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Editors

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Introduction

It is my pleasure to write the foreword to the proceedings of the very successful and very exciting SPIE Quantum Communications and Quantum Imaging VIII conference, which was held in San Diego, California, 2, 4–5 August 2010. This is actually the ninth of our ongoing series of international conferences at the SPIE annual Optics + Photonics meeting providing new theoretical and experimental results and insights into the fundamentals of quantum communications and imaging science and technology. The purpose of this conference is to bring together scientists performing fundamental research in quantum communications and quantum imaging for the benefit of both. Distinguished scientists from many countries presented state-of-the-art scientific papers on quantum communications and quantum imaging and stimulated lively discussions with audience participants. This conference is known for the spirited insightful discussions, which continue after the presentations and after the sessions.

Scientific highlights included research on the role of the quantum properties in quantum imaging as well as experimental methods for quantum imaging with entanglement and incoherent thermal sources; In particular, the concept natural nonfactorizeability of the ghost imaging two-photon amplitude correlations was explored. It leads to experiments in compressive turbulence-free ghost imaging. Other research demonstrated quantum imaging methods to overcome imaging aberrations. In addition, man-made compressive quantum inspired ghost imaging was explored with pseudo random micro-pixel illumination and pseudo-randomly displace Bessel beam illumination and using compressive sensing. Analysis was presented that indicates various types of ghost imaging exhibit higher signal to noise ratios than conventional laser radars. Quantum communications was reviewed in the conference and new fiber and free-space technologies were presented for achieving high speed quantum communications. Research was presented on high speed and high security quantum encryption and quantum key distribution methodologies and their expanding role with national programs in bringing increased communications security and bandwidth. For the first time it was shown that light can factor numbers having values over one-million and determine primes. New fundamental relations in quantum properties of thermal light were presented and experimentally verified with determination of Bell states of thermal light. With regards to new sources of radiation we found that diamonds are achieving a greatly increased capability as single photon sources. It was also demonstrated how slow light can be used to achieve memory of thermal light photon statistics. Research in superresolution is achieving unprecedented subwavelength resolution. The close relation between quantum communications and quantum imaging continues to be demonstrated by important scientific and technological achievements.

I would like to thank Professor Yanhua Shih of the University of Maryland, Baltimore County and Keith Deacon of the Army Research Laboratory for helping to organize the conference and for providing high standards and achievement in quantum imaging and quantum science. In particular, I would like to thank Keith Deacon for helping chair the sessions. A debt is due to each on the program committee for providing recommendations and contacts of those who attended.

I look forward to meeting all of our participants at our next SPIE Quantum Communications and Quantum Imaging conference, 21–25 August 2011 in San Diego, California.

Ronald E. Meyers
Yanhua Shih
Keith S. Deacon