

# SIWIR

## System for radiometric testing/calibration of SWIR imagers/cores



Fig. 1. Photos of the SIWIR150 system in two configurations: a) testing/calibration imagers, b) testing/calibration cores.

### 1 What is SIWIR?

Inframet offers a series of systems for testing SWIR imagers at different stages of life:

1. Systems for testing SWIR sensors/camera cores: VIT, SIT, SOL ([https://www.inframet.com/vis-swir\\_\\_fpas.htm](https://www.inframet.com/vis-swir__fpas.htm))
2. Systems for basic testing/calibration of SWIR imagers/cores at production stage: **SIWIR**,
3. Systems for expanded testing of complete SWIR imagers: ST, SINIS ([https://www.inframet.com/swir\\_imager-s.htm](https://www.inframet.com/swir_imager-s.htm))

### 2 Test capabilities

SIWIR enables two groups of tests: 1) tests/calibration of SWIR imagers (core and optics and mechanical case), 2) tests/calibration of SWIR camera cores (image sensor and control electronics). In both cases the list of measured parameters of calibration function is the same:

1. Two point NUC,
2. Measurement of noise/sensitivity parameters (noise equivalent radiance NER in case of imagers or noise equivalent irradiance NEI in case of camera cores),
3. Measurement of spatial noise (non uniformity, fixed pattern noise) – option,
4. Measurement of relative spectral sensitivity (simplified measurement at several wavelengths) – option.

### 3 How SIWIR is built?

SIWIR is a modular system built from following blocks: LS-SAL light source (different versions possible), RCB radiometric conversion block, PC set, frame grabber card, Light Control program, TAS program. SWIR can work in two configurations: a) testing/calibration imagers, b) testing/calibration cores. If tested imager is located at output of LS-SAL light source then the imager will see a large uniform light source of variable intensity that fills imager field of view. When LS-SAL light source is combined with RCB block then it is converted into an irradiator that can irradiate camera core located at output of the RCB block.

PC set, frame grabber card, Light Control program, TAS program form Image Capture and Analysis system ICAS. The systems is used to capture images from tested imager/core and calculate parameters of tested devices.

### 4 Recommended test procedures

Inframet recommends to follow this test procedures:

1. Measurement of NEI of camera core to verify potential sensor performance,
2. Two point NUC of total imager,
3. Measurement of NER of imager (to verify its performance)
4. Measurement of relative spectral sensitivity (option)
5. Measurement of residual spatial noise (option)

Inframet does not recommend two point NUC of camera cores due to limited value of such data. The spatial noise changes when camera core is integrated with the optics of the imager. Therefore the two point NUC operation must be repeated for imager. However, technically SIWIR station can be also used to carry out two point NUC of camera cores.

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### 5 Technical specifications

LS-SAL	Two versions: 1)LS-SAL50 or 2)LS-SAL-150 Technical data as in <a href="https://www.inframet.com/Data_sheets/LS-SAL.pdf">https://www.inframet.com/Data_sheets/LS-SAL.pdf</a>
RCB radiometric converter block	Irradiated area: at least 18mm diameter irradiance range: at least 1mlx to 600lx (halogen mode) at least 0.1mW/m <sup>2</sup> to 0.1W/m <sup>2</sup> at monochromatic 1550nm mode
PC set	Typical desktop PC
Frame grabber	User is to choose one (option two) frame grabber card (Camera Link, GigE , LVDS, HD-SDI/DVI/HDMI, HD-TVI/HD-CVI, CoaXPress, USB2.0, USB3.0, Ethernet)
Light Control program	Control of light intensity of LS-SAL light source
TAS program	Image capture and calculation of parameters of SWIR imagers/cores

### 6 Version of SIWIR

SIWIR is offered in two main versions: SWIR50 built using light source of 48 mm (approximately 50mm) aperture and SWIR150 built using light source of 150 mm aperture. SWIR50 is optimized for testing SWIR imager of FOV smaller than 15° circular projection area. SWIR150 is optimized for testing SWIR imagers of FOV smaller than 7° circular projection area. Inframet can also deliver optionally SIWIR90 s optimized for testing SWIR imager of FOV smaller than 10° circular projection area.

Inframet can also deliver SWIR100 built using light source of approximately 100mm aperture and of 10° circular angular projection area.

### 7 Options

#### Filters

SIWIR in basic version is offered using LS-SAL light source equipped with only one spectral filter: 1550nm filter.

Optional versions: SAL50-up to 4 filters manually exchanged (typical set: 900nm, 1100nm, 1300nm, 1550nm)

SAL150-up to 8 filters – motorized exchange (typical set 900nm, 1000nm, 1100nm, 1200nm, 1300nm, 1400nm, 1550nm, 1600nm). When this optional solution is chosen then relative spectral sensitivity of imagers/cores can be measured.

Please add FilterX (X filter number) to code of SIWIR.

#### Limited version

Some customers have already frame grabbers and software for capturing and analysis video generated by tested SWIR imagers/cores. Therefore for such cases Inframet offers limited cheaper version of SIWIR without Image Capture and Analysis system ICAS.

Please add X letter to code of SIWIR.

Version 2.2

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