UCF DEPARTMENT OF ELECTRICAL ENGINEERING AND COMPUTER SCEINCE

Fall 2014 Seminar Series

Presented by the ECE Division

VISIBLE LIGHT COMMUNICATION

WEDNESDAY AUGUST 20, 2014

10:00 AM – HEC 450

Optical wireless communication can be set as an alternative physical layer to RF techniques and can be implemented more easily and equivalently tested also at high data rates (recent experiments demonstrated up to 1 Tbit/s for optical wireless backhaul links at 1550 nm and up to 5 Gbit/s in access links using visible light).

Replacing incandescent light bulbs with more compact light-emitting diodes (LEDs) based light sources is a simple and cost-effective way to reduce the carbon emissions and increase the energy utilization efficiency at a global level. LEDs have several advantages over incandescent and fluorescent lamps including multitude of colours, compactness, longer life expectancy, lower power consumption and higher energy conversion efficiency. Moreover, they can be modulated at a high-speed to provide data communications and illumination simultaneously - thus the name visible light communications (VLC) - a unique trait that will have a major impact in the way we will use light in future. In recent years we have seen a growing interest in research and development in VLCs at a global level. A gigabit-class transmission system was reported with data rates of 1.5 Gbit/s and 3.4 Gbit/s were achieved using a single Ce:YAG/GaN LED (white emitting) and a three chip red/green/blue LED utilizing wavelength division multiplexing (WDM), respectively, were demonstrated.

Organic polymer LEDs (PLEDs) represent an alternative light source to Ce:YAG/GaN LEDs, offering lower cost, a range of flat panel shapes and sizes with much smoother lighting effects due to the solution based processing technology. PLEDs are therefore free of the photoactive area size and shape limitations in contrast to the conventional LEDs, which are restricted by the brittle epitaxial crystals due to the high temperature processing. A transmission speed of Mbps using a red-orange emitting PLED (with 270 kHz bandwidth) has been reported.

VLC systems are expected to mainly be utilized for the indoor environment. However they can also be used in outdoor environment to provide Internet hot spots using the street lighting, and mobile access as part of the 5G technology in highly congested areas (VLC has been accepted to the 5GPP). It works with NLOS it is resistant to background noise and adapts the throughput according to the current channel condition. The seminar will highlight recent achievements within European Action COST IC 1101 Opticwise (Optical Wireless Communications - An Emerging Technology) and CTU team dealing with VLC.

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Stanislav Zvánovec is an associate professor (from Sept 2014 a full professor) and vice-head of the Department of Electromagnetic Field at the Czech Technical University in Prague and chairperson of PhD branch at CTU. His current research interests include free space and fiber optical systems, Visible Light Communications, OLED and electromagnetic wave propagation issues for millimeter wave band. He is the head of Free-space and fiber optics group at CTU. Till 2014 he was a chair (now is vice-chair) of the Joint MTT/AP/ED/EMC chapter of the IEEE Czechoslovakia Section and he is head of the Commission F „Wave Propagation and Remote Sensing“ of the Czech National URSI Committee. He leads research and participates within in the frame of international projects ESA PECS no. 98069, ESA 4000105298/12/NL/CLP, ACE 2, EU COST projects IC1101 OPTICWISE (Optical Wireless Communications - An Emerging Technology) as vice chair of WG1, IC0802, IC0603, Centre for quasi-optical systems and terahertz spectroscopy, holder of projects TACR TA01011105, TA03010060, GACR P206/10/2182. He is author of one book, three book chapters and more than 100 journal and conference papers and holder of 1 patent.