

GALIPIX^{3D}

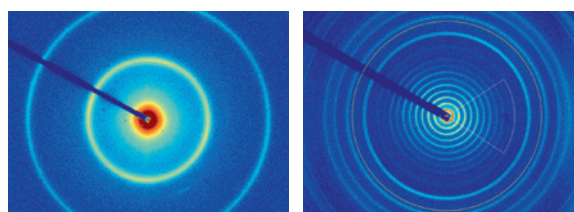
Extending the range of solid-state pixel detectors

THE BEST IN CLASS DETECTOR FOR HARD RADIATION APPLICATIONS AND MORE ...

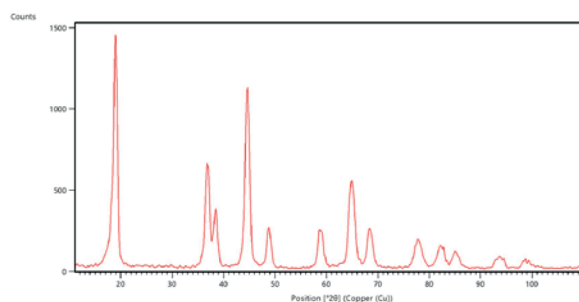
The GaliPIX^{3D} is Malvern Panalytical's high end X-ray detector for diffraction, scattering and imaging instruments. It is designed for advanced studies of materials, for applications requiring the use of hard radiation, e.g. Pair Distribution Function, Computed Tomography or Transmission measurement through either absorbing samples loaded in capillaries or thick samples such as batteries, it will also provide excellent results with softer radiation, such as Cu or Co.

With the combination of very small pixels (60 microns), a CdTe sensor and an overall sensor with dimensions of 30.06 mm x 24.16 mm on one single chip, GaliPIX^{3D} provides users with cutting edge for their research.

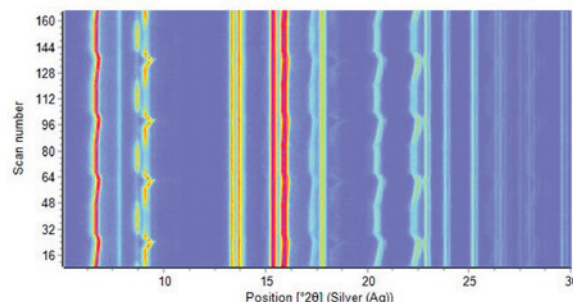
The high-quality CdTe sensor results in unrivalled stopping power for X-rays, with close to 100% efficiency even for the highest energy radiations available on laboratory instruments, like the ones provided by Ag and Mo anodes. Below some examples of data collected using the GaliPIX^{3D} detector.



2D SAXS (left) and 2D WAXS (right) of Silver behenate using Cu radiation.



Hyper-speed full pattern snapshot (33° 2θ with Ag radiation, equivalent to ~100° 2θ with Cu radiation) recorded in just 2 seconds.

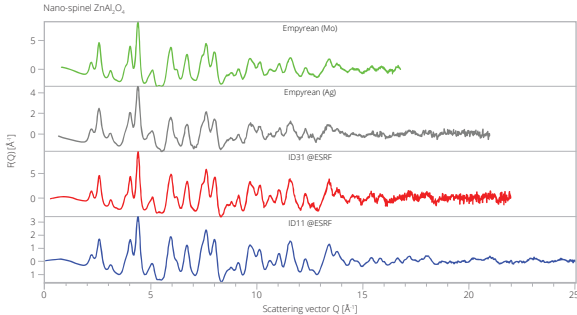


Four complete charge-discharge cycles of a commercial prismatic battery cell, measured with Ag radiation (5 minutes per scan, 14 hours total measuring time).

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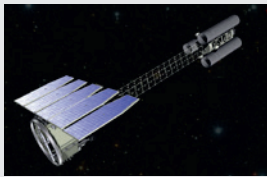
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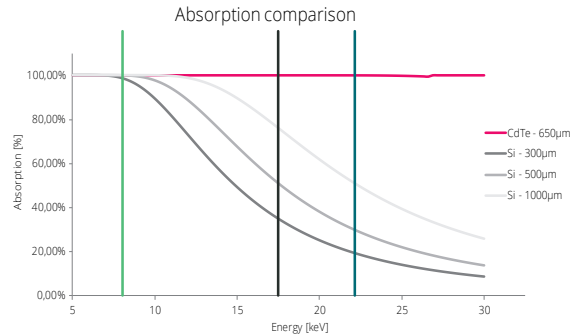
Reduced structure function - F(Q) data from the Empyrean equipped with a GaliPIX^{3D}, with Mo and Ag radiations, and the data from ESRF synchrotron.

The GaliPIX^{3D} makes use of technology that was initially developed with space exploration in mind. It is the result of a collaboration between Pixirad, a spin-off of INFN (Italian Institute of Nuclear Physics), NASA (National Aeronautics and Space Administration) and ASI (Italian Space Agency). The technology will be launched into space in 2020 for the IXPE (Imaging X-ray Polarimetry Explorer) mission.

This large ASIC with very small pixels, combined with a CdTe sensor for 100% efficiency for hard radiation, has great potential. Therefore, Malvern Panalytical has started a collaboration with Pixirad, to create the GaliPIX^{3D} detector for the flagship Empyrean systems. In 2017, Malvern Panalytical acquired the Pixirad technology, ensuring exclusivity of the technology.



Technology developed for space explorations... in your Empyrean diffractometer.



Absorption of Si and CdTe sensors for different energies, with the CdTe having a 100% absorption up to very high energies.

Technical specifications: GaliPIX^{3D}

| | |
|--------------------------------|---|
| Window size | 30.06 mm x 24.16 mm |
| Efficiency Cu Kα | 100% (same for Mo and Ag) |
| 99% Linearity range | 0 – 3.9 x 10 ⁹ cps – Overall 0 – 7.8 x 10 ⁶ cps – Column |
| Energy resolution around Cu Kα | 25% |
| Maximum count rate | 2.4 x 10 ¹¹ cps – Overall 4.7 x 10 ⁸ cps – Column |
| Maximum background | <6 cps – Overall |
| Active length | 30.06 |
| Total number of pixels | 501 x 465 = 232965 |
| Pixel size | 60 µm |
| Smallest step size | 0.0018° 2θ at 240 mm goniometer radius |
| Supported wavelengths | Ag, Mo, Cu (Co upon request) |
| Point spread function | 1 pixel (FWHM) |

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