



ISBN 3 900 734 24 0

COMMISSION INTERNATIONALE DE L'ÉCLAIRAGE
INTERNATIONAL COMMISSION ON ILLUMINATION
INTERNATIONALE BELEUCHTUNGSKOMMISSION

TECHNICAL REPORT

COLORIMETRY OF SELF-LUMINOUS DISPLAYS - A BIBLIOGRAPHY

Pub. N°. CIE 87

1st Edition 1990

UDC: 535.65-014

Descriptor: Colour measurement - Bibliography

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2. To develop basic standards and procedures of metrology in the fields of light and lighting.
3. To provide guidance in the application of principles and procedures in the development of international and national standards in the fields of light and lighting.
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Les objectifs de la CIE sont :

1. De constituer un centre d'étude international pour toute matière relevant de la science, de la technologie et de l'art de la lumière et de l'éclairage et pour l'échange entre pays d'informations dans ces domaines.
2. D'élaborer des normes et des méthodes de base pour la métrologie dans les domaines de la lumière et de l'éclairage.
3. De donner des directives pour l'application des principes et des méthodes d'élaboration de normes internationales et nationales dans les domaines de la lumière et de l'éclairage.
4. De préparer et publier des normes, rapports et autres textes, concernant toutes matières relatives à la science, la technologie et l'art dans les domaines de la lumière et de l'éclairage.
5. De maintenir une liaison et une collaboration technique avec les autres organisations internationales concernées par des sujets relatifs à la science, la technologie, la normalisation et l'art dans les domaines de la lumière et de l'éclairage.

Les travaux de la CIE sont effectués par 7 Divisions, ayant chacune environ une 20 de Comités Techniques. Les sujets d'études s'étendent des questions fondamentales, à tous les types d'applications de l'éclairage. Les normes et les rapports techniques élaborés par ces Divisions Internationales de la CIE sont reconnus dans le monde entier.

Tous les quatre ans, une Session plénière passe en revue le travail des Divisions et des Comités Techniques, en fait rapport et établit les projets de travaux pour l'avenir. La CIE est reconnue comme la plus haute autorité en ce qui concerne tous les aspects de la lumière et de l'éclairage. Elle occupe comme telle une position importante parmi les organisations internationales.

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Die Internationale Beleuchtungskommission (CIE) ist eine Organisation, die sich der internationalen Zusammenarbeit und dem Austausch von Informationen zwischen ihren Mitgliedsländern bezüglich der Kunst und Wissenschaft der Lichttechnik widmet. Die Mitgliedschaft besteht aus den Nationalen Komitees in 34 Ländern und einem geographischen Gebiet und aus 9 persönlichen Mitgliedern.

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2. Grundnormen und Verfahren der Meteknik auf dem Gebiet der Lichttechnik zu entwickeln.
3. Richtlinien für die Anwendung von Prinzipien und Vorgängen in der Entwicklung internationaler und nationaler Normen auf dem Gebiet der Lichttechnik zu erstellen.
4. Normen, Berichte und andere Publikationen zu erstellen und zu veröffentlichen, die alle Fragen auf dem Gebiet der Wissenschaft, Technik und Kunst der Lichttechnik betreffen.
5. Liaison und technische Zusammenarbeit mit anderen internationalen Organisationen zu unterhalten, die mit Fragen der Wissenschaft, Technik, Normung und Kunst auf dem Gebiet der Lichttechnik zu tun haben.

Die Arbeit der CIE wird in 7 Divisionen, jede mit etwa 20 Technischen Komitees, geleistet. Diese Arbeit betrifft Gebiete mit grundlegendem Inhalt bis zu allen Arten der Lichtenanwendung. Die Normen und Technischen Berichte, die von diesen international zusammengesetzten Divisionen ausgearbeitet werden, sind von der ganzen Welt anerkannt.

Tagungen werden alle vier Jahre abgehalten, in der die Arbeiten der Divisionen überprüft und berichtet und neue Pläne für die Zukunft ausgearbeitet werden. Die CIE wird als höchste Autorität für alle Aspekte des Lichtes und der Beleuchtung angesehen. Auf diese Weise unterhält sie eine bedeutende Stellung unter den internationalen Organisationen.

Published by the

COMMISSION INTERNATIONALE DE L'ECLAIRAGE
CIE Central Bureau
Kegelgasse 27, A-1030 Vienna, AUSTRIA
Tel: (01)75 31 87, Tlx: 111151 cie a, Fax: (01)713 08 38

This Technical Report has been prepared by CIE Technical Committee 1-10 of Division 1 'Vision and Colour' and has been approved by the Council of the Commission Internationale de l'Éclairage for study and application. The document reports on current knowledge and experience within the specific field of light and lighting described, and is intended to be used by the CIE membership and other interested parties. It should be noted, however, that the status of this document is advisory and not mandatory. The latest CIE Proceedings or CIE NEWS, or publication listings should be consulted regarding possible subsequent amendments.

Ce rapport technique a été préparé par le Comité Technique CIE 1-10 de la Division 1 'Vision et Couleur' et a été approuvé par le Conseil de la Commission Internationale de l'Éclairage, pour étude et application. Le document traite des connaissances courantes et de l'expérience dans le domaine spécifique indiqué de la lumière et de l'éclairage, et il est établi pour l'usage des membres de la CIE et autres groupements intéressés. Il faut cependant noter que ce document est indicatif et non obligatoire. Pour connaître d'éventuels amendements, consulter les plus récents comptes rendus, CIE NEWS ou liste des publications de la CIE.

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FOREWORD

The Technical Committee TC 1-10 Colorimetry of Self-Luminous Displays was formed in 1983 in response to the growing need to establish standardization in the measurement, design and perception of colour on visual display units (VDU's). Many national and international professional societies, as well as military and government agencies, are concerned with the use of colour in VDU's. Members of TC 1-10 who took part in the preparation of this Technical Report are listed below. The Committee comes under CIE Division 1 Vision and Colour.

G. Bertrand	France	
W. Cowan	Canada	
T. Fuchida	Japan	
M. Krystek	Germany	
P. Keller	U.S.A.	(Secretary)
J. Kokoschka	Germany	
J. Rennilson	U.S.A.	(Chairman)
J. Schanda	Hungary	
H. Snyder	U.S.A.	
P. Tannenbaum	U.S.A.	
G. Verriest	Belgium	

Advisors

P. McManus	U.S.A.
L. Silverstein	U.S.A.

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Colorimetry of Self-Luminous Displays. A Bibliography

SUMMARY

This technical report compiles a list of technical books and papers dealing with the Colorimetry of Self-Luminous Displays. Annotated references and abstracts are included where available. The report is divided into four general groups. The first is restricted to classical colorimetry as applied to colour visual display units. The second group covers the measurement, the technical standards, and the uncertainties involved with assessing the colour on VDU's. The third and fourth groups are related to the use of colour on VDU's and the perception of those colours respectively. The latter group was limited to include only those references which involved the use of colour (as opposed to monochrome) VDU's.

Farbmetrik selbstleuchtender Anzeigen. Eine Bibliographie

ZUSAMMENFASSUNG

Dieser technische Bericht umfasst ein Inhaltsverzeichnis von technischen Werken und Vorträgen, die sich mit Farbmetrik von selbstleuchtenden Anzeigen befassen. Mit Anmerkungen versehene Referenzen und Abstracts sind eingeschlossen, soweit vorhanden. Dieser Bericht ist in vier Gruppen eingeteilt. Die erste beschränkt sich auf klassische Farbmetrik in Anwendung auf Farbige Bildschirme (VDU's). Die zweite Gruppe schliesst die Messungen, technischen Normen und Unbestimmtheiten ein, die mit dem Bewerten von Farben in VDU's verbunden sind. Die dritte und vierte Gruppe betreffen die Farbempfindung. Die letzte Gruppe beschränkt sich auf die Literatur, die sich mit der Anwendung Farbiger VDU's befasst.

Colorimétrie des écrans auto-lumineux. Une bibliographie

RESUME

Ce rapport technique réunit une liste d'ouvrages et de documents techniques traitant de la colorimétrie des écrans auto-lumineux. Des références avec commentaires et des résumés ont été inclus lorsqu'ils étaient disponibles. Ce rapport se divise en quatre groupes. Le premier se limite à la colorimétrie classique, appliquée à des écrans de visualisation en couleurs. Le second groupe traite des mesures, des normes techniques, ainsi que des incertitudes liées à l'évaluation de la couleur sur les écrans de visualisation et de leurs couleurs perçues. Ce dernier groupe se limite uniquement aux références concernant l'utilisation des écrans de visualisation en couleurs (et non des écrans colorés monochromes).

1 INTRODUCTION

Committee TC-1-10, Colorimetry of Self-Luminous Displays, was formed in response to the growing need to establish standardization in the measurement, design and perception of colour on visual display units (VDU's) - sometimes called selfluminous displays (SLD's). The terms of reference of this committee were, in retrospect, too large to fulfil all the needs of the international community. The scientific methods for measuring colours displayed on VDU's or SLD's are sufficiently well established that a technical committee in Division 2 (TC 2-26) has been formed to make recommendations for standard procedures.

The major concern in TC 1-10 was to establish the state-of-knowledge which would encompass the general performance of colour VDU's, the measurement of their colorimetric characteristics, the use of colour in display design under various viewing conditions, and the perceptual aspects of colour on VDU's. The further goal was to develop methods of predicting the colour appearance of a colour seen on a VDU under various viewing conditions. This was not achieved because of the difficulty in modelling the perceptual attributes of the human visual system. It was determined in subsequent committee meetings to defer predictive modelling to a later committee when the state-of-knowledge has greatly improved in this area. Thus, the task of the committee involved only the compilation of a bibliography which reflected the above four areas.

The bibliography is therefore arranged in four sections:

- Classical colorimetry as used in colour visual display units
- Colorimetric measurement
- Colour design and use on visual display units
- Colour perception

The references listed are generally not annotated, however where such annotation exists it is included. Complete abstracts are omitted in the majority of references but are included where available.

2 CLASSICAL COLORIMETRY AS USED IN COLOUR VISUAL DISPLAY UNITS

This section is composed of references which fall into the general category of classical colorimetry of VDU's. Principles of colour generation such as found in television and common cathode-ray tube video display units are included so long as these references include the use of VDU's. General colorimetry of colour reproduction as well as colour science references are omitted as they are well covered in other CIE documents.

ANDERSON, B.H., PUTT, C.W., GIAMETI, C.C.

Application of Computer Generated Colour Graphic Techniques.

NASA, Lewis Research Center, Cleveland, Ohio; NASA-TM-82658, 1981.

Results shown as contours over an area; easier to remember 7 colours (a graduation from blue to yellow) than 7 labels (A to G) when cross-referring to a table of contour values. A labelled edge may still have to be followed with the eye; a coloured area (formed from 1 or more edges) has some more immediate coherence, and can more nearly be taken in at a glance.

BARTLESON, C. J.

Color Perception and Color Television.

J.Soc.Mot.Pic.Tel.Eng., vol. 77, no. 1, p. 1-12, Jan. 1968.

BARTLESON, C. J.

Color Vision and Color Television.

Annual meeting of the Optical Society of America, 22, p. 5-8, Oct. 1971, Ottawa, Canada.

Treatment: general review; theoretical

The theoretical extension of black-and-white television to colour television drew heavily upon the application of colorimetric principles. Colour-television systems provide considerable freedom for adjustment and analysis of colour-reproduction parameters. This freedom has been used in evaluating the colour-television system, but is only beginning to be used for general studies of colour reproductions and has not yet been applied to advantage in the study of colour vision. A general discussion of the background, colorimetric properties, and characteristics of colour television as a stimulus for colour vision indicates both its advantages and limitations as a system of colour reproduction. Some of the limitations are inherent by virtue of physical restrictions. Some arise through fiat of convention. Other limitations are amendable of change and gradually are being eliminated through improved technology.

BARTLESON, C. J., BILLMEYER, F.W. JR., COWAN, W., HUNT, R.W.G., KINNEY, JOANN S., MERRIFIELD, R., WARUZEWSKI, H.L., RENNILSON, J.J., Editor

Colorimetry of Self-Luminous Displays.

Joint ISCC & SID Informal Symposium Proc., Charlotte, NC, 1982.

BARSTOW, J.M.

ABC's of Color Television.

Inst. Radio Engrs. Proc., vol. 43, no. 11, p. 1574-9, Nov. 1955.

BENSON, J.E.

Survey of Methods and Colorimetric Principles of Colour Television.

AWA Tech.Rev., vol. 9, no. 3, p. 171, Jan. 1953, see also Brit.Inst. Radio Engrs. Journ., vol. 13, no. 1, p. 9-49, Jan. 1953.

BICHYTSKII, V.I.

Television Colour Analyzing Colorimeter TFK-5.

TEKH. KINO and TELEV. (USSR), no. 2, p. 40-5, Feb. 1971.

BINGLEY, F.J.

Colorimetry in Color Television.

Inst. Radio Engrs. Proc., vol. 41, no. 7, p. 838-51, Jul. 1953.

BUCHANAN, M.D., PENDERGRASS, R.

Digital Image Processing: Can Intensity, Hue, and Saturation Replace Red, Green and Blue.

Electro-Opt. Syst. Des. (USA), vol. 12, no. 3, p. 29-36, 5 Refs., Mar. 1980.

Treatment: General, theoretical.

BUTTERFIELD, J. F.

Highly Saturated Colour Displays.

Proceedings of SPIE Annual Technical Symposium. Photo-Optical Instrumentation for the 70's. Anaheim, CA., USA, 14-17 Sep. 1970, p. 553-7, 8 Refs., 1971.

Treatment: Practical

CARNT, P.S.G., TOWNSEND, G.B.
Colour Television.
Iliffe Books Ltd., London, 1961.

CARTER, R.C., CARTER, E.C.
CIE L*U*V* Color-Difference Equations for Self-Luminous Displays.
Color Res. & Applic., vol. 8, no. 4, p. 252-3, 6 Refs., Winter 1983.

Treatment: Theoretical

CARTER, R.C., CARTER, E.C.
High Contrast Sets of Color.
Applied Optics, vol. 21, no. 16, p. 2936-2939, 1982.

CHRIST, R.E.
Analysis of Colour and Its Effectiveness in Display Devices.
Proc. 3rd Advanced Aircrew Display Symp., p. 380-392, 1976.

DANN, R.T.
Defense Graphics.
Machine Design, vol. 55, p. 94-103, Dec. 1983.

DEMARSH, L.E.
Colorimetric Standards in US Color Television.
A Report by the Subcommittee on System Colorimetry of the SMPTE Television Committee.
J.Soc.Mot.Pic.Tel.Eng., vol. 83, no. 1, p. 105, Jan. 1974, IEEE Trans. Broadcast and Telev. Receivers (USA), vol. BTR-20, no. 2, p. 167-2, May 1974.

DERYUGIN, N.G.
Zametnost okrashivaniya seroi shkaly v tsvetnom televidenii. Elektrosvyaz, vol. 15, no. 8, p. 26-34, Aug. 1961.

DURRETT, J., ZWIENER, C.
Human Information Processing and Color Displays.
Southcon/81 Conference Record. Atlanta, GA. USA 13-15, Jan. 1981, p.12-1/1-7, 18 Refs., 1981.

EHEMANN, G.M., JR.
Three-Filter Colorimetry of Color-Television Picture Tubes.
RCA Rev., vol. 36, no. 2, p. 254-73, Jun. 1973.

EPSTEIN, D.W.
Colorimetric Analysis of RCA Color Television System.
RCA Rev., vol. 14, no. 2, p. 227-58, Jun. 1953.

FREEMAN, K.G., DE HAAN, G., MENTING, J.M., PARKER, D.W.
Experimental Work Towards High Fidelity Television.
IBC 82. International Broadcasting Convention, Brighton, England, 18-21 Sept. 1982, p. 140-43, 7 Refs., 1982.

Treatment general new developments.

HACKING, K.
Colorimetric Analysis of Interference in Colour Television.
BBC-Eng. Div. Monograph, no. 60, p. 5-28, Feb. 1966.

HARDY, A.E.

Colorimetry of Color Television Picture Tube Phosphor Screens.
Electrochem Technology, vol. 4, p. 3, Jan. 1966.

HIRSCH, C.J.

The Chromaticity of Reference White in Color Television.
J.Soc.Mot.Pic.Tel.Eng., vol. 77, p. 702, 1968.

HIRSCH, C.J.

Principles of NTSC Color Television.
Inst. Elec.Engrs-J, vol. 2, no. p. 89-97, 14, Feb. 1956.

HUNT, R.W.G.

The Reproduction of Colour.
Fountain Press, London, England, 1987.

HUTSON, G.H.

Colour Television Theory.
McGraw-Hill, Maidenhead, England, p. 325, 1971.

IEC, PUBLICATION #441

Photometric and Colorimetric Methods of Measurement of the Light Emitted by a Cathode Ray Tube Screen.
International Electrotechnical Commission #441, 1974.

KEITHLEY, D.

Inside Colour TV.
Hobby Electron. (GB), vol. 4, no. 4, p. 16-19, Apr. 1982.

LANG, H.

Farbmetrik und Farbfernsehen.
München/Wien: Oldenbourg, 1978.

LARACH, S., HARDY, A.E.

Cathode-Ray-Tube Phosphors: Principles and Applications.
IEEE Proc., vol. 61, no. 7, p. 915-26, Jul. 1973.

LAYCOCK, J.

Diffraction Optics - Calculating Perceived Colour.
Royal Aircraft Establishment, Farnborough, Tech. Rep. (in press), 1985

LAYCOCK, J.

Recommended Colours for Use on Airborne Displays.
Royal Aircraft Establishment, Farnborough, Tech. Rep. TR82110, 1982.

LIVINGSTON, D.C.

Colorimetric Analysis of Gamma-Corrected Shunted-Monochrome Simultaneous Color Television System.
Sylvania Technologist, vol.6, no. 1, p. 13-7, Jan. 1953.

LOUGHLIN, B.D.

Review of Some of Recent Developments in Color TV.
IRE-Trans. on Broadcast & Television Receivers, vol. BTR-8, no. 1, p. 55-59, Apr. 1962.

LOUGHREN, A.V.

Psychophysical and Electrical Foundations of Color Television.

IEEE Trans. Consum. Electron., vol. CE-30, no. 2, p.188-190, May 1984.

This paper appeared originally in 1953 and is reprinted because of its historical interest. The foundations for engineering advance consist of quantitative knowledge of the nature of the need to be served and knowledge of the new principles needed to serve the need. The nature of these foundations for colour television, and their possible consequences in other arts are presented.

MACADAM, D.L.

New Look at Colorimetry.

J.Soc.Mot.Pic.Tel.Eng., vol. 64, no. 11, p.629-31, Nov 1955.

Report on proceedings of International Commission on Illumination, Zurich, June 13-22, 1955; status of revision of standard data for colorimetry; pertinence to present FCC standards for colour television which are specified in terms of colorimetric data adopted by CIE in 1931; significance of proposed revisions in relation to that work and to future work and specifications.

MACADAM, D.L.

Quality of Color Reproduction.

Inst. of Radio Engrs. - Proc., vol. 39, p. 468, May 1951.

J.Soc.Mot.Pic.Tel.Eng., vol. 56, p. 487, May 1951.

MACADAM, D.L.

Color Balance for Television.

Inst. of Radio Eng. - Proc., vol. 43, p. 1, Jan. 1968.

MAKLIK, M.

The Properties of Colour TV Receivers, with PIL Picture Tubes. Sdelovaci Tech (Czech), vol. 32. no. 10, p. 842-849, Oct. 1981.

MARTIN, A.

CRT/Observer Interface.

Electro Opt. Syst. Des., vol. 9, no. 6, p. 35-41, Jun. 1977.

MARTIN, A.

CRT's and Color CRT's in 1976: The Interface with the Observer. Electrochemical Society Fall meeting. (Extended abstracts) Las Vegas, NV, USA, 17-22 Oct. 1976, p. 517-18, 1976.

MCNAY, S.R.

Color Monitor Display.

IEEE Trans. Consum. Electron., vol. 22, no. 1, p. 8-12, Feb 1976.

MENDOZA, P.

Colour Television-Colorimetry and Colour Representation on Television. (in Spanish)

Rev. Esp. Electron. (Spain), vol. 21, no. 239, p. 20-24, Oct. 1974.

Treatment: General, review

The principles of colorimetry, the numerical definition and measurement of colours, are explained and illustrated with particular reference to colour television applications. The three dimensional diagram of colours representing tone or shade, saturation and luminosity is reduced to a two dimensional

diagram by omitting the luminosity factor and then converted into a chromaticity diagram. The properties and applications of the chromaticity diagram are discussed and an idea for a simplified colour television system is proposed.

MICHAELS, E.L.

Basic Colorimetry for Color Television.

Elec. Eng., vol. 75, no. 11, p. 984-9, Nov. 1956.

MINARIK, L.

Objective Methods of Adjusting a Correct Picture Reproduced by the Colour CRT.

Radio Telev. (Czechoslovakia) no. 4, p. 21-9, 1976.

MITROFAN, G.H.

Colorimeter Study of Image Analysis and Synthesis Processes in the Color Television Systems.

Posta and Telecomunicatii (Rumania), vol. 1, no. 6, p. 303-8, Jun. 1971.

MITROFAN, G.H.

Notions of Colorimetry Used in Colour Television.

Posta and Telecomunicatii (Rumania), vol. 1, no. 4, p. 180-9, Apr. 1972.

MIZOGUCHI, R.

Evaluation and Optimization by Colorimetry of Polarizers for Liquid Crystal Display.

Disp. Technol. & Appl. (GB), vol. 4, p. 201-6, 18 Refs., Oct. 1983.

Treatment: Experimental

MOUCHEL, P.

L'illuminant et l'ambiance pour un récepteur de télévision en couleur.

Onde électrique, vol. 47, no. 486, p. 1041-5, Sep. 1967.

NEAL, C. B.

Television Colorimetry for Receiver Engineers.

IEEE Trans. Broadcast & Telev. Receivers (USA), vol. BTR-19, no. 3, p. 149-62, 22 Refs., 1973.

Treatment: General

OTSUKA, Y.

Tone Adjustments in Color Television.

J.Soc.Mot.Pic.Tel.Eng., vol. 79, p. 802, 1970.

OZAWA, R., SHIMOMURA, T., MADA, H., KOBAYASHI, S.

Colorimetric Study of Multiplexability for Twisted Nematic Liquid Crystal Displays.

J. Appl. Phys. (Japan), vol. 20, no. 10, p. L701-4, Oct. 1981.

Treatment: Experimental

PATCHETT, G.N.

Colour Television.

Brit. Instn. Radio Engrs-J, vol. 16, no. 11, p. 591-620, Nov. 1956.

POETSCH, D.

New Ways to Automatic Colour Correction.

Fernseh- und Kino-Tech. (Germany), vol. 29, no. 10, p. 309-13, Oct. 1975.

POINTER, M.R.

The Gamut of Real Surface Colours.

Color Res. and Applic. (USA), vol. 5, no. 3, p. 145-55, 10 Refs., Fall 1980.

Treatment: Theoretical; experimental

A maximum gamut for real surface colours has been derived from the analysis of the colour coordinates of 4089 samples. the gamut has been derived in both the CIE 1976 L*U*V* Colour Space and the CIE 1976 L*A*B* Colour Space. The data are compared with the gamut produced by a typical dye set used in a photographic colour paper. And with the gamut of a typical television receiver display tube. Comparison with printing inks is difficult because of the large number available, but a large set of ink colours was used in deriving the maximum real-colour gamut.

RICHARD, H., RICHARD, G.

Survey of the Principles of Colour Television. I. (In German)

Fernmelde-Ing., (Germany), vol. 30, no. 6, p. 1-29, Jun. 1976.

Treatment: General, review, 20 Refs.

A systematic explanation is given of the principles of design and operation of colour TV systems. Part 1 deals with the physical nature of colour from the viewpoint of colour TV; the measurement of colour; a review of black-and-white TV; and fundamentals of colour TV.

RICHARD, H., RICHARD, G.

Survey of the Principles of Colour Television, II. (In German)

Fernmelde-Ing., (Germany), vol. 30, no. 7, p. 1-32, Jul. 1976.

Treatment: General, review, 20 Refs.

The functional principles of colour television are only touched upon and the authors try in broad outline to make this technically complex communication medium more understandable and transparent. This is first done by a glance at colorimetrics, followed by a cross-section of the entire field up to the colour picture tube. The three colour television transmission systems NTSC, SECAM, and PAL are included in the considerations.

RIZY, E.F.

Color Specifications for Additive Color Group Displays.

U.S.A.F. RADF TR-65-278, Rome Air Development Center, NY, Aug. 1965.

ROBERTSON, P.J.

The Use of Colour for Computer Displays.

MSc Thesis, Univ. Aston, Birmingham, Book no. 13368, Oct. 1976.

SAKATA, H.

Resolution of Saturated Color Television Picture - Color MTF of Vision and Improvement of NTSC Signal.

J. Inst. Telev. Eng. Jpn., vol. 32, no. 2, p. 147-52, Feb. 1980.

SANCHEZ-CORDOVES, J.

Basic Problems of Colour Television. (In Spanish)

Metal. and Electr. (Spain), vol. 40, no. 466, p. 120-4, Jul. 1976.

Treatment: Applic; general, review

Deals with the problem involved in the fact that the illumination of the CRT television screen is not a linear function of the voltage applied. To overcome this problem, black and white television employs 'Gamma correction' which is not a complete solution to the problem. With colour television this lack of linearity not only causes errors in luminance but also causes colour distortion.

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Treatment: Theoretical

SCHEIBNER, H.

Chrominance and Chromaticity in Colour Television. (In German)
Optica Acta (GB), vol. 17, no. 2, p. 143-50, 30 Refs., Feb. 1970.

Colour valences are set-theoretically defined as classes of metameric colours; colour space is explained. Following a comparison of chromaticity and chrominance, a statement of compatibility in purely colorimetric terms results, e.g. compatibility is based on a 'direct' sum of sub-spaces making up the three-dimensional colour space, with the sub-spaces consisting of a two-dimensional chrominance space and a one-dimensional luminance space. A statement of compatibility in terms of the tristimulus value differences, which are transmitted by the well-known colour difference signals, is not of the same generality. Metrical refinements of the chrominance space as well as the difference concepts of saturation inherent in chromaticity and chrominance are explained.

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Treatment: General

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Treatment: Experimental

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Treatment: General, review, 11 Refs.

The US colour television standards proposed by the National Television System Committee (NTSC) and adopted by the FCC represent masterful 'trade-offs' among psychophysical effects and electronic implementation techniques. The fundamental principles including colorimetry, constant luminance, frequency interface, encoding and decoding techniques, and relevant communications and systems developments, are presented in tutorial format.

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Proceedings of a symposium jointly sponsored by the Inter-Society Color Council and the Society for Information Display, Charlotte, NC, April, 1982.

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TEICHNER, W.H.

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Treatment: General

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