



Color & Appearance Testing Program

Summary Report #196 - 2nd Qtr 2021

[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 |
|---------------------|---|

| | |
|---------------------|---|
| 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) |
|---------------------|---|

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.

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Office Hours: 8:00 a.m. - 4:30 p.m. ET

Key for Color Program Web Summary Report

| | |
|---------------------------------------|---|
| WebCode | Assigned laboratory identification number (temporary) used to ensure lab confidentiality while permitting a lab to locate its data in the Color Report published on the CTS web site. The Web Code for each analysis can be found in the Performance Analysis Report emailed to each participant. |
| Lab Mean | The average of the 2 test results obtained by the participant for CIE L*,a*,b* color space values. |
| Grand Mean | The average of the LAB MEANS for all included participants. Laboratories flagged with an X or an M (see DATA FLAG column) are excluded from the GRAND MEAN. |
| Between-Lab Standard Deviation | An indication of the precision of measurement between the laboratories. The greater the spread of the LAB MEANS about the GRAND MEAN, the larger the BETWEEN-LAB STANDARD DEVIATION (and vice versa). |
| Comparative Performance Value | An indication of how well a laboratory's results agree with the other participants. The CPV is a ratio indicating the number of standard deviations from the GRAND MEAN. The closer a laboratory's COMPARATIVE PERFORMANCE VALUE is to zero, the more consistent its results are with the other participants' data (and vice versa). The critical value for each CPV will vary depending on the number of labs participating in a test. |
| Graphs | For each laboratory, the LAB MEAN for the first sample is plotted against the LAB MEAN for the second sample with each point representing a laboratory. The horizontal and vertical axes are the GRAND MEANS for each sample. For each test there are three plots: L*2 vs L*1, a*2 vs a*1 and b*2 vs b*1. The a* and b* plots are created using absolute values. |
| Inst Code | A code indicating the manufacturer of the instrument used to perform the test (see separate INSTRUMENT CODE LIST for each test section). |
| Data Flag | DATA FLAGS are assigned based on the simultaneous analysis of both samples tested. Refer to the following chart for an explanation of each symbol: |

| <u>DATA FLAG</u> | <u>STATISTICALLY INCLUDED/EXCLUDED</u> | <u>ACTION REQUIRED</u> |
|------------------|--|---|
| * | INCLUDED | CAUTION - review testing procedure and monitor future results. Results fall outside 95% ellipse but within a 99% ellipse that is calculated but not drawn. |
| X | EXCLUDED | STOP - immediate review of data and/or testing procedure is required. Results fall outside the 99% ellipse and one or more CPV are greater than critical value. See specific notes following each table for more information on why the data is excluded. It is also possible to have an "X" for individual color coordinate (L*, a* or b*) without overall "X" flag. It means that results fall outside the 99% ellipse for particular coordinate but have no CPV flags. Those results will not require any action. |
| M | EXCLUDED | PROCEED - lab was unable to report data for at least one sample. However, a lab receiving two of more M flags for a test may need to stop and review its testing procedures. |

Key for Spectrophotometric Web Summary Report

| | |
|---------------------------------------|---|
| WebCode | Assigned laboratory identification number (temporary) used to ensure lab confidentiality while permitting a lab to locate its data in the Color Report published on the CTS web site. The Web Code for each analysis can be found in the Performance Analysis Report emailed to each participant. |
| Grand Mean | The average of the LAB MEANS for all included participants. Laboratories flagged with an X or an M (see DATA FLAG column) are excluded from the GRAND MEAN. |
| Between-Lab Standard Deviation | An indication of the precision of measurement between the laboratories. The greater the spread of the LAB MEANS about the GRAND MEAN, the larger the BETWEEN-LAB STANDARD DEVIATION (and vice versa). |
| Inst Code | A code indicating the manufacturer of the instrument used to perform the test (see separate INSTRUMENT CODE LIST for each test section). |
| Data Flag | DATA FLAGS are assigned based on the simultaneous analysis of both samples tested. Refer to the following chart for an explanation of each symbol: |

| <u>DATA FLAG</u> | <u>STATISTICALLY INCLUDED/EXCLUDED</u> | <u>ACTION REQUIRED</u> |
|------------------|--|--|
| X | EXCLUDED | STOP - immediate review of data and/or testing procedure is required. See specific notes following each table for more information on why the data is excluded. |

In addition to the DATA FLAG column, it is also possible to have a flag on individual wavelength values as follows:

- * The laboratory's mean for that wavelength deviates from the GRAND MEAN by more than two BETWEEN-LAB STANDARD DEVIATIONS.
- X The laboratory's mean for that wavelength deviates from the GRAND MEAN by more than the critical limit determined by a 99.5% confidence interval.

Key for Gloss Web Summary Report

WebCode Assigned laboratory identification number (temporary) used to ensure lab confidentiality while permitting a lab to locate its data in the Color Report published on the CTS web site. The Web Code for each analysis can be found in the Performance Analysis Report emailed to each participant.

Lab Mean The average of the test results obtained by the participant.

Grand Mean The average of the LAB MEANS for all included participants. Laboratories flagged with an X or an M (see DATA FLAG column) are excluded from the GRAND MEAN.

Difference from Grand Mean The difference of the LAB MEAN from the GRAND MEAN.

Between-Lab Standard Deviation An indication of the precision of measurement between the laboratories. The greater the spread of the LAB MEANS about the GRAND MEAN, the larger the BETWEEN-LAB STANDARD DEVIATION (and vice versa).

Comparative Performance Value An indication of how well a laboratory's results agree with the other participants. The CPV is a ratio indicating the number of standard deviations from the GRAND MEAN. The closer a laboratory's COMPARATIVE PERFORMANCE VALUE is to zero, the more consistent its results are with the other participants' data (and vice versa). The critical value for each CPV will vary depending on the number of labs participating in a test.

Inst Code A code indicating the manufacturer of the instrument used to perform the test (see separate INSTRUMENT CODE LIST for each test section).

Graphs For each laboratory, the LAB MEAN for the first sample (x-axis) is plotted against the LAB MEAN for the second sample (y-axis) with each point representing a laboratory. The horizontal and vertical cross-hairs are the GRAND MEANS for each sample. When 20 or more laboratories are in the statistics, an ellipse is also drawn so that 95% of the time a randomly selected laboratory will be included inside the ellipse. Plotted data flags are explained above.

Data Flag DATA FLAGS are assigned based on the simultaneous analysis of both samples tested. Refer to the following chart for an explanation of each symbol:

| <u>DATA FLAG</u> | <u>STATISTICALLY INCLUDED/EXCLUDED</u> | <u>ACTION REQUIRED</u> |
|------------------|--|--|
| * | INCLUDED | CAUTION - review testing procedure and monitor future results. Results fall outside 95% ellipse but within a 99% ellipse that is calculated but not drawn. |
| X | EXCLUDED | STOP - immediate review of data and/or testing procedure is required. Results fall outside the 99% ellipse. See specific notes following each table for more information on why the data is excluded. |
| M | EXCLUDED | PROCEED - lab was unable to report data for at least one sample. However, a lab receiving two of more M flags for a test may need to stop and review its testing procedures. |



CTS Interlaboratory Testing Program for Color & Appearance Report #196
Analysis 408 2nd Qtr 2021

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^* | |
| 3743H7 | | B211 | 34.16 | 7.54 | -7.06 | 0.70 | 0.34 | -0.77 | 1.09 | HW |
| | | B212 | 34.85 | 7.88 | -7.84 | | | | | |
| 37PN7P | | B211 | 35.23 | 7.06 | -7.27 | 0.62 | 0.32 | -0.76 | 1.03 | MS |
| | | B212 | 35.85 | 7.37 | -8.03 | | | | | |
| 39WWHV | | B211 | 33.22 | 7.60 | -7.35 | 0.83 | 0.22 | -0.72 | 1.12 | XO |
| | | B212 | 34.05 | 7.82 | -8.06 | | | | | |
| 689FBQ | | B211 | 33.74 | 7.39 | -7.03 | 0.83 | 0.33 | -0.80 | 1.20 | XU |
| | | B212 | 34.57 | 7.71 | -7.83 | | | | | |
| 6KXGPC | | B211 | 33.00 | 7.31 | -7.27 | 0.91 | 0.23 | -0.70 | 1.17 | GE |
| | | B212 | 33.90 | 7.54 | -7.97 | | | | | |
| 6TRHAW | | B211 | 33.52 | 7.51 | -7.31 | 0.75 | 0.32 | -0.80 | 1.14 | XM |
| | | B212 | 34.27 | 7.83 | -8.11 | | | | | |
| 7AFW6F | | B211 | 33.91 | 7.36 | -7.17 | 0.65 | 0.32 | -0.78 | 1.06 | HY |
| | | B212 | 34.56 | 7.68 | -7.94 | | | | | |
| 8JCFYF | | B211 | 33.83 | 7.34 | -7.10 | 0.82 | 0.27 | -0.75 | 1.14 | XU |
| | | B212 | 34.65 | 7.61 | -7.85 | | | | | |
| 8L72UR | | B211 | 33.17 | 7.54 | -7.18 | 0.83 | 0.17 | -0.68 | 1.09 | GH |
| | | B212 | 34.00 | 7.71 | -7.86 | | | | | |
| 9CBRGE | | B211 | 34.09 | 7.43 | -7.10 | 0.73 | 0.29 | -0.71 | 1.06 | HW |
| | | B212 | 34.82 | 7.72 | -7.81 | | | | | |
| 9THMEF | | B211 | 33.40 | 7.48 | -7.40 | 1.00 | 0.23 | -0.67 | 1.22 | GE |
| | | B212 | 34.40 | 7.70 | -8.07 | | | | | |
| ABY6PR | | B211 | 34.44 | 7.49 | -7.00 | 0.70 | 0.25 | -0.71 | 1.03 | HW |
| | | B212 | 35.14 | 7.74 | -7.70 | | | | | |
| BADXWF | | B211 | 34.43 | 7.27 | -7.10 | 0.62 | 0.30 | -0.75 | 1.01 | HW |
| | | B212 | 35.05 | 7.57 | -7.85 | | | | | |
| BG2LRK | | B211 | 33.15 | 7.46 | -7.37 | 0.84 | 0.31 | -0.79 | 1.20 | MD |
| | | B212 | 33.99 | 7.77 | -8.16 | | | | | |
| BZD9EE | | B211 | 32.32 | 7.51 | -7.68 | 0.51 | 0.11 | -0.36 | 0.63 | BG |
| | | B212 | 32.82 | 7.62 | -8.03 | | | | | |
| CQW9X9 | | B211 | 33.74 | 7.48 | -7.23 | 0.77 | 0.31 | -0.76 | 1.13 | XD |
| | | B212 | 34.51 | 7.79 | -7.98 | | | | | |



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Analysis 408 **2nd Qtr 2021**

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^* | |
| DMGUCM | X | B211 | 34.57 | 34.56 | 34.56 | 0.67 | 0.67 | 0.68 | 1.17 | HW |
| | | B212 | 35.24 | 35.24 | 35.24 | | | | | |
| DZJP9U | | B211 | 33.52 | 7.52 | -7.08 | 0.83 | 0.23 | -0.68 | 1.09 | GA |
| | | B212 | 34.35 | 7.75 | -7.76 | | | | | |
| EJDHTR | X | B211 | 35.79 | 6.47 | -7.24 | 0.73 | 0.31 | -0.75 | 1.09 | GE |
| | | B212 | 36.52 | 6.78 | -7.99 | | | | | |
| EWWC2C | | B211 | 34.65 | 7.30 | -7.00 | 0.70 | 0.30 | -0.70 | 1.03 | HW |
| | | B212 | 35.35 | 7.60 | -7.70 | | | | | |
| FHBEB2 | | B211 | 33.39 | 7.65 | -7.60 | 0.19 | 0.02 | -0.03 | 0.19 | XS |
| | | B212 | 33.58 | 7.67 | -7.63 | | | | | |
| FTXBHU | X | B211 | 32.60 | 7.79 | -7.75 | 1.06 | 0.38 | -0.87 | 1.42 | PR |
| | | B212 | 33.66 | 8.17 | -8.62 | | | | | |
| H3AFHP | | B211 | 33.77 | 7.02 | -6.95 | 0.67 | 0.37 | -0.84 | 1.14 | GE |
| | | B212 | 34.44 | 7.39 | -7.79 | | | | | |
| HMKACG | | B211 | 34.56 | 7.44 | -7.07 | 0.85 | 0.29 | -0.68 | 1.13 | MG |
| | | B212 | 35.41 | 7.73 | -7.75 | | | | | |
| HYELM9 | | B211 | 33.18 | 7.79 | -6.73 | 0.76 | 0.28 | -0.76 | 1.11 | MP |
| | | B212 | 33.94 | 8.07 | -7.49 | | | | | |
| JJYUD9 | | B211 | 34.25 | 7.60 | -7.10 | 0.95 | 0.30 | -0.70 | 1.22 | HW |
| | | B212 | 35.20 | 7.90 | -7.80 | | | | | |
| KH3NFE | | B211 | 33.91 | 7.45 | -7.42 | 1.00 | 0.25 | -0.71 | 1.25 | XE |
| | | B212 | 34.91 | 7.70 | -8.13 | | | | | |
| KYPAYK | X | B211 | 33.68 | 8.88 | -7.22 | 0.70 | 0.47 | -0.82 | 1.18 | XU |
| | | B212 | 34.38 | 9.35 | -8.04 | | | | | |
| L362K7 | | B211 | 32.90 | 7.44 | -7.59 | 0.57 | 0.27 | -0.78 | 1.00 | XW |
| | | B212 | 33.46 | 7.71 | -8.37 | | | | | |
| L6PX8B | | B211 | 36.05 | 6.90 | -7.07 | 0.62 | 0.30 | -0.72 | 1.00 | XH |
| | | B212 | 36.67 | 7.20 | -7.79 | | | | | |
| LWEWLB | | B211 | 33.28 | 7.43 | -7.45 | 0.21 | 0.29 | -0.75 | 0.83 | XE |
| | | B212 | 33.49 | 7.71 | -8.20 | | | | | |
| M7LLA8 | | B211 | 33.04 | 7.33 | -7.20 | 0.71 | 0.26 | -0.74 | 1.06 | GG |
| | | B212 | 33.75 | 7.59 | -7.94 | | | | | |



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Analysis 408 2nd Qtr 2021

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^* | |
| MT72GX | | B211 | 34.61 | 7.09 | -6.86 | 0.67 | 0.30 | -0.76 | 1.06 | HK |
| | | B212 | 35.28 | 7.39 | -7.62 | | | | | |
| MZW7HE | | B211 | 35.82 | 6.87 | -7.23 | 0.70 | 0.37 | -0.77 | 1.10 | MR |
| | | B212 | 36.51 | 7.23 | -8.00 | | | | | |
| Q6TZ67 | | B211 | 33.57 | 7.82 | -7.11 | 0.84 | 0.27 | -0.71 | 1.13 | HW |
| | | B212 | 34.41 | 8.09 | -7.82 | | | | | |
| QQZAAA | | B211 | 33.43 | 7.55 | -7.47 | 0.87 | 0.23 | -0.72 | 1.15 | XU |
| | | B212 | 34.30 | 7.78 | -8.19 | | | | | |
| TU8KB3 | | B211 | 33.27 | 7.54 | -7.38 | 0.94 | 0.29 | -0.77 | 1.25 | XP |
| | | B212 | 34.21 | 7.83 | -8.15 | | | | | |
| UDDG3W | | B211 | 32.53 | 7.51 | -7.77 | 0.95 | 0.24 | -0.74 | 1.22 | BG |
| | | B212 | 33.48 | 7.74 | -8.51 | | | | | |
| UVFE6T | | B211 | 33.37 | 7.52 | -6.98 | 0.82 | 0.31 | -0.74 | 1.15 | HW |
| | | B212 | 34.20 | 7.83 | -7.72 | | | | | |
| UW9ANV | | B211 | 34.22 | 7.42 | -7.25 | 0.66 | 0.30 | -0.77 | 1.06 | HX |
| | | B212 | 34.88 | 7.73 | -8.02 | | | | | |
| WHYDHX | | B211 | 35.70 | 7.04 | -7.07 | 0.63 | 0.30 | -0.73 | 1.02 | GB |
| | | B212 | 36.33 | 7.35 | -7.81 | | | | | |
| WK8FCA | | B211 | 33.23 | 7.30 | -7.20 | 0.67 | 0.34 | -0.80 | 1.10 | GG |
| | | B212 | 33.90 | 7.64 | -8.01 | | | | | |
| X3K6GU | | B211 | 34.15 | 7.60 | -7.05 | 0.70 | 0.25 | -0.80 | 1.09 | HW |
| | | B212 | 34.85 | 7.85 | -7.85 | | | | | |
| ZEAXN9 | | B211 | 35.86 | 6.93 | -7.27 | 0.72 | 0.31 | -0.73 | 1.07 | XX |
| | | B212 | 36.58 | 7.24 | -8.00 | | | | | |

| Summary Statistics | | | | | | | | |
|--------------------------|-------|------|-------|--------------|--------------|--------------|--------------|--|
| Samples | L* | a* | b* | ΔL^* | Δa^* | Δb^* | ΔE^* | |
| Grand Means | | | | | | | | |
| B211 | 33.98 | 7.38 | -7.19 | 0.73 | 0.27 | -0.71 | 1.07 | |
| B212 | 34.75 | 7.67 | -7.94 | | | | | |
| Std Dev Btwn Labs | | | | | | | | |
| B211 | 0.92 | 0.23 | 0.20 | 0.17 | 0.06 | 0.13 | 0.18 | |
| B212 | 0.86 | 0.21 | 0.20 | | | | | |

Statistics based on 40 of 44 reporting participants



Comments Assigned on Data Flags for Test #408

DMGUCM(X) - Extreme data for "a*" and "b*" values. Large Delta a & b.

EJDHTR(X) - Low "a*" values for both samples.

FTXBHU(X) - Inconsistent in testing between the "a*" values. Low "b*" values for both samples. Large replication difference for both "b*" values.

KYPAYK(X) - Very high "a*" values for both samples. Large Delta a.

Key to Instrument Codes Reported by Participants

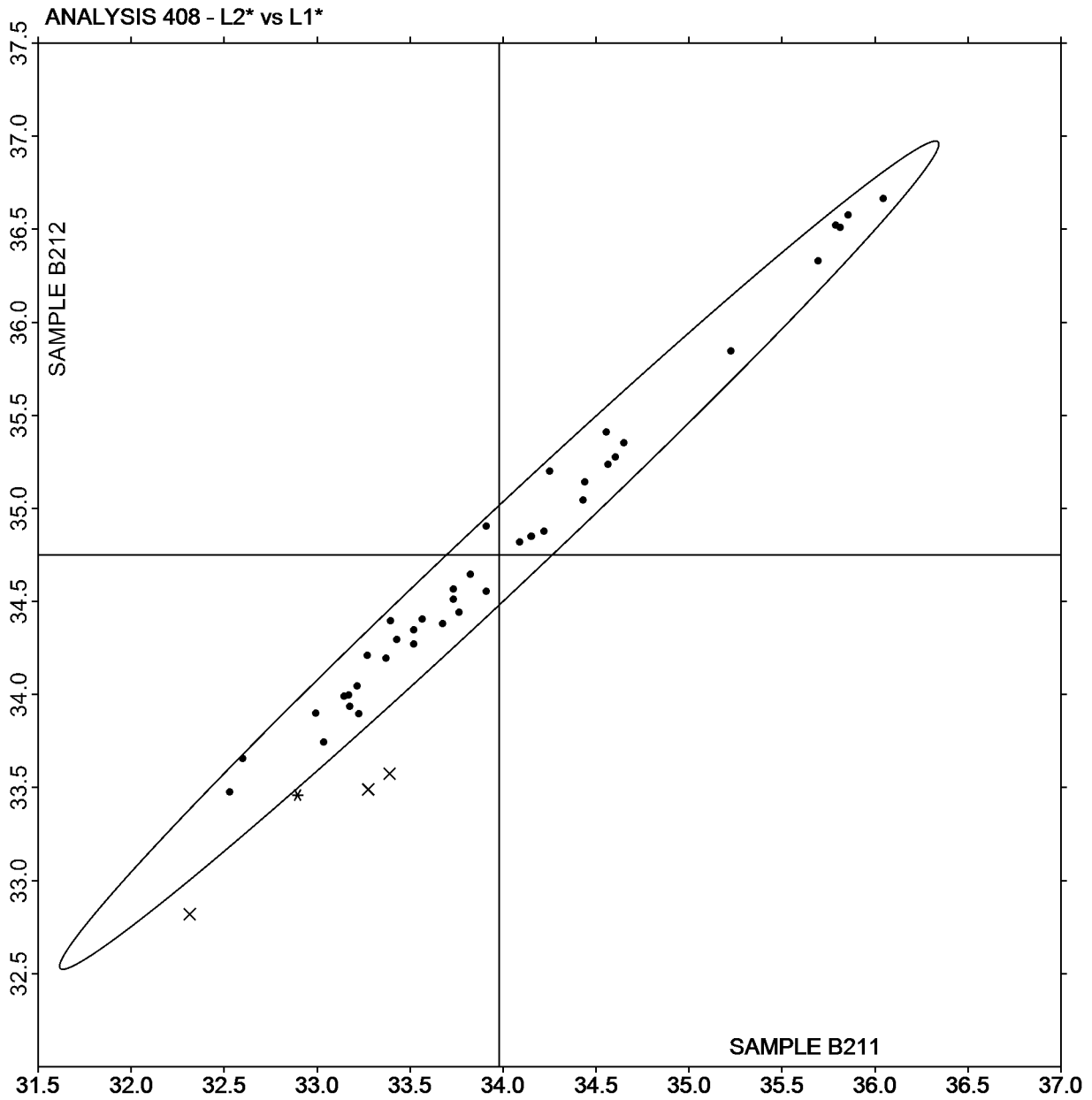
| | | | |
|-----------|--|-----------|--|
| BG | BYK Mac i | GA | BYK-Gardner |
| GB | BYK-Gardner spectro-guide sphere gloss | GE | BYK-Gardner spectro-guide (45/0) |
| GG | BYK-Gardner spectro2-guide (45/0) gloss | GH | BYK-Gardner Color-View |
| HK | Hunter MiniScan XE (45/0) | HW | Hunter LabScan XE |
| HX | Hunter Color FlexEZ 45/0 | HY | Hunter Color Flex 45/0 |
| MD | Minolta FD 7 | MG | Macbeth 1500/PLUS or 2025+ Color Eye |
| MP | Minolta CM-2500c Spectrophotometer | MR | Minolta CM-3600A Spectrophotometer |
| MS | Minolta CM-600d Spectrophotometer | PR | PhotoResearch PR730 |
| XD | X-Rite 500 Series SpectroDensitometer | XE | X-Rite eXact Portable Spectrophotometer |
| XH | X-Rite Color i5 | XM | X-Rite MA58 Multi-Angle Spectrophotometer |
| XO | X-Rite MA68 II Multi-Angle Spectrophotometer | XP | X-Rite MA9 Multi-Angle Spectrophotometer |
| XS | X-Rite 962 Portable Spectrophotometer | XU | X-Rite 964 Portable Spectrophotometer |
| XW | X-Rite | XX | Instrument make/model not specified by lab |



L2* vs L1*

SAMPLE B211 = 33.98

SAMPLE B212 = 34.75

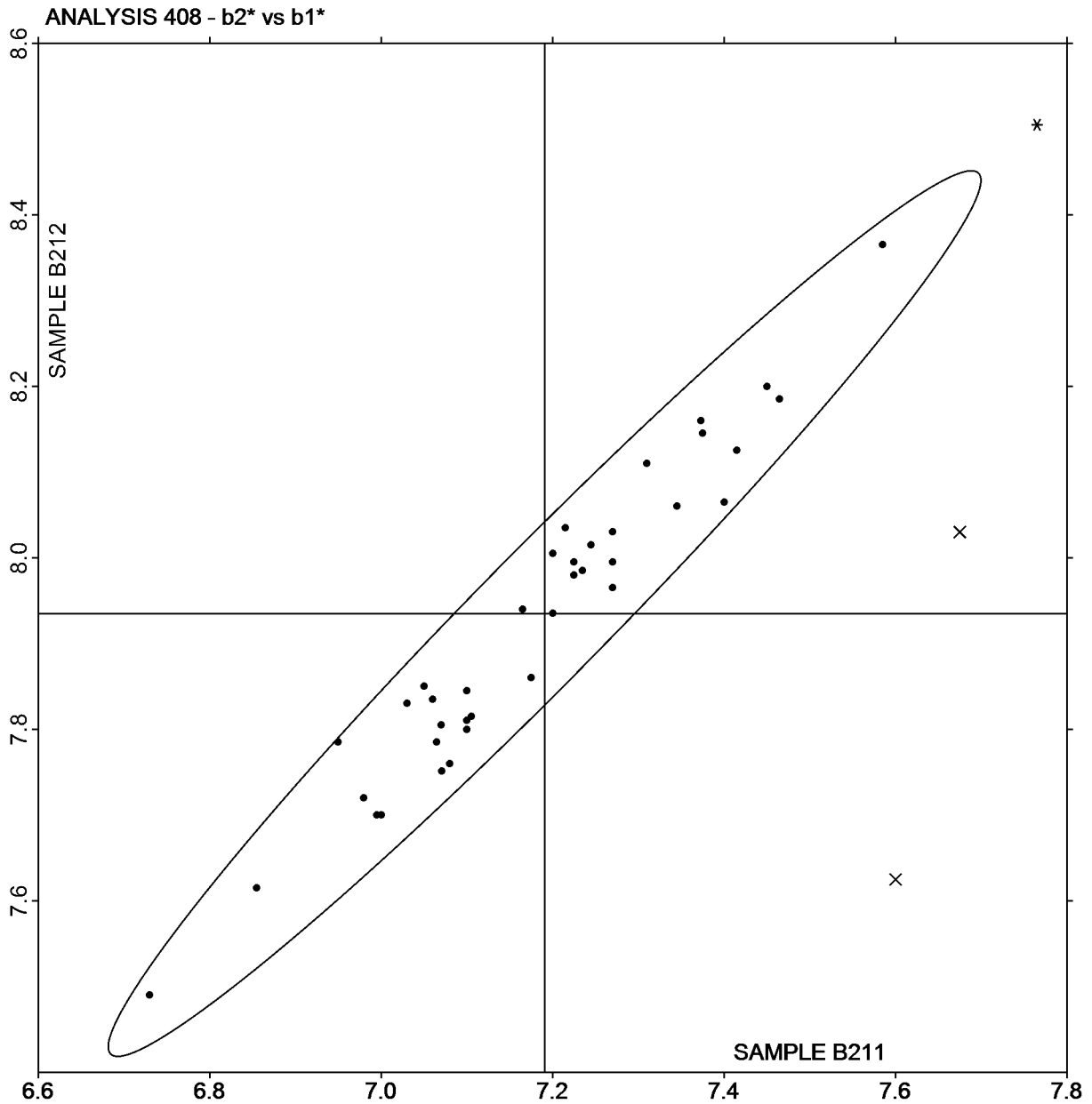




b2* vs b1*

SAMPLE B211 = -7.19

SAMPLE B212 = -7.94



Plot created using absolute values.



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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^* | |
| 2476TM | | B211 | 35.87 | 6.96 | -7.16 | 0.68 | 0.34 | -0.75 | 1.06 | AJ |
| | | B212 | 36.54 | 7.31 | -7.90 | | | | | |
| 24NYPQ | | B211 | 35.85 | 6.96 | -7.15 | 0.69 | 0.31 | -0.73 | 1.04 | AS |
| | | B212 | 36.53 | 7.27 | -7.87 | | | | | |
| 39WWHV | | B211 | 36.06 | 7.01 | -7.13 | 0.55 | 0.28 | -0.80 | 1.01 | MI |
| | | B212 | 36.61 | 7.29 | -7.92 | | | | | |
| 3FDBKZ | | B211 | 35.91 | 6.88 | -7.08 | 0.72 | 0.42 | -0.80 | 1.15 | AO |
| | | B212 | 36.63 | 7.31 | -7.87 | | | | | |
| 3QVYBT | | B211 | 36.06 | 6.91 | -7.11 | 0.69 | 0.35 | -0.77 | 1.09 | AJ |
| | | B212 | 36.74 | 7.27 | -7.88 | | | | | |
| 4EFGZ2 | | B211 | 35.89 | 6.95 | -7.33 | 0.67 | 0.35 | -0.77 | 1.08 | AO |
| | | B212 | 36.57 | 7.30 | -8.10 | | | | | |
| 4TTZQF | | B211 | 35.58 | 6.97 | -7.17 | 0.68 | 0.29 | -0.69 | 1.02 | XI |
| | | B212 | 36.26 | 7.26 | -7.86 | | | | | |
| 4Y3BP3 | | B211 | 35.75 | 6.85 | -7.36 | 0.68 | 0.32 | -0.72 | 1.04 | HP |
| | | B212 | 36.43 | 7.16 | -8.08 | | | | | |
| 629VD3 | | B211 | 35.91 | 6.91 | -7.04 | 0.69 | 0.33 | -0.74 | 1.06 | AT |
| | | B212 | 36.60 | 7.23 | -7.78 | | | | | |
| 63FBLT | | B211 | 35.79 | 6.82 | -7.29 | 0.66 | 0.33 | -0.73 | 1.04 | HP |
| | | B212 | 36.44 | 7.15 | -8.03 | | | | | |
| 67GECV | | B211 | 35.47 | 6.88 | -6.87 | 0.91 | 0.40 | -0.84 | 1.30 | XH |
| | | B212 | 36.38 | 7.28 | -7.71 | | | | | |
| 689FBQ | | B211 | 35.85 | 6.88 | -7.01 | 0.68 | 0.34 | -0.75 | 1.07 | XI |
| | | B212 | 36.54 | 7.23 | -7.76 | | | | | |
| 6AVWMK | | B211 | 35.82 | 6.95 | -7.22 | 0.69 | 0.36 | -0.77 | 1.09 | MT |
| | | B212 | 36.50 | 7.32 | -7.98 | | | | | |
| 6NLLQW | X | B211 | 36.55 | 6.64 | -6.67 | 0.61 | 0.38 | -0.79 | 1.06 | MU |
| | | B212 | 37.16 | 7.03 | -7.45 | | | | | |
| 76YPLM | | B211 | 35.95 | 6.99 | -7.06 | 0.69 | 0.34 | -0.73 | 1.06 | AT |
| | | B212 | 36.64 | 7.32 | -7.78 | | | | | |
| 87BNDB | | B211 | 36.10 | 6.90 | -7.07 | 0.69 | 0.27 | -0.71 | 1.02 | XH |
| | | B212 | 36.78 | 7.17 | -7.78 | | | | | |



CTS Interlaboratory Testing Program for Color & Appearance **Report #196**
Analysis 409 **2nd Qtr 2021**

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^* | |
| 8JCFYF | | B211 | 35.69 | 7.03 | -7.20 | 0.68 | 0.33 | -0.73 | 1.05 | XB |
| | | B212 | 36.37 | 7.36 | -7.93 | | | | | |
| 8KAQW4 | | B211 | 35.85 | 6.96 | -7.17 | 0.65 | 0.29 | -0.71 | 1.00 | MU |
| | | B212 | 36.50 | 7.25 | -7.87 | | | | | |
| 8L72UR | | B211 | 36.09 | 6.98 | -7.10 | 0.64 | 0.34 | -0.72 | 1.02 | MV |
| | | B212 | 36.74 | 7.31 | -7.82 | | | | | |
| 8RCY4W | | B211 | 35.79 | 7.04 | -7.19 | 0.72 | 0.32 | -0.74 | 1.08 | XI |
| | | B212 | 36.50 | 7.36 | -7.93 | | | | | |
| 9UBHXH | | B211 | 35.89 | 6.84 | -7.04 | 0.70 | 0.36 | -0.74 | 1.08 | MW |
| | | B212 | 36.58 | 7.19 | -7.78 | | | | | |
| A8VECK | | B211 | 35.52 | 7.06 | -7.22 | 0.67 | 0.39 | -0.78 | 1.09 | XD |
| | | B212 | 36.19 | 7.44 | -7.99 | | | | | |
| ACQ9B8 | | B211 | 35.65 | 7.10 | -7.31 | 0.68 | 0.28 | -0.70 | 1.02 | AS |
| | | B212 | 36.33 | 7.38 | -8.01 | | | | | |
| AR76XV | | B211 | 36.17 | 6.87 | -6.96 | 0.66 | 0.34 | -0.73 | 1.04 | XO |
| | | B212 | 36.83 | 7.21 | -7.69 | | | | | |
| ARZWMM | | B211 | 35.95 | 6.99 | -7.02 | 0.70 | 0.35 | -0.74 | 1.08 | AS |
| | | B212 | 36.64 | 7.34 | -7.76 | | | | | |
| ATDK7M | | B211 | 35.67 | 6.97 | -7.18 | 0.68 | 0.29 | -0.70 | 1.01 | MM |
| | | B212 | 36.34 | 7.26 | -7.88 | | | | | |
| AZXMAJ | | B211 | 35.94 | 6.95 | -7.08 | 0.68 | 0.33 | -0.73 | 1.05 | XH |
| | | B212 | 36.62 | 7.28 | -7.81 | | | | | |
| BBCWFN | | B211 | 35.96 | 6.90 | -7.11 | 0.69 | 0.30 | -0.73 | 1.05 | AM |
| | | B212 | 36.65 | 7.20 | -7.84 | | | | | |
| BM7BEK | | B211 | 35.96 | 6.96 | -7.26 | 0.65 | 0.30 | -0.74 | 1.03 | AO |
| | | B212 | 36.62 | 7.25 | -8.01 | | | | | |
| D83QQR | | B211 | 35.85 | 6.99 | -7.06 | 0.69 | 0.36 | -0.80 | 1.12 | AS |
| | | B212 | 36.54 | 7.35 | -7.87 | | | | | |
| DR978J | | B211 | 36.11 | 6.86 | -7.23 | 0.70 | 0.30 | -0.73 | 1.05 | AJ |
| | | B212 | 36.81 | 7.16 | -7.96 | | | | | |
| DUVMJC | | B211 | 35.84 | 6.90 | -7.04 | 0.70 | 0.32 | -0.76 | 1.07 | AS |
| | | B212 | 36.53 | 7.22 | -7.79 | | | | | |



CTS Interlaboratory Testing Program for Color & Appearance Report #196
Analysis 409 2nd Qtr 2021

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^* | |
| DZJP9U | | B211 | 36.02 | 7.04 | -7.09 | 0.64 | 0.28 | -0.74 | 1.02 | AJ |
| | | B212 | 36.67 | 7.31 | -7.83 | | | | | |
| EBX4LG | | B211 | 35.85 | 6.85 | -7.26 | 0.68 | 0.26 | -0.68 | 0.99 | AJ |
| | | B212 | 36.54 | 7.11 | -7.93 | | | | | |
| EDLKXA | | B211 | 35.93 | 6.96 | -7.31 | 0.66 | 0.34 | -0.78 | 1.08 | AQ |
| | | B212 | 36.59 | 7.30 | -8.09 | | | | | |
| EZYBC6 | | B211 | 35.66 | 6.78 | -7.42 | 0.66 | 0.31 | -0.68 | 0.99 | HP |
| | | B212 | 36.31 | 7.09 | -8.10 | | | | | |
| EZZ2NE | | B211 | 35.90 | 6.94 | -7.15 | 0.68 | 0.29 | -0.72 | 1.03 | AO |
| | | B212 | 36.58 | 7.23 | -7.87 | | | | | |
| F6LHA4 | | B211 | 35.97 | 6.90 | -7.02 | 0.60 | 0.30 | -0.74 | 1.00 | XH |
| | | B212 | 36.57 | 7.21 | -7.76 | | | | | |
| FCCQZN | | B211 | 35.75 | 6.91 | -7.32 | 0.69 | 0.29 | -0.70 | 1.03 | XI |
| | | B212 | 36.44 | 7.20 | -8.03 | | | | | |
| FHBEB2 | | B211 | 35.86 | 6.96 | -6.98 | 0.69 | 0.29 | -0.73 | 1.04 | AJ |
| | | B212 | 36.54 | 7.25 | -7.71 | | | | | |
| FKMU63 | | B211 | 35.84 | 6.89 | -7.06 | 0.66 | 0.32 | -0.75 | 1.05 | XI |
| | | B212 | 36.49 | 7.21 | -7.81 | | | | | |
| FTG3M8 | | B211 | 35.81 | 6.96 | -7.07 | 0.70 | 0.37 | -0.76 | 1.10 | AS |
| | | B212 | 36.51 | 7.33 | -7.84 | | | | | |
| FTXBHU | | B211 | 35.63 | 6.85 | -7.23 | 0.68 | 0.33 | -0.77 | 1.07 | CA |
| | | B212 | 36.31 | 7.18 | -8.00 | | | | | |
| G3FGLB | | B211 | 35.56 | 7.05 | -7.04 | 0.64 | 0.31 | -0.76 | 1.04 | AS |
| | | B212 | 36.20 | 7.36 | -7.80 | | | | | |
| GQQDMR | | B211 | 35.81 | 6.94 | -7.26 | 0.70 | 0.30 | -0.73 | 1.05 | MV |
| | | B212 | 36.51 | 7.24 | -7.99 | | | | | |
| GTU7HB | | B211 | 35.76 | 6.93 | -7.35 | 0.66 | 0.33 | -0.71 | 1.02 | HP |
| | | B212 | 36.42 | 7.26 | -8.05 | | | | | |
| GYF7QB | | B211 | 35.88 | 6.90 | -7.18 | 0.71 | 0.34 | -0.75 | 1.08 | AS |
| | | B212 | 36.59 | 7.23 | -7.92 | | | | | |
| H3AFHP | X | B211 | 35.77 | 6.59 | -7.12 | 0.68 | 0.28 | -0.72 | 1.03 | GD |
| | | B212 | 36.45 | 6.87 | -7.84 | | | | | |



CTS Interlaboratory Testing Program for Color & Appearance Report #196
Analysis 409 2nd Qtr 2021

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^* | |
| H4NNP4 | | B211 | 35.86 | 6.89 | -7.22 | 0.66 | 0.32 | -0.76 | 1.06 | AQ |
| | | B212 | 36.52 | 7.20 | -7.98 | | | | | |
| H93HNA | | B211 | 35.86 | 6.97 | -7.24 | 0.66 | 0.28 | -0.70 | 1.00 | AJ |
| | | B212 | 36.52 | 7.25 | -7.94 | | | | | |
| HYELM9 | | B211 | 35.56 | 6.98 | -7.30 | 0.68 | 0.31 | -0.70 | 1.02 | XB |
| | | B212 | 36.24 | 7.28 | -8.00 | | | | | |
| J84J62 | | B211 | 35.80 | 6.95 | -7.15 | 0.71 | 0.32 | -0.72 | 1.06 | MM |
| | | B212 | 36.51 | 7.27 | -7.86 | | | | | |
| JDA9QF | | B211 | 35.94 | 6.98 | -7.06 | 0.66 | 0.32 | -0.75 | 1.05 | AS |
| | | B212 | 36.60 | 7.31 | -7.81 | | | | | |
| JDUTCE | | B211 | 35.60 | 7.00 | -7.21 | 0.72 | 0.36 | -0.76 | 1.10 | XD |
| | | B212 | 36.31 | 7.36 | -7.97 | | | | | |
| K2R6J9 | | B211 | 35.93 | 7.00 | -7.24 | 0.66 | 0.34 | -0.76 | 1.06 | AJ |
| | | B212 | 36.59 | 7.34 | -8.00 | | | | | |
| KB3869 | X | B211 | 36.49 | 6.78 | -7.43 | 0.65 | 0.33 | -0.70 | 1.01 | HH |
| | | B212 | 37.14 | 7.11 | -8.13 | | | | | |
| KE2LQD | | B211 | 35.68 | 6.84 | -7.14 | 0.66 | 0.31 | -0.71 | 1.02 | XI |
| | | B212 | 36.35 | 7.14 | -7.84 | | | | | |
| LHQNNA | | B211 | 35.76 | 6.86 | -6.99 | 0.67 | 0.29 | -0.73 | 1.03 | XI |
| | | B212 | 36.43 | 7.15 | -7.72 | | | | | |
| LWDWNV | | B211 | 35.90 | 6.97 | -7.09 | 0.69 | 0.31 | -0.76 | 1.07 | XX |
| | | B212 | 36.59 | 7.28 | -7.85 | | | | | |
| MQ8FWM | | B211 | 35.74 | 6.88 | -7.08 | 0.75 | 0.33 | -0.72 | 1.09 | XI |
| | | B212 | 36.48 | 7.21 | -7.81 | | | | | |
| MZW7HE | | B211 | 35.85 | 6.94 | -7.13 | 0.69 | 0.37 | -0.76 | 1.09 | MW |
| | | B212 | 36.54 | 7.31 | -7.89 | | | | | |
| PAWF3A | | B211 | 35.81 | 6.96 | -7.19 | 0.68 | 0.30 | -0.71 | 1.03 | XD |
| | | B212 | 36.49 | 7.26 | -7.90 | | | | | |
| PYDYA3 | | B211 | 35.75 | 6.84 | -7.07 | 0.65 | 0.32 | -0.73 | 1.03 | XI |
| | | B212 | 36.40 | 7.16 | -7.80 | | | | | |
| Q6BZ42 | | B211 | 35.81 | 6.92 | -7.21 | 0.66 | 0.37 | -0.76 | 1.07 | MS |
| | | B212 | 36.47 | 7.28 | -7.97 | | | | | |



CTS Interlaboratory Testing Program for Color & Appearance **Report #196**
Analysis 409 **2nd Qtr 2021**

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^* | |
| QQCA4H | | B211 | 35.94 | 6.94 | -7.25 | 0.70 | 0.35 | -0.75 | 1.09 | CA |
| | | B212 | 36.64 | 7.29 | -8.00 | | | | | |
| QQU3Y2 | | B211 | 35.53 | 7.08 | -7.42 | 0.71 | 0.35 | -0.77 | 1.10 | CA |
| | | B212 | 36.24 | 7.43 | -8.19 | | | | | |
| QQZAAA | | B211 | 35.86 | 6.88 | -7.21 | 0.69 | 0.30 | -0.72 | 1.04 | XI |
| | | B212 | 36.55 | 7.18 | -7.93 | | | | | |
| QZZ8NW | | B211 | 35.74 | 6.90 | -7.17 | 0.68 | 0.32 | -0.72 | 1.04 | MM |
| | | B212 | 36.42 | 7.22 | -7.88 | | | | | |
| R3HLW3 | | B211 | 35.81 | 6.97 | -7.19 | 0.72 | 0.34 | -0.76 | 1.09 | XE |
| | | B212 | 36.53 | 7.31 | -7.95 | | | | | |
| R7639W | | B211 | 35.60 | 6.96 | -7.11 | 0.68 | 0.37 | -0.78 | 1.10 | XI |
| | | B212 | 36.28 | 7.33 | -7.89 | | | | | |
| R8EDZT | | B211 | 35.42 | 7.09 | -7.14 | 0.69 | 0.33 | -0.77 | 1.09 | AS |
| | | B212 | 36.12 | 7.42 | -7.92 | | | | | |
| RBDNWT | | B211 | 35.95 | 6.93 | -7.13 | 0.65 | 0.33 | -0.75 | 1.04 | AJ |
| | | B212 | 36.59 | 7.25 | -7.88 | | | | | |
| RCNLAB | | B211 | 36.12 | 6.94 | -7.05 | 0.64 | 0.34 | -0.73 | 1.03 | XC |
| | | B212 | 36.76 | 7.28 | -7.78 | | | | | |
| RWUWDE | | B211 | 35.89 | 6.95 | -7.15 | 0.71 | 0.35 | -0.75 | 1.09 | AJ |
| | | B212 | 36.60 | 7.30 | -7.89 | | | | | |
| T34AXX | | B211 | 36.09 | 6.92 | -7.31 | 0.67 | 0.31 | -0.71 | 1.03 | CA |
| | | B212 | 36.76 | 7.22 | -8.02 | | | | | |
| T74LUX | | B211 | 35.58 | 7.04 | -7.22 | 0.72 | 0.22 | -0.67 | 1.00 | XI |
| | | B212 | 36.30 | 7.26 | -7.89 | | | | | |
| TAEYAB | | B211 | 35.60 | 7.01 | -7.06 | 0.70 | 0.35 | -0.75 | 1.08 | XB |
| | | B212 | 36.30 | 7.36 | -7.81 | | | | | |
| TC9MR8 | | B211 | 35.60 | 6.98 | -7.20 | 0.68 | 0.32 | -0.77 | 1.08 | XR |
| | | B212 | 36.28 | 7.30 | -7.97 | | | | | |
| TF3GP9 | | B211 | 35.79 | 6.91 | -7.20 | 0.65 | 0.38 | -0.76 | 1.07 | MV |
| | | B212 | 36.44 | 7.29 | -7.97 | | | | | |
| TRH9DH | | B211 | 35.94 | 6.97 | -7.26 | 0.68 | 0.25 | -0.71 | 1.01 | MV |
| | | B212 | 36.62 | 7.22 | -7.97 | | | | | |



CTS Interlaboratory Testing Program for Color & Appearance Report #196
Analysis 409 2nd Qtr 2021

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^* | |
| TTV3V4 | | B211 | 35.72 | 6.86 | -7.07 | 0.63 | 0.35 | -0.76 | 1.04 | XI |
| | | B212 | 36.35 | 7.21 | -7.82 | | | | | |
| TU8KB3 | | B211 | 36.17 | 6.85 | -6.96 | 0.28 | 0.31 | -0.66 | 0.78 | XF |
| | | B212 | 36.45 | 7.15 | -7.62 | | | | | |
| UJJAXT | | B211 | 35.81 | 6.97 | -7.17 | 0.69 | 0.29 | -0.70 | 1.02 | MM |
| | | B212 | 36.50 | 7.26 | -7.87 | | | | | |
| UR9XRV | | B211 | 35.54 | 7.03 | -7.18 | 0.70 | 0.28 | -0.71 | 1.03 | XB |
| | | B212 | 36.24 | 7.31 | -7.88 | | | | | |
| UVCP4G | | B211 | 35.91 | 6.86 | -7.16 | 0.66 | 0.34 | -0.76 | 1.06 | MM |
| | | B212 | 36.57 | 7.20 | -7.92 | | | | | |
| VB7GLW | | B211 | 35.61 | 7.00 | -7.13 | 0.67 | 0.31 | -0.74 | 1.04 | XB |
| | | B212 | 36.29 | 7.31 | -7.86 | | | | | |
| VCFGMX | | B211 | 35.95 | 6.88 | -7.09 | 0.65 | 0.25 | -0.71 | 1.00 | AO |
| | | B212 | 36.60 | 7.14 | -7.80 | | | | | |
| VKRKPP | | B211 | 35.41 | 6.95 | -7.31 | 0.64 | 0.31 | -0.71 | 1.00 | MM |
| | | B212 | 36.05 | 7.26 | -8.01 | | | | | |
| VZQJLY | | B211 | 35.74 | 6.86 | -7.15 | 0.72 | 0.28 | -0.68 | 1.02 | XI |
| | | B212 | 36.45 | 7.14 | -7.82 | | | | | |
| WHYDHX | | B211 | 35.70 | 7.06 | -7.10 | 0.69 | 0.29 | -0.70 | 1.02 | GD |
| | | B212 | 36.39 | 7.35 | -7.80 | | | | | |
| WK8FCA | X | B211 | 35.91 | 6.73 | -6.79 | 0.70 | 0.31 | -0.75 | 1.07 | GE |
| | | B212 | 36.61 | 7.05 | -7.54 | | | | | |
| WMDQMR | | B211 | 36.05 | 6.93 | -7.18 | 0.61 | 0.30 | -0.74 | 1.01 | AS |
| | | B212 | 36.66 | 7.22 | -7.92 | | | | | |
| WYNEFP | | B211 | 35.82 | 6.88 | -6.91 | 0.66 | 0.38 | -0.78 | 1.09 | XH |
| | | B212 | 36.47 | 7.26 | -7.69 | | | | | |
| X36X26 | | B211 | 35.93 | 6.99 | -7.10 | 0.73 | 0.32 | -0.76 | 1.10 | AJ |
| | | B212 | 36.66 | 7.30 | -7.85 | | | | | |
| XET36V | | B211 | 35.71 | 6.99 | -7.18 | 0.65 | 0.35 | -0.76 | 1.06 | MK |
| | | B212 | 36.36 | 7.34 | -7.94 | | | | | |
| XMTKK8 | | B211 | 35.74 | 6.86 | -7.17 | 0.66 | 0.33 | -0.74 | 1.04 | XI |
| | | B212 | 36.40 | 7.19 | -7.90 | | | | | |



CTS Interlaboratory Testing Program for Color & Appearance Report #196
Analysis 409 2nd Qtr 2021

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^* | |
| XX7REL | | B211 | 35.74 | 6.91 | -7.04 | 0.65 | 0.30 | -0.73 | 1.02 | XB |
| | | B212 | 36.39 | 7.21 | -7.77 | | | | | |
| YFM7EW | | B211 | 35.54 | 6.96 | -7.22 | 0.70 | 0.34 | -0.74 | 1.07 | AB |
| | | B212 | 36.24 | 7.31 | -7.96 | | | | | |
| YFN8YU | | B211 | 35.57 | 7.04 | -7.37 | 0.70 | 0.31 | -0.72 | 1.04 | XB |
| | | B212 | 36.27 | 7.35 | -8.08 | | | | | |
| Z49BWC | | B211 | 35.96 | 6.89 | -6.98 | 0.66 | 0.28 | -0.67 | 0.98 | MI |
| | | B212 | 36.62 | 7.17 | -7.66 | | | | | |
| ZUJM4U | X | B211 | 37.95 | 6.91 | -7.15 | -1.34 | 0.35 | -0.73 | 1.57 | AJ |
| | | B212 | 36.61 | 7.26 | -7.88 | | | | | |

| Summary Statistics | | | | | | | | |
|---------------------------|-------|------|-------|--------------|--------------|--------------|--------------|--|
| Samples | L* | a* | b* | ΔL^* | Δa^* | Δb^* | ΔE^* | |
| Grand Means | | | | | | | | |
| B211 | 35.81 | 6.93 | -7.16 | 0.67 | 0.32 | -0.74 | 1.05 | |
| B212 | 36.48 | 7.25 | -7.89 | | | | | |
| Stnd Dev Btwn Labs | | | | | | | | |
| B211 | 0.16 | 0.07 | 0.11 | 0.06 | 0.03 | 0.03 | 0.05 | |
| B212 | 0.16 | 0.08 | 0.10 | | | | | |

Statistics based on 96 of 101 reporting participants

Comments Assigned on Data Flags for Test #409

- 6NLLQW(X) - High "L*" and "b*" values for both samples. Large replication difference for "b*" values for B212. Low "a*" values for both samples.
- H3AFHP(X) - Low "a*" values for both samples.
- KB3869(X) - High "L*" values for both samples.
- WK8FCA(X) - High "b*" values for both samples.
- ZUJM4U(X) - Extreme data for "L*" B211 values. Small Delta L & large Delta E.



Key to Instrument Codes Reported by Participants

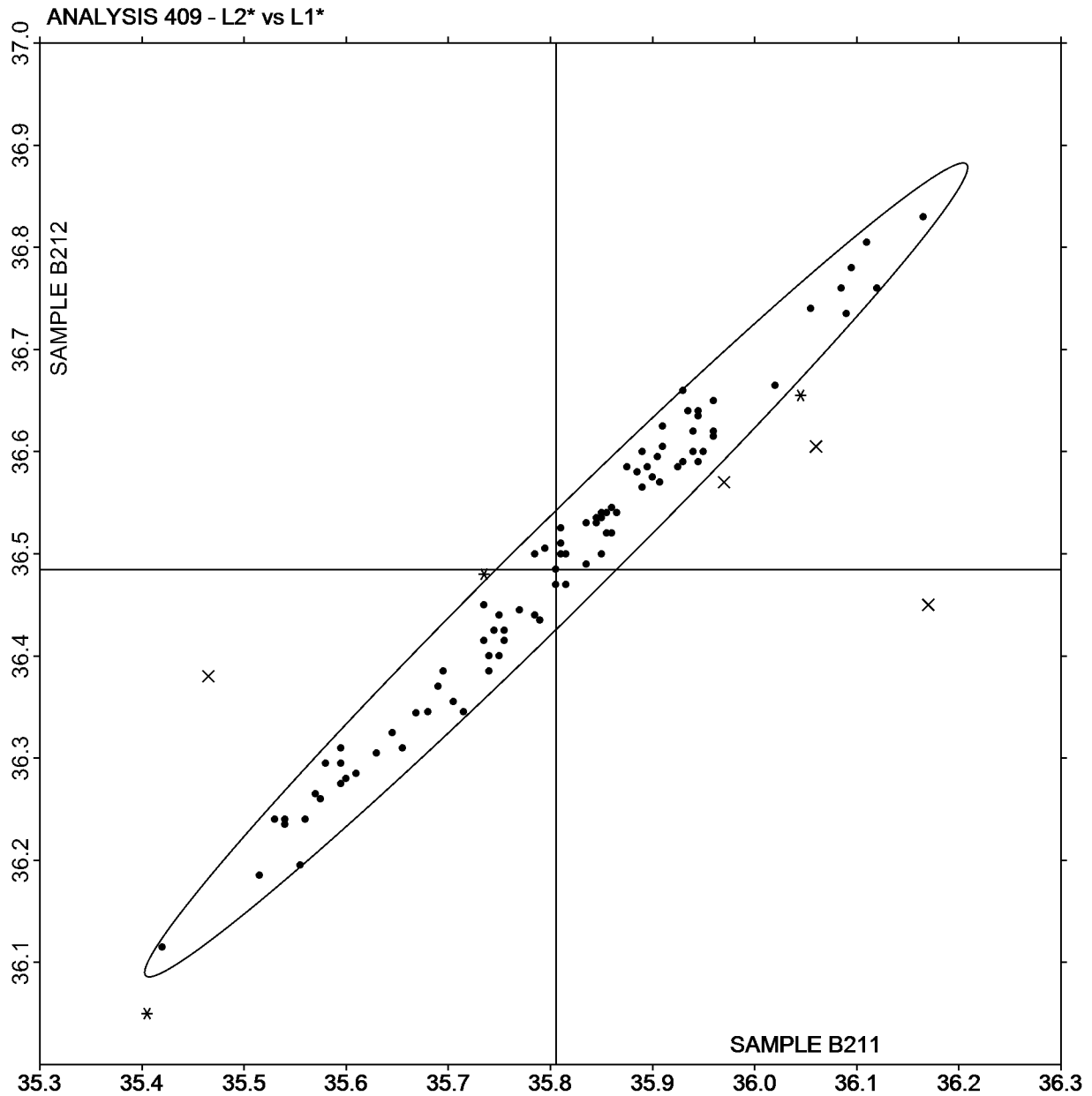
| | | | |
|-----------|---|-----------|---|
| AB | Datacolor 100 | AJ | Datacolor 600 |
| AM | Datacolor 600 Plus | AO | Datacolor 650x |
| AQ | Datacolor 600x | AS | Datacolor 800 |
| AT | Datacolor 850 | CA | Cary 5000 |
| GD | BYK-Gardner Spectro-Guide Sphere | GE | BYK-Gardner Spectro2-Guide Sphere Gloss |
| 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 | MU | Minolta |
| MV | Minolta CM-3000d Spectrophotometer | MW | Minolta CM 3700a Spectrophotometer |
| XB | X-Rite Ci7000 Series Benchtop Spectrophotometer | XC | X-Rite Ci4200 Benchtop Spectrophotometer |
| XD | X-Rite Ci7800 Benchtop Spectrophotometer | XE | X-Rite Ci7600 Benchtop Spectrophotometer |
| XF | X-Rite Ci6x Portable Spectrophotometer | XH | X-Rite Color i5 Benchtop Spectrophotometer |
| XI | X-Rite Color i7 Benchtop Spectrophotometer | XO | X-Rite SP64 Portable Sphere Spectrophotometer |
| XR | X-Rite | XX | Instrument make/model not specified by lab |



L2* vs L1*

SAMPLE B211 = 35.81

SAMPLE B212 = 36.48

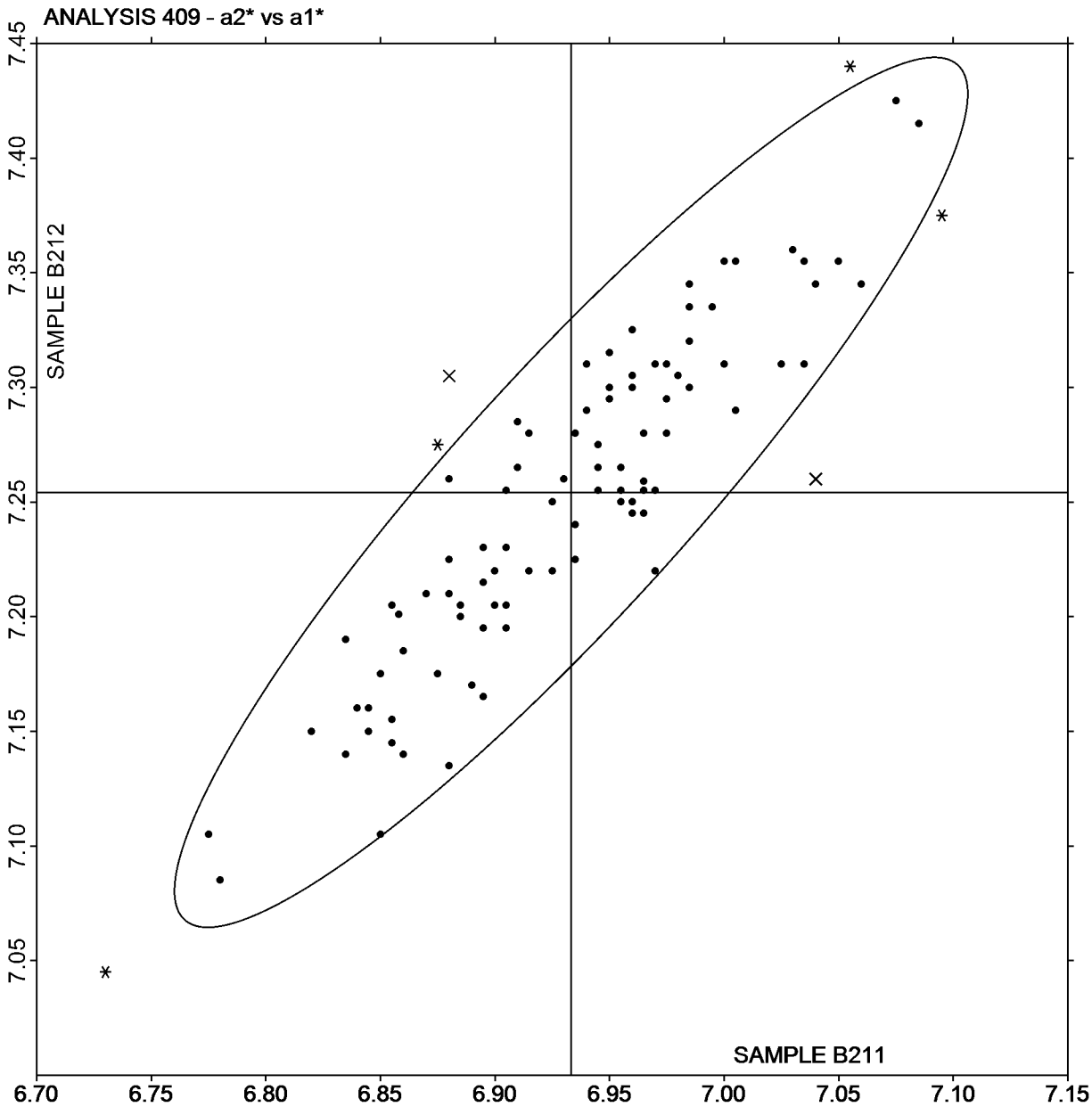




a2* vs a1*

SAMPLE B211 = 6.93

SAMPLE B212 = 7.25

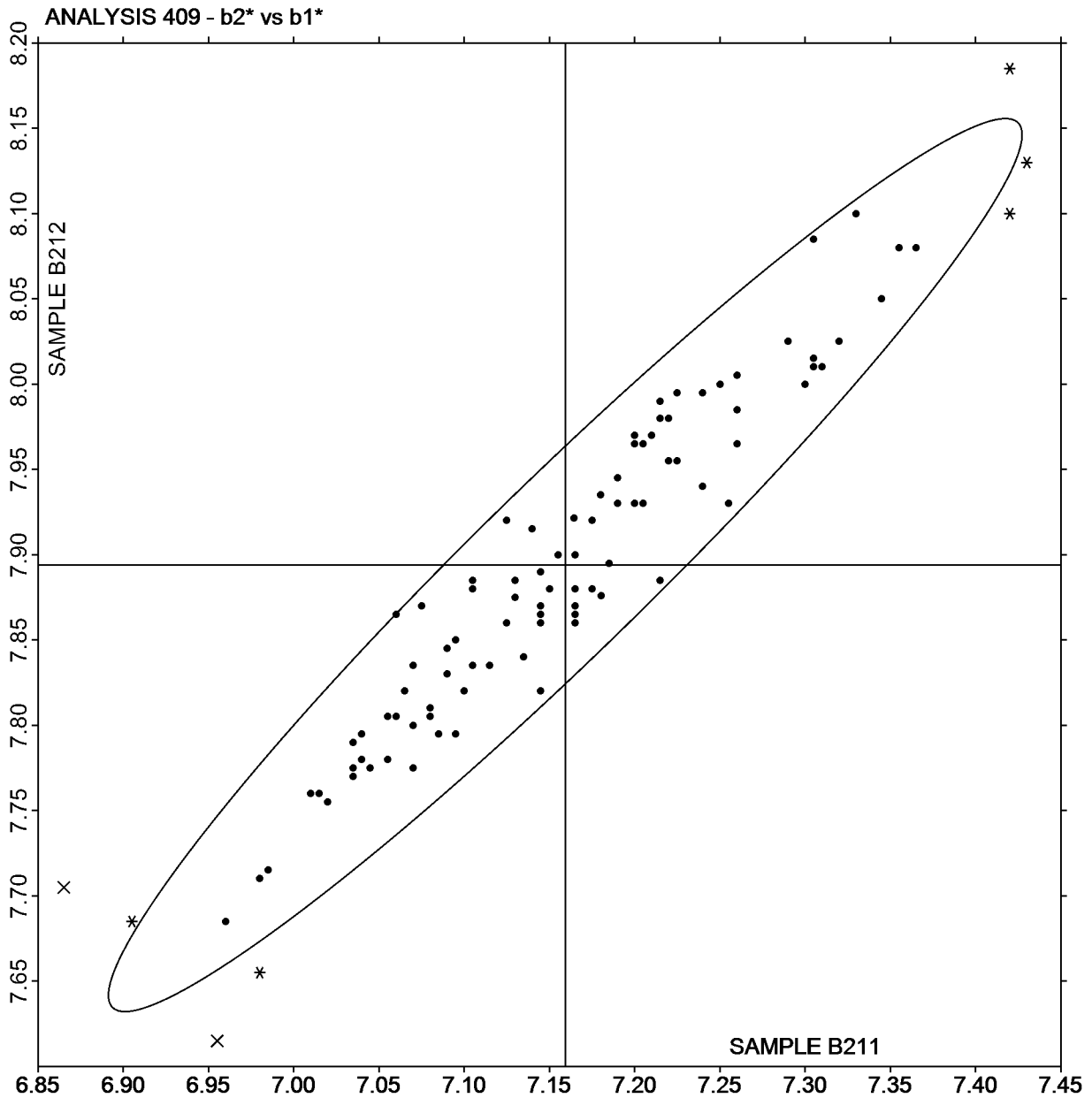




b2* vs b1*

SAMPLE B211 = -7.16

SAMPLE B212 = -7.89



Plot created using absolute values.



CTS Interlaboratory Testing Program for Color & Appearance Analysis 411

**Report #196
2nd Qtr 2021**

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 B211 | | | | | | | | | | | | | | | | | | |
| 2476TM | | 11.72 | 12.04 | 11.68 | 11.19 | 10.43 | 9.25 | 8.18 | 7.77 | 7.96 | 8.84 | 10.37 | 10.07 | 10.44 | 12.81 | 14.32 | 14.70 | AJ |
| 24NYPQ | | 11.70 | 11.96 | 11.71 | 11.18 | 10.42 | 9.27 | 8.19 | 7.77 | 7.93 | 8.82 | 10.34 | 10.06 | 10.42 | 12.83 | 14.63 | 14.68 | AS |
| 39WWHV | | 11.64 | 12.10 | 11.81 | 11.33 | 10.53 | 9.38 | 8.30 | 7.84 | 8.02 | 8.97 | 10.48 | 10.11 | 10.63 | 12.90 | 14.43 | 14.83 | MI |
| 3FDBKZ | | 11.65 | 11.95 | 11.70 | 11.19 | 10.48 | 9.30 | 8.21 | 7.80 | 7.99 | 8.86 | 10.39 | 10.07 | 10.41 | 12.84 | 14.44 | 14.61 | AN |
| 3QVYBT | | 11.78 | 12.09 | 11.74 | 11.30 | 10.56 | 9.38 | 8.29 | 7.89 | 8.01 | 8.90 | 10.50 | 10.12 | 10.54 | 12.95 | 14.62 | 14.73 | AJ |
| 4EFGZ2 | | 11.75 | 12.09 | 11.78 | 11.25 | 10.52 | 9.28 | 8.21 | 7.80 | 7.94 | 8.81 | 10.37 | 9.99 | 10.42 | 12.72 | 14.36 | 14.79 | AO |
| 4TTZQF | | 11.33 | 11.79 | 11.53 | 11.02 | 10.28 | 9.15 | 8.08 | 7.60 | 7.78 | 8.69 | 10.20 | 9.83 | 10.39 | 12.69 | 14.07 | 14.52 | XI |
| 4Y3BP3 | | 11.53 | 11.95 | 11.65 | 11.13 | 10.40 | 9.23 | 8.13 | 7.65 | 7.82 | 8.64 | 10.32 | 9.86 | 10.02X | 12.79 | 14.27 | 14.71 | HP |
| 629VD3 | | 11.73 | 12.00 | 11.71 | 11.11 | 10.44 | 9.29 | 8.21 | 7.82 | 7.90 | 8.82 | 10.42 | 10.09 | 10.50 | 12.80 | 14.36 | 14.64 | AT |
| 67GECV | | 11.17* | 11.58X | 11.34X | 10.85X | 10.14X | 9.04* | 8.00 | 7.61 | 7.75 | 8.69 | 10.10* | 9.76* | 10.34 | 12.58 | 14.03 | 14.56 | XH |
| 689FBQ | | 11.42 | 11.91 | 11.61 | 11.16 | 10.42 | 9.27 | 8.21 | 7.76 | 7.93 | 8.86 | 10.37 | 9.98 | 10.47 | 12.68 | 14.20 | 14.75 | XI |
| 6AVWMK | | 11.52 | 11.99 | 11.66 | 11.20 | 10.45 | 9.26 | 8.19 | 7.72 | 7.88 | 8.77 | 10.36 | 9.99 | 10.41 | 12.77 | 14.35 | 14.82 | MT |
| 6NLLQW | X | 11.79 | 12.21* | 11.92* | 11.44X | 10.72X | 9.61X | 8.58X | 8.12X | 8.31X | 9.19X | 10.73X | 10.38X | 10.78X | 13.10X | 14.67* | 15.14X | MU |
| 76YPLM | | 11.68 | 12.00 | 11.71 | 11.20 | 10.48 | 9.28 | 8.20 | 7.83 | 7.98 | 8.85 | 10.45 | 10.11 | 10.50 | 12.99 | 14.55 | 14.55 | AT |
| 87BNDB | | 11.60 | 12.14 | 11.80 | 11.31 | 10.54 | 9.39 | 8.33 | 7.88 | 8.05 | 8.97 | 10.47 | 10.10 | 10.63 | 12.92 | 14.42 | 14.78 | XH |
| 8JCFYF | | 11.58 | 11.93 | 11.61 | 11.10 | 10.35 | 9.17 | 8.11 | 7.69 | 7.84 | 8.78 | 10.29 | 9.86 | 10.43 | 12.75 | 14.20 | 14.48 | XB |
| 8KAQW4 | | 11.52 | 11.99 | 11.67 | 11.21 | 10.47 | 9.28 | 8.19 | 7.73 | 7.91 | 8.81 | 10.41 | 10.00 | 10.39 | 12.75 | 14.41 | 14.87 | MV |
| 8L72UR | | 11.72 | 12.09 | 11.80 | 11.34 | 10.60 | 9.39 | 8.28 | 7.85 | 8.02 | 8.99* | 10.56* | 10.11 | 10.58 | 12.95 | 14.55 | 15.01* | MV |
| 8RCY4W | | 11.50 | 12.04 | 11.66 | 11.14 | 10.40 | 9.20 | 8.18 | 7.72 | 7.88 | 8.85 | 10.31 | 9.92 | 10.50 | 12.85 | 14.21 | 14.64 | XI |
| A8VECK | | 11.90 | 11.81 | 11.50 | 11.00 | 10.26 | 9.08 | 8.03 | 7.59 | 7.75 | 8.68 | 10.19 | 9.79 | 10.34 | 12.65 | 14.10 | 14.53 | XD |
| ACQ9B8 | | 11.57 | 11.89 | 11.64 | 11.10 | 10.37 | 9.17 | 8.07 | 7.66 | 7.82 | 8.69 | 10.33 | 9.91 | 10.37 | 12.78 | 14.45 | 14.54 | AS |
| AR76XV | | 11.67 | 12.08 | 11.84 | 11.34 | 10.57 | 9.39 | 8.84X | 7.98* | 8.11* | 9.05X | 10.52 | 10.12 | 10.71* | 13.01* | 14.50 | 14.88 | XO |



CTS Interlaboratory Testing Program for Color & Appearance Analysis 411

**Report #196
2nd Qtr 2021**

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 B211 | | | | | | | | | | | | | | | | | | |
| ARZWMM | | 11.78 | 12.00 | 11.68 | 11.19 | 10.47 | 9.29 | 8.22 | 7.82 | 8.00 | 8.84 | 10.45 | 10.10 | 10.57 | 12.87 | 14.56 | 14.82 | AS |
| ATDK7M | | 11.25 | 11.91 | 11.60 | 11.09 | 10.33 | 9.16 | 8.10 | 7.67 | 7.83 | 8.74 | 10.22 | 9.92 | 10.43 | 12.64 | 14.16 | 14.59 | MM |
| AZXMAJ | | 11.59 | 12.02 | 11.71 | 11.23 | 10.43 | 9.29 | 8.25 | 7.82 | 7.97 | 8.92 | 10.39 | 10.04 | 10.49 | 12.78 | 14.27 | 14.73 | XH |
| BBCWFN | | 11.60 | 12.05 | 11.73 | 11.23 | 10.54 | 9.34 | 8.24 | 7.84 | 8.00 | 8.86 | 10.43 | 10.11 | 10.49 | 12.87 | 14.56 | 14.58 | AM |
| BM7BEK | | 11.66 | 12.08 | 11.80 | 11.26 | 10.56 | 9.31 | 8.26 | 7.84 | 7.99 | 8.84 | 10.43 | 10.08 | 10.48 | 12.87 | 14.47 | 14.82 | AO |
| D83QQR | | 11.72 | 11.93 | 11.62 | 11.16 | 10.46 | 9.25 | 8.18 | 7.76 | 7.93 | 8.80 | 10.44 | 10.08 | 10.44 | 12.85 | 14.54 | 14.76 | AS |
| DR978J | | 11.77 | 12.15 | 11.90* | 11.34 | 10.63* | 9.44* | 8.32 | 7.92* | 8.04 | 8.94 | 10.47 | 10.15 | 10.52 | 12.92 | 14.47 | 14.72 | AJ |
| DUVMJC | | 11.59 | 11.97 | 11.65 | 11.12 | 10.43 | 9.23 | 8.17 | 7.77 | 7.94 | 8.79 | 10.38 | 10.01 | 10.43 | 12.83 | 14.45 | 14.52 | AS |
| EBX4LG | | 11.52 | 12.07 | 11.75 | 11.20 | 10.49 | 9.31 | 8.20 | 7.76 | 7.91 | 8.75 | 10.35 | 10.01 | 10.33 | 12.72 | 14.33 | 14.80 | AJ |
| EDLKXA | | 12.17X | 12.13 | 11.78 | 11.26 | 10.50 | 9.30 | 8.23 | 7.80 | 7.97 | 8.84 | 10.37 | 10.04 | 10.43 | 12.76 | 14.43 | 14.74 | AQ |
| EZYBC6 | | 11.54 | 11.96 | 11.70 | 11.15 | 10.40 | 9.22 | 8.15 | 7.70 | 7.84 | 8.61* | 10.24 | 9.84 | 10.15* | 12.79 | 14.25 | 14.64 | HP |
| EZZ2NE | | 11.70 | 12.00 | 11.70 | 11.20 | 10.45 | 9.30 | 8.20 | 7.80 | 8.00 | 8.80 | 10.40 | 10.05 | 10.50 | 13.00* | 14.60 | 14.70 | AN |
| F6LHA4 | | 11.58 | 12.03 | 11.72 | 11.22 | 10.45 | 9.32 | 8.26 | 7.81 | 7.98 | 8.93 | 10.41 | 10.03 | 10.63 | 12.88 | 14.32 | 14.68 | XH |
| FCCQZN | | 11.57 | 12.00 | 11.68 | 11.18 | 10.41 | 9.23 | 8.17 | 7.72 | 7.87 | 8.80 | 10.28 | 9.86 | 10.43 | 12.72 | 14.14 | 14.53 | XI |
| FKMU63 | | 11.59 | 11.93 | 11.61 | 11.14 | 10.40 | 9.29 | 8.20 | 7.74 | 7.89 | 8.87 | 10.32 | 9.94 | 10.48 | 12.81 | 14.17 | 14.62 | XI |
| FTG3M8 | | 11.54 | 11.94 | 11.62 | 11.13 | 10.40 | 9.23 | 8.15 | 7.76 | 7.94 | 8.77 | 10.34 | 10.07 | 10.47 | 12.79 | 14.46 | 14.57 | AS |
| FTXBHU | | 11.45 | 11.79 | 11.52 | 11.06 | 10.37 | 9.15 | 8.10 | 7.65 | 7.81 | 8.67 | 10.31 | 9.82 | 10.20 | 12.56* | 14.14 | 14.61 | CA |
| G3FGLB | | 11.41 | 11.77 | 11.46 | 10.97* | 10.27 | 9.08 | 8.02 | 7.63 | 7.76 | 8.65 | 10.26 | 9.87 | 10.33 | 12.69 | 14.44 | 14.34* | AS |
| GQQDMR | | 11.50 | 12.00 | 11.70 | 11.20 | 10.50 | 9.30 | 8.20 | 7.70 | 7.90 | 8.75 | 10.40 | 10.00 | 10.30 | 12.70 | 14.35 | 14.85 | MV |
| GTU7HB | | 11.81 | 11.99 | 11.66 | 11.20 | 10.46 | 9.21 | 8.13 | 7.74 | 7.85 | 8.65 | 10.46 | 9.83 | 9.99X | 12.89 | 14.34 | 14.65 | HP |
| GYF7QB | | 11.70 | 12.04 | 11.73 | 11.17 | 10.48 | 9.29 | 8.21 | 7.81 | 7.93 | 8.80 | 10.38 | 10.05 | 10.43 | 12.78 | 14.50 | 14.60 | AS |
| H3AFHP | | 11.87 | 11.74* | 11.56 | 11.20 | 10.64* | 9.26 | 8.31 | 7.81 | 7.80 | 8.67 | 10.05X | 10.04 | 10.45 | 12.77 | 14.11 | 14.04X | GD |



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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 B211 | | | | | | | | | | | | | | | | | | |
| H4NNP4 | | 11.46 | 12.02 | 11.70 | 11.22 | 10.48 | 9.30 | 8.21 | 7.77 | 7.96 | 8.80 | 10.27 | 10.06 | 10.43 | 12.75 | 14.30 | 14.71 | AQ |
| H93HNA | | 11.68 | 12.08 | 11.71 | 11.20 | 10.48 | 9.28 | 8.18 | 7.76 | 7.95 | 8.79 | 10.37 | 10.02 | 10.45 | 12.86 | 14.41 | 14.63 | AJ |
| HYELM9 | | 11.44 | 11.87 | 11.55 | 11.06 | 10.33 | 9.14 | 8.07 | 7.60 | 7.76 | 8.65 | 10.26 | 9.77 | 10.21 | 12.58 | 14.06 | 14.42 | XB |
| J84J62 | | 11.52 | 11.96 | 11.66 | 11.16 | 10.43 | 9.25 | 8.20 | 7.75 | 7.90 | 8.81 | 10.35 | 9.95 | 10.48 | 12.79 | 14.27 | 14.73 | MM |
| JDA9QF | | 11.66 | 11.98 | 11.71 | 11.21 | 10.47 | 9.31 | 8.20 | 7.81 | 7.99 | 8.84 | 10.42 | 10.12 | 10.51 | 12.93 | 14.41 | 14.70 | AS |
| K2R6J9 | | 11.85 | 12.13 | 11.76 | 11.23 | 10.51 | 9.33 | 8.22 | 7.80 | 7.99 | 8.84 | 10.36 | 10.15 | 10.47 | 12.86 | 14.43 | 14.76 | AJ |
| KB3869 | X | 12.15X | 12.52X | 12.28X | 11.65X | 10.87X | 9.64X | 8.55X | 8.09X | 8.24X | 9.16X | 10.79X | 10.14 | 10.52 | 13.32X | 14.98X | 15.27X | HH |
| LHQNNA | | 11.44 | 11.89 | 11.57 | 11.05 | 10.33 | 9.25 | 8.18 | 7.70 | 7.88 | 8.77 | 10.27 | 9.99 | 10.43 | 12.69 | 14.16 | 14.55 | XI |
| LWDWNV | | 11.58 | 12.02 | 11.70 | 11.17 | 10.48 | 9.29 | 8.21 | 7.80 | 7.95 | 8.81 | 10.45 | 10.10 | 10.42 | 12.93 | 14.50 | 14.61 | XX |
| MQ8FWM | | 11.50 | 11.95 | 11.60 | 11.10 | 10.40 | 9.15 | 8.20 | 7.70 | 7.80 | 8.80 | 10.20 | 9.90 | 10.50 | 12.70 | 14.20 | 14.55 | XI |
| MZW7HE | | 11.54 | 11.97 | 11.68 | 11.20 | 10.46 | 9.31 | 8.20 | 7.72 | 7.88 | 8.76 | 10.37 | 9.99 | 10.28 | 12.67 | 14.27 | 14.74 | MY |
| PAWF3A | | 11.61 | 12.00 | 11.67 | 11.16 | 10.43 | 9.23 | 8.18 | 7.73 | 7.91 | 8.82 | 10.35 | 9.92 | 10.43 | 12.74 | 14.19 | 14.57 | XD |
| PYDYA3 | | 11.40 | 11.91 | 11.59 | 11.07 | 10.37 | 9.26 | 8.18 | 7.70 | 7.87 | 8.79 | 10.27 | 9.88 | 10.45 | 12.73 | 14.12 | 14.59 | XI |
| Q6BZ42 | | 11.60 | 12.00 | 11.65 | 11.20 | 10.40 | 9.25 | 8.15 | 7.70 | 7.90 | 8.75 | 10.35 | 9.95 | 10.40 | 12.75 | 14.25 | 14.75 | MS |
| QQCA4H | | 11.73 | 12.06 | 11.76 | 11.28 | 10.56 | 9.31 | 8.23 | 7.77 | 7.93 | 8.83 | 10.49 | 9.99 | 10.40 | 12.84 | 14.41 | 14.87 | CA |
| QQU3Y2 | | 11.71 | 12.05 | 11.71 | 11.25 | 10.55 | 9.28 | 8.21 | 7.75 | 7.91 | 8.82 | 10.47 | 9.96 | 10.36 | 12.79 | 14.40 | 14.86 | CA |
| QQZAAA | | 11.55 | 12.01 | 11.70 | 11.21 | 10.45 | 9.33 | 8.23 | 7.76 | 7.89 | 8.83 | 10.32 | 9.96 | 10.51 | 12.83 | 14.27 | 14.72 | XI |
| QZZ8NW | | 11.45 | 11.90 | 11.62 | 11.13 | 10.40 | 9.21 | 8.15 | 7.70 | 7.84 | 8.74 | 10.27 | 9.92 | 10.44 | 12.75 | 14.25 | 14.72 | MM |
| R8EDZT | | 11.36 | 11.70* | 11.42* | 10.90* | 10.24* | 9.03* | 7.96* | 7.54* | 7.71* | 8.58* | 10.19 | 9.82 | 10.29 | 12.58 | 14.52 | 14.34* | AS |
| RBDNWT | | 11.67 | 12.04 | 11.75 | 11.22 | 10.51 | 9.31 | 8.23 | 7.82 | 7.98 | 8.84 | 10.43 | 10.07 | 10.47 | 12.83 | 14.50 | 14.65 | AJ |
| RCNLAB | | 11.59 | 11.93 | 11.65 | 11.14 | 10.39 | 9.23 | 8.13 | 7.72 | 7.90 | 8.86 | 10.34 | 9.91 | 10.49 | 12.74 | 14.27 | 14.79 | XC |
| RWUWDE | | 12.38X | 12.01 | 11.73 | 11.20 | 10.47 | 9.29 | 8.21 | 7.79 | 7.96 | 8.81 | 10.38 | 10.10 | 10.47 | 12.84 | 14.43 | 14.83 | AJ |



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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 B211 | | | | | | | | | | | | | | | | | | |
| T34AXX | | 11.86 | 12.19* | 11.89* | 11.39* | 10.66* | 9.42 | 8.32 | 7.85 | 8.01 | 8.91 | 10.56* | 10.06 | 10.46 | 12.92 | 14.53 | 15.01* | CA |
| TAEYAB | | 11.37 | 11.79 | 11.49 | 10.99 | 10.27 | 9.10 | 8.07 | 7.62 | 7.80 | 8.72 | 10.22 | 9.85 | 10.37 | 12.67 | 14.15 | 14.57 | XB |
| TC9MR8 | | 11.48 | 11.86 | 11.53 | 11.04 | 10.31 | 9.10 | 8.04 | 7.62 | 7.77 | 8.71 | 10.22 | 9.78 | 10.30 | 12.62 | 14.05 | 14.39 | XR |
| TF3GP9 | | 11.55 | 11.97 | 11.66 | 11.16 | 10.42 | 9.28 | 8.16 | 7.71 | 7.86 | 8.78 | 10.39 | 9.90 | 10.34 | 12.75 | 14.28 | 14.76 | MV |
| TRH9DH | | 11.63 | 12.06 | 11.76 | 11.28 | 10.51 | 9.40 | 8.22 | 7.77 | 7.93 | 8.84 | 10.48 | 9.99 | 10.38 | 12.85 | 14.44 | 14.93 | MV |
| TTV3V4 | | 11.51 | 11.91 | 11.55 | 11.06 | 10.32 | 9.23 | 8.15 | 7.70 | 7.83 | 8.82 | 10.22 | 9.86 | 10.46 | 12.60 | 14.04 | 14.39 | XI |
| TU8KB3 | X | 12.50X | 12.90X | 12.56X | 12.01X | 11.19X | 9.88X | 8.67X | 8.18X | 8.34X | 9.35X | 10.98X | 10.54X | 11.17X | 13.58X | 15.15X | 15.66X | XR |
| UJJAXT | | 11.49 | 11.93 | 11.66 | 11.17 | 10.43 | 9.24 | 8.19 | 7.72 | 7.91 | 8.80 | 10.34 | 9.98 | 10.49 | 12.80 | 14.33 | 14.79 | MM |
| UR9XRV | | 11.48 | 11.81 | 11.51 | 11.00 | 10.27 | 9.08 | 8.03 | 7.59 | 7.75 | 8.67 | 10.24 | 9.77 | 10.31 | 12.68 | 14.11 | 14.49 | XB |
| UVCP4G | | 11.60 | 12.06 | 11.74 | 11.20 | 10.50 | 9.30 | 8.24 | 7.80 | 7.95 | 8.84 | 10.33 | 10.04 | 10.52 | 12.74 | 14.29 | 14.77 | MM |
| VB7GLW | | 11.44 | 11.83 | 11.53 | 11.03 | 10.29 | 9.14 | 8.07 | 7.63 | 7.80 | 8.73 | 10.25 | 9.83 | 10.36 | 12.69 | 14.14 | 14.48 | XB |
| VCFGMX | | 11.70 | 12.00 | 11.70 | 11.20 | 10.50 | 9.30 | 8.20 | 7.80 | 8.00 | 8.80 | 10.50 | 10.15 | 10.50 | 12.90 | 14.60 | 14.80 | AN |
| VZQJLY | | 11.62 | 11.89 | 11.63 | 11.13 | 10.37 | 9.23 | 8.15 | 7.69 | 7.85 | 8.81 | 10.24 | 9.87 | 10.40 | 12.72 | 14.10 | 14.43 | XI |
| WHYDHX | | 11.32 | 11.84 | 11.56 | 11.06 | 10.29 | 9.14 | 7.97* | 7.87 | 7.68* | 8.72 | 10.43 | 10.06 | 10.38 | 12.68 | 14.37 | 14.73 | GD |
| WK8FCA | | 11.30 | 11.79 | 11.57 | 11.13 | 10.44 | 9.31 | 8.22 | 7.79 | 7.96 | 8.88 | 10.35 | 10.04 | 10.51 | 12.74 | 14.30 | 14.75 | GE |
| WMDQMR | | 11.92 | 12.12 | 11.81 | 11.30 | 10.58 | 9.41 | 8.29 | 7.87 | 8.02 | 8.86 | 10.52 | 10.16 | 10.54 | 12.96 | 14.62 | 14.91 | AS |
| X36X26 | | 11.71 | 12.01 | 11.73 | 11.21 | 10.47 | 9.30 | 8.21 | 7.81 | 7.99 | 8.86 | 10.48 | 10.09 | 10.48 | 12.88 | 14.64 | 14.69 | AJ |
| XET36V | | 11.43 | 11.89 | 11.61 | 11.12 | 10.38 | 9.20 | 8.13 | 7.68 | 7.84 | 8.76 | 10.30 | 9.92 | 10.41 | 12.72 | 14.25 | 14.71 | MK |
| XMTKK8 | | 11.48 | 11.94 | 11.62 | 11.11 | 10.38 | 9.22 | 8.18 | 7.71 | 7.87 | 8.79 | 10.23 | 9.88 | 10.43 | 12.67 | 14.08 | 14.45 | XI |
| XX7REL | | 11.44 | 11.86 | 11.56 | 11.08 | 10.35 | 9.20 | 8.17 | 7.71 | 7.87 | 8.78 | 10.30 | 9.93 | 10.41 | 12.67 | 14.45 | 14.58 | XB |
| YFM7EW | | 11.32 | 11.83 | 11.48 | 11.04 | 10.31 | 9.14 | 8.06 | 7.61 | 7.77 | 8.64 | 10.20 | 9.85 | 10.24 | 12.59 | 14.11 | 14.53 | AB |
| YFN8YU | | 11.54 | 11.89 | 11.60 | 11.08 | 10.31 | 9.12 | 8.07 | 7.60 | 7.76 | 8.69 | 10.23 | 9.80 | 10.27 | 12.59 | 14.07 | 14.44 | XB |



CTS Interlaboratory Testing Program for Color & Appearance Analysis 411

**Report #196
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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 B211 | | | | | | | | | | | | | | | | | | |
| Z49BWC | | 11.51 | 11.97 | 11.69 | 11.18 | 10.43 | 9.29 | 8.26 | 7.82 | 7.99 | 8.91 | 10.37 | 10.10 | 10.54 | 12.84 | 14.30 | 14.74 | MI |
| ZUJM4U | X | 12.35X | 12.76X | 12.43X | 11.87X | 11.09X | 9.75X | 8.48X | 8.02X | 8.17X | 9.08X | 10.81X | 10.45X | 10.87X | 13.40X | 15.03X | 15.30X | AJ |

Summary Statistics

| | 400 | 420 | 440 | 460 | 480 | 500 | 520 | 540 | 560 | 580 | 600 | 620 | 640 | 660 | 680 | 700 |
|---------------------|-------|-------|-------|-------|-------|------|------|------|------|------|-------|------|-------|-------|-------|-------|
| Grand Means | 11.59 | 11.96 | 11.66 | 11.16 | 10.43 | 9.25 | 8.18 | 7.74 | 7.90 | 8.79 | 10.35 | 9.98 | 10.42 | 12.78 | 14.33 | 14.66 |
| SD Btwn Labs | 0.18 | 0.11 | 0.10 | 0.10 | 0.10 | 0.09 | 0.11 | 0.08 | 0.09 | 0.09 | 0.10 | 0.11 | 0.12 | 0.11 | 0.17 | 0.16 |

6NLLQW (X) - High % reflectance data for most wavelengths.

KB3869 (X) - High % reflectance data for almost all wavelengths.

TU8KB3 (X) - High % reflectance data at all wavelengths.

ZUJM4U (X) - High % reflectance data at all wavelengths.



CTS Interlaboratory Testing Program for Color & Appearance Analysis 411

Report #196
2nd Qtr 2021

Spectrophotometric - Sphere Geometry Instruments
Reflectance at 16 Selected Wavelengths

Key to Instrument Codes Reported by Participants

| | | |
|---|--|---|
| AB Datacolor 100 | AJ Datacolor 600 | AM Datacolor 600 Plus |
| AN Datacolor 650 | AO Datacolor 650x | AQ Datacolor 600x |
| AS Datacolor 800 | AT Datacolor 850 | CA Cary 5000 |
| GD BYK-Gardner Spectro-Guide Sphere | GE BYK-Gardner Spectro2-Guide Sphere Gloss | 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 |
| MU Minolta | MV Minolta CM-3000d Spectrophotometer | MY Minolta Benchtop Spectrophotometer CM-3600a |
| XB X-Rite Ci7000 Series Benchtop Spectrophotometer | XC X-Rite Ci4200 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 | XX Instrument make/model not specified by lab | |



Interlaboratory Testing Program for Color & Appearance

**Report #196
2nd Qtr 2021**

Analysis 440

60 Degree Gloss - Paint Chips

ASTM Method D 523

| WebCode | Data Flag | Sample F211 | | | Sample F212 | | | Instr Code |
|---------|-----------|-------------|----------------------|-------|-------------|----------------------|-------|------------|
| | | Lab Mean | Diff from Grand Mean | CPV | Lab Mean | Diff from Grand Mean | CPV | |
| 39WWHV | | 33.10 | -0.58 | -0.77 | 43.05 | -0.44 | -0.46 | GL |
| 3QVYBT | | 33.98 | 0.30 | 0.40 | 44.05 | 0.56 | 0.59 | GL |
| 4QP46R | | 34.55 | 0.87 | 1.17 | 44.25 | 0.76 | 0.80 | GN |
| 4YLUWU | | 33.45 | -0.23 | -0.30 | 42.70 | -0.79 | -0.83 | RA |
| 63FBLT | | 33.90 | 0.22 | 0.30 | 44.70 | 1.21 | 1.28 | GL |
| 689FBQ | | 33.83 | 0.15 | 0.20 | 43.08 | -0.41 | -0.43 | GL |
| 6KXGPC | | 33.10 | -0.58 | -0.77 | 42.38 | -1.11 | -1.17 | GK |
| 6TRHAW | | 33.48 | -0.20 | -0.27 | 42.95 | -0.54 | -0.56 | GL |
| 87BNDB | | 33.30 | -0.38 | -0.51 | 44.08 | 0.59 | 0.62 | GL |
| 8JCFYF | | 33.60 | -0.08 | -0.10 | 43.85 | 0.36 | 0.38 | GL |
| 8KAQW4 | | 32.78 | -0.90 | -1.21 | 42.23 | -1.26 | -1.33 | GL |
| 9CAM9X | | 34.13 | 0.45 | 0.60 | 43.38 | -0.11 | -0.12 | GN |
| 9THMEF | X | 32.10 | -1.58 | -2.12 | 40.10 | -3.39 | -3.56 | GB |
| 9UBHXH | | 34.10 | 0.42 | 0.57 | 43.18 | -0.31 | -0.33 | GN |
| A8VECK | | 34.13 | 0.45 | 0.60 | 43.98 | 0.49 | 0.51 | RA |
| ABY6PR | | 33.33 | -0.35 | -0.47 | 43.03 | -0.46 | -0.49 | GL |
| AR76XV | | 33.95 | 0.27 | 0.37 | 43.95 | 0.46 | 0.49 | MW |
| AZXMAJ | | 34.05 | 0.37 | 0.50 | 44.38 | 0.89 | 0.94 | GK |
| BZD9EE | | 33.83 | 0.15 | 0.20 | 43.03 | -0.46 | -0.49 | GL |
| C3DV89 | | 33.40 | -0.28 | -0.37 | 43.63 | 0.14 | 0.15 | GL |
| DZJP9U | | 33.85 | 0.17 | 0.23 | 43.78 | 0.29 | 0.30 | GK |
| EJDHTR | | 34.03 | 0.35 | 0.47 | 43.45 | -0.04 | -0.04 | GN |
| F6LHA4 | | 34.43 | 0.75 | 1.00 | 43.55 | 0.06 | 0.07 | GL |
| FHBEB2 | | 33.80 | 0.12 | 0.17 | 43.13 | -0.36 | -0.38 | GL |
| FHFUPM | | 34.90 | 1.22 | 1.64 | 45.35 | 1.86 | 1.96 | GN |
| FTG3M8 | | 33.25 | -0.43 | -0.57 | 42.70 | -0.79 | -0.83 | GL |
| FTXBHU | | 33.58 | -0.10 | -0.14 | 43.70 | 0.21 | 0.22 | GL |
| G3FGLB | | 33.10 | -0.58 | -0.77 | 42.60 | -0.89 | -0.93 | GL |
| GEBH8R | | 33.03 | -0.65 | -0.88 | 43.85 | 0.36 | 0.38 | GL |
| GYF7QB | | 34.13 | 0.45 | 0.60 | 44.98 | 1.49 | 1.57 | GK |



Interlaboratory Testing Program for Color & Appearance

**Report #196
2nd Qtr 2021**

Analysis 440

60 Degree Gloss - Paint Chips

ASTM Method D 523

| WebCode | Data Flag | Sample F211 | | | Sample F212 | | | Instr Code |
|---------|-----------|-------------|----------------------|-------|-------------|----------------------|-------|------------|
| | | Lab Mean | Diff from Grand Mean | CPV | Lab Mean | Diff from Grand Mean | CPV | |
| H3AFHP | | 33.70 | 0.02 | 0.03 | 43.73 | 0.24 | 0.25 | GN |
| HJHDKZ | | 34.23 | 0.55 | 0.74 | 43.95 | 0.46 | 0.49 | GK |
| HTTF72 | | 33.45 | -0.23 | -0.30 | 42.78 | -0.71 | -0.75 | RA |
| HYELM9 | | 33.75 | 0.07 | 0.10 | 44.15 | 0.66 | 0.70 | ZA |
| JDUTCE | | 33.95 | 0.27 | 0.37 | 43.80 | 0.31 | 0.33 | GL |
| KB3869 | * | 34.38 | 0.70 | 0.94 | 42.55 | -0.94 | -0.99 | RA |
| KE2LQD | | 34.08 | 0.40 | 0.53 | 44.38 | 0.89 | 0.94 | GL |
| KH3NFE | | 34.85 | 1.17 | 1.58 | 45.43 | 1.94 | 2.04 | RA |
| KN7T7D | | 34.05 | 0.37 | 0.50 | 44.13 | 0.64 | 0.67 | GL |
| KUX3FB | | 33.25 | -0.43 | -0.57 | 43.28 | -0.21 | -0.22 | GL |
| L362K7 | | 34.78 | 1.10 | 1.47 | 44.60 | 1.11 | 1.17 | GN |
| LHQNNA | | 32.75 | -0.93 | -1.25 | 41.83 | -1.66 | -1.75 | GT |
| M6MGTD | | 33.00 | -0.68 | -0.91 | 43.15 | -0.34 | -0.35 | GL |
| M7LLA8 | * | 35.58 | 1.90 | 2.55 | 45.80 | 2.31 | 2.43 | GD |
| MQ8FWM | X | 49.05 | 15.37 | 20.65 | 62.48 | 18.99 | 19.98 | GK |
| MT72GX | | 32.13 | -1.55 | -2.08 | 41.65 | -1.84 | -1.93 | GL |
| MZW7HE | | 34.65 | 0.97 | 1.31 | 44.88 | 1.39 | 1.46 | GL |
| PYDYA3 | | 32.88 | -0.80 | -1.08 | 43.23 | -0.26 | -0.27 | MM |
| Q6BZ42 | | 32.83 | -0.85 | -1.14 | 43.13 | -0.36 | -0.38 | GK |
| QQZAAA | | 33.65 | -0.03 | -0.04 | 43.93 | 0.44 | 0.46 | GN |
| QZZ8NW | | 34.84 | 1.16 | 1.56 | 44.34 | 0.86 | 0.90 | GL |
| R7639W | | 34.60 | 0.92 | 1.24 | 44.63 | 1.14 | 1.20 | GL |
| R8EDZT | | 32.95 | -0.73 | -0.98 | 42.65 | -0.84 | -0.88 | GK |
| RBDNWT | | 34.95 | 1.27 | 1.71 | 45.25 | 1.76 | 1.86 | MW |
| T74LUX | | 34.43 | 0.75 | 1.00 | 43.73 | 0.24 | 0.25 | GL |
| TC9MR8 | | 33.85 | 0.17 | 0.23 | 43.00 | -0.49 | -0.51 | GK |
| TDZMR4 | | 33.25 | -0.43 | -0.57 | 41.80 | -1.69 | -1.77 | GK |
| TTV3V4 | | 33.23 | -0.45 | -0.60 | 43.25 | -0.24 | -0.25 | GL |
| TU8KB3 | X | 32.80 | -0.88 | -1.18 | 39.70 | -3.79 | -3.98 | GL |
| UVCP4G | | 32.50 | -1.18 | -1.58 | 42.80 | -0.69 | -0.72 | GL |



Interlaboratory Testing Program for Color & Appearance

Report #196
2nd Qtr 2021

Analysis 440

60 Degree Gloss - Paint Chips

ASTM Method D 523

| WebCode | Data Flag | Sample F211 | | | Sample F212 | | | Instr Code |
|---------|-----------|-------------|----------------------|-------|-------------|----------------------|-------|------------|
| | | Lab Mean | Diff from Grand Mean | CPV | Lab Mean | Diff from Grand Mean | CPV | |
| WHYDHX | | 33.85 | 0.17 | 0.23 | 43.93 | 0.44 | 0.46 | GK |
| WMDQMR | | 32.95 | -0.73 | -0.98 | 43.13 | -0.36 | -0.38 | GK |
| WYNEFP | | 32.42 | -1.26 | -1.69 | 42.25 | -1.24 | -1.30 | GL |
| X36X26 | | 34.25 | 0.57 | 0.77 | 43.73 | 0.24 | 0.25 | GL |
| XX6U4Q | | 32.85 | -0.83 | -1.11 | 43.23 | -0.26 | -0.27 | GX |
| YDZG9X | * | 34.70 | 1.02 | 1.37 | 43.03 | -0.46 | -0.49 | GK |
| YFM7EW | | 34.43 | 0.75 | 1.00 | 44.68 | 1.19 | 1.25 | GL |
| YJ78GV | | 32.48 | -1.20 | -1.61 | 41.25 | -2.24 | -2.35 | GK |
| YK2L79 | | 32.43 | -1.25 | -1.68 | 42.43 | -1.06 | -1.12 | GL |
| YPUTMW | | 33.65 | -0.03 | -0.04 | 42.95 | -0.54 | -0.56 | GL |
| Z49BWC | | 33.60 | -0.08 | -0.10 | 44.03 | 0.54 | 0.57 | GL |
| ZEAXN9 | | 31.95 | -1.73 | -2.32 | 41.53 | -1.96 | -2.06 | GL |
| ZUJM4U | | 33.33 | -0.35 | -0.47 | 43.25 | -0.24 | -0.25 | GL |

Summary Statistics

Grand Means

33.68 Gloss Units

43.49 Gloss Units

Std Dev Btwn Labs

0.74 Gloss Units

0.95 Gloss Units

Statistics based on 70 of 73 reporting participants

Comments on Assigned Data Flags for Test #440

9THMEF(X) - Low data for Sample F212.

MQ8FWM(X) - Extreme data.

TU8KB3(X) - Low data for Sample F212. Inconsistent within the determinations for Sample F212.

Key to Instrument Codes Reported by Participants

| | | | |
|-----------|--|-----------|--------------------------------|
| GB | BYK Gardner Spectro - Guide Sphere Gloss | GD | BYK Gardner Spectro2Guide 45/0 |
| 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) |
| GX | BYK-Gardner (model not specified) | MM | Macbeth Lab-Gloss |
| MW | Minolta Multi-Gloss 268 | RA | Rhpoint Novo-Gloss Glossmeter |
| ZA | Zehntner ZGM Series | | |



Interlaboratory Testing Program for Color & Appearance

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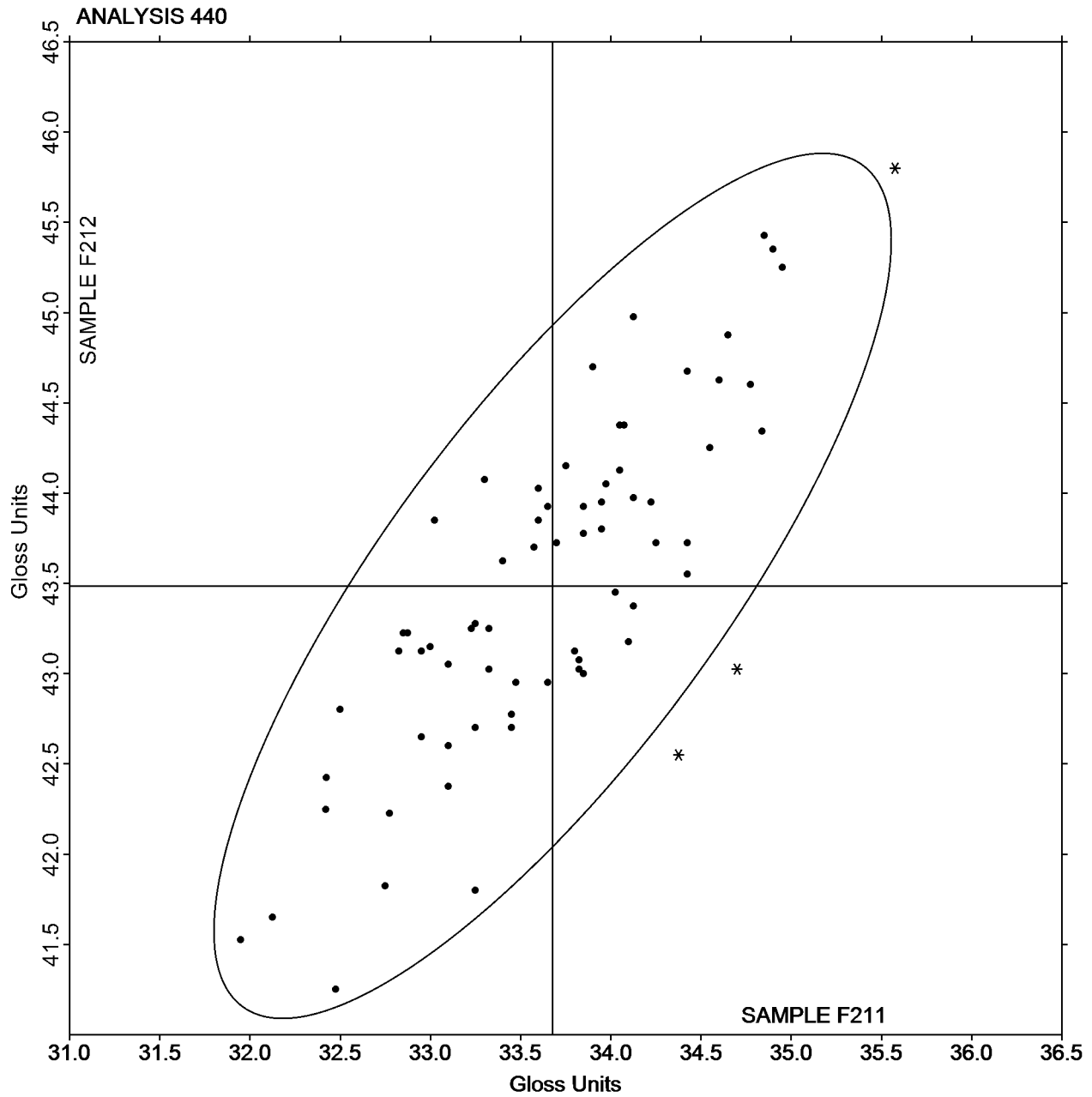
Analysis 440

60 Degree Gloss - Paint Chips

ASTM Method D 523

SAMPLE F211 = 33.68 Gloss Units

SAMPLE F212 = 43.49 Gloss Units



-End of Report-