

WIRELESS WORLD
RESEARCH FORUM*

5G HUDDLE 2020

5G AS A CATALYST FOR
DIGITAL TRANSFORMATION

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WRC19 Outcomes - Satellite Industry Considerations

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Satellite Achievements at WRC-19

WRC-19 outcomes show a greater understanding of satellite's essential role across multiple bands and across the whole satellite eco-system

C-Band

Ku-Band

Ka-Band

Q-V Bands

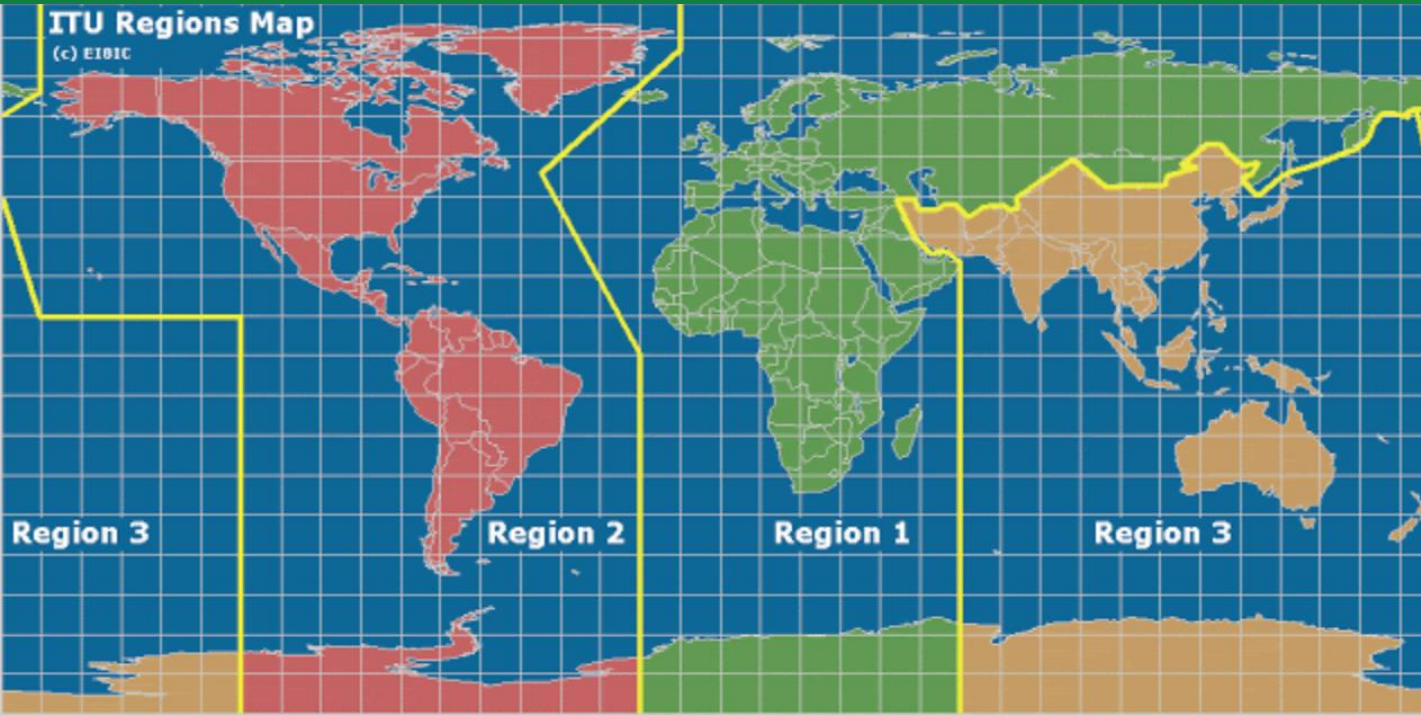
WRC-19 outcomes mean the satellite industry is well-positioned for the future

Als to make more FSS & MSS spectrum available to support continued growth

Als to increase flexibility in use of existing satellite spectrum

Only a limited number of bands being examined for IMT

- ⇒ No new Agenda Item to study 3.8 - 4.2 GHz for IMT Globally
- ⇒ No new Agenda Item to study 3.6 - 3.8 GHz for IMT in Region 3 (but in R2)
- ⇒ New Agenda item for 3.6-3.8 GHz in Region 1 for Mobile only (i.e. not IMT)



Administrations understood the need to protect critical services such as:

- ◆ Humanitarian
- ◆ Broadcasting
- ◆ Aviation Safety

Intensified the use & future use of 28 GHz band for satellite services

**The Ka-Band is now available
for GSO ESIMs**

*Use of ... 17.7-19.7 GHz & 27.5-29.5 GHz by
earth stations in motion communicating
with geostationary space stations in FSS*
- Agenda Item 1.5 of WRC-19

**A new Agenda Item will consider
future use of the Ka-Band by
NGSO ESIMs**

*To study and ... facilitate use of [Ka-band] by
non-GSO FSS earth stations in motion*
- Agenda Item 1.16 of WRC-23

- ⇒ **HAPS did not enter into 28 GHz band**
- ⇒ **No new Agenda Item for IMT for 28 GHz band**

Proposals at WRC-19 to study more bands for IMT have been limited to fixed wireless systems in Fixed Service (FS) bands - See Resolution 175 under Topic 9.1 c).

Satellite successes:

- ⇒ **1 GHz more gateway spectrum for FSS allocated in Q/V bands**
- ⇒ **More studies for NGSO systems (inter-satellite links)**
- ⇒ **New Agenda Item for GSO ESIMs in Ku-Band**
- ⇒ **Earth stations on vessels & aircraft in the AP30B uplink bands**
- ⇒ **Regulatory framework defined for NGSO systems to operate in Q/V bands (while protecting GSO satellite systems)**

| Generation | Device | Specifications |
|--|---|---|
| 1G  |  | 1G Year: early 80s Standards: AMPS, TACS Technology: Analog Bandwidth: - Data rates: - |
| 2G  |  | 2G Year: 1991 Standards: GSM, GPRS, EDGE Technology: Digital Bandwidth: Narrow Band Data rates: < 80 - 100 Kbit/s |

WRC-19 Outcomes support the Satellite Vision for 5G

- ⇒ 5G is not just about mobile networks
- ⇒ 5G is a *Network of Networks* that pools the strengths of different technologies
- ⇒ Satellite will extend the reach of 5G networks & enable a host of 5G services



Satellite Integration into 5G is Happening



⇒ **At technical level: 3GPP Release 17 includes essential NTN elements (5G NR enhancements to support satellite & NB-IoT/eMTC also to support satellite)**

⇒ **3GPP sent a Liaison Statement to ITU-R in 2019**

Multiple satellite-terrestrial projects are validating key technologies for satellite integration into 5G:

⇒ **Live over-the-air demos using satellite backhaul for video chat/ streaming/ internet browsing for 5G test beds**

⇒ **4K-8K video backhaul to edge supported by network slicing**

⇒ **Direct access via satellite based on narrowband IoT**

⇒ **Multi-connectivity between cellular & satellite (direct/indirect access)**

⇒ **Full integration of 5G RAN with CPE**



THANK YOU



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