http://farbe.li.tu-berlin.de/eer0/eer0l0np.pdf /.ps; only vector graphic VG; start output
see separate figures of this output: http://farbe.li.tu-berlin.de/eer0/eer0.htm

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

Achromatic colour vision with relative luminance
Mathematical equations with hyperbel functions

$$F_{ab}(x_r,a)=b\tanh(x_r/a)=b\frac{e^{x_r/a}-e^{-x_r/a}}{e^{x_r/a}+e^{-x_r/a}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r<=0\quad [1]$$
$$\frac{dF_{ab}(x_r,a)}{dx_r}=\frac{4b}{a[e^{x_r/a}+e^{-x_r/a}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ m=1/(\ln(10)a)\quad [5]$$
$$\frac{dF_{ab}(x_r,a)}{dx_r}\frac{dx_r}{dL_r}=\frac{4bm}{[e^{x_r/a}+e^{-x_r/a}]^2L_r}\quad L_r/dL_r=L/dL,\ dF_{ab}(x_r,a)=1\quad [6]$$
$$\frac{L}{dL}=\frac{4bm}{[e^{x_r/a}+e^{-x_r/a}]^2}\quad dL=\frac{[e^{x_r/a}+e^{-x_r/a}]^2L}{4bm}\quad [7]$$
eer00-1n

Achromatic colour vision with relative luminance
Mathematical equations with hyperbel functions

$$F_{cb}(x_r,c)=b\tanh(x_r/c)=b\frac{e^{x_r/c}-e^{-x_r/c}}{e^{x_r/c}+e^{-x_r/c}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r>=0\quad [1]$$
$$\frac{dF_{cb}(x_r,c)}{dx_r}=\frac{4b}{c[e^{x_r/c}+e^{-x_r/c}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ n=1/(\ln(10)c)\quad [5]$$
$$\frac{dF_{cb}(x_r,c)}{dx_r}\frac{dx_r}{dL_r}=\frac{4bm}{[e^{x_r/c}+e^{-x_r/c}]^2L_r}\quad L_r/dL_r=L/dL,\ dF_{cb}(x_r,c)=1\quad [6]$$
$$\frac{L}{dL}=\frac{4bm}{[e^{x_r/c}+e^{-x_r/c}]^2}\quad dL=\frac{[e^{x_r/c}+e^{-x_r/c}]^2L}{4bm}\quad [7]$$
eer00-2n

Achromatic colour vision with relative luminance
Mathematical hyperbel and potential functions

$$F_{ab}(x_r,a)=b\tanh(x_r/a)=b\frac{e^{x_r/a}-e^{-x_r/a}}{e^{x_r/a}+e^{-x_r/a}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r<=0\quad [1]$$
$$\frac{dF_{ab}(x_r,a)}{dx_r}=\frac{4b}{a[e^{x_r/a}+e^{-x_r/a}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ m=1/(\ln(10)a)\quad [5]$$
$$\frac{L}{dL}=\frac{4bm}{[e^{x_r/a}+e^{-x_r/a}]^2}\quad dL=\frac{[e^{x_r/a}+e^{-x_r/a}]^2L}{4bm}\quad [7]$$
$$\frac{L}{dL}=\frac{4bm}{[L_r^m+L_r^{-m}]^2}\quad dL=\frac{[L_r^m+L_r^{-m}]^2L}{4bm}\quad [8]$$
eer01-1n

Achromatic colour vision with relative luminance
Mathematical hyperbel and potential functions

$$F_{cb}(x_r,c)=b\tanh(x_r/c)=b\frac{e^{x_r/c}-e^{-x_r/c}}{e^{x_r/c}+e^{-x_r/c}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r>=0\quad [1]$$
$$\frac{dF_{cb}(x_r,c)}{dx_r}=\frac{4b}{c[e^{x_r/c}+e^{-x_r/c}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ n=1/(\ln(10)c)\quad [5]$$
$$\frac{L}{dL}=\frac{4bn}{[e^{x_r/c}+e^{-x_r/c}]^2}\quad dL=\frac{[e^{x_r/c}+e^{-x_r/c}]^2L}{4bn}\quad [7]$$
$$\frac{L}{dL}=\frac{4bn}{[L_r^n+L_r^{-n}]^2}\quad dL=\frac{[L_r^n+L_r^{-n}]^2L}{4bn}\quad [8]$$
eer01-2n

Achromatic colour vision with relative luminance
Mathematical equations with hyperbel functions

$$F_{ab}(x_r,a)=b\tanh(x_r/a)=b\frac{e^{x_r/a}-e^{-x_r/a}}{e^{x_r/a}+e^{-x_r/a}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r<=0\quad [1]$$
$$\frac{dF_{ab}(x_r,a)}{dx_r}=\frac{4b}{a[e^{x_r/a}+e^{-x_r/a}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ m=1/(\ln(10)a)\quad [5]$$
$$\frac{L}{dL}=\frac{4bm}{[e^{x_r/a}+e^{-x_r/a}]^2}\quad dL=\frac{a[e^{x_r/a}+e^{-x_r/a}]^2L}{4bm}\quad [7]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4}{[e^{x_r/a}+e^{-x_r/a}]^2};\ \frac{dL}{dL_u}=\frac{[e^{x_r/a}+e^{-x_r/a}]^2L}{4L_u}\quad [8]$$
eer00-3n

Achromatic colour vision with relative luminance
Mathematical equations with hyperbel functions

$$F_{cb}(x_r,c)=b\tanh(x_r/c)=b\frac{e^{x_r/c}-e^{-x_r/c}}{e^{x_r/c}+e^{-x_r/c}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r>=0\quad [1]$$
$$\frac{dF_{cb}(x_r,c)}{dx_r}=\frac{4b}{c[e^{x_r/c}+e^{-x_r/c}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ n=1/(\ln(10)c)\quad [5]$$
$$\frac{L}{dL}=\frac{4bn}{[e^{x_r/c}+e^{-x_r/c}]^2}\quad dL=\frac{c[e^{x_r/c}+e^{-x_r/c}]^2L}{4bn}\quad [7]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4}{[e^{x_r/c}+e^{-x_r/c}]^2};\ \frac{dL}{dL_u}=\frac{[e^{x_r/c}+e^{-x_r/c}]^2L}{4L_u}\quad [8]$$
eer00-4n

Achromatic colour vision with relative luminance
Mathematical hyperbel and potential functions

$$F_{ab}(x_r,a)=b\tanh(x_r/a)=b\frac{e^{x_r/a}-e^{-x_r/a}}{e^{x_r/a}+e^{-x_r/a}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r<=0\quad [1]$$
$$\frac{dF_{ab}(x_r,a)}{dx_r}=\frac{4b}{a[e^{x_r/a}+e^{-x_r/a}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ m=1/(\ln(10)a)\quad [5]$$
$$\frac{L}{dL}=\frac{4bm}{[e^{x_r/a}+e^{-x_r/a}]^2}\quad dL=\frac{[e^{x_r/a}+e^{-x_r/a}]^2L}{4bm}\quad [7]$$
$$\frac{L}{dL}=\frac{4bm}{[L_r^{2m}+2+L_r^{-2m}]}\quad dL=\frac{[L_r^{2m}+2+L_r^{-2m}]L}{4bm}\quad [8]$$
eer01-3n

Achromatic colour vision with relative luminance
Mathematical hyperbel and potential functions

$$F_{cb}(x_r,c)=b\tanh(x_r/c)=b\frac{e^{x_r/c}-e^{-x_r/c}}{e^{x_r/c}+e^{-x_r/c}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r>=0\quad [1]$$
$$\frac{dF_{cb}(x_r,c)}{dx_r}=\frac{4b}{c[e^{x_r/c}+e^{-x_r/c}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ n=1/(\ln(10)c)\quad [5]$$
$$\frac{L}{dL}=\frac{4bn}{[e^{x_r/c}+e^{-x_r/c}]^2}\quad dL=\frac{[e^{x_r/c}+e^{-x_r/c}]^2L}{4bn}\quad [7]$$
$$\frac{L}{dL}=\frac{4bn}{[L_r^{2n}+2+L_r^{-2n}]}\quad dL=\frac{[L_r^{2n}+2+L_r^{-2n}]L}{4bn}\quad [8]$$
eer01-4n

Achromatic colour vision with relative luminance
Mathematical equations with hyperbel functions

$$F_{ab}(x_r,a)=b\tanh(x_r/a)=b\frac{e^{x_r/a}-e^{-x_r/a}}{e^{x_r/a}+e^{-x_r/a}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r<=0\quad [1]$$
$$\frac{dF_{ab}(x_r,a)}{dx_r}=\frac{4b}{a[e^{x_r/a}+e^{-x_r/a}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ m=1/(\ln(10)a)\quad [5]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4}{[e^{x_r/a}+e^{-x_r/a}]^2};\ \frac{dL}{dL_u}=\frac{[e^{x_r/a}+e^{-x_r/a}]^2L}{4L_u}\quad [8]$$
$$\frac{L/dL}{(L/dL)_u}=1\text{ for }\begin{cases}L=L_u\\x_r=0\end{cases}\quad \frac{dL}{dL_u}=1\text{ for }\begin{cases}L=L_u\\x_r=0\end{cases}\quad [9]$$
eer00-5n

Achromatic colour vision with relative luminance
Mathematical equations with hyperbel functions

$$F_{cb}(x_r,c)=b\tanh(x_r/c)=b\frac{e^{x_r/c}-e^{-x_r/c}}{e^{x_r/c}+e^{-x_r/c}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r>=0\quad [1]$$
$$\frac{dF_{cb}(x_r,c)}{dx_r}=\frac{4b}{c[e^{x_r/c}+e^{-x_r/c}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ n=1/(\ln(10)c)\quad [5]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4}{[e^{x_r/c}+e^{-x_r/c}]^2};\ \frac{dL}{dL_u}=\frac{[e^{x_r/c}+e^{-x_r/c}]^2L}{4L_u}\quad [8]$$
$$\frac{L/dL}{(L/dL)_u}=1\text{ for }\begin{cases}L=L_u\\x_r=0\end{cases}\quad \frac{dL}{dL_u}=1\text{ for }\begin{cases}L=L_u\\x_r=0\end{cases}\quad [9]$$
eer00-6n

Achromatic colour vision with relative luminance
Mathematical hyperbel and potential functions

$$F_{ab}(x_r,a)=b\tanh(x_r/a)=b\frac{e^{x_r/a}-e^{-x_r/a}}{e^{x_r/a}+e^{-x_r/a}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r<=0\quad [1]$$
$$\frac{dF_{ab}(x_r,a)}{dx_r}=\frac{4b}{a[e^{x_r/a}+e^{-x_r/a}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ m=1/(\ln(10)a)\quad [5]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4}{[e^{x_r/a}+e^{-x_r/a}]^2};\ \frac{dL}{dL_u}=\frac{[e^{x_r/a}+e^{-x_r/a}]^2L}{4L_u}\quad [8]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4}{[L_r^m+L_r^{-m}]^2};\ \frac{dL}{dL_u}=\frac{[L_r^m+L_r^{-m}]^2L}{4L_u}\quad [9]$$
eer01-5n

Achromatic colour vision with relative luminance
Mathematical hyperbel and potential functions

$$F_{cb}(x_r,c)=b\tanh(x_r/c)=b\frac{e^{x_r/c}-e^{-x_r/c}}{e^{x_r/c}+e^{-x_r/c}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r>=0\quad [1]$$
$$\frac{dF_{cb}(x_r,c)}{dx_r}=\frac{4b}{c[e^{x_r/c}+e^{-x_r/c}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ n=1/(\ln(10)c)\quad [5]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4}{[e^{x_r/c}+e^{-x_r/c}]^2};\ \frac{dL}{dL_u}=\frac{[e^{x_r/c}+e^{-x_r/c}]^2L}{4L_u}\quad [8]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4}{[L_r^n+L_r^{-n}]^2};\ \frac{dL}{dL_u}=\frac{[L_r^n+L_r^{-n}]^2L}{4L_u}\quad [9]$$
eer01-6n

Achromatic colour vision with relative luminance
Mathematical equations with hyperbel functions

$$F_{ab}(x_r,a)=b\tanh(x_r/a)=b\frac{e^{x_r/a}-e^{-x_r/a}}{e^{x_r/a}+e^{-x_r/a}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r<=0\quad [1]$$
$$\frac{dF_{ab}(x_r,a)}{dx_r}=\frac{4b}{a[e^{x_r/a}+e^{-x_r/a}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ m=1/(\ln(10)a)\quad [5]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4}{[e^{x_r/a}+e^{-x_r/a}]^2};\ \frac{dL}{dL_u}=\frac{[e^{x_r/a}+e^{-x_r/a}]^2L}{4L_u}\quad [8]$$
$$\frac{L/dL}{(L/dL)_u}=1\text{ for }\begin{cases}L_r=1\\x_r=0\end{cases}\quad \frac{dL}{dL_u}=1\text{ for }\begin{cases}L_r=1\\x_r=0\end{cases}\quad [9]$$
eer00-7n

Achromatic colour vision with relative luminance
Mathematical equations with hyperbel functions

$$F_{cb}(x_r,c)=b\tanh(x_r/c)=b\frac{e^{x_r/c}-e^{-x_r/c}}{e^{x_r/c}+e^{-x_r/c}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r>=0\quad [1]$$
$$\frac{dF_{cb}(x_r,c)}{dx_r}=\frac{4b}{c[e^{x_r/c}+e^{-x_r/c}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ n=1/(\ln(10)c)\quad [5]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4}{[e^{x_r/c}+e^{-x_r/c}]^2};\ \frac{dL}{dL_u}=\frac{[e^{x_r/c}+e^{-x_r/c}]^2L}{4L_u}\quad [8]$$
$$\frac{L/dL}{(L/dL)_u}=1\text{ for }\begin{cases}L_r=1\\x_r=0\end{cases}\quad \frac{dL}{dL_u}=1\text{ for }\begin{cases}L_r=1\\x_r=0\end{cases}\quad [9]$$
eer00-8n

Achromatic colour vision with relative luminance
Mathematical hyperbel and potential functions

$$F_{ab}(x_r,a)=b\tanh(x_r/a)=b\frac{e^{x_r/a}-e^{-x_r/a}}{e^{x_r/a}+e^{-x_r/a}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r<=0\quad [1]$$
$$\frac{dF_{ab}(x_r,a)}{dx_r}=\frac{4b}{a[e^{x_r/a}+e^{-x_r/a}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ m=1/(\ln(10)a)\quad [5]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4}{[e^{x_r/a}+e^{-x_r/a}]^2};\ \frac{dL}{dL_u}=\frac{[e^{x_r/a}+e^{-x_r/a}]^2L}{4L_u}\quad [8]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4}{L_r^{2m}+2+L_r^{-2m}};\ \frac{dL}{dL_u}=\frac{(L_r^{2m}+2+L_r^{-2m})L}{4L_u}\quad [9]$$
eer01-7n

Achromatic colour vision with relative luminance
Mathematical hyperbel and potential functions

$$F_{cb}(x_r,c)=b\tanh(x_r/c)=b\frac{e^{x_r/c}-e^{-x_r/c}}{e^{x_r/c}+e^{-x_r/c}}\quad x_r=\log(L_r),\ L_r=L/L_u,\ x_r>=0\quad [1]$$
$$\frac{dF_{cb}(x_r,c)}{dx_r}=\frac{4b}{c[e^{x_r/c}+e^{-x_r/c}]^2}\quad x_r=\ln L_r/\ln(10),\ dx_r/dL_r=1/(\ln(10)L_r),\ n=1/(\ln(10)c)\quad [5]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4}{[e^{x_r/c}+e^{-x_r/c}]^2};\ \frac{dL}{dL_u}=\frac{[e^{x_r/c}+e^{-x_r/c}]^2L}{4L_u}\quad [8]$$
$$\frac{L/dL}{(L/dL)_u}=\frac{4}{L_r^{2n}+2+L_r^{-2n}};\ \frac{dL}{dL_u}=\frac{(L_r^{2n}+2+L_r^{-2n})L}{4L_u}\quad [9]$$
eer01-8n

TUB-test chart eer0; Model of normalized receptor-response functions $F_{ab}(x_r)$ and $F_{cb}(x_r)$
Calculation of derivations $F'_{ab}(x_r)$, $F'_{cb}(x_r)$, of contrasts $L/\Delta L$, and discriminations $(\Delta L)_{ab}$, $(\Delta L)_{cb}$

TUB registration: 20230701-eer0/eer0l0np.pdf /.ps
application for evaluation and measurement of display or print output
TUB material: code=rha4ta