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Linda Sansoni

Integrated Devices for Quantum Information with Polarization Encoded Qubits

Doctoral Thesis accepted by
Sapienza Università di Roma, Italy

Springer

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ISSN 2190-5053 ISSN 2190-5061 (electronic)
ISBN 978-3-319-07102-2 ISBN 978-3-319-07103-9 (eBook)
DOI 10.1007/978-3-319-07103-9
Springer Cham Heidelberg New York Dordrecht London

Library of Congress Control Number: 2014939536

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

To my family

Supervisors' Foreword

It is a pleasure to write this Foreword for Linda Sansoni's thesis, which reports on work performed at an exciting time for the development of integrated photonics technologies in the quantum domain. During the three-year research activity corresponding to the Ph.D. program, Linda Sansoni carried out some important experiments in a synergistic collaboration with the Group of IFN-CNR and Politecnico di Milano, using integrated waveguide optical devices fabricated by the ultrafast laser writing technique, and introducing for the first time the polarization of the photon as a suitable degree of freedom to encode quantum information. Among the other results, the first realization of an integrated controlled NOT (C-NOT) gate based on polarization qubits and the realization of complex interferometric networks enabling accurate polarization behavior and phase and transmission control are worth noting. The thesis reports on the study of photon propagation through such networks, simulating both single particles and two entangled particles travelling in discrete quantum walks. By exploiting polarization entanglement of photons to simulate the bunching–antibunching feature of noninteracting bosons and fermions, it has been possible to investigate how particle statistics affects the diffusion through such systems. With these experiments, most of whose results have been published in prestigious international journals, Linda Sansoni has made a significant and effective contribution to integrated quantum photonics.

Rome, April 2014

Prof. Paolo Mataloni
Prof. Fabio Sciarrino

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