added with M_h to form M. It should be emphasized once more that in this signal the "lows" are composed of signals originating in three different lines, whereas the "highs" belong to each line proper and are not averaged.

So far the synchronizing has not been mentioned in describing the encoder and decoder. It is known that the R,G,B-sequence has a special relation with the rasters, or a given relation to the synchronizing scheme. This enables us to synchronize the R,G,B-sequence with the vertical pulses in the encoder as well as in the decoder. The alternating color bursts for PAL (or non-alternating bursts for NTSC) are automatically generated in the correct phases when, at the back porches of the recorded video signal from the encoder at the right position and in the right amplitude, unmodulated pulses are added.

The purpose of the composition of the M signal with equal shares of the line signals is its advantage for the play-back operation. In case of a Y-signal being used unequal portions of the three-line signals would be added which results in a visible line structure on the screen along the horizontal or oblique edges. It can be proved that these transition structures can be avoided by averaging due to the application of a luminance signal M, which is made from equal portions of the three-line signals.

This is the unique feature which matches the sequentially transmitted Tripal picture with the standard or simultaneously transmitted picture. The picture quality obtained with Tripal is remarkable. Due to the method of composing the mixed highs, a typical viewer of a large picture tube at a normal viewing distance will not observe a difference in these pictures in 99% of all scenes when compared to standard PAL-transmission. The color fidelity of video-disc pictures matches that of professional VTRs, since the sharpness is determined by the video bandwidth of the recorded signal and not the chromaticity of the colors. Color noise is small due to the color being recorded and transmitted in the best part of the video transmission range. Tripal is a method which might not only be applied for the video disc. It is suitable for video-telephone connections and for the recording of color television signals on narrow-band VTRs. We can envision application of the disc in studios. Compared to the helical-scan magnetic video recorder it delivers an uninterrupted signal which proves to be advantageous. All VTRs need some means of synchronizing with the studio sync. The synchronizing pulses for controlling a time stabilizing circuit, like Amtec, are always accessible and make it possible, in a later stage of development, to feed the picture into a studio mixer for easier handling of commercial spots, for instance.

References

1. H. Redlich and H. J. Klemp (Teldec) and G. Dickopp and E. Schueller (AEG-Telefunken), "The video-disc technique — recording and reproduction," papers presented at the first demonstration of the video disc in Berlin, June 1970.
2. W. Bruch, "Neue Methoden der Farbbild-aufzeichnung auf einfachen Magnetband-geraeten (Tripal)," *Telefunken-Zeitung, 40:* no. 3, (1967).

standards and recommended practices

SMPTE Recommended Practices Approved

On October 3, 1971, the Society's Board of Governors approved two SMPTE Recommended Practices specifying test patterns for the alignment of television systems.

SMPTE Recommended Practices RP 27.2-1971, Specifications for Operational Registration Test Pattern for Multiple-Channel Television Cameras, and RP·38.1-1971, Specifications for Deflection Linearity Test Pattern for Television, were developed by the Television Committee as part of a series of precision patterns. A subcommittee report describing this work was published in the December 1967 *Journal*.

The two patterns are basically the same as those developed by the EIA TR-4 Committee and described in EIA Standard TR-135 and EIA Industrial Bulletins Nos. 3 and 4.

Copies of these and other SMPTE Recommended Practices may be obtained from Society Headquarters upon request. — A.E.A.

SMPTE RECOMMENDED PRACTICE — RP 27.2-1971

Specifications for Operational Registration Test Pattern for Multiple-Channel Television Cameras

1. *Scope*

Format, dimensions and optical densities are specified for a test pattern transparency to be used as an operational alignment tool for multiple-channel color television cameras.

2. *Purpose*

This recommended practice specifies a test pattern designed to provide a television picture signal suitable for aligning, adjusting and checking multiple-channel color cameras for combined optical, mechanical, and electrical registration.

3. *Format*

3.1 Pattern. A reproduction of the test pattern is shown in Fig. 1.

3.2 Grid. The horizontal and vertical black lines of the grid produce a uniformly-spaced grid dividing the picture area into 18 squares vertically and 24 squares horizontally. Half dimensions have been added near the edges of the pattern where registration is most difficult to achieve.

3.3 Circles and Diagonals. Circles and diagonal black lines are provided to center the pattern on the camera tubes and check alignment.

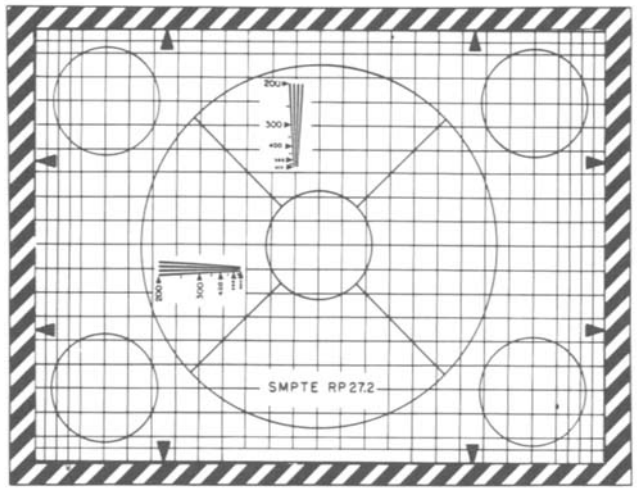

Figure 1
Reproduction of Test Pattern

Approved October 1971

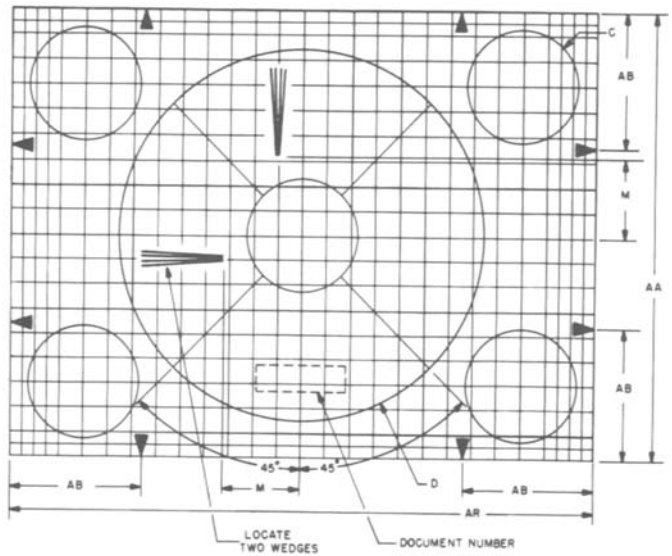

Figure 2
Location of Boundary Arrows, Circles, Wedges and 45° Lines

3.4 Resolution Wedges. Vertical and horizontal wedges are provided for checking optical and electrical focus and to aid registration.

3.5 Arrows and Border. The eight boundary arrows and black-and-white border define the edge of the test pattern area and the scanned area.

3.6 Pattern Identification. The identification number of this document shall appear on the pattern as specified in Fig. 2.

4. *Dimensions*

4.1 Test Pattern. The dimensions of the test pattern shall be as shown in Figs. 2 through 5, in percentages of frame height and reproduced with a tolerance of ± 0.1 percent of the frame height.

4.2 Image Size. The size of the scanned area as indicated by the eight boundary arrows shall be as follows:

4.2.1 2x2 in test slides and 8x10 in transparencies shall have Category 1 dimensions, as specified in American National Standard Dimensions and Optical Specifications of Test Slides and Transparencies for Television, PH22.144-1965 (Reaffirmed 1969).

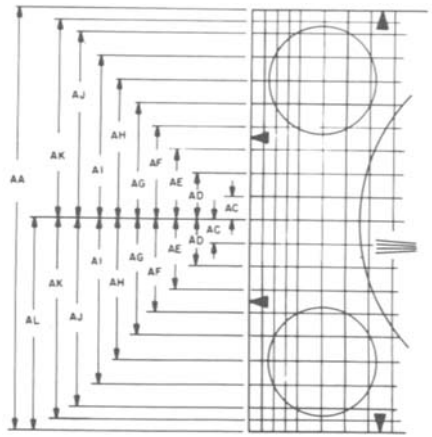

Figure 3
Location of Horizontal Grating Lines

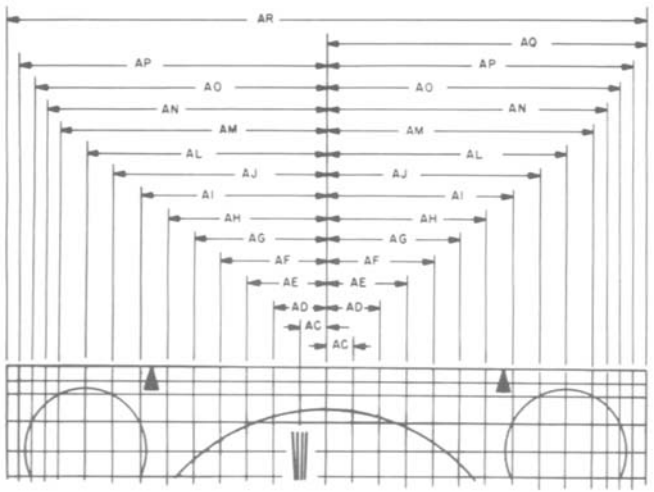

Figure 4
Location of Vertical Grating Lines

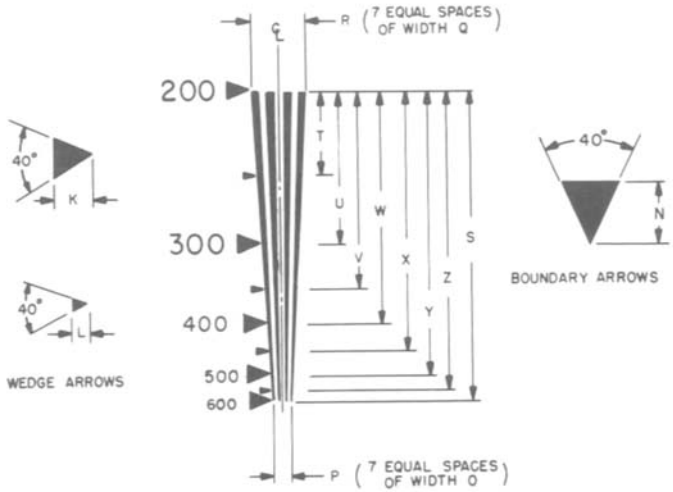

Figure 5
Wedge Detail and Boundary Arrows

		Inches			
Dimensions	*Percentage*	*8 x 10*	*2 x 2*	*35mm*	*16mm*
AA	100.0000	6.300	0.8430	0.5940	0.2760
AB	50.0000	3.150	0.4215	0.2970	0.1380
AC	2.8986	0.183	0.0244	0.0172	0.0080
AD	10.1449	0.639	0.0856	0.0603	0.0280
AE	17.3913	1.096	0.1466	0.1033	0.0480
AF	24.6377	1.552	0.2077	0.1463	0.0680
AG	31.8841	2.009	0.2688	0.1894	0.0880
AH	39.1304	2.465	0.3299	0.2324	0.1080
AI	46.3768	2.922	0.3910	0.2755	0.1280
AJ	53.6232	3.378	0.4520	0.3185	0.1480
AK	60.8696	3.835	0.5131	0.3616	0.1680
AL	68.1159	4.291	0.5742	0.4046	0.1880
AM	75.3623	4.748	0.6353	0.4477	0.2080
AN	82.6087	5.204	0.6964	0.4907	0.2280
AO	89.8551	5.661	0.7575	0.5337	0.2480
AP	97.1014	6.117	0.8186	0.5768	0.2680
BA	133.33333	8.400	1.1240	0.7920	0.3680
BB	21.88618	1.379	0.1845	0.1300	0.0604
BC	1.62602	0.102	0.0137	0.0097	0.0049
BD	9.75610	0.615	0.0822	0.0580	0.0269
BE	17.88618	1.127	0.1508	0.1062	0.0494
BF	26.01626	1.639	0.2193	0.1545	0.0718
BG	34.14634	2.151	0.2879	0.2028	0.0942
BH	42.27642	2.663	0.3564	0.2511	0.1167
BI	50.40650	3.176	0.4249	0.2994	0.1391
BJ	58.53658	3.688	0.4935	0.3477	0.1616
BK	66.66666	4.200	0.5620	0.3960	0.1840
BL	74.79674	4.712	0.6305	0.4443	0.2064
BM	82.92682	5.224	0.6991	0.4926	0.2289
BN	91.05690	5.737	0.7676	0.5409	0.2513
BO	99.18698	6.249	0.8361	0.5892	0.2738
BP	107.31706	6.761	0.9047	0.6375	0.2962
BQ	115.44714	7.273	0.9732	0.6858	0.3186
BR	123.57722	7.785	1.0418	0.7340	0.3411
BS	131.70730	8.298	1.1103	0.7823	0.3635
CA	0.3500	0.022	0.0030	0.0021	0.0010
CB	7.6000	0.479	0.0641	0.0451	0.0210
CC	4.0000	0.252	0.0337	0.0238	0.0110
CD	4.0000	0.252	0.0337	0.0238	0.0110
CE	0.0100	0.006	0.0001	0.0001	0.00003
CF	2.0000	0.126	0.0169	0.0119	0.0055
CG	1.0000	0.063	0.0084	0.0059	0.0028
CH	0.50000	0.032	0.0042	0.0030	0.0014

4.2.2 35mm test films shall have image dimensions in accordance with American National Standard Dimensions for Television Image Area on 35mm Motion-Picture Film, PH22.95-1963 (Reaffirmed 1969).

4.2.3 16mm test films shall have image dimensions in accordance with American National Standard Dimensions for Television Image Area on 16mm Motion-Picture Film, PH22.96-1963 (Reaffirmed 1969).

4.3 Black Border. The dimensions of the black border shall be as follows:

4.3.1 Height and width dimensions of the black border for 2x2 in slides and 8x10 in transparencies are specified in ANSI PH22.144-1965.

4.3.2 For 35mm motion-picture films, the black border shall extend to the dimensions specified by Style A in American National Standard Dimensions of 35mm Motion-Picture Camera Aperture Images, PH22.59-1966.

4.3.3 For 16mm motion-picture films, the black border shall extend to the dimensions specified in American National Standard Dimensions of 16mm Motion-Picture Camera Aperture Image, PH22.7-1964 (Reaffirmed 1969).

5. *Optical Densities*

5.1 Optical Densities. All optical densities shall be measured in accordance with American National Standard Method of Determining Transmission Density of Motion-Picture Films, PH22.27-1960 (Reaffirmed 1969).

5.2 Background. The density of the background shall be 0.6 ± 0.2.

5.3 Pattern. The black border, arrows, rings, centering cross, and lettering shall have a density greater than 1.9.

NOTE: The emulsion position shall correspond to the one normally used for the specific format.

April 1972 Journal of the SMPTE Volume 81

SMPTE RECOMMENDED PRACTICE — RP 38.1-1971

Specifications for Deflection Linearity Test Pattern for Television

1. *Scope*

Format, dimensions, and optical densities are specified for a test pattern transparency to be used in the measurement of geometric distortion of television systems.

2. *Purpose*

The specified test pattern is to be used with a suitable electronically-generated grating signal to facilitate the adjustment of deflection linearity and the measurement of geometric distortion of television cameras and picture display devices. A suitable electronically-generated grating signal is specified in IEEE Standard 202, Television: Methods of Measurement of Aspect Ratio and Geometric Distortion (54 IRE 23 S1).

3. *Format*

3.1 Pattern. A reproduction of the test pattern is shown in Fig. 1.

3.2 Black Rings. Black rings, having an inner radius of one percent of picture height and an outer radius of two percent of picture height, are uniformly spaced and arranged to overlay an electronically-generated grating pattern. A black ball having a radius of 0.5 percent of picture height is located in the center of each black ring.

3.3 Number of Rings. There are 148 rings arranged in a grid of 17 vertical columns and 14 horizontal rows. Numbers appear from left to right indicating columns 2 through 16 and letters from top to bottom, B through M, indicating rows 2 through 13.

3.4 Centering. A black cross is located in the center of the test pattern.

3.5 Arrows and Border. The eight boundary arrows and black border define the edge of the test pattern area and the scanned area.

3.6 Pattern Identification. The identification number of this document appears on the test pattern.

4. *Dimensions*

4.1 Test Pattern. The dimensions of the test pattern shall be as shown in Figs. 2 through 5, in percentages of frame height (AA).

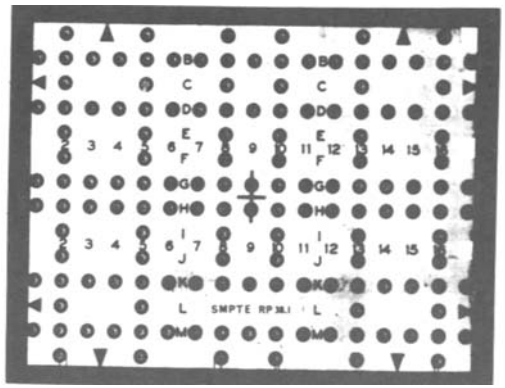

Figure 1
Reproduction of Test Pattern

Approved October 1971

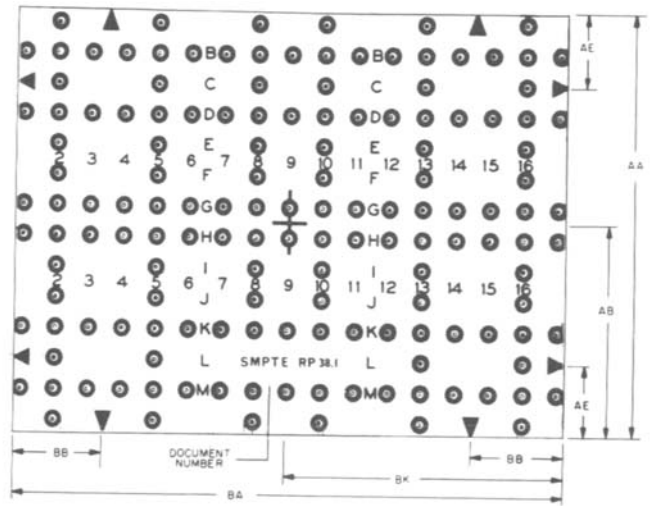

Figure 2
Location of Boundary Arrows (Fig. 5) and Center Cross (Fig. 5)

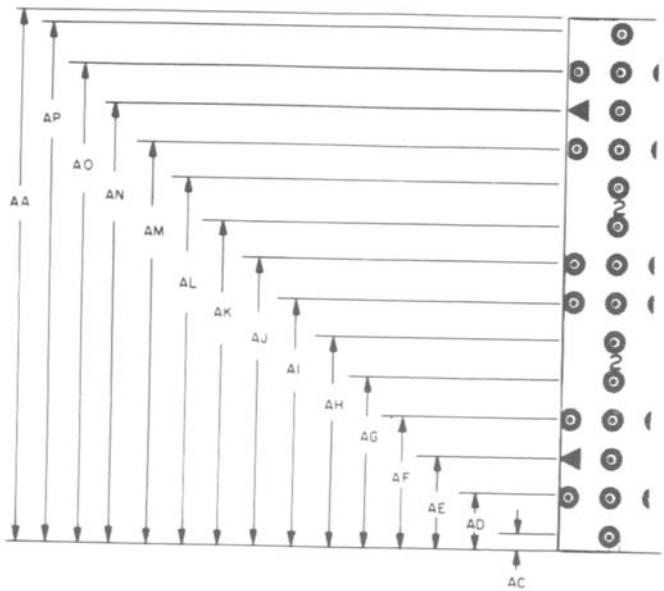

Figure 3
Location of Horizontal Rows of Circles (Fig. 5)

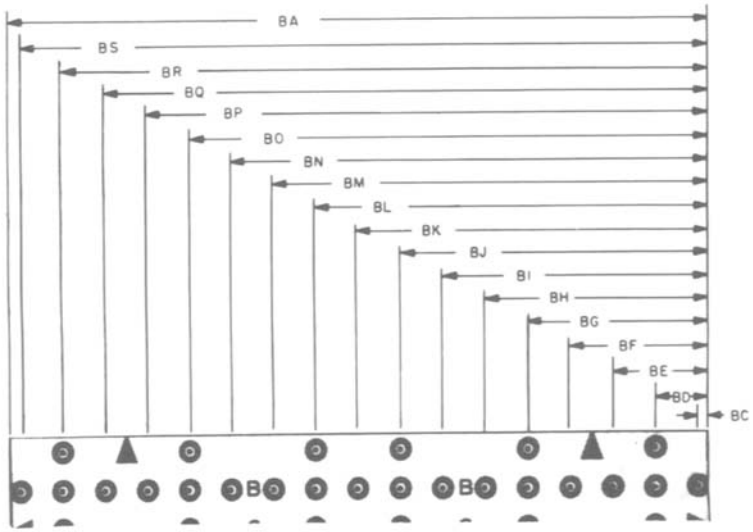

Figure 4

Location of Vertical Rows of Circles (Fig. 5)

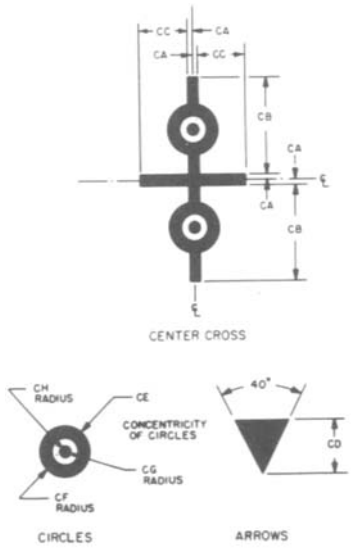

Figure 5

Details of Figures on Pattern

4.1.1 Circular Targets (Figs. 3 and 4). The tolerance on the dimensions for the location of these targets is to be ± 0.02 percent of picture height (AA). The tolerance on the radii of the circles is ± 0.1 percent of picture height.

4.1.2 Central Cross (Fig. 2). The tolerance *on the* dimensions locating the central cross is ± 0.02 percent of picture height. The tolerance on the dimensions of the cross is ± 0.1 percent of picture height.

4.1.3 Boundary Arrows (Fig. 2). The tolerance on the dimensions for the location of the boundary arrows is ± 1 percent of picture height (AA). *The tolerances of the dimensioning of the arrow* are ± 1 percent and ± 1 degree.

4.1.4 Row and Column Identification. The identification numbering and lettering for the rows and columns, respectively, is to be in bold type of approximately the size shown.

4.1.5 Pattern Identification. The SMPTE identification number shall be centrally located in the lower portion of the pattern approximately as shown. Bold type shall be used.

4.2 *Image Size. The size of the scanned area as indicated* by the boundary arrows shall be as follows:

4.2.1 2x2 in test slides and 8x10 in transparencies shall have Category 2 dimensions, as specified in American National Standard Dimensions and Optical Specifications of Test Slides and Transparencies for Television, PH22.144-1965 (Reaffirmed 1969).

Dimensions	*Percentage*	*Inches* 8 x 10	2 x 2	35mm	16mm
AA	100.00000	6.300	0.8430	0.5940	0.2760
AB	30.00000	1.890	0.2529	0.1782	0.0828
AC	5.55556	0.350	0.0468	0.0330	0.0153
AD	11.11111	0.700	0.0937	0.0660	0.0307
AE	16.66667	1.050	0.1405	0.0990	0.0460
AF	22.22222	1.400	0.1873	0.1320	0.0613
AG	27.77778	1.750	0.2342	0.1650	0.0767
AH	33.33333	2.100	0.2810	0.1980	0.0920
AI	38.88889	2.450	0.3278	0.2310	0.1073
AJ	44.44444	2.800	0.3747	0.2640	0.1227
AK	47.22222	2.975	0.3981	0.2805	0.1303
AL	50.00000	3.150	0.4215	0.2970	0.1380
AM	55.55556	3.500	0.4683	0.3300	0.1533
AN	58.33333	3.675	0.4917	0.3465	0.1610
AO	61.11111	3.850	0.5151	0.3630	0.1687
AP	63.88888	4.025	0.5386	0.3795	0.1763
AQ	66.66667	4.200	0.5620	0.3960	0.1840
AR	133.33333	8.400	1.1240	0.7920	0.3680
C	25.00000	1.575	0.2108	0.1485	0.0690
D	83.33333	5.250	0.7025	0.4950	0.2300
K	1.00000	0.063	0.0084	0.0059	0.0027
L	0.50000	0.032	0.0042	0.0030	0.0014
M	17.7777	1.120	0.1499	0.1056	0.0491
N	4.0000	0.252	0.0337	0.0238	0.0110
O	0.1667	0.011	0.0014	0.0010	0.0005
P	1.1667	0.074	0.0098	0.0069	0.0032
Q	0.5000	0.032	0.0042	0.0030	0.0014
R	3.5000	0.221	0.0295	0.0208	0.0097
S	20.0000	1.260	0.1686	0.1188	0.0552
T	6.0000	0.378	0.0506	0.0356	0.0166
U	10.0000	0.630	0.0843	0.0594	0.0276
V	12.8571	0.810	0.1084	0.0764	0.0355
W	15.0000	0.945	0.1264	0.0891	0.0414
X	16.6667	1.050	0.1405	0.0990	0.0460
Y	18.0000	1.134	0.1517	0.1070	0.0497
Z	19.0909	1.203	0.1610	0.1134	0.0527

4.2.2 35mm test films shall have image dimensions in accordance with American National Standard Dimensions for Television Image Area on 35mm Motion-Picture Film, PH22.95-1963 (Reaffirmed 1969).

4.2.3 16mm test films shall have image dimensions in accordance with American National Standard Dimensions for Television Image Area on 16mm Motion-Picture Film, PH22.96-1963 (Reaffirmed 1969).

4.3 Black-and-White Border. The dimensions of the black-and-white border shall be as follows:

4.3.1 Height and width dimensions of the black-and-white border for 2x2 in slides and 8x10 in transparencies are specified in ANSI PH22.144-1965.

4.3.2 For 35mm motion-picture films, the black-and-white border shall extend to the dimensions specified by Style A in American National Standard Dimensions of 35mm Motion-Picture Camera Aperture Images, PH22.59-1966.

4.3.3 For 16mm motion-picture films, the black-and-white border shall extend to the dimensions specified in American National Standard Dimensions of 16mm Motion-Picture Camera Aperture Image, PH22.7-1964 (Reaffirmed 1969).

4.4 Line Widths. The width of the grid lines, the circles, and the diagonals shall be 0.167 ± 0.011 percent of the scanned image height.

4.5 Resolution Wedges. The resolution portion of the pattern *is shown in detail in Fig. 5.* The tolerance of the nominal dimensions of the lines of the wedge shall be ± 0.011 percent of the scanned image height.

4.5.1 The nominal dimensions of the wedge shall be as illustrated in Fig. 5.

4.5.2 At any given television line number, the ratio of the width of the black half cycle to the white half cycle shall be 1.00 ± 0.05.

5. *Optical Densities*

5.1 Optical Densities. All optical densities shall be measured in accordance with American National Standard Method of Determining Transmission Density of Motion-Picture Films, PH22.27-1960 (Reaffirmed 1969).

5.2 Background. The white background shall have a density between 0.3 and 0.4.

5.3 Grid lines, circles, diagonals, arrows, and lettering shall have a density greater than 1.9.

5.4 Resolution Wedges and Black-and-White Border. The resolution wedges and black-and-white border shall have a black density greater than 1.9 and a white density between 0.3 and 0.4.

NOTE: The emulsion position shall correspond to the one normally used for the specific format.