
Making the invisible visible

LynX
Hybrid pixel detectors for X-ray

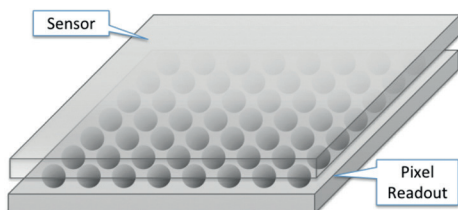


Fast and sensitive detectors for novel X-ray applications

Technology

Our technology

ASI's LynX detector series are hybrid pixel area detectors, with a pixel pitch of 55 μm , suitable for a wide range of applications. The capability of the LynX detectors to discriminate or measure energy of X-rays in each of its 512 x 512 pixels offers unprecedented possibilities for X-ray detection, imaging and tomography. LynX sensors (Si, GaAs, CdTe) are divided into an array of pixels and connected via bump-bonds to the readout electronics integrated in the chips below the sensor.



Schematic view of readout chip

LynX 120 is based on the Timepix ASIC. Each pixel either counts the number of detected events, measures the amount of energy deposited in the pixel or measures the time of arrival of the detected photon. The readout provides frame rates up to 120 frames/s.

"ASI's Timepix is an essential tool for characterizing our novel X-ray sources. The camera's high speed and detection efficiency allows for time resolving an X-ray emitting region. Furthermore, the ability to easily obtain spectral information from an X-ray image makes the Timepix a unique and valuable instrument. In addition, the customer support has been outstanding!"

Carlos Camara, Founder & Chief Scientist, Tribogenics

LynX 1800 is based on the Medipix3RX ASIC and has improved speed. In continuous read out mode up to 1800 frames/s with zero dead time can be recorded. In charge summing mode improved spectroscopic performance is achieved, avoiding loss of energy because of pixel to pixel charge sharing.

In addition, the LynX 1800s which is also based on Medipix3RX but with bumps every 110 μm is also available. In charge summing mode, it has 4 energy thresholds allowing to count X-rays of different energy windows in a single measurement.

Application

Advantages of our detector

- Direct, single photon detection
- Excellent point spread function
- Zero noise, high S/N and high dynamic range
- Short read out time and high frame rates
- Modular detectors, enabling large active area
- Increased high energy efficiency with high Z sensor materials

Applications

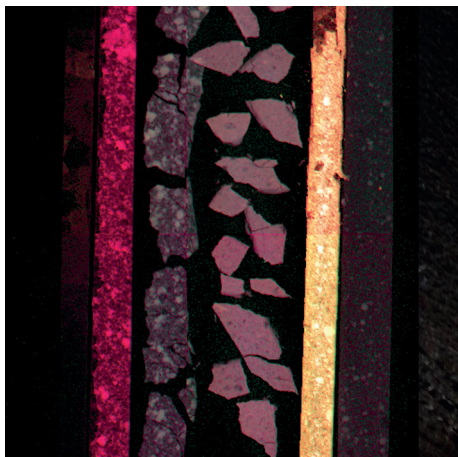
- Phase Contrast Imaging (Ptychography, Grating Interferometry)
- Scanning SAXS/WAXS Imaging Small-Angle X-ray Scattering
- X-ray Diffraction
- Time Resolved Experiments
- X-ray and medical imaging
- Macromolecular Crystallography
- Tomography



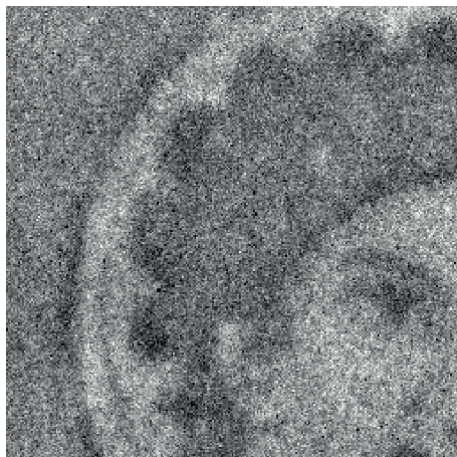
LynX 120 detector



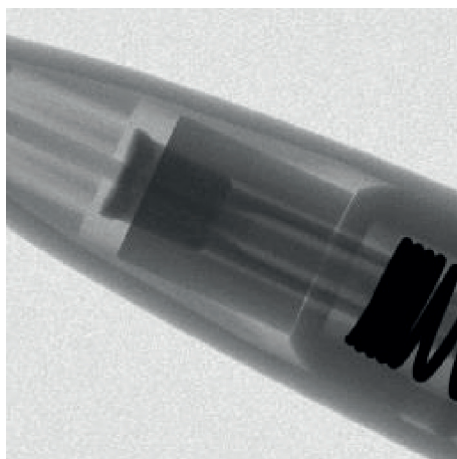
LynX 1800 detector



Top left image shows spectral X-ray scan of pigment stripes and grains. Colors stand for (left to right) Au (gilding) and Cd, Cr, Cu, Pb and Co (painting).



Top right image shows a detail of a 5 euro note; X-rays: 35kVp, 74 mA; 0.5 s frame time; flat field corrected.



Bottom right image shows part of a pen; X-rays: 35kVp, 12 mA; 0.5 s frame time; flat field corrected.

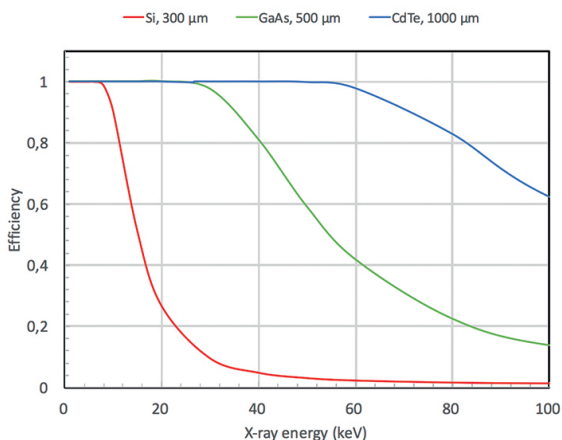
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“We have enjoyed excellent collaboration and support by ASI, who provided on-site as well as teleconference training and technical support. They have also provided us with software updates and other technical upgrades. We highly recommend ASI to other research institutions interested in the Timepix based detectors.”

Eva Bezak, Head of department of Medical Physics Royal Adelaide Hospital and University of Adelaide, South Australia

Specifications

Right figure shows efficiency for several sensor materials



Resolution: 50% MTF @ 9 line pairs per mm
 Sensor: 300 μm Si, 500 μm Si, 500 μm GaAs, 1000 μm CdTe (*)
 Maximum count rate: 106 counts/s/pixel (**)
 Cooling: Air cooling (optional: watercooling, vacuum)

(*) Please contact ASI on availability (**) X-rays, 8 keV

Main product specifications for X-ray

	LynX 120 Timepix	LynX 1800 Medipix3RX	LynX 1800s Medipix3RX
Pixel pitch	55 μm	55 μm	110 μm
No of pixels	512 x 512 (quad)	512 x 512 (quad)	256 x 256 (quad)
No of thresholds	1	1 or 2	4 or 8
Time resolution	20 ns	na	na
Read-out time	8 ms	0 (cont. readout)	0 (cont. readout)
Dimensions (mm)	100 x 36 x 50 100 x 46 x 50 (ext. bias)	270 x 85 x 80	270 x 85 x 80
Modes	Counting, ToA, ToT	SPM, CSM	SPM, CSM

Selected publications

"Coincidence velocity map imaging using Tpx3Cam, a time stamping optical camera with 1.5 ns timing resolution"

Arthur Zhao et. al., Review of Scientific Instruments 88, 113104 (2017);
DOI: 10.1063/1.4996888

"Development of a transmission alpha particle dosimetry technique using A549 cells and a Ra-223 source for targeted alpha therapy."

Al Darwish R, et al, Med Phys.
2016 Nov;43(11):6145.
Pub Med ID: 27806616

"Deriving spatially resolved beta dose rates in sediment using the Timepix pixelated detector"

Anna A.Romanyukha,et.al., 2017
Radiation Measurements;
DOI:10.1016/j.radmeas.2017.04.007

"Nanoscale Hard X-Ray Microscopy Methods for Materials Studies"

M. Holt et. al., Vol. 43:183-211 (Volume publication date July 2013), First published online as a Review in Advance on February 28, 2013
DOI:10.1146/annurev-matsci-071312-121654

Amsterdam Scientific Instruments

is a spin-off company from Nikhef, the Dutch research institute for particle physics. The company brings to the market unprecedented detector technologies developed by the joint efforts of the Nikhef institute, the Medipix collaboration (CERN) and the ASI team. The broad experience of ASI's team in various applications makes ASI products a unique and reliable out of the box solution for industry and research institutions.

ASI's technology can be used in multiple applications such as:

- Energy resolved X-ray
- Computed tomography
- Fast product-line X-ray inspection
- Electron microscopy
- Mass spectrometry

Amsterdam Scientific Instruments

Tel.: +31 20 592 2055 | info@amscins.com
Science Park 105, 1098 XG Amsterdam, The Netherlands
www.amscins.com

