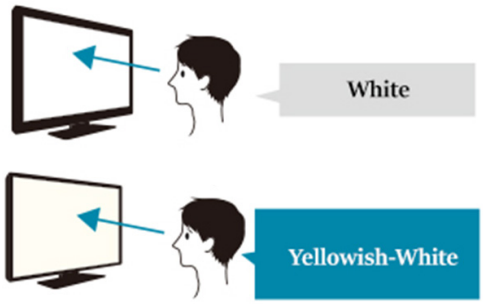
Resolving Display Color Matching Issue

Introduction

The display industry for whom color fidelity is important has long depended on the CIE 1931 2° Standard Observer Color Matching Functions (CMF) for color quantification.

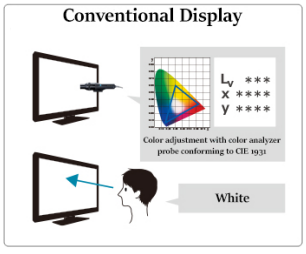


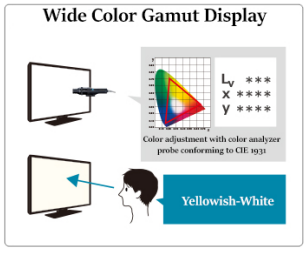
However, under this CMF, two display of different display technology can have exactly the same color coordinates within the CIE 1931 xy color diagram but noticeable color difference visually.

Deficiencies of the CIE 1931 Color Matching Functions

This display color matching issue arises due to the deficiencies in the CIE 1931 Standard Observer CMF, in particular, our vision in blue and red is believed to be more sensitive than first thought. Also, we are able to see further into the deep blue/violet than was believed.

Though these deficiencies have long been known to academic researchers, the CIE 1931 Standard Observer CMF is still adopted by many. This is because the defects do not cause many practical difficulties in day to day use largely due to the limited usage of narrowband emitters in the display industry previously.





However, with the emergence of Organic Light-Emitting Diode (OLED) with narrow-band phosphorescent emitters and narrow-band emitters such as, Light-Emitting Diode (LED), Quantum Dot (QD) and laser lights that are used in LCD backlight, it is a total different story now.

Such advances in display and lighting technology have exposed deficiencies in the CIE 1931 Standard Observer CMF with displays utilizing such technology to achieve wider color gamut.

Potential Solutions

Since colorimetry was established in 1931, several academic researchers had proposed several alternative CMFs. The CIE established a Technical Committee in 1936 (TC 1-36) with the goal of creating a chromaticity diagram based on the best set of color matching functions and cone fundamentals available to date.

The committee published the CIE 170-1 standard in 2006 and the subsequent CIE 170-2 standard in 2015, with new CMF that improved greatly on the 1931 2° Standard Observer CMF.

The new CIE 170-2:2015 CMF has not been adopted by CIE as a replacement standard for the current CIE CMF as yet. However, it provides a possible resolution to such display color matching issue caused by deficiencies of current CMF, especially when all possible causes by imprecision in the measurement methods and tools have been excluded.

Measurement solutions

Display Color Analyzer CA-310 with Full Color FPD

Resolving Display Color Matching Issue

Universal Measuring Probe CA-PU32C probes has new color-matching functions conforming to the CIE 170-2:2015 definition that provides luminance and chromaticity data that have high correlation with visual evaluation results.

Similarly, Display Color Analyzer CA-410 with customised probes, CA-P427C and CA-P410C, possess new CIE170-2:2015 XYZ filters, is capable of measuring and adjusting wide color gamut displays that utilise new display technologies such as OLED or LCD with QLED or Laser backlights.

Konica Minolta also provides Color Calculator Software for Spectroradiometer CS-2000/2000A or customised CS-2000/2000A that is capable of outputting XYZ values based on the CIE 170-2:2015 definition directly, upon request.

To find out more about the above-mentioned measurement solutions or have encountered any display color matching issue and require a solution, write to us or contact us at (+65) 6563 5533 for a free consultation.