IEEE P802.18
Radio Regulatory Technical Advisory Group (RR-TAG)

|  |
| --- |
| Draft Response to India TRAI’s consultation re TeraHertz |
| Date: 2023-11-09 |
| Author(s): |
| Name | Company | Address | Phone | email |
| Edward Au | Huawei |  |  | edward.ks.au@gmail.com |

This contribution proposed a response to Telecom Regulatory Authority of India (TRAI)’s consultation “Consultation Paper on Open and De-licensed use of Unused or Limited Used Spectrum Bands for Demand Generation for Limited Period in Tera Hertz Range”

**Notice:** This document has been prepared to assist IEEE 802.18. 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.

Electronic filing November 15, 2023

Re: Consultation Paper on Open and De-licensed use of Unused or Limited Used Spectrum Bands for Demand Generation for Limited Period in Tera Hertz Range

Dear Shri Akhilesh Kumar Trivedi, Advisor (Network, Spectrum & Licensing)

IEEE 802 LAN/MAN Standards Committee (IEEE 802 LMSC) thanks Telecom Regulatory Authority of India (TRAI) for issuing the consultation “Consultation Paper on Open and De-licensed use of Unused or Limited Used Spectrum Bands for Demand Generation for Limited Period in Tera Hertz Range” and for the opportunity to provide feedback.

IEEE 802 LMSC is a leading consensus-based open standards development committee for networking standards that are used by industry globally. It produces standards for networking devices, including wired and wireless local area networks (“LANs” and “WLANs”), wireless specialty networks (“WSNs”), wireless metropolitan area networks (“Wireless MANs”), and wireless regional area networks (“WRANs”). Technologies produced by implementers of our standards are a critical element for all networked applications today.

IEEE 802 LMSC is a committee of the IEEE Standards Association and of Technical Activities, two of the Major Organizational Units of the IEEE. IEEE has about 400,000 members in over 160 countries and its core purpose is to foster technological innovation and excellence for the benefit of humanity.  IEEE is also a major accredited standards development organization whose standards are recognized world-wide. In submitting this document, IEEE 802 LMSC acknowledges and respects that other components of IEEE Organizational Units may have perspectives that differ from, or compete with, those of IEEE 802 LMSC. Therefore, this submission should not be construed as representing the views of IEEE as a whole[[1]](#footnote-1).

Please find below the comments of IEEE 802 LMSC on Question 3 “Whether there is a need for permitting license-exempt operations in any other bands in the 95 GHz to 3 THz frequency range? Please provide a detailed response with justification”.

**Recommend to permit license-exempt operations between 252 GHz and 325 GHz**

IEEE 802 LMSC applauds TRAI’s progressive approach in permitting license-exempt operations in the frequency bands 116 GHz to 123 GHz, 174.8 GHz to 182 GHz, 185 GHz to 190 GHz, and 244 GHz to 246 GHz. In addition to the proposal, IEEE 802 LMSC recommends TRAI to allow license-exempt operations between 252 GHz and 325 GHz.

IEEE 802 LMSC has been working on TeraHertz (THz) Communications since 2008, when an Interest Group (IG) THz was formed in the IEEE 802.15 Working Group for Wireless Specialty Network, followed by transiting the Interest Group to the current IEEE 802.15 Standing Committee THz (SC THz). As a spin-off of the activities of the IEEE 802.15 IG THz group, IEEE 802 LMSC published IEEE Std 802.15.3dTM-2017 in 2017 - an amendment to IEEE Std 802.15.3TM-2016, which defines physical layer (PHY) at the frequency range between 252 GHz and 325 GHz for switched point-to-point links and defines two PHY modes that enables data rates of up to 100 Gb/s using eight different bandwidths between 2.16 GHz and 69.12 GHz. Applications targeted with this standard comprise wireless backhaul/fronthaul links, wireless links in data centers as well as short-range applications such as kiosk downloading, intra-device and close-proximity communication. In 2022, IEEE 802 LMSC initiated a project to revise IEEE Std 802.15.3TM-2016, which also includes the integration of amendment IEEE Std 802.15.3dTM-2017 into the main standard IEEE Std 802.15.3TM-2016 and an extension of the channel plan up 450 GHz covering the spectrum, that has been identified by World Radiocommunications Conference (WRC) 2019 in Radio Regulation (RR) No. 5.564A.

**Use cases supported by** **IEEE Std 802.15.3dTM-2017**

The standard defines a wireless switched point-to-point physical layer operating at PHY data rates of 100 Gb/s with fallback solutions at lower data rates. The standard provides low complexity, low cost, low power consumption, and high data rate wireless connectivity among devices. The supported data rates are expected to satisfy a set of consumer multimedia industry needs, and to support emerging wireless switched point-to-point applications. Five use cases supported by this standard are shown below and the detailed information is provided in Application Requirement Document[[2]](#footnote-2).

- Intra-device communication

- Close proximity P2P applications (e.g. kiosk downloading and file exchange)

- Wireless backhaul/fronthaul

- Data centers

- Touchless gate systems[[3]](#footnote-3)

**Technical requirements for IEEE Std 802.15.3dTM-2017**

The requirements to define a wireless switched point-to-point physical layer operating at a nominal PHY data rate of 100 Gb/s with fallbacks to lower data rates as needed in terms of minimum data rates, required BER and required transmission distances depending on the specific use cases are shown in Table 1.

Table 1 Required performance for different use cases

|  |  |  |  |
| --- | --- | --- | --- |
| Use case | Minimum Data Rate in Gb/s | Required BER after error correction | Required Transmission Distance (m) |
| Intra-Device Communication  | 1 | 10-12 | 0.03 |
| Close Proximity Communication  | 1 | 10-6 | 0.1 |
| Wireless Fronthauling  | 10[[4]](#footnote-4) | 10-12 | 200 |
| Wireless Backhauling  | 10 | 10-12 | 500 |
| Wireless Data Center  | 1 | 10-12 | 100 |

The standard shall also comply with the regulatory requirements taking into account the specific situation for carrier frequencies beyond 275 GHz. However, it would be preferable for IEEE 802.15.3d devices to use the whole range of the operational frequency 252 GHz to 325 GHz. The channel arrangement of IEEE Std 802.15.3dTM-2017 is shown in Figure 1. The maximum channel bandwidth is 69.12 GHz could be in worldwide operation if the regulations allow IEEE 802.15.3d devices to radiate transmission power in the whole range of the frequency in Regions 1, 2, and 3. The further information on technical requirements is provided in Technical Requirement Document[[5]](#footnote-5).



Figure 1 Channel arrangement in the frequency range 252 GHz to 325 GHz

**Conclusion**

IEEE 802 LMSC thanks TRAI for the opportunity to provide this submission and commends the TRAI’s leadership in opening THz bands for license-exempt operations. IEEE 802 LMSC kindly requests TRAI to consider our requests in opening 252 GHz to 325 GHz frequency band for license-exempt operations.

Respectfully submitted

By: /ss/.

Paul Nikolich

IEEE 802 LAN/MAN Standards Committee Chairman

em: p.nikolich@ieee.org

1. This document solely represents the views of IEEE 802 LMSC and does not necessarily represent a position of either the IEEE or the IEEE Standards Association. [↑](#footnote-ref-1)
2. See <https://mentor.ieee.org/802.15/dcn/14/15-14-0304-16-003d-applications-requirement-document-ard.docx> [↑](#footnote-ref-2)
3. This use case was standardized using 60 GHz band and published as IEEE Std 802.15.3eTM-2017. See IEEE Xplore <https://ieeexplore.ieee.org/document/7856917> [↑](#footnote-ref-3)
4. 10 Gb/s is the maximum data rate available today in CPRI. Hence, this shall be the minimum data rate targeted in the amendment. [↑](#footnote-ref-4)
5. See <https://mentor.ieee.org/802.15/dcn/14/15-14-0309-20-003d-technical-requirements-document.docx> [↑](#footnote-ref-5)