



Is C-Band really safe?

The well-publicised fight for the satellite industry's right to continue to use C-Band without interference from new broadband wireless access technology such as Wi-Fi and Wi-Max reached a peak at the World Radiocommunication Conference (WRC) meeting in Geneva in November 2007 when the satellite industry triumphed over Broadband Wireless Access (BWA) and secured C-Band for its own. However, the fight is not yet over. Satellite Evolution looks at the C-band issue, the outcome of the WRC and what happens next.

The C-Band lies at 3.4-4.2 GHz and is widely used by satellite services, radar systems and domestic microwave links. These services cover large areas including those in the developing world where they facilitate vital applications such as disaster recovery, telemedicine, distance learning and universal access.

South and Central America, Southern Asia and equatorial Africa are regions heavily reliant on C-band due to its resilience in heavy rain. Over the next 3-5 years, C-band will be used by satellite providers to roll-out additional services, faster than that proposed for IMT services. C-band is also used to deliver IP-related satellite networks in Africa.

C-band is also used for military operations. The US Department

of Defense operate mission critical, high-powered radars in this band – globally and continuously.

What is the threat?

Broadband Wireless Access (BWA) and IMT mobile services such as Wi-Fi and Wi-Max, 3G and 4G are becoming more and more popular across the world. Global administrations, that are responsible for the spectrum allocating process, have designated portions of the C-Band for these terrestrial wireless applications. However, this band is already in use by satellite services and in places where administrations have allowed the C-band to be used by BWA services, there have been massive interruptions of satellite services. Interference



with radar and domestic microwave links is also likely. Australia, Bolivia, Fiji, Hong Kong, Pakistan and Indonesia have all already been affected by this problem.

Antennas that receive satellite downlinks signals in the C-band are by necessity extremely sensitive devices. They are designed to receive a low-power signal emitted by small transmitters located in orbit 36,000 kilometres above the equator. In the C-band, satellite services have co-existed with domestic microwave links and radars for many years, because the latter systems operate via tightly focused beams from fixed points, and de-confliction can take place where necessary.

By contrast, terrestrial wireless applications are by definition ubiquitous and increasingly mobile/nomadic. Mobile and base stations for terrestrial wireless applications emit signals from many locations, in all directions, simultaneously that are powerful enough to saturate the sensitive C-band receiving systems causing a potential for loss of service in the C-band. This interference has been confirmed in several locations, including Hong Kong where, during experiments, television signals were inadvertently knocked off the air feeding 300,000,000 households!

Due to the sensitive nature of C-band satellite receiving systems they may also be disrupted by mobile terrestrial use of frequencies in immediately adjacent bands. Field tests by the Office of Telecommunications Authority in Hong Kong concluded that use of frequencies for terrestrial wireless services in the Extended C-band and Standard C-band was not practical.

No-change

The key to the C-band campaign has always been heightening awareness of the problems that the satellite industry could potentially face. Organisations such as the Global VSAT Forum (GVF), the Satellite Users Interference Group (SUIRG) and the Asia-Pacific Satellite Communications Committee (APSCC) produced a strategic plan aimed at elevating the issue amongst all relevant stakeholders. The creation of a C-Band Satellite Forum resulted in a World Bank-funded international forum involving six key administrations throughout the Americas in a videoconference link and a live webcasting.

As a reaction to the threat, a Satellite Industry Position Paper was also circulated by the Global VSAT Forum's Regulatory Working Group that consists of the world's major satellite operators. The paper was endorsed by GVF, the Cable & Satellite Broadcasting Association of Asia (CASBAA), The Asia Pacific Satellite Communications Council (APSCC), the European Satellite Operators Association (ESOA), Europe's Satellite Action Plan-Regulatory Working Group (SAP-REG), the World Teleport Association (WTA), the Satellite Users Interference Reduction Group (SUIRG), and the US Satellite Industry Association (SIA) and many more concerned groups. The position paper was then circulated to national administrations and regional groups of governments in advance of the Conference Preparatory Meeting (CPM) and received an excellent response there, as well as at the WRC-07 itself.

This support gathered momentum from many more satellite industry players and was eventually given the name of the "No Change" campaign, initiated by the global satellite community to help raise awareness of the potential consequences. Further information and important documentation can be found at the No Change website (www.no-change.info).

The principal arguments for satellite in C-Band

The position paper put together by the satellite industry sent to the various Administrations around the world identified the following four issues as pivotal in the allocation of the C-band spectrum to the satellite industry:

- **IMT's 'spectrum requirement' is unusually high and may be based on a significant overestimation of mobile user needs.**
 - there are no clear-cut technology winners, but stifling one

technology in favour of another creates many losers;

- no one single technology is suited to every user community;
- technology migration tends to be evolutionary rather than revolutionary, and users and markets must be allowed to migrate when they are ready.

Moreover, there is no consistency within the mobile community on what future spectrum requirements will be. Indeed, a very recent WiMax Forum Report suggests that certain external market forecasts for WiMax are significantly above internal WiMax Forum forecasts, and, that as recent subscriber numbers suggest, initial adoption may occur at a lower rate than many independent forecasts.

- **Realistic solutions to protect existing satellite links in C-band have not been identified; migration of IMT services to this band may cause extreme harm to the satellite sector.**

It is clear from the most recent reports and studies from the ITU, CEPT and the WiMax Forum itself, that mitigation techniques, such as separation distance, earth station shielding, or the use of filters on satellite receive antennas, to block interference from IMT networks into satellite networks would be far too severe to be justifiable from a technical or economic perspective. This means that in practice, mitigation measures would not be effectively implemented. Furthermore current IMT proposals offer no protection for FSS receive-only earth stations that are deployed broadly and on a licence-exempt basis in many countries.

The satellite sector has experienced further degradation of its services in some parts of the world due to terrestrial mobile operations using the same C-band frequencies. For example, a large oil company reported installation delays, changes of site, and higher installation costs to its VSAT networks due to interference from mobile services in Nigeria and Congo. They have also experienced interruption of service in Cameroon and Uganda. These are not isolated incidents - disruption of C-band satellite services from terrestrial wireless interference has been taking place around the world over the last three years.

It is understood that this has been the result of Broadband Wireless Access (BWA) systems being deployed in the C-band. However, the negative effects will be far more wide-reaching in the case of terrestrial mobile IMT broadband services, which have large coverage requirements and are expected to transmit at very high rates.

- **Alternative spectrum bands do exist for IMT, but not for satellite.**

Proposals to identify all or parts of the C-band for IMT are not the solution. They do not take into account that C-band has unique characteristics which make it ideal for the delivery of satellite services. By contrast, it is far from optimal for mobile terrestrial services.

- **Alternative spectrum bands do exist for IMT, but not for satellite.**

C-band is used by satellite operators to provide inter-continental connectivity between Europe and the rest of the world, as well as for the provision of a whole variety of critical services worldwide. Just in Europe, there are already more than 1,000 registered C-band earth stations plus many more licence-exempt TV receive-only earth stations in operation. The European Commission is itself a large user of C-band satellite capacity (for connections with Africa & Latin America).

Satellite operators are also investing in new C-band services in Europe (e.g. Inmarsat, which has installed a new hub in the Netherlands which entered into service in 2006 and SES, through customer



Photo courtesy of GigaSat.

agreements to support global maritime services). Furthermore, the Galileo project includes the development of a network of satellite earth stations used as centres (the so-called 'GDDN' for Global Data Dissemination Network) which will depend on very high-reliability C-band satellite links within Europe and between Europe and the rest of the world in order to support this critical infrastructure project.

What happened in Geneva?

The global satellite industry emerged from four weeks of successful negotiations at WRC-07 to protect the users of its C-band spectrum from terrestrial interference. With its unequivocal "no change" campaign, the satellite industry at WRC-07 has ensured its uninterrupted, interference-free use of C-band for the future. The WRC-07 of the UN's International Telecommunication Union (ITU), is held every four years. At this meeting the precious radio frequency available is allocated with the 191 Member States present.

"This outcome represents a strong endorsement by a large number of administrations of the critical nature and value of C-band satellite services as they exist today," said Rob Bednarek, CEO of SES NEW SKIES. "The certainty and stability provided by today's outcome allows us to continue our further development of new markets and services, including mobile broadband, by an industry well acquainted with customers real needs."

Andrew Sukawaty, Chairman and CEO of Inmarsat, stated: "We would like to thank all WRC 2007 delegates for recognising the importance of the C-band for the satellite industry. Their decision to

protect the C-band will enable us to continue offering essential communications to mobile users where terrestrial networks cannot reach, including aeronautical and maritime safety services."

In addition to ensuring their uninterrupted use of the C-band, WRC-07 also gave satellite operators assurances that any future IMT (International Mobile Telecommunications) networks will provide them with full protection from interference. The endorsement of the satellite industry's use of this highly valuable spectrum in the band 3.4 – 4.2 GHz will ensure that operators will also have adequate bandwidth to roll out future service – especially in those regions where they are most in demand. These include the developing world, large industrialised countries, and remote regions.

"The results from the conference were very positive for the satellite industry," Phil Spector, General Counsel of Intelsat, commented. "The satellite industry and our customers worked together in an unprecedented manner to raise the awareness of regulators to how critical satellites are to the global telecommunications infrastructure," Spector continued.

The WRC has decided against the global identification for IMT, including Wimax, in any part of the satellite C-band. In effect, the ITU table of allocations remains unchanged and the limited number of countries in favour of change are identified in an opt-in footnote. With this approach, the world's regulators participating in the WRC have clearly signalled that these bands are not globally harmonised for IMT. The WRC further restricted IMT, including Wimax, by imposing stringent requirements for the protection of existing and future satellite services in the band, including transborder protection.

Specifically, in Region 2 (the Americas and the Caribbean), there is no identification for IMT, just an upgrade, through a footnote, in 14 countries of the mobile service allocation in 3.4-3.5 GHz. In Region 3, only a very few (8) countries inserted their name to the footnote identifying IMT. Only in Region 1 was there broader support from countries to be included in the footnote identifying IMT for national use.

This outcome therefore shows overwhelming recognition of the need for continued interference-free operation of C-band satellite services that are essential for the provision of national over-the-air and cable television services, emergency and disaster recovery communications, Internet services, and mobile and wireline telephony trunking services.

The WRC-07 saw a well-organised lobbying campaign that included support from governments, international organisations, non-profits, and technology companies. Also on offer was terrestrial spectrum below 1GHz that results from the transition from analogue to digital television, and here the mobile network operators were awarded the promise to use much of that spectrum in years to come.

A permanent solution?

The unification of the satellite industry was, and will always be, the only way to make governments and spectrum management authorities aware of the any threats or problems that other services and technologies pose to the satellite industry. The pro-active work of GVF, its Members, other satellite industry associations and the users of satcom services worldwide have succeeded in making the relevant authorities stand up and listen. The "No Change" campaign is absolute proof of this.

However, there are still several administrations that have not acknowledged that C-band should be left alone exclusively for satellite services and this forms the next part of the fight for C-band. For now, C-band is safe and there are no plans to review this decision in the future as yet. However, rather than resting on their laurels, the satellite community will continue to raise awareness and to attempt to change the minds of those countries where the impact of IMT services has not yet been recognised. The satellite industry has done a wonderful job and has secured C-band for satellite. However, there is still work to do and the satellite industry will always step up to the mark. ■