



**Planning of the 3700- 4200 MHz band, Discussion Paper**

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**Subject: Planning of the 3700-4200 MHz band, Discussion paper**

Dear Sir/Madam,

Huawei welcomes the opportunity to make this submission to the Australian Communications and Media Authority (ACMA) in response to its planning of the 3700-4200 MHz band, discussion paper.

In summary, we believe that the 3700-4200 MHz band has great potential for Australia to serve as a 5G mid-band extension to the primary C-band in the range of 3400-4200 MHz band and will accommodate an exponential growing demand of fixed and mobile network carriers, verticals and all local users.

Huawei thanks the ACMA for continually striving to be effective in planning and managing our national spectrums. Huawei will continue to support the ACMA's commitments - the development of spectrum work programs and efficient spectrum allocation in facilitating the Australian telecommunication industry for the national requirements in timely manner.

Please do not hesitate to contact us if you have any queries regarding our points in this submission.

**Huawei Technologies (Australia) Pty Ltd.**

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## DISCUSSION PAPER QUESTIONS AND OUR RESPONSES

### 1. Are there any other international developments in the 3700–4200 MHz band that the ACMA should be aware of?

#### Huawei's response:

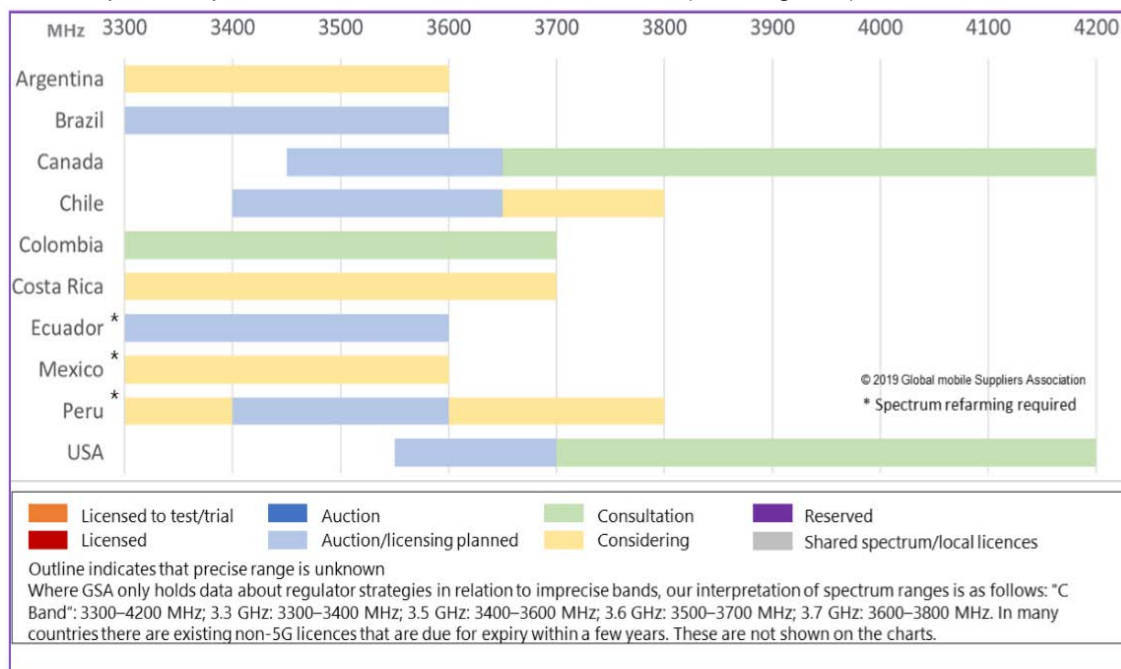
Huawei applauds the ACMA for the efforts taken to present us with international developments including updates collected from the International Telecommunication Union Radio (ITU-R) Regulations allocation, the Third Generation Partnership Project (3GPP) standards development for New Radio and E-UTRA bands, the Global Mobile Supplier Association (GSA) data for the ecosystem readiness, and development in other regions and countries position for the relevant portions of the 3400-4200 MHz band.

Huawei is pleased with the progress made by the ACMA in the following spectrum work programs:

- 3400-3575 MHz – currently consulting with licensees on defragmentation
- 3575-3700 MHz – completed allocation and re-planning (auctioned completed in December 2018)
- 3700-4200 MHz – discussing with industry to investigate possible arrangements to new Wireless Broadband (WBB)

It is difficult for Huawei to add to what the ACMA has already presented in its preparation work shown in this discussion paper. Huawei further highlights the progress of the 5G spectrum band allocation in the different regions<sup>1</sup> for the range of 3300-4200 MHz.

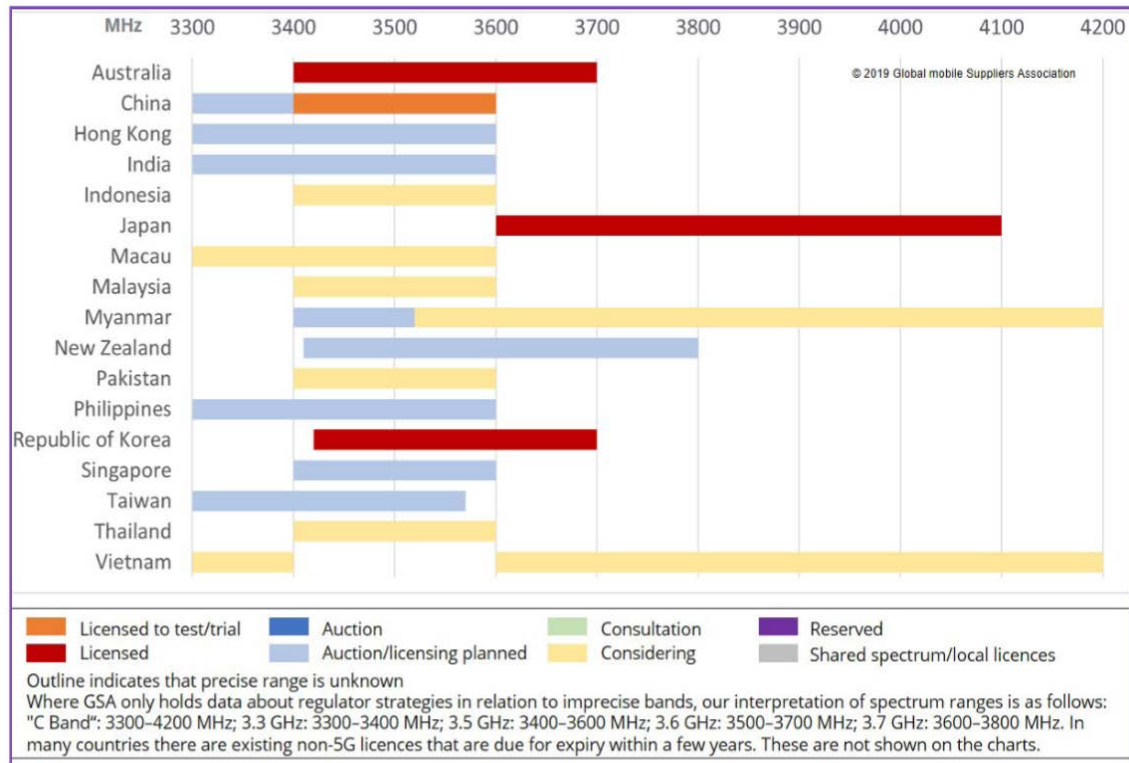
- 5G spectrum positions in the C-band – The Americas (ITU Region 2)



<sup>1</sup> GSA 5G Spectrum Report, August 2019 (<file:///C:/Users/t00342770/Downloads/190903-GSA-5G-spectrum-report-August-2019.pdf>)

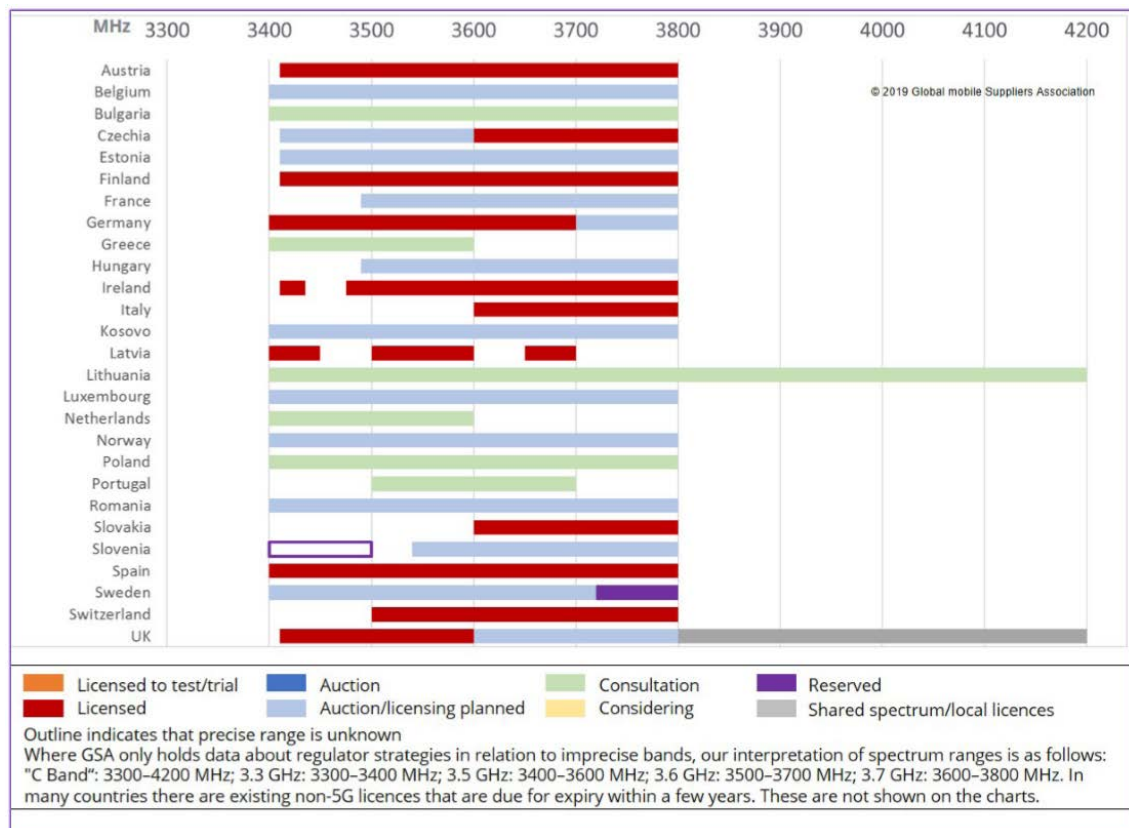
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- 5G spectrum positions in the C-band – Asia-Pacific (ITU Region 3)



(Note: The ACMA's initial investigation of 3700-4200 MHz band is to be included in the above figure.)

- 5G spectrum positions in the C-band – CEPT (ITU Region 1)





**2. What are the future requirements of point-to-point links and FSS earth stations in the 3700–4200 MHz band? Does this differ by geographical area and/or segment of the band?**

Huawei's response:

We acknowledge that the ACMA is now seeking feedback from incumbent users to better understand their future needs in the 3700-4200 MHz band.

We, however, noted the ACMA's static RRL data, information provided for the use of fixed services (point-to-point links) and Fixed-satellite service (FSS), showing a decline in use over recent years.

**3. If licensed point-to-point links and FSS earth stations are affected by replanning activities in the 3700–4200 MHz band, what alternative deployment options could be considered?**

Huawei's response:

We have also noted that there are only a small number of point-to-point licences remaining in metropolitan (the majority of them in Sydney) and mostly are located in regional areas of Australia.

Among the ACMA identified planning options given in the paper, Huawei's preferred option is for point-to-point licences to be reallocated from the band.

The few links that cannot practically be re-located from the band should be considered on a case by case basis to be defined for different geographical areas. For dense metropolitan areas new WBB deployment, reallocation of point-to-point service will be necessary.

If FSS earth stations services will be affected by replanning activities of this band, Huawei suggests the ACMA to consider and to investigate the below options based on different geographical considerations.

- Relocating some or all licensed FSS earth stations in defined geographical areas (such as significant population centres) to one of the Earth Station Protection Zones (ESPZs) defined in RALI MS4
- Relocating services to a different band, such as Ka/Ku band where possible, or moving to an alternate delivery technology, such as fibre

**4. In the event arrangements are made for new services in the 3700–4200 MHz band, do stakeholders have any comments on the ACMA's proposal to maintain the existing arrangements for Radiodetermination and LIPD devices, and the existing policy around TVRO systems?**

Huawei's response:

We appreciate the information provided on Page 22 of this paper for the ACMA's current proposal with regards to TVRO systems, Radiodetermination and Low interference potential devices.

The ACMA's approach and consideration for these incumbent services, which is a similar approach has been taken during 3575-3700 MHz band planning, is suitable.

**5. What are the future requirements for WBB services in the 3700–4200 MHz band and what arrangements should be considered? Does this differ by geographical area and/or segment of the band?**

Huawei's response:

Please refer to our responses for questions 9, 10, 11, 12 and 13.

**6. What WBB deployment scenarios should be considered for the 3700–4200 MHz band? Should use be limited to one scenario or should more flexible arrangements be implemented?**

Huawei's response:

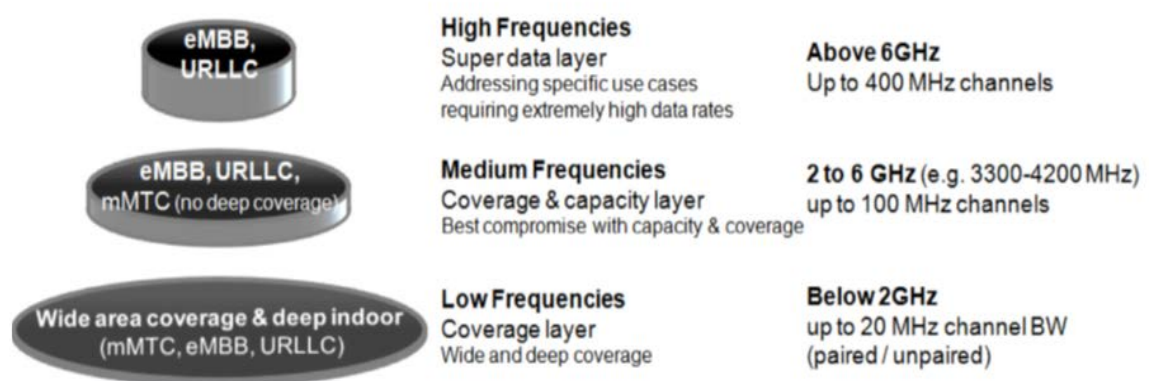
Huawei commends the ACMA for their efforts in providing a number of possible WBB deployment scenarios to aid this discussion with industry stakeholders.

Huawei noted the ACMA's identified possible WBB deployment scenarios for the 3700-4200 MHz band are with below.

- Large cell fixed wireless broadband deployments for wide-area coverage
- Local area fixed mobile broadband deployments for small communities, local councils, mines, campuses and other use
- Macro cell mobile wireless broadband deployments for local area or wide-area coverage
- Small cell mobile broadband deployment, typically used for highly populated, indoor or other high density applications as well as providing macro-cellular coverage infill

Huawei, however, suggests that the suitable deployment scenarios should be decided by licensees as per their preferred business models and their service provision plan. Thus, more flexible arrangements should be given to licensees and they should not be limited to one deployment scenario.

It is important to highlight that diverse set of 5G services and applications will be utilising different spectrum bands, low to high, with different characteristics. Utilisation of multi-layer bands in 5G is shown below<sup>2</sup>. Both macro cells and small cells are not planned with one spectrum band alone and require different spectrums for different characteristic.



<sup>2</sup> Huawei's submission to the ACMA in November 2017 for Spectrum for broadband in the millimetre wave bands paper



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The existing Australian bands (low bands: 700, 850, 900 MHz and mid bands: 2100, 2300, 2600 MHz) will be utilised as mobile network carriers deploy this mid 3400-4200 MHz frequency band in order to achieve strategically planned coverage layer and capacity layer.

Dual connectivity (DC), Carrier Aggregation (CA), and Supplementary Uplink and Downlink (SUL/DL) between new radio and new radio or new radio and LTE of 3GPP, will benefit mobile network carriers in utilising the spectrum more efficiently as well as leading to very high capacity, seamless mobility and high reliability in communications that 5G promises.

**7. What is the current and planned availability of fixed and mobile WBB equipment in the 3700–4200 MHz band?**

Huawei's response:

The up-to-date information can be downloaded directly from Global Suppliers Association Analyser for Mobile Broadband Data (GAMBoD) Analysis Tool.<sup>3 4</sup> Huawei noted the ACMA also used the report from this database for reviewing ecosystem availability of mobile WBB equipment for different spectrum bands.

**8. Is there interest in the use of other new service types in the 3700–4200 MHz band?**

Huawei's response:

Please refer to our response for below question.

**9. What services/applications should be accommodated in the 3700–4200 MHz band?**

Huawei's response:

Delivering Enhanced Mobile Broadband (eMBB), Ultra-Reliable and Low-Latency Communication (URLLC) and Massive Machine-Type Communication (mMTC), 5G applications represent tremendous opportunities for consumers, homes, businesses and communities. Industries are transforming intense dynamics and business opportunities around 5G for new applications and services.

At below, some of the foreseen applications<sup>5</sup> that will benefit from the availability of 5G in 3300-4200 MHz band.

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<sup>3</sup> Global Suppliers Association Analyser for Mobile Broadband Data (GAMBoD) Analysis Tool (<https://gsacom.com/gambod/>)

<sup>4</sup> The latest 5G Device Ecosystem, GSA, August 2019 also can be found at (<file:///C:/Users/t00342770/Downloads/190813-GSA-5G-Devices-August-2019.pdf>).

<sup>5</sup> Huawei Technologies' Position Paper, "5G Applications" released in September 2019



## Planning of the 3700- 4200 MHz band, Discussion Paper

### • Telecommunications

Use case	Specific scenario	URLLC (ms/% <sup>1</sup> )	eMBB (Mbps)	mMTC (density)
eMBB for smartphones	Smartphones enabling better connectivity and higher speed	<20	100	Low to medium
	Enhanced TV and video services	<20	100	Low to medium
Fixed Wireless Access (FWA)	Improved residential connectivity in less-densely populated areas	<20	1,000	Medium
Edge computing	Closer and faster link between data centers and customers	<20	1,000	Low

### • Media and entertainment

Use case	Specific scenario	URLLC (ms/% <sup>1</sup> )	eMBB (Mbps)	mMTC (density)
High definition streaming	Multicasting image treatment	<20	100	Medium to high
	HD mobile video	<20	100	Medium to high
Augmented Reality and Virtual Reality (AR/VR)	Augmented reality services in real time	<20	100	Medium to high
	Immersive gaming and/or training	<20	100	Medium to high
	Advanced VR capabilities (haptic touch, 3D holographic display)	<20	100	Medium to high

### • Manufacturing

Use case	Specific scenario	Availability	Cycle time	Typical payload size	# of devices	Typical service area
Motion control	Printing machine	>99.9999%	< 2ms	20 bytes	>100	100mx100mx30m
	Machine tool	>99.9999%	< 0.5ms	50 bytes	~20	15mx15mx3m
	Packaging machine	>99.9999%	< 1ms	40 bytes	~50	10mx5mx3m
Mobile robots	Cooperative motion control	>99.9999%	1ms	40-250 bytes	100	< 1 km <sup>2</sup>
	Video-operated remote control	>99.9999%	10-100ms	15-150 kbytes	100	< 1 km <sup>2</sup>
Mobile control panels	Assembly robots or milling machines	>99.9999%	4-8ms	40-250 bytes	4	10mx10m
	Mobile cranes	>99.9999%	12ms	40-250 bytes	2	40mx60m
Process automation(process management)		>99.99%	> 50ms	Varies	10000 devices per km <sup>2</sup>	

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- Transportation

Use case	Specific scenario	URLLC (ms/% <sup>1</sup> )	eMBB (Mbps)	mMTC (density)
V2X communication	Collision avoidance and emergency braking	<5		Low
	Intelligent traffic systems (Vehicle-to-Infrastructure)	<5		Medium
Platooning	Truck convoy system	<5/ 99.99%	10	Medium
Advanced driving	'See through' the front vehicle In-dash junction cameras	3/ 99.999%	30	Medium
Remote driving	Multiple real-time HD video feeding remote driver Remote control	5/ 99.999%		Medium
In-car infotainment services	On-demand entertainment services Traffic management Enhanced GPS, weather and location-based services	10	>10	Low
Data collection	Pay-as-you-drive insurance		>10	Medium

- Public services

Use case	Specific scenario	URLLC (ms/% <sup>1</sup> )	eMBB (Mbps)	mMTC (density)
Smarter medication	Remote therapies, connected medication	<10	<10	High
	Enhanced therapies: multiple connections, telemedicine	100	10	Medium
Wireless tele-surgery	Wireless telesurgery with a robot	<1/ 99,999%	10-15	Low
Asset management in hospitals	Tracking equipment location and usage inside the hospital	100	<10	High

Note: Market development insights within Huawei for above use cases can be made available upon request.

Huawei would also like to mention “Drones” to the ACMA, as 5G could support cellular assisted flights of drones beyond visual line of sight. Applications will include public safety, transport and delivery, real-time image transmission, monitoring and policing, agriculture, site operation and maintenance service with 24/7 automated flights.

## 10. Which frequencies ranges should be made available for these services/applications?

### Huawei's response:

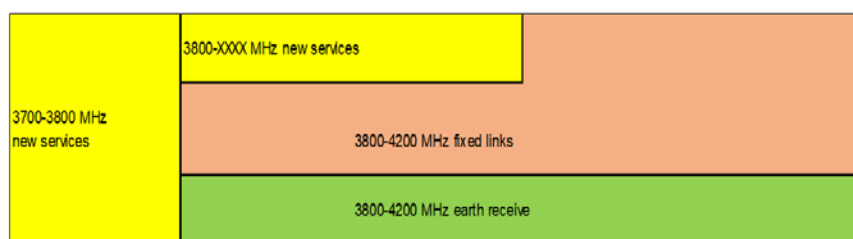
Among identified spectrum scenarios presented by the ACMA at this initial investigation stage of the band, Huawei prefers the spectrum scenario c which has a consideration of

- exclusive use in one segment (3700 – 3800 MHz) by new services



- shared use in another segment by new service and incumbent services (3800 MHz and above)
- incumbent use only in the rest of the band

**Figure 8: Spectrum scenario c, exclusive use in one band segment by new services. Shared use in another segment by new services and incumbent services. Incumbent use only in the rest of the band**



(Source: The ACMA Discussion paper, Planning of the 3700-4200 MHz band, page 27)

Another possible spectrum scenario would be to start with spectrum scenario b1 (but not b2) before progressing to spectrum scenario c where the ACMA would:

- focus initially on the 3700-3800 MHz segment for new WBB services where the global ecosystem is already mature and has the domestic interest and demand of national mobile carriers
- progressively make different segments of the band available to new WBB services at defined points in the future, for example from 2023 (providing additional time for incumbent services reallocations)

## 11. Which geographic areas should be made available for these services/applications?

### Huawei's response:

We recommend the ACMA to develop a geographical area scenario for new WBB services in the 3700-4200 MHz band as defined in the adjacent 3.6 GHz frequency band. This scenario involves spectrum licensed access for defined metropolitan and regional areas on an exclusive basis, and all other areas on a share (co-existence) basis with other services for new and incumbent.

We support this strategy if the implementation of arrangements for new WBB services is to be done in different areas over different timeframes - initially implementing for metropolitan areas, few important regional areas then progressively implementing to regional and remote areas.

However, it is important to note that the allocation of the entire spectrum is to be completed with one allocation auction process. This is in order to attract a business certainty of the investment from network carriers and for them to execute their network deployment strategy for providing geographical coverage, required network capacity, and end user throughput.

Huawei noted additional consideration requirements to apply at any apparatus licence for the areas (within 150 km the GPOs of Darwin in NT or Geraldton in WA) in this 3700-4200 MHz band.



**12. On what basis should access be provided? Should access be granted on an exclusive or shared basis, on a coordinated or uncoordinated basis, et cetera?**

Huawei's response:

This 3700-4200 MHz band is within global tuning range of the C- band, the best compromised frequency band globally for 5G capacity and coverage with respect to intended usage scenarios of IMT-2020 and beyond.

Mobile network operators have over 30 years of experience in deploying national communication infrastructures. They are well placed to invest in triggering equipment development and consolidating for international standardisation and a foundation for a large scale next generation mobile network ecosystem.

5G connectivity is also a key element for various vertical industries including Industry 4.0. Beyond mobile broadband services, nation-wide and exclusive licences can be used to address 5G connection demands from vertical industries either-

- Mobile network operators offering network slices to verticals, or
- Mobile network operators leasing their spectrum to verticals (or 3rd party) on a local basis.

Thus, Huawei recommends the ACMA to consider-

- Providing an exclusive spectrum access to new WBB services for the 3700-3800 MHz spectrum segment, enabling a contiguous and wider spectrum holding combining with a 3400-3700 MHz spectrum segment for national mobile network carriers, and
- Enabling sharing spectrum access to new WBB services at remaining segments of 3800-4200 MHz.

(Sharing concepts – traditional or/and innovative are to be further analysed and discussed. We are also preparing for our submission to respond to the ACMA on the consultation paper for "Spectrum Sharing".)

**13. What licensing mechanisms are appropriate (spectrum, apparatus or class licensing)?**

Huawei's response:

From our national mobile carriers and service providers' point of view (which is also Huawei's view), the "spectrum" licensing mechanism is appropriate for new WBB services. The obvious benefits with spectrum licensing are (but not limited to):

- Authorisation to utilise the band in longer durations, up to 15-20 years, providing a certainty for their Return on Investment (ROI)
- Authorisation to deploy any technology (technology neutrality) as long as licensing conditions are followed, providing a better flexibility in today dynamic changing network environment
- Authorisation to lease to third party, enabling for network slicing features with enterprises
- Having a common licensing condition, providing a controlled mechanism in managing interference among licenses where licensing conditions closely follow international technical specification such as emission limits

Apparatus licensing mechanisms could be considered for low-density population regional and remote areas, which could facilitate the site-based or smaller area-wide requirement from enterprises including mining, local internet service providers. This would also balance out the investment and service demand.

14. If arrangements for WBB specifically are implemented in the 3700–4200 MHz band, are the proposed interference management techniques with services in the 3.6 GHz band suitable? Are any other techniques proposed? Are there any other compatibility issues with the 3.6 GHz band the ACMA should consider?

Huawei's response:

The same interference management techniques used in the 3.6 GHz band, is considered suitable for the 3700-4200 MHz band if arrangements for WBB specifically are implemented.

Huawei supports for spectrum licensees to manage via a synchronisation condition requirement to avoid guard bands, promote efficient utilisation of spectrum, and resulting in no service degradation due to interference caused by unaligned frame transmission among network operators.

The ACMA should consider innovations made by global technical specification groups that have been completed for specifications required for end to end ecosystems and services for its regulatory framework. The interference management mechanisms of this band could be discussed in more details when the ACMA has progressed planning of this frequency range to the "Preliminary replanning" stage.

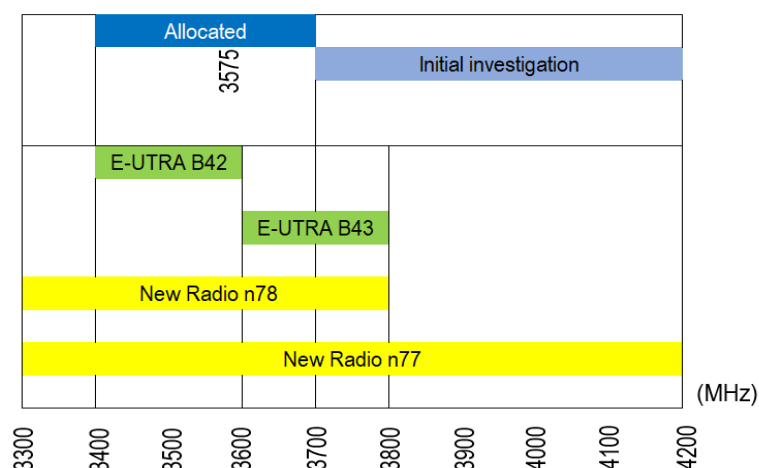
15. Should the ACMA consider extending existing apparatus and spectrum licence arrangements in the 3.6 GHz band into the 3700–3800 MHz band or another segment of the 3700–4200 MHz band?

Huawei's response:

Huawei believes that the ACMA should consider extending spectrum licence arrangements in the 3.6 GHz band into the 3700-3800 MHz band. The ACMA should also consider extending apparatus licence arrangements including other non-wireless broadband services in the 3.4 and 3.6 GHz band into the 3800-4200 MHz band.

With this arrangement, trading and re-arrangement in spectrum holdings via licensees' agreement could be achieved and each mobile operator will gain to access to a minimum of 100 MHz contiguous bandwidth. This arrangement would also allow mobile network operators to hold the spectrum in the tuneable frequency range (3400-3800 MHz) for a smooth network evolution from LTE/4G to NR/5G and vice versa when required.

Aligning with 3GPP frequency bands- E-UTRA Band42 (3400-3600 MHz), E-UTRA Band 43 (3600-3800 MHz); NR Band n78 (3300-3800 MHz); and NR Band n77 (3300-4200 MHz) for WBB services will lead to a harmonised global ecosystem for mobile broadband services.





- 16. Is there any additional information available that would assist the ACMA in assessing compatibility of potential new WBB services in the 3700–4200 MHz band with WAIC and radio altimeter systems in the 4200–4400 MHz band?**

Huawei's response:

Huawei appreciates the ACMA for their efforts, including collecting and commencing an initial compatibility study for "Wireless Avionics Intra-Communication systems (WAIC)".

At this point in time, Huawei does not have information to add for the compatibility studies of WBB and WAIC.



## About Huawei

Huawei is a leading global provider of information and communications technology (ICT) infrastructure and smart devices. With integrated solutions across four key domains – telecom networks, IT, smart devices, and cloud services – we are committed to bringing digital to every person, home and organisation for a fully connected, intelligent world.

Huawei's end-to-end portfolio of products, solutions and services are both competitive and secure. Through open collaboration with ecosystem partners, we create lasting value for our customers, working to empower people, enrich home life, and inspire innovation in organisations of all shapes and sizes.

At Huawei, innovation focuses on customer needs. We invest heavily in basic research, concentrating on technological breakthroughs that drive the world forward. We have more than 188,000 employees, and we operate in more than 170 countries and regions. Founded in 1987, Huawei is a private company fully owned by its employees.

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