

# Abstract

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## **An efficient hybrid visible light communication/radio frequency system for vehicular applications**

This paper focuses on improving the traffic system for Intelligent Transportation System (ITS) by using an imaging receiver instead of photodiode as a single receiver. Here, two simple traffic models have been proposed and analyzed in order to optimize the design characteristics such as signal to noise ratio, required power, received information, bit error rate, and modulation technique. First, a standalone visible light communication (VLC) with different modulation techniques is considered. The On-OFF Keying, L-Pulse Position Modulation (L-PPM), and Inverse L-Pulse Position Modulation (I-L-PPM) are investigated. Then, a hybrid communication system utilizing VLC and radio frequency (RF) is proposed for position-based services. The VLC/RF system combines the benefits of both systems and offers long distance transmission which is an important concern in ITS and in order to improve the link reliability in infrastructure to vehicle communications. This means that the probability of having a communication link between the transmitter and receiver is maintained without interruption. Then, the performance is finally evaluated. The obtained simulation results show a considerable increase in the received information using the proposed hybrid VLC/RF system compared to a VLC system.