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Young's double-slit interference with two-color biphotons

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In classical optics, Young's double-slit experiment with colored coherent light gives rise to individual interference fringes for each light frequency, referring to single-photon interference. However, two- photon double-slit interference has been widely studied only for wavelength-degenerate biphoton, known as subwavelength quantum lithography. In this work, we report double-slit interference experiments with two-color biphoton. Different from the degenerate case, the experimental results depend on the measurement methods. From a two-axis coincidence measurement pattern we can extract complete interference information about two colors. The conceptual model provides an intuitional picture of the in-phase and out-of-phase photon correlations and a complete quantum understanding about the which-path information of two colored photons.

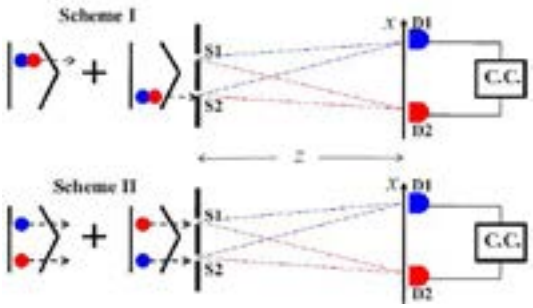

Figure 1: Two schemes of two-photon double-slit interference patterns.

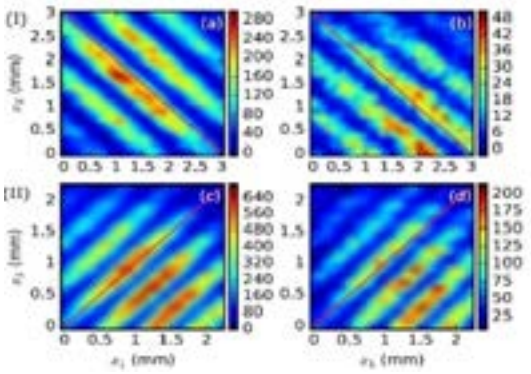

Figure 2: Experimental results of the two-axis coincidence count interference patterns: (a, b) for Scheme I (c, d) for Scheme II (a, c) show the 800 nm frequency degenerate case (b, d) 760 nm–840 nm non-degenerate case.

Recent Publications

1. De Jian Zhang, Shuang Wu, Hong Guo Li, Hai Bo Wang, Jun Xiong and Kaige Wang (2017) Young's double-slit interference with two-color biphotons. Scientific Reports 7:17372.
2. De Jian Zhang, Hong Guo Li, Qiu Li Zhao, Sen Wang, Hai Bo Wang, Jun Xiong and Kaige Wang (2015) Wavelength - multiplexing ghost-imaging. Physical Review A 92(1):013823.
3. Hong Guo Li, De Jian Zhang, De Qin Xu, Qiu Li Zhao, Sen Wang, Hai Bo Wang, Jun Xiong and Kaige Wang (2015) Ghost imaging via optical parametric amplification. Physical Review A 92(4):043816.
4. Hong Guo Li, De Jian Zhang, Qiu Li Zhao, Sen Wang, Hai Bo Wang and Jun Xiong (2015) Influence of detector response speed on the contrast-to-noise ratio of reflective ghost imaging. Optics Communications 355:558-561.
5. De Jian Zhang, Qiang Tang, Teng Fei Wu, Hao Chuan Qiu, De Qin Xu, Hong Guo Li, Hai Bo Wang, Jun Xiong and Kaige Wang (2014) Lensless ghost imaging of a phase object with pseudo-thermal light. Applied Physics Letters 104(12):121113.

Biography

Shuang Wu obtained his BS degree at MinZu University in China in 2014. Now he is a PhD student in Department of Physics, Beijing Normal University, China. His current research focuses on quantum imaging.

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