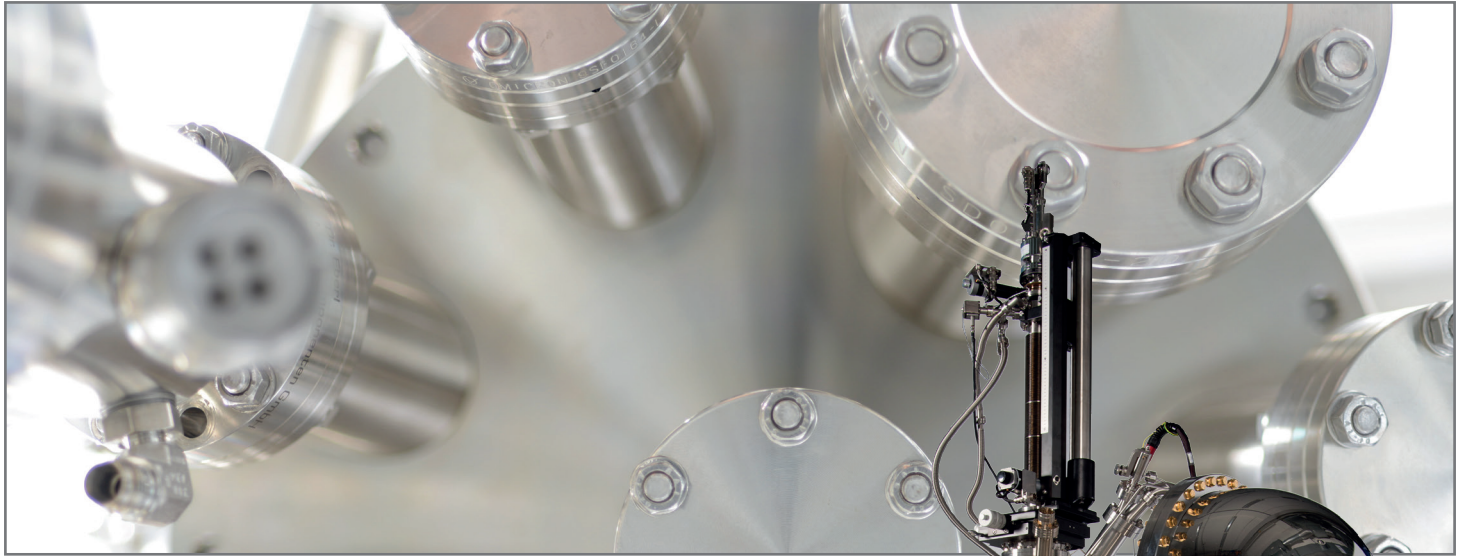


# The expert solution for Angle Resolved Photoemission Spectroscopy

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- Comprehensive ARPES solution by market leader
- Expert integration of the best technologies
- Smart system and measurement automation
- Expert support for configuration and design
- Fast help by world-wide service teams



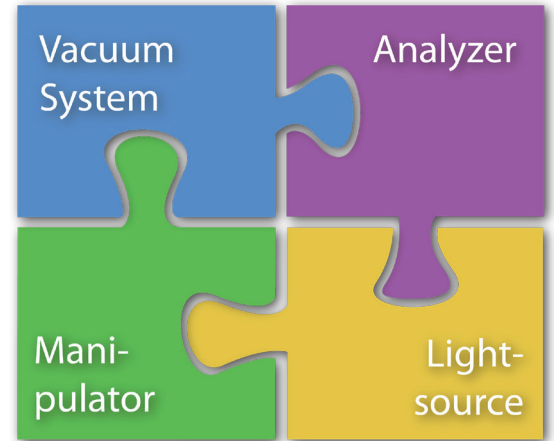
# ARPES-Lab

## What is state of the art in ARPES?

**Angular resolved photoemission spectroscopy (ARPES) has emerged as the most powerful technique to understand the electronic structure of materials and what can influence their physics and chemistry.**

Revealing the band-structure of the valence band and the Fermi-level is fundamental to understanding electron transport, band-gap phenomena and spin-related effects. The progress of new technologies and the development of emergent materials rely more than ever on the ARPES technique to provide a precise understanding of the inherent abilities of complex material systems. This powerful tool is now being extended to time-resolved ARPES experiments yielding direct dynamical information during the evolution of electronic band structure. Scienta Omicron, the provider of the world leading electron spectrometers to specialist in the field, also offers complete turn-key automated ARPES measurement systems with guaranteed performance and expert local support as one of our “Materials Innovation Platforms”.

The key to ultimate ARPES performance is the optimal integration of high class components to a comprehensive system. The ultimate energy and angular resolution of a measurement depends on the analyzer as well as on the light source, the manipulator cooling and the manipulation precision. Advanced measurements of sensitive samples need a powerful vacuum system and an effective shielding.



The Scienta Omicron ARPES-Lab performs band structure mapping measurements faster, more precisely, yielding data sets with fewer variables for simplified data analysis than any other system available. Magnetically shielded chambers and cryogenic sample manipulators that are the standard for many advanced synchrotron endstations are the building blocks to the Scienta Omicron ARPES-Lab.

Intelligently integrated with superior automatization and software control from data acquisition reaching through vacuum control, the ARPES-Lab brings the powerful ARPES technique into an accessible and reliable measurement tool. A pumping system optimized to lowest working pressures even when operating with He-discharge lamps extends sample lifetime and integrity.

### ARPES-Lab advantages:

- Comprehensive solution from one supplier
- DA30-L deflector technology for precise ARPES results
- High photon density VUV sources with small beam spots
- He I and He II monochromators for minimal photon bandwidth
- Ease of use by interplay with system and measurement software
- User-friendly adjustment of light-source and manipulator
- Expert support for configuration and design
- World-wide local Sales and Service-Support

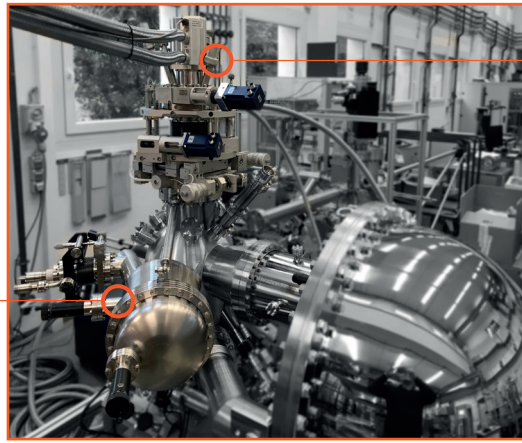
### Best technology concept

The ARPES-Lab is designed to maximize the advantages gained from the revolutionary DA30-L hemispherical high-resolution analyzer with its patented in-lens deflector. The analyzer measures the full 3D surface cone of a band-structure without sample tilt by deflecting the electron trajectories perpendicular to the analyzer entrance slit, which allows for:

- Improved  $k_y$  accuracy in shorter measurement times
- Maintains near constant matrix elements by keeping sample angle fixed
- Ensures reliable measurement position on a fixed sample point necessary for exploring dichroic effects in ARPES and measuring very small samples and/or multi-domain samples

#### Mono XPS source

- Al  $K_{\alpha}$  excitation (1486 eV) for complementary XPS



#### ARPES Manipulator

- LHe cooling < 5 K
- Open cycle or closed cycle
- Fully motorized
- Anti-crash security system

#### Preparation chamber with ports for:

- LEED
- Evaporators
- Sputter-gun
- Heating stage
- Cleaving stage

#### DA30-L analyzer

- In-lens deflector
- Energy resolution < 1.8 meV
- Angular resolution < 0.1°

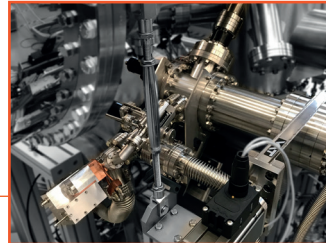
#### Fast Entry lock

#### Magnetic shielding

- Single and double mu-metal liners

#### VUV 5k light source

- Monochromatized VUV source
- Precise beam adjustment stage



#### PUMPING SYSTEM

- Ion getter, Ti sublimation, tandem turbo-molecular and dry scroll pumps

For wide range Brillouin zone scans the motorized sample manipulator is integrated into the measurement (SES) and system software (MISTRAL). The software driven adjustment of the manipulator allows for:

- Precise sample movement during scans
- Automatic movement of the sample between different measurement positions (ARPES, LEED, etc.)
- Security interlocks for manipulator movement

All manipulators (4, 5 or 6 axis) reach very low temperatures (< 10 K) to allow for high energy resolution.

Experts in magnetic shielding design have perfected the chamber to achieve the highest performance from the combination of analyzer and excitation sources.

The ARPES-Lab can support multiple light sources covering a broad energy range to enable investigation of all class of materials. The renowned VUV5k high intensity monochromatic light source can be paired with new laser sources providing selectable energies and polarization exhibiting extremely narrow line width and/or ultra fast pulse width for time resolved ARPES. The ARPES-Lab can additionally support a monochromatic x-ray source for core level chemical state analysis.

Designs incorporating the latest techniques are available; additionally Scienta Omicron can custom tailor the system to enable your unique ideas.



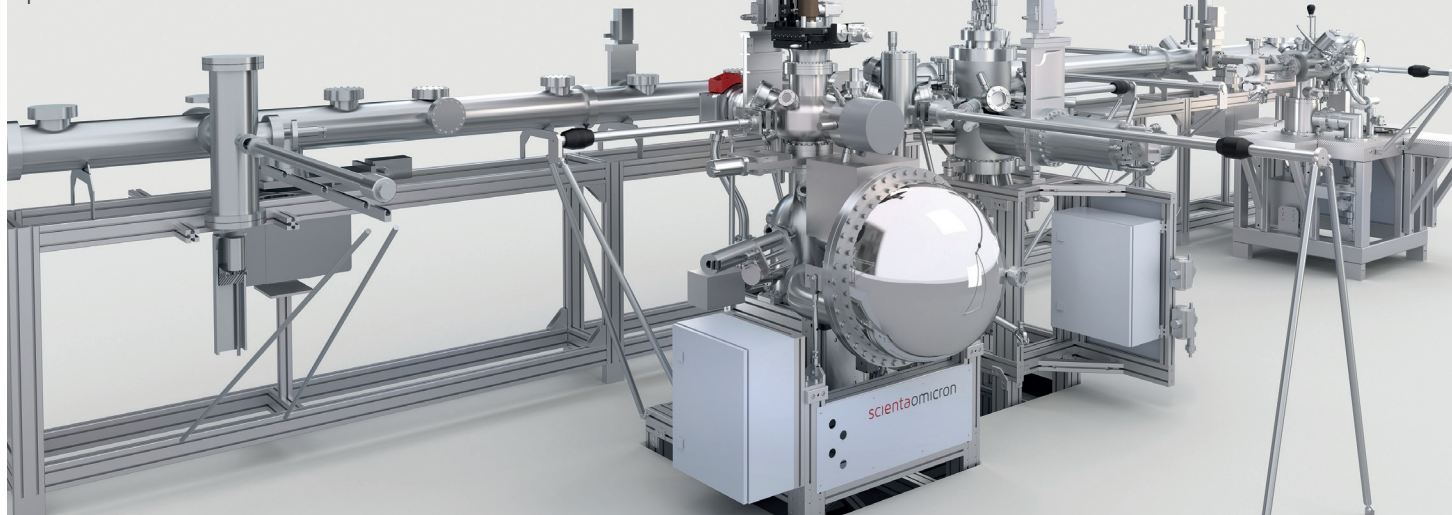
# Scienta Omicron

## Multi-technique from one company

### World-wide service and support centers



Powerful Materials Innovation Platforms can be created by integration with Scienta Omicron thin film growth systems such as MBE plus scanning probe techniques such as STM-AFM to our Low Temperature Nanoprobe for cryogenic transport measurements. Sample preparation and spin filter options are available for extending the scientific possibilities.



## Technical Data

### ARPES-Lab UPS/XPS

Stainless steel chamber with mu-metal liner, DA30-L analyzer, VUV 5k VUV source, XPS source, LHe 5-ax manipulator open cycle \*\*

Property	Target Specification
Energy resolution, analyzer*	1.8 meV
Energy range	3- 1500 eV (angular mode)
Angular resolution, analyzer*	0.1°
Angular resolved range	+/- 15° full cone
Deflector mode for full cone detection	yes
Magnetic shielding, chamber	< 500 nT
Base pressure, analysis chamber	< 1E-10 mBar
Pressure during operation	< 5E-10 mBar
Fast He pumping (tandem turbo pump)	yes
VUV photon flux density	> 1E12 ph/s/mm <sup>2</sup>
VUV beam spot size	< 600 µm
VUV energy-resolution	1 meV (He I)
XPS excitation energy	1487 eV (Al), 1254 eV (Mg)
Manipulator axis	x, y, z, polar, azimuthal
Measurement axis motorization	all
Manipulator temperature range	< 6 K .. 400 K
Super stable electronics	Yes
MISTRAL System Control	Yes
SES Analysis Software	Yes

\*Component specification, Total performance depends on component configuration. Please contact us for details.

\*\* These set-up is an example configuration. Please contact us for your personal configuration.

### Options

A wide range of options allow for tailoring the system to the specific needs of individual research. For example:

<b>Light sources</b>	
HIS 14 HD for small beam spots Laser	< 300 µm
ports	Yes
Monochromatized x-ray sources	Yes
<b>DA30-L 8000 analyzer</b>	
Energy resolution, analyzer*	1.0 meV
Energy range	0.5- 12 eV (angular mode)
<b>Vacuum Chamber</b>	
improved magnetic shielding double chamber design with preparation capabilities	< 100 nT yes
<b>Manipulators</b>	
4-, 5-, and 6- axes, upgradeable	yes
Closed cycle He cooling	yes
Base temperatures	3.5 K- 10 K, depends on model
Counter heating for temp stabilization	for all models