

See original or copy: <http://web.me.com/klaus.richter/NE35/NE35L0NP.PDF> / .PS
Technical information: <http://www.ps.bam.de> or <http://130.149.60.45/~farbmantik>

PSL2-program code: raster cell threshold data (24×24 , 8 bit, horizontal)[illegible]

NE350-7, B8_29

digital image processing
with *Adobe PostScript Level 2*
CIEBasedABC—color space

The *ABC*-color data represent zone theory of colorvision in two non linear steps:

1. non linear trichromatic step
2. non linear opponent color step

NE351-1, B8 33 1

CIE 1931 XYZ–color space in PSL2

```
[/CIEBasedABC<< %Dict PostScript Level 2
/MatrixABC [1 0 0 0 1 0 0 0 1] %default
/DecodeABC [{] {}}] %default, empty function
/RangeABC [0 0.9505 0 1 0 1.0890] %D65
/MatrixLMN [1 0 0 0 1 0 0 0 1] %default
/DecodeLMN [{] {}}] %default, empty function
/RangeLMN [0 0.9505 0 1 0 1.0890] %D65
/WhitePoint [0.9505 1 1.0890] %D65
/BlackPoint [0 0 0] % default
>>]setcolorspace
```

NE351-3, B8 33 3

EBU- RGB^* -color space in PSL2

```
[/CIEBasedABC<< %Dict PostScript Level 2
/MatrixABC [1 0 0 1 0 0 1] %default
/DecodeABC [{] {}] %default, empty function
/RangeABC [0 0.9505 0 1 0 1.0890] %D65
/MatrixLMN [0.4303 0.2219 0.0202 0.3416
0.6720 0.1412 0.1845 0.0833 0.9227]
/DecodeLMN [{2.2 exp] [2.2 exp] [2.2 exp]
/RangeLMN [0 0.9505 0 1 0 1.0890] %D65
/WhitePoint [0.9505 1 1.0890] %D65
/BlackPoint [0 0 0] % default
>>]setcolorspace
```

NE351-5, B8 34 2

CIELAB 1976 $L^*a^*b^*$ -color space
definition and reversal

$$L^* = 116 (Y/Y_n)^{1/3} - 16$$

$$a^* = 500 \left[(X/X_p)^{1/3} - (Y/Y_p)^{1/3} \right]$$

$$b^* = 200 \left[(Y/Y_n)^{1/3} - (Z/Z_n)^{1/3} \right]$$

$$X = X_n \left[(L^* + 16) / 116 + a^*/500 \right]^3$$

$$Y = Y_n \left[(L^* + 16) / 116 \right]^3$$

$$Z = Z_0 \left[(L^* + 16) / 116 - b^*/200 \right]^3$$

NE351-7, B8_35_1

CIEBased*ABC*–color space in PSL2
transformation $ABC^* \rightarrow XYZ$
three coloriness \rightarrow tristimulus values

$$\begin{pmatrix} L^* \\ M^* \\ N^* \end{pmatrix} = \begin{pmatrix} 3 \times 3 \\ \text{Matrix } ABC \end{pmatrix} \times \begin{pmatrix} D(A^*) \\ D(B^*) \\ D(C^*) \end{pmatrix}$$

$$\begin{pmatrix} X \\ Y \\ Z \end{pmatrix} = \begin{pmatrix} 3 \times 3 \\ \text{Matrix } LMN \end{pmatrix} \times \begin{pmatrix} D(L^*) \\ D(M^*) \\ D(N^*) \end{pmatrix}$$

NE351-2, B8 33 2

CIEBased*ABC*–color space in PSL2
 $LMN^* / OLV^* / RGB^* \rightarrow XYZ$
 EBU-screen phosphors, D65

L	$=$	$\text{Decode}L^*$	$=$	$\{2.2 \text{ exp}\}$
M	$=$	$\text{Decode}M^*$	$=$	$\{2.2 \text{ exp}\}$
N	$=$	$\text{Decode}N^*$	$=$	$\{2.2 \text{ exp}\}$

$$\begin{pmatrix} X \\ Y \\ Z \end{pmatrix} = \begin{pmatrix} 0,4303 & 0,3416 & 0,1782 \\ 0,2219 & 0,7068 & 0,0713 \\ 0,0202 & 0,1296 & 0,9387 \end{pmatrix} \times \begin{pmatrix} L \\ M \\ N \end{pmatrix}$$

NE351-4. B8 34 1

CIEBasedABC-color space in PSL2
 $LMN^* / OLV^* / RGB^* \rightarrow XYZ$
 NTSC-screen phosphors, D65

L	$=$	$\text{Decode}L^*$	$=$	$\{1.8 \text{ exp}\}$
M	$=$	$\text{Decode}M^*$	$=$	$\{1.8 \text{ exp}\}$
N	$=$	$\text{Decode}N^*$	$=$	$\{1.8 \text{ exp}\}$

$$\begin{pmatrix} X \\ Y \\ Z \end{pmatrix} = \begin{pmatrix} 0,4497 & 0,3163 & 0,1845 \\ 0,2446 & 0,6720 & 0,0833 \\ 0,0252 & 0,1412 & 0,9227 \end{pmatrix} \times \begin{pmatrix} L \\ M \\ N \end{pmatrix}$$

NE351-6, B8 34 3

CIELAB 1976 $L^*a^*b^*$ -color space
and CIEBasedABC-transformation

$$X = X_n \left[(L^* + 16) / 116 + a^*/500 \right]^3$$

$$Y = Y_p [(L^* + 16) / 116]^3$$

$$Z = Z_p [(L^* + 16) / 116 - b^*/200]^3$$

$$A = \text{Decode}L^* = \{16 \text{ add } 116 \text{ div}\}$$

$$B = \text{Decode}a^* = \{500 \text{ div}\}$$

$$C = \text{Decode}b^* = \{200 \text{ div}\}$$

NE351-8, B8_35_2

TUB-test chart NE35; Richter: Computer graphics, colorimetry
Colour book series: *PostScript* and CIE colour spaces no. 9

input: *rgb setrgbcolor*
output: no colour data change