Qualcomm

WRC-27 Agenda Item 1.7

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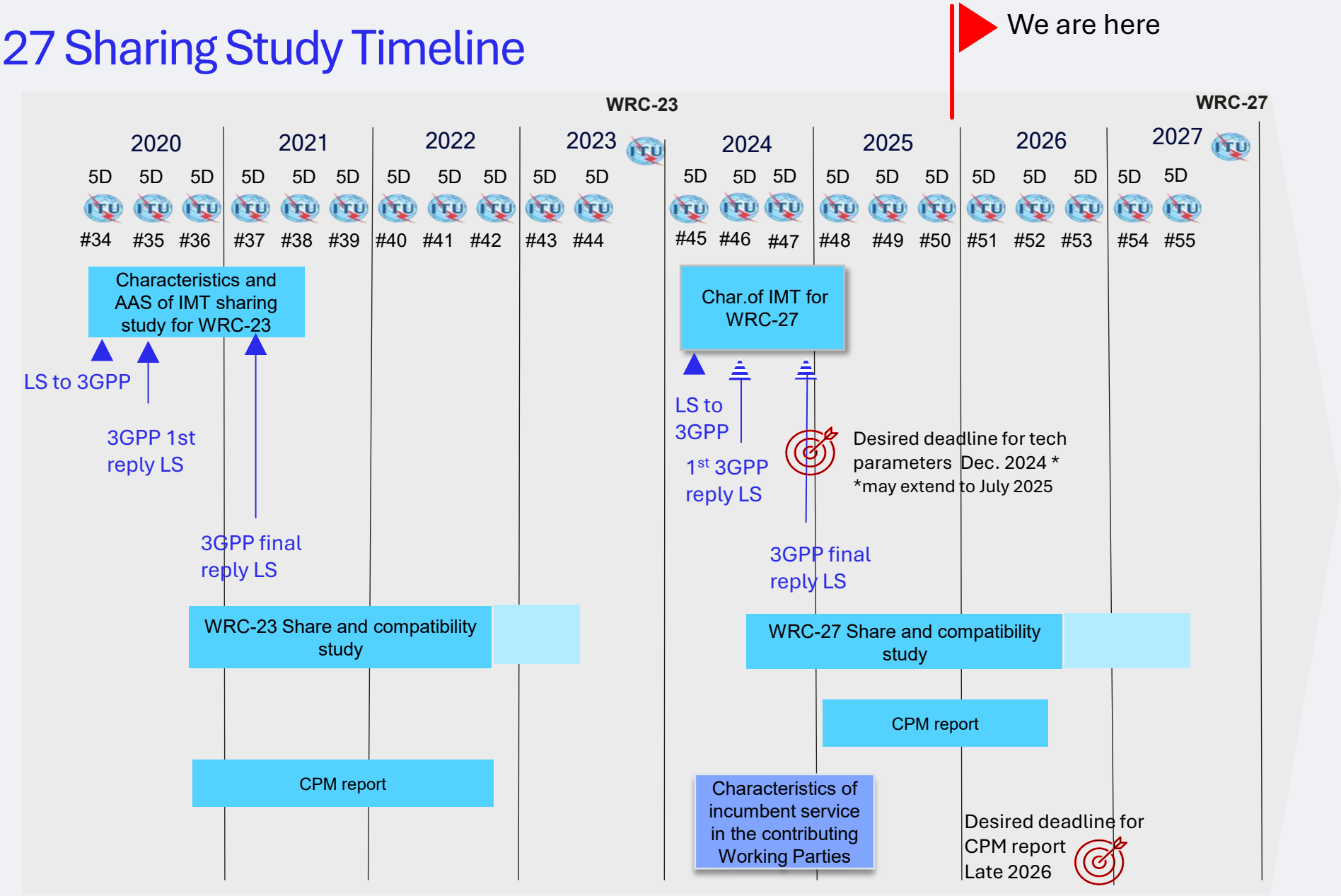
Introduction

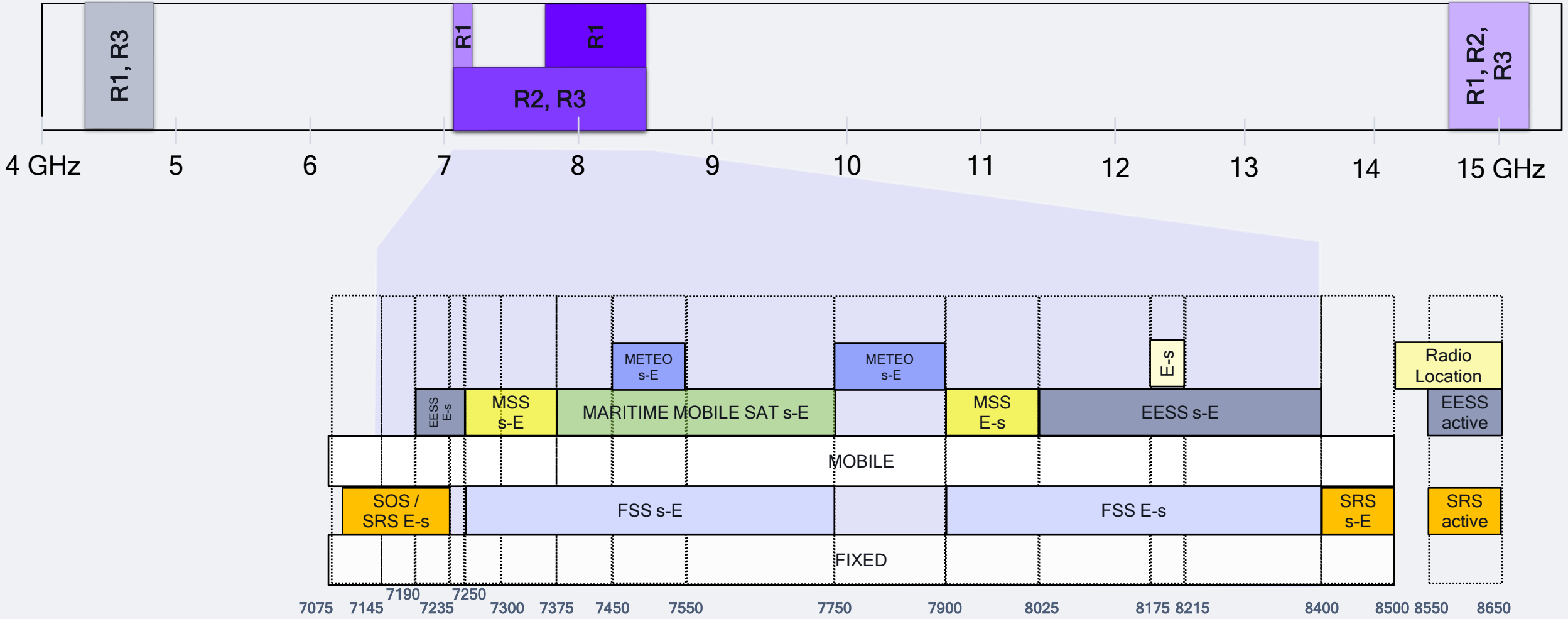
- WRC-27 Agenda Item 1.7 to study the use of IMT in the following bands:
  - 4 400-4 800 MHz, or parts thereof, in Regions 1 and 3
  - 7 125-8 400 MHz, or part thereof, in Regions 2 and 3
  - 7 125-7 250 MHz and 7 750-8 400 MHz, or part thereof, in Region 1
  - 14.8-15.35 GHz
- Objective of the sharing studies
  - Ensure IMT deployment does not cause harmful interference to incumbent services
  - Coordination between countries sharing the same borders
- Sharing studies include in general three types
  - UL studies i.e., assess the interference levels seen by satellites e.g., SRS, FSS, MSS, EESS, etc..
  - DL studies i.e., assess the interference levels seen by terrestrial stations e.g., FSS, Met Sat, etc..
  - Studies to assess the interference levels seen by the fixed services stations (FS)

WRC-27 Sharing Study Timeline



Overview of WRC 27 AI 1.7 – focus on 7.125-8.4 GHz

WRC-27 agenda item 1.7 considers International Mobile Telecommunications (IMT)



General grouping of interference scenarios

Satellite Downlink

FSS | MetSat | SRS (adj band)

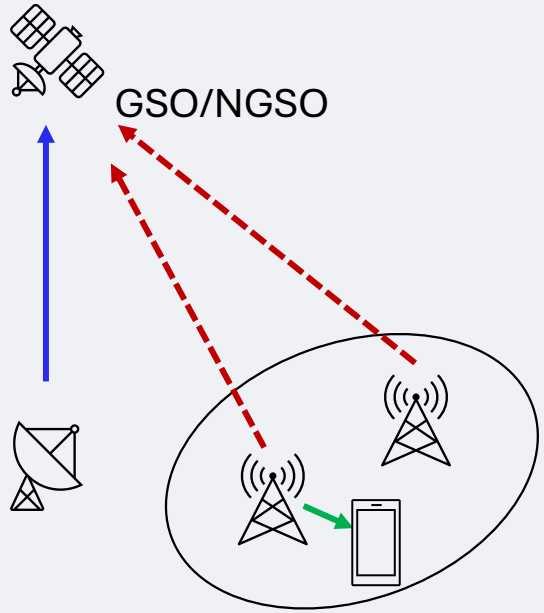
MSS | EESS

* Some of the Earth Stations could be both FSS / MSS

Satellite Uplink

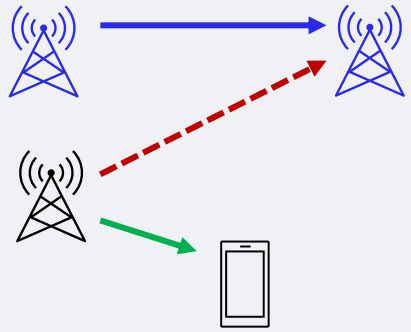
FSS | MetSat | SOS

MSS | SRS deep space | SRS near Earth



Terrestrial

FS

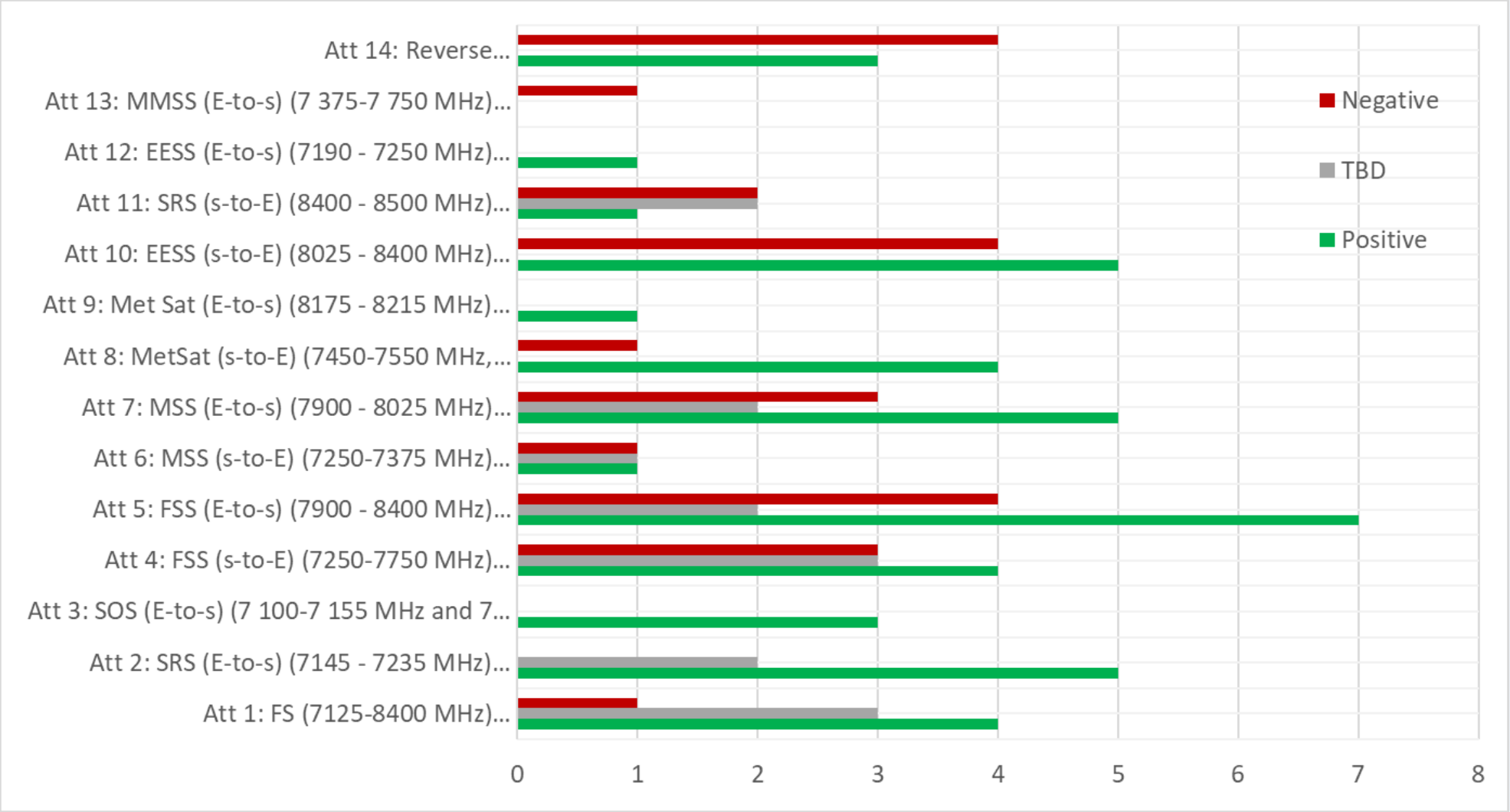


Incumbent link

IMT link

Interfering link

Summary of 7-8 GHz Studies



WRC-27 agenda item 1.7 (7125 – 8400 MHz): list of open technical items

Terrestrial receiving stations (DL studies)

- How to use clutter model P.2108, e.g., one side only, how to use propagation models e.g., P.452 or P.2001 Tpc%
- Separate time/space methodology ➔ Verifying protection criteria exceedance per location (to show a worst-case scenario, they are proposing to verify the protection criteria per each victim location instead of doing an overall time and spatial averaging
- TDD activity factor usage e.g., BSs are sync or async

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Satellite receiving stations (UL studies)

- Larger contours for Sat UL studies e.g., 20 dB or full visible area instead of 3 dB contour
- Distribution of IMT BSs in the satellite footprint ➔ uniform with larger contours is not realistic ➔ some agreement in the offline however the use the population-based method which overestimate the total number of BSs
- Satellite antenna pattern issue ➔ the used pattern is a mask not real pattern, and it is total integrated gain doesn't reflect reality e.g., exceeding 0 dB so need correction
- FSS UL polarization loss and apportionment ➔ no agreement, claim that linear polarization will be used on Sat (**TG5/1 concluded during WRC19 it can be used even for linear**), and 3dB apportionment is needed to protect MSS/FSS in same band (**need to be calculated since density of terminal are low**)
- Slant path updated clutter loss model and selection of the median clutter height area in the study e.g., low rise, mid rise or high rise
- High gain GSO satellite e.g., 56 dBi is not filed and will be difficult to coordinate with other incumbents e.g., FS in the band

Summary Tables

[*Editor's note: Descriptive text and notes of the table. Rows to be added or deleted based on the decision of WP 5D. The table below is an example for comparison table created at the end of every Appendix.*] *Note: If need to explain, results in percentage of cases or percentage of time

	Parameters from expert WPs	Study A (USA)	Study B (J)
Methodology			
Single-entry or Multiple-entry (aggregated)	Multiple entry	Multiple entry (aggregated)	Multiple-entry (aggregated)
Statistical, or Statistical and Deterministic	5D Rec. ITU-R M.2101. Statistical	Statistical (Monte-Carlo)	Statistical
Technical and operational characteristics of IMT systems			
Deployment scenario	5D Rec. ITU-R M.2101 and 5D/792 Annex 4.32	Urban and Sub-Urban macro	Urban/suburban macro
IMT stations	5D/792 Annex 4.32	BS	BS and UE
Method to deploy multiple IMT stations for the aggregated interference analysis over a relatively large area (as applicable to scenarios for the studies)	Not applicable to FS		Rec. ITU-R M.2101
Number of IMT base stations (BS)	5D Rec. ITU-R M.2101 57 BSs (19 sites ×3 sectors)	19 sites, 57 base stations for Urban and Sub-Urban Macro	57 BSs (19 sites ×3 sectors)
Network loading factor for BS and UE (%)	5D/792 Annex 4.32. 20% and 50%	20% (50% as sensitivity)	20, 50
TDD activity factor (%)	5D/792 Annex 4.32. 75% downlink and 25% uplink	75% for BS and 25% for UE.	BS: 75, UE: 25
UE power control	5D Rec. ITU-R M.2101 and 5D/792 Annex 4.32	Yes.	Rec. ITU-R M.2101
UE body loss (dB)	5D/792 Annex 4.32 (Table-14) 4 dB	4	4
IMT antenna pattern	Extended AAS model (Table 17 in 5D/792 Annex 4.32)	Extended AAS antenna model (Table 17 in 5D/792 Annex 4.32)	Extended AAS model (Table 19, Annex 4.32 to Document 5D/792)
BS antenna mechanical downtilt	5D/792 Annex 4.32. 6 degrees	6	6 degrees-
UE antenna pointing (if beamforming)	Omni directional antenna. No antenna pointing -4 dBi.	N/A	N/A
UE distribution	Uniform random distribution within a sector	Random location within each 120° sector	Uniform distribution
User equipment density for terminals that are transmitting simultaneously	Up to three UEs can transmit simultaneously	Up to 3 UEs transmit simultaneously	3 UEs per sector

Technical and operational characteristics (of incumbent service)			
Channel spacing and receiver noise bandwidth (MHz)	40 per 5C Rec. ITU-R F.758 and/or 5D/583 from 5C last cycle	40	40
Receiver antenna gain (dBi)	5C Rec. ITU-R F.758 and/or 5D/583 from 5C last cycle	36, 38, 39.5	36, 38, 39.5
Receiver Noise figure (dB)	5C Rec. ITU-R F.758 and/or 5D/583 from 5C last cycle	4.6	5
Antenna gain pattern	5C Rec. ITU-R F.1245	Rec. ITU-R F.1245-3	Rec. ITU-R F.1245
Station height (m)	5C Rec. ITU-R F.758 and/or 5D/583 from 5C last cycle	20 and 60	20 and 60
Feeder/multiplexer loss (dB)	5C Rec. ITU-R F.758 and/or 5D/583 from 5C last cycle	1 and 1.8	1 and 1.8
Tx output power (dBW)	5C Rec. ITU-R F.758 and/or 5D/583 from 5C last cycle)	N/A	N/A
Link length (km)	5C Rec. ITU-R F.758 and/or 5D/583 from 5C last cycle	N/A	N/A
Protection criterion (Long Term, 20% of Time) I/N, (dB)	5C Rec ITU-R F.758	−10	−10
Propagation model/losses			
Basic transmission loss	SG-3 5D/160 and 5D/629	Rec. ITU-R P.2001-4 Random time percentage range from 0 to 100%	Rec. ITU-R P.2001 Random time percentage range from 0 to 100%
Clutter loss	SG-3 5D/160 and 5D/629	Rec. ITU-R P.2108-1. Location variability p% random range from 0 to 100% Clutter loss applied to all IMT Base Stations) Clutter loss not applied to FS	Rec. ITU-R P.2108 Location variability p% random range from 0 to 100% Clutter loss applied to all IMT Base Stations or below rooftop Base Stations (65% for urban and 15% for suburban) Clutter loss applied to FS 20 m height receiver
Building entry loss	Rec. ITU-R P.2109	None (UEs not studied)	Rec. ITU-R P.2109
Cross-polarization loss (dB)	No reference. 3 dB loss typically used.	3	3
Results of studies			
Does the study result consider both BS and UEs?		No, snapshots results are for BSs. UEs interference are much lower and not included in the CDFs.	Yes
Results summary*		For FS main-lobe: 42 km and 53 km For Side-lobe: 14 km to 20 km. For back-lobe a negligible separation distance of 1.8 km to 2.7 km.	I/N = −10 dB not exceeded 20% of the time Baseline I/N case: Main lobe: less than 5 km to 75 km

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