



Color & Appearance Testing Program

Summary Report #188 - 2nd Qtr 2019

[About the Color Program, About CTS](#)

[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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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 #188**
Analysis 408 **2nd Qtr 2019**

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^*	
3R7WQX		B191	42.16	5.81	-6.71	0.95	0.06	-0.15	0.97	XB
		B192	43.12	5.87	-6.86					
4LGVNP		B191	42.38	5.94	-6.52	0.98	0.11	-0.12	0.99	XO
		B192	43.36	6.04	-6.64					
4TVHXU		B191	42.43	5.87	-6.51	0.95	0.08	-0.04	0.95	XM
		B192	43.37	5.95	-6.55					
68TMAJ		B191	42.25	6.00	-6.45	0.97	0.12	-0.10	0.98	HW
		B192	43.22	6.12	-6.55					
6V3RFX		B191	42.62	5.88	-6.50	1.06	0.04	-0.06	1.06	XD
		B192	43.68	5.92	-6.56					
7VQPYN		B191	42.87	5.76	-6.82	1.00	0.09	-0.06	1.00	AB
		B192	43.86	5.84	-6.88					
8UZ9FK		B191	42.15	5.83	-6.59	1.07	0.13	-0.08	1.08	XU
		B192	43.22	5.96	-6.67					
9VTEHW		B191	42.68	5.86	-6.96	0.94	0.09	-0.13	0.95	MU
		B192	43.62	5.94	-7.09					
ABZER8		B191	42.32	6.14	-6.60	1.06	0.09	-0.18	1.07	HW
		B192	43.37	6.22	-6.78					
CF4MZR		B191	41.73	5.80	-6.82	1.09	0.09	-0.04	1.09	FA
		B192	42.82	5.89	-6.86					
CHCQWN		B191	42.30	5.92	-6.60	1.03	0.05	-0.13	1.04	XU
		B192	43.33	5.96	-6.72					
EDQN3N		B191	42.37	5.88	-6.33	0.91	0.10	-0.02	0.91	GE
		B192	43.28	5.97	-6.35					
EMDMUU		B191	41.91	5.74	-6.72	1.02	0.03	-0.15	1.03	XZ
		B192	42.92	5.77	-6.86					
G6L86A		B191	42.35	5.79	-6.66	1.06	0.04	0.00	1.06	MU
		B192	43.41	5.83	-6.66					
G8EJ6L		B191	42.56	5.89	-6.65	0.91	0.10	-0.07	0.92	XN
		B192	43.47	5.99	-6.71					
GGH9PQ		B191	42.06	5.84	-6.60	1.01	0.03	-0.13	1.02	HK
		B192	43.07	5.87	-6.73					



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WebCode	Flag	Samples	CIE L* a* b* Color Values			Color Difference Values				InstrCode
			L*	a*	b*	ΔL^*	Δa^*	Δb^*	ΔE^*	
JB2R37		B191	42.21	5.99	-6.64	1.09	0.03	-0.13	1.09	XO
		B192	43.30	6.02	-6.77					
JCGGJH		B191	41.98	5.83	-6.56	0.93	0.09	-0.11	0.94	MQ
		B192	42.90	5.92	-6.66					
KCRAJX		B191	42.20	6.05	-6.50	1.10	0.05	-0.20	1.12	HW
		B192	43.30	6.10	-6.70					
KHHKTV		B191	41.80	6.08	-6.69	1.01	0.13	-0.10	1.02	HY
		B192	42.81	6.20	-6.79					
KKP7WG		B191	42.31	5.95	-6.33	0.94	0.11	-0.08	0.95	GE
		B192	43.25	6.06	-6.41					
KVUBUP		B191	42.09	6.11	-6.60	0.99	0.16	-0.11	1.01	MG
		B192	43.08	6.27	-6.71					
LWGEUA		B191	42.48	5.88	-6.72	1.22	0.12	-0.19	1.23	TO
		B192	43.69	6.00	-6.90					
MDJBTY		B191	42.46	6.17	-6.44	0.88	0.11	-0.04	0.89	HW
		B192	43.34	6.28	-6.48					
MGL8KE		B191	42.21	5.89	-6.58	0.87	0.15	-0.16	0.89	XU
		B192	43.08	6.04	-6.74					
Q6XJVV		B191	42.55	6.04	-6.51	1.00	0.14	-0.11	1.02	HW
		B192	43.55	6.18	-6.62					
QBHJBA	X	B191	41.32	6.04	-6.47	1.32	0.05	-0.12	1.33	HW
		B192	42.64	6.08	-6.59					
QDPU8D		B191	42.28	6.12	-6.54	1.01	0.14	-0.08	1.02	GE
		B192	43.28	6.26	-6.62					
QHZHUA		B191	41.81	6.04	-6.64	0.98	0.09	-0.10	0.98	HY
		B192	42.79	6.13	-6.74					
QNQWCP		B191	42.23	6.04	-6.69	1.13	0.06	-0.07	1.13	HW
		B192	43.35	6.10	-6.76					
RM8D6W		B191	42.22	6.07	-6.66	1.01	0.10	-0.13	1.02	HK
		B192	43.23	6.17	-6.78					
TPUR9H		B191	42.62	5.81	-6.69	0.91	0.11	-0.08	0.92	XZ
		B192	43.53	5.92	-6.77					



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WebCode	Flag	Samples	CIE L* a* b* Color Values			Color Difference Values				InstrCode
			L*	a*	b*	ΔL^*	Δa^*	Δb^*	ΔE^*	
TQ2Q47		B191	42.35	5.87	-6.54	1.11	0.03	-0.07	1.11	XZ
		B192	43.46	5.90	-6.61					
V3DGVD		B191	42.67	5.87	-6.51	1.07	0.13	-0.05	1.07	GH
		B192	43.73	5.99	-6.56					
VDTPKL		B191	42.14	6.09	-6.64	1.08	0.02	-0.08	1.08	HW
		B192	43.22	6.11	-6.72					
XED9KA		B191	42.21	6.07	-6.35	1.01	0.03	-0.11	1.01	GE
		B192	43.21	6.09	-6.46					
XN6CL4		B191	42.18	5.93	-6.48	0.89	0.18	-0.16	0.92	HW
		B192	43.07	6.10	-6.64					
XWEJG7		B191	42.15	5.99	-6.56	1.06	0.05	-0.04	1.06	HW
		B192	43.21	6.03	-6.59					
XXQWPV		B191	41.94	5.79	-7.00	0.97	0.04	-0.11	0.97	XZ
		B192	42.90	5.83	-7.11					
YLDWT2		B191	41.78	5.91	-6.53	1.11	0.07	-0.10	1.11	AB
		B192	42.89	5.97	-6.63					

Summary Statistics								
Samples	L*	a*	b*	ΔL^*	Δa^*	Δb^*	ΔE^*	
Grand Means								
B191	42.25	5.94	-6.60	1.01	0.08	-0.10	1.02	
B192	43.26	6.02	-6.69					
Std Dev Btwn Labs								
B191	0.27	0.12	0.14	0.08	0.04	0.05	0.08	
B192	0.27	0.13	0.16					

Statistics based on 39 of 40 reporting participants

Comments Assigned on Data Flags for Test #408

QBHJBA(X) - Low "L*" values for Sample B191. Large Delta L and DE values.



Key to Instrument Codes Reported by Participants

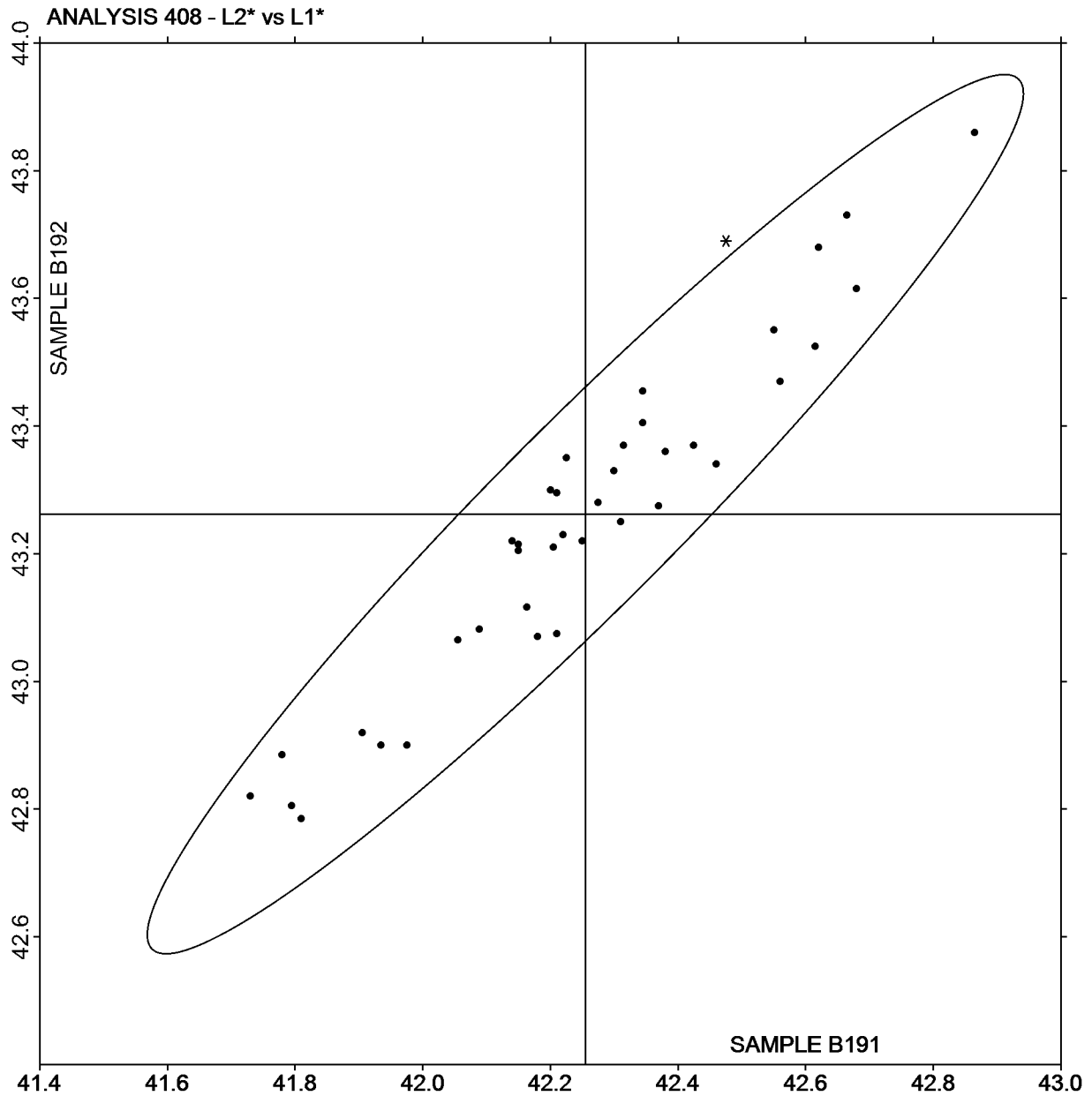
AB	Data Color	FA	BYK Mac
GE	BYK-Gardner spectro-guide (45/0)	GH	BYK-Gardner Color-View
HK	Hunter MiniScan XE (45/0)	HW	Hunter LabScan XE
HY	Hunter Color Flex 45/0	MG	Macbeth 1500/PLUS or 2025+ Color Eye
MQ	Minolta CM-503c Spectrophotometer	MU	Minolta
TO	Topcon SR-3 Spectroradiometer	XB	X-Rite i1Basic Pro 2
XD	X-Rite 500 Series SpectroDensitometer	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 B191 = 42.25

SAMPLE B192 = 43.26



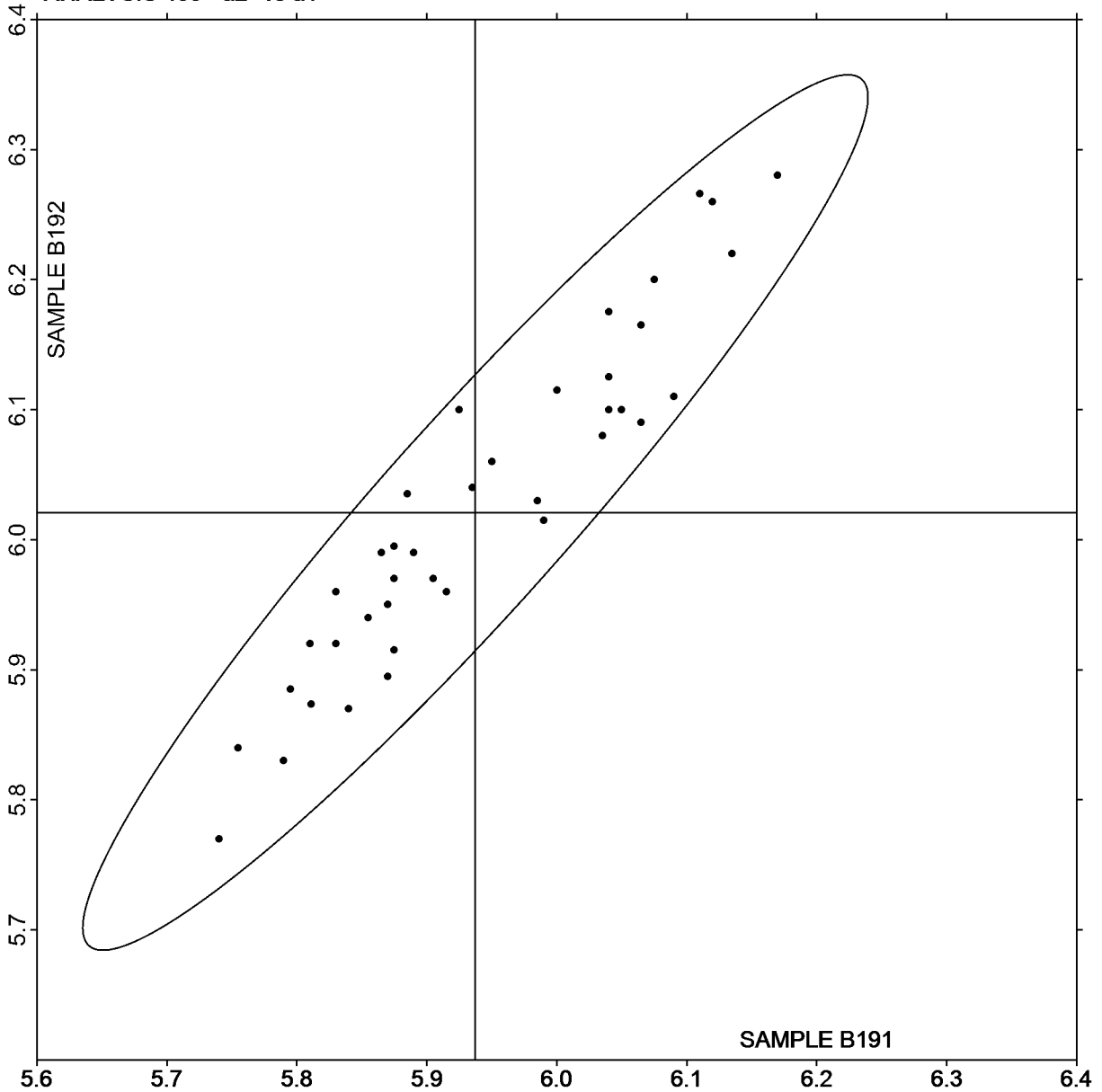


a2* vs a1*

SAMPLE B191 = 5.94

SAMPLE B192 = 6.02

ANALYSIS 408 - a2* vs a1*



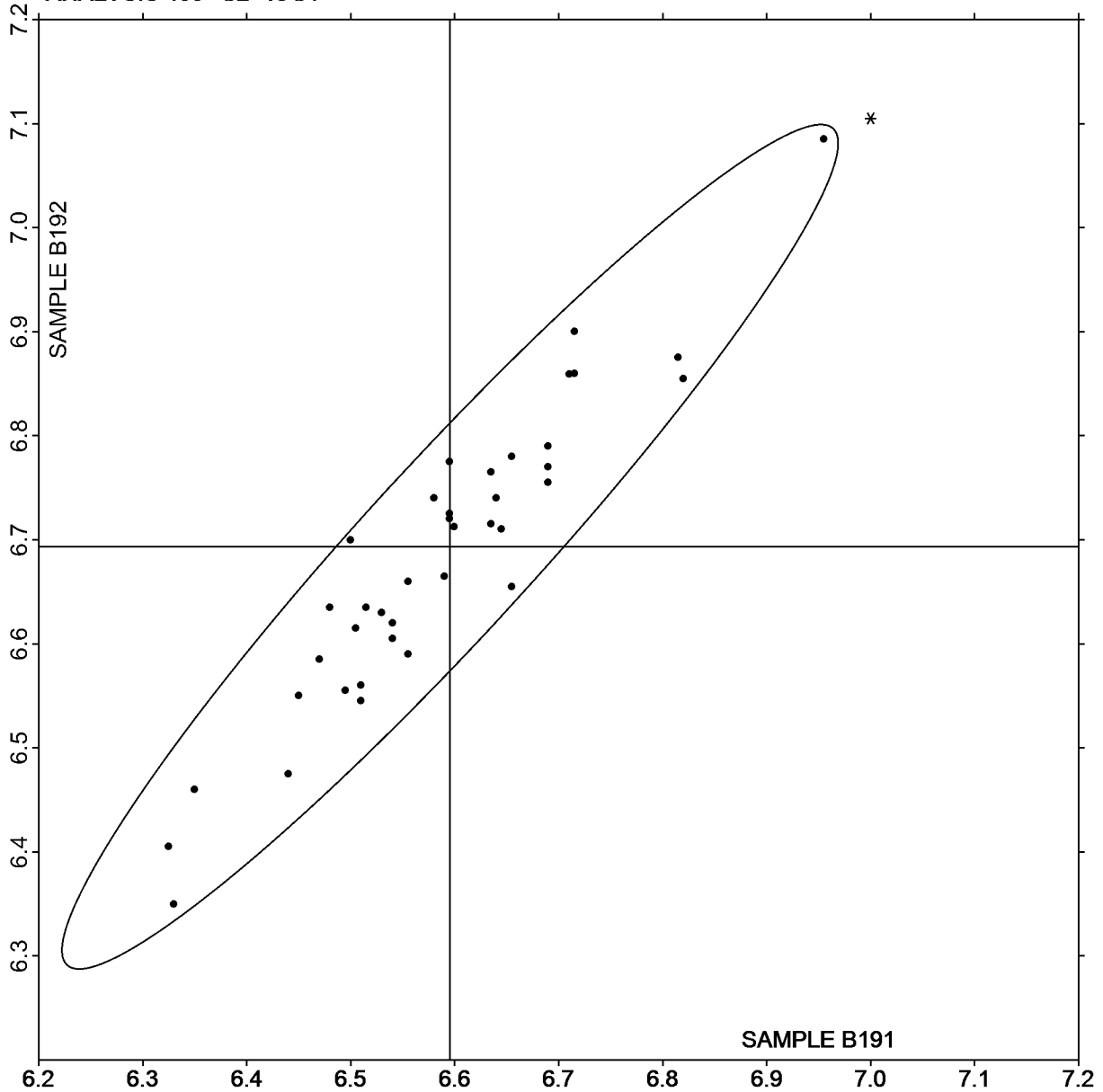


b2* vs b1*

SAMPLE B191 = -6.60

SAMPLE B192 = -6.69

ANALYSIS 408 - b2* vs b1*



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^*	
22F24N		B191	42.88	5.84	-6.80	1.00	0.10	-0.15	1.01	AJ
		B192	43.88	5.93	-6.94					
286VBG		B191	42.81	5.71	-6.73	0.95	0.12	-0.07	0.96	XB
		B192	43.76	5.83	-6.79					
2NCT9R		B191	42.52	5.92	-6.72	1.00	0.06	-0.04	1.00	XH
		B192	43.52	5.97	-6.75					
36F2T7		B191	42.74	5.84	-6.93	1.08	0.05	-0.10	1.09	AJ
		B192	43.82	5.89	-7.03					
376X7K		B191	42.38	5.82	-6.83	0.97	0.07	-0.09	0.97	XH
		B192	43.35	5.89	-6.91					
3EY3YL		B191	42.70	5.84	-6.79	0.90	0.08	-0.13	0.91	AS
		B192	43.60	5.91	-6.92					
3W4RJR		B191	42.85	5.81	-6.82	0.97	0.07	-0.06	0.97	AS
		B192	43.82	5.87	-6.88					
4JDYLA		B191	43.07	5.71	-6.85	1.07	0.03	-0.12	1.08	AO
		B192	44.14	5.74	-6.97					
4LGVNP		B191	42.59	5.93	-6.95	0.97	0.12	-0.16	0.99	MI
		B192	43.56	6.05	-7.10					
6JPNUZ		B191	42.39	5.84	-6.67	1.04	0.05	-0.07	1.04	XH
		B192	43.43	5.89	-6.73					
6RMMY9	X	B191	42.78	5.63	-6.81	1.00	0.04	-0.09	1.00	XI
		B192	43.77	5.67	-6.89					
6WWZG8	X	B191	46.78	4.16	-5.46	-0.16	-0.10	-0.10	0.21	XI
		B192	46.62	4.06	-5.56					
6XLEYP		B191	42.95	5.76	-6.72	0.95	0.11	-0.03	0.95	AJ
		B192	43.90	5.87	-6.75					
763AFK		B191	42.80	5.85	-6.76	1.04	0.01	-0.11	1.04	AS
		B192	43.84	5.86	-6.87					
7QYHGF		B191	42.74	5.84	-6.82	1.02	0.10	-0.10	1.02	XI
		B192	43.76	5.94	-6.91					
7TRRP3		B191	42.62	5.85	-6.80	0.91	0.10	-0.12	0.92	XH
		B192	43.52	5.95	-6.92					



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WebCode	Flag	Samples	CIE L* a* b* Color Values			Color Difference Values				InstrCode
			L*	a*	b*	ΔL^*	Δa^*	Δb^*	ΔE^*	
87TVLF		B191	42.79	5.77	-6.66	0.86	0.17	-0.09	0.88	XI
		B192	43.65	5.93	-6.75					
8B69EV		B191	42.64	5.77	-6.94	0.87	0.11	-0.10	0.88	MM
		B192	43.50	5.87	-7.04					
8BMKBZ		B191	42.91	5.81	-6.98	0.88	0.11	-0.09	0.89	AO
		B192	43.79	5.91	-7.07					
8DULXD	X	B191	0.02	-0.02	0.02	0.03	-0.01	-0.01	0.03	AH
		B192	0.04	-0.02	0.01					
98MV8X		B191	42.80	5.86	-6.89	1.00	0.08	-0.02	1.00	XB
		B192	43.80	5.93	-6.90					
9DMP9Z		B191	42.66	5.77	-6.93	1.03	0.11	-0.05	1.03	AQ
		B192	43.68	5.88	-6.98					
9VNEHC		B191	42.70	5.86	-6.87	0.93	0.04	-0.17	0.95	CA
		B192	43.63	5.91	-7.04					
9VRQUR		B191	42.85	5.81	-6.86	0.88	0.11	-0.13	0.90	MV
		B192	43.73	5.92	-6.99					
A3G9TE		B191	42.61	5.82	-6.86	0.73	0.13	-0.11	0.75	MS
		B192	43.34	5.94	-6.96					
AD27RC		B191	42.78	5.76	-6.65	0.92	0.12	-0.09	0.93	MM
		B192	43.70	5.88	-6.74					
AFADWQ		B191	42.59	5.76	-6.58	0.91	0.11	-0.07	0.92	XO
		B192	43.50	5.87	-6.64					
AXQD7U		B191	42.81	5.81	-6.86	0.97	0.07	-0.09	0.98	AD
		B192	43.78	5.88	-6.95					
B739TV		B191	43.07	5.79	-6.80	0.99	0.04	-0.09	0.99	XH
		B192	44.06	5.83	-6.89					
BETCTN		B191	42.84	5.82	-6.92	1.07	0.07	-0.10	1.08	AJ
		B192	43.91	5.89	-7.02					
BETLET		B191	43.15	5.85	-6.92	1.00	0.09	-0.07	1.00	CA
		B192	44.14	5.94	-6.99					
BF4EFM		B191	42.78	5.80	-6.77	1.03	0.09	-0.07	1.03	MM
		B192	43.80	5.88	-6.84					



CTS Interlaboratory Testing Program for Color & Appearance Report #188
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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^*	
BULQRC		B191	42.95	5.82	-6.81	0.89	0.13	-0.16	0.91	MM
		B192	43.84	5.95	-6.97					
C7J8GX		B191	42.97	5.82	-6.81	0.80	0.17	-0.14	0.82	AS
		B192	43.77	5.99	-6.95					
CHCQWN		B191	42.88	5.65	-6.66	0.98	0.08	-0.14	0.99	XI
		B192	43.86	5.72	-6.80					
CJ32NG		B191	42.95	5.76	-6.77	1.04	0.14	-0.14	1.05	HF
		B192	43.99	5.89	-6.91					
D86RM9	X	B191	42.48	5.89	-6.76	0.71	0.11	-0.07	0.72	XM
		B192	43.18	6.00	-6.83					
D8ATMU		B191	42.74	5.85	-6.80	0.95	0.11	-0.05	0.96	MK
		B192	43.69	5.96	-6.84					
DA9PWF		B191	42.87	5.81	-6.91	0.99	0.06	-0.04	0.99	AQ
		B192	43.86	5.87	-6.95					
ECYPNQ		B191	42.73	5.70	-6.59	0.95	0.05	-0.11	0.95	XU
		B192	43.68	5.74	-6.69					
ERB47N		B191	42.87	5.73	-6.66	0.88	0.12	-0.15	0.90	XH
		B192	43.75	5.85	-6.80					
F4Y7UT		B191	42.87	5.83	-6.80	0.96	0.06	-0.12	0.96	AJ
		B192	43.82	5.89	-6.92					
FM9T77		B191	42.68	5.76	-6.85	1.01	0.11	-0.05	1.01	XZ
		B192	43.69	5.87	-6.90					
FTZZPE		B191	42.84	5.70	-6.76	0.96	0.06	-0.17	0.98	XI
		B192	43.80	5.76	-6.93					
G8EJ6L	X	B191	42.57	5.93	-6.35	0.91	0.15	-0.49	1.04	XO
		B192	43.48	6.07	-6.84					
G8WFMM		B191	42.78	5.77	-6.89	1.03	0.06	-0.08	1.03	MM
		B192	43.81	5.83	-6.97					
GDYNUF		B191	42.59	5.84	-6.89	0.95	0.16	-0.10	0.96	MV
		B192	43.53	6.00	-6.99					
GV4NTP		B191	43.24	5.81	-6.76	0.97	0.09	-0.06	0.97	XI
		B192	44.20	5.90	-6.82					



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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^*	
H6432L		B191	42.38	5.80	-6.69	0.95	0.09	-0.13	0.96	MI
		B192	43.33	5.89	-6.81					
H66UFG		B191	42.55	5.80	-6.93	1.02	0.07	-0.07	1.02	AJ
		B192	43.56	5.86	-7.00					
HLQJ4J		B191	42.80	5.86	-6.79	0.96	0.11	-0.11	0.97	MU
		B192	43.76	5.97	-6.90					
J2J72H		B191	42.84	5.76	-6.91	1.00	0.09	-0.13	1.01	AS
		B192	43.84	5.85	-7.03					
JDT9DK		B191	42.77	5.74	-6.92	1.01	0.09	-0.14	1.02	AM
		B192	43.78	5.83	-7.06					
JJE728		B191	42.81	5.70	-6.86	0.93	0.14	-0.13	0.94	XI
		B192	43.73	5.83	-6.98					
KKP7WG	X	B191	42.49	5.47	-6.85	0.90	0.12	-0.09	0.91	GD
		B192	43.39	5.59	-6.94					
L3H678		B191	42.69	5.82	-6.81	1.14	0.01	0.10	1.14	MT
		B192	43.83	5.83	-6.71					
LWGEUA		B191	42.60	5.81	-6.91	1.02	0.09	-0.06	1.02	CA
		B192	43.61	5.89	-6.96					
LXNWT6		B191	42.73	5.84	-6.89	1.09	0.07	-0.09	1.10	HU
		B192	43.82	5.90	-6.98					
M7H2L7		B191	42.86	5.84	-7.04	0.94	0.10	-0.06	0.95	XO
		B192	43.80	5.94	-7.09					
MGL8KE		B191	42.72	5.85	-6.81	0.85	0.19	-0.16	0.88	XI
		B192	43.56	6.03	-6.97					
N2G63C		B191	42.76	5.82	-6.93	0.98	0.08	-0.12	0.99	XI
		B192	43.74	5.90	-7.05					
N2HAQE		B191	42.84	5.95	-7.06	0.92	0.12	-0.10	0.93	AM
		B192	43.76	6.06	-7.16					
NF782P		B191	42.79	5.79	-6.94	1.09	0.03	-0.07	1.09	XB
		B192	43.88	5.82	-7.01					
NJ66AC		B191	42.73	5.84	-6.86	0.97	0.15	-0.10	0.99	XB
		B192	43.70	5.98	-6.96					



CTS Interlaboratory Testing Program for Color & Appearance **Report #188**
Analysis 409 **2nd Qtr 2019**

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^*	
NZTYZL		B191	42.83	5.76	-6.72	0.85	0.10	-0.20	0.87	XI
		B192	43.68	5.85	-6.92					
PFEHUT		B191	42.62	5.80	-6.74	1.08	0.04	-0.14	1.09	MV
		B192	43.70	5.84	-6.88					
PYN4L9		B191	42.55	5.83	-6.58	0.90	0.13	-0.15	0.92	XH
		B192	43.44	5.96	-6.72					
Q2VHUY		B191	42.66	5.85	-6.78	1.01	0.01	-0.11	1.01	XI
		B192	43.67	5.86	-6.89					
Q6V4RQ		B191	42.81	5.79	-6.88	0.88	0.12	-0.13	0.90	HP
		B192	43.69	5.91	-7.01					
QDRKFG		B191	42.77	5.74	-6.82	0.92	0.14	-0.14	0.94	XB
		B192	43.68	5.88	-6.96					
QLH837		B191	42.49	5.85	-6.68	1.13	0.15	-0.09	1.14	XM
		B192	43.62	6.00	-6.76					
QRCZJF		B191	42.93	5.74	-6.81	1.12	0.03	-0.07	1.12	AJ
		B192	44.05	5.76	-6.88					
R67PEX		B191	42.79	5.79	-6.74	1.02	0.12	-0.13	1.04	AJ
		B192	43.81	5.91	-6.87					
R8YYMK		B191	42.86	5.84	-6.81	1.00	0.09	-0.13	1.01	AJ
		B192	43.85	5.92	-6.94					
RV2HYX		B191	42.89	5.78	-6.90	0.88	0.13	-0.16	0.90	AS
		B192	43.77	5.91	-7.05					
T8RQWQ		B191	42.73	5.70	-6.96	0.89	0.10	-0.17	0.91	HP
		B192	43.61	5.79	-7.12					
TWUFGA		B191	42.92	5.82	-6.86	0.90	0.15	-0.12	0.91	AS
		B192	43.82	5.97	-6.98					
UTQX6Z		B191	42.90	5.82	-6.81	1.05	0.08	-0.09	1.05	AJ
		B192	43.94	5.89	-6.89					
V3DGVD		B191	42.69	5.92	-6.76	1.10	0.12	-0.07	1.11	MV
		B192	43.79	6.04	-6.82					
V7D2T6		B191	42.90	5.84	-6.80	0.95	0.06	-0.16	0.96	XB
		B192	43.84	5.90	-6.96					



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Analysis 409 **2nd Qtr 2019**

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^*	
VCLNX9		B191	42.66	5.90	-7.07	1.04	0.08	-0.03	1.04	AM
		B192	43.70	5.98	-7.09					
VN8JXZ		B191	42.77	5.86	-6.73	1.03	0.12	-0.06	1.04	XM
		B192	43.80	5.97	-6.79					
VR9DPU	X	B191	42.83	5.65	-6.79	0.90	0.16	-0.14	0.92	XI
		B192	43.73	5.81	-6.92					
W8LYU7		B191	42.80	5.82	-6.83	0.99	0.11	-0.08	1.00	AS
		B192	43.79	5.92	-6.91					
W9TXPU		B191	42.73	5.81	-6.79	0.83	0.19	-0.14	0.86	MM
		B192	43.56	5.99	-6.93					
WCVUGA		B191	42.69	5.83	-6.72	0.98	0.05	-0.11	0.99	AJ
		B192	43.67	5.88	-6.83					
WNNB7B		B191	42.76	5.80	-6.99	1.13	0.07	-0.07	1.13	AH
		B192	43.89	5.87	-7.06					
WT2GYG		B191	42.57	5.84	-6.93	1.07	0.03	-0.10	1.07	XI
		B192	43.64	5.87	-7.02					
WUW6D7		B191	42.91	5.81	-6.72	0.90	0.11	-0.07	0.91	AJ
		B192	43.81	5.92	-6.78					
X6AN9L		B191	43.00	5.78	-6.87	0.87	0.10	-0.17	0.89	AM
		B192	43.87	5.88	-7.04					
XN4YYP		B191	42.56	5.91	-6.99	1.02	0.12	-0.07	1.03	CA
		B192	43.58	6.03	-7.05					
XV87Z6		B191	42.82	5.90	-6.91	0.94	0.05	0.07	0.94	MV
		B192	43.76	5.95	-6.85					
XXAALZ		B191	42.59	5.83	-6.55	1.24	0.04	-0.33	1.28	MV
		B192	43.83	5.87	-6.88					
Y7JYX		B191	42.86	5.79	-6.86	1.03	0.08	-0.10	1.03	AO
		B192	43.88	5.87	-6.96					
Z2KUQC		B191	43.03	5.79	-6.83	1.05	0.03	-0.11	1.05	AO
		B192	44.08	5.82	-6.94					
ZH9QTL		B191	42.82	5.76	-6.82	0.94	0.10	-0.14	0.96	MM
		B192	43.76	5.86	-6.96					



WebCode	Flag	Samples	CIE L* a* b* Color Values			Color Difference Values				InstrCode
			L*	a*	b*	ΔL^*	Δa^*	Δb^*	ΔE^*	
ZKD2FU		B191	42.75	5.76	-6.84	0.83	0.15	-0.12	0.85	XI
		B192	43.58	5.91	-6.96					
ZKE896		B191	42.78	5.84	-6.84	1.03	0.04	-0.11	1.04	AS
		B192	43.81	5.88	-6.95					
ZNBHTN		B191	42.88	5.81	-6.96	0.90	0.15	-0.09	0.92	AQ
		B192	43.78	5.96	-7.04					

Summary Statistics								
Samples	L*	a*	b*	ΔL^*	Δa^*	Δb^*	ΔE^*	
Grand Means								
B191	42.77	5.81	-6.82	0.97	0.09	-0.10	0.98	
B192	43.74	5.90	-6.92					
Stnd Dev Btwn Labs								
B191	0.16	0.06	0.10	0.08	0.04	0.05	0.08	
B192	0.17	0.07	0.10					

Statistics based on 92 of 99 reporting participants

Comments Assigned on Data Flags for Test #409

- 6RMMY9(X) - Low "a*" values for both samples.
- 6WWZG8(X) - Extreme data for "L*", "a*" and "b*" values. Small Delta L, Delta a and Delta E values.
- 8DULXD(X) - Extreme data for "L*", "a*" and "b*" values. Small Delta L and Delta E values.
- D86RM9(X) - Low "L*" values for Sample B192. Large replication difference for "L*" values on Sample B192. Small Delta L and Delta E values.
- G8EJ6L(X) - High "b*" values for Sample B191. Large replication difference for "b*" values on Sample B191. Small Delta b values.
- KKP7WG(X) - Low "a*" values for both samples.
- VR9DPU(X) - Low "a*" values for Sample B191.



Key to Instrument Codes Reported by Participants

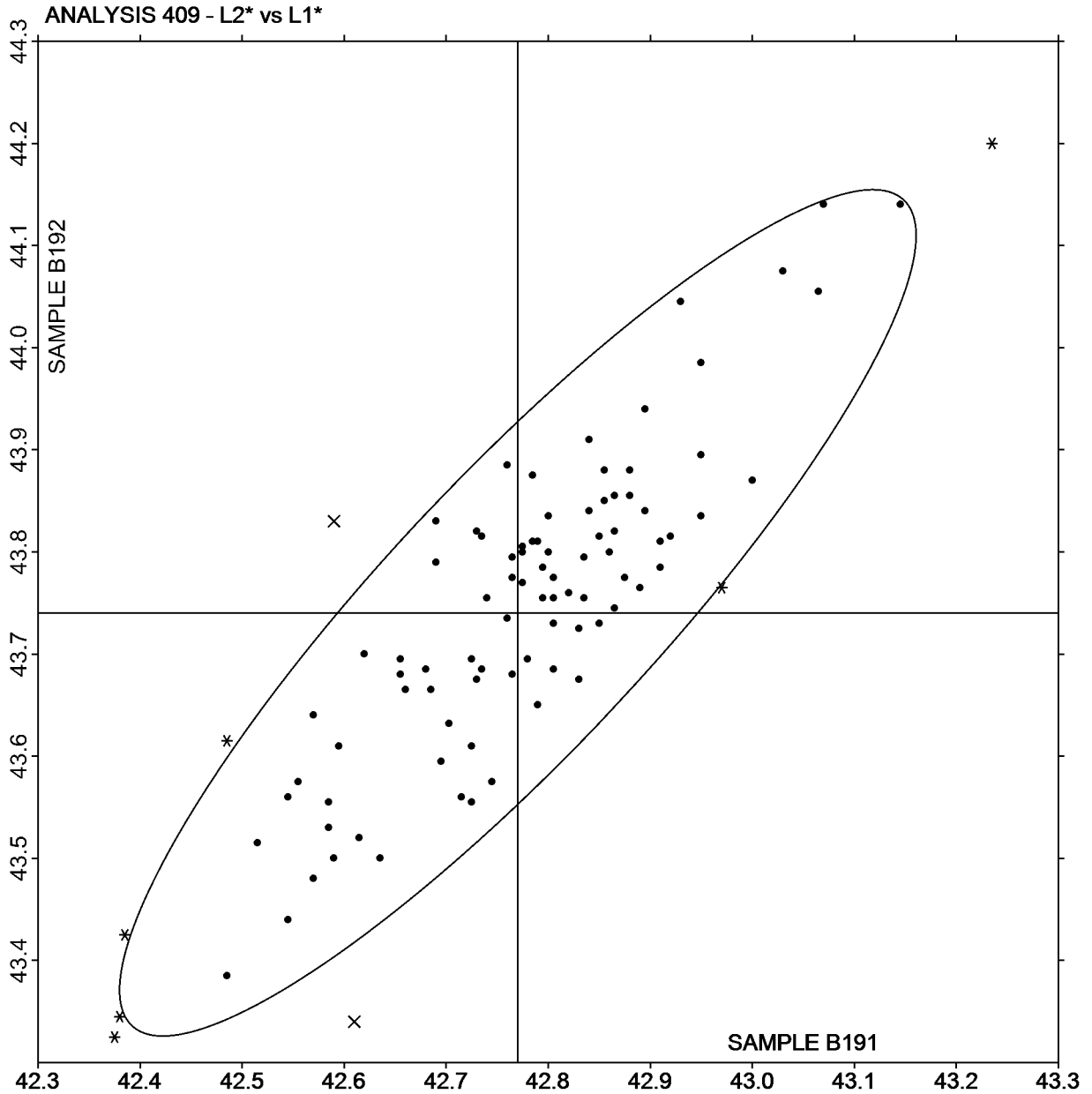
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AJ	ACS-Datacolor 600	AM	ACS-Datacolor 600 Plus
AO	ACS-Datacolor 650X	AQ	ACS-Datacolor 600X
AS	ACS-Datacolor 800 Series	CA	Cary 5000
GD	BYK-Gardner spectro-guide sphere	HF	Hunter ColorFlex Diffuse
HP	Hunter UltraScan PRO	HU	Hunter UltraScan
MI	Macbeth 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
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
XU	X-Rite Color Premier 8200 Spectrophotometer	XZ	X-Rite



L2* vs L1*

SAMPLE B191 = 42.77

SAMPLE B192 = 43.74

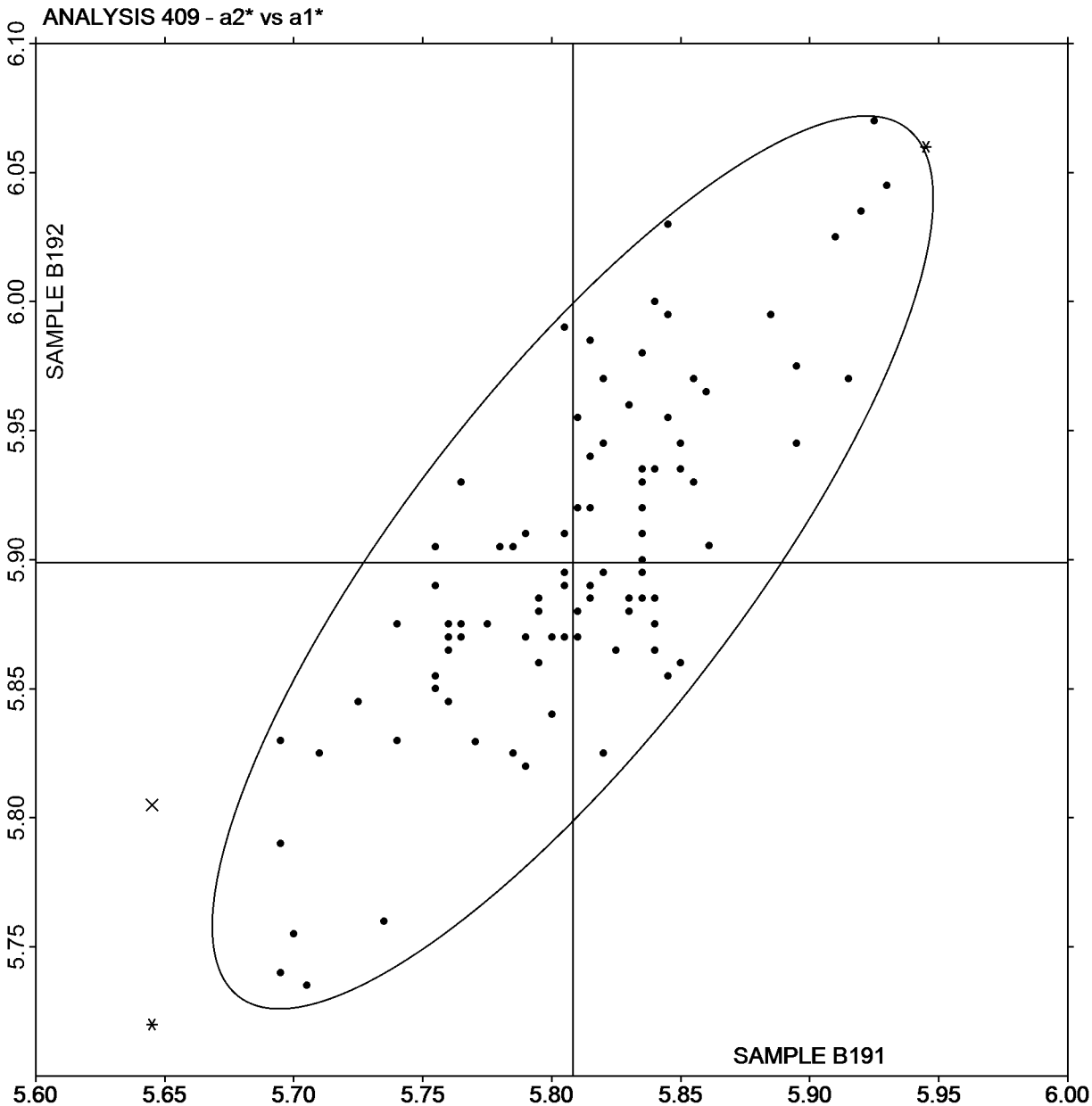




a2* vs a1*

SAMPLE B191 = 5.81

SAMPLE B192 = 5.90

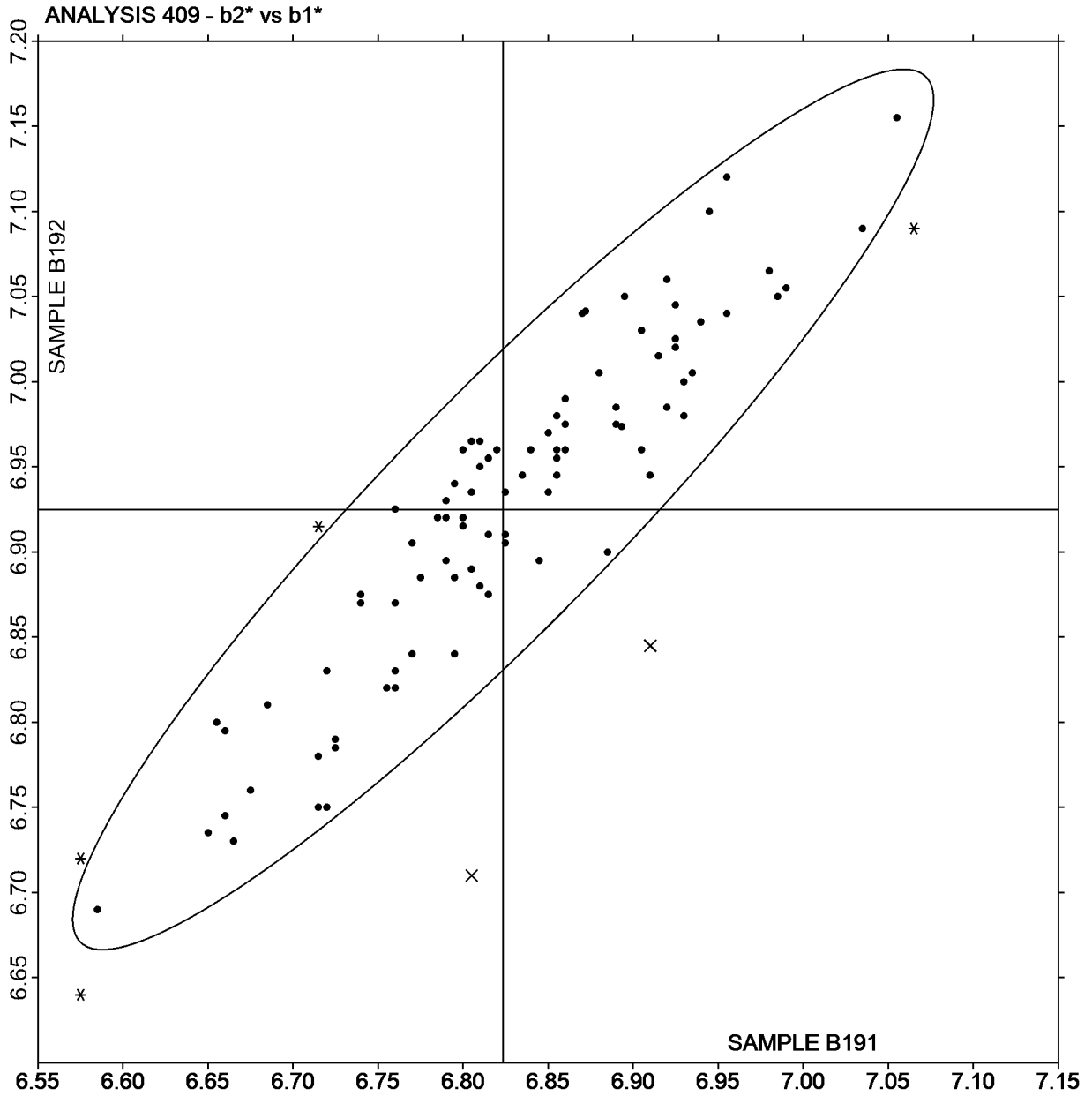




b2* vs b1*

SAMPLE B191 = -6.82

SAMPLE B192 = -6.92



Plot created using absolute values.



CTS Interlaboratory Testing Program for Color & Appearance Analysis 411

**Report #188
2nd Qtr 2019**

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 B191																		
22F24N		16.67X	16.70	16.38	15.81	15.02	13.74	12.35	11.72	11.87	12.88	14.65	14.34	14.57	16.34	17.13	17.20	AJ
286VBG		15.54	16.62	16.29	15.72	14.95	13.65	12.31	11.66	11.80	12.88	14.58	14.17	14.49	16.13	16.86	16.92	XB
36F2T7		15.42	16.67	16.30	15.76	14.96	13.66	12.25	11.64	11.77	12.76	14.55	14.24	14.46	16.19	16.90	16.87	AJ
376X7K		14.91	16.37	16.00*	15.46*	14.64*	13.38*	12.04*	11.38*	11.56*	12.64	14.25*	13.87*	14.22*	15.89*	16.65*	16.65*	XH
3EY3YL		15.65	16.59	16.20	15.64	14.89	13.60	12.21	11.62	11.72	12.76	14.56	14.16	14.42	16.21	16.93	16.98	AS
3W4RJR		15.43	16.68	16.35	15.79	15.03	13.73	12.31	11.71	11.86	12.88	14.62	14.29	14.57	16.35	16.96	16.86	AS
4JDYLA		15.60	16.80	16.60*	15.90	15.20	13.90*	12.50*	11.85*	12.00*	13.00	14.80	14.40	14.60	16.45	17.20	17.00	AO
4LGVNP		15.11	16.51	16.24	15.64	14.85	13.54	12.17	11.50	11.65	12.73	14.44	14.12	14.42	16.05	16.83	17.00	MI
6JPNUZ		14.79*	16.26*	15.94*	15.40X	14.63X	13.38*	12.01X	11.34X	11.54*	12.67	14.32*	13.89*	14.37	15.98	16.70	16.75	XH
6RMMY9		15.22	16.68	16.33	15.73	14.94	13.69	12.32	11.64	11.77	12.85	14.50	14.07	14.48	16.10	16.76	16.90	XI
6WWZG8	X	16.92X	19.08X	18.77X	18.32X	17.65X	16.57X	15.32X	14.65X	14.76X	15.70X	17.07X	16.74X	16.95X	18.19X	18.62X	18.64X	XI
6XLEYD		15.58	16.71	16.38	15.84	15.06	13.77	12.39	11.77	11.93	12.97	14.70	14.33	14.58	16.40	17.06	16.91	AJ
763AFK		15.72	16.63	16.26	15.74	14.99	13.65	12.29	11.66	11.82	12.87	14.70	14.21	14.50	16.28	17.04	17.05	AS
7TRRP3		15.16	16.47	16.16	15.62	14.84	13.55	12.18	11.50	11.68	12.78	14.47	14.07	14.45	16.09	16.79	16.92	XH
87TVLF		15.22	16.57	16.21	15.70	14.92	13.65	12.32	11.63	11.81	12.93	14.56	14.17	14.59	16.23	16.89	17.03	XI
8BMKBZ		15.52	16.83	16.42	15.95	15.10	13.80	12.38	11.73	11.89	12.90	14.61	14.35	14.53	16.29	17.10	17.13	AO
8DULXD		15.25	16.54	16.20	15.67	14.95	13.63	12.27	11.66	11.79	12.83	14.57	14.28	14.55	16.29	16.92	16.79	AF
98MV8X		15.54	16.72	16.34	15.78	14.98	13.67	12.31	11.64	11.79	12.89	14.59	14.17	14.55	16.23	16.97	17.00	XB
9DMP9Z		15.24	16.59	16.23	15.71	14.91	13.61	12.24	11.56	11.75	12.75	14.40	14.11	14.38	16.11	16.87	16.97	AQ
9VNEHC		15.49	16.59	16.24	15.73	14.98	13.62	12.24	11.54	11.68	12.75	14.63	14.15	14.37	16.20	17.01	17.13	CA
9VRQUR		15.30	16.76	16.37	15.82	15.05	13.77	12.32	11.65	11.78	12.89	14.69	14.22	14.44	16.30	17.06	17.17	MV
A3G9TE		15.17	16.54	16.18	15.64	14.84	13.54	12.17	11.52	11.65	12.72	14.48	14.06	14.37	16.07	16.88	16.96	MS
AD27RC		15.15	16.54	16.22	15.68	14.94	13.63	12.30	11.62	11.80	12.86	14.54	14.23	14.60	16.20	17.03	17.14	MM



CTS Interlaboratory Testing Program for Color & Appearance Analysis 411

**Report #188
2nd Qtr 2019**

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 B191																		
AFADWQ		15.02	16.39	16.02*	15.55	14.76	13.44*	12.15	11.54	11.71	12.80	14.47	14.01	14.46	16.06	16.90	16.95	XO
AXQD7U		15.34	16.71	16.33	15.78	15.00	13.68	12.34	11.66	11.80	12.85	14.58	14.27	14.47	16.19	16.98	16.97	AE
B739TV		15.29	16.88	16.48	15.97	15.16	13.85	12.50*	11.82	11.96	13.09*	14.74	14.35	14.81X	16.37	17.15	17.26	XH
BETCTN		15.50	16.75	16.42	15.78	15.07	13.75	12.32	11.71	11.80	12.86	14.60	14.29	14.50	16.25	16.98	16.89	AJ
BETLET		15.88	16.99*	16.62*	16.08*	15.29*	13.93*	12.51*	11.82	11.97	13.06	14.93*	14.43	14.69	16.52*	17.33*	17.44*	CA
BF4EFM		15.34	16.60	16.27	15.72	14.96	13.65	12.28	11.62	11.76	12.85	14.57	14.19	14.55	16.24	17.03	17.13	MM
BULQRC		15.40	16.75	16.42	15.89	15.09	13.79	12.41	11.73	11.89	12.99	14.70	14.33	14.68	16.32	17.12	17.22	MM
CHCQWN		15.31	16.59	16.28	15.77	15.00	13.75	12.38	11.72	11.86	12.95	14.63	14.23	14.52	16.14	16.92	17.14	XI
CJ32NG		15.43	16.93	16.36	15.83	15.14	13.91*	12.44	11.69	11.89	13.02	14.62	14.53*	14.14X	16.45	17.24	17.57X	HF
D86RM9	X	14.37X	15.67X	15.34X	14.78X	14.03X	12.82X	11.51X	10.93X	11.08X	12.14X	13.72X	13.31X	13.71X	15.31X	16.01X	16.11X	XF
D8ATMU		15.31	16.60	16.24	15.72	14.92	13.63	12.28	11.60	11.77	12.84	14.56	14.18	14.49	16.18	16.95	17.06	MK
DA9PWF		16.37X	16.69	16.41	15.88	15.03	13.73	12.36	11.71	11.86	12.87	14.55	14.27	14.54	16.32	17.08	17.16	AQ
F4Y7UT		15.48	16.69	16.37	15.79	15.04	13.75	12.34	11.72	11.87	12.89	14.69	14.30	14.54	16.30	17.05	16.94	AJ
FM9T77		15.41	16.59	16.24	15.68	14.90	13.60	12.26	11.57	11.72	12.83	14.49	14.02	14.41	16.10	16.75	16.79	XZ
G8EJ6L		14.88	16.36	16.08	15.58	14.78	13.53	12.17	11.55	11.69	12.84	14.48	14.09	14.58	16.20	16.93	17.02	XO
G8WFMM		15.37	16.71	16.35	15.77	15.00	13.68	12.32	11.64	11.77	12.81	14.52	14.23	14.52	16.17	17.02	17.14	MM
GDYNUF		15.29	16.58	16.15	15.66	14.83	13.58	12.16	11.48	11.60	12.72	14.53	14.05	14.31	16.11	16.87	16.99	MV
GV4NTP		15.65	16.98*	16.62*	16.06*	15.26*	13.98*	12.59X	11.93X	12.05*	13.19X	14.91*	14.54X	14.78*	16.44	17.22	17.24	XI
H6432L		14.81*	16.21X	15.91X	15.39X	14.63X	13.38*	12.04*	11.42*	11.51*	12.63*	14.23*	13.98	14.32	15.90*	16.66*	16.81	MI
H66UFG		15.12	16.54	16.19	15.60	14.86	13.53	12.14	11.50	11.62	12.60*	14.41	14.09	14.28	16.01	16.73	16.61*	AJ
HLQJ4J		15.27	16.71	16.27	15.76	14.99	13.67	12.28	11.60	11.77	12.86	14.66	14.23	14.46	16.22	17.09	17.19	MV
J2J72H		15.48	16.73	16.41	15.81	15.07	13.77	12.36	11.72	11.86	12.87	14.69	14.37	14.54	16.32	17.08	16.92	AS



CTS Interlaboratory Testing Program for Color & Appearance Analysis 411

**Report #188
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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 B191																		
JDT9DK		15.46	16.66	16.37	15.75	14.96	13.66	12.30	11.68	11.76	12.81	14.54	14.19	14.42	16.16	16.92	16.95	AM
JJE728		15.41	16.67	16.36	15.79	14.96	13.70	12.33	11.69	11.80	12.89	14.48	14.13	14.47	16.15	16.83	16.89	XI
KKP7WG		16.20*	16.24*	16.02*	15.59	14.98	13.52	12.16	11.54	11.60	12.54X	14.06X	14.00	14.33	15.99	16.75	16.37X	GD
L3H678		15.14	16.52	16.21	15.71	14.92	13.61	12.24	11.56	11.68	12.76	14.55	14.17	14.44	16.17	17.00	17.11	MT
LWGEUA		15.36	16.43	16.13	15.60	14.86	13.56	12.19	11.50	11.62	12.70	14.52	14.06	14.31	16.11	16.90	16.99	CA
LXNWT6		15.14	16.65	16.27	15.78	14.95	13.66	12.28	11.56	11.71	12.72	14.67	14.21	14.16*	16.32	16.80	17.00	HU
M7H2L7		15.50	16.87	16.52	15.89	15.05	13.71	12.32	11.70	11.83	12.92	14.61	14.18	14.57	16.25	17.06	17.10	XO
MGL8KE		15.29	16.61	16.22	15.83	14.90	13.67	12.27	11.60	11.70	12.84	14.52	14.18	14.59	16.21	16.93	17.12	XI
N2G63C		15.45	16.75	16.33	15.76	14.98	13.68	12.29	11.62	11.75	12.87	14.51	14.14	14.51	16.14	16.89	16.90	XI
N2HAQE		15.41	16.87	16.48	15.85	15.02	13.72	12.33	11.65	11.81	12.89	14.60	14.27	14.60	16.23	17.10	16.91	AM
NF782P		15.49	16.73	16.36	15.78	15.03	13.70	12.32	11.64	11.77	12.85	14.63	14.12	14.40	16.11	16.85	16.81	XB
NZTYZL		15.36	16.61	16.26	15.75	14.99	13.66	12.35	11.68	11.79	12.95	14.62	14.16	14.53	16.25	16.83	16.94	XI
PYN4L9		15.09	16.32*	16.01*	15.48*	14.72*	13.50	12.13	11.50	11.65	12.75	14.46	14.06	14.44	16.03	16.81	16.92	XH
Q2VHUY		15.25	16.53	16.22	15.60	14.85	13.57	12.23	11.54	11.70	12.81	14.51	14.07	14.48	16.19	16.82	16.94	XI
Q6V4RQ		15.94	16.64	16.31	15.79	15.01	13.70	12.31	11.66	11.76	12.76	14.60	14.34	14.40	16.26	16.82	17.05	HP
QDRKFG		15.38	16.62	16.29	15.74	14.95	13.66	12.33	11.64	11.77	12.85	14.52	14.16	14.46	16.15	16.86	16.91	XB
QLH837		15.80	16.70	16.30	15.80	15.00	13.70	12.30	11.70	11.90	13.10*	14.80	14.10	14.50	16.25	16.90	17.10	HW
QRCZJF		15.59	16.71	16.40	15.87	15.11	13.78	12.36	11.74	11.89	12.92	14.68	14.35	14.57	16.36	17.07	17.01	AJ
R67PEX		15.37	16.60	16.26	15.70	14.95	13.68	12.32	11.68	11.79	12.85	14.61	14.20	14.50	16.31	16.97	16.84	AJ
R8YYMK		15.59	16.79	16.33	15.75	14.98	13.71	12.33	11.69	11.90	12.89	14.67	14.28	14.53	16.30	17.01	16.97	AJ
RV2HYX		15.64	16.74	16.45	15.84	15.07	13.78	12.39	11.73	11.87	12.89	14.69	14.27	14.53	16.32	17.08	16.91	AS
T8RQWQ		15.79	16.71	16.28	15.76	14.94	13.70	12.32	11.60	11.72	12.67	14.52	14.16	14.19*	16.12	16.77	16.97	HP
TWUFGA		15.48	16.71	16.43	15.85	15.12	13.76	12.38	11.77	11.88	12.91	14.71	14.31	14.59	16.40	17.11	17.01	AS



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Spectrophotometric - Sphere Geometry Instruments
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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 B191																		
UTQX6Z		15.58	16.72	16.40	15.81	15.03	13.71	12.35	11.74	11.91	12.94	14.65	14.34	14.54	16.31	17.09	17.11	AJ
V3DGVD		15.33	16.56	16.18	15.67	14.91	13.58	12.18	11.54	11.69	12.84	14.59	14.16	14.47	16.22	17.05	17.16	MV
V7D2T6		15.65	16.74	16.37	15.82	15.04	13.73	12.36	11.71	11.84	12.96	14.68	14.24	14.59	16.31	17.04	17.11	XB
VCLNX9		15.32	16.72	16.33	15.72	14.96	13.63	12.23	11.53	11.69	12.76	14.54	14.13	14.34	16.07	16.93	16.97	AM
VN8JXZ		15.39	16.66	16.26	15.68	14.87	13.60	12.23	11.62	11.78	12.90	14.56	14.13	14.55	16.23	16.98	17.13	XF
VR9DPU		15.38	16.71	16.29	15.77	14.96	13.72	12.36	11.67	11.83	12.94	14.50	14.12	14.50	16.16	16.63*	16.82	XI
W8LYU7		15.43	16.66	16.30	15.74	15.00	13.69	12.32	11.68	11.82	12.82	14.64	14.24	14.50	16.27	16.99	16.88	AS
W9TXPU		15.32	16.57	16.22	15.69	14.93	13.61	12.27	11.61	11.74	12.82	14.54	14.16	14.49	16.16	16.94	17.05	MM
WNNB7B		15.40	16.74	16.36	15.78	15.02	13.66	12.29	11.67	11.79	12.80	14.51	14.20	14.39	16.11	16.96	17.02	AH
X6AN9L		15.48	16.81	16.47	15.93	15.18	13.84	12.45	11.82	11.94	12.98	14.73	14.38	14.62	16.42	17.19	16.90	AM
XN4YYP		15.56	16.71	16.29	15.80	15.04	13.67	12.29	11.59	11.76	12.83	14.68	14.18	14.43	16.22	17.04	17.15	CA
XV87Z6		15.70	16.71	16.36	15.85	15.07	13.69	12.29	11.64	11.73	12.84	14.65	14.28	14.47	16.28	17.08	17.16	MV
XXAALZ		15.73	16.68	16.33	15.80	15.02	13.72	12.27	11.64	11.79	12.86	14.68	14.30	14.48	16.25	17.13	17.21	MV
Y7JXYX		15.52	16.69	16.39	15.80	15.03	13.75	12.34	11.69	11.88	12.88	14.63	14.28	14.51	16.32	17.03	16.93	AO
Z2KUQC		15.65	16.85	16.50	15.90	15.15	13.80	12.45	11.80	12.00*	13.00	14.80	14.35	14.65	16.50*	17.20	17.00	AO
ZH9QTL	X	32.88X	45.40X	45.29X	43.48X	40.19X	36.73X	32.48X	31.48X	33.81X	47.92X	61.55X	67.25X	68.62X	69.11X	69.31X	69.49X	MM
ZKD2FU		15.23	16.68	16.29	15.72	14.94	13.65	12.32	11.57	11.74	12.86	14.52	14.13	14.52	16.11	16.82	16.91	XI
ZKE896		15.50	16.57	16.34	15.75	15.01	13.69	12.27	11.65	11.78	12.82	14.64	14.23	14.52	16.26	16.97	16.82	AS
ZNBHTN	X	16.73X	17.55X	17.33X	16.58X	15.75X	14.37X	12.89X	12.26X	12.42X	13.48X	15.27X	15.02X	15.24X	17.07X	17.82X	17.89X	AQ



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Spectrophotometric - Sphere Geometry Instruments
Reflectance at 16 Selected Wavelengths

Summary Statistics

	400	420	440	460	480	500	520	540	560	580	600	620	640	660	680	700
Grand Means	15.43	16.65	16.30	15.75	14.97	13.67	12.29	11.64	11.78	12.85	14.58	14.20	14.48	16.22	16.96	17.00
SD Btwn Labs	0.29	0.15	0.14	0.12	0.12	0.11	0.10	0.10	0.11	0.11	0.13	0.12	0.12	0.13	0.14	0.17

Comments Assigned on Data Flags for Test #411

- 6WWZG8 (X) - High % reflectance data at all wavelengths.
- D86RM9 (X) - Low % reflectance data at all wavelengths.
- ZH9QTL (X) - Very high % reflectance data at all wavelengths.
- ZNBHTN (X) - High % reflectance data at all wavelengths.

Key to Instrument Codes Reported by Participants

AE ACS-Datascolor 110	AF ACS-Datascolor 500	AH ACS-Datascolor 550
AJ ACS-Datascolor 600	AM ACS-Datascolor 600 Plus	AO ACS-Datascolor 650
AQ ACS-Datascolor 600X	AS ACS-Datascolor 800 Series	CA Cary 5000
GD BYK-Gardner spectro-guide sphere	HF Hunter ColorFlex Diffuse	HP Hunter UltraScan PRO
HU Hunter UltraScan	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	MV Minolta CM-3000d Series Spectrophotometer	XB X-Rite Ci7000 Series 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 #188
2nd Qtr 2019

Analysis 440

60 Degree Gloss - Paint Chips

ASTM Method D 523

WebCode	Data Flag	Sample F191			Sample F192			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
2NCT9R		38.88	-0.08	-0.17	49.64	0.29	0.56	GL
36F2T7		38.83	-0.13	-0.30	48.95	-0.39	-0.75	GK
3W4RJR		38.35	-0.61	-1.38	48.90	-0.44	-0.85	GL
4LGVNP		38.70	-0.26	-0.58	49.53	0.18	0.35	GL
4TVHXU		39.10	0.14	0.32	49.45	0.11	0.20	GL
63MDHV		38.70	-0.26	-0.58	49.23	-0.12	-0.23	GL
6EXRGM	X	37.65	-1.31	-2.96	47.43	-1.92	-3.67	RA
6FQDYZ		39.00	0.04	0.09	49.68	0.33	0.63	GK
6JPNUZ		39.73	0.77	1.73	49.98	0.63	1.21	GL
6WWZG8		38.63	-0.33	-0.75	49.73	0.38	0.73	MM
6XAE6G		38.98	0.02	0.04	49.93	0.58	1.11	GL
6XLEYP		38.05	-0.91	-2.05	48.08	-1.27	-2.43	GL
6YM3MV		38.58	-0.38	-0.87	48.85	-0.49	-0.94	GK
7QYHGF		38.90	-0.06	-0.13	49.28	-0.07	-0.13	GL
7TRRP3		39.50	0.54	1.23	49.43	0.08	0.16	GK
87TVLF		39.20	0.24	0.55	49.51	0.17	0.32	GL
8DULXD		38.93	-0.03	-0.08	49.33	-0.02	-0.04	GL
9VTEHW		39.03	0.07	0.15	49.60	0.26	0.49	GK
A3G9TE		39.05	0.09	0.21	48.75	-0.59	-1.14	GK
AFADWQ	*	39.68	0.72	1.62	50.85	1.51	2.88	GN
AXQD7U		38.95	-0.01	-0.02	49.10	-0.24	-0.47	GL
B739TV		39.30	0.34	0.77	49.43	0.08	0.16	GL
CF4MZR		38.73	-0.23	-0.53	49.63	0.28	0.54	GL
CHCQWN		39.10	0.14	0.32	49.03	-0.32	-0.61	GL
CVCBX8		39.33	0.37	0.83	49.95	0.61	1.16	GN
CZPEZN		38.28	-0.68	-1.55	48.73	-0.62	-1.18	GL
D86RM9		38.60	-0.36	-0.81	49.48	0.13	0.25	GK
ECYPNQ		39.43	0.47	1.06	50.00	0.66	1.25	GK
EDQN3N	X	36.50	-2.46	-5.56	46.43	-2.92	-5.58	GB
EMDMUU		39.60	0.64	1.45	49.88	0.53	1.02	GN



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60 Degree Gloss - Paint Chips

ASTM Method D 523

WebCode	Data Flag	Sample F191			Sample F192			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
F4Y7UT	X	40.75	1.79	4.05	50.03	0.68	1.30	MW
FTZZPE		38.93	-0.03	-0.08	49.35	0.01	0.01	GL
G8EJ6L		38.43	-0.53	-1.21	49.23	-0.12	-0.23	GL
G8WFMM		38.93	-0.03	-0.08	49.50	0.16	0.30	GL
GGH9PQ		38.55	-0.41	-0.92	48.80	-0.54	-1.04	GL
H6432L		39.10	0.14	0.32	49.73	0.38	0.73	GL
HLQJ4J		38.40	-0.56	-1.26	48.50	-0.84	-1.61	GL
J2Y82Y		38.10	-0.86	-1.94	48.58	-0.77	-1.47	GK
KKP7WG		38.65	-0.31	-0.70	48.73	-0.62	-1.18	GN
LWGEUA		39.30	0.34	0.77	50.33	0.98	1.88	GL
M7H2L7		38.75	-0.21	-0.47	49.10	-0.24	-0.47	MW
MGL8KE		38.45	-0.51	-1.15	48.80	-0.54	-1.04	GL
NF782P		37.98	-0.98	-2.22	48.85	-0.49	-0.94	GL
NJ66AC		39.00	0.04	0.09	48.80	-0.54	-1.04	GL
PFEHUT		39.15	0.19	0.43	49.48	0.13	0.25	GN
PYN4L9		39.18	0.22	0.49	49.30	-0.04	-0.08	GL
QDPU8D	X	37.40	-1.56	-3.53	47.25	-2.09	-4.00	GN
QLH837		38.70	-0.26	-0.58	48.98	-0.37	-0.70	GK
QLZV82		39.18	0.22	0.49	49.40	0.06	0.11	GN
QRCZJF		39.15	0.19	0.43	49.48	0.13	0.25	GL
R67PEX		39.40	0.44	1.00	49.58	0.23	0.44	GL
TPUR9H		38.48	-0.48	-1.09	48.93	-0.42	-0.80	RA
VCLNX9		39.63	0.67	1.51	50.40	1.06	2.02	GQ
W8LYU7		39.58	0.62	1.40	49.25	-0.09	-0.18	GN
W9TXPU		38.65	-0.31	-0.70	48.28	-1.07	-2.04	RA
WCVUGA		39.08	0.12	0.26	49.80	0.46	0.87	GL
WT2GYG		39.90	0.94	2.13	49.85	0.51	0.97	GL
WUW6D7		39.03	0.07	0.15	49.45	0.11	0.20	GK
XED9KA		38.60	-0.36	-0.81	49.58	0.23	0.44	GK
XWHFZC		38.80	-0.16	-0.36	48.65	-0.69	-1.33	GL



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ASTM Method D 523

WebCode	Data Flag	Sample F191			Sample F192			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
Z3FH62		38.78	-0.18	-0.41	49.18	-0.17	-0.32	GL
ZH9QTL		39.05	0.09	0.20	49.53	0.18	0.35	GL
ZHA7WR		40.00	1.04	2.36	50.00	0.66	1.25	GL
ZKD2FU		39.50	0.54	1.23	49.85	0.51	0.97	GK
ZNBHTN		39.03	0.07	0.15	48.93	-0.42	-0.80	GK

Summary Statistics

Grand Means

38.96 Gloss Units

49.34 Gloss Units

Std Dev Btwn Labs

0.44 Gloss Units

0.52 Gloss Units

Statistics based on 61 of 65 reporting participants

Comments on Assigned Data Flags for Test #440

6EXRGM(X) - Data for both samples are low. Possible systematic error.

EDQN3N(X) - Data for both samples are low. Possible systematic error.

F4Y7UT(X) - High data for Sample F191. Inconsistent within the determinations for Sample F191.

QDPU8D(X) - Data for both samples are low. Possible systematic error.

Key to Instrument Codes Reported by Participants

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

GQ BYK-Gardner haze-gloss

MM Macbeth Lab-Gloss

MW Minolta Multi-Gloss 268

RA Rhopoint Novo-Gloss Glossmeter



Interlaboratory Testing Program for Color & Appearance

Report #188
2nd Qtr 2019

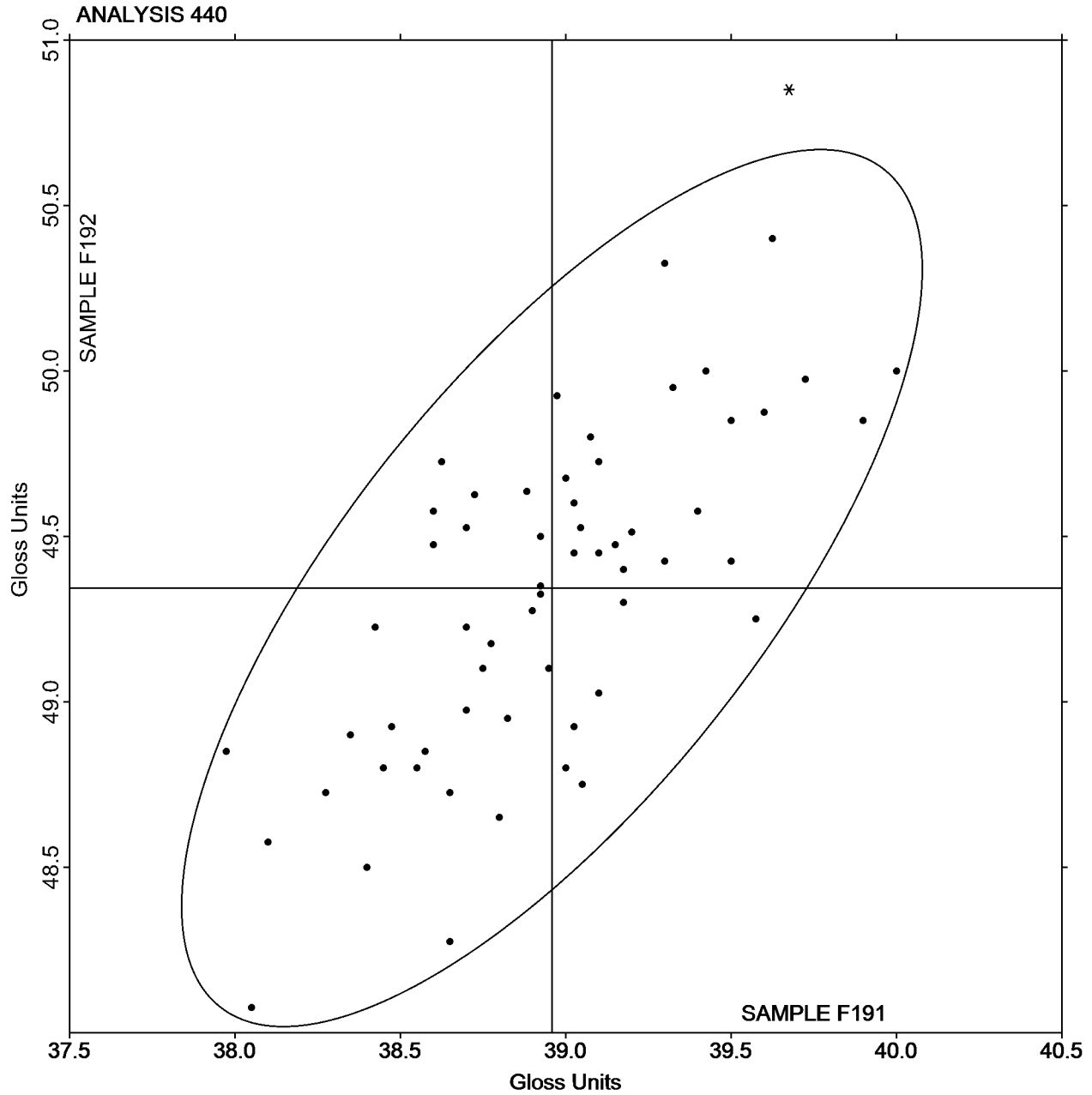
Analysis 440

60 Degree Gloss - Paint Chips

ASTM Method D 523

SAMPLE F191 = 38.96 Gloss Units

SAMPLE F192 = 49.34 Gloss Units



-End of Report-