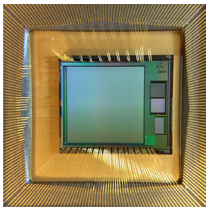
BRILLIANSE™
X-RAY DETECTOR

KA IMAGING™

DIRECT CONVERSION DETECTOR

KA Imaging introduces its patented amorphous selenium (a-Se) BrillianSe™ X-ray detector for high-brilliance imaging. The hybrid a-Se/CMOS detector uses an a-Se photoconductor with high intrinsic spatial resolution for direct conversion of X-ray photons to electric charge. The electronic signal is then read by a low noise CMOS active pixel sensor (APS). Without the need to first convert X-ray photons to visible light (which is required in indirect scintillator-based approaches), thinning of the conversion layer to minimize optical scatter is not necessary. BrillianSe™ provides a unique combination of high spatial resolution using 8 µm pixels, and high Detective Quantum Efficiency (DQE) for energies up to 120 keV. This combination enables efficient imaging at low flux and high energy, as well as propagation-based (grating-less) phase-contrast enhancement for improved sensitivity when imaging low-density materials. The BrillianSe™ X-ray detector is available in a 16-megapixel format (16M).

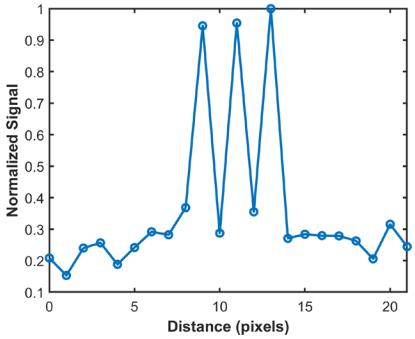


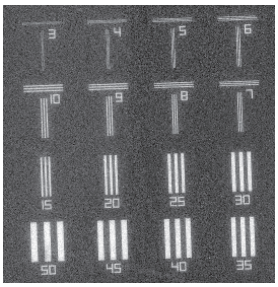
BrillianSe™ sensor at the core of the X-ray detector

KEY APPLICATIONS

- ✓ Low-density material phase-contrast
- ✓ Synchrotron micro-nano CT
- ✓ Single photon sensitivity (>50 keV)
- ✓ High energy (>50 keV) Bragg coherent diffraction imaging

TECHNOLOGY





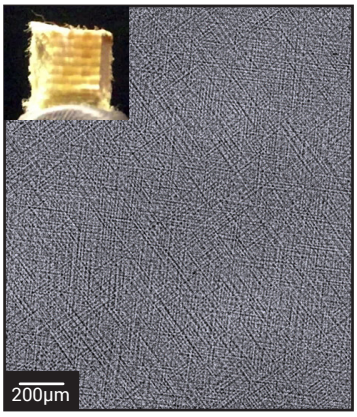
BrillianSe™ image of JIMA spatial resolution target (21 keV). Numbers indicate bar width in microns. The cross section on the left is for the 8 µm pattern.

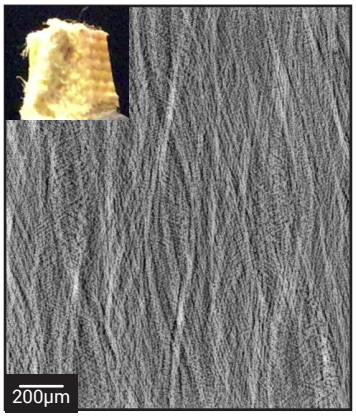
The direct conversion approach allows a thick conversion layer and operation at 100% fill factor for high DQE. At 60 kVp (2 mm Al filtration), BrillianSe™ has a market-leading combination of high DQE (36% at 10 cycles/mm) and a small point-spread function (PSF) (1.1 pixel). This facilitates imaging for low flux applications such as X-ray diffraction, dose sensitive protein crystallography, and throughput-limited imaging of materials with and without phase-contrast.

At 63 keV the MTF is 10% at Nyquist frequency. Additionally, at low energy (21 keV), resolving power down to 8 µm can be demonstrated using a transmission bar target.

KEVLAR COMPOSITE SAMPLE

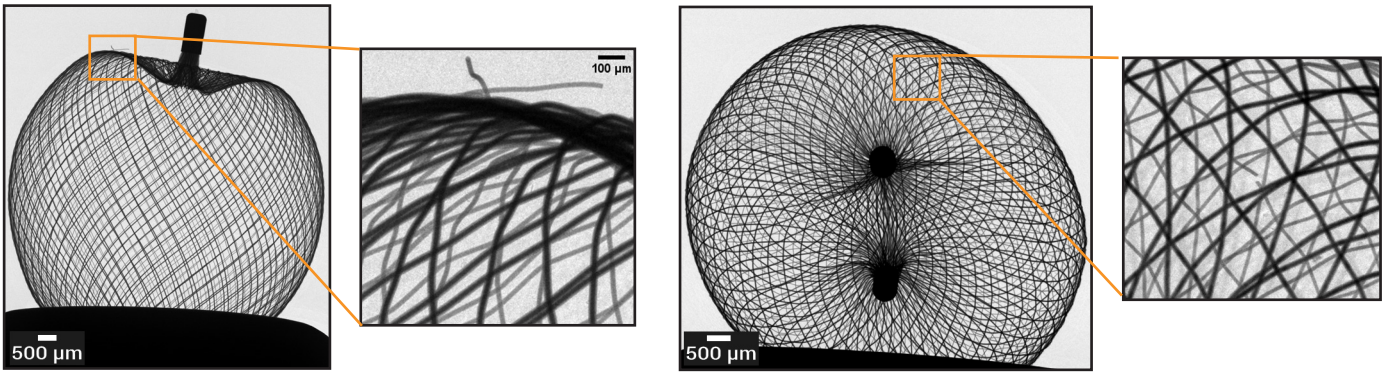
We used the detector to acquire phase contrast images of a Kevlar composite in seconds. We can see individual fibers on the left, followed by the layering. The last image shows a 3D reconstruction.



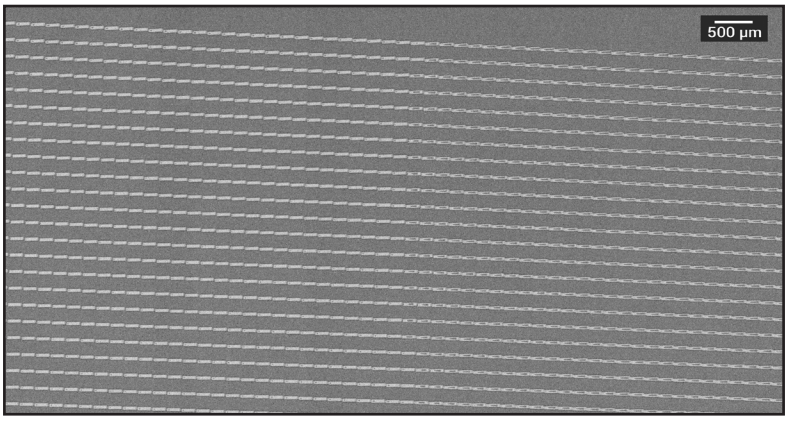


BRAIN STENT SAMPLE

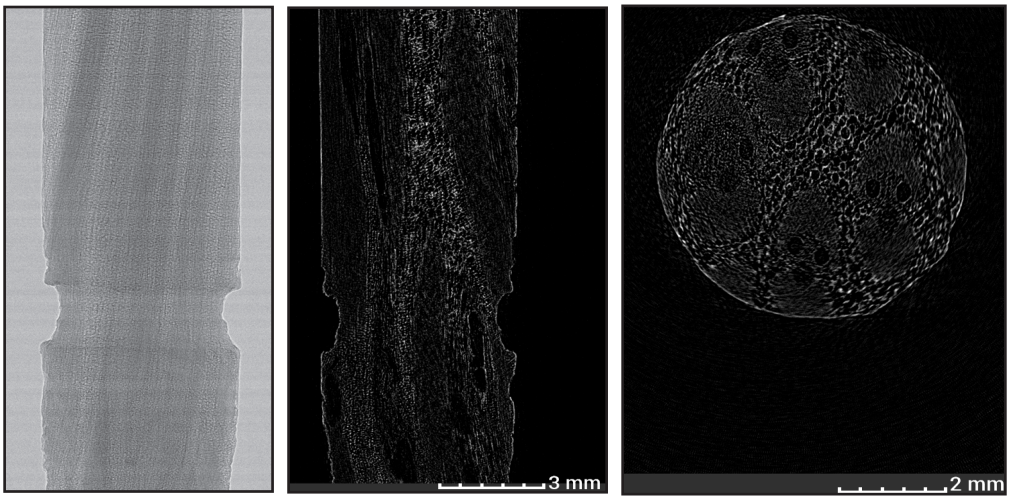
Stents usually range from 2.5 mm to 4.5 mm in diameter. The loose wires are highlighted on the right.



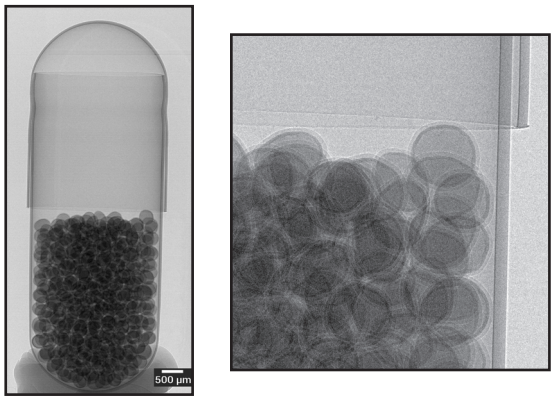
THROUGH-SILICON VIA (TSV) SAMPLE



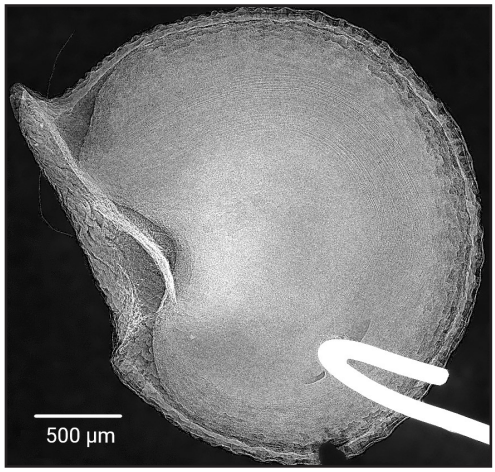
TOOTH PICK SAMPLE



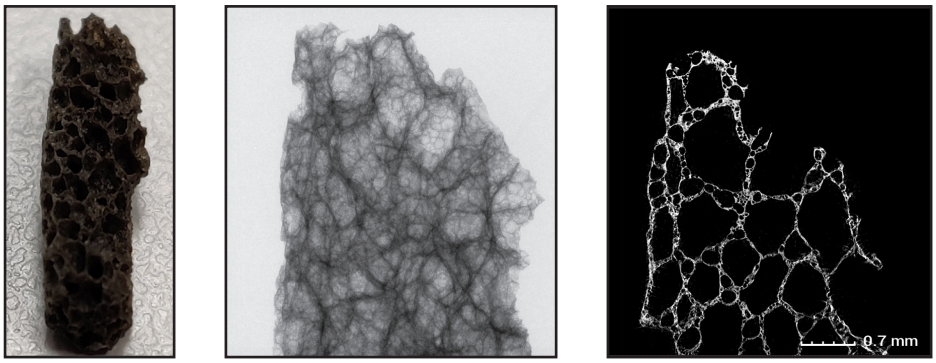
ESOMEPRAZOLE PILL SAMPLE



BELL PEPPER SEED SAMPLE



LIGHTWEIGHT AGGREGATE MATERIAL



TECHNICAL SPECIFICATIONS

Detector	Description
Sensor	Amorphous Selenium (a-Se)
Sensor thickness	100 µm (nominal)
Quantum efficiency (nominal)	90% at 20 keV 29% at 40 keV 11% at 60 keV 3% at 100 keV
Readout chip	CMOS
Pixel size	8 µm x 8 µm
Format	4096 × 4096 = 16,777,216 pixels (16-megapixel)
Defective pixels	< 0.1%
Area	32.8 × 32.8 mm^2
Energy Range	13 – 120 keV (not tested at <13 keV)
Frame rate	0.25 – 2 Hz
Dynamic range	180 e^- –701,250 e^- (71.8 dB) (nominal)

System	Description
Readout noise	180 e^- rms (nominal)
ADC depth	14-bit
Readout scheme	Split rolling shutter (64 parallel outputs)
Data format	Raw data, no header, 16-bit unsigned (little endian)
Cooling	Air (fan)
Power consumption	24 W (maximum)
X-ray window shielding	3 mm lead (nominal)
Front/internal electronics shielding	3 mm lead (nominal)
Dimensions (W x H x D)	269 x 245 x 117 mm^3
Weight	7.0 kg

Preliminary specifications only.

About KA Imaging

KA Imaging was founded in 2015 as a University of Waterloo spin-off. The company has successfully developed a line of innovative X-ray imaging products in the areas of micro-computed tomography, high-efficiency X-ray area detection, and multi-energy spectral separation detection. KA is proud to strive to understand the needs of its customers, ensuring that we stay ahead on the innovation curve.

KA Imaging Inc.
3-560 Parkside Dr
Waterloo, ON
T: 1-226-215-9897
www.kaimaging.com

Sales and Product Information
sales@kaimaging.com

Customer Support
support@kaimaging.com

Investor Information
investor@kaimaging.com

Media Inquiries
media@kaimaging.com

KA IMAGING™