Benefit from a versatile system that includes both light collection or injection modes.

Reveal unprecedent features of your sample: composition, structure and/or defects.

Take advantage from a fully optimized system with large collection angle.

Excite samples to reveal local behaviour under light/thermal excitation.
The Mönch is an easy to use and accurate add-on for light collection or injection in (S)TEM thanks to:

- A mirror independent from the sample holder allowing for a perfect and optimized alignment
- An absolute encoding system ensuring high alignment precision and reproducibility (100nm-precision)
- The ability to inject/collect light either in free space or via an optical fiber.

**System overview**

![System overview diagram]

**Light collection mode:**

The Mönch has been designed and carefully optimized to achieve unprecedent signal-to-noise ratio thanks to:

- A proprietary parabolic collection mirror designed to fit into pole piece gap as small as 4.5mm;
- A positioning system with sub-micrometer precision for perfect alignment of the mirror with respect to the sample;
- A high curvature parabolic mirror with a NA > 0.4;
- A working distance reduced to 300µm to maximize the light collection/injection efficiency;
- A patented asymmetric optical fiber designed to preserve brightness and spectral resolution.

**Light injection mode:**

The Mönch has been designed to reach unprecedent level of performances and versatility thanks to:

- A beam size reduced to few microns for localized light or thermal excitation of samples;
- The ability to perform injection and light collection measurements simultaneously.

**Patented optical fiber:**

The Mönch uses of an asymmetric optical fiber with a bundle rearrangement from round to parallel to the entrance slit of the imaging spectrograph. This enables keeping constant spectral resolution even when the slit is opened and the spot moving at the entrance of the slit due to scanning.
Light collection/injection modes

<table>
<thead>
<tr>
<th>Mode</th>
<th>Typical excitation sources</th>
<th>Nature of analysis</th>
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<tbody>
<tr>
<td><strong>Light collection</strong></td>
<td>E-beam, Laser, Thermal, Electrical...</td>
<td>Cathodoluminence (light)</td>
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<tr>
<td>Light collection after surface excitation</td>
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<td><strong>Light injection</strong></td>
<td>Laser</td>
<td>Electron imaging (electron) in photo emission/thermo-ionic regimes</td>
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<tr>
<td>Electron imaging after light/thermal excitation</td>
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</table>

**Topics:**

- Electronics & Optoelectronics (GaN, InP, SiC...)
- Photovoltaic cells (GaAs, CdTe, Perovskites...)
- Light emitting diodes (LEDs)
- 2D materials (Graphene, BN, WS2, diamond...)
- Noble metals (plasmonic)
- Photonic crystals
- Quantum wells & quantum dots
- Minerals, glasses, ceramics and gemstones
- Inorganic coatings
- Organic, polymer samples

**Mönch: Unique Light collection/injection add-on for STEM**

- High spectral resolution • High collection efficiency • Versatile and flexible system
- Large choice of source, detectors, stages • Fast hyperspectral map measurement time
- Low beam dosage • Can be used with sensitive samples • Unprecedented signal-to-noise ratio
- Sub-micrometer alignment of mirror • High resolution images • Fits into small pole-piece gap
- No compromise between brightness and spectral resolution • Compatible with other techniques (EELS, EDS...)
Mönch Features

Specifications

Mirror:
• Proprietary parabolic reflective mirror
• Thickness: 2.0 mm (other thicknesses on request)
• Compatibility for light collection and injection mode
• Sample to mirror distance: 300µm
• Mirror reflection: up to 90% from 200nm to 1.7µm.

Micro-positionning system:
• Travel range: 30mm (X), +/-1.5mm (Y), +/-1.5mm (Z)
• Automated retractable mirror
• Absolute encoders with 300nm-precision
• Stage touch alarm to avoid damaging pole pieces or sample holder
• Compact module: 161mm x 210mm x 133 mm
• Compatible with Thorlabs cage system

Light collection/injection couplings:
• Optical fiber with adapted insertion slot
• Free space to avoid loss of spatial coherence and degradation of signal power density
• Switching between both modes takes few seconds

System control:
• External scanning card with 4 inputs (12 bits) for additional single channel detectors (PMT...); 2 outputs for controlling the STEM scan (X and Y); 1 output for the beam blanker.
• Fastest measurement speed: 900Hz (18s for a 128x128 map)

Software:
• Arm/mirror control software (Windows® 10 or higher, 64 bits)
• Acquisition/visualisation module for Gatan Digital Micrograph
• Option: Python API scripting

Options:
• Dispersive spectrometer
• Two imaging exits (320 mm focal length)
• Large choice of gratings turret

Detectors:
• High speed UV-Visible CCD camera (200 nm–1100 nm)
• InGaAs near infra-red camera (900 nm–1700 nm)
• Panchromatic detection (PMT; 200 nm–900 nm)

Others detectors on request

About Attolight AG:
Attolight AG started off to revolutionise cathodoluminescence (CL) by designing top of the line CL instruments that deliver superior performance, maximum ease-of-use and make quantitative cathodoluminescence. The Company firmly believes in the potential of cathodoluminescence and aims at establishing the technology as a standard in-line inspection method in semiconductor industry.

Attolight AG is a company with global presence with systems in Europe, Asia, and North America. The Company headquartered at the EPFL Innovation Park where the Attolab is located as well.