NIMAX

Computerized station for testing night vision devices

Fig. 1. NIMAX test station

BASIC INFORMATION:

MIL standards present recommendations for a simple, non-computerized test stations for testing NVDs. Such recommendations are logical because these standards were created decades ago when when computers were not available for metrology applications. Next, there have always been pressure from military users for creations of compact, simple test stations. Therefore, so far simple, non computerized stations totally dominate market of equipment for testing night vision devices. Typical Inframet test stations (NVT, NVS, NV14, NV20) are also non-computerized stations.

NIMAX is currently the most advanced computerized test station offered by Inframet for testing NVDs. This station enables expanded testing of virtually all night vision devices (all night vision goggles, all night vision monooculars, and night vision sights/binoculars of aperture of the optics up to 120mm (magnification up to 10). NIMAX station enables not only expanded testing of night vision devices but recording of measurement results and recording of images generated by tested devices. The latter function is a big advantage over typical non-computerized test stations.

NIMAX test station station is an optimal choice for quality control of manufacturing line, research projects, and for acceptance tests.

NIMAX should be treated as a more advanced version of of NICOM station. Both stations can measure practically the same parameters but there is a series of differences. The first station enables tests of night vision sights with bigger optics (higher magnification). The second station is built using two separate image projectors when the fisr use only a single projector. Precision positioning of tested NVDs is easier in case of NIMAX. Speed of tests was increased, too.

NIMAX test station is the most advanced station from NV series stations offered by Inframet for testing night vision devices. The test methods used by the NIMAX station are mostly based on recommendations of the MIL series military standards.

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Why computerized test station?

Lack of computerized stations for testing night vision devices can be considered as one of many reasons of difficulties in effective, accurate evaluation of night vision devices.

We must remember that humans can very well compare quality of several images seen at the same time but have big problems to evaluate quality of images seen at different moments of time. Therefore big variability of indications of team teams during resolution measurement of night vision devices or image intensifier tubes occur frequently. Modern computer technology could help to improve accuracy of resolution measurements.

Computerized test stations can enable measurement of important objective parameters like modulation transfer function MTF and signal to noise ratio SNR. These parameters cannot be measured by typical non-computerized stations.

Further on, use of computer technology in testing NVDs can potentially reduce differences between methodology of testing NVDs and methodology of testing electronic imagers like thermal imagers, and visible/NIR cameras. Nowadays, there is basically no major technical obstacles to use well matured methodology of testing visible/NIR cameras also for testing NVDs. This scenario would potentially enable easy comparison of performance of NVDs and low light TV cameras.

How NIMAX stations works?

NIMAX test station works as a set of two image projectors that project images of standard targets into direction of tested night vision devices. The latter devices create output image that is later evaluated by human observer or with help of more objective measuring tools (luminance meter, high-res video camera, or digital still camera).
The first projector of small aperture optics is used to test night vision goggles/monoculars. The second projector of big aperture optics is used to test night vision sights/binoculars.

Light source

MIL standards recommend to use a calibrated tungsten filament lamp of 2856K color temperature as a radiation source. It is technically difficult to develop a reliable, long life, 2856K color temperature tungsten filament light source that enables regulation of light intensity in wide range. Therefore typical test stations for testing night vision devices offered on market are built using a single monochromatic LED light source. Such test stations are calibrated to simulate 2856K color temperature light source for one specific type of night vision device (typically built using Gen 3 tubes and Class A filter). Measurement accuracy significantly deteriorate when night vision devices of different type are tested.

NIMAX test station is built using more advanced concept. The station is built using two light sources that can work in two modes: a)halogen bulb of 2856K color temperature source and b)monochromatic LED light source. Halogen source is used during measurement of photometric parameters; monochromatic LED source during measurement of imaging parameters. Therefore NIMAX station enables accurate measurement of photometric parameters (like brightness gain) of all types of night vision devices. Next, NIMAX station can be checked and re-calibrated by advanced photometric laboratories in many countries because these stations use classical photometric light source. At the same time life time of the test station was significantly extended due to use of halogen source only for measurement of photometric parameters.

Test capabilities

NIMAX test station enables measurement (or checking) of a long list of parameters that can be divided into six main groups

1. Typical tests: resolution (center, peripheral, high level), screen quality (dark spots), brightness gain, field of view, ocular diopter range
2. Maintenance checks: Operational defects (shading, edge glow, flashing,/flickering/intermittent operation, emission points); Cosmetic defects (Dark Spots, Bright Spots, Fixed-Pattern Noise, Chicken Wire, Image Disparity, Output Brightness Variation, Image Distortion),
3. Binocular tests: collimation error, gain disparity,
4. Expanded tests: Minimal Resolvable Contrast, magnification and EBI (option).
5. Electrical tests: power consumption, current,
6. Advanced tests: MTF, SNR.

NIMAX test station enables recording of test results and video recording of images generated by tested night vision devices. Special software that enables presentation of recorded videos from several tested NVDs at the same time at PC screen is a part of NIMAX test station.

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SPECIFICATIONS

Modules	NIM base module (different versions), LP1 luminance probe, LP2 luminance probe, set of exchangeable adaptors, PS1 power supply, BC12 beam combiner, BC21 beam divider, NVC high-res video camera, NDC digital camera, frame grabber, PC, TAS-NV computer program, NIMAX Display computer program
Light Sources	Set of light sources working in two modes: 1) 2850K color temperature polychromatic source, 2)660nm monochromatic light source
Illuminance range of light sources	from at least 2 10^{-5} lx to 200 lx
Regulation resolution	10 µlx (at low intensity range)
Regulation type	continuous (any value can be set within the regulation range)
Regulation mechanism	manual
Regulation stability	better than 2% of the set value
Aperture of built in collimator	1) 35 mm; 2)120mm
Collimator resolution	1) > 30 lp/mrad, 2) > 60 lp/mrad,
Type of tube holders	exchangeable holders for different types of NVDs
Targets	set of exchangeable targets
Range of luminance probe	0.01-100 cd/m^2
Output readout	PC monitor
Control method	manual: Light knobs, Target knobs
Power	230 -110 VAC 50/60 Hz
Operating temperature	5°C to 40°C
Units	Metric (US - option)
Mass	130 kg
Dimensions	1771×1429×553 mm

*specifications are subject to change without prior notice

VERSIONS

NIMAX test station can be delivered in form of a set of different versions of different test capabilities.

Three versions of different test range are offered:
Version A: Tested only goggles and monoculars (typical devices of of FOV about 40º)
Version B: All types of NVDs can be tested (goggles, monoculars, sights/binoculars)
Version C: Tested only sights/binoculars of narrow FOV.
Next, all versions are divided according to test capabilities:

1. Basic tests: resolution (center, peripheral, high level), screen quality (dark spots), brightness gain, field of view, diopter power range. Optional maintenance checks: operational defects cosmetic defects.
2. Binocular tests: collimation error, gain disparity,
3. Electrical tests: power consumption, current,
4. Expanded tests: Minimal Resolvable Contrast, magnification, distortion.
5. Advanced tests: MTF, SNR.

Detail definitions of available versions of NIMAX are presented in Table 1. Additional options in Table 2.

Tab. 1. Definitions of code used to describe versions of NIMAX test system

Version code	Range of tested NVDs	Test capabilities
A1	Goggles and monoculars (FOV about 40º)	Basic test range
A2	As above	Basic test range + Binocular tests
A3	As above	Basic test range + Binocular tests+ Electrical tests
A4	As above	Basic test range + Binocular tests+Electrical tests + Expanded tests
A5	As above	Basic test range + Binocular tests+Electrical tests + Expanded tests+Advanced tests

B1	All types of NVDs can be tested including goggles, monoculars, sights, binoculars	Basic test range
B2	As above	Basic test range + Binocular tests
B3	As above	Basic test range + Binocular tests+ Electrical tests
B4	As above	Basic test range + Binocular tests+Electrical tests + Expanded tests
B5	As above	Basic test range + Binocular tests+Electrical tests + Expanded tests+Advanced tests

Tab. 2. Additional options that enable limited testing of image intensifiers

Code	Description
R	additional adapter that enables measurement of resolution of image intensifier tubes
G	additional adapter that enables measurement of luminance gain of image intensifier tubes

Example: Code NIMAX B5-RG means Nimax test station capable to test goggles and monoculars and sights/binoculars with test range as per code B5 in Table 1 capable to measure resolution and luminance gain of image intensifier.

Attention: NIMAX can enable some basic testing of II tubes. However, it is recommended to use more advanced ITIP test stations to do more expanded tests of these tubes.

Version 2.3

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