PHOTON III Detector for Macromolecular Crystallography

● Largest Active Area – Highest Sensitivity – Best Data Quality

It has long been appreciated that a detector with a large active area offers compelling advantages for macromolecular crystallography. A large detector allows faster, more efficient data collection and thus better data. This is especially crucial when working with small, radiation sensitive samples. For this reason, synchrotron beamlines typically deploy large pixel area detectors with active areas of 40,000 mm^2 or larger. However, in the home laboratory costs have limited available pixel area sizes to a tiny fraction of this size. Until now – the new PHOTON III is the largest pixel array detector offered for the home laboratory with an active area of 200 × 140 mm^2.

The PHOTON III also brings another advanced feature of the latest beamline detectors into the home lab for the first time: mixed-mode detection. Mixed-mode seamlessly combines photon counting and integration simultaneously to offer both the highest sensitivity and the best linearity of any laboratory detector for the best possible data quality.

PHOTON III – Bring your beamline home.

Innovation with Integrity

SC-XRD

PHOTON III M28

Large Active Area, Mixed-mode Detector for Perfect Data
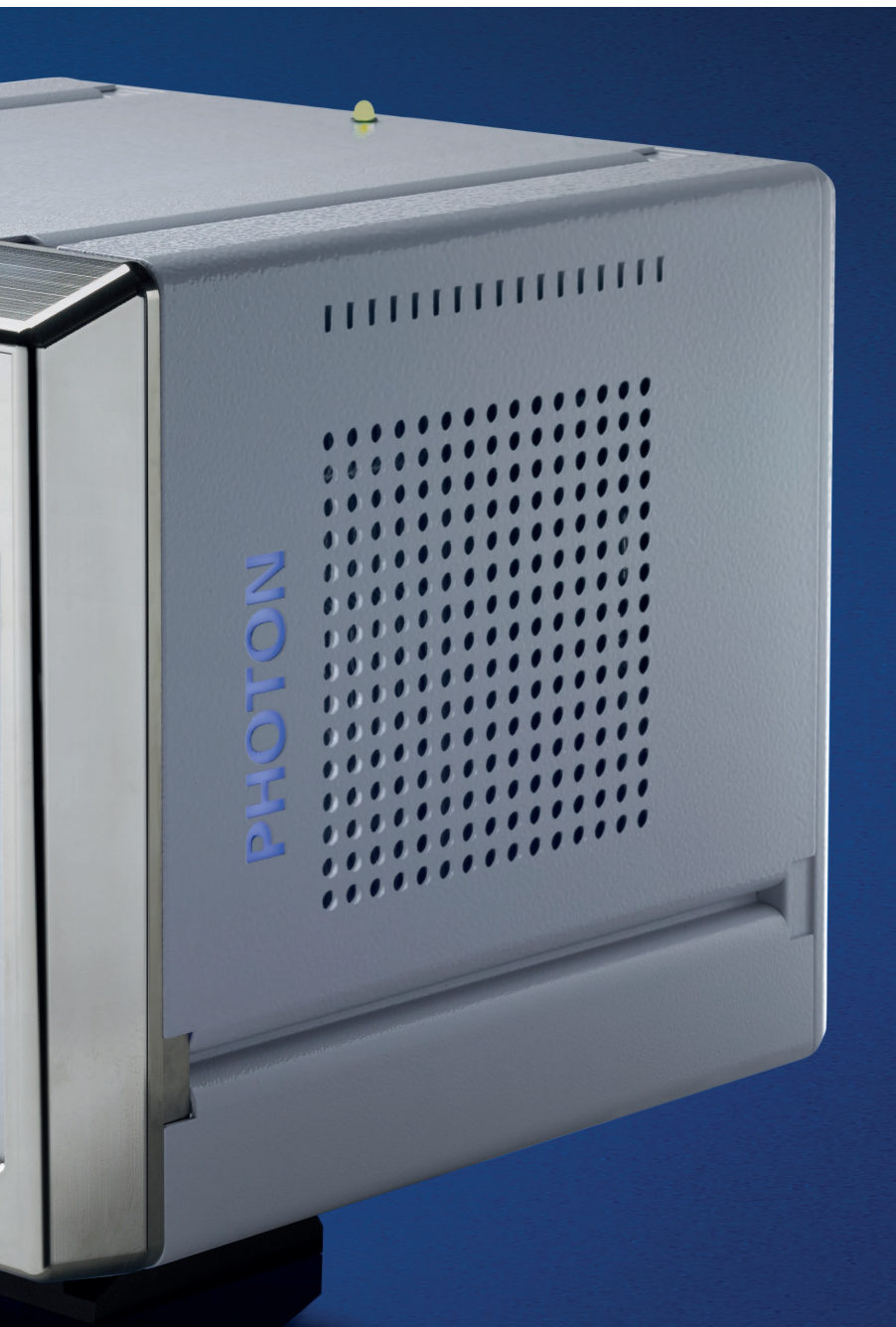
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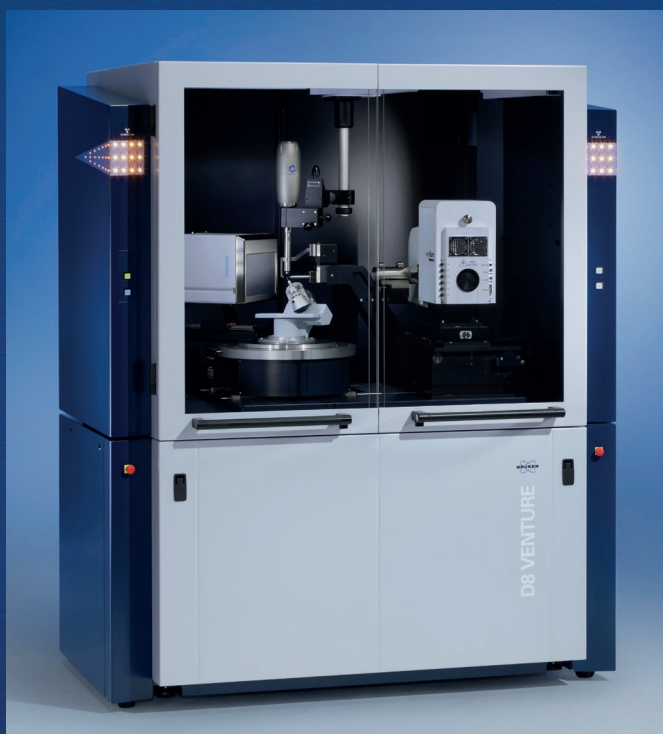
Active Area

The PHOTON III is the next-generation detector that uniquely combines photon counting and integrating modes. This guarantees best data for weak and strong data without compromises.

Features

Largest Active Area

With a size of 20×14 cm^2, the PHOTON III M28 surpasses any laboratory detector in Detective Collection Efficiency (DCE). Capture more reflections in just one detector setting.

Best Data Quality

The only detector with mixed-mode photon counting and integrating – excels for both the weakest and strongest reflections for superior data.

Speed

With a detector frame rate of up to 70 Hz, zero readout dead time and shutterless operation, data are acquired quickly and accurately.

Sensitivity

It cannot get better than photon counting in terms of sensitivity – Best possible data for weak reflections.

Linearity

No count rate losses for strong reflections due to integrating mode – Best data for strong reflections.

Reliability

Three year warranty, air cooling and no maintenance go hand in hand to deliver a long-lasting, best-quality product.

79% Data Quality
68% Speed
58% Sensitivity
45% Reliability
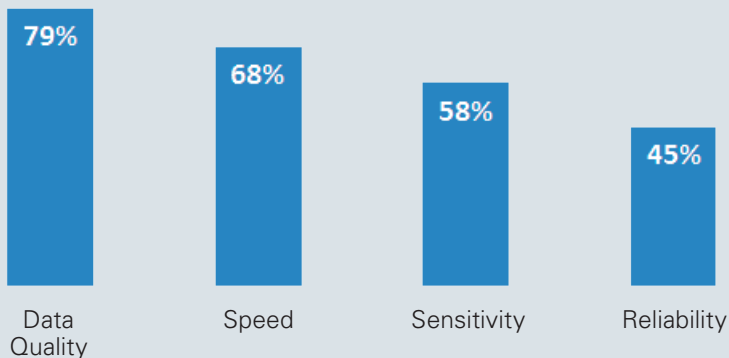
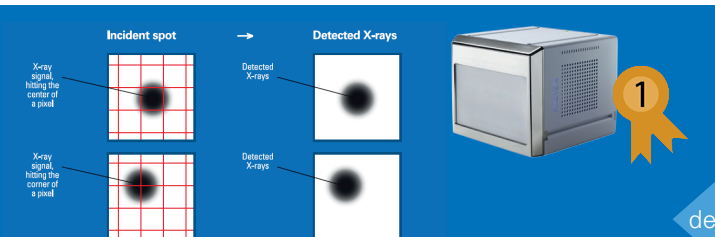**most important to crystallographers**

Large area for fast and efficient data

M28
289 cm²

Modern macromolecular beamlines use large active area pixel array detectors to optimize the speed and efficiency of data collection. The PHOTON III M28 offers the same features for your home laboratory.

detector active area

30 cm²
30 cm²

Small laboratory detectors such as the 6000 detector, require up to five times longer to collect equivalent data thus increasing radiation damage to the sample.

Best readout mode for quality data

Incident spot → Detected X-rays

X-ray signal, hitting the center of a pixel — Detected X-rays

X-ray signal, hitting the corner of a pixel — Detected X-rays

Advanced mixed-mode pixel detectors do not suffer from charge sharing losses – the PHOTON III M28 perfectly records every single X-ray photon.
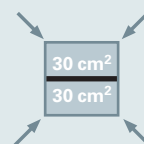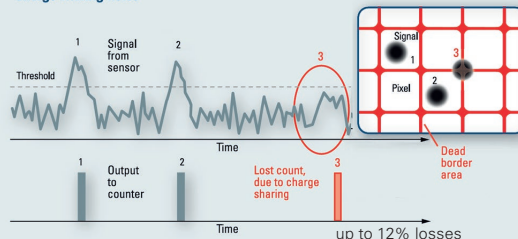
detector read out

Charge sharing noise

Threshold — Signal from sensor — 1 — 2 — 3
Time

Output to counter — 1 — 2 — Lost count, due to charge sharing — 3
Time — up to 12% losses

Signal — 1 — 3 — Pixel — 2 — Dead border area

Conventional pixel array detectors suffer from losses of incident X-rays due to the charge sharing effect.

No count rate saturation

Measured count rate / Incident count rate

PHOTON III truly counts all X-ray photons.

detector saturation

Measured count rate / Incident count rate

HPAD suffer from count rate losses.

Overview of Features and Benefits

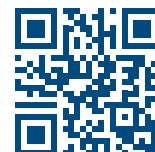|	
Detector Type	Charge Integrating Pixel Array Detector (CPAD)
Active area (mm)	208 × 139
Sensor format (pixels)	1,536 × 1,024
Pixel size (microns)	135
Total dead area (%)	0 (no gaps)
Percentage of active area with charge sharing losses (%)	0 (no charge sharing)
Count rate nonlinearity (% at 10^6 X-rays per pixel-sec)	0 (no count rate saturation)
Maximum parallax error (pixels)	<1
Sensor dynamic range	>200,000
Sensor frame rate (Hz)	70
Readout dead time between frames (msec)	0
Operating energy range (keV)	5-12
Operation mode	Simultaneous photon counting and integrating (mixed mode)
Cooling	Air-cooled

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