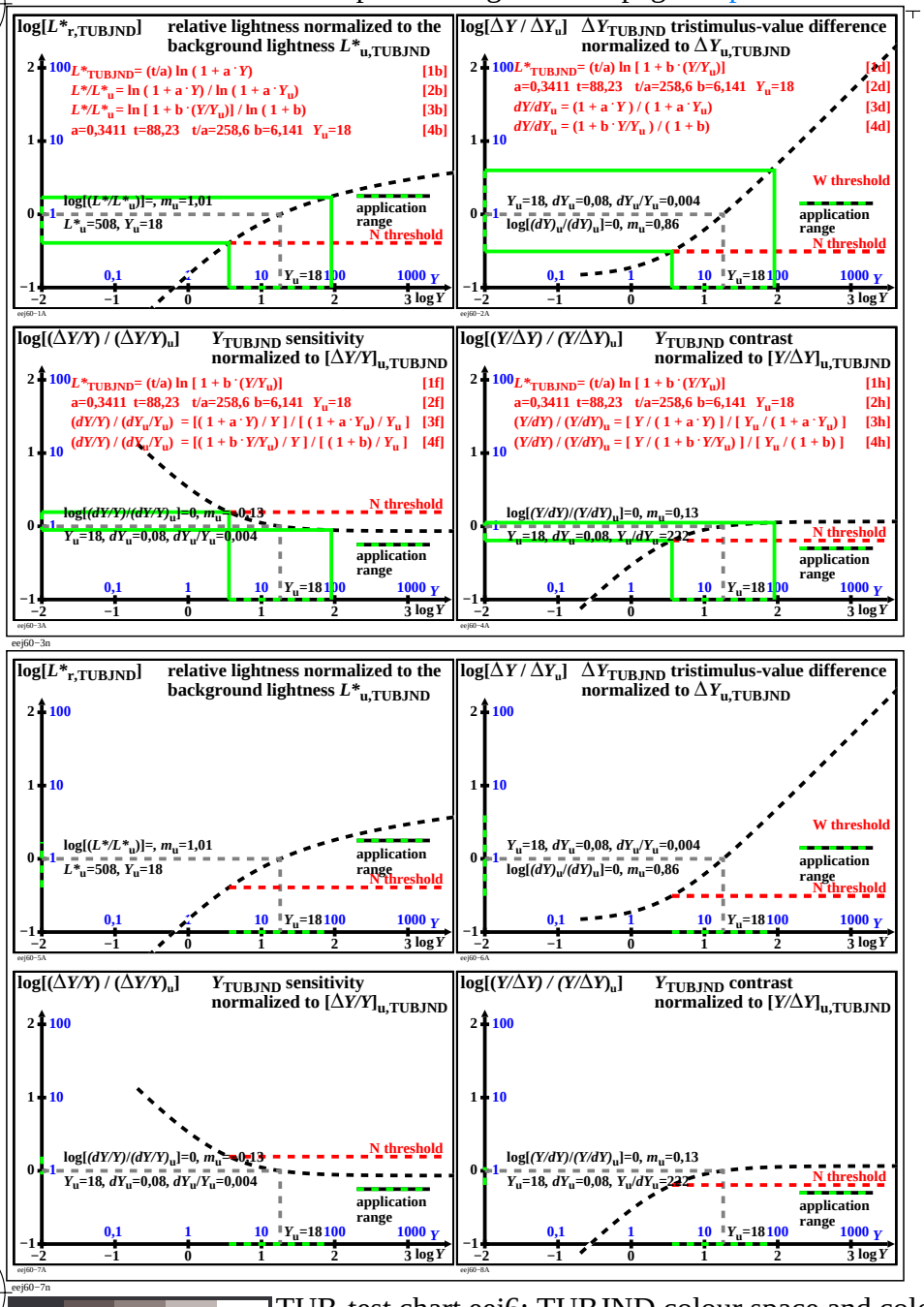

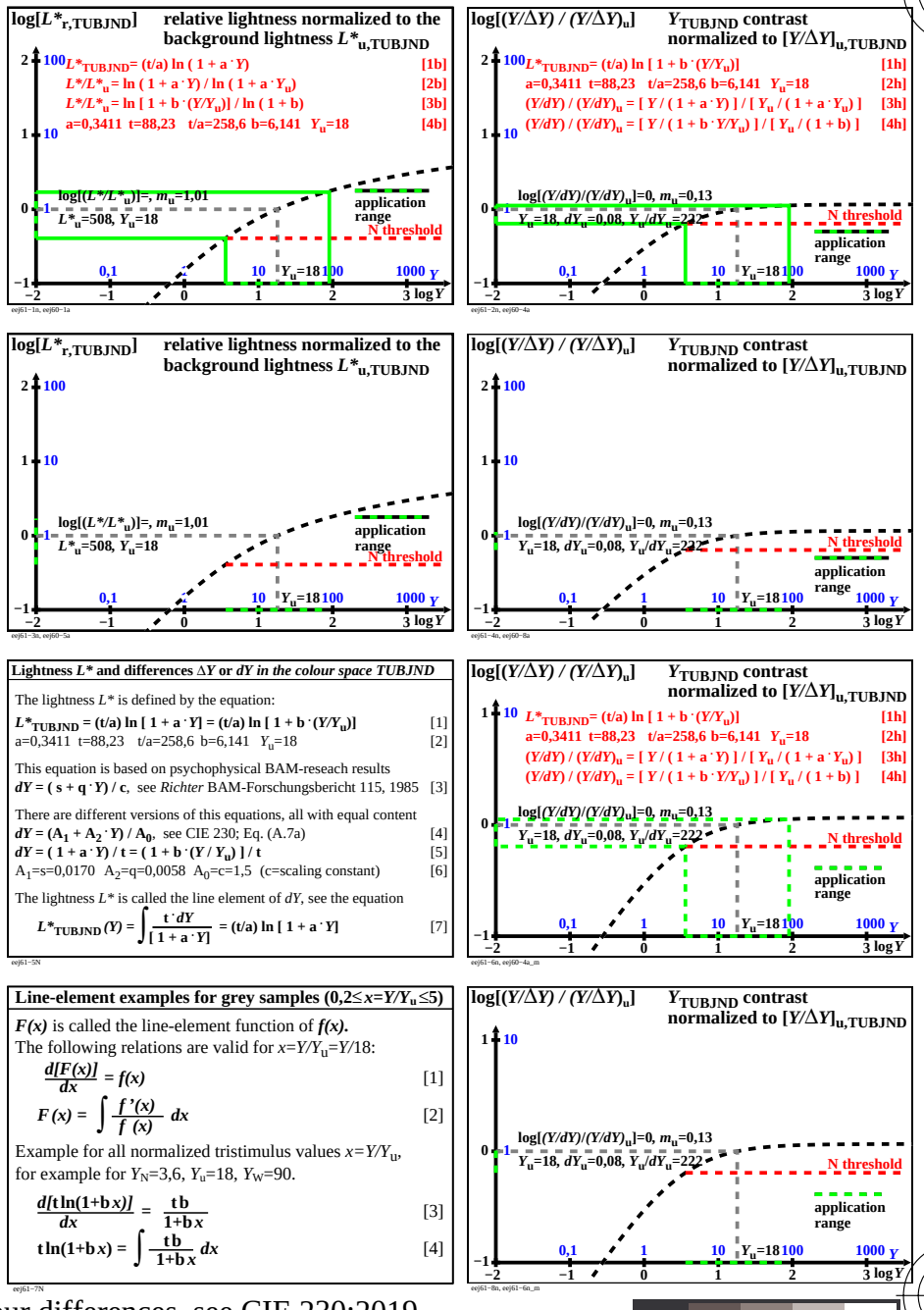

Lightness L^* and differences ΔY or dY in the colour space TUBJND

The lightness L^* is defined by the equation:

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

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

This equation is based on psychophysical BAM-reseach results

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

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

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

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

A_1=s=0,0170 A_2=q=0,0058 A_0=c=1,5 (c=scaling constant) [6]

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

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

Line-element examples for grey samples ($0{,}2 \le x = Y/Y_u \le 5$)

$F(x)$ is called the line-element function of $f(x)$.

The following relations are valid for $x = Y/Y_u = Y/18$:

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

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

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

$$\frac{d[t \ln(1+b\,x)]}{dx} = \frac{t\,b}{1+b\,x} \quad [3]$$

$$t \ln(1+b\,x) = \int \frac{t\,b}{1+b\,x}\, dx \quad [4]$$