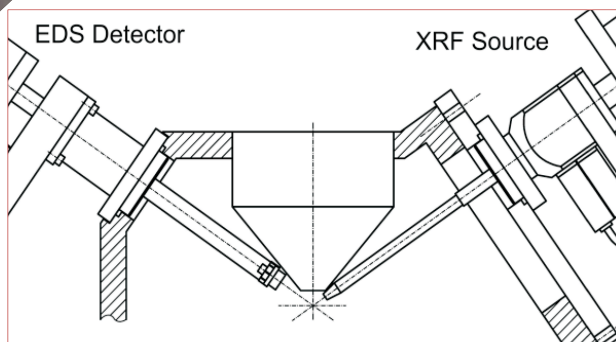
SEM-XRF
DATA DISCOVERED

IXRF SYSTEMS

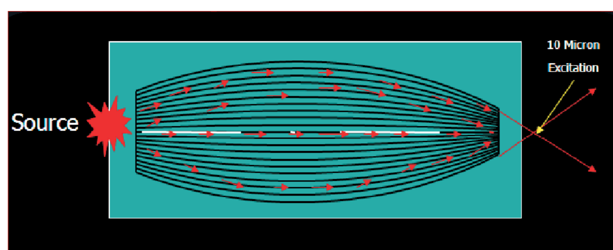
INNOVATION

The primary component of X-ray Fluorescence is brought into the SEM chamber by a low powered transmission target X-ray tube. The tubes are reduced in size and produce less heat than larger tubes. Mo, W and Ag thin film targets deposited on a Be window are available for varying applications.

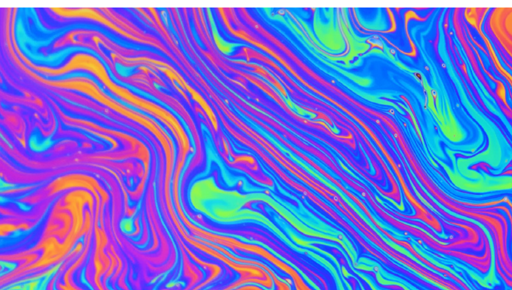


X-ray tube additions may be interfaced to almost any SEM. High angle (35deg) as well as horizontal flange mounts are available for every tube package.

Packaged tubes may be operated up to 50kV and come with integral high voltage power supplies. Power supplies are integrated with interlocking vacuum sensors which shut off the x-rays when the SEM chamber is vented. Each unit automatically “ramps” the tubes for increased longevity.



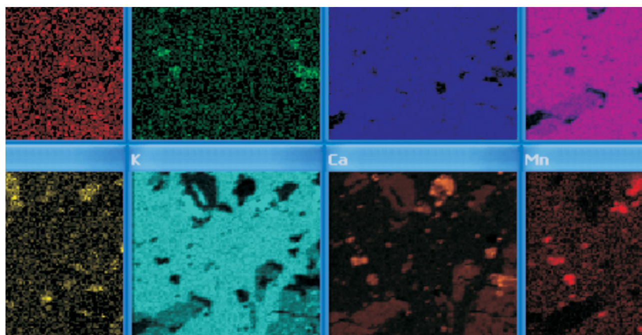
The addition of focusing capillary optics enables microspot XRF analysis down to 10 microns. A greatly reduced spot size increases XRF X-ray elemental mapping capability and enhances trace analysis at the micron level.

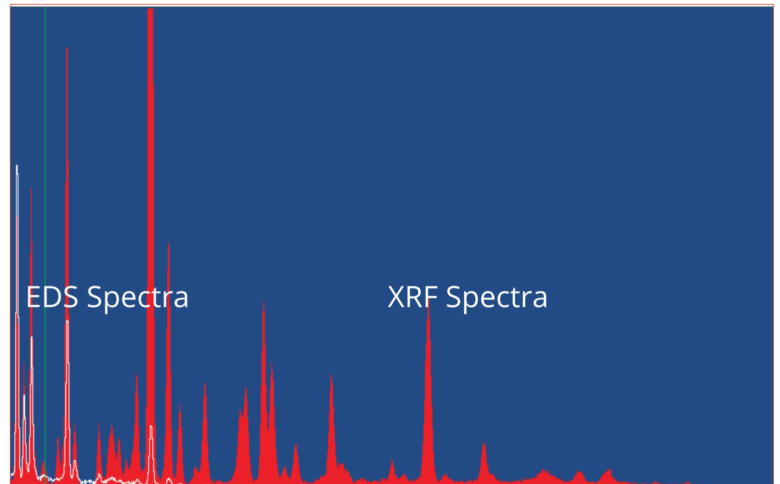


APPLICATION

THE ADDITION OF XRF TO THE SEM OFFERS:

- **INCREASE.** Higher peak to background ratios enable greater elemental sensitivity for higher Z elements; sensitivity exceeding SEM-EDS by a factor of 10-1000x
- **IMPROVE.** Increased beam stability, premium X-ray detectors and greater vacuum, yields higher accuracy when using standards making ppm level analysis a snap!
- **SEPARATE.** Less complex handling of various peak overlaps
- **VALUE ADDED.** Analysis of non-conductive materials without coating
- **VALUE ADDED.** Integrated with EDS software for the most accurate low energy-high energy (full spectrum) analysis available

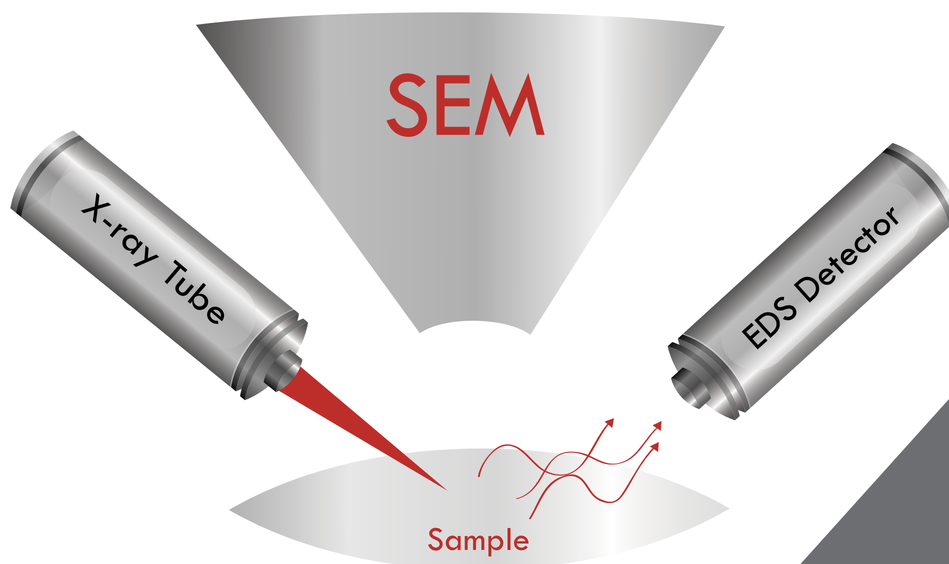




X-RAY IMAGING

This is a picture of a 12 micron Ni grid X-ray map. The grid is imaged with a 10 micron "X-Beam" demonstrating 10 micron spatial resolution.

Combined EDS and XRF X-ray mapping bring previously unseen capability to the microscopist. Never before have the two been combined and made commercially available.

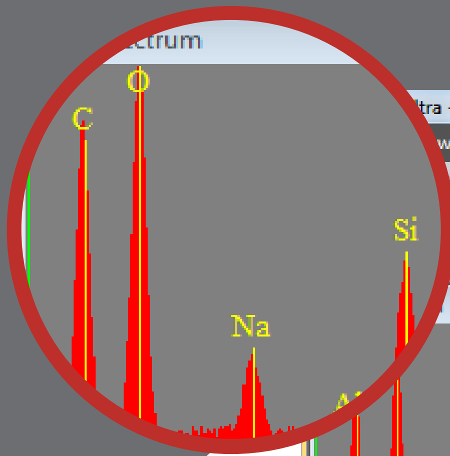


INNOVATION

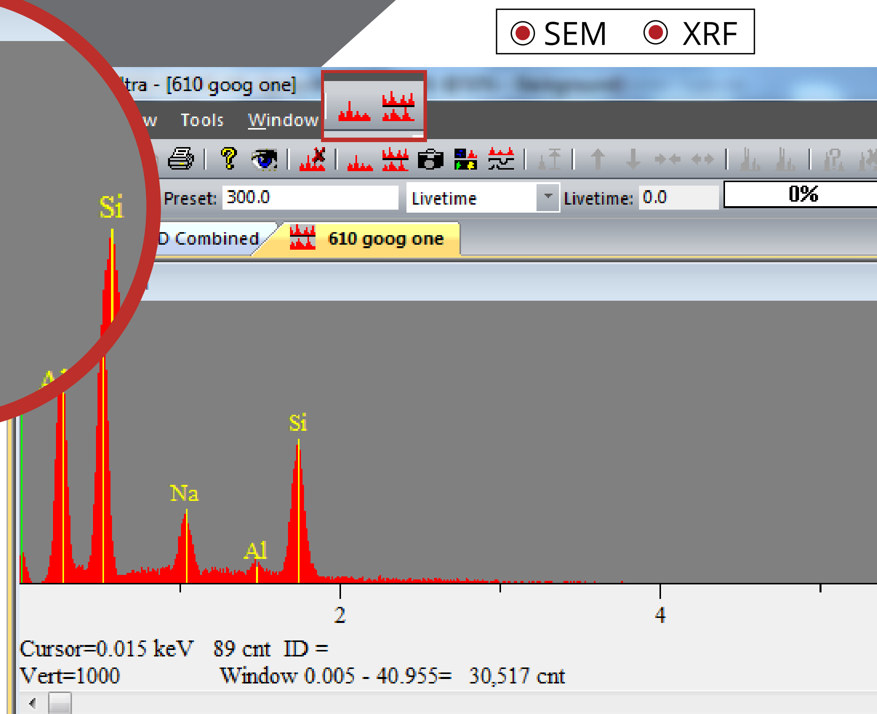
EDS-X
INTEGRATED A

SEM XRF

EDS

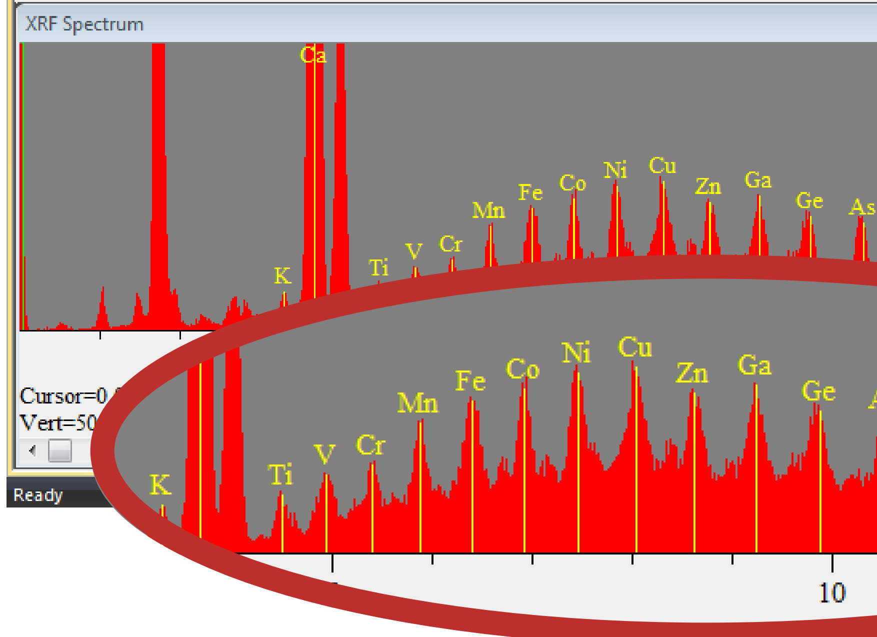


To acquire the most comprehensive and accurate full spectrum in seconds, use your EDS system to capture the light elements between 0-3kV, then use the IXRF SEM-XRF tool to acquire the heavier, higher energy elements between 3-50kV.



XRF

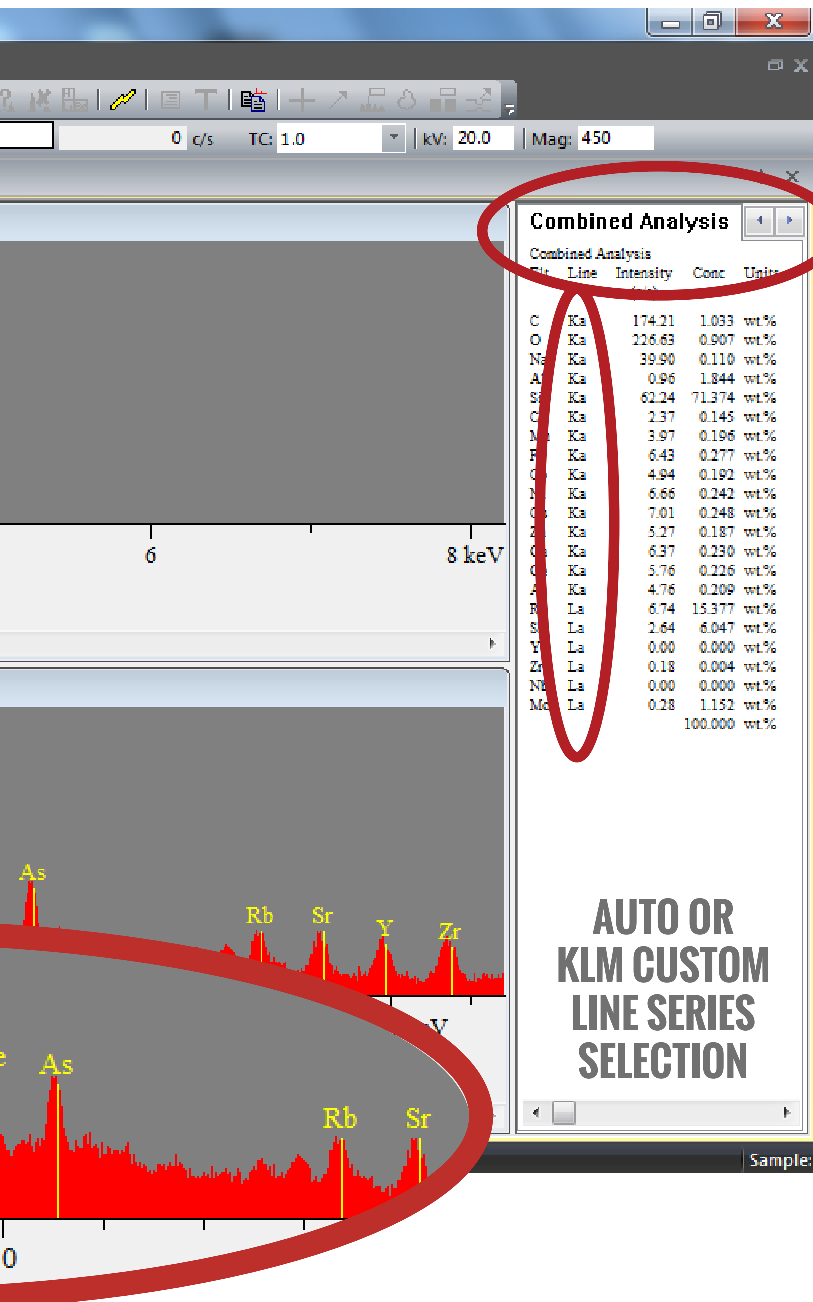
Acquire your full spectrum using one technique at a time or collect simultaneously. Acquire light and heavy elements using two techniques at the same sample location without ever opening the chamber.



= FULL SPECTRUM SOLUTION

S-XRF
ACQUISITION

QUANTITATION



COMBINED QUANTITATION

See both the EDS spectrum and the XRF spectrum in our exclusive dual panel display for quick qualitative comparison. Experience quantitative power like never before. Run in full auto mode for fast standardless analysis of all elements. Our software will automatically select the appropriate line series for each element.

For quantitative superiority, customize line series and use standards to mix-match quantitative routines. Only IXRF offers the flexibility to use any quantitative routine for individual elements in a single spectrum!

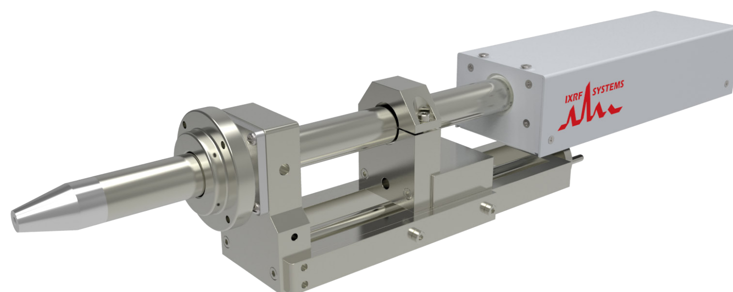
AVAILABLE QUANTITATIVE ROUTINES
Auto
ZAF
FP
Least Squares
Match

BULK XRF

ƒX SEM™

The new ƒX SEM™ custom x-ray source is designed exclusively for use on electron microscopes. The compact design and slide mounting allow very close coupling to the sample. The orientation yields high "flux" (x-rays) in small to large excitation areas on the sample surface. The ƒX SEM™ offers excitation areas 500µm to 25mm. The integrated high-voltage power supply operates up to a maximum power of 10 watts (35 kV and 0.1 mA depending on anode material). The close coupling provides XRF analytical results comparable to those from traditional "benchtop" or "standalone" units. The ƒX SEM™ is designed so that it does not interfere with the normal operation of the electron microscope. The electron beam can be used on the same sample at the same time as the ƒX SEM™ collecting all elements simultaneously.

No special cooling is required.

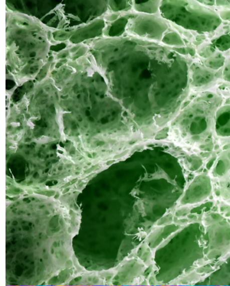


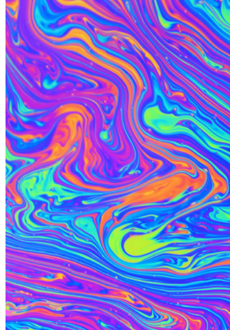
BUT WHY?

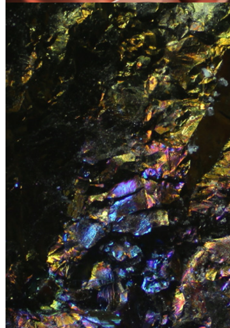
Electron beams (from scanning electron microscopes) produce very high backgrounds hiding the trace elements in the sample. X-rays, from a true "x-ray" source don't have this effect. Using the ƒX SEM™, ppm levels of elements can be easily identified, quantified, and even produce x-ray maps of elemental distribution of trace elements in your sample.

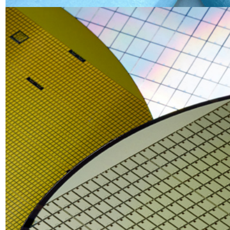
ƒX SEM™ Specifications	
Anode Type	End-window transmission
Target Material	Ag, Mo & W
Accelerating Voltage	10-35kV
Beam Current	0-100µA
Anode Spot Size	<500µm
Collimator Size	200µm, 500µm, 1000µm (others available)
Source Filters	Available upon request
Cooling Requirements	Conduction cooled, no fan required
Controls/Safety	Variable control kV/µA, X-ray on/off buttons, kV/µA display. Inter-locked to SEM, keyed power-on switch, Integrated high-voltage power supply, HV-On lamp, warning beacon

MICRO XRF





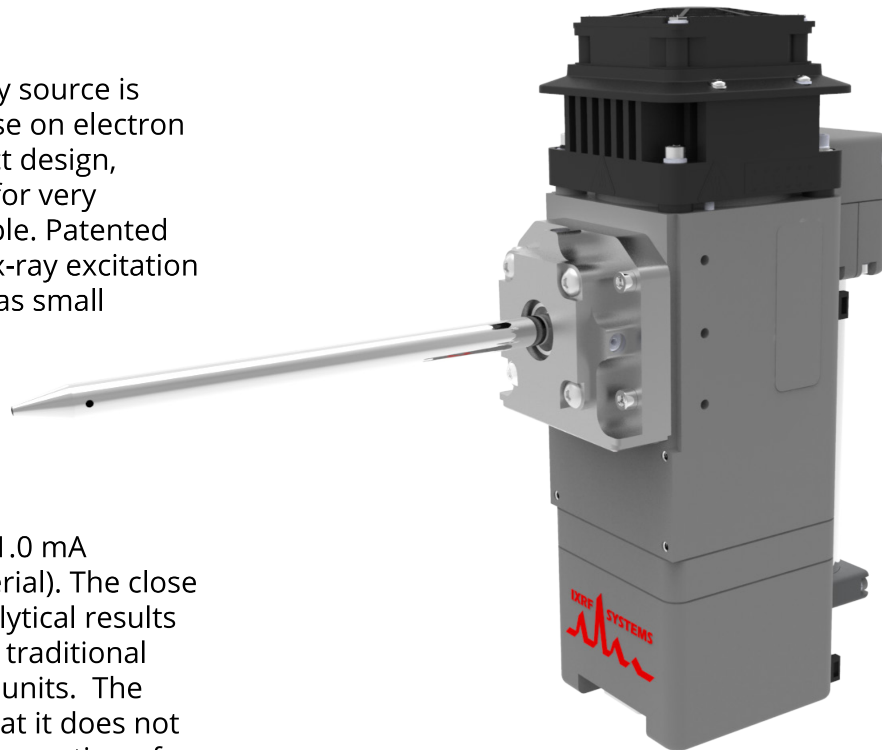




Xb SEM™

The Xb SEM™ custom x-ray source is designed exclusively for use on electron microscopes. The compact design, and slide mounting allow for very close coupling to the sample. Patented polycapillary optics focus x-ray excitation down to sample spot size as small as 10µm. The Xb SEM™ is offered in 10µm, 20µm and 40µm spot sizes. The integrated high-voltage power supply operates up to a maximum power of 50 watts (35-50 kV and 1.0 mA depending on anode material). The close coupling provides XRF analytical results comparable to those from traditional "tabletop" or "standalone" units. The Xb SEM™ is designed so that it does not interfere with the normal operation of the electron microscope. The electron beam can be used on the same sample at the same time as the Xb SEM™ collecting all elements simultaneously.

No special cooling is required.

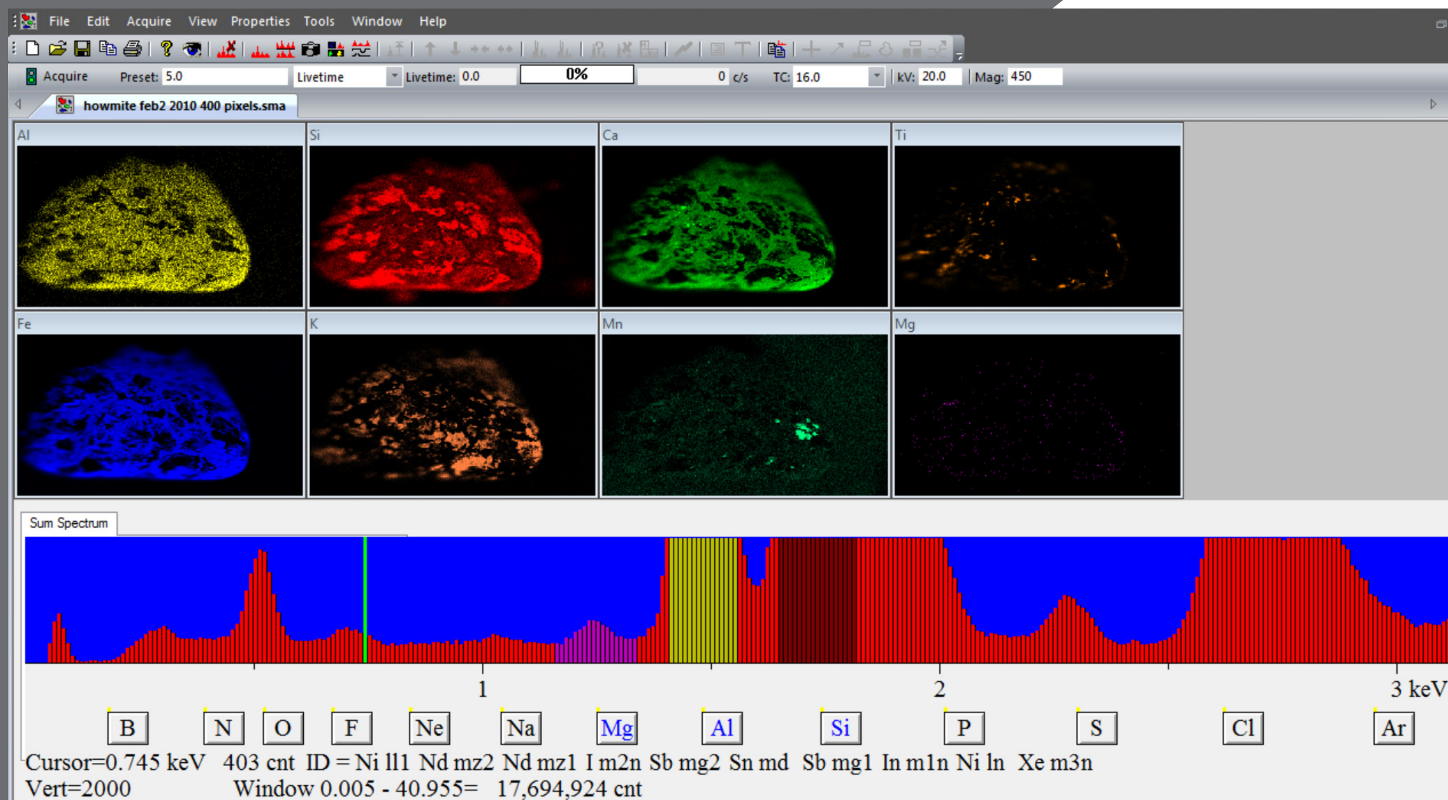


BUT WHY?

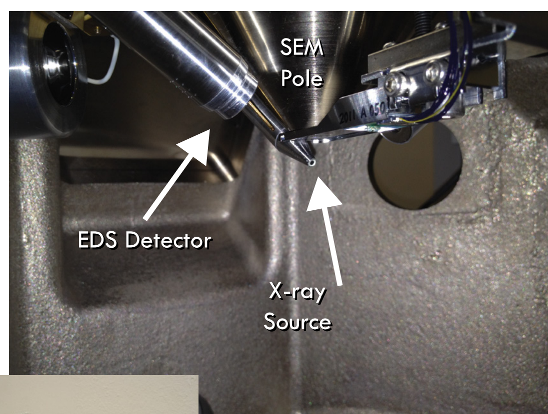
Electron beams (from scanning electron microscopes) produce very high backgrounds hiding the trace elements in the sample. X-rays, from a true "x-ray" source don't have this effect. Using the Xb, ppm levels of elements can be easily identified, quantified, and even produce x-ray maps of elemental distribution of trace elements in your sample.

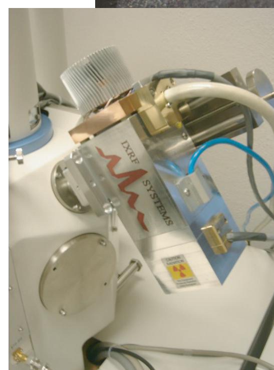
Xb SEM™ Specifications	
Anode Type	Side-window
Target Material	Ag, Cu, Mo, Rh & W
Accelerating Voltage	0-50kV
Beam Current	Max 1mA
Excitation Spot Size	10, 20, 40µm
Collimator Size	Patented Polycapillary Focusing Optic
Source Filters	Available upon request
Cooling Requirements	Fan cooled for power > 100watts
Controls/Safety	Variable control kV/µA, X-ray on/off buttons, kV/µA display, internal inter-locked shutter. Interlocked to SEM, keyed power-on switch, HV-On lamp, warning beacon

EXTENDED APPLICATION INFORMATION



XRF provides non-destructive analysis of various sample sizes and sample types including solids, environmental samples, powders and residues. Below are examples of common applications for traditional tabletop (bench top) XRF that are now available inside the SEM:



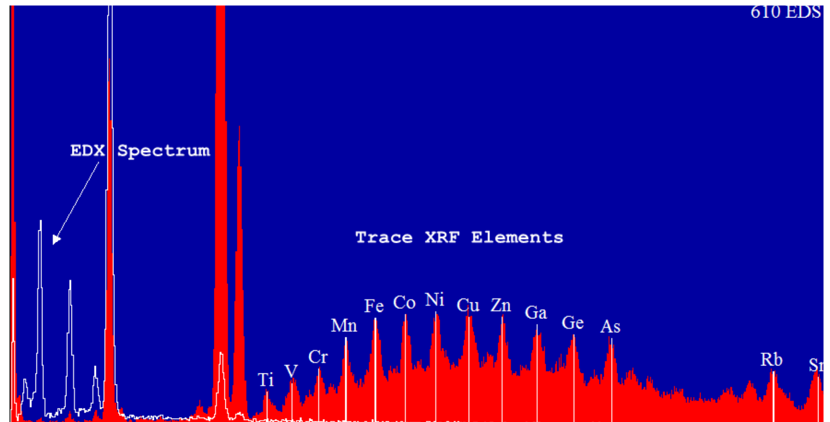


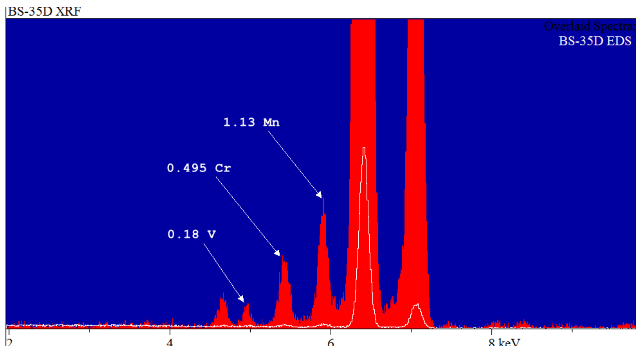
- Art and Archeological
- Chemical
- Coatings and Thin Film
- Cosmetic
- Educational
- Environmental
- Food Applications
- Forensics
- Metal and Ore
- Mineral and Mineral Products
- Petroleum EDXRF
- Pharmaceutical Applications
- Plastics, Polymers, and Rubber
- Plating and Plating Baths
- Wood Treating
- Concrete Treating
- And Others

EXTENDED APPLICATION INFORMATION

INCREASE SENSITIVITY

XRF can be used for trace spectral acquisition down to low PPM levels. XRF can be 10-1000 times more sensitive than SEM-EDS analysis, exemplified here by the greatly increased trace level peaks in the NIST SRM 610 glass standard.



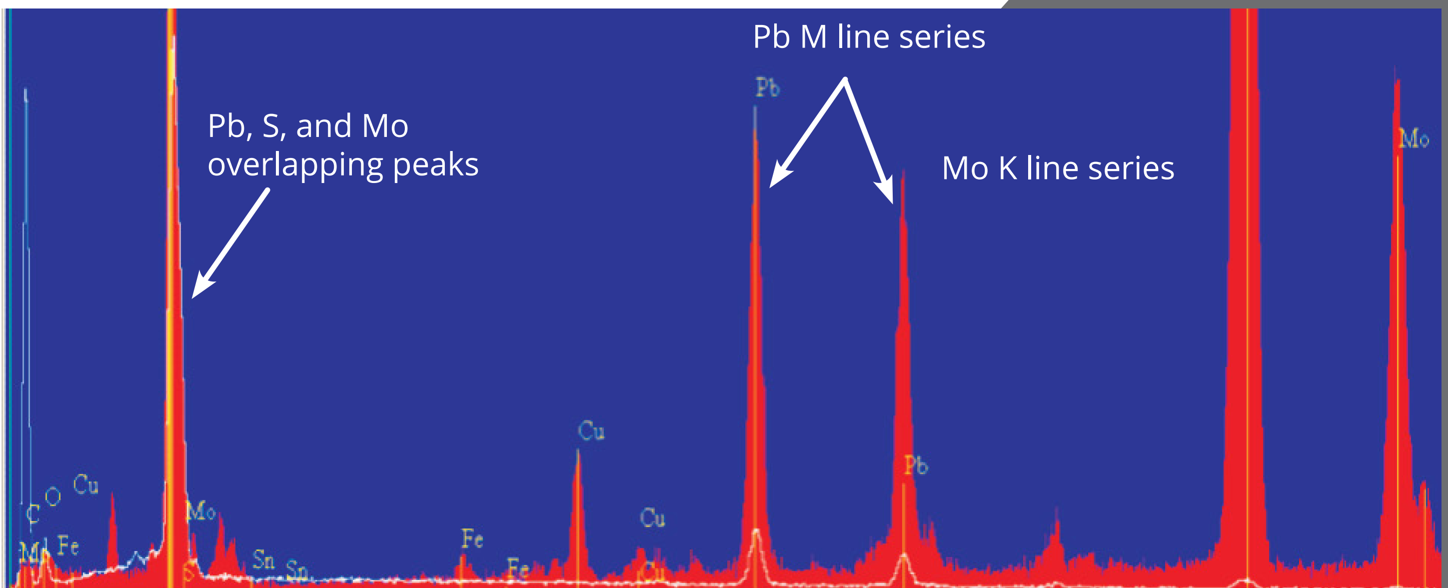


IMPROVE ACCURACY

XRF produced no electron- induced X-ray broadband radiation and thus yields a greatly reduced background. Only X-ray scattered radiation occurs (monochromatic), which is much less than the electron-induced bremsstrahlung created by the e-beam. Trace peaks not observed or lost, in the SEM-EDS background are often clearly visible when using XRF; illustrated here by the 0.495% Chromium XRF peak.

SEPARATE PEAKS

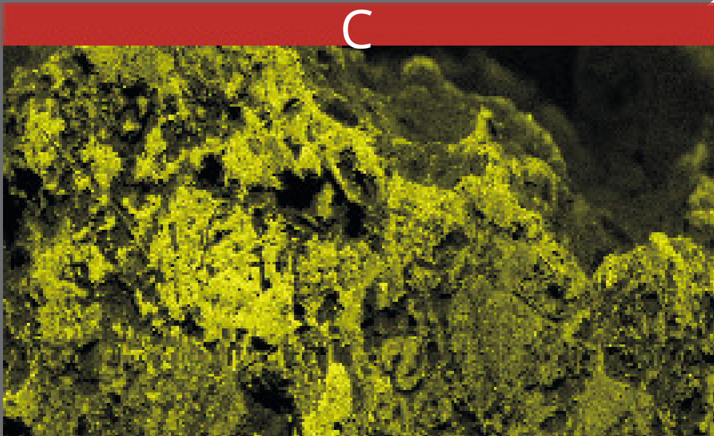
More efficient excitation for heavier, higher Z elements enables XRF to adequately separate and identify peak overlaps, displayed here: Pb and Mo peaks identified at 12kV and 19kV (right). In this instance the higher energy K lines are less complex and less overlapped.



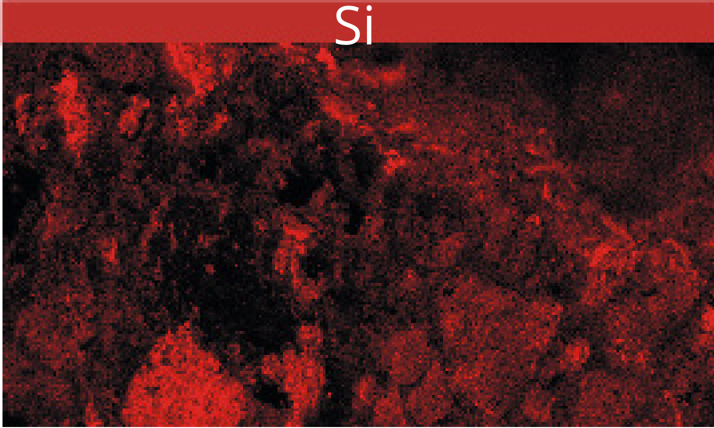
EXTENDED APPLICATION INFORMATION

The IXRF SEM-XRF option, offers the ability to use both the electron beam and Micro-XRF beam simultaneously. With the electron beam at 3-5kV, only the light elements are excited. There is no significant background added to the XRF spectra, allowing all the elements in the sample to be seen.

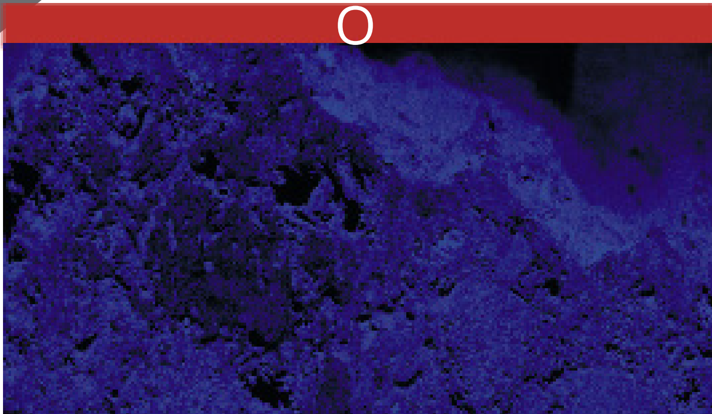
E-BEAM



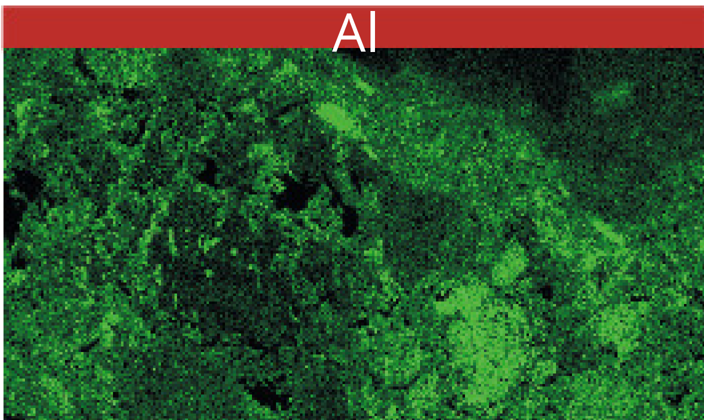
E-BEAM

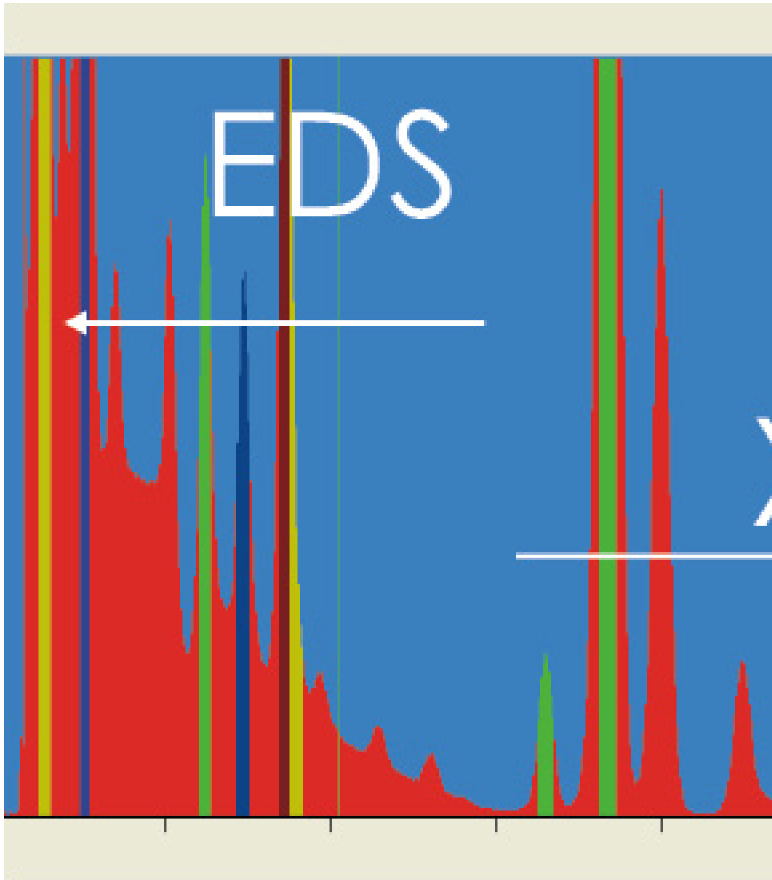


E-BEAM



XRF



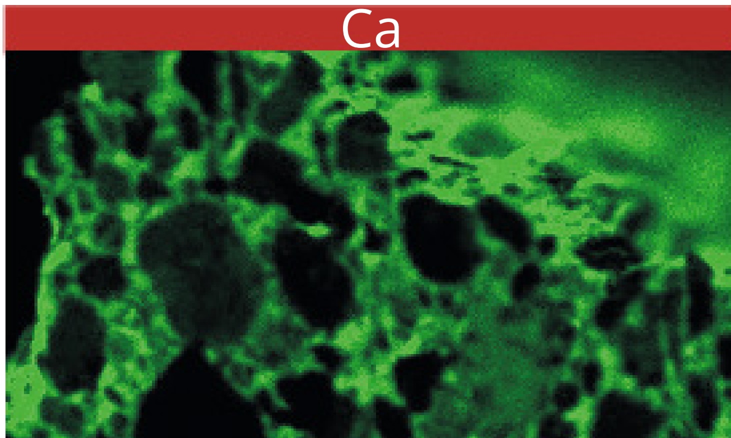


Light Element Excitation
0-5kV

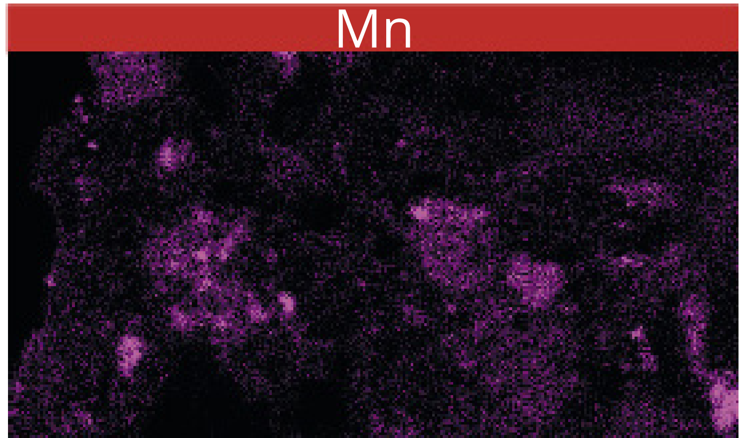
EXTENDED APPLICATION INFORMATION

Below are example maps of both excitation in “play”, on the same sample, at the same time!
Never before has this ability been demonstrated.

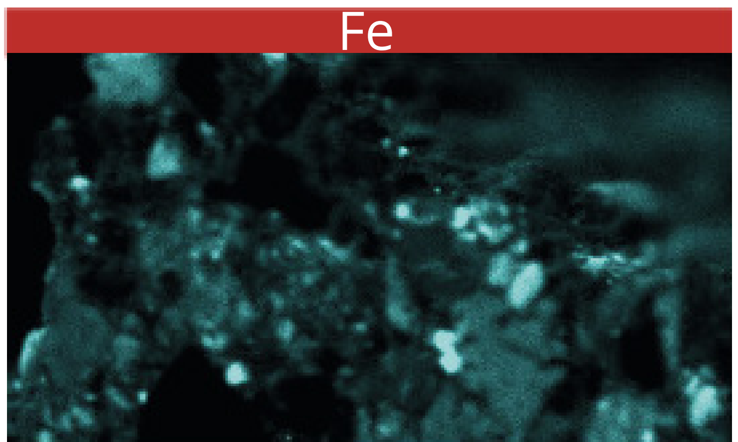
XRF



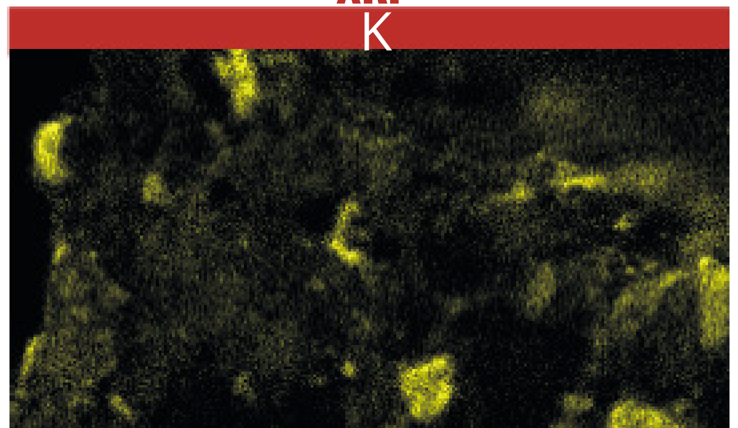
XRF

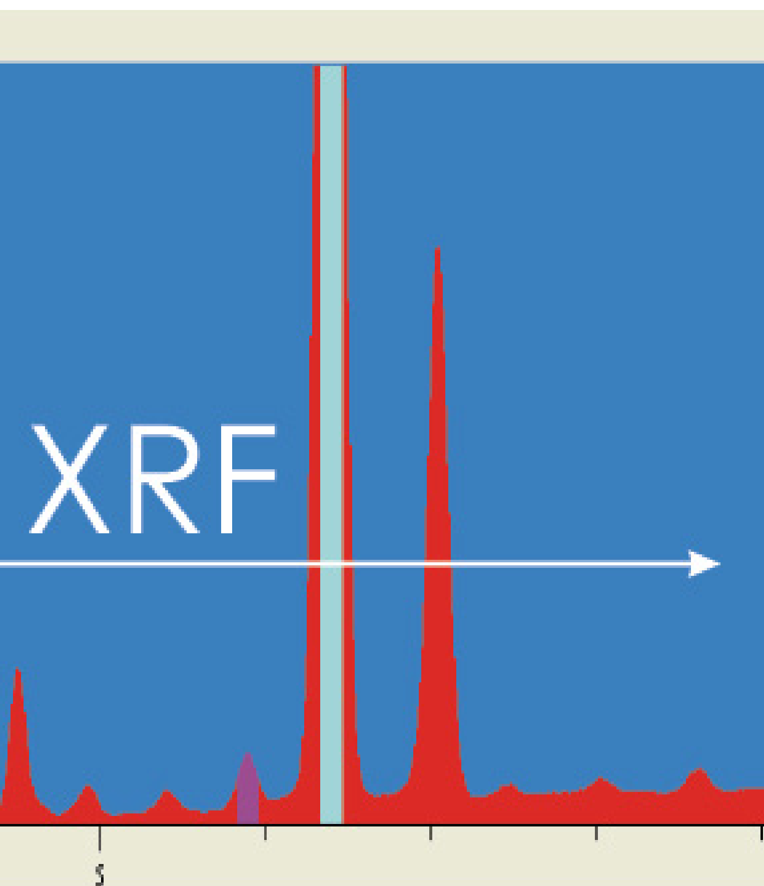


XRF

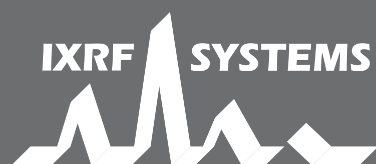


XRF





Heavy Element Excitation
5kV-50kV



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