

# Equations: colorimetric data transfer from $rgb_e$ to $nce^*_e$ data and $LCH^*_{a,e}$ data

Given:  $rgb_e$  elementary colour data of any colour  $rgb_e = lab^*rgb_e$  and of 48 step colour circle  $j=0$  to  $47$

$rgb_{Me,j}$  and adapted CIELAB data  $L^*_{Me,j}$ ,  $C^*_{ab,a,Me,j}$ ,  $h_{ab,a,Me,j} = LCH^*_{a,Me,j}$

Aim: calculate  $nce^*_e$  with ( $0 \leq n^*_e, c^*_e, e^*_e \leq 1$ ) (similar to NCS data) and  $LCH^*_{a,e}$  data of elementary colour

Data of a given elementary (e) colour

relative chroma of the elementary colour  $c^*_e = \max [ rgb_e ] - \min [ rgb_e ]$  (1)

relative blackness of the elementary colour  $n^*_e = 1 - \max [ rgb_e ]$  (2)

relative triangle lightness of the elementary colour  $t^*_e = 1 - n^*_e - 0,5 c^*_e$  (3)

relative red-green chroma in 4x90 degree system s  $a^*_{rs,e} = r_e \cos(0) + g_e \cos(180)$  (4)

relative yellow-blue chroma in 4x90 degree system s  $b^*_{rs,e} = r_e \sin(0) + g_e \sin(180) + b_e \sin(270)$  (5)

hue angle in 4x90 degree system s  $h_{ab,s,e} = \arctan[ b^*_{rs,e} / a^*_{rs,e} ]$  ( $0 \leq h_{ab,s,e} \leq 360$ ) (6)

hue number in 4x90 degree system s  $e^*_e = h_{ab,s,e} / 360$  ( $0 \leq e^*_e \leq 1$ ) (7)

CIELAB hue angle in elementary system  $h_{ab,a,e} = \text{function} [ h_{ab,s,e} ]$  (with table/equations) (8)

adapted CIELAB  $LCH^*_{a,e}$  data of maximum colour  $M_e$   $L^*_{Me} = \text{function} [ h_{ab,a,e} ]$  (with table/equations) (9)

$C^*_{ab,a,Me} = \text{function} [ h_{ab,a,e} ]$  (with table/equations) (10)

$h_{ab,a,Me} = h_{ab,a,e}$  (11)

relative lightness of maximum colour  $M_e$   $l^*_{Me} = [ L^*_{Me} - L^*_{Ne} ] / [ L^*_{We} - L^*_{Ne} ]$  (12)

relative lightness of the elementary colour  $l^*_e = t^*_e + l^*_{Me} c^*_e + 0,5 c^*_e$  (13)

adapted CIELAB  $LCH^*_{a,e}$  data of the elementary colour  $L^*_e = l^*_e [ L^*_{We} - L^*_{Ne} ] + L^*_{Ne}$  (14)

$C^*_{ab,a,d} = c^*_e C^*_{ab,a,Me}$  (15)