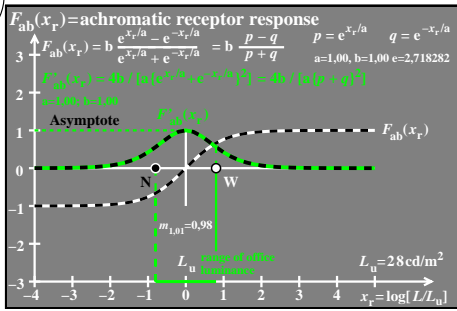
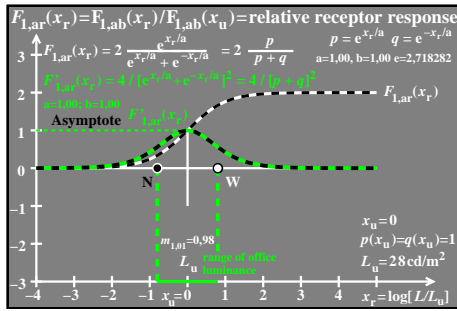


see similar files of the whole serie: <http://farbe.li.tu-berlin.de/feks.htm>  
 technical information: <http://farbe.li.tu-berlin.de> or <http://color.li.tu-berlin.de>

TUB registration: 20230701-fek0/fek010np.pdf / .ps  
 application for evaluation and measurement of display or print output  
 TUB material: code=rh4ta



fek00-1a



fek00-2a

**Mathematical equations of hyperbel functions**  
 See: Papula, L., (2003), *Mathematische Formelsammlung*, Vieweg

$$F_{ab}(x/a) = b \tanh(x/a) = b \frac{e^{x/a} - e^{-x/a}}{e^{x/a} + e^{-x/a}} = b \frac{u(x/a)}{v(x/a)} \quad [1]$$

$$F'_{ab}(x/a) = b \frac{u'(x/a)v(x/a) - u(x/a)v'(x/a)}{v^2(x/a)} \quad [2]$$

$$F'_{ab}(x/a) = b \frac{v^2(x/a) - u^2(x/a)}{a v^2(x/a)} \quad [3]$$

$$F'_{ab}(x/a) = \frac{4b}{a [e^{x/a} + e^{-x/a}]^2} = \frac{b}{a \cosh^2(x/a)} \quad [4]$$

fek01-1a

**Mathematical equations of hyperbel functions**  
 See: Papula, L., (2003), *Mathematische Formelsammlung*, Vieweg

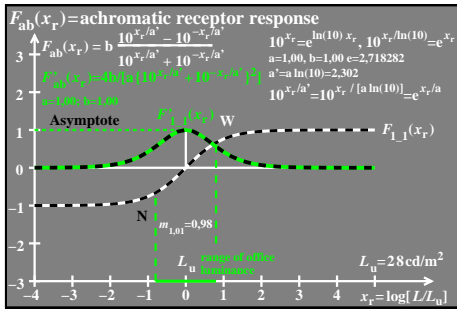
$$F_{abu}(x/a) = [\tanh(x/a)+1] / [\tanh(x_u/a)+1] \quad [1u]$$

$$F'_{abu}(x/a) = \tanh(x/a) \text{ with } \tanh(x_u/a)=0 \quad [2u]$$

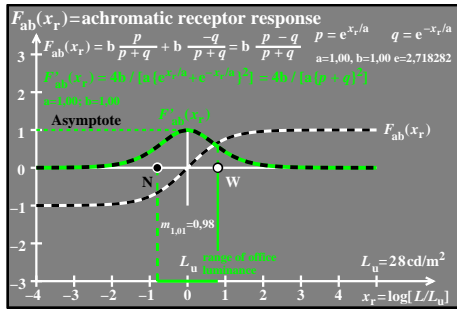
$$F'_{abu}(x/a) = \frac{v^2(x/a) - u^2(x/a)}{a v^2(x/a)} \quad [3u]$$

$$F'_{abu}(x/a) = \frac{4}{a [e^{x/a} + e^{-x/a}]^2} = \frac{1}{a \cosh^2(x/a)} \quad [4u]$$

fek01-2a



fek00-3a



fek00-3a

**Mathematical equations of hyperbel functions**  
 See: Papula, L., (2003), *Mathematische Formelsammlung*, Vieweg

$$F_{ab}(x/a) = b \tanh(x/a) = b \frac{e^{x/a} - e^{-x/a}}{e^{x/a} + e^{-x/a}} = b \frac{u(x/a)}{v(x/a)} \quad [1]$$

$$F'_{ab}(x/a) = b \frac{u'(x/a)v(x/a) - u(x/a)v'(x/a)}{v^2(x/a)} \quad [2]$$

$$F'_{ab}(x/a) = b \frac{v^2(x/a) - u^2(x/a)}{a v^2(x/a)} \quad [3]$$

$$F'_{ab}(x/a) = \frac{4b}{a [e^{x/a} + e^{-x/a}]^2} = \frac{b}{a \cosh^2(x/a)} \quad [4]$$

fek01-3a

**Mathematical equations of hyperbel functions**  
 See: Papula, L., (2003), *Mathematische Formelsammlung*, Vieweg

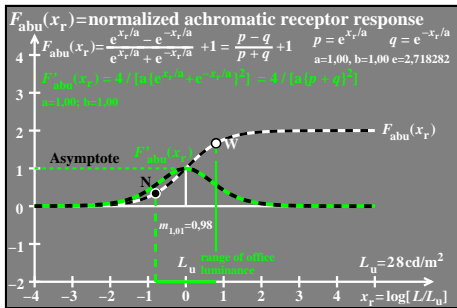
$$F_{abu}(x/a) = \tanh(x/a) = \frac{e^{x/a} - e^{-x/a}}{e^{x/a} + e^{-x/a}} = \frac{u(x/a)}{v(x/a)} \quad [1u]$$

$$F'_{abu}(x/a) = \frac{u'(x/a)v(x/a) - u(x/a)v'(x/a)}{v^2(x/a)} \quad [2u]$$

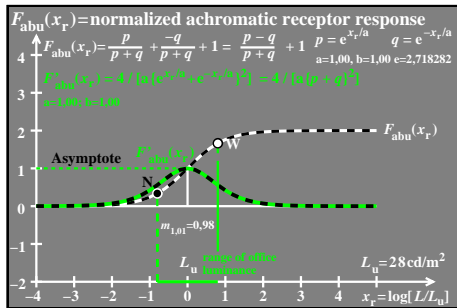
$$F'_{abu}(x/a) = \frac{v^2(x/a) - u^2(x/a)}{a v^2(x/a)} \quad [3u]$$

$$F'_{abu}(x/a) = \frac{4}{a [e^{x/a} + e^{-x/a}]^2} = \frac{1}{a \cosh^2(x/a)} \quad [4u]$$

fek01-4a



fek00-5a



fek00-6a

**Mathematical equations of hyperbel functions**  
 See: Papula, L., (2003), *Mathematische Formelsammlung*, Vieweg

$$F_{ab}(x/a) = b \tanh(x/a) = b \frac{e^{x/a} - e^{-x/a}}{e^{x/a} + e^{-x/a}} \quad [1]$$

$$\frac{dF_{ab}(x/a)}{dx} = \frac{4b}{a [e^{x/a} + e^{-x/a}]^2} = \frac{b}{a \cosh^2(x/a)} \quad [4]$$

$$\frac{dF_{ab}(x_r/a)}{dx_r} = \frac{4b}{a [e^{x_r/a} + e^{-x_r/a}]^2} \quad x_r = \log(L/L_{u1}) \quad [5]$$

$$\frac{dF_{ab}(x_r/a)}{dx_r} \frac{dx_r}{dL} = \frac{4b}{a [e^{x_r/a} + e^{-x_r/a}]^2} \frac{\ln(10)}{L} \quad [6]$$

fek01-5a

**Mathematical equations of hyperbel functions**  
 See: Papula, L., (2003), *Mathematische Formelsammlung*, Vieweg

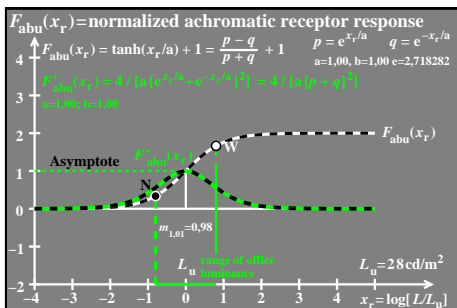
$$F_{abu}(x/a) = \tanh(x/a) = \frac{e^{x/a} - e^{-x/a}}{e^{x/a} + e^{-x/a}} \quad [1u]$$

$$\frac{dF_{abu}(x/a)}{dx} = \frac{4}{a [e^{x/a} + e^{-x/a}]^2} = \frac{1}{a \cosh^2(x/a)} \quad [4u]$$

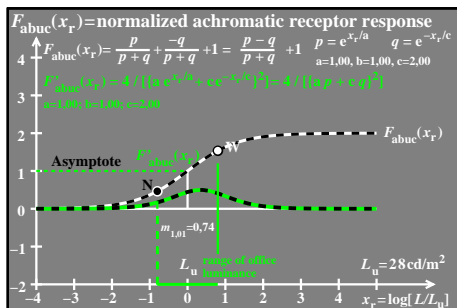
$$\frac{dF_{abu}(x_r/a)}{dx_r} = \frac{4}{a [e^{x_r/a} + e^{-x_r/a}]^2} \quad x_r = \log(L/L_{u1}) \quad [5u]$$

$$\frac{dF_{abu}(x_r/a)}{dx_r} \frac{dx_r}{dL} = \frac{4}{a [e^{x_r/a} + e^{-x_r/a}]^2} \frac{\ln(10)}{L} \quad [6u]$$

fek01-6a



fek00-7a



fek00-8a

**Mathematical equations of hyperbel functions**  
 See: Papula, L., (2003), *Mathematische Formelsammlung*, Vieweg

$$F_{ab}(x_r/a) = b \tanh(x_r/a) = b \frac{e^{x_r/a} - e^{-x_r/a}}{e^{x_r/a} + e^{-x_r/a}} \quad [1]$$

$$\frac{dF_{ab}(x_r/a)}{dx_r} = \frac{4b}{a [e^{x_r/a} + e^{-x_r/a}]^2} \quad x_r = \log(L/L_{u1}) \quad [5]$$

$$\frac{dF_{ab}(x_r/a)}{dx_r} \frac{dx_r}{dL} = \frac{4b}{a [e^{x_r/a} + e^{-x_r/a}]^2} \frac{\ln(10)}{L} \quad [6]$$

$$\frac{L}{dL} = \frac{4b \ln(10)}{a [e^{x_r/a} + e^{-x_r/a}]^2} \quad dL = \frac{a [e^{x_r/a} + e^{-x_r/a}]^2 L}{4b \ln(10)} \quad [7]$$

fek01-7a

**Mathematical equations of hyperbel functions**  
 See: Papula, L., (2003), *Mathematische Formelsammlung*, Vieweg

$$F_{abu}(x_r/a) = \tanh(x_r/a) = \frac{e^{x_r/a} - e^{-x_r/a}}{e^{x_r/a} + e^{-x_r/a}} \quad [1u]$$

$$\frac{dF_{abu}(x_r/a)}{dx_r} = \frac{4}{a [e^{x_r/a} + e^{-x_r/a}]^2} \quad x_r = \log(L/L_{u1}) \quad [5u]$$

$$\frac{dF_{abu}(x_r/a)}{dx_r} \frac{dx_r}{dL} = \frac{4}{a [e^{x_r/a} + e^{-x_r/a}]^2} \frac{\ln(10)}{L} \quad [6u]$$

$$\frac{L}{dL} = \frac{4 \ln(10)}{a [e^{x_r/a} + e^{-x_r/a}]^2} \quad dL = \frac{a [e^{x_r/a} + e^{-x_r/a}]^2 L}{4 \ln(10)} \quad [7u]$$

fek01-8a

TUB-test chart fek0; Model of normalized response function  $F_{ab}(x_r)$  and derivation  $F'_{ab}(x_r)$   
 Mathematical calculation of the derivation  $F'_{ab}(x_r)$ , of the contrast  $L/\Delta L$ , and the discrimination  $\Delta L$