

SIPEK

Dynamic target simulator



Fig. 1. Photo of SIPEK simulator

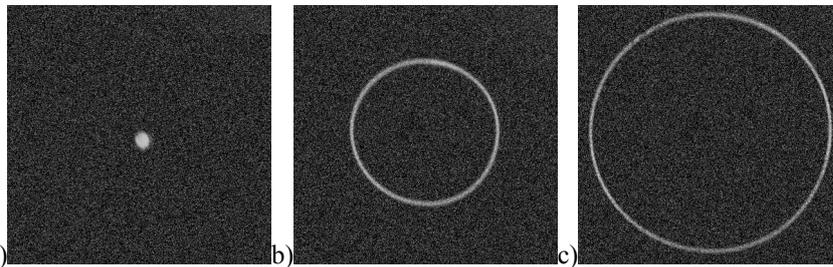


Fig. 2. Exemplary simulated scenario: a) target at 0' position, b) projected pinhole target spin radius = 25', c) projected pinhole target spin radius = 50'

1 Basic information

SIPEK is a dynamic target simulator, in infrared spectral range, capable to projects the image pinhole target that can spin along a circle of regulated radius. In other words, SIPEK projects into direction of tested EO system an image of a circle of variable diameter. From designer point of view, Sipek project image of point target reflected by a slanted rotating mirror. The target is located at uniform background.

SIPEK is a general purpose simulator. It can be used for both for astronomy applications (simulation of dynamic astronomical objects), military applications (testing IR missile seeker), scientific applications (evaluation of detection of small size source that radiate in different bands of optical radiation).

In contrast to the modern military type infrared scene image projectors. SIPEK enables simulation of only relatively simple scenarios: simple shape target on an uniform background. However, SIPEK offers precision regulation of angular diameter of a circle image, radiance intensity and spectrum of simulated targets. These regulations are important in both civilian scientific applications and boresighting of optics/sensor of some IR seekers.

2 Main blocks

SIPEK simulator is built from seven main blocks: 1) set of IR source, 2) spectral filters, 3) set of targets, 4) optical modulator, 5) collimating mirror, 6) rotating mirror 7) controller. However, the first six modules are integrated on one common bench.

3 Technical specifications

SIPEK can be delivered in a series of different versions depending on customer preferences. Below presented parameter of basic version of SIPEK simulator.

Table 1.

FUNCTIONS	DESCRIPTION
Typical tested IR system	
Maximal aperture of optics of tested IR	70 [mm]
Typical spectral bands	Dual spectral band system (typical: SWIR band and MWIR band) option: SWIR band, MWIR band and VIS+SWIR band
General parameters	
Simulated scenario	semi-dynamic image of circle targets
Type of background	uniform
Target movement trajectory	spin along variable angle radius
Field of projection	Circle of regulated diameter in range 0 to 90' (arc minutes)

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Radiation source that irradiates target	1. BMIM blackbody of fixed temperature (option: regulated temperature) 2. HIR 1900 Infrared source
BMIM blackbody parameters	
Spectral band of radiation	1.1-8 μm
Temperature of the BMIM blackbody	300°C (option: regulated from 150°C to 550°C)
Irradiance at simulator exit at MWIR band due to the simulated target	about 15 nW/cm ² for target 0.3 mrad about 150 nW/cm ² for target 1 mrad (option: a set of neutral filters to reduce of irradiance level; optionally regulation in range 5 – 700 nW/cm ² for option of regulated temperature of blackbody)
HIR 1900 IR source parameters	
Spectral band of radiation	0.4-5.5 μm
Color temperature of the HIR 1900 IR source	1900 K (in SWIR band)
Irradiance at simulator exit at SWIR + MWIR band due to the simulated target	about 340 nW/cm ² for target 0.3 mrad about 3000 nW/cm ² for target 1 mrad (option: a set of neutral filters to reduce of irradiance level)
Target parameters	
Shape of targets	pinhole
Angular size of the target	step regulation: 0.3 mrad and 1 mrad
Target selection mechanism	manual
Coincidence of pinholes	not higher than 1'
RM module - Rotating mirror block parameters	
Rotation speed	100 \pm 1Hz
Long term stabilization of rotation speed	0.5 Hz
Angular position	adjustable in range 0' to 90'
Resolution of angular position	1'
Diameter of rotating circle image at 0 position	Not higher that 3'
OM Optical Modulator parameters	
Modulator frequency	1200 \pm 20Hz
Long term stabilization of modulator frequency	10Hz
Environmental parameters	
Working ambient temperature	+10°C to +30°C
Storage ambient temperature	-5°C to +55°C
Maximal acceptable humidity	Up to 90% (non condensing)
Geometric parameters	
Dimension	WxHxL (450x300x1120 mm)
Mass	< 85 kg

4 Options

Inframet can optionally deliver also SIPEK simulator of expanded simulation capabilities:

1. Maximal irradiance for BMIM blackbody can increased at least up to to 700 nW/cm² at system output at blackbody temperature 300°C (basic version 150 nW/cm²).
2. Temperature of BMIM blackbody can be regulated up to 550°C (basic version - fixed to 300°C).
3. Rotation speed of RM Rotating mirror can be changed according to customer requirements (maximum value is 100Hz)
4. Additional spectral filters for IR sources: SWIR only (0.9 – 2.7 μm), VIS + SWIR (0.4 – 3.5 μm), SWIR + MWIR type 1 (0.4 – 5.5 μm), SWIR + MWIR type 2 (1.2 – 9 μm). Other spectral bands on request.

Version 2.1

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