ATLAS M

microXRF spectrometer

Energy dispersive X-ray fluorescence spectrometer
Elemental analysis and hyperspectral XRF imaging

IXRF
SYSTEMS

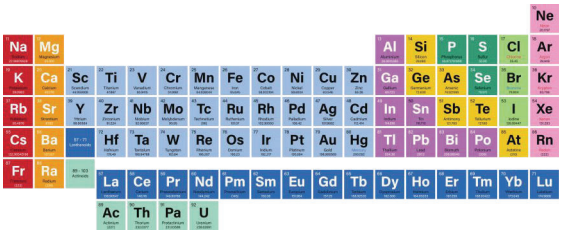
Advanced hyperspectral imaging microXRF spectrometer

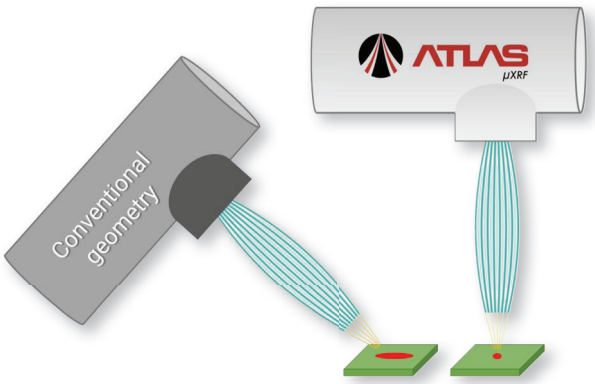
IXRF Systems' ATLAS M is our general purpose micro spot energy dispersive X-ray fluorescence spectrometer for the quantification and microXRF hyperspectral imaging of elements from sodium (Na) through uranium (U) in air, vacuum or helium environments.

Designed to non-destructively analyze and map a wide variety of sample types, ATLAS leads the industry in virtually every major specification category, from the most powerful software and the largest detector active area, to our superior perpendicular X-ray beam geometry and available 5 µm diameter micro X-ray spot. In addition, ATLAS M features the largest sample stage in its class, with the ability to map 100% of a 150 mm wafer (190 x 220 mm mapping travel).

ATLAS' **Iridium Ultra** software platform, developed with SEM/EDS elemental mapping and analytical functionality, is unsurpassed in its ability to provide elemental and phase mapping, line scans, critical dimensions (CD) as well as qualitative and quantitative elemental analyses of solids, liquids, particles, powders and thin films.

The functional, flexible, and feature-rich software suite guarantees unprecedented productivity. With the smallest available spot, a cavernous sample chamber, the optimal optical geometry and most comprehensive software, ATLAS M is the microXRF (µEDXRF) imaging spectrometer that leads the world with innovation.



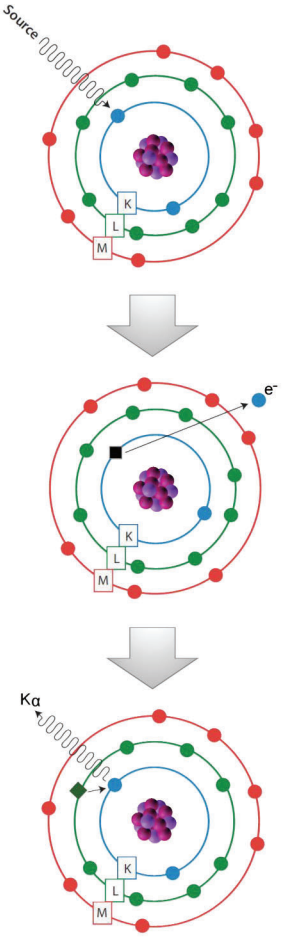


In contrast to the ellipse painted by conventional microXRF instruments, ATLAS features a perpendicular X-ray beam geometry (normal to the sample surface) that delivers a perfectly circular 5µm micro spot for superior imaging.

How does X-ray fluorescence work ?

In X-ray fluorescence (XRF), an electron can be ejected from its atomic orbital by the absorption of a light wave (photon) of sufficient energy (top image). The energy of the photon (hv) must be greater than the energy with which the electron is bound to the nucleus of the atom. When an inner orbital electron is ejected from an atom (middle image), an electron from a higher energy level orbital will be transferred to the lower energy level orbital. During this transition a photon maybe emitted from the atom (bottom image). This fluorescent light is called the characteristic X-ray of an element. The energy of the emitted photon will be equal to the difference in energies between the two orbitals occupied by the electron making the transition. Because the energy difference between two specific orbital shells, for a given element, is always the same, the photon emitted will always have the same energy.

For a particular energy (wavelength) of fluorescent light emitted by an element, the number of photons per unit time (generally referred to as peak intensity or count rate) is related to the amount of that analyte in the sample. The counting rates for all detectable elements within a sample are usually calculated by counting, for a set amount of time, the number of photons that are detected for the various analytes' characteristic X-ray energy lines. Therefore, by determining the energy of the X-ray peaks in a sample's spectrum, and by calculating the count rate of the various elemental peaks, it is possible to qualitatively establish the elemental composition of the samples and to quantitatively measure the concentration of these elements.



XRF Theory

MicroXRF elemental map of K, Ca and Se in a hydrated fully opened leaflet of *Neptunia amplexicaulis* (image courtesy of University of Queensland).

What is microXRF ?

Micro X-ray fluorescence (µXRF, µEDXRF, micro-XRF, microEDXRF) spectroscopy is an elemental analysis technique that relies on the same principles as X-ray fluorescence (XRF) spectrometry. The difference is that micro x-ray fluorescence (microXRF) spectrometry has a spatial resolution with a diameter many orders of magnitude smaller than conventional XRF, TXRF, WDXRF or EDXRF spectrometers.

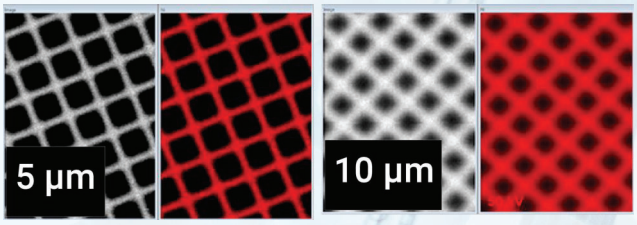
Practically, microXRF spectrometers with high-precision scanning XYZ-stages — like the ATLAS M — function as a type of XRF hyperspectral imaging microscope, where each pixel (in a map or image) contains information from 1 – 40 keV in the electromagnetic spectrum. For ATLAS, the standard pixel size is 5 microns, with 10 and 25 µm being optionally available.

While not having nearly the spacial resolution of a scanning electron microscope equipped with an energy dispersive spectrometer (SEM/EDS), in operation they are quite similar as ATLAS M shares the same **Iridium Ultra** software employed by IXRF Systems' SEM/EDS offerings.

ATLAS μXRF

5 µm microspot X-ray excitation

50 kV / 50 W / 1 mA Rh target X-ray tube with polycapillary focusing optic. Image of TEM grid at right shows the superior resolution of a 5 µm spot (left) compared with a 10 µm spot (right).

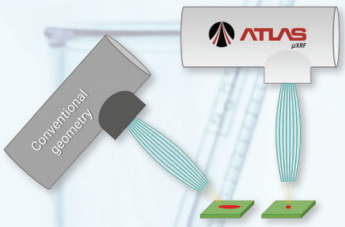


Optional second X-ray tube

Never compromise on sensitivity by adding a second X-ray source to your instrument. With a choice of anodes, secondary tubes are available in several spotsize and maximum kV configurations.

Perpendicular tube geometry

The optimal microXRF optical design points the primary X-ray beam straight down, resulting in a high intensity round microspot. Available spot sizes are 5, 10, and 25 microns.

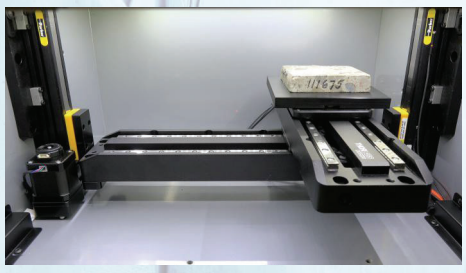


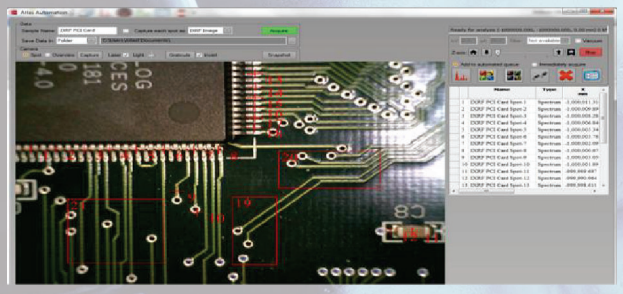
Largest detector area — 280 mm²

Mix and match up to 4 silicon drift detectors (SDD) to achieve unmatched throughput. Customize your system with a choice of 25 or 70 mm² active areas (≤130-145 eV res).

Largest microXRF sample chamber

Chamber size is 508 x 457 x 254 mm, with mapping area of 190 x 220 mm under automatic control. LED lighting is provided for the three sample positioning and analysis cameras.





Advanced overview & spot automation

Imaging is highly automated through the integrated overview or (telescope) spot video camera systems. Simply drag the mouse on the image to create an area for microXRF mapping.

Energy dispersive X-ray fluorescence spectrometer

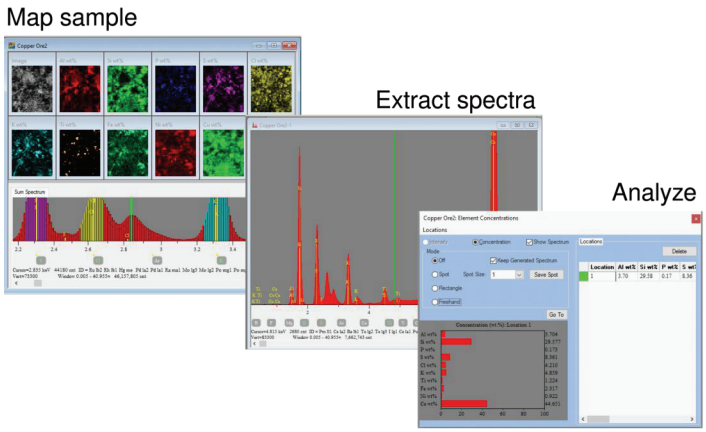
Elemental analysis and hyperspectral microXRF imaging

Up to 16K x 16K pixel (256 MP) images, with each pixel a complete EDXRF spectrum.

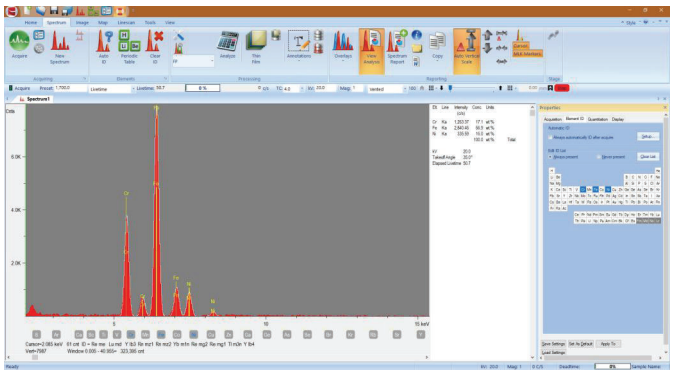
IXRF SYSTEMS

Iridium Ultra software

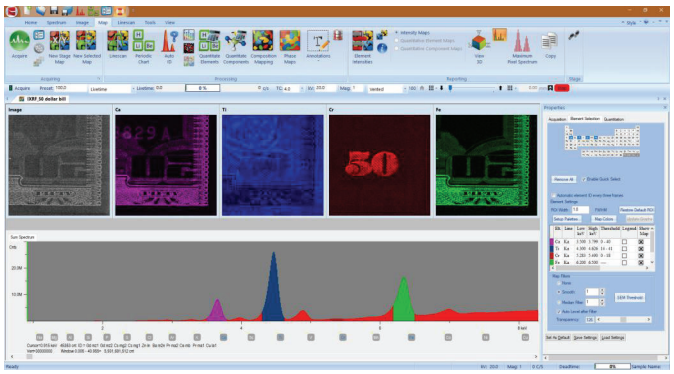
For our SEM-EDS, SEM-XRF and microEDXRF products, IXRF offers **Iridium Ultra**: an all-inclusive state-of-the-art software suite featuring a myriad of comprehensive qualitative and quantitative capabilities supporting both e-beam and X-ray excitation. Included are stage control and automation, data acquisition, spectral manupulation (including deconvolution and artifact removal), mapping, imaging, and statistical analysis tools. The platform is unsurpassed in it's ability to provide elemental and phase mapping, line scans, critical dimensions (CD) as well as qualitative and quantitative elemental analyses. For the ATLAS microXRF line, this includes analysis of solids, liquids, particles, powders and thin films.



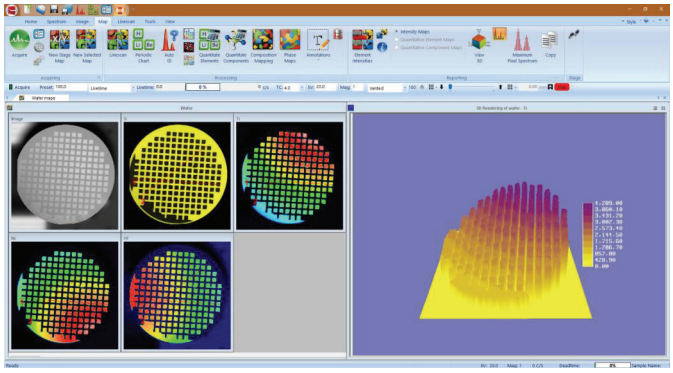
Workflow for ATLAS series instruments is straightforward. Typically a sample is mapped to reveal features and/or components. Sum spectra for like things are then defined and analyzed. A formal report may be created if desired.



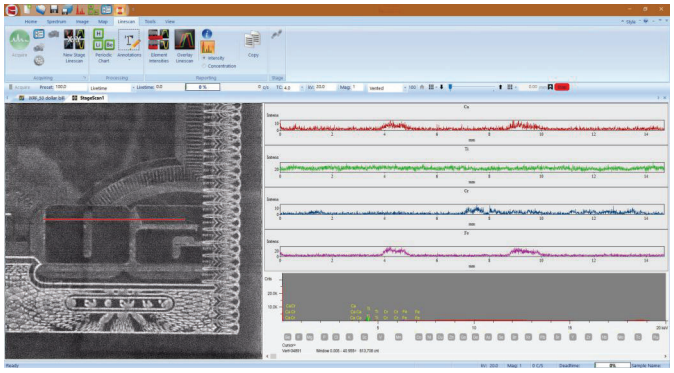
Spectrum tab affords a conventional EDXRF viewpoint for qualitative and quantitative evaluation. Shown are KLM markers, FP results and an overlay of the deconvolution.



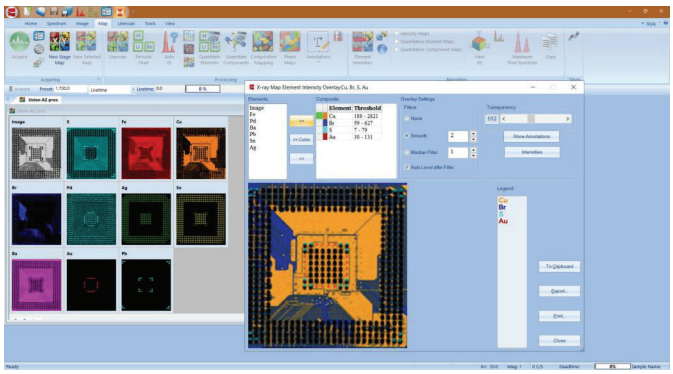
Map tab displays the prototypical microXRF dashboard with a monochrome image of the sample followed by maps for each element. The sum spectrum for the map is at screen bottom.



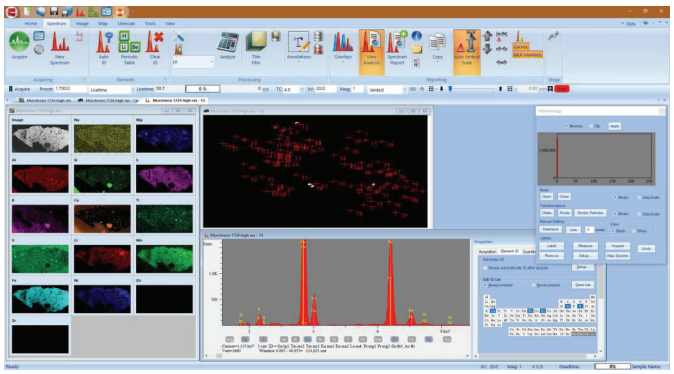
In 3D Viewer, the intensity of each pixel in a map is used as a height (Z axis), thus forming a surface from the data. Note that this feature is not a topographical map.



In Linescan, an arbitrary line can be drawn to calculate the elemental composition across a sample: an excellent tool for determining the location of phases, particles and features.



Map Overlay provides a multi-element overlay over a Stage Map. Above is a lead frame example of a typical map overly. Transparency and filters are applied for contrast.



Using the Murchison meteorite as an example, highly automated morphology tools provide sum spectra analysis of bright calcium inclusions with just a few mouse clicks.

Iridium Ultra features*

* for a more comprehensive list with examples, please visit the product's page: ixrfsystems.com/atlas_m

- 16K x 16K images/maps
- ASTM E2926 (optional)
- Auto peak I.D.
- Automation
- Composition maps
- Custom reporting
- Elemental maps
- Fundamental parameters (FP)
- Least squares (LS) calibration
- Linescans
- Match
- Scatter plot analysis
- Maximum pixel spectrum
- Morphology (feature analysis)
- Phase analysis & mapping
- Principal component analysis (PCA)
- Ratio maps
- Spot/overview cameras automation
- Standardless FP
- Thermal maps
- Thin film FP
- Three camera views
- Three dimentsional viewer (3D)
- Type standard FP

About IXRF

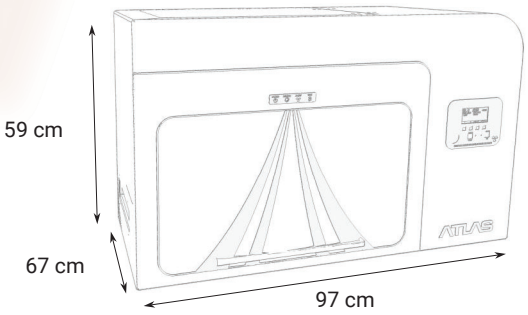
For almost three decades IXRF has been designing and manufacturing high-end X-ray Microanalysis systems in the United States of America. We specialize in SEM/EDS, SEM-XRF, and microXRF spectrometry.

Atlas M specifications

Configurations shown below are subject to change. By design, Atlas M is highly customizable. As such, IXRF routinely works with customers to tailor our instruments to specific customer needs and requirements.

Elemental range:	Sodium (Na) to uranium (U)
Elemental range (optional):	Carbon (C) through uranium (U)
Sample types:	Solids, liquids, particles, powders and thin films
Sample chamber size:	508 x 457 x 254 mm (20 x 18 x 10 inches)
Analysis atmosphere:	Air, vacuum, or $He_{(g)}$ purge
Primary X-ray source:	50 W max power, 50 kV @ 1 mA, polycapillary optic
Optional secondary X-ray source:	4 W max power, 50 kV @ 2 mA, pinhole collimation
X-ray source anode:	Rhodium (others optionally available)
X-ray source spot size (primary):	5 µm standard (optional: 10 or 25 µm)
X-ray source filters:	Up to 7 plus an open position
Primary X-ray source geometry:	Top-down beam (perpendicular to sample stage)
Detector(s):	1 standard, optionally up to a maximum of 4
Detector type:	Silicon drift detector (SDD)
Detector active area:	25 to 70mm^2, up to 280mm^2 w/ 4 detectors
Sample stage type:	Motorized X,Y and Z
Sample stage travel:	220(W) x 220(D) x 120(H) mm
Mapping travel:	190(X) x 220(Y) mm
Mapping scan speed:	1 ms/pixel (minimum)
Stage XY speed:	Up to 300 mm/s
Sample view:	3 cameras for sample positioning and analysis
Computer and OS:	SFF PC w/ Microsoft ® Windows™
Analysis and control software:	Iridium Ultra™
Quality and safety:	CE marked, RoHS, radiation < 0.5 µSv/h
Dimensions:	97(L) x 67(W) x 59(H) cm (38 x 26 x 23 inches)
Power:	100-240 V, 1 phase, 50/60 Hz

CE



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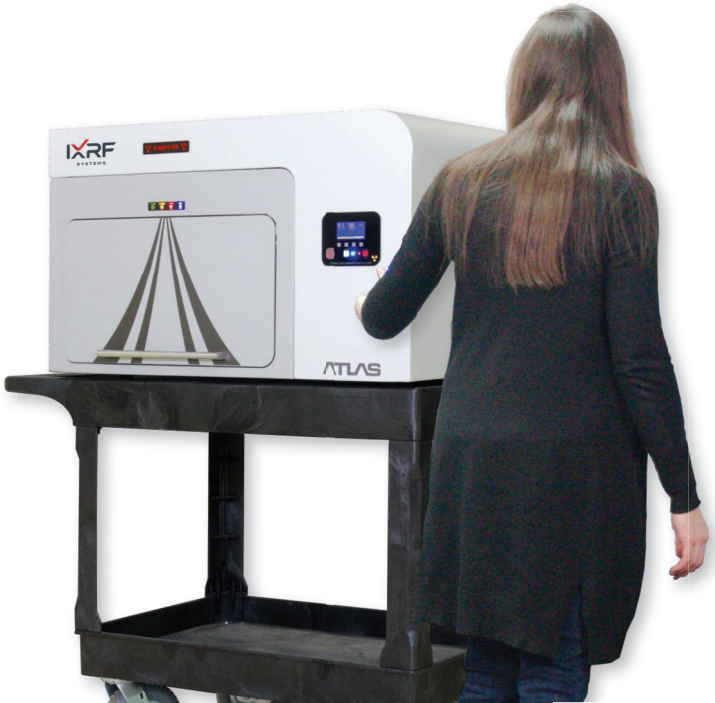
https://www.ixrfsystems.com/atlas_m/



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