LABJND colour-difference formula of CIE 230:2019
Main integral equations with Y and Y_u of surround u

$dY = A_1[1+A_2Y]$ error 0,0004 A_1=0,0170, A_2=0,3343 [5d]
$dY_r = A_1[1+A_{2u}Y_r]$ A_1=0,0170, A_{2u}=5,931, $Y_r = (Y/Y_u)$ [6d]

$$\frac{1}{A_1}\int\frac{dY}{1+A_2Y} = \frac{1}{A_1A_2}\ln|1+A_2Y| = F^*(Y) \quad (A_2{=}1)\ [5l]$$

$dY = A_1[1+A_2Y]A_3$ error 0,0018 A_1=0,0251, A_2=0,1566, A_3=1,107 [7d]
$dY_r = A_1[1+A_{2u}(Y_u)]^{A_3}$ A_1=0,0251, A_{2u}=2,778, A_3=1,107 [8d]

$$\frac{1}{A_1}\int\frac{dY}{[1+A_2Y]^{A_3}} = \frac{1}{A_1}\frac{[1+A_2Y]^{(A_3+1)}}{A_2(A_3+1)} = F^*(Y) \quad (A_2{\neq}1)\ [7l]$$

sec10-1a

LABJND colour-difference formula of CIE 230:2019
Modifications with normalization to Y_u of surround

$dY = A_1+A_2Y$ error 0,0004 A_1=0,0170, A_2=0,0058 [1]
$=A_1+A_{2u}(Y/Y_u)$ A_1=0,0170, A_{2u}=0,1004=A_2Y_u [2]

$dY = A_1+A_2Y^{A_3}$ error 0,0019 A_1=0,0258, A_2=0,0036, A_3=1,087 [3]
$=A_1+A_{2u}(Y/Y_u)^{A_3}$ A_1=0,0258, A_{2u}=0,0823, A_3=1,087 [4]

$dY = A_1[1+A_2Y]$ error 0,0004 A_1=0,0170, A_2=0,3343 [5]
$=A_1[1+A_{2u}(Y/Y_u)]$ A_1=0,0170, A_{2u}=5,931=A_2Y_u [6]

$dY = A_1[1+A_2Y]^{A_3}$ error 0,0018 A_1=0,0251, A_2=0,1566, A_3=1,107 [7]
$=A_1[1+A_{2u}(Y/Y_u)]^{A_3}$ A_1=0,0251, A_{2u}=2,778, A_3=1,107 [8]

$$\frac{1}{A_1}\int\frac{dY}{[1+A_2Y]^{A_3}} = \frac{1}{A_1}\frac{[1+A_2Y]^{(A_3+1)}}{A_2(A_3+1)} = F^*(Y) \quad (A_2{\neq}1)\ [7l]$$

sec10-3c DEQ20–3N

LABJND colour-difference formula of CIE 230:2019
Modifications with normalization to Y_u of surround

$dY = A_1+A_2Y$ error 0,0004 A_1=0,0170, A_2=0,0058 [1d]
$=A_1+A_{2u}(Y/Y_u)$ A_1=0,0170, A_{2u}=0,1004=A_2Y_u [2d]

$dY = A_1+A_2Y^{A_3}$ error 0,0019 A_1=0,0258, A_2=0,0036, A_3=1,087 [3d]
$=A_1+A_{2u}(Y/Y_u)^{A_3}$ A_1=0,0258, A_{2u}=0,0823, A_3=1,087 [4d]

$dY = A_1[1+A_2Y]$ error 0,0004 A_1=0,0170, A_2=0,3343 [5d]
$=A_1[1+A_{2u}(Y/Y_u)]$ A_1=0,0170, A_{2u}=5,931=A_2Y_u [6d]

$dY = A_1[1+A_2Y]^{A_3}$ error 0,0018 A_1=0,0251, A_2=0,1566, A_3=1,107 [7d]
$=A_1[1+A_{2u}(Y/Y_u)]^{A_3}$ A_1=0,0251, A_{2u}=2,778, A_3=1,107 [8d]

$$\frac{1}{A_1}\int\frac{dY}{[1+A_2Y]^{A_3}} = \frac{1}{A_1}\frac{[1+A_2Y]^{(A_3+1)}}{A_2(A_3+1)} = F^*(Y) \quad (A_2{\neq}1)\ [7l]$$

sec10-4a DEQ20–4N

LABJND colour-difference formula of CIE 230:2019
Modifications with normalization to Y_u of surround

$dY = A_1+A_2Y$ error 0,0004 A_1=0,0170, A_2=0,0058 [1d]
$dY_r = A_1+A_{2u}Y_r$ A_1=0,0170, A_{2u}=0,1004, $Y_r = (Y/Y_u)$ [2d]

$$\int\frac{dY_r}{A_1+A_2Y_r} = \frac{1}{A_2}\ln|A_1+A_2Y_r| = F^*(Y_u) \quad (A_2{=}1)\ [2l]$$

$dY = A_1[1+A_2Y]$ error 0,0004 A_1=0,0170, A_2=0,3343 [5d]
$dY_r = A_1[1+A_{2u}Y_r]$ A_1=0,0170, A_{2u}=5,931, $Y_r = (Y/Y_u)$ [6d]

$$\frac{1}{A_1}\int\frac{dY}{1+A_2Y} = \frac{1}{A_1A_{2u}}\ln|1+A_{2u}Y_r| = F^*(Y_u) \quad (A_2{=}1)\ [6l]$$

sec10-5c DEQ20–5N

LABJND colour-difference formula of CIE 230:2019
Modifications with normalization to Y_u of surround

$dY = [A_1+A_2Y]^{A_3}$ error 0,0018 A_1=0,0358, A_2=0,00561, A_3=1,107 [9d]
$=[A_1+A_{2u}(Y/Y_u)]^{A_3}$ A_1=0,0358, A_{2u}=0,0995, A_3=1,107 [10d]

$$\int\frac{dY}{(A_1+A_2Y)^{A_3}} = \frac{[A_1+A_2Y]^{(A_3+1)}}{A_2(A_3+1)} = F^*(Y) \quad A_2{\neq}1\ [8l]$$

$dY = A_1[1+A_2Y]^{A_3}$ error 0,0018 A_1=0,0251, A_2=0,1566, A_3=1,107 [7d]
$=A_1[1+A_{2u}(Y/Y_u)]^{A_3}$ A_1=0,0251, A_{2u}=2,778, A_3=1,107 [8d]

$$\frac{1}{A_1}\int\frac{dY}{[1+A_2Y]^{A_3}} = \frac{1}{A_1}\frac{[1+A_2Y]^{(A_3+1)}}{A_2(A_3+1)} = F^*(Y) \quad A_2{\neq}1\ [7l]$$

sec10-7a DEQ20–7N

LABJND colour-difference formula of CIE 230:2019
Modifications with normalization to Y_u of surround

$dY = A_1+A_2Y^{A_3}$ error 0,0019 A_1=0,0258, A_2=0,0036, A_3=1,087 [3d]
$=A_1+A_{2u}(Y/Y_u)^{A_3}$ A_1=0,0258, A_{2u}=0,0823, A_3=1,087 [4d]

$$\int\frac{dY_r}{A_1+A_2Y_r^{A_3}} = A_1Y_r + \frac{A_2[Y]^{(A_3+1)}}{A_3+1} = F^*(Y_u)\ (A_2{\neq}1)\ [3l]$$

$dY = A_1[1+A_2Y^{A_3}]$ error 0,0018 A_1=0,0251, A_2=0,1566, A_3=1,107 [7d]
$=A_1[1+A_{2u}(Y/Y_u)^{A_3}]$ A_1=0,0251, A_{2u}=2,778, A_3=1,107 [8d]

$$\frac{1}{A_1}\int\frac{dY}{[1+A_2Y]^{A_3}} = \frac{1}{A_1}\frac{[1+A_2Y]^{(A_3+1)}}{A_2(A_3+1)} = F^*(Y)\ (A_2{\neq}1)\ [7l]$$

sec10-6a DEQ20–6N

LABJND colour-difference formula of CIE 230:2019
Modifications with normalization to Y_u of surround

$dY = A_1+A_2Y^{A_3}$ error 0,0019 A_1=0,0258, A_2=0,0036, A_3=1,087 [3d]
$=A_1+A_{2u}(Y/Y_u)^{A_3}$ A_1=0,0258, A_{2u}=0,0823, A_3=1,087 [4d]

$$\int\frac{dY_r}{A_1+A_2[Y_r]^{A_3}} = A_1Y_r + \frac{A_{2u}[Y_r]^{(A_3+1)}}{A_3+1} = F^*(Y_u)\ (A_2{\neq}1)\ [4l]$$

$dY = A_1[1+A_2Y^{A_3}]$ error 0,0018 A_1=0,0251, A_2=0,1566, A_3=1,107 [7d]
$=A_1[1+A_{2u}(Y/Y_u)^{A_3}]$ A_1=0,0251, A_{2u}=2,778, A_3=1,107 [8d]

$$\frac{1}{A_1}\int\frac{dY_r}{[1+A_2Y_r]^{A_3}} = \frac{1}{A_1}\frac{[1+A_{2u}Y_r]^{(A_3+1)}}{A_{2u}(A_3+1)} = F^*(Y_u)\ (A_2{\neq}1)\ [8l]$$

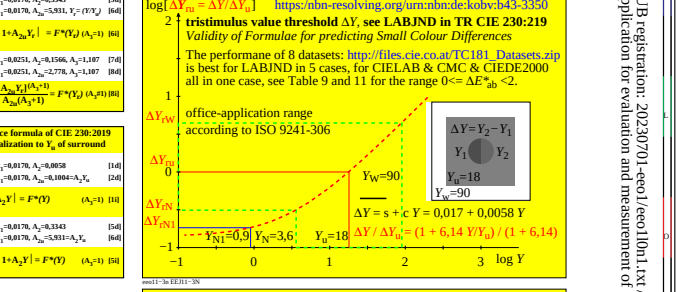
sec10-8a DEQ20–8N

Normalized *NW*-achromatic thresholds $\Delta Y_{ru} = \Delta Y / \Delta Y_u$ as function of Y

experiments and data: BAM-research report no. 115 (1985), page 72, see
$\log[\Delta Y_{ru} = \Delta Y/\Delta Y_u]$ https://nbn-resolving.org/urn:nbn:de:kobv:b43-3350

tristimulus value threshold ΔY, see LABJND in TR CIE 230:2019
Validity of Formulae for predicting Small Colour Differences

The performane of 8 datasets: http://files.cie.co.at/TC181_Datasets.zip is best for LABJND in 5 cases, for CIELAB & CMC & CIEDE2000 all in one case, see Table 9 and 11 for the range 0<= ΔE^*_{ab} <2.



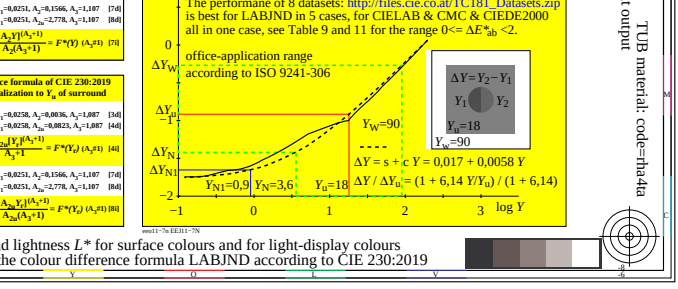
sec11-3a EEJ11 – 3N

***NW*-achromatic thresholds ΔY as function of Y**

experiments and data: BAM-research report no. 115 (1985), page 72, see
$\log[\Delta Y]$ https://nbn-resolving.org/urn:nbn:de:kobv:b43-3350

tristimulus value threshold ΔY, see LABJND in TR CIE 230:2019
Validity of Formulae for predicting Small Colour Differences

The performane of 8 datasets: http://files.cie.co.at/TC181_Datasets.zip is best for LABJND in 5 cases, for CIELAB & CMC & CIEDE2000 all in one case, see Table 9 and 11 for the range 0<= ΔE^*_{ab} <2.



sec11-7a EEJ11 – 7N

TUB-test chart eeo1; CIE Y and lightness L^* for surface colours and for light-display colours
Line-element optimization of the colour difference formula LABJND according to CIE 230:2019