VINIS

System for basic tests of VIS-NIR cameras

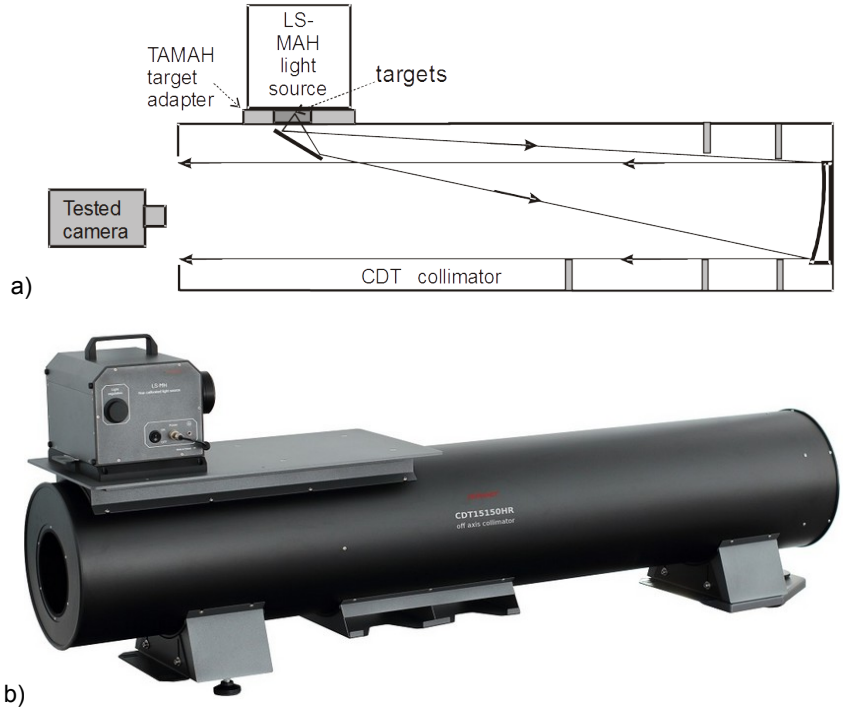

Fig. 1. VINIS test system:: a)block diagram, b)photo of VINIS150

1 BASIC INFORMATION

For over a decade Inframet offers TVT systems as ultra advanced test systems for testing surveillance VIS-NIR cameras (CCD/CMOS/ICCD/EBCCD/EBAPS, etc). These systems built as completed test systems in form of computerized image projectors and PC set with software enable measurement of all important parameters of VIS-NIR cameras and are capable to simulate any illumination condition on Earth. Next, TVT have already proved their value in a series of top world laboratories by accurate testing VIS-NIR cameras for long range surveillance or for space missions. However, TVT systems are characterized by one drawback: high price due to use of ultra advanced computerized multi-channel calibrated light sources (coded as LS-DAL light source) and high value of workload to develop test software.

VINIS system can be treated as a cost effective solution for testing VIS-NIR cameras. It is based on manual halogen light source coded as LS-MAH (non calibrated in basic version) in contrast to computerized calibrated DAL light source. Next, targets are manually inserted when in TVT system targets are automatically exchanged using MRW-8 rotary wheel. Finally, VINIS is typically delivered as an image projector without PC and test software (it is assumed that these blocks are delivered by customer if needed). All these changes in design have enabled significant price reduction comparing to typical TVT test system.

VINIS can be also optionally delivered in version capable to do boresight of small laser range finders to a reference optical axis of VIS-NIR camera.

2 HOW IS BUILT?

VINIS system is built from following blocks: CDT collimator (three models of different aperture and different focal length are offered), LS-MAH light source (offered in a series of versions), TAMAH target adapter to enable manual insertion of test targets, Set of targets, Set of spectral filters (option), laser sensing card (option).

3 TECHNICAL PARAMETERS

3.1 Collimator

VINIS is typically built using one of four collimators: CDT660HR, CDT11100HR, CDT12100HR, CDT15150HR. VINIS built using CDT11100HR is coded as VINIS110, and VINIS built using CDT15150HR is coded as VINIS150.

Table 1. Parameters of CDT collimators.

	VINIS60	VINIS110	VINIS120	VINIS150
Parameter	CDT660HR	CDT11100HR	CDT12100HR	CDT15150
Aperture	60mm	110mm	120mm	150 mm
Focal length	600 mm	1000 mm	1000 mm	1500 mm
Collimator resolution	60 lp/mrad	110 lp/mrad	115 lp/mrad	130 lp/mrad

Detail parameter of CDT collimators are shown in data sheet https://www.inframet.com/Data%20sheets/CDT.pdf

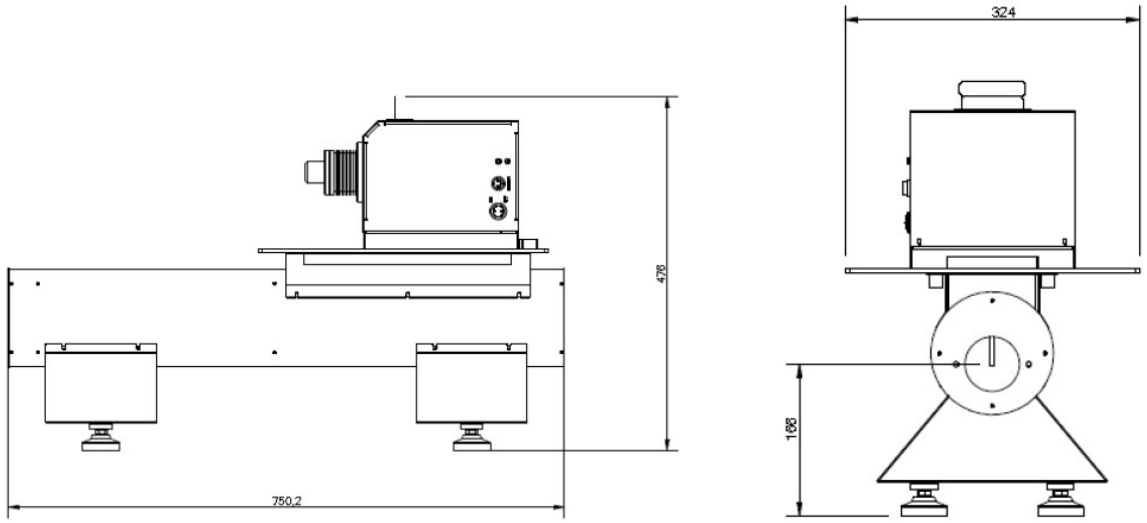

Fig. 2. VINIS60 test system dimensions

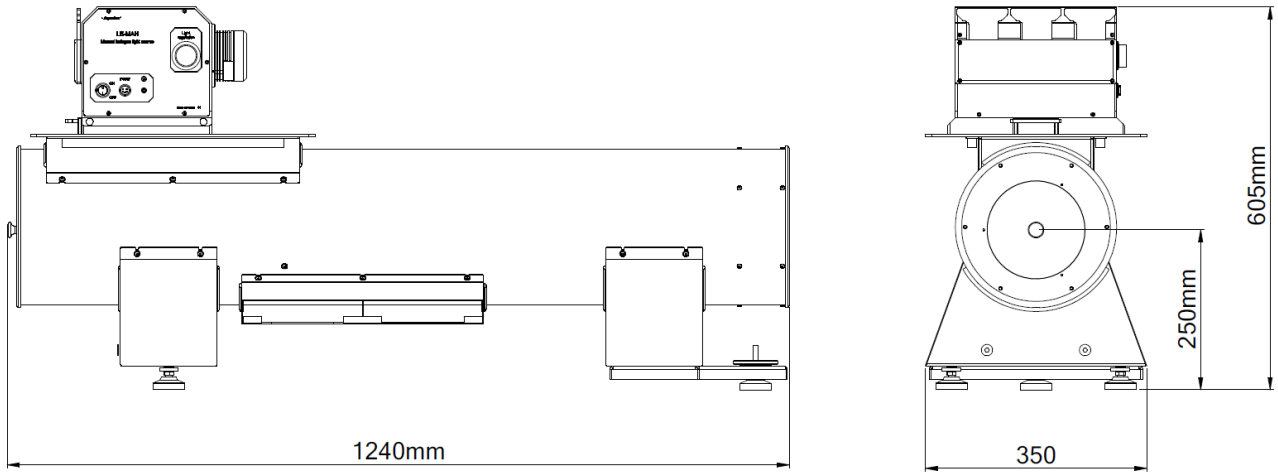

Fig. 3. VINIS110 test system dimensions

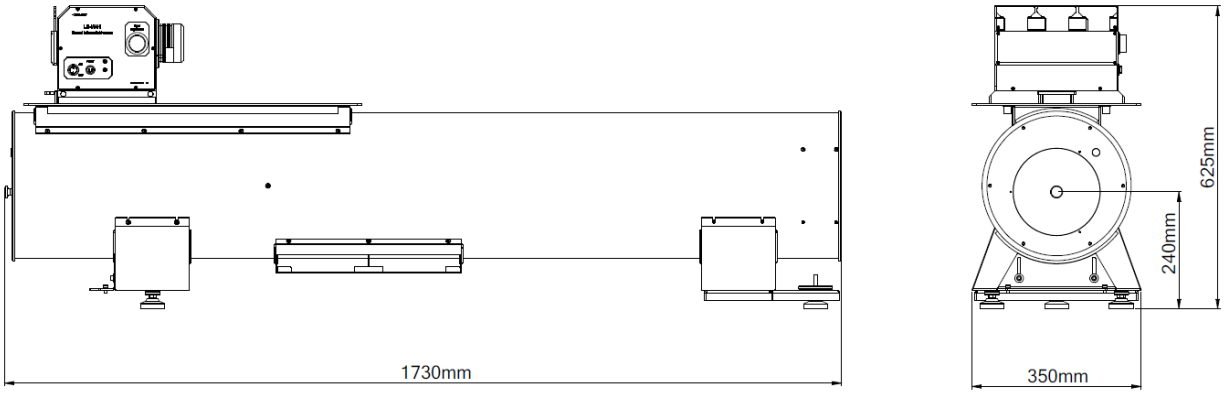

Fig. 4. VINIS150 test system dimensions

3.2 Light source

Table 2. Parameters of LS-MAH light source

Parameter	Value
Light emission source	Halogen bulb
Light source diameter	40 mm
Spectral band	At least 400nm to 2000nm
Light spectrum	Light of 2856K color temperature in spectral band from 400nm to 1100nm (typical spectrum as in Fig.3)
Method of regulation of light intensity	Manual rotation of a knob that controls opto-mechanical attenuator
Range of regulation of light intensity of the light emitter	At least 60 mcd/m^2 to 6 kcd/m^2 - basic version
Method of regulation of light spectrum	Manual insertion of bandpass or narrow band filters (only in advanced versions)
Total dynamic of light source	At least 10^5 - basic version
Emission angle	Lambertian source at angles up to 15°
Calibration	Basic version: non calibrated
Work temperature	+5°C to +35°C
Storage temperature	-5°C to +55°C
Humidity	Up to 90% (non condensing)
Dimensions	280x260x230
Mass	8 kg

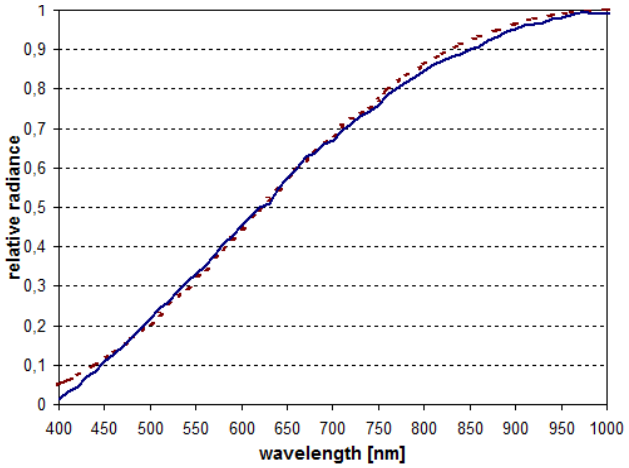

Fig.3. Spectrum of light emitted by LS-MAH source (continuous – real spectrum, dots – ideal 2856K source)

3.3 TAMAH target adapter

Mechanical adapter to enable manual insertion of a test target at collimator focal plane.

3.4 Set of test targets

VINIS is typically offered with a single positive 100% contrast USAF 1951 resolution target (groups from 0 to 6). Number of targets can be optionally expanded.

4 OPTIONS

VINIS is typically offered in 3 versions based on three collimators: CDT660HR collimator, CDT11100HR collimator, CDT15150HR collimator. However, different collimators can be offered too. Other options as below:

4.1 Rotary wheel

A1. TAMAH target adapter to enable manual insertion of test targets is replaced by MRW-8 rotary wheel that can be controlled using external electronic controller https://www.inframet.com/Data_sheets/MRW8.pdf.

4.2 Calibration in photometric units:

B1. External luminance meter that measures absolute value of emitter luminance in cd/m^2 units. Additional meter is delivered. Internal electronics is modified.

B2. LS-MAH communicates with PC. Software can be used to read and display current light luminance. Internal electronics is modified. PC with proper software to communicate with LS-MAH is delivered.

4.3 Light spectrum

C1.Modified design of LS-MAS source enables regulation of light spectrum using manually inserted set of three band pass filters: visible only, NIR and SWIR only, SWIR only.

C2. Modified design enables regulation of light spectrum using manually inserted set of three band pass filters (visible only, NIR and SWIR only, SWIR only) and a set of eight narrow band filters of 10nm spectral bands. Center wavelengths: 400nm, 500nm, 600nm, 700nm, 800nm, 900nm, 1000nm. Bigger number of filters or other wavelengths are possible.

C3. As in B2 but spectral radiance in W/m^2 sr µm units can be measured and absolute value is displayed by software. Attention: B3 option is possible only if A2 option is chosen, too.

4.4 Test targets

D1. Set of five variable contrast USAF1951 targets is delivered.

D2. Additional targets for MTF measurements are delivered: slanted edge and slanted L shape target.

D3. Set of 3 pinhole targets is delivered.

4.5 Light regulation dynamic

E1. Light regulation dynamic is increased to 10^7. It means that luminance can be regulated in range at least from 0.06 mcd/m^2 to 6 kcd/m^2 and LS-MAH can be used to simulate dark night conditions.

4.6 Boresight of laser systems

VINIS can be also optionally delivered in version capable to do boresight of laser range finders/pointers to a reference optical axis of VIS-NIR camera using additional boresight tools.
L1 - boresight of multi pulse LRFs (operating at 1550nm and 910nm bands) and laser pointers. In this option following modules are delivered: FOS laser sensing card, SOA set of optical attenuators. The FOS card generates visible image of laser spot created by tested LRF operating 1550nm band at collimator focal plane that is visible to tested VIS-NIR camera. SOA enable attenuation of light emitted by 910nm LRFs or laser pointers to level suitable for tested VIS-NIR camera.
L2 - boresight of of both multi pulse LRFs and mono pulse LRFs (operating at 1550nm, 1064nm or 910nm bands) . Additional set of MON, MOG laser sensing cards is deliverd.
Attention:

1. multi pulse LRFs - are devices that emit a series of low energy pulses in order to make distance measurement.
2. mono pulse LRFs - are devices that emit a single high energy pulse in order to make distance measurement.

Boresight of laser system (LRFs, pointers, designators) is very simple. Tested VIS camera should be aligned in way when its aiming mark indicate roughly center of laser sensing card located at collimator focal plane. Then the LRF shoots and generated laser spot that is visible for the VIS camera. If center of the laser spot is the same as location of aimiming markt then it means that VIS camera is perfectly aligned with transmitter of LRF. If there is noticeable difference then there is non perfect alignment between VIS camera and LRF.
If low power multi pulse LRFs are tested then FOS laser card is used. If high power mono pulse LRFs are tested then MON/MOG laser cards, and SOA optical attenuators are used. CDT collimator is also modified to withstand high power pulses.

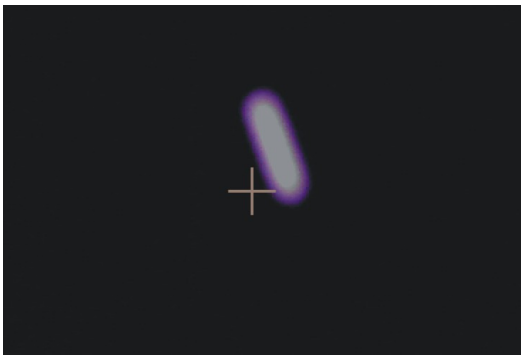

Fig.4. Image of laser spot created by multi pulse LRF working at 1550nm band created by VIS camera of narrow FOV

5 SYSTEM CODING

If option is interesting then please add option code.

VINIS110A1B2C3 means system built using colllimator of 110 aperture and with options A1,B2 and C3.

VINIS120L1 means system built using colllimator of 120 aperture with option L1

SUMMARY

VINIS test system is a near perfect solution for a moderate cost system for basic tests of VIS-NIR cameras. Due to high dynamic of its light source this test system can simulate both day and night condition. The system can be delivered in a series of versions of different configurations.

Data sheet v.1.5

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