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

Submission Title: Partial PHY proposal in support of Coordinated-Interference Management for IEEE802.15.7r1

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Abstract: This contribution presents a partial PHY proposal with interference coordination support for IEEE 802.15.7r1

Purpose: This is a partial PHY proposal to enable interference coordination modes.

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- Introduction

- Coordinated-Interference Management

- Numerical Results

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Introduction (1/2)

- Interference due

  - Overlapped access points coverage regions

- Interference coordination mechanism is required in VLC.

- Constraint: limited optical transmission power

  - Depending on illumination level

  - Depending on safety regulations

Introduction (2/2)

■ Propose centralized coordination operation with the following two modes:

  ■ Orthogonal Transmissions

  ■ Power-controlled Transmissions

Coordinated-Interference Management (1/2)
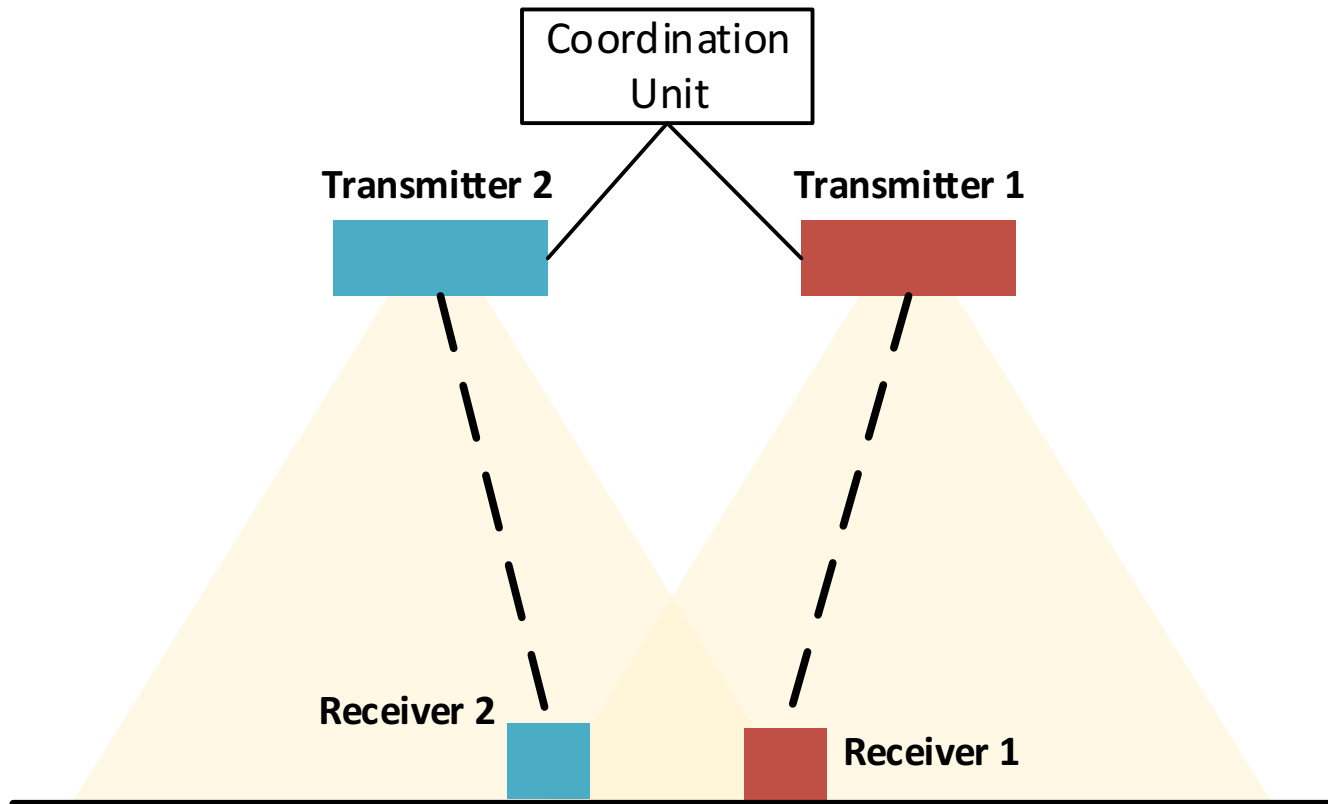
Coordinated-Interference Management (2/2)

- Two Modes of Operation

    - Orthogonal Transmissions: resources are allocated to a transmitter. Examples include time division multiple access (TDMA) and frequency division multiple access (FDMA).

    - Power-controlled Transmissions: resources are shared among transmitters. The electrical power is controlled of each transmitter under a fixed average optical power requirement.

- The coordination unit uses the location information of nodes to determine the mode of operation and the used electrical powers of the transmitters
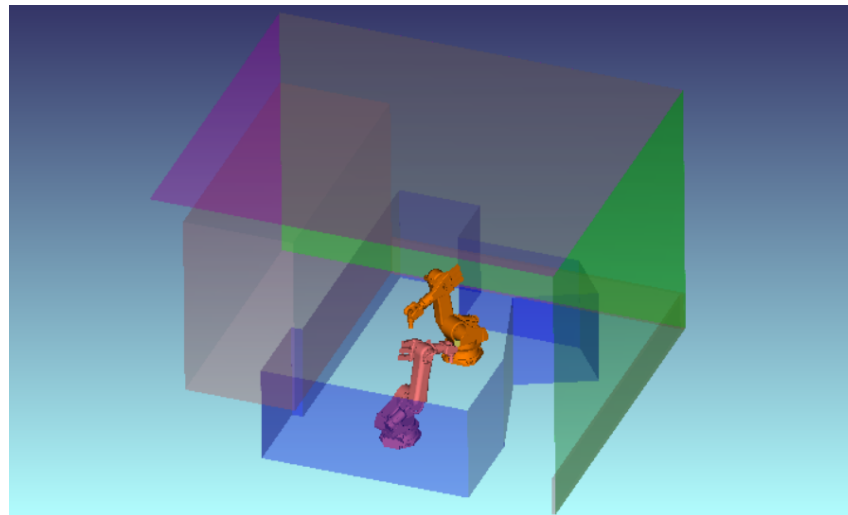
Numerical Results

- DCO-OFDM
- Pulse shaping filter: Root raised cosine
- Number of subcarrier: 64
- Cyclic prefix length: 3
- Noise power spectral density (N_0): 10^{-21} W/Hz

Example: Manufacturing Cell

Various destinations have different channel responses for the available LED transmitters.

Scenario 4 from IEEE P802.15-15-0746-01-007a.

manufacturing cell with two robots in a
factory environment

The bit error rate (BER) performance of various pairs of LEDs and destinations. In orthogonal transmissions 4-QAM transmission is used. For power-controlled transmissions, BPSK is used. The shown performance is the min-max BER performance of the system.
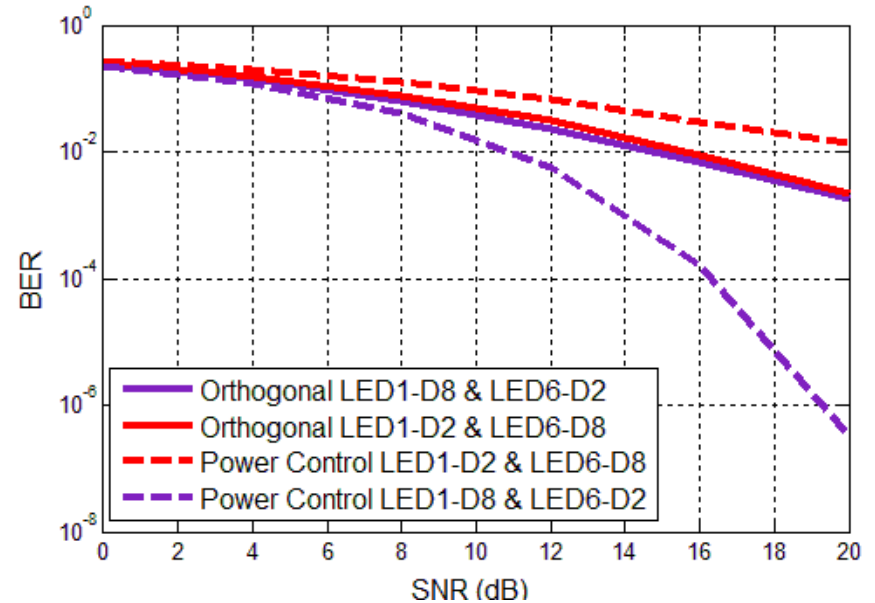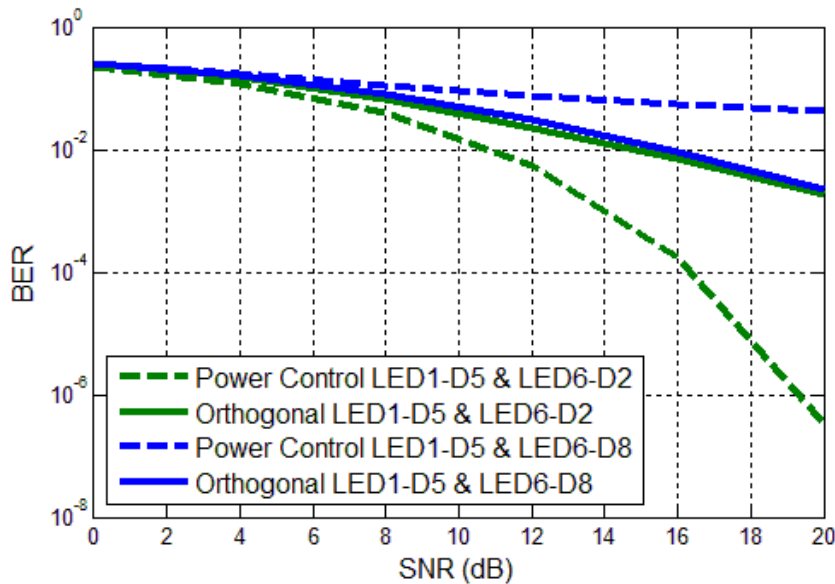
Based on the transmitter and the associated destination, the transmission mode of either orthogonal or power-controlled transmissions can improve the BER performance significantly.

Summary

- Proposed interference coordination support techniques for IEEE 802.15.7.r1

- Two coordination modes: orthogonal and power-controlled transmissions.

- Examples at the manufacturing cell model have shown gains of at least 3 dB can be obtained by applying interference coordination.

Acknowledgement

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