B-NVC150
Night vision compatibility testing

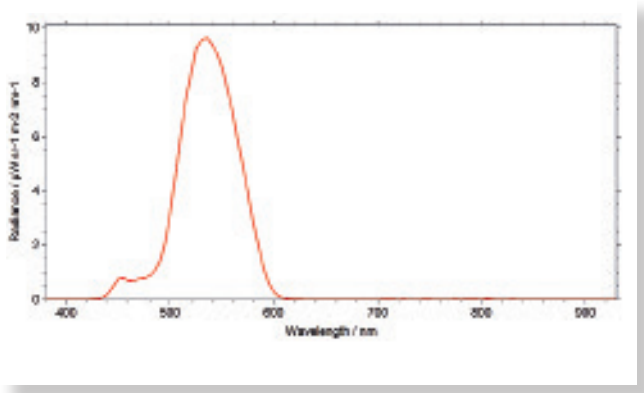
The Bentham B-NVC150 is a complete and accurate solution for night vision compatibility testing.

Configured as a spectroradiometer, the B-NVC150 is used in the testing of interior lighting (MIL STD 3009) and exterior lighting (SAE ARP5825, STANAG 1445 etc) whilst as a spectrophotometer, it is used in the testing of NVIS filter transmission.

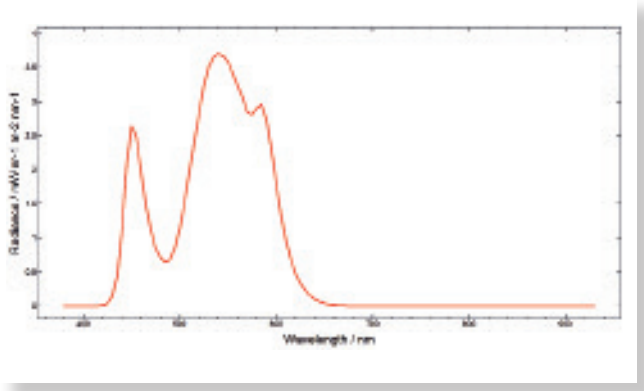
In both cases, the superlative performance of the B-NVC150, including excellent stray light rejection and unparalleled sensitivity, ensures accurate NVIS compatibility characterisation.

Key features include:

- Double monochromator for superlative stray light performance
- Thermoelectrically cooled photomultiplier detector (S20 photocathode)
- Optional spectroradiometer and spectrophotometer modes
- Range of telescope input optics
- Easy to use Windows control
- Reports colourimetric parameters, luminance, NR_a and NR_{br}



Spectrum of traditional electro-luminescent panel (NVIS green)



Spectrum of filtered white LED

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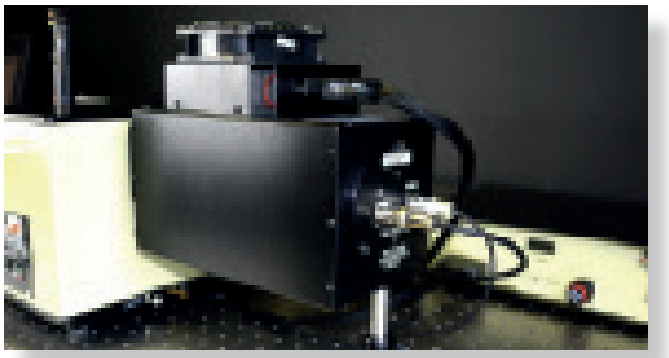
System overview

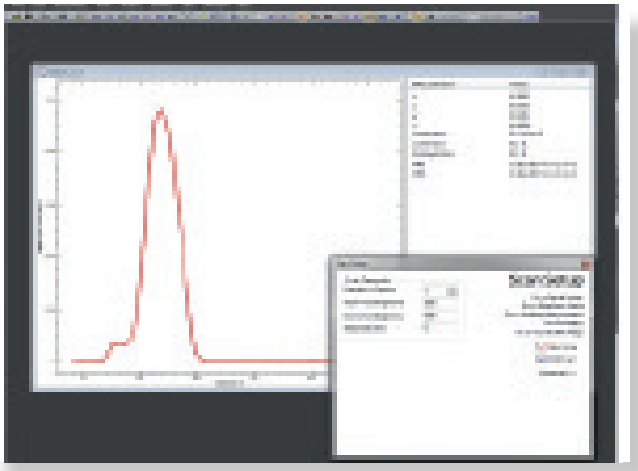
B-IDR150

The B-IDR150, incorporating a compact double monochromator with all detection electronics integrated to the base of the unit, combines accuracy with the convenience of an easily transportable measurement system. The throughput and stray light performance of B-IDR150 is optimised in this application through careful choice of diffraction gratings and filters.

B-DH50-TE & CPS50

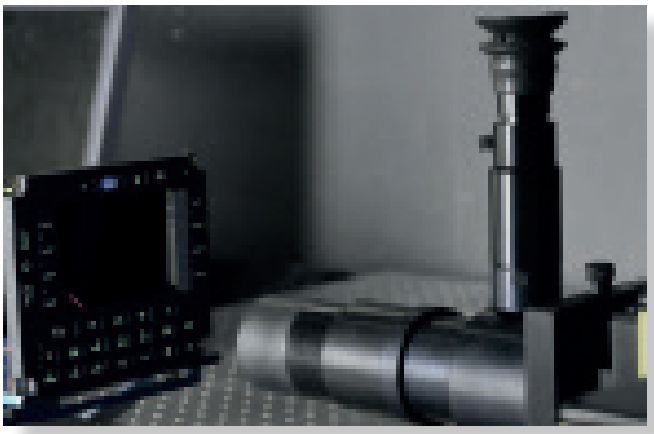
To ensure correct reporting of NR_a and NR_b, the measurement must not be limited by the instrument noise equivalent radiance. Highest sensitivity is ensured in employing a thermoelectrically cooled end-window multi-alkali photomultiplier (S20 photocathode). Whilst the gain of the PMT can be maximised, the attendant increase in dark current is suppressed by operation at -20 °C





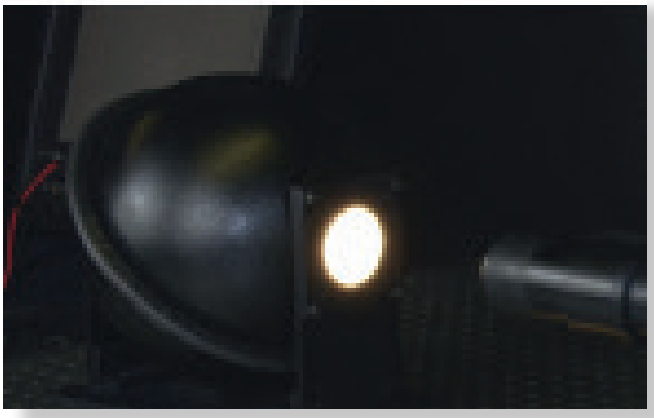
B-TEL301 Direct view telescope

The B-TEL301 direct view telescope is used to define the measurement geometry in the measurement of spectral radiance and spectral radiant intensity. A range of lenses and apertures are available to select the measurement area, from a character on a panel to an entire exterior luminaire.



B-SRS8 Radiance standard

Comprised of a quartz halogen source in a barium sulphate coated integrating sphere, the B-SRS8 spectral radiance standard provides a stable source having excellent uniformity, a pre-requisite of a spectral radiance standard. Calibration is provided traceable to PTB, Germany.



Software control

The B-NVC150 is fully automated through the USB interface, and controlled by the Benwin+ Windows® software, allowing easy system calibration, source measurement, and the automatic reporting of NVIS parameters including colourimetric parameters, NVIS colour region, NR_a and NR_b.

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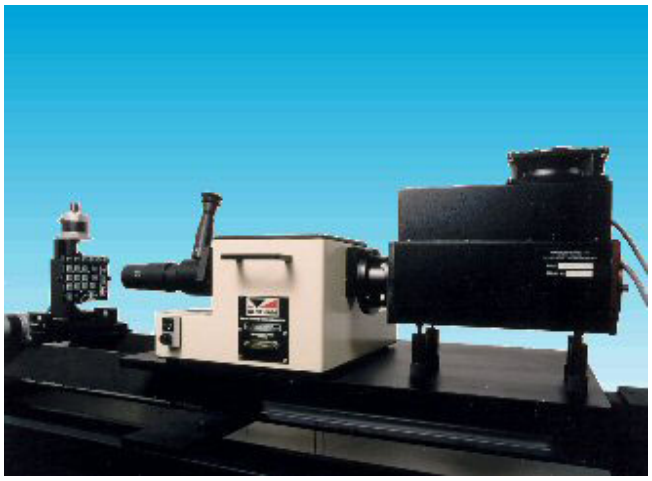
NVG compatibility testing



The human eye has, as we all know, very limited night vision (NVIS) capability. Night vision goggles (NVG) were developed for military applications to enable night- time missions under the cover of dark, with particular issues arising in their use in aircraft and other vehicles.

In effect, at night time, there remains a very low level of natural celestial illumination, the reflection of which from the landscape is imaged by the NVG.

NVG's are based on image intensifiers, where a photon of light, falling on a photocathode, liberates an electron. This single electron goes through an electron amplifier, the resultant electrons then falling on a phosphor screen. Using lenses to image the view of the user, it is possible to obtain a typical green-black image of the landscape on the phosphor screen.

It is important to ensure that such devices are not illuminated by artificial sources, such as display screen in aircraft and vehicle cockpits, else their operation may be entirely compromised.

Measurements for NVG compatibility are centred around two main themes, and are stated in document MIL-STD 3009 Lighting, aircraft, night vision imaging system (NVIS) compatible.

- Measurement of the radiance of NVIS sources over the spectral range 380 - 930 nm
- Measurement of the transmission of source filters intended for NVIS use over the range 380 - 930 nm.

In essence, both measurements seek to ensure that no output is seen in the wavelength range at which the NVG is responsive, typically ~600 - 930 nm.

This measurement requires an instrument with high sensitivity and high dynamic range, at the core of which is a double monochromator and cooled photomultiplier detector. Coupled to this is an easy-to-use control software which reports directly NVG results to determine pass or fail.

Specification	
Spectral range of operation	380 - 930 nm
Spectral data interval	5 nm
Spectral bandwidth (FWHM)	5 nm
Wavelength accuracy	± 0.3 nm, ± 0.05 nm with software correction
Wavelength reproducibility	± 0.05 nm
Stray light rejection at 2.5 FWHM	10^{-8}
Minimum working distance	25 mm with Macro lens
Maximum working distance	50 m with TL1 lens
Typical NER	10^{-10} $W.m^{-2}.sr^{-1}$
Bench space required	1 m deep x 2.5 m wide typical including working space
Computer requirements	OS: Windows 7 or newer (32-/64-bit)
	Minimum hard disk space: approx. 100 MB
	Minimum RAM: 2 GB
	1 x USB 2.0 ports
Services requirements	2 x 110/220 V AC mains sockets, 400 VA total
Options	
Extension to 1100 nm (or greater) for measurement of IR LEDs	Inclusion of second exit port and DH_Si silicon photodiode
Transmission measurement of filters	Inclusion of IL1 general illuminator and filter holder, to be mounted on monochromator entrance slit

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