Summary of Asymmetry Extrapolation

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13 Jun 2016

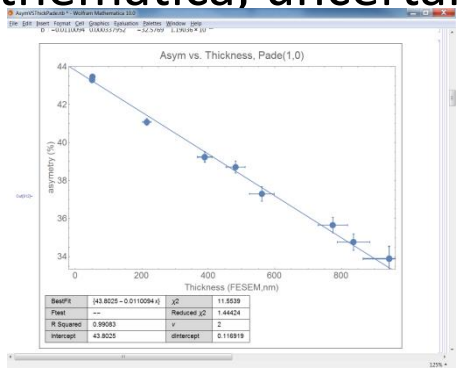
Run 1: A vs. T and A vs. R

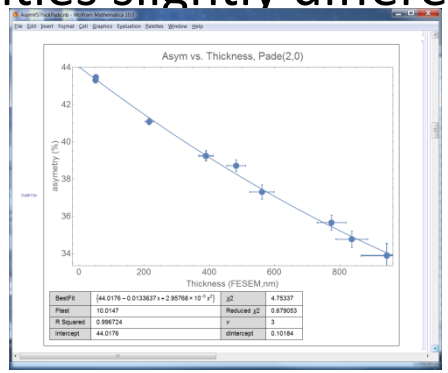
	Run 1	a0	d(a0)	reduced chi^2	
A vs. T	**Pade(01)**	44.0856	0.0919634	0.856446	
	Pade(11)	44.108	0.117068	0.940306	Marty
	Pade(20)	44.0735	0.105747	1.00743	
	Pade(10)	43.8946	0.0845447	1.89035	
AVERAGE		**44.02337**	**0.100 (avg)** **0.049 (error of the weighted mean)**		
		c0	**d(c0)**	**reduced chi^2**	
A vs. R	**Pade(02)**	44.0788	0.077479	1.37299	
	Pade(11)	44.1266	0.083209	1.22889	
	Pade(20)	43.9609	0.0715709	2.33358	Marty
		44.047	**0.077 (avg)** **0.044 (error of the mean)**		

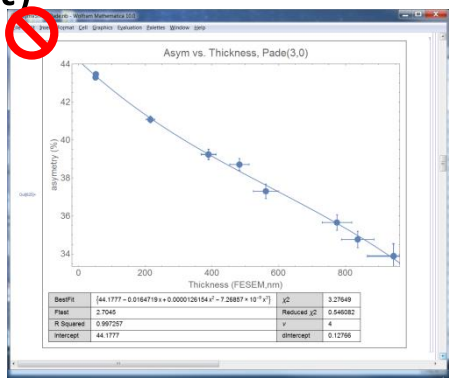
Run 2: A vs. T and A vs. R

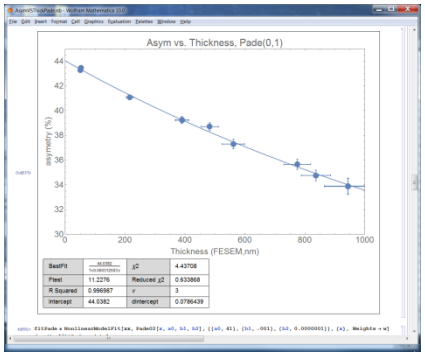
	Run 1	a0	d(a0)	reduced chi^2	
A vs. T	**Pade(01)**	44.1016	0.103806	0.876513	
	Pade(11)	44.1703	0.133349	0.890758	Marty
	Pade(20)	44.1206	0.118668	0.990906	
	Pade(10)	43.9127	0.096891	2.09715	
AVERAGE		**44.056**	**0.113 (average)** **0.055 (error of the weighted mean)**		
		c0	**d(c0)**	**reduced chi^2**	
A vs. R	**Pade(02)**	44.1362	0.0916015	4.68436	
	Pade(11)	44.2195	0.100298	4.36452	
	Pade(20)	43.9896	0.0848022	5.96496	Marty
		44.102	**0.092 (average)** **0.053 (error of the weighted mean)**		

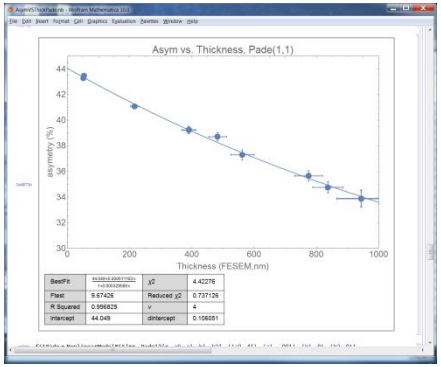
Choosing which Pade orders are not excluded: Asymmetry vs. Thickness (mathematica, uncertainties slightly different)

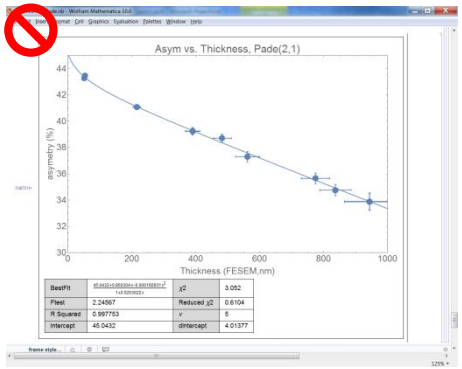


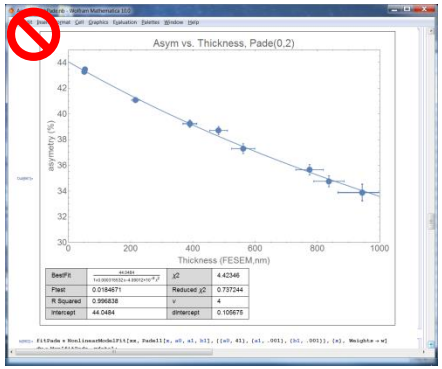


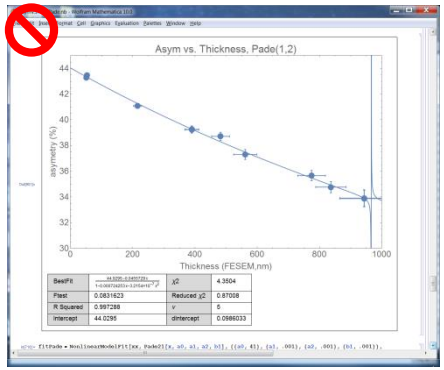










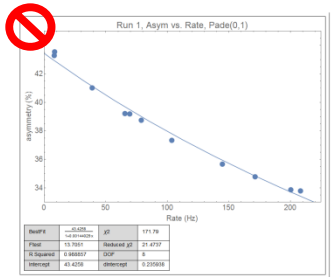


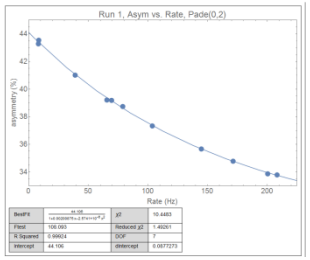
Pade(n,m) orders: Asy vs. Thick

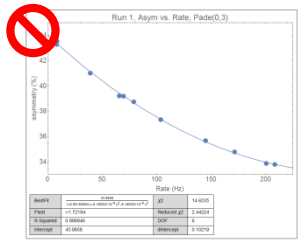
Pade(n,m)	intercept	dA	R^2	red. χ^2	likelihood	Ftest
(1,0)	43.8025	0.1169	0.991	1.44		-- worst red. χ^2
(2,0)	44.0176	0.1018	0.997	0.679		10.01
(3,0)	~~44.1777~~	0.128	0.997	0.546		2.70 (rej F test)
(0,1)	44.0382	0.0786	0.997	0.634		11.23
(0,2)	~~44.0484~~	0.1057	0.997	0.737		0.0185 (rej ftest)
(1,1)	44.049	0.1061	0.997	0.737		9.67
(1,2)	~~44.0295~~	0.0986	0.997	0.870		0.083 (rej. Ftest)

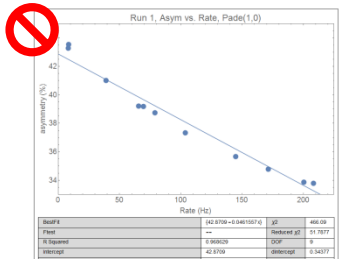
df	0.995	0.99	0.975	0.95	0.90	0.10	0.05	0.025	0.01	0.005
1	---	---	0.001	0.004	0.016	2.706	3.841	5.024	6.635	7.879
2	0.010	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210	10.597
3	0.072	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345	12.838
4	0.207	0.297	0.484	0.711	1.064	7.779	9.488	11.143	13.277	14.860
5	0.412	0.554	0.831	1.145	1.610	9.236	11.070	12.833	15.086	16.750
6	0.676	0.872	1.237	1.635	2.204	10.645	12.592	14.449	16.812	18.548
7	0.989	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.475	20.278
8	1.344	1.646	2.180	2.733	3.490	13.362	15.507	17.535	20.090	21.955
9	1.735	2.088	2.700	3.325	4.168	14.684	16.919	19.023	21.666	23.589
10	2.156	2.558	3.247	3.940	4.865	15.987	18.307	20.483	23.209	25.188
11	2.603	3.053	3.816	4.575	5.578	17.275	19.675	21.920	24.725	26.757
12	3.074	3.571	4.404	5.226	6.304	18.549	21.026	23.337	26.217	28.300

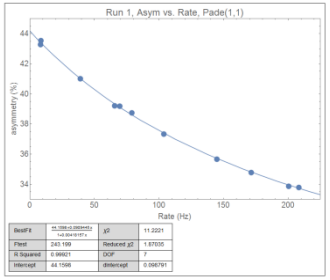
Choosing which Pade orders are not excluded: Asymmetry vs. Rate (mathematica, uncertainties slightly different)

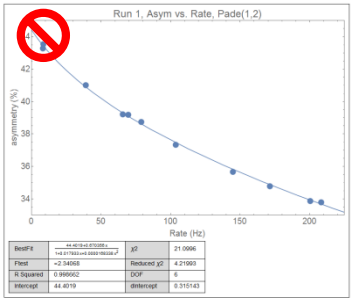


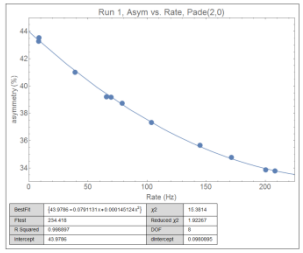


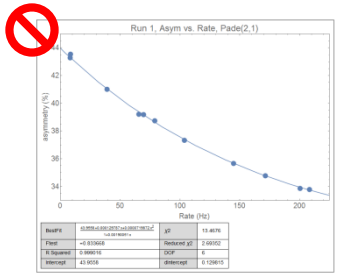


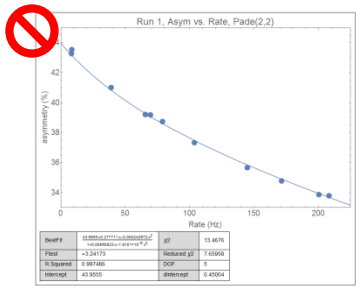


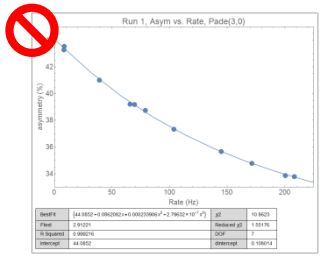












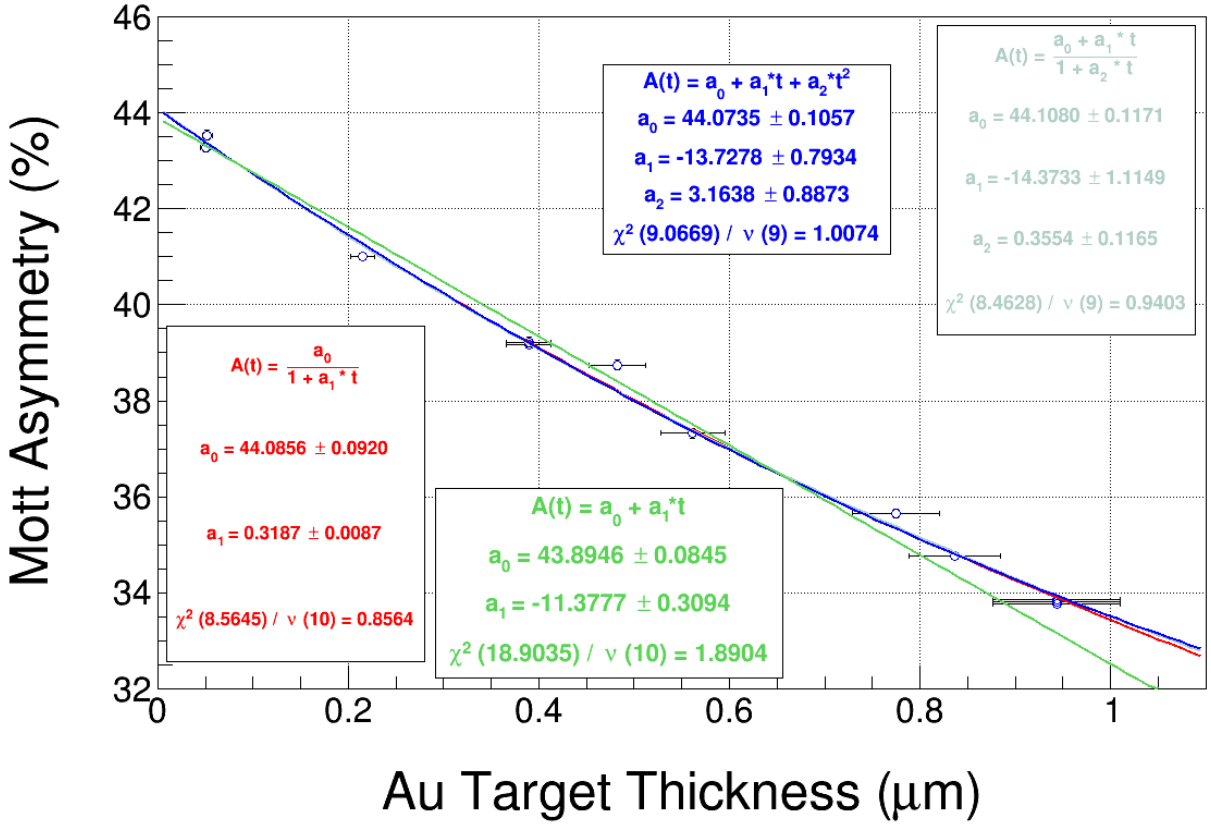
Again, rate uncertainty extrapolated to asym uncertainty for fitting. Rate uncertainties much smaller percentage than thickness uncertainties

Pade(n,m) orders, run 1: A vs rate

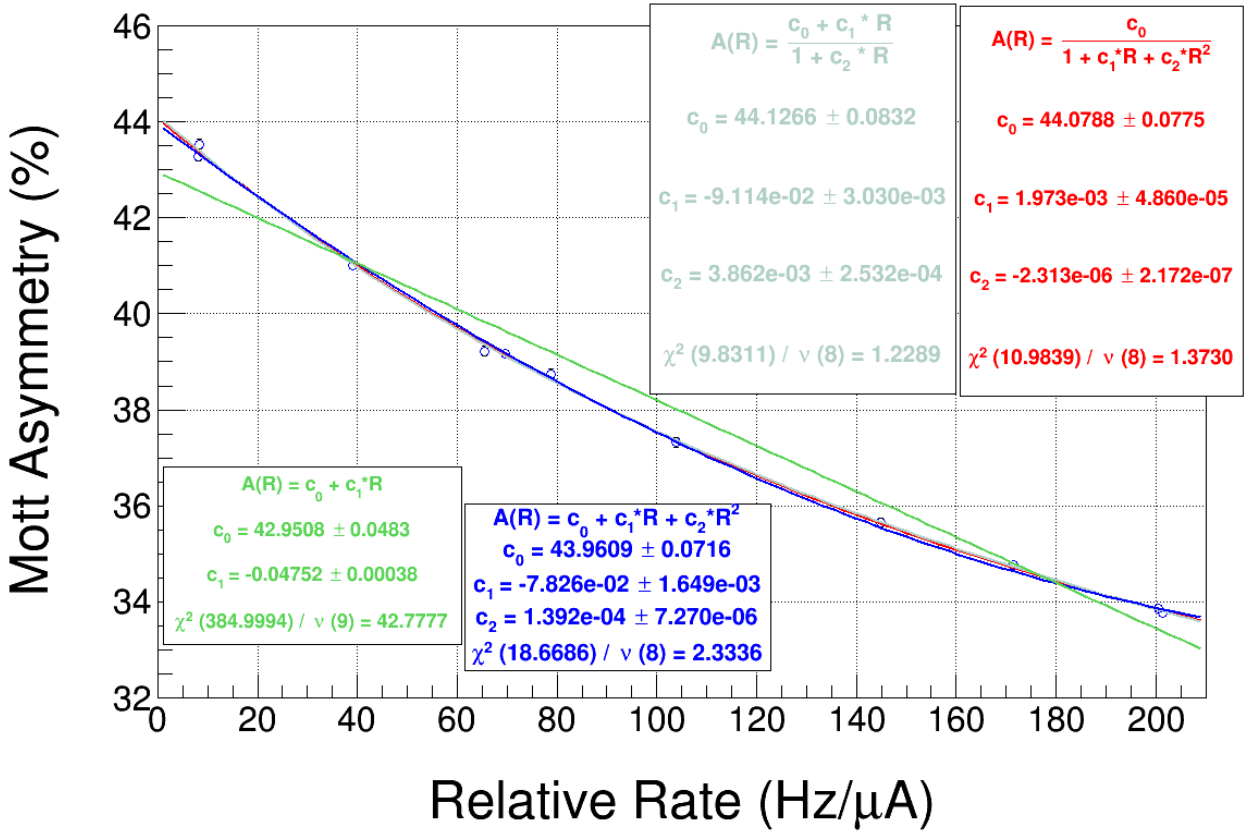
Pade(n,m)	intercept	dA	R^2	red. χ^2	Ftest	
(1,0)	42.87	.343	.968	51.8	--	Reject chi
(2,0)	43.98	.098	.99	1.92	234	
(3,0)	~~44.09~~	.108	.999	1.55	2.91	Reject F
(1,1)	44.1598	0.0988	.999	1.87	243	
(2,1)	~~43.956~~	.130	.999	2.69	-0.83	Reject F
(1,2)	~~44.400~~	.315	.998	4.22	-2.34	Reject F
(0,1)	~~43.4~~	.24	.98	171	13.70	Reject chi
(0,2)	44.106	0.0877	0.999	1.49	108	
(0,3)	43.986	0.102	.999	2.44	-1.72	Reject F
(2,2)	~~43.956~~	.450	.997	7.66	-3.24	Reject F

The following graphs are Daniel’s Root fits with more precise error handling for the best cuts on the data. They are the data that generated the date in the first two tables.

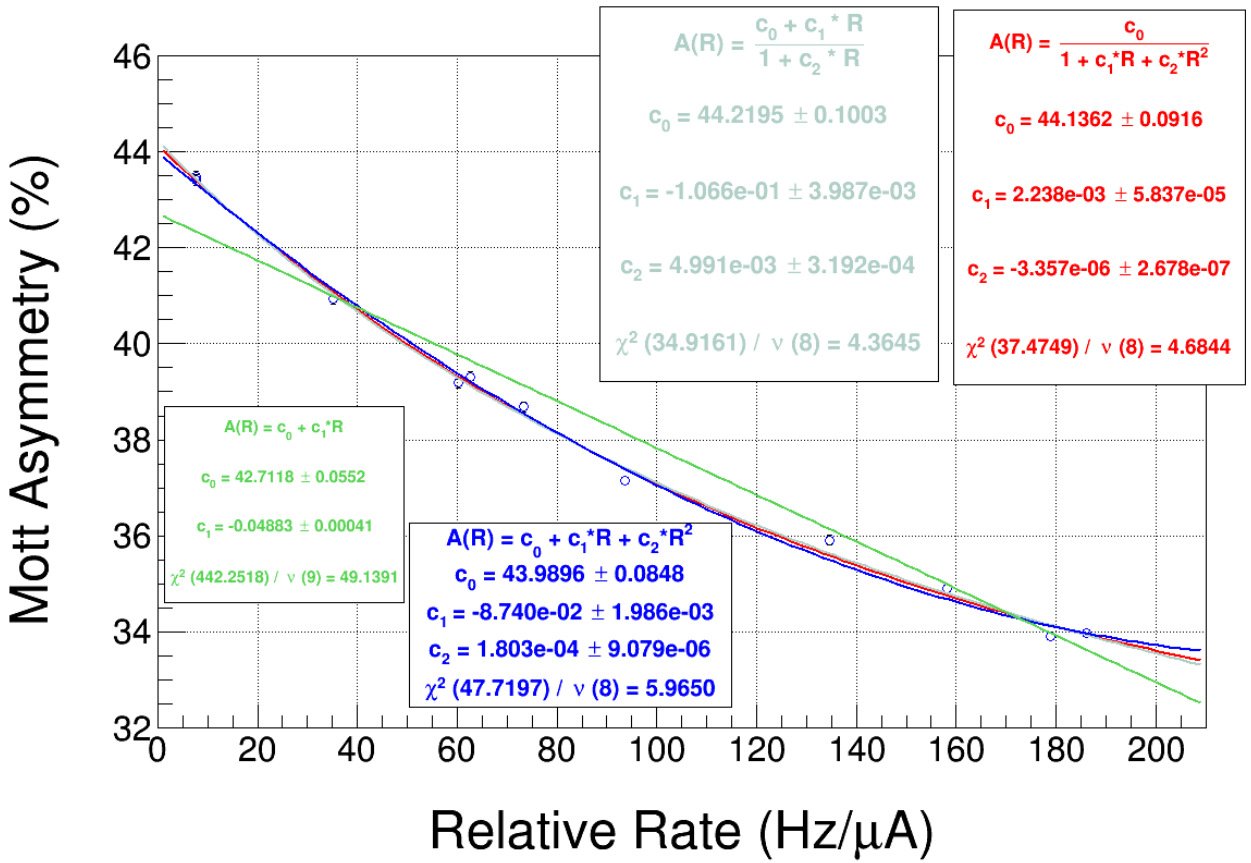
Asym Vs. T Run 1



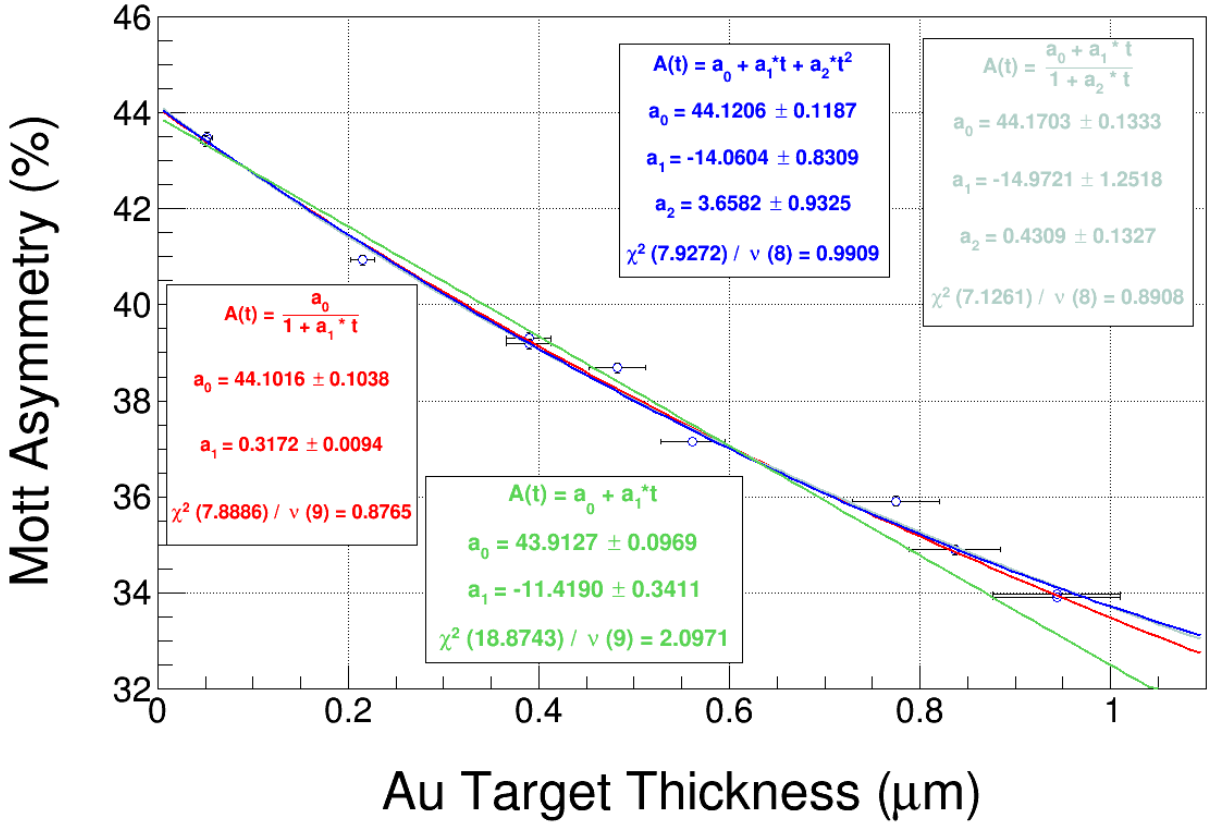
Run 1 A vs. R


Mott Asymmetry (%)
Relative Rate (Hz/μA)
46
44
42
40
38
36
34
32
0
20
40
60
80
100
120
140
160
180
200
A(R) = (c0 + c1 * R) / (1 + c2 * R)
c0 = 44.1266 ± 0.0832
c1 = -9.114e-02 ± 3.030e-03
c2 = 3.862e-03 ± 2.532e-04
χ2 (9.8311) / ν (8) = 1.2289
A(R) = c0 / (1 + c1*R + c2*R2)
c0 = 44.0788 ± 0.0775
c1 = 1.973e-03 ± 4.860e-05
c2 = -2.313e-06 ± 2.172e-07
χ2 (10.9839) / ν (8) = 1.3730
A(R) = c0 + c1*R
c0 = 42.9508 ± 0.0483
c1 = -0.04752 ± 0.00038
χ2 (384.9994) / ν (9) = 42.7777
A(R) = c0 + c1*R + c2*R2
c0 = 43.9609 ± 0.0716
c1 = -7.826e-02 ± 1.649e-03
c2 = 1.392e-04 ± 7.270e-06
χ2 (18.6686) / ν (8) = 2.3336

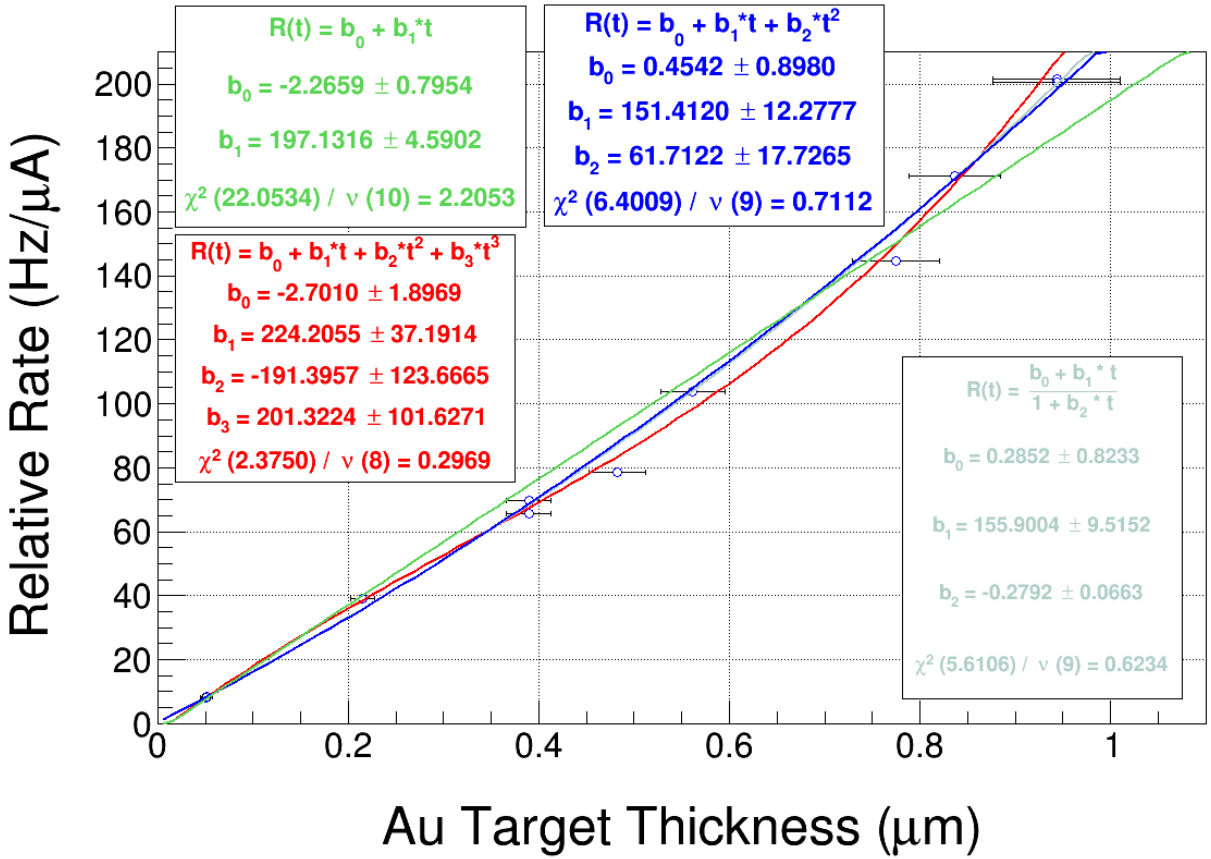
Run 2 A vs. R


Mott Asymmetry (%)
Relative Rate (Hz/μA)
46
44
42
40
38
36
34
32
0
20
40
60
80
100
120
140
160
180
200
A(R) = (c0 + c1 * R) / (1 + c2 * R)
c0 = 44.2195 ± 0.1003
c1 = -1.066e-01 ± 3.987e-03
c2 = 4.991e-03 ± 3.192e-04
χ2 (34.9161) / ν (8) = 4.3645
A(R) = c0 / (1 + c1*R + c2*R2)
c0 = 44.1362 ± 0.0916
c1 = 2.238e-03 ± 5.837e-05
c2 = -3.357e-06 ± 2.678e-07
χ2 (37.4749) / ν (8) = 4.6844
A(R) = c0 + c1*R
c0 = 42.7118 ± 0.0552
c1 = -0.04883 ± 0.00041
χ2 (442.2518) / ν (9) = 49.1391
A(R) = c0 + c1*R + c2*R2
c0 = 43.9896 ± 0.0848
c1 = -8.740e-02 ± 1.986e-03
c2 = 1.803e-04 ± 9.079e-06
χ2 (47.7197) / ν (8) = 5.9650

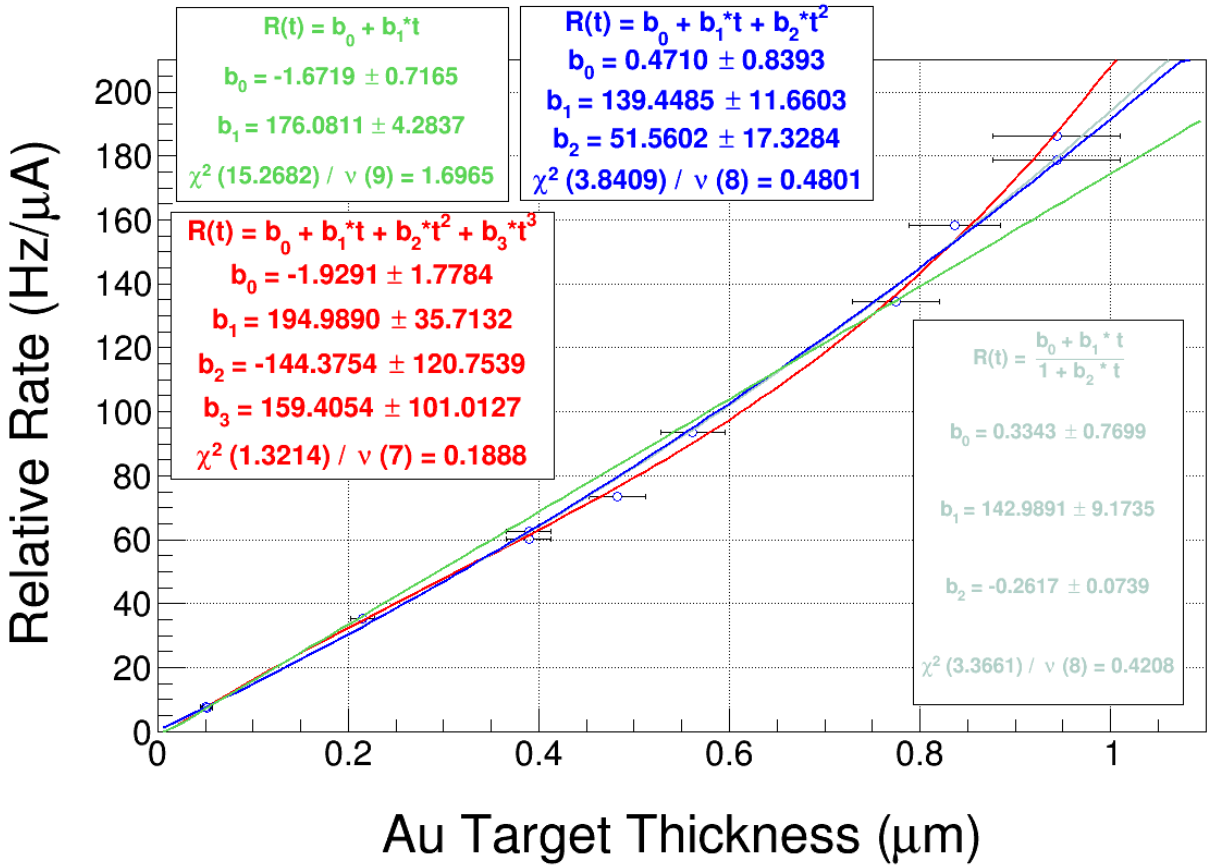
Run 2 A vs. T


Mott Asymmetry (%)
Au Target Thickness (μm)
46
44
42
40
38
36
34
32
0
0.2
0.4
0.6
0.8
1
A(t) = a0 + a1*t + a2*t2
a0 = 44.1206 ± 0.1187
a1 = -14.0604 ± 0.8309
a2 = 3.6582 ± 0.9325
χ2 (7.9272) / ν (8) = 0.9909
A(t) = (a0 + a1 * t) / (1 + a2 * t)
a0 = 44.1703 ± 0.1333
a1 = -14.9721 ± 1.2518
a2 = 0.4309 ± 0.1327
χ2 (7.1261) / ν (8) = 0.8908
A(t) = a0 / (1 + a1 * t)
a0 = 44.1016 ± 0.1038
a1 = 0.3172 ± 0.0094
χ2 (7.8886) / ν (9) = 0.8765
A(t) = a0 + a1*t
a0 = 43.9127 ± 0.0969
a1 = -11.4190 ± 0.3411
χ2 (18.8743) / ν (9) = 2.0971

Run 1 R vs T


R(t) = b0 + b1*t
b0 = -2.2659 ± 0.7954
b1 = 197.1316 ± 4.5902
χ2 (22.0534) / ν (10) = 2.2053
R(t) = b0 + b1*t + b2*t2
b0 = 0.4542 ± 0.8980
b1 = 151.4120 ± 12.2777
b2 = 61.7122 ± 17.7265
χ2 (6.4009) / ν (9) = 0.7112
R(t) = b0 + b1*t + b2*t2 + b3*t3
b0 = -2.7010 ± 1.8969
b1 = 224.2055 ± 37.1914
b2 = -191.3957 ± 123.6665
b3 = 201.3224 ± 101.6271
χ2 (2.3750) / ν (8) = 0.2969
R(t) = (b0 + b1 * t) / (1 + b2 * t)
b0 = 0.2852 ± 0.8233
b1 = 155.9004 ± 9.5152
b2 = -0.2792 ± 0.0663
χ2 (5.6106) / ν (9) = 0.6234
Relative Rate (Hz/μA)
Au Target Thickness (μm)
0
20
40
60
80
100
120
140
160
180
200
0
0.2
0.4
0.6
0.8
1

Run 2 R vs. T


R(t) = b0 + b1*t
b0 = -1.6719 ± 0.7165
b1 = 176.0811 ± 4.2837
χ2 (15.2682) / ν (9) = 1.6965
R(t) = b0 + b1*t + b2*t2
b0 = 0.4710 ± 0.8393
b1 = 139.4485 ± 11.6603
b2 = 51.5602 ± 17.3284
χ2 (3.8409) / ν (8) = 0.4801
R(t) = b0 + b1*t + b2*t2 + b3*t3
b0 = -1.9291 ± 1.7784
b1 = 194.9890 ± 35.7132
b2 = -144.3754 ± 120.7539
b3 = 159.4054 ± 101.0127
χ2 (1.3214) / ν (7) = 0.1888
R(t) = (b0 + b1 * t) / (1 + b2 * t)
b0 = 0.3343 ± 0.7699
b1 = 142.9891 ± 9.1735
b2 = -0.2617 ± 0.0739
χ2 (3.3661) / ν (8) = 0.4208
Relative Rate (Hz/μA)
Au Target Thickness (μm)
0
20
40
60
80
100
120
140
160
180
200
0
0.2
0.4
0.6
0.8
1