

Lightness L^* and differences ΔY or dY in the colour space TUBJND

The lightness L^* is defined by the equation:

$$L^*_{\text{TUBJND}} = (t/a) \ln [1 + a \cdot Y] = (t/a) \ln [1 + b \cdot (Y/Y_u)] \quad [1]$$

$$a=0,3411 \quad t=88,23 \quad t/a=258,6 \quad b=6,141 \quad Y_u=18 \quad [2]$$

This equation is based on psychophysical BAM-research results

$$dY = (s + q \cdot Y) / c, \text{ see Richter BAM-Forschungsbericht 115, 1985} \quad [3]$$

There are different versions of this equations, all with equal content

$$dY = (A_1 + A_2 \cdot Y) / A_0, \text{ see CIE 230; Eq. (A.7a)} \quad [4]$$

$$dY = (1 + a \cdot Y) / t = (1 + b \cdot (Y / Y_u)) / t \quad [5]$$

$$A_1=s=0,0170 \quad A_2=q=0,0058 \quad A_0=c=1,5 \quad (c=\text{scaling constant}) \quad [6]$$

The lightness L^* is called the line element of dY , see the equation

$$L^*_{\text{TUBJND}}(Y) = \int \frac{t \cdot dY}{[1 + a \cdot Y]} = (t/a) \ln [1 + a \cdot Y] \quad [7]$$