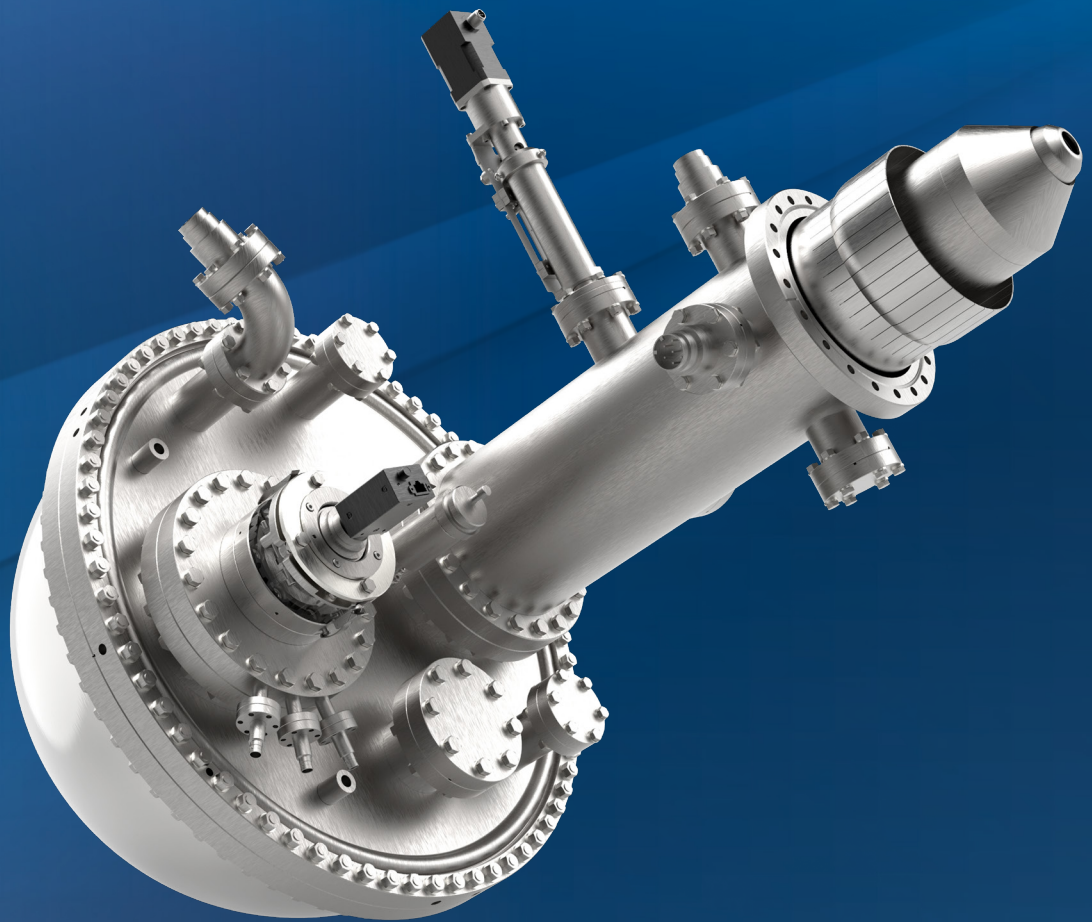


# ASTRAIOS 190

2D MOMENTUM MAPPING ELECTRON ANALYZER  
FOR UNRIVALED ARPES PERFORMANCE

## KEY FEATURES

- Single spot parallel shifting lens (patent applied)
- $\pm 30^\circ$  acceptance angle  
( $\pm 1 \text{ \AA}^{-1}$  k-range for He I,  
 $\pm 2.5 \text{ \AA}^{-1}$  k-range for (S)XPS)
- k-resolution  $< 0.003 \text{ \AA}^{-1}$
- Energy resolution  $< 1.5 \text{ meV}$
- Motorized virtual analyzer entrance slit



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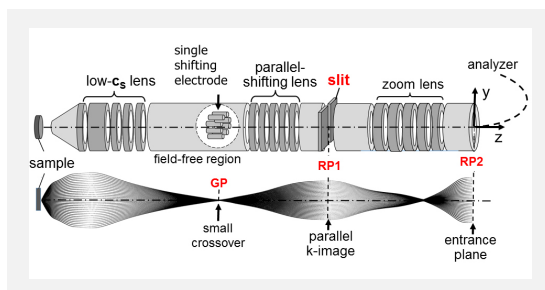
## 2D momentum mapping electron analyzer with a revolutionary direct k-mapping single spot parallel shifting lens with a virtual entrance slit for ultimate k- and energy resolved ARPES

### Direct k-mapping Lens

The lens of the ASTRAIOS is optimized for 2D momentum mapping. The parameters that are imaged by the hemisphere are the k-parallel components and the energy of the photoelectrons recorded with a minimum amount of data transformations. A revolutionary approach that we have pioneered in the KREIOS analyzer family and which we can offer now for the ASTRAIOS as well, optimized for extraction-field-free experiments for the ASTRAIOS.

### Wide Acceptance Angle

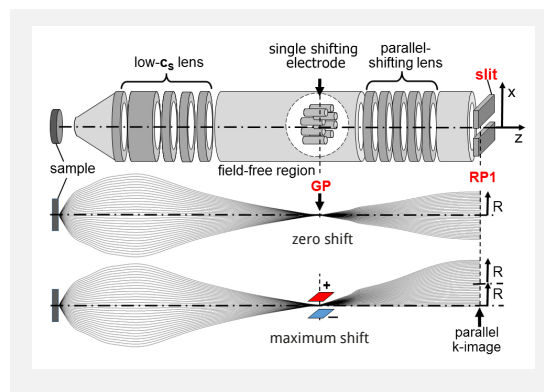
A completely new objective lens allows for wide acceptance angles of up to  $\pm 30^\circ$  at 22 mm working distance. This is possible due to its significantly smaller spherical aberration than that of conventional ARPES lenses. The outer contour is shaped to be compatible with all kinds of UV sources, lasers and synchrotron geometries.



### Single Spot Parallel Shifting Lens

The lens of ASTRAIOS 190 is unique in many aspects and thus a patent is applied for the new design. One of the most important design aspects is the parallel momentum imaging: the

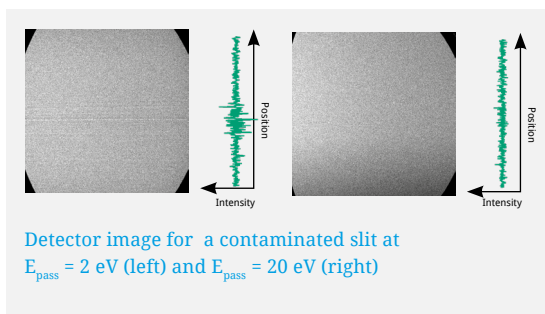
divergent beam of electrons coming from the sample is converted into a perfect parallel bundle of electrons in the entrance plane of the analyzer (RP2). This is achieved by focusing the electrons into a sharp spot in the first real space image in GP. A single shifting electrode assembly in this plane can shift the momentum image such that the full momentum space mapping can be performed on the full acceptance cone of the accepted electrons.



### Motorized Virtual Entrance Slit

The ASTRAIOS 190 features a completely new and revolutionary entrance slit concept: the virtual entrance slit. Instead of placing the slit in the entrance plane of the analyzer, the ASTRAIOS has its entrance slits in an electron-optically equivalent plane RP1 in the lens.

The left picture shows the detector image of an analyzer after several years of use with a slightly contaminated entrance slit for electrons at 2 eV pass energy, typical for operation at high resolution. In such cases, the slits might have to be exchanged. When used at 20 eV pass energy (right picture) the same slit is still usable. The advantage of inserting the entrance slit in RP1 is that the kinetic energies in RP1 are typically one order of magnitude higher than in the entrance plane RP2. The virtual entrance slit enables



long-term operation at highest resolutions and detector homogeneities, increasing uptime and productivity. The motorization and complete software control finally allows for programmable experiments, making ARPES experiments easier to perform.

### Direct Counting 2D-CMOS Detector with 2D/3D Spin Option

The ASTRAIOS is equipped with our newest detector development: the 2D-CMOS detector. This detector offers true pulse counting with excellent linearity, extremely high dynamic range, highest count rates and pixel resolution. Combinations with 2D/3D spin detectors (Mott or VLEED) are available.

### Power Supply HSA 3500 plus

ASTRAIOS 190 is an optimized ARPES analyzer package with a special power supply configuration of the proven HSA 3500 plus. The voltage modules, connectors, cables, and filter boxes are optimized for ultimate energy resolution on a daily base.

## Prodigy Software

ASTRAIOS is best controlled by the SpecsLab Prodigy Software package, including acquisition and visualization of data and full experiment control. Full remote control from and of Prodigy is available.

## Technical Data

### Specifications

| ASTRAIOS 190           | Value   |
|------------------------|---|
| Lens acceptance angle  | 60° full cone   |
| Angular resolved modes | $\pm 1.0 \text{ \AA}^{-1}$ ( $\pm 30^\circ$ for He I)<br>$\pm 1.0 \text{ \AA}^{-1}$ ( $\pm 20^\circ$ for 100 eV)<br>$\pm 2.5 \text{ \AA}^{-1}$ ( $\pm 7.5^\circ$ for 1500 eV) |
| k resolution           | $0.003 \text{ \AA}^{-1}$ for 0.1 mm emission spot   |
| Angular resolution     | $0.1^\circ$ for 0.1 mm emission spot @ HeI  |
| Energy Resolution      | < 1.5 meV   |
| Pass Energy            | 1 - 200 eV  |
| Kinetic Energy         | 0.5 - 200 eV (Shifting Mode)  |
| Kinetic Energy         | 0.5 - 1500 eV   |
| Working distance       | 27,5 mm   |
| Magnetic shielding     | Double $\mu$ -metal shield  |
| Analyzer radius        | 190 mm  |
| Mounting flange        | NW 150 CF, rotatable  |
| Entrance Slit          | motorized   |
| Detector type          | 2D-CMOS detector with SPIN option   |
| Acquisition modes      | Swept, Fixed  |
| Detector modes         | True pulse counting   |

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