see similar files of the whole serie: http://farbe.li.tu-berlin.de/heos.htm
technical information: http://farbe.li.tu-berlin.de or http://color.li.tu-berlin.de

TUB registration: 20241001-heo1/heo1l0np.pdf /.ps
application for evaluation and measurement of display or print output
TUB material: code=rha4ta

log ($L^*_{85,2}/L^*_{85,2,u}$) LABJND lightness $L^*_{85,2}$ normalized to the background lightness $L^*_{85,2,u}$

$L^*/L^*_{85,2,u}$

$L^*/L^*_u = (t/a)\ \{ \ln (1 + a \cdot Y) - \ln (1 + a \cdot Y_u) \}$ [1a]

$L^*/L^*_u = (t/a)\ \{ \ln [1 + b \cdot (Y/Y_u)] - \ln (1 + b) \}$ [1b]

a=0,3411 t=88,23 t/a=258,6 b=6,141 [1c]

m_{nu} = n = 1,000

m_u = 0,430

0,257

−0,825

application range

Y_u=18

heo10−1a

log ($\Delta Y/\Delta Y_u$) LABJND tristimulus value difference ΔY normalized to ΔY_u

$\Delta Y/\Delta Y_u$

$L^*/L^*_u = (t/a)\ \{ \ln (1 + a \cdot Y) - \ln (1 + a \cdot Y_u) \}$ [1a]

$L^*/L^*_u = (t/a)\ \{ \ln [1 + b \cdot (Y/Y_u)] - \ln (1 + b) \}$ [1b]

normalized tristimulus value Y difference

$dY/dY_u = (1 + a \cdot Y) / (1 + a \cdot Y_u)$ [3d]

m_{nu} = 1−n = 0,000

m_u = 0,866

0,691

−0,726

application range

Y_u=18

heo10−2a

log [$(\Delta Y/Y) / (\Delta Y/Y)_u$] LABJND-$Y$ sensitivity normalized to $(\Delta Y/Y)_u$

$S_r/S_{ru}=(\Delta Y/Y)/(\Delta Y/Y)_u$

$L^*/L^*_u = (t/a)\ \{ \ln (1 + a \cdot Y) - \ln (1 + a \cdot Y_u) \}$ [1a]

$L^*/L^*_u = (t/a)\ \{ \ln [1 + b \cdot (Y/Y_u)] - \ln (1 + b) \}$ [1b]

tristimulus value Y sensitivity

$(dY/Y) / (dY_u/Y_u)$

$= [(1 + a \cdot Y) / Y] / [(1 + a \cdot Y_u) / Y_u]$ [3f]

m_{nu} = −n = −1,000

m_u = −0,133

0,528

−0,052

application range

Y_u=18

heo10−3a

heo10−3n

log[$(Y/\Delta Y) / (Y/\Delta Y)_u$] LABJND-$Y$ contrast normalized to $(Y/\Delta Y)_u$

$C_r/C_{ru}=(Y/\Delta Y)/(Y/\Delta Y)_u$

$L^*/L^*_u = (t/a)\ \{ \ln (1 + a \cdot Y) - \ln (1 + a \cdot Y_u) \}$ [1a]

$L^*/L^*_u = (t/a)\ \{ \ln [1 + b \cdot (Y/Y_u)] - \ln (1 + b) \}$ [1b]

tristimulus value Y contrast

$(Y/dY) / (Y_u/dY_u)$

$= [Y / (1 + a \cdot Y)] / [Y_u / (1 + a \cdot Y_u)]$ [4h]

m_{nu} = n = 1,000

m_u = 0,133

0,052

−0,528

application range

Y_u=18

heo10−4a

log (L^*/L^*_u) IECsRGB lightness L^* normalized to the background lightness L^*_u

L^*/L^*_u

$L^* = s\ (Y/Y_u)^n - d$ (Y_n=100, Y_u=18, s=100, n=1/2,4, d=0) [1a]

$L^* = r\ (Y/Y_u)^n - d$ (r = s $(Y_u/Y_n)^n$=48,94, L^*_u= r − d) [1b]

$L^*/L^*_u = (Y/Y_u)^n$ [1c]

$\log (L^*/L^*_u) = n \log (Y/Y_u)$ [1d]

$\ln (L^*/L^*_u) = \ln(10)\ n \log (Y/Y_u)$ [1e]

$L^*/L^*_u = e^{\ln(10)\ n \log (Y/Y_u)}$ [1f]

m_{nu} = n = 0,416

m_u = 0,416

0,301

−0,532

application range

Y_u=18

heo10−5a

log ($\Delta Y/\Delta Y_u$) IECsRGB tristimulus value difference ΔY normalized to ΔY_u

$\Delta Y/\Delta Y_u$

$L^* = s\ (Y/Y_u)^n - d$ (Y_n=100, Y_u=18, s=100, n=1/2,4, d=0) [1a]

$L^* = r\ (Y/Y_u)^n - d$ (r = s $(Y_u/Y_n)^n$=48,94, L^*_u= r − d) [1b]

$dY = [Y_n / (n\ s)]\ (Y / Y_n)^{1-n}$ [2c]

$dY_u = [Y_n / (n\ s)]\ (Y_u / Y_n)^{1-n} = 1{,}1746$ [2d]

$dY / dY_u = (Y / Y_u)^{1-n}$ [2e]

$\log (dY / dY_u) = (1-n) \log (Y / Y_u)$ [2f]

m_{nu} = 1−n = 0,583

m_u = 0,583

0,421

−0,745

application range

Y_u=18

heo10−6a

log [$(\Delta Y/Y) / (\Delta Y/Y)_u$] IECsRGB-$Y$ sensitivity normalized to $(\Delta Y/Y)_u$

$S_r/S_{ru}=(\Delta Y/Y)/(\Delta Y/Y)_u$

$L^* = s\ (Y/Y_u)^n - d$ (Y_n=100, Y_u=18, s=100, n=1/2,4, d=0) [1a]

$L^* = r\ (Y/Y_u)^n - d$ (r = s $(Y_u/Y_n)^n$=48,94, L^*_u= r − d) [1b]

$dY / Y = [(Y_n / (n\ s)]\ (Y / Y_n)^{1-n} / Y$ [3c]

$(dY / Y)_u = [(Y_n / (n\ s)]\ (Y_u / Y_n)^{1-n} / Y_u$ [3d]

$(dY / Y) / (dY / Y)_u = (Y / Y_u)^{-n}$ [3e]

$\log [(dY / Y) / (dY / Y)_u] = (-n) \log (Y / Y_u)$ [3f]

m_{nu} = −n = −0,416

m_u = −0,416

0,532

−0,301

application range

Y_u=18

heo10−7a

heo10−7n

log[$(Y/\Delta Y) / (Y/\Delta Y)_u$] IECsRGB-$Y$ contrast normalized to $(Y/\Delta Y)_u$

$C_r/C_{ru}=(Y/\Delta Y)/(Y/\Delta Y)_u$

$L^* = s\ (Y/Y_u)^n - d$ (Y_n=100, Y_u=18, s=100, n=1/2,4, d=0) [1a]

$L^* = r\ (Y/Y_u)^n - d$ (r = s $(Y_u/Y_n)^n$=48,94, L^*_u= r − d) [1b]

$Y / dY = Y_u / \{ [(Y_n / (n\ s)]\ (Y_u / Y_n)^{1-n} \}$ [4c]

$(Y / Y)_u = Y_u / \{ [(Y_n / (n\ s)]\ (Y_u / Y_n)^{1-n} \}$ [4d]

$(Y / dY) / (Y / dY)_u = (Y / Y_u)^n$ [4e]

$\log [(Y / dY) / (Y / dY)_u] = (n) \log (Y / Y_u)$ [4f]

m_{nu} = n = 0,416

m_u = 0,416

0,301

−0,532

application range

Y_u=18

heo10−8a

$L^*_{85,2}/L^*_{85,2,u}$ LABJND lightness $L^*_{85,2}$ normalized to the background lightness $L^*_{85,2,u}$

$L^*/L^*_{85,2,u}$

$L^*/L^*_u = (t/a)\ \{ \ln (1 + a \cdot Y) - \ln (1 + a \cdot Y_u) \}$ [1a]

$L^*/L^*_u = (t/a)\ \{ \ln [1 + b \cdot (Y/Y_u)] - \ln (1 + b) \}$ [1b]

a=0,3411 t=88,23 t/a=258,6 b=6,141 [1c]

m_{u90_4} = 7,806, f_{90}=893, f_4=222

m_u = 11,800

1,810

0,149

application range

Y_u=18

heo11−1a

$\Delta Y/\Delta Y_u$ LABJND tristimulus value difference ΔY normalized to ΔY_u

$\Delta Y/\Delta Y_u$

$L^*/L^*_u = (t/a)\ \{ \ln (1 + a \cdot Y) - \ln (1 + a \cdot Y_u) \}$ [1a]

$L^*/L^*_u = (t/a)\ \{ \ln [1 + b \cdot (Y/Y_u)] - \ln (1 + b) \}$ [1b]

normalized tristimulus value Y difference

$dY/dY_u = (1 + a \cdot Y) / (1 + a \cdot Y_u)$ [3d]

4,917

m_{u90_4} = 0,003, f_{90}=0, f_4=0

m_u = 0,003

0,187

application range

Y_u=18

heo11−2a

$(\Delta Y/Y) / (\Delta Y/Y)_u$ LABJND-Y sensitivity normalized to $(\Delta Y/Y)_u$

$S_r/S_{ru}=(\Delta Y/Y)/(\Delta Y/Y)_u$

$L^*/L^*_u = (t/a)\ \{ \ln (1 + a \cdot Y) - \ln (1 + a \cdot Y_u) \}$ [1a]

$L^*/L^*_u = (t/a)\ \{ \ln [1 + b \cdot (Y/Y_u)] - \ln (1 + b) \}$ [1b]

tristimulus value Y sensitivity

$(dY/Y) / (dY_u/Y_u)$

$= [(1 + a \cdot Y) / Y] / [(1 + a \cdot Y_u) / Y_u]$ [3f]

3,380

m_{u90_4} = −0,000, f_{90}=0, f_4=0

m_u = −0,000

0,885

application range

Y_u=18

heo11−3a

heo11−3n

$(Y/\Delta Y) / (Y/\Delta Y)_u$ LABJND-Y contrast normalized to $(Y/\Delta Y)_u$

$C_r/C_{ru}=(Y/\Delta Y)/(Y/\Delta Y)_u$

$L^*/L^*_u = (t/a)\ \{ \ln (1 + a \cdot Y) - \ln (1 + a \cdot Y_u) \}$ [1a]

$L^*/L^*_u = (t/a)\ \{ \ln [1 + b \cdot (Y/Y_u)] - \ln (1 + b) \}$ [1b]

tristimulus value Y contrast

$(Y/dY) / (Y_u/dY_u)$

$= [Y / (1 + a \cdot Y)] / [Y_u / (1 + a \cdot Y_u)]$ [4h]

m_{u90_4} = 1,176, f_{90}=250, f_4=149

m_u = 1,579

1,129

0,295

application range

Y_u=18

heo11−4a

L^*/L^*_u IECsRGB lightness L^* normalized to the background lightness L^*_u

L^*/L^*_u

$L^* = s\ (Y/Y_u)^n - d$ (Y_n=100, Y_u=18, s=100, n=1/2,4, d=0) [1a]

$L^* = r\ (Y/Y_u)^n - d$ (r = s $(Y_u/Y_n)^n$=48,94, L^*_u= r − d) [1b]

$L^*/L^*_u = (Y/Y_u)^n$ [1c]

2,000

m_{u90_4} = 0,808, f_{90}=95, f_4=26

m_u = 1,098

0,293

application range

Y_u=18

heo11−5a

$\Delta Y/\Delta Y_u$ IECsRGB tristimulus value difference ΔY normalized to ΔY_u

$\Delta Y/\Delta Y_u$

$L^* = s\ (Y/Y_u)^n - d$ (Y_n=100, Y_u=18, s=100, n=1/2,4, d=0) [1a]

$L^* = r\ (Y/Y_u)^n - d$ (r = s $(Y_u/Y_n)^n$=48,94, L^*_u= r − d) [1b]

$dY = [Y_n / (n\ s)]\ (Y / Y_n)^{1-n}$ [2c]

$dY_u = [Y_n / (n\ s)]\ (Y_u / Y_n)^{1-n} = 1{,}1746$ [2d]

$dY / dY_u = (Y / Y_u)^{1-n}$ [2e]

2,639

m_{u90_4} = 0,021, f_{90}=2, f_4=0

m_u = 0,027

0,179

application range

Y_u=18

heo11−6a

$(\Delta Y/Y) / (\Delta Y/Y)_u$ IECsRGB-Y sensitivity normalized to $(\Delta Y/Y)_u$

$S_r/S_{ru}=(\Delta Y/Y)/(\Delta Y/Y)_u$

$L^* = s\ (Y/Y_u)^n - d$ (Y_n=100, Y_u=18, s=100, n=1/2,4, d=0) [1a]

$L^* = r\ (Y/Y_u)^n - d$ (r = s $(Y_u/Y_n)^n$=48,94, L^*_u= r − d) [1b]

$dY / Y = [(Y_n / (n\ s)]\ (Y / Y_n)^{1-n} / Y$ [3c]

$(dY / Y)_u = [(Y_n / (n\ s)]\ (Y_u / Y_n)^{1-n} / Y_u$ [3d]

$(dY / Y) / (dY / Y)_u = (Y / Y_u)^{-n}$ [3e]

3,406

m_{u90_4} = −0,000, f_{90}=0, f_4=0

m_u = −0,001

0,499

application range

Y_u=18

heo11−7a

heo11−7n

$(Y/\Delta Y) / (Y/\Delta Y)_u$ IECsRGB-Y contrast normalized to $(Y/\Delta Y)_u$

$C_r/C_{ru}=(Y/\Delta Y)/(Y/\Delta Y)_u$

$L^* = s\ (Y/Y_u)^n - d$ (Y_n=100, Y_u=18, s=100, n=1/2,4, d=0) [1a]

$L^* = r\ (Y/Y_u)^n - d$ (r = s $(Y_u/Y_n)^n$=48,94, L^*_u= r − d) [1b]

$Y / dY = Y / \{ [(Y_n / (n\ s)]\ (Y_u / Y_n)^{1-n} \}$ [4c]

$(Y / Y)_u = Y_u / \{ [(Y_n / (n\ s)]\ (Y_u / Y_n)^{1-n} \}$ [4d]

$(Y / dY) / (Y / dY)_u = (Y / Y_u)^n$ [4e]

2,000

m_{u90_4} = 0,336, f_{90}=39, f_4=10

m_u = 0,457

0,293

application range

Y_u=18

heo11−8a