

line element of Stiles
(1946) with „color values” P, D, T
three separate color signal functions

$$F(P) = i \ln(1+9P)$$

$$F(D) = j \ln(1+9D)$$

$$F(T) = k \ln(1+9T)$$

Taylor-derivations:

$$\Delta F(P, D, T) = \frac{dF}{dP} \Delta P + \frac{dF}{dD} \Delta D + \frac{dF}{dT} \Delta T$$

$$= \frac{9i}{1+9P} \Delta P + \frac{9j}{1+9D} \Delta D + \frac{9k}{1+9T} \Delta T$$

VE230-1, B4_47_1

line element of Vos&Walraven
(1972) with „color values” P, D, T
three separate color signal functions

$$F(P) = -2i\sqrt{P}$$

$$F(D) = -2j\sqrt{D}$$

$$F(T) = -2k\sqrt{T}$$

Taylor-derivations:

$$\Delta F(P, D, T) = \frac{dF}{dP} \Delta P + \frac{dF}{dD} \Delta D + \frac{dF}{dT} \Delta T$$

$$\Delta F(P, D, T) = \frac{i}{\sqrt{P}} \Delta P + \frac{j}{\sqrt{D}} \Delta D + \frac{k}{\sqrt{T}} \Delta T$$

VE230-2, B4_47_2

functions $q[k(x-u)]$
„achromatic signal”-description

with $x = \log L$ (L = luminance)
 $u = \log L_u$ (L_u = surround luminan.)

$$q[k(x-u)] = 1 + 1/[1 + \sqrt{2}e^{k(x-u)}]$$

function values:

$$q[k(x-u) \rightarrow +\infty] = 1$$

$$q[k(x-u) = 0] = \sqrt{2}$$

$$q[k(x-u) \rightarrow -\infty] = 2$$

VE230-3, B4_48_1

„achromatic signal”-description
functions $Q_{lm}[k(x-u)]$

with $x = \log L$ (L = luminance)
 $u = \log L_u$ (L_u = surround luminan.)

$$Q_{lm}[k(x-u)] = -\frac{1}{\ln \sqrt{2}} \ln q[k(x-u)] - m$$

function values with $l = m = 1$:

$$Q[k(x-u) \rightarrow +\infty] = 1$$

$$Q[k(x-u) = 0] = 0$$

$$Q[k(x-u) \rightarrow -\infty] = -1$$

VE230-4, B4_48_2

„achromatic signal”discrimination
as function of relative light density
 $h = \ln H = k(x-u)$ $\ln$ = natural log.

$$Q' = \frac{d}{dh} [\ln \{1 + 1/(1 + \sqrt{2}H)\}] / \ln \sqrt{2}$$

$$= -\sqrt{2} / [\ln \sqrt{2} (1 + \sqrt{2}H)(2 + \sqrt{2}H)]$$

function values:

$$Q'[k(x-u) \rightarrow +\infty] = 0$$

$$Q'[k(x-u) = 0] = -0,5$$

$$Q'[k(x-u) \rightarrow -\infty] = 0$$

VE230-5, B4_49_1

luminance discrimination
possibility $L/\Delta L$ as function of H

with: $L = 10^x$ $H = e^h = 10^{\log e k(x-u)}$
 $dL/dx = \ln 10 L$ $dH/dx = k H$

it follows: $L/\Delta L = [kH / (dH \ln 10)]$
 $\frac{L}{\Delta L} = \text{const } H / [(1 + \sqrt{2}H)(2 + \sqrt{2}H)]$

function values:

$$Q'[k(x-u) \rightarrow +\infty] = 0$$

$$Q'[k(x-u) = 0] = \text{maximum}$$

$$Q'[k(x-u) \rightarrow -\infty] = 0$$

VE230-6, B4_49_2

double line element of Richter
(1987) for the lighting technic with
luminance $L = F(P, D, T)$

luminance signal function $F(L)$

$$F(L) = iQ(H) = \begin{cases} iQ(H) & (x < u) \\ \bar{i}Q(\bar{H}) & (x \geq u) \end{cases}$$

with: $k=1,4$ $\bar{k}=1$ $i=1$ $\bar{i}=-2$
 $x = \log L$ $u = \log L_u$
 $H = e^{k(x-u)}$ $\bar{H} = e^{\bar{k}(x-u)}$

VE230-7, B4_50_1

double line element of Richter
(1987) for the lighting technic with
luminance $L = F(P, D, T)$

luminance signal function $F(L)$

$$F(L) = iQ(H) \quad H = e^{k(x-u)}$$

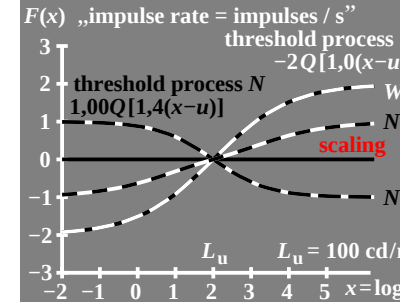
$$Q[\ln \{1 + 1/(1 + \sqrt{2}H)\}] / \ln \sqrt{2} - 1$$

Taylor-derivations:

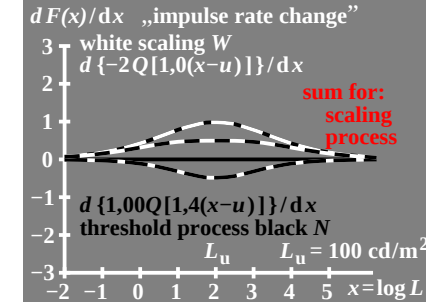
$$\Delta F(L) = \frac{dF}{dL} \Delta L = i \frac{dQ}{dH} \Delta H$$

$$= -i\sqrt{2} \Delta H / [\ln \sqrt{2} (1 + \sqrt{2}H)(2 + \sqrt{2}H)]$$

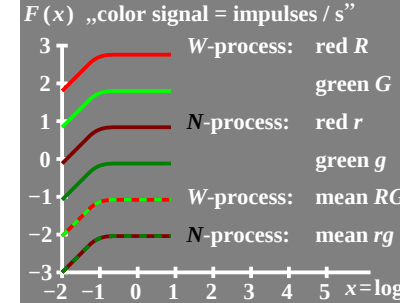
VE230-8, B4_50_2



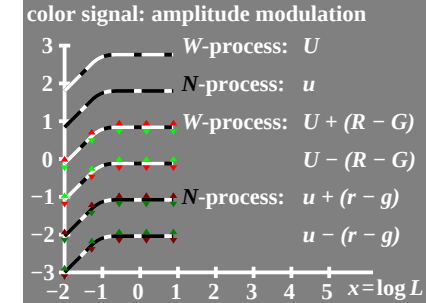
VE231-1, B4_52_1



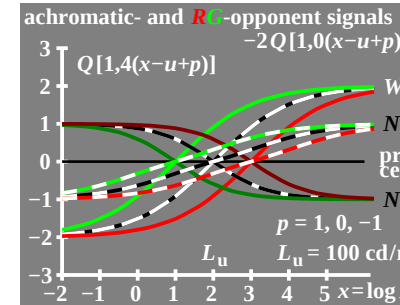
VE231-2, B4_52_2



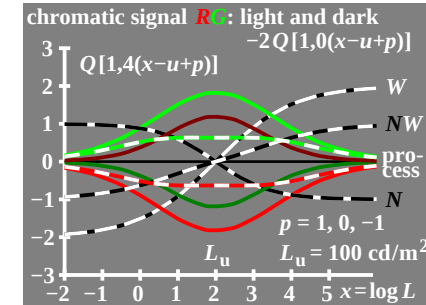
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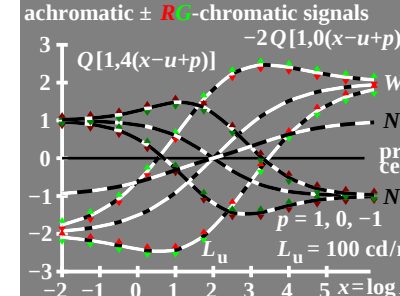
VE231-4, B4_53_2



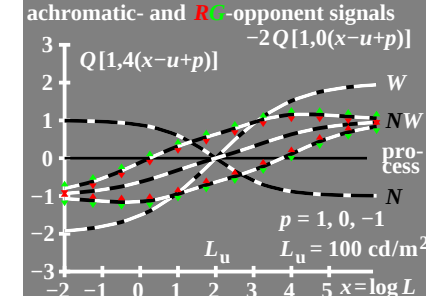
VE231-5, B4_54_1



VE231-6, B4_54_2



VE231-7, B4_55_1



VE231-8, B4_55_2