



WRC and the ITU (1)

Recent Activity on IMT Expansion

Ross Bateson, Special Adviser Government Affairs, GSMA

GSMA Workshop, Nairobi
November 2017



World Radiocommunication Conferences

- WRCs occur ever 4 years
- Cover huge range of issues that require changes to the ITU Radio Regulations
- IMT identifications for mobile and mobile broadband have featured prominently in recent conferences





WRC-2000 IMT Decisions

- WRC-2000 made a number of IMT decisions:
 - 2500-2670 MHz identification
 - 1700 and 1800 MHz IMT identification (in addition to 1900 and 2100 MHz)

- Subsequently, WRC-03 made broadband decisions including increased spectrum for WiFi (5 GHz)





WRC-07: IMT Expansion

- WRC-07 made some key decisions:
 - Advent of UHF for IMT
 - 700/800 MHz bands depending on Region
- 2.3 GHz band identified
 - Usage now growing after TDD advances
- 3.4-3.6 GHz identified in some countries
 - Regional identifications follow later at WRC-15
 - Europe forms breakaway identification through local EU laws





WRC-12: New Agenda Item

- WRC-07 produced key coverage bands at 700/800 MHz
- Lack of capacity immediately became clear: iPhone 3G launched in 2008
- Two WRCs were needed to get more spectrum for IMT
 - Agenda Item discussed at WRC-12
 - WRC-15 Agenda Item agreed, studies to be carried out in massive Joint Task Group – JTG 4-5-6-7 – between Conferences
- But Africa moved faster





WRC-12: Africa leads 700 MHz

- Usually new IMT identifications take two cycles
- Fast-move from African Administrations noted that CDMA-850 blocked use of 800 MHz band
- Plans to identify 700 MHz band in Region 1 were fast-tracked
- Africa led efforts to come to agreement in Middle East, Europe and Africa
- . . . But first assignments of spectrum in Region 1 have been in Europe





WRC-15: Harmonisation in Part

- At WRC-15 some quasi-global bands were found
 - Options in 3300-3700 MHz range
 - Africa leads way in identifying 3300-3400 MHz
 - 1427-1518 MHz
 - and 700 MHz decision ratified in Region 1
- But some goals were missed:
 - No new regional UHF in Region 2 & 3: 600 MHz in certain countries only
 - Some industrialised countries wanted more capacity





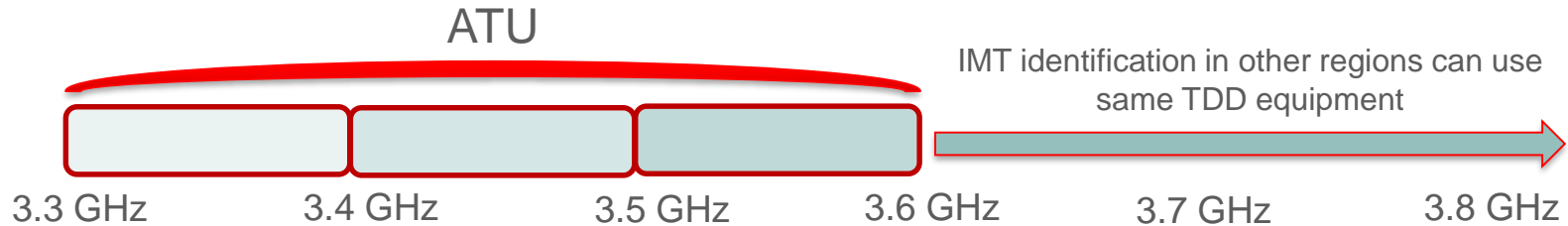
WRC Lead Times and Africa Take-Up

- Long lead times occur between a W(A)RC and use in-country
- Africa has traditionally allowed technologies to mature
- Lead times are decreasing as broadband take-up accelerates

W(A)RC	Frequency	Technology	Commercial Launch	Africa Launch
1979	900 MHz	GSM	1991 (Finland)	1994 (South Africa)
1992	2100 MHz	W-CDMA	2001 (Japan)	2004 (Mauritius)
2000	2600 MHz	W-CDMA or LTE	2009 (Sweden and Norway)	2013 (Uganda)
2007	7/800 MHz	W-CDMA or LTE	2010 (Germany)	2013 (Nigeria)



The 3.5 GHz range: harmonisation through TDD



- 3.3-3.6 GHz will provide capacity in Africa
 - 3.3-3.4 GHz widespread identification for IMT in ATU countries via footnote **5.429B**
 - ATU (along with all of R1 and R2) has harmonised position identifying 3.4-3.6 GHz - footnote **5.430A**
- Equipment can be used across the common range: **countries can pick which part to use**

TDD option opens the door to a global ecosystem



3.5 GHz Range: TDD allows flexibility

- TDD allows administrations to assess market and assign frequencies required in their country
- 3.3-3.4 GHz has been pioneered by many African countries to add to 3.4-3.6 GHz
- ITU studies give Administrations guidance on national issues such as adjacent band compatibility, including **Report ITU-R S.2368**

MHz	3300	3400	3500	3600
1			TDD	
2	TDD			



3.3-3.4 GHz portion
300 MHz of harmonised frequency
arrangement at 3.3-3.6 GHz

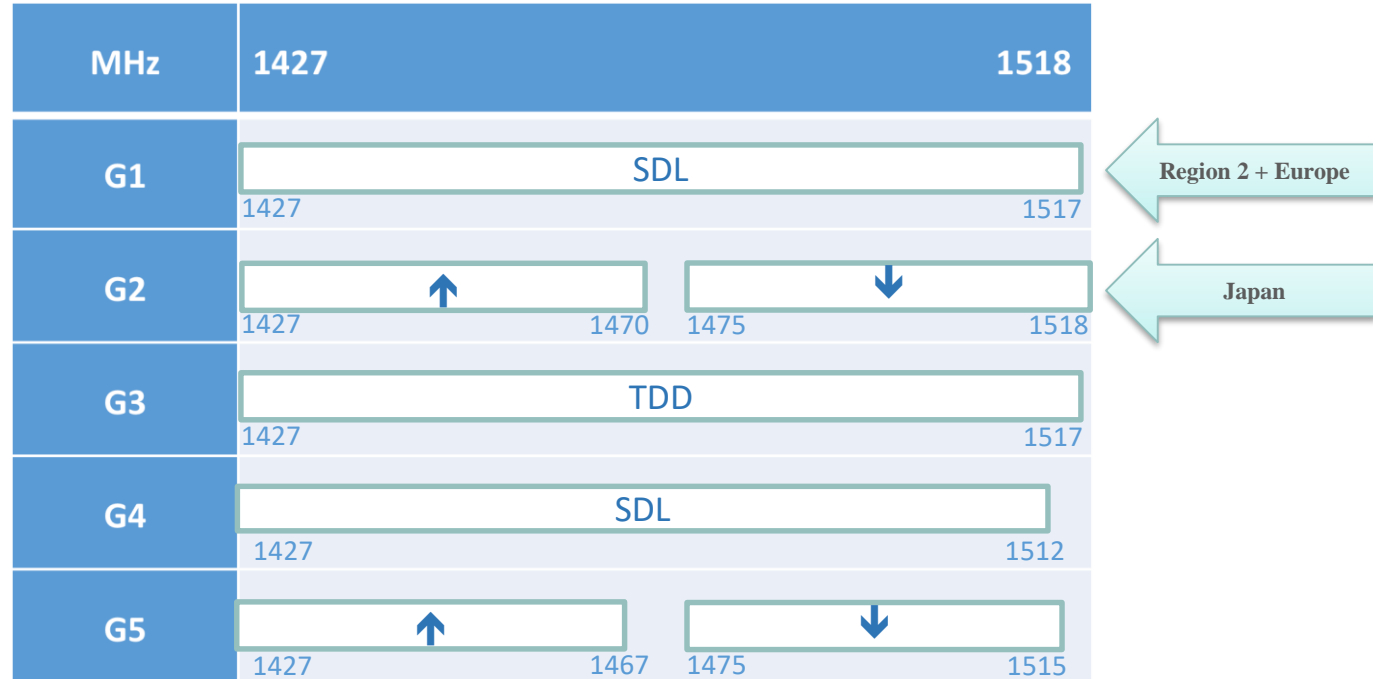


3.4-3.6 GHz is
harmonised
throughout ATU



The 1 500 MHz range

- Three different technologies are proposed:
 - SDL
 - FDD
 - TDD
- ATU agreement will ensure that one option is chosen to benefit from in-Africa harmonisation
- Alignment with other regions is important





1500 MHz Options

SDL

- Supported by Europe and the Americas
- Seeks to address download vs upload disparity
- Large footprint will lead to early ecosystem

TDD

- Being considered in some regions
- Offers greater flexibility
- Needs early adopters to find scale

FDD

- Supported by Japan
- Equipment already in market
- Ecosystem supported by Japanese scale



IMT and BSS in 1452- 1492 MHz

'to prepare, inter alia, the regulatory action that could be taken, based on the studies carried out under resolves to invite ITU-R 1 above, in order to facilitate the long-term stability of IMT and BSS (sound) in the frequency band 1 452-1 492 MHz'

- WRC-19 Agenda Item 9.1.2 discusses use of BSS and coordination with IMT in 1452-1492 MHz
- Future BSS networks may present a risk to IMT implementation in the band
- GSMA supports specification of a pfd limit on BSS (sound) in accordance with sharing and compatibility studies
- Work ongoing at TG 5/1
- **QUESTION: who is planning BSS in 1452-1492 MHz?**



Conclusion

Harmonised frequency arrangements are key



Widely agreed channel plans are vital for affordable devices and interoperability



Governments can work with the mobile industry, the ITU and the 3GPP to implement/develop standardized channel plans



Issue mobile licences based on these harmonized channel plans

Africa has an opportunity to pursue a harmonised approach for new mobile technologies, in line with what was done in the past



WRC and the ITU (2)

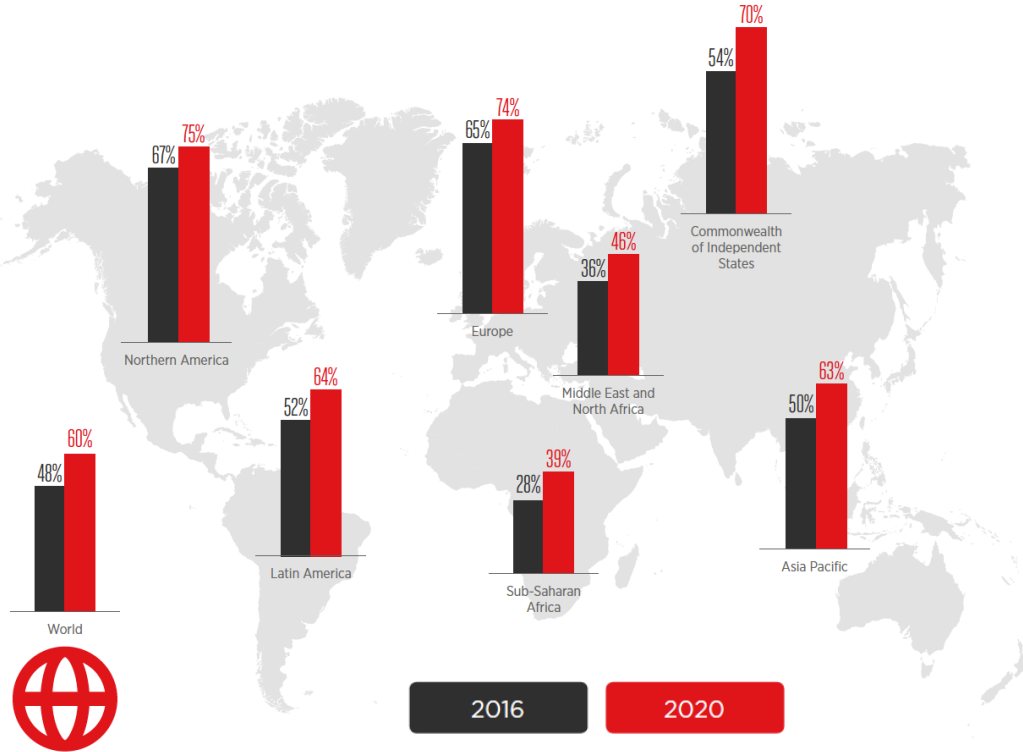
WRC-19: Bands above 24 GHz for 5G

Ross Bateson, Special Adviser Government Affairs, GSMA

GSMA Workshop, Nairobi
November 2017



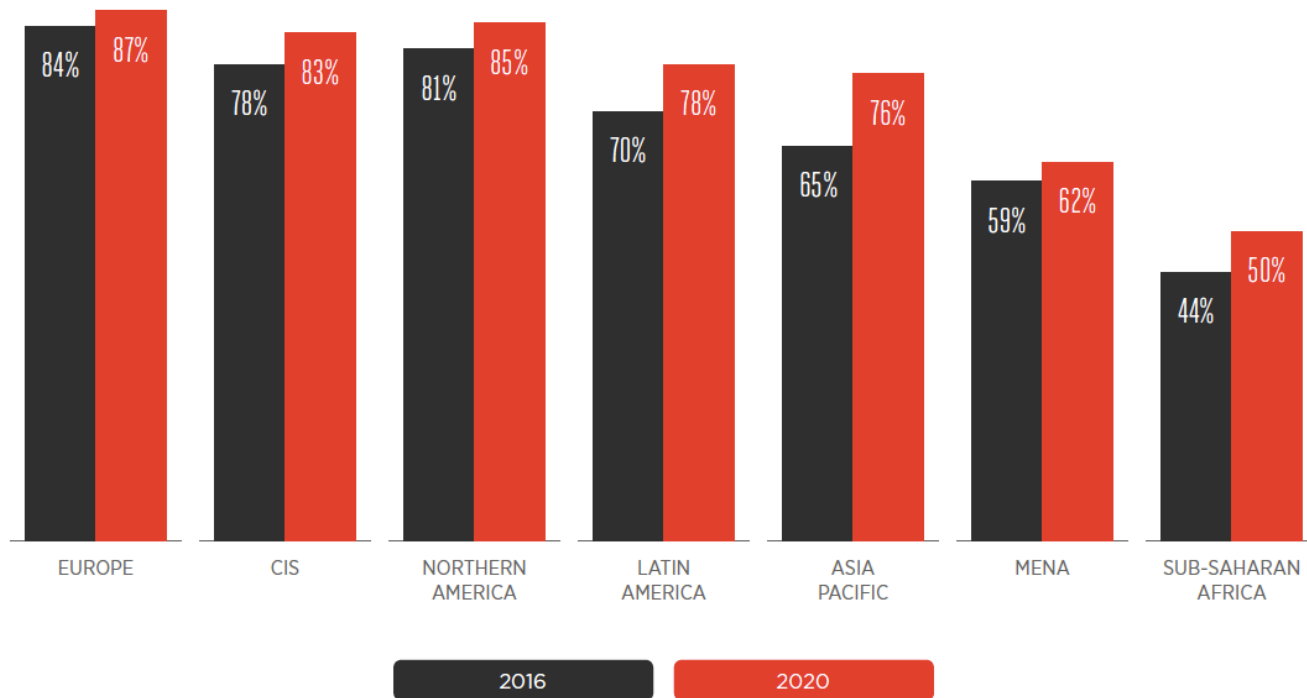
Mobile internet subscriber penetration



Source: GSMA Intelligence



Unique subscriber penetration by region



Source: GSMA Intelligence

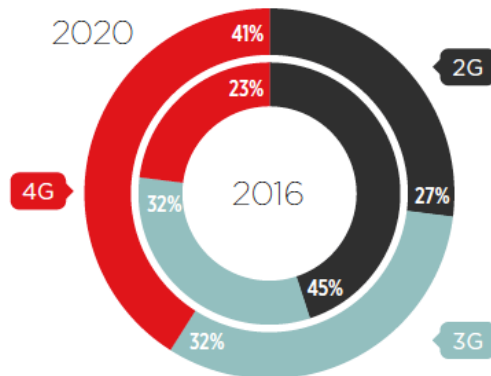


World: 4G on track to become no.1 technology

Global



TECHNOLOGY MIX



SUBSCRIBER PENETRATION



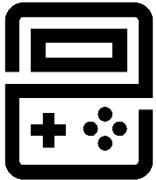
SMARTPHONE ADOPTION



Source: GSMA Intelligence



5G – a network of opportunity



**The 5G era will be characterised as the age of
boundless connectivity and intelligent automation**





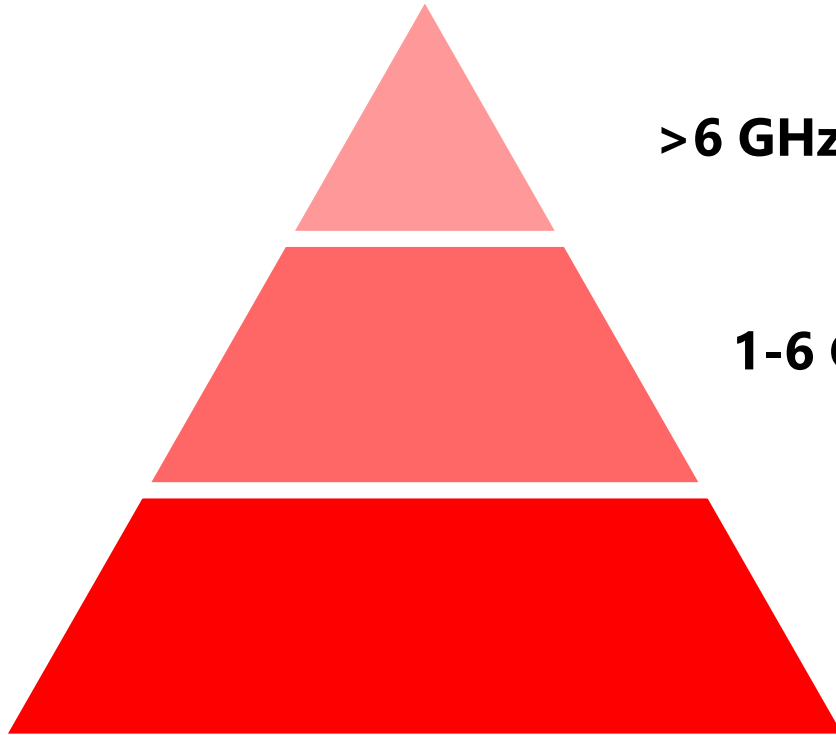
Fixed wireless solutions: connecting business and home

- New service offerings come with 5G
- mmWave bands will provide fibre optic speeds
- Potential alternative for residential and commercial fibre





There are three key frequency ranges for 5G...



>6 GHz: Superfast 5G

1-6 GHz: Mid-band 5G

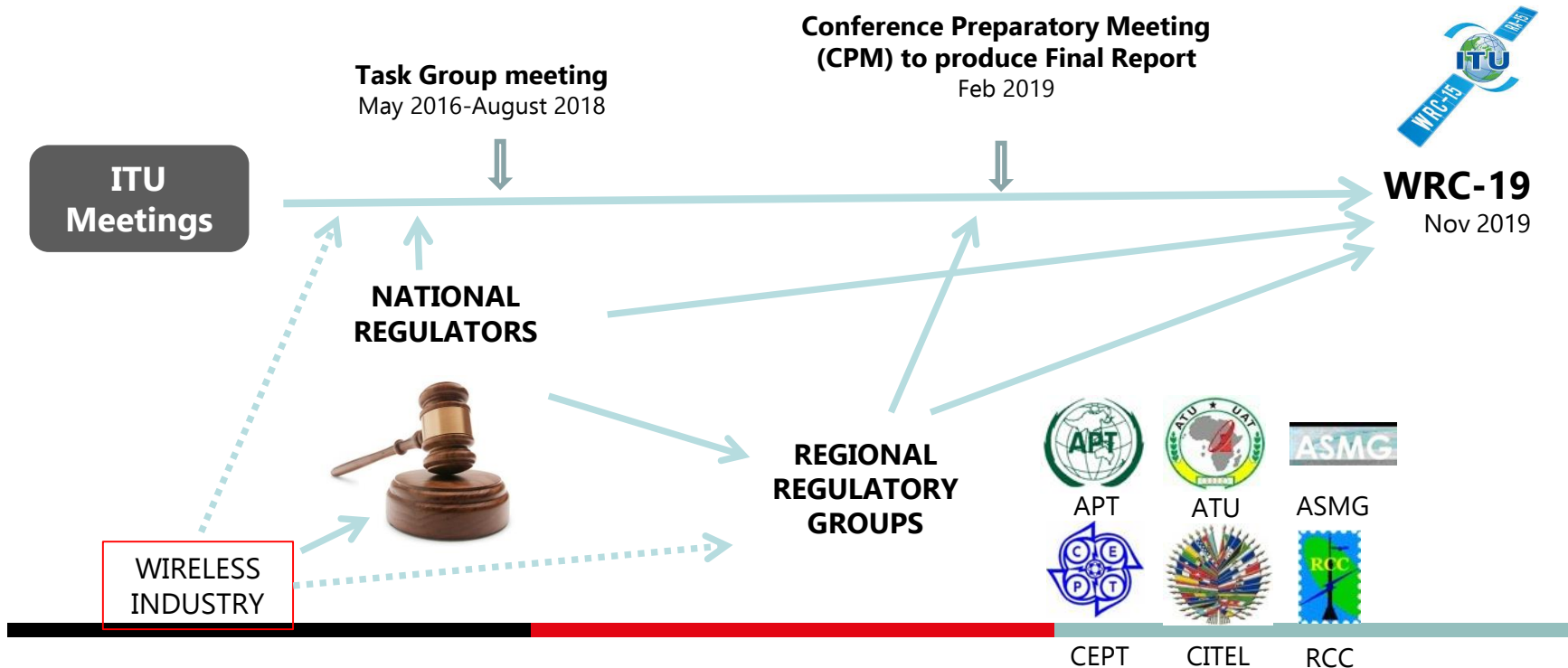
Sub-1GHz: Wide area 5G





... and WRC-19 is vital for the superfast vision

WRC-19 will consider spectrum in three ranges:
24.25-33.4 GHz, 37-52.6 GHz & 66-86 GHz

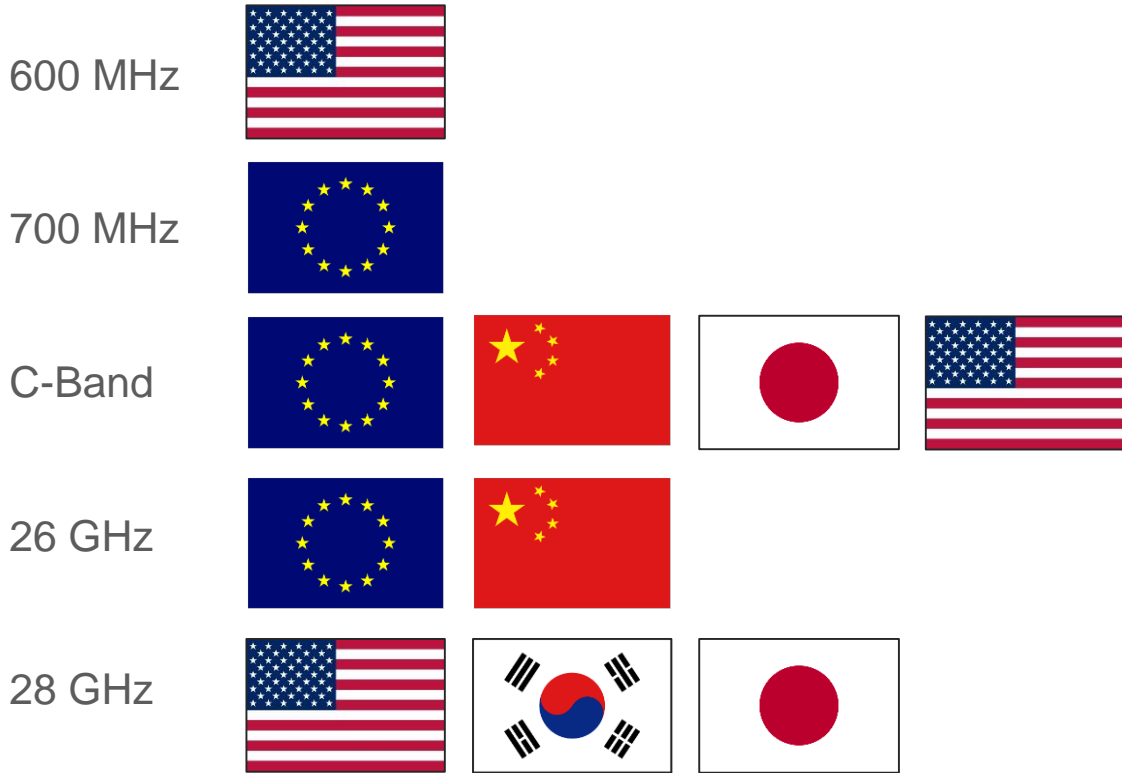




What spectrum bands should we use for 5G?



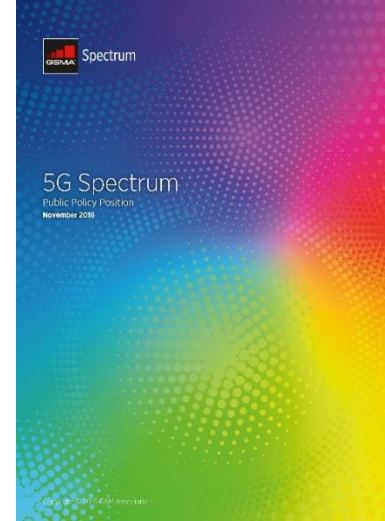
5G spectrum – an international summary





GSMA's positions on 5G spectrum

1. Significant new widely harmonised mobile spectrum is needed
2. 5G needs spectrum below 1 GHz, 1-6 GHz and above 6 GHz
3. Licensed 5G spectrum is vital but unlicensed & spectrum sharing can help too
4. Technology neutral spectrum licences are essential to enable refarming
5. Governments should encourage investment-friendly 5G²⁵ policies





Agenda Item 1.13

“to consider identification of frequency bands for the future development of International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution 238”



Seven spectrum ranges

24.25-27.5 GHz
31.8-33.4 GHz
37-43.5 GHz
45.5-50.2 GHz
50.4-52.6 GHz
66-76 GHz
81-86 GHz



Agenda Item 1.13: IMT Progress in Africa

- 26 GHz supported as priority candidate band for IMT
 - 40 GHz supported as priority candidate band for IMT
 - . . . 32 GHz supported as candidate band for IMT
-
- ATU Working Groups will continue discussion next year
 - TGs in January and May 2018 take place beforehand
 - ATU WRC Meeting expected September 2018





Agenda Item 1.13: 26 GHz priority

- 26 GHz supported as priority candidate band by multiple regions:
 - Priority band for ATU
 - “pioneer” band for European Union
 - Other regions still deciding
- Large capacity
- Sits next to 28 GHz band used in US, Korea, Japan: equipment very similar





Agenda Item 1.13: 40 GHz capacity support

- Again, Europe and Africa joined in support at 40 GHz
 - . . . And now Russia (November 2017)
- US supports lower part of band

- Large capacity allows for very high speeds
- Tuning range may be used to accommodate regional differences





Task Group 5/1 will help make 5G a reality

Task Group TG 5/1 has the important job of carrying out sharing studies and draft the CPM text for agenda item 1.13. AI 1.13 calls for consideration of identification of multiple frequency bands for the future development of IMT, including possible additional allocations to mobile services on a primary basis.

- WG 1 – CPM
- WG 2 – 30 GHz
- WG 3 – 40 and 50 GHz
- WG 4 – 70 and 80 GHz

Three meetings are scheduled for 2018 as the groups work to finish the draft CPM text by August 2018.

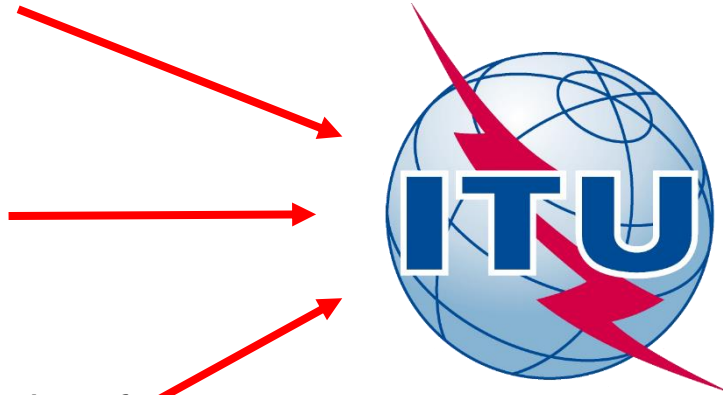


WRC-19 preparation paves the way for 5G

WP5D provided spectrum needs and system characteristics

SG3 WPs provided propagation models for bands above 24 GHz

Other WPs provide characteristics of incumbent services



Until March 31 2017

WRC-19 preparation paves the way for 5G



Between March 31 2017 and CPM19-2



TG 5/1 Studies

26 GHz

- EESS and SRS downlinks in 25.5-27 GHz
- ISS in 25.25-27.5 GHz
- Passive services (EESS, SRS, RAS) in 23.6-24 GHz
- Fixed links
- FSS in 27-27.5 GHz and above 27.5 GHz

32 GHz

- Passive services (EESS, SRS, RAS) in 31.3-31.8 GHz
- Space research in 31.8-32.3 GHz
- ISS in 32.3-33 GHz
- Radionavigation
- Fixed links

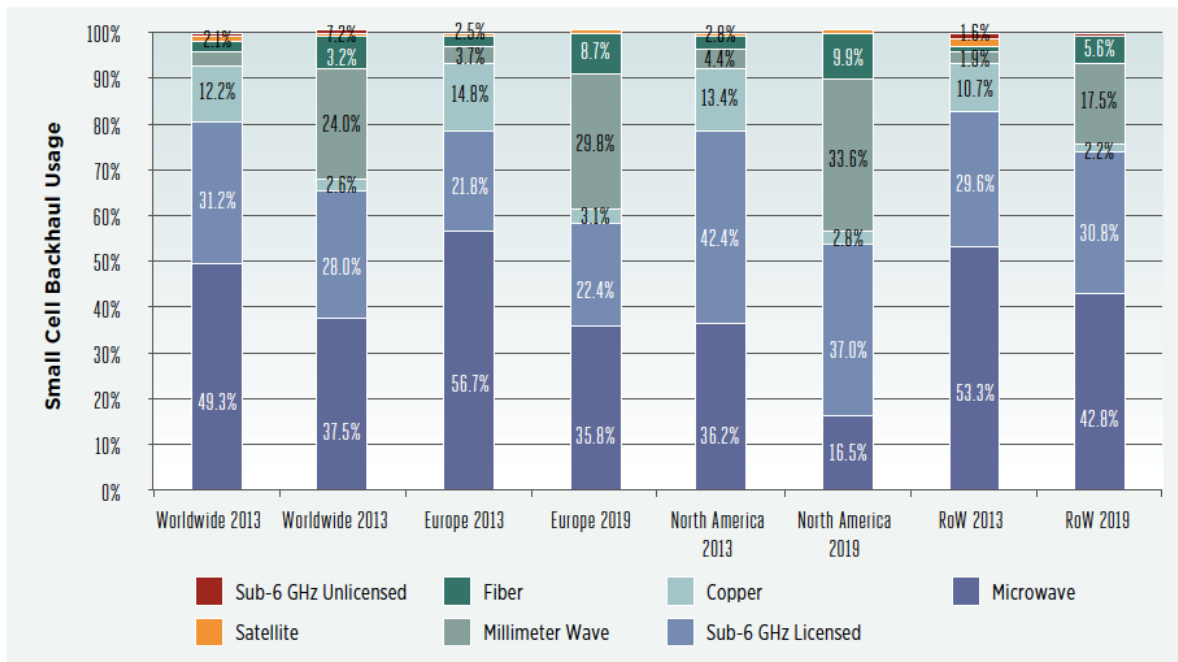
40 GHz

- FSS (space-to-Earth) in 37-42.5 GHz
- EESS, SRS (passive) in 36-37 GHz
- EESS, SRS uplinks in 40-40.5 GHz
- Fixed links
- RAS in 42.5-43.5 GHz
- FSS (Earth-to-space) in 42.5-43.5 GHz



LTE backhaul breakdown

CHART 1-5: LTE SMALL BACKHAUL USAGE WORLDWIDE, 2013 AND 2019



Source: ABI Research



WRC-19: Agenda Item 1.5

- FSS stands for Fixed-Satellite Service!
- Connecting earth station in motion to the FSS is an exception to the service definition

How did it all start?





WRC-2000 and WRC-03

5.457A In the frequency bands 5 925-6 425 MHz and 14-14.5 GHz, earth stations located on board vessels may communicate with space stations of the fixed-satellite service. Such use shall be in accordance with Resolution 902 (WRC-03). In the frequency band 5 925-6 425 MHz, earth stations located on board vessels and communicating with space stations of the fixed-satellite service may employ transmit antennas with minimum diameter of 1.2 m and operate without prior agreement of any administration if located at least 330 km away from the low-water mark as officially recognized by the coastal State. All other provisions of Resolution 902 (WRC-03) shall apply. (WRC-15)

RESOLUTION 902 (WRC-03)

Provisions relating to earth stations located on board vessels which operate in fixed-satellite service networks in the uplink bands 5 925-6 425 MHz and 14-14.5 GHz



WRC-2000 and WRC-03

considering

- d) that ESVs have the potential to cause unacceptable interference to other services in the bands 5 925-6 425 MHz and 14-14.5 GHz;
- f) that, without special regulatory provisions, ESVs could place a heavy coordination burden on some administrations, especially those in developing countries;
- g) that, in order to ensure the protection and future growth of other services, ESVs need to operate under certain technical and operational limitations;

resolves

that ESVs transmitting in the 5 925-6 425 MHz and 14-14.5 GHz bands shall operate under the regulatory and operational provisions contained in Annex 1 and the technical limitations in Annex 2 of this Resolution,



From Vessels to Moving Stations

RESOLUTION 158 (WRC-15)

Use of the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space) by earth stations in motion communicating with geostationary space stations in the fixed-satellite service

recognizing further

k) that the fixed and mobile services are allocated on a primary basis in the frequency bands 27.5-29.5 GHz on a global basis;

resolves to invite ITU-R

2 to **study sharing and compatibility between** earth stations in motion operating with geostationary FSS networks and **current and planned stations of existing services allocated** in the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz **to ensure protection of, and not impose undue constraints on,** services allocated in those frequency bands, and taking into account *recognizing further a) to n);*



Issues to Note

- 17.7-19.7 GHz is a downlink band therefore ESIMs will not interfere with FS/MS
 - Solution from ESVs still applicable (noting a)):
 - ESIMs shall not claim protection from, nor cause interference to, other services having allocations in these bands
- Important to establish regulatory conditions to ensure coexistence with FS/MS
 - Maritime ESIMs
 - Aeronautical ESIMs
 - Land ESIMs



Regulatory Solutions

Proposed WP 4A Resolution:

- “ 4.7 with respect to terrestrial services operating in the band 17.7-19.7 GHz the ESIM shall not claim protection or impose constraints on the development of these terrestrial services operating in accordance with the Radio Regulations;
- 4.8 with respect to any terrestrial systems operating in the frequency band 27.5-29.5 GHz, the earth station in motion shall conform to the requirements in Annex 2;
 - pfd values for A-ESIM
 - distance to coast/port for M-ESIM.
 - distance/pfd threshold for L-ESIM



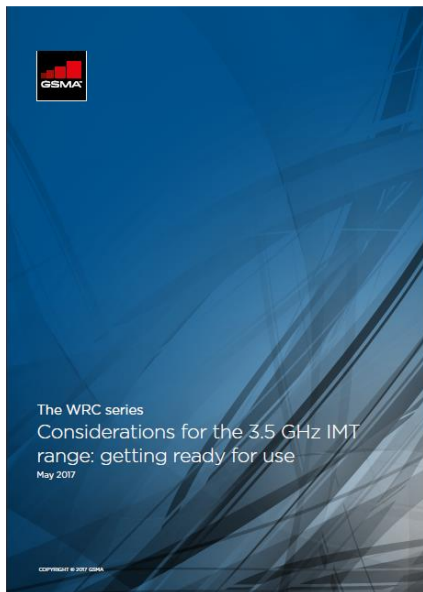
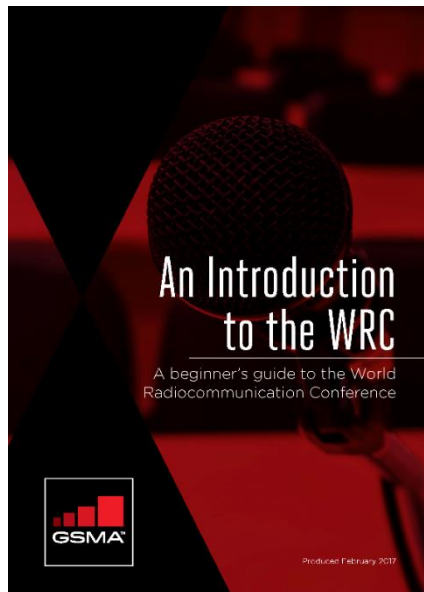
WRC-19: Other Agenda Items (2)

- **AI 1.5: ESIMs**
- **AI 1.11: train communications**
- **AI 1.12: intelligent transport systems**
- **AI 1.14: HAPS**
- **Issue 9.1.1**
- **Issue 9.1.2**





THE GSMA WRC SERIES





THANK YOU FOR YOUR KIND ATTENTION

Ross Bateson
Special Adviser, Government Affairs
rbateson@gsma.com