

VEMS

System for testing vehicle mounted EO imaging/laser systems

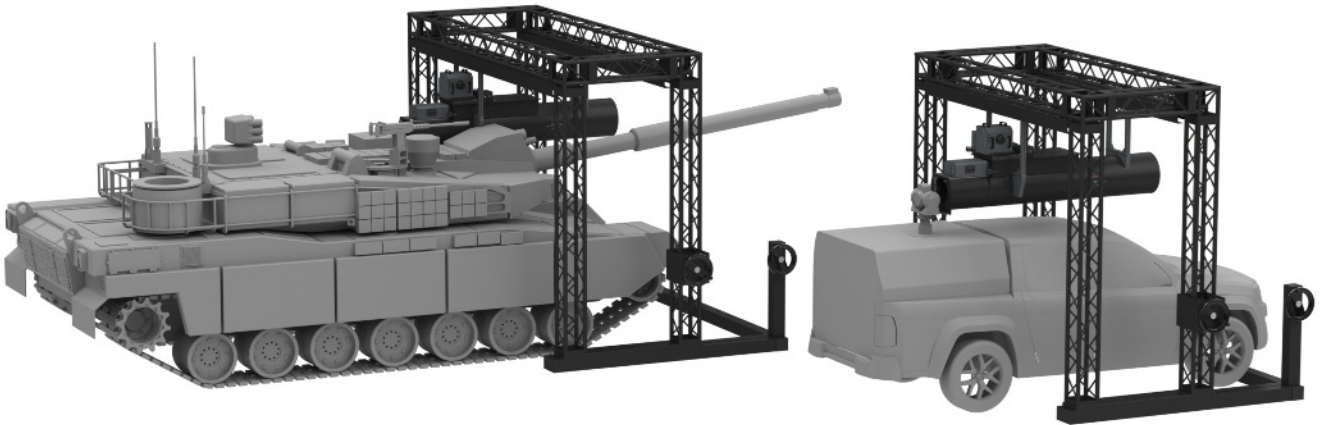


Fig. 1. View of two VEMS systems

1 Introduction

Majority of electro-optical imaging/laser systems (multi-sensor imaging/laser systems) used for surveillance applications are small size/mass portable systems. Due to small mass/size they can be easily delivered for testing at laboratory/workshop conditions. However, significant portion of multi sensor imaging/laser systems used worldwide are systems mounted on different types of vehicles (optionally aircraft). Due to big size/mass and difficult disconnecting of such EO system from vehicle electrical/mechanical system it is difficult or often not possible to have such EO system at laboratory/workshop rooms where could be tested using typical test systems located on optical tables. Such vehicle mounted EO system must be tested at field condition or when located at non heated garages. Therefore testing vehicle mounted EO systems is a technical challenge.

2 What are VEMS systems?

VEMS systems are modified laboratory class MS systems that are optimized for testing multi sensor imaging/laser system specially modified to enable tests of vehicle mounted EO systems. These VEMS systems are targeted to enable expanded testing/boresight of EO imaging/laser systems mounted on different vehicles (cars, trucks, tanks, mechanical carriers) and used in wide range of defense, security or civilian applications.

3 How VEMS systems are built?

Typical MS systems https://www.inframet.com/Data_sheets/MS.pdf for testing multi-sensor imaging/laser systems are laboratory class modular system located on optical table. Human operator is expected manually to change some modules from time to time.

There are three main modifications of VEMS system comparing to typical MS systems.

First, VEMS systems are compact systems optimized for remote operation when all blocks are integrated with collimator and there is no need for manual change of any block during test procedure.

Second, test systems hangs on special elevating frame and is at the same height as height of tested EO system mounted to vehicle (Figs.1-2).

Third, VEMS system are built using athermalized optics to enable work at wide temperature range from about 5°C to +35°C.

There are two main blocks of VEMS system:

1. Modified MS system (modifications as describe earlier),
2. EFS elevated frame system.

The second block enables positioning of VEMS system relative to tested EO system mounted on specified vehicle. In detail EFS elevated frame system enables (Fig. 2):

- to fix test system at specified height (no regulation – height is optimized for specified vehicle),
- to regulate side position of test system (left-right) to correct limited repeatability of side position of vehicle,
- to regulate forward-back position of test system to accommodate safe stop distance vehicle-test system.

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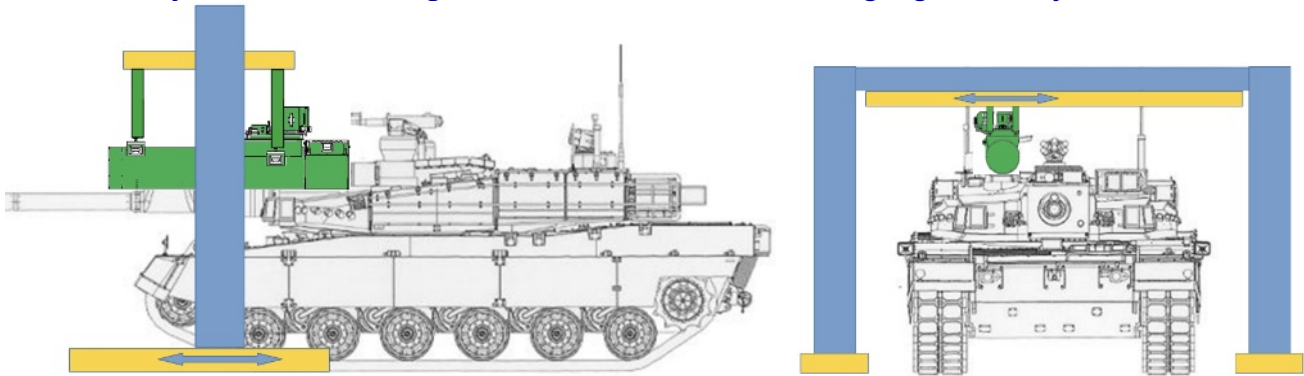


Fig. 2. Positioning concept of the test system (green color) relative to EO system mounted on vehicle

4 How VEMS system works?

VEMS systems work as typical MS systems that combine five functions:

1. Multispectral image projector is an optical system that project into direction of tested imager some reference images in several spectral bands (MWIR/LWIR, VIS-NIR and SWIR).
2. Boresight tools are a block that support measurement of two main types of boresight errors: 1) laser to imager (TI imager or VIS-NIR camera); 2) imager to reference mechanical plane (option).
3. Meter of laser radiometric/temporal properties: pulse energy, pulse peak power, mean power, pulse repetition frequency, pulse time width, missing pulses. This aim can achieved using several optical meters of different level of measurement capabilities (number of parameters) and different level of automation/computerization.
4. Optical pulse generator is a block to enable simulation of a target irradiated by a series of optical pulses in order to enable distance accuracy/range tests of laser range finders.
5. Image acquisition and computing block is a block to carry out acquisition of video image generated by tested imagers, carry out image processing and to calculate parameters of tested imagers and boresight errors.

The main difference is that physical access of user to VEMS system to change some blocks is not needed. User can control all functions of VEMS system from PC set.

1. Further on, before any tests operator is expected to position VEMS system head opposite tested EO system mounted on the vehicle using three step procedure:
Drive vehicle to achieve situation when distance EO system to test system is approximately 1m (shorter distance can be risky due to danger of hitting to test system).
2. Regulate side position of VEMS system head.
3. Regulate forward-back position.

5 Versions

Theoretically is possible to develop quasi universal VEMS system that could be used for testing different EO systems mounted at different vehicles. However, such universality is risky. Therefore, VEMS systems are modified version of MS systems customized for testing specified EO system mounted to specified vehicle and potential customer should accept this limitation and deliver following information:

1. type of EO system/vehicle (height of EO system)
2. equivalent version of MS system (required test capabilities)

6 Options

Some of tested EO systems mounted on vehicles does generate video image seen directly on internal monitor but there is no output of electrical video image that can be used to capture such video image using suitable frame grabber. In such situation Inframet can deliver additional video camera that captures video image from the monitor and enables to carry out most of measurements.

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7 Why VEMS ?

VEMS are first commercially available systems for testing multi sensor imaging/laser systems. These systems have potential to revolutionize testing mobile EO systems mounted to vehicles by removing need to dismantle EO system from vehicle to enable expanded tests.

Version: 1.2

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