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Wei Jiang

Rutgers Univeristy, USA

Silicon photonics: High-density integration for novel functionality

Silicon photonics can potentially transform the photonics technology owing to its low-cost fabrication and large-scale integration advantages. Integration can open up new opportunities, such as new methods of laser beam steering and new modalities of optical computing, in addition to low-cost optical communications and interconnects. To realize these opportunities, reducing device size and increasing integration density will be the crucial research directions. Towards these directions, this talk will review our work on novel micro/nano-photonic structures, including photonic crystals, waveguide superlattices and free-form structures. Novel waveguide superlattices are introduced to enable low-crosstalk, high-density waveguide integration at half-wavelength pitches, which opens to the door to high-performance optical phased arrays for lidars. Wavefront evolution will be explored to reveal how optimization of free-form structures can turn an ultra-short waveguide “taper” into a “semi-lens”. Modulators/switches based on photonic crystals and resonators will also be mentioned. Applications of our work in wavelength-division multiplexing, space-division multiplexing, optical phased arrays and modulation/switching will be discussed. These may lead to further opportunities in lidars for autonomous driving, optical interconnects and optical information processing.

Biography

Wei Jiang is working as an associate professor in the University of Rutgers, USA. He has completed his Ph.D. in Electrical & Computer Engineering, University of Texas at Austin, 2005. His research interest includes :- Silicon nanophotonics: modulators, switches, light emission, Photonic crystals: devices & physics (e.g. slow light, superprism), Silicon photonic microsystems: optical phased arrays, spatial light modulators, on-chip optical interconnects, optical information processing microsystems, Nanoimprint and molding Plasmonics and metamaterials; disordered and quasi-periodic media and Other interests: polymer photonics; fiber optics; laser beam steering; gratings; liquid crystals; phased array antennas.

wjiangmail@yahoo.com

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