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Optical analogue of quantum spin and dynamic localization in optical waveguides arrays KIN CHUNG AU YEUNG, KIN WAH YU, The Chinese University of Hong Kong — We have discovered an optical analogue of quantum spin in optical waveguides arrays. Quantum-optical analogy is recently a hot topic. By using special configuration of optical devices, some optical analogues of quantum systems can be realized. Stefano Longhi and coworkers proposed some classical realization of quantum phenomena like the two-site Fermi-Hubbard system [1] and Rabi oscillation [2]. In this work, we propose an optical waveguides arrays system with evanescent couplings according a symmetrized Kac matrix. The system can mimic the quantum spin under different operators like the rotation operator. Also by adding a suitable time-dependent applied potential to the system, dynamic localization of optical signal can be realized along the signal propagation. The system can be extended to mimic any arbitrary angular momentum by increasing the number of optical waveguides arrays. The occurrences of spin under rotation operator and dynamic localization are simulated by a field-evolution analysis using an input Gaussian beam.

[1] S. Longhi, G. Della Valle, V. Foglietti, arXiv:1111.3460 (November 2011)
[2] Ivan L. Garanovich, Stefano Longhi, Andrey A. Sukhorukov, Yuri S. Kivshar, Physics Reports, Volume 518, Issues 1-2, September 2012, Pages 1-7

Kin Chung Au Yeung
The Chinese University of Hong Kong

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