



## Color & Appearance Testing Program

### Summary Report # 146 - 4th Q 2008

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

[Key to Tables and Graphs](#)

<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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[Instrument Code List](#)

## **ABOUT THE 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 50 countries, currently participate in the CTS programs.

If there are any questions on the report or testing program, please contact:

**Collaborative Testing Services, Inc.  
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Sterling, Virginia 20166 USA**

**+1-571-434-1925  
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## 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.

**Interlaboratory Testing Program for Color & Appearance  
Analysis 408**

**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*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$	
19QPZW		D81	66.79	-13.83	27.60	0.80	0.08	-0.44	0.92	XO
		D82	67.59	-13.75	27.16					
1PFV SX		D81	66.41	-13.74	27.78	0.86	-0.02	-0.57	1.02	MQ
		D82	67.27	-13.75	27.22					
1W4CNM		D81	66.51	-13.99	27.22	0.81	0.07	-0.56	0.98	HW
		D82	67.31	-13.92	26.66					
1WLLFM		D81	66.93	-13.71	27.81	0.82	0.07	-0.50	0.96	GH
		D82	67.75	-13.65	27.31					
32KS4P		D81	66.56	-13.20	27.99	0.86	0.04	-0.53	1.00	XR
		D82	67.41	-13.16	27.46					
3AXJYT		D81	66.58	-14.57	27.41	0.79	0.03	-0.49	0.93	MG
		D82	67.37	-14.54	26.93					
3D72DM		D81	67.12	-14.41	27.97	0.71	0.00	-0.46	0.84	GH
		D82	67.83	-14.41	27.52					
4JK2LZ	X	D81	67.37	-20.50	28.14	0.82	0.00	-0.52	0.96	XX
		D82	68.18	-20.50	27.62					
7R9MN4		D81	66.86	-14.16	27.50	0.80	0.04	-0.56	0.97	HW
		D82	67.66	-14.12	26.94					
8DZ83W		D81	66.91	-13.43	27.84	0.83	0.00	-0.54	0.99	XS
		D82	67.74	-13.43	27.30					
8T5WMX		D81	66.50	-13.45	27.56	0.79	0.01	-0.52	0.94	XL
		D82	67.28	-13.45	27.05					
8ZYULZ		D81	66.61	-14.42	27.29	0.78	0.06	-0.61	0.99	HW
		D82	67.39	-14.36	26.68					
A8KJAY		D81	66.50	-12.59	27.74	0.78	-0.08	-0.53	0.94	GU
		D82	67.28	-12.66	27.21					
AA3YEL		D81	66.62	-13.97	27.70	0.77	-0.01	-0.54	0.93	HK
		D82	67.38	-13.98	27.16					

**Interlaboratory Testing Program for Color & Appearance  
Analysis 408**

**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*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$	
ATHAV4		D81	66.94	-13.22	27.38	0.83	0.03	-0.50	0.97	MU
		D82	67.77	-13.19	26.89					
B8CUH8		D81	66.92	-13.75	27.64	0.84	0.03	-0.53	0.99	XO
		D82	67.76	-13.72	27.11					
BURKLF		D81	66.94	-14.42	27.40	0.86	0.06	-0.54	1.01	HW
		D82	67.79	-14.36	26.86					
CRJNES		D81	66.73	-13.59	28.30	0.93	0.05	-0.99	1.36	XU
		D82	67.66	-13.55	27.31					
DKR3PG		D81	66.55	-13.53	27.65	0.94	0.03	-0.57	1.10	XU
		D82	67.48	-13.50	27.08					
DLZN6K		D81	66.69	-14.16	27.34	0.77	0.12	-0.42	0.88	HW
		D82	67.46	-14.04	26.93					
E19WKT		D81	66.60	-13.84	27.41	0.83	0.06	-0.55	0.99	HW
		D82	67.43	-13.78	26.86					
E2NUZG		D81	67.00	-13.93	27.81	0.83	0.01	-0.59	1.02	GD
		D82	67.83	-13.92	27.22					
F3VZSR	X	D81	65.80	-13.35	27.60	0.75	-0.10	-0.55	0.94	TN
		D82	66.55	-13.45	27.05					
GJGVQZ		D81	66.71	-13.99	27.89	0.80	-0.03	-0.56	0.97	GH
		D82	67.51	-14.02	27.33					
GQX9PK		D81	66.96	-13.37	28.07	0.73	-0.06	-0.46	0.86	HN
		D82	67.69	-13.42	27.62					
H6GM59		D81	66.35	-12.91	27.01	0.75	-0.02	-0.47	0.89	HK
		D82	67.10	-12.92	26.54					
H7193R		D81	67.42	-12.60	28.16	0.00	0.11	-0.76	0.77	GU
		D82	67.42	-12.49	27.40					
KCRTHQ		D81	67.13	-13.86	27.83	0.92	0.03	-0.66	1.13	XN
		D82	68.05	-13.83	27.18					

**Interlaboratory Testing Program for Color & Appearance  
Analysis 408**

**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*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$	
KCZETD		D81	66.80	-13.79	27.84	0.79	-0.06	-0.51	0.94	XT
		D82	67.59	-13.85	27.33					
MMFXD	X	D81	67.25	-16.95	27.80	0.25	-0.10	-0.40	0.48	GQ
		D82	67.50	-17.05	27.40					
N9VK1E		D81	67.11	-13.61	27.73	0.54	-0.03	-0.38	0.66	XP
		D82	67.65	-13.64	27.35					
P96ZQ1		D81	67.38	-14.36	27.63	0.79	-0.01	-0.50	0.93	HW
		D82	68.17	-14.37	27.13					
Q6N4KM		D81	66.62	-13.65	27.69	0.85	0.03	-0.60	1.03	XM
		D82	67.47	-13.62	27.10					
S9X4SY		D81	66.93	-13.67	27.76	0.88	0.06	-0.43	0.98	MH
		D82	67.80	-13.62	27.33					
SMYWX3		D81	66.73	-14.41	27.30	0.73	0.03	-0.47	0.87	HW
		D82	67.46	-14.38	26.83					
U5TZ9A		D81	66.94	-13.68	27.63	0.75	0.01	-0.40	0.85	XO
		D82	67.69	-13.68	27.24					
VHRP58		D81	66.31	-12.72	27.92	0.94	0.06	-0.64	1.14	GU
		D82	67.24	-12.66	27.28					
VZVVKA		D81	66.50	-12.61	27.88	0.80	-0.03	-0.52	0.95	GU
		D82	67.29	-12.64	27.36					
X82EYR		D81	66.99	-13.45	28.13	0.77	-0.06	-0.45	0.89	GE
		D82	67.76	-13.50	27.68					
X9XUL9		D81	66.58	-14.18	27.39	0.80	-0.01	-0.59	0.99	XX
		D82	67.38	-14.18	26.80					
XMK448		D81	66.67	-14.19	27.24	0.79	0.05	-0.49	0.93	HW
		D82	67.46	-14.14	26.75					
YMR24G		D81	66.86	-13.23	28.17	0.85	0.06	-0.46	0.96	GA
		D82	67.70	-13.18	27.71					

**Interlaboratory Testing Program for Color & Appearance  
Analysis 408**

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

**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>
<b>Grand Means</b>							
D81	66.76	-13.69	27.67				
D82	67.58	-13.67	27.15	0.79	0.02	-0.53	0.96
<b>Std Dev Btwn Labs</b>							
D81	0.26	0.53	0.28				
D82	0.26	0.52	0.29	0.15	0.04	0.11	0.11
<b>Statistics based on 39 of 42 reporting participants</b>							

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

4JK2LZ(X) - Low "a\*" values.

F3VZSR(X) - Low "L\*" values.

MMFXDB(X) - Low "a\*" values. Large replication difference for "L" value on Sample D82.

# Interlaboratory Testing Program for Color & Appearance

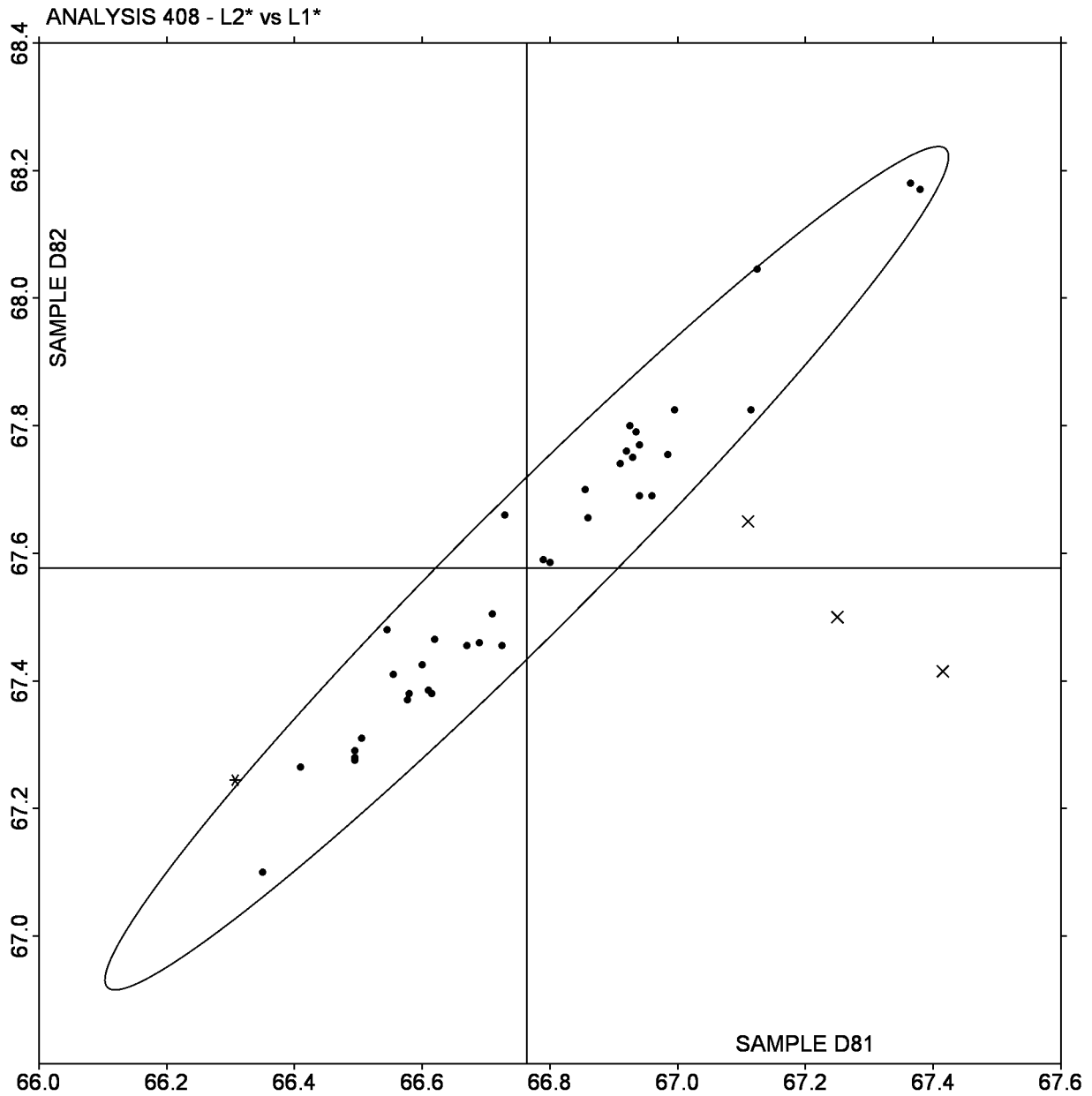
## Analysis 408

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

### L2\* vs L1\*

SAMPLE D81 = 66.76

SAMPLE D82 = 67.58



# Interlaboratory Testing Program for Color & Appearance

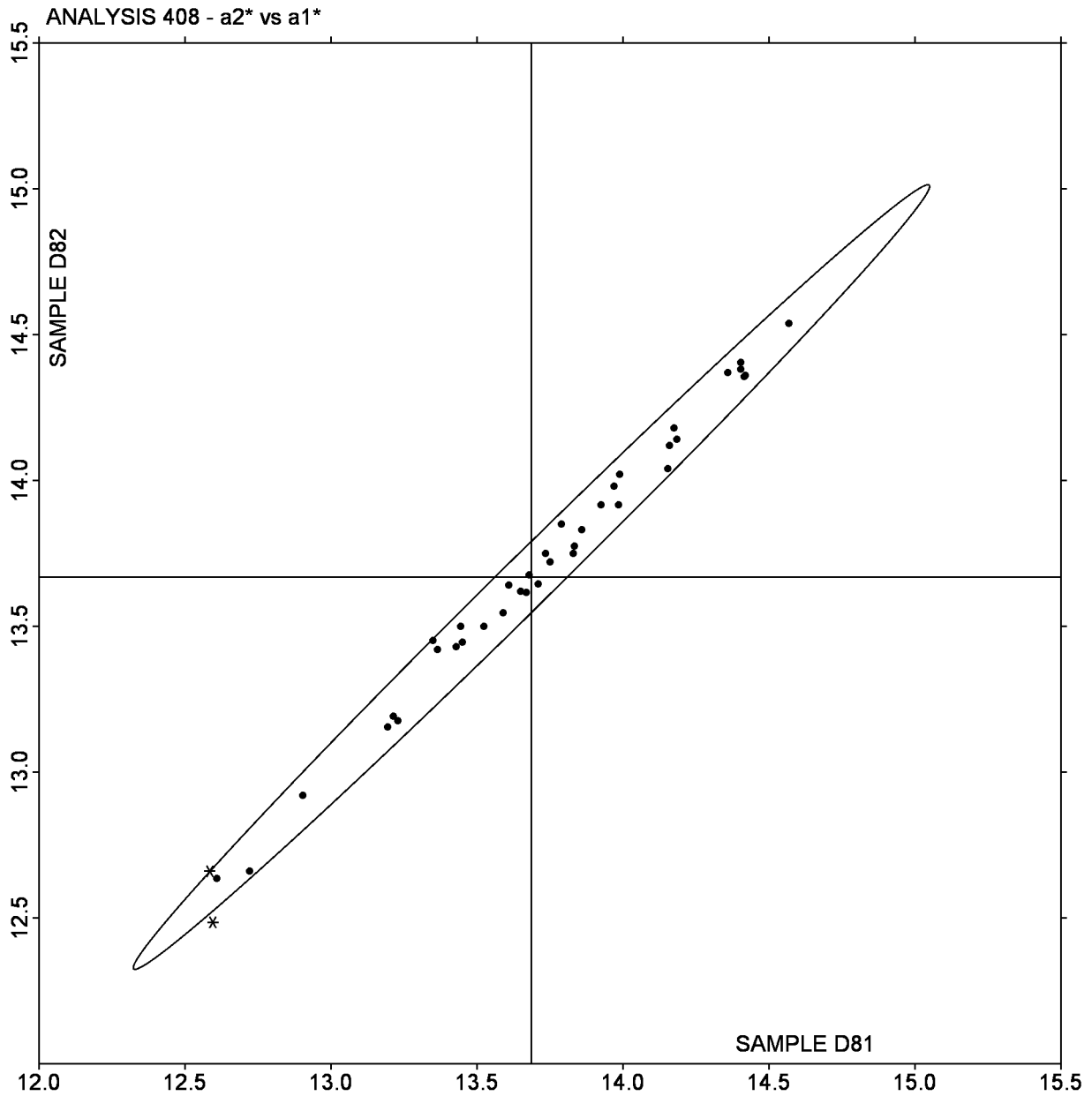
## Analysis 408

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

### a2\* vs a1\*

SAMPLE D81 = -13.69

SAMPLE D82 = -13.67



Plot created using absolute values.

# Interlaboratory Testing Program for Color & Appearance

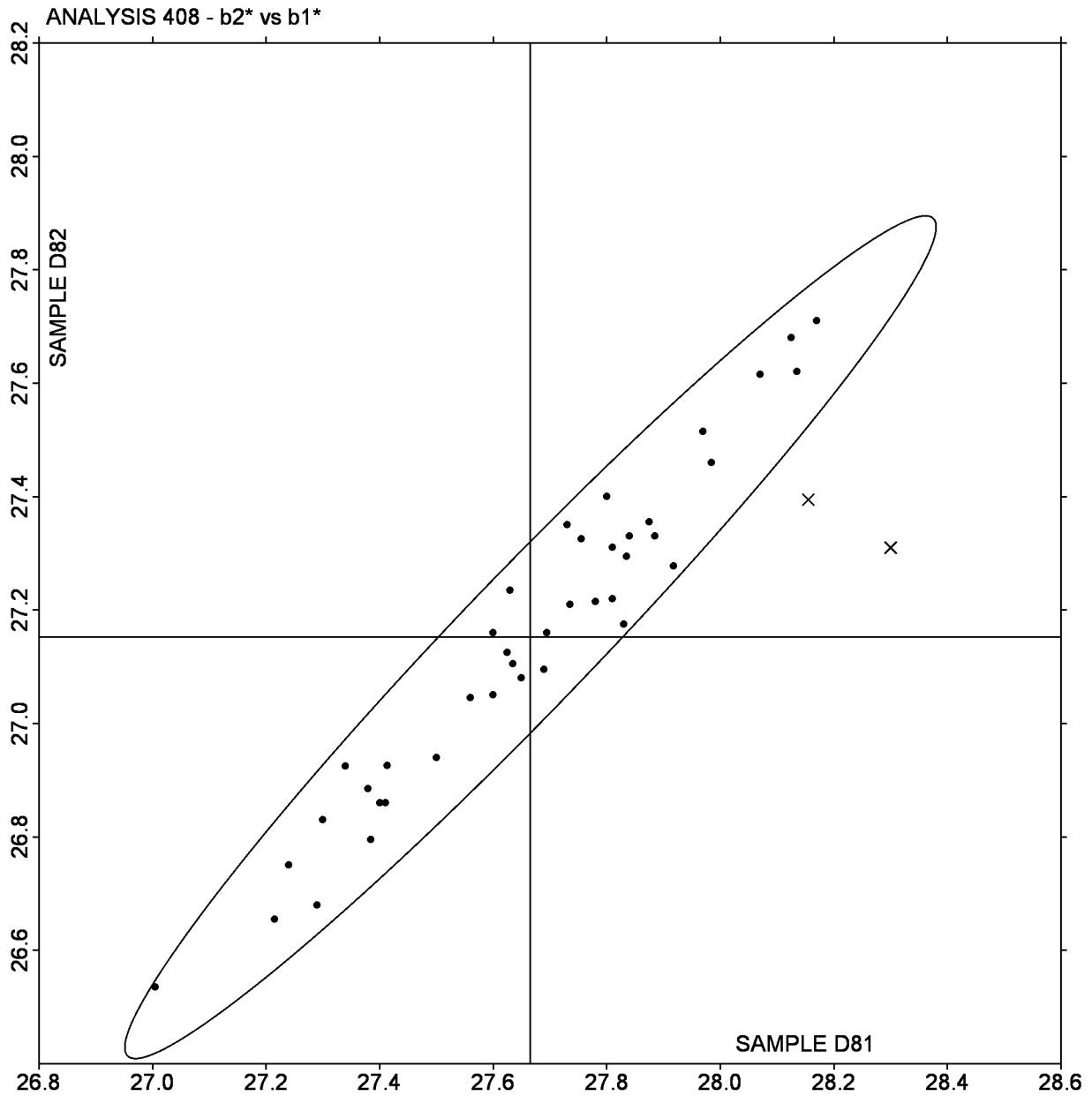
## Analysis 408

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

### b2\* vs b1\*

SAMPLE D81 = 27.67

SAMPLE D82 = 27.15



**Interlaboratory Testing Program for Color & Appearance  
Analysis 409**

**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*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$	
1394Y5		D81	66.87	-13.24	27.13	0.87	0.09	-0.53	1.02	AD
		D82	67.73	-13.15	26.60					
186311		D81	66.85	-13.35	27.25	0.70	0.00	-0.40	0.81	SH
		D82	67.55	-13.35	26.85					
1EX82V		D81	66.94	-13.41	27.33	0.80	0.04	-0.55	0.97	AJ
		D82	67.74	-13.37	26.78					
1S84B5		D81	66.35	-13.00	26.75	0.77	-0.02	-0.44	0.89	MJ
		D82	67.12	-13.02	26.32					
23RYB5		D81	67.05	-13.69	27.22	0.84	0.06	-0.47	0.96	GG
		D82	67.89	-13.63	26.76					
27FU1A		D81	66.60	-13.13	26.96	0.77	0.01	-0.42	0.88	MJ
		D82	67.37	-13.12	26.54					
28LQYU		D81	66.87	-13.75	27.14	0.84	0.02	-0.63	1.04	XR
		D82	67.71	-13.73	26.52					
2FT6U2		D81	66.83	-13.13	27.12	0.86	0.16	-0.62	1.07	MM
		D82	67.69	-12.97	26.50					
2GEU44		D81	66.57	-13.66	27.21	0.90	0.05	-0.61	1.09	GD
		D82	67.47	-13.62	26.60					
2GLN3V		D81	66.80	-13.06	27.27	0.86	0.04	-0.61	1.05	AJ
		D82	67.66	-13.02	26.66					
2UWTH4		D81	66.84	-13.26	26.98	0.81	0.02	-0.50	0.95	MM
		D82	67.65	-13.24	26.49					
2Y339S		D81	67.11	-13.64	27.20	0.77	0.02	-0.49	0.91	AJ
		D82	67.87	-13.62	26.71					
2YNRMF		D81	66.89	-13.02	27.20	0.85	0.06	-0.53	1.00	HP
		D82	67.74	-12.96	26.67					
36NYRS		D81	67.01	-13.44	27.02	0.77	0.05	-0.44	0.89	HW
		D82	67.78	-13.40	26.58					

**Interlaboratory Testing Program for Color & Appearance  
Analysis 409**

**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*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$	
3JQSJJ		D81	67.10	-13.60	27.37	0.81	0.05	-0.51	0.96	MV
		D82	67.91	-13.55	26.86					
3LFLAY		D81	66.92	-13.58	27.08	0.79	0.07	-0.52	0.95	AM
		D82	67.71	-13.52	26.56					
3LX7QQ		D81	66.76	-13.18	27.08	0.78	0.02	-0.48	0.91	AJ
		D82	67.53	-13.16	26.61					
3M24EY		D81	66.44	-13.07	27.07	0.79	-0.02	-0.56	0.97	MG
		D82	67.23	-13.09	26.51					
456R45		D81	67.04	-13.20	27.08	0.84	0.03	-0.66	1.07	AJ
		D82	67.88	-13.17	26.42					
45MQEG		D81	67.01	-13.72	27.02	0.85	0.10	-0.46	0.97	AJ
		D82	67.86	-13.62	26.57					
4A2WBM		D81	67.12	-13.18	27.25	0.74	-0.02	-0.48	0.88	AJ
		D82	67.86	-13.20	26.77					
4CGV8H		D81	66.95	-14.07	26.69	0.83	0.05	-0.45	0.94	HW
		D82	67.78	-14.02	26.24					
51P7TF		D81	66.85	-13.78	26.99	0.81	0.04	-0.52	0.96	HW
		D82	67.66	-13.74	26.47					
586KUZ		D81	67.03	-13.39	27.32	0.86	0.04	-0.63	1.06	AM
		D82	67.88	-13.36	26.69					
5DNTLY		D81	66.54	-13.45	26.99	0.87	0.04	-0.54	1.02	MM
		D82	67.41	-13.41	26.45					
5FGQ35	X	D81	66.53	-13.63	26.67	0.75	-0.01	-0.62	0.97	GD
		D82	67.28	-13.64	26.05					
5K8ZAH		D81	66.93	-13.44	27.18	0.85	0.05	-0.55	1.01	AJ
		D82	67.78	-13.39	26.63					
5L4A68		D81	66.93	-13.15	27.23	0.85	0.06	-0.59	1.03	AM
		D82	67.78	-13.09	26.64					

**Interlaboratory Testing Program for Color & Appearance  
Analysis 409**

**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*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$	
5LG5E6	X	D81	67.04	-13.59	27.71	0.80	0.04	-0.51	0.94	MV
		D82	67.84	-13.55	27.20					
5RGG74		D81	66.87	-13.17	27.09	0.79	0.04	-0.49	0.93	AM
	D82	67.66	-13.13	26.61						
65E14L		D81	66.89	-13.30	27.09	0.83	0.04	-0.53	0.98	AJ
	D82	67.71	-13.26	26.57						
665RX8		D81	67.09	-13.25	27.37	0.85	0.02	-0.52	0.99	MV
	D82	67.93	-13.23	26.85						
68YEVW		D81	67.10	-13.62	26.97	0.79	-0.02	-0.48	0.92	HW
	D82	67.89	-13.63	26.49						
6F4K6Z		D81	66.79	-13.33	27.07	0.80	0.02	-0.49	0.93	MK
	D82	67.59	-13.31	26.59						
6H1X6Y		D81	66.92	-13.05	27.08	0.82	0.00	-0.48	0.94	AM
	D82	67.73	-13.05	26.60						
6MMXQ6		D81	67.09	-13.26	27.22	0.84	0.10	-0.56	1.01	AJ
	D82	67.92	-13.16	26.66						
6NR952		D81	66.84	-14.18	26.70	0.82	0.04	-0.47	0.95	HW
	D82	67.66	-14.14	26.23						
6XAM47		D81	66.75	-12.97	27.36	0.83	0.02	-0.58	1.01	MV
	D82	67.57	-12.95	26.78						
74U5UF		D81	66.99	-13.14	27.18	0.77	-0.04	-0.43	0.88	AJ
	D82	67.76	-13.18	26.75						
77AS6Z		D81	66.92	-13.57	27.29	0.81	0.03	-0.55	0.98	MV
	D82	67.73	-13.54	26.75						
7AURP8		D81	66.80	-13.42	27.15	0.81	0.01	-0.56	0.98	AJ
	D82	67.61	-13.41	26.59						
7C7226		D81	66.79	-13.36	26.98	0.82	0.07	-0.57	1.00	AJ
	D82	67.61	-13.29	26.41						

**Interlaboratory Testing Program for Color & Appearance  
Analysis 409**

**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*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$	
7HHM6B		D81	66.77	-13.41	26.98	0.79	0.03	-0.49	0.93	MK
		D82	67.55	-13.39	26.49					
7PNHSW		D81	67.02	-13.30	27.12	0.78	0.03	-0.52	0.94	AO
		D82	67.80	-13.28	26.60					
8AEJHJ	X	D81	65.24	-13.03	24.96	0.75	0.06	-0.41	0.85	AJ
		D82	65.99	-12.97	24.55					
8BBKCV		D81	66.67	-13.38	26.94	0.83	0.02	-0.53	0.98	XI
		D82	67.50	-13.36	26.41					
8DC5S9		D81	66.92	-13.25	27.09	0.76	0.02	-0.42	0.86	AM
		D82	67.68	-13.23	26.68					
8E9KFS		D81	66.49	-13.65	27.09	0.80	0.05	-0.55	0.97	XQ
		D82	67.29	-13.61	26.54					
8JTPTA		D81	66.74	-13.35	26.84	0.75	-0.01	-0.41	0.85	ME
		D82	67.49	-13.35	26.43					
8KDD8P	X	D81	67.40	-13.30	27.34	0.65	-0.14	-0.73	0.99	HK
		D82	68.05	-13.44	26.61					
8RNGGP		D81	66.75	-13.81	26.98	0.73	0.06	-0.45	0.86	XP
		D82	67.48	-13.75	26.53					
8V64GU		D81	66.81	-13.15	26.92	0.84	0.02	-0.52	0.99	MK
		D82	67.65	-13.13	26.40					
8ZVBEN		D81	66.68	-13.07	26.99	0.84	0.03	-0.51	0.98	MK
		D82	67.53	-13.04	26.48					
93DLA7	X	D81	66.63	-12.55	27.46	0.61	0.17	-0.50	0.81	HG
		D82	67.24	-12.38	26.96					
9KNUPU		D81	66.83	-13.42	27.12	0.78	0.00	-0.50	0.93	MM
		D82	67.61	-13.42	26.62					
9MU9XL		D81	66.59	-13.92	26.95	0.86	0.02	-0.40	0.95	XL
		D82	67.45	-13.90	26.55					

**Interlaboratory Testing Program for Color & Appearance  
Analysis 409**

**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*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$	
A8LJ8D		D81	66.95	-13.64	27.32	0.84	0.03	-0.59	1.02	MX
		D82	67.79	-13.61	26.74					
ACX9U8		D81	66.45	-13.56	27.03	0.84	0.05	-0.58	1.02	HW
		D82	67.29	-13.51	26.45					
AFSDU6		D81	66.83	-13.20	27.10	0.75	-0.25	-0.38	0.88	AM
		D82	67.58	-13.45	26.72					
AHNWB		D81	66.78	-13.42	27.05	0.85	0.09	-0.49	0.98	MM
		D82	67.62	-13.34	26.56					
AZRDEC		D81	66.71	-13.32	27.22	0.87	0.05	-0.62	1.07	MV
		D82	67.58	-13.27	26.60					
B41RXB		D81	66.79	-13.51	27.09	0.82	0.04	-0.56	0.99	MK
		D82	67.61	-13.47	26.53					
BB4EQG		D81	66.81	-13.34	27.25	0.78	0.02	-0.47	0.91	MV
		D82	67.59	-13.32	26.79					
BG64S4		D81	67.09	-13.36	27.18	0.77	0.00	-0.45	0.89	AO
		D82	67.85	-13.36	26.74					
BYM7GP		D81	66.75	-13.78	27.11	0.73	0.01	-0.45	0.86	XO
		D82	67.48	-13.77	26.66					
C333QZ		D81	66.38	-13.34	26.89	0.85	0.04	-0.55	1.01	XQ
		D82	67.22	-13.31	26.34					
C5T7MC	X	D81	66.80	-13.22	27.55	0.88	0.06	-0.65	1.09	PE
		D82	67.68	-13.16	26.90					
CC2T98	X	D81	67.67	-15.37	26.47	0.83	0.06	-0.64	1.05	PE
		D82	68.50	-15.30	25.84					
CCQZV7		D81	66.72	-13.22	27.16	0.87	0.05	-0.54	1.02	AM
		D82	67.58	-13.17	26.62					
D9WRPA		D81	66.64	-13.73	27.21	0.75	-0.02	-0.44	0.86	GD
		D82	67.39	-13.75	26.78					

**Interlaboratory Testing Program for Color & Appearance  
Analysis 409**

**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*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$	
DBXU4Q		D81	66.91	-13.85	26.95	0.85	0.06	-0.52	0.99	HU
		D82	67.76	-13.79	26.43					
DC4S61		D81	66.78	-13.43	27.18	0.83	0.01	-0.50	0.96	AJ
		D82	67.61	-13.42	26.68					
DEL63W		D81	66.66	-14.14	26.94	0.74	0.06	-0.51	0.90	XO
		D82	67.40	-14.08	26.44					
DFK7C9		D81	66.95	-13.81	26.94	0.80	0.00	-0.42	0.90	HF
		D82	67.74	-13.81	26.52					
DRGD8T		D81	66.85	-13.07	27.13	0.79	0.00	-0.59	0.98	AO
		D82	67.63	-13.07	26.54					
E2VQ2G		D81	67.10	-13.31	27.38	0.75	-0.04	-0.44	0.87	AG
		D82	67.84	-13.35	26.94					
EBB5BC		D81	67.03	-13.32	26.99	0.80	0.01	-0.39	0.89	AJ
		D82	67.83	-13.31	26.60					
EKVPAP		D81	67.02	-13.51	27.40	0.82	-0.01	-0.60	1.02	MV
		D82	67.84	-13.52	26.80					
FCUNMV		D81	67.02	-13.22	26.97	0.79	0.00	-0.44	0.90	AM
		D82	67.81	-13.22	26.54					
G7QN6H		D81	66.56	-13.55	27.07	0.82	0.07	-0.56	1.00	MJ
		D82	67.38	-13.48	26.51					
GM1N22		D81	66.78	-13.80	26.82	0.77	0.05	-0.41	0.87	MZ
		D82	67.55	-13.75	26.42					
HKMJNB		D81	66.77	-13.22	27.40	0.73	-0.06	-0.48	0.88	EE
		D82	67.50	-13.28	26.92					
HTFNTL		D81	66.60	-13.12	27.12	0.75	-0.06	-0.41	0.85	AP
		D82	67.34	-13.18	26.71					
JRQR2J	X	D81	66.84	-13.18	25.70	0.35	0.12	-0.52	0.64	MK
		D82	67.18	-13.06	25.17					

**Interlaboratory Testing Program for Color & Appearance  
Analysis 409**

**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*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$	
K96P6M		D81	66.90	-12.91	27.16	0.80	-0.01	-0.53	0.96	AJ
		D82	67.70	-12.92	26.63					
KMCGB		D81	66.89	-13.08	27.22	0.75	-0.06	-0.53	0.92	AM
		D82	67.64	-13.14	26.70					
L61736		D81	66.91	-13.49	27.21	0.85	0.12	-0.49	0.99	MV
		D82	67.76	-13.38	26.72					
L9Z6CF		D81	66.87	-13.25	27.19	0.80	0.05	-0.54	0.96	AM
		D82	67.67	-13.20	26.65					
LHT7VE		D81	67.05	-13.50	27.26	0.81	0.02	-0.55	0.98	AG
		D82	67.86	-13.48	26.71					
LP9BKN	X	D81	65.76	-13.14	28.05	0.84	0.03	-0.55	1.00	GH
		D82	66.59	-13.11	27.50					
LRNCPF		D81	67.18	-13.48	27.17	0.84	0.04	-0.55	1.00	AG
		D82	68.02	-13.44	26.62					
LSGHAV		D81	66.97	-13.44	27.11	0.79	0.02	-0.39	0.88	AJ
		D82	67.76	-13.43	26.72					
LZSTCU	X	D81	67.19	-13.51	26.57	-0.50	0.06	0.47	0.69	AP
		D82	66.69	-13.46	27.04					
N6QARX		D81	67.13	-13.46	27.36	0.78	0.06	-0.49	0.92	HP
		D82	67.91	-13.40	26.87					
NDKHSQ		D81	66.96	-13.37	27.05	0.77	0.01	-0.41	0.87	AG
		D82	67.72	-13.36	26.64					
NM1WD	X	D81	66.80	-13.85	26.58	0.89	0.08	-0.50	1.02	HH
		D82	67.69	-13.78	26.08					
NQKVNG	X	D81	66.64	-12.65	27.25	0.66	-0.08	-0.45	0.80	HG
		D82	67.29	-12.73	26.80					
NTNMY3		D81	66.69	-12.82	27.22	0.77	0.03	-0.50	0.91	HX
		D82	67.45	-12.79	26.72					

**Interlaboratory Testing Program for Color & Appearance  
Analysis 409**

**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*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$	
P57QBE		D81	66.98	-13.01	27.03	0.74	-0.07	-0.40	0.84	AQ
		D82	67.72	-13.08	26.63					
P67JGC		D81	66.88	-13.59	26.90	0.70	0.02	-0.45	0.83	HW
		D82	67.58	-13.57	26.45					
PARZ7Q		D81	67.08	-13.61	27.20	0.81	0.05	-0.44	0.92	AJ
		D82	67.89	-13.56	26.76					
PAUELB		D81	66.52	-13.63	27.01	0.80	0.06	-0.54	0.97	MJ
		D82	67.32	-13.58	26.47					
PCXG5L		D81	66.96	-13.13	27.18	0.85	0.07	-0.54	1.01	AJ
		D82	67.81	-13.06	26.64					
PHWMBS		D81	66.78	-13.05	27.13	0.79	0.01	-0.50	0.93	AM
		D82	67.56	-13.04	26.63					
PZCYS9		D81	66.39	-13.00	26.90	0.87	0.02	-0.61	1.06	MJ
		D82	67.25	-12.99	26.29					
QENZ25		D81	66.83	-13.41	26.99	0.74	-0.03	-0.51	0.90	MM
		D82	67.57	-13.44	26.48					
QRSMT4		D81	66.61	-13.87	27.08	0.75	0.17	-0.62	0.99	XO
		D82	67.36	-13.70	26.46					
R3EB4T		D81	66.99	-13.46	27.18	0.80	0.03	-0.45	0.91	AM
		D82	67.78	-13.44	26.74					
RMNFLY		D81	67.03	-13.89	27.06	0.81	0.02	-0.45	0.92	GG
		D82	67.84	-13.88	26.62					
RN7TEL		D81	66.51	-13.55	27.04	0.84	-0.01	-0.48	0.96	MI
		D82	67.35	-13.56	26.56					
RTFUWH		D81	66.78	-13.18	27.23	0.79	-0.01	-0.50	0.93	AL
		D82	67.57	-13.19	26.73					
S91ZLN		D81	66.41	-13.78	27.06	0.83	0.04	-0.45	0.94	MI
		D82	67.24	-13.74	26.62					

**Interlaboratory Testing Program for Color & Appearance  
Analysis 409**

**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*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$	
SJFJHU		D81	67.15	-13.46	27.27	0.77	-0.02	-0.49	0.91	AM
		D82	67.92	-13.47	26.79					
SJHEZ5		D81	66.60	-13.15	27.09	0.89	0.04	-0.61	1.08	MM
		D82	67.49	-13.12	26.48					
SR5E1W	X	D81	66.91	13.25	27.29	0.81	0.01	-0.53	0.97	AJ
		D82	67.72	13.26	26.76					
SZS1LF		D81	67.00	-13.65	27.20	0.85	0.00	-0.45	0.96	CA
		D82	67.85	-13.65	26.75					
T4N99M		D81	67.02	-13.04	27.19	0.85	0.04	-0.50	0.99	HP
		D82	67.87	-13.00	26.69					
T6NCXQ		D81	66.77	-13.49	26.93	0.80	0.01	-0.49	0.94	MM
		D82	67.56	-13.49	26.44					
TG8RXX		D81	66.45	-13.40	27.06	1.08	-0.05	-0.46	1.17	AP
		D82	67.53	-13.45	26.61					
TMY4Z7		D81	66.82	-13.47	27.12	0.82	0.11	-0.48	0.96	AJ
		D82	67.64	-13.36	26.64					
TWUDS		D81	66.96	-13.55	27.24	0.82	0.03	-0.46	0.94	MT
		D82	67.78	-13.52	26.78					
TZ1P5D		D81	66.92	-13.53	27.35	0.82	0.06	-0.55	0.99	AJ
		D82	67.74	-13.48	26.80					
U5ZHGS		D81	67.07	-13.40	27.21	0.82	0.04	-0.51	0.97	AO
		D82	67.89	-13.36	26.70					
UGN8UY		D81	66.80	-13.46	26.99	0.84	0.06	-0.61	1.04	MM
		D82	67.64	-13.41	26.38					
UHLDFY		D81	66.66	-13.92	26.90	0.82	0.03	-0.54	0.98	XO
		D82	67.47	-13.89	26.36					
UTKB1C		D81	67.13	-13.20	27.25	0.48	-0.03	-0.60	0.77	GF
		D82	67.61	-13.23	26.65					

**Interlaboratory Testing Program for Color & Appearance  
Analysis 409**

**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*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$	
UW2GV2		D81	66.64	-13.60	27.06	0.85	0.05	-0.64	1.06	MM
		D82	67.48	-13.56	26.42					
UXJJNV		D81	66.85	-13.26	27.02	0.81	0.02	-0.57	0.99	MM
		D82	67.66	-13.24	26.45					
VDQFNS		D81	66.92	-13.64	26.98	0.87	0.08	-0.55	1.03	AJ
		D82	67.78	-13.56	26.43					
VFK2WA		D81	66.67	-13.11	27.00	0.84	0.02	-0.51	0.98	MM
		D82	67.51	-13.09	26.49					
VHHDRH		D81	66.91	-13.47	27.03	0.86	0.04	-0.57	1.03	AO
		D82	67.77	-13.43	26.46					
VK6HQG		D81	66.98	-12.72	27.30	0.78	-0.05	-0.46	0.90	MV
		D82	67.76	-12.77	26.84					
VMLDE1		D81	66.95	-13.91	26.99	0.87	0.05	-0.61	1.06	HW
		D82	67.81	-13.86	26.38					
VTHXBJ		D81	67.18	-13.55	27.18	0.82	0.01	-0.46	0.94	AQ
		D82	68.00	-13.55	26.73					
VUVBX7	X	D81	67.43	-13.55	27.18	0.77	-0.03	-0.62	0.99	HF
		D82	68.20	-13.57	26.56					
W9LEU8		D81	66.87	-13.47	27.40	0.83	0.02	-0.58	1.01	MV
		D82	67.70	-13.45	26.83					
WQVMU		D81	66.91	-13.53	26.82	0.73	-0.04	-0.33	0.80	MK
		D82	67.64	-13.57	26.49					
XAX6PA		D81	66.73	-13.36	27.10	0.79	0.00	-0.50	0.93	MM
		D82	67.52	-13.36	26.61					
XU844Z		D81	66.58	-13.55	26.83	0.84	0.00	-0.55	1.00	MG
		D82	67.41	-13.55	26.28					
XWFJB6	X	D81	66.85	-12.98	26.77	0.90	0.01	-0.67	1.12	AJ
		D82	67.75	-12.97	26.10					

**Interlaboratory Testing Program for Color & Appearance  
Analysis 409**

**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*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$	
XY17TX		D81	66.76	-13.42	27.05	0.81	0.04	-0.43	0.92	MK
		D82	67.57	-13.38	26.62					
Y6FSGP		D81	66.88	-13.70	27.06	0.75	0.03	-0.44	0.87	MK
		D82	67.63	-13.68	26.62					
YWC6D2		D81	66.71	-13.48	27.04	0.85	0.02	-0.56	1.02	MM
		D82	67.56	-13.46	26.49					
YZWYNJ		D81	66.91	-13.39	27.25	0.79	0.04	-0.42	0.90	AJ
		D82	67.70	-13.35	26.83					
Z5HEAT		D81	67.01	-12.92	27.34	0.77	0.01	-0.54	0.94	AJ
		D82	67.78	-12.92	26.80					
ZAQRL8		D81	67.09	-13.39	27.28	0.80	0.02	-0.51	0.94	AJ
		D82	67.89	-13.37	26.77					

**Summary Statistics**

Samples	L*	a*	b*	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$
<b>Grand Means</b>							
D81	66.84	-13.41	27.11	0.81	0.02	-0.51	0.95
D82	67.65	-13.38	26.60				
<b>Std Dev Btwn Labs</b>							
D81	0.18	0.27	0.15	0.06	0.04	0.07	0.07
D82	0.19	0.26	0.15				
<b>Statistics based on 131 of 146 reporting participants</b>							

**Interlaboratory Testing Program for Color & Appearance  
Analysis 409**

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

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

5FGQ35(X) - Low "b\*" values.

5LG5E6(X) - High "b\*" values.

8AEJHJ(X) - Low "L\*" and "b\*" values.

8KDD8P(X) - High "L\*" values for Sample D81. Large replication difference for "L\*" and "b\*" value on Sample D81.

93DLA7(X) - Low "b\*" values.

C5T7MC(X) - High "b\*" values for sample D81. Large replication difference for all values.

CC2T98(X) - High "L\*" values and low "a\*" and "b\*" values.

JRQR2J(X) - Low "b\*" values. Large replication difference for "L" value on Sample D82.

LP9BKN(X) - High "b\*" values and low "L\*" values.

LZSTCU(X) - Data appear to be transposed between samples.

NM1WDT(X) - High "a\*" values. Large replication difference for "L\*" value on Sample D81.

NQKVNG(X) - High "a\*" values for Sample D81.

SR5E1W(X) - It appears that the lab may have forgotten to include the negative sign when reporting "a\*" values.

VUVBX7(X) - High "L\*" values.

XWFB6(X) - Low "b\*" values for Sample D82.

# Interlaboratory Testing Program for Color & Appearance

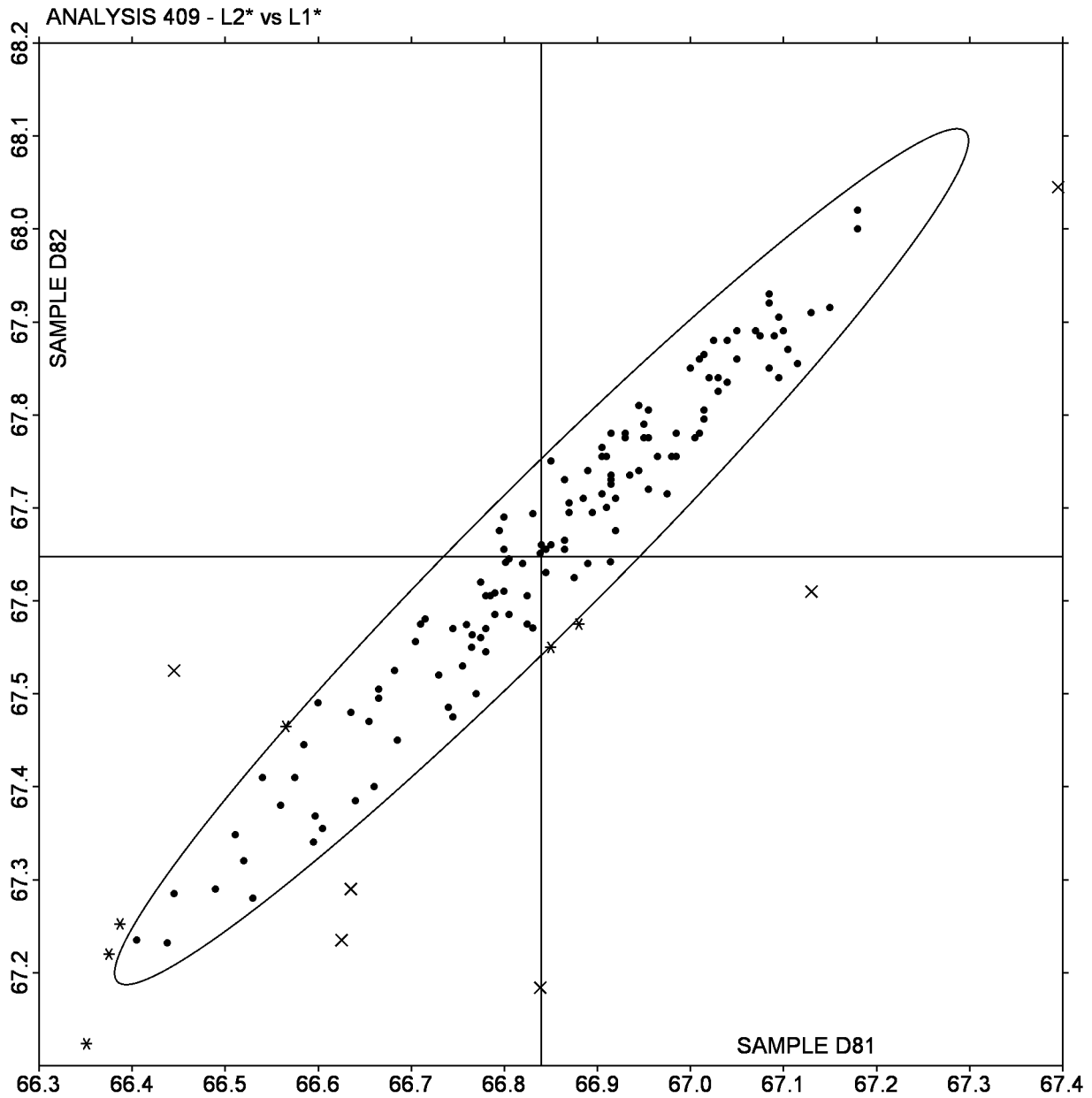
## Analysis 409

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

### L2\* vs L1\*

SAMPLE D81 = 66.84

SAMPLE D82 = 67.65



# Interlaboratory Testing Program for Color & Appearance

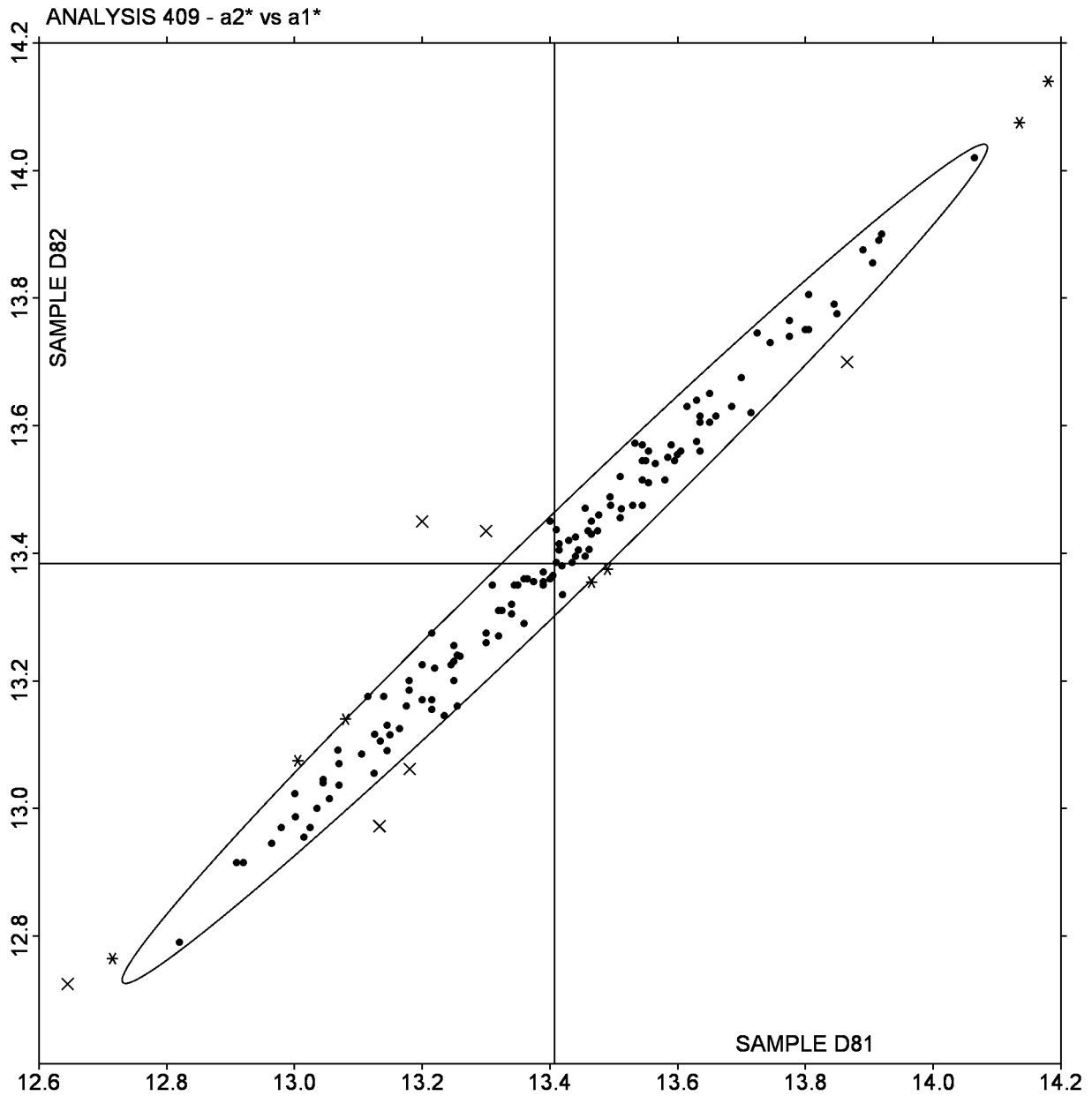
## Analysis 409

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

### a2\* vs a1\*

SAMPLE D81 = -13.41

SAMPLE D82 = -13.38



Plot created using absolute values.

# Interlaboratory Testing Program for Color & Appearance

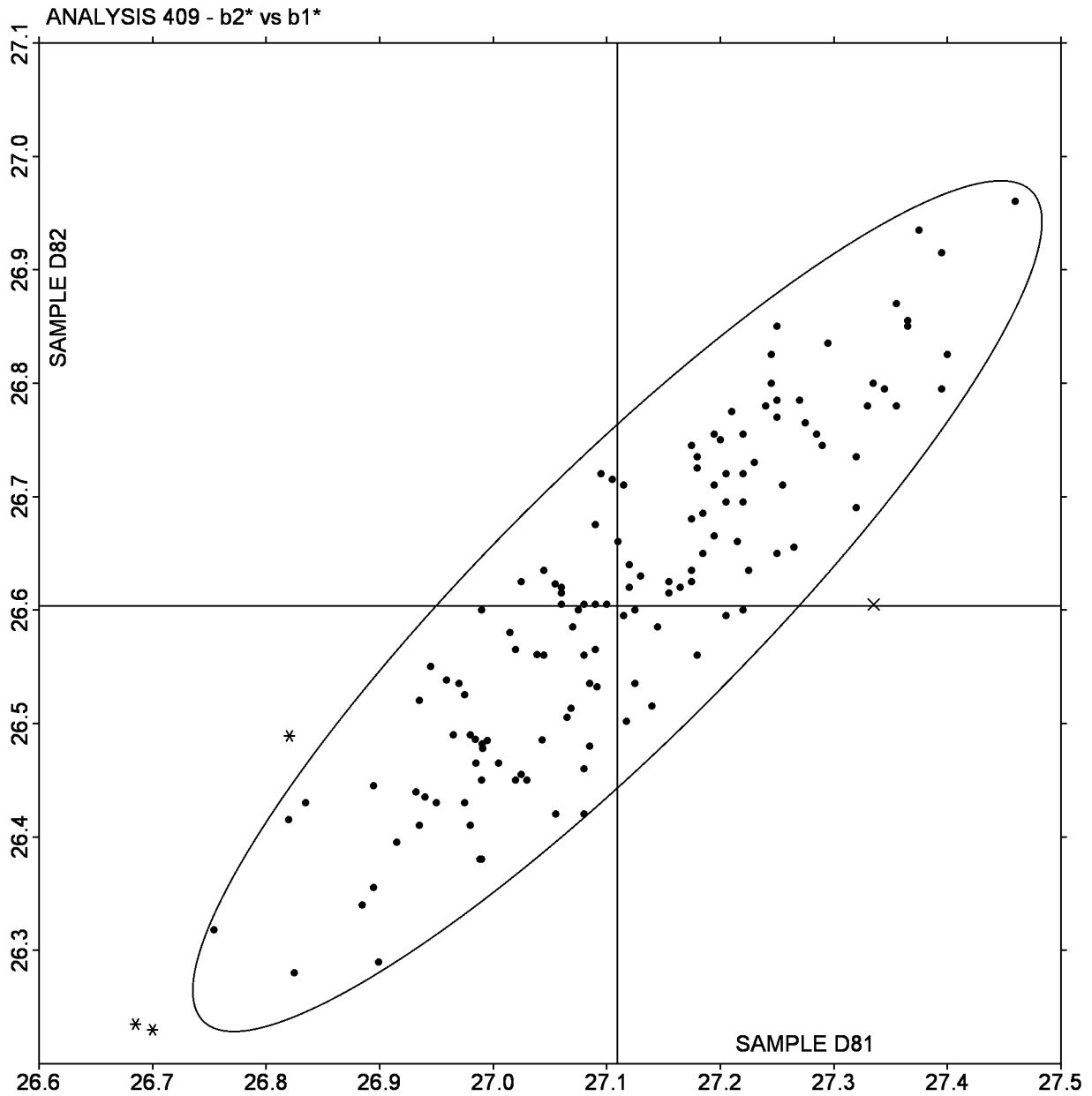
## Analysis 409

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

### b2\* vs b1\*

SAMPLE D81 = 27.11

SAMPLE D82 = 26.60



## Instrument Code List - Report# 146

### Instrument information as provided by laboratories

<u>Analysis</u>	<u>Analysis Name</u>
408	<u>Color &amp; Color Difference (Paint Chips) - 45/0</u>

Instrument code and description

GA	BYK-Gardner Color Guide (45/0)
GD	BYK-Gardner The Color Machine
GE	BYK-Gardner spectro-guide (45/0)
GH	BYK-Gardner Color-View
GQ	Gretag SpectroMat
GU	Gretag Spectrolino Spectrophotometer
HK	Hunter MiniScan XE (45/0)
HN	Hunter D25M-9 Colorimeter
HW	Hunter LabScan XE
MG	Macbeth 1500/PLUS or 2025+ Color Eye
MH	Macbeth CE 2145
MQ	Minolta CM-503c Spectrophotometer
MU	Minolta CM-3600D
TN	Topcon SR-1 Spectroradiometer
XL	X-Rite MA90
XM	X-Rite MA58 Multi-Angle SpectroPhotometer
XN	X-Rite MA68 Multi-Angle SpectroPhotometer
XO	X-Rite MA68 II Multi-Angle SpectroPhotometer
XP	X-Rite 962 SpectroPhotometer
XR	X-Rite 968 Portable SpectroPhotometer
XS	X-Rite 938 SpectroDensitometer
XT	X-Rite 948 SpectroColorimeter
XU	X-Rite 964 Portable SpectroPhotometer
XX	Instrument make/model not specified by lab

409	<u>Color &amp; Color Difference (Paint Chips) Sphere</u>
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Instrument code and description

AD	ACS Chroma-Sensor CS-5	HW	Hunter UltraScan XE
AG	ACS-DataColor Intl. Spectraflash 450	HX	Hitachi C-2000S Spectrophotometer
AJ	ACS-Datacolor Intl. Spectraflash 600	ME	Macbeth 1500/PLUS or 2020+ Color Eye
AL	ACS-Datacolor Intl. Dataflash 100	MG	Macbeth 2180 Color Eye
AM	ACS-Datacolor Intl. Spectraflash 600 Plus	MI	Macbeth Color i 5
AO	ACS-Datacolor Intl. Spectraflash 650X	MJ	Macbeth Color-Eye 3000
AP	DataColor Check Plus	MK	Macbeth Color-Eye 7000
AQ	ACS-Datacolor Intl. Spectraflash 600X	MM	Macbeth Color-Eye 7000a
CA	Cary 5000	MT	Minolta CM-2600
EE	Datacolor Elrepho 2000	MV	Minolta CM-3000d Series Spectrophotometer
GD	BYK-Gardner spectro-guide sphere	MX	Minolta CM-508d Spectrophotometer
GF	BYK-Gardner The Color Sphere (TCS)	MZ	Minolta CM-2002 Spectrophotometer
GG	BYK-Gardner TCS II	PE	Perkin Elmer Spectrophotometer
GH	BYK Gardner Color-Guide Sphere	SH	SIMADZU UV 3101PC
HF	ColorFlex Diffuse	XI	X-Rite Color i7
HG	Hunter ColorQUEST	XL	X-Rite SP60 Portable Sphere Spectrophotometer
HH	Hunter ColorQUEST XE	XO	X-Rite SP64 Portable Sphere Spectrophotometer
HK	Hunter MiniScan XE (Sphere)	XP	X-Rite SP88 Portable Sphere Spectrophotometer
HP	Hunter UltraScan PRO	XQ	X-Rite SP68 Portable Sphere Spectrophotometer
HU	Hunter UltraScan	XR	X-Rite SP78 Portable Sphere Spectrophotometer