Empowering Next Generation RF & Optical Sensor Systems: Innovations in Hardware & Signal Processing

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Abstract: Today, Radio Frequency (RF) and optical sensors provide vital information in the defense, communications, energy, and manufacturing/test sectors. This talk will show how recent innovations in optical hardware and related signal processing methods can empower next generation sensor systems. For example, the talk will describe a new hybrid analog-digital approach to RF signal processing that leads to powerful (e.g., over 16-bits) RF fiber-optic programmable delay lines for advanced wideband RF phased array antenna beamforming. Another innovation shown is a novel optically implemented RF transversal filter that provides wide RF tuning capability with extensive (e.g., over 1000) independent tap weight and delay controls. All-optical sensors can also be empowered by a new three dimensional optical beamformer. In particular, shown is a near zero free-space optical communication link design that can lead to high data rates and low power levels. The talk concludes with recently implemented remote sensor designs for the extreme temperature environments of the energy and test sectors and an integrated sensor design for a combined RF-Optical Smart Antenna System.

Nabeel Riza holds a doctorate in electrical engineering from the California Institute of Technology. After completing his Ph.D. in 1989, Riza joined the General Electric Corporate Research and Development Center, Schenectady, New York, where he initiated and led the GE Optically Controlled Radar Project. In 1995, he joined the ECE Dept. and CREOL-The Optics Institute at the University of Central Florida where he is Full Professor and Head of the Photonic Information Processing Systems Laboratory (http://pips.creol.ucf.edu). Riza’s awards include the 2009 IEEE Photonics Society Distinguished Lecturer Award, 2007 IEEE Fellow Award, 1998 Optical Society of America Fellow Award, and 2001 International Prize of the International Commission of Optics.