


COURSE ON VISIBLE LIGHT COMMUNICATIONS (VLC)

Prof. Dominic O'Brien
Oxford University, UK

November 22nd, 2013

Course schedule and venues: 22 Nov 9:00-16:00 in **TS 127** (Tietotalo, University of Oulu)

Target audience: PhD students, faculty members, R&D industry professionals

ECTS: For those interested in obtaining credits from this course, an additional seminar work and seminar day will be organized.

Course host at DCE: Marcos Katz

Objectives

The course provides an introduction to optical wireless communications, with particular emphasis on visible light communications.

Course contents

1. Introduction to optical wireless and visible light communications (VLC)

1.1 System overview

LOS

Diffuse

MIMO

1.2 Sources

Lasers

Characteristics

Eye safety

Driving strategies

Beamshaping

LEDs

Characteristics

Eye safety

Driving strategy

Beamshaping

1.3 Channel

Line of sight

Characteristics

Model

Diffuse

Characteristics

Model

Measurements

Channel impairments

Ambient light

1.4 Receiver

Receiver overview

Optical systems

Photodetector and amplifier

Performance calculations

SNR estimation

Impairments

Ambient light

Amplifier noise

Advanced receiver geometries

Imaging receivers

Angle diversity

MIMO receivers

1.5 Link models

LOS

Single channel link model

Diffuse

Single channel link model

2. System examples: VLC

1.6 The challenge of high speed

Equalisation

OFDM

MIMO

MIMO OFDM

1.7 IR examples: a comparison

OMEGA demonstrators

Beamsteering approaches

3. Design example: single channel VLC link

1.8 Transmitter

Modelling intensity at receiver

1.9 Receiver

Estimating sensitivity and BER

1.10 Implementation

Electronics

Optics

4. VLC applications, developments and challenges

1.11 Applications

1.12 Technical challenges

1.13 Non-technical challenges

1.14 Conclusions

Evaluation

Based on a written seminar assignment as well as participation on a seminar day.

Curriculum vitae

Dominic O'Brien is a Professor of Engineering Science at the University of Oxford, where he is Deputy Head of Department and leads the optical wireless communications group. He gained MA(1991) and PhD (1993) Degrees from the Department of Engineering at the University of Cambridge. From 1993-1995 he was a NATO fellow at the Optoelectronic Computing Systems Center at the University of Colorado. His current research is in the field of optical wireless systems, particularly in the implementation of optical wireless systems. He is the author or co-author of approximately 150 publications or patents in the area of optics and optoelectronics.