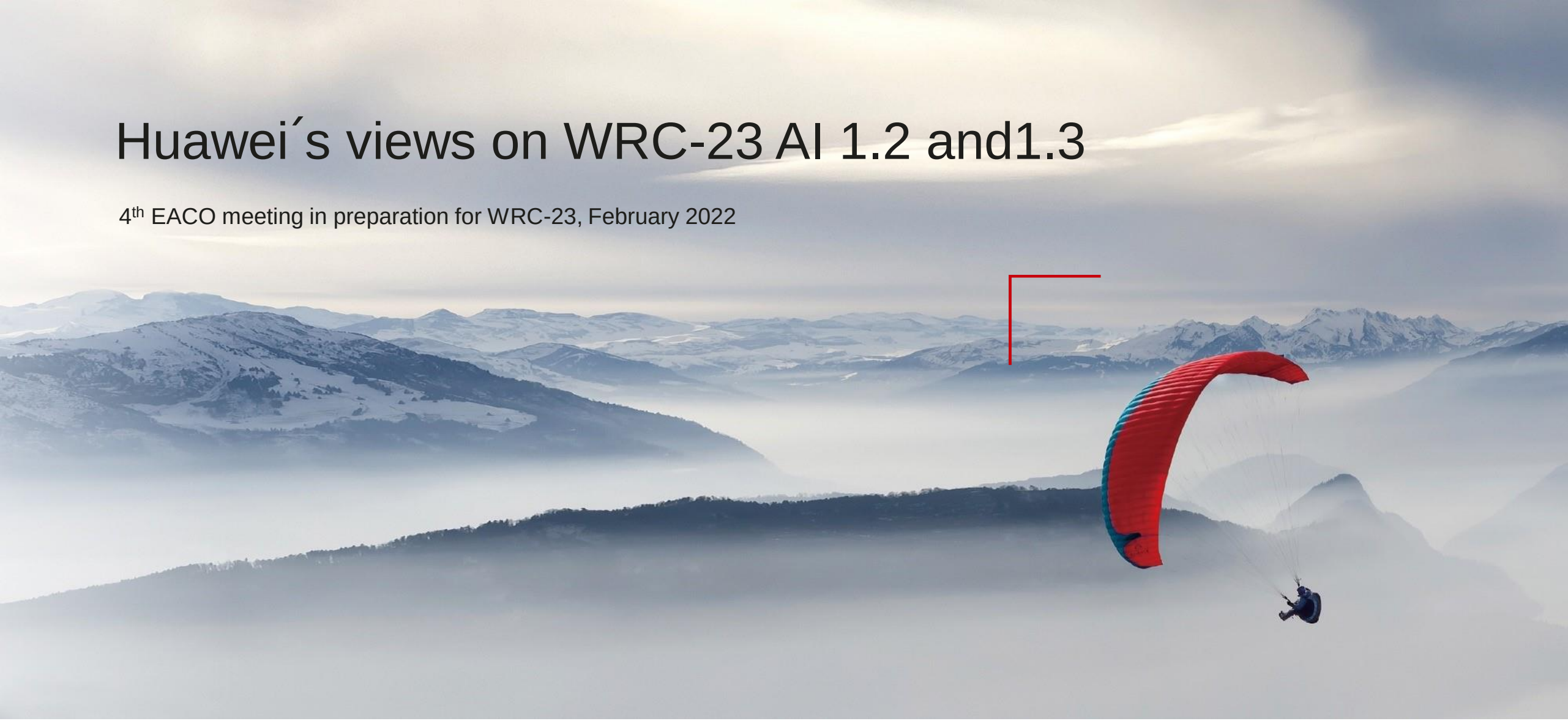
Huawei´s views on WRC-23 AI 1.2 and1.3

4th EACO meeting in preparation for WRC-23, February 2022



Security Level:

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Contents

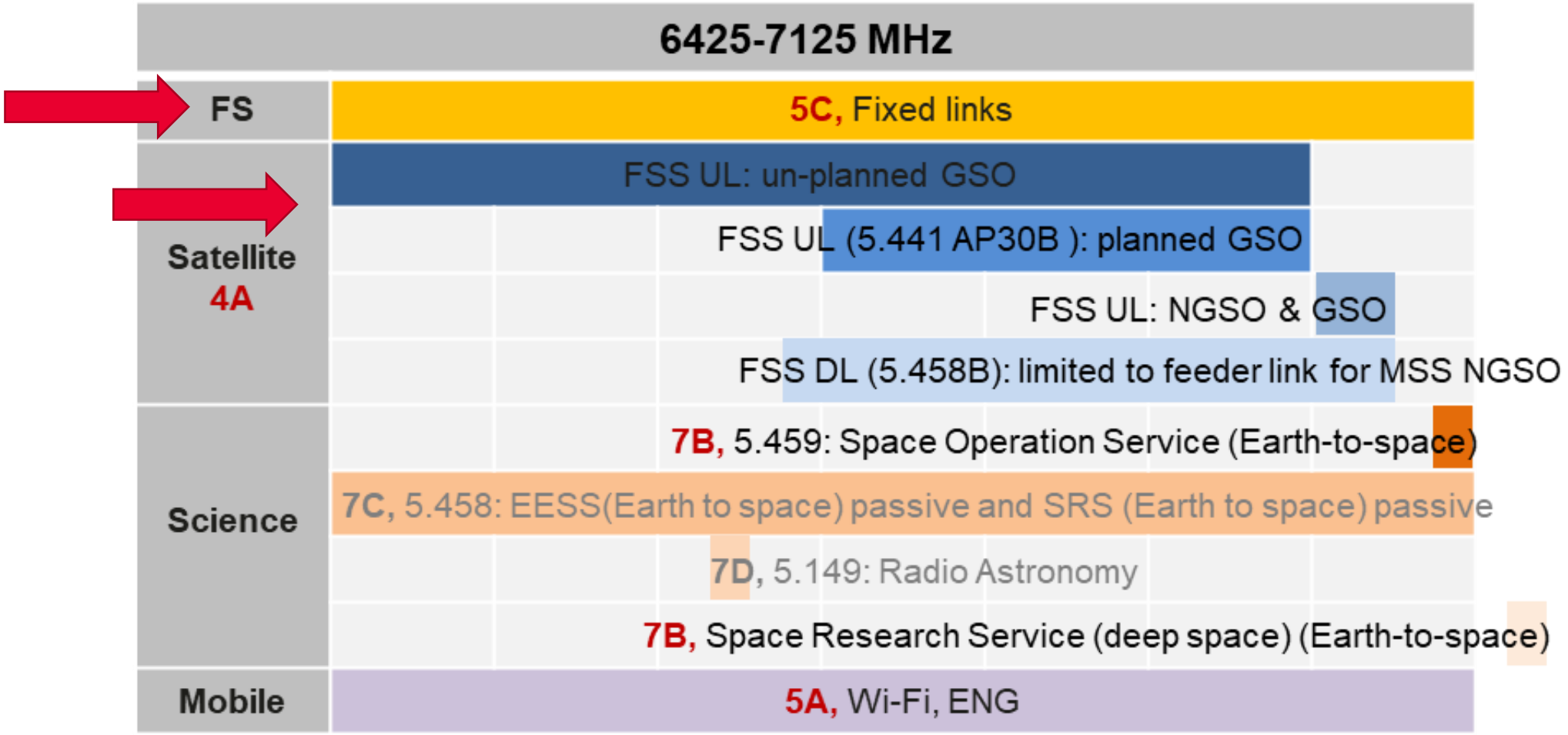
Agenda Item 1.2

to consider identification of the frequency bands 3 300-3 400 MHz, 3 600-3 800 MHz, 6 425-7 025 MHz, 7 025-7 125 MHz and 10.0-10.5 GHz for International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution 245 (WRC-19);

Agenda Item 1.3

to consider primary allocation of the frequency band 3 600-3 800 MHz to the mobile service in Region 1 and take appropriate regulatory actions, in accordance with Resolution 246 (WRC-19);

Services/applications potentially impacted by IMT identification in 6425-7125 MHz



WP5D #40 (Feb 2022) – summary of AI 1.2 6425-7125 MHz

Summary of input studies

	Positive view on coexistence	Concerns about coexistence
FSS UL	China, South Africa and others, France, Japan, Ericsson Positive margin 1-16.7dB	4：Niger and others, IAFI, GSOA，Saudi Arabia and others (results to be updated) Negative margin ~ 23.5dB from GSOA
FS	Russia, China, Ericsson Max separation distance around 60km	1：Germany MCL without clutter loss 77-128km MCL with clutter loss 50-63km
FSS DL	2：Russia, China, Ericsson Max separation distance around 20+km	1：Saudi Arabia and others （results to be updated）
SRS adj. band	1：GSMA Sharing is feasible for both deep space case and earth launch/return case	Roscosmos had concerns on the GSMA studies on the characteristics and protection criteria

Working document on sharing studies

Working Document 6 425-7 125 MHz	WP5D TEMP/561
Attachment 1 – SRS	WP5D TEMP/556
Attachment 2 – SOS	WP5D TEMP/557
Attachment 3 – FS	WP5D TEMP/558R1
Attachment 4 – FSS (Earth-to-space)	WP5D TEMP/559R1
Attachment 5 – FSS (space-to-Earth)	WP5D TEMP/560R1

WP5D #40 (Feb 2022) – key issues on AI 1.2 6425-7125 MHz

FSS UL
• **Clutter loss model** → LS is sent to 3K/3M to clarify
• **Ra/Rb values**: No agreement, different sets used
• **Simulation area**: 3dB contour or visible area
• **Removal of low-populated area** → no agreement but a way forward: “those studies that exclude certain unpopulated areas, should clearly state the percentage of area in the footprint which is excluded so that all the studies are comparable”
• **Interference apportionment by FS**
• **FSS UL receiver antenna characteristics** (normalization, efficiency, feederloss) → draft LS to 4A is captured in chairman report, will be further discussed in April meeting.
• **AP30B studies**: in scope or not
• **Same study submitted three times**

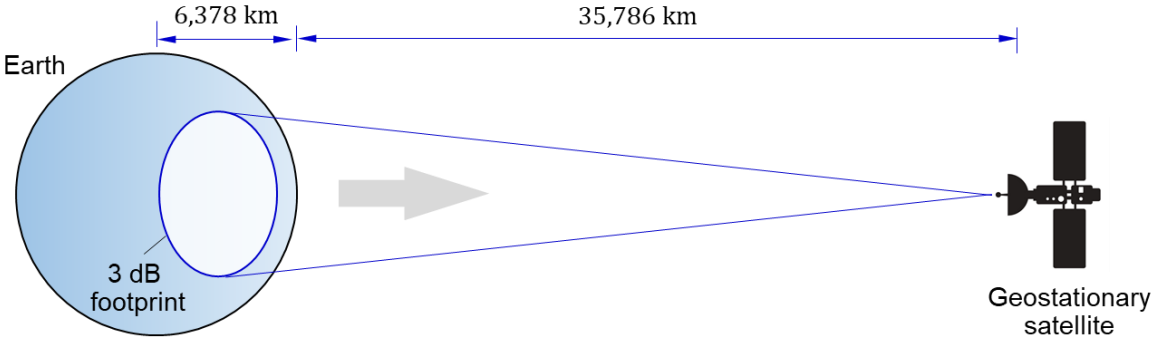
FSS DL
• Clutter loss model
• Time percentage in propagation model
• Polarization loss
• Extra noise level for FSS receiver ->Captured in draft LS to 4A
• Earth station tracking strategy
• Calculation method for single entry interference

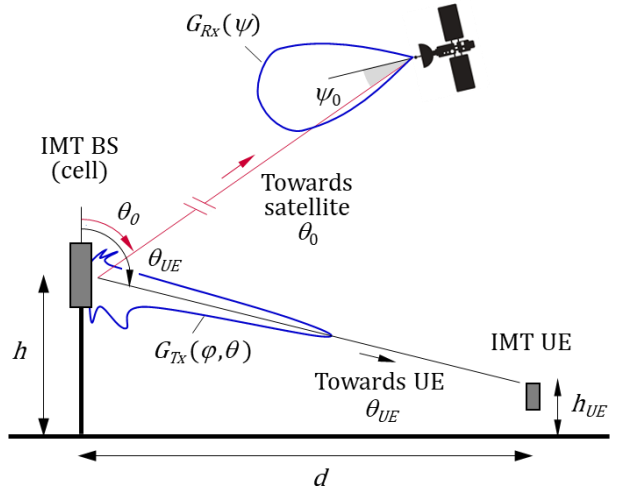
FS
• Clutter loss model
• Time percentage for propagation model
• MCL

FSS Uplink – IMT coexistence in 6425-7125 MHz

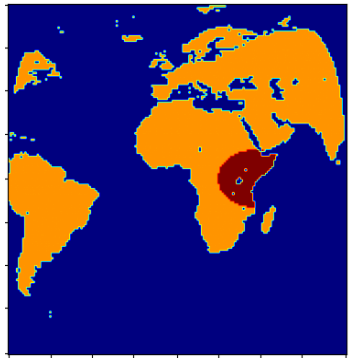
Huawei is actively engaged in the ITU-R and regional sharing studies and are committed to assist administrations in ensuring a realistic modelling of interference from IMT networks to the Fixed Satellite Service, accounting for:

- The ability of active antenna systems (AAS) in mitigating interference towards geostationary satellites.
- Realistic clutter loss and its impact on reducing the interference levels arriving at geostationary satellites.
- Realistic modelling of the numbers and locations of IMT base stations at 6 GHz.





Huawei studies of FSS UL-IMT coexistence

		Case 1 – Regional beam	Case 2 – Rwanda	Case 3 – Uganda
FSS carrier		Carrier #8	AP30B RRW00000	AP30B UGA00000
Orbital position		2.9° E	17.6 ° E	31.5 ° E
Beam type		Zone beam	Spot beam	Spot beam
Boresight location on Earth		0° N, 38° E	1.9° S, 29.7° E	0.9° N, 32.2° E
Antenna pattern		S.672	AP30B	AP30B
Elevation angle of satellite from boresight location on Earth		49.0°	76.1°	88.9°
Range of elevation angles		34.9° - 66.6°	70.9° - 80.6°	83.7° - 89.9°
Satellite footprint				
Experienced I/N (80th percentile) at the satellite receiver	**Suburban**	-33.2 dB	-36.7 dB	-40.4 dB
	Urban	-22.7 dB	-27.1 dB	-36.2 dB
	Combined	**-22.3 dB**	**-26.6 dB**	**-34.8 dB**

to be compared with a threshold I/N of -10.5 dB

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Summary of simulation assumptions

IMT modelling

According to Annex 4.4 of WP5D chairman´s report
The number of IMT BSs per 100 MHz channel is

$$N_{BS} = N_{BS,u} + N_{BS,s} = \left(\rho_u R_{a,u} R_b + \rho_s R_{a,s} R_b\right) A = DA$$

Path loss

Path loss L_{path} as the sum (in dB) of free-space path loss L_{bfs} and beam-spreading loss A_{bs}, both described in ITU-R P.619-4.

Clutter loss

Clutter loss L_{clut} is modelled as a random variable with a specific probability distribution, as specified in the ITU-R WP 3K Chairman's Report of July 2021

Satellite receiver parameters

- Parameter values from the ITU-R WP4A reply LS to WP5D, antenna pattern from ITU-R S.672
- Appendix 30B parameters for case 2 & 3

Appendix 30B parameters

	Orbital position	Longitude of boresight	Latitude of boreight	3dB BW (major)	3dB BW (minor)	Orientation of the ellipse	ES EIRP density (dB(W/Hz))	Satellite EIRP density (dB(W/Hz))
RRW00000	17.60	29.70	−1.90	1.60	1.60	90.00	−9.6	−41.9
UGA00000	31.50	32.20	0.90	1.60	1.60	90.00	−9.6	−40.3

Protection criteria

A satellite receiver is protected if the I-over-N at the satellite receiver exceeds -10.5 dB only with a probability less than 20%.

Contents

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WRC-23 AI1.3 – WP5A update

WP5A meeting in November 2021

- Long and difficult meeting, with very polarised views and little spirit for compromise. As a result the progress was limited.
- 2 sharing studies were presented. The studies are divergent in terms of results.
- Several proposals for the CPM text. A lot of time wasted discussing text details, so little progress. A compilation is available for the next meeting

Next WP5A meeting (May 2022)

- The CPM text is the absolute priority. Likely WP5A will get a raster of proposal for methods ranging from NoC to IMT identification.
- There will be technical studies as well, but WP5A cannot dedicate a lot of time to them. Likely studies will be noted and the discussion will continue at the meeting in November.

WRC-23 AI 1.3 – regional update

CEPT

"CEPT is considering an upgrade of the allocation of the frequency band 3 600-3 800 MHz to the mobile, except aeronautical mobile, service on a primary basis in Region 1 to improve opportunities for the introduction of MS applications in Europe.

This consideration is subject to the conditions that the current use in the frequency bands 3 400-3 800 MHz and the protection of primary services, under the existing CEPT regulatory framework, can be continued, and that no undue constraints are imposed on the existing services and their future development.

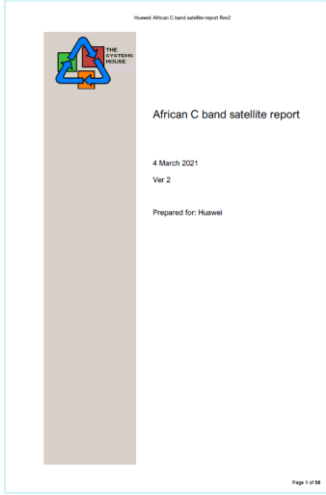
In consequence, CEPT supports that the technical and regulatory conditions applicable to the band 3400-3600 MHz, in particular the pfd limit of -154.5 dBW/m²/4 kHz not to be exceeded for more than 20 % of time 3 m above ground at the border to protect the neighbouring countries, are one part of the technical conditions in response to WRC- 23 Agenda item 1.3, recognizing that sharing studies are required in ITU-R to ensure that the full objective of Resolution **246 (WRC-19)** is met.

CEPT is of the view that Res 246 does not extend the scope of this AI to consideration of an IMT identification in this band"

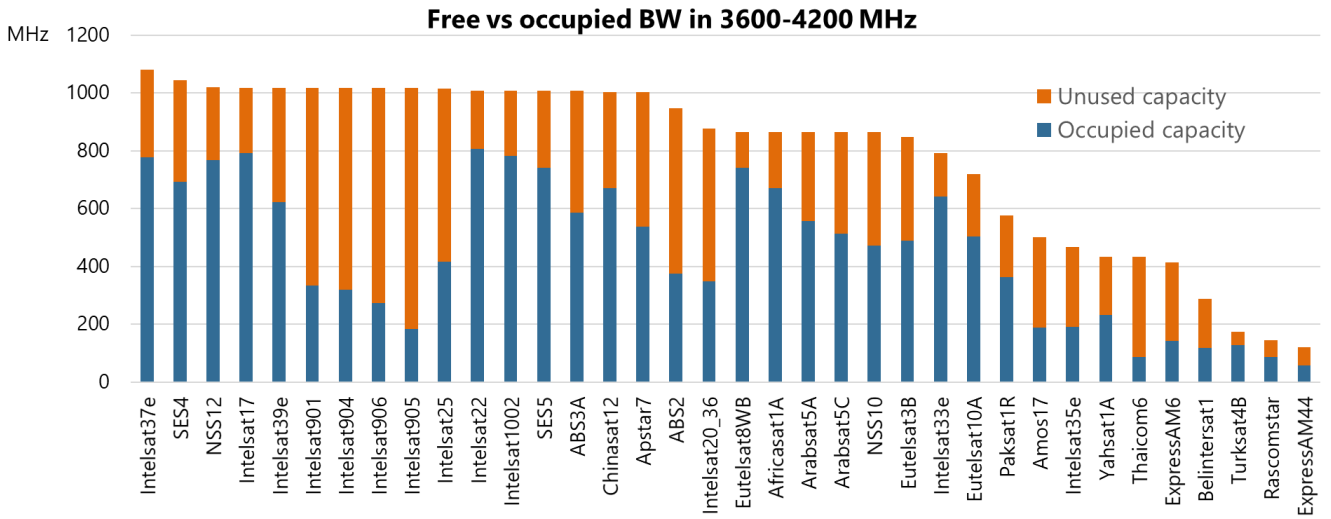
ASMG

"Support to elevate the status of the frequency band 3 600 3 800 MHz for the mobile service, with the exception of aeronautical mobile, on a primary basis in Region 1 , without imposing unnecessary restrictions on existing services and future development"

Huawei study of C-band satellite usage



- Actual utilisation of C-band satellite capacity is around **60%**
- It is possible to move users in 12 satellites from 3600-3800 MHz to channels above 3800 MHz with minimal technical disruption
- Use is **not** ubiquitous: there are 23000 terminals in the continent, less than 500 per country on average
- Consumer use is marginal, and **direct-to-home TV** does **NOT** exist in this band



https://gsacom.com/paper/african-c-band-satellite-report-the-systems-house-2021/

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Final remarks

1) ITU WP5D studies for 6425-7125 MHz show promising results for all coexistence scenarios
   - The FSS uplink scenario is complex to study and there are still several points of disagreement, but realistic assumptions result in interference levels below the threshold
2) Consideration of 6425-7125 MHz for IMT is an ATU proposal. Several African countries are actively participating in the ITU work. EACO members are encouraged to join the discussions in WP5D

3) Primary mobile and FSS allocations in 3600-3800 MHz would allow countries to decide individually whether to authorise mobile services, maintain FSS in parts of the band, or share the band among the two services
4) EACO administration are kindly invited to asses actual satellite usage nationally, and to consider the upgrade to mobile

Thank you.

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