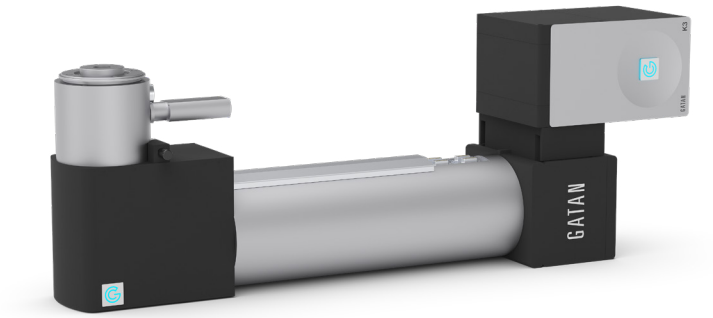
BioQuantum K3 Imaging Filter

Model 1967

The BioQuantum™ K3™ imaging filter provides fundamental insights into cellular organization and ultrastructure by combining high-performance post-column energy filtration with direct detection technology. Ideally suited for low-dose imaging applications, researchers can maximize their cryo-electron microscopy (cryo-EM) and cryo-electron tomography (cryo-ET) capabilities to gain further insight into system function and disease progression at the molecular level.



Benefits

- **Highest DQE available:** See smaller particles, more confidently detect conformational changes, perform cryo-ET at lower dose, preserve higher resolution information for 3D reconstruction
- **Optional inline, GPU-based motion correction:** Avoid the need to save terabytes of raw frames
- **24 megapixels (5,760 x 4,092) field of view:** 1.6 times the size of the K2 camera
- **1,500 full frames per second:** 3.75 times the speed of the K2 camera

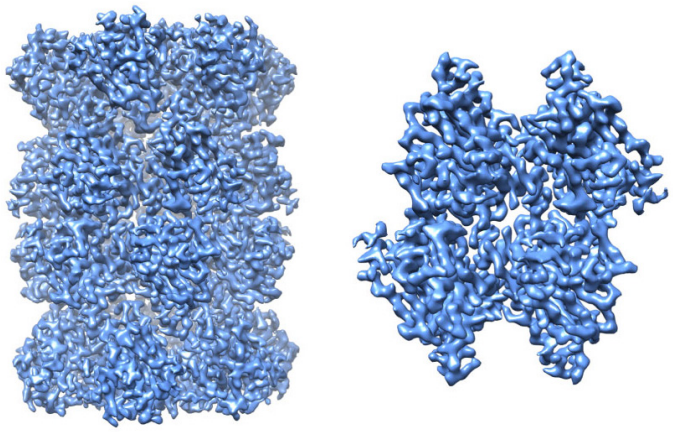


Figure 1. Breakthrough K3 result: 2.7 Å structure of the 20S Proteasome with the K3 camera and Elsa cryo-holder on a TF20. Data courtesy of Alexander Myasnikov, Michael Braunfeld, Yifan Cheng, and David Agard.

By combining electron counting with a state-of-the-art electron energy filter, the BioQuantum K3 provides the highest detective quantum efficiency (DQE) and minimizes electron scatter produced by thicker specimens. By removing inelastically scattered electrons from the images collected with the revolutionary K3 camera, researchers can increase the signal-to-noise ratio in thick samples and see smaller particles more easily.

Using a maximum frame rate of 1500 full frames per second (fps), this technology recognizes and counts individual image electrons in real-time. Unlike conventional direct detection capture speeds (e.g., 40 fps), the BioQuantum K3's high-speed capture rate counts electrons that are in close proximity as distinct electron events delivering the highest resolution, single electron counted images available.

Improving the signal-to-noise provides researchers with enough image contrast to identify conformational heterogeneity for single-particle reconstructions and give enhanced contrast for cryo-ET.

To add, the BioQuantum K3's high frame rate is ideal for capturing high-resolution information before a specimen's structural integrity is damaged due to electron beam irradiation. While exposing a specimen to a typical dose of 10 – 30 $e^-/Å^2$, the significantly shorter exposure time allows you to collect the same number of images 3.75 times faster than K2. When used with dose fractionation, the BioQuantum K3 can compensate more accurately for specimen motion and drift.

Powered by Latitude® S single-particle software, the user-friendly wizard simplifies setup and automation of multi-region acquisition to improve throughput for 3D cryo-EM. Complemented by tracking algorithms for specimen motion correction, researchers can remove drift or vibration to enhance single-particle imaging and cryo-ET.

Specifications

TEM operating voltage (kV)	200	300
Detector performance		
Sensor size (pixels)	5,760 x 4,092	
Readout modes	Counting Super-resolution	
Max. image size (pixels)	11,520 x 8,184 Super-resolution	
Performance relative to physical Nyquist (DQE)		
Peak	>0.87	>0.83
0.5	>0.53	>0.53
Sensor read-out (full fps)	>1500	
Transfer speed to computer (full fps)	>75	
Motion correction	Inline	
Gatan Microscopy Suite® software	Included	
Automation support	Latitude® and other third-party software	
Filter performance		
Filter electron optics	GIF Quantum® energy filter	
Entrance aperture size (mm)	9	
Magnification (entrance aperture to detector)	<5.25x	
Alignment mask pattern (W x H)	9 x 7	
Slit width min. (eV)	3	3
Slit width max. (eV)	100	143
Mask image distortion root mean square (RMS, %)	<0.25	
Mask image distortion max. (%)	0.75	
Non-isochromaticity residual energy variation RMS (eV)	0.5	0.7
Non-isochromaticity max. (eV)	2.0	2.75
Chromatic distortion RMS (% over 50 eV)	0.5	
Chromatic distortion max. (% over 50 eV)	1.0	

Performance of system depends on the specific instrument configuration including the performance of the TEM. Listed features and specifications includes optional equipment and packages. Not all GIF Quantum models support all features and specifications.

Specifications are subject to change without notice.

Ordering

Model	Description
1967	BioQuantum K3 Imaging Filter
1025.GPU	GPU Upgrade for K3 Camera

Other products to consider

- K3 direct detection camera
- Elsa™ cryo-transfer holder
- Latitude S single-particle software
- Solarus® II plasma cleaner

Applications

- Cryo-electron microscopy
- Single particle cryo-EM
- Cryo-tomography
- Beam-sensitive materials

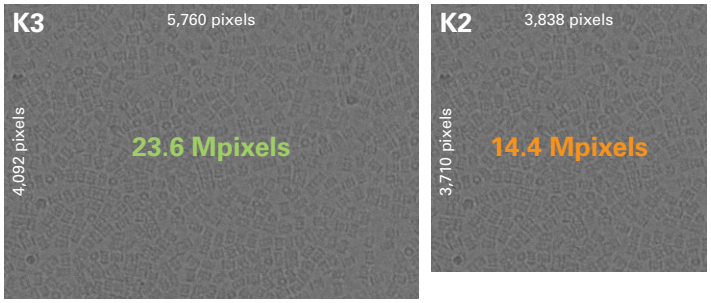


Figure 2. At 23.6 megapixels (Mpixels), the K3 provides 1.65 throughput of the K2 (pixels/frame).

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