Making the Invisible Visible

CheeTah

Detectors for Electron Microscopy

Noise free data acquisition
Dead time free operations
High dynamic range
Continuous read out
High frame rate
Software synchronization

NEW!
Retractable detector with 512x512 pixels for TEM 35mm port

"Hybrid pixel detectors boost the power of electron diffraction by at least an order of magnitude. Protein crystals as small as just 100 nm are now allowing structure determination."

Prof. Dr. Jan Pieter Abrahams, Biozentrum; Centre for Molecular Life Sciences

Technology

ASI's CheeTah is a hybrid pixel detector for electron microscopy applications. Enabling the full power of MEDIPIX® technology, the CheeTah detector allows single electron sensitivity, high-speed and noiseless data acquisition and offers unprecedented possibilities to boost the power of standard TEMs.

Our versatile design makes our detector backward compatible with almost any electron microscope. We offer customized static and retractable design, depending on available space among other detectors already mounted in the microscope.

For typical TEM applications (200 kV), a silicon sensor of 300 μm is the best option with DQE(0) > 0.9. Different materials such as GaAs,CdTe and thicker sensors are also available for higher electron energies.

The CheeTah detector consists of a pixelated semiconductor sensor where each pixel is bump-bonded to its readout ASIC.

The readout ASIC, processes the detected signal in the semiconductor layer into meaningful spectral and timing information for each pixel and provides digitized data.

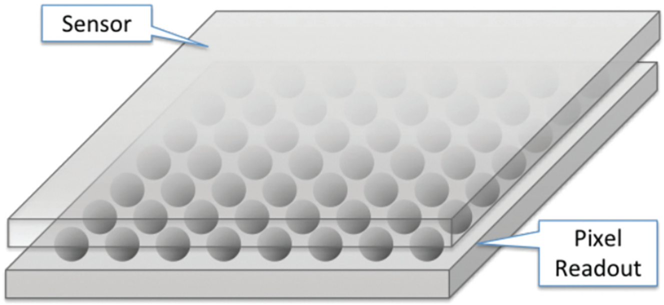
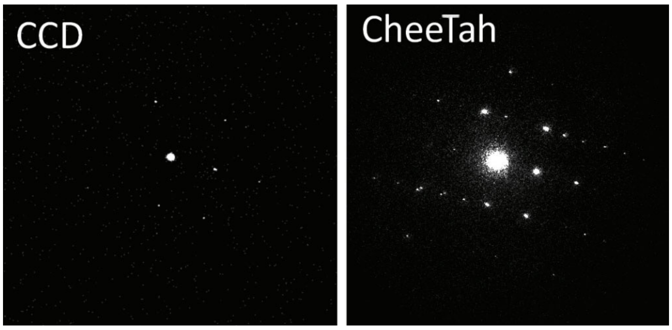


Illustration: A schematic view of readout chip

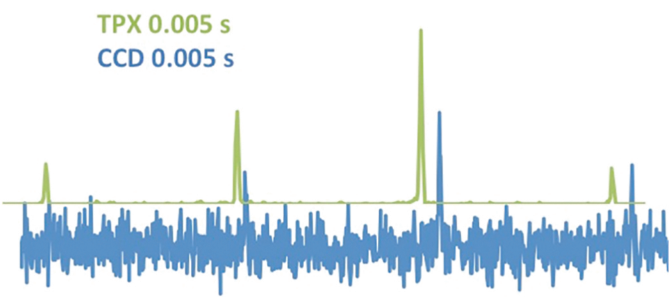
"The Timepix detector combined with continuous rotation electron diffraction greatly improved the data quality and shortened the data collection time from hours to minutes. Ab initio structure determination by electron diffraction has now become as feasible as by X-ray diffraction, but from crystals thousands of times smaller than what are needed for X-ray diffraction."

Prof. Xiaodong Zou, Department of Materials and Environmental Chemistry at Stockholm University

Figure: Diffraction pattern taken during a 1 sec exposure with a total dose 0.05 el Å^{-2}. Image courtesy of Mauro Gemmi IIT@NEST



Compared to a standard CCD camera, The CheeTah has much greater sensitivity to observe weak intensity points in diffraction patterns.



Applications

The single electron sensitive CheeTah is the detector of choice for many scientists in various fields:

- Physics
- Materials science
- Crystallography
- Chemistry
- Nanoscience
- Life science

Low dose applications for beam sensitive materials

Noise-free operation and high-speed frame acquisition make CheeTah the ideal detector for protein and pharmaceuticals research.

3D ED Tomography

MicroED

Precession Electron Diffraction

4D-STEM

CryoEM

EELS*

and many more...

*See Specifications

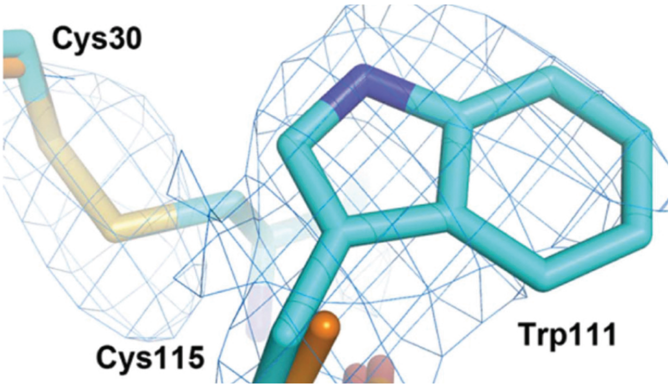


Figure: Structure of novel HEWL polymorph obtained by 3D ED. Source: A. Lanza et al. IUCrJ. 6, 178 (2019)

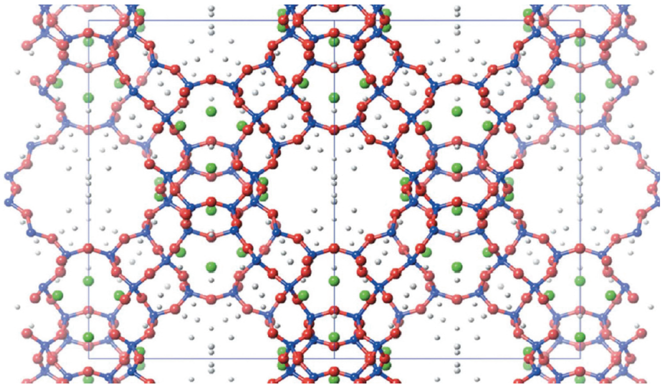


Figure: Structure of zeolite Y. Source: S. Smeets et al. J. Appl. Cryst. 51, 1262 (2018)

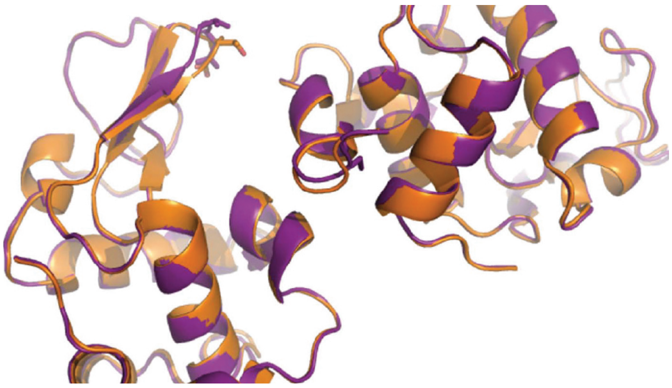
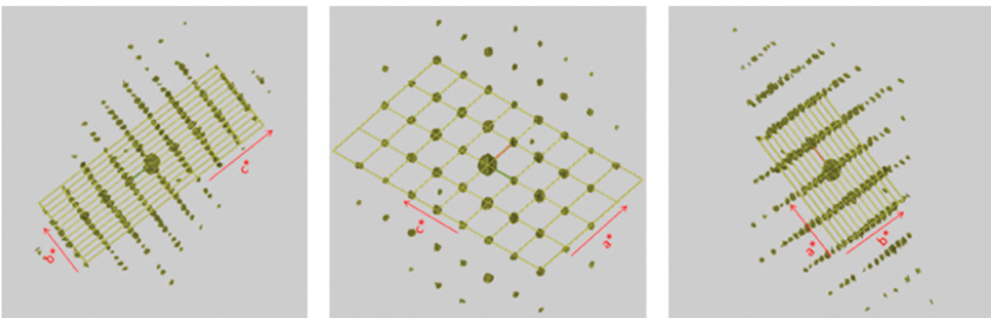


Figure: Superposition of HEWL structure obtained with 3D ED and XRD. Source: A. Lanza et al IUCrJ. 6, 178 (2019)

Figure: 2D reconstructed projections (along x, y, and z directions) of 3D diffraction volume from PEDT data for Tolvaptan. Source: P. P. Das et al. Org. Process Res. Dev. 22, 1365 (2018)



Specifications

	CheeTah T3	CheeTah M3
The ASICs	Timepix3	Medipix3RX
Pixel size	55 µm	55 µm
Number of pixels	512 x 512 (262k) *256 x 1024	512 x 512 (262k) *256 x 1024
Sensor area	(262k) 28 x 28 mm^2	(262k) 28 x 28 mm^2
Min. detectable energy	4.5 keV	4.5 keV
Read-out & Max speed	Data-driven Sequential >500 MHz	Frame-based Sequential - 24 bits - 700 Hz Continuous - 12 bits - 2000 Hz
Operation mode	ToT & ToA Time resolution: 1.56 ns	EC Counter depth: 24/12/6/1 bits
# of thresholds	1	2 (seq) & 1 (cont)
Max count rate	1 MHits per pixel and 120 MHits for quad chip	
Sensor material**	Si 300-500 µm / GaAs 500 µm / CdTe 1000 µm	

** Different sensor materials and thicknesses are available upon request

CheeTah M3

is the ideal detector for applications which require high spectral capabilities and high frame rates.

Simultaneous detection in multiple spectral ranges is achieved by setting 2 thresholds and up to 24 bit counter depth allows longer frame acquisitions.

With the continuous RW mode speeds of 2000 fps with 12 bits counter depth is reachable.

Trigger Box

The data acquisition can be synchronized and automated with other units in your experimental system by sending voltage signals to our trigger box. It is also possible to use our server solution for complete remote control of the detector.

CheeTah T3

is suitable for applications where the timing of the detected particles is more important.

The CheeTah T3 can detect events with a time resolution of 1.56 ns and the data-driven read-out scheme results in a significant reduction of data transfer and processing requirements.

Visit our website for selected CheeTah publications: ***www.amscins.com/publications***

AMSTERDAM SCIENTIFIC INSTRUMENTS

Amsterdam Scientific Instruments B.V
Tel.: +31 20 7235200 | info@amscins.com
Science Park 106, 1098 XG Amsterdam, The Netherlands
www.amscins.com