Sensitivity to Choice of Time-of-Flight and Energy Cuts

06/13/17

This document describes how Mott Runs I and II's sensitivty to choice of time-of-flight and energy cut was explored. The goal of the exploration is to determine whether or not it is appropriate to add an additional systematic uncertainty to the final physics asymmetry and rate uncertainties, respectively, and what those values should be.

One run was chosen from each set of runs on a given foil thickness from the Asymmetry vs Thickness studies, and then an additional run from each set of stability runs – Run I has two sets of stability runs, one with the low-threshold PMT setting, one with the high-threshold PMT settings; Run II has only one set of stability runs; all stability runs are on the 1 micron foil. Run I's sample set, then, has 12 individual runs, Run II's has 11. Table 1 shows which runs from each Run were chosen.

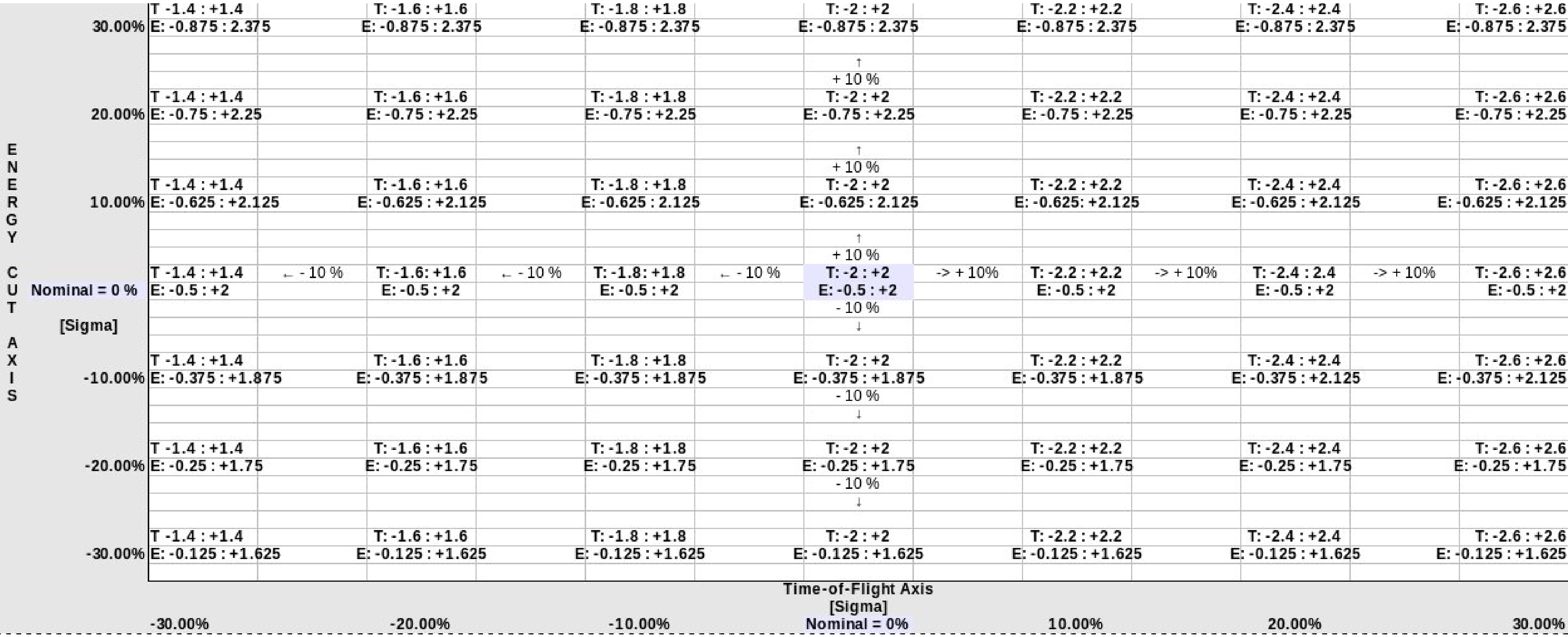
Foil Number	Nominal Thickness	Run I Runs	Run I PMT Threshold	Run II Runs	Run II PMT Threshold
#	T_o [nm]		low/high		-
15	1000	7999	low	8487	-
3	870	8013	low	8513	-
4	750	8024	low	8524	-
2	625	8032	low	8492	-
5	500	8040	low	8533	-
14	350	8048	low	8507	-
8	350	8060	high	8545	-
1	225	8066	high	8521	-
12	50	8074	high	8539	-
13	50	8086	high	8502	-
15	1000	8022	Low-stability	8495	stability
15	1000	8058	High-stability		

Table 1

These runs were then analyzed (run through the analysis code) with various Time-of-Flight and Energy cuts, about our nominal ones – ToF: -2 to +2 sigma; E: -0.5 to +2 sigma. 10% steps of the nominal Time-of-Flight and Energy Cut windows were chosen, varying each by as much as +/- 30%, and creating a 7x7 grid of results as shown in Figure 1. Two grids were created – one for the physics asymmetry, and one for the average rate.

Figure 1:

Cut Grid



ENERGY CUT AXIS [Sigma]	-30.00%		-20.00%		-10.00%		Nominal = 0%		10.00%		20.00%		30.00%
30.00%	T -1.4 : +1.4 E: -0.875 : 2.375		T: -1.6 : +1.6 E: -0.875 : 2.375		T: -1.8 : +1.8 E: -0.875 : 2.375		T: -2 : +2 E: -0.875 : 2.375		T: -2.2 : +2.2 E: -0.875 : 2.375		T: -2.4 : +2.4 E: -0.875 : 2.375		T: -2.6 : +2.6 E: -0.875 : 2.375
							↑ + 10 %						
20.00%	T -1.4 : +1.4 E: -0.75 : +2.25		T: -1.6 : +1.6 E: -0.75 : +2.25		T: -1.8 : +1.8 E: -0.75 : +2.25		T: -2 : +2 E: -0.75 : +2.25		T: -2.2 : +2.2 E: -0.75 : +2.25		T: -2.4 : +2.4 E: -0.75 : +2.25		T: -2.6 : +2.6 E: -0.75 : +2.25
							↑ + 10 %						
10.00%	T -1.4 : +1.4 E: -0.625 : +2.125		T: -1.6 : +1.6 E: -0.625 : +2.125		T: -1.8 : +1.8 E: -0.625 : 2.125		T: -2 : +2 E: -0.625 : 2.125		T: -2.2 : +2.2 E: -0.625: +2.125		T: -2.4 : +2.4 E: -0.625 : +2.125		T: -2.6 : +2.6 E: -0.625 : +2.125
							↑ + 10 %						
Nominal = 0 %	T -1.4 : +1.4 E: -0.5 : +2	← - 10 %	T: -1.6: +1.6 E: -0.5 : +2	← - 10 %	T: -1.8: +1.8 E: -0.5 : +2	← - 10 %	T: -2 : +2 E: -0.5 : +2	-> + 10%	T: -2.2 : +2.2 E: -0.5 : +2	-> + 10%	T: -2.4 : 2.4 E: -0.5 : +2	-> + 10%	T: -2.6 : +2.6 E: -0.5 : +2
							- 10 % ↓						
-10.00%	T -1.4 : +1.4 E: -0.375 : +1.875		T: -1.6 : +1.6 E: -0.375 : +1.875		T: -1.8 : +1.8 E: -0.375 : +1.875		T: -2 : +2 E: -0.375 : +1.875		T: -2.2 : +2.2 E: -0.375 : +1.875		T: -2.4 : +2.4 E: -0.375 : +2.125		T: -2.6 : +2.6 E: -0.375 : +2.125
							- 10 % ↓						
-20.00%	T -1.4 : +1.4 E: -0.25 : +1.75		T: -1.6 : +1.6 E: -0.25 : +1.75		T: -1.8 : +1.8 E: -0.25 : +1.75		T: -2 : +2 E: -0.25 : +1.75		T: -2.2 : +2.2 E: -0.25 : +1.75		T: -2.4 : +2.4 E: -0.25 : +1.75		T: -2.6 : +2.6 E: -0.25 : +1.75
							- 10 % ↓						
-30.00%	T -1.4 : +1.4 E: -0.125 : +1.625		T: -1.6 : +1.6 E: -0.125 : +1.625		T: -1.8 : +1.8 E: -0.125 : +1.625		T: -2 : +2 E: -0.125 : +1.625		T: -2.2 : +2.2 E: -0.125 : +1.625		T: -2.4 : +2.4 E: -0.125 : +1.625		T: -2.6 : +2.6 E: -0.125 : +1.625

Time-of-Flight Axis
[Sigma]

Asymmetry

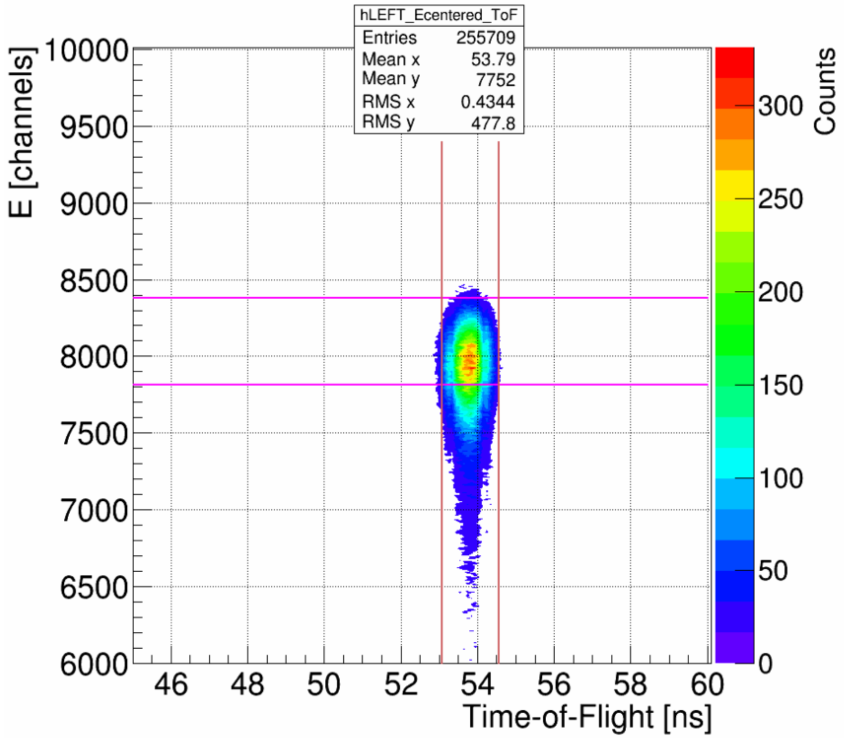
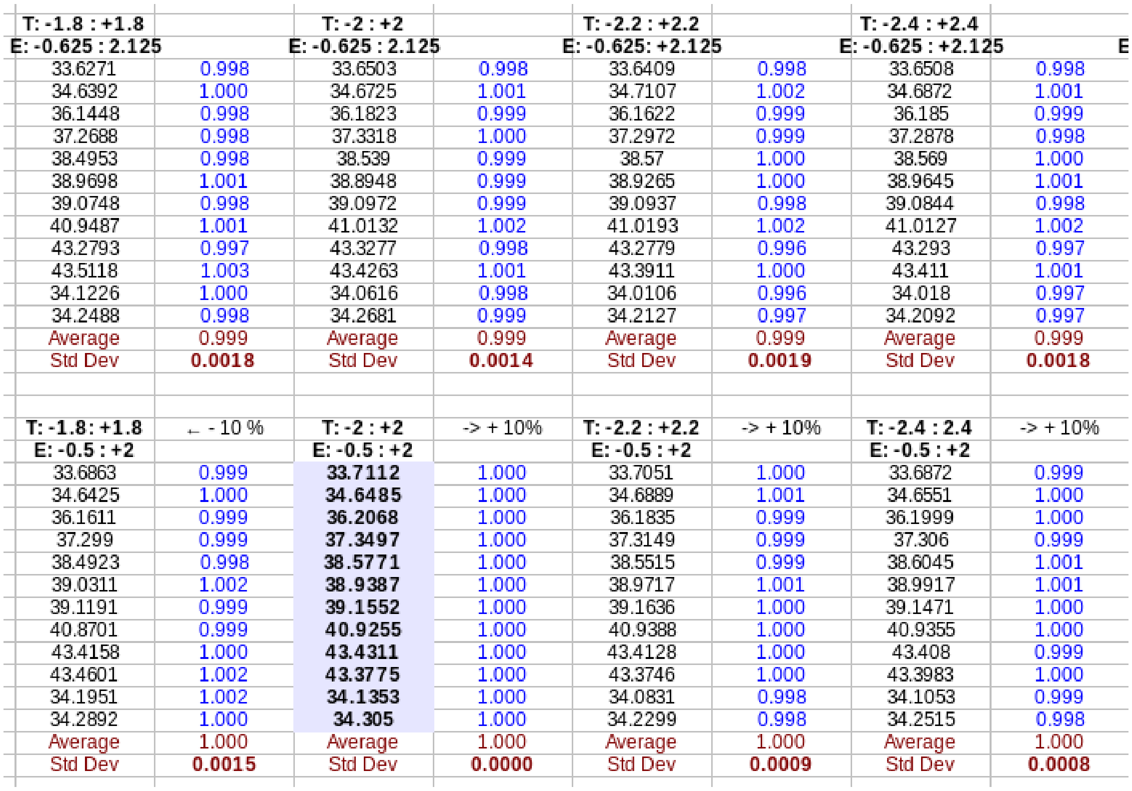


Figure 2: Energy vs Time-of-Flight with Cuts, Contour Plot

With a correct choice of nominal cuts we expect the vast majority of events encompassed by our cut area on an Energy vs ToF 2D plot (Figure 2) to be from scatterings off of the target foil and carrying asymmetry. Varying these cuts by as much as +30%, this assumption should remain true, and of course it is true when shrinking our cut area. As such, we can directly compare asymmetries computed using our nominal set of cuts to asymmetries computed using varied cuts. This is done by dividing the varied-cut asymmetry for a given foil thickness by the corresponding nominal-cut asymmetry for the same foil. Below, Figure 3, is a sampling of the 7x7 asymmetry grid to illustrate this. The bold-font, blue-gray background numbers are the nominal-cuts asymmetries for our sample runs from Run I. Surrounding it in black font are varied-cut asymmetries. To the right of each black-font, varied-cut asymmetry is the computed varied-cut asymmetry / nominal-cut asymmetry value in blue font, values distributed about unity. One could call these values



T: -1.8 : +1.8		**T: -2 : +2**		**T: -2.2 : +2.2**		**T: -2.4 : +2.4**		
E: -0.625 : 2.125		**E: -0.625 : 2.125**		**E: -0.625: +2.125**		**E: -0.625 : +2.125**		**E**
33.6271	0.998	33.6503	0.998	33.6409	0.998	33.6508	0.998	
34.6392	1.000	34.6725	1.001	34.7107	1.002	34.6872	1.001	
36.1448	0.998	36.1823	0.999	36.1622	0.999	36.185	0.999	
37.2688	0.998	37.3318	1.000	37.2972	0.999	37.2878	0.998	
38.4953	0.998	38.539	0.999	38.57	1.000	38.569	1.000	
38.9698	1.001	38.8948	0.999	38.9265	1.000	38.9645	1.001	
39.0748	0.998	39.0972	0.999	39.0937	0.998	39.0844	0.998	
40.9487	1.001	41.0132	1.002	41.0193	1.002	41.0127	1.002	
43.2793	0.997	43.3277	0.998	43.2779	0.996	43.293	0.997	
43.5118	1.003	43.4263	1.001	43.3911	1.000	43.411	1.001	
34.1226	1.000	34.0616	0.998	34.0106	0.996	34.018	0.997	
34.2488	0.998	34.2681	0.999	34.2127	0.997	34.2092	0.997	
Average	0.999	Average	0.999	Average	0.999	Average	0.999	
Std Dev	**0.0018**	Std Dev	**0.0014**	Std Dev	**0.0019**	Std Dev	**0.0018**	
T: -1.8: +1.8	← - 10 %	**T: -2 : +2**	-> + 10%	**T: -2.2 : +2.2**	-> + 10%	**T: -2.4 : 2.4**	-> + 10%	
E: -0.5 : +2		**E: -0.5 : +2**		**E: -0.5 : +2**		**E: -0.5 : +2**		
33.6863	0.999	**33.7112**	1.000	33.7051	1.000	33.6872	0.999	
34.6425	1.000	**34.6485**	1.000	34.6889	1.001	34.6551	1.000	
36.1611	0.999	**36.2068**	1.000	36.1835	0.999	36.1999	1.000	
37.299	0.999	**37.3497**	1.000	37.3149	0.999	37.306	0.999	
38.4923	0.998	**38.5771**	1.000	38.5515	0.999	38.6045	1.001	
39.0311	1.002	**38.9387**	1.000	38.9717	1.001	38.9917	1.001	
39.1191	0.999	**39.1552**	1.000	39.1636	1.000	39.1471	1.000	
40.8701	0.999	**40.9255**	1.000	40.9388	1.000	40.9355	1.000	
43.4158	1.000	**43.4311**	1.000	43.4128	1.000	43.408	0.999	
43.4601	1.002	**43.3775**	1.000	43.3746	1.000	43.3983	1.000	
34.1951	1.002	**34.1353**	1.000	34.0831	0.998	34.1053	0.999	
34.2892	1.000	**34.305**	1.000	34.2299	0.998	34.2515	0.998	
Average	1.000	Average	1.000	Average	1.000	Average	1.000	
Std Dev	**0.0015**	Std Dev	**0.0000**	Std Dev	**0.0009**	Std Dev	**0.0008**	

Figure 3

the asymmetry ratios for a given set of cuts versus the nominal set. Then, the average and the standard deviation (standard deviation *of a sample*) for each set of asymmetry ratios is computed in red font below blue. The ultimate take-away from the 7x7 grid of asymmetries, and then computed asymmetry ratios, is the standard deviation for a varied set of cuts' asymmetry ratios. This value is a direct measure of the amount of change in physics asymmetry due to change from nominal cuts. If a varied set of cuts produced the exact same asymmetries as the nominal set, this value would be zero. The more the asymmetries computed from a varied set of cuts vary from the nominal set of cuts asymmetries, the larger this value will be.

From these standard deviations, Table 2.1 is created from Run I data. Blue-grey-background center box represents nominal cuts, or 0% variation in cuts. The 8 values around it, represent the 10% variation in cuts box, put together with the next 16 values around it gives the 20% variation in cuts box, and then finally all the values taken together represent the 30% variation in cuts box.

		T -1.4 : +1.4	**T: -1.6 : +1.6**	**T: -1.8 : +1.8**	**T: -2 : +2**	**T: -2.2 : +2.2**	**T: -2.4 : +2.4**	**T: -2.6 : +2.6**
		-30	-20	-10	0	10	20	30
E: -0.875 : 2.375	30	0.0021	0.0022	0.0023	0.0019	0.0025	0.0024	0.0026
E: -0.75 : +2.25	20	0.0019	0.0020	0.0021	0.0016	0.0022	0.0020	0.0022
E: -0.625 : +2.125	10	0.0021	0.0017	0.0018	0.0014	0.0019	0.0018	0.0020
E: -0.5 : +2	0	0.0024	0.0016	0.0015	0.0000	0.0009	0.0008	0.0011
E: -0.375 : +1.875	-10	0.0029	0.0024	0.0018	0.0014	0.0014	0.0014	0.0017
E: -0.25 : +1.75	-20	0.0037	0.0034	0.0029	0.0030	0.0027	0.0030	0.0032
E: -0.125 : +1.625	-30	0.0040	0.0033	0.0029	0.0027	0.0025	0.0025	0.0026

Table 2.1

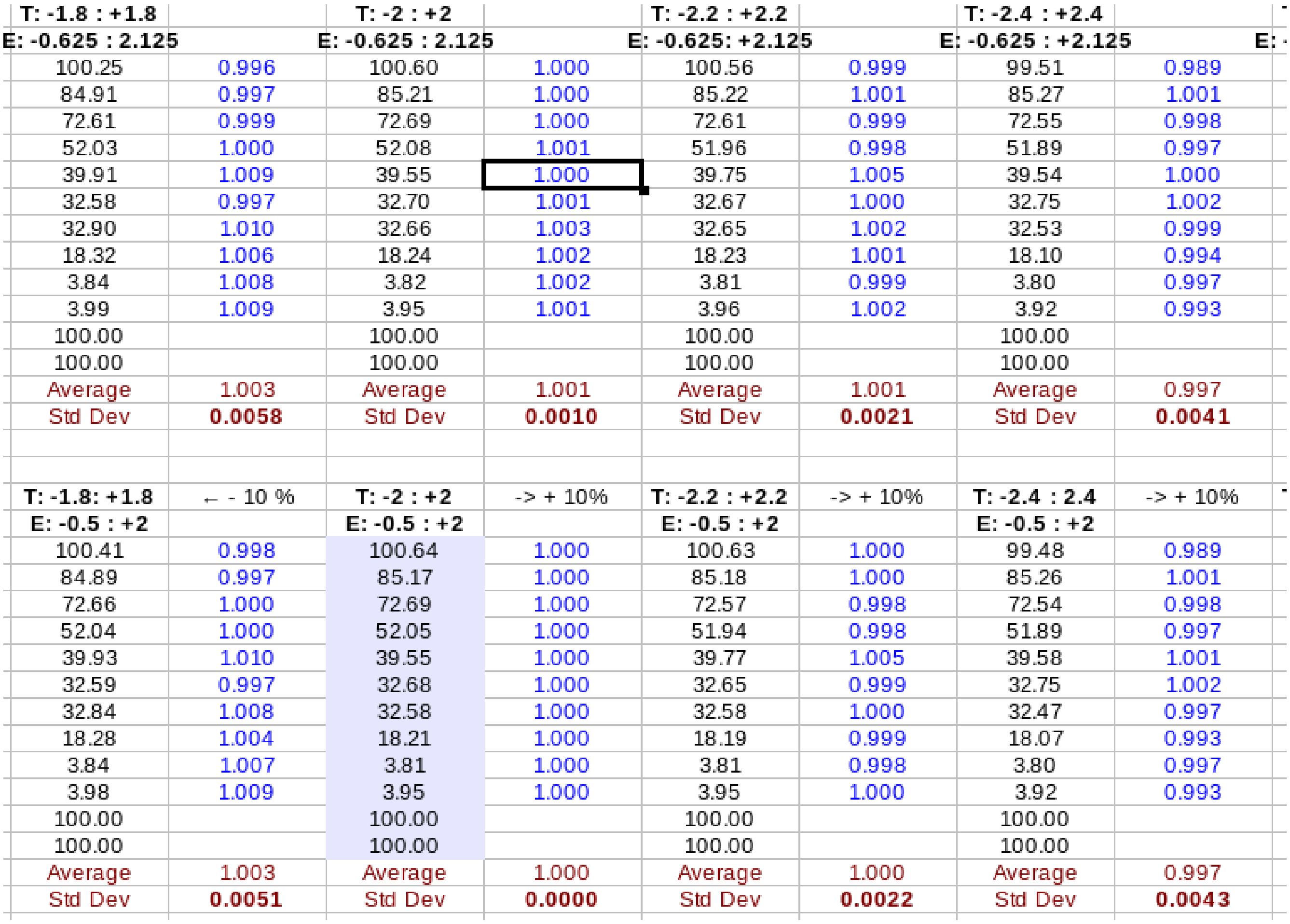
The maximum value within a given percent variation in cuts box, then, is the maximum change in physics asymmetry due to variation in cuts up to that percent. In other words, the maximum value in a given box is a systematic uncertainty due to our choice of nominal time-of-flight and energy cuts. When multiplied by 100, this value is a percent uncertainty, as shown in the table below for Run I data.

Variation in Cuts	dA_syst
10 Percent Box	0.19%
20 Percent Box	0.34%
30 Percent Box	0.40%

Table 2.2

Rate

A similar 7x7 grid is created for average rate. Unlike asymmetry, when varying our time-of-flight and energy cuts we expect the average rate to change because we are changing the number of good physics events used to compute asymmetry and rate in the analysis code (ie we are encompassing a smaller or larger area of the Energy vs ToF 2D plot shown in figure 2). Rate is directly proportional to total number of good physics events (whereas asymmetry is not). To account for this, prior to filling in the 7x7 grid of average rate on a given foil for a set of cuts, we normalize each set of rates by the set's stability run and for ease of reading multiply by 100. In Run II, since all the Asymmetry vs Foil Thickness runs were taken with the same detector PMT high-voltages, all runs in our sample set are divided by the one sample stability run. In Run I, where two sets of detector PMT high-voltages were used, theshold low and high, two different stability runs are employed. If the run was performed at low threshold, it is normalized by the low threshold stability run and likewise for the high threshold ones. A sample of the Run I rate grid is shown in figure 4 below.



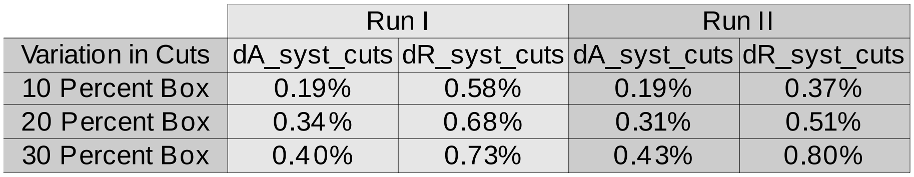
T: -1.8 : +1.8		**T: -2 : +2**		**T: -2.2 : +2.2**		**T: -2.4 : +2.4**	
E: -0.625 : 2.125		**E: -0.625 : 2.125**		**E: -0.625: +2.125**		**E: -0.625 : +2.125**	
100.25	0.996	100.60	1.000	100.56	0.999	99.51	0.989
84.91	0.997	85.21	1.000	85.22	1.001	85.27	1.001
72.61	0.999	72.69	1.000	72.61	0.999	72.55	0.998
52.03	1.000	52.08	1.001	51.96	0.998	51.89	0.997
39.91	1.009	39.55	1.000	39.75	1.005	39.54	1.000
32.58	0.997	32.70	1.001	32.67	1.000	32.75	1.002
32.90	1.010	32.66	1.003	32.65	1.002	32.53	0.999
18.32	1.006	18.24	1.002	18.23	1.001	18.10	0.994
3.84	1.008	3.82	1.002	3.81	0.999	3.80	0.997
3.99	1.009	3.95	1.001	3.96	1.002	3.92	0.993
100.00		100.00		100.00		100.00	
100.00		100.00		100.00		100.00	
Average	1.003	Average	1.001	Average	1.001	Average	0.997
Std Dev	**0.0058**	Std Dev	**0.0010**	Std Dev	**0.0021**	Std Dev	**0.0041**
T: -1.8: +1.8	← - 10 %	**T: -2 : +2**	-> + 10%	**T: -2.2 : +2.2**	-> + 10%	**T: -2.4 : 2.4**	-> + 10%
E: -0.5 : +2		**E: -0.5 : +2**		**E: -0.5 : +2**		**E: -0.5 : +2**	
100.41	0.998	100.64	1.000	100.63	1.000	99.48	0.989
84.89	0.997	85.17	1.000	85.18	1.000	85.26	1.001
72.66	1.000	72.69	1.000	72.57	0.998	72.54	0.998
52.04	1.000	52.05	1.000	51.94	0.998	51.89	0.997
39.93	1.010	39.55	1.000	39.77	1.005	39.58	1.001
32.59	0.997	32.68	1.000	32.65	0.999	32.75	1.002
32.84	1.008	32.58	1.000	32.58	1.000	32.47	0.997
18.28	1.004	18.21	1.000	18.19	0.999	18.07	0.993
3.84	1.007	3.81	1.000	3.81	0.998	3.80	0.997
3.98	1.009	3.95	1.000	3.95	1.000	3.92	0.993
100.00		100.00		100.00		100.00	
100.00		100.00		100.00		100.00	
Average	1.003	Average	1.000	Average	1.000	Average	0.997
Std Dev	**0.0051**	Std Dev	**0.0000**	Std Dev	**0.0022**	Std Dev	**0.0043**

Figure 4

Again, blue-gray-background implies nominal set of cuts. The last two rows of any set are the two stability runs, and so when normalized by themselves and mulitplied by 100 are always 100. They are not included in any further calculations. Black font numbers represent stability-normalized rates. Then, similar to the asymmetry grid, to the right of each set of stability-normalized rates in blue font are ratios of stability-normalized rates for varied cuts to stability normalized rates for nominal cuts. That is, blue font numbers = ratio of stability-normalized rate = varied cut stability-normalized rate for a given foil / nominal cut stability-normalized rate for the same foil. Then, the average and the standard deviation (of a sample) for these sets of ratios of stability-normalized rates are calculated beneath in red font.

Just like from the asymmetry grid, the standard deviation is a measure of how much the stability-normalized rate changes due to change in cuts about the nominal choice of cuts. We can construct 0, 10, 20 and 30% variation in cuts boxes, and from the maximum value in each of these boxes determine a systematic percent uncertainty due to choice of cuts on our rate.

Grid Results



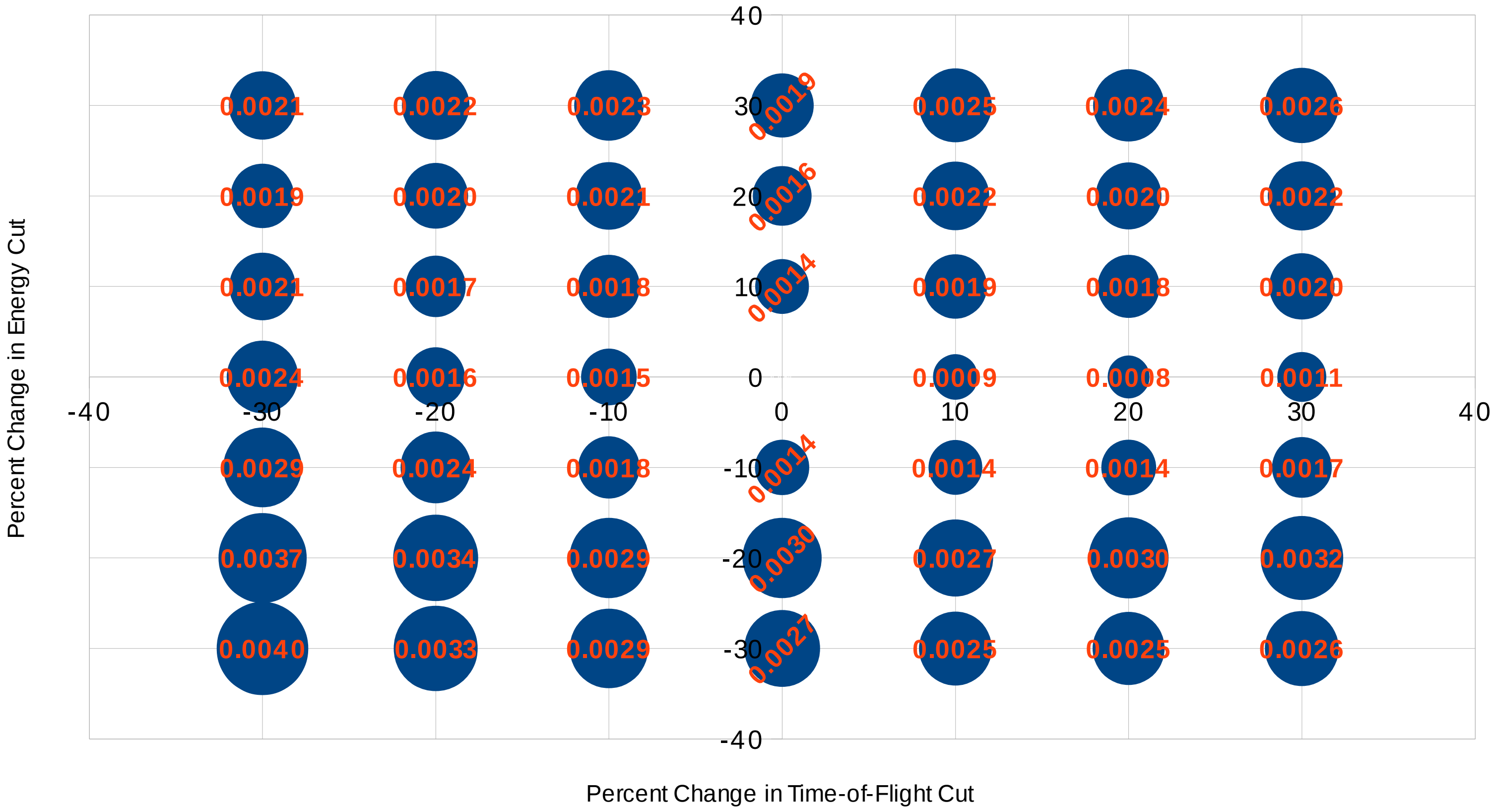
	Run I		Run II	
Variation in Cuts	dA_syst_cuts	dR_syst_cuts	dA_syst_cuts	dR_syst_cuts
10 Percent Box	0.19%	0.58%	0.19%	0.37%
20 Percent Box	0.34%	0.68%	0.31%	0.51%
30 Percent Box	0.40%	0.73%	0.43%	0.80%

Table 3

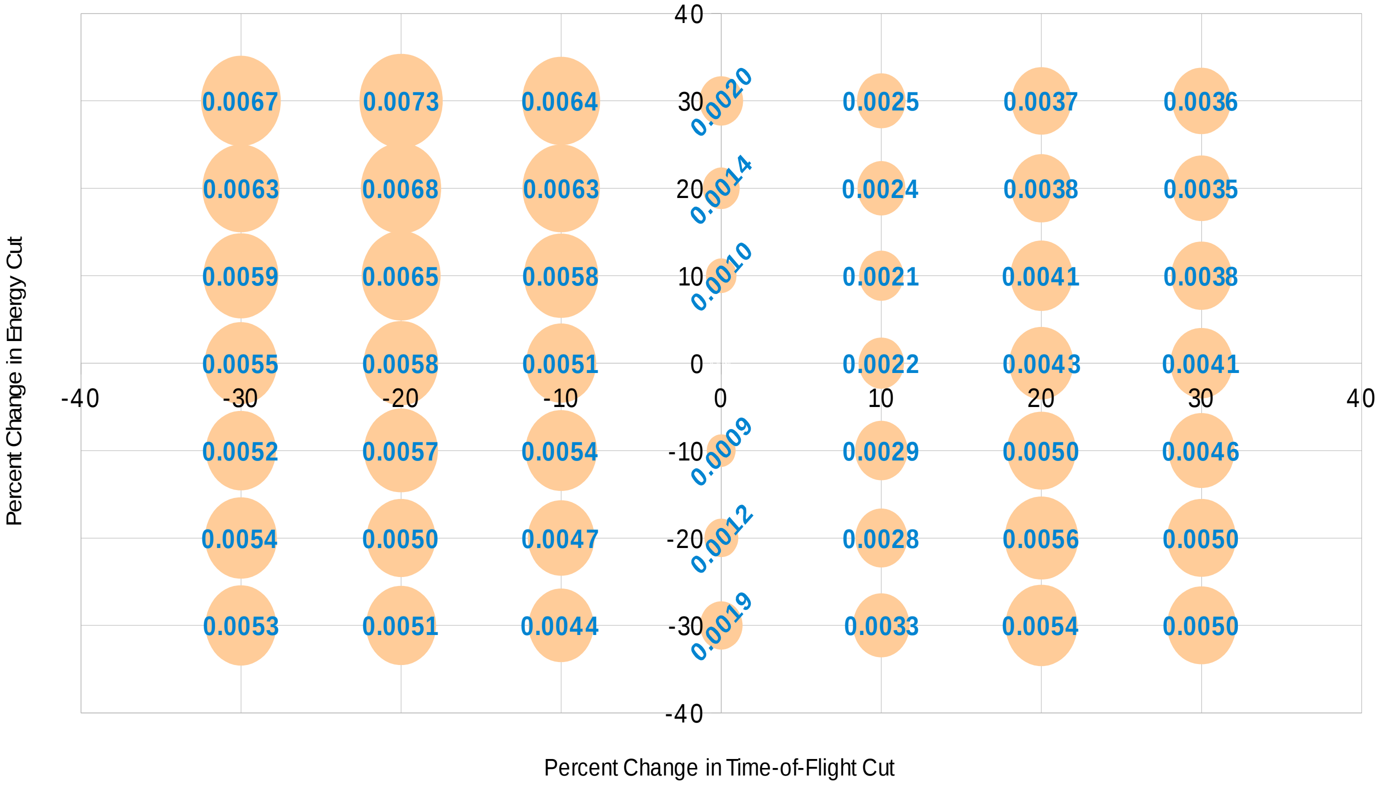
Table 3 presents percent systematic uncertainties for asymmetry and rate respectively, for each percent variation from nominal cuts box, up to 30%. For each box, these values are added in quadrature with the other respective rate and asymmetry uncertainities to form final rate and asymmetry uncertainties. At this point, the Asymmetry vs Foil Thickness and Asymmetry vs Rate fits are performed from which A_0, the zero-thickness/single-atom scattering, is extrapolated from. How choice of percent variation from nominal cuts box affects these final AvT and AvR fits is explored next.

Run I Bubble Graphs

Standard Deviation of Asymmetry Ratio (varied-cuts/nominal-cuts) versus Time-of-Flight and Energy Cut

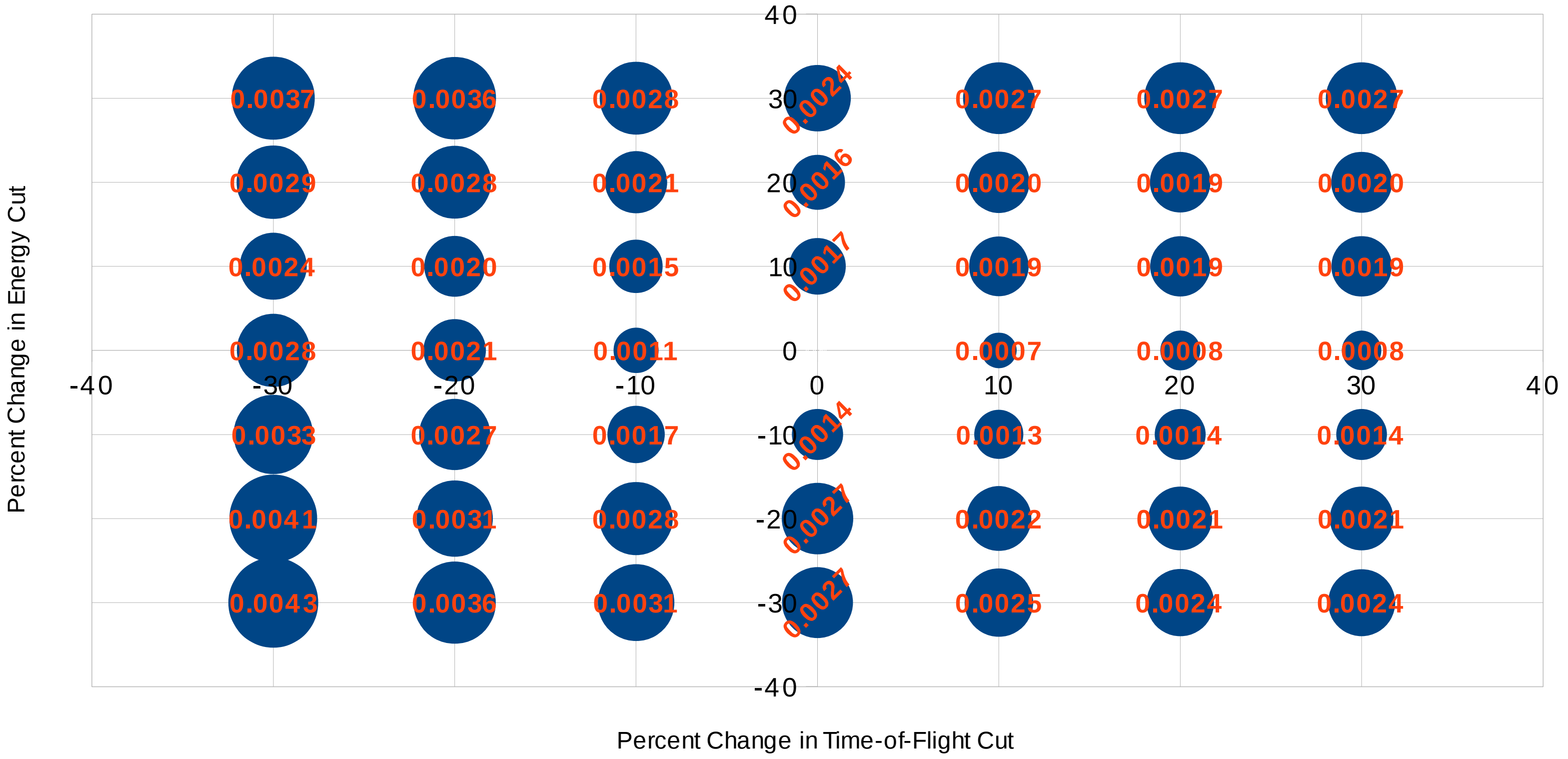


Standard Deviation of Stability-Normalized Rate Ratio (varied-cuts/nominal-cuts) versus Time-of-Flight and Energy Cut

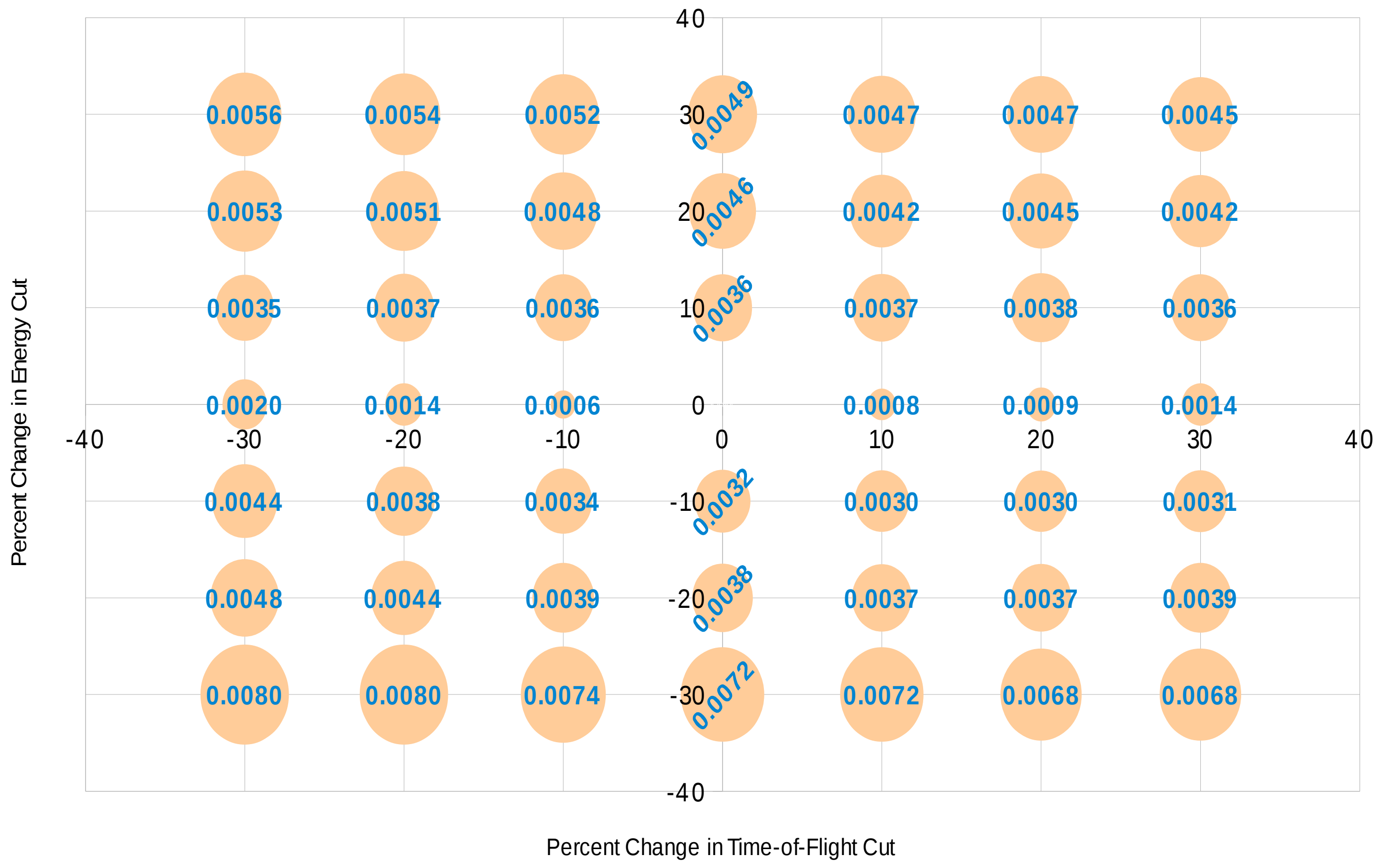


Run II Bubble Graphs

Standard Deviation of Asymmetry Ratio (varied-cuts/nominal-cuts) versus Time-of-Flight and Energy Cut



Standard Deviation of Stability-Normalized Rate Ratio (varied-cuts/nominal-cuts) versus Time-of-Flight and Energy Cut



AvT and AvR Fits versus Choice of Systematic Uncertainty due to Time-of-Flight and Energy Cuts (ie choice of box)

Adding in, in quadrature with all other relevant uncertainties, the percent uncertainties due to choice of cuts changes final dA and dR values, while A and R values remain the same. As such, AvT and AvR fits change. This section explores how the three best AvT and AvR fits change due to choice of uncertainty due to cuts.

Run I

Run I Asymmetry vs Foil Thickness Fit Parameters' Sensitivity to Choice of Cuts											
		Fit	a0	d(a0)	a1	d(a1)	a2	d(a2)	Chi^2 / NDF	Sum of Residuals / N_points	Sum of Square of Residuals / N_points
Box (%)	0.00%	Pade(0,1)	44.083	0.093	0.316	0.008			0.974	0.022	0.062
dA_syst_cuts	0.0000	Pade(1,1)	44.109	0.118	1.428	3.808	0.357	0.108	1.066	0.012	0.065
		Pade(2,0)	44.072	0.108	-13.641	0.763	3.134	0.836	1.150	0.019	0.066
Box (%)	10.00%	Pade(0,1)	44.073	0.110	0.315	0.009			0.815	0.015	0.062
dA_syst_cuts	0.0019	Pade(1,1)	44.090	0.140	0.808	4.045	0.338	0.116	0.901	0.010	0.063
		Pade(2,0)	44.053	0.128	-13.488	0.834	2.983	0.897	0.967	0.016	0.065
Box (%)	20.00%	Pade(0,1)	44.063	0.139	0.314	0.010			0.625	0.006	0.062
dA_syst_cuts	0.0034	Pade(1,1)	44.061	0.178	-0.092	4.462	0.312	0.129	0.695	0.007	0.062
		Pade(2,0)	44.023	0.164	-13.263	0.965	2.762	1.009	0.738	0.011	0.063
Box (%)	30.00%	Pade(0,1)	44.062	0.151	0.314	0.010			0.567	0.004	0.062
dA_syst_cuts	0.0040	Pade(1,1)	44.051	0.189	-0.390	4.408	0.303	0.128	0.629	0.006	0.061
		Pade(2,0)	44.014	0.179	-13.189	1.023	2.689	1.060	0.667	0.009	0.063
Fits		Pade(0,1) ::: A(t) = a0 / (1 + a1 * t)									
		Pade(1,1) ::: A(t) = (a0 + a1 * t) / (1 + a2 * t)									
		Pade(2,0) ::: A(t) = a0 + a1*t + a2*t*t									

Table 4

For Asymmetry vs Thickness, the three best fits are a Pade(1,1) predicted from simulation, a Pade(0,1) and then a Pade(2,0). Table 4 displays how the various fit parameters are affected by different choice of percent variation in cuts box. The far left two columns refer to the simple (data – fit) = residual. Associated plots for this table, along with plots of residuals from each fit, are in the appendix under Run I Asymmetry versus Thickness Fits.

Run I Asymmetry vs Rate Fit Parameters' Sensitivity to Choice of Cuts

		Fit	c0	d(c0)	c1	d(c1)	c2	d(c2)	Chi^2 / NDF	Sum of Residuals / N_points	Sum of Square of Residuals / N_points
Box (%)	0.00%	Pade(0,2)	44.022	0.083	2.11E-03	6.08E-05	-2.79E-06	2.96E-07	1.440	0.010	0.033
dA_syst_cuts	0.0000	Pade(1,1)	44.077	0.091	-9.84E-02	3.92E-03	4.34E-03	3.43E-04	1.177	0.007	0.030
dR_syst_cuts	0.0000	Pade(2,0)	43.912	0.078	-8.37E-02	2.07E-03	1.62E-04	9.75E-06	2.360	0.017	0.042
Box (%)	10.00%	Pade(0,2)	44.016	0.106	2.11E-03	7.49E-05	-2.75E-06	3.61E-07	0.937	0.007	0.033
dA_syst_cuts	0.0019	Pade(1,1)	44.072	0.116	-9.80E-02	4.85E-03	4.30E-03	4.18E-04	0.769	0.004	0.030
dR_syst_cuts	0.0058	Pade(2,0)	43.903	0.099	-8.33E-02	2.54E-03	1.60E-04	1.19E-05	1.540	0.012	0.042
Box (%)	20.00%	Pade(0,2)	44.007	0.145	2.10E-03	9.86E-05	-2.71E-06	4.68E-07	0.541	0.004	0.033
dA_syst_cuts	0.0034	Pade(1,1)	44.065	0.157	-9.75E-02	6.33E-03	4.26E-03	5.38E-04	0.445	0.003	0.030
dR_syst_cuts	0.0068	Pade(2,0)	43.889	0.134	-8.28E-02	3.31E-03	1.58E-04	1.54E-05	0.893	0.008	0.042
Box (%)	30.00%	Pade(0,2)	44.005	0.161	2.09E-03	1.08E-04	-2.70E-06	5.11E-07	0.447	0.004	0.033
dA_syst_cuts	0.0040	Pade(1,1)	44.064	0.173	-9.74E-02	6.89E-03	4.25E-03	5.84E-04	0.368	0.002	0.030
dR_syst_cuts	0.0073	Pade(2,0)	43.886	0.150	-8.27E-02	3.67E-03	1.57E-04	1.70E-05	0.739	0.006	0.042
Fits		Pade(0,2) ::: A(R) = c0 / (1 + c1*R + c2*R*R)									
		Pade(1,1) ::: A(R) = (c0 + c1*R) / (1 + c2*R)									
		Pade(2,0) ::: A(R) = c0 + c1*R + c2*R*R									

Table 5

For Asymmetry vs Rate there is no simulation-predicted functional form, and so we simply observe the three best Pade fits – Pade(0,2), Pade(1,1) and Pade(2,0). Table 5 diplaus how the various fit parameters are affected by different choice of percent variation in cuts box. The residual is the same as in Table 4, simply data – fit. Associated plots for this table, along with plots of residuals from each fit, are in the appendix under Run I Asymmetry vs Rate Fits.

Run II

Table 6 presents Asymmetry versus Thickness fit parameter variation due to choice of percent change in cuts box for Run II data. Table 7 presents the same but for Asymmetry versus Rate results. The appendix contains plots associated with each of these tables along with plots of residuals for each fit.

********When looking at residual plots, the data points are simply Residual = Data – Fit for a given Thickness or Rate (whichever is on the x-axis). The error bars on the residual plots are those from the source data. ********

Run II Asymmetry vs Foil Thickness Fit Parameters' Sensitivity to Choice of Cuts

		Fit	a0	d(a0)	a1	d(a1)	a2	d(a2)	Chi^2 / NDF	Sum of Residuals / N_points	Sum of Square of Residuals / N_points
Box (%)	0.00%	Pade(0,1)	44.077	0.104	0.314	0.009			1.051	0.037	0.076
dA_syst_cuts	0.0000	Pade(1,1)	44.145	0.135	3.727	4.521	0.419	0.128	1.091	0.015	0.077
		Pade(2,0)	44.096	0.120	-13.892	0.796	3.548	0.879	1.195	0.022	0.079
Box (%)	10.00%	Pade(0,1)	44.066	0.120	0.313	0.009			0.941	0.031	0.075
dA_syst_cuts	0.0019	Pade(1,1)	44.131	0.155	3.271	4.701	0.405	0.133	0.995	0.013	0.076
		Pade(2,0)	44.081	0.138	-13.781	0.864	3.439	0.940	1.082	0.019	0.078
Box (%)	20.00%	Pade(0,1)	44.054	0.141	0.312	0.010			0.811	0.023	0.075
dA_syst_cuts	0.0034	Pade(1,1)	44.115	0.178	2.701	4.835	0.389	0.138	0.875	0.011	0.075
		Pade(2,0)	44.064	0.164	-13.645	0.960	3.305	1.023	0.942	0.015	0.077
Box (%)	30.00%	Pade(0,1)	44.044	0.165	0.311	0.011			0.684	0.016	0.074
dA_syst_cuts	0.0040	Pade(1,1)	44.098	0.215	2.153	5.408	0.373	0.155	0.748	0.008	0.075
		Pade(2,0)	44.047	0.195	-13.513	1.081	3.174	1.129	0.799	0.011	0.077
Fits		Pade(0,1) ::: A(t) = a0 / (1 + a1 * t)									
		Pade(1,1) ::: A(t) = (a0 + a1 * t) / (1 + a2 * t)									
		Pade(2,0) ::: A(t) = a0 + a1*t + a2*t*t									

Table 6

Run II Asymmetry vs Rate Fit Parameters' Sensitivity to Choice of Cuts

		Fit	c0	d(c0)	c1	d(c1)	c2	d(c2)	Chi^2 / NDF	Sum of Residuals / N_points	Sum of Square of Residuals / N_points
Box (%)	0.00%	Pade(0,2)	44.064	0.097	2.25E-03	7.01E-05	-3.38E-06	3.55E-07	1.505	0.010	0.040
dA_syst_cuts	0.0000	Pade(1,1)	44.136	0.106	-1.06E-01	4.75E-03	4.95E-03	4.16E-04	1.218	0.007	0.036
dR_syst_cuts	0.0000	Pade(2,0)	43.940	0.091	-8.82E-02	2.36E-03	1.85E-04	1.15E-05	2.451	0.016	0.051
Box (%)	10.00%	Pade(0,2)	44.059	0.118	2.24E-03	8.33E-05	-3.36E-06	4.20E-07	1.111	0.008	0.040
dA_syst_cuts	0.0019	Pade(1,1)	44.132	0.129	-1.06E-01	5.66E-03	4.94E-03	4.92E-04	0.898	0.006	0.036
dR_syst_cuts	0.0058	Pade(2,0)	43.931	0.109	-8.80E-02	2.80E-03	1.84E-04	1.37E-05	1.806	0.013	0.051
Box (%)	20.00%	Pade(0,2)	44.054	0.145	2.24E-03	1.02E-04	-3.34E-06	5.11E-07	0.783	0.006	0.040
dA_syst_cuts	0.0034	Pade(1,1)	44.129	0.158	-1.06E-01	6.85E-03	4.92E-03	5.93E-04	0.633	0.004	0.036
dR_syst_cuts	0.0068	Pade(2,0)	43.924	0.135	-8.77E-02	3.42E-03	1.83E-04	1.67E-05	1.270	0.010	0.051
Box (%)	30.00%	Pade(0,2)	4.051	0.178	2.23E-03	1.23E-04	-3.33E-06	6.21E-07	0.541	0.004	0.040
dA_syst_cuts	0.0040	Pade(1,1)	44.127	0.193	-1.06E-01	8.25E-03	4.91E-03	7.13E-04	0.436	0.003	0.036
dR_syst_cuts	0.0073	Pade(2,0)	43.918	0.164	-8.76E-02	4.13E-03	1.82E-04	2.03E-05	0.877	0.007	0.051
Fits		Pade(0,2) ::: A(R) = c0 / (1 + c1*R + c2*R*R)									
		Pade(1,1) ::: A(R) = (c0 + c1*R) / (1 + c2*R)									
		Pade(2,0) ::: A(R) = c0 + c1*R + c2*R*R									

Table 7