

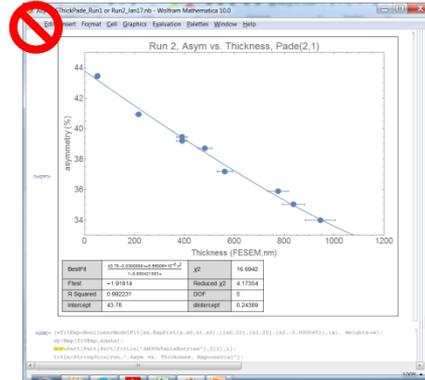
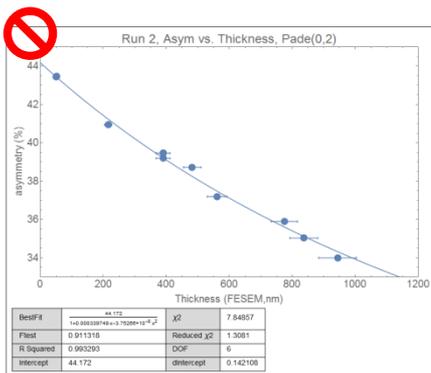
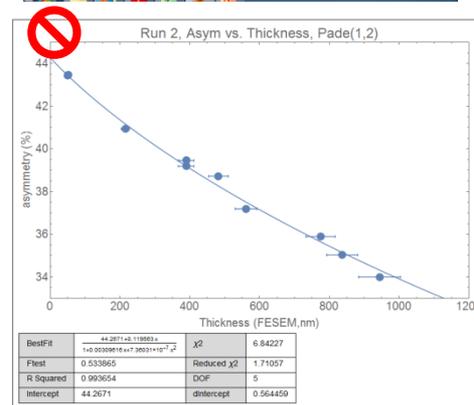
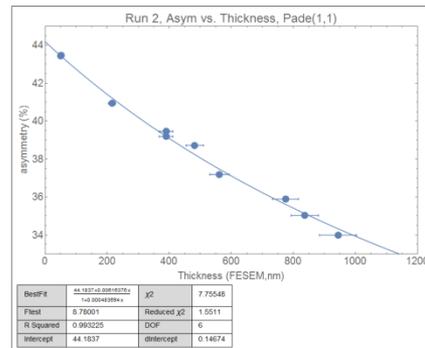
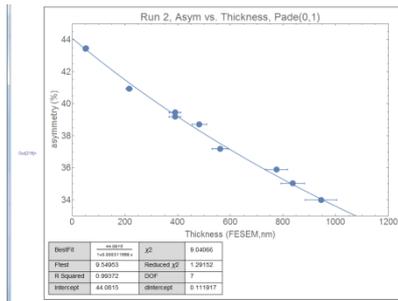
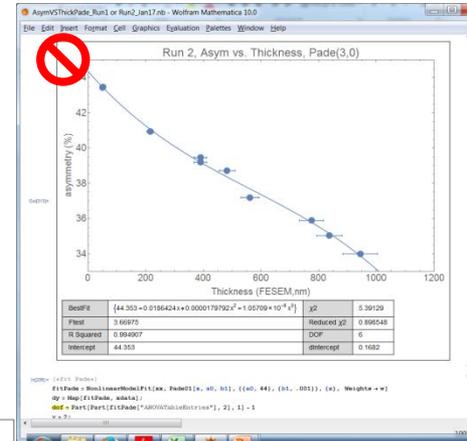
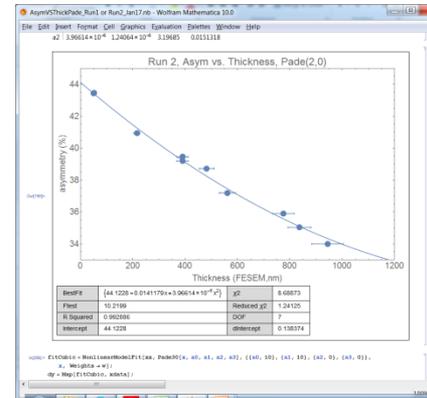
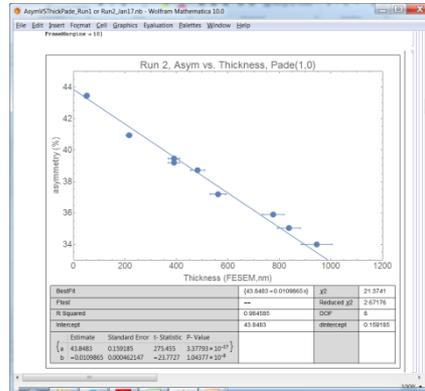
# Pade order investigation

## Re-run of functional forms

11Jan2017

All data

# Asymmetry vs. Thickness Run 2 2017



# Pade(n,m) orders: Asy vs. Thick, Run2 2017

Pade(n,m)	intercept	dA	R <sup>2</sup>	red. $\chi^2$	D.O.Free.	Ftest
(1,0)	43.8483	0.1592	.984	2.67	8	-- worst red. $\chi^2$
(2,0)	44.1228	0.1384	.993	1.24	7	10.22
(3,0)	<del>44.353</del>	.168	0.995	0.899	6	3.67 (rej F test)
(0,1)	44.0815	0.1119	0.994	1.292	7	9.55
(0,2)	<del>44.172</del>	0.1421	0.9933	1.3081	6	0.9113 (rej F. Test)
(1,1)	44.1837	0.1467	0.9932	1.5511	6	8.78
(1,2)	<del>44.2671</del>	0.5644	0.994	1.710	5	0.534 (rej F test)
(2,1)	<del>43.78</del>	0.244	0.992	4.17	5	-1.918 (reject F test)

df	0.995	0.99	0.975	0.95	0.90	0.10	0.05	0.025	0.0
1	---	---	0.001	0.004	0.016	2.706	3.841	5.024	6.63
2	0.010	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.21
3	0.072	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.34
4	0.207	0.297	0.484	0.711	1.064	7.779	9.488	11.143	13.27
5	0.412	0.554	0.831	1.145	1.610	9.236	11.070	12.833	15.08
6	0.676	0.872	1.237	1.635	2.204	10.645	12.592	14.449	16.81
7	0.989	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.47
8	1.344	1.646	2.180	2.733	3.490	13.362	15.507	17.535	20.09

$$F = \frac{S_{j-1} - S_j}{S_j} (N - j - 1)$$

is distributed as a Fisher-Snedecor  $F(1, N - j - 1)$  variable if the  $j^{\text{th}}$  degree is not justified.

From the tabulated value of the  $F$  distribution one can then give the prescription in Table 10.2.

Table 10.2. Maximum degree needed in polynomial approximation.

$N - j - 1$	2	3	4	6	8	12	20	60	120
Reject $j^{\text{th}}$ order to 95% confidence level if $F$ is smaller than	18.5	10.1	7.7	6	5.3	4.7	4.3	4	3.9

# Pade(n,m) orders: Asy vs. Thick, Run1 2017

Pade(n,m)	intercept	dA	R <sup>2</sup>	red. $\chi^2$	D.O.Free.	Ftest
(1,0)	43.8274	0.1370	0.987	2.50	8	n/a
(2,0)	44.052	0.128	0.994	1.338	7	7.93
(3,0)	<del>44.259</del>	0.164	0.995	1.037	6	3.02 rej Ftest
(0,1)	44.041	0.0999	0.9944	1.304	7	8.32
(0,2)	<del>44.0921</del>	0.1334	0.994	1.4429	6	0.327 rej Ftest
(1,1)	44.0976	0.1364	0.998	1.7244	6	6.587
(1,2)	<del>45.0844</del>	23	0.994	1.82	5	0.74 rej Ftest
(2,1)	<del>43.78</del>	0.211	0.994	3.82	5	-1.54 rej F Test

df	0.995	0.99	0.975	0.95	0.90	0.10	0.05	0.025	0.0
1	---	---	0.001	0.004	0.016	2.706	3.841	5.024	6.63
2	0.010	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.21
3	0.072	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.34
4	0.207	0.297	0.484	0.711	1.064	7.779	9.488	11.143	13.27
5	0.412	0.554	0.831	1.145	1.610	9.236	11.070	12.833	15.08
6	0.676	0.872	1.237	1.635	2.204	10.645	12.592	14.449	16.81
7	0.989	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.47
8	1.344	1.646	2.180	2.733	3.490	13.362	15.507	17.535	20.09

$$F = \frac{S_{j-1} - S_j}{S_j} (N - j - 1)$$

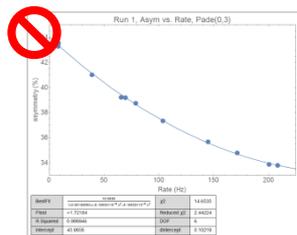
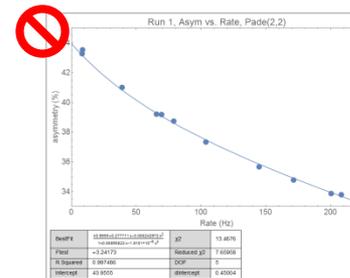
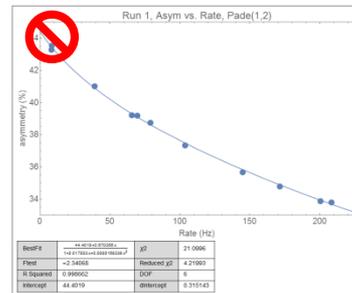
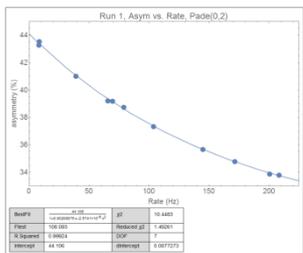
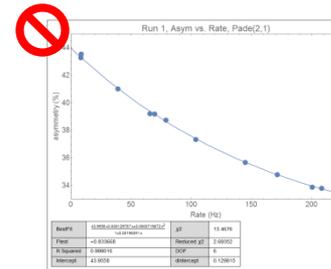
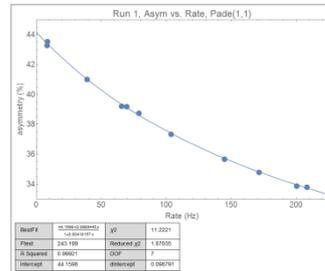
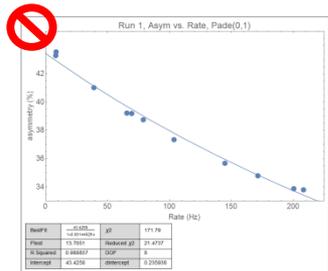
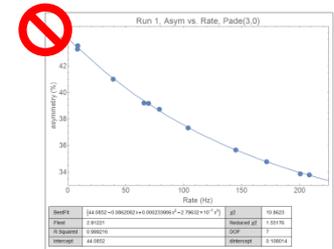
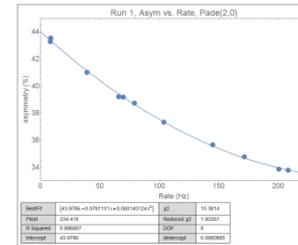
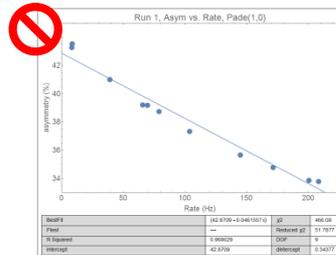
is distributed as a Fisher-Snedecor  $F(1, N - j - 1)$  variable if the  $j^{\text{th}}$  degree is not justified.

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# Pade orders, run 1: Asym vs. Rate

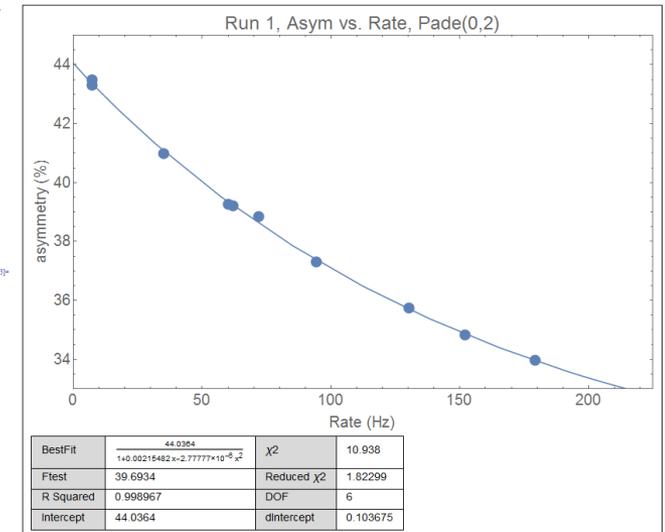
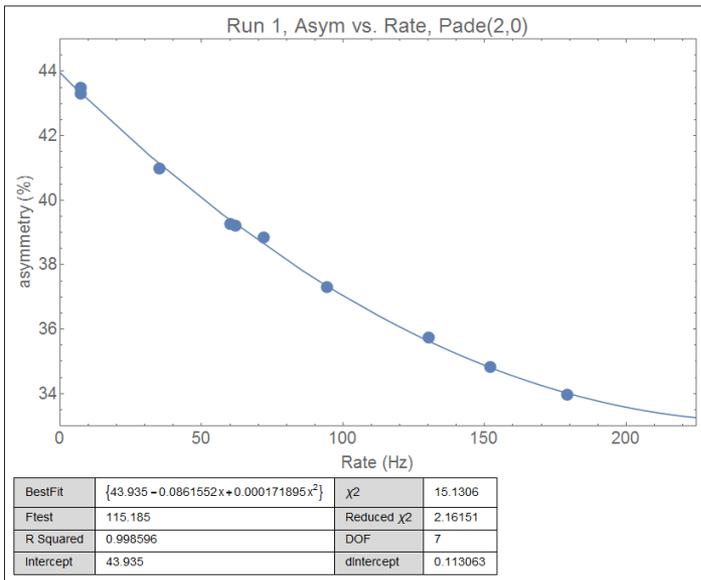
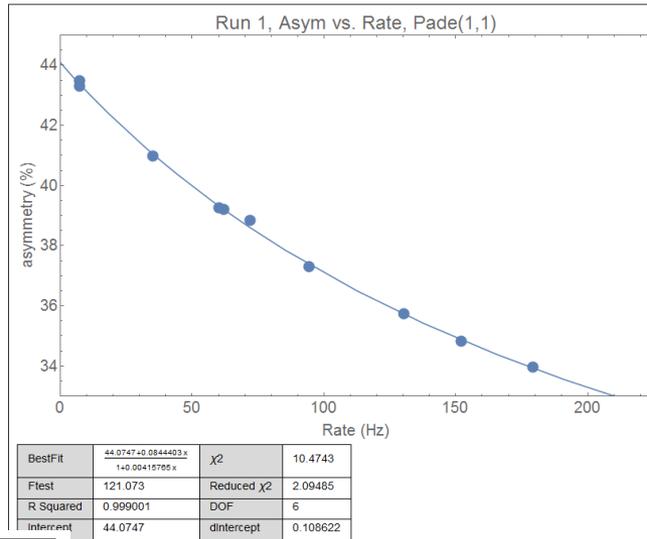


Again, rate uncertainty extrapolated to asym uncertainty for fitting. Rate uncertainties much smaller percentage than thickness uncertainties

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

Pade(n,m)	intercept	dA	R <sup>2</sup>	red. $\chi^2$	Ftest	
(1,0)	43.0651	0.308	0.974	33.01	--	Reject chi
(2,0)	43.935	0.113	0.998	2.16	115	
(3,0)	<del>44.04</del>	0.127	0.999	1.86	2.12	Reject F
(1,1)	44.0747	0.1086	0.999	2.09	121	
(2,1)	<del>44.078</del>	0.143	0.999	2.62	-0.004	Reject F
(1,2)	<del>44.0577</del>	0.139	0.999	2.65	-0.058	Reject F
(0,1)	<del>43.56</del>	0.196	0.99	11	15.194	Reject chi
(0,2)	44.0364	0.1037	0.999	1.82	29.69	
(0,3)	<del>43.939</del>	0.119	0.999	2.92	-1.28	Reject F
(2,2)	<del>43.9554</del>	0.3903	0.998	5.68	-2.15	Reject F

# Allowed Pade fits A vs. R, Run 1



# Pade(n,m) orders, run 2: A vs rate

Pade(n,m)	intercept	dA	R <sup>2</sup>	red. $\chi^2$	Ftest	
(1,0)	42.884	0.3747	0.964	36.88	--	Reject chi
(2,0)	43.9593	0.1866	0.996	4.266	62.158	
(3,0)	<del>44.159</del>	0.1776	0.998	2.607	5.45	Reject F
(1,1)	44.10746	0.1695	0.998	3.55	78.043	
(2,1)	<del>44.043</del>	0.227	0.997	5.47	-0.756	Reject F
(1,2)	<del>44.2403</del>	0.2462	0.998	4.18	0.2467	Reject F
(0,1)	<del>43.4299</del>	0.2726	0.986	17.23	10.123	Reject chi
(0,2)	44.0951	0.1673	0.997	3.44	29.1323	
(0,3)	<del>43.9577</del>	0.199	0.997	5.90	-1.51	Reject F
(2,2)	<del>43.9555</del>	1.106	0.993	15.21	-2.56	Reject F

# Pade(n,m) orders, run 1: Rate vs. Thickness

Pade(n, m)	function	dA	DOF	red. $\chi^2$	Ftest	
(1,0)*	{0.164479 x}	0.0046	8	2.73	n/a	Not reject
(2,0)	{0.111449 + 0.141093 x + 0.0000436137 x^2}	0.7601	7	0.895	17.39	Not reject
(2,0)*	{0.142228 x + 0.0000422168 x^2}	0.0056	8	0.898	17.31	Not reject
(3,0)	{0.151723 x - 6.89155*10^-6 x^2 + 4.70547*10^-8 x^3}	0.0088	6	0.711	1.81	Reject F
(0,1)	15.6383/(1 - 0.000982543 x)	4.81	7	159	-6.86	Reject F
(0,2)	11.7609/(1 - 0.00244356 x + 1.6083*10^-6 x^2)	2.86	6	68	10.267	Reject chi
(1,1)	(0.143629 x)/(1 - 0.000232145 x)	0.0046	6	1.14	14.098	Not reject
(1,2)	(0.837584 + 1.0258 x)/(1 + 0.0470451 x - 0.0000460074 x^2)	1095	5	200	-3.97	Reject F
(2,1)	(0.748261 + 0.14042 x - 0.0000438248 x^2)/(1 - 0.000497014 x)	1.09	5	1.66	-0.518	Reject F

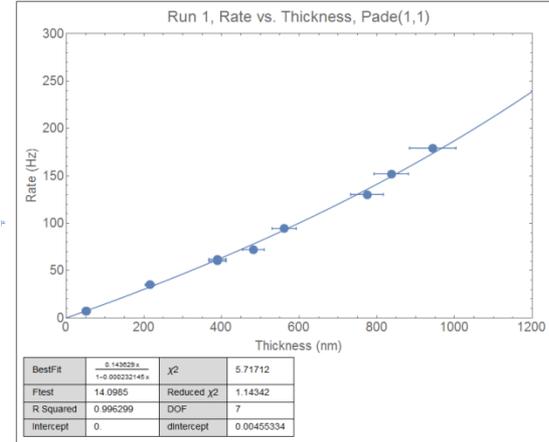
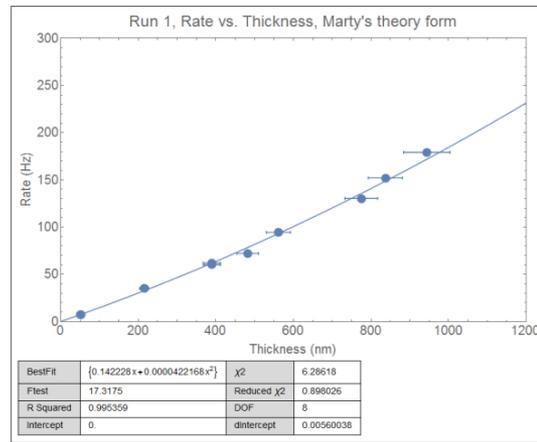
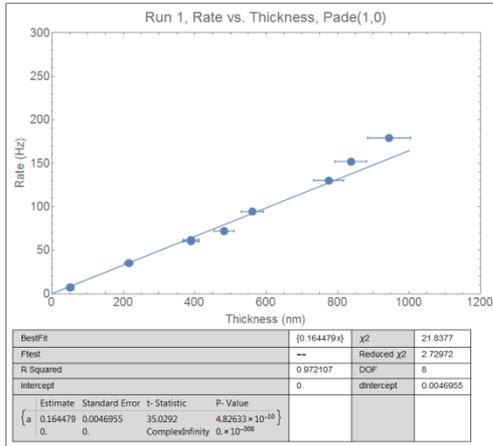
$$F = \frac{\sum_{j=1}^N \sigma_j^2}{S_j} (N - j - 1)$$
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# Allowed orders, RvsT



# Pade(n,m) orders, run 2: Rate vs. Thickness

Pade(n, m)	function	dA	DOF	red. $\chi^2$	Ftest	
(1,0)*	{0.153224 x}	0.0049	8	2.96	n/a	Bad chi sq
(2,0)	{0.404822 + 0.125329 x + 0.0000501778 x^2}	0.723	7	22.26	0.81	Bad chi sq
(2,0)*	{0.12945 x + 0.0000451039 x^2}	0.0054	8	0.845	21	Not reject
(3,0)						Reject F
(0,1)						Reject F
(0,2)						Reject chi
(1,1)*	(0.131145 x)/(1 - 0.000262462 x)	0.0042	7	1.027	18.04	Not reject
(1,2)						Reject F
(2,1)						Reject F

$$F = \frac{S_{j-1}^{-2} / (N - j - 1)}{S_j^{-2} / (N - j - 1)}$$
 is distributed as a Fisher-Snedecor  $F(1, N - j - 1)$  variable if the  $j^{\text{th}}$  degree is not justified.

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# Summary: Allowed Pade orders

For Asy. vs. Thickness

$(1,0)$ ,  $(2,0)$ ,  $(0,1)$ ,  $(1,1)$

For Asy. vs. Rate

$(2,0)$ ,  $(1,1)$ ,  $(0,2)$

For Rate vs. Thickness

$(1,0)$ ,  $(2,0)^*$ ,  $(1,1)^*$  (\*=forced zero)

Theory suggested fits: **in red**

*Italics: doesn't look good, but should still be looked at*