

SOL

Tester of VIS-SWIR imaging sensors



Fig. 1. Photo of the SOL test station

BASIC INFORMATION:

SOL is a test station developed for testing imaging sensors sensitive in VIS-SWIR spectral bands (silicon/black silicon/ InGaAs sensors sensitive in spectral band from 400nm to 2500nm).

From design point of view SOL station is a calibrated light source of step regulated spectral band and continuously regulated light intensity that irradiate tested image sensor and image processing system that analyse image generated by tested image sensor (camera core). Step spectral filtering is done using a set of narrow band filters. The light source can generate light in up to 16 spectral bands located in VIS-SWIR range(400-2500nm or more narrow band).

SOL enables measurement of a series of radiometric, photometric and spectral parameters. Radiometric parameters are: Noise Equivalent Irradiance, response function (responsivity, linearity, dynamic range), D^* (Normalized Detectivity), Quantum Efficiency, spatial noise. Photometric parameters are: Noise Equivalent Illuminance, response function. Radiometric parameters can be measured at any of narrow bands offered by light source of SOL station. In this way relative spectral sensitivity of tested imaging sensor can be measured too.

It is assumed that tested imaging sensor is integrated with control electronics (delivered by customer or third parties) that can generate output images in standard electronics formats like Camera Link, GigE, HD SDI, ect. Therefore practically SOL test station enables direct testing of camera cores sensitive in VIS-SWIR spectral bands.

HOW IS BUILT:

SOL system is a sum of two main blocks: 1)calibrated light source of step regulated wavelength and continuously regulated light intensity called SOLO, and 2) image processing system (PC, frame grabber, software) called PCFS system. Tested image sensor located at output of the SOLO light source called the Light plate. The sensor is uniformly irradiated with light of required wavelength and irradiance. Tested sensor generates images in one of standards of electronic imaging. The images are captured, analysed by PCFS system and important parameters of VIS-SWIR imaging sensors are determined.

SOLO light source is a sophisticated multi module device built from modules shown in Fig.1. All functions of SOLO light source are controlled from PC: powering of the IR halogen bulb, attenuator control, filter wheel control, and readout from two light meters.

It should be noted that on international market there are many variable wavelength light sources. However there are very few calibrated light sources of precisely regulated wavelength and light intensity. Therefore SOLO combined with PCFS system form an unique test system.

COMPARISON TO OTHER TEST STATIONS :

SOL test station is similar to SIT test station. Both stations are based on calibrated light source of regulated spectral band. However there is step regulation of wavelength in case of SOL (up to 16 spectral bands) when SIT enables continuous regulation of wavelength of emitted light. This continuous regulation of light intensity is an advantage of SIT station. However, higher dynamic of regulation of light intensity (possibility to measure sensor dynamic range and linearity) and ability to emit not only monochromatic light but also polychromatic light (possibility to measure photometric parameters) is an advantage of SOL station.

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SPECIFICATIONS

Parameter	Value
<i>SOLO light source</i>	calibrated light source of step regulated spectral band and continuously regulated light intensity
Type	light source of variable wavelength and light intensity
Diameter of the output light plate	≥ 24 mm
Non-uniformity (spatial intensity uncertainty)	2% (in central 20mm part)
Modes of work	1-broadband, 2-monochromatic
Calibration of light intensity	sensor illuminance [lx] or Sensor irradiance [$\mu\text{W}/\text{cm}^2$]
Type of light intensity regulation	continuous – using software
Light intensity stability	not worse 1.5%
<i>Broadband mode</i>	
Spectral band	at least 400 nm to 2500nm
Light spectrum	approximately 2850K color temperature light
Maximal illuminance	at least 10000 lx
Dynamic of regulation of light intensity	at least 100000 times (can be optionally extended)
<i>Monochromatic mode</i>	
Spectral band of regulated wavelength	400 nm to 2500nm
Number of spectral bands	up to 16 (including broadband 400 nm to 2500nm)
Center wavelengths of narrow bands	in 400 nm to 2500nm according to customer requirements
Width of monochromatic spectral bands	typically in 10-20nm but depends on customer requirements
Maximal irradiance level at sensor plane (for wavelengths in 450-2000nm band)	depends on wavelength and requirements width of used filters example: at least $70 \mu\text{W}/\text{cm}^2$ for 10nm width filter at 1000 nm wavelength
Regulation of active wavelength (narrow spectral band)	Step regulation using software
<i>IPS system</i>	
Acceptable formats of electronic images from tested sensor	CameraLink, GigE, HD SDI, HDMI (list can be extended)
Measured parameters	Broadband mode: Noise Equivalent Illuminance, response function (responsivity, linearity, dynamic range) Monochromatic mode: Noise Equivalent Irradiance, response function (responsivity, linearity, dynamic range), D^* (Normalized Detectivity), Quantum Efficiency, spatial noise, relative spectral sensitivity
<i>General parameters</i>	
Temperature range (work/storage)	+5°C to +35°C / -5°C to +55°C
Mass	119 x 40 x 24 cm
Dimensions	29.2kg

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SUMMARY

SOL test station is a perfect solution for testing imaging sensors sensitive in VIS-SWIR spectral bands (silicon/black silicon/ InGaAs sensors sensitive in spectral band from 400nm to 2500nm). It is a professional compact, user friendly test station optimized for high speed testing in contrast to typical stations built from a set of different modules located on an optical table that offer only slow and non convenient tests.

Version 1.2

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