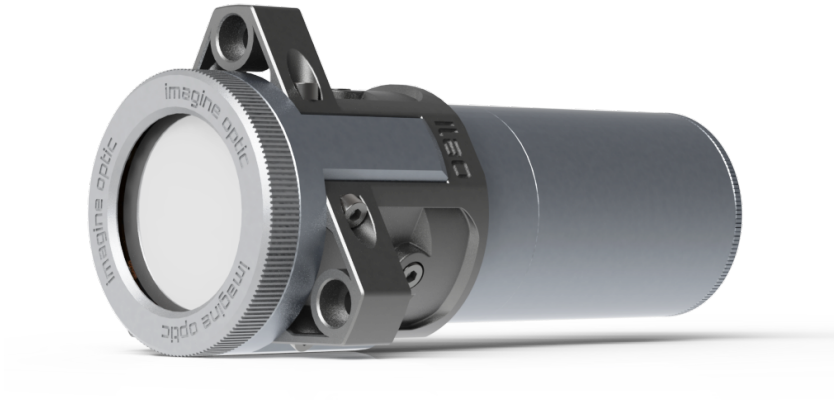
High Harmonic Generation

OPTIMIZE IR BEAM
WITH ADAPTIVE OPTICS

INCREASE HHG
SETUP EFFICIENCY



DIAGNOSE PHASE
MATCHING

ALIGN EUV
OPTICS IN REAL-TIME

Characterize & optimize your HHG beamline using Adaptive Optics & Wavefront Sensing technologies

WHAT WE OFFER

- Wavefront sensing and correction technologies to improve the performance of High Harmonic Generation (HHG) setups

  - Infrared (IR) driving path: wavefront correction to optimize the shape of the focal spot

  - Extreme ultraviolet (EUV) emission path: high accuracy, real-time wavefront and intensity measurements of the generated beam

- Easy and fast alignment of EUV optics e.g., micro-focusing system adjustment
- High accuracy characterization of complex patterns e.g., high-charge optical vortex

TECHNOLOGY

- Simultaneous intensity and phase information as well as far field or near field calculation
- Achromatic wavefront sensing for various wavelength range, e.g., 0.5-4nm, 4-40nm, 400-1100nm, and 900-1700mm
- High-dynamic, high-stability deformable mirrors for ultra-intense laser beam correction
- Advanced metrology and adaptive optics software
- SDK in C/C++, LabView and Python

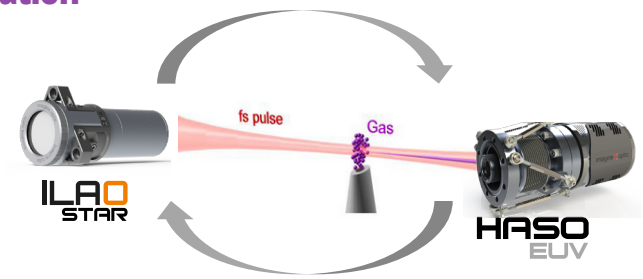
Contact Imagine Optic for more details: contact@imagine-optic.com or +33 1 64 89 15 60

imagine optic™

High Harmonic Generation

Use Cases

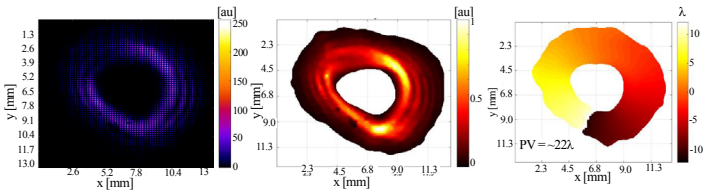
IR beam optimization



IR phase aberrations are transferred to the generated EUV beam. Correcting the femtosecond wavefront is therefore crucial. Imagine Optic provides adaptive optics systems including HASO wavefront sensor and ILAO Star deformable mirror to optimize the driving beam, and EUV wavefront sensor for easy phase characterization and shaping.

Laboratoire d'Optique Appliquée

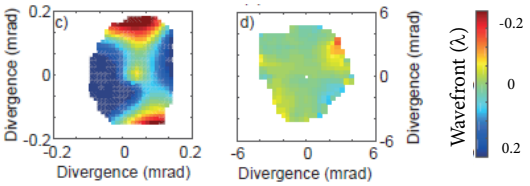
Vortex beam characterization



Laboratoire de Physique des Gaz et des Plasma at Université Paris-Saclay in France reported the experimental characterization of the infrared vortex driver and the resulting upconverted EUV vortex through the HHG. The images above show the data obtained from HASO EUV wavefront sensor; the raw Hartmann data (left), far-field intensity (middle) and reconstructed wavefront(right).

A. K. Pandey et al. "Impure infrared vortex driven high harmonic generation" presented at CHILI 2019

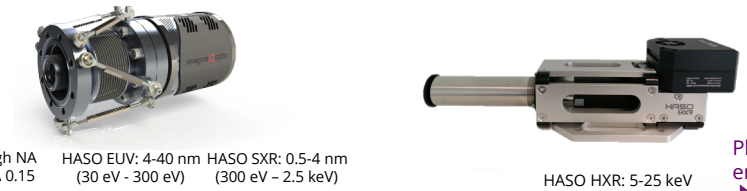
Micro-focusing of broadband high-order harmonic radiation



Two toroidal mirrors in a Wolter configuration are used to focus broadband EUV radiation. Optimization of the focusing optics alignment was carried out using HASO EUV at Department of Physics, Lund University in Sweden. Once optimized, the setup is capable of focusing the beam to a spot size of 3.6x4.0 µm². The image shows the wavefront before (left) and after (right) the focusing optics.

H. Coudert-Alteirac et al. Appl. Sci. (2017). 7, 1159

Product range of X-EUV wavefront sensors

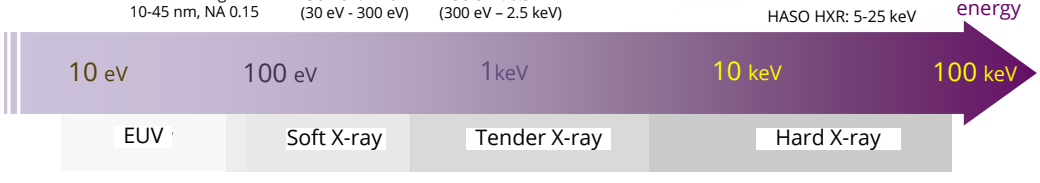


HASO EUV high NA
10-45 nm, NA 0.15

HASO EUV: 4-40 nm
(30 eV - 300 eV)

HASO SXR: 0.5-4 nm
(300 eV – 2.5 keV)

HASO HXR: 5-25 keV



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