

Colorimetric data for system line NRS18 -> TLS70

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: TLS70

Six CIELAB hue angles of device TLS70: (21.9 107.3 142.3 197.9 293.9 326.1);

no. Colour	->NRS18 LCH^*_{a0}	->NRS18 n^* , c^* , H^*_{ai0}	TLS70 $LCH^*_{a,M1}$	TLS70 $olv^*_{3,M1}$	TLS70 LCH^*_{a1}	TLS70 olv^*_{31}	0 1
01 $R=r00j$	52.8 38.5 25	0.3 0.5 25	77.1 27.0 25	1.0 0.04 0.0	78.5 13.5 25	0.7 0.22 0.2	
02 $r10j$	52.8 36.2 32	0.3 0.5 32	78.5 24.7 32	1.0 0.12 0.0	79.2 12.4 32	0.7 0.26 0.2	
03 $r20j$	52.8 34.4 39	0.3 0.5 39	79.9 23.1 39	1.0 0.2 0.0	80.0 11.5 39	0.7 0.3 0.2	
04 $r30j$	52.8 33.1 46	0.3 0.5 46	81.4 22.0 46	1.0 0.28 0.0	80.7 11.0 46	0.7 0.34 0.2	
05 $r40j$	52.8 32.5 52	0.3 0.5 52	82.6 21.3 52	1.0 0.35 0.0	81.3 10.7 52	0.7 0.38 0.2	
06 $r50j$	52.8 32.3 59	0.3 0.5 59	84.0 20.9 59	1.0 0.43 0.0	82.0 10.5 59	0.7 0.42 0.2	
07 $r60j$	52.8 32.6 66	0.3 0.5 66	85.5 20.8 66	1.0 0.52 0.0	82.7 10.4 66	0.7 0.46 0.2	
08 $r070j$	52.8 33.2 72	0.3 0.5 72	86.7 21.0 72	1.0 0.59 0.0	83.3 10.5 72	0.7 0.49 0.2	
09 $r80j$	52.8 34.4 79	0.3 0.5 79	88.1 21.5 79	1.0 0.67 0.0	84.1 10.7 79	0.7 0.53 0.2	
10 $r90j$	52.8 36.3 86	0.3 0.5 86	89.6 22.4 86	1.0 0.75 0.0	84.8 11.2 86	0.7 0.58 0.2	
11 $J=j00g$	52.8 38.6 92	0.3 0.5 92	90.8 23.4 92	1.0 0.82 0.0	85.4 11.7 92	0.7 0.61 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 -> TLS70

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: TLS70

Six CIELAB hue angles of device TLS70: (21.9 107.3 142.3 197.9 293.9 326.1);

no. Colour	->NRS18 $olv^*_{30}=rgb^*_{30}n^*$, c^* , H^*_{si0}	TLS70 $LCH^*_{a,M1}$	TLS70 $olv^*_{3,M1}$	TLS70 LCH^*_{a1}	TLS70 olv^*_{31}	0 1
01 $R=r00j$	0.7 0.2 0.2 0.3 0.5 30	77.1 27.0 25	1.0 0.04 0.0	78.5 13.5 25	0.7 0.22 0.2	
02 $r10j$	0.7 0.25 0.2 0.3 0.5 35	78.5 24.7 32	1.0 0.12 0.0	79.2 12.4 32	0.7 0.26 0.2	
03 $r20j$	0.7 0.3 0.2 0.3 0.5 41	79.9 23.1 39	1.0 0.2 0.0	80.0 11.5 39	0.7 0.3 0.2	
04 $r30j$	0.7 0.35 0.2 0.3 0.5 47	81.4 22.0 46	1.0 0.28 0.0	80.7 11.0 46	0.7 0.34 0.2	
05 $r40j$	0.7 0.4 0.2 0.3 0.5 53	82.6 21.3 52	1.0 0.35 0.0	81.3 10.7 52	0.7 0.38 0.2	
06 $r50j$	0.7 0.45 0.2 0.3 0.5 60	84.0 20.9 59	1.0 0.43 0.0	82.0 10.5 59	0.7 0.42 0.2	
07 $r60j$	0.7 0.5 0.2 0.3 0.5 67	85.5 20.8 66	1.0 0.52 0.0	82.7 10.4 66	0.7 0.46 0.2	
08 $r070j$	0.7 0.55 0.2 0.3 0.5 73	86.7 21.0 72	1.0 0.59 0.0	83.3 10.5 72	0.7 0.49 0.2	
09 $r80j$	0.7 0.6 0.2 0.3 0.5 79	88.1 21.5 79	1.0 0.67 0.0	84.1 10.7 79	0.7 0.53 0.2	
10 $r90j$	0.7 0.65 0.2 0.3 0.5 85	89.6 22.4 86	1.0 0.75 0.0	84.8 11.2 86	0.7 0.58 0.2	
11 $J=j00g$	0.7 0.7 0.2 0.3 0.5 90	90.8 23.4 92	1.0 0.82 0.0	85.4 11.7 92	0.7 0.61 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)