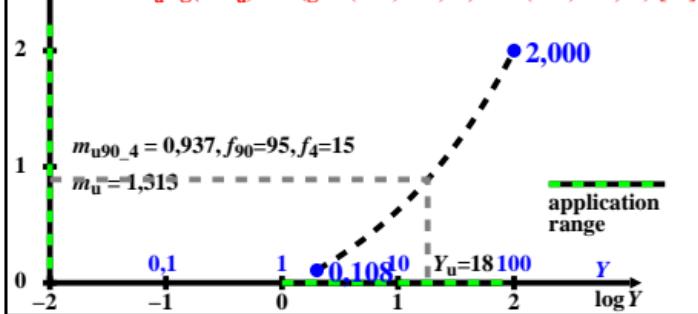


$L^*_{80}/L^*_{80,u}$ HAULAB lightness L^*_{80} normalized to the background lightness $L^*_{80,u}$

$$L^*/L^*_{80,u} = L^* = s(Y/Y_u)^n - d \quad (Y_n=100, Y_u=18, s=22, n=0,31, d=30) \quad [1a]$$

$$L^* = r(Y/Y_u)^n - d \quad (r = s(Y_u/Y_n)^n = 13,49, L^*_u = r - d) \quad [1b]$$

$$L^*/L^*_u = g(Y/Y_u)^n - h \quad (g=r/(r-d)=-0,78, h=d/(r-d)=-1,78) \quad [1c]$$



hep31-1a

$\Delta Y/\Delta Y_u$ HAULAB tristimulus value difference ΔY normalized to ΔY_u

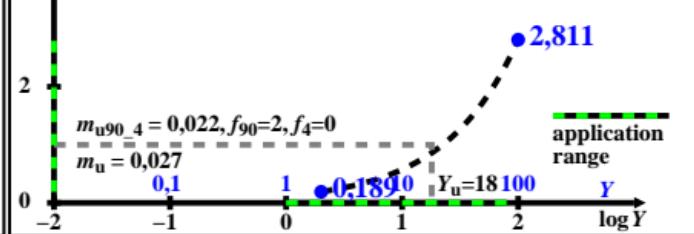
$$\Delta Y/\Delta Y_u = L^* = s(Y/Y_u)^n - d \quad (Y_n=100, Y_u=18, s=22, n=0,31, d=30) \quad [1a]$$

$$L^* = r(Y/Y_u)^n - d \quad (r = s(Y_u/Y_n)^n = 13,49, L^*_u = r - d) \quad [1b]$$

$$dY = [Y_n / (n s)] (Y/Y_u)^{1-n} \quad [2c]$$

$$dY_u = [Y_n / (n s)] (Y_u/Y_n)^{1-n} = 8,2533 \quad [2d]$$

$$dY/dY_u = (Y/Y_u)^{1-n} \quad [2e]$$



hep31-2a

$(\Delta Y/Y) / (\Delta Y/Y)_u$ HAULAB-Y sensitivity normalized to $(\Delta Y/Y)_u$

$$S_r/S_{ru} = (\Delta Y/Y)/(\Delta Y/Y)_u \quad [1a]$$

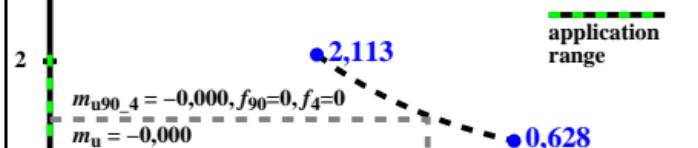
$$L^* = s(Y/Y_u)^n - d \quad (Y_n=100, Y_u=18, s=22, n=0,31, d=30) \quad [1a]$$

$$L^* = r(Y/Y_u)^n - d \quad (r = s(Y_u/Y_n)^n = 13,49, L^*_u = r - d) \quad [1b]$$

$$dY/Y = [(Y_n / (n s)) (Y/Y_u)^{1-n}] / Y \quad [3c]$$

$$(dY/Y)_u = [(Y_n / (n s)) (Y_u/Y_n)^{1-n}] / Y_u \quad [3d]$$

$$(dY/Y) / (dY/Y)_u = (Y/Y_u)^{-n} \quad [3e]$$



hep31-3a

hep31-3n

$(Y/\Delta Y) / (Y/\Delta Y)_u$ HAULAB-Y contrast normalized to $(Y/\Delta Y)_u$

$$C_r/C_{ru} = (Y/\Delta Y)/(Y/\Delta Y)_u \quad [1a]$$

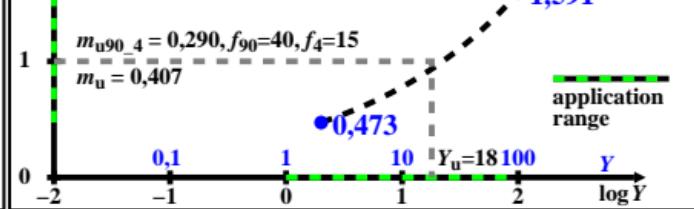
$$L^* = s(Y/Y_u)^n - d \quad (Y_n=100, Y_u=18, s=22, n=0,31, d=30) \quad [1a]$$

$$L^* = r(Y/Y_u)^n - d \quad (r = s(Y_u/Y_n)^n = 13,49, L^*_u = r - d) \quad [1b]$$

$$Y/dY = Y / \{ [(Y_n / (n s)) (Y/Y_u)^{1-n}] \} \quad [4c]$$

$$(Y/Y)_u = Y_u / \{ [(Y_n / (n s)) (Y_u/Y_n)^{1-n}] \} \quad [4d]$$

$$(Y/dY) / (Y/dY)_u = (Y/Y_u)^n \quad [4e]$$



hep31-4a