

Angle resolved hemispherical analyser **Service only**



High precision angular dispersive analysis

The ARUPS10 is a UHV compatible hemispherical sector spectrometer analyser/lens system designed specifically for high precision analysis where the angular dependence of electrons from the sample is being studied.

Techniques supported by the ARUPS10 include Angle-Resolved Ultra-violet Photoelectron Spectroscopy (UPS), X-Ray Photoelectron Spectroscopy (XPS), Low Energy Electron Loss Spectroscopy (LEELS), and Angular Ion Scattering Spectroscopy (ISS).

High performance analyser/lens package

The unit consists of a 75mm hemispherical sector electrostatic analyser and lens mounted on a 2-axis high precision goniometer with matched electronics and a [Mu-metal](#) vacuum chamber. The chamber will also accommodate all commonly used analytical components. As the chamber and ports are fabricated from mu-metal, magnetic-field penetration is guaranteed to be very low, the thick (5mm) wall, and 28 integral ports offering the ultimate in magnetic shielding and full flexibility for multiple

techniques or future upgrades.

High sensitivity for best angular resolution

The analyser is a high precision 180° hemispherical-sector electrostatic design with a mean sector radius of 75mm and hemisphere gap of 30mm. The energy resolution is variable from less than 10meV to greater than 2eV. The angular resolution, defined by a multi-element lens, is better than ± 0.4 degrees to greater than ± 2 degrees. The Multi-element lens can be electrically zoomed, without breaking vacuum, to increase or decrease the collection angle of the electrons. This facility offers the user the maximum flexibility of angular resolution vs transmission. The compact lens design also allows less than 15 degrees included angle between an axis of incident radiation and the axis of the collection lens.

Versatility of hemispherical sector analysis

The single channeltron ARUPS10 uses a single channel electron multiplier operating in pulse-counting mode. The double-focusing properties of the genuine hemispherical sector analyser are fully exploited with a full $\pm 90^\circ$ in the non-dispersive direction.

Multi-channel detector option

The ARUPS10 analyser can be supplied with a multi-channel detector system which gives up to a factor of 5 increase in the specification compared to the single channel detector. The multi-channel detector comprises a stack of two channelplates which provide a gain of approximately 10^8 , and a resistive anode encoder which has a 25mm active area. The resistive anode encoder can detect the position at which electrons are incident on the detector.

The position of the dispersive direction of the analyser is dependent on the kinetic energy of the electron, allowing the signal over a range of kinetic energies to be recorded.

The ultimate resolution is also improved with the multi-channel detector. Counting only those electrons that strike the detector within a narrow area has the same effect as having a very narrow conventional exit slit. In this way the "apparent" exit slit can be reduced to 0.25mm, compared to an actual 1mm wide slit on a single channel ARUPS10.

Analyser/lens operating ranges

The lens may be switched to different modes of operation offering various angles of acceptance and kinetic energy ranges. With the lens switched off, a point source at the sample (for example, from a synchrotron monochromator) offers an angular resolution of $\pm 0.2^\circ$ from 0 - 2500eV, without electronic-changing or

cable-changing, and as standard. The operating ranges of the lens modes are as follows:

Mode	a	KE limit	Spot size
1	$\pm 1.2^\circ$	1.0keV	3mm
2	$\pm 0.8^\circ$	1.5keV	3mm
3	$\pm 0.4^\circ$	1.5keV	3mm
4	$\pm 2.0^\circ$	0.5keV	1.75mm
Lens off	$\pm 0.2^\circ$	2.5keV	Point

Note : Lens off mode $\pm 0.2^\circ$ assumes a point source (for example, synchrotron monochromator) is used.

The Goniometer

The analyser is mounted on a precision 2-axis Goniometer designed specifically for anti-clash and sample access. Both axes are fitted with vernier readouts of 0.1° precision. With no sources hindering analyser movement, the analyser may be moved a full 360° in the horizontal plane.

The goniometer passes, without fouling, beneath all standard components mounted in the horizontal plane providing a full 360° polar rotation. The chamber may be fully loaded with standard Thermo VG Scientific sources and analysers, maintaining full 180° horizontal rotation with the analyser in the horizontal position. The azimuthal rotation covers the 90° range from vertically-upward pointing lens to horizontal ($\pm 5^\circ$ extra at each end of the travel). The lens-axis of the analyser may be brought to within 15° of the incident light axis without overlapping it.

Multi-technique versatility

The chamber is two-level, for RVLEED at the higher level and ARUPS at the lower level. The chamber can also be fitted with a CLAM2AR integrated-angle photoelectron-spectrometer. Ports are also available for the Thermo VG Scientific x-ray source and high power x-ray source, LEG63AR scanning auger electron gun, high-intensity helium discharge UV source and a port for synchrotron monochromator, plus several other ports for cleaning guns, etc.

Provision is also made for a vertical manipulator (Omni-ax), and for a sample manipulator for transfer (adjacent preparation-chamber port). Several viewport flanges are included for sample and angle-scale viewing.

Computer control

The ARUPS10 complimented by Thermo VG Scientifics [VGX900](#) data acquisition and processing software.