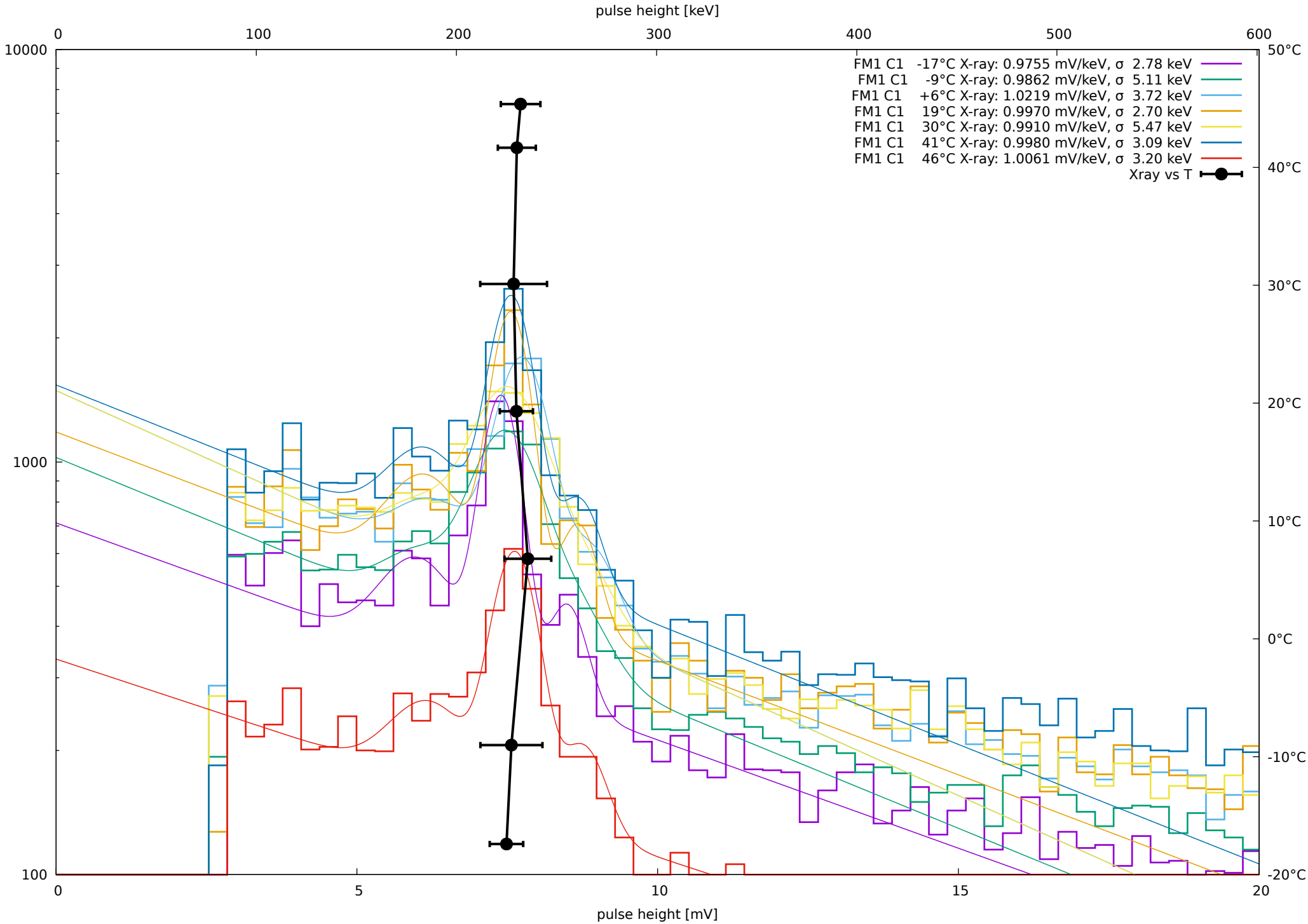
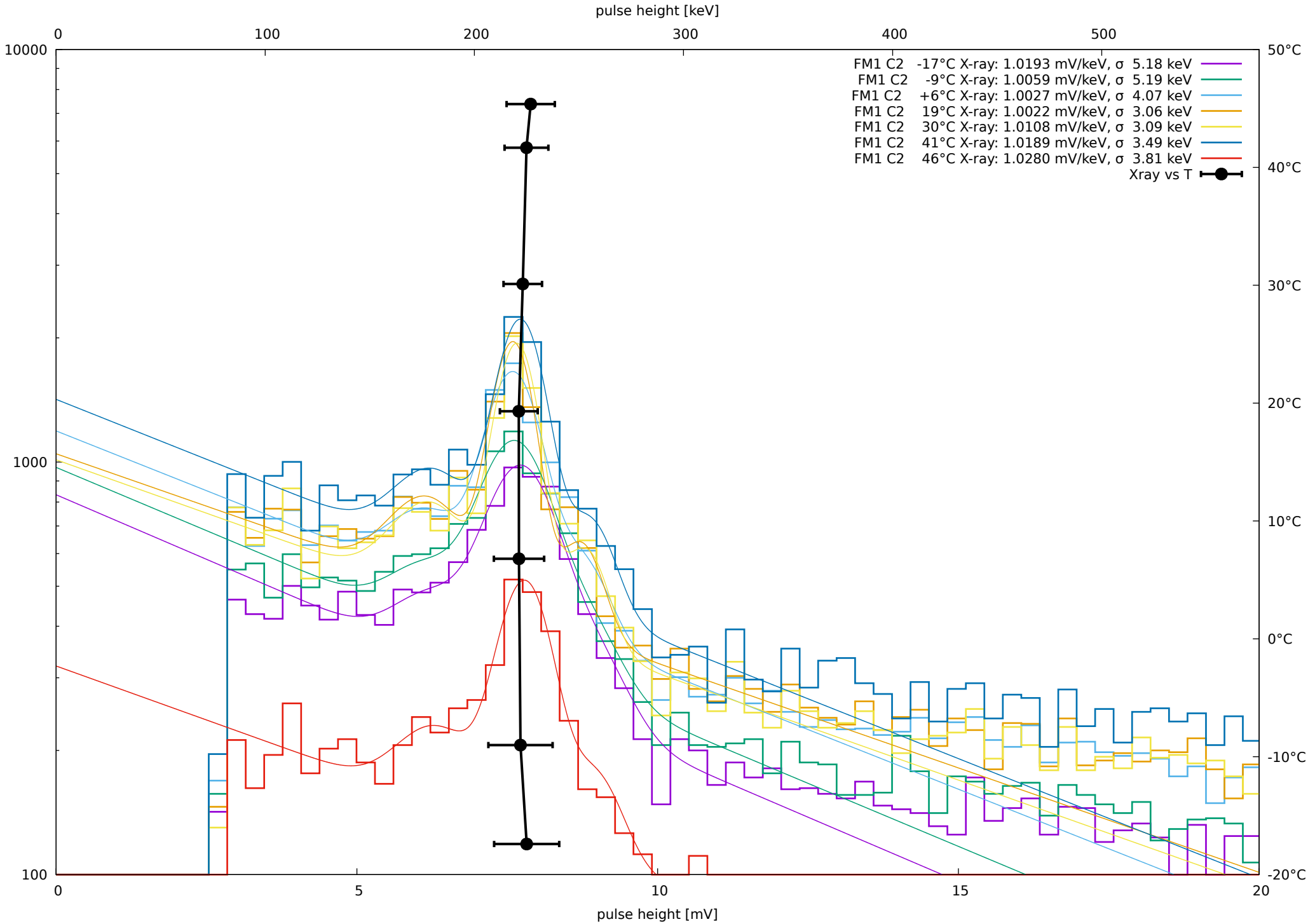
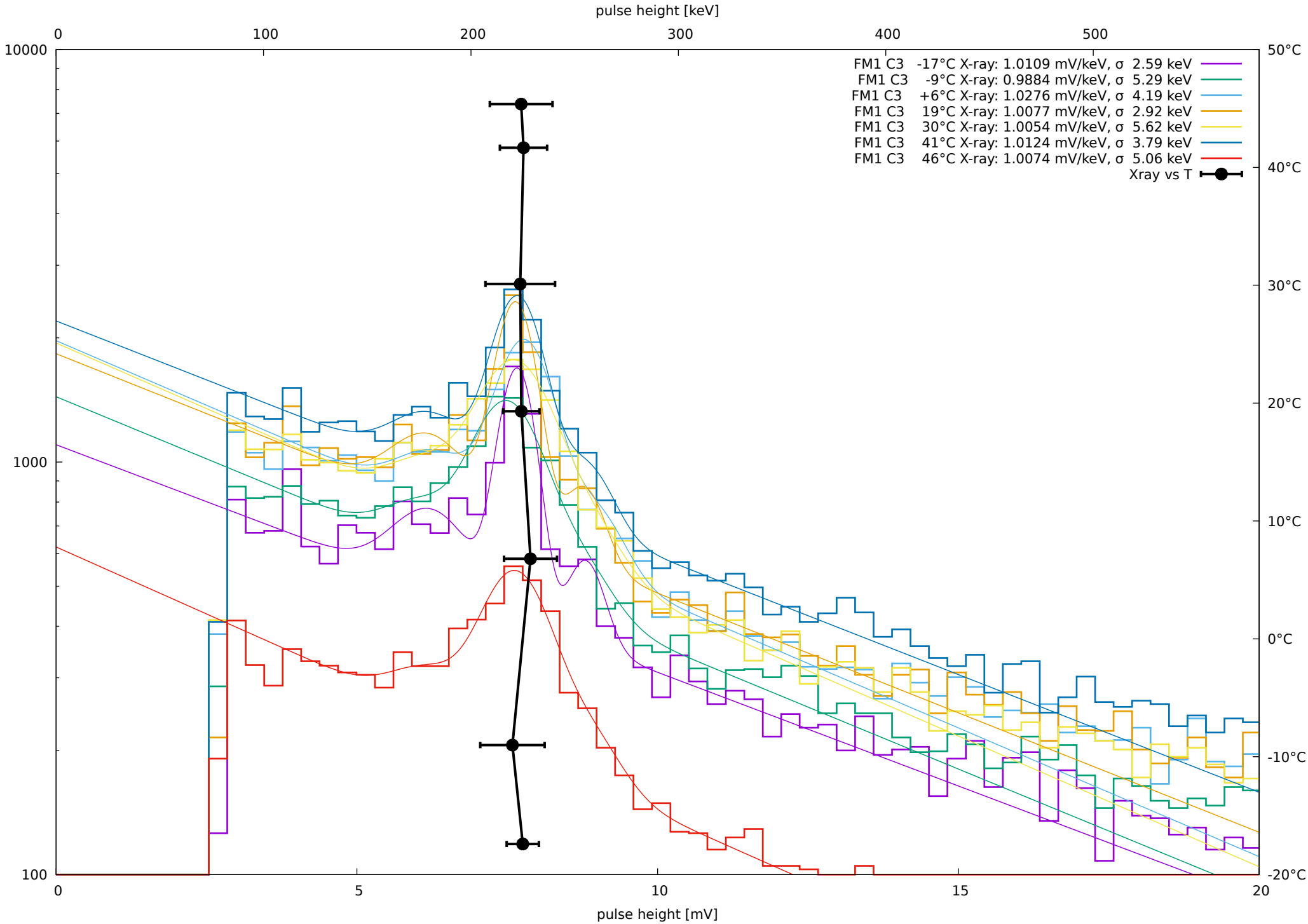
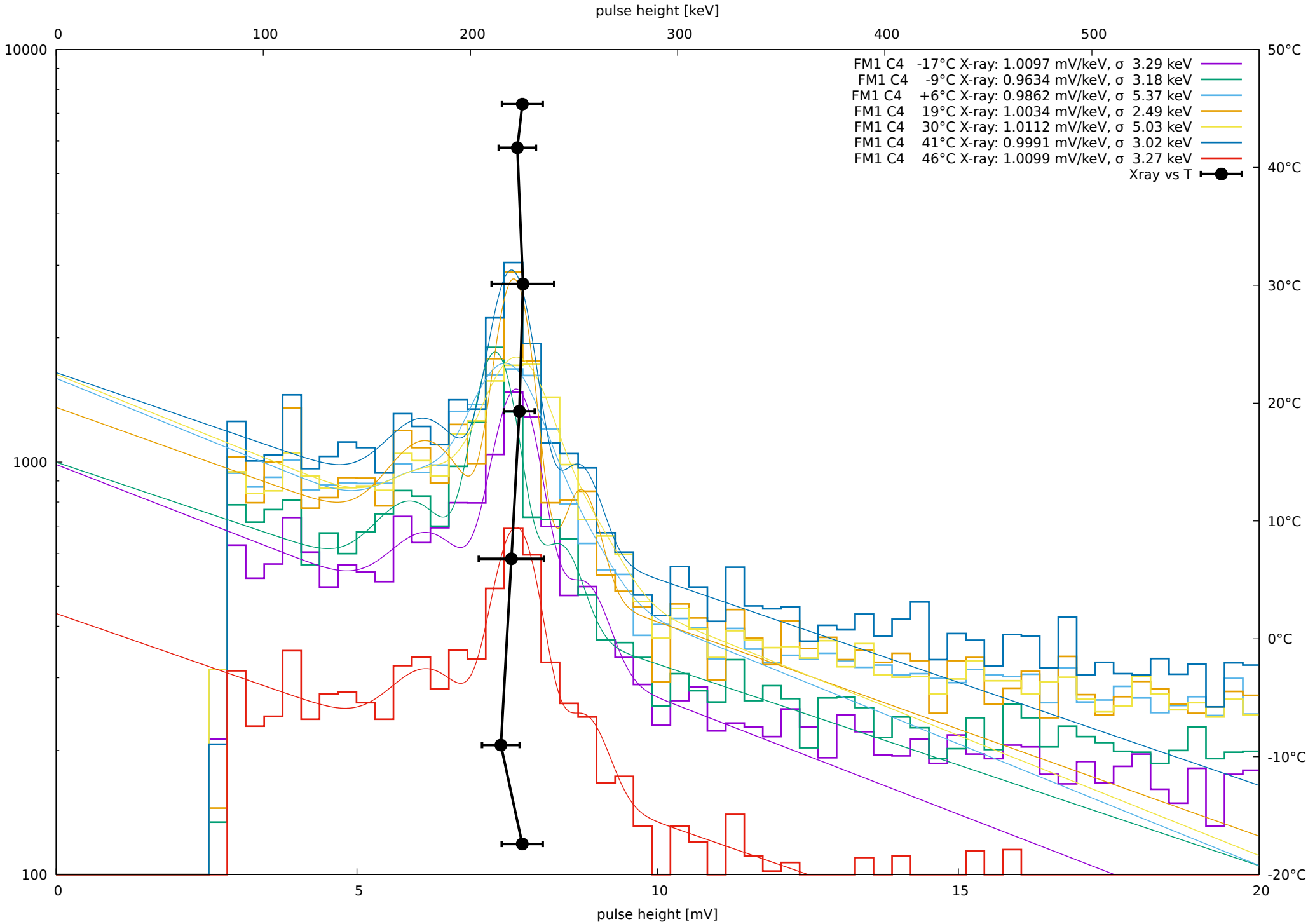
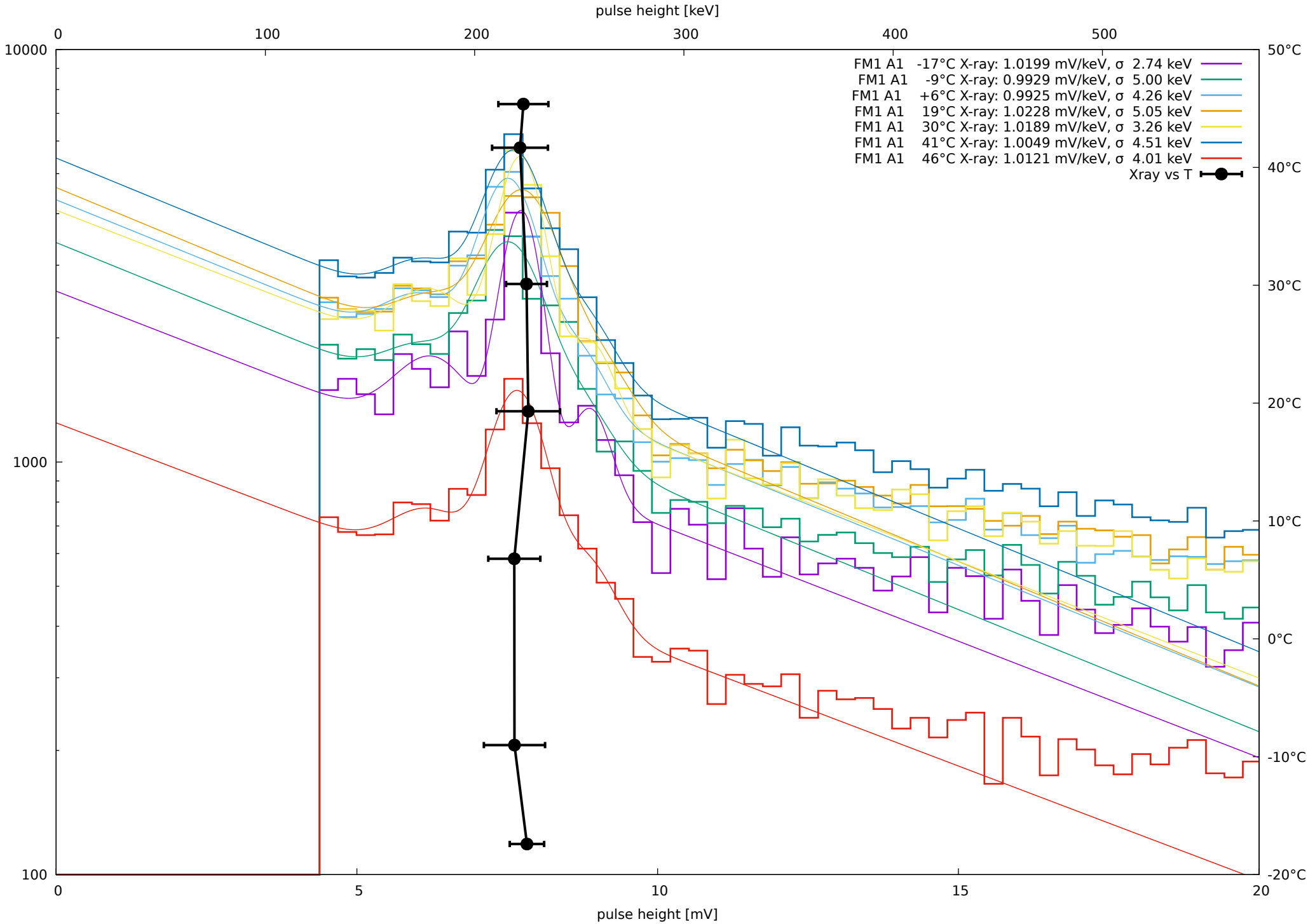
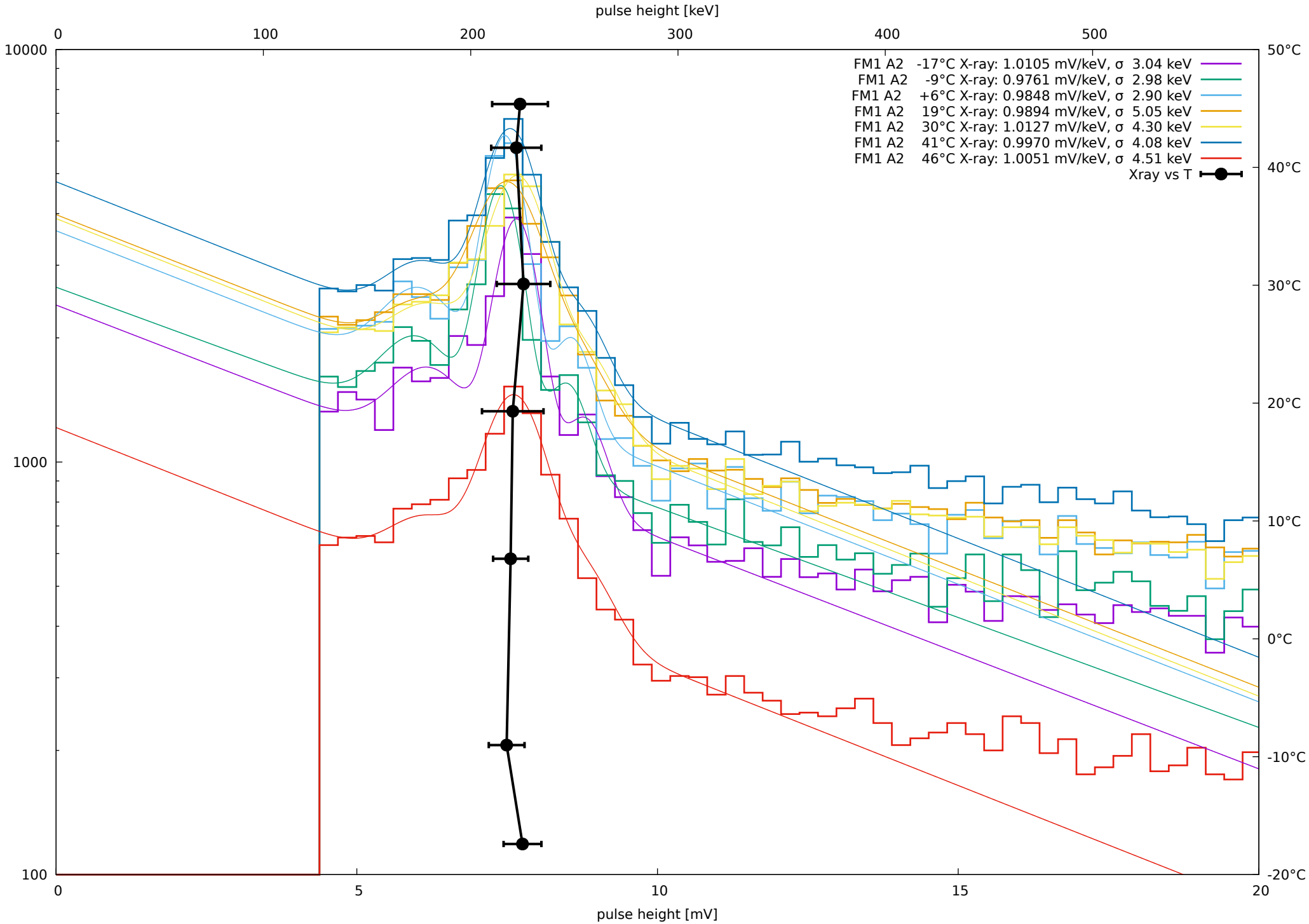

pulse height [keV]
0
100
200
300
400
500
600
10000
1000
100
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
FM1 C1 -17°C X-ray: 0.9755 mV/keV, σ 2.78 keV
FM1 C1 -9°C X-ray: 0.9862 mV/keV, σ 5.11 keV
FM1 C1 +6°C X-ray: 1.0219 mV/keV, σ 3.72 keV
FM1 C1 19°C X-ray: 0.9970 mV/keV, σ 2.70 keV
FM1 C1 30°C X-ray: 0.9910 mV/keV, σ 5.47 keV
FM1 C1 41°C X-ray: 0.9980 mV/keV, σ 3.09 keV
FM1 C1 46°C X-ray: 1.0061 mV/keV, σ 3.20 keV
Xray vs T
0
5
10
15
20
pulse height [mV]

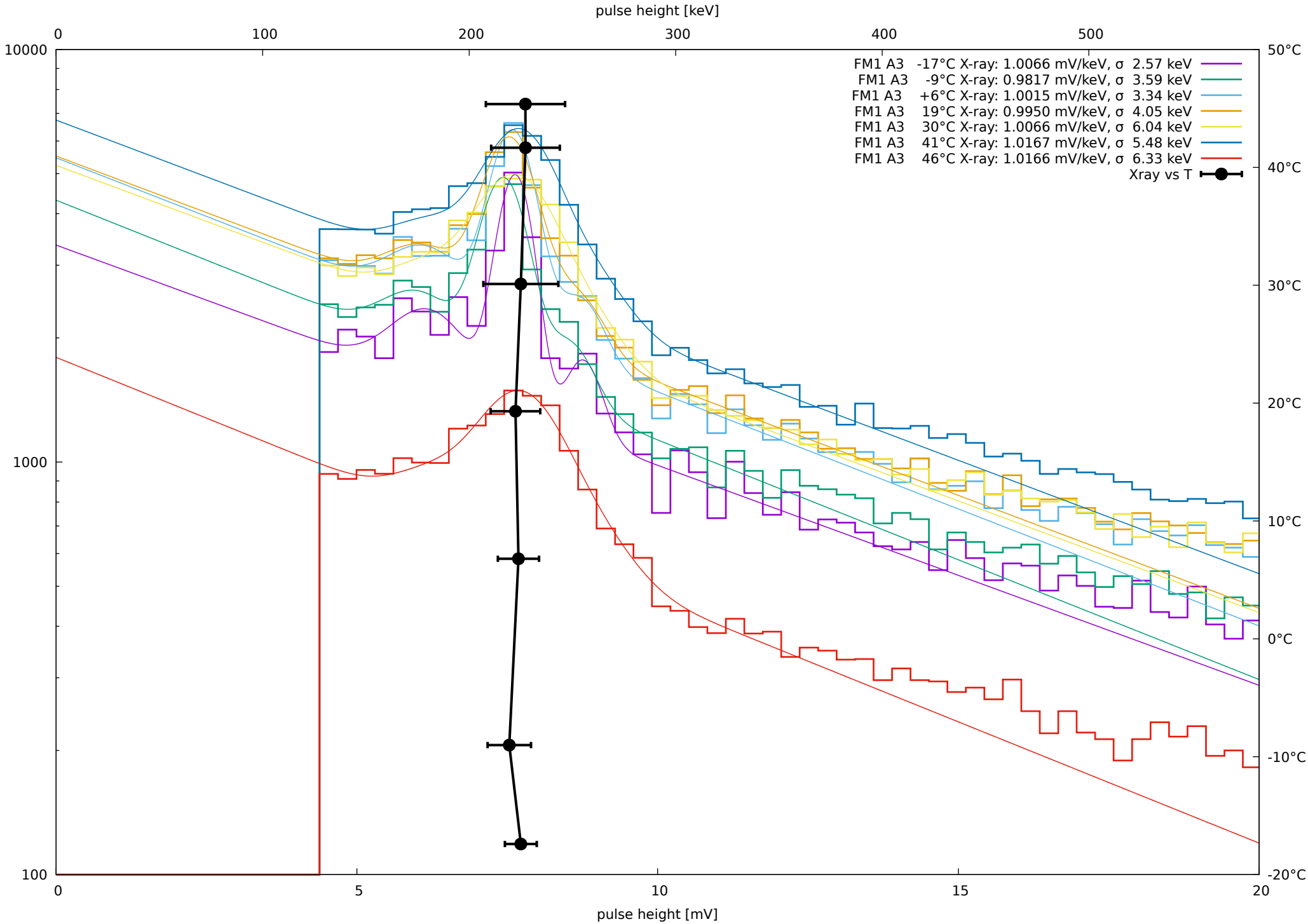

pulse height [keV]
0
100
200
300
400
500
10000
1000
100
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
FM1 C2 -17°C X-ray: 1.0193 mV/keV, σ 5.18 keV
FM1 C2 -9°C X-ray: 1.0059 mV/keV, σ 5.19 keV
FM1 C2 +6°C X-ray: 1.0027 mV/keV, σ 4.07 keV
FM1 C2 19°C X-ray: 1.0022 mV/keV, σ 3.06 keV
FM1 C2 30°C X-ray: 1.0108 mV/keV, σ 3.09 keV
FM1 C2 41°C X-ray: 1.0189 mV/keV, σ 3.49 keV
FM1 C2 46°C X-ray: 1.0280 mV/keV, σ 3.81 keV
Xray vs T
0
5
10
15
20
pulse height [mV]

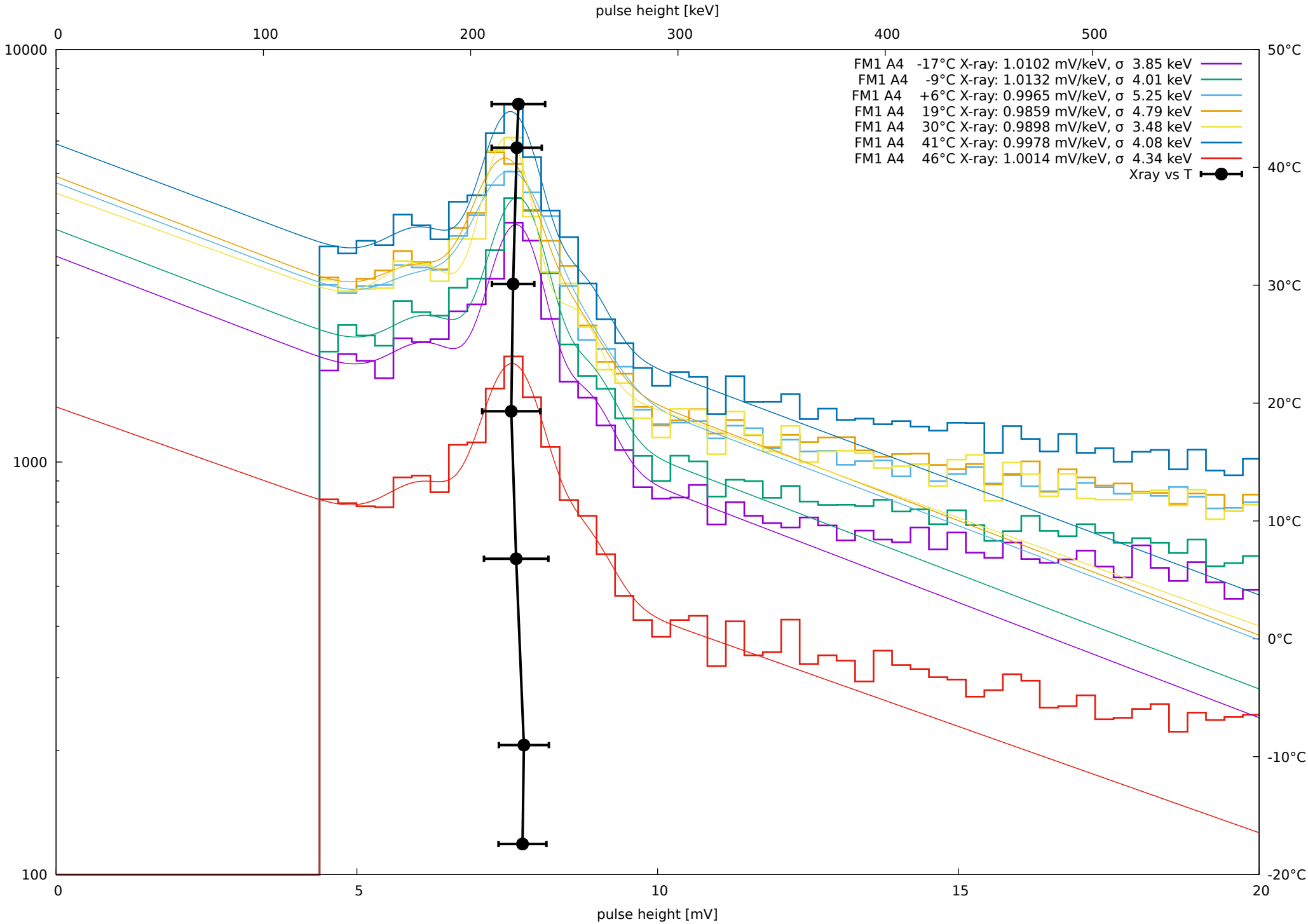

pulse height [keV]
0
100
200
300
400
500
10000
1000
100
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
FM1 C3 -17°C X-ray: 1.0109 mV/keV, σ 2.59 keV
FM1 C3 -9°C X-ray: 0.9884 mV/keV, σ 5.29 keV
FM1 C3 +6°C X-ray: 1.0276 mV/keV, σ 4.19 keV
FM1 C3 19°C X-ray: 1.0077 mV/keV, σ 2.92 keV
FM1 C3 30°C X-ray: 1.0054 mV/keV, σ 5.62 keV
FM1 C3 41°C X-ray: 1.0124 mV/keV, σ 3.79 keV
FM1 C3 46°C X-ray: 1.0074 mV/keV, σ 5.06 keV
Xray vs T
0
5
10
15
20
pulse height [mV]

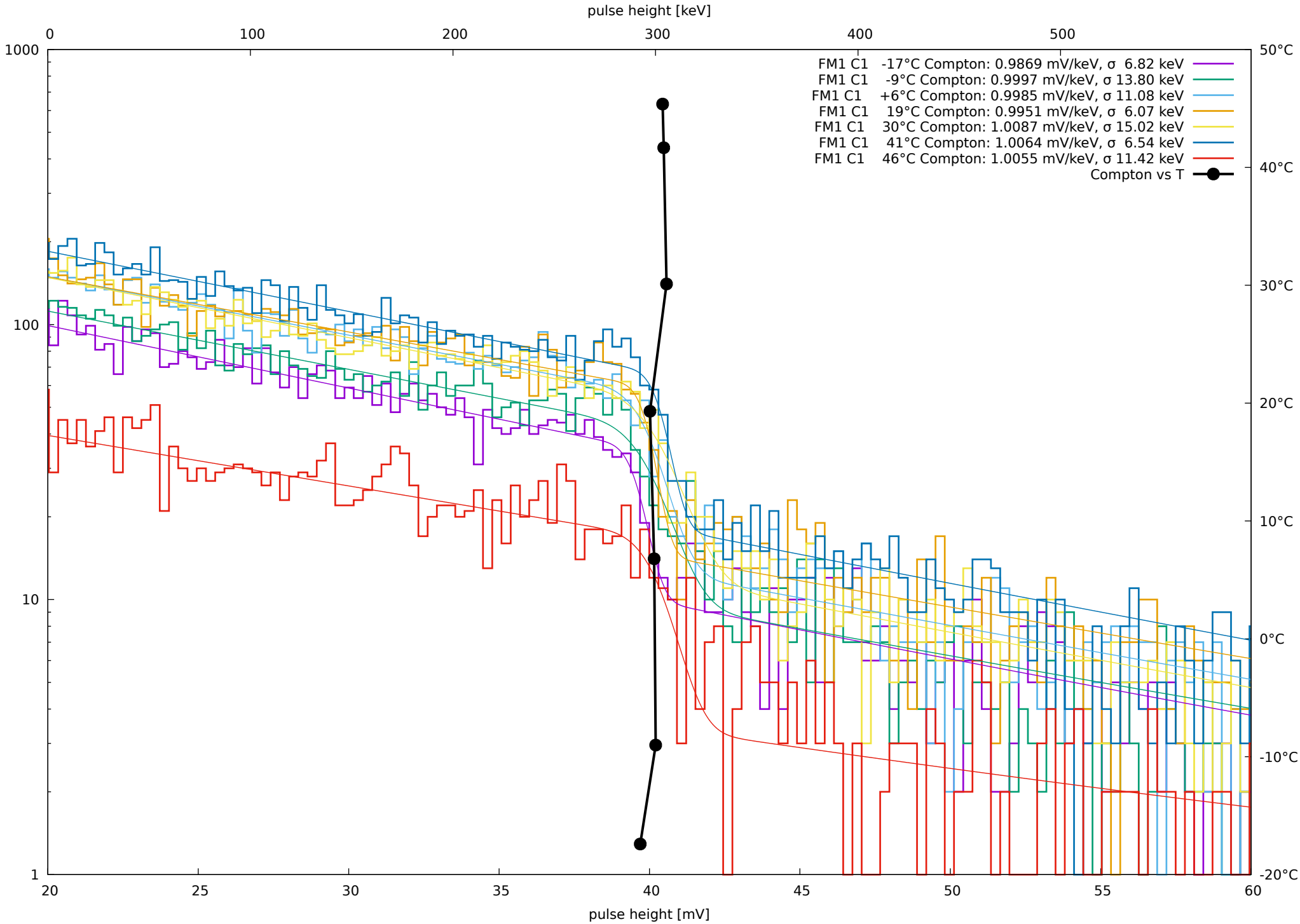

pulse height [keV]
0
100
200
300
400
500
10000
1000
100
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
FM1 C4 -17°C X-ray: 1.0097 mV/keV, σ 3.29 keV
FM1 C4 -9°C X-ray: 0.9634 mV/keV, σ 3.18 keV
FM1 C4 +6°C X-ray: 0.9862 mV/keV, σ 5.37 keV
FM1 C4 19°C X-ray: 1.0034 mV/keV, σ 2.49 keV
FM1 C4 30°C X-ray: 1.0112 mV/keV, σ 5.03 keV
FM1 C4 41°C X-ray: 0.9991 mV/keV, σ 3.02 keV
FM1 C4 46°C X-ray: 1.0099 mV/keV, σ 3.27 keV
Xray vs T
0
5
10
15
20
pulse height [mV]

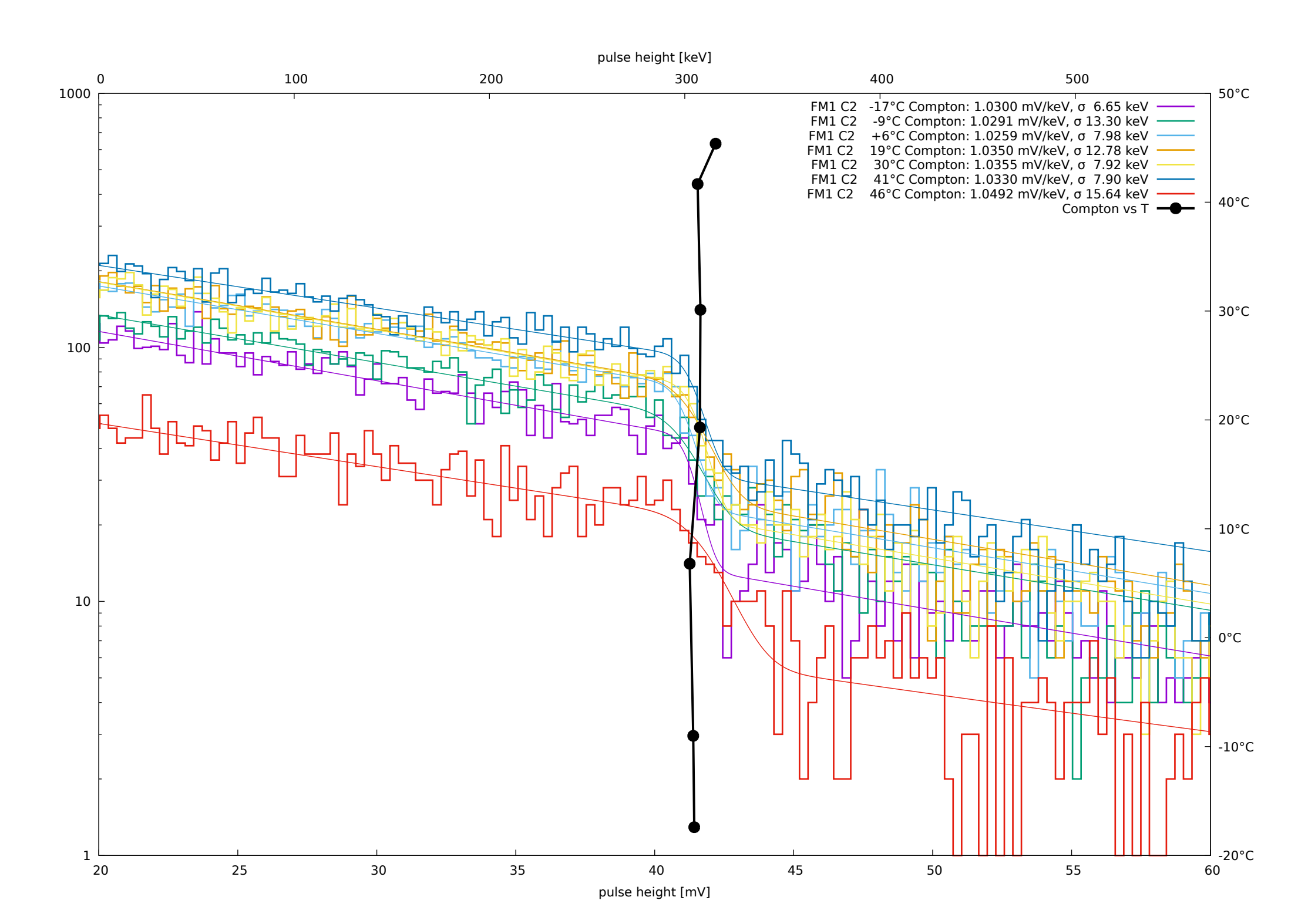

pulse height [keV]
0
100
200
300
400
500
10000
1000
100
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
FM1 A1 -17°C X-ray: 1.0199 mV/keV, σ 2.74 keV
FM1 A1 -9°C X-ray: 0.9929 mV/keV, σ 5.00 keV
FM1 A1 +6°C X-ray: 0.9925 mV/keV, σ 4.26 keV
FM1 A1 19°C X-ray: 1.0228 mV/keV, σ 5.05 keV
FM1 A1 30°C X-ray: 1.0189 mV/keV, σ 3.26 keV
FM1 A1 41°C X-ray: 1.0049 mV/keV, σ 4.51 keV
FM1 A1 46°C X-ray: 1.0121 mV/keV, σ 4.01 keV
Xray vs T
0
5
10
15
20
pulse height [mV]

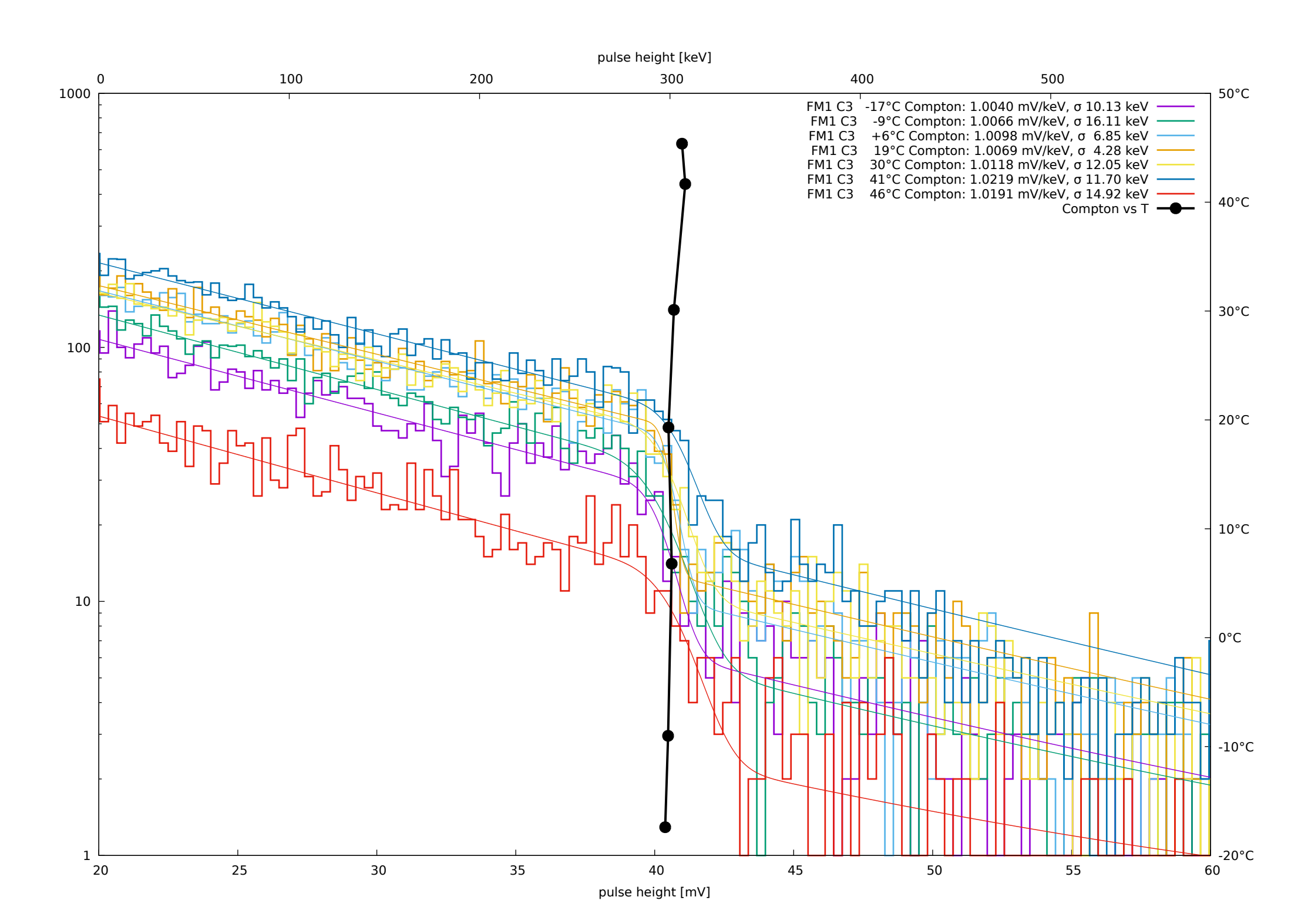

pulse height [keV]
0
100
200
300
400
500
10000
1000
100
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
FM1 A2 -17°C X-ray: 1.0105 mV/keV, σ 3.04 keV
FM1 A2 -9°C X-ray: 0.9761 mV/keV, σ 2.98 keV
FM1 A2 +6°C X-ray: 0.9848 mV/keV, σ 2.90 keV
FM1 A2 19°C X-ray: 0.9894 mV/keV, σ 5.05 keV
FM1 A2 30°C X-ray: 1.0127 mV/keV, σ 4.30 keV
FM1 A2 41°C X-ray: 0.9970 mV/keV, σ 4.08 keV
FM1 A2 46°C X-ray: 1.0051 mV/keV, σ 4.51 keV
Xray vs T
0
5
10
15
20
pulse height [mV]

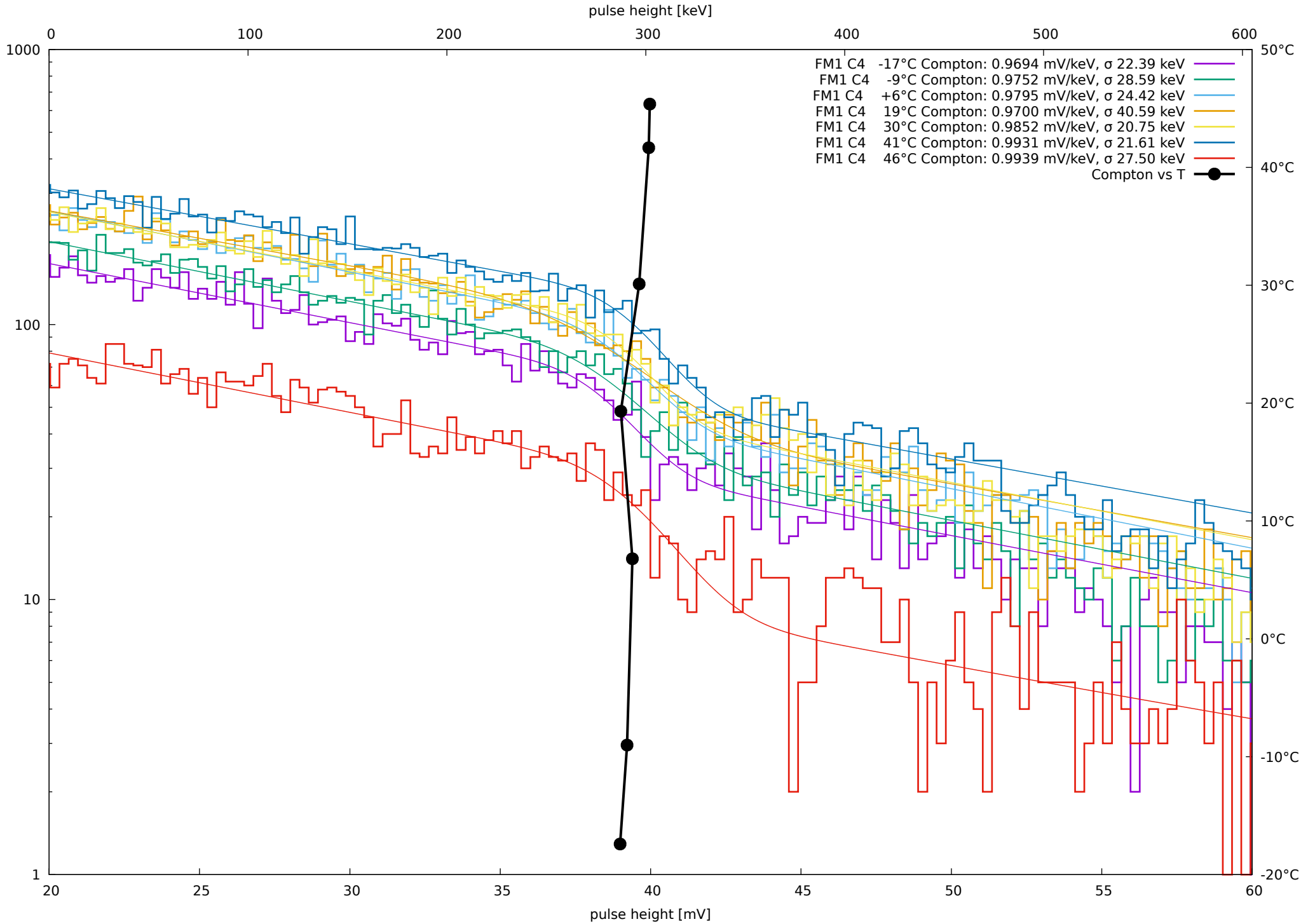

pulse height [keV]
0
100
200
300
400
500
10000
1000
100
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
FM1 A3 -17°C X-ray: 1.0066 mV/keV, σ 2.57 keV
FM1 A3 -9°C X-ray: 0.9817 mV/keV, σ 3.59 keV
FM1 A3 +6°C X-ray: 1.0015 mV/keV, σ 3.34 keV
FM1 A3 19°C X-ray: 0.9950 mV/keV, σ 4.05 keV
FM1 A3 30°C X-ray: 1.0066 mV/keV, σ 6.04 keV
FM1 A3 41°C X-ray: 1.0167 mV/keV, σ 5.48 keV
FM1 A3 46°C X-ray: 1.0166 mV/keV, σ 6.33 keV
Xray vs T
0
5
10
15
20
pulse height [mV]

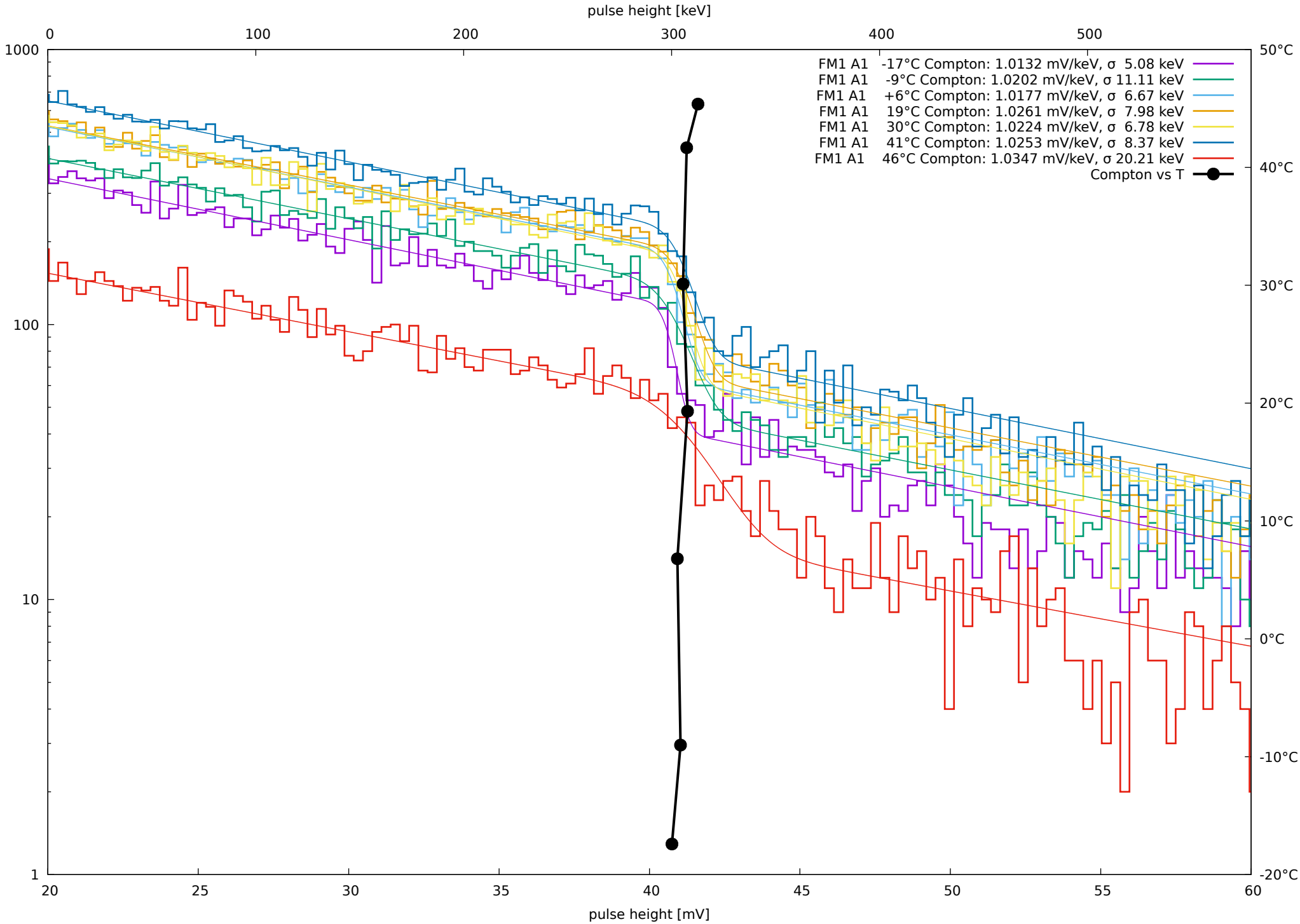

pulse height [keV]
0
100
200
300
400
500
10000
1000
100
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
FM1 A4 -17°C X-ray: 1.0102 mV/keV, σ 3.85 keV
FM1 A4 -9°C X-ray: 1.0132 mV/keV, σ 4.01 keV
FM1 A4 +6°C X-ray: 0.9965 mV/keV, σ 5.25 keV
FM1 A4 19°C X-ray: 0.9859 mV/keV, σ 4.79 keV
FM1 A4 30°C X-ray: 0.9898 mV/keV, σ 3.48 keV
FM1 A4 41°C X-ray: 0.9978 mV/keV, σ 4.08 keV
FM1 A4 46°C X-ray: 1.0014 mV/keV, σ 4.34 keV
Xray vs T
0
5
10
15
20
pulse height [mV]

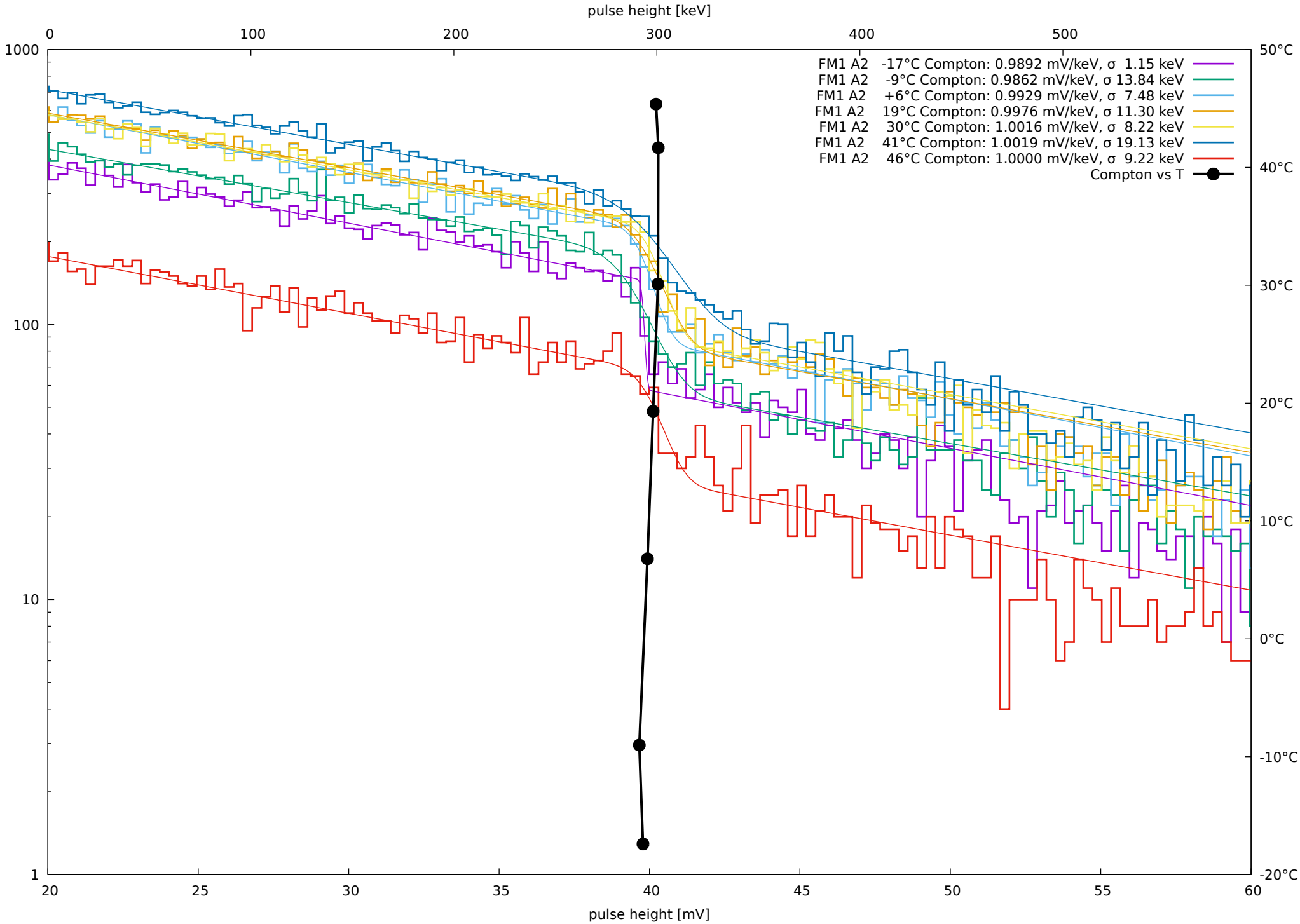

pulse height [keV]
0
100
200
300
400
500
1000
100
10
1
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
20
25
30
35
40
45
50
55
60
pulse height [mV]
FM1 C1 -17°C Compton: 0.9869 mV/keV, σ 6.82 keV
FM1 C1 -9°C Compton: 0.9997 mV/keV, σ 13.80 keV
FM1 C1 +6°C Compton: 0.9985 mV/keV, σ 11.08 keV
FM1 C1 19°C Compton: 0.9951 mV/keV, σ 6.07 keV
FM1 C1 30°C Compton: 1.0087 mV/keV, σ 15.02 keV
FM1 C1 41°C Compton: 1.0064 mV/keV, σ 6.54 keV
FM1 C1 46°C Compton: 1.0055 mV/keV, σ 11.42 keV
Compton vs T

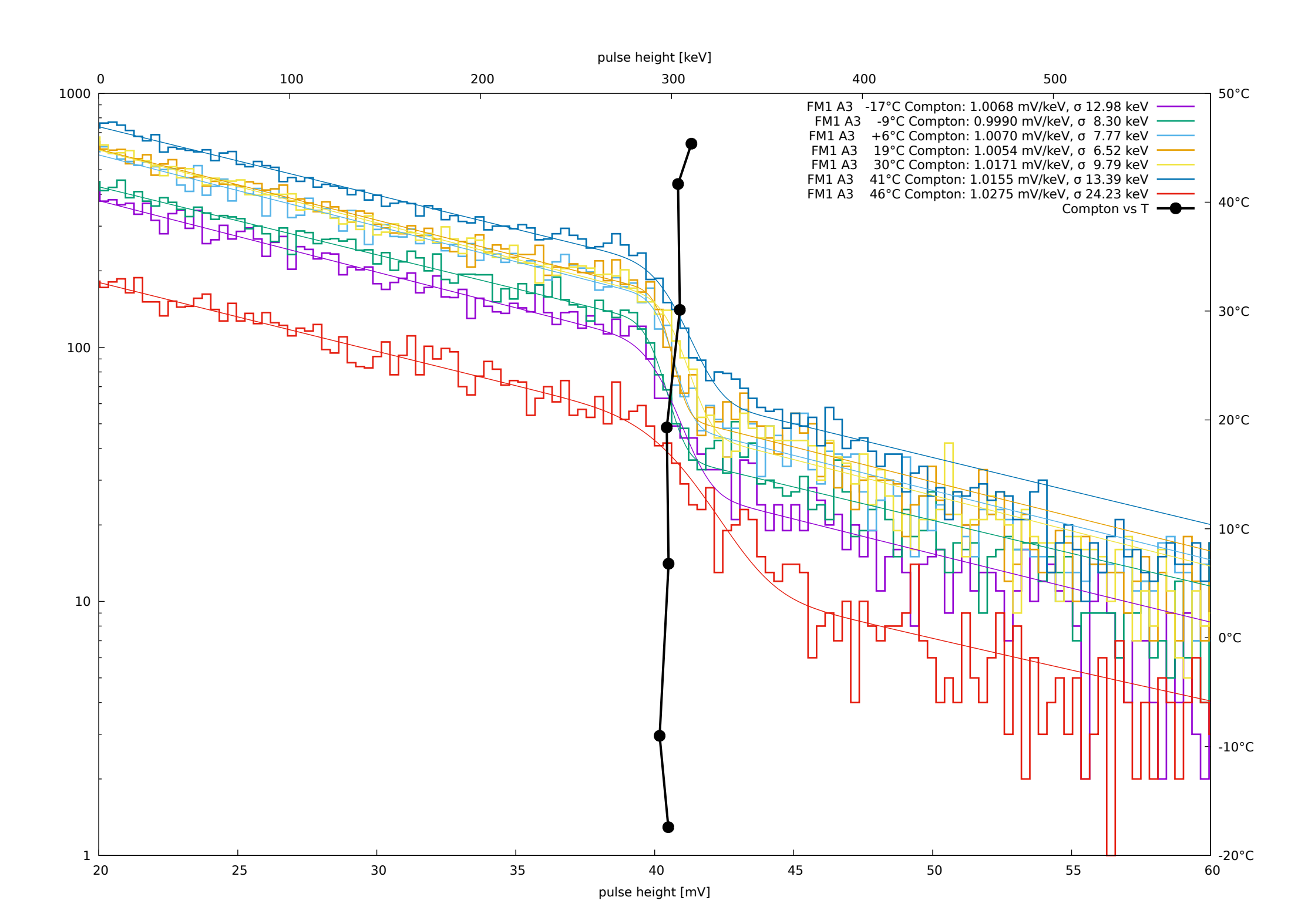

pulse height [keV]
0
100
200
300
400
500
1000
100
10
1
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
20
25
30
35
40
45
50
55
60
pulse height [mV]
FM1 C2 -17°C Compton: 1.0300 mV/keV, σ 6.65 keV
FM1 C2 -9°C Compton: 1.0291 mV/keV, σ 13.30 keV
FM1 C2 +6°C Compton: 1.0259 mV/keV, σ 7.98 keV
FM1 C2 19°C Compton: 1.0350 mV/keV, σ 12.78 keV
FM1 C2 30°C Compton: 1.0355 mV/keV, σ 7.92 keV
FM1 C2 41°C Compton: 1.0330 mV/keV, σ 7.90 keV
FM1 C2 46°C Compton: 1.0492 mV/keV, σ 15.64 keV
Compton vs T

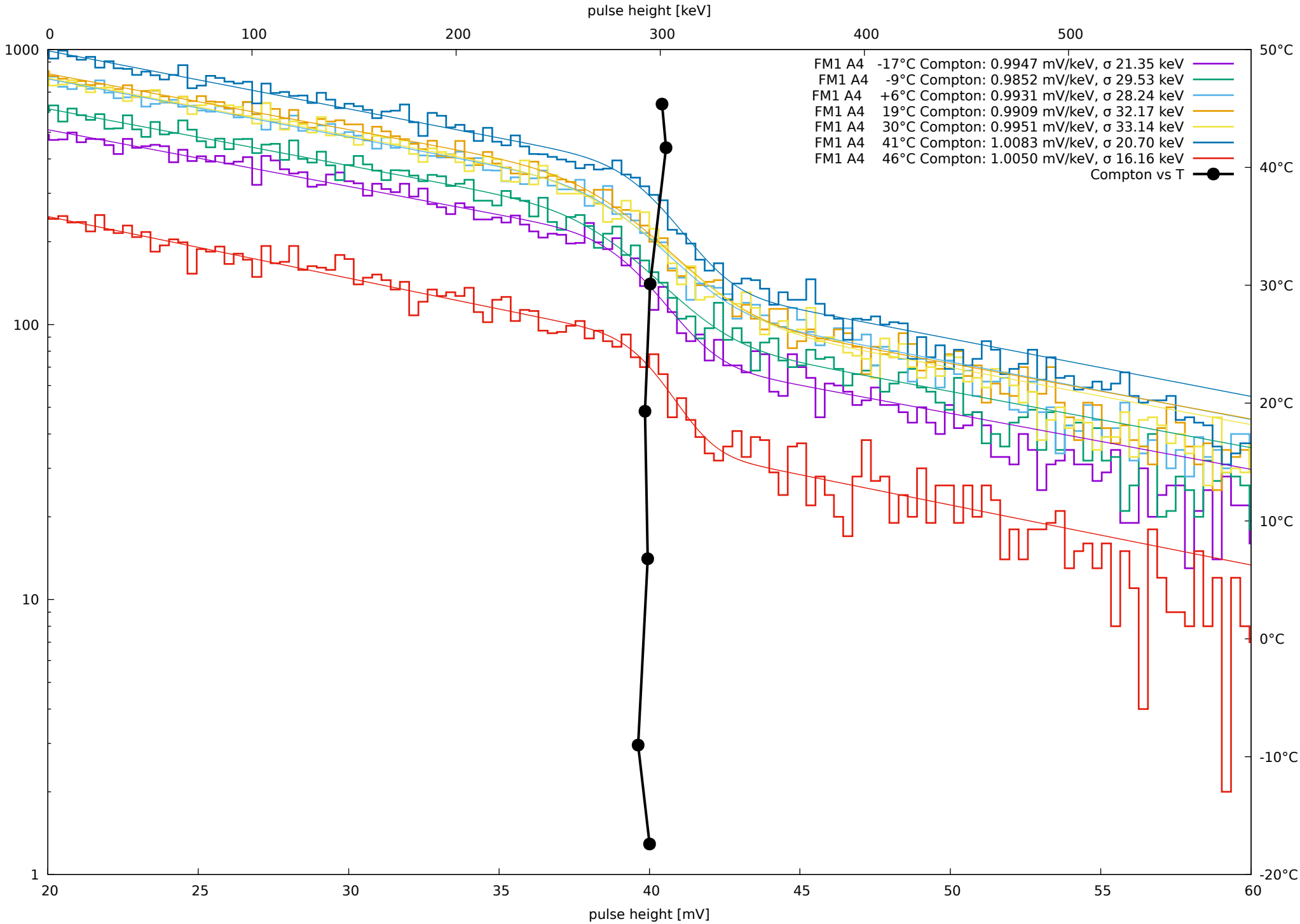

pulse height [keV]
0
100
200
300
400
500
1000
100
10
1
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
20
25
30
35
40
45
50
55
60
pulse height [mV]
FM1 C3 -17°C Compton: 1.0040 mV/keV, σ 10.13 keV
FM1 C3 -9°C Compton: 1.0066 mV/keV, σ 16.11 keV
FM1 C3 +6°C Compton: 1.0098 mV/keV, σ 6.85 keV
FM1 C3 19°C Compton: 1.0069 mV/keV, σ 4.28 keV
FM1 C3 30°C Compton: 1.0118 mV/keV, σ 12.05 keV
FM1 C3 41°C Compton: 1.0219 mV/keV, σ 11.70 keV
FM1 C3 46°C Compton: 1.0191 mV/keV, σ 14.92 keV
Compton vs T

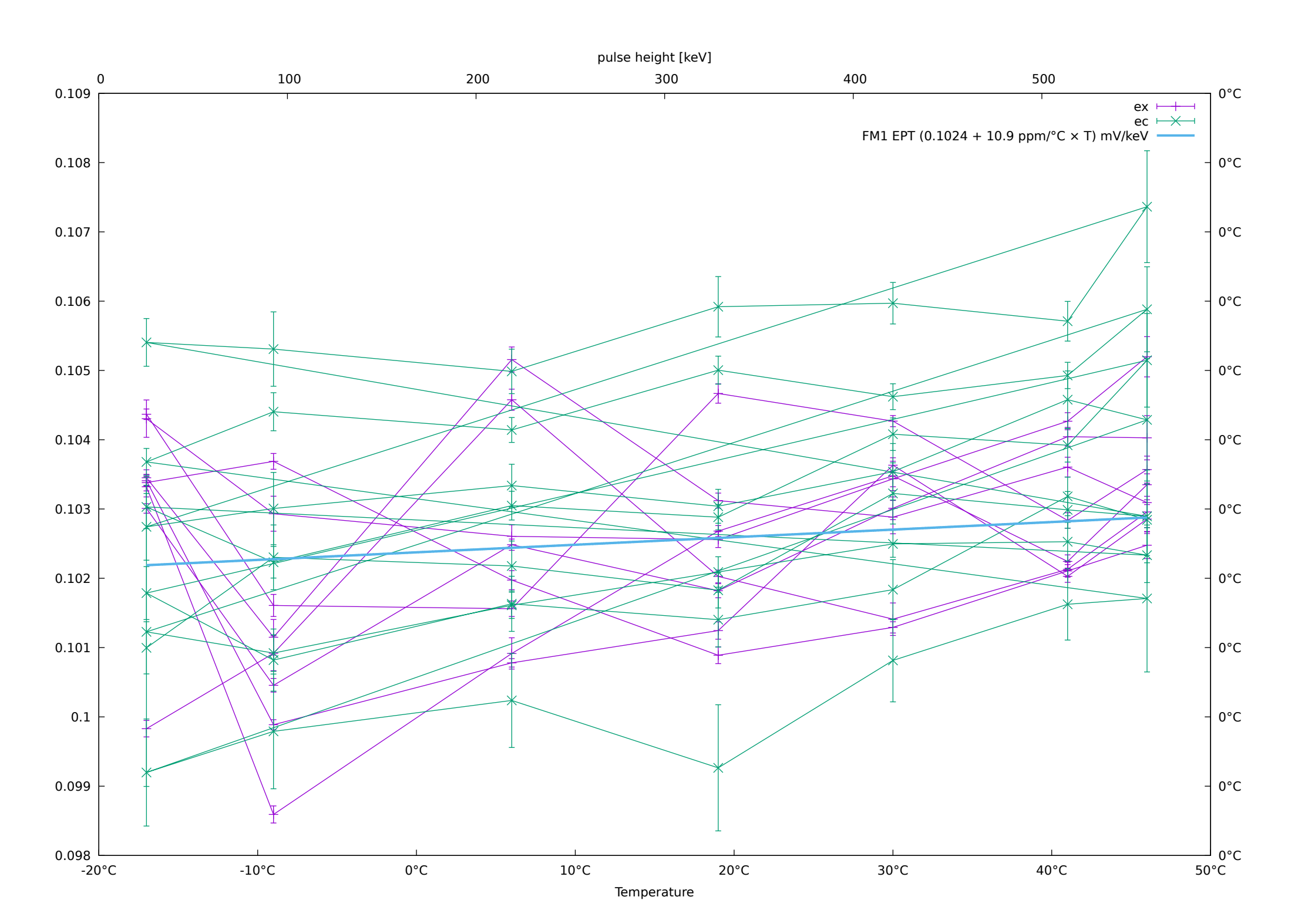

pulse height [keV]
0
100
200
300
400
500
600
1000
100
10
1
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
FM1 C4 -17°C Compton: 0.9694 mV/keV, σ 22.39 keV
FM1 C4 -9°C Compton: 0.9752 mV/keV, σ 28.59 keV
FM1 C4 +6°C Compton: 0.9795 mV/keV, σ 24.42 keV
FM1 C4 19°C Compton: 0.9700 mV/keV, σ 40.59 keV
FM1 C4 30°C Compton: 0.9852 mV/keV, σ 20.75 keV
FM1 C4 41°C Compton: 0.9931 mV/keV, σ 21.61 keV
FM1 C4 46°C Compton: 0.9939 mV/keV, σ 27.50 keV
Compton vs T
20
25
30
35
40
45
50
55
60
pulse height [mV]

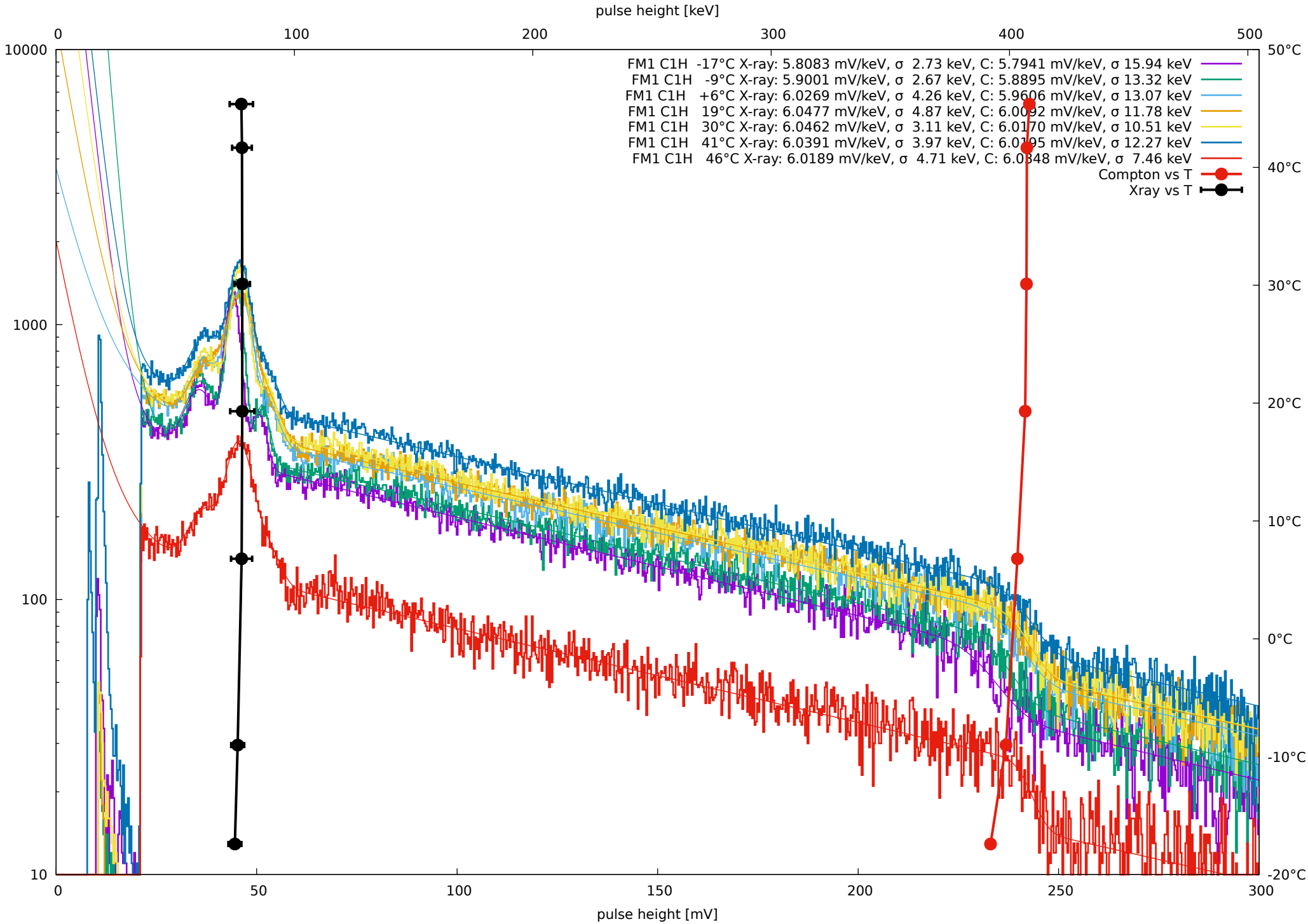

pulse height [keV]
0
100
200
300
400
500
1000
100
10
1
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
20
25
30
35
40
45
50
55
60
pulse height [mV]
FM1 A1 -17°C Compton: 1.0132 mV/keV, σ 5.08 keV
FM1 A1 -9°C Compton: 1.0202 mV/keV, σ 11.11 keV
FM1 A1 +6°C Compton: 1.0177 mV/keV, σ 6.67 keV
FM1 A1 19°C Compton: 1.0261 mV/keV, σ 7.98 keV
FM1 A1 30°C Compton: 1.0224 mV/keV, σ 6.78 keV
FM1 A1 41°C Compton: 1.0253 mV/keV, σ 8.37 keV
FM1 A1 46°C Compton: 1.0347 mV/keV, σ 20.21 keV
Compton vs T

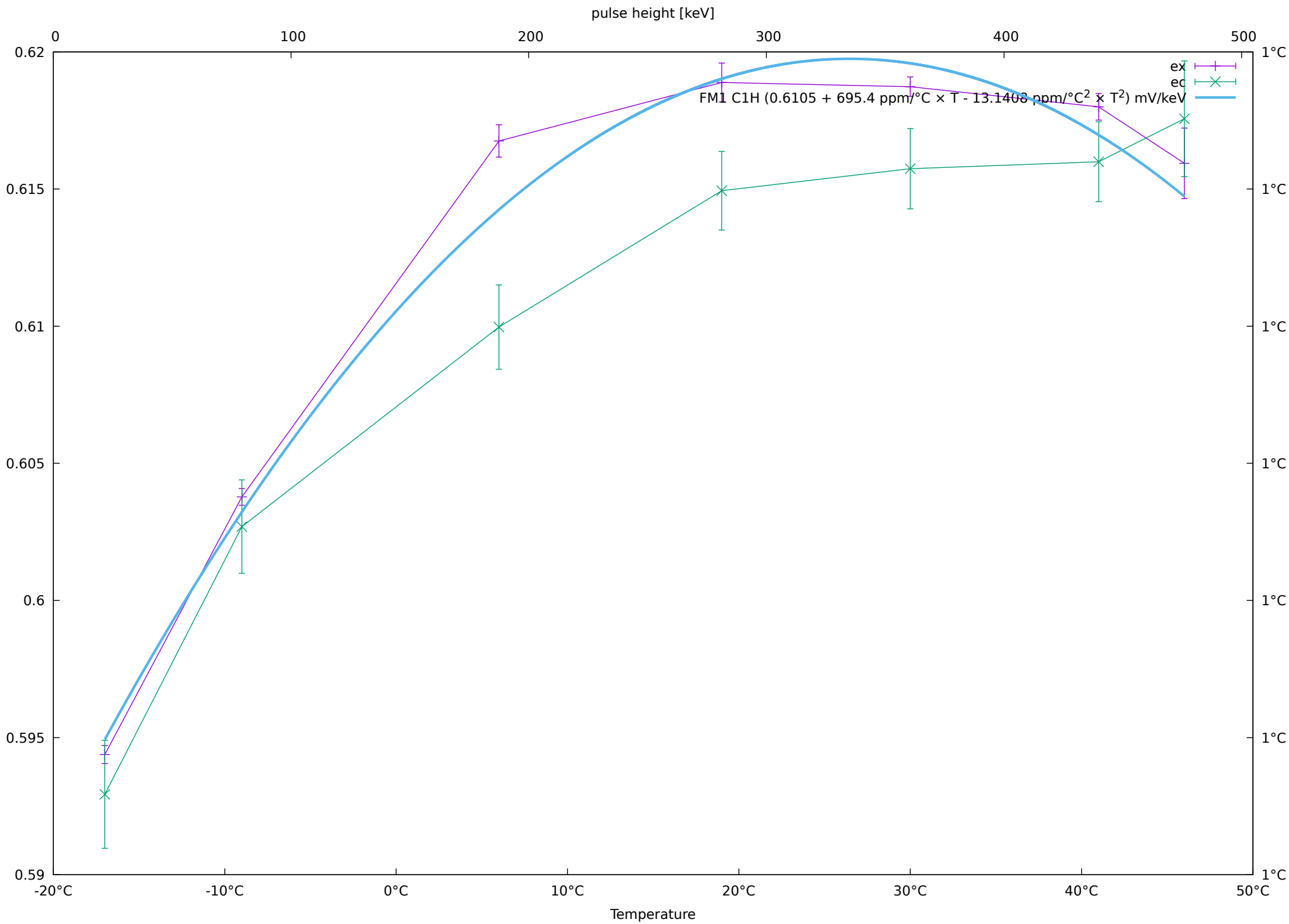

pulse height [keV]
0
100
200
300
400
500
1000
100
10
1
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
20
25
30
35
40
45
50
55
60
pulse height [mV]
FM1 A2 -17°C Compton: 0.9892 mV/keV, σ 1.15 keV
FM1 A2 -9°C Compton: 0.9862 mV/keV, σ 13.84 keV
FM1 A2 +6°C Compton: 0.9929 mV/keV, σ 7.48 keV
FM1 A2 19°C Compton: 0.9976 mV/keV, σ 11.30 keV
FM1 A2 30°C Compton: 1.0016 mV/keV, σ 8.22 keV
FM1 A2 41°C Compton: 1.0019 mV/keV, σ 19.13 keV
FM1 A2 46°C Compton: 1.0000 mV/keV, σ 9.22 keV
Compton vs T

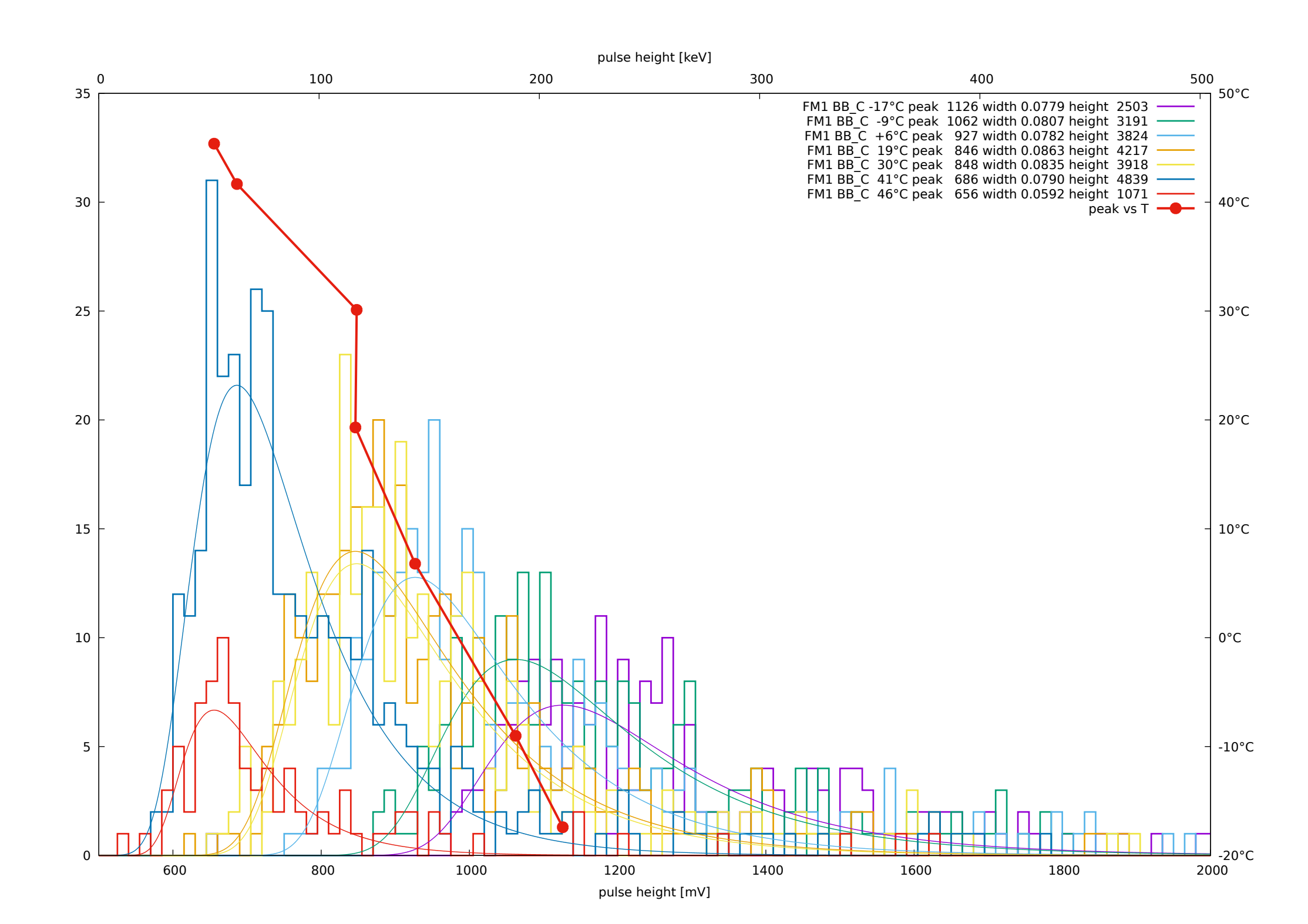

pulse height [keV]
0
100
200
300
400
500
1000
100
10
1
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
20
25
30
35
40
45
50
55
60
pulse height [mV]
FM1 A3 -17°C Compton: 1.0068 mV/keV, σ 12.98 keV
FM1 A3 -9°C Compton: 0.9990 mV/keV, σ 8.30 keV
FM1 A3 +6°C Compton: 1.0070 mV/keV, σ 7.77 keV
FM1 A3 19°C Compton: 1.0054 mV/keV, σ 6.52 keV
FM1 A3 30°C Compton: 1.0171 mV/keV, σ 9.79 keV
FM1 A3 41°C Compton: 1.0155 mV/keV, σ 13.39 keV
FM1 A3 46°C Compton: 1.0275 mV/keV, σ 24.23 keV
Compton vs T

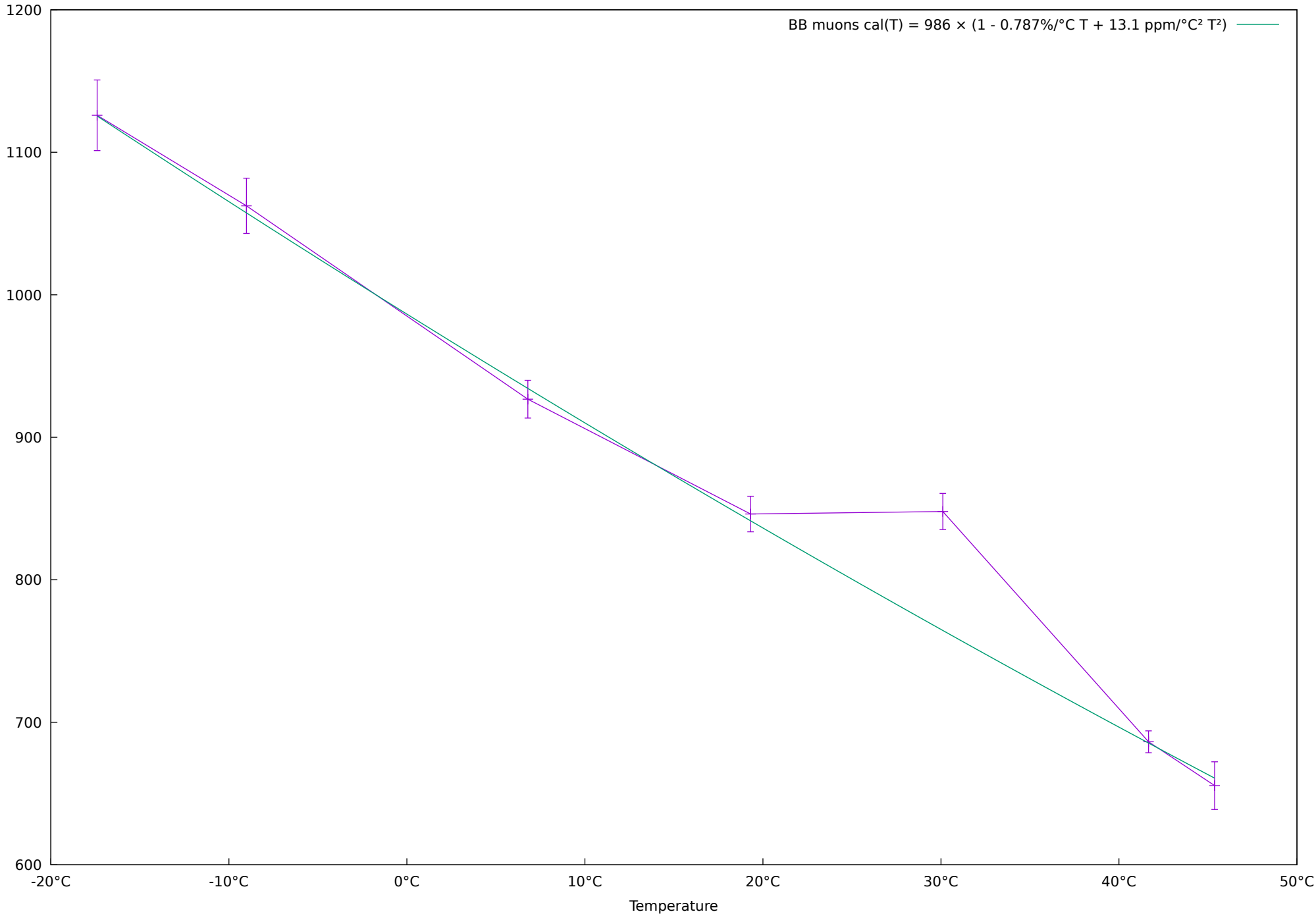

pulse height [keV]
0
100
200
300
400
500
1000
100
10
1
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
20
25
30
35
40
45
50
55
60
pulse height [mV]
FM1 A4 -17°C Compton: 0.9947 mV/keV, σ 21.35 keV
FM1 A4 -9°C Compton: 0.9852 mV/keV, σ 29.53 keV
FM1 A4 +6°C Compton: 0.9931 mV/keV, σ 28.24 keV
FM1 A4 19°C Compton: 0.9909 mV/keV, σ 32.17 keV
FM1 A4 30°C Compton: 0.9951 mV/keV, σ 33.14 keV
FM1 A4 41°C Compton: 1.0083 mV/keV, σ 20.70 keV
FM1 A4 46°C Compton: 1.0050 mV/keV, σ 16.16 keV
Compton vs T

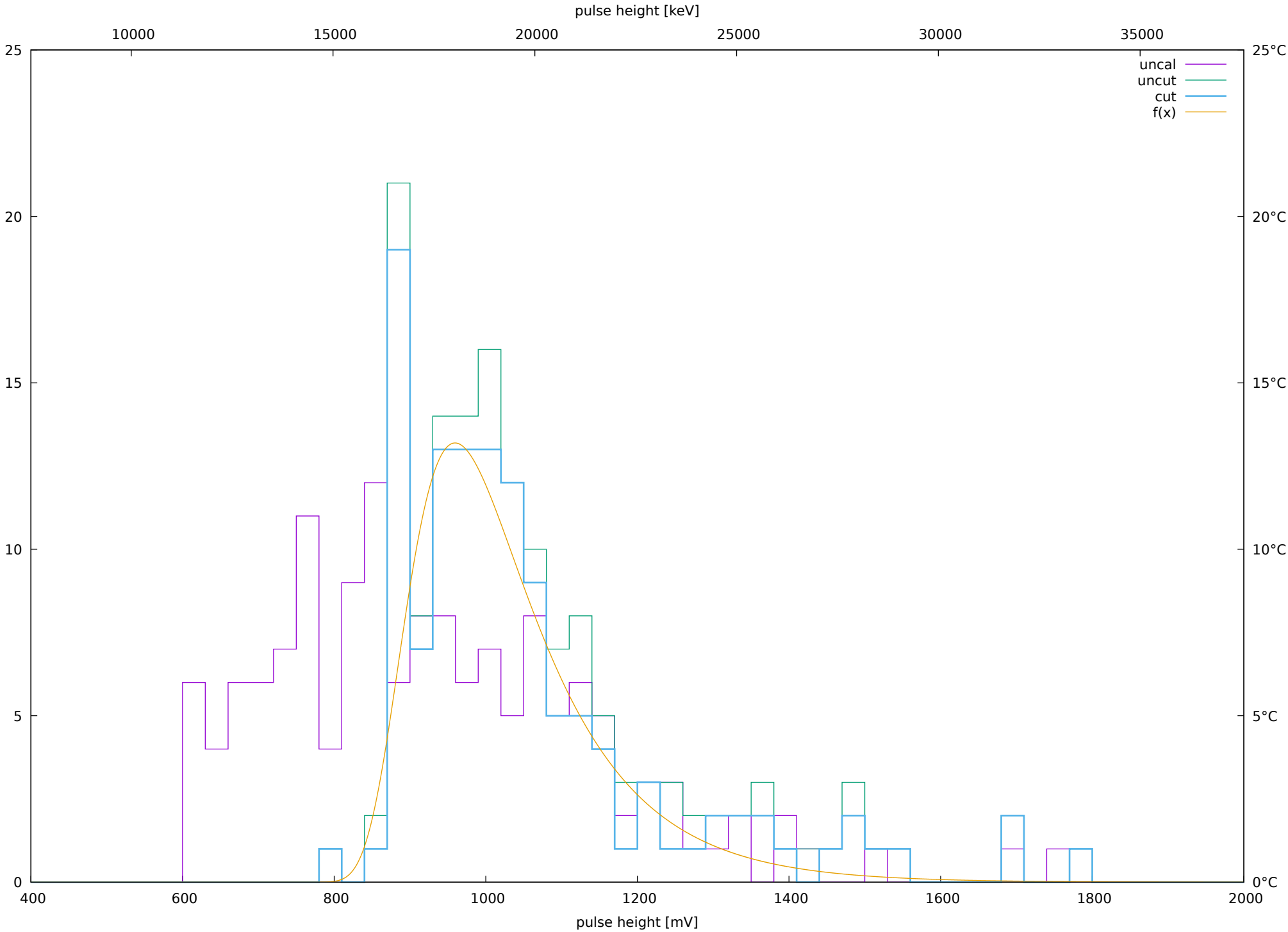

pulse height [keV]
0
100
200
300
400
500
0.109
0.108
0.107
0.106
0.105
0.104
0.103
0.102
0.101
0.1
0.099
0.098
0°C
ex
ec
FM1 EPT (0.1024 + 10.9 ppm/°C × T) mV/keV
-20°C
-10°C
0°C
10°C
20°C
30°C
40°C
50°C
Temperature

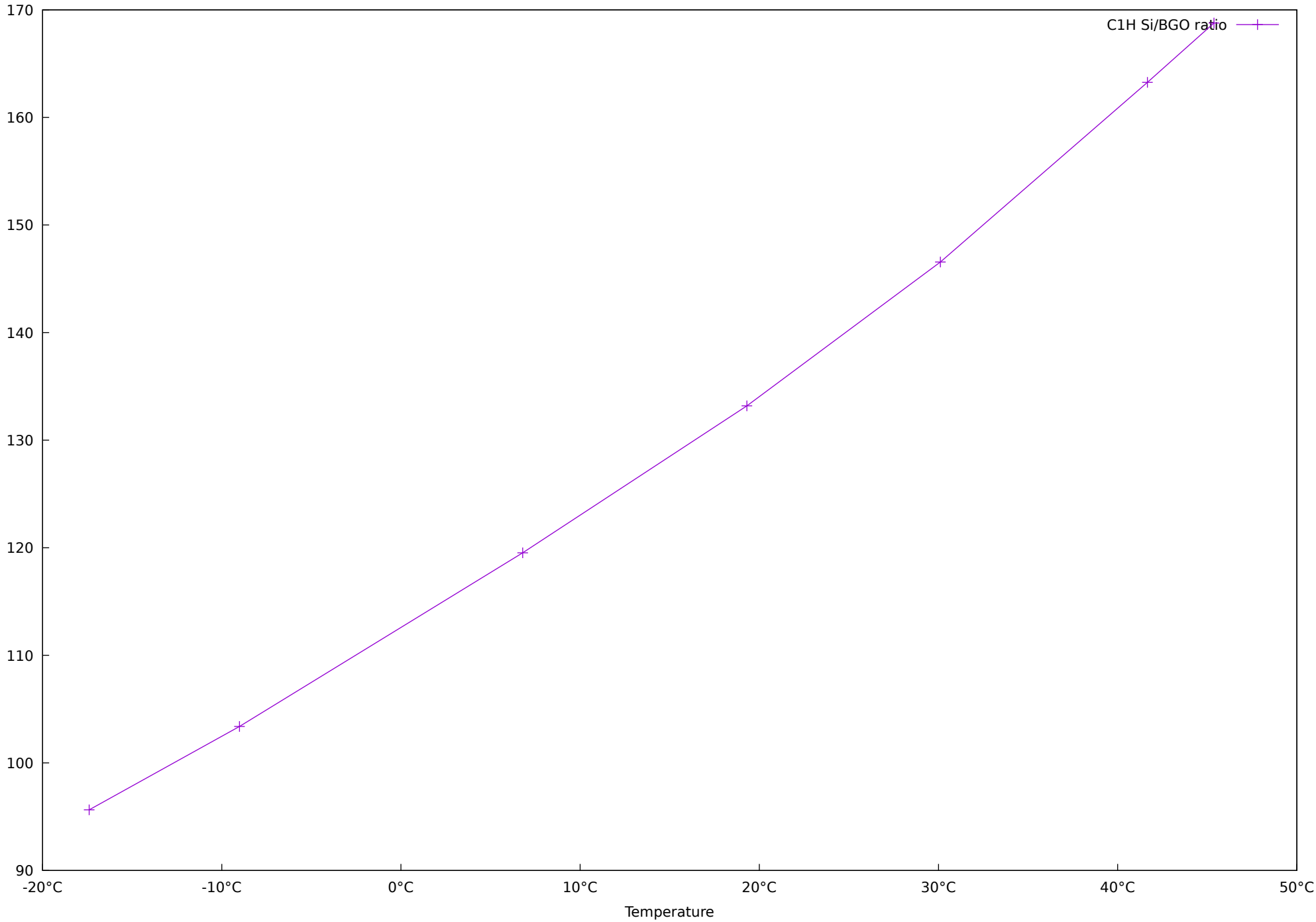

pulse height [keV]
0
100
200
300
400
500
10000
1000
100
10
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
FM1 C1H -17°C X-ray: 5.8083 mV/keV, σ 2.73 keV, C: 5.7941 mV/keV, σ 15.94 keV
FM1 C1H -9°C X-ray: 5.9001 mV/keV, σ 2.67 keV, C: 5.8895 mV/keV, σ 13.32 keV
FM1 C1H +6°C X-ray: 6.0269 mV/keV, σ 4.26 keV, C: 5.9606 mV/keV, σ 13.07 keV
FM1 C1H 19°C X-ray: 6.0477 mV/keV, σ 4.87 keV, C: 6.0092 mV/keV, σ 11.78 keV
FM1 C1H 30°C X-ray: 6.0462 mV/keV, σ 3.11 keV, C: 6.0170 mV/keV, σ 10.51 keV
FM1 C1H 41°C X-ray: 6.0391 mV/keV, σ 3.97 keV, C: 6.0195 mV/keV, σ 12.27 keV
FM1 C1H 46°C X-ray: 6.0189 mV/keV, σ 4.71 keV, C: 6.0348 mV/keV, σ 7.46 keV
Compton vs T
Xray vs T
0
50
100
150
200
250
300
pulse height [mV]

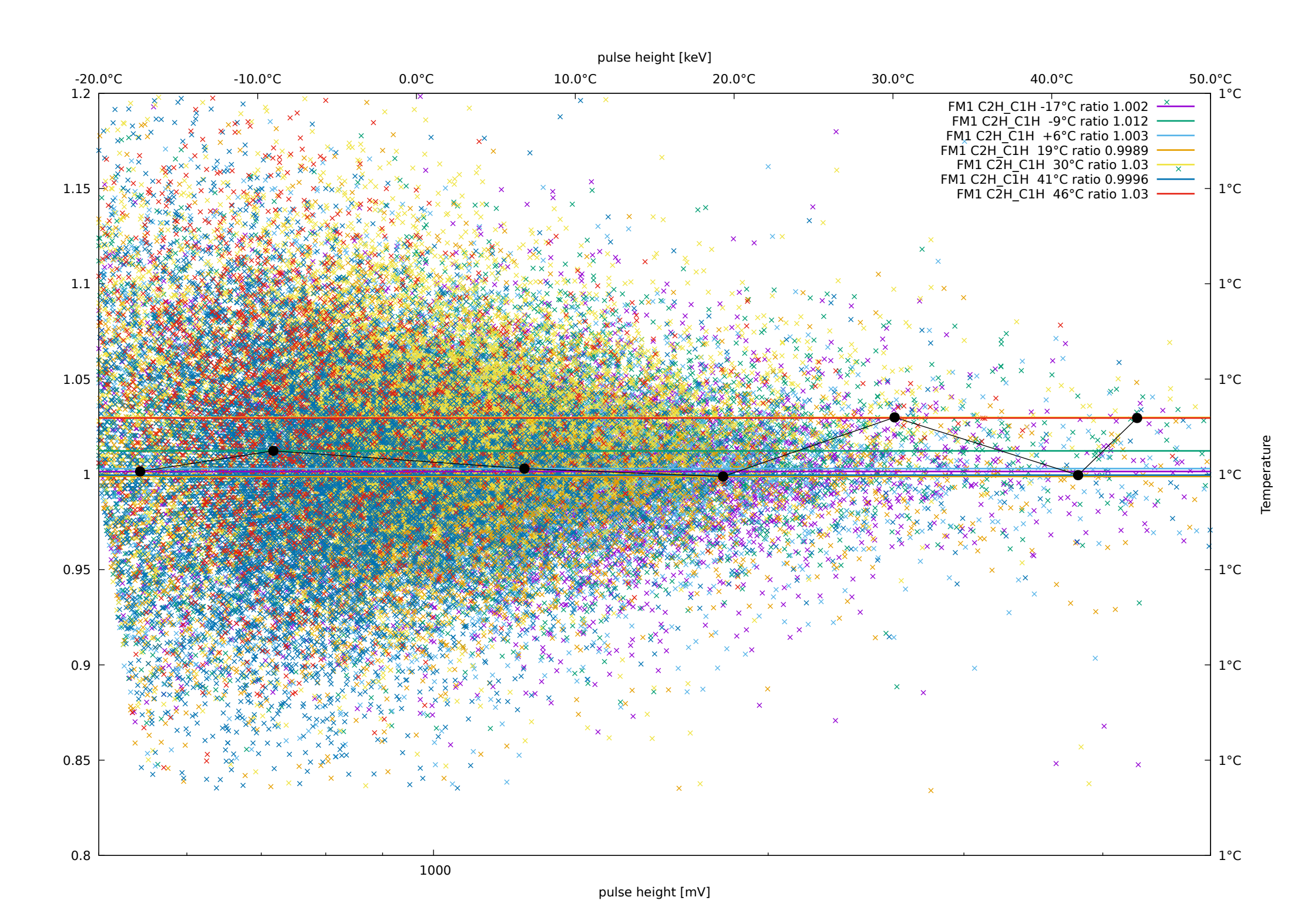

pulse height [keV]
0
100
200
300
400
500
0.62
0.615
0.61
0.605
0.6
0.595
0.59
1°C
1°C
1°C
1°C
1°C
1°C
1°C
ex
ec
FM1 C1H (0.6105 + 695.4 ppm/°C × T - 13.1408 ppm/°C^2 × T^2) mV/keV
-20°C
-10°C
0°C
10°C
20°C
30°C
40°C
50°C
Temperature


pulse height [keV]
0
100
200
300
400
500
35
30
25
20
15
10
5
0
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
FM1 BB_C -17°C peak 1126 width 0.0779 height 2503
FM1 BB_C -9°C peak 1062 width 0.0807 height 3191
FM1 BB_C +6°C peak 927 width 0.0782 height 3824
FM1 BB_C 19°C peak 846 width 0.0863 height 4217
FM1 BB_C 30°C peak 848 width 0.0835 height 3918
FM1 BB_C 41°C peak 686 width 0.0790 height 4839
FM1 BB_C 46°C peak 656 width 0.0592 height 1071
peak vs T
600
800
1000
1200
1400
1600
1800
2000
pulse height [mV]

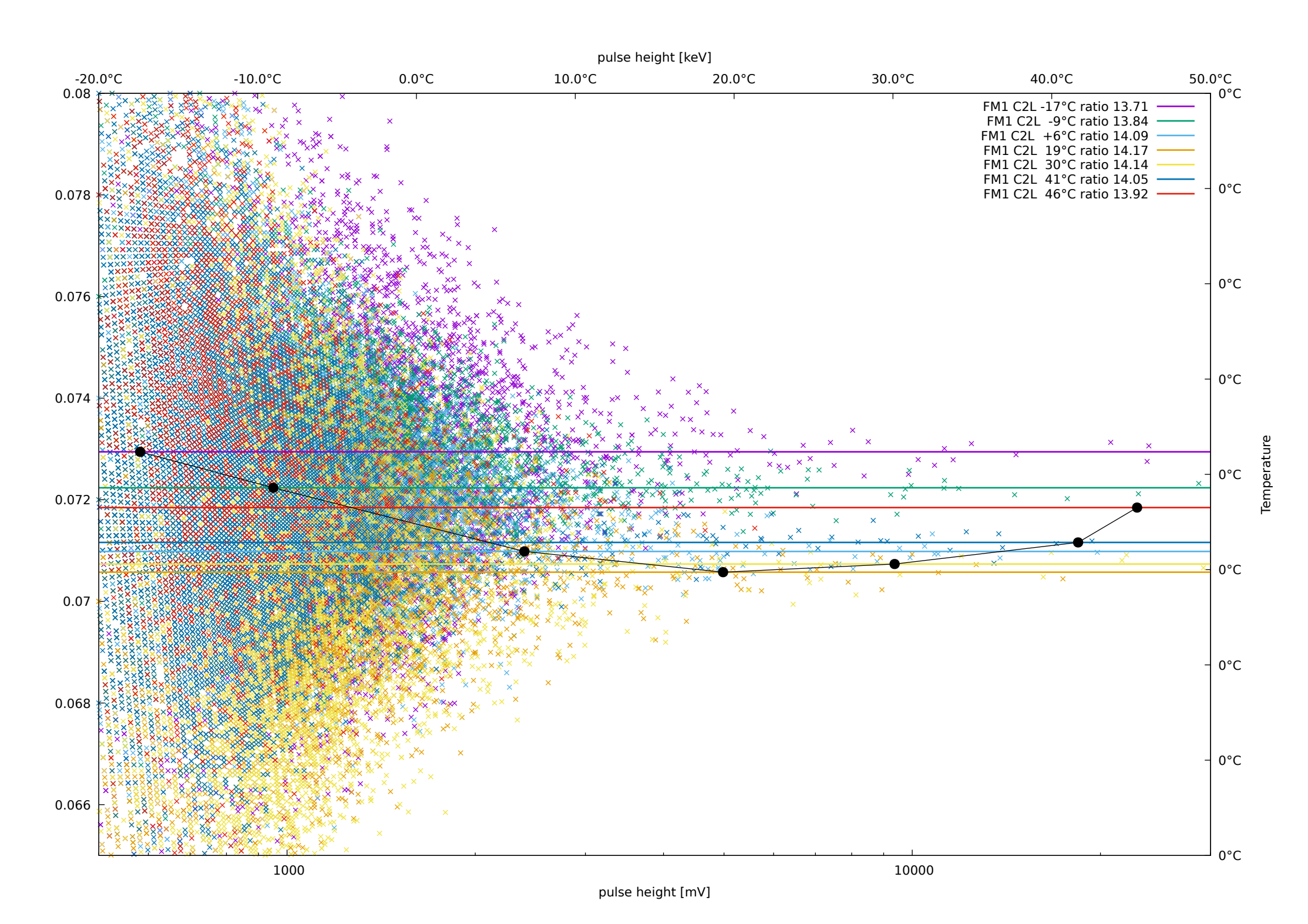

BB muons cal(T) = 986 × (1 - 0.787%/°C T + 13.1 ppm/°C² T²)
1200
1100
1000
900
800
700
600
-20°C
-10°C
0°C
10°C
20°C
30°C
40°C
50°C
Temperature

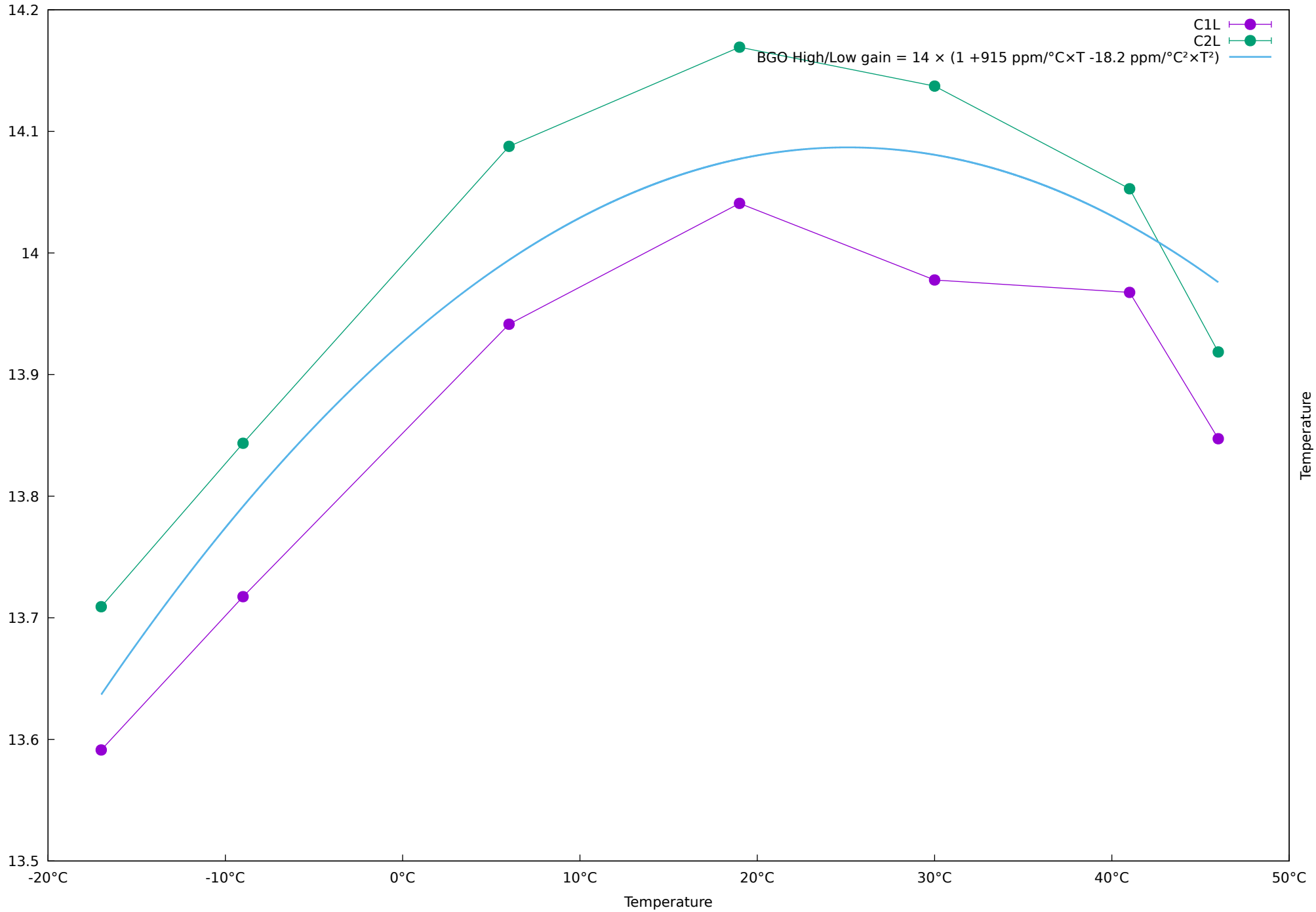

pulse height [keV]
10000
15000
20000
25000
30000
35000
25
20
15
10
5
0
25°C
20°C
15°C
10°C
5°C
0°C
uncal
uncut
cut
f(x)
400
600
800
1000
1200
1400
1600
1800
2000
pulse height [mV]

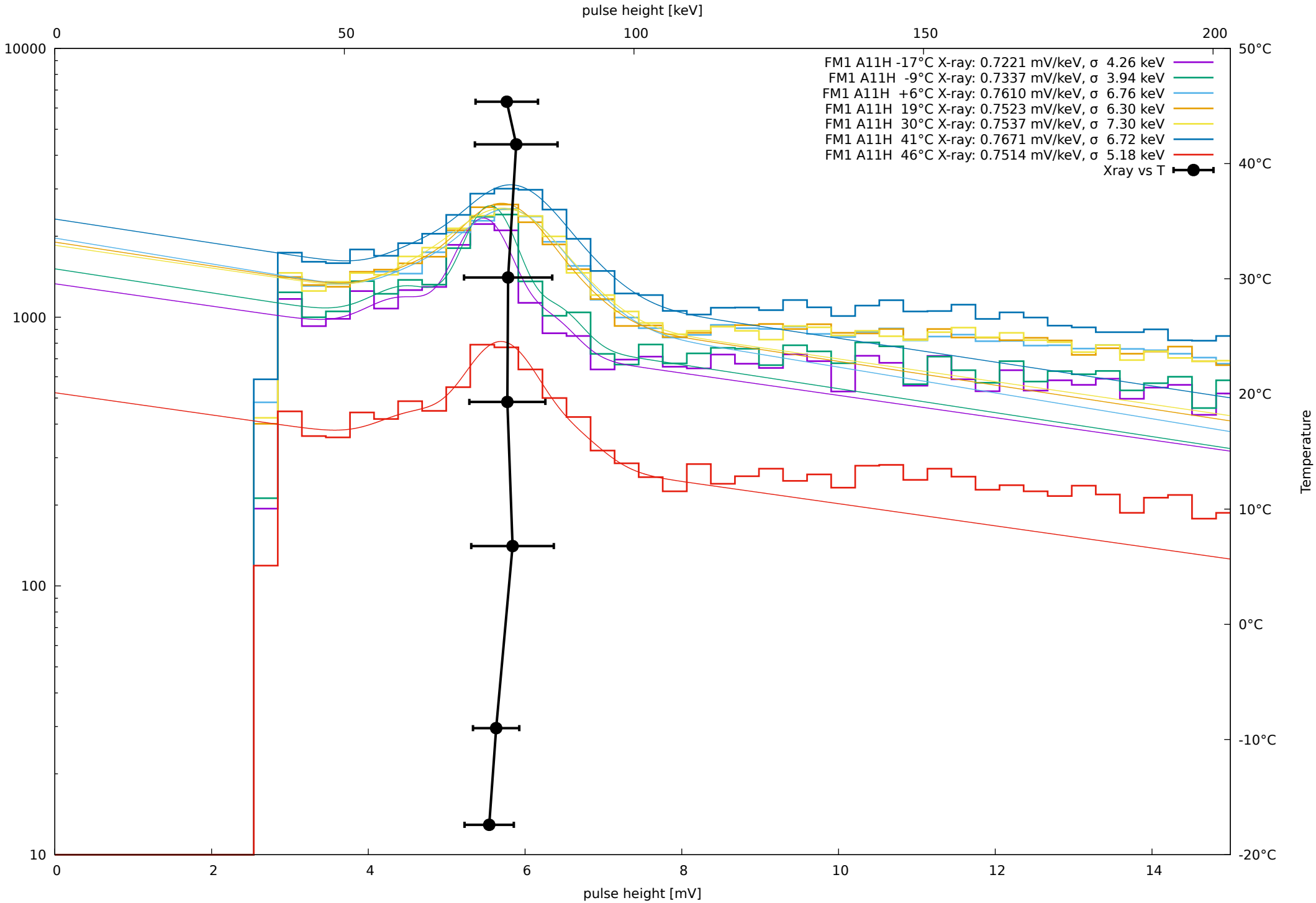

C1H Si/BGO ratio
170
160
150
140
130
120
110
100
90
-20°C
-10°C
0°C
10°C
20°C
30°C
40°C
50°C
Temperature

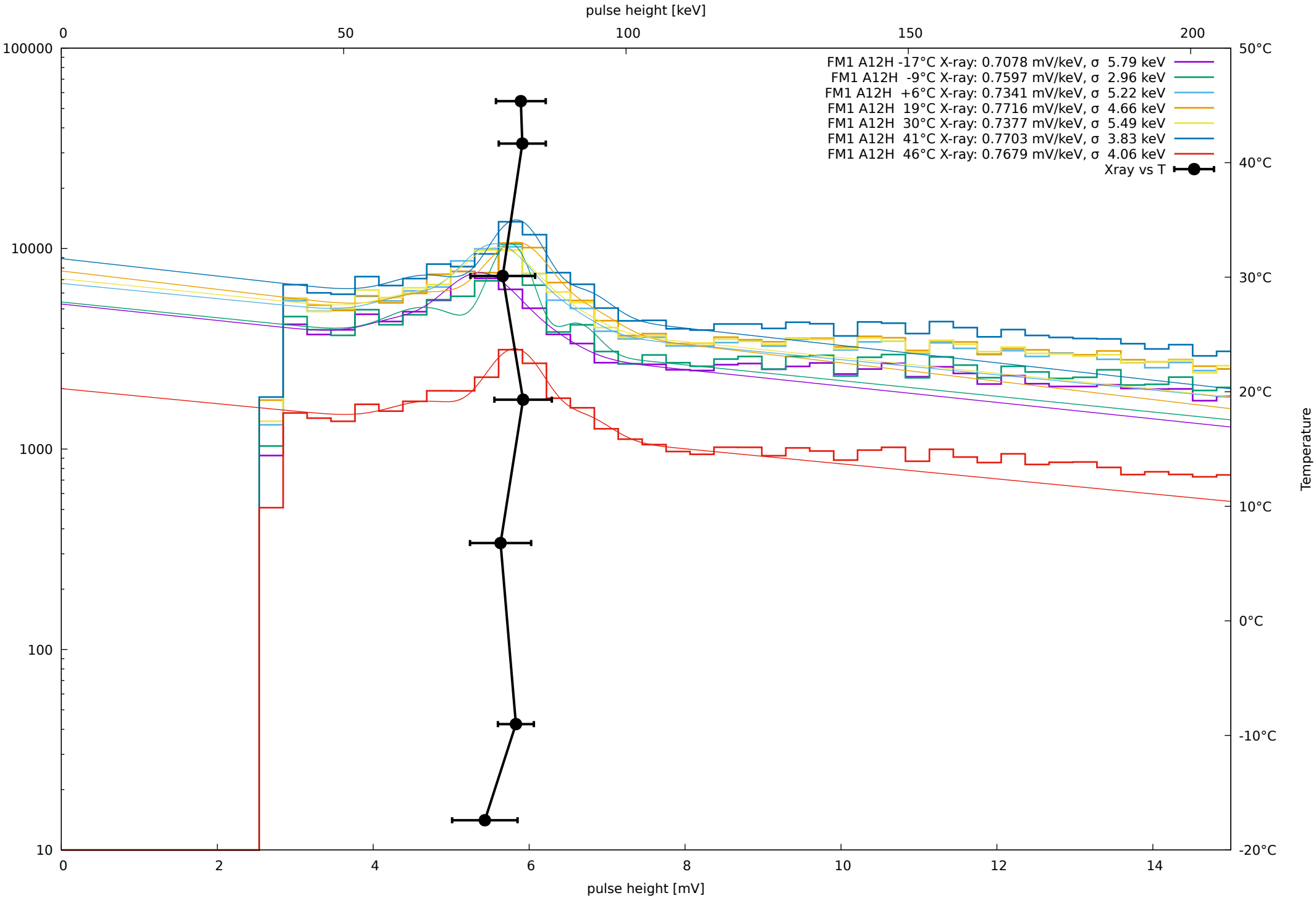

pulse height [keV]
-20.0°C
-10.0°C
0.0°C
10.0°C
20.0°C
30.0°C
40.0°C
50.0°C
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
1°C
Temperature
1000
pulse height [mV]
FM1 C2H_C1H -17°C ratio 1.002
FM1 C2H_C1H -9°C ratio 1.012
FM1 C2H_C1H +6°C ratio 1.003
FM1 C2H_C1H 19°C ratio 0.9989
FM1 C2H_C1H 30°C ratio 1.03
FM1 C2H_C1H 41°C ratio 0.9996
FM1 C2H_C1H 46°C ratio 1.03

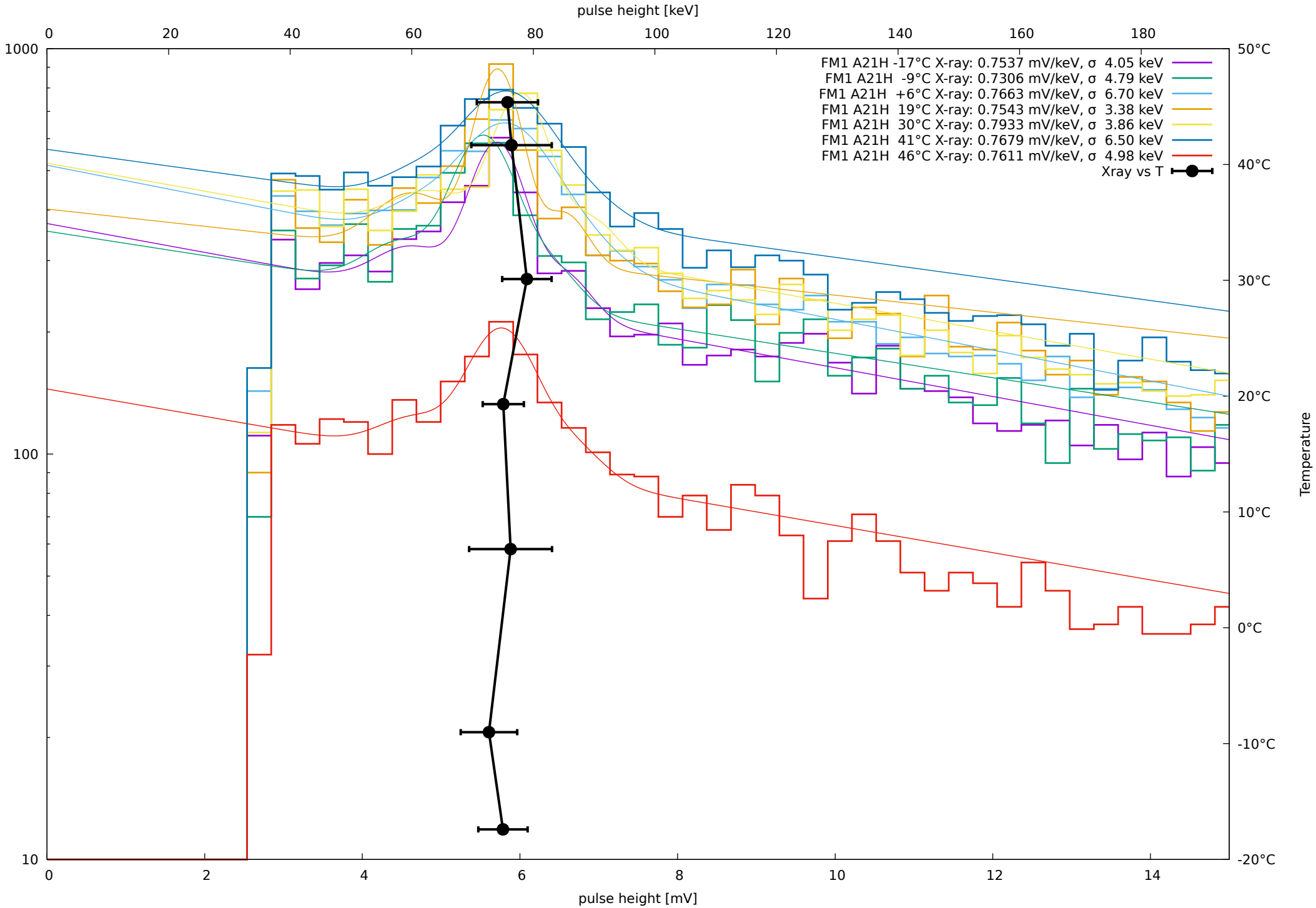
pulse height [keV]
-20.0°C
-10.0°C
0.0°C
10.0°C
20.0°C
30.0°C
40.0°C
50.0°C
0.08
0.078
0.076
0.074
0.072
0.07
0.068
0.066
0°C
Temperature
FM1 C1L -17°C ratio 13.59
FM1 C1L -9°C ratio 13.72
FM1 C1L +6°C ratio 13.94
FM1 C1L 19°C ratio 14.04
FM1 C1L 30°C ratio 13.98
FM1 C1L 41°C ratio 13.97
FM1 C1L 46°C ratio 13.85
1000
10000
pulse height [mV]

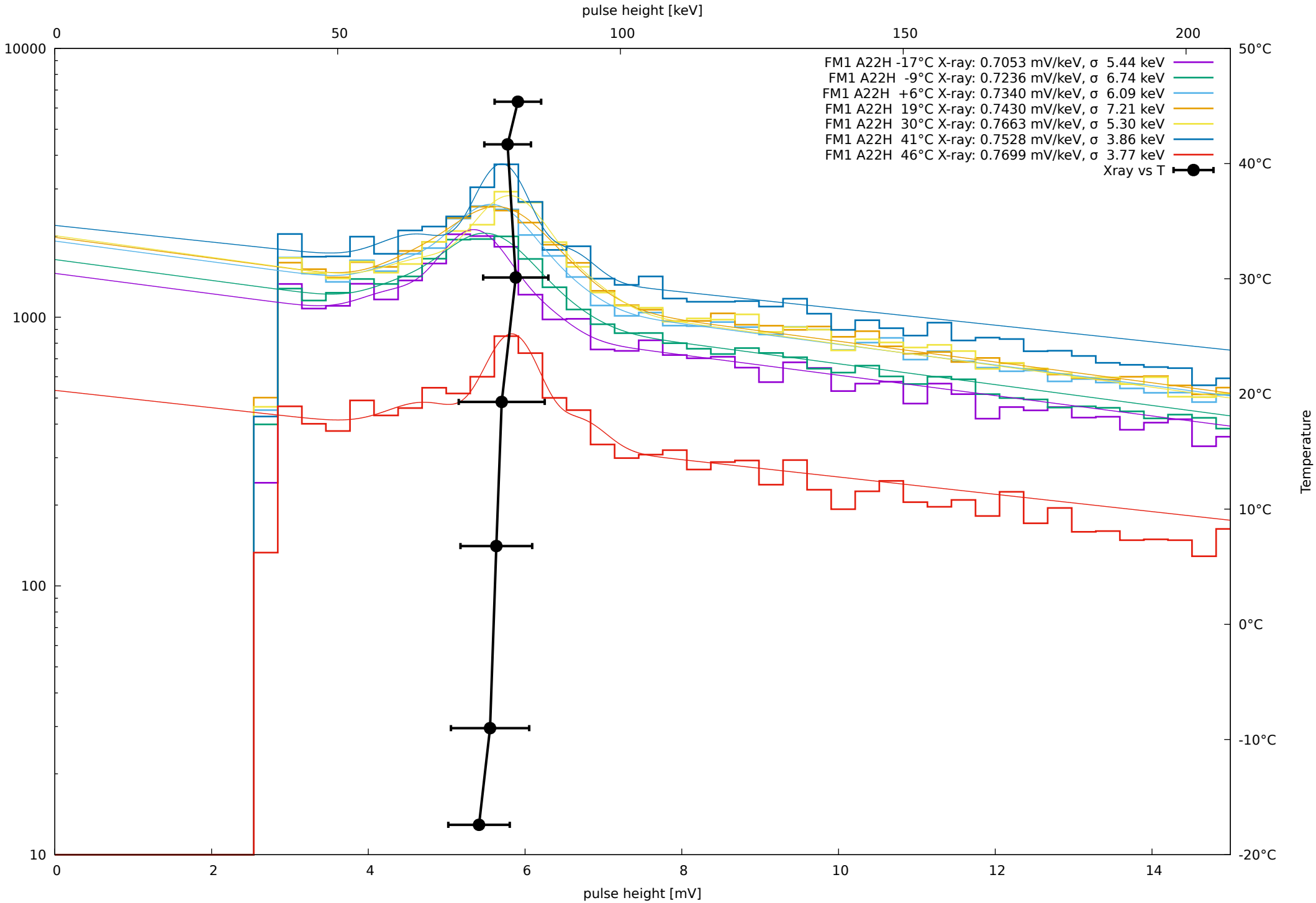

pulse height [keV]
-20.0°C
-10.0°C
0.0°C
10.0°C
20.0°C
30.0°C
40.0°C
50.0°C
0.08
0.078
0.076
0.074
0.072
0.07
0.068
0.066
0°C
Temperature
FM1 C2L -17°C ratio 13.71
FM1 C2L -9°C ratio 13.84
FM1 C2L +6°C ratio 14.09
FM1 C2L 19°C ratio 14.17
FM1 C2L 30°C ratio 14.14
FM1 C2L 41°C ratio 14.05
FM1 C2L 46°C ratio 13.92
1000
10000
pulse height [mV]

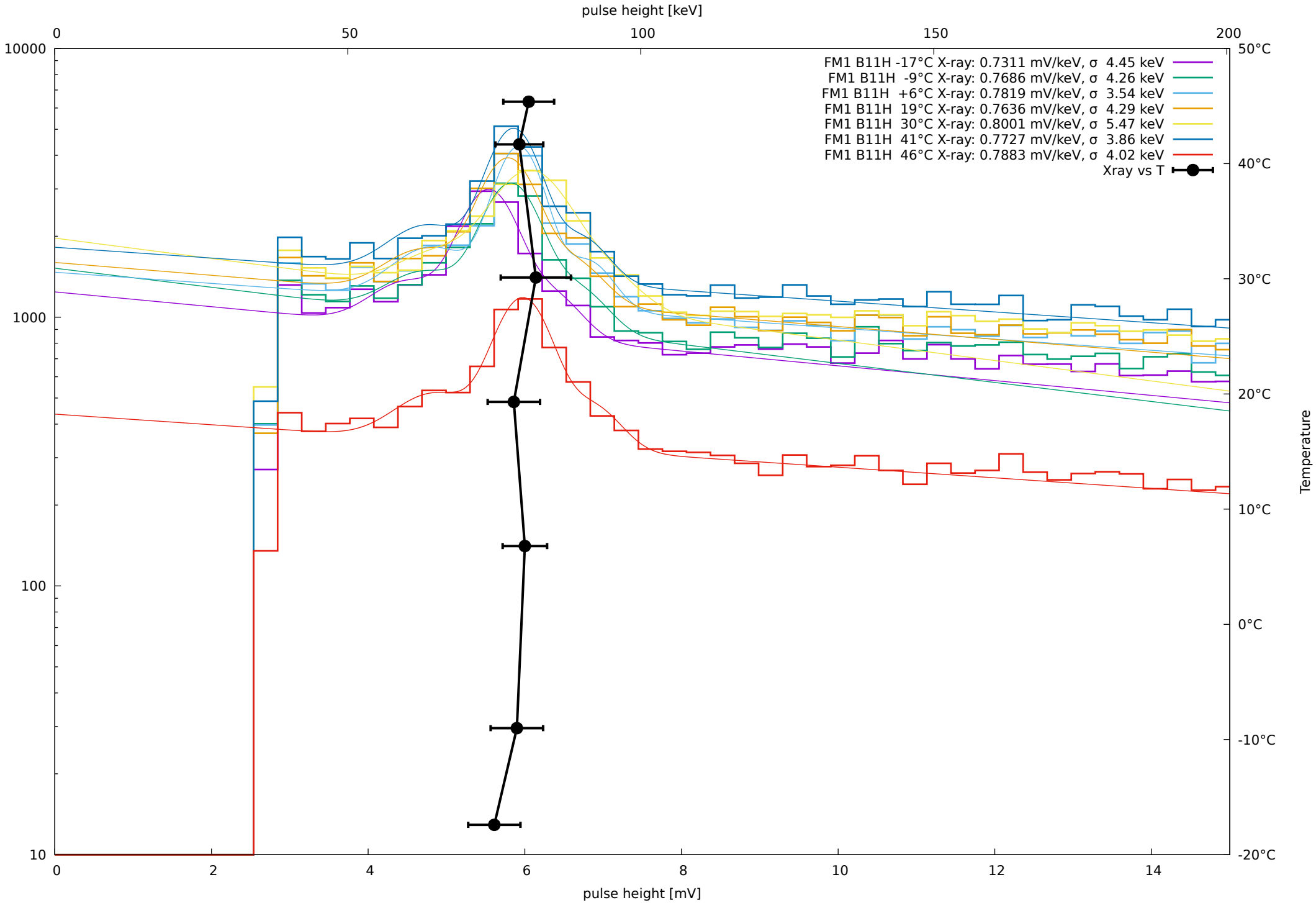

C1L
C2L
BGO High/Low gain = 14 × (1 +915 ppm/°C×T -18.2 ppm/°C²×T²)
14.2
14.1
14
13.9
13.8
13.7
13.6
13.5
-20°C
-10°C
0°C
10°C
20°C
30°C
40°C
50°C
Temperature
Temperature

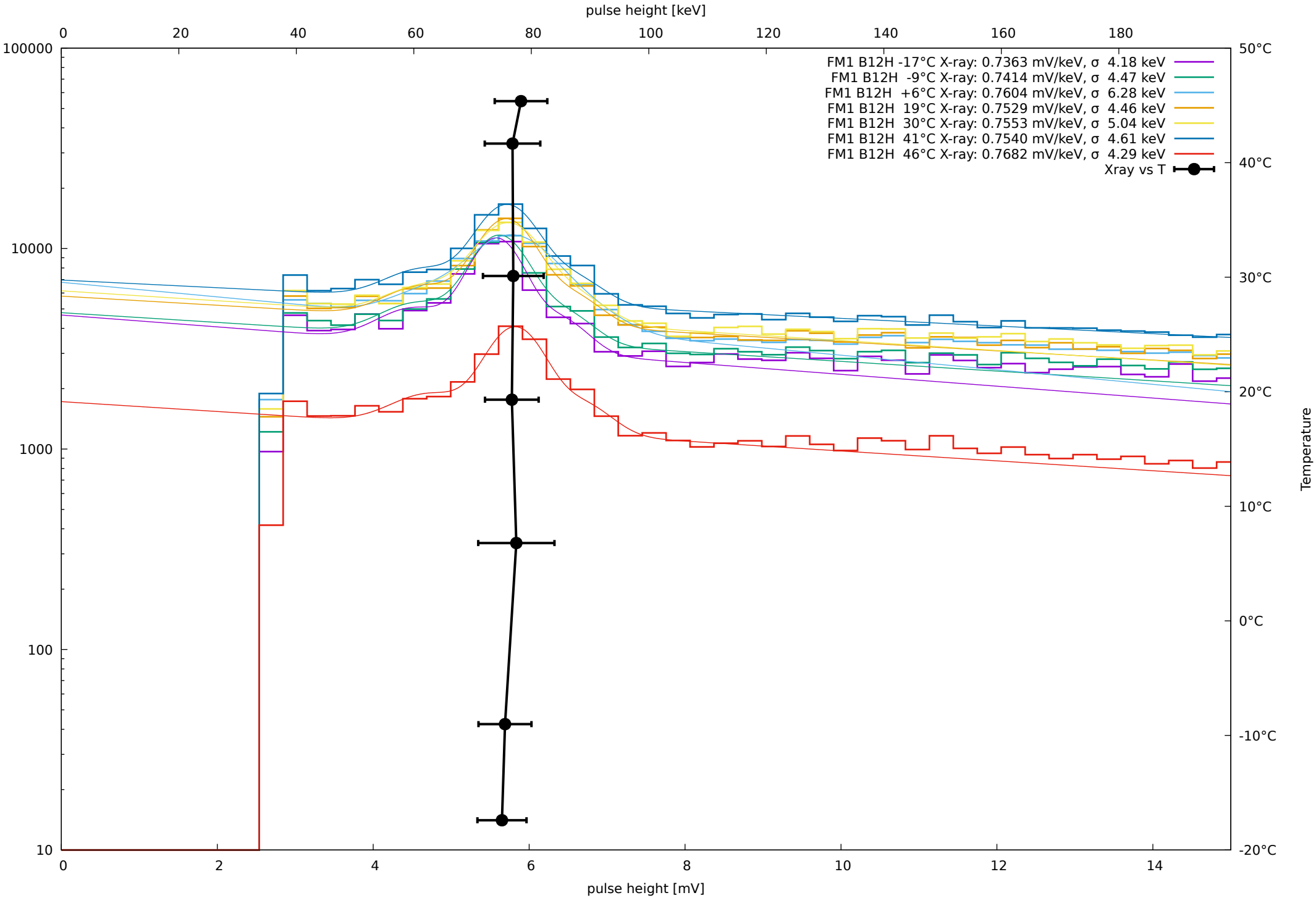

pulse height [keV]
0
50
100
150
200
10000
1000
100
10
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
Temperature
FM1 A11H -17°C X-ray: 0.7221 mV/keV, σ 4.26 keV
FM1 A11H -9°C X-ray: 0.7337 mV/keV, σ 3.94 keV
FM1 A11H +6°C X-ray: 0.7610 mV/keV, σ 6.76 keV
FM1 A11H 19°C X-ray: 0.7523 mV/keV, σ 6.30 keV
FM1 A11H 30°C X-ray: 0.7537 mV/keV, σ 7.30 keV
FM1 A11H 41°C X-ray: 0.7671 mV/keV, σ 6.72 keV
FM1 A11H 46°C X-ray: 0.7514 mV/keV, σ 5.18 keV
Xray vs T
0
2
4
6
8
10
12
14
pulse height [mV]

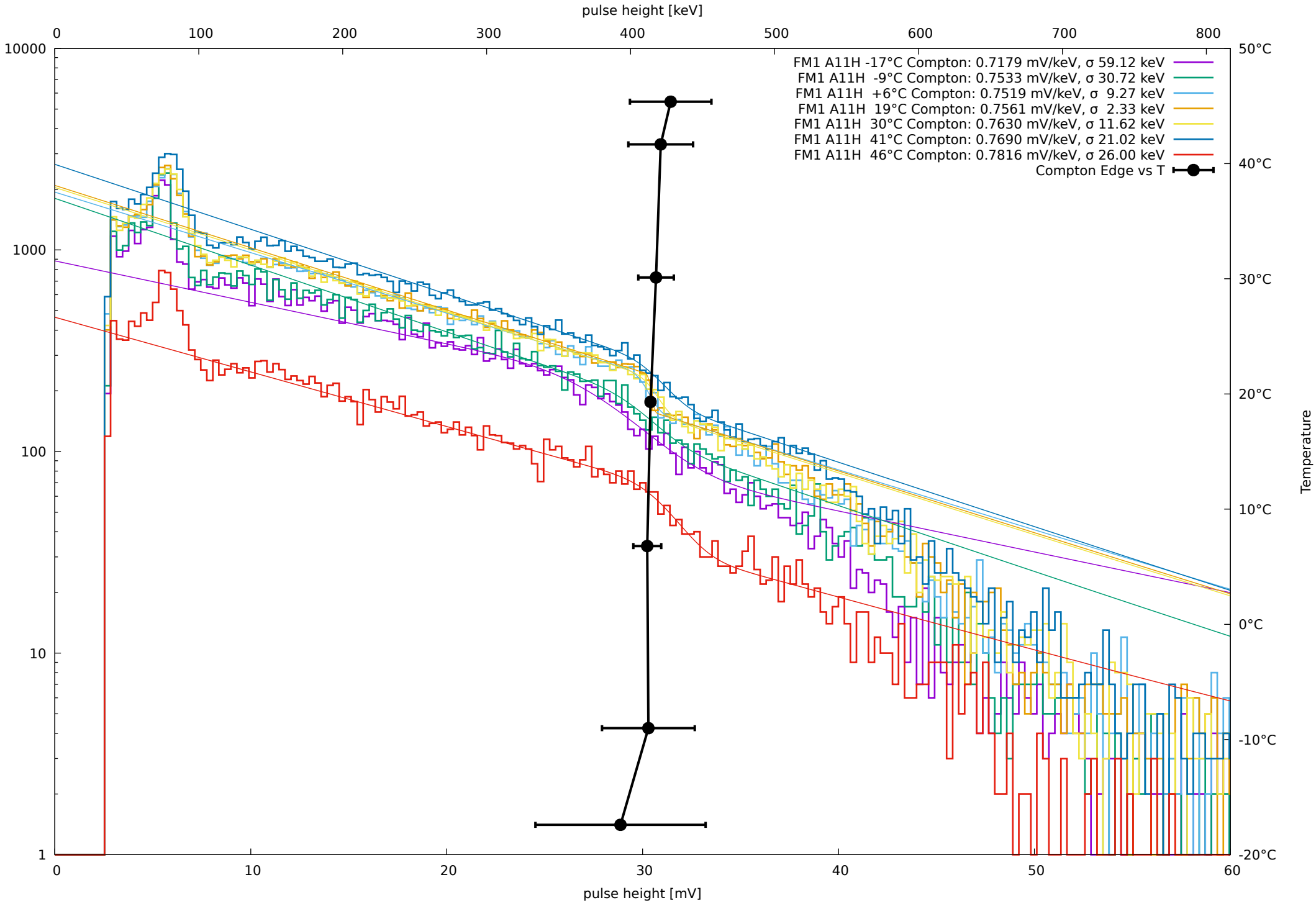

pulse height [keV]
0
50
100
150
200
100000
10000
1000
100
10
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
Temperature
FM1 A12H -17°C X-ray: 0.7078 mV/keV, σ 5.79 keV
FM1 A12H -9°C X-ray: 0.7597 mV/keV, σ 2.96 keV
FM1 A12H +6°C X-ray: 0.7341 mV/keV, σ 5.22 keV
FM1 A12H 19°C X-ray: 0.7716 mV/keV, σ 4.66 keV
FM1 A12H 30°C X-ray: 0.7377 mV/keV, σ 5.49 keV
FM1 A12H 41°C X-ray: 0.7703 mV/keV, σ 3.83 keV
FM1 A12H 46°C X-ray: 0.7679 mV/keV, σ 4.06 keV
Xray vs T
0
2
4
6
8
10
12
14
pulse height [mV]

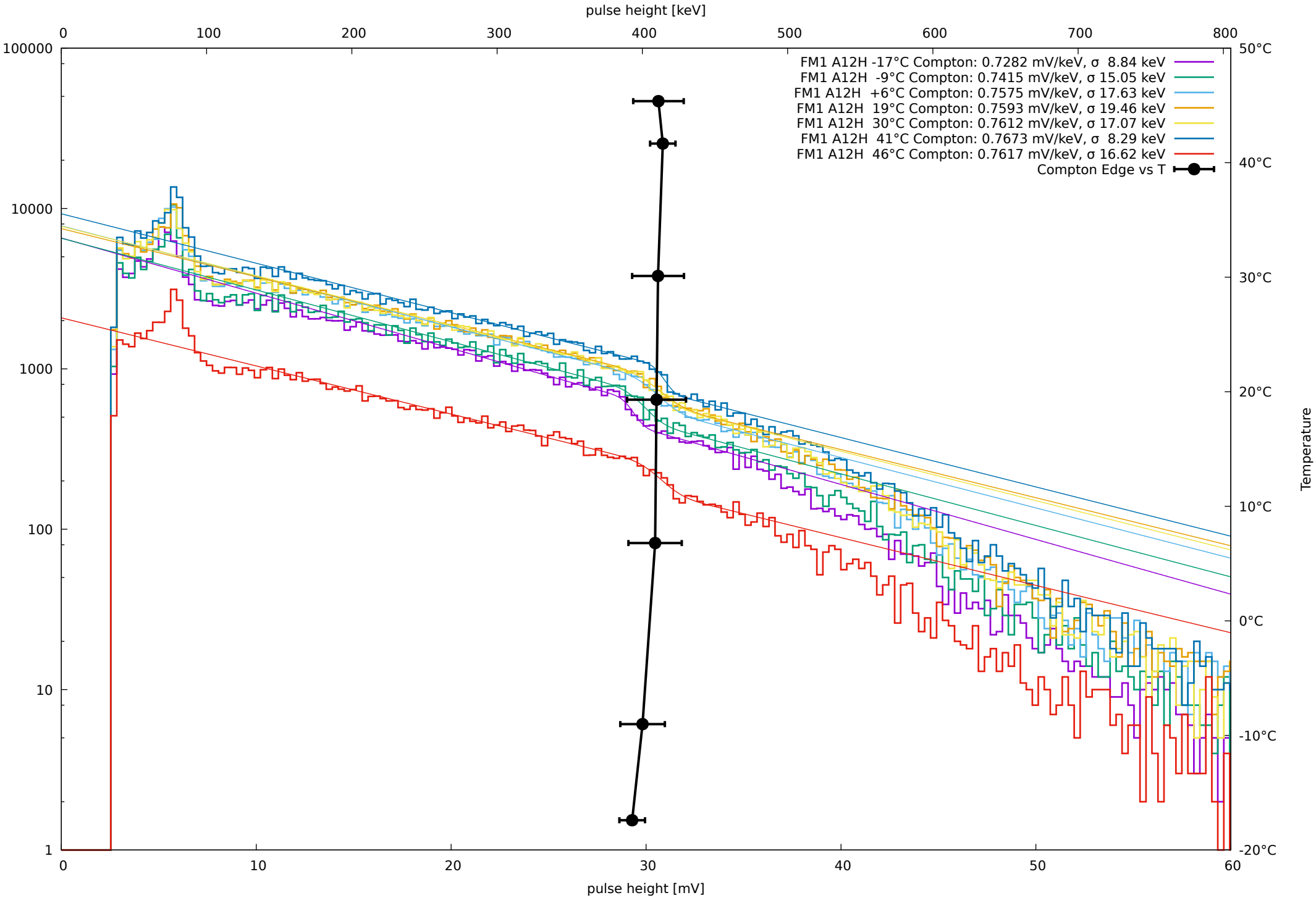

pulse height [keV]
0
20
40
60
80
100
120
140
160
180
1000
100
10
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
Temperature
FM1 A21H -17°C X-ray: 0.7537 mV/keV, σ 4.05 keV
FM1 A21H -9°C X-ray: 0.7306 mV/keV, σ 4.79 keV
FM1 A21H +6°C X-ray: 0.7663 mV/keV, σ 6.70 keV
FM1 A21H 19°C X-ray: 0.7543 mV/keV, σ 3.38 keV
FM1 A21H 30°C X-ray: 0.7933 mV/keV, σ 3.86 keV
FM1 A21H 41°C X-ray: 0.7679 mV/keV, σ 6.50 keV
FM1 A21H 46°C X-ray: 0.7611 mV/keV, σ 4.98 keV
Xray vs T
0
2
4
6
8
10
12
14
pulse height [mV]

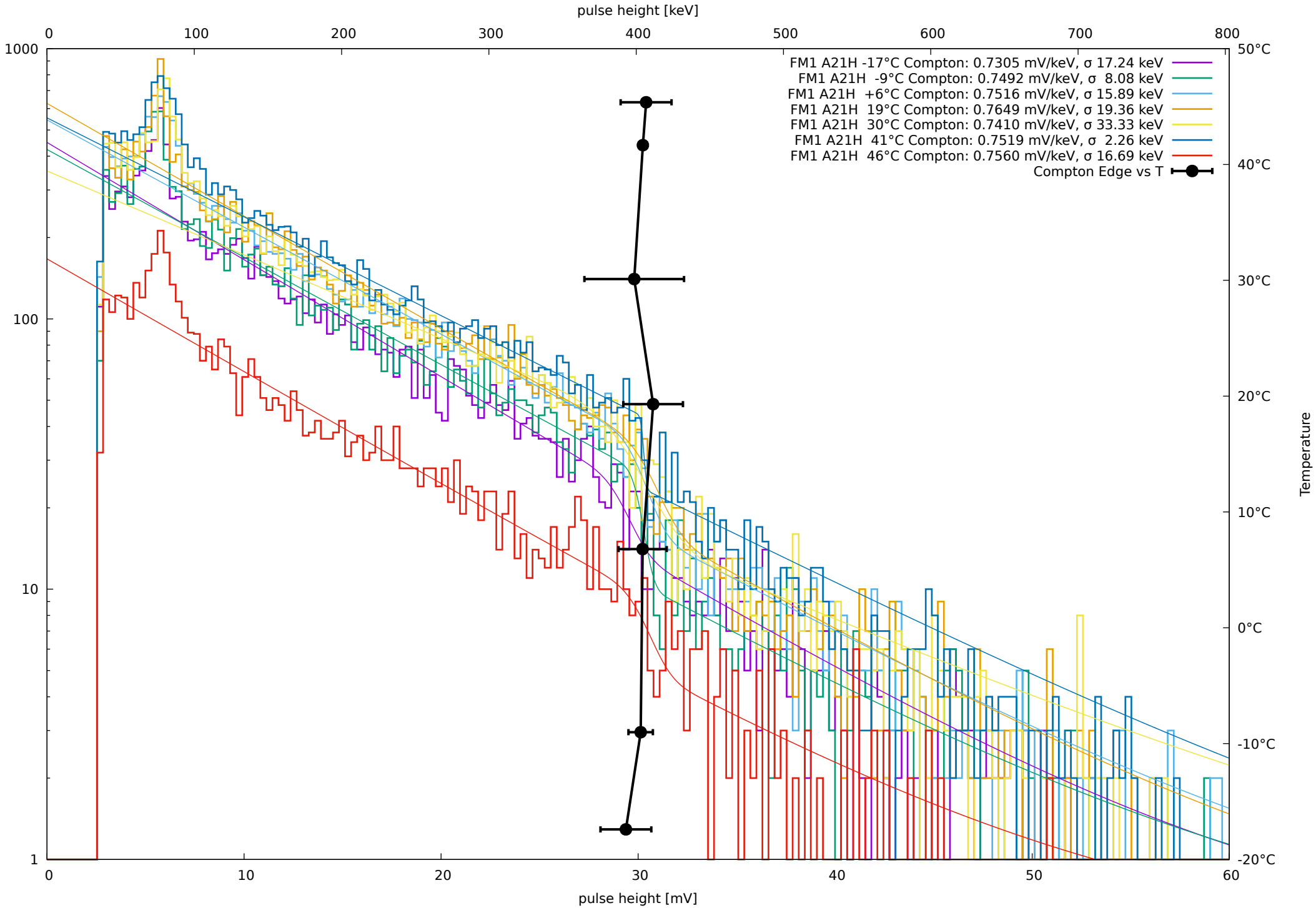

pulse height [keV]
0
50
100
150
200
10000
1000
100
10
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
Temperature
FM1 A22H -17°C X-ray: 0.7053 mV/keV, σ 5.44 keV
FM1 A22H -9°C X-ray: 0.7236 mV/keV, σ 6.74 keV
FM1 A22H +6°C X-ray: 0.7340 mV/keV, σ 6.09 keV
FM1 A22H 19°C X-ray: 0.7430 mV/keV, σ 7.21 keV
FM1 A22H 30°C X-ray: 0.7663 mV/keV, σ 5.30 keV
FM1 A22H 41°C X-ray: 0.7528 mV/keV, σ 3.86 keV
FM1 A22H 46°C X-ray: 0.7699 mV/keV, σ 3.77 keV
Xray vs T
0
2
4
6
8
10
12
14
pulse height [mV]

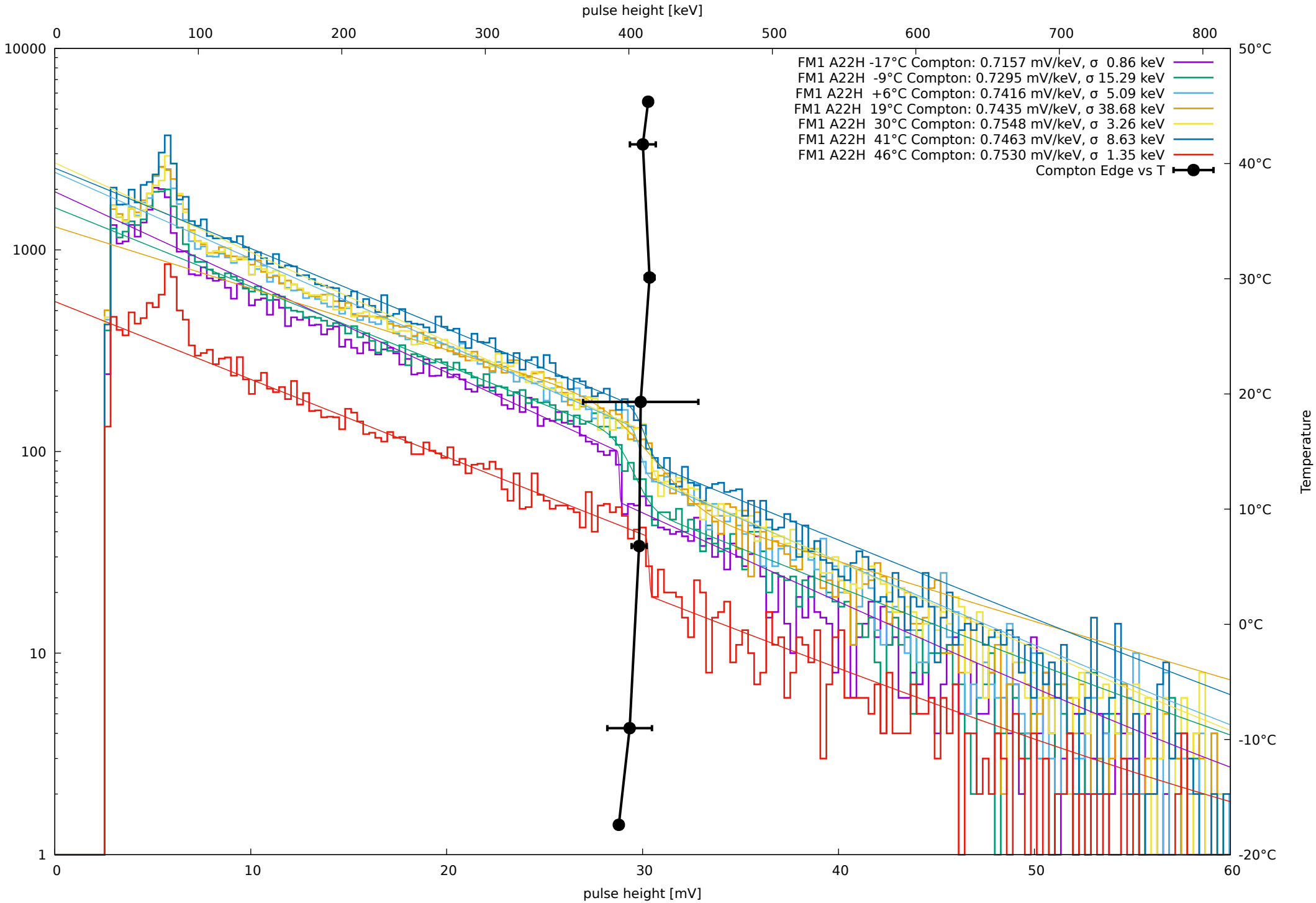

pulse height [keV]
0
50
100
150
200
10000
1000
100
10
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
Temperature
FM1 B11H -17°C X-ray: 0.7311 mV/keV, σ 4.45 keV
FM1 B11H -9°C X-ray: 0.7686 mV/keV, σ 4.26 keV
FM1 B11H +6°C X-ray: 0.7819 mV/keV, σ 3.54 keV
FM1 B11H 19°C X-ray: 0.7636 mV/keV, σ 4.29 keV
FM1 B11H 30°C X-ray: 0.8001 mV/keV, σ 5.47 keV
FM1 B11H 41°C X-ray: 0.7727 mV/keV, σ 3.86 keV
FM1 B11H 46°C X-ray: 0.7883 mV/keV, σ 4.02 keV
Xray vs T
0
2
4
6
8
10
12
14
pulse height [mV]

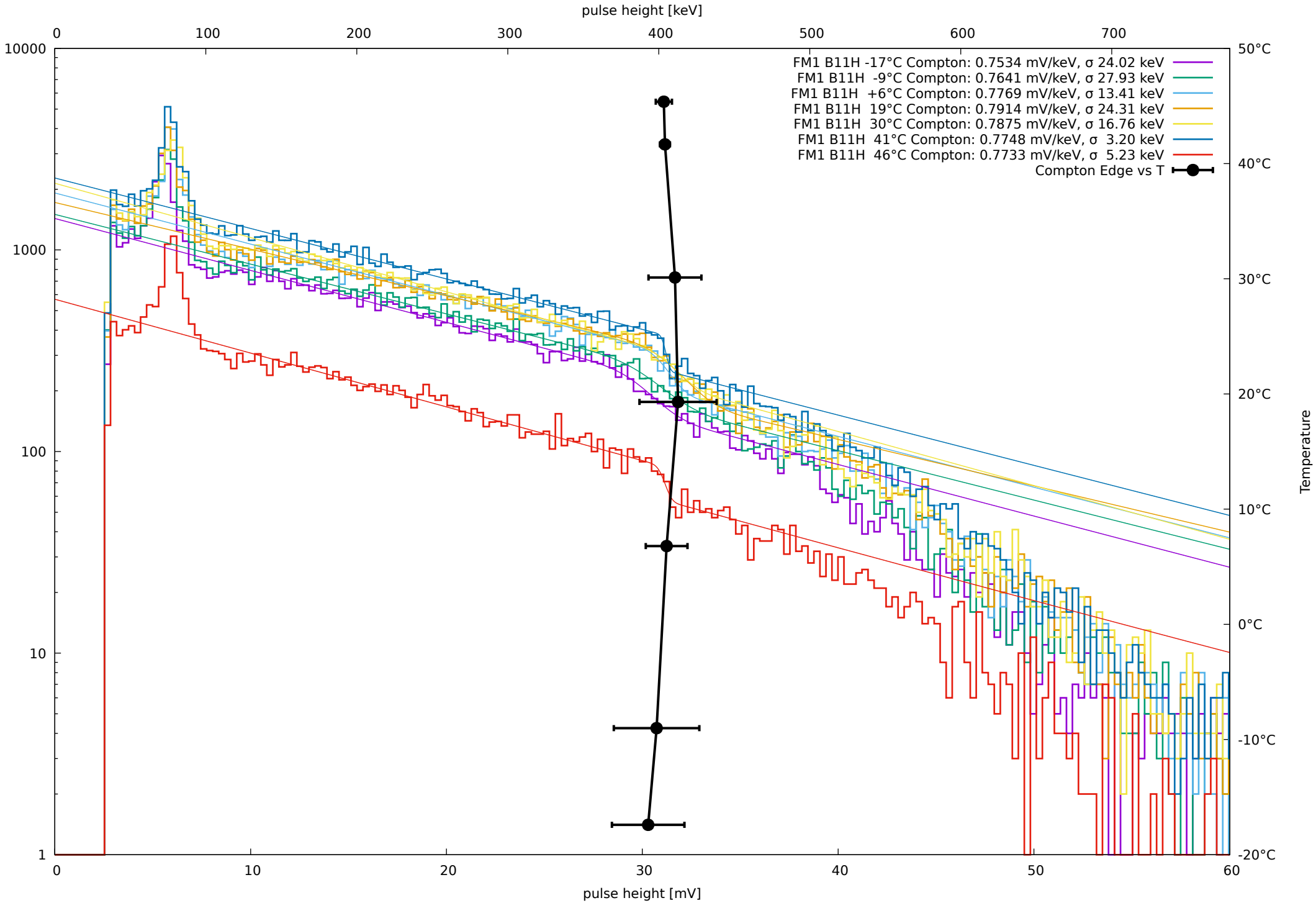

pulse height [keV]
0
20
40
60
80
100
120
140
160
180
100000
10000
1000
100
10
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
Temperature
FM1 B12H -17°C X-ray: 0.7363 mV/keV, σ 4.18 keV
FM1 B12H -9°C X-ray: 0.7414 mV/keV, σ 4.47 keV
FM1 B12H +6°C X-ray: 0.7604 mV/keV, σ 6.28 keV
FM1 B12H 19°C X-ray: 0.7529 mV/keV, σ 4.46 keV
FM1 B12H 30°C X-ray: 0.7553 mV/keV, σ 5.04 keV
FM1 B12H 41°C X-ray: 0.7540 mV/keV, σ 4.61 keV
FM1 B12H 46°C X-ray: 0.7682 mV/keV, σ 4.29 keV
Xray vs T
0
2
4
6
8
10
12
14
pulse height [mV]

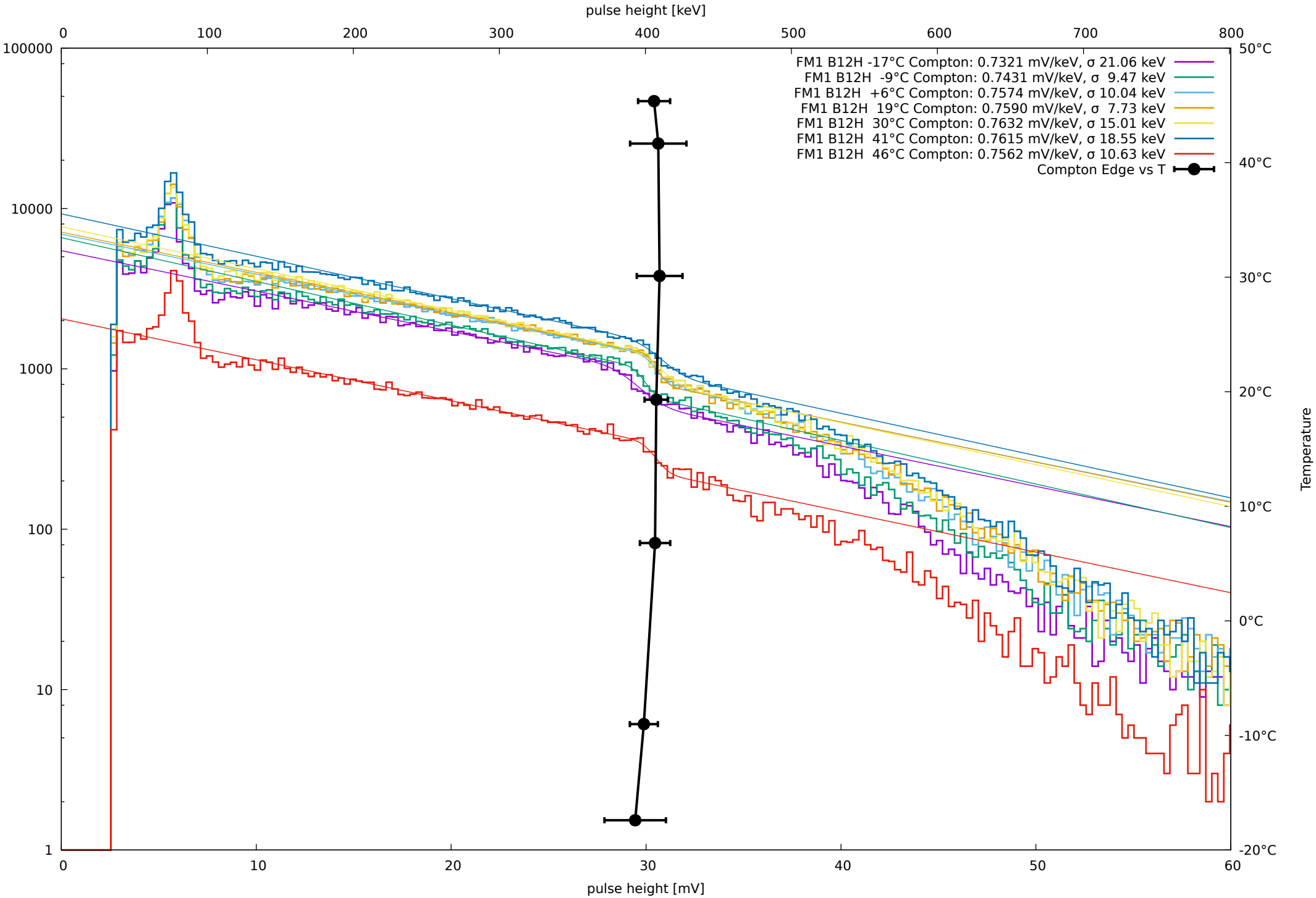

pulse height [keV]
0
100
200
300
400
500
600
700
800
10000
1000
100
10
1
0
10
20
30
40
50
60
pulse height [mV]
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
Temperature
FM1 A11H -17°C Compton: 0.7179 mV/keV, σ 59.12 keV
FM1 A11H -9°C Compton: 0.7533 mV/keV, σ 30.72 keV
FM1 A11H +6°C Compton: 0.7519 mV/keV, σ 9.27 keV
FM1 A11H 19°C Compton: 0.7561 mV/keV, σ 2.33 keV
FM1 A11H 30°C Compton: 0.7630 mV/keV, σ 11.62 keV
FM1 A11H 41°C Compton: 0.7690 mV/keV, σ 21.02 keV
FM1 A11H 46°C Compton: 0.7816 mV/keV, σ 26.00 keV
Compton Edge vs T

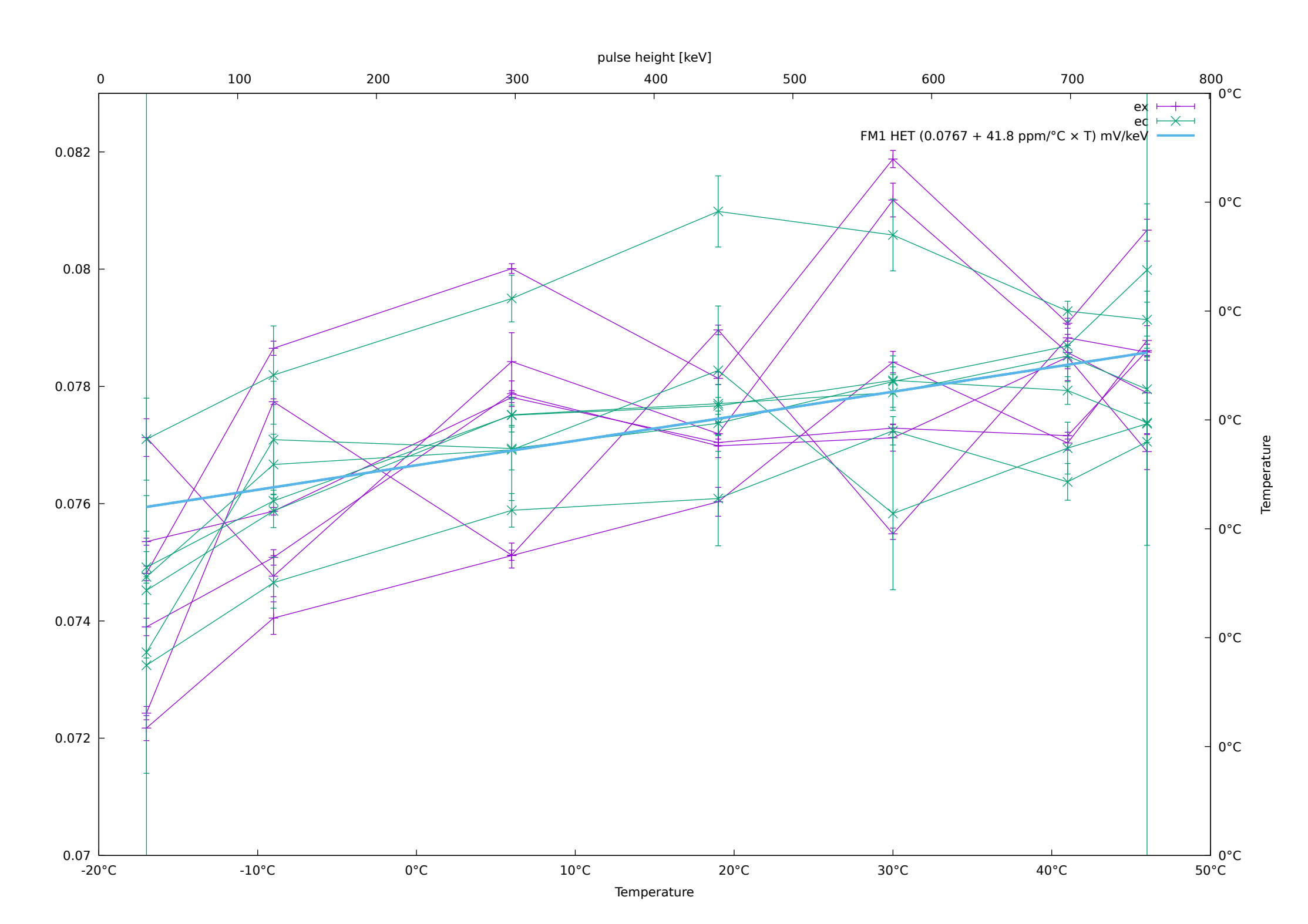

pulse height [keV]
0
100
200
300
400
500
600
700
800
100000
10000
1000
100
10
1
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
Temperature
FM1 A12H -17°C Compton: 0.7282 mV/keV, σ 8.84 keV
FM1 A12H -9°C Compton: 0.7415 mV/keV, σ 15.05 keV
FM1 A12H +6°C Compton: 0.7575 mV/keV, σ 17.63 keV
FM1 A12H 19°C Compton: 0.7593 mV/keV, σ 19.46 keV
FM1 A12H 30°C Compton: 0.7612 mV/keV, σ 17.07 keV
FM1 A12H 41°C Compton: 0.7673 mV/keV, σ 8.29 keV
FM1 A12H 46°C Compton: 0.7617 mV/keV, σ 16.62 keV
Compton Edge vs T
0
10
20
30
40
50
60
pulse height [mV]

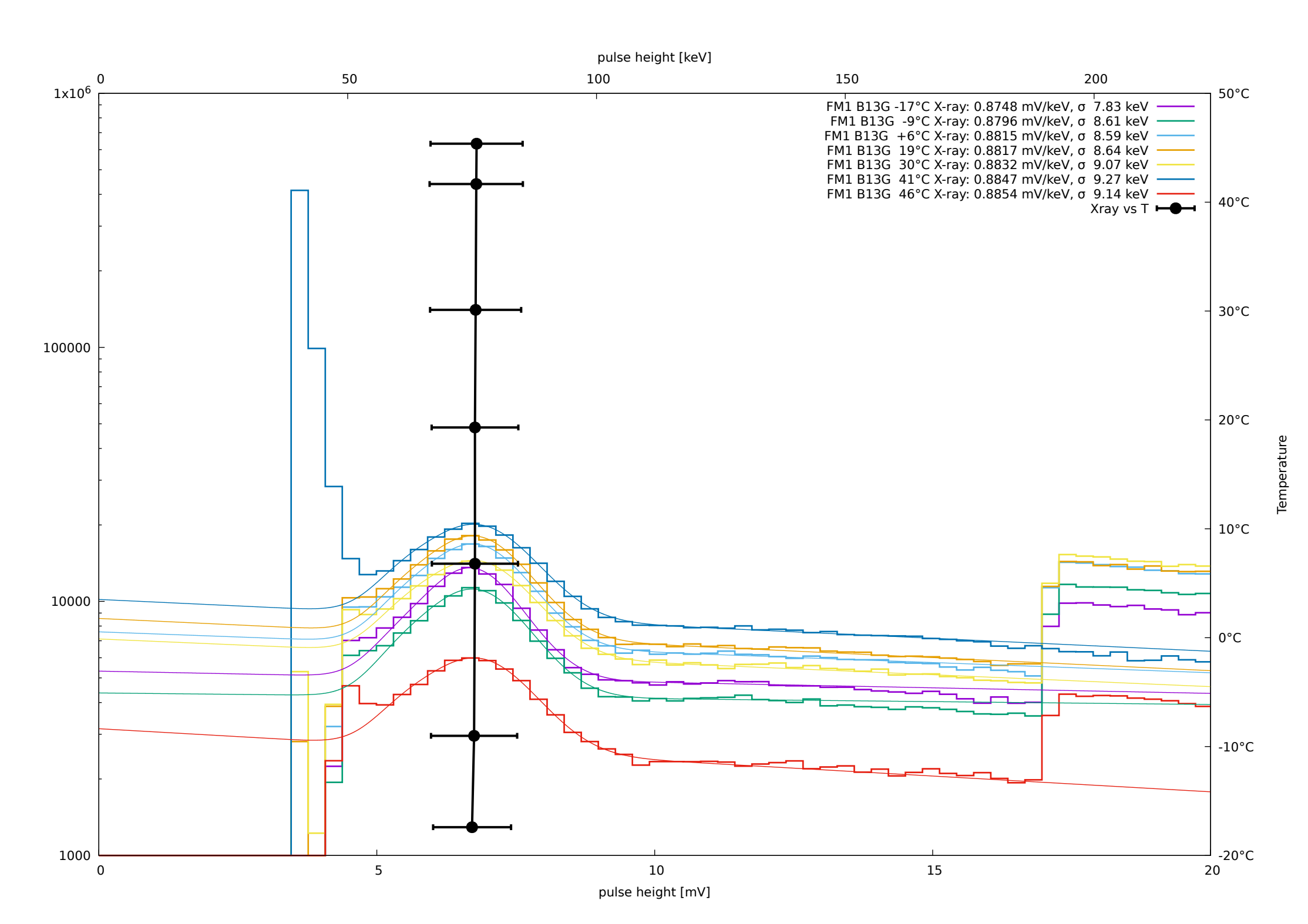

pulse height [keV]
0
100
200
300
400
500
600
700
800
1000
100
10
1
0
10
20
30
40
50
60
pulse height [mV]
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
Temperature
FM1 A21H -17°C Compton: 0.7305 mV/keV, σ 17.24 keV
FM1 A21H -9°C Compton: 0.7492 mV/keV, σ 8.08 keV
FM1 A21H +6°C Compton: 0.7516 mV/keV, σ 15.89 keV
FM1 A21H 19°C Compton: 0.7649 mV/keV, σ 19.36 keV
FM1 A21H 30°C Compton: 0.7410 mV/keV, σ 33.33 keV
FM1 A21H 41°C Compton: 0.7519 mV/keV, σ 2.26 keV
FM1 A21H 46°C Compton: 0.7560 mV/keV, σ 16.69 keV
Compton Edge vs T

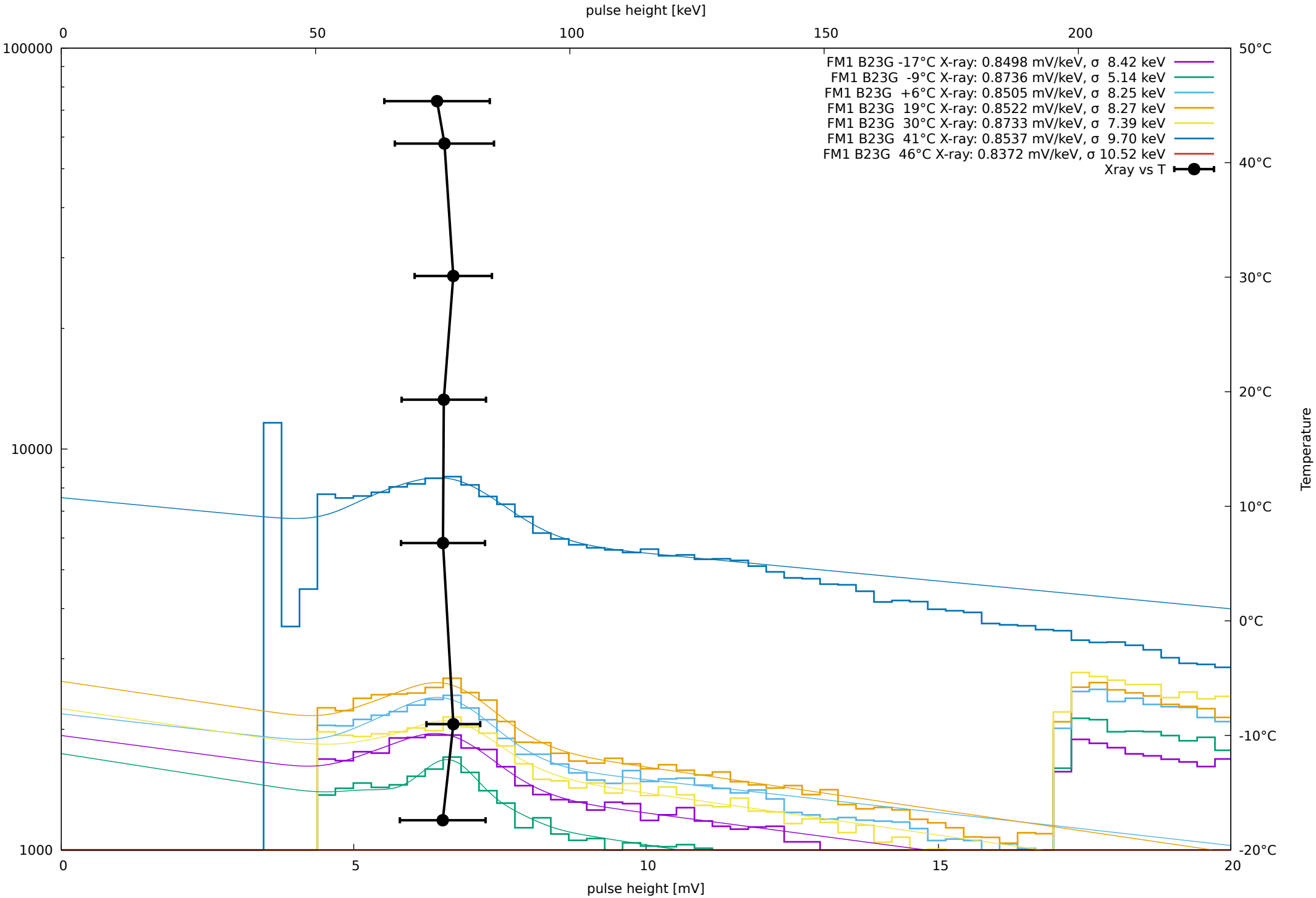

pulse height [keV]
0
100
200
300
400
500
600
700
800
10000
1000
100
10
1
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
Temperature
FM1 A22H -17°C Compton: 0.7157 mV/keV, σ 0.86 keV
FM1 A22H -9°C Compton: 0.7295 mV/keV, σ 15.29 keV
FM1 A22H +6°C Compton: 0.7416 mV/keV, σ 5.09 keV
FM1 A22H 19°C Compton: 0.7435 mV/keV, σ 38.68 keV
FM1 A22H 30°C Compton: 0.7548 mV/keV, σ 3.26 keV
FM1 A22H 41°C Compton: 0.7463 mV/keV, σ 8.63 keV
FM1 A22H 46°C Compton: 0.7530 mV/keV, σ 1.35 keV
Compton Edge vs T
0
10
20
30
40
50
60
pulse height [mV]

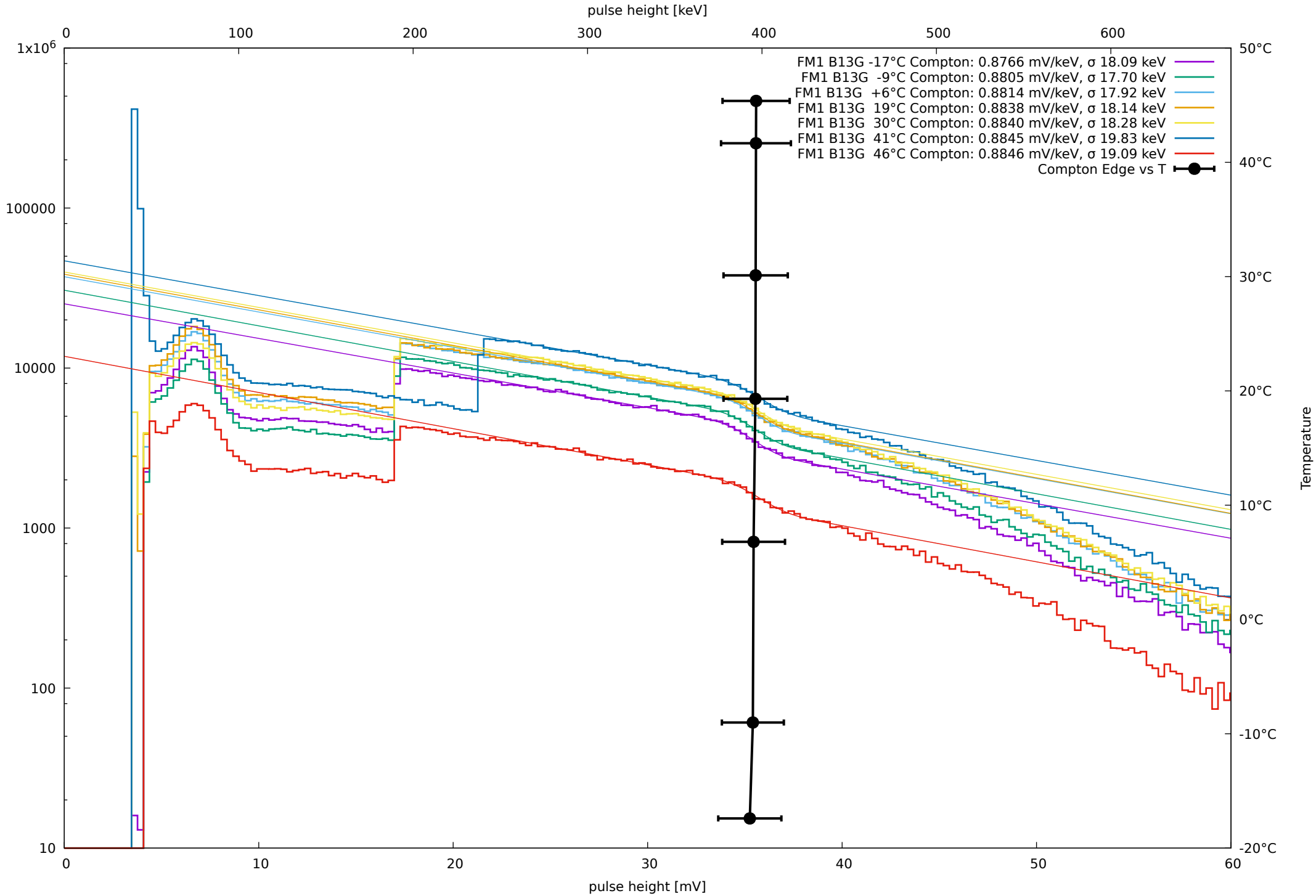

pulse height [keV]
0
100
200
300
400
500
600
700
10000
1000
100
10
1
FM1 B11H -17°C Compton: 0.7534 mV/keV, σ 24.02 keV
FM1 B11H -9°C Compton: 0.7641 mV/keV, σ 27.93 keV
FM1 B11H +6°C Compton: 0.7769 mV/keV, σ 13.41 keV
FM1 B11H 19°C Compton: 0.7914 mV/keV, σ 24.31 keV
FM1 B11H 30°C Compton: 0.7875 mV/keV, σ 16.76 keV
FM1 B11H 41°C Compton: 0.7748 mV/keV, σ 3.20 keV
FM1 B11H 46°C Compton: 0.7733 mV/keV, σ 5.23 keV
Compton Edge vs T
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
Temperature
0
10
20
30
40
50
60
pulse height [mV]

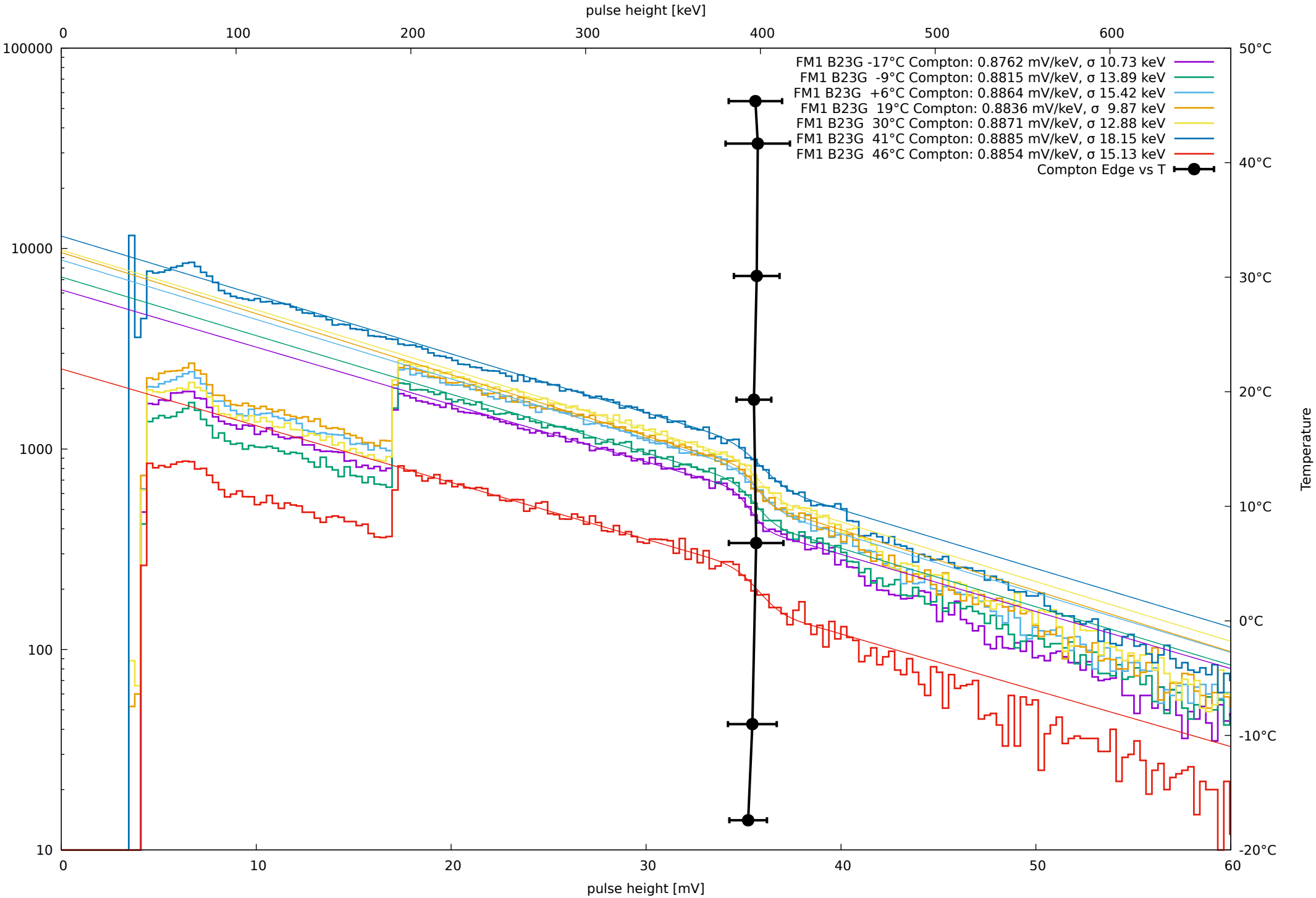

pulse height [keV]
0
100
200
300
400
500
600
700
800
100000
10000
1000
100
10
1
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
Temperature
FM1 B12H -17°C Compton: 0.7321 mV/keV, σ 21.06 keV
FM1 B12H -9°C Compton: 0.7431 mV/keV, σ 9.47 keV
FM1 B12H +6°C Compton: 0.7574 mV/keV, σ 10.04 keV
FM1 B12H 19°C Compton: 0.7590 mV/keV, σ 7.73 keV
FM1 B12H 30°C Compton: 0.7632 mV/keV, σ 15.01 keV
FM1 B12H 41°C Compton: 0.7615 mV/keV, σ 18.55 keV
FM1 B12H 46°C Compton: 0.7562 mV/keV, σ 10.63 keV
Compton Edge vs T
0
10
20
30
40
50
60
pulse height [mV]

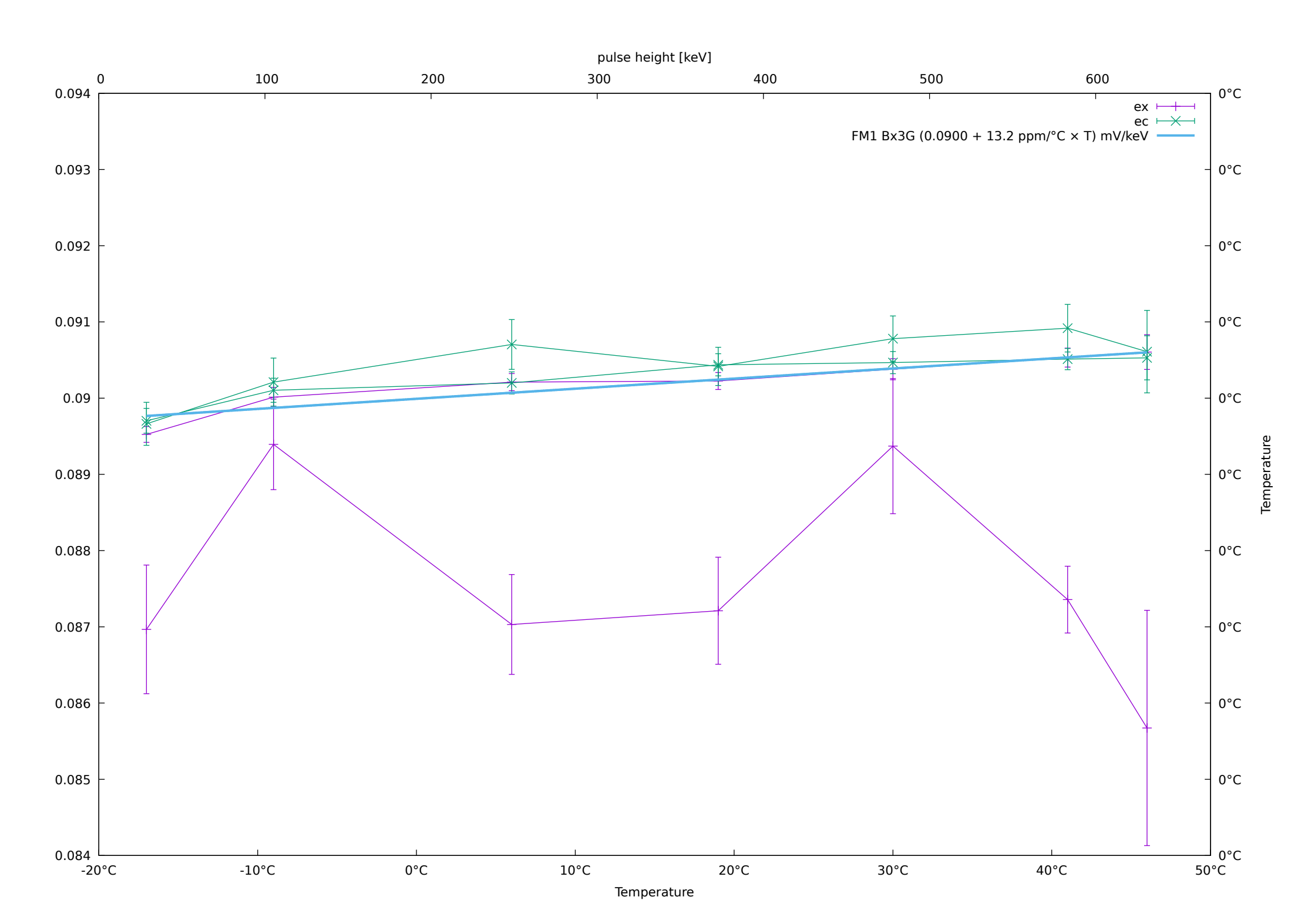

pulse height [keV]
0
100
200
300
400
500
600
700
800
ex
ec
FM1 HET (0.0767 + 41.8 ppm/°C × T) mV/keV
0.082
0.08
0.078
0.076
0.074
0.072
0.07
0°C
-20°C
-10°C
0°C
10°C
20°C
30°C
40°C
50°C
Temperature
Temperature

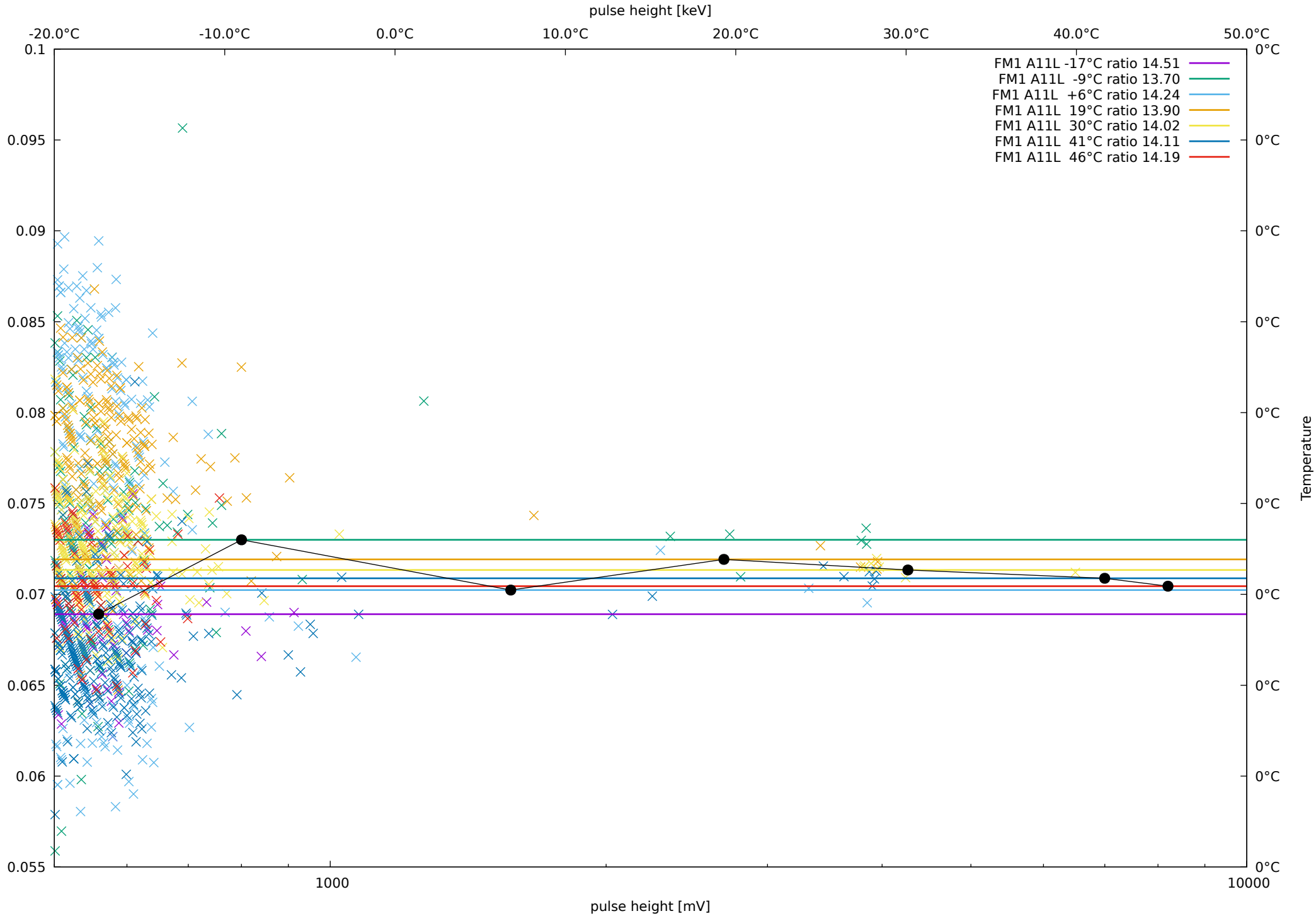

pulse height [keV]
0
50
100
150
200
1x10^6
100000
10000
1000
FM1 B13G -17°C X-ray: 0.8748 mV/keV, σ 7.83 keV
FM1 B13G -9°C X-ray: 0.8796 mV/keV, σ 8.61 keV
FM1 B13G +6°C X-ray: 0.8815 mV/keV, σ 8.59 keV
FM1 B13G 19°C X-ray: 0.8817 mV/keV, σ 8.64 keV
FM1 B13G 30°C X-ray: 0.8832 mV/keV, σ 9.07 keV
FM1 B13G 41°C X-ray: 0.8847 mV/keV, σ 9.27 keV
FM1 B13G 46°C X-ray: 0.8854 mV/keV, σ 9.14 keV
Xray vs T
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
Temperature
0
5
10
15
20
pulse height [mV]

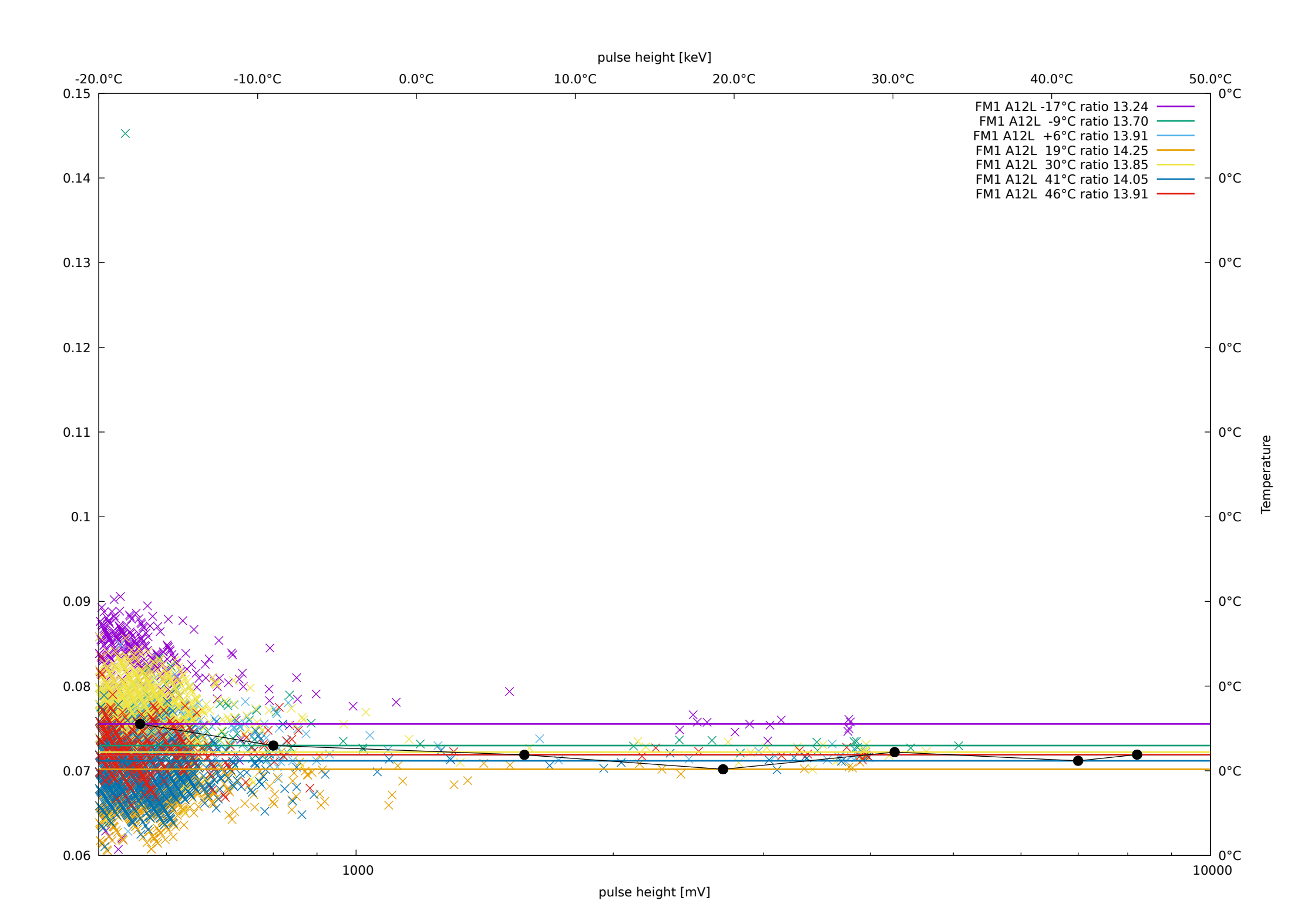

pulse height [keV]
0
50
100
150
200
100000
10000
1000
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
Temperature
FM1 B23G -17°C X-ray: 0.8498 mV/keV, σ 8.42 keV
FM1 B23G -9°C X-ray: 0.8736 mV/keV, σ 5.14 keV
FM1 B23G +6°C X-ray: 0.8505 mV/keV, σ 8.25 keV
FM1 B23G 19°C X-ray: 0.8522 mV/keV, σ 8.27 keV
FM1 B23G 30°C X-ray: 0.8733 mV/keV, σ 7.39 keV
FM1 B23G 41°C X-ray: 0.8537 mV/keV, σ 9.70 keV
FM1 B23G 46°C X-ray: 0.8372 mV/keV, σ 10.52 keV
Xray vs T
0
5
10
15
20
pulse height [mV]

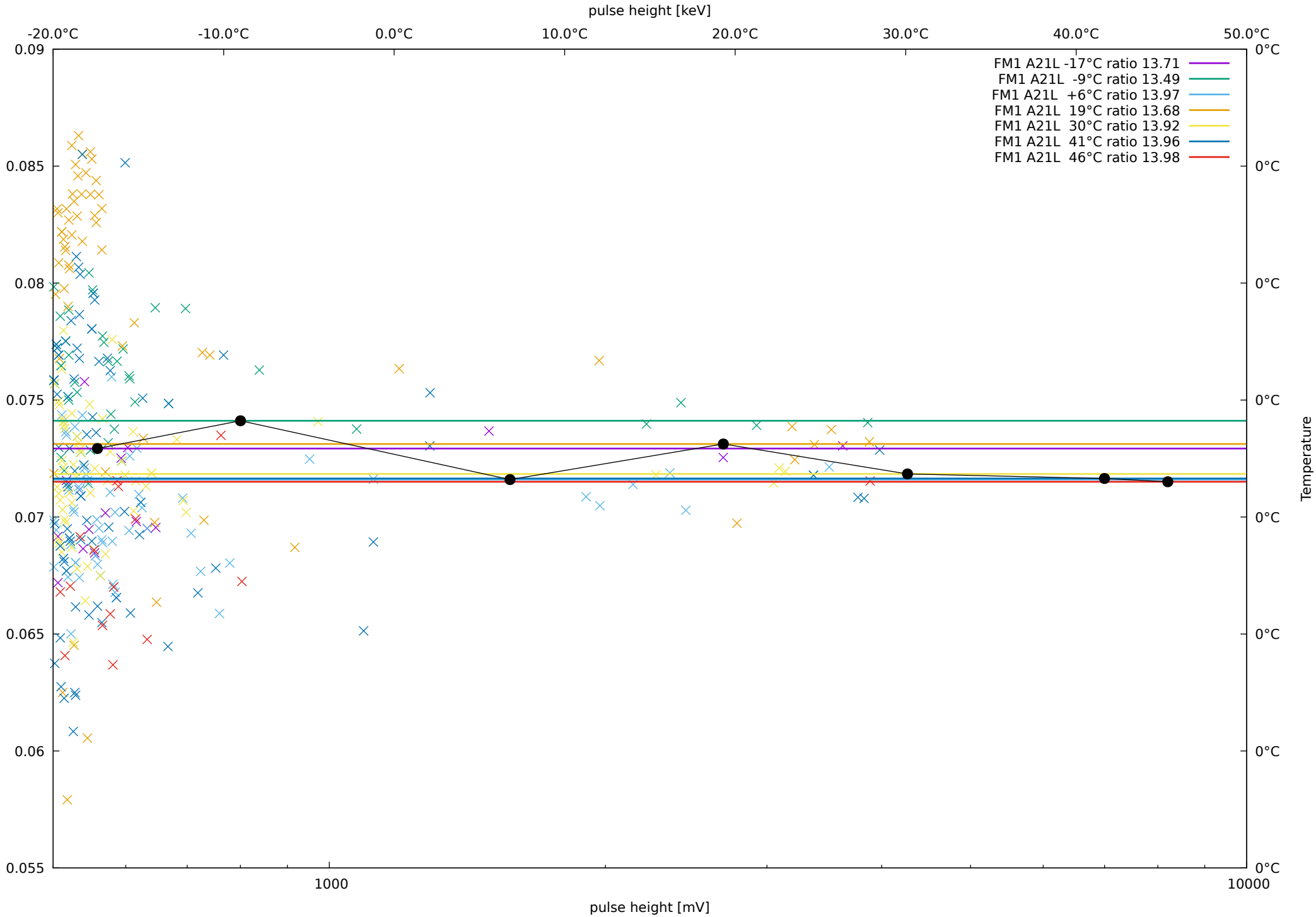

pulse height [keV]
0
100
200
300
400
500
600
1x10^6
100000
10000
1000
100
10
FM1 B13G -17°C Compton: 0.8766 mV/keV, σ 18.09 keV
FM1 B13G -9°C Compton: 0.8805 mV/keV, σ 17.70 keV
FM1 B13G +6°C Compton: 0.8814 mV/keV, σ 17.92 keV
FM1 B13G 19°C Compton: 0.8838 mV/keV, σ 18.14 keV
FM1 B13G 30°C Compton: 0.8840 mV/keV, σ 18.28 keV
FM1 B13G 41°C Compton: 0.8845 mV/keV, σ 19.83 keV
FM1 B13G 46°C Compton: 0.8846 mV/keV, σ 19.09 keV
Compton Edge vs T
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
Temperature
0
10
20
30
40
50
60
pulse height [mV]

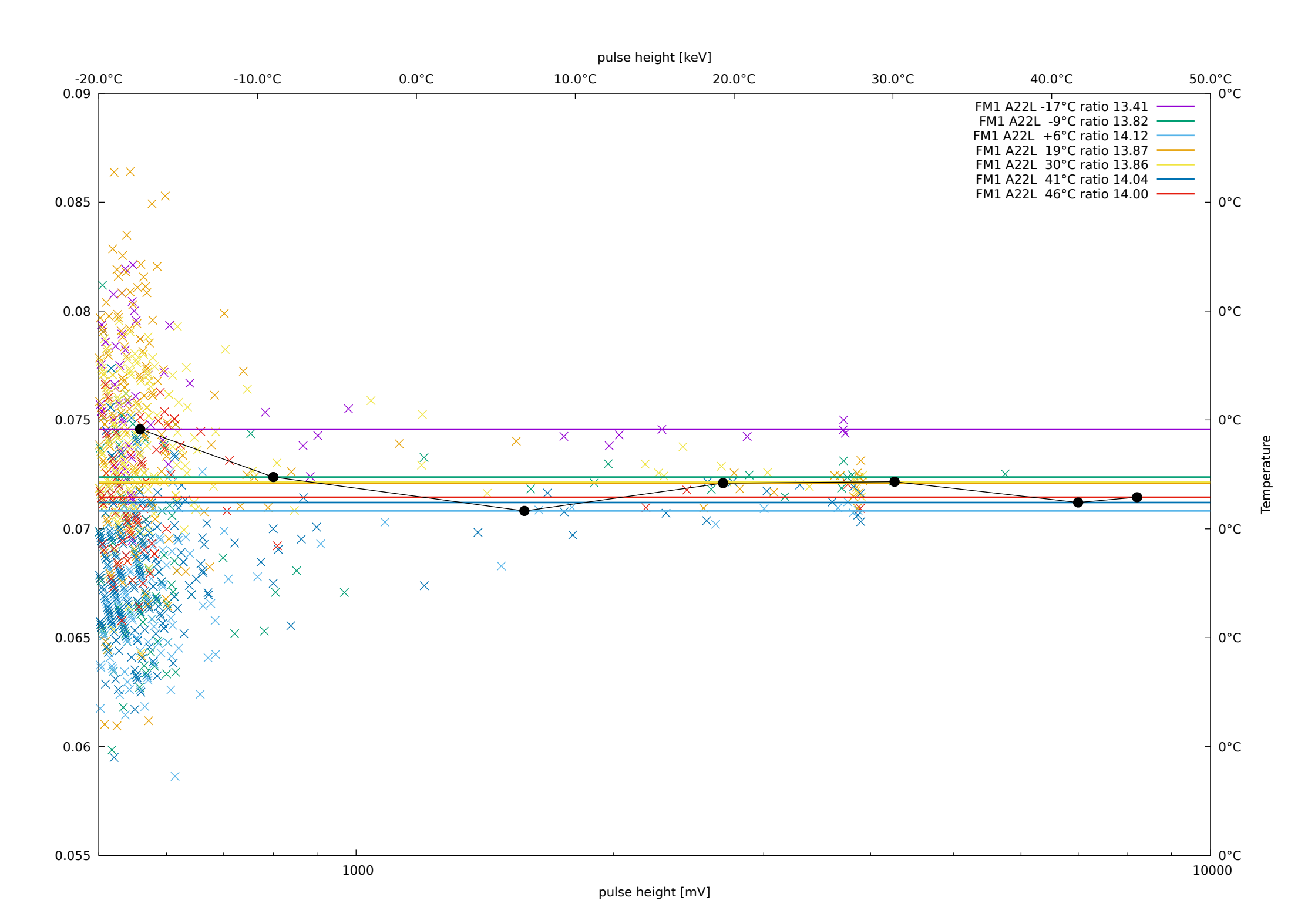

pulse height [keV]
0
100
200
300
400
500
600
100000
10000
1000
100
10
50°C
40°C
30°C
20°C
10°C
0°C
-10°C
-20°C
Temperature
FM1 B23G -17°C Compton: 0.8762 mV/keV, σ 10.73 keV
FM1 B23G -9°C Compton: 0.8815 mV/keV, σ 13.89 keV
FM1 B23G +6°C Compton: 0.8864 mV/keV, σ 15.42 keV
FM1 B23G 19°C Compton: 0.8836 mV/keV, σ 9.87 keV
FM1 B23G 30°C Compton: 0.8871 mV/keV, σ 12.88 keV
FM1 B23G 41°C Compton: 0.8885 mV/keV, σ 18.15 keV
FM1 B23G 46°C Compton: 0.8854 mV/keV, σ 15.13 keV
Compton Edge vs T
0
10
20
30
40
50
60
pulse height [mV]

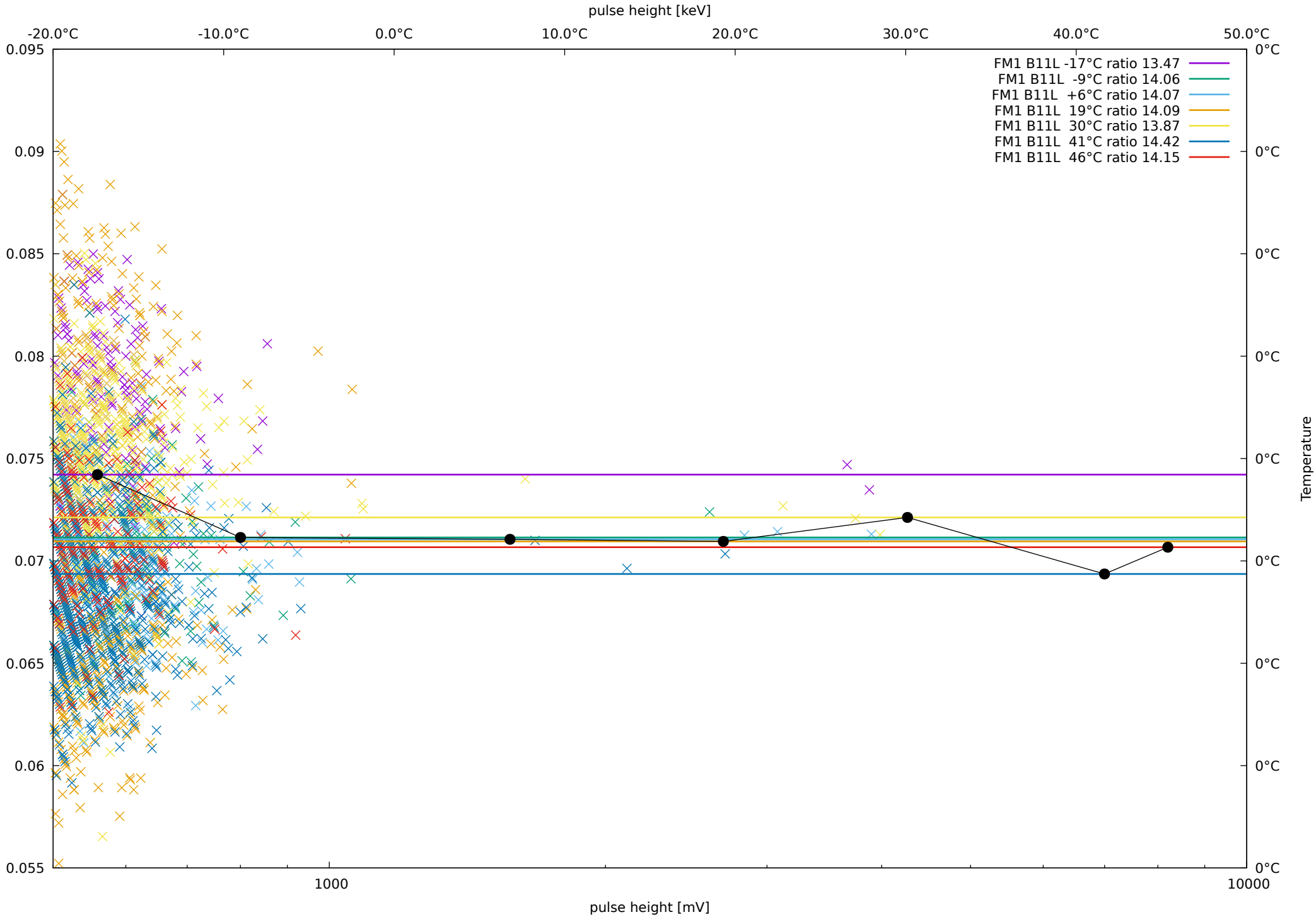

pulse height [keV]
0
100
200
300
400
500
600
0.094
0.093
0.092
0.091
0.09
0.089
0.088
0.087
0.086
0.085
0.084
0°C
ex
ec
FM1 Bx3G (0.0900 + 13.2 ppm/°C × T) mV/keV
-20°C
-10°C
0°C
10°C
20°C
30°C
40°C
50°C
Temperature
Temperature

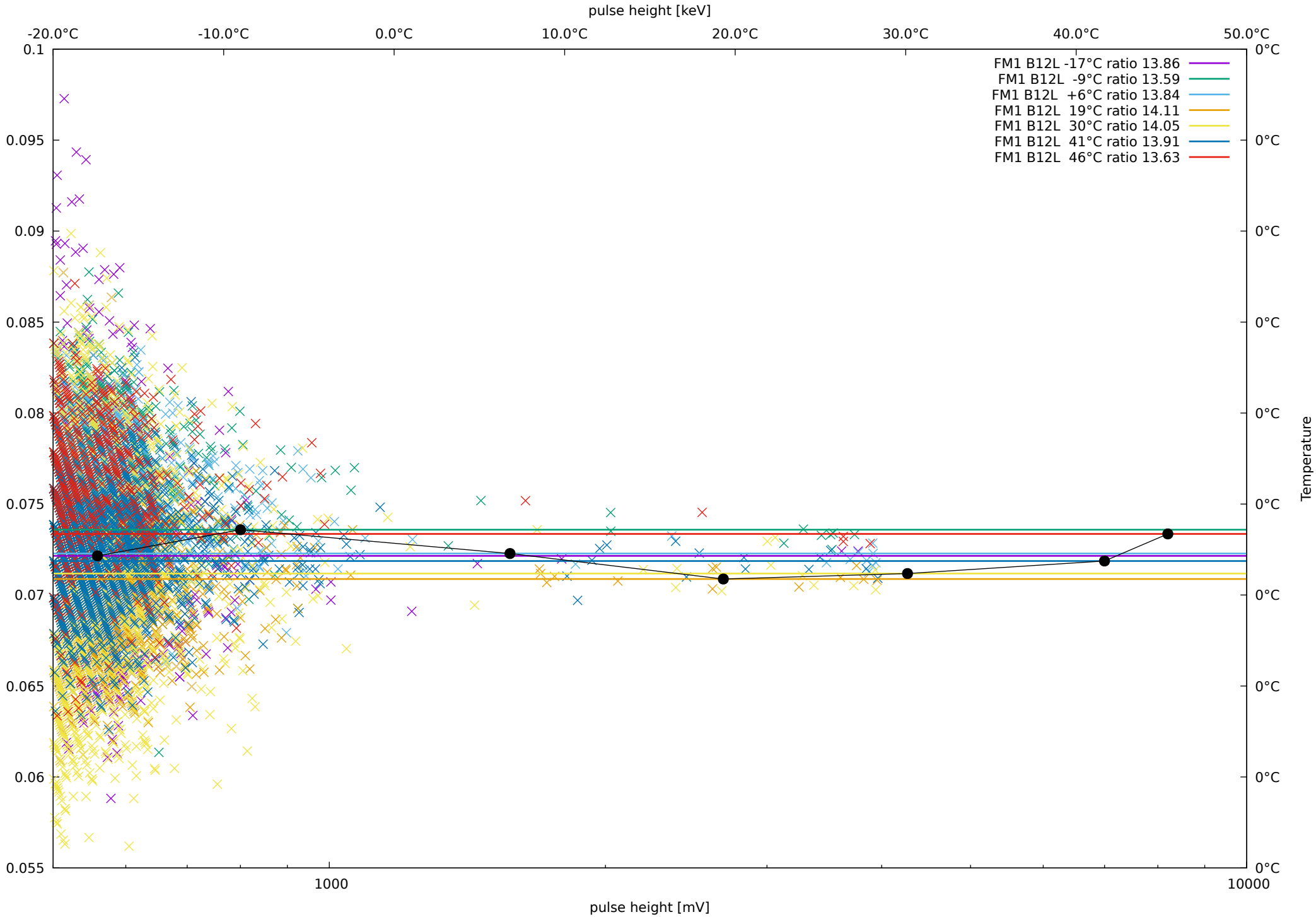

pulse height [keV]
-20.0°C
-10.0°C
0.0°C
10.0°C
20.0°C
30.0°C
40.0°C
50.0°C
0.1
0.095
0.09
0.085
0.08
0.075
0.07
0.065
0.06
0.055
0°C
Temperature
FM1 A11L -17°C ratio 14.51
FM1 A11L -9°C ratio 13.70
FM1 A11L +6°C ratio 14.24
FM1 A11L 19°C ratio 13.90
FM1 A11L 30°C ratio 14.02
FM1 A11L 41°C ratio 14.11
FM1 A11L 46°C ratio 14.19
1000
10000
pulse height [mV]

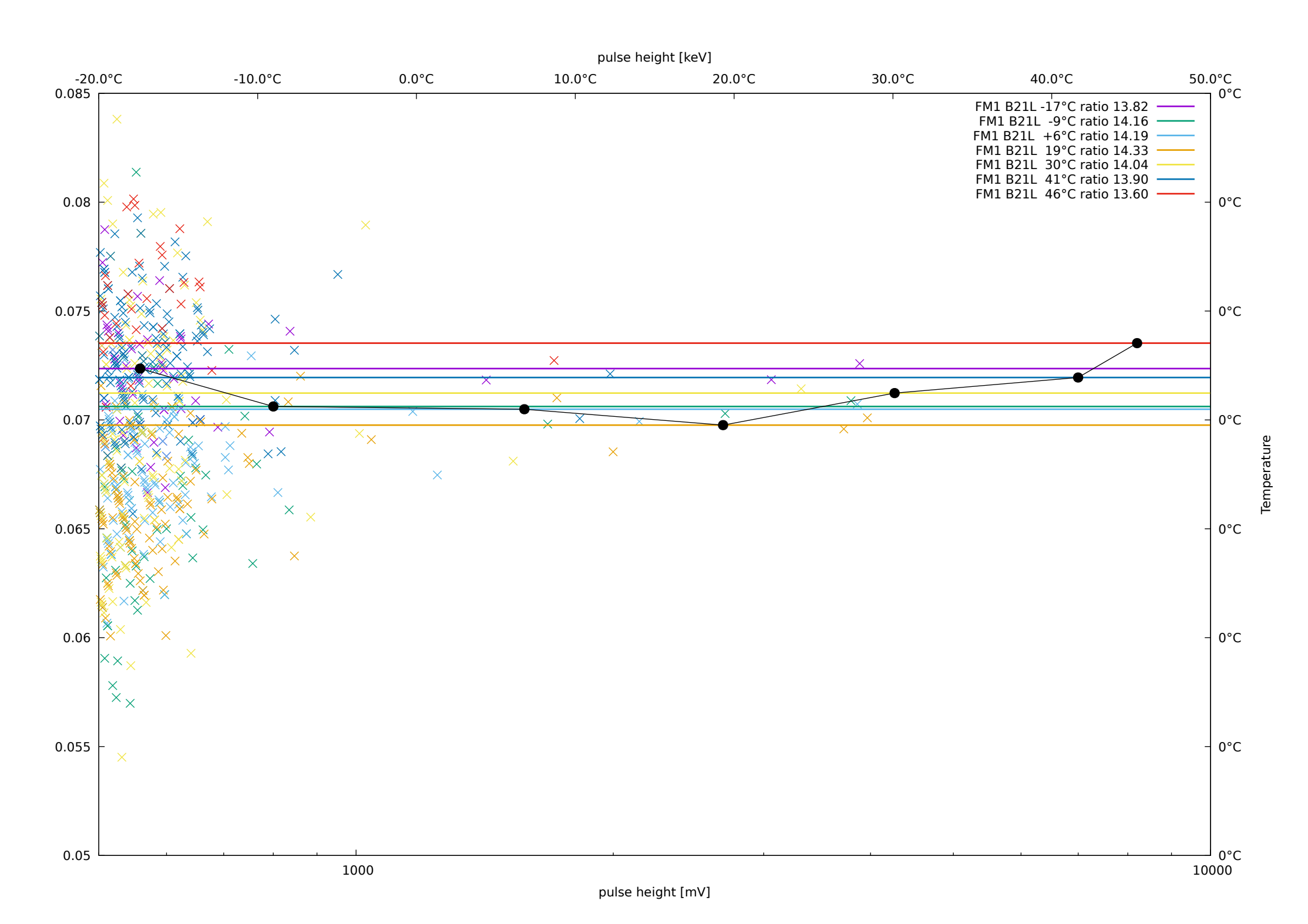

pulse height [keV]
-20.0°C
-10.0°C
0.0°C
10.0°C
20.0°C
30.0°C
40.0°C
50.0°C
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0°C
Temperature
FM1 A12L -17°C ratio 13.24
FM1 A12L -9°C ratio 13.70
FM1 A12L +6°C ratio 13.91
FM1 A12L 19°C ratio 14.25
FM1 A12L 30°C ratio 13.85
FM1 A12L 41°C ratio 14.05
FM1 A12L 46°C ratio 13.91
1000
10000
pulse height [mV]

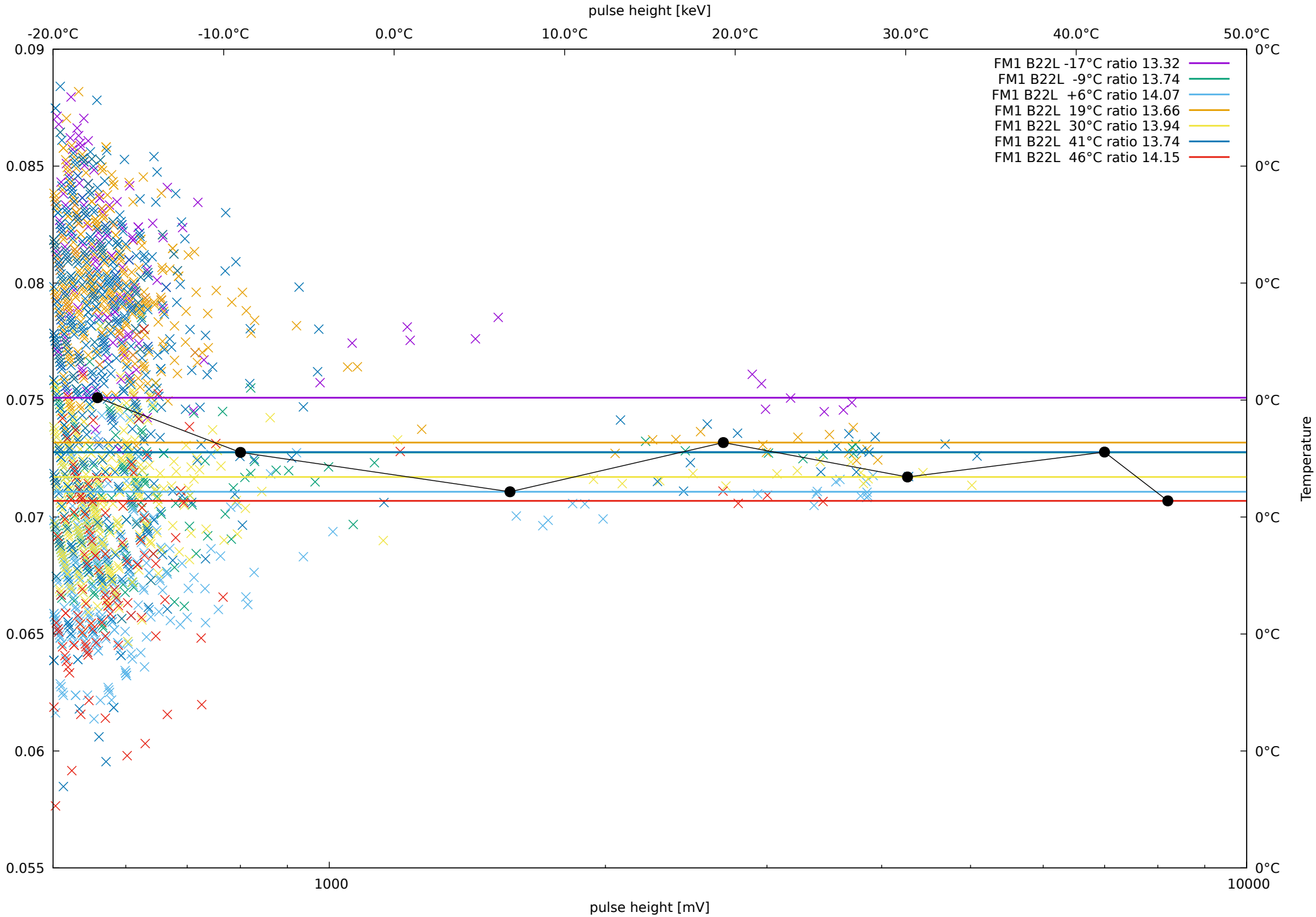

pulse height [keV]
-20.0°C
-10.0°C
0.0°C
10.0°C
20.0°C
30.0°C
40.0°C
50.0°C
0.09
0.085
0.08
0.075
0.07
0.065
0.06
0.055
0°C
FM1 A21L -17°C ratio 13.71
FM1 A21L -9°C ratio 13.49
FM1 A21L +6°C ratio 13.97
FM1 A21L 19°C ratio 13.68
FM1 A21L 30°C ratio 13.92
FM1 A21L 41°C ratio 13.96
FM1 A21L 46°C ratio 13.98
Temperature
1000
10000
pulse height [mV]

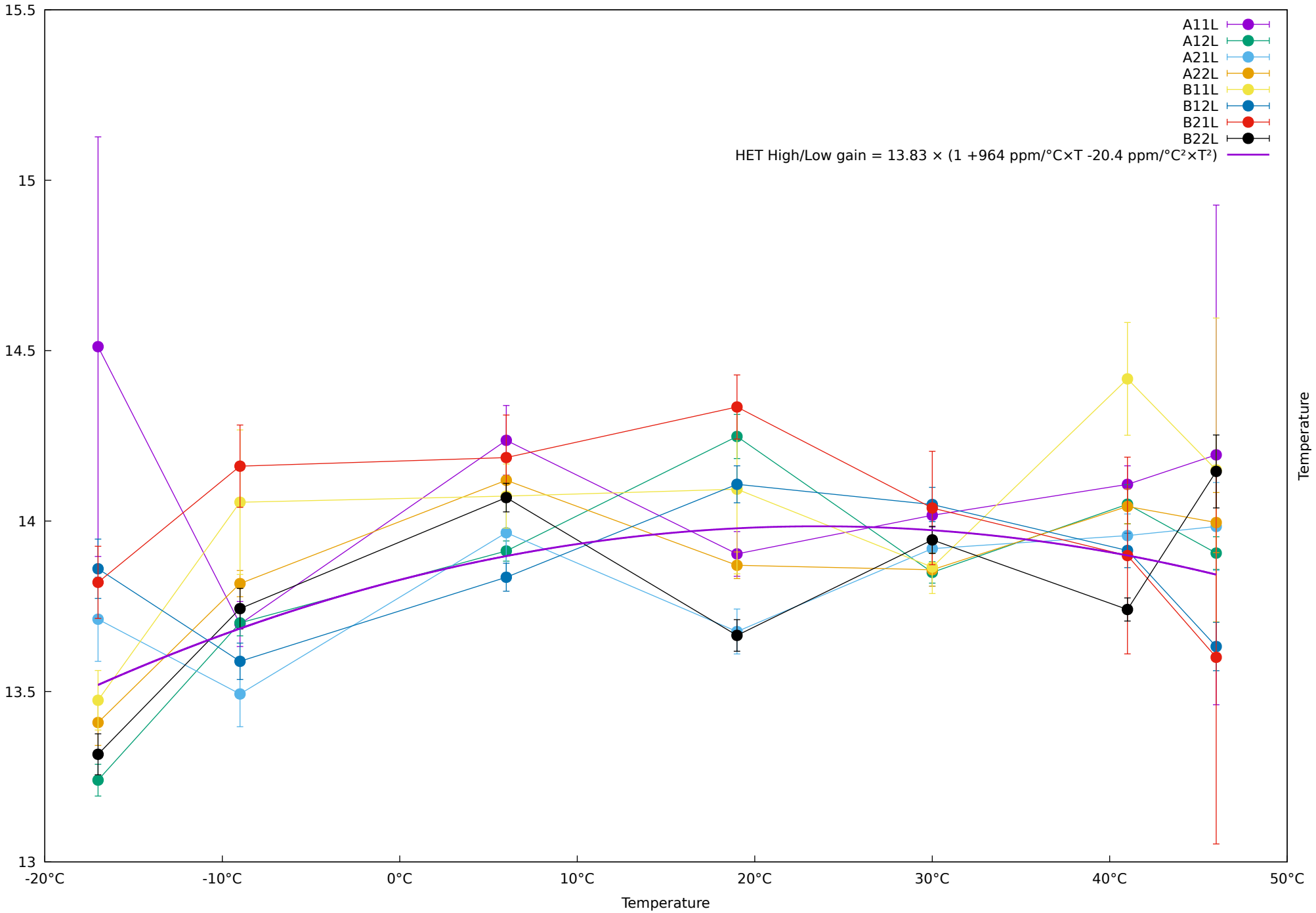

pulse height [keV]
-20.0°C
-10.0°C
0.0°C
10.0°C
20.0°C
30.0°C
40.0°C
50.0°C
0.09
0.085
0.08
0.075
0.07
0.065
0.06
0.055
0°C
Temperature
FM1 A22L -17°C ratio 13.41
FM1 A22L -9°C ratio 13.82
FM1 A22L +6°C ratio 14.12
FM1 A22L 19°C ratio 13.87
FM1 A22L 30°C ratio 13.86
FM1 A22L 41°C ratio 14.04
FM1 A22L 46°C ratio 14.00
1000
10000
pulse height [mV]


pulse height [keV]
-20.0°C
-10.0°C
0.0°C
10.0°C
20.0°C
30.0°C
40.0°C
50.0°C
0.095
0.09
0.085
0.08
0.075
0.07
0.065
0.06
0.055
0°C
Temperature
FM1 B11L -17°C ratio 13.47
FM1 B11L -9°C ratio 14.06
FM1 B11L +6°C ratio 14.07
FM1 B11L 19°C ratio 14.09
FM1 B11L 30°C ratio 13.87
FM1 B11L 41°C ratio 14.42
FM1 B11L 46°C ratio 14.15
1000
10000
pulse height [mV]


pulse height [keV]
-20.0°C
-10.0°C
0.0°C
10.0°C
20.0°C
30.0°C
40.0°C
50.0°C
0.1
0.095
0.09
0.085
0.08
0.075
0.07
0.065
0.06
0.055
0°C
Temperature
FM1 B12L -17°C ratio 13.86
FM1 B12L -9°C ratio 13.59
FM1 B12L +6°C ratio 13.84
FM1 B12L 19°C ratio 14.11
FM1 B12L 30°C ratio 14.05
FM1 B12L 41°C ratio 13.91
FM1 B12L 46°C ratio 13.63
1000
10000
pulse height [mV]


pulse height [keV]
-20.0°C
-10.0°C
0.0°C
10.0°C
20.0°C
30.0°C
40.0°C
50.0°C
0.085
0.08
0.075
0.07
0.065
0.06
0.055
0.05
0°C
Temperature
FM1 B21L -17°C ratio 13.82
FM1 B21L -9°C ratio 14.16
FM1 B21L +6°C ratio 14.19
FM1 B21L 19°C ratio 14.33
FM1 B21L 30°C ratio 14.04
FM1 B21L 41°C ratio 13.90
FM1 B21L 46°C ratio 13.60
1000
10000
pulse height [mV]


pulse height [keV]
-20.0°C
-10.0°C
0.0°C
10.0°C
20.0°C
30.0°C
40.0°C
50.0°C
0.09
0.085
0.08
0.075
0.07
0.065
0.06
0.055
0°C
Temperature
FM1 B22L -17°C ratio 13.32
FM1 B22L -9°C ratio 13.74
FM1 B22L +6°C ratio 14.07
FM1 B22L 19°C ratio 13.66
FM1 B22L 30°C ratio 13.94
FM1 B22L 41°C ratio 13.74
FM1 B22L 46°C ratio 14.15
1000
10000
pulse height [mV]


A11L
A12L
A21L
A22L
B11L
B12L
B21L
B22L
HET High/Low gain = 13.83 × (1 +964 ppm/°C×T -20.4 ppm/°C²×T²)
15.5
15
14.5
14
13.5
13
-20°C
-10°C
0°C
10°C
20°C
30°C
40°C
50°C
Temperature
Temperature