

Proposed updates to the LIPD Class Licence for 6 GHz RLANs

Outcomes paper

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Executive summary

In October 2021, the ACMA released a [consultation paper](#) proposing updates to the Radiocommunications (Low Interference Potential Devices) Class Licence 2015 (the LIPD Class Licence).) The proposed updates aimed to support new technology applications, most notably next generation wi-fi systems (known as Wi-Fi 6e), by authorising the use of radio local area network (RLAN) devices in the 5925–6425 MHz frequency band (the 'lower 6 GHz band').

The consultation paper proposed to allow 2 different classes of device in the lower 6 GHz band with differing operating restrictions. It also proposed emission parameters to ensure protection of lower-frequency-adjacent intelligent transport systems (ITS) and equitable sharing between RLAN devices through implementation of appropriate spectrum access protocols.

Following consideration of submissions on this issue, we have decided to proceed with the updates to the LIPD Class Licence as proposed and have made the Radiocommunications (Low Interference Potential Devices) Class Licence Variation 2022 (No.1).

Along with these proposed updates, views were sought on potential future uses of the 6425–7125 MHz band (the 'upper 6 GHz band'), expanding on a more general discussion in the previous (April 2021) [discussion and options paper](#) on the band.

Having reviewed responses and considered ongoing international developments in both regulatory and equipment standardisation circles, we believe it is too early to make any firm decisions on the use of the upper band. We recognise there is a sound case for making the upper band available for RLANs in the longer term, but consider that a future decision on the upper band will be better informed by international developments, including harmonisation studies and further evolution of equipment standards.

The consultation paper also discussed a number of related issues which, while they may be investigated further in future, we have decided not to implement at this time. These included:

- > the addition of a third class of device with higher power limits (known as 'standard power' devices)
- > allowing devices to use higher gain directional antennas
- > methods to enable coordination of the 2 above-mentioned types of devices, including the use of a database-driven automatic frequency coordination (AFC) system
- > potential updates to arrangements for RLAN devices in the adjacent 5 GHz band (particularly the range 5150–5250 MHz).

A separate proposal to include arrangements for frequency-hopping spread spectrum devices in the LIPD Class Licence was made in one submission. We intend to examine this issue further, along with the potential 5 GHz updates, as part of our next general LIPD Class Licence review, scheduled for Q3 2022.

The ACMA received 25 submissions to this consultation. Submitters are listed in Appendix A and submissions are available on the [ACMA website](#).

This outcomes paper provides a summary of the submissions received, our response to the main issues raised in those submissions and next steps.

Comments received and responses

The consultation paper asked questions about a variety of issues relating to RLAN use in the 5 GHz and 6 GHz bands. This section summarises the proposals and questions raised in the consultation paper, the comments received in submissions, and provides a response to those comments from the ACMA.

Lower 6 GHz band power levels and classes of device

Consultation

We proposed updating the LIPD Class Licence to allow 2 classes of device in the lower 6 GHz band, referred to as low power indoor (LPI) and very low power (VLP) devices. The proposed power limits and restrictions specific to these classes were:

1. For LPI devices:
 - > maximum power 24 dBm EIRP
 - > maximum power density 11 dBm/MHz EIRP
 - > must operate indoors.
2. For VLP devices
 - > maximum power 14 dBm EIRP
 - > maximum power density 1 dBm/MHz EIRP
 - > may operate in any location.

Comments

There was no opposition to updating the LIPD Class Licence to allow RLAN devices in the lower band. However, several submissions asked for the proposed power or power spectral density limits to be increased.

The proposed power limits in this consultation were the same as those discussed in our preceding (April 2021) consultation, and the requests for higher limits were also mostly repeated from submissions to that first paper. Most often, these requests cited the need to allow very high bandwidth devices to operate at the same power spectral densities as lower bandwidth devices.

ACMA response

We previously noted that bandwidths greater than 160 MHz are not part of the current Wi-Fi 6 specification, but are likely to feature in future technologies (for example, Wi-Fi 7). We have set power limits at the lower end of the useful range at this time, as the limits can be revisited and raised in the future if deemed necessary (for example, as newer, wider bandwidth technologies become available). This may be in the form of an increase in the power limits for VLP and/or LPI devices, or a third class of device that would be able to operate at higher power levels (often referred to as 'standard power' devices), which we are still considering for inclusion in a future update to the class licence.

The power limits now included in the updated LIPD Class Licence will enable the use of current RLAN devices and are broadly aligned with those adopted in several other regulatory jurisdictions, such as Europe and the UK.

Protection of intelligent transport systems (ITS)

Consultation

Along with in-band power limits, the consultation paper also proposed out-of-band limits to ensure ongoing protection of ITS in the adjacent 5855–5925 MHz band. There are similar spectrum arrangements for ITS in place in Europe and the US, and both have restrictions on out-of-band emission levels from 6 GHz RLAN devices to protect ITS systems. Our consultation proposed out-of-band limits of -27 dBm/MHz for LPI devices (the US limit for all devices) and -37 dBm/MHz for VLP devices (the proposed long-term European limit for VLP devices).

Comments

Most responses agreed with the proposal; however, some expressed a view that the -37 dBm/MHz value was too strict, stating that:

- > ITS devices are designed to operate in-band with devices at -30 dBm/MHz
- > an out-of-band limit of -37 dBm/MHz would restrict the use of lower channels and, in particular, the use of wide bandwidth devices, which are already constrained by the number of channels available to them
- > some current/previous generation wi-fi devices already operate with -27 dBm/MHz out-of-band limits
- > European limits may be stricter than necessary as they have to apply to numerous European countries.

It was also noted that the lower boundary of European RLAN frequency arrangements developed by the ECC is 5945 MHz, which provides a 20 MHz guard band at the bottom of their 6 GHz band. Cisco and the Federal Chamber of Automobile Industries called for this also to be implemented in Australia.

ACMA response

The lower -37 dBm/MHz limit is imposed on VLP devices as they can operate in any location, including outdoors. LPI devices will provide additional protection to (outdoor) ITS systems due to the requirement that they always be operated indoors. Note that under the LIPD Class Licence, 'indoor' does not include inside vehicles.

We are not inclined to introduce a guard band, or any further restrictions on the use of the lower channels of the 6 GHz band, to provide further protection for ITS. In Europe, where the guard band is in place, communication-based train control (CBTC) systems are used in some cities above 5925 MHz. The existence of CBTC was necessarily taken into account in studies done by the European Electronic Communication Committee (ECC), and was a factor in their decision to implement a guard band at the lower end of the band. This issue is not relevant to the Australian environment. We note the UK regulator Ofcom did not implement a guard band above 5925 MHz in the UK, citing a lack of CBTC use and low demand for the service.

As with the in-band power limits, we have implemented the lower out-of-band emission limits now but remain open to revisiting those values later if necessary. Also, as with the in-band limits, these values align with other jurisdictions, so will not significantly affect the availability of devices in Australia from overseas markets. The LIPD Class Licence has been updated to include the 2 classes of device with the power limits proposed in the consultation.

Contention-based protocols

Consultation

Under class licensing, any device that meets the listed requirements for a band can legally operate. Wi-Fi 6e and New Radio Unlicensed¹ (NR-U) are 2 technologies that we expect are likely to be deployed in the band. Both implement similar spectrum access protocols and allow seamless sharing between devices.

The consultation paper noted the possible introduction of (as yet unknown) future technologies that might preclude access by the types of technologies that the band is being planned for. The proposed LIPD Class Licence updates in the consultation therefore contained a requirement that devices must implement appropriate contention-based access protocols to mitigate this risk.

The consultation paper sought comment on this requirement, and on the proposed wording used in the draft variation.

Comments

There was little substantial feedback on this proposal, and general acceptance of the proposed wording among those who did comment. Qualcomm noted that the LIPD Class Licence doesn't need to prescribe such access protocols, as the ACMA can require compliance with a given standard to ensure the appropriate protocols were implemented. The Wireless Internet Service Provider Association of Australia (WISPAU) and Apple urged not to be too prescriptive in whatever wording was chosen.

ACMA response

On balance, we consider that the requirement, as expressed in the draft variation, is not overly prescriptive, and we have included this requirement as proposed, rather than requiring compliance with specific standards at this stage.

Use of the upper 6 GHz band (6425–7125 MHz)

Consultation

The question of whether the upper 6 GHz band should be planned for RLANs or to support wireless broadband, such as International Mobile Telecommunications (IMT) technologies, in a manner suitable for wide area networks operated by mobile network operators was discussed in the April 2021 consultation. As industry responses were sharply divided, changes to the upper band were not proposed during the October 2021 consultation, and the question of 'RLAN vs IMT' in the upper band was not repeated. However, many submitters reiterated their views on this issue in their responses to this consultation.

Questions about the upper 6 GHz band in this consultation focused on specific details of potential arrangements for RLANs in the upper band, should such arrangements ultimately be implemented.

¹ NR-U is a feature of 5G standards that allows ad hoc localised networks to be deployed in 'unlicensed' (class licensed) spectrum.

Comments

Supporting arguments for making the upper band for either RLAN or wireless broadband were along the same lines as those submitted in response to the April 2021 consultation, including the following claims:

- > In favour of RLAN:
 - > wireless broadband/IMT would require either more stringent restrictions to protect the fixed service, or the clearance of fixed links from the band altogether
 - > ever-increasing amounts of data are being carried over wi-fi, including increasing offload from mobile networks to wi-fi
 - > it would not be possible for wireless broadband/IMT to co-exist with satellite services in the upper 6 GHz band (noting that some satellite operators continue to prefer no new services in the upper band at all)
 - > there are no alternative bands for RLANs.
- > In favour of wireless broadband/IMT:
 - > wi-fi is inefficient in public spaces, and demand for wi-fi in these spaces is falling
 - > there is no international support for harmonised RLAN arrangements in the upper 6 GHz band outside of the US
 - > it would be better to wait until the outcomes of agenda item 1.2 of the World Radiocommunications Conference in 2023 (WRC-23) are known before deciding
 - > 5G users are reducing their wi-fi use, not increasing it
 - > home internet connections can be provided by 5G networks
 - > there is a lack of alternative mid-band spectrum for wireless broadband.

Telstra was the only submitter that had a notable change in position between consultation rounds. They had previously supported RLAN use across the whole band (but noted that it may be possible for wireless broadband and RLAN to share) but are now in favour of waiting until after WRC-23 to make any decision. They are of the view that wireless broadband will require more mid-band spectrum but note that WRC studies may show that sharing between wireless broadband and other services is not feasible, in which case, class licensing the entire band would be the appropriate choice.

ACMA response

We see strong arguments for the introduction of arrangements for RLANs across the entire 6 GHz band, and do not believe that waiting for the outcomes of WRC-23 agenda item 1.2 is itself a valid reason to defer a decision on the upper 6 GHz band (especially given that it is only considering 100 MHz from the band in our region).

However, we also note that future use of the upper band will be better informed by a range of international harmonisation, equipment standardisation and demand developments that are yet to occur. These include possible future changes to spectrum management arrangements supporting wireless broadband uses (including for IMT technology), as well as the standardisation timeframe for RLAN technologies for which the upper 6 GHz band is expected to be most critical. In particular, the IEEE 802.11be standard ('Wi-Fi 7') is not expected to be finalised until 2024²

² https://www.ieee802.org/11/Reports/802.11_Timelines.htm

(acknowledging though that regulatory clarity prior to widespread availability can be important).

We believe that decisions on the future use of the upper band will be better informed by these developments, regardless of WRC-23 outcomes.

Ofcom have recently commenced a consultation process on arrangements in the upper band that will allow users to take out individual licences. The licences are proposed for indoor-only operation of RLAN and similar systems. This is intended to be an interim arrangement only, as they are not yet prepared to make a definitive decision on the long-term use of the upper band, noting that WRC-23 Agenda Item 1.2 outcomes will help inform their 'emerging view on this band'.

'Standard power' devices

Consultation

Along with LPI and VLP devices, we are also considering introducing a third class of device in the 6 GHz band that would be able to transmit at higher powers without being restricted to indoor operation – often referred to as 'standard power' devices. While not proposing changes to the LIPD Class Licence to support these devices in this revision, the consultation paper asked further questions about whether we should introduce arrangements for such devices and, if so, what measures could be implemented to manage coexistence with other devices.

We noted that – assuming standard power RLAN devices would be authorised by class licence – options to manage coexistence with existing services might include some form of manual registration or 'light licensing' system, however, we did not propose any specific arrangements for implementing such a system. We also discussed the possibility of mandating an automatic frequency coordination (AFC) system to manage access by higher power devices.

Comments

There was no substantial support for a manual registration or light licensing approach among the submissions. RLAN proponents all supported the use of an AFC, stating that any other system would be slower, less efficient, and require more work for both the ACMA and wi-fi operators.

Submissions agreed that if standard power devices were to be introduced, some form of coordination would be needed– they could not operate solely under the class licence on an equal footing with lower power devices.

Qualcomm suggested that a manual system could be used as a temporary measure to enable operation of standard power devices sooner, pending the longer-term rollout of an AFC system. Telstra was of the view that an AFC system should be used in conjunction with a device registration system, as registration on ACMA's Register of Radiocommunications Licences (RRL) would allow greater visibility of existing devices for interference investigations. Several submitters preferred the use of other (non-class) licensing schemes to authorise access to the upper band – for example, apparatus licensing.

ACMA response

Similar to the question of the upper 6 GHz band use (discussed in the previous section), there is no urgency to make a decision on potentially enabling access by higher power devices at this time. We will continue to monitor developments on this issue and consider which licensing or authorisation scheme(s) would be most suitable in Australia if arrangements for these devices were to be introduced.

High-gain antennas

Consultation

We solicited views on potentially allowing the use of high-gain directional antennas in the 6 GHz band; for example, use in fixed point-to-point links as part of a system providing fixed wireless broadband services in remote areas.

Comments

Opinions on this issue generally mirrored those on higher power devices. Not all submissions supported the use of high-gain antennas, but those that did suggested there would need to be some form of coordination and authorisation along the same lines as for higher power devices.

WISPAU supported this option, noting that this type of use is valuable in regional and/or remote communities in providing communications services to typically underserved communities, further noting that the use of narrow beamwidths antennas helps limit the potential for interference between services.

ACMA response

As with the questions around the future use of the upper 6 GHz band and potential implementation of standard power devices, any further consideration of this issue may be informed by developments in potential use-cases and technology/market trends in the 6 GHz band.

Automatic frequency coordination (AFC)

Consultation

The paper asked a variety of question on the feasibility of establishing and operating an AFC system in Australia, including questions on:

- > industry interest in administering AFC systems
- > required input from the ACMA
- > advantages of aligning with AFC systems deployed in other jurisdictions
- > other considerations relevant to the design, establishment and ongoing operation of an AFC system.

Comments

Generally, RLAN proponents were of the view that an AFC system could and should be implemented in Australia. They suggested that there would be no impediments to its implementation in Australia – it would just require that the ACMA be willing to proceed and able to provide a framework and a pathway to allow systems to be deployed. Opponents expressed reservations about the benefits of implementing such a system in Australia and uncertainty around the effectiveness of AFC systems in general.

Those that supported the introduction of an AFC system mostly agreed that Australia should replicate the processes and system design parameters adopted in the US, both to simplify its setup and to ensure harmonisation and economies of scale that would enable devices designed for the US system to operate here.

Some submissions suggested that we also implement the same coordination rules and calculations as the US, but most pointed out that an Australian system could customise these aspects to meet unique domestic requirements and could therefore be as flexible as we want in that regard. It was also noted that the US system is designed primarily to protect fixed links, and does not consider other issues such as aggregate interference to satellite receivers and ENG.

Federated Wireless, the WISP Association and 'several members' of the Wi-Fi Alliance and Dynamic Spectrum Alliance expressed interest in operating an AFC system in Australia. Specifically, Federated Wireless and Qualcomm were among the 14 organisations that applied to be an operator in the US. There is also a group of organisations developing 'Open AFC' – open source software that will be available to any entity that wishes to operate an AFC system.

Telstra was of the view that an AFC and manual registration process should both be implemented for higher power devices – the AFC to coordinate and protect against interference issues, and the registration process to ensure visibility of devices in the RRL.

We also asked a question about the possibility of applying differing licensing and/or access management requirements to different geographic areas. This question was interpreted in 2 different ways by respondents: some took it to mean that we would require devices in some areas to use an AFC, but not in others – there was no support for this idea – while others contributed views on potentially having different coordination rules in different areas, but all rules being enforced via an AFC. The latter idea had some support, with comments noting that an AFC can be set up to enforce any required coordination rules, including applying different rules to different areas.

ACMA response

The initial implementation of an AFC in Australia is likely to be a significant body of work for both the ACMA and industry, and a significant change to the way spectrum access coordination is undertaken in Australia. It is a concept that we will continue to explore with industry and will follow the ongoing deployments in the US.

The issue of whether an AFC is feasible and appropriate for Australia is one that we will continue to investigate further through a program of direct engagement with relevant industry participants, to help inform a decision to be made at a later date. This decision will likely be concurrent with considerations on higher power devices, high-gain antennas and the future use of the upper 6 GHz band.

5 GHz band

Consultation

At WRC-19, some changes were made to the Radio Regulations regarding the use of RLAN devices in part the 5 GHz band – specifically in relation to the implementation of higher power limits and outdoor use. In the consultation paper, we sought views on whether those changes should be implemented in Australia, and if higher power devices in the 5 GHz band should be recorded using measures similar to those being considered for standard power devices in the 6 GHz band, such as a registration system or apparatus licensing.

Comments

There were mixed views on what changes should be made to arrangements in the 5 GHz band, if any. They included implementing some or all of the latest changes to the Radio Regulations to the very high power (4 watt) arrangements in place in the US, to some satellite operators preferring no changes at all.

Most respondents agreed that if there were to be higher power devices operating in the band, they should not be required to use the coexistence management methods being considered for standard power devices in the 6 GHz band. Common reasons for this view were that these devices have been authorised elsewhere without additional administration, and that the 5 GHz and 6 GHz bands differ in terms of incumbency issues and protection requirements.

ACMA response

We did not propose any specific changes to this band during the consultation, and the responses received did not indicate any clear preference for whether these changes should be implemented.

As the proposed changes are updates to existing arrangements, rather than new arrangements, we intend that they will be proposed again as part of our next general update of the LIPD Class Licence, which is currently planned for Q3 2022. This will provide further opportunity for comment on the merits, or otherwise, of updating the LIPD Class Licence to incorporate some/all of the changes to international regulations made at WRC-23.

Non-RLAN issues raised in submissions regarding frequency-hopping devices

Comments

While the issue of non-RLAN type devices using the band was not discussed in the consultation paper, a submission from Apple requested the inclusion of a separate entry in the LIPD Class Licence for frequency-hopping spread spectrum devices. The LIPD Class Licence currently has similar separate entries for 'frequency hopping transmitters' in some other bands where RLANs and/or 'digital transmitters' are authorised (such as 2400–2483.5 MHz and 5725–5850 MHz). Since frequency-hopping devices use narrow bandwidth transmissions, devices like this may require a separate entry if their transmissions do not meet the listed power spectral density limit.

Apple proposed a separate entry that would allow frequency-hopping devices to operate at a higher power spectral density (10 dBm/MHz) than other proposed VLP device limits.

ACMA response

As they are not related to the use of RLAN devices, the inclusion of frequency-hopping devices in the LIPD Class Licence is beyond the scope of the current consultation process. Additionally, we do not yet have sufficient information on coexistence between the proposed higher power hopping devices and RLANs to be assured that RLAN performance would not be materially degraded by their inclusion (we note that there is work ongoing internationally to make these assessments, which we will continue to monitor and, potentially supplement with our own studies).

For these reasons, no changes have been made to the LIPD Class Licence to include 6 GHz frequency-hopping transmitters at this time, noting that the changes to the class licence were limited to the scope of this consultation process (being RLANs). As mentioned previously, however, we intend to undertake a general review and update of the LIPD Class Licence in Q3 2022 and may consider the addition of 6 GHz frequency hoppers as part of that process – again, there will be further opportunity for industry comment at that time.

Next steps and future updates

Noting the various elements captured in this process, the suggestions made, concerns raised by industry and, in some cases, lack of maturity of international arrangements, standards and/or studies, we have identified 3 broad next steps in considering the future of the 6 GHz (and 5 GHz) band.

The first step was to update the LIPD Class Licence to authorise the use of LPI and VLP devices in the lower 6 GHz band. The power limits and other requirements of these devices are unchanged from those proposed in the draft variation.

There may be scope, based on further consideration and additional supporting evidence, for future updates to incorporate several other aspects, including:

- > increasing the power and power spectral density limits
- > including specific standards that devices must comply with (for example, in place of, or in addition to, the sharing protocol requirement)
- > relaxing the out-of-band emission limits.

The second step will be including consideration of a range of residual, additional and/or complementary issues in our next general review and update of the LIPD Class Licence in Q3 2022. Potential issues for consultation will include:

- > updates to existing arrangements for RLANs in the 5 GHz band to incorporate WRC-19 outcomes
- > inclusion of frequency-hopping devices (subject to assessments of coexistence with RLANs).

As with all general updates of the LIPD Class Licence, there will be opportunity to both comment on proposed updates and suggest items for inclusion in the class licence.

Lastly, further consideration on the future use of the upper 6 GHz band and the potential inclusion of higher power devices and high-gain antennas across the entire band may take place at a later, to-be-determined date. We will continue to monitor developments on a range of relevant issues, ongoing processes and other factors that will determine future steps and associated timing, including:

- > WRC-23 agenda item 1.2 – noting that:
 - > only 100 MHz in the upper band is being considered in Region 3
 - > while a potentially useful input, the outcome of the agenda item isn't necessarily a prerequisite in determining the most appropriate spectrum management arrangements in Australia.
- > Further decisions on international arrangements – for example, upcoming ECC work on technical conditions required for RLAN use in the upper 6 GHz band – and general trends in the use of the band internationally.
- > Other spectrum options for wireless broadband, including IMT, and learned experiences in meeting demand for these services in bands currently being planned and/or allocated.
- > Development and deployment of the AFC system in the US.

Appendix A

A total of 25 submissions were received from the following organisations and are available on the [ACMA website](#):

- > AMTA
- > Apple
- > Cambium Networks
- > Cisco
- > Communications Alliance Satellite Services Working Group
- > CSIRO
- > Dynamic Spectrum Alliance
- > Ericsson
- > Federal Chamber of Automotive Industries
- > Federated Wireless
- > GSMA
- > Hewlett Packard Enterprise
- > Intel
- > ITS Australia
- > Mobile Satellite Services Australia and Pivotel
- > Nokia
- > Optus
- > Qualcomm
- > Shure
- > Telstra
- > TPG Telecom
- > Wi-Fi Alliance
- > Wireless Broadband Alliance
- > Wireless Internet Service Provider Association of Australia (WISPAU)
- > Joint submission from Apple Inc., Broadcom Inc., Cisco Systems Inc., Google, LLC, Hewlett Packard Enterprise, Intel Corporation, Meta Platforms Inc. (formerly Facebook Inc.), Microsoft Corporation and Qualcomm Incorporated