

NATURAL LIGHT OUTPUT DEGRADATION
OF LIGHT EMITTING DIODES
AND
THE IMPLICATION ON THE OPERATIONAL LIFETIME OF LED-BASED PRODUCTS

The operational life on any LED-based product is dependent on the inherent LED characteristic of natural intensity degradation over its lifetime

As can be seen from the extract and graph (alongside) from an application brief from Agilent Technologies (formerly Hewlett-Packard) – one of the foremost organizations on LED development and manufacture in the world – **LED light intensity output degrades over time.**

Accordingly, the C.I.E. (the international body on illumination) has denoted that **the life of an LED is considered to be ended when the light output depreciates to 50% of the initial value.** (When the LED degrades to half of its original intensity, it is at the end of its useful life, although the LED will continue to operate with gradually diminishing light intensity.)

In view of the above, the initial intensity of any LED-based product must be maintained at a much higher level than the minimum requirement (at least twice the minimum), to allow for normal LED intensity depreciation over the operational lifetime of the product.

As an example, our Model A/LI-300 Low Intensity LED Aviation Obstruction Light has a designed initial intensity **greater than 20 candela** (30 candela nominal), so as to provide an adequate buffer to allow for normal depreciation down to 10cd up to the end of its rated 20-year life. Our Model LI-90 Low Intensity Aviation Obstruction Light has a lower designed initial intensity, and while it will also have a working life of 20 years, the light output may go down below 10cd earlier.

As such, any LED Aviation Obstruction Light meeting **just** the ICAO requirement only at the outset will be unsuitable for use, as the intensity will drop below the minimum requirement within a short period of operational use.

*The above discussion leads to the concept of **ICAO life** of an LED Aviation Obstruction Light, which can be defined as: That life period of the Light, at the end of which the light emitted by the LEDs in the unit still meets the minimum ICAO requirement for that type/model of Light.*



Projected Long Term HTOL Light Output Degradation of Precision Optical Performance AlInGaP LEDs

Application Brief I-018

Projected Long Term Degradation

High temperature operating life, HTOL, testing is used to project long term light output degradation. HTOL testing is performed in an ambient of +55°C using an uninterrupted dc current to drive the LED devices under test.

The projected long term average light output degradation characteristic for Precision Optical Performance AlInGaP LED lamps is shown in Figure 1. The lamps under test exhibit a positive degradation characteristic out to the 1000 hour point. From the 1000 hour time point, the light output degrades gradually as a logarithmic function of time.

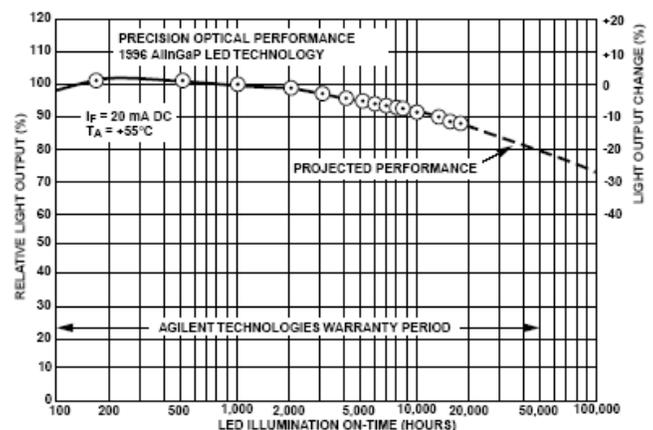


Figure 1. Projected Average Light Output Degradation Performance for Precision Optical Performance AlInGaP LED Lamps, based on 16,000 hour HTOL data



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