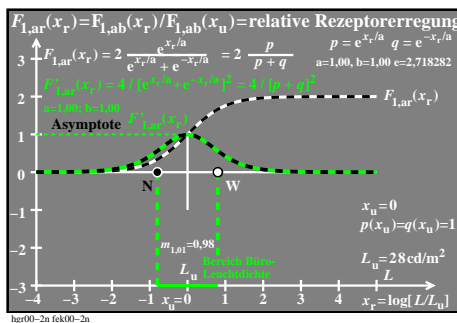
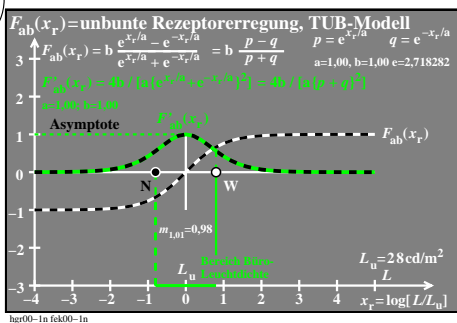


Technische Information: <http://farbe.li.tu-berlin.de> oder <http://color.li.tu-berlin.de>



**Mathematikgleichungen der Hyperbelfunktionen**  
 Siehe: *Handbook of mathematical functions, NBS, USA, Sec. 4.5*

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

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

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

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

hgr01-1n fek01-1n

**Mathematikgleichungen der Hyperbelfunktionen**  
 Siehe: *Handbook of mathematical functions, NBS, USA, Sec. 4.5*

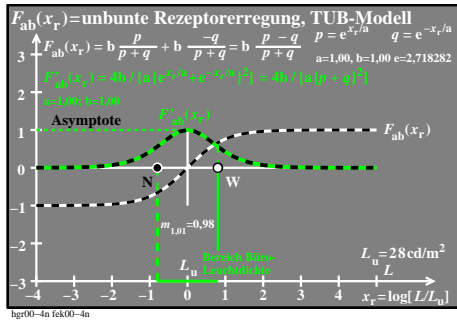
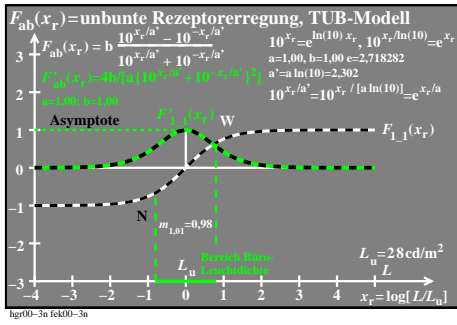
$$F_{abu}(x/a) = [\tanh(x/a) + 1] / [\tanh(x_u/a) + 1] \quad [1u]$$

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

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

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

hgr01-2n fek01-2n



**Mathematikgleichungen der Hyperbelfunktionen**  
 Siehe: *Handbook of mathematical functions, NBS, USA, Sec. 4.5*

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

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

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

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

hgr01-3n fek01-3n

**Mathematikgleichungen der Hyperbelfunktionen**  
 Siehe: *Handbook of mathematical functions, NBS, USA, Sec. 4.5*

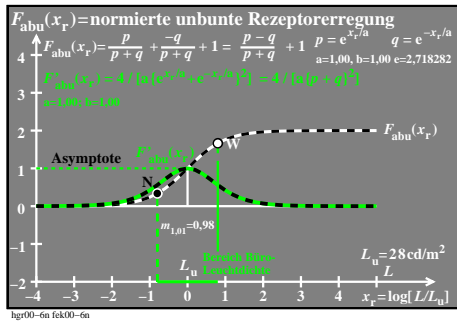
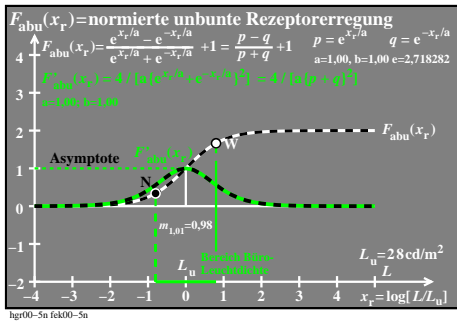
$$F_{abu}(x/a) = \tanh(x/a) = \frac{e^{x/a} - e^{-x/a}}{e^{x/a} + e^{-x/a}} = \frac{u(x/a)}{v(x/a)} \quad [1u]$$

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

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

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

hgr01-4n fek01-4n



**Mathematikgleichungen der Hyperbelfunktionen**  
 Siehe: *Handbook of mathematical functions, NBS, USA, Sec. 4.5*

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

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

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

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

hgr01-5n fek01-5n

**Mathematikgleichungen der Hyperbelfunktionen**  
 Siehe: *Handbook of mathematical functions, NBS, USA, Sec. 4.5*

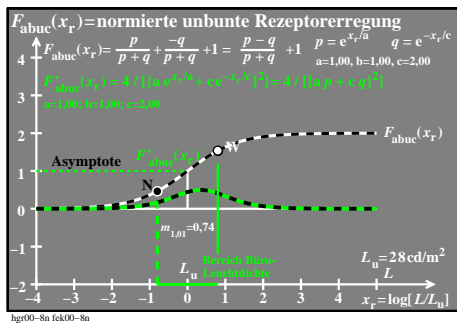
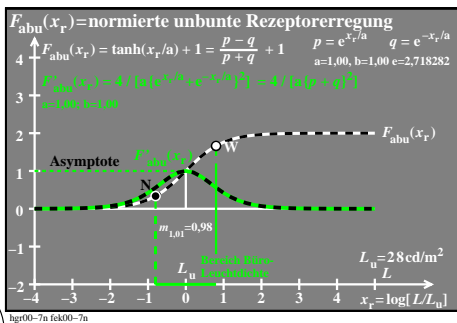
$$F_{abu}(x/a) = \tanh(x/a) = \frac{e^{x/a} - e^{-x/a}}{e^{x/a} + e^{-x/a}} \quad [1u]$$

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

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

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

hgr01-6n fek01-6n



**Mathematikgleichungen der Hyperbelfunktionen**  
 Siehe: *Handbook of mathematical functions, NBS, USA, Sec. 4.5*

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

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

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

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

hgr01-7n fek01-7n

**Mathematikgleichungen der Hyperbelfunktionen**  
 Siehe: *Handbook of mathematical functions, NBS, USA, Sec. 4.5*

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

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

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

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

hgr01-8n fek01-8n

TUB-Prüfvorlage hgr0; Modell für normierte Erregungsfunktion  $F_{ab}(x_r)$  und Ableitung  $F'_{ab}(x_r)$   
 Mathematische Berechnung der Ableitung  $F'_{ab}(x_r)$ , des Kontrastes  $L/\Delta L$  und der Unterscheidung  $\Delta L$

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