

Cone Excitation Coordinates and the *Munsell* System

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CIE cone sensitivities *LMS* and CIE tristimulus values *XYZ*
LMS and *XYZ* excitations in luminance units with $Y=0,5(L+M)$

Linear model equations between colour values in both directions

$$\begin{pmatrix} X \\ Y \\ Z \end{pmatrix} = \begin{pmatrix} 1,32 & -0,66 & 0,34 \\ 0,50 & 0,50 & 0,00 \\ 0,00 & 0,00 & 1,00 \end{pmatrix} \cdot \begin{pmatrix} L \\ M \\ S \end{pmatrix} \quad \begin{pmatrix} L \\ M \\ S \end{pmatrix} = \begin{pmatrix} 0,51 & -0,51 & 0,34 \\ 0,67 & 1,33 & 0,00 \\ -0,17 & 0,17 & 1,00 \end{pmatrix} \cdot \begin{pmatrix} X \\ Y \\ Z \end{pmatrix}$$

Linear model equations between colour excitations in both directions

$$\begin{pmatrix} X/Y \\ Y/Y \\ Z/Y \end{pmatrix} = \begin{pmatrix} 1,32 & -0,66 & 0,34 \\ 0,50 & 0,50 & 0,00 \\ 0,00 & 0,00 & 1,00 \end{pmatrix} \cdot \begin{pmatrix} L/Y \\ M/Y \\ S/Y \end{pmatrix} \quad \begin{pmatrix} L/Y \\ M/Y \\ S/Y \end{pmatrix} = \begin{pmatrix} 0,51 & -0,51 & 0,34 \\ 0,67 & 1,33 & 0,00 \\ -0,17 & 0,17 & 1,00 \end{pmatrix} \cdot \begin{pmatrix} X/Y \\ Y/Y \\ Z/Y \end{pmatrix}$$

The colour difference formula LABJND 1976 of CIE TC1-81:2018 uses a chromaticity diagram (*a*, *b*), defined by the following equations:

$$a=X/Y=x/y \text{ and } b=-0,4Z/Y=-0,4z/y$$

If logarithmic equations are used, it is for example valid $\log S/Y=\log S-\log Y$