**IEEE P802.15**

**Wireless Personal Area Networks**

|  |  |
| --- | --- |
| Project | IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) |
| Title | **Kookmin Suggested Hybrid rolling shutter signal for OCC system** |
| Date Submitted | [July 2021] |
| Source | Huy Nguyen and Yeong Min Jang  (Kookmin University) |
| Re: |  |
| Abstract | Suggested the Hybrid rolling shutter signal for OCC system |
| Purpose | Suggested the Hybrid rolling shutter signal for OCC system |
| Notice | This document has been prepared to assist the IEEE P802.15. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein. |
| Release | The contributor acknowledges and accepts that this contribution becomes the property of IEEE and may be made publicly available by P802.15. |

# **Introduction**

C-OOK stands for Camera- On Off Keying, a communication mode within the IEEE 802.15.7-2018 Optical Wireless Communication standard. Particularly, C-OOK is within the PHY V layer of IEEE 802.15.7-2018 standard.

Orthogonal Frequency-Division Multiplexing (OFDM) is a digital multi-carrier modulation scheme that is employed in broadband wired and wireless communication as an effective solution with Inter-Symbol Interference (ISI) caused by a multipath channel. Rolling Shutter OFDM scheme was proposed to take advantage of OFDM waveform for OCC system.

Hybrid waveform will be proposed by combining two waveforms: C-OOK and OFDM for indoor applications. With this scheme, two waveforms will be decoded with just one rolling shutter camera.

# **System Architecture**



Reference architecture of Hybrid Rolling Shutter signal for Optical Camera Communication

The OFDM and the OOK waveforms can transmit via single LED via hybrid waveform. C-OOK scheme was shown as a candidate for the low-rate stream. The high-rate data stream, based on the OFDM waveform, was embedded into the C-OOK waveform in both the high period and the low period of the C-OOK scheme. With single camera, we can receive two signals from single LED via hybrid waveform.

# **Data packet structure**



Data frame structure of hybrid OFDM-OOK scheme. (a) OOK packet. (b) OOK data (c) hybrid signal (d) OFDM signal.

In each ‘high’ and ‘low’ period of C-OOK waveform, we can embed the high-frequency OFDM waveform to increase data rate of the system.

In the low data rate stream, we apply the C-OOK frame as the above figure. With high data rate stream, each period of C-OOK waveform will be put one OFDM frame to generate hybrid waveform.