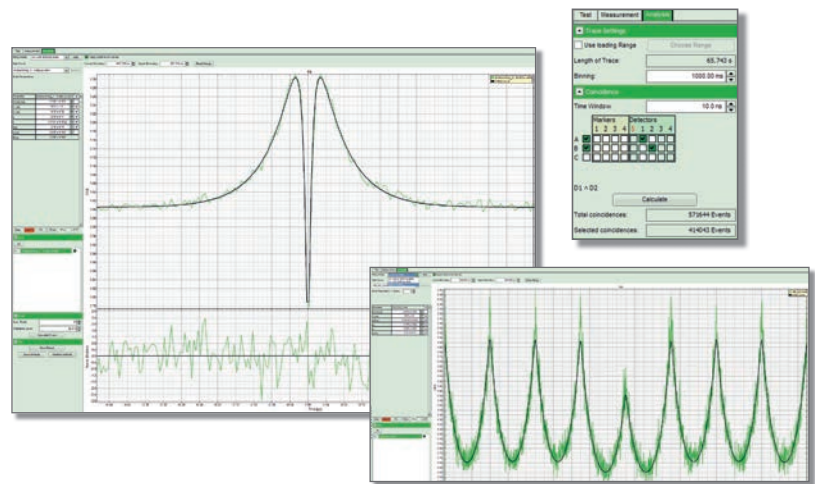


# QuCoa

## Quantum Correlation Analysis Software

- Antibunching  $g^{(2)}$  measurements including fitting to several models
- Coincidence counting / event filtering, using logical operators (AND, OR, NOT)
- Preview of antibunching curve and correlation data during measurement
- Calculation of TCSPC histograms and intensity time traces
- Remote control via TCP/IP Interface
- Export of all results to ASCII or images
- User programming script language „STUPSLANG“



### Applications

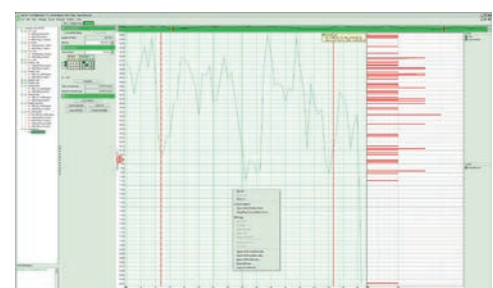
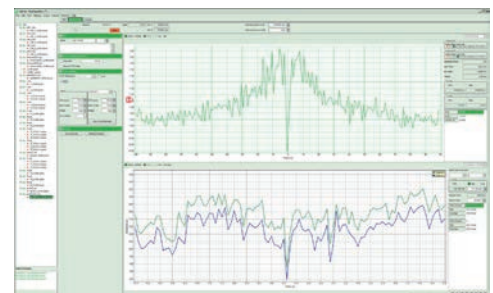
- Photon antibunching
- Coincidence correlation
- Coincidence counting
- Quantum technologies
- Single photon sources

The QuCoa software package is an integrated solution for data acquisition and analysis using PicoQuant's TCSPC electronics in their unique T2 time-tagging mode. It is mainly targeted at all research areas that rely on coincidence detection such as Hanbury-Brown-Twiss setups to study single photon sources ( $g^{(2)}$  / antibunching), quantum key distribution (QKD), or the study of entanglement using Hong-Ou Mandel (HOM) setups, to name only a few.

The software is designed for a 64 bit operation system and features an intuitive graphical user interface (GUI). Its clearly structured layout and powerful analysis routines allows the user to focus on the results rather than on the data processing. Data dependencies are directly visible in the underlying workspace concept

### Antibunching with cw or pulsed excitation

The QuCoa software package includes one of the fastest software correlators on the market. This unique feature permits to correlate the absolute arrival times of photons in real time to, e.g., assess the quality of an antibunching curve during the measurement. The  $g^{(2)}(0)$  value as well as count rates on all detectors are always displayed. Pulsed and cw excitation is supported. The measured data can be fitted to several established models such as single emitter with or without shelved state or pulsed excitation based on exponential decays. The influence of the limited resolution of the detectors as well as correlated and uncorrelated background can also be included in the fitting. Global fitting is supported for all models.



## Coincidence counting

The QuCoa software also includes event filters for coincidence counting applications. Filters can be constructed via a simple click interface and permit to combine detection channels and markers in a user-defined time window using logical operations (AND, OR, NOT). The filters can be applied already during data acquisition and also offline. Time gates permit to restrict the coincidence detection to user-defined time ranges.

## Integrated scripting language and remote control

The QuCoa software includes an integrated scripting language („STUPSLANG“) that puts the user in a position to freely add new analysis procedures or customize existing ones. Remote control of the software is also possible via a dedicated TCP/IP protocol.

## Specifications

Data acquisition	
Supported TCSPC modules	HydraHarp 400, PicoHarp 300, TimeHarp 260
Supported number of detectors	up to 8
Supported number of markers for coincidence counting	up to 4
Measurement modes	antibunching, coincidence correlation, coincidence counting
Measurement previews	coincidence correlation trace (antibunching, $g^{(2)}$ ), coincidence counting, intensity time trace, TCSPC histogram, parallel calculation and display of up to 4 different previews
Data analysis	
General features	time gating, binning, least-squares fitting, MLE fitting, bootstrap error analysis GUI Themes
Coincidence correlation	antibunching correlation ( $g^{(2)}$ ), antibunching fitting (models: single photon emitter with and without shelving state, pulsed excitation) incl. treatment of limited detector resolution, user-defined models via scripting, bootstrap error analysis
Coincidence counting	combination of detection channels and markers using logical filters (AND, OR, NOT) in user-defined time gates
Export data formats	BMP, ASCII, TIFF, binary
User scripting (STUPSLANG)	user-defined analysis procedures
Remote control	via TCP/IP protocol
Required PC CPU	with SSE2 and EMT64 or AMD64 extension; recommended: quad-core or better
CPU clock	minimum 2.2 GHz; recommended: $\geq 3$ GHz
RAM	minimum 4 GB; recommended: $\geq 16$ GB
Operating system	Windows 7/8/10 x64
Disk space	$\geq 100$ MB (except data storage)
Display(s)	with single display: Full HD; with dual display: $2 \times 1680 \times 1050$ or better; no hiDPI
Protection module (HASP)	USB



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