

Color & Appearance Testing Program

Summary Report #194 - 4th Qtr 2020

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

[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:

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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 #194
Analysis 408 4th Qtr 2020

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^*	
3AKURZ		D201	61.54	-19.38	9.07	0.85	-0.04	-0.42	0.95	HX
		D202	62.40	-19.42	8.65					
3FCYL4	X	D201	60.56	-19.24	9.28	0.90	-0.02	-0.37	0.97	PR
		D202	61.46	-19.26	8.91					
499FXV		D201	62.05	-19.40	8.80	0.90	-0.10	-0.40	0.99	HW
		D202	62.95	-19.50	8.40					
4PVTQ	X	D201	44.63	-19.11	9.33	0.94	0.03	-0.28	0.98	GB
		D202	45.56	-19.07	9.05					
7FWAL8		D201	61.95	-19.48	8.57	0.87	0.03	-0.39	0.95	HW
		D202	62.82	-19.45	8.18					
86TE43		D201	61.58	-19.17	9.23	0.83	0.05	-0.32	0.89	XU
		D202	62.41	-19.12	8.90					
89FQBK		D201	61.61	-19.15	9.25	1.07	0.00	-0.29	1.11	XU
		D202	62.68	-19.15	8.97					
8CE37K		D201	61.51	-19.06	8.66	0.83	0.04	-0.32	0.89	HW
		D202	62.34	-19.02	8.34					
974GRL		D201	61.60	-19.17	9.36	0.77	-0.10	-0.43	0.89	MF
		D202	62.37	-19.26	8.93					
9K3H4M		D201	61.54	-19.70	9.49	0.94	0.07	-0.20	0.96	BG
		D202	62.48	-19.63	9.28					
A9PG8U		D201	61.92	-19.23	9.47	0.80	-0.06	-0.43	0.91	GE
		D202	62.72	-19.29	9.04					
AB8Y3J		D201	62.14	-19.09	9.13	0.82	0.05	-0.32	0.88	XE
		D202	62.96	-19.04	8.81					
AD2RX3		D201	61.82	-19.28	8.65	0.86	0.02	-0.36	0.93	HW
		D202	62.67	-19.26	8.29					
AMNQP9		D201	61.92	-19.02	9.25	0.86	0.02	-0.36	0.93	XD
		D202	62.77	-19.00	8.90					
APDVLL		D201	61.71	-19.11	8.72	0.84	-0.08	-0.41	0.94	HW
		D202	62.55	-19.19	8.31					
B9Y7LQ	X	D201	61.07	-18.95	9.20	0.76	-0.04	-0.43	0.87	HX
		D202	61.82	-18.99	8.77					



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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^*	
BDDN48		D201	61.56	-19.10	9.21	0.88	-0.02	-0.36	0.96	XU
		D202	62.44	-19.12	8.85					
EAKUWG		D201	61.88	-19.09	9.50	0.87	-0.07	-0.41	0.96	GE
		D202	62.75	-19.16	9.09					
ECCPJP		D201	61.90	-19.20	8.50	0.90	0.00	-0.40	0.98	HW
		D202	62.80	-19.20	8.10					
F6A36V		D201	61.97	-19.29	9.27	0.89	0.00	-0.37	0.96	XU
		D202	62.86	-19.29	8.90					
FETPVB		D201	61.60	-19.13	9.03	0.90	-0.05	-0.32	0.95	XN
		D202	62.49	-19.18	8.72					
GVT7EE		D201	61.75	-19.17	9.28	0.89	0.09	-0.32	0.96	XC
		D202	62.65	-19.08	8.95					
H827LR		D201	61.76	-19.26	8.51	0.93	0.02	-0.33	0.99	MG
		D202	62.68	-19.24	8.18					
HNQG9U		D201	61.81	-19.20	9.09	0.88	0.05	-0.39	0.96	XM
		D202	62.69	-19.14	8.70					
J8LAUT		D201	61.25	-19.10	9.25	0.85	0.00	-0.32	0.91	GG
		D202	62.10	-19.09	8.93					
LTD6JH		D201	62.04	-19.30	8.71	0.86	-0.06	-0.42	0.96	HW
		D202	62.90	-19.36	8.28					
MBNEXN		D201	61.79	-19.40	9.10	0.65	0.00	-0.37	0.75	XZ
		D202	62.44	-19.40	8.73					
MLAH6M		D201	61.72	-19.34	9.40	0.89	0.05	-0.28	0.94	GH
		D202	62.61	-19.29	9.12					
MPAU2M		D201	62.38	-19.26	9.24	0.86	-0.10	-0.44	0.97	XE
		D202	63.23	-19.36	8.80					
NB8KWE		D201	61.62	-19.02	8.53	0.84	-0.07	-0.42	0.94	XX
		D202	62.46	-19.09	8.11					
P2XFKN	X	D201	61.74	-21.40	8.80	0.88	0.05	-0.34	0.94	XU
		D202	62.62	-21.34	8.46					
PB2PQD		D201	61.75	-19.13	9.04	0.86	0.00	-0.34	0.93	XO
		D202	62.61	-19.13	8.70					



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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^*	
PLZMCR		D201	62.11	-19.50	8.70	0.81	-0.05	-0.42	0.92	HW
		D202	62.93	-19.54	8.28					
QHUGCC		D201	61.64	-18.74	8.75	0.86	0.00	-0.32	0.92	HK
		D202	62.50	-18.74	8.44					
QPFANC		D201	61.62	-19.32	9.62	0.88	-0.05	-0.41	0.98	BG
		D202	62.50	-19.37	9.21					
RYYBGQ		D201	61.66	-19.69	9.56	0.90	0.06	-0.33	0.96	BG
		D202	62.56	-19.63	9.23					
TMYZNA		D201	62.04	-19.18	9.31	0.82	-0.09	-0.41	0.92	XS
		D202	62.86	-19.27	8.89					
TX6HL8		D201	61.36	-19.14	9.20	0.86	0.01	-0.36	0.94	HY
		D202	62.22	-19.13	8.84					
UFVDAF	X	D201	60.85	-18.76	9.64	0.80	-0.09	-0.42	0.90	MP
		D202	61.64	-18.84	9.22					
VMFN6V		D201	61.94	-19.09	9.71	0.81	-0.07	-0.41	0.91	GE
		D202	62.75	-19.16	9.30					
VXWK2L		D201	61.88	-19.40	9.54	0.89	0.02	-0.28	0.93	GE
		D202	62.77	-19.38	9.26					
W3M9Y6		D201	62.00	-19.40	8.60	0.80	-0.05	-0.40	0.90	HW
		D202	62.80	-19.45	8.20					
WA4PRE		D201	61.70	-19.14	9.22	0.84	-0.01	-0.37	0.92	XU
		D202	62.54	-19.14	8.85					
WBB6XK		D201	61.85	-19.09	9.47	0.84	-0.11	-0.43	0.95	GA
		D202	62.70	-19.20	9.04					
Y7HMXE		D201	61.97	-18.69	8.94	0.81	-0.10	-0.42	0.91	MU
		D202	62.78	-18.79	8.52					
YKBEHF		D201	61.63	-19.10	9.01	0.86	-0.02	-0.35	0.93	XO
		D202	62.49	-19.12	8.66					
Z3PBBD		D201	61.62	-19.24	8.56	0.85	0.02	-0.33	0.91	HW
		D202	62.47	-19.21	8.24					



Summary Statistics							
<u>Samples</u>	<u>L*</u>	<u>a*</u>	<u>b*</u>	<u>ΔL*</u>	<u>Δa*</u>	<u>Δb*</u>	<u>ΔE*</u>
Grand Means							
D201	61.78	-19.19	9.10	0.86	-0.02	-0.37	0.94
D202	62.64	-19.21	8.73				
Stnd Dev Btwn Labs							
D201	0.22	0.20	0.34	0.06	0.05	0.05	0.05
D202	0.22	0.19	0.35				

Statistics based on 42 of 47 reporting participants

Comments Assigned on Data Flags for Test #408

- 3FCYL4(X) - Low "L*" values. Large replication difference for D201 "L*" values.
- 4PVTQC(X) - Extreme data for "L*" values.
- B9Y7LQ(X) - Low "L*" values.
- P2XFKN(X) - Extreme data for "a*" values.
- UFVDAF(X) - Low "L*" values.

Key to Instrument Codes Reported by Participants

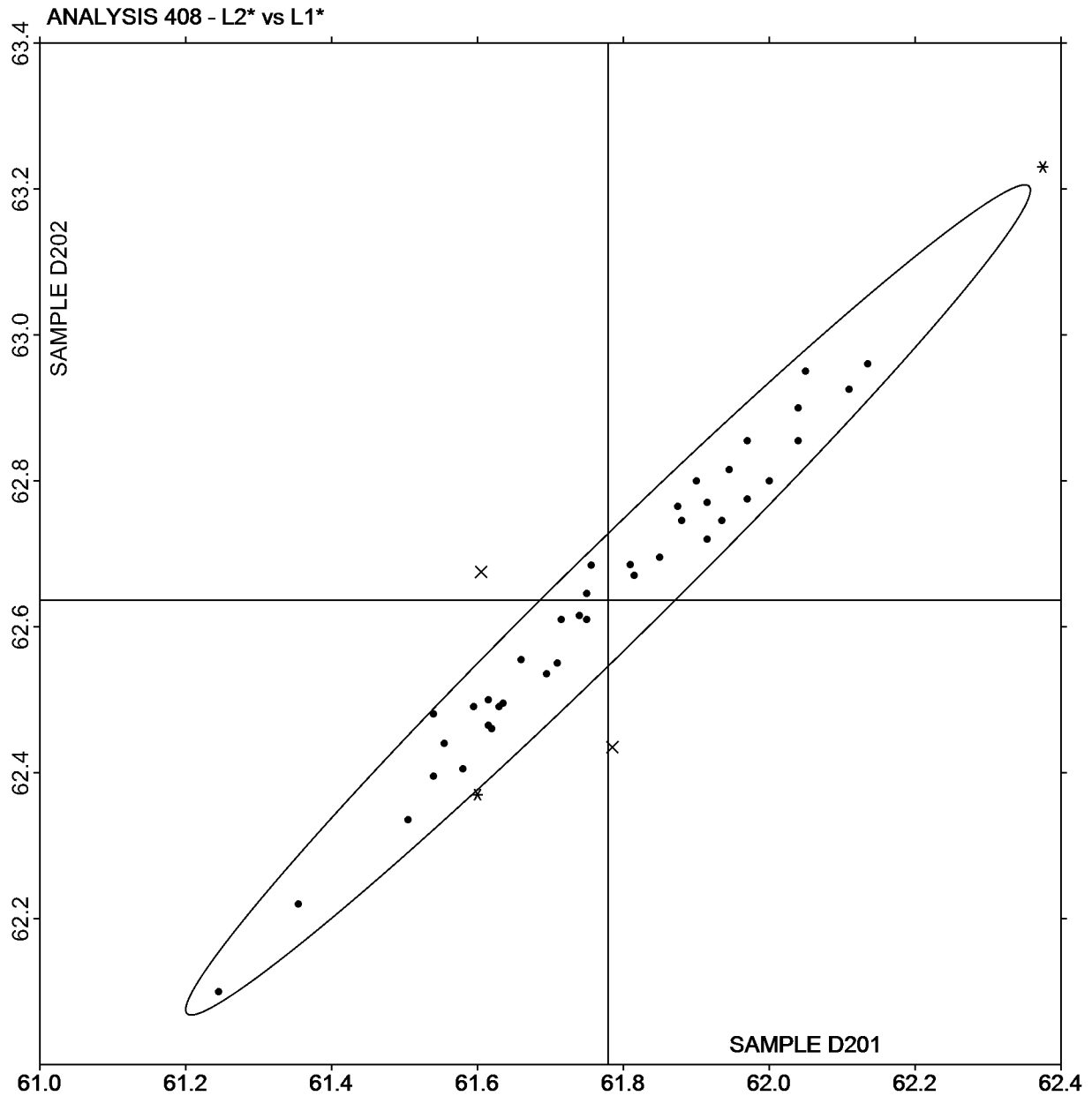
BG BYK Mac i	GA BYK-Gardner
GB BYK-Gardner spectro-guide sphere gloss	GE BYK-Gardner spectro-guide (45/0)
GG BYK-Gardner spectro2-guide (45/0) gloss	GH BYK-Gardner Color-View
HK Hunter MiniScan XE (45/0)	HW Hunter LabScan XE
HX Hunter Color FlexEZ 45/0	HY Hunter Color Flex 45/0
MF Minolta FD Series	MG Macbeth 1500/PLUS or 2025+ Color Eye
MP Minolta CM-2500c Spectrophotometer	MU Minolta
PR PhotoResearch PR730	XC X-Rite i1Basic Pro
XD X-Rite 500 Series SpectroDensitometer	XE X-Rite eXact Portable Spectrophotometer
XM X-Rite MA58 Multi-Angle Spectrophotometer	XN X-Rite MA68 Multi-Angle Spectrophotometer
XO X-Rite MA68 II Multi-Angle Spectrophotometer	XS X-Rite 962 Portable Spectrophotometer
XU X-Rite 964 Portable Spectrophotometer	XX Instrument make/model not specified by lab
XZ X-Rite	



L2* vs L1*

SAMPLE D201 = 61.78

SAMPLE D202 = 62.64

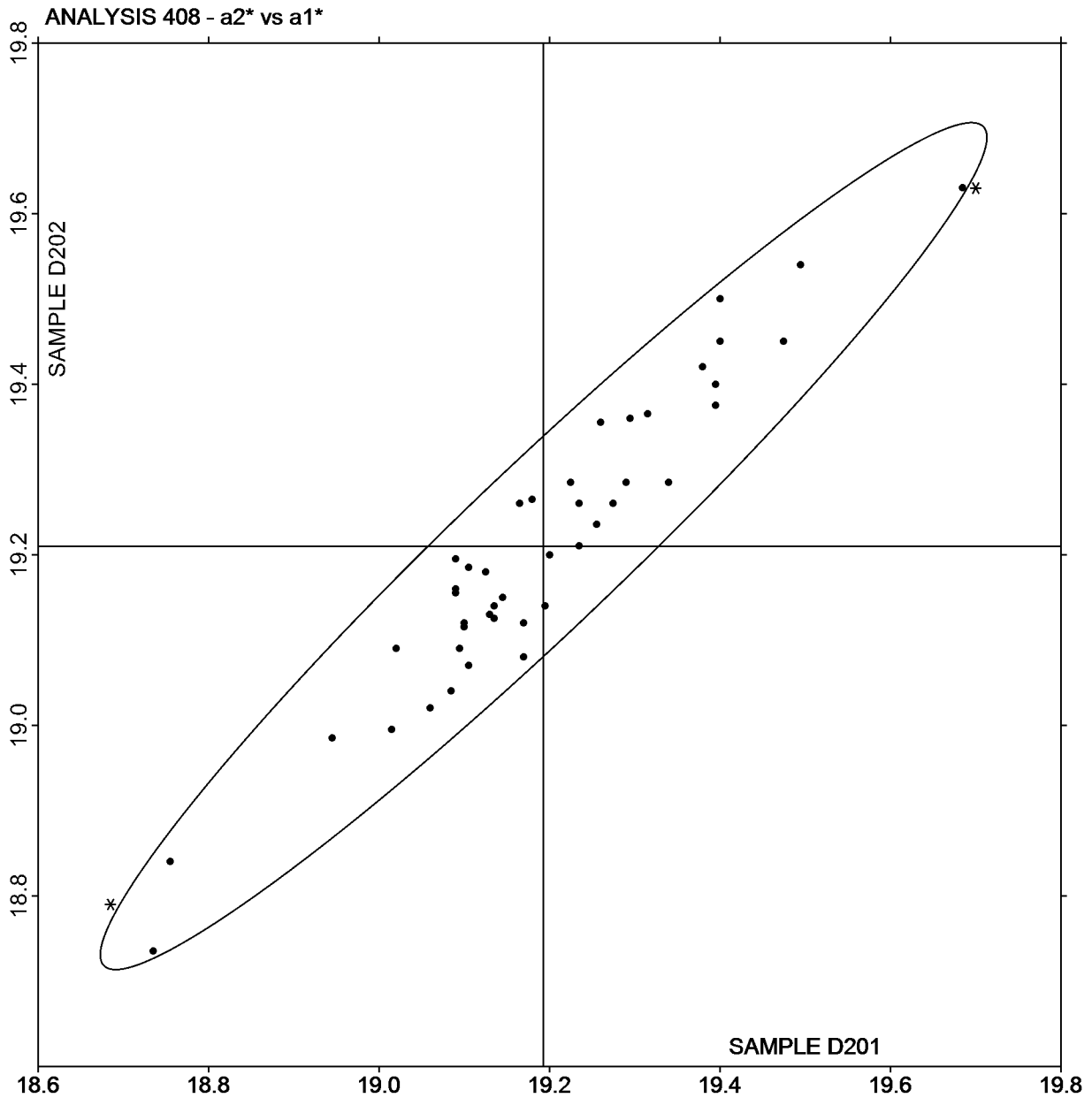




a2* vs a1*

SAMPLE D201 = -19.19

SAMPLE D202 = -19.21



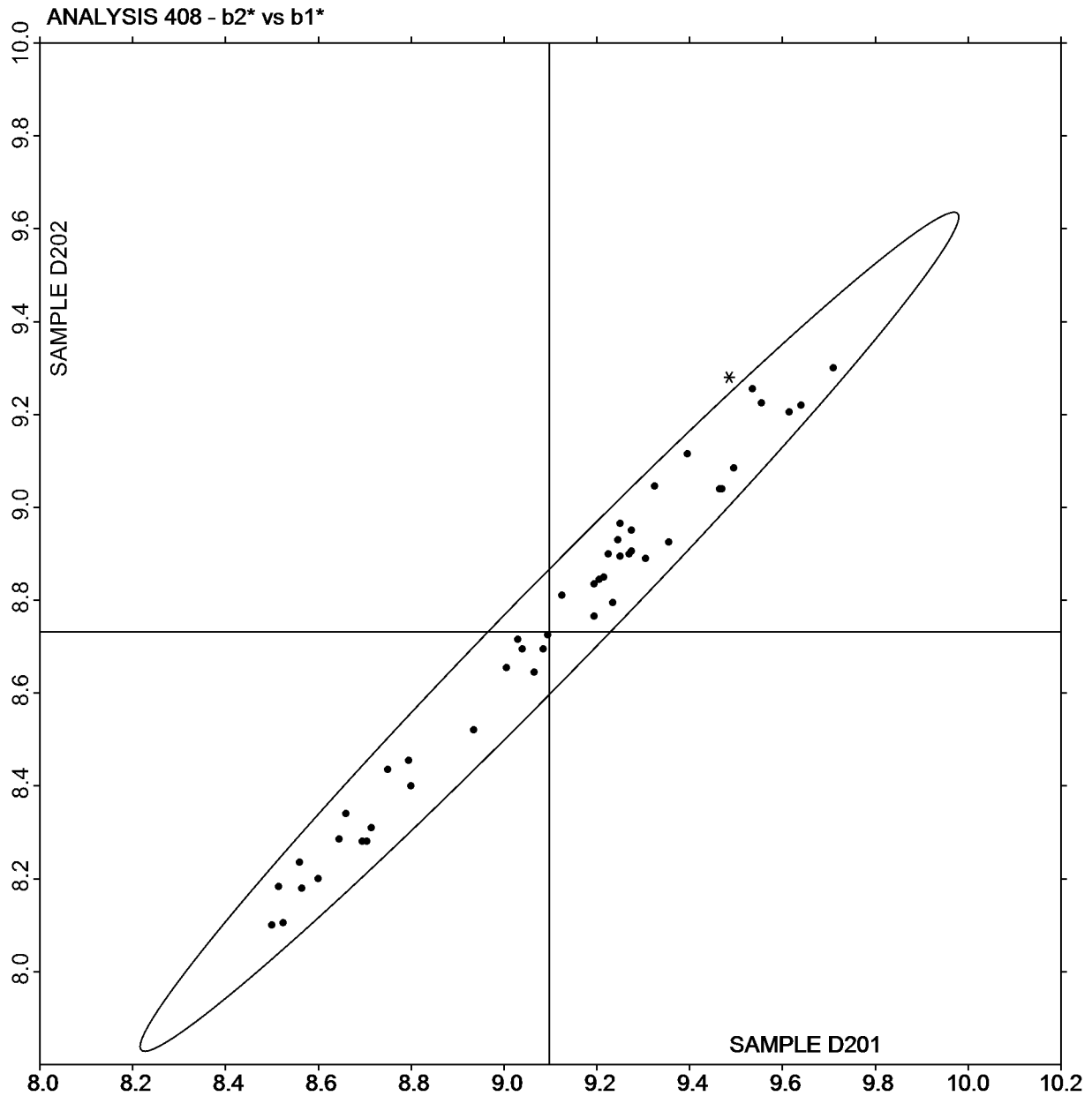
Plot created using absolute values.



b2* vs b1*

SAMPLE D201 = 9.10

SAMPLE D202 = 8.73





CTS Interlaboratory Testing Program for Color & Appearance

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Analysis 409

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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^*	
2G4XZ3		D201	62.13	-18.96	8.82	0.84	-0.06	-0.42	0.94	HP
		D202	62.97	-19.03	8.40					
3AZBK8		D201	61.79	-18.73	8.69	0.86	0.18	-0.39	0.96	XI
		D202	62.64	-18.55	8.30					
3FCYL4		D201	62.08	-18.87	8.68	0.77	-0.09	-0.42	0.88	CA
		D202	62.85	-18.96	8.26					
3HEZL2		D201	62.15	-18.88	8.70	0.86	-0.04	-0.39	0.95	AH
		D202	63.01	-18.92	8.31					
3PGART		D201	62.24	-18.89	8.60	0.85	-0.06	-0.41	0.95	AQ
		D202	63.10	-18.95	8.19					
3R6HZA	X	D201	62.22	-18.80	8.23	0.86	0.06	-0.32	0.92	HH
		D202	63.08	-18.74	7.91					
3XQBUD		D201	62.14	-18.91	8.76	0.88	0.04	-0.34	0.95	AS
		D202	63.02	-18.87	8.42					
4PVTCQ	X	D201	44.63	-19.11	9.33	0.94	0.03	-0.28	0.98	GD
		D202	45.56	-19.07	9.05					
4Q46R8		D201	62.14	-18.95	8.64	0.89	-0.05	-0.32	0.94	AJ
		D202	63.03	-19.00	8.32					
4QPL8A		D201	61.84	-18.78	8.65	0.85	-0.06	-0.42	0.95	XI
		D202	62.69	-18.85	8.23					
6F4WNU		D201	62.18	-18.87	8.94	0.87	-0.02	-0.39	0.95	AS
		D202	63.05	-18.89	8.55					
6VR8BW		D201	62.29	-18.97	8.86	0.82	-0.12	-0.39	0.92	AS
		D202	63.12	-19.09	8.47					
77URB4		D201	62.17	-18.85	8.83	0.87	0.02	-0.38	0.95	AS
		D202	63.04	-18.83	8.45					
7FYYP		D201	62.16	-18.78	8.94	0.85	-0.02	-0.41	0.95	AS
		D202	63.01	-18.80	8.52					
7XCJM8		D201	61.82	-18.56	8.53	0.86	0.05	-0.34	0.92	MM
		D202	62.68	-18.51	8.20					
8346VL		D201	62.15	-18.77	8.91	0.85	-0.08	-0.41	0.95	AJ
		D202	63.01	-18.85	8.50					



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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^*	
89FQBK		D201	61.81	-18.93	8.42	0.91	0.04	-0.31	0.96	XI
		D202	62.72	-18.90	8.10					
8UYT6J		D201	62.16	-19.06	8.70	0.84	0.02	-0.34	0.91	AJ
		D202	63.01	-19.04	8.36					
94G2Y7		D201	61.83	-18.76	8.63	0.85	-0.06	-0.40	0.94	XI
		D202	62.68	-18.83	8.23					
9KPT3V		D201	61.92	-19.02	8.98	0.82	-0.06	-0.41	0.92	CA
		D202	62.75	-19.08	8.57					
9PGZL6		D201	62.39	-18.90	8.60	0.90	0.00	-0.36	0.97	XO
		D202	63.29	-18.90	8.24					
ACL7N2		D201	62.22	-18.88	8.77	0.89	0.06	-0.32	0.94	AO
		D202	63.11	-18.82	8.45					
AF4Q9V		D201	62.19	-18.87	8.75	0.87	-0.01	-0.35	0.94	AO
		D202	63.06	-18.88	8.40					
AULHX3		D201	62.22	-18.82	8.89	0.83	-0.05	-0.44	0.94	AJ
		D202	63.05	-18.87	8.45					
AUM94K		D201	61.94	-18.75	8.62	0.89	0.05	-0.31	0.95	XI
		D202	62.83	-18.71	8.30					
AWBK3Q		D201	62.02	-18.85	8.69	0.88	-0.01	-0.41	0.97	AQ
		D202	62.90	-18.86	8.27					
B2MUTY		D201	62.11	-18.90	8.94	0.85	-0.05	-0.42	0.95	AB
		D202	62.96	-18.95	8.51					
BDHWEF		D201	61.72	-18.70	8.73	0.84	0.00	-0.35	0.91	XH
		D202	62.56	-18.70	8.38					
CNTVF2		D201	61.74	-18.89	8.78	0.88	0.06	-0.33	0.94	XH
		D202	62.62	-18.83	8.44					
CQKUTZ		D201	62.17	-18.79	8.70	0.90	-0.04	-0.31	0.95	AO
		D202	63.06	-18.82	8.39					
CYD3EQ		D201	62.22	-19.13	8.96	0.84	-0.07	-0.42	0.94	CA
		D202	63.06	-19.19	8.54					
D3L86G		D201	61.74	-19.04	8.52	0.96	-0.02	-0.32	1.01	XM
		D202	62.70	-19.06	8.19					



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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^*	
EAKUWG	X	D201	61.98	-18.84	8.35	0.82	-0.05	-0.40	0.92	MM
		D202	62.80	-18.89	7.95					
EPX3VZ		D201	61.97	-18.87	8.59	0.87	-0.01	-0.37	0.95	XB
		D202	62.84	-18.88	8.22					
ETDWBW		D201	62.10	-18.67	8.59	0.91	0.03	-0.30	0.96	AJ
		D202	63.01	-18.64	8.29					
F3H4QW		D201	62.02	-18.81	8.52	0.83	-0.08	-0.42	0.93	XI
		D202	62.85	-18.89	8.10					
F3WQ3J		D201	62.04	-18.98	8.62	0.86	0.00	-0.36	0.93	MM
		D202	62.90	-18.98	8.26					
F6A36V		D201	61.98	-18.79	8.55	0.85	0.02	-0.38	0.93	XI
		D202	62.83	-18.77	8.17					
FBCAJX		D201	62.12	-18.97	8.75	0.87	0.00	-0.36	0.94	AS
		D202	62.98	-18.96	8.40					
FCP2CE		D201	61.99	-18.85	8.71	0.89	0.05	-0.31	0.94	MM
		D202	62.87	-18.80	8.39					
FETPVB	X	D201	61.73	-18.71	8.38	0.87	-0.06	-0.43	0.97	XO
		D202	62.60	-18.78	7.94					
FM6TY4		D201	62.03	-18.55	8.64	0.82	-0.07	-0.41	0.92	MM
		D202	62.86	-18.62	8.23					
G9ZWF2		D201	62.06	-18.70	8.91	0.85	0.01	-0.37	0.93	XB
		D202	62.91	-18.69	8.54					
GDUQD3		D201	62.19	-18.84	8.78	0.83	0.03	-0.34	0.90	AS
		D202	63.02	-18.82	8.44					
HNQG9U		D201	61.96	-18.78	8.76	0.84	-0.04	-0.37	0.91	XQ
		D202	62.79	-18.83	8.40					
HYRG9T	X	D201	61.87	-18.75	8.69	0.48	-0.02	-0.15	0.51	XB
		D202	62.35	-18.77	8.53					
J6WZMC		D201	62.10	-18.81	8.91	0.86	-0.07	-0.42	0.96	MT
		D202	62.96	-18.88	8.49					
JBKKPR		D201	62.04	-18.99	8.73	0.84	0.05	-0.31	0.89	MK
		D202	62.87	-18.93	8.42					



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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^*	
JP2HVT		D201	61.91	-18.78	8.59	0.83	-0.05	-0.42	0.93	XB
		D202	62.74	-18.83	8.17					
KCRZWX		D201	61.89	-18.77	8.66	0.84	-0.01	-0.34	0.91	XO
		D202	62.73	-18.78	8.32					
LCRGC9		D201	61.95	-18.99	8.62	0.88	0.06	-0.32	0.94	XD
		D202	62.83	-18.93	8.30					
LFP32Q		D201	62.16	-18.83	8.72	0.88	0.09	-0.34	0.95	AJ
		D202	63.04	-18.74	8.38					
LWCGFH		D201	61.98	-18.82	8.91	0.82	-0.07	-0.41	0.92	MW
		D202	62.81	-18.89	8.50					
M2NQ7Q		D201	61.95	-18.92	8.55	0.88	0.05	-0.34	0.94	XR
		D202	62.82	-18.86	8.21					
M7UKZM		D201	62.27	-18.68	9.04	0.83	-0.09	-0.40	0.93	AO
		D202	63.10	-18.76	8.64					
M7W8FF		D201	62.11	-18.88	8.77	0.86	0.02	-0.35	0.93	AS
		D202	62.97	-18.86	8.42					
M9Y6Q9		D201	61.83	-18.92	8.62	0.85	-0.07	-0.41	0.94	XI
		D202	62.68	-18.99	8.22					
MBR2DG		D201	61.78	-18.74	8.62	0.86	-0.02	-0.36	0.94	XH
		D202	62.64	-18.76	8.26					
MHB6KJ		D201	61.79	-18.67	8.60	0.84	-0.09	-0.38	0.92	XM
		D202	62.62	-18.76	8.22					
MJHJQP		D201	62.20	-19.07	8.88	0.86	0.02	-0.36	0.93	AS
		D202	63.06	-19.05	8.52					
MKYGJN		D201	62.10	-18.74	8.76	0.87	-0.03	-0.33	0.93	AJ
		D202	62.97	-18.77	8.43					
MLAH6M		D201	62.13	-19.00	8.73	0.87	0.02	-0.35	0.93	MV
		D202	63.00	-18.98	8.39					
MQ2PNW		D201	62.39	-19.14	8.81	0.86	0.04	-0.38	0.94	CA
		D202	63.25	-19.10	8.44					
N7QC9E		D201	62.18	-18.76	8.83	0.83	-0.08	-0.42	0.94	AS
		D202	63.01	-18.84	8.40					



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4th Qtr 2020

**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^*	
NZLFMT		D201	62.09	-18.81	8.70	0.85	-0.07	-0.42	0.96	AM
		D202	62.95	-18.89	8.28					
PJUT22		D201	61.83	-18.95	8.49	0.87	0.03	-0.31	0.92	XI
		D202	62.70	-18.92	8.17					
PMEPM7		D201	61.93	-18.57	8.77	0.84	-0.09	-0.41	0.94	MM
		D202	62.77	-18.65	8.36					
QFCZGL		D201	61.96	-18.86	8.74	0.88	0.02	-0.39	0.96	XI
		D202	62.84	-18.84	8.35					
QMNE23	X	D201	62.20	-19.08	8.18	0.85	-0.08	-0.43	0.96	XD
		D202	63.05	-19.16	7.75					
QPDM9J		D201	62.46	-19.17	8.79	0.88	0.07	-0.36	0.95	CA
		D202	63.34	-19.09	8.44					
QXQCAC		D201	61.95	-18.80	8.75	0.90	0.05	-0.30	0.95	MS
		D202	62.85	-18.75	8.45					
R4AYGM		D201	61.96	-19.00	8.73	0.88	0.07	-0.32	0.94	HP
		D202	62.85	-18.93	8.42					
RTTFXQ		D201	61.85	-19.05	8.65	0.82	0.00	-0.35	0.89	MY
		D202	62.68	-19.05	8.31					
RVJG4E		D201	61.89	-18.91	8.84	0.84	-0.09	-0.42	0.95	MV
		D202	62.74	-18.99	8.42					
RZXAZY		D201	62.03	-18.97	8.71	0.86	0.10	-0.31	0.92	AS
		D202	62.89	-18.87	8.39					
T7BMAH		D201	61.82	-18.79	8.72	0.88	-0.04	-0.40	0.96	XH
		D202	62.70	-18.83	8.32					
TJZLZK		D201	61.83	-18.90	8.56	0.84	-0.01	-0.37	0.92	XI
		D202	62.67	-18.91	8.20					
TMYZNA		D201	62.07	-18.71	8.92	0.81	-0.09	-0.40	0.91	AJ
		D202	62.88	-18.79	8.51					
U4MBBC		D201	62.21	-18.81	8.89	0.84	-0.09	-0.43	0.95	AJ
		D202	63.05	-18.89	8.47					
UFVDAF		D201	62.07	-18.99	8.80	0.88	-0.09	-0.39	0.97	XB
		D202	62.95	-19.07	8.41					



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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^*	
UWJQM8		D201	61.93	-18.75	8.79	0.84	-0.08	-0.43	0.95	XB
		D202	62.77	-18.83	8.36					
VJY9TH		D201	61.83	-18.90	8.50	0.92	0.05	-0.30	0.97	XH
		D202	62.75	-18.85	8.20					
VK7NZN		D201	62.04	-19.01	8.73	0.90	0.05	-0.34	0.96	MV
		D202	62.94	-18.95	8.40					
VP2HYB		D201	61.80	-18.72	8.49	0.86	0.05	-0.30	0.91	XI
		D202	62.66	-18.67	8.19					
WA4PRE		D201	62.04	-18.74	8.63	0.88	0.00	-0.35	0.94	XI
		D202	62.91	-18.75	8.28					
WBB6XK		D201	62.18	-18.67	8.96	0.85	-0.07	-0.44	0.95	AJ
		D202	63.02	-18.74	8.53					
WFALBE		D201	62.20	-18.91	8.61	0.88	0.05	-0.31	0.93	AO
		D202	63.08	-18.86	8.30					
WKNWQ4		D201	61.80	-18.70	8.76	0.85	-0.08	-0.42	0.95	XI
		D202	62.65	-18.77	8.35					
Y7HMXE		D201	62.01	-18.83	8.98	0.80	-0.08	-0.42	0.91	MW
		D202	62.81	-18.91	8.57					
YKBEHF		D201	62.12	-18.76	8.69	0.86	0.02	-0.39	0.95	MI
		D202	62.99	-18.74	8.30					
YVC3AC		D201	61.96	-18.73	8.67	0.86	0.00	-0.35	0.93	XB
		D202	62.82	-18.73	8.32					
YWVLG6		D201	62.18	-18.71	8.69	0.84	-0.07	-0.37	0.92	XH
		D202	63.01	-18.78	8.32					
ZE7XMZ		D201	62.17	-18.87	8.74	0.85	-0.03	-0.37	0.93	AJ
		D202	63.02	-18.90	8.37					
ZFYQHJ		D201	62.19	-18.43	8.56	0.84	-0.07	-0.40	0.94	MM
		D202	63.04	-18.49	8.16					
ZNRY3A		D201	61.70	-18.69	8.55	0.87	-0.07	-0.39	0.96	XI
		D202	62.57	-18.76	8.16					



Summary Statistics							
<u>Samples</u>	<u>L*</u>	<u>a*</u>	<u>b*</u>	<u>ΔL*</u>	<u>Δa*</u>	<u>Δb*</u>	<u>ΔE*</u>
Grand Means							
D201	62.03	-18.84	8.72	0.86	-0.01	-0.37	0.94
D202	62.89	-18.86	8.35				
Std Dev Btwn Labs							
D201	0.17	0.14	0.13	0.03	0.06	0.04	0.02
D202	0.17	0.13	0.12				

Statistics based on 89 of 95 reporting participants

Comments Assigned on Data Flags for Test #409

- 3R6HZA(X) - Low "b*" values.
- 4PVTCQ(X) - Extreme data for "L*" values. High "b*" values. Large Delta L.
- EAKUWG(X) - Low "b*" values.
- FETPVB(X) - Low "b*" values for D202.
- HYRG9T(X) - Low "L*" values for D202. Large replication difference for "L*" and "b*" values for D202. Small Delta L & Delta E. Large Delta b.
- QMNE23(X) - Low "b*" values.

Key to Instrument Codes Reported by Participants

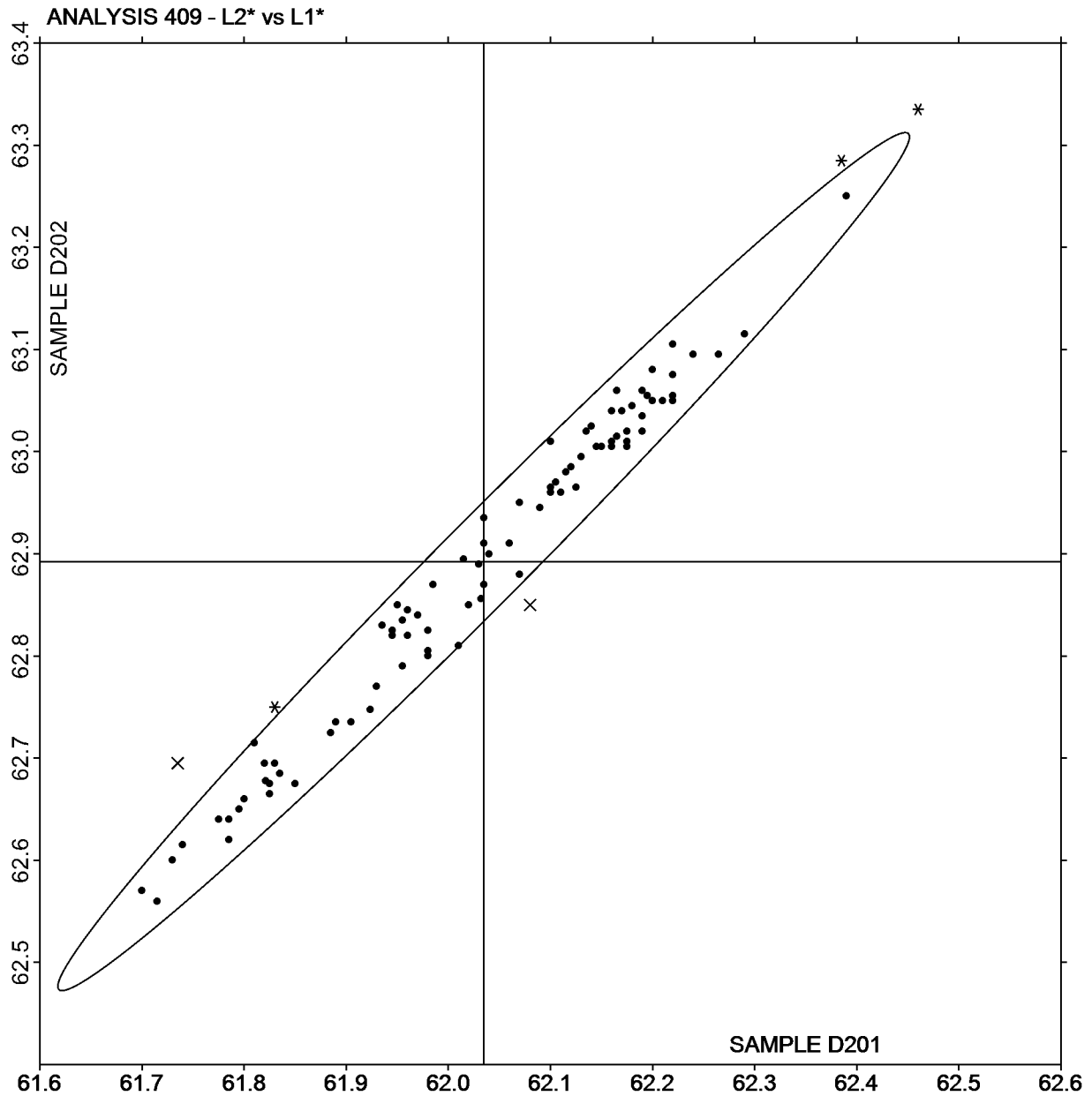
AB Datacolor 100	AH DataColor 550
AJ Datacolor 600	AM Datacolor 600 Plus
AO Datacolor 650x	AQ Datacolor 600x
AS Datacolor 800	CA Cary 5000
GD BYK-Gardner Spectro-Guide Sphere	HH Hunter ColorQUEST XE
HP Hunter UltraScan PRO	MI Macbeth Color i5
MK Macbeth Color-Eye 7000	MM Macbeth Color-Eye 7000a
MS Minolta CM-600d	MT Minolta CM-2600d
MV Minolta CM-3000d Spectrophotometer	MW Minolta CM 3700a Spectrophotometer
MY Minolta Benchtop Spectrophotometer CM-3600a	XB X-Rite Ci7000 Series Benchtop Spectrophotometer
XD X-Rite Ci7800 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	XQ X-Rite SP68 Portable Sphere Spectrophotometer
XR X-Rite	



L2* vs L1*

SAMPLE D201 = 62.03

SAMPLE D202 = 62.89

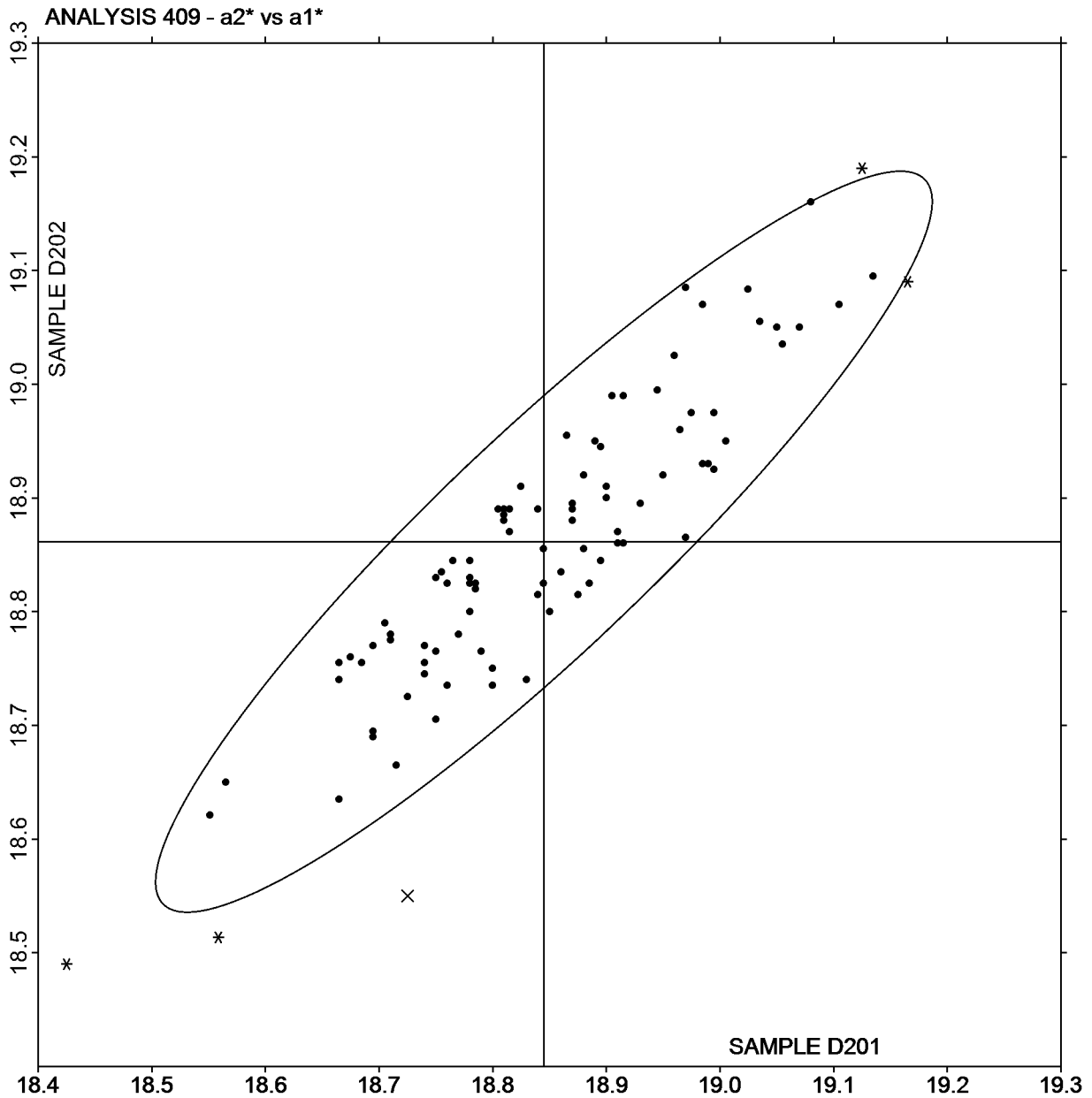




a2* vs a1*

SAMPLE D201 = -18.84

SAMPLE D202 = -18.86



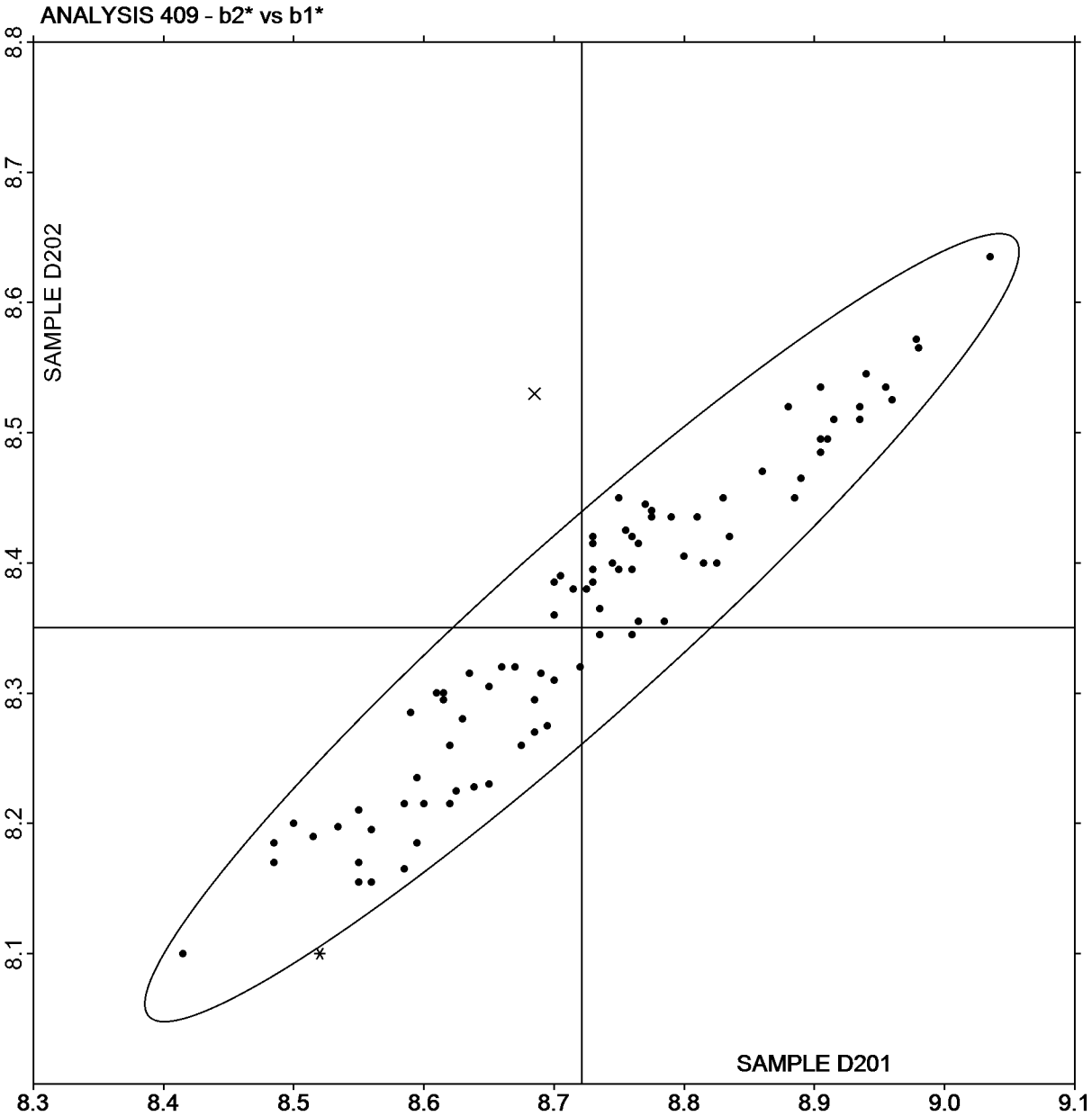
Plot created using absolute values.



b2* vs b1*

SAMPLE D201 = 8.72

SAMPLE D202 = 8.35





CTS Interlaboratory Testing Program for Color & Appearance Analysis 411

Report #194
4th Qtr 2020

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 D201																		
2G4XZ3		16.77	19.54	23.72	26.44	27.45	30.68	36.50	39.92	33.28	25.82	21.98	20.00	19.54*	21.16	20.98	18.85	HP
3AZBK8		16.17	19.33	23.38	26.18	27.17	30.30	35.95	39.20	32.78	25.47	21.73	19.90	19.70	20.85	20.56	18.57	XI
3FCYL4		16.61	19.51	23.68	26.52	27.38	30.53	36.40	40.03	33.20	25.66	21.93	20.07	19.78	21.10	20.86	18.83	CA
3HEZL2		16.65	19.65	23.72	26.55	27.53	30.57	36.47	39.84	33.42	25.77	22.02	20.10	19.84	21.00	20.76	18.81	AH
3PGART		17.21	19.76	23.95	26.70	27.67	30.78	36.69	39.92	33.40	25.87	22.08	20.19	19.97	21.15	21.03	18.90	AQ
3R6HZA		16.99	19.99	24.43X	26.74	27.71	30.89	36.78	39.96	33.29	25.80	21.92	20.15	19.75	21.76X	21.43X	19.45X	HH
3XQBUD		16.47	19.50	23.74	26.50	27.54	30.68	36.51	39.69	33.39	25.74	21.97	20.08	19.88	21.25	20.75	18.56	AS
4PVTCQ		18.62X	18.62X	22.85X	26.15	27.16	29.41X	36.39	40.14	32.96	25.69	21.65	18.33X	19.67	20.61*	20.68	19.09	GD
4Q46R8		16.50	19.67	23.86	26.52	27.56	30.68	36.52	39.68	33.30	25.74	21.94	20.07	19.87	21.12	20.76	18.66	AJ
4QPL8A		16.47	19.51	23.45	26.23	27.22	30.32	36.06	39.31	32.86	25.48	21.73	19.94	19.68	20.86	20.48	18.41	XI
6F4WNU		16.42	19.50	23.60	26.42	27.47	30.58	36.43	39.69	33.54	25.83	22.06	20.15	19.98	21.18	20.86	18.49	AS
6VR8BW		16.76	19.63	23.82	26.57	27.63	30.84	36.78	40.01	33.48	25.87	22.16	20.24	20.05	21.42	21.37*	19.02	AS
77URB4		16.44	19.66	23.74	26.52	27.60	30.67	36.58	34.66X	33.57	25.92	22.13	20.18	20.05	21.43	21.00	18.73	AS
7FYYP		16.42	19.41	23.61	26.39	27.43	30.62	36.43	39.56	33.48	25.89	22.10	20.19	20.00	21.28	20.83	18.64	AS
7XCJM8		16.48	19.59	23.53	26.26	27.26	30.38	36.00	39.14	32.94	25.61	21.72	19.92	19.71	20.85	20.66	18.64	MM
8346VL		16.48	19.58	23.60	26.39	27.44	30.55	36.40	39.63	33.44	25.86	22.10	20.17	19.98	21.27	20.99	18.66	AJ
89FQBK		16.56	19.66	23.55	26.35	27.29	30.39	36.12	39.31	32.81	25.42	21.56*	19.74	19.57	20.72	20.51	18.51	XI
8UYT6J		16.61	19.69	23.69	26.49	27.55	30.72	36.56	39.73	33.39	25.68	21.88	20.08	19.86	21.05	20.81	18.80	AJ
9KPT3V		16.26	19.17*	23.35	26.18	27.10	30.27	36.17	39.89	33.03	25.43	21.73	19.85	19.55	20.89	20.67	18.62	CA
9PGZL6		16.79	20.03*	24.02	26.90*	27.87*	31.00	37.16X	40.34	33.42	25.87	22.19	20.34	20.26X	21.50*	21.21	19.11	XO
ACL7N2		16.70	19.80	23.70	26.60	27.60	30.70	36.60	39.80	33.60	25.90	22.00	20.10	19.95	21.40	20.90	18.50	AN
AF4Q9V		16.61	19.71	23.71	26.53	27.56	30.70	36.53	39.59	33.53	25.87	22.02	20.13	19.93	21.18	20.95	18.73	AN



CTS Interlaboratory Testing Program for Color & Appearance Analysis 411

**Report #194
4th Qtr 2020**

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 D201																		
AULHX3		17.74X	19.64	23.70	26.44	27.49	30.61	36.49	39.77	33.53	25.89	22.12	20.21	20.04	21.15	20.94	19.06	AJ
AUM94K		16.28	19.65	23.56	26.39	27.36	30.53	36.16	39.47	33.11	25.68	21.75	19.90	19.70	21.00	20.53	18.55	XI
AWBK3Q		16.26	19.49	23.61	26.40	27.41	30.46	36.34	39.59	33.13	25.64	21.90	20.04	19.78	20.96	20.72	18.69	AQ
B2MUTY		16.28	19.50	23.52	26.36	27.41	30.58	36.39	39.68	33.31	25.82	22.01	20.07	19.83	21.02	20.86	18.78	AB
CNTVF2		16.10	19.35	23.24	26.07*	27.12	30.27	35.99	39.14	32.76	25.47	21.56*	19.80	19.55*	20.80	20.51	18.42	XH
CQKUTZ		16.56	19.71	23.66	26.60	27.55	30.57	36.44	39.69	33.42	25.88	22.04	20.14	19.94	21.11	20.96	18.87	AN
CYD3EQ		16.61	19.54	23.69	26.58	27.50	30.63	36.62	40.27	33.40	25.79	22.04	20.17	19.87	21.22	20.97	18.93	CA
EAKUWG		16.74	19.77	23.88	26.48	27.49	30.81	36.58	39.58	32.74	25.52	21.74	20.05	19.88	21.13	20.74	18.69	MM
EPX3VZ		16.65	19.62	23.64	26.38	27.40	30.57	36.33	39.57	32.90	25.58	21.82	20.04	19.78	21.00	20.58	18.59	XB
ETDWBW		16.67	19.71	23.79	26.53	27.52	30.61	36.43	39.54	33.37	25.74	22.02	20.09	19.95	21.15	20.82	18.69	AJ
F3H4QW		16.57	19.79	23.72	26.48	27.47	30.65	36.40	39.49	33.02	25.71	21.87	20.04	19.84	20.99	20.64	18.59	XI
F3WQ3J		16.53	19.60	23.73	26.44	27.44	30.69	36.44	39.70	33.05	25.62	21.78	20.03	19.81	21.08	20.79	18.72	MM
F6A36V		16.44	19.69	23.64	26.45	27.43	30.55	36.24	39.44	33.11	25.65	21.82	20.00	19.76	20.99	20.68	18.67	XI
FBCAJX		16.72	19.52	23.70	26.45	27.50	30.64	36.51	39.69	33.26	25.66	21.98	20.06	19.92	21.19	20.81	18.80	AS
FCP2CE		16.52	19.55	23.56	26.39	27.38	30.50	36.21	39.60	33.12	25.66	21.80	20.00	19.80	21.04	20.77	18.72	MM
FETPVB		17.38*	20.27X	24.20*	26.83*	27.86*	30.99	36.77	38.70	33.11	25.66	22.03	20.15	20.02	21.24	20.93	18.87	XO
FM6TY4		16.63	19.71	23.68	26.43	27.47	30.61	36.24	39.51	33.19	25.82	21.95	20.16	19.91	21.03	20.85	18.88	MM
G9ZWF2		16.50	19.58	23.50	26.28	27.35	30.49	36.20	39.56	33.29	25.87	22.01	20.13	19.87	21.01	20.72	18.70	XB
GDUQD3		16.52	19.71	23.76	26.49	27.49	30.65	36.46	39.74	33.52	25.81	22.08	20.15	19.95	21.26	20.96	18.73	AS
HYRG9T		16.47	19.55	23.48	26.19	27.20	30.33	36.09	39.38	32.89	25.54	21.77	19.99	19.70	20.90	20.61	18.60	XB
J6WZMC		16.25	19.43	23.64	26.46	27.39	30.51	36.52	39.81	33.32	25.74	21.99	20.13	19.89	21.16	20.92	18.86	MT
JBKKPR		16.40	19.51	23.60	26.41	27.41	30.61	36.34	39.71	33.13	25.68	21.77	19.98	19.75	21.01	20.77	18.74	MK



CTS Interlaboratory Testing Program for Color & Appearance Analysis 411

**Report #194
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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 D201																		
JP2HVT		16.63	19.60	23.60	26.31	27.31	30.48	36.14	39.40	32.92	25.55	21.77	20.00	19.74	20.95	20.49	18.49	XB
KCRZWX		16.43	19.48	23.43	26.36	27.26	30.44	36.39	39.49	32.71	25.52	21.71	19.98	19.84	21.01	20.77	18.73	XO
LFP32Q		16.63	19.69	23.76	26.51	27.47	30.56	36.41	39.68	33.52	25.82	22.02	20.12	19.88	21.05	20.84	18.88	AJ
M2NQ7Q		16.58	19.63	23.65	26.40	27.40	30.59	36.40	39.66	32.90	25.50	21.75	19.95	19.70	20.91	20.49	18.36	XR
M7UKZM		16.60	19.60	23.60	26.55	27.60	30.60	36.50	39.80	33.70	26.00	22.20	20.30	20.10	21.30	21.00	18.80	AN
M7W8FF		16.67	19.54	23.71	26.39	27.49	30.59	36.44	39.51	33.41	25.76	21.97	20.04	19.87	21.13	20.86	18.62	AS
MBR2DG		16.48	19.48	23.37	26.23	27.18	30.32	36.11	39.29	32.73	25.38	21.66	19.88	19.77	20.89	20.56	18.42	XH
MHB6KJ		16.80	19.60	23.80	26.45	27.50	30.70	36.60	39.40	32.75	25.60	21.90	20.10	19.70	21.30	21.15	19.30*	HW
MJHJQP		16.81	19.49	23.66	26.48	27.53	30.71	36.60	39.89	33.35	25.74	22.00	20.11	19.93	21.16	20.86	18.76	AS
MKYGJN		16.54	19.63	23.62	26.47	27.46	30.50	36.33	39.88	33.38	25.79	21.98	20.11	19.87	21.04	20.87	18.94	AJ
MLAH6M		16.55	19.61	23.75	26.52	27.44	30.67	36.79	39.90	33.22	25.60	21.92	20.08	19.95	21.22	21.04	18.89	MV
MQ2PNW		16.75	19.66	23.92	26.77	27.68	30.90	36.92*	40.59	33.53	25.84	22.07	20.21	19.93	21.30	21.05	18.96	CA
N7QC9E		16.64	19.56	23.76	26.46	27.50	30.56	36.38	39.70	33.47	25.83	22.11	20.20	20.02	21.23	20.96	18.61	AS
NZLFMT		16.57	19.59	23.74	26.48	27.51	30.61	36.51	39.75	33.18	25.79	21.98	20.09	19.87	21.01	20.81	18.72	AM
PJUT22		16.52	19.58	23.62	26.28	27.30	30.47	36.19	39.31	32.83	25.36	21.57*	19.84	19.64	20.81	20.47	18.43	XI
PMEPM7		16.48	19.50	23.47	26.29	27.25	30.38	36.04	39.47	33.11	25.71	21.86	20.04	19.81	21.02	20.76	18.76	MM
QFCZGL		16.42	19.55	23.53	26.28	27.31	30.49	36.28	39.52	32.96	25.60	21.81	20.02	19.78	20.98	20.62	18.60	XI
QMNE23		17.04	20.15*	24.14*	26.84*	27.83*	30.99	36.81	39.95	33.14	25.65	21.84	20.05	19.83	21.10	20.66	18.62	XD
QPDM9J		16.82	19.74	24.00	26.85*	27.79	31.01	37.00*	40.70	33.42	25.88	22.13	20.24	19.96	21.35	21.12	19.01	CA
QXQCAC		16.40	19.35	23.50	26.40	27.30	30.40	36.35	39.65	33.05	25.65	21.85	19.95	19.75	21.05	20.80	18.80	MS
RTTFXQ		15.83*	19.16*	23.19*	26.25	27.10	30.08*	36.06	40.04	33.65	25.83	22.02	20.09	19.81	21.11	21.11	19.09	MY
RVJG4E		16.31	19.34	23.41	26.29	27.12	30.22	36.20	39.83	32.93	25.43	21.70	19.95	19.68	21.03	20.81	18.77	MV



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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 D201																		
RZXAZY		16.93	20.00	24.18*	26.96X	27.97X	31.09*	36.95*	40.07	33.81*	26.07*	22.25	20.34	20.17*	21.51*	21.06	18.83	AS
T7BMAH		16.52	19.48	23.37	26.17	27.17	30.24	36.08	39.34	32.84	25.48	21.70	19.95	19.70	20.88	20.63	18.58	XH
TJZLZK		16.42	19.56	23.50	26.27	27.23	30.40	36.17	39.34	32.77	25.40	21.64	19.87	19.68	20.82	20.46	18.31	XI
U4MBBC		16.53	19.60	23.69	26.44	27.52	30.62	36.55	38.18*	33.53	25.92	22.12	20.22	20.01	21.24	20.90	18.73	AJ
UFVDAF		16.47	19.55	23.59	26.38	27.42	30.52	36.39	39.87	33.14	25.65	21.90	20.06	19.70	20.96	20.65	18.43	XB
UWJQM8		16.56	19.50	23.50	26.23	27.23	30.41	36.21	39.58	32.96	25.63	21.82	19.98	19.75	20.99	20.65	18.60	XB
VJY9TH		16.55	19.59	23.54	26.33	27.29	30.38	36.16	39.37	32.79	25.40	21.63	19.88	19.66	20.88	20.51	18.46	XH
VK7NZN	X	17.07	20.55X	24.75X	27.64X	28.49X	31.67X	37.61X	41.21*	34.25X	26.40X	22.58X	20.74X	20.49X	21.97X	21.76X	19.59X	MV
VP2HYB		16.60	19.60	23.60	26.25	27.30	30.40	36.10	39.30	32.80	25.40	21.70	19.80	19.70	20.80	20.45	18.45	XI
WA4PRE		16.51	19.62	23.67	26.46	27.46	30.65	36.32	39.54	33.06	25.73	22.00	20.15	19.86	20.99	20.72	18.87	XI
WFALBE		16.69	19.73	23.84	26.66	27.66	30.62	36.51	39.82	33.49	25.80	22.01	20.10	19.89	21.12	20.84	18.82	AO
WKNWQ4		16.30	19.40	23.34	26.13	27.09	30.30	35.92	39.18	32.88	25.52	21.76	19.92	19.74	20.84	20.51	18.57	XI
Y7HMXE		16.23	19.38	23.45	26.32	27.15	30.14	36.13	39.78	33.24	25.65	21.88	20.02	19.74	21.02	20.93	18.96	MU
YKBEHF		16.55	19.74	23.69	26.47	27.56	30.79	36.36	39.72	33.17	25.81	22.02	20.27	20.00	21.21	20.97	18.97	MI
YVC3AC		16.56	19.65	23.58	26.31	27.33	30.47	36.18	39.45	33.02	25.70	21.88	20.05	19.77	20.94	20.61	18.59	XB
YVVLG6		16.63	19.85	23.75	26.57	27.53	30.71	36.42	39.78	33.31	25.83	22.10	20.25	20.09	21.21	20.92	18.85	XH
ZE7XMZ		16.58	19.61	23.74	26.54	27.52	30.66	36.52	39.68	33.42	25.78	22.05	20.13	19.93	21.14	20.90	18.69	AJ
ZFYQHJ		16.94	20.00	23.92	26.62	27.61	30.84	36.48	39.60	33.37	26.07*	22.18	20.33	20.08	21.16	20.96	19.09	MM
ZNRY3A		16.61	19.48	23.37	26.16	27.11	30.28	35.98	39.17	32.61*	25.30*	21.63	19.87	19.59	20.76	20.38*	18.27*	XI



CTS Interlaboratory Testing Program for Color & Appearance Analysis 411

**Report #194
4th Qtr 2020**

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	16.60	19.60	23.65	26.44	27.43	30.56	36.39	39.58	33.19	25.70	21.91	20.04	19.84	21.08	20.80	18.73
SD Btwn Labs	0.34	0.21	0.23	0.18	0.19	0.24	0.25	0.65	0.28	0.17	0.17	0.23	0.15	0.19	0.21	0.22

VK7NZN (X) - High % reflectance data for almost all wavelengths.

Key to Instrument Codes Reported by Participants

AB Datacolor 100	AH Datacolor 550	AJ Datacolor 600
AM Datacolor 600 Plus	AN Datacolor 650	AO Datacolor 650x
AQ Datacolor 600x	AS Datacolor 800	CA Cary 5000
GD BYK-Gardner Spectro-Guide Sphere	HH Hunter ColorQUEST XE	HP Hunter UltraScan PRO
HW Hunter UltraScan XE	MI Macbeth Color i5	MK Macbeth Color-Eye 7000
MM Macbeth Color-Eye 7000a	MS Minolta CM-600d	MT Minolta CM-2600d
MU Minolta	MV Minolta CM-3000d Spectrophotometer	MY Minolta Benchtop Spectrophotometer CM-3600a
XB X-Rite Ci7000 Series Benchtop Spectrophotometer	XD X-Rite Ci7800 Benchtop Spectrophotometer	XH X-Rite Color i5 Benchtop Spectrophotometer
XI X-Rite Color i7 Benchtop Spectrophotometer	XO X-Rite SP64 Sphere Spectrophotometer	XR X-Rite



Interlaboratory Testing Program for Color & Appearance

Report #194

Analysis 440

4th Qtr 2020

60 Degree Gloss - Paint Chips

ASTM Method D 523

WebCode	Data Flag	Sample H201			Sample H202			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
3AZBK8		45.05	-0.30	-0.46	56.50	0.23	0.31	MM
3FCYL4		45.00	-0.35	-0.53	55.65	-0.62	-0.82	GL
3R6HZA	X	45.33	-0.02	-0.04	54.38	-1.89	-2.52	RA
3YPL8C		45.33	-0.02	-0.04	56.73	0.46	0.61	GK
4PVTCCQ		45.38	0.03	0.04	56.30	0.03	0.04	GK
6CFKPP		44.95	-0.40	-0.61	55.50	-0.77	-1.02	RQ
6F4WNU		44.83	-0.52	-0.80	55.38	-0.89	-1.19	GK
6VR8BW		44.95	-0.40	-0.61	55.65	-0.62	-0.82	GK
746H4N		44.93	-0.42	-0.65	55.33	-0.94	-1.26	GL
8346VL		44.23	-1.12	-1.72	55.28	-0.99	-1.32	GL
86TE43		45.93	0.58	0.88	56.50	0.23	0.31	GL
89FQBK		44.85	-0.50	-0.76	55.80	-0.47	-0.63	GL
94G2Y7		45.43	0.08	0.12	56.30	0.03	0.04	GL
9CVNAU		45.50	0.15	0.23	56.33	0.06	0.07	GN
9GJKHH		44.80	-0.55	-0.84	55.55	-0.72	-0.96	GL
9K3H4M		43.78	-1.57	-2.41	54.55	-1.72	-2.29	GL
9PGZL6		45.58	0.23	0.35	56.40	0.13	0.17	MW
A9PG8U		45.10	-0.25	-0.38	55.75	-0.52	-0.69	GK
AQKATR		45.40	0.05	0.08	56.13	-0.14	-0.19	GK
AUM94K		44.30	-1.05	-1.60	54.75	-1.52	-2.02	GT
B2MUTY		45.78	0.43	0.65	57.13	0.86	1.14	GL
B3XR8G	*	44.43	-0.92	-1.41	54.35	-1.92	-2.56	GK
BDDN48		45.13	-0.22	-0.34	56.48	0.21	0.27	GK
BDHWEF		45.14	-0.21	-0.32	56.53	0.26	0.35	GL
BHB6F2		44.85	-0.50	-0.76	55.03	-1.24	-1.66	RA
E4VE44		45.70	0.35	0.54	56.88	0.61	0.81	GL
EAKUWG		45.33	-0.02	-0.04	56.25	-0.02	-0.03	GL
ETDWBW		45.83	0.48	0.73	56.78	0.51	0.67	GL
F6A36V		46.15	0.80	1.22	57.18	0.91	1.21	GN
FETPVB	X	44.28	-1.07	-1.64	53.10	-3.17	-4.22	GL



Interlaboratory Testing Program for Color & Appearance

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4th Qtr 2020

60 Degree Gloss - Paint Chips

ASTM Method D 523

WebCode	Data Flag	Sample H201			Sample H202			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
FM6TY4		45.28	-0.07	-0.11	56.73	0.46	0.61	GL
HNQG9U		45.58	0.23	0.35	56.13	-0.14	-0.19	GL
HT9ATA	*	44.60	-0.75	-1.14	54.43	-1.84	-2.46	GK
J8LAUT		45.58	0.23	0.35	56.18	-0.09	-0.13	GK
JYQ8RG	*	46.40	1.05	1.61	56.38	0.11	0.14	GK
KCRZWX		46.15	0.80	1.22	56.90	0.63	0.84	GN
LCRGC9		44.88	-0.47	-0.72	55.78	-0.49	-0.66	GL
LFP32Q		46.83	1.48	2.26	57.88	1.61	2.14	GN
LVGXCV		45.25	-0.10	-0.15	56.35	0.08	0.11	GL
LWCGFH		45.98	0.63	0.96	56.65	0.38	0.51	GN
M2NQ7Q		45.20	-0.15	-0.23	55.65	-0.62	-0.82	GK
M9Y6Q9		45.40	0.05	0.08	56.20	-0.07	-0.09	GL
MBNEXN	X	47.43	2.08	3.17	59.18	2.91	3.87	GN
MBR2DG		46.88	1.53	2.33	57.45	1.18	1.57	GL
MHB6KJ		44.60	-0.75	-1.14	55.68	-0.59	-0.79	GK
MJKAX8		43.93	-1.42	-2.18	54.95	-1.32	-1.76	GL
MPAU2M		45.70	0.35	0.54	57.33	1.06	1.41	RA
PB2PQD		45.88	0.53	0.80	56.25	-0.02	-0.03	GL
QHUGCC		44.40	-0.95	-1.45	55.95	-0.32	-0.43	GL
QMNE23		46.28	0.93	1.42	56.70	0.43	0.57	RA
QXQCAC		45.76	0.41	0.62	56.89	0.62	0.83	GK
R4AYGM	X	45.58	0.23	0.35	54.95	-1.32	-1.76	GL
RYYBGQ		45.15	-0.20	-0.30	56.28	0.01	0.01	GL
RZXAZY		45.38	0.03	0.04	56.68	0.41	0.54	GK
T7BMAH		45.58	0.23	0.35	56.53	0.26	0.34	GK
T7EAPB		45.70	0.35	0.54	56.35	0.08	0.11	GK
TJZLZK		44.88	-0.47	-0.72	56.17	-0.10	-0.14	GL
TMYZNA		45.98	0.63	0.96	57.03	0.76	1.01	GL
U4MBBC		45.78	0.43	0.65	56.53	0.26	0.34	GL
UFVDAF		45.75	0.40	0.61	57.38	1.11	1.47	ZA



Interlaboratory Testing Program for Color & Appearance

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60 Degree Gloss - Paint Chips

ASTM Method D 523

WebCode	Data Flag	Sample H201			Sample H202			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
VJY9TH		45.70	0.35	0.54	56.65	0.38	0.51	GL
VMFN6V	*	43.80	-1.55	-2.37	55.68	-0.59	-0.79	GB
VQTDLJ		45.85	0.50	0.77	56.78	0.51	0.67	GL
VXWK2L		46.23	0.88	1.34	57.03	0.76	1.01	GN
WA4PRE		45.40	0.05	0.08	56.90	0.63	0.84	GL
WBB6XK	*	44.70	-0.65	-0.99	56.68	0.41	0.54	GK
WHWXC7		45.18	-0.17	-0.27	56.25	-0.02	-0.03	GK
Y7HMXE		46.43	1.08	1.64	57.33	1.06	1.41	GL
YKBEHF		45.75	0.40	0.61	56.75	0.48	0.64	GL
YWVLG6		45.55	0.20	0.31	56.53	0.26	0.34	GL
ZE7XMZ	X	47.38	2.03	3.10	56.58	0.31	0.41	MW
ZL4PVU		45.53	0.18	0.27	57.25	0.98	1.31	GN

Summary Statistics

Grand Means

45.35 Gloss Units

56.27 Gloss Units

Std Dev Btwn Labs

0.65 Gloss Units

0.75 Gloss Units

Statistics based on 67 of 72 reporting participants

Comments on Assigned Data Flags for Test #440

3R6HZA(X) - Inconsistent in testing between samples. Inconsistent within the determinations for Sample H202.

FETPVB(X) - Low data for Sample H202. Inconsistent within the determinations for both samples.

MBNEXN(X) - Data for both samples are high. Possible systematic error.

R4AYGM(X) - Inconsistent within the determinations for Sample H202.

ZE7XMZ(X) - High data for Sample H201.

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

GT Gardco Novo-Gloss (20/60/85)

MM Macbeth Lab-Gloss

MW Minolta Multi-Gloss 268

RA Rhopoint Novo-Gloss Glossmeter

RQ Rhopoint IQ Goniophotometer 20/60/85°

ZA Zehntner ZGM Series



Interlaboratory Testing Program for Color & Appearance

Report #194

Analysis 440

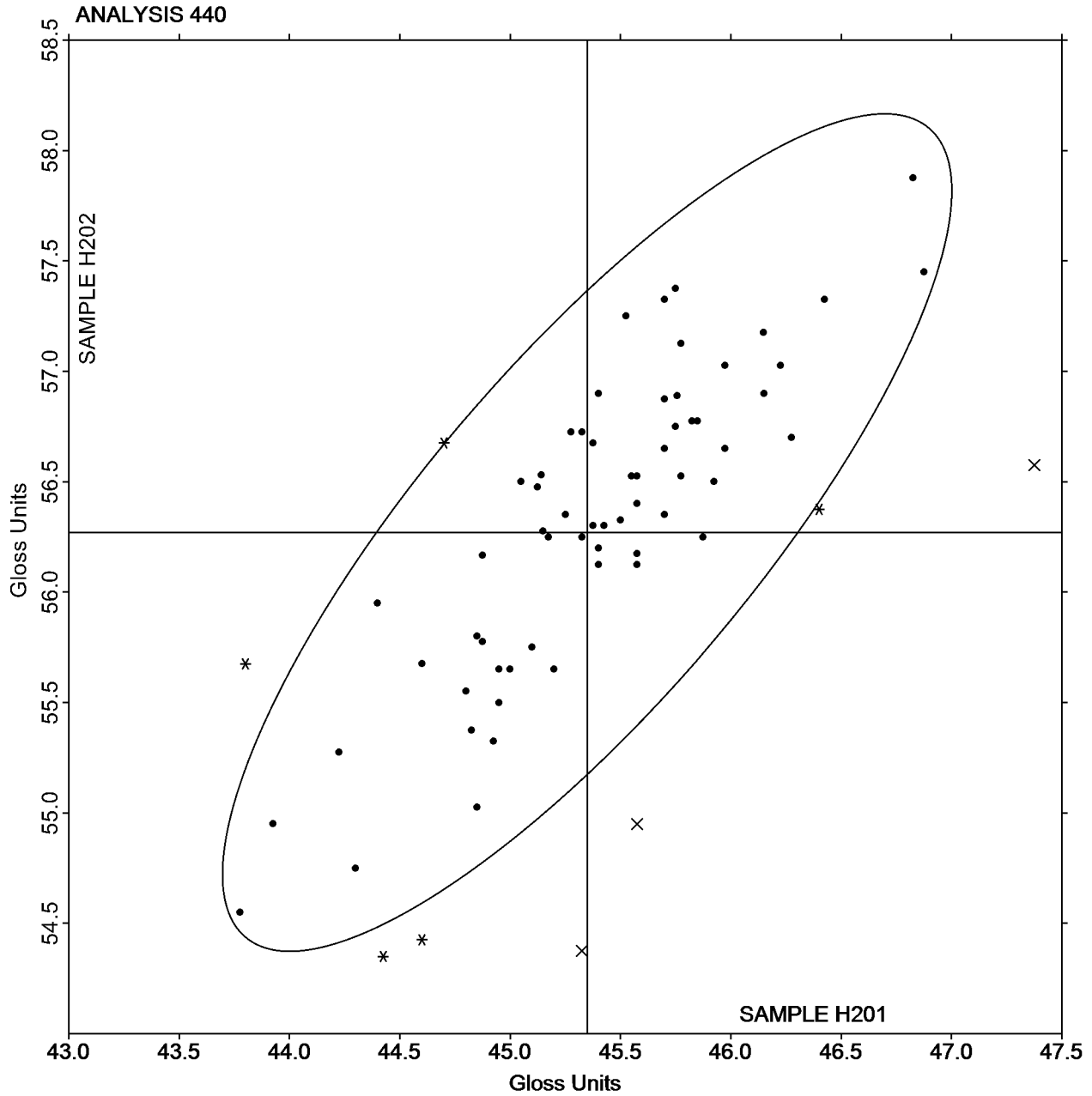
4th Qtr 2020

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SAMPLE H201 = 45.35 Gloss Units

SAMPLE H202 = 56.27 Gloss Units



-End of Report-