Getac

## Technology Brief — Getac Night Vision Technology

# Making Every Mission a Success Under Dark Environment with Getac's Night Vision Technology

Night vision is the ability to see in a dark environment whether by biological or technical means; night vision is made possible by a combination of wo approaches : sufficient spectral range and sufficient intensity range. Humans have poor night vision compared to many animals, in part because the human eye lacks a tapeturn lucidum. Current night vision applications were mainly enabled through two devices , NVG (Night Vision Goggles) and NVIS (Night Vision Imaging System).

### • Night Vision Goggles (NVG)

Night vision goggles enhance images through use of a micro-channel plate (MCP) designed to enable the observation of optical electronic images by intensifying weak optical signals. NVGs have been widely used in military applications and have now evolved to their third generation.

### • Night Vision Imaging System (NVIS)

Military-Spec. Monitors (MSM) require compatibility with Night Vision Imaging Systems to enable NVG wearers to complete nighttime missions, and must be MIL-STD-3009 (or MIL-L-85762A) compliant. Figure 1 indicates a MIL-STD-3009 compliant MSM used in the Boeing B52 bomber, a well-known application example of Boeing's Evolutionary Data Link (EDL) system that incorporates three NVIS monitors in its cockpit.

A Mobile Computing System that supports night vision allows end users to be able to operate the system while wearing night vision goggles, and is also classified as an NVIS system that should meet the following three requirements listed in MIL-STD-3009 Gen. III Class B specifications (Figure 2).

**1. Brightness ≦1.71 nits (cd/m2)**
**2. NVIS Radiance ≦2.2 x10-9 (or Maximum 11x10-9)**
**3. Chromaticity (u', v') = (0.19, 0.49), △u'v'≦0.04**

**[Figure 1] MIL-STD-3009 Compliant MSM Used in B-52**

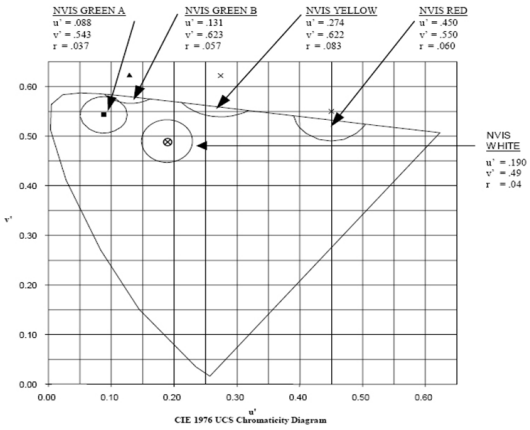
There are two MSM technologies that commonly used by missions in the dark environment -- NVIS filters attached externally to MSM by either "overhanging" or "sticking" methods and Co-existence of standard and night vision-compatible backlight sources for the Liquid Crystal Module within an MSM:

In NVIS filter approach, "Overhanging" is a technique normally used with rugged notebooks or PDAs, while "sticking" is traditionally used in fixed MSMs. However, there are inherent disadvantages to using external NVIS filter modules.

| Lighting components | | Paragraph | TYPE 1 Class A Not Less Than: ($nNR_A$) | TYPE 1 Class A Not Greater Than: ($nNR_A$) | TYPE 1 Class A $cd/m^2$ | TYPE 1 Class B Not Less Than: ($nNR_B$) | TYPE 1 Class B Not Greater Than: ($nNR_B$) | TYPE 1 Class B $cd/m^2$ | TYPE II Class A Not Less Than: ($nNR_A$) | TYPE II Class A Not Greater Than: ($nNR_A$) | TYPE II Class A $cd/m^2$ | TYPE II Class B Not Less Than: ($nNR_B$) | TYPE II Class B Not Greater Than: ($nNR_B$) | TYPE II Class B $cd/m^2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Primary | | 4.3.5.1 | --- | 0.17 | 0.343 | *1/* Same as Class A | | | --- | 0.17 | 0.343 | *1/* Same as Class A | | |
| Secondary | | 4.3.5.2 | --- | 0.17 | 0.343 | | | | --- | 0.17 | 0.343 | | | |
| Illuminated controls | | 4.3.5.3 | --- | 0.17 | 0.343 | | | | --- | 0.17 | 0.343 | | | |
| Compartment | | 4.3.5.4 | --- | 0.17 | 0.343 | | | | --- | 0.17 | 0.343 | | | |
| Utility, map, work, and inspection lights | Green | 4.3.5.5 | --- | 0.17 | 0.343 | | | | --- | 0.17 | 0.343 | | | |
| | White | | | 1.0 | 0.343 | | | | | 1.0 | 0.343 | | | |
| Caution and advisory lights | | 4.3.5.6 | --- | 0.17 | 0.343 | | | | --- | 0.17 | 0.343 | | | |
| Jump lights | | 4.3.5.7 | 17.1 | 50 | 17.1 | 16 | 47 | 17.1 | --- | 50 | 17.1 | --- | 47 | 17.1 |
| Warning signal | | 4.3.5.8 | 50 | 150 | 51.5 | 47 | 140 | 51.5 | --- | 150 | 51.5 | --- | 140 | 51.5 |
| Master caution signal | | 4.3.5.8 | 50 | 150 | 51.5 | 47 | 140 | 51.5 | --- | 150 | 51.5 | --- | 140 | 51.5 |
| Emergency exit lighting | | | 50 | 150 | 51.5 | 47 | 140 | 51.5 | --- | 150 | 51.5 | --- | 140 | 51.5 |
| Electronic and electro-optical displays (monochromatic) | | | --- | 0.17 | 1.71 | --- | 0.16 | 1.71 | --- | 0.17 | 1.71 | -- | 0.16 | 1.71 |
| Electronic and electro-optical displays (multi-color) | White | | --- | 2.3 | 1.71 | --- | 2.2 | 1.71 | --- | 2.3 | 1.71 | --- | 2.2 | 1.71 |
| | MAX | | --- | 12 | 1.71 | --- | 11 | 1.71 | --- | 12 | 1.71 | --- | 11 | 1.71 |
| HUD systems | | 4.3.5.10 | 1.71 | 5.1 | 17.1 | 1.6 | 4.7 | 17.1 | --- | 17 | 17.1 | --- | 1.6 | 17.1 |

Where:

$nNR_A$ = nano NVIS radiance requirements for Class A equipment.
$nNR_B$ = nano NVIS radiance requirements for Class B equipment.
"nano", abbreviated "n", represents a factor of $10^{-9}$, which is factored out of the radiance numbers in this table.
$cd/m^2$ = Candela per square meter, sometimes called "nits".




**[Figure 2] MIL-STD-3009 Specifications**

NVG users must carry NVIS filters with them, which can result in potential damage to or loss of the filters. Using an external NVIS filter will also cause temporary unavailability of touch screen functions.

And in co-existence approach, CCFL tubes and LED light bars are built into the MSM and used simultaneously as backlight sources with a specially designed IR cut-off filter in the light path. Users can toggle the Liquid Crystal Module (LCM) backlight source between standard and NVIS mode depending on whether they are wearing NVGs or not. This technology is currently used in fixed type MSMs due to the large space required.

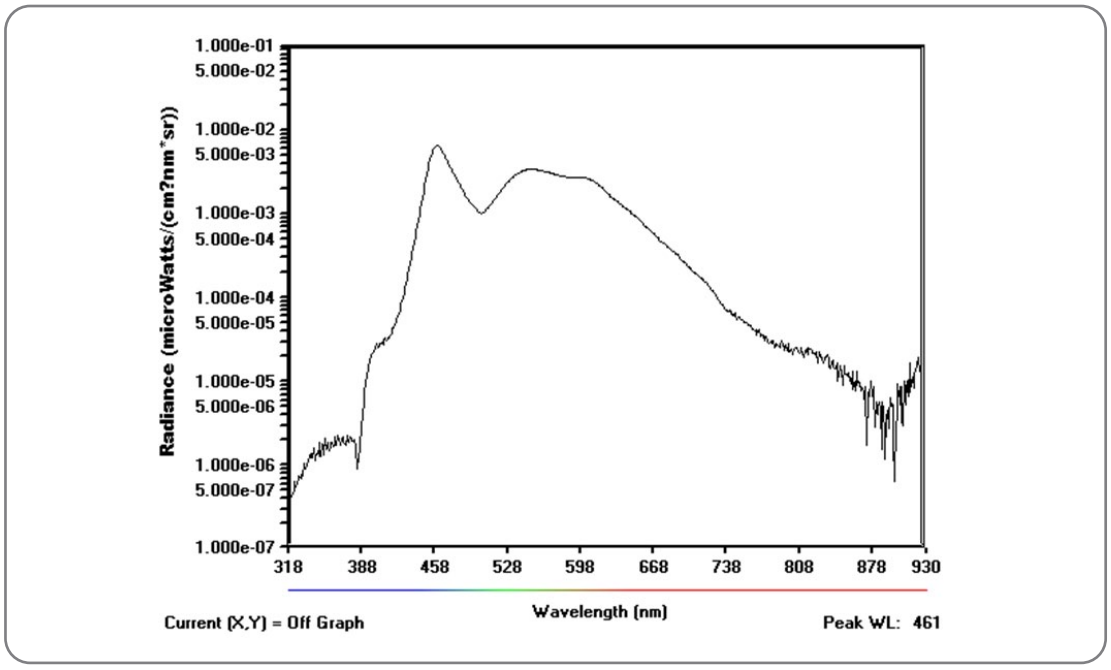
Getac's MIL-STD-3009 compliant night vision displays are designed for all-day operation. They not only achieve great daytime readability under strong sunlight conditions (B300: 1200nits / ECR: 41.7@10K lux; V100: 1200nits / ECR: 34.6@10K lux), but also function in night vision operation mode without the use of an external NVIS filter. Simply clicking on a preset function key or software shortcut icon will switch the display from standard operation mode to night vision mode. MIL-STD-3009 compliant Getac products with sunlight-readable display technology are shown below in Figure 3.


**[Figure 3] Sunlight Readable and Mil-STD-3009 Compliant Notebooks & Convertible Notebook**

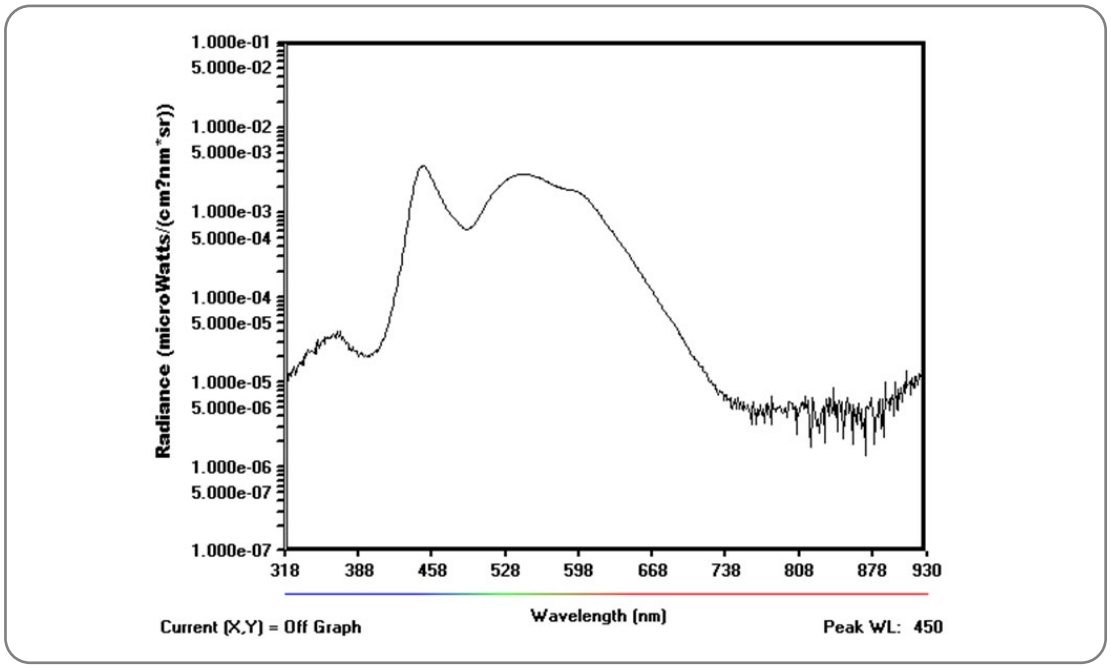
## Getac's Patented Spectrum Adjustment Technology (SAT)

These products are equipped with Getac's patented Spectrum Adjustment Technology (SAT), which is built into the display's proprietary LED backlight module. Once the night vision mode is trigged, both red and infrared light will be properly adjusted to prevent images from appearing over-saturated due to high gain from wavelengths exceeding 650nm output by the MCP in third-generation night vision goggles. Figures 4.1 and 4.2 illustrate the difference between the spectrum of a standard light source and the spectrum of night vision light source.

The night vision mode of Getac products can be customized with several different brightness levels SAT technology enhances the display functionality of portable devices with no added weight penalty. The use of LED backlights is also more eco-friendly and provides extra product ruggedness.




[Figure 4-1] Spectrum of Std. Light Source




[Figure 4-2] Spectrum of NV Light Source

## Value to Customers

- **Integrated Night Vision Support:**
  Getac's night vision technology is built into the product and requires no external NVIS filters for operation. Night vision mode is switched on easily with one easy mouse click or a quick button press.

- **Dust and Water Resistant:**
  Getac's night vision compatible LCD displays feature water-resistant technology that allows reliable operation in challenging environments.

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