香港中文大學
The Chinese University of Hong Kong
Center for Advanced Research in Photonics

IEEE photonics SOCIETY
Hong Kong Chapter

IEEE Photonics Society Distinguished Lecture

Time : 12th December 2016 (Monday), 10:00 — 11: 00 am
Venue : Rm 1009, William MW Mong Engineering Building, The Chinese University of Hong Kong, Hong Kong

Space-Time Dualities and Temporal Imaging of Optical Waveforms

By

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Abstract:

There is an intriguing duality between the equations of Fresnel diffraction and narrowband dispersion. In addition, a quadratic time phase modulation applied to an optical waveform produces the dual of a lens; therefore it can be thought of as a "time lens". By combining appropriate dispersion before and after the time lens we can create the temporal analog of an imaging system which allows for magnification, demagnification and local time reversal of optical waveforms while preserving their envelope profiles. Time lenses can be realized by electro-optic modulation as well as optical parametric processes of both second and higher order. The requisite dispersion is realized by the natural dispersion available in optical fibers or with delay lines based on prisms or gratings. In this lecture I will develop the dualities between the diffraction and dispersion problems, present the defining characteristics of time lenses and develop the equations of temporal imaging, magnification, resolution, etc. Interesting applications include stretching time waveforms from the femtosecond to picosecond scale, pulse compression, signal processing and even temporal cloaking. The historical timeline for temporal imaging appears to have its roots in chirp radar, although all of the mathematics were available long before the advent of radar.

Biography:

Brian Kolner received the B.S. degree in Electrical Engineering from the University of Wisconsin, Madison, in 1979 and the M.S. and Ph.D. degrees in Electrical Engineering from Stanford University, Stanford, CA, in 1981 and 1985, respectively. He was a Member of the Technical Staff at Hewlett- Packard Laboratories, Palo Alto, CA, from 1985 to 1991, and in 1991, he joined the Electrical Engineering Department at the University of California, Los Angeles (UCLA), and became Vice Chairman for Undergraduate Affairs in 1993. At UCLA, he taught courses in microwave theory and measurements, Fourier optics, and quantum mechanics and conducted research on space-time duality and temporal imaging. In 1996, he moved to the University of California, Davis, where he held joint appointments in the Departments of Applied Science, Electrical and Computer Engineering, and the Lawrence Livermore National Laboratory. His current research interests are in optical clocks, laser phase and amplitude noise, space-time analogies and terahertz spectroscopy. In 2015 he became a Visiting Scholar at the W. W. Hansen Laboratory of Experimental Physics at Stanford University where he collaborates on high-stability optical clocks. Dr. Kolner was awarded a David and Lucile Packard Foundation Fellowship in 1991. In 1996 and 2003 he served as Guest Editor for the IEEE Journal of Special Topics in Quantum Electronics. In 2009 Dr. Kolner shared an R&D 100 Award for developing the time-microscope, in 2010 he became a Fellow of the Optical Society of America and in 2012 he was elected a Fellow of the IEEE. He has been an IEEE Distinguished Lecturer for the Photonics Society for the 2015-2016 year and was recently named one of 125 People of Impact from the University of Wisconsin Electrical and Computer Engineering Department on occasion of their 125th anniversary.

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