



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 optoelectronics.



A VLC-based Ad Hoc smart traffic system scenario.

CONTACT

Venkata S. Krishnamurty
venkata.krishnamurty@ucr.edu
 tel: .

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

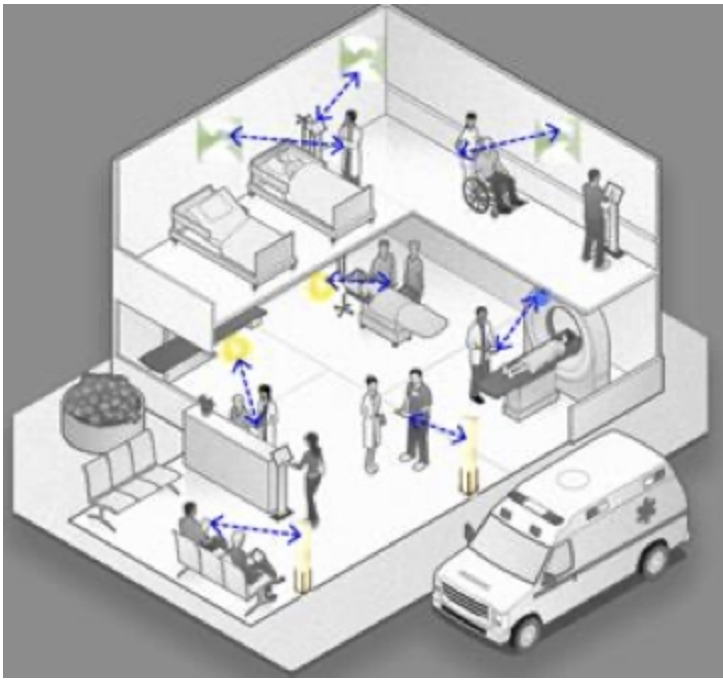


Illustration of an LED-based VLC system scenario for smart hospitals using a given hospital layout.

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](#)

