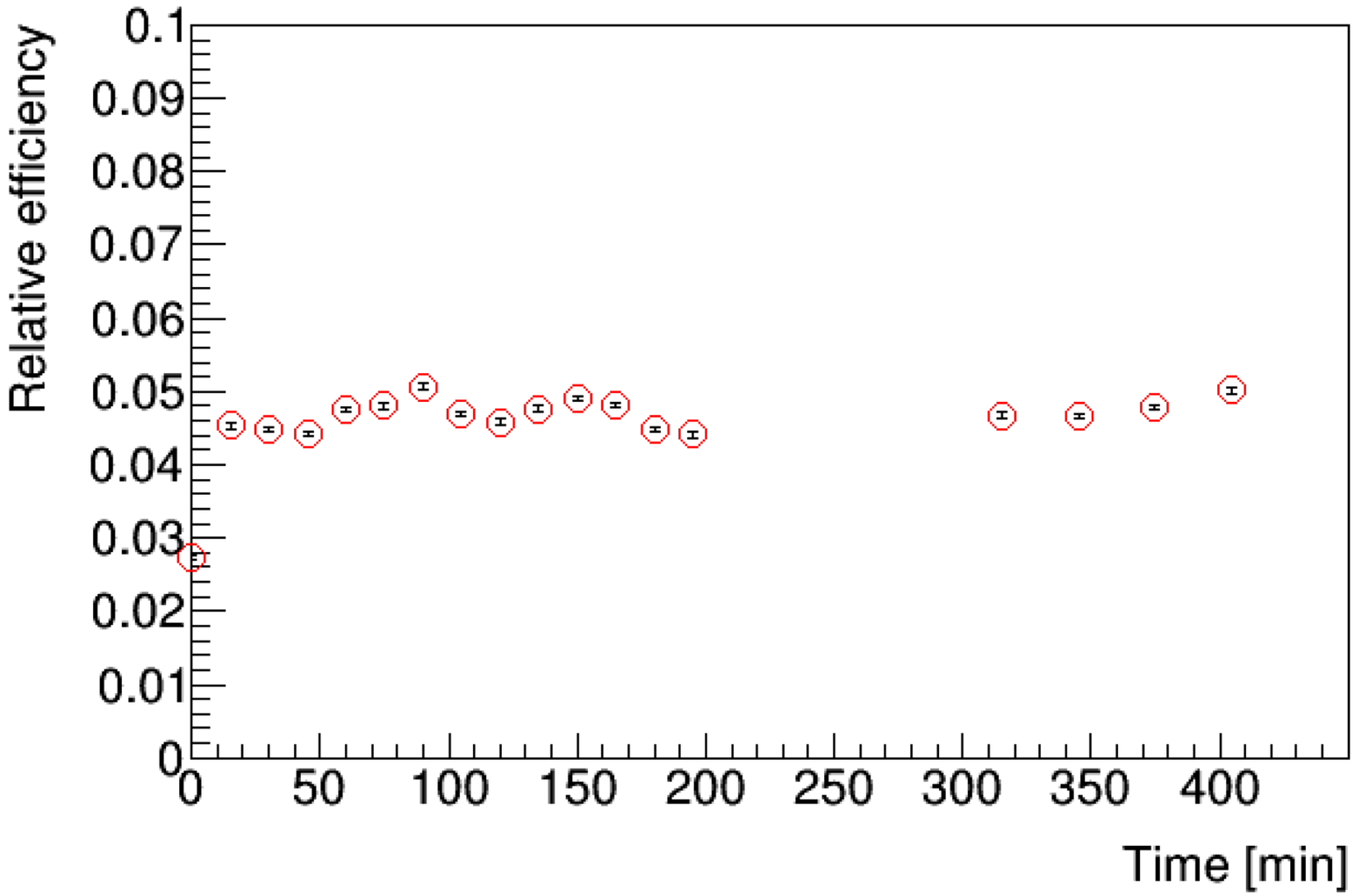


Light intensity

- I checked the time dependence of the light intensity with the laser oscillator.
- Measurement time is 5 min.



Light intensity



- The result shows that the time dependence is stable after about 15 min.
- Variation of the efficiency is about 10 %.

Future plan

- I will check the time dependence of the light intensity again.

Backup

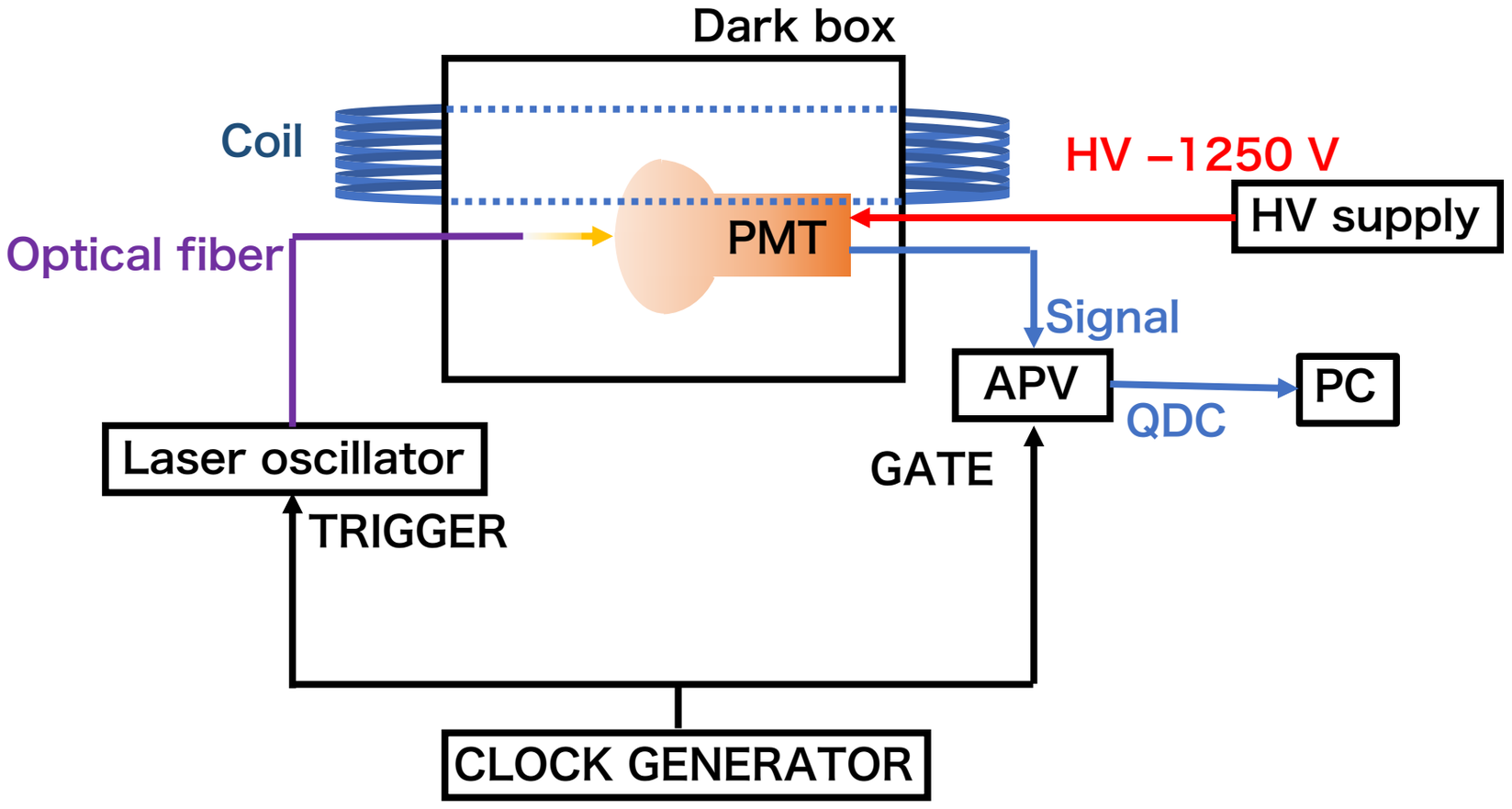
Relative efficiency

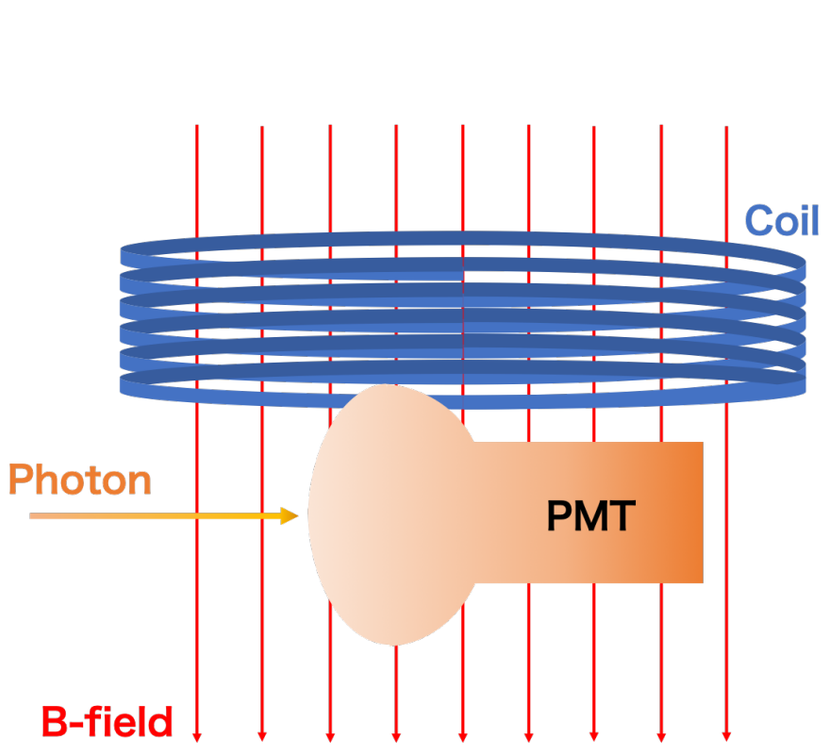
Relative efficiency is defined as follows:

$$\text{Relative efficiency} = \frac{\text{the number of PMT's signals}}{\text{the number of signals from clock generator}}$$

"the number of PMT's signals" is the counts above the threshold.

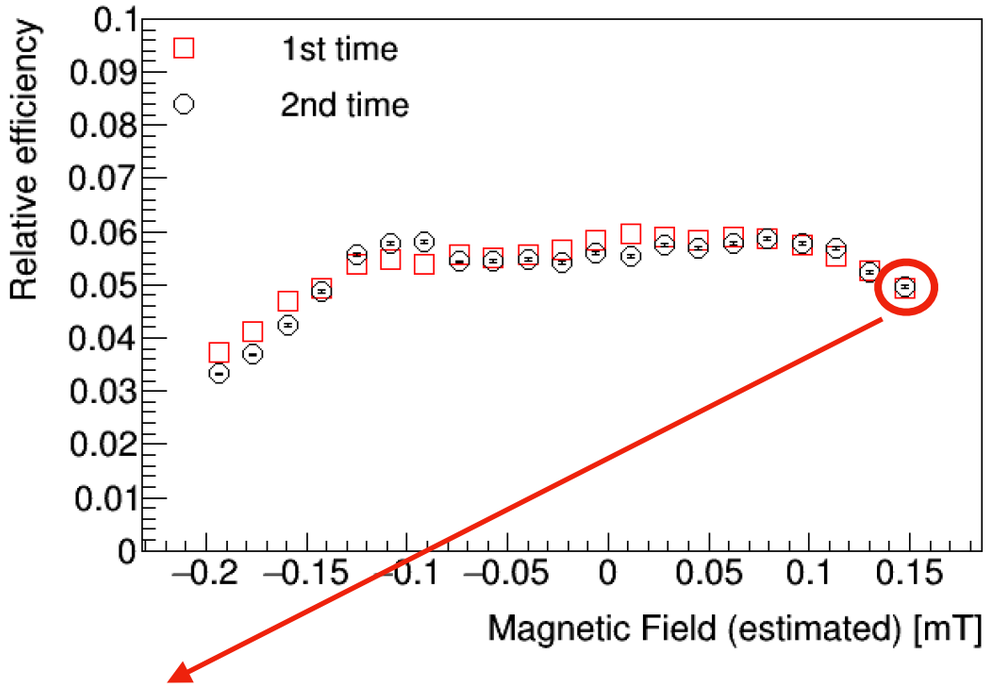
I measured relative efficiencies of non-HA coated PMT with B-field parallel to photo-cathode.

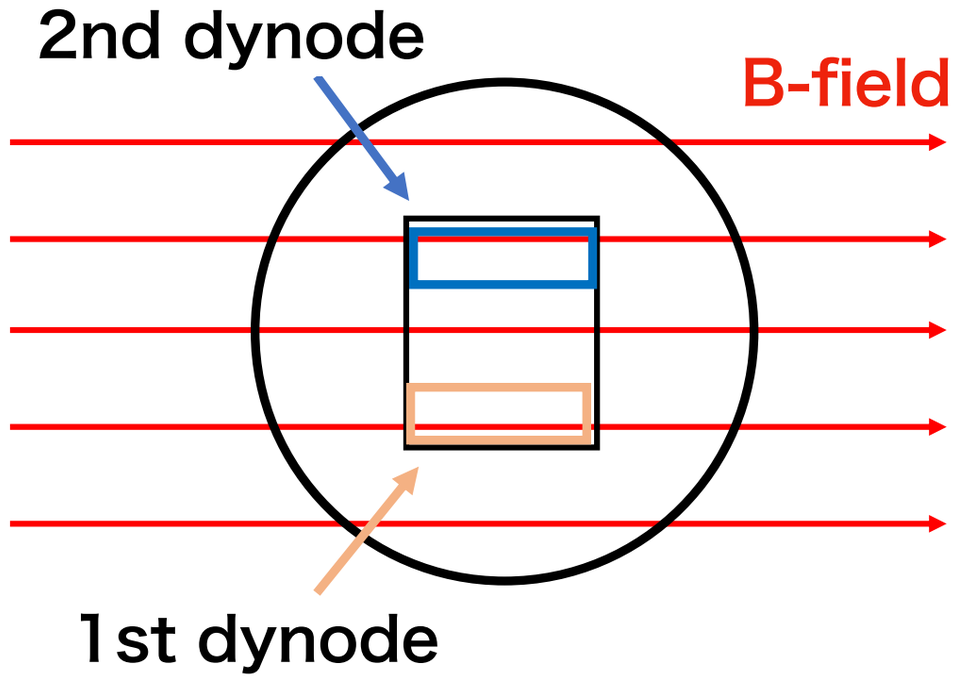




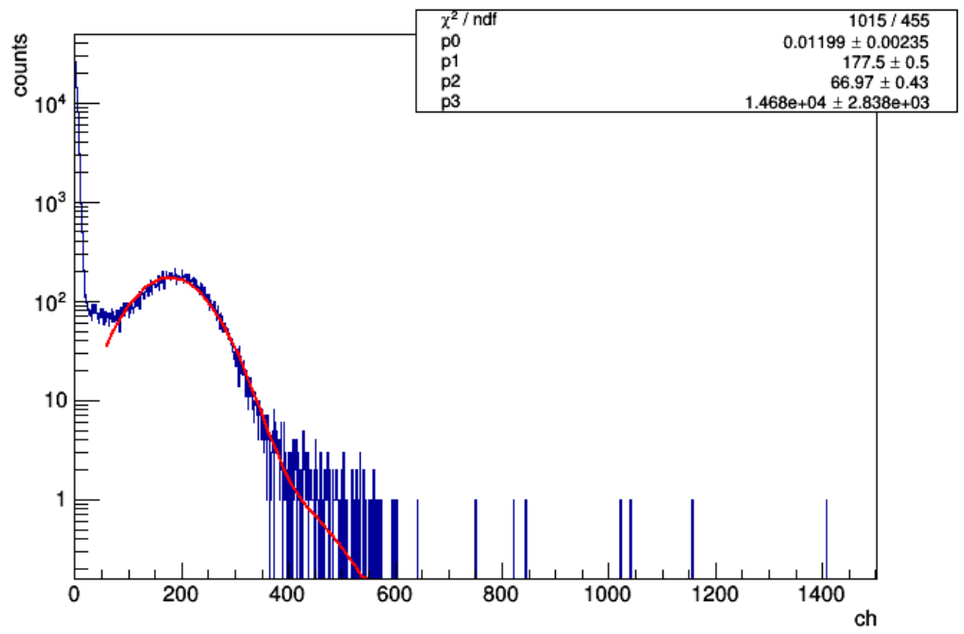
Generated pulse wave with 1 kHz frequency

Dynode Structure

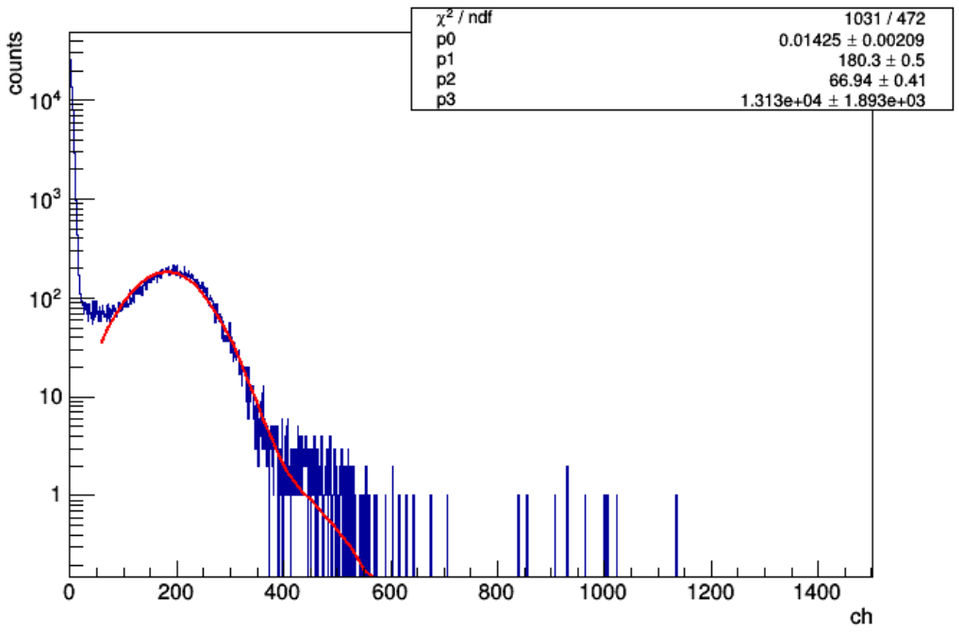




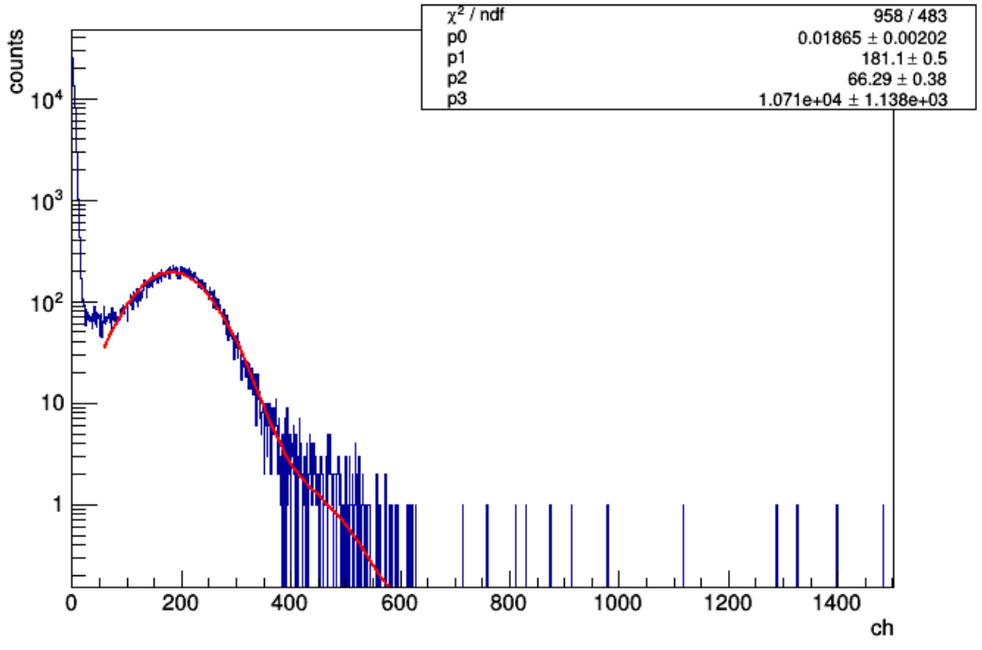
-500 mA



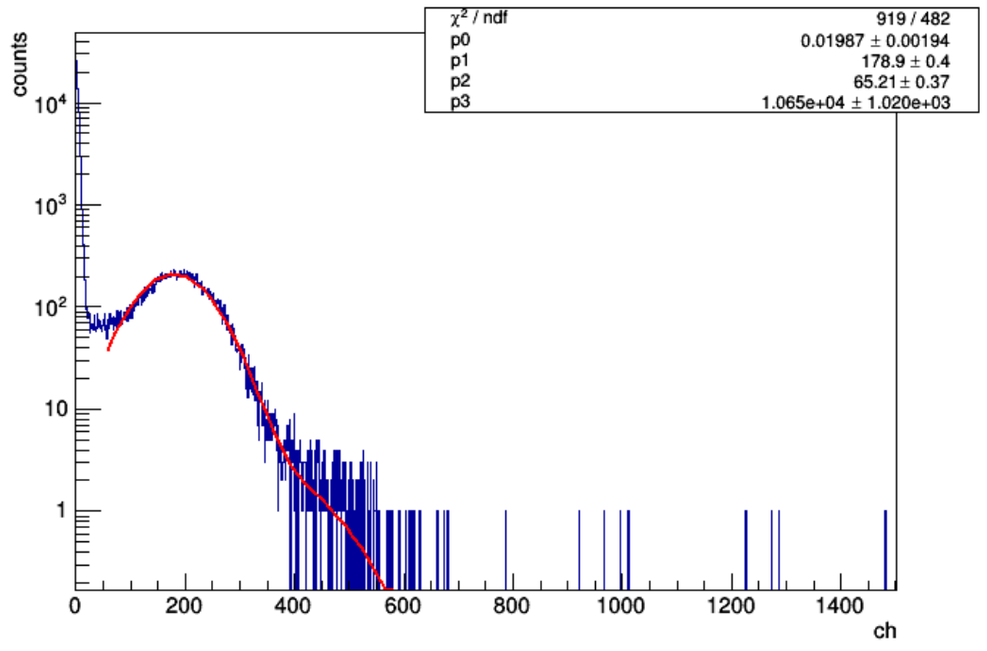
-450 mA



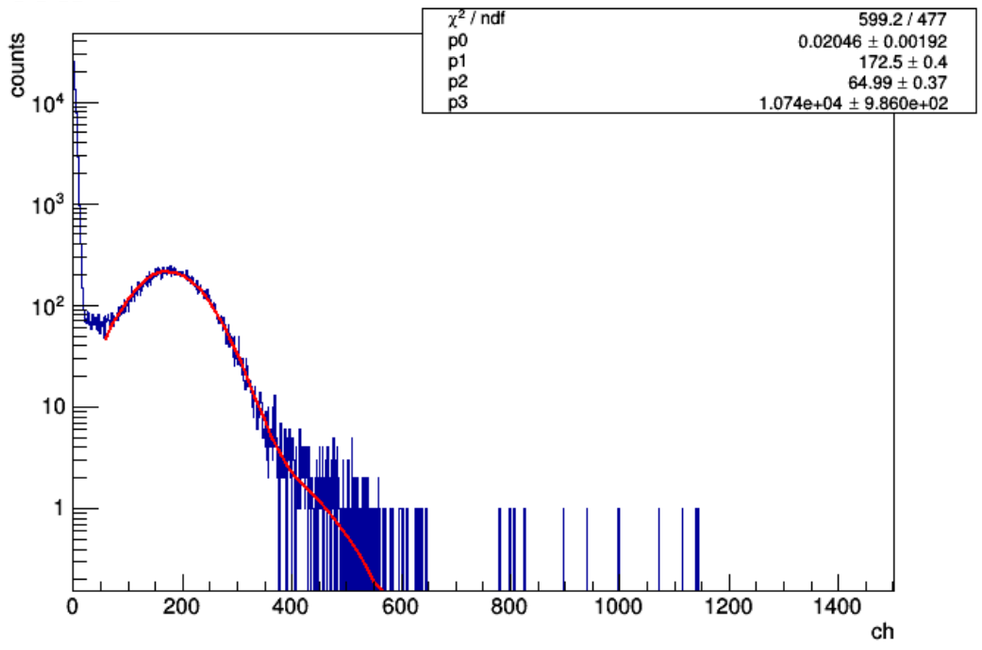
-400 mA



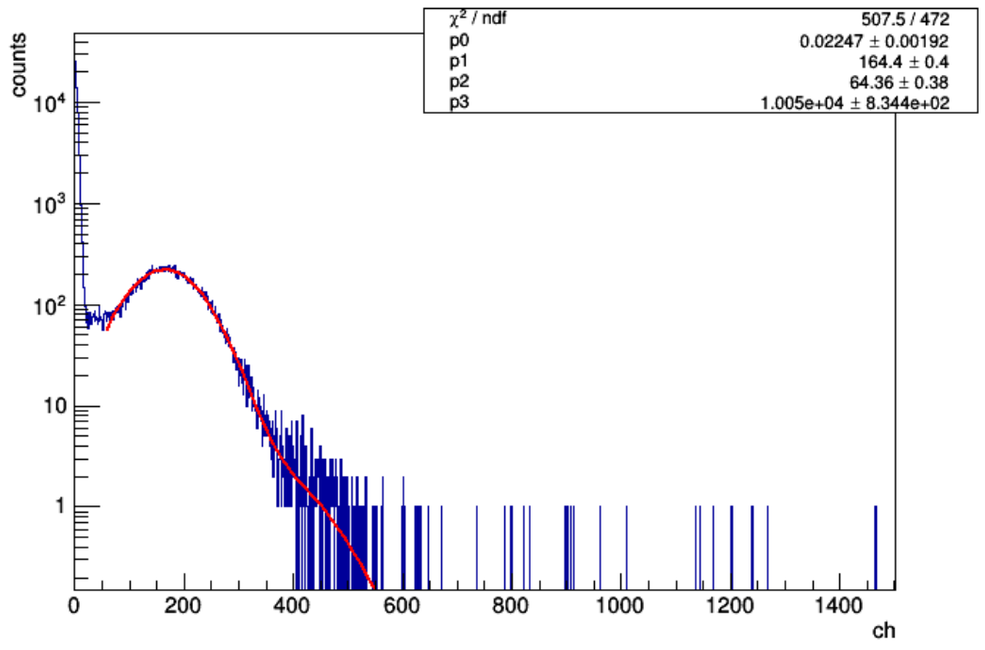
-350 mA



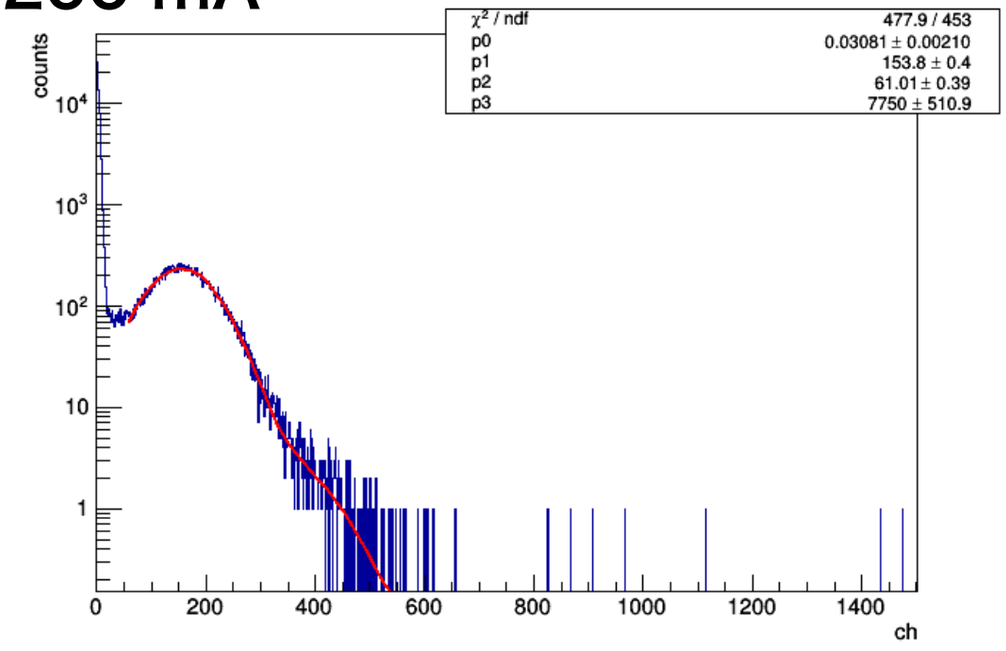
-300 mA



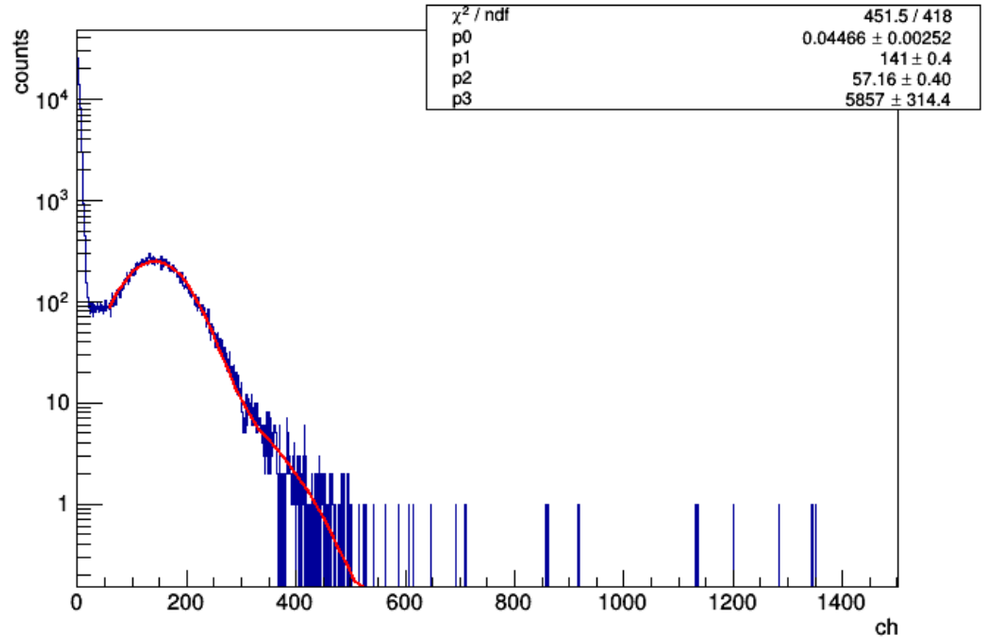
-250 mA



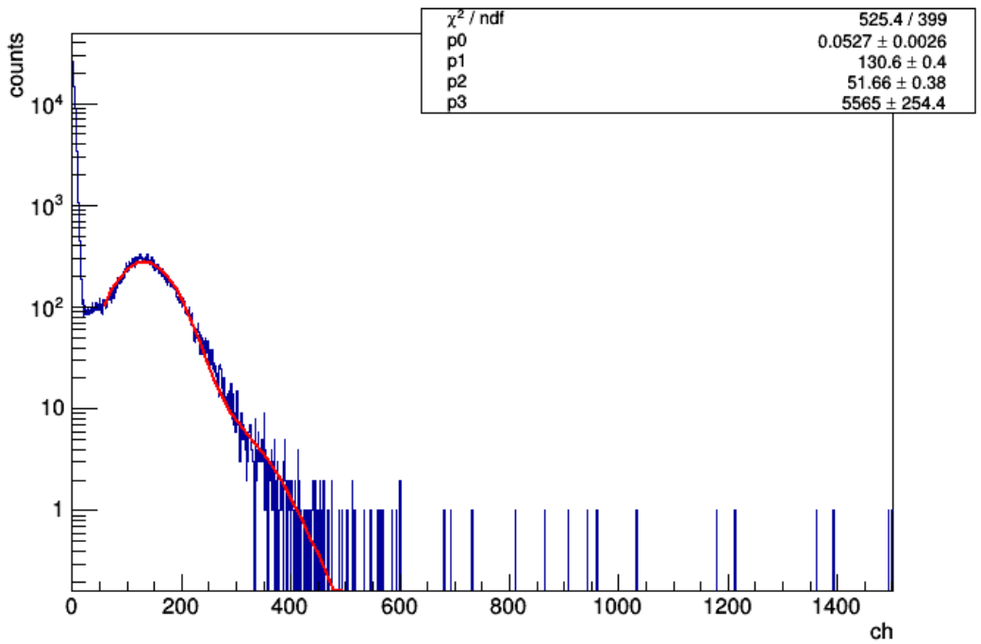
-200 mA



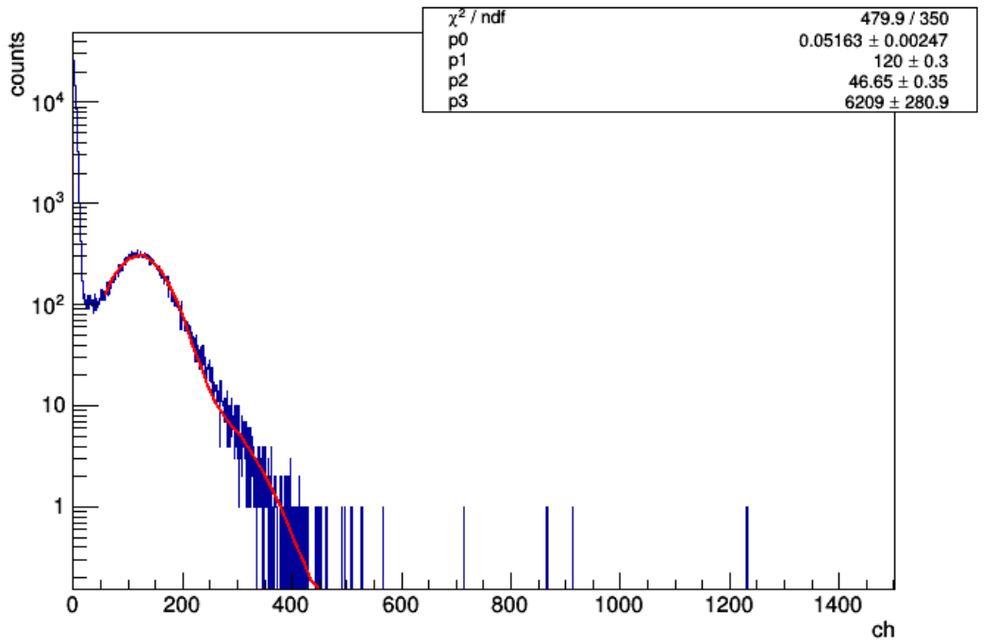
-150 mA



-100 mA



-50 mA



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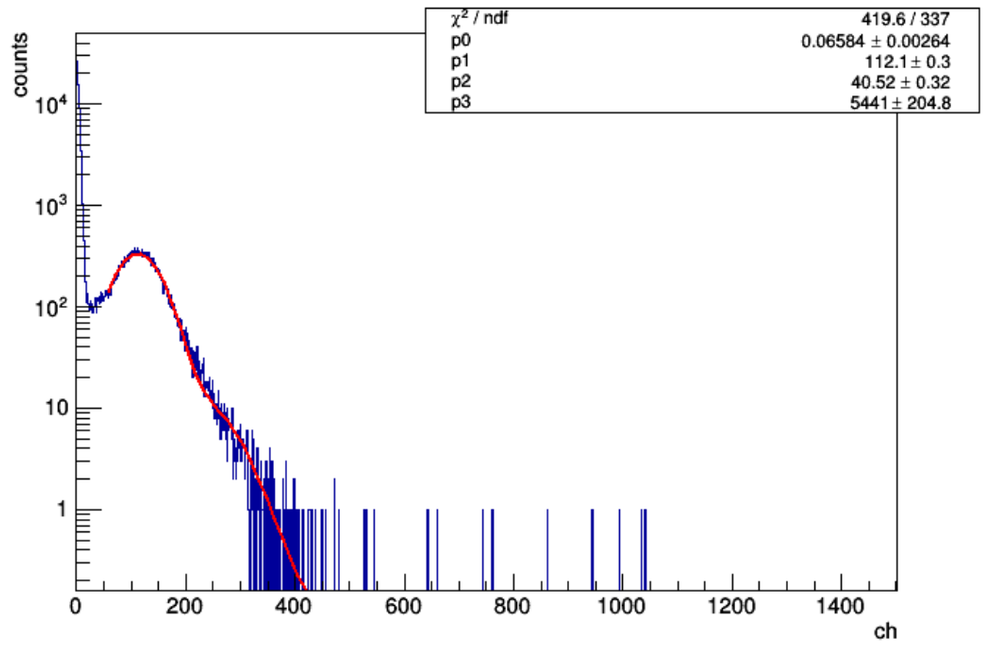

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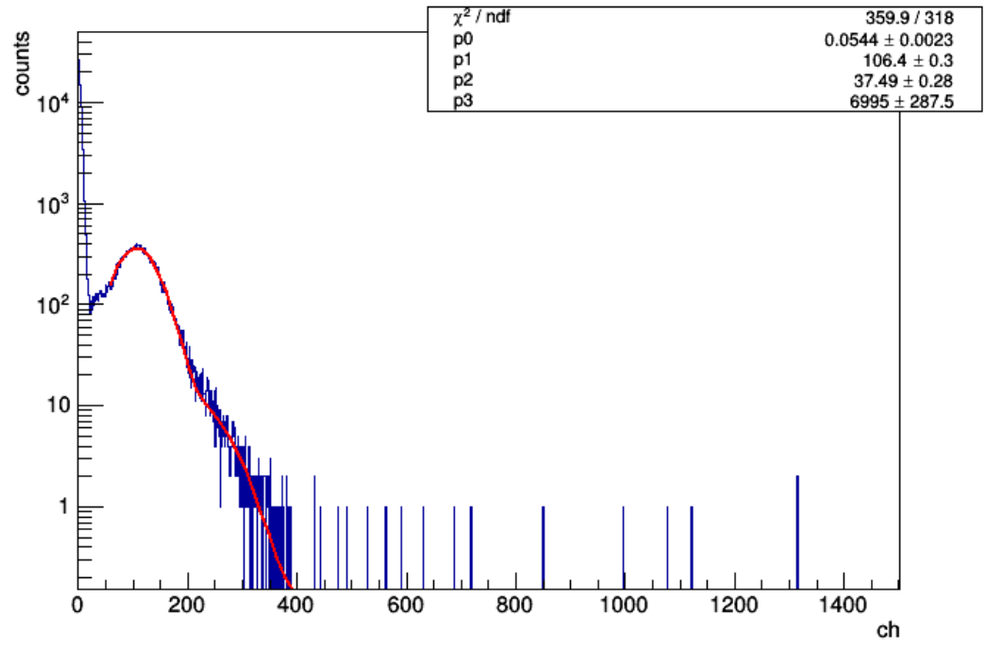

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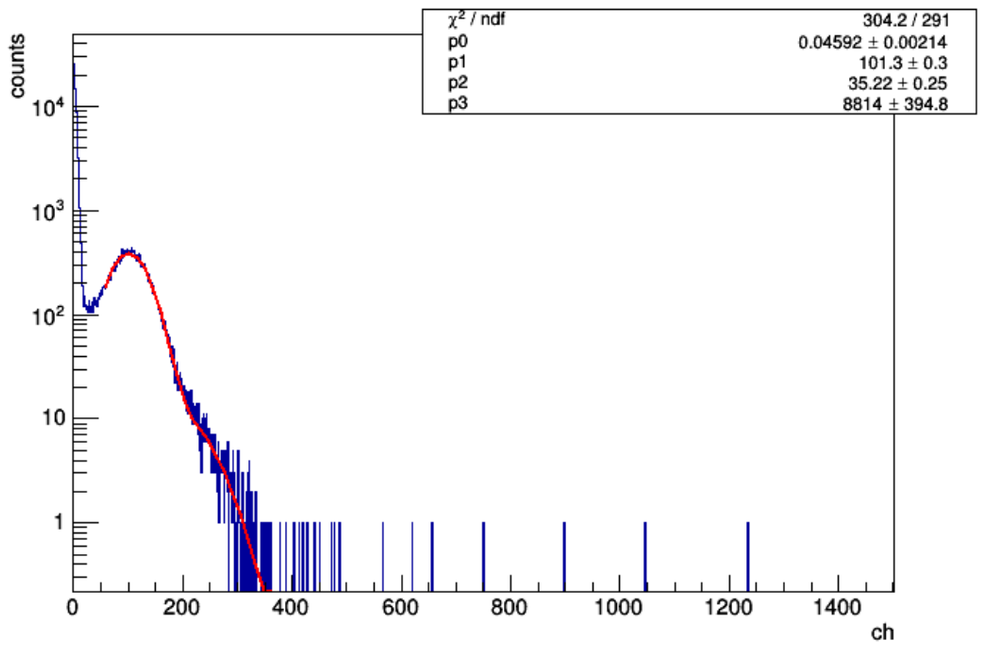

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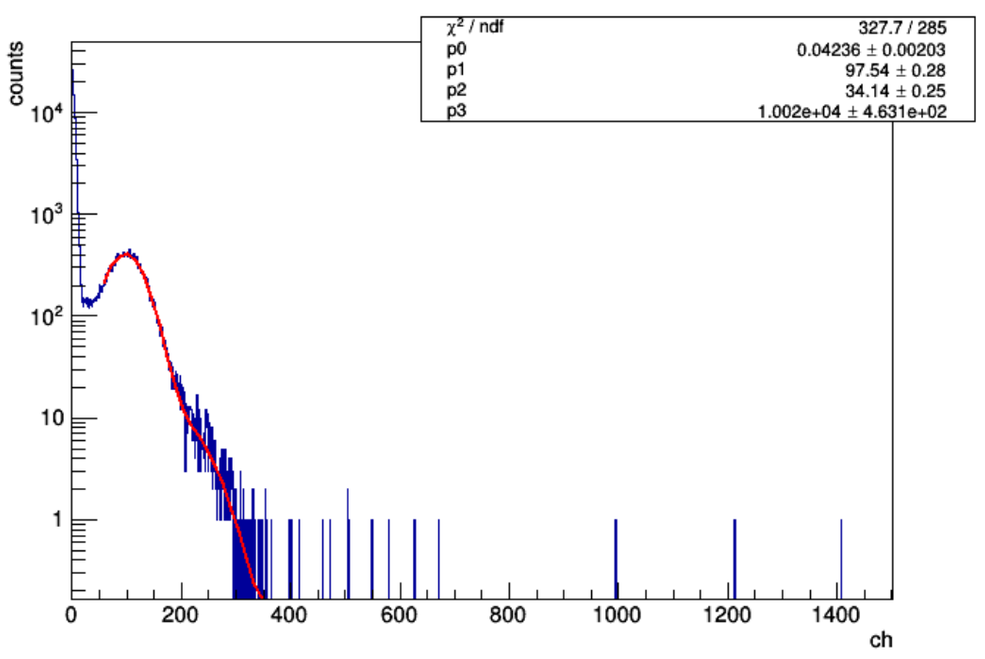
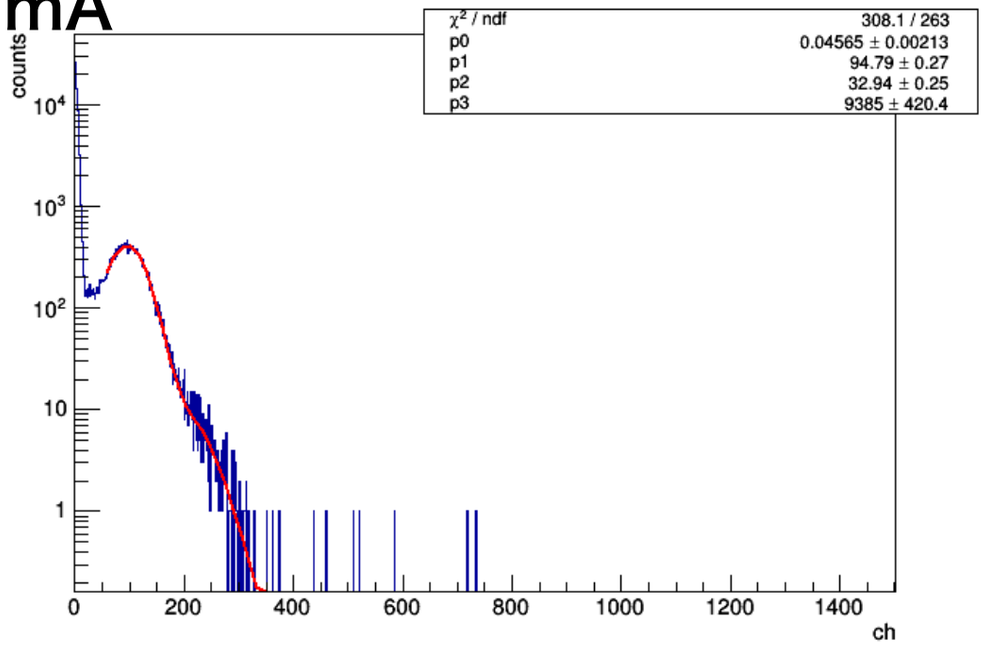
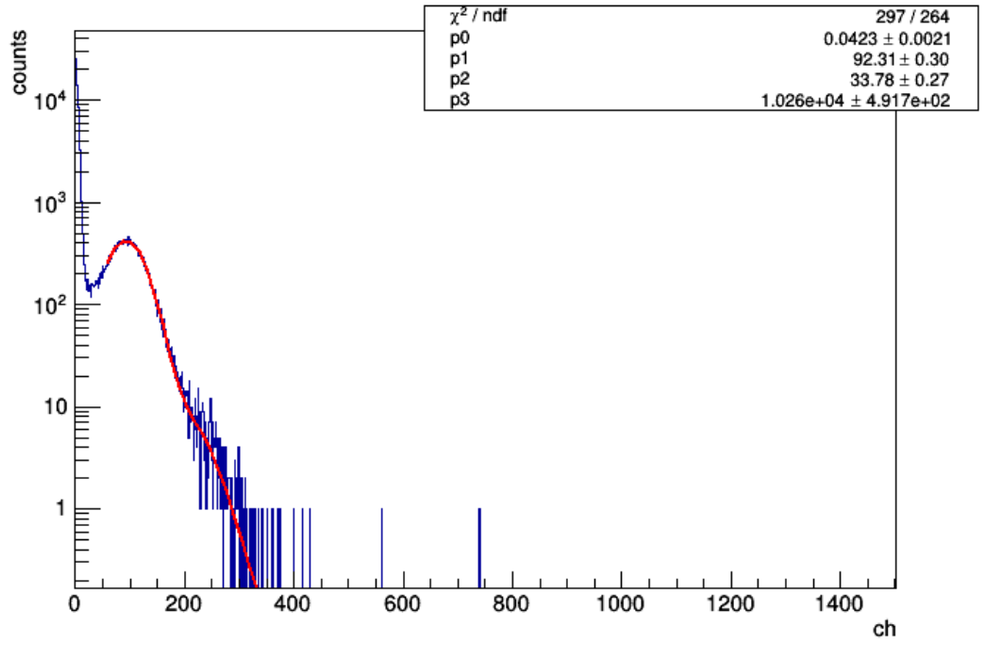


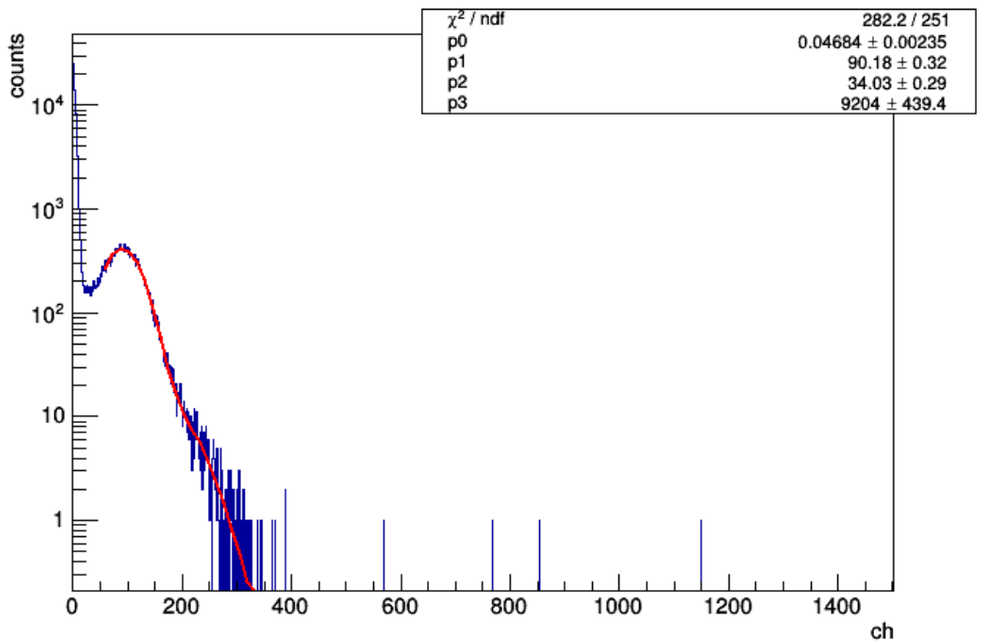
200 mA



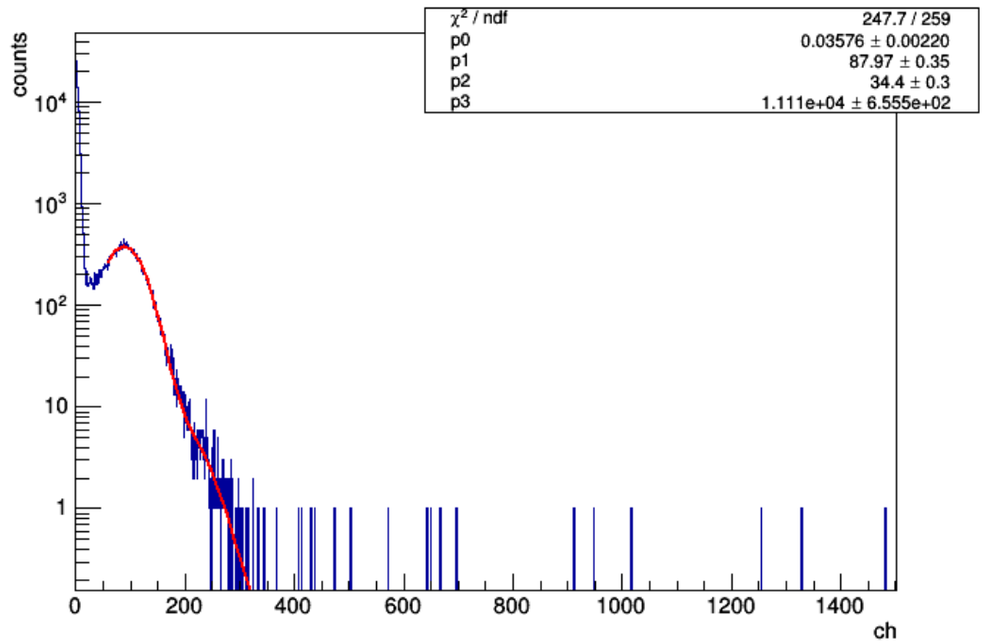
250 mA



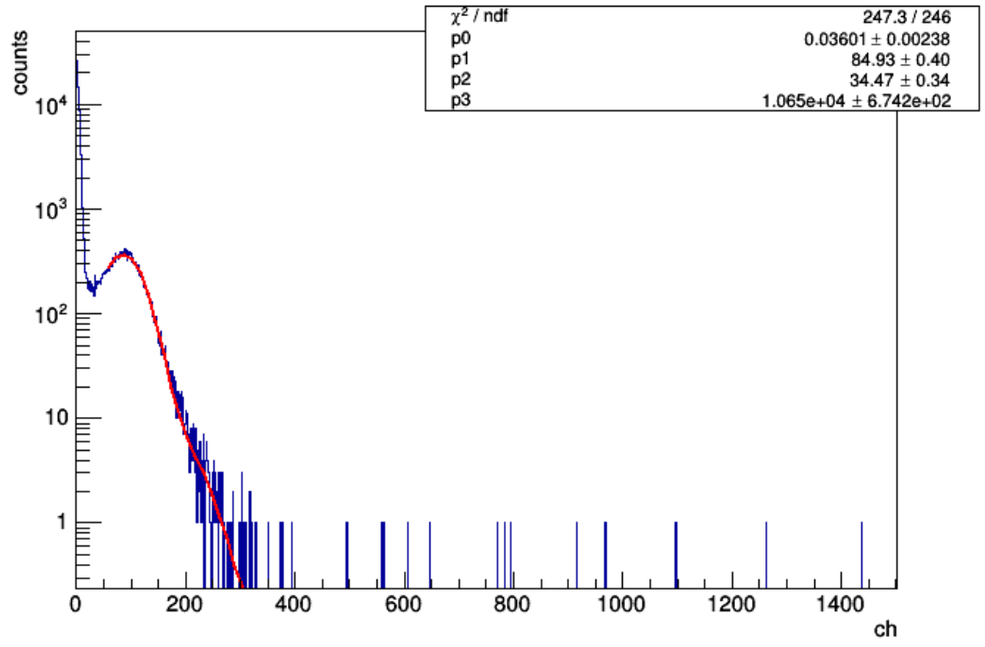
300 mA



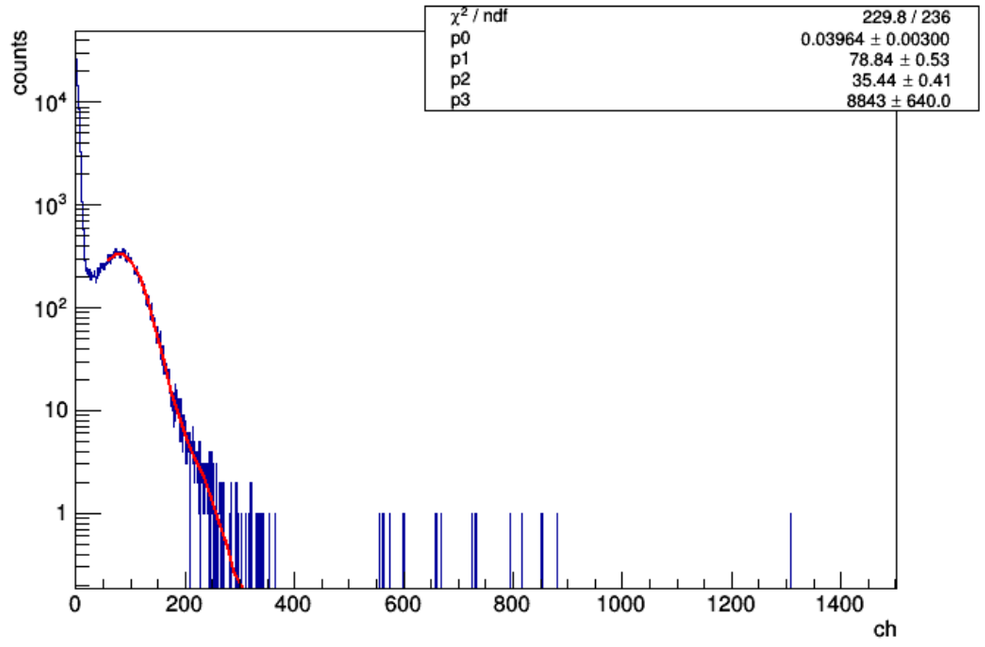
350 mA



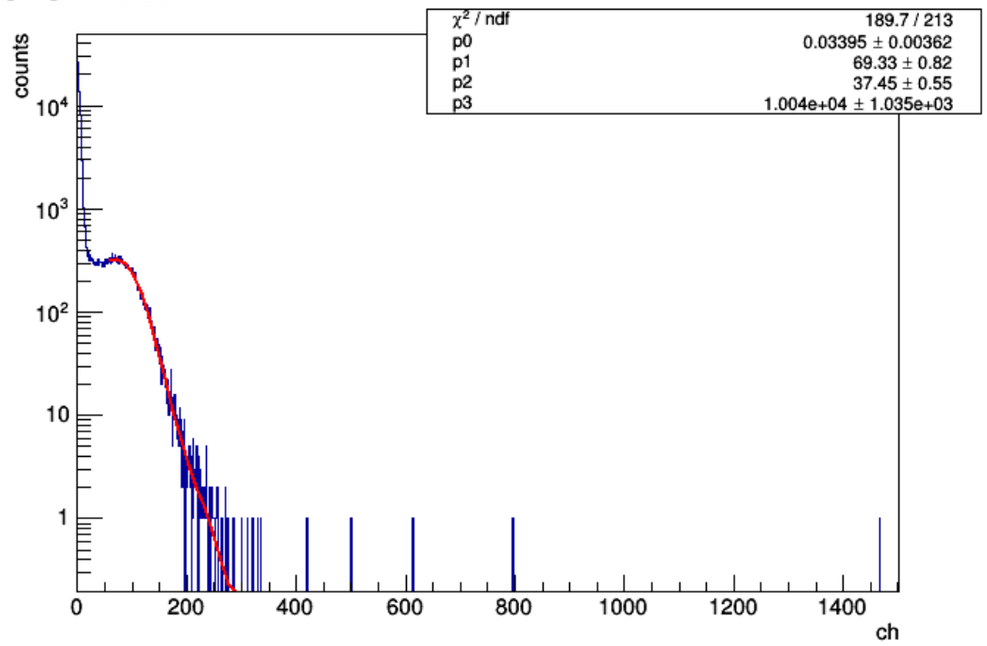
400 mA



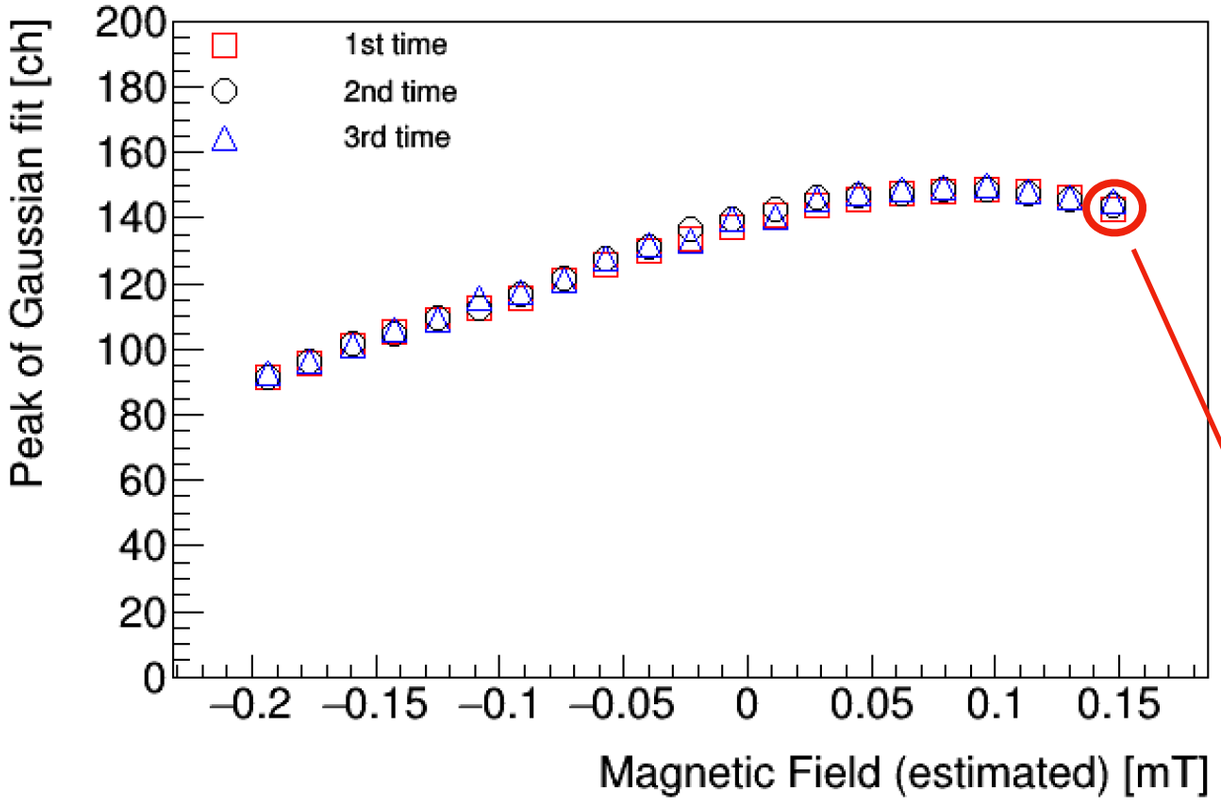
450 mA

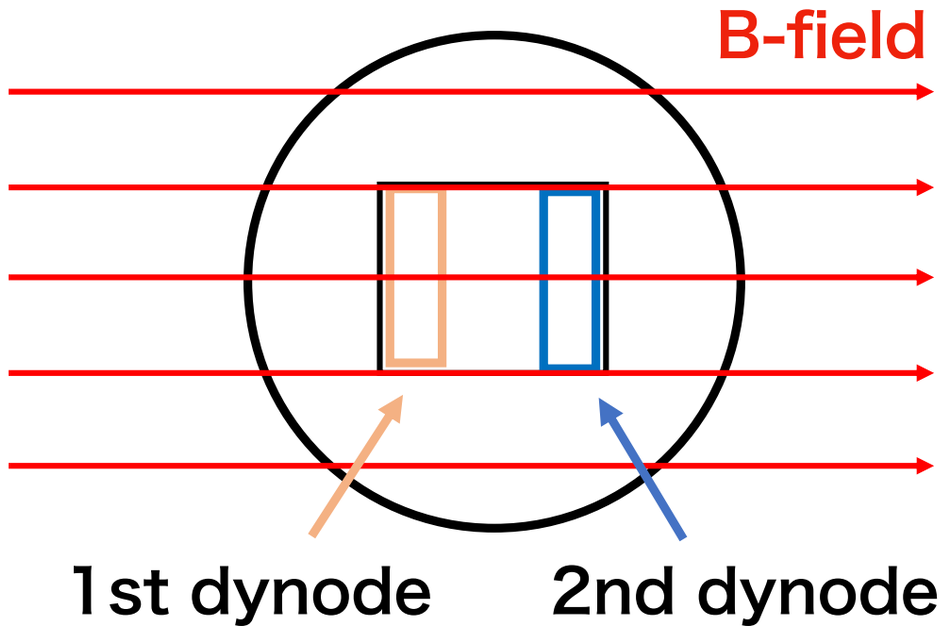


500 mA

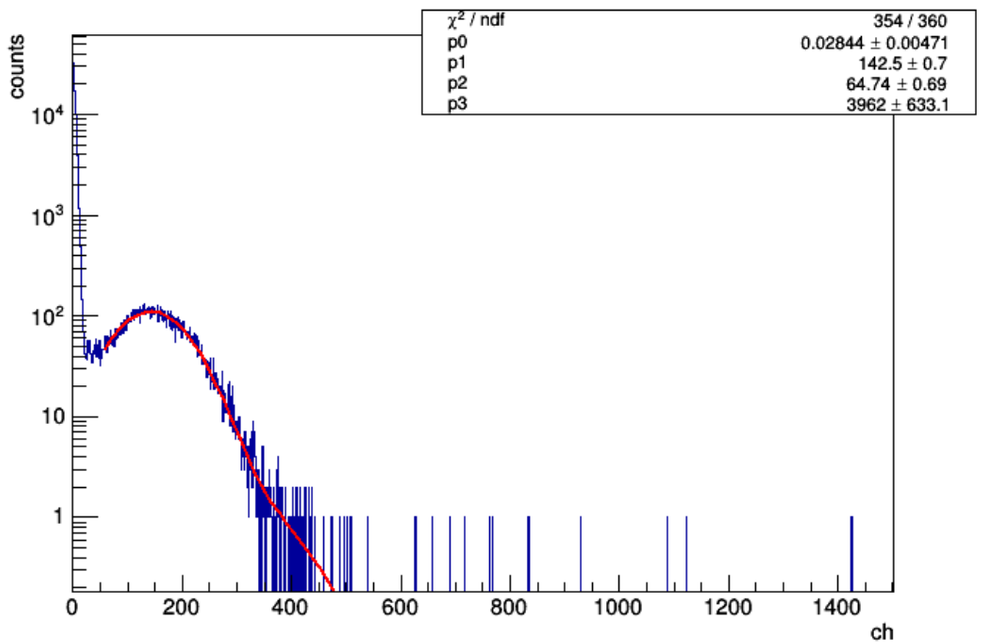


Dynode Structure

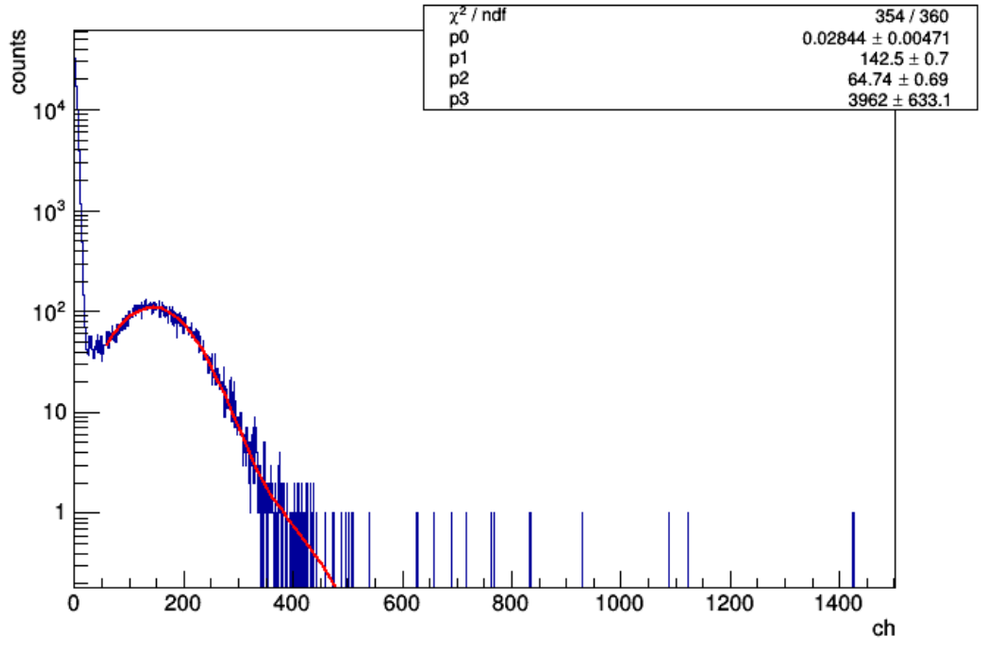


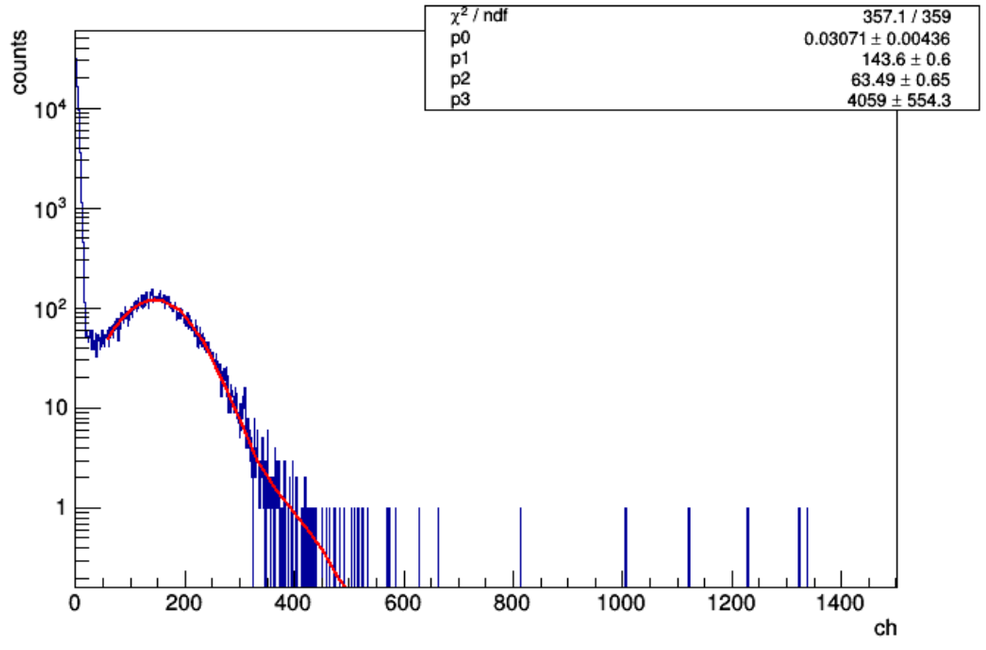


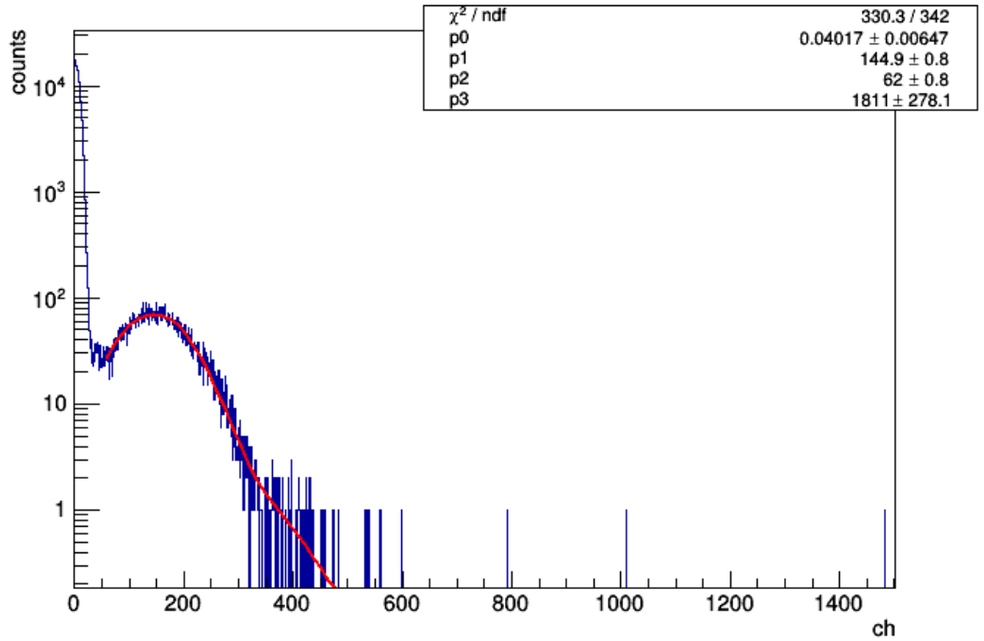
-500 mA

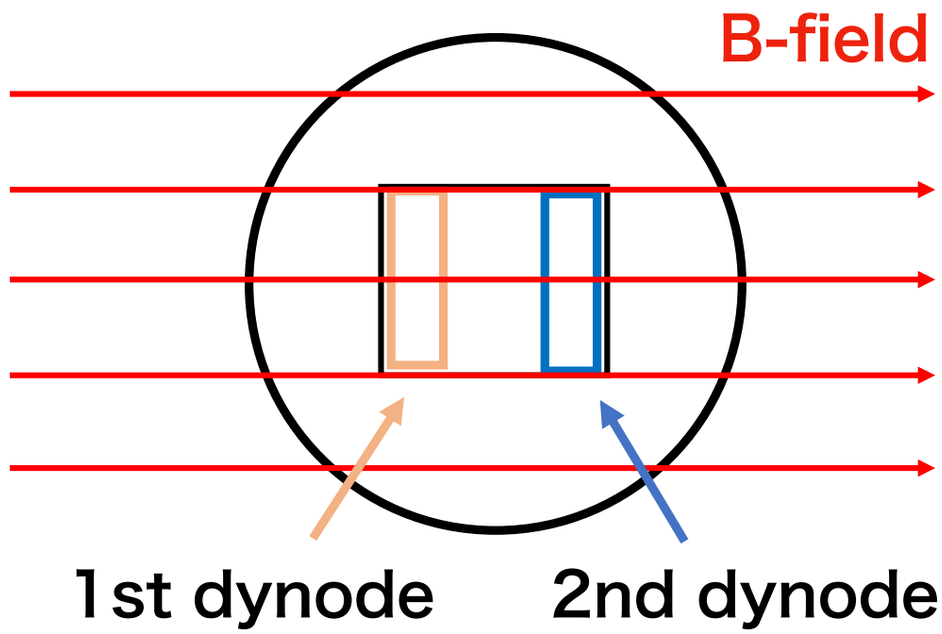


-500 mA

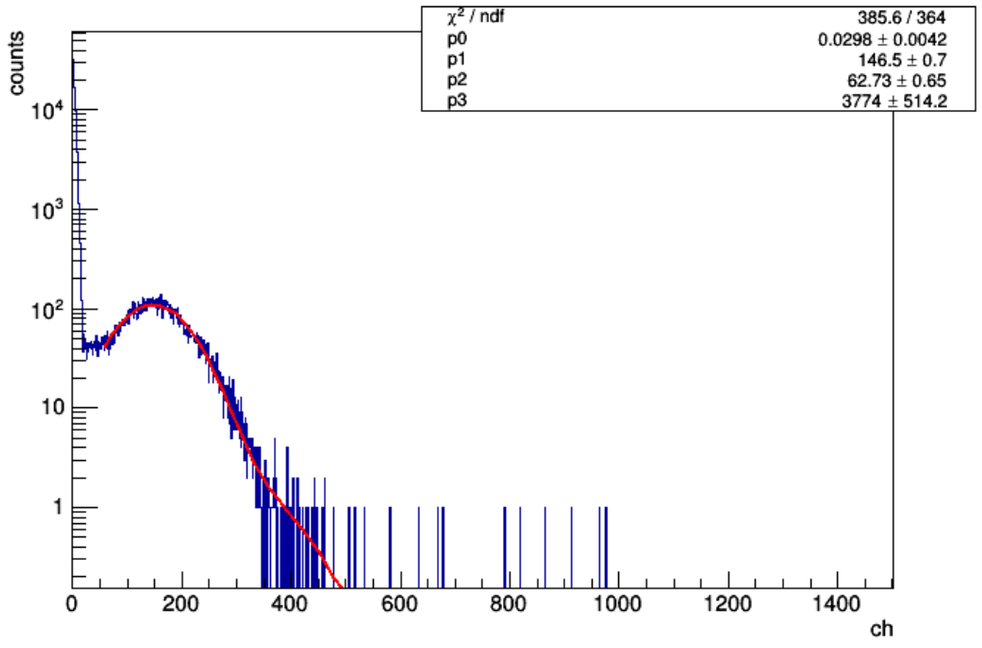

χ² / ndf 354 / 360
p0 0.02844 ± 0.00471
p1 142.5 ± 0.7
p2 64.74 ± 0.69
p3 3962 ± 633.1
counts
ch

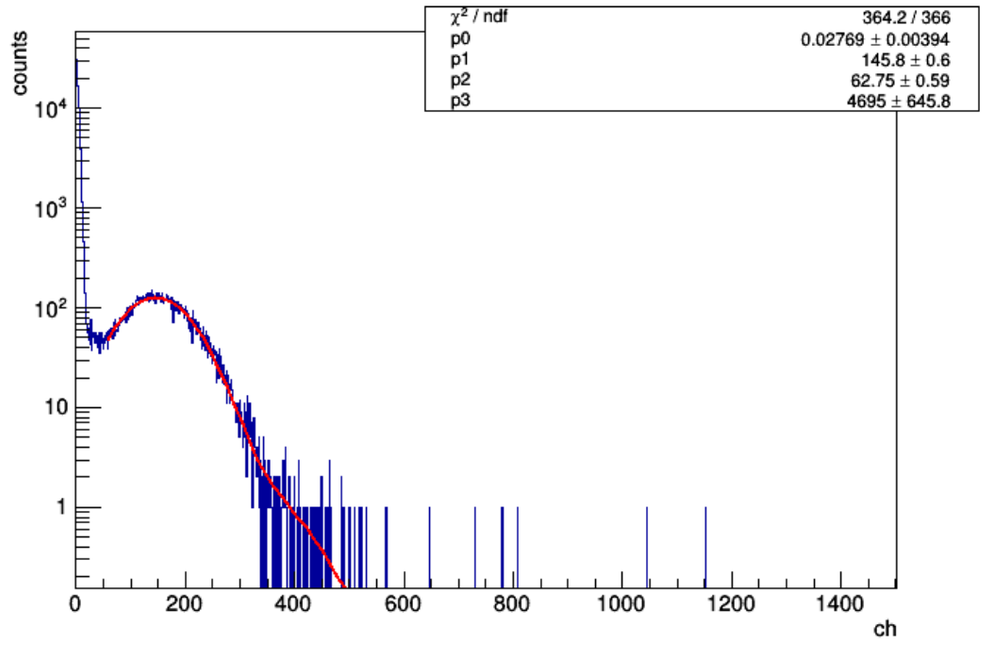

χ² / ndf 357.1 / 359
p0 0.03071 ± 0.00436
p1 143.6 ± 0.6
p2 63.49 ± 0.65
p3 4059 ± 554.3
counts
ch

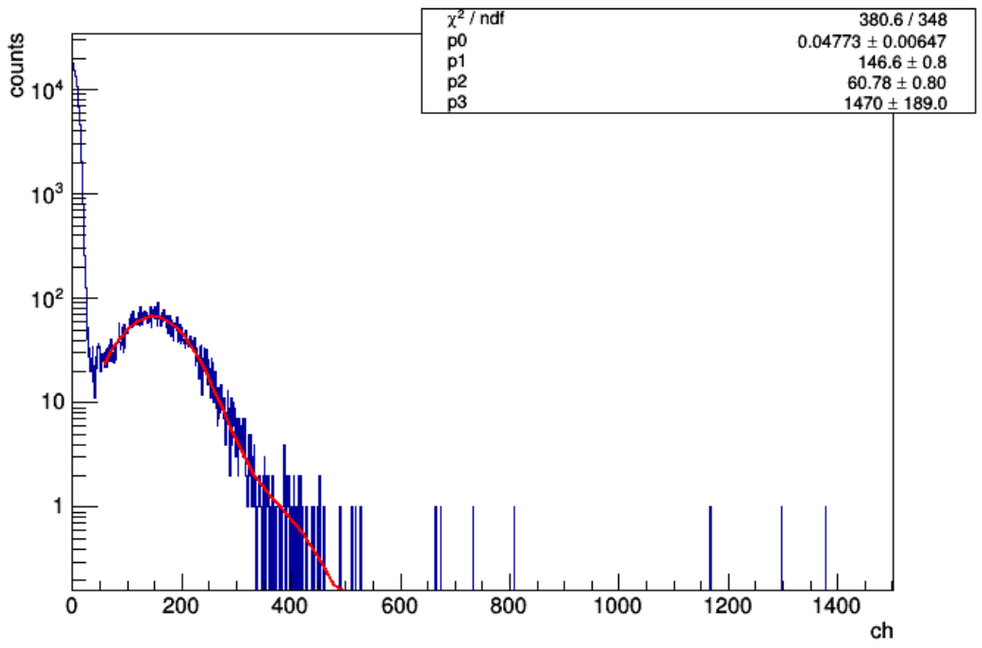

χ² / ndf 330.3 / 342
p0 0.04017 ± 0.00647
p1 144.9 ± 0.8
p2 62 ± 0.8
p3 1811 ± 278.1
counts
ch


B-field
1st dynode
2nd dynode

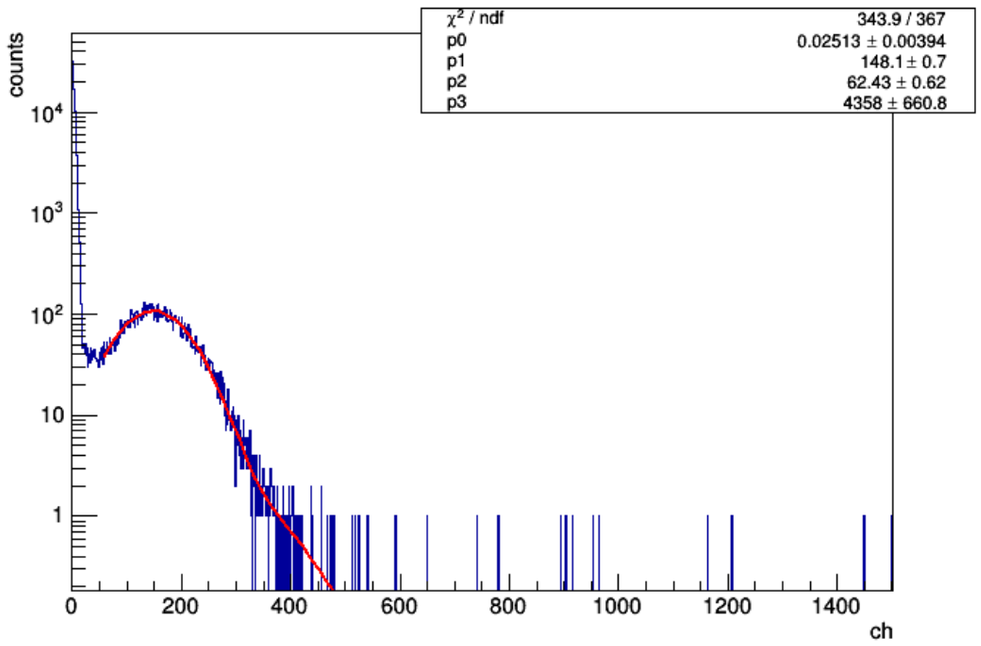
-450 mA

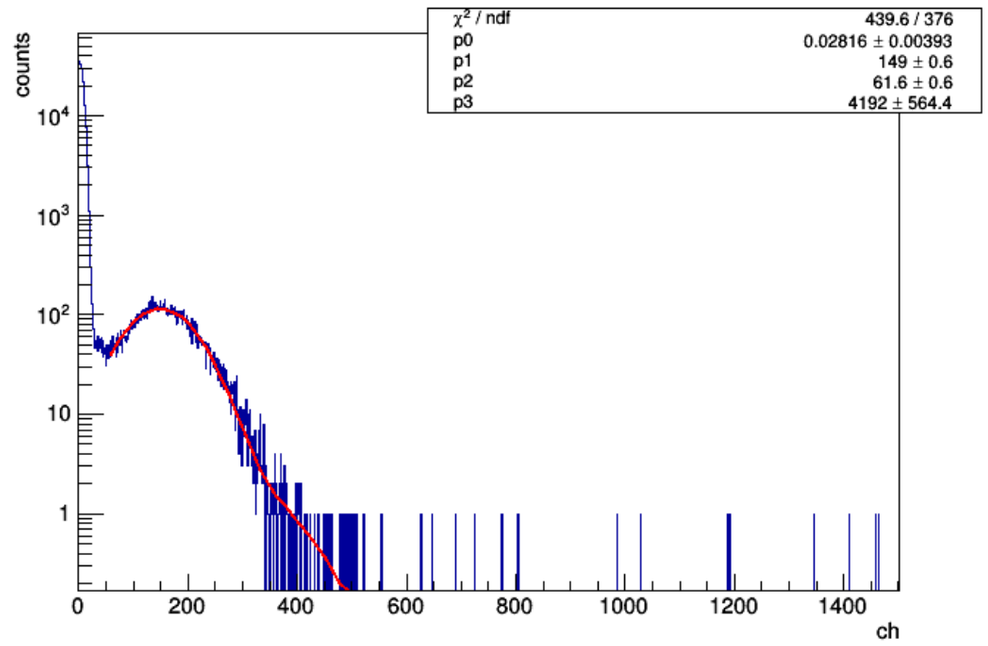

χ² / ndf 385.6 / 364
p0 0.0298 ± 0.0042
p1 146.5 ± 0.7
p2 62.73 ± 0.65
p3 3774 ± 514.2
counts
ch

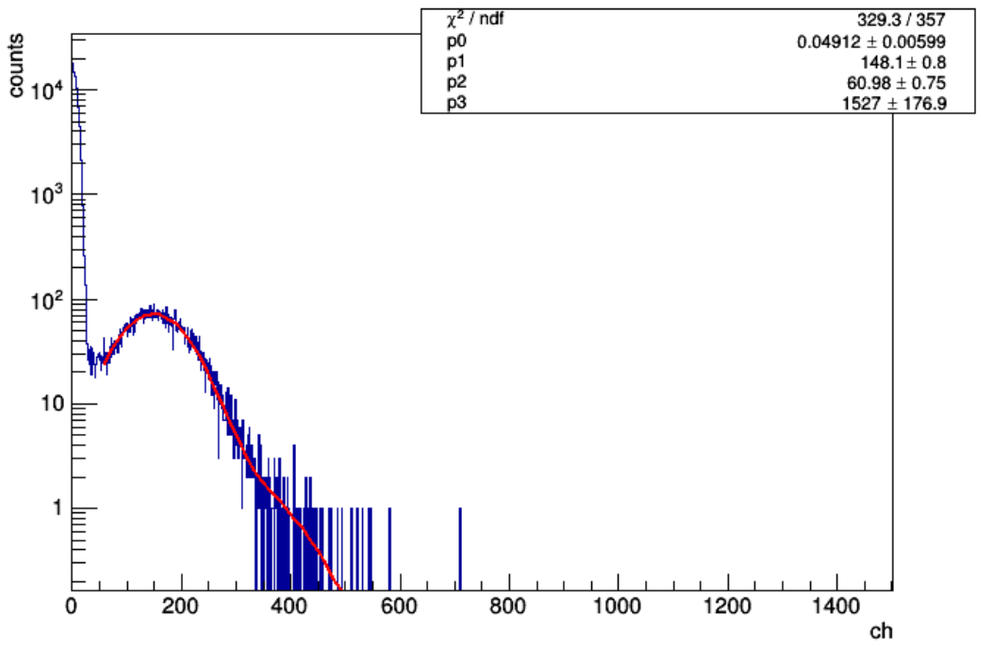

χ² / ndf 364.2 / 366
p0 0.02769 ± 0.00394
p1 145.8 ± 0.6
p2 62.75 ± 0.59
p3 4695 ± 645.8
counts
ch


χ² / ndf 380.6 / 348
p0 0.04773 ± 0.00647
p1 146.6 ± 0.8
p2 60.78 ± 0.80
p3 1470 ± 189.0
counts
ch

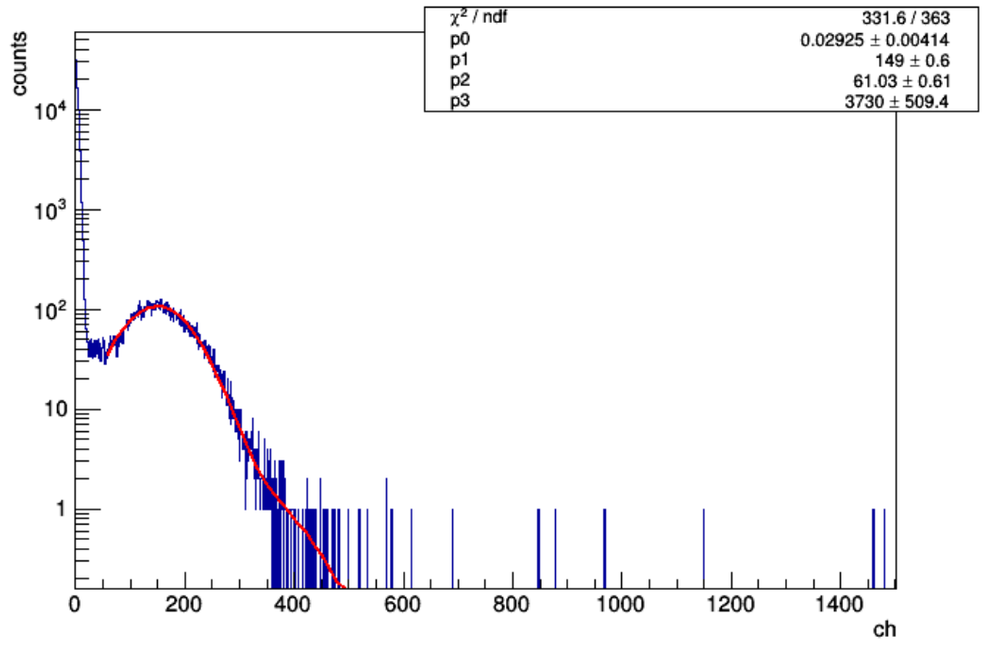
-400 mA

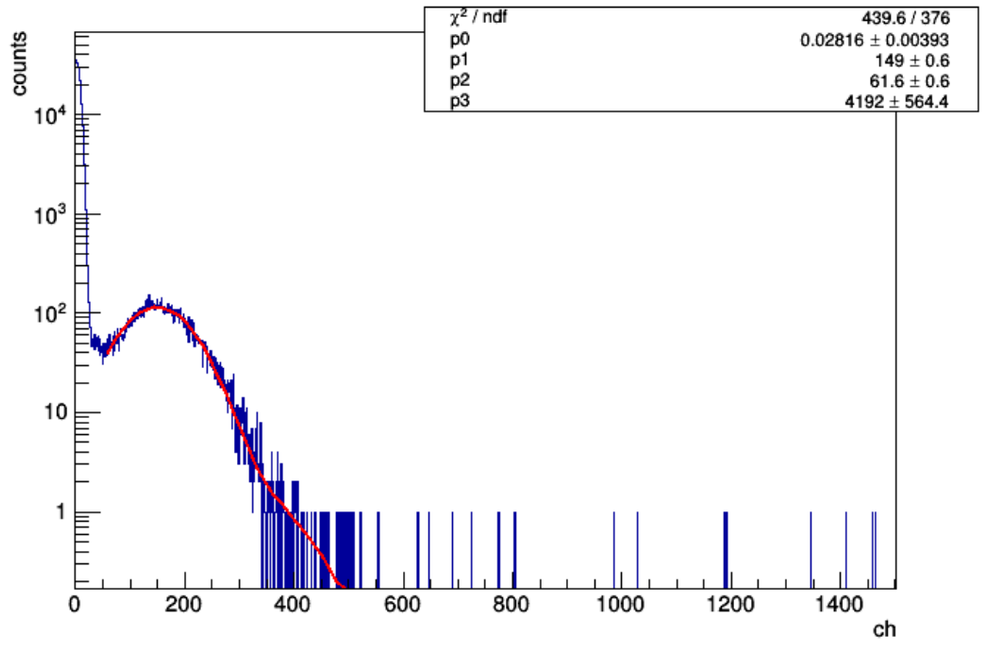

χ² / ndf 343.9 / 367
p0 0.02513 ± 0.00394
p1 148.1 ± 0.7
p2 62.43 ± 0.62
p3 4358 ± 660.8
counts
ch

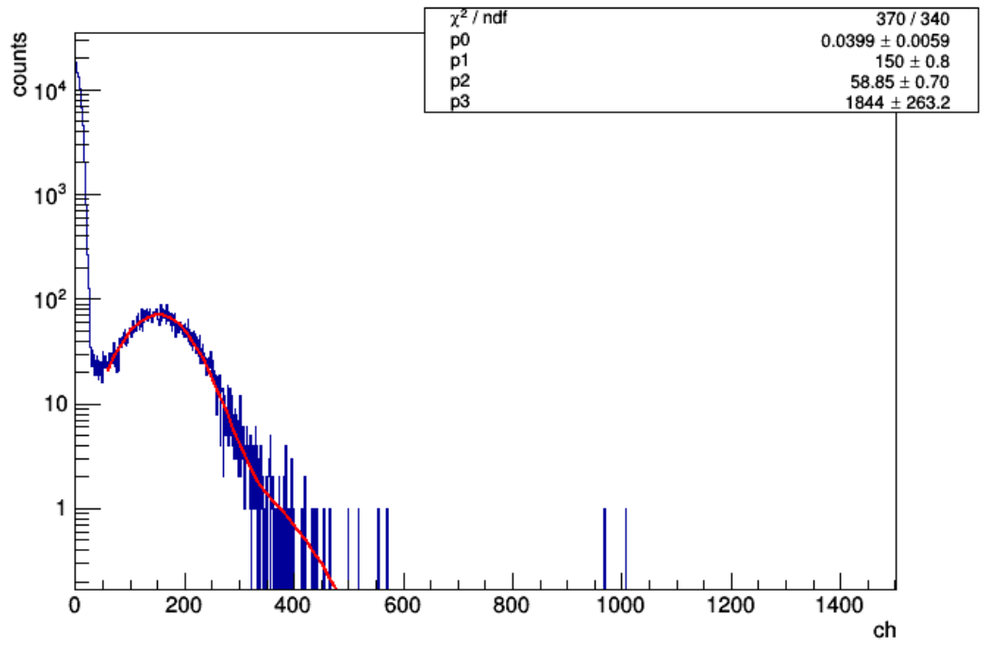

χ² / ndf 439.6 / 376
p0 0.02816 ± 0.00393
p1 149 ± 0.6
p2 61.6 ± 0.6
p3 4192 ± 564.4
counts
ch


χ² / ndf 329.3 / 357
p0 0.04912 ± 0.00599
p1 148.1 ± 0.8
p2 60.98 ± 0.75
p3 1527 ± 176.9
counts
ch

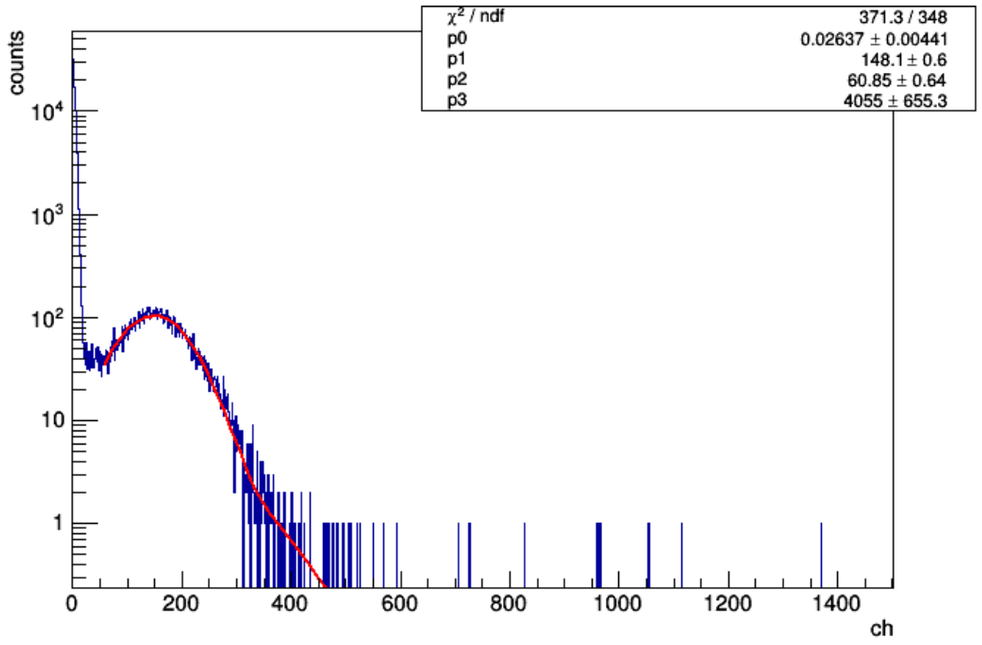
-350 mA

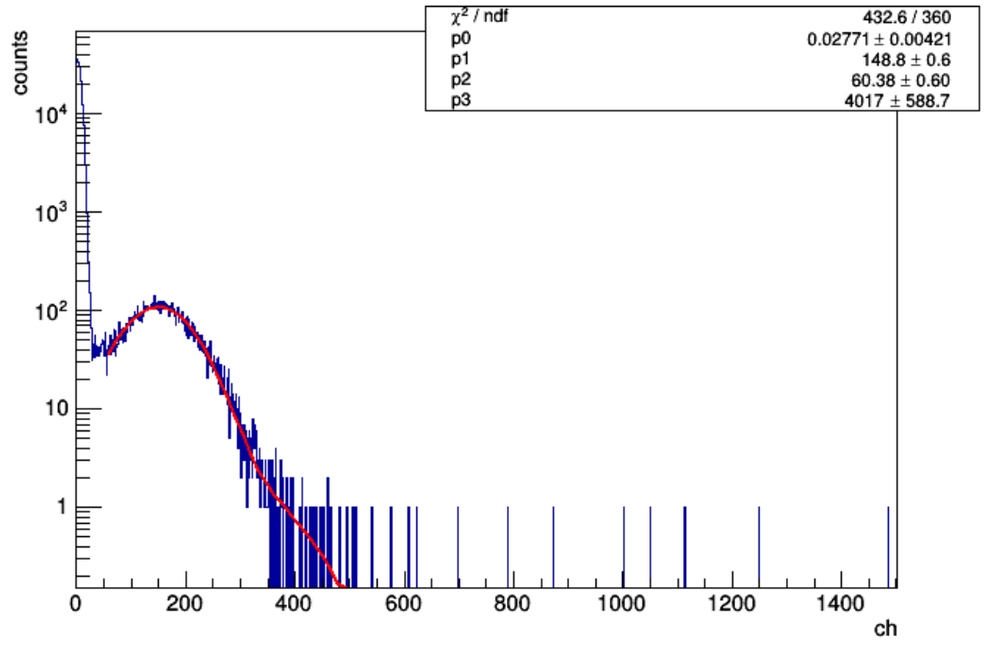

χ² / ndf 331.6 / 363
p0 0.02925 ± 0.00414
p1 149 ± 0.6
p2 61.03 ± 0.61
p3 3730 ± 509.4
counts
ch

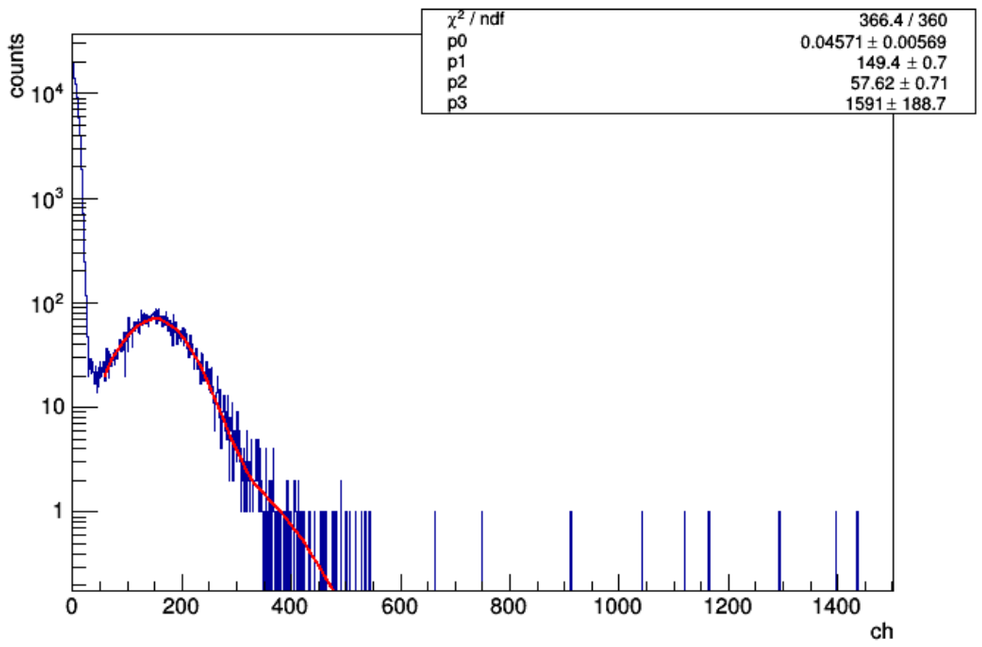

χ² / ndf 439.6 / 376
p0 0.02816 ± 0.00393
p1 149 ± 0.6
p2 61.6 ± 0.6
p3 4192 ± 564.4
counts
ch


χ² / ndf 370 / 340
p0 0.0399 ± 0.0059
p1 150 ± 0.8
p2 58.85 ± 0.70
p3 1844 ± 263.2
counts
ch

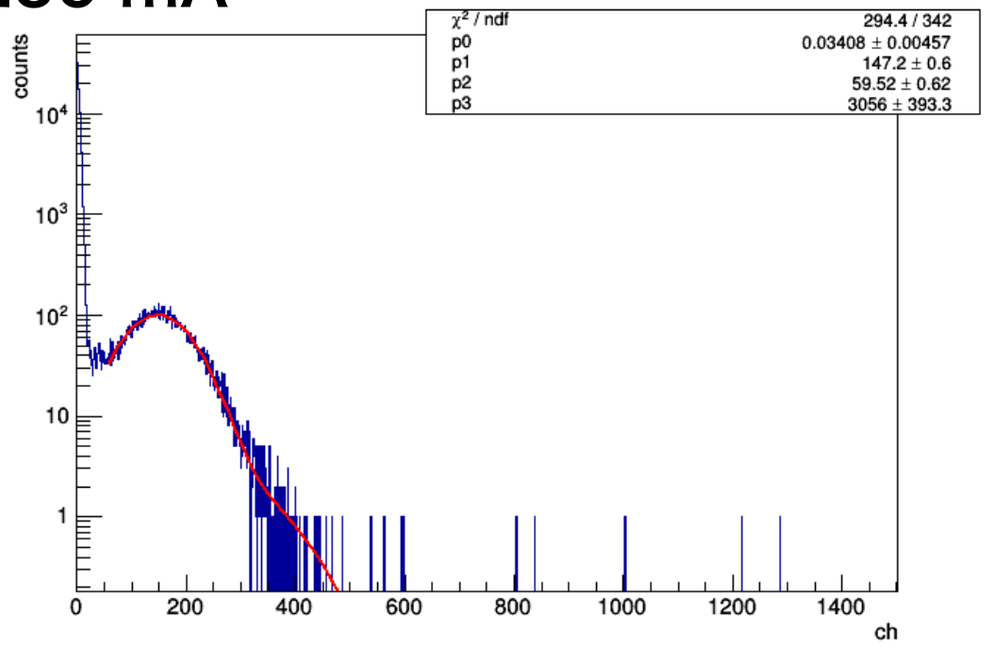
-300 mA

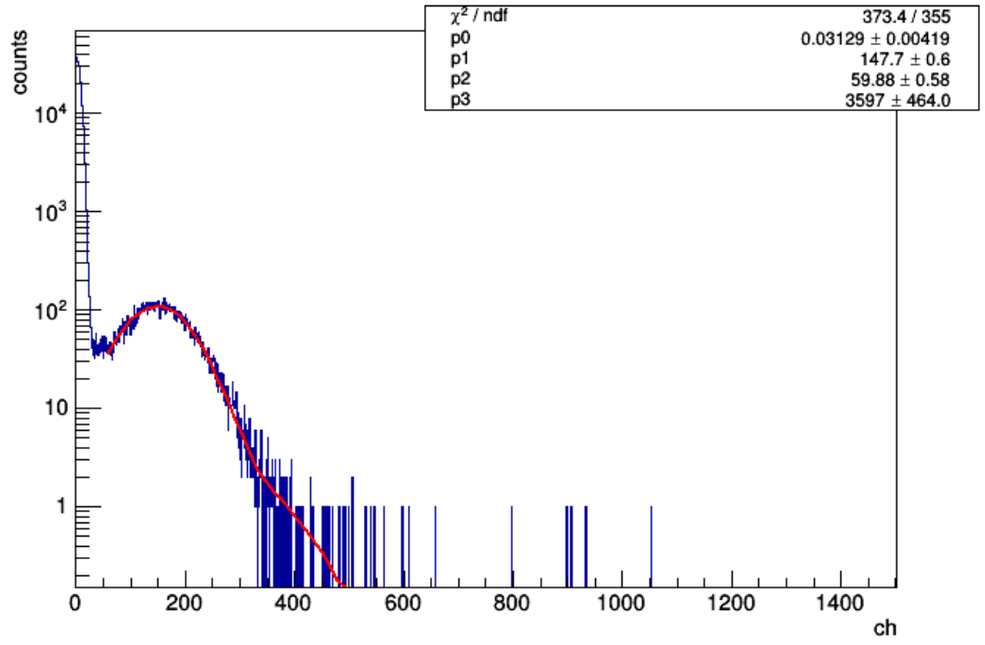

χ² / ndf 371.3 / 348
p0 0.02637 ± 0.00441
p1 148.1 ± 0.6
p2 60.85 ± 0.64
p3 4055 ± 655.3
counts
ch

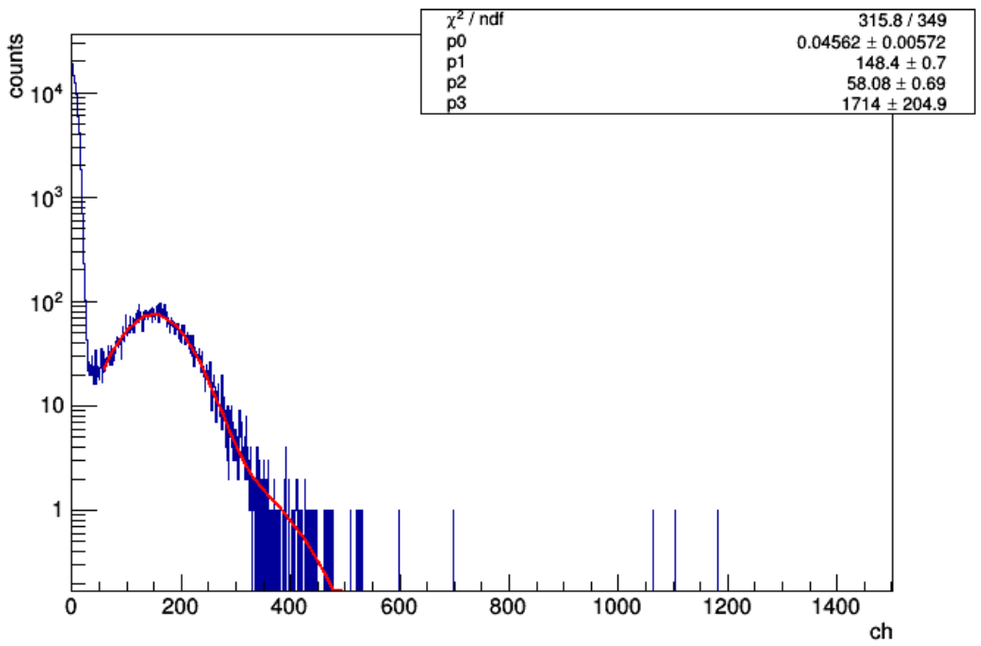

χ² / ndf 432.6 / 360
p0 0.02771 ± 0.00421
p1 148.8 ± 0.6
p2 60.38 ± 0.60
p3 4017 ± 588.7
counts
ch


χ² / ndf 366.4 / 360
p0 0.04571 ± 0.00569
p1 149.4 ± 0.7
p2 57.62 ± 0.71
p3 1591 ± 188.7
counts
ch

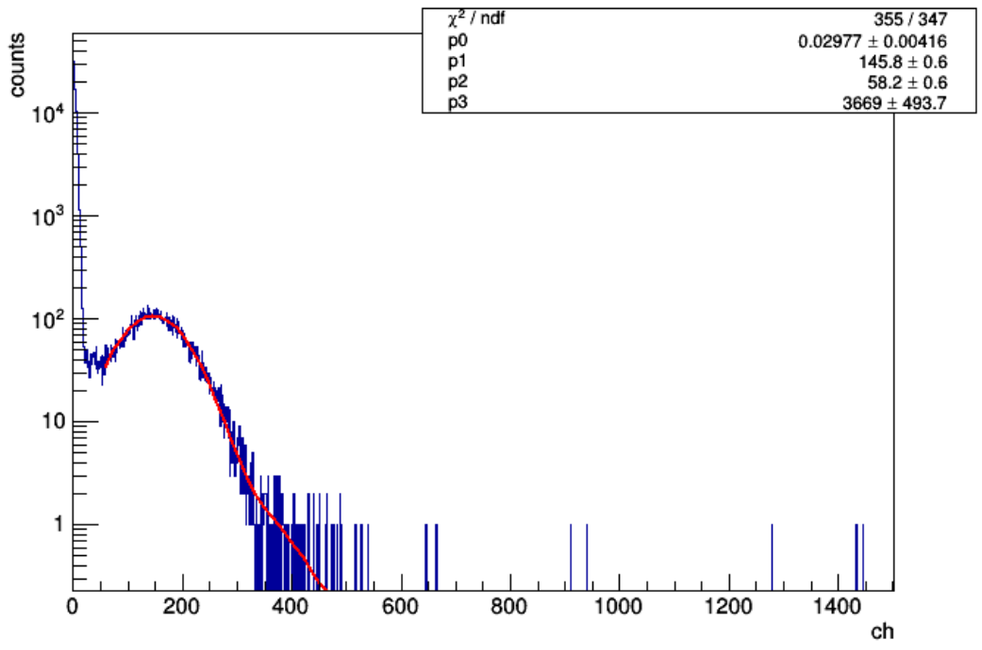
-250 mA

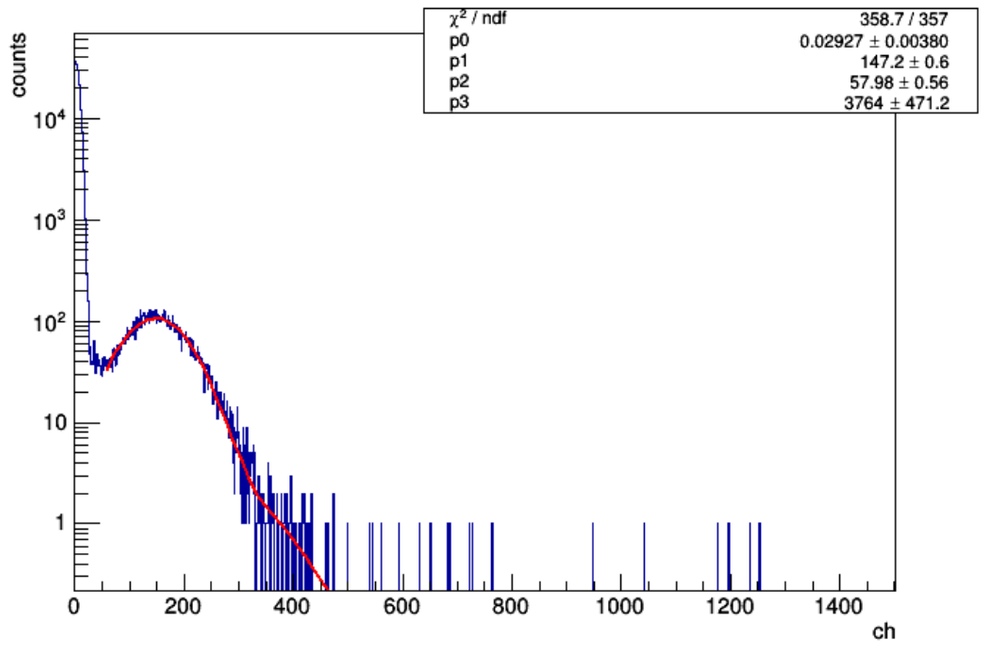

χ² / ndf 294.4 / 342
p0 0.03408 ± 0.00457
p1 147.2 ± 0.6
p2 59.52 ± 0.62
p3 3056 ± 393.3
counts
ch

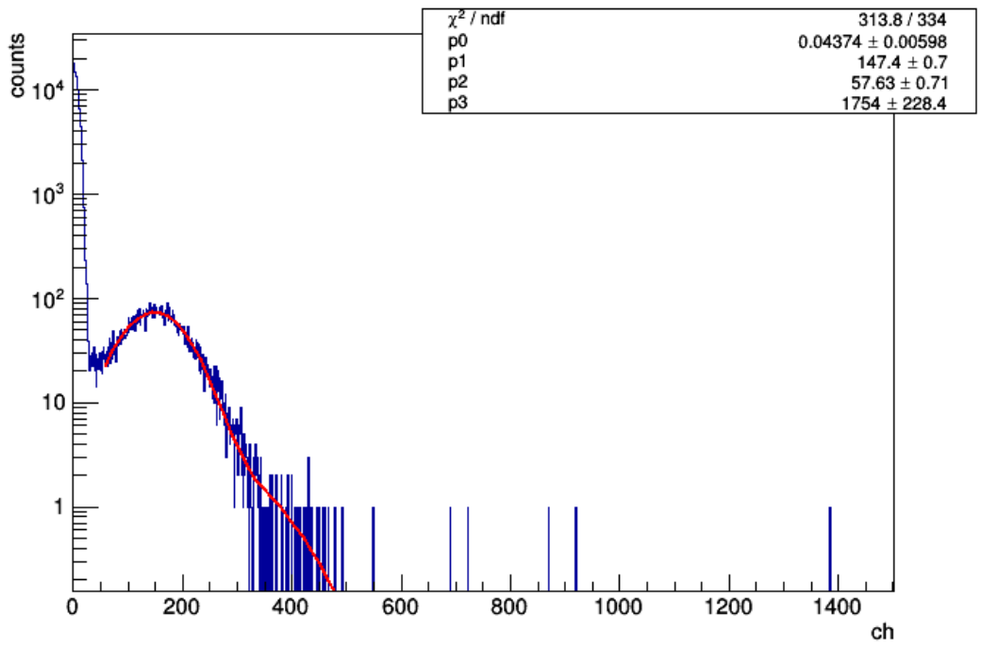

χ² / ndf 373.4 / 355
p0 0.03129 ± 0.00419
p1 147.7 ± 0.6
p2 59.88 ± 0.58
p3 3597 ± 464.0
counts
ch


χ² / ndf 315.8 / 349
p0 0.04562 ± 0.00572
p1 148.4 ± 0.7
p2 58.08 ± 0.69
p3 1714 ± 204.9
counts
ch

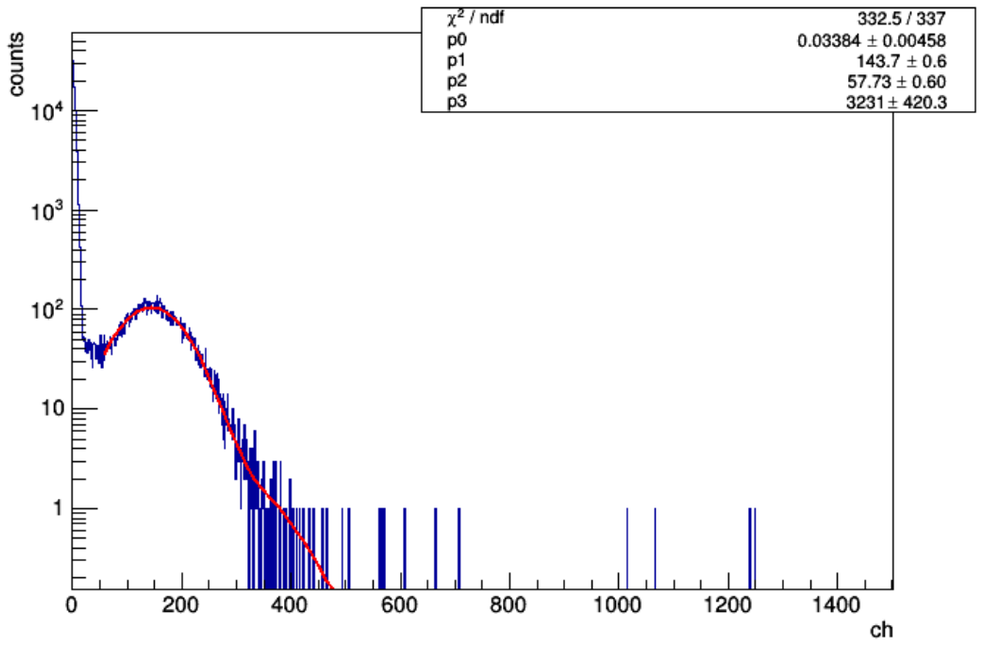
-200 mA

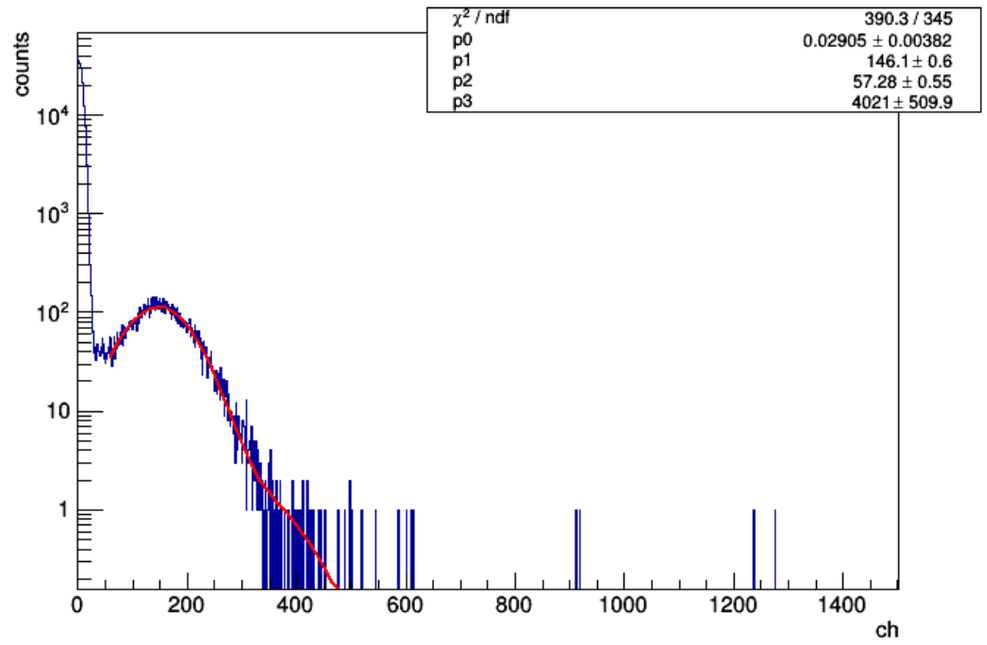

χ² / ndf 355 / 347
p0 0.02977 ± 0.00416
p1 145.8 ± 0.6
p2 58.2 ± 0.6
p3 3669 ± 493.7
counts
ch

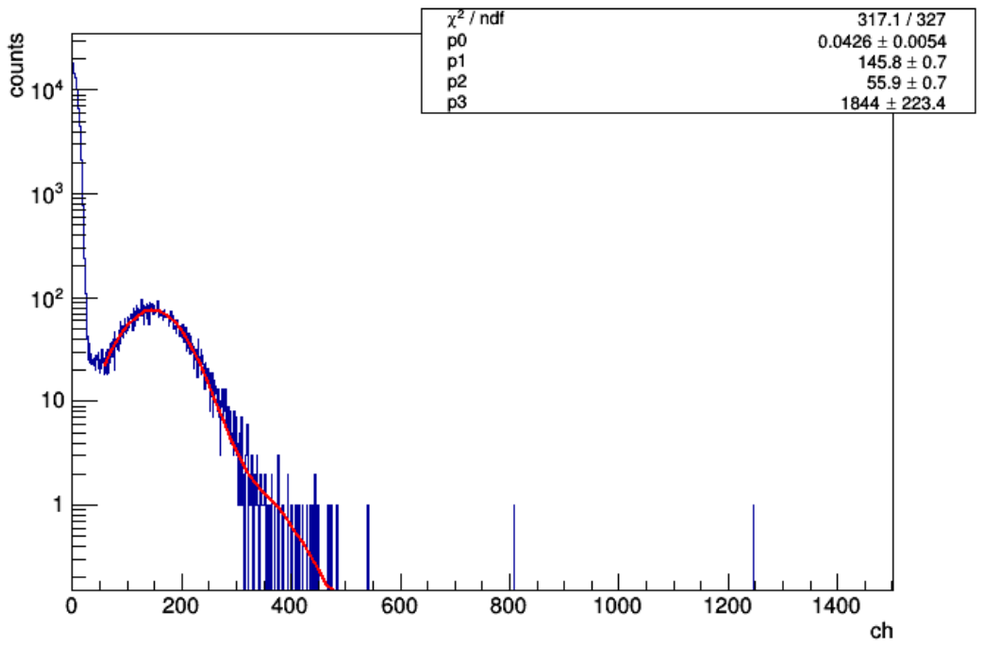

χ² / ndf 358.7 / 357
p0 0.02927 ± 0.00380
p1 147.2 ± 0.6
p2 57.98 ± 0.56
p3 3764 ± 471.2
counts
ch


χ² / ndf 313.8 / 334
p0 0.04374 ± 0.00598
p1 147.4 ± 0.7
p2 57.63 ± 0.71
p3 1754 ± 228.4
counts
ch

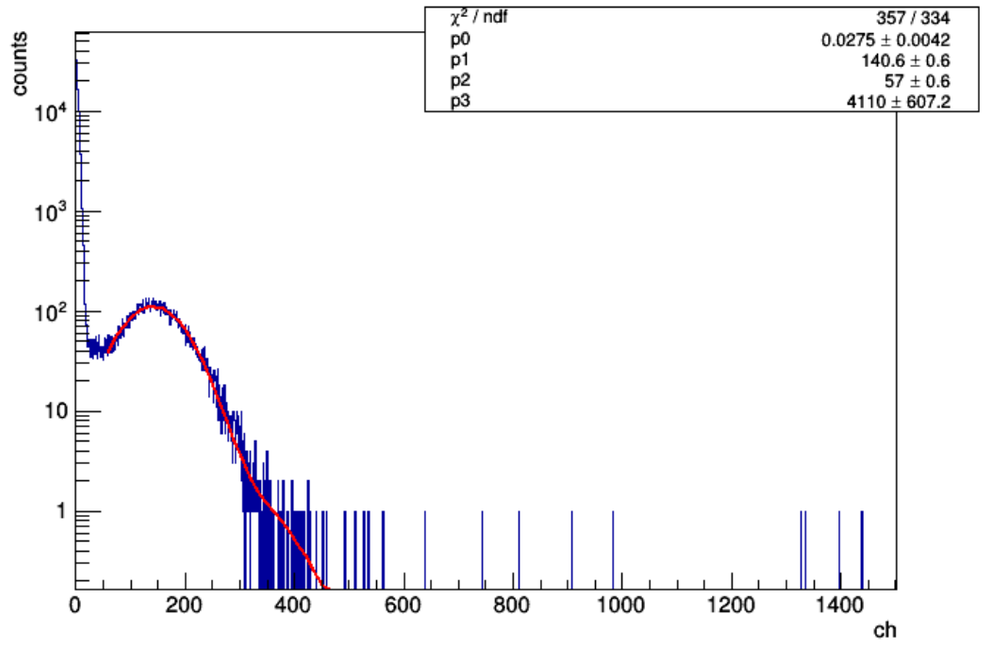
-150 mA

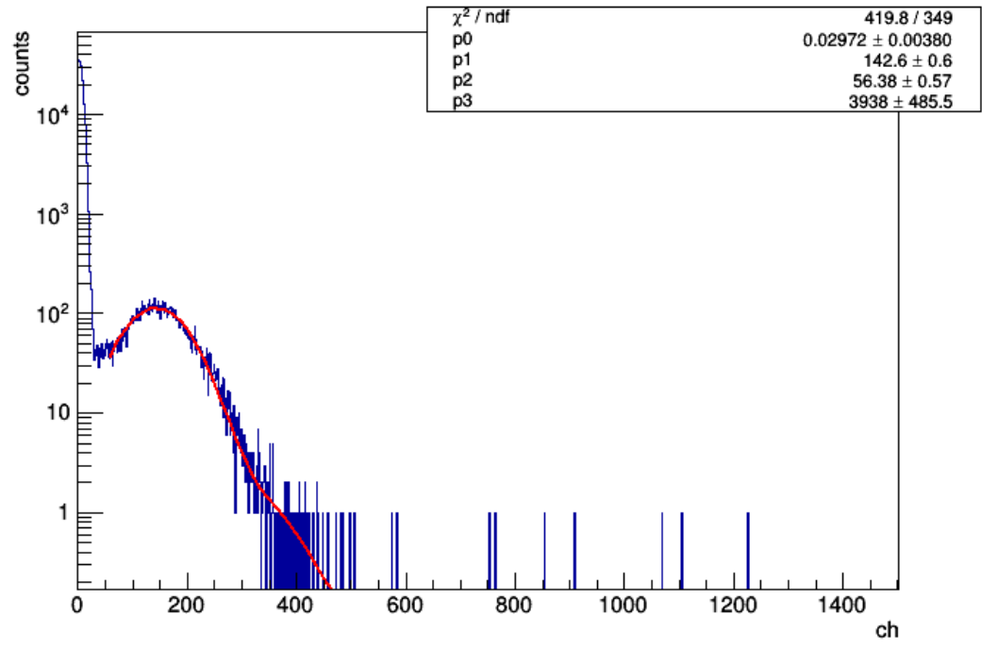

χ² / ndf 332.5 / 337
p0 0.03384 ± 0.00458
p1 143.7 ± 0.6
p2 57.73 ± 0.60
p3 3231 ± 420.3
counts
ch

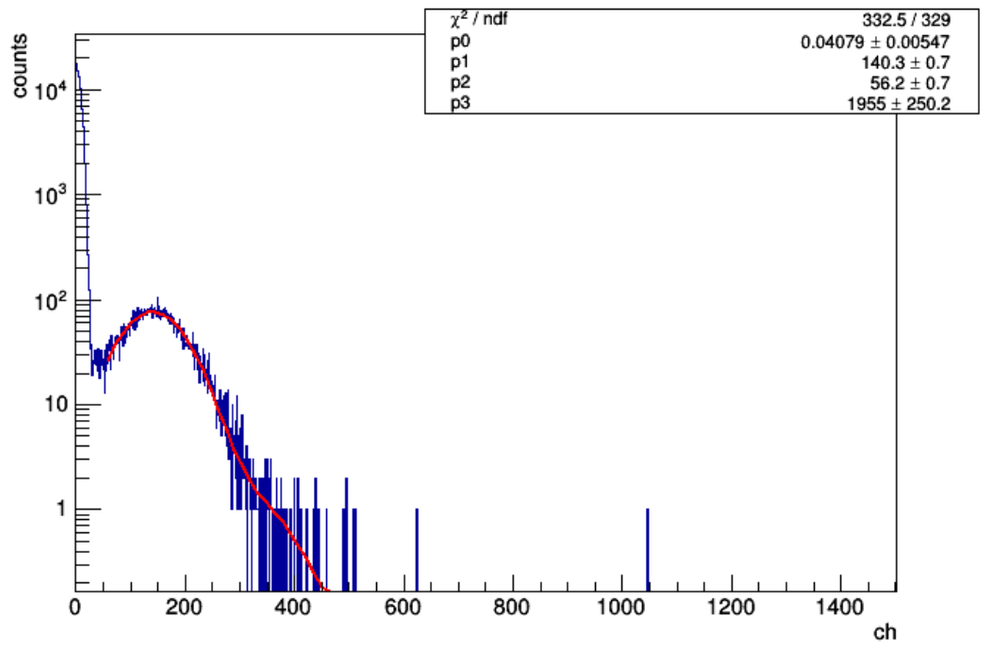

χ² / ndf 390.3 / 345
p0 0.02905 ± 0.00382
p1 146.1 ± 0.6
p2 57.28 ± 0.55
p3 4021 ± 509.9
counts
ch


χ² / ndf 317.1 / 327
p0 0.0426 ± 0.0054
p1 145.8 ± 0.7
p2 55.9 ± 0.7
p3 1844 ± 223.4
counts
ch

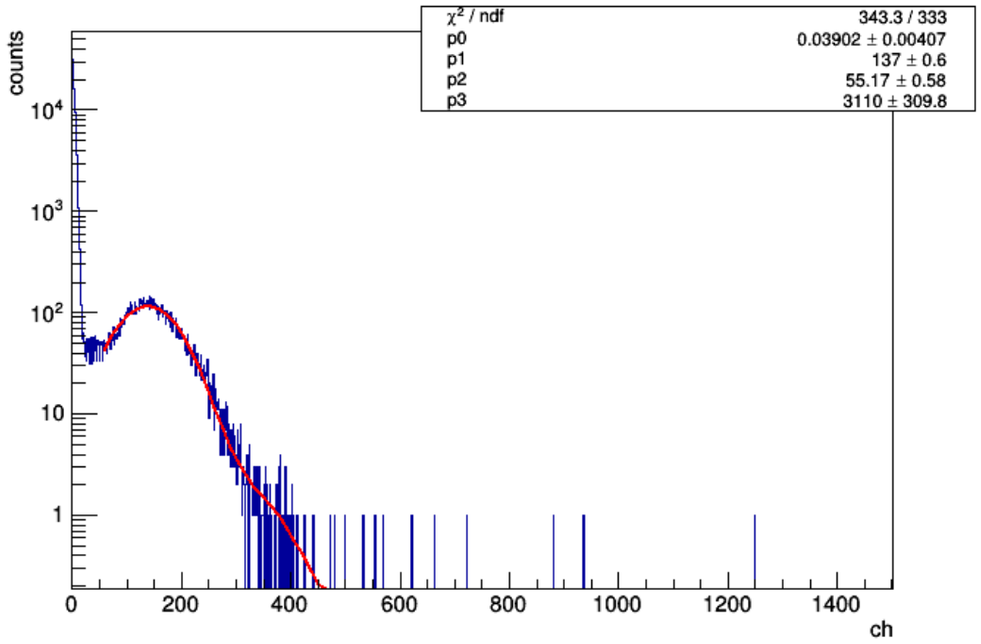
-100 mA

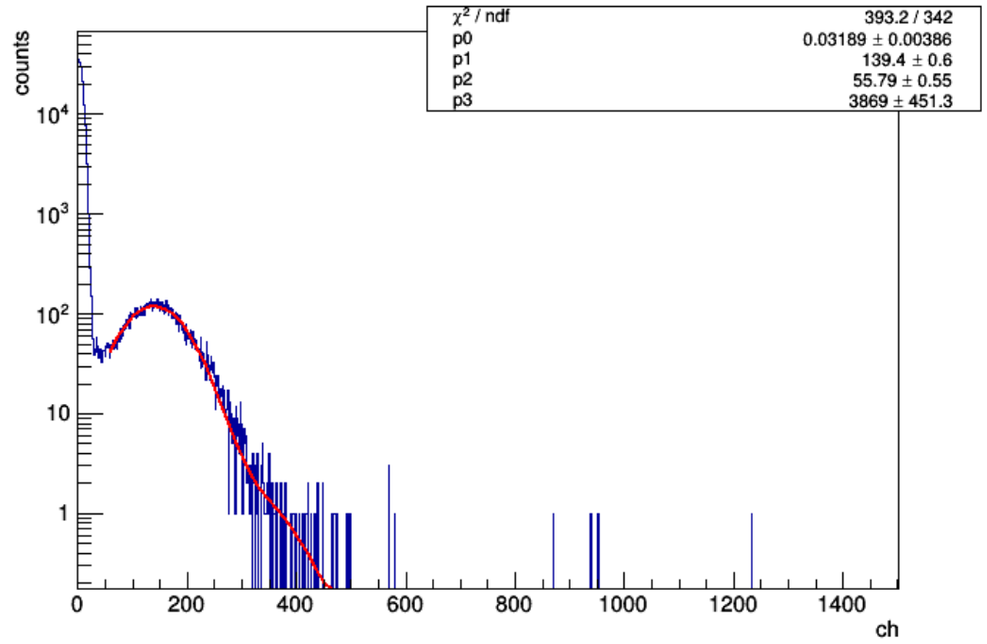

χ² / ndf 357 / 334
p0 0.0275 ± 0.0042
p1 140.6 ± 0.6
p2 57 ± 0.6
p3 4110 ± 607.2
counts
ch

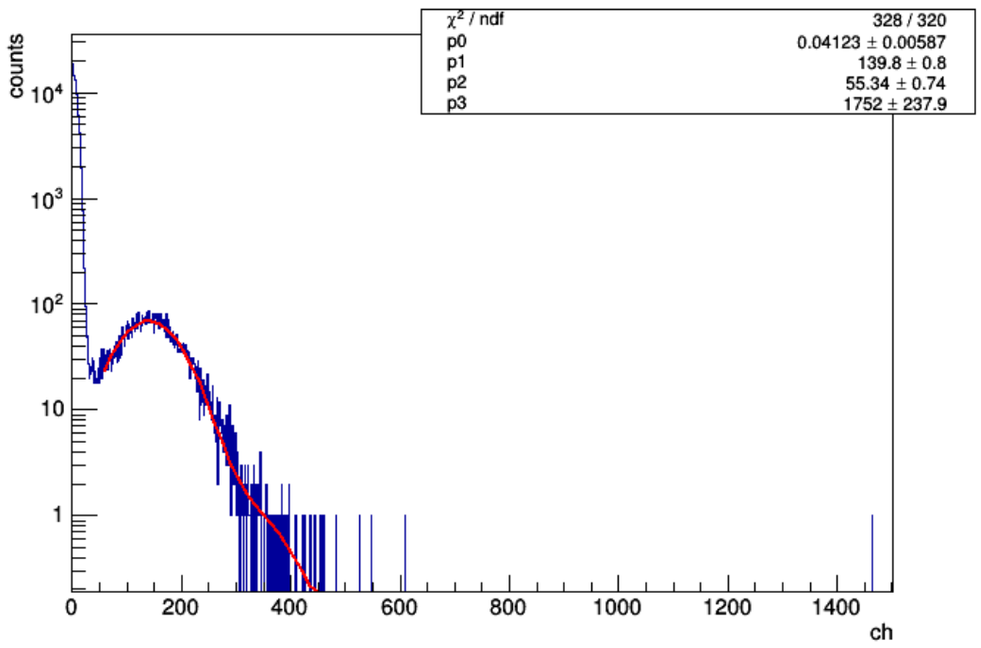

χ² / ndf 419.8 / 349
p0 0.02972 ± 0.00380
p1 142.6 ± 0.6
p2 56.38 ± 0.57
p3 3938 ± 485.5
counts
ch


χ² / ndf 332.5 / 329
p0 0.04079 ± 0.00547
p1 140.3 ± 0.7
p2 56.2 ± 0.7
p3 1955 ± 250.2
counts
ch

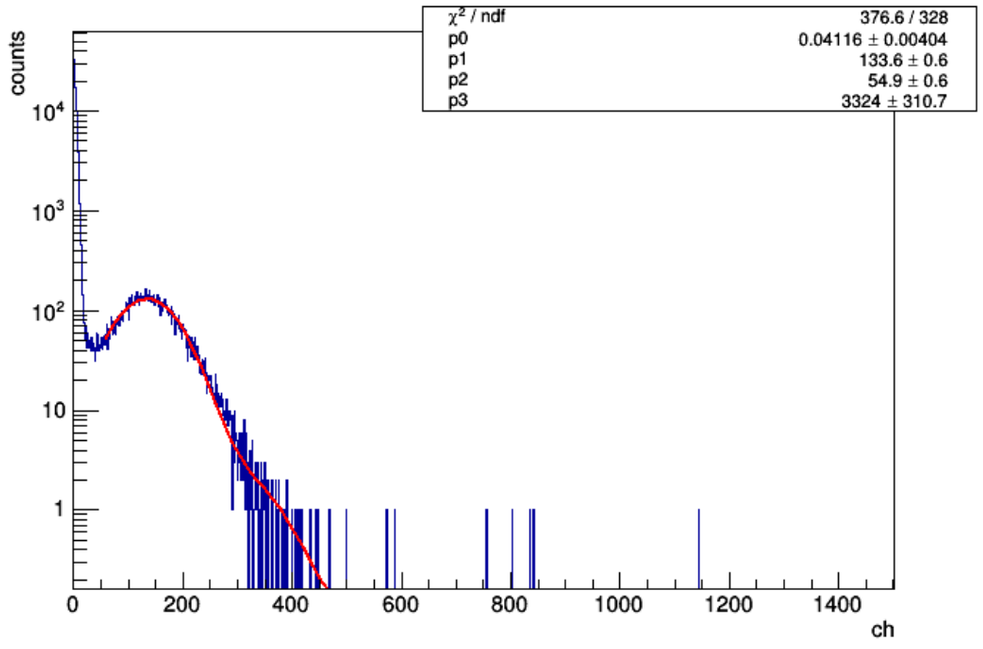
-50 mA

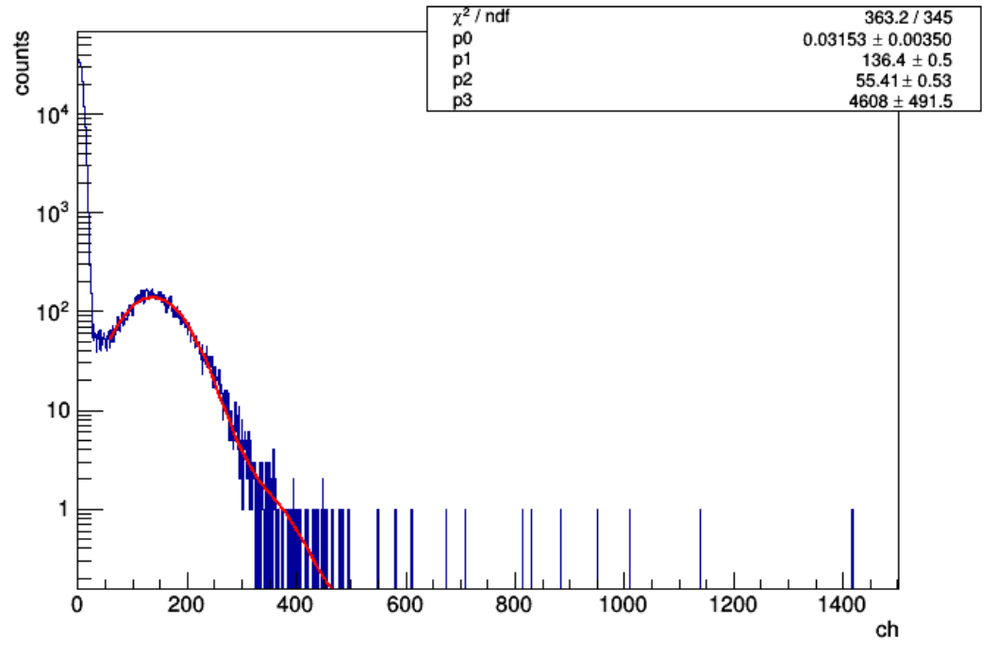

χ² / ndf 343.3 / 333
p0 0.03902 ± 0.00407
p1 137 ± 0.6
p2 55.17 ± 0.58
p3 3110 ± 309.8
counts
ch

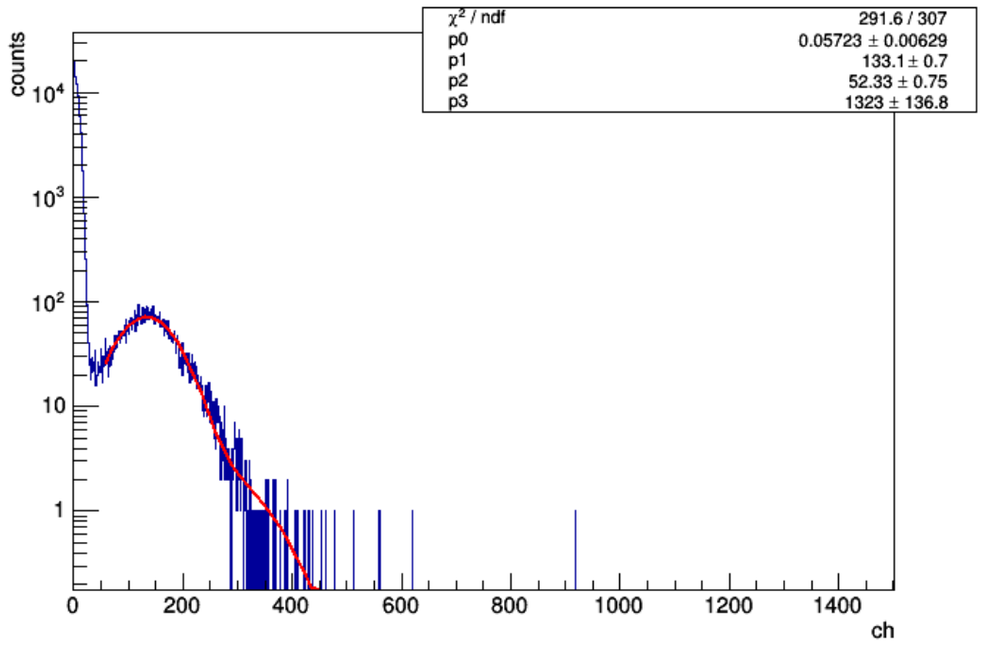

χ² / ndf 393.2 / 342
p0 0.03189 ± 0.00386
p1 139.4 ± 0.6
p2 55.79 ± 0.55
p3 3869 ± 451.3
counts
ch


χ² / ndf 328 / 320
p0 0.04123 ± 0.00587
p1 139.8 ± 0.8
p2 55.34 ± 0.74
p3 1752 ± 237.9
counts
ch

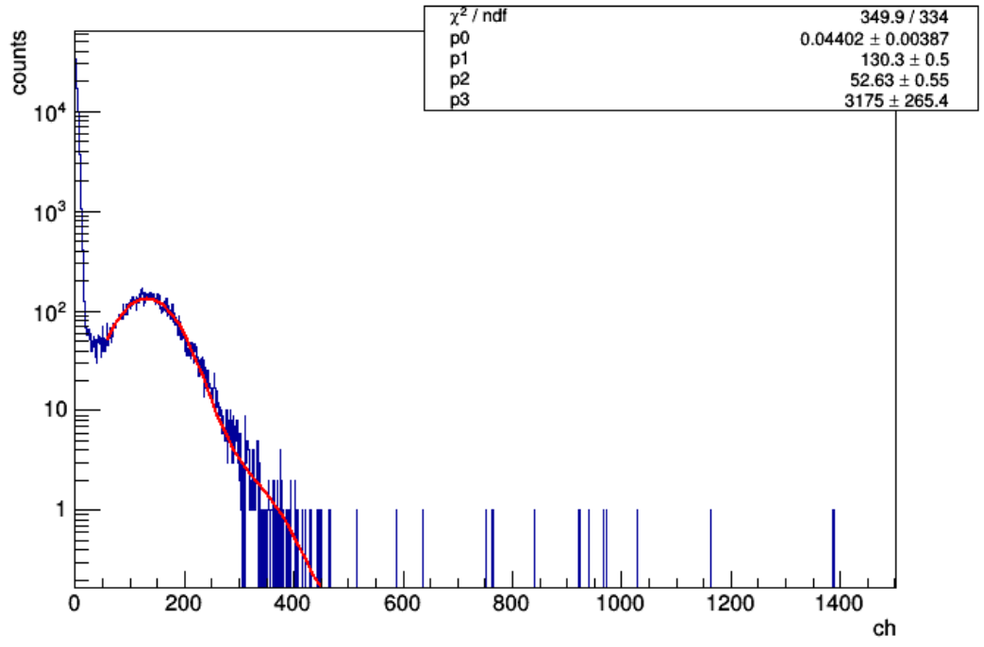
0 mA

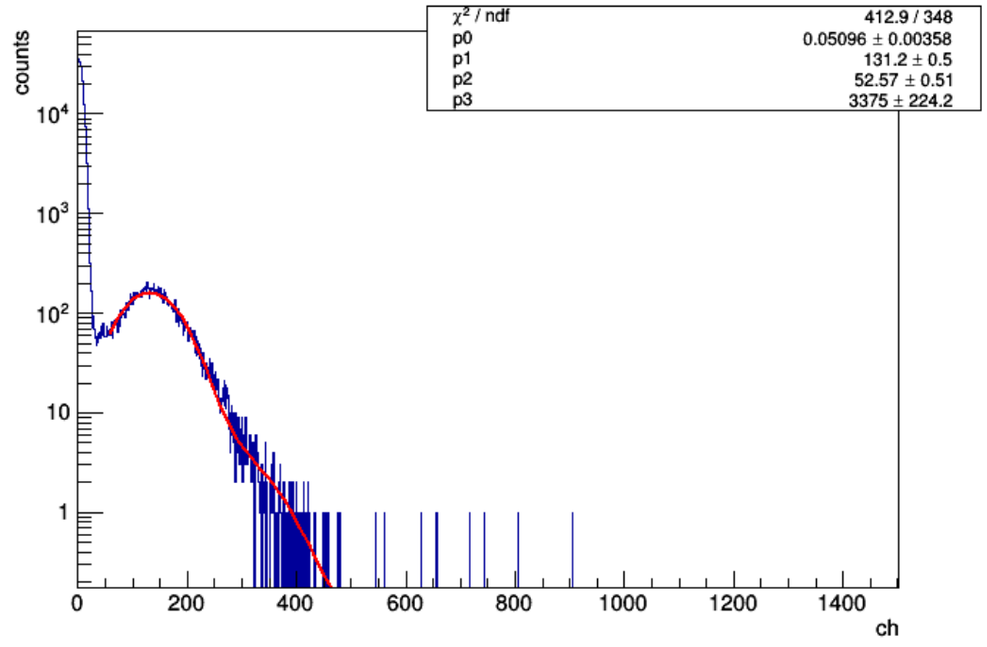

χ² / ndf 376.6 / 328
p0 0.04116 ± 0.00404
p1 133.6 ± 0.6
p2 54.9 ± 0.6
p3 3324 ± 310.7
counts
ch

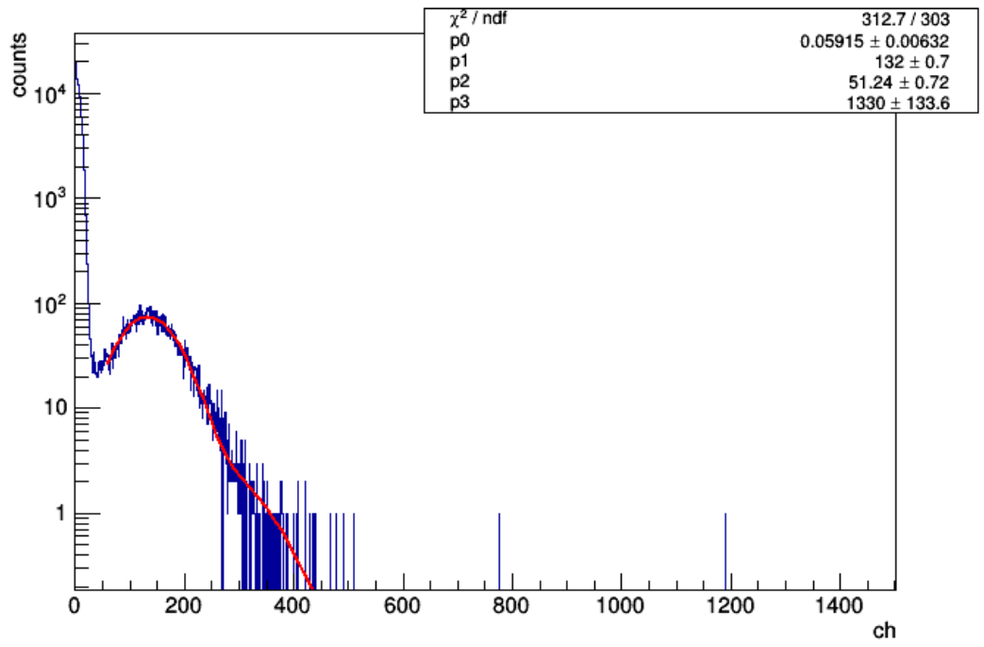

χ² / ndf 363.2 / 345
p0 0.03153 ± 0.00350
p1 136.4 ± 0.5
p2 55.41 ± 0.53
p3 4608 ± 491.5
counts
ch


χ² / ndf 291.6 / 307
p0 0.05723 ± 0.00629
p1 133.1 ± 0.7
p2 52.33 ± 0.75
p3 1323 ± 136.8
counts
ch

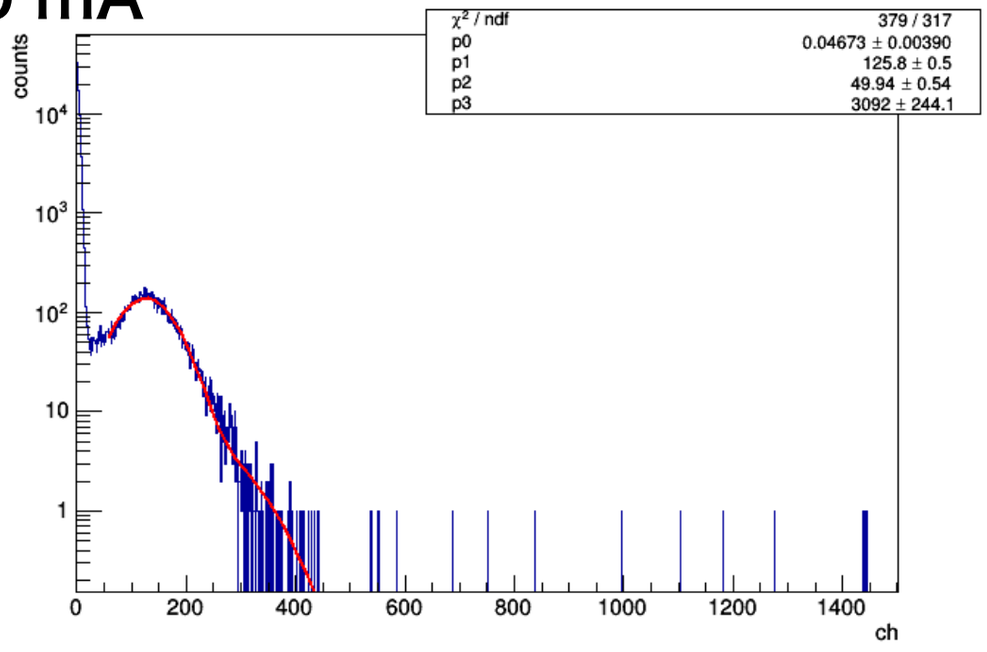
50 mA

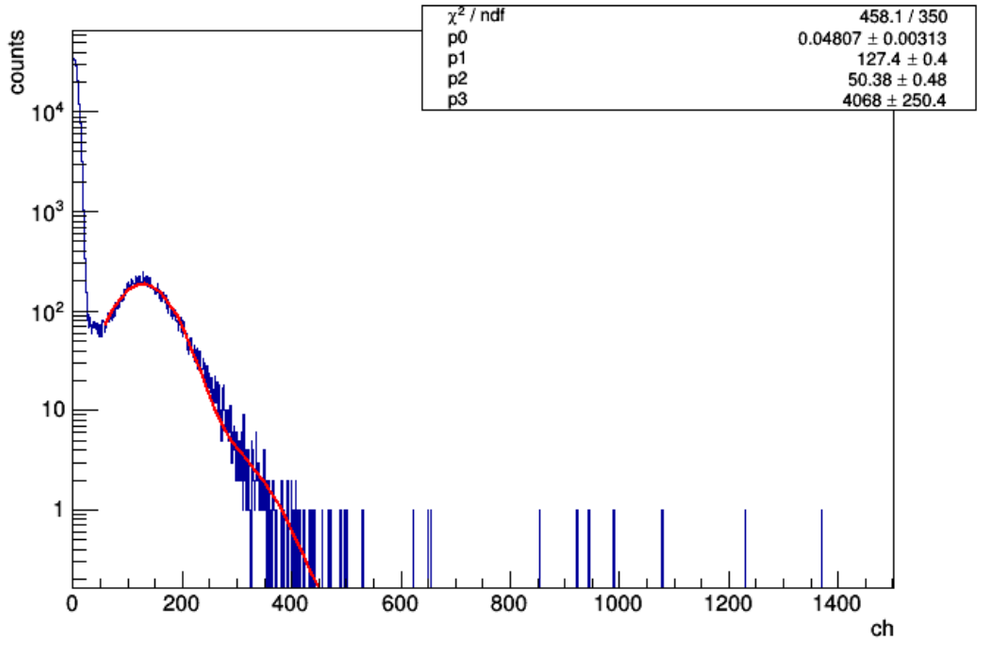

χ² / ndf 349.9 / 334
p0 0.04402 ± 0.00387
p1 130.3 ± 0.5
p2 52.63 ± 0.55
p3 3175 ± 265.4
counts
ch

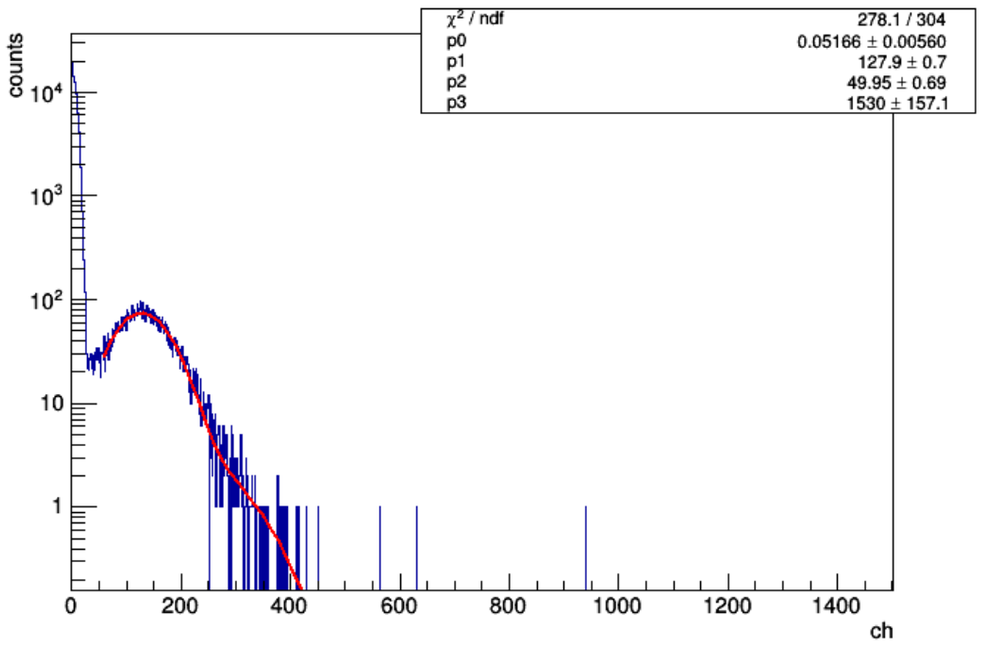

χ² / ndf 412.9 / 348
p0 0.05096 ± 0.00358
p1 131.2 ± 0.5
p2 52.57 ± 0.51
p3 3375 ± 224.2
counts
ch


χ² / ndf 312.7 / 303
p0 0.05915 ± 0.00632
p1 132 ± 0.7
p2 51.24 ± 0.72
p3 1330 ± 133.6
counts
ch

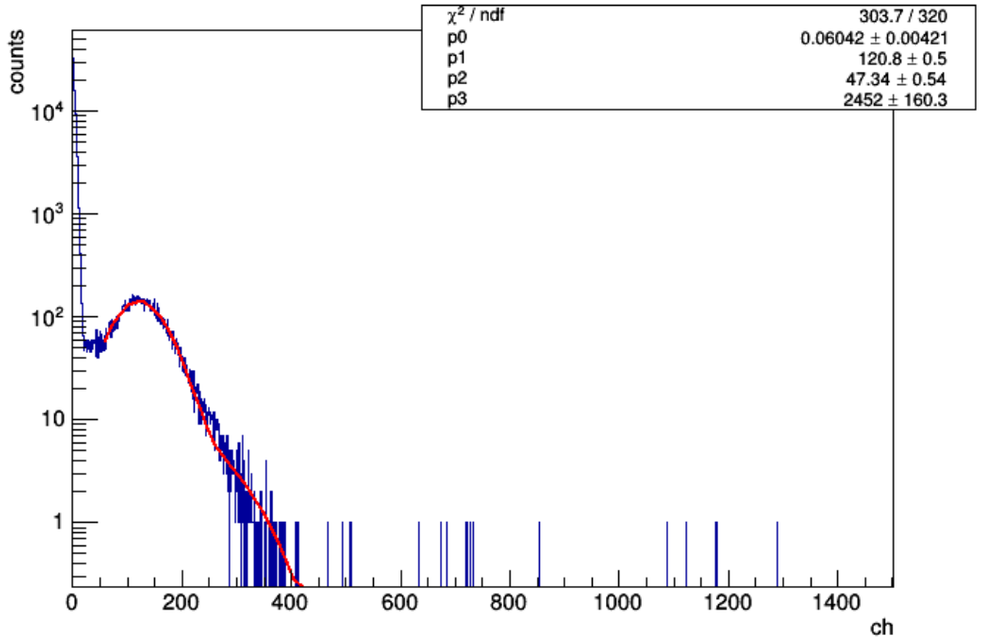
100 mA

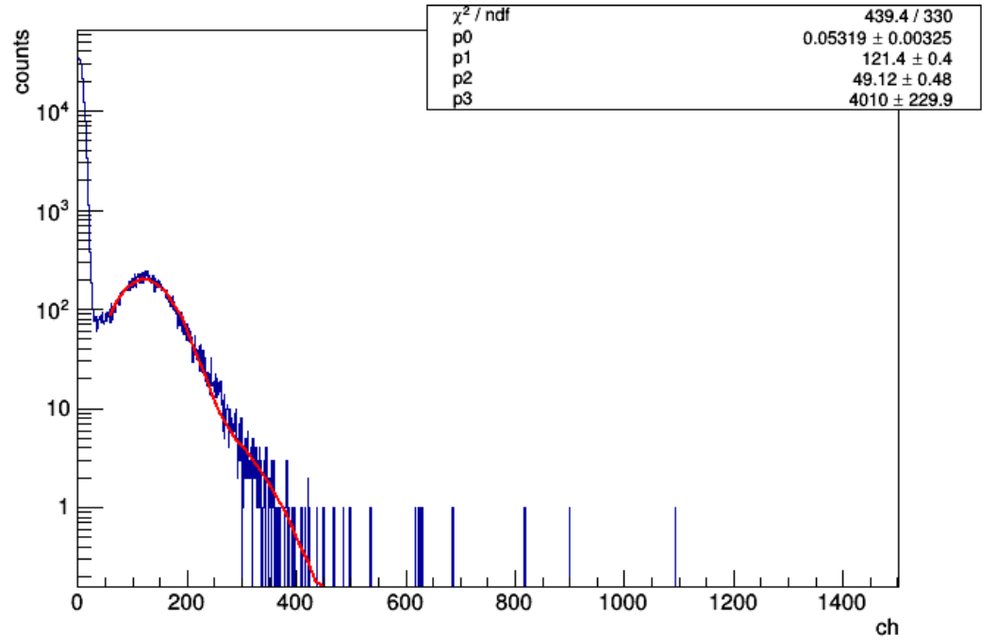

χ² / ndf 379 / 317
p0 0.04673 ± 0.00390
p1 125.8 ± 0.5
p2 49.94 ± 0.54
p3 3092 ± 244.1
counts
ch

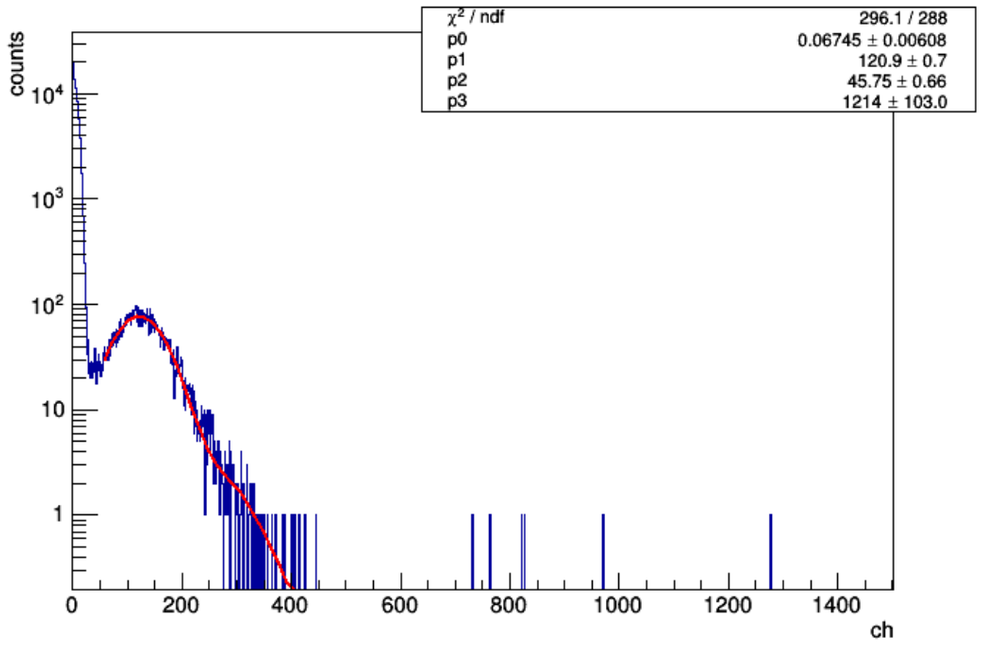

χ² / ndf 458.1 / 350
p0 0.04807 ± 0.00313
p1 127.4 ± 0.4
p2 50.38 ± 0.48
p3 4068 ± 250.4
counts
ch


χ² / ndf 278.1 / 304
p0 0.05166 ± 0.00560
p1 127.9 ± 0.7
p2 49.95 ± 0.69
p3 1530 ± 157.1
counts
ch

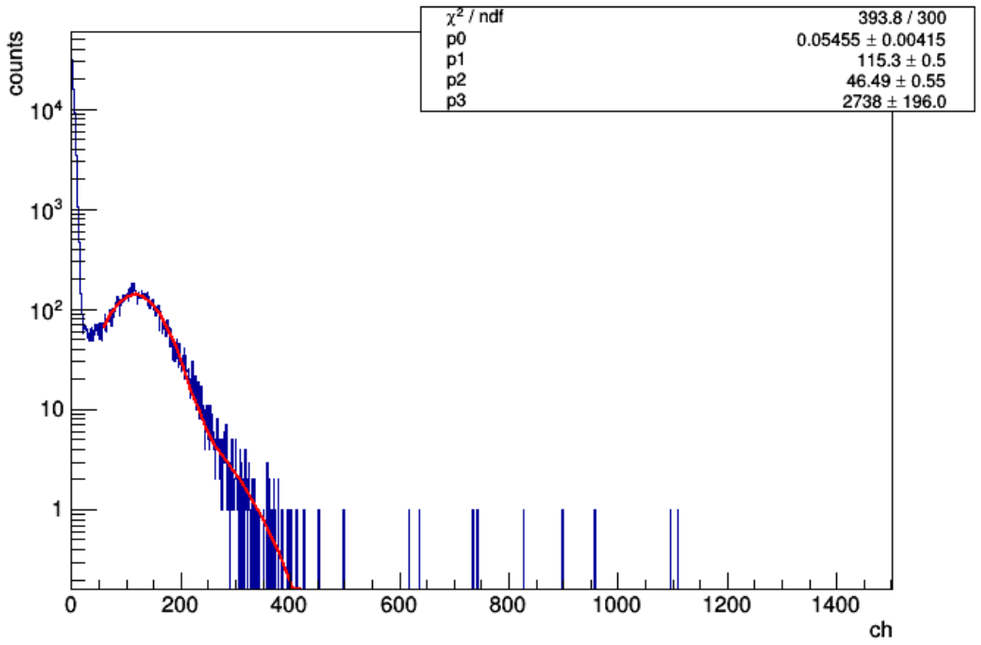
150 mA

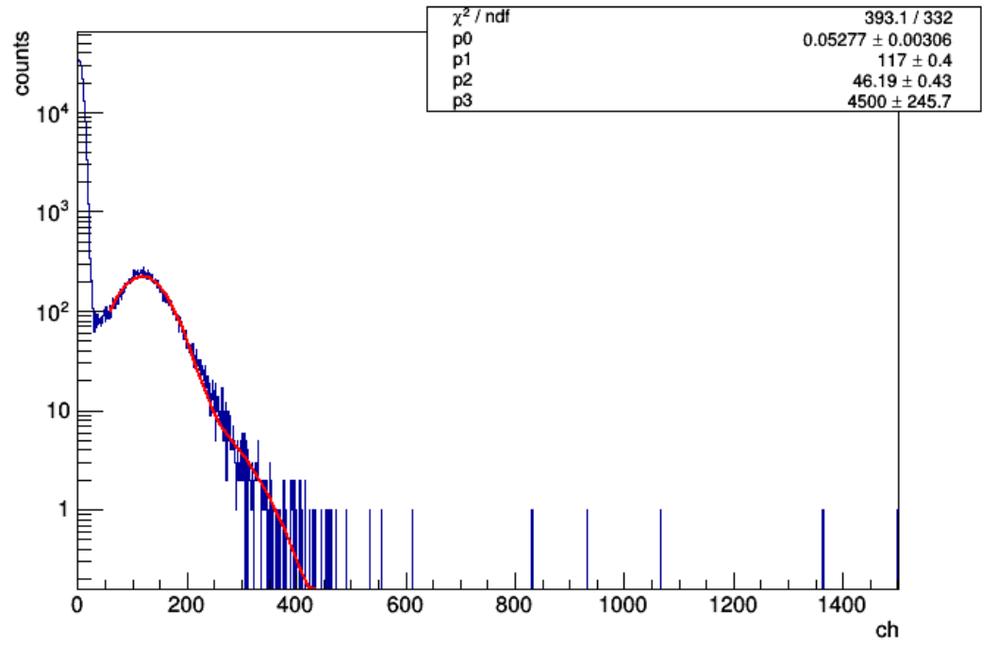

χ² / ndf 303.7 / 320
p0 0.06042 ± 0.00421
p1 120.8 ± 0.5
p2 47.34 ± 0.54
p3 2452 ± 160.3
counts
ch

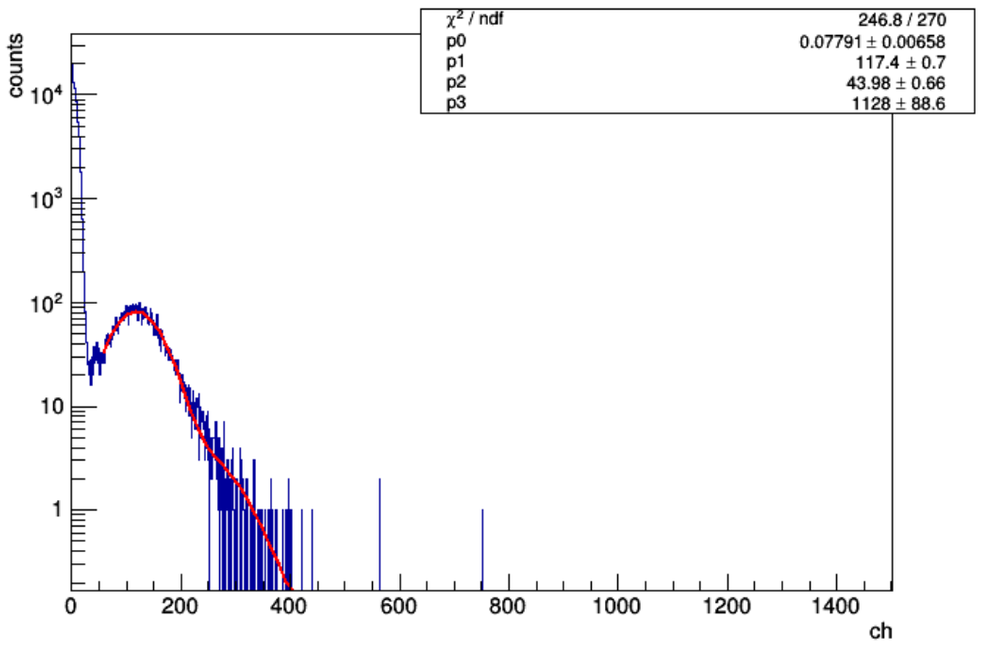

χ² / ndf 439.4 / 330
p0 0.05319 ± 0.00325
p1 121.4 ± 0.4
p2 49.12 ± 0.48
p3 4010 ± 229.9
counts
ch


χ² / ndf 296.1 / 288
p0 0.06745 ± 0.00608
p1 120.9 ± 0.7
p2 45.75 ± 0.66
p3 1214 ± 103.0
counts
ch

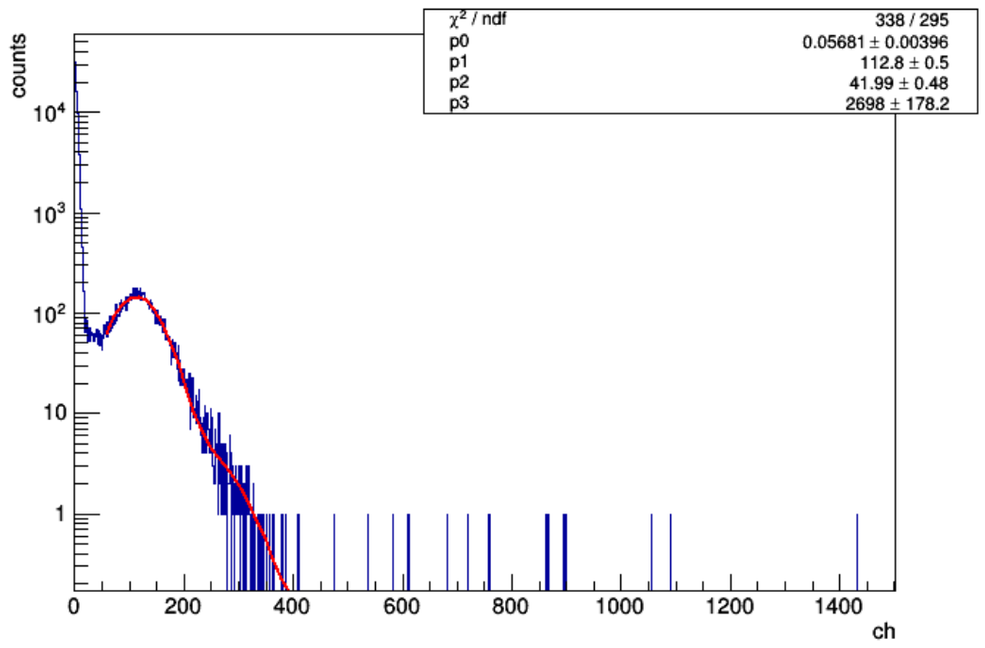
200 mA

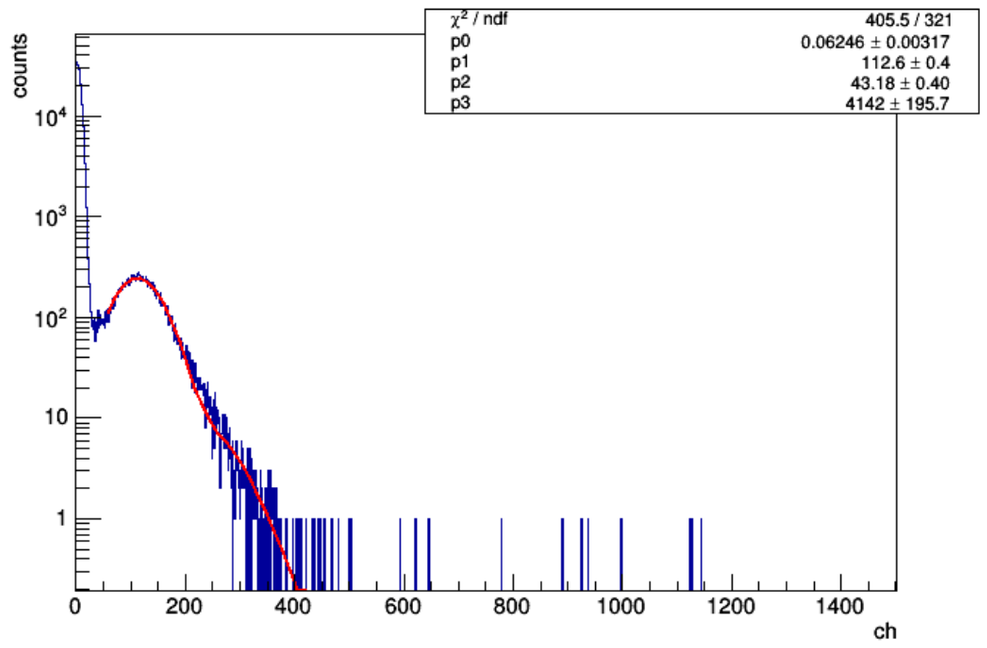

χ² / ndf 393.8 / 300
p0 0.05455 ± 0.00415
p1 115.3 ± 0.5
p2 46.49 ± 0.55
p3 2738 ± 196.0
counts
ch

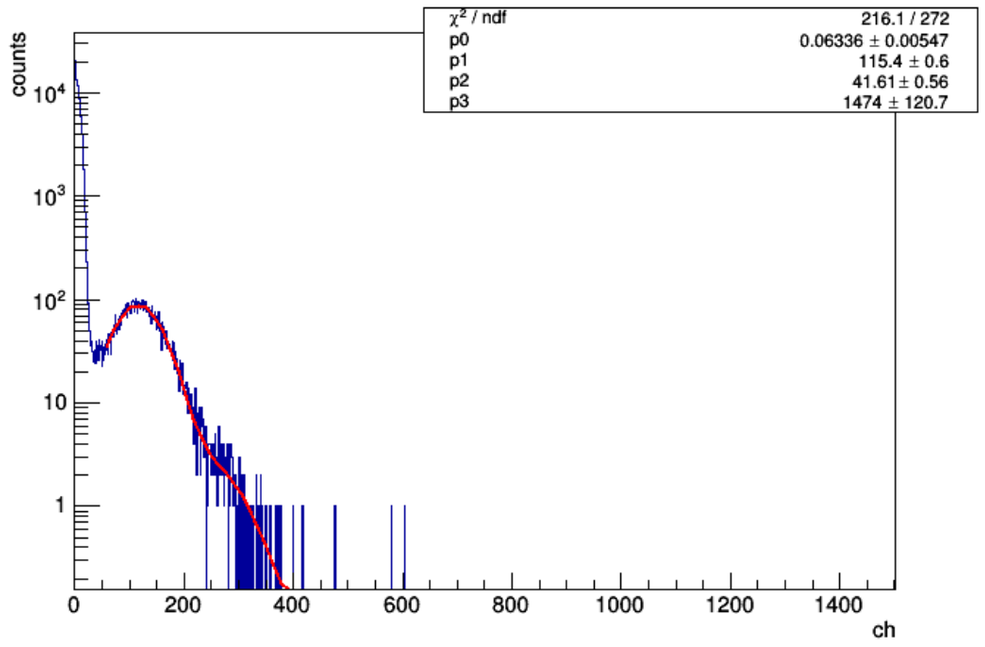

χ² / ndf 393.1 / 332
p0 0.05277 ± 0.00306
p1 117 ± 0.4
p2 46.19 ± 0.43
p3 4500 ± 245.7
counts
ch


χ² / ndf 246.8 / 270
p0 0.07791 ± 0.00658
p1 117.4 ± 0.7
p2 43.98 ± 0.66
p3 1128 ± 88.6
counts
ch

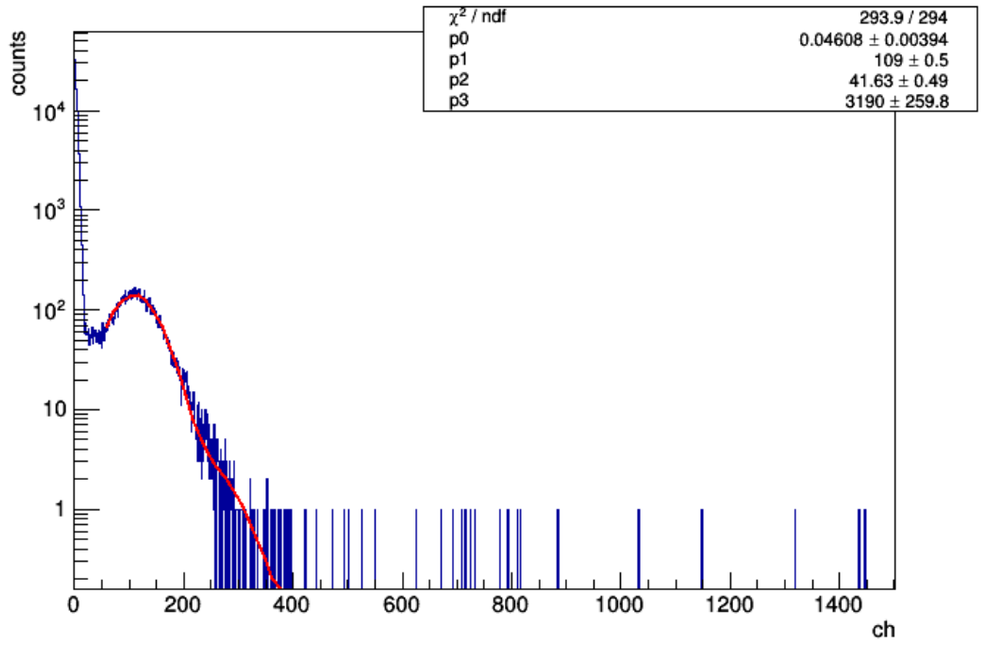
250 mA

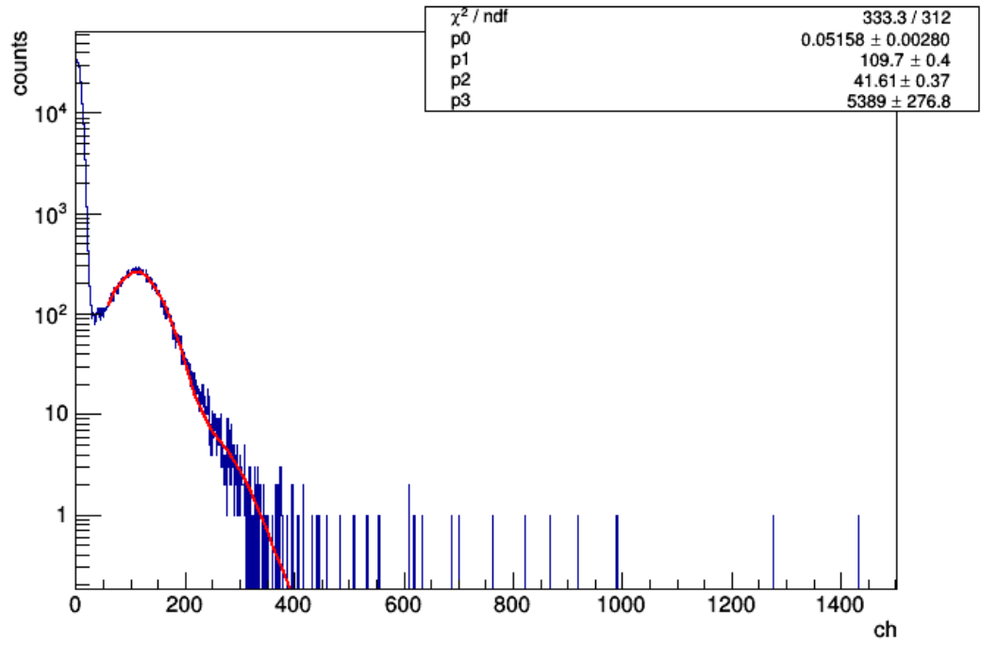

χ² / ndf 338 / 295
p0 0.05681 ± 0.00396
p1 112.8 ± 0.5
p2 41.99 ± 0.48
p3 2698 ± 178.2
counts
ch

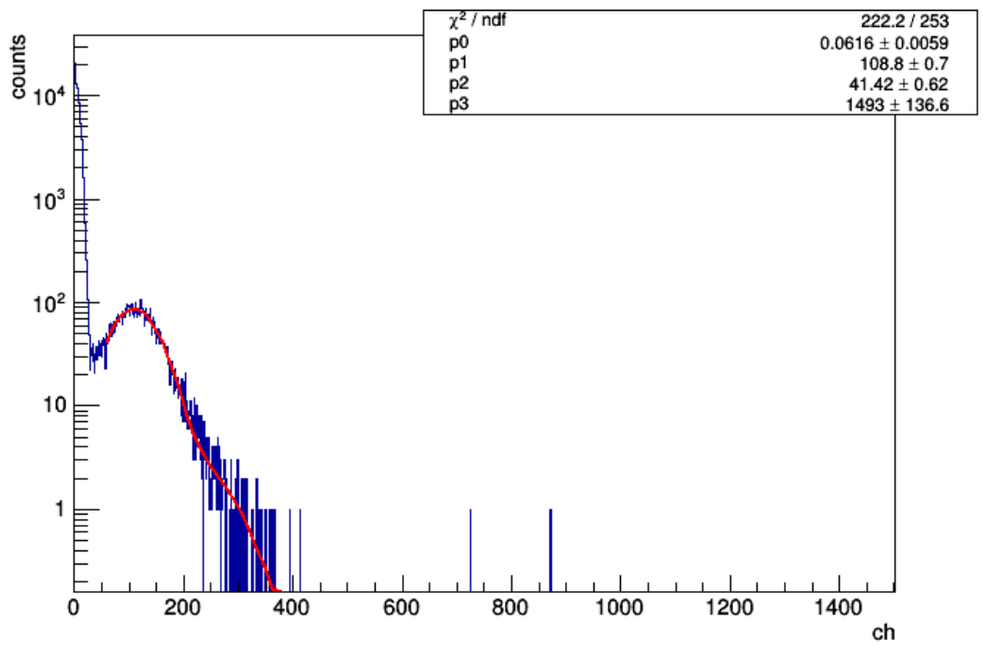

χ² / ndf 405.5 / 321
p0 0.06246 ± 0.00317
p1 112.6 ± 0.4
p2 43.18 ± 0.40
p3 4142 ± 195.7
counts
ch


χ² / ndf 216.1 / 272
p0 0.06336 ± 0.00547
p1 115.4 ± 0.6
p2 41.61 ± 0.56
p3 1474 ± 120.7
counts
ch

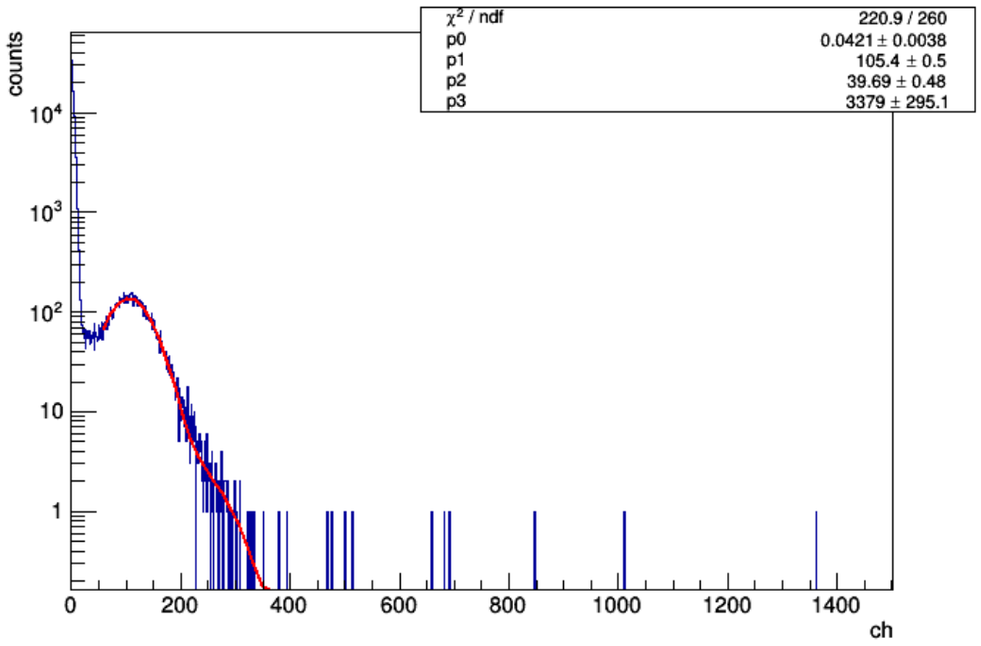
300 mA

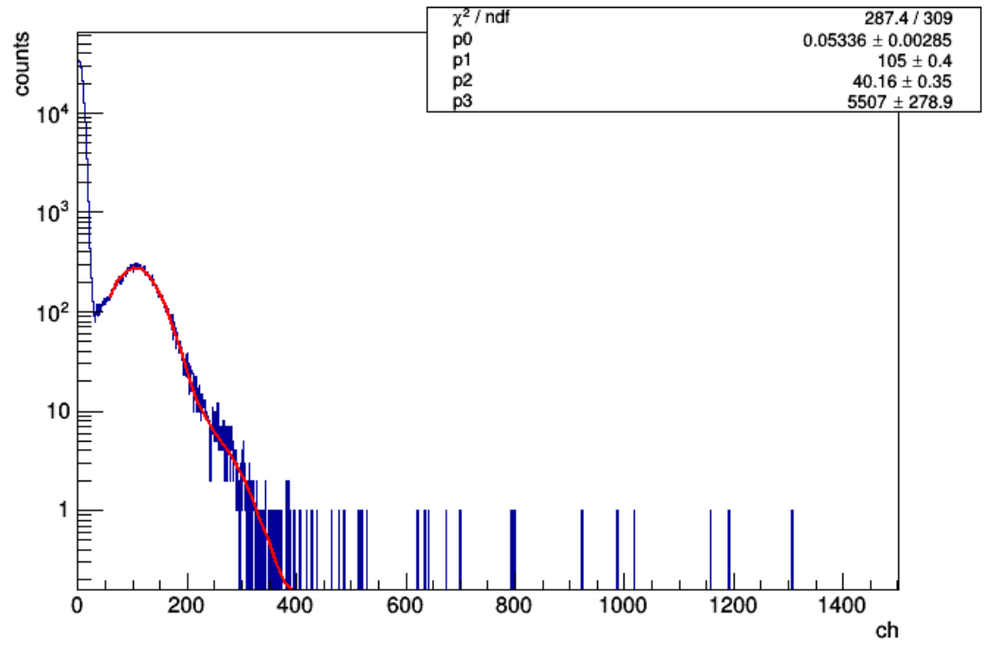

χ² / ndf 293.9 / 294
p0 0.04608 ± 0.00394
p1 109 ± 0.5
p2 41.63 ± 0.49
p3 3190 ± 259.8
counts
ch

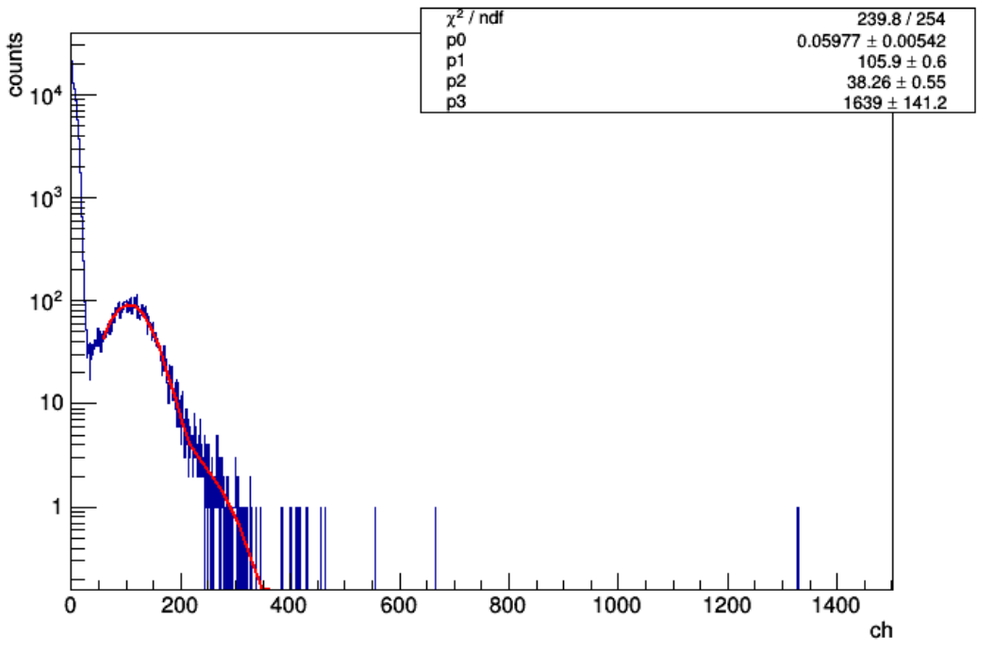

χ² / ndf 333.3 / 312
p0 0.05158 ± 0.00280
p1 109.7 ± 0.4
p2 41.61 ± 0.37
p3 5389 ± 276.8
counts
ch


χ² / ndf 222.2 / 253
p0 0.0616 ± 0.0059
p1 108.8 ± 0.7
p2 41.42 ± 0.62
p3 1493 ± 136.6
counts
ch

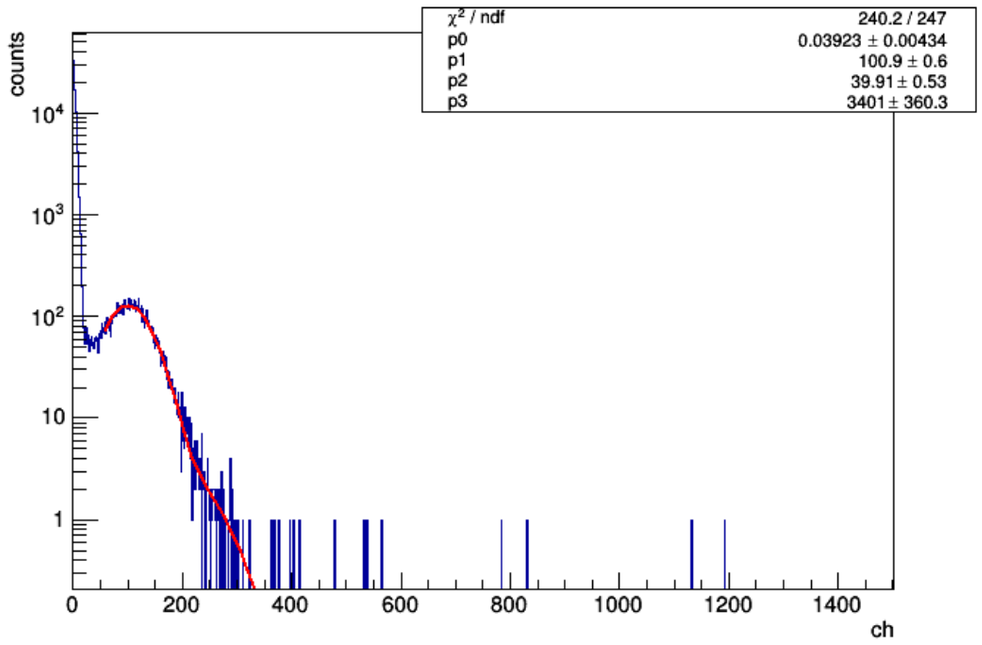
350 mA

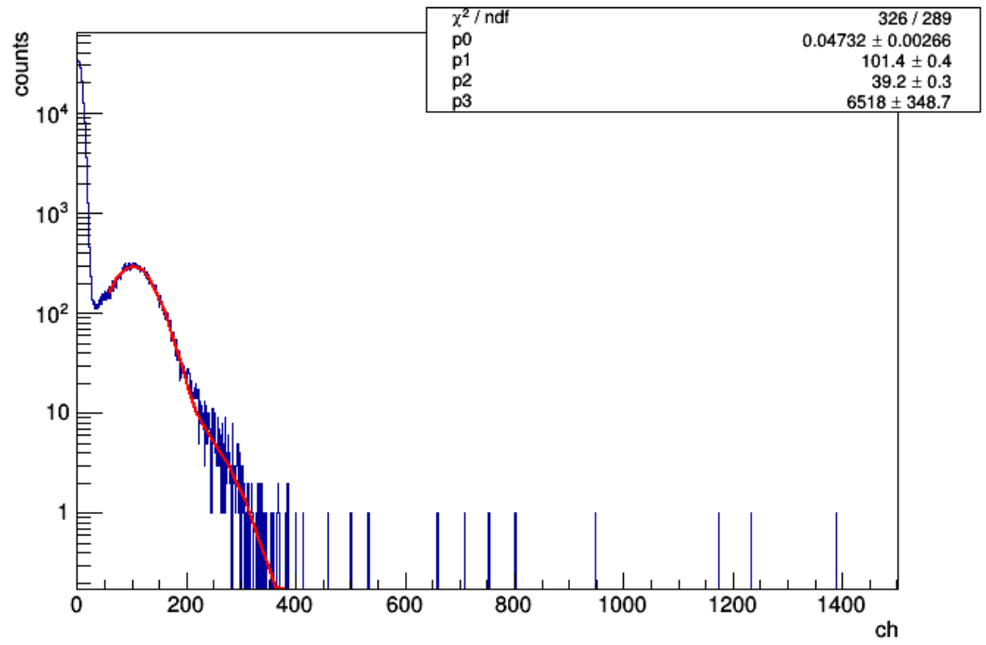

χ² / ndf 220.9 / 260
p0 0.0421 ± 0.0038
p1 105.4 ± 0.5
p2 39.69 ± 0.48
p3 3379 ± 295.1
counts
ch

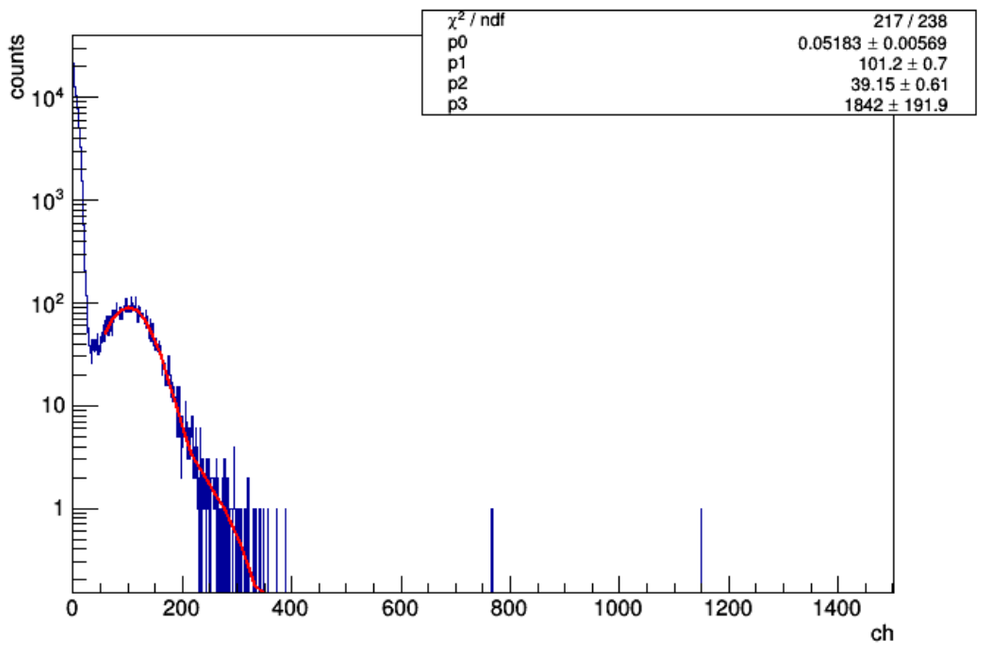

χ² / ndf 287.4 / 309
p0 0.05336 ± 0.00285
p1 105 ± 0.4
p2 40.16 ± 0.35
p3 5507 ± 278.9
counts
ch


χ² / ndf 239.8 / 254
p0 0.05977 ± 0.00542
p1 105.9 ± 0.6
p2 38.26 ± 0.55
p3 1639 ± 141.2
counts
ch

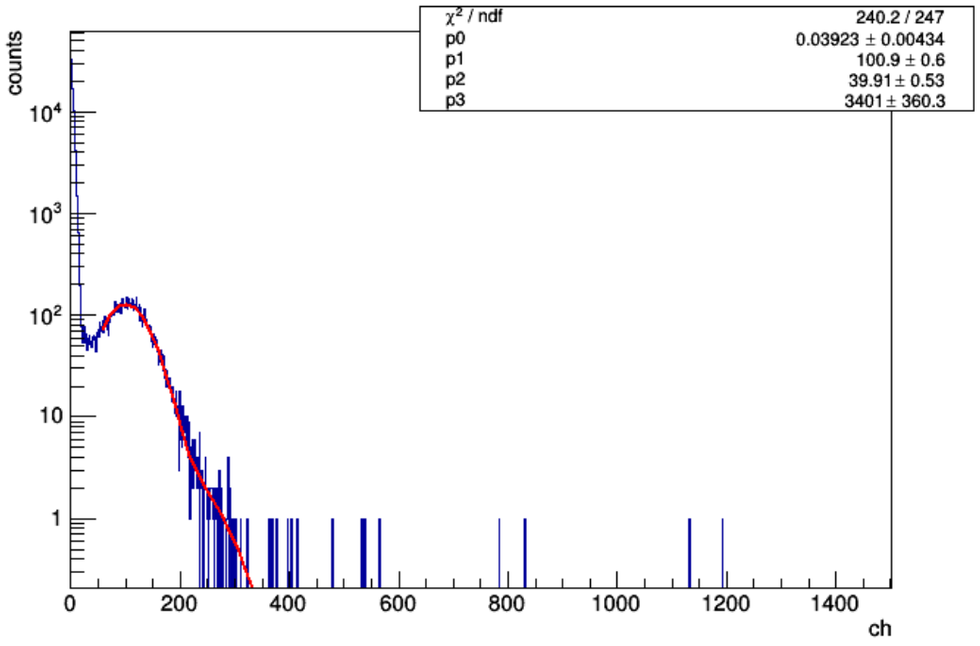
400 mA

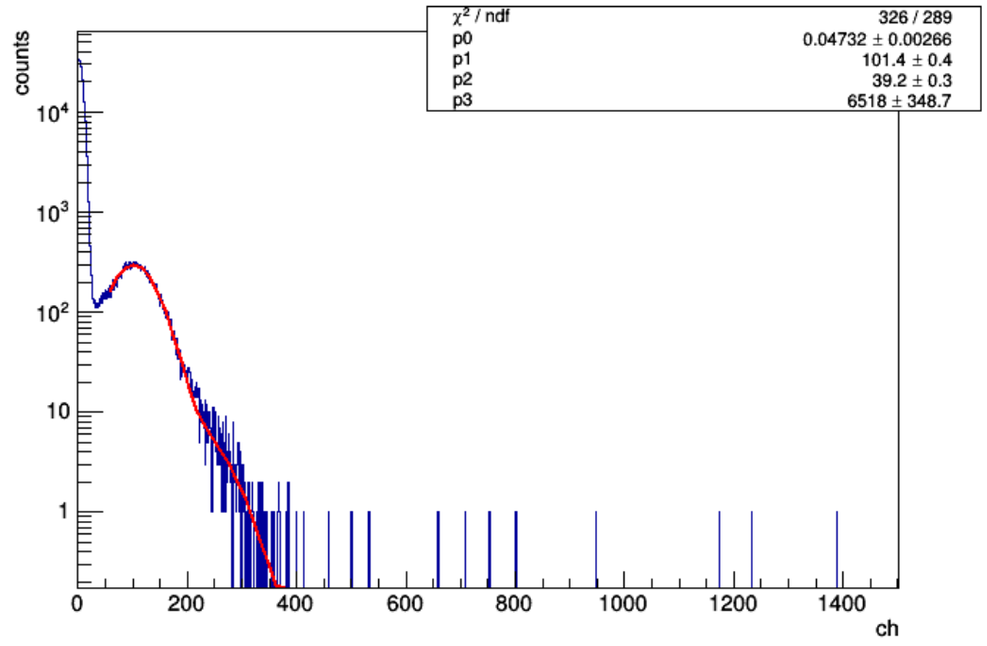

χ² / ndf 240.2 / 247
p0 0.03923 ± 0.00434
p1 100.9 ± 0.6
p2 39.91 ± 0.53
p3 3401 ± 360.3
counts
ch

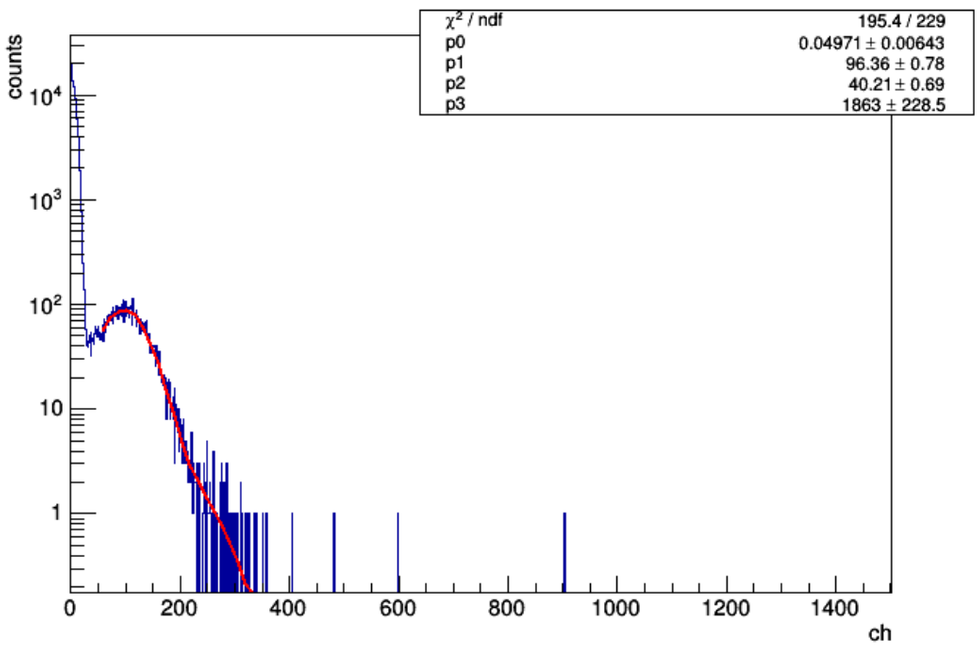

χ² / ndf 326 / 289
p0 0.04732 ± 0.00266
p1 101.4 ± 0.4
p2 39.2 ± 0.3
p3 6518 ± 348.7
counts
ch


χ² / ndf 217 / 238
p0 0.05183 ± 0.00569
p1 101.2 ± 0.7
p2 39.15 ± 0.61
p3 1842 ± 191.9
counts
ch

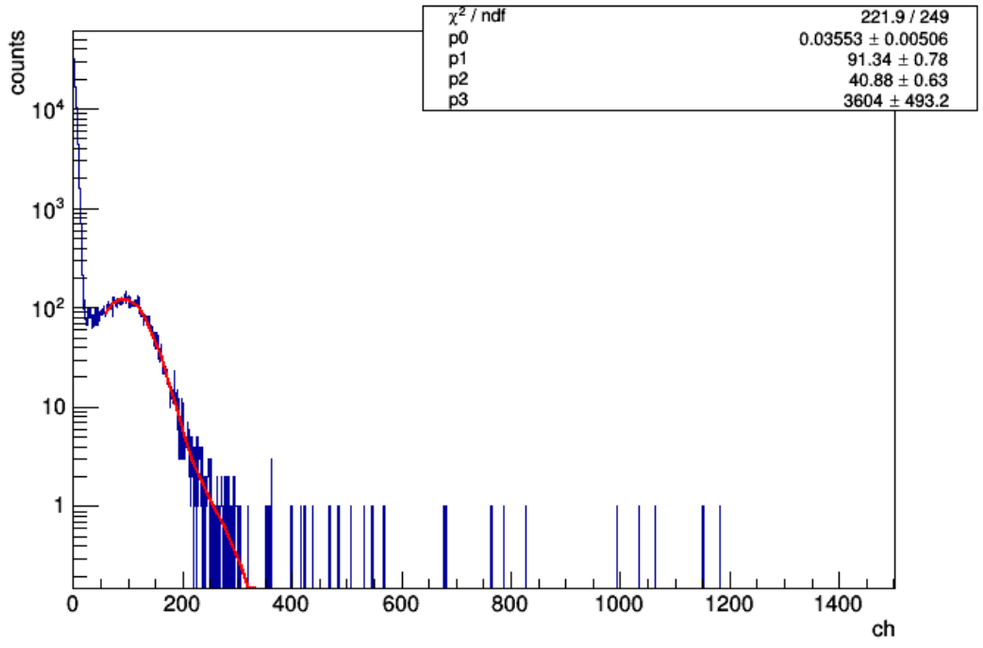
450 mA

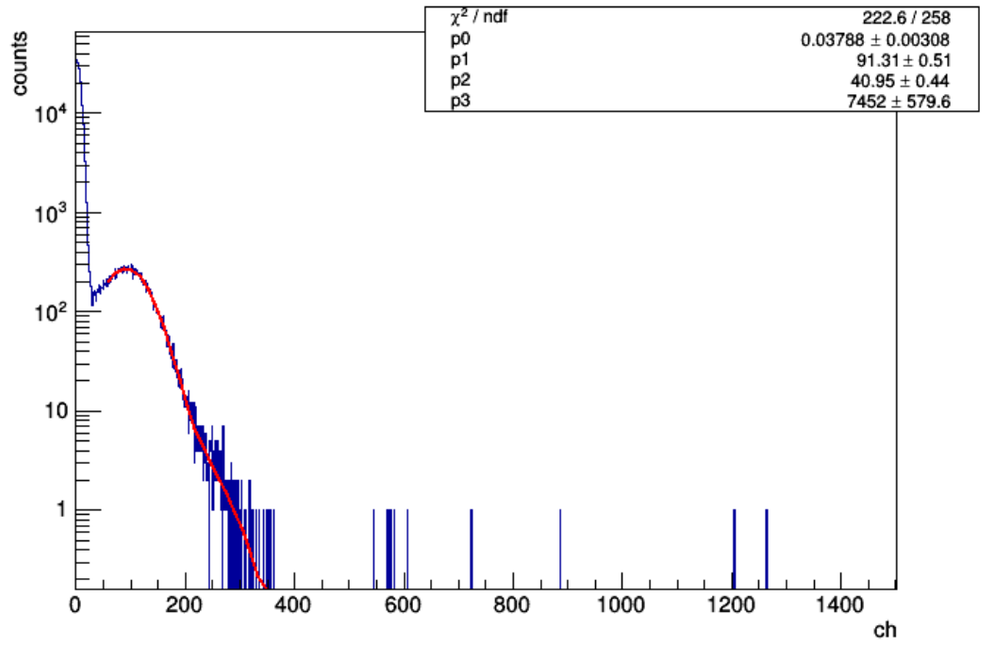

χ² / ndf 240.2 / 247
p0 0.03923 ± 0.00434
p1 100.9 ± 0.6
p2 39.91 ± 0.53
p3 3401 ± 360.3
counts
ch

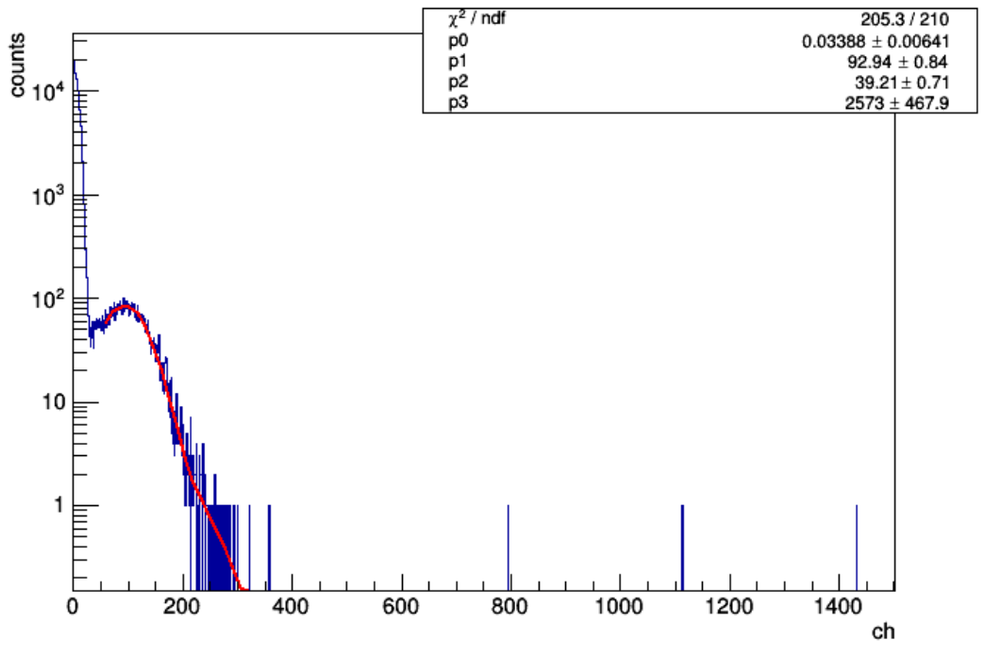

χ² / ndf 326 / 289
p0 0.04732 ± 0.00266
p1 101.4 ± 0.4
p2 39.2 ± 0.3
p3 6518 ± 348.7
counts
ch


χ² / ndf 195.4 / 229
p0 0.04971 ± 0.00643
p1 96.36 ± 0.78
p2 40.21 ± 0.69
p3 1863 ± 228.5
counts
ch

500 mA


χ² / ndf 221.9 / 249
p0 0.03553 ± 0.00506
p1 91.34 ± 0.78
p2 40.88 ± 0.63
p3 3604 ± 493.2
counts
ch


χ² / ndf 222.6 / 258
p0 0.03788 ± 0.00308
p1 91.31 ± 0.51
p2 40.95 ± 0.44
p3 7452 ± 579.6
counts
ch


χ² / ndf 205.3 / 210
p0 0.03388 ± 0.00641
p1 92.94 ± 0.84
p2 39.21 ± 0.71
p3 2573 ± 467.9
counts
ch