
Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)

Submission Title: The OMEGA use case

Date Submitted: 8th March 2009

Source: Joachim W. Walewski,¹ Klaus-Dieter Langer,² and Jelena Vucic² Company 1) Siemens AG, Corporate Technology, Information & Communications; 2) Fraunhofer Institute for Telecommunications, Heinrich-Hertz Institut Address 1) Otto-Hahn-Ring 6, DE-81739 Munich, Germany; 2) Einsteinufer 37, 10587 Berlin, Germany

Voice: +49-89-636-45850, FAX: +49-89-636-51115, E-Mail: joachim.walewski@siemens.com

Re: N/A

Abstract: The OMEGA use case (EU, FP-7.1) is presented with a main focus on VLC demonstrator and how it will be integrated into the OMEGA demonstrator

Purpose: Helping TG 802.15.7 to shape the use-case scope of a VLC standard

Notice: This document has been prepared to assist the IEEE P802.15. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.

Release: The contributor acknowledges and accepts that this contribution becomes the property of IEEE and may be made publicly available by P802.15.

The OMEGA use case

Joachim W. Walewski
Siemens AG

Corporate Technology
Information & Communications
Munich, Germany

Klaus-Dieter Langer, Jelena Vucic
Fraunhofer Institute for Telecommunications,
Heinrich-Hertz-Institut
Berlin, Germany

Acknowledgment

The research leading to these results has received funding from the European Commission's Seventh Framework Programme FP7/2007-2013 under grant agreement n° 213311, also referred to as OMEGA. The authors acknowledge the contributions of OMEGA colleagues. This information reflects the consortiums view, and the Commission is not liable for any use that may be made of any of the information contained therein.

Motivation for this talk

- Familiarise TG IEEE 802.15.7 with OMEGA's activities and goals
- Emphasis on VLC within OMEGA: discuss PHY and MAC aspects relevant to IEEE 802.15.7

Outline

- Home Gigabit Access
- OMEGA architecture
- Hybrid optical wireless
- VLC within OMEGA
- Current status
- Relevance for IEEE 802.15.7
- Summary

Home Gigabit Access: salient facts

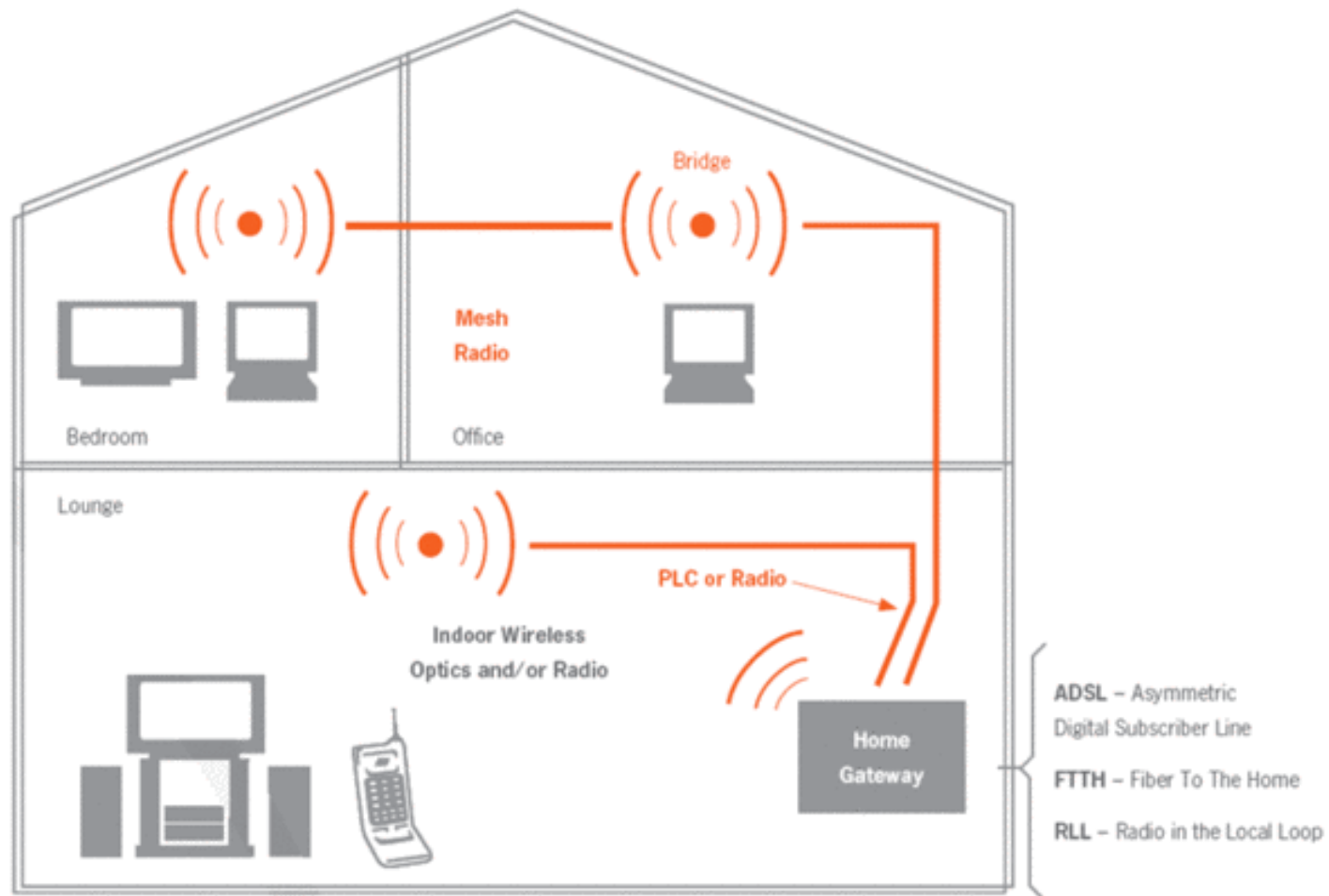
- Integrated Platform within 7th Frame Programme
- Jan 2008 – Dec 2010
- Main deliverable: Showroom demonstrator @ Orange labs, Rennes, France
- ~ 130 person years



OMEGA: partners

The image features a map of Europe where countries are color-coded: France, Spain, Italy, and Greece are highlighted in orange, while other European countries are in blue. Surrounding the map are logos of partner organizations. On the left side, the logos are: France Telecom Orange, IETR (Institut Polytechnique et de Télécommunications de Rennes), ihp, infineon, ISKRA ZAŠČITE, THOMSON images & beyond, ComNet, SPiDCOM TECHNOLOGIES, and technikon. On the right side, the logos are: Telefónica TELEFÓNICA INVESTIGACIÓN Y DESARROLLO, th, a classical bust logo, a circular university logo, EURESCOM, infineon, SIEMENS, and HHI.

OMEGA: mission & scope

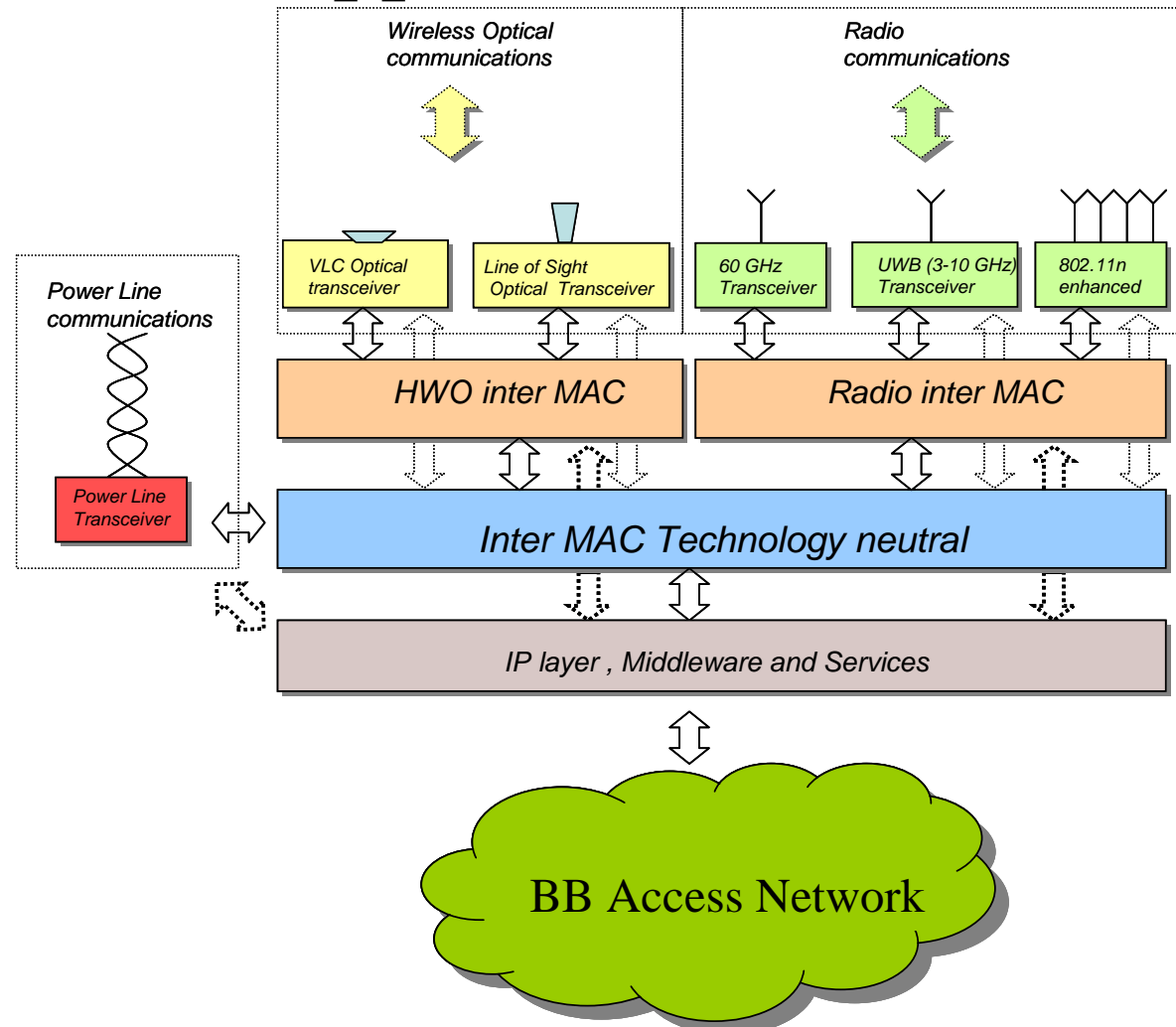


OMEGA: mission & scope

- Gbit/s home backbone ‘without new wires’
- Develop RF, PLC and optical-wireless PHYs and MACs
- Technology-aware routing by aid of Inter-MAC

OMEGA: approach

- Technology-unaware transport layer
- Technology-aware Inter-MAC
- Technology-specific (Inter-)MACs

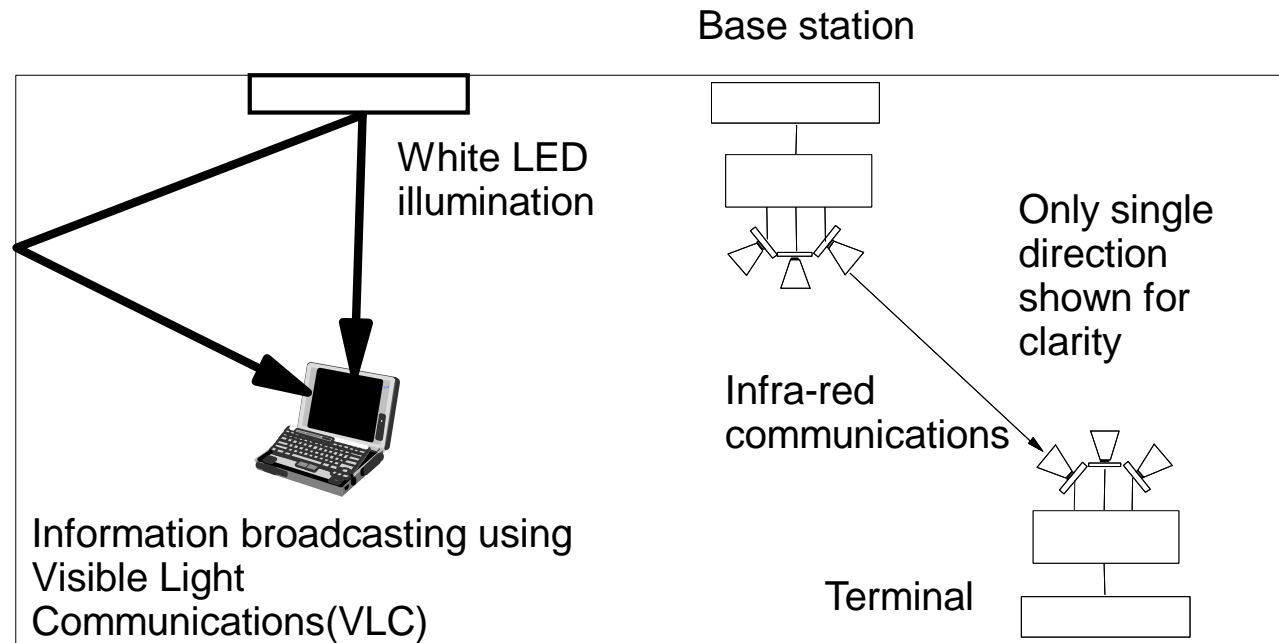


OMEGA work groups

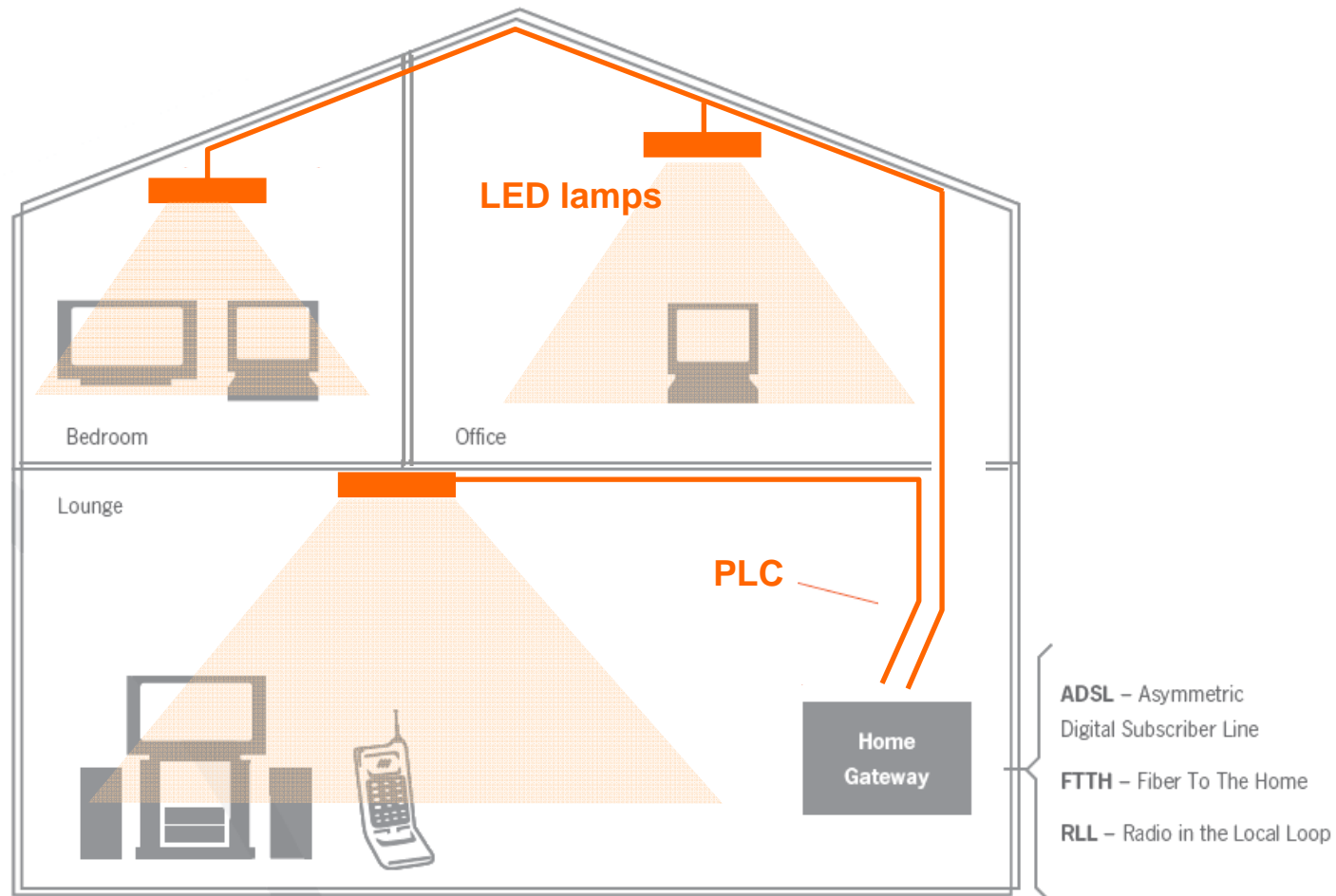
- Scenarios and requirements
- Radio Communications
- Powerline Communications
- Hybrid Wireless Optics
- Inter-MAC
- Architecture and Security
- Integration and Demonstration
- Dissemination, Training, and Standardisation

Hybrid wireless optics in OMEGA

- VLC: 100 Mbit/s, broadcast
- IR: 1 Gbit/s hotspot, bidirectional

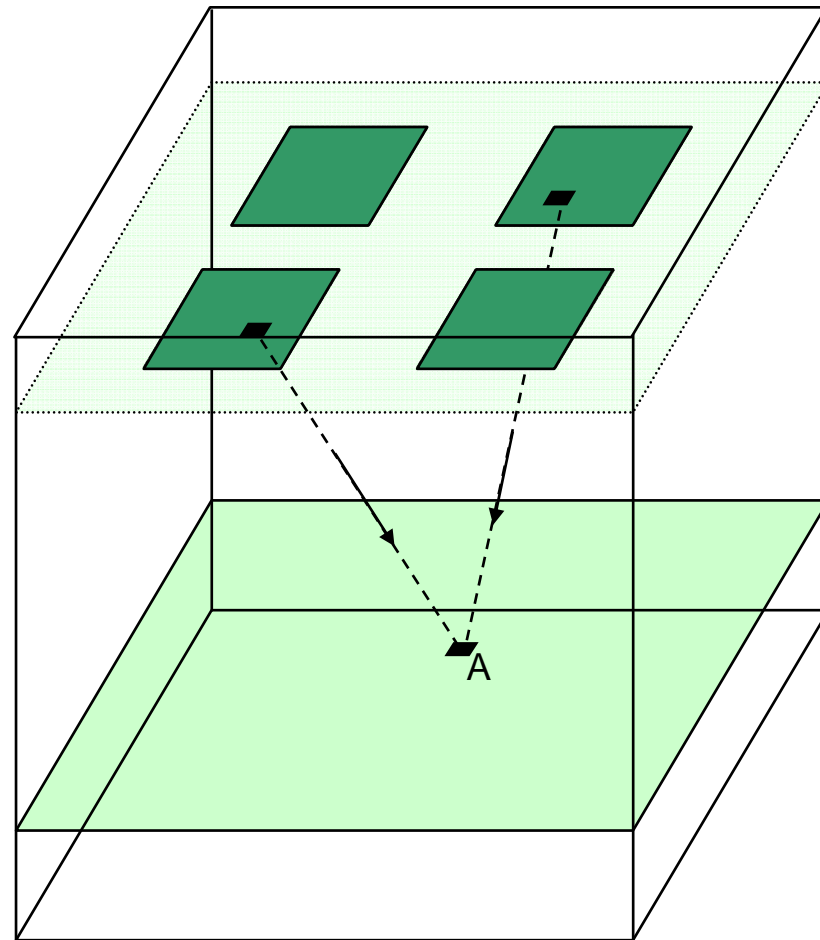


OMEGA use case for VLC



OMEGA use case for VLC

- Ambient lighting with high-power LEDs (200-500 lm/module)
- Simplex (VLC-only)
- Duplex in hybrid scenario (VLC + IR, VLC + RF)



OMEGA use case for VLC

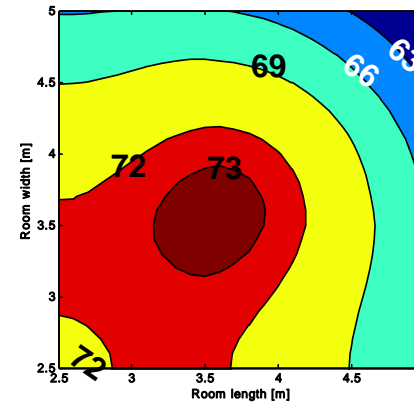
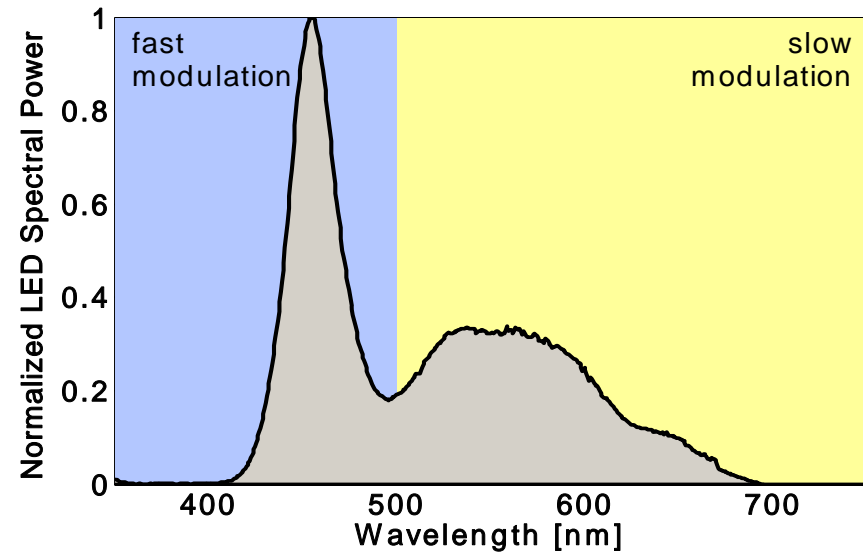
- No spatial multiplexing

Future:

- Accommodate spatial multiplexing
- Multiple users in duplex scenario
- Accommodate PWM dimming

VLC PHY

- Target: 100 Mbit/s
- DMT for avoiding interference from fluorescent lighting
- Modulation-bandwidth boost through blue spectral filtering
- Spectrally efficient modulation (QAM) enabled by high SNR



Current status of VLC

- PHY and MAC underway
- First system tests (MAC + PHY)
summer 2009
- First test in showroom autumn 2009

Relevance of OMEGA VLC for IEEE 802.15.7

- Compiled [literature overview](#) on optical wireless communications
- Hands-on experience with synergetic VLC/illumination high-speed use case
 - Full-blown demonstrator
 - Develop own PHY & MAC
 - Address coexistence issues with other PHYs (IR, RF)
 - Assessment of use-case viability
- “Roadmap to the all-optical home” (public document, due mid 2010)

Relevance of OMEGA VLC for IEEE 802.15.7

Decisions due for TG:

- Synergetic illumination & VLC?
 - Lighting technology (DC filters, PWM dimming, ...)
 - Packages and interfaces: in one package?, add-on?, ...
- High-speed with VLC?
 - Blue-filtering (patent by Schneider, US 7,208,888 B2)?
 - Pre-compensation and resonant LED drivers? ([IEEE 802.15-15-08-0265-03-0vlc](#))
 - Spectrally efficient modulation? (OMEGA)
 - ...

Summary

- Familiarised TG IEEE 802.15.7 with OMEGA project
- Presented OMEGA VLC use case: ceiling lighting as 100-Mbit/s broadcaster
- Outlined
 - Decisions due for TG IEEE 802.15.7
 - Potential input to IEEE 802.15.7 standard

More info on OMEGA

- Public homepage: <http://www.ict-omega.eu>
- List of publications: <http://www.ict-omega.eu/publications/papers.html>
- Public deliverables: <http://www.ict-omega.eu/publications/deliverables.html>

Appendix - VLC PHY

