# Equations: colorimetric data transfer from $rgb_d$ to $nce*_d$ data and $LCH*_d$ data

Given: $rgb_d$ device colour data of any colour $rgb_d = lab*rgb_d$ and of 48 step colour circle $j=0$ to 47
$rgb_{Md,j}$ and CIELAB data $L*_{Md,j}$, $C*_{ab,Md,j}$, $h_{ab,Md,j} = LCH*_{Md,j}$

Aim: calculate $nce*_d$ with ($0<=n*_d$, $c*_d$, $e*_d<=1$) (similar to NCS data) and $LCH*_{a,d}$ data of the device colour

*Data of a given device (d) colour*

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|---|---|---|
| relative chroma of the device colour | $c*_d = max [ rgb_d ] - min [ rgb_d ]$ | (1) |
| relative blackness of the device colour | $n*_d = 1 - max [ rgb_d ]$ | (2) |
| relative triangle lightness of the device colour | $t*_d = 1 - n*_d - 0,5\ c*_d$ | (3) |
| relative red-green chroma in 6x60 degree system s | $a*_{rs,d} = r_d\ cos(30) + g_d\ cos(150)$ | (4) |
| relative yellow-blue chroma in 6x60 degree system s | $b*_{rs,d} = r_d\ sin(30) + g_d\ sin(150) + b_d\ sin(270)$ | (5) |
| hue angle in 6x60 degree system s | $h_{ab,s,d} = arctan[ b*_{rs,d} / a*_{rs,d}]$   ($0<= h_{ab,s,d}<=360$) | (6) |
| hue number in 6x60 degree system s | $e*_d = h_{ab,s,d}/360$   ($0<=e*_d<=1$) | (7) |
| CIELAB hue angle in device system | $h_{ab,d} =$ function $[h_{ab,s,d}]$   (with table/equations) | (8) |
| adapted CIELAB $LCH*_d$ data of maximum colour $M_d$ | $L*_{Md} =$ function $[h_{ab,d}]$   (with table/equations) | (9) |
| | $C*_{ab,Md} =$ function $[h_{ab,d}]$   (with table/equations) | (10) |
| | $h_{ab,Md} = h_{ab,d}$ | (11) |
| relative lightness of maximum colour $M_d$ | $l*_{Md} = [ L*_{Md} - L*_{Nd} ] / [ L*_{Wd} - L*_{Nd} ]$ | (12) |
| relative lightness of the device colour | $l*_d = t*_d + l*_{Md}\ c*_d + 0,5\ c*_d$ | (13) |
| CIELAB $LCH*_d$ data of the device colour | $L*_d = l*_d [ L*_{Wd} - L*_{Nd} ] + L*_{Nd}$ | (14) |
| | $C*_{ab,d} = c*_d\ C*_{ab,Md}$ | (15) |

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