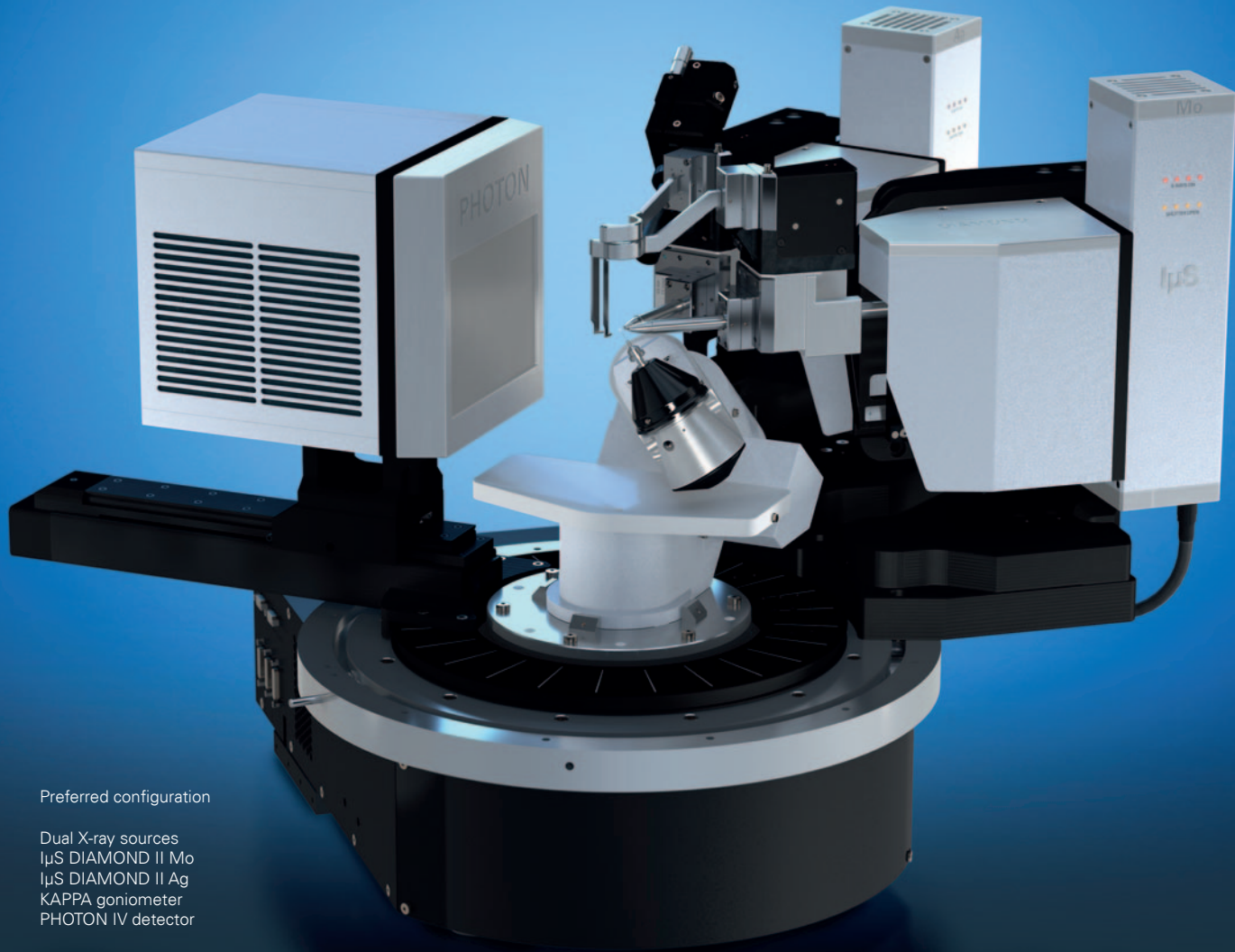


CRYSTALLOGRAPHY

D8 VENTURE HE

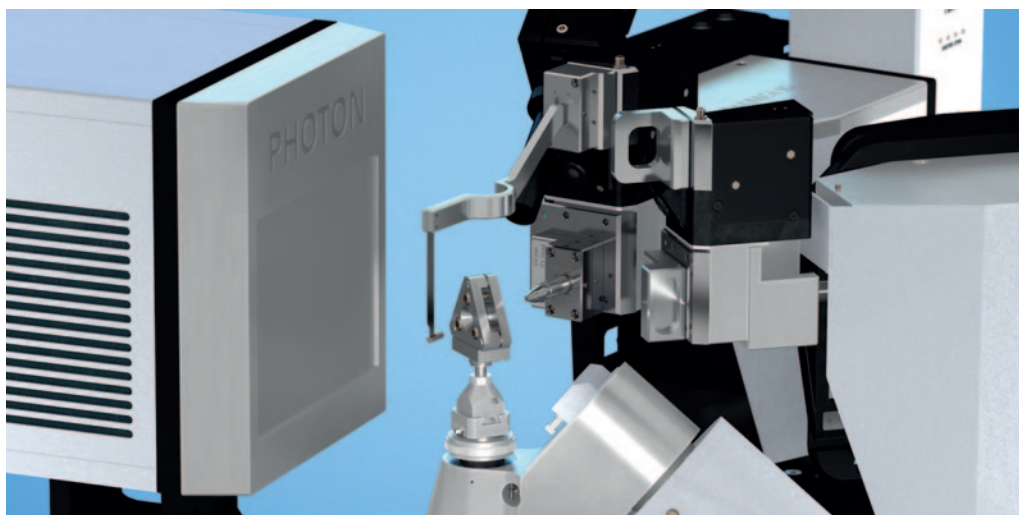
High-Energy Crystallography Solution for Material Science

Innovation with Integrity



Preferred configuration

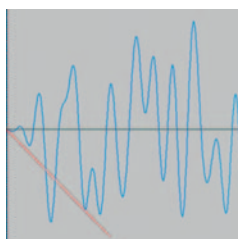
Dual X-ray sources
IµS DIAMOND II Mo
IµS DIAMOND II Ag
KAPPA goniometer
PHOTON IV detector



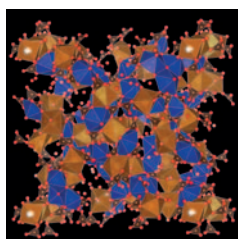
High-pressure solution

The High-Pressure Kit is compatible with most commercially available Diamond Anvil Cells (DAC). Installing the kit ensures collision avoidance and safe positioning of the DAC. Switching between standard and high-pressure setups takes just seconds.

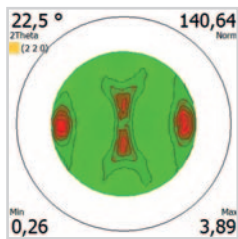
D8 VENTURE HE – Where High-Energy Meets High-Impact Science



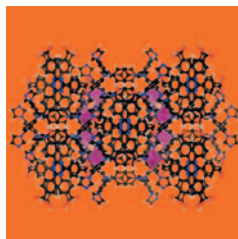
PDF



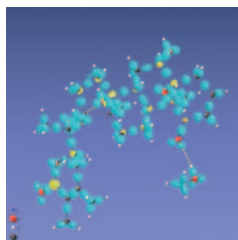
Minerals



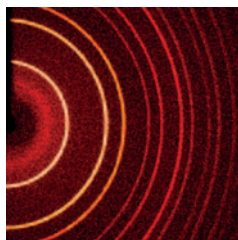
Texture



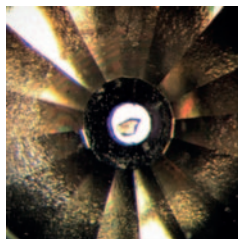
MOF



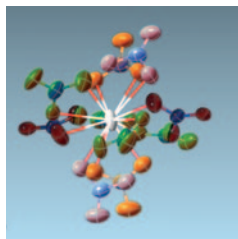
Charge density



Powder



High pressure



Coordination

The unique benefits of high-energy crystallography

Materials Sciences, including solid-state and intermetallic chemistry, focus on the synthesis, structure, and properties of solid materials. In these fields, X-ray crystallography is crucial for determining precise atomic structures, which is essential for understanding material properties, guiding synthesis, and identifying new compounds.

High-energy crystallography in the home lab uses Mo or Ag X-ray sources with enhanced resolution, penetration power, and data quality. Ag radiation reduces absorption and extinction, leading to clearer and more precise diffraction patterns. These advancements enable the development of new materials with tailored properties for high-performance applications.

Elevate your research with Ag radiation – where precision meets efficiency

High-Pressure Crystallography: Achieve better completeness to higher resolution in geometrically restricted experimental setups, such as those using diamond anvil cells (DACs). Enhance data quality with the DIAMOND II source's small beam minimizing diffraction from diamond anvils and gaskets

Quantum Crystallography: Benefit from the compressed reciprocal space provided by Ag radiation. The diffraction geometry of the D8 VENTURE HE enables the collection of highly accurate data, achieving precision up to 1.5 \AA^{-1} with short measurement times. Additionally, mitigating extinction effects allows for more accurate intensity measurements and superior structural models by reducing multiple scattering events within the crystal.

PDF Analysis: Harness the power of Ag radiation achieving a Q of up to 21 \AA^{-1} in PDF analysis to achieve unparalleled high-resolution data collection. Accurately characterize the local structure of materials, leading to a deeper understanding and optimization of their properties.

D8 VENTURE HE – the power to perform

The D8 VENTURE HE combines the high intensity of DIAMOND II sources with the PHOTON HE photon-counting detector, optimized for Mo and Ag radiation. With versatile Mo and breakthrough Ag sources, it delivers top-quality data for inorganic, material science, and geo-chemists, enabling the most demanding chemical crystallography experiments.

Enhanced X-ray intensities: By optimizing the cathode, electron optics, and take-off angle, the μ S DIAMOND II achieves significantly higher X-ray intensities compared to conventional microfocus sealed tubes and traditional microfocus rotating anodes. This means faster measurement times and more efficient data collection, allowing users to complete their experiments more quickly and accurately.

Improved heat management: The innovative diamond hybrid anode design dramatically enhances heat management, delivering stable output performance over extended periods. This thermal stability minimizes fluctuations, ensuring consistent results and reducing the need for frequent recalibrations or manual adjustments. Best of all, it achieves this with a fully air-cooled system, eliminating the complexity and maintenance demands of traditional water-cooled setups.

Convenience and reliability: Unlike rotating anodes, which suffer from rapid output degradation due to repeated heating and cooling cycles, the μ S DIAMOND II maintains a constant heat load on its target. This results in a stable output and eliminates the hassle of regular maintenance, making the instrument more convenient and cost-effective to use.

High performance: The μ S DIAMOND II combines the performance of a rotating anode with the convenience of a sealed tube. Users benefit from high X-ray intensities without the high operational costs and maintenance requirements associated with rotating anodes.

Better experiments: Overall, these innovations allow users to achieve superior X-ray intensities, stable performance, and reliable results, enhancing their research capabilities and efficiency.

μ S DIAMOND II Hybrid Anode X-ray Sources

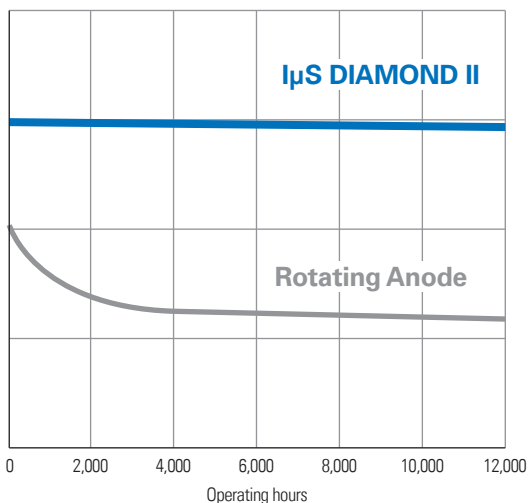
μ S DIAMOND II offers highest intensity, advanced heat management and proven reliability

The X-ray sources are available with silver, molybdenum and copper radiation.



- 1 Newly developed cathode delivers strong electron beam
- 2 Electron beam
- 3 Focusing electron optics
- 4 Target layer, take-off angle optimized for crystallography
- 5 Diamond hybrid for highest X-ray intensities due to the diamond substrate and its most efficient thermal conductivity
- 6 X-ray beam
- 7 HELIOS optics

Relative intensity over time



Brilliance without compromise

Bruker's μ S DIAMOND II microfocus X-ray source delivers up to twice the intensity of rotating anodes. It enables near-instant wavelength switching, 99% uptime, and maintenance-free operation. With exceptional beam stability and long tube life, it redefines SC-XRD performance, offering high brilliance and reliability without the complexity of rotating anode systems.



All about the
µS DIAMOND II



All about the
PHOTON IV

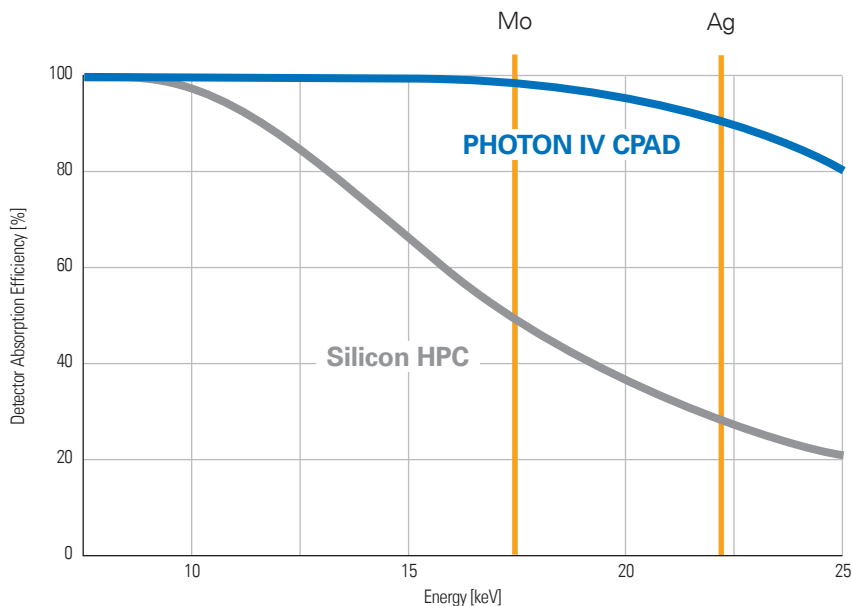


PHOTON IV HE Detector

The latest detector technology optimized for high-energy applications

The PHOTON IV HE features a customized rare-earth X-ray scintillator, achieving near-ideal Detective Quantum Efficiency (DQE) for X-rays in the 15-25 keV energy range, making it an excellent detector for Mo and Ag X-ray sources. Its large, monolithic sensors have no insensitive regions, ensuring efficient collection of highly accurate data at very high resolutions. This design is particularly advantageous for experiments requiring larger detector distances or higher data multiplicity for utmost accuracy, such as in charge density measurements.

Additionally, the PHOTON IV leverages massively parallelized readout, high pixel density, and extended dynamic range. This enables precise photon counting and real-time off-pixel processing, ensuring no information is lost and every photon is accurately counted. This technology also supports intelligent photon counting with inter-pixel logics, providing sub-pixel resolution for best data accuracy.



Absorption efficiency of X-rays

Superior X-ray absorption efficiency for Ag and Mo radiation, the PHOTON IV HE delivers Detective Quantum Efficiency (DQE) on par with CdTe-based hybrid photon counting (HPC) detectors and significantly surpasses traditional Si-based HPC detectors. In addition to its exceptional absorption performance, the PHOTON IV HE features a substantially larger active area, enabling faster data acquisition and optimal throughput. The result: high-quality data in the shortest possible time.

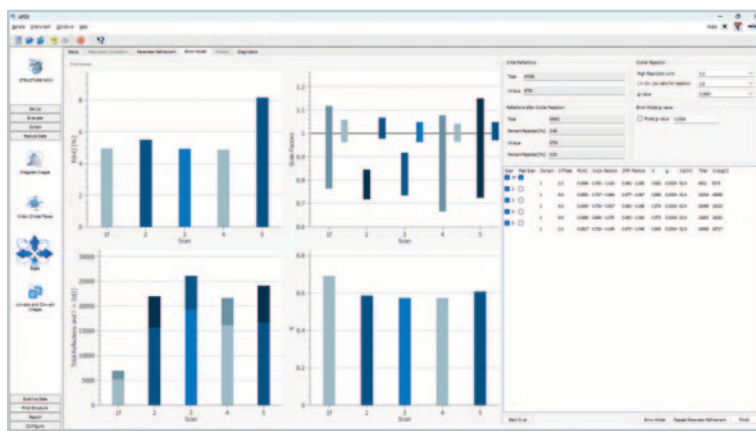
Data collection made simple

Achieve the full potential of your instrumentation with smart strategy planning. The APEX suite empowers users to efficiently collect complete datasets, featuring high multiplicity and optimized experiment time, ensuring every minute of instrument time is maximized. With intelligent, automated strategy determination, you can fine-tune acquisition parameters while retaining full control over experimental outcomes. Optimal results, minimal effort.



Scaling and absorption correction

Materials science compounds can exhibit significant absorption even with high-energy radiation, and high-pressure experiments present their own unique challenges. Effective empirical absorption correction and scaling are crucial for obtaining the best possible data.



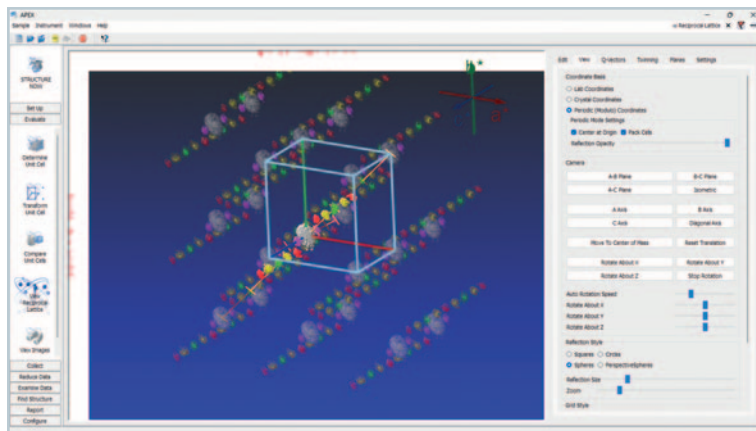
Face indexing

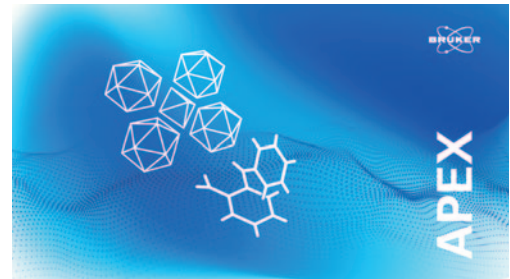
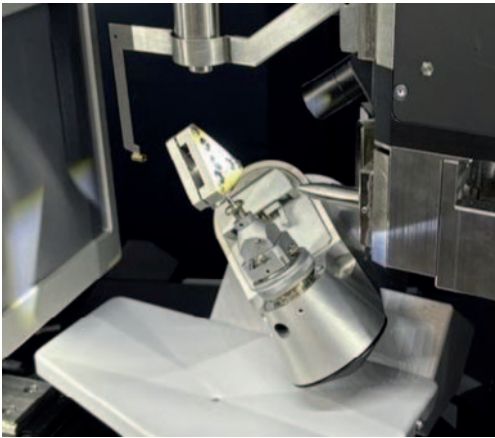
APEX lets you effortlessly and intuitively characterize a crystal's shape from a pre-recorded movie using user-friendly tools and intelligent assistants. When combined with higher-energy radiation, face indexing delivers the best data from even the most strongly absorbing samples.



Reciprocal lattice viewer

The GPU-accelerated plug-in enables you to efficiently work with challenging samples and interactively modify reflection arrays. The visual separation of multiple lattice components is now quicker than ever. To accurately describe incommensurate structures, we developed a unique dimensional reduction algorithm that folds three dimensions onto themselves. This allows for precise determination of q-vectors and the indexing of satellite peaks.



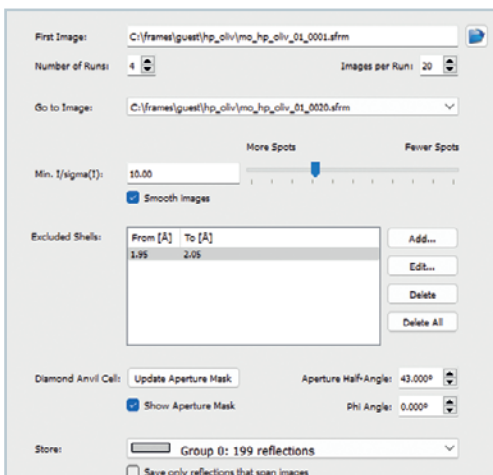
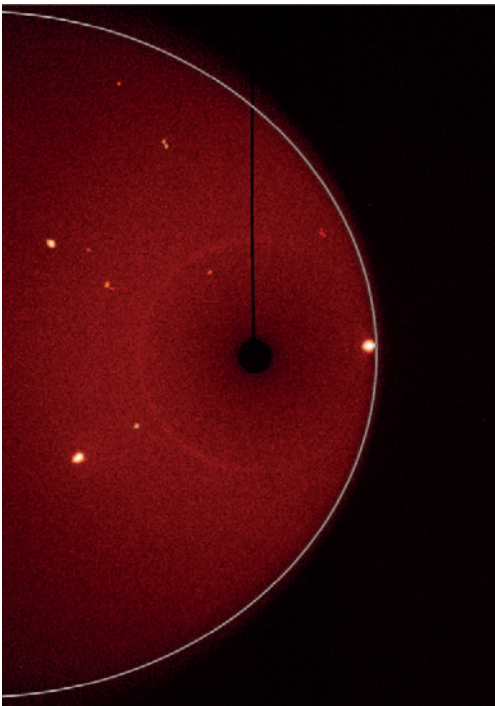


APEX Software – All the Tools for the Most Demanding Experiments

Getting the best results from high-pressure experiments

Advanced crystallographic methods demand meticulous data analysis. We developed numerous innovative techniques and methodologies to not only enhance data quality but also to facilitate easy and intuitive handling through new and improved software features.

- Component recognition for path planning and collision avoidance
- Powder ring exclusion during indexing
- Powerful indexing methods to identify orientation matrices of the sample and the diamond anvil crystals
- Concurrent handling of multiple matrices during data integration
- Concurrent handling of multiple Bravais lattices during data integration
- Interactive dynamic image mask for modeling the partial shading of the diffraction images by the DAC
- Proven “best-plane” background treatment of inhomogeneous and rapidly changing backgrounds
- Comprehensive interface for scaling and absorption correction



Features and Benefits

Main characteristics

D8 VENTURE HE System

The D8 VENTURE HE is a pioneering system for materials science, offering dual-source flexibility with Mo and Ag X-ray configurations. It combines the high intensity of DIAMOND II, shorter wavelengths, and the precision of the photon-counting PHOTON IV HE detector. Its robust sample stage supports high-pressure cells while maintaining a tight sphere of confusion. APEX software and custom solutions help researchers tackle complex crystallographic challenges with precision and confidence.

Feature		Benefit
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Photon-counting pixel-array detector	4 th generation pixel-array detector technology	Higher speed and sensitivity, best data quality
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Small pixel size [μm^2]	100 × 100	Higher resolution
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Large active area [mm^2]	111 × 72, ~8,000 111 × 145, ~16,000	
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Readout frequency [Hz]	112	Faster data collection
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Count rate [counts·pixel ⁻¹ ·sec ⁻¹]	Up to 4 × 10 ⁶	
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Dead time [sec]	0	
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PHOTON IV HE Detector

No dead areas	Single, monolithic silicon sensor	
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No charge-sharing noise	0 electrons charge-sharing noise	
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Parallax [pixel]	< 1	Improved data quality
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Count-rate nonlinearity, before correction [%]	< 1	
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Detector absorption efficiency	Ag 92%, Mo 99%	High Detectable Quantum Efficiency (DQE)
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No operating gas or cooling water	Completely sealed design, air cooled	No maintenance, high uptime
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High reliability	3-year warranty	
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I μ S DIAMOND II Source

Very high intensity beam, completely air-cooled, revolutionary e-beam and cooling technology	Ag and Mo radiation	Dual-wavelength configuration with instantaneous wavelength switch for advanced data collection. Shorter measurement times and better data from difficult samples.
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Sphere of confusion [μm]	< 7	Best data quality
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High speed [deg/min]	Up to 3,000	Faster data collection
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Kappa geometry [deg]	-183 ... +183	Highest experimental flexibility
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APEX Software

The most comprehensive software package for single crystal X-ray diffraction (SC-XRD), utilizing well-tested, first-class algorithms. It offers a user-selectable level of automation, catering to both novices and providing complete control for experienced crystallographers. With state-of-the-art responsiveness, it incorporates user feedback from hundreds of installations. The software features unparalleled twin handling, boasting the most powerful reciprocal lattice viewer to address all crystallographic challenges. Additionally, it includes first-class interactive model-building and refinement tools.

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