BROADBAND POLARIZATION-ENTANGLED PHOTON SOURCE

Features

- High-quality polarization and frequency entanglement
- Broad bandwidth covering C- and L- bands
- High fidelity and excellent stability
- Turn-key and room-temperature operation
- Low power consumption
- Compact and light weight platform
- Rugged, alignment free, all fiber design
- Built-in Optical switch and WDM

Broadband Polarization-Entangled Photon Source

Applications

- Quantum imaging
- Quantum metrology
- Quantum key distribution networks
- Quantum computing and information processing

Product Description

This fiber-based device is a compact, robust, and alignment-free source of broadband polarization-entangled photon pairs. Based on periodically-poled silica fiber (PPSF) technology, it features turn-key, room-temperature operation, and needs little maintenance. The all-fiber design makes it environmentally stable for challenging applications such as space-based instruments. It generates high-quality polarization-entangled photon pairs at telecom wavelengths with more than 80 nm of bandwidth. This unit comes with a built-in optical switch to allow the user to direct the light either to a common output port or to a built-in wavelength division multiplexor to have the Signal and Idler photons of the entangled photon pairs separated to two output ports. This ideal entanglement source has myriad applications in quantum information processing, quantum sensing, and WDM-based quantum key distribution networks.

Performance Specifications[1]

Part number: EPS-1000-3A3A3A-1566-9/125-S					
Parameter		**Max.**	**Typical**	**Min.**	**Unit**
Signal/Idler degeneracy wavelength[2]		1580	1566 ±2	1530	nm
Signal/Idler degeneracy wavelength accuracy		–	±2	–	nm
Biphoton bandwidth (3 dB)[3]		>120	80	60	nm
Signal/Idler sum frequency bandwidth (3 dB)		0.4	0.2	0.1	nm
Pair-generation rate		4×10^6	2×10^6	1×10^6	Pairs/second
Coincidence-to-accidental ratio[4]		–	1000	100	
Fidelity[5] to $\vert\Psi\rangle=(\vert HV\rangle+\vert VH\rangle)/\sqrt{2}$		99.5%[6]	98%	97%	
Two-photon interference visibility[7]		99.5%[6]	98%	97%	
Physical dimensions	Width x depth x height (cm)	39 x 34.4 x 8.6			
	Weight (kg)	~4			

Note:
1 Under continuous-wave (CW) operation.
2 The degeneracy wavelength is usually conveniently set at the boundary of C- and L-bands. Customized degeneracy wavelength in the indicated range is possible.
3 Before signal and idler is separated by the wavelength splitter.
4 Coincidence counts are measured on signal/idler FWHM bandwidth of 16 nm each, over 0.65 ns window, with free-run SPAD detectors having dark counts of ~5 kHz.
5 Measured on conjugated signal/idler pairs of 1 nm FWHM bandwidth over 80 nm centered at degeneracy. Without subtracting accidentals.
6 Limited by detector dark counts.
7 Measured for both HV basis and AD basis. Without subtracting accidentals.

Optical Specifications

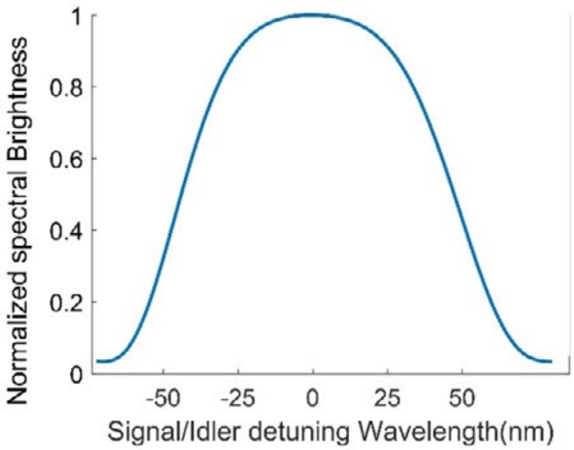

Figure 1. Typical biphoton spectrum.

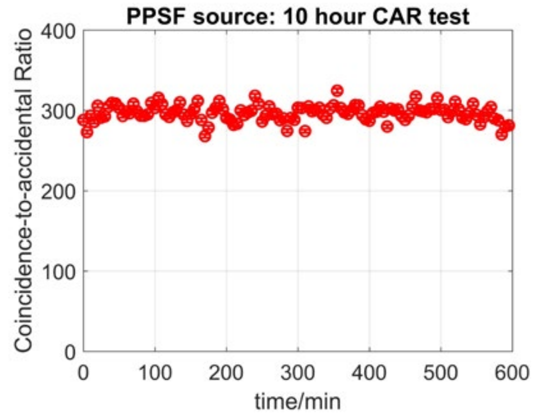

Figure 2. Typical Coincidence-to-Accidental Ratio (CAR) over 10 hours of continuous operation.

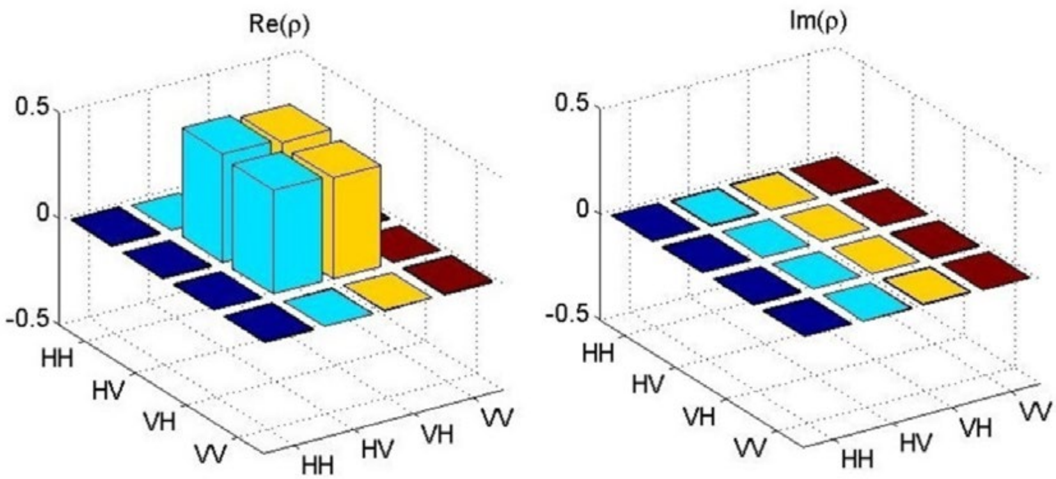

Figure 3. Typical polarization density matrix.

Operating And Storage Conditions

Parameter	Min.	Max.
Operating temperature	15°C	25°C
Operating relative humidity (% RH)	5	60
Storage temperature	-40°C	40°C
Storage relative humidity (% RH)	0	90

Links To White Paper

1. Changjia Chen, Eric Y. Zhu, Arash Riazi, Alexey V. Gladyshev, Costantino Corbari, Morten Ibsen, Peter G. Kazansky, and Li Qian, "Compensation-free broadband entangled photon pair sources," *Opt. Express* 25, 22667–22678 (2017). https://www.osapublishing.org/oe/abstract.cfm?uri=oe-25-19-22667
2. Zhu, E. Y., et al. "Multi-party agile quantum key distribution network with a broadband fiber-based entangled source," arXiv preprint arXiv:1506.03896 (2015).
3. Changjia Chen, Arash Riazi, Eric Y. Zhu, Alexey V. Gladyshev, Mili Ng, Peter G. Kazansky, and Li Qian. "A Compact All-fiber Polarization Entangled Photon Source Pumped by a Laser Diode," Conference on Lasers and Electro-Optics, 2018, San Jose, CA, USA. https://arxiv.org/abs/1506.03896