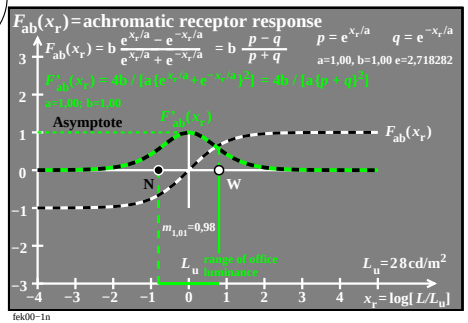

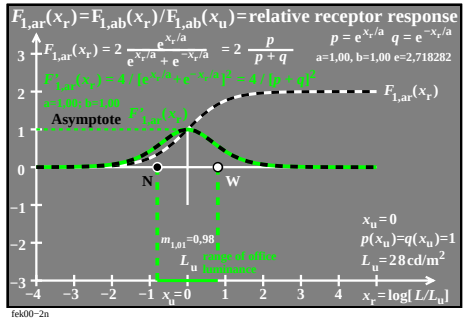

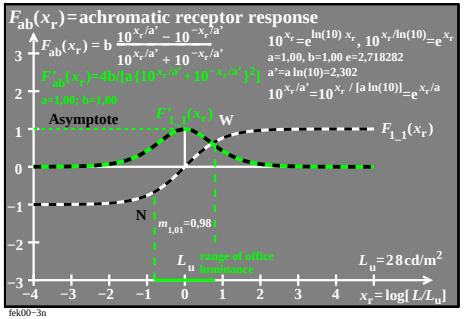

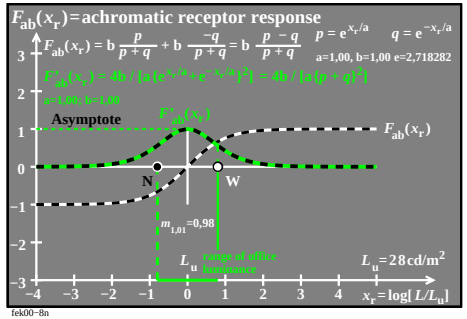

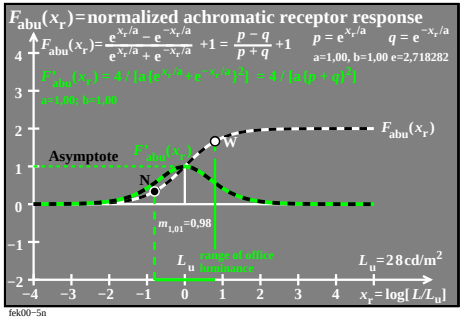

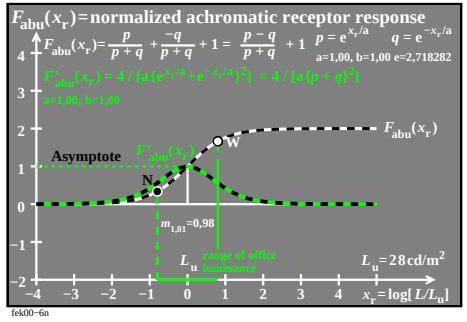

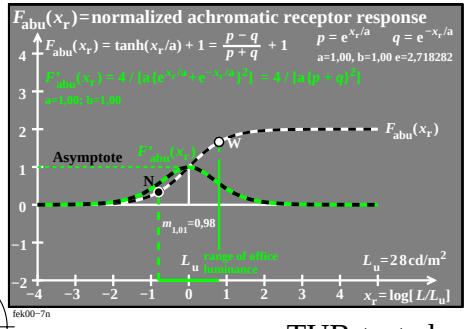

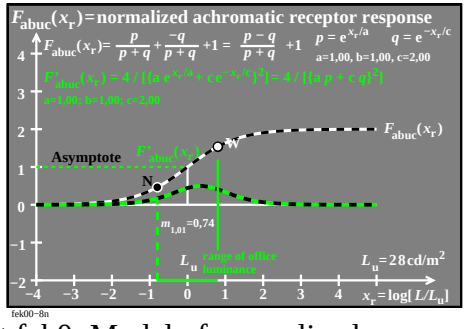

Mathematical equations of hyperbel functions

See: *Papula, L., (2003), Mathematische Formelsammlung, Vieweg*

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

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

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

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

fek01−1n

Mathematical equations of hyperbel functions

See: *Papula, L., (2003), Mathematische Formelsammlung, Vieweg*

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

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

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

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

fek01−2n

Mathematical equations of hyperbel functions

See: *Papula, L., (2003), Mathematische Formelsammlung, Vieweg*

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

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

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

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

fek01−3n

Mathematical equations of hyperbel functions

See: *Papula, L., (2003), Mathematische Formelsammlung, Vieweg*

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

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

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

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

fek01−4n

Mathematical equations of hyperbel functions

See: *Papula, L., (2003), Mathematische Formelsammlung, Vieweg*

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

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

$\frac{dF_{ab}(x_r/a)}{dx_r} = \frac{4b}{a[e^{x_r/a}+e^{-x_r/a}]^2}$ $x_r = \log(L/L_u)$ [5] $dx_r/dL = \ln(10)/L$

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

fek01−5n

Mathematical equations of hyperbel functions

See: *Papula, L., (2003), Mathematische Formelsammlung, Vieweg*

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

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

$\frac{dF_{abu}(x_r/a)}{dx_r} = \frac{4}{a[e^{x_r/a}+e^{-x_r/a}]^2}$ $x_r = \log(L/L_u)$ [5u] $dx_r/dL = \ln(10)/L$

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

fek01−6n

Mathematical equations of hyperbel functions

See: *Papula, L., (2003), Mathematische Formelsammlung, Vieweg*

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

$\frac{dF_{ab}(x_r/a)}{dx_r} = \frac{4b}{a[e^{x_r/a}+e^{-x_r/a}]^2}$ $x_r = \log(L/L_u)$ [5] $dx_r/dL = \ln(10)/L$

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

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

fek01−7n

Mathematical equations of hyperbel functions

See: *Papula, L., (2003), Mathematische Formelsammlung, Vieweg*

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

$\frac{dF_{abu}(x_r/a)}{dx_r} = \frac{4}{a[e^{x_r/a}+e^{-x_r/a}]^2}$ $x_r = \log(L/L_u)$ [5u] $dx_r/dL = \ln(10)/L$

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

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

fek01−8n

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 ΔL