

Color & Appearance Testing Program

Summary Report #190 - 4th Qtr 2019

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

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<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 #190

Analysis 408

4th 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^*	
3VR8NA		D191	59.46	-20.45	7.07	1.14	0.21	-0.22	1.18	HK
		D192	60.61	-20.24	6.85					
43GCTV		D191	59.90	-20.22	6.80	1.01	0.13	-0.23	1.04	XB
		D192	60.91	-20.09	6.57					
48YCE3		D191	59.60	-20.03	6.35	1.02	0.15	-0.24	1.06	HW
		D192	60.63	-19.89	6.11					
4MCRLR		D191	59.78	-20.06	7.14	0.98	0.14	-0.21	1.01	XU
		D192	60.76	-19.92	6.93					
67M4RN	X	D191	59.71	-22.03	5.86	0.99	0.22	-0.23	1.04	HW
		D192	60.70	-21.82	5.63					
6AHRH3		D191	60.00	-20.20	6.40	0.95	0.15	-0.20	0.98	HW
		D192	60.95	-20.05	6.20					
6AZWE8		D191	59.68	-20.19	6.60	1.02	0.15	-0.21	1.05	HW
		D192	60.69	-20.04	6.39					
6PCFAT		D191	60.00	-19.98	7.42	0.97	0.17	-0.21	1.01	GE
		D192	60.97	-19.81	7.21					
B69PQ8		D191	59.86	-20.42	6.46	0.95	0.14	-0.21	0.98	HW
		D192	60.81	-20.27	6.25					
BBDKDM		D191	59.33	-20.33	7.04	1.02	0.16	-0.26	1.06	MQ
		D192	60.35	-20.17	6.78					
BXPDKT		D191	59.90	-20.21	7.35	0.99	0.18	-0.22	1.03	GE
		D192	60.89	-20.03	7.12					
CBUWVT		D191	59.89	-20.22	6.49	0.97	0.14	-0.20	1.00	HW
		D192	60.86	-20.08	6.29					
CLW33D		D191	59.60	-20.06	6.45	0.94	0.14	-0.17	0.97	HW
		D192	60.54	-19.91	6.28					
CYXV8V		D191	59.58	-20.02	6.47	0.95	0.14	-0.21	0.99	HW
		D192	60.54	-19.88	6.26					
DD2K2B		D191	59.80	-20.03	6.84	0.77	0.20	-0.26	0.84	XO
		D192	60.57	-19.83	6.58					
DF2T6K		D191	59.76	-20.57	7.42	0.97	0.14	-0.20	1.00	FA
		D192	60.73	-20.43	7.22					



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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^*	
E9BWMM		D191	59.28	-20.16	7.06	0.97	0.15	-0.19	1.00	HY
		D192	60.25	-20.01	6.87					
EB6HHZ		D191	59.94	-20.09	6.99	0.89	0.11	-0.25	0.93	XO
		D192	60.83	-19.98	6.74					
EEQ687		D191	59.58	-20.24	6.42	0.96	0.13	-0.18	0.98	MG
		D192	60.53	-20.11	6.23					
EMX2W6		D191	60.09	-19.93	6.81	0.99	0.17	-0.25	1.03	AB
		D192	61.08	-19.76	6.56					
G2DPCL		D191	59.78	-20.26	7.10	0.97	0.12	-0.23	1.00	XM
		D192	60.75	-20.14	6.87					
J2DXX9		D191	59.67	-19.84	6.91	0.97	0.11	-0.22	1.00	XH
		D192	60.64	-19.73	6.69					
J2EM7C		D191	59.90	-20.31	7.49	1.01	0.17	-0.20	1.04	GE
		D192	60.90	-20.14	7.29					
KACKLT		D191	60.08	-20.34	7.00	0.88	0.17	-0.21	0.92	XZ
		D192	60.96	-20.17	6.79					
MNHHQB		D191	59.28	-20.12	7.17	1.02	0.16	-0.24	1.06	XX
		D192	60.30	-19.96	6.93					
NDXQGR	X	D191	59.61	-20.64	7.46	0.71	0.25	-0.20	0.78	FA
		D192	60.32	-20.40	7.26					
NWWWZK		D191	59.76	-20.12	7.16	1.01	0.14	-0.22	1.05	XU
		D192	60.77	-19.98	6.94					
PF3NFR	X	D191	62.17	-20.77	4.81	1.04	0.26	-0.28	1.10	XN
		D192	63.20	-20.51	4.53					
RA98G7		D191	59.77	-20.26	7.25	0.94	0.08	-0.24	0.97	TO
		D192	60.71	-20.18	7.01					
T9PWQC		D191	59.79	-20.16	6.49	0.97	0.20	-0.25	1.02	HW
		D192	60.76	-19.97	6.24					
TBGV6B		D191	59.59	-19.82	6.62	0.98	0.15	-0.16	1.00	HK
		D192	60.57	-19.66	6.46					
U4P8MB		D191	59.40	-20.40	6.92	0.99	0.13	-0.20	1.01	HY
		D192	60.38	-20.27	6.72					



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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^*	
UQ6PTL		D191	59.75	-20.04	7.23	0.94	0.15	-0.23	0.98	MF
		D192	60.70	-19.89	7.01					
V9LYJE		D191	59.90	-19.97	7.47	0.97	0.12	-0.24	1.01	GE
		D192	60.87	-19.85	7.24					
VBPNUA		D191	60.11	-20.05	7.16	0.98	0.16	-0.21	1.01	XD
		D192	61.09	-19.89	6.96					
VP8K7P		D191	60.06	-20.21	7.24	0.98	0.16	-0.21	1.02	GH
		D192	61.05	-20.06	7.03					
VW9YMK		D191	59.76	-20.09	7.00	1.02	0.13	-0.23	1.05	XU
		D192	60.78	-19.96	6.77					
X3MF6K		D191	59.31	-19.83	7.47	1.06	0.14	-0.19	1.09	XB
		D192	60.37	-19.69	7.29					
XD9NWM		D191	59.86	-20.06	7.01	1.02	0.13	-0.24	1.05	XZ
		D192	60.88	-19.92	6.77					
ZVXQLM		D191	60.04	-19.98	6.77	0.98	0.15	-0.21	1.01	MU
		D192	61.01	-19.83	6.56					
ZZ9XTT		D191	59.32	-20.35	7.23	1.04	0.14	-0.24	1.08	AB
		D192	60.36	-20.21	7.00					
ZZAM2W		D191	59.99	-20.20	6.57	0.95	0.16	-0.21	0.98	HW
		D192	60.94	-20.04	6.37					

Summary Statistics								
Samples	L*	a*	b*	ΔL^*	Δa^*	Δb^*	ΔE^*	
Grand Means								
D191	59.75	-20.15	6.93	0.98	0.15	-0.22	1.01	
D192	60.73	-20.00	6.71					
Std Dev Btwn Labs								
D191	0.24	0.17	0.39	0.06	0.02	0.02	0.05	
D192	0.23	0.17	0.39					

Statistics based on 39 of 42 reporting participants



Comments Assigned on Data Flags for Test #408

67M4RN(X) - Very low "a*" values. Large Delta a values.

NDXQGR(X) - Inconsistent in testing between the "L*" values for both samples. Low "a*" value for Sample D191. Small Delta L & Delta E. Large Delta a.

PF3NFR(X) - Very high "L*" values and low "a*" and "b*" values. Large Delta a values.

Key to Instrument Codes Reported by Participants

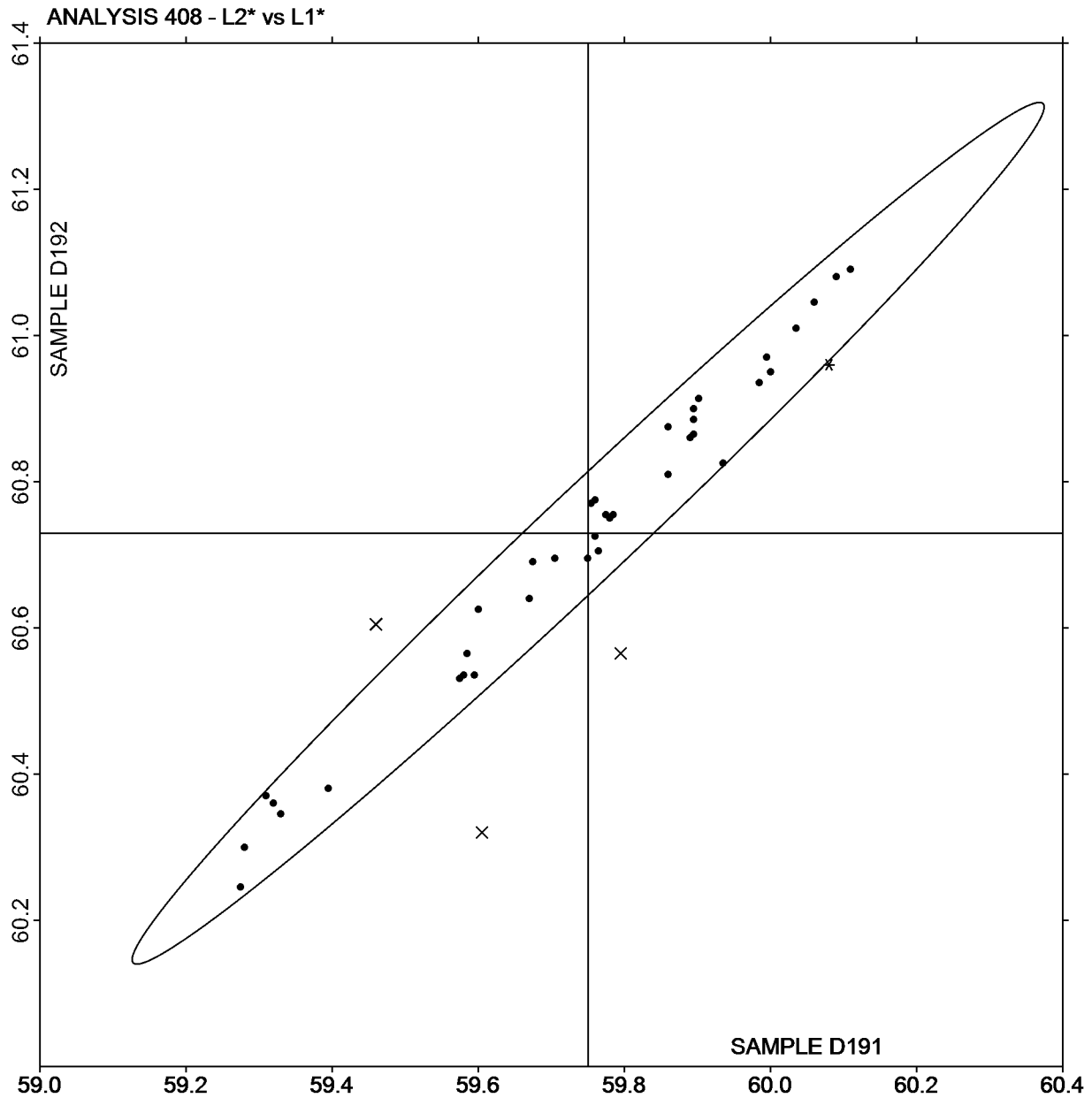
AB	Data Color	FA	BYK Mac
GE	BYK-Gardner spectro-guide (45/0)	GH	BYK-Gardner Color-View
HK	Hunter MiniScan XE (45/0)	HW	Hunter LabScan XE
HY	Hunter Color Flex 45/0	MF	Minolta FD Series
MG	Macbeth 1500/PLUS or 2025+ Color Eye	MQ	Minolta CM-503c Spectrophotometer
MU	Minolta	TO	Topcon SR-3 Spectroradiometer
XB	X-Rite i1Basic Pro 2	XD	X-Rite 500 Series SpectroDensitometer
XH	X-Rite Color i5	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	XX	Instrument make/model not specified by lab
XZ	X-Rite		



L2* vs L1*

SAMPLE D191 = 59.75

SAMPLE D192 = 60.73

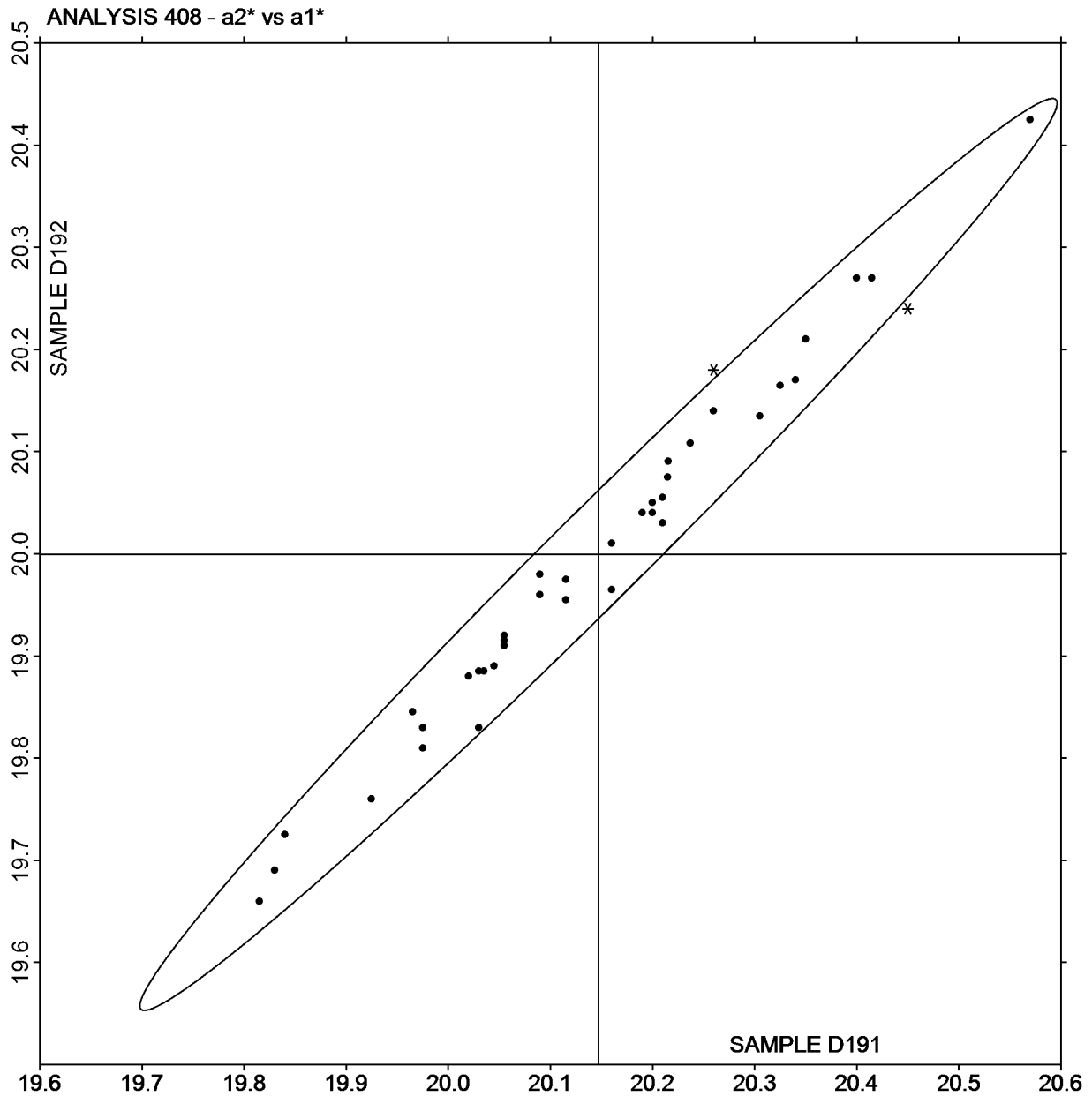




a2* vs a1*

SAMPLE D191 = -20.15

SAMPLE D192 = -20.00



Plot created using absolute values.

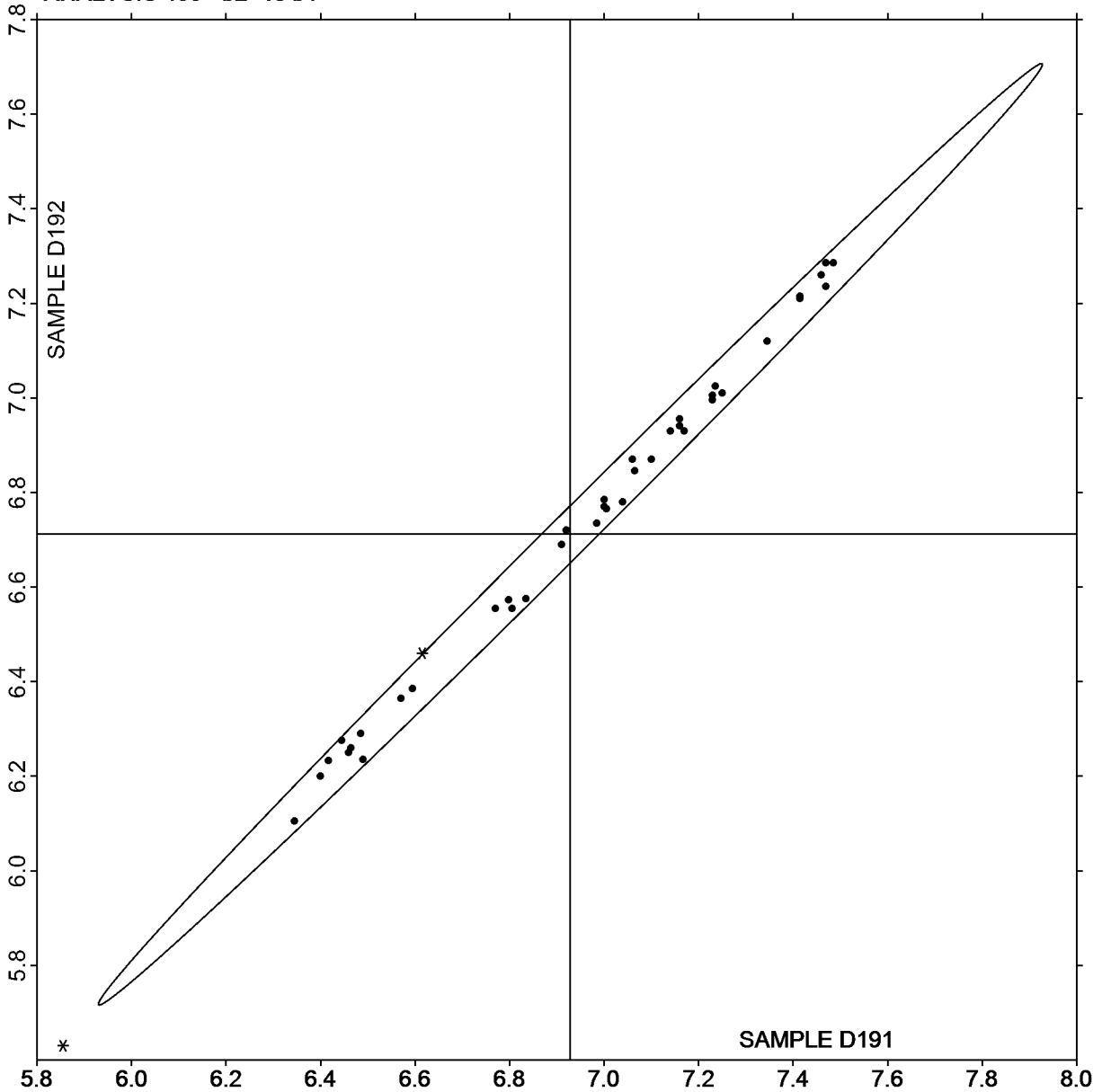


b2* vs b1*

SAMPLE D191 = 6.93

SAMPLE D192 = 6.71

ANALYSIS 408 - b2* vs b1*





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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^*	
2JFH9T		D191	60.11	-19.86	6.87	0.99	0.13	-0.23	1.03	AJ
		D192	61.10	-19.74	6.65					
2N8PQ2		D191	59.93	-19.88	6.38	0.95	0.13	-0.21	0.98	XI
		D192	60.88	-19.74	6.17					
33XMNJ		D191	60.19	-20.01	6.75	1.01	0.15	-0.23	1.04	AJ
		D192	61.20	-19.86	6.52					
3JJBWT		D191	60.10	-20.07	6.54	0.99	0.18	-0.22	1.03	HU
		D192	61.09	-19.89	6.32					
3QJPJF		D191	59.72	-19.96	6.80	1.06	0.13	-0.30	1.11	XH
		D192	60.79	-19.83	6.51					
3QZQMH		D191	59.75	-19.77	6.49	0.95	0.16	-0.23	0.99	XI
		D192	60.70	-19.60	6.26					
3RAZB9		D191	60.06	-19.66	6.54	0.97	0.14	-0.21	1.00	MM
		D192	61.03	-19.52	6.33					
43P64Q		D191	59.92	-20.01	6.52	0.96	0.16	-0.23	1.00	XI
		D192	60.88	-19.85	6.29					
48J4DE		D191	59.74	-19.73	6.53	0.99	0.16	-0.19	1.03	XI
		D192	60.74	-19.56	6.35					
4CQLFN		D191	60.16	-19.88	6.62	1.00	0.15	-0.24	1.04	AJ
		D192	61.16	-19.73	6.38					
4EHLTQ		D191	59.92	-19.95	6.55	1.02	0.15	-0.24	1.06	XI
		D192	60.94	-19.80	6.31					
6FLU4V		D191	60.23	-20.09	6.66	0.98	0.15	-0.23	1.02	AJ
		D192	61.21	-19.94	6.43					
6HU399		D191	60.15	-20.30	6.90	0.96	0.18	-0.24	1.01	CA
		D192	61.12	-20.12	6.67					
6JL7YV		D191	60.16	-19.99	6.73	1.01	0.17	-0.25	1.05	AJ
		D192	61.17	-19.82	6.48					
6PAQZP		D191	59.76	-20.27	6.94	1.00	0.19	-0.25	1.05	GD
		D192	60.76	-20.08	6.69					
6PCFAT		D191	59.47	-19.84	6.37	0.96	0.14	-0.19	0.99	GD
		D192	60.43	-19.70	6.18					



**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^*	
6RKEX9		D191	59.80	-20.03	6.58	0.92	0.20	-0.19	0.96	XH
		D192	60.72	-19.83	6.40					
6Y86GH	X	D191	60.26	-19.76	6.20	0.95	0.14	-0.08	0.96	HH
		D192	61.21	-19.62	6.12					
7CFW4L		D191	59.98	-19.90	6.74	1.00	0.13	-0.23	1.04	MM
		D192	60.99	-19.77	6.51					
7M3QJP		D191	59.73	-19.90	6.63	0.82	0.18	-0.22	0.87	XO
		D192	60.55	-19.72	6.41					
7MP3EG		D191	59.90	-19.80	6.61	1.00	0.18	-0.25	1.04	XI
		D192	60.89	-19.62	6.36					
7RWKJC		D191	60.03	-19.92	6.89	0.98	0.18	-0.28	1.04	MT
		D192	61.01	-19.73	6.61					
8WATEE		D191	59.82	-20.10	6.43	0.95	0.14	-0.21	0.98	XO
		D192	60.77	-19.96	6.23					
8YUHYR		D191	60.24	-20.02	6.70	0.98	0.16	-0.23	1.01	AO
		D192	61.21	-19.86	6.47					
8ZMPNW		D191	59.86	-19.89	6.67	0.93	0.15	-0.21	0.97	MM
		D192	60.79	-19.74	6.46					
9AMKGL		D191	60.11	-19.91	6.87	1.01	0.13	-0.24	1.05	AJ
		D192	61.12	-19.78	6.63					
ABYPK3		D191	60.07	-20.11	6.76	0.99	0.16	-0.22	1.03	MU
		D192	61.07	-19.96	6.54					
ACB7WU		D191	60.15	-19.91	6.64	0.97	0.17	-0.21	1.01	AH
		D192	61.12	-19.74	6.43					
AD9JG2		D191	59.87	-19.92	6.53	0.93	0.14	-0.21	0.96	XI
		D192	60.79	-19.78	6.33					
AMXDKC		D191	59.68	-19.82	6.57	0.99	0.16	-0.23	1.03	XI
		D192	60.68	-19.65	6.34					
BXAUZV		D191	59.93	-19.98	6.55	1.01	0.18	-0.22	1.05	HP
		D192	60.94	-19.80	6.32					
CAJZGF		D191	59.78	-19.92	6.57	1.03	0.15	-0.23	1.07	XI
		D192	60.81	-19.78	6.34					



CTS Interlaboratory Testing Program for Color & Appearance

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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^*	
CFAAQE	X	D191	59.44	-19.39	6.67	0.97	0.15	-0.23	1.00	MM
		D192	60.40	-19.24	6.44					
D3Y2L2		D191	60.15	-19.95	6.69	0.99	0.16	-0.25	1.03	AO
		D192	61.14	-19.79	6.44					
D42B4W	X	D191	59.39	-20.16	6.36	0.94	0.16	-0.23	0.98	XM
		D192	60.33	-20.00	6.13					
D7YDH2		D191	60.06	-19.82	6.56	1.02	0.16	-0.21	1.05	XB
		D192	61.08	-19.66	6.34					
DD2K2B		D191	60.07	-19.85	6.57	1.00	0.16	-0.20	1.03	MI
		D192	61.07	-19.69	6.37					
DX66WB		D191	60.03	-20.01	6.72	0.95	0.14	-0.21	0.99	MK
		D192	60.99	-19.87	6.52					
E8MB6X		D191	60.46	-20.17	6.75	0.98	0.16	-0.22	1.01	CA
		D192	61.43	-20.02	6.53					
EPLJ6H		D191	59.80	-19.88	6.48	0.97	0.14	-0.21	1.00	XO
		D192	60.77	-19.74	6.26					
FAZGTJ		D191	60.04	-20.08	6.77	1.04	0.20	-0.25	1.09	MV
		D192	61.08	-19.88	6.52					
FHY2ZL		D191	60.05	-19.73	6.46	1.02	0.16	-0.24	1.05	XI
		D192	61.06	-19.57	6.23					
FQT8TM		D191	60.00	-19.87	6.83	0.95	0.15	-0.22	0.99	AJ
		D192	60.95	-19.72	6.61					
G9NZEK		D191	60.13	-19.99	6.86	1.01	0.16	-0.21	1.04	AS
		D192	61.14	-19.83	6.65					
GMT7GW		D191	59.95	-19.90	6.67	0.99	0.16	-0.21	1.02	XB
		D192	60.94	-19.75	6.45					
GTXZKZ		D191	60.14	-19.87	6.54	0.99	0.13	-0.22	1.02	AQ
		D192	61.13	-19.74	6.32					
H96MFZ		D191	60.18	-19.81	6.50	0.98	0.13	-0.21	1.02	XZ
		D192	61.16	-19.67	6.29					
HLRWZJ		D191	59.72	-19.84	6.49	0.94	0.11	-0.21	0.97	XH
		D192	60.66	-19.73	6.28					



**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^*	
HNHX78		D191	59.84	-19.89	6.62	0.95	0.13	-0.19	0.98	XM
		D192	60.79	-19.77	6.43					
HQ4TFT		D191	60.15	-19.86	6.66	0.94	0.15	-0.22	0.98	MM
		D192	61.09	-19.71	6.44					
JBPVYY		D191	60.24	-19.85	6.70	1.04	0.14	-0.24	1.08	AO
		D192	61.28	-19.71	6.46					
JEPVBP		D191	60.03	-19.92	6.71	1.00	0.14	-0.23	1.04	HP
		D192	61.03	-19.78	6.48					
JL8N2F		D191	59.66	-19.87	6.65	1.01	0.15	-0.21	1.04	XH
		D192	60.67	-19.72	6.45					
JP7QEV		D191	60.16	-19.92	6.57	0.96	0.16	-0.22	1.00	AJ
		D192	61.12	-19.76	6.34					
JRZCA9		D191	59.82	-19.92	6.49	0.96	0.12	-0.20	0.99	XI
		D192	60.78	-19.80	6.30					
JTM8JU		D191	59.81	-19.67	6.66	0.97	0.14	-0.22	1.00	MM
		D192	60.78	-19.53	6.44					
JW6FVZ		D191	60.06	-19.98	6.80	0.99	0.12	-0.23	1.02	AD
		D192	61.05	-19.86	6.58					
KL72BU		D191	59.96	-19.75	6.63	1.00	0.12	-0.22	1.03	MM
		D192	60.96	-19.63	6.41					
LY9Q69		D191	60.18	-20.01	6.86	1.05	0.19	-0.27	1.09	AJ
		D192	61.22	-19.82	6.60					
LYM78N		D191	59.96	-19.88	6.64	0.97	0.16	-0.22	1.01	MM
		D192	60.93	-19.72	6.42					
M72KFC		D191	60.18	-19.96	6.82	0.96	0.11	-0.20	0.99	AJ
		D192	61.14	-19.85	6.63					
MEVP9D		D191	59.70	-19.85	6.60	1.00	0.05	-0.20	1.02	XM
		D192	60.70	-19.80	6.40					
MNHHQB		D191	59.72	-20.06	7.01	1.02	0.17	-0.25	1.06	XX
		D192	60.73	-19.88	6.76					
MV84RW		D191	60.33	-19.94	6.83	0.95	0.18	-0.25	0.99	AS
		D192	61.28	-19.76	6.58					



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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^*	
MZYBB6		D191	59.98	-19.88	6.67	0.98	0.16	-0.22	1.02	XZ
		D192	60.96	-19.72	6.45					
N3CL88		D191	60.07	-19.94	6.62	0.93	0.15	-0.19	0.96	AM
		D192	61.00	-19.79	6.43					
N922ZK		D191	59.95	-19.91	6.67	0.96	0.16	-0.23	1.01	XB
		D192	60.92	-19.75	6.44					
NF7TDP		D191	59.77	-19.79	6.65	0.95	0.14	-0.18	0.98	MI
		D192	60.73	-19.65	6.47					
NG29AU		D191	60.14	-20.02	6.75	0.98	0.16	-0.21	1.01	AS
		D192	61.12	-19.86	6.54					
NHNZRQ		D191	60.17	-19.92	6.74	0.98	0.14	-0.21	1.01	AS
		D192	61.15	-19.79	6.53					
NJ3M3D		D191	60.07	-19.78	6.54	0.95	0.13	-0.19	0.97	XH
		D192	61.01	-19.65	6.35					
NUNGRT		D191	59.84	-19.88	6.56	1.03	0.13	-0.23	1.07	XH
		D192	60.87	-19.74	6.32					
NWWWZK		D191	59.82	-19.92	6.47	0.99	0.16	-0.22	1.03	XI
		D192	60.81	-19.77	6.25					
PDBP3T		D191	60.26	-19.79	6.61	1.02	0.15	-0.21	1.05	AO
		D192	61.28	-19.64	6.40					
PF3NFR		D191	59.50	-19.81	6.51	1.05	0.19	-0.21	1.09	XO
		D192	60.55	-19.63	6.29					
PLTYQP		D191	60.08	-19.80	6.75	0.97	0.16	-0.24	1.02	AJ
		D192	61.05	-19.64	6.51					
Q4JN8B		D191	60.00	-19.99	6.61	0.95	0.14	-0.23	0.99	AQ
		D192	60.95	-19.84	6.38					
QJVYY6		D191	60.05	-20.01	6.82	0.96	0.20	-0.25	1.02	MV
		D192	61.01	-19.81	6.56					
QQVGDG		D191	60.11	-19.90	6.70	0.94	0.12	-0.21	0.98	MM
		D192	61.05	-19.77	6.50					
QTYCXJ		D191	60.13	-19.94	6.85	0.98	0.15	-0.23	1.02	AS
		D192	61.11	-19.79	6.62					



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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^*	
RA98G7		D191	59.87	-19.75	6.92	1.04	0.09	-0.20	1.06	CA
		D192	60.90	-19.65	6.73					
RDLZ6Q		D191	59.91	-20.17	6.40	0.99	0.14	-0.22	1.03	XM
		D192	60.90	-20.02	6.18					
RY3LRJ		D191	59.67	-19.83	6.71	1.00	0.12	-0.23	1.03	XH
		D192	60.67	-19.71	6.48					
RYUC4R		D191	59.87	-19.79	6.49	0.99	0.16	-0.23	1.03	XI
		D192	60.86	-19.63	6.27					
TMRB29		D191	59.93	-20.11	6.76	0.96	0.16	-0.21	1.00	MV
		D192	60.90	-19.96	6.55					
TTJHKG		D191	60.24	-20.14	6.85	0.98	0.19	-0.23	1.02	AJ
		D192	61.22	-19.96	6.62					
TYML9U		D191	60.08	-19.88	6.57	0.97	0.16	-0.20	1.00	AJ
		D192	61.05	-19.73	6.37					
URWN7J		D191	59.96	-19.91	6.64	1.01	0.16	-0.24	1.04	MS
		D192	60.97	-19.75	6.41					
VP8K7P		D191	60.04	-20.09	6.75	1.03	0.17	-0.25	1.07	MV
		D192	61.06	-19.93	6.51					
VQHDTD		D191	59.89	-20.02	6.83	1.02	0.15	-0.22	1.06	MV
		D192	60.92	-19.87	6.61					
VTRAQ3	X	D191	59.84	-19.65	6.48	0.48	0.07	-0.11	0.50	XI
		D192	60.32	-19.58	6.37					
VW9YMK		D191	59.92	-19.75	6.67	1.01	0.13	-0.25	1.05	XI
		D192	60.93	-19.62	6.42					
W866H4		D191	59.65	-19.72	6.77	0.93	0.18	-0.17	0.96	MU
		D192	60.58	-19.54	6.60					
WDQBL6	X	D191	59.74	-20.08	7.15	0.95	0.11	-0.20	0.98	MM
		D192	60.69	-19.97	6.96					
WPKRB7		D191	59.98	-19.88	6.64	0.96	0.12	-0.19	0.99	XB
		D192	60.94	-19.76	6.44					
WT24GM		D191	59.81	-20.12	6.78	1.00	0.17	-0.24	1.05	XU
		D192	60.82	-19.95	6.54					



WebCode	Flag	Samples	CIE L* a* b* Color Values			Color Difference Values				InstrCode
			L*	a*	b*	ΔL^*	Δa^*	Δb^*	ΔE^*	
WZ7KAG		D191	60.15	-19.96	6.46	0.94	0.16	-0.17	0.97	AM
		D192	61.09	-19.80	6.28					
XAUTGP		D191	60.11	-19.71	6.45	1.02	0.13	-0.04	1.03	HF
		D192	61.13	-19.59	6.41					
XCWW2K		D191	60.11	-20.13	6.73	0.97	0.14	-0.21	1.00	XB
		D192	61.08	-19.99	6.53					
XE2NRD		D191	60.18	-19.91	6.80	0.91	0.16	-0.18	0.95	AS
		D192	61.10	-19.75	6.61					
XFAPP6		D191	60.13	-20.03	6.74	1.02	0.16	-0.25	1.07	AS
		D192	61.16	-19.87	6.50					
XUGHNW		D191	60.16	-20.22	6.86	1.05	0.18	-0.30	1.11	AS
		D192	61.21	-20.04	6.57					
XXQPYA		D191	59.91	-19.82	6.71	0.97	0.15	-0.22	1.01	XB
		D192	60.88	-19.67	6.49					
Y4C637		D191	60.21	-19.91	6.75	0.95	0.11	-0.17	0.98	AR
		D192	61.16	-19.81	6.57					
Z9JYEU		D191	59.99	-19.94	6.61	1.05	0.14	-0.24	1.08	XB
		D192	61.03	-19.80	6.37					
ZBTZJ2		D191	59.66	-19.90	6.65	1.02	0.15	-0.22	1.06	XH
		D192	60.68	-19.75	6.43					
ZNDEMZ		D191	59.87	-20.17	6.87	0.90	0.17	-0.23	0.94	CA
		D192	60.77	-20.00	6.64					

Summary Statistics								
Samples	L*	a*	b*	ΔL^*	Δa^*	Δb^*	ΔE^*	
Grand Means								
D191	59.98	-19.93	6.66	0.98	0.15	-0.22	1.02	
D192	60.96	-19.78	6.44					
Std Dev Btwn Labs								
D191	0.19	0.13	0.14	0.04	0.02	0.03	0.04	
D192	0.19	0.12	0.13					
Statistics based on 102 of 107 reporting participants								



Comments Assigned on Data Flags for Test #409

6Y86GH(X) - Low "b*" value for Sample D191. Large replication difference for "b*" Sample D192. Large Delta b value.

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

D42B4W(X) - Low "L*" values for both samples.

VTRAQ3(X) - Large replication difference for "L*", "a*" & "b*" Sample D192 values. Low "L*" value for D192. Small Delta L, Delta a and Delta E values. Large Delta b values.

WDQBL6(X) - High "b*" values for both samples.

Key to Instrument Codes Reported by Participants

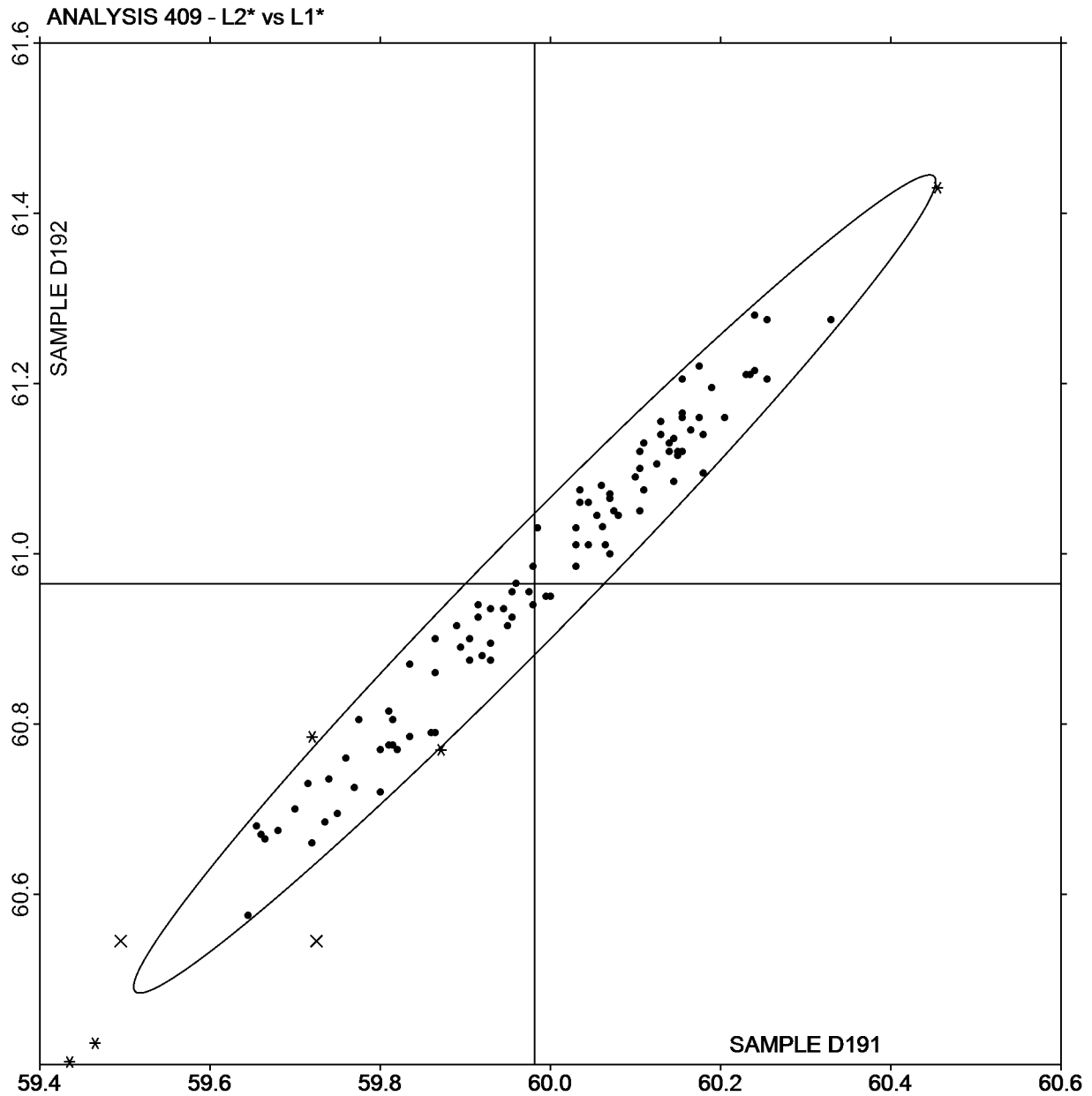
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AJ	ACS-Datacolor 600	AM	ACS-Datacolor 600 Plus
AO	ACS-Datacolor 650X	AQ	ACS-Datacolor 600X
AR	Datacolor 400	AS	ACS-Datacolor 800 Series
CA	Cary 5000	GD	BYK-Gardner spectro-guide sphere
HF	Hunter ColorFlex Diffuse	HH	Hunter ColorQUEST XE
HP	Hunter UltraScan 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	XX	Instrument make/model not specified by lab
XZ	X-Rite		



L2* vs L1*

SAMPLE D191 = 59.98

SAMPLE D192 = 60.96

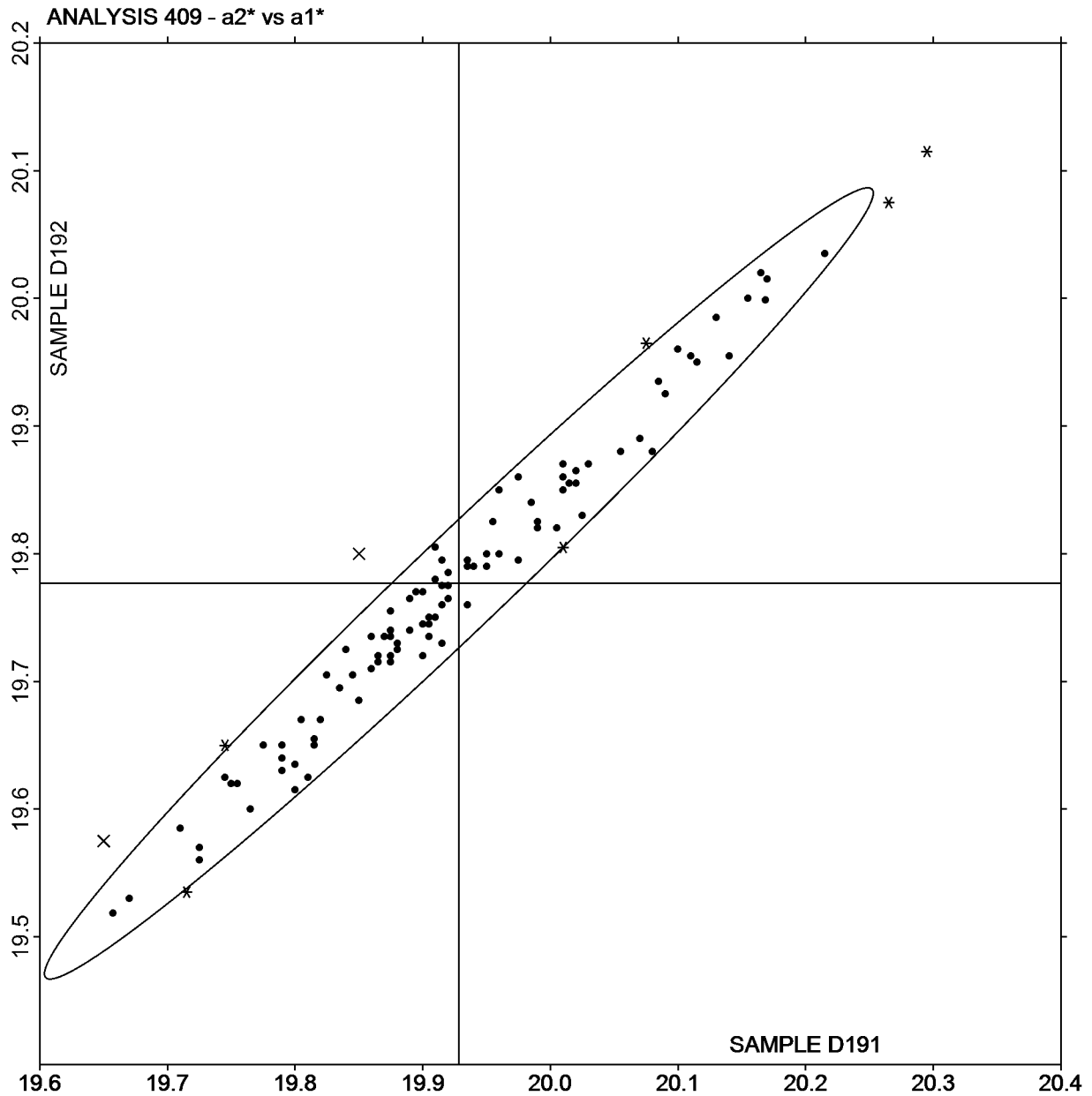




a2* vs a1*

SAMPLE D191 = -19.93

SAMPLE D192 = -19.78



Plot created using absolute values.

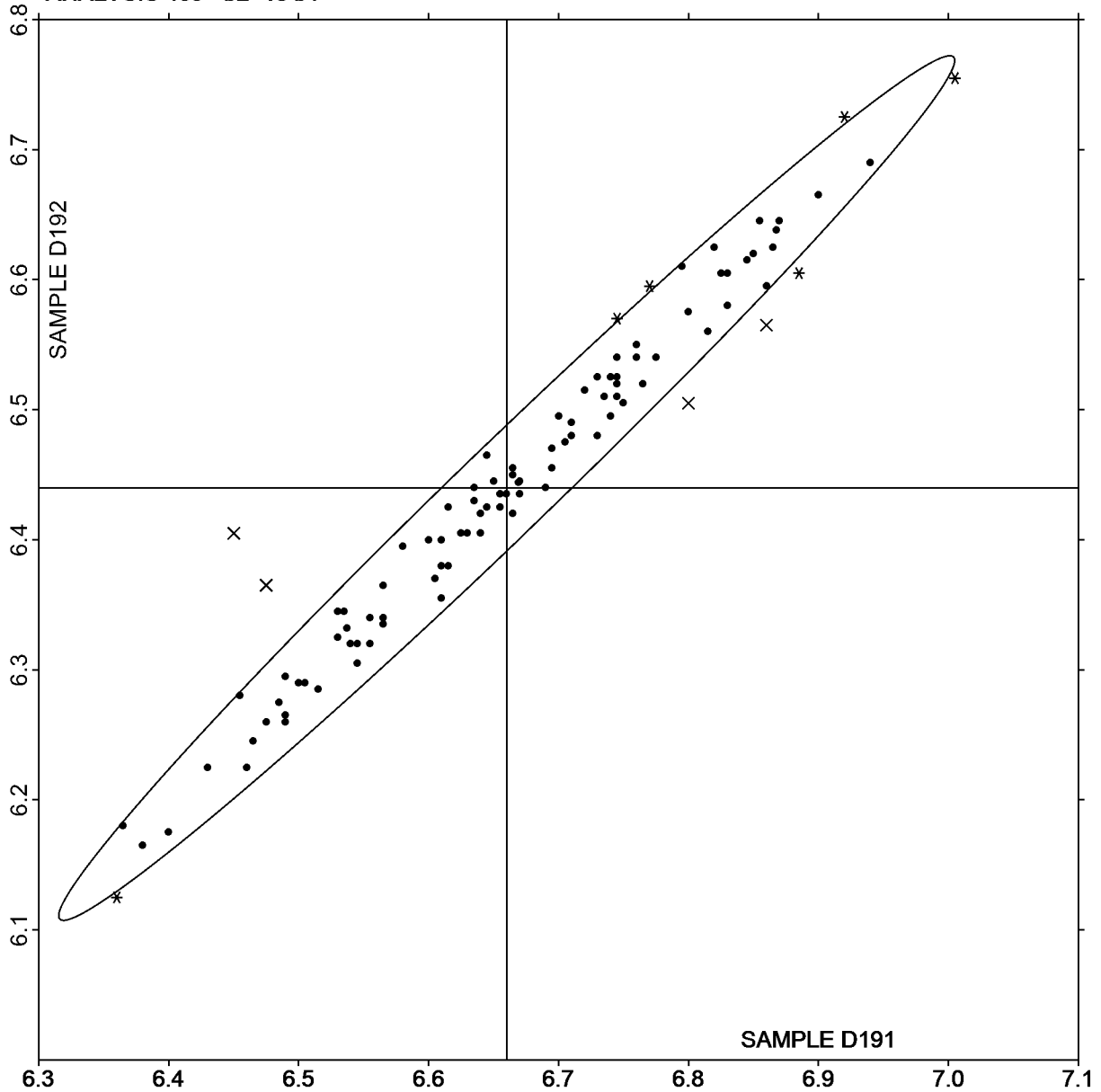


b2* vs b1*

SAMPLE D191 = 6.66

SAMPLE D192 = 6.44

ANALYSIS 409 - b2* vs b1*





CTS Interlaboratory Testing Program for Color & Appearance Analysis 411

Report #190
4th 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 D191																		
2N8PQ2		16.20	19.22	22.97	25.54	26.42	29.35	34.63	36.88	29.81	22.73	19.18	17.57	17.43	18.57	18.10	16.28	XI
33XMNJ		16.13	19.20	22.95	25.60	26.54	29.43	34.81	37.30	30.42	22.98	19.43	17.73	17.54	18.68	18.20	16.28	AJ
3JJBWT		16.10	19.24	22.93	25.68	26.58	29.67	34.90	37.05	30.27	22.97	19.27	17.56	17.26	18.81	18.19	16.48	HU
3QJPJF		15.54	18.84	22.41	25.11	26.05	29.08	34.28	36.55	29.73	22.68	19.00	17.41	17.23	18.34	18.03	16.10	XH
3QZQMH		16.20	19.03	22.69	25.32	26.22	29.16	34.39	36.66	29.64	22.58	19.12	17.50	17.29	18.37	17.99	16.07	XI
3RAZB9		16.24	19.26	23.02	25.59	26.57	29.47	34.63	36.96	30.20	23.00	19.39	17.73	17.51	18.56	18.39	16.56	MM
43P64Q		16.11	19.08	22.89	25.43	26.41	29.41	34.60	36.83	29.87	22.73	19.16	17.54	17.36	18.54	18.01	16.23	XI
4CQLFN		17.70X	19.18	23.02	25.64	26.58	29.43	34.84	37.17	30.24	22.99	19.46	17.76	17.59	18.67	18.49	16.59	AJ
4EHLTQ		15.99	19.08	22.89	25.40	26.35	29.37	34.61	36.74	29.92	22.76	19.19	17.54	17.32	18.45	18.12	16.24	XI
6FLU4V		16.21	19.22	23.02	25.67	26.65	29.56	34.96	37.42	30.36	22.99	19.44	17.70	17.57	18.65	18.28	16.38	AJ
6HU399		16.10	18.93	22.90	25.62	26.40	29.41	34.88	37.61	30.24	22.87	19.37	17.67	17.42	18.68	18.46	16.55	CA
6JL7YV		16.10	19.08	22.94	25.61	26.53	29.46	34.81	37.22	30.31	22.94	19.45	17.71	17.54	18.65	18.38	16.37	AJ
6PAQZP		18.04X	17.83X	22.02X	25.18	26.14	28.21X	34.70	37.43	29.93	22.85	19.02	16.10X	17.30	18.14*	18.18	16.71	GD
6PCFAT		16.27	18.59	22.27*	25.36	26.51	29.10	34.13	35.76	29.60	22.51	18.34X	17.15*	17.13*	18.34	18.13	17.29X	GD
6RKEX9		16.05	19.00	22.67	25.32	26.22	29.14	34.47	36.76	29.76	22.58	19.05	17.43	17.26	18.34	18.11	16.23	XH
6Y86GH		16.56	19.52*	23.66X	25.90	26.76	29.70	35.13	37.35	30.27	23.06	19.42	17.82	17.52	19.31X	19.03X	17.15X	HH
7CFW4L		15.97	19.01	22.77	25.40	26.33	29.28	34.50	36.97	30.09	22.87	19.25	17.60	17.41	18.52	18.32	16.46	MM
7M3QJP		15.91	18.91	22.57	25.32	26.17	29.13	34.58	36.72	29.56	22.58	19.08	17.42	17.39	18.41	18.20	16.31	XO
7RWKJC		15.72	18.83	22.78	25.46	26.36	29.26	34.74	37.10	30.18	22.87	19.34	17.62	17.46	18.63	18.40	16.53	MT
8WATEE		15.97	18.95	22.83	25.36	26.34	29.48	34.81	36.74	29.54	22.49	19.03	17.43	17.32	18.44	18.20	16.36	XF
8YUHYR		16.19	19.23	23.04	25.66	26.60	29.57	34.91	37.30	30.43	23.06	19.46	17.74	17.58	18.70	18.50	16.45	AO
9AMKGL		15.98	19.02	22.80	26.45X	26.42	29.32	35.17*	37.12	30.30	22.96	19.46	17.67	17.53	18.72	18.49	16.35	AJ



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**Report #190
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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 D191																		
ABYPK3		15.82	19.03	22.78	25.64	26.40	29.29	34.92	37.30	30.23	22.74	19.26	17.59	17.40	18.57	18.46	16.51	MV
ACB7WU		16.20	19.15	22.95	25.67	26.56	29.37	34.75	37.23	30.36	22.97	19.46	17.70	17.50	18.55	18.29	16.52	AH
AD9JG2		16.03	19.05	22.79	25.38	26.33	29.33	34.58	36.68	29.79	22.67	19.13	17.59	17.48	18.56	18.11	16.32	XI
AMXDKC		15.74	18.86	22.54	25.21	26.14	29.04	34.17	36.47	29.64	22.56	19.05	17.39	17.26	18.37	17.96	16.23	XI
BXAUZV		16.51	19.13	22.97	25.41	26.26	29.41	34.71	36.97	29.88	22.74	19.12	17.49	17.24	18.67	18.11	16.38	HP
CAJZGF		15.97	18.97	22.66	25.31	26.20	29.14	34.36	36.69	29.71	22.61	19.08	17.46	17.29	18.38	17.92	16.02	XI
CFAAQE		15.91	18.74	22.31*	24.85*	25.77X	28.69X	33.73X	35.99	29.52	22.53	18.97	17.35	17.18	18.19*	17.98	16.18	MM
D3Y2L2		16.08	19.16	22.84	25.65	26.56	29.39	34.72	37.22	30.29	23.00	19.40	17.69	17.52	18.60	18.46	16.51	AO
D42B4W		15.67	18.66	22.40	24.96*	25.89*	28.97	34.25	36.15	28.99	22.05X	18.69X	17.13*	17.01X	18.14*	17.89	16.03	XF
D7YDH2		16.28	19.39	22.97	25.56	26.46	29.38	34.64	37.03	30.13	22.96	19.37	17.69	17.45	18.53	18.23	16.31	XB
DD2K2B		16.03	19.15	22.94	25.60	26.55	29.61	34.64	37.03	30.05	22.94	19.37	17.77	17.59	18.61	18.38	16.58	MI
DX66WB		15.95	18.96	22.84	25.48	26.39	29.44	34.67	37.05	30.07	22.88	19.26	17.61	17.43	18.56	18.33	16.49	MK
E8MB6X		16.37	19.22	23.24	25.93*	26.78*	29.78*	35.31*	37.97	30.56	23.09	19.55	17.84	17.59	18.85	18.63	16.69	CA
EPLJ6H		16.09	19.02	22.74	25.43	26.31	29.28	34.62	36.80	29.59	22.63	19.06	17.46	17.38	18.41	18.17	16.32	XO
FAZGTJ		15.79	18.98	22.80	25.51	26.31	29.29	34.74	37.41	30.09	22.71	19.23	17.56	17.34	18.64	18.44	16.55	MV
FHY2ZL		16.43	19.34	23.01	25.58	26.54	29.40	34.71	36.96	29.98	22.91	19.45	17.72	17.51	18.62	18.31	16.40	XI
G9NZEK		16.07	18.97	22.88	25.47	26.45	29.35	34.72	37.22	30.28	22.94	19.43	17.69	17.55	18.66	18.40	16.29	AS
GMT7GW		16.02	19.04	22.82	25.38	26.35	29.30	34.59	36.91	29.91	22.80	19.27	17.63	17.41	18.53	18.17	16.26	XB
GTXZKZ		16.71	19.22	23.07	25.72	26.60	29.41	34.79	37.15	30.27	22.98	19.45	17.69	17.53	18.61	18.48	16.57	AQ
H96MFZ		16.36	19.34	23.12	25.75	26.65	29.59	34.92	37.21	30.14	23.00	19.47	17.79	17.57	18.67	18.28	16.28	XZ
HLRWZJ		16.03	18.99	22.67	25.31	26.16	29.03	34.30	36.60	29.62	22.57	19.06	17.44	17.27	18.38	18.02	16.12	XH
HNHX78		15.80	18.92	22.75	25.30	26.26	29.26	34.65	36.83	28.20X	22.67	19.13	17.47	17.37	18.41	18.19	16.40	XM



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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 D191																		
HQ4TFT		16.18	19.22	22.95	25.65	26.52	29.50	34.71	37.17	30.30	23.04	19.40	17.74	17.56	18.70	18.46	16.57	MM
JBPVYY		16.20	19.30	23.05	25.70	26.60	29.60	34.90	37.35	30.45	23.10	19.50	17.80	17.70*	18.90	18.50	16.30	AO
JEPVBP		16.59	19.08	22.86	25.53	26.35	29.32	34.63	37.14	30.19	22.97	19.31	17.51	17.17	18.56	18.18	16.47	HP
JL8N2F		15.55	18.73	22.50	25.18	26.13	29.11	34.30	36.51	29.53	22.55	18.99	17.40	17.34	18.40	17.95	16.14	XH
JP7QEV		16.13	19.25	23.10	25.64	26.58	29.44	34.77	37.26	30.25	22.95	19.44	17.71	17.54	18.64	18.37	16.42	AJ
JRZCA9		16.03	19.05	22.77	25.38	26.26	29.20	34.44	36.71	29.74	22.62	19.11	17.48	17.33	18.35	18.02	16.09	XI
JTM8JU		15.82	18.97	22.68	25.29	26.21	29.17	34.32	36.62	29.94	22.76	19.16	17.57	17.40	18.46	18.09	16.27	MM
JW6FVZ		15.94	18.99	22.78	25.47	26.42	29.36	34.68	37.03	30.18	22.92	19.37	17.62	17.43	18.54	18.38	16.40	AB
KL72BU		16.12	19.05	22.84	25.44	26.38	29.34	34.55	36.92	30.02	22.85	19.26	17.65	17.47	18.58	18.31	16.46	MM
LY9Q69		17.09*	19.00	22.92	25.49	26.47	29.38	34.76	37.36	30.37	22.97	19.47	17.70	17.56	18.62	18.41	16.66	AJ
LYM78N		16.09	19.00	22.83	25.46	26.36	29.36	34.56	37.00	30.02	22.80	19.20	17.56	17.39	18.54	18.26	16.40	MM
M72KFC		16.09	19.06	22.92	25.54	26.53	29.42	34.83	37.25	30.39	23.01	19.47	17.73	17.59	18.77	18.42	16.41	AJ
MEVP9D		16.50	19.10	23.10	25.55	26.50	29.50	34.90	36.80	29.70	22.70	19.20	17.70	17.40	18.80	18.65	17.00X	HW
MNHHQB		15.43	18.38*	22.38	25.03	26.01	29.01	34.34	36.69	29.82	22.56	19.00	17.37	17.19	18.24	18.04	16.27	GD
MZYBB6		16.11	19.07	22.81	25.41	26.38	29.33	34.64	36.94	29.88	22.83	19.36	17.69	17.46	18.54	18.08	16.13	XZ
N3CL88		16.14	19.09	22.97	25.61	26.56	29.41	34.78	37.25	30.12	22.93	19.35	17.63	17.46	18.54	18.33	16.42	AM
N922ZK		16.07	19.04	22.78	25.41	26.33	29.27	34.55	36.96	29.93	22.79	19.27	17.61	17.41	18.53	18.19	16.30	XB
NF7TDP		15.78	18.95	22.59	25.21	26.22	29.16	34.25	36.49	29.84	22.70	19.14	17.48	17.34	18.38	18.07	16.25	MI
NG29AU		16.29	19.07	22.94	25.55	26.52	29.44	34.83	37.27	30.20	22.90	19.41	17.69	17.57	18.71	18.34	16.51	AS
NHNZRQ		16.22	19.05	22.97	25.56	26.57	29.41	34.79	37.16	30.41	22.99	19.47	17.70	17.56	18.68	18.51	16.39	AS
NJ3M3D		16.05	19.31	22.95	25.62	26.51	29.44	34.61	37.02	30.12	22.96	19.36	17.73	17.54	18.66	18.35	16.47	XH
NWVWZK		16.04	19.08	22.74	25.44	26.27	29.15	34.38	36.69	29.85	22.68	19.08	17.40	17.23	18.31	18.10	16.28	XI



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		400	420	440	460	480	500	520	540	560	580	600	620	640	660	680	700	
Sample D191																		
PDBP3T		16.20	19.25	23.20	25.80	26.70	29.60	34.95	37.35	30.50	23.05	19.55	17.80	17.70*	18.90	18.50	16.40	AO
PF3NFR		15.41	18.52*	22.42	25.00*	25.86*	28.97	34.25	36.49	29.64	22.54	19.01	17.28	17.19	18.21	18.06	16.14	XO
PLTYQP		16.01	19.05	22.81	25.55	26.46	29.29	34.61	37.21	30.29	22.95	19.41	17.68	17.47	18.54	18.41	16.64	AJ
Q4JN8B		15.87	18.96	22.86	25.48	26.44	29.31	34.69	52.00X	30.01	22.80	19.28	17.58	17.37	18.47	18.22	16.38	AQ
QQVGDG		15.97	19.13	22.90	25.57	26.48	29.42	34.69	37.14	30.23	22.99	19.35	17.71	17.52	18.64	18.37	16.52	MM
QTYCXJ		15.92	18.85	22.84	25.49	26.47	29.35	34.70	37.15	30.34	22.99	19.43	17.70	17.55	18.72	18.30	16.28	AS
RA98G7		15.79	18.67	22.54	25.23	26.09	29.00	34.30	37.04	29.98	22.68	19.24	17.64	17.40	18.61	18.35	16.26	CA
RDLZ6Q		16.11	19.07	22.92	25.48	26.41	29.55	34.93	36.97	29.66	22.55	19.05	17.46	17.34	18.47	18.28	16.40	XF
RYUC4R		16.04	19.19	22.86	25.38	26.29	29.27	34.41	36.69	29.85	22.78	19.19	17.56	17.32	18.51	18.07	16.21	XI
TMRB29		15.88	18.92	22.73	25.48	26.23	29.16	34.66	37.32	29.95	22.64	19.13	17.51	17.30	18.56	18.37	16.47	MV
TTJHKG		16.19	19.08	22.94	25.57	26.59	29.51	34.92	37.45	30.42	23.02	19.45	17.71	17.52	18.59	18.43	16.56	AJ
TYML9U		16.19	19.18	23.01	25.57	26.52	29.45	34.77	37.18	30.19	22.83	19.36	17.63	17.60	18.63	18.31	16.36	AJ
URWN7J		16.00	19.05	22.80	25.50	26.35	29.30	34.75	37.05	29.95	22.75	19.25	17.60	17.40	18.55	18.25	16.45	MS
VP8K7P		15.96	18.97	22.86	25.51	26.34	29.38	34.97	37.18	30.05	22.71	19.27	17.60	17.49	18.67	18.49	16.51	MV
VTRAQ3		16.15	19.10	22.80	25.40	26.30	29.20	34.35	36.70	29.90	22.75	19.20	17.50	17.40	18.50	18.10	16.30	XI
VW9YMK		15.87	18.95	22.75	25.42	26.31	29.27	34.46	36.76	29.92	22.85	19.36	17.67	17.42	18.44	18.19	16.48	XI
W866H4		15.63	18.71	22.44	25.06	25.95*	28.86*	34.19	36.45	29.73	22.56	19.04	17.39	17.23	18.39	18.22	16.43	MU
WDQBL6		15.30*	18.51*	22.24*	24.92*	25.93*	29.01	34.24	36.68	29.78	22.60	19.05	17.45	17.25	18.29	18.15	16.31	MM
WPKRB7		16.23	19.11	22.85	25.42	26.38	29.33	34.59	36.97	26.46X	22.84	19.30	17.64	17.45	18.60	18.26	16.39	XB
WT24GM		16.19	18.93	22.65	25.13	26.28	29.11	34.81	36.68	29.64	22.71	19.04	17.41	17.26	18.37	18.10	16.26	XU
WZ7KAG		15.99	19.44	23.16	25.68	26.61	29.57	34.98	37.14	30.10	22.94	19.40	17.68	17.50	18.52	18.32	16.64	AM
XAUTGP		16.40	19.26	23.11	25.55	26.66	29.58	34.71	37.02	30.25	22.99	19.53	17.62	17.66	18.80	18.62	17.03X	HF



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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 D191																		
XCWW2K		16.10	19.09	22.88	25.56	26.48	29.42	34.82	37.33	30.14	22.85	19.32	17.65	17.34	18.54	18.22	16.14	XB
XE2NRD		16.11	19.12	22.92	25.56	26.51	29.37	34.71	37.27	30.43	23.03	19.48	17.73	17.57	18.76	18.52	16.44	AS
XFAPP6		16.04	19.06	22.94	25.57	26.47	29.40	34.72	37.22	30.31	22.95	19.39	17.63	17.50	18.69	18.40	16.30	AS
XUGHNW		16.38	18.95	22.86	25.54	26.51	29.50	34.91	37.32	30.21	22.87	19.38	17.64	17.51	18.64	18.34	16.42	AS
XXQPYA		16.13	18.98	22.50	25.31	26.27	29.21	34.50	36.92	29.94	22.80	19.23	17.56	17.32	18.48	18.18	16.35	XB
ZBTZJ2		15.57	18.86	22.52	25.09	26.04	28.98	34.21	36.44	29.69	22.51	18.79*	17.38	17.25	18.36	17.93	16.19	XH
ZNDEMZ		15.86	18.65	22.58	25.28	26.10	29.11	34.55	37.19	29.90	22.55	19.08	17.39	17.15	18.41	18.19	16.27	CA

Summary Statistics

	400	420	440	460	480	500	520	540	560	580	600	620	640	660	680	700
Grand Means	16.09	19.02	22.81	25.46	26.38	29.31	34.64	37.14	29.96	22.81	19.25	17.57	17.41	18.55	18.27	16.40
SD Btwn Labs	0.38	0.23	0.24	0.23	0.20	0.22	0.26	1.58	0.50	0.19	0.20	0.21	0.14	0.18	0.19	0.21



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Reflectance at 16 Selected Wavelengths

Key to Instrument Codes Reported by Participants

AB ACS-Datcolor 100	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
HF Hunter ColorFlex Diffuse	HH Hunter ColorQUEST XE	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	MU Minolta	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	XM X-Rite SP62	XO X-Rite SP64
XU X-RiteColor Premier 8200 Spectrophotometer	XZ X-Rite	



Interlaboratory Testing Program for Color & Appearance

Report #190

Analysis 440

4th Qtr 2019

60 Degree Gloss - Paint Chips

ASTM Method D 523

WebCode	Data Flag	Sample H191			Sample H192			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
2JFH9T		58.78	0.19	0.32	69.85	0.47	0.73	GX
36BJX2		58.55	-0.03	-0.05	69.38	0.00	0.00	GL
3RAZB9		59.10	0.52	0.87	70.20	0.82	1.28	GL
48J4DE		59.30	0.72	1.20	70.50	1.12	1.74	GL
6FLU4V		58.33	-0.26	-0.43	69.55	0.17	0.27	GK
6JL7YV		57.15	-1.43	-2.40	68.10	-1.28	-1.98	MW
6PAQZP		58.30	-0.28	-0.47	69.08	-0.30	-0.47	GK
6PCFAT		58.60	0.02	0.03	69.32	-0.06	-0.10	GN
6RKEX9		59.25	0.67	1.12	70.15	0.77	1.20	GK
6VX9KT		58.20	-0.38	-0.64	69.48	0.10	0.15	GL
6Y86GH		59.08	0.49	0.83	69.83	0.45	0.69	RA
7CFW4L		58.05	-0.53	-0.89	68.63	-0.75	-1.17	RA
7M3QJP		59.83	1.24	2.08	70.15	0.77	1.20	GN
7MP3EG		59.18	0.59	0.99	70.00	0.62	0.97	GL
8WATEE		58.48	-0.11	-0.18	69.25	-0.13	-0.20	GN
9AMKGL		58.53	-0.06	-0.10	69.50	0.12	0.19	GL
9DNJZQ		58.70	0.12	0.20	69.38	0.00	0.00	GK
9E7J9M		59.25	0.67	1.12	70.05	0.67	1.04	GL
ABYPK3		57.95	-0.63	-1.06	68.70	-0.68	-1.05	GL
AD9JG2		57.98	-0.61	-1.02	69.00	-0.38	-0.59	GL
AMXDKC		58.18	-0.41	-0.68	68.73	-0.65	-1.01	MM
AVADFM	X	52.43	-6.16	-10.32	60.88	-8.50	-13.20	RA
BXPDKT		58.75	0.17	0.28	69.55	0.17	0.27	GK
C23HRM	X	34.83	-23.76	-39.81	33.43	-35.95	-55.80	GN
DD2K2B	*	58.28	-0.31	-0.51	68.10	-1.28	-1.98	GL
DF2T6K		58.78	0.19	0.32	69.20	-0.18	-0.28	GL
ELB9E9		59.38	0.79	1.33	70.00	0.62	0.97	GL
EPLJ6H	X	62.75	4.17	6.98	62.83	-6.55	-10.17	MW
FQT8TM		59.35	0.77	1.29	69.88	0.50	0.77	GL
G2DPCL		57.95	-0.63	-1.06	68.70	-0.68	-1.05	GL



Interlaboratory Testing Program for Color & Appearance

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Analysis 440

4th Qtr 2019

60 Degree Gloss - Paint Chips

ASTM Method D 523

WebCode	Data Flag	Sample H191			Sample H192			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
GA2TRZ		58.43	-0.16	-0.26	69.25	-0.13	-0.20	GX
H96MFZ		58.68	0.09	0.16	69.45	0.07	0.11	GK
HLRWZJ		58.30	-0.28	-0.47	69.43	0.05	0.07	GL
J2EM7C		59.10	0.52	0.87	69.98	0.60	0.93	GN
JL8N2F		59.03	0.44	0.74	69.73	0.35	0.54	GL
JRZCA9		59.00	0.42	0.70	69.60	0.22	0.34	GL
JW6FVZ		59.08	0.49	0.83	69.65	0.27	0.42	GL
KACKLT		59.28	0.69	1.16	70.20	0.82	1.28	GN
KUZ84V		58.05	-0.53	-0.89	68.68	-0.70	-1.09	GK
M72KFC		59.05	0.47	0.78	69.73	0.35	0.54	GL
MEVP9D		57.68	-0.91	-1.52	68.30	-1.08	-1.67	GK
NC2DWK		58.83	0.24	0.41	69.43	0.05	0.07	GN
NDXQGR	*	57.70	-0.88	-1.48	69.30	-0.08	-0.12	GL
NF7TDP		58.90	0.32	0.53	69.75	0.37	0.58	GL
NJ3M3D		58.98	0.39	0.66	70.10	0.72	1.12	GL
NWWWZK		58.08	-0.51	-0.85	68.95	-0.43	-0.66	GL
PF3NFR		57.83	-0.76	-1.27	68.53	-0.85	-1.32	GL
Q2WTWP		57.90	-0.68	-1.14	68.60	-0.78	-1.21	GK
QTYCXJ		58.70	0.12	0.20	69.40	0.02	0.03	GL
RA98G7		59.40	0.82	1.37	70.48	1.10	1.70	GL
RQU47E		57.23	-1.36	-2.27	67.78	-1.60	-2.49	GL
RY3LRJ		58.62	0.04	0.06	69.64	0.26	0.41	GL
T6QH4M		59.23	0.64	1.08	69.35	-0.03	-0.04	GN
TBGV6B		57.73	-0.86	-1.44	68.90	-0.48	-0.74	GL
TYML9U		58.13	-0.46	-0.77	68.43	-0.95	-1.48	GL
UJPWRN		58.95	0.37	0.62	70.40	1.02	1.59	GL
URWN7J	*	57.38	-1.21	-2.02	68.85	-0.53	-0.82	GK
V9LYJE		58.15	-0.43	-0.72	69.20	-0.18	-0.28	GB
VQHDTD		58.60	0.02	0.03	69.83	0.45	0.69	GN
VTRAQ3	*	58.90	0.32	0.53	68.68	-0.70	-1.09	GK



Interlaboratory Testing Program for Color & Appearance

Report #190

Analysis 440

4th Qtr 2019

60 Degree Gloss - Paint Chips

ASTM Method D 523

WebCode	Data Flag	Sample H191			Sample H192			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
VW9YMK		58.20	-0.38	-0.64	68.90	-0.48	-0.74	GL
WT24GM	X	59.08	0.49	0.83	70.98	1.60	2.48	GK
XCWW2K		59.35	0.77	1.29	70.48	1.10	1.70	ZA
XD9NWM		58.58	-0.01	-0.01	68.90	-0.48	-0.74	RA
Y4C637		59.28	0.69	1.16	69.93	0.55	0.85	GN
YFPAA3		58.30	-0.28	-0.47	68.90	-0.48	-0.74	GL
Z9JYEU		58.08	-0.51	-0.85	68.98	-0.40	-0.63	GL
ZVXQLM		59.43	0.84	1.41	70.35	0.97	1.51	GK

Summary Statistics

Grand Means

58.58 Gloss Units

69.38 Gloss Units

Std Dev Btwn Labs

0.60 Gloss Units

0.64 Gloss Units

Statistics based on 64 of 68 reporting participants

Comments on Assigned Data Flags for Test #440

AVADFM(X) - Extreme data.

C23HRM(X) - Extreme data.

EPLJ6H(X) - Extreme data.

WT24GM(X) - Inconsistent in testing between samples.

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

GX BYK-Gardner (model not specified)

MM Macbeth Lab-Gloss

MW Minolta Multi-Gloss 268

RA Rhopoint Novo-Gloss Glossometer

ZA Zehntner ZGM Series

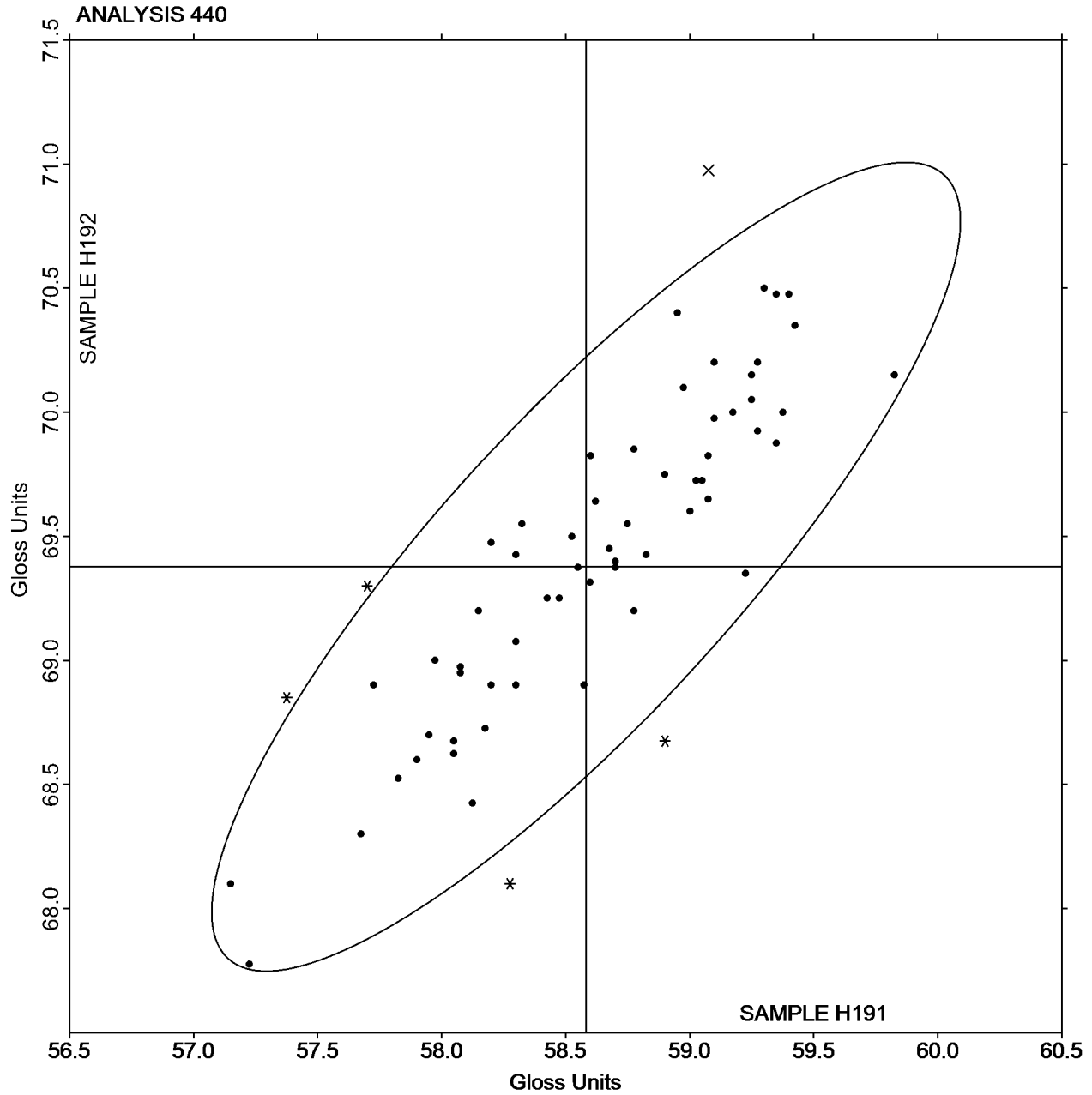


Interlaboratory Testing Program for Color & Appearance
Analysis 440
60 Degree Gloss - Paint Chips
ASTM Method D 523

Report #190
4th Qtr 2019

SAMPLE H191 = 58.58 Gloss Units

SAMPLE H192 = 69.38 Gloss Units



-End of Report-