

Please Explain the Term "Black body curve"

This curve originates in the dark red region of the diagram, proceeds through the white region, and ends in blue. This curve represents the black body curve or Planckian Locus, named in honor of Max Planck (Karl Ernst Ludwig Planck, a German physicist who lived from 1858-1947). In 1900, Planck derived an equation that relates the spectral characteristics of light emitted from a glowing body to increases in temperature of that same body. An iron bar placed in a furnace appears dull red as it begins to heat. The bar proceeds through red-orange, white, and finally blue-white as temperature rises. In the same way, a filament in an incandescent lamp changes color as varying voltages are applied. Planck's Law can be used to designate the relative color temperature of a light source and can be expressed as absolute temperature (Kelvin). The Kelvin scale (a thermodynamic temperature scale) has the same unit size as those in the Celsius scale, except they start at absolute zero (minus 273.16 degrees Celsius).

Planckian Curve

Technically, a color temperature designation can apply to an incandescent lamp only, and for those sources that adhere to the Planckian Curve. However, in illumination engineering, the terms Apparent Color Temperature and Correlated Color Temperature are often used to specify a degree of the whiteness of fluorescent, high-intensity discharge and daylight lamps. Even daylight does not exactly match the black body curve. It should be understood that color temperature alone is one of the weakest specifications for a light source. Consider a household incandescent source and a warm white fluorescent source. Both have the same correlated color temperature at 3000K, however they render colors very differently.

If a section of the 1931 CIE diagram containing the black body curve is enlarged, there can be an infinite number of chromaticity coordinates that could represent any correlated or apparent color temperature. For this reason the American National Standards Institute (ANSI) has specified a range of chromaticities acceptable for a specific color temperature. Because of the inconsistencies associated with using chromaticity coordinates, these are a very weak specification for any light source when used alone.

Standard Illuminants

In addition to the black body curve located at the center of most CIE diagrams, there are also alpha-numeric designations: A, B, C, and D65. These represent standard illuminants that have been identified by the CIE and other standardization committees including ANSI. Known as CIE Standard Illuminants, they are mathematical reference models used for performing visual or instrumental calculations. The physical simulation of an illuminant is called a light source. Some illuminants (A, B, D55, D65 and D75) can be represented by actual light sources. Others (such as C) cannot. Therefore, all light sources can be illuminants, but not all illuminants can be light sources.

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