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DATASHEET

Panther STEM Detector

The retractable double sensor array for fast, low-damage, multimodal STEM imaging

The Thermo Scientific™ Panther STEM Detector is a segmented dual sensor STEM imaging solution. It enables all state-of-the-art imaging techniques with its 16 segments. It is optimized for simultaneous multimodal STEM imaging in combination with spectral mapping applications. The high sensitivity and speed of the detector enable low-dose STEM imaging on beam-sensitive materials, dynamic STEM, and E/B field visualization via center of mass (COM) analysis.

All-in-one STEM detector for all high tensions

The Panther STEM Detector combines high speed and high sensitivity down to single electron detection with optimized geometries for multiple STEM imaging techniques. The two individual sensors with a total of 16 segments (Figure 1) are mounted on two ultra-precise retraction mechanisms. A third mechanism provides flexibility for future user-specific experiments.

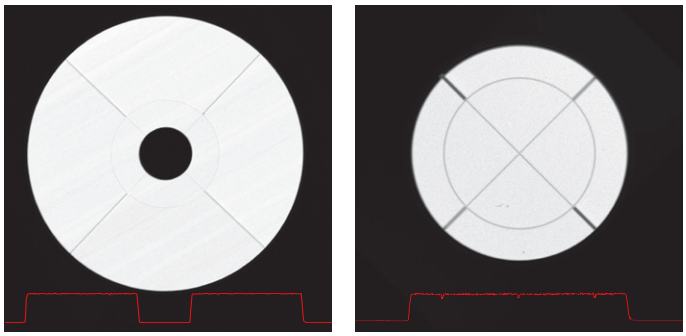

Figure 1. Scanned ring and disk sensor with profile proving the excellent homogeneity of sensitivity across the segments as displayed by the red line.

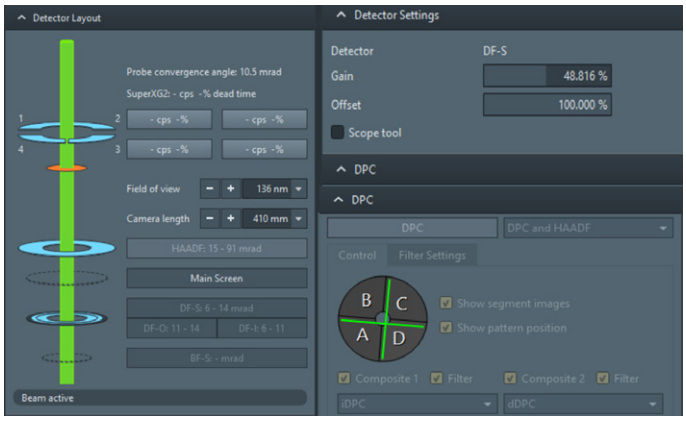

Figure 2. The Velox GUI for insert/retraction of detectors and scattering angle indication. Segmented STEM experiment setup becomes simple with live, graphical centering indication of diffraction patterns.

Key benefits

Highest sensitivity and dynamic range. The optimized sensors enable imaging with single electron sensitivity for beam-sensitive materials and simultaneous imaging and mapping acquisition with high electron doses (1.25 nA/segment at 300 kV).

Highest experimental flexibility with unique dual sensors with segmented design. The two retractable sensors, one ring and one disk sensor—each with 8 segments—are optimized in geometry for (i)DPC, BF, DF HAADF, and ABF imaging in combination with XEDS and EELS spectroscopy.

High linearity and homogeneous areal response function. A homogeneous and linear response of each sensor segment (<1%) enables quantitative segment processing for accurate COM analysis used for light element atomic imaging, (i)DPC imaging, and in E/B field visualization.

Highest throughput with precise, double on-axis retraction mechanism. The highly accurate retraction mechanism with 60 µm precision allows for fast reproducible mode switching and multimodal recording in combination with post column filters and spectrometers.

Flexible software and hardware for new applications. A third retractable detector position allows for the insertion of user-made sensors. In combination with the optional Autoscripting engine, all standard segments can be user-defined readout and processed.

The standard readout modes of BF/DF/HAADF and (i)DPC with all STEM parameters can be recorded in the Thermo Scientific™ Velox™ Graphical User Interface (Figure 2).

The collection angles of the sensors in mrad are displayed live in the GUI and are stored in the metadata for quantitative analysis. Up to four signals are displayed live in the GUI. For easy set-up and reproducibility the sensitivity of the different sensors is equalized by software and a graphical indication allows for easy centering of the diffraction pattern.

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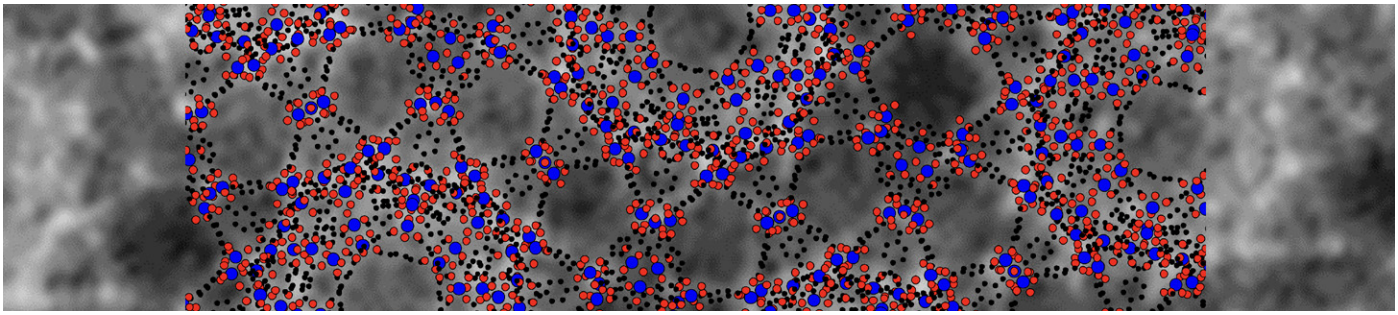

Figure 3. iDPC STEM in high-contrast, low-dose imaging of MIL-101 with 2 Å resolution using only an electron dose of 45 e/ Å².

The new electronics allow for both low-dose experiments (Figure 3) as well high-dose experiments for high signal-to-noise imaging or multimodal mapping applications (XEDS,EELS). The inner hole of the ring sensor is optimized for EELS acquisition. The detector is operational across the entire high-tension range of the tool (30–300 kV). All imaging specifications of the column are guaranteed.

Multimodal readout for XEDS or EELS are optionally available via additional modules.

For retrofits, please contact your sales and service representative to ensure compatibility.

Panther Detector specifications	
Operation voltage	30–300 kV
Detector parameters	• 2 sensors • Disk sensor diameter: 7.0 mm • Ring sensor inner diameter: 4.13 mm; outer diameter: 21.0 mm
Detector total # segments	16
Sensitivity (200, 300 kV)	Down to single electron sensitivity
Dynamic range (300 kV)	1.25 nA/segment; 10 nA/sensor
Detection modes	• Bright field, annular bright field • Dark field, high annular dark field • Differential phase contrast • (i)DPC
Multimodal modes(optional)	Combination of XEDS, 4D STEM, and EELS*
Non-Homogeneity of segments	<1%
Non-linearity in dynamic range	<1%
Mounting position	On-axis, bottom-mounted, retractable
User interface	Velox GUI
Computer platform	Windows® 10, 64-bit
Additional retraction mechanism	3rd retraction mechanism with 6 signal feed-throughs for user specific applications**
Scripting	Sensor signal readout/processing scriptable via Autoscripting environment (optional)
X-ray safety	2013/59/Euratom ionizing radiation directive

* Only in combination of detectors on the tool system tree.
** Sensor with electronics is user's responsibility. Dimensions of mounting position can be shared with user.

Find out more at **thermofisher.com/EM-Sales**

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