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Radio Regulatory Technical Advisory Group (RR-TAG)

Proposed Response to ACMA consultation "New arrangements for low interference potential devices"

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This contribution proposed a response to:

Australian Communications and Media Authority (ACMA) New arrangements for low interference potential devices - consultation 35/2022

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Re: Consultation on "New arrangements for low interference potential devices - consultation 35/2022"

Dear ACMA,

IEEE 802 LAN/MAN Standards Committee (LMSC) thanks ACMA for issuing the consultation and the opportunity to provide feedback on "New arrangements for low interference potential devices - consultation 35/2022". The Consultation is an important mechanism for soliciting feedback that will provide ACMA with the information necessary.

IEEE 802 LMSC is a leading consensus-based industry standards body, producing standards for wireless networking devices, including wireless local area networks ("WLANs"), wireless specialty networks ("WSNs"), wireless metropolitan area networks ("Wireless MANs"), and wireless regional area networks ("WRANs"). We also produce standards for wired ethernet networks, and technologies produced by implementers of our standards are critical for all networked applications today.

IEEE 802 LMSC is a committee of the IEEE Standards Association and Technical Activities, two of the Major Organizational Units of the Institute of Electrical and Electronics Engineers (IEEE). IEEE has about 400,000 members in over 160 countries. IEEE's core purpose is to foster technological innovation and excellence for the benefit of humanity. 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].

In the past ten years, the IEEE 802 LMSC has overseen the development of many standards (including IEEE Std. 802.11ac-2014 [1], IEEE Std. 802.11ah-2016 [2], and IEEE Std. 802.11ax-2021 [3]) that operate in unlicensed bands and can provide physical layer throughputs from 150 kb/s in support of IoT devices to over 1 Gb/s in support of applications such as teleconferencing, video, and video gaming. The current Wi-Fi HaLow technology [4] is based on the IEEE Std. 802.11ah-2016 standard [2]. The current Wi-Fi 6 and Wi-Fi 6E technologies [5] are based on the IEEE Std. 802.11ax-2021 standard [3]. IEEE P802.11be [6] will provide physical layer throughput capacity at gigabit speeds and is the basis that the upcoming Wi-Fi 7 technologies [7] utilize for development. These IEEE 802 technologies have become an integral part of global citizens' lives.

IEEE Std 802.15.4 serves billions of devices worldwide using unlicensed spectrum for many applications such as IoT sensors, monitoring, control, real-time location services, and secure access control. A major revision project to the IEEE Std 802.15.4-2020 standard has commenced, rolling up several published amendments since 2020, including IEEE Std 802.15.4z-2020 [8], which defined enhanced UWB technology. IEEE Std 802.15.4z-2020 is already widely being used in consumer, automotive, commercial, and industrial markets. In addition to the revision to IEEE Std 802.15.4-2020, a new amendment on "Next generation UWB," which will be rolled up in a future revision to IEEE 802.15.4, is being developed in task group IEEE 802.15.4ab [9] to further enhance UWB capabilities for better performance, greater precision, and new uses such as presence detection and other sensing applications.

[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.

Discussion: The 915-928 MHz and 2.4 GHz Bands are Already Heavily Used

Satellite IoT undoubtedly has a role to play in Australia where the use of sensors in remote areas is desirable, e.g., for agricultural, mining, flood, and bushfire monitoring use cases.

However, the 915-928 MHz and 2.4 GHz LIPD frequency bands in Australian towns and cities are already heavily used.

In the 915-928 MHz band, Wi-Fi HaLow (IEEE 802.11ah), Wi-SUN (IEEE 802.15.4g), LoRaWAN, and RFID devices are present throughout Australia. In particular:

- IEEE 802.15.4g (Wi-SUN) mesh networks are deployed in the state of Victoria, and the city of Melbourne in particular, for smart meters [10, 11].
- The heat map provided by the Things Network (https://ttnmapper.org/heatmap/) illustrates the concentration of LoRaWAN IoT devices in the major centers across Australia and the relative sparseness elsewhere.
- RFID is used extensively across the country in logistics and for applications such as road toll collection. Existing congestion in the 915-928 MHz band led to an allocation of an additional 7 MHz for duty cycle-based devices in the 928-935 MHz band, effective in 2021 [12].
- The 915-928 MHz band in Melbourne has been studied for potential use by Satellite IoT [13]. The band was found to be "highly" used and that additional use of the band by Satellite IoT would need consideration of "smarter" medium access methods. The study did not consider hotspots that may occur in buildings and particular areas, or the effect of Satellite IoT on existing terrestrial devices already using the band, or the likelihood of additional terrestrial devices using the band in future. ACMA is already aware of this potential growth [14].

In the 2.4 GHz band, Wi-Fi 4 (IEEE 802.11n), Wi-Fi 6 (IEEE 802.11ax), Bluetooth, Zigbee, and Thread (IEEE 802.15.4) devices are widely used.

Responses to Question 1

Q: Should a separate new item be introduced to facilitate higher-power RLAN transmitters in 5150–5250 MHz, or should existing item 61 be modified?

IEEE 802 LMSC supports ACMA's proposal to allow outdoor use with a maximum EIRP of 1 W (30 dBm) in line with ITU Resolution 229 (Rev. WRC-19). IEEE 802 LMSC proposes to modify the existing item 61 with maximum EIRP of 1 W (30 dBm) and other required changes, and does not recommend a separate new item.

Responses to Question 2

Q: Which of the 2 simple emission masks outlined in ITU Resolution 229 (Rev. WRC-19) should be implemented in Australia for 1 W RLAN transmitters in the 5150–5250 MHz band?

IEEE 802 LMSC supports aligning regulatory requirements for 5150–5250 MHz with other regulatory bodies, such as US FCC for U-NII-1 band. Therefore, IEEE 802 LMSC proposes AMCA to adopt "the maximum EIRP at any elevation angle above 30 degrees, as measured from the horizon shall not exceed 125 mW (21 dBm)".

Please note that similar radiation mask requirements are used for outdoor Standard Power devices operating under supervision of automated frequency coordination in 6 GHz band in US and Canada.

Responses to Question 3

Q: Subject to which emission mask is implemented (see Question 2), would a device registration system (or similar – see Canadian approach above) be needed for outdoor deployments exceeding 200 mW (23 dBm) transmission power? Note that such a regime would require further regulatory development. Accordingly, a decision to implement such a regime may delay access under those arrangements.

IEEE 802 LMSC believes that the radiation mask subject of Question 2 properly addresses any coexistence concerns, and no additional restrictions are needed for outdoor deployments exceeding 23 dBm. US FCC authorizes operation in the band with maximum EIRP of 4 W (36 dBm) without any additional requirements.

Responses to Question 11

Q: What is an appropriate power for such services so that there is no impact on other services? While some might operate at power levels slightly higher than those currently supported under the LIPD class licence, others could at operate higher levels. The impact also depends on other technical parameters such the orbital characteristics, number of satellites and what types of services are sharing the band. Such considerations suggest a case-by-case approach (more akin to an apparatus licensing regime) may be required.

Satellite IoT at any transmit power is likely to impact existing services in dense population centers where the frequency band is already congested. Existing devices may cease to operate reliably due to congestion or raising of the noise floor. Detailed comments or recommendations would require knowledge of the technology involved, for example, the size of messages, transmit power, medium access control method, number of devices in a given area, direction and volume of data traffic, antenna orientation, receive footprint, duty cycle, and location of devices. IEEE 802 LMSC agrees that a case-by-case approach may be required.

Q: What effect, if any, will the proposed use have on existing services such as the amateur-satellite services and services authorised under the LIPD class licence? For example, Wi-Fi, Bluetooth and radio frequency identification devices (RFID).

This depends on the level to which the overall noise floor is raised by Satellite IoT and on the potential increase in the number of packet collisions. Additional devices in the frequency band will cause an increase in packets and therefore, an increase in packet collisions, which in turn decrease the achievable throughputs for all existing technologies. An overall increase in noise floor above certain energy detect levels would cause existing LIPD devices relying on listen before talk (LBT), such as Wi-Fi and Wi-SUN based on IEEE 802.11 and IEEE 802.15 technologies, respectively, to cease transmission. It would also cause duty cycle-based technologies, e.g., LoRaWAN, relying on very low receiver sensitivities to fail to receive packets, and similarly cause RFID tags to become unreadable.

Energy detect levels for representative LBT technologies are provided as reference.

- IEEE Std 802.11ah devices operating at 915-928 MHz: -75 dBm [2]
- IEEE Std 802.15.4g devices operating at 915-928 MHz [15]:
  - OFDM PHY: in [-100 dBm, -78 dBm]
  - O-QPSK PHY: in [-100 dBm, -80 dBm]
  - FSK PHY with FEC: in [-100 dBm, -78 dBm]
  - FSK PHY without FEC: in [-94 dBm, -72 dBm]
- IEEE Std 802.11n and IEEE Std 802.11ax devices operating at 2.4 GHz: -62 dBm [1]

Typical recommended sensitivity levels for representative duty cycle devices are also provided as reference.

- LoRaWAN [16]: -120 dBm
- RFID reader receive sensitivity [17]: -90 dBm

Q: Do systems need to be brought under the scope of the Radiocommunications Act via variations to the Radiocommunications (Australian Space Objects) Determination 2014 or the Radiocommunications (Foreign Space Objects) Determination 2014?

No comment.

Q: Is the LIPD class licence or the communication with space objects (CSO) class licence the appropriate legislative instrument to be used to facilitate such systems?

No comment.

Q: If apparatus licensing is used, are the current apparatus licence fees and taxes appropriate? (Assuming the entire band is licensed, for the 915–928 MHz band, the annual tax for an Australia-wide space licence is estimated as $36,673; for the 2400–2483.5 MHz band, the annual tax for an Australia-wide space licence is $235,194.)

No comment.

Response to the Supplementary Information on 925–6425 MHz band

The draft variation includes the proposed insertion of item 57A in Schedule 1 to authorise these transmitters. A maximum effective isotropic radiated power (EIRP) of 25 mW is proposed in line with existing item 63AB in Schedule 1 of the LIPD class licence. However, a higher maximum spectral density of 10 mW, compared with 1.25 mW in item 63AB, a maximum channel bandwidth of 20 MHz, a maximum EIRP density for out-of-band emissions below 5925 MHz of -37 dBm/MHz and a minimum of 15 hopping frequencies are proposed to align with European arrangements.

It appears that the proposal may be related to preliminary study from Europe and the UK, and IEEE 802 LMSC is unaware of completed supporting coexistence studies.. While IEEE 802 LMSC supports revision of regulation for very low power devices to facilitate a broader range of applications, we observe that the introduction of higher power spectral density for narrowband frequency hopping devices may potentially introduce excessive interference into IEEE 802.11 based Wi-Fi devices. ETSI BRAN is currently in the final phase of development of the compliance specification (EN 303 687), which includes requirements for narrowband operation with higher spectral density. Mechanisms specific to narrowband devices to ensure effective and efficient use of the band is still to be defined and further studies are likely to be conducted on this topic to serve as input into a future revision of EN 303 687. For this reason, IEEE 802 LMSC recommends postponing the details of narrowband operation with higher spectral density to after such detailed studies are conducted.

IEEE 802 LMSC would like to use this opportunity to also comment on Item 63AA for Low Power Indoor operation and request an explicit clarification that Low Power Indoor clients in this band can connect to an access point or another client device and may or may not be battery powered. This clarification is consistent with European Decision (20)01 and UK regulatory requirement for license-exempt operation in the 6 GHz band to enable Client to Client operation.

Conclusion

IEEE 802 LMSC thanks the ACMA for providing this invaluable opportunity to provide this submission on “New arrangements for low interference potential devices - consultation 35/2022”. IEEE 802 LMSC kindly requests ACMA to take into account responses to Questions 1, 2, 3, 11 and comments regarding the 6 GHz band above.

Respectfully submitted

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