

SIM790

Dynamic target simulator



Fig. 1. Photo of SIM790 simulator

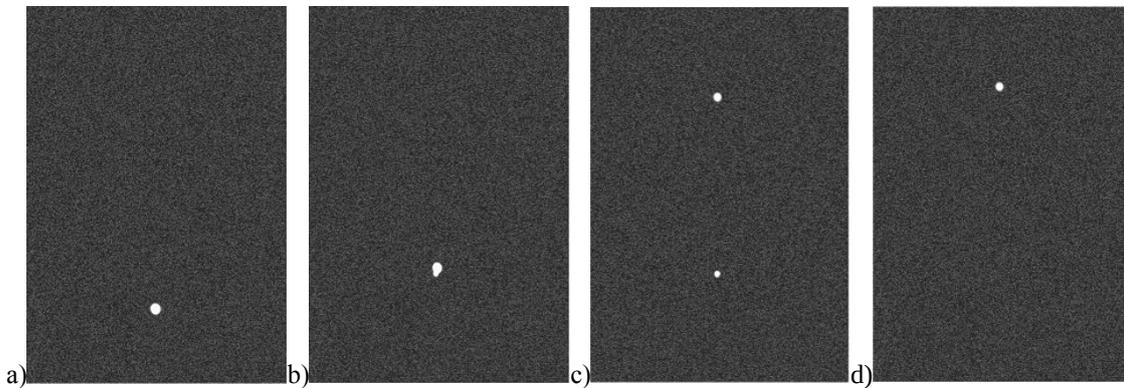


Fig. 2. Exemplary simulated scenario: dynamic primary target ejecting secondary static target

1 Basic information

SIM790 is a dynamic target simulator capable to projects simplified images of dynamic space/airborne targets (astronomical objects, aircraft, helicopters, decoys etc.) in infrared spectral range.

In detail, SIM790 projects into direction of tested EO system a fused image combined from two sub-images:

1. image of a spatially dynamic simulated target of variable angular size and variable radiation intensity,
 2. image of a spatially static simulated secondary targets of variable angular size and constant radiation intensity.
- Switching ON/OFF of this target is time-controlled and can be precisely determined in relation to movement of primary target

Both images are presented on a uniform background.

SIM790 is a general purpose simulator. It can be used for both for astronomy applications (simulation of dynamic astronomical objects), military applications (simulation of aircraft/helicopter ejecting decoys), 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, SIM790 enables simulation of only relatively simple scenarios: several static/dynamic targets on an uniform background. However, SIM790 offers precision regulation of both radiance intensity and spectrum of simulated targets important in many scientific applications. In addition, price of SIM790 is modest comparing to infrared scene projectors.

2 Main blocks

SIM790 simulator is built from five main blocks: 1) secondary image generator, 2) primary image generator, 3) dual image projector, 4) image combiner, 5) PC/software. The primary/secondary image generators and the image combiner block are integrated with the dual image projector. Therefore from mechanical point of view SIM790 is delivered as a set of two blocks: base block and PC/software.

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3 Technical specifications

SIM790 can be delivered in a series of different versions depending on customer preferences. Below presented parameter of basic version of SIM790 simulator.

Table 1.

FUNCTIONS	DESCRIPTION
Typical tested IR system	
Maximal aperture of optics of tested IR	90 [mm]
Type	dual spectral (typical: MWIR primary target, SWIR+MWIR secondary target; option: multispectral)
Height of optical axis of tested IR system	no more than 130 mm
Typical spectral bands	Dual spectral band system (typical: SWIR band and MWIR band) option: SWIR band and LWIR band
General parameters	
Simulated scenario	dynamic simulated target ejecting static simulated secondary targets in form of pinhole
Type of background	uniform
Direction of movement of the primary target	vertically up/down
Field of projection	Image of simulated scenery of at least $\pm 6,5^\circ$
Spectral band of radiation emitted by simulated targets	primary target: 1.1-8 μm secondary target: 0.4-5.6 μm
Primary channel	
Shape of the primary target	pinhole
Angular size of the primary target	step regulation: 1 mrad and 1.4 mrad
Radiation source that irradiates primary target	blackbody of fixed temperature (option: regulated temperature)
Temperature of the blackbody	300°C (option: regulated from 150°C to 550°C)
Irradiance at simulator exit at MWIR band due to the simulated primary target	about 80 nW/cm ² for target 1 mrad about 150 nW/cm ² for target 1.4 mrad (option: a set of neutral filters to reduce of irradiance level; optionally regulation in range 30 – 800 nW/cm ² for option of regulated temperature of blackbody)
Angular position of the primary target	- moving along vertical line at $\pm 6,5^\circ$ FOV - horizontal direction 0° FOV
Resolution of angular position of primary target	0.1°
Average angular speed of moving primary target	adjustable in the range of 0,2 %/s to 9,2 %/s
Resolution of angular speed of moving primary target	0,1%/s
Time of pause for changing direction of movement	Not longer than 200ms
Acceleration and deceleration time of moving primary target	Not longer than 80ms
Secondary target	
Shape of simulated secondary targets	pinhole
Angular size of the primary target	step regulation: 0.7 mrad; 0.5 mrad and 0.3 mrad
Radiation source that irradiates secondary target	HIR1500 infrared lamp
Color temperature of the radiation source	1500 K
Irradiance at simulator exit at SWIR + MWIR band due to the single pinhole of simulated secondary target	about 40 nW/cm ² for target 0.3 mrad about 70 nW/cm ² for target 0.5 mrad about 150 nW/cm ² for target 0.7 mrad
Ration of radiance of secondary target at SWIR band to radiance at MWIR band	Fixed – about 0.7 (option: regulated in range from about 0.25 up to about 2)
Angular position of secondary target	H = 0°; V = +0.5° (non regulated)
Switching ON/OFF of secondary target	Time-controlled, synchronized with the primary target

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Boresight parameters	
Aligning error of images projected by both channels	not worse than 0.25 [mrad]
Environmental parameters	
Working ambient temperature	+5°C to +35°C
Storage ambient temperature	-5°C to +55°C
Maximal acceptable humidity	Up to 90% (non condensing)
Geometric parameters	
Dimension	WxHxL (240x560x920 mm)
Mass	< 85 kg

4 Options

Inframet can optionally deliver also SIM790 simulator of expanded simulation capabilities:

1. Maximal irradiance at channel 1 can be increased at least up to 800 nW/cm² at system output at blackbody temperature 300°C (basic version 150 nW/cm²).
2. Temperature of the primary target can be regulated up to 550°C (basic version - fixed to 300°C).
3. Color ratio SWIR/MWIR of simulated secondary targets can be regulated in range from about 0.25 up to about 2 (at present this ratio is fixed about 0.7).
4. Simulated scenarios can be more sophisticated. At present secondary targets in form of one pinhole. Option: secondary targets in form of three or five pinholes.

Version 2.1

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