DCB

Dual color blackbody

Fig.1. Photo of exemplary DCB dual-color blackbodies integrated with SEM light sources: from the left DCB-2D, DCB-6D and optional notebook

Basic information:

DCB dual-color blackbody is a broadband reference source of optical radiation having emitter module that simultaneously reflects light emitted by an external shortwave light source (source emitting in range from UV to SWIR) and emits longwave thermal radiation in MWIR-LWIR region. The name originates from the fact that it works like a typical blackbody in middle/far infrared range but its emitter appear to be white from middle UV range to middle SWIR range. DCB color blackbody is built by combining modified (different emitter) TCB differential area blackbody with an exchangeable external light source. A series of light sources can be used as emitters of shortwave light (white LED, multi-LED, halogen, optional xenon) depending on desired spectral band of emitted light. Design of DCB color blackbody is based on patent pending technology developed by Inframet.

In general DCB color blackbody belongs to a group of broadband radiation sources called fused blackbodies that are offered on international market from several vendors. However DCB color blackbody significantly exceeds performance of similar devices. In contrast to typical fused blackbodies DCB color blackbody can emit high intensity light in wide spectral band (from middle UV to middle SWIR) behaving at the same time as near perfect blackbody (emissivity over 0.95) in MWIR-LWIR spectral band. The competing fused blackbodies emit light of several times lower maximum luminance at narrow light spectrum and have emitters of lower emissivity at MWIR-LWIR band.

Versions:

DCB color blackbodies are modular systems offered in form of a series of versions that differ in blackbody emitter area and type of attached light source. Both emitter size and type of light source are indicated by code of DCB blackbody. The code is DCB-XD-Type where X is approximate size of square of the emitter in inches and Type is type of the light source. Following emitters are available: 2D, 4D, 6D and 8D. Next, four standard light sources SEM1, SEM2, SIR, HAL and XEN are offered:

1. SEM1 – light source that emits light having spectrum of roughly 5000K temperature greybody in crucial part of visible band: 450-630nm – see Fig.2. It can be treated as improved typical white LED source.
2. SEM2 – light source that emits light of 5000K temperature greybody spectrum in total VIS band and most of NIR band: 400-850 nm (the spectral band can be expanded) – see Fig.3.
3. SIR – light source can be combined with SEM1 or SEM2 light source. It emits regulated monochromatic SWIR radiation of wavelength around 1050nm.
4. HAL – light source that emits broadband polychromatic light in VIS-SWIR range. Spectrum of 2856K color temperature in VIS-NIR range – see Fig.4.
5. XEN light source built using opto-mechanically controlled xenon bulb that emits light of quasi typical xenon spectrum in in approximate 300 nm to 1100nm band (spectrum can be optionally extended) – see Fig.5.

Exemplary code of most popular model is DCB-2D-SEM2. It means color blackbody built using emitter size equal to 2" square (50mm) and SEM2 light source. It should be noted that active aperture of DCB color blackbodies is smaller than size of the blackbody emitter. For details please check technical specifications on next page.

Tel: +48 22 668780
Fax: +48 22 3987244

• INFRAMET

info@inframet.com

DCB

Dual color blackbody

Spectral characteristics

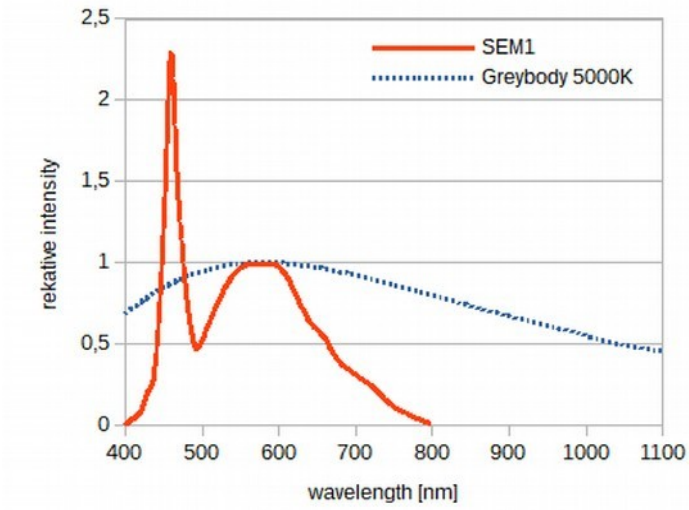

Fig.2. Relative spectrum of SEM1 light source

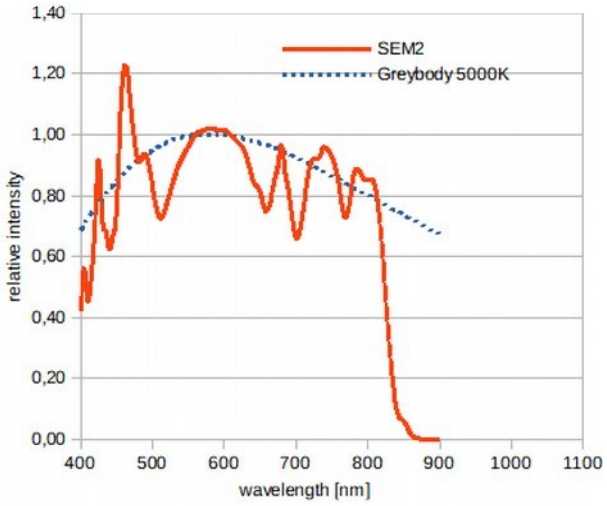

Fig.3. Relative spectrum of SEM2 light source

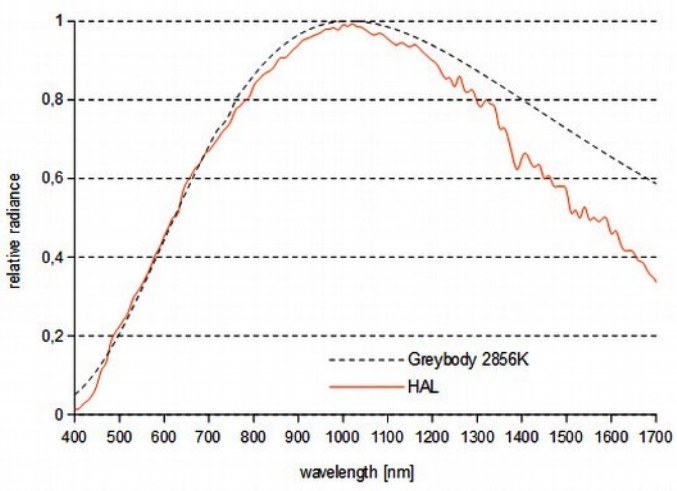

Fig.4. Relative spectrum of HAL light source

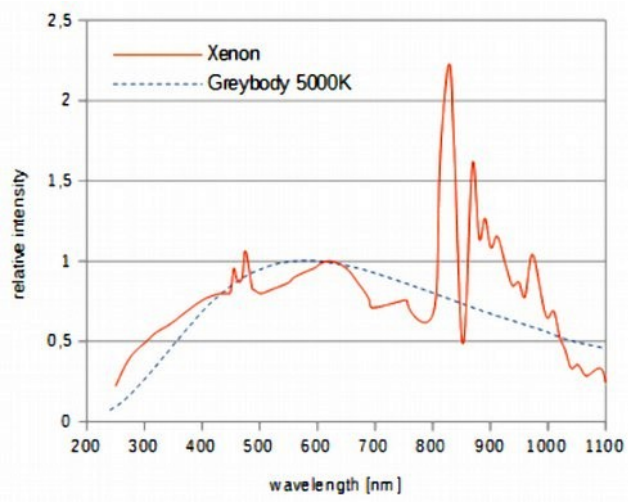

Fig.5. Relative spectrum of XEN light source

Options:

1. Typical DCB color blackbodies use four types of light sources of spectrum seen in Figs. 2-4 and additional SWIR boost in form of SIR light source. However light sources of different spectrum can be optionally delivered, too.
2. Typical DCB color blackbodies are manufactured to simulate day light conditions. However, they can be delivered in version of expanded light intensity range capable to simulate both day and night light conditions.
3. Typical DCB color blackbody emits polychromatic broadband light and is calibrated in photometric units. However, special DCB blackbody emitting monochromatic light can be delivered. Such color blackbody is calibrated in radiometric units.

Tel: +48 22 668780
Fax: +48 22 3987244

• INFRAMET

info@inframet.com

DCB

Dual color blackbody

Specifications:

Table 1. Parameters of DCB blackbodies

Parameter	DCB-2D	DCB-4D	DCB-6D
Blackbody mode			
Active aperture	35×35 mm	70×70 mm	100×100 mm
Emitter size	50×50 mm	100×100 mm	150×150 mm
Absolute temp. range	0ºC ÷ +100ºC at +25ºC ambient temperature		
Differential temp. range	-25ºC ÷ +75ºC		
Effective emissivity	0.95 ± 0.01 at MWIR 0.96 ± 0.01 at LWIR		
Temperature spatial distribution uncertainty (temperature uniformity)	< 0.01ºC or 0.4% of ΔT		< 0.01ºC or 0.5% of ΔT
Set point and resolution	1 mK		
Regulation stability	±2 mK		
Total temperature uncertainty	0,03ºC		
Heating rate[2]	0.8ºC/sec	0.2ºC/sec	0.15ºC/sec
Cooling rate	0.3ºC/sec	0.1ºC/sec	0.06ºC/sec
Settling time	< 30sec	< 40sec	< 60sec
Light source mode			
Active aperture	35×35 mm	70×70 mm	100×100 mm
Approximate spectral band	420 – 750 nm for SEM1 version 380 – 850 nm for SEM2 version 350 – 1700 nm for HAL version 300 – 1100 nm for XEN version 1050 nm monochromatic boost for SIR integrated with SEM1 or SEM2		
Luminance range SEM1/SEM2/XEN – day option SEM1/SEM2/XEN – day/night option HAL – day option HAL – day/night option	at least: 0.2cd/m^2 ÷ 2kcd/m^2 0.2mcd/m^2 ÷ 2kcd/m^2 0.1cd/m^2 ÷ 800cd/m^2 0.1mcd/m^2 ÷ 800cd/m^2	at least: 0.2 cd/m^2 ÷ 1 kcd/m^2 0.2 mcd/m^2 ÷ 1 kcd/m^2 0.1 cd/m^2 ÷ 400 cd/m^2 0.1 mcd/m^2 ÷ 400 cd/m^2	
Spectrum of light source	As in figs. 2-5		
Other parameters			
Computer control	USB 2.0		
Power supply	115-230VAC 50/60Hz		
Operating temperature	+5ºC ÷ +45ºC (non condensing)		
Storage temperature	-10ºC ÷ +60ºC		
Dimensions of DCB with SEM [cm]	About 39×22×28	About 39×22×28	About 51×27×32
Mass	About 10 kg	About 11 kg	About 20 kg

Summary:

DCB color blackbody is a perfect solution for a broadband radiation source in systems for testing multi-sensor / fused surveillance systems. DCB blackbody eliminates need for mechanical exchange of typical blackbody with typical light source and makes the test system more compact, lighter and more reliable. Next, performance parameters of DCB color blackbody significantly exceed parameters of similar radiation sources offered on international market.

Tel: +48 22 668780
Fax: +48 22 3987244

• INFRAMET

info@inframet.com