

3rd ITU INTER-REGIONAL WORKSHOP ON WRC-15 PREPARATION (Geneva, 1 – 3 September 2015)

Panel Session 5 **WRC-15 Agenda items** 1.6, 1.8, 1.9.1 and 1.7

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Fixed-Satellite Service



- > **A.I. 1.6** To consider possible additional primary allocations:
 - ✓ **A.I. 1.6.1** Primary FSS allocation (Earth-to-space and space-to-Earth) of 250 MHz in the range between 10 GHz and 17 GHz in Region 1
 - ✓ A.I. 1.6.2 Primary FSS allocation (Earth-to-space) of 250 MHz in Region 2 and 300 MHz in Region 3 within the range 13-17 GHz
- ➤ **A.I. 1.7** Review the use of the band 5 091-5 150 MHz by FSS (Earth-to-space), limited to feeder links of the non-GSO MSS systems
- ➤ **A.I. 1.8** Review the provisions relating to earth stations located on board vessels (ESVs)
- ➤ **A.I. 1.9.1** Consider possible new allocations to FSS in 7 150-7 250 MHz (space-to-Earth) and 8 400-8 500 MHz (Earth-to-space)



Fixed-Satellite Service



2nd ITU Inter-regional Workshop on WRC-15 Preparation:

The draft CPM Report was finalized

The required technical studies are being finalized

Focus on the draft Methods to satisfy the agenda items

3rd ITU Inter-regional Workshop on WRC-15 Preparation:

The CPM Report to WRC-15 was finalized

The required technical studies were completed

Focus on Regional Group Considerations, referring to relevant parts of CPM Report





1. CPM Methods to satisfy the agenda item:

- a) In all methods, only possibilities for **GSO satellite networks** for the primary FSS allocation are analyzed.
- b) Focus on 3 contiguous/near contiguous frequency ranges:

Method Table

Sub-frequency band	Band letter (method	s: 1=NOC, 2=MOD)		
(GHz)	Earth-to-space	Space-to-Earth		
13.40-13.75	<u>E (E1, E2)</u>	EE (EE1, EE2)		
14.50-14.80	<u>F (F1, F2)</u>	<u>FF (FF1, FF2)</u>		
14.80-15.35	<u>G (G1, G2)</u>	<u>GG (GG1, GG2)</u>		

- NOC is proposed for sub-frequency bands AA (10-10.5 GHz, downlink), I and II (15.4-15.7 GHz).
- No specific Methods are proposed for the other sub-frequency bands.





2. Method 2 and RR in the Earth-to-space direction:

Frequency band Methods and Regulatory & procedural considerations Bands in Method 2 Modification of RR Art.5 to make a primary GSO FSS allocation E: 13.4-13.75 GHz 1) Setting up PSD limitation -53.5 dB(W/Hz) for the transmission of FSS E/S. Modification	
E: 13.4-13.75 GHz 1) Setting up PSD limitation -53.5 dB(W/Hz) for the transmission of FSS E/S. Modification	
(13.5-13.75 GHz in Reg.1) RR No. 5.502 to only extend minimum FSS E/S antenna limitation to the band it ap	piies
2) Adding footnote to protect EESS (active) system applications and development	
3) Protect SRS inter-orbit links by hard limits on FSS in the uplink. Modification of RR No.5.501A and apply RR No.9.17A to protect existing SRS (DRS) systems (SRS feeded downlinks) with regard to FSS	er
4) Modification of Table 7b of RR App.7 to extend coordination trigger of FSS E/S with to RLS and RNS	respect
F: 14.5-14.75 GHz in Regions 1 and 2 2) Include coordination trigger under RR No.9.7 in RR App.5 concerning GSO/GSO coordination trigger under RR No.9.7 in RR App.30A	
3) Modification of Articles 4 and 7 of App.30A to define the procedure for coordination unplanned FSS assignments vis-à-vis assignments in, or proposed modifications to Plan/List	
4) Revisions of Annexes 1 and 4 for triggering the coordination as in 3)	
5) Regarding the coordination of unplanned FSS with respect to MS, using current cooperation of the procedures of the procedure of the	ordination
6) Regarding the coordination of unplanned FSS with respect to DRS in the SRS, upgraexisting SRS (Earth-to-space) allocation to primary under conditions and RR No.9.7	
G: 14.8-15.35 GHz (14.8-15.05 GHz in Reg.1) 1) To coordinate with and protect existing grandfathered SRS systems with regard to I through new and modified regulatory provisions	SS
2) Modification of Table 7b of RR App.7 to extend coordination trigger of FSS E/S with to FS and MS 3rd ITU Inter-regional Workshop on WRC-15 Preparation, 1-3 September 2015, Geneva	respect 5





3. Method 2 and RR in the space-to-Earth direction:

Frequency band	Methods and Regulatory & procedural considerations
Bands in Method 2	 Modification of RR Art.5 to make a primary GSO FSS allocation Modification of RR Art.21 Table 21-4 by setting up pfd limits produced by GSO FSS satellites
EE: 13.4-13.75 GHz (13.4-13.65 GHz in Reg.1)	 Agreement under RR No.9.21 is required with respect to existing (i.e. grandfathered) SRS (DRS, space-to-space) systems from FSS. Primary SRS is limited to active spaceborne sensors, as well as grandfathered SRS (DRS, space-to-Earth, space-to-space) systems. RR No.5.501A is modified, and additional footnotes are proposed. RR No.9.7 applies w.r.t. SRS feeder downlink. Shall not preclude the deployment and operation of transmitting E/S in the SFTSSS No protection is claimed from the EESS (active). RR Nos.5.43A and 22.2 do not apply Modification of Table 8c of RR App.7 to compute the coordination distance between receiving FSS E/S and transmitting station of incumbent FS and MS services
FF: 14.5-14.8 GHz	 Protect existing GSO SRS (DRS, Earth-to-space) systems with regard to FSS by means of adding a new footnote Modification of Table 8c of RR App.7 to compute the coordination distance between receiving FSS E/S and transmitting station of incumbent FS and MS/AMS Modification RR No.21.2.1, specifying the separation of the direction of the maximum gain of FS receiving antennas from GSO orbit by at least 1.5 degrees For opposite transmission of FSS, RR No.9.17A will apply
GG: 14.8-15.35 GHz (14.85-15.1 GHz in Reg.1)	 Protect existing GSO SRS (DRS, Earth-to-space, space-to-space) systems with regard to FSS by means of adding new footnote to apply RR No.9.7 and modifying current provisions. Primary SRS is limited to GSO SRS (DRS, Earth-to-space, space-to-space), and non-GSO SRS (space-to-Earth) systems. Newly filed FSS shall not claim protection from non-GSO SRS (space-to-Earth), and RR Nos.5.43A and 22.2 does not apply. Modification of Table 8c of RR App.7 to compute the coordination distance between receiving FSS E/S and transmitting station of incumbent FS and MS/AMS services Modification RR No.21.2.1, specifying the separation of the direction of the maximum gain of FS receiving antennas from GSO orbit by at least 1.5 degrees





4. Regional Group Considerations:





Frequency	<u>Method</u>	<u>Method</u>	APT Position
(GHz)	Letter for UL	Letter for DL	(PACP)
10.00-10.50	Α	AA	NOC
10.50-10.60	В	ВВ	NOC
10.60-10.68	С	СС	NOC
13.25-13.40	D	DD	NOC
	Е	<u> </u>	Do not support for uplink
13.40-13.75	E	E↓	Support 13.4-13.65 GHz (downlink in Region 1)
	F	:↑	No PACP
14.50-14.80	F	F↓	Do not support for downlink
14.80-15.35	G	GG	NOC
15.35-15.40	Н	НН	NOC
15.40-15.70	I	II	NOC
15.70-16.60	J	IJ	NOC
16.60-17.00	K	KK	NOC









Frequency (GHz)	Method Letter for UL	<u>Method</u> Letter for DL	<u>Position</u>	
10.00-10.50	Α	AA	NOC	
10.50-10.60	В	ВВ	NOC	
10.60-10.68	С	CC	NOC	
13.25-13.40	D	DD	NOC	
40 40 40 75		E↑	NOC	
13.40-13.75		EE↓	Support EE2	
14.50-14.80	F	FF	NOC	
14.80-15.35	G	GG	NOC	
15.35-15.40	Н	нн	NOC	
15.40-15.70	I	II	NOC	
15.70-16.60	J	IJ	NOC	
16.60-17.00	К	KK	NOC	

- Support an allocation of 250 MHz to the FSS (Space-to-Earth) in the band 13.4-13.75 GHz in Region 1 (Method EE2)
- Confirm further: NOC for all other sub-frequency bands?









Frequency (GHz)	Method Letter for UL	Method Letter for DL	<u>AFCP</u>
10.00-10.50	Α	AA	NOC
10.50-10.60	В	ВВ	NOC
10.60-10.68	С	СС	NOC
13.25-13.40	D	DD	NOC
12 40 12 75	E	<u> </u>	NOC
13.40-13.75	EI	E↓	NO AFCP
14.50-14.80	F	FF	NOC
14.80-15.35	G	GG	NOC
15.35-15.40	5.35-15.40 H HH		NOC
15.40-15.70	I	II	NOC
15.70-16.60	J	IJ	NOC
16.60-17.00	К	KK	NOC







The RCC Administrations:

- ➤ in favour of the new primary allocation of 250 MHz to GSO systems in the fixed satellite service (GSO FSS) in both directions (Earth-to-space and space-to-Earth) in the bands 10-17 GHz in Region 1 subject to protection of incumbent services in the considered and adjacent frequency bands.
- > support the following frequency bands for the new allocation to GSO FSS in Region 1:
 - 13.4-13.65 GHz or 14.85-15.1 GHz (space-to-Earth), Methods EE2 or GG2 of CPM Report
 - 14.5-14.75 GHz (Earth-to-space), Method F2 of the CPM Report
- ➤ The new GSO FSS allocation **shall not impose substantial additional constraints** to existing frequency assignments or prevent development of the FS.
- ➤ The RCC Administrations **oppose** allocation of the frequency bands **13.4-13.75** GHz and **14.8-15.35** GHz to the GSO FSS (Earth-to-space) in Region 1.









Option 1 (Up-link and down-link FSS allocation)

FSS (space-to-Earth): 13.4-13.65 GHz FSS (Earth-to-space): 14.5-14.75 GHz

with the constraint of a **minimum antenna diameter** of **6 m** for countries in Europe and **2.4 m** for countries outside Europe.

Option 2 (Down-link FSS allocation and no up-link FSS allocation)

The frequency band **13.4-13.65 GHz** for a new primary allocation (**space-to-Earth**).

Difficulties remain to identify a frequency band for FSS (Earth-to-space), demonstrating compatibility with existing services.

Option 3 (No ECP on up-link allocation)
The frequency band 13.4-13.65 GHz for a new primary allocation (space-to-Earth).
There is no European Common Proposal (ECP) for ESS.

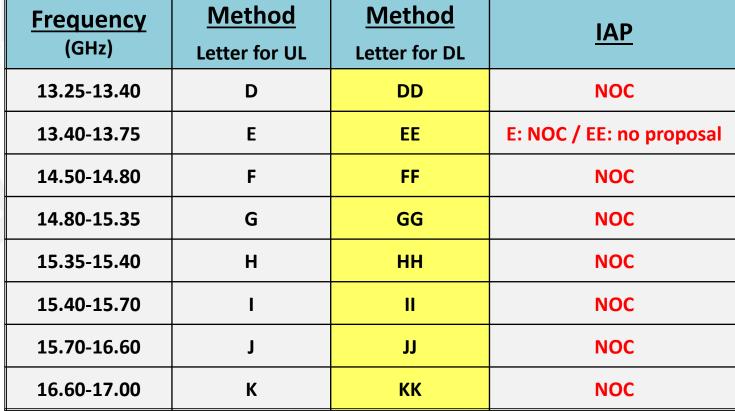
There is no European Common Proposal (ECP) for FSS (Earth-to-space) allocation.

Does not support additional allocation to FSS (**Earth-to-space**) in the frequency band **13.25-13.75** GHz











- NOC is proposed for uplink and downlink except for EE
- No position for EE





5. Matrix of Regional Group Considerations:













	Frequency (GHz)	Method UP or DL	APT (PACP)	ASMG (Position*)	ATU (AFCP)	CEPT (Pre. Position)	CITEL (IAP*)	RCC (Position)
		E↑	Do not support	NOC	NOC	Do not support	NOC	Oppose
	13.40-13.75	EE↓	Support 13.4-13.65 GHz	Support (250 MHz)	NO AFCP	Support 13.4-13.65 GHz	No IAP	Support 13.4-13.65 GHz (or 14.85-15.1 GHz)
	14.50-14.80	F↑	No PACP	NOC	NOC	NOC/14.5-14.75↑ (options under considerations)	NOC	Support 14.5-14.75 GHz
		FF↓	Do not support	NOC	NOC	-	NOC	-
		G↑	NOC	NOC	NOC	-	NOC	Oppose
	14.80-15.35	GG↓	NOC	NOC	NOC	-	NOC	Support 14.85-15.1 GHz (or 13.4-13.65 GHz) Relevant to EE

- > It is assumed that SUP of Res. 151 (WRC-12) is agreed by all Regional Groups
- NOC for all other sub-frequency band (* Need confirm further)





1. CPM Methods to satisfy the agenda item:

- a) In all methods, only possibilities for **GSO satellite networks** for the primary FSS allocation are analyzed.
- b) Focus on **3 contiguous/near contiguous** frequency ranges:

Method Table

Sub-frequency band (GHz)	Band letter (methods: 1=NOC, 2=MOD)
13.40-13.75	<u>E (E1, E2)</u>
14.50-14.80	<u>F (F1, F2)</u>
14.80-15.35	<u>G (G1, G2)</u>

Only NOC is proposed for Earth-to-space sub-frequency bands: D (13.25-13.4 GHz), H (15.35-15.4 GHz), I (15.4-15.7 GHz), J (15.7-16.6 GHz) and K (16.6-17 GHz).





2. CPM Method 2 to satisfy the agenda item

Same
method
applies to
both
regions,
but only:
250 MHz in
Region 2 ↑
and
<u>300 MHz in</u>
Region 3 ↑

	Frequency band	Methods and Regulatory & procedural considerations
	Bands in Method 2	1) Modification of RR Art.5 to make a primary GSO FSS allocation
	13.5-13.75 GHz in Region 2 and 13.45-13.75 GHz in Region 3	 Setting up PSD limitation -53.5 dB(W/Hz) for the transmission of FSS E/S. Modification to RR No. 5.502 to only extend minimum FSS E/S antenna limitation to the band it applies Adding footnote to protect EESS (active) system applications and development Protect SRS inter-orbit links by hard limits on FSS in the uplink. Modification of RR No.5.501A and apply RR No.9.17A to protect existing SRS (DRS) systems (SRS feeder
		downlinks) with regard to FSS 4) Modification of Table 7b of RR App.7 to extend coordination trigger of FSS E/S with respect to RLS and RNS
	14.5-14.75 GHz	1) Unplanned primary FSS allocation is proposed on a global basis with min. E/S antenna
ı	and 14.5-14.8 GHz in Region 3	 Include coordination trigger under RR No.9.7 in RR App.5 concerning GSO/GSO coordination the assignments of which are not subject to RR App.30A Modification of Articles 4 and 7 of App.30A to define the procedure for coordination of an unplanned FSS assignments vis-à-vis assignments in, or proposed modifications to, App.30A Plan/List Revisions of Annexes 1 and 4 for triggering the coordination as in 3) Regarding the coordination of unplanned FSS with respect to MS, using current coordination procedures OR developing a new Resolution describing the procedures Regarding the coordination of unplanned FSS with respect to DRS in the SRS, upgrade existing SRS (Earth-to-space) allocation to primary under conditions and RR No.9.7 applies
		1) To coordinate with and protect existing grandfathered SRS systems with regard to FSS through new and modified regulatory provisions
	and <u>14.8-15.1GHz</u> in Reg.3	2) Modification of Table 7b of RR App.7 to extend coordination trigger of FSS E/S with

respect to FS and MS





3. Regional Group Considerations:





<u>Frequency</u> (GHz)	<u>Method</u> (Letter for UL)	APT Position (PACP)
13.25-13.40	D	NOC
13.40-13.75	E	No PACP
14.50-14.80	F	No PACP
14.80-15.1	G	NOC
15.35-15.40	Н	NOC
15.40-15.70	I	NOC
15.70-16.60	J	NOC
16.60-17.00	K	NOC







Position:

Ensure that the proposed allocations do not cause undue constrains to services allocated in these bands in Region 1



To be determined by ATU (No AFCP)







The RCC Administrations:

- ➤ no objection to the new allocation of the frequency band 14.5-14.75 GHz for GSO FSS (Earth-to-space) on a primary basis in Region 2 and 14.5-14.8 GHz in Region 3, Method F2 of CPM Report.
- ▶ oppose allocation of the frequency bands 13.4-13.75 GHz and 14.8-15.35 GHz for GSO FSS (Earth-to-space) in Regions 2 and 3.
- necessary regulatory provisions and restrictions of technical characteristics of newly filed GSO FSS systems should be included in the Radio Regulations, in order to protect incumbent services.
- this additional allocation with a worldwide basis (in all three Regions) has advantage over regional allocation (in one Region) when planning satellite communication networks and providing efficient territory coverage.









Osition CEP1

- Option 1 Supports a worldwide additional allocation to the GSO-FSS (Earth-to-space). The band 14.5-14.8 GHz (Earth-to-space) is being considered, noting that the band is already allocated for FSS (Earth-to-space) limited to BSS feeder link under RR No.5.510.
 - **Option 2 Difficulties remain to identify** a frequency band to be allocated worldwide to the FSS (Earth-to-space) while **demonstrating compatibility** with the existing services.
- ▶ Option 3 If compatibility studies show feasibility, CEPT supports additional worldwide primary allocation (Earth-to-space) to the GSO-FSS in frequency bands between 13 and 17 GHz in all Regions.
- CEPT considers that the additional allocation of 250 MHz to FSS (Earth-to-space) in Region 2 and 300 MHz in Region 3 in frequency bands between 13 and 17 GHz could be made only while ensuring compatibility with existing services in these frequency bands, in particular to radio services also allocated in Region 1.
- ➤ CEPT **does not support** additional allocation to FSS (**Earth-to-space**) in the frequency bands **13.25-13.75** GHz and 15.35-15.4 GHz due to the difficulty of sharing with active and passive services operating in these bands.







Method D1, E1, I1, J1 and K1

NOC to Article 5 for the:

- √ 13.25-13.4 GHz band because of incompatibility
 with EESS and ARNS systems
- √ 13.4-13.75 GHz band because of incompatibility with EESS
- √ 15.4-17.1 GHz band because of incompatibility with RLS systems

NO IAP for the band 14.5-15.4 GHz







4. Matrix of Regional Group Considerations:









Frequency (GHz)	Method Letter for UL	APT (PACP)	ASMG (Position)	<u>ATU</u>	CEPT (Pre. Position)	CITEL (IAP)	RCC (Position)	
13.40-13.75	E↑	No PACP			Do not support	NOC	Oppose	
14.50-14.80	F↑	No PACP	No constraint		TBD	3 Options (TBC)		14.5-14.75 GHz (Reg 2) 14.5-14.8 GHz (Reg 3)
14.80-15.35	G↑	NOC			-		Oppose	
15.35-15.40	H↑	NOC			-		-	

- > **ASMG:** no undue constrains to services allocated in all sub-bands in Region 1
- > ATU: TBD
- Other regional groups agreed to NOC for all other Sub-frequency bands?
- It is assumed that all Regional Groups agree to SUP of Res.152 (WRC-12)





CPM Methods and Regulatory & Procedural Considerations to satisfy the agenda item:

Method A: No Change to the Radio Regulations

Any reduction in antenna size and reduction of protection distance would adversely impact the deployment of backbone terrestrial services.

Method B: Increasing off-shore protection distance in the C band

Based on the increasing number of vessels and the current maximum ESV e.i.r.p. density levels, the protection distance is increased in the C band **from 300 km to 345 km** and no change for the Ku band.





- Method C: Establishment of different protection distances for different maximum e.i.r.p. density levels, with shorter protection distances for e.i.r.p. density levels lower than those currently allowed by Resolution 902 (WRC-03)
- 1) Continue adequately protecting terrestrial services
- 2) Adoption of **protection distances associated with maximum values of ESV e.i.r.p. spectral density** towards the horizon when lower transmitting e.i.r.p. density levels (e.g. use of spread spectrum modulation) are or planned to be deployed
- 3) The effect of **increased frequency of ESV passes needs to be taken into account** since the minimum ESV antenna diameter considered for the 6 GHz band nowadays is 1.2m instead of the 2.4m diameter provided in Resolution **902 (WRC-03)**





- Method D: Establishment of different protection distances for different maximum e.i.r.p. density levels for the increasing ESVs passes in the C and Ku bands
- 1) The fundamental rules in Resolution 902 (WRC-03) are still valid
- According to protection afforded by Resolution 902 (WRC-03), different protection distances could be derived for ESVs transmitting lower e.i.r.p. density levels toward the horizon (e.g. use of spread spectrum modulation)

Method E: Review of the regulatory regime governing operation of ESVs

To review the regulatory regime governing the operation of ESVs to conform to the principles and objectives of the RR





2. Regional Group Considerations:













Method	APT (PACP)	ASMG (Position)	ATU (AFCP)	CEPT (Pre. Position)	CITEL	RCC (Position)
Method A	NOC	NOC	NOC			
Method B						
Method C					No IAP	
Method D				MOD		MOD
Method E						

➤ It is assumed that SUP of Res. 909 (WRC-12) is agreed by all Regional Groups





1. CPM Methods and Regulatory & procedural considerations to satisfy the agenda item

Method A

- 1) Make a primary FSS allocation on a worldwide basis for the bands 7 150-7 250 (s-E) & 8 400-8 500 MHz (E-s), limited to GSO FSS space stations
- 2) Space station emissions in the band 7 150-7 235 MHz shall comply with an e.i.r.p. spectral density mask. When this is not sufficient for protection of near-Earth operations of SRS (deep space), a Resolution provides an operational consultation procedure for involved FSS and SRS parties
- 3) FSS Tx earth stations in the band 8 400-8 500 MHz shall be limited to specific E/S, i.e. operating at fixed, known locations, with 3.5 m minimum antenna diameter
- 4) **Coordination under** RR No. **9.17**, No. **9.17A** (which is also applicable to sharing with stations of the EESS that may be allocated to this band at WRC-15 under agenda item 1.11), and **notification under** RR No. **11.2** shall apply
- 5) RR Art. 21 (Tables 21-2, 21-3 and 21-4), RR App.4 (Items A and C in Annex 2) and RR App.7 (Tables 7b, 8c and 9a) are amended to include these bands
- 6) The FSS shall not claim protection from the SRS and the SOS, nor constrain the use and development of SRS and SOS earth stations. RR Nos. **5.43A** and **22.2** do not apply

Method B: Same as A, but FSS (s-E) allocation limited to 7190-7250 MHz.

Unwanted emissions from FSS space station should also be controlled

Method C: No change, i.e. no FSS allocation in 7 150-7 250 & 8 400-8 500 MHz bands





2. Regional Group Considerations:













Method	APT (PACP)	ASMG (Position)	ATU (AFCP)	CEPT (Pre.Position)	CITEL (IAP)	RCC (Position)
Method A				Allocation		
Method B						
Method C	NOC	NOC	NOC		NOC	NOC

➤ It is assumed that SUP of Res. 758 (WRC-12) is agreed by all Regional Groups





- 1. CPM Method and Regulatory & procedural considerations to satisfy the agenda item: Only One Method Is Proposed
- 1. **the use of the band** 5 091-5 150 MHz by systems of the FSS providing Earth-to-space feeder links of non-GSO systems in the MSS **be maintained as a primary allocation**
- each of the time limits on this allocation given in RR No. 5.444A,
 i.e. after 1 January 2016 no new assignments shall be made and after 1
 January 2018 the FSS will become secondary to the ARNS,
 be suppressed
- 3. the text specifying that "use of the band 5 091-5 150 MHz by FSS feeder links shall be made in accordance with Resolution 114 (Rev.WRC-15)" be added to the footnote
- 4. coordination between FSS earth stations and ARNS ground stations is required under certain circumstances to ensure that the ARNS is protected from harmful interference and that a fixed distance be used in determining the coordination area; and
- 5. **flexibility for AM(R)S** improved while ensuring protection of the FSS





2. Regional Group Considerations:



APT:

The PACP proposes that Rec. ITU-R P.526-13 (the latest version in force) be incorporated by reference in RR No. **5.444B** via a revision of Resolution **748** (Rev. WRC-12).