Integrated Circuit System-On-Chip And System-In-A-Package For Visible Light Communications And Navigation

Tech ID: 32653 / UC Case 2014-812-0

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,244,590	03/26/2019	2014-812

FULL DESCRIPTION

Background

Wireless Visible Light Communication (VLC) is enabled by Light Emitting Diodes (LED) and their ability to switch on/off at tens of MHz without flickering. Visible Light Communication offers significant advantages over Radio Frequency (RF) based wireless communication.

- Optical spectrum offers a bandwidth upto 300 THz thereby allowing for streaming at multiple gigabits per second.
- Data rates can be boosted with more emission power without harm to human beings.
- Unable to penetrate walls, VLC is inherently secure.
- Being interference free, VLC can co-exist with and complement existing RF technology.
- VLC devices are inexpensive compared to multi-gigahertz RF devices.

Current VLC systems are essentially a Lego-type testbed that have significant disadvantages. These include:

- Large size and complex electronics.
- Low performance, low reliability and high cost.

Current Invention

Prof. Wang at UCR has developed a patented, system-in-a-package (SIP) and system-on-a-chip (SoC) architecture for VLC that integrates all the electronic circuits with the LEDs and photodetectors (PD) to make VLC and Visible Light Positioning (VLP) systems with integrated opto-electronics.

A VLC-based Ad Hoc smart traffics system scenario.

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OTHER INFORMATION

KEYWORDS

Big data transmission, Data transfer, Broadband wireless, LED, Photodetector, Visible light communication, Visible light positioning, Wireless communication, Smart locks

CATEGORIZED AS

- **Optics and Photonics**
  - All Optics and Photonics
- **Communications**
  - Internet
  - Networking
  - Optical
  - Wireless
- **Computer**
  - Hardware
  - Security
- **Security and Defense**
  - Cyber security
- **Semiconductors**
  - Assembly and Packaging
  - Design and Fabrication
- **Sensors & Instrumentation**
  - Other
  - Position sensors
- **Transportation**
  - Automotive

RELATED CASES

2014-812-0, 2016-937-0

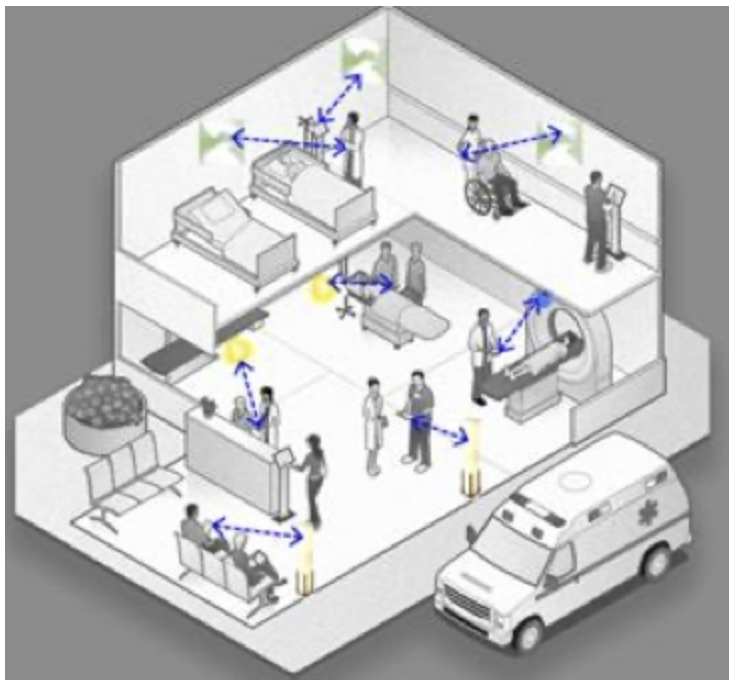

Illustration of an LED-based VLC system scenario for smart hospitals using a given hospital layout.

ADVANTAGES

The novelty and benefits of this design and architecture are:

- Small footprint and low cost.
- Very high performance and reliability.
- With integrated Orthogonal Frequency Division Multiplexing (OFDM), larger LED array and demultiplexer, the design will offer better signal quality and wider bandwidth.
- A larger PD array combined with CMOS/CCD imager offers higher data rates.
- Low voltage differential signaling (LVDS) removes background noise.

SUGGESTED USES

- Smart cities
- Smart wireless communication in:
  - RF prohibited hospital setting
  - Smart traffic control, car-to-car collision avoidance and signal data broadcasting
  - Home/Office with higher security, bandwidth, and data rate
  - Retail/Store setting
- Ubiquitous energy efficient computing & Greener broadband wireless communication
- Video streaming over light
- Smart locks

STATE OF DEVELOPMENT

Prototype built and tested

RELATED MATERIALS

- Visible Light Communication Cyber-Physical Systems-on- Chip for Smart Cities

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