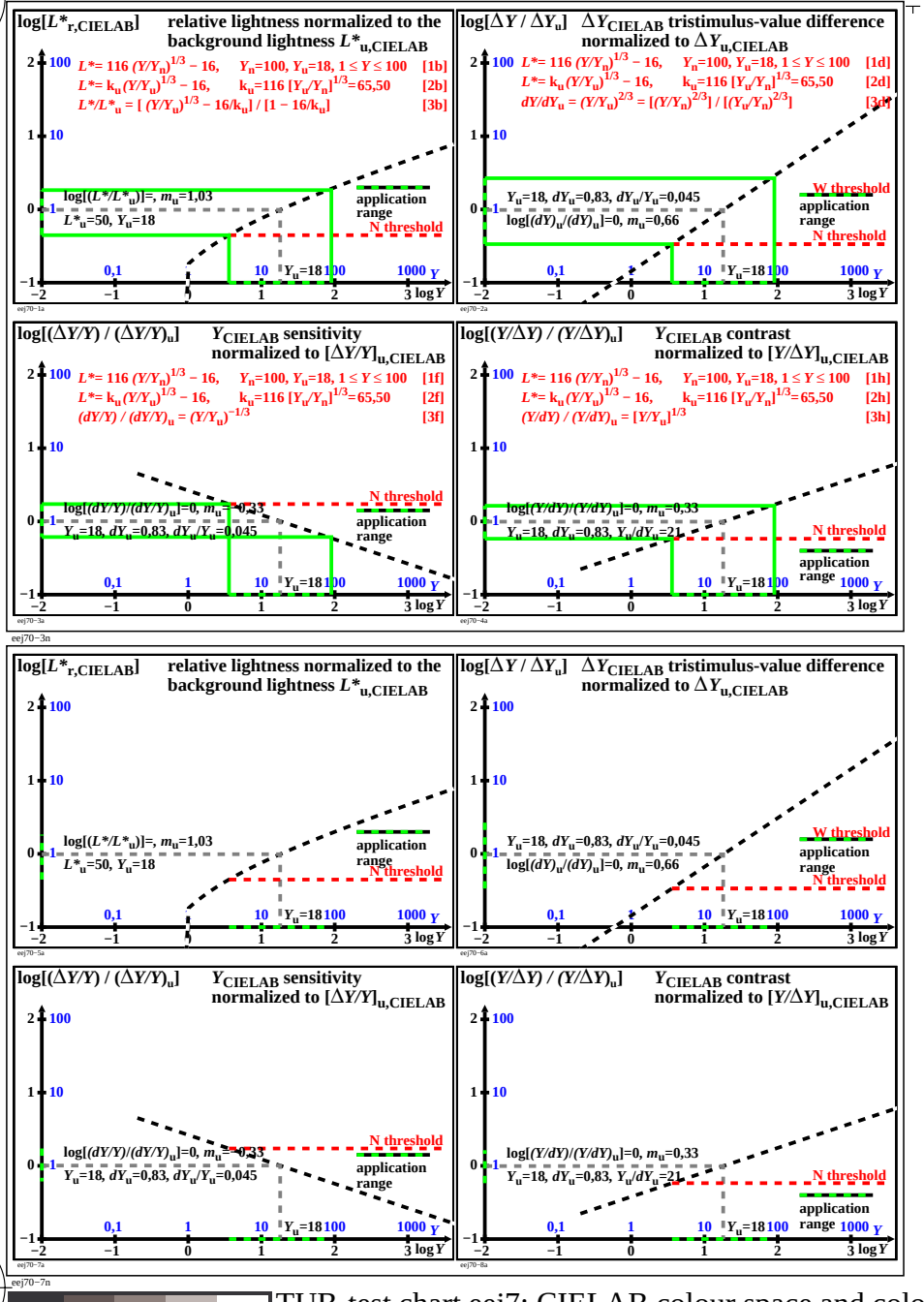

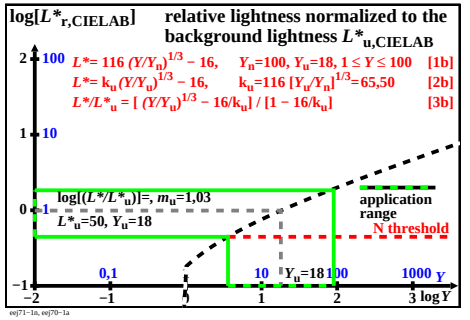

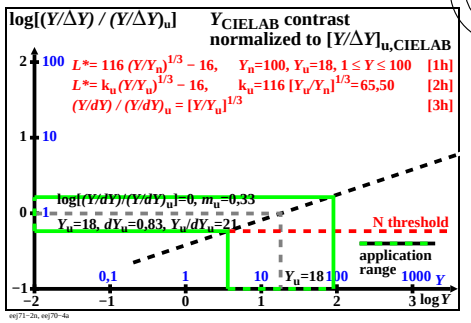

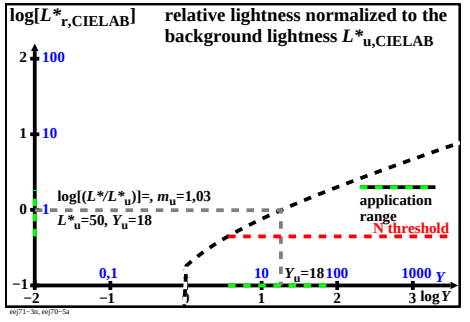

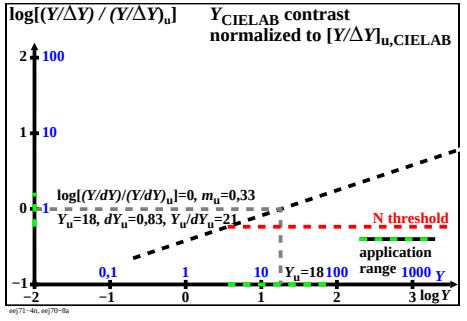

Lightness L^* and differences ΔY or dY in the colour space CIELAB

The lightness L^* is defined by the equation:

$L^* = 116\,(Y/Y_n)^{1/3} - 16, \quad Y_n=100,\ Y_u=18,\ 1 \le Y \le 100$ [1]

This CIELAB equation as function of relative tristimulus values is

$L^* = k_u\,(Y/Y_u)^{1/3} - 16, \quad k_u=116\,[Y_u/Y_n]^{1/3}=65{,}50$ [2]

The tristimulus values difference dY is for $dL^*=1$

$dY = (3/116)\cdot(Y/Y_n)^{2/3} = a\cdot(Y/Y_n)^{2/3} = b\cdot(Y/Y_u)^{2/3}$ [3]

a = 0,557 b = 6,516 [4]

Relative nomalized differences are dY/dY_u and $[Y/dY] / [(Y/dY)_u]$

$dY/dY_u = (Y/Y_u)^{2/3} = [(Y/Y_n)^{2/3}] / [(Y_u/Y_n)^{2/3}]$ [5]

$(Y/dY) / (Y/dY)_u = [Y/Y_u]^{1/3}$ [6]

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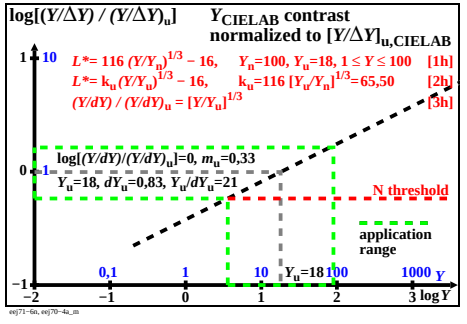

Line-element examples for grey samples ($0{,}2 \le x = Y/Y_u \le 5$)

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

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

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

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

$\frac{d\,[\,k_u(x)^{1/3} - 16\,]}{dx} = [\,k_u(x)^{-2/3}\,] / 3$ [3]

$k_u(x)^{1/3} + \text{const} = \int \frac{k_u(x)^{-2/3}}{3}$ [4]

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