MCCA

MANUFACTURERS COUNCIL ON COLOR AND APPEARANCE

COLLABORATIVE REFERENCE PROGRAM

COLOR AND APPEARANCE

COLOR AND COLOR DIFFERENCE

REPORT NO. 28

U.S. DEPARTMENT OF COMMERCE

National Bureau of Standards

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NBS Collaborative Reference Programs
A05 Technology Building
National Bureau of Standards
Washington, DC 20234

Rev. 10/79

MANUFACTURERS COUNCIL ON
COLOR AND APPEARANCE

COLLABORATIVE REFERENCE PROGRAM FOR COLOR AND APPEARANCE

COLOR AND COLOR DIFFERENCE

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U. S. DEPARTMENT OF COMMERCE
National Bureau of Standards

NBSIR 79-1812

INTRODUCTION

This Collaborative Reference Program is sponsored by the Manufacturers Council on Color and Appearance and the National Bureau of Standards. Four times per year, color chip samples are distributed to each participating laboratory. After the data has been returned to and analyzed by NBS, a report (as illustrated by this report) showing the data from all participants is prepared. A plot of the spectrophotometric curves of the samples was provided by Hemmendinger Color Laboratory, Belvedere, New Jersey. Reflectance values and colorimetric data for 45/0 geometry usually provided by NBS were unavailable for this report.

If there are any questions on the notes, the analyses, or the report in general, contact J. Horlick on 301-921-2946.

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KEY TO TABLES

MEAN — The average of individual test determinations.

GRAND MEAN - (GR. MEAN) — The average of the individual laboratory MEANS, excluding laboratories flagged (see column F) with an X, #, or +.

SD OF MEANS - The standard deviation of the laboratory MEANS about the GRAND MEAN: an index of the among-laboratory precision.

INST CODE - Code for instrument type and color space used to report meansurements, see Table of Instrument Codes.

F - Flag, is based on ΔE column with the following meaning:

- 0 - Included in grand mean analysis.
- * - Included in grand means but results are between two and three standard deviations. The participants should take this as a warning to reexamine testing procedures.
- X - Excluded from all calculations because ΔE is beyond (3) standard deviations.
- + - Excluded from all grand mean calculations because lab is using a nonstandard instrument or test method.
- # - Excluded from all grand mean calculations because data were not understood, data were extreme, late, or insufficient information was supplied concerning instrument and test method used.

Note: In additon to flag (F) based on delta E column, it is also possible to have either an X or an * on individual MEANS as follows:

X - following a MEAN signifies that the mean is greater than 3 SD of MEANS from the Grand Mean. The values for this laboratory have been omitted in the calculations involving the MEAN for the column.

* - following any of the MEANS signifies that the quantity is greater than 2 but less than 3 of the appropriate stnadard deviations from the corresponding average. The participant should take this as a warning to reexamine his testing procedures.

ΔE - Total color difference between two samples. In X, Y, Z analysis it is calculated in MacAdams (FMC II) units. For L, a, b analysis it is calculated in Hunter units.

ΔE Calculation

ΔE is calculated in the Color and Color Difference Collaborative Reference Program by the FMC2* equations (X, Y, Z analysis) as follows:

The yellow-blue chromatic difference is

$$\Delta C_1 = K_1 S(P\Delta P + Q\Delta Q)/bD^2 - K_1 \Delta S/b;$$

the lightness difference is

$$\Delta L = 0.279 K_2 (P\Delta P + Q\Delta Q)/aD;$$

and the red-green chromatic difference is

$$\Delta C_3 = K_1 (Q\Delta P - P\Delta Q)/aD.$$

The quantity, D, is an abbreviation,

$$D = (P^2 + Q^2)^{1/2}.$$

$$K_1 = 0.55669 + 0.049434\ Y - 0.82575 \cdot 10^{-3} Y^2 + 0.79172 \cdot 10^{-5} Y^3 - 0.30087 \cdot 10^{-7} Y^4,$$

$$K_2 = 0.17548 + 0.027556\ Y - 0.57262 \cdot 10^{-3} Y^2 + 0.63893 \cdot 10^{-5} Y^3 - 0.26731 \cdot 10^{-7} Y^4,$$

$$a^2 = 17.3 \cdot 10^{-6} (P^2 + Q^2)/[1 + 2.73 P^2 Q^2/(P^4 + Q^4)],$$

$$b^2 = 3.098 \cdot 10^{-4} (S^2 + 0.2015\ Y^2)$$

$$P = 0.724\ X + 0.382\ Y - 0.098\ Z,$$

$$Q = -0.48\ X + 1.37\ Y + 0.1276\ Z,$$

$$S = 0.686\ Z,$$

$$\Delta E = [(\Delta C_1)^2 + (\Delta L)^2 + (\Delta C_3)^2]^{1/2}$$

*Friele-MacAdam-Chickering metric

Notes on Specific Laboratory Results

C241	- Reported extreme a value compared to other labs on samples D05 and D06
C256A, C256B C637, C633	- Data received too late for inclusion in Grand Mean Statistics
C320, C538	- Apparent reporting or measurement problem
C514, C662	- Used illuminant D-65
C549	- Apparent reporting or measurement problem on mean X samples D07 and D08
C608	- Reported extreme X and Y values compared to other labs on samples D07 and D08
C664	- Reported extreme Y and Z values on all five samples

Notes on Samples

Several labs reported that the sample identification mark on sample W17 showed through in the test area. Care will be taken to insure that this does not happen in the future.

ANALYSIS C70-1 TABLE 1
COLOR & COLOR DIFFERENCE

INSTRUMENT IDENTIFICATION

INST CODE	INSTRUMENT	COLOR SPACE	DATA CODE
C70AC	ACS SPECTRA SENSOR	X Y Z	9014
C70BL	B+L 505 SPECTROPHOTOMETER	X Y Z	9014
C70CA	CARY 14	X Y Z	9014
C70CD	COLOR EYE SMALL SPHERE	X Y Z	9014
C70CE	COLOR EYE SMALL SPHERE	XX'YZ,4V	9016
C70CF	COLOR EYE SMALL SPHERE	XYZ,BaS04	9017
C70CG	COLOR EYE SMALL SPHERE	XX'YZ,Ba	9018
C70CH	COLOR EYE SMALL SPHERE	XYZ,3V	9011
C70CL	COLOR EYE LARGE SPHERE	XX'YZ,4V	9016
C70CM	COLOR EYE LARGE SPHERE	XX'YZ,Ba	9018
C70CN	COLOR EYE LARGE SPHERE	XYZ,BaS04	9017
C70DC	DIANO CHROMASCAN SPECTROPHOTOMETER	X Y Z	9014
C70DH	DIANO MATCH SCAN SPECTROPHOTOMETER	X Y Z	9014
C70DK	DIANO/LSCE AUTOMATE	XYZ,BaS04	9017
C70DL	DIANO/LSCE AUTOMATE	XYZ,3V,4F	9019
C70DM	DIANO/LSCE AUTOMATE	XX'YZ,4V	9016
C70DS	DIANO/SSCE AUTOMATE	XX'YZ,Ba	9018
C70DT	DIANO/SSCE AUTOMATE	XYZ,BaS04	9017
C70GA	GARDNER AUTO AC2/AC3	L a b	9013
C70GB	GARDNER AUTO AC2/AC3	X Y Z	9014
C70GC	GARDNER XL-20/XL-30 SERIES	X Y Z	9014
C70GD	GARDNER XL-20/XL-30 SERIES	L a b	9013
C70GE	GE/DIANO/HARDY SPECTROPHOTOMETER	X Y Z	9014
C70GK	GARDNER XL-70	X Y Z	9014
C70GL	GARDNER XL-70	L a b	9013
C70GM	GARDNER MULTIPURPOSE REFLECTOMETER	X Y Z	9014
C70GP	GARDNER XL-200 SERIES	L a b	9013
C70GX	GARDNER XL-10	L a b	9013
C70GY	GARDNER XL-10	X Y Z	9014
C70HA	HUNTER D25A (DA,D1A,D2A)	L a b	9013
C70HB	HUNTER D25A (DA,D1A,D2A)	X Y Z	9014
C70HF	HUNTER D25AA	L a b	9013
C70HG	HUNTER D25AA	X Y Z	9014
C70HM	HUNTER D25M (DM,D1M,D2M)	L a b	9013
C70HN	HUNTER D25M (DM,D1M,D2M)	X Y Z	9014
C70HP	HUNTER D25P (DP,D1P,D2P)	X Y Z	9014
C70HQ	HUNTER D25P (DP,D1P,D2P)	L a b	9013
C70HR	HUNTER D25A (DA,D1A,D2A)	Rd a b	9012
C70HI	HUNTER D54 SPECTROPHOTOMETER	X Y Z	9014
C70HU	HUNTER D54 SPECTROPHOTOMETER	L a b	9013
C70IB	IBM SPECTROPHOTOMETER	X Y Z	9014
C70KC	KCS-18	XX'YZ,4V	9016
C70KD	KCS-18	XX'YZ,Ba	9018
C70KS	KCS-18	X Y Z	9014
C70KT	KCS-40	X Y Z	9014
C70LS	LERES TRILAC	X Y Z	9014
C70LT	LERES TRILAC	XYZ,3V	9011
C70MD	MACBETH MS2000 SPECTROPHOTOMETER	X Y Z	9014
C70ME	MACBETH MS2000 SPECTROPHOTOMETER	L a b	9013
C70MG	MACBETH MC1010	L a b	9013
C70MB	MACBETH MC1010	X Y Z	9014
C70MS	MARTIN SWEETS	X Y Z	9014
C70MT	MARTIN SWEETS	XX'YZ,Ba	9018
C70ND	NEOTEC 220 DU COLOR	R G B	9015
C70NE	NEOTEC 220 DU COLOR	X Y Z	9014
C70SA	SPECIAL INSTRUMENT - INCLUDED	X Y Z	9014
C70SB	SPECIAL INSTRUMENT - INCLUDED	Rd a b	9012
C70SC	SPECIAL INSTRUMENT - INCLUDED	L a b	9013
C70SL	SPECIAL INSTRUMENT - INCLUDED	R G B	9015
C70SP	SPECIAL INSTRUMENT - EXCLUDED	X Y Z	9014
C70SQ	SPECIAL INSTRUMENT - EXCLUDED	Rd a b	9012
C70SR	SPECIAL INSTRUMENT - EXCLUDED	L a b	9013
C70SS	SPECIAL INSTRUMENT - EXCLUDED	R G B	9015
C70ZD	ZEISS DMC25	X Y Z	9014
C70ZE	ZEISS ELREPHO	X Y Z	9014
C70ZF	ZEISS ELREPHO	R G B	9015
C70XX	GIVE INSTRUMENT MAKE+MODEL.	NOT SPECIFIED	9020

FORMAT OF COLORIMETRIC (INPUT) DATA

DATA CODE	COLOR SCALE
9011	X,Y,Z 3 FUNCTION VITROLITE CORRECTION
9012	Rd,a,b
9013	L,a,b HUNTER
9014	X,Y,Z
9015	R,G,B
9016	X,X',Y,Z 4 FUNCTION VITROLITE CORRECTION
9017	X,Y,Z, BaSO4 CORRECTION
9018	X,X',Y,Z BaSO4 CORRECTION
9019	X,Y,Z 4 FUNCTION VITROLITE CORRECTION
9020	(NON-STD. INST. SCALE SPECIFIED WITH DATA)

LAB		SAMPLE D05			SAMPLE D06			DIFFERENCE D06 - D05				INST	
CODE	F	MEAN X	MEAN Y	MEAN Z	MEAN X	MEAN Y	MEAN Z	ΔX	ΔY	ΔZ	ΔE	CODE	LAB
C157	D	41.93	42.28	76.90	41.53	41.64	76.42	-.40	-.64	-.48	1.58	70GE	C157
C244	X	41.84	42.65	76.65	41.98	42.80	76.88	.14 *	.15 X	.23 X	.26X	70ZE	C244
C250	X	42.26	42.65	76.76	42.41	42.75	77.00	.16 *	.10 X	.24 X	.44X	70ZF	C250
C251	X	41.72	42.50	76.29	41.82	42.70	76.40	.10 *	.20 X	.11 *	.60X	70ZE	C251
C253	X	42.38	43.03	77.83	42.53	43.17	76.99	.14 *	.14 X	-.84 *	2.11X	70GC	C253
C278	X	42.40	43.55	75.75	42.45	43.65	75.75	.05	.10 X	.00 *	.28X	70NE	C278
C396	X	43.75*	40.95X	75.55	43.55*	40.45X	75.10	-.20	-.50	-.45	2.35X	70GY	C396
C407	D	42.62	43.46	77.49	42.66	43.25	77.40	.04	-.21	-.09	1.68	70BL	C407
C414	X	41.82	42.84	75.15	41.54	42.34	74.82	-.28	-.50	-.32	1.35X	70MD	C414
C416A	D	42.76	43.83	77.90	42.50	43.30	77.40	-.26	-.53	-.51	1.72	70GE	C416A
C416B	D	44.12*	45.42X	78.42	43.97X	45.01X	78.20	-.14	-.41	-.22	1.57	70SA	C416B
C418	X	41.53	41.47*	75.81	41.49	41.05*	75.55	-.03	-.41	-.26	2.65X	70CE	C418
C422	D	41.07	41.97	74.80	41.17	41.79	74.90	.10 *	-.17 *	.10 *	1.75	70SA	C422
C424	D	42.45	43.24	76.93	42.43	42.98	76.85	-.01	-.26	-.08	1.54*	70CA	C424
C428	X	41.66	42.56	77.31	41.61	42.20	77.13	-.05	-.37	-.18	2.04X	70HB	C428
C437	D	42.44	42.66	79.98*	42.40	42.36	79.71*	-.04	-.30	-.26	1.78	70CE	C437
C444	D	42.44	43.19	77.48	42.24	42.73	77.11	-.20	-.47	-.37	1.73	70GE	C444
C451	D	42.18	43.13	76.37	42.23	42.94	76.21	.05	-.20	-.15	1.72	70AC	C451
C453	D	42.64	44.04	77.15	42.63	43.74*	77.02	-.01	-.30	-.13	1.87	70HT	C453
C459	D	41.75	42.64	75.82	41.52	42.14	75.41	-.24	-.50	-.42	1.70	70GE	C459
C460	D	41.97	42.65	76.73	41.73	42.33	76.44	-.24	-.52	-.30	1.65	70GE	C460
C462A	X	41.35	42.45	77.15	41.15	42.05	76.75	-.20	-.40	-.40	1.32X	70HB	C462A
C463	D	42.53	43.22	77.45	42.39	42.84	77.15	-.14	-.38	-.30	1.51*	70ZD	C463
C469	X	42.83	43.34	77.18	42.04	42.78	76.73	-.79 X	-.56	-.45	3.06X	70GE	C469
C470	D	42.33	42.94	77.11	42.02	42.36	76.49	-.31	-.57	-.62	1.81	70DH	C470
C472	D	42.61	43.28	77.17	42.40	42.81	76.73	-.21	-.47	-.44	1.74	70ZD	C472
C473	D	42.26	42.84	76.57	42.03	42.37	76.14	-.23	-.47	-.43	1.63	70DH	C473
C474	D	41.63	42.46	76.19	41.42	41.99	75.79	-.21	-.47	-.40	1.73	70GE	C474
C476	D	42.11	42.87	77.02	41.95	42.45	76.69	-.16	-.43	-.33	1.71	70SA	C476
C479B	D	42.98	43.77	78.41	42.94	43.48	78.14	-.04	-.29	-.27	1.72	70SA	C479B
C480	D	42.25	43.15	77.76	42.06	42.70	77.39	-.19	-.45	-.38	1.67	70HB	C480
C481	D	41.65	42.55	77.10	41.55	42.15	76.90	-.10	-.40	-.20	1.86	70HG	C481
C483	D	41.38	42.15	75.70	41.04	41.60	75.11	-.33	-.55	-.59	1.52*	70ZF	C483
C495	D	42.59	43.48	76.80	42.36	43.00	76.44	-.22	-.48	-.42	1.65	70KS	C495
C496A	D	42.60	43.42	77.54	42.35	42.90	77.09	-.26	-.51	-.45	1.68	70GE	C496A
C499C	D	43.86*	45.32X	79.64*	43.44*	44.62X	79.03*	-.41	-.69	-.61	1.73	70BL	C499C
C503	D	42.44	43.38	77.56	42.25	42.92	77.22	-.19	-.45	-.34	1.66	70GE	C503
C508	D	42.13	43.20	76.72	41.99	42.78	76.47	-.14	-.42	-.25	1.72	70GE	C508
C511	D	42.12	42.96	76.58	42.04	42.60	76.26	-.09	-.35	-.31	1.85	70DH	C511
C521A	D	42.70	43.69	77.91	42.41	43.12	77.44	-.29	-.58	-.47	1.79	70CA	C521A
C521B	D	41.12	41.71*	76.11	40.67	41.01*	75.49	-.45	-.70	-.62	1.70	70SA	C521B
C522	D	41.42	42.38	75.51	41.16	41.83	74.97	-.26	-.55	-.54	1.90*	70SA	C522
C524	D	42.97	43.93	78.08	42.89	43.56	77.86	-.09	-.37	-.23	1.77	70GE	C524
C526	D	42.72	43.51	77.13	42.55	43.07	76.63	-.17	-.43	-.31	1.67	70KS	C526
C532	D	42.24	43.18	77.13	42.02	42.69	76.77	-.22	-.49	-.36	1.71	70GE	C532
C534	D	41.86	42.79	75.21	41.62	42.29	74.83	-.24	-.49	-.38	1.59	70MD	C534
C540	D	43.03	43.93	77.74	42.72	43.34	77.22	-.31	-.59	-.51	1.76	70GE	C540
C543	D	41.67	42.66	77.58	41.45	42.18	77.16	-.22	-.48	-.42	1.70	70HB	C543
C545	D	40.62*	41.54*	74.41	40.37*	41.03*	73.98	-.25	-.50	-.43	1.67	70SA	C545
C549	#	42.36	43.03	76.96	42.38	42.80	76.81	.02	-.23	-.16	1.74	70DH	C549
C552	D	41.14	42.04	76.67	41.18	41.82	76.59	.04	-.22	-.09	1.76	70HN	C552
C608	X	40.87	39.50X	71.48X	42.66	41.48	75.57	1.79 X	1.97 X	4.09 X	4.76X	70GC	C608
C612	D	41.79	42.66	76.42	41.64	42.23	76.10	-.16	-.43	-.32	1.77	70GE	C612
C627	#	42.40	43.35	76.50	41.97	42.68	75.91	-.43	-.68	-.59	1.64	70SA	C627
C630	D	42.49	43.30	77.35	42.29	42.84	76.97	-.19	-.47	-.38	1.74	70KS	C630
C631A	D	42.38	43.15	76.53	42.10	42.62	76.05	-.28	-.53	-.48	1.62	70AC	C631A
C631B	D	42.59	43.48	76.80	42.25	42.87	76.24	-.34	-.61	-.56	1.74	70AC	C631B
C632	D	42.17	43.00	76.23	41.78	42.36	75.53	-.39	-.64	-.70	1.74	70AC	C632
C634	X	40.45*	40.70X	73.68*	40.26*	40.23X	73.38*	-.19	-.47	-.49	2.03X	70CE	C634
C638	D	41.05	42.10	75.25	40.80	41.60	74.80	-.25	-.50	-.45	1.64	70GC	C638
C639	D	41.85	42.32	75.98	41.52	41.73	75.41	-.33	-.59	-.57	1.77	70DH	C639
C644	D	42.09	43.19	75.32	41.68	42.51	74.69	-.41	-.68	-.63	1.75	70MD	C644
C645	D	42.36	43.21	76.54	41.98	42.56	75.96	-.37	-.65	-.58	1.77	70AC	C645
C656	D	42.20	43.19	76.42	41.94	42.67	75.97	-.26	-.52	-.44	1.67	70SA	C656
C657	D	40.70	43.23	70.17X	40.41*	42.67	69.72X	-.30	-.57	-.44	1.65	70SA	C657

X, Y, Z SPACE ANALYSIS, NORMAL DATA

COLOR * COLOR DIFFERENCE

LAB CODE	F	SAMPLE D05 MEAN X	MEAN Y	MEAN Z	SAMPLE D06 MEAN X	MEAN Y	MEAN Z	DIFFERENCE D06 - D05 ΔX	ΔY	ΔZ	ΔE	INST CODE	LAB
C660	♂	41.01	43.56	70.64X	40.73	43.00	70.23X	-.27	-.56	-.41	1.72	70AC	C660
C662	♂	40.38*	42.53	70.15X	40.19*	42.08	69.91X	-.18	-.45	-.24	1.59	70SP	C662
C664	#	39.60X	38.01X	21.35X	39.40X	37.62X	21.19X	-.21	-.39	-.16	1.86	70HT	C664
C671A	♂	41.54	42.45	75.26	41.64	42.30	75.20	.10 *	-.15 *	-.06	1.83	70DH	C671A
C671B	♂	41.37	41.95	75.02	41.29	41.63	74.62	-.08	-.32	-.40	1.81	70DH	C671B
C671C	♂	40.98	41.98	75.16	40.92	41.66	74.99	-.07	-.32	-.18	1.64	70GC	C671C
C671D	♂	42.19	43.17	78.10	41.90	42.61	77.57	-.28	-.55	-.52	1.75	70HB	C671D
C672	♂	41.90	42.85	76.00	41.70	42.40	75.60	-.20	-.45	-.40	1.64	70GC	C672
C675	♂	42.43	43.29	76.69	42.29	42.90	76.35	-.14	-.40	-.34	1.69	70AC	C675
C683	♂	39.62X	40.57X	74.19*	39.52X	40.22X	73.84*	-.10	-.35	-.35	1.81	70GC	C683
C691	♂	41.62	42.85	74.73	41.48	42.48	74.38	-.14	-.38	-.36	1.62	70SA	C691
C699	♂	41.91	42.95	75.30	41.99	42.79	75.28	.09 *	-.16 *	-.02 *	1.71	70BL	C699
C700	♂	41.77	42.57	75.71	41.72	42.26	75.49	-.05	-.31	-.23	1.71	70DH	C700
GRAND MEANS		42.07	42.94	76.08	41.84	42.49	76.31	-.19	-.45	-.37	1.71		
SD OF MEANS		.71	.58	1.18	.67	.58	1.18	.13	.13	.17	.08		
INCLUDED LABS FOR THIS MEAN		61	59	59	60	59	59	62	62	62	62		

X, Y, Z SPACE ANALYSIS, NORMAL DATA

COLOR * COLOR DIFFERENCE

LAB CODE	F	SAMPLE D07 MEAN X	MEAN Y	MEAN Z	SAMPLE D08 MEAN X	MEAN Y	MEAN Z	DIFFERENCE D08 - D07 ΔX	ΔY	ΔZ	ΔE	INST CODE	LAB
C157	6	7.57*	11.40	12.00	7.50*	11.47	11.44	-.07	.07	-.56	2.52	70GE	C157
C244	6	8.31	11.95	11.96	8.13	11.90	11.16	-.19	-.05	-.80 *	3.02	70ZE	C244
C250	6	8.45	12.00	13.11	8.23	11.95	12.28	-.22 *	-.05	-.83 *	3.00	70ZF	C250
C251	6	8.34	11.80	12.40	8.22	11.80	11.69	-.12	.00	-.71	2.76	70ZE	C251
C253	X	8.30	11.84	11.90	8.15	11.92	11.15	-.15	.09	-.75	3.53X	70GC	C253
C278	6	8.80	12.00	13.75X	8.65	12.00	13.10X	-.15	.00	-.65	2.42	70NE	C278
C396	6	8.95*	11.10*	11.85	8.90*	11.15*	11.20	-.05	.05	-.65	2.90	70GY	C396
C407	6	8.86	12.36	13.00	8.79*	12.41	12.40	-.07	.05	-.60	2.47	70BL	C407
C414	6	8.07	11.64	11.97	7.93	11.64	11.29	-.14	.00	-.68	2.71	70MD	C414
C416A	6	8.26	11.99	12.25	8.10	11.95	11.50	-.16	-.03	-.75	2.83	70GE	C416A
C416B	6	8.36	12.07	11.79	8.23	12.06	11.10	-.13	-.01	-.69	2.75	70SA	C416B
C418	6	8.31	11.90	12.46	8.17	11.88	11.76	-.14	-.02	-.70	2.62	70CE	C418
C422	6	8.02	11.47	11.46	7.96	11.52	10.83	-.06	.05	-.63	2.83	70SA	C422
C424	6	8.57	12.21	12.97	8.51	12.29	12.27	-.06	.08	-.70	2.99	70CA	C424
C428	6	8.02	11.64	11.80	7.92	11.65	11.09	-.11	.01	-.71	2.89	70HB	C428
C437	6	8.57	12.08	14.03X	8.45	12.08	13.29X	-.13	.00	-.73	2.59	70CE	C437
C444	6	8.27	11.86	12.54	8.17	11.89	11.88	-.10	.02	-.66	2.64	70GE	C444
C451	6	8.29	11.84	12.30	8.25	11.91	11.73	-.04	.07	-.58	2.57	70AC	C451
C453	6	8.66	12.36	12.31	8.83*	12.64*	12.02	.17 X	.28 X	-.29 X	2.77	70HT	C453
C459	6	8.12	11.66	12.18	8.01	11.66	11.49	-.11	-.00	-.69	2.70	70GE	C459
C460	6	8.01	11.59	12.31	7.92	11.61	11.66	-.09	.02	-.66	2.66	70GE	C460
C462A	6	8.00	11.60	11.60	7.90	11.60	10.90	-.10	.00	-.70	2.88	70HB	C462A
C463	6	8.26	11.87	12.53	8.24	11.98	11.94	-.02	.11	-.59	2.79	70ZD	C463
C469	6	8.56	12.14	12.89	8.47	12.16	12.26	-.08	.02	-.63	2.48	70GE	C469
C470	6	8.14	11.67	12.53	8.09	11.75	11.93	-.04	.08	-.59	2.65	70DH	C470
C472	6	8.18	11.81	12.71	8.11	11.86	12.07	-.07	.04	-.64	2.64	70ZD	C472
C473	6	8.14	11.65	12.51	8.11	11.73	11.94	-.03	.09	-.57	2.58	70DH	C473
C474	6	8.01	11.56	12.03	7.80	11.47	11.24	-.21 *	-.09 *	-.79	2.79	70GE	C474
C476	6	7.99	11.58	12.56	7.80	11.52	11.80	-.19 *	-.06	-.76	2.70	70SA	C476
C479B	6	8.54	12.18	12.88	8.44	12.19	12.18	-.10	.01	-.71	2.74	70SA	C479B
C480	6	8.21	11.87	11.94	8.19	11.96	11.33	-.02	.09	-.61	2.88	70HB	C480
C481	6	7.95	11.45	11.60	7.90	11.50	10.90	-.05	.05	-.70	3.18*	70HG	C481
C483	6	8.45	11.85	12.40	8.33	11.90	11.69	-.12	.05	-.71	2.97	70ZF	C483
C495	6	8.40	12.01	12.88	8.30	12.03	12.20	-.10	.02	-.68	2.66	70KS	C495
C496A	6	8.29	11.91	12.44	8.17	11.91	11.75	-.12	.00	-.69	2.69	70GE	C496A
C499C	6	8.95*	12.93X	12.55	8.64	12.72*	11.69	-.32 X	-.21 X	-.87 X	2.84	70BL	C499C
C503	6	8.19	11.80	12.48	8.06	11.77	11.75	-.13	-.03	-.73	2.71	70GE	C503
C508	6	8.29	11.96	12.12	8.20	11.98	11.50	-.09	.02	-.62	2.54	70GE	C508
C511	6	8.23	11.82	12.41	8.11	11.81	11.72	-.13	-.01	-.70	2.66	70DH	C511
C521A	6	8.38	12.08	12.30	8.30	12.13	11.67	-.08	.05	-.63	2.67	70CA	C521A
C521B	6	7.49*	10.95*	11.63	7.54*	11.20	11.25	.05 X	.25 X	-.38 X	2.71	70SA	C521B
C522	6	8.38	11.84	12.80	8.28	11.86	12.00	-.10	.02	-.81 *	3.18*	70SA	C522
C524	6	8.74	12.38	13.03	8.65	12.43	12.41	-.09	.05	-.62	2.53	70GE	C524
C526	6	8.42	11.98	12.95	8.30	12.00	12.25	-.12	.02	-.70	2.70	70KS	C526
C532	6	8.03	11.66	12.15	7.93	11.70	11.45	-.11	.04	-.70	2.92	70GE	C532
C534	6	8.13	11.56	12.17	7.98	11.54	11.48	-.14	-.02	-.69	2.63	70MD	C534
C540	6	8.98*	12.61*	13.13	8.94*	12.70*	12.54*	-.04	.08	-.59	2.55	70GE	C540
C543	6	8.10	11.75	11.87	7.96	11.73	11.12	-.14	-.02	-.75	2.89	70HB	C543
C545	6	7.76	11.24	11.68	7.60	11.18	10.97	-.16	-.06	-.71	2.67	70SA	C545
C549	#	84.05X	11.96	12.67	82.65X	11.94	11.96	-1.40 X	-.02	-.71	2.28*	70DH	C549
C552	6	7.90	11.42	11.41	7.76	11.40	10.68	-.14	-.03	-.73	2.90	70HN	C552
C608	X	12.35X	8.63X	12.22	12.31X	8.48X	11.44	-.04	-.15 X	-.78	6.05X	70GC	C608
C612	6	7.77	11.33	11.77	7.64	11.32	11.08	-.13	-.01	-.69	2.75	70GE	C612
C627	#	8.40	12.05	12.56	8.22	11.99	11.77	-.18	-.06	-.78	2.81	70SA	C627
C630	6	8.38	12.00	12.57	8.28	12.02	11.93	-.10	.03	-.64	2.56	70KS	C630
C631A	6	8.35	11.85	12.51	8.23	11.85	11.85	-.12	-.00	-.66	2.54	70AC	C631A
C631B	6	8.48	12.04	12.57	8.39	12.07	11.92	-.10	.03	-.65	2.62	70AC	C631B
C632	6	8.32	11.83	12.42	8.23	11.86	11.77	-.09	.03	-.65	2.65	70AC	C632
C634	6	8.28	11.84	12.27	8.17	11.88	11.56	-.11	.04	-.70	2.92	70CE	C634
C638	6	7.90	11.50	11.50	7.80	11.60	10.90	-.10	.10	-.60	3.00	70GC	C638
C639	6	8.15	11.60	12.69	8.05	11.62	12.04	-.10	.02	-.65	2.55	70DH	C639
C644	6	8.12	11.76	11.79	8.00	11.76	11.11	-.11	.00	-.68	2.74	70MD	C644
C645	6	8.43	11.96	12.52	8.23	11.89	11.74	-.20 *	-.07	-.78	2.80	70AC	C645
C656	6	8.26	11.88	12.21	8.13	11.87	11.49	-.13	-.01	-.72	2.77	70SA	C656
C657	6	8.14	12.02	11.64	8.03	12.04	11.00	-.11	.02	-.64	2.70	70SA	C657

X, Y, Z SPACE ANALYSIS, NORMAL DATA

COLOR • COLOR DIFFERENCE

LAB CODE	F	SAMPLE D07 MEAN X	MEAN Y	MEAN Z	SAMPLE D08 MEAN X	MEAN Y	MEAN Z	DIFFERENCE D08 - D07 ΔX	ΔY	ΔZ	ΔE	INST CODE	LAB
C660	6	8.28	12.21	11.86	8.21	12.26	11.28	-.07	.04	-.58	2.51	70AC	C660
C662	6	7.98	11.79	11.51	7.89	11.83	10.91	-.09	.05	-.60	2.64	70SP	C662
C664	#	7.90	9.98X	3.91X	7.87	9.99X	3.73X	-.03	.01	-.18 X	1.32X	70HT	C664
C671A	6	8.16	11.72	12.12	8.09	11.77	11.50	-.07	.05	-.62	2.66	70DH	C671A
C671B	6	8.07	11.49	12.52	7.99	11.54	11.90	-.08	.05	-.62	2.59	70DH	C671B
C671C	6	7.90	11.34	11.48	7.85	11.44	10.86	-.05	.10	-.62	2.95	70GC	C671C
C671D	6	8.22	11.86	11.85	8.09	11.88	11.12	-.13	.01	-.73	3.00	70HB	C671D
C672	6	8.75	12.20	12.40	8.50	12.10	11.50	-.25 X	-.10 *	-.90 X	3.21*	70GC	C672
C675	6	8.37	11.91	12.39	8.25	11.90	11.70	-.13	-.00	-.69	2.66	70AC	C675
C683	6	7.62*	11.05*	11.17*	7.54	11.09*	10.59*	-.08	.04	-.58	2.58	70GC	C683
C691	6	8.56	11.88	12.61	8.47	11.87	12.01	-.09	-.00	-.60	2.30*	70SA	C691
C699	6	8.80	12.48*	12.87	8.68	12.48	12.17	-.13	.00	-.70	2.64	70BL	C699
C700	6	8.18	11.71	12.24	8.11	11.79	11.64	-.06	.08	-.60	2.68	70DH	C700
GRAND MEANS		8.27	11.81	12.26	8.16	11.85	11.59	-.10	.02	-.67	2.73		
SD OF MEANS		.31	.32	.47	.31	.34	.46	.04	.05	.06	.18		
INCLUDED LABS FOR THIS MEAN		73	72	71	73	73	71	69	70	69	73		

LAB CODE	F	SAMPLE D05 MEAN L	MEAN A	MEAN B	SAMPLE D06 MEAN L	MEAN A	MEAN B	DIFFERENCE D06 - D05 ΔL	ΔA	ΔB	ΔE	INST CODE	LAB
C105	0	65.10	-.00	-24.30	64.80	.70	-24.55	-.30	.70	-.25	.80	70HM	C105
C121	0	64.70	-.10	-25.10	64.30	.55	-25.50*	-.40	.65	-.40	.86	70HM	C121
C122	0	65.20	-.40	-24.40	64.70	.40	-24.75	-.50	.80	-.35	1.01	70SC	C122
C148	0	65.55	-.25	-24.20	65.20	.40	-24.50	-.35	.65	-.30	.80	70SC	C148
C150	0	65.79	-.80	-24.20	65.17	.03	-24.67	-.63	.84	-.48 *	1.15	70HA	C150
C152	0	65.90	-.20	-23.90	65.10	.60	-24.60	-.80 *	.80	-.70 X	1.33	70HA	C152
C166	0	65.40	-.40	-24.30	65.05	.30	-24.50	-.35	.70	-.20	.81	70HA	C166
C183	0	65.35	.10	-23.80	65.05	.80	-24.00	-.30	.70	-.20	.79	70HA	C183
C213	0	64.30*	-.20	-24.20	64.10*	-.00	-24.40	-.20	.20	-.20	.35	70SC	C213
C223	0	65.97	-.42	-23.61	65.72	.15	-23.80	-.26	.57	-.19	.66	70SC	C223
C230	0	65.37	.09	-24.27	64.87	.80	-24.69	-.50	.71	-.42	.96	70HA	C230
C241	#	65.05	-7.25X	-24.30	64.85	-6.55X	-24.50	-.20	.70	-.20	.75	70HA	C241
C256A	#	64.70	.68	-24.52	64.63	.70	-24.56	-.07	.03 *	-.04	.08*	70HM	C256A
C256H	#	65.15	.63	-23.04	65.21	.65	-23.04*	.06 *	.02 *	-.00 *	.07*	70HU	C256H
C259	0	65.15	-.70	-24.65	65.10	-.70*	-24.65	-.05	.00 *	.00 *	.05*	70SC	C259
C262	0	65.33	.53	-23.86	65.36	.49	-23.89	.03 *	-.05 *	-.04 *	.07*	70SB	C262
C285	0	64.90	.70	-24.70	64.85	.90	-24.90	-.05	.20	-.20	.29	70HA	C285
C288	0	65.20	.70	-24.80	65.30	.70	-24.70	.10 *	-.00 *	.10 X	.14*	70HA	C288
C291	0	65.20	.60	-24.35	65.05	.60	-24.40	-.15	.00 *	-.05	.16	70HA	C291
C301	0	64.65	.50	-25.00	64.60	.50	-25.00	-.05	-.00 *	-.00 *	.05*	70HM	C301
C317	0	64.60	.90	-24.30	64.60	.90	-24.30	.00	.00 *	.00 *	.00*	70HM	C317
C320	#	65.60	.54	23.54X	65.65	.52	23.56X	.05 *	-.02 *	.02 *	.06*	70HA	C320
C325	0	65.61	.87	-23.13	65.35	1.60*	-23.35	-.27	.73	-.22	.80	70SB	C325
C340	0	65.69	-.44	-23.04*	65.41	.15	-23.38	-.29	.59	-.34	.74	70SC	C340
C352	0	65.65	-.20	-24.35	65.35	.40	-24.60	-.30	.60	-.25	.72	70HA	C352
C356	0	65.00	-.30	-24.40	64.70	.40	-24.70	-.30	.70	-.30	.82	70HM	C356
C380	0	65.50	-.70	-24.35	65.15	-.00	-24.60	-.35	.70	-.25	.82	70HA	C380
C382	0	65.45	.70	-23.80	65.05	1.35	-24.10	-.40	.65	-.30	.82	70HA	C382
C402	0	65.36	-.20	-24.15	65.06	.52	-24.42	-.30	.72	-.28	.82	70HA	C402
C427	0	65.50	-.00	-24.10	65.25	.75	-24.40	-.25	.75	-.30	.85	70HA	C427
C440	0	65.76	-.03	-24.15	65.42	.69	-24.47	-.34	.71	-.31	.85	70HA	C440
C442	0	65.10	-.20	-24.20	64.60	.50	-24.60	-.50	.70	-.40	.95	70HM	C442
C454	0	66.03	1.04	-23.85	65.83*	1.79*	-24.10	-.20	.75	-.25	.81	70SC	C454
C456	0	65.47	-.34	-25.03	65.25	.36	-25.26	-.21	.70	-.23	.77	70HA	C456
C458	0	65.03	-.37	-24.34	64.68	.26	-24.62	-.35	.63	-.29	.78	70HM	C458
C475	0	65.58	-.19	-24.04	65.17	.32	-24.33	-.41	.51	-.29	.72	70HA	C475
C477	0	65.91	-.16	-22.70*	65.55	.57	-23.05*	-.36	.73	-.29	.86	70HA	C477
C494	0	65.95	-.20	-23.80	65.50	.70	-24.20	-.45	.90	-.40	1.08	70HA	C494
C496H	0	65.26	-.05	-24.60	64.85	.67	-24.88	-.41	.72	-.28	.87	70GP	C496H
C499A	0	65.20	-.50	-24.25	64.85	.20	-24.60	-.35	.70	-.35	.86	70HA	C499A
C506	0	65.10	-.50	-24.60	64.75	.20	-24.80	-.35	.70	-.20	.81	70HA	C506
C514A	•	65.18	-.68	-23.07	64.86	.05	-23.34	-.32	.73	-.27	.84	70SR	C514A
C517	0	65.50	.80	-24.20	65.00	1.60*	-24.50	-.50	.80	-.30	.99	70HQ	C517
C538	#	66.25*	4.05X	-23.60	65.90*	4.60X	-23.80	-.35	.55	-.20	.68	70GX	C538
C541	0	65.20	-.10	-24.20	64.75	.65	-24.55	-.45	.75	-.35	.94	70GP	C541
C547	0	63.83X	.61	-24.90	63.47X	1.29	-25.15	-.36	.68	-.25	.81	70HQ	C547
C548	0	65.15	-1.60*	-22.95*	64.88	-.82*	-23.22*	-.27	.78	-.27	.86	70SB	C548
C574	0	65.80	.45	-24.05	65.60	1.20	-24.25	-.20	.75	-.20	.80	70HQ	C574
C576	0	64.88	-.76	-24.22	64.51	-.06	-24.56	-.37	.71	-.34	.87	70SB	C576
C585	0	65.41	-.37	-24.61	65.03	.37	-24.96	-.38	.74	-.35	.90	70SC	C585
C600	0	65.55	-1.40*	-22.95*	65.10	-.70*	-23.20*	-.45	.70	-.25	.87	70GD	C600
C619	0	65.00	.20	-23.90	64.40	1.00	-24.20	-.60	.80	-.30	1.04	70SC	C619
C620	0	63.91X	-.47	-22.03X	63.40X	.31	-22.33X	-.51	.78	-.31	.99	70NG	C620
C633	#	65.39	.05	-23.88	64.62	.79	-24.45	-.77 *	.75	-.57 *	1.22	70HA	C633
C648	0	66.30*	.47	-23.19	65.82*	1.12	-23.57	-.48	.65	-.38	.89	70HA	C648
C674	0	65.55	.10	-24.00	65.25	.80	-24.30	-.30	.70	-.30	.82	70HF	C674
C677	0	67.01X	-.63	-24.40	66.81X	.02	-24.57	-.20	.65	-.17	.70	70SC	C677
GRAND MEANS		65.36	-.08	-24.13	65.04	.53	-24.39	-.32	.60	-.26	.75		
SD OF MEANS		.41	.56	.54	.38	.53	.53	.17	.26	.11	.30		
INCLUDED LABS FOR THIS MEAN		47	50	49	47	50	49	50	50	48	50		

L, a, b SPACE ANALYSIS, NORMAL DATA

COLOR - COLOR DIFFERENCE

LAB CODE	F	SAMPLE D07 MEAN L	MEAN A	MEAN B	SAMPLE D08 MEAN L	MEAN A	MEAN B	DIFFERENCE D08 - D07 ΔL	ΔA	ΔB	ΔE	INST CODE	LAB
C105	G	34.20	-17.20	3.40	34.20	-17.80	4.65	.00	-.60	1.25	1.39	70HM	C105
C121	G	33.70	-18.30	3.70	33.65	-19.00	5.00	-.05	-.70	1.30	1.48	70HM	C121
C122	G	34.00	-17.40	3.25	33.90	-18.05	4.50	-.10	-.65	1.25	1.41	70SC	C122
C148	G	34.40	-18.05	3.85	34.35	-18.70	5.10	-.05	-.65	1.25	1.41	70SC	C148
C150	X	34.56	-17.99	3.58	35.57X	-19.98X	4.72	1.01 X	-1.99 X	1.14	2.50X	70HA	C150
C152	G	34.60	-17.40	3.60	34.60	-17.90	4.80	.00	-.50 *	1.20	1.30	70HA	C152
C166	G	34.10	-17.35	3.15	34.10	-18.00	4.40	.00	-.65	1.25	1.41	70HA	C166
C183	G	34.15	-18.20	3.70	34.25	-18.85	4.85	.10	-.65	1.15	1.32	70HA	C183
C213	G	33.40*	-18.45*	3.20	33.40*	-18.60	4.40	.00	-.15 X	1.20	1.21*	70SC	C213
C223	G	35.05*	-17.74	3.39	35.09*	-18.43	4.60	.04	-.68	1.20	1.39	70SC	C223
C230	G	34.35	-17.50	3.63	34.33	-18.15	4.83	-.01	-.65	1.20	1.36	70HA	C230
C241	#	34.10	-17.90	3.60	34.15	-18.25	4.80	.05	-.35 X	1.20	1.25	70HA	C241
C256A	#	33.83	-17.71	3.49	33.82	-18.28	4.71	-.02	-.57	1.22	1.34	70BM	C256A
C256B	#	34.34	-17.12	2.61	34.33	-17.76	3.78	-.01	-.64	1.17	1.33	70HU	C256B
C259	G	34.35	-17.15	3.20	34.35	-17.75	4.45	.00	-.60	1.25	1.39	70SC	C259
C262	G	34.65	-17.98	3.27	34.63	-18.73	4.51	-.02	-.75	1.25	1.46	70SH	C262
C285	G	34.20	-17.75	3.00	34.15	-18.45	4.30	-.05	-.70	1.30	1.48	70HA	C285
C288	G	34.40	-17.90	3.50	34.30	-18.60	4.80	-.10	-.70	1.30	1.48	70HA	C288
C291	G	34.45	-17.50	3.75	34.30	-18.20	5.00	-.15	-.70	1.25	1.44	70HA	C291
C301	G	34.00	-17.20	3.30	33.90	-17.90	4.60	-.10	-.70	1.30	1.48	70HM	C301
C317	G	33.90	-17.70	3.60	33.80	-18.40	4.85	-.10	-.70	1.25	1.44	70HM	C317
C320	#	34.94	17.00X	3.42	34.95	17.75X	4.62	.01	.75 X	1.20	1.42	70HA	C320
C325	G	34.57	-17.90	3.41	34.57	-18.64	4.56	.00	-.74	1.15	1.37	70SH	C325
C340	G	34.80	-17.28	2.79	34.75	-17.64	3.96	-.05	-.36 X	1.17	1.22*	70SC	C340
C352	G	34.45	-17.85	3.65	34.45	-18.55	4.90	.00	-.70	1.25	1.43	70HA	C352
C356	G	33.90	-17.40	3.30	33.90	-18.10	4.60	.00	-.70	1.30	1.48	70HM	C356
C380	G	34.30	-17.60	3.70	34.20	-18.20	4.95	-.10	-.60	1.25	1.39	70HA	C380
C382	G	34.30	-17.95	3.40	34.25	-18.65	4.70	-.05	-.70	1.30	1.48	70HA	C382
C402	G	34.30	-17.61	3.72	34.42	-18.25	4.95	.12	-.64	1.23	1.39	70HA	C402
C427	G	34.30	-17.50	3.75	34.30	-18.15	5.00	.00	-.65	1.25	1.41	70HA	C427
C440	G	34.50	-17.63	3.65	34.55	-18.26	4.86	.05	-.64	1.21	1.37	70HA	C440
C442	G	33.90	-17.30	2.80	34.00	-17.90	4.00	.10	-.60	1.20	1.35	70HM	C442
C454	G	34.90	-17.80	3.30	35.05	-18.46	4.55	.15	-.66	1.25	1.42	70SC	C454
C456	G	34.15	-17.74	3.46	34.33	-18.25	4.65	.19 *	-.50 *	1.19	1.31	70HA	C456
C458	G	34.01	-17.62	2.81	34.06	-18.16	4.05	.05	-.54	1.24	1.35	70HM	C458
C475	G	34.64	-17.50	2.39	34.53	-18.14	3.64	-.11	-.64	1.25	1.41	70HA	C475
C477	G	34.75	-17.99	2.92	34.73	-18.66	4.13	-.01	-.67	1.21	1.38	70HA	C477
C494	G	34.60	-18.10	2.50	34.65	-18.95	3.70	.05	-.85 *	1.20	1.47	70HA	C494
C496B	G	34.12	-16.74	3.07	34.06	-17.42	4.34	-.05	-.68	1.27	1.43	70GP	C496B
C499A	G	34.05	-17.75	3.40	34.00	-18.35	4.60	-.05	-.60	1.20	1.34	70HA	C499A
C506	G	34.05	-17.50	3.50	34.15	-18.10	4.70	.10	-.60	1.20	1.35	70HA	C506
C514A	*	34.24	-17.55	2.57	34.27	-18.16	3.74	.03	-.61	1.17	1.32	70SR	C514A
C517	G	34.20	-16.10X	2.25*	34.45	-16.60X	3.40*	.25 *	-.50 *	1.15	1.28	70HQ	C517
C538	#	35.45X	-14.30X	.35X	35.40*	-15.05X	1.70X	-.05	-.75	1.35 *	1.55	70GX	C538
C541	G	34.15	-17.00	3.00	34.20	-17.60	4.20	.05	-.60	1.20	1.34	70GP	C541
C547	G	32.33X	-18.53*	2.85	32.11X	-19.23*	4.12	-.22 *	-.70	1.27	1.46	70HQ	C547
C548	G	33.99	-18.12	3.69	33.91	-18.77	4.91	-.07	-.65	1.23	1.39	70SB	C548
C574	G	34.60	-17.25	2.20*	34.40	-18.10	3.50*	-.20	-.85 *	1.30	1.57*	70HQ	C574
C576	G	33.83	-17.27	3.41	33.78	-17.89	4.65	-.05	-.62	1.24	1.39	70SB	C576
C585	G	34.38	-17.54	3.41	34.38	-18.14	4.64	.00	-.61	1.23	1.37	70SC	C585
C600	G	34.90	-17.70	3.60	34.80	-18.40	4.80	-.10	-.70	1.20	1.39	70GD	C600
C619	G	34.10	-17.70	2.80	34.00	-18.40	3.90	-.10	-.70	1.10 *	1.31	70SC	C619
C620	G	32.96X	-17.25	2.85	32.80X	-17.93	4.02	-.16	-.69	1.17	1.37	70MG	C620
C633	#	34.15	-17.43	3.63	34.22	-18.02	4.83	.07	-.59	1.21	1.34	70HA	C633
C648	G	35.39X	-16.78	4.02	35.35*	-17.60	5.30	-.05	-.82 *	1.28	1.52	70HA	C648
C674	G	34.55	-17.45	3.50	34.40	-18.10	4.75	-.15	-.65	1.25	1.42	70HF	C674
C677	G	34.63	-16.40*	2.27*	34.44	-17.07*	3.54*	-.19	-.67	1.27	1.45	70SC	C677
GRAND MEANS		34.30	-17.59	3.26	34.31	-18.24	4.49	-.02	-.66	1.23	1.40		
SD OF MEANS		.34	.43	.44	.37	.43	.45	.10	.07	.05	.07		
INCLUDED LABS FOR THIS MEAN		46	48	49	47	48	49	49	47	49	49		

EXPLANATION OF DATA FOR WHITE SAMPLE

Specimens of a white sample were distributed to the participants along with the usual two pairs of colored specimens, and each participant was asked to return measurement data for the white specimen, reporting results in the same manner as for the colored specimens.

As a first step, three laboratories were selected to serve as "reference" laboratories for the purposes of this analysis and the average of their X, Y, Z values for the white sample were computed. Next, the ratios of the participants data to the combined reference laboratory values were calculated for each participant (transformed to X, Y, Z space if necessary). These ratios are shown in the White Sample Analysis tables.

Two observations can be made about the data in the White Sample Analysis tables. First, the participants as a whole tend to be high compared with the combined average values obtained by the selected reference laboratories. Second, a few participants had noticeably extreme values for one or more of the components and these participants especially should look to the cause.

Next, the ratios in the White Sample Analysis tables were used to "adjust" the data of the normal data tables to obtain the adjusted data table values. The adjustment consisted of dividing the X, Y, Z values of the normal data tables by the respective ratios in the White Sample Analysis tables.

The significant change in the adjusted data tables is in the SD OF MEANS. Comparison of these among-laboratory standard deviations with those in the normal data tables, shows considerable reduction for X, Y, Z. Thus part, at least, of the disagreement among participants is due to errors in standardization that could be corrected through use of an agreed-upon white standard. There is no similar significant change for ΔX, ΔY, and ΔZ.

WHITE SAMPLE ANALYSIS
X, Y, Z LABORATORIES

LAB CODE	RATIO--(LAB/COMBINED) X	Y	Z	INST CODE	PERCENT FROM COMBINED X	Y	Z
C157	1.0110	1.0055	1.0137	70GE	1.10	.95	1.37
C244	1.0056	1.0071	1.0141	70ZE	.96	.71	1.41
C250	1.0078	1.0022	1.0055	70ZF	.78	.22	.55
C251	1.0118	1.0077	1.0123	70ZE	1.18	.77	1.23
C253	1.0219	1.0185	1.0205	70GC	2.19	1.85	2.05
C278	1.0368	1.0363	1.0339	70NE	3.68	3.63	3.39
C396	1.0226	.9751	1.0002	70GY	2.26	-2.49	.02
C407	1.0166	1.0147	1.0225	70HL	1.66	1.47	2.25
C414	.9933	.9939	.9876	70MD	-.67	-.61	-1.24
C416A	1.0240	1.0228	1.0236	70GE	2.40	2.28	2.36
C416B	1.0577	1.0561	1.0292	70SA	5.77	5.61	2.92
C418	.9915	.9866	1.0071	70CE	-.85	-1.34	.71
C422	.9983	.9933	.9960	70SA	-.17	-.67	-.40
C424	1.0119	1.0114	1.0185	70CA	1.19	1.14	1.85
C428	1.0113	1.0070	1.0169	70HB	1.13	.70	1.69
C437	1.0174	1.0134	1.0727	70CE	1.74	1.34	7.27
C444	1.0148	1.0152	1.0211	70GE	1.48	1.52	2.11
C451	1.0136	1.0133	1.0061	70AC	1.36	1.33	.61
C453	1.0145	1.0136	1.0094	70HT	1.45	1.36	.94
C459	1.0003	1.0001	1.0010	70GE	.03	.01	.10
C460	1.0102	1.0105	1.0120	70GE	1.02	1.09	1.20
C462A	1.0113	1.0082	1.0233	70HB	1.13	.82	2.33
C463	1.0145	1.0109	1.0209	70ZD	1.45	1.09	2.09
C469	1.0179	1.0167	1.0289	70GE	1.79	1.67	2.89
C470	1.0139	1.0140	1.0222	70DH	1.39	1.40	2.22
C472	1.0035	1.0013	1.0094	70ZD	.35	.13	.94
C473	1.0095	1.0070	1.0095	70DH	.95	.70	.95
C474	1.0073	1.0081	1.0099	70GE	.73	.81	.99
C476	.9391	.9351	.9374	70SA	-6.09	-6.49	-6.26
C479B	1.0292	1.0291	1.0343	70SA	2.92	2.91	3.43
C480	1.0131	1.0104	1.0185	70HB	1.31	1.04	1.85
C481	1.0102	1.0071	1.0146	70HG	1.02	.71	1.46
C483	1.0022	.9989	1.0038	70ZF	.22	-.11	.38
C495	1.0163	1.0160	1.0156	70KS	1.63	1.60	1.56
C496A	1.0229	1.0224	1.0268	70GE	2.29	2.24	2.68
C499C	1.0311	1.0317	1.0371	70HL	3.11	3.17	3.71
C503	1.0171	1.0168	1.0224	70GE	1.71	1.68	2.24
C508	1.0128	1.0134	1.0152	70GE	1.28	1.34	1.52
C511	1.0081	1.0075	1.0101	70DH	.81	.75	1.01
C521A	1.0195	1.0202	1.0232	70CA	1.95	2.02	2.32
C521B	1.0063	1.0036	1.0138	70SA	.63	.36	1.38
C522	1.0014	1.0008	.9997	70SA	.14	.08	-.03
C524	1.0243	1.0236	1.0276	70GE	2.43	2.36	2.76
C526	1.0175	1.0156	1.0184	70KS	1.75	1.56	1.84
C532	1.0169	1.0194	1.0198	70GE	1.69	1.94	1.98
C534	.9949	.9955	.9872	70MD	-.51	-.45	-1.28
C540	1.0231	1.0226	1.0272	70GE	2.31	2.26	2.72
C543	1.0055	1.0068	1.0185	70HB	.95	.68	1.85
C545	.9705	.9711	.9766	70SA	-2.95	-2.89	-2.34
C549	1.0108	1.0078	1.1012	70DH	1.08	.78	-89.88
C552	.9983	.9957	1.0068	70HN	-.17	-.43	.68
C608	1.0240	.9727	.9960	70GC	2.40	-2.73	-.40
C612	1.0110	1.0122	1.0081	70GE	1.10	1.22	.81
C627	1.0036	1.0021	1.0004	70SA	.36	.21	.04
C630	1.0099	1.0081	1.0150	70KS	.99	.81	1.50
C631A	1.0191	1.0175	1.0141	70AC	1.91	1.75	1.41
C631B	1.0159	1.0149	1.0082	70AC	1.59	1.49	.82
C632	1.0126	1.0110	1.0071	70AC	1.26	1.10	.71
C634	.9876	.9821	.9861	70CE	-1.24	-1.79	-1.39
C638	1.0006	.9985	.9997	70GC	.06	-.11	-.03
C639	1.0020	.9995	1.0058	70DH	.20	-.05	.58
C644	1.0030	1.0048	.9935	70MD	.30	.48	-.65
C645	1.0158	1.0148	1.0116	70AC	1.58	1.48	1.16
C656	1.0023	1.0011	1.0013	70SA	.23	.11	.13
C657	.9824	1.0126	.9288	70SA	-1.76	1.26	-7.12
C660	.9872	1.0169	.9324	70AC	-1.28	1.69	-6.76
C662	.9686	.9915	.9219	70SP	-3.14	-.85	-7.81
C664	1.0610	.9417	.2865	70HT	6.10	-5.83	-71.35
C671A	.9922	.9914	.9881	70DH	-.78	-.86	-1.19
C671B	.9938	.9920	.9928	70DH	-.62	-.80	-.72
C671C	.9948	.9926	.9902	70GC	-.52	-.74	-.98
C671D	1.0125	1.0101	1.0191	70HB	1.25	1.01	1.91
C672	1.0023	1.0000	.9997	70GC	.23	-.00	-.03
C675	1.0141	1.0126	1.0089	70AC	1.41	1.26	.89
C683	1.0199	1.0162	1.0111	70GC	1.99	1.62	1.11
C691	1.0030	.9964	1.0053	70SA	.30	-.36	.53
C699	.9960	.9979	.9923	70BL	-.40	-.21	-.77
C700	.9977	.9965	.9954	70DH	-.23	-.35	-.46

WHITE SAMPLE ANALYSIS
L, a, b LABORATORIES

LAB CODE	RATIO--(LAB/COMBINED) X	Y	Z	INST CODE	PERCENT FROM COMBINED X	Y	Z
C105	1.0170	1.0139	1.0227	70HM	1.70	1.39	2.27
C121	1.0055	1.0013	1.0176	70HM	.55	.13	1.76
C122	1.0100	1.0076	1.0163	70SC	1.00	.76	1.63
C148	1.0167	1.0139	1.0204	70SC	1.67	1.39	2.04
C150	1.0113	1.0096	1.0158	70HA	1.13	.96	1.58
C152	1.0159	1.0129	1.0177	70HA	1.59	1.29	1.77
C166	1.0115	1.0097	1.0184	70HA	1.15	.97	1.84
C183	1.0073	1.0055	1.0079	70HA	.73	.55	.79
C213	.9944	.9908	.9976	70SC	-.56	-.92	-.24
C223	1.0201	1.0156	1.0247	70SC	2.01	1.56	2.47
C230	1.0083	1.0050	1.0141	70HA	.83	.50	1.41
C241	1.0059	1.0023	1.0093	70HA	.59	.23	.93
C256A	1.0022	.9997	1.0057	70HM	.22	-.03	.57
C256B	.9973	.9959	.9945	70HU	-.27	-.41	-.55
C259	1.0149	1.0118	1.0198	70SC	1.49	1.18	1.98
C262	1.0169	1.0138	1.0240	70SB	1.69	1.38	2.40
C285	1.0076	1.0034	1.0151	70HA	.76	.34	1.51
C288	1.0165	1.0150	1.0222	70HA	1.65	1.50	2.22
C291	1.0126	1.0108	1.0164	70HA	1.26	1.08	1.64
C301	1.0016	.9992	1.0108	70HM	.16	-.08	1.08
C317	1.0022	.9992	1.0069	70HM	.22	-.08	.69
C320	1.0231	1.0150	1.0193	70HA	2.31	1.50	1.93
C325	1.0130	1.0110	1.0125	70SB	1.30	1.10	1.25
C340	1.0122	1.0095	1.0158	70SC	1.22	.95	1.58
C352	1.0174	1.0150	1.0246	70HA	1.74	1.50	2.46
C356	1.0046	1.0034	1.0104	70HM	.46	.34	1.04
C380	1.0158	1.0139	1.0726	70HA	1.58	1.39	7.26
C382	1.0117	1.0087	1.0142	70HA	1.17	.87	1.42
C402	1.0081	1.0060	1.0122	70HA	.81	.60	1.22
C427	1.0138	1.0108	1.0164	70HA	1.38	1.08	1.64
C440	1.0139	1.0107	1.0163	70HA	1.39	1.07	1.63
C442	1.0034	1.0013	1.0114	70HM	.34	.13	1.14
C454	1.0161	1.0125	1.0253	70SC	1.61	1.25	2.53
C456	1.0122	1.0094	1.0276	70HA	1.22	.94	2.76
C458	1.0041	1.0014	1.0127	70HM	.41	.14	1.27
C475	1.0116	1.0075	1.0179	70HA	1.16	.75	1.79
C477	1.0195	1.0154	1.0178	70HA	1.95	1.54	1.78
C494	1.0328	1.0288	1.0489	70HA	3.28	2.88	4.89
C496B	1.0244	1.0225	1.0218	70GP	2.44	2.25	2.18
C499A	1.0058	1.0034	1.0151	70HA	.58	.34	1.51
C506	1.0114	1.0087	1.0173	70HA	1.14	.87	1.73
C514A	.9980	.9963	.9959	70SR	-.20	-.37	-.41
C517	1.0368	1.0331	1.0367	70HQ	3.68	3.31	3.67
C538	.9806	.9887	.9839	70GX	-1.94	-1.13	-1.61
C541	1.0285	1.0267	1.0302	70GP	2.85	2.67	3.02
C547	1.0052	1.0028	1.0057	70HQ	.52	.28	.57
C548	.9658	.9658	.9665	70SB	-3.42	-3.42	-3.35
C574	1.0380	1.0331	1.0344	70HQ	3.80	3.31	3.44
C576	1.0013	.9965	1.0077	70SB	.13	-.15	.77
C585	1.0104	1.0075	1.0217	70SC	1.04	.75	2.17
C600	1.0010	.9992	.9984	70GD	.10	-.08	-.16
C619	1.0191	1.0161	1.0171	70SC	1.91	1.61	1.71
C620	.9597	.9611	.9482	70NG	-4.03	-3.89	-5.18
C633	1.0069	1.0047	1.0118	70HA	.69	.47	1.18
C648	1.0184	1.0137	1.0247	70HA	1.84	1.37	2.47
C674	1.0117	1.0087	1.0158	70HF	1.17	.87	1.58
C677	1.0321	1.0285	1.0418	70SC	3.21	2.85	4.18

X, Y, Z SPACE ANALYSIS, ADJUSTED DATA

COLOR • COLOR DIFFERENCE

LAB		SAMPLE D05			SAMPLE D06			DIFFERENCE D06 - D05				INST	
CODE	F	MEAN X	MEAN Y	MEAN Z	MEAN X	MEAN Y	MEAN Z	ΔX	ΔY	ΔZ	ΔE	CODE	LAB
C157	G	41.47	41.68*	75.86	41.08	41.25*	75.39	-.40	-.63	-.47	1.58	70GE	C157
C244	X	41.44	42.35	75.59	41.58	42.50	75.81	.14 *	.15 X	.23 X	.25X	70ZE	C244
C250	X	41.93	42.56	76.34	42.08	42.66	76.58*	.16 *	.10 X	.23 X	.44X	70ZF	C250
C251	X	41.23	42.18	75.36	41.33	42.37	75.47	.10 *	.20 X	.11 *	.60X	70ZE	C251
C253	X	41.48	42.25	76.26	41.62	42.39	75.44	.14 *	.14 X	-.82 *	2.09X	70GC	C253
C278	X	40.90*	42.02	73.27X	40.94	42.12	73.27X	.05	.10 X	.00 *	.28X	70NE	C278
C396	X	42.78X	41.99	75.53	42.59X	41.48	75.08	-.20	-.51	-.45	2.27X	70GY	C396
C407	G	41.93	42.63	75.78	41.97	42.62	75.70	.04	-.21	-.09	1.67	70BL	C407
C414	X	42.10	43.10	76.09	41.83	42.60	75.77	-.28	-.50	-.33	1.35X	70MD	C414
C416A	G	41.76	42.65	76.11	41.50	42.33	75.62	-.26	-.52	-.49	1.71	70GE	C416A
C416B	G	41.71	43.01	76.20	41.57	42.62	75.98	-.14	-.39	-.22	1.52*	70SA	C416B
C418	X	41.88	42.03	75.28	41.85	41.61	75.02	-.03	-.42	-.25	2.66X	70CE	C418
C422	G	41.14	42.25	75.10*	41.24	42.08	75.20	.10 *	-.18 *	.10 *	1.75	70SA	C422
C424	G	41.95	42.76	75.54	41.94	42.50	75.46	-.01	-.26	-.08	1.54	70CA	C424
C426	X	41.20	42.27	76.03	41.15	41.91	75.85	-.04	-.36	-.18	2.04X	70HB	C428
C437	G	41.71	42.10	74.55X	41.67	41.80	74.31*	-.04	-.30	-.24	1.80	70CE	C437
C444	G	41.82	42.55	75.89	41.63	42.09	75.52	-.19	-.46	-.37	1.73	70GE	C444
C451	G	41.62	42.57	75.91	41.66	42.38	75.75	.04	-.19	-.15	1.71	70AC	C451
C453	G	42.03	43.46*	76.43	42.02	43.15*	76.30	-.01	-.30	-.13	1.85	70HT	C453
C459	G	41.75	42.64	75.82	41.52	42.14	75.41	-.24	-.50	-.42	1.70	70GE	C459
C460	G	41.55	42.39	75.83	41.31	41.88	75.53	-.24	-.51	-.29	1.64	70GE	C460
C462A	X	40.89*	42.10	75.39	40.69*	41.71	75.00	-.20	-.40	-.39	1.32X	70HB	C462A
C463	G	41.93	42.76	75.67	41.78	42.38	75.58	-.14	-.38	-.29	1.51*	70ZD	C463
C469	X	42.08	42.63	75.01*	41.30	42.08	74.58*	-.78 X	-.55	-.43	3.04X	70GE	C469
C470	G	41.76	42.35	75.44	41.45	41.78	74.84	-.31	-.57	-.61	1.80	70DH	C470
C472	G	42.46*	43.23	76.46	42.25*	42.76	76.02	-.21	-.47	-.44	1.74	70ZD	C472
C473	G	41.87	42.55	75.85	41.64	42.07	75.42	-.23	-.47	-.43	1.62	70DH	C473
C474	G	41.33	42.13	75.44	41.12	41.66	75.05	-.20	-.47	-.40	1.73	70GE	C474
C476	G	44.84X	45.85X	82.17X	44.67X	45.40X	81.82X	-.17	-.45	-.35	1.74	70SA	C476
C479B	G	41.76	42.53	75.82	41.72	42.25	75.55	-.04	-.28	-.26	1.71	70SA	C479B
C480	G	41.70	42.71	76.35	41.51	42.27	75.98	-.19	-.45	-.37	1.66	70HB	C480
C481	G	41.23	42.25	75.99	41.13	41.85	75.79	-.10	-.40	-.20	1.85	70HG	C481
C483	G	41.29	42.20	75.42	40.95	41.65	74.83	-.33	-.55	-.59	1.52*	70ZF	C483
C495	G	41.91	42.60	75.68	41.69	42.33	75.27	-.22	-.47	-.41	1.64	70KS	C495
C496A	G	41.65	42.47	75.52	41.40	41.97	75.08	-.25	-.50	-.44	1.67	70GE	C496A
C499C	G	42.54*	43.93X	76.79*	42.13	43.26*	76.20	-.40	-.67	-.59	1.72	70BL	C499C
C503	G	41.73	42.66	75.87	41.54	42.22	75.53	-.19	-.45	-.33	1.66	70GE	C503
C508	G	41.60	42.63	75.57	41.46	42.21	75.33	-.14	-.41	-.24	1.71	70GE	C508
C511	G	41.79	42.64	75.82	41.70	42.29	75.50	-.08	-.35	-.31	1.84	70DH	C511
C521A	G	41.89	42.83	76.15	41.60	42.27	75.69	-.28	-.56	-.46	1.78	70CA	C521A
C521B	G	40.87*	41.57X	75.08*	40.42X	40.87X	74.46*	-.45	-.70	-.61	1.70	70SA	C521B
C522	G	41.37	42.35	75.54	41.10	41.80	74.99	-.26	-.54	-.55	1.89*	70SA	C522
C524	G	41.96	42.92	75.99	41.87	42.56	75.77	-.08	-.36	-.22	1.76	70GE	C524
C526	G	41.99	42.64	75.74	41.82	42.42	75.45	-.17	-.43	-.30	1.66	70KS	C526
C532	G	41.54	42.36	75.63	41.33	41.88	75.28	-.22	-.49	-.35	1.70	70GE	C532
C534	G	42.08	42.98	76.19	41.83	42.48	75.81	-.25	-.50	-.38	1.59	70MD	C534
C540	G	42.06	42.96	75.68	41.76	42.39	75.18	-.30	-.57	-.50	1.75	70GE	C540
C543	G	41.28	42.37	76.17	41.06	41.89	75.76	-.22	-.48	-.41	1.70	70HB	C543
C545	G	41.86	42.78	76.20	41.60	42.26	75.76	-.26	-.52	-.44	1.69	70SA	C545
C549	#	41.91	42.70	760.34X	41.93	42.47	758.81X	.02	-.23	-1.53 X	.27X	70DH	C549
C552	G	41.21	42.22	76.10	41.25	42.01	76.07	.05	-.22	-.08	1.76	70HN	C552
C608	X	39.92X	40.61X	71.77X	41.66	42.64	75.87	1.75 X	2.03 X	4.11 X	4.69X	70GC	C608
C612	G	41.34	42.15	75.81	41.19	41.73	75.49	-.15	-.42	-.32	1.76	70GE	C612
C627	#	42.25	43.27	76.47	41.83	42.59	75.88	-.42	-.67	-.58	1.64	70SA	C627
C630	G	42.07	42.96	76.21	41.88	42.50	75.83	-.19	-.46	-.37	1.73	70KS	C630
C631A	G	41.58	42.41	75.47	41.31	41.89	74.99	-.27	-.52	-.48	1.60	70AC	C631A
C631B	G	41.93	42.84	76.18	41.59	42.24	75.62	-.34	-.60	-.56	1.72	70AC	C631B
C632	G	41.65	42.54	75.69	41.26	41.90	75.00	-.39	-.64	-.69	1.73	70AC	C632
C634	X	40.96*	41.45X	74.92*	40.77*	40.97X	74.42*	-.19	-.48	-.50	2.03X	70CE	C634
C638	G	41.03*	42.15	75.27	40.78*	41.65	74.82	-.25	-.50	-.45	1.63	70GC	C638
C639	G	41.77	42.34	75.54	41.44	41.75	74.98	-.33	-.59	-.57	1.77	70DH	C639
C644	G	41.97	42.99	75.82	41.56	42.31	75.19	-.41	-.67	-.63	1.75	70MD	C644
C645	G	41.70	42.58	75.67	41.33	41.94	75.09	-.37	-.64	-.58	1.76	70AC	C645
C656	G	42.10	43.14	76.32	41.84	42.62	75.88	-.26	-.52	-.44	1.67	70SA	C656
C657	G	41.43	42.70	75.55	41.13	42.14	75.07	-.30	-.56	-.48	1.64	70SA	C657

X, Y, Z SPACE ANALYSIS, ADJUSTED DATA

COLOR • COLOR DIFFERENCE

LAB CODE	F	SAMPLE D05 MEAN X	MEAN Y	MEAN Z	SAMPLE D06 MEAN X	MEAN Y	MEAN Z	DIFFERENCE D06 - D05 ΔX	ΔY	ΔZ	ΔE	INST CODE	LAB
C660	6	41.54	42.84	75.77	41.26	42.29	75.33	-.28	-.55	-.44	1.70	70AC	C660
C662	6	41.69	42.90	76.10	41.50	42.45	75.83	-.19	-.45	-.27	1.58	70SP	C662
C664	#	37.33X	40.37X	74.53X	37.13X	39.95X	73.95X	-.19	-.41	-.58	1.53	70HT	C664
C671A	6	41.87	42.83	76.17	41.97	42.67	76.11	.10 *	-.16 *	-.06	1.83	70DH	C671A
C671B	6	41.63	42.29	75.57	41.55	41.97	75.16	-.08	-.32	-.41	1.81	70DH	C671B
C671C	6	41.20	42.29	75.91	41.13	41.97	75.73	-.07	-.32	-.18	1.63	70GC	C671C
C671D	6	41.67	42.74	76.64*	41.39	42.19	76.12	-.28	-.55	-.52	1.75	70HB	C671D
C672	6	41.80	42.85	76.02	41.60	42.40	75.62	-.20	-.45	-.40	1.64	70GC	C672
C675	6	41.85	42.76	76.01	41.71	42.37	75.68	-.14	-.39	-.34	1.68	70AC	C675
C683	6	38.85X	39.92X	73.37X	38.75X	39.58X	73.03X	-.09	-.34	-.35	1.79	70GC	C683
C691	6	41.49	43.01	74.34X	41.36	42.63	73.99X	-.13	-.38	-.35	1.62	70SA	C691
C699	6	42.08	43.04	75.89	42.16	42.88	75.87	.09 *	-.17 *	-.03 *	1.71	70BL	C699
C700	6	41.87	42.73	76.06	41.82	42.41	75.84	-.06	-.31	-.23	1.71	70DH	C700
GRAND MEANS		41.71	42.64	75.87	41.54	42.21	75.48	-.19	-.45	-.36	1.70		
SD OF MEANS		.32	.32	.35	.32	.38	.42	.13	.13	.17	.08		
INCLUDED LABS FOR THIS MEAN		60	58	58	59	59	59	62	62	62	62		

LAB CODE	F	SAMPLE D07 MEAN X	MEAN Y	MEAN Z	SAMPLE D08 MEAN X	MEAN Y	MEAN Z	DIFFERENCE D08 - D07 ΔX	ΔY	ΔZ	ΔE	INST CODE	LAB
C157	6	7.49*	11.29	11.84	7.42*	11.36	11.29	-.07	.07	-.55	2.50	70GE	C157
C244	6	8.24	11.87	11.79	8.05	11.82	11.01	-.18	-.05	-.79	3.01	70ZE	C244
C250	6	8.38	11.97	13.04	8.17	11.92	12.22	-.21 *	-.05	-.82 *	3.00	70ZF	C250
C251	6	8.24	11.71	12.25	8.12	11.71	11.55	-.12	.00	-.70	2.75	70ZE	C251
C253	X	8.12	11.63	11.66	7.98	11.71	10.93	-.15	.08	-.73	3.50X	70GC	C253
C278	6	8.49	11.58	13.30*	8.34	11.58	12.67*	-.14	.00	-.63	2.39	70NE	C278
C396	6	8.75	11.38	11.85	8.70*	11.43	11.20	-.05	.05	-.65	2.91	70GY	C396
C407	6	8.71	12.19	12.72	8.65	12.23	12.13	-.06	.05	-.59	2.45	70BL	C407
C414	6	8.12	11.71	12.12	7.98	11.71	11.44	-.14	.00	-.68	2.72	70ND	C414
C416A	6	8.07	11.72	11.97	7.91	11.69	11.23	-.16	-.03	-.74	2.81	70GE	C416A
C416B	6	7.91	11.43	11.46	7.79	11.42	10.78	-.12	-.01	-.68	2.71	70SA	C416B
C418	6	8.38	12.06	12.37	8.24	12.04	11.68	-.14	-.02	-.69	2.62	70CE	C418
C422	6	8.04	11.55	11.51	7.98	11.60	10.88	-.06	.05	-.63	2.83	70SA	C422
C424	6	8.47	12.08	12.73	8.41	12.16	12.05	-.06	.08	-.69	2.97	70CA	C424
C428	6	7.94	11.56	11.60	7.83	11.57	10.91	-.10	.01	-.69	2.87	70HB	C428
C437	6	8.43	11.92	13.08	8.30	11.92	12.39	-.13	.00	-.68	2.55	70CE	C437
C444	6	8.15	11.69	12.28	8.06	11.71	11.64	-.10	.02	-.65	2.62	70GE	C444
C451	6	8.18	11.68	12.23	8.14	11.75	11.66	-.04	.07	-.57	2.57	70AC	C451
C453	6	8.54	12.20	12.20	8.71*	12.48*	11.91	.17 X	.28 X	-.29 X	2.76	70BT	C453
C459	6	8.12	11.66	12.18	8.01	11.66	11.49	-.11	-.00	-.69	2.70	70GE	C459
C460	6	7.93	11.47	12.17	7.84	11.49	11.52	-.08	.02	-.65	2.64	70GE	C460
C462A	6	7.91	11.51	11.34	7.81	11.51	10.65	-.10	.00	-.68	2.86	70HB	C462A
C463	6	8.15	11.75	12.28	8.13	11.85	11.70	-.02	.10	-.58	2.77	70ZD	C463
C469	6	8.41	11.94	12.53	8.33	11.96	11.92	-.08	.02	-.61	2.45	70GE	C469
C470	6	8.03	11.51	12.26	7.98	11.59	11.68	-.04	.08	-.58	2.62	70DH	C470
C472	6	8.16	11.80	12.60	8.09	11.84	11.96	-.07	.04	-.63	2.64	70ZD	C472
C473	6	8.07	11.57	12.39	8.03	11.65	11.83	-.03	.08	-.56	2.57	70DH	C473
C474	6	7.95	11.47	11.91	7.75	11.38	11.13	-.20 *	-.09 *	-.78	2.78	70GE	C474
C476	6	8.51	12.39*	13.40*	8.31	12.32	12.59*	-.20 *	-.07	-.81 *	2.77	70SA	C476
C479B	6	8.29	11.83	12.46	8.20	11.84	11.77	-.10	.01	-.68	2.71	70SA	C479B
C480	6	8.10	11.75	11.72	8.08	11.84	11.13	-.02	.09	-.59	2.86	70BB	C480
C481	6	7.87	11.37	11.43	7.82	11.42	10.74	-.05	.05	-.69	3.16*	70HG	C481
C483	6	8.43	11.86	12.35	8.31	11.91	11.65	-.12	.05	-.71	2.97	70ZF	C483
C495	6	8.27	11.82	12.68	8.17	11.85	12.02	-.09	.02	-.66	2.64	70KS	C495
C496A	6	8.10	11.65	12.12	7.99	11.65	11.45	-.11	.00	-.67	2.67	70GE	C496A
C499C	6	8.68	12.53*	12.11	8.38	12.33	11.27	-.31 X	-.20 X	-.83 *	2.81	70BL	C499C
C503	6	8.06	11.61	12.21	7.93	11.58	11.50	-.13	-.02	-.71	2.69	70GE	C503
C508	6	8.19	11.81	11.94	8.10	11.83	11.33	-.09	.02	-.61	2.52	70GE	C508
C511	6	8.17	11.74	12.29	8.04	11.73	11.60	-.12	-.01	-.69	2.65	70DH	C511
C521A	6	8.22	11.84	12.02	8.15	11.89	11.41	-.07	.05	-.62	2.65	70CA	C521A
C521B	6	7.44*	10.91*	11.47	7.49*	11.16*	11.10	.05 X	.25 X	-.37 X	2.71	70SA	C521B
C522	6	8.37	11.84	12.81	8.27	11.86	12.00	-.10	.02	-.81 *	3.18*	70SA	C522
C524	6	8.53	12.10	12.68	8.45	12.15	12.08	-.08	.05	-.60	2.51	70GE	C524
C526	6	8.28	11.80	12.72	8.16	11.82	12.03	-.12	.02	-.68	2.68	70KS	C526
C532	6	7.90	11.44	11.92	7.80	11.48	11.23	-.10	.04	-.69	2.90	70GE	C532
C534	6	8.17	11.62	12.33	8.03	11.59	11.63	-.15	-.03	-.70	2.64	70MD	C534
C540	6	8.78*	12.34	12.78	8.74*	12.42*	12.21	-.04	.08	-.57	2.53	70GE	C540
C543	6	8.03	11.68	11.65	7.89	11.65	10.92	-.14	-.02	-.73	2.87	70HB	C543
C545	6	8.00	11.57	11.97	7.83	11.52	11.23	-.16	-.06	-.73	2.70	70SA	C545
C549	#	83.15X	11.87	125.22X	81.77X	11.85	118.15X	-1.39 X	-.02	-7.06 X	3.38X	70DB	C549
C552	6	7.92	11.47	11.34	7.78	11.45	10.61	-.14	-.03	-.73	2.90	70HN	C552
C608	X	12.06X	8.88X	12.27	12.02X	8.72X	11.49	-.04	-.16 X	-.78	6.13X	70GC	C608
C612	6	7.69	11.20	11.68	7.56	11.19*	10.99	-.13	-.01	-.69	2.74	70GE	C612
C627	#	8.37	12.03	12.55	8.20	11.97	11.77	-.18	-.06	-.78	2.80	70SA	C627
C630	6	8.30	11.90	12.38	8.20	11.93	11.75	-.10	.02	-.63	2.55	70KS	C630
C631A	6	8.20	11.65	12.34	8.08	11.65	11.69	-.12	-.00	-.66	2.53	70AC	C631A
C631B	6	8.35	11.86	12.47	8.26	11.89	11.82	-.09	.03	-.64	2.61	70AC	C631B
C632	6	8.22	11.70	12.33	8.13	11.73	11.69	-.09	.03	-.65	2.64	70AC	C632
C634	6	8.38	12.06	12.44	8.27	12.10	11.73	-.11	.04	-.71	2.94	70CE	C634
C638	6	7.90	11.51	11.50	7.80	11.61	10.90	-.10	.10	-.60	3.00	70GC	C638
C639	6	8.14	11.61	12.62	8.04	11.63	11.98	-.10	.02	-.65	2.55	70DB	C639
C644	6	8.10	11.70	11.87	7.98	11.70	11.19	-.11	.00	-.68	2.74	70MD	C644
C645	6	8.30	11.79	12.38	8.11	11.72	11.61	-.19 *	-.06	-.77	2.78	70AC	C645
C656	6	8.25	11.87	12.20	8.12	11.86	11.48	-.13	-.01	-.72	2.77	70SA	C656
C657	6	8.29	11.88	12.54	8.17	11.90	11.85	-.12	.02	-.69	2.73	70SA	C657

X, Y, Z SPACE ANALYSIS, ADJUSTED DATA

COLOR + COLOR DIFFERENCE

LAB CODE	F	SAMPLE D07 MEAN X	MEAN Y	MEAN Z	SAMPLE D08 MEAN X	MEAN Y	MEAN Z	DIFFERENCE D08 - D07 ΔX	ΔY	ΔZ	ΔE	INST CODE	LAB
C660	6	8.39	12.01	12.72	8.32	12.06	12.10	-.08	.04	-.62	2.56	70AC	C660
C662	6	8.24	11.89	12.49	8.15	11.94	11.83	-.09	.05	-.65	2.70	70SP	C662
C664	#	7.45*	10.60X	13.65*	7.42*	10.61X	13.02*	-.03	.01	-.63	2.70	70HT	C664
C671A	6	8.23	11.82	12.27	8.16	11.88	11.64	-.07	.06	-.62	2.67	70DH	C671A
C671B	6	8.12	11.59	12.62	8.04	11.64	11.99	-.08	.05	-.62	2.60	70DH	C671B
C671C	6	7.94	11.42	11.59	7.90	11.53	10.97	-.05	.10	-.62	2.96	70GC	C671C
C671D	6	8.12	11.75	11.63	7.99	11.76	10.91	-.13	.01	-.72	2.99	70HB	C671D
C672	6	8.73	12.20	12.40	8.48	12.10	11.50	-.25 X	-.10 *	-.90 X	3.21*	70GC	C672
C675	6	8.26	11.76	12.28	8.14	11.76	11.60	-.12	-.00	-.68	2.65	70AC	C675
C683	6	7.47*	10.87*	11.05*	7.40*	10.91X	10.47*	-.07	.04	-.57	2.57	70GC	C683
C691	6	8.54	11.92	12.54	8.44	11.92	11.95	-.09	-.01	-.60	2.29*	70SA	C691
C699	6	8.84*	12.51*	12.97	8.71*	12.51*	12.27	-.13	.00	-.70	2.65	70BL	C699
C700	6	8.20	11.75	12.30	8.13	11.83	11.70	-.07	.08	-.60	2.68	70DH	C700
GRAND MEANS		8.20	11.75	12.22	8.10	11.78	11.56	-.10	.02	-.67	2.72		
SD OF MEANS		.28	.30	.48	.28	.28	.48	.04	.05	.06	.18		
INCLUDED LABS FOR THIS MEAN		73	73	73	73	72	73	69	70	70	73		

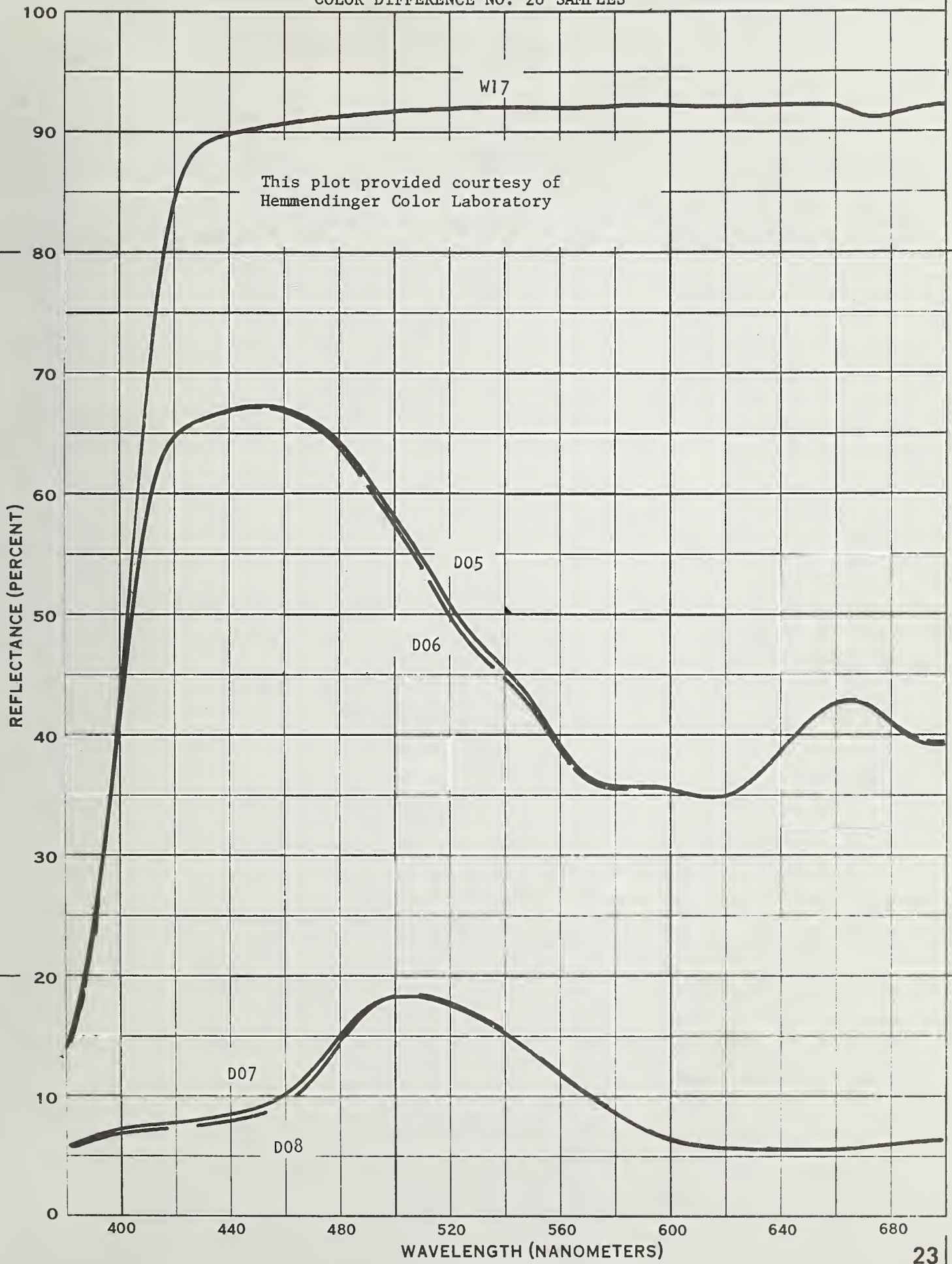
L, a, b SPACE ANALYSIS, ADJUSTED DATA
COLOR - COLOR DIFFERENCE

LAB CODE	F	SAMPLE D05 MEAN L	MEAN A	MEAN B	SAMPLE D06 MEAN L	MEAN A	MEAN B	DIFFERENCE D06 - D05 ΔL	ΔA	ΔB	ΔE	INST CODE	LAB
C105	G	64.65	-.34	-23.54	64.35	.36	-23.78	-.30	.69	-.25	.80	70HM	C105
C121	G	64.66	-.57	-23.96	64.26	.08	-24.36	-.40	.65	-.40	.86	70HM	C121
C122	G	64.95	-.67	-23.71	64.46	.13	-24.06	-.50	.80	-.35	1.00	70SC	C122
C148	G	65.10	-.56	-23.59	64.75	.09	-23.89	-.35	.65	-.30	.79	70SC	C148
C150	G	65.48	-.99	-23.65	64.85	-.15	-24.13	-.62	.84	-.48 *	1.15	70HA	C150
C152	G	65.48	-.54	-23.42	64.68	.25	-24.11	-.79 *	.80	-.69 X	1.32	70HA	C152
C166	G	65.09	-.60	-23.59	64.74	.09	-23.79	-.35	.70	-.20	.80	70HA	C166
C183	G	65.17	-.11	-23.57	64.87	.59	-23.77	-.30	.70	-.20	.78	70HA	C183
C213	G	64.60	-.60	-23.84	64.40	-.40	-24.04	-.20	.20	-.20	.35	70SC	C213
C223	G	65.46	-.91	-22.82	65.21	-.34	-23.00	-.25	.57	-.19	.65	70SC	C223
C230	G	65.21	-.28	-23.58	64.71	.43	-24.00	-.49	.71	-.42	.96	70HA	C230
C241	#	64.97	-7.62X	-23.79	64.77	-6.93X	-23.99	-.20	.70	-.20	.75	70HA	C241
C256A	#	64.71	.40	-24.11	64.64	.42	-24.15	-.07	.03 *	-.04	.08*	70HM	C256A
C256H	#	65.28	.48	-23.19	65.35	.50	-23.19	.07 *	.02 *	-.00 *	.07*	70HU	C256H
C259	G	64.77	-1.03	-23.96	64.72	-1.03*	-23.96	-.05	.00 *	-.00 *	.05*	70SC	C259
C262	G	64.89	.18	-23.01	64.92	.13	-23.04	.03 *	-.05 *	-.04 *	.07*	70SH	C262
C285	G	64.79	.22	-23.85	64.74	.42	-24.05	-.05	.20	-.20	.28	70HA	C285
C288	G	64.72	.52	-24.12	64.82	.52	-24.02	.10 *	-.00 *	.10 X	.14*	70HA	C288
C291	G	64.85	.39	-23.84	64.70	.39	-23.89	-.15	.00 *	-.05	.16	70HA	C291
C301	G	64.68	.23	-24.21	64.63	.23	-24.21	-.05	.00 *	-.00 *	.05*	70HM	C301
C317	G	64.63	.56	-23.78	64.63	.56	-23.78	.00	.00 *	.00 *	.00*	70HM	C317
C320	#	65.11	-.37	23.46X	65.16	-.39	23.48X	.05 *	-.02 *	.02 *	.06*	70HA	C320
C325	G	65.26	.64	-22.90	64.99	1.36*	-23.12	-.27	.72	-.22	.80	70SH	C325
C340	G	65.38	-.74	-22.51	65.10	-.16	-22.85	-.28	.59	-.34	.73	70SC	C340
C352	G	65.16	-.47	-23.52	64.87	.12	-23.76	-.30	.60	-.25	.71	70HA	C352
C356	G	64.89	-.43	-23.87	64.59	.26	-24.17	-.30	.70	-.30	.82	70HM	C356
C380	G	65.05	-.90	-20.37X	64.70	-.20	-20.62X	-.35	.70	-.25	.82	70HA	C380
C382	G	65.17	.35	-23.32	64.77	1.00	-23.62	-.40	.65	-.30	.82	70HA	C382
C402	G	65.16	-.44	-23.65	64.87	.27	-23.93	-.30	.71	-.27	.82	70HA	C402
C427	G	65.15	-.34	-23.59	64.90	.40	-23.89	-.25	.74	-.30	.84	70HA	C427
C440	G	65.41	-.39	-23.64	65.07	.31	-23.95	-.34	.71	-.31	.84	70HA	C440
C442	G	65.06	-.44	-23.49	64.56	.26	-23.89	-.50	.70	-.40	.95	70HM	C442
C454	G	65.62	.62	-22.83	65.42*	1.36*	-23.08	-.20	.74	-.25	.80	70SC	C454
C456	G	65.16	-.66	-23.67	64.95	.04	-23.90	-.21	.70	-.23	.76	70HA	C456
C458	G	64.98	-.67	-23.54	64.63	-.04	-23.83	-.34	.63	-.28	.78	70HM	C458
C475	G	65.34	-.66	-23.24	64.93	-.15	-23.53	-.41	.51	-.29	.71	70HA	C475
C477	G	65.40	-.61	-22.43*	65.05	.11	-22.71*	-.36	.72	-.28	.86	70HA	C477
C494	G	65.02	-.64	-22.14*	64.58	.25	-22.54*	-.44	.89	-.39	1.07	70HA	C494
C496B	G	64.54	-.26	-24.38	64.14	.45	-24.66	-.41	.71	-.28	.86	70GP	C496H
C499A	G	65.09	-.77	-23.41	64.74	-.07	-23.76	-.35	.70	-.35	.86	70HA	C499A
C506	G	64.82	-.80	-23.90	64.47	-.11	-24.10	-.35	.70	-.20	.80	70HA	C506
C514A	*	65.30	-.87	-23.14	64.99	-.15	-23.41	-.32	.73	-.27	.84	70SR	C514A
C517	G	64.44	.38	-23.57	63.95*	1.16	-23.86	-.49	.79	-.30	.97	70HQ	C517
C538	#	66.63X	5.08X	-24.08	66.27X	5.63X	-24.28	-.35	.55	-.20	.69	70GX	C538
C541	G	64.35	-.30	-23.65	63.90*	.44	-23.99	-.44	.74	-.35	.93	70GP	C541
C547	G	63.75X	.34	-24.66*	63.38X	1.02	-24.91*	-.36	.68	-.25	.81	70HQ	C547
C548	G	66.30X	-1.63*	-23.30	66.02X	-.84*	-23.58	-.27	.79	-.27	.88	70SH	C548
C574	G	64.74	-.10	-23.58	64.54	.63	-23.77	-.20	.74	-.20	.79	70HQ	C574
C576	G	64.93	-1.08	-23.60	64.56	-.37	-23.94	-.38	.71	-.34	.87	70SH	C576
C585	G	65.16	-.70	-23.55	64.79	.04	-23.89	-.37	.74	-.35	.90	70SC	C585
C600	G	65.58	-1.60*	-23.01	65.13	-.90*	-23.26	-.45	.70	-.25	.87	70GD	C600
C619	G	64.48	-.14	-23.64	63.89*	.65	-23.94	-.60	.79	-.30	1.04	70SC	C619
C620	G	65.19	-.31	-23.40	64.67	.49	-23.71	-.53	.80	-.31	1.01	70MG	C620
C633	#	65.24	-.21	-23.34	64.47	.54	-23.90	-.77 *	.74	-.57 *	1.21	70HA	C633
C648	G	65.85*	-.06	-22.30*	65.37	.59	-22.67*	-.48	.65	-.37	.89	70HA	C648
C674	G	65.27	-.24	-23.41	64.97	.45	-23.71	-.30	.70	-.30	.81	70HF	C674
C677	G	66.07*	-1.02	-23.16	65.87X	-.38	-23.33	-.20	.64	-.17	.69	70SC	C677
GRAND MEANS		65.06	-.38	-23.49	64.71	.22	-23.75	-.32	.60	-.26	.75		
SD OF MEANS		.37	.53	.50	.33	.50	.48	.17	.26	.11	.30		
INCLUDED LABS FOR THIS MEAN		48	50	49	47	50	49	50	50	48	50		

L, a, b SPACE ANAYLSIS, ADJUSTED DATA
COLOR - COLOR DIFFERENCE

LAB CODE	F	SAMPLE D07 MEAN L	MEAN A	MEAN B	SAMPLE D08 MEAN L	MEAN A	MEAN B	DIFFERENCE D08 - D07 ΔL	ΔA	ΔB	ΔE	INST CODE	LAB
C105	G	33.96	-17.21	3.55	33.96	-17.80	4.78	.00	-.59	1.23	1.37	70HM	C105
C121	G	33.68	-18.46	4.02	33.63	-19.15	5.29	-.05	-.70	1.28	1.46	70HM	C121
C122	G	33.87	-17.43	3.41	33.77	-18.08	4.65	-.10	-.65	1.23	1.40	70SC	C122
C148	G	34.16	-18.04	3.95	34.11	-18.68	5.18	-.05	-.64	1.23	1.39	70SC	C148
C150	X	34.40	-17.97	3.69	35.40X	-19.95X	4.82	1.00 X	-1.98 X	1.13	2.49X	70HA	C150
C152	G	34.38	-17.42	3.67	34.38	-17.91	4.86	.00	-.50 *	1.19	1.29	70HA	C152
C166	G	33.94	-17.34	3.31	33.94	-17.99	4.54	.00	-.65	1.23	1.39	70HA	C166
C183	G	34.06	-18.22	3.74	34.16	-18.87	4.88	.10	-.65	1.14	1.32	70HA	C183
C213	G	33.55	-18.68*	3.35	33.55	-18.83	4.55	.00	-.15 X	1.20	1.21*	70SC	C213
C223	G	34.77*	-17.80	3.55	34.81	-18.47	4.74	.04	-.68	1.19	1.37	70SC	C223
C230	G	34.26	-17.60	3.80	34.25	-18.24	4.99	-.01	-.64	1.19	1.35	70HA	C230
C241	#	34.06	-18.03	3.74	34.11	-18.38	4.93	.05	-.35 X	1.19	1.24	70HA	C241
C256A	#	33.84	-17.82	3.61	33.82	-18.38	4.82	-.02	-.57	1.21	1.34	70HM	C256A
C256B	#	34.41	-17.21	2.58	34.40	-17.85	3.75	-.01	-.64	1.17	1.33	70HU	C256B
C259	G	34.15	-17.18	3.34	34.15	-17.77	4.58	.00	-.59	1.23	1.37	70SC	C259
C262	G	34.41	-17.99	3.45	34.39	-18.73	4.68	-.02	-.74	1.23	1.43	70SB	C262
C285	G	34.14	-17.90	3.24	34.09	-18.59	4.52	-.05	-.70	1.28	1.46	70HA	C285
C288	G	34.14	-17.83	3.62	34.05	-18.52	4.90	-.10	-.69	1.28	1.46	70HA	C288
C291	G	34.27	-17.48	3.84	34.12	-18.18	5.08	-.15	-.69	1.24	1.43	70HA	C291
C301	G	34.01	-17.31	3.54	33.91	-18.01	4.82	-.10	-.70	1.28	1.47	70HM	C301
C317	G	33.91	-17.63	3.76	33.81	-18.53	5.00	-.10	-.70	1.24	1.43	70HM	C317
C320	#	34.68	16.26X	3.48	34.69	17.00X	4.67	.01	.74 X	1.19	1.40	70HA	C320
C325	G	34.38	-17.88	3.42	34.38	-18.62	4.57	.00	-.73	1.14	1.36	70SB	C325
C340	G	34.63	-17.31	2.91	34.58	-17.67	4.06	-.05	-.35 X	1.15	1.21*	70SC	C340
C352	G	34.19	-17.82	3.81	34.19	-18.51	5.04	.00	-.69	1.23	1.41	70HA	C352
C356	G	33.84	-17.42	3.44	33.84	-18.12	4.72	.00	-.70	1.29	1.47	70HM	C356
C380	G	34.06	-17.55	4.78*	33.96	-18.15	5.95*	-.10	-.59	1.17	1.32	70HA	C380
C382	G	34.15	-18.00	3.50	34.10	-18.69	4.79	-.05	-.69	1.29	1.46	70HA	C382
C402	G	34.19	-17.65	3.83	34.31	-18.29	5.05	.12	-.64	1.22	1.38	70HA	C402
C427	G	34.12	-17.53	3.84	34.12	-18.18	5.08	.00	-.64	1.24	1.39	70HA	C427
C440	G	34.32	-17.67	3.75	34.37	-18.30	4.95	.05	-.63	1.20	1.35	70HA	C440
C442	G	33.88	-17.38	3.01	33.98	-17.98	4.19	.10	-.60	1.19	1.33	70HM	C442
C454	G	34.68	-17.84	3.54	34.83*	-18.50	4.77	.15	-.65	1.23	1.40	70SC	C454
C456	G	33.99	-17.78	3.80	34.17	-18.28	4.97	.18 *	-.50 *	1.17	1.28	70HA	C456
C458	G	33.99	-17.72	3.04	34.04	-18.26	4.26	.05	-.53	1.22	1.33	70HM	C458
C475	G	34.51	-17.62	2.60	34.40	-18.25	3.84	-.10	-.63	1.23	1.39	70HA	C475
C477	G	34.48	-18.02	2.95	34.47	-18.68	4.15	-.01	-.66	1.20	1.37	70HA	C477
C494	G	34.11	-18.01	2.87	34.16	-18.84	4.04	.05	-.83 *	1.16	1.43	70HA	C494
C496B	G	33.74	-16.64*	3.03	33.69	-17.30*	4.28	-.05	-.67	1.25	1.42	70GP	C496B
C499A	G	33.99	-17.82	3.63	33.94	-18.42	4.81	-.05	-.60	1.18	1.33	70HA	C499A
C506	G	33.90	-17.54	3.66	34.00	-18.13	4.84	.10	-.60	1.19	1.33	70HA	C506
C514A	*	34.31	-17.66	2.57	34.33	-18.27	3.74	.03	-.61	1.17	1.32	70SR	C514A
C517	G	33.65	-16.00X	2.29*	33.89	-16.49X	3.42*	.25 *	-.49 *	1.13	1.25	70HQ	C517
C538	#	35.65X	-13.98X	.23X	35.60X	-14.74X	1.60X	-.05	-.76	1.36 X	1.56*	70GX	C538
C541	G	33.70	-16.86	3.03	33.75	-17.45	4.21	.05	-.59	1.18	1.32	70GP	C541
C547	G	32.29X	-18.59*	2.90	32.07X	-19.29*	4.17	-.22 *	-.69	1.26	1.46	70HQ	C547
C548	G	34.58	-18.44	3.77	34.51	-19.10	5.01	-.07	-.66	1.25	1.41	70SB	C548
C574	G	34.04	-17.18	2.19*	33.85	-18.01	3.47*	-.20	-.83 *	1.28	1.54*	70HQ	C574
C576	G	33.86	-17.40	3.60	33.80	-18.02	4.82	-.05	-.62	1.23	1.38	70SB	C576
C585	G	34.25	-17.60	3.69	34.25	-18.20	4.90	.00	-.60	1.21	1.35	70SC	C585
C600	G	34.91*	-17.78	3.58	34.81	-18.48	4.79	-.10	-.70	1.20	1.39	70GD	C600
C619	G	33.83	-17.68	2.80	33.73	-18.38	3.89	-.10	-.69	1.09 *	1.29	70SC	C619
C620	G	33.61	-17.53	2.63	33.45	-18.23	3.84	-.16	-.70	1.21	1.41	70MG	C620
C633	#	34.07	-17.49	3.76	34.14	-18.07	4.95	.07	-.59	1.19	1.33	70HA	C633
C648	G	35.15X	-16.87	4.21	35.10*	-17.68	5.47	-.04	-.81 *	1.26	1.50	70HA	C648
C674	G	34.40	-17.50	3.63	34.25	-18.15	4.86	-.15	-.64	1.24	1.40	70HF	C674
C677	G	34.15	-16.32X	2.52	33.96	-16.98*	3.75	-.18	-.66	1.24	1.42	70SC	C677
GRAND MEANS		34.12	-17.67	3.42	34.13	-18.28	4.63	-.02	-.66	1.22	1.38		
SD OF MEANS		.31	.42	.50	.35	.46	.51	.10	.07	.04	.07		
INCLUDED LABS FOR THIS MEAN		47	47	49	48	48	49	49	47	49	49		

SPECTROPHOTOMETRIC CURVES OF COLOR AND
COLOR DIFFERENCE NO. 28 SAMPLES



NBS-114A (REV. 9-78)

U.S. DEPT. OF COMM. BIBLIOGRAPHIC DATA SHEET	1. PUBLICATION OR REPORT NO. MCCA CRP Color 28	2. Gov't. Accession No.	3. Recipient's Accession No.

4. TITLE AND SUBTITLE

Manufacturers Council on Color and Appearance Collaborative Reference Program, Color and Appearance Report No. 28, Color and Color Difference

5. Publication Date

November 9, 1979

6. Performing Organization Code

7. AUTHOR(S)

T.L. Cummings, J. Horlick

8. Performing Organ. Report No.

NBSIR 79-1812

9. PERFORMING ORGANIZATION NAME AND ADDRESS

NATIONAL BUREAU OF STANDARDS
DEPARTMENT OF COMMERCE
WASHINGTON, DC 20234

10. Project/Task/Work Unit No.

7825578

11. Contract/Grant No.

12. SPONSORING ORGANIZATION NAME AND COMPLETE ADDRESS *(Street, City, State, ZIP)*

Collaborative Testing Services, Inc., 9241 Wood Glade Drive, Great Falls, VA 22066; and Manufacturers Council on Color and Appearance.

13. Type of Report & Period Covered

Final

14. Sponsoring Agency Code

15. SUPPLEMENTARY NOTES

☐ Document describes a computer program; SF-185, FIPS Software Summary, is attached.

16. ABSTRACT *(A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)*

Collaborative Reference Programs provide participating laboratories with the means for checking periodically the level and uniformity of their testing in comparison with that of other participating laboratories. An important by-product of the programs is the provision of realistic pictures of the state of the testing art. This is one of the periodic reports showing averages for each participant, within and between laboratory variability, and other information for participants and standards committees.

17. KEY WORDS *(six to twelve entries; alphabetical order; capitalize only the first letter of the first key word unless a proper name; separated by semicolons)*

Collaborative reference program; Color; Laboratory evaluation; Precision; Reference samples; Testing calibration

18. AVAILABILITY

☐ Unlimited

☒ For Official Distribution. Do Not Release to NTIS

☐ Order From Sup. of Doc., U.S. Government Printing Office, Washington, DC 20402, SD Stock No. SN003-003-

☐ Order From National Technical Information Service (NTIS), Springfield, VA. 22161

19. SECURITY CLASS (THIS REPORT)	21. NO. OF PRINTED PAGES
UNCLASSIFIED	24
20. SECURITY CLASS (THIS PAGE)	**22. Price**
UNCLASSIFIED	

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