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GSC Lunchtime Sessions

APT

WRC-19 Agenda Items:
1.5, 1.13, 10

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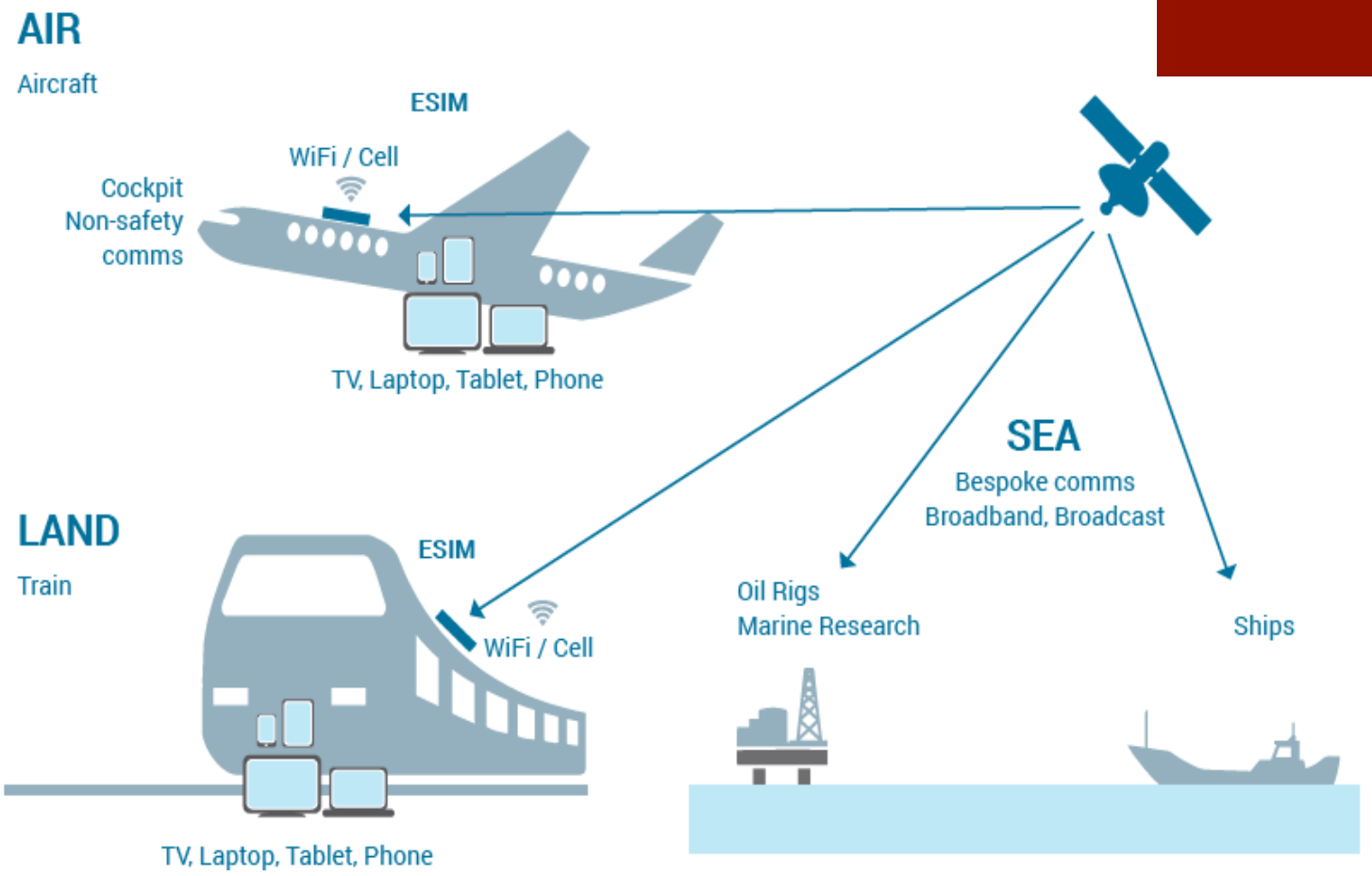
GSC Position
Agenda Item 1.5
ESIMs



Optimizing the Use of Existing Satellite Spectrum to meet growing demand for new satellite services

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AI 1.5 ESIMs in the FSS Ka-band

Resolution 156 adopted at WRC-15
Recognizes the need for global broadband mobile-satellite communications

→ ESIMs communicating with FSS space stations →

AI 1.5 (Resolution 158)
Regulated operation of ESIMs to meet increasing demand for mobility applications

GSC Position:

Establish provisions for aeronautical, maritime, land ESIM operations within GSO FSS networks at 17.7-19.7 GHz & 27.5-29.5 GHz, with technical & regulatory protection mechanisms for the FSS, FS, MSS & EESS operations

AI 1.5: ESIMs in the FSS Ka-Band

Demand for satellite mobility applications

Aeronautical Market:

- 100+ commercial airlines offer IFC = a $40B opportunity for airlines by 2035
- 8200+ commercial aircraft connected
- Connecting passengers. Reducing fuel consumption & delays. Improving route planning.

Maritime Market:

- 20 000 VSAT enabled vessels (75000 by 2028)
- Drivers: crew & passenger connectivity, more sensors/applications for operational vessel monitoring, route planning & vessel tracking, autonomous vessels.

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AI 1.5 ESIMs in the FSS Ka-band

- **Proposals from regional groups: CITEL (doc 11); RCC (doc 12); CEPT (doc 16); APT (doc 24); ATU (doc 46); ASMG (doc 29) + various multi-country and individual country proposals**
- **Common elements:**
  - ⇒ General support for new Resolution to address ESIM in 17.7-19.7 GHz & 27.5-29.5 GHz
  - ⇒ Operation of ESIM within envelope of GSO FSS network characteristics & verification of compliance with envelope by BR (based on CR/C or notified network data)
  - ⇒ 70km off-shore distance for maritime ESIM in which prior agreement from coastal state is needed to operate
  - ⇒ Sharing between GSO ESIMs & non-GSO FSS or non-GSO MSS feeder links to be based on existing coordination procedures

Some elements still need to be resolved

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AI 1.5 - ESIMs
Elements to be resolved, 1

1/ Technical requirements for A-ESIM (pfd limit values, possible altitude limit)

- GSC supports “Option 1” pfd limits (based on results of sharing studies with terrestrial services, including 5G)
- Altitude limit is not necessary, provided Option 1 pfd limits are adopted & notifying administrations provide a commitment of compliance.
- **GSC has major concerns with feasibility for BR to run compliance check with pfd limit. Compliance should be a condition of ESIM authorization.**

2/ Reference bandwidth for ESIM EIRP limits (1 MHz reference bandwidth or 14 MHz reference bandwidth)

- GSC supports 14 MHz reference bandwidth: smallest bandwidth for terrestrial service receivers. Hence the EIRP limit towards the horizon for M-ESIM is 24.44 dB(W/14 MHz). A-ESIM pfd limit should be expressed in 14 MHz reference bandwidth to avoid unnecessarily restrictive limits on A-ESIM operation.

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AI 1.5 - ESIMs
Elements to be resolved, 2

3/ Conditions for sharing with non-GSO FSS and non-GSO MSS feeder links

- GSC supports inclusion ESIM power limits only in 27.5-28.6 GHz, coordination under 9.11A in 28.6-29.5 GHz

4/ Annex 3 guidelines (possible inclusion of guidelines to the Resolution)

- Annex 3 is unnecessary: ideas already clearly defined in main body of Resolution.

5/ Status of the protection limits for terrestrial services (Annex 2 of the Resolution)

- Maritime & aeronautical ESIMs meet pfd limits/minimum off-shore distance, to avoid unacceptable interference to the terrestrial services operating in accordance with the Radio Regulations within line-of-sight and on a co-frequency basis
- Compliance with these limits should be a necessary and sufficient condition for ESIM to meet its requirements with respect to terrestrial services

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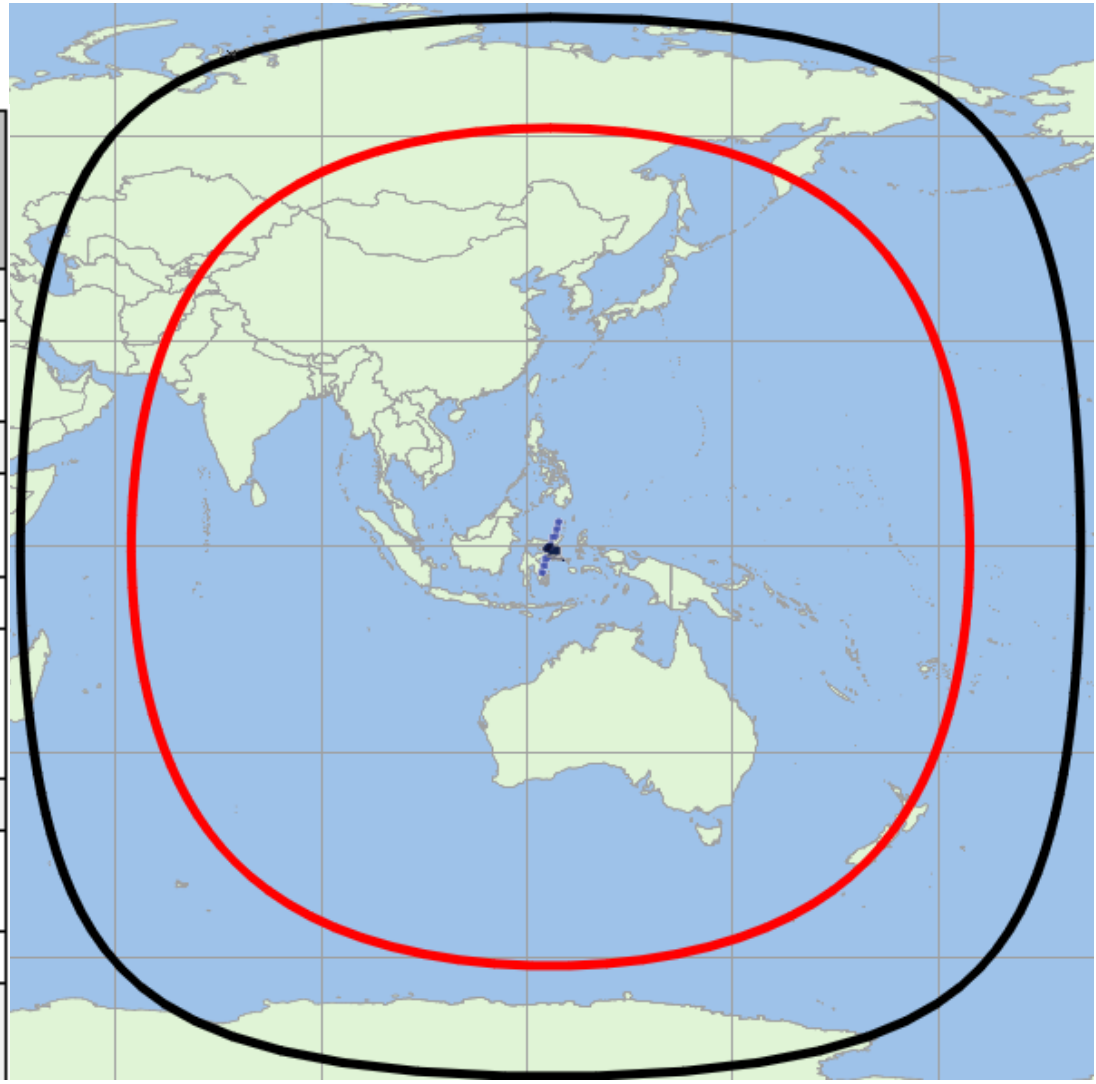
AI 1.5 ESIMs in the FSS Ka-band

STUDY ASSUMPTIONS:
AI 1.13 in 26 GHz vs ESIM in 28 GHz

AI 1.13 26 GHz STUDIES MS INTERFERNECE INTO FSS		AI 1.5 OPTION 2 PFD MASK ESIM (FSS) INTO MS
Methodology		
Type of interference evaluation method	Statistical (Monte Carlo) ITU-R M.2101	Worst-case (deterministic)
Technical and operational characteristics		
Network loading factor	20%	ESIM duty cycle not considered
TDD activity factor	BS:80%, UE:20%	
UE body loss	4 dB	Not considered
Antenna pointing	BS antenna beam not pointed toward the horizon	BS antenna beam pointed towards horizon
Propagation model		
Clutter loss	ITU-R P.2108 (up to 20-30 dB)	0 dB clutter loss
Polarisation loss	3 dB	0 dB
TOTAL INTERFERENCE REDUCTION CONSIDERED	>20 dB	>20 dB APPLICABLE, BUT NOT CONSIDERED

20 degree elevation limitation (red)



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GSC Position
Agenda Item 1.13 - IMT

ISSUE

Identification of frequency bands, among candidate bands listed in Resolution 238, for future development of IMT

… while preserving access to satellite spectrum for existing & future users

Frequency band(s)	Band(s) CPM Report
24.25-27.5 GHz	A
31.8-33.4 GHz	B
37-40.5 GHz	C
40.5-43.5 GHz	D & E
45.5-47.2 GHz	F & G
47.2-50.2 GHz & 50.4-52.6 GHz	H & I
66-71 GHz	J
71-76 GHz & 81-86 GHz	K & L

Total: 33.25 GHz

AI 1.13
Additional spectrum for IMT

- **A huge amount of spectrum has been studied**
- **More than enough to find 'more spectrum' for IMT**
- **New identifications should only be made against certain key principles**

GSC Principles

- Consider ONLY bands of Res. 238 (WRC-15)
- Harmonisation of spectrum is key
- IMT identification with reasonable sharing conditions between IMT & satellite services

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AI 1.13: Additional spectrum for IMT

The GSC recommends IMT identifications at WRC-19 stay within:

- **26 GHz:** 24.25-27.5 GHz globally (3.25 GHz)
- **40 GHz:** 37-40 GHz in Region 2 and 40.5-43.5 GHz in Regions 1 and 3 (3 GHz)
- **66 GHz:** 66-71 GHz globally (5 GHz)

⇒ with reasonable sharing conditions & measures to ensure co-existence between IMT & satellite services:

- Power / pointing conditions on IMT base stations to protect FSS receivers, with no undue constraints on IMT
- Assistance to administrations in defining measures for future FSS earth station deployment

<u>11.25 GHz</u> above 24 GHz for IMT in each ITU-R Region

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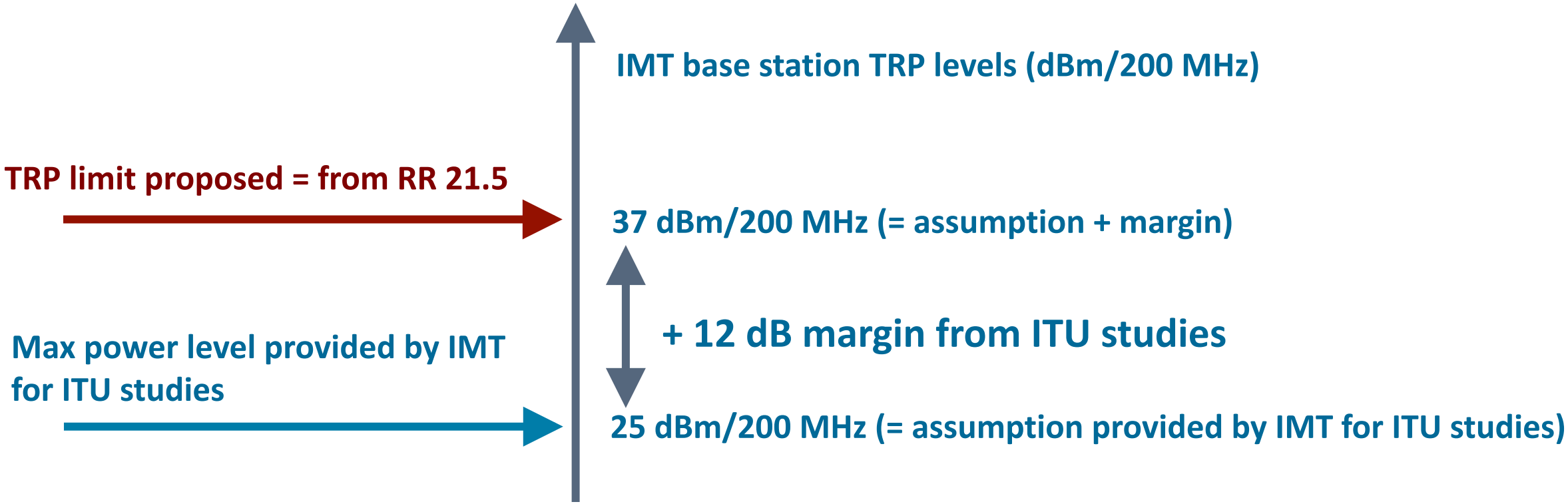
AI 1.13: Additional spectrum for IMT

Proposed power and pointing conditions for IMT base stations do not put undue constraints on IMT

Max power level provided by IMT, TRP limit proposed and RR 21.5



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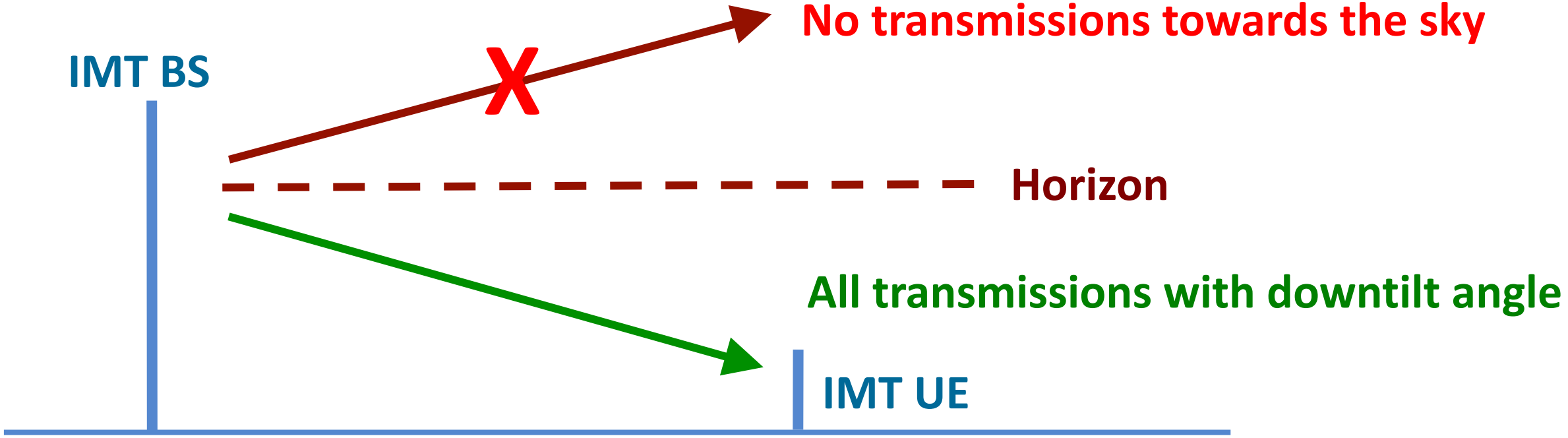
AI 1.13: Additional spectrum for IMT

Proposed power + pointing conditions for IMT base stations do not put undue constraints on IMT

IMT base stations all transmit below horizon, with a downtilt angle



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AI 1.13: Additional spectrum for IMT

	37-39.5 GHz	39.5-40 GHz	40-40.5 GHz	40.5-42 GHz	42-43.5 GHz
Region 1		HDFSS			
Region 2			HDFSS		
Region 3			HDFSS		

	37-39.5 GHz	39.5-40 GHz	40-40.5 GHz	40.5-42 GHz	42-43.5 GHz
Region 1	No Change			IMT	
Region 2	IMT			No Change	
Region 3	No Change			IMT	

⇒ Bands should not be identified for IMT in a Region where it is not intended for use by IMT

⇒ Global economies of scale for IMT equipment can be achieved through identification of 3 GHz of spectrum for IMT in each ITU Region

⇒ There is no need for a global 6 GHz wide band for IMT

Handsets used today are can already support multiple frequency bands AND can accommodate regional band differences

Summary of Methods and Options (CPM text) supported by GSC for AI1.13

Band	IMT-2020	CPM Report
24.25-27.5 GHz (Band A)	Yes	Method A2 (Alternative 1 or 2), subject to: • Condition A2d Option 1 • Condition A2e Option 3 (with 37 dBm/200 MHz) • Condition A2g Option 3 or 4 Draft New Resolution [A113-IMT 26 GHZ] (WRC-19)
31.8-33.4 GHz (Band B)	No	Method B1 (No Change)
37.0-40.5 GHz (Band C)	Yes in Region 2 except in 40-40.5 GHz No in Regions 1 and 3	• In Region 1: Method C1 (NOC). • In Region 2, Method C2, Conditions C2b Option 1 for the band 37-40 GHz and C1 (NOC) for the band 40-40.5 GHz. • In Region 3: Method C1 (NOC). Draft New Resolution [B113-IMT 40/50GHZ] (WRC-19)
40.5-42.5 GHz (Band D)	Yes in Regions 1 and 3 No in Region 2	• In Region 1: Method D2, Conditions D2a Option 1. • In Region 2: Method D1 (NOC), • In Region 3: Method D2, Conditions D2a Option 1. Draft New Resolution [B113-IMT 40/50GHZ] (WRC-19)
42.5-43.5 GHz (Band E)	Yes in Regions 1 and 3 No in Region 2	• In Region 1: Method E2, with conditions below: • In Region 2: Method E1 (NOC), • In Region 3: Method E2, with conditions below: ○ Condition E2a Option 2 (with 37 dBm/200 MHz) ○ Condition E2c Option 3 or 4 ○ Condition E2d Option 1 Draft New Resolution [B113-IMT 40/50GHZ] (WRC-19)
45.5-47.2 GHz (Bands F and G)	No	Method F1 and G1 (No Change)
47.2-50.2 GHz (Band H)	No	Method H1 (No Change)
50.4-52.6 GHz (Band I)	No	Method I1 (No Change)
66-71 GHz (Band J)	Yes	Method J2 (either alternative 1 or 2) with the conditions of Draft New Resolution [C113-IMT 66/71GHZ-J2] (WRC-19)
71-76 GHz (Band K)	Yes	Method K2 (either alternative 1 or 2) with the conditions of Draft New Resolution [E113-IMT 70/80GHZ] (WRC-19)
81-86 GHz (Band L)	Yes	Method L2 (either alternative 1 or 2) with the conditions of Draft New Resolution [E113-IMT 70/80GHZ] (WRC-19)

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GSC Position
Agenda Item 10
(C-Band)

Crucial Issue

- **Can IMT replace the services that will be displaced?**
- **Do alternatives exist to provide these services?**

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C-band facts & figures for Asia

Asia Population: 4.58 Billion (2019)

16+	80+	3800+	$56B
Indigenous C-Band Satellite Systems	C-band Satellites Serving Asia	TV Channels distributed by C-band	Pay TV Revenues in 2018

There is no substitute for C-band Satellite Services in Asia

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Critical telecom sectors rely on FSS C-band

Mobile Backhaul: the only way to bring mobile telephony to remote areas

Broadcasting: the only robust way to bring TV/ next generation video to the whole territory

Oil & Gas: the most reliable way to connect exploration sites & offshore platforms

Humanitarian Programs: C-band recognized as a standard by UN for emergency comms

Air Navigation & Meteorology Services: the only solution for high reliability & wide coverage

Maritime: the only solution for vessels in remote regions/long routes

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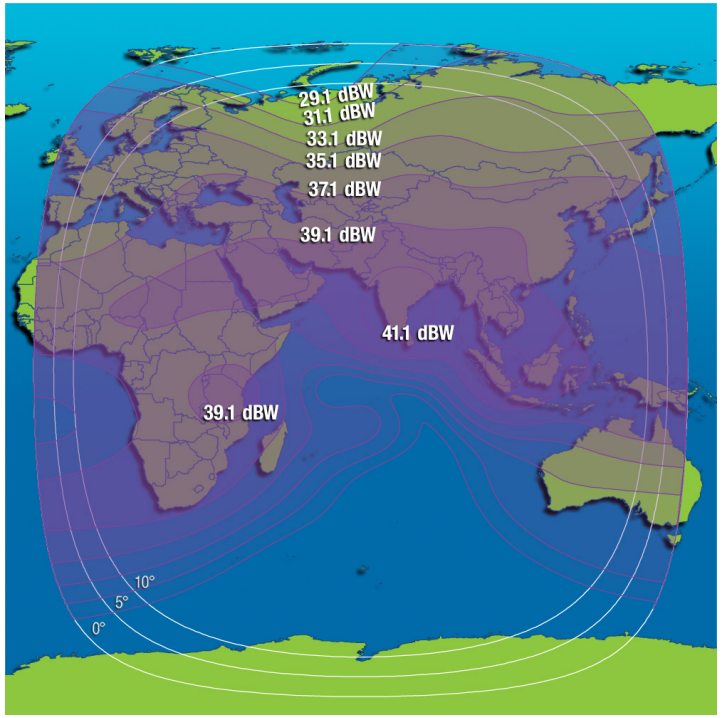
Why C-Band remains the distribution platform of choice

The most efficient, reliable, & economical medium for Media distribution



Intelsat 20 at 68.5° E
(Traditional wide beams)

Intelsat 35e at 34.5° W
(Channelized multi-spot beams)

- **REACH:** C-band beams cover large geographic areas & facilitate intercontinental/global communications
- **ECONOMICS:** 100s of thousands of installed earth stations around the world; over a hundred satellites in orbit, global reach, distribution efficiency
- **RESILIENCE:** C-band has unique propagation & coverage characteristics that cannot be replicated in other frequency bands

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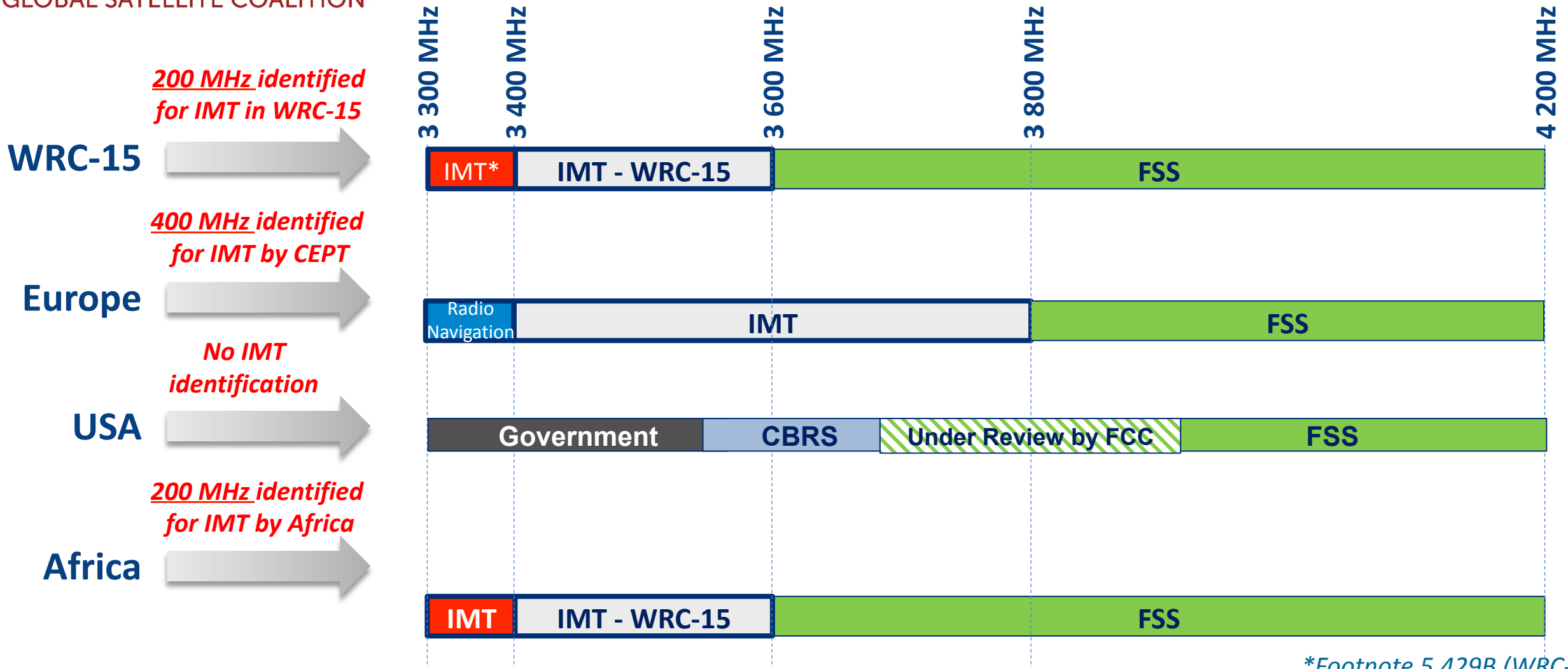
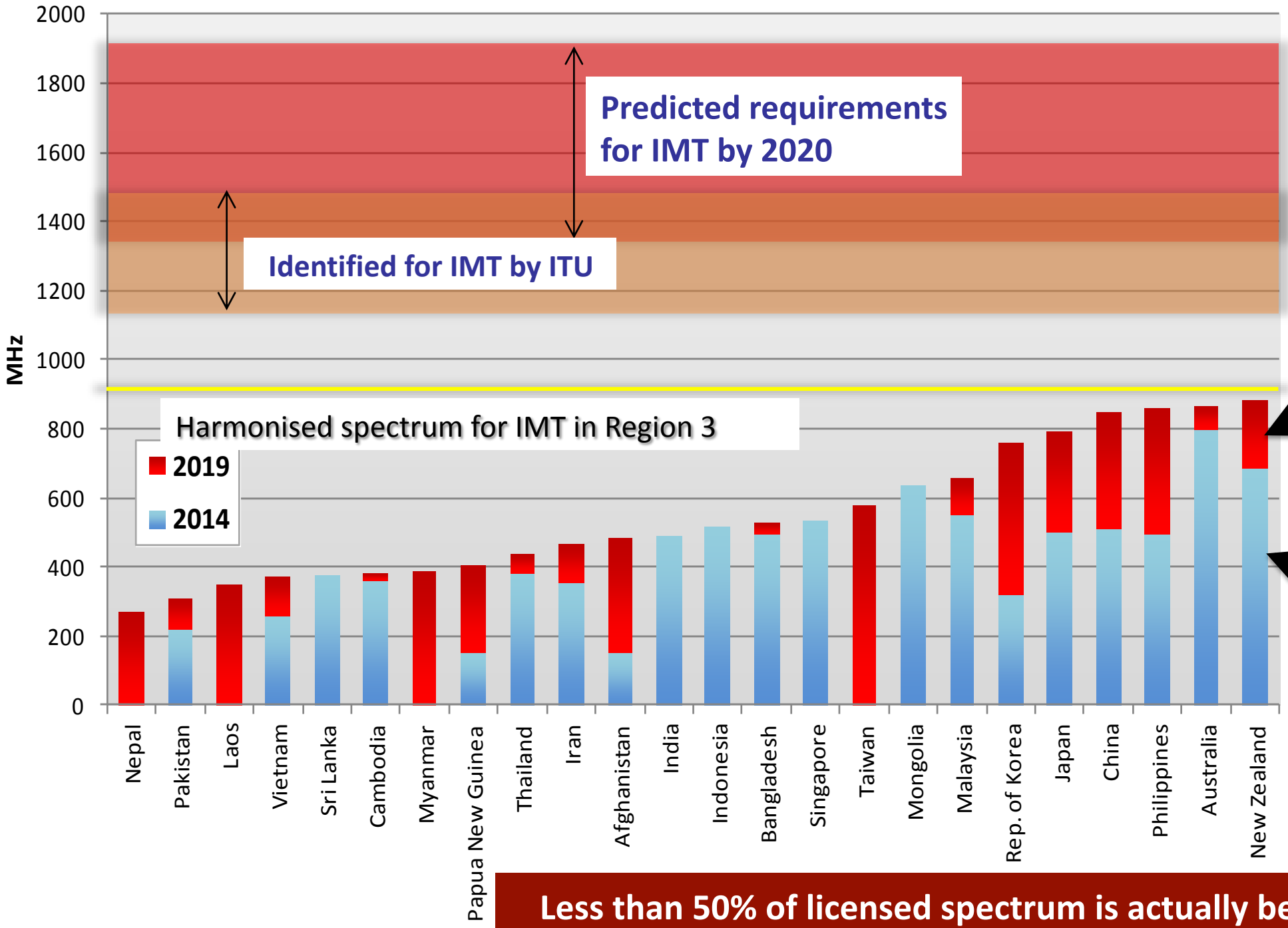
C-band usage varies around the world



*Footnote 5.429B (WRC-15)

Every region has unique needs ⇒ One size does not fit all

LS Telcom: Region 3 Analysis



Amount of spectrum licensed since 2014

Amount of spectrum licensed in 2014

Less than 50% of licensed spectrum is actually being used by IMT today

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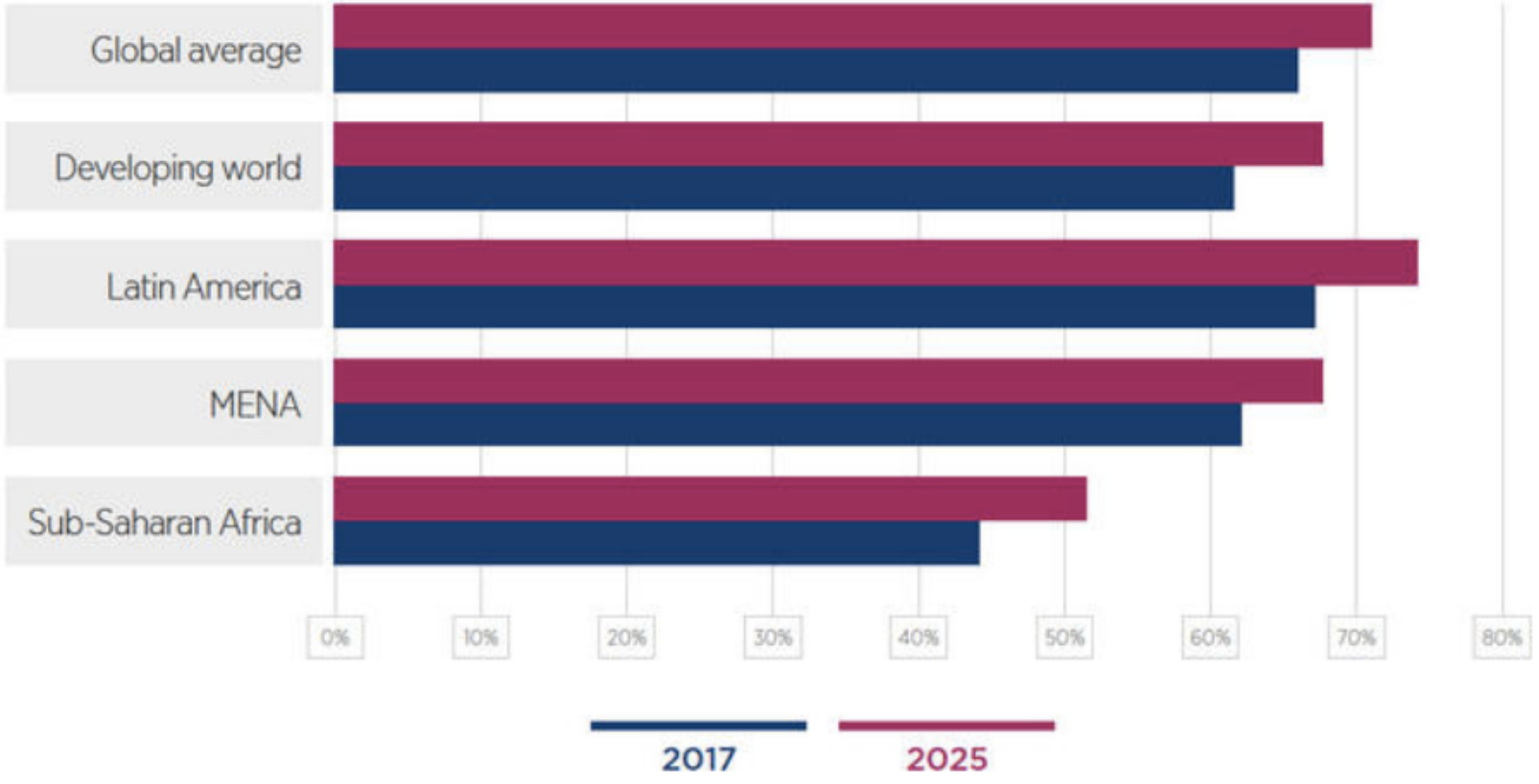
Coverage or Capacity?

The Challenge in the Asia-Pacific Region is Coverage

- 50% of mobile networks are still using 2G
- By 2025, 3G will account for 60% of all mobile connections
- 400 million people have no access to mobile broadband
- C-band & mmWave are capacity bands (not coverage bands)
- Focus should be on digital dividend bands (700/800/900 MHz bands)

Subscriber Penetration:



Source: GSMA Intelligence – The Mobile Economy; Asia-Pacific 2018

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FSS and mobile co-frequency sharing is not feasible

FSS operators & mobile operators agree that co-frequency sharing is not practical

- Numerous studies show that co-frequency sharing between 5G and FSS is not feasible
- Statements made by Ericsson & Nokia to the FCC confirmed that sharing was not feasible due to large exclusion zones around earth stations
- Even when 5G & FSS operate in adjacent bands, interference into FSS will occur, unless carefully managed
- 5G signals are far more powerful than satellite signals; this complicates coexistence between mobile & FSS

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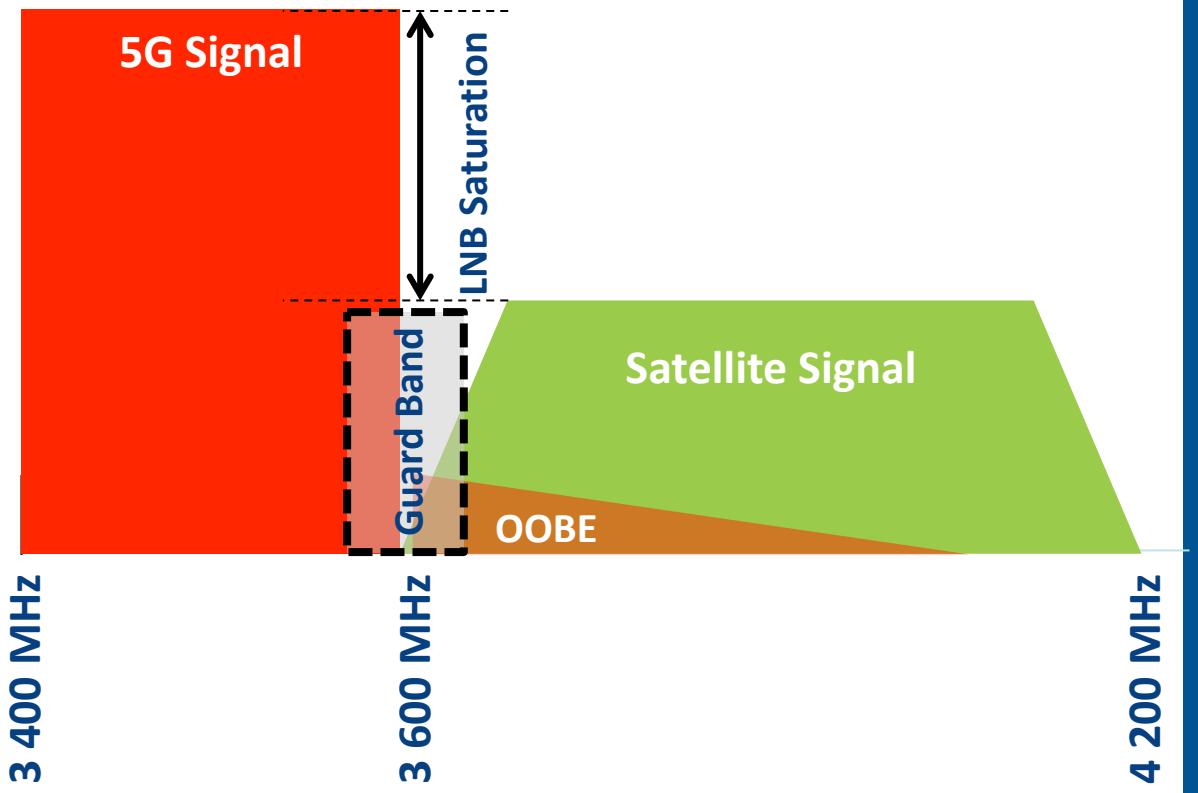
Co-existence between FSS and 5G in adjacent bands must be carefully managed



- Satellite earth stations are very sensitive to terrestrial interference
- 5G signals can interfere with FSS receive earth stations in two ways:
  - Saturate the LNB of the earth station, even if the 5G signal is adjacent to the satellite signal
  - Out-of-Band-Emissions (OOBE) and Spurious Emissions (SE) of the 5G signal can cause in-band interference to FSS signals
- OOBE levels specified in 3GPP standards do not protect FSS signals in adjacent bands

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GSC Position
Agenda Item 10
(6-24 GHz)

Issue

- Can IMT replace the services that will be displaced?
- 33 GHz has just been studied, should even more spectrum for IMT really be studied?

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AI 10
Proposals for IMT in 6-24 GHz

The GSC is of the view that there is no need for any additional spectrum to be identified for IMT:

- WRC-19, under AI 1.13, is expected to identify **many GHz** of new spectrum for IMT
- **Significant** amount of unlicensed or unused spectrum is **already** identified for IMT –
  ⇒ Around the world, less than 50% of available spectrum is licensed
- **6-24 GHz range covers core bands for the satellite industry:** C-, X, Ku- and Ka-band
  ⇒ Many satellites operate in these bands => heavily used for applications e.g. broadcasting DTH, VSAT, SNG, broadband, security, etc.

Any identification of IMT in the 6-24 GHz range will:

- Interfere with existing satellite services
- Negatively impact existing investments
- Harm competition by limiting the ability of satellite operators to meet the growing demands of satellite users, including government

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GSC Position
Agenda Item 9.1.7
- Unauthorized Earth Stations -

ISSUE

To address concerns raised with unauthorised earth stations while preserving regulatory certainty & flexibility

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AI 9.1 - Issue 9.1.7
Unauthorised earth stations

The GSC recognizes the concerns of administrations affected by unauthorized operation of earth stations terminals:

- Re Issue 2a (Annex to Resolution 958 WRC-15): GSC supports Option 1 **NO CHANGE to Radio Regulations** (international regulatory measures already addressed appropriately with Art 18)
- Additional **Regulatory Measures will not resolve this problem** of illegal transmissions
- Re Issue 2b (Annex to Resolution 958 WRC-15): GSC supports **ITU-R studies on best practices** in training & monitoring and development of **ITU reports/ handbooks/capacity building** to help administrations to prevent use of & locate unauthorized uplink earth terminals

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Thank you!