GLOBAL SATELLITE COALITION

ASIA VIDEO INDUSTRY ASSOCIATION

C-band is Critical for Satellite Services

Standard C-band downlink frequencies, 3.7 - 4.2 GHz, are globally identified and used **today** – with the extended C-band 3.4 - 3.7 GHz – to deliver a wide range of critical satellite services, which in many cases cannot be reliably provided by other means. Portions of the entire C-band are also considered preferred bands by a number of countries for the development and growth of **future** 5G terrestrial mobile IMT-2020 services.

Many Asia Pacific countries experience frequent, intense rainfall. C-band signals penetrate through many kilometres of precipitation with far less loss than higher frequency signals, while supporting high data rates. C-band also offers wide area regional satellite coverage. This combination of high availability, high capacity and wide coverage makes C-band satellite delivery highly desirable.

While continuing to invest in C-band, including into new high-throughput satellites, as demand for C-band satellite continues to increase, satellite operators recognise that in specific regions or countries the band may be used less by satellite or used in ways such that solutions could be found that allow satellite and IMT to use the spectrum in mutually compatible ways.

Work continues in various fora to determine technical measures to protect satellite reception whilst permitting introduction of new mobile services, where feasible. However:

→ The global satellite industry insists that a blanket approach to sharing C-band with terrestrial mobile IMT services will cause immense interference to satellite services and disruption to users.

→ Putting its hundreds of millions of users worldwide first, the global satellite industry thus remains fully committed to preserving the C-band frequency spectrum for satellite services.

Sectors relying on C-band in the Asia Pacific include:

Video Distribution

C-band is used to deliver high quality content via cable and other distribution networks to hundreds of millions of viewers and directly to tens of millions

Banking

C-band is crucial where service level agreements set high reliability requirements.

75,000 antennas use C-band to dispense $400 million per day from Indonesian ATMs alone

Oil & Gas, Mining and Resources

C-band supports mission-critical operations in remote areas

Mobile Networks

C-band offers reliable backhaul for mobile networks in remote areas and provides capacity for large regions.

In Indonesia between 6 and 15 million mobile subscribers are served via C-band, representing a total market value of up to $558 million

Air Navigation, Flight Tracking, Meteorology

C-band is used for networks which require wide coverage and very high reliability

Maritime

Global C-band coverage is crucial for vessels operating in remote regions or on long routes and for Safety of Life at Sea services. C-band is also of increasing importance for large vessels

Telemedicine

C-band supports the remote delivery of healthcare services, reaching otherwise underserved rural populations.

150,000 people a year are treated with the support of C-band in India alone

E-government

C-band solutions facilitate efficient delivery of services to underserved and unserved areas across Asia Pacific

Humanitarian Programmes

C-band offers connectivity for field offices, programme deployment and disaster management in remote areas

While most countries in Asia Pacific continue to rely on satellite services in the extended C-band 3.4 - 3.7 GHz, and more rely on satellite services in the standard C-band, some countries around the world have identified sub-bands of 100 - 300 MHz within the range 3.3 - 3.7 GHz for 5G IMT-2020 services.

The Need for Guard Bands

Wherever deployed, 5G IMT-2020 signals from large cell base stations can be millions to billions of times stronger (W/m^2) than incoming satellite signals received at C-band earth stations. IMT (as all) transmitters generate unwanted emissions into adjacent bands. No filter can perfectly pass the IMT signals within a given frequency band and completely cut them just outside it. Unwanted IMT emissions into the near adjacent satellite band will still be more powerful than the wanted satellite signals, yet cannot be filtered out at the satellite earth stations, blocking satellite signal reception.

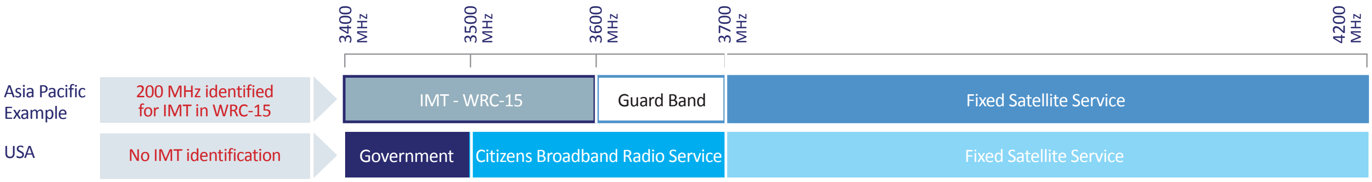
Similarly at the satellite receiver, wideband amplifiers cannot perfectly block far more powerful unwanted signals just outside; yet lock on to and amplify far weaker wanted signals just inside the satellite band.

C-band is Critical for Satellite Services

A guard band between IMT and satellite bands is required, where neither service operates, to obtain sufficiently low levels of unwanted IMT emissions and sufficiently high rejection of the same. The guard band size depends primarily on the IMT unwanted emissions limits, which administrations should set as low as possible, and on the separation distances between base stations and earth stations and specification of pre-inserted filters in the satellite receiver. The choice of guard band, IMT unwanted emissions limits, separation distance and reception filter is a commercial-technical-timescale tradeoff. Narrower guard bands, higher IMT unwanted emissions limits, and lower separation distances raise the reception filters' costs with today's technology.

The USA-Unique Proposed Solution

The FCC set an objective to enable 5G in "mid-band" spectrum while maintaining the robustness and viability of satellite C-band. In response, major USA-covering C-band satellite operators are working on a division of C-band. They propose to clear some spectrum for terrestrial 5G services in the lower part of the US C-band, 3.7 - 4.2 GHz, in return for the IMT industry financially compensating this clearance and the necessary supporting technical measures.



The proposed US solution requires interference protection for existing C-band earth stations, based on their specific locations and characteristics. C-band satellite is the primary content distribution link to millions of US viewers, received by thousands of C-band stations feeding cable and other distribution networks. C-band stations also provide international connectivity, broadband access and government services. C-band receive-only stations are being identified and registered, to ensure their protection by geographical separation from base stations and other technical measures.

The US solution will not work in the Asia Pacific

The US solution will not work in Asia-Pacific. Reasons include: the large numbers of administrations and satellite operators, greater service diversity, orders of magnitude more C-band earth stations, including many under blanket licenses lacking location details, with more even urban/rural distribution, and of smaller diameter (thus susceptible to interference from wider cones), greater cost sensitivity and lack of compensation for spectrum loss and/or necessary technical protection measures.

In the Asia Pacific region, the C-band delivers US$ billions of value through multiple service sectors, as highlighted in the graphics overleaf. Besides these existing services, satellite will also be an essential part of future 5G services and will play a major role in delivering the Internet of Things.

Look out of the window of any building in the region: many C-band dishes are seen on commercial, educational, government and residential rooftops. Using any C-band frequencies for 5G terrestrial mobile IMT-2020 services in the region threatens untold interference to domestic television reception and a wide range of business critical and safety related applications including emergency communications. Terrestrial solutions simply do not offer any viable or economical alternative for the provision of these satellite services. The US proposed solution is completely unworkable in the Asia Pacific region, as also in Africa and Latin America. Every city, town and village has C-band dishes whose performance would be impacted by sharing with mobile technologies in the same frequency band, whether or not some frequencies are officially cleared from satellite use.

Enabling 5G in the Asia Pacific

Thankfully, there are other viable 5G spectrum options in the Asia Pacific region. Allocating and filling feasible free frequencies first from the lowest upwards enhances efficiency. Many countries have yet to license mid-band 2.3 and 2.6 GHz bands. With global allocations for IMT services, and 5G trials and tests already under way in the 2.6 GHz band, these bands will undoubtedly become future terrestrial 5G bands and could afford much better solutions in the Asia Pacific region than C-band. Proven spectrum currently used by 2G, 3G and 4G services should also progressively be reallocated for 5G services.

Millimetre-wave bands with over 33 GHz new spectrum – over 41 times the 800 MHz 3.4 to 4.2 GHz C-band – are also being examined for possible identification for IMT services at the World Radiocommunications Conference 2019 (WRC-19), following ITU Resolution 238 at WRC-15.

Opening 10 GHz of spectrum from 66 - 76 GHz using existing co-primary mobile allocations would for example, triple the available spectrum for IMT, affording significant future-proofing for 5G IMT-2020.

In short, other solutions are available for the mobile industry, without needing to wipe out critical and widespread C-band satellite services.