

**Presentation on
agenda items of Chapter 1, 9.1c & Art. 21.5 of
CPM23 report for
5th National Preparatory Workshop organised
by IAFI for WRC23**

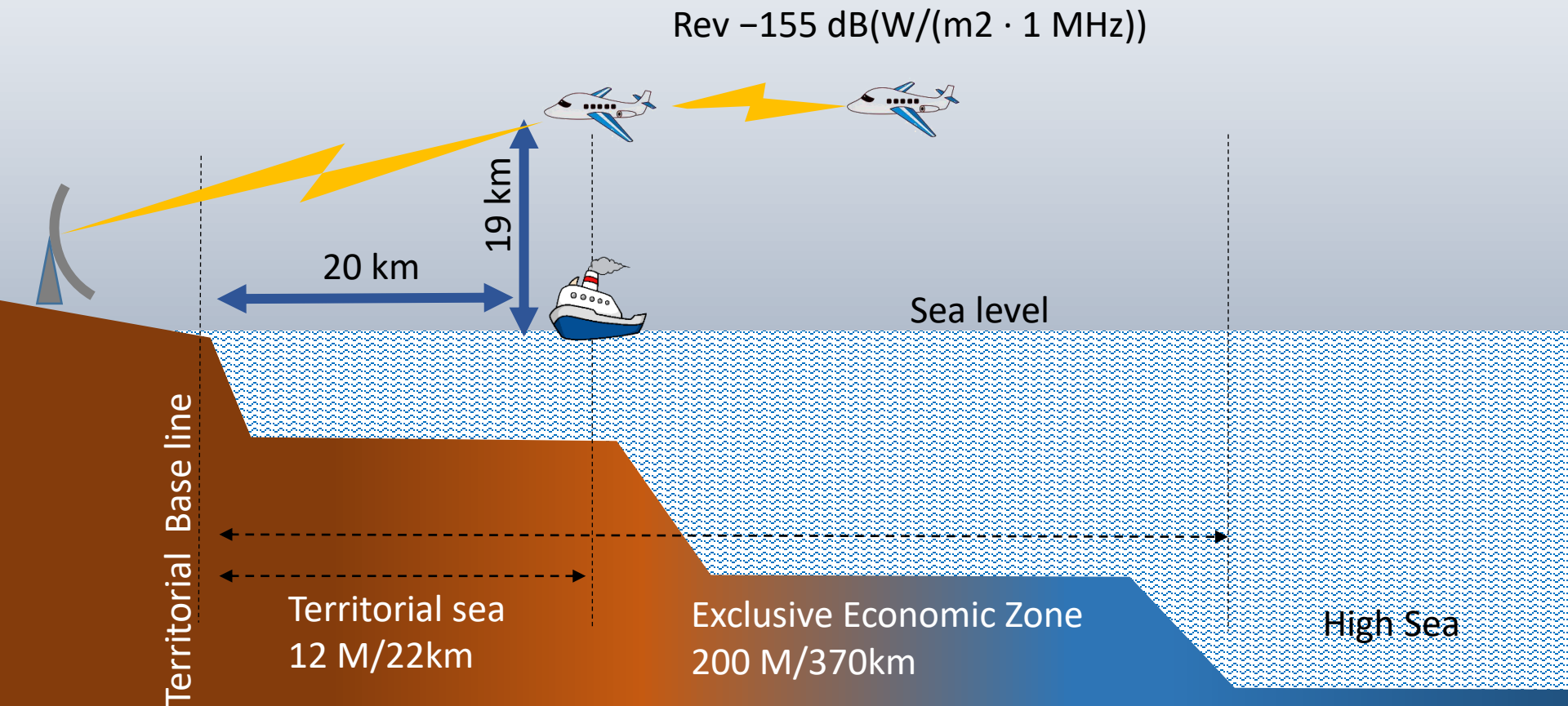
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Sr DWA WPC Wing, RLO NE

Guwahati 14 Feb 2023

Agenda Item 1.1 Protection of AMS & MMS in frequency band 4800-4990 MHz, while review of pfd limit in International airspace/Water

AMS uses broadband, narrow-band, airborne data-links to support remote sensing, e.g. earth sciences, land management, energy distribution, etc., applications



Study result:

- **Technical characteristic**

Antenna gain : i) Airborn : 3 to 19 dBi ; ii) Ground base : 3 to 31 dBi
 Protection criteria : $I/N = -6$ dB

- **WP5D studies results**

i) Shipborn : -111.57 to -139.57 (dB(W/(m². MHz)))
 ii) Airborne : -105.57 to -130.07 (dB(W/(m². MHz)))

- **Our understanding**

Ref external Radio Noise power dBW/MHz	Shipborn Antenna Gain			Airborn Antenna Gain		
	0 dBi	3 dBi	31 dBi	0 dBi	3 dBi	19 dBi
-148	-113*	-116*	-144*	-113*	-116*	-132*
-164	-129*	-132*	-160*	-129*	-132*	-148*

*Power spectral density in dB(W/(m². MHz))

- **Methods to satisfy Agenda 1.1**

- **Method A:** No change.

- **Method B:** Keeping the existing pfd and applying it to all countries listed in RR No. 5.441B.

- **Method C:** New pfd value (in dB(W/(m² · 1 MHz)))

Method C Alternatives	MMS pfd	MMS Freq	Above sea km	Away fr coast km	AMS pfd	AMS Freq	Above sea km	Away fr coast km
Alt 1	-134	f1	0-.03		-138	f2	.03-19	22
Alt 2	-134	f1	0-.03	22	-140	f2	0-19	22
Alt 3					-122	f3	0-19	82
					-122	f4		82 (AMT)
Alt 3bis					-122	f3	0-19	22
					-122	f4		22(AMT)
Alt4	-115	f1	0-.03	22	-117	f3	0-19	22
Alt5	-115	f1	0-.03	370	-117	f3	0-19	370

f1:4800-4990 MHz, f2=4800-4950 MHz, f3=4800-4825 & 4835-4950 MHz, f4=4825-4835

- **Method D:** New pfd value and applying it to all countries listed in RR No. 5.441B. (with alternatives in Method C)
- **Method E** – Keeping the existing pfd and extension of list of countries where it is not applied
- **Method F** – Only application of RR No. 9.21 for the protection of AMS/MMS stations in international airspace and waters
- **Method G:** Bilateral/multilateral coordination between concerned countries.
- **Method H** – Only application of RR No. 9.21 for the protection of AMS/MMS stations in international airspace and waters and protection of AMS/MMS is limited to national territory

Administration	AI 1.1 Views for protection of AMS/MMS
Japan	Supports modification to facilitate IMT while protection to AMS/MMS
Australia	Supports protection with PFD at 12 nm. Does not support 9.21 solely
Korea	Method D, Alt1 or 2. Oppose Method E
China	IMT identification without restriction
Thailand	Supports studies and ensure protection while reviewing pfd limit
New Zealand	Supports existing pfd limit in addition to Art 9.21
Singapore	IMT implementation subject to agreement
Malaysia	Supports studies
Nepal	Supports studies
Philippines	Supports studies and ensure protection while reviewing pfd limit
Viet Nam	Method F,G,H. Method A, E could be. Method C on condition. Oppose Method B, D
Iran	NOC

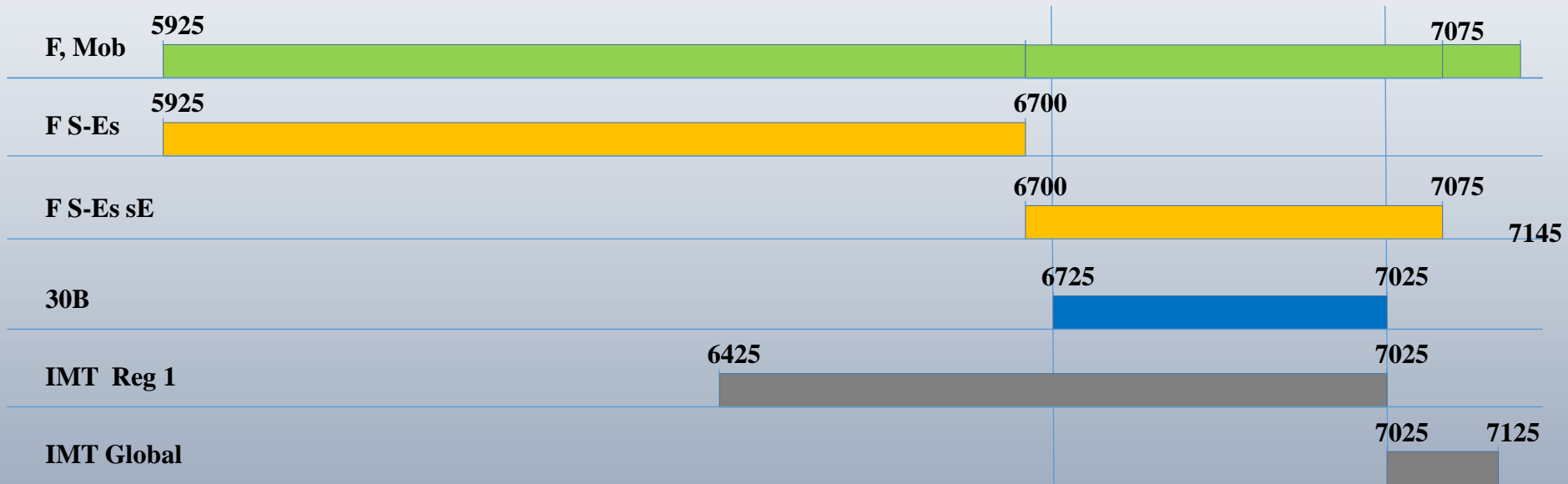
Regional Groups	AI 1.1 Views for protection of AMS/MMS
ASMG	Ensuring the protection of existing services and not imposing additional restrictions on them
ATU	Global/regional harmonisation for IMT. Ensure protection to existing service
CEPT	Review of existing pfd limits
CITEL	<p>Administrations</p> <ol style="list-style-type: none"> 1. Ensure protection while reviewing pfd limit in addition to Art 9.21 2. Supports studies for IMT identification 3. Supports studies for co-existence
RCC	Removal of pfd restriction.
ICAO	Supports studies which enhance the protection of flight testing

1.2 Identification of IMT in bands

Band 1 (3 300- 3 400 MHz (amend footnote in Region 1)),
Band 2 (3 300-3 400 MHz (Region 2)),
Band 3 (3 600- 3 800 MHz (Region 2)),
Band 4 (6 425-7 025 MHz (Region 1)),
Band 5 (7 025-7 125 MHz (globally)) and
Band 6 (10.0-10.5 GHz (Region 2))

1.2 Identification of IMT in bands

Allocation of Radiocommunication service in a band 6425 – 7112 MHz

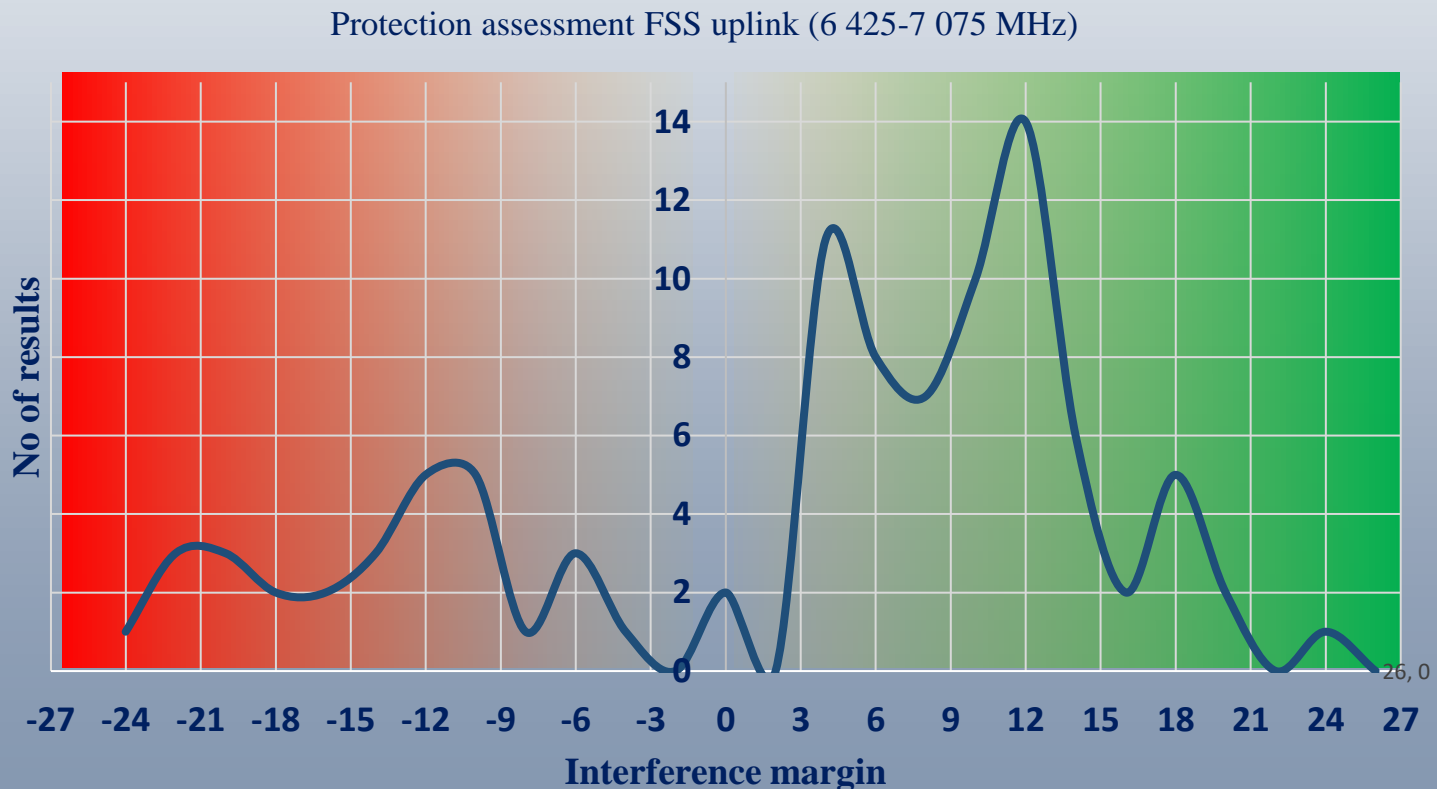


1.2 Identification of IMT in bands

Protection assessment : FSS uplink (6 425 – 7 025 MHz)

Band 4

Sharing studies (A to T) 20 Nos. for FSS uplink out of which 14 studies (A, B, D, H, I, J, K, L, M, N, O, P, Q & R) has shown the positive margin, and 6 studies (C, E, F, G, S & T) has shown the negative margin (means interference)



1.2 Identification of IMT in bands

Issue / Band	Methods to satisfy this agenda item				
	NoC	New MS allocation	Add countries to MS footnote	IMT identification	IMT identification + conditions
1 / 3 300-3 400 MHz in R1	1A	1E	1B, 1C	1B, 1C, 1D, 1E	
2 / 3 300-3 400 MHz in R2	2A	2B, 2C			2B, 2C
3 / 3 600-3 800 MHz in R1	3A			3D, 3F	3B, 3C, 3E
4 / 6 425-7 025 MHz in R1	4A			4B, 4C	4D
5 / 7 025-7 125 MHz globally	5A			5B	5C, 5D
6 / 10.0-10.5 GHz in R2	6A	6B, 6C			6B, 6C

Methods in bands 6 425-7 025 MHz

- 4A NOC
- 4B IMT without conditions
- 4C IMT with conditions
- 4D IMT with condition on parts of band
- 4E IMT after 2030

1.2 Identification of IMT in bands

Asia Pacific administrations views on Ai 1.2

Administration /Band	3.3-3.4 MHz in R1 1	3.3-3.4 MHz in R2 2	3.6-3.8 MHz in R2 3	6425-7025 MHz in R1 4	7025-7125 MHz glo 5	10.0 -10.5 GHz in R2 6
Japan	*	*	IMT*	IMT *	IMT*	*
Australia	*	*	*	*	IMT	*
Bangladesh	1C	2B	3B	4C	5D	6C
Iran	IMT in part	*	*	*	*	*
Korea					5A or 5C	
China	SSS	SSS	SSS	IMT*	IMT	SSS
Thailand				*	IMT*	

- Protection to existing service
- SSS Support sharing studies

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Lao				SSS	IMT*	
New Zealand					IMT	
Singapore	*	*		*		
India	1D	2C			5C	
Malaysia					IMT*	
Myanmar				SSS	IMT*	
Nepal					IMT *	

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Cambodia	SSS	SSS	SSS	SSS	IMT*	
Philippines	*SSS	*SSS	*SSS	*SSS	IMT*	IMT*
Viet Nam	1A, 2A	1A,2A	3B,3C,3D	Monitor	Monitor	*
Indonesia					*	
Mongolia			SSS	SSS	IMT*	
Sri Lanka					IMT*	
Pakistan				*	IMT*	

- Protection to existing service
- SSS Support sharing studies

1.2 Identification of IMT in bands

Regional Groups	Views for protection of AMS/MMS
ASMG	3300-3400MHz – IMT via country footnote. 6425-7125 MHz – Protection of existing services. Position to be decided
ATU	3300-3400MHz – IMT via country footnote (5.429B). 6425-7125 MHz – IMT identification while protecting existing services
CEPT	3300-3400MHz – Does not support IMT identification, and interested in protecting existing service. 10-10.4 MHz – Does not support
CITEL	Administrations <ul style="list-style-type: none">• Some countries are interested for IMT in 3300-3400 MHz• 3600-3800 MHz – IMT via country footnote (5.434)• 6425-7125 MHz – NOC , where as some countries support sharing and compatibility studies in 7025-7125 MHz.• 10-10.5 – Some countries support sharing and compatibility studies

1.2 Identification of IMT in bands

Regional Groups	Views for protection of AMS/MMS
RCC	6425-7125 MHz – Support for IMT systems while ensuring protection to existing services. In rest band no-objection for IMT subject to protection to existing services.
IARU	10-10.5 – Oppose IMT identification
WMO	6425-7075 MHz and 7075-7250 MHz – Raise concern to protect EESS (passive) .
ICAO	3 600-3 800 MHz and 6 425-7 025 – To oppose any proposal which lead to harmful interference and reduce protection level.

1.2 Identification of IMT in bands

India position:

1 / 3 300-3 400 MHz in R1

Method 1D: New Primary allocation to the mobile (except aeronautical mobile) service and identification of IMT.

2 / 3 300-3 400 MHz in R2

Method 2C: Upgradation to the mobile (except aeronautical) service to primary service and identification of IMT in Region 2.

3 / 3 600-3 800 MHz in R2: No contribution required

To identify IMT.

4 / 6 425-7 025 MHz in R1

Position to be decided

5 / 7 025-7 125 MHz globally

Method 5B: IMT by creating a new RR footnote without any conditions

6 / 10.0-10.5 GHz in R2: No contribution required

Its for new allocation for mobile and to identify IMT

Agenda item 1.3 In Region 1, upgradation of mobile service to primary allocation in band 3 600-3 800 MHz, and to identify IMT

Position : India supports upgradation based on ensuring protection

Agenda item 1.4 – Use of HIBS in the bands below 2.7 GHz already identified for IMT)

Issues - Frequency band(s)	Methods			
	No change to the Radio Regulations (RR)	Use by HIBS in single footnote	Use by HIBS in single footnote not claiming protection	Use by HIBS in regional footnotes
A - 694-960 MHz	A1	A2	A3	A4
B - 1 710-1 885 MHz	B1	B2	B3	B4
C - 1 885-1 980 MHz, 2 010-2 025 MHz, and 2 110-2 170 MHz	C1	C2	C3	-
D - 2 500-2 690 MHz	D1	D2	D3	D4

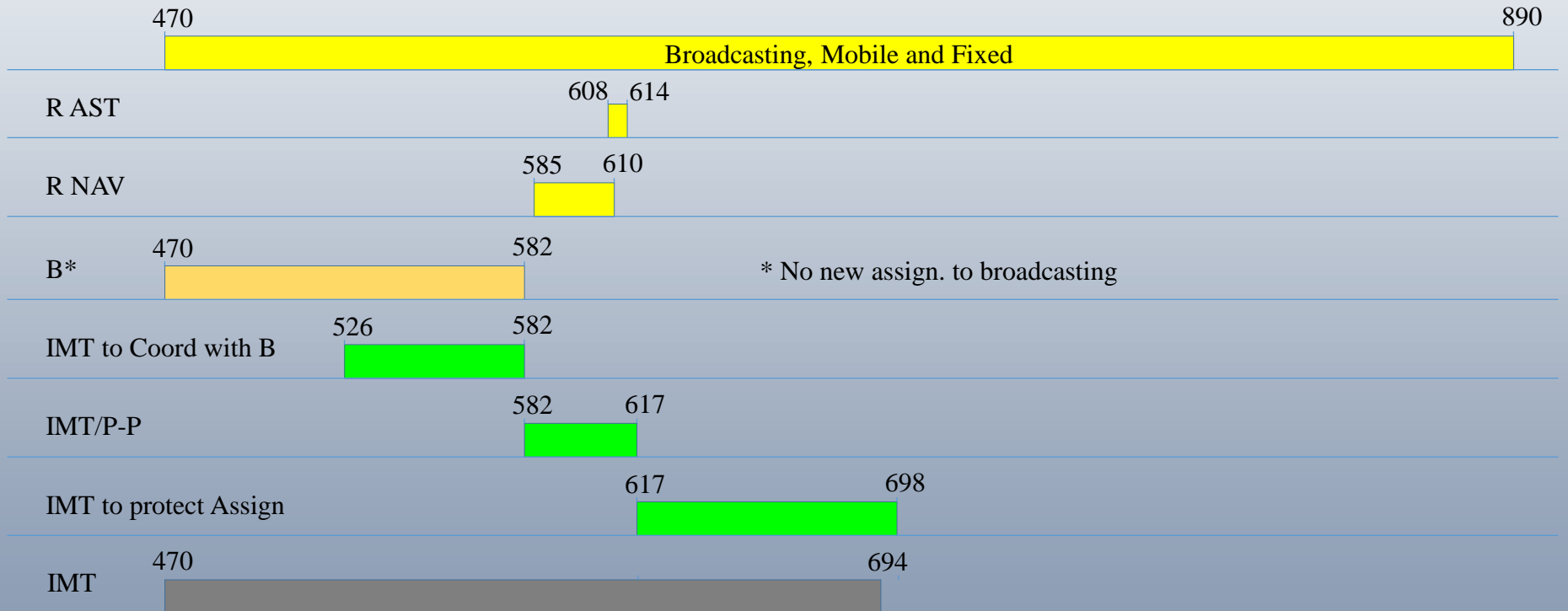
Agenda item 1.4 – Use of HIBS in the bands below 2.7 GHz already identified for IMT)

Administration	Views for protection of AMS/MMS
Japan	Methods A2, B2, C2 and D2
Australia	Ensure protection to IMT with no constrain to IMT
Bangladesh	A1, B1, C1 & D1
Iran	Ensure protection to IMT
Korea	D2 and D3
China	Support global harmonisation while ensuring protection
Thailand	Support global harmonisation while ensuring protection to IMT
India	A3,B3,C3 & D1
Viet Nam	1A. B3, C3, D3 could be
Malaysia	Supports studies while ensuring protection
Nepal	Supports studies while ensuring protection
Philippines	Supports studies while ensuring protection
Indonesia	Supports studies while ensuring protection

Agenda item 1.4 – Use of HIBS in the bands below 2.7 GHz already identified for IMT)

Regional Groups	Views for protection of AMS/MMS
ASMG	Ensuring the protection of existing services and not imposing additional restrictions on them
ATU	Global/regional harmonisation of HIBS. Ensure protection to existing service
CEPT	Does not support
CITEL	Ensure protection to IMT service
RCC	Ensure protection
ICAO	Ensure protection and oppose the use of HIBS within the frequency band 2 500-2 690 MHz
WMO	Ensure protection (2700-2900 MHz ,2500-2690 MHz, 1675-1710 MHz,1710-1885 MHz 2025-2110 MHz)

Agenda item 1.5 (In Region 1, review of spectrum needs in the band(470 – 690 MHz & consideration of regulatory action in band (470- 694 MHz))



Agenda item 1.5 (In Region 1, review of spectrum needs in the band(470 – 690 MHz & consideration of regulatory action in band (470- 694 MHz))

Methods to satisfy agenda item 1.5

Method A: No Change.

Method B : 470-694 MHz (MOBILE) & IMT in band 470 -694 MHz or in parts there of with or without

- Alt B1 : 470-694 MHz (MOBILE) & 614 -694 MHz (IMT without condition)
- Alt B2 : 470-694 MHz (MOBILE) & 470 -694 MHz (IMT without condition)
- Alt B3 : 470-694 MHz (MOBILE)

Agenda item 1.5 (In Region 1, review of spectrum needs in the band(470 – 690 MHz & consideration of regulatory action in band (470- 694 MHz))

Method C : 470-694 MHz (MOBILE ex Aero) & IMT in band 470 -694 MHz or in parts there of

Alternative	MOBLE ex Aero		IMT		Condition	
	470-694	614-694	470-694	614-694	With	Without
1	Yes			Yes		Yes
2	Yes		Yes			Yes
3	Yes			Yes	Yes	
4	Yes		Yes		Yes	
5		Yes		Yes		Yes
6		Yes		Yes	Yes	
7	Yes			Yes	Yes	
8	Yes		Yes		Yes	
9		Yes	Yes		Yes	

Agenda item 1.5 (In Region 1, review of spectrum needs in the band(470 – 690 MHz & consideration of regulatory action in band (470- 694 MHz))

Method D: Primary allocation to the mobile, except aeronautical mobile, service within the band 470-694 MHz without IMT identification.

- Alt1: Use of Mobile ex Aero via footnote
- Alt2: Allocation in table with condition
- Alt3: Use of Mobile ex Aero via country specific footnote
- Alt4: Use of Mobile ex Aero later 01/01/2031
- Alt5: Use of Mobile in parts (614-694 MHz)

Method E: Primary allocation to the mobile, except aeronautical mobile, service of the band 470-694 MHz in Region 1 with technical condition limiting mobile operations to downlink in this band.

Method F: Secondary allocation to mobile, except aeronautical mobile, service in the band 470-694 MHz in Region 1

Method G: In conjunction with Methods B, C, D and E, upgrade of the radio astronomy allocation to primary status

Agenda item 1.5 (In Region 1, review of spectrum needs in the band(470 – 690 MHz & consideration of regulatory action in band (470- 694 MHz))

Administration	Views for protection of AMS/MMS
Japan	NOC
Australia	Ensure protection to other region
Iran	No change, as sharing is not possible between Broadcasting and mobile service
Samoa	Does not support changes in 470-694 MHz
China	Ensure protection to region 3
India	Ensure protection to region 3
Viet Nam	Method C

Agenda item 1.5 (In Region 1, review of spectrum needs in the band(470 – 690 MHz & consideration of regulatory action in band (470- 694 MHz))

Regional Groups	Views for protection of AMS/MMS
ASMG	Ensure protection to Broadcasting service. And study to find possible way for IMT
ATU	-
CEPT	Ensure protection to Broadcasting and other services.
CITEL	Some administration propose NOC
RCC	NOC
ICAO	-
WMO	Interested in the development of wind profiler radars in the 470-494 MHz
IARU	-

Verification of RR No. 21.5 for the notification of IMT stations operating in the frequency band 24.45-27.5 GHz which use an antenna that consists of an array of active elements

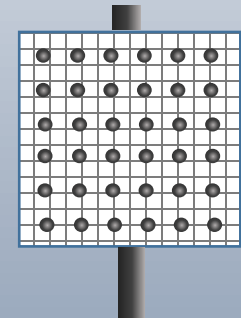
As per RR article

21.3 § 3 1) The maximum equivalent isotropically radiated power (e.i.r.p.) of a station in the fixed or mobile service shall not exceed +55 dBW.

21.5 3) The power delivered by a transmitter to the antenna of a station in the fixed or mobile services shall not exceed +13 dBW in frequency bands between 1 GHz and 10 GHz, or +10 dBW in frequency bands above 10 GHz, except as cited in No. 21.5A. (WRC-2000)

Appendix 4. (No. 11.15.) (Radio station characteristic)

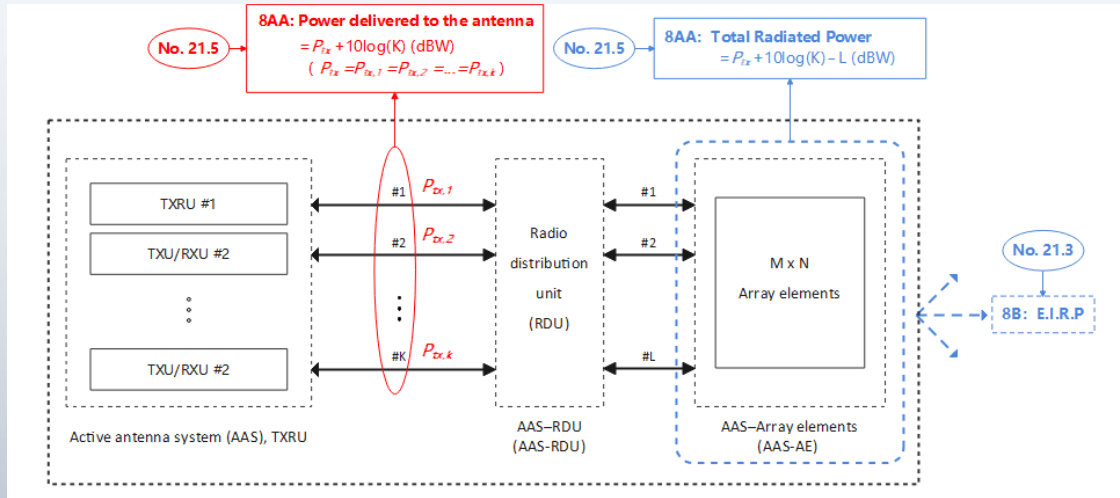
- 8AA – Power to antenna
- 8B – Radiated power (eirp/ erp/ emrp)
- 9G – Gain of antenna (Max)
- 7AB – Necessary bandwidth



AAS

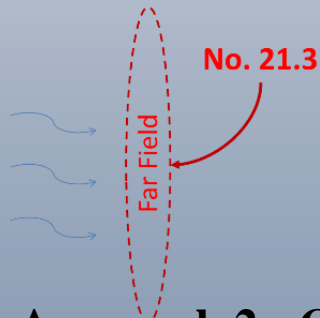
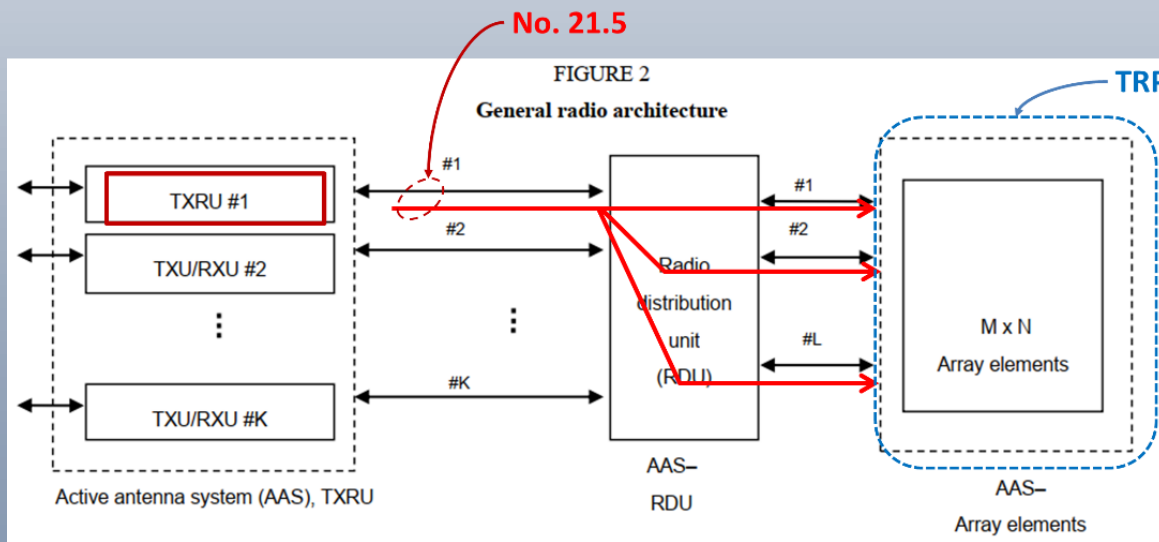
One frequency one record in MIFR. Item Identifiers 8AA, 8B and 9G represent the values over the assigned frequency and necessary bandwidth, i.e. the radio-frequency channel.

Verification of RR No. 21.5 for the notification of IMT stations operating in the frequency band 24.45-27.5 GHz which use an antenna that consists of an array of active elements



Study were conducted base on 3 approaches

Approach 1 : TRP based



Approach 2 : Conducted power by single Tx

Approach 3 : Guidance fr. WP5D

Verification of RR No. 21.5 for the notification of IMT stations operating in the frequency band 24.45-27.5 GHz which use an antenna that consists of an array of active elements

Study were conducted base on 3 approaches

Approach 1 : TRP based

Approach 2 : Conducted power by single transmitter

Approach 3 : Guidance from WP5D

Approach 1

Short term solution

- 8AA – Power to antenna [TRP] **21.5**
- 8B – Radiated power (eirp/ erp/ emrp) [TRP + Gain(Max) +Loss] **21.3**
- 9G – Gain of antenna (Max) [Gain(Max)]
- 7AB – Necessary bandwidth

Example

- 8AA – Power to antenna [25dBm (i.e 10 dBm +10log₁₀(8x8)-3dB]
- 8B – Radiated power (eirp/ erp/ emrp) [48dBm (i.e 25 dBm + 23 dBi)]
- Gain of antenna (Max) [23 dBi (i.e 5 dBi + 10 log₁₀(8x8)]
- 7AB – Necessary bandwidth

Verification of RR No. 21.5 for the notification of IMT stations operating in the frequency band 24.45-27.5 GHz which use an antenna that consists of an array of active elements

Approach 1

Long term solution

$$\mathbf{8AA} \leq \mathbf{X} + \mathbf{BAF} + \mathbf{ASF}$$

Where,

$$X = TRP_{studies} + M - K, \text{ where } M \text{ is the I/N \& } K \text{ [3dB] margin}$$

$$\text{Band Adjustment factor } BAF = \max \left(10 \log_{10} \left(\frac{BW_{Tx}}{BW_{Ref}} \right), 0 \right)$$

$$\text{Array Scaling Factor ASF} = \max \left(10 \log_{10} \left(\frac{NB}{NB_{Ref}} \right), 0 \right)$$

Study 2

$$TRP \leq 10 \text{ dBW} / \text{MHz}$$

Study 3

$$TRP \leq 10 \text{ dBW}$$

Applicability of 21.5 should not be changed

Verification of RR No. 21.5 for the notification of IMT stations operating in the frequency band 24.45-27.5 GHz which use an antenna that consists of an array of active elements

Approach 1

Study 4

Interim solution

$8AA \leftarrow TRP \leq 10 \text{ dBW}$

7AB Bandwidth, an appropriate bandwidth adjustment if BW differ from 200 MHz

Long term solution

Amendment to Art 21 & identifier for introduction of IMT in 26 GHz band

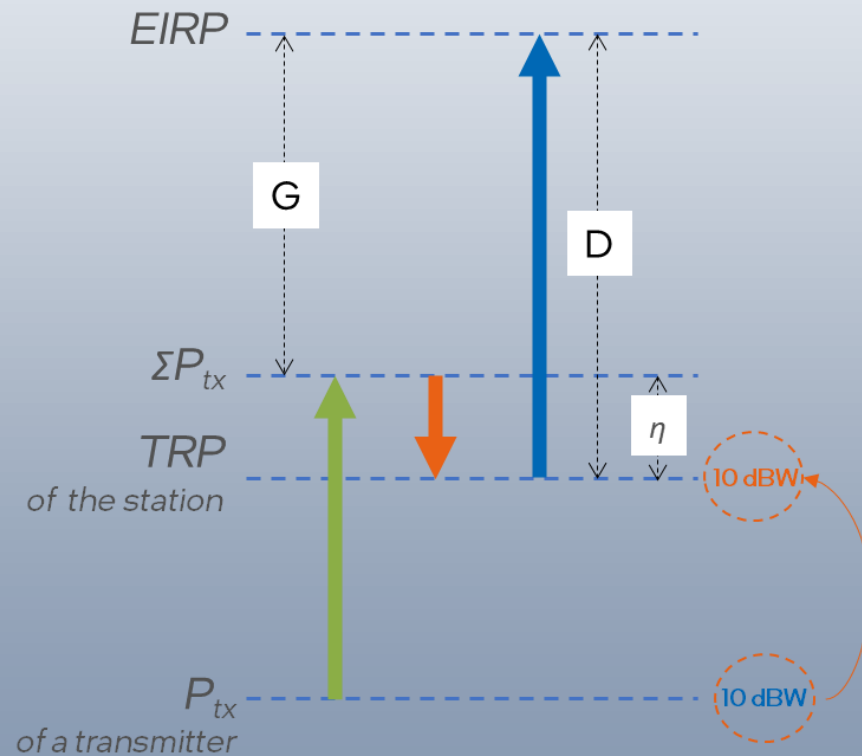
Approach 2

No change to the text of No. 21.5, no interpretation (conducted power delivered by a single transmitter).

Verification of RR No. 21.5 for the notification of IMT stations operating in the frequency band 24.45-27.5 GHz which use an antenna that consists of an array of active elements

Approach 2

No change to the text of No. 21.5, no interpretation (conducted power delivered by a single transmitter).



Consequences of considering TRP

$$1. P_{tx}^{new} = \frac{TRP (=10W)}{K \cdot \eta}$$

Where,

K is no. of Tx

η is efficiency

Example: $K=1024, \eta = 0.5$ then

$$P_{tx}^{new} = 0.0195 \text{ W (reduction in power)}$$

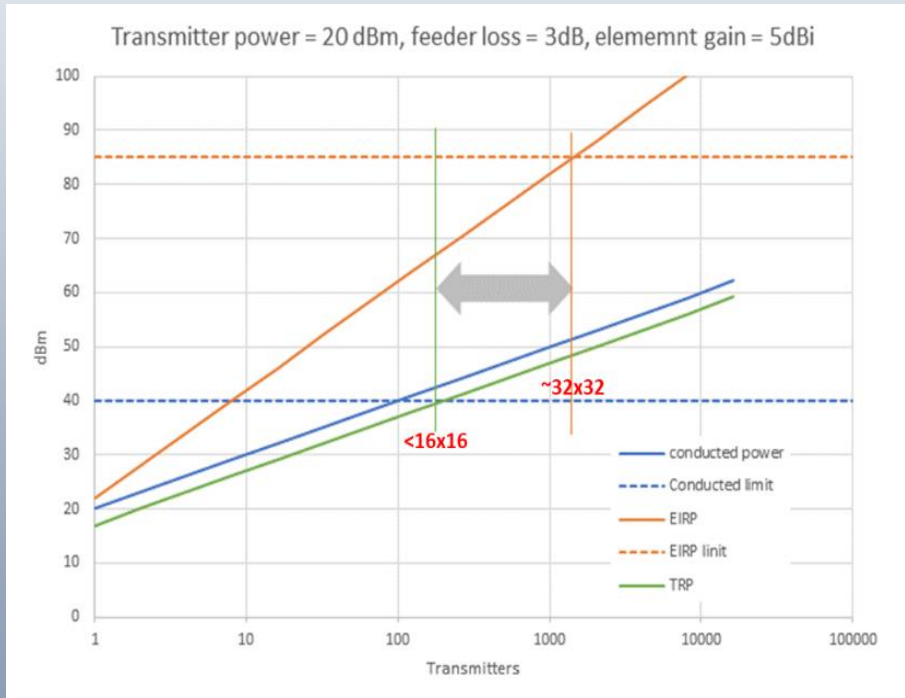
2. Limitation on No. of antenna (i.e eirp is limited to no. of antenna elements)

Verification of RR No. 21.5 for the notification of IMT stations operating in the frequency band 24.45-27.5 GHz which use an antenna that consists of an array of active elements

Approach 2

No change to the text of No. 21.5, no interpretation (conducted power delivered by a single transmitter).

Consequences of considering TRP



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Where,

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2. Limitation on No. of antenna (i.e eirp is limited to no. of antenna elements)

Verification of RR No. 21.5 for the notification of IMT stations operating in the frequency band 24.45-27.5 GHz which use an antenna that consists of an array of active elements

Approach 3

Guidance from WP5D on the calculation of data element 8AA for the notification of IMT base stations utilizing AAS in the frequency range 24.45-27.5 GHz

Verification of RR No. 21.5 for the notification of IMT stations operating in the frequency band 24.45-27.5 GHz which use an antenna that consists of an array of active elements

Administration	Views for protection of AMS/MMS
Japan	TRP/200MHz (8AA)
Australia	Support TRP with reference bandwidth
Korea	Support conducting power for single transmitter. Required studies if required 21.5 modification
China	TRP with correction factor based on reference bandwidth
New Zealand	TRP/MHz
Singapore	TRP/26 MHz
Samoa	TRP/Ref BW

Verification of RR No. 21.5 for the notification of IMT stations operating in the frequency band 24.45-27.5 GHz which use an antenna that consists of an array of active elements

Regional Groups	Views for protection of AMS/MMS
ASMG	No change to RR 21.5
ATU	-
CEPT	TRP with bandwidth adjustment factor
CITEL	
RCC	TRP with bandwidth adjustment factor

9.1-c Study the use of International Mobile Telecommunication system for fixed wireless broadband in the frequency bands allocated to the fixed services on primary basis, in accordance with Resolution 175 (WRC-19)

Approach 1

Development of new ITU-R Recommendation(s), Report(s) and Handbook

Approach 2

Revision of ITU-R Recommendation(s), Report(s) and Handbook

Meeting were mainly focused on meaning of fixed wireless broadband (FWB)

Further proposal to progress.

Alternative 1

Revision of resolution 175 or draft new resolution for WRC 27 to continue studies.

Alternative 2

No revision of resolution.

9.1-c Study the use of International Mobile Telecommunication system for fixed wireless broadband in the frequency bands allocated to the fixed services on primary basis, in accordance with Resolution 175 (WRC-19)

Administration	Views for protection of AMS/MMS
Japan	Supports discussion for changes or development of new in Reports, Recommendations and Handbook. But no changes in RR. Suppression of res
Australia	Approach 2 and Alternative 2
Bangladesh	No changes to RR Suppression res. Use of IMT tech for FWBS
Iran	Shall not adverse affect existing system. No changes in RR. Suppression of res. IMT tech. is compatible with FWBS
Korea	Approach 2 and Alternative 2. Suppression of Res
China	Supports for changes or development of new in Reports, Recommendations and Handbook.
Thailand	Approach 2 and Alternative 2. But no changes in RR

9.1-c Study the use of International Mobile Telecommunication system for fixed wireless broadband in the frequency bands allocated to the fixed services on primary basis, in accordance with Resolution 175 (WRC-19)

Administration	Views for protection of AMS/MMS
New Zealand	Supports changes or development of new (if required) in Reports, Recommendations and Handbook. But no changes in RR. Alternative 2
Singapore	Approach 2 and alternative 2.
Samoa	The scope of the studies should be IMT technologies used for FWA
India	Approach 2 and if required Approach 1. Alternative 1 (New draft res)
Philippines	Supports changes in Reports, Recommendations and Handbook. But no changes in RR.

9.1-c Study the use of International Mobile Telecommunication system for fixed wireless broadband in the frequency bands allocated to the fixed services on primary basis, in accordance with Resolution 175 (WRC-19)

Regional Groups	Views for protection of AMS/MMS
ASMG	Supports use of IMT systems and technologies in fixed service freq. allocation.
ATU	Protection shall be ensure.
CEPT	Consideration of broadband fixed wireless access (BFWA) that use IMT technologies shall only be considered in FS.
CITEL	One administration views : IMT system shall not be used in FS.
RCC	IMT system shall be used in Mobile service. Where as, IMT technology can be used in FS.

Thank you

M P S Alawa
Sr DWA WPC Wing, RLO NE
Guwahati 14 Feb 2023