



Color & Appearance Testing Program

Summary Report #184 - 2nd Qtr 2018

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[Key to Tables and Graphs \(Color Tests\)](#)

[Key to Tables and Graphs \(Spectro Test\)](#)

[Key to Tables and Graphs \(Gloss Tests\)](#)

<u>Analysis</u>	<u>Analysis Name</u>
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408	Color & Color Difference (Paint Chips) - 45-0
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409	Color & Color Difference (Paint Chips) Sphere
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411	Spectrophotometric (Paint Chips) - Sphere
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440	Gloss 60 Degree (Paint Chips)
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442	Gloss 85 Degree (Paint Chips)
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About The Color & Appearance Program

The Collaborative Reference Program for Color & Appearance is operated and maintained by Collaborative Testing Services, Inc. (CTS), with technical guidance and advice provided by representatives from various instrument manufacturers. The program allows laboratories to compare periodically the performance of their testing with that of other laboratories.

Paint chip samples, which have been custom-made specifically for Collaborative Testing Services by Munsell Color, X-Rite Inc., Grand Rapids, MI, are distributed four times per year to participating laboratories. Gloss participants test two pairs of paint chip samples at different gloss levels, approximately 5-10 units apart. Color & Color Difference participants measure a set of two opaque color paint chips, selected from throughout the full color spectrum, consisting of a nonmetameric match with small color differences. These data are analyzed in two separate tables based on the conditions of measurement used. Laboratories that also participate in the Spectrophotometric analyses measure one of the opaque color chips for % reflectance at 16 wavelengths.

Please refer to each test's 'Key' for definitions of terms used in the tables and graphs and guidelines to interpreting the results. Also shown are notes concerning specific laboratory results, as well as significant findings related to instrument types or other testing variations.

ABOUT CTS

Founded in 1971, CTS is a privately-owned company that specializes in interlaboratory tests for a wide variety of industries, including rubber, plastics, fasteners and metals, containerboard, paper, color, and wine as well as proficiency tests for forensic laboratories. All of the tests are designed to assist organizations in achieving and maintaining quality control objectives. Labs from the U.S., as well as more than 80 countries, currently participate in the CTS programs.

For further information concerning this report contact:

**Collaborative Testing Services, Inc.
21331 Gentry Drive
Sterling, Virginia 20166 USA**

**+1-571-434-1925
FAX #: +1-571-434-1937
color@cts-interlab.com**

Office Hours: 8:00 a.m. - 4:30 p.m. ET

Key for Color Program Web Summary Report

WebCode	Assigned laboratory identification number (temporary) used to ensure lab confidentiality while permitting a lab to locate its data in the Color Report published on the CTS web site. The Web Code for each analysis can be found in the Performance Analysis Report emailed to each participant.
Lab Mean	The average of the 2 test results obtained by the participant for CIE L*,a*,b* color space values.
Grand Mean	The average of the LAB MEANS for all included participants. Laboratories flagged with an X or an M (see DATA FLAG column) are excluded from the GRAND MEAN.
Between-Lab Standard Deviation	An indication of the precision of measurement between the laboratories. The greater the spread of the LAB MEANS about the GRAND MEAN, the larger the BETWEEN-LAB STANDARD DEVIATION (and vice versa).
Comparative Performance Value	An indication of how well a laboratory's results agree with the other participants. The CPV is a ratio indicating the number of standard deviations from the GRAND MEAN. The closer a laboratory's COMPARATIVE PERFORMANCE VALUE is to zero, the more consistent its results are with the other participants' data (and vice versa). The critical value for each CPV will vary depending on the number of labs participating in a test.
Graphs	For each laboratory, the LAB MEAN for the first sample is plotted against the LAB MEAN for the second sample with each point representing a laboratory. The horizontal and vertical axes are the GRAND MEANS for each sample. For each test there are three plots: L*2 vs L*1, a*2 vs a*1 and b*2 vs b*1. The a* and b* plots are created using absolute values.
Inst Code	A code indicating the manufacturer of the instrument used to perform the test (see separate INSTRUMENT CODE LIST for each test section).
Data Flag	DATA FLAGS are assigned based on the simultaneous analysis of both samples tested. Refer to the following chart for an explanation of each symbol:

<u>DATA FLAG</u>	<u>STATISTICALLY INCLUDED/EXCLUDED</u>	<u>ACTION REQUIRED</u>
*	INCLUDED	CAUTION - review testing procedure and monitor future results. Results fall outside 95% ellipse but within a 99% ellipse that is calculated but not drawn.
X	EXCLUDED	STOP - immediate review of data and/or testing procedure is required. Results fall outside the 99% ellipse and one or more CPV are greater than critical value. See specific notes following each table for more information on why the data is excluded. It is also possible to have an "X" for individual color coordinate (L*, a* or b*) without overall "X" flag. It means that results fall outside the 99% ellipse for particular coordinate but have no CPV flags. Those results will not require any action.
M	EXCLUDED	PROCEED - lab was unable to report data for at least one sample. However, a lab receiving two of more M flags for a test may need to stop and review its testing procedures.

Key for Spectrophotometric Web Summary Report

WebCode	Assigned laboratory identification number (temporary) used to ensure lab confidentiality while permitting a lab to locate its data in the Color Report published on the CTS web site. The Web Code for each analysis can be found in the Performance Analysis Report emailed to each participant.
Grand Mean	The average of the LAB MEANS for all included participants. Laboratories flagged with an X or an M (see DATA FLAG column) are excluded from the GRAND MEAN.
Between-Lab Standard Deviation	An indication of the precision of measurement between the laboratories. The greater the spread of the LAB MEANS about the GRAND MEAN, the larger the BETWEEN-LAB STANDARD DEVIATION (and vice versa).
Inst Code	A code indicating the manufacturer of the instrument used to perform the test (see separate INSTRUMENT CODE LIST for each test section).
Data Flag	DATA FLAGS are assigned based on the simultaneous analysis of both samples tested. Refer to the following chart for an explanation of each symbol:

<u>DATA FLAG</u>	<u>STATISTICALLY INCLUDED/EXCLUDED</u>	<u>ACTION REQUIRED</u>
X	EXCLUDED	STOP - immediate review of data and/or testing procedure is required. See specific notes following each table for more information on why the data is excluded.

In addition to the DATA FLAG column, it is also possible to have a flag on individual wavelength values as follows:

- * The laboratory's mean for that wavelength deviates from the GRAND MEAN by more than two BETWEEN-LAB STANDARD DEVIATIONS.
- X The laboratory's mean for that wavelength deviates from the GRAND MEAN by more than the critical limit determined by a 99.5% confidence interval.

Key for Gloss Web Summary Report

WebCode Assigned laboratory identification number (temporary) used to ensure lab confidentiality while permitting a lab to locate its data in the Color Report published on the CTS web site. The Web Code for each analysis can be found in the Performance Analysis Report emailed to each participant.

Lab Mean The average of the test results obtained by the participant.

Grand Mean The average of the LAB MEANS for all included participants. Laboratories flagged with an X or an M (see DATA FLAG column) are excluded from the GRAND MEAN.

Difference from Grand Mean The difference of the LAB MEAN from the GRAND MEAN.

Between-Lab Standard Deviation An indication of the precision of measurement between the laboratories. The greater the spread of the LAB MEANS about the GRAND MEAN, the larger the BETWEEN-LAB STANDARD DEVIATION (and vice versa).

Comparative Performance Value An indication of how well a laboratory's results agree with the other participants. The CPV is a ratio indicating the number of standard deviations from the GRAND MEAN. The closer a laboratory's COMPARATIVE PERFORMANCE VALUE is to zero, the more consistent its results are with the other participants' data (and vice versa). The critical value for each CPV will vary depending on the number of labs participating in a test.

Inst Code A code indicating the manufacturer of the instrument used to perform the test (see separate INSTRUMENT CODE LIST for each test section).

Graphs For each laboratory, the LAB MEAN for the first sample (x-axis) is plotted against the LAB MEAN for the second sample (y-axis) with each point representing a laboratory. The horizontal and vertical cross-hairs are the GRAND MEANS for each sample. When 20 or more laboratories are in the statistics, an ellipse is also drawn so that 95% of the time a randomly selected laboratory will be included inside the ellipse. Plotted data flags are explained above.

Data Flag DATA FLAGS are assigned based on the simultaneous analysis of both samples tested. Refer to the following chart for an explanation of each symbol:

<u>DATA FLAG</u>	<u>STATISTICALLY INCLUDED/EXCLUDED</u>	<u>ACTION REQUIRED</u>
*	INCLUDED	CAUTION - review testing procedure and monitor future results. Results fall outside 95% ellipse but within a 99% ellipse that is calculated but not drawn.
X	EXCLUDED	STOP - immediate review of data and/or testing procedure is required. Results fall outside the 99% ellipse. See specific notes following each table for more information on why the data is excluded.
M	EXCLUDED	PROCEED - lab was unable to report data for at least one sample. However, a lab receiving two of more M flags for a test may need to stop and review its testing procedures.



CTS Interlaboratory Testing Program for Color & Appearance **Report #184**
Analysis 408 **2nd Qtr 2018**

Color and Color Difference - Paint Chips - 45-0 Geometry Instruments
 CIE L*a*b* Color Space - Illuminant D65 - CIE 1964 (10 Degree) Observer

WebCode	Flag	Samples	CIE L* a* b* Color Values			Color Difference Values				InstrCode
			L*	a*	b*	ΔL^*	Δa^*	Δb^*	ΔE^*	
4XNLFG		B181	42.30	6.32	-8.75	0.93	0.07	-0.32	0.99	MU
		B182	43.23	6.38	-9.07					
4YFV8W		B181	42.49	6.44	-8.68	1.01	0.01	-0.30	1.05	XM
		B182	43.50	6.45	-8.97					
7E4TNH		B181	41.82	6.35	-8.93	1.07	0.05	-0.30	1.11	FA
		B182	42.89	6.40	-9.23					
7LYYYB	X	B181	34.13	8.31	-10.48	1.64	-0.20	-0.19	1.66	XE
		B182	35.77	8.11	-10.67					
8LHXXU		B181	42.45	6.71	-8.61	1.09	0.06	-0.32	1.13	HW
		B182	43.53	6.77	-8.92					
8Y8UX8		B181	42.56	6.28	-8.82	0.79	0.08	-0.30	0.84	XZ
		B182	43.35	6.36	-9.12					
94VY8M		B181	42.34	6.47	-8.70	1.12	0.07	-0.34	1.17	XO
		B182	43.46	6.54	-9.03					
AM4JGV		B181	42.42	6.35	-8.66	0.89	0.06	-0.33	0.95	XU
		B182	43.31	6.40	-8.99					
BAUXX3		B181	42.34	6.60	-8.52	1.01	0.10	-0.32	1.06	GH
		B182	43.35	6.70	-8.83					
BMXNBU		B181	42.29	6.51	-8.64	1.03	0.06	-0.29	1.07	HW
		B182	43.32	6.57	-8.93					
C9HME4	X	B181	29.60	29.50	29.21	12.87	12.51	11.38	21.25	XN
		B182	42.47	42.00	40.59					
E4XHVV	X	B181	42.84	6.41	-9.08	1.00	0.04	-0.27	1.04	MU
		B182	43.84	6.45	-9.35					
EBXWFZ		B181	42.87	6.40	-8.61	0.47	0.07	-0.31	0.57	XU
		B182	43.34	6.47	-8.92					
EG2XHF		B181	42.41	6.65	-8.66	1.08	0.10	-0.32	1.13	GE
		B182	43.49	6.74	-8.98					
EUQVLY		B181	42.28	6.37	-8.81	0.99	0.09	-0.30	1.04	HK
		B182	43.27	6.46	-9.11					
FQ79P6		B181	42.59	6.37	-8.77	0.91	0.05	-0.22	0.94	XB
		B182	43.49	6.42	-8.99					



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WebCode	Flag	Samples	CIE L* a* b* Color Values			Color Difference Values				InstrCode
			L*	a*	b*	ΔL^*	Δa^*	Δb^*	ΔE^*	
FVDUD3		B181	42.79	6.27	-8.83	1.05	0.10	-0.34	1.10	XZ
		B182	43.84	6.37	-9.16					
G7BWDP		B181	42.39	6.41	-8.58	1.01	0.06	-0.27	1.04	GB
		B182	43.40	6.46	-8.85					
GVYUUD		B181	42.17	6.51	-8.63	1.11	0.07	-0.32	1.16	HW
		B182	43.28	6.58	-8.95					
HB4FUE		B181	42.59	6.78	-8.62	0.90	0.05	-0.27	0.93	HW
		B182	43.49	6.83	-8.89					
HXC8W		B181	42.39	6.53	-8.52	0.99	0.02	-0.26	1.02	HW
		B182	43.38	6.54	-8.78					
JEZLQW		B181	42.65	6.47	-8.79	0.88	0.10	-0.31	0.94	XO
		B182	43.53	6.56	-9.10					
LF399T		B181	42.74	6.51	-8.72	0.93	0.06	-0.35	1.00	XO
		B182	43.67	6.57	-9.07					
MMH8KJ		B181	42.26	6.45	-8.67	1.10	0.07	-0.33	1.15	XU
		B182	43.36	6.52	-9.00					
MTAE6D		B181	42.34	6.70	-8.71	0.96	0.07	-0.30	1.01	MG
		B182	43.30	6.77	-9.01					
QNJ7BU		B181	42.65	6.57	-8.64	1.03	0.09	-0.31	1.08	HW
		B182	43.68	6.66	-8.95					
R3XYC7	X	B181	42.44	6.65	-0.01	1.09	0.06	-8.90	8.96	HW
		B182	43.53	6.71	-8.90					
RDXL43		B181	42.36	6.37	-8.63	1.02	0.11	-0.33	1.07	GE
		B182	43.37	6.48	-8.96					
UQJHH7		B181	42.58	6.43	-8.67	1.09	0.05	-0.28	1.13	GH
		B182	43.67	6.48	-8.95					
W8K2V		B181	41.85	6.54	-8.75	1.07	0.07	-0.32	1.11	HY
		B182	42.92	6.61	-9.07					
VWJG9L		B181	41.96	6.19	-8.65	0.89	0.05	-0.32	0.94	HY
		B182	42.84	6.24	-8.97					
WDKL94		B181	43.36	6.23	-8.64	0.97	0.09	-0.35	1.03	XZ
		B182	44.33	6.31	-8.99					



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 CIE L*a*b* Color Space - Illuminant D65 - CIE 1964 (10 Degree) Observer

WebCode	Flag	Samples	CIE L* a* b* Color Values			Color Difference Values				InstrCode
			L*	a*	b*	ΔL^*	Δa^*	Δb^*	ΔE^*	
WN27VK		B181	42.49	6.71	-8.63	0.97	0.08	-0.30	1.02	HW
		B182	43.46	6.78	-8.93					
X983RL		B181	42.65	6.62	-8.72	1.01	0.08	-0.32	1.06	HW
		B182	43.66	6.70	-9.04					
Y22Q9U		B181	42.74	6.45	-8.57	1.07	0.01	-0.29	1.10	XD
		B182	43.81	6.46	-8.86					
YTABJQ		B181	42.17	6.54	-8.66	1.02	0.09	-0.29	1.06	TO
		B182	43.19	6.63	-8.95					
Z9X3JG		B181	42.40	6.65	-8.60	0.98	0.10	-0.33	1.03	HW
		B182	43.38	6.75	-8.93					

Summary Statistics								
Samples	L*	a*	b*	ΔL^*	Δa^*	Δb^*	ΔE^*	
Grand Means								
B181	42.44	6.48	-8.67	0.98	0.07	-0.31	1.03	
B182	43.44	6.54	-8.98					
Stnd Dev Btwn Labs								
B181	0.29	0.15	0.09	0.12	0.02	0.03	0.11	
B182	0.28	0.15	0.10					

Statistics based on 33 of 37 reporting participants

Comments Assigned on Data Flags for Test #408

- 7LYYYB(X) - Extreme Data.
- C9HME4(X) - Extreme Data.
- E4XHVY(X) - Low "b*" values.
- R3XYC7(X) - Extreme Data for B181 second reading "b*" value.



Key to Instrument Codes Reported by Participants

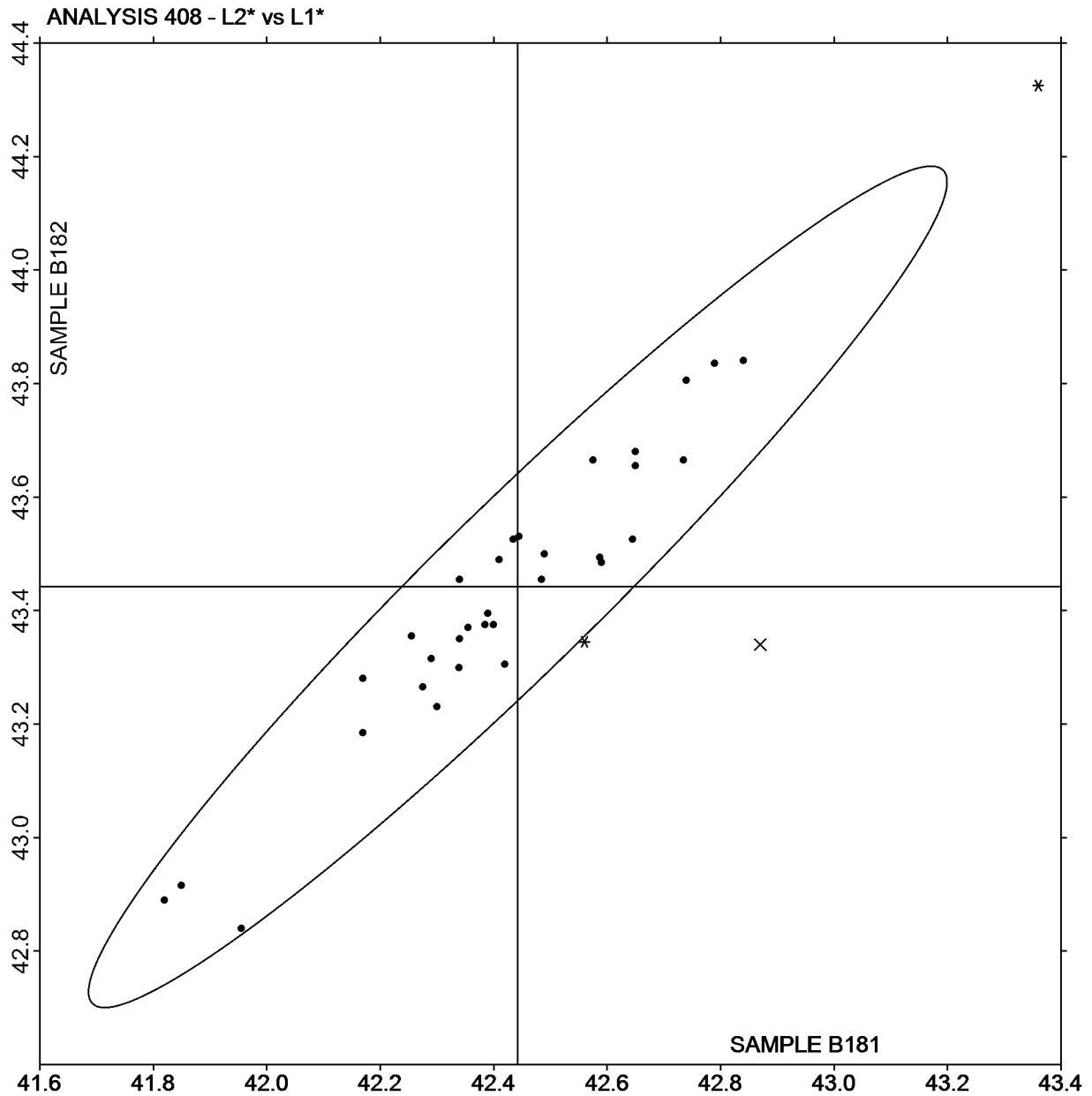
FA	BYK Mac	GB	BYK-Gardner spectro-guide sphere gloss
GE	BYK-Gardner spectro-guide (45/0)	GH	BYK-Gardner Color-View
HK	Hunter MiniScan XE (45/0)	HW	Hunter LabScan XE
HY	Hunter Color Flex 45/0	MG	Macbeth 1500/PLUS or 2025+ Color Eye
MU	Minolta	TO	Topcon SR-3 Spectroradiometer
XB	X-Rite i1Basic Pro 2	XD	X-Rite 500 Series SpectroDensitometer
XE	X-Rite eXact Portable Spectrophotometer	XM	X-Rite MA58 Multi-Angle Spectrophotometer
XN	X-Rite MA68 Multi-Angle Spectrophotometer	XO	X-Rite MA68 II Multi-Angle Spectrophotometer
XU	X-Rite 964 Portable Spectrophotometer	XZ	X-Rite



L2* vs L1*

SAMPLE B181 = 42.44

SAMPLE B182 = 43.44



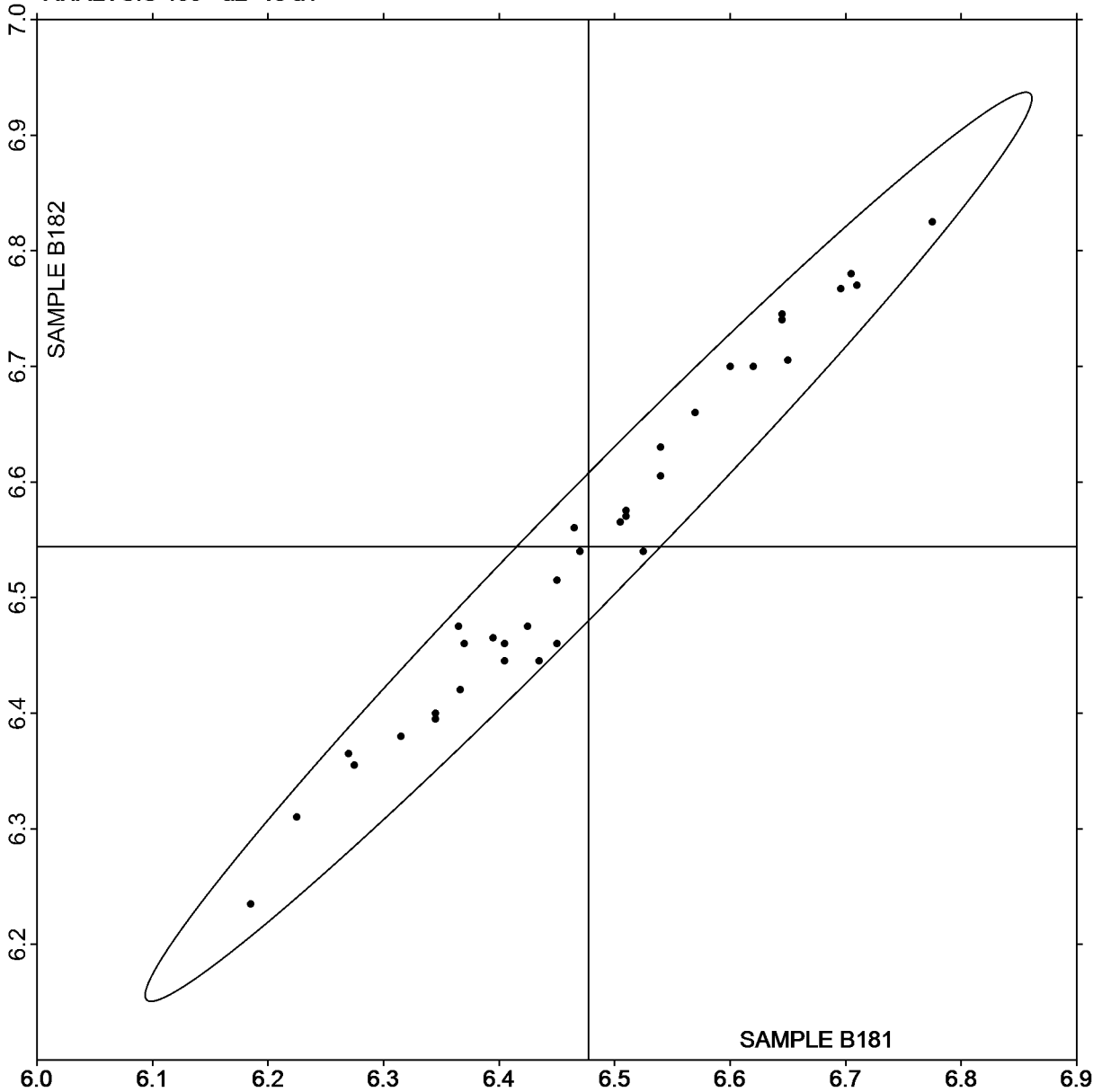


a2* vs a1*

SAMPLE B181 = 6.48

SAMPLE B182 = 6.54

ANALYSIS 408 - a2* vs a1*

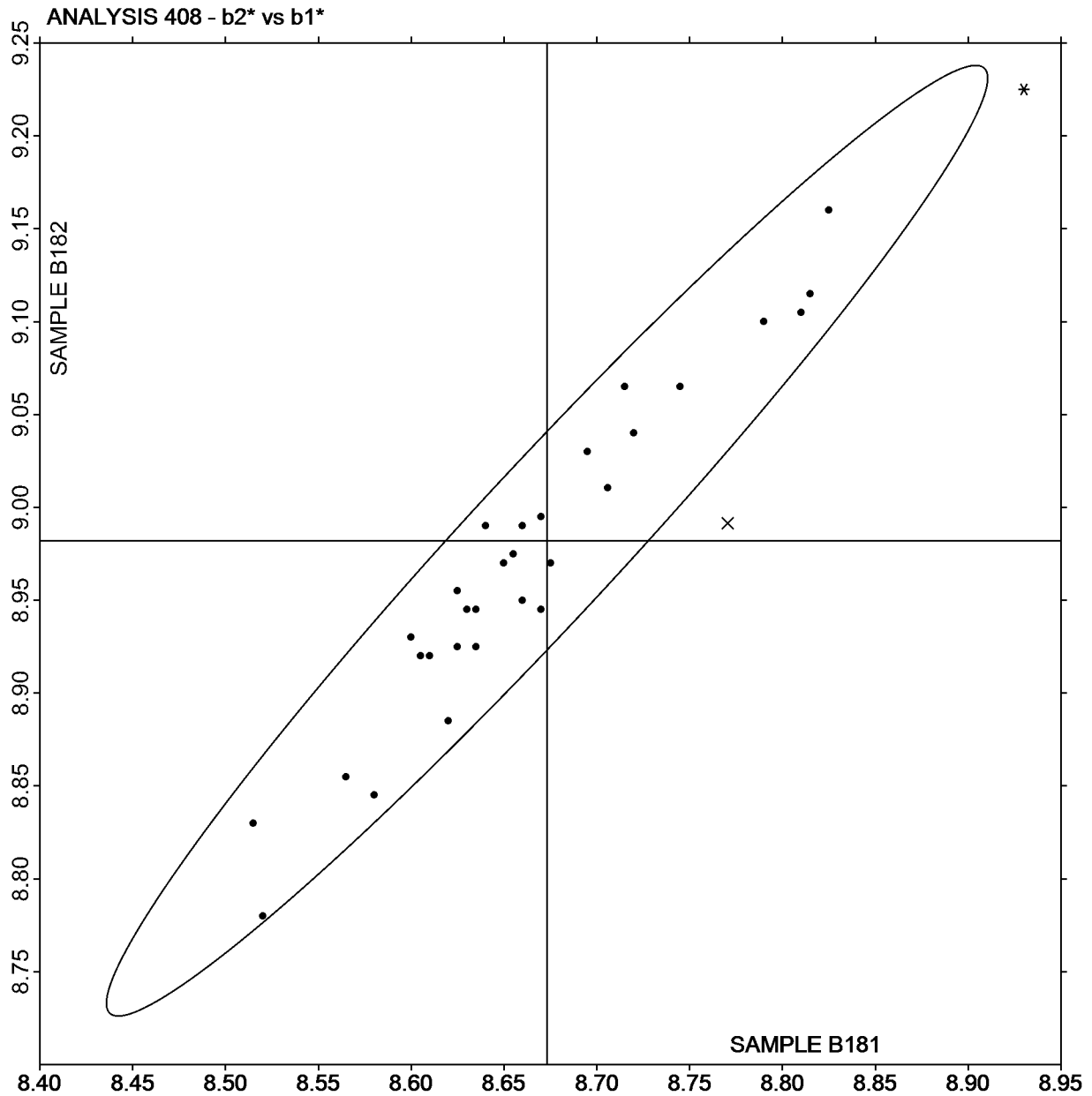




b2* vs b1*

SAMPLE B181 = -8.67

SAMPLE B182 = -8.98



Plot created using absolute values.



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WebCode	Flag	Samples	CIE L* a* b* Color Values			Color Difference Values				InstrCode
			L*	a*	b*	ΔL^*	Δa^*	Δb^*	ΔE^*	
2A7HN3		B181	43.07	6.40	-8.93	0.85	0.08	-0.28	0.90	AS
		B182	43.92	6.47	-9.21					
2RMJLP		B181	42.84	6.29	-9.02	1.02	0.05	-0.30	1.06	AQ
		B182	43.86	6.34	-9.32					
39QKQB		B181	42.92	6.28	-8.91	0.94	0.06	-0.30	0.98	MM
		B182	43.86	6.33	-9.20					
3BV4WJ		B181	42.94	6.39	-8.87	0.97	0.04	-0.27	1.00	MU
		B182	43.90	6.43	-9.13					
3EUGHN		B181	42.95	6.38	-8.94	1.06	0.02	-0.28	1.09	AJ
		B182	44.01	6.39	-9.22					
3PW2FA	X	B181	43.56	6.26	-9.05	0.90	0.08	-0.26	0.94	HH
		B182	44.45	6.34	-9.31					
3PXUEH		B181	42.72	6.28	-9.11	0.93	0.08	-0.27	0.97	HP
		B182	43.66	6.36	-9.38					
49P3CD		B181	42.83	6.34	-9.00	0.81	0.13	-0.32	0.88	MS
		B182	43.64	6.46	-9.32					
4AHV6B		B181	42.99	6.46	-9.03	0.97	0.08	-0.28	1.01	MV
		B182	43.95	6.53	-9.31					
4KJJYT		B181	42.88	6.36	-8.85	1.03	0.02	-0.23	1.05	MM
		B182	43.90	6.38	-9.08					
4RZWZD		B181	42.90	6.24	-8.84	1.08	0.08	-0.31	1.12	XH
		B182	43.98	6.31	-9.14					
6KDNTR		B181	42.86	6.32	-8.95	0.96	0.03	-0.25	0.99	XZ
		B182	43.82	6.35	-9.19					
7EP4K6		B181	43.26	6.29	-8.97	0.93	0.09	-0.32	0.99	AO
		B182	44.19	6.38	-9.29					
7P3KUN		B181	42.81	6.21	-8.75	0.92	0.08	-0.30	0.97	AJ
		B182	43.73	6.29	-9.05					
7VNFVR		B181	42.51	6.24	-8.84	0.95	0.10	-0.32	1.00	XH
		B182	43.46	6.34	-9.16					
87MHR9		B181	42.79	6.32	-8.96	1.40	0.10	-0.51	1.49	AJ
		B182	44.19	6.42	-9.47					



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WebCode	Flag	Samples	CIE L* a* b* Color Values			Color Difference Values				InstrCode
			L*	a*	b*	ΔL^*	Δa^*	Δb^*	ΔE^*	
88Y9YR		B181	43.04	6.39	-8.93	0.88	0.07	-0.27	0.92	AJ
		B182	43.92	6.46	-9.20					
8JVETQ		B181	43.00	6.31	-8.93	1.03	0.06	-0.30	1.07	GG
		B182	44.03	6.37	-9.23					
8PGAVF		B181	42.95	6.26	-8.96	0.99	0.04	-0.27	1.02	MM
		B182	43.94	6.30	-9.22					
8QEKRH		B181	43.04	6.33	-9.00	0.98	0.05	-0.30	1.02	AO
		B182	44.02	6.38	-9.30					
94VY8M		B181	42.68	6.48	-9.10	1.11	0.00	-0.26	1.14	MI
		B182	43.78	6.48	-9.36					
A4BF3F		B181	42.92	6.19	-8.93	0.94	0.06	-0.26	0.97	XI
		B182	43.86	6.25	-9.19					
AAZ3P9		B181	42.92	6.42	-9.03	0.88	0.06	-0.27	0.92	MM
		B182	43.80	6.48	-9.30					
AAZVRM		B181	43.01	6.18	-8.79	1.08	0.03	-0.30	1.12	HF
		B182	44.09	6.21	-9.09					
ADETWN		B181	43.01	6.40	-9.08	0.98	0.08	-0.29	1.02	AQ
		B182	43.99	6.48	-9.37					
AHCAB4		B181	43.05	6.35	-9.09	1.02	0.12	-0.33	1.07	XX
		B182	44.06	6.46	-9.42					
AUK2U3		B181	42.54	6.50	-8.89	0.86	0.09	-0.31	0.91	XM
		B182	43.40	6.59	-9.19					
AVFDYJ		B181	42.97	6.36	-9.02	0.97	0.10	-0.31	1.02	AS
		B182	43.93	6.46	-9.33					
BBQGXH		B181	42.82	6.35	-8.74	0.99	0.07	-0.32	1.04	XO
		B182	43.81	6.41	-9.06					
C9HME4	X	B181	42.46	42.33	42.37	1.09	1.22	1.18	2.01	XO
		B182	43.55	43.55	43.55					
CGBXNY		B181	42.74	6.46	-8.93	0.90	0.12	-0.33	0.96	XI
		B182	43.64	6.57	-9.25					
CZJ7X7	X	B181	42.63	6.56	-8.97	0.79	0.12	-0.34	0.87	GD
		B182	43.42	6.68	-9.30					



CTS Interlaboratory Testing Program for Color & Appearance **Report #184**
Analysis 409 **2nd Qtr 2018**

Color and Color Difference - Paint Chips - Sphere Geometry Instruments
 CIE L*a*b* Color Space - Illuminant D65 - CIE 1964 (10 Degree) Observer

WebCode	Flag	Samples	CIE L* a* b* Color Values			Color Difference Values				InstrCode
			L*	a*	b*	ΔL^*	Δa^*	Δb^*	ΔE^*	
DANR6X		B181	43.00	6.32	-9.06	0.88	0.09	-0.29	0.93	XB
		B182	43.88	6.41	-9.35					
DDJGNP		B181	42.86	6.32	-8.87	0.95	0.05	-0.27	0.99	XI
		B182	43.81	6.37	-9.14					
DJRP9Z		B181	43.06	6.36	-8.93	0.96	0.04	-0.25	0.99	MM
		B182	44.02	6.40	-9.18					
DZWAQP		B181	43.30	6.12	-8.73	0.99	0.09	-0.30	1.03	HW
		B182	44.29	6.21	-9.02					
EBXWFZ		B181	43.11	6.24	-8.74	0.89	0.10	-0.34	0.96	XI
		B182	44.00	6.34	-9.08					
ELXM29		B181	42.93	6.51	-9.21	0.96	0.04	-0.26	0.99	AM
		B182	43.89	6.54	-9.47					
ETEYEA		B181	42.73	6.35	-8.84	0.89	0.06	-0.27	0.93	XH
		B182	43.62	6.40	-9.10					
F264LF		B181	42.83	6.29	-8.65	1.09	0.06	-0.31	1.13	XI
		B182	43.91	6.34	-8.95					
FHRJMQ		B181	42.68	6.46	-8.83	0.97	0.07	-0.31	1.02	XH
		B182	43.65	6.53	-9.14					
FVHDYK		B181	42.75	6.42	-8.78	1.01	0.06	-0.29	1.05	XH
		B182	43.76	6.47	-9.07					
GF2HLA		B181	42.73	6.44	-8.95	0.98	0.04	-0.25	1.01	XC
		B182	43.71	6.48	-9.20					
GMYEZY		B181	42.63	6.46	-9.11	1.05	0.10	-0.32	1.10	CA
		B182	43.68	6.55	-9.42					
GRWTUF		B181	42.84	6.32	-8.87	0.94	0.09	-0.29	0.98	XI
		B182	43.77	6.41	-9.15					
GT9NB2		B181	42.66	6.34	-8.98	0.99	0.10	-0.31	1.04	HP
		B182	43.65	6.44	-9.29					
H2FMHH		B181	42.58	6.26	-9.02	0.99	0.07	-0.30	1.04	XI
		B182	43.57	6.33	-9.31					
HD9BCW		B181	43.18	6.35	-9.09	0.91	0.07	-0.26	0.94	AJ
		B182	44.08	6.41	-9.35					



CTS Interlaboratory Testing Program for Color & Appearance **Report #184**
Analysis 409 **2nd Qtr 2018**

Color and Color Difference - Paint Chips - Sphere Geometry Instruments
 CIE L*a*b* Color Space - Illuminant D65 - CIE 1964 (10 Degree) Observer

WebCode	Flag	Samples	CIE L* a* b* Color Values			Color Difference Values				InstrCode
			L*	a*	b*	ΔL^*	Δa^*	Δb^*	ΔE^*	
HK9TNM		B181	43.11	6.39	-8.96	0.88	0.09	-0.31	0.94	AS
		B182	43.99	6.48	-9.27					
HUHVEU		B181	42.89	6.33	-8.84	0.92	0.12	-0.32	0.98	AJ
		B182	43.81	6.45	-9.16					
HXGBMH		B181	42.98	6.26	-8.83	0.92	0.10	-0.31	0.97	XI
		B182	43.90	6.36	-9.13					
J6UKQ6		B181	43.28	6.34	-9.04	0.95	0.10	-0.28	0.99	CA
		B182	44.22	6.44	-9.32					
K3ZBVU		B181	42.96	6.37	-8.93	1.05	0.04	-0.28	1.08	AO
		B182	44.00	6.40	-9.21					
K7K6RU		B181	42.95	6.32	-8.87	0.94	0.08	-0.28	0.98	MM
		B182	43.88	6.40	-9.15					
KMB9C6		B181	42.72	6.40	-8.75	0.91	0.07	-0.29	0.96	XM
		B182	43.63	6.47	-9.03					
KU9V7Q		B181	42.53	6.35	-8.96	0.98	0.10	-0.32	1.03	CA
		B182	43.50	6.46	-9.29					
L8AVEK		B181	42.99	6.33	-8.88	0.92	0.07	-0.29	0.97	XI
		B182	43.91	6.40	-9.17					
LPTRTT		B181	42.91	6.26	-9.00	1.02	0.06	-0.29	1.06	AJ
		B182	43.93	6.32	-9.29					
LZV6TT		B181	42.94	6.31	-9.05	1.06	0.05	-0.28	1.09	AJ
		B182	44.00	6.35	-9.33					
M3CZNW		B181	42.90	6.37	-9.05	0.96	0.07	-0.32	1.01	AQ
		B182	43.86	6.44	-9.37					
M8UUAX		B181	42.88	6.35	-8.83	0.90	0.13	-0.32	0.96	MV
		B182	43.78	6.48	-9.15					
MDTMXX		B181	42.36	6.32	-8.82	1.01	0.09	-0.29	1.05	XM
		B182	43.36	6.40	-9.11					
MMH8KJ		B181	42.82	6.32	-8.99	1.11	0.03	-0.26	1.14	XI
		B182	43.93	6.34	-9.25					
MU3ALU		B181	42.92	6.36	-9.05	0.98	0.12	-0.31	1.03	AS
		B182	43.90	6.48	-9.35					



CTS Interlaboratory Testing Program for Color & Appearance **Report #184**
Analysis 409 **2nd Qtr 2018**

Color and Color Difference - Paint Chips - Sphere Geometry Instruments
 CIE L*a*b* Color Space - Illuminant D65 - CIE 1964 (10 Degree) Observer

WebCode	Flag	Samples	CIE L* a* b* Color Values			Color Difference Values				InstrCode
			L*	a*	b*	ΔL^*	Δa^*	Δb^*	ΔE^*	
NLM49M		B181	43.04	6.38	-8.93	0.97	0.12	-0.32	1.03	AS
		B182	44.01	6.49	-9.25					
NUZY9N		B181	42.90	6.43	-9.02	0.98	0.09	-0.32	1.03	AE
		B182	43.88	6.52	-9.34					
PF9WYU		B181	42.88	6.22	-8.83	0.89	0.08	-0.28	0.94	AO
		B182	43.77	6.30	-9.11					
PXEWEP		B181	42.82	6.36	-8.80	1.02	0.06	-0.32	1.06	XH
		B182	43.83	6.42	-9.12					
PZX763		B181	42.83	6.36	-8.88	1.07	0.05	-0.29	1.11	XI
		B182	43.90	6.41	-9.17					
Q3HBFK		B181	42.66	6.28	-8.75	0.91	0.09	-0.34	0.97	XH
		B182	43.57	6.37	-9.09					
Q8BGUM		B181	43.03	6.38	-9.14	0.97	0.08	-0.31	1.02	AO
		B182	44.00	6.46	-9.45					
RDXL43		B181	42.73	6.51	-8.70	0.97	0.08	-0.31	1.02	GD
		B182	43.70	6.59	-9.01					
RHN72Q		B181	43.06	6.35	-8.89	0.85	0.06	-0.30	0.90	AJ
		B182	43.91	6.41	-9.18					
RHRLGD		B181	42.71	6.33	-8.79	0.86	0.02	-0.27	0.90	XO
		B182	43.57	6.35	-9.06					
RJ2DPT		B181	42.96	6.38	-9.00	0.97	0.06	-0.28	1.01	MT
		B182	43.93	6.43	-9.27					
RM4AGA		B181	43.15	6.36	-8.92	1.05	0.08	-0.31	1.09	AO
		B182	44.20	6.44	-9.23					
RV3W99		B181	42.50	6.30	-8.84	0.97	0.04	-0.25	1.00	MU
		B182	43.47	6.34	-9.08					
T7DNB9		B181	42.95	6.41	-9.17	1.02	0.06	-0.29	1.06	AO
		B182	43.97	6.46	-9.46					
TCKEFZ		B181	42.98	6.42	-8.93	0.90	0.07	-0.26	0.93	AJ
		B182	43.88	6.49	-9.19					
TNCZKA		B181	42.99	6.35	-9.00	1.08	0.05	-0.29	1.11	AJ
		B182	44.06	6.40	-9.29					



CTS Interlaboratory Testing Program for Color & Appearance **Report #184**
Analysis 409 **2nd Qtr 2018**

Color and Color Difference - Paint Chips - Sphere Geometry Instruments
 CIE L*a*b* Color Space - Illuminant D65 - CIE 1964 (10 Degree) Observer

WebCode	Flag	Samples	CIE L* a* b* Color Values			Color Difference Values				InstrCode
			L*	a*	b*	ΔL^*	Δa^*	Δb^*	ΔE^*	
TP8NZK		B181	42.93	6.44	-8.95	0.97	0.05	-0.28	1.01	MK
		B182	43.90	6.49	-9.23					
TYQ6PK		B181	42.85	6.38	-8.92	1.00	0.06	-0.27	1.04	XI
		B182	43.85	6.43	-9.19					
U9EB2H		B181	42.98	6.26	-8.96	1.00	0.09	-0.31	1.05	AJ
		B182	43.98	6.35	-9.26					
UHLQAC		B181	42.84	6.34	-8.72	0.84	0.04	-0.26	0.88	XO
		B182	43.68	6.38	-8.98					
UQJHH7		B181	42.96	6.34	-8.90	0.94	0.08	-0.29	0.99	MV
		B182	43.90	6.42	-9.19					
UXVWZ2		B181	42.97	6.40	-9.09	1.05	0.04	-0.28	1.09	AM
		B182	44.02	6.44	-9.36					
VKRV3Q		B181	43.03	6.38	-8.96	1.00	0.03	-0.27	1.03	AS
		B182	44.03	6.41	-9.23					
VWJG9L		B181	42.81	6.32	-9.04	0.99	0.06	-0.31	1.04	HP
		B182	43.80	6.38	-9.35					
WN2B89		B181	43.05	6.21	-8.97	0.93	0.05	-0.28	0.97	XI
		B182	43.97	6.26	-9.25					
WZG6GF		B181	42.90	6.39	-9.11	0.92	0.05	-0.29	0.97	AQ
		B182	43.82	6.44	-9.40					
X9KW4F		B181	42.86	6.15	-8.89	1.05	0.07	-0.30	1.09	AM
		B182	43.90	6.22	-9.19					
XGYL4A		B181	43.00	6.37	-8.94	0.93	0.09	-0.31	0.98	AJ
		B182	43.92	6.46	-9.25					
XVVVPU		B181	42.87	6.35	-8.95	1.07	0.08	-0.32	1.11	XB
		B182	43.94	6.43	-9.26					
XYV99D		B181	42.95	6.17	-8.89	0.94	0.08	-0.28	0.98	XI
		B182	43.89	6.24	-9.17					
YACCV3		B181	42.93	6.21	-8.87	1.01	0.09	-0.29	1.05	XI
		B182	43.94	6.30	-9.16					
YLNFHL		B181	42.86	6.18	-8.85	1.00	0.09	-0.29	1.04	MV
		B182	43.85	6.27	-9.13					



WebCode	Flag	Samples	CIE L* a* b* Color Values			Color Difference Values				InstrCode
			L*	a*	b*	ΔL^*	Δa^*	Δb^*	ΔE^*	
YTABJQ		B181	42.71	6.35	-9.07	1.00	0.06	-0.27	1.04	CA
		B182	43.71	6.41	-9.34					
YYF84Q		B181	43.09	6.36	-8.85	0.87	0.05	-0.29	0.92	AJ
		B182	43.96	6.41	-9.14					

Summary Statistics								
Samples	L*	a*	b*	ΔL^*	Δa^*	Δb^*	ΔE^*	
Grand Means								
B181	42.88	6.33	-8.93	0.97	0.07	-0.29	1.02	
B182	43.85	6.40	-9.22					
Std Dev Btwn Labs								
B181	0.17	0.08	0.11	0.08	0.03	0.03	0.08	
B182	0.18	0.08	0.11					

Statistics based on 95 of 98 reporting participants

Comments Assigned on Data Flags for Test #409

3PW2FA(X) - High "L*" values.

C9HME4(X) - Extreme Data for "a*" and "b*" values. Large Da, Db and DE values.

CZJ7X7(X) - High "a*" values.

Key to Instrument Codes Reported by Participants

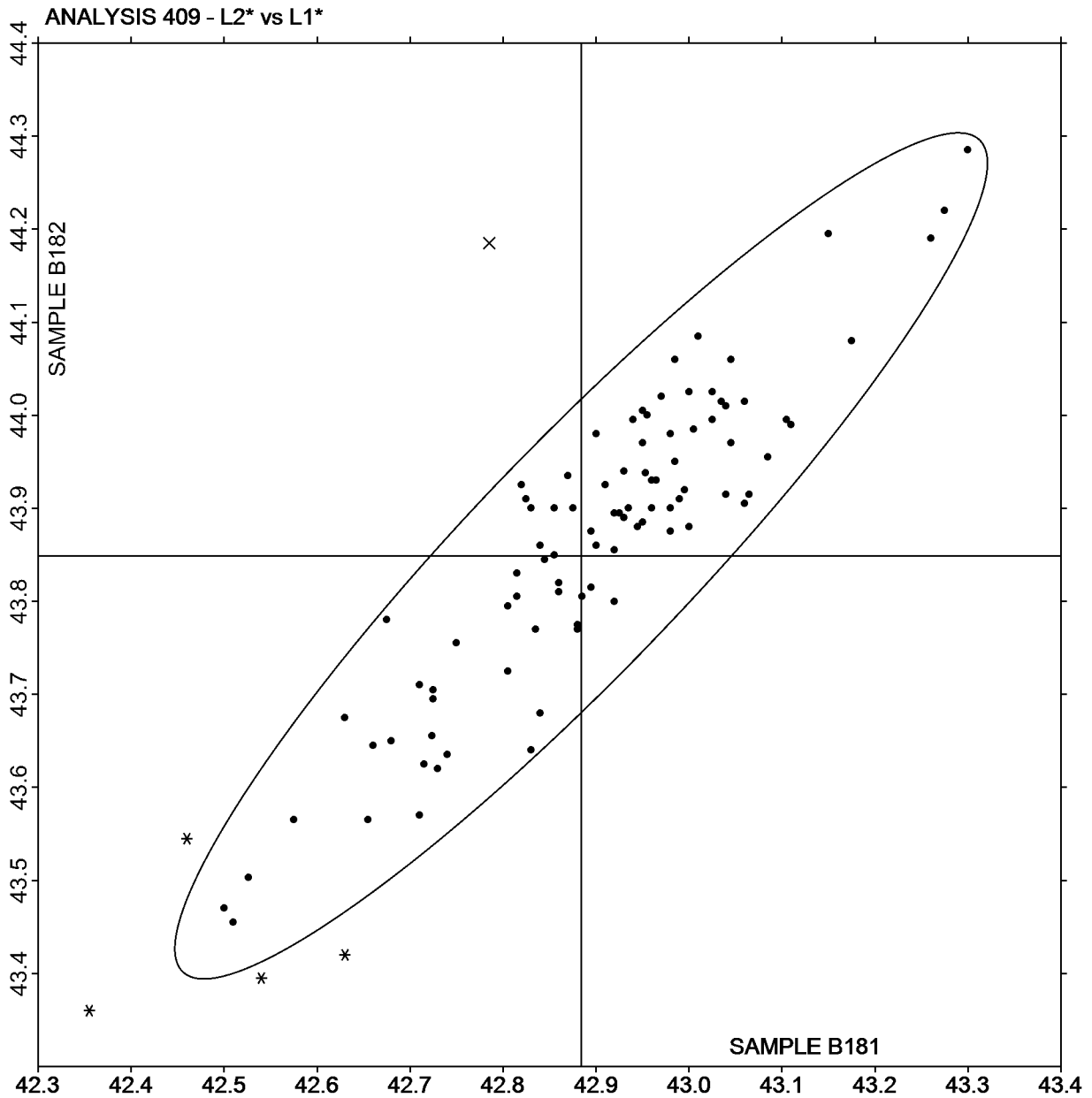
AE ACS-Datcolor 110	AJ ACS-Datcolor 600
AM ACS-Datcolor 600 Plus	AO ACS-Datcolor 650X
AQ ACS-Datcolor 600X	AS ACS-Datcolor 800 Series
CA Cary 5000	GD BYK-Gardner spectro-guide sphere
GG BYK-Gardner TCS II	HF Hunter ColorFlex Diffuse
HH Hunter ColorQUEST XE	HP Hunter UltraScan PRO
HW Hunter UltraScan XE	MI Macbeth Color i 5
MK Macbeth Color-Eye 7000	MM Macbeth Color-Eye 7000a
MS Minolta CM-600d	MT Minolta CM-2600d
MU Minolta	MV Minolta CM-3000d Series Spectrophotometer
XB X-Rite Ci7000 Series Benchtop Spectrophotometer	XC X-Rite Ci4200 Benchtop Spectrophotometer
XH X-Rite Color i5 Benchtop Spectrophotometer	XI X-Rite Color i7 Benchtop Spectrophotometer
XM X-Rite SP62 Portable Sphere Spectrophotometer	XO X-Rite SP64 Portable Sphere Spectrophotometer
XX Instrument make/model not specified by lab	XZ X-Rite



L2* vs L1*

SAMPLE B181 = 42.88

SAMPLE B182 = 43.85

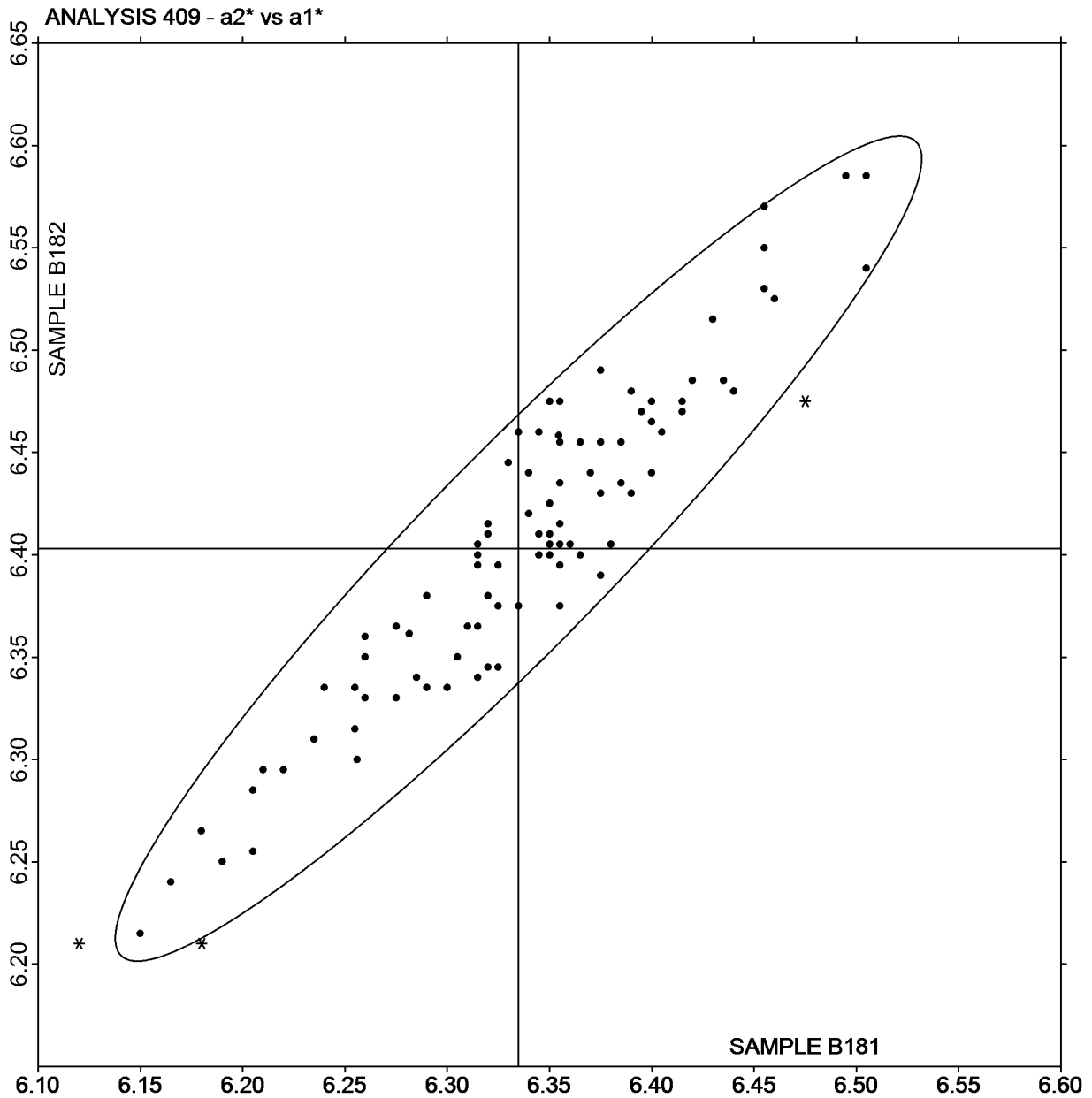




a2* vs a1*

SAMPLE B181 = 6.33

SAMPLE B182 = 6.40

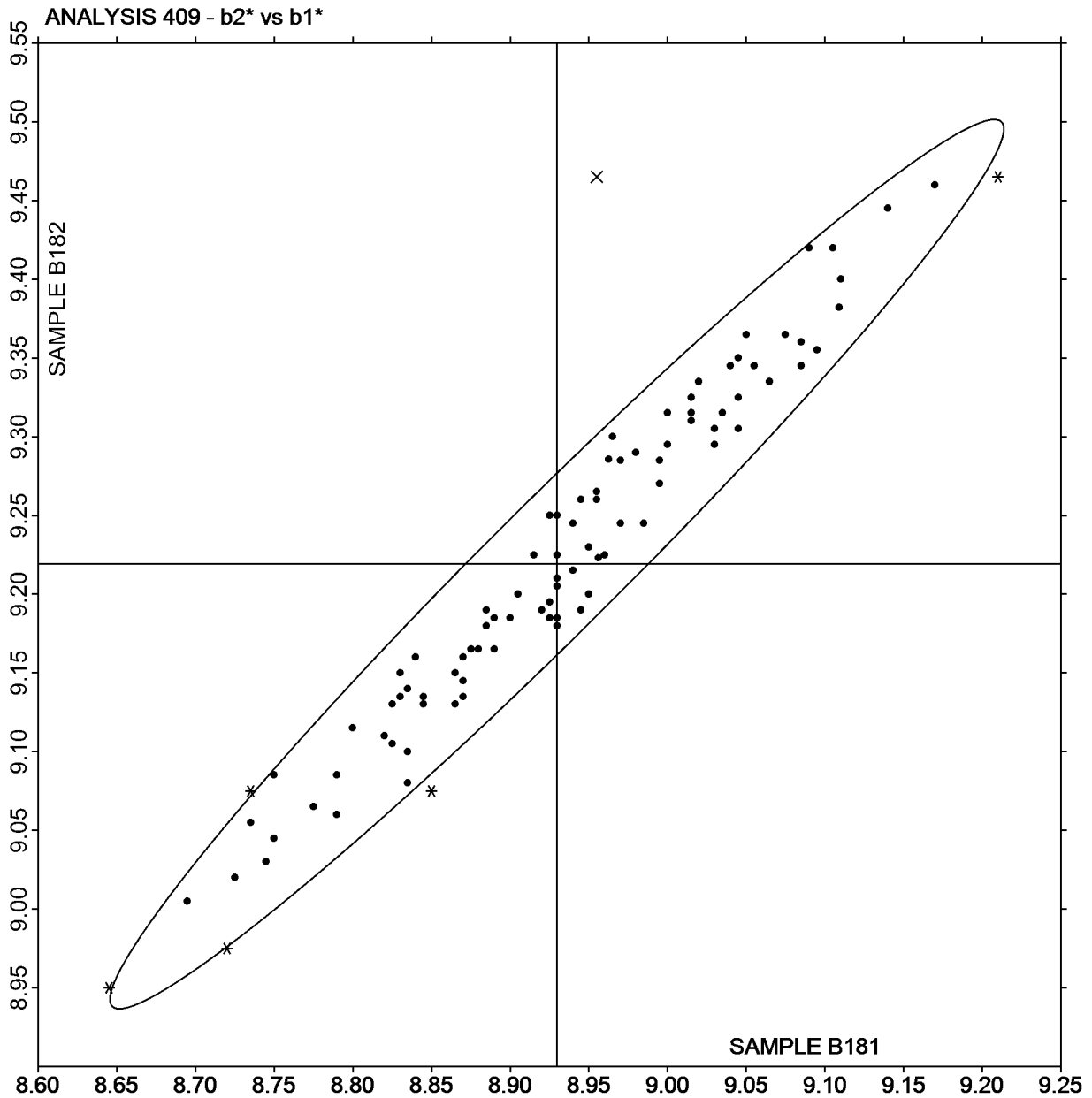




b2* vs b1*

SAMPLE B181 = -8.93

SAMPLE B182 = -9.22



Plot created using absolute values.



CTS Interlaboratory Testing Program for Color & Appearance Analysis 411

**Report #184
2nd Qtr 2018**

Spectrophotometric - Sphere Geometry Instruments
Reflectance at 16 Selected Wavelengths

WebCode	Data Flag	Spectrophotometric Reflectance values (as %) at selected wavelengths																Instr Code
		400	420	440	460	480	500	520	540	560	580	600	620	640	660	680	700	
Sample B181																		
2A7HN3		16.79	17.89	17.53	16.96	16.00	14.24	12.48	11.69	11.77	12.73	14.84	14.25	14.65	17.13	18.31	18.41	AS
2RMJLP		16.28	17.75	17.40	16.83	15.84	14.10	12.35	11.54	11.64	12.59	14.56	14.04	14.43	16.85	18.00	18.22	AQ
39QKQB		16.33	17.75	17.44	16.85	15.87	14.14	12.40	11.57	11.64	12.63	14.60	14.10	14.59	16.95	18.15	18.35	MM
3BV4WJ		16.22	17.85	17.42	16.85	15.88	14.16	12.37	11.56	11.65	12.68	14.73	14.18	14.53	16.94	18.29	18.49	MV
3EUGHN		16.40	17.81	17.50	16.83	15.88	14.17	12.39	11.63	11.68	12.65	14.68	14.16	14.54	16.99	18.14	18.10	AJ
3PW2FA	X	17.01*	18.37X	18.10X	17.36X	16.32X	14.57X	12.78	11.99	12.02X	13.11X	15.16X	14.32	14.72	17.60X	18.74X	18.94X	HH
3PXUEH		16.72	17.70	17.33	16.78	15.77	14.03	12.32	11.43	11.46	12.37*	14.53	14.02	14.14*	16.75	17.85	18.17	HP
49P3CD		16.40	17.80	17.40	16.80	15.80	14.10	12.30	11.50	11.60	12.60	14.60	14.05	14.40	16.85	18.10	18.30	MS
4AHV6B		16.47	17.98	17.55	16.94	15.93	14.17	12.39	11.57	11.66	12.69	14.78	14.14	14.53	17.06	18.30	18.56	MV
4KJJYT		16.15	17.69	17.38	16.79	15.80	14.07	12.35	11.52	11.62	12.64	14.55	14.12	14.66	16.94	18.18	18.42	MM
6KDNTR		16.41	17.76	17.42	16.78	15.82	14.10	12.35	11.54	11.61	12.66	14.58	13.99	14.52	16.93	18.02	18.11	XZ
7EP4K6		16.69	18.02	17.79*	17.10	16.13	14.42*	12.60	11.84	11.89*	12.85	14.92*	14.33	14.78	17.28*	18.33	18.27	AO
7P3KUN		16.02	17.56	17.31	16.68	15.68	14.01	12.32	11.56	11.63	12.58	14.33*	14.14	14.60	16.74	17.98	18.32	AJ
7VNFVR		15.79*	17.40*	17.06*	16.49*	15.54	13.84*	12.16	11.36	11.43	12.41*	14.25*	13.82*	14.34	16.57*	17.80*	18.03	XH
87MHR9		17.20X	18.20*	17.83*	17.16*	16.19*	14.41*	12.63	11.81	11.90*	12.85	14.82	14.34*	14.72	17.13	18.28	18.43	AJ
8JVETQ		16.72	17.89	17.55	16.94	15.90	14.24	12.44	11.64	11.70	12.76	14.66	14.14	14.62	16.97	18.16	18.41	GG
8PGAVF		16.40	17.85	17.51	16.88	15.90	14.18	12.43	11.59	11.67	12.65	14.56	14.16	14.61	16.87	18.15	18.38	MM
8QEKRH		16.55	17.88	17.60	16.93	15.99	14.24	12.46	11.67	11.76	12.71	14.74	14.17	14.59	17.07	18.19	18.15	AO
94VY8M		16.19	17.69	17.36	16.68	15.71	13.99	12.21	11.43	11.49	12.50	14.45	13.98	14.44	16.71	18.00	18.25	MI
A4BF3F		16.20	17.78	17.48	16.83	15.88	14.16	12.46	11.55	11.64	12.68	14.54	14.04	14.61	16.89	17.95	18.17	XI
AAZ3P9		16.39	17.83	17.51	16.89	15.89	14.13	12.39	11.57	11.64	12.65	14.65	14.12	14.59	16.97	18.19	18.41	MM
AAZVRM		16.63	17.87	17.32	16.91	15.92	14.28	12.47	11.61	11.75	12.69	14.65	14.30	14.24	17.20	18.24	18.67*	HF
ADETWN		16.96*	17.92	17.61	16.96	15.94	14.19	12.42	11.66	11.75	12.72	14.67	14.15	14.61	17.03	18.23	18.38	AQ
AHCAB4		16.53	18.03	17.64	16.98	15.99	14.23	12.47	11.70	11.75	12.72	14.68	14.21	14.54	16.93	18.20	18.35	AH
AUK2U3		16.09	17.47	17.17	16.51*	15.47*	13.81*	12.07	11.35	11.43	12.51	14.36	13.78*	14.41	16.71	17.81*	18.02	XF



CTS Interlaboratory Testing Program for Color & Appearance Analysis 411

**Report #184
2nd Qtr 2018**

Spectrophotometric - Sphere Geometry Instruments
Reflectance at 16 Selected Wavelengths

WebCode	Data Flag	Spectrophotometric Reflectance values (as %) at selected wavelengths															Instr Code	
		400	420	440	460	480	500	520	540	560	580	600	620	640	660	680		700
Sample B181																		
AVFDYJ		16.44	17.85	17.55	16.90	15.94	14.22	12.42	11.64	11.73	12.67	14.67	14.16	14.56	17.08	18.21	18.13	AS
BBQGXH		16.25	17.63	17.28	16.68	15.70	13.96	12.28	11.54	11.62	12.63	14.60	13.97	14.60	16.88	18.14	18.30	XO
CGBXNY		16.16	17.66	17.29	16.66	15.73	14.01	12.27	11.42	11.54	12.54	14.55	14.02	14.59	16.86	17.98	18.16	XI
CZJ7X7		16.86	17.62	17.27	16.56	15.51*	13.89	11.90	11.57	11.37*	12.50	14.53	14.06	14.39	16.82	18.27	18.33	GD
DANR6X		16.56	17.95	17.59	16.93	15.98	14.23	12.46	11.61	11.68	12.69	14.74	14.07	14.47	16.90	18.07	18.14	XB
DDJGNP		16.37	17.70	17.40	16.71	15.78	14.07	12.37	11.53	11.61	12.68	14.55	13.99	14.61	16.95	17.98	18.19	XI
DJRP9Z		16.43	17.92	17.56	16.91	15.96	14.25	12.48	11.67	11.72	12.76	14.74	14.21	14.71	17.09	18.26	18.48	MM
EBXWFZ		16.31	17.79	17.49	16.92	15.91	14.27	12.51	11.70	11.78	12.85	14.74	14.25	14.68	16.91	18.14	18.46	XI
ELXM29		16.31	18.05	17.61	16.92	15.89	14.16	12.40	11.55	11.64	12.67	14.63	14.15	14.67	16.95	18.25	18.18	AM
ETEYEA		16.03	17.60	17.26	16.63	15.64	14.00	12.26	11.47	11.52	12.60	14.44	13.98	14.53	16.79	17.97	18.18	XH
FHRJMQ		16.02	17.59	17.20	16.61	15.59	13.95	12.21	11.37	11.54	12.56	14.45	14.01	14.51	16.86	17.87	18.07	XH
FVHDYK		16.09	17.49	17.15	16.60	15.60	13.94	12.21	11.40	11.50	12.55	14.50	13.98	14.57	16.83	17.99	18.23	XH
GF2HLA		16.24	17.65	17.32	16.68	15.67	13.99	12.18	11.43	11.51	12.57	14.47	13.92	14.46	16.75	17.97	18.26	XC
GMYEZY		16.40	17.73	17.39	16.82	15.86	14.10	12.31	11.50	11.59	12.58	14.67	14.07	14.42	16.93	18.17	18.39	CA
GRWTUF		16.12	17.68	17.33	16.76	15.77	14.08	12.36	11.49	11.60	12.66	14.52	14.05	14.62	16.91	18.04	18.29	XI
GT9NB2		16.52	17.61	17.25	16.69	15.68	13.97	12.25	11.38	11.48	12.39*	14.56	13.96	14.02X	16.74	17.79*	18.15	HP
H2FMHH		16.23	17.50	17.18	16.64	15.63	13.91	12.19	11.42	11.44	12.41*	14.28*	13.90	14.34	16.59*	17.78*	17.99	XI
HD9BCW		16.64	18.06	17.76*	17.07	16.14	14.37	12.54	11.78	11.81	12.81	14.81	14.30	14.67	17.15	18.29	18.26	AJ
HK9TNM		16.56	17.96	17.60	16.97	16.00	14.27	12.52	11.72	11.81	12.77	14.81	14.27	14.69	17.16	18.27	18.26	AS
HXGBMH		16.28	17.80	17.43	16.83	15.87	14.20	12.45	11.63	11.66	12.73	14.65	14.11	14.66	16.98	18.09	18.28	XI
J6UKQ6		16.92	18.16*	17.78*	17.17*	16.20*	14.40*	12.61	11.76	11.85	12.84	14.98*	14.30	14.69	17.22*	18.47*	18.67*	CA
K3ZBVU		16.56	17.82	17.45	16.85	15.88	14.16	12.41	11.61	11.72	12.67	14.73	14.14	14.54	17.03	18.13	18.18	AO
K7K6RU		16.37	17.78	17.46	16.82	15.86	14.14	12.40	11.58	11.66	12.68	14.65	14.12	14.65	17.00	18.20	18.40	MM
KMB9C6		16.79	17.77	17.45	16.83	15.83	14.13	12.38	11.62	11.75	12.89*	14.85	13.98	14.47	16.94	18.04	18.34	HW
KU9V7Q		16.21	17.48	17.13	16.56	15.62	13.85*	12.12	11.30	11.38*	12.35*	14.46	13.81*	14.18	16.66	17.89	18.11	CA



CTS Interlaboratory Testing Program for Color & Appearance Analysis 411

**Report #184
2nd Qtr 2018**

Spectrophotometric - Sphere Geometry Instruments
Reflectance at 16 Selected Wavelengths

WebCode	Data Flag	Spectrophotometric Reflectance values (as %) at selected wavelengths																Instr Code
		400	420	440	460	480	500	520	540	560	580	600	620	640	660	680	700	
Sample B181																		
L8AVEK		16.30	17.80	17.47	16.87	15.89	14.17	12.40	11.63	11.70	12.75	14.65	14.11	14.65	16.92	18.13	18.30	XI
LPTRTT		16.39	17.85	17.49	16.85	15.91	14.17	12.39	11.59	11.64	12.56	14.59	14.15	14.41	16.85	18.07	18.30	AJ
LZV6TT		16.48	17.87	17.51	16.88	15.93	14.18	12.40	11.63	11.68	12.62	14.61	14.13	14.54	16.96	18.08	18.11	AJ
M3CZNW		17.21X	17.82	17.48	16.88	15.86	14.15	12.38	11.59	11.66	12.61	14.56	14.14	14.53	17.00	18.20	18.36	AQ
MDTMXX	X	15.92	17.35*	16.97X	16.33X	15.34X	13.68X	12.00	11.22	11.32X	12.35*	14.20X	13.64X	14.20	16.48X	17.64X	17.87*	XF
MMH8KJ		16.30	17.80	17.37	16.77	15.77	14.14	12.35	11.51	11.54	12.63	14.51	14.03	14.54	16.82	18.05	18.36	XI
MU3ALU		16.62	17.81	17.54	16.86	15.92	14.18	12.40	11.60	11.66	12.64	14.68	14.10	14.54	17.00	18.24	18.11	AS
NLM49M		16.59	17.84	17.56	16.93	15.98	14.24	12.46	11.68	11.74	12.73	14.77	14.23	14.64	17.09	18.19	18.14	AS
NUZY9N		16.41	17.79	17.48	16.83	15.90	14.14	12.36	11.59	11.64	12.60	14.69	14.17	14.48	16.93	17.97	17.57X	AE
PF9WYU		16.08	17.69	17.38	16.78	15.77	14.10	12.35	11.60	11.66	12.65	14.45	14.11	14.64	16.91	17.95	17.97	AO
PXEWEP		16.08	17.58	17.29	16.72	15.73	14.05	12.32	11.49	11.59	12.67	14.56	14.04	14.57	16.88	18.02	18.18	XH
PZX763		16.20	17.73	17.34	16.73	15.75	14.09	12.34	11.51	11.57	12.63	14.54	14.03	14.60	16.89	18.03	18.22	XI
Q3HBFK		15.84	17.51	17.16	16.56	15.59	13.94	12.20	11.38	11.50	12.55	14.41	13.88	14.48	16.78	17.86	18.04	XH
Q8BGUM		16.53	17.99	17.60	17.03	15.99	14.26	12.45	11.66	11.74	12.71	14.69	14.18	14.56	17.02	18.26	18.41	AO
RDXL43		16.48	17.53	17.22	16.53	15.53*	13.93	11.93	11.58	11.50	12.79	14.62	14.10	14.37	16.73	18.16	18.31	GD
RHN72Q		16.53	17.88	17.51	16.93	15.95	14.24	12.49	11.71	11.76	12.73	14.76	14.24	14.64	17.11	18.19	18.19	AJ
RHRLGD		16.09	17.53	17.29	16.61	15.65	13.87	12.23	11.47	11.54	12.56	14.47	13.93	14.46	16.83	18.03	18.24	XO
RJ2DPT		16.31	17.85	17.50	16.94	15.91	14.19	12.41	11.57	11.64	12.65	14.69	14.15	15.07*	17.00	18.23	18.52	MT
RM4AGA		16.66	18.00	17.65	16.99	16.03	14.29	12.52	11.72	11.83	12.79	14.87	14.28	14.71	17.22*	18.38	18.26	AO
RV3W99		15.92	17.39*	17.07*	16.46*	15.49*	13.85*	12.12	11.30	11.39*	12.38*	14.31*	13.85*	14.24	16.62*	17.89	18.16	MU
T7DNB9		16.61	17.94	17.58	16.96	15.97	14.16	12.39	11.63	11.66	12.63	14.65	14.13	14.50	16.88	18.16	18.38	AO
TNCZKA		16.42	17.81	17.58	16.88	15.95	14.20	12.41	11.65	11.72	12.67	14.65	14.22	14.58	17.02	18.23	18.36	AJ
TP8NZK		16.38	17.82	17.45	16.85	15.87	14.12	12.39	11.56	11.64	12.68	14.65	14.13	14.62	16.97	18.18	18.40	MK
TYQ6PK		16.33	17.75	17.36	16.77	15.80	14.08	12.34	11.51	11.59	12.67	14.56	14.03	14.65	16.92	17.98	18.19	XI
U9EB2H		16.51	17.85	17.52	16.88	15.94	14.20	12.42	11.63	11.70	12.65	14.66	14.11	14.56	17.01	18.12	18.15	AJ



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Spectrophotometric - Sphere Geometry Instruments
Reflectance at 16 Selected Wavelengths

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		400	420	440	460	480	500	520	540	560	580	600	620	640	660	680	700	
Sample B181																		
UHLQAC		16.22	17.56	17.35	16.72	15.71	14.02	12.31	11.53	11.63	12.62	14.57	14.03	15.64X	17.03	18.14	18.35	XO
UQJHH7		16.22	17.82	17.45	16.90	15.91	14.19	12.39	11.57	11.65	12.68	14.73	14.15	14.55	16.94	18.24	18.49	MV
UXVWZ2		16.32	17.96	17.59	16.91	15.95	14.22	12.42	11.59	11.64	12.64	14.63	14.21	14.64	17.07	18.30	18.39	AM
VKRV3Q		16.50	17.83	17.55	16.91	15.99	14.22	12.45	11.68	11.73	12.70	14.76	14.20	14.58	17.10	18.22	18.15	AS
WN2B89		16.34	17.87	17.53	16.97	16.00	14.26	12.51	11.68	11.70	12.72	14.66	14.12	14.66	17.01	18.08	18.29	XI
WZG6GF		16.56	17.87	17.55	16.87	15.87	14.12	12.36	11.57	11.68	12.64	14.62	14.04	14.48	16.88	18.16	18.27	AQ
X9KW4F		15.83*	17.63	17.40	16.77	15.82	14.10	15.01X	14.51X	11.66	12.63	14.42	14.07	14.50	16.78	17.96	18.13	AM
XGYL4A		16.62	17.87	17.55	16.88	15.94	14.18	12.43	11.64	11.74	12.71	14.67	14.23	14.58	16.99	18.23	18.37	AJ
XVVVPU		16.46	17.76	17.41	16.79	15.81	14.11	12.37	11.54	11.60	12.63	14.58	14.05	14.56	16.94	18.11	18.33	XB
XYV99D		16.28	17.85	17.49	16.85	15.86	14.20	12.45	11.60	11.67	12.74	14.58	14.00	14.60	16.90	17.97	18.18	XI
YACCV3		16.15	17.78	17.39	16.82	15.86	14.18	12.44	11.58	11.67	12.70	14.56	14.05	14.62	16.91	17.98	18.24	XI
YLNFHL		15.73*	17.56	17.30	16.83	15.89	14.17	12.36	11.51	11.54	12.59	14.65	14.02	14.38	16.94	18.15	18.40	MV
YTABJQ		16.29	17.60	17.25	16.71	15.77	14.00	12.25	11.41	11.50	12.47	14.59	13.95	14.28	16.80	18.02	18.24	CA
YYF84Q		16.55	17.94	17.58	16.93	15.97	14.27	12.50	11.74	11.81	12.77	14.84	14.27	14.68	17.16	18.25	18.21	AJ

Summary Statistics

	400	420	440	460	480	500	520	540	560	580	600	620	640	660	680	700
Grand Means	16.38	17.77	17.44	16.82	15.84	14.13	12.39	11.60	11.64	12.65	14.62	14.09	14.55	16.93	18.11	18.26
SD Btwn Labs	0.28	0.17	0.16	0.15	0.15	0.13	0.31	0.33	0.11	0.11	0.14	0.12	0.19	0.14	0.15	0.16

Comments Assigned on Data Flags for Test #411

3PW2FA (X) - High % reflectance data for most wavelengths.

MDTMXX (X) - Low % reflectance data for most wavelengths.



CTS Interlaboratory Testing Program for Color & Appearance Analysis 411

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2nd Qtr 2018

Spectrophotometric - Sphere Geometry Instruments
Reflectance at 16 Selected Wavelengths

Key to Instrument Codes Reported by Participants

AE ACS-Datcolor 110	AH ACS-Datcolor 550	AJ ACS-Datcolor 600
AM ACS-Datcolor 600 Plus	AO ACS-Datcolor 650	AQ ACS-Datcolor 600X
AS ACS-Datcolor 800 Series	CA Cary 5000	GD BYK-Gardner spectro-guide sphere
GG BYK-Gardner TCS II	HF Hunter ColorFlex Diffuse	HH Hunter ColorQUEST XE
HP Hunter UltraScan PRO	HW Hunter UltraScan XE	MI Macbeth Color i5
MK Macbeth Color-Eye 7000 Spectrophotometer	MM Macbeth Color-Eye 7000a	MS Minolta CM-600d
MT Minolta CM-2600d	MU Minolta	MV Minolta CM-3000d Series Spectrophotometer
XB X-Rite Ci7000 Series Benchtop Spectrophotometer	XC X-Rite Ci4200 Benchtop Spectrophotometer	XF X-Rite Ci6x Series Portable Spectrophotometer
XH X-Rite Color i5	XI X-Rite Color i7	XO X-Rite SP64
XZ X-Rite		



Interlaboratory Testing Program for Color & Appearance

**Report #184
2nd Qtr 2018**

Analysis 440

60 Degree Gloss - Paint Chips

ASTM Method D 523

WebCode	Data Flag	Sample F181			Sample F182			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
39QKQB		40.35	0.05	0.07	49.68	0.03	0.04	GL
3BV4WJ	X	63.83	23.53	34.38	72.23	22.58	29.54	GL
3EUGHN	X	42.13	1.83	2.67	50.13	0.48	0.63	MW
3PW2FA		39.68	-0.62	-0.91	49.18	-0.47	-0.61	RA
463MGB	X	35.20	-5.10	-7.45	53.88	4.23	5.54	GK
493WPR		40.83	0.53	0.77	50.28	0.63	0.83	GL
49P3CD		39.48	-0.82	-1.20	49.10	-0.54	-0.71	GK
4YFV8W		39.95	-0.35	-0.51	49.75	0.11	0.14	GL
6Q2FWE		40.15	-0.15	-0.22	49.33	-0.32	-0.42	XX
7E4TNH		40.00	-0.30	-0.44	49.38	-0.27	-0.35	GL
7RQ4RE	*	38.38	-1.92	-2.81	47.90	-1.74	-2.28	EC
87MHR9		40.45	0.15	0.22	49.68	0.03	0.04	GK
8PGAVF		40.13	-0.17	-0.25	49.60	-0.04	-0.06	GL
8Y8UX8		40.75	0.45	0.66	50.10	0.46	0.60	GN
94VY8M		40.48	0.18	0.26	49.90	0.26	0.34	GL
A4BF3F		41.53	1.23	1.79	51.15	1.51	1.97	GK
ADETWN		41.13	0.83	1.21	50.25	0.61	0.79	GK
AUK2U3		39.60	-0.70	-1.02	48.93	-0.72	-0.94	GK
BAUXX3		39.90	-0.40	-0.58	49.83	0.18	0.24	GK
BBQGXH		39.95	-0.35	-0.51	49.60	-0.04	-0.06	GN
C9HME4		39.98	-0.32	-0.47	49.33	-0.32	-0.42	GL
CGBXNY		40.88	0.58	0.84	50.78	1.13	1.48	GL
CW2264		39.30	-1.00	-1.46	48.03	-1.62	-2.12	GK
DANR6X		40.60	0.30	0.44	50.28	0.63	0.83	GL
DZWAQP		41.75	1.45	2.12	51.40	1.76	2.30	GL
E4XHVV		41.63	1.33	1.94	51.33	1.68	2.20	GK
EBXWFZ		40.45	0.15	0.22	49.63	-0.02	-0.02	GL
EG2XHF		40.73	0.43	0.62	50.13	0.48	0.63	GB
EUQVLY		40.20	-0.10	-0.15	49.45	-0.19	-0.25	GL
F264LF		40.78	0.48	0.69	50.58	0.93	1.22	GL



Interlaboratory Testing Program for Color & Appearance

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60 Degree Gloss - Paint Chips

ASTM Method D 523

WebCode	Data Flag	Sample F181			Sample F182			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
FHRJMQ		40.37	0.07	0.10	50.15	0.51	0.66	GL
FVHDYK		39.95	-0.35	-0.51	49.05	-0.59	-0.78	GL
G7BWDP		38.83	-1.47	-2.15	48.15	-1.49	-1.95	GB
GEP3R9		41.98	1.68	2.45	51.40	1.76	2.30	GN
GRWTUF		40.30	0.00	-0.01	50.15	0.50	0.66	GL
H2EW8T		40.93	0.63	0.91	50.13	0.48	0.63	MW
H2FMHH		39.28	-1.02	-1.50	49.08	-0.57	-0.74	MH
HK9TNM		41.48	1.18	1.72	50.93	1.28	1.68	GN
HUHVEU		40.18	-0.12	-0.18	49.58	-0.07	-0.09	GL
HXGBMH		40.40	0.10	0.15	49.93	0.28	0.37	GL
K3ZBVU		41.03	0.73	1.06	49.95	0.31	0.40	GK
KECKJJ		41.20	0.90	1.32	50.60	0.96	1.25	GL
KMB9C6		39.55	-0.75	-1.10	48.98	-0.67	-0.87	GK
LF399T		41.20	0.90	1.32	49.98	0.33	0.43	GL
LZV6TT		39.65	-0.65	-0.95	49.13	-0.52	-0.68	GK
M8UUAX		40.18	-0.12	-0.18	49.58	-0.07	-0.09	GN
MH8BHU		40.13	-0.17	-0.25	49.33	-0.32	-0.42	GK
MMH8KJ		40.65	0.35	0.51	49.93	0.28	0.37	GL
N8PWC8		41.08	0.78	1.13	49.80	0.16	0.21	GL
NCG84W		40.35	0.05	0.07	50.08	0.43	0.57	GL
NUZY9N		39.88	-0.42	-0.62	49.35	-0.29	-0.38	GL
PTXNQQ		40.00	-0.30	-0.44	48.85	-0.79	-1.04	GL
PXEWEP		40.13	-0.17	-0.25	49.65	0.01	0.01	GK
Q3HBFK		40.40	0.10	0.15	49.30	-0.34	-0.45	GL
RDXL43		40.68	0.38	0.55	49.98	0.33	0.43	GN
RHN72Q		40.33	0.03	0.04	49.58	-0.07	-0.09	GL
RHRLGD		39.55	-0.75	-1.10	48.68	-0.97	-1.27	MW
RPURZL		40.40	0.10	0.15	49.35	-0.29	-0.38	GL
T8BY8C		40.18	-0.12	-0.18	49.55	-0.09	-0.12	GN
TCKEFZ		39.98	-0.32	-0.47	48.88	-0.77	-1.00	MW



Interlaboratory Testing Program for Color & Appearance

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60 Degree Gloss - Paint Chips

ASTM Method D 523

WebCode	Data Flag	Sample F181			Sample F182			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
TYQ6PK		40.18	-0.12	-0.18	49.70	0.06	0.08	GL
TZ4R8Y		39.95	-0.35	-0.51	49.05	-0.59	-0.78	GL
U9EB2H		40.25	-0.05	-0.07	49.68	0.03	0.04	GL
UBLQEF		40.70	0.40	0.59	49.83	0.18	0.24	GK
UCEJAY		39.43	-0.87	-1.28	48.28	-1.37	-1.79	GL
UHLQAC	*	39.90	-0.40	-0.58	48.45	-1.19	-1.56	RA
UPJPGR		40.90	0.60	0.88	50.38	0.73	0.96	GX
VEZNHW		40.68	0.38	0.55	49.90	0.26	0.34	GK
W6RDQX		40.58	0.28	0.40	50.28	0.63	0.83	PA
WDKL94		40.15	-0.15	-0.22	49.48	-0.17	-0.22	RA
WU3RCM		41.15	0.85	1.24	50.03	0.38	0.50	GL
WZG6GF		39.85	-0.45	-0.66	49.33	-0.32	-0.42	GL
YFGVCG	X	41.40	1.10	1.61	49.75	0.11	0.14	GN
YTABJQ		39.60	-0.70	-1.02	48.88	-0.77	-1.00	GL
YYF84Q		38.83	-1.47	-2.15	47.90	-1.74	-2.28	GL

Summary Statistics	
Grand Means	
40.30 Gloss Units	49.64 Gloss Units
Std Dev Btwn Labs	
0.68 Gloss Units	0.76 Gloss Units
Statistics based on 71 of 75 reporting participants	

Comments on Assigned Data Flags for Test #440

- 3BV4WJ(X) - Extreme data.
- 3EUGHN(X) - Inconsistent in testing between samples.
- 463MGB(X) - Extreme data.
- YFGVCG(X) - Inconsistent in testing between samples.



Interlaboratory Testing Program for Color & Appearance

Report #184

Analysis 440

2nd Qtr 2018

60 Degree Gloss - Paint Chips

ASTM Method D 523

Key to Instrument Codes Reported by Participants

EC	Elcometer	GB	BYK Gardner Spectro - Guide Sphere Gloss
GK	BYK-Gardner micro-gloss (60)	GL	BYK-Gardner micro-TRI-gloss
GN	BYK-Gardner new micro-TRI-gloss	GX	BYK-Gardner (model not specified)
MH	X-Rite/Macbeth Color-Eye XTH	MW	Minolta Multi-Gloss 268
PA	Photovolt micro-TRI-gloss G3	RA	Rhopoint Novo-Gloss Glossmeter
XX	Instrument make/model not specified by lab		



Interlaboratory Testing Program for Color & Appearance

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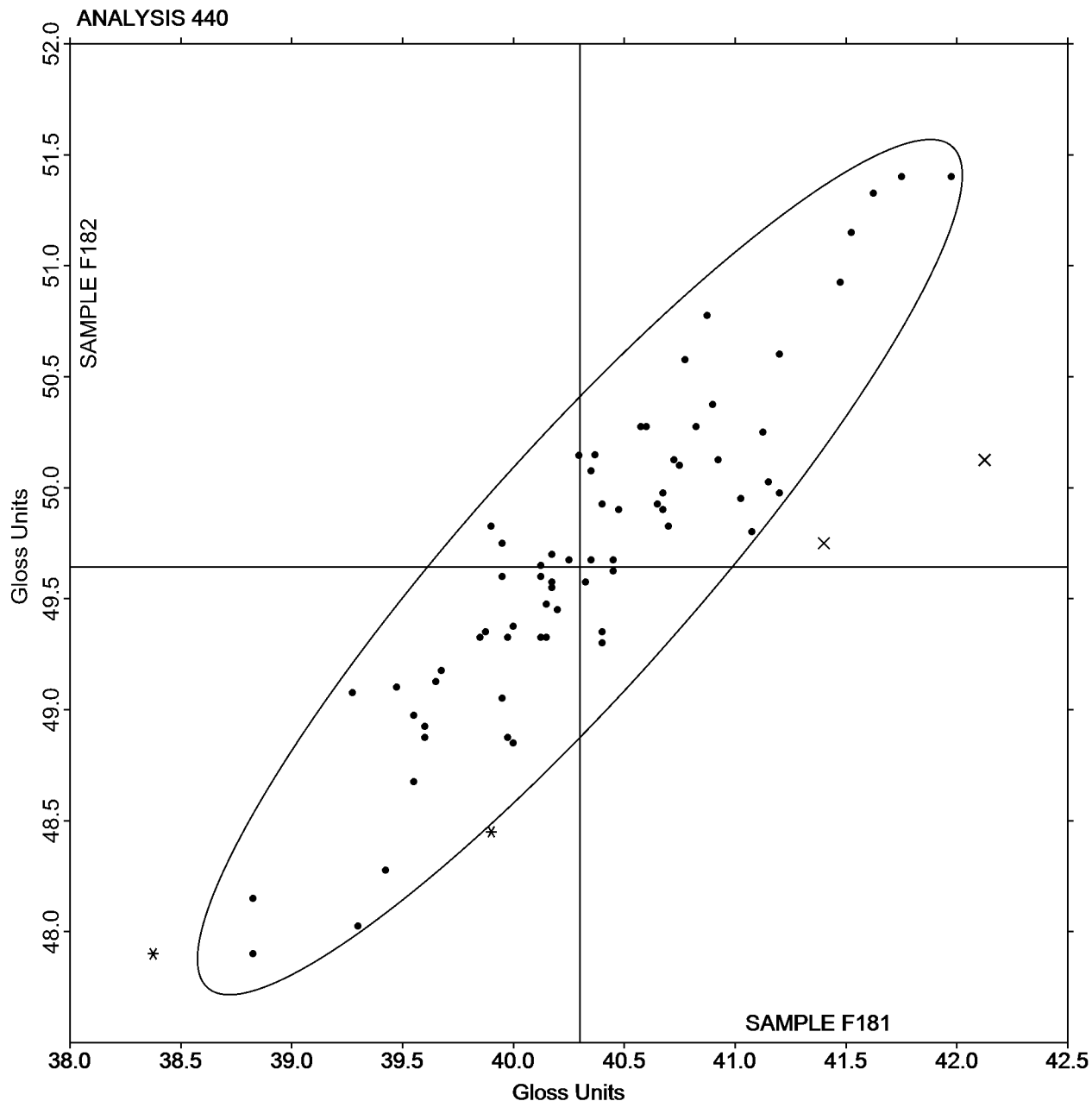
Analysis 440

60 Degree Gloss - Paint Chips

ASTM Method D 523

SAMPLE F181 = 40.30 Gloss Units

SAMPLE F182 = 49.64 Gloss Units





Interlaboratory Testing Program for Color & Appearance

**Report #184
2nd Qtr 2018**

Analysis 442

85 Degree Gloss - Paint Chips

ASTM Method D 523

WebCode	Data Flag	Sample K181			Sample K182			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
39QKQB		6.75	0.00	0.01	11.08	-0.53	-1.44	GL
3BV4WJ	X	4.18	-2.57	-14.36	6.03	-5.58	-15.07	GL
6Q2FWE		6.85	0.10	0.56	11.48	-0.13	-0.36	XX
8PGAVF		6.43	-0.32	-1.81	11.23	-0.38	-1.04	GN
BBQGXH		6.80	0.05	0.28	11.68	0.07	0.18	GN
CGBXNY		6.60	-0.15	-0.83	11.45	-0.16	-0.43	GL
FHRJMQ		6.92	0.17	0.94	12.08	0.47	1.26	GL
RDXL43		6.98	0.23	1.26	12.08	0.47	1.26	GN
TYQ6PK		6.68	-0.07	-0.41	11.83	0.22	0.58	GL

Summary Statistics

Grand Means

6.75 Gloss Units

11.61 Gloss Units

Std Dev Btwn Labs

0.18 Gloss Units

0.37 Gloss Units

Statistics based on 8 of 9 reporting participants

Comments on Assigned Data Flags for Test #442

3BV4WJ(X) - Extreme data.

Key to Instrument Codes Reported by Participants

GL BYK-Gardner micro-TRI-gloss

GN BYK-Gardner new micro-TRI-gloss

XX Instrument make/model not specified by lab



Interlaboratory Testing Program for Color & Appearance

Report #184
2nd Qtr 2018

Analysis 442

85 Degree Gloss - Paint Chips

ASTM Method D 523

SAMPLE K181 = 6.75 Gloss Units SAMPLE K182 = 11.61 Gloss Units

