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Radio Regulatory Technical Advisory Group (RR-TAG)

Draft Response to Japan MIC's consultation re IEEE 802.11ah				
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This contribution proposed a response to Japan Ministry of Internal Affairs and Communications (MIC)'s consultation "Soliciting opinions on the draft notification that defines the range of frequencies that can be used as a specified experimental testing station related to the Digital Rural Health Special Zone"

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Re: Consultation "Soliciting opinions on the draft notification that defines the range of frequencies that can be used as a specified experimental testing station related to the Digital Rural Health Special Zone"

Dear Radio Policy Division, Radio Department, Telecommunications Infrastructure Bureau,

IEEE 802 LAN/MAN Standards Committee (IEEE 802 LMSC) thanks Japan Ministry of Internal Affairs and Communications (MIC) for issuing the consultation "Soliciting opinions on the draft notification that defines the range of frequencies that can be used as a specified experimental testing station related to the Digital Rural Health Special Zone" 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].

Please find below the comments of IEEE 802 LMSC.

Overview of IEEE Std 802.11ah-2016

IEEE Std 802.11ah-2016[2], known as Wi-Fi HaLow in the marketplace[3], was an amendment to the IEEE 802.11 standard[4] that specifies mechanisms for the operation of Wi-Fi in the license exempt sub 1 GHz bands. It was developed with sensor and IoT networks and applications, such as

[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.

[2] IEEE Standard for Information technology—Telecommunications and information exchange between systems - Local and metropolitan area networks—Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment 2: Sub 1 GHz License Exempt Operation, IEEE Std 802.11ah-2016 (Amendment to IEEE Std 802.11-2016, as amended by IEEE Std 802.11ai-2016), vol., no., pp.1-594, 5 May 2017, doi: 10.1109/IEEESTD.2017.7920364.

[3] Wi-Fi Alliance: Wi-Fi CERTIFIED HaLow. Available online [accessed: 17 October 2023]

[4] IEEE Std 802.11ah-2016 is incorporated into the IEEE Std 802.11-2020 standard (see clauses 10.45 to 10.62, clause 23, and Annex L).

agriculture[5], in mind. Other application areas include digital healthcare and smart homes, as well as industrial, retail, and smart city environments.

IEEE Std 802.11ah-2016 is designed for long range, low power sensor applications. It excels in long range coverage of over 1 km (subject to the maximum allowed transmit power) and allows excellent penetration through walls and obstacles. The standard supports a wide range of OFDM data rates from 150 Kbps to 43.3 Mbps[6] that allow support for sensors and new applications that may combine video applications with sensors. It also introduced many features to increase energy efficiency and optimize power consumption per device. Of particular note are the mechanisms for reducing overhead and relaxing timing for energy limited clients that may operate from a coin cell, and the introduction of Target Wake Time (TWT) that allows long sleeping devices to negotiate a time for the devices to be active.

For the commercial IEEE 802.11ah-based Wi-Fi HaLow devices, it uses the same robust security mechanisms defined in IEEE Std 802.11-2020[7] that are found in consumer smartphone and PC products.

Recommendation on the technical requirements

IEEE 802 LMSC supports MIC's initiative to promote rapid technical development and commercialization of IEEE 802.11ah-based Wi-Fi HaLow devices through its proposed experimental trial in the license exempt 800 MHz band (i.e., 853 MHz to 860 MHz). The license exempt model is a very effective way to deploy new IoT applications and allow them to scale. Experience gathered from such deployment and operation will be very valuable to MIC.

IEEE 802.11ah technologies are spectrum and energy efficient, allowing for denser deployments of devices, and particularly useful where new IoT device applications require secure bi-directional communication over the Internet, for example to support firmware upgrades or cloud services. To gain a full appreciation of the capabilities of IEEE 802.11ah-based Wi-Fi HaLow devices, IEEE 802 LMSC recommends the following technical requirements on this experimental trial:

- IEEE 802.11ah technologies can be deployed in scenarios where video is transmitted at a range farther than an IEEE 802.11 device operating in other frequency bands. Such video use can be enabled by increasing the maximum EIRP limit from 0.035 W to 1W, which is available in other jurisdictions, for example, under the Low Interference Potential Devices Class License in Australia[8].
- IEEE 802.11ah technologies can be deployed in new applications that may combine video applications with sensors. Such new applications can be enhanced by removing the 10%

[5] Wi-Fi Alliance: The future of farming: Testing the rural range of Wi-Fi CERTIFIED HaLow™. Available online [accessed: 17 October 2023]

[6] For a single stream 8 MHz capable IEEE 802.11ah device

[7] "IEEE Standard for Information Technology--Telecommunications and Information Exchange between Systems - Local and Metropolitan Area Networks--Specific Requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications," IEEE Std 802.11-2020 (Revision of IEEE Std 802.11-2016) , vol., no., pp.1-4379, 26 February 2021, doi: 10.1109/IEEESTD.2021.9363693.

[8] "Radiocommunications (Low Interference Potential Devices) Class Licence 2015, as amended made under section 132 of the Radiocommunications Act 1992," Federal Register of Legislation of the Australian Government, 19 May 2023. Available online [accessed: 17 October 2023]

duty cycle requirement as documented in ARIB STD-T108[9] and by providing wider channels, for example up to 8 MHz wide.

Lastly, IEEE 802 LMSC recommends that MIC considers extending the scope of the experimental trial to permit other IEEE 802 radio technologies, such as IEEE Std 802.15.4-2020 Smart Utility Networks (SUN)[10], to be evaluated for use in the band. IEEE Std 802.15.4-2020 specifies physical layer radio and medium access control mechanisms for operation in sub 1 GHz license exempt frequency bands from 169 MHz to 928 MHz. The technology was initially developed for SUN and other large scale IoT networks, such as smart city networks. Devices using IEEE Std 802.15.4-2020 SUN are extensively deployed as Wi-SUN home area network (HAN) and Wi-SUN field area network (FAN) in a range of applications not only for smart utilities and smart cities[11,12] but also for smart agriculture and healthcare[13].

Conclusion

IEEE 802 LMSC thanks MIC for the opportunity to provide this submission and commends the proposed experimental trial of IEEE 802.11ah-based Wi-Fi HaLow devices in the 853 MHz to 860 MHz band. IEEE 802 LMSC kindly requests MIC to consider our requests on the change in technical requirements and extend the scope of the trial to cover other IEEE 802 based technologies.

Respectfully submitted

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[9] "920MHz-Band Telemeter, Telecontrol and Data Transmission Radio Equipment," ARIB STD-T108, version 1.5, 3 March 2023.
[10] "IEEE Standard for Low-Rate Wireless Networks," IEEE Std 802.15.4-2020 (Revision of IEEE Std 802.15.4-2015), vol., no., pp.1-800, 23 July 2020, doi: 10.1109/IEEESTD.2020.9144691.
[11] Wi-SUN Alliance. Available online [accessed: 17 October 2023]
[12] National Institute of Information and Communications Technology: World's First Application of Wi-SUN Radio Sensor Network to Fishery Industry, MOZUKU Seaweed Aquaculture, 25 December 2015. Available online [accessed: 17 October 2023]
[13] Japan Science: Successful multi-stage relay demonstration experiment performed at Kyoto University medical institution, 26 July 2021. Available online [accessed: 17 October 2023]