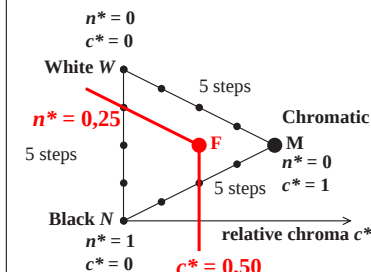


User friendly colorimetric colour notation ncu^* or nce^* and linear relation to three rgb^*_3 data

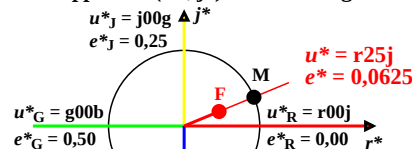
n^* relative blackness
 c^* relative chroma
 u^* elementary (unique) hue text
 e^* elementary hue number



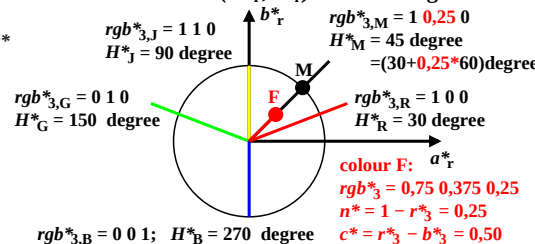
example for colour notation:

$ncu^* = 0,25 \ 0,50 \ r25j$
or
 $nce^* = 0,25 \ 0,50 \ 0,0625 (=0,25/4)$

relative opponent (r^* , j^*) chroma diagram



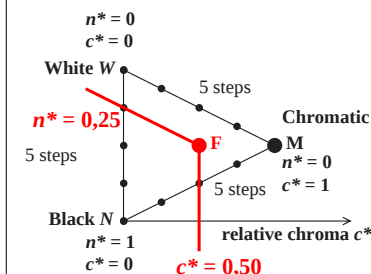
relative CIELAB (a^*_r , b^*_r) chroma diagram



ZE210-3

User friendly colorimetric colour notation ncu^* or nce^* and linear relation to three rgb^*_3 data

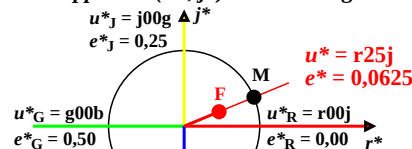
n^* relative blackness
 c^* relative chroma
 u^* elementary (unique) hue text
 e^* elementary hue number



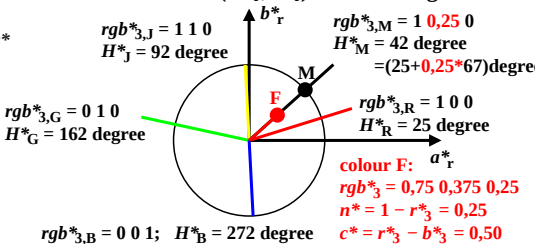
example for colour notation:

$ncu^* = 0,25 \ 0,50 \ r25j$
or
 $nce^* = 0,25 \ 0,50 \ 0,0625 (=0,25/4)$

relative opponent (r^* , j^*) chroma diagram



relative CIELAB (a^*_r , b^*_r) chroma diagram



ZE210-7

Equations: colorimetric data transfer from nce^* to elementary colour data rgb^*_3 and LCH^*

Given: nce^* data (similar NCS) of any colour $nce^* = lab^*nce^*$ (in example M located between R and J)
CIELAB data L^*_X , $C^*_{ab,X}$, $h_{ab,X}$, a^*_X , b^*_X of eight basic colours $X = RJGC^*BM^*NW$

Aim: Elementary colour data rgb^*_3 and LCH^* (CIELAB) of the given colour

$$\begin{aligned} \text{relative whiteness of the given colour} & w^* = 1 - n^* - c^* & (1) \\ \text{relative triangle lightness of the given colour} & t^* = 1 - n^* - 0,5 c^* & (2) \\ \text{CIELAB hue angle of maximum colour } M & h_{ab,M} = \text{function} [e^*] & (3) \\ \text{Relative device hue angle ratio of } M & \alpha_M = [h_{ab,M} - h_{ab,R}] / [h_{ab,J} - h_{ab,R}] & (4) \\ \text{relative } rgb^*_3, M \text{ data of } M & r^*_3, M = \alpha_M r^*_3, J + (1 - \alpha_M) r^*_3, R & (5) \\ & g^*_3, M = \alpha_M g^*_3, J + (1 - \alpha_M) g^*_3, R & (6) \\ & b^*_3, M = \alpha_M b^*_3, J + (1 - \alpha_M) b^*_3, R & (7) \\ & r^*_3 = w^* + c^* r^*_3, M & (8) \\ & g^*_3 = w^* + c^* g^*_3, M & (9) \\ & b^*_3 = w^* + c^* b^*_3, M & (10) \\ \text{CIELAB data } L^*_M, a^*_M, b^*_M, C^*_{ab,M} \text{ of } M & L^*_M = \alpha_M L^*_J + (1 - \alpha_M) L^*_R & (11) \\ & a^*_M = \alpha_M a^*_J + (1 - \alpha_M) a^*_R & (12) \\ & b^*_M = \alpha_M b^*_J + (1 - \alpha_M) b^*_R & (13) \\ & C^*_{ab,M} = [a^{*2}_M + b^{*2}_M]^{1/2} & (14) \\ \text{relative lightness } l^* \text{ of the given colour} & l^* = t^* + c^* [L^*_M - L^*_N] / [L^*_W - L^*_N] - 0,5 c^* & (15) \\ \text{CIELAB data } LCH^* \text{ of the given colour} & L^* = L^*_N + l^* [L^*_W - L^*_N] & (16) \\ & C^*_{ab} = c^* C^*_{ab,M} & (17) \\ & h_{ab} = h_{ab,M} & (18) \end{aligned}$$

ZE211-3

Equations: colorimetric data transfer from rgb^*_3 to nce^* data and LCH^* data

Given: Elementary colour data of any colour $rgb^*_3 = lab^*rgb^*_3$ (in example M located between R and J)
CIELAB data L^*_X , $C^*_{ab,X}$, $h_{ab,X}$, a^*_X , b^*_X of eight basic colours $X = RJGC^*BM^*NW$

Aim: $nce^* = lab^*nce^*$ (similar NCS) and LCH^* (CIELAB) data of the given colour ($0 \leq e^* \leq 1$)

$$\begin{aligned} \text{relative chroma of the given colour} & c^* = \max [rgb^*_3] - \min [rgb^*_3] & (1) \\ \text{relative blackness of the given colour} & n^* = 1 - \max [rgb^*_3] & (2) \\ \text{relative triangle lightness of the given colour} & t^* = 1 - n^* - 0,5 c^* & (3) \\ \text{relative red-green chroma in standard system s} & a^*_{rs} = r^*_3 \cos(30) + g^*_3 \cos(150) & (4) \\ \text{relative yellow-blue chroma in standard system s} & b^*_{rs} = r^*_3 \sin(30) + g^*_3 \sin(150) + b^*_3 \sin(270) & (5) \\ \text{hue angle in standard system s} & h_{ab,s} = \arctan [b^*_{rs} / a^*_{rs}] \quad (0 \leq h_{ab,s} \leq 360) & (6) \\ \text{CIELAB hue angle of maximum colour } M & h_{ab,M} = \text{function} [h_{ab,s}] & (7) \\ \text{elementary hue number of the given colour} & e^* = \text{function} [h_{ab,M}] & (8) \\ \text{Relative device hue angle ratio of } M & \alpha_M = [h_{ab,M} - h_{ab,R}] / [h_{ab,J} - h_{ab,R}] & (9) \\ \text{CIELAB data } L^*_M, a^*_M, b^*_M, C^*_{ab,M} \text{ of } M & L^*_M = \alpha_M L^*_J + (1 - \alpha_M) L^*_R & (10) \\ & a^*_M = \alpha_M a^*_J + (1 - \alpha_M) a^*_R & (11) \\ & b^*_M = \alpha_M b^*_J + (1 - \alpha_M) b^*_R & (12) \\ & C^*_{ab,M} = [a^{*2}_M + b^{*2}_M]^{1/2} & (13) \\ \text{relative lightness } l^* \text{ of the given colour} & l^* = t^* + c^* [L^*_M - L^*_N] / [L^*_W - L^*_N] - 0,5 c^* & (14) \\ \text{CIELAB data } LCH^* \text{ of the given colour} & L^* = L^*_N + l^* [L^*_W - L^*_N] & (15) \\ & C^*_{ab} = c^* C^*_{ab,M} & (16) \\ & h_{ab} = h_{ab,M} & (17) \end{aligned}$$

ZE211-7

BAM-test chart ZE21; colorimetric coordinate transfer
User coordinates and transfer olv^*_3 , LCH^* and nce^*

input: rgb ($\rightarrow olv^*_3$) $setrgbcolor$
output: no change compared to input