LTF

Performance tester of laser range finders

BASIC INFORMATION

Final performance tests of laser range finders are typically done at field conditions. In detail the user shoots the LRF into direction of a reference target (of specified angular size and reflectance) located at some distance (typically about 0.5-1.5 km), attenuates radiation emitted by the LRF using a set of attenuators and checks at what attenuation level the LRF stops giving proper distance indications. The maximal attenuation (in dB) when tested LRF is still capable to work properly is called Extinction Ratio and considered as most important performance parameter of LRFs (attention: different manufacturers/scientific centers use slightly different test methodology). If tests are done for a small target then boresight errors (alignment error between transmitter and aiming; alignment error between receiver and aiming) can be checked too. Finally, if tests are carried out for several small targets of short distance difference then additionally distance discrimination is measured.

LTF station is a compact, mobile test station based on a concept of a test station that would imitate performance field tests of LRFs in laboratory/depot conditions and eliminates several drawbacks of field tests: long time duration, high costs and variable results due to unpredictable behavior of atmosphere.

Design of LTF is based on a concept of a test station that transmits a light pulse generated by the transmitter of tested LRF through a long fiber optics line of regulated attenuation and finally emits a small fraction of incoming light into direction of a receiver of tested LRF. Maximal attenuation of fiber loop when tested LRF indicate proper distance of fiber loop is good indicator of operational range of this LRF.

The design concept of fiber loop appears to be very simple to implement. Practically design of LTF station is sophisticated due to necessity to design a special calibrated fiber loop of fixed distance but of regulated angular size of input, regulated angular size of output, and regulated attenuation at several wavelengths where LRFs operate.

LTF is targeted as an advanced performance tester capable to measure ER extinction ratio. However, it can be also used as a simple Yes/No performance tester.

Features

1. LTF simulates real field tests conditions. User sees a small bright square target and shoots to it.
2. Measured parameters: ER extinction ratio (indirect measurement of operational ranger), distance discrimination (option)
3. Checking of boresight errors and divergence angle
4. Ability to test both monopulse LRFs and multipulse LRFs
5. LRFs working at all typical wavelengths can be tested: 905/910 nm, 1060nm, 1540nm, 1550nm, 1570nm.
6. Ability to simulate six targets of different angular size (from 0.25 mrad to 4 mrad).
7. Fully computerized test system. Target size, system attenuation can be controlled from PC.
8. Ability to test laser range finder equipped with night vision channel.
9. Enables testing typical dual channel LRFs with internal aiming channel or external aiming channel located close to receiver/transmitter. Other types of LRFs can be optionally tested, too.

INFRAMET

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TECHNICAL SPECIFICATION

Parameter	Value
Spectral range	700-1700nm
Calibrated wavelengths	Typical: 1060nm, 1550 band (1540, 1550, 15570), 910 nm
Number of simulated targets	One (option up to three)
Simulated target distance	About 1200 m
Regulated attenuation range	At least 40dB
Attenuation regulation method	Motorized, PC control
Max target size	4 mrad
Minimal target size	0.25 mrad
Regulation of target size	Step regulation, five values
Control of target size	Motorized, PC control
Ability to simulate boresight errors	Yes, simulation of non parallel axis of transmitter and receiver
Max acceptable diameter of transmitter optics	50 mm (models with bigger optics can be delivered)
Max acceptable diameter of receiver optics	50mm (models with bigger optics can be delivered)
Design optimization	Testing LRFs having two separate channels (LRFs having coaxial optics can be optionally tested)
Location of tested LRF relative to test station	LTF optics should overlaps optics of tested LRF
Work temperature range	5°C to 40°C
Storage temperature range	-5°C to 60°C
Humidity range	up to 95% (non condensing)
Voltage power	AC 110-230 V
Dimensions	1360x 320x280 (main module) plus typical PC dimensions
Mass	44 kg

Requirements on tested LRFs

From the point of optics the laser range finders can be divided onto several groups:

A) Dual channel LRFs with integrated aiming (two separate optical channels and aiming system integrated with transmitter or receiver. The channels are located at very short distance from one to another.
B) Three channel LRFs having channels at short distance from each other. Aiming device is a separate optical channel.
C) Dual channel LRFs with additional aiming channels (optical sight/video camera) located at significant distance from LRF optics,
D) Single channel LRFs built using using coaxial optics solution (receiver is integrated with transmitter (and sometimes also with a video camera as aiming device) in one optical system)
E) LRFs using an external thermal imager as an aiming device.

Typical LTF test station is built using two separate optical channels. Diameter of optics in both optical channels is 70mm. It is typically required that optics of the LTF station should at least partially overlap the optics of the tested LRF (Fig.1). It means that situation shown in Fig 1a is preferable but situation shown in Fig.1b is still acceptable.

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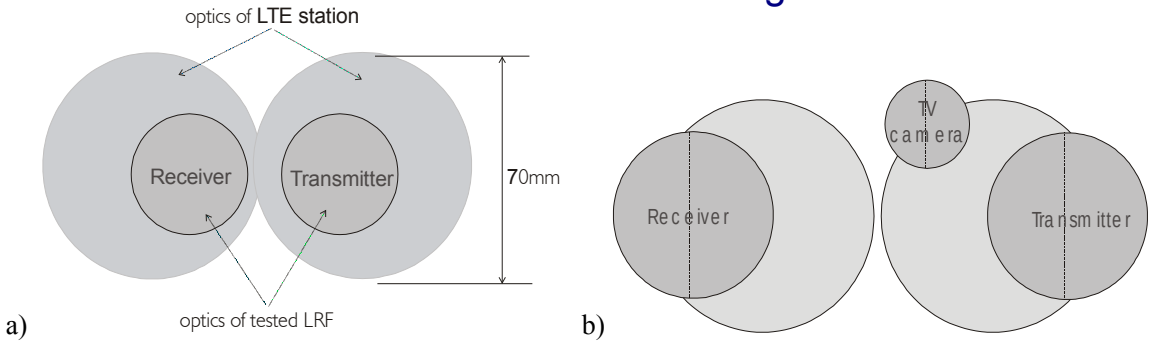

Fig. 1. Optics of tested LRF relative to optics of LTF test station a)optics of LTF test station fully overlaps optics of LTF test station overlaps only partially optics of tested LRF

Design of LTF station is optimized for testing of LRFs from groups A and B. Such LRFs represent at least 99% of all hi-tech LRFs.
LRFs from group C can be optionally tested using a special version of LTF station with third additional channel.
LRFs from group D can be optionally tested using a special version equipped with additional adapters. Detail information about active aperture of coaxial optics is needed.
LRFs from group E cannot be tested at all because optics of LTF station is non transparent for thermal imagers. A test station of different optical designed can be delivered.

Options

Several options are offered:

1. Additional mechanical platform for tested LRFs to allow precision angular positioning of tested LRF
2. Additional HEC camera to replace human operator and increase accuracy of angular positioning of tested LRF.
3. Additional external aiming channel in form of RTP reference target projector to enable testing LRFs having an VIS-NIR aiming channel (optical sight, VIS-NIR camera) at some distance from LRF receiver/transmitter optics of LRF to enable testing dual channel LRFs with additional external aiming channel (optical sight/video camera) located at significant distance from LRF optics,
4. Additional adapters to enable testing single channel LRFs built using using coaxial optics solution,
5. Additional external aiming channel in form of TTP thermal target projector to enable testing LRFs having an thermal sight at some distance from LRF receiver/transmitter optics of LRF
6. Measurement of distance discrimination by simulation of two targets at slightly different distance (distance difference can be defined by customer),
7. AT716 optical table optimized for LTF station

Coding: Number of interesting option should be added to the station code. LTF-124 means that LTF station with options 1,2 and 4 is to be delivered.

Summary

LTF test station is an efficient, user friendly and compact test station for final performance evaluation of modern LRFs. The station is mostly used by maintenance centers of LRFs but can be also an useful tool for manufacturers and scientific institutes.

Version 3.2

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