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

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**Source:** Joachim W. Walewski,<sup>1</sup> Klaus-Dieter Langer,<sup>2</sup> and Jelena Vucic<sup>2</sup> 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

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# 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

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## 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

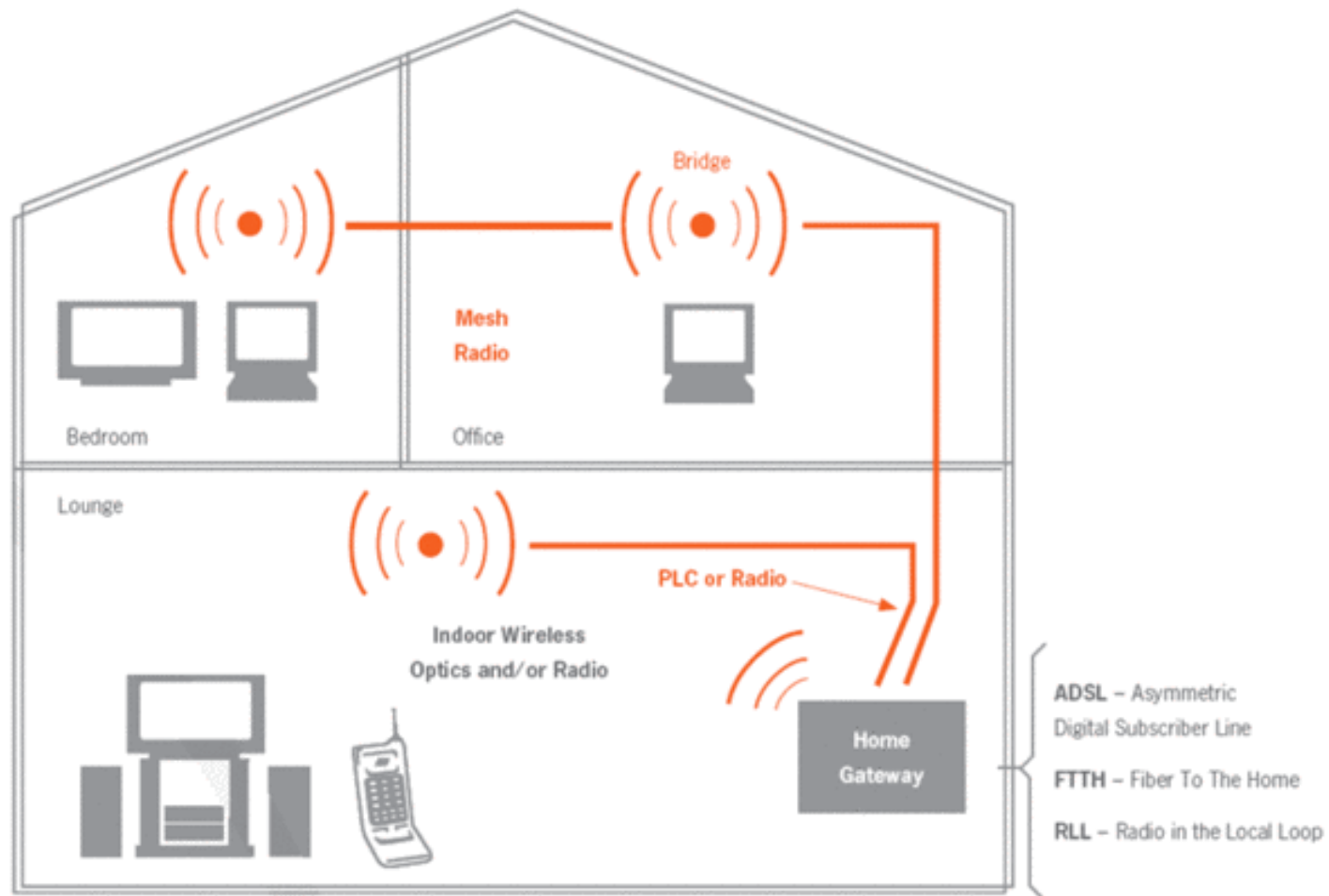
- Integrated Platform within 7th Framework Programme
- Jan 2008 – Dec 2010
- Main deliverable: Showroom demonstrator @ Orange labs, Rennes, France
- EU funding: ~ 11 M€ (~ 130 person years)



# 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. To the left of the map is a vertical column of logos for partner organizations, including France Telecom, IETR, ihp, infineon, ISKRA ZAŠČITE, THOMSON, and SPiDCOM. To the right of the map is another vertical column of logos, including Telefonica, th, EURESCOM, infineon, SIEMENS, and HHI. The text 'technikon' is located at the bottom left of the map area.

# OMEGA: mission & scope



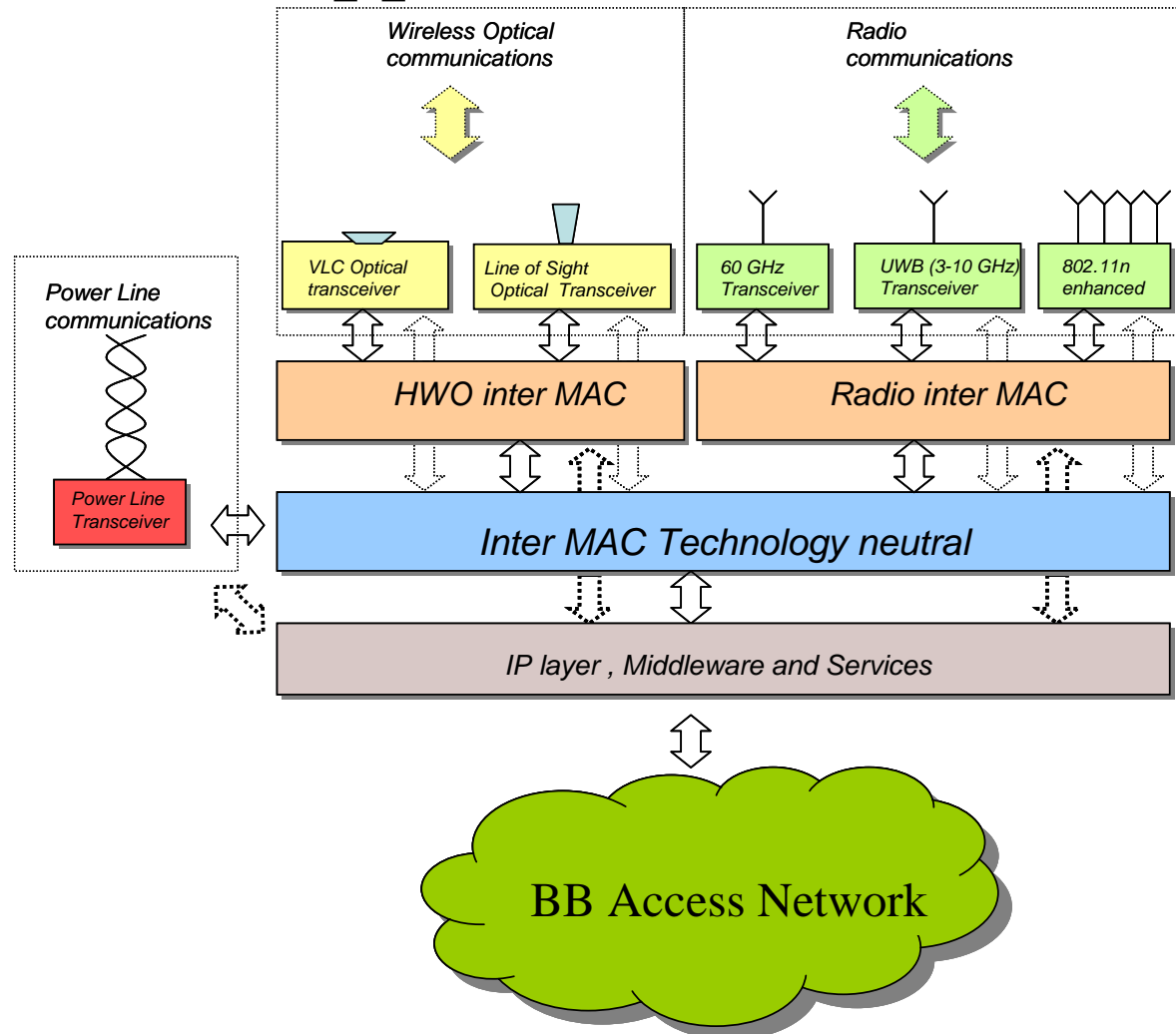


## OMEGA: mission & scope

- 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

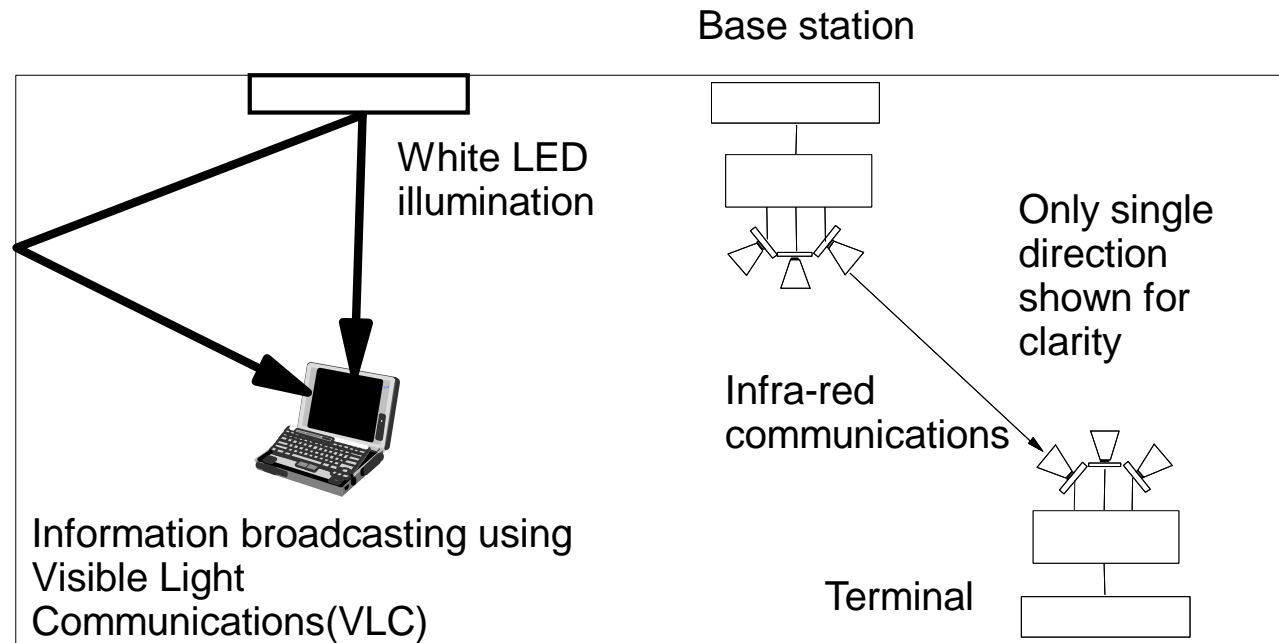


# OMEGA work groups

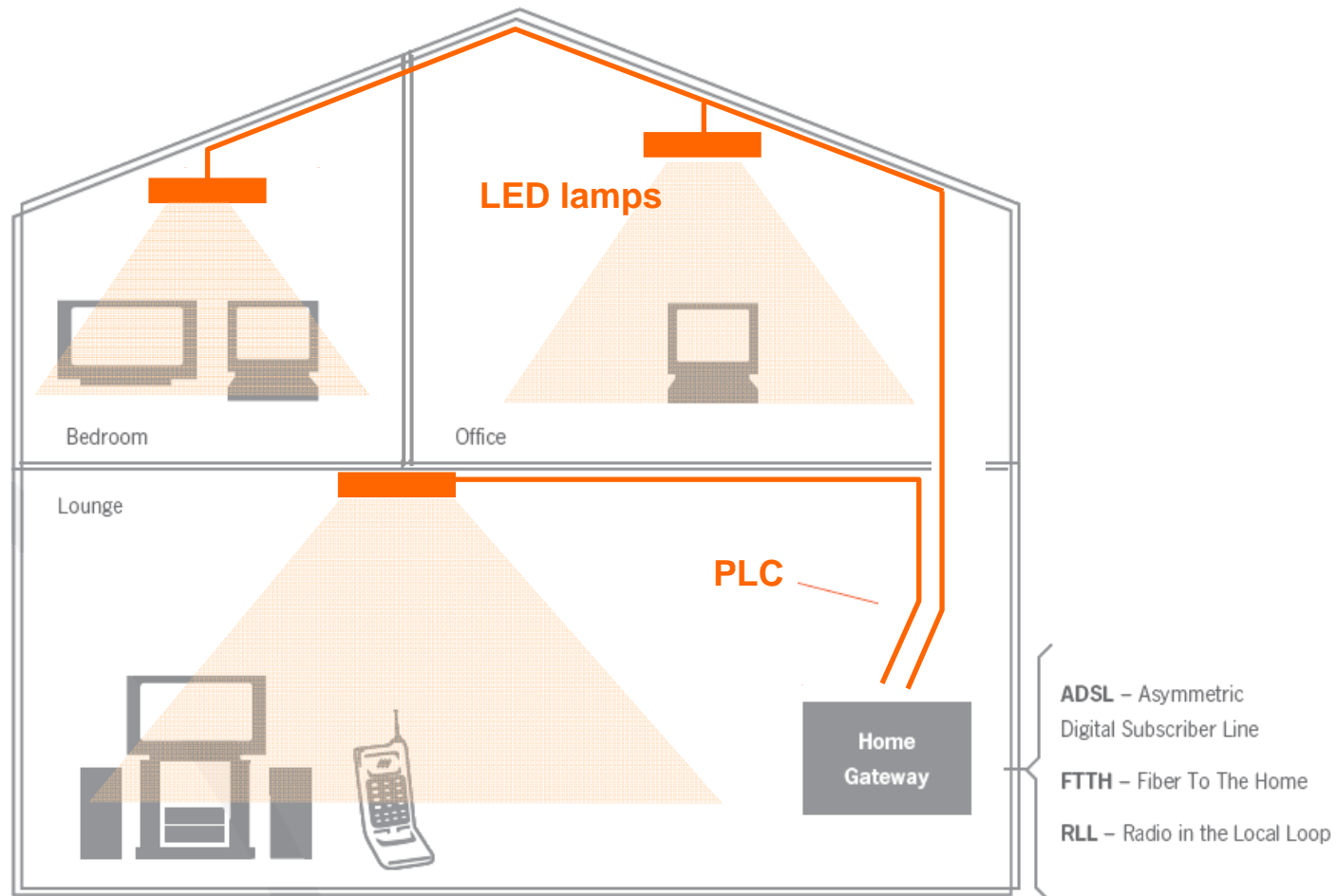
- Scenarios and requirements
- Radio Communications
- Powerline Communications
- Hybrid Wireless Optics
- Inter-MAC
- Architecture and Security
- Integration and Demonstration
- Dissemination, Training, and Standardisation

# Hybrid wireless optics in OMEGA

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

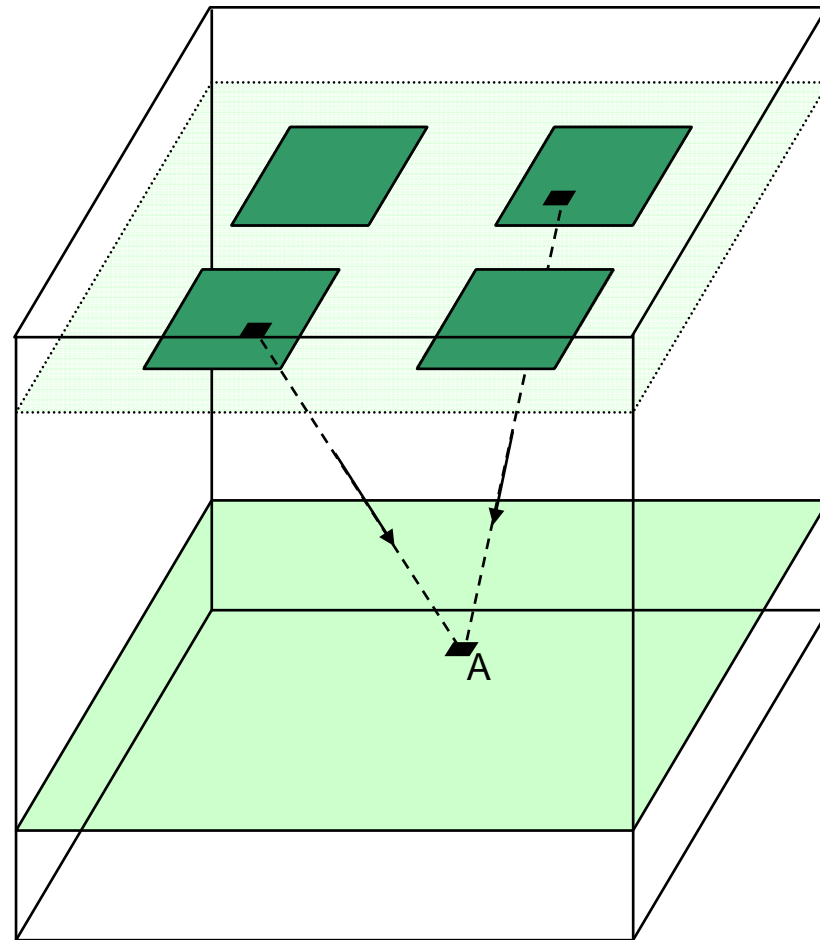


# OMEGA use case for VLC



## 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

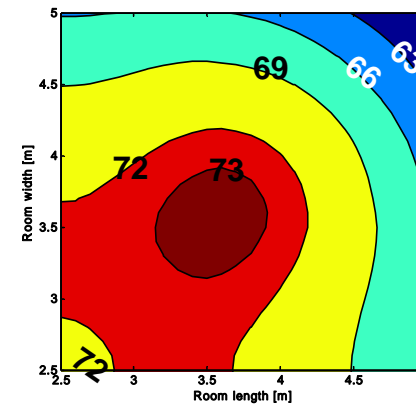
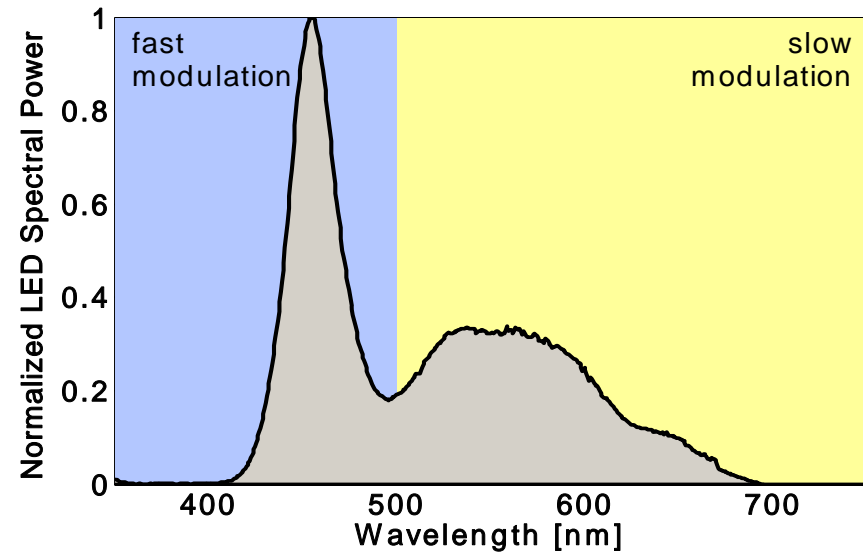
- No spatial multiplexing

### 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

