Designation: D1535 – 14

Standard Practice for Specifying Color by the Munsell System[1]

This standard is issued under the fixed designation D1535; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This practice provides a means of specifying the colors of objects in terms of the Munsell color order system, a system based on the color-perception attributes hue, lightness, and chroma. The practice is limited to opaque objects, such as painted surfaces viewed in daylight by an observer having normal color vision. This practice provides a simple visual method as an alternative to the more precise and more complex method based on spectrophotometry and the CIE system (see Practices E308 and E1164). Provision is made for conversion of CIE data to Munsell notation.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D1729 Practice for Visual Appraisal of Colors and Color Differences of Diffusely-Illuminated Opaque Materials

D3134 Practice for Establishing Color and Gloss Tolerances

E284 Terminology of Appearance

E308 Practice for Computing the Colors of Objects by Using the CIE System

E1164 Practice for Obtaining Spectrometric Data for Object-Color Evaluation

3. Terminology

3.1 Terms and definitions in Terminology E284 are applicable to this practice.

3.2 *Definitions:*

3.2.1 *Munsell notation, n*—(*1*) the Munsell hue, value, and chroma assigned to the color of a specimen by visually comparing the specimen to the chips in the *Munsell Book of Color*;[3] (*2*) a notation in the Munsell color system, derived from luminous reflectance factor *Y* and chromaticity coordinates *x* and *y*, in the CIE system for standard illuminant *C*, by the use of scales defined by the Optical Society of America Subcommittee on the Spacing of the Munsell Colors(**1**).[4]

3.2.1.1 *Discussion*—The Munsell notation is written as a combination of letters and numbers by which the color of an opaque object may be specified with respect to Munsell hue *H*, Munsell value *V*, and Munsell chroma *C*, written in the form *H V/C*.

3.2.2 *hue, n*—the attribute of color perception by means of which a color is judged to be red, orange, yellow, green, blue, purple, or intermediate between adjacent pairs of these, considered in a closed ring (red and purple being an adjacent pair).

3.2.3 *Munsell hue, n*—an attribute of color used in the Munsell color system to indicate the hue of a specimen viewed in daylight.

3.2.3.1 *Discussion*—Two systems of designating Munsell hue are shown in Fig. 1, a letter-number system and an all-number system. The two systems are equivalent, but the letter-number system is preferred, because it requires no prior knowledge or memory of the correspondence of numbers to hues. The hue circle is graduated in steps judged visually to be approximately equal.

3.2.4 *lightness, n*—the attribute of color perception by which a non-self-luminous body is judged to reflect more or less light.

3.2.5 *Munsell value, n*—an attribute of color used in the Munsell color system to indicate the lightness of a specimen viewed in daylight, on a scale extending from 0 for ideal black to 10 for ideal white, in steps that are visually approximately equal in magnitude.

3.2.5.1 *Discussion*—Achromatic or neutral colors are designated *N* followed by the value notation, thus: *N* 5.61/.

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[1] This practice is under the jurisdiction of ASTM Committee E12 on Color and Appearance and is the direct responsibility of Subcommittee E12.07 on Color Order Systems.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from Munsell, 4300 44th Street SE, Grand Rapids, MI 49512, www.munsell.com.

[4] The boldface numbers in parentheses refer to a list of references at the end of this standard.

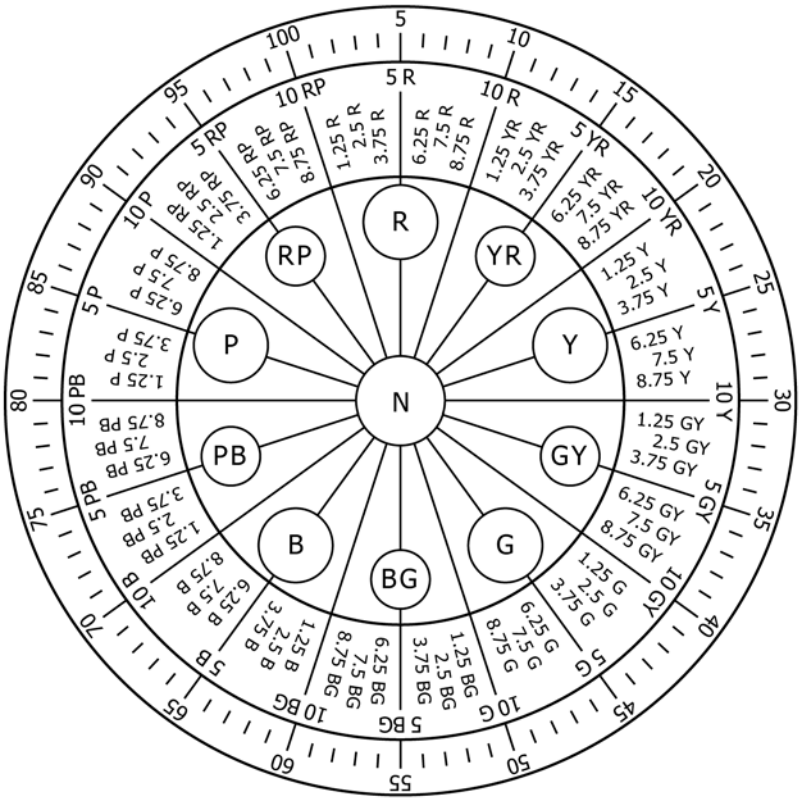

FIG. 1 Designation Systems for Munsell Hue

3.2.6 *chroma, n*—the attribute of color used to indicate the degree of departure of the color from a neutral color of the same lightness.

3.2.7 *Munsell chroma, n*—an attribute of color used in the Munsell color system to indicate the degree of departure of a color from a gray of the same Munsell value, in steps that are visually approximately equal in magnitude.

3.3 *Definitions of Terms Specific to This Standard:*

3.3.1 *Munsell surface-color perception solid, n*—a spatial representation of colors in the form of a cylindrical coordinate system based on the three perceptual attributes: hue, lightness and chroma.

3.3.1.1 *Discussion*—(*1*) This solid (see Fig. 2(**2**)) forms the basis of the Munsell notation in which Munsell hue corresponds to hue, Munsell value corresponds to lightness, and Munsell chroma corresponds to chroma. The central, vertical axis dimension represents neutral colors, ranging from black at the bottom, through a gradation of grays, to white at the top. The lightness of a color perceived as chromatic (not gray) is represented by the distance above the base plane. Hue is represented by the angular position about this axis (see Discussion (2)). Chroma is represented by the perpendicular distance from the central axis. If the observer has normal color vision, is adapted to daylight, and views the specimen illuminated by CIE source *C* or *D*65, against a medium gray to white background, the Munsell value of the specimen correlates well with the observer's perception of the lightness of the color. Under the same conditions, the Munsell hue correlates well with the observer's perception of hue and the Munsell chroma with the perception of chroma.

3.3.1.2 *Discussion*—(*2*) Although the original system proposed by Munsell was a left-handed coordinate system, the system is often represented as a right-handed system because it facilitates comparison to the CIE chromaticity diagram, taken to be right-handed.

3.3.2 *Munsell hue circle, n*—a spatial representation of the Munsell hue sectors on a circle, where the angular spacing represents a uniform scaling of hue; see Fig. 2.

4. Significance and Use

4.1 This practice is used by artists, designers, scientists, engineers, and government regulators, to specify an existing or desired color. It is used in the natural sciences to record the colors of specimens, or identify specimens, such as human complexion, flowers, foliage, soils, and minerals. It is used to specify colors for commerce and for control of color-production processes, when instrumental color measurement is not economical. The Munsell system is widely used for color tolerancing, even when instrumentation is employed (see Practice D3134). It is common practice to have color chips made to illustrate an aim color and the just tolerable deviations from that color in hue, value, and chroma, such a set of chips being called a *Color Tolerance Set*. A color tolerance set exhibits the aim color and color tolerances so that everyone involved in the selection, production, and acceptance of the color can directly perceive the intent of the specification,

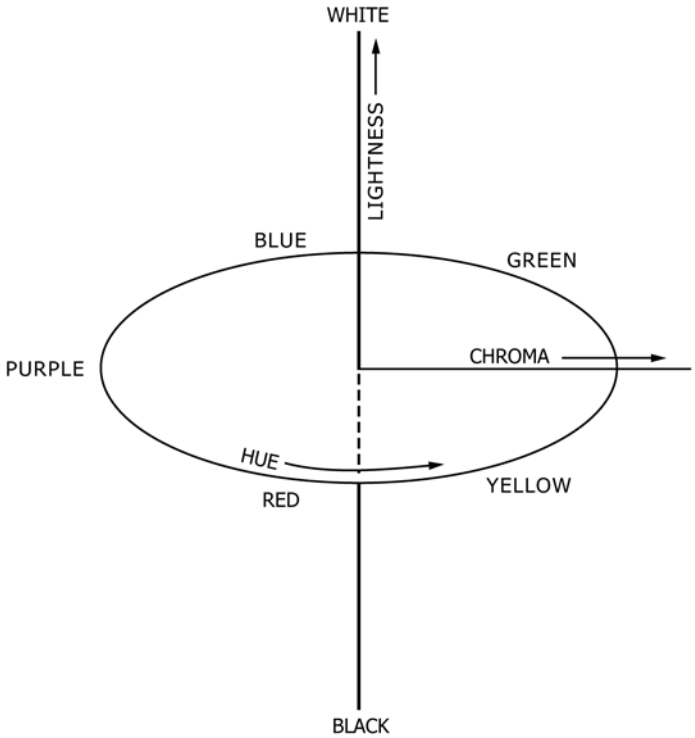

FIG. 2 Dimensions of the Surface-Color-Perception Solid

before bidding to supply the color or starting production. A color tolerance set may be measured to establish instrumental tolerances. Without extensive experience, it may be impossible to visualize the meaning of numbers resulting from color measurement, but by this practice, the numbers can be translated to the Munsell color-order system, which is exemplified by colored chips for visual examination. This color-order system is the basis of the ISCC-NBS Method of Designating Colors and a Dictionary of Color Names, as well as the Universal Color Language, which associates color names, in the English language, with Munsell notations (**3**).

5. Apparatus

5.1 *Munsell Book of Color,* matte or glossy edition.[3]

5.2 *Gray Masks,* with rectangular openings the size of the chips in the *Munsell Book of Color*.

5.3 *Daylight Illuminating Equipment,* as described in Practice D1729.

6. Preparation of Test Specimens

6.1 This practice does not cover the preparation of test specimens. If preparation is necessary, see other ASTM standards covering the appropriate materials or agree among interested parties on what the procedure shall be.

7. Munsell Notation by Visual Means

7.1 *Lighting and Viewing Conditions:*

7.1.1 Specimens must be examined by an observer with normal color vision.

7.1.2 For critical applications, use daylight illuminating equipment as described in Practice D1729.

7.1.3 If the lighting equipment described in Practice D1729 is not available, natural daylight can be used to obtain notations having accuracy adequate for many purposes.

7.2 *Procedure:*

7.2.1 When using daylight illuminating equipment, follow the lighting and viewing recommendations of Practice D1729.

7.2.2 When determining the Munsell notation with natural daylight, select a window through which the sun is not shining. A north window is usually used in the northern hemisphere, and a south window is usually used in the southern hemisphere. Place a working surface at the window so the light reaches the surface from the observer's side, chiefly from the sky, and at angles centering on 45° above the horizontal. Place a canopy of black cloth above the working surface to prevent errors caused by the ceiling or other objects being reflected from the surface of the specimens, or by light other than daylight falling on the work surface. Place the specimen on a neutral medium gray to white background, where it is uniformly illuminated by daylight. View the specimen along a direction just far enough from the normal to avoid reflection of your forehead. Although 45° illumination and perpendicular viewing are recommended by the CIE, converse conditions are equivalent if a black matte surface is placed opposite the observer to minimize the amount of light reflected from the specimen surface.

7.2.3 If both matte and glossy editions of the *Munsell Book of Color* are available, use the one having gloss most like the specimen. Select the two adjacent Munsell constant-hue charts or chips between which the hue of the specimen lies. Place one on each side of the specimen. Cover the specimen and charts with the gray masks so the specimen and one chip from each chart can be seen. Move the masks from chip to chip to find the

chips most like the specimen. The glossy chips are removable. Remove them and place immediately adjacent to the specimen. Estimate, in the following order, the value, the chroma, and the hue, by interpolation or extrapolation of the notations on the chips, as described in 7.2.3.1 to 7.2.3.3. Interchange the positions of the charts, repeat the estimations, and average the results.

7.2.3.1 *Value*—Find the chips between which the value of the specimen lies. Estimate the value of the specimen to the nearest tenth of the one-value-step interval between adjacent value levels and record it, for example, 4.2.

7.2.3.2 *Chroma*—Move the masks to present successive colors of the same chroma and, by interpolation or extrapolation, determine the Munsell chroma. Pay chief attention to the Munsell chips having values nearest that of the specimen and secondary attention to those next nearest. Although all Munsell chips of the same Munsell chroma are intended to appear to have the same perceptual chroma, a slightly different estimate of chroma may be obtained by comparison with the chips of the next value. In such cases, average the estimated Munsell chromas. Note that there are usually two chroma steps between adjacent columns of a chart. Estimate chroma to the nearest fifth of the 2-chroma interval and record it, for example, 6.4.

7.2.3.3 *Hue*—Estimate the hue of the specimen by interpolation between the chips of the nearest Munsell value and chroma in the selected hue charts. Estimate to the nearest fifth of the 2.5-hue steps between adjacent hue charts and record it, for example, 4.5*R*. (The tenth step of one hue sector is the zero of the next. The 10 is used; the zero is not.) If the value and chroma of the specimen do not correspond closely to those of any chip, repeat the interpolation of hue with the next closest pair of chips and record the average or estimate the hue as being closer to that of one or the other of the selected pairs of chips.

7.2.3.4 The Munsell notation for the hue *H*, the value *V*, and the chroma *C*, is written in the form *HV/C*. Using the examples given, the Munsell notation would be written 4.5*R* 4.2/6.4.

8. Munsell Color Notation from CIE Measurement

NOTE 1—The CIE results for the specimen must be based upon color measurements in which the specular component was excluded, and with calculations made using the 1931 2° standard observer and illuminant C.

8.1 *Procedure*—Convert the luminous reflectance, *Y*, and the chromaticity coordinates, *x, y*, of the specimen to Munsell color notation by use of Table 1 and Figs. 3-16.[5] Table 2 contains the numerical data from Ref (**1**) upon which Figs. 3-16 were based.

NOTE 2—For further information concerning Figs. 3-7, Fig. 9, Fig. 11, Fig. 13, Fig. 15 and Fig. 16 and see Newhall, et al. (**1**). For further information concerning Fig. 8 and Fig. 10, see I. Nimeroff (**2**).

NOTE 3—The luminous reflectance in the original reference (**1**) was measured relative to Magnesium Oxide. The luminous reflectance values in Table 2 were changed so that it is relative to the perfect reflecting diffuser.

8.2 In Table 1, find the value, *V*, equivalent to the luminous reflectance, *Y*. Use Figs. 3-16 to estimate hue and chroma for value levels above and below the value found and linearly interpolate the hues and chromas for the desired value level (if those hues and chromas are well defined). If the required value level differs from the nearest level by 0.05 or less, simply use the hue and chroma for the nearest level. If the hue and chroma are ill-defined for the requisite value levels, then do not try to estimate them.

NOTE 4—The hue and chroma are ill-defined if, at the upper value level, the chromaticity (*x*, *y*) lies (*a*) outside the MacAdam limit; or (*b*) within a chroma-hue sector that is incomplete because it is cut off by the MacAdam limit.

8.3 *Munsell Notation of Dark Colors*—If the Munsell value is less than 1.0, use the extension of the Munsell system to very dark colors (**4**). Table 3 contains the numerical data from Ref (**4**) for 40 hues at values 0.8/, 0.6/, 0.4/, and 0.2/ and chromas up to the theoretical pigment limits.

NOTE 5—The luminous reflectance in the original reference (**4**) was measured relative to Magnesium Oxide. The luminous reflectance in Table 3 was changed so that it is relative to the perfect reflecting diffuser.

8.4 *Munsell Notation of Light Colors*—If the Munsell value, V, of the target color is greater than 9, use Fig. 15 and Fig. 16 to estimate the hue and chroma at value 9, and adopt these respective values as the hue and chroma of the target color. This is done because there are no Munsell data on hue or chroma for values greater than 9, and because the hue and chroma values for a given chromaticity (x,y) do not change much between values 8 and 9, so they are extrapolated so as not to change between values 9 and 10.

8.5 Table 1 was derived from the following relationships (**5**):

$$\text{For } Y \le 0.9: V = UY^{W} \tag{1}$$

$$\text{For } Y > 0.9: V = AY^{1/3} - B - C/\left[(DY - E)^{2} + F\right] + G/Y^{H} + J\sin\left(KY^{1/3} + 1\right) + (M/Y)\sin\left[N(Y - 2)\right] - (P/QY)\sin\left[S(Y - T)\right]$$

where:

$A = 2.49268$
$B = 1.5614$
$C = 0.985$
$D = 0.1073$
$E = 3.084$
$F = 7.54$
$G = 0.0133$
$H = 2.3$
$J = 0.0084$
$K = 4.1$
$M = 0.0221$
$N = 0.39$
$P = 0.0037$
$Q = 0.44$
$S = 1.28$
$T = 0.53$
$U = 0.87445$
$W = 0.9967$

[5] Fig. 8, Fig. 10, Fig. 12, Fig. 14, and Fig. 16 are enlargements of the low-chroma areas of Fig. 7, Fig. 9, Fig. 11, Fig. 13, and Fig. 15.

TABLE 1 Munsell Value V for Given Luminous Reflectance Factor *Y*, in Percent, Relative to the Perfect Reflecting Diffuser

Y	V	Y	V	Y	V	Y	V	Y	V
0.01	0.01	0.71	0.62	1.41	1.16	2.11	1.57	2.81	1.90
0.02	0.02	0.72	0.63	1.42	1.17	2.12	1.58	2.82	1.90
0.03	0.03	0.73	0.64	1.43	1.18	2.13	1.58	2.83	1.91
0.04	0.04	0.74	0.65	1.44	1.18	2.14	1.59	2.84	1.91
0.05	0.04	0.75	0.66	1.45	1.19	2.15	1.59	2.85	1.92
0.06	0.05	0.76	0.67	1.46	1.20	2.16	1.60	2.86	1.92
0.07	0.06	0.77	0.67	1.47	1.20	2.17	1.60	2.87	1.92
0.08	0.07	0.78	0.68	1.48	1.21	2.18	1.61	2.88	1.93
0.09	0.08	0.79	0.69	1.49	1.22	2.19	1.61	2.89	1.93
0.10	0.09	0.80	0.70	1.50	1.22	2.20	1.62	2.90	1.94
0.11	0.10	0.81	0.71	1.51	1.23	2.21	1.62	2.91	1.94
0.12	0.11	0.82	0.72	1.52	1.24	2.22	1.63	2.92	1.94
0.13	0.11	0.83	0.73	1.53	1.24	2.23	1.63	2.93	1.95
0.14	0.12	0.84	0.73	1.54	1.25	2.24	1.64	2.94	1.95
0.15	0.13	0.85	0.74	1.55	1.25	2.25	1.64	2.95	1.96
0.16	0.14	0.86	0.75	1.56	1.26	2.26	1.65	2.96	1.96
0.17	0.15	0.87	0.76	1.57	1.27	2.27	1.65	2.97	1.97
0.18	0.16	0.88	0.77	1.58	1.27	2.28	1.66	2.98	1.97
0.19	0.17	0.89	0.78	1.59	1.28	2.29	1.66	2.99	1.97
0.20	0.18	0.90	0.79	1.60	1.29	2.30	1.67	3.00	1.98
0.21	0.18	0.91	0.79	1.61	1.29	2.31	1.67	3.01	1.98
0.22	0.19	0.92	0.80	1.62	1.30	2.32	1.68	3.02	1.99
0.23	0.20	0.93	0.81	1.63	1.30	2.33	1.68	3.03	1.99
0.24	0.21	0.94	0.81	1.64	1.31	2.34	1.69	3.04	1.99
0.25	0.22	0.95	0.82	1.65	1.32	2.35	1.69	3.05	2.00
0.26	0.23	0.96	0.83	1.66	1.32	2.36	1.70	3.06	2.00
0.27	0.24	0.97	0.84	1.67	1.33	2.37	1.70	3.07	2.01
0.28	0.25	0.98	0.85	1.68	1.33	2.38	1.71	3.08	2.01
0.29	0.25	0.99	0.86	1.69	1.34	2.39	1.71	3.09	2.01
0.30	0.26	1.00	0.86	1.70	1.35	2.40	1.72	3.10	2.02
0.31	0.27	1.01	0.87	1.71	1.35	2.41	1.72	3.11	2.02
0.32	0.28	1.02	0.88	1.72	1.36	2.42	1.72	3.12	2.03
0.33	0.29	1.03	0.89	1.73	1.36	2.43	1.73	3.13	2.03
0.34	0.30	1.04	0.90	1.74	1.37	2.44	1.73	3.14	2.03
0.35	0.31	1.05	0.90	1.75	1.38	2.45	1.74	3.15	2.04
0.36	0.32	1.06	0.91	1.76	1.38	2.46	1.74	3.16	2.04
0.37	0.32	1.07	0.92	1.77	1.39	2.47	1.75	3.17	2.05
0.38	0.33	1.08	0.93	1.78	1.39	2.48	1.75	3.18	2.05
0.39	0.34	1.09	0.94	1.79	1.40	2.49	1.76	3.19	2.05
0.40	0.35	1.10	0.94	1.80	1.40	2.50	1.76	3.20	2.06
0.41	0.36	1.11	0.95	1.81	1.41	2.51	1.77	3.21	2.06
0.42	0.37	1.12	0.96	1.82	1.42	2.52	1.77	3.22	2.06
0.43	0.38	1.13	0.97	1.83	1.42	2.53	1.78	3.23	2.07
0.44	0.39	1.14	0.97	1.84	1.43	2.54	1.78	3.24	2.07
0.45	0.39	1.15	0.98	1.85	1.43	2.55	1.78	3.25	2.08
0.46	0.40	1.16	0.99	1.86	1.44	2.56	1.79	3.26	2.08
0.47	0.41	1.17	1.00	1.87	1.44	2.57	1.79	3.27	2.08
0.48	0.42	1.18	1.00	1.88	1.45	2.58	1.80	3.28	2.09
0.49	0.43	1.19	1.01	1.89	1.45	2.59	1.80	3.29	2.09
0.50	0.44	1.20	1.02	1.90	1.46	2.60	1.81	3.30	2.10
0.51	0.45	1.21	1.03	1.91	1.47	2.61	1.81	3.31	2.10
0.52	0.46	1.22	1.03	1.92	1.47	2.62	1.82	3.32	2.10
0.53	0.46	1.23	1.04	1.93	1.48	2.63	1.82	3.33	2.11
0.54	0.47	1.24	1.05	1.94	1.48	2.64	1.82	3.34	2.11
0.55	0.48	1.25	1.05	1.95	1.49	2.65	1.83	3.35	2.11
0.56	0.49	1.26	1.06	1.96	1.49	2.66	1.83	3.36	2.12
0.57	0.50	1.27	1.07	1.97	1.50	2.67	1.84	3.37	2.12
0.58	0.51	1.28	1.08	1.98	1.50	2.68	1.84	3.38	2.13
0.59	0.52	1.29	1.08	1.99	1.51	2.69	1.85	3.39	2.13
0.60	0.53	1.30	1.09	2.00	1.51	2.70	1.85	3.40	2.13
0.61	0.53	1.31	1.10	2.01	1.52	2.71	1.86	3.41	2.14
0.62	0.54	1.32	1.10	2.02	1.53	2.72	1.86	3.42	2.14
0.63	0.55	1.33	1.11	2.03	1.53	2.73	1.86	3.43	2.14
0.64	0.56	1.34	1.12	2.04	1.54	2.74	1.87	3.44	2.15
0.65	0.57	1.35	1.12	2.05	1.54	2.75	1.87	3.45	2.15
0.66	0.58	1.36	1.13	2.06	1.55	2.76	1.88	3.46	2.15
0.67	0.59	1.37	1.14	2.07	1.55	2.77	1.88	3.47	2.16
0.68	0.60	1.38	1.14	2.08	1.56	2.78	1.89	3.48	2.16
0.69	0.60	1.39	1.15	2.09	1.56	2.79	1.89	3.49	2.17
0.70	0.61	1.40	1.16	2.10	1.57	2.80	1.89	3.50	2.17
3.51	2.17	4.21	2.41	4.91	2.62	5.61	2.81	6.31	2.98
3.52	2.18	4.22	2.41	4.92	2.62	5.62	2.81	6.32	2.98
3.53	2.18	4.23	2.42	4.93	2.62	5.63	2.81	6.33	2.98
3.54	2.18	4.24	2.42	4.94	2.63	5.64	2.81	6.34	2.99
3.55	2.19	4.25	2.42	4.95	2.63	5.65	2.82	6.35	2.99

TABLE 1 *Continued*

Y	V	Y	V	Y	V	Y	V	Y	V
3.56	2.19	4.26	2.43	4.96	2.63	5.66	2.82	6.36	2.99
3.57	2.19	4.27	2.43	4.97	2.64	5.67	2.82	6.37	2.99
3.58	2.20	4.28	2.43	4.98	2.64	5.68	2.83	6.38	3.00
3.59	2.20	4.29	2.44	4.99	2.64	5.69	2.83	6.39	3.00
3.60	2.21	4.30	2.44	5.00	2.64	5.70	2.83	6.40	3.00
3.61	2.21	4.31	2.44	5.01	2.65	5.71	2.83	6.41	3.00
3.62	2.21	4.32	2.44	5.02	2.65	5.72	2.84	6.42	3.01
3.63	2.22	4.33	2.45	5.03	2.65	5.73	2.84	6.43	3.01
3.64	2.22	4.34	2.45	5.04	2.66	5.74	2.84	6.44	3.01
3.65	2.22	4.35	2.45	5.05	2.66	5.75	2.84	6.45	3.01
3.66	2.23	4.36	2.46	5.06	2.66	5.76	2.85	6.46	3.01
3.67	2.23	4.37	2.46	5.07	2.66	5.77	2.85	6.47	3.02
3.68	2.23	4.38	2.46	5.08	2.67	5.78	2.85	6.48	3.02
3.69	2.24	4.39	2.47	5.09	2.67	5.79	2.85	6.49	3.02
3.70	2.24	4.40	2.47	5.10	2.67	5.80	2.86	6.50	3.02
3.71	2.24	4.41	2.47	5.11	2.67	5.81	2.86	6.51	3.03
3.72	2.25	4.42	2.48	5.12	2.68	5.82	2.86	6.52	3.03
3.73	2.25	4.43	2.48	5.13	2.68	5.83	2.86	6.53	3.03
3.74	2.25	4.44	2.48	5.14	2.68	5.84	2.87	6.54	3.03
3.75	2.26	4.45	2.48	5.15	2.69	5.85	2.87	6.55	3.04
3.76	2.26	4.46	2.49	5.16	2.69	5.86	2.87	6.56	3.04
3.77	2.26	4.47	2.49	5.17	2.69	5.87	2.87	6.57	3.04
3.78	2.27	4.48	2.49	5.18	2.69	5.88	2.88	6.58	3.04
3.79	2.27	4.49	2.50	5.19	2.70	5.89	2.88	6.59	3.05
3.80	2.28	4.50	2.50	5.20	2.70	5.90	2.88	6.60	3.05
3.81	2.28	4.51	2.50	5.21	2.70	5.91	2.88	6.61	3.05
3.82	2.28	4.52	2.51	5.22	2.70	5.92	2.89	6.62	3.05
3.83	2.29	4.53	2.51	5.23	2.71	5.93	2.89	6.63	3.05
3.84	2.29	4.54	2.51	5.24	2.71	5.94	2.89	6.64	3.06
3.85	2.29	4.55	2.51	5.25	2.71	5.95	2.89	6.65	3.06
3.86	2.30	4.56	2.52	5.26	2.72	5.96	2.90	6.66	3.06
3.87	2.30	4.57	2.52	5.27	2.72	5.97	2.90	6.67	3.06
3.88	2.30	4.58	2.52	5.28	2.72	5.98	2.90	6.68	3.07
3.89	2.31	4.59	2.53	5.29	2.72	5.99	2.90	6.69	3.07
3.90	2.31	4.60	2.53	5.30	2.73	6.00	2.91	6.70	3.07
3.91	2.31	4.61	2.53	5.31	2.73	6.01	2.91	6.71	3.07
3.92	2.32	4.62	2.54	5.32	2.73	6.02	2.91	6.72	3.07
3.93	2.32	4.63	2.54	5.33	2.73	6.03	2.91	6.73	3.08
3.94	2.32	4.64	2.54	5.34	2.74	6.04	2.91	6.74	3.08
3.95	2.33	4.65	2.54	5.35	2.74	6.05	2.92	6.75	3.08
3.96	2.33	4.66	2.55	5.36	2.74	6.06	2.92	6.76	3.08
3.97	2.33	4.67	2.55	5.37	2.74	6.07	2.92	6.77	3.09
3.98	2.34	4.68	2.55	5.38	2.75	6.08	2.92	6.78	3.09
3.99	2.34	4.69	2.56	5.39	2.75	6.09	2.93	6.79	3.09
4.00	2.34	4.70	2.56	5.40	2.75	6.10	2.93	6.80	3.09
4.01	2.35	4.71	2.56	5.41	2.76	6.11	2.93	6.81	3.10
4.02	2.35	4.72	2.56	5.42	2.76	6.12	2.93	6.82	3.10
4.03	2.35	4.73	2.57	5.43	2.76	6.13	2.94	6.83	3.10
4.04	2.36	4.74	2.57	5.44	2.76	6.14	2.94	6.84	3.10
4.05	2.36	4.75	2.57	5.45	2.77	6.15	2.94	6.85	3.10
4.06	2.36	4.76	2.58	5.46	2.77	6.16	2.94	6.86	3.11
4.07	2.37	4.77	2.58	5.47	2.77	6.17	2.95	6.87	3.11
4.08	2.37	4.78	2.58	5.48	2.77	6.18	2.95	6.88	3.11
4.09	2.37	4.79	2.58	5.49	2.78	6.19	2.95	6.89	3.11
4.10	2.37	4.80	2.59	5.50	2.78	6.20	2.95	6.90	3.12
4.11	2.38	4.81	2.59	5.51	2.78	6.21	2.96	6.91	3.12
4.12	2.38	4.82	2.59	5.52	2.78	6.22	2.96	6.92	3.12
4.13	2.38	4.83	2.60	5.53	2.79	6.23	2.96	6.93	3.12
4.14	2.39	4.84	2.60	5.54	2.79	6.24	2.96	6.94	3.12
4.15	2.39	4.85	2.60	5.55	2.79	6.25	2.97	6.95	3.13
4.16	2.39	4.86	2.61	5.56	2.79	6.26	2.97	6.96	3.13
4.17	2.40	4.87	2.61	5.57	2.80	6.27	2.97	6.97	3.13
4.18	2.40	4.88	2.61	5.58	2.80	6.28	2.97	6.98	3.13
4.19	2.40	4.89	2.61	5.59	2.80	6.29	2.97	6.99	3.14
4.20	2.41	4.90	2.62	5.60	2.80	6.30	2.98	7.00	3.14
7.01	3.14	7.71	3.29	8.41	3.43	9.11	3.56	9.81	3.69
7.02	3.14	7.72	3.29	8.42	3.43	9.12	3.56	9.82	3.69
7.03	3.14	7.73	3.29	8.43	3.43	9.13	3.57	9.83	3.69
7.04	3.15	7.74	3.30	8.44	3.44	9.14	3.57	9.84	3.69
7.05	3.15	7.75	3.30	8.45	3.44	9.15	3.57	9.85	3.70
7.06	3.15	7.76	3.30	8.46	3.44	9.16	3.57	9.86	3.70
7.07	3.15	7.77	3.30	8.47	3.44	9.17	3.57	9.87	3.70
7.08	3.16	7.78	3.30	8.48	3.44	9.18	3.58	9.88	3.70
7.09	3.16	7.79	3.31	8.49	3.45	9.19	3.58	9.89	3.70
7.10	3.16	7.80	3.31	8.50	3.45	9.20	3.58	9.90	3.70

TABLE 1 *Continued*

Y	V	Y	V	Y	V	Y	V	Y	V
7.11	3.16	7.81	3.31	8.51	3.45	9.21	3.58	9.91	3.71
7.12	3.16	7.82	3.31	8.52	3.45	9.22	3.58	9.92	3.71
7.13	3.17	7.83	3.31	8.53	3.45	9.23	3.59	9.93	3.71
7.14	3.17	7.84	3.32	8.54	3.46	9.24	3.59	9.94	3.71
7.15	3.17	7.85	3.32	8.55	3.46	9.25	3.59	9.95	3.71
7.16	3.17	7.86	3.32	8.56	3.46	9.26	3.59	9.96	3.71
7.17	3.18	7.87	3.32	8.57	3.46	9.27	3.59	9.97	3.72
7.18	3.18	7.88	3.32	8.58	3.46	9.28	3.59	9.98	3.72
7.19	3.18	7.89	3.33	8.59	3.47	9.29	3.60	9.99	3.72
7.20	3.18	7.90	3.33	8.60	3.47	9.30	3.60	10.00	3.72
7.21	3.18	7.91	3.33	8.61	3.47	9.31	3.60	10.01	3.72
7.22	3.19	7.92	3.33	8.62	3.47	9.32	3.60	10.02	3.72
7.23	3.19	7.93	3.34	8.63	3.47	9.33	3.60	10.03	3.73
7.24	3.19	7.94	3.34	8.64	3.48	9.34	3.60	10.04	3.73
7.25	3.19	7.95	3.34	8.65	3.48	9.35	3.61	10.05	3.73
7.26	3.19	7.96	3.34	8.66	3.48	9.36	3.61	10.06	3.73
7.27	3.20	7.97	3.34	8.67	3.48	9.37	3.61	10.07	3.73
7.28	3.20	7.98	3.35	8.68	3.48	9.38	3.61	10.08	3.73
7.29	3.20	7.99	3.35	8.69	3.48	9.39	3.61	10.09	3.74
7.30	3.20	8.00	3.35	8.70	3.49	9.40	3.62	10.10	3.74
7.31	3.21	8.01	3.35	8.71	3.49	9.41	3.62	10.11	3.74
7.32	3.21	8.02	3.35	8.72	3.49	9.42	3.62	10.12	3.74
7.33	3.21	8.03	3.36	8.73	3.49	9.43	3.62	10.13	3.74
7.34	3.21	8.04	3.36	8.74	3.49	9.44	3.62	10.14	3.74
7.35	3.21	8.05	3.36	8.75	3.50	9.45	3.62	10.15	3.75
7.36	3.22	8.06	3.36	8.76	3.50	9.46	3.63	10.16	3.75
7.37	3.22	8.07	3.36	8.77	3.50	9.47	3.63	10.17	3.75
7.38	3.22	8.08	3.37	8.78	3.50	9.48	3.63	10.18	3.75
7.39	3.22	8.09	3.37	8.79	3.50	9.49	3.63	10.19	3.75
7.40	3.22	8.10	3.37	8.80	3.51	9.50	3.63	10.20	3.76
7.41	3.23	8.11	3.37	8.81	3.51	9.51	3.64	10.21	3.76
7.42	3.23	8.12	3.37	8.82	3.51	9.52	3.64	10.22	3.76
7.43	3.23	8.13	3.38	8.83	3.51	9.53	3.64	10.23	3.76
7.44	3.23	8.14	3.38	8.84	3.51	9.54	3.64	10.24	3.76
7.45	3.24	8.15	3.38	8.85	3.51	9.55	3.64	10.25	3.76
7.46	3.24	8.16	3.38	8.86	3.52	9.56	3.64	10.26	3.77
7.47	3.24	8.17	3.38	8.87	3.52	9.57	3.65	10.27	3.77
7.48	3.24	8.18	3.39	8.88	3.52	9.58	3.65	10.28	3.77
7.49	3.24	8.19	3.39	8.89	3.52	8.59	3.65	10.29	3.77
7.50	3.25	8.20	3.39	8.90	3.52	9.60	3.65	10.30	3.77
7.51	3.25	8.21	3.39	8.91	3.53	9.61	3.65	10.31	3.77
7.52	3.25	8.22	3.39	8.92	3.53	9.62	3.65	10.32	3.78
7.53	3.25	8.23	3.40	8.93	3.53	9.63	3.66	10.33	3.78
7.54	3.25	8.24	3.40	8.94	3.53	9.64	3.66	10.34	3.78
7.55	3.26	8.25	3.40	8.95	3.53	9.65	3.66	10.35	3.78
7.56	3.26	8.26	3.40	8.96	3.54	9.66	3.66	10.36	3.78
7.57	3.26	8.27	3.40	8.97	3.54	9.67	3.66	10.37	3.78
7.58	3.26	8.28	3.41	8.98	3.54	9.68	3.67	10.38	3.79
7.59	3.26	8.29	3.41	8.99	3.54	9.69	3.67	10.39	3.79
7.60	3.27	8.30	3.41	9.00	3.54	9.70	3.67	10.40	3.79
7.61	3.27	8.31	3.41	9.01	3.54	9.71	3.67	10.41	3.79
7.62	3.27	8.32	3.41	9.02	3.55	9.72	3.67	10.42	3.79
7.63	3.27	8.33	3.41	9.03	3.55	9.73	3.67	10.43	3.79
7.64	3.28	8.34	3.42	9.04	3.55	9.74	3.68	10.44	3.80
7.65	3.28	8.35	3.42	9.05	3.55	9.75	3.68	10.45	3.80
7.66	3.28	8.36	3.42	9.06	3.55	9.76	3.68	10.46	3.80
7.67	3.28	8.37	3.42	9.07	3.56	9.77	3.68	10.47	3.80
7.68	3.28	8.38	3.42	9.08	3.56	9.78	3.68	10.48	3.80
7.69	3.29	8.39	3.43	9.09	3.56	9.79	3.68	10.49	3.80
7.70	3.29	8.40	3.43	9.10	3.56	9.80	3.69	10.50	3.81
10.51	3.81	11.21	3.92	11.91	4.03	12.61	4.14	13.31	4.24
10.52	3.81	11.22	3.92	11.92	4.03	12.62	4.14	13.32	4.24
10.53	3.81	11.23	3.92	11.93	4.03	12.63	4.14	13.33	4.24
10.54	3.81	11.24	3.93	11.94	4.04	12.64	4.14	13.34	4.25
10.55	3.81	11.25	3.93	11.95	4.04	12.65	4.14	13.35	4.25
10.56	3.82	11.26	3.93	11.96	4.04	12.66	4.15	13.36	4.25
10.57	3.82	11.27	3.93	11.97	4.04	12.67	4.15	13.37	4.25
10.58	3.82	11.28	3.93	11.98	4.04	12.68	4.15	13.38	4.25
10.59	3.82	11.29	3.93	11.99	4.04	12.69	4.15	13.39	4.25
10.60	3.82	11.30	3.94	12.00	4.05	12.70	4.15	13.40	4.25
10.61	3.82	11.31	3.94	12.01	4.05	12.71	4.15	13.41	4.26
10.62	3.83	11.32	3.94	12.02	4.05	12.72	4.15	13.42	4.26
10.63	3.83	11.33	3.94	12.03	4.05	12.73	4.16	13.43	4.26
10.64	3.83	11.34	3.94	12.04	4.05	12.74	4.16	13.44	4.26
10.65	3.83	11.35	3.94	12.05	4.05	12.75	4.16	13.45	4.26

TABLE 1 *Continued*

Y	V	Y	V	Y	V	Y	V	Y	V
10.66	3.83	11.36	3.95	12.06	4.05	12.76	4.16	13.46	4.26
10.67	3.83	11.37	3.95	12.07	4.06	12.77	4.16	13.47	4.26
10.68	3.84	11.38	3.95	12.08	4.06	12.78	4.16	13.48	4.27
10.69	3.84	11.39	3.95	12.09	4.06	12.79	4.16	13.49	4.27
10.70	3.84	11.40	3.95	12.10	4.06	12.80	4.17	13.50	4.27
10.71	3.84	11.41	3.95	12.11	4.06	12.81	4.17	13.51	4.27
10.72	3.84	11.42	3.95	12.12	4.06	12.82	4.17	13.52	4.27
10.73	3.84	11.43	3.96	12.13	4.07	12.83	4.17	13.53	4.27
10.74	3.85	11.44	3.96	12.14	4.07	12.84	4.17	13.54	4.27
10.75	3.85	11.45	3.96	12.15	4.07	12.85	4.17	13.55	4.28
10.76	3.85	11.46	3.96	12.16	4.07	12.86	4.18	13.56	4.28
10.77	3.85	11.47	3.96	12.17	4.07	12.87	4.18	13.57	4.28
10.78	3.85	11.48	3.96	12.18	4.07	12.88	4.18	13.58	4.28
10.79	3.85	11.49	3.97	12.19	4.07	12.89	4.18	13.59	4.28
10.80	3.85	11.50	3.97	12.20	4.08	12.90	4.18	13.60	4.28
10.81	3.86	11.51	3.97	12.21	4.08	12.91	4.18	13.61	4.28
10.82	3.86	11.52	3.97	12.22	4.08	12.92	4.18	13.62	4.29
10.83	3.86	11.53	3.97	12.23	4.08	12.93	4.19	13.63	4.29
10.84	3.86	11.54	3.97	12.24	4.08	12.94	4.19	13.64	4.29
10.85	3.86	11.55	3.98	12.25	4.08	12.95	4.19	13.65	4.29
10.86	3.86	11.56	3.98	12.26	4.09	12.96	4.19	13.66	4.29
10.87	3.87	11.57	3.98	12.27	4.09	12.97	4.19	13.67	4.29
10.88	3.87	11.58	3.98	12.28	4.09	12.98	4.19	13.68	4.29
10.89	3.87	11.59	3.98	12.29	4.09	12.99	4.19	13.69	4.30
10.90	3.87	11.60	3.98	12.30	4.09	13.00	4.20	13.70	4.30
10.91	3.87	11.61	3.98	12.31	4.09	13.01	4.20	13.71	4.30
10.92	3.87	11.62	3.99	12.32	4.09	13.02	4.20	13.72	4.30
10.93	3.88	11.63	3.99	12.33	4.10	13.03	4.20	13.73	4.30
10.94	3.88	11.64	3.99	12.34	4.10	13.04	4.20	13.74	4.30
10.95	3.88	11.65	3.99	12.35	4.10	13.05	4.20	13.75	4.30
10.96	3.88	11.66	3.99	12.36	4.10	13.06	4.20	13.76	4.31
10.97	3.88	11.67	3.99	12.37	4.10	13.07	4.21	13.77	4.31
10.98	3.88	11.68	4.00	12.38	4.10	13.08	4.21	13.78	4.31
10.99	3.89	11.69	4.00	12.39	4.10	13.09	4.21	13.79	4.31
11.00	3.89	11.70	4.00	12.40	4.11	13.10	4.21	13.80	4.31
11.01	3.89	11.71	4.00	12.41	4.11	13.11	4.21	13.81	4.31
11.02	3.89	11.72	4.00	12.42	4.11	13.12	4.21	13.82	4.31
11.03	3.89	11.73	4.00	12.43	4.11	13.13	4.21	13.83	4.32
11.04	3.89	11.74	4.00	12.44	4.11	13.14	4.22	13.84	4.32
11.05	3.90	11.75	4.01	12.45	4.11	13.15	4.22	13.85	4.32
11.06	3.90	11.76	4.01	12.46	4.12	13.16	4.22	13.86	4.32
11.07	3.90	11.77	4.01	12.47	4.12	13.17	4.22	13.87	4.32
11.08	3.90	11.78	4.01	12.48	4.12	13.18	4.22	13.88	4.32
11.09	3.90	11.79	4.01	12.49	4.12	13.19	4.22	13.89	4.32
11.10	3.90	11.80	4.01	12.50	4.12	13.20	4.22	13.90	4.32
11.11	3.91	11.81	4.02	12.51	4.12	13.21	4.23	13.91	4.33
11.12	3.91	11.82	4.02	12.52	4.12	13.22	4.23	13.92	4.33
11.13	3.91	11.83	4.02	12.53	4.13	13.23	4.23	13.93	4.33
11.14	3.91	11.84	4.02	12.54	4.13	13.24	4.23	13.94	4.33
11.15	3.91	11.85	4.02	12.55	4.13	13.25	4.23	13.95	4.33
11.16	3.91	11.86	4.02	12.56	4.13	13.26	4.23	13.96	4.33
11.17	3.91	11.87	4.03	12.57	4.13	13.27	4.24	13.97	4.33
11.18	3.92	11.88	4.03	12.58	4.13	13.28	4.24	13.98	4.34
11.19	3.92	11.89	4.03	12.59	4.13	13.29	4.24	13.99	4.34
11.20	3.92	11.90	4.03	12.60	4.14	13.30	4.24	14.00	4.34
14.01	4.34	14.71	4.44	15.41	4.53	16.11	4.62	16.81	4.71
14.02	4.34	14.72	4.44	15.42	4.53	16.12	4.62	16.82	4.71
14.03	4.34	14.73	4.44	15.43	4.53	16.13	4.62	16.83	4.71
14.04	4.34	14.74	4.44	15.44	4.53	16.14	4.62	16.84	4.71
14.05	4.35	14.75	4.44	15.45	4.53	16.15	4.62	16.85	4.71
14.06	4.35	14.76	4.44	15.46	4.54	16.16	4.63	16.86	4.71
14.07	4.35	14.77	4.44	15.47	4.54	16.17	4.63	16.87	4.72
14.08	4.35	14.78	4.45	15.48	4.54	16.18	4.63	16.88	4.72
14.09	4.35	14.79	4.45	15.49	4.54	16.19	4.63	16.89	4.72
14.10	4.35	14.80	4.45	15.50	4.54	16.20	4.63	16.90	4.72
14.11	4.35	14.81	4.45	15.51	4.54	16.21	4.63	16.91	4.72
14.12	4.36	14.82	4.45	15.52	4.54	16.22	4.63	16.92	4.72
14.13	4.36	14.83	4.45	15.53	4.54	16.23	4.64	16.93	4.72
14.14	4.36	14.84	4.45	15.54	4.55	16.24	4.64	16.94	4.72
14.15	4.36	14.85	4.46	15.55	4.55	16.25	4.64	16.95	4.73
14.16	4.36	14.86	4.46	15.56	4.55	16.26	4.64	16.96	4.73
14.17	4.36	14.87	4.46	15.57	4.55	16.27	4.64	16.97	4.73
14.18	4.36	14.88	4.46	15.58	4.55	16.28	4.64	16.98	4.73
14.19	4.37	14.89	4.46	15.59	4.55	16.29	4.64	16.99	4.73
14.20	4.37	14.90	4.46	15.60	4.55	16.30	4.64	17.00	4.73

TABLE 1 *Continued*

Y	V	Y	V	Y	V	Y	V	Y	V
14.21	4.37	14.91	4.46	15.61	4.56	16.31	4.65	17.01	4.73
14.22	4.37	14.92	4.46	15.62	4.56	16.32	4.65	17.02	4.73
14.23	4.37	14.93	4.47	15.63	4.56	16.33	4.65	17.03	4.74
14.24	4.37	14.94	4.47	15.64	4.56	16.34	4.65	17.04	4.74
14.25	4.37	14.95	4.47	15.65	4.56	16.35	4.65	17.05	4.74
14.26	4.37	14.96	4.47	15.66	4.56	16.36	4.65	17.06	4.74
14.27	4.38	14.97	4.47	15.67	4.56	16.37	4.65	17.07	4.74
14.28	4.38	14.98	4.47	15.68	4.56	16.38	4.65	17.08	4.74
14.29	4.38	14.99	4.47	15.69	4.57	16.39	4.66	17.09	4.74
14.30	4.38	15.00	4.48	15.70	4.57	16.40	4.66	17.10	4.74
14.31	4.38	15.01	4.48	15.71	4.57	16.41	4.66	17.11	4.75
14.32	4.38	15.02	4.48	15.72	4.57	16.42	4.66	17.12	4.75
14.33	4.38	15.03	4.48	15.73	4.57	16.43	4.66	17.13	4.75
14.34	4.39	15.04	4.48	15.74	4.57	16.44	4.66	17.14	4.75
14.35	4.39	15.05	4.48	15.75	4.57	16.45	4.66	17.15	4.75
14.36	4.39	15.06	4.48	15.76	4.57	16.46	4.66	17.16	4.75
14.37	4.39	15.07	4.48	15.77	4.58	16.47	4.67	17.17	4.75
14.38	4.39	15.08	4.49	15.78	4.58	16.48	4.67	17.18	4.75
14.39	4.39	15.09	4.49	15.79	4.58	16.49	4.67	17.19	4.76
14.40	4.39	15.10	4.49	15.80	4.58	16.50	4.67	17.20	4.76
14.41	4.40	15.11	4.49	15.81	4.58	16.51	4.67	17.21	4.76
14.42	4.40	15.12	4.49	15.82	4.58	16.52	4.67	17.22	4.76
14.43	4.40	15.13	4.49	15.83	4.58	16.53	4.67	17.23	4.76
14.44	4.40	15.14	4.49	15.84	4.59	16.54	4.67	17.24	4.76
14.45	4.40	15.15	4.50	15.85	4.59	16.55	4.68	17.25	4.76
14.46	4.40	15.16	4.50	15.86	4.59	16.56	4.68	17.26	4.76
14.47	4.40	15.17	4.50	15.87	4.59	16.57	4.68	17.27	4.77
14.48	4.41	15.18	4.50	15.88	4.59	16.58	4.68	17.28	4.77
14.49	4.41	15.19	4.50	15.89	4.59	16.59	4.68	17.29	4.77
14.50	4.41	15.20	4.50	15.90	4.59	16.60	4.68	17.30	4.77
14.51	4.41	15.21	4.50	15.91	4.59	16.61	4.68	17.31	4.77
14.52	4.41	15.22	4.50	15.92	4.60	16.62	4.68	17.32	4.77
14.53	4.41	15.23	4.51	15.93	4.60	16.63	4.69	17.33	4.77
14.54	4.41	15.24	4.51	15.94	4.60	16.64	4.69	17.34	4.77
14.55	4.41	15.25	4.51	15.95	4.60	16.65	4.69	17.35	4.78
14.56	4.42	15.26	4.51	15.96	4.60	16.66	4.69	17.36	4.78
14.57	4.42	15.27	4.51	15.97	4.60	16.67	4.69	17.37	4.78
14.58	4.42	15.28	4.51	15.98	4.60	16.68	4.69	17.38	4.78
14.59	4.42	15.29	4.51	15.99	4.60	16.69	4.69	17.39	4.78
14.60	4.42	15.30	4.51	16.00	4.61	16.70	4.69	17.40	4.78
14.61	4.42	15.31	4.52	16.01	4.61	16.71	4.70	17.41	4.78
14.62	4.42	15.32	4.52	16.02	4.61	16.72	4.70	17.42	4.78
14.63	4.43	15.33	4.52	16.03	4.61	16.73	4.70	17.43	4.79
14.64	4.43	15.34	4.52	16.04	4.61	16.74	4.70	17.44	4.79
14.65	4.43	15.35	4.52	16.05	4.61	16.75	4.70	17.45	4.79
14.66	4.43	15.36	4.52	16.06	4.61	16.76	4.70	17.46	4.79
14.67	4.43	15.37	4.52	16.07	4.61	16.77	4.70	17.47	4.79
14.68	4.43	15.38	4.53	16.08	4.62	16.78	4.70	17.48	4.79
14.69	4.43	15.39	4.53	16.09	4.62	16.79	4.71	17.49	4.79
14.70	4.43	15.40	4.53	16.10	4.62	16.80	4.71	17.50	4.79
17.51	4.79	18.21	4.88	18.91	4.96	19.61	5.04	20.31	5.12
17.52	4.80	18.22	4.88	18.92	4.96	19.62	5.04	20.32	5.12
17.53	4.80	18.23	4.88	18.93	4.96	19.63	5.04	20.33	5.12
17.54	4.80	18.24	4.88	18.94	4.96	19.64	5.04	20.34	5.12
17.55	4.80	18.25	4.88	18.95	4.97	19.65	5.05	20.35	5.12
17.56	4.80	18.26	4.89	18.96	4.97	19.66	5.05	20.36	5.12
17.57	4.80	18.27	4.89	18.97	4.97	19.67	5.05	20.37	5.13
17.58	4.80	18.28	4.89	18.98	4.97	19.68	5.05	20.38	5.13
17.59	4.80	18.29	4.89	18.99	4.97	19.69	5.05	20.39	5.13
17.60	4.81	18.30	4.89	19.00	4.97	19.70	5.05	20.40	5.13
17.61	4.81	18.31	4.89	19.01	4.97	19.71	5.05	20.41	5.13
17.62	4.81	18.32	4.89	19.02	4.97	19.72	5.05	20.42	5.13
17.63	4.81	18.33	4.89	19.03	4.98	19.73	5.05	20.43	5.13
17.64	4.81	18.34	4.89	19.04	4.98	19.74	5.06	20.44	5.13
17.65	4.81	18.35	4.90	19.05	4.98	19.75	5.06	20.45	5.13
17.66	4.81	18.36	4.90	19.06	4.98	19.76	5.06	20.46	5.14
17.67	4.81	18.37	4.90	19.07	4.98	19.77	5.06	20.47	5.14
17.68	4.82	18.38	4.90	19.08	4.98	19.78	5.06	20.48	5.14
17.69	4.82	18.39	4.90	19.09	4.98	19.79	5.06	20.49	5.14
17.70	4.82	18.40	4.90	19.10	4.98	19.80	5.06	20.50	5.14
17.71	4.82	18.41	4.90	19.11	4.98	19.81	5.06	20.51	5.14
17.72	4.82	18.42	4.90	19.12	4.99	19.82	5.07	20.52	5.14
17.73	4.82	18.43	4.91	19.13	4.99	19.83	5.07	20.53	5.14
17.74	4.82	18.44	4.91	19.14	4.99	19.84	5.07	20.54	5.14
17.75	4.82	18.45	4.91	19.15	4.99	19.85	5.07	20.55	5.15

TABLE 1 *Continued*

Y	V	Y	V	Y	V	Y	V	Y	V
17.76	4.83	18.46	4.91	19.16	4.99	19.86	5.07	20.56	5.15
17.77	4.83	18.47	4.91	19.17	4.99	19.87	5.07	20.57	5.15
17.78	4.83	18.48	4.91	19.18	4.99	19.88	5.07	20.58	5.15
17.79	4.83	18.49	4.91	19.19	4.99	19.89	5.07	20.59	5.15
17.80	4.83	18.50	4.91	19.20	4.99	19.90	5.07	20.60	5.15
17.81	4.83	18.51	4.91	19.21	5.00	19.91	5.08	20.61	5.15
17.82	4.83	18.52	4.92	19.22	5.00	19.92	5.08	20.62	5.15
17.83	4.83	18.53	4.92	19.23	5.00	19.93	5.08	20.63	5.15
17.84	4.83	18.54	4.92	19.24	5.00	19.94	5.08	20.64	5.16
17.85	4.84	18.55	4.92	19.25	5.00	19.95	5.08	20.65	5.16
17.86	4.84	18.56	4.92	19.26	5.00	19.96	5.08	20.66	5.16
17.87	4.84	18.57	4.92	19.27	5.00	19.97	5.08	20.67	5.16
17.88	4.84	18.58	4.92	19.28	5.00	19.98	5.08	20.68	5.16
17.89	4.84	18.59	4.92	19.29	5.01	19.99	5.08	20.69	5.16
17.90	4.84	18.60	4.93	19.30	5.01	20.00	5.09	20.70	5.16
17.91	4.84	18.61	4.93	19.31	5.01	20.01	5.09	20.71	5.16
17.92	4.84	18.62	4.93	19.32	5.01	20.02	5.09	20.72	5.16
17.93	4.85	18.63	4.93	19.33	5.01	20.03	5.09	20.73	5.17
17.94	4.85	18.64	4.93	19.34	5.01	20.04	5.09	20.74	5.17
17.95	4.85	18.65	4.93	19.35	5.01	20.05	5.09	20.75	5.17
17.96	4.85	18.66	4.93	19.36	5.01	20.06	5.09	20.76	5.17
17.97	4.85	18.67	4.93	19.37	5.01	20.07	5.09	20.77	5.17
17.98	4.85	18.68	4.93	19.38	5.02	20.08	5.09	20.78	5.17
17.99	4.85	18.69	4.94	19.39	5.02	20.09	5.10	20.79	5.17
18.00	4.85	18.70	4.94	19.40	5.02	20.10	5.10	20.80	5.17
18.01	4.86	18.71	4.94	19.41	5.02	20.11	5.10	20.81	5.17
18.02	4.86	18.72	4.94	19.42	5.02	20.12	5.10	20.82	5.18
18.03	4.86	18.73	4.94	19.43	5.02	20.13	5.10	20.83	5.18
18.04	4.86	18.74	4.94	19.44	5.02	20.14	5.10	20.84	5.18
18.05	4.86	18.75	4.94	19.45	5.02	20.15	5.10	20.85	5.18
18.06	4.86	18.76	4.94	19.46	5.02	20.16	5.10	20.86	5.18
18.07	4.86	18.77	4.95	19.47	5.03	20.17	5.10	20.87	5.18
18.08	4.86	18.78	4.95	19.48	5.03	20.18	5.11	20.88	5.18
18.09	4.86	18.79	4.95	19.49	5.03	20.19	5.11	20.89	5.18
18.10	4.87	18.80	4.95	19.50	5.03	20.20	5.11	20.90	5.18
18.11	4.87	18.81	4.95	19.51	5.03	20.21	5.11	20.91	5.18
18.12	4.87	18.82	4.95	19.52	5.03	20.22	5.11	20.92	5.19
18.13	4.87	18.83	4.95	19.53	5.03	20.23	5.11	20.93	5.19
18.14	4.87	18.84	4.95	19.54	5.03	20.24	5.11	20.94	5.19
18.15	4.87	18.85	4.95	19.55	5.03	20.25	5.11	20.95	5.19
18.16	4.87	18.86	4.96	19.56	5.04	20.26	5.11	20.96	5.19
18.17	4.87	18.87	4.96	19.57	5.04	20.27	5.11	20.97	5.19
18.18	4.88	18.88	4.96	19.58	5.04	20.28	5.12	20.98	5.19
18.19	4.88	18.89	4.96	19.59	5.04	20.29	5.12	20.99	5.19
18.20	4.88	18.90	4.96	19.60	5.04	20.30	5.12	21.00	5.19
21.01	5.20	21.71	5.27	22.41	5.34	23.11	5.42	23.81	5.49
21.02	5.20	21.72	5.27	22.42	5.35	23.12	5.42	23.82	5.49
21.03	5.20	21.73	5.27	22.43	5.35	23.13	5.42	23.83	5.49
21.04	5.20	21.74	5.27	22.44	5.35	23.14	5.42	23.84	5.49
21.05	5.20	21.75	5.27	22.45	5.35	23.15	5.42	23.85	5.49
21.06	5.20	21.76	5.28	22.46	5.35	23.16	5.42	23.86	5.49
21.07	5.20	21.77	5.28	22.47	5.35	23.17	5.42	23.87	5.49
21.08	5.20	21.78	5.28	22.48	5.35	23.18	5.42	23.88	5.49
21.09	5.20	21.79	5.28	22.49	5.35	23.19	5.42	23.89	5.49
21.10	5.21	21.80	5.28	22.50	5.35	23.20	5.43	23.90	5.50
21.11	5.21	21.81	5.28	22.51	5.35	23.21	5.43	23.91	5.50
21.12	5.21	21.82	5.28	22.52	5.36	23.22	5.43	23.92	5.50
21.13	5.21	21.83	5.28	22.53	5.36	23.23	5.43	23.93	5.50
21.14	5.21	21.84	5.28	22.54	5.36	23.24	5.43	23.94	5.50
21.15	5.21	21.85	5.29	22.55	5.36	23.25	5.43	23.95	5.50
21.16	5.21	21.86	5.29	22.56	5.36	23.26	5.43	23.96	5.50
21.17	5.21	21.87	5.29	22.57	5.36	23.27	5.43	23.97	5.50
21.18	5.21	21.88	5.29	22.58	5.36	23.28	5.43	23.98	5.50
21.19	5.21	21.89	5.29	22.59	5.36	23.29	5.43	23.99	5.50
21.20	5.22	21.90	5.29	22.60	5.36	23.30	5.44	24.0	5.51
21.21	5.22	21.91	5.29	22.61	5.36	23.31	5.44	24.1	5.52
21.22	5.22	21.92	5.29	22.62	5.37	23.32	5.44	24.2	5.53
21.23	5.22	21.93	5.29	22.63	5.37	23.33	5.44	24.3	5.54
21.24	5.22	21.94	5.29	22.64	5.37	23.34	5.44	24.4	5.55
21.25	5.22	21.95	5.30	22.65	5.37	23.35	5.44	24.5	5.55
21.26	5.22	21.96	5.30	22.66	5.37	23.36	5.44	24.6	5.56
21.27	5.22	21.97	5.30	22.67	5.37	23.37	5.44	24.7	5.57
21.28	5.22	21.98	5.30	22.68	5.37	23.38	5.44	24.8	5.58
21.29	5.23	21.99	5.30	22.69	5.37	23.39	5.44	24.9	5.59
21.30	5.23	22.00	5.30	22.70	5.37	23.40	5.45	25.0	5.60

TABLE 1 *Continued*

Y	V	Y	V	Y	V	Y	V	Y	V
21.31	5.23	22.01	5.30	22.71	5.38	23.41	5.45	25.1	5.61
21.32	5.23	22.02	5.30	22.72	5.38	23.42	5.45	25.2	5.62
21.33	5.23	22.03	5.30	22.73	5.38	23.43	5.45	25.3	5.63
21.34	5.23	22.04	5.31	22.74	5.38	23.44	5.45	25.4	5.64
21.35	5.23	22.05	5.31	22.75	5.38	23.45	5.45	25.5	5.65
21.36	5.23	22.06	5.31	22.76	5.38	23.46	5.45	25.6	5.66
21.37	5.23	22.07	5.31	22.77	5.38	23.47	5.45	25.7	5.67
21.38	5.24	22.08	5.31	22.78	5.38	23.48	5.45	25.8	5.68
21.39	5.24	22.09	5.31	22.79	5.38	23.49	5.45	25.9	5.69
21.40	5.24	22.10	5.31	22.80	5.38	23.50	5.46	26.0	5.70
21.41	5.24	22.11	5.31	22.81	5.39	23.51	5.46	26.1	5.71
21.42	5.24	22.12	5.31	22.82	5.39	23.52	5.46	26.2	5.72
21.43	5.24	22.13	5.31	22.83	5.39	23.53	5.46	26.3	5.73
21.44	5.24	22.14	5.32	22.84	5.39	23.54	5.46	26.4	5.74
21.45	5.24	22.15	5.32	22.85	5.39	23.55	5.46	26.5	5.75
21.46	5.24	22.16	5.32	22.86	5.39	23.56	5.46	26.6	5.75
21.47	5.24	22.17	5.32	22.87	5.39	23.57	5.46	26.7	5.76
21.48	5.25	22.18	5.32	22.88	5.39	23.58	5.46	26.8	5.77
21.49	5.25	22.19	5.32	22.89	5.39	23.59	5.46	26.9	5.78
21.50	5.25	22.20	5.32	22.90	5.39	23.60	5.47	27.0	5.79
21.51	5.25	22.21	5.32	22.91	5.40	23.61	5.47	27.1	5.80
21.52	5.25	22.22	5.32	22.92	5.40	23.62	5.47	27.2	5.81
21.53	5.25	22.23	5.33	22.93	5.40	23.63	5.47	27.3	5.82
21.54	5.25	22.24	5.33	22.94	5.40	23.64	5.47	27.4	5.83
21.55	5.25	22.25	5.33	22.95	5.40	23.65	5.47	27.5	5.84
21.56	5.25	22.26	5.33	22.96	5.40	23.66	5.47	27.6	5.85
21.57	5.26	22.27	5.33	22.97	5.40	23.67	5.47	27.7	5.86
21.58	5.26	22.28	5.33	22.98	5.40	23.68	5.47	27.8	5.87
21.59	5.26	22.29	5.33	22.99	5.40	23.69	5.47	27.9	5.87
21.60	5.26	22.30	5.33	23.00	5.40	23.70	5.48	28.0	5.88
21.61	5.26	22.31	5.33	23.01	5.41	23.71	5.48	28.1	5.89
21.62	5.26	22.32	5.33	23.02	5.41	23.72	5.48	28.2	5.90
21.63	5.26	22.33	5.34	23.03	5.41	23.73	5.48	28.3	5.91
21.64	5.26	22.34	5.34	23.04	5.41	23.74	5.48	28.4	5.92
21.65	5.26	22.35	5.34	23.05	5.41	23.75	5.48	28.5	5.93
21.66	5.27	22.36	5.34	23.06	5.41	23.76	5.48	28.6	5.94
21.67	5.27	22.37	5.34	23.07	5.41	23.77	5.48	28.7	5.95
21.68	5.27	22.38	5.34	23.08	5.41	23.78	5.48	28.8	5.96
21.69	5.27	22.39	5.34	23.09	5.41	23.79	5.48	28.9	5.96
21.70	5.27	22.40	5.34	23.10	5.42	23.80	5.49	29.0	5.97
29.1	5.98	36.1	6.56	43.1	7.08	50.1	7.55	57.1	7.97
29.2	5.99	36.2	6.57	43.2	7.09	50.2	7.55	57.2	7.98
29.3	6.00	36.3	6.58	43.3	7.10	50.3	7.56	57.3	7.98
29.4	6.01	36.4	6.59	43.4	7.10	50.4	7.57	57.4	7.99
29.5	6.02	36.5	6.60	43.5	7.11	50.5	7.57	57.5	7.99
29.6	6.03	36.6	6.60	43.6	7.12	50.6	7.58	57.6	8.00
29.7	6.03	36.7	6.61	43.7	7.12	50.7	7.59	57.7	8.01
29.8	6.04	36.8	6.62	43.8	7.13	50.8	7.59	57.8	8.01
29.9	6.05	36.9	6.63	43.9	7.14	50.9	7.60	57.9	8.02
30.0	6.06	37.0	6.63	44.0	7.14	51.0	7.60	58.0	8.02
30.1	6.07	37.1	6.64	44.1	7.15	51.1	7.61	58.1	8.03
30.2	6.08	37.2	6.65	44.2	7.16	51.2	7.62	58.2	8.03
30.3	6.09	37.3	6.66	44.3	7.16	51.3	7.62	58.3	8.04
30.4	6.10	37.4	6.67	44.4	7.17	51.4	7.63	58.4	8.05
30.5	6.10	37.5	6.67	44.5	7.18	51.5	7.64	58.5	8.05
30.6	6.11	37.6	6.68	44.6	7.19	51.6	7.64	58.6	8.06
30.7	6.12	37.7	6.69	44.7	7.19	51.7	7.65	58.7	8.06
30.8	6.13	37.8	6.70	44.8	7.20	51.8	7.65	58.8	8.07
30.9	6.14	37.9	6.70	44.9	7.21	51.9	7.66	58.9	8.07
31.0	6.15	38.0	6.71	45.0	7.21	52.0	7.67	59.0	8.08
31.1	6.16	38.1	6.72	45.1	7.22	52.1	7.67	59.1	8.09
31.2	6.16	38.2	6.73	45.2	7.23	52.2	7.68	59.2	8.09
31.3	6.17	38.3	6.73	45.3	7.23	52.3	7.69	59.3	8.10
31.4	6.18	38.4	6.74	45.4	7.24	52.4	7.69	59.4	8.10
31.5	6.19	38.5	6.75	45.5	7.25	52.5	7.70	59.5	8.11
31.6	6.20	38.6	6.76	45.6	7.25	52.6	7.70	59.6	8.11
31.7	6.21	38.7	6.76	45.7	7.26	52.7	7.71	59.7	8.12
31.8	6.21	38.8	6.77	45.8	7.27	52.8	7.72	59.8	8.13
31.9	6.22	38.9	6.78	45.9	7.27	52.9	7.72	59.9	8.13
32.0	6.23	39.0	6.79	46.0	7.28	53.0	7.73	60.0	8.14
32.1	6.24	39.1	6.79	46.1	7.29	53.1	7.73	60.1	8.14
32.2	6.25	39.2	6.80	46.2	7.29	53.2	7.74	60.2	8.15
32.3	6.26	39.3	6.81	46.3	7.30	53.3	7.75	60.3	8.15
32.4	6.27	39.4	6.82	46.4	7.31	53.4	7.75	60.4	8.16
32.5	6.27	39.5	6.82	46.5	7.31	53.5	7.76	60.5	8.16

TABLE 1 *Continued*

Y	V	Y	V	Y	V	Y	V	Y	V
32.6	6.28	39.6	6.83	46.6	7.32	53.6	7.76	60.6	8.17
32.7	6.29	39.7	6.84	46.7	7.33	53.7	7.77	60.7	8.18
32.8	6.30	39.8	6.85	46.8	7.33	53.8	7.78	60.8	8.18
32.9	6.31	39.9	6.85	46.9	7.34	53.9	7.78	60.9	8.19
33.0	6.32	40.0	6.86	47.0	7.35	54.0	7.79	61.0	8.19
33.1	6.32	40.1	6.87	47.1	7.35	54.1	7.79	61.1	8.20
33.2	6.33	40.2	6.87	47.2	7.36	54.2	7.80	61.2	8.20
33.3	6.34	40.3	6.88	47.3	7.37	54.3	7.81	61.3	8.21
33.4	6.35	40.4	6.89	47.4	7.37	54.4	7.81	61.4	8.21
33.5	6.36	40.5	6.90	47.5	7.38	54.5	7.82	61.5	8.22
33.6	6.36	40.6	6.90	47.6	7.39	54.6	7.82	61.6	8.23
33.7	6.37	40.7	6.91	47.7	7.39	54.7	7.83	61.7	8.23
33.8	6.38	40.8	6.92	47.8	7.40	54.8	7.84	61.8	8.24
33.9	6.39	40.9	6.93	47.9	7.41	54.9	7.84	61.9	8.24
34.0	6.40	41.0	6.93	48.0	7.41	55.0	7.85	62.0	8.25
34.1	6.41	41.1	6.94	48.1	7.42	55.1	7.85	62.1	8.25
34.2	6.41	41.2	6.95	48.2	7.43	55.2	7.86	62.2	8.26
34.3	6.42	41.3	6.95	48.3	7.43	55.3	7.87	62.3	8.26
34.4	6.43	41.4	6.96	48.4	7.44	55.4	7.87	62.4	8.27
34.5	6.44	41.5	6.97	48.5	7.44	55.5	7.88	62.5	8.27
34.6	6.45	41.6	6.98	48.6	7.45	55.6	7.88	62.6	8.28
34.7	6.45	41.7	6.98	48.7	7.46	55.7	7.89	62.7	8.29
34.8	6.46	41.8	6.99	48.8	7.46	55.8	7.90	62.8	8.29
34.9	6.47	41.9	7.00	48.9	7.47	55.9	7.90	62.9	8.30
35.0	6.48	42.0	7.00	49.0	7.48	56.0	7.91	63.0	8.30
35.1	6.49	42.1	7.01	49.1	7.48	56.1	7.91	63.1	8.31
35.2	6.49	42.2	7.02	49.2	7.49	56.2	7.92	63.2	8.31
35.3	6.50	42.3	7.03	49.3	7.50	56.3	7.92	63.3	8.32
35.4	6.51	42.4	7.03	49.4	7.50	56.4	7.93	63.4	8.32
35.5	6.52	42.5	7.04	49.5	7.51	56.5	7.94	63.5	8.33
35.6	6.52	42.6	7.05	49.6	7.52	56.6	7.94	63.6	8.33
35.7	6.53	42.7	7.05	49.7	7.52	56.7	7.95	63.7	8.34
35.8	6.54	42.8	7.06	49.8	7.53	56.8	7.95	63.8	8.34
35.9	6.55	42.9	7.07	49.9	7.53	56.9	7.96	63.9	8.35
36.0	6.56	43.0	7.07	50.0	7.54	57.0	7.97	64.0	8.36
64.1	8.36	71.3	8.73	78.5	9.08	85.7	9.41	92.9	9.72
64.2	8.37	71.4	8.74	78.6	9.09	85.8	9.41	93.0	9.72
64.3	8.37	71.5	8.74	78.7	9.09	85.9	9.42	93.1	9.72
64.4	8.38	71.6	8.75	78.8	9.10	86.0	9.42	93.2	9.73
64.5	8.38	71.7	8.75	78.9	9.10	86.1	9.43	93.3	9.73
64.6	8.39	71.8	8.76	79.0	9.10	86.2	9.43	93.4	9.74
64.7	8.39	71.9	8.76	79.1	9.11	86.3	9.43	93.5	9.74
64.8	8.40	72.0	8.77	79.2	9.11	86.4	9.44	93.6	9.74
64.9	8.40	72.1	8.77	79.3	9.12	86.5	9.44	93.7	9.75
65.0	8.41	72.2	8.78	79.4	9.12	86.6	9.45	93.8	9.75
65.1	8.41	72.3	8.78	79.5	9.13	86.7	9.45	93.9	9.76
65.2	8.42	72.4	8.79	79.6	9.13	86.8	9.46	94.0	9.76
65.3	8.42	72.5	8.79	79.7	9.14	86.9	9.46	94.1	9.76
65.4	8.43	72.6	8.80	79.8	9.14	87.0	9.47	94.2	9.77
65.5	8.44	72.7	8.80	79.9	9.15	87.1	9.47	94.3	9.77
65.6	8.44	72.8	8.81	80.0	9.15	87.2	9.47	94.4	9.78
65.7	8.45	72.9	8.81	80.1	9.16	87.3	9.48	94.5	9.78
65.8	8.45	73.0	8.82	80.2	9.16	87.4	9.48	94.6	9.79
65.9	8.46	73.1	8.82	80.3	9.17	87.5	9.49	94.7	9.79
66.0	8.46	73.2	8.83	80.4	9.17	87.6	9.49	94.8	9.79
66.1	8.47	73.3	8.83	80.5	9.17	87.7	9.50	94.9	9.80
66.2	8.47	73.4	8.84	80.6	9.18	87.8	9.50	95.0	9.80
66.3	8.48	73.5	8.84	80.7	9.18	87.9	9.50	95.1	9.81
66.4	8.48	73.6	8.85	80.8	9.19	88.0	9.51	95.2	9.81
66.5	8.49	73.7	8.85	80.9	9.19	88.1	9.51	95.3	9.81
66.6	8.49	73.8	8.86	81.0	9.20	88.2	9.52	95.4	9.82
66.7	8.50	73.9	8.86	81.1	9.20	88.3	9.52	95.5	9.82
66.8	8.50	74.0	8.87	81.2	9.21	88.4	9.53	95.6	9.83
66.9	8.51	74.1	8.87	81.3	9.21	88.5	9.53	95.7	9.83
67.0	8.51	74.2	8.88	81.4	9.22	88.6	9.53	95.8	9.83
67.1	8.52	74.3	8.88	81.5	9.22	88.7	9.54	95.9	9.84
67.2	8.53	74.4	8.89	81.6	9.22	88.8	9.54	96.0	9.84
67.3	8.53	74.5	8.89	81.7	9.23	88.9	9.55	96.1	9.85
67.4	8.54	74.6	8.90	81.8	9.23	89.0	9.55	96.2	9.85
67.5	8.54	74.7	8.90	81.9	9.24	89.1	9.56	96.3	9.85
67.6	8.55	74.8	8.91	82.0	9.24	89.2	9.56	96.4	9.86
67.7	8.55	74.9	8.91	82.1	9.25	89.3	9.56	96.5	9.86
67.8	8.56	75.0	8.92	82.2	9.25	89.4	9.57	96.6	9.87
67.9	8.56	75.1	8.92	82.3	9.26	89.5	9.57	96.7	9.87
68.0	8.57	75.2	8.93	82.4	9.26	89.6	9.58	96.8	9.87

TABLE 1 *Continued*

Y	V	Y	V	Y	V	Y	V	Y	V
68.1	8.57	75.3	8.93	82.5	9.27	89.7	9.58	96.9	9.88
68.2	8.58	75.4	8.93	82.6	9.27	89.8	9.59	97.0	9.88
68.3	8.58	75.5	8.94	82.7	9.27	89.9	9.59	97.1	9.89
68.4	8.59	75.6	8.94	82.8	9.28	90.0	9.59	97.2	9.89
68.5	8.59	75.7	8.95	82.9	9.28	90.1	9.60	97.3	9.89
68.6	8.60	75.8	8.95	83.0	9.29	90.2	9.60	97.4	9.90
68.7	8.60	75.9	8.96	83.1	9.29	90.3	9.61	97.5	9.90
68.8	8.61	76.0	8.96	83.2	9.30	90.4	9.61	97.6	9.91
68.9	8.61	76.1	8.97	83.3	9.30	90.5	9.62	97.7	9.91
69.0	8.62	76.2	8.97	83.4	9.31	90.6	9.62	97.8	9.91
69.1	8.62	76.3	8.98	83.5	9.31	90.7	9.62	97.9	9.92
69.2	8.63	76.4	8.98	83.6	9.32	90.8	9.63	98.0	9.92
69.3	8.63	76.5	8.99	83.7	9.32	90.9	9.63	98.1	9.93
69.4	8.64	76.6	8.99	83.8	9.32	91.0	9.64	98.2	9.93
69.5	8.64	76.7	9.00	83.9	9.33	91.1	9.64	98.3	9.93
69.6	8.65	76.8	9.00	84.0	9.33	91.2	9.64	98.4	9.94
69.7	8.65	76.9	9.01	84.1	9.34	91.3	9.65	98.5	9.94
69.8	8.66	77.0	9.01	84.2	9.34	91.4	9.65	98.6	9.95
69.9	8.66	77.1	9.02	84.3	9.35	91.5	9.66	98.7	9.95
70.0	8.67	77.2	9.02	84.4	9.35	91.6	9.66	98.8	9.95
70.1	8.67	77.3	9.03	84.5	9.36	91.7	9.67	98.9	9.96
70.2	8.68	77.4	9.03	84.6	9.36	91.8	9.67	99.0	9.96
70.3	8.68	77.5	9.03	84.7	9.36	91.9	9.67	99.1	9.97
70.4	8.69	77.6	9.04	84.8	9.37	92.0	9.68	99.2	9.97
70.5	8.69	77.7	9.04	84.9	9.37	92.1	9.68	99.3	9.97
70.6	8.70	77.8	9.05	85.0	9.38	92.2	9.69	99.4	9.98
70.7	8.70	77.9	9.05	85.1	9.38	92.3	9.69	99.5	9.98
70.8	8.71	78.0	9.06	85.2	9.39	92.4	9.69	99.6	9.99
70.9	8.71	78.1	9.06	85.3	9.39	92.5	9.70	99.7	9.99
71.0	8.72	78.2	9.07	85.4	9.40	92.6	9.70	99.8	9.99
71.1	8.72	78.3	9.07	85.5	9.40	92.7	9.71	99.9	10.00
71.2	8.73	78.4	9.08	85.6	9.40	92.8	9.71	100.0	10.00

NOTE 6—The arguments of the trigonometric functions in Eq 1 are in radians rather than degrees.

8.6 *Computer Conversion of CIE Measurement Data*—Computer programs that convert CIE data to Munsell color notations are available commercially from various manufacturers of color control instruments or software, or both. The accuracy of a computer program can be determined by comparing the results obtained with that program to those obtained using the graphical method described in this practice. Before using a computer conversion program, the user should ascertain that the program's accuracy is sufficient for the proposed usage. Table 4 contains graphical conversions that may be used to verify the accuracy of data obtained by computer conversions.

NOTE 7—Many of the original computer programs used Magnesium Oxide as the reference white for determining luminous reflectance, Y, and Munsell Value, V. The reference white was changed to the perfect reflecting diffuser, and the user should ascertain that the computer conversion program uses the correct reference white.

NOTE 8—Although the chromaticity coordinates were not affected by the change of the reference white to the perfect reflecting diffuser, CIE X and Z tristimulus values calculated from them will change. The changes in X, Y, and Z will also affect color coordinates determined by transforming those tristimulus values.

8.7 In the interest of completeness, and because the reference white has changed since the year 1943 when it was proposed and published (**1**) (See Notes 3-8), the Munsell fifth-order equation relating Munsell value V to CIE luminance Y is presented here with the perfect reflecting diffuser as the white reference:

$$Y = 1.1914\,V - 0.22533\,V^2 + 0.23352\,V^3 - 0.020484\,V^4 + 0.00081939\,V^5 \quad (2)$$

The coefficients of this equation are obtained from the 1943 equation by multiplying each coefficient by 0.975, the reflectance factor of magnesium oxide with respect to the perfect reflecting diffuser, and rounding to five digits of precision. Presumably these five digits consist of four that are significant and a guard digit. Results obtained from this equation should thus be rounded to no more than four significant digits.

9. Report

9.1 Report the notation in the Munsell system, specifying whether the notation was obtained visually, using the matte or glossy *Munsell Book of Color*, or by conversion of CIE colorimetric data.

9.1.1 If obtained visually, note the source of illumination (artificial daylight or natural daylight).

9.1.2 If obtained from colorimetric data, note the instrument used.

10. Precision

10.1 The estimated precision within which a color notation can be determined by visual interpolation is 0.5 hue step, 0.1 value step, and 0.4 chroma step.

11. Keywords

11.1 color; Munsell; Munsell color order system; Munsell notation

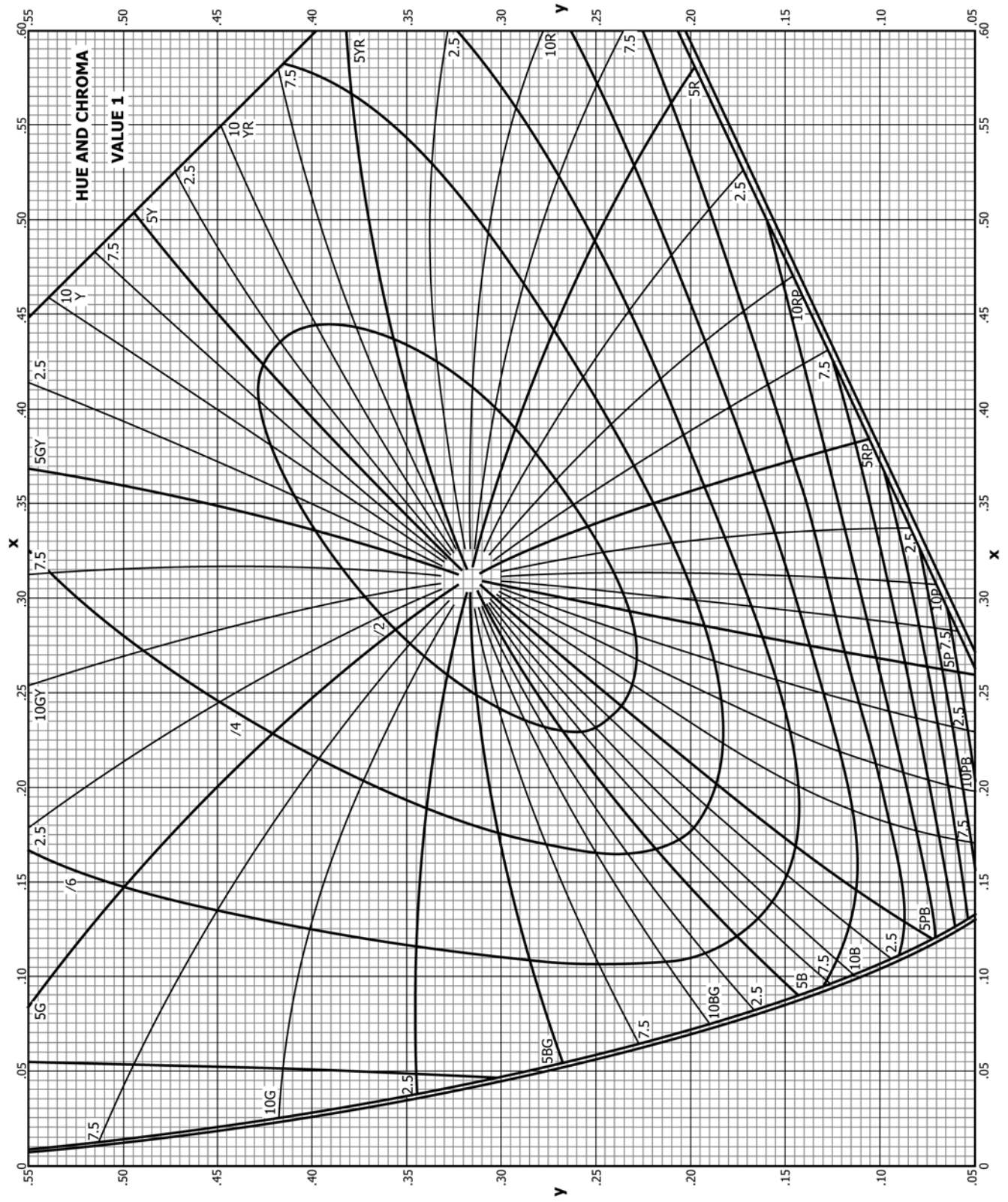

FIG. 3 Munsell Value 1—Loci of Constant Hue and Constant Chroma in CIE (*x*,*y*) Coordinates

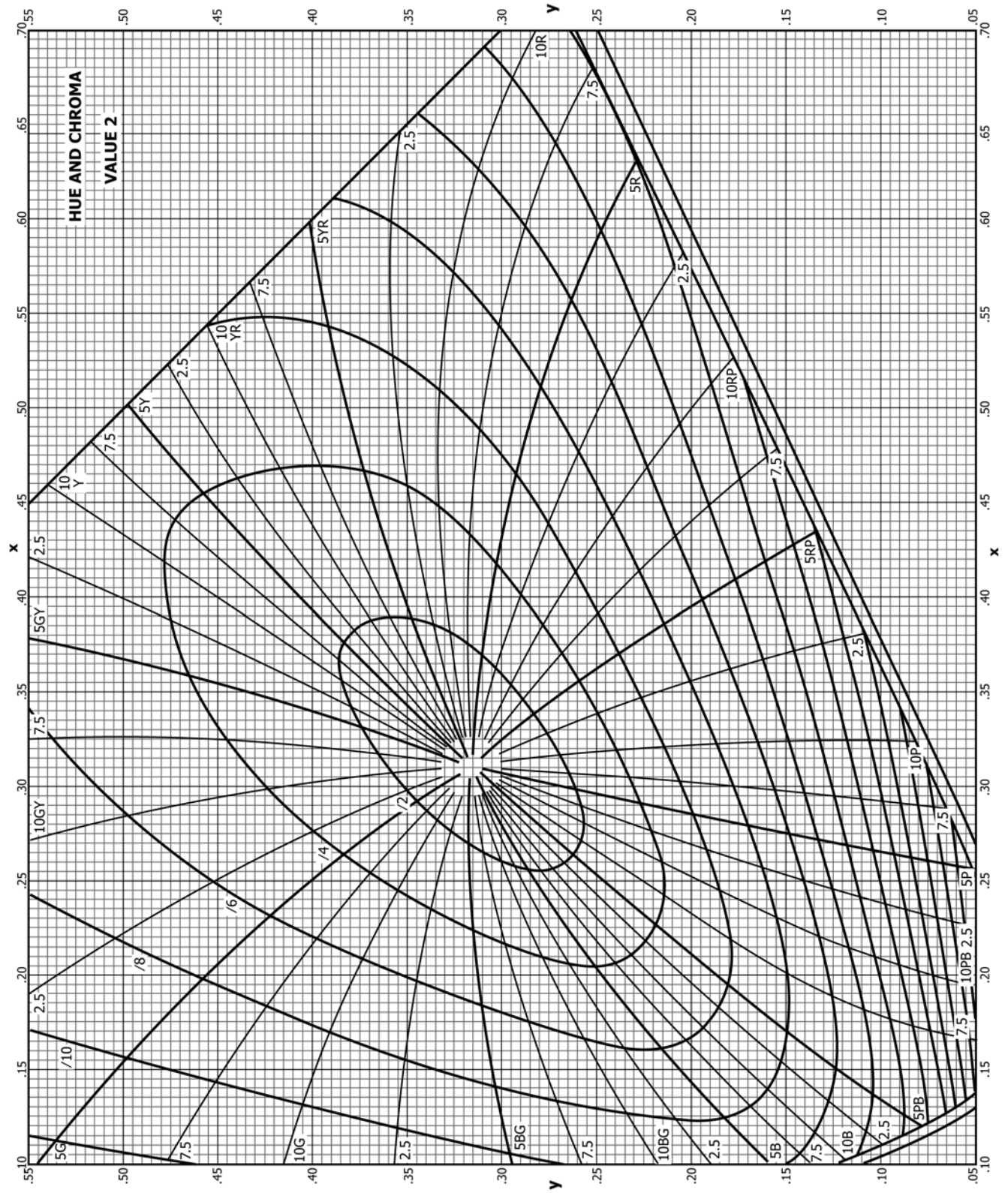

FIG. 4 Munsell Value 2—Loci of Constant Hue and Constant Chroma in CIE (*x*,*y*) Coordinates

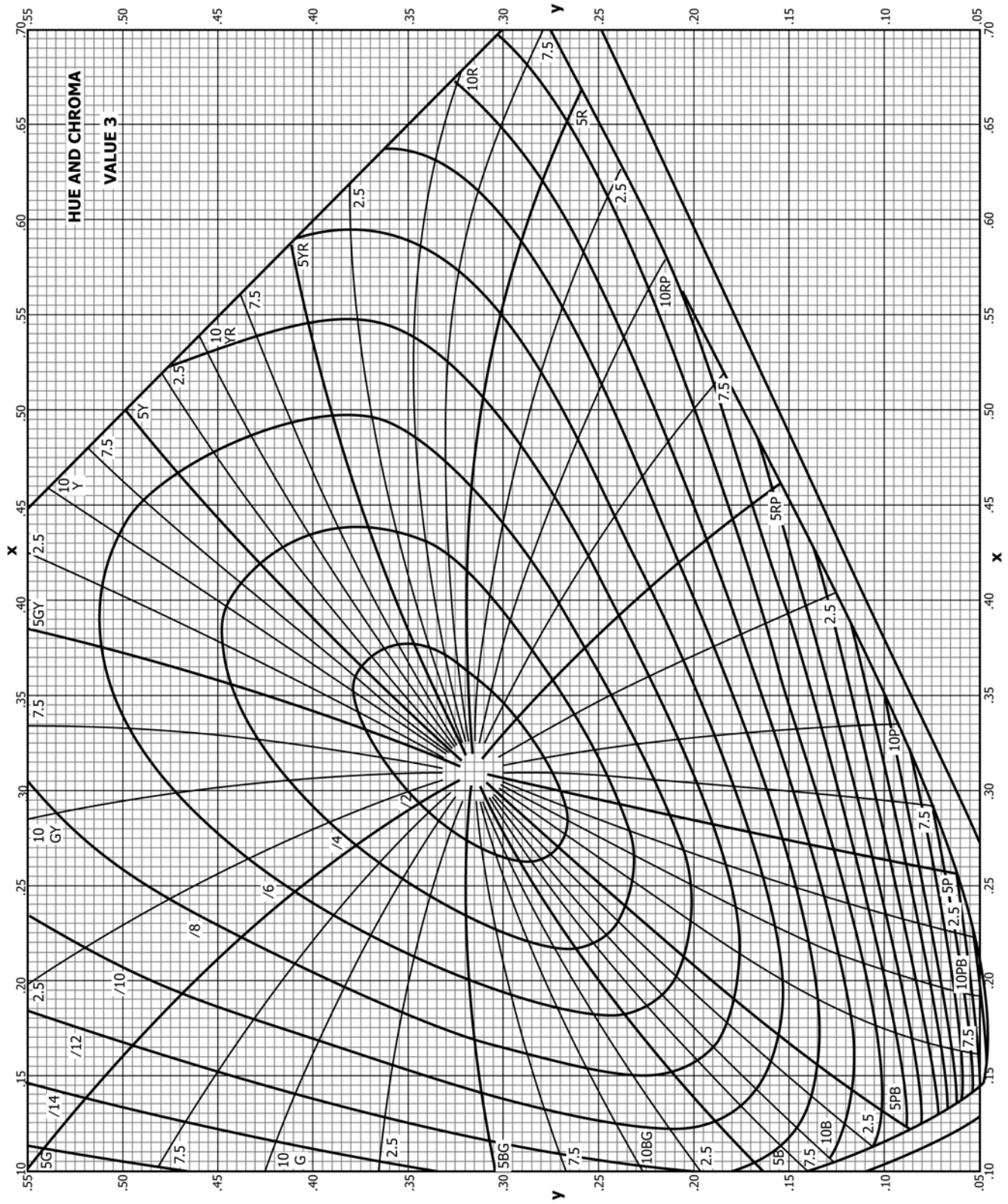

FIG. 5 Munsell Value 3—Loci of Constant Hue and Constant Chroma in CIE (*x*,*y*) Coordinates

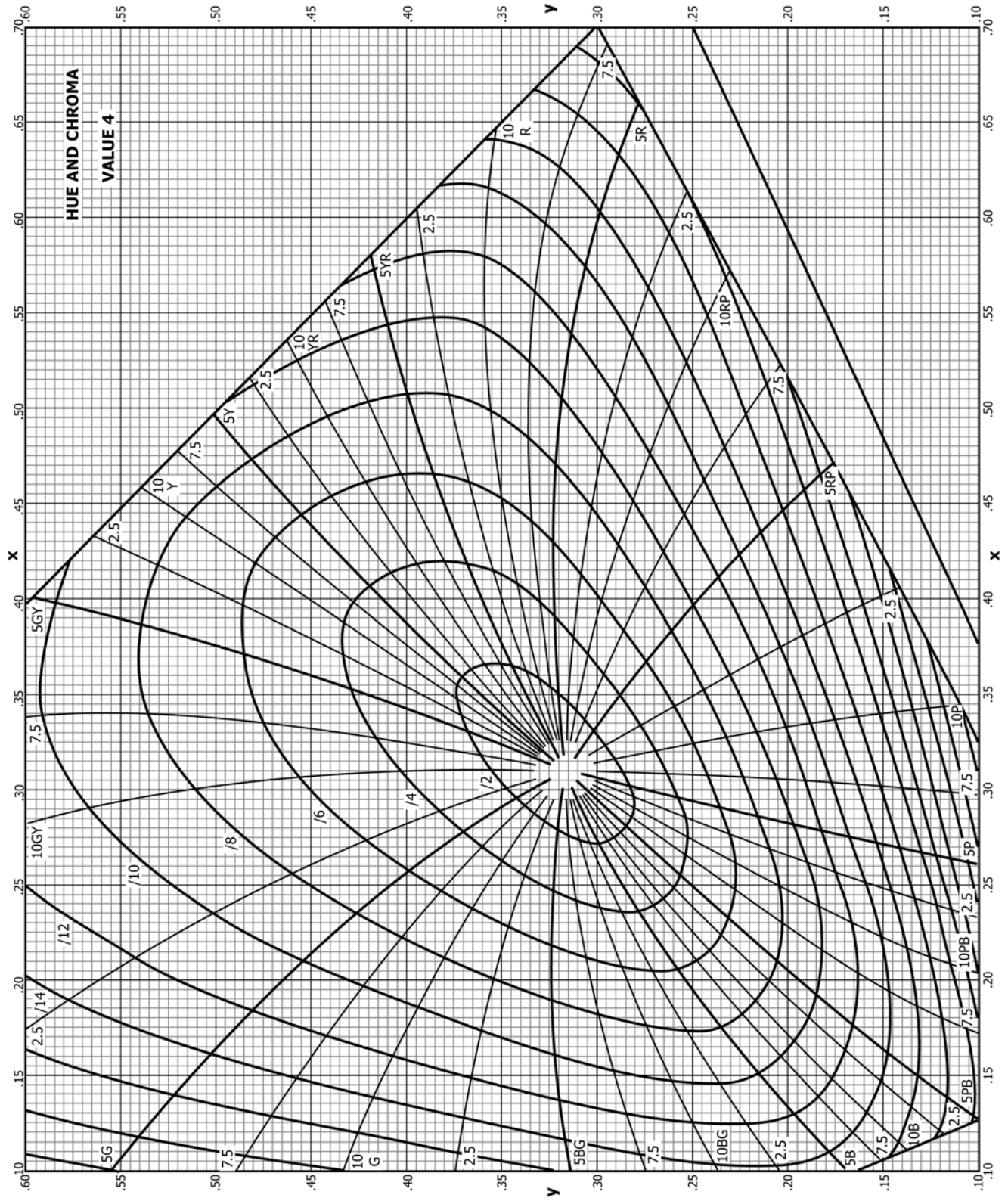

FIG. 6 Munsell Value 4—Loci of Constant Hue and Constant Chroma in CIE (*x*,*y*) Coordinates

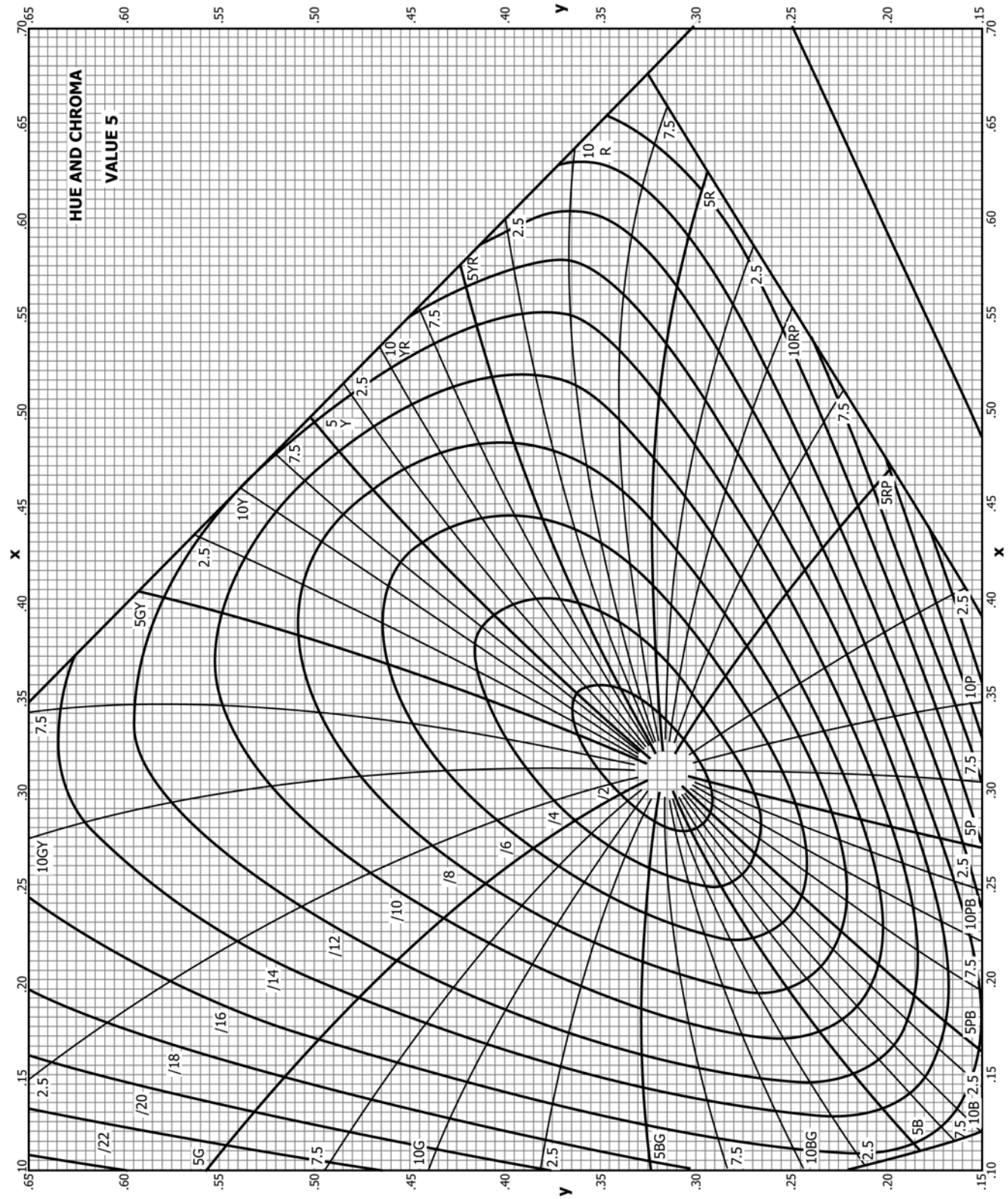

FIG. 7 Munsell Value 5—Loci of Constant Chroma in CIE (*x*,*y*) Coordinates

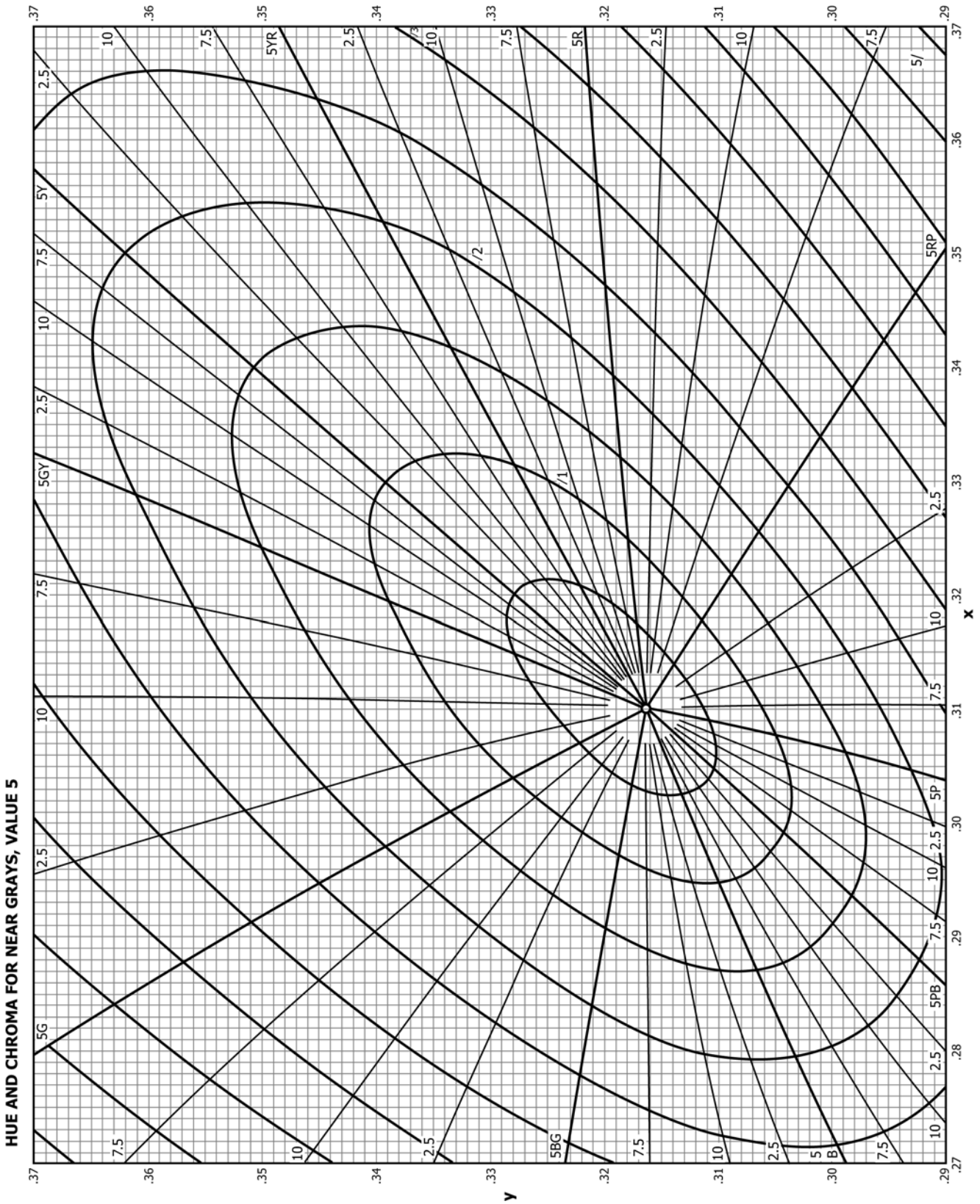

FIG. 8 Munsell Value 5—Loci of Constant Hue and Constant Chroma, Near Gray, in CIE (*x*,*y*) Coordinates

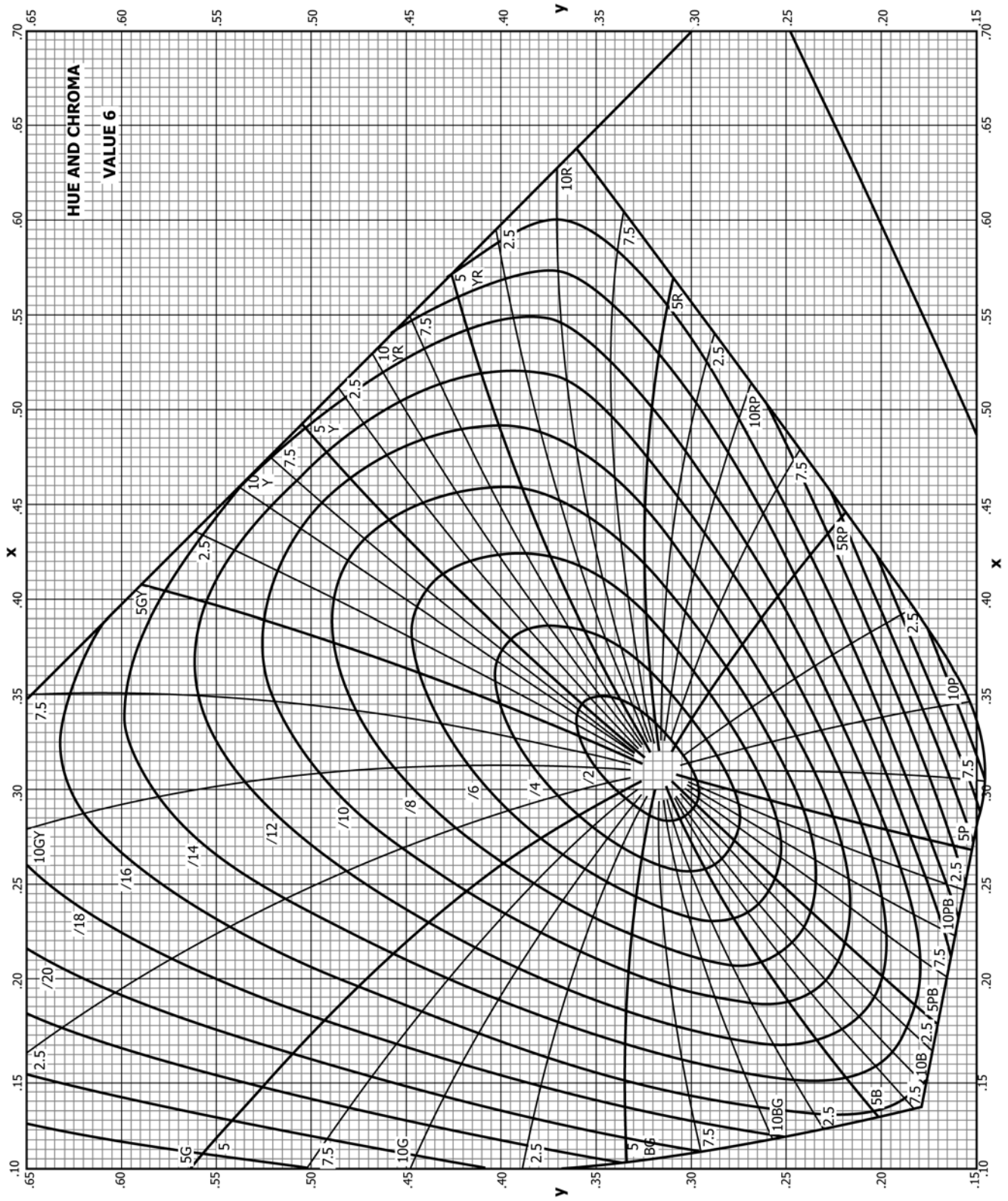

FIG. 9 Munsell Value 6—Loci of Constant Hue and Constant Chroma in CIE (*x*,*y*) Coordinates

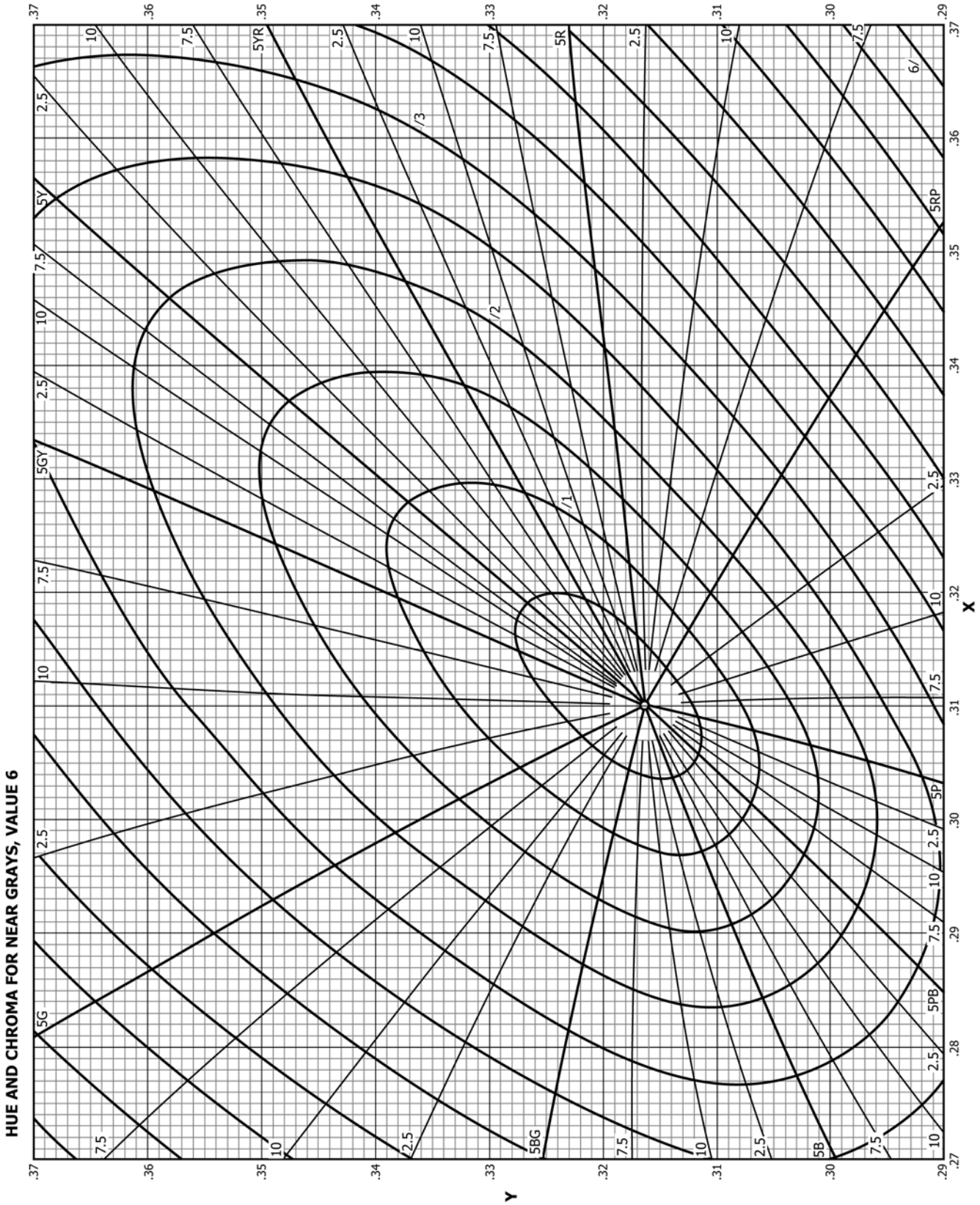

FIG. 10 Munsell Value 6—Loci of Constant Hue and Constant Chroma, Near Gray, in CIE (*x,y*)

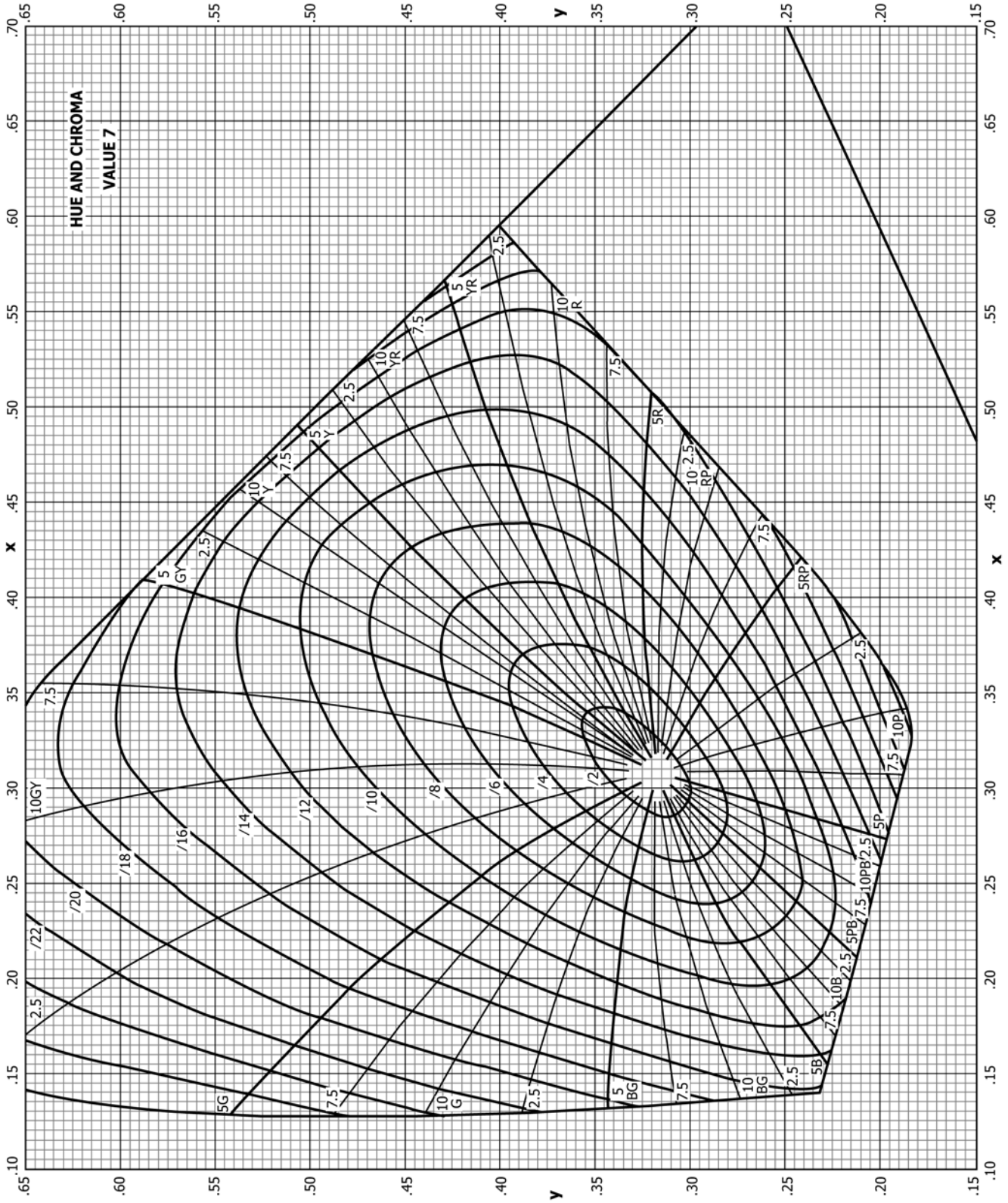

FIG. 11 Munsell Value 7—Loci of Constant Hue and Constant Chroma in CIE (*x*,*y*) Coordinates

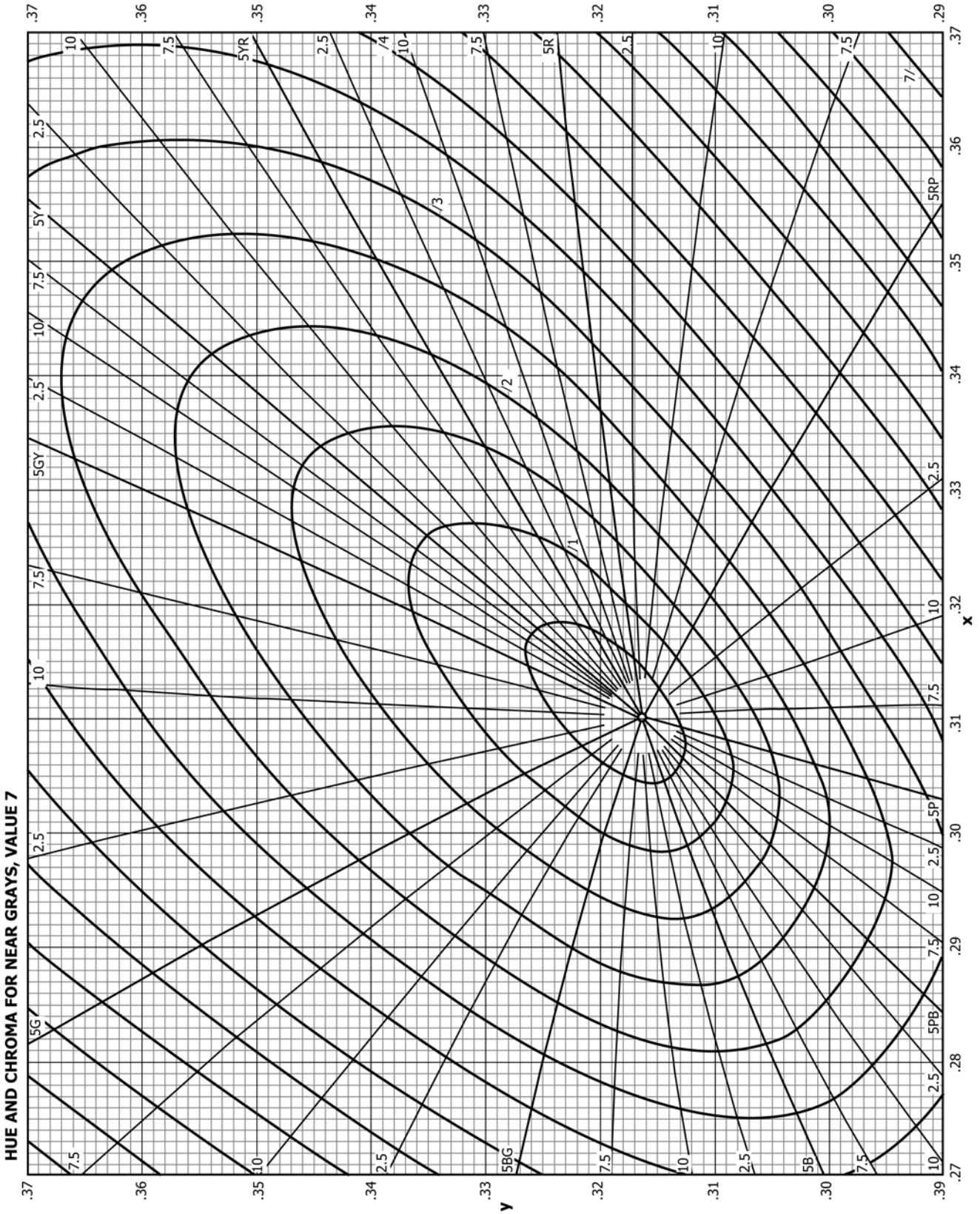

FIG. 12 Munsell Value 7—Loci of Constant Hue and Constant Chroma, Near Gray, in CIE (*x*,*y*) Coordinates

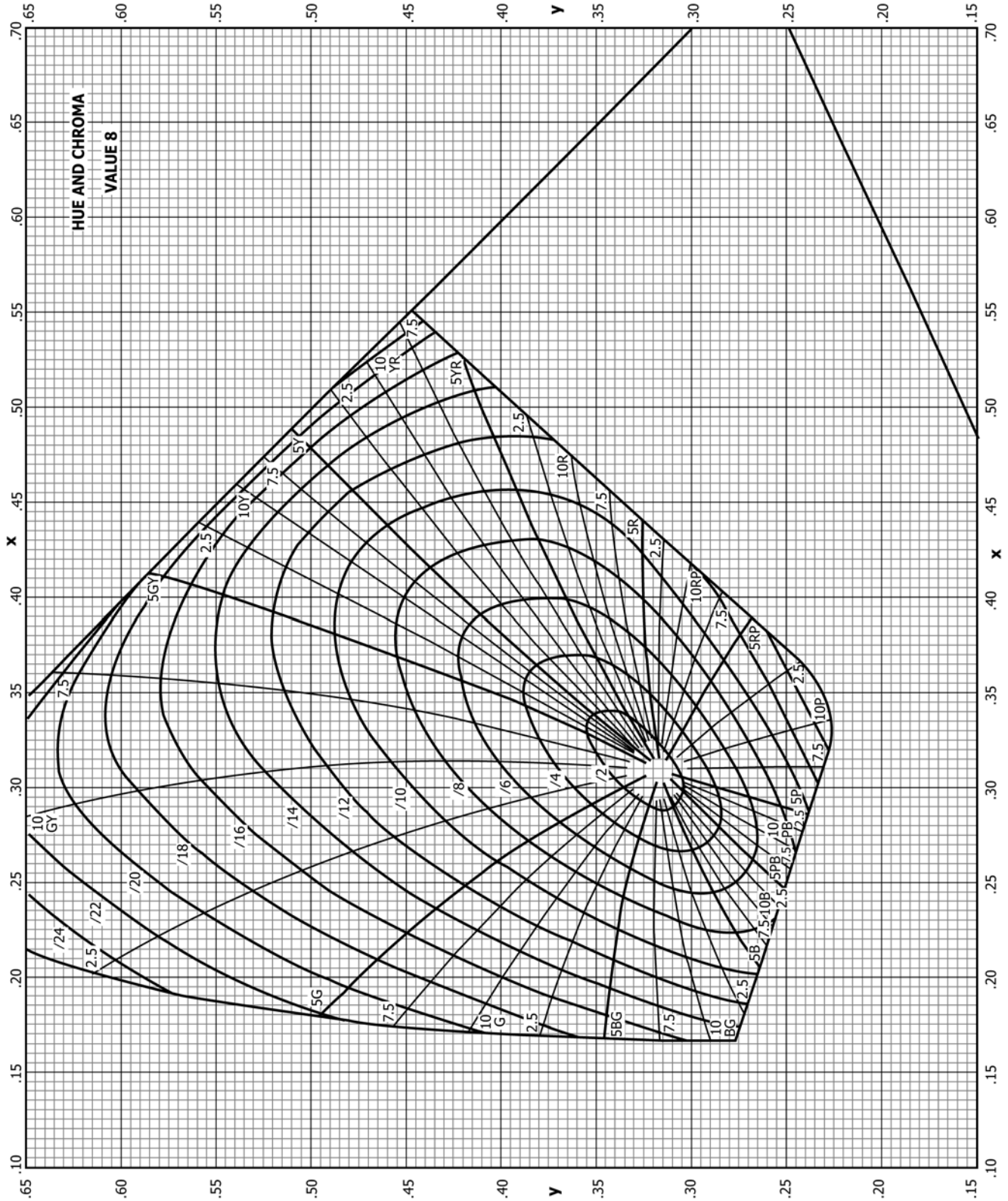

FIG. 13 Munsell Value 8—Loci of Constant Hue and Constant Chroma in CIE (*x*,*y*) Coordinates

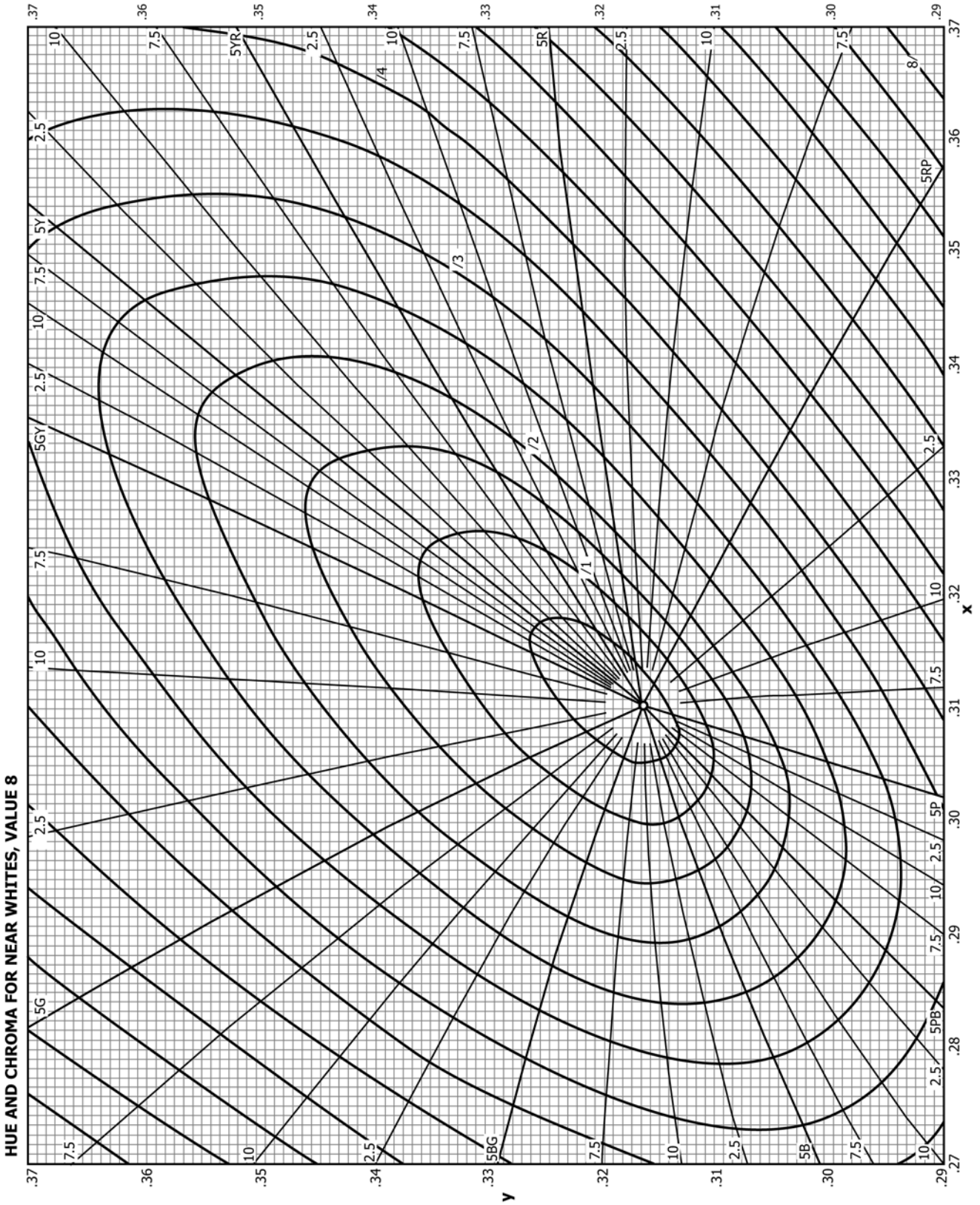

FIG. 14 Munsell Value 8—Loci of Constant Hue and Constant Chroma, Near White, in CIE (*x*,*y*) Coordinates

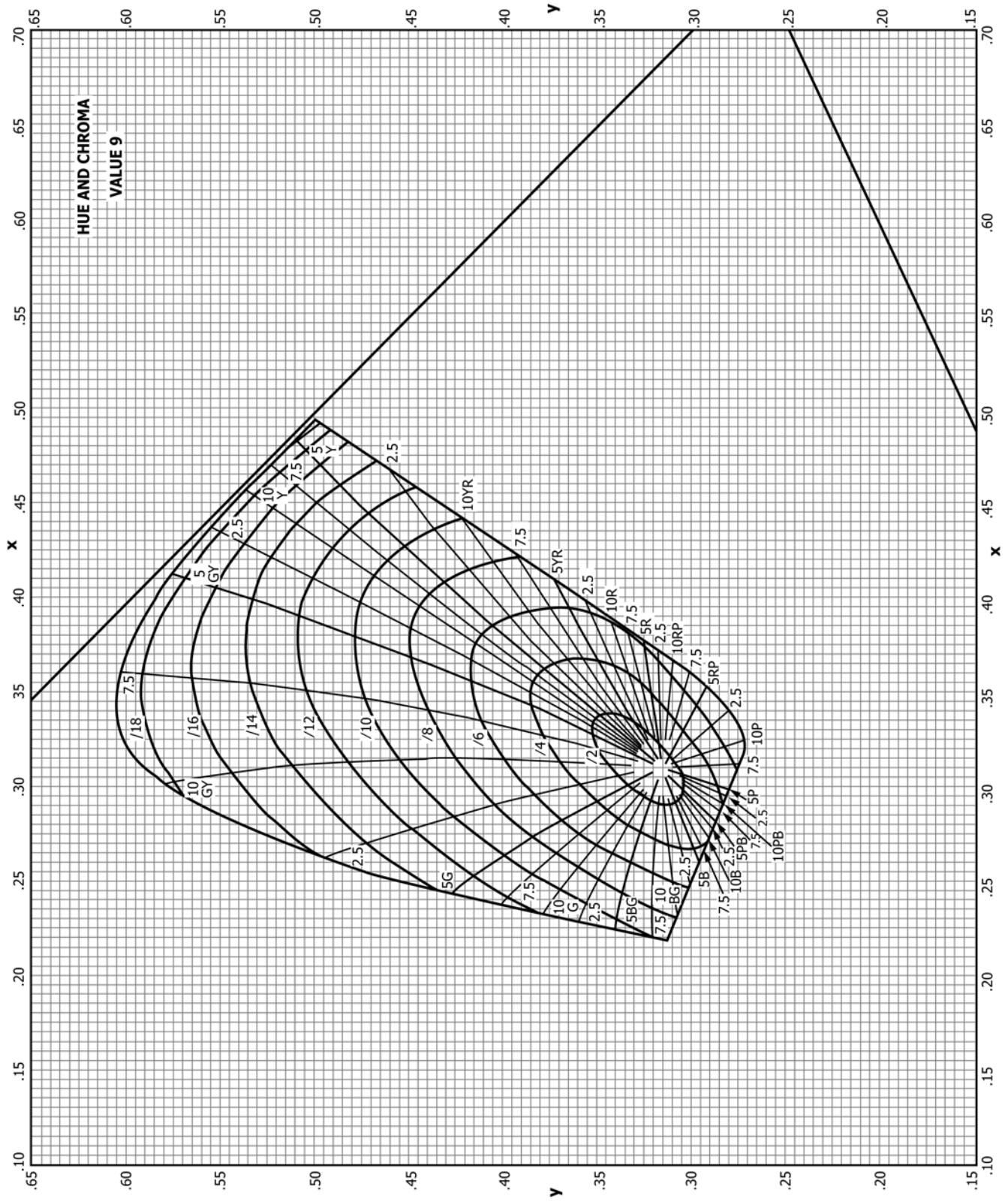

FIG. 15 Munsell Value 9—Loci of Constant Hue and Constant Chroma in CIE (*x*,*y*) Coordinates

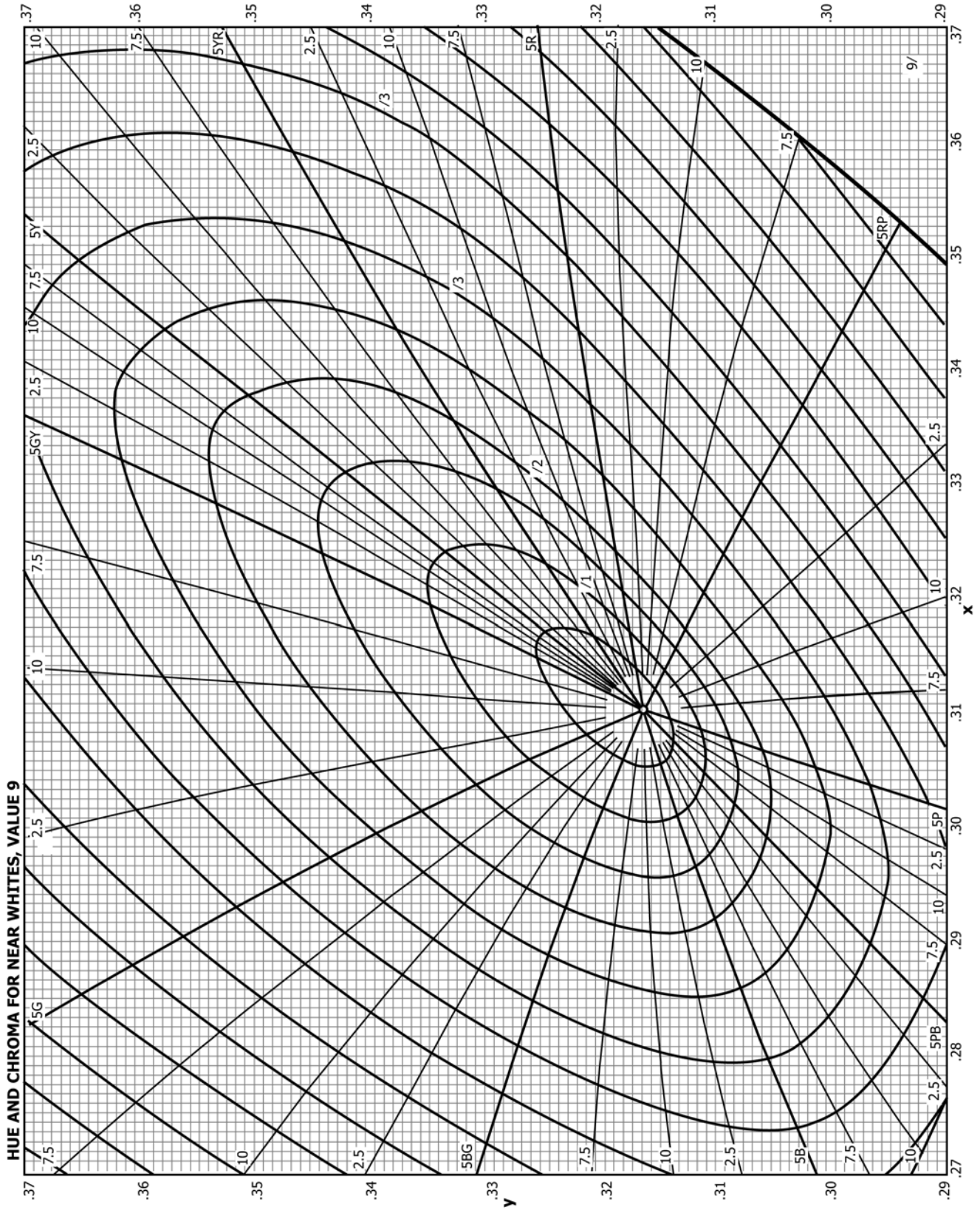

FIG. 16 Munsell Value 9—Loci of Constant Hue and Constant Chroma, Near White, in CIE (*x*,*y*) Coordinates

TABLE 2 The CIE (Y, x, y) Specifications for the Recommended Munsell Notations for 40 Hues (H) and 9 Values (V/) at Every Second Chroma (/C) Step from /2 to the Theoretical Colorant Limits Maximum

Value/ Chroma		Reds										Yellow-Reds							
		2.5R		5.0R		7.5R		10.0R				2.5YR		5.0YR		7.5YR		10.0YR	
(V/C)	Y	*x*	*y*	*x*	*y*	*x*	*y*	*x*	*y*	*V/C*	*Y*	*x*	*y*	*x*	*y*	*x*	*y*	*x*	*y*
										9/8	76.70					0.4220	0.3930	0.4199	0.4069
9/6	76.70	0.3665	0.3183	0.3734	0.3256	0.3812	0.3348	0.3880	0.3439	6		0.3927	0.3550	0.3948	0.3659	0.3950	0.3763	0.3941	0.3877
4		0.3445	0.3179	0.3495	0.3226	0.3551	0.3283	0.3600	0.3348	4		0.3641	0.3422	0.3668	0.3509	0.3679	0.3585	0.3677	0.3668
2		0.3210	0.3168	0.3240	0.3188	0.3263	0.3210	0.3284	0.3233	2		0.3320	0.3273	0.3353	0.3325	0.3380	0.3377	0.3392	0.3430
										8/20	57.62					0.5391	0.4518	0.5245	0.4709
										18						0.5316	0.4480	0.5179	0.4670
										16						0.51.95	0.4424	0.5079	0.4613
										14				0.5088	0.4145	0.5025	0.4338	0.4940	0.4530
										12		0.4852	0.3847	0.4849	0.4050	0.4816	0.4232	0.4753	0.4414
8/10	57.62	0.4125	0.3160	0.4249	0.3270	0.4388	0.3419	0.4490	0.3589	10		0.4552	0.3761	0.4576	0.3938	0.4568	0.4100	0.4527	0.4268
8	.	0.3900	0.3171	0.4001	0.3263	0.4118	0.3385	0.4212	0.3526	8		0.4275	0.3662	0.4310	0.3820	0.4306	0.3952	0.4280	0.4102
6		0.3671	0.3175	0.3743	0.3248	0.3830	0.3335	0.3910	0.3442	6		0.3960	0.3547	0.3988	0.3663	0.4000	0.1770	0.3994	0.3896
4		0.3460	0.3177	0.3510	0.3224	0.3564	0.3279	0.3621	0.3349	4		0.3667	0.3429	0.3690	0.3510	0.3699	0.3586	0.3701	0.3674
2		0.3236	0.3169	0.3254	0.3186	0.3277	0.3211	0.3301	0.3237	2		0.3334	0.3276	0.3373	0.3330	0.3395	0.3379	0.3407	0.3434
										7/20	41.99	0.5824	0.4046	0.5657	0.4298				
										18		0.5695	0.4024	0.5564	0.4267	0.5417	0.4492	0.5276	0.4700
7/16	41.99	0.4885	0.3039			0.5341	0.3452	0.5519	0.3729	16		0.5522	0.3989	0.5437	0.4228	0.5319	0.4449	0.5188	0.4650
14		0.4660	0.3082	0.4848	0.3238	0.5059	0.3450	0.5234	0.3700	14		0.5297	0.3938	0.5252	0.4168	0.5174	0.4381	0.5074	0.4581
12		0.4435	0.3119	0.4595	0.3252	0.4777	0.3435	0.4930	0.3659	12		0.5001	0.3861	0.5007	0.4081	0.4970	0.4282	0.4900	0.4480
10		0.4183	0.3144	0.4320	0.3260	0.4470	0.3413	0.4600	0.3596	10		0.4671	0.3768	0.4711	0.3972	0.4704	0.4151	0.4667	0.4335
8		0.3961	0.3160	0.4067	0.3256	0.4196	0.3382	0.4308	0.3533	8		0.4371	0.3679	0.4402	0.3842	0.4415	0.3996	0.4399	0.4164
6		0.3728	0.3170	0.3805	0.3244	0.3888	0.3336	0.3984	0.3452	6		0.4053	0.3570	0.4091	0.3701	0.4107	0.3820	0.4102	0.3960
4		0.3499	0.3171	0.3552	0.3222	0.3611	0.3282	0.3671	0.3360	4		0.3715	0.3439	0.3750	0.3530	0.3772	0.3613	0.3778	0.3719
2		0.3284	0.3170	0.3306	0.3190	0.3335	0.3220	0.3360	0.3253	2		0.3392	0.3298	0.3421	0.3349	0.3437	0.3397	0.3443	0.3454
6/18	29.30	0.5262	0.2928	0.5552	0.3138	0.5829	0.3396	0.6009	0.3720	6/18	29.30	0.5879	0.4021	0.5715	0.4270				
16		0.5041	0.2983	0.5297	0.3179	0.5560	0.3420	0.5741	0.3713	16		0.5698	0.3990	0.5597	0.4239	0.5468	0.4478		
14		0.4790	0.3041	0.5020	0.3212	0.5265	0.3431	0.5468	0.3697	14		0.5488	0.3947	0.5423	0.4188	0.5320	0.4412	0.5200	0.4623
12		0.4568	0.3082	0.4760	0.3234	0.4961	0.3428	0.5150	0.3667	12		0.5215	0.3887	0.5199	0.4119	0.5145	0.4331	0.5050	0.4536
10		0.4320	0.3118	0.4480	0.3250	0.4655	0.3412	0.4812	0.3619	10		0.4891	0.3806	0.4921	0.4022	0.4904	0.4220	0.4843	0.4416
8		0.4065	0.3144	0.4187	0.3251	0.4318	0.3383	0.4449	0.3550	8		0.4533	0.3708	0.4592	0.3900	0.4596	0.4064	0.4570	0.4249
6		0.3832	0.3158	0.3921	0.3244	0.4000	0.3340	0.4103	0.3473	6		0.4180	0.3600	0.4229	0.3750	0.4242	0.3876	0.4240	0.4030
4		0.3566	0.3163	0.3628	0.3221	0.3692	0.3291	0.3768	0.3381	4		0.3806	0.3467	0.3840	0.3564	0.3860	0.3652	0.3861	0.3767
2		0.3318	0.3166	0.3343	0.3190	0.3381	0.3228	0.3417	0.3268	2		0.3453	0.3321	0.3474	0.3373	0.3487	0.3421	0.3491	0.3483
5/20	19.27	0.5784	0.2719	0.6142	0.2970	0.6388	0.3216												
18		0.5540	0.2804	0.5918	0.3038	0.6161	0.3277	0.6297	0.3642										
16		0.5300	0.2880	0.5637	0.3102	0.5901	0.3331	0.6037	0.3657	5/16	19.27	0.5933	0.3989						
14		0.5047	0.2950	0.5341	0.3158	0.5590	0.3370	0.5771	0.3664	14		0.5731	0.3953	0.5642	0.4201	0.5506	0.4450		
12		0.4820	0.3002	0.5071	0.3194	0.5280	0.3389	0.5481	0.3660	12		0.5482	0.3909	0.5422	0.4141	0.5335	0.4378	0.5211	0.4600
10		0.4533	0.3058	0.4747	0.3227	0.4927	0.3399	0.5113	0.3630	10		0.5175	0.3844	0.5161	0.4064	0.5108	0.4276	0.5025	0.4489
8		0.4252	0.3101	0.4413	0.3240	0.4563	0.3387	0.4713	0.3575	8		0.4795	0.3758	0.4830	0.3960	0.4820	0.4141	0.4770	0.4338
6		0.3960	0.3130	0.4078	0.3238	0.4180	0.3348	0.4299	0.3499	6		0.4365	0.3640	0.4420	0.3808	0.4440	0.3954	0.4428	0.4128
4		0.3660	0.3148	0.3740	0.3220	0.3806	0.3294	0.3879	0.3398	4		0.3925	0.3494	0.3968	0.3614	0.3991	0.3714	0.3995	0.3840
2		0.3360	0.3158	0.3392	0.3192	0.3425	0.3229	0.3464	0.3278	2		0.3506	0.3337	0.3530	0.3395	0.3540	0.3445	0.3546	0.3514
4/20	11.70					0.6806	0.2988												
18		0.5898	0.2622	0.6329	0.2881	0.6538	0.3100												
16		0.5620	0.2724	0.6039	0.2978	0.6260	0.3192	0.6409	0.3533										
14		0.5369	0.2810	0.5714	0.3057	0.5959	0.3269	0.6154	0.3568										
12		0.5072	0.2897	0.5385	0.3129	0.5603	0.3321	0.5801	0.3588	4/12	11.70	0.5809	0.3910	0.5729	0.4169				
10		0.4774	0.2969	0.5043	0.3176	0.5235	0.3351	0.5418	0.3580	10		0.5475	0.3856	0.5432	0.4097	0.5356	0.4342	0.5250	0.4573
8		0.4472	0.3031	0.4690	0.3209	0.4850	0.3359	0.4995	0.3557	8		0.5071	0.3777	0.5070	0.3994	0.5038	0.4204	0.4965	0.4414
6		0.4141	0.3085	0.4299	0.3226	0.4415	0.3340	0.4535	0.3500	6		0.4612	0.3674	0.4651	0.3859	0.4655	0.4029	0.4618	0.4213
4		0.3800	0.3125	0.3916	0.3223	0.3990	0.3300	0.4078	0.3412	4		0.4141	0.3539	0.4187	0.3679	0.4208	0.3809	0.4189	0.3948
2		0.3461	0.3150	0.3508	0.3200	0.3538	0.3236	0.3582	0.3294	2		0.3624	0.3367	0.3651	0.3442	0.3662	0.3504	0.3660	0.3590
3/16	6.391	0.6116	0.2456	0.6520	0.2660	0.6817	0.2872												
14		0.5828	0.2579	0.6204	0.2789	0.6492	0.3012	0.6703	0.3249										
12		0.5536	0.2691	0.5884	0.2904	0.6158	0.3129	0.6322	0.3361										
10		0.5191	0.2811	0.5500	0.3024	0.5730	0.3240	0.5871	0.3440	3/10	6.391	0.5941	0.3818						
8		0.4821	0.2918	0.5064	0.3114	0.5251	0.3297	0.5393	0.3477	8		0.5475	0.3771	0.5456	0.4040	0.5390	0.4306	0.5305	0.4559
6		0.4409	0.3009	0.4592	0.3168	0.4738	0.3316	0.4854	0.3467	6		0.4954	0.3692	0.4966	0.3908	0.4930	0.4116	0.4872	0.4326
4		0.4021	0.3076	0.4148	0.3190	0.4240	0.3302	0.4308	0.3412	4		0.4360	0.3563	0.4376	0.3715	0.4378	0.3865	0.4341	0.4018
2		0.3591	0.3130	0.3645	0.3190	0.3690	0.3248	0.3728	0.3314	2		0.3757	0.3391	0.3771	0.3476	0.3771	0.3549	0.3747	0.3630
2/14	3.048	0.5734	0.2083	0.6302	0.2287	0.6791	0.2520	0.7165	0.2734										
12		0.5438	0.2254	0.5930	0.2465	0.6392	0.2704	0.6732	0.2937										
10		0.5122	0.2428	0.5557	0.2633	0.5952	0.2874	0.6247	0.3120										
8		0.4776	0.2593	0.5143	0.2800	0.5433	0.3027	0.5713	0.3259	2/8	3.048	0.5995	0.3590						

TABLE 2 *Continued*

Value/ Chroma		Reds										Yellow-Reds							
		2.5R		5.0R		7.5R		10.0R				2.5YR		5.0YR		7.5YR		10.0YR	
(V/C)	Y	*x*	*y*	*x*	*y*	*x*	*y*	*x*	*y*	*V/C*	*Y*	*x*	*y*	*x*	*y*	*x*	*y*	*x*	*y*
6		0.4390	0.2760	0.4642	0.2934	0.4875	0.3123	0.5095	0.3331	6		0.5280	0.3581	0.5426	0.3925	0.5475	0.4271		
4		0.4021	0.2900	0.4184	0.3032	0.4335	0.3169	0.4481	0.3330	4		0.4598	0.3508	0.4674	0.3738	0.4690	0.3964	0.4676	0.4168
2		0.3614	0.3033	0.3692	0.3111	0.3751	0.3181	0.3811	0.3274	2		0.3852	0.3365	0.3880	0.3476	0.3889	0.3590	0.3872	0.3688
1/10	1.179	0.5058	0.1900	0.5604	0.2100	0.6111	0.2290	0.6661	0.2499										
8		0.4812	0.2103	0.5282	0.2297	0.5722	0.2487	0.6178	0.2713	1/8	1.179	0.6721	0.3058						
6		0.4515	0.2329	0.4885	0.2515	0.5235	0.2698	0.5584	0.2921	6		0.6048	0.3270						
4		0.4166	0.2569	0.4420	0.2728	0.4660	0.2888	0.4933	0.3068	4		0.5311	0.3371	0.5660	0.3795				
2		0.3768	0.2816	0.3908	0.2929	0.4020	0.3034	0.4128	0.3154	2		0.4258	0.3344	0.4377	0.3580	0.4430	0.3775	0.4446	0.3982
		Yellows										Green-Yellows							
		2.5Y		5.0Y		7.5Y		10.0Y				2.5GY		5.0GY		7.5GY		10.0GY	
V/C	*Y*	*x*	*y*	*x*	*y*	*x*	*y*	*x*	*y*	*V/C*	*Y*	*x*	*y*	*x*	*y*	*x*	*y*	*x*	*y*
9/20	76.70			0.4830	0.5092														
18				0.4782	0.5049	0.4663	0.5188	0.4540	0.5320	9/18	76.70	0.4354	0.5508	0.4108	0.5699	0.3602	0.5920	0.3032	0.5748
16				0.4711	0.4977	0.4595	0.5104	0.4477	0.5225	16		0.4288	0.5383	0.4058	0.5541	0.3581	0.5654	0.3079	0.5440
14				0.4602	0.4869	0.4503	0.4993	0.4393	0.5101	14		0.4212	0.5237	0.3993	0.5329	0.3551	0.5339	0.3115	0.5129
12		0.4569	0.4527	0.4455	0.4719	0.4369	0.4829	0.4271	0.4920	12		0.4108	0.5028	0.3911	0.5082	0.3518	0.5042	0.3139	0.4829
10		0.4370	0.4369	0.4275	0.4529	0.4201	0.4622	0.4120	0.4694	10		0.3973	0.4761	0.3810	0.4791	0.3471	0.4735	0.3155	0.4558
8		0.4154	0.4186	0.4080	0.4319	0.4019	0.4392	0.3957	0.4450	8		0.3834	0.4490	0.3698	0.4497	0.3414	0.4415	0.3157	0.4259
6		0.3910	0.3972	0.3858	0.4071	0.3811	0.4123	0.3761	0.4155	6		0.3670	0.4178	0.3572	0.4179	0.3351	0.4111	0.3153	0.4008
4		0.3655	0.3738	0.3621	0.3799	0.3591	0.3832	0.3558	0.3852	4		0.3199	0.3866	0.3437	0.3861	0.3274	0.3793	0.3144	0.3711
2		0.3390	0.3472	0.3378	0.3504	0.3365	0.3527	0.3349	0.3537	2		0.3321	0.3539	0.3284	0.3534	0.3198	0.3500	0.3124	0.3454
										8/24	57.62							0.2781	0.6840
										22								0.2846	0.6564
8/20	57.62	0.5091	0.4900							20				0.4127	0.5855	0.3592	0.6235	0.2918	0.6255
18		0.5033	0.4855	0.4847	0.5069	0.4709	0.5220	0.4570	0.5366	18		0.4371	0.5557	0.4104	0.5785	0.3585	0.6063	0.2987	0.5919
16		0.4957	0.4800	0.4791	0.5012	0.4658	0.5158	0.4525	0.5295	16		0.4327	0.5475	0.4061	0.5641	0.3569	0.5798	0.3043	0.5578
14		0.4842	0.4712	0.4699	0.4920	0.4574	0.5062	0.4450	0.5181	14		0.4261	0.5344	0.4011	0.5468	0.3546	0.5490	0.3091	0.5247
12		0.4678	0.4589	0.4562	0.4788	0.4455	0.4917	0.4341	0.5020	12		0.4154	0.5133	0.3924	0.5199	0.3511	0.5144	0.3124	0.4926
10		0.4469	0.4423	0.4376	0.4601	0.4283	0.4712	0.4190	0.4791	10		0.4021	0.4869	0.3816	0.4879	0.3463	0.4791	0.3140	0.4601
8		0.4231	0.4231	0.4158	0.4378	0.4088	0.4466	0.4008	0.4520	8		0.3858	0.4550	0.3696	0.4542	0.3408	0.4452	0.3149	0.4284
6		0.3969	0.4009	0.3913	0.4117	0.3862	0.4175	0.3803	0.4216	6		0.3690	0.4230	0.3573	0.4214	0.3220	0.4129	0.3150	0.4014
4		0.3684	0.3751	0.3650	0.3826	0.3622	0.3861	0.3581	0.3883	4		0.3504	0.3887	0.3433	0.3872	0.3266	0.3809	0.3140	0.3727
2		0.3406	0.3484	0.3394	0.3518	0.3379	0.3540	0.3359	0.3552	2		0.3327	0.3555	0.3284	0.3542	0.3194	0.3502	0.3121	0.3459
										7/22	41.99							0.2728	0.6893
										20								0.2816	0.6563
										18						0.3555	0.6242	0.2905	0.6186
7/16	41.99	0.5049	0.4843	0.4875	0.5047	0.4728	0.5215	0.4582	0.5375	16		0.4366	0.5578	0.4076	0.5783	0.3549	0.6000	0.2981	0.5835
14		0.4950	0.4773	0.4791	0.4965	0.4652	0.5128	0.4516	0.5277	14		0.4309	0.5459	0.4027	0.5615	0.3532	0.5700	0.3047	0.5458
12		0.4806	0.4666	0.4677	0.4857	0.4547	0.5005	0.4420	0.5131	12		0.4213	0.5270	0.3949	0.5367	0.3502	0.5328	0.3092	0.5095
10		0.4606	0.4516	0.4509	0.4696	0.4400	0.4830	0.4289	0.4937	10		0.4091	0.5030	0.3852	0.5051	0.3461	0.4950	0.3123	0.4732
8		0.4353	0.4312	0.4271	0.4462	0.4184	0.4568	0.4090	0.4641	8		0.3919	0.4684	0.3722	0.4669	0.3406	0.4558	0.3140	0.4387
6		0.4073	0.4073	0.4009	0.4198	0.3943	0.4264	0.3864	0.4305	6		0.3728	0.4316	0.3581	0.4291	0.3341	0.4191	0.3142	0.4058
4		0.3761	0.3800	0.3718	0.3885	0.3677	0.3925	0.3624	0.3951	4		0.3534	0.3953	0.3437	0.3929	0.3267	0.3848	0.3133	0.3761
2		0.3436	0.3507	0.3419	0.3540	0.3396	0.3558	0.3369	0.3569	2		0.3328	0.3569	0.3284	0.3559	0.3190	0.3516	0.3117	0.3469
										6/20	29.30							0.2648	0.7004
										18								0.2763	0.6616
										16						0.3498	0.6282	0.2872	0.6199
6/14	29.30	0.5061	0.4829	0.4905	0.5038	0.4754	0.5220	0.4593	0.5392	14		0.4354	0.5594	0.4042	0.5788	0.3498	0.5985	0.2962	0.5802
12		0.4928	0.4730	0.4780	0.4920	0.4638	0.5087	0.4488	0.5237	12		0.4269	0.5414	0.3980	0.5564	0.3488	0.5596	0.3037	0.5358
10		0.4760	0.4607	0.4639	0.4790	0.4512	0.4943	0.4372	0.5068	10		0.4159	0.5190	0.3891	0.5264	0.3463	0.5196	0.3086	0.4949
8		0.4517	0.4421	0.4426	0.4588	0.4321	0.4719	0.4201	0.4812	8		0.4006	0.4885	0.3772	0.4880	0.3418	0.4768	0.3116	0.4563
6		0.4203	0.4176	0.4140	0.4305	0.4060	0.4400	0.3960	0.4452	6		0.3799	0.4470	0.3622	0.4438	0.3351	0.4321	0.3128	0.4175
4		0.3840	0.3867	0.3794	0.3955	0.3745	0.4004	0.3679	0.4033	4		0.3572	0.4038	0.3461	0.4008	0.3275	0.3922	0.3124	0.3822
2		0.3480	0.3540	0.3457	0.3580	0.3431	0.3601	0.3398	0.3611	2		0.3342	0.3607	0.3288	0.3592	0.3193	0.3550	0.3112	0.3496
										5/18	19.27							0.2549	0.7179
										16								0.2702	0.6700
										14						0.3429	0.6335	0.2838	0.6208
5/12	19.27	0.5082	0.4812	0.4932	0.5019	0.4767	0.5208	0.4590	0.5390	12		0.4333	0.5602	0.4011	0.5802	0.3450	0.5949	0.2940	0.5751
10		0.4905	0.4683	0.4777	0.4876	0.4632	0.5057	0.4468	0.5209	10		0.4224	0.5369	0.3928	0.5485	0.3451	0.5490	0.3028	0.5237
8		0.4685	0.4524	0.4579	0.4692	0.4450	0.4850	0.4307	0.4967	8		0.4088	0.5068	0.3815	0.5093	0.3412	0.4976	0.3080	0.4759
6		0.4380	0.4292	0.4302	0.4435	0.4199	0.4551	0.4072	0.4621	6		0.3879	0.4646	0.3663	0.4614	0.3354	0.4483	0.3108	0.4301
4		0.3968	0.3954	0.3915	0.4057	0.3850	0.4120	0.3762	0.4158	4		0.3621	0.4143	0.3482	0.4097	0.3274	0.3994	0.3111	0.3881
2		0.3534	0.3570	0.3500	0.3620	0.3470	0.3640	0.3422	0.3648	2		0.3352	0.3636	0.3289	0.3612	0.3188	0.3560	0.3110	0.3508
										4/16	11.70							0.2422	0.7360
										14								0.2590	0.6858
										12						0.3348	0.6468	0.2758	0.6282

TABLE 2 *Continued*

		Yellows										Green-Yellows							
		2.5Y		5.0Y		7.5Y		10.0Y				2.5GY		5.0GY		7.5GY		10.0GY	
V/C	*Y*	*x*	*y*	*x*	*y*	*x*	*y*	*x*	*y*	*V/C*	*Y*	*x*	*y*	*x*	*y*	*x*	*y*	*x*	*y*
4/10	11.70	0.5120	0.4800							10						0.3395	0.5913	0.2908	0.5672
8		0.4865	0.4625	0.4745	0.4810	0.4595	0.4990	0.4430	0.5153	8		0.4174	0.5300	0.3868	0.5384	0.3400	05348	0.3008	0.5095
6		0.4542	0.4391	0.4451	0.4550	0.4331	0.4688	0.4190	0.4795	6		0.3968	0.4857	0.3718	0.4852	0.3355	0.4739	0.3069	0.4550
4		0.4138	0.4076	0.4069	0.4188	0.3982	0.4272	0.3871	0.4321	4		0.3708	0.4329	0.3538	0.4284	0.3281	0.4157	0.3100	0.4018
2		0.3633	0.3654	0.3590	0.3701	0.3542	0.3727	0.3476	0.3732	2		0.3382	0.3706	0.3312	0.3678	0.3185	0.3604	0.3109	0.3550
										3/14	6.391							0.2283	0.7423
										12								0.2531	0.6700
										10						0.3266	0.6448	0.2724	0.6026
										8				0.3924	0.5832	0.3341	0.5700	0.2887	0.5361
3/6	6.391	0.4784	0.4531	0.4670	0.4711	0.4526	0.4889	0.4345	0.5026	6		0.4069	0.5110	0.3750	0.5109	0.3333	0.4967	0.2992	0.4717
4		0.4277	0.4166	0.4191	0.4283	0.4086	0.4379	0.3961	0.4452	4		0.3772	0.4484	0.3554	0.4429	0.3270	0.4288	0.3053	0.4123
2		0.3703	0.3700	0.3646	0.3748	0.3589	0.3778	0.3513	0.3789	2		0.3412	0.3768	0.3319	0.3729	0.3180	0.3644	0.3088	0.3578
										2/12	3.048							0.1907	0.7798
										10								0.2307	0.6814
										8						0.3160	0.6509	0.2628	0.5837
										6				0.3839	0.5748	0.3260	0.5379	0.2852	0.4972
2/4	3.048	0.4627	0.4392	0.4543	0.4573	0.4401	0.4723	0.4188	0.4789	4		0.3881	0.4752	0.3582	0.4650	0.3248	0.4457	0.2986	0.4240
2		0.3825	0.3785	0.3757	0.3839	0.3660	0.3858	0.3556	0.3848	2		0.3421	0.3803	0.3309	0.3743	0.3165	0.3650	0.3069	0.3580
										1/6	1.179							0.2232	0.6392
										4				0.3765	0.5942	0.3133	0.5380	0.2722	0.4903
1/2	1.179	0.4362	0.4177	0.4230	0.4265	0.4042	0.4287	0.3802	0.4212	2		0.3540	0.4088	0.3359	0.3982	0.3154	0.3840	0.3006	0.3720

		Greens										Blue-Greens							
		2.5G		5.0G		7.5G		10.0G				2.5BG		5.0BG		7.5BG		10.0BG	
V/C	*Y*	*x*	*y*	*x*	*y*	*x*	*y*	*x*	*y*	*V/C*	*Y*	*x*	*y*	*x*	*y*	*x*	*y*	*x*	*y*
9/16	76.70	0.2630	0.4966																
14		0.2711	0.4726																
12		0.2786	0.4491	0.2528	0.4160	0.2419	0.3985	0.2325	0.3796										
10		0.2851	0.4275	0.2634	0.4001	0.2545	0.3855	0.2457	0.3702	9/10	76.70	0.2382	0.3568	0.2301	0.3405	0.2215	0.3226		
8		0.2912	0.4054	0.2735	0.3854	0.2652	0.3738	0.2574	0.3618	8		0.2509	0.3507	0.2437	0.3378	0.2361	0.3225		
6		0.2966	0.3846	0.2832	0.3697	0.2763	0.3607	0.2703	0.3513	6		0.2652	0.3433	0.2599	0.3338	0.2543	0.3220	0.2501	0.3118
4		0.3018	0.3606	0.2933	0.3519	0.2882	0.3461	0.2840	0.3402	4		0.2805	0.3349	0.2768	0.3287	0.2728	0.3208	0.2700	0.3140
2		0.3058	0.3400	0.3017	0.3357	0.2987	0.3323	0.2964	0.3293	2		0.2947	0.3267	0.2930	0.3232	0.2911	0.3188	0.2907	0.3159
8/24	57.62	0.2091	0.6033																
22		0.2221	0.5799	0.1821	0.4940														
20		0.2339	0.5561	0.1956	0.4806	0.1845	0.4492	0.1734	0.4164										
18		0.2451	0.5309	0.2103	0.4652	0.2980	0.4372	0.1866	0.4086	8/18	57.62	0.1759	0.3782						
16		0.2563	0.5045	0.2240	0.4500	0.2120	0.4252	0.2012	0.3992	16		0.1915	0.3732	0.1814	0.3450	0.1721	0.3168		
14		0.2661	0.4780	0.2368	0.4348	0.2254	0.4125	0.2148	0.3903	14		0.2057	0.3681	0.1958	0.3432	0.1868	0.3179	0.1788	0.2936
12		0.2743	0.4554	0.2489	0.4191	0.2380	0.4002	0.2282	0.3811	12		0.2196	0.3630	0.2101	0.3412	0.2010	0.3188	0.1937	0.2978
10		0.2829	0.4301	0.2613	0.4026	0.2515	0.3867	0.2430	0.3710	10		0.2352	0.3566	0.2264	0.3383	0.2184	0.3196	0.2120	0.3025
8		0.2896	0.4065	0.2723	0.3865	0.2639	0.3733	0.2564	0.3611	8		0.2500	0.3500	0.2419	0.3352	0.2352	0.3198	0.2302	0.3063
6		0.2952	0.3851	0.2822	0.3702	0.2754	0.3608	0.2693	0.3512	6		0.2647	0.3429	0.2588	0.3318	0.2525	0.3198	0.2489	0.3099
4		0.3009	0.3614	0.2924	0.3523	0.2874	0.3464	0.2828	0.3403	4		0.2791	0.3351	0.2752	0.3278	0.2718	0.3200	0.2686	0.3130
2		0.3053	0.3404	0.3009	0.3359	0.2981	0.3326	0.2957	0.3293	2		0.2940	0.3268	0.2919	0.3228	0.2900	0.3183	0.2894	0.3152
7/26	41.99	0.1689	0.6549	0.1397	0.5312	0.1303	0.4858												
24		0.1875	0.6265	0.1521	0.3200	0.1415	0.4778	0.1310	0.4377										
22		0.2029	0.6017	0.1659	0.5074	0.1539	0.4683	0.1434	0.4306	7/22	41.99	0.1334	0.3870						
20		0.2181	0.5714	0.1805	0.4933	0.1688	0.4570	0.1589	0.4220	20		0.1490	0.3827	0.1380	0.3412				
18		0.2328	0.5467	0.1967	0.4771	0.1841	0.4448	0.1734	0.4135	18		0.1626	0.3788	0.1515	0.3410	0.1427	0.3076		
16		0.2448	0.5203	0.2111	0.4616	0.1982	0.4330	0.1881	0.4049	16		0.1788	0.3739	0.1675	0.3401	0.1584	0.3101	0.1489	0.2768
14		0.2568	0.4931	0.2262	0.4130	0.2139	0.4199	0.2033	0.3956	14		0.1932	0.3694	0.1838	0.3390	0.1751	0.3129	0.1671	0.2832
12		0.2672	0.4667	0.2416	0.4267	0.2295	0.4058	0.2195	0.3854	12		0.2102	0.3636	0.1997	0.3379	0.1914	0.3148	0.1841	0.2892
10		0.2775	0.4395	0.2554	0.4087	0.2445	0.3914	0.2352	0.3748	10		0.2264	0.3576	0.2163	0.3361	0.2094	0.3165	0.2035	0.2956
8		0.2861	0.4129	0.2687	0.3901	0.2595	0.3764	0.2513	0.3635	8		0.2439	0.3508	0.2354	0.3335	0.2292	0.3178	0.2235	0.3014
6		0.2933	0.3873	0.2801	0.3721	0.2728	0.3622	0.2662	0.3526	6		0.2608	0.3430	0.2543	0.3302	0.2490	0.3186	0.2448	0.3069
4		0.2992	0.3644	0.2902	0.3548	0.2850	0.3482	0.2803	0.3415	4		0.2764	0.3354	0.2712	0.3269	0.2671	0.3189	0.2642	0.3109
2		0.3047	0.3413	0.3001	0.3366	0.2972	0.3333	0.2945	0.3297	2		0.2927	0.3269	0.2898	0.3225	0.2878	0.3182	0.2869	0.3143
6/28	29.30	0.1145	0.7122	0.0908	0.5695	0.0858	0.5127												
26		0.1340	0.6871	0.1079	0.5560	0.1010	0.5018	0.0941	0.4520										
24		0.1536	0.6605	0.1252	0.5408	0.1159	0.4910	0.1070	0.4458										
22		0.1739	0.6318	0.1432	0.5252	0.1325	0.4795	0.1230	0.4378	6/22	29.30	0.1120	0.3860						
20		0.1922	0.6035	0.1609	0.5091	0.1485	0.4677	0.1382	0.4299	20		0.1269	0.3829	0.1168	0.3344				
18		0.2102	0.5737	0.1785	0.4924	0.1654	0.4551	0.1551	0.4208	18		0.1428	0.3790	0.1325	0.3345	0.1248	0.2981	0.1181	0.2581
16		0.2278	0.5430	0.1960	0.4751	0.1832	0.4414	0.1722	0.4113	16		0.1600	0.3748	0.1491	0.3345	0.1408	0.3017	0.1337	0.2651
14		0.2426	0.5133	0.2130	0.4571	0.2001	0.4278	0.1895	0.4015	14		0.1779	0.3699	0.1662	0.3343	0.1585	0.3052	0.1518	0.2729
12		0.2574	0.4814	0.2293	0.4390	0.2171	0.4138	0.2060	0.3914	12		0.1954	0.3645	0.1844	0.3337	0.1762	0.3081	0.1698	0.2802

TABLE 2 *Continued*

		Greens										Blue-Greens							
		2.5G		5.0G		7.5G		10.0G				2.5BG		5.0BG		7.5BG		10.0BG	
V/C	*Y*	*x*	*y*	*x*	*y*	*x*	*y*	*x*	*y*	*V/C*	*Y*	*x*	*y*	*x*	*y*	*x*	*y*	*x*	*y*
10		0.2690	0.4530	0.2466	0.4181	0.2350	0.3979	0.2247	0.3796	10		0.2148	0.3584	0.2037	0.3329	0.1961	0.3110	0.1909	0.2881
8		0.2799	0.4239	0.2612	0.3990	0.2510	0.3829	0.2420	0.3679	8		0.2332	0.3522	0.2236	0.3311	0.2171	0.3138	0.2116	0.2950
6		0.2892	0.3963	0.2748	0.3795	0.2662	0.3672	0.2591	0.3558	6		0.2526	0.3448	0.2441	0.3290	0.2384	0.3155	0.2335	0.3015
4		0.2967	0.3695	0.2868	0.3595	0.2807	0.3522	0.2749	0.3443	4		0.2702	0.3369	0.2648	0.3262	0.2604	0.3169	0.2578	0.3078
2		0.3039	0.3437	0.2988	0.3382	0.2958	0.3344	0.2929	0.3303	2		0.2902	0.3268	0.2872	0.3219	0.2849	0.3172	0.2837	0.3132
5/28	19.27	0.0794	0.7385	0.0609	0.5898	0.0585	0.5224	0.0572	0.4590										
26		0.0992	0.7155	0.0784	0.5761	0.0730	0.5131	0.0690	0.4542										
24		0.1188	0.6918	0.0953	0.5628	0.0878	0.5039	0.0811	0.4491	5/24	19.27	0.0738	0.3851						
22		0.1377	0.6674	0.1144	0.5463	0.1050	0.4927	0.0958	0.4428	22		0.0861	0.3832	0.0781	0.3211				
20		0.1579	0.6392	0.1318	0.5321	0.1212	0.4817	0.1120	0.4360	20		0.1005	0.3814	0.0904	0.3231				
18		0.1782	0.6095	0.1489	0.5171	0.1372	0.4705	0.1275	0.4288	18		0.1165	0.3785	0.1046	0.3244	0.0982	0.2828		
16		0.2005	0.5759	0.1695	0.4981	0.1571	0.4561	0.1469	0.4192	16		0.1348	0.3750	0.1243	0.3261	0.1167	0.2880	0.1108	0.2489
14		0.2211	0.5411	0.1912	0.4773	0.1776	0.4415	0.1671	0.4089	14		0.1559	0.3708	0.1448	0.3275	0.1364	0.2932	0.1308	0.2582
12		0.2385	0.5071	0.2104	0.4578	0.1964	0.4271	0.1852	0.3992	12		0.1735	0.3668	0.1614	0.3280	0.1537	0.2976	0.1485	0.2662
10		0.2565	0.4705	0.2329	0.4331	0.2200	0.4082	0.2095	0.3853	10		0.1980	0.3606	0.1850	0.3280	0.1776	0.3032	0.1716	0.2760
8		0.2710	0.4380	0.2511	0.4107	0.2395	0.3915	0.2297	0.3730	8		0.2205	0.3537	0.2100	0.3280	0.2030	0.3082	0.1970	0.2860
6		0.2841	0.4045	0.2690	0.3860	0.2598	0.3724	0.2519	0.3587	6		0.2448	0.3452	0.2360	0.3270	0.2292	0.3125	0.2234	0.2952
4		0.2943	0.3735	0.2841	0.3628	0.2775	0.3545	0.2711	0.3455	4		0.2659	0.3369	0.2591	0.3246	0.2550	0.3150	0.2512	0.3040
2		0.3030	0.3445	0.2978	0.3392	0.2945	0.3355	0.2910	0.3310	2		0.2880	0.3270	0.2841	0.3210	0.2812	0.3161	0.2796	0.3111
4/26	11.70	0.0528	0.7502	0.0407	0.6010	0.0392	0.5258	0.0400	0.4545										
24		0.0760	0.7250	0.0614	0.5857	0.0581	0.5151	0.0553	0.4492	4/24	11.70	0.0510	0.3800						
22		0.1009	0.6975	0.0841	0.5684	0.0770	0.5040	0.0702	0.4440	22		0.0636	0.3788						
20		0.1230	0.6706	0.1018	0.5543	0.0928	0.4942	0.0850	0.4388	20		0.0768	0.3773	0.0675	0.3075				
18		0.1446	0.6431	0.1188	0.5400	0.1086	0.4842	0.1006	0.4330	18		0.0915	0.3754	0.0828	0.3108	0.0768	0.2667		
16		0.1682	0.6111	0.1402	0.5214	0.1293	0.4703	0.1212	0.4245	16		0.1102	0.3720	0.0992	0.3141	0.0922	0.2718	0.0888	0.2298
14		0.1909	0.5779	0.1627	0.5015	0.1500	0.4562	0.1398	0.4168	14		0.1283	0.3688	0.1170	0.3170	0.1092	0.2774	0.1033	0.2376
12		0.2128	0.5425	0.1843	0.4807	0.1706	0.4419	0.1602	0.4070	12		0.1492	0.3649	0.1379	0.3198	0.1298	0.2840	0.1248	0.2484
10		0.2355	0.5006	0.2115	0.4532	0.1989	0.4219	0.1876	0.3933	10		0.1738	0.3600	0.1618	0.3219	0.1540	0.2910	0.1480	0.2600
8		0.2561	0.4597	0.2359	0.4266	0.2232	0.4022	0.2124	0.3799	8		0.2006	0.3540	0.1890	0.3234	0.1815	0.2985	0.1760	0.2730
6		0.2735	0.4215	0.2581	0.3992	0.2467	0.3822	0.2374	0.3655	6		0.2278	0.3463	0.2182	0.3240	0.2113	0.3052	0.2065	0.2863
4		0.2891	0.3821	0.2781	0.3704	0.2702	0.3602	0.2628	0.3498	4		0.2552	0.3375	0.2480	0.3232	0.2429	0.3108	0.2384	0.2984
2		0.3012	0.3470	0.2959	0.3417	0.2919	0.3371	0.2880	0.3327	2		0.2840	0.3270	0.2799	0.3208	0.2764	0.3148	0.2740	0.3091
3/22	6.391	0.0390	0.7468	0.0340	0.6011	0.0332	0.5206	0.0333	0.4444										
20		0.0720	0.7127	0.0620	0.5802	0.0568	0.5082	0.0528	0.4393	3/20	6.391	0.0482	0.3695						
18		0.1049	0.6766	0.0882	0.5605	0.0798	0.4954	0.0718	0.4340	18		0.0648	0.3682	0.0580	0.2940				
16		0.1341	0.6420	0.1120	0.5414	0.1023	0.4818	0.0925	0.4275	16		0.0843	0.3667	0.0735	0.2979	0.0691	0.2559		
14		0.1626	0.6052	0.1382	0.5197	0.1262	0.4667	0.1161	0.4192	14		0.1051	0.3648	0.0940	0.3027	0.0874	0.2627	0.0798	0.2151
12		0.1902	0.5642	0.1660	0.4948	0.1516	0.4505	0.1411	0.4095	12		0.1288	0.3620	0.1158	0.3071	0.1086	0.2706	0.1018	0.2281
10		0.2170	0.5211	0.1935	0.4682	0.1800	0.4310	0.1688	0.3974	10		0.1552	0.3580	0.1410	0.3118	0.1326	0.2784	0.1250	0.2411
8		0.2435	0.4752	0.2228	0.4380	0.2088	0.4101	0.1970	0.3841	8		0.1845	0.3531	0.1703	0.3159	0.1620	0.2872	0.1551	0.2571
6		0.2642	0.4342	0.2471	0.4100	0.2346	0.3901	0.2240	0.3699	6		0.2132	0.3468	0.2020	0.3188	0.1928	0.2958	0.1861	0.2722
4		0.2836	0.3915	0.2711	0.3780	0.2618	0.3667	0.2525	0.3537	4		0.2437	0.3386	0.2343	0.3200	0.2272	0.3041	0.2221	0.2886
2		0.2999	0.3500	0.2935	0.3439	0.2890	0.3391	0.2844	0.3337	2		0.2799	0.3271	0.2742	0.3192	0.2699	0.3120	0.2660	0.3050
2/16	3.048	0.0329	0.7358	0.0277	0.5986	0.0276	0.5153	0.0285	0.4327										
14		0.0820	0.6860	0.0688	0.5691	0.0629	0.4973	0.0599	0.4270	2/14	3.048	0.0555	0.3588						
12		0.1307	0.6308	0.1120	0.5358	0.1022	0.4759	0.0934	0.4183	12		0.0851	0.3576	0.0769	0.2880	0.0724	0.2478		
10		0.1773	0.5698	0.1560	0.4981	0.1442	0.4505	0.1321	0.4059	10		0.1190	0.3551	0.1050	0.2956	0.0991	0.2582	0.0929	0.2133
8		0.2192	0.5042	0.1979	0.4583	0.1842	0.4244	0.1705	0.3911	8		0.1557	0.3517	0.1405	0.3037	0.1325	0.2710	0.1258	0.2331
6		0.2493	0.4522	0.2318	0.4231	0.2200	0.3983	0.2092	0.3739	6		0.1971	0.3452	0.1843	0.3110	0.1747	0.2853	0.1669	0.2570
4		0.2763	0.3998	0.2640	0.3845	0.2540	0.3705	0.2442	0.3559	4		0.2343	0.3378	0.2234	0.3150	0.2162	0.2981	0.2096	0.2790
2		0.2978	0.3507	0.2918	0.3450	0.2869	0.3400	0.2820	0.3341	2		0.2765	0.3271	0.2697	0.3175	0.2651	0.3098	0.2606	0.3010
1/8	1.179	0.0620	0.6896	0.0559	0.5710	0.0530	0.4943	0.0511	0.4158	1/8	1.179	0.0476	0.3458						
6		0.1711	0.5619	0.1468	0.4996	0.1344	0.4505	0.1249	0.4019	6		0.1169	0.3452	0.1093	0.2860	0.1059	0.2485	0.1074	0.2129
4		0.2454	0.4489	0.2290	0.4218	0.2159	0.3967	0.2040	0.3724	4		0.1883	0.3406	0.1753	0.3021	0.1702	0.2768	0.1658	0.2496
2		0.2910	0.3634	0.2833	0.3564	0.2758	0.3484	0.2689	0.3407	2		0.2600	0.3289	0.2500	0.3141	0.2430	0.3023	0.2362	0.2882

		Blues										Purple-Blues							
		2.5B		5.0B		7.5B		10.0B				2.5PB		5.0PB		7.5PB		10.0PB	
V/C	*Y*	*x*	*y*	*x*	*y*	*x*	*y*	*x*	*y*	*V/C*	*Y*	*x*	*y*	*x*	*y*	*x*	*y*	*x*	*y*
9/4	76.70	0.2680	0.3073	0.2675	0.3005	0.2688	0.2961	0.2712	0.2924	9/4	76.70							0.2910	0.2850
2		0.2909	0.3125	0.2919	0.3102	0.2937	0.3087	0.2949	0.3076	2		0.2975	0.3063	0.2991	0.3057	0.3015	0.3052	0.3038	0.3054
8/12	57.62	0.1877	0.2752																
10		0.2066	0.2839																
8		0.2264	0.2923	0.2237	0.2761	0.2252	0.2668	0.2294	0.2587	8/8	57.62							0.2677	0.2443
6		0.2462	0.3000	0.2457	0.2888	0.2472	0.2821	0.2512	0.2760	6		0.2562	0.2709	0.2614	0.2670	0.2702	0.2648	0.2792	0.2649
4		0.2668	0.3067	0.2671	0.2998	0.2688	0.2956	0.2718	0.2911	4		0.2758	0.2879	0.2798	0.2861	0.2856	0.2846	0.2911	0.2848
2		0.2897	0.3124	0.2908	0.3096	0.2922	0.3077	0.2935	0.3062	2		0.2957	0.3047	0.2974	0.3039	0.3003	0.3034	0.3027	0.3035

TABLE 2 *Continued*

		Blues										Purple-Blues							
		2.5B		5.0B		7.5B		10.0B				2.5PB		5.0PB		7.5PB		10.0PB	
V/C	*Y*	*x*	*y*	*x*	*y*	*x*	*y*	*x*	*y*	*V/C*	*Y*	*x*	*y*	*x*	*y*	*x*	*y*	*x*	*y*
7/16	41.99	0.1435	0.2472																
14		0.1624	0.2581	0.1615	0.2307														
12		0.1797	0.2672	0.1778	0.2430	0.1818	0.2303	0.1883	0.2203	7/12	41.99							0.2465	0.2058
10		0.1994	0.2775	0.1986	0.2579	0.2016	0.2466	0.2078	0.2382	10		0.2162	0.2309	0.2254	0.2267	0.2410	0.2224	0.2563	0.2240
8		0.2208	0.2871	0.2204	0.2729	0.2225	0.2631	0.2277	0.2559	8		0.2352	0.2498	0.2427	0.2458	0.2546	0.2418	0.2670	0.2425
6		0.2418	0.2960	0.2410	0.2854	0.2436	0.2787	0.2478	0.2728	6		0.2538	0.2677	0.2596	0.2643	0.2687	0.2612	0.2776	0.2612
4		0.2629	0.3038	0.2633	0.2972	0.2651	0.2927	0.2685	0.2886	4		0.2729	0.2848	0.2773	0.2828	0.2833	0.2809	0.2886	0.2801
2		0.2867	0.3110	0.2875	0.3078	0.2888	0.3058	0.2908	0.3039	2		0.2932	0.3025	0.2952	0.3011	0.2982	0.3003	0.3005	0.3000
6/16	29.30	0.1294	0.2348	0.1310	0.2048	0.1376	0.1879	0.1454	0.1778	6/16	29.30							0.2265	0.1671
14		0.1480	0.2459	0.1496	0.2193	0.1556	0.2043	0.1629	0.1947	14		0.1754	0.1868	0.1873	0.1822	0.2119	0.1799	0.2352	0.1839
12		0.1660	0.2561	0.1685	0.2339	0.1734	0.2203	0.1803	0.2114	12		0.1913	0.2038	0.2026	0.1999	0.2241	0.1975	0.2440	0.1998
10		0.1879	0.2682	0.1883	0.2487	0.1934	0.2374	0.2000	0.2298	10		0.2095	0.2225	0.2197	0.2188	0.2378	0.2168	0.2540	0.2176
8		0.2080	0.2789	0.2088	0.2635	0.2132	0.2537	0.2189	0.2468	8		0.2274	0.2406	0.2360	0.2365	0.2505	0.2347	0.2637	0.2352
6		0.2312	0.2899	0.2320	0.2789	0.2352	0.2708	0.2399	0.2650	6		0.2465	0.2599	0.2533	0.2558	0.2638	0.2531	0.2740	0.2533
4		0.2571	0.3008	0.2579	0.2938	0.2602	0.2881	0.2637	0.2840	4		0.2684	0.2804	0.2734	0.2778	0.2798	0.2752	0.2863	0.2747
2		0.2835	0.3097	0.2842	0.3063	0.2854	0.3037	0.2871	0.3012	2		0.2897	0.2991	0.2923	0.2978	0.2955	0.2963	0.2988	0.2961
										5/22	19.27							0.2082	0.1225
										20						0.1794	0.1239	0.2121	0.1329
5/18	19.27							0.1203	0.1505	18		0.1363	0.1410	0.1518	0.1365	0.1862	0.1365	0.2174	0.1444
16		0.1090	0.2166	0.1132	0.1863	0.1230	0.1711	0.1326	0.1632	16		0.1495	0.1559	0.1638	0.1521	0.1945	0.1511	0.2224	0.1555
14		0.1283	0.2292	0.1320	0.2021	0.1404	0.1878	0.1492	0.1797	14		0.1642	0.1728	0.1773	0.1689	0.2042	0.1661	0.2299	0.1698
12		0.1461	0.2406	0.1505	0.2172	0.1584	0.2042	0.1666	0.1964	12		0.1793	0.1894	0.1918	0.1858	0.2157	0.1830	0.2384	0.1857
10		0.1697	0.2549	0.1729	0.2347	0.1792	0.2230	0.1860	0.2149	10		0.1968	0.2078	0.2080	0.2041	0.2285	0.2020	0.2478	0.2030
8		0.1947	0.2687	0.1958	0.2519	0.2007	0.2417	0.2067	0.2344	8		0.2157	0.2278	0.2255	0.2239	0.2417	0.2204	0.2572	0.2211
6		0.2210	0.2823	0.2215	0.2701	0.2248	0.2612	0.2299	0.2548	6		0.2365	0.2488	0.2447	0.2449	0.2563	0.2417	0.2686	0.2412
4		0.2492	0.2954	0.2493	0.2879	0.2511	0.2808	0.2547	0.2757	4		0.2600	0.2720	0.2662	0.2687	0.2739	0.2666	0.2821	0.2659
2		0.2791	0.3071	0.2794	0.3032	0.2803	0.3000	0.2821	0.2966	2		0.2847	0.2942	0.2882	0.2923	0.2918	0.2908	0.2959	0.2905
										4/30	11.70							0.1952	0.0778
										28								0.1971	0.0840
										26						0.1659	0.0825	0.1994	0.0904
										24						0.1684	0.0899	0.2020	0.0985
										22						0.1713	0.0980	0.2048	0.1064
										20				0.1288	0.1027	0.1742	0.1058	0.2075	0.1140
										18		0.1218	0.1208	0.1392	0.1167	0.1798	0.1185	0.2120	0.1256
4/16	11.70	0.0900	0.1973					0.1155	0.1416	16		0.1336	0.1349	0.1504	0.1317	0.1861	0.1316	0.2170	0.1373
14		0.1027	0.2057	0.1098	0.1785	0.1204	0.1655	0.1310	0.1580	14		0.1473	0.1513	0.1627	0.1479	0.1941	0.1468	0.2220	0.1503
12		0.1247	0.2209	0.1299	0.1963	0.1393	0.1837	0.1487	0.1760	12		0.1634	0.1698	0.1773	0.1659	0.2037	0.1629	0.2298	0.1659
10		0.1463	0.2354	0.1512	0.2148	0.1601	0.2028	0.1681	0.1954	10		0.1805	0.1888	0.1925	0.1843	0.2158	0.1811	0.2388	0.1837
8		0.1737	0.2524	0.1759	0.2345	0.1821	0.2232	0.1893	0.2160	8		0.1995	0.2094	0.2103	0.2050	0.2304	0.2023	0.2497	0.2038
6		0.2048	0.2708	0.2060	0.2572	0.2102	0.2470	0.2157	0.2407	6		0.2235	0.2343	0.2325	0.2300	0.2471	0.2266	0.2618	0.2263
4		0.2360	0.2872	0.2363	0.2782	0.2368	0.2704	0.2429	0.2648	4		0.2487	0.2597	0.2562	0.2560	0.2657	0.2528	0.2759	0.2522
2		0.2727	0.3038	0.2723	0.2992	0.2733	0.2947	0.2753	0.2910	2		0.2782	0.2876	0.2816	0.2842	0.2861	0.2819	0.2911	0.2804
										3/34	6.391					0.1608	0.0480	0.1918	0.0503
										32						0.1612	0.0511	0.1926	0.0542
										30						0.1621	0.0556	0.1938	0.0599
										28						0.1632	0.0609	0.1950	0.0650
										26						0.1642	0.0655	0.1963	0.0708
										24						0.1658	0.0711	0.0982	0.0772
										22						0.1677	0.0782	0.2004	0.0847
										20						0.1702	0.0867	0.2030	0.0930
										18				0.1228	0.0895	0.1730	0.0948	0.2060	0.1020
										16				0.1318	0.1024	0.1765	0.1048	0.2092	0.1118
3/14	6.391							0.1065	0.1285	14		0.1251	0.1218	0.1431	0.1184	0.1824	0.1188	0.2142	0.1250
12		0.0989	0.1963	0.1042	0.1681	0.1131	0.1542	0.1228	0.1460	12		0.1398	0.1395	0.1557	0.1356	0.1903	0.1353	0.2206	0.1407
10		0.1220	0.2132	0.1259	0.1879	0.1343	0.1756	0.1432	0.1675	10		0.1576	0.1600	0.1718	0.1562	0.2005	0.1536	0.2278	0.1565
8		0.1511	0.2331	0.1527	0.2119	0.1583	0.1987	0.1658	0.1905	8		0.1780	0.1833	0.1908	0.1799	0.2149	0.1761	0.2387	0.1786
6		0.1826	0.2536	0.1835	0.2375	0.1875	0.2258	0.1933	0.2173	6		0.2022	0.2101	0.2122	0.2052	0.2311	0.2010	0.2511	0.2031
4		0.2183	0.2748	0.2176	0.2632	0.2200	0.2536	0.2246	0.2467	4		0.2312	0.2405	0.2393	0.2361	0.2520	0.2319	0.2660	0.2319
2		0.2636	0.2983	0.2617	0.2921	0.2616	0.2857	0.2631	0.2801	2		0.2663	0.2756	0.2708	0.2719	0.2777	0.2687	0.2847	0.2670
										2/38	3.048					0.1623	0.0280		
										36						0.1628	0.0310		
										34						0.1630	0.0340	0.1911	0.0344
										32						0.1635	0.0373	0.1918	0.0379
										30						0.1640	0.0409	0.1925	0.0420
										28						0.1647	0.0451	0.1937	0.0471
										26						0.1653	0.0492	0.1949	0.0520
										24						0.1660	0.0538	0.1962	0.0578

TABLE 2 *Continued*

		Blues										Purple-Blues							
		2.5B		5.0B		7.5B		10.0B				2.5PB		5.0PB		7.5PB		10.0PB	
V/C	*Y*	*x*	*y*	*x*	*y*	*x*	*y*	*x*	*y*	*V/C*	*Y*	*x*	*y*	*x*	*y*	*x*	*y*	*x*	*y*
										22						0.1670	0.0594	0.1978	0.0643
										20						0.1685	0.0666	0.1998	0.0718
										18						0.1701	0.0742	0.2021	0.0808
										16						0.1728	0.0839	0.2052	0.0910
										14				0.1253	0.0873	0.1762	0.0955	0.2087	0.1026
										12		0.1166	0.1076	0.1363	0.1048	0.1813	0.1094	0.2139	0.1170
2/10	3.048	0.0911	0.1828	0.0965	0.1558	0.1051	0.1422	0.1157	0.1346	10		0.1332	0.1278	0.1500	0.1240	0.1882	0.1258	0.2200	0.1330
8		0.1230	0.2076	0.1245	0.1827	0.1313	0.1692	0.1396	0.1603	8		0.1540	0.1530	0.1685	0.1491	0.2005	0.1495	0.2294	0.1551
6		0.1621	0.2358	0.1617	0.2162	0.1658	0.2026	0.1716	0.1937	6		0.1825	0.1857	0.1942	0.1811	0.2189	0.1790	0.2440	0.1840
4		0.2060	0.2649	0.2048	0.2518	0.2063	0.2400	0.2102	0.2313	4		0.2175	0.2245	0.2263	0.2192	0.2420	0.2148	0.2600	0.2162
2		0.2578	0.2940	0.2559	0.2874	0.2545	0.2799	0.2558	0.2725	2		0.2592	0.2675	0.2638	0.2624	0.2712	0.2582	0.2803	0.2567
										1/38	1.179					0.1680	0.0140		
										36						0.1681	0.0160		
										34						0.1682	0.0180		
										32						0.1682	0.0202		
										30						0.1684	0.0234	0.1928	0.0240
										28						0.1686	0.0270	0.1936	0.0281
										26						0.1689	0.0309	0.1942	0.0326
										24						0.1691	0.0352	0.1952	0.0380
										22						0.1696	0.0402	0.1965	0.0436
										20						0.1701	0.0454	0.1976	0.0493
										18						0.1709	0.0518	0.1991	0.0564
										16						0.1720	0.0583	0.2008	0.0638
										14						0.1738	0.0688	0.2038	0.0745
										12						0.1763	0.0804	0.2070	0.0869
										10				0.1285	0.0870	0.1804	0.0950	0.2120	0.1029
1/8	1.179					0.0968	0.1280	0.1077	0.1218	8		0.1273	0.1157	0.1447	0.1124	0.1872	0.1141	0.2190	0.1228
6		0.1118	0.1908	0.1212	0.1745	0.1303	0.1639	0.1392	0.1563	6		0.1539	0.1491	0.1678	0.1447	0.2000	0.1422	0.2290	0.1470
4		0.1649	0.2324	0.1667	0.2168	0.1716	0.2048	0.1783	0.1974	4		0.1895	0.1911	0.2012	0.1867	0.2232	0.1821	0.2459	0.1828
2		0.2322	0.2781	0.2291	0.2677	0.2291	0.2579	0.2309	0.2491	2		0.2360	0.2420	0.2427	0.2368	0.2547	0.2310	0.2677	0.2280

		Purples										Red-Purples							
		2.5P		5.0P		7.5P		10.0P				2.5RP		5.0RP		7.5RP		10.0RP	
V/C	*Y*	*x*	*y*	*x*	*y*	*x*	*y*	*x*	*y*	*V/C*	*Y*	*x*	*y*	*x*	*y*	*x*	*y*	*x*	*y*
9/6	76.70					0.3120	0.2788	0.3218	0.2845	9/6	76.70	0.3322	0.2910	0.3431	0.2988	0.3512	0.3052	0.3590	0.3118
4		0.2963	0.2865	0.3003	0.2870	0.3117	0.2928	0.3176	0.2966	4		0.3234	0.3010	0.3301	0.3060	0.3350	0.3099	0.3400	0.3140
2		0.3050	0.3051	0.3067	0.3060	0.3107	0.3081	0.3128	0.3094	2		0.3149	0.3108	0.3172	0.3126	0.3190	0.3141	0.3205	0.3155
8/14	57.62							0.3342	0.2349	8/14	57.62	0.3621	0.2496						
12						0.3117	0.2370	0.3312	0.2470	12		0.3552	0.2594	0.3818	0.2742	0.4002	0.2859		
10				0.2870	0.2380	0.3116	0.2497	0.3282	0.2582	10		0.3479	0.2699	0.3685	0.2828	0.3830	0.2930	0.3983	0.3049
8		0.2800	0.2488	0.2914	0.2534	0.3116	0.2626	0.3250	0.2700	8		0.3406	0.2793	0.3570	0.2900	0.3682	0.2983	0.3800	0.3082
6		0.2881	0.2671	0.2963	0.2704	0.3114	0.2785	0.3213	0.2829	6		0.3327	0.2898	0.3440	0.2978	0.3521	0.3042	0.3600	0.3112
4		0.2962	0.2850	0.3012	0.2868	0.3114	0.2915	0.3175	0.2955	4		0.3239	0.3000	0.3308	0.3052	0.3360	0.3092	0.3412	0.3135
2		0.3048	0.3040	0.3065	0.3047	0.3107	0.3070	0.3131	0.3084	2		0.3154	0.3100	0.3180	0.3120	0.3200	0.3136	0.3218	0.3152
7/22	41.99							0.3430	0.1883										
20								0.3410	0.1988	7/20	41.99	0.3811	0.2143						
18						0.3093	0.1962	0.3391	0.2088	18		0.3751	0.2241	0.4186	0.2459				
16						0.3099	0.2074	0.3368	0.2192	16		0.3688	0.2342	0.4076	0.2540	0.4346	0.2689	0.4648	0.2878
14				0.2801	0.2068	0.3101	0.2192	0.3341	0.2308	14		0.3620	0.2448	0.3958	0.2628	0.4195	0.2762	0.4456	0.2931
12		0.2664	0.2127	0.2833	0.2197	0.3104	0.2320	0.3314	0.2423	12		0.3555	0.2545	0.3841	0.2710	0.4040	0.2834	0.4260	0.2980
10		0.2729	0.2289	0.2872	0.2343	0.3108	0.2442	0.3288	0.2531	10		0.3487	0.2648	0.3713	0.2798	0.3871	0.2906	0.4040	0.3030
8		0.2799	0.2459	0.2918	0.2504	0.3109	0.2584	0.3256	0.2654	8		0.3417	0.2745	0.3603	0.2869	0.3722	0.2963	0.3851	0.3067
6		0.2873	0.2633	0.2961	0.2663	0.3111	0.2730	0.3221	0.2786	6		0.3338	0.2854	0.3470	0.2949	0.3562	0.3022	0.3648	0.3098
4		0.2950	0.2810	0.3009	0.2831	0.3111	0.2880	0.3181	0.2920	4		0.3254	0.2971	0.3332	0.3032	0.3389	0.3079	0.3446	0.3125
2		0.3031	0.3000	0.3059	0.3010	0.3109	0.3037	0.3138	0.3054	2		0.3170	0.3076	0.3206	0.3104	0.3232	0.3125	0.3258	0.3148
6/26	29.30							0.3457	0.1604										
24						0.3058	0.1547	0.3441	0.1698	6/24	29.30	0.3927	0.1892						
22						0.3062	0.1638	0.3426	0.1785	22		0.3877	0.1978	0.4449	0.2219				
20				0.2702	0.1621	0.3069	0.1745	0.3409	0.1882	20		0.3833	0.2056	0.4368	0.2283	0.4735	0.2464		
18		0.2504	0.1658	0.2731	0.1738	0.3075	0.1870	0.3388	0.1995	18		0.3773	0.2158	0.4245	0.2382	0.4581	0.2549	0.4961	0.2751
16		0.2548	0.1768	0.2761	0.1852	0.3080	0.1976	0.3370	0.2095	16		0.3718	0.2251	0.4136	0.2467	0.4448	0.2622	0.4781	0.2812
14		0.2593	0.1909	0.2794	0.1979	0.3084	0.2095	0.3349	0.2203	14		0.3652	0.2355	0.4023	0.2552	0.4285	0.2705	0.4552	0.2881
12		0.2647	0.2052	0.2829	0.2121	0.3090	0.2222	0.3321	0.2329	12		0.3582	0.2462	0.3900	0.2646	0.4125	0.2784	0.4360	0.2936
10		0.2703	0.2204	0.2862	0.2260	0.3092	0.2350	0.3293	0.2450	10		0.3509	0.2578	0.3769	0.2738	0.3960	0.2860	0.4150	0.2989
8		0.2770	0.2372	0.2905	0.2421	0.3099	0.2502	0.3259	0.2584	8		0.3437	0.2688	0.3648	0.2820	0.3791	0.2929	0.3930	0.3038
6		0.2842	0.2550	0.2950	0.2585	0.3101	0.2650	0.3226	0.2716	6		0.3362	0.2799	0.3520	0.2904	0.3635	0.2987	0.3740	0.3074
4		0.2932	0.2759	0.3001	0.2778	0.3107	0.2831	0.3181	0.2871	4		0.3272	0.2929	0.3371	0.3001	0.3439	0.3056	0.3508	0.3112
2		0.3016	0.2960	0.3050	0.2967	0.3107	0.2993	0.3146	0.3018	2		0.3188	0.3048	0.3232	0.3085	0.3261	0.3113	0.3292	0.3141
5/30	19.27					0.3010	0.1170	0.3490	0.1308										

TABLE 2 *Continued*

		Purples										Red-Purples							
		2.5P		5.0P		7.5P		10.0P				2.5RP		5.0RP		7.5RP		10.0RP	
V/C	*Y*	*x*	*y*	*x*	*y*	*x*	*y*	*x*	*y*	*V/C*	*Y*	*x*	*y*	*x*	*y*	*x*	*y*	*x*	*y*
28				0.2618	0.1135	0.3018	0.1253	0.3478	0.1388										
26		0.2348	0.1140	0.2635	0.1224	0.3022	0.1331	0.3468	0.1460	5/26	19.27	0.4011	0.1652						
24		0.2372	0.1223	0.2652	0.1304	0.3030	0.1423	0.3450	0.1555	24		0.3965	0.1738	0.4683	0.1978				
22		0.2402	0.1315	0.2673	0.1398	0.3038	0.1500	0.3437	0.1644	22		0.3924	0.1814	0.4581	0.2068	0.5045	0.2248		
20		0.2438	0.1419	0.2694	0.1499	0.3042	0.1606	0.3422	0.1735	20		0.3873	0.1909	0.4484	0.2150	0.4915	0.2330	0.5396	0.2535
18		0.2476	0.1532	0.2718	0.1604	0.3052	0.1711	0.3401	0.1840	18		0.3821	0.2007	0.4372	0.2242	0.4761	0.2421	0.5185	0.2620
16		0.2515	0.1644	0.2744	0.1718	0.3060	0.1830	0.3382	0.1951	16		0.3763	0.2108	0.4261	0.2331	0.4617	0.2506	0.4986	0.2695
14		0.2560	0.1774	0.2775	0.1847	0.3068	0.1951	0.3360	0.2066	14		0.3703	0.2211	0.4142	0.2428	0.4454	0.2596	0.4767	0.2776
12		0.2608	0.1913	0.2806	0.1977	0.3071	0.2080	0.3335	0.2187	12		0.3635	0.2325	0.4022	0.2523	0.4303	0.2675	0.4579	0.2841
10		0.2665	0.2075	0.2845	0.2137	0.3080	0.2230	0.3308	0.2328	10		0.3560	0.2452	0.3880	0.2630	0.4108	0.2773	0.4332	0.2918
8		0.2728	0.2240	0.2885	0.2296	0.3087	0.2375	0.3280	0.2464	8		0.3490	0.2570	0.3748	0.2729	0.3932	0.2852	0.4105	0.2980
6		0.2806	0.2444	0.2932	0.2487	0.3093	0.2555	0.3243	0.2630	6		0.3396	0.2718	0.3585	0.2842	0.3726	0.2941	0.3851	0.3039
4		0.2898	0.2667	0.2986	0.2699	0.3100	0.2750	0.3198	0.2807	4		0.3298	0.2869	0.3421	0.2954	0.3515	0.3024	0.3594	0.3090
2		0.3000	0.2912	0.3045	0.2928	0.3103	0.2959	0.3148	0.2986	2		0.3199	0.3019	0.3256	0.3065	0.3296	0.3098	0.3332	0.3131
4/32	11.70	0.2265	0.0774	0.2574	0.0833	0.2962	0.0906												
30		0.2285	0.0847	0.2588	0.0907	0.2969	0.0979	0.3440	0.1080										
28		0.2302	0.0909	0.2600	0.0971	0.2979	0.1062	0.3432	0.1172										
26		0.2322	0.0978	0.2618	0.1052	0.2986	0.1135	0.3428	0.1248	4/26	11.70	0.4048	0.1428						
24		0.2348	0.1062	0.2635	0.1132	0.2993	0.1225	0.3421	0.1337	24		0.4011	0.1504						
22		0.2371	0.1143	0.2652	0.1218	0.3001	0.1306	0.3411	0.1424	22		0.3967	0.1593	0.4656	0.1821				
20		0.2394	0.1221	0.2670	0.1300	0.3010	0.1396	0.3400	0.1500	20		0.3926	0.1679	0.4571	0.1906	0.5130	0.2101	0.5674	0.2319
18		0.2430	0.1332	0.2693	0.1408	0.3016	0.1500	0.3386	0.1626	18		0.3865	0.1802	0.4455	0.2023	0.4965	0.2217	0.5466	0.2424
16		0.2467	0.1452	0.2718	0.1520	0.3028	0.1621	0.3370	0.1756	16		0.3807	0.1923	0.4339	0.2139	0.4799	0.2329	0.5234	0.2530
14		0.2509	0.1585	0.2747	0.1660	0.3035	0.1755	0.3351	0.1875	14		0.3748	0.2039	0.4225	0.2249	0.4629	0.2437	0.5020	0.2623
12		0.2559	0.1730	0.2778	0.1808	0.3045	0.1905	0.3331	0.2014	12		0.3683	0.2162	0.4104	0.2361	0.4450	0.2541	0.4789	0.2717
10		0.2619	0.1903	0.2814	0.1967	0.3056	0.2060	0.3306	0.2162	10		0.3608	0.2301	0.3960	0.2489	0.4259	0.2651	0.4528	0.2811
8		0.2685	0.2089	0.2855	0.2150	0.3066	0.2228	0.3280	0.2318	8		0.3533	0.2438	0.3833	0.2600	0.4072	0.2750	0.4282	0.2890
6		0.2763	0.2300	0.2903	0.2347	0.3076	0.2416	0.3248	0.2493	6		0.3442	0.2595	0.3671	0.2733	0.3850	0.2859	0.3999	0.2972
4		0.2855	0.2531	0.2958	0.2565	0.3084	0.2622	0.3210	0.2686	4		0.3340	0.2770	0.3491	0.2872	0.3612	0.2963	0.3715	0.3042
2		0.2962	0.2807	0.3022	0.2825	0.3093	0.2859	0.3162	0.2902	2		0.3231	0.2951	0.3310	0.3010	0.3371	0.3061	0.3417	0.3106
3/34	6.391	0.2230	0.0543																
32		0.2242	0.0587	0.2557	0.0630														
30		0.2252	0.0638	0.2568	0.0690	0.2922	0.0750												
28		0.2268	0.0698	0.2579	0.0750	0.2930	0.0812												
26		0.2286	0.0765	0.2590	0.0822	0.2938	0.0892	0.3343	0.0978										
24		0.2305	0.0832	0.2602	0.0891	0.2944	0.0967	0.3341	0.1055										
22		0.2329	0.0911	0.2620	0.0978	0.2953	0.1057	0.3340	0.1146	3/22	6.391	0.4018	0.1304						
20		0.2354	0.1003	0.2639	0.1074	0.2961	0.1151	0.3332	0.1240	20		0.3969	0.1413	0.4577	0.1593				
18		0.2380	0.1094	0.2657	0.1163	0.2969	0.1239	0.3329	0.1332	18		0.3929	0.1506	0.4503	0.1695	0.5130	0.1893		
16		0.2410	0.1198	0.2680	0.1272	0.2981	0.1356	0.3320	0.1456	16		0.3876	0.1629	0.4418	0.1809	0.4991	0.2011	0.5628	0.2241
14		0.2449	0.1325	0.2707	0.1397	0.2992	0.1475	0.3309	0.1572	14		0.3818	0.1758	0.4313	0.1944	0.4831	0.2140	0.5380	0.2369
12		0.2498	0.1480	0.2739	0.1539	0.3003	0.1618	0.3301	0.1715	12		0.3754	0.1898	0.4199	0.2089	0.4654	0.2273	0.5139	0.2489
10		0.2548	0.1638	0.2772	0.1707	0.3020	0.1794	0.3286	0.1889	10		0.3681	0.2054	0.4073	0.2235	0.4445	0.2419	0.4851	0.2618
8		0.2615	0.1845	0.2819	0.1910	0.3037	0.1981	0.3269	0.2075	8		0.3598	0.2233	0.3930	0.2395	0.4234	0.2556	0.4552	0.2741
6		0.2691	0.2072	0.2870	0.2135	0.3057	0.2208	0.3243	0.2293	6		0.3501	0.2425	0.3765	0.2569	0.3990	0.2708	0.4218	0.2864
4		0.2792	0.2342	0.2928	0.2386	0.3072	0.2448	0.3214	0.2517	4		0.3400	0.2624	0.3586	0.2742	0.3739	0.2851	0.3889	0.2969
2		0.2922	0.2680	0.2997	0.2700	0.3088	0.2740	0.3170	0.2790	2		0.3272	0.2861	0.3370	0.2940	0.3450	0.3001	0.3526	0.3068
2/30	3.048	0.2231	0.0432																
28		0.2245	0.0491	0.2559	0.0525														
26		0.2260	0.0555	0.2569	0.0594														
24		0.2277	0.0621	0.2582	0.0669	0.2882	0.0719												
22		0.2298	0.0696	0.2597	0.0750	0.2890	0.0799	0.3230	0.0861										
20		0.2320	0.0779	0.2612	0.0838	0.2902	0.0901	0.3231	0.0962	2/20	3.048	0.3802	0.1080						
18		0.2345	0.0873	0.2632	0.0935	0.2912	0.0995	0.3233	0.1063	18		0.3778	0.1188	0.4338	0.1340				
16		0.2372	0.0980	0.2652	0.1045	0.2922	0.1106	0.3235	0.1181	16		0.3748	0.1310	0.4269	0.1454	0.4744	0.1595		
14		0.2406	0.1100	0.2676	0.1163	0.2938	0.1235	0.3235	0.1317	14		0.3711	0.1449	0.4180	0.1598	0.4624	0.1737	0.5129	0.1888
12		0.2449	0.1245	0.2709	0.1320	0.2956	0.1392	0.3233	0.1477	12		0.3668	0.1618	0.4080	0.1764	0.4481	0.1903	0.4911	0.2060
10		0.2501	0.1422	0.2748	0.1500	0.2979	0.1569	0.3230	0.1659	10		0.3617	0.1800	0.3971	0.1939	0.4321	0.2082	0.4678	0.2237
8		0.2570	0.1635	0.2791	0.1707	0.3000	0.1781	0.3219	0.1862	8		0.3555	0.2003	0.3858	0.2140	0.4137	0.2276	0.4428	0.2419
6		0.2661	0.1921	0.2850	0.1992	0.3025	0.2058	0.3207	0.2132	6		0.3470	0.2259	0.3708	0.2380	0.3918	0.2490	0.4139	0.2608
4		0.2758	0.2208	0.2908	0.2261	0.3048	0.2321	0.3189	0.2390	4		0.3382	0.2496	0.3558	0.2597	0.3702	0.2683	0.3850	0.2778
2		0.2892	0.2583	0.2984	0.2612	0.3071	0.2647	0.3161	0.2691	2		0.3279	0.2754	0.3383	0.2829	0.3459	0.2892	0.3532	0.2957
1/26	1.179	0.2251	0.0355																
24		0.2266	0.0418																
22		0.2279	0.0473	0.2590	0.0509														
20		0.2295	0.0542	0.2601	0.0586	0.2831	0.0625												
18		0.2312	0.0618	0.2612	0.0667	0.2841	0.0706	0.3069	0.0748										
16		0.2331	0.0696	0.2625	0.0746	0.2852	0.0790	0.3078	0.0839	1/16	1.179	0.3368	0.0902						
14		0.2361	0.0810	0.2645	0.0863	0.2868	0.0903	0.3084	0.0952	14		0.3368	0.1020	0.3811	0.1138				

TABLE 2 *Continued*

		Purples										Red-Purples							
		2.5P		5.0P		7.5P		10.0P				2.5RP		5.0RP		7.5RP		10.0RP	
V/C	*Y*	*x*	*y*	*x*	*y*	*x*	*y*	*x*	*y*	*V/C*	*Y*	*x*	*y*	*x*	*y*	*x*	*y*	*x*	*y*
12		0.2394	0.0940	0.2670	0.1006	0.2884	0.1059	0.3094	0.1110	12		0.3361	0.1181	0.3772	0.1283	0.4240	0.1400	0.4668	0.1514
10		0.2441	0.1112	0.2701	0.1178	0.2905	0.1229	0.3102	0.1282	10		0.3354	0.1351	0.3727	0.1458	0.4132	0.1580	0.4521	0.1710
8		0.2496	0.1303	0.2742	0.1375	0.2932	0.1429	0.3114	0.1481	8		0.3342	0.1551	0.3660	0.1662	0.4005	0.1793	0.4357	0.1921
6		0.2570	0.1559	0.2794	0.1628	0.2960	0.1682	0.3126	0.1737	6		0.3321	0.1811	0.3588	0.1920	0.3865	0.2036	0.4151	0.2169
4		0.2668	0.1874	0.2854	0.1927	0.2991	0.1974	0.3132	0.2032	4		0.3290	0.2095	0.3503	0.2196	0.3705	0.2300	0.3920	0.2423
2		0.2808	0.2296	0.2936	0.2330	0.3030	0.2361	0.3132	0.2404	2		0.3240	0.2459	0.3378	0.2542	0.3498	0.2617	0.3629	0.2710

TABLE 3 The CIE (Y, x, y) Equivalents of the Recommended Munsell Renotation for 40 hues, 4 Values, and 6 Chromas Up to the Theoretical Pigment Maximum

				Reds					
		2.5R		5.0R		7.5R		10.0R	
V/C	Y	x	y	x	y	x	y	x	y
0.8/8	0.924	0.483	0.195	0.536	0.214	0.584	0.234	0.635	0.259
6		0.455	0.219	0.496	0.237	0.534	0.255	0.578	0.280
4		0.421	0.245	0.450	0.261	0.477	0.276	0.508	0.296
3		0.400	0.259	0.423	0.275	0.441	0.288	0.461	0.304
2		0.381	0.272	0.399	0.286	0.411	0.297	0.423	0.309
1		0.348	0.294	0.357	0.302	0.362	0.308	0.367	0.314
0.6/8	0.685	0.489	0.176	0.551	0.197	0.604	0.214	0.660	0.235
6		0.464	0.200	0.514	0.221	0.558	0.240	0.605	0.261
4		0.432	0.227	0.469	0.246	0.502	0.264	0.537	0.284
3		0.412	0.244	0.440	0.261	0.467	0.278	0.493	0.296
2		0.391	0.260	0.411	0.274	0.431	0.290	0.447	0.305
1		0.356	0.286	0.365	0.294	0.375	0.305	0.382	0.314
0.4/6	0.456	0.477	0.170	0.537	0.190	0.588	0.208	0.649	0.229
4		0.450	0.198	0.498	0.219	0.539	0.238	0.582	0.258
3		0.430	0.218	0.469	0.238	0.503	0.256	0.537	0.275
2		0.411	0.236	0.441	0.255	0.466	0.272	0.490	0.289
1		0.371	0.270	0.386	0.283	0.399	0.294	0.409	0.305
0.2/3	0.228	0.470	0.162	0.527	0.183	0.581	0.203	0.637	0.226
2		0.451	0.183	0.501	0.204	0.543	0.224	0.592	0.246
1		0.404	0.230	0.435	0.249	0.458	0.265	0.484	0.284
				Yellow-reds					
		2.5YR		5.0YR		7.5YR		10.0YR	
V/C	Y	x	y	x	y	x	y	x	y
0.8/6	0.924	0.637	0.320						
4		0.558	0.330	0.612	0.376				
3		0.495	0.334	0.529	0.372	0.554	0.409		
2		0.445	0.333	0.463	0.361	0.475	0.386	0.481	0.411
1		0.376	0.327	0.384	0.342	0.386	0.351	0.386	0.360
0.6/6	0.685	0.693	0.303						
4		0.603	0.322						
3		0.542	0.330	0.601	0.372				
2		0.474	0.332	0.505	0.367	0.526	0.397	0.551	0.444
1		0.394	0.328	0.403	0.345	0.408	0.359	0.410	0.374
0.4/4	0.456	0.665	0.298						
3		0.606	0.314						
2		0.534	0.324	0.585	0.367				
1		0.428	0.327	0.448	0.354	0.462	0.379	0.471	0.407
0.2/2	0.228	0.679	0.290						
1		0.526	0.317	0.584	0.366				
				Yellows					
		2.5Y		5.0Y		7.5Y		10.0Y	
V/C	Y	x	y	x	y	x	y	x	y
0.8/2	0.924	0.479	0.439	0.465	0.457	0.434	0.460	0.397	0.448
1		0.381	0.370	0.372	0.375	0.359	0.375	0.346	0.371
0.6/2	0.685							0.432	0.501
1		0.404	0.388	0.388	0.394	0.374	0.392	0.356	0.385
0.4/1	0.456	0.468	0.432	0.445	0.444	0.411	0.436	0.379	0.422
				Green-yellows					
		2.5GY		5.0GY		7.5GY		10.0GY	
V/C	Y	x	y	x	y	x	y	x	y
0.8/6	0.924							0.150	0.791
4						0.305	0.613	0.254	0.537
3		0.418	0.564	0.363	0.524	0.313	0.481	0.280	0.447
2		0.363	0.425	0.336	0.410	0.314	0.394	0.298	0.381
1		0.335	0.364	0.322	0.357	0.312	0.351	0.306	0.346
0.6/4	0.685							0.208	0.652
3						0.304	0.561	0..263	0.499
2		0.377	0.468	0.342	0.442	0.315	0.420	0.292	0.399
1		0.338	0.376	0.325	0.367	0.314	0.359	0.304	0.351
0.4/3	0.456							0.204	0.645
2				0.358	0.528	0.312	0.482	0.277	0.445
1		0.350	0.404	0.331	0.391	0.315	0.379	0.299	0.365
0.2/2	0.228							0.185	0.676
1		0.394	0.522	0.349	0.485	0.308	0.449	0.285	0.423
				Greens					
		2.5G		5.0G		7.5G		10.0G	
V/C	Y	x	y	x	y	x	y	x	y
0.8/6	0.924	0.102	0.660	0.082	0.553	0.073	0.476	0.070	0.408
4		0.225	0.488	0.205	0.447	0.191	0.414	0.178	0.382
3		0.262	0.424	0.247	0.403	0.236	0.385	0.224	0.366
2		0.287	0.371	0.280	0.363	0.272	0.355	0.265	0.346

TABLE 3 *Continued*

1		0.300	0.341	0.296	0.338	0.293	0.335	0.289	0.332
0.6/4	0.685	0.175	0.561	0.152	0.493	0.137	0.440	0.124	0.339
3		0.241	0.465	0.221	0.431	0.204	0.400	0.190	0.370
2		0.281	0.388	0.270	0.376	0.259	0.363	0.247	0.349
1		0.300	0.348	0.294	0.343	0.289	0.338	0.283	0.332
0.4/3	0.456	0.166	0.564	0.143	0.499	0.126	0.442	0.112	0.390
2		0.258	0.423	0.239	0.399	0.226	0.380	0.213	0.361
1		0.292	0.360	0.283	0.351	0.276	0.344	0.270	0.338
0.2/2	0.228	0.144	0.584	0.117	0.516	0.097	0.458	0.080	0.397
1		0.266	0.403	0.255	0.390	0.241	0.375	0.229	0.358
				Blue-greens					
		2.5BG		5.0BG		7.5BG		10.0BG	
V/C	Y	x	y	x	y	x	y	x	y
0.8/6	0.924	0.070	0.341	0.072	0.275	0.077	0.233	0.086	0.199
4		0.163	0.342	0.150	0.299	0.145	0.264	0.146	0.237
3		0.209	0.338	0.196	0.308	0.187	0.281	0.183	0.258
2		0.253	0.332	0.241	0.315	0.230	0.296	0.223	0.280
1		0.283	0.325	0.276	0.316	0.270	0.308	0.266	0.300
0.6/4	0.685	0.117	0.341	0.112	0.284	0.113	0.254	0.116	0.221
3		0.177	0.339	0.164	0.299	0.160	0.275	0.160	0.249
2		0.236	0.334	0.221	0.311	0.213	0.295	0.206	0.276
1		0.277	0.326	0.269	0.316	0.264	0.309	0.258	0.300
0.4/4	0.456							0.074	0.187
3		0.103	0.335	0.102	0.278	0.106	0.247	0.116	0.217
2		0.196	0.332	0.180	0.298	0.173	0.275	0.169	0.249
1		0.259	0.326	0.248	0.310	0.242	0.300	0.236	0.284
0.2/2	0.228	0.068	0.332	0.066	0.261	0.072	0.226	0.085	0.195
1		0.210	0.330	0.191	0.295	0.183	0.275	0.176	0.251
				Blues					
		2.5B		5.0B		7.5B		10.0B	
V/C	Y	x	y	x	y	x	y	x	y
0.8/6	0.924	0.094	0.181	0.106	0.163	0.115	0.153	0.128	0.145
4		0.149	0.222	0.154	0.207	0.160	0.196	0.168	0.187
3		0.182	0.246	0.184	0.231	0.187	0.221	0.192	0.212
2		0.220	0.271	0.218	0.258	0.220	0.249	0.222	0.241
1		0.264	0.295	0.262	0.289	0.262	0.283	0.263	0.278
0.6/6	0.685			0.088	0.145	0.099	0.136	0.115	0.128
4		0.123	0.202	0.134	0.187	0.143	0.178	0.153	0.172
3		0.162	0.233	0.167	0.217	0.172	0.206	0.178	0.197
2		0.202	0.260	0.202	0.245	0.204	0.235	0.209	0.227
1		0.255	0.291	0.252	0.282	0.252	0.275	0.254	0.268
0.4/4	0.456	0.087	0.172	0.102	0.159	0.113	0.151	0.126	0.145
3		0.123	0.203	0.133	0.190	0.141	0.180	0.151	0.172
2		0.169	0.236	0.172	0.223	0.176	0.213	0.183	0.203
1		0.233	0.275	0.232	0.267	0.232	0.259	0.234	0.251
0.2/3	0.228					0.097	0.133	0.112	0.127
2		0.097	0.177	0.111	0.164	0.121	0.157	0.133	0.149
1		0.175	0.239	0.178	0.226	0.182	0.216	0.188	0.206
				Purple-blues					
		2.5PB		5.0PB		7.5PB		10.0PB	
V/C	Y	x	y	x	y	x	y	x	y
0.8/8	0.924	0.117	0.105	0.139	0.102	0.179	0.104	0.220	0.112
6		0.142	0.138	0.160	0.132	0.194	0.131	0.229	0.137
4		0.178	0.181	0.192	0.174	0.216	0.170	0.242	0.170
3		0.200	0.205	0.212	0.200	0.231	0.194	0.252	0.194
2		0.225	0.234	0.234	0.226	0.247	0.221	0.263	0.219
1		0.265	0.273	0.269	0.268	0.275	0.264	0.283	0.262
0.6/8	0.685			0.131	0.088	0.176	0.092	0.216	0.098
6		0.131	0.122	0.152	0.118	0.188	0.117	0.225	0.124
4		0.166	0.165	0.182	0.160	0.208	0.155	0.237	0.157
3		0.188	0.190	0.201	0.185	0.222	0.180	0.246	0.178
2		0.215	0.221	0.223	0.215	0.239	0.208	0.257	0.204
1		0.257	0.263	0.260	0.260	0.268	0.254	0.278	0.250
0.4/8	0.456					0.165	0.072	0.206	0.078
6		0.113	0.098	0.135	0.095	0.175	0.095	0.212	0.100
4		0.141	0.139	0.161	0.134	0.192	0.130	0.223	0.131
3		0.163	0.165	0.179	0.158	0.204	0.153	0.230	0.151
2		0.190	0.196	0.202	0.188	0.220	0.180	0.241	0.176
1		0.238	0.246	0.244	0.239	0.253	0.234	0.265	0.228
0.2/6	0.228					0.159	0.061	0.206	0.064
4		0.109	0.094	0.133	0.090	0.171	0.087	0.213	0.088
3		0.129	0.121	0.150	0.115	0.181	0.108	0.219	0.106
2		0.147	0.143	0.165	0.136	0.192	0.130	0.227	0.126
1		0.196	0.200	0.207	0.193	0.224	0.186	0.248	0.180
				Purples					
		2.5P		5.0P		7.5P		10.0P	

TABLE 3 *Continued*

V/C	Y	x	y	x	y	x	y	x	y
0.3/8	0.924	0.248	0.120	0.275	0.127	0.291	0.132	0.308	0.137
6		0.255	0.144	0.279	0.151	0.294	0.156	0.309	0.162
4		0.264	0.174	0.283	0.179	0.298	0.184	0.310	0.189
3		0.270	0.196	0.286	0.202	0.301	0.206	0.312	0.210
2		0.277	0.220	0.292	0.224	0.304	0.228	0.312	0.232
1		0.291	0.262	0.300	0.264	0.307	0.266	0.312	0.269
0.6/8	0.685	0.244	0.104	0.270	0.110	0.288	0.115	0.304	0.119
6		0.250	0.129	0.274	0.136	0.292	0.141	0.306	0.145
4		0.258	0.160	0.280	0.166	0.296	0.170	0.308	0.174
3		0.264	0.181	0.282	0.184	0.298	0.189	0.310	0.193
2		0.272	0.205	0.287	0.207	0.301	0.211	0.311	0.214
1		0.286	0.250	0.295	0.251	0.306	0.254	0.312	0.256
0.4/8	0.456	0.233	0.082	0.260	0.087	0.280	0.091	0.298	0.095
6		0.238	0.104	0.265	0.110	0.284	0.114	0.302	0.119
4		0.246	0.134	0.272	0.138	0.289	0.142	0.304	0.146
3		0.252	0.153	0.276	0.157	0.292	0.161	0.306	0.165
2		0.259	0.177	0.281	0.182	0.296	0.185	0.309	0.189
1		0.276	0.226	0.291	0.228	0.303	0.230	0.312	0.234
0.2/8	0.228	0.232	0.052	0.264	0.056	0.277	0.058	0.291	0.060
6		0.236	0.067	0.266	0.072	0.280	0.074	0.293	0.075
4		0.241	0.090	0.269	0.093	0.283	0.094	0.296	0.097
3		0.245	0.106	0.272	0.109	0.285	0.111	0.298	0.113
2		0.250	0.127	0.275	0.129	0.288	0.131	0.300	0.134
1		0.266	0.180	0.283	0.181	0.295	0.183	0.305	0.185
				Red-purples					
		2.5RP		5.0RP		7.5RP		10.0RP	
V/C	Y	x	y	x	y	x	y	x	y
0.8/8	0.924	0.329	0.144	0.362	0.154	0.397	0.165	0.435	0.177
6		0.328	0.168	0.355	0.179	0.384	0.190	0.415	0.203
4		0.326	0.195	0.347	0.206	0.369	0.217	0.393	0.230
3		0.324	0.216	0.342	0.224	0.360	0.234	0.379	0.246
2		0.322	0.236	0.336	0.243	0.350	0.251	0.365	0.261
1		0.317	0.272	0.325	0.276	0.332	0.281	0.339	0.287
0.6/8	0.685	0.326	0.125	0.359	0.135	0.397	0.146	0.434	0.158
6		0.325	0.151	0.354	0.159	0.387	0.170	0.419	0.182
4		0.324	0.179	0.347	0.189	0.373	0.200	0.399	0.211
3		0.323	0.198	0.343	0.207	0.364	0.217	0.386	0.229
2		0.322	0.218	0.337	0.226	0.355	0.236	0.372	0.247
1		0.318	0.259	0.327	0.264	0.336	0.271	0.346	0.278
0.4/8	0.456	0.320	0.100	0.350	0.106	0.391	0.117	0.437	0.128
6		0.320	0.123	0.348	0.131	0.384	0.141	0.423	0.153
4		0.320	0.151	0.344	0.158	0.374	0.169	0.406	0.181
3		0.320	0.170	0.341	0.177	0.368	0.188	0.394	0.200
2		0.320	0.193	0.337	0.199	0.360	0.209	0.381	0.220
1		0.319	0.237	0.328	0.242	0.343	0.251	0.355	0.259
0.2/6	0.228	0.312	0.078	0.342	0.084				
4		0.313	0.100	0.341	0.106	0.381	0.115	0.424	0.125
3		0.314	0.116	0.340	0.122	0.376	0.131	0.415	0.143
2		0.315	0.137	0.337	0.143	0.370	0.152	0.404	0.164
1		0.316	0.188	0.331	0.194	0.353	0.203	0.375	0.214

TABLE 4 CIE Data Converted Graphically to Munsell Notations

CIE Y[A]	CIE x	CIE y	Munsell Notation	CIE L*	CIE C*	CIE h°
59.53	0.2395	0.2905	3.9 B 8.11 / 6.6	81.58	30.05	218.10
21.98	0.2437	0.3240	5.6 BG 5.30 / 5.3	54.01	26.02	191.00
72.22	0.4183	0.3790	5.4 YR 8.78 / 7.6	88.07	45.42	66.23
50.30	0.4690	0.4953	5.6 Y 7.56 / 13.7	76.25	96.67	92.75

[A] The CIE Y value is relative to the perfect reflecting diffuser. For older computer programs in which the CIE Y value is relative to MgO, the CIE Y values become 61.06, 22.54, 74.07 and 51.59 respectively.

Note that the MgO values for Y in the note have been slightly modified from the current table, as those values did not correctly agree with the 0.975 factor between MgO and the Perfect Reflecting Diffuser. For ease in visualizing the locations of the table colors in CIElab color space, the L*, C* and h° values were added to the table.

As an example, below are the calculations that were used in determining the Munsell notation of the color Y = 21.98, x = .2437 and y = .3240.

From Table 1, Y = 21.9 converts to V = 5.30. Therefore, the interpolation factor becomes 0.30.

Using the Chart for Value-5, the graphically determined Hue is 5.5 BG and the Chroma is 5.2. Using the Chart for Value 6, the graphically determined Hue is 5.8 BG and the Chroma is 5.5.

Using the 0.3 interpolation factor between Value 5 and Value 6 you get:

Hue = 0.3*(5.8-5.5) + 5.5 = 5.59, rounded to 5.6

Chroma = 0.3*(5.5-5.2) + 5.2 = 5.29, rounded to 5.3

Thus Munsell Notaiton is 5.6 BG 5.30 / 5.3

APPENDIXES

(Nonmandatory Information)

X1. EXAMPLE OF CONVERTING OF MUNSELL NOTATION

X1.1 Given the CIE data $Y = 46.02$, $x = 0.500$ and $y = 0.454$, find the Munsell notation.

X1.1.1 In Table 1, $Y = 46.02$ corresponds to Munsell value 7.28.

X1.1.2 The value lies between 7 and 8, so the hue and chroma will be found by interpolating these quantities between those found in Fig. 11 and Fig. 13. On Fig. 11, $x = 0.500$ and $y = 0.454$ corresponds to a hue of 10*YR* and a chroma of 13.1. On Fig. 13, the same x and y correspond to a hue just a small amount redder than 10*YR*, an amount less than 0.25 hue step, so the hue is read as 10*YR*. The chroma is 14.6.

X1.1.3 The value is 7.28, which is 0.28 of the way from 7 to 8, so the interpolated hue is that for value 7 plus 0.28 times the difference between the hues found at those two value levels. Since the difference was zero, the interpolated hue is simply the hue found for value 7. The interpolated chroma is found in the same way. The difference in chroma for the two value levels is 14.6–13.1 = 1.5. The difference is multiplied by the interpolation factor: $1.5 \times 0.28 = 0.42$, which may be rounded to 0.4. This amount is added to the chroma for value level 7: 0.4 + 13.1 = 13.5.

X1.1.4 The Munsell notation is 10*YR* 7.2/13.5.

X2. METHOD FOR CALCULATING TRISTIMULUS VALUES OF MUNSELL NOTATIONS IN ILLUMINANT-OBSERVER COMBINATIONS OTHER THAN ILLUMINANT C–2° OBSERVER

X2.1 *Starting From Munsell Notations*—Look-up the tristimulus values of the Munsell notation of interest in Table 2 or Table 3. Follow the procedures of 8.1 – 8.3 in the opposite sense to that given there. 8.1 – 8.3 give instructions for table look-up from CIE C–2° tristimulus values to Munsell notation. You will be looking up the CIE C–2° tristimulus values from Munsell notation. The table will yield CIE tristimulus values in Y, x, y format. Calculate the tristimulus values from:

$$X = x\ Y/y \tag{X2.1}$$

$$Y = Y$$

$$Z = z\ Y/y$$

and

$$z = 1 - x - y$$

X2.2 *Starting From Tristimulus Values in Any Illuminant-Observer Combination*—Calculate, by the following matrix equation, three values C using data supplied in Table X2.1 of this practice appropriate to the Illuminant-Observer combination of the tristimulus values.

$$C = T^{-1}\,(Q - Q_{v0}) \tag{X2.2}$$

where C is a 3 × 1 vector containing the three derived principal component coefficients, T^{-1} is a 3 × 3 transformation matrix given in Table X2.1, Q is a 3 × 1 vector of the three tristimulus values such that:

$$Q = [X\ Y\ Z]^T \tag{X2.3}$$

and Q_{v0} is a 3 × 1 vector of mean reflectances given in Table X2.1 in a column labeled V_0 and the symbol T refers to the transpose of the matrix.

X2.2.1 The tristimulus values in another illuminant-observer combination may be calculated from the following:

$$Q = TC + V_0 \tag{X2.4}$$

where T and V_0 are chosen from Table X2.1 and refer to the new illuminant-observer combination in whose view the tristimulus values are sought.

X2.2.2 It should be understood that measuring and integrating the reflectance factor curve of a specimen from the *Munsell Book of Color* may not give exactly the same results as this matrix transformation. This occurs because the specimen's notation specification is set only in terms of tristimulus values and only in CIE Illuminant C for the 2° Observer. Further there exists a color-difference tolerance from that specification in producing the atlas.

X2.2.3 Reference (**6**) covers the derivation of the principal components of reflectance used here. This reference also provides additional information about these transformations and provides methods for transforming among spectral data, tristimulus values, principal component coordinates and all combinations thereof.

X2.3 A worked example of the above calculations:

X2.3.1 Begin with Munsell notation 7.5G 5/10. From the Table 2 look-up of X2.1, the Y, x, y values are: Y = 19.27, x = 0.2200, and y = 0.4082. From Eq X2.1 the tristimulus values in Illuminant C-1931 Standard Colorimetric Observer are X = 10.39, Y = 19.27, and Z = 17.55.

X2.3.2 For Eq X2.2 the T^{-1} matrix from Table X2.1 that applies to the current illuminant-observer combination (Illuminant C–1931 Observer) is chosen with the values of V_0 from the same table:

$$C = \begin{bmatrix} 6.264 & -1.516 & 0.695 \\ 7.811 & -5.680 & -2.358 \\ 4.048 & -5.450 & 1.440 \end{bmatrix} \begin{bmatrix} 10.39 \\ 19.27 \\ 17.55 \end{bmatrix} - \begin{bmatrix} 31.67 \\ 31.96 \\ 31.07 \end{bmatrix} \tag{X2.5}$$

TABLE X2.1 The Values of the Matrix V_0 and the 3 × 3 Values of the Matrices T and T^{-1} for Several Important Illuminant-Observer Combinations

		T Matrices			
		V_0	V_1	V_2	V_3
Illuminant A – 1931 2° Observer					
	X	37.30	0.2192	0.0891	-0.0948
	Y	32.74	0.1893	-0.0080	-0.1708
	Z	9.50	0.0522	-0.0750	0.0538
Illuminant A – 1964 10° Observer					
	X	37.56	0.2206	0.0802	-0.1076
	Y	32.60	0.1881	-0.0142	-0.1618
	Z	9.32	0.0514	-0.0739	0.0580
Illuminant C – 1931 2° Observer					
	X	31.67	0.1848	0.0141	-0.0661
	Y	31.96	0.1827	-0.0545	-0.1775
	Z	31.07	0.1720	-0.2460	0.2086
Illuminant C – 1964 10° Observer					
	X	31.25	0.1821	0.0052	-0.0736
	Y	31.63	0.1801	-0.0670	-0.1556
	Z	30.34	0.1683	-0.2396	0.2143
Illuminant D50 – 1931 2° Observer					
	X	31.72	0.1856	0.0353	-0.0788
	Y	32.13	0.1840	-0.0460	-0.1791
	Z	21.81	0.1203	-0.1729	0.1385
Illuminant D50 – 1964 10° Observer					
	X	31.65	0.1850	0.0261	-0.0881
	Y	31.88	0.1820	-0.0563	-0.1620
	Z	21.37	0.1182	-0.1692	0.1446
Illuminant D65 – 1931 2° Observer					
	X	30.77	0.1796	0.0159	-0.0684
	Y	31.95	0.1824	-0.0570	-0.1790
	Z	28.64	0.1853	-0.2267	0.1891
Illuminant D65 – 1964 10° Observer					
	X	30.53	0.1779	0.0071	-0.0761
	Y	31.64	0.1800	-0.0687	-0.1582
	Z	28.04	0.1554	-0.2214	0.1957
Illuminant FL2 – 1931 2° Observer					
	X	32.37	0.1905	0.0250	-0.1266
	Y	32.30	0.1872	-0.0291	-0.2082
	Z	17.59	0.0980	-0.1376	0.1240
Illuminant FL2 – 1964 10° Observer					
	X	33.59	0.1975	0.0192	-0.1350
	Y	32.12	0.1858	-0.0358	-0.1947
	Z	17.90	0.0999	-0.1401	0.1323
Illuminant FL8 – 1931 2° Observer					
	X	31.71	0.1855	0.0333	-0.0782
	Y	32.15	0.1842	-0.0460	-0.1837
	Z	21.71	0.1203	-0.1713	0.1431
Illuminant FL8 – 1964 10° Observer					
	X	31.78	0.1857	0.0245	-0.0886
	Y	31.91	0.1822	-0.0554	-0.1672
	Z	21.26	0.1180	-0.1677	0.1481
		T^{-1} Matrices			
			V_1	V_2	V_3
Illuminant A – 1931 2° Observer					
	X		4.013	-0.700	4.844
	Y		5.790	-5.076	-5.908
	Z		4.175	-6.393	5.648
Illuminant A – 1964 10° Observer					
	X		4.342	-1.122	4.929
	Y		6.533	-6.227	-5.252
	Z		4.477	-6.940	6.192
Illuminant C – 1931 2° Observer					
	X		6.264	-1.516	0.695
	Y		7.811	-5.680	-2.358
	Z		4.048	-5.450	1.440
Illuminant C – 1964 10° Observer					
	X		6.984	-2.234	0.776
	Y		8.761	-6.953	-2.039
	Z		4.311	-6.019	1.777
Illuminant D50 – 1931 2° Observer					
	X		5.727	-1.340	1.526
	Y		7.214	-5.397	-2.875
	Z		4.031	-5.574	2.306
Illuminant D50 – 1964 10° Observer					
	X		6.307	-1.975	1.630
	Y		8.066	-6.593	-2.472

TABLE X2.1 *Continued*

		T Matrices		
	Z	4.282	-6.100	2.690
Illuminant D65 – 1931 2° Observer				
	X	6.410	-1.560	0.842
	Y	7.842	-5.591	-2.455
	Z	4.035	-5.396	1.640
Illuminant D65 – 1964 10° Observer				
	X	7.097	-2.262	0.929
	Y	8.757	-6.828	-2.118
	Z	4.272	-5.929	1.976
Illuminant FL2 – 1931 2° Observer				
	X	7.286	-3.110	1.982
	Y	9.853	-8.050	-3.775
	Z	5.174	-6.475	2.309
Illuminant FL2 – 1964 10° Observer				
	X	7.739	-3.958	2.072
	Y	10.644	-9.576	-3.232
	Z	5.428	-7.152	2.572
Illuminant FL8 – 1931 2° Observer				
	X	5.733	-1.300	1.464
	Y	7.301	-5.417	-2.964
	Z	3.920	-5.319	2.210
Illuminant FL8 – 1964 10° Observer				
	X	6.307	-1.954	1.567
	Y	8.128	-6.605	-2.594
	Z	4.179	-5.922	2.567

thus:

$C_1 = -123.46$
$C_2 = -62.26$
$C_3 = -36.45.$

X2.3.3 For Eq X2.4 the T matrix that applies to the new illuminant-observer combination is chosen from Table X2.1 with the values of V_0 also for the new illuminant-observer combination:

$$Q = \begin{bmatrix} 0.1779 & 0.0071 & -0.0761 \\ 0.1800 & -0.0687 & -0.1582 \\ 0.1554 & -0.2214 & 0.1957 \end{bmatrix} \begin{bmatrix} -123.46 \\ -62.26 \\ -36.45 \end{bmatrix} + \begin{bmatrix} 30.53 \\ 31.64 \\ 28.04 \end{bmatrix} \quad \text{(X2.6)}$$

and the tristimulus values for the new illuminant-observer combination (Illuminant D65–1964 Standard Colorimetric Observer) are X = 10.86, Y = 19.46, and Z = 15.51.

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