

ONLINE SUBMISSION

5 May 2021

The Manager
Spectrum Management Outlook and Strategy Section
Spectrum Allocations Branch
Australian Communications and Media Authority
PO Box Q500
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Re: Draft Five Year Spectrum Outlook 2021 - 26 (IFC: 10/2021)

Intelsat, the leading provider of fixed-satellite services (“FSS”) worldwide,¹ is pleased to submit comments to the discussion paper on Draft Five Year Spectrum Outlook 2021-2026, published by the ACMA at the end of March 2021.²

Issues for Comment

In the Consultation Paper, the ACMA itemized a list of specific questions for comment. We address these issues below.

Part 1

1. Do you have any feedback on the ACMA’s approach to the five-year spectrum outlook?

While Intelsat supports Australia plans to play an important role in the global space community by making a \$7 billion investment in space capabilities over the next 10 years as well as the establishment of Australian Space Agency with the objectives to triple the size of the Australian space sector by 2030, Intelsat is disappointed with the large amount of mid band spectrum, in particular C-band, being allocated to the terrestrial mobile industry without any strong and valid justifications. The band 3700 – 4000 MHz is in the process of being allocated to 5G in addition to the previous C-band spectrum that have been made available for 5G deployment (i.e. 3400 – 3700 MHz). Only the 4000-4200 MHz Earth

¹ For the past 50 years, Intelsat has been delivering information and entertainment for many of the world’s leading media and network companies, multinational corporations, Internet Service Providers and governmental agencies, among many users. Intelsat Asia Carrier Services, LLC, a subsidiary of Intelsat US LLC, holds an Australian carrier licence under subsection 56(1) of the Telecommunications Act 1997.

² See, Consultation Paper, Draft Five Year Spectrum Outlook 2021-26 (March 2021) (hereafter “Consultation Paper”), available online at <https://www.acma.gov.au/consultations/2021-03/draft-five-year-spectrum-outlook-2021-26-consultation-102021>

receive segment being preserved for FSS which will not be shared with 5G services. While, the C-band uplink (i.e. 6 GHz) are also under consideration for Wi-Fi and 5G. These conditions (i.e. FSS lost access or under threat to the current FSS spectrum such as C-band, 28 GHz band, and Q/V band) will not support Australia's plan to play an important role in the global space community since access to the current FSS spectrum is a vital factor for Australia to be able to achieve its objectives in the global space community.

Intelsat also regrets that the ACMA has agreed to the mobile industry claims with regard to the spectrum needs of 100 MHz of contiguous C-band spectrum per operator despite the recent OFCOM findings³ demonstrating that with only 40 MHz of non-contiguous C-band spectrum was sufficient to provide all the main services anticipated under 5G services ((see 1.20, 1.35 and Figures 1, 2 and 3).

Apart from the above comments, below are Intelsat's additional observations that might not have been considered in the ACMA spectrum C-band planning refer to the outcome paper of the replanning 3700 – 4200 MHz band:

- 1) The ACMA have created unfair competition environment between satellite industry and mobile industry in the metropolitan and regional areas with only 200 MHz of C-band spectrum made available for FSS and 600 MHz of C-band spectrum made available for terrestrial 5G. Please see our below responses to question 3 on the "Implementation Stage" of the band 3700 – 4200 MHz.
- 2) While there is only 200 MHz of C-band exclusively made available for FSS in the metropolitan and regional areas, it will still be challenging for FSS to use these 200 MHz of C-band spectrum since Out of Band Emission (OOBE) interference due to 5G services operating in the adjacent band services need to be managed accordingly.

In addition to the above observations, it is stated in the Consultation paper that the ACMA's responsibilities is to ensure spectrum is used and managed to maximize overall public benefit, Intelsat believe that the current C-band spectrum planning in Australia do not represent the use of spectrum for overall public benefit especially when we could see that Australian national broadcasters (e.g. ABC) are struggling to distribute its content to all citizens and customers in Australian in particular in large population areas (i.e. metropolitan and major regional areas).

³ https://www.ofcom.org.uk/__data/assets/pdf_file/0023/195521/consultation-sut-modelling-700mhz-3.6-3.8ghz-spectrum.pdf

2. Are there other technology developments or sources of spectrum demand that the ACMA should be aware of in considering spectrum management over the next 5 years?

An interesting article from technology columnist posted in the Washington post found out that the speed of 5G network is just slightly faster than 4G network⁴. From more than 4000 download tests, below are the summary of download test results:

- a. AT& T Network:5G phone: 32 Mbps vs 4G phone: 34 Mbps (Median)
- b. T-Mobile Network:5G phone: 15 Mbps Vs 4G phone: 13 Mbps (Median)

The above download test results backed up by RootMetrics, a network analysis firm, which stated that median AT&T 5G speeds were 46 Mbps, only slightly faster than 4G LTE speed of 43 Mbps.

Part 2

3. Do you have any feedback on the ACMA's plans for monitoring, initial investigation, preliminary replanning or implementation of bands?

Monitoring Stage

- a. Bands being studied under WRC-23 agenda item 1.15 (12.75 – 13.25 GHz)

As indicated in the Consultation paper, the 12.75 – 13.25 GHz band is the subject of agenda item 1.15 (WRC-23). In this regard, Intelsat support the ACMA to play an active role on the ITU-R studies under agenda item 1.15 (WRC-23) and Intelsat as the proponent of agenda item 1.15 (WRC-23) would be happy to be able to work closely with the ACMA to make progress of the on-going ITU-R studies under this agenda item in order to support establishing a regulatory framework and technical requirements for operation of earth stations on aircraft and vessels in the frequency band 12.75-13.25 GHz (Earth-to-space) with conditions that protect the services currently allocated in this frequency band and bands adjacent to it. Therefore, we request the ACMA to support the establishment of a regulatory framework and technical requirements for the operations of earth stations on aircraft and vessels in the frequency band 12.75-13.25 GHz (Earth-to-space) based on the results of the studies conducted taking into account the protection of services currently allocated in this frequency band and bands adjacent to it.

⁴ See, interesting article from technology columnist posted in Washingpost about 5G speed compare to 4G speed, available online at <https://www.washingtonpost.com/technology/2020/09/08/5g-speed/>

b. Bands being studied under WRC-23 agenda item 1.2

Resolution 245 (WRC-19) as the main reference for the on-going ITU-R studies under agenda item 1.2 (WRC-23) clearly stated that Region 3 will only consider the band 7025 – 7125 MHz for the possible IMT identification which Australia.

With regard to the possibilities of IMT identification in other frequency bands in other Regions, Australia and other countries in Region 3 should only focus on the impact of the possible IMT identification of those other frequency bands in other Regions (i.e. Region 1 and Region 2) to the current existing services in Region 3. These considerations have been reflected on the output paper under agenda item 1.2 (WRC-23) resulted from the recent APG23-2 meeting.

Initial Investigation

6 GHz RLAN

Intelsat do not support and object to the possibilities of allocating the band 6425 – 7025 MHz for 5G services considering the current large amount of mid-band spectrum which have been allocated for 5G services in Australia. Further comments on 6 GHz RLAN will be submitted through separate submission to the ACMA public consultation on exploring RLAN use in the 5 GHz and 6 GHz bands.

Implementation Stage

3700 – 4200 MHz

With regard to the band 3700 -4200 MHz, Australia have made the reference to what happened in the United States to reallocate part of the band 3700 – 4200 MHz for the deployment of wireless broadband (5G) in Australia. The possibilities of 600 MHz of C-band spectrum could be available for 5G deployment in Australia while it's only 280 MHz of C-band spectrum have been made available for 5G deployment in United States. Based on these data, it is interesting that 280 MHz of C-band spectrum are adequate to deploy 5G services in the whole United States territory while Australia need 600 MHz of C-band spectrum to deploy 5G service in its territory, particularly when current spectrum harmonized for 5G hasn't yet been fully utilized.

Furthermore, mobile connectivity challenges in Australia isn't caused by spectrum shortage – it is rather caused by infrastructure, affordability, and coverage. Therefore, the ACMA should not priorities mobile broadband services – above revenue maximization – when awarding new frequencies.

Ensuring 5G spectrum licensing in a balanced way is key, especially when there are low and mid band still available to be licensed. For example, the sub-1 GHz has accounted for 20% of mobile operators who operate this spectrum for 5G. Then, mid band 2.5/3.5GHz where towers can cover several-mile radius with 5G that currently ranges from 100 to 900Mbps still hasn't been fully utilized. Therefore, we strongly encourage the ACMA to have a balanced approach between wider geographic areas in low bands and ultra-high speeds and the lowest latencies for higher bands. Especially when satellite continues to

provide critical services that cannot be provided by other means and where 3400-3700 MHz remains sufficient to use for 5G services as we can from recent auctions around the world such as in the UK, Ofcom just released the official results⁵ after mobile operators came to the end of a negotiation period in which they had to reach agreement with each other to reshuffle licences throughout the 3.4–3.8 GHz band. Yet after this latest spectrum auctions in the UK we see Vodafone and Telefonica swapping their spectrum in C band.

- Vodafone have 90 MHz in total but not contiguous (50 MHz in 3410-3460 MHz) & (40 MHz in 3500-3540 MHz)
- EE have 80 MHz in total but not contiguous (40 MHz in 3540 -3580 MHz) & (40 MHz in 3680-3720 MHz)

So both EE and Vodafone will be using carrier aggregation as we know this is possible based on the ITU recommendation which mentions that contiguous spectrum is not necessarily needed to achieve 5G throughput speed (See ITU-M.2410⁶, page 10 section 4.13) you can see that no mention of 100 MHz per operator or 100 MHz contiguous spectrum. Rather it says “Bandwidth is the maximum aggregated system bandwidth. The bandwidth may be supported by single or multiple radio frequency (RF) carriers. So the requirement for bandwidth of 100 MHz could be aggregated from other bands and this is certainly possible with TDD technology. Today Mobile network operators can use Dynamic spectrum sharing (DSS) which allows operators to use the same spectrum band for different radio access technologies such as 4G and 5G.

The conclusions of Ofcom’s model are backed up by real-world observations of operators around the world, who have launched high-quality 5G services using less than 80-100 MHz of C-band spectrum per MNO. Some relevant statistics are shown in Table 1 below:

Country	C band Allocated to MNO (MHz)	Number of Nationwide MNOs
Singapore	200	4
Italy	200	4
UK	390	4
France	310	4
Hong Kong	200	4

Table 1 C-band Allocation for 5G services in Several Countries

⁵ https://www.ofcom.org.uk/spectrum/spectrum-management/spectrum-awards/awards-in-progress/700-mhz-and-3.6-3.8-ghz-auction?utm_medium=email&utm_campaign=Ofcom%20spectrum%20auction%20final%20results%20announced&utm_content=Ofcom%20spectrum%20auction%20final%20results%20announced+CID_d7a1b0c2f591300a25be2fa49b84b683&utm_source=updates&utm_term=final%20results

⁶ https://www.itu.int/dms_pub/itu-r/opb/rep/R-REP-M.2410-2017-PDF-E.pdf

In addition, based on the outcome paper on the replanning of the 3700 – 4200 MHz band, the band 3800 – 4000 MHz plan to be shared between local area wireless broadband, FSS, and PTP. The following considerations need to be considered regarding the plan to share the band 3800 – 4000 MHz between local area wireless broadband, FSS, and PTP:

- 1) The ITU-R Report S.2368; “Sharing studies between International Mobile Telecommunication-Advanced systems and geostationary satellite networks in the fixed-satellite service in the 3 400-4 200 MHz and 4 500-4 800 MHz frequency bands in the WRC study cycle leading to WRC-15” concludes that the sharing between IMT-Advanced and FSS is feasible only when FSS earth stations are at known, specific locations, and deployment of IMT-Advanced is limited to the areas outside of the minimum required separation distances (i.e. at least 10s of km and typically exceed 100km) for each azimuth to protect these specific FSS earth stations.
- 2) Co-frequency sharing in the same geographical area between FSS and IMT systems is neither feasible nor practical. Numerous studies have shown this fact, and both satellite and terrestrial mobile industry agree that this is true. Even when 5G and FSS operate in adjacent bands, interference to FSS receivers will occur unless mitigation techniques are implemented.
- 3) When reading the outcome paper on the replanning of the band 3700 – 4200 MHz, Intelsat believe that the FSS most likely at the end will get secondary status compare to local area wireless broadband for the band 3800 – 4000 MHz in Australia. If it happened, then FSS will only able to use the band 4000 – 4200 MHz in the metropolitan and regional areas. Even with the available 200 MHz of C-band spectrum in the metropolitan and regional areas, it will still challenging for FSS to use the band 4000 – 4200 MHz in both areas with the consideration that FSS need to manage the OOB (Out Of Band Emissions) interference issues due to the deployment of 5G operating in the adjacent band.
- 4) Currently, a total of 530 MHz in the 5 GHz band have been allocated to RLAN in Australia. Intelsat believe RLAN and local area wireless broadband are quite similar applications.

Based on the above considerations, Intelsat questions the need to share the 3800 – 4000 MHz band in Australia between local area wireless access, PTP, and FSS.

Therefore, Intelsat believes the current available spectrum for the deployment of terrestrial 5G (i.e. 3400 – 3700 MHz) should be more than enough to accommodate the demand for 5G services in Australia in addition to the other mid-band spectrum (i.e. 1800 MHz, 2 GHz, and 2.3 GHz) that have been allocated for 5G services in Australia.⁷ A total of 470 MHz of mid-band spectrum have been made available for the deployment of 5G services in Australia. Based on these facts, the ACMA should postpone releasing the decision paper and make a thorough review to the outcome paper on the replanning of 3700 – 4200 MHz band.

⁷ See, 5G spectrum in Australia, available online at <https://www.communications.gov.au/what-we-do/spectrum/spectrum-allocations>

Even with the current FSS C-band spectrum allocation (i.e. 3700 – 4200 MHz), satellite industry still need to make an effort to manage the OOB (Out Of Band Emissions) interference issues due to 5G services operating in adjacent bands to be able to provide its services in the metropolitan and regional areas. One of the mitigation measures for managing the OOB interference issues which could be implemented at the receiver of earth stations would be to insert a RF waveguide filter between the output of the antenna and the input of the LNB. This will filter out to a great extent the unwanted 5G signal. Beside the use of RF waveguide filter installed at the receiver of earth stations, the guard band between satellite signal and 5G signal will be needed as shown in Figure 1 below.

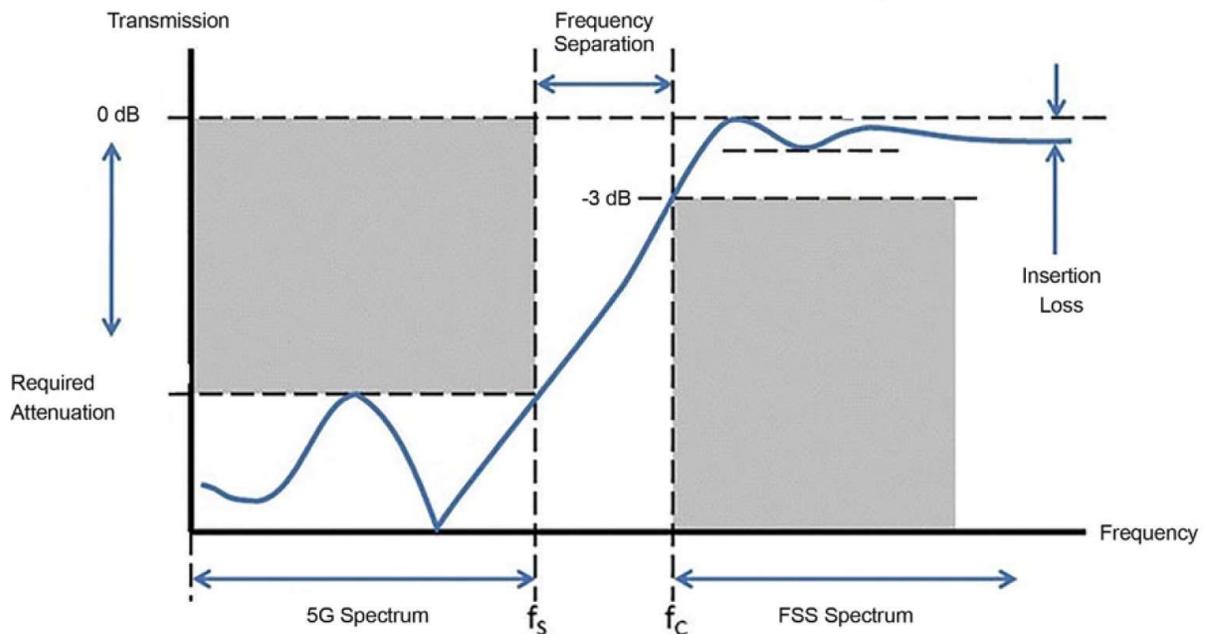


Figure 1. Filter and Guard Band

As shown in Figure 1 above, the filter could be operated properly if there is frequency separation (i.e. Guardband) between the edge of the IMT/5G transmission and the FSS transmission to provide the waveguide filter the necessary bandwidth to reject the 5G interference at the earth station. Therefore, it would be challenging for satellite industry to provide its services in the metropolitan areas and regional areas without the need of filters installed at the receiver of the earth stations. When identifying the need for receivers with improved selectivity, spectrum users should be entitled to use that equipment for a reasonable time period to implement the transition. Financial incentives to encourage replacement of equipment should not penalize users of old equipment with increased fees due to spectrum policy changes. The ACMA should also consider direct subsidy of the cost of replacement equipment, if the benefits provided by the new spectrum user outweigh the costs of upgrading receivers.

4. Do you have any comments about the ACMA's approach to forward allocations?

As per Intelsat's responses to question 3) above on the band 3700 – 4200 MHz, Intelsat do not agree to the forward allocation timing as indicated in Table 2, The ACMA need to postpone releasing the decision paper and make further thorough review to the outcome paper on the replanning of 3700 – 4200 MHz band.

5. Do you have any other comments on Part 2?

No further comments on Part 2.

Overall: FYSO format

6. How do you use the FYSO (for example, read once a year or regularly refer to)?

The draft FYSO is quite beneficial for Intelsat to keep track the updates on spectrum policy in Australia. It will be much better if the draft FYSO could also include Frequency Audit Table so that the ACMA and the industry could keep track on the amount of spectrum that have been allocated to certain applications/services.

7. Do you find the 6-month and annual progress reports useful?

Intelsat agree that the 6 month and annual progress reports would be useful to have.

Concluding Comments

Based on the above explanations, below are the summary of our feedback on the draft FYSO 2021 - 26:

- 1) Maintaining access to the current FSS spectrum will support Australia's plan to play an important role in the global space community.
- 2) Creating fair and balanced competition environment between satellite industry and mobile industry is vital to the success of both industries and is aligned with the spirit of maximizing the use of spectrum for public benefit.
- 3) The current available C-band spectrum for the deployment of terrestrial 5G (i.e. 3400 – 3700 MHz) should be more than enough to accommodate the demand for 5G services in Australia with the consideration that there is currently total of 470 MHz of mid-band spectrum have been made available for 5G.
- 4) The ACMA should postpone releasing the decision paper to make further thorough review to the outcome paper on the replanning of 3700 – 4200 MHz band.

Intelsat stands ready to provide additional information on any of the topics discussed in this contribution.

Respectfully submitted,



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