The Vital Hertz: Radio Spectrum

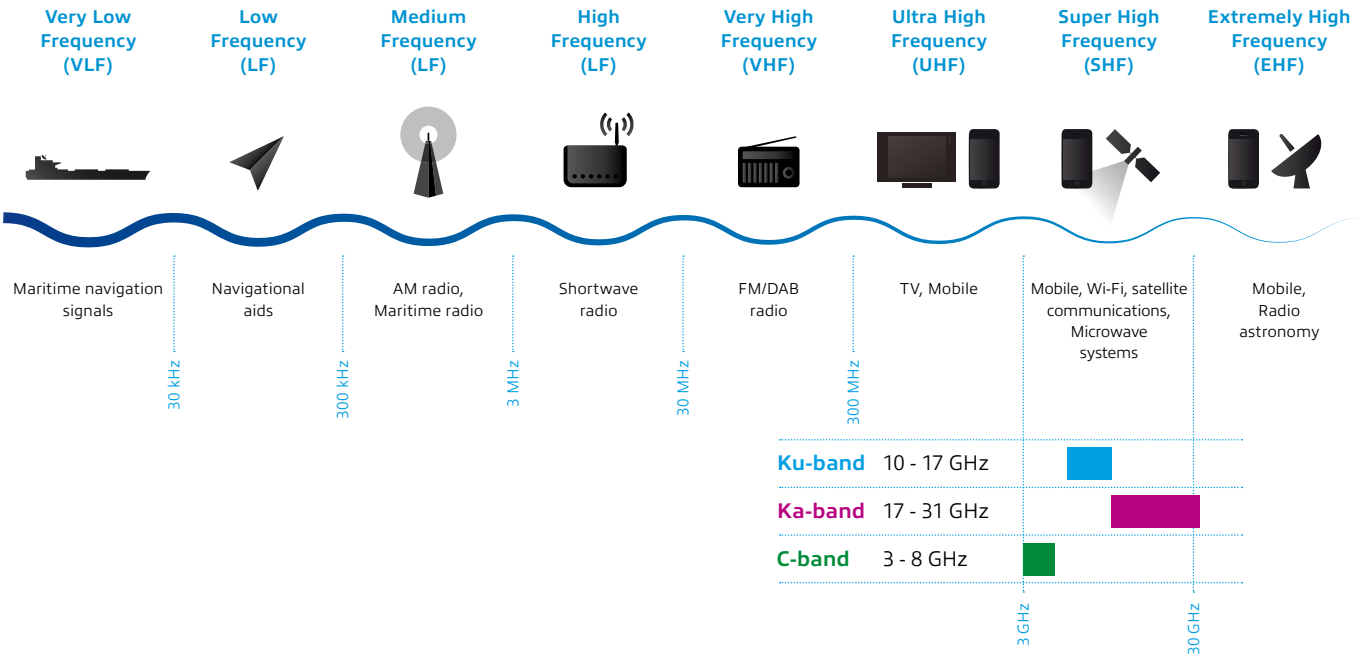
SES White Paper
November 2015

Satellite operators provide crucial connectivity around the world using vital satellite frequency bands and therefore sharing arrangements with mobile operators should not target these bands.

The space 36,000 kilometers above the Earth, as unlimited as it may seem, is quite a finite resource.

Irrespective of the number of spacecraft orbiting at that far a distance, the transmissions are confined, as per the law of physics, by the radio spectrum that can be operated at the geostationary ring around the Equator. The authorisation to use this spectrum is granted by the States which have applied for these rights through the International Telecommunication Union (ITU), a regulatory body of the United Nations.

SPECTRUM IS SPLIT INTO DIFFERENT PARTS THAT ARE THEN ALLOCATED TO ONE OR MORE SERVICES



The ITU: Allocating radio spectrum and orbital positions

The electromagnetic spectrum used for all radio communication technologies and services is defined as the range from 1 hertz to 3000 gigahertz. This includes television broadcasting, telecommunications and mobile phone services, with a certain portion of the spectrum allocated for each group of services, including satellite services.

The use of this spectrum is coordinated by the ITU, a specialised UN agency for information and communication technologies.

The ITU is responsible for allocating transmission frequencies and satellite orbits, developing the technical standards that ensure networks and technologies interconnect seamlessly, and working to improve access to information and communication technologies in underserved communities worldwide.

Its activities affect broadband Internet, latest-generation wireless technologies, aeronautical and maritime navigation, radio astronomy, satellite-based meteorology, convergence in fixed-mobile phone, data, voice telephony, TV broadcasting and next-generation networks.

Based in Geneva, Switzerland, the ITU is part of the United Nations Development Group. ITU members include 193 countries (Member States) and close to 800 academic institutions and private-sector companies (Academia, Sector Members and Associates), which conduct most of the work for each sector. Private organisations – such as carriers, equipment manufacturers, funding bodies, research and development organisations, and international and regional telecommunications organisations – may join the ITU as non-voting Sector Members. SES is a Sector Member of the ITU through various Administrations and actively participates in the meetings.

The World Radiocommunications Conference (WRC) is the key ITU meeting, convening in Geneva for three to four weeks every three years. Thousands of delegates from over 150 countries gather to discuss and revise the international Radio Regulations, which cover all telecommunications throughout the world. The conference this year, WRC-15 runs from November 2-27, 2015.

Ku-, Ka- and C-band

Commercial satellite operators like SES mainly use three spectrum bands: Ku-, Ka- and C-band.

Ku-band

The Ku-band represents the portion of the electromagnetic spectrum from 10 to 17 gigahertz. Ku-band is used primarily for satellite broadcast and for fixed data services (commercial and government customers), and increasingly for mobility services due to its small antennas and favourable propagation characteristics.

Ka-band

The Ka-band represents the portion of the electromagnetic spectrum from 17 to 31 gigahertz. Currently, Ka-band is used primarily to enable broadband type of applications for both commercial and government customers. Demand for this band is set to grow further as demand for broadband connectivity continues to rise.

Emergency.lu being deployed in Tacloban, The Philippines at the aftermath of Typhoon Haiyan in 2013

C-band

The C-band covers the frequencies from 3 to 8 gigahertz[1] in the microwave range. C-band satellite networks provide many critical services, including TV broadcasting, mobile backhaul, satellite telemetry, public meteorological data distribution, corporate business networks, aviation security, aeronautical applications such as the International Civil Aviation Organisation (ICAO) network, and vital communications for public protection and disaster relief. C-band satellite networks are extremely reliable – even in rainy regions – and cannot be replaced by bands with different propagation characteristics and narrower beams, such as Ku- and Ka-bands. C-band satellites can cover very large areas from continents to the entire globe as seen from one satellite.

1 The exact frequency range is 3400-4200 MHz & 4500-4800 MHz for downlink and 5725-7025 MHz for uplink

SATMED e-health platform recently deployed in a Maternity hospital in Benin

C-band networks provide crucial connectivity for emergency response

C-band enables emergency support to the public when they need it most. When disaster strikes and terrestrial infrastructure is down, up-to-the-minute information can mean the difference between life and death. Satellite connectivity via C-band is the fastest way to get communications services up and running for those seeking rescue or coordinating relief efforts.

First deployed in South Sudan in January 2011, emergency.lu is such a platform designed to quickly re-establish communications in remote areas isolated by natural disasters or other emergency situations. The platform was again deployed in November 2013, when Typhoon Haiyan devastated up to 80% of the built environment in the central Philippines, took thousands of lives, and displaced and cut off all means of communications for millions of people.

Other critical communication networks enabled by C-band

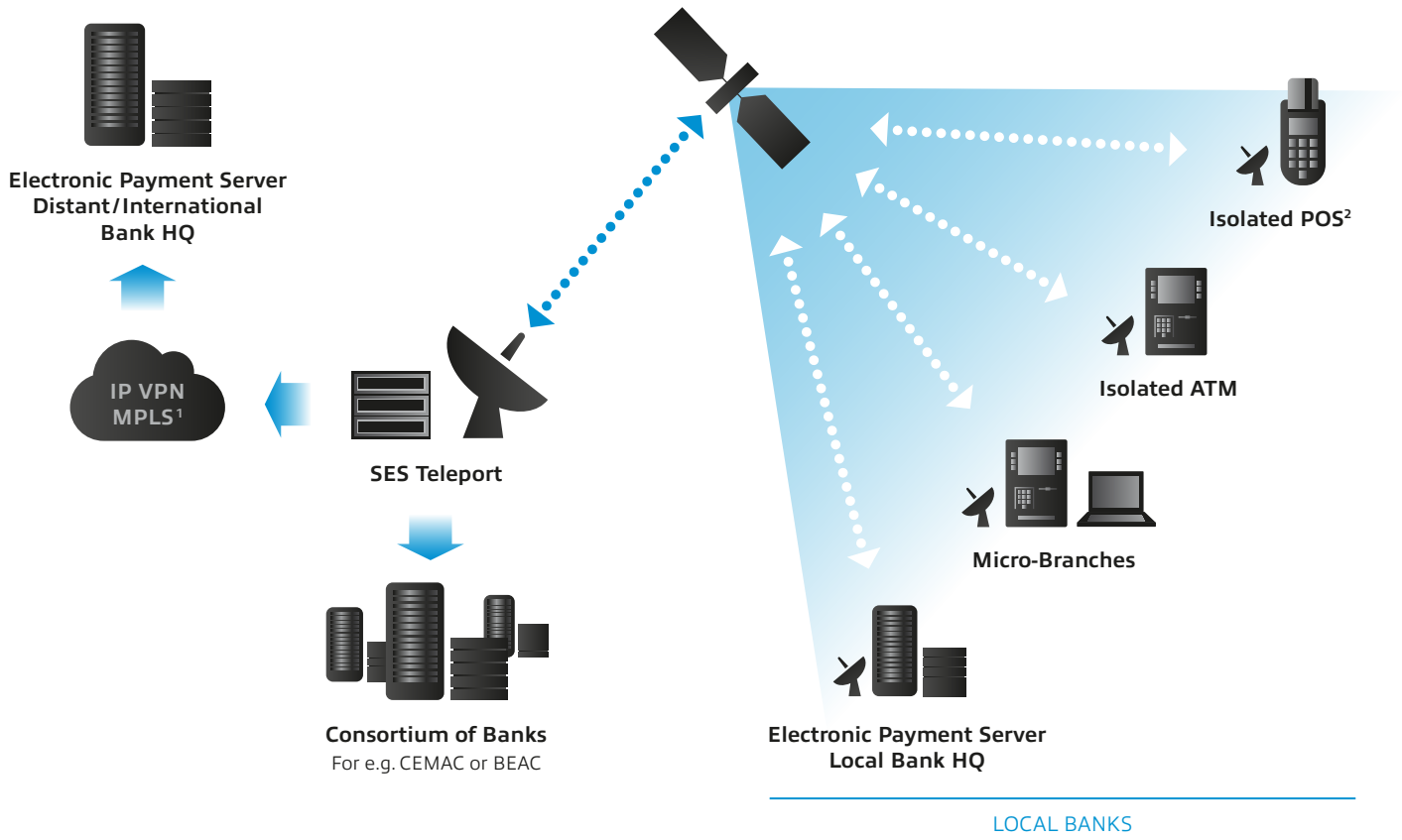
C-band is the core communication infrastructure for most humanitarian organisations and NGOs for e-learning and e-health. Empowering remote communities by providing access to education and healthcare has proven itself one of the most valuable aspects of satellite connectivity.

The SATMED e-health platform from SES relies heavily on C-band to fulfill its ambition to improve public health in emerging and developing countries. This satellite-based communication solution connects health staff working in the world's most remote areas to the international health community for consultation and regular training.

The global VSAT industry on the other hand is also heavily dependent on C-band, as it provides vital communication links with the highest availability for the commercial maritime industry as well as the oil and gas sector, and enables land-based VSAT applications such as mobile backhaul services across challenging terrain and remote territories.

There are as many as 75,000 bank branches, ATM networks and trading platforms connected via C-band across Indonesia that allow as much as USD 400 million to be dispensed on a daily basis. In rural areas in Africa and Asia, this frequency band is also used for mobile backhaul, allowing 2.9 billion people to stay connected to their friends and family through mobile phones. Oil and gas platforms rely on C-band for exploration, extraction and monitoring. In the maritime sector, as many as 12,000 vessels and cargo ships are using C-band to maintain crew welfare and optimise operational efficiency.

E-BANKING NETWORK SOLUTIONS POWERED BY C-BAND



WRC-15 Proposal: Mobile telecommunications seek more spectrum

In the lead-up to WRC-15, the international community of terrestrial mobile service providers and equipment manufacturers requested more spectrum, with the aim to gain access to a portion of the C-band that is currently allocated to satellite operators.

Satellite operators oppose this proposal as it raises major concerns. A global designation of the C-band for terrestrial mobile communications would prompt countries to allow mobile wireless services into the spectrum, causing insurmountable interferences. Nearly a dozen technical studies which are summarized in ITU reports have clearly concluded that sharing C-band between mobile and satellite operators is not feasible in the same geographical area since a minimum separation distance between the operations cannot be guaranteed.

The practical result is that terrestrial mobile networks cannot operate in the C-band anywhere in the world without causing substantial harmful interference with the established satellite transmissions. The interferences would lead to the loss of vital communications during emergency response and disaster relief efforts around the globe. In addition, it would put at risk video distribution, satellite news gathering, programme distribution chains, international programming feeds, terrestrial transmission networks, and the provision of programming to cable head-ends.

C-band is the backbone of the broadcasting industry and to other users currently using this spectrum. Today about 170 commercial satellites are using C-band spectrum. Billions of euros and dollars are invested in C-band technology and ground infrastructure; hundreds of millions of households worldwide depend on C-band for their television programming. Only looking at the geostationary orbit, C-band satellites represent an in-orbit investment of as much as USD 50 billion. Substantial additional investment has been made on the ground to communicate with, and receive services from, satellites using C-band.

The risks and losses of sharing C-band to the global community far outweigh the gains to the mobile communications sector. Satellite operators therefore strongly oppose it.

1 Internet Protocol Virtual Private Network Multiprotocol Lable Switching
2 Point of Sales

Recommended read from the industry:

- *C-band: one common resource for different sectors*
- *Frontier economics studies: fiction vs reality of C-band reallocation impacts*
- *C-band: Satellite spectrum vital to global communications*
- *The Importance of the Global C-band Allocation for Satellite Communications Services*
- *Interference to C-band satellite terminals from wireless devices: What can be done?*

C-band enables emergency support to the public when they need it most

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