
ANNULAR BACKSCATTERED ELECTRON DETECTORS

LOW NOISE, HIGH QUALITY IMAGING BEYOND TV-SPEED



PND's Backscattered Electron Detectors

The PNDetector annular backscattered electron detectors are designed to combine high speed imaging with low noise signal detection at a broad range of energies. The BSE Detectors are available as a module with integrated preamplifier stage or as a single chip on substrate.

Our compact backscattered electron detector module with integrated preamplifier enables scan speeds up to 10 nsec pixel dwell time.



Key benefits

► Higher collection efficiency

Increased signal intensities are achieved with our optimized chip technology and geometries.

► Faster detection speeds

The integrated 4-channel preamplifier and low signal capacitance enable ultrafast imaging beyond TV-Speed with scan rates up to 100 MHz.

► Low noise characteristics

The low dark current and signal capacitance values provide low noise imaging of sensitive samples.

► Small working distances

The flat aluminum housing allows for imaging at short working distances.

► Different BSE geometries

Various types of BSE Diodes are available as preamplified version or as single chips on substrates (see table on last page).

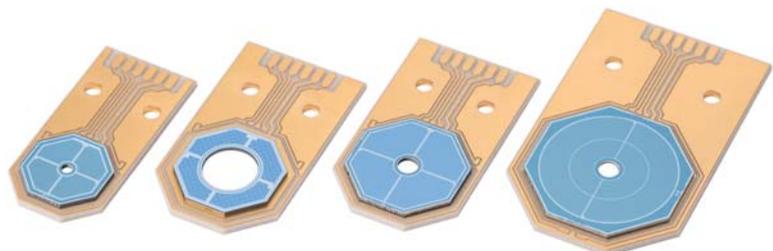
► Customer specific solutions

Our own silicon fabrication facilities are dedicated to manufacture radiation sensors. This unique feature offers an unmatched degree of freedom for custom designs from chip to module.

Choose the geometry that fits your needs

Many different chip geometries are available to get the highest possible signal for every application. Collection efficiencies up to 60 % lead to high contrast and optimum signal to noise ratios.

Different sizes and shapes of premounted detectors are available. Additionally, we offer custom designs to fit your needs.



Vary your energy

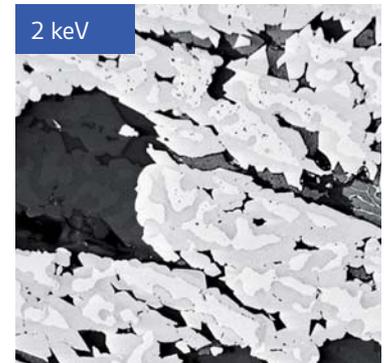
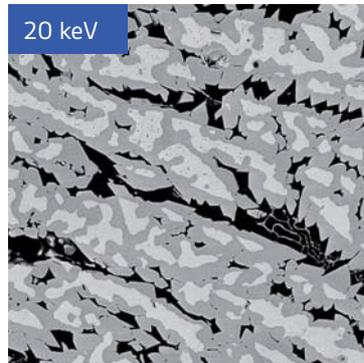
Obtain BSE images at different energies and thus vary your depth of information. Observe sensitive samples with low beam energies and minimal currents.

Compositional BSE images of a Raney nickel cross section observed at:

left: 20 keV beam energy

right: 2 keV beam energy

At low keV areas of surface oxidation become visible which are not detected at higher beam energies.

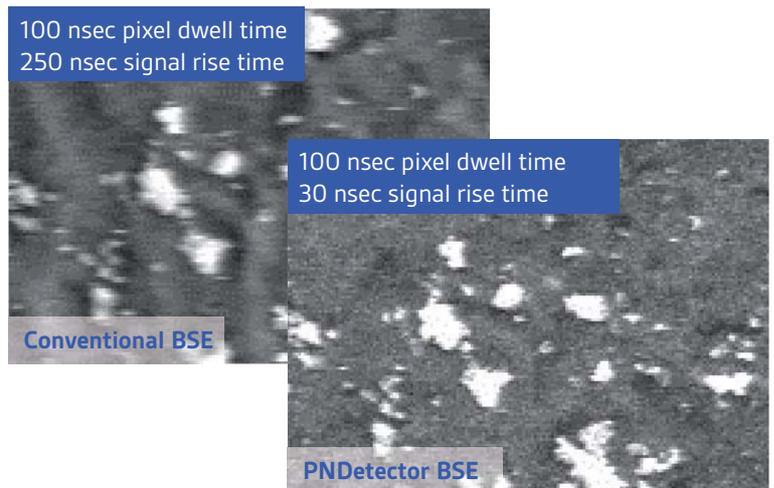


Speed up your image acquisition

Obtain BSE images beyond TV-speed to minimize acquisition time for protecting the sample and increasing throughput.

Comparison of two images recorded at 100 nsec pixel dwell time: Left image with a conventional BSE detector with 250 nsec minimum signal rise time and right image with PNDetector's BSE detector with a signal rise time of 30 nsec.

The superior speed of the PNDetector's BSE detector gives sharp images without smearing even at high scan speeds below 50 nsec pixel dwell time.



Combine your channel information

The segmentation of the detectors in either quadrants or annular rings enables to obtain different sample information with just one mouse click. The detector channels can be individually mixed to fit your analytical needs. Switch from compositional imaging to topographic contrast to remove artifacts or to use surface reconstruction algorithms.

Topographic BSE Image of Sn spheres on a Graphite substrate measured at 5 keV electron energy.

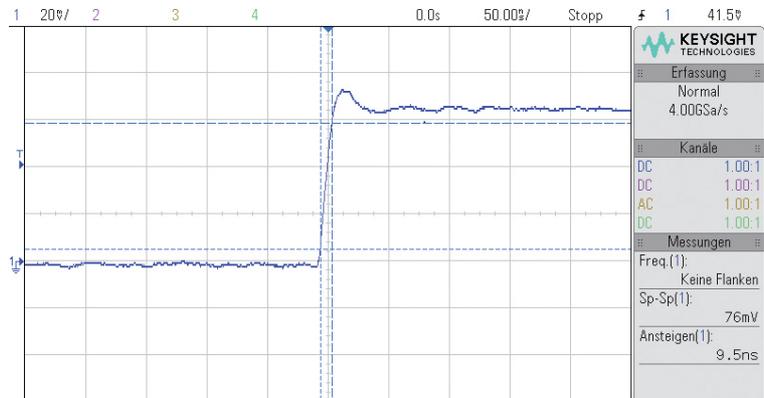
To enhance the structural contrast, opposing channels are set to different colors.



Get the highest speed

PNDetector's Backscattered Electron Detectors can be used for dedicated high speed applications with scan rates up to 100 MHz (10 nsec pixel dwell time).

Measured signal rise time of 10 nsec with PNDetector's BSE detector type BSD-40-4-1-10-OPW. The measurement was performed with a fast LED signal with about 5 nsec pulse rise time.



Upgrade your system

PNDetector is happy to support you with the mechanical and electrical integration into your system. Together with Point Electronic GmbH we can offer the whole image acquisition chain including high gain signal conditioning up to scan rates of 100 MHz.

Mounted on a retractable arm with X-Y-Z adjustment the BSE detector module can be easily integrated into any SEM.



Choose your detector now

Annular Silicon Backscattered Electron Detectors

Type	Total active area	Number of segments / rings		Central hole diameter	Outer diameter	Energy threshold (50% efficiency)	Max. geom. collection efficiency	Signal cap. per cell @ full depl.
BSD-40-4-1-10-OPW	40 mm ²	4	1	1.0 mm	9 mm	2 keV	50%	3 pF
BSD-50-4-1-56-OPW	50 mm ²	4	1	5.6 mm	12 mm	2 keV	20%	4 pF
BSD-80-4-1-20-OPW	80 mm ²	4	1	2.0 mm	12 mm	2 keV	50%	6 pF
BSD-150-2-2-20-OPW	150 mm ²	2	2	2.0 mm	16 mm	2 keV	60%	<15 pF