DTR system

Refractive image projector

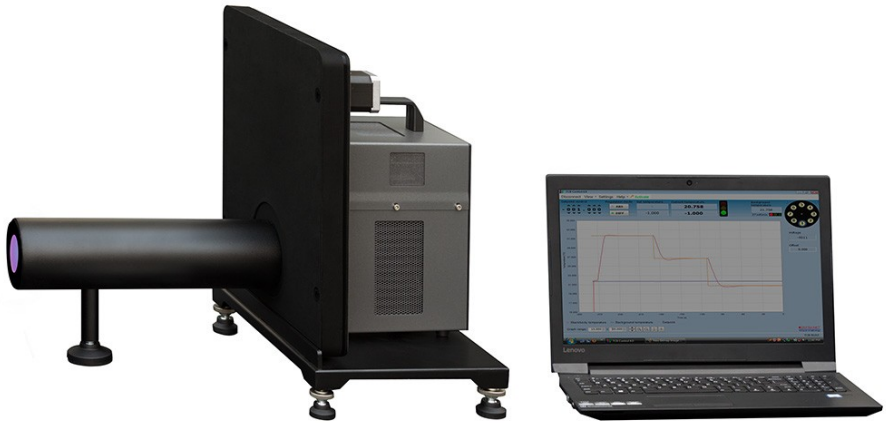

Fig. 1. Photo of DTR test system

BASIC INFORMATION:

DTR can be treated as a special version of classical DT system. Both systems work as variable target projectors that use a series of reference targets to project their images to a tested thermal imager. The tested imager generates electronic copies of the projected optical images. Quality of these electronic images generated by the imager is evaluated directly by humans or by software and important characteristics of tested imager are measured.

Classical DT systems are built using reflective collimators of relatively long focal length and big aperture when DTR system is built using a refractive collimator of relatively short focal length and small aperture. Therefore the same infrared reference target projected by DTR system will be perceived by tested imager as much large target comparing to situation when the same imager sees this target projected by a DT system. Mathematically it means that DTR systems can project images of 4-bar targets of spatial frequency several times lower than typical DT system.

TESTED IMAGER

DTR system is optimized for testing low resolution thermal imagers of wide FOV (over 20º) for typical 640x480 sensors). Effective aperture of objective of tested imager should not be higher than 20mm (front optics diameter can be higher). Nyquist spatial frequency (equal to 1/2 IFOV) of tested thermal imager is expected to be in range from 0.03lp/mrad to 0.6 lp/mrad. This range can be modified if optional collimators are used.

DESIGN STRUCTURE

1. CROL430 refractive collimator (two versions depending on spectral band of tested thermal imager)
2. TCB-2D differential blackbody (reference radiation source)
3. MRW-8 motorized rotary wheel (optimized for a set of eight targets)
4. RP45 rotating platform (for positioning tested imager)
5. Set of IR targets (number and type depend on version)
6. Standard analog video frame grabber (for capturing images of resolution/frame rate not higher than typical TV signal)
7. Optional digital frame grabber (for capturing images of high resolution/frame rate)
8. PC set - typical PC set working under Windows 7/10 operating system (laptop or desktop PC are delivered depending on version)
9. Industrial monitor with analog video input
10. TCB Control - computer program used for control of TCB blackbody and MRW wheel
11. SUB-T program - computer program that offers software support during measurement of subjective parameters like MRTD, MDTD (and TOD - option)
12. TAS-T - computer program used for semi-automatic measurement of a series of objective parameters of thermal imagers: MTF, SiTF, NETD, FPN, non uniformity, distortion, FOV, AutoMRTD, PVF, SRF, ATF, NPSD, 3D noise. Program is delivered in different versions of different test capabilities.

DTR system

Refractive image projector

BASIC TECHNICAL DATA

RCOL430 collimator	
Models	RCOL 430L or RCOL430M
Collimator type	refractive
Aperture	40mm
Focal length	300mm
Spectral range	8-14 µm (RCOL430L) or 3-5 µm (RCOL430M)
Spatial resolution	> 3 lp/mrad (on axis)
Transmission	> 93%
Field of view	8º
Mass /size	2kg/300x150x75mm

TCB-2D blackbody	
Aperture	50 x 50 mm
Absolute temperature range	0ºC ÷ +100ºC at 20ºC ambient temp.
Differential temperature range	-20ºC ÷ +80ºC
Emissivity	0.98 ± 0.005
Temperature uniformity	<0.01ºC or 0.4% |T-Tamb|
Set point and resolution	1 mK
Regulation stability	±2 mK @ ΔT=10ºC
Total temperature uncertainty [ºC]	0.001 x |T-Tamb| + 0.01 [ºC]
Settling time	< 30s
Computer control	USB 2.0
Power supply	115-230VAC 50/60Hz

Operating / storage temperature	+5ºC ÷ +45ºC / -10ºC ÷ +60ºC

RP45 rotating platform	
Rotation range	At least up to 90º

MRW-8 rotary wheel	
Number of holes for targets	8
Control type	motorized, digital
Wheel emissivity	0.97 ± 0.01

Targets	
Diameter	54 mm (for wheel holes)
Emissivity	0.97 ± 0.01
Type	4-bar, edge, cross (number and type depends on version)

Computing system	
PC	Typical modern PC set
Frame grabber no 1	Dynamic 8-bit, SNR>256 Input signal formats - PAL, NTSC
Frame grabber no 2	One of interfaces: CL, GigE, LVDS, HD-SDI, HDMI
TCB Control program	Control of blackbody and rotary wheel
SUB-T program	Computer support in MRTD measurement
TAS program	Measurement support of MTF, SiTF, NETD, FPN, non-uniformity, distortion, FOV, Auto MRTD, SRF, ATF, PVF , NPSD, AutoMRTD, 3D Noise
Industrial monitor	Input: analog video, area at leat 17”

DTR system

Refractive image projector

VERSIONS

DTR test systems are modular test systems that can be delivered in form of different versions of different configurations, test capabilities and price. In order to select version we need to determine:

1. Spectral band of the collimator,
2. Frame grabbers (acceptable electronic image formats of tested imagers)
3. Test range of thermal imagers (number of parameters to be measured)

Table 1. Definitions of the three letter code used to describe versions of DTR test system

	1	2	3
Code	**Spectral band**	**Frame grabbers**	**Measured parameters**
A	LWIR 8-14 µm	No frame grabber	Basic: MRTD
B	MWIR 3-5 µm	Standard analog video (PAL/NTSC)	Typical: MRTD, MTF, SiTF, NETD, FPN, non-uniformity, FOV
C		Additional software accepting USB 2.0/3.0	Advanced: as in 3c but also: Response function, 3DNoise, NPSD, Bad pixels, PVF, SRF, ATF, SNR, MDTD, Auto-MRTD
D		Additional frame grabber: CL, GigE, LVDS, HD-SDI, HDMI	

The code DTR-ABB means DTR system of following features:

1. Spectral band: LWIR 8-14 um
2. Acceptable electronic interface: Standard analog video (PAL/NTSC)
3. Test capabilities: MRTD, MTF, SiTF, NETD, FPN, non-uniformity, FOV

Version 1.5

CONTACT:

Tel: +48 22 6668780 Fax: +48 22 3987244 Email: info@inframet.com