

# SMPTE Television Video Technology Committee: Report on Standardization of Monitor Colorimetry by SMPTE

By Charles W. Rhodes

Broadcasters have long recognized the need to standardize the colorimetry of picture monitors. This report on monitor colorimetry was prepared by a subgroup chaired by Charles W. Rhodes, under the Committee on Television Video Technology chaired by David Horowitz, CBS Television Network, New York.

In 1970, a prominent U.S. monitor manufacturer standardized his product's colorimetric aim points. In Europe, in 1972 the British Radio Electronic Manufacturers Association (BREMA) established a different set of colorimetric aim points and sets of points defining quadrilaterals around the aim points which define colorimetric limits. These quadrilaterals and aim points were later accepted by the European Broadcast Union (EBU). Thus they enjoy a high level of acceptance as the standard for broadcasting, not only in Europe, but in most countries operating in 625/50 PAL or Secam systems.

Figure 1 shows the EBU aim points and quadrilaterals. Also shown are the aim points established in 1970 by the U.S. monitor manufacturer. It might appear that pictures obtained with either colorimetry would be quite similar. However, it is well recognized that colorimetric errors are not readily visualized when data is plotted in the  $x, y$  coordinants. Further, the scale of Fig. 1 does not provide adequate resolution.

Figure 2 shows the data of Fig. 1, re-plotted in  $u, v$  coordinates on scales expanded enough so that one just noticeable difference (j.n.d.) can be meaningfully plotted. One j.n.d. in the  $u, v$  plane is a circle of radius .004 and applies to all colors.

From Fig. 2, it may be readily determined that the EBU color points and that which has to all intents and purposes become a de facto standard in the U.S. are significantly different.

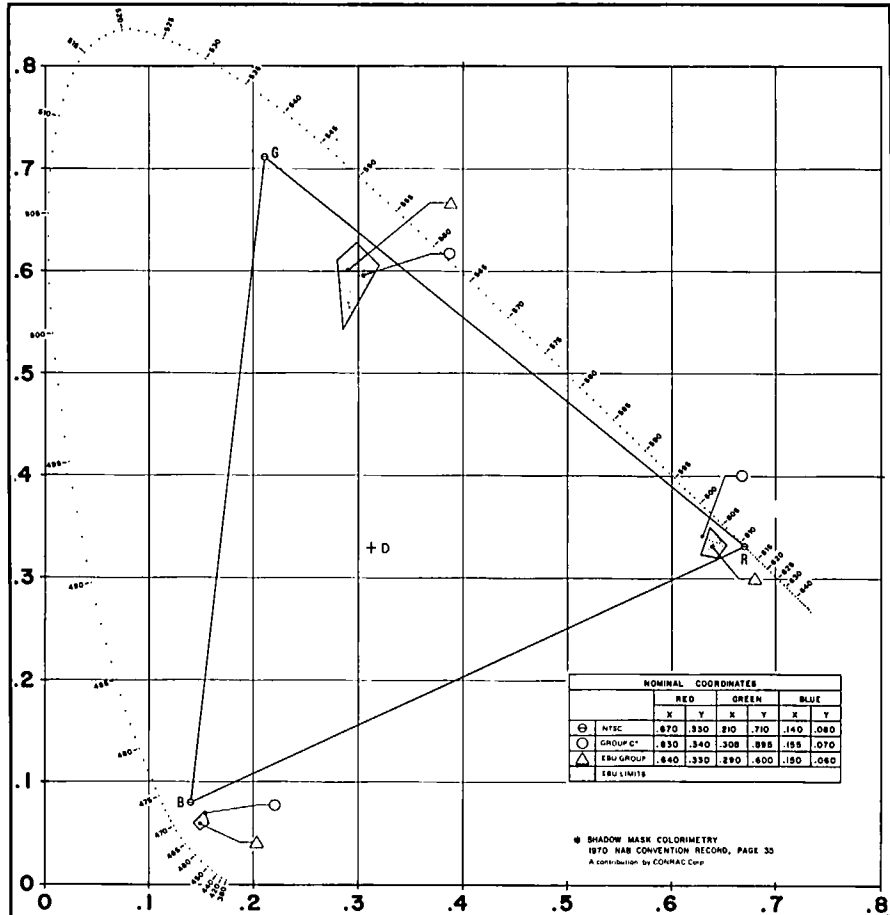


Figure 1. Comparative chromaticity diagram.

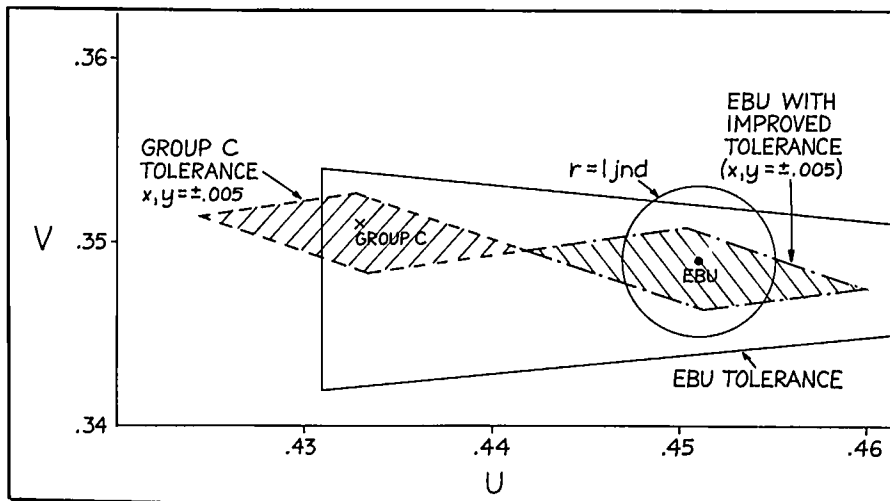


Figure 2a. Red phosphor coordinates.

It is also apparent that the present tolerance of the EBU recommendation permits quite large color differences. Probably those tolerances represented what could be realized in CRT manufacture in the early 70's. Currently, at least three major manufacturers of color tubes specify a much tighter tolerance for monitor tubes  $\pm 0.005 x, y$  (each primary).

In the view of the Television Video Technology Committee of SMPTE, it would be unwise to continue the present situation in which only a de facto standard exists in the U.S. unsupported by any professional body of opinion. The Committee discussed adopting the aim-points established by the EBU (with the much smaller tolerances now possible) with the objective of establishing a world-wide standard. It is the consensus of the Television Video Technology Committee of SMPTE that it would be difficult to adopt the EBU aim points for the U.S., as the differences in color reproduction are too great to be ignored. Further, should the EBU aim points be adopted, there will be an interim period during which most picture monitors continue to use either the de facto 1970 colorimetry, or something else which is not extremely close to the EBU aim points. Thus, the color inconsistencies between various program producers would continue, unabated. This interval might extend indefinitely, should broadcasters choose to stay with their present colorimetry.<sup>†</sup>

The Society believes this is an important matter which should be

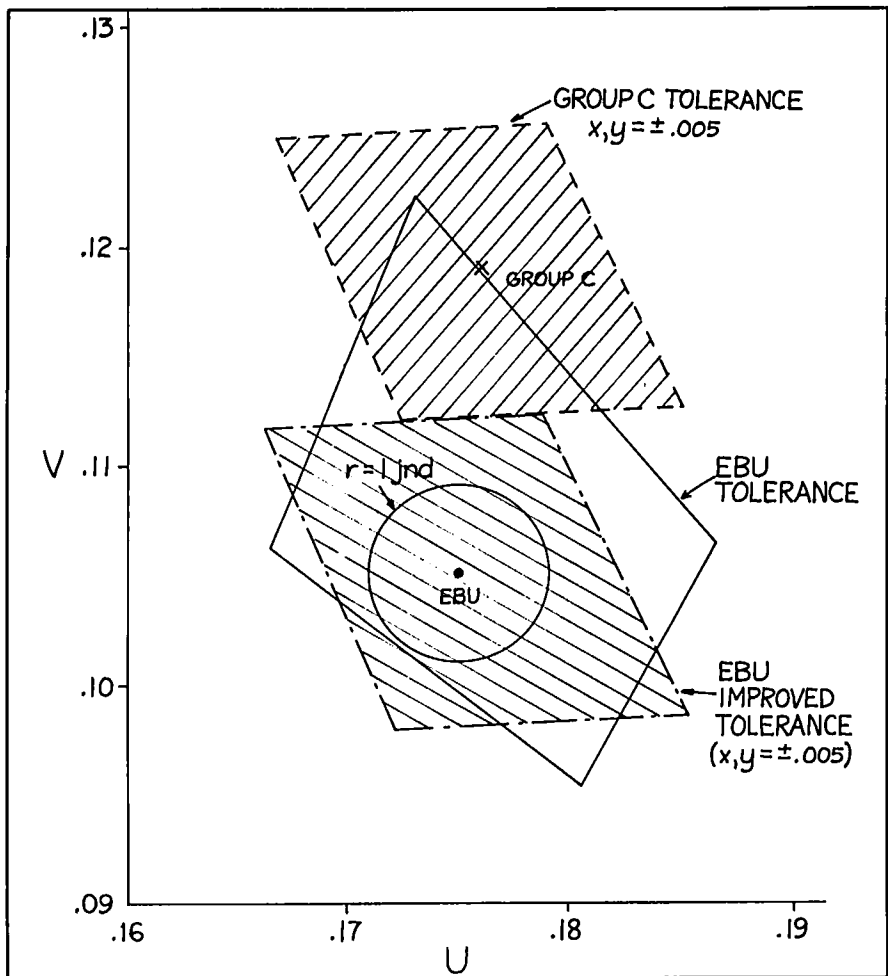


Figure 2c. Blue phosphor coordinates.

brought to the attention of the entire industry. We urgently request comments from CRT manufacturers, monitor manufacturers, camera and telecine manufacturers, production, post-production houses, broadcasters,

and other interested parties.\*

Comments received will be taken into consideration at the next meeting of the Television Technology Committee of your Society during the Winter TV meeting February 4-5 in San Francisco.

Should the present plan appear the best choice, the SMPTE will draft a Recommended Practice on Professional NTSC Color Monitors, specifying colorimetry aim points and tolerances.

	Red	Green	Blue
x	.635	.305	.155
y	.340	.595	.070

Tolerance  $\pm 0.005$  in both  $x, y$ , each primary in the operating color display device.

<sup>†</sup> Note: It is not the intent to modify any FCC rules, inasmuch as the question pertains only to broadcast monitors.

\* The Committee is anxious to receive as many comments as possible from the television community. Please address comments to Charles W. Rhodes, Scientific Atlanta, Mail Stop 10-56-00, 1 Technology Parkway, Atlanta, GA 30348.

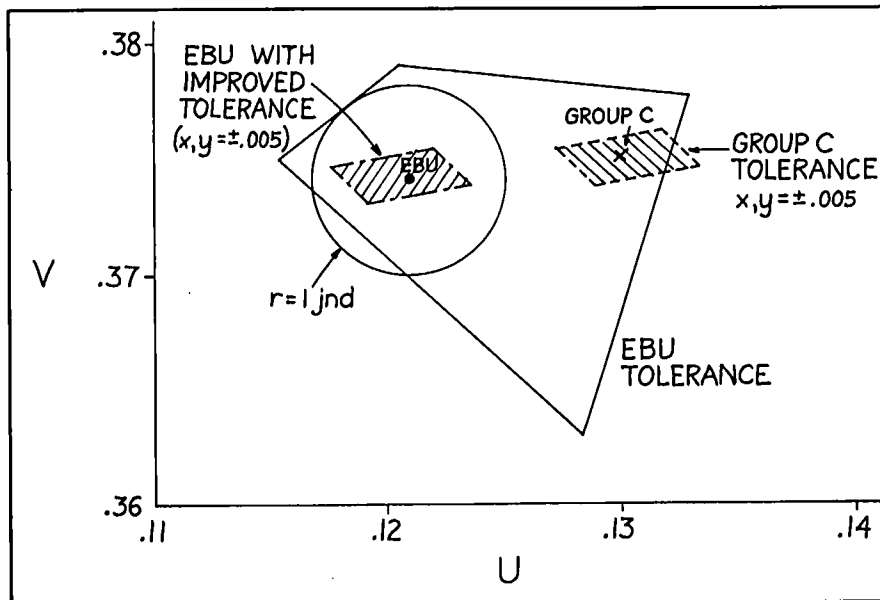


Figure 2b. Green phosphor coordinates.