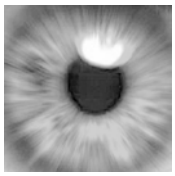

# Correlated Colour Temperature, $T_{cp}$

## Colour Temperature

The spectral radiation of a hot body (black body) is well defined as a function (Planck's radiation law) of the absolute surface temperature. Well known examples of (almost) black bodies are the Sun (app. 5600 K), a tungsten filament lamp (app. 2856 K) or a halogen tungsten lamp (app. 3200 K).

In figure 1 the Planck Locus is shown, which gives the colour coordinates of black body radiators as a function of their temperature. From tungsten lamps (reddish-2000 K) through the Sun (white) to young stars (bluish-10000 K). A higher colour temperature gives bluish (cool) light and a lower colour temperature gives reddish (warmer) light

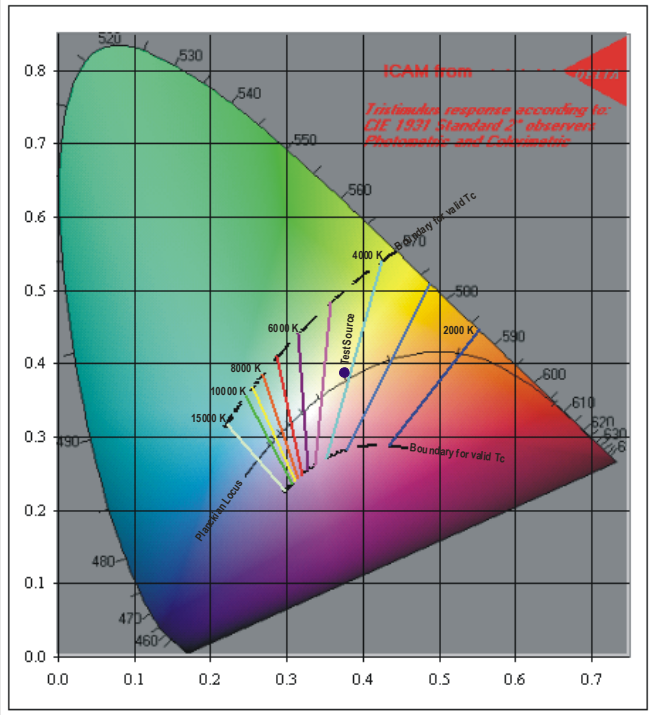


*Figure 1 CIE 1931 colour space.*

The concept of colour temperature is only valid for black body radiators. The spectrum of man made light source, for 'white light' illumination purpose, like fluorescent light tubes, white LED's or high pressure lamps are not black body radiators and can not be described by a simple function of the surface temperature.

## Correlated Colour Temperature

Instead is used the concept of the correlated colour temperature, Tcp. The definition is: "the correlated colour temperature is the temperature of a Planckian radiator having the chromaticity nearest the chromaticity associated with the given spectral distribution on a diagram where the (u, v) (UCS 1960) coordinates of the Planckian locus and the test stimulus is depicted".

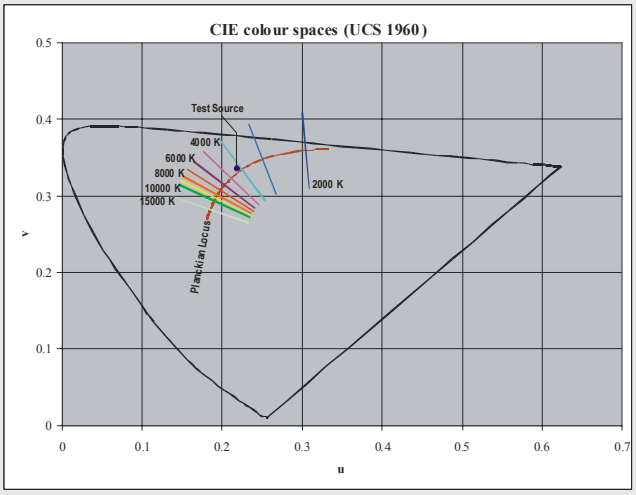


*Figure 2 CIE 1960 colour space.*

In figure 2 is shown the Planckian Locus and some isothermal lines in a (u, v) diagram. Here the isothermal lines are perpendicular to the Planckian locus. To calculate Tcp of a test source, the chromatic coordinates are measured (by radiometer or colorimeter) and transformed into the (u, v) colour space. Here it is simple to find that isothermal having the same chromaticity as the test source. The test source is assigned this temperature as the correlated colour temperature. In the shown example Tcp is app. 4100 K.

The extent of the isothermal lines is a measure of the region in which the correlated colour temperature is defined. This region is also indicated in figure 1.

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