



## Color & Appearance Testing Program

### Summary Report #179 - 1st Qtr 2017

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

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

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

[Key to Tables and Graphs \(GlossTests\)](#)

<b><u>Analysis</u></b>	<b><u>Analysis Name</u></b>
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<a href="#">408</a>	<a href="#">Color &amp; Color Difference (Paint Chips) - 45-0</a>
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<a href="#">409</a>	<a href="#">Color &amp; Color Difference (Paint Chips) Sphere</a>
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<a href="#">411</a>	<a href="#">Spectrophotometric (Paint Chips) - Sphere</a>
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<a href="#">440</a>	<a href="#">Gloss 60 Degree (Paint Chips)</a>
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<a href="#">442</a>	<a href="#">Gloss 85 Degree (Paint Chips)</a>
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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

<b>WebCode</b>	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 mailed to each participant.
<b>Lab Mean</b>	The average of the 2 test results obtained by the participant for CIE L*,a*,b* color space values.
<b>Grand Mean</b>	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.
<b>Between-Lab Standard Deviation</b>	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).
<b>Comparative Performance Value</b>	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.
<b>Graphs</b>	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.
<b>Inst Code</b>	A code indicating the manufacturer of the instrument used to perform the test (see separate INSTRUMENT CODE LIST for each test section).
<b>Data Flag</b>	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	<b>CAUTION</b> - 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	<b>STOP</b> - 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	<b>PROCEED</b> - 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

<b>WebCode</b>	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 mailed to each participant.
<b>Grand Mean</b>	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.
<b>Between-Lab Standard Deviation</b>	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).
<b>Inst Code</b>	A code indicating the manufacturer of the instrument used to perform the test (see separate INSTRUMENT CODE LIST for each test section).
<b>Data Flag</b>	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	<b>CAUTION</b> - 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	<b>STOP</b> - 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 an X on individual wavelength values as follows:

- X - The laboratory's mean for that wavelength is greater than a 95% deviation from the GRAND MEAN.

## 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 mailed 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	<b>CAUTION</b> - 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	<b>STOP</b> - 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	<b>PROCEED</b> - 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 #179  
**Analysis 408** 1st Qtr 2017

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*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$	
23QG2J		A171	47.87	7.27	6.53	1.09	-0.13	-0.20	1.11	XU
		A172	48.96	7.14	6.34					
342JNH	X	A171	48.14	8.19	7.26	1.12	-0.17	-0.22	1.15	XZ
		A172	49.26	8.03	7.05					
3WYC7U		A171	48.23	7.30	6.29	0.90	-0.15	-0.14	0.92	XO
		A172	49.13	7.15	6.16					
6PP2L6		A171	48.12	7.32	6.55	1.00	-0.11	-0.10	1.01	HW
		A172	49.12	7.21	6.46					
6UMGFL		A171	48.14	7.30	6.46	1.09	-0.10	-0.15	1.10	XO
		A172	49.23	7.20	6.32					
7UGWCX		A171	47.94	7.15	6.57	1.12	-0.08	-0.09	1.13	HW
		A172	49.06	7.07	6.48					
7XHPYM		A171	48.02	7.38	6.55	0.96	-0.15	-0.14	0.98	GE
		A172	48.98	7.23	6.42					
7ZQPD2		A171	47.93	7.44	6.66	1.10	-0.09	-0.14	1.11	GH
		A172	49.02	7.35	6.52					
8N7ZR2		A171	48.31	7.27	6.61	1.03	-0.10	-0.12	1.04	HW
		A172	49.33	7.18	6.49					
AEVB9M		A171	47.93	7.34	6.50	1.11	-0.12	-0.15	1.12	HW
		A172	49.03	7.22	6.35					
AKYE28	X	A171	49.24	7.08	5.89	0.01	-0.01	-0.01	0.02	MU
		A172	49.25	7.07	5.88					
AVHXB6		A171	48.21	7.20	6.39	0.88	-0.06	-0.05	0.88	XD
		A172	49.08	7.14	6.35					
BDWWC2		A171	48.59	7.08	6.25	1.01	-0.09	-0.14	1.02	XZ
		A172	49.60	7.00	6.11					
CGBNJ2		A171	47.98	7.21	6.49	0.97	-0.12	-0.14	0.99	HW
		A172	48.95	7.09	6.36					
CVDKY2		A171	47.88	7.25	6.31	0.93	-0.15	-0.12	0.95	XZ
		A172	48.80	7.10	6.20					
EW3XP4		A171	47.69	7.27	6.58	1.18	-0.13	-0.20	1.21	MG
		A172	48.87	7.14	6.38					



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WebCode	Flag	Samples	CIE L* a* b* Color Values			Color Difference Values				InstrCode
			L*	a*	b*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$	
F7HCXY		A171	47.53	7.48	6.54	1.01	-0.11	-0.11	1.02	HY
		A172	48.53	7.38	6.43					
GB6NA7		A171	48.03	7.25	6.50	1.04	-0.12	-0.11	1.05	HW
		A172	49.07	7.13	6.39					
GGVPYZ		A171	48.16	7.11	6.44	1.01	-0.14	-0.05	1.02	HG
		A172	49.17	6.97	6.39					
HDQM4V		A171	48.14	7.28	6.08	1.15	-0.10	-0.16	1.17	MO
		A172	49.29	7.18	5.92					
JE6EUQ	X	A171	48.30	7.36	6.34	1.47	-0.12	-0.18	1.48	XO
		A172	49.77	7.25	6.17					
JP43RF		A171	48.06	7.28	6.62	1.12	-0.13	-0.17	1.14	HW
		A172	49.18	7.16	6.45					
K27XHU		A171	48.16	7.34	6.32	1.11	-0.10	-0.14	1.12	XK
		A172	49.26	7.25	6.19					
LDH8FR		A171	48.00	7.26	6.39	1.12	-0.18	-0.23	1.15	MU
		A172	49.12	7.09	6.16					
LTEUXY		A171	48.09	7.23	6.70	1.22	-0.14	-0.17	1.23	GH
		A172	49.31	7.09	6.53					
MF3TTR		A171	47.63	7.21	6.39	1.30	-0.07	-0.28	1.33	HK
		A172	48.93	7.15	6.12					
MKD33A		A171	48.11	7.23	6.63	1.04	-0.10	-0.10	1.04	HW
		A172	49.14	7.13	6.53					
MRG434		A171	48.09	7.23	6.44	0.93	-0.13	-0.12	0.94	XM
		A172	49.01	7.11	6.33					
MVAC4P		A171	47.99	7.46	6.61	1.09	-0.08	-0.14	1.10	GE
		A172	49.08	7.38	6.47					
MZQH3K		A171	48.10	7.24	6.61	1.10	-0.12	-0.16	1.12	HW
		A172	49.20	7.12	6.45					
NXFXRP	X	A171	49.19	48.37	49.58	1.13	1.13	1.11	1.94	MA
		A172	50.32	49.50	50.69					
PLMNQ2		A171	48.01	7.26	6.56	1.23	-0.12	-0.16	1.24	TO
		A172	49.23	7.15	6.40					



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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*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$	
Q6BUCX		A171	47.86	7.22	6.51	1.09	-0.10	-0.16	1.11	XU
		A172	48.95	7.12	6.36					
RETTHT		A171	48.12	7.27	6.37	0.99	-0.12	-0.18	1.01	XN
		A172	49.11	7.16	6.19					
VWZ294		A171	47.86	7.18	6.38	0.98	-0.11	-0.11	0.99	XR
		A172	48.84	7.07	6.28					
Y66EUB		A171	47.64	7.30	6.74	1.13	-0.14	-0.20	1.16	FA
		A172	48.77	7.16	6.54					
YCH3BC		A171	48.12	7.29	6.54	1.10	-0.10	-0.13	1.11	HW
		A172	49.22	7.20	6.42					
Z3DBPN		A171	47.89	7.09	6.33	1.12	-0.08	-0.13	1.13	XZ
		A172	49.01	7.01	6.20					
ZB7J9T	X	A171	49.11	6.97	6.21	0.52	-0.06	-0.21	0.56	XZ
		A172	49.62	6.92	6.01					
ZCCBUF		A171	47.65	7.23	6.57	1.14	-0.12	-0.21	1.16	XX
		A172	48.79	7.11	6.36					
ZQDZUL		A171	47.99	7.47	6.73	1.03	-0.10	-0.12	1.04	GB
		A172	49.02	7.37	6.61					

Summary Statistics							
Samples	L*	a*	b*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$
<b>Grand Means</b>							
A171	48.00	7.26	6.48	1.07	-0.11	-0.14	1.08
A172	49.07	7.15	6.33				
<b>Std Dev Btwn Labs</b>							
A171	0.21	0.11	0.15	0.09	0.03	0.05	0.10
A172	0.19	0.10	0.16				

Statistics based on 36 of 41 reporting participants





**Comments Assigned on Data Flags for Test #408**

342JNH(X) - High "a\*" & "b\*" values.

AKYE28(X) - High "L\*" value for Sample A171 and low "b\*" values.

JE6EUQ(X) - High "L\*" value for Sample A172. Also inconsistent in testing within "L\*" value for Sample A171.

NXFXRP(X) - High "L\*" values. Extremely high "a\*" & "b\*" values.

ZB7J9T(X) - High "L\*" values.

**Key to Instrument Codes Reported by Participants**

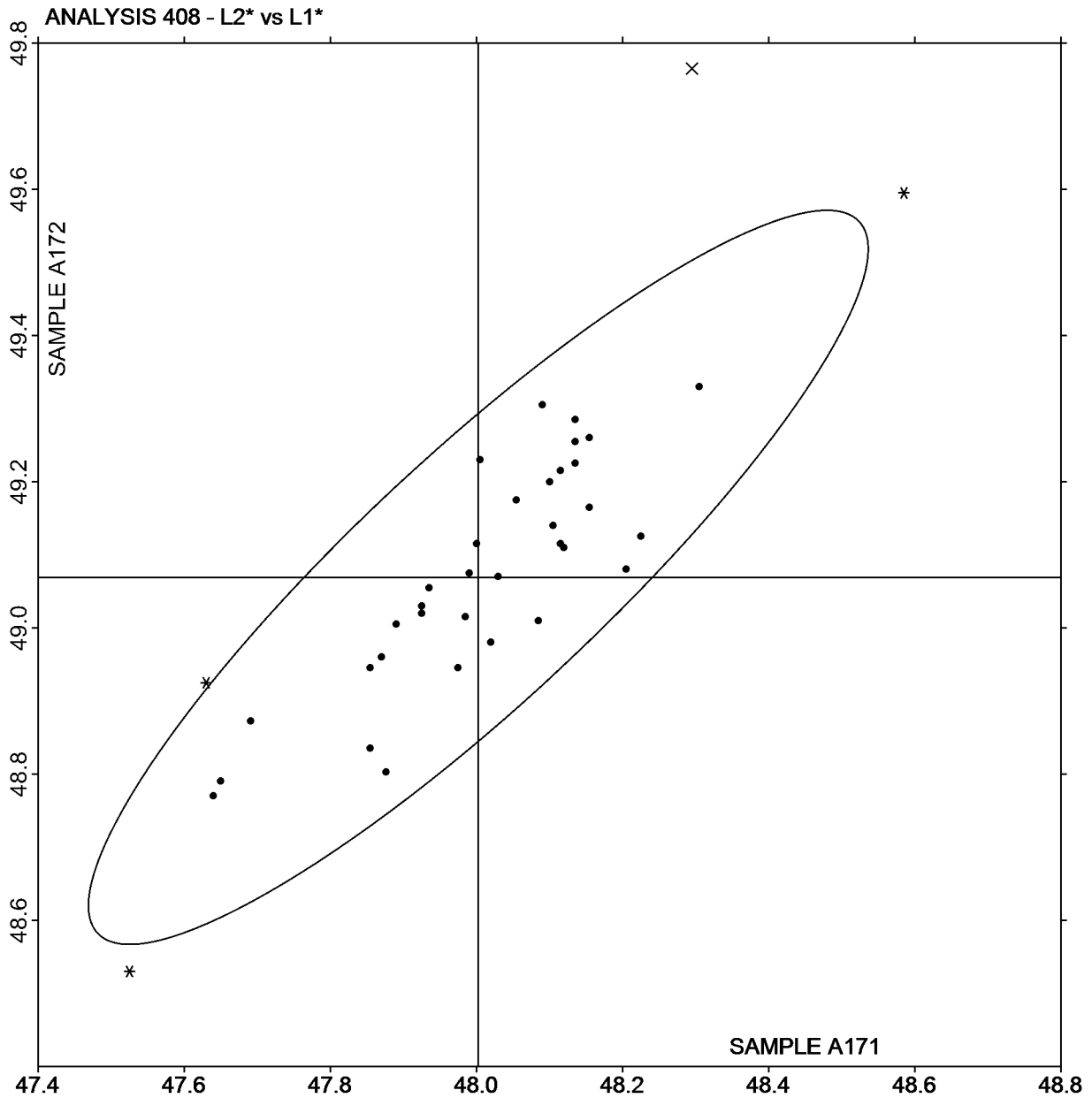
<b>FA</b>	BYK Mac	<b>GB</b>	BYK-Gardner spectro-guide sphere gloss
<b>GE</b>	BYK-Gardner spectro-guide (45/0)	<b>GH</b>	BYK-Gardner Color-View
<b>HG</b>	Hunter ColorQUEST	<b>HK</b>	Hunter MiniScan XE (45/0)
<b>HW</b>	Hunter LabScan XE	<b>HY</b>	Hunter Color Flex 45/0
<b>MA</b>	Macbeth	<b>MG</b>	Macbeth 1500/PLUS or 2025+ Color Eye
<b>MO</b>	Minolta CM-3600d Spectrophotometer	<b>MU</b>	Minolta
<b>TO</b>	Topcon SR-3 Spectroradiometer	<b>XD</b>	X-Rite 500 Series SpectroDensitometer
<b>XK</b>	X-Rite MA100 Multi-Angle SpectroPhotometer	<b>XM</b>	X-Rite MA58 Multi-Angle SpectroPhotometer
<b>XN</b>	X-Rite MA68 Multi-Angle SpectroPhotometer	<b>XO</b>	X-Rite MA68 II Multi-Angle SpectroPhotometer
<b>XR</b>	X-Rite 968 Portable SpectroPhotometer	<b>XU</b>	X-Rite 964 Portable SpectroPhotometer
<b>XX</b>	Instrument make/model not specified by lab	<b>XZ</b>	X-Rite



L2\* vs L1\*

SAMPLE A171 = 48.00

SAMPLE A172 = 49.07

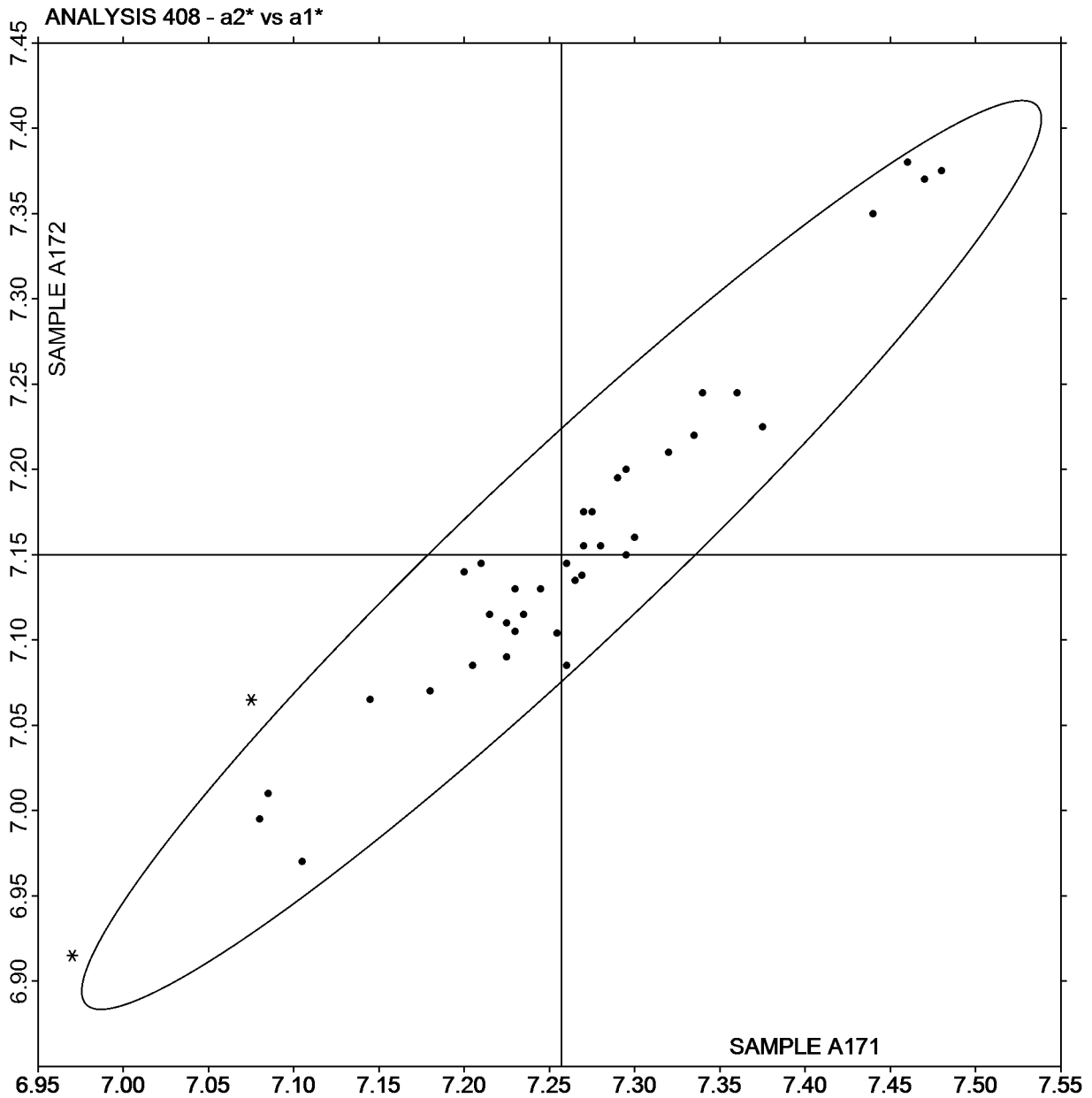




a2\* vs a1\*

SAMPLE A171 = 7.26

SAMPLE A172 = 7.15



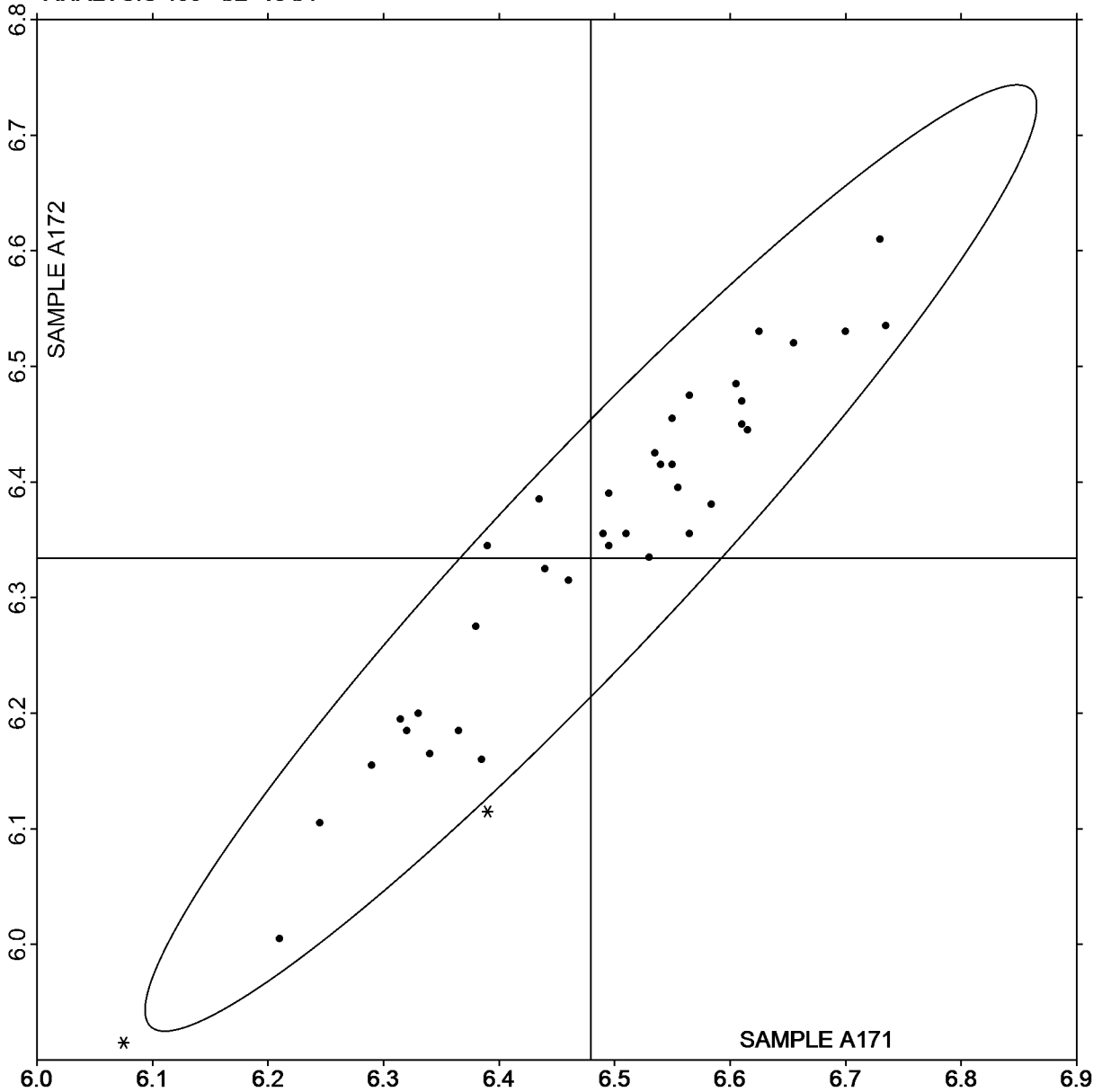


**b2\* vs b1\***

SAMPLE A171 = 6.48

SAMPLE A172 = 6.33

ANALYSIS 408 - b2\* vs b1\*





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WebCode	Flag	Samples	CIE L* a* b* Color Values			Color Difference Values				InstrCode
			L*	a*	b*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$	
23QG2J		A171	48.09	7.09	6.04	1.18	-0.16	-0.18	1.20	XI
		A172	49.26	6.93	5.87					
2V62H2		A171	48.21	7.09	6.04	1.09	-0.10	-0.15	1.10	MM
		A172	49.30	6.99	5.89					
34GP48		A171	48.43	7.29	6.13	1.04	-0.16	-0.22	1.07	AS
		A172	49.47	7.13	5.91					
39VH3D		A171	48.29	7.19	6.07	1.06	-0.09	-0.12	1.07	AL
		A172	49.35	7.10	5.96					
3LWEXK		A171	48.20	7.15	5.99	1.14	-0.14	-0.18	1.16	AJ
		A172	49.34	7.01	5.81					
3R88DP		A171	48.49	7.24	6.06	1.07	-0.11	-0.14	1.08	AO
		A172	49.56	7.13	5.93					
3WYC7U		A171	48.33	7.17	5.97	0.95	-0.16	-0.20	0.98	MI
		A172	49.28	7.01	5.77					
4696TA		A171	48.24	7.06	6.13	1.03	-0.11	-0.15	1.04	AJ
		A172	49.26	6.96	5.99					
4BD3KL	X	A171	48.24	6.83	6.22	1.10	-0.11	-0.14	1.11	XI
		A172	49.34	6.72	6.08					
4NJMW8	X	A171	48.14	6.86	6.09	1.04	-0.15	-0.21	1.07	XX
		A172	49.18	6.71	5.88					
4R43CL		A171	47.93	7.14	6.07	1.01	-0.07	-0.14	1.02	GD
		A172	48.94	7.07	5.93					
6AUH83		A171	48.15	7.18	5.92	1.04	-0.10	-0.15	1.05	HP
		A172	49.19	7.08	5.77					
6MJ3H7	X	A171	41.21	5.56	4.33	1.02	-0.04	-0.05	1.02	XM
		A172	42.23	5.53	4.28					
6NFXB2		A171	47.89	7.24	6.13	1.08	-0.08	-0.10	1.09	XH
		A172	48.97	7.16	6.04					
78JMTW		A171	48.33	7.18	5.95	1.12	-0.10	-0.15	1.13	AR
		A172	49.45	7.08	5.80					
7B463L		A171	48.40	7.28	6.06	1.06	-0.11	-0.17	1.07	MV
		A172	49.45	7.17	5.89					



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WebCode	Flag	Samples	CIE L* a* b* Color Values			Color Difference Values				InstrCode
			L*	a*	b*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$	
7XHPYM		A171	48.04	7.16	6.33	0.98	-0.16	-0.17	1.00	GD
		A172	49.01	7.00	6.17					
8FDPH7		A171	48.24	7.15	6.08	1.15	-0.13	-0.16	1.16	AQ
		A172	49.39	7.03	5.93					
8N7TUF		A171	48.17	7.19	6.10	1.00	-0.08	-0.10	1.00	XH
		A172	49.17	7.11	6.00					
8T3JZR		A171	48.27	7.08	6.21	0.97	-0.17	-0.20	1.00	XO
		A172	49.24	6.91	6.01					
9EFQPQ		A171	48.26	7.09	5.90	1.07	-0.12	-0.13	1.08	XI
		A172	49.33	6.97	5.77					
9HGX7G		A171	48.43	7.23	6.15	1.01	-0.14	-0.14	1.03	MG
		A172	49.44	7.09	6.01					
9ZGRV2		A171	48.21	7.15	5.96	1.08	-0.09	-0.10	1.09	HP
		A172	49.29	7.06	5.86					
9ZYVBE		A171	48.46	7.19	5.98	0.95	-0.09	-0.13	0.96	AO
		A172	49.41	7.11	5.86					
AF4K47		A171	48.43	7.10	6.08	1.02	-0.15	-0.25	1.06	AO
		A172	49.45	6.95	5.83					
APCWHN		A171	48.37	7.09	6.13	1.01	-0.15	-0.18	1.03	XI
		A172	49.37	6.94	5.95					
ARGMMH	X	A171	94.30	0.92	-4.29	0.02	-0.03	0.11	0.12	XZ
		A172	94.32	0.89	-4.18					
AU6TRU		A171	48.26	7.04	6.04	1.01	-0.06	-0.11	1.01	XI
		A172	49.27	6.98	5.93					
BZR7L9	X	A171	-0.01	-0.01	0.01	0.08	0.02	0.00	0.08	HH
		A172	0.07	0.02	0.01					
C3BKMM		A171	48.41	7.22	5.87	1.04	-0.11	-0.15	1.05	AO
		A172	49.45	7.12	5.72					
CH8WXC		A171	48.30	7.10	6.08	1.09	-0.09	-0.12	1.09	MM
		A172	49.39	7.01	5.97					
CJEEUM		A171	48.40	7.06	5.84	0.97	-0.15	-0.13	0.99	XI
		A172	49.37	6.91	5.71					



**CTS Interlaboratory Testing Program for Color & Appearance**    **Report #179**  
**Analysis 409**    **1st Qtr 2017**

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*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$	
CT8P6H		A171	48.47	7.12	5.83	1.02	-0.15	-0.18	1.05	AO
		A172	49.49	6.97	5.65					
CYTK88		A171	48.42	7.17	6.09	1.04	-0.17	-0.23	1.08	AO
		A172	49.46	7.00	5.86					
DG4YUU		A171	48.00	7.22	5.86	0.99	-0.10	-0.07	1.00	XH
		A172	48.99	7.12	5.79					
DHZ897		A171	48.10	7.04	6.00	1.10	-0.10	-0.13	1.11	XI
		A172	49.20	6.94	5.87					
DYBUUG		A171	48.38	7.28	5.94	1.07	-0.09	-0.16	1.08	AM
		A172	49.44	7.19	5.78					
EPZVGW		A171	48.15	7.19	6.25	1.41	-0.14	-0.31	1.44	AJ
		A172	49.55	7.05	5.94					
ERGKFZ		A171	48.22	7.22	6.07	1.04	-0.12	-0.14	1.06	MM
		A172	49.26	7.10	5.94					
ETGBTA		A171	48.46	7.07	5.96	0.95	-0.05	-0.09	0.95	AJ
		A172	49.40	7.02	5.87					
F7J3B9		A171	48.55	6.95	6.06	1.03	-0.12	-0.18	1.05	AM
		A172	49.57	6.83	5.88					
FPDZAF		A171	48.38	7.04	6.12	0.98	-0.07	-0.11	0.98	XI
		A172	49.35	6.97	6.01					
FTBJEY		A171	48.38	7.10	6.01	1.05	-0.08	-0.14	1.06	XI
		A172	49.43	7.03	5.87					
FX89V7		A171	48.27	7.23	5.99	1.06	-0.10	-0.14	1.07	AM
		A172	49.33	7.13	5.86					
G2FVZV		A171	48.32	7.22	6.21	1.11	-0.11	-0.14	1.12	AJ
		A172	49.42	7.11	6.07					
GC3MVZ		A171	48.48	7.14	6.05	0.99	-0.09	-0.17	1.00	AJ
		A172	49.46	7.05	5.88					
GGVPYZ		A171	48.30	7.20	6.03	0.91	-0.16	-0.15	0.93	XI
		A172	49.21	7.05	5.88					
GPP4FQ	X	A171	48.03	5.75	11.56	0.99	-0.12	-0.04	1.00	AS
		A172	49.02	5.63	11.52					



**CTS Interlaboratory Testing Program for Color & Appearance**    **Report #179**  
**Analysis 409**    **1st Qtr 2017**

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*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$	
GW6UM	X	A171	48.71	7.07	6.42	1.00	-0.10	-0.12	1.01	MU
		A172	49.71	6.97	6.30					
GW7ETR		A171	48.30	7.13	6.16	1.05	-0.08	-0.14	1.06	AJ
	A172	49.35	7.05	6.02						
H2HXA Z		A171	48.38	7.24	6.15	1.12	-0.10	-0.15	1.13	AJ
	A172	49.50	7.14	6.00						
HLLHA7		A171	48.47	7.28	6.05	0.94	-0.09	-0.15	0.96	MV
	A172	49.41	7.19	5.90						
J43ANV		A171	48.43	7.16	6.04	0.91	-0.13	-0.14	0.93	MM
	A172	49.34	7.02	5.90						
JZ3XPB		A171	48.07	7.08	6.04	1.10	-0.06	-0.11	1.11	MI
	A172	49.17	7.03	5.94						
K27XHU		A171	48.34	7.15	5.84	1.16	-0.11	-0.12	1.17	AO
	A172	49.50	7.05	5.72						
K67XBJ		A171	48.42	6.99	5.92	1.10	-0.09	-0.12	1.11	MM
	A172	49.52	6.90	5.80						
KG43UY		A171	48.44	7.14	6.13	1.07	-0.12	-0.15	1.08	AS
	A172	49.51	7.03	5.98						
KQQT4Q	X	A171	48.52	7.20	5.59	1.00	-0.12	-0.15	1.02	HH
		A172	49.52	7.08	5.44					
KYK94A		A171	48.05	7.17	6.09	1.07	-0.13	-0.15	1.09	XH
	A172	49.12	7.05	5.94						
LTEUXY		A171	48.35	7.22	6.15	1.04	-0.13	-0.14	1.06	MV
	A172	49.39	7.10	6.01						
LWBJE7		A171	48.02	7.22	6.09	1.09	-0.14	-0.17	1.11	XH
	A172	49.11	7.08	5.93						
MUY9TL	X	A171	47.58	7.20	6.28	1.29	-0.13	-0.23	1.31	XO
		A172	48.86	7.08	6.05					
N2ZYGA		A171	48.32	7.22	6.12	1.12	-0.14	-0.21	1.15	MM
	A172	49.44	7.08	5.91						
N8KXA4		A171	48.06	7.10	6.31	1.10	-0.09	-0.16	1.11	XM
	A172	49.16	7.01	6.15						





**CTS Interlaboratory Testing Program for Color & Appearance** Report #179  
**Analysis 409** 1st Qtr 2017

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*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$	
N9Z7FH		A171	48.28	7.23	6.16	1.04	-0.12	-0.16	1.06	CE
		A172	49.32	7.11	5.99					
NDD36T		A171	48.37	7.23	6.14	0.99	-0.12	-0.15	1.00	MK
		A172	49.36	7.11	5.99					
NW6K3F		A171	48.33	7.14	5.97	1.09	-0.10	-0.12	1.10	AQ
		A172	49.42	7.04	5.85					
NXFXRP	X	A171	49.19	48.37	49.58	1.13	1.13	1.11	1.94	MM
		A172	50.32	49.50	50.69					
NYQWNJ		A171	48.33	7.13	5.92	1.04	-0.08	-0.13	1.05	XX
		A172	49.36	7.05	5.79					
NYRM2T		A171	48.30	7.29	6.00	1.03	-0.12	-0.16	1.05	MV
		A172	49.33	7.18	5.84					
P9FC7F		A171	48.37	7.17	5.99	1.13	-0.09	-0.12	1.14	MM
		A172	49.50	7.08	5.87					
PJXG76		A171	48.26	7.16	6.08	1.09	-0.05	-0.10	1.10	MU
		A172	49.35	7.11	5.98					
PLMNQ2	X	A171	47.12	7.15	6.03	1.13	-0.06	-0.13	1.14	CA
		A172	48.25	7.09	5.91					
Q6BUCX		A171	48.30	7.02	6.09	1.08	-0.10	-0.15	1.09	XI
		A172	49.38	6.92	5.95					
Q9QYBT		A171	47.89	7.29	6.06	1.02	-0.09	-0.08	1.02	XH
		A172	48.90	7.20	5.98					
QD46LT		A171	48.37	7.20	6.05	0.93	-0.14	-0.13	0.95	AJ
		A172	49.30	7.07	5.92					
QPDLAP		A171	48.39	7.21	6.10	1.04	-0.11	-0.17	1.05	AS
		A172	49.43	7.10	5.93					
QTFMAL		A171	48.24	7.18	6.13	1.25	-0.17	-0.28	1.29	AO
		A172	49.49	7.01	5.85					
QXRVK		A171	48.20	7.00	6.13	1.03	-0.13	-0.16	1.05	AO
		A172	49.23	6.87	5.97					
R4A2AJ		A171	48.14	7.18	6.14	1.00	-0.12	-0.11	1.01	MV
		A172	49.14	7.06	6.04					



**CTS Interlaboratory Testing Program for Color & Appearance**    **Report #179**  
**Analysis 409**    **1st Qtr 2017**

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*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$	
R4WPDY		A171	48.28	7.24	6.17	1.01	-0.12	-0.17	1.03	MV
		A172	49.29	7.12	6.01					
R7HDRK		A171	48.13	7.07	6.19	1.00	-0.10	-0.13	1.01	XO
		A172	49.13	6.98	6.06					
RETTHT	X	A171	47.68	6.99	6.22	1.04	-0.13	-0.13	1.06	XO
		A172	48.72	6.86	6.09					
RU9TCX		A171	48.36	7.07	6.02	1.07	-0.08	-0.13	1.08	PE
		A172	49.43	6.99	5.89					
T7ATGM		A171	48.40	7.11	5.90	1.07	-0.10	-0.13	1.08	XI
		A172	49.47	7.02	5.77					
TDDTX4		A171	48.25	7.19	6.09	1.08	-0.12	-0.17	1.10	XI
		A172	49.33	7.07	5.93					
TT9KUL		A171	48.39	7.08	5.94	0.92	-0.08	-0.09	0.93	XI
		A172	49.31	7.01	5.86					
TTAR4L		A171	48.33	7.16	6.11	1.13	-0.10	-0.15	1.14	AJ
		A172	49.46	7.07	5.96					
UWK2M		A171	47.87	7.17	6.13	1.09	-0.11	-0.14	1.10	XZ
		A172	48.96	7.06	5.99					
V4K7YJ		A171	48.29	7.19	5.97	1.19	-0.09	-0.14	1.20	AJ
		A172	49.47	7.10	5.83					
VD8XR3		A171	48.38	7.18	6.05	1.05	-0.13	-0.18	1.07	AJ
		A172	49.43	7.05	5.88					
VFANKH		A171	48.42	7.20	6.16	1.01	-0.20	-0.24	1.06	XX
		A172	49.43	7.00	5.92					
VN9LJZ		A171	47.99	7.13	6.17	1.18	-0.15	-0.26	1.21	MM
		A172	49.16	6.98	5.91					
VTYZ3F	X	A171	48.40	7.02	6.46	1.03	-0.11	-0.18	1.05	XZ
		A172	49.43	6.91	6.28					
XDHAAD		A171	48.37	7.19	6.07	1.08	-0.12	-0.14	1.10	AQ
		A172	49.45	7.08	5.93					
XEW7QW		A171	48.39	7.07	6.03	1.02	-0.09	-0.11	1.03	MM
		A172	49.41	6.98	5.93					



**CTS Interlaboratory Testing Program for Color & Appearance**

**Report #179**

**Analysis 409**

**1st Qtr 2017**

**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*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$	
XEX2BN		A171	48.40	7.22	6.19	1.09	-0.12	-0.17	1.10	AJ
		A172	49.49	7.10	6.03					
XNYN2Z		A171	48.17	7.26	6.26	1.26	-0.14	-0.21	1.28	AS
		A172	49.43	7.12	6.05					
XYZNZY		A171	48.59	7.24	6.13	0.96	-0.12	-0.16	0.98	HF
		A172	49.55	7.12	5.97					
YBRUAM		A171	47.97	7.28	6.09	1.06	-0.11	-0.17	1.08	XH
		A172	49.03	7.17	5.92					
Z2YGU3		A171	47.99	7.06	6.03	1.12	-0.09	-0.16	1.13	XM
		A172	49.11	6.97	5.87					
ZB8EUK		A171	48.60	7.06	6.21	1.09	-0.11	-0.15	1.10	XH
		A172	49.69	6.95	6.06					
ZCCBUF		A171	48.12	7.15	5.93	1.04	-0.14	-0.18	1.06	MM
		A172	49.16	7.01	5.75					
ZFG8XB		A171	48.42	7.21	6.05	1.13	-0.12	-0.17	1.14	MT
		A172	49.54	7.10	5.88					

<b>Summary Statistics</b>							
Samples	L*	a*	b*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$
<b>Grand Means</b>							
A171	48.28	7.15	6.06				
A172	49.33	7.04	5.92	1.06	-0.11	-0.15	1.07
<b>Std Dev Btwn Labs</b>							
A171	0.17	0.08	0.10				
A172	0.16	0.08	0.10	0.08	0.03	0.04	0.08

Statistics based on 91 of 104 reporting participants



**Comments Assigned on Data Flags for Test #409**

4BD3KL(X) - Low "a\*" values.

4NJMW8(X) - Low "a\*" values.

6MJ3H7(X) - All values are very low.

ARGMMH(X) - Apparently measured back of the samples.

BZR7L9(X) - All values are extremely low.

GPP4FQ(X) - Low "a\*" values. Very high "b\*" values.

GVV6UM(X) - High "b\*" values.

KQQT4Q(X) - Low "b\*" values.

MUY9TL(X) - Low "L\*" values.

NXFXRP(X) - High "L\*" values. Extremely high "a\*" & "b\*" values.

PLMNQ2(X) - Low "L\*" values. Also inconsistent in testing within "L\*" values.

RETTHT(X) - Low "L\*" values.

VTYZ3F(X) - High "b\*" values.

**Key to Instrument Codes Reported by Participants**

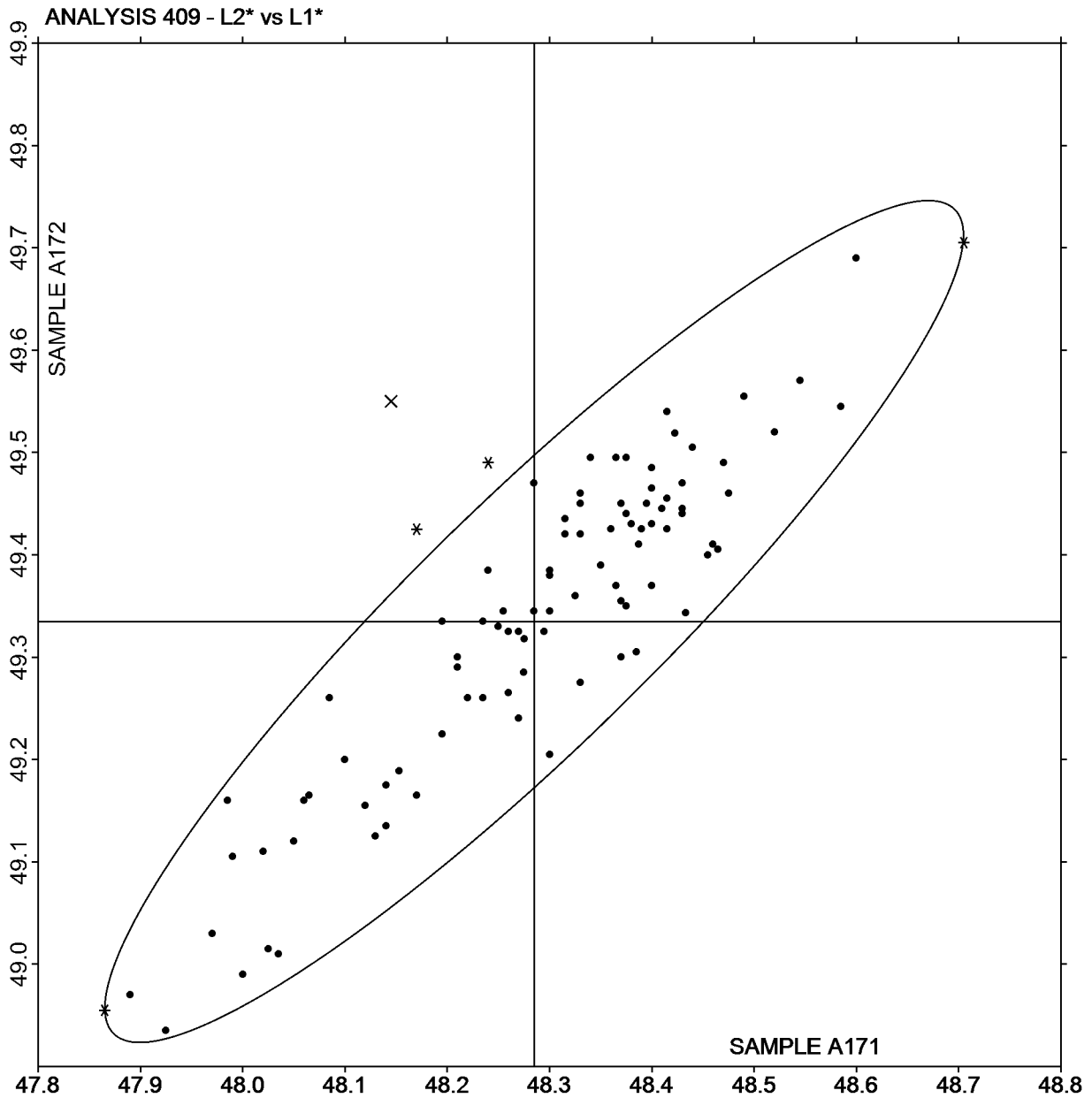
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AM	ACS-Datcolor 600 Plus	AO	ACS-Datcolor 650X
AQ	ACS-Datcolor 600X	AR	Datcolor 400
AS	ACS-Datcolor 800 Series	CA	Cary 5000
CE	Cary 500	GD	BYK-Gardner spectro-guide sphere
HF	Hunter ColorFlex Diffuse	HH	Hunter ColorQUEST XE
HP	Hunter UltraScan PRO	MG	Macbeth 2180 Color Eye
MI	Macbeth Color i 5	MK	Macbeth Color-Eye 7000
MM	Macbeth Color-Eye 7000a	MT	Minolta CM-2600d
MU	Minolta	MV	Minolta CM-3000d Series Spectrophotometer
PE	Perkin Elmer Spectrophotometer	XH	X-Rite Color i5
XI	X-Rite Color i7	XM	X-Rite SP62 Portable Sphere Spectrophotometer
XO	X-Rite SP64 Portable Sphere Spectrophotometer	XX	Instrument make/model not specified by lab
XZ	X-Rite		



L2\* vs L1\*

SAMPLE A171 = 48.28

SAMPLE A172 = 49.33

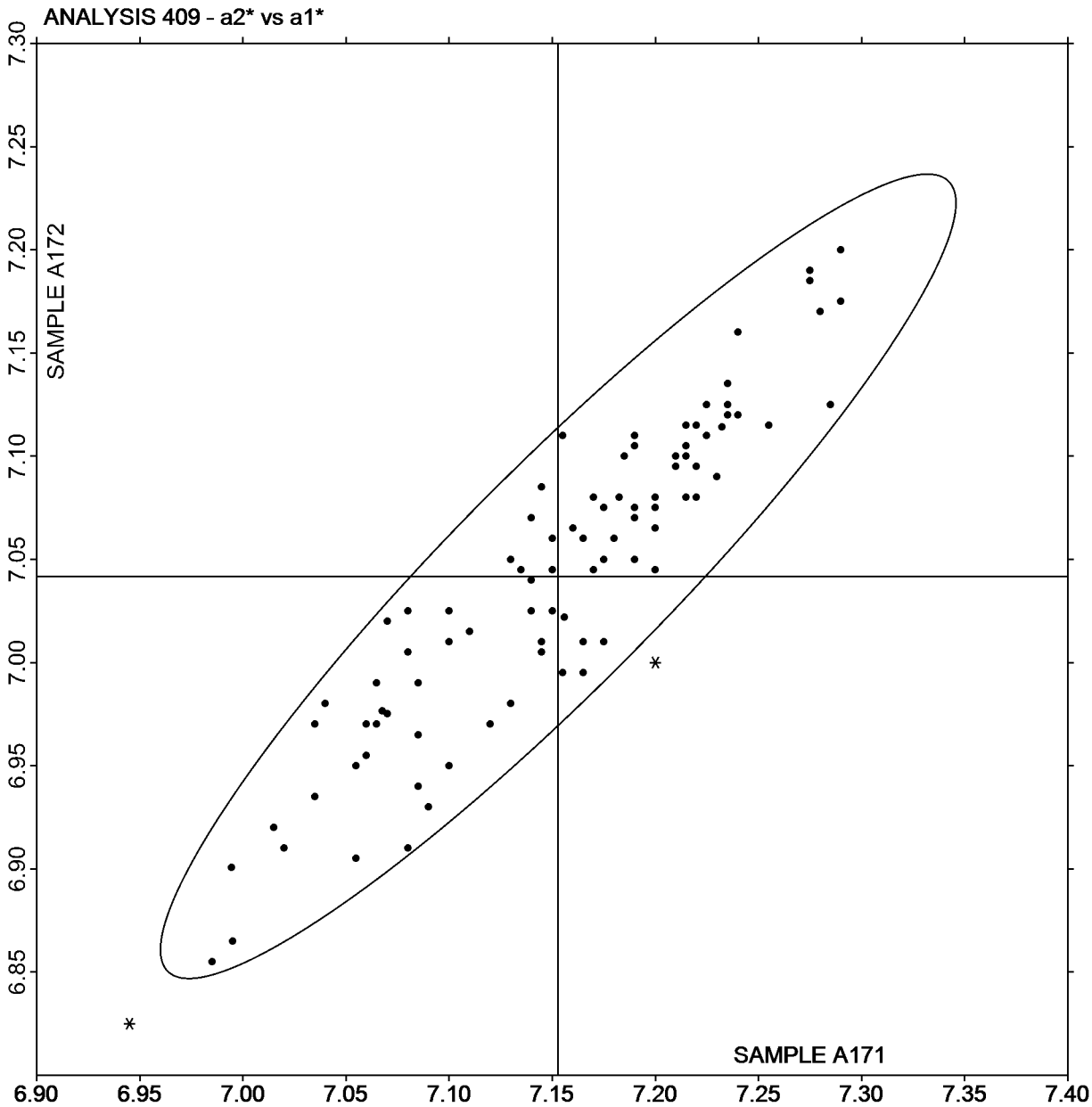




a2\* vs a1\*

SAMPLE A171 = 7.15

SAMPLE A172 = 7.04

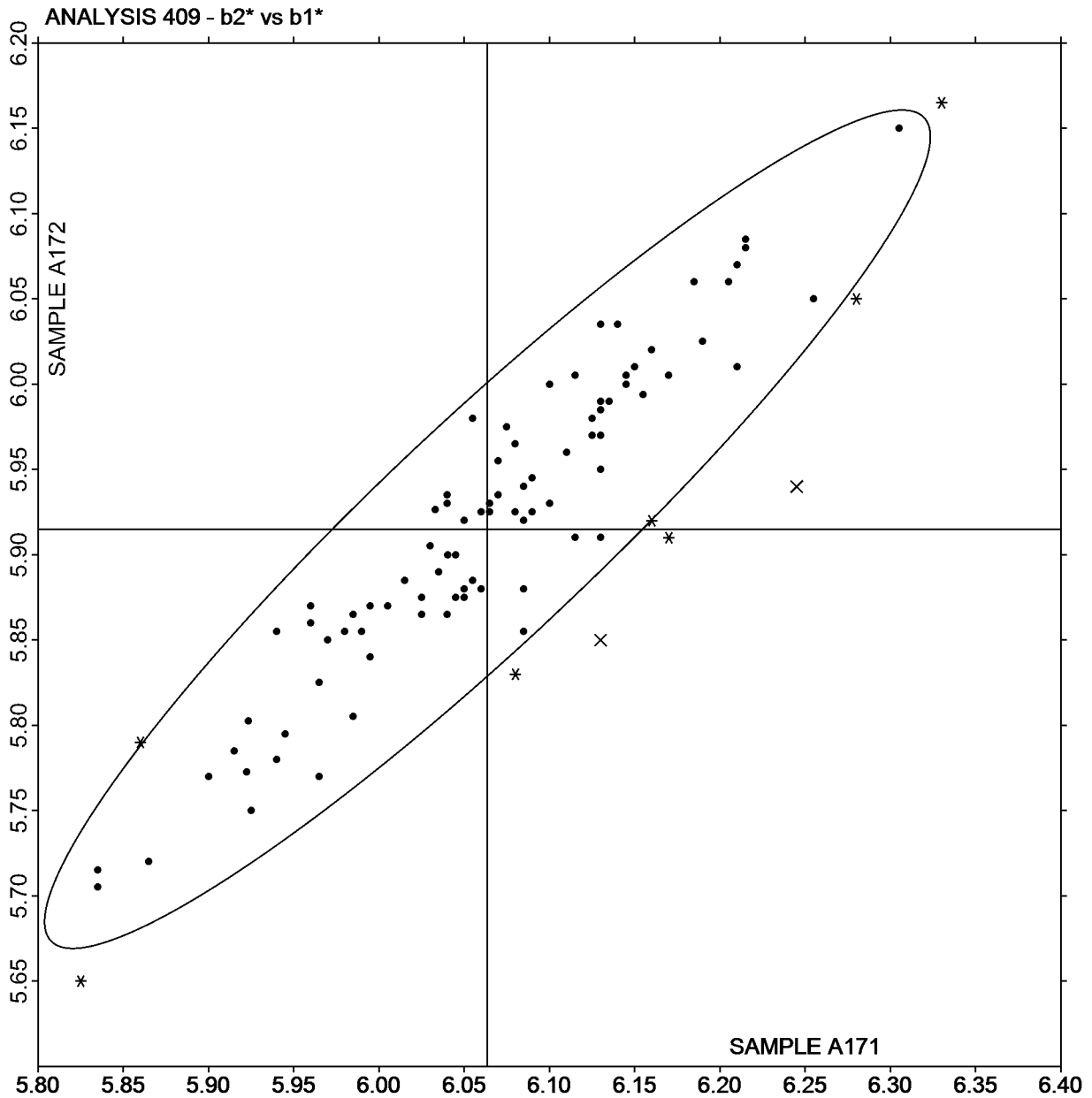




**b2\* vs b1\***

SAMPLE A171 = 6.06

SAMPLE A172 = 5.92





## CTS Interlaboratory Testing Program for Color & Appearance Analysis 411

**Report #179**  
**1st Qtr 2017**

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 A171																		
23QG2J		12.81	13.91	14.31	14.35	14.15	14.35	14.64	15.14	16.49	19.40	20.88	20.91	20.48	20.20	19.94	19.78	XI
2V62H2		12.81	13.91	14.40	14.47	14.30	14.42	14.74	15.21	16.54	19.41	21.03	21.06	20.74	20.44	20.16	19.91	MM
34GP48		13.21	14.04	14.51	14.56	14.46	14.57	14.88	15.37	16.62	19.66	21.32	21.33	21.05	20.82	20.38	20.18	AM
39VH3D		12.73	13.97	14.44	14.50	14.36	14.51	14.81	15.26	16.58	19.48	21.11	21.20	20.87	20.56	20.31	19.94	AL
3LWEXK		12.79	13.99	14.37	14.49	14.34	14.42	14.73	15.20	16.48	19.37	21.01	21.11	20.81	20.50	20.22	19.97	AJ
3R88DP		13.03	14.12	14.56	14.65	14.52	14.62	14.92	15.42	16.71	19.74	21.36	21.36	21.05	20.75	20.29	19.74	AO
3WYC7U		12.84	14.06	14.52	14.57	14.39	14.50	14.82	15.30	16.68	19.53	21.16	21.14	20.84	20.51	20.25	20.01	MI
4696TA		12.71	13.95	14.35	14.46	14.32	14.40	14.72	15.27	16.65	19.39	20.97	21.12	20.83	20.46	20.17	19.98	AJ
4BD3KL		12.79	13.94	14.35	14.36	14.27	14.43	14.81	15.26	16.69	19.43	20.96	20.90	20.64	20.32	19.97	19.63	XI
4R43CL		13.23	13.71	14.21	14.26	14.06	14.19	14.56	15.07	16.17	19.30	20.79	20.80	20.54	20.26	19.98	19.94	GD
6AUH83		13.07	13.95	14.42	14.51	14.29	14.42	14.72	15.18	16.40	19.29	21.06	21.07	20.75	20.46	20.05	19.84	HP
6MJ3H7		12.83	13.89	13.85	14.39	14.24	14.39	14.70	15.17	16.59	19.36	20.91	20.92	20.64	20.37	20.10	19.84	XM
6NFXB2		12.49	13.70	14.14	14.20	14.00	14.11	14.50	14.88	16.34	19.24	20.77	20.84	20.50	20.16	19.84	19.69	XH
78JMTW		13.04	14.09	14.51	14.60	14.40	14.48	14.82	15.29	16.66	19.57	21.09	21.18	20.82	20.45	20.21	19.90	AR
7B463L		12.86	14.07	14.54	14.61	14.39	14.51	14.85	15.28	16.65	19.65	21.29	21.31	20.97	20.67	20.39	20.21	MV
7XHPYM		11.79X	13.78	14.18	14.24	14.06	14.33	14.54	15.07	16.41	19.46	20.97	20.83	20.63	20.35	20.07	19.73	GD
8FDPH7		12.72	13.91	14.37	14.50	14.39	14.44	14.78	15.21	16.59	19.50	21.04	21.09	20.78	20.48	20.19	19.85	AQ
8N7TUF		12.73	13.94	14.29	14.41	14.26	14.36	14.68	15.16	16.56	19.42	21.00	21.06	20.69	20.38	20.05	19.81	XH
8T3JZR		12.60	13.85	14.38	14.45	14.30	14.37	14.79	15.28	16.67	19.45	21.10	21.10	20.82	20.54	20.29	20.01	XO
9EFQPQ		12.88	14.06	14.48	14.55	14.37	14.46	14.78	15.26	16.63	19.48	21.05	21.01	20.65	20.36	20.07	19.81	XI
9HGX7G		13.27	14.46	14.89	15.00	14.86	14.96	15.30	15.80	17.08	20.08	21.72	21.79	21.50	21.20	20.68	20.17	MG
9ZGRV2		13.05	14.04	14.45	14.52	14.32	14.44	14.80	15.19	16.50	19.35	21.01	21.15	20.90	20.54	20.02	19.87	HP
9ZYVBE		12.98	14.15	14.53	14.70	14.51	14.60	14.91	15.41	16.73	19.66	21.26	21.31	20.97	20.66	20.40	20.06	AO
AF4K47		12.90	14.00	14.50	14.60	14.50	14.60	14.90	15.30	16.70	19.65	21.25	21.30	21.00	20.70	20.20	19.70	AO
APCWHN		12.79	14.01	14.45	14.54	14.38	14.51	14.83	15.30	16.69	19.59	21.18	21.22	20.87	20.48	20.18	19.94	XI





## CTS Interlaboratory Testing Program for Color & Appearance Analysis 411

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**1st Qtr 2017**

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 A171																		
ARGMMH	X	33.13X	85.39X	97.04X	92.63X	89.87X	87.64X	85.84X	85.22X	85.27X	84.67X	84.71X	85.11X	86.45X	86.96X	86.55X	87.44X	XZ
AU6TRU		12.88	13.99	14.43	14.49	14.34	14.47	14.81	15.23	16.65	19.48	21.02	21.05	20.73	20.36	20.02	19.77	XI
BZR7L9		13.95X	15.18X	15.96X	15.95X	15.82X	16.01X	16.42X	16.98X	18.47X	22.09X	24.02X	24.13X	23.91X	23.61X	23.48X	23.28X	HH
C3BKMM		13.04	14.13	14.56	14.71	14.52	14.55	14.89	15.37	16.63	19.60	21.20	21.28	20.92	20.66	20.39	20.12	AO
CH8WXC		12.85	13.97	14.44	14.51	14.36	14.48	14.80	15.28	16.63	19.48	21.11	21.17	20.85	20.53	20.26	20.02	MM
CJEEUM		13.02	14.18	14.64	14.64	14.49	14.59	14.91	15.33	16.71	19.62	21.15	21.12	20.70	20.39	20.01	19.79	XI
CT8P6H		12.92	14.19	14.66	14.74	14.58	14.65	14.95	15.45	16.67	19.65	21.22	21.28	20.95	20.68	20.12	19.71	AO
CYTK88		13.00	14.10	14.50	14.60	14.50	14.55	14.90	15.40	16.70	19.65	21.20	21.30	21.00	20.80	20.25	19.70	AO
DG4YUU		12.75	13.91	14.30	14.35	14.16	14.25	14.58	15.05	16.40	19.22	20.84	20.90	20.57	20.27	19.98	19.77	XH
DHZ897		12.77	13.79	14.34	14.42	14.24	14.29	14.67	15.19	16.51	19.27	20.85	20.88	20.61	20.31	20.01	19.71	XI
DYBUUG		12.81	14.18	14.57	14.60	14.40	14.52	14.86	15.27	16.71	19.60	21.21	21.26	20.95	20.56	20.30	19.82	AM
EPZVGW		12.73	13.78	14.23	14.34	14.21	14.36	14.68	15.15	16.47	19.43	21.04	21.03	20.74	20.37	19.94	19.26	AO
ERKGFZ		12.80	13.92	14.39	14.46	14.30	14.40	14.73	15.20	16.55	19.45	21.07	21.12	20.78	20.48	20.20	19.94	MM
ETGBTA		13.03	14.15	14.58	14.65	14.55	14.65	14.93	15.42	16.69	19.67	21.19	21.25	20.90	20.58	20.15	19.73	AJ
F7J3B9		12.72	14.15	14.60	14.66	14.57	14.71	15.01	15.53	16.89	19.62	21.22	21.33	21.02	20.67	20.35	19.97	AM
FTBJEY	X	4.25X	4.20X	4.20X	4.23X	4.24X	4.12X	4.07X	4.01X	4.00X	3.99X	4.02X	4.03X	4.13X	4.13X	4.19X	4.35X	XI
FX89V7		12.71	13.98	14.47	14.52	14.38	14.47	14.79	15.20	16.61	19.49	21.16	21.17	20.81	20.50	20.23	19.89	AM
GC3MVZ		13.01	14.14	14.54	14.66	15.03	14.63	14.93	15.41	16.69	19.67	21.29	21.34	21.03	20.75	20.28	19.83	AJ
GGVPYZ		12.94	14.01	14.44	14.53	14.39	14.46	14.80	15.26	16.65	19.49	21.13	21.18	20.88	20.53	20.19	20.00	XI
GPP4FQ	X	56.31X	12.09X	10.26X	12.00X	12.84X	13.63X	14.35	14.97	16.32	19.27	20.90	20.93	20.58	20.46	20.06	19.93	AS
GVV6UM		12.90	14.20	14.60	14.65	14.50	14.60	15.00	15.40	16.70	19.70	21.45	21.30	20.90	20.60	20.30	20.15	MU
HLLHA7		12.99	14.13	14.59	14.66	14.45	14.57	14.90	15.34	16.70	19.74	21.35	21.36	21.00	20.69	20.41	20.24	MV
J43ANV		12.92	14.09	14.57	14.63	14.45	14.55	14.88	15.36	16.71	19.64	21.26	21.30	20.98	20.66	20.38	20.12	MM
JZ3XPB		12.60	13.85	14.28	14.36	14.19	14.28	14.62	15.18	16.49	19.27	20.88	20.85	20.56	20.21	19.92	19.67	MI
K27XHU		12.91	14.08	14.57	14.64	14.47	14.55	14.85	15.34	16.60	19.50	21.09	21.21	20.87	20.57	20.31	19.99	AO



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		400	420	440	460	480	500	520	540	560	580	600	620	640	660	680	700	
Sample A171																		
K67XBJ		14.14X	14.60	14.68	14.52	14.61	14.92	15.40	16.75X	19.51X	21.12X	21.26	20.92	20.62	20.31	20.14	19.81	MM
KG43UY		13.23	14.07	14.50	14.58	14.49	14.61	14.90	15.40	16.67	19.67	21.24	21.30	21.01	20.74	20.38	20.11	AS
KQQT4Q		13.27	14.41	14.95	14.84	14.64	14.70	15.03	15.47	16.66	19.70	21.32	21.30	20.97	20.70	20.48	20.34	HH
KYK94A		12.56	13.83	14.27	14.31	14.15	14.28	14.64	15.10	16.43	19.28	20.85	20.96	20.63	20.30	20.03	19.81	XH
LTEUXY		12.72	13.97	14.43	14.57	14.38	14.50	14.80	15.25	16.66	19.58	21.26	21.26	20.95	20.60	20.34	20.12	MV
LWBJE7		12.73	13.79	14.24	14.32	14.15	14.27	14.58	15.06	16.44	19.25	20.91	20.94	20.66	20.27	20.04	19.77	XH
MUY9TL		12.35	13.51	13.83	13.90	13.83	13.89	14.25	14.69	16.14	18.95	20.50	20.50	20.22	19.93	19.68	19.38	XO
N2ZYGA		12.80	13.95	14.43	14.52	14.36	14.47	14.79	15.28	16.64	19.54	21.17	21.22	20.88	20.59	20.32	20.06	MM
N8KXA4		13.27	14.11	14.59	14.64	14.46	14.59	14.95	15.42	17.00	19.96	21.42	21.41	21.04	20.75	20.35	20.11	HW
N9Z7FH		12.87	13.87	14.40	14.47	14.30	14.42	14.78	15.22	16.52	19.56	21.18	21.17	20.83	20.52	20.21	19.77	CE
NDD36T		12.88	13.98	14.47	14.53	14.37	14.48	14.82	15.30	16.69	19.62	21.20	21.25	20.93	20.59	20.31	20.05	MK
NW6K3F		12.94	14.05	14.50	14.57	14.43	14.51	14.83	15.59	16.64	19.50	21.13	21.18	20.85	20.55	20.34	19.97	AQ
NXFXRP		12.67	14.04	14.54	14.58	14.44	14.50	14.83	15.34	16.71	19.52	21.16	21.25	20.91	20.60	20.31	20.06	MM
NYQWNJ		12.93	14.08	14.48	14.61	14.45	14.52	14.85	15.31	16.63	19.55	21.10	21.15	20.83	20.50	20.23	19.93	XX
NYRM2T		13.08	14.07	14.45	14.55	14.35	14.48	14.77	15.22	16.55	19.57	21.20	21.21	20.86	20.57	20.33	20.13	MV
P9FC7F		12.93	14.06	14.54	14.60	14.44	14.54	14.85	15.33	16.68	19.55	21.18	21.22	20.89	20.57	20.32	20.04	MM
PJXG76		12.70	13.96	14.38	14.51	14.33	14.42	14.78	15.22	16.57	19.44	21.13	21.13	20.81	20.53	20.27	20.04	MV
PLMNQ2		12.14	13.10X	13.60X	13.68X	13.52X	13.65X	13.97X	14.39X	15.65	18.58	20.10	20.08X	19.75X	19.45	19.18	18.96	CA
Q6BUCX		12.82	13.93	14.42	14.49	14.32	14.48	14.79	15.28	16.67	19.50	21.05	21.04	20.66	20.40	20.15	20.03	XI
Q9QYBT		12.41	13.68	14.16	14.23	14.04	14.20	14.49	14.92	16.26	19.15	20.79	20.87	20.53	20.33	19.92	19.76	XH
QD46LT		12.98	14.11	14.48	14.55	14.42	14.54	14.85	15.34	16.66	19.55	21.18	21.29	20.96	20.67	20.13	19.83	AJ
QPD LAP		12.88	14.01	14.47	14.56	14.44	14.57	14.86	15.34	16.63	19.62	21.25	21.28	20.97	20.72	20.16	19.73	AM
QTFMAL		12.56	13.85	14.18	14.27	14.12	14.29	14.56	15.06	16.45	19.37	20.89	20.95	20.64	20.28	19.96	19.48	XI
QXRVVK		12.63	13.86	14.35	14.44	14.29	14.41	14.73	15.28	16.56	19.39	20.94	21.06	20.78	20.41	19.85	19.42	AO
R4WPDY		12.95	13.88	14.35	14.53	14.32	14.42	14.77	15.22	16.57	19.48	21.20	21.22	20.90	20.59	20.33	20.12	MV



## CTS Interlaboratory Testing Program for Color & Appearance Analysis 411

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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 A171																		
R7HDRK		12.65	13.81	14.28	14.33	14.21	14.31	14.70	15.16	16.59	19.40	20.99	20.94	20.70	20.35	20.15	19.79	XO
RETTHT		12.39	13.41	13.95	13.94	13.86	13.93	14.35	14.80	16.22	18.91	20.44	20.43	20.16	19.90	19.67	19.39	XO
RU9TCX		13.13	14.06	14.53	14.57	14.39	14.53	14.84	15.28	16.63	19.63	21.18	21.15	20.80	20.48	20.21	19.95	PE
T7ATGM		12.96	14.18	14.59	14.62	14.48	14.54	14.88	15.36	16.70	19.60	21.17	21.20	20.80	20.48	20.17	19.96	XI
TDDTX4		12.68	13.94	14.38	14.49	14.31	14.41	14.74	15.20	16.63	19.53	21.07	21.12	20.80	20.47	20.14	19.94	XI
TT9KUL		12.84	14.06	14.56	14.62	14.49	14.55	14.89	15.35	16.70	19.55	21.13	21.19	20.83	20.54	20.22	19.92	XI
TTAR4L		12.87	13.97	14.42	14.53	14.40	14.52	14.82	15.30	16.60	19.58	21.16	21.18	20.89	20.60	20.05	19.67	AJ
UWKF2M		12.58	13.65	14.11	14.18	14.03	14.13	14.47	14.96	16.30	19.19	20.75	20.73	20.41	20.09	19.73	19.54	XI
V4K7YJ		12.89	14.05	14.45	14.55	14.40	14.49	14.80	15.30	16.54	19.48	21.07	21.16	20.86	20.56	20.07	19.68	AJ
VD8XR3		13.87X	14.01	14.48	14.58	14.44	14.54	14.86	15.34	16.65	19.60	21.16	21.27	20.93	20.64	20.30	20.08	AJ
VFANKH		12.90	14.01	14.45	14.57	14.44	14.55	14.89	15.38	16.67	19.59	21.26	21.32	21.07	20.82	20.29	19.82	XX
VN9LJZ		12.52	13.73	14.18	14.26	14.10	14.22	14.56	15.04	16.41	19.21	20.82	20.93	20.63	20.29	20.07	19.80	MM
VTYZ3F		11.55X	13.82	14.32	14.50	14.33	14.54	14.87	15.39	16.67	19.64	21.33	21.45	21.08	20.84	20.55	20.28	XZ
XDHAAD		13.95X	14.02	14.45	14.57	14.40	14.54	14.85	15.30	16.68	19.57	21.17	21.23	20.96	20.65	20.34	20.06	AQ
XEW7QW		12.89	14.05	14.52	14.60	14.43	14.55	14.85	15.35	16.70	19.54	21.17	21.23	20.89	20.59	20.29	20.09	MM
XEX2BN		12.97	13.98	14.46	14.53	14.41	14.51	14.85	15.38	16.65	19.64	21.23	21.31	20.98	20.67	20.38	20.04	AJ
XNYN2Z		13.02	13.81	14.24	14.36	14.24	14.34	14.69	15.18	16.47	19.46	21.09	21.11	20.80	20.53	20.11	19.86	AS
XYZNZY		13.00	14.24	14.64	14.71	14.56	14.69	14.97	15.48	16.86	19.87	21.32	21.56	20.82	20.88	20.63	20.66	HF
YBRUAM		12.55	13.78	14.21	14.27	14.08	14.21	14.51	14.97	16.41	19.27	20.83	20.93	20.58	20.26	19.90	19.65	XH
Z2YGU3		13.01	14.23	14.70	14.73	14.58	14.71	15.03	15.51	16.92	19.67	21.25	21.29	21.01	20.72	20.46	20.21	XM
ZFG8XB		12.85	14.05	14.54	14.64	14.44	14.53	14.90	15.31	16.67	19.63	21.26	21.30	20.97	20.63	20.33	20.15	MT



## CTS Interlaboratory Testing Program for Color & Appearance Analysis 411

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**1st Qtr 2017**

Spectrophotometric - Sphere Geometry Instruments  
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### Summary Statistics

	400	420	440	460	480	500	520	540	560	580	600	620	640	660	680	700
<b>Grand Means</b>	12.87	13.99	14.43	14.51	14.36	14.47	14.80	15.29	16.64	19.54	21.12	21.16	20.84	20.53	20.21	19.93
<b>SD Btwn Labs</b>	0.36	0.24	0.25	0.24	0.25	0.25	0.25	0.30	0.40	0.38	0.37	0.39	0.39	0.39	0.40	0.43

#### Comments Assigned on Data Flags for Test #411

ARGMMH (X) - Extreme data for all wavelengths. Apparently measured back of the sample.

FTBJEY (X) - Low % reflectance data at all wavelengths.

GPP4FQ (X) - Extreme data for 400nm wavelength. Low % reflectance data for shorter wavelengths.

### Key to Instrument Codes Reported by Participants

<b>AJ</b> ACS-Datcolor 600	<b>AL</b> ACS-Datcolor Intl. Dataflash 100	<b>AM</b> ACS-Datcolor 600 Plus
<b>AO</b> ACS-Datcolor 650	<b>AQ</b> ACS-Datcolor 600X	<b>AR</b> Datcolor 400
<b>AS</b> ACS-Datcolor 800 Series	<b>CA</b> Cary 5000	<b>CE</b> Cary 500
<b>GD</b> BYK-Gardner spectro-guide sphere	<b>HF</b> Hunter ColorFlex Diffuse	<b>HH</b> Hunter ColorQUEST XE
<b>HP</b> Hunter UltraScan PRO	<b>HW</b> Hunter UltraScan XE	<b>MG</b> Macbeth 2180 Color Eye
<b>MI</b> Macbeth Color i5	<b>MK</b> Macbeth Color-Eye 7000 Spectrophotometer	<b>MM</b> Macbeth Color-Eye 7000a
<b>MT</b> Minolta CM-2600d	<b>MU</b> Minolta	<b>MV</b> Minolta CM-3000d Series Spectrophotometer
<b>PE</b> Perkin Elmer Spectrophotometer	<b>XH</b> X-Rite Color i5	<b>XI</b> X-Rite Color i7
<b>XM</b> X-Rite SP62	<b>XO</b> X-Rite SP64	<b>XX</b> Instrument make/model not specified by lab
<b>XZ</b> X-Rite		



**Interlaboratory Testing Program for Color & Appearance**

**Report #179**

**Analysis 440**

**1st Qtr 2017**

**60 Degree Gloss - Paint Chips**

**ASTM Method D 523**

WebCode	Data Flag	Sample E171			Sample E172			Instr Code
		Lab Mean	Difference from Grand Mean	Comparative Performance Value	Lab Mean	Difference from Grand Mean	Comparative Performance Value	
23QG2J	*	29.40	-0.16	-0.26	38.73	0.66	0.89	GL
2FVHZU		30.05	0.49	0.80	38.60	0.54	0.73	GL
2V62H2		29.58	0.02	0.03	37.43	-0.64	-0.85	GL
342JNH		29.43	-0.13	-0.22	37.53	-0.54	-0.72	RA
39VH3D		29.43	-0.13	-0.22	38.03	-0.04	-0.05	GL
3C9VPZ		30.45	0.89	1.45	39.13	1.06	1.43	MW
3WYC7U		29.25	-0.31	-0.50	37.80	-0.26	-0.35	GL
4BD3KL		29.05	-0.51	-0.83	37.48	-0.59	-0.79	GK
4R43CL	X	29.65	0.09	0.15	37.05	-1.01	-1.36	GB
6NFXB2		30.15	0.59	0.97	38.15	0.09	0.12	GL
6UMGFL		29.28	-0.28	-0.46	37.68	-0.39	-0.52	GL
7RB4BP		29.68	0.12	0.19	38.33	0.26	0.36	GN
7XHPYM		29.75	0.19	0.31	38.20	0.14	0.19	GN
7ZQPD2		29.18	-0.38	-0.62	37.75	-0.31	-0.42	GA
8JUF23		28.83	-0.73	-1.19	36.58	-1.49	-2.00	GL
8N7TUF		29.60	0.04	0.07	38.33	0.26	0.36	GK
8T3JZR		29.93	0.37	0.60	38.35	0.29	0.39	XX
9HGX7G		29.48	-0.08	-0.13	38.13	0.06	0.09	GL
AKYE28		30.08	0.52	0.84	38.33	0.26	0.36	GK
AU6TRU		29.70	0.14	0.23	38.10	0.04	0.05	GL
BZR7L9	X	0.60	-28.96	-47.19	0.70	-37.36	-50.20	GK
DG4YUU		29.40	-0.16	-0.26	38.23	0.16	0.22	GL
DHZ897		29.73	0.17	0.27	38.40	0.34	0.46	MH
ERGHQV		28.78	-0.78	-1.27	36.68	-1.39	-1.86	GK
FLVPFW		30.65	1.09	1.78	39.33	1.26	1.70	GL
FPDZAF		29.10	-0.46	-0.74	37.58	-0.49	-0.65	GL
G2FVZV		29.33	-0.23	-0.38	37.95	-0.11	-0.15	MW
GC3MVZ		30.05	0.49	0.80	38.78	0.71	0.96	XX
GGVPYZ		30.50	0.94	1.54	39.15	1.09	1.46	GL
GW7ETR		30.30	0.74	1.21	38.83	0.76	1.03	GL



**Interlaboratory Testing Program for Color & Appearance**

**Report #179**

**Analysis 440**

**1st Qtr 2017**

**60 Degree Gloss - Paint Chips**

**ASTM Method D 523**

WebCode	Data Flag	Sample E171			Sample E172			Instr Code
		Lab Mean	Difference from Grand Mean	Comparative Performance Value	Lab Mean	Difference from Grand Mean	Comparative Performance Value	
HNT4X7	*	28.08	-1.48	-2.42	37.00	-1.06	-1.42	GK
J43ANV		28.88	-0.68	-1.11	37.23	-0.84	-1.12	GL
JZ3XPB		29.28	-0.28	-0.46	37.75	-0.31	-0.42	GL
K27XHU		28.85	-0.71	-1.15	37.28	-0.79	-1.05	GQ
KPWFRD		29.83	0.27	0.44	38.60	0.54	0.73	GK
LWBJE7		29.58	0.02	0.03	38.10	0.04	0.05	GL
MF3TTR		29.25	-0.31	-0.50	38.10	0.04	0.05	GL
MRG434		29.28	-0.28	-0.46	37.30	-0.76	-1.02	GL
MU4RFP		29.53	-0.03	-0.05	37.85	-0.21	-0.28	GL
MUY9TL		30.15	0.59	0.97	38.58	0.51	0.69	GK
MVAC4P		28.63	-0.93	-1.52	36.95	-1.11	-1.49	GK
N2ZYGA		29.40	-0.16	-0.26	38.03	-0.04	-0.05	RA
N8KXA4		29.15	-0.41	-0.66	38.00	-0.06	-0.08	GK
NW6K3F		29.95	0.39	0.64	38.70	0.64	0.86	PC
NYRM2T		29.03	-0.53	-0.87	37.00	-1.06	-1.42	RA
PJXG76		30.50	0.94	1.54	39.03	0.96	1.30	GL
PLMNQ2		28.58	-0.98	-1.60	36.48	-1.59	-2.13	GL
Q34E37		29.55	-0.01	-0.01	37.75	-0.31	-0.42	GL
Q6BUCX		29.50	-0.06	-0.09	38.25	0.19	0.26	GL
QV2A8F		29.63	0.07	0.11	38.08	0.01	0.02	GK
R4A2AJ		29.65	0.09	0.15	38.23	0.16	0.22	GN
R4WPDY		28.60	-0.96	-1.56	37.58	-0.49	-0.65	GL
R7HDRK		29.65	0.09	0.15	38.38	0.31	0.42	GN
RETTHT		28.88	-0.68	-1.11	37.15	-0.91	-1.22	GL
TDDTX4		29.61	0.06	0.09	38.31	0.25	0.34	GL
TTAR4L	*	31.15	1.59	2.60	39.85	1.79	2.40	MW
UNQDV6		30.73	1.17	1.90	39.28	1.21	1.63	GL
UWNZNQ		28.98	-0.58	-0.95	37.30	-0.76	-1.02	GL
V4K7YJ		29.70	0.14	0.23	38.30	0.24	0.32	GK
WG38DP		28.65	-0.91	-1.48	37.08	-0.99	-1.32	GK



# Interlaboratory Testing Program for Color & Appearance

Report #179

## Analysis 440

1st Qtr 2017

### 60 Degree Gloss - Paint Chips

#### ASTM Method D 523

WebCode	Data Flag	Sample E171			Sample E172			Instr Code
		Lab Mean	Difference from Grand Mean	Comparative Performance Value	Lab Mean	Difference from Grand Mean	Comparative Performance Value	
WG3DBB		30.60	1.04	1.70	39.13	1.06	1.43	GN
WN6FHW		29.33	-0.23	-0.38	38.10	0.04	0.05	GL
XEW7QW		29.75	0.19	0.31	38.08	0.01	0.02	GL
Y66EUB		30.28	0.72	1.17	38.73	0.66	0.89	GL
YBRUAM		29.91	0.35	0.57	38.16	0.10	0.13	GL
Z2YGU3	*	29.68	0.12	0.19	39.08	1.01	1.36	GK
Z3DBPN		30.53	0.97	1.58	39.25	1.19	1.60	GK
ZH2B69	X	31.80	2.24	3.65	32.95	-5.11	-6.87	XX
ZQDZUL		28.48	-1.08	-1.76	36.50	-1.56	-2.10	GB

#### Summary Statistics

##### Grand Means

29.56 Gloss Units

38.06 Gloss Units

##### Std Dev Btwn Labs

0.61 Gloss Units

0.74 Gloss Units

Statistics based on 66 of 69 reporting participants

#### Comments on Assigned Data Flags for Test #440

4R43CL(X) - Inconsistent in testing between samples, data for Sample E172 are low.

BZR7L9(X) - Extreme data.

ZH2B69(X) - Inconsistent in testing between samples, data for Sample E171 are high and data for Sample E172 are low.

#### Key to Instrument Codes Reported by Participants

<b>GA</b>	BYK Gardner Color - Guide Gloss	<b>GB</b>	BYK Gardner Spectro - Guide Sphere Gloss
<b>GK</b>	BYK-Gardner micro-gloss (60)	<b>GL</b>	BYK-Gardner micro-TRI-gloss
<b>GN</b>	BYK-Gardner new micro-TRI-gloss	<b>GQ</b>	BYK-Gardner haze-gloss
<b>MH</b>	X-Rite/Macbeth Color-Eye XTH	<b>MW</b>	Minolta Multi-Gloss 268
<b>PC</b>	Picogloss 503 Erichson	<b>RA</b>	Rhpoint Novo-Gloss Glossmeter
<b>XX</b>	Instrument make/model not specified by lab		



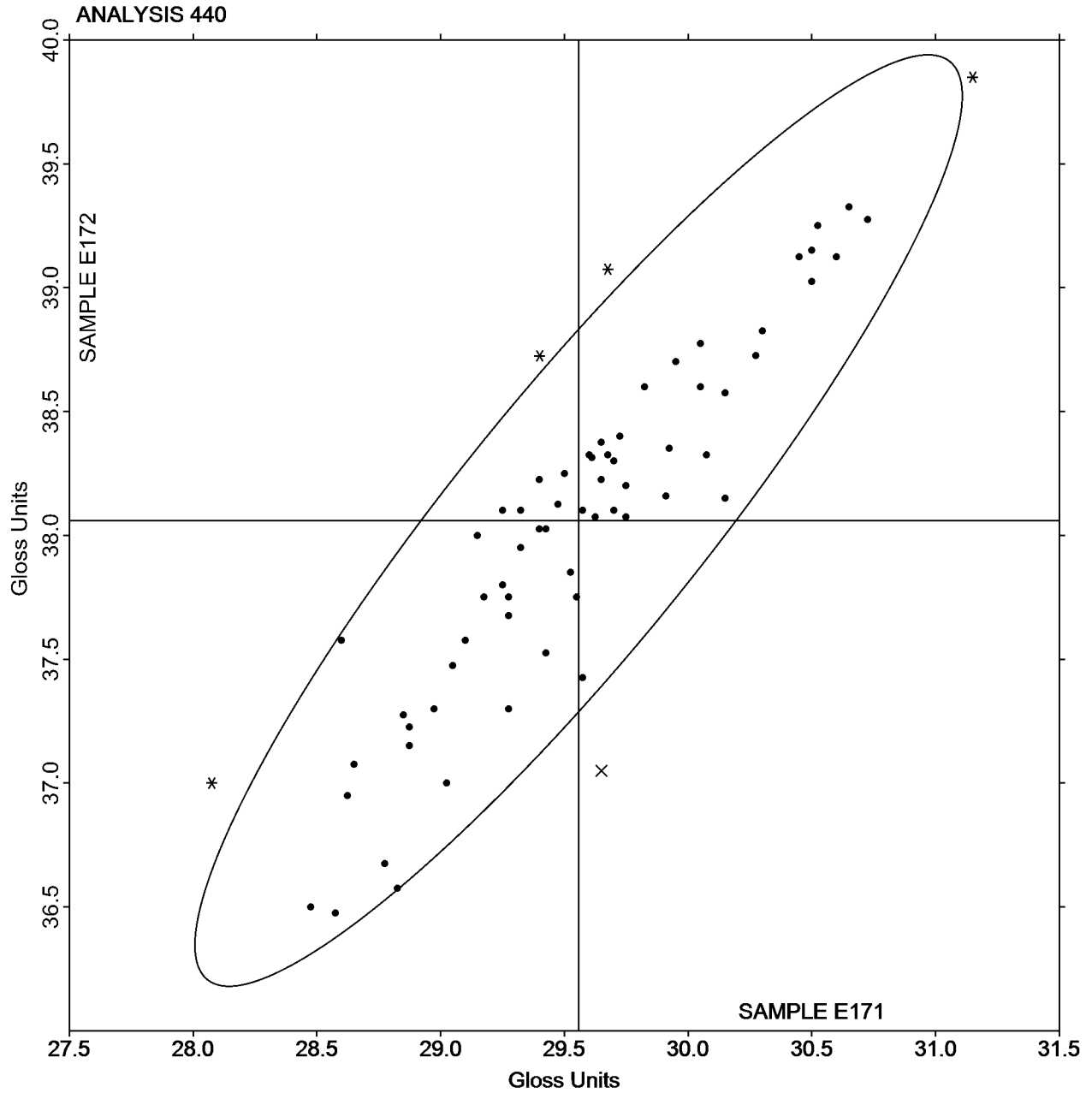
Analysis 440

60 Degree Gloss - Paint Chips

ASTM Method D 523

SAMPLE E171 = 29.56 Gloss Units

SAMPLE E172 = 38.06 Gloss Units







# Interlaboratory Testing Program for Color & Appearance

Report #179

## Analysis 442

1st Qtr 2017

### 85 Degree Gloss - Paint Chips

#### ASTM Method D 523

WebCode	Data Flag	Sample J171			Sample J172			Instr Code
		Lab Mean	Difference from Grand Mean	Comparative Performance Value	Lab Mean	Difference from Grand Mean	Comparative Performance Value	
2V62H2		12.38	0.46	0.25	16.08	0.54	0.23	GL
7RB4BP		12.50	0.59	0.31	16.03	0.49	0.21	XX
7XHPYM		12.58	0.66	0.35	16.65	1.12	0.48	GN
AU6TRU		12.63	0.71	0.38	16.50	0.97	0.42	GL
GGVPYZ		12.53	0.61	0.33	16.28	0.74	0.32	GL
PJXG76		13.03	1.11	0.59	17.10	1.57	0.68	GL
PLMNQ2		10.53	-1.39	-0.74	13.88	-1.66	-0.72	GL
R4WPDY		6.63	-5.29	-2.82	9.05	-6.48	-2.82	GL
R7HDRK		12.85	0.94	0.50	16.35	0.82	0.35	GN
XEW7QW		12.60	0.69	0.37	16.35	0.82	0.35	GN
YBRUAM		12.80	0.89	0.48	16.62	1.09	0.47	GL

#### Summary Statistics

##### Grand Means

11.91 Gloss Units

15.53 Gloss Units

##### Std Dev Btwn Labs

1.87 Gloss Units

2.30 Gloss Units

Statistics based on 11 of 11 reporting participants

#### Key to Instrument Codes Reported by Participants

**GL** BYK-Gardner micro-TRI-gloss

**GN** BYK-Gardner new micro-TRI-gloss

**XX** Instrument make/model not specified by lab



Interlaboratory Testing Program for Color & Appearance

Report #179

Analysis 442

1st Qtr 2017

85 Degree Gloss - Paint Chips

ASTM Method D 523

SAMPLE J171 = 11.91 Gloss Units

SAMPLE J172 = 15.53 Gloss Units

