

Colorimetric data for system line TLS00 -> NRS18

For input LCH^*_{a0} of the system 0: TLS00

Six CIELAB hue angles of device TLS00: (40.0 102.8 136.0 196.4 306.3 328.2);

and output $LCH^*_{a,M1}$, $olv^*_{3,M1}$, LCH^*_{a1} , olv^*_{31} of the system 1: NRS18

Six CIELAB hue angles of device NRS18: (25.5 92.3 162.2 217.0 271.7 328.6);

no. Colour	->TLS00 LCH^*_{a0}	->TLS00 n^*, c^*, H^*_{ai0}	NRS18 $LCH^*_{a,M1}$	NRS18 $olv^*_{3,M1}$	NRS18 LCH^*_{a1}	NRS18 olv^*_{31}	0 1
01 O=000y	44.3 55.5 40	0.3 0.5 40	56.7 68.3 40	1.0 0.22 0.0	52.8 34.1 40	0.7 0.31 0.2	
02 o10y	46.3 47.4 46	0.3 0.5 46	56.7 66.3 46	1.0 0.31 0.0	52.8 33.1 46	0.7 0.35 0.2	
03 o20y	48.7 45.2 53	0.3 0.5 53	56.7 64.9 53	1.0 0.41 0.0	52.8 32.5 53	0.7 0.41 0.2	
04 o30y	50.7 43.9 59	0.3 0.5 59	56.7 64.6 59	1.0 0.5 0.0	52.8 32.3 59	0.7 0.45 0.2	
05 o40y	52.7 43.1 65	0.3 0.5 65	56.7 65.0 65	1.0 0.59 0.0	52.8 32.5 65	0.7 0.5 0.2	
06 o50y	54.7 42.8 71	0.3 0.5 71	56.7 66.1 71	1.0 0.68 0.0	52.8 33.0 71	0.7 0.54 0.2	
07 o60y	57.1 43.1 78	0.3 0.5 78	56.7 68.4 78	1.0 0.79 0.0	52.8 34.2 78	0.7 0.59 0.2	
08 o70y	59.1 43.9 84	0.3 0.5 84	56.7 71.3 84	1.0 0.88 0.0	52.8 35.7 84	0.7 0.64 0.2	
09 o80y	61.1 45.2 90	0.3 0.5 90	56.7 75.5 90	1.0 0.97 0.0	52.8 37.7 90	0.7 0.68 0.2	
10 o90y	63.5 47.5 97	0.3 0.5 97	56.7 73.4 97	0.93 1.0 0.0	52.8 36.7 97	0.67 0.7 0.2	
11 Y=y00l	65.4 46.5 103	0.3 0.5 103	56.7 69.6 103	0.85 1.0 0.0	52.8 34.8 103	0.62 0.7 0.2	

Goal: Transfer coordinates LCH^*_{a0} (system m=0) to LCH^*_{a1} and olv^*_{31} (system m=1)

The given data LCH^*_{a0} include the device hue H^*_{a0}

Integer (i) device hue: $H^*_{ai0} = \text{round} (H^*_{a0})$ (1)

Fetch device data $LCH^*_{a,M0}$ from table with 361 entries for H^*_{ai0} from 0 to 360 degrees

Lightness, chroma, hue: $LCH^*_{a,M0} = LCH^*_{a,M0} [H^*_{ai0}]$ (2)

Calculate lcw^* data from LC^*_{a0} and $LC^*_{a,M0}$:

Relative lightness: $l^* = [L^*_{0} - L^*_{N0}] / [L^*_{W0} - L^*_{N0}]$ (3)

Relative chroma: $c^* = C^*_{a0} / C^*_{a,M0}$ (4)

Relative Blackness: $n^* = 1 - l^* + c^* [L^*_{M0} - L^*_{N0}] / [L^*_{W0} - L^*_{N0}]$ (5)

Fetch device data $LCH^*_{a,M1}$ and $olv^*_{3,M1}$ from table with 361 entries for H^*_{ai0}

lightness, chroma, hue: $LCH^*_{a,M1} = LCH^*_{a,M1} [H^*_{ai0}]$ (6)

"Red, Green, Blue" rgb_1 data: $olv^*_{3,M1} = olv^*_{3,M1} [H^*_{ai0}]$ (7)

For any input or output device (m=0 to 1) it is valid for constant n^*, c^*, l^*, H^*_{a} :

CIELAB lightness: $L^*_1 = L^*_{a1} = L^*_{N1} + l^* [L^*_{W1} - L^*_{N1}]$ (8)

Adated CIELAB chroma: $C^*_{a1} = c^* C^*_{a,M1}$ (9)

Adated CIELAB hue: $H^*_{a1} = H^*_{a0}$ (10)

"red, green, blue" rgb_1 data: $olv^*_{31} = 1 - n^* - c^* + c^* olv^*_{3,M1}$ (11)

Result: device dependent adapted and relative CIELAB data of system m=1:

lightness, chroma, hue: LCH^*_{a1} and rgb_1 data: olv^*_{31} (12)

Colorimetric data for system line TLS00 -> NRS18

For input olv^*_{30} of the system 0: TLS00

Six CIELAB hue angles of device TLS00: (40.0 102.8 136.0 196.4 306.3 328.2);

and output $LCH^*_{a,M1}$, $olv^*_{3,M1}$, LCH^*_{a1} , olv^*_{31} of the system 1: NRS18

Six CIELAB hue angles of device NRS18: (25.5 92.3 162.2 217.0 271.7 328.6);

no. Colour	->TLS00 olv^*_{30}	->TLS00 n^*, c^*, H^*_{si0}	NRS18 $LCH^*_{a,M1}$	NRS18 $olv^*_{3,M1}$	NRS18 LCH^*_{a1}	NRS18 olv^*_{31}	0 1
01 O=000y	0.7 0.2 0.2 0.3 0.5 30	56.7 68.3 40	1.0 0.22 0.0	52.8 34.1 40	0.7 0.31 0.2		
02 o10y	0.7 0.25 0.2 0.3 0.5 35	56.7 66.3 46	1.0 0.31 0.0	52.8 33.1 46	0.7 0.35 0.2		
03 o20y	0.7 0.3 0.2 0.3 0.5 41	56.7 64.9 53	1.0 0.41 0.0	52.8 32.5 53	0.7 0.41 0.2		
04 o30y	0.7 0.35 0.2 0.3 0.5 47	56.7 64.6 59	1.0 0.5 0.0	52.8 32.3 59	0.7 0.45 0.2		
05 o40y	0.7 0.4 0.2 0.3 0.5 53	56.7 65.0 65	1.0 0.59 0.0	52.8 32.5 65	0.7 0.5 0.2		
06 o50y	0.7 0.45 0.2 0.3 0.5 60	56.7 66.1 71	1.0 0.68 0.0	52.8 33.0 71	0.7 0.54 0.2		
07 o60y	0.7 0.5 0.2 0.3 0.5 67	56.7 68.4 78	1.0 0.79 0.0	52.8 34.2 78	0.7 0.59 0.2		
08 o70y	0.7 0.55 0.2 0.3 0.5 73	56.7 71.3 84	1.0 0.88 0.0	52.8 35.7 84	0.7 0.64 0.2		
09 o80y	0.7 0.6 0.2 0.3 0.5 79	56.7 75.5 90	1.0 0.97 0.0	52.8 37.7 90	0.7 0.68 0.2		
10 o90y	0.7 0.65 0.2 0.3 0.5 85	56.7 73.4 97	0.93 1.0 0.0	52.8 36.7 97	0.67 0.7 0.2		
11 Y=y00l	0.7 0.7 0.2 0.3 0.5 90	56.7 69.6 103	0.85 1.0 0.0	52.8 34.8 103	0.62 0.7 0.2		

Goal: Transfer coordinates olv^*_{30} (system m=0) to LCH^*_{a1} and olv^*_{31} (system m=1)

The following equations for relative blackness and chroma are valid for any device:

$n^* = 1 - \max (o^*_{30}, l^*_{30}, v^*_{30})$ (1)

$c^* = \max (o^*_{30}, l^*_{30}, v^*_{30}) - \min (o^*_{30}, l^*_{30}, v^*_{30})$ (2)

For the calculation of the missing relative device hue assume

as a starting point that the three values olv^*_{30} belong to the standard (s) device SRS18:

relative red-green chroma: $a^*_{r0} = o^*_{30} \cos(30) + l^*_{30} \cos(150)$ (3)

relative yellow-blue chroma: $b^*_{r0} = o^*_{30} \sin(30) + l^*_{30} \sin(150) - v^*_{30} \sin(270)$ (4)

Standard integer hue: $H^*_{si0} = \text{round} [\text{atan} (b^*_{r0} / a^*_{r0})]$ (5)

Fetch device integer hue: $H^*_{ai0} = H^*_{si-ai} [H^*_{si0}]$ (6)

Fetch device data $LCH^*_{a,M0}$ from table with 361 entries for H^*_{ai0} from 0 to 360 degrees

Lightness, chroma, hue: $LCH^*_{a,M0} = LCH^*_{a,M0} [H^*_{ai0}]$ (7)

Fetch device data $LCH^*_{a,M1}$ from table with 361 entries for H^*_{ai0} from 0 to 360 degrees

lightness, chroma, hue: $LCH^*_{a,M1} = LCH^*_{a,M1} [H^*_{ai0}]$ (8)

For any input or output device (m=0 to 1) it is valid for constant n^*, c^*, l^*, H^*_{a} :

CIELAB lightness: $L^*_1 = L^*_{a1} = L^*_{N1} + l^* [L^*_{W1} - L^*_{N1}]$ (9)

Adated CIELAB chroma: $C^*_{a1} = c^* C^*_{a,M1}$ (10)

Adated CIELAB hue: $H^*_{a1} = H^*_{a,M0} = H^*_{a,M1}$ (11)

"red, green, blue" rgb_1 data: $olv^*_{31} = 1 - n^* - c^* + c^* olv^*_{3,M1}$ (12)

Result: device dependent adapted and relative CIELAB data of system m=1:

lightness, chroma, hue: LCH^*_{a1} and rgb_1 data: olv^*_{31} (13)