# Ultim Extreme ∞ EDS detectors

Beyond conventional EDS analysis, start with nano to explore the infinite!

Ultim® Extreme ∞ ("Infinity") is optimised to work at short working distance with a low accelerating voltage and beam current allowing for simultaneous ultra-high spatial resolution imaging and EDS acquisition. This new approach results in EDS maps approaching the resolution limit of the SEM itself.
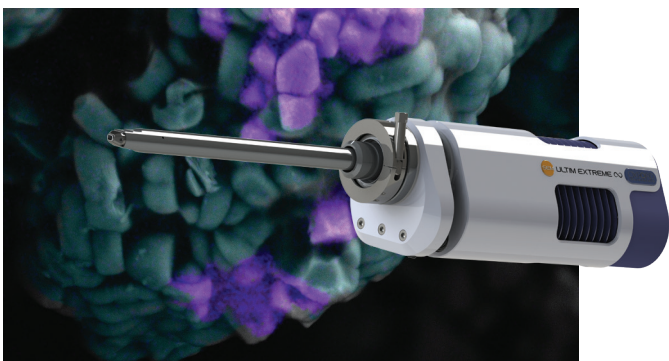
Infinity means guaranteed performance, tested on installation, beyond the typical specifications of any other detector including:

The highest sensitivity guaranteed due to specific technological solutions such as: specially shaped sensor, windowless design, proximity of sensor to the sample, small electron trap and very high solid angle. Solid angle is 5-7× that of a typical 100 mm² conventional EDS detector.

## For the best nano-characterisation and light element detection:

- The only windowless EDS detector with excellent low energy performance

- Resolution guaranteed at **CKα of 46 eV** or better at all count rates up to **50,000 cps**

For the most accurate element identification and X-ray mapping:

Unique **new Tru-Q® IQ** spectrum processing. Each detector is characterised on SEM during manufacture and individually optimised to ensure accurate data processing every time.

Excellent characterisation at high spatial resolution

Excellent low energy spectral resolution, guaranteed for Extreme Infinity to be 46 eV or better at CKα, is particularly important when analysing samples using very low kV conditions. Improved resolution offers sharper spectral peaks that have the correct energy position (no shift) and shape. Improved resolution offers sharper spectral peaks that have the correct energy position (no shift) and shape.
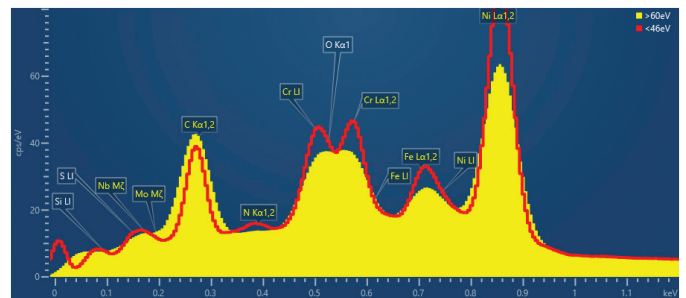
Spectra from an alloy sample collected at 3 kV comparing bad (>60 eV) and good (<46 eV) energy resolution.

Solve more difficult challenges with Tru-Q IQ

With new Tru-Q IQ, the performance of each detector is individually characterised to optimise the spectrum processing. This optimisation results in new capabilities to help solve the most difficult overlaps or to display trace element information. Optimisation ensures that peak shape and position always correspond to collected data which is particularly important when analysing the low energy part of the spectrum. Therefore, the software can correctly identify all the constituent elements and display the correct element distribution in X-ray maps.
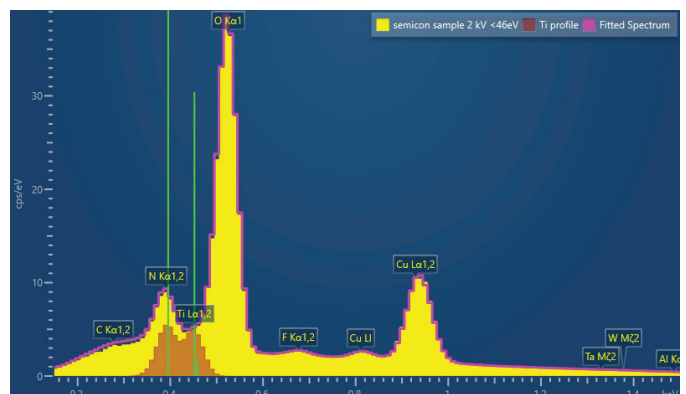
Analysing small features in a semiconductor device at low kV. With Tru-Q IQ even low intensity, overlapped peaks, such as TiL, are correctly identified, and the correct conclusion about the TiN layer can be made.

Fastest, most accurate nano-characterisation

Ultim Extreme Infinity provides a significant boost in the signal intensity when working at low kV of, typically, 10x or more. This enables much faster characterisation of small structures when working under high-spatial resolution, low kV conditions.
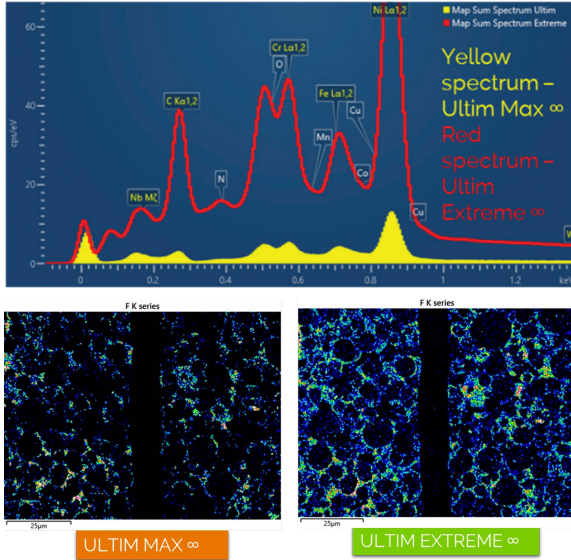
The significant increase in the light element signal allows faster collection, and real-time data processing.

Nano resolution imaging and elemental analysis at the same conditions (WD, current, kV)

Ultim Extreme Infinity allows the mapping of small, low intensity features at the imaging conditions needed to see the structures.
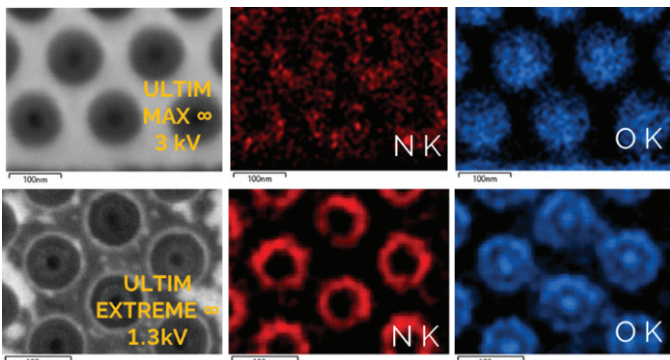
At 3 kV, by using conventional EDS conditions, the ring structure is not visible in the electron image, and maps exhibit poor signal and lack spatial resolution. At 1.3 kV, using a lower beam current and shorter working distance, the ring structure is clearly revealed in the electron image, and element distribution is spatially resolved, with significant improvement in signal to noise ratio.

Light element sensitivity and analysis of beam sensitive materials

Ultim Extreme Infinity is an ideal tool for samples with light elements, such as biomaterials, where low intensity signal from the light elements, cannot be resolved with long acquisition due to the beam damage. Extreme Infinity measurement allows new levels of detectability for elements such as nitrogen.
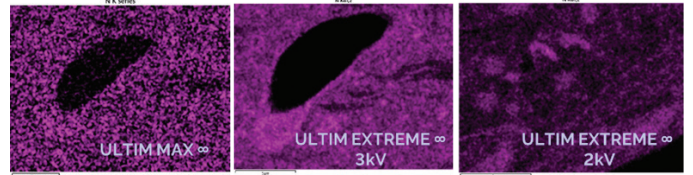
With conventional EDS, it is possible to detect the N signal, but the cellular structure is not visible. With Extreme Infinity, the structure is more pronounced at 3 kV, and at 2 kV, the structure is clearly resolved.

Ultim Extreme ∞ Detector Specification

EDS Hardware – Ultim Extreme ∞ with Extreme II electronics and X4 pulse processor and imaging electronics	
Sensor shape and Size	Racetrack 100 mm² Solid angles of up to 0.4 sr are possible
Detection Range	Li (3) to Cf (98) ⁻$
Resolution performance guaranteed*	C Kα ≤ 46 eV @ 50,000 cps F Kα ≤ 59 eV @ 50,000 cps Mn Kα ≤ 127 eV @ 200,000 cps*
Detector Optimisation with Tru-Q ™ IQ	Detector output characterised on SEM and individually optimised for spectrum processing and pulse-pile up.
Operational range	1 kV to 7 kV Extended operation: 1 kV to 30 kV#
Motorised slide	As standard
Unique geometry design	Optimised tube, sensor, electron trap and collimator design to minimise analytical working distance for unparalleled spatial resolution and extended operating range down to <1 kV. Optimal take off angle to maximise count rates and solid angle (specific to each SEM)
Multiple detectors	Up to 4 detectors or up to 2 detectors + Unity use the same X4 electronics
Minimum detectable line	MgL 49 eV
Window	Windowless
Safety features	Automatic detector warm up and retraction behind flap on vacuum loss

* as defined by ISO15632:2021 (Section 4.2 – Energy Resolution), resolution guaranteed and tested on installation using an X4 pulse processor, between 10˚ C and 30˚ C up to 1,500 m.
# Extended operation dependant on microscope and when used in combination with an immersion lens field. ~not available for hotcell or radioactive environments,
$ Requires sample material that exhibits electron induced X-ray emission of LiK

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