



Huawei Technologies (New Zealand) Company Limited
Submission to RSM's Public Consultation
"WLAN use in the 6 GHz band Discussion document June 2021"

Created: 15-06-2021

Version: 1.0

Radio Spectrum Management Policy and Planning

Ministry of Business, Innovation and Employment

PO Box 2847

WELLINGTON 6140

Radio.Spectrum@mbie.govt.nz

Re: RSM “WLAN use in the 6 GHz band Discussion document June 2021”

Huawei Technologies (New Zealand) Company Limited (referred to as Huawei NZ in the rest of this paper) welcomes the opportunity to respond to RSM “WLAN use in the 6 GHz band Discussion document June 2021” (referred to as the *RSM Discussion Document* in the rest of this document) released in June 2021.

Executive Summary

In this submission, Huawei NZ responds to a number of questions raised in the RSM Discussion Document. Huawei NZ submits the following for RSM’s consideration,

1. In principle, Huawei NZ calls for RSM to delay its decision on the use of 5925-7125MHz until the conclusion of World Radio Congress (WRC) 2023;
2. If RSM must assign 5925-6425MHz before WRC-23, Huawei NZ recommends RSM to take a technology neutral position and make available this part of the frequency spectrum under the GURL regime, **and**
3. Take appropriate measures to mitigate the introduction of harmful interference to in-band incumbent services as well as to adjacent band;
4. Reserve 6425-7125MHz for licensed IMT systems and make a related decision at the conclusion of WRC-23;
5. Prior to the conclusion of WRC-23, make available 5925-6345MHz for the deployment of licence-exempt technologies, **and**
6. for indoor deployment scenarios, the criterion applied on LPI or VLP users should be adhered to, **and**
7. for outdoor deployment scenarios, licensing approval is necessary to prevent harmful interference to incumbent services;
8. The restrictions in Point 5, 6, and 7 may be progressively relaxed when more credible co-sharing studies become available.



The above summary is addressed to Radio Spectrum Management New Zealand.

Huawei Technologies (New Zealand) Company Limited

June 2021

In principle, Huawei NZ recommends RSM to delay its decision on the use of 5925-7125MHz, to the conclusion of World Radio Congress (WRC) 2023, where the relevant coexistence studies and appropriate identifications are accepted. Thereafter RSM may set out its allocation of 6GHz in accordance with the relevant resolutions made at WRC 2023 (WRC-23). Although it is up to each country to determine the use of any frequency spectrum, by delaying the 6GHz allocation post WRC-23 New Zealand can make an informed decision gained from ITU level spectrum harmonisation and the economies of scale at the maximum potentials.

However, if RSM is leaning towards making an early decision and must assign a part of the 6GHz frequency spectrum, i.e., 5925-6425MHz as indicated in the RSM Discussion Document, Huawei NZ suggests RSM to take a technology neutral position and make available this part of frequency spectrum to a few technology options under the licence-exempt regime. Furthermore, the harmful interference and unwanted emissions from these technology options should be ring-fenced/restricted, which otherwise, can significantly limit the effective bandwidth of the 6425 - 7125 MHz frequency spectrum when it becomes available. Huawei NZ presents some restricting measures for RSM to consider in this submission.

Huawei NZ recommends RSM to reserve 6425-7125MHz for licenced IMT system as per Agenda Item 1.2 of WRC-23.

Huawei NZ provides details below in responding to some of the questions raised in RSM Discussion Document. A reference list is provided at the end of this paper.

Question 1. Do you agree with RSM's proposal on making the 5925 - 6425 MHz available for WLAN use?

Huawei NZ responds to this question from three aspects.

1. The demand on more frequency spectrum for WLAN needs to be recognised; however, not as much as 500MHz in 5925 - 6425 MHz.
2. Secondly, Huawei NZ recommends that RSM takes a technology neutral position on allocating 5925-6425MHz for assigning this spectrum to WLAN is not the best use of this spectrum and limits the effective use of this spectrum by other licence-exempt technologies.
3. Thirdly, appropriate measures must be taken to restrict new harmful interference from being introduced from 5925-6425MHz into co-channel and adjacent spectrum bands.

Supporting evidence can be found below to demonstrate how Huawei NZ has come to these arguments.

The global data traffic volume of Wi-Fi which is the most successful WLAN technology and standardised by IEEE has witnessed substantial growth in recent years [1]. Data traffic offloaded by Wi-Fi from cellular networks has increased rapidly and contributed considerable portions to the overall Wi-Fi traffic volume growth [1]. However, it is reported in [2] that “there is qualitative evidence that the Wi-Fi offload traffic may not grow significantly” as per data shown in [3-6]. This is indeed the case in some countries, such as South Korea, where with the fast roll-out of IMT-Advanced technologies, smartphone users no longer ration their mobile data usage and stay connected to a mobile network even when free of charge Wi-Fi access is available [7].

Nevertheless, the issue of additional spectrum to cater for the growing Wi-Fi traffic was already considered by ITU at WRC-15 and WRC-19, and no new spectrum allocation was identified at these two events. Despite that in December 2017 European Commission (EC) mandated a study [8] on the feasibility and identify harmonised technical conditions for Wireless Access Systems (WAS), including Radio Local Area Networks (RLAN) in the 5925-6425 MHz band, no new agenda items were established in WRC-19 to consider any part of the 6GHz band for WLAN in WRC-23. Nevertheless, in 2020 the Federal Communication Commission (FCC) of the US implemented the entire 6GHz band (5925-7125MHz) for WLAN and other unlicensed applications of services. In New Zealand, to this date, RSM has made 688.5MHz available for WLAN. This 688.5MHz bandwidth is, by Wi-Fi specifications, the maximum amount of spectrum available for WLAN in the 2.4 GHz and 5 GHz bands. *The growth of Wi-Fi traffic volume, when compared to Europe and the USA, is much slower. Therefore, Huawei NZ sees little justification for an allocation of 500MHz exclusively for WLAN. On this premise, there is even less case for the entire 6GHz (5925-7125MHz) allocation to WLAN.*

It is recognised by RSM that the indoor scenarios, whether at home or at work, dominate the Wi-Fi traffic production environment in, and the outdoor deployment of WLAN is much less attractive to service



providers. Therefore, should the 5925-6425 MHz band be allocated to WLAN, it is reasonable to foresee the pre-dominant deployment of indoor Wi-Fi on 5925-6425 MHz to carry on the user behavior currently observed. *Thus should the 5925-6425 MHz band be exclusively assigned to WLAN, the right of other competitive applications of services, particularly those offering outdoor services, may be disadvantaged if precluded from using this spectrum.*

There are such competitive applications of services based on technologies either immediately available or on the looming horizon. One of these technologies is called NR-U (New Radio Unlicensed) [9]. NR-U has been widely recognised by industries for it is defined to operate under the licence-exempt regime and provides cellular grade services. NR-U is specified by 3GPP. In 3GPP Release 16, n69 (5925-6425MHz) was specifically created for NR-U, and related technical details were provided. NR-U is particularly attractive to enterprise deployment scenarios [10]. NR-U-based enterprise private networks enable the operation of stand-alone networks and scale freely without any access to licensed spectrum [11]. NR-U aims to provide cellular grade guarantees on the Quality of Service to meet the Industrial grade requirements on reliability, security protection, and latency which are challenging to be met by WLAN technologies [11]. Thanks to the cellular grade power control, NR-U is suitable for both indoor and outdoor deployment scenarios and thus allow for seamless handovers [11]. Hitherto Huawei NZ has not found many co-existence studies between NR-U and Wi-Fi on the 6GHz bands; however, a recent IEEE transaction paper [12] reports the simulation-based evaluation of the cross-technology co-existence study of NR-U and Wi-Fi over the unlicensed 6GHz band. Evaluation results in [12] show NR-U and Wi-Fi can co-exist, sharing the same 6GHz frequency spectrum. In addition, results in [12] show that NR-U outperforms Wi-Fi in package delivery reliability, collision immunity, and latency reduction, particularly at heavy traffic load. This means that NR-U is capable of achieving higher spectrum utilisation and provide more robust and reliable data transmission than Wi-Fi.

The licence-exempt approach for the 5925-6425 MHz frequency range that does not favour WLAN has been accepted by many European regulators, and it is also intended to be technology neutral in the UK [2].

Huawei NZ has briefly addressed one co-existence study of WLAN and NU-R in the previous paragraph. This paragraph addresses the co-existence studies of WLAN and other services in the 6GHz band to assess the harmful interference WLAN can introduce. Recently some co-existence studies of Wi-Fi and incumbent services on 5925-6425MHz were accepted by CEPT. CEPT Report 75 [13] concludes that co-existence between WAS/ RLAN operating in the 5945-6425 MHz band and existing services and systems within the band and in adjacent bands would be technically feasible under some generic technical conditions. Report 75 also provides a framework on the WLAN transmitting power limits and unwanted emission criterion to foster the broader regional harmonisation of the use of the frequency band 5945-6425MHz by WAS/RLAN devices which eventuated in ECC Decision (20)01. However, it is worth noting that in [14] lab testing based measurements report some preliminary results showing Wi-Fi, when operates in the 6GHz band, can



generate considerable interference and damage the performance of co-channel micro-wave links. It is reported in [14] that, for a Wi-Fi station with Tx power of 1 Watt (30dBm) over 80 MHz of bandwidth, co-channel interference to micro-wave link becomes noticeable when attenuation as strong as 40 dB applies. And with a reduction on attenuation, the micro-wave link experiences worse performance downturns such as downshift on modulation, frequency shifting, and link availability reduction, etc. Hitherto Huawei NZ is not aware of credited co-existence studies of WLAN and other systems (whether incumbent or not) that operate on adjacent frequency spectrums in the 6GHz band. In light of 6425-7125 MHz being called for IMT in Region 1 and 3 and seeking for IMT identification at WRC-23, Huawei NZ suggests RSM to safeguard the full bandwidth of 6425-7125 MHz and avert the introduction of new harmful interference. *Huawei NZ shares some early thoughts of safeguard measures in our response to Question 3 and 4.*

In summary, Huawei NZ calls for RSM to consider the technology neutral approach for 5925-6425 MHz if RSM must decide an early allocation of this spectrum before the conclusion of WRC-23.

Question 2. What are your views on the potential future use of 6425 - 7125 MHz for new applications (e.g. Wi-Fi or IMT)?

Frequency bands 6425-7025MHz and 7025-7125MHz are seeking for IMT identifications at WRC-23. Extensive relevant studies on these bands have been carried out at an ITU level. Huawei NZ presumes RSM is aware of the significance of the 6425-7125MHz frequency band for IMT systems from information sources other than Huawei. Huawei NZ is in the view of supporting the 6425-7125MHz frequency band for licenced IMT systems. Huawei NZ can make available supporting evidence to RSM upon request. Huawei NZ recommends RSM reserve the 6425-7125MHz frequency band for licenced IMT systems and awaits the updates in Radio Regulations which will be published at the conclusion of WRC-23.

Question 3. Do you agree that RSM should include 5925 - 6425 MHz in the GURL-SRD for WLAN low power indoor and very low power use?

The Low power indoor (LPI) use and the very low power (VLP) portable indoor or outdoor use of 5925 - 6425 MHz in RSM Discussion Document come from CEPT Report 75 [13] / ECC Report 302 [15]. The maximum 200mW (23dBm) e.i.r.p. is given to LPI and maximum 25mW (14dBm) e.i.r.p. to VLP, and these two reports do not favour any particular WAS/RLAN technologies. These two reports studied the co-channel sharing case of WAS/RLAN and incumbent services, including Fixed Services over 5925 - 6425MHz. However, lab test based measurements show in [14] preliminary results that Wi-Fi Tx power of 1 Watt (30dBm) over 80 MHz of bandwidth can cause noticeable co-channel interference to micro-wave FS links even at 40dB attenuation. At this time, there is a lack of adjacent-channel co-existence studies of Wi-Fi and licensed IMT.

Even though RSM has expressed a preliminary view that the protection against harmful interference by these low power devices is a "low risk" of an uncontrolled device being able to cause harmful interference;

however, with the expected proliferation of devices, the risk will become significantly higher. RSM compliance team will need to engage in an expensive and time-consuming search for the interfering devices, with the possibility of the offending devices never being identified.

Taking into account the above situations, Huawei NZ recommends to RSM the following to facilitate the deployment of Wi-Fi,

1. Identifying 5925 - 6425 MHz in the GURL-SRD regime, *and*
2. Before the conclusion of WRC-23, make available 5925-6345MHz for Wi-Fi deployment, *and*
3. For indoor deployment scenarios of Wi-Fi, the criterion applied on LPI or VLP users should be adhered to, *and*
4. For outdoor deployment scenarios of Wi-Fi, the criterion applied on VLP users should be adhered to, and licensing approval is necessary to prevent harmful interference to incumbent services.
5. The above restrictions may be progressively relaxed when more credited co-sharing studies become available.

The rationale behind the second piece of the above recommendations is to allocate 80MHz of bandwidth between 6345MHz and 6425MHz as a guard-band whilst to maximising the usable bandwidth for Wi-Fi. As per Figure 1 where the 6 GHz channels for unlicensed access in Europe [16] is shown, our recommendations not only enable Wi-Fi 6E to operate using 2 channels at maximum 160MHz bandwidth each channel (i.e., Channel 15 and 47) but also allow for Wi-Fi evolution to Wi-Fi 7 which is planned to work on 320MHz channel bandwidth, i.e., Channel 31. Over time the 80MHz guard-band may be reduced in size when the accumulated harmful interference to adjacent channels is either quantified or completely removed if there is negligible or no such harmful interference.

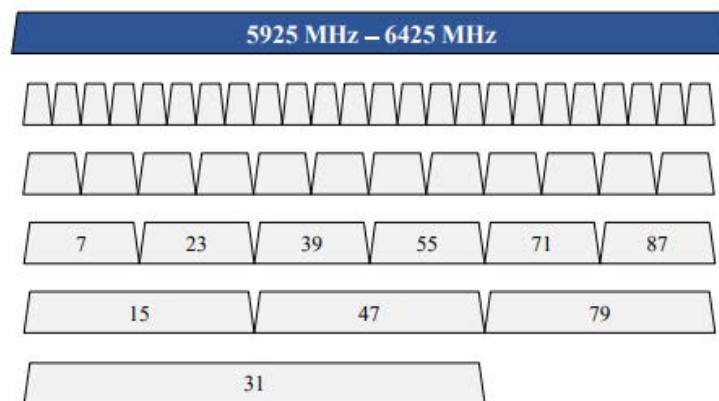


Figure 1. The 6 GHz channels for unlicensed access in Europe

Question 4. Do you agree that RSM should mandate ETSI EN 303 687 as the radio standard for WLAN use in the 6 GHz band? Is there any other regulatory compliance standard we should consider?

Huawei NZ supports RSM in adopting ETSI EN 303 687 as the mandate standard for lower 6GHz band. Huawei NZ also recommends RSM to take additional criterion as per the measures outlined in our response to Question 2. Huawei NZ notes that ETSI EN 303 687 is still being developed and finalised.

Question 5. What are your views on using a licensing approach to support 30 dBm EIRP WLAN devices?

Potential harmful interference raised from 30dBm e.i.r.p. WLAN devices has been addressed in our response to Question 1 and 2. If the NZ market is keen to deploy such devices, Huawei NZ recommends RSM to take an individual licensing approach that is pragmatic to protect incumbent services.

Question 6. What are your views on supporting 36 dBm EIRP standard power devices using Automatic Frequency Coordination (AFC) system? Do you have any proposals to provide AFC systems to New Zealand?

Huawei NZ is aware that the standard for AFC is yet to be developed. There is no successful practice on AFC systems at the moment, and the possible AFC testing and certification process is foreseen to take years [17]. Should there be such a system available, it is suggested that RSM considers not only the procurement but also operation and maintenance aspects of such system.

Question 7. Any other comments?

In this submission Huawei NZ responds to RSM's public consultation on the WLAN use in the 6 GHz band Discussion document. Huawei NZ calls for RSM to delay its decision on the use of 5925-7125MHz until the conclusion of World Radio Congress (WRC) 2023; however, if RSM must make an early decision, Huawei NZ recommends RSM to take a technology neutral position and make available this part of the frequency spectrum under the GURL regime.

Huawei NZ makes a number of recommendations, including guard-band, transmitting power limits, and licensing measures, to restrict the harmful interference and unwanted emissions from technologies to be deployed using 5925-6425MHz.

Huawei NZ recommends RSM to reserve 6425-7125MHz for licenced IMT system.



Contact for any further questions or communications:

Junhe Hu

General Manager of Solution Sales

Huawei Technologies New Zealand Co. Ltd.

Email: hujunhe@huawei.com

Dr. Alex Fang

Wireless Product Manager

Huawei Technologies New Zealand Co. Ltd.

Email: alex.fang@huawei.com

References

- [1] Cisco Visual Networking Index (VNI) Complete Forecast Update, 2017–2022, APJC Cisco Knowledge Network (CKN) Presentation, Cisco, 2018.
- [2] Industry views on the potential use of 6 GHz (5925-7125 MHz) for licensed and licence-exempt Systems, TechUK report, 11th June 2021.
- [3] The 6 GHz opportunity for IMT (page 42), Coleago, 2020.
- [4] The 5G consumer business case, Ericsson, 2018.
- [5] A playbook for accelerating 5G in Europe, Boston Consulting Group, 2018.
- [6] Building the 5G Business Case, Cisco, 2018.
- [7] File #933, November 2020, Ministry of Science and ICT, the Republic of Korea, <https://www.msit.go.kr/bbs/list.do?sCode=user&mPid=74&mId=99>.
- [8] European Commission, Mandate to CEPT, To Study Feasibility and Identify Harmonised Technical Conditions for Wireless Access Systems Including Radio Local Area Networks in the 5925-6426 MHz Band for the Provision of Wireless Broadband Services, 2017.
- [9] NR-U, 3GPP TR 21.916 V2.0.0.
- [10] Matthew Baker, and Miikka Poikselkä, 5G Releases 16 and 17 in 3GPP, Nokia White Paper, https://d1p0gxnqcu0lvz.cloudfront.net/documents/Nokia_Bell_Labs_5G_Releases_16_and_17_in_3GPP_White_Paper_1_EN.pdf
- [11] Y. Wei, and X. Zhang, How does unlicensed spectrum with NR-U transform what 5G can do for you?, Qualcomm, <https://www.qualcomm.com/media/documents/files/presentation-how-nr-u-can-transform-what-5g-can-do-for-you.pdf>
- [12] M. Hirzallah, M. Krunz, B. Kecicioglu, and B., Hamzeh, 5G New Radio Unlicensed: Challenges and Evaluation, IEEE Transactions on Cognitive Communications and Networking, Dec 2020.
- [13] CEPT Report 75, <https://docdb.cept.org/download/aefb853d-8780/CEPT%20Report%2075.pdf>.
- [14] FWCC Supports APCO's 6 GHz Petition for Stay, <https://ecfsapi.fcc.gov/file/106040035611332/01432982.PDF>.
- [15] ECC Report 302, <https://docdb.cept.org/download/1396>
- [16] G. Naik, J.Park, J. Ashdown, and W. Lehr, Next Generation Wi-Fi and 5G NR-U in the 6 GHz Bands: Opportunities & Challenges, Vol. 8, IEEE Access, August 2020.
- [17] M. Gibson, 6 GHz Automated Frequency Coordinating System: Basic Requirements & Testing / Certification, 16th European Spectrum Management Conference, 23-25th June 2021.