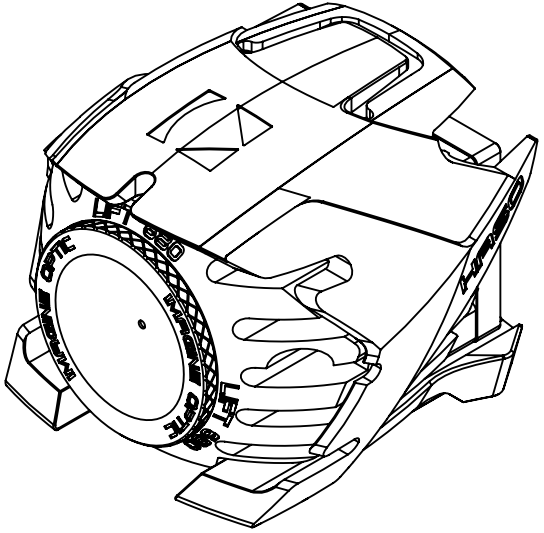
WAVEFRONT SENSORS



imagine optic

A 25-YEAR INNOVATION RUN IN WAVEFRONT SENSING METROLOGY

Index

Imagine Optic 1st generation of -linear!- Shack-Hartmann wavefront sensors was designed and manufactured in Orsay 25 years ago.
Coupling with **deformable mirrors** and constant updates were developed since the early 2000s, leading to the current 4th generation of **HASO**, covering an ever-broader range of applications for optical metrology and adaptive optics.

In 2020 the **LIFT** series added ultra-high resolution, bringing wavefront sensing on par with Fizeau interferometers for most applications.

Today, the **Optical Engineer Companion** connects Imagine Optic wavefront sensors and illumination modules, offering over 800 possible metrology setups.

Optical Engineer Companion

LIFT

H-LINE

IMAGINE OPTIC'S UNIQUE PROPOSITION IN THE WORLD

Imagine Optic implementation of the **LIFT** phase reconstruction provides a unique resolution increase of x16 to detect the smallest phase changes

Compatible with the **Optical Engineer Companion®** modular system means sensors and optical modules easily combine together to ensure any optical configuration needed

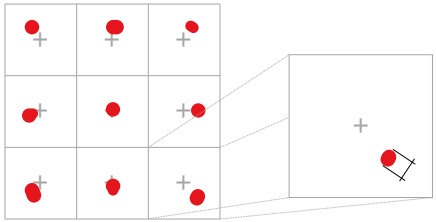
The patented **SpotTracker™** technology provides absolute wavefront and tilt information, eliminating alignment requirements for faster and easier implementation

Patented technology for simultaneous and **independent measurements of phase and intensity** prevents artifacts to compromise measurements

POP™, patented procedure for the characterization of (thin) plane parallel optics avoids the need for sample preparation or expensive accessories

LIFT SERIES

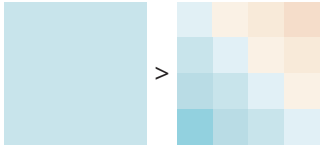
The LIFT principle:



Linearized Focal Plane Technique (LIFT) was developed in the early 2010s and presented in a seminal paper by S. Meimon et al.

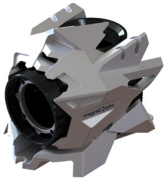
The principle is to **analyze the centroid intensity distribution** created by each microlens and use phase retrieval techniques to **reconstruct complex wavefronts at the scale of each microlens**.

Imagine Optic implementation of the LIFT results in a **16-fold increase in spatial resolution** bringing ultra-high resolution to wavefront sensors.



SWIR LIFT 160 | The Prodigy

Best for:
+ SWIR metrology (1050-1700nm)
+ High Resolution testing of IR optics and coatings



LIFT LP | The Cyclops

Best for:
+ Applications requiring large pupil (22x22mm) without adapting the beam diameter
+ High accuracy

LIFT 680 | The Best-in-Class

Best for:
+ Ultra-High Resolution testing
+ Large optics, freeform & metasurface testing, polishing control

LIFT 272 | The polymath

Best for:
+ Ultra-High Resolution on a budget

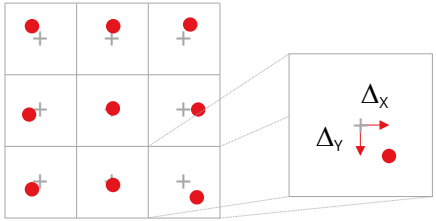
REACHING INTERFEROMETRY STANDARD IN RESOLUTION

Shack-Hartmann is a very robust and precise technology with a long track record in optical metrology. Yet, its limitations in resolution when compared to interferometry were a clear obstacle to its applications in large and flat optics manufacturing.

The LIFT technology is a game-changer. LIFT wavefront sensing is now poised to disrupt optical metrology by bringing together the best of two worlds:
+ simplicity, robustness and precision from its Shack-Hartmann core
+ single-frame, ultra high-resolution analysis from the LIFT algorithm.

HASO SERIES

Shack-Hartmann principle:



Shack-Hartmann wavefront sensors use a microlens array and a camera to **measure the wavefront local slopes** and compute the aberrations of the beam.

Their reliability makes Shack-Hartmann the **most trusted reference in wavefront sensing** applications

HASO BROADBAND | The Workhorse

Best for:
+ Labs and teams with strong expectations for versatility
+ Use cases over a broad spectrum
+ Metrology, microscopy, laser diagnosis

HASO FIRST | The Chameleon

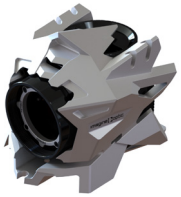
Best for:
+ Single wavelength use cases
+ Adaptive Optics applications for microscopy or Ultra-High Intensity Laser
+ OEM applications

HASO FAST | The kHz

Best for:
+ Adaptive optics for atmospheric turbulence correction and Free Space Optics
+ Laser beam optimization

HASO 126 | The Big guys

Best for:
+ Freeform optics & metasurface, parabolic mirror characterization
+ Applications involving high spatial frequency aberrations



HASO LP | The Cyclops

Best for:
+ Optical metrology without relay lens
+ Laser beam testing
+ Collimation and focusing distance adjustment

HASO DUV | NEW

Best for:
+ Lithography, semiconductor manufacturing
+ Laser fusion
+ Excimer laser-based applications

HASO SWIR | The InGaAs

Best for:
+ Telecommunications, LIDAR
+ Adaptive optics for Free Space Optics
+ IR & SWIR lasers alignment and characterization

HASO SWIR FAST | The SWIR kHz

Best for:
+ Atmospheric turbulence quantification in SWIR range
+ Laser beam optimization

KEY ADVANTAGES OF SHACK-HARTMANN WAVEFRONT SENSING

#1 LIVE
Dynamic measurement of all the parameters

#2 ROBUSTNESS
Insensitive to vibrations and atmospheric turbulences

#3 ACCURACY
Standard accuracy of λ/100 RMS

#4 ACHROMATISM
Achromaticity on the whole spectral range of the sensor

#5 EASE OF USE
Thanks to factory calibration and powerful WAVESUITE algorithms

HASO SERIES

HASO HXR | The X

Best for:
+ X Rays single shot wavefront sensing in the 5-25 keV energy range
+ Source characterization
+ Beamline, KB, toroidal mirrors, elliptical mirrors alignment

HASO MULTISPECTRAL | The polychromatic

Best for:
+ Spatio-temporal characterization
+ Compressor alignment
+ Measurement of spatial chirp, chromatic curvature
+ Characterization of phase spectral effects on dielectric coatings

HASO EUV | The Hartmann

Best for:
+ Synchrotron, EUV-FEL and laser-driven secondary source alignment and characterization
+ Micro- and nano-focusing
+ Dense plasma diagnostics

HASO EDGE SERIES

HASO HIGH ACCURACY

+ 3nm RMS absolute wavefront accuracy
+ 13.8 x 10.2 mm²
+ visible range

HASO VACUUM

+ 10^{-6} mbar with no outgassing
+ 60 x 38 phase points
+ 650 - 950 nm

HASO VERY LOW FLUX

+ 10nm RMS repeatability @ 10000 ph/s
+ 26 x 18 phase points
+ visible range

Imagine Optic's trademark for over 25 years has been to develop and deliver made-to-measure solutions to scientific and industrial conundrums. Across dozens of wavefront sensors that were born to **meet specific needs**, we have carefully selected the EDGE series. They are essentially clones that can be quickly produced and delivered to meet specific requirements.

Other EDGE wavefront sensors are available : contact us to discuss our **extensive portfolio of custom wavefront sensors** and application-specific implementations.

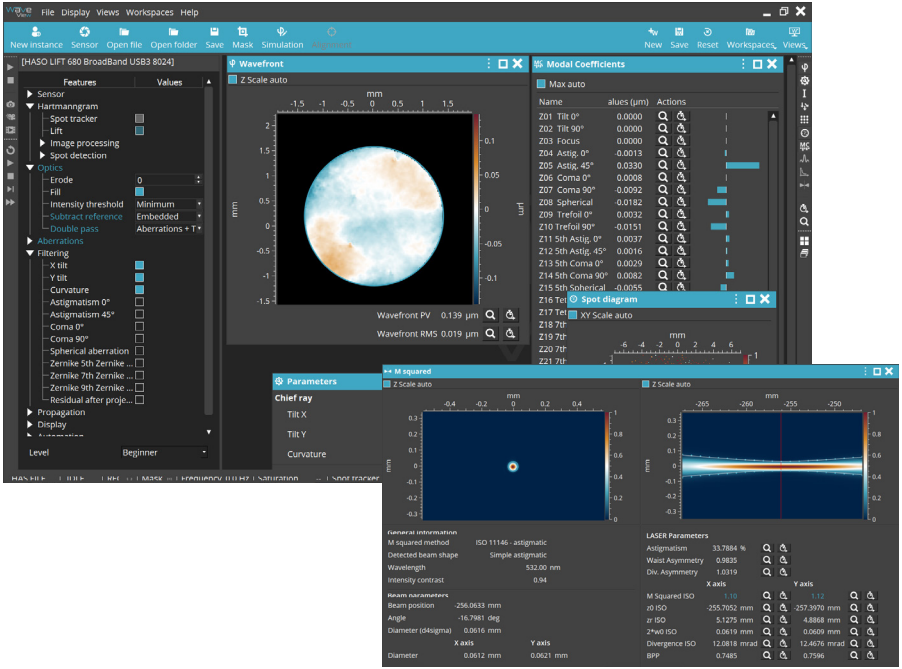
WAVESUITE SOFTWARE

WAVEVIEW

WAVEVIEW™ is the most advanced wavefront measurement and analysis software.

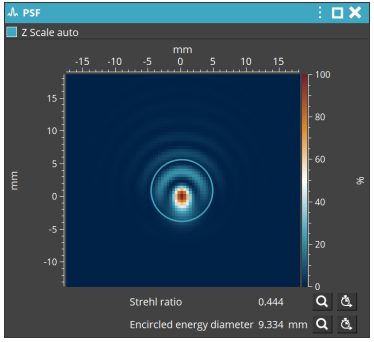
Its interface offers an **easy and optimized workflow**: configure the acquisition, analyze the results in live and export the results for an absolute traceability.

It offers more than 150 features and tools covering a wide range of highly demanding applications.



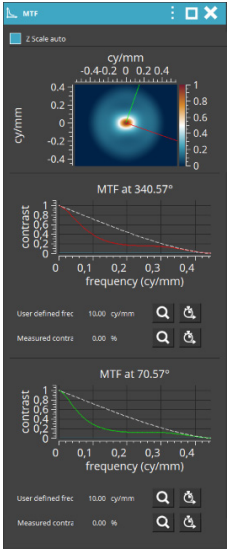
WAVESQUARED

User interface software working in conjunction with CAM SQUARED sensors for laser beam diagnostics and live M2 testing.



Extensions are available to complete the features offered by WaveView.

Get the **PSF** (top) or calculate the 360 **MTF** (right) in only one shot!



WAVEKIT

WAVEKIT is a versatile and **comprehensive SDK** allowing to integrate Imagine Optic wavefront sensors in complex applications: multi-modal platforms, automated benches, industrial control, etc.

Available for C/C++, LabVIEW™ and Python

SERVICES

All our hardware equipment comes with complementary services:
+ **Installation** assistance by our technicians and engineers
+ **Training** on both software and hardware, on site or remote
+ **Support** through our Zendesk-powered interface featuring FAQs, troubleshooting and other useful resources as well as a customer login and assistance system with a > 90 % satisfaction rating

Imagine Optic also provides on-demand services :
+ **Recalibration** of HASO wavefront sensors
+ **Equipment rental**
+ **Characterization** of optical components and systems
+ **Custom** optical metrology and adaptive optics benches

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