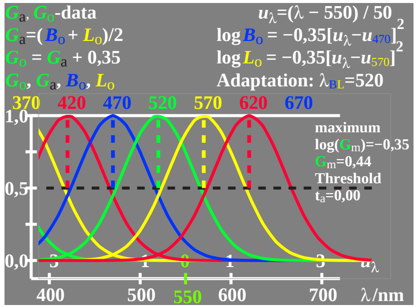

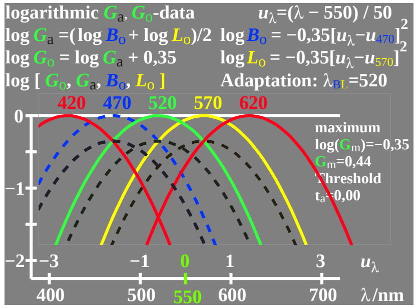

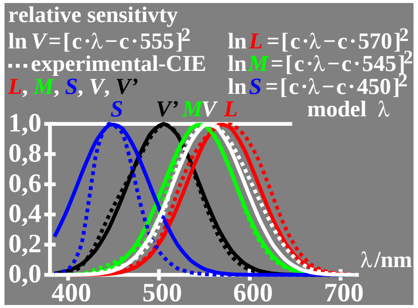

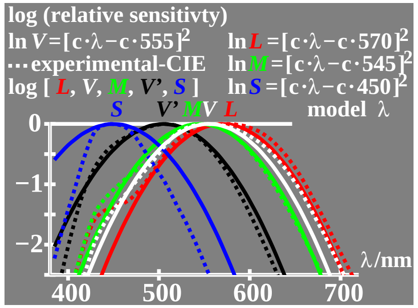

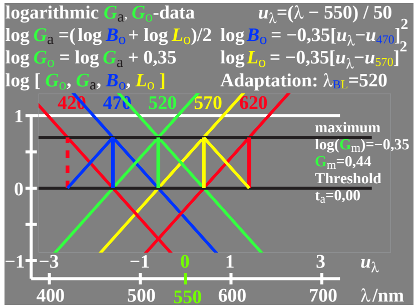

Cone Excitation Coordinates and the *Munsell* System

K. Richter, Berlin University of Technology, Berlin, Germany

CIE cone sensitivities *LMS* and CIE tristimulus values *XYZ*
LMS and *XYZ* excitations in luminance units with $Y=0,5(L+M)$

Linear model equations between colour values in both directions

$$\begin{pmatrix}X\\Y\\Z\end{pmatrix}=\begin{pmatrix}1,32 & -0,66 & 0,34\\0,50 & 0,50 & 0,00\\0,00 & 0,00 & 1,00\end{pmatrix}\cdot\begin{pmatrix}L\\M\\S\end{pmatrix}\qquad\begin{pmatrix}L\\M\\S\end{pmatrix}=\begin{pmatrix}0,51 & -0,51 & 0,34\\0,67 & 1,33 & 0,00\\-0,17 & 0,17 & 1,00\end{pmatrix}\cdot\begin{pmatrix}X\\Y\\Z\end{pmatrix}$$

Linear model equations between colour excitations in both directions

$$\begin{pmatrix}X/Y\\Y/Y\\Z/Y\end{pmatrix}=\begin{pmatrix}1,32 & -0,66 & 0,34\\0,50 & 0,50 & 0,00\\0,00 & 0,00 & 1,00\end{pmatrix}\cdot\begin{pmatrix}L/Y\\M/Y\\S/Y\end{pmatrix}\qquad\begin{pmatrix}L/Y\\M/Y\\S/Y\end{pmatrix}=\begin{pmatrix}0,51 & -0,51 & 0,34\\0,67 & 1,33 & 0,00\\-0,17 & 0,17 & 1,00\end{pmatrix}\cdot\begin{pmatrix}X/Y\\Y/Y\\Z/Y\end{pmatrix}$$

The colour difference formula LABJND 1976 of CIE TC1−81:2018 uses a chromaticity diagram *(a, b)*, defined by the following equations:
$a=X/Y=x/y$ and $b=-0,4Z/Y=-0,4z/y$

If logarithmic equations are used, it is for example valid $\log S/Y=\log S-\log Y$

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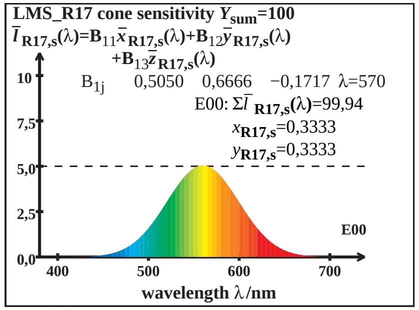

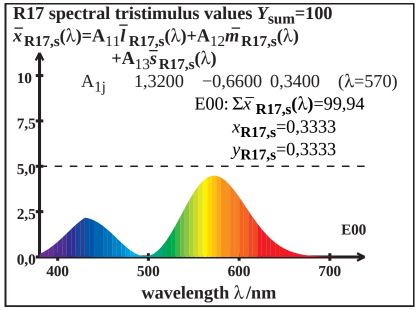

Elementary Colours and Colour Image Technology

K. Richter, 2015, Colour, Colour Vision and Elementary Colours in Color Information Technology, 85 pages, in six languages.
http://farbe.li.tu-berlin.de/color/ES15.PDF

ISO 9241-306:2018, Ergonomics of human-system interaction Part 306: Field assessment method for electronic visual displays. Test charts in three languages for elementary colour output, see
http://www.standards.iso.org/9241/306/ed-2/index.html

Reportership Report CIE R1-47:2009, Hue angles of elementary colours, *Thorstein Seim*, Norway, see
http://files.cie.co.at/526.pdf

Request for elementary colour research of ISO/TC159/SC4/WG2 *Visual Display Requirements* to CIE Division 1 *Vision and Colour*
http://farbe.li.tu-berlin.de/SE38O-1N.PDF

for further technical information and publications:
go to the homepage *Colorimetry and Colour Image Technology*
http://farbe.li.tu-berlin.de/index.html

DE000−5N

Elementary Colours and Colour Image Technology

K. Richter, 2016, Output Linearization Method *OLM16* for Displays, Offset and Printers, 60 pages, with many figures.
http://farbe.li.tu-berlin.de/OUTLIN16_01.PDF

Richter, K., 1985, Colour appearance elementary hue and chroma differences as function of chromaticity and luminance of center and background field,
BAM research report 115, 1985, 119 pages.

Richter, K., 1980 ,Cube-root color spaces and chromatic adaptation, Color res. and appl. 5, no. 1, 25-43.

Reportership Report CIE R1-57:2013, Border between blackish and luminous colours, *Thorstein Seim*, see
http://files.cie.co.at/716 CIE R1-57 Report 20Jul-13 10v.2.pdf

Richter, K., 1970, The appearance of hue as function of saturation and lightness, Farbe 19, no. 1/6, pages 277-282.

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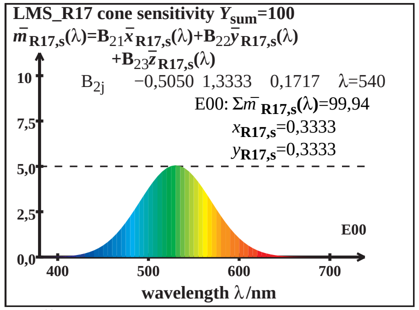

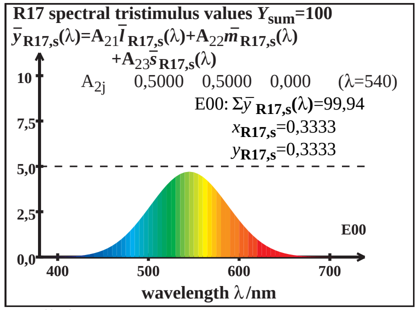

Conclusion 31/2007 ISO TC159/SC4/WG2

Ergonomics − Visual Display Requirements

ISO TC159/SC4/WG2 realizes that the colour spaces CIELAB and CIELUV of ***CIE Division 1*** will soon become ISO/CIE standards. In applications we use these CIE colour spaces and *device−dependent* relative RGB colour spaces. For users of visual display systems a *device−independent* RGB colour space is useful. This produces via software the elementary hues Red, Green and Blue for the RGB data 100, 010 and 001 and equally spaced output in CIE colour spaces for equally spaced RGB input. We recommend that ***CIE Division 1*** study the colorimetric definition of such a space, which can be used in visual display applications.

Remark: We have realized that an example colour space of this type is published in CIE X030:2006, p. 139−144.
Note: For this table text compare the identical content on page 2 of the public document CIE R1-47.

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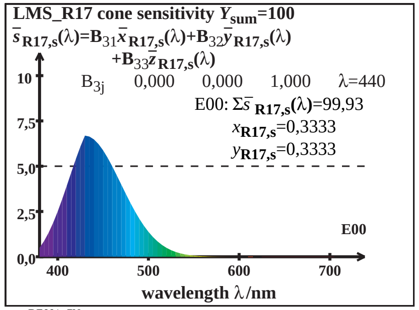

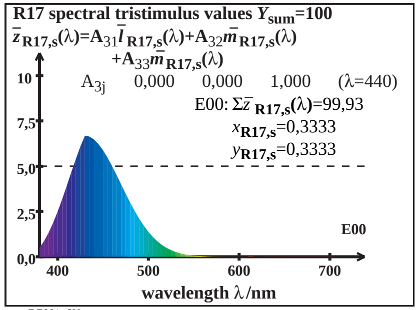

see similar files: http://farbe.li.tu-berlin.de/DE00/DE00.HTM
technical information: http://farbe.li.tu-berlin.de or http://130.149.60.45/~farbmetrik

TUB registration: 20180701-DE00/DE00L0NP.PDF /.PS
application for measurement of display output

TUB material: code=rha4ta