GLOBAL SATELLITE COALITION

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 countries in Africa, Asia and the Americas 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 new, including high-throughput, C-band capacity, 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.

Satellite operators continue to work constructively in various fora to help determine technical measures to protect satellite reception whilst permitting introduction of new mobile services, where feasible.

> ▸ **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.**

> ▸ **Considering its hundreds of millions of users worldwide, the global satellite industry remains fully committed to preserving the C-band frequency spectrum for satellite services.**

While many countries 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 already identified sub-bands of 100-300 MHz within the range 3.3-3.7 GHz for 5G/IMT services.

The Need for Guard Bands

Wherever deployed, 5G/IMT 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.

Satellite receivers cannot block strong unwanted signals on adjacent frequencies and still successfully receive the much weaker, wanted, satellite signals within the satellite band.

Sectors relying on C-band include:

Broadcasting

C-band is used in broadcast distribution to deliver high quality content to **millions** of end-users in tropical areas.

80 million Nigerians (16 million households) depend on C-band for access to TV content.

Tele-medicine

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.

Oil and gas

C-band supports mission-critical operations in remote areas.

ATM networks

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

75000 antennas use C-band to dispense **$400 million** per day in Indonesia alone.

E-government

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

At least 50 C-band satellites provide critical public services and connectivity for millions of Africans.

Humanitarian Programmes

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

Air navigation and meteorology Services

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

20 million air passengers in Angola, DRC and Nigeria reach their destinations thanks to air navigation services using C-band.

Maritime

Global coverage is crucial for vessels operating in remote regions or on long routes, moreover C-band is considered of increasing importance for large vessels.

Mobile Backhaul

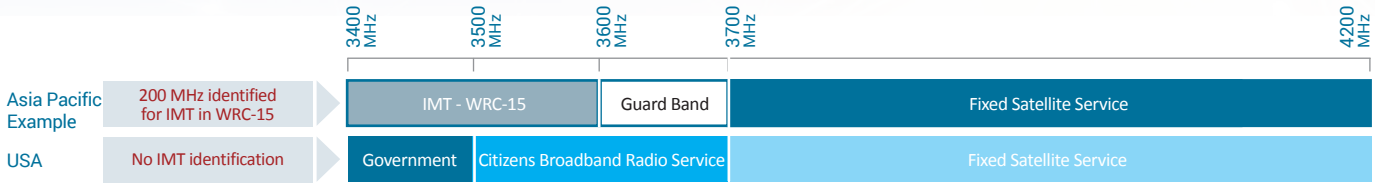
C-band offers reliable backhaul for mobile networks in remote areas and provides capacity for large regions.

In Indonesia between **6 and 15 million** mobile subscribers (total market value up to **$558 million**) are served with the help of C-band.

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 as well. 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 elsewhere

The US C-band approach will not work across Asia, Africa and Latin America for various reasons: 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 for example, 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.


Asia Video Industry Association

Look out of the window of any urban building in Asia or Africa: 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 therefore completely unworkable in the Asia Pacific region, Africa and Latin America. Multiple cities, towns and villages have 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

At least 300 MHz of C-Band spectrum has already been made available for IMT as follows:

- **200 MHz (3400-3600 MHz)** has been identified for IMT across ITU Regions 1&2, and some APAC countries
- **100 MHz (3300-3400 MHz)** has in addition been identified across large parts of Africa, some Latin American and some APAC countries
- **100 MHz (3600-3700 MHz)** has been added by some ITU Region 2 countries to their WRC-15 IMT identifications
- **190 MHz (4800-4990 MHz)** has been identified for IMT in some countries

All this is in addition to the 33 GHz new spectrum being considered for IMT under Agenda Item 1.13.

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