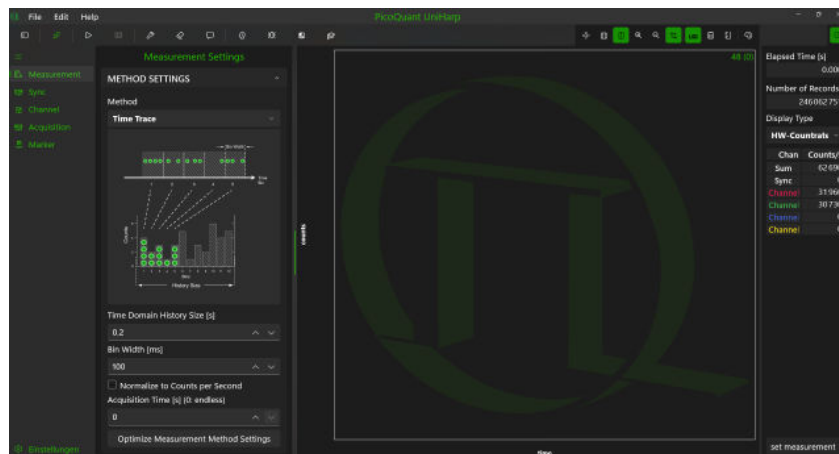


UniHarp

Free Universal Data Acquisition Software



- Sleek and modern interface for efficient research workflows
- Supports all advanced measurement classes such as histogram, time trace, correlation, unfold and RAW
- Supports real-time data acquisition, visualization, and flexible data saving
- Intuitive parameter-setting tools to streamline complex experiment configurations
- Comprehensive monitoring of device performance
- Compatible with multiple PicoQuant devices and supports PTU/PHU data import/export

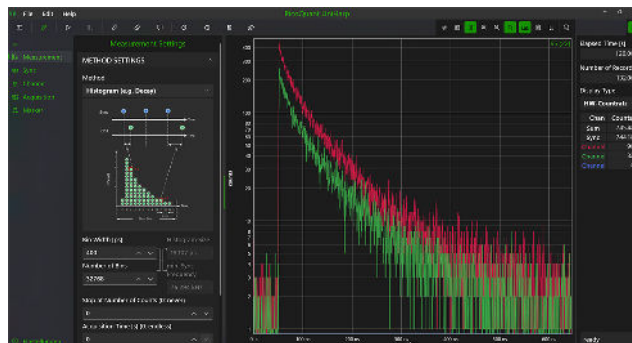
UniHarp is a unique, state-of-the-art graphical user interface for data acquisition that brings precision, flexibility, and simplicity to working with PicoQuant's time-correlated single-photon counting (TCSPC) and time-tagging devices. Designed with versatility and ease of use in mind, UniHarp allows researchers to utilize advanced measurement classes such as histogram, time trace, unfold, RAW, and correlation (e.g., FCS and g^2) while maintaining full control over all hardware and software parameters. The universal software is compatible with all current PicoQuant time-tagging devices, including the HydraHarp 500, PicoHarp 330, MultiHarp 150/160, and TimeHarp 260 (with optional DLLs). It offers real-time data acquisition, plotting, saving, and loading capabilities, as well as intuitive parameter-setting tools and comprehensive status monitoring for your PicoQuant time-tagging devices. With UniHarp, conducting cutting-edge experiments in quantum optics, photonics, materials science, and life sciences has never been easier.

Measurement Class Details

The software's data acquisition capabilities are based on the unique time-tagging modes by PicoQuant's TCSPC electronics. In these modes, photons on each detection channel are either tagged with the absolute arrival time since the beginning of the measurement or with the time difference to the last laser pulse. This schemes preserve photon timing information and allow a large range of data interpretation ranging from simple TCSPC histograms to complex correlation analysis.

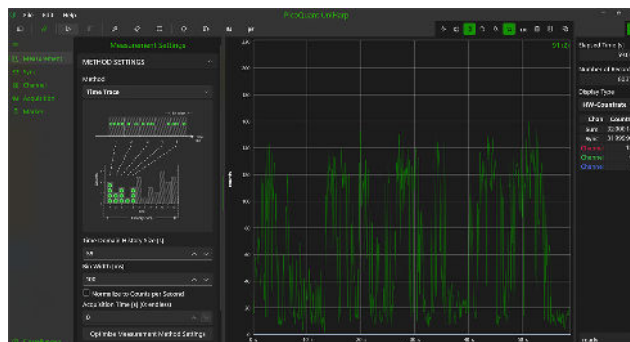
Histogram

Histograms of photon arrival times are essential for studying temporal kinetics, including excited state lifetimes in time-resolved photoluminescence (TRPL) experiments. UniHarp allows precise parameter adjustments and visualizes the histogram as data is acquired, making it easy to record decay dynamics. Histogramming photon arrival times captures the relative timing between a synchronization signal and photon detection, with picosecond-level resolution. This technique is highly versatile and is utilized in various fields including Quantum Optics, Quantum Cryptography (QC), Time-Of-Flight (TOF), fluorescence decay, and coincidence correlation, among others.



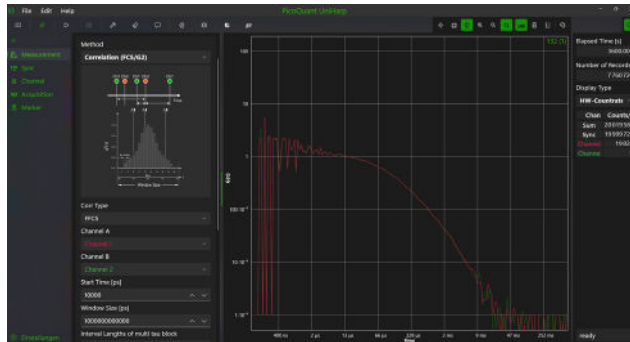
Time Trace

Time trace measurement captures photon arrival times over extended periods, ideal for monitoring signal intensity over time or analyzing time-dependent behaviors such as molecular blinking. UniHarp provides intuitive controls to configure these measurements and allows real-time plotting for immediate feedback.



Correlation

Correlation analysis, including auto- and cross-correlation for FCS or $g(2)$ measurements, is integral for characterizing molecular interactions and quantum emitter properties. UniHarp simplifies correlation setups and visualizes results for instant interpretation.



Unfold

Unfold measurement processes data streams to extract detailed photon timing information. This class is essential for experiments requiring high temporal resolution and provides a robust interface for managing unfolded photon arrival data.

The screenshot shows the UniHarp software interface with the 'Unfold' view selected. The main window displays a table of unfolded photon arrival data. The table has columns for 'ID', 'Channel', 'Abs. Time', 'Sync', and 'Offset'. The data is organized into a grid with 10 columns and 20 rows. On the left, the 'Measurement Settings' are visible, including 'Unfold (Time Tag Table)', 'Multiplication of Events', and 'Sub-Block Size'. On the right, there is a 'Report Time' section showing 'Elapsed Time: 0:00:00', 'Number of Records: 214750/100', and 'Display Type: Table'.

ID	Channel	Abs. Time	Sync	Offset
15428274	1	378.3539350453		
15428275	1	378.3539601503		
15428276	2	378.3539701503		
15428277	1	378.3539854758		
15428278	2	378.3539954758		
15428279	1	378.3540054758		
15428280	2	378.3540154758		
15428281	2	378.3540254758		
15428282	1	378.3540354758		
15428283	2	378.3540454758		
15428284	1	378.3540554758		
15428285	2	378.3540654758		
15428286	1	378.3540754758		
15428287	1	378.3540854758		
15428288	1	378.3540954758		
15428289	1	378.3541054758		
15428290	2	378.3541154758		
15428291	1	378.3541254758		
15428292	2	378.3541354758		
15428293	1	378.3541454758		
15428294	1	378.3541554758		
15428295	1	378.3541654758		
15428296	1	378.3541754758		
15428297	2	378.3541854758		
15428298	2	378.3541954758		
15428299	1	378.3542054758		
15428300	1	378.3542154758		
15428301	2	378.3542254758		
15428302	2	378.3542354758		
15428303	2	378.3542454758		
15428304	2	378.3542554758		
15428305	1	378.3542654758		

RAW

RAW data acquisition enables direct access to unprocessed photon data, empowering researchers to develop custom analysis pipelines or validate device performance under unique conditions. UniHarp makes exporting and managing RAW data seamless.

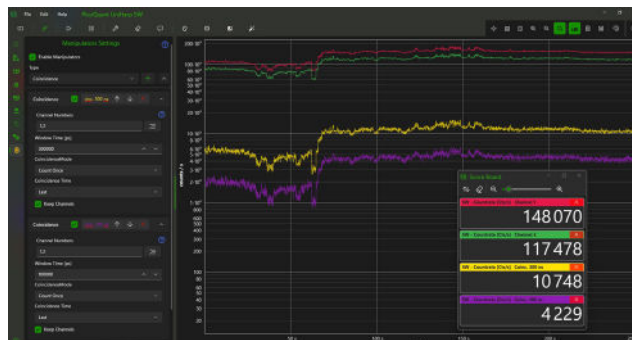
Data Manipulators

With powerful built-in manipulators functioning as „virtual channels“, you can process and transform data on-the-fly:

- Coincidence - Study coincidences between any channels for user-defined time windows
- Herald - Use a reference channel to flexibly gate the time tags of target channels
- Substream - Filter your time tags by a start and stop time
- Merge - Combine the data streams of various channels
- Delay - Add a time shift on your channel of interest in post processing

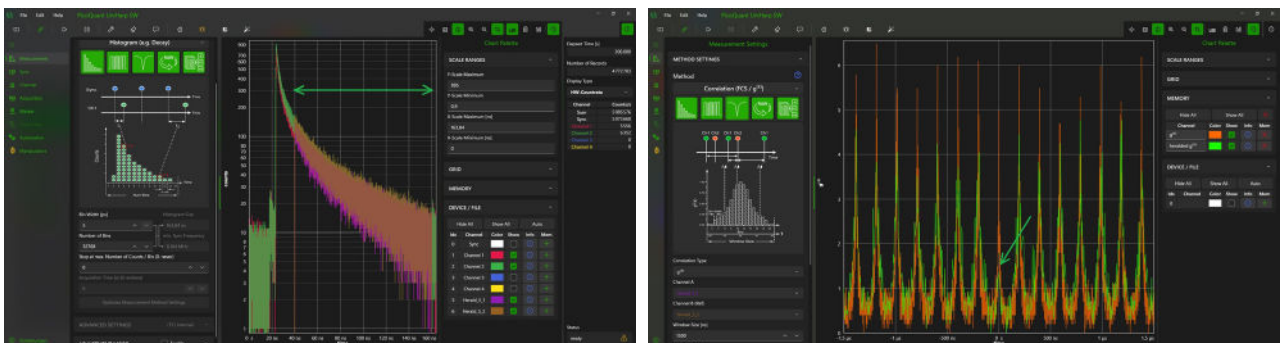
Manipulator “Coincidence”

Coincidences between selectable channels can now be studied for a user-defined coincidence time window directly in the UniHarp software. The example shows the time traces coming from two SNSPDs, whose coincidence count rates are displayed for coincidence windows of 300ns and 100ns, respectively.



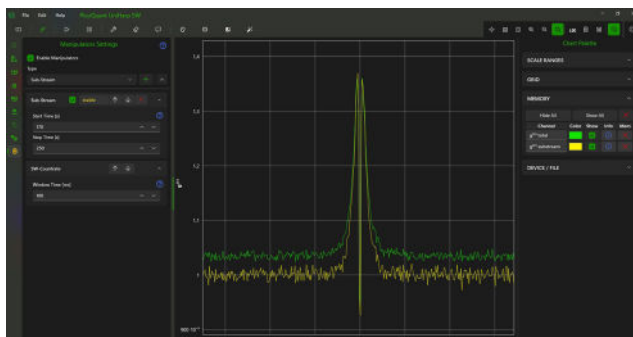
Manipulator “Herald”

Heralded measurements are typically used to confirm the presence of a photon by detection of its (entangled) pair, i.e. produced by a SPDC source. The Herald manipulator can be understood as a time-gating filter in post-processing. The g2 antibunching dip of a single emitter is demonstrated to be significantly lowered when time tags caused by irrelevant transitions are suppressed with the Herald manipulator.



Manipulator "Substream"

The Substream manipulator is an ideal data analysis tool allowing you to have a closer look at certain time intervals and to check for changes that may have occurred during a measurement. This is especially useful to suppress artifacts in the analysis, which are caused by instabilities in the experiment. In this example, the Substream manipulator is used to correct for a baseline-shift in a g^2 correlation, which has been caused by realignment of the setup during data acquisition.



Specifications

Graphical user interface	Windows based GUI
Supported TCSPC modules	HydraHarp 500 PicoHarp 330 TimeHarp 260 (with optional DLLs) MultiHarp 150/160
Supported Channels	1 to 64
Measurement Classes	Histogram Time Trace Correlation (FCS or g^2) Unfold RAW
Measurement preview	TCSPC histogram Time Trace FCS
Display	Linear or logarithmic scale, zoomable
Export Data Format	PTU PHU ASCII also via Windows clipboard
Operating System	Win 10/11



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