

AZtecWave Hardware

Wave Spectrometer in Combination with Ultim Max EDS Detectors

AZtecWave

The AZtecWave software fully integrates Wavelength Dispersive Spectrometry (WDS) and Energy Dispersive Spectrometry (EDS). It enables the combination of high spectral resolution WDS, **to resolve X-ray peaks and quantify minor and trace elements**, with fast and flexible EDS. Specifically designed guided workflows, step-by-step instructions, and unique technology, which automatically optimises WDS (+EDS) setup and analysis, guarantees maximum accessibility to users with all experience levels. Bringing WDS and EDS together with AZtecWave delivers a **complete solution** for fast and accurate elemental analysis on the SEM.

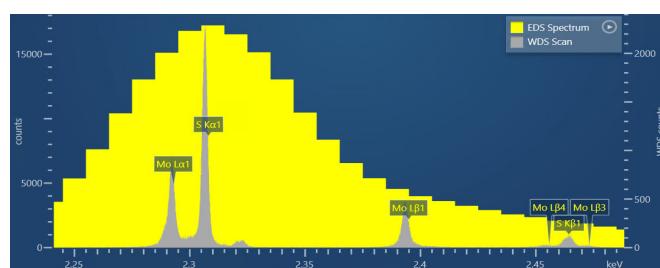


Wave Spectrometer

The Wave spectrometer delivers the **highest spectral resolution available** for the SEM. When EDS reaches its limitations, the Wave spectrometer can be effectively utilised to:

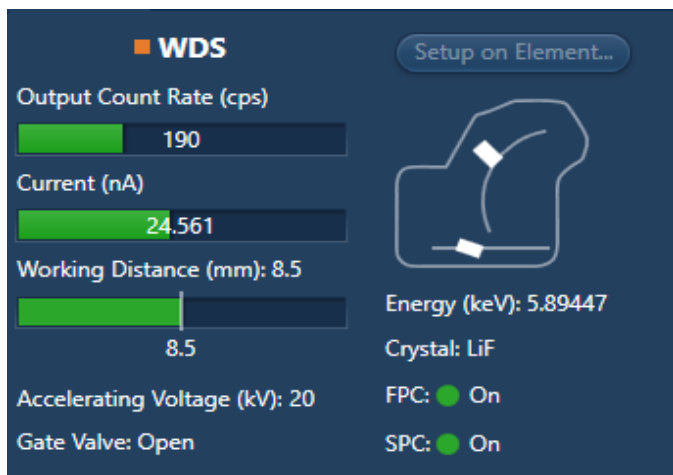
- Detect and accurately quantify trace elements (<1000 ppm)

- Separate X-ray peaks that overlap in the EDS spectrum, bringing certainty to element identification and accuracy to quantification



The highest SEM-WDS resolution available - for separation of closely spaced lines, such as S Kα - 2.307 keV and Mo Lα - 2.293 keV

- Fully focussing Rowland circle geometry with curved crystals delivering high spectral resolution:
 - Si Kα <2 eV
 - Fe Kα <25 eV
- High peak to background ratios results in detection limits of <100 ppm for many elements:
 - Si Kα = 9 ppm
 - Fe Kα = 15 ppm
- Wave is optimised for a wide range of X-ray energies (max = 0.07 – 15.33 keV) enabling the ideal element lines to be selected to give more accurate results
- Motorised counter entrance slit further optimises resolution and peak to background ratio for every X-ray line
- Dual proportional counters in series with Ar-CH₄ for optimised light element collection and Xe for optimised high energy collection
- Setup Spectrometer in AZtecWave ensures the Wave spectrometer is optimised prior to analysis
- Spectrometer Miniview and mimic shows spectrometer position and status at all times

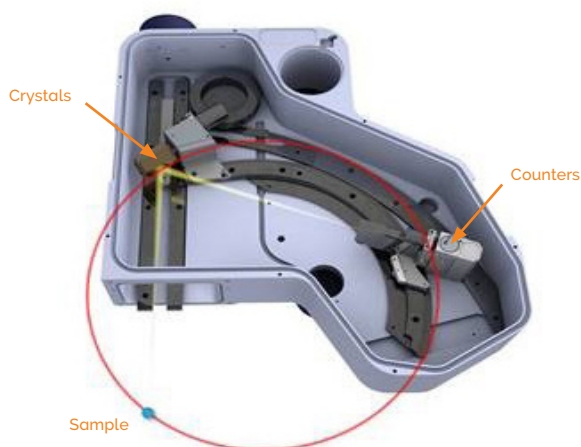


Spectrometer Miniview in the AZtecWave software

Rowland Circle Geometry

Wave is the only wavelength dispersive spectrometer available for the SEM that uses Rowland circle geometry – providing the best spectral resolution

- Very similar geometry and design as used on electron microprobes (EMPA) – the dedicated WDS instrument
- Wave spectrometer is mounted at an inclined angle on the SEM allowing for simple sample positioning
- No requirement for fragile optic, slow mechanical alignment, or transmission losses for high energy lines
- Diffracting crystals are bent and ground to achieve the highest spectral resolution
- This unique geometry allows a wide range of elements/energies (max = 0.07 – 15.33 keV) to be effectively analysed



Internal view of the Wave spectrometer showing the sample, diffracting crystals, and counters positioned equidistant on the Rowland circle

Ultim Max EDS Detector

For major-minor elements that are unaffected by peak overlaps, fast and accurate results can be obtained using the Ultim Max EDS detectors, powered by large area SDD, and Tru-Q® spectrum processing.

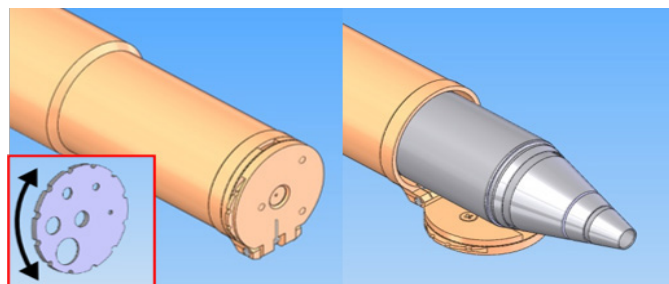
Ultim Max delivers the latest EDS detector technology and pulse processing for faster and more accurate EDS collection and analysis

- Large area silicon drift detectors (SDD) of up to 170 mm² for highly sensitive EDS analysis
- Extreme electronics coupled with the X4 pulse processor - providing accurate and reliable EDS data even at high count rate (typical when combining with WDS analysis):
 - Accurate quantitative analysis up to 400,000 cps
 - Reliable X-ray mapping >1,000,000 cps
- Guaranteed performance at high count rate and at high and low energy, in line with ISO15632:2012
 - Carbon, fluorine and manganese resolution all guaranteed at 130,000 cps

Max+ Assembly

Ensures EDS is collected at optimum X-ray count rates even when simultaneously collecting WDS data at high SEM beam current (e.g. >100 nA)

- Apertures of varying sizes reduce the X-ray count rate being received by the EDS detector
- Ensures optimum EDS performance is always achieved, so the analytical parameters can be optimised for WDS detection
- Ultim Max EDS detectors fitted with the Max+ assembly can be used for low beam current EDS nanoanalysis, through to combined EDS-WDS microanalysis at high beam current



Max+ assembly with changeable apertures in an active position and with the EDS detector fully inserted

WDS Hardware - Wave spectrometer with W1 electronics
(For more information, please refer to the Technical Data Sheet)

Design/geometry	Fully focussing 210 mm Rowland circle with a 2θ range of 33° to 135° (i.e. electron microprobe style)
Orientation on SEM column	Inclined
Attachment to SEM	Interface with motorised gate valve as standard
Diffracting crystals	Maximum of 6 on rotating crystal turret Standard: TAP, PET, LiF (200), plus LSM80N or LSM60 and LSM200 Additional options (element optimised for): LSM200 (for B), LSM80N (for C), LSM80E (for N), LSM60 (for O), LiF (220)
Quantification range	Wave 500 spectrometer = 0.17 – 10.84 keV (B to Pu) Wave 700 spectrometer = 0.07 – 10.84 keV (Be to Pu) Maximum achievable = 0.07 – 15.33 keV
Spectral resolution	Si $K\alpha$ = <2 eV Fe $K\alpha$ = <25 eV
Detection limit	Si $K\alpha$ = 9 ppm Fe $K\alpha$ = 15 ppm
X-ray counters	P10 (Ar-CH ₄) flow proportional counter and Xe sealed proportional counter mounted in tandem

EDS Hardware – Ultim Max EDS detector with Extreme electronics and X4

Sensor size	40 mm ² to 170 mm ²
Detection range	Be (4) to Cf (98)
Resolution @130,000cps Fully in-line with ISO15632:2012	Mn $K\alpha$ <127 eV F $K\alpha$ <64 eV C $K\alpha$ <56 eV
Quantitative count rate	>400,000 cps
Mapping input count rate	>1,000,000 cps
Motorised slide	Standard
Max+ assembly – with selectable apertures for optimum EDS at high beam current	Included for compatible microscopes

*Ultim Max EDS detectors are recommended for combination with Wave, but the Xplore 30 mm² EDS detector with X4 electronics is also compatible with Wave.

Visit nano.oxinst.com/AZtecWave

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