Impetus MIM Lab

Momentum microscope with hemispherical energy analyser and multi-mode front lens

Understanding the electronic structure on the micro -meter scale increasingly requires more than a conventional spectrum. Researchers need to identify micron and sub-µm-scale regions of interest, connect them to momentum-space information, and relate local sample features to energy-resolved electronic structure.

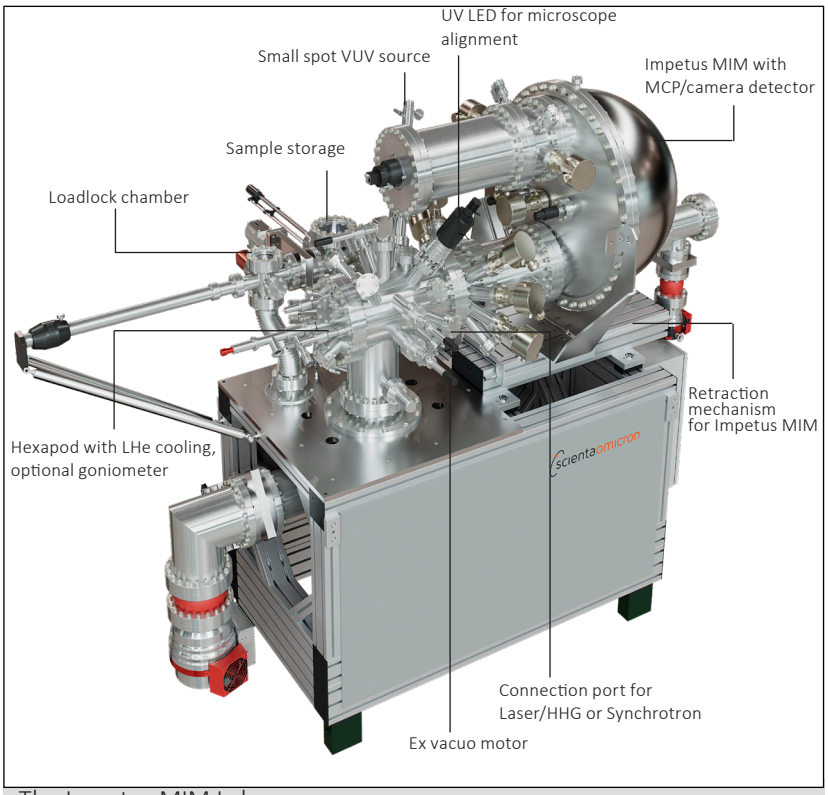
Impetus MIM is Scienta Omicron's advanced Momentum and Imaging Microscopy platform for energy-resolved real-space and k-space photoemission microscopy. It combines a momentum and imaging microscope with a single hemispherical energy analyser, microchannel plate/camera detection, and a multi-mode front lens (German patent DE10 2017 126 882 B3).

Developed in a joint effort with Momentum Microscopy pioneer Professor Gerd Schönhense (University of Mainz), Impetus MIM brings together new microscope concepts with Scienta Omicron's experience in high-resolution ARPES and complex UHV systems.

Advanced zoom optics, piezo-driven contrast and field apertures, and a double mu-metal-shielded lens column support controlled navigation between real-space features and k-space information. The extension for sub-µm ARPES, XPEEM and dark-field imaging (German patent DE10 2020 104 151 B3) expands the workflows available from selected regions of interest by including enlarged aperture arrays for field and contrast apertures.

The hemispherical energy analyser uses a 200 mm mean radius and supports energy selection over defined pass-energy settings.
Detection is based on a microchannel plate, phosphor screen and camera, with simple switching between image mode and event mode for integrated-intensity imaging or single-event counting at low intensity.

The chamber can be configured with a UV LED for alignment, a small-spot VUV gas discharge lamp, or a port for synchrotron or laser connection. A multitude of upgrades and system extensions is available to adapt the Impetus MIM Lab as your research needs evolve.



The Impetus MIM Lab

The Impetus MIM advantages

- Energy-resolved real-space and k-space microscopy with imaging hemispherical energy analyser
- Multi-mode front lens for adaptable extraction-field conditions
- Region-of-interest selection with piezo-driven field and contrast apertures
- Extension for sub-µm ARPES, XPEEM and dark-field imaging using enlarged aperture arrays
- Excellent performance in spatial and k-space modes
- Flexible UV, VUV, laser or synchrotron excitation integration

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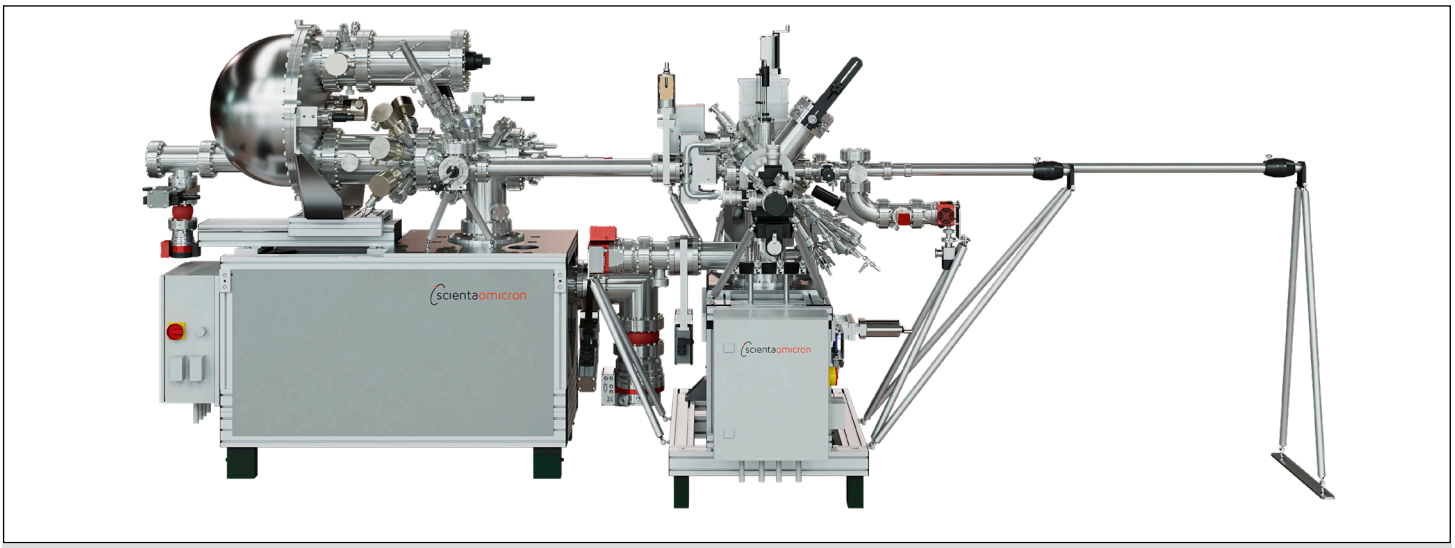

Impetus MIM Lab with integrated multiprobe prep

From momentum microscope to integrated UHV workflow

Impetus MIM Lab is configured around a momentum and imaging microscope lens column and a 200 mm hemispherical energy analyser. Zoom optics create intermediate real-space and k-space images, while piezo-driven field and contrast apertures support controlled region selection.

The multi-mode front lens supports operation under different extraction-field conditions, including modes designed to reduce the field at the sample or suppress space-charge effects from slow electrons.

For laboratory operation, the UHV system can be extended with further preparation and analysis modules. Multiprobe Prep integration adds a practical route for sample preparation and SPM workflows while preserving the core photoemission microscopy path.

Integration highlights

- Multiprobe Prep extension for sample preparation and SPM
- UHV suitcase exchange with remote UHV systems
- Loadlock and 10-position sample storage for flag-style samples
- UV LED alignment and VUV gas discharge excitation options
- Port for synchrotron or laser connection
- Spare ports for in-vacuum optics, mirrors or additional sources

Specifications

Core platform	Momentum and imaging microscope with hemispherical energy analyser and multi-mode front lens
Energy analyser	Hemispherical energy analyser, 200 mm mean radius.
Energy ranges	Kinetic energy range 0-2000 eV; HEA pass energy range 2-200 eV with pre-defined settings 2-25 eV and further high-pass-energy settings
Resolution and ROI	Energy resolution < 10 meV; PEEM spatial resolution < 50 nm; minimum region-of-interest in k-mode < 1 µm diameter; k-space resolution < 0.01 $Å^{-1}$
Lens column	Special objective lens; two zoom-optic sets for intermediate real-space and k-space images, both with octopole stigmator and deflector; double mu-metal shielding
Apertures	7 contrast and 16 field apertures with UHV-compatible, non-magnetic piezo motors with encoders
Detector and software	Microchannel plate, phosphor screen and camera; image mode and event mode; data acquisition PC with PEAK-based software
Sample stage	High-precision hexapod with LHe cooling; ±10 mm x/y travel; 25 mm z travel; two orthogonal tilt motions ±5°
Rotation and temperature	Optional 0-200° azimuthal goniometer; x/y/z precision 1 µm; rotation precision 0.5°; LHe flow cryostat < 15 K to 500 K
Excitation options	UV LED pre-alignment; small-spot VUV gas discharge lamp with differential pumping and multilayer focusing mirrors; port for synchrotron or laser
UHV and extensions	Guaranteed base pressure < 5 x 10^{-10} mbar; MISTRAL control with interlocks; 10-position sample storage and loadlock; extension possible with Multiprobe Prep for sample preparation and SPM, UHV suitcase exchange, in-vacuum optics/mirrors and additional sources

Learn more at **scientaomicron.com/ImpetusMIM**