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| **Radiocommunication Study Groups** |  |
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| **18 June 2021** |
| **English only** |
| Annex 12 to Working Party 1A Chairman's Report |
| Working document towards a PRELIMINARY DRAFT new RECOMMENDATION ITU-R SM.[OPTICAL WIRELESS] |
| Complementing current radio frequency delivery mechanisms using Optical wireless communication |

(20XX)

Optical Wireless Communication (OWC) may ease the pressure on the radio spectrum that is now in use. OWC technologies offer a promising solution for indoor and in some cases wireless broadband communication over a distance up to a few meters. Other methods besides OWC can be used to reduce the constraints of conventional radio frequency (RF) delivery mechanisms, but the unique feature of OWC is its similarity to traditional RF approaches in terms of management, planning~~,~~ and maintenance.

Scope

This Recommendation contains elements to be taken into account when implementing OWC for broadband communications. Two main OWC variants can be distinguished: Visible Light Communication (VLC) and Beam Steered Infrared (IR) Light Communication, Ultra-violet (UV) communication

Keywords

Optical wireless communication, visible light communication, beam steered infrared light communication, radio frequency

Abbreviations/Glossary

EMF electromagnetic field

ICU intensive care unit

IEC International Electrotechnical Commission

IEEE Institute of Electrical and Electronics Engineers

IR infrared

LED ID light emit diode Identification

nm nanometre

OCC optic camera communication

OWC optical wireless communication

RF radio frequency

VLC visible light communication

Related ITU Recommendations and Reports

Report ITU-R SM.2422 – Visible light for broadband communications

The ITU Radiocommunications Assembly,

considering

*a*) that the radio spectrum is a limited resource;

*b)* that electromagnetic waves above 3000 GHz are not included in the ITU-R Radio Regulations;

*c)* that OWC uses the visible spectrum (wavelengths between 390 nm and 750 nm) or infrared spectrum (wavelengths between 780 nm and 1 mm) to provide wireless communications These frequencies are commonly known as THz frequencies;

*d)* that OWC has the potential to ease pressure on ~~lower frequency spectrum~~ RF spectrum bands since light spectrum can be used as additional spectrum for broadband communications;

*e)* that OWC could be seen as complementary to existing broadband wireless access systems;

*f)* that OWC is subject to different propagation characteristics relative to the wavelengths; *g)* that OWC could be especially useful in environments where the use of radio spectrum is (or will be) less feasible because of a combination of factors, e.g. spectrum scarcity, need for very high capacity, legislation, and others;

*h)* that OWC based solutions may provide benefits over RF spectrum based solutions with respect to suitability for dense employment, alleviation of current coexistence situations, and more robustness against jamming; higher data rate, more security than RF communication

*j)* that inside houses, offices, and buildings OWC might be an installed technology in the future;

*k)* that electromagnetic interference (EMI) sensitive environments (e.g. hospitals especially intensive care units (ICU), airplanes, certain industry applications) could benefit from OWC based solutions because they are not sensitive to the EM radiation from radio communication systems.

*l)* that VLC/OWC can also be applied for; underwater communication, eHealth, IoT(M2M/D2D/smart-factory), indoor navigation systems, connected cars, and autonomous vehicles in order to support Intelligent Transport System messaging,

recognizing

*a)* Report ITU-R SM.2422 on Visible light for broadband communications;

*b)* that ITU-T Study Group 15 is responsible in ITU-T for the development of standards for the optical transport network, access network, home network and power utility network infrastructures, systems, equipment, optical fibers and cables;

*c)* that the IEEE 802.15 Working Group completed in 2011 IEEE Std 802.15.7-2011 on “Short Range Wireless Optical Communication Using Visible Light

*d)* that the IEEE 802.15 Working Group completed in 2018 IEEE Standard for Local and metropolitan area networks – Part 15.7: Short-Range Optical Wireless Communications;

*e)* ~~that the IEEE 802.15 has formed a Task Group~~ ~~in 2021 to write a revision to IEEE 802.15.7-2011 that accommodates infrared and near ultraviolet wavelengths, in addition to visible light, and adds options such as: Optical Camera Communications and LED-ID,~~ ( that the IEEE 802.15.7a TG has created on September 2020 to write a revision to IEEE 802.15.7-2018 that accommodates infrared and near-ultraviolet wavelengths, in addition to visible light. In this Task Group, we proposed MIMO and Artificial intelligence (AI)-based PHY and MAC layers for higher-rate, longer-range OCC system)

*f)* IEEE 802.15.13 TG

noting

that with regard to eye-safety, due regard should be given to relevant safety limits information provided by several organizations, e.g. IEC 60825-12:2019 “Safety of laser products - Part 12: Safety of free space optical communication systems used for transmission of information”, IEC 62471 “Photobiological safety of lamps and lamp systems”, Recommendation ITU-T G.996 Amd. 1, national standards of administrations and/or in Advisory Circulars as issued by several aviation authorities,

recommends

1 that OWC systems should preferably comply with international standards, e.g. the standards referenced under recognizing and noting and at the same time comply with the law and regulations of the individual countries where the systems and devices are used;

2 that, in order to improve industry acceptance and user deployment, OWC uses, as much as possible existing solutions and standards;

3 that, while designing and constructing road infrastructure, offices, public spaces, and houses, the potential of OWC is taken into account for the delivery of communications facilities in addition to the usual fixed (wired) infrastructure;

4 that the standardization bodies involved in OWC closely cooperate with those in the traditional radio applications to improve the potential of those technologies working together;

5 that because the OWC technology is continuously developing, new technologies are continuously considered.