

4th National Workshop on WRC-23

Perspective from 5GIF

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About 5GIF

An industry collaborative forum, established to enable synergizing the national efforts and play a significant role in shaping the strategic, commercial and regulatory development of the 5G ecosystem in India

5GIF Engagements

- Visibility of 3GPP technologies amongst Indian stakeholders and regulatory bodies
 - Facilitating the 3GPP meetings in India and 3GPP knowledge dissemination
 - Technical activities including the generation of Technical Reports, performance studies and drafting Recommendations
 - IMT-2020 Technology Evaluation

5GIF Working Groups

Standards &
Technology

Spectrum
studies

Vertical
Industries

Technology
Evaluation
Group

- 6G Initiatives and engagements in India
- Contributions towards IMT-2030 in ITU-R
- WRC-23 studies and technical studies for National preparatory committees

WRC-23 MOBILE/IMT related AI

Fixed, Mobile and Broadcasting issues

1.1 4800-4990 MHz

1.2 IMT identification

1.3 3600-3800 MHz mobile allocation

1.4 HIBS below 2.7GHz

1.5 470-694 MHz R1 broadcast and mobile

1.1 Technical and regulatory conditions for the protection of stations of the aeronautical and maritime mobile services located in international airspace or waters (i.e. outside national territories) from IMT in the band 4 800-4 990 MHz;

1.2 Potential IMT identifications:

- 3 300-3 400 MHz (footnotes R1, R2);
- 3 600-3 800 MHz (R2);
- 7 025-7 125 MHz (global);
- 6 425-7 025 MHz (R1);
- 10 000-10 500 MHz (R2)

1.3 Primary mobile allocation 3 600-3 800 MHz (R1)

1.5 Review of the spectrum use of the frequency band 470-960 MHz in R1, with possible regulatory actions in 470 – 694 MHz

General issues

9.1 c IMT for FWA under FS

Studies and structure towards WRC-23 for IMT

WP 5D towards WRC-23 for possible IMT identification of the bands

3300 – 3400 MHz	(Region 1, 2)
3600 – 3800 MHz	(Region 2)
6425 – 7025 MHz	(Region 1)
7025 – 7125 MHz	(Globally)
10 000 – 10 500 MHz	(Region 2)

WP 5A on a primary Mobile Service allocation for the band 3.6 – 3.8 GHz (Region 1)

TG 6/1 on the UHF band 470 – 960 MHz in Region 1, agreed already at WRC-15

WP 5D + WP 5B on the band 4800 – 4990 MHz for protection of stations of aeronautical and maritime mobile service in international airspace

WP 5D on High Altitude IMT Base Station (HIBS) in the bands 694 – 960 MHz, 1710 – 1885 MHz and 2500 - 2690 MHz

WP 5A on fixed wireless broadband using IMT in the frequency bands allocated to the Fixed Service on primary basis

WP5D Structure

Ad Hoc Work Plan

Dr. Hakan
OHLSEN,
Sweden

WG General Aspects

Dr. Kyu Jin WEE, Korea

SWG CIRCULAR

Mr. Yong WU

SWG SPECIFIC APPLICATIONS

Mr. Bharat BHATIA

SWG Vision :

Mr. Hyoung Jin Choi

WG Technology Aspects

Mr. Hu WANG, China

1. **SWG COORDINATION** Mr. Yoshio HONDA
2. **SWG EVALUATION** Ms. Ying PENG
3. **SWG IMT SPECIFICATIONS** Mr. Yoshinori ISHIKAWA
4. **SWG OUT OF BAND EMISSIONS (OOBE)** Mr. Uwe BAEDER
5. **SWG RADIO ASPECTS** Mr. Marc GRANT

WG Spectrum Aspects &

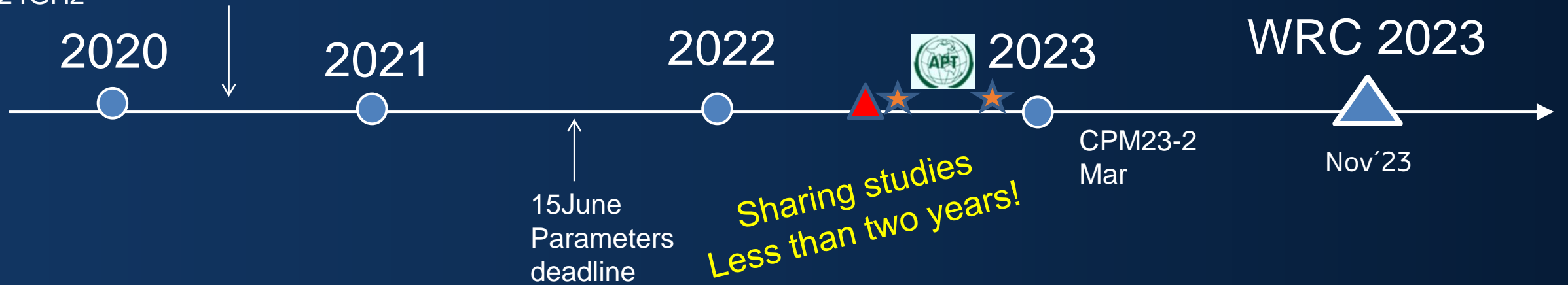
WRC-23 Preparations

Mr. Michael KRAEMER,
Germany

1. **SWG Sharing Studies** (Dr. Hiroyuki ATARASHI)
2. **SWG Frequency Arrangements** (Dr. Yutao ZHU)
3. **SWG WRC-23 agenda item 1.1** (Mr. Baxton SIREWU)
4. **SWG WRC-23 agenda item 1.2** (Ms. Luciana CAMARGOS)
5. **SWG WRC-23 agenda item 1.4** (Mr. Geraldo NETO)

Critical Timeline

March: 3GPP SI "Feasibility on 7-24GHz"



IMT For Sharing & Compatibility Studies: Characteristics, Deployment, Protection Criteria

For Sharing Study Bands WRC-23

1. 470-694 MHz, 694-960 MHz;
2. 1 710–1 885 MHz, 1 885-1 980 MHz, 2 010-2 025 MHz, 2 110-2 170 MHz and 2 500-2 690 MHz;
3. 3 300-3 400 MHz (3 300-3 315 MHz and 3 385-3 400 MHz), 3 600-3 800 MHz, 4 800-4 990 MHz;
4. 6 425-7 025 MHz, 7 025-7 125 MHz; and
5. 10.0-10.5 GHz

Categorized : <1 GHz, 1-3GHz, 3-6GHz, 6-8 GHz, 10-11GHz

IMT-2020 Specification Parameters

1. Base Station, Mobile Station

- Non-AAS, AAS

2. Transmitter

- Spectral Mask, ACLR, Spurious Emissions, Maximum Output Power

3. Receiver

- Noise Figure, Sensitivity, ACS, Blocking Response, Operating SINR

Deployment Characteristics

1. Environment

- Urban/Suburban/Rural Macro
- Antenna Pattern, Networking Loading, height, Max UE Tx Power, Cell-Radius, Tilt
- Beamforming with AAS

Source : 5D/716 Annex 4.4

IMT For Sharing & Compatibility Studies: Characteristics, Deployment, Protection Criteria

Deployment : Relatively large area

1. Bands : 6-8 GHz, 10-11GHz
2. unrealistic to assume that IMT BS/UE density will be same when studies are scaled to a large area

$$Dl = Ds * Ra * Rb$$

Ds = density value for coverage area, i.e. density of simultaneously transmitting UEs or number of BS per km²;

Ra (%) = ratio of coverage areas to areas of cities/built areas/districts;

Rb (%) = ratio of built areas to total area of region in study.

6-8 GHz – IMT identification, 10-11GHz Fixed Wireless Access using IMT

Ra Parameters (6-8 GHz)

Options *	Macro	Micro
1	30% Urban (area < 200 000 km ²) 10% Urban (area > 200 000 km ²) 10% Suburban (area < 200 000 km ²) 5% Suburban (area > 200 000 km ²)	10% Urban (area < 200 000 km ²) 5% Urban (area > 200 000 km ²)
2	45% Urban, 20% Suburban	10% Urban

Rb Parameters (6-8 GHz)

1	5% (area < 200 000 km ²) 2% (200 000 - 1 000 000 km ²) 1% (area > 1 000 000 km ²)	5% (area < 200 000 km ²) 2% (200 000 - 1 000 000 km ²) 1% (area > 1 000 000 km ²)
2	5% (area < 3 500 000 km ²) 3% (area > 3 500 000 km ²)	5% (area < 3 500 000 km ²) 3% (area > 3 500 000 km ²)
3	2.5% (area < 200 000 km ²) ** 2% (200 000 - 1 000 000 km ²) 1% (area > 1 000 000 km ²)	2.5% (area < 200 000 km ²) ** 2% (200 000 - 1 000 000 km ²) 1% (area > 1 000 000 km ²)

** The value is applicable for Region 1, for bands considered globally the value of 5% should be used.

Source : 5D/716 Annex 4.4

IMT Parameters (A10 5D/1155)

How should the “Rb” described in Annex 4.4 of Document 5D/716 be applied in studies where the satellite footprint includes significant landmass-areas that are unpopulated ?

- Rb is defined as the ratio of built-up areas to the total area of the region under study
- Satellite footprint includes significant unpopulated landmass-areas.
- Studies should clearly state the percentage of area in the footprint which is excluded so that all the studies are comparable as much as

What AAS pattern is to be used in adjacent frequency bands?

- small fractional frequency offsets from the AAS operating band border (e.g. 1-2%), the best assumption is the beamformed radiation pattern as per the model in Recommendation ITU-R M.2101, with adjustment of d/λ .
- Further work would be necessary to model the transient radiation from beamformed to non-beamformed (single element).

Down to which size of a satellite footprint to apply the Rb values described in Annex 4.4 of Document 5D/716, or how small the footprint needs to be to set Rb to 100%?

For satellite footprint areas $> 1\,000\text{ km}^2$, the formula and values for Ra and Rb in Document 5D/716. Annex 4.4 (section 3.3) should be used.

It should also be noted that, although Rb may be set to 100% for very small footprints, Rb = 100% is a pessimistic assumption that only applies where the small footprint coincides with the centre of a large city. If the footprint moves to different areas of a country, this assumption will only apply to an extremely small percentage of all cases.

New slant path clutter loss model of Recommendation [ITU-R P.2108-0](#) based on Doc. [3K/178 Annex 6 \(Item 3.3\)](#)

TBD

Sharing Study Parameters & Views

Clutter Loss @ BS – BS above rooftop, part of BS in urban

Further discussion is needed (both in 3 GHz and 6 GHz bands)

Clutter Loss @ ES - If ES is at low height, foliage loss, apply for specific locations

Percentage of time for propagation model: 50% P.2001, or 20% and 0.005% for P.452

- **IMT N/w location** w.r.t ES : FSS ES over a distribution and range,
- **Polarization Loss** : - 0dB for single entry, and 3dB for aggregated Interference
- FSS ES additional Noise level : LS to WP4A
- **ES tracking strategy** : Tracking closest vs max-hold tracking

Single Entry - TVG methodology presented in Appendix 7 of the Radio Regulations

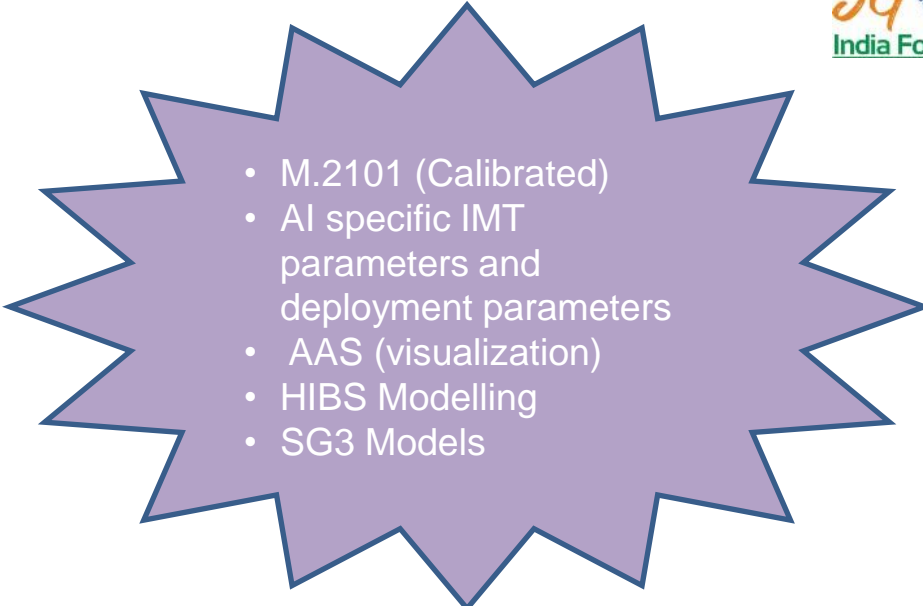
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Down to which size of a satellite footprint to apply the Rb values described in Annex 4.4 of Document 5D/716, or **how small the footprint needs to be to set Rb to 100%?**

5GIF Recommendations

- IMT Network Modeling tools
- ITU-R SG3 propagation models (e.g., P.452, P.1801, P.619)
- Validation and Calibration of models of various services
- Choose appropriate IMT parameters., keeping in view typical deployments and information from users of the service

- 
- M.2101 (Calibrated)
 - AI specific IMT parameters and deployment parameters
 - AAS (visualization)
 - HIBS Modelling
 - SG3 Models

- Allow detailed technical discussions for fruitful and timely contribution to ITU-R, APG and WP meetings
- Active participation in WP5D-SWG Spectrum Aspects
- Prioritize and Differentiate studies for ITU-R and National level studies
- Identify local study or assessment of existing study reports
- Decisions based on feasibility and Implementability of co-existence conditions at national level, administrative border, etc.

Thank you



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