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POLARIZATION ENTANGLEMENT TOMOGRAPHY ANALYZER

PRELIMINARY

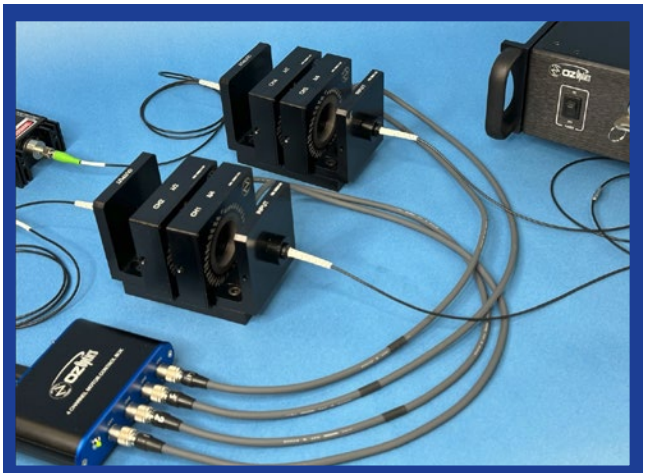

Figure 1. A photo of a Quantum Polarization State Analyzer illustrating the two motorized rotation stages and the control unit along with the GUI.

Features:

- Plug-and-play analyzer with a controller unit
- Customized software and intuitive GUI
- Quick and precise polarization state rotators
- Compact size and small footprint

Applications:

- Polarization state tomography
- Automation of multi-polarization state analysis

Product Description:

This cost-effective analyzer reduces the complexity level, effort, and cost to perform one of the most precise polarization entanglement analysis using two detectors [1]. The analyzer as shown in Figure 1 is provided along with a control unit, USB cable and power supply. The intuitive graphical user interface (GUI) can be used to perform any desired wave plate rotation. Default settings allow one to perform a set of 36 measurements (shown in Figure 3) in the canonical basis {H, V, D, A, R, L}⊗{H, V, D, A, R, L}, for generating precise tomography through two single-photon detectors.

This device consists of two rotation stages as shown in Figure 2. Each stage contains a rotatable quarter-wave plate (QWP), rotatable half-wave plate (HWP) and fixed polarizer, which can be replaced with a polarizing beam splitter (PBS) if required. The input and output ports are coupled to fiber pigtails. Systems with connector receptacles or collimators for free-space detection can also be provided.

This polarization system rotates the polarization states of the photon pairs with sub-degree precision. This is achieved through built-in encoders enabling closed loop operation. The coincidences rate, which is the core of reconstructing a photon pair polarization state, is thus realized at high precision with excellent repeatability in the course of a quick experiment.

In addition, heralding efficiency of a given polarization entangled-photon source can be maintained thanks to high coupling efficiency between the input and output fibers delivering the photon pairs from the source to the detectors with a negligible optical loss.

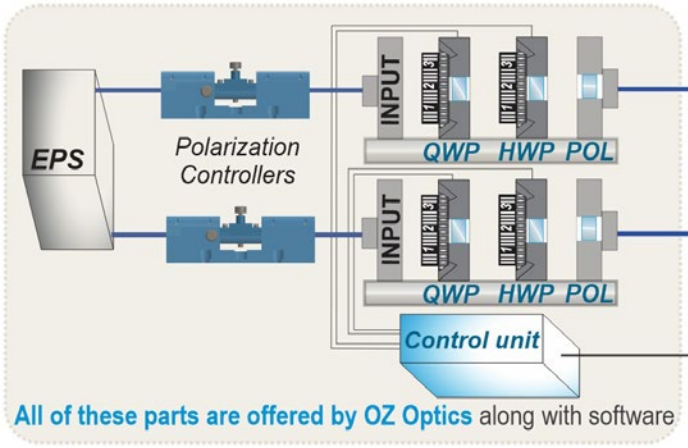

Figure 2. Schematic of a Quantum Polarization State Analyzer illustrating the two motorized rotation stages and the control unit. In each stage, a rotatable quarter –wave plate (QWP), half-wave plate (HWP) and fixed polarizer (POL) combination allows projection into any single-qubit basis. The two-qubit measurements are then recorded from the two rails feeding two single-photon detectors, connected to a time tagging unit.

Specifications

Parameters	
Optical Insertion loss	<0.75 dB*
Optical Wavelength (nm)	1550, 810 or upon request
Repeatability	0.1°
DC Voltage Input	5 V
Communication	TTL RS232 via USB port
Environmental Operating Conditions	
Temperature Range	15 to 40 °C
Maximum Relative Humidity	<80% at 31 °C (Non-Condensing)

* Measured at 1550 nm at room temprature

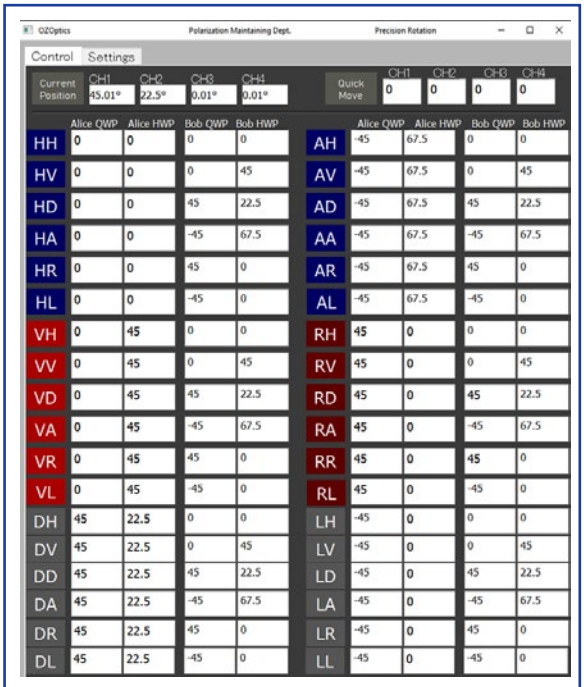

Figure 3. Analyzer GUI allowing for 36 measurments.

Ordering Information:

(Pigtail Style, Polarization Entanglement Analyzer)

MQA-100-11-W-a/b-I-O-P-LB-XY-JD-L

W = is the operating wavelength in nm

a/b = Fiber core/cladding

I Input fiber type: S = Singlemode (standard)
P = Polarization maintaining

O Output Fiber type: M= Multimode
S = Singlemode
P = Polarization maintaining

P = Polarizer option 1 = for Polarizer
PBS = for Polarizing Beam Splitter

LB = Backreflection level: 40, 50, or 60 dB
60 dB for 1550 nm only

L = length (meter)

JD = Fiber Jacket Type:
1 = 900 Micron OD hytrel jacket
3 = 3 mm OD Kevlar reinforced PVC cable
See Table 7 of the Standard Tables data sheets for other jacket types

XY Input and Output Connector Codes:
3S = Super NTT-FC/PC
3U = Ultra NTT-FC/PC
3A = Angled NTT-FC/PC
LC =LC
LCA= Angled LC
SC = SC
SCA = Angled SC
See Table 6 of the Standard Tables data sheet for other connectors

References:

[1] J. B. Altepeter, E. R. Jeffrey, P. G. Kwiat, S. Tanzilli, N. Gisin, and A. Acín “Experimental Methods for Detecting Entanglement” Phys. Rev. Lett. 95, 033601,15 July 2005.