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Orbital Slots and Spectrum Use in an Era of Interference

Interference and Telecommunication Services

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Brussels, 9 October 2014

C-band Satellite User Groups: Achieving Policy Goals and Economic Objectives

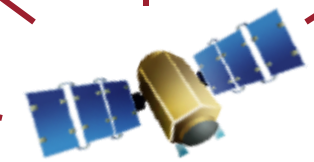
Maritime Communications

Aviation Security

Wireless Extension Services

Corporate Networks

Telemedicine



C-band

Distance Education

Internet Connectivity

Peace Keeping

TV contribution

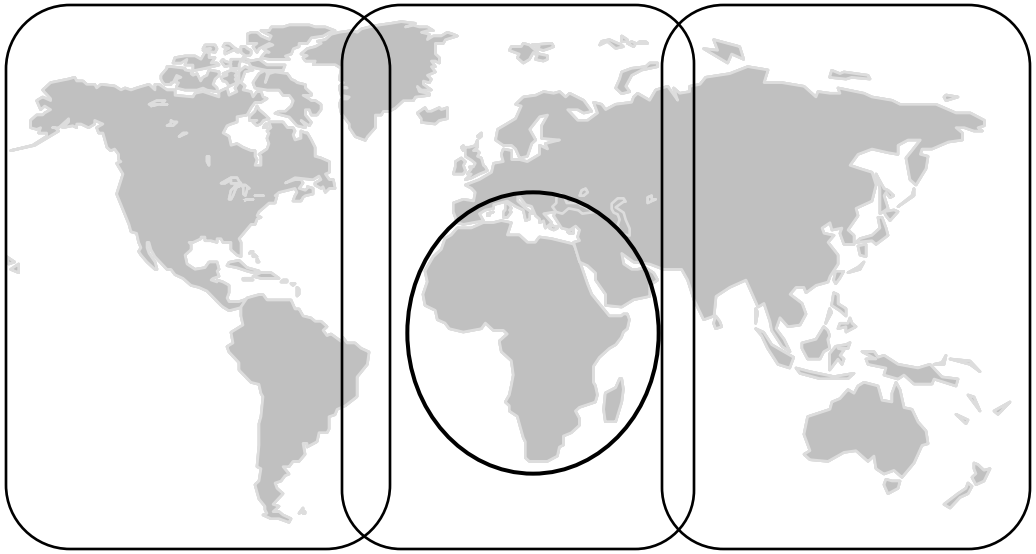
Disaster Preparedness

C-band satellite applications increase teledensity rates, provide distance education and telemedicine, enable broadband to rural areas, and more

Unique attributes of satellite C Band

C-band satellite services in 3400-4200 MHz / 5725-6425 MHz cannot easily be replicated at other satellite bands or via terrestrial means

- Geographic reach. C Band easily covers entire continents and oceans and offers an economically viable way of providing intercontinental and global communications
  - Smaller or hard-to-reach markets and low density regions are covered as easily as metropolitan areas
  - Particularly ideal for point-to-multipoint applications (broadcast, widely-dispersed networks), and remote/rural deployment
- Resistance to rain-fade
  - C Band is less susceptible to signal interruptions from heavy rains than higher bands (Ku, Ka), making it better suited for tropical or high-rain areas at high availabilities



Is spectrum sharing feasible?

Examples of FSS sharing

- Satellite services have had to share their spectrum with Fixed terrestrial wireless for years.
- This is still the case in C Band in Europe.
- This is the case in some parts of Ka Band.
- This only works under specific conditions; and such a sharing can constrain high density, ubiquitous deployment of satellite services (e.g. for unlicensed small dishes).

What if Mobile terrestrial wireless deploys e.g. in C Band?

- Latest findings: the JTG put in place after WRC12 already looked at the possibility of sharing with new LTE systems (incl. when using small cells). 11 different studies, only one summary and one single conclusion.

- New Report ITU-R [C-BAND DOWNLINK] concluded: *"when FSS earth stations are deployed in a typical ubiquitous manner or with no individual licensing, sharing between IMT-Advanced and FSS is not feasible in the same geographical area since no minimum separation distance can be guaranteed. Deployment of IMT-Advanced would constrain future FSS earth stations from being deployed in the same area in the bands 3 400-4 200 MHz and 4 500-4 800 MHz as shown by the studies."*

IMT / FSS sharing is not practicable

IMT use of C Band is not compatible with existing satellite operations:

- ITU studies have concluded that protection distances of 10s to 100s kilometers are necessary to allow co-frequency sharing between BWA/IMT systems and FSS earth stations
- Many countries have experienced interference when deploying BWA systems in C Band
- Shielding & filters are expensive or not protective enough
- Large number of receive only earth stations already deployed – many are unregistered (TVROs)

WBU Members' Increasing Concerns

- BBC World or RFI / France Médias Monde (FMM) or EBU (Eurovision) rely heavily on C-band for TV programme distribution outside Europe – no alternative options

- All earth-stations are receive only and often part of an on-going distribution chain
- No local registration of these earth-stations, so no protection available
- Interference causes break-up or total loss of signal, with cases about everywhere in the world (esp. in Africa which Europe acts as a Hub for)
- Mixed success of mitigation techniques (filters, shields, changing location)

IMT and spectrum sharing?

- IMT manufacturers may be the best promoters of ASA / LSA, but the GSMA issued a report in Feb 2014 indicating that shared spectrum can only complement but in no way replaces the need for exclusive-access spectrum in the provision of mobile broadband.
- The report, “The Impacts of Licensed Shared Use of Spectrum”, developed by Deloitte, highlights how strict limitations associated with Licensed Shared Access (LSA) spectrum agreements – such as shorter terms, build obligations, lack of certainty and small allocations – can significantly reduce the likelihood of a mobile operator to invest.
- This means that the potential economic benefits derived from spectrum sharing are ultimately lower than those achieved through exclusive-access spectrum.

- *http://www.gsma.com/newsroom/gsma-report-reveals-licensed-spectrum-for-mobile-offers-best-possible-economic-benefit/*

How to protect satellite C Band?

- Clearly there is a strong demand for terrestrial mobile broadband communications.
- However, it is important to balance that demand with the need for countries and citizens to have access to other means of communications as well, such as critical satellite services in C Band.
- The satellite industry is conducting surveys on the ground in various countries to collect information on the usage of C-band satellite systems and inform governments and regulators (e.g. Asia, Africa)
- The ITU is also inviting member countries to proceed with the notification of satellite earth stations using C Band spectrum.
- Many other frequency bands are available for IMT, and more desirable from a coverage perspective.
- We encourage all countries and companies to actively participate to the ITU preparatory work for the next WRC-15 in order to preserve satellite C Band and ensure protection of C-band networks distributing critical aeronautical & meteorological data.
- We encourage all ITU regions to adopt Common Positions that make it clear that C Band is essential to many satellite services worldwide and cannot be compromised with an opening to IMT.

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Thank you

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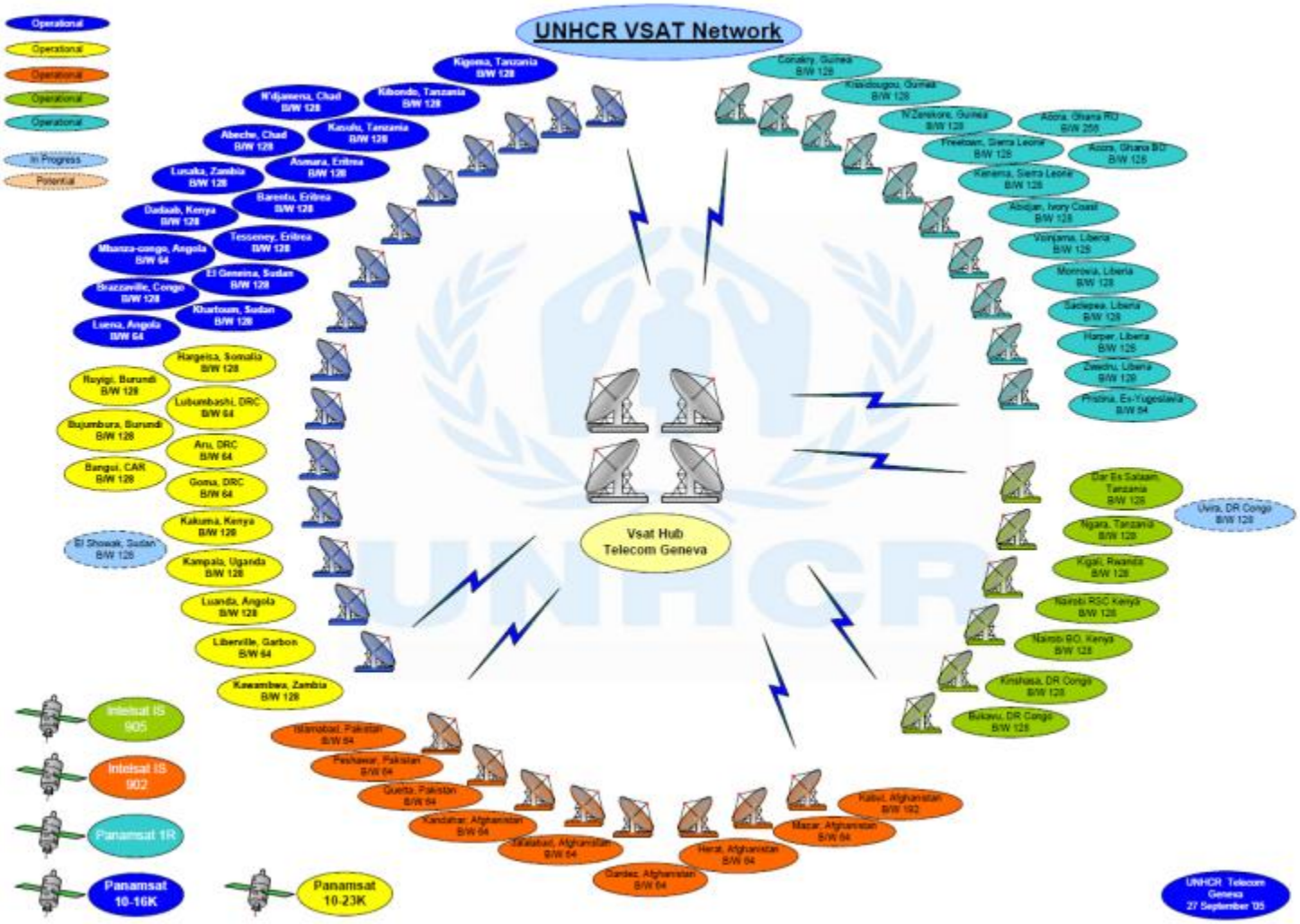
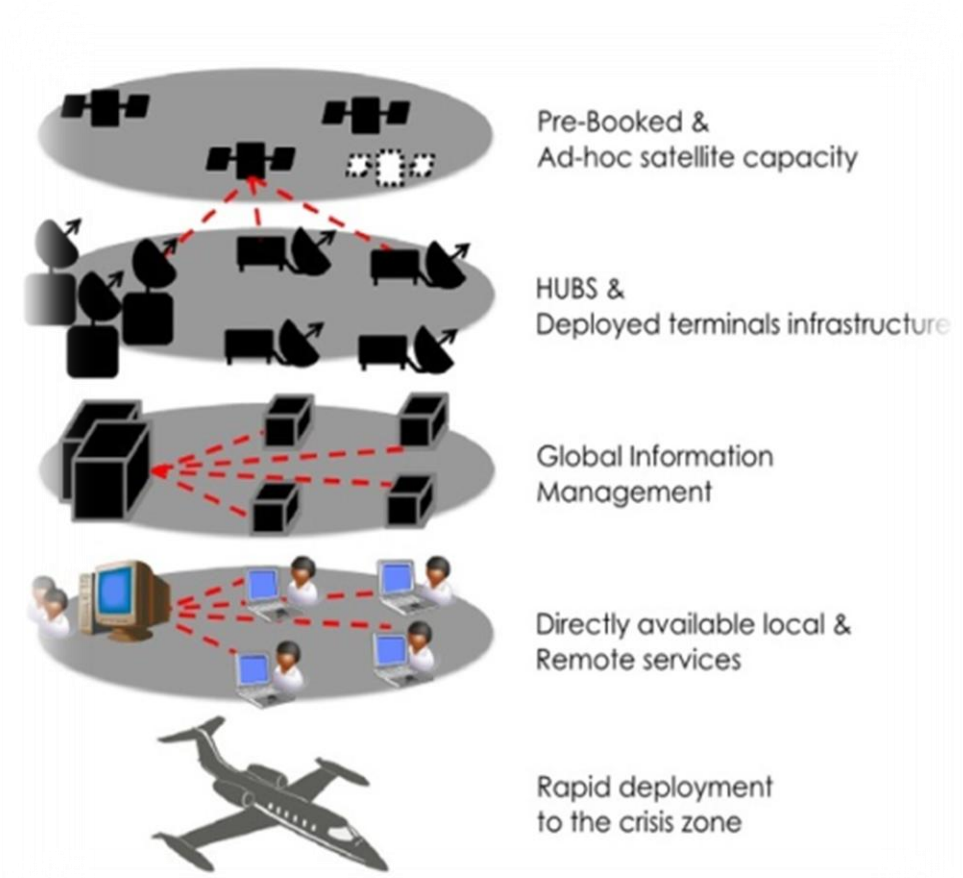
C Band use for UNHCR



C Band use for emergency.lu



- All public info & details are available from: www.emergency.lu

- Established in Dec 2011.

- Benefiting from the operational support of the Lux government, the UN and several humanitarian bodies as well as Skype and Ericsson.

- Deployed in Sudan, Venezuela, Mali (2012) and Asia (2013).

- Relying on 3 hubs around the world, incl. one in Europe.

- It's using C-band for its high reliability – downlinks have to be ensured at 3900-4000 MHz:

www.emergency.lu/index.php/system-elements/satellite-capacity

C Band use for Aviation Navigation & Safety

- ✓ Safety of Civil Aviation, Continuity, Regularity of air traffic rely on a robust seamless integrated communication infrastructure. The services requirement are standardized in ICAO (Annex to the Chicago Convention on International Civil Aviation)
- ✓ Communication needs include:
  - Ground/Ground Communication (Voice and data)
  - Air/Ground Communication (voice and data)
  - Navigation (Global Navigation Satellite System-GPS; Glonass Galileo)
  - Surveillance data exchange (Radar, flight data)
- ✓ Dedicated C Band VSAT networks are backbone of the aeronautical infrastructure:
  - Support all aeronautical communications services including the extension of VHF aeronautical mobile, navigation and surveillance.
  - Also used for data links for the meteorological services in Africa.
  - Today, constitute a real infrastructure, spanning entire continents (e.g. Africa, Latin America and parts of Asia).
  - The availability of the entire 3.4 to 4.2 GHz FSS band is crucial to ensure the continued growth of air traffic while maintaining the required level of safety in these regions.

- ✓ **Example**: Africa is a huge region with remote areas such as:
  - Deserts (Sahara and Kalahari)
  - Deep equatorial forests
  - Oceanic area (Atlantic and Indian oceans, Mediterranean and Red seas)
- ✓ Nearly 550 ground stations are using spectrum in 3650 - 3925 MHz

C Band use for Galileo

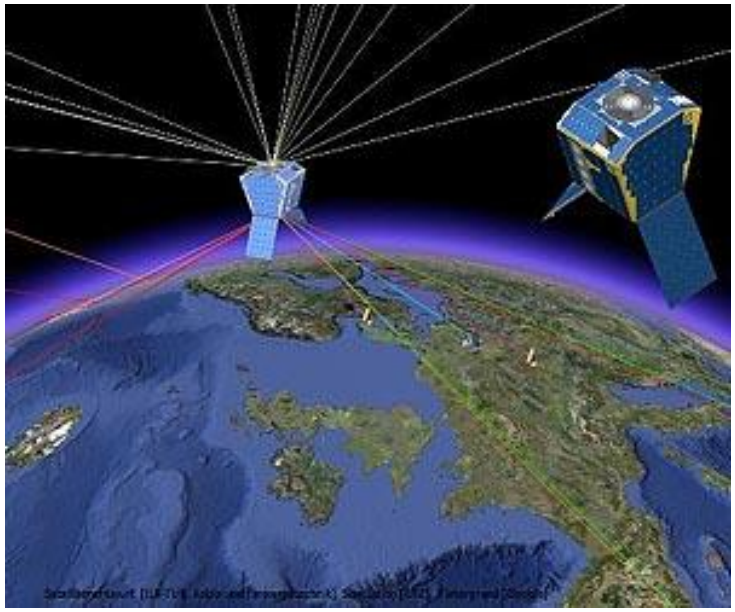
The Galileo Data Dissemination Network GDDN is the "network" side of Galileo, to be used for data transmission between the main ground sites.

5 of these sites are in Europe: Redu in BE, Fucino in IT, Oberpfaffenhofen in DE, Svalbard in NO, Kiruna in SE. This does not include FR or UK territories such as New Caledonia, St Pierre et Miquelon, Falklands.

GDDN is to be operational end of 2013.

EU Commission said (in 2009):

The GDDN will rely heavily on receiving signals in C-band (3.6-4.2 GHz) to achieve its planned performance targets.
It is to be noted that these frequencies - even though used for Galileo Data Dissemination Network purposes - are used by leased connections subject to regular commercial agreements. However, the service provider has planned/concluded that these connection links are to be deployed in C-band worldwide as in the majority of cases the stringent GDDN continuity performance requirements cannot be met economically by other means (terrestrial or Ku-band links).



IMT Spectrum Demand: Review of ITU 'speculator' model - findings

Monthly data traffic PetaBytes per square km; the figures from the low density settings in the ITU model compared with benchmark values for urban area traffic in five example countries

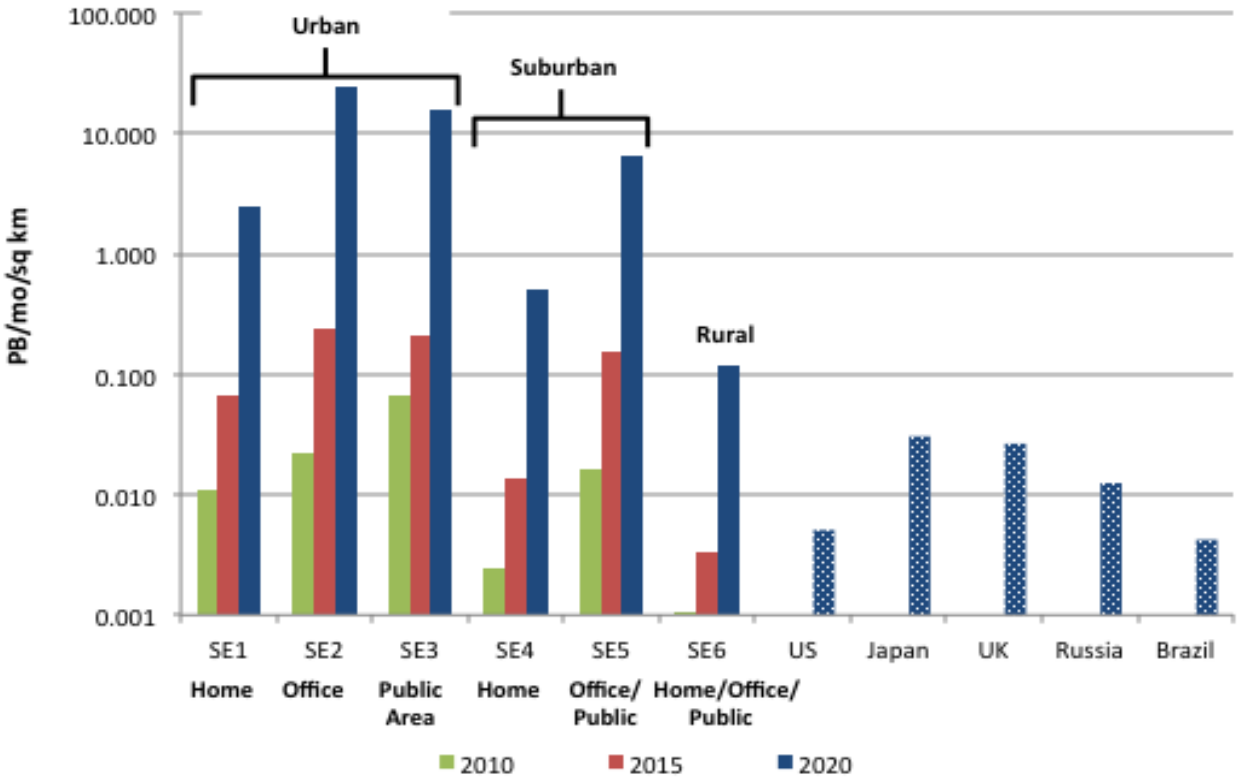


Image illustrates the traffic that the model shows in each of the service environments, compared to generally accepted forecasts for urban areas in several different countries.
(Note: scale is logarithmic; values from the ITU model are taken from the low demand setting)

- Given the unrealistic values the model uses, its outputs cannot be applied to any country

Migration from C to Ku not an option

- The many C- and Ku-band satellites covering e.g. Africa are heavily used.

- There is scarcity in Ku-band capacity e.g. in Africa and Europe, and most is dedicated to broadcast services.

- <u>Migrating services out of C-band causes real issues</u>:
  - Given the scarcity of Ku, where would the services migrate?
  - Limited coverage of Ku beam compared to C-band creates potential network problems
  - Lower Ku-band availability which will have an impact on critical transmission
  - There are many legacy C-band systems out there which cannot be converted