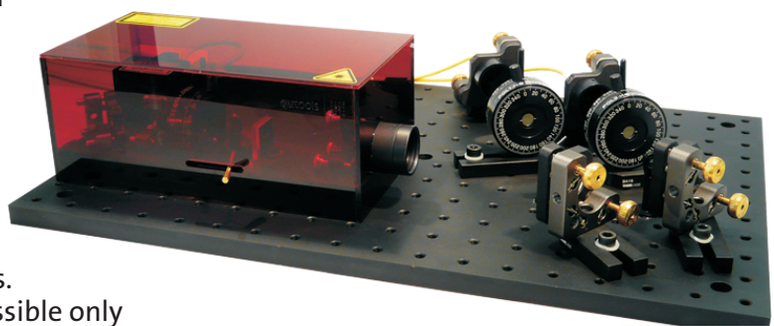
quED

Entanglement Demonstrator

Key features

- Generation/analysis of true polarization-entangled photon pairs
- Complete system: Ready to violate Bell's inequalities
- Hands-on study of quantum phenomena
- Easy-to-use, no expertise needed
- Custom configuration



Contemporary physics experiment:
The quED is a complete setup to generate and analyze polarization entangled photons. A few years ago, such experiments were possible only in a few laboratories around the world. Today, the intriguing world of entanglement-related phenomena becomes accessible to everybody.

Simple, yet efficient:
The design of our quED combines recent achievements of quantum optics technology into a simple and user-friendly system, which can be operated without any expertise or previous training. The basic quED configuration is perfectly suited to practically demonstrate the physics of entanglement in student lab courses at colleges and universities. Advanced models for scientific or commercial purposes are available as well, with a high performance meeting the requirements of state-of-the-art physics experiments. The properties of each quED system can be custom-configured to match the customer's exact needs and applications.

Complete system:
The heart of quED employs a spontaneous parametric down conversion process (SPDC - type I or type II; collinear or non-collinear) to generate polarization entangled photon pairs. Fiber coupled single photon detectors in connection with polarizing filters are used to detect the photon pairs, analyze their polarizations and verify their non-classical correlations. A counter and coincidence detection unit registers single and pair events and displays the corresponding counting rates on a well readable graphical display. Additionally, alignment help utilities including an auxiliary low-power laser are delivered with the system, to ensure that optimum system operation can be retrieved even after a coarse misalignment.

Possible experiments* (excerpt)

- preparation/ analysis of distinct entangled states, violation of Bell's inequalities
- quantum state tomography
- Single photon experiments (e.g. single photon interference, quantum eraser)
- 2-photon interference (Hong-Ou-Mandel)

*: Additional analysis tools are recommended or required for some experiments.

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System includes

- Source of fiber-coupled polarization-entangled photon pairs
- Two Silicon avalanche photodiodes
- Alignment help utilities including auxiliary low-power laser module
- Three-channel counter with integrated coincidence logic unit
- Two polarizers in rotation optic mounts
- Control and read-out unit

Optional accessories

- Additional polarization-control and polarization-analysis optics
- Laser safety protection (interlock system for pump laser, laser safety goggles)
- Motorized rotation optic mounts
- Connection to a PC (driver for Windows or Linux operating systems)

Technical specifications

	Basic model	High rate option
Single-count rate [1]	> 10 kHz (typ. 25 kHz)	> 50 kHz
Coincidence-count rate [1]	> 1 kHz (typ. 3 kHz)	> 5 kHz
Entanglement quality [2]	> 88% (typ. 92%)	> 88% (typ. 92%)
Operating wavelength	810 nm	810 nm
Pump laser power	15 mW	up to 100 mW
Phase-matching	Type I or Type II	Type I or Type II
SPDC type	Degenerate; Non-collinear	Degenerate; Non-collinear
Coincidence window length	approx. 40 ns	
Dimensions	Optical Unit: < 450 (l) x 600 (w) x 100 (h) mm Electronic Unit: 480 (l) x 300 (w) x 150 (h) mm	
Counting rate interface	Graphical Touch Display USB, Ethernet	

1) Detected rates without polarizers.
2) Measured as the visibility of correlation curves in two complementary bases.

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