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Committee D02 on PETROLEUM PRODUCTS AND LUBRICANTS

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Originally Issued: May 19, 2010

Reply to: Richard Grundza
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Unapproved Minutes of the May 12, 2010
Sequence IV Surveillance Panel Meeting
held in San Antonio, TX

A copy of the Agenda is included as Attachment 1

The signed attendance sheet is included as Attachment 2.

Minutes from May 6, 2009 Surveillance panel meeting were approved with no changes.

Action Item Review: Action items from the November 19, 2009 meeting were reviewed and their status is documented below.

Motions and Action Items

May 12, 2010 IV Minutes
San Antonio, TX

As Recorded at the Meeting by Bill Buscher

1. Action Item – SwRI to provide information (schematic and equipment list) on how they monitor injector pulse width and ignition timing.

Done. SwRI to submit today. To be included in 11/19/09 meeting minutes.

2. Action Item – SwRI to provide information on their load cell enclosure and blanket heater.
   Open. SwRI working on. To be included in 11/19/09 meeting minutes.

3. Action Item – Severity task force to evaluate the load cell range specification currently included in the Sequence IVA test procedure.
   Done. Dropped at last severity task force meeting.

4. Action Item – Labs to start conducting ICP analysis on the Flush 1 and Flush 2 oil samples, for all reference tests, and report in comment section of test report. Evaluate data at next surveillance panel meeting.
   Open. Anyone bring data to review at today's meeting? Lubrizol has been doing, other labs have not. Other labs will start doing this.

5. Action Item –Sequence IVA SAE paper number to be included in 5/6/09 meeting minutes.
   Done.

6. Motion – Modify Sequence IVA test procedure to remove the requirement to conduct valve spring free length and squareness measurements and to require vacuum checks of the cylinder head after assembly. Effective 5/6/09.

Bill Buscher / Al Lopez / Passed Unanimously
   Done. TMC issued Sequence IVA Information Letter 09-1 on 6/18/09.

7. Motion – Considering that the oil cooler assembly (p/n 21305-03E00) and distributor assembly (p/n 22100-40F00RE) are no longer available from Nissan, modify Sequence IVA test procedure to eliminate the number of allowed runs criteria on these two parts and to allow for replacement of distributor caps (p/n 22162-40F00) and rotors (p/n 22157-21E01). Effective 5/6/09.

   Bill Buscher / Greg Seman / Passed Unanimously
   Done. TMC issued Sequence IVA Information Letter 09-1 on 6/18/09.

8. Motion – Modify Sequence IVA test procedure to add record only measurements for fresh air flow rate to the front cover, rocker cover coolant in temperature, rocker cover coolant out temperature, and to add coolant system

pressure measurement and control to 70±5kPa (in a manner similar to the Sequence VG and VIB). Modify test report forms and data dictionary accordingly. Implement by 8/1/09.

Al Lopez / Bill Buscher / Passed 10-0-1
Done. TMC issued Sequence IVA Information Letter 09-1 on 6/18/09. Report forms issued on 8/1/09.

9. Motion – Modify Sequence IVA test procedure to allow for 32 (from 20) runs per engine assembly and 16 (from 10) runs per cylinder head assembly. Effective 5/6/09.

   Bill Buscher / Al Lopez / Passed 8-0-3
   Done. TMC issued Sequence IVA Information Letter 09-1 on 6/18/09.

10. Motion – Modify Sequence IVA test procedure to require the 1/8" needle valve (as per SwRI's set-up) in the PVC system and to allow for both blowby measurement methods, using either the Sequence III or Sequence V blowby cart (a previous motion that never made it into the test procedure). Test procedure to indicate that the valve position is to be wide open for all test conditions except when a blowby measurement is being taken.

    Tabled for refinement, and will Eballot by 6/1/09.
    Open. Refine motion and vote on at today's meeting.

11. Action Item – Chairman to contact Todd Dvorak to see if he would be available to perform similar analysis on KA24E Green fuel data as he did on EEE fuel data.
    Done. To review at May 2010 SP meeting.

Fuel Suppliers Report.
Copy of the report is included as attachment 3. Todd Dvorak reviewed work he had done on fuel batches and suggested that many of the parameters were highly correlated. He did note that age may have had an effect earlier in the test, but now that fuel batches are blended as needed, there seems to be little effect on test results. A copy of Todd's analysis is included as attachment 4.

TMC Report
There was no report given. A copy of the TMC report can be accessed via the following link.
ftp://ftp.astmtmc.cmu.edu/docs/gas/sequenceiv/semiannualreports/IVA-04-2010.pdf

ACC Report.
A copy of the report is available via the following link. There were no questions on the report.
https://acc-ma.org/docs/pcmo/iva/SemiAnnualReports/2010APR_IVA.pdf

May 12, 2010 IV Minutes
San Antonio, TX

Test Hardware Report
Bill Buscher reviewed the hardware status to date. There appear to be no hardware shortages. 2008 kits have been received and no labs were shorted parts. 2009 kits are being processed and should be available late this year early next year. Bill noted that Nissan may be able to supply kits through 2020, so life extension of the IVA test may be feasible. Labs have been stock piling engines and heads which were removed after 10 and 20 runs. Some labs may need to redistribute some of these parts. Throttle bodies and distributers may need to be reworked to be used in the future, as these parts are no longer available.

LTMS Version 2
Doyle Boese presented the LTMS Task Forces recommendations for changes to the Sequence IVA LTMS. The panel decided to form a small group to review he LTMS changes and make recommendations to the panel, the group will report back to the panel within 6 weeks. A copy of the presentation is included as attachment 5.

Scope and Objectives
The scope and objectives were reviewed and updated and are included as attachment 6.

New Business
The panel reviewed two potential GF-5 reference oils and deemed both acceptable, summaries of the oil properties and test results are included as attachment . The panel expressed a preference for the oil which provided 18 um in the IVA test. Copies of the test results summaries supporting GF-5 performance are included as attachments 7 and 8.

A listing of the action items fro this meeting are included as attachment 9.

The meeting was adjourned at 12:20 pm.

Attachment 1

Sequence IVA Surveillance Panel
San Antonio, TX
Southwest Research Institute
May 12, 2010
10:30 a.m. - 12:00 p.m.

A G E N D A

1.	Chairman comments	
2.	Attendance sign-in sheet distribution	
3.	Membership changes	
4.	Motion and Action recorders	
5.	Approval of minutes for 11/19/2009	All
6.	Review action items from last meeting	Buscher
7.	Fuel supplier report KA24E Green Fuel	Carter
8.	TMC report	Grundza
9.	ACC report	Clark
10.	Test hardware report	Buscher
11.	LTMS 2nd Edition Review	Boese
12.	Review Scope & Objectives	All
13.	Old business	
14.	New business	
15.	Next meeting	
16.	Adjourn	

Attachment 2

MEMBERSHIP
ASTM IVA SURVEILLANCE PANEL

May 12, 2010

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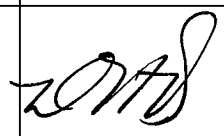
Bowden, Dwight	OH Technologies, Inc. 9300 Progress Parkway P.O. Box 5039 Mentor, OH 44061-5039 Phone No.: 440-354-7007 Fax No.: 440-354-7080 Email: dhbowden@ohtech.com	
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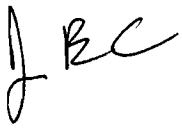
Carter, James	Haltermann Products 2296 Hulett Okemos, MI 48864 Phone No.: 517-347-3021 Fax No.: ~~517-347-1024~~ Email: jecarter@~~dow.com~~ JHALTERMANN.COM	
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May 12, 2010

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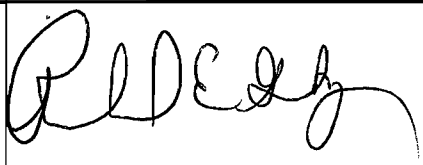
Grundza, Rich	ASTM Test Monitoring Center 6555 Penn Avenue Pittsburgh, PA 15206 Phone No.: 412-365-1031 Fax No.: 412-365-1047 Email: reg@astmtmc.cmu.edu	
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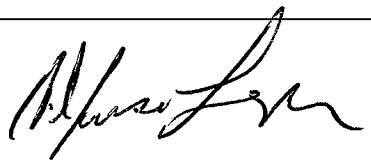
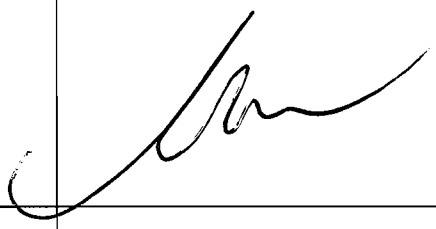
Lopez, Al	Intertek Automotive Research 5404 Bandera Road San Antonio, TX 78238-1993 Phone No.: 210-862-7935 Fax No.: 210-523-4607 Email: al.lopez@intertek.com	
Miranda, Timothy	BP Castrol 1500 Valley Road Wayne, NJ 07470 Phone No.: 973-305-3334 Fax No.: 973-686-4039 Email: timothy.miranda@bp.com	
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May 12, 2010

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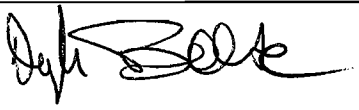
Boese, Doyle	Infineum USA L.P. 1900 E. Linden Avenue Linden, NJ 07036-0536 Phone No.: 908-474-3176 Fax No.: 908-474-3637 Email: doyle.boese@infineum.com	
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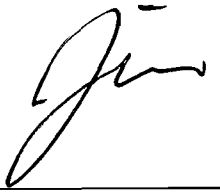
Rutherford, Jim	Chevron Oronite Company LLC 100 Chevron Way, 60-1211 P.O. Box 1627 Richmond, CA 94802-0627 Phone No.: 510-242-3410 Fax No.: 510-242-1930 Email: jaru@chevrontexaco.com	
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May 12, 2010

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May 12, 2010

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	Phone No.: Fax No.: Email:	
	Phone No.: Fax No.: Email:	
	Phone No.: Fax No.: Email:	
	Phone No.: Fax No.: Email:	

Attachment 3

PRODUCT INFORMATION

Haltermann PRODUCTS

T (281) 457-2768 F (281) 457-1469

PRODUCT: KA24E TEST FUEL
Seq. IV & VIII

PRODUCT CODE: HF0008

Batch No.:	XK2321GP02	XK0921GP01	XH1721GP01
TMO No.:	800506	MTS	800388
Batch Size:	7088	8186	4302
Tank No.:	52	52	27
Analysis Date:	11/25/2009	11/19/2009	8/19/2009

TEST	METHOD	UNITS	SPECIFICATIONS			RESULTS	RESULTS	RESULTS
			MIN	TARGET	MAX			
Distillation - IBP	ASTM D86	°F	75		95	92	93	94
5%		°F				112	118	119
10%		°F	120		135	125	129	130
20%		°F				144	148	150
30%		°F				169	172	175
40%		°F				200	203	204
50%		°F	200		230	220	222	221
60%		°F				230	231	230
70%		°F				239	240	237
80%		°F				255	256	253
90%		°F	300		325	312	315	313
95%		°F				341	343	339
Distillation - EP		°F	385		415	403	407	410
Recovery		vol %		Report		96.9	98.2	98.8
Residue		vol %		Report		0.9	1.0	1.0
Loss		vol %		Report		2.2	0.8	0.2
Gravity	ASTM D4052	°API	58.7		61.2	59.7	59.9	59.7
Density	ASTM D4052	kg/l	0.734		0.744	0.739	0.739	0.740
Reid Vapor Pressure	ASTM D5191	psi	8.8		9.2	8.8	9.1	9.1
Carbon	ASTM E191	wt fraction	0.8580		0.8667	0.8592	0.8626	0.8602
Carbon	ASTM D3343	wt fraction		Report		0.8645	0.8641	0.8660
Sulfur	ASTM D2622	wt %	0.01		0.04	0.02	0.015	0.013
Lead	ASTM D3237	g/gal			0.05	<0.01	<0.01	<0.01
Oxygen	ASTM D4815	wt %			0.2	<0.01	<0.01	<0.01
Composition, aromatics	ASTM D1319	vol %			35.0	27.7	27.6	30.8
Composition, olefins	ASTM D1319	vol %	5.0		10.0	5.0	6.4	5.8
Composition, saturates	ASTM D1319	vol %		Report		67.2	66.0	63.4
Oxidation Stability	ASTM D525	minutes	1440			>1440	>1440	>1440
Copper Corrosion	ASTM D130				1	1a	1a	1a
Gum content, washed	ASTM D381	mg/100ml			5	<0.5	<0.5	<0.5
Research Octane Number	ASTM D2699		96.0		97.5	96.7	96.6	97.5
Motor Octane Number	ASTM D2700			Report		87.4	87.5	87.5
R+M/2	D2699/2700			Report		92.1	92.1	92.5
Sensitivity	D2699/2700		7.5			9.3	9.1	10.0
Net Heat of Combustion	ASTM D240	btu/lb		Report		18284	18284	18325
Color	Visual			Green		Green	Green	Green

Attachment 4

Investigating the relationships of the KA24E Fuel Batch Properties on the Seq. IVA ACW Parameter Test Results

May 11, 2010

By: Todd Dvorak

Investigating the Effects of Fuel Batch Properties on the Seq. IVA

Analyzed data included:

- 110 “Chartable” Results with matching known fuel batch properties (229 total Chartable results with 28 different fuel batches)
- 14 different fuel batches (with known C of A properties)
- The estimated fuel batch age factor
- Labs A, B, B1, C, E1, F, and G & Oils 1006, 1007, and 1009

Investigating the Effects of Fuel Batch Properties on the Seq. IVA

- Fuel Batch Age factor estimate is based on the difference between the fuel batch (decoded) manufacturing date and the LTMS start date.
- Two of the initial KA24E fuel batch codes could not be decoded (11769 and 109688). For these two batches, the first LTMS start date was selected as the initial manufacturing date for the corresponding batch.

Investigating the Effects of Fuel Batch Properties on the Seq. IVA

- Performed stepwise regression and GLM modeling of class variable data to investigate the possible effects of the fuel factor variable data on the ACW parameter
  - Stepwise regression included an analysis of indicator (lab & oil) and fuel property data
  - GLM analysis of Lab and Oil class variables was performed with follow-on diagnostic checks of the residuals w.r.t. the fuel property factors
    - "Residuals" are defined as the difference of the observed and predicted value
    - Possible correlations of fuel property variables with the residuals can provide some insight into factors that may be affecting the test.
    - Caution - correlation does not necessarily mean causality

Stepwise Regression Analysis Summary

Stepwise regression results:

- Fuel Age and Distillation_80% are identified as possible factors that are related to the ACW parameter test results

Dependent Variable: ACW

Number of Observations Read	110
Number of Observations Used	110

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	126055	18008	139.82	<.0001
Error	102	13137	128.79529		
Corrected Total	109	139192			

Root MSE	11.3488	R-Square	0.9056
Dependent Mean	72.26964	Adj R-Sq	0.8991
Coeff Var	15.70342		

Parameter Estimates						
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	423.49434	124.4148	3.4	0.001	0
LabC	1	10.97173	4.60916	2.38	0.0192	1.08115
LabB	1	8.81932	3.21316	2.74	0.0072	1.15213
LabG	1	23.57102	6.08887	3.87	0.0002	1.63292
Oil1006	1	20.30492	2.53327	8.02	<.0001	1.28145
Oil1009	1	-64.19673	2.82424	-22.73	<.0001	1.26169
EstFuelAge	1	-0.01237	0.00436	-2.84	0.0055	2.07741
dist_80	1	-1.31369	0.48389	-2.71	0.0078	1.51145

GLM Modeling with Residual Diagnostic Checks

GLM Modeling Results (of Chartable data with Fuel C of A's):

- Model fit residuals will be used for follow-on (diagnostic) analysis

Class Level Information		
Class	Levels	Values
RefOil	3	Oil_1006 Oil_1007 Oil_1009
LTMSLAB	7	A B B1 C E1 F G

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	8	123597.2617	15449.658	100.06	<.0001
Error	101	15594.7907	154.4039		
Corrected Total	109	139192.0524			

R-Square	Coeff Var	Root MSE	ACW Mean
0.887962	17.19385	12.42594	72.26964

Source	DF	Type III SS	Square	F Value	Pr > F
RefOil	2	115265.6579	57632.829	373.26	<.0001
LTMSLAB	6	2465.945	410.9908	2.66	0.0194

Parameter	Estimate		Standard Error	t Value	Pr > |t|
Intercept	23.850304	B	5.8200804	4.1	<.0001
RefOil Oil_1006	84.315305	B	3.1549096	26.73	<.0001
RefOil Oil_1007	64.418478	B	3.1046904	20.75	<.0001
RefOil Oil_1009	0	B	.	.	.
LTMSLAB A	-7.3763588	B	5.4949296	-1.34	0.1825
LTMSLAB B	-3.2289129	B	5.9599207	-0.54	0.5892
LTMSLAB B1	-0.1698983	B	7.2507859	-0.02	0.9814
LTMSLAB C	-4.3590681	B	6.9407134	-0.63	0.5314
LTMSLAB E1	-14.353096	B	6.5731766	-2.18	0.0313
LTMSLAB F	-14.813803	B	5.8849972	-2.52	0.0134
LTMSLAB G	0	B	.	.	.

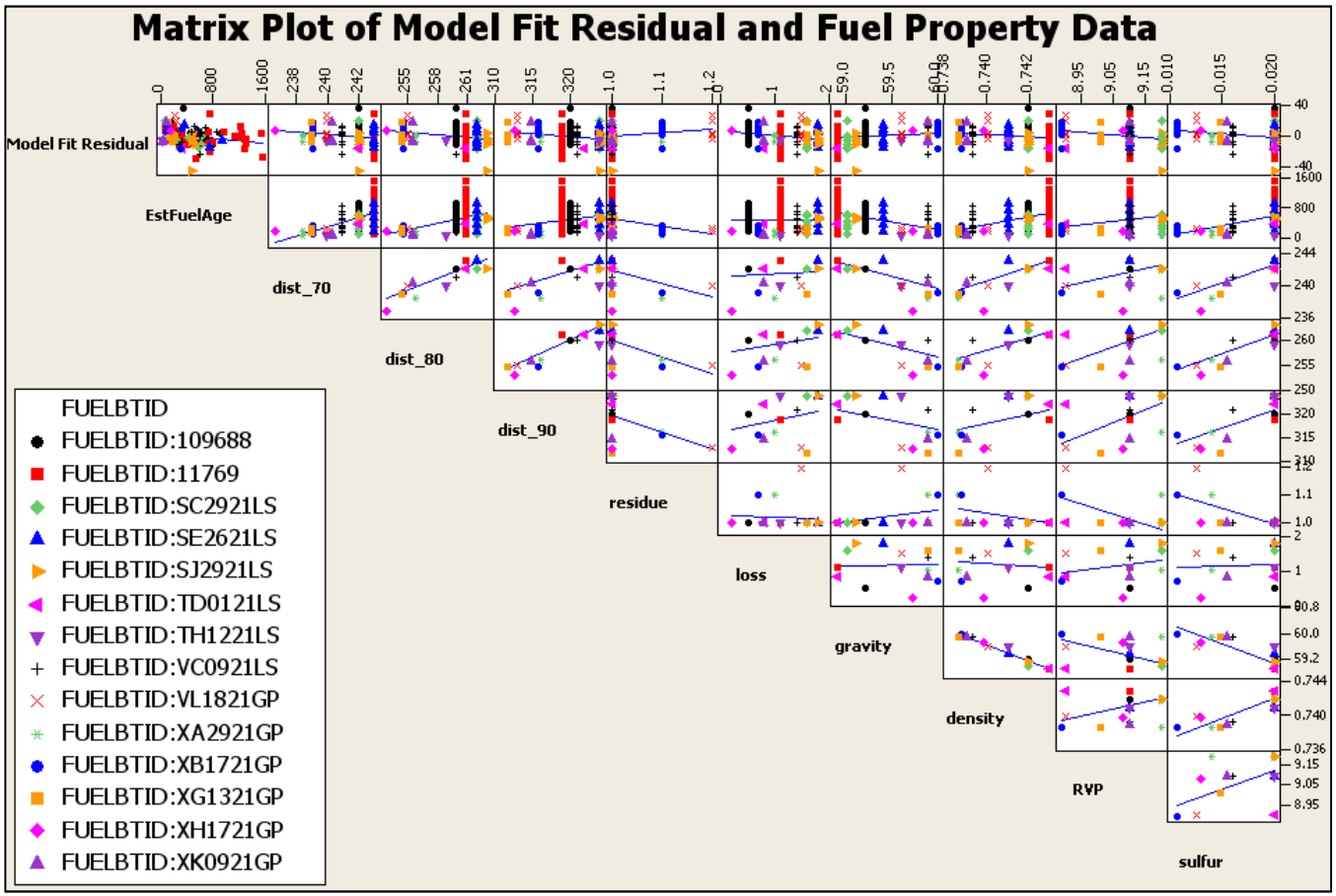
GLM Modeling with Residual Diagnostic Checks

- Correlation summary of the model fit residuals with the identified fuel property and age factors:

Factor	Pairwise Relationship with "Model Fit Residual"
EstFuelAge (Cor. Coef.)	-0.25
p value	*0.009*
dist_70 (Cor. Coef.)	-0.19
p value	*0.047*
dist_80 (Cor. Coef.)	-0.271
p value	*0.004*
dist_90 (Cor. Coef.)	-0.23
p value	*0.015*
residue (Cor. Coef.)	0.221
p value	*0.02*
loss (Cor. Coef.)	-0.191
p value	*0.046*
gravity (Cor. Coef.)	0.214
p value	*0.025*
density (Cor. Coef.)	-0.198
p value	*0.038*
RVP (Cor. Coef.)	-0.266
p value	*0.005*
sulfur (Cor. Coef.)	-0.249
p value	*0.009*

GLM Modeling with Residual Diagnostic Checks

- Matrix plot of identified fuel factors with model fit residuals:



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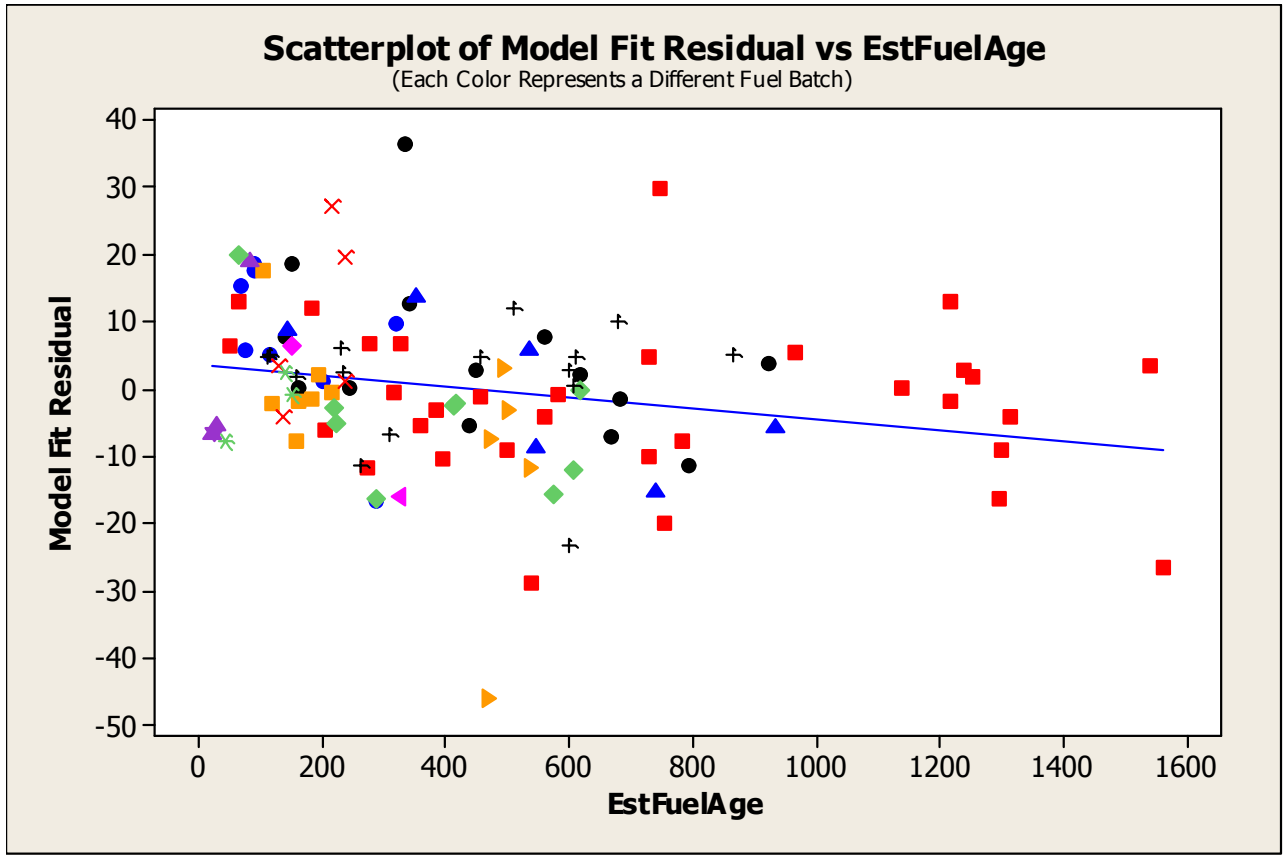
GLM Modeling with Residual Diagnostic Checks

Model Fit Residuals and Estimated Fuel Age variable Plot:



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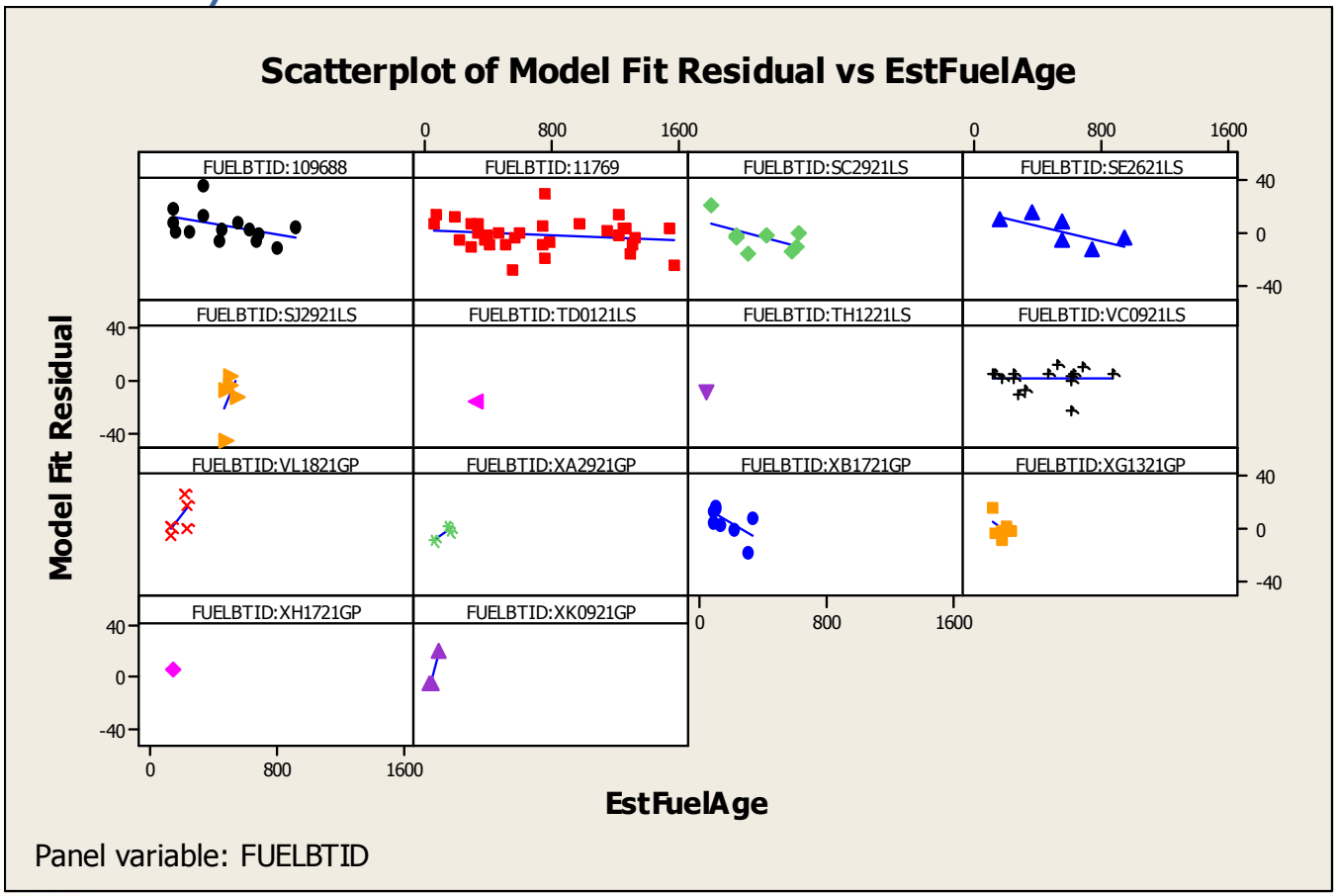
GLM Modeling with Residual Diagnostic Checks

- Model Fit Residuals and Estimated Fuel Age variable Plot (by fuel batch):



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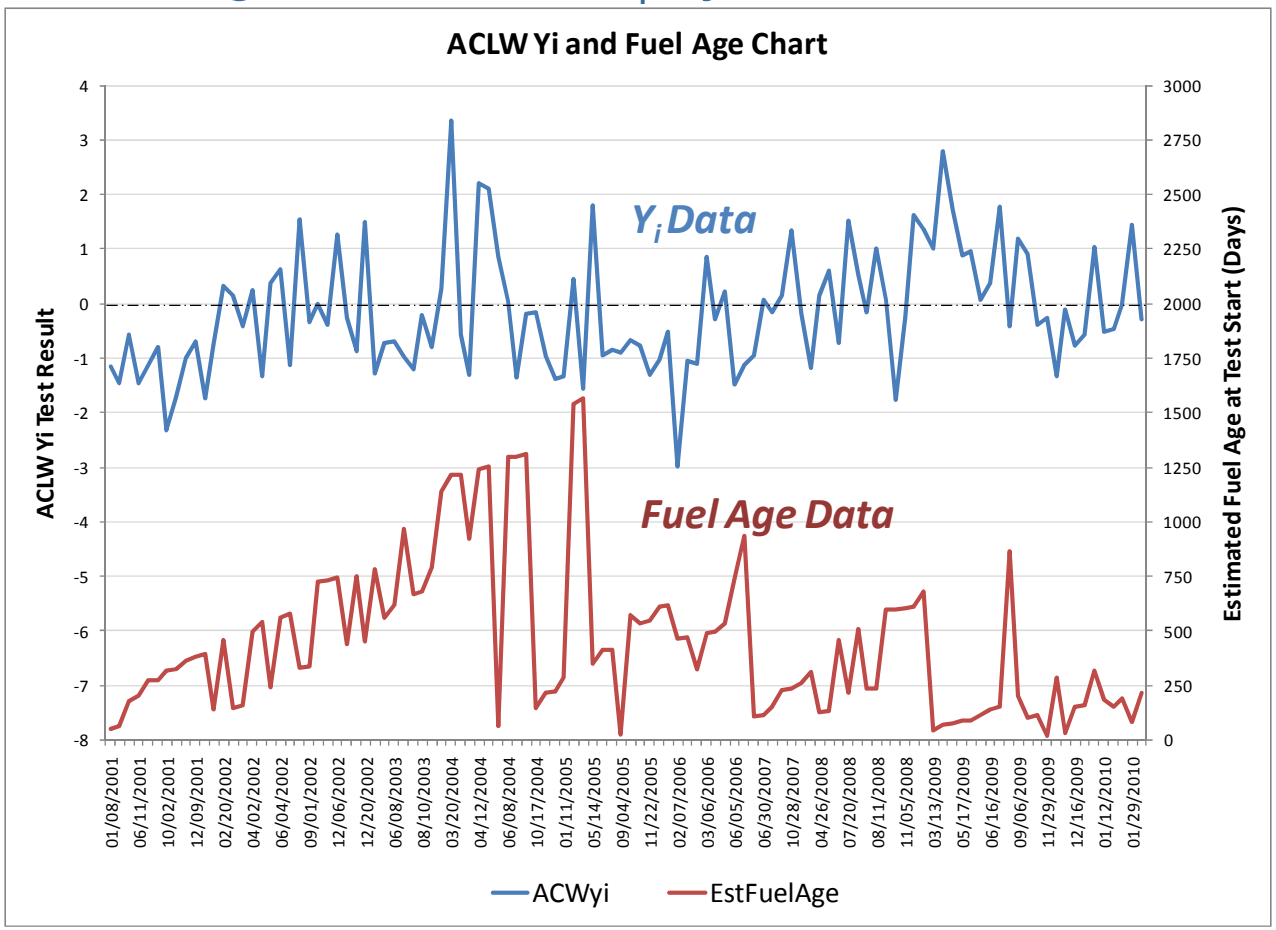
Investigating the Effects of Fuel Batch Properties on the Seq. IVA

- Plot of Fuel Age and ACW Y_i by test date:



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Investigating the Effects of Fuel Batch Properties on the Seq. IVA

Summary

- Model fit residuals and stepwise regression results suggest that there may be some possible relationship between the fuel properties and the ACW parameter test results
- Even though correlation exists, it does not necessarily mean causality
- If factors such as fuel age affect the test, the reduction in the fuel age during the past several years of tests should minimize the effect of this factor.

Appendix A – Additional Plots of Fuel Factor and Residuals Data

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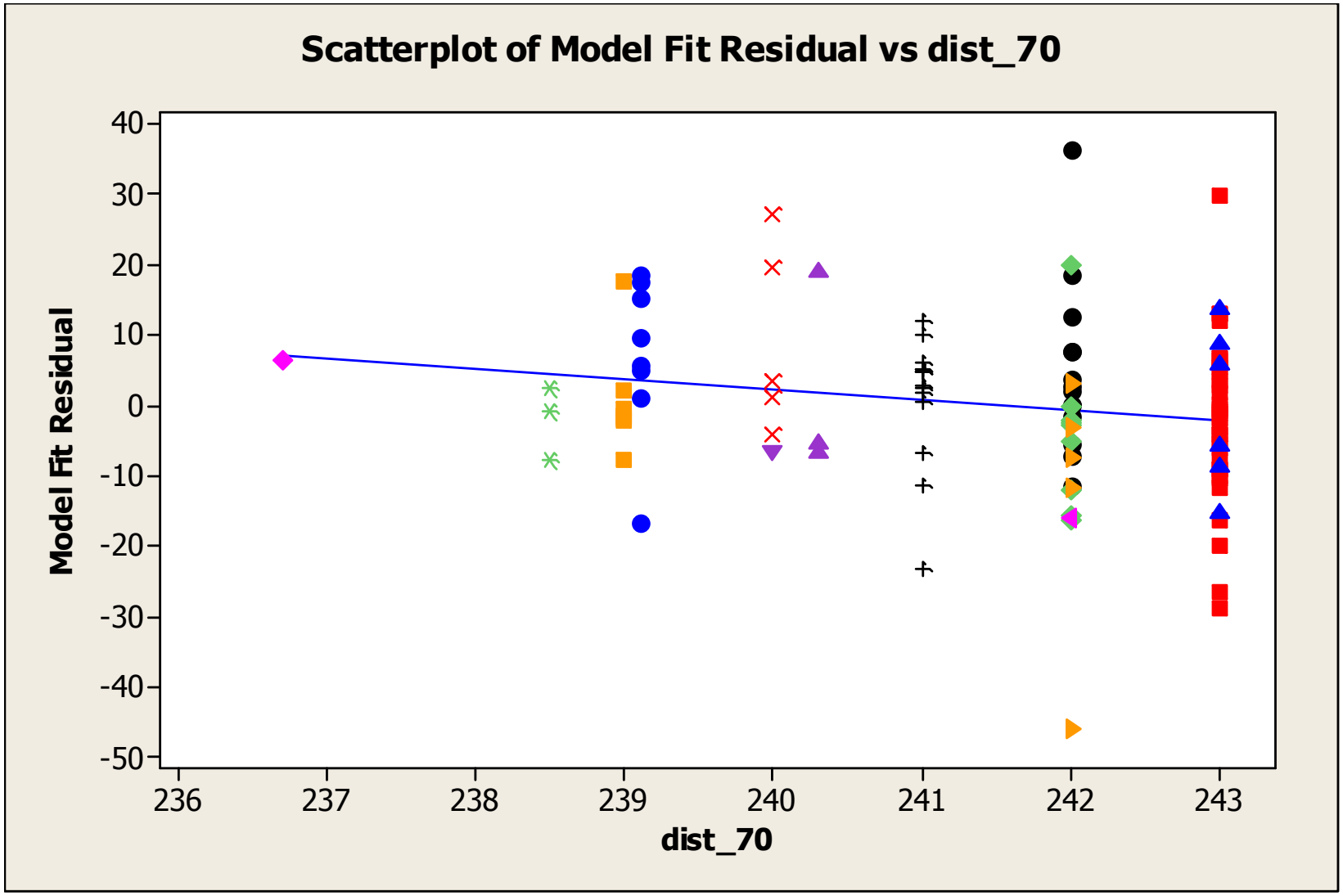
Fuel Factor and Model Fit Residual Plots



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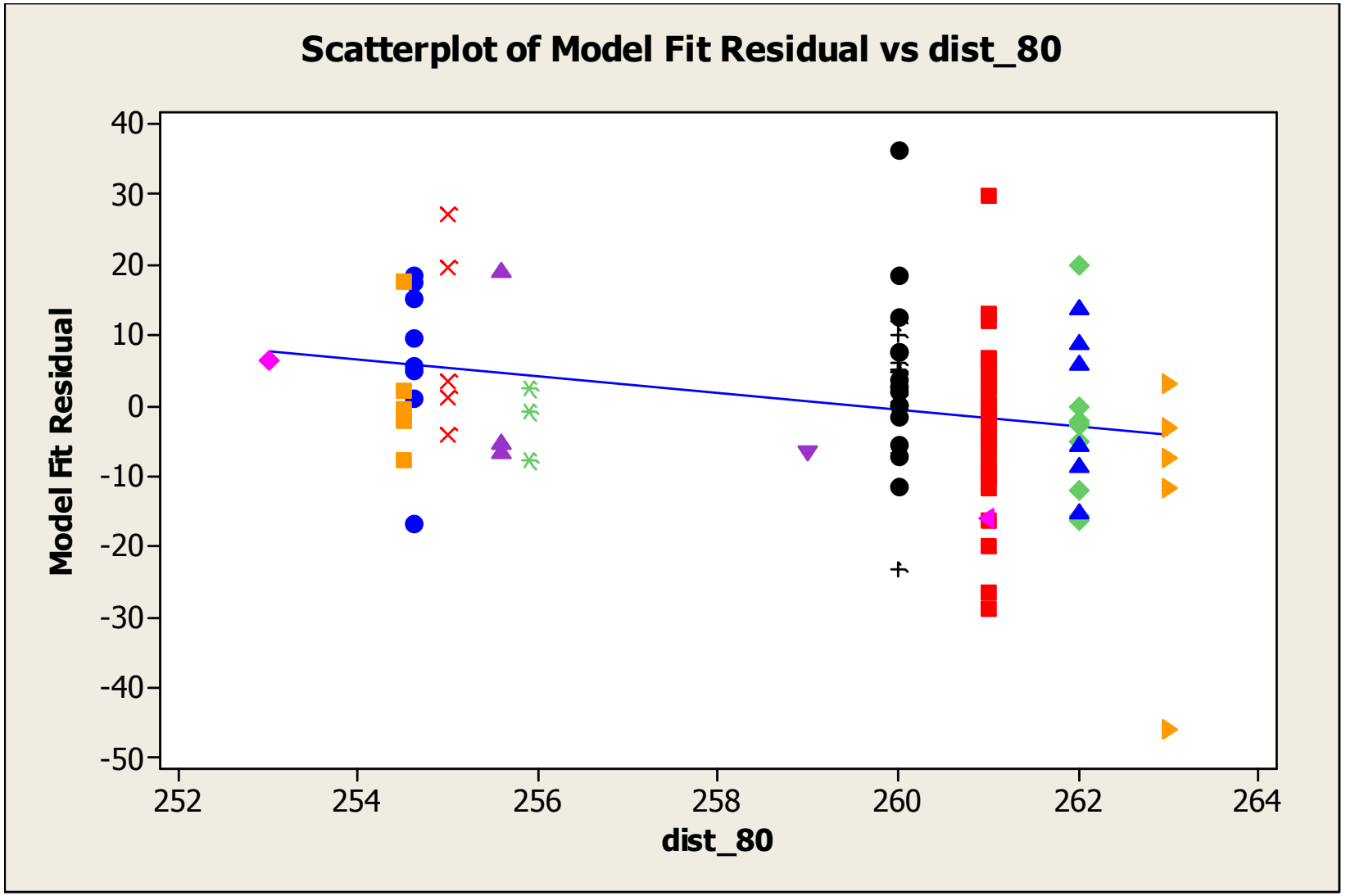
Fuel Factor and Model Fit Residual Plots



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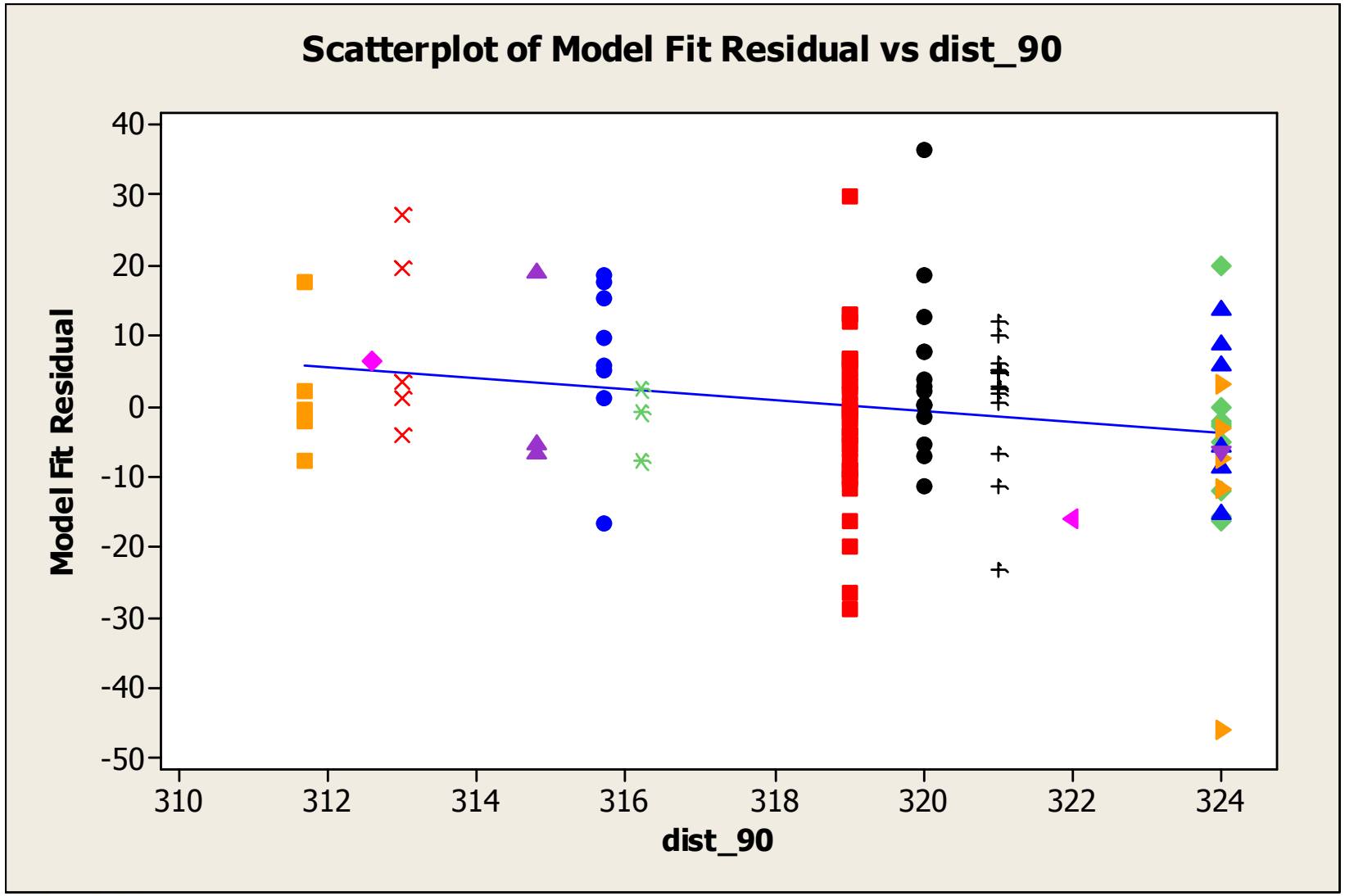
Fuel Factor and Model Fit Residual Plots



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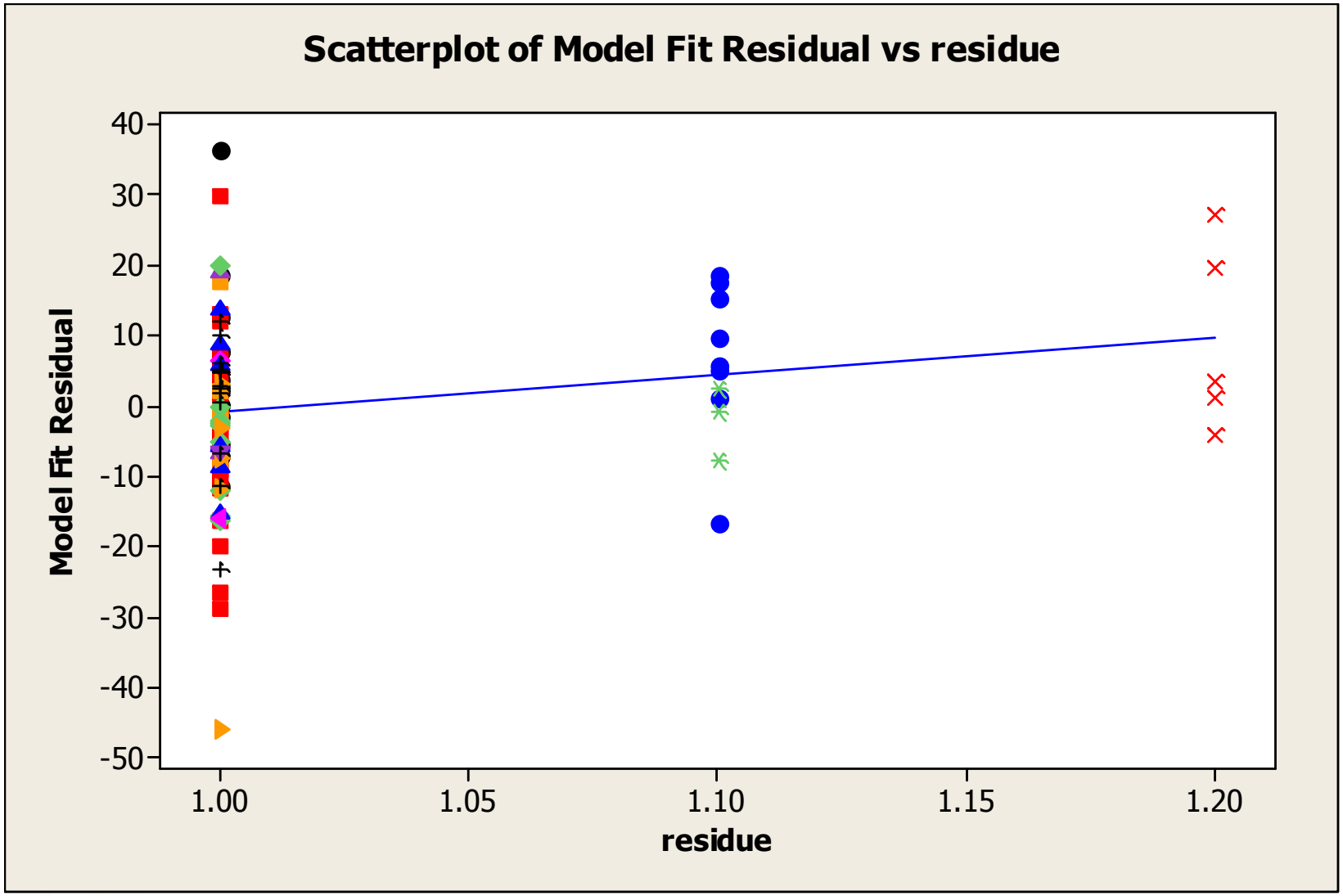
Fuel Factor and Model Fit Residual Plots



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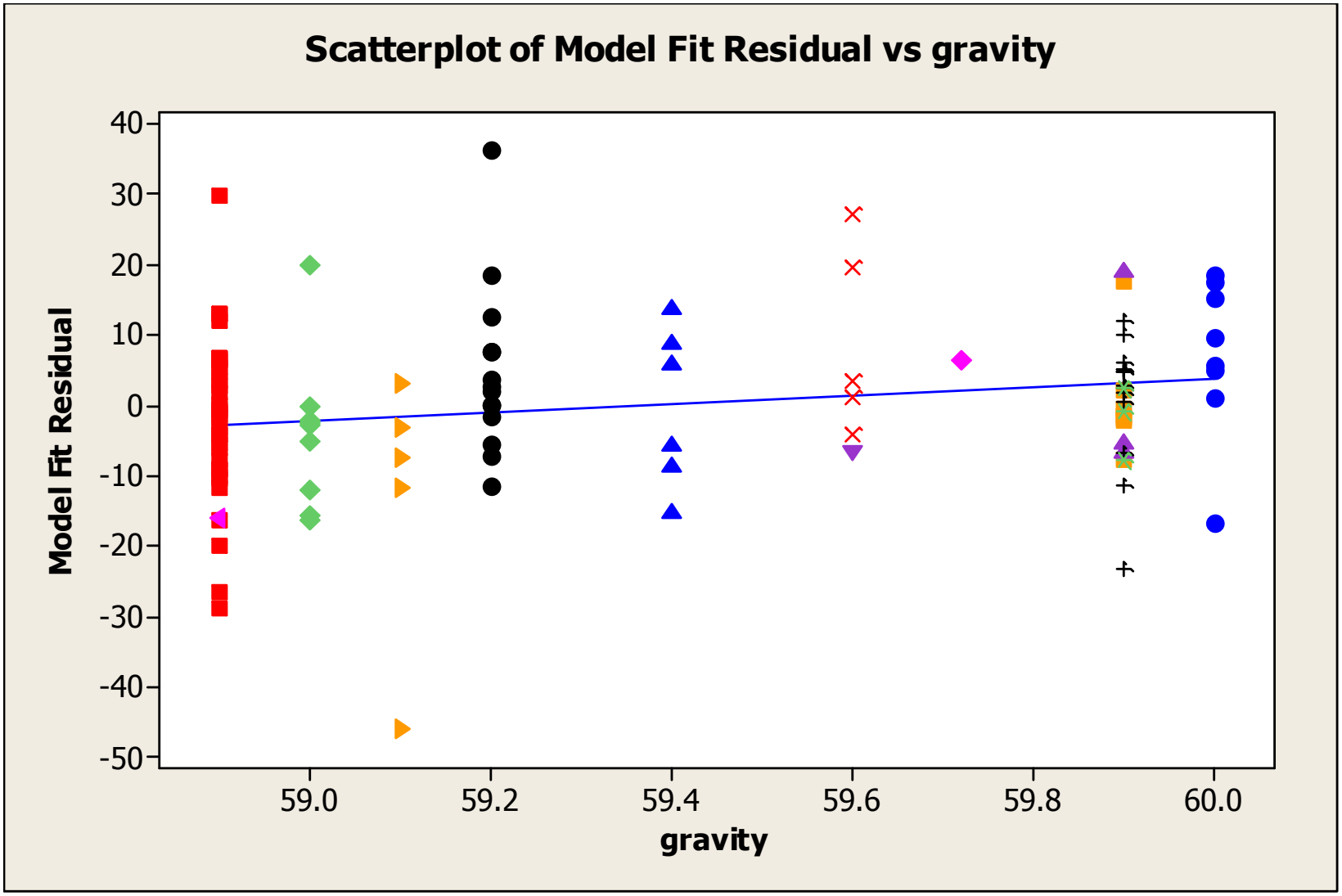
Fuel Factor and Model Fit Residual Plots



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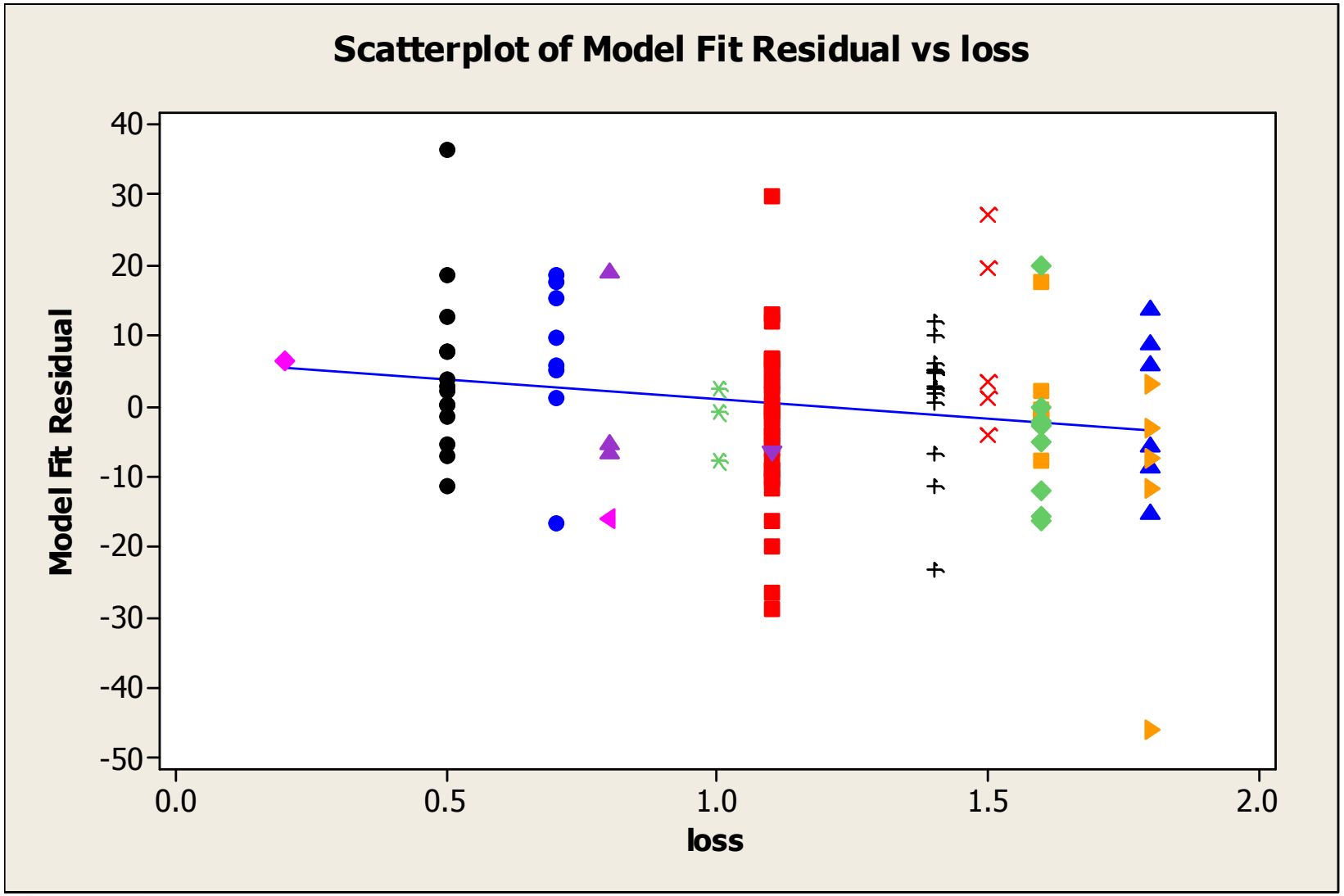
Fuel Factor and Model Fit Residual Plots



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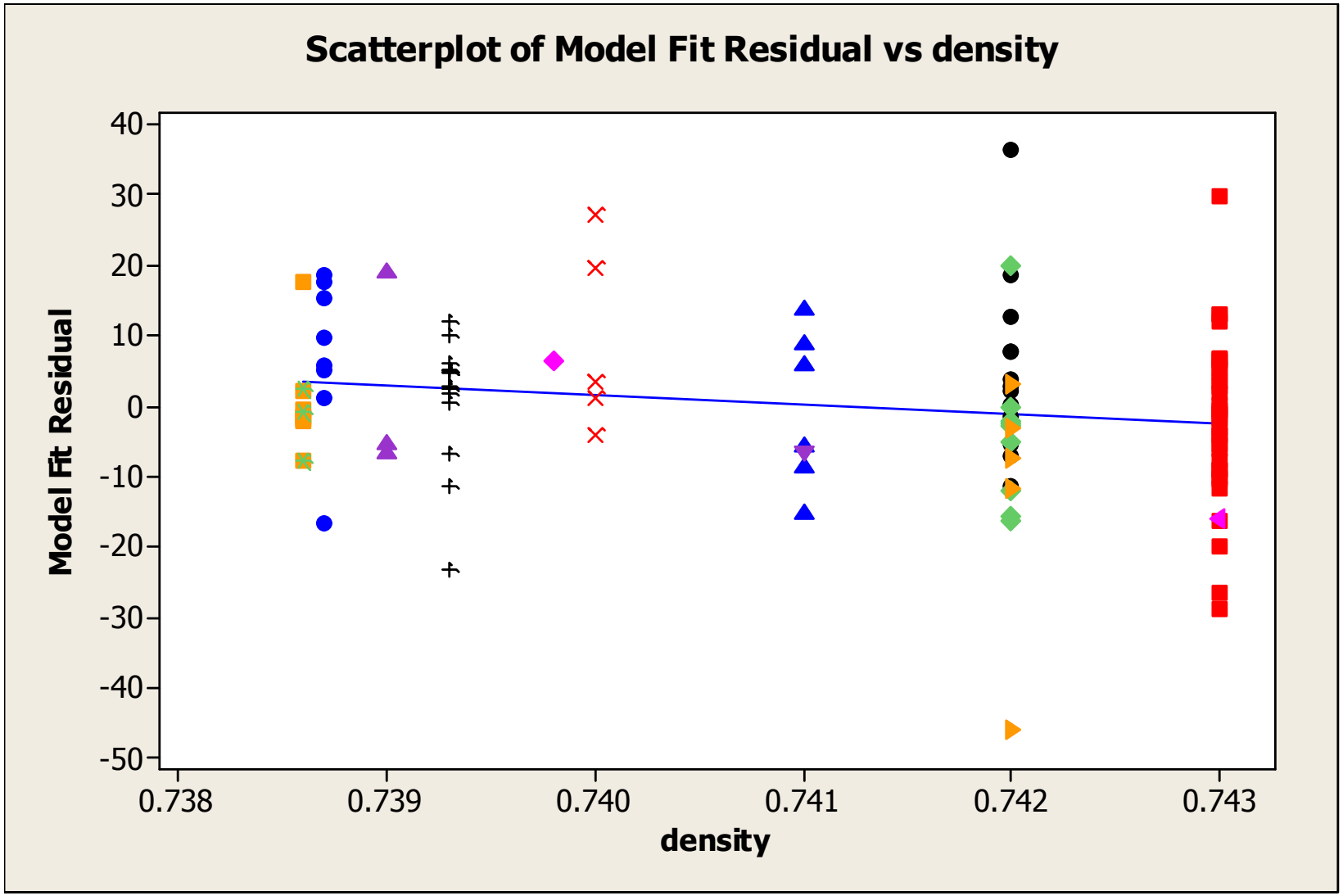
Fuel Factor and Model Fit Residual Plots



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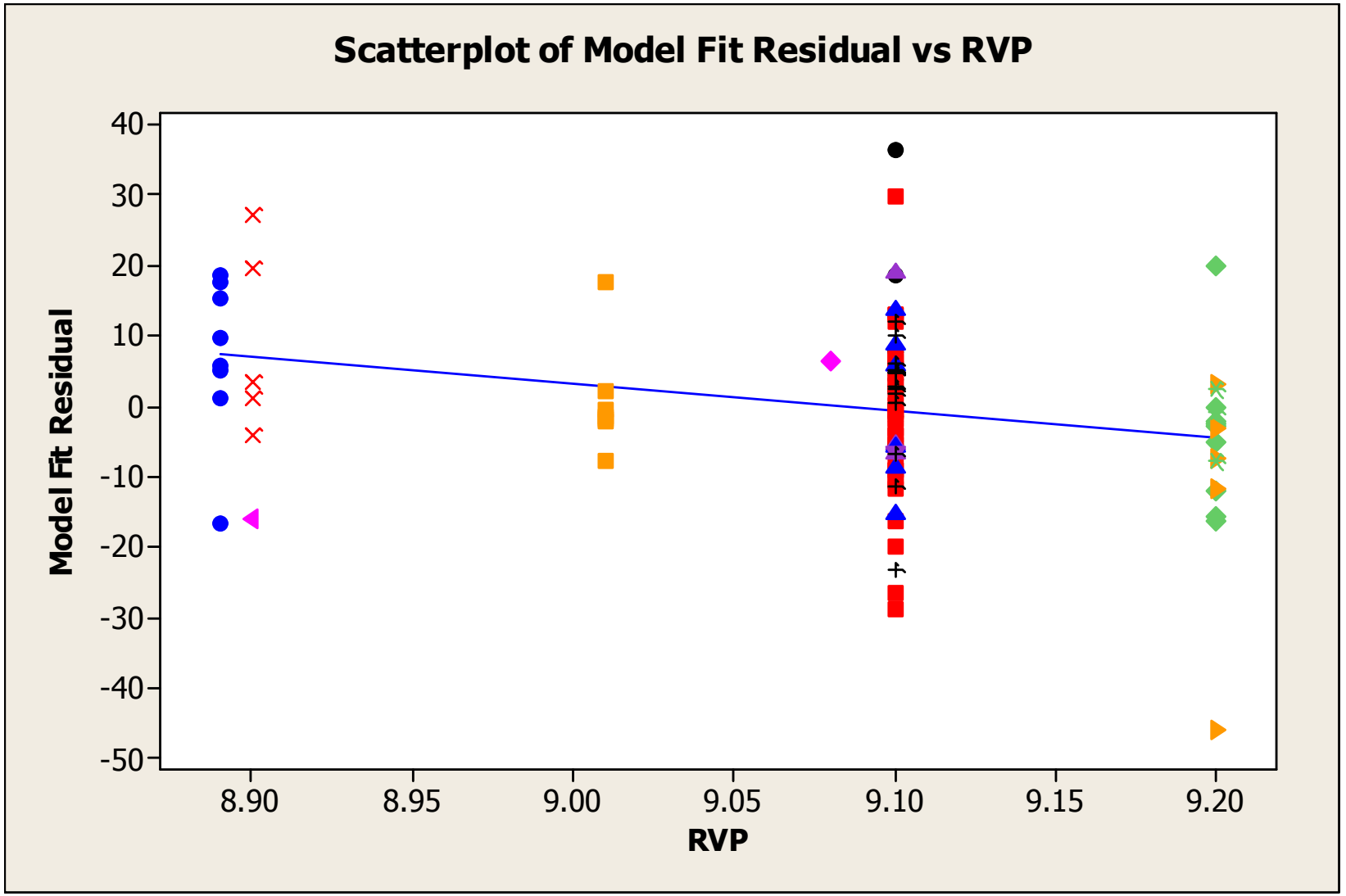
Fuel Factor and Model Fit Residual Plots



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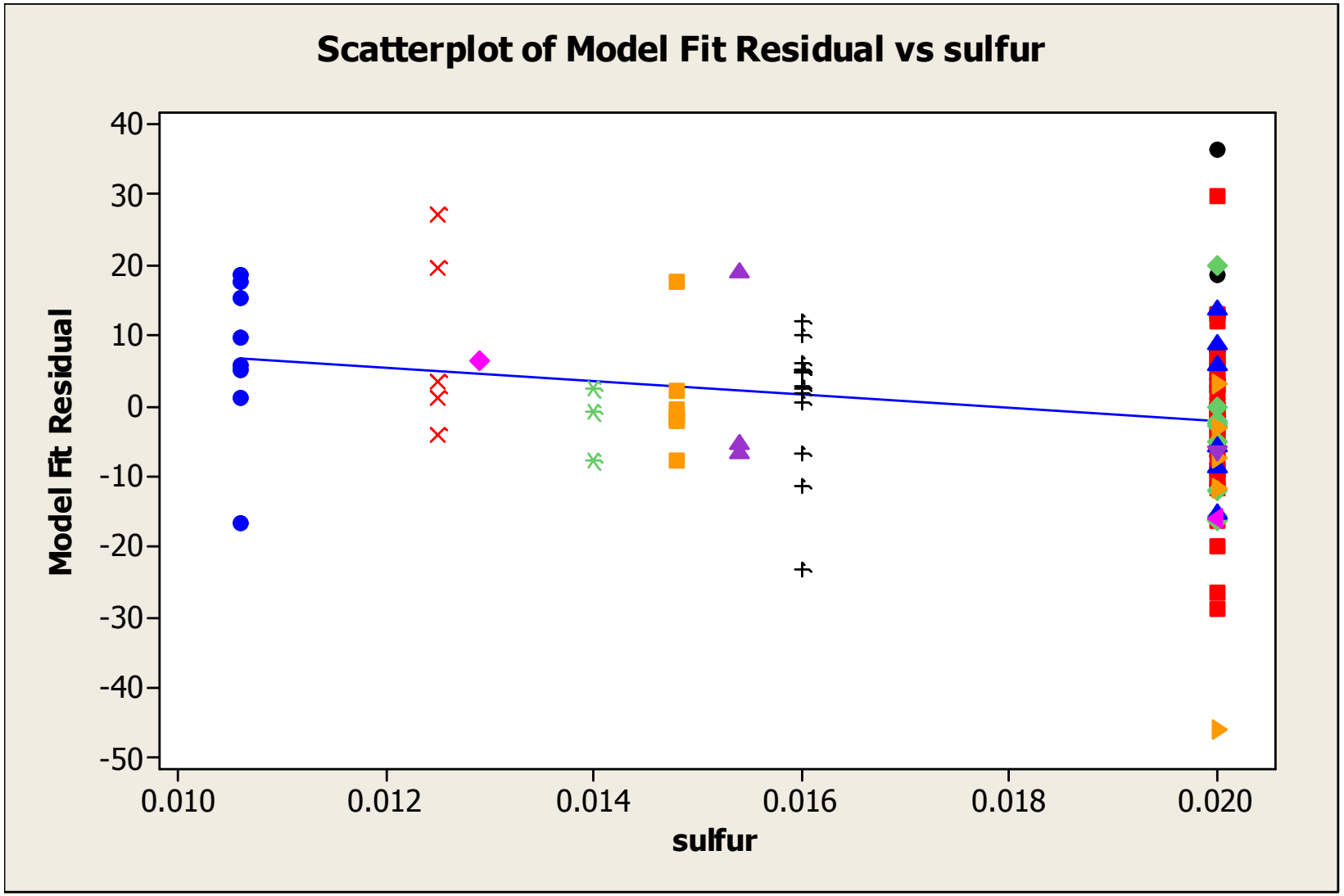
Fuel Factor and Model Fit Residual Plots



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Attachment 5

Application of Current and Proposed Version 2 LTMS to Sequence IVA

LTMS TF SS

May 11, 2010

Data

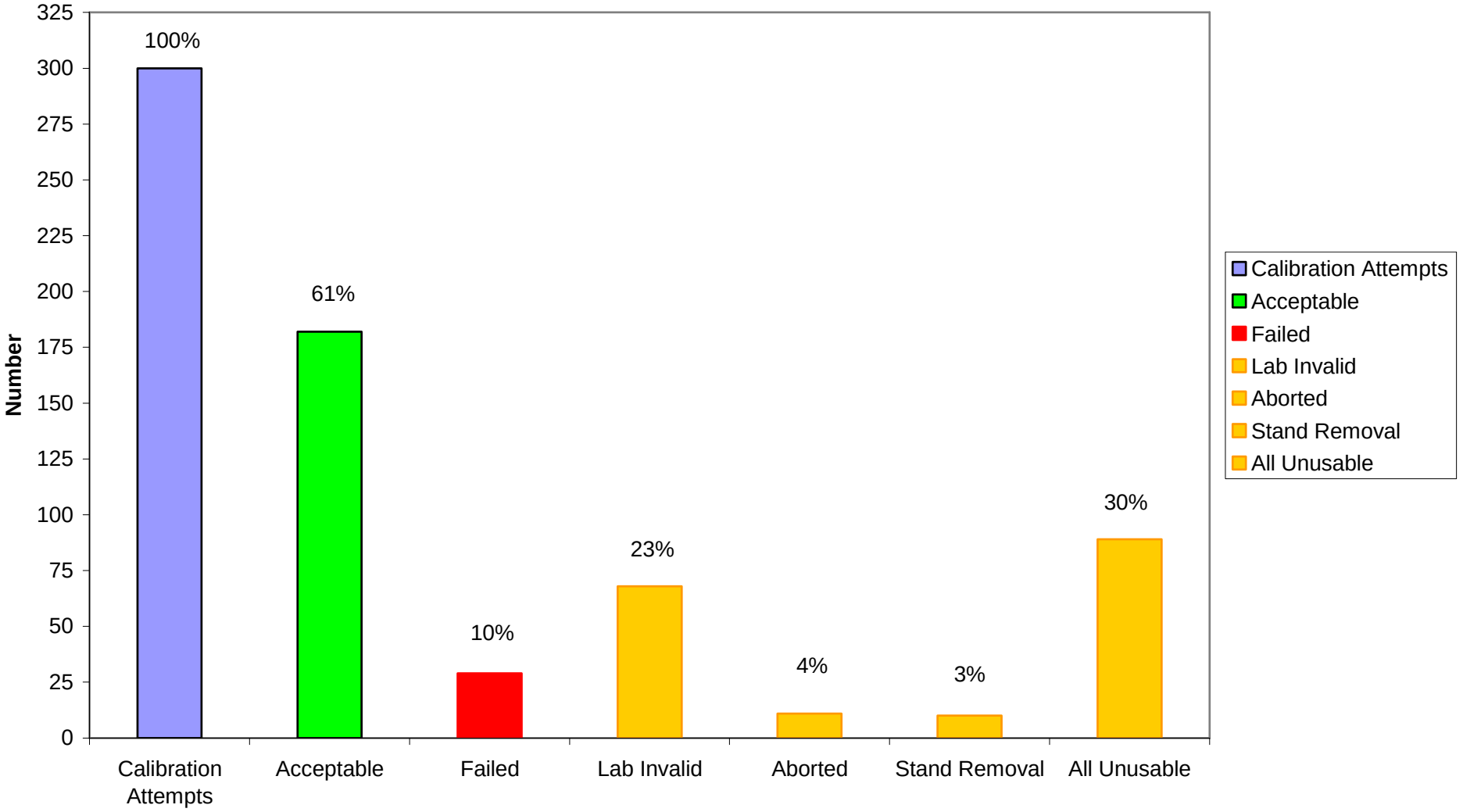
- Sequence IVA LTMS reference oil results as of April 26, 2010
- Plots include only chartable data: n = 229

LTMS Version 2

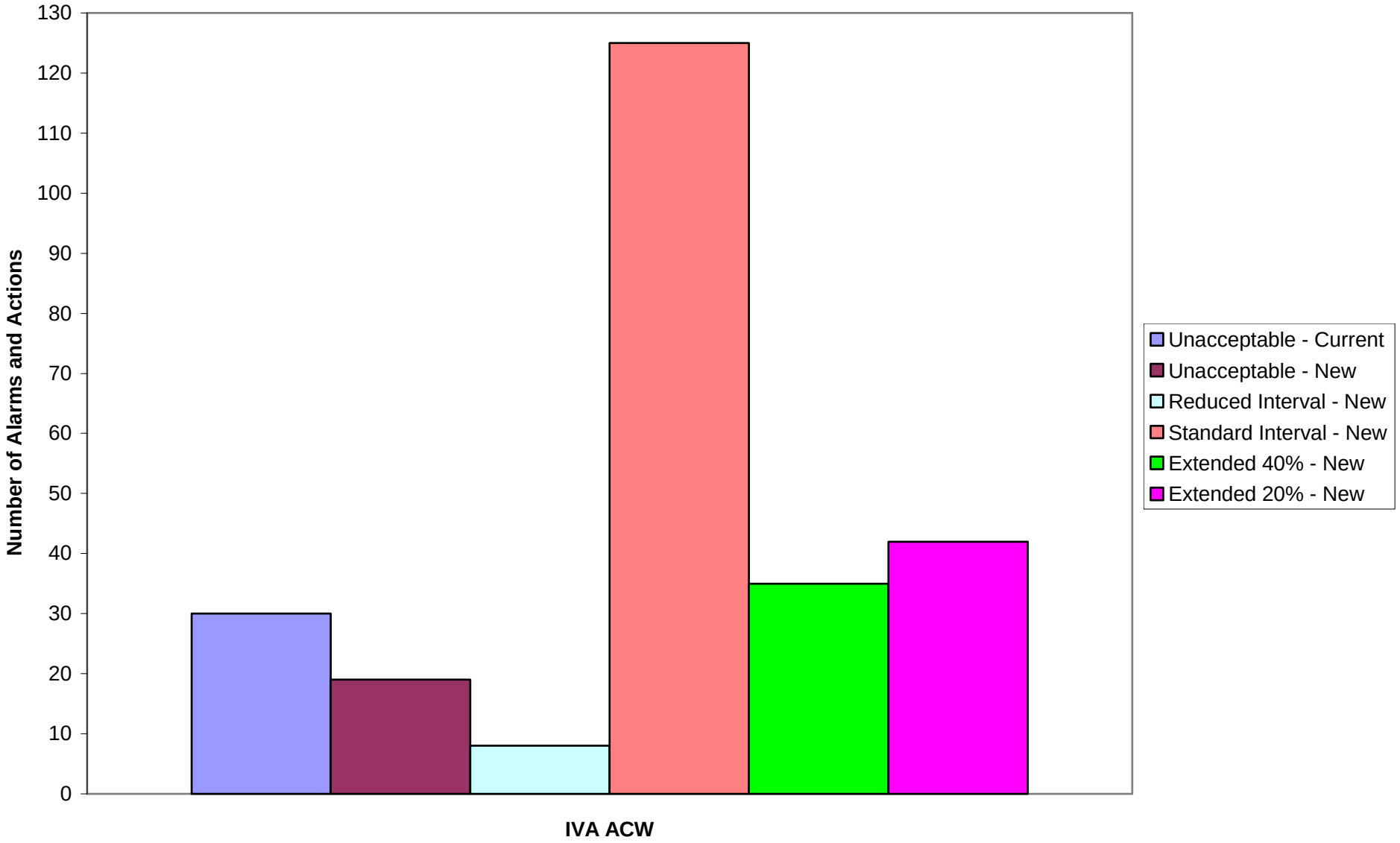
Shewhart Chart of Prediction Error $e_i = Y_i - Z_{i-1}$		
Limit Type	K	Limit
Level 3	1.960	2.126
Level 2	1.645	1.784
Level 1	1.282	1.390

EWMA of Standardized Test Result: Z_i		
Limit Type	Lambda	Limit
Limit 2 Upper	0.3	TBD by SP
Limit 2 Lower	0.3	TBD by SP
Level 1	0.3	0

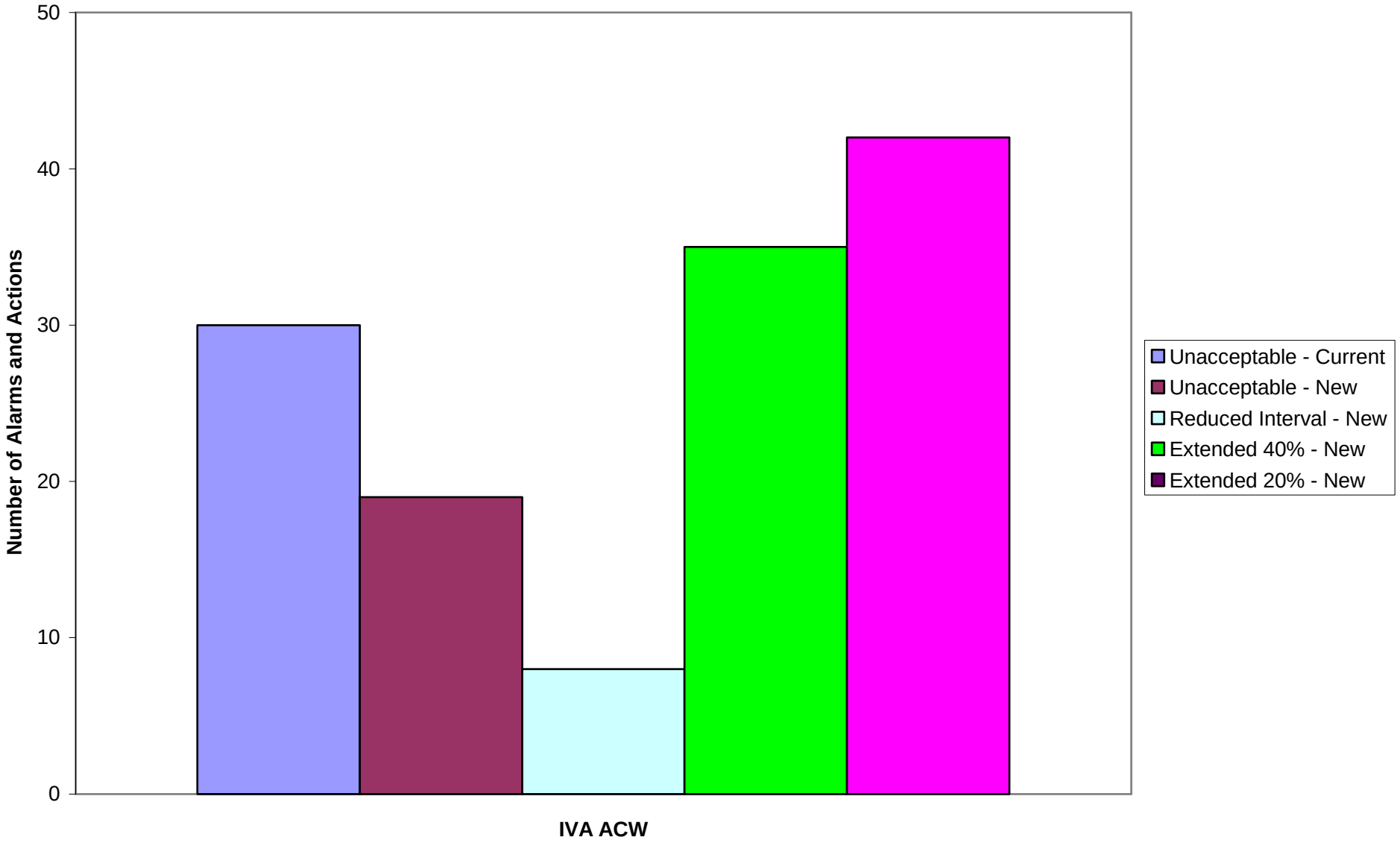
Fate of IVA Calibration Attempts
According to TMC Semi-Annual Reports
(Oct '00 - Apr '10)



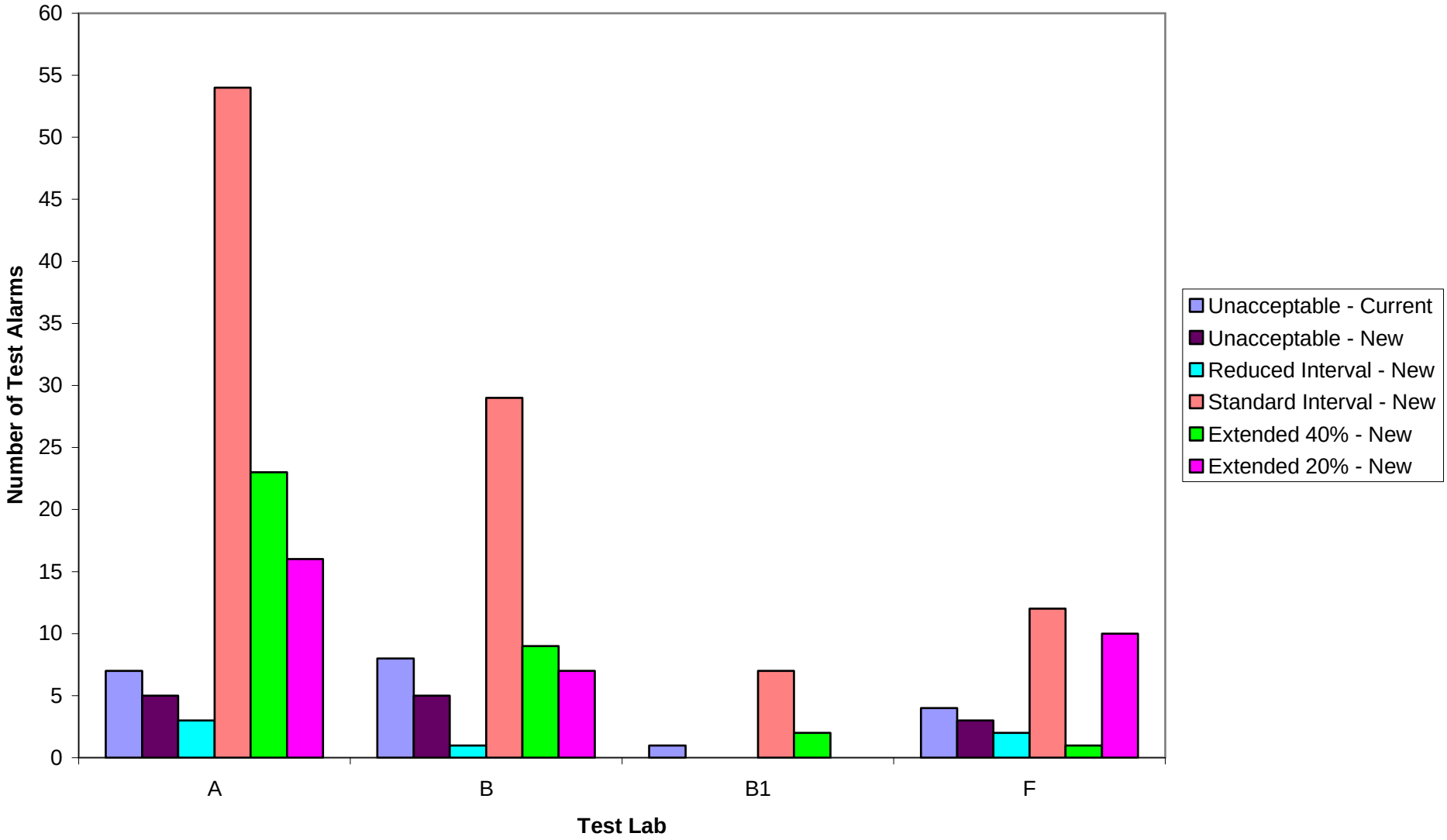
LTMS Alarms and Actions in the Sequence IVA Based on Chartable Tests Only (All Labs)



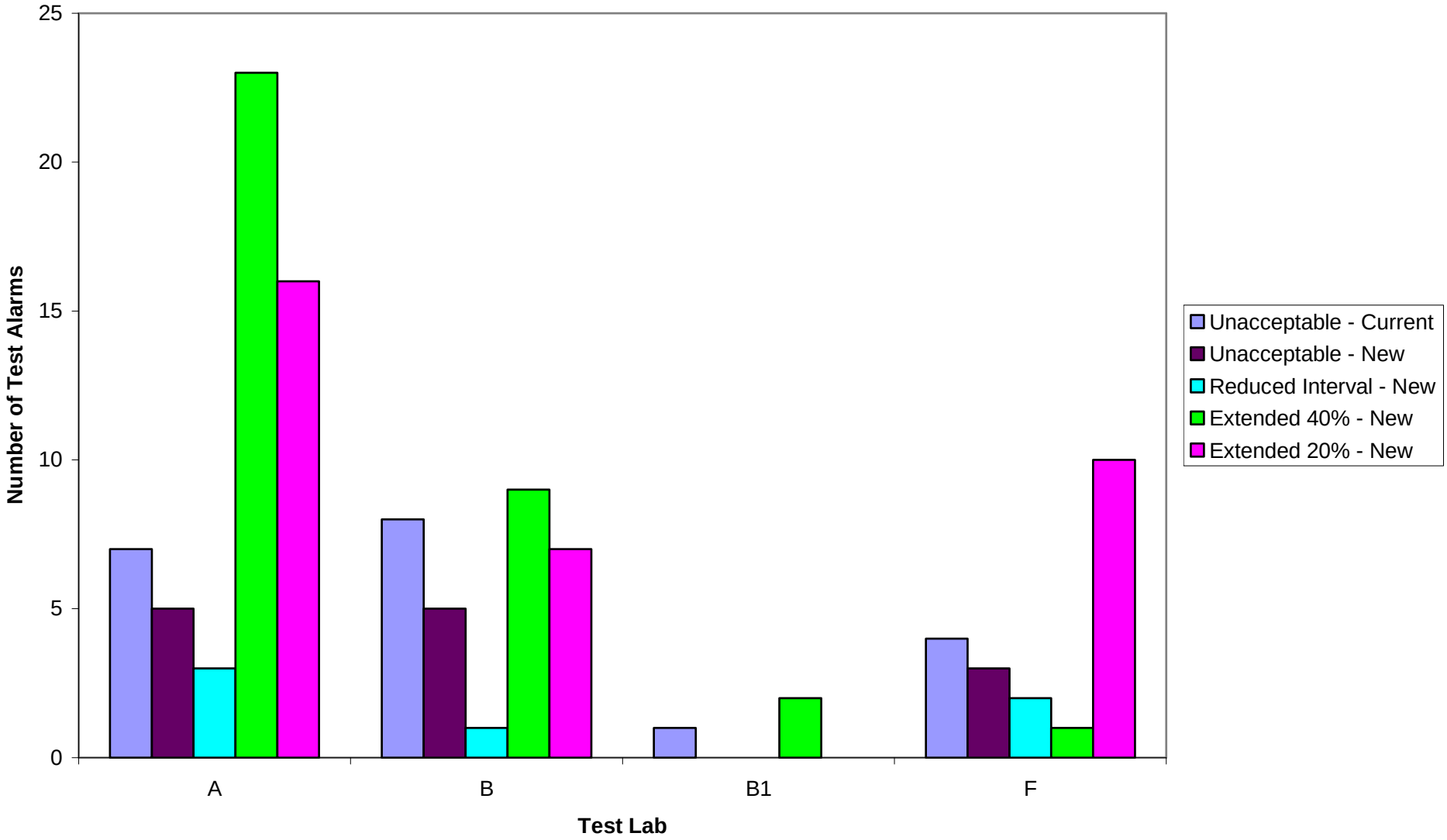
LTMS Alarms and Actions in the Sequence IVA Based on Chartable Tests Only (All Labs)

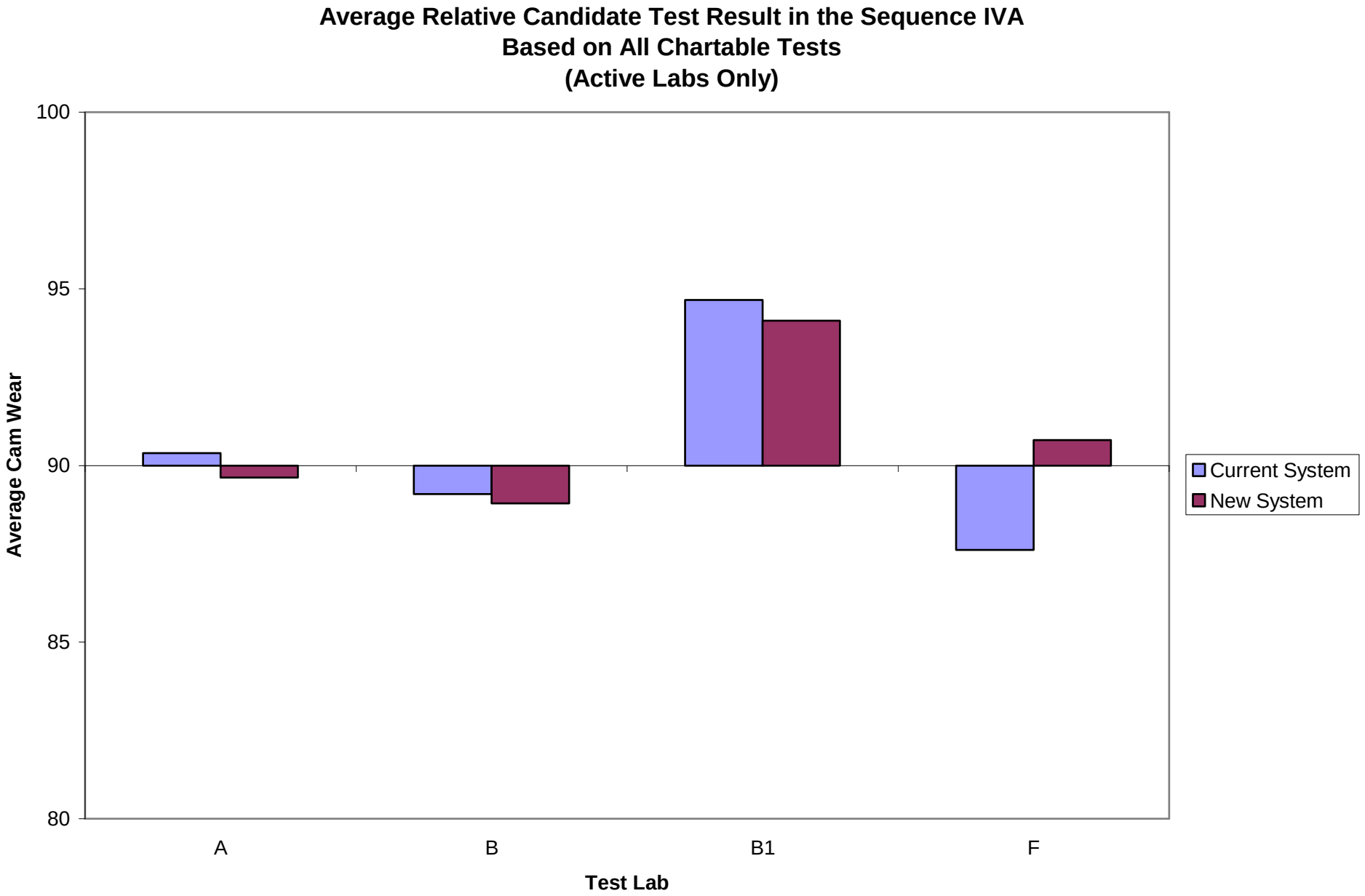


LTMS Alarms in the Sequence IVA Test Based on Chartable Tests Only (Active Labs Only)

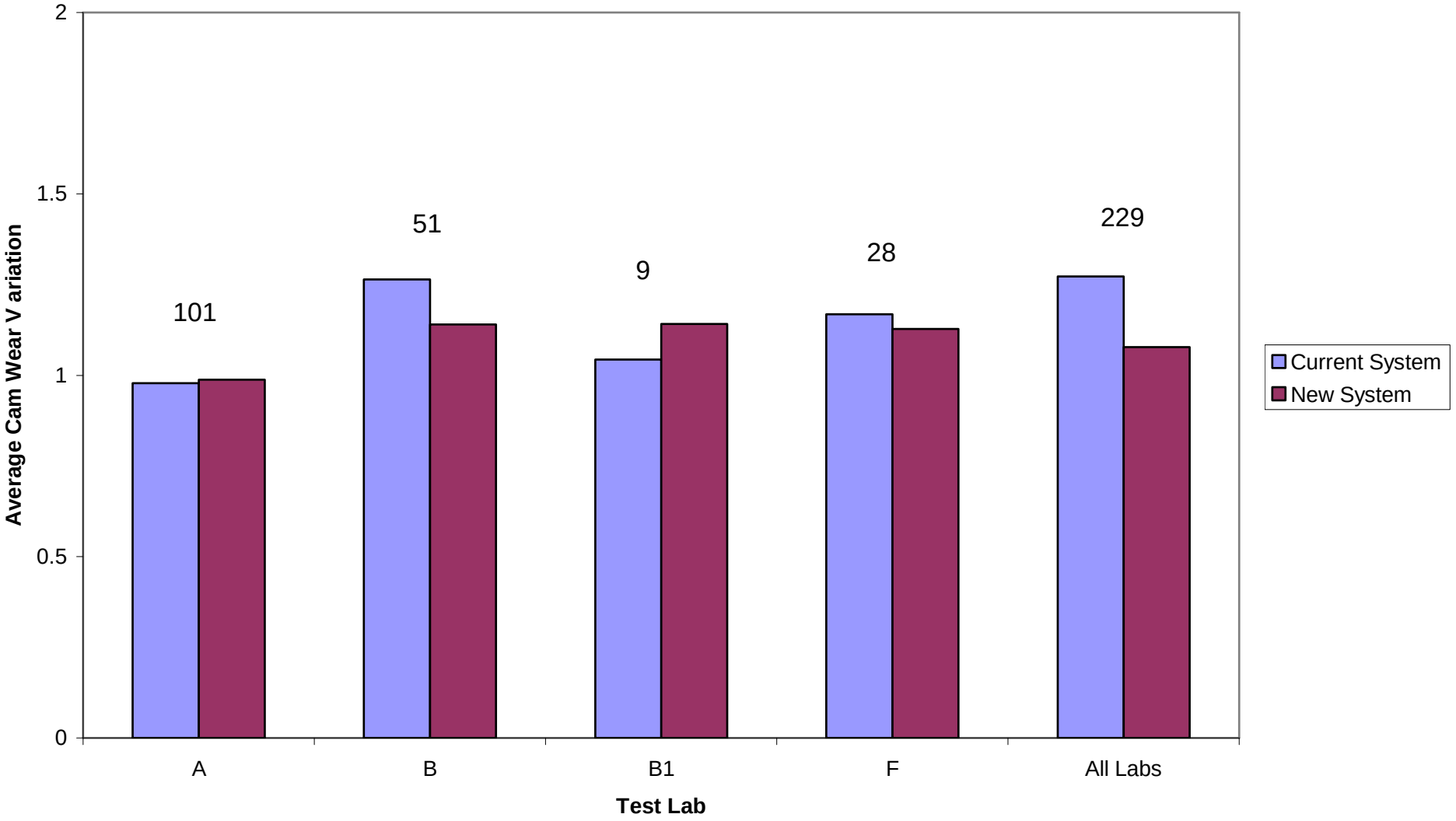


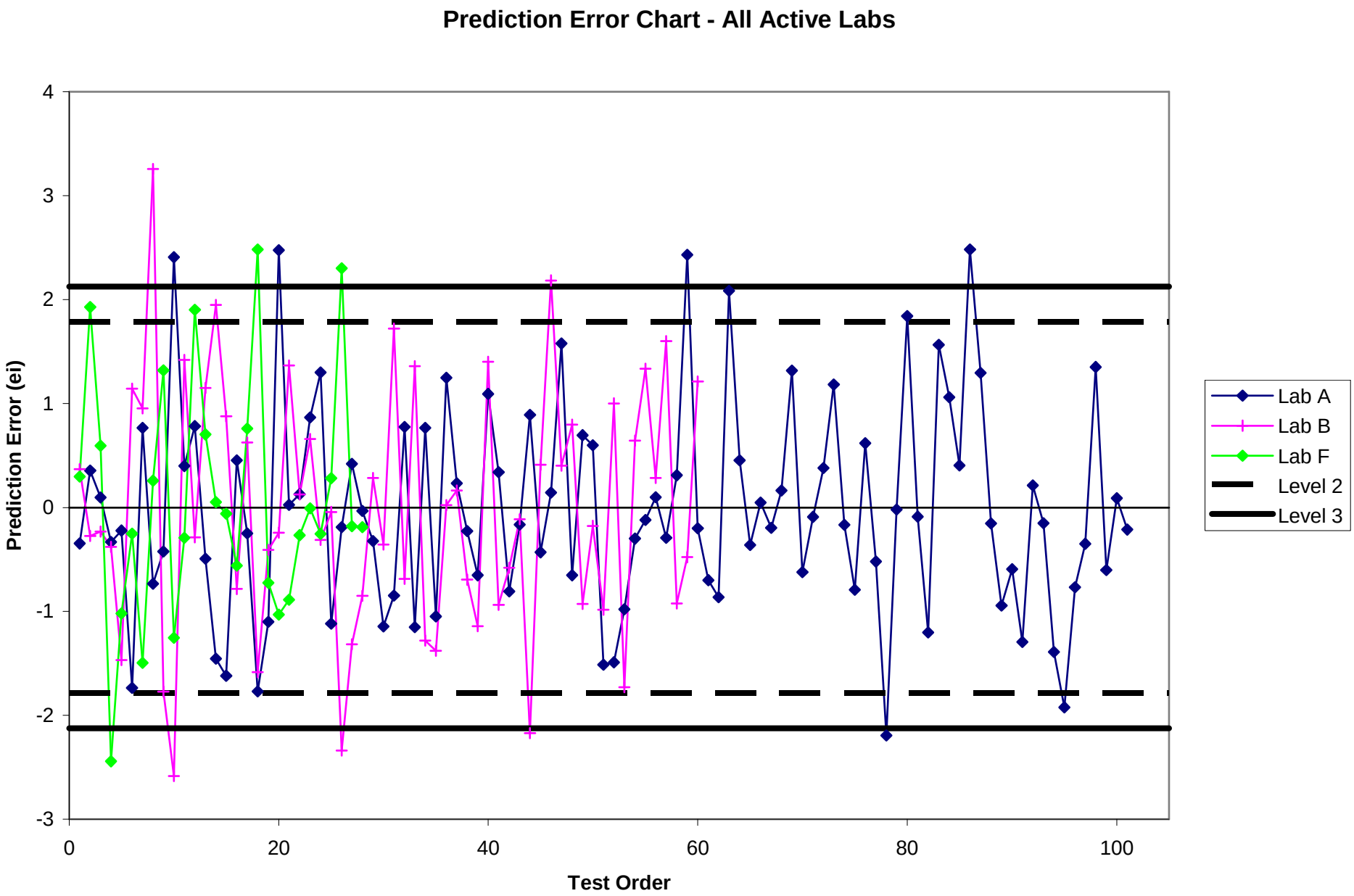
LTMS Alarms in the Sequence IVA Test Based on Chartable Tests Only (Active Labs Only)

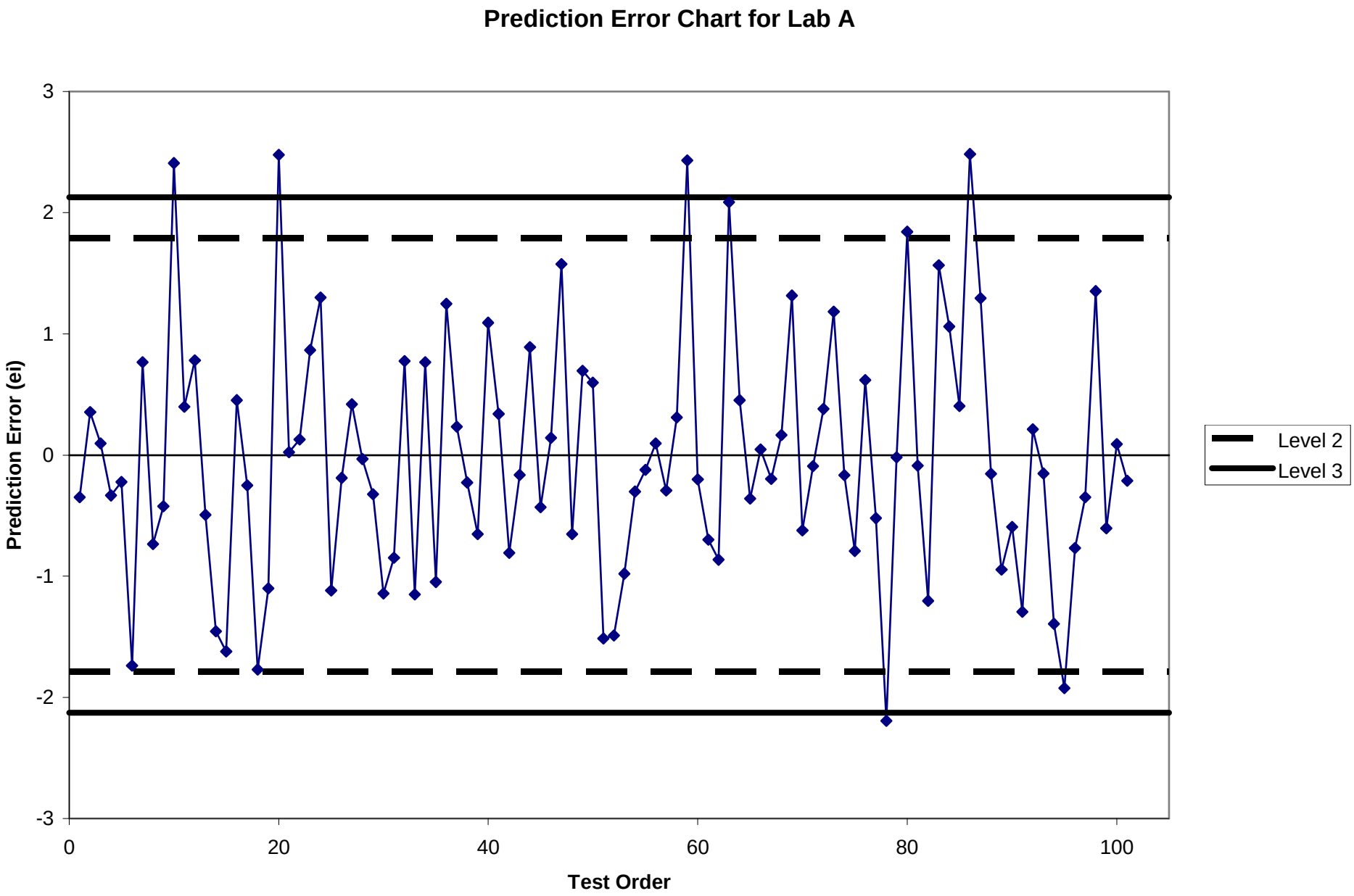



Average Relative Candidate Test Result in the Sequence IVA
Based on All Chartable Tests
(Active Labs Only)
100
95
90
85
80
Average Cam Wear
A
B
B1
F
Test Lab
Current System
New System

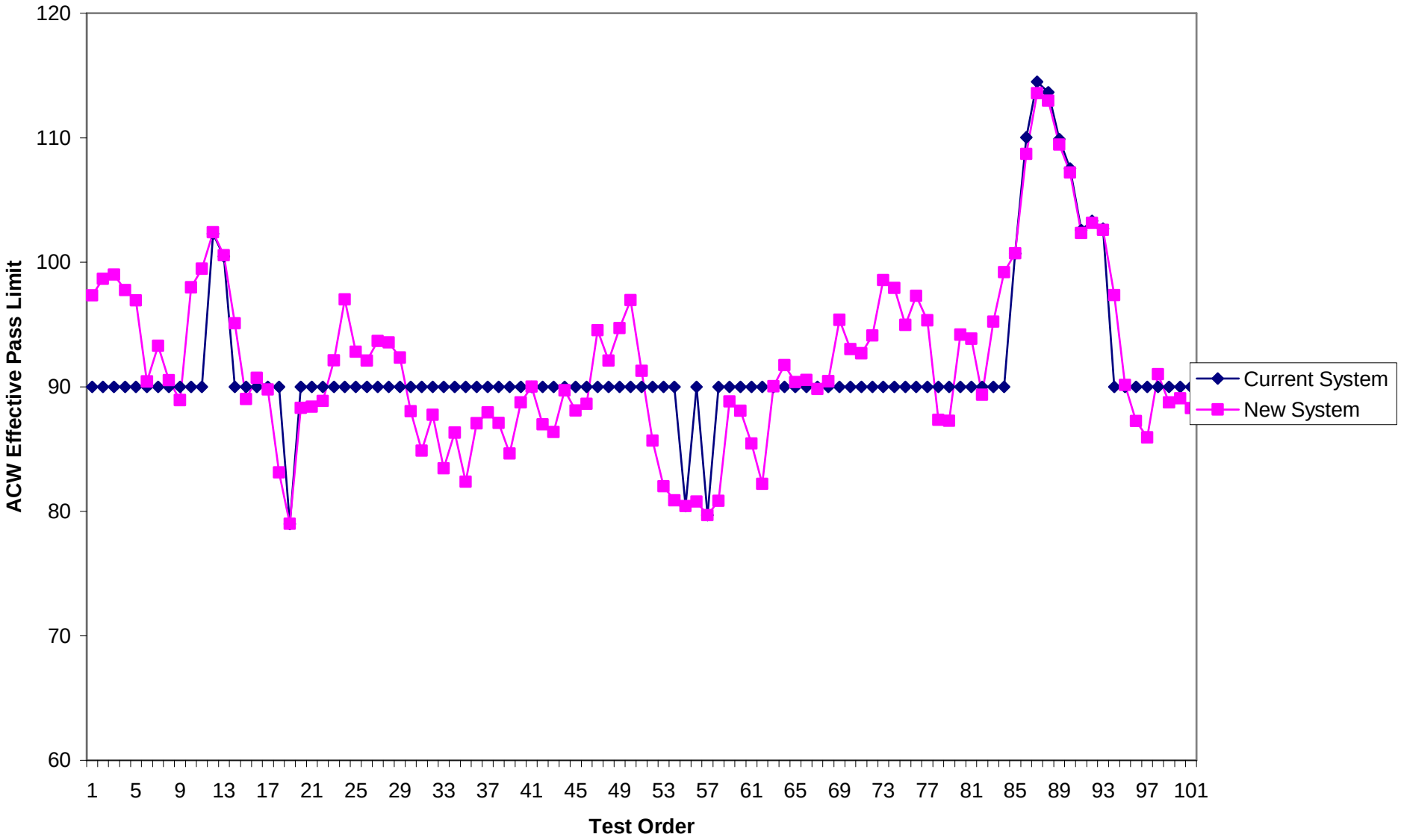
Candidate Oil Test Result Target Variation in the Sequence IVA
Based on All Chartable Tests

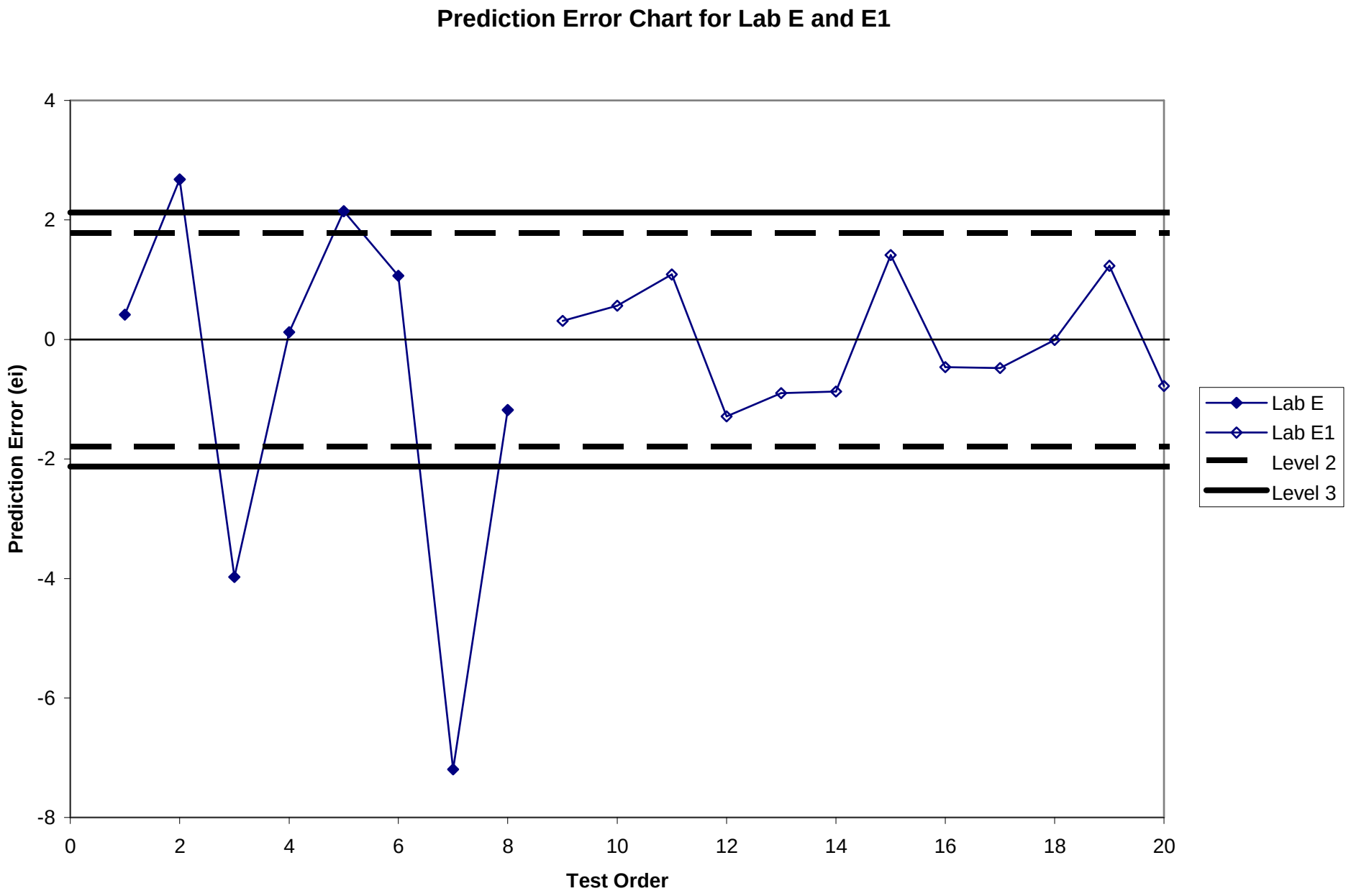



Prediction Error Chart - All Active Labs
Prediction Error (ei)
Test Order
4
3
2
1
0
-1
-2
-3
0
20
40
60
80
100
Lab A
Lab B
Lab F
Level 2
Level 3

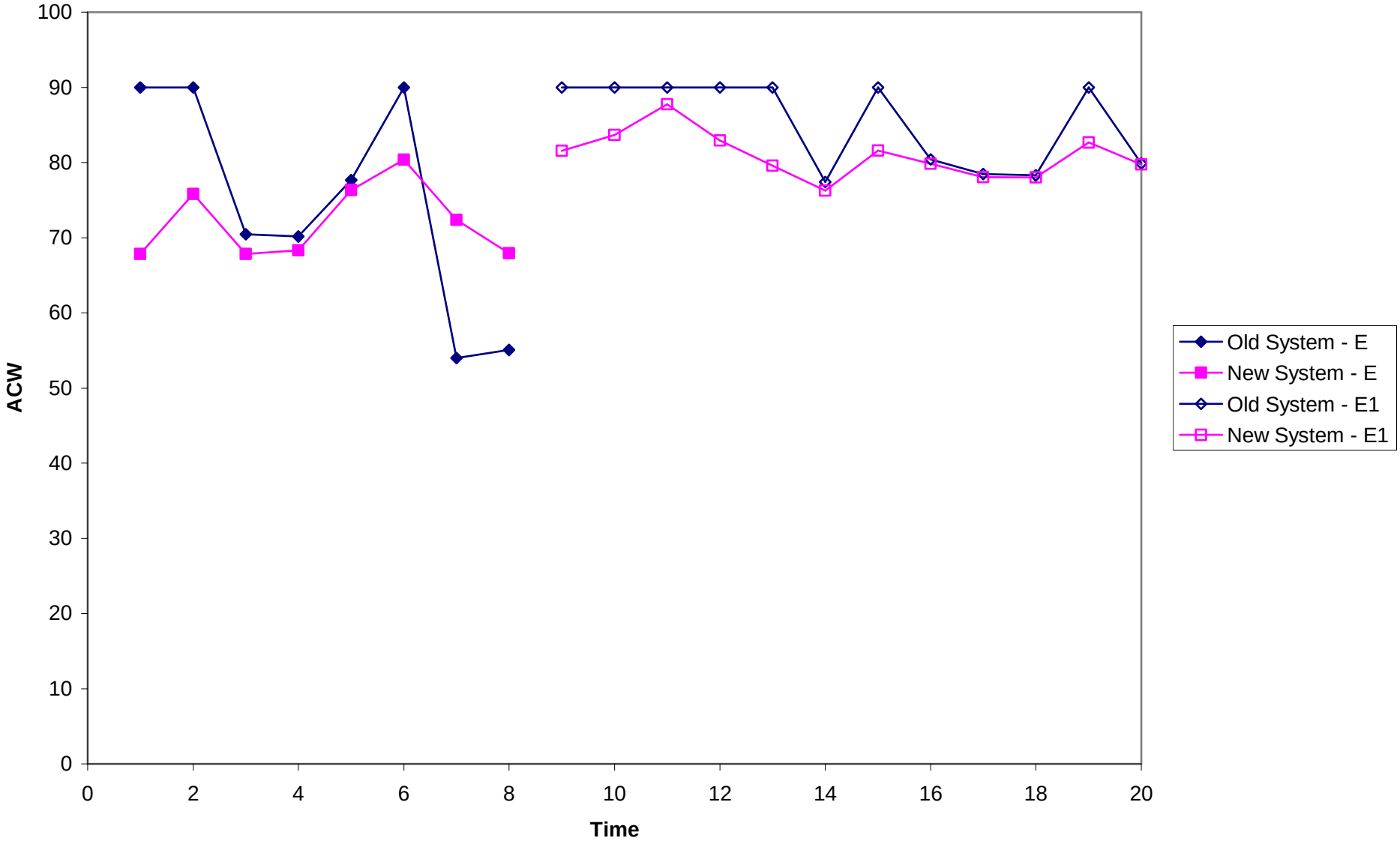

Prediction Error Chart for Lab A
Prediction Error (ei)
3
2
1
0
-1
-2
-3
0
20
40
60
80
100
Test Order
Level 2
Level 3

Effective Pass Limit Given Severity Adjustment for Lab A




Prediction Error Chart for Lab E and E1
Prediction Error (ei)
Test Order
4
2
0
-2
-4
-6
-8
0
2
4
6
8
10
12
14
16
18
20
Lab E
Lab E1
Level 2
Level 3

Effective Pass Limit Given Severity Adjustment for Lab E and E1



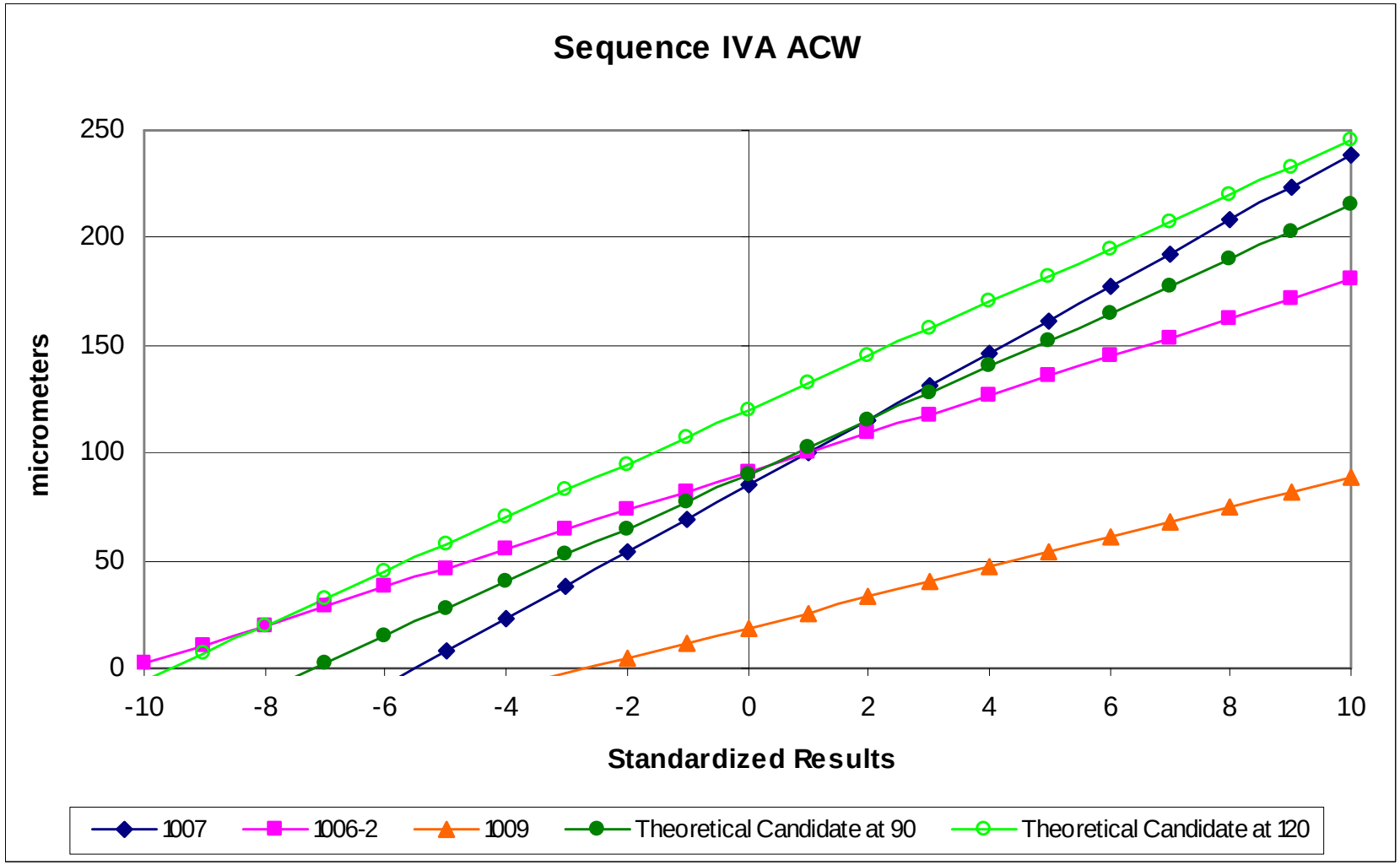
LTMS Version 2 Statistics

LTMS Version 2 Statistics for Sequence IVA

Lab	n	Average % of Normal Reference Period	Z_i Range	
			Lower	Upper
A	101	112%	-0.88	1.88
B	60	110%	-1.46	1.39
C	14	105%	-0.70	1.68
E	20	106%	-1.77	-0.18
F	28	108%	-1.54	0.02
G	6	96%	0.95	2.79
All	229	110%	-1.77	2.79

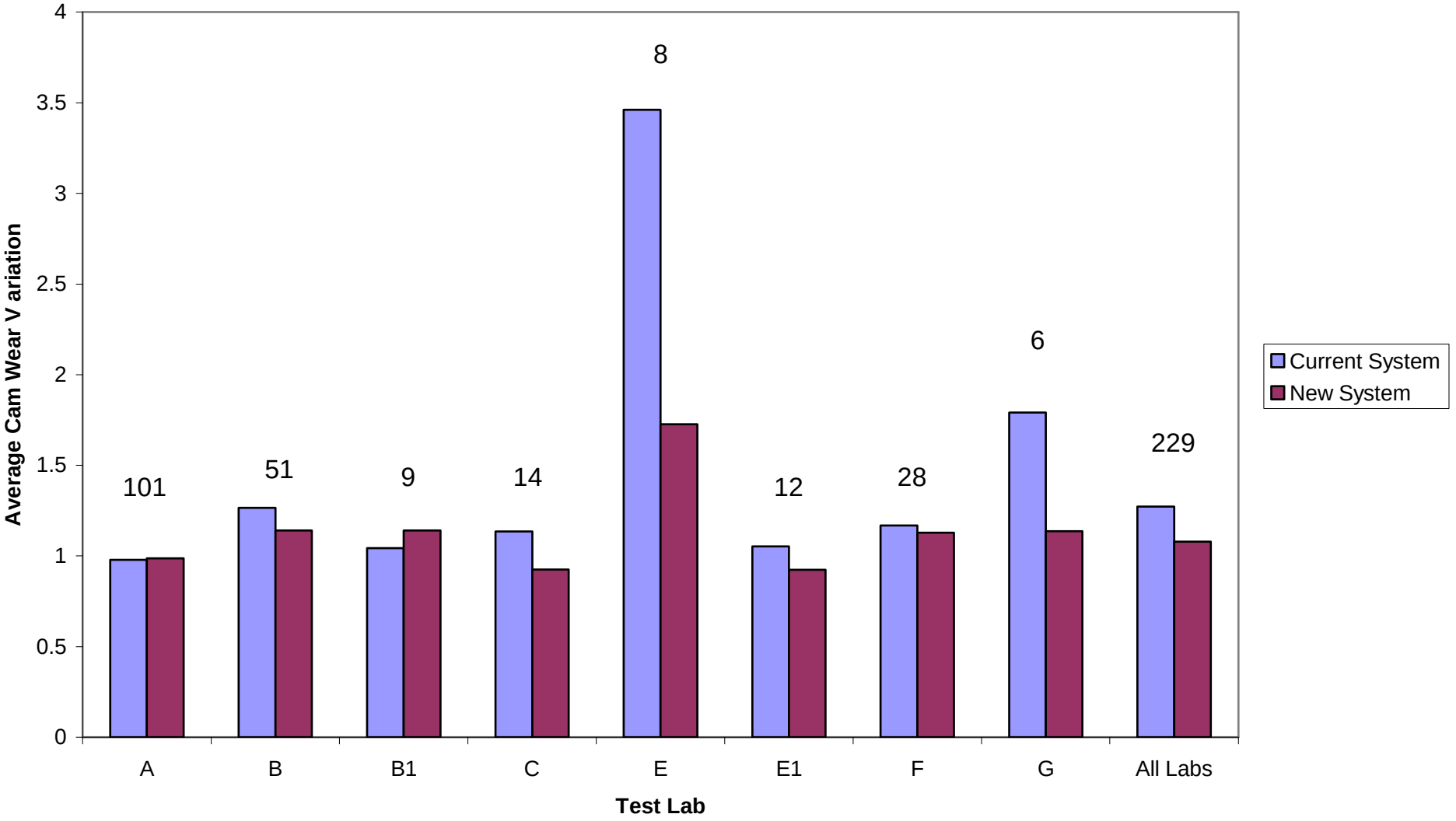
- Average % of Normal Reference Period is a weighted average % of the reference periods following a reference pass taking into account reduced (80%), standard (100%) and extended (120% and 140%) reference periods.
  - If the standard reference period is 15 tests, the average reference period for All Labs would have been 16.5 tests.
- The Z_i Range can be used to develop EWMA Z_i Level 2 limits.

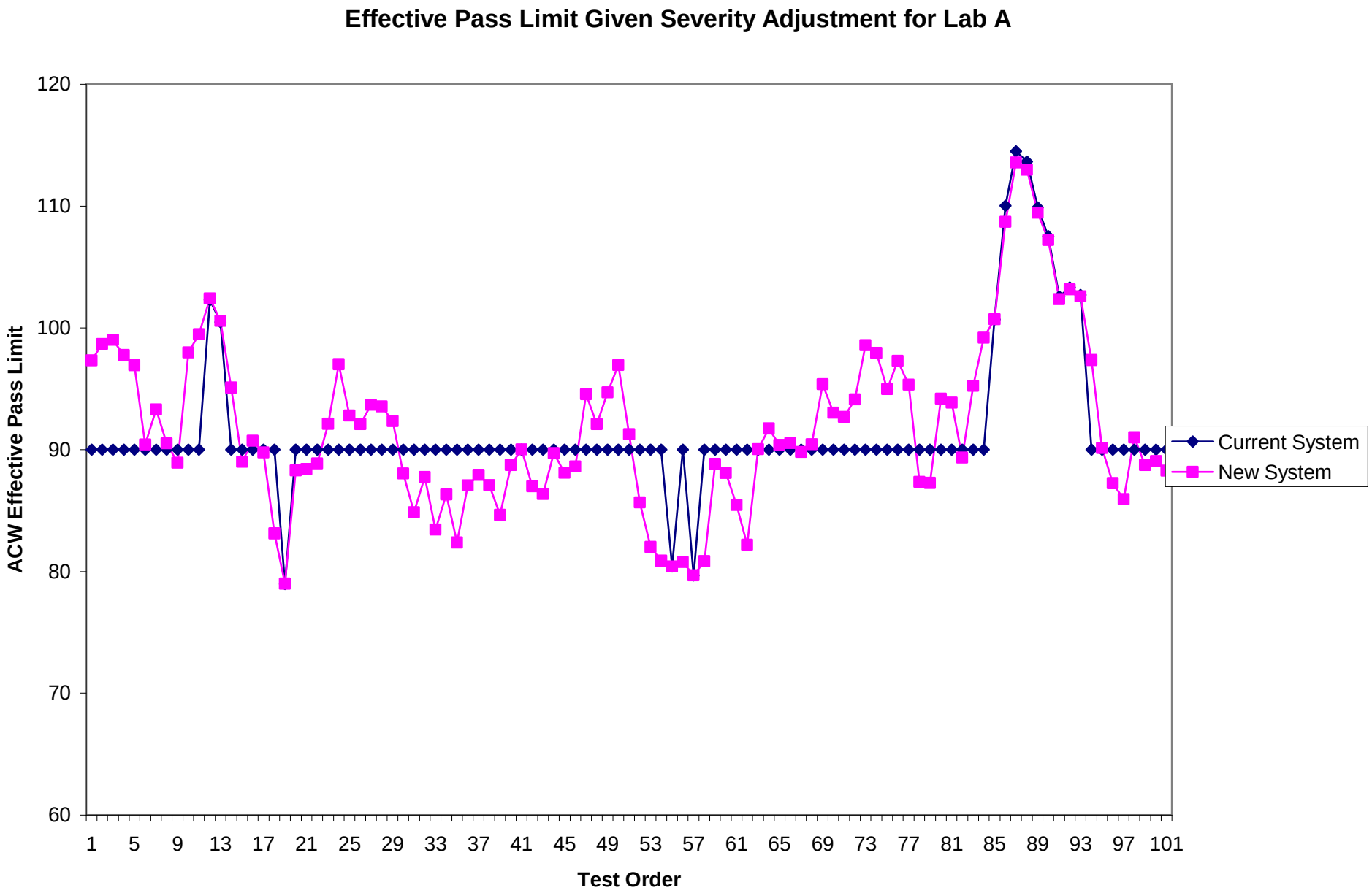
Level 2 Z_i Limits Consideration



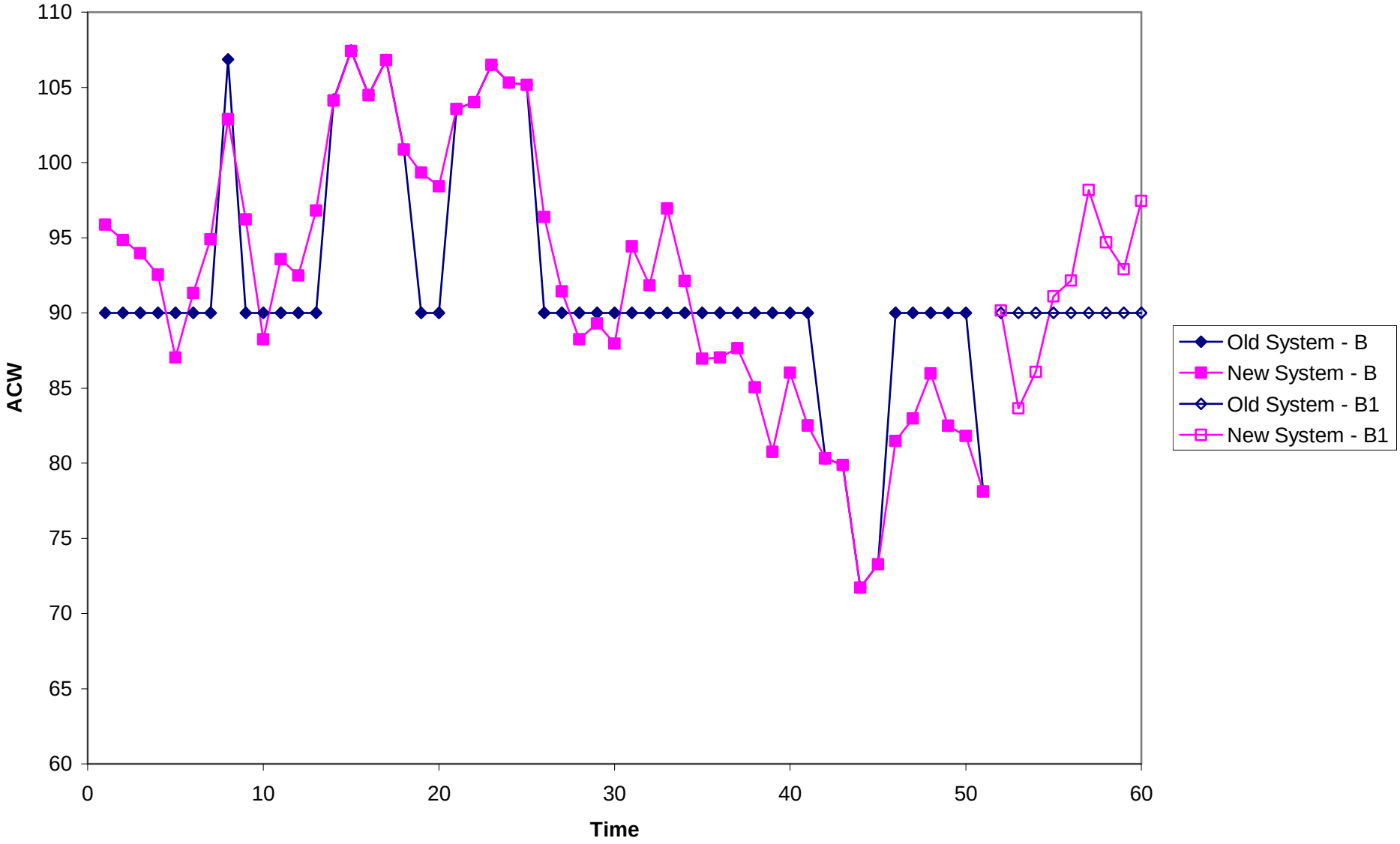
Additional Slides

Candidate Oil Test Result Target Variation in the Sequence IVA
Based on All Chartable Tests

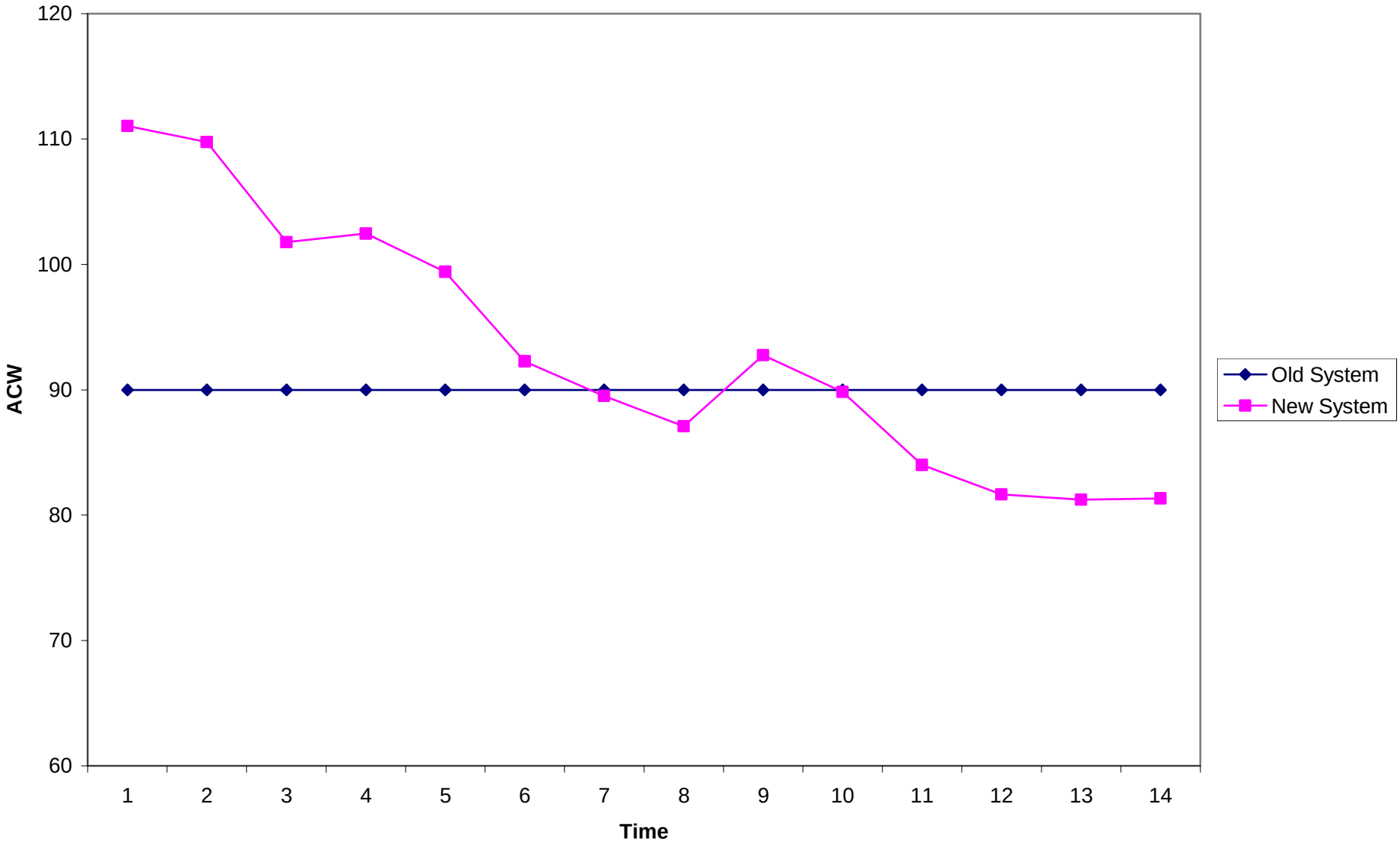



Effective Pass Limit Given Severity Adjustment for Lab A
ACW Effective Pass Limit
120
110
100
90
80
70
60
1
5
9
13
17
21
25
29
33
37
41
45
49
53
57
61
65
69
73
77
81
85
89
93
97
101
Test Order
Current System
New System

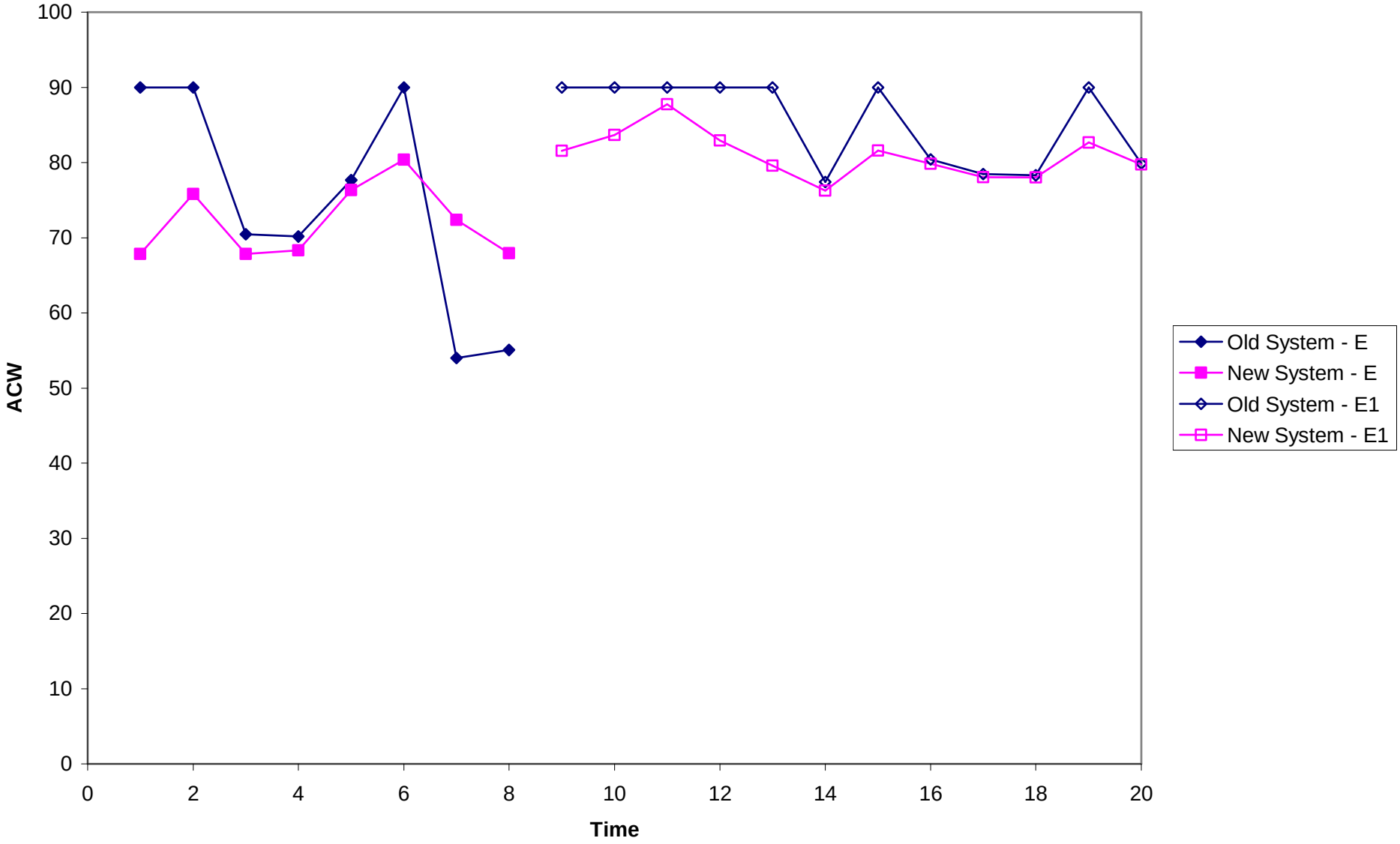
Effective Pass Limit Given Severity Adjustment for Lab B and B1



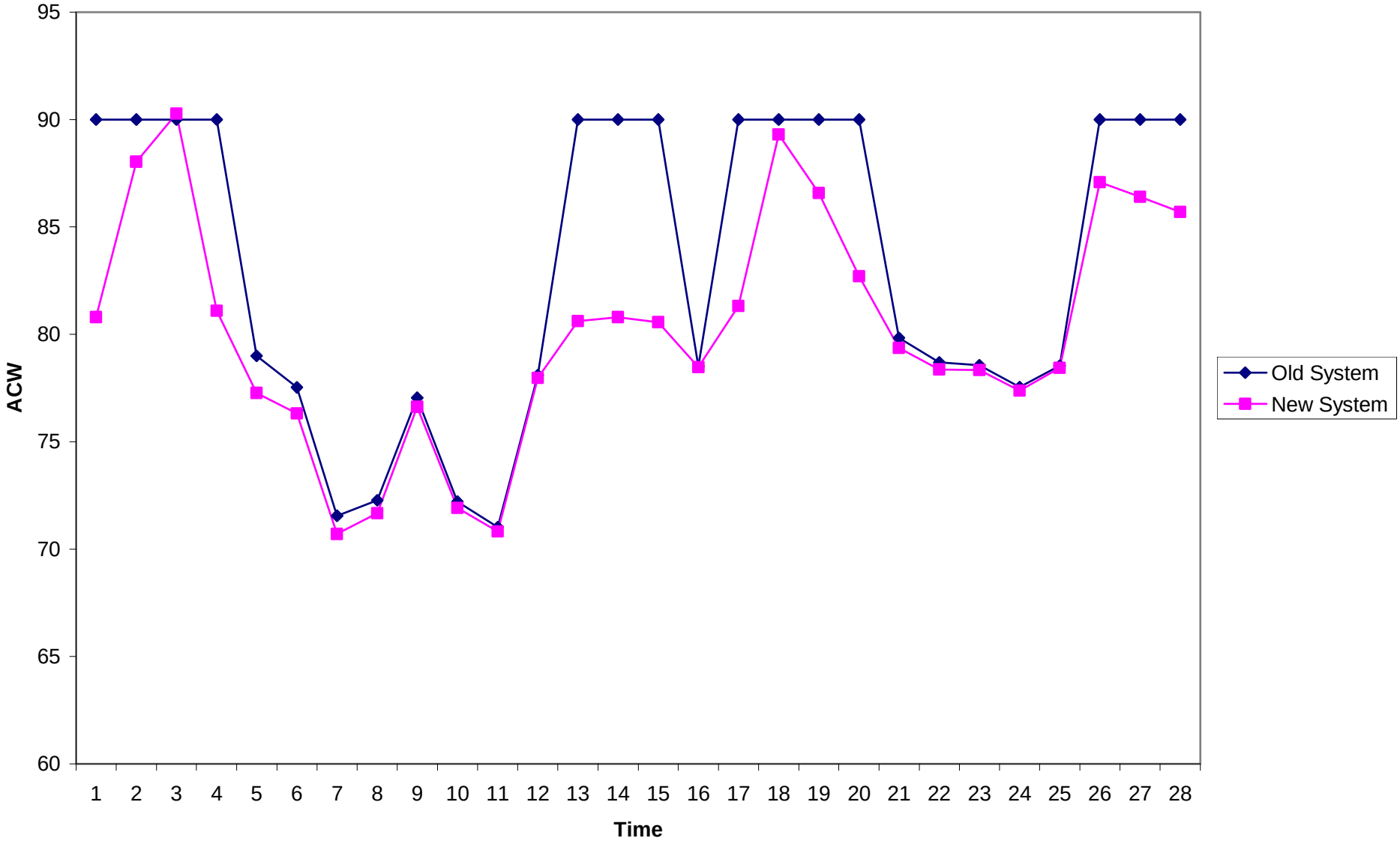
Effective Pass Limit Given Severity Adjustment for Lab C



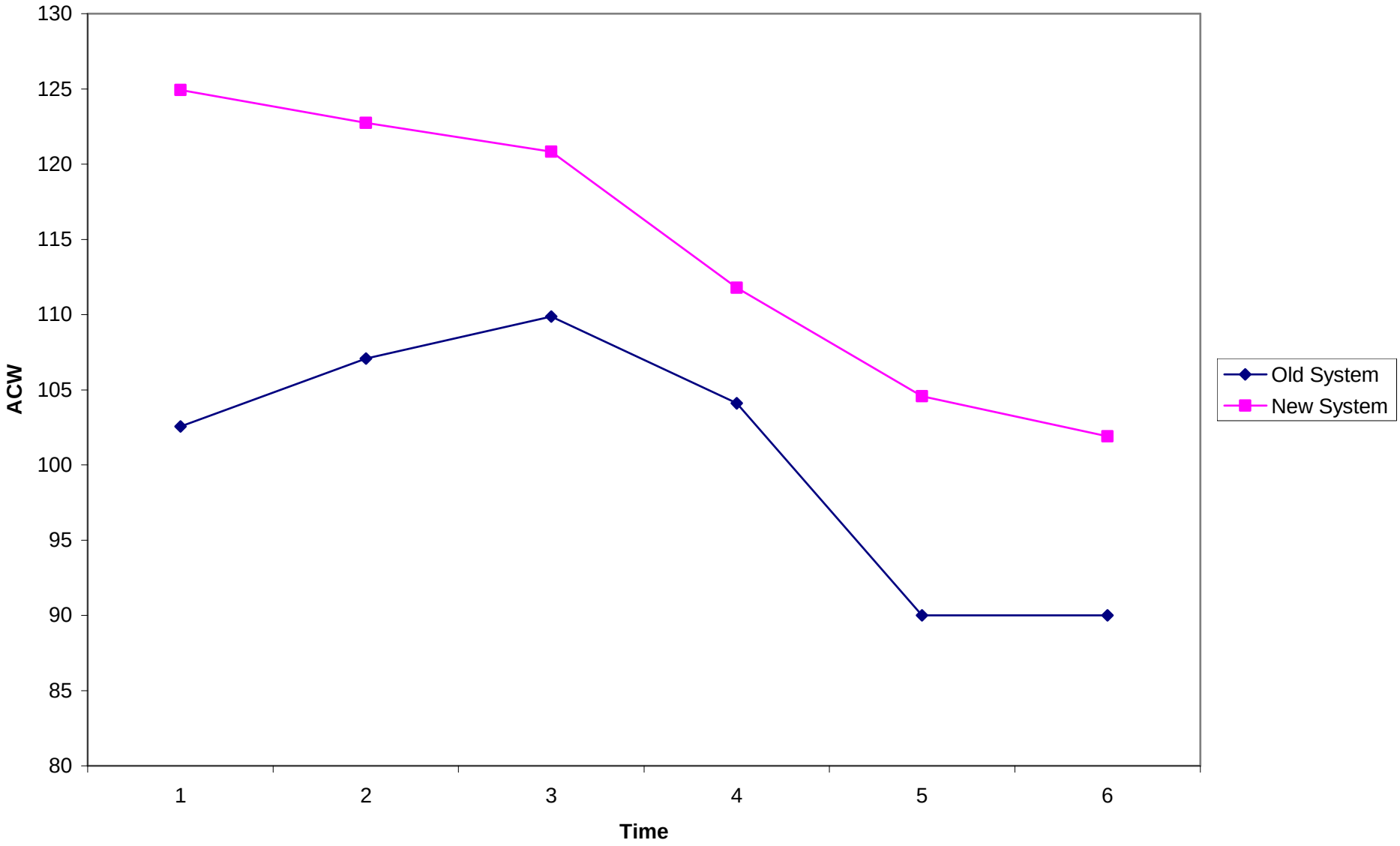
Effective Pass Limit Given Severity Adjustment for Lab E and E1

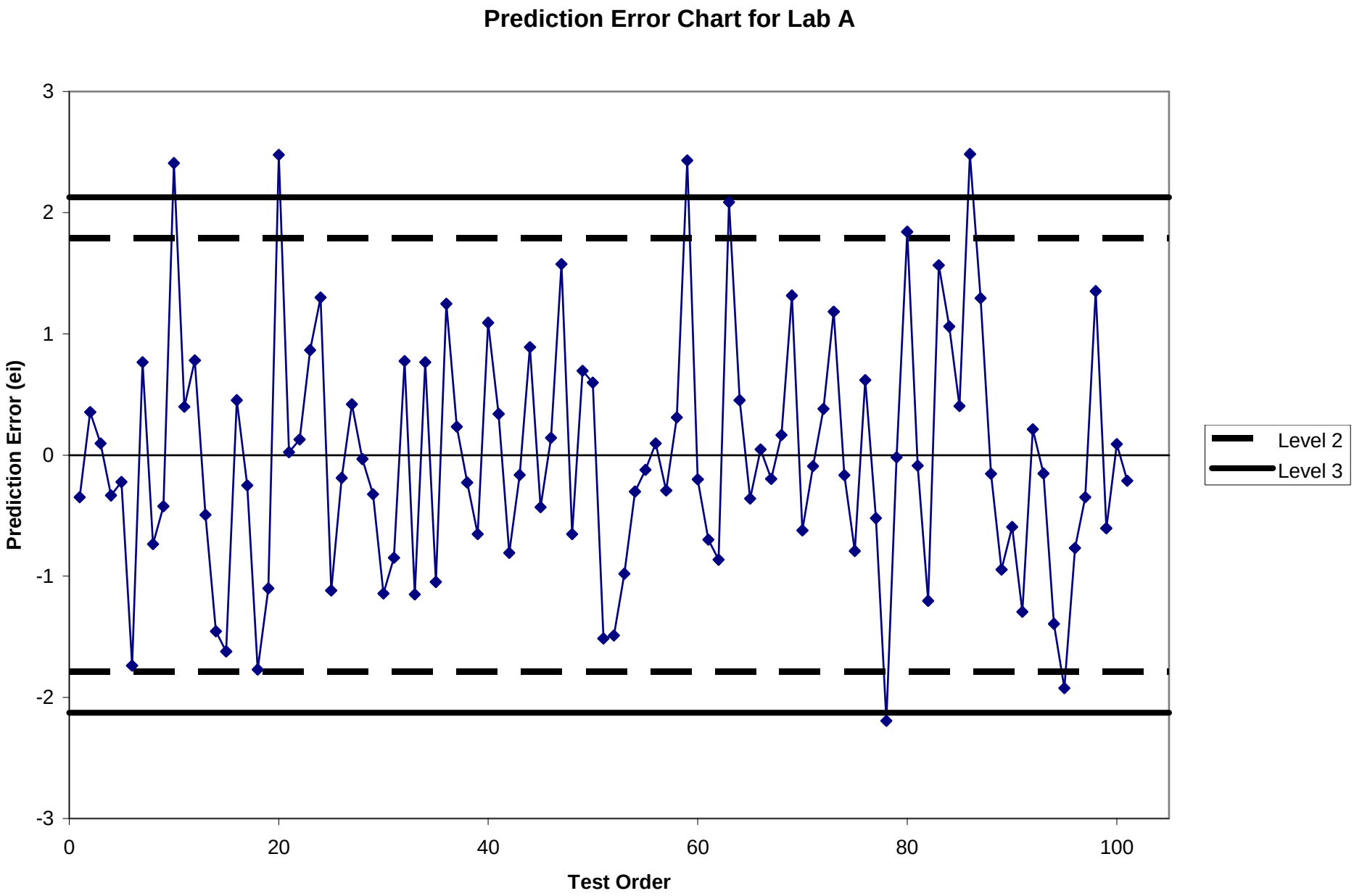


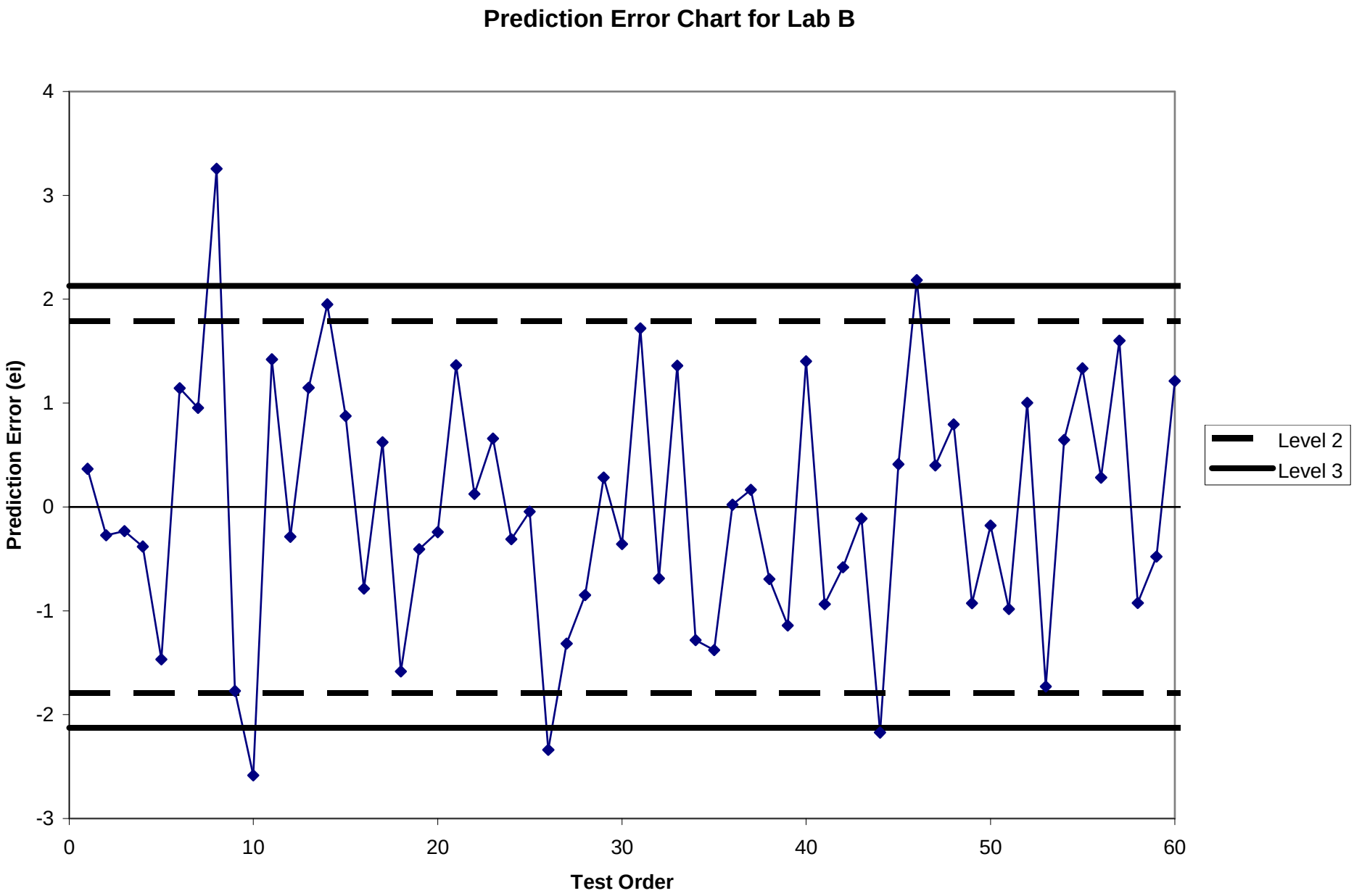
Effective Pass Limit Given Severity Adjustment for Lab F

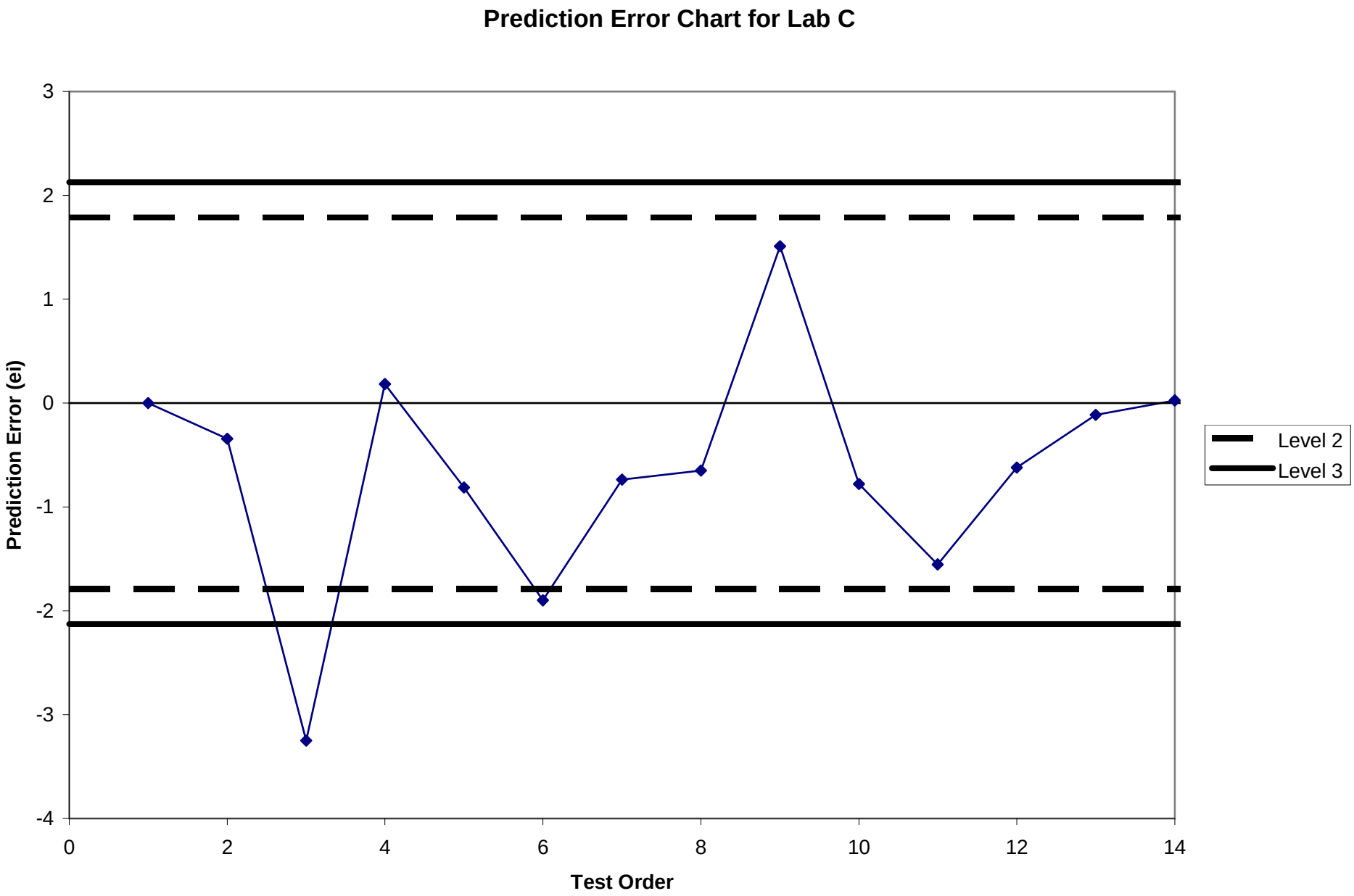


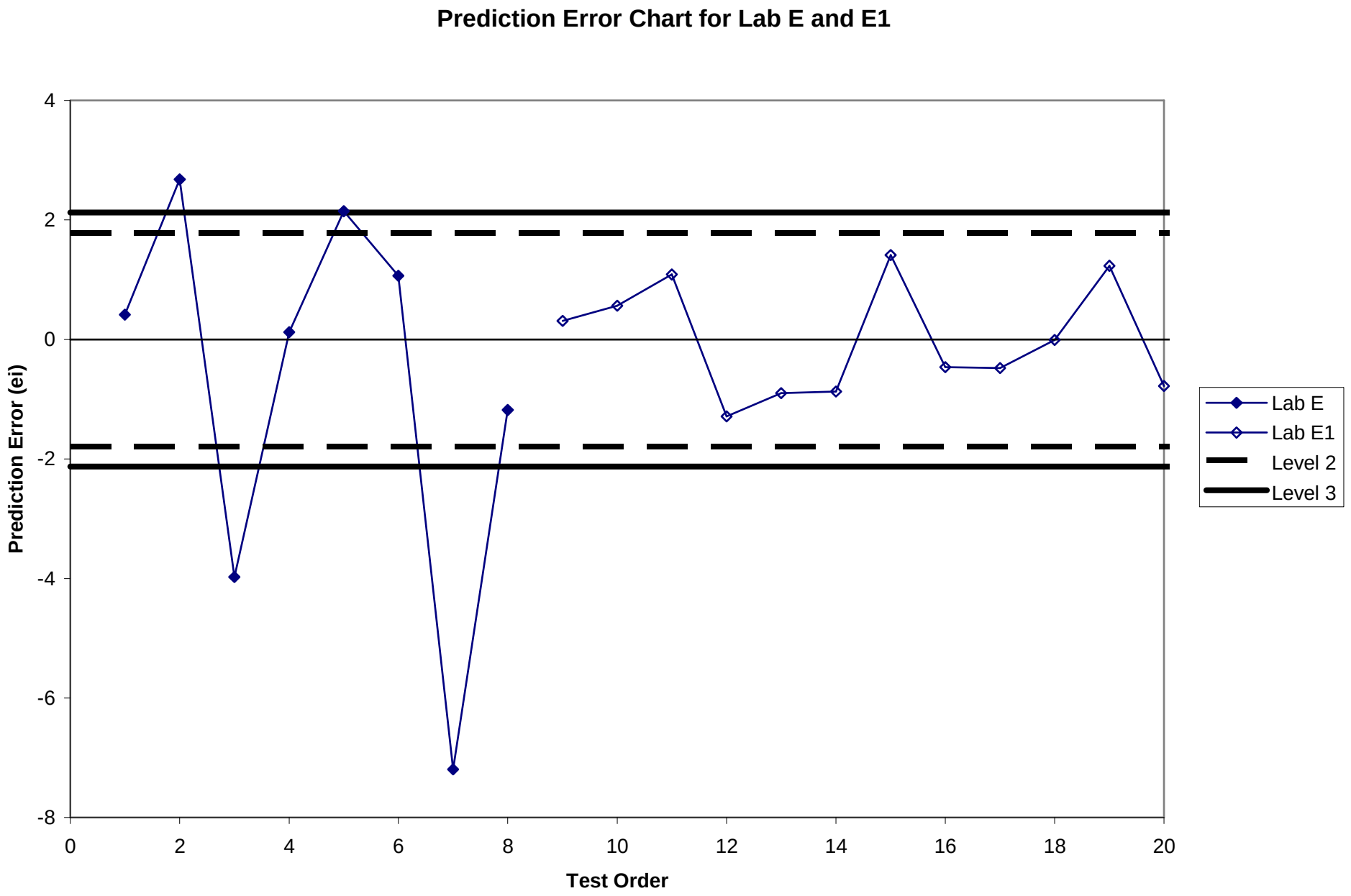
Effective Pass Limit Given Severity Adjustment for Lab G

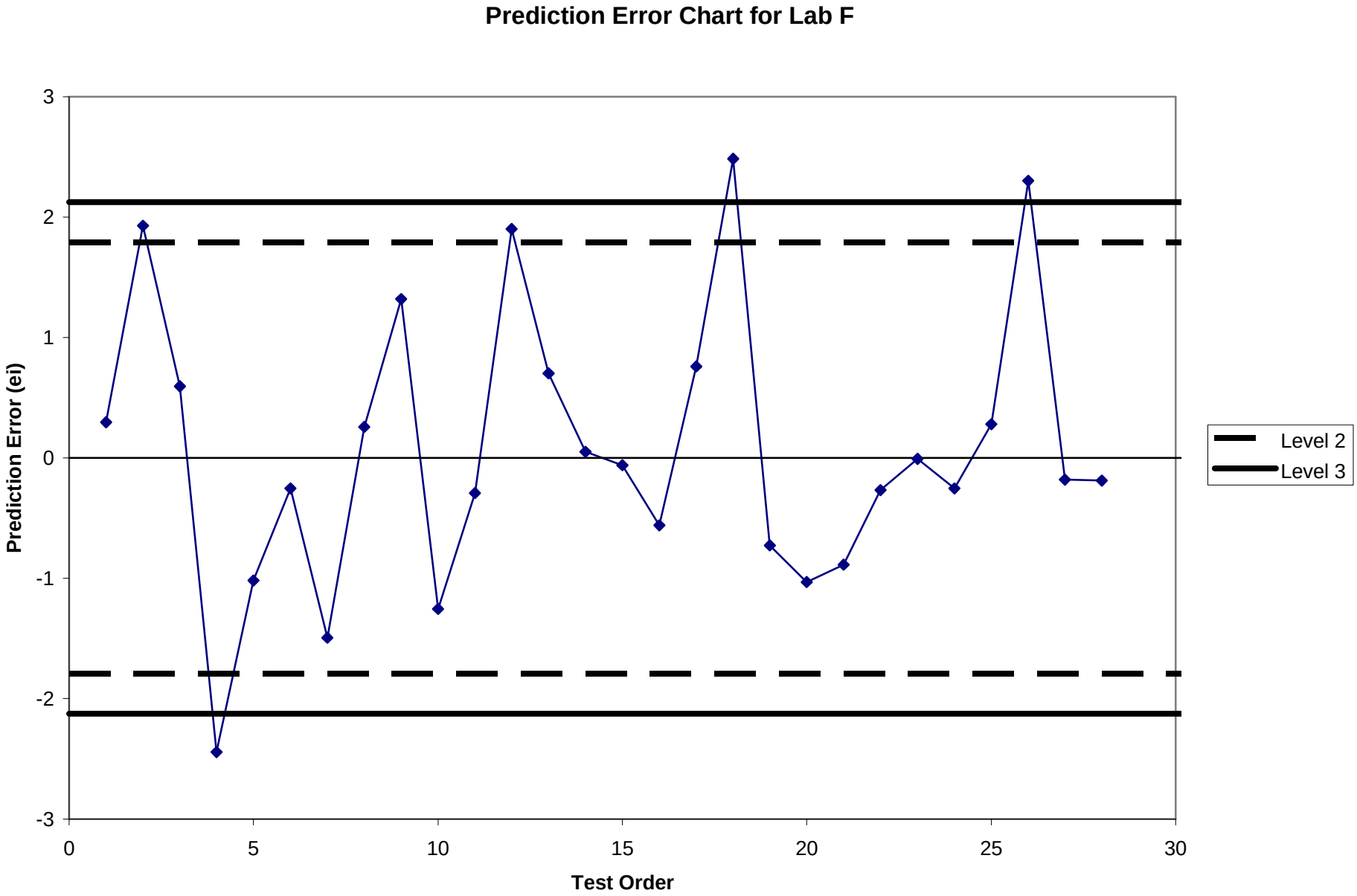


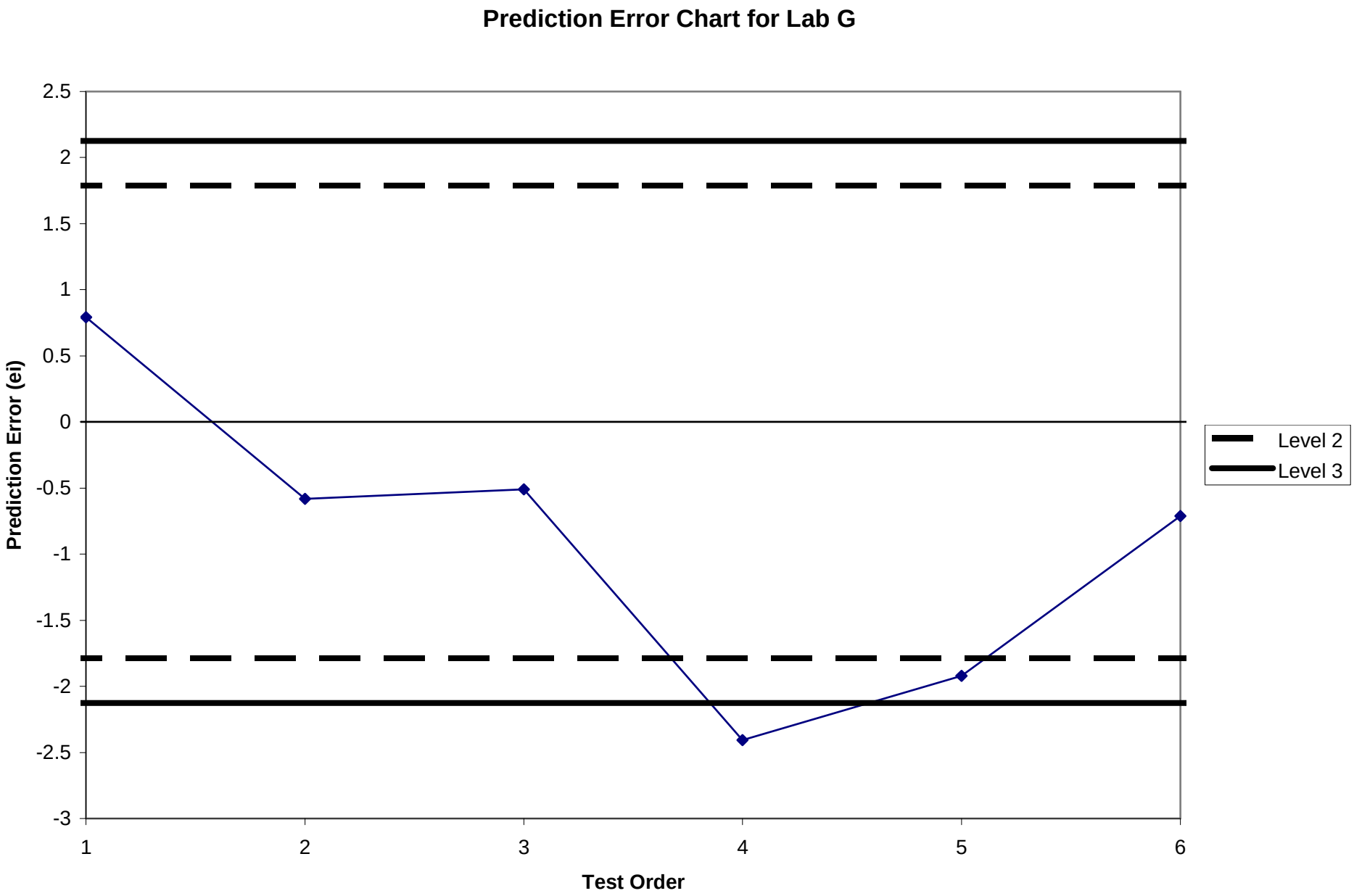

Prediction Error Chart for Lab A
Prediction Error (ei)
3
2
1
0
-1
-2
-3
0
20
40
60
80
100
Test Order
Level 2
Level 3


Prediction Error Chart for Lab B
Prediction Error (ei)
Test Order
4
3
2
1
0
-1
-2
-3
0
10
20
30
40
50
60
Level 2
Level 3


Prediction Error Chart for Lab C
Prediction Error (ei)
3
2
1
0
-1
-2
-3
-4
0
2
4
6
8
10
12
14
Test Order
Level 2
Level 3


Prediction Error Chart for Lab E and E1
Prediction Error (ei)
Test Order
4
2
0
-2
-4
-6
-8
0
2
4
6
8
10
12
14
16
18
20
Lab E
Lab E1
Level 2
Level 3


Prediction Error Chart for Lab F
Prediction Error (ei)
3
2
1
0
-1
-2
-3
0
5
10
15
20
25
30
Test Order
Level 2
Level 3


Prediction Error Chart for Lab G
Prediction Error (ei)
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
1
2
3
4
5
6
Test Order
Level 2
Level 3

Attachment 6

ASTM Sequence IVA Surveillance Panel

Scope and Objectives

Scope

The Sequence IVA Surveillance Panel is responsible for the surveillance and continued improvement of the Sequence IVA test documented in Test Method D 6891 as updated by the Information Letter system. Data on test precision and laboratory versus field correlation will be solicited and evaluated at least every six months. Improvements in wear measurement technique, test operation, test monitoring and test validation will be accomplished through continual communication with the Test Sponsor and Parts Distributor, ASTM Test Monitoring Center, ASTM Committee D02.B0.01 and the ASTM Passenger Car Engine Oil Classification Panel. Actions to improve the process will be recommended when deemed appropriate based on input from the proceeding. The Panel will review development and correlation of updated test procedures with previous test procedures. This process will provide a suitable test procedure for evaluating an automotive lubricant's effect on controlling cam lobe wear for overhead valvetrain equipped engines with sliding cam followers.

Objectives	**Target Date**
1. Ensure a secure supply of Nissan KA24E hardware is available to accommodate testing beyond GF-5, anticipating the need for additional parts solicitations from Nissan.	*On-going*
2. Solicit a GF-5 reference oil producing wear results around 50 microns.	*Nov 2010*

William A. Buscher III, Chairman
Sequence IVA Surveillance Panel

Updated: May 2010

Potential GF-5 Reference Oil Test Data

Test Method	Parameter	Unit	Limit			Test Result	
						5W-20	5W-30
Sequence VIII - D6709	10 h Stripped Viscosity	cSt	stay in grade			VGRA	9.7
	Total Bearing Weight Loss	mg	26 max.				20
Sequence IIIGB - D7320	Phosphorus Retention	%	79			VGRA	88
Sequence IVA - D6891	Average Cam Wear	µm	90 max.			VGRA	6
Sequence VID - D7589			XW20	XW30	10W30		
	FEI Sum	%	2.6	1.9	1.5 min	2.7	N/A
	FEI2	%	1.2	0.9	0.6 min	1.3	N/A
Sequence IIIG - D7320	Kinematic Viscosity Increase @40 °C	%	150 max.			VGRA	66
	Average Piston Skirt Varnish	merits	report				9.5
	Weighted Piston Deposits	merits	4.0 min				4.4
	Avg. Cam and Lifter Wear	µm	60 max.				24
	Hot Stuck Rings		None				none
	Oil Consumption	Liters	Report				3.5
Sequence VG - D6593	Average Engine Sludge	merits	8.0 min.			VGRA	9.1
	Rocker Cover Sludge	merits	8.3 min.				9.4
	Average Piston Skirt Varnish	merits	7.5 min.				8.1
	Average Engine Varnish	merits	8.9 min.				9.0
	Oil Screen Sludge	%	15 max.				2
	Hot Stuck Compression Rings		none				none
	Cold Stuck Rings		report				1
	Oil Screen Debris	%	report				20
	Oil Ring Clogging	%	report				0
	Average Follower Pin Wear	µm	30 max. (Ford spec)				3.9
	Average Ring Gap Increase	µm	225 max. (Ford spec)				76
Ball Rust Test - D6557	Average Gray Value		100 min.			VGRA	131

Attachment 8

Ford Motor Company
Ford Customer Service Division
Service Engineering Office

Diagnostic Service Center II
1800 Fairlane Drive
Allen Park, mi. 48101

May 6, 2010

Thom Smith
PCEOCP Chairman
The Valvoline Company
P.O. Box 14000 VL-2
Lexington, Ky. 40512-4001

Dear Thom,

At the last PCEOCP meeting the group requested the submission of a candidate for a GF-5 reference oil that met at least the Sequence VID and Sequence IIIG ILSAC GF-5 limits. I'd like to submit the attached data from a candidate oil for consideration. This is an SAE 5W-20 oil that passes both the Sequence IIIG and VID and most of the other GF-5 tests. This oil doesn't meet the emulsion retention requirements of ILSAC GF-5. The test data provided are single tests, but we're confident in the data as we've run a number of tests on this DI chemistry with passing results on the Sequence VID, IIIG, VG, IVA, etc. The additional data is proprietary and can not be shared.

Please circulate this information to the PCEOCP members and Surveillance Panel chairs for consideration and discussion at the next meeting.

If you have any question please contact me.

Sincerely

Ron Romano
Service Lubricants Technical Expert

SAE 5W-20 GF-5 Reference Oil Candidate

Performance Requirements	Specification	Test Results
ASTM Ball Rust (ASTM D6557)		
Average Gray Value	100 min	124
Sequence IIIG		
Viscosity Increase at 40 °C	150% max	81
Weighted Piston Deposits	4.0 min	4.0
Hot Stuck Piston Rings	0	0
Cam Plus Lifter Wear, Average	60 μm max	12
Sequence IIIGA		
Aged oil CCS Viscosity at -30°C	Report	7200
MRV TP-1, cP	1 grade up max	11400@ -30°C
Yield Stress, Pa	<35 max	<35
Sequence IIIB		
Phosphorus Retention, %	79 min	85
Sequence IVA (ASTM D6891)		
Average Cam Wear (7 position average)	90 μm, max	18
Sequence VG (ASTM D6593)		
Average Engine Sludge	8.0 min	9.5
Rocker Arm Cover Sludge	8.3 min	9.6
Average Engine Varnish	8.9 min	9.1
Piston Skirt Varnish	7.5 min	8.1
Oil Screen Clogging	15% max	1
Hot Stuck Compression Rings	0	0
Cold Stuck Rings	Report	0
Sequence VID (ASTM D7589)		
SAE 5W-20		
FEI SUM *	2.6% min	2.79
FEI 2 at 100 Hours	1.2% min	1.41
* FEI SUM = FEI at 16 hours + FEI at 100 hours		
Sequence VIII (ASTM D6709)		
Bearing Weight Loss	26 mg, max	1
TEOST MHT-4 (ASTM D7097)		
Deposit Weight	35 mg, max	35
TEOST 33C (ASTM D6335)		
Deposit Weight	30 mg, max	15

SAE 5W-20 GF-5 Reference Oil Candidate

Physical/Chemical Property Requirements	**Specification**	**Results**
Viscosity at 100 °C (ASTM D445), mm^2/s, 5W-20	5.6 - <9.3	8.3
Viscosity at -30 °C (ASTM D5293), mPa.s	6600 max	3500
Low Temp. Pumping Viscosity at -35°C, mPa.s	60,000 max	10,000
Volatility		
Evap. Loss, 1 hr at 250 °C (ASTM D5800), %	15.0 max	14
Dist. by GC at 371 °C (ASTM D6417), %	10.0 max	5
Gelation Index (ASTM D5133)	12.0 max	5
HTHS Viscosity, mPa-sec at 150 °C & 10^6 1/sec (ASTM D4741 or ASTM D4683)	2.6 min	2.6
Filterability with short heating (ASTM D6795), %	50 max	-26
Filterability with long heating (ASTM D6794), %	50 max	-10
Foaming (ASTM D892) (after 1 minute settling time for all foaming sequences)		
Sequence I, mL*	10/0 max	0/0
Sequence II, mL*	50/0 max	0/0
Sequence III, mL*	10/0 max	0/0
High Temperature Foaming (ASTM D6082), mL*	100/0 max	50/0
Phosphorus, (ASTM D4951), % mass	0.06 - 0.08	0.077
Sulfur, (ASTM D4951 or D5453), % mass	0.50 max	0.3
Emulsion Retention,(ASTM D7563)		
0°C, 24 hours	No water separation	Water separation
25°C, 24 hours	No water separation	Water separation
Homogeneity and Miscibility (ASTM D6922)	No Separation	No Separation
Elastomer Compatibility (ASTM D7216 ANNEX A2)		
a. Polyacrylate Rubber (ACM-1)		
Volume (ASTM D471), %Δ	-5, 9	0.51
Hardness (ASTM D2240), pts.	-10, 10	-2
Tensile Strength (D412), %Δ	-40, 40	-12.5
b. Hydrogenated Nitrile Rubber (HNBR-1)		
Volume (ASTM D471), %Δ	-5, 10	-1.79
Hardness (ASTM D2240), pts.	-10, 5	0
Tensile Strength (D412), %Δ	-20,15	10.1
c. Silicone Rubber (VMQ-1)		
Volume (ASTM D471), %Δ	-5, 40	22.98
Hardness (ASTM D2240), pts.	-30,10	-20
Tensile Strength (D412), %Δ	-50, 5	-45.5
d. Fluorocarbon Rubber (FKM-1)		
Volume (ASTM D471), %Δ	-2, 3	-0.52
Hardness (ASTM D2240), pts.	-6, 6	-1
Tensile Strength (D412), %Δ	-65, 10	-12.9
e. Ethylene Acrylic Rubber (AEM-1)		
Volume (ASTM D471), %Δ	-5, 30	14.47
Hardness (ASTM D2240), pts.	-20,10	-7
Tensile Strength (D412), %Δ	-30, 30	-4.4

Attachment 9

Sequence IVA Surveillance Panel
May 12, 2010
10:30AM – 12:00PM
Southwest Research Institute
San Antonio, TX

Motions and Action Items
As Recorded at the Meeting by Bill Buscher

12. Action Item – Labs to provide a list of what connectors are failing on the engine wiring harnesses, so that OHT can attempt to procure replacement connectors to allow for repair of existing wiring harnesses. Labs to respond to OHT within two weeks of today's meeting.

13. Action Item – Labs to draft a maintenance procedure and interval for engine mounts and driveline. Submit a recommendation to the surveillance panel by 7/1/10.

14. Motion – Form a task force to develop a recommendation to the surveillance panel for adopting LTMS 2nd Edition to the Sequence IVA. Task force to report to surveillance panel within six weeks of today's meeting.

    Bill Buscher / Jason Bowden / Passed 12-0-0

15. Action Item – Accept both potential reference oils as GF-5 category reference oils. Consider using oil # 2 (ACW = 18µm) for the Sequence IVA and replacing reference oil 1009. Conduct a follow-up surveillance panel conference call to develop a plan for adopting one or both of these potential reference oils.

16. Action Item – Include Todd Dvorak's analysis report on KA24E Green fuel data in today's meeting minutes.