

Specification of ROMM RGB.

(Specified in the US Standard ANSI/I3A IT10.7666:2003.)

Chromaticity co-ordinates of primaries:

R: $x=0.7347$, $y=0.2653$, $z=0$;

G: $x=0.1596$, $y=0.8404$, $z=0$;

B: $x=0.0366$, $y=0.0001$, $z=0.9633$.

Gamma: 1.8 (see precise specification below).

The reference white for ROMM RGB is specified as D50 (i.e. chromaticity co-ordinates of $x=0.3457$, $y=0.3585$; $z=0.2958$).

Conversion from XYZ (D50) to ROMM RGB:

$$\begin{bmatrix} Rr \\ Gr \\ Br \end{bmatrix} = \begin{bmatrix} 1.3460 & -0.2556 & -0.0511 \\ -0.5446 & 1.5082 & 0.0205 \\ 0.0 & 0.0 & 1.2123 \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}$$

where XYZ are normalised such that $Y=1$ and values of RGB outside of 0-1 are clipped.

If Rr , Gr , or Br are less than 0.001953

$$R = Rr * 16$$

$$G = Gr * 16$$

$$B = Br * 16$$

If Rr , Gr , or Br are greater than or equal to 0.001953

$$R = Rr^{1/1.8}$$

$$G = Gr^{1/1.8}$$

$$B = Br^{1/1.8}$$

Hints for Profile makers:

1) D50 referenced characterisation data

When normalised such that $Y=1$ for the reference white, the tristimulus values of the primaries and white are:

R: $X=0.7977$, $Y=0.2881$, $Z=0.0$;

G: $X=0.1352$, $Y=0.7118$, $Z=0.0$;

B: $X=0.0314$, $Y=0.0001$, $Z=0.8249$

White: $X=0.9642$, $Y=1.00$, $Z=0.8249$

The matrix to convert XYZ to linear ROMM RGB (i.e. prior to application of the non-linear function) is that given above.

2) Measurement 'correction'

The above transformation produces 1 and 0 in each of RGB when XYZ is set to 0.9642, 1, 0.8249 and 0, 0, 0 respectively. However, in practice some degree of flare will be present if ROMM RGB is intended to represent a real viewing situation. The amount of this flare will vary with the actual conditions used. However, it has been concluded by the committee developing ISO 22028-1 (a standard pertaining to colour image encodings) that for measurement consistency a level of flare should be assumed for colour encodings that is consistent with the 0/45 measurement condition assumed for ICC PCS measurements. In this context the specification states that the reference white should be assumed to have a luminance of 142 cd/m² and the reference black a luminance slightly under 0.5 cd/m². So, it is recommended that profile makers utilise this information when producing profiles and assume the black point has a Y value of 0.003473 when the white is 1. This correction can be achieved by applying the following corrections to the computed RGB values:

$$\begin{aligned} \text{ROMMRGB}' &= 0.003473 + 0.0622829 * \text{ROMMRGB} && \text{ROMMRGB} < 0.03125 \\ \text{ROMMRGB}' &= 0.003473 + 0.996527 * \text{ROMMRGB}^{1.8} && \text{ROMMRGB} \geq 0.03125 \end{aligned}$$