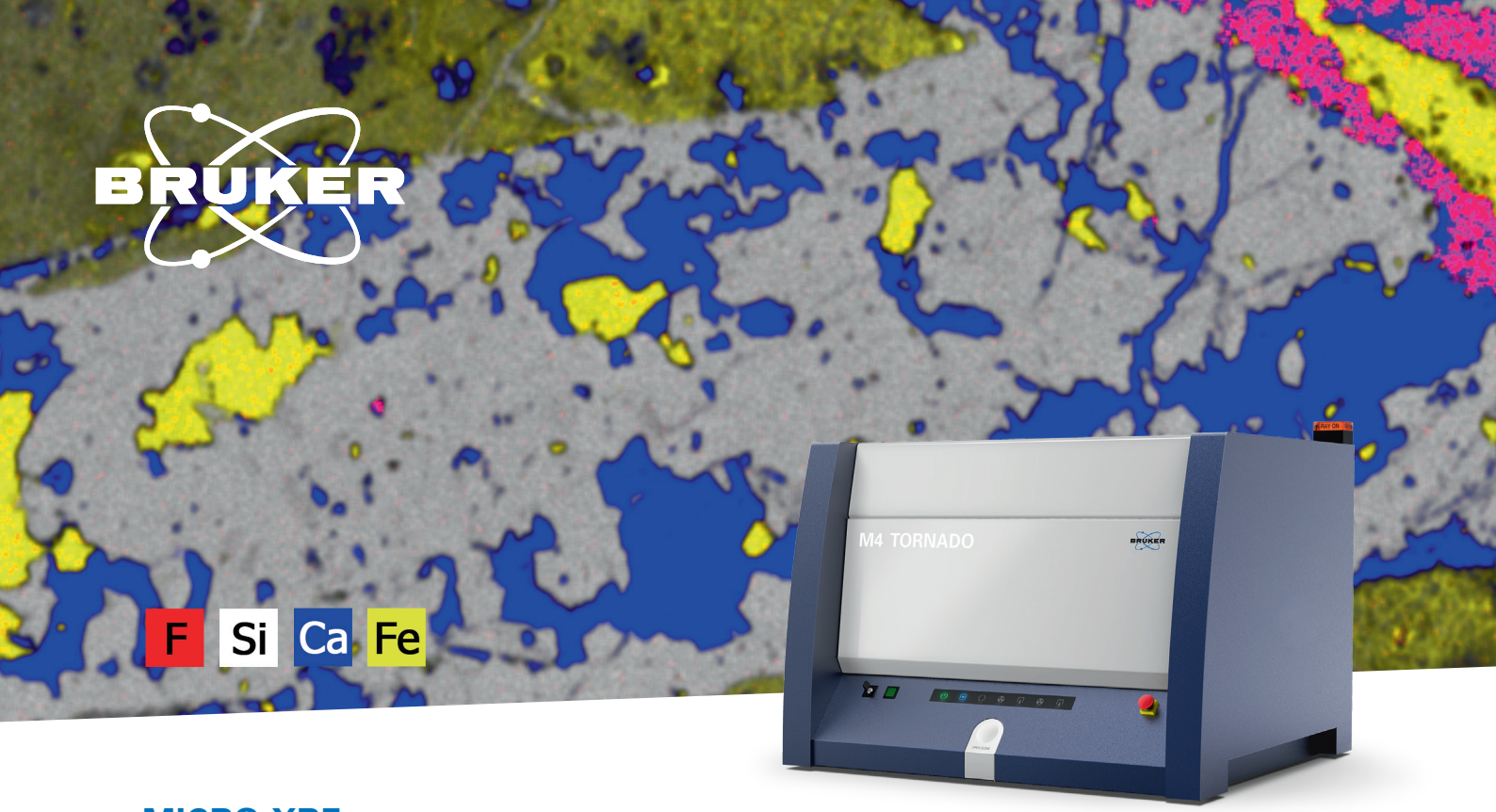

MICRO-XRF

LE Option for M4 TORNADO

Breakthrough in light element detection

Detector options drive analytical excellence

Traditional micro-XRF systems rely on beryllium window detectors, which absorb low-energy X-rays and limit detection to elements heavier than sodium. The LE (light element) option for the M4 TORNADO overcomes this with advanced light-element detectors, enabling analysis down to oxygen and significantly boosting sensitivity across the ~0.5 – 4 keV range. This capability is especially valuable for detecting sodium, magnesium, aluminum and even oxygen and fluorine.

Designed holistically, the LE option combines cutting-edge detectors, vacuum systems, and excitation sources to deliver fast, accurate analysis of light elements – ideal for high-speed applications and demanding research environments.

The M4 TORNADO with LE detector is equipped with automatic illumination control to minimize detector noise caused by light interaction. Additionally, a specially designed magnetic electron trap (e-trap) significantly improves signal-to-background ratio and protects the detector from damage caused by secondary electrons generated in the sample during the fluorescence process. The fully controlled vacuum pump can lower the chamber pressure to 2 mbar (10× below standard), resulting in a 50% stronger oxygen signal and improved low-energy X-ray transmission.

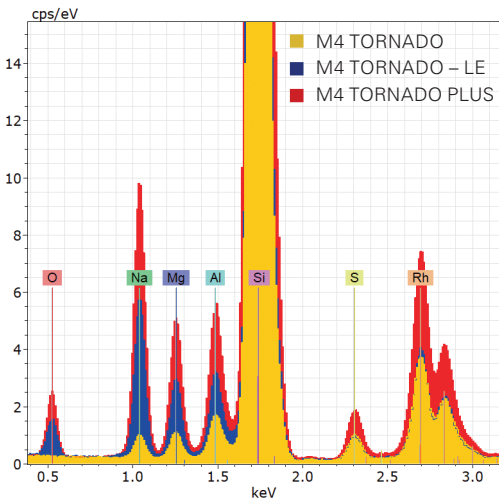

Figure 1
NIST 620 spectra measured with the M4 TORNADO, M4 TORNADO – LE and M4 TORNADO PLUS. The LE option significantly increases sensitivity in the low energy range for the M4 TORNADO. The M4 TORNADO PLUS further benefits from an optimized source.

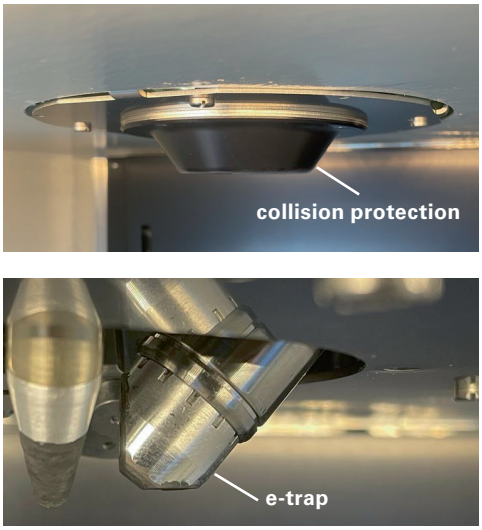

Figure 2
Top: Mechanical collision protection on the M4 TORNADO. Bottom: Components under the collision protection. The M4 TORNADO – LE magnetic electron trap was specially designed to deflect secondary electrons and collimate the detected radiation.

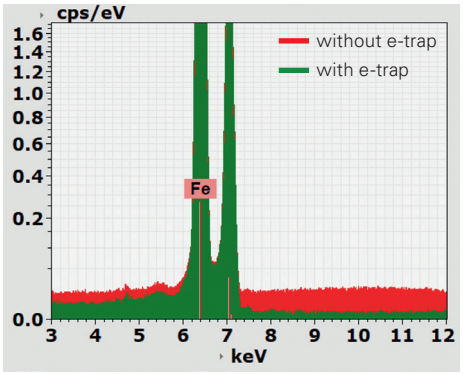

Figure 3
Comparison of Fe-sample spectra acquired without and with electron trap. The use of an electron trap reduces the background caused by secondary electrons and improves the spectral information.

Electron Trap – Enhancing SDD Performance

The electron trap (e-trap) is a critical feature in Silicon Drift Detectors (SDDs), designed to deflect stray secondary electrons before they reach the detector. This reduces noise, enhances spectral clarity, and ensures more accurate elemental analysis.

By protecting the thin detector window from electron damage, the e-trap contributes to long-term stability and reliability. It also enables the use of ultra-thin windows, which are essential for detecting low-energy X-rays from light elements such as oxygen and fluorine – elements that traditional detectors often miss.

Thanks to these benefits, the e-trap is indispensable for high-quality, low-energy X-ray analysis, especially in applications requiring precision and sensitivity.

The M4 TORNADO reflects decades of innovation and a commitment to analytical precision. The LE option, combined with the latest technologies already built into the M4 TORNADO, is key to achieving unmatched performance in light element detection.

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