http://farbe.li.tu-berlin.de/eer1/eer1l0np.pdf /.ps; only vector graphic VG; start output
see separate figures of this output: http://farbe.li.tu-berlin.de/eer1/eer1.htm

Achromatic colour vision with relative luminance
Mathematical equations with potential functions

$$F_{ab}(L_r,m)=b\tanh(x_r/a)=b\frac{L_r^m-L_r^{-m}}{L_r^m+L_r^{-m}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r<=0\quad[1]$$
$$\frac{dF_{ab}(L_r,m)}{dL_r}=\frac{4bm}{L_r[L_r^m+L_r^{-m}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ m=1/(\ln(10)a)\quad[5]$$
$$\frac{dF_{ab}(L_r,m)}{dL}=\frac{4bmL_u}{L_r[L_r^m+L_r^{-m}]^2}\quad dL_r=dL/L_u,\ dF_{ab}(L_r,m)=1\quad[6]$$
$$\frac{L}{dL}=\frac{4bmL_uL}{L_r[L_r^m+L_r^{-m}]^2}\qquad dL=\frac{L_r[L_r^m+L_r^{-m}]^2}{4bmL_u}\quad[7]$$

eer10−1n eeo41−8n

Achromatic colour vision with relative luminance
Mathematical equations with potential functions

$$F_{cb}(L_r,n)=b\tanh(x_r/c)=b\frac{L_r^n-L_r^{-n}}{L_r^n+L_r^{-n}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r>=0\quad[1]$$
$$\frac{dF_{cb}(L_r,n)}{dL_r}=\frac{4bm}{L_r[L_r^n+L_r^{-n}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ n=1/(\ln(10)c)\quad[5]$$
$$\frac{dF_{cb}(L_r,n)}{dL}=\frac{4bnL_u}{L_r[L_r^n+L_r^{-n}]^2}\quad dL_r=dL/L_u,\ dF_{cb}(L_r,n)=1\quad[6]$$
$$\frac{L}{dL}=\frac{4bnL_uL}{L_r[L_r^n+L_r^{-n}]^2}\qquad dL=\frac{L_r[L_r^n+L_r^{-n}]^2}{4bnL_u}\quad[7]$$

eer10−2n eeo41−8n

Achromatic colour vision with relative luminance
Mathematical hyperbel and potential functions

$$F_{ab}(x_r,a)=b\tanh(x_r/a)=b\frac{e^{x_r/a}-e^{-x_r/a}}{e^{x_r/a}+e^{-x_r/a}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r<=0\quad[1]$$
$$\frac{dF_{ab}(x_r,a)}{dx_r}=\frac{4b}{a[e^{x_r/a}+e^{-x_r/a}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ m=1/(\ln(10)a)\quad[5]$$
$$\frac{L}{dL}=\frac{4bm}{[e^{x_r/a}+e^{-x_r/a}]^2}\qquad dL=\frac{[e^{x_r/a}+e^{-x_r/a}]^2L}{4bm}\quad[7]$$
$$\frac{L}{dL}=\frac{4bm}{[L_r^m+L_r^{-m}]^2}\qquad dL=\frac{[L_r^m+L_r^{-m}]^2L}{4bm}\quad[8]$$

eer11−1n

Achromatic colour vision with relative luminance
Mathematical hyperbel and potential functions

$$F_{cb}(x_r,a)=b\tanh(x_r/c)=b\frac{e^{x_r/c}-e^{-x_r/c}}{e^{x_r/c}+e^{-x_r/c}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r>=0\quad[1]$$
$$\frac{dF_{cb}(x_r,a)}{dx_r}=\frac{4b}{c[e^{x_r/c}+e^{-x_r/c}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ n=1/(\ln(10)c)\quad[5]$$
$$\frac{L}{dL}=\frac{4bn}{[e^{x_r/c}+e^{-x_r/c}]^2}\qquad dL=\frac{[e^{x_r/c}+e^{-x_r/c}]^2L}{4bn}\quad[7]$$
$$\frac{L}{dL}=\frac{4bn}{[L_r^n+L_r^{-n}]^2}\qquad dL=\frac{[L_r^n+L_r^{-n}]^2L}{4bn}\quad[8]$$

eer11−2n

Achromatic colour vision with relative luminance
Mathematical equations with potential functions

$$F_{ab}(L_r,m)=b\tanh(x_r/a)=b\frac{L_r^m-L_r^{-m}}{L_r^m+L_r^{-m}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r<=0\quad[1]$$
$$\frac{dF_{ab}(L_r,m)}{dL_r}=\frac{4bm}{L_r[L_r^m+L_r^{-m}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ m=1/(\ln(10)a)\quad[5]$$
$$\frac{L}{dL}=\frac{4bmL_uL}{L_r[L_r^m+L_r^{-m}]^2}\qquad dL=\frac{L_r[L_r^m+L_r^{-m}]^2}{4bmL_u}\quad[7]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4L}{L_r[L_r^m+L_r^{-m}]^2L_u};\quad\frac{dL}{dL_u}=\frac{L_r[L_r^m+L_r^{-m}]^2}{4}\quad[8]$$

eer10−3n eeo41−8n,ch

Achromatic colour vision with relative luminance
Mathematical equations with potential functions

$$F_{cb}(L_r,n)=b\tanh(x_r/c)=b\frac{L_r^n-L_r^{-n}}{L_r^n+L_r^{-n}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r>=0\quad[1]$$
$$\frac{dF_{cb}(L_r,n)}{dL_r}=\frac{4bm}{L_r[L_r^n+L_r^{-n}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ n=1/(\ln(10)c)\quad[5]$$
$$\frac{L}{dL}=\frac{4bnL_uL}{L_r[L_r^n+L_r^{-n}]^2}\qquad dL=\frac{L_r[L_r^n+L_r^{-n}]^2}{4bnL_u}\quad[7]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4L}{L_r[L_r^n+L_r^{-n}]^2L_u};\quad\frac{dL}{dL_u}=\frac{L_r[L_r^n+L_r^{-n}]^2}{4}\quad[8]$$

eer10−4n eeo41−8n,ch

Achromatic colour vision with relative luminance
Mathematical hyperbel and potential functions

$$F_{ab}(x_r,a)=b\tanh(x_r/a)=b\frac{e^{x_r/a}-e^{-x_r/a}}{e^{x_r/a}+e^{-x_r/a}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r<=0\quad[1]$$
$$\frac{dF_{ab}(x_r,a)}{dx_r}=\frac{4b}{a[e^{x_r/a}+e^{-x_r/a}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ m=1/(\ln(10)a)\quad[5]$$
$$\frac{L}{dL}=\frac{4bm}{[e^{x_r/a}+e^{-x_r/a}]^2}\qquad dL=\frac{[e^{x_r/a}+e^{-x_r/a}]^2L}{4bm}\quad[7]$$
$$\frac{L}{dL}=\frac{4bm}{[L_r^{2m}+2+L_r^{-2m}]}\qquad dL=\frac{[L_r^{2m}+2+L_r^{-2m}]L}{4bm}\quad[8]$$

eer11−3n

Achromatic colour vision with relative luminance
Mathematical hyperbel and potential functions

$$F_{cb}(x_r,a)=b\tanh(x_r/c)=b\frac{e^{x_r/c}-e^{-x_r/c}}{e^{x_r/c}+e^{-x_r/c}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r>=0\quad[1]$$
$$\frac{dF_{cb}(x_r,a)}{dx_r}=\frac{4b}{c[e^{x_r/c}+e^{-x_r/c}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ n=1/(\ln(10)c)\quad[5]$$
$$\frac{L}{dL}=\frac{4bn}{[e^{x_r/c}+e^{-x_r/c}]^2}\qquad dL=\frac{[e^{x_r/c}+e^{-x_r/c}]^2L}{4bn}\quad[7]$$
$$\frac{L}{dL}=\frac{4bn}{[L_r^{2n}+2+L_r^{-2n}]}\qquad dL=\frac{[L_r^{2n}+2+L_r^{-2n}]L}{4bn}\quad[8]$$

eer11−4n

Achromatic colour vision with relative luminance
Mathematical equations with potential functions

$$F_{ab}(L_r,m)=b\tanh(x_r/a)=b\frac{L_r^m-L_r^{-m}}{L_r^m+L_r^{-m}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r<=0\quad[1]$$
$$\frac{dF_{ab}(L_r,m)}{dL_r}=\frac{4bm}{L_r[L_r^m+L_r^{-m}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ m=1/(\ln(10)a)\quad[5]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4L}{L_r[L_r^m+L_r^{-m}]^2L_u};\quad\frac{dL}{dL_u}=\frac{L_r[L_r^m+L_r^{-m}]^2}{4}\quad[8]$$
$$\frac{L/dL}{(L/dL)_u}=1\text{ for }\begin{cases}L=L_u\\x_r=0\end{cases}\qquad\frac{dL}{dL_u}=1\text{ for }\begin{cases}L=L_u\\x_r=0\end{cases}\quad[9]$$

eer10−5n eeo41−8n,ch

Achromatic colour vision with relative luminance
Mathematical equations with potential functions

$$F_{cb}(L_r,n)=b\tanh(x_r/c)=b\frac{L_r^n-L_r^{-n}}{L_r^n+L_r^{-n}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r>=0\quad[1]$$
$$\frac{dF_{cb}(L_r,n)}{dL_r}=\frac{4bm}{L_r[L_r^n+L_r^{-n}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ n=1/(\ln(10)c)\quad[5]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4L}{L_r[L_r^n+L_r^{-n}]^2L_u};\quad\frac{dL}{dL_u}=\frac{L_r[L_r^n+L_r^{-n}]^2}{4}\quad[8]$$
$$\frac{L/dL}{(L/dL)_u}=1\text{ for }\begin{cases}L=L_u\\x_r=0\end{cases}\qquad\frac{dL}{dL_u}=1\text{ for }\begin{cases}L=L_u\\x_r=0\end{cases}\quad[9]$$

eer10−6n eeo41−8n,ch

Achromatic colour vision with relative luminance
Mathematical hyperbel and potential functions

$$F_{ab}(x_r,a)=b\tanh(x_r/a)=b\frac{e^{x_r/a}-e^{-x_r/a}}{e^{x_r/a}+e^{-x_r/a}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r<=0\quad[1]$$
$$\frac{dF_{ab}(x_r,a)}{dx_r}=\frac{4b}{a[e^{x_r/a}+e^{-x_r/a}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ m=1/(\ln(10)a)\quad[5]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4}{[e^{x_r/a}+e^{-x_r/a}]^2};\quad\frac{dL}{dL_u}=\frac{[e^{x_r/a}+e^{-x_r/a}]^2L}{4L_u}\quad[8]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4}{[L_r^m+L_r^{-m}]^2};\quad\frac{dL}{dL_u}=\frac{[L_r^m+L_r^{-m}]^2L}{4L_u}\quad[9]$$

eer11−5n

Achromatic colour vision with relative luminance
Mathematical hyperbel and potential functions

$$F_{cb}(x_r,a)=b\tanh(x_r/c)=b\frac{e^{x_r/c}-e^{-x_r/c}}{e^{x_r/c}+e^{-x_r/c}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r>=0\quad[1]$$
$$\frac{dF_{cb}(x_r,a)}{dx_r}=\frac{4b}{c[e^{x_r/c}+e^{-x_r/c}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ n=1/(\ln(10)c)\quad[5]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4}{[e^{x_r/c}+e^{-x_r/c}]^2};\quad\frac{dL}{dL_u}=\frac{[e^{x_r/c}+e^{-x_r/c}]^2L}{4L_u}\quad[8]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4}{[L_r^n+L_r^{-n}]^2};\quad\frac{dL}{dL_u}=\frac{[L_r^n+L_r^{-n}]^2L}{4L_u}\quad[9]$$

eer11−6n

Achromatic colour vision with relative luminance
Mathematical equations with potential functions

$$F_{ab}(L_r,m)=b\tanh(x_r/a)=b\frac{L_r^m-L_r^{-m}}{L_r^m+L_r^{-m}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r<=0\quad[1]$$
$$\frac{dF_{ab}(L_r,m)}{dL_r}=\frac{4bm}{L_r[L_r^m+L_r^{-m}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ m=1/(\ln(10)a)\quad[5]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4L}{L_r[L_r^m+L_r^{-m}]^2L_u};\quad\frac{dL}{dL_u}=\frac{L_r[L_r^m+L_r^{-m}]^2}{4}\quad[8]$$
$$\frac{L/dL}{(L/dL)_u}=1\text{ for }\begin{cases}L_r=1\\x_r=0\end{cases}\qquad\frac{dL}{dL_u}=1\text{ for }\begin{cases}L_r=1\\x_r=0\end{cases}\quad[9]$$

eer10−7n eeo41−8n,ch

Achromatic colour vision with relative luminance
Mathematical equations with potential functions

$$F_{cb}(L_r,n)=b\tanh(x_r/c)=b\frac{L_r^n-L_r^{-n}}{L_r^n+L_r^{-n}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r>=0\quad[1]$$
$$\frac{dF_{cb}(L_r,n)}{dL_r}=\frac{4bm}{L_r[L_r^n+L_r^{-n}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ n=1/(\ln(10)c)\quad[5]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4L}{L_r[L_r^n+L_r^{-n}]^2L_u};\quad\frac{dL}{dL_u}=\frac{L_r[L_r^n+L_r^{-n}]^2}{4}\quad[8]$$
$$\frac{L/dL}{(L/dL)_u}=1\text{ for }\begin{cases}L_r=1\\x_r=0\end{cases}\qquad\frac{dL}{dL_u}=1\text{ for }\begin{cases}L_r=1\\x_r=0\end{cases}\quad[9]$$

eer10−8n eeo41−8n,ch

Achromatic colour vision with relative luminance
Mathematical hyperbel and potential functions

$$F_{ab}(x_r,a)=b\tanh(x_r/a)=b\frac{e^{x_r/a}-e^{-x_r/a}}{e^{x_r/a}+e^{-x_r/a}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r<=0\quad[1]$$
$$\frac{dF_{ab}(x_r,a)}{dx_r}=\frac{4b}{a[e^{x_r/a}+e^{-x_r/a}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ m=1/(\ln(10)a)\quad[5]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4}{[e^{x_r/a}+e^{-x_r/a}]^2};\quad\frac{dL}{dL_u}=\frac{[e^{x_r/a}+e^{-x_r/a}]^2L}{4L_u}\quad[8]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4}{L_r^{2m}+2+L_r^{-2m}};\quad\frac{dL}{dL_u}=\frac{(L_r^{2m}+2+L_r^{-2m})L}{4L_u}\quad[9]$$

eer11−7n

Achromatic colour vision with relative luminance
Mathematical hyperbel and potential functions

$$F_{cb}(x_r,a)=b\tanh(x_r/c)=b\frac{e^{x_r/c}-e^{-x_r/c}}{e^{x_r/c}+e^{-x_r/c}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r>=0\quad[1]$$
$$\frac{dF_{cb}(x_r,a)}{dx_r}=\frac{4b}{c[e^{x_r/c}+e^{-x_r/c}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ n=1/(\ln(10)c)\quad[5]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4}{[e^{x_r/c}+e^{-x_r/c}]^2};\quad\frac{dL}{dL_u}=\frac{[e^{x_r/c}+e^{-x_r/c}]^2L}{4L_u}\quad[8]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4}{L_r^{2n}+2+L_r^{-2n}};\quad\frac{dL}{dL_u}=\frac{(L_r^{2n}+2+L_r^{-2n})L}{4L_u}\quad[9]$$

eer11−8n

TUB-test chart eer1; Model of normalized receptor-response functions $F_{ab}(L_r)$ and $F_{cb}(L_r)$
Calculation of derivations $F'_{ab}(L_r)$, $F'_{cb}(L_r)$, of contrasts $L/\Delta L$, and discriminations $(\Delta L)_{ab}$, $(\Delta L)_{cb}$

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

TUB registration: 20230701-eer1/eer1l0np.pdf /.ps
application for evaluation and measurement of display or print output

TUB material: code=rha4ta