

http://130.149.60.45/~farbmatrik/ME36/ME36L0N1.TXT /PS; start output
N: No Output Linearization (OL) data in File (F), Startup (S) or Device (D)

CIEBasedABC—color space
transformation $ABC^* \rightarrow XYZ$
CIELAB part 1: $ABC^* \rightarrow LMN^*$

$A = \text{Decode}A^* = \{16 \text{ add } 116 \text{ div}\}$
 $B = \text{Decode}B^* = \{500 \text{ div}\}$
 $C = \text{Decode}C^* = \{200 \text{ div}\}$

$$\begin{pmatrix} L^* \\ M^* \\ N^* \end{pmatrix} = \begin{pmatrix} 1 & 1 & 0 \\ 1 & 0 & 0 \\ 1 & 0 & -1 \end{pmatrix} \times \begin{pmatrix} A \\ B \\ C \end{pmatrix}$$

ME360-1, BS_36,1

CIELAB $L^*a^*b^*$ —color space

[CIEBasedABC<< %Dict PostScript Level 2
/MatrixABC [1 0 0 1 0 0 1 0] % default
/DecodeABC [{16 add 116 div} bind
{500 div} bind {200 div} bind]
/RangeABC [0 100 -128 127 -128 127] % Lab*
/MatrixLMN [0.9505 0 0 1 0 0 1 0.0890]
/DecodeLMN [{3 exp} {3 exp} {3 exp}]
/RangeLMN [0 0.9505 0 1 0 1.0890] % D65
/WhitePoint [0.9505 1 1.0890] % D65
/BlackPoint [0 0 0] % default
>>]setcolorspace

ME360-3, BS_36,3

least square fit for color rendering
 $Lab^*_i \text{ aim} - Lab^*_i \text{ gopt} = \text{Min.}$

color-differences $\Delta(Lab^*)$ for
CIE-test colors $i = 1, 2, \dots, 17$

$$\begin{aligned} \Delta L^*_i &= L^*_{i, \text{aim}} - L^*_{i, \text{gopt}} \\ \Delta a^*_i &= a^*_{i, \text{aim}} - a^*_{i, \text{gopt}} \\ \Delta b^*_i &= b^*_{i, \text{aim}} - b^*_{i, \text{gopt}} \\ \Sigma [(\Delta L^*_i)^2 + (\Delta a^*_i)^2 + (\Delta b^*_i)^2]^{1/2} &= \text{Min.} \end{aligned}$$

$i = 1, 17$

ME360-5, BS_37,2

CIEBasedABC—color space
transformation $ABC^* \rightarrow XYZ$
CIELAB part 2: $LMN^* \rightarrow XYZ$

$L = \text{Decode}L^* = \{3 \text{ exp}\}$
 $M = \text{Decode}M^* = \{3 \text{ exp}\}$
 $N = \text{Decode}N^* = \{3 \text{ exp}\}$

$$\begin{pmatrix} X \\ Y \\ Z \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \times \begin{pmatrix} X_n & L \\ Y_n & M \\ Z_n & N \end{pmatrix}$$

ME360-2, BS_36,2

CIEBasedABC—optimization of
color rendering $Lab^*_\text{soil} - Lab^*_\text{eopt}$

PSL2-program output measure
 $L^*_\text{aim} \rightarrow L^* \rightarrow L^*_\text{real}$
 $a^*_\text{aim} \rightarrow M^* \rightarrow M^*_\text{real}$
 $b^*_\text{aim} \rightarrow N^* \rightarrow N^*_\text{real}$
 $L^*_\text{aimc} = L^*_\text{aim} + (L^*_\text{aim} - L^*_\text{real}) \cdot L^*_\text{eopt}$
 $a^*_\text{aimc} = a^*_\text{aim} + (a^*_\text{aim} - a^*_\text{real}) \cdot a^*_\text{eopt}$
 $b^*_\text{aimc} = b^*_\text{aim} + (b^*_\text{aim} - b^*_\text{real}) \cdot b^*_\text{eopt}$

ME360-4, BS_37,1

least square fit for color rendering
 $Lab^*_i \text{ aim} - Lab^*_i \text{ gopt} = \text{Min.}$

color-differences $\Delta(Lab^*)$ for
CIE-test colors $i = 1$ to 17 \rightarrow min.

$$\begin{pmatrix} L^*_{i, \text{gopt}} \\ a^*_{i, \text{gopt}} \\ b^*_{i, \text{gopt}} \end{pmatrix} = \begin{pmatrix} a_{11} & a_{21} & a_{31} \\ a_{12} & a_{22} & a_{32} \\ a_{13} & a_{23} & a_{33} \end{pmatrix} \times \begin{pmatrix} L^*_{i, \text{aim}} \\ a^*_{i, \text{aim}} \\ b^*_{i, \text{aim}} \end{pmatrix}$$

$i = 1, 17$

ME360-6, BS_37,3

PSL2-program code: definition and reproduction of 17 CIE-test colors

```
%!PS-Adobe-3.0 87221-7n.eps 20.10.94
%%BoundingBox: 72 90 226 206
/FS [findfont exch scalefont setfont] bind def
/MM [72 25.4 div mul] def
/languagelevel where {pop languagelevel} {1} ifelse
/dictende {countmark 2 idiv dup dict begin {def}
repeat pop currentdict end} bind def
%%EndProlog

72 90 translate 0.01 MM dup scale 20 setlinewidth

PSL12 2 eq { [ /CIEBasedABC [ %color space and limits for D65
/WhitePoint [ 0.9505 1 1.0890 ]
/RangeABC [ 0 1 0 1 0 1.0885 ] %CIEXYZ-limits N/W
/RangeLMN [ 0 0.9505 0 1 0 1.0885 ] dictende }
setcolorspace } if %end standard definition PSL2-CIEBasedA

PSL12 1 eq { %definition for PSL1-devices
{ /setrgbcolor where %question for PSL1-color device
{pop setrgbcolor} %PSL1-color device
/setcolor exch def } if %PSL1-NW-device

/colRec [moveto s 0 rlineto s neg 0 rlineto %square
closepath setcolor] bind def

0.1885 0.1983 0.2157 setcolor %test color no. 16 (mean gray)

0 0 moveto 5400 0 rlineto 0 4000 rlineto %image size 54mm x 40mm
-5400 0 rlineto closepath fill

250 /Times-Bold FS 0.7239 0.7615 0.8289 setcolor %white
3200 3300 moveto (17 CIE-test colors) show

500 500 translate %zero point lower left test color

/s 600 def /xw 1000 def /yw 800 def %square width and distances

% X Y Z x,y-position fill color rectangle
0.3298 0.2976 0.2459 0 0 colRec fill %CIE-TP01
0.2749 0.2890 0.1501 xw 1 mul yw 1 mul colRec fill %CIE-TP02
0.2393 0.3043 0.0996 xw 2 mul yw 0 mul colRec fill %CIE-TP03
0.2045 0.2948 0.2127 xw 3 mul yw 0 mul colRec fill %CIE-TP04
0.2502 0.3087 0.4042 xw 4 mul yw 0 mul colRec fill %CIE-TP05
0.2826 0.2983 0.5791 0 yw 1 mul colRec fill %CIE-TP06
0.3333 0.2939 0.5322 xw 1 mul yw 1 mul colRec fill %CIE-TP07
0.3757 0.3133 0.4164 xw 2 mul yw 1 mul colRec fill %CIE-TP08
0.2048 0.1120 0.0436 xw 3 mul yw 1 mul colRec fill %CIE-TP09
0.5487 0.5894 0.1208 xw 4 mul yw 1 mul colRec fill %CIE-TP10
0.1212 0.2035 0.1533 0 yw 2 mul colRec fill %CIE-TP11
0.0628 0.0647 0.2773 xw 1 mul yw 2 mul colRec fill %CIE-TP12
0.5885 0.5709 0.4139 xw 2 mul yw 2 mul colRec fill %CIE-TP13
0.0935 0.1171 0.0543 xw 3 mul yw 2 mul colRec fill %CIE-TP14
0.0342 0.0359 0.0394 0 yw 3 mul colRec fill %CIE-TP15 N
0.1885 0.1983 0.2157 xw 1 mul yw 3 mul colRec fill %CIE-TP16 Z
0.7239 0.7615 0.8289 xw 2 mul yw 3 mul colRec fill %CIE-TP17 W
0.7239 0.7615 0.8289 xw 1 mul yw 3 mul colRec stroke %TP17 W

1 1 17 {/nrl exch def %squares and text no. 1 to 17
nrl 9 gt {[x 300 def]{/xp 200 def} ifelse
nrl 14 gt {[/nr nrl 1 add def]{/nr nrl def} ifelse
nr 1 sub 5 idiv /i exch def
nr 1 sub 5 mod /j exch def
j xw mul xp sub i yw mul 20 add moveto
nrl 4 string cvs show } for
showpage
```

ME361-7, BS_37,4

TUB-test chart ME36; Richter: Computer graphics, colorimetry
Colour book series: PostScript and CIE colour spaces no. 10

input: cmyk setcmykcolor
output: no colour data change

TUB registration: 20101101-ME36/ME36L0N1.TXT /PS
application for measurement of printer or monitor systems

TUB material: code=rtatua