Federal Aviation Administration

Research Highlights

OLED Light Sources for Airfield Signage

Study Goals

OLED light panels

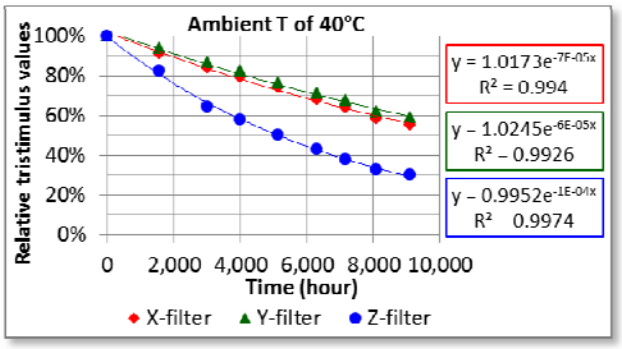
The organic light-emitting diode (OLED) is a new solid-state light source that has the potential to be used in runway and taxiway signs. Researchers from the Lighting Research Center (LRC) at Rensselaer Polytechnic Institute investigated the feasibility of using OLEDs in airport runways and taxiways signs, which depends on whether OLEDs can meet the prescribed requirements for luminance and lifetime (luminance maintenance over time). FAA Advisory Circular 150/5345-44K calls for luminance values in the range of 30–100 cd/m² for the background and for the white and yellow legends of L-858 type signs.

Research Activities

To determine if OLEDs could meet the luminance requirements for airfield signs, commercial product samples were obtained for an early study in 2010. Using an imaging photometer, luminance measurements were taken of red, green, blue, and white OLED panels (2 inch by 2 inch) when driven at the manufacturer-recommended current values. The results indicated that OLEDs have acceptable luminance. In 2015, an improved performance white OLED panel (3 inch by 3 inch) was procured and tested. A white OLED is typically made using a mixture of red, green, and blue organic emitting materials. Luminance measurements were taken at an ambient temperature of 40°C while driving the panel at the rated current of 386 mA. The average luminance measured was 7790 cd/m², a significant improvement over the earlier 2010 panels.

	I (mA)	L (cd/m²)
Blue	95	871
Green	34	860
Red	105	830
White	123	1732

The different color components of the 2015 white OLED panel were measured by considering the tristimulus values gathered by an imaging photometer as a function of time for 9,000 hours. The measured luminance values are shown in the graph below. Assuming a 30% light output reduction (L_{70}) as the end of life, the blue component had a lifetime of 2,500 hours, and the green and red components had a lifetime of 6,000 hours. These values are much lower than the typical of life of LEDs and linear fluorescent lamps. Lifetime is an area where OLED technology needs to improve to compete with other light sources for the target application. Because the OLED luminance values are much higher than required, under-driving is an option for extending lifetime.



The relative light level of red, green, and blue OLEDs as a function of time, represented by the tristimulus values X, Y, and Z at an ambient temperature of 40°C.

Present white OLED technology can meet the luminance requirements of airport runway and taxiway signs. However, lifetime needs further improvement for OLED technology to compete with other light sources.

This project was conducted by the Lighting Research Center at Rensselaer Polytechnic Institute (www.lrc.rpi.edu) under FAA contract 13-G-009. This summary was prepared by the Lighting Research Center on behalf of the FAA.

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Lighting Research Center