

## Lightness $L^*$ and differences $\Delta Y$ 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

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