

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
09 April 2020 (09.04.2020)



(10) International Publication Number
WO 2020/072005 A1

(51) International Patent Classification:
G02B 27/10 (2006.01) *H04B 10/70* (2013.01)
G02F 1/39 (2006.01)

(21) International Application Number:
PCT/SG2019/050500

(22) International Filing Date:
04 October 2019 (04.10.2019)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10201808768Y 04 October 2018 (04.10.2018) SG

(71) Applicant: NATIONAL UNIVERSITY OF SINGAPORE [SG/SG]; 21 Lower Kent Ridge Road, Singapore 119077 (SG).

(72) Inventors: **PERUMANGATT, Chithrabhanu**; c/o National University of Singapore, Centre for Quantum Technologies, 21 Lower Kent Ridge Road, Singapore 119077 (SG). **ALEXANDER, Lohrmann**; c/o National University of Singapore, Centre for Quantum Technologies, 21 Lower Kent Ridge Road, Singapore 119077 (SG). **LING, Alexander**; c/o National University of Singapore, Centre for Quantum Technologies, 21 Lower Kent Ridge Road, Singapore 119077 (SG).

(74) Agent: **VIERING, JENTSCHURA & PARTNER LLP**; P.O. Box 1088, Rochor Post Office, Rochor Road, Singapore 911833 (SG).

(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,

(54) Title: A METHOD AND SYSTEM FOR CONVERTING POSITION OR MOMENTUM CORRELATION OF PHOTON PAIRS TO A POLARIZATION ENTANGLED PHOTON PAIR

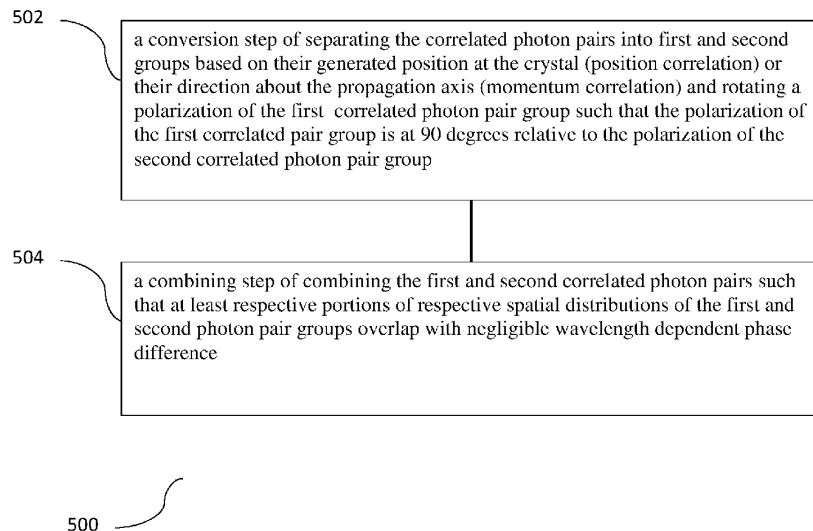


Figure 5

(57) Abstract: A method of, and module for, converting position or momentum correlation of correlated photon pairs to a polarization entangled photon pair, and a source for polarization entangled photon pairs. The method comprises a conversion step of separating the correlated photon pairs into first and second groups based on their generated position at the crystal (position correlation) or their direction about the propagation axis (momentum correlation) and rotating a polarization of the first correlated photon pair group such that the polarization of the first correlated pair group is at 90 degrees relative to the polarization of the second correlated photon pair group; and a combining step of combining the first and second correlated photon pairs such that at least respective portions of respective spatial distributions of the first and second photon pair groups overlap with negligible wavelength dependent phase difference.

[Continued on next page]



WO 2020/072005 A1

HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- in black and white; the international application as filed contained color or greyscale and is available for download from PATENTSCOPE