



WRC-15 outcomes

The views of the satellite industry

25 April 2016



Members



21 operators – Europe – Middle-East - Africa

01

The Conference

In brief

Space-related topics in WRC-15 agenda



Satellite allocations
(FSS @ 10-17 GHz
FSS & MMSS @ 7/8 GHz
EESS @ 7-8 GHz & 9 GHz
MSS @ 22-26 GHz)

ESIMs (Earth Stations in Motion)

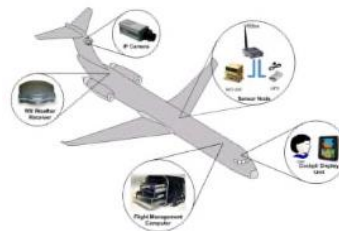


ESVs



**Feederlinks
to NGSO MSS @ 5 GHz**

**Satellite UAS,
GFT**



**Space
regulations**



**Space
research**

02

The outcomes

Main results

From the world press...



Satellite Industry Fares Better Than Expected at WRC-15

“... Regarding Earth Stations in Motion (ESIMs), the conference adopted new regulations in part of the Ka-band satellite spectrum ranging from 19.7 to 20.2 GHz and 29.5 to 30 GHz. The new regulations are to facilitate the global roaming of such terminals, which are used for satellite broadband connectivity to mobile terminals, while preventing interference with other services and applications. WRC-15 also adopted several agenda items for future conferences regarding additional spectrum for satellite, and regarding frequency bands for 5G. The conference rejected proposals to consider globally harmonized 5G spectrum in C-, Ku- or Ka-band at WRC-19, instead agreeing to evaluate high-frequency bands above 24 GHz for 5G mobile services. ...”



Satellite Industry Held its Ground at Global Spectrum Conclave

“... Just as important to the satellite industry was whether WRC-15's 3,300 delegates would permit detailed studies of the use of Ka-band by terrestrial networks, with decisions to be made at WRC-19. WRC-15 ultimately decided that satellite Ka-band frequencies would be removed from the list of potential terrestrial network use. ...”



World Radiocommunication Conference 2015 Decides Satellite Spectrum is Central to Future Vision for Global Connectivity

Long-term Delivery of Innovative Satellite Services Are Assured a Pivotal Role Alongside Wireless and Other Complementary Technologies

“... Throughout the deliberations, multiple administrations in every world region expressed strong opposition to studying the Ka band for IMT/5G, again confirming the Conference's confidence in satellite being a key player in the future digital eco-system. ...”



UK representing the future

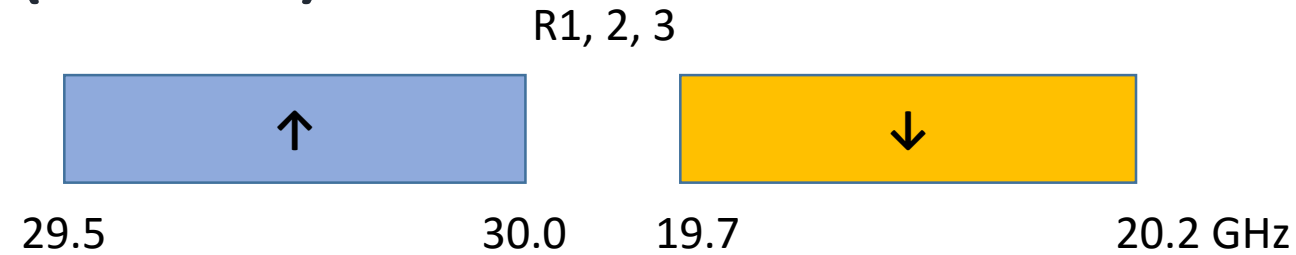
WRC-2015 and the impossible task of achieving a delicate balance

“... The **satellite** industry saw the outcome of the WRC-15 as successful. ... The 27.5-29.5 GHz range was hotly debated and the conference eventually decided not to include it for study (even though this range already has a co-primary mobile allocation in the ITU Radio Regulations). ...”



SATÉLITES DE BANDA KA TÊM ESPECTRO PRESERVADO E INVESTIMENTOS GARANTIDOS

Earth Stations in Motion (ESIMs) in GSO FSS Ka-band



5.527A The operation of earth stations in motion communicating with the FSS is subject to Resolution **156 (WRC-15)**. (WRC-15)

RESOLUTION 156 (WRC-15)

Use of the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz by earth stations in motion communicating with geostationary space stations in the fixed-satellite service

...

resolves

- 1 that earth stations in motion communicating with the GSO FSS shall operate under the following conditions:
 - Tx e/s: off-axis e.i.r.p. density limits & protect terrestrial of RR 5.542 (29.5-29.9 GHz in R1&3)
 - Rx e/s: no protection from terrestrial of RR 5.524 (19.7-20.1 GHz in R1&3)
 - e/s subject to Network Control and Monitoring Centre (NCMC)

Broadband with mobility available in FSS Ka-band in its full right.

Earth Stations on board Vessels (ESVs)

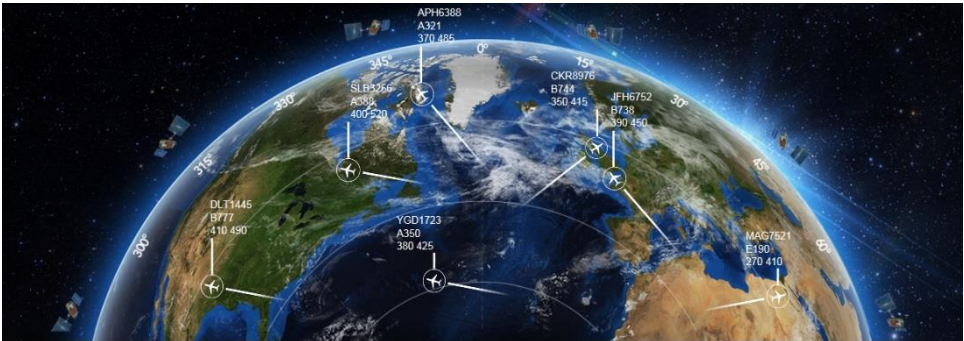


5.457A and Resolution **902 (WRC-03)** provide technical, regulatory and operational conditions under which ESVs may communicate with space stations of FSS in the bands 5 925-6 425 MHz and 14-14.5 GHz

WRC-15 decided on the possibility to use smaller (1.2m) antenna for ESVs transmitting in the frequency band 5 925-6 425 MHz

Increased use and further development of ESVs in the frequency band 5 925-6 425 MHz with sufficient protection to the terrestrial services

Global Flight Tracking (GFT) – satellite ADS-B

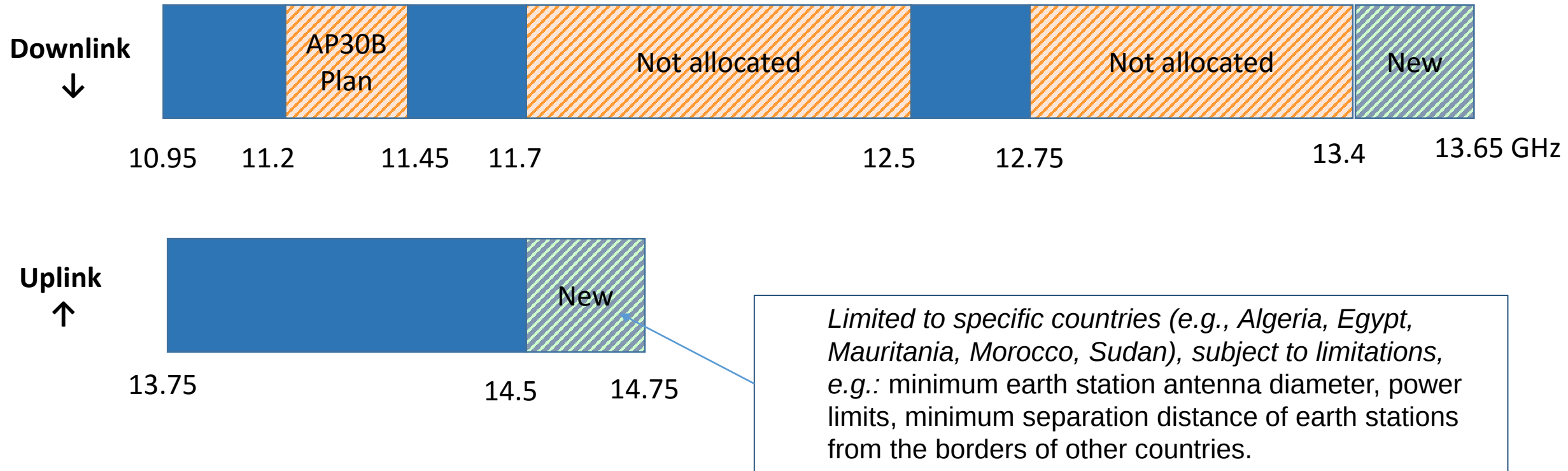


890-1 300 MHz

Allocation to services	
...	
960-1 164	AERONAUTICAL MOBILE (R) 5.327A AERONAUTICAL RADIONAVIGATION 5.328 5.328AA
...	

5.328AA The frequency band 1 087.7-1 092.3 MHz is also allocated to the aeronautical mobile-satellite (R) service (Earth-to-space) on a primary basis, limited to the space station reception of Automatic Dependent Surveillance-Broadcast (ADS-B) emissions from aircraft transmitters that operate in accordance with recognized international aeronautical standards. Stations operating in the aeronautical mobile-satellite (R) service shall not claim protection from stations operating in the aeronautical radionavigation service. Resolution **425 (WRC-15)** shall apply. (WRC-15)

FSS GSO new allocations in unplanned bands (R1)



Increased and balanced allocations will facilitate development of various applications e.g. VSAT, video distribution, broadband networks, internet service, satellite news gathering, backhaul link, etc.

MMSS GSO new allocations in the X-band

7250 7375 7750 MHz



New allocation to the maritime-satellite service (MMSS) in 7 375 – 7 750 MHz in the space-to-Earth direction

Earth stations in MMSS shall not claim protection, nor constrain use of fixed and mobile stations, except aeronautical mobile.

New spectrum will provide for additional bandwidth for downlink data transmissions of the next-generation satellites in the MMSS



Space science services new allocations

Earth Exploration-Satellite Service (EESS) up link primary allocation limited to tracking, telemetry and command (TT&C) in the 7 190-7 250 MHz band

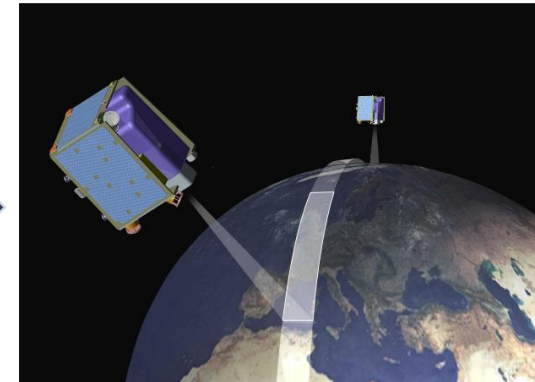
In combination with existing EESS downlink allocation in 8 025-8 400 MHz this new allocation will lead to simplified on-board architecture and operational concepts for future missions of EESS

EESS(active) primary allocations in the 9 200-9 300MHz, 9 900-10 000MHz and 10-10.4 GHz bands

Development of modern broadband sensing technologies and space-borne radars on active sensing EESS that provides high quality measurements in all weather conditions with enhanced applications for disaster relief and humanitarian aid, large-area coastal surveillance

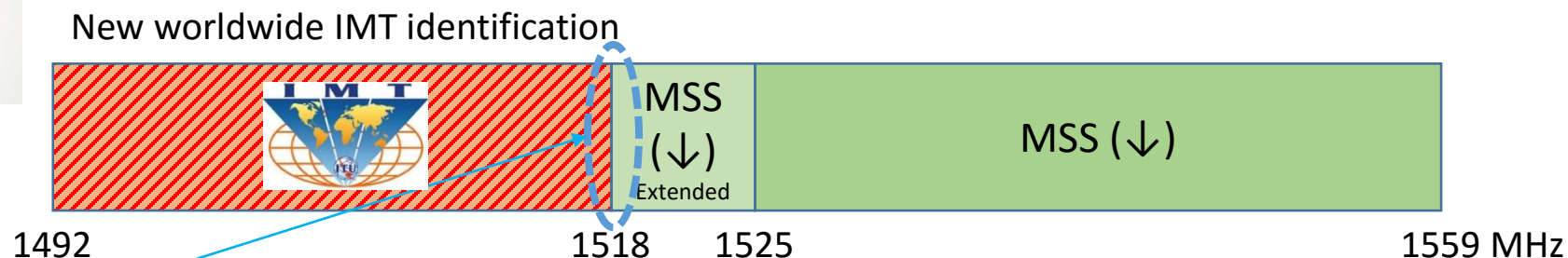
Removal of the 5 km distance limitation in No. 5.268 for use of 410-420 MHz Space Research Service band for Extra Vehicular Activities

Facilitation of rendezvous and docking manoeuvres which leads to safety of human life in a manned vehicle





IMT adjacent to MSS extended L-band



RESOLUTION 223 (REV.WRC-15)
Additional frequency bands identified for International Mobile Telecommunications

invites ITU-R

1 to conduct compatibility studies in order to provide technical measures to ensure coexistence between MSS in the frequency band 1 518-1 525 MHz and IMT in the frequency band 1 492-1 518 MHz;

Interference from IMT BS to MSS user terminals

Results show that, to avoid interference, technical measures need to be taken for both IMT and MSS:

- a guard band for IMT operations of 3-5 MHz
- peak EIRP and out of band emission limits on IMT base stations
- improvement of MSS UT performance

MSS extended L-band already available in Africa (Alphasat)



IMT in the satellite C-band

3400

↓ 4200 MHz

Essential frequency allocation for satellite use (↓)

5925

↑ 6425 MHz

Already been identified by WRC-07 for IMT

3400

3600

3700

4200 MHz

R1

R2

R3



4 countries

12 countries

NOC

Region 1
3 400-3 600 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.430A Radiolocation
5.431
3 600-4 200 FIXED FIXED-SATELLITE (space-to-Earth) Mobile

Conditions of use by IMT

Administrations shall:

- seek agreement under RR 9.21
- effect coordination under RR 9.18

Mobile stations shall:

- guarantee pfd (3 m above ground) < -154.5 dB(W/(m² × 4 kHz)) for more than 20% of time at the border of the territory of any other administration
- not claim more protection from space stations than that provided in Table 21-4 of the Radio Regulations (Edition of 2004)

Satellite services which are critical and vital for Africa have been recognized and preserved for future growth, e.g.:

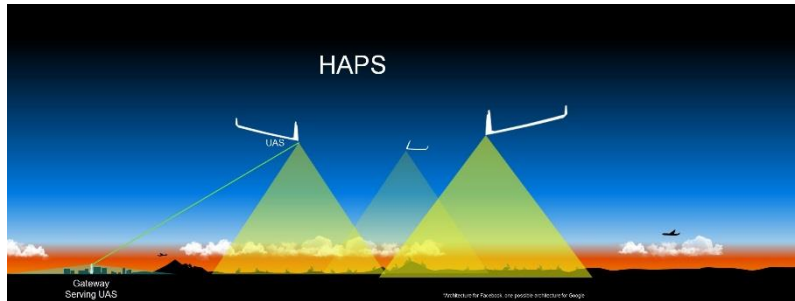
- Disaster relief communications
- Civil aviation security
- Banking communications
- Oil and gas industry communications

Exclusion of Ka-band from future 5G, HAPS & NGSO

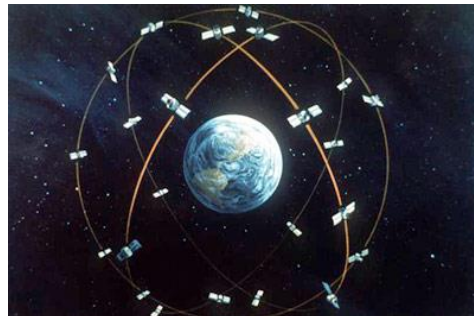
IMT-2020/5G



HAPS



NGSO



Bands for consideration by WRC-19:

IMT: 24.25-27.5 GHz, 37-40.5 GHz, 42.5-43.5 GHz, 45.5-47 GHz, 47.2-50.2 GHz, 50.4-52.6 GHz, 66-76 GHz and 81-86 GHz, and 31.8-33.4 GHz, 40.5-42.5 GHz and 47-47.2 GHz

HAPS: 38-39.5 GHz, and 21.4-22 GHz and 24.25-27.5 GHz (R2)

NGSO: 37.5-39.5 GHz↓, 39.5-42.5 GHz↓, 47.2-50.2 GHz↑ and 50.4-51.4 GHz↑

27.5 to 29.5 GHz not included

Q/V bands: to be used for next generation FSS networks!

Satellite regulations



Main modifications:

- penalties for the late notification to ITU-BR regarding suspension (RR 11.49);
- publication of information on BIU (bringing into use) of satellite networks at the ITU website;
- automatic generation of the Advance Publication Information (API) when receiving a coordination information;
- no changes to RR made to limit using one space station to BIU frequency assignments at different orbital locations within a short period of time, but It was agreed to gather statistics on satellite hopping requiring administrations to provide information when using the same space station to BIU at different orbital locations;
- removal of the link between the date of receipt of the notification information and the BIU date (RR 11.44B);
- reduction of the coordination arc in C and Ku band by one degree, and application of a pfd threshold in C-band (Earth-to-space only) and Ku-band (E-to-s and s-to-E) outside the coordination arcs.

03

WRC-19

Satellite items

Space-related topics in WRC-19 agenda

ESIMs (Earth Stations in Motion)



GMDSS & GADSS



MMSS VDES

S-band MSS-MS



BSS



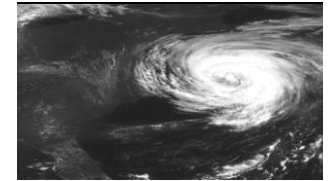
NGSO short-duration



NGSO FSS C & Q/V-bands



Space science (MetSat, EESS)



Unauthorised Earth stations



Space regulations



04

The way forward to WRC-19

Spectrum is a rare resource and satellite operators have demonstrated their ability to make the best use of it.

Connectivity needs are huge and growing in Africa.

Thanks to the clear regulatory framework provided by WRC-15, satellite operators will be able to keep investing in infrastructure and services.

Mobile & satellite operators are complementary answers to this demand, and should take part in WRC-19 preparation in a constructive spirit.

