

# Testing electro-optical imaging and laser systems

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Electro-optical imaging and laser systems (thermal imagers, night vision devices, visible/NIR cameras, SWIR imagers, laser range finders, laser designators, laser pointers, fused images, multi-sensors system) are one of most important technologies for modern armed forces. Testing of these systems or their main modules (images intensifier tubes, IR FPA sensors, CCD/CMOS sensors, optical blocks) is a very difficult task. Technical limitations of accuracy of measurement of performance parameters and poor standardization of test methods are the main obstacles. Results of testing these systems carried out by different test teams often differ significantly. There are problems with interpretation of data sheets presented by manufacturers.

This course consists of seven main parts:

1. Review of electro-optical imaging and laser systems,
2. Normalization of testing E-O systems and modules,
3. Testing electronic imaging systems (thermal imagers, visible/NIR cameras, SWIR imagers),
4. Testing laser systems (laser range finders, laser designators, laser pointers, laser illuminators),
5. Testing and boresight multi sensor imaging&laser systems,
6. Testing night vision devices and image intensifier tubes,
7. Calibration of test stations.

First, a short review of electro-optical imaging and laser systems is done. Different types of E-O systems are discussed. Second, normalization of testing E-O systems and modules is discussed. A series of standards that regulate testing E-O systems and modules are briefly presented. Third, test methods and equipment for testing electronic imaging systems are presented. Fourth, test methods and equipment for testing laser systems are presented. Fifth, test methods and equipment for testing and boresight multi-sensor systems are presented. Sixth, test methods and equipment for testing night vision devices and image intensifier tubes are presented. Seventh, sources of potential errors during tests and recommendations for calibration of the test systems to assure traceability to national standards are presented.

## Intended Audience

This material is intended for engineers, scientists, and managers who need practical knowledge on testing and evaluation of modern thermal imagers, VIS/NIR cameras, and SWIR imagers.

## Biography

Krzysztof Chrzanowski received his Ph.D. and D.Sc. both in Electronics, from Military University of Technology in Warsaw, Poland. He works currently as Professor in the mentioned above university. His main scientific interests include testing electro-optical imaging&laser systems (thermal imagers, night vision devices, VIS/NIR cameras, SWIR imagers, laser systems, multi-sensor surveillance systems) and modules of such systems (image intensifier tubes, IR FPA/CCD/CMOS sensors, optical modules), non-contact thermometry and general metrology. He is an author or co-author of over 100 scientific papers, books and conference communications. Krzysztof Chrzanowski is also a founder and CEO of Inframet company. Inframet is a high-tech company that specializes in high-tech equipment for testing, evaluation and simulation of surveillance electro-optical systems and modules. Nowadays, Inframet is a global high-tech company and one top world leaders in optronic metrology.