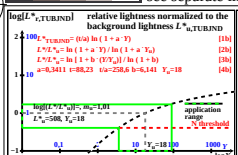

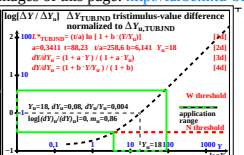

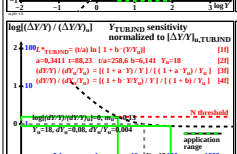

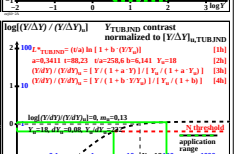

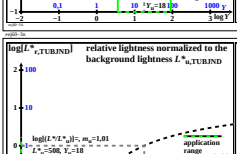

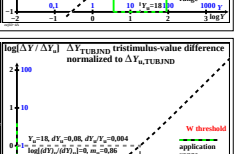

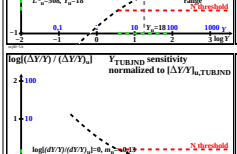

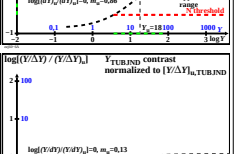

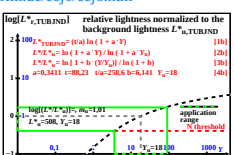

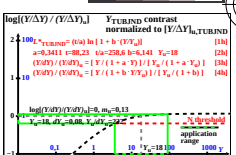

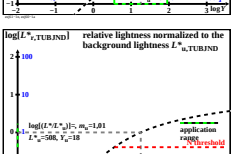

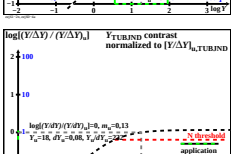

Lightness L* and differences ΔY or dY in the colour space TUBJND

The lightness L^* is defined by the equation:

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

a=0,3411 t=88,23 t/a=258,6 b=6,141 Y_n=18 [2]

This equation is based on psychophysical BAM-reseach results
dY = (**s** • **q** · **Y**) / c, see *Richter* BAM-Forschungsbericht 115, 1985 [3]

There are different versions of this equations, all with equal content
$\mathbf{dY} = (\mathbf{s} \bullet \mathbf{A}_Y \cdot \mathbf{Y}) / \mathbf{A}_{Yn}$ see CIE 230, Eq. (A.7a) [4]
$dY = (1 + a \cdot Y) / c = (1 + (Y / Y_n)) / c$ [5]
A_1;$_5$=0,0170 A_2=q=0,0058 A_3=c=1,5 (c=scaling constant) [6]

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

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

Line-element examples for grey samples (0,2≤x=Y/Yn≤5)

$F(x)$ is called the line-element function of $f(x)$.
The following relations are valid for $x=Y/Y_n$=Y/18:

$$\frac{d[F(x)]}{dx} = f(x) \quad [1]$$

$$F(x) = \int \frac{f'(x)}{f(x)}\, dx \quad [2]$$

Example for all normalized tristimulus values $x=Y/Y_n$,
for example for Y_n=3,6, Y_n=18, Y_n=90.

$$\frac{d[\mathrm{tln}(1+b\cdot x)]}{dx} = \frac{\mathrm{tb}}{1+\mathrm{b}\cdot\mathrm{x}} \quad [3]$$

$$\mathrm{tln}(1+\mathrm{b}\cdot\mathrm{x}) = \int \frac{\mathrm{tb}}{1+\mathrm{b}\cdot\mathrm{x}}\, dx \quad [4]$$