Optikos®

The Optical Engineering Experts™

POWERED BY OPTEST® SOFTWARE

A Complete Optical Measurement and Testing System by Optikos

Understanding Lens and Image Quality

Those involved in optical design and fabrication understand that lens elements and optical systems are seldom perfect. Despite the presence of the most sophisticated design and manufacturing techniques, lenses can still vary considerably in quality.

Optikos is a leader and pioneer in lens and image testing and our products and systems are based on over thirty years of experience and innovations in optical engineering. The result is that our customers are able to use the most advanced metrology tools for performing accurate and efficient lens and camera system measurements that make a difference in their product quality and performance.

Our flagship products includes the OpTest® Lens Measurement System with a complete range of hardware options, as well as the LensCheck™ VIS and LWIR instruments, compact versions that are portable and easy-to-use for smaller lenses. Both are powered by OpTest® 7, Optikos proprietary software.

OpTest® Lens Measurement System: There is a Difference

The OpTest Lens Measurement System has been completely redesigned by Optikos engineers to include the latest technologies and innovations in optical and opto-mechanical engineering. Other products on the market compromise by manufacturing their systems around general purpose off-the-shelf lab components, while every step of an Optikos solution is a custom one. OpTest systems are comprised almost completely of custom optics, mechanics, and electronics designed by Optikos engineers solely for the purpose of lens testing.

The result is that our customers now have access to the most advanced metrology tools for performing accurate and efficient lens measurements.

Whatever You Design, You Can Measure

Optikos offers the most comprehensive product line for lens testing. Upgrade paths are available to expand your testing capabilities with OpTest to include measurements such as transmission and stray light.

OpTest® or *LensCheck*™ Hardware for Your Application –No Matter What Shape or Size

The OpTest Lens Measurement System includes a complete range of hardware options to meet and surpass your testing requirements. For smaller lenses, the LensCheck product is a compact version that is portable and easy-to-use. Both are powered by OpTest 7, Optikos proprietary software.

There's More to Measurement than MTF

The OpTest test bench performs system tests in situations similar to actual applications. Field angle positions, conjugate ratios, spectral regions, and image plane architecture can all be replicated or simulated in the testing of an optical system. The OpTest measurement system can also provide great testing versatility. Although MTF is a common measurement, other lens measurements are critical to lens performance. The OpTest system provides testing capability for these measurements.

Using advanced OpTest® 7 Software, these measurements include:

- MTF
- Through-Focus MTF
- Depth of Focus
- Blur Spot Size
- Astigmatism
- Effective Focal Length (EFL)
- Distortion
- Field Curvature
- Chief Ray Angle (Principal Ray Angle)
- Encircled and Ensquared Energy
- Axial Color
- Lateral Color
- Line of Sight (Boresight)*
- Transmission*
- Stray Light*

*Additional equipment is required.

OpTest® 7 Software Optimized for Performance

Powers *OpTest®* Metrology Benches and *LensCheck™* Instruments

At its core, OpTest 7 is a software application that integrates with all OpTest metrology benches, and LensCheck instruments to control electronic hardware assemblies (including all motorized motion elements); to acquire and analyze video and scanning detector signals; and to present the measurement results to the user in a graphical manner. OpTest 7 runs under Windows® 7 and includes a licensed version of Microsoft Excel with each installation. All measurement data may be exported directly to formatted Excel workbooks for easy inclusion in customer reports or internal documents.

Sophisticated Measurements for a Wide Range of Users

Drawing on a tried and tested legacy of over 20 years of Optikos® MTF measurement software, OpTest 7 offers an entirely fresh approach to the problem of making a sophisticated measurement technique accessible to a wide range of users. And the compatibility of the application across future generations of operating systems has been assured by adopting the very latest Microsoft® programming environments and by coding the graphical user interface separately from the application. Typical users of the software will be completely unaware of these safeguards, but by carefully considering the underlying architecture Optikos has ensured that the software will endure across new generations of operating systems.

Easily Select the Interface to Match Your Information Requirements

In earlier versions, the OpTest application was targeted towards engineers and presented a single interface to the operator. All of the sophistication of the controls and processing functions was exposed to anyone using the software. OpTest 7 features operating modes that are designed to match the requirements and technical sophistication of various users. This makes OpTest 7 a powerful laboratory tool in Engineering Mode, while at the same time ensuring that manufacturing operators are comfortable using it in Production Mode. Earlier versions of OpTest software required the use of separate macros to make measurements of focal length, field curvature, etc., while OpTest 7 includes the measurement of many of these first order parameters in a manner that makes the setup and execution easy to understand. It is now possible to perform sequences of measurements and to extract many of these measurements from a single data structure. And measurements may require less configuring than before. Instead of asking the operator to make choices regarding such things as camera gain and exposure or sampling reticle width, OpTest 7 now includes the option to make intelligent choices for you.

Features of *OpTest® 7* Software Include:

- A newly-designed, *intuitive graphical user interface*
- *Multiple user modes* optimized for a diverse user base:
  - Production
  - Laboratory
  - Engineering
- *Easy-to-configure* test routines
  - Routines set-up by engineers and available to Laboratory and Production users
- *Faster measurement* time
- *Automatic reticle sizing* for more accurate measurements
- Advanced *report generation directly to Microsoft® Excel*
- The *most comprehensive* set of lens measurements available:

With Appropriate Hardware, *OpTest® 7* Software Measures:

- MTF (Modulation transfer Function)
- Focal Length
- Distortion
- Back and Flange Focal Length
- Chief Ray Angle
- Field Tilt
- Field Curvature
- Relative Illumination
- Line of Sight
- Transmission
- Encircled Energy
- Axial Color
- Lateral Color

OpTest® 7 Software: Sample Screenshots

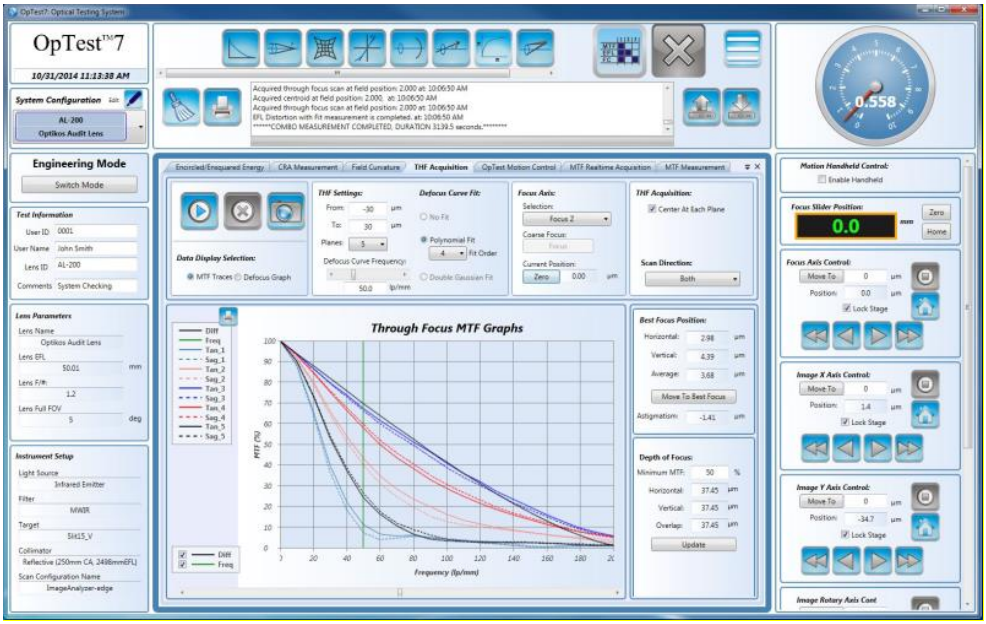


Figure 1: OpTest 7 Main Window

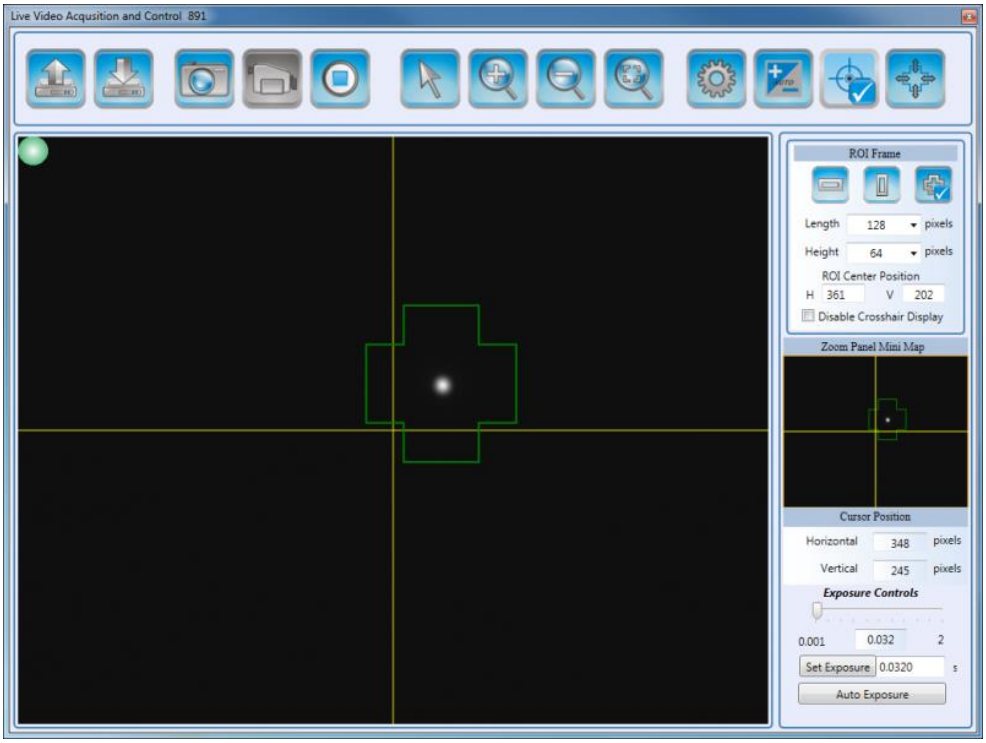


Figure 2: OpTest 7 Live Video Window

Designed for Video- and Scanning-Based Image Analyzers

OpTest 7 Software works with both video-based and scanning-based image analyzers. For video-based sensors (two-dimensional imagers), the VideoMTF® Image Analysis Module is used to provide real-time measurement of MTF and other optical parameters. A VideoMTF™ Image Analysis-based testing system is recommended for visible applications or for production testing at any wavelength. Video image analyzers are available in the UV, VIS, SWIR, MWIR, and LWIR.

Image scanning is used where video image acquisition is impractical. For scanning-based sensors, the EROS™ Scanning Image Analysis Module is used with OpTest mechanical scan hardware and an infrared image analyzer to perform the most flexible and demanding measurements. The EROS scanning module enables control of the scan length, number of samples, data averaging, and data filtering.

OpTest® 7 Software: SampleTest Reports

Optikos®

OpTest 7 Test Report

MTF Test Data

Lens Name	Lens ID	Operator ID	Operator Name	Log Time
	No. 12	0	John Boule	Tuesday, November 12, 2013 11:05:10 AM

Lens Nominal EFL	Test Configuration	Collimator EFL
11.6 mm	Infinite Conjugate	353.28

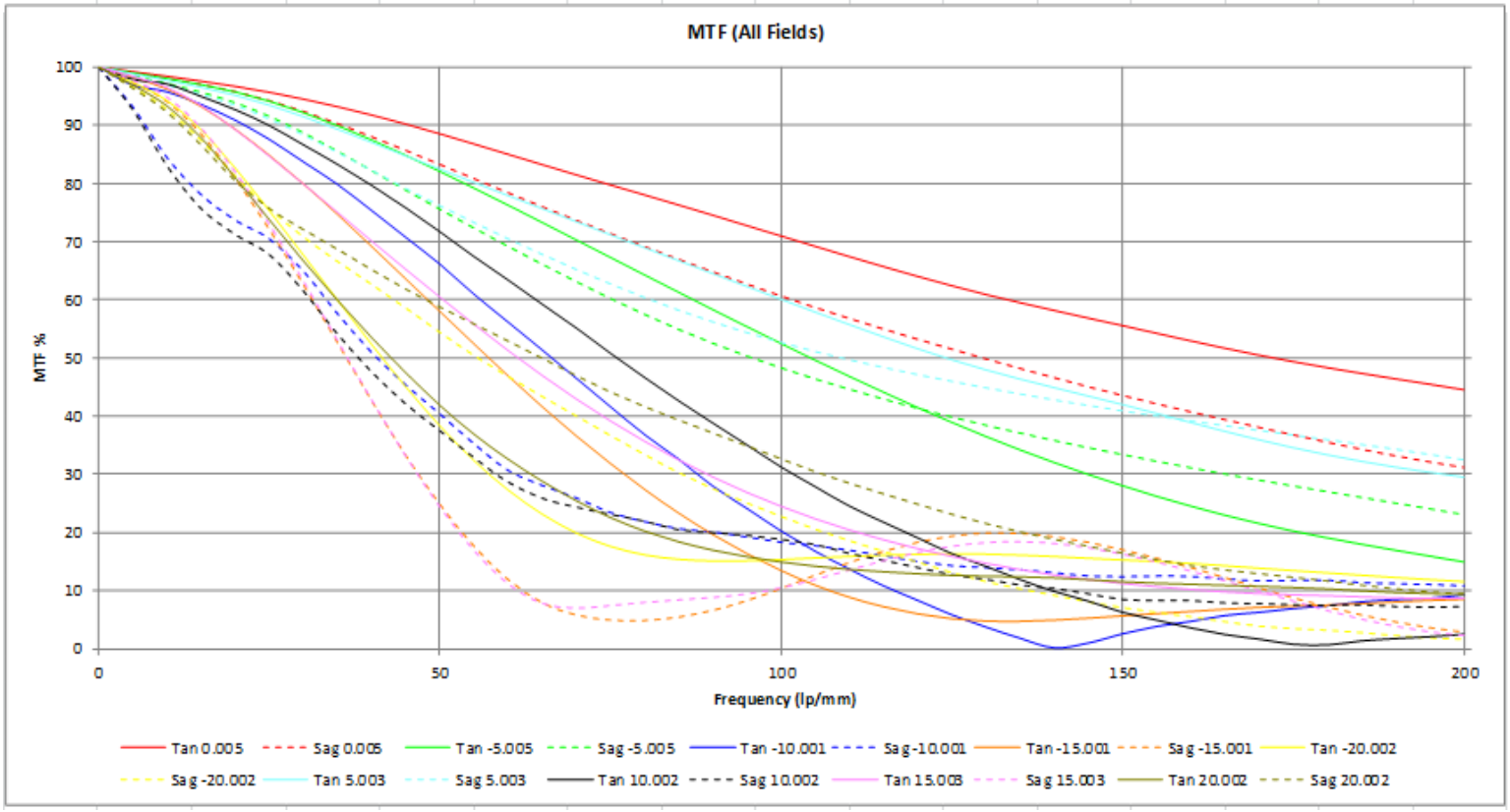


Figure 3: Sample MTF Report

Optikos®

OpTest 7 Test Report

Defocus Test Data

Lens Name	Lens ID	Operator ID	Operator Name	Log Time
	No. 12	0	John Boule	Tuesday, November 12, 2013 11:05:10 AM

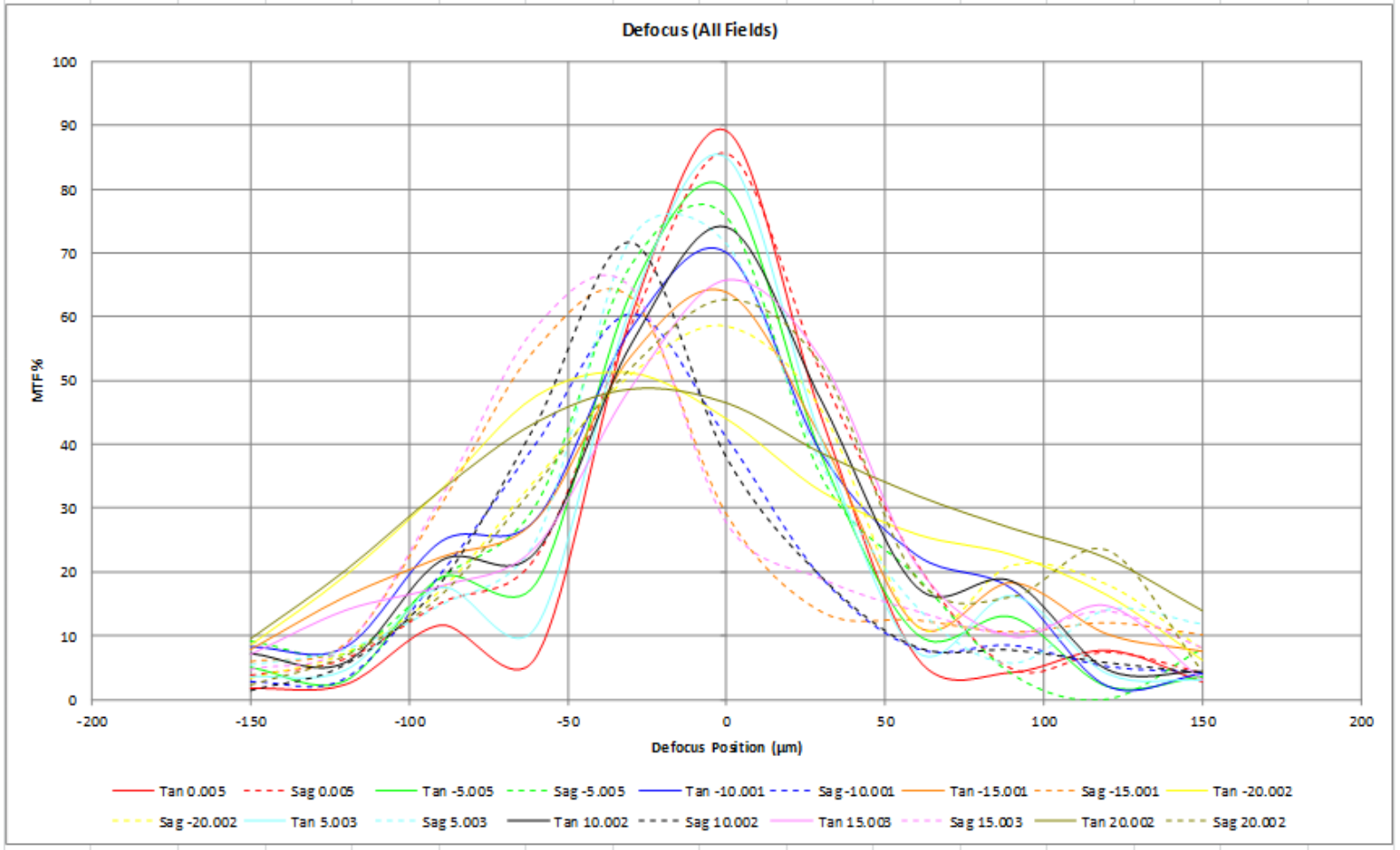


Figure 4: Sample Defocus Report

Optikos®

OpTest 7 Test Report

Field Curvature Test Data

Lens Name	Lens ID	Operator ID	Operator Name	Log Time
	No. 12	0	John Boule	Tuesday, November 12, 2013 11:05:10 AM

	Horizontal	Vertical	Average	
Lens Tilt	0.0770063	0.0114718		degrees
Average Focus	-9.878679	-19.50962	-14.69415	µm

Azimuth (°)	H-Defocus (µm)	V-Defocus (µm)	Avg-Defocus (µm)	Astigmatism (µm)
-20.00177	-32.471126	-3.3429745	-17.90705042	-29.1281519
-15.00146	-5.370513	-40.160152	-22.76533262	34.7896392
-10.00149	-8.5148323	-29.181678	-18.84825511	20.66684563
-5.004919	-8.6027551	-15.320778	-11.96176664	6.718023161
0.0046142	-5.6898422	-3.9452442	-4.817543202	-1.74459809
5.0028315	-6.0482938	-11.967679	-9.007986142	5.919384764
10.001818	-3.5642376	-30.776656	-17.17044689	27.21241863
15.003001	2.2218535	-41.705002	-19.74157427	43.92685555
20.002427	-20.866991	0.81376535	-10.02661278	-21.6807563

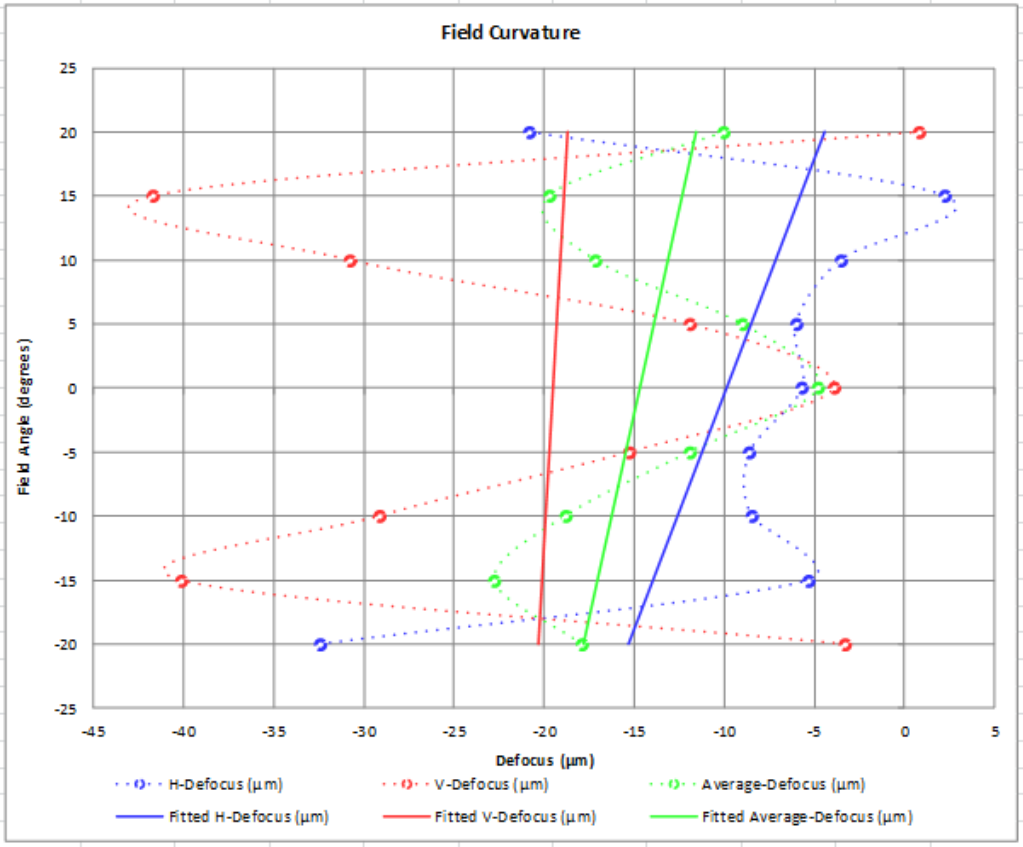


Figure 5: Sample Field Curvature Report

Optikos®

OpTest 7 Test Report

EFL/Distortion Test Data

Lens Name	Lens ID	Operator ID	Operator Name	Log Time
	No. 12	0	John Boule	Tuesday, November 12, 2013 11:05:10 AM

Fitted EFL	Polynomial Fitting Formula
11.735551 mm	$11.73555067568X + 5.744323624117 85E\text{-}02X^2 + 1.767422599704 96X^3$

Field Angle (°)	Distortion (%)
-20.00177	1.817327862
-15.00146	0.95034069
-10.00149	0.382066982
-5.004919	0.072638168
0.0046142	3.95174E-05
5.0028315	0.158256063
10.001618	0.554744821
15.003001	1.212925698
20.002427	2.173824181

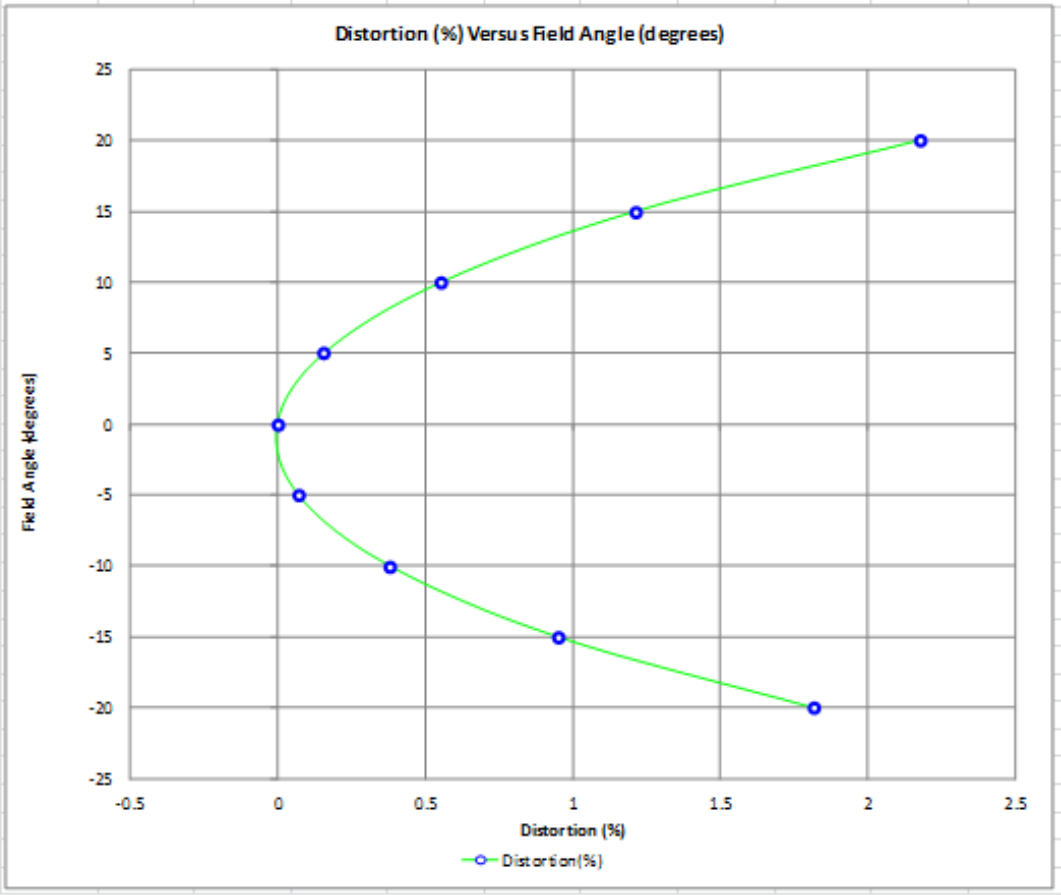
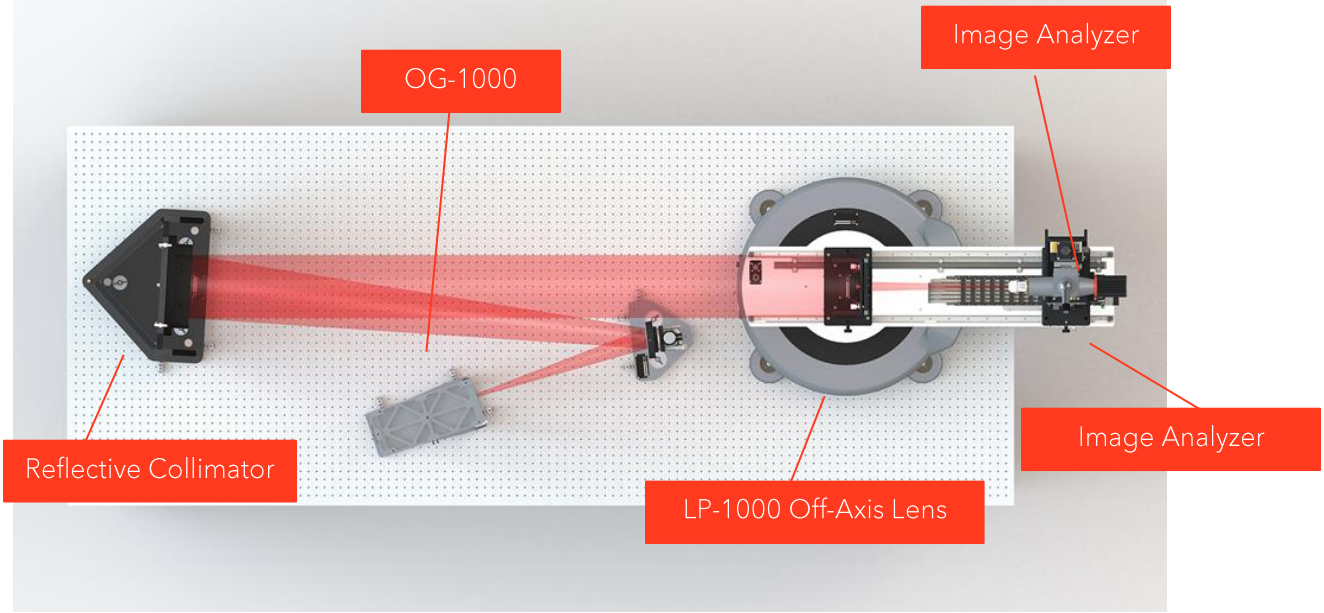


Figure 6: Sample EFL/Distortion Report

OpTest® [JB1]Bench: Custom-Designed to Fit Your Needs

Optikos not only builds your optical testing system with sub-assemblies and components that meet your immediate needs, but also provides a simple upgrade path as your needs change. The Optikos approach provides you with a technical as well as economical solution: one that doesn't become obsolete as your application or business develops–one that is flexible enough to meet your requirements now and in the future.

With the range of products available, it's important to select the components that best suit your purposes and give you maximum flexibility. In the optical testing section that follows, you will be introduced to a range of products that will work together to perform the tests that meet your unique application. Descriptions and illustrations explain how each product may be used to create the overall system.

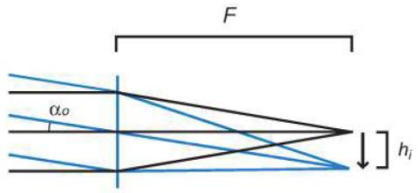


A Buildable Solution

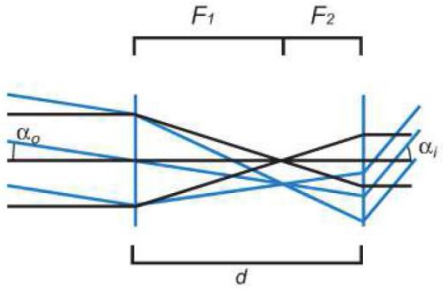
The modular components of the OpTest® system can be configured to test most types of lenses. Selecting and configuring modules appropriate for the optical system under test requires defining how the system is to be used, in particular:

1. Location of object and image conjugates
2. Spectral range
3. Spatial resolution
4. Image and object size and system field-of-view
5. Pupil diameters, F/number, and numerical aperture
6. Physical dimension and system layout

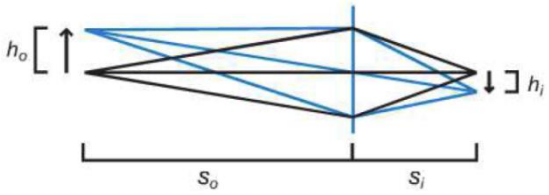
1. For location of **object and image conjugates**, most optical systems fall within three groups:



Infinite conjugate systems:
The object plane is located at infinity.
Examples: Camera lenses, eyepieces, infinity-correct microscope objectives

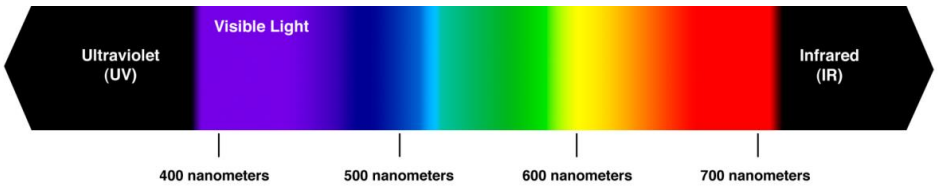


Afocal systems:
Both the object and image plane are at infinity.
Examples: Telescopes, binoculars, and beam expanders



Finite conjugate systems:
Both the object and image planes are located at finite distances.
Examples: Photographic enlarging lenses, macro lenses, fiber optic faceplates, image tubes, and photolithography lenses

2. The OpTest® System supports image analyzers that can operate over **spectral wavelength** from the UV to the LWIR.



3. All optical systems are limited in their ability to form images due to spatial resolution. One fundamental limitation stems from the wave nature of light. In a case where the wave nature of light limits the performance of an optical system, the system has "diffraction limited" resolution.

   The performance of an optical system can also be limited by the design of the system or by manufacturing imperfections. In this case the optical system is resolution-limited by aberrations. The residual aberrations of the optical testing system must be small compared to those of the system under test. The resulting image analyzer of the test system must also have sufficient resolution to analyze the resulting image formed by the optical system under test. Spatial resolution is specified in line-pairs per millimeter for infinite and finite conjugate systems. It is specified in cycles per milliradian for afocal systems.

4. The test system must be able to cover the field-of-view (FOV) of the system under test in both object and image space. For infinite conjugate systems, the test system must cover the angular FOV in object space and linear dimension of the full field image height. For finite conjugate testing the translation stages must be able to cover the full object and image heights. For testing afocal systems, it is necessary to span the angular FOV in both object and image space.

5. The test system must be able to fill the entrance pupil of the system under test in object space and collect light from the entire exit pupil. For infinite conjugate and afocal systems under test, the entrance pupil diameter specifies the size of the collimated beam required in object space. Image space requirements are specified by the exit pupil diameter of afocal systems, whereas the working F/number or numerical aperture is relevant when testing infinite or finite conjugate systems.

6. The OpTest system needs an optical table to accommodate system components and a folded optical path. The optical system under test may be massive or may include folded optical paths or other unusual physical characteristics. An optical table with ¼"-20 on 1" centers or M6 on 25mm centers is required for OpTest systems.

OpTest® System Hardware Options

OG-1000 Source – Easily Switch between Visible and Infrared

The OG-1000 series of multispectral Object Generators uses state-of-the-art light sources, optics, electronic controls and automation. These sources provide uniform, high intensity illumination from the visible to long-wave infrared (0.4 – 15µm). With the touch of a button, the unit electronically switches between visible and infrared sources, providing shorter lens set-up times and improved alignment and throughput efficiency.

- High-speed, 16-position target wheel with precision-aligned, laser cut apertures eliminates the need to pause measurements to change targets
- Touchscreen display provides intuitive user interface for computer and module control
- New AlignMode substantially speeds up lens set-up and alignment, while a single touchscreen button switches from your test configuration (visible or infrared) to a visible alignment target, and switches back to your original configuration
- Redesigned optics provide substantially improved signal
- Single set-up testing of visible and infrared multispectral optical systems

Other features include:

- 3000K tungsten halogen emitter (VIS to SWIR)
- 1000° C Infrared emitter (MWIR to LWIR)
- Drive electronics for target wheel and waveband switching
- Integrated and automated chopper wheel
- Integrated shutter enables automatic background corrections

Image Analyzers: for Video and Scanning Applications

Image Analyzers acquire the image formed by the optical system under test, converting the optical image into an electronic image that is analyzed by OpTest 7 software. Optikos uses two types of image acquisition methods – video and scanning. The type of system most appropriate to a particular application depends on the type of optical system to be tested and the testing environment.

- A video image analyzer acquires the image by enlarging (magnifying) it onto an image sensor such as a CCD or microbolometer array.
- A scanning system acquires the image information by measuring the variation in the light level as an edge or slit and is translated through the image plane.

VideoMTF® Image Analyzers – Four Models Feature Various Spectral Responses

A focal plane array or image sensor-based system using the VideoMTF Image Analysis Module will perform the image scanning quickly and allow you to directly view the image. This speeds up and simplifies the system set-up since both the image location and the plane of best-focus can be determined quickly.

VI-1000 Visible Image Analyzer (400-1000nm)

- Spectral responsivity, 400-1000nm
- Switch between electronic imaging and direct manual viewing of the image spot using integrated flip-mirror assembly
- Apochromatic tube lens; high-sensitivity camera, 12-bit video output

VI-2000 SWIR Image Analyzer (0.6 – 1.7µm)

- Spectral responsivity 0.6 – 1.7µm
- 640 x 512 resolution
- Switch between electronic imaging and direct manual viewing of the image spot using integrated flip-mirror assembly
- NIR apochromatic tube lens

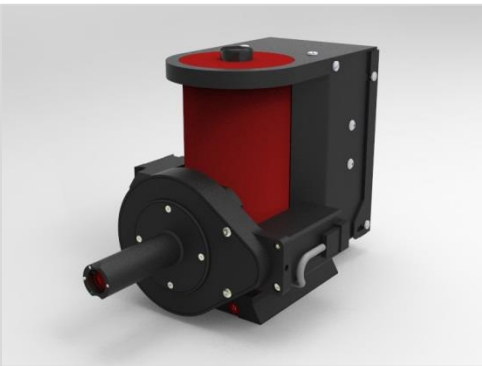
VI-3000 MWIR Image Analyzer (3 – 5µm)

VI-4000 LWIR Image Analyzer (7.5 – 15µm)

- Uncooled microbolometer
- Spectral responsivity 7.5 – 15µm
- 320x240 resolution
- Calibrated LWIR objective lens
    - 7.5x magnification
    - NA 0.70

EROS™ Image Analyzers – Two Models Feature Various Spectral Responses

A knife-edge scanning system is inherently more flexible for testing a wider range of optical systems. There is a larger variety of single element detectors available compared with array detectors. Collection and relay optics do not need to provide the image quality that is required by video analysis. With the EROS Image Analyzer, relay optics collect light from the test optic's image plane and project it onto the detector.



SD-500 SWIR/MWIR Scanning Image Analyzer (1 – 5µm)

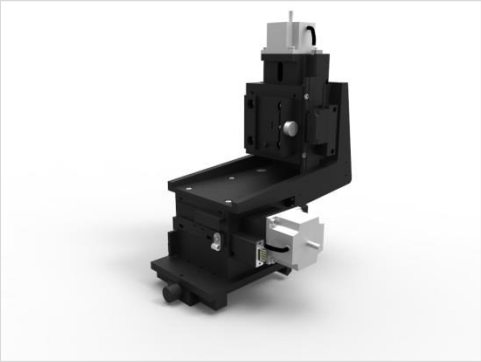
- Comprised of a SWIR/MWIR detector, relay optics, scanning aperture set, and ultra-compact, motorized rotary assembly
- Unique geometry of the SD-500 enables measurements at image planes recessed up to 56mm with its <19mm diameter probe
- Detector assembly is an LN2-cooled InSb detector (1 to 5 µm range) with matched preamplifier and temperature sensor built into the 8-hour hold time dewar
- Multi-element relay lens collects light from scanning aperture at an f-number up to 0.7
- Scanning aperture set includes a 2.5 m nominal slit and a knife-edge, both metal film on sapphire substrates.

SD-600 LWIR Scanning Image Analyzer (8 – 14µm)

- Comprised of a LWIR detector, relay optics, scanning aperture set, and ultra-compact, motorized rotary assembly
- Unique geometry enables measurements at image planes recessed up to 56mm with its <19mm diameter probe

- Detector assembly is an LN2-cooled HgCdTe detector (8-14 µm sensitivity) with matched preamplifier and temperature sensor built into the 8-hour hold time dewar
- Multi-element relay lens collects light from the scanning aperture at an f-number up to 0.7
- Scanning aperture set includes a slit and a knife-edge, both metal film on ZnS substrates

Image Analyzer Mount – AM-600 for Accurate Positioning of Lens Under Test



The AM-600 positions the image analyzer at the image plane of the lens under test, and defines the following three-axis convention in the image space of the lens under test:

- X adjusts the lateral image height parallel to the optical table
- Y adjusts the image height perpendicular to the optical table
- Z is the focus adjustment along the optical axis

Features include the following translation and encoders:

- X-Stage (Off-Axis Stage): Motorized with 50mm translation mounted with ≤ 0.1µm resolution linear encoder
- Y-Stage (Vertical Stage): Motorized with 50mm translation mounted with ≤ 0.1µm resolution linear encoder
- Z-Stage (Focus Stage): Motorized with 50mm translation mounted with ≤ 0.1µm resolution linear encoder

Collimators: for Basic to Most Challenging Lens Testing Applications

Collimators are used to project a source at infinity for infinite conjugate testing of optical systems. The projected beam from the collimator should overfill the entrance pupil of the optical system under test. This means that the clear aperture of the collimator should be larger than the entrance pupil of the system under test.

Reflective collimators are the standard offered by Optikos. Each collimator is an off-axis parabolic mirror (OAP) with λ/8 surface accuracy guaranteed after mounting and a protected aluminum coating for polychromatic testing. Each OAP is potted in a high-stability mount which has undergone rigorous finite element analysis to optimize the design.

Testing Platforms – for Infinite, Finite and Afocal Testing

LP-1000 Off-Axis Heavy Duty Lens Platform for Precise Rotation Testing

Optikos engineers utilized finite element analysis to design structural castings in the LP-1000 that maintain flatness when mounted to an optical table–improving on traditional rail systems that mount directly to the optical table and are vulnerable to bending to the shape of a less-precise optical table surface.

- Unique cable management system eliminates cables dragging on optical table which may introduce errors to centroid measurement routines (EFL, Distortion, Chief Ray Angle, Lateral Color, etc.)
- Main bearing surface is shielded to minimize exposure to contamination–a unique level of integration
- Most precise rotary encoder on the market, <0.1 arc second resolution for precise field angle control
    - Incorporates stainless steel linear guides aligned to granite master to ensure straightness
    - Integrated linear encoder enables long flange and back focal length measurements
    - Industry leading 300° of total rotary travel

FP-1000 Automated Finite Conjugate Platform – for Precise Adjustments in Object Space

Finite conjugate platforms are used to position object generator assemblies at finite object distances when testing finite conjugate optical systems. The platform allows for precise adjustment of source distance (Z-axis), lateral object height (X-axis), and vertical (Y-axis) translation in object space. The FPA-1000 provides automated motion of the object generator along the X-axis. The Z-Axis of the FP-1000 remains under manual control.

- Enables automated off-axis testing of finite conjugate optics
- Large format two-axis translating platform for the OG-1110
- X-axis motion (perpendicular to the optical axis)
    - Computer controlled motorized motion
    - 900mm total travel
    - 2 micron resolution encoder
- Z-axis motion (parallel to the optical axis)
    - Manual adjustment
    - 1200mm total travel

LensCheck™ Lens Testing System

Portable and Precise for VIS/NIR and LWIR Lens Measurements

LensCheck™ Systems are a cost-effective solution to your production and prototype lens qualification needs. Optikos, the leader in image quality test equipment, is pleased to offer this compact, efficient, easy-to-use quality control tool. LensCheck, with patented VideoMTF® image analysis software, features real-time MTF testing and analysis that allow manufacturers to qualify incoming products quickly and reliably, thereby minimizing the risks of sub-standard complete assemblies.

Figure 7: LensCheck™ VIS Instrument

APPLICABLE LENSES FOR TESTING:

LensCheck Systems test a majority of lenses that meet the following criteria:

Specification	VIS	LWIR
Entrance pupil diameter	up to 50 mm	up to 50 mm
Focal length	3-200mm (with appropriate image analyzer objective lens)	5 - 50 mm
f-number of the lens	f/20 – f/1 (with appropriate image analyzer objective) The suitability of fast, non-telecentric lenses at off-axis field angles is determined by whether the image cone falls within the acceptance cone of the image analyzer objective.	f/20 - f/1
Image format size	up to 25 mm image diagonal	up to 25 mm image diagonal

Other characteristics that factor into the determination are:

- spatial frequency of interest
- chromatic performance of the lens
- departure from telecentricity at off-axis angles

These parameters are seldom independent, making it difficult to place rigid bounds on the space of lenses that may be tested on LensCheck instruments. However, it is generally true to say that lenses that fall within the bounds given above are usually good candidates for testing with this instrument. There may be some special case in which lenses within these bounds may not be suitable for testing, and there are certainly cases in which lenses outside of these bounds may be tested. When in doubt, consult an Optikos engineer for advice.

APPLICABLE MEASUREMENTS:

- MTF – on/off axis
- EFL and f-number
- Back focal length
- Astigmatism
- Field Curvature
- Distortion
- Transmission (VIS optional)
- Stray light (VIS optional)

FEATURES:

- Patented VideoMTF® technology enables real time MTF measurements
- Flexible platform allows a wide range of measurements (e.g. MTF, EFL, distortion)
- VIS - industry leading measurement accuracy better than 2% (1% typical); and better than 1% (0.5% typical) repeatability – each validated with 50mm F/5 Audit Lens
- LWIR - industry leading measurement accuracy better than 3% (2% typical) to 40 lp/mm; and better than 2% (1% typical) repeatability – each validated with 50mm F/5 AuditLens
- Configurable automated measurement routines
- Installed in production and R&D facilities around the world

LENSCHECK SPECIFICATIONS:

Physical Size:	15″ (355mm) H 30″ (762mm) W 48″ (1219mm) L
Power Requirements:	100~240VAC 60/50Hz Computer 8/5A, Monitors 0.6A each, DC Power Supply 1.6A, Light Source 2/1A
Environmental:	Optimal performance is achieved in a dark room
Refractive Collimator:	355 mm EFL, 50mm clear aperture
Source Module:	VIS - Fiber-optic light source: 400-1000nm 8-position manual target and filter wheels Target set: pinholes, USAF 1951, and alignment target Filter set: photopic, 546nm bandpass, infrared cutoff, and RGB set LWIR - Broadband Emitter: 7-15 microns 12-position high-speed motorized target wheel Target set: slits, pinholes, crosshairs, and alignment target Filter: 8-12 micron bandpass
Image Analyzer:	VIS - Sony EXview HAD CCD II offers improved sensitivity, dynamic range, and noise characteristics 2736 x 2192 pixels 12-bit video output Calibrated 40x 0.65NA achromatic objective LWIR - Uncooled Microbolometer 324 x 256 format Spectral sensitivity 7.5-15 microns Calibrated 7.5x 0.70NA relay lens
Motorized Z-axis:	25 mm travel 0.1 µm resolution
Motorized X-axis:	25 mm travel with 0.05 µm resolution glass scale encoder
Manual Y-axis:	12.5 mm travel
Motorized Lens Platform:	+/- 100° off-axis rotation 0.0001° resolution glass scale encoder 0.5m optical rail Self-centering lens mount

LENSCHECK OPTIONS:

	VIS	LWIR
• Rotary Lens Mount - 360°	☑	☑
• Audit Lenses	☑	☑
• Reference Lenses	☑	☑
• Transmission Kit / Relative Illumination Kit	☑	
• Stray Light Kit	☑	
• Finite Conjugate Instrument Option or standalone unit available	☑	
• Reflective Collimator	☑	☑
• Line of Sight (Rotary Lens Mount)	☑	☑
• Achromatic Objectives	☑	
• Apochromatic Objectives	☑	
• Lens Mounts*	☑	☑

Lens Mounts*

*Supplied with standard three-jaw caliper lens holder for lenses diameters in 5-25 mm range. For best results, we suggest using available lens mount for specific mounting interfaces. A partial list of available adapters includes the following: M7 through M12; C-Mount; T-Mount; F-Mount, etc. Custom adapter plates are available.