IEEE P802.15  
Wireless Specialty Networks

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| IEEE 802.15.13  Draft text for Abstract and Introduction | | | | |
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**Abstract**

Abstract

# This document contains missing text for the TG13 draft abstract and introduction.

This standard defines the protocol and compatible network equipment for optical wireless communications and its operation as an optical wireless personal area network (OWPAN) supporting data rates of multiple Gbit/s for industrial wireless applications. The standard defines a MAC layer operating in beacon-enabled and non-beacon-enabled modes and three PHY layers enabling low complexity, low power and high throughput.

**Introduction**

The IEEE Std. 802.15.13 was developed to provide Gigabit optical wireless communication (also denoted as LiFi) over short-range wireless links with applications in industrial wireless, fixed wireless access, home and office scenarios. Main requirements are the provision of high data rates in fixed and mobile scenarios with the additional support of robustness and low latency. A properly designed network interface for integration with existing RF technologies was another important design criterion.

Original ideas for a new LiFi standard were presented in March 2015 together with other ideas, to develop optical camera communications (OCC), as a tutorial at the IEEE 802 Plenary in Berlin, Germany. Initially, the IEEE decided to consider both technologies in a joint revision of IEEE Std. 802.15.7-2011. Having initial proposals presented in January 2016, the first draft was presented in May 2016. After a first revision in November 2016, the Technical Editor noticed the revision draft has evolved from 309 to 634 pages. While OCC introduced many new PHYs but only minor changes to the MAC, LiFi introduced two new PHYs and significantly revised the MAC for mobile communications. IEEE then decided to split the group. While IEEE 802.15.7r1 continued to add OCC, a new task group IEEE 802.15.13 started in May 2017 to create IEEE Std. 802.15.13 focussing on LiFi. The new group started from the existing 802.15.7r1 draft and deleted OCC parts first. Several inputs were merged into a third, low-power pulsed modulation (PM) PHY. After consolidating PM PHY, low-bandwidth (LB) PHY and HB OFDM PHY until July 2018, work then focussed on the MAC.

After technical discussions, the group decided to implement the mobility support for LiFi by using an innovative approach considering transmitters in the illumination infrastructure and mobile users in the service area as inputs and outputs of a distributed multiple-input multiple-output (MIMO) link. The corresponding MAC layer proposals for multiple optical frontends was presented in September 2018. The group next started to rewrite the 802.15.13 MAC. The aim was a minimalistic design which can be implemented on low-cost FPGA suitable for specialty applications. In this way, page count reduced significantly. In November 2019, the first working group letter ballot was started and the draft was accepted by the 802.15 working group in January 2020. After recirculations, the draft was submitted to the IEEE SA sponsor ballot.

Overall, work towards IEEE Std. 802.15.13 demonstrated that it is more efficient to handle lighting (i.e. dimming) and communication (i.e. data transport) separately and follow a wavelength-agnostic approach. These two steps lead to great simplifications of the PHY and the insight that optical wireless protocols can be very similar to those used for other wireless and wired media like RF, coax and power lines. As a third innovation, the analogue switching between optical frontends in 802.15.7 was further evolved in 802.15.13 into an innovative distributed multiuser MIMO protocol supported by the PHY and MAC. The new approach allows for the first time seamless mobility support and enables mobility independent of the network and higher layers. Further advantages are ultra-low latency and no packet loss due to occasional line-of-sight blockage.