

Visible Light Communications for Gb/s Indoor Connectivity

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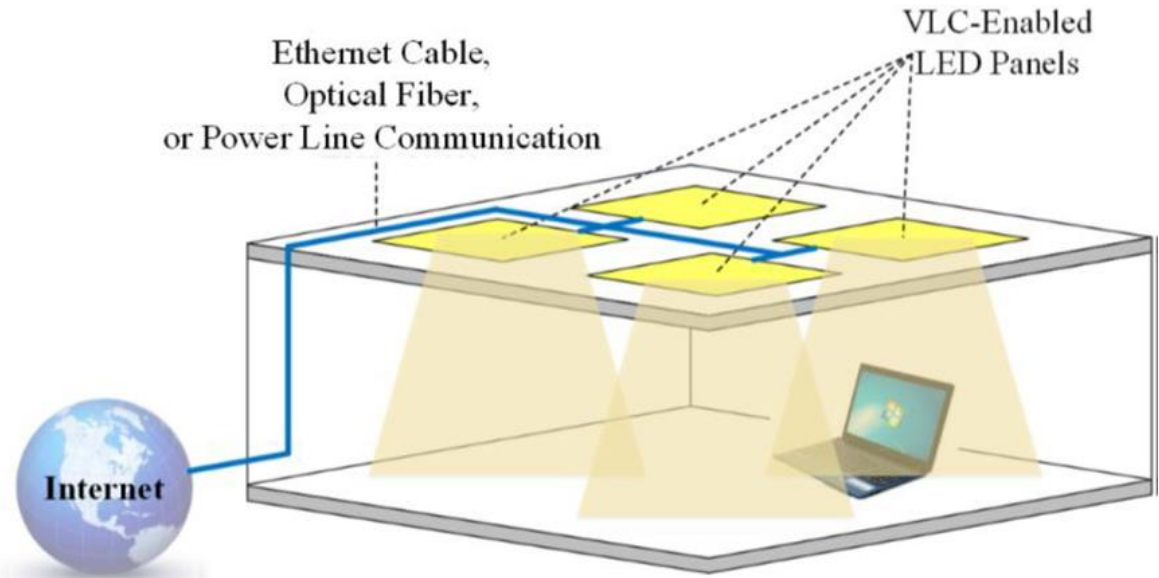
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SCHOOL of ENGINEERING
& APPLIED SCIENCE

Why Visible Light?

- Create a dual-use lighting-communication system
- Ubiquitous, energy efficient transmitters
- Visible light is suitable for RF sensitive environments
- High data throughput possible
- Secure and safe



Uses:

- Indoor communications (Li-Fi)
- Indoor positioning
- Very short-range outdoor (e.g., V2x)

Applications



Indoor Communications

- Wi-Fi cannot continue to support many users with increasing data demands
- VLC can support > 1 Gp/s per access point with current technology
- Access points can be densely packed with high reuse factor per room
- Can augment Wi-Fi or create a stand-alone system

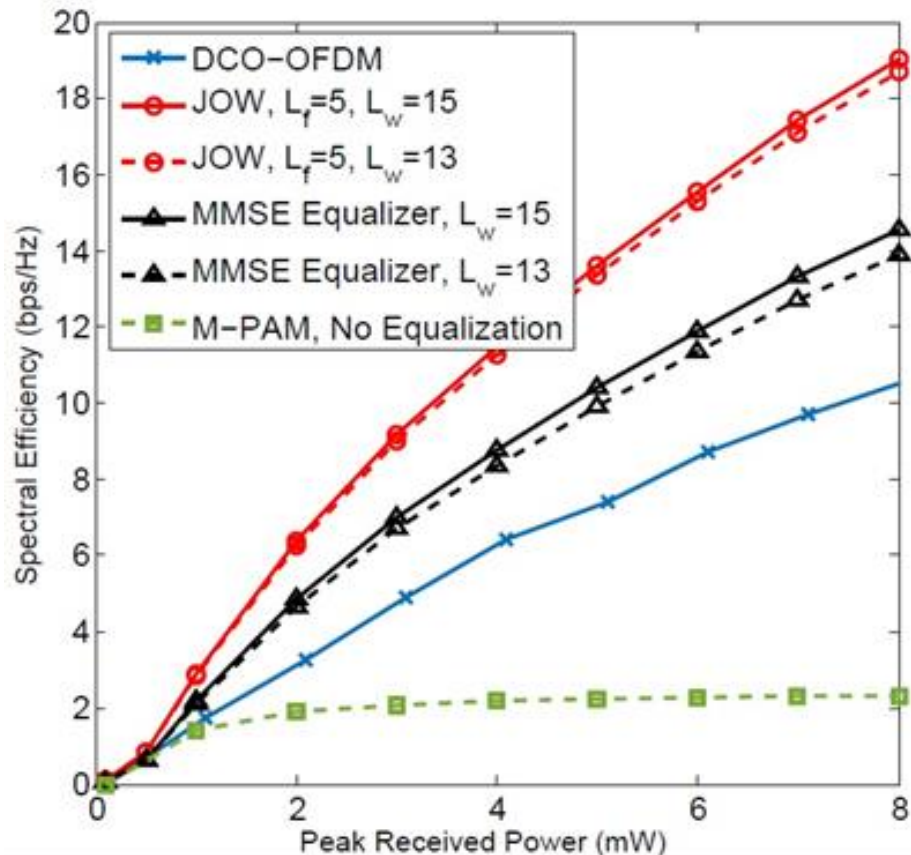
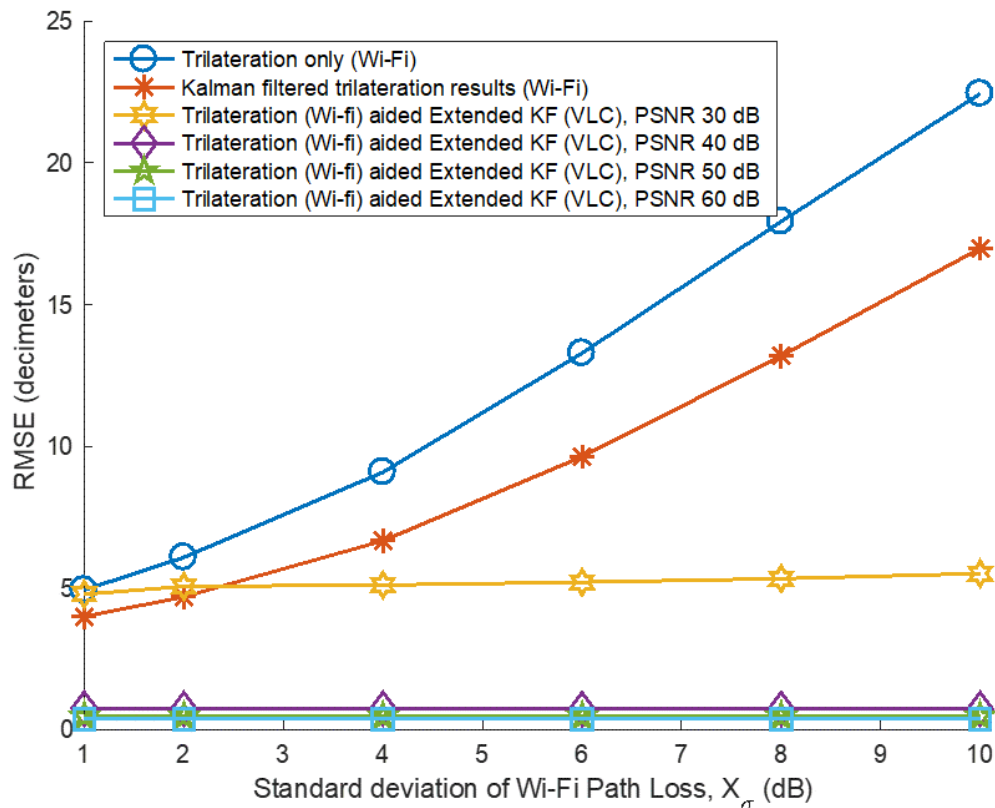


Figure: Spectral efficiency of several VLC modulation schemes (using LED 3 dB bandwidth) showing advantage of transmitter and receiver-based signal processing

Indoor Localization

- Location based services are growing, enabled by advanced mobile devices
- No currently available wide-spread indoor positioning system
- VLC can achieve cm accuracy
- Can use existing lighting infrastructure – only new LED-driver needed



Vatansever, Brandt-Pearce, ICCN'17

Figure: Advantage of VLC over Wi-Fi-based positioning. VLC fingerprinting method with site-survey collected using Wi-Fi crowd-sourced data.

Open Research Problems

- What are the fundamental limits of VLC networks?
- What kind of devices are needed to support VLC?
- How does it converge with the current telecomm infrastructure – Wi-Fi, PONs, PoE, PLC, etc.?
- How can communications drive lighting?
- How can emerging technologies exploit VLC:
 - Internet of things (peer-to-peer ?)
 - Cloud computing
 - Personalized health care
 - 5G
- What is the killer app?

