

$\log(L^*/L_u^*)$

TUBsRGB lightness  $L^*$  normalized to the background lightness  $L_u^*$

$$L^*/L_u^*$$

$$100L^*=s(Y/Y_u)^n-d \quad (Y_n=100, Y_u=18, s=100, n=1/\ln(10), d=0) \text{ [1a]}$$

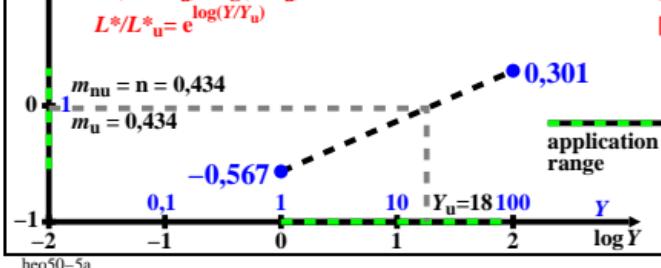
$$L^*=r(Y/Y_u)^n-d \quad (r=s(Y_u/Y_n)^n=47.48, L_u^*=r-d) \text{ [1b]}$$

$$L^*/L_u^* = (Y/Y_u)^{1/\ln(10)} \quad (\ln(x)=\ln(10) \log(x)) \text{ [1c]}$$

$$\log(L^*/L_u^*) = (1/\ln(10)) \log(Y/Y_u) \text{ [1d]}$$

$$L^*/L_u^* = e^{\log(Y/Y_u)} \text{ [1e]}$$

$$L^*/L_u^* = e^{\log(Y/Y_u)} \text{ [1f]}$$



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

$$\log[(\Delta Y/Y)/(\Delta Y/Y)_u]$$

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

$$100L^*=s(Y/Y_u)^n-d \quad (Y_n=100, Y_u=18, s=100, n=1/\ln(10), d=0) \text{ [1a]}$$

$$L^*=r(Y/Y_u)^n-d \quad (r=s(Y_u/Y_n)^n=47.48, L_u^*=r-d) \text{ [1b]}$$

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

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

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

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



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

$$\log[(Y/\Delta Y)/(\Delta Y/Y)_u]$$

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

$$100L^*=s(Y/Y_u)^n-d \quad (Y_n=100, Y_u=18, s=100, n=1/\ln(10), d=0) \text{ [1a]}$$

$$L^*=r(Y/Y_u)^n-d \quad (r=s(Y_u/Y_n)^n=47.48, L_u^*=r-d) \text{ [1b]}$$

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

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

$$(Y/dY)/(Y/dY)_u = (Y/Y_u)^n \text{ [4e]}$$

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



$\log(\Delta Y/\Delta Y_u)$

TUBsRGB tristimulus value difference  $\Delta Y$  normalized to  $\Delta Y_u$

$$\Delta Y/\Delta Y_u$$

$$100L^*=s(Y/Y_u)^n-d \quad (Y_n=100, Y_u=18, s=100, n=1/\ln(10), d=0) \text{ [1a]}$$

$$L^*=r(Y/Y_u)^n-d \quad (r=s(Y_u/Y_n)^n=47.48, L_u^*=r-d) \text{ [1b]}$$

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

$$dY_u = [Y_n/(n s)](Y_u/Y_n)^{1-n} = 1.0934 \text{ [2d]}$$

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

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



heo50-6a

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

$$\log[(\Delta Y/Y)/(\Delta Y/Y)_u]$$

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

$$100L^*=s(Y/Y_u)^n-d \quad (Y_n=100, Y_u=18, s=100, n=1/\ln(10), d=0) \text{ [1a]}$$

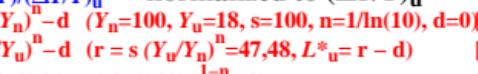
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$$dY/Y = [(Y_n/(n s)](Y/Y_n)^{1-n}/Y \text{ [3c]}$$

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

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

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



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

$$\log[(Y/\Delta Y)/(\Delta Y/Y)_u]$$

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

$$100L^*=s(Y/Y_u)^n-d \quad (Y_n=100, Y_u=18, s=100, n=1/\ln(10), d=0) \text{ [1a]}$$

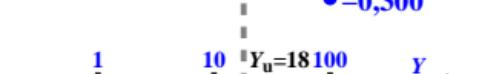
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$$(Y/Y_u) = Y_u / \{ [(Y_n/(n s)](Y_u/Y_n)^{1-n}] \} \text{ [4d]}$$

$$(Y/dY)/(Y/dY)_u = (Y/Y_u)^n \text{ [4e]}$$

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



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heo50-7n