Swabian instruments

ADVANCING PHOTON MEASUREMENT

DLScat

Simultaneous Multi-Angle Dynamic Light Scattering

Record every photon. Measure every angle at once.
Re-analyze without re-running the sample.

- Up to 5 simultaneous angles
- Raw photon data
- Post-acquisition reanalysis
- Kinetics for evolving samples



www.swabianinstruments.com

Simultaneous acquisition,
across up to 5 scattering angles

Keep access to the underlying raw photon data, not only the reported result.



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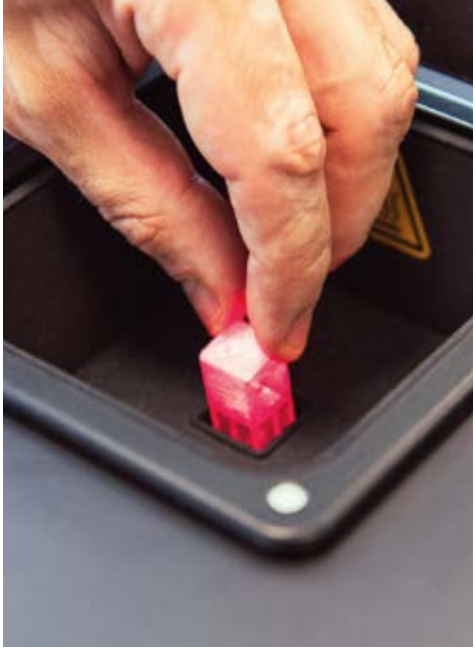
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AT A GLANCE

Up to 5 simultaneous angles
Multiple angular views at the same moment

Raw photon data
Time-tagged photon stream recorded

Post-acquisition reanalysis
Reprocess, filter, and refine without re-measuring

Kinetics for evolving samples
Track how particle sizes change over time

SCIENCE

Particle size, every angle, at once

Multi-angle, time-resolved particle characterization based on picosecond photon time tagging to evaluate even challenging evolving samples.

What is DLS?

Dynamic Light Scattering (DLS) determines hydrodynamic particle size by analyzing fluctuations in scattered light caused by Brownian motion. Correlating these intensity fluctuations yields the particle diffusion coefficient and, from this, hydrodynamic size. Fast, non-invasive, and broadly applicable, DLS is a standard technique for characterizing particles and molecules in solution.

However, many commercial DLS systems are built around fixed processing workflows, single-angle detection, or limited access to photon arrival-time data. Where multi-angle capability exists, measurements may often still be acquired sequentially rather than simultaneously.

For complex, heterogeneous, or time-dependent samples, these constraints can limit both what is captured during the measurement and how the data can be examined afterward.

We began seeing an increasing number of research groups using Swabian Instruments' Time Taggers as correlators in home-built DLS setups. DLScat grew from that workflow: integrating simultaneous multi-angle acquisition and time-tagged photon data into a turnkey instrument.

"We kept seeing researchers build custom DLS systems around our Time Taggers as correlators. DLScat brings that into one complete measurement system."

- Mohit Agarwal, DLS application scientist



TECHNOLOGY

From a correlator researchers trust

Powered by Swabian Instruments Time Tagger technology.



What makes DLScat different?

Simultaneous multi-angle DLS

Acquire up to five scattering angles simultaneously, so each angle captures the same sample state. DLScat uses the Swabian Instruments Time Tagger 20 as a correlator, acquiring multiple detector channels in parallel and streaming the photon data for analysis.

Comparing the five simultaneously acquired angles provides a built-in consistency check and removes the need to rerun a measurement to examine angle dependence or sample kinetics separately.

Raw-photon access

DLScat retains the underlying time-tagged photon stream, not only the processed correlation result. Correlation parameters, time windows, filtering, and analysis methods can be revisited after acquisition, allowing the same dataset to be reprocessed without repeating the measurement.

Post-acquisition filtering

Transient intensity spikes can be identified and filtered during post-processing. This helps reduce the influence of dust, rare aggregates, or other short-lived events without requiring a new measurement.

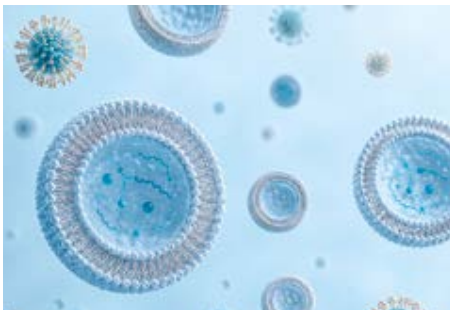
Kinetics

Because all angles are acquired simultaneously, changes in hydrodynamic size can be followed over time without temporal offsets between angles. Processes such as aggregation, self-assembly, and phase transitions can be tracked as the sample evolves.

SAMPLES

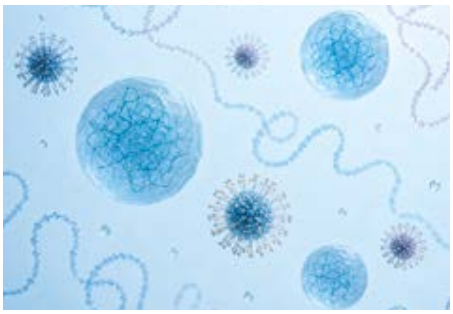
For complex and evolving samples

Representative sample systems can be evaluated with DLScat, even when they are not monodisperse samples or if they experience aggregation over time.



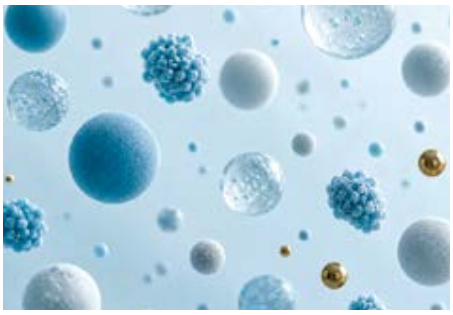
EVs, liposomes, and lipid nanoparticles

Characterize hydrodynamic size, size distributions, aggregation, and stability in vesicular and lipid-based systems. Time-resolved measurements are particularly useful for monitoring during formulation, mixing, storage, or temperature-dependent studies.



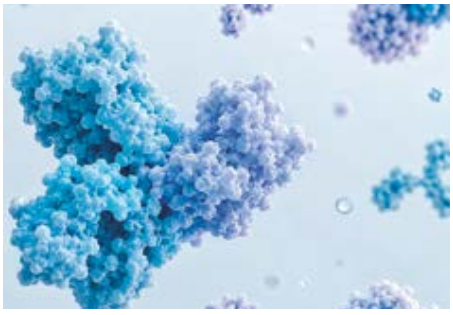
Polymers, micelles, and microgels

Study polymeric and self-assembled systems as they respond to concentration, temperature, or other experimental conditions. Investigate micellization, swelling, association, aggregation, and changes in hydrodynamic size as the system evolves.



Colloids and other engineered nanoparticles

Measure hydrodynamic size and particle-size distributions across colloidal and nanoparticle systems. Simultaneous multi-angle DLS helps assess measurement consistency and extract more information from broad, polydisperse, or multimodal samples. Intelligent intensity-spike filtering helps to reduce distortion from dust, contaminants, and transient aggregates.



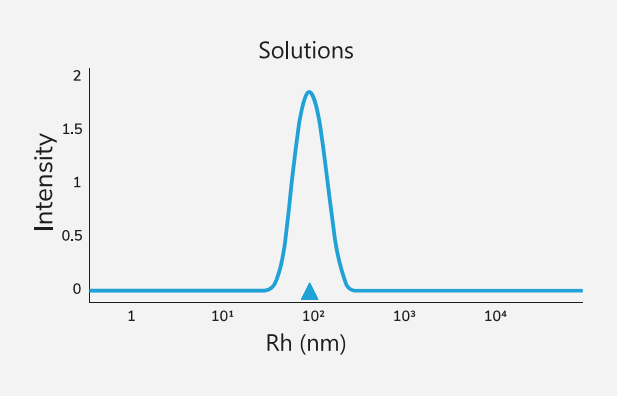
Proteins and biomacromolecules

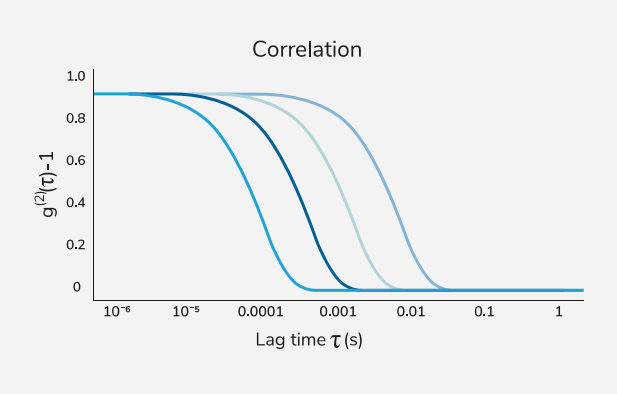
Monitor hydrodynamic size, polydispersity, and aggregation of proteins and other biomolecular systems. Multi-angle measurements provide complementary views of sample behavior and help assess consistency across complex systems. Suited for examining changes associated with formulation conditions, temperature, storage, or other stressors that affect solution-state behavior.

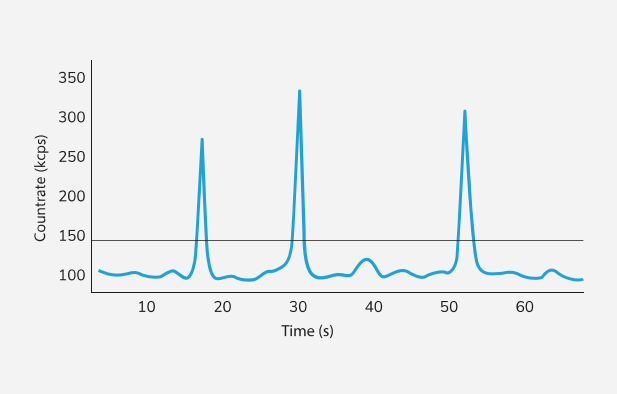
MEASUREMENTS

Where angle and time both matter

DLScat is built to address additional measurement objectives beyond particle size analysis.







Particle size and distribution

Measure hydrodynamic particle size and polydispersity in suspensions and samples in solution. DLScat enables reliable size extraction even for complex or weakly scattering samples thanks to the combination of time-tagged detection with flexible post-processing.

Aggregation, kinetics, and stability

Investigate early-stage aggregation and analyze changes in particle size over time. Time-resolved correlation analysis allows aggregation processes to be observed directly rather than averaged out.

Track particle size and dynamics during mixing, temperature ramps, chemical reactions, or the application of stress. Correlations can be computed over user-defined time intervals to reveal non-equilibrium behavior.

Method development and advanced data analysis

Develop and validate custom correlation algorithms, filtering strategies, and analysis pipelines. Full access to raw photon data makes DLScat suitable for research beyond standard DLS workflows.

Follow measurements as they happen

Reprocess the data as the sample demands. All from one interface.

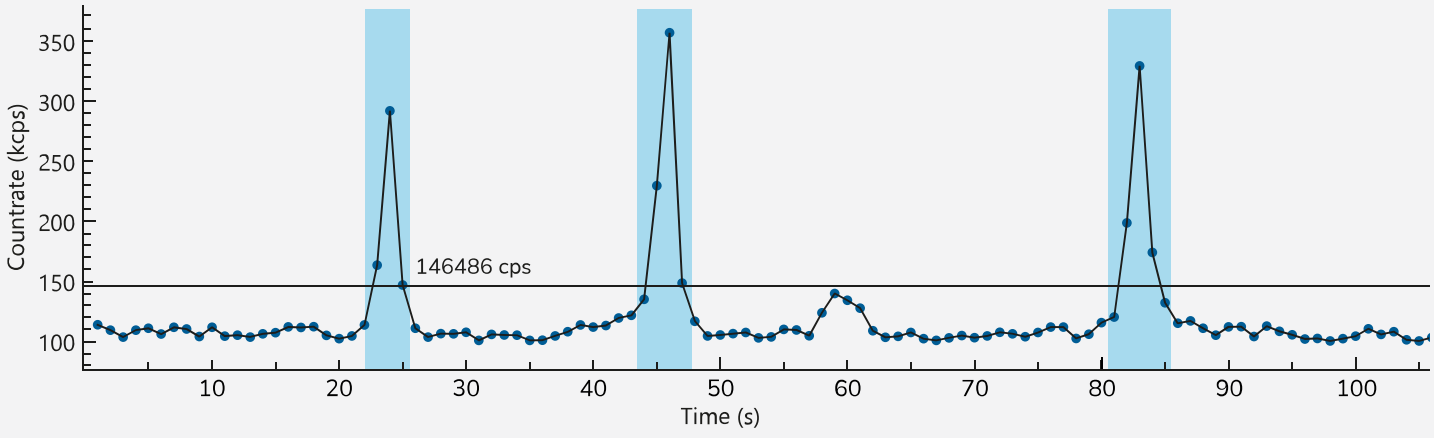
Analyze every angle

Cumulant and CONTIN analyses are integrated directly. Cumulant analysis assumes a single, monomodal population; CONTIN resolves multiple populations and is better suited to polydisperse or multimodal samplesv.

Hydrodynamic size, polydispersity, decay rates, and correlation functions remain available as a function of scattering angle, rather than reducing the experiment to a single reported number.

Filter with control

DLScat includes multiple filtering approaches to remove dust events, rare aggregates, and transient artifacts directly from photon-level data. Manual selection, threshold-based filtering, and advanced algorithmic methods can be applied individually or consistently across all angles, improving data quality while preserving true sample dynamics.





Unexpected event? Return to the photon stream.

Inspect and reprocess transient scattering events without returning to the sample.

Follow the measurement, not just the result

Monitor count-rate and correlation data across all active scattering angles as you work. Before acquisition, the Countrate Tuner adjusts attenuation independently per angle to optimize count rates for measurement. Laser power can be set between 3–30 mW to suit each sample.

Reprocess without remeasuring

Enable photon-stream recording so the measurement remains open for further analysis after acquisition. E.g., the correlation parameters can be changed, and the same data reprocessed or filtered, without returning to the sample.

Data export and reproducibility

Results and raw data can both be exported in structured, machine-readable formats, including ZIP folders with clear metadata and schema definitions. This supports reproducible analysis, long-term data traceability, and integration into custom analysis pipelines.

MAIN CONFIGURATIONS

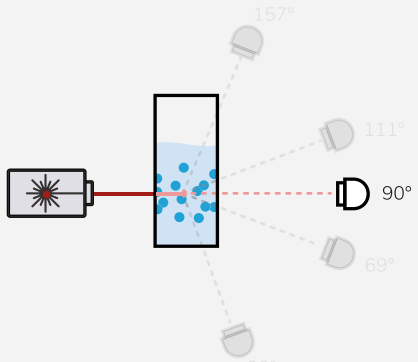
Available configuration by angle count

Select 1-, 3-, or 5-angle detection according to the information your experiment requires. Other geometries can be developed on demand.

1-angle | 90°

Standard DLS measurements

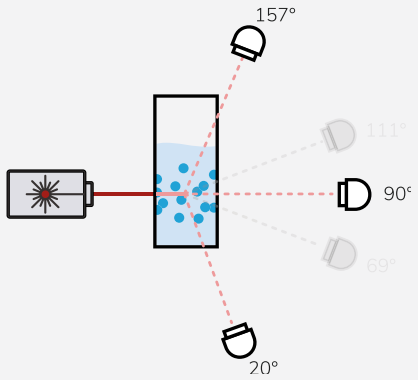
For routine particle sizing and applications in which angular comparison is not required.



3-angle | 20° · 90° · 157°

Multi-angle DLS characterization

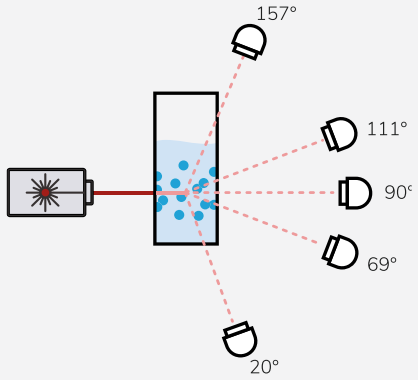
Detect angle-dependent artifacts, common in heterogeneous or evolving samples.



5-angle | 20° · 69° · 90° · 111° · 157°

Complete DLS angular analysis

Maximum angular coverage for highly complex and evolving systems.



CUSTOMIZABLE OPTIONS

Explore options with us

Built on deep expertise in photonics and precision measurement, DLScat can be adapted for specialized experimental requirements beyond the standard configurations.



Customizations we are asked about

Detector configuration

Model, amount, and specific geometry.

Laser and optical filtering

Wavelength (e.g. 561 nm) and filtering options.

Sample handling

Cuvette/cell options, temperature control, and accessories.

Microfluidics

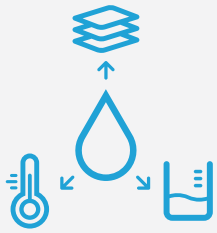
Flow systems and inline assesment, inclduding custom sample delivery.

To discuss further, please reach out to: solutions@swabianinstruments.com

Cuvette compatibility

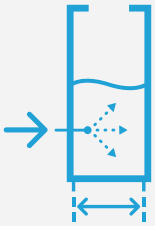
DLScat supports standard disposable and reusable cuvettes across common volumes and materials.





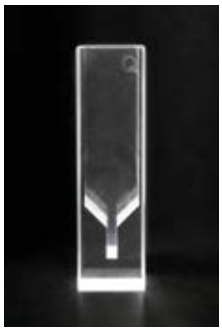
Choose by sample requirements

Select cell material and volume to suit sample availability, solvent compatibility, and temperature conditions.



Match geometry to the measurement

Select the cuvette geometry that best balances sample volume, optical access, and measurement needs.

	Macro Standard volumes	Reduced Smaller sample volumes	Micro Highly limited samples
Standard polystyrene High-clarity disposable cuvettes ideal for routine aqueous samples.			
Reusable glass/quartz High optical quality and chemical resistance, suitable for general-purpose measurement and repeated use.			

	Ultra Precious samples
Absorption (Ultra-micro) For precious or highly volume-limited samples, for which single angle measurements are sufficient.	

To discuss further, please reach out to: solutions@swabianinstruments.com

Experts in photon timing electronics used by scientists worldwide

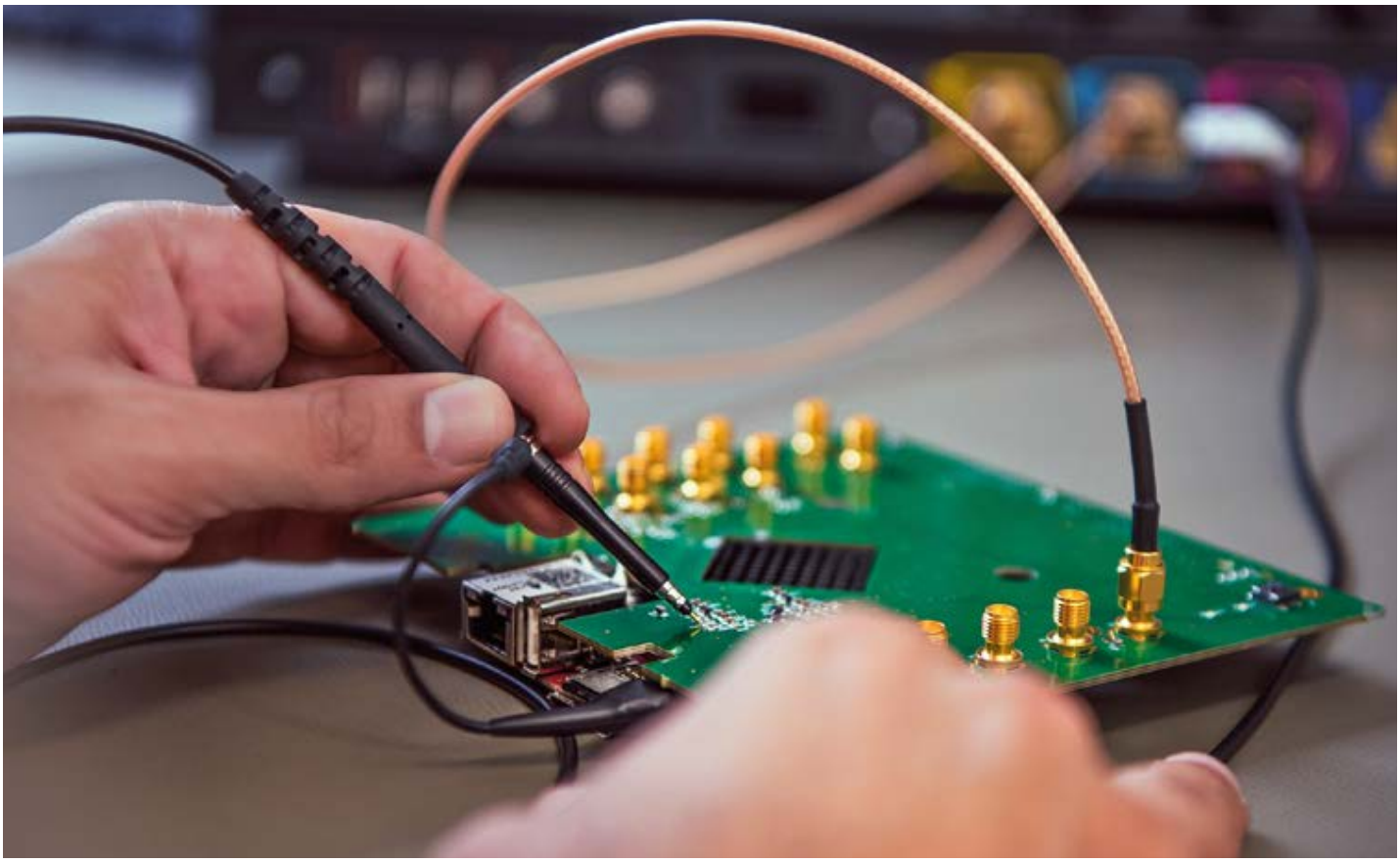
Swabian Instruments builds high-precision photon timing and time-tagging electronics. Our hardware is used worldwide in quantum optics, biophotonics, fluorescence spectroscopy, and time-resolved measurement.



That background shapes DLScat directly. Rather than adapting a correlator-based architecture, DLScat applies a photon-first approach: record every detected event, then decide how to analyze it.

Built on proven timing hardware. DLScat uses the same time-tagging platform trusted in laboratories worldwide for multi-channel photon detection.

Analysis lives in software. Capabilities extend through software updates rather than hardware replacement.



SUMMARY

What is DLScat engineered for?



Proven, research-grade hardware platform

Swabian Instruments' Time Taggers are multi-channel time-to-digital converters trusted across laboratories worldwide for high-precision experiments. Integrating a Time Tagger for data analysis in the DLScat enables true simultaneous multi-angle acquisition and data analysis.



Software-defined analysis, long-term

Analysis methods are implemented in software rather than fixed hardware, allowing capabilities to evolve over time. Continuous software development ensures compatibility with new workflows, emerging analysis methods, and future system expansions.



Transparent data access and reproducibility

Full access to raw photon data, structured exports, and detailed metadata support reproducible research, rigorous validation, and method development. DLScat users retain ownership and control of their data at every stage of the measurement.



Designed for flexibility, not assumptions

Modular hardware configurations and adaptable software workflows allow DLScat to be tailored to a wide range of samples and applications, from routine measurements to advanced, time-resolved, and multi-angle studies.

Specifications

Particle Size Specifications

Size Range	0.3 nm – 10 µm hydrodynamic diameter
Geometric Angles	20° (forward); 69°, 90°, 111° (side); 157° (back scattering)
Analysis	CONTIN, Cumulant analysis, Intensity spike filtering, Kinetics
Temperature Range	16 °C – 100 °C (+/- 0.1 °C) *

Sample Characteristics

Minimum Concentration	0.1 mg/mL (lysozyme), 0.1 ppm (latex 100 nm diameter)
Maximum Concentration	40% w/v
Minimum Volume	12 µL (1-angle), 50 µL (3-angles), 100 µL (5-angles)

Optics - Laser

Laser Wavelength	633 nm (561 nm and other wavelengths available upon request)
Laser Power	tunable, 3 – 30 mW (wavelength-dependent)
Laser Safety Class	Class 1
Laser Warmup Time	1 min

Optics - Detector

Detector Type	Single-mode fiber coupled with high-performance SPAD
Number of Detectors	1-angle, 3-angle, 5-angle configurations available
Attenuation Range	1 – 1000
Number of Bins	Up to 500

System & Interface

Dimensions	L: 485 mm, W: 330 mm, H: 230 mm, weight approx. 16 kg
Correlator	Time Tagger, auto- or pseudo-cross-correlation
Digital Communication	USB 2.0 Type C connection
Computer	Optional NUC PC
Software	Windows 11, Graphical user interface

A controlled working environment is required to meet all the specifications mentioned.
Sample performance metrics are sample-dependent.

*Temperatures down to 0 °C are achievable with external dry-air purging to prevent condensation.

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