

### Colorimetric data for system line NRS18 -> TLS18

For input  $LCH^*_{a0}$  of the system 0: NRS18

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

and output  $LCH^*_{a,M1}, olv^*_{3,M1}, LCH^*_{a1}, olv^*_{31}$  of the system 1: TLS18

Six CIELAB hue angles of device TLS18: (34.9 103.3 136.9 196.5 304.3 328.1);

no. Colour	->NRS18 $LCH^*_{a0}$	->NRS18 $n^*, c^*, H^*_{ai0}$	TLS18 $LCH^*_{a,M1}$	TLS18 $olv^*_{3,M1}$	TLS18 $LCH^*_{a1}$	TLS18 $olv^*_{31}$	0 1
01 $R=r00j$	52.8 38.5 25	0.3 0.5 25	53.7 95.9 25	1.0 0.0 0.15	51.3 47.9 25	0.7 0.2 0.27	
02 $r10j$	52.8 36.2 32	0.3 0.5 32	53.0 102 32	1.0 0.0 0.04	51.0 51.0 32	0.7 0.2 0.22	
03 $r20j$	52.8 34.4 39	0.3 0.5 39	55.2 83.4 39	1.0 0.06 0.0	52.1 41.7 39	0.7 0.23 0.2	
04 $r30j$	52.8 33.1 46	0.3 0.5 46	59.3 78.5 46	1.0 0.16 0.0	54.1 39.2 46	0.7 0.28 0.2	
05 $r40j$	52.8 32.5 52	0.3 0.5 52	62.8 75.5 52	1.0 0.25 0.0	55.9 37.8 52	0.7 0.33 0.2	
06 $r50j$	52.8 32.3 59	0.3 0.5 59	66.9 73.3 59	1.0 0.35 0.0	57.9 36.7 59	0.7 0.38 0.2	
07 $r60j$	52.8 32.6 66	0.3 0.5 66	71.0 72.3 66	1.0 0.46 0.0	60.0 36.1 66	0.7 0.43 0.2	
08 $r070j$	52.8 33.2 72	0.3 0.5 72	74.5 72.3 72	1.0 0.54 0.0	61.7 36.1 72	0.7 0.47 0.2	
09 $r80j$	52.8 34.4 79	0.3 0.5 79	78.6 73.3 79	1.0 0.65 0.0	63.8 36.6 79	0.7 0.52 0.2	
10 $r90j$	52.8 36.3 86	0.3 0.5 86	82.7 75.5 86	1.0 0.75 0.0	65.8 37.7 86	0.7 0.57 0.2	
11 $J=j00g$	52.8 38.6 92	0.3 0.5 92	86.2 78.4 92	1.0 0.84 0.0	67.6 39.2 92	0.7 0.62 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 NRS18 -> TLS18

For input  $olv^*_{30}$  of the system 0: NRS18

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

and output  $LCH^*_{a,M1}, olv^*_{3,M1}, LCH^*_{a1}, olv^*_{31}$  of the system 1: TLS18

Six CIELAB hue angles of device TLS18: (34.9 103.3 136.9 196.5 304.3 328.1);

no. Colour	->NRS18 $olv^*_{30}=rgb^*_{30}n^*, c^*, H^*_{si0}$	->NRS18 $olv^*_{30}$	TLS18 $LCH^*_{a,M1}$	TLS18 $olv^*_{3,M1}$	TLS18 $LCH^*_{a1}$	TLS18 $olv^*_{31}$	0 1
01 $R=r00j$	0.7 0.2 0.2 0.3 0.5 30	53.7 95.9 25	1.0 0.0 0.15	51.3 47.9 25	0.7 0.2 0.27		
02 $r10j$	0.7 0.25 0.2 0.3 0.5 35	53.0 102 32	1.0 0.0 0.04	51.0 51.0 32	0.7 0.2 0.22		
03 $r20j$	0.7 0.3 0.2 0.3 0.5 41	55.2 83.4 39	1.0 0.06 0.0	52.1 41.7 39	0.7 0.23 0.2		
04 $r30j$	0.7 0.35 0.2 0.3 0.5 47	59.3 78.5 46	1.0 0.16 0.0	54.1 39.2 46	0.7 0.28 0.2		
05 $r40j$	0.7 0.4 0.2 0.3 0.5 53	62.8 75.5 52	1.0 0.25 0.0	55.9 37.8 52	0.7 0.33 0.2		
06 $r50j$	0.7 0.45 0.2 0.3 0.5 60	66.9 73.3 59	1.0 0.35 0.0	57.9 36.7 59	0.7 0.38 0.2		
07 $r60j$	0.7 0.5 0.2 0.3 0.5 67	71.0 72.3 66	1.0 0.46 0.0	60.0 36.1 66	0.7 0.43 0.2		
08 $r070j$	0.7 0.55 0.2 0.3 0.5 73	74.5 72.3 72	1.0 0.54 0.0	61.7 36.1 72	0.7 0.47 0.2		
09 $r80j$	0.7 0.6 0.2 0.3 0.5 79	78.6 73.3 79	1.0 0.65 0.0	63.8 36.6 79	0.7 0.52 0.2		
10 $r90j$	0.7 0.65 0.2 0.3 0.5 85	82.7 75.5 86	1.0 0.75 0.0	65.8 37.7 86	0.7 0.57 0.2		
11 $J=j00g$	0.7 0.7 0.2 0.3 0.5 90	86.2 78.4 92	1.0 0.84 0.0	67.6 39.2 92	0.7 0.62 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:

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

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

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)