LED Intensity Measurement (Case Study)

Challenge

In a recent application test engineers needed to test LEDs in automotive brake lights. The brake light consisted of an array of 120 high power red LEDs. The brake light operated in a high intensity mode called ‘stop mode’ and a low intensity mode called ‘tail mode’.

When the LEDs were in ‘stop mode’ their measurement system would saturate.
In order to counteract this, neutral density filters were used to reduce the LED intensity to a level acceptable to the test system. However, when operated in ‘tail mode’, the attenuation of the neutral density filters caused inaccuracy in the measurement of LED colour and intensity,

Solution

The solution was to use the Feasa LED Analyser in conjunction with Feasa Optical Heads. The Feasa LED Analyser has an extremely wide dynamic range which allows it to test LEDs from the dimmest LED (0.5 mcd) to the brightest LEDs without the use of any external optical attenuators or filters (at least 200 lumens). Six Feasa 20-F LED Analysers were connected together in a daisy chain configuration in order to test 120 LEDs simultaneously.

In this particular case the customer opted to use the XY chromaticity and intensity outputs from the Feasa LED Analyser. Feasa provided a comprehensive suite of software tools which were used to adjust the Feasa LED Analyser after it was fitted to the test fixture. This ensured that each fiber was measuring the correct intensity and colour. By using the most advanced sensor technology it was possible to achieve a repeatability of +/- 0.0015 in CIE X and Y chromaticity and a repeatability of <1% in terms of intensity measurement with a linear response between 0 and full scale.

One of the biggest challenges when setting up this test fixture was determining the test limits to use. It was decided that the best method was to test a large quantity of PCBs and using the measured outputs to calculate the mean and standard deviation of each Fiber position. Test limits were determined using the mean values as measured by the Feasa LED Analyser and the Min/Max tolerances were derived from the relevant LED data sheets.

In order to ensure that the LEDs were thermally stable the LEDs were powered on for a fixed time before any measurement was made.

Result

Using the Feasa balancing software it was then possible to adjust the mean intensity value of each fiber to compensate for any fixture variations. A golden board (Reference board) was tested and the measured value for each fiber was stored. This board was then used to verify the test fixture each day to ensure that there was no drift in the test results.

After debug of the test software the test time was approximately 1.5 seconds for the high intensity test and 1.5 seconds for the low intensity test of all 120 LEDs. The customer reported a near theoretical response from the Feasa LED Analyser in terms of both colour and intensity measurement. See Feasa Demo Video :
http://vimeo.com/68235901