Hewlett Packard Enterprise

19 Dec 2022

The Manager
Spectrum Planning Section
Australian Communications and Media Authority
PO Box 78
Belconnen ACT 2616

Re: Variation to the Low Interference Potential Device Class Licence

Hewlett Packard Enterprise (HPE) submits these comments in response to the consultation from the Australian Communications and Media Authority (ACMA) on the Variation to the Low Interference Potential Device (LIPD) Class Licence.

HPE is one of the world's largest providers of managed wireless local area network (WLAN or RLAN) infrastructure and is a global leader in the Wi-Fi equipment marketplace. HPE's Aruba business unit ships millions of indoor and outdoor Wi-Fi access points (APs) every year, representing approximately 15% of the global market revenue for such devices. We have been a significant provider of WLAN equipment to Australian enterprises and service providers for nearly two decades.

HPE welcomes ACMA's proposal of updating the LIPD class licence to enable higher-power and outdoor RLAN use in 5150 – 5250 MHz. As HPE noted in our response to ACMA's initial 6 GHz consultation last year, HPE supplies outdoor Wi-Fi solutions for a variety of mission critical deployment types in Australia, including the mining, petrochemical, logistics/shipping, healthcare, education (primary and secondary), sporting and other large public venue, municipal, and government agency sectors. As examples, here are a few leading Australian companies/entities (and HPE Aruba customers) whose outdoor connectivity needs will directly benefit from permitting a new spectrum band for higher-power outdoor use under the LIPD class license:

a. Chevron Australia
b. Pilbara Ports Authority
c. Mid West Ports Authority
d. SA Health
e. James Cook University
f. Sydney Showground Stadium (aka "Giants Stadium")
g. Newcastle City Council

In addition to "RLAN radiocommunications transmitters in the 5150 – 5250MHz", HPE also has interests in ACMA's proposed changes on "Frequency hopping radiocommunications transmitters in the 5925–6425 MHz band" and "Definition of 'indoor'", with our comments on the following pages.

Should you have questions, please contact any of the HPE signatories below.

Sincerely,

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RLAN radiocommunications transmitters in the 5150–5250 MHz band

Question 1 Should a separate new item be introduced to facilitate higher-power RLAN transmitters in 5150–5250 MHz, or should existing item 61 be modified? **Question 2** 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?

HPE welcomes ACMA's proposal of updating the LIPD class licence to enable higher-power and outdoor RLAN use in 5150 – 5250 MHz. The current available spectrum for outdoor RLAN use is very limited in Australia, with only three available 80 MHz channels in the 5 GHz band, of which channel 106 (5490 – 5570 MHz) requires DFS. This is not enough to make a reliable network. Permitting 5150 – 5250 MHz and later the 6 GHz band for higher-power and outdoor use will enable a lot of outdoor Wi-Fi use cases, which can catalyze business innovation and promote broadband connectivity in rural and remote areas in Australia.

Resolve 3 of Resolution-229 (WRC-19) provides guidance for administrators who want to deploy higher-power outdoor RLAN services in 5150 – 5250MHz. In this resolve, EIRP emission masks are required on RLAN to prevent aggregate interference to FSS Earth-to-space communications. However, it is HPE's view that *resolve 3* is only necessary for outdoor RLAN deployment, there is no need to mandate the resolve for indoor RLAN since the building entry loss already provides enough attenuation for RF emissions to the space. Indeed, countries that have already permitted higher-power RLAN in the band such as Canada and US only require the EIRP emission mask for outdoor RLAN deployment despite their permitted EIRP being 4 times higher than ACMA proposed.

Mandating EIRP masks for indoor RLAN contributes little to reduce the aggregate interference seen by the satellite space receiver. Instead, it creates an unnecessary barrier for enterprise customers who may have to use wall-mounted installation option either because reaching ceiling is difficult or wiring through a hard ceiling is impossible. Figure 1 shows a typical wall-mounted installation for Wi-Fi AP. The antenna 3dB beamwidth from the AP in this case can be greater than 60 degrees. To meet the EIRP mask, users may have to reduce AP's EIRP, which will lead to poor coverage and compromised user experience.

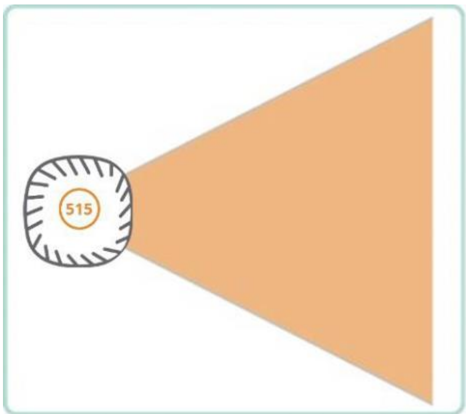
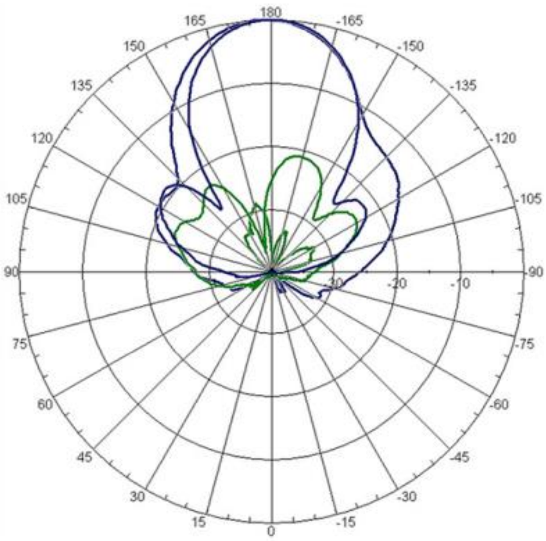


Figure 1 Wall Mounted Access Point

With respect to the EIRP mask options, we think ACMA should use the second EIRP mask in the consultation, being:

> "the maximum EIRP at any elevation angle above 30 degrees, as measured from the horizon shall not exceed 125 mW (21 dBm)."

Using the EIRP mask at 30 degrees rather than 5 degrees allows users to install a high directivity antenna that concentrates its RF energy to the intended service area. High directivity antenna has the advantage of energy savings and interference reduction, it is commonly used by rural broadband providers in their fixed wireless access or in mesh Wi-Fi networks to backhaul the internet traffic. In Figure 2's example, the Aruba dual-polarized antenna used for outdoor Wi-Fi has 30° H x 30° V beamwidths. The antenna gain at 30 degrees elevation is about 10 dB below its peak, this converts to 20 dBm at that elevation when AP transmits a maximum EIRP of 30 dBm. However, if the 5 degrees EIRP mask is mandated, users will have to reduce AP's EIRP to 24 dBm as there is little antenna gain discrimination at 5 degrees off the boresight. This will result in a much shorter hop distance.



Vertical Pattern

Figure 2 Vertical Patter of an Aruba outdoor dual-polarized antenna

In addition to the comments above, we recommend ACMA to use maximum EIRP instead of power spectral density for the EIRP mask. Therefore, our suggestion that item 61 in Schedule 1 of Radiocommunications (Low Interference Potential Devices) Class Licence 2015 should be modified to:

	Class of transmitter	Permitted operating frequency band (MHz)	Maximum EIRP	Limitations
61	Radio local area network transmitters	5150–5250	1 W (averaged over the entire transmission burst)	For outdoor RLAN use, the maximum EIRP must not exceed 125 mW (21 dBm) EIRP, in any direction, above 30 degrees of elevation as measured from the horizon.

Question 3

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.

HPE does not think a device registration system is needed for outdoor RLAN deployment with EIRP greater than 200 mW. LIPD class licence provides a blanket licensing provision for RLAN users to operate under a no-interference, no-protection basis. It brings great success for residential and enterprise users to establish their wireless networks without going through a complex licensing arrangement. Any individual licensed approach for RLAN to access the spectrum will entails a higher administrative burden for users.

The rationale for administrations to use the licensing system is to control the number of higher-power outdoor RLAN equipment in 5150 – 5250 MHz to ensure the protection of incumbent services. For example, the FCC only requires parties to submit a letter to the Commission acknowledging that, before deploying an aggregate total of more than one thousand outdoor access points within the 5150 – 5250 MHz band.

In fact, outdoor RLAN only contributes a very small percentage of the total RLAN equipment deployed. Data shows outdoor RLANs comprise no more than about 0.5% of total consumer and enterprise annual access point shipments by unit volume, this is well under the 3% threshold in the ITU-R sharing study between RLAN and FSS. In addition, ACMA only proposes 1W EIRP for outdoor RLAN to operate within the 5150 – 5250 MHz band, this is one-fourth of the radiating energy in comparison with US and Canada allowed. Given the lower EIRP proposed and the limited number of outdoor RLANs, HPE recommends ACMA continue using LIPD class licence regime to accommodate higher-power outdoor RLAN without imposing a device registration system.

Definition of 'indoor'

HPE agrees with the ACMA that there is a need to clarify that the intention of indoor use is to limit use within buildings. However, the definition of "indoor" should not be too restrictive. Many indoor places such as warehouses, retail, sports stadium, and hospitality spaces are enclosed by a mixture of building structures such as walls, windows, doors or other partly opened areas. Requiring permanent walls on all sides will prevent such places to use indoor Wi-Fi such as the recent approved Wi-Fi 6E LPI devices. The indoor definition should also include places like boats and cabins in ferries and cruise liners. They have fixed walls but are not permanently fixed to land, however they are similar to land indoor environment in terms of RF interference. ACMA may decide to explicitly prohibit LIPD operation within planes, trains, ships, and/or automobiles for certain bands, but the general indoor definition should encompass those spaces.

Frequency hopping radiocommunications transmitters in the 5925 – 6425 MHz band

There isn't any question from ACMA on permitting frequency hopping transmitters use in the 5925 – 6425MHz band, but we would like to comment on this variation.

1. Study shows VLP devices with higher PSD will increase the interference risk to incumbent Fixed Services.

The sharing and combability study in ECC 302, which is used as a basis for the response to the EC Mandate on 6 GHz WAS/RLAN in CEPT Report 73, used a power density sensitivity analysis to assess the interference to FS from RLAN. In the minimal coupling loss analyses carried by study A in the report (result cited in Figure 3), the peak separation distance between FS and RLAN increases linearly with the PSD level (dBm/MHz) of RLAN devices. Relaxing the PSD limit of VLP devices from 1.25mW/MHz to 10mW/MHz use will require to a greater separation distance between frequency hopping devices and fixed microwave link. In other words, it can increase the interference risk to Fixed Services.

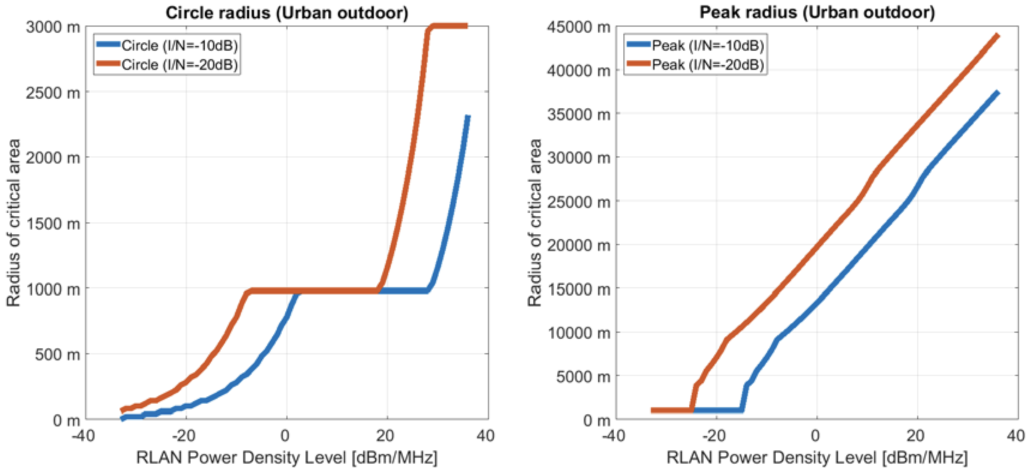


Figure 3 Dependency of critical radii on the WAS/RLAN power density outdoors (Cited from ECC Report 302)

2. 6 GHz is critical to the future Wi-Fi network, decision on permitting another technology to access this band should be carefully made.

The 6 GHz band has multiple 80/160 MHz channels that previous 2.4/5 GHz cannot provide. This greenfield spectrum is indispensable to novel use cases such as Augmented Reality (AR) and Virtual Reality (VR) that require wider channels for their throughput and latency requirements. The 6 GHz band is also vital to the future enterprise Wi-Fi networks. Not only for its premium speed and latency performance, but also Wi-Fi networks deployed on the 6 GHz band do not need to be backwards compatible with previous generations, which means the wireless network built on the band can fully utilize the latest Wi-Fi technology such as WPA3 for enhanced security protocol, BSS colouring for reducing interference, and OFDMA for increased capacity.

Because of the great potential of the 6 GHz spectrum, it is crucial to fully understand the co-existence issues between unlicensed technologies operating in the same band. For instance, international standard development bodies took years to find a sharing compromise between Wi-Fi & LAA/NR-U technologies that were similar in terms of spectrum access. However, studies from IEEE 802.11 Coex SC and ETSI BRAN show frequency hopping spread spectrum transmitters (FHSS) can degrade the throughput and latency performance of Wi-Fi networks because of their way of accessing the spectrum[1]. There is still no consensus from standard bodies on how FHSS can fairly access the spectrum. If FHSS devices unreasonably interfere with 802.11 protocol at 6 GHz then businesses and citizens will not realize the tremendous benefits of this greenfield spectrum mentioned above.

[1] https://mentor.ieee.org/802.11/dcn/21/11-21-1550-00-coex-narrowband-coexistence-issues-with-enhanced-daa-in-6-ghz.docx

Even though FHSS use Listen-Before-Talk (LBT) protocol to access the spectrum, it can still degrade RLAN performance. FHSS device hops over multiple narrow channels within the authorized frequency band. A narrow bandwidth RF signal with high PSD can block an entire Wi-Fi channel if the frequency of the FHSS transmitter falls into that Wi-Fi channel. When it comes to multiple FHSS devices exist in a Wi-Fi network, the scattered narrow channels from FHSS devices can dominate the entire 6 GHz band, which leads a poor utilization of the spectrum that would otherwise be used as several wide Wi-Fi channels.

3. LIPD class licence already provides abundant spectrum for FHSS devices.

Bluetooth devices, as the majority of FHSS devices, currently only operate on the 2.4 GHz band. We noticed that FHSS devices have already been authorised to operate in 2400 – 2483.5 MHz, 915 – 928 MHz, and 5725 – 5850 MHz bands in the ACMA LIPD class licence. The supply of the spectrum for FHSS devices well exceeds the demand. Indeed, manufactures just started to release new FHSS devices operating in 5725 – 5850 MHz[2], there are very limited number of FHSS devices operating in the 5 GHz band currently. No evidence shows there is a need for new spectrum band to accommodate the services. In order to make the spectrum use more efficiently, ACMA should assess the current spectrum utilization rate of FHSS devices before authorising new frequency bands.

[2] Measurement Report FCC Part 15.247/ISED RSS-247 Bluetooth