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**

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# 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, respectively.

**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 scenarios. Main requirements were 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 easy integration with existing RF technologies was another important design criterion.

Original ideas for a new LiFi standard were presented together with other ideas to develop low-speed optical camera communications (OCC) in a tutorial at the IEEE 802 Plenary in March 2015 in Berlin, Germany. At this time, the 802.15 working group decided to consider both technologies in a revision of the IEEE Std. 802.15.7-2011. Initial proposals were presented in November 2015 and January 2016 and contributions were merged into the first draft in March and May 2016. After revising the draft, in November 2016 the group observed that the text grow from 309 to 634 pages. While OCC introduced many new PHY modes but only minor changes to the MAC, LiFi introduced two new PHYs and revised the MAC to enable mobile communications.

The 802.15. working group decided to split the group for further work. While IEEE 802.15.7r1 continued to introduce OCC, a new task group IEEE 802.15.13 started its work in May 2017 to create a new IEEE Std. 802.15.13 focussing on LiFi. The new group started from the existing 802.15.7r1 draft and deleted OCC contributions initially. Group members merged inputs into a third, low-power pulsed modulation (PM) PHY which was thoroughly evaluated as well. After consolidating PM and low-bandwidth PHY in May 2018, and HB OFDM PHY in July 2018, work focussed onto the MAC.

After controversial 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 support for multiple optical frontends was presented in September 2018. It was the starting point to essentially rewrite the entire MAC. The result was a minimalistic MAC including only those features being helpful to meet the scope of the group. In this way, page count reduced significantly. In November 2019, the first working group letter ballot was started. The working group accepted the draft already in the first ballot in January 2020. After one more recirculation, the draft was submitted to the IEEE SA sponsor ballot.

Work towards IEEE Std. 802.15.13 demonstrated that it is important to handle lighting (i.e. dimming) and communication (i.e. data transport) separately and to follow a wavelength-agnostic approach. These two new paradigms lead to great simplifications of the PHY layer showing that optical wireless protocols can be very similar to those used for other wireless and wired media like mobile radio, phone and power lines. As a third new paradigm, the distributed multiuser MIMO approach greatly simplified the mobility support in an integrated PHY and MAC layer that enables mobility almost independent on the network and higher layers.