

**ATTACHMENT 1**  
**to FCC Public Notice DA 14-88**

**Recommendations presented at  
27 January 2014 Meeting of  
the Advisory Committee for  
the 2015 World Radiocommunication Conference**

**Maritime Aeronautical and Radar Services**

**UNITED STATES OF AMERICA**

**DRAFT PROPOSALS FOR THE WORK OF THE CONFERENCE**

**Agenda Item 1.14:** *to consider the feasibility of achieving a continuous reference time-scale, whether by the modification of coordinated universal time (UTC) or some other method, and take appropriate action, in accordance with Resolution 653 (WRC-12)*

**Background Information:** Coordinated Universal Time (UTC) is the international standard time scale for practical timekeeping in the modern world. The basic unit of measurement is the internationally accepted Système International (SI) second, which is realized in practice by atomic clocks in national laboratories throughout the world. The Bureau International des Poids et Mesures uses clock information from these laboratories to coordinate the various national realizations of UTC. This process provides time with a stability of better than a billionth of a second per day for the international infrastructure that requires accurate timing information, such as communications, computer networks, navigation, and air traffic control. The Radio Regulations define UTC in No. **1.14** through incorporation by reference of Recommendation ITU-R TF.460-6.

The International Radio Consultative Committee (CCIR) formally adopted the system for UTC in Recommendation 374 in 1963. The CCIR introduced leap seconds into the definition of UTC beginning on January 1, 1972. In its Recommendation 460, the CCIR stated that UTC is a timescale that uses the SI second. The CCIR also stated the accounting of those seconds will be adjusted, when necessary, in 1 second steps to compensate for the slowing of the Earth's rotation rate. This version of the UTC system remains in use today, defined by ITU-R (formerly CCIR) Recommendation ITU-R TF.460-6. Since their introduction, leap seconds have been inserted into UTC at irregular intervals because the slowing of the Earth's rotation rate is not uniform.

Much of our international infrastructure relies on steady, accurate timing. Many of these systems view leap seconds as disruptions of the count in the time stream. Resolution **653 (WRC-12)**, considering e, states "that the occasional insertion of leap seconds into UTC may create difficulties for systems and applications that depend on accurate timing." Given that our reliance on many of these systems and applications is both critical and growing with time, WRC-12 adopted agenda item 1.14 in order to consider the feasibility of achieving a continuous reference time-scale, whether by the modification of UTC or some other method.

Given the results of studies, this proposal supports the adoption of UTC without leap seconds as the most feasible means for achieving a continuous reference time-scale for dissemination by radiocommunication systems. To ensure sufficient time for legacy systems to update hardware and/or software to accommodate the elimination of leap seconds from UTC, a period of five years from the date of entry into force of the Final Acts of WRC-15 will be the effective date of application of revisions to the Radio Regulations resulting from Resolution **653 (WRC-12)**.

**Proposal:**

ARTICLE 1

**Terms and definitions**

**MOD** USA/AI 1.14/1

**Section I – General terms**

**1.14** *Coordinated Universal Time (UTC):* Time scale, based on the second (SI) and maintained by the Bureau International de Poids et Mesures (BIPM), that forms the basis for the coordinated dissemination of standard frequencies and time signals, ~~as defined in Recommendation ITU-R TF.460-6. (WRC-03)~~

~~For most practical purposes associated with the Radio Regulations, UTC is equivalent to mean solar time at the prime meridian (0° longitude), formerly expressed in GMT.~~

**Reasons:** The modification removes the incorporation by reference of Recommendation ITU-R TF.460-6, which defines the use of leap seconds in UTC. The modification also adds a reference to the international organization responsible for the maintenance of the UTC time scale. Finally, because UTC will no longer be tied to Earth's rotation, the modification removes the equivalence between UTC and the mean solar time at the prime meridian.

ARTICLE 2

**Nomenclature**

**Section II – Dates and times**

**MOD** USA/AI 1.14/2

**2.5** Whenever a date is used in connection with Coordinated Universal Time (UTC), this date shall be that of the prime meridian, ~~at the appropriate time~~ corresponding to zero degrees geographical longitude.

**Reasons:** Consequential change resulting from removing the equivalence between UTC and the mean solar time at the prime meridian in the definition of UTC.

**MOD** USA/AI 1.14/3

## CHAPTER X

### **Provisions for entry into force of the Radio Regulations** (WRC-15~~2~~)

**Reasons:** To update the WRC where provisions for entry into force will be recorded for the final acts of the conference.

**MOD** USA/AI 1.14/4

## ARTICLE 59

### **Entry into force and provisional application of the Radio Regulations** (WRC-15~~2~~)

**Reasons:** To update the WRC in the Article where provisions for entry into force will be recorded for the final acts of the conference.

**MOD** USA/AI 1.14/5

**59.1** These Regulations, which complement the provisions of the Constitution and Convention of the International Telecommunication Union, and as revised and contained in the Final Acts of WRC-95, WRC-97, WRC-2000, WRC-03, WRC-07, ~~and WRC-12,~~ and WRC-15 shall be applied, pursuant to Article 54 of the Constitution, on the following basis. (WRC-15~~2~~)

**Reasons:** To update the WRC where provisions for entry into force will be recorded for the final acts of the conference.

**ADD** USA/AI 1.14/6

**59.AA** The other provisions of these Regulations, as revised by WRC-15, shall enter into force on 1 January 2017, with the following exceptions: (WRC-15)

**Reasons:** To update Article 59 add provisions for entry into force for Regulations as revised by WRC-15 as well as other effective dates of application as specified in the listed Resolutions.

**ADD** USA/AI 1.14/7

**59.BB** the revised provisions for which other effective dates of application are stipulated in Resolution:

**[USA/114/AAA] (WRC-15) (WRC-15)**

**Reasons:** To update Article 59 add provisions for entry into force for Regulations as revised by WRC-15 as well as other effective dates of application as specified in the listed Resolutions.

**ADD** USA/AI 1.14/8

#### RESOLUTION [USA/114/AAA] (WRC-15)

### **Provisional application of certain provisions of the Radio Regulations as revised by WRC-15 and abrogation of certain Resolutions and Recommendations**

The World Radiocommunication Conference (Geneva, 2015),

*considering*

- a) that this Conference has, in accordance with its terms of reference adopted a partial revision to the Radio Regulations (RR), which will enter into force on 1 January 2017;
- b) that some of the provisions, as amended by this Conference, need to apply provisionally before that date;
- c) that some of the provisions, as amended by this Conference, need to apply after that date;
- d) that, as a general rule, new and revised Resolutions and Recommendations enter into force at the time of the signing of the Final Acts of a Conference;
- e) that, as a general rule, Resolutions and Recommendations which a WRC has decided to suppress are abrogated at the time of the signing of the Final Acts of a Conference,

*resolves*

that, as of 1 January 2022, the following provisions of the RR, as revised or established by WRC-15, shall apply: Nos. **1.14, 2.5**;

**Reasons:** To ensure sufficient time for legacy systems to update hardware and/or software to accommodate the elimination of leap seconds, this provision is added to Resolution [USA/114/AAA] “Provisional application of certain provisions of the Radio Regulations as revised by WRC-15 and abrogation of certain Resolutions and Recommendations” (WRC-15). Additional provisions and abrogation for WRC-15 may be added to Resolution [USA/114/AAA].

**SUP**                      USA/AI 1.14/9

**RESOLUTION 653 (WRC-12)**

**Future of the Coordinated Universal Time time-scale**

**Reasons:** The required studies have been completed and this resolution is no longer needed.

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**WAC/064(27.01.14)**

**UNITED STATES OF AMERICA**  
**DRAFT PROPOSALS FOR THE WORK OF THE CONFERENCE**

**Agenda Item 1.16:** *to consider regulatory provisions and spectrum allocations to enable possible new Automatic Identification System (AIS) technology applications and possible new applications to improve maritime radiocommunication in accordance with Resolution 360 [COM6/21] (WRC-12)*

**Resolution 360 (WRC-2012):** *Consideration of regulatory provisions and spectrum allocations for enhanced Automatic Identification System technology applications and for enhanced maritime radiocommunication*

**Background Information:** This agenda item addresses regulatory provisions and spectrum allocations for use by maritime safety systems for ships and ports.

Since AIS 1 and AIS 2 are very close in frequency to channels 2078, 2019, 2079 and 2020, the use of these channels for radio communications by ships will block the ship's AIS receiver, consequentially causing the ship's AIS to be unable to update the location of other ships nearby, resulting in a navigation safety hazard and possible collision. This problem should be solved, not only to protect the AIS channels, but also to protect the additional channels that may be allocated to support AIS technology applications.

**Proposals:**

**MOD** USA/AI 1.16/1

APPENDIX 18 (Rev.WRC-12)

**Table of transmitting frequencies in the VHF maritime mobile band**

(See Article 52)

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**MOD**

Channel designator	Notes	Transmitting frequencies (MHz)		Inter-ship	Port operations and ship movement		Public correspondence
		From ship stations	From coast stations		Single frequency	Two frequency	
60	<i>m)</i>	156.025	160.625		x	x	x
01	<i>m)</i>	156.050	160.650		x	x	x
61	<i>m)</i>	156.075	160.675		x	x	x
02	<i>m)</i>	156.100	160.700		x	x	x
62	<i>m)</i>	156.125	160.725		x	x	x
03	<i>m)</i>	156.150	160.750		x	x	x
63	<i>m)</i>	156.175	160.775		x	x	x
04	<i>m)</i>	156.200	160.800		x	x	x
64	<i>m)</i>	156.225	160.825		x	x	x
05	<i>m)</i>	156.250	160.850		x	x	x
65	<i>m)</i>	156.275	160.875		x	x	x
06	<i>f)</i>	156.300		x			
2006	<i>r)</i>	160.900	160.900				
66	<i>m)</i>	156.325	160.925		x	x	x
07	<i>m)</i>	156.350	160.950		x	x	x
67	<i>h)</i>	156.375	156.375	x	x		
08		156.400		x			
68		156.425	156.425		x		
09	<i>i)</i>	156.450	156.450	x	x		
69		156.475	156.475	x	x		
10	<i>h), q)</i>	156.500	156.500	x	x		
70	<i>f), j)</i>	156.525	156.525	Digital selective calling for distress, safety and calling			
11	<i>q)</i>	156.550	156.550		x		
71		156.575	156.575		x		
12		156.600	156.600		x		
72	<i>i)</i>	156.625		x			
13	<i>k)</i>	156.650	156.650	x	x		
73	<i>h), i)</i>	156.675	156.675	x	x		
14		156.700	156.700		x		
74		156.725	156.725		x		
15	<i>g)</i>	156.750	156.750	x	x		
75	<i>n), s)</i>	156.775	156.775		x		
16	<i>f)</i>	156.800	156.800	DISTRESS, SAFETY AND CALLING			
76	<i>n), s)</i>	156.825	156.825		x		
17	<i>g)</i>	156.850	156.850	x	x		

Channel designator	Notes	Transmitting frequencies (MHz)		Inter-ship	Port operations and ship movement		Public correspondence
		From ship stations	From coast stations		Single frequency	Two frequency	
77		156.875		x			
18	m)	156.900	161.500		x	x	x
78	t), u), v)	156.925	161.525		x	x	x
1078		156.925	156.925		x		
2078	<del>tt)</del>	<del>161.525</del>	161.525		x		
19	t), u), v)	156.950	161.550		x	x	x
1019		156.950	156.950		x		
2019	<del>tt)</del>	<del>161.550</del>	161.550		x		
79	t), u), v)	156.975	161.575		x	x	x
1079		156.975	156.975		x		
2079	<del>tt)</del>	<del>161.575</del>	161.575		x		
20	t), u), v)	157.000	161.600		x	x	x
1020		157.000	157.000		x		
2020	<del>tt)</del>	<del>161.600</del>	161.600		x		
80	w), y)	157.025	161.625		x	x	x
21	w), y)	157.050	161.650		x	x	x
81	w), y)	157.075	161.675		x	x	x
22	w), y)	157.100	161.700		x	x	x
82	w), x), y)	157.125	161.725		x	x	x
23	w), x), y)	157.150	161.750		x	x	x
83	w), x), y)	157.175	161.775		x	x	x
24	w), ww), x), y)	157.200	161.800		x	x	x
84	w), ww), x), y)	157.225	161.825		x	x	x
25	w), ww), x), y)	157.250	161.850		x	x	x
85	w), ww), x), y)	157.275	161.875		x	x	x
26	w), ww), x), y)	157.300	161.900		x	x	x
86	w), ww), x), y)	157.325	161.925		x	x	x
27	z)	157.350	161.950			x	x
87	z)	157.375	157.375		x		
28	z)	157.400	162.000			x	x
88	z)	157.425	157.425		x		

Channel designator	Notes	Transmitting frequencies (MHz)		Inter-ship	Port operations and ship movement		Public correspondence
		From ship stations	From coast stations		Single frequency	Two frequency	
AIS 1	<i>f), l), p)</i>	161.975	161.975				
AIS 2	<i>f), l), p)</i>	162.025	162.025				

Notes referring to the Table

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**ADD**

*tt)* Channels 2078, 2019, 2079 and 2020 are not available for transmitting from ships.

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**UNITED STATES OF AMERICA**

**DRAFT PROPOSALS FOR THE WORK OF THE CONFERENCE**

**Agenda Item 1.17:** *to consider possible spectrum requirements and regulatory actions, including appropriate aeronautical allocations, to support wireless avionics intra-communications (WAIC), in accordance with Resolution 423 (WRC-12)*

**Background Information:** The 2012 World Radiocommunication Conference (WRC-12) in response to a request to consider possible spectrum requirements and regulatory measures in support of wireless avionics communication systems approved Agenda Item 1.17 for WRC-12.

WRC-12 resolved to invite the ITU-R to consider, based on the results of ITU-R studies, possible regulatory actions, including appropriate aeronautical allocations, to support the implementation of WAIC systems, while taking into account spectrum requirements for WAIC and protection requirements for incumbent systems operating in accordance with existing allocations.

Resolution 423 (WRC-12) invites Working Party 5B (WP5B) to consider:

- i. frequency bands within existing worldwide aeronautical mobile service, aeronautical mobile (R) service and aeronautical radionavigation service allocations; and
- ii. additional frequency bands above 15.7 GHz for aeronautical services if spectrum requirements cannot be met in frequency bands studied under *invites ITU-R 3 i)*

Studies submitted to WP5B show that WAIC systems can be accommodated in the band 4200-4400 MHz provided that mitigation techniques for some applications, provided in [Working document towards a preliminary draft new Report, ITU-R M.[WAIC\_SHARING\_4 200-4 400MHz - Compatibility analysis between wireless avionics intra-communications systems and systems in the existing services in the frequency band 4 200-4 400 MHz. Document 5B/TEMP/241] are utilized. If such mitigation techniques cannot be utilized, then some external WAIC applications might not be compatible with existing aeronautical services.

However, both radio altimeter and WAIC systems are aeronautical applications and regulated by aviation certification authorities. . Additional standardization and aircraft certification efforts must occur within the aviation community in order to guarantee the safe and compatible operation of WAIC and radio altimeter systems.

Therefore, the United States proposes an additional allocation to the Aeronautical Mobile (Route) Service, limited to WAIC systems to the frequency band 4 200-4 400 MHz.

**Proposal:**

**ADD**      **USA/1.17/1**

**ARTICLE 5**

**Frequency allocations**

**Section IV – Table of Frequency Allocations**

**4 200-4 400 MHz**

<b>Allocation to services</b>		
<b>Region 1</b>	<b>Region 2</b>	<b>Region 3</b>
<b>4 200-4 400</b>	AERONAUTICAL RADIONAVIGATION <u>MOD 5.438</u> AERONAUTICAL MOBILE (R) <u>ADD 5.XXX</u> 5.439 5.440 <u>ADD 5.YYY</u>	

**MOD 5.438** Use of the band 4 200-4 400 MHz by the aeronautical radionavigation service is reserved exclusively for radio altimeters installed on board aircraft and for the associated transponders on the ground. ~~However, passive sensing in the Earth exploration-satellite and space research services may be authorized in this band on a secondary basis (no protection is provided by the radio altimeters).~~

**ADD 5.XXX** Use of the frequency band 4 200- 4 400 MHz by the aeronautical mobile (R) service is limited to internationally standardized aeronautical systems for the provision of wireless avionics intra-communications.

**ADD 5.YYY** Passive sensing in the Earth exploration-satellite and space research services may be authorized in the band 4200-4400 MHz on a secondary basis (no protection is provided by radio altimeters or by wireless avionics intra-communications).

Reason: To add a primary Aeronautical mobile (route) service (AM(R)S) allocation in the frequency band 4200-4400 MHz to Article 5 of the Radio Regulations. The AM(R)S allocation is limited to WAIC systems via footnote. The Earth exploration-satellite and Space research services maintain their status via footnote.

**SUP**                      **USA/AI 1.17/2**

**RESOLUTION 423 (WRC-12)**

**Consideration of regulatory actions, including allocations, to support  
Wireless Avionics Intra-Communications**

Reason: The required studies have been completed and this resolution is no longer needed.

## **Terrestrial Services**

**UNITED STATES OF AMERICA**

**DRAFT PRELIMINARY VIEWS FOR WRC-15**

**Agenda Item 1.1:** to consider additional spectrum allocations to the mobile service on a primary basis and identification of additional frequency bands for International Mobile Telecommunications (IMT) and related regulatory provisions, to facilitate the development of terrestrial mobile broadband applications, in accordance with Resolution **233 (WRC-12)**

**BACKGROUND:** The concept of identifying spectrum for IMT was conceived at WARC-92. Since WARC-92 there has been a tremendous growth in mobile communications including an increasing demand for mobile broadband multimedia capability. The bands identified for IMT generally are also allocated to other services in addition to the mobile service.

Conference Preparatory Meeting (CPM) 15-1 created JTG-4-5-6-7 to develop draft CPM text and perform associated studies under WRC-15 Agenda items 1.1 and 1.2. The sharing studies in the JTG for WRC-15 agenda item 1.1 are to be performed in accordance with the provisions of Resolution **233 (WRC-12)**. The Terms of Reference of the JTG 4-5-6-7 identify that ITU-R WP 5D has the responsibility of identifying suitable frequency ranges for possible consideration for additional spectrum to be identified for IMT and for providing this information to the JTG 4-5-6-7. WP 5D has provided to the JTG 4-5-6-7 the suitable frequency ranges for IMT, which range from 410 MHz to 6,425 MHz, as suitable.

The band 3 400-4 200 MHz has been used by the FSS for space-to-Earth links (downlinks) since the 1970's. The technology needed to support FSS operations is mature and the equipment is readily available and ubiquitously deployed in all or part of the band. This, together with the wide coverage beams possible in this band, has led to satellites in this band being an integral part of the telecommunications infrastructure in almost every developing country. As of 2008, there are more than 160 geostationary satellites worldwide operating in all or part of the band 3400-4200 MHz. Nearly two out of three of commercial satellites included payloads using part or all of the 3 400-4 200 MHz FSS allocation. This indicates that administrations and operators are still investing substantially in this FSS spectrum. In addition, many satellites that operate in other bands have their telemetry operations (telemetry, tracking and ranging) in the 3 400-4 200 MHz range under the FSS allocation, including for the purposes of launch and transfer orbit operations. This band, in particular the lower part of the band, is also used for feeder links to satellites in the mobile-satellite service.

The United States is currently considering the 3550-3650 MHz band for small cell deployments in the United States. Recently, the United States Federal Communications Commission (FCC) published a notice of proposed rulemaking (NRPM) entitled "Amendment of the Commission's

Rules with regard to commercial operations in the 3550-3650 MHz band. The FCC proceeding indicates that its intention is to “promote two major advances that enable more efficient use of radio spectrum: small cells and spectrum sharing” “while ensuring that incumbent services remain protected.” The NPRM builds on the United States rulemaking experience with spectrum sharing in the television white spaces (TVWS), proposes ideas from the FCC’s recent Notice of Inquiry on dynamic spectrum access technologies, and broadly reflects recommendations made in a recent report by the President’s Council of Advisors on Science and Technology (PCAST). The FCC is also considering whether to include these proposed new, flexible rules in the neighboring 3650-3700 MHz band: this band is already used for commercial broadband services on a non-exclusive basis, with protections for incumbent FSS operations. In November 2013, the FCC issued a new public notice seeking additional comment on licensing models and technical requirements in the 3550-3650 MHz band. The proceeding is still open and no decision has been taken.

United States National Telecommunications and Information Administration (NTIA), in its 2010 fast track report, identified federal spectrum (including the 3.5 GHz band) for increased sharing with mobile broadband and analyzed how sharing could be accomplished with those federal systems. With regard to sharing with federal users, NTIA, in its 2010 fast track report, recommended that the band 3550-3650 MHz be made available for wireless broadband, by licensing it for broadband use outside certain coastal areas and test and training areas to protect Federal users, within 5 years contingent on timely allocation of funds for implementation.

Under a similar Agenda Item at World Radiocommunication Conference 2007 (WRC-07) the spectrum 3400-3600 MHz was identified for use by IMT systems in countries indicated in Nos. **5.430A**, **5.432A**, **5.432B** and **5.433A** under the conditions of the associated provisions. Prior to WRC-07, extensive studies were performed and captured in Report ITU-R M.2109 titled “Sharing studies between IMT Advanced systems and geostationary satellite networks in the fixed-satellite service in the 3 400-4 200 and 4 500-4 800 MHz frequency bands.” Report ITU-R M.2109 considered compatibility between FSS networks and IMT including macro and micro IMT deployments.

Subsequent to WRC-07, Study Group 4 adopted Report ITU-R S.2199 “Studies on compatibility of broadband wireless access systems and fixed-satellite service networks in the 3 400-4 200 MHz band (2010).”

These previous technical studies showed that IMT systems studied in the 3 400-4 200 MHz (Report ITU-R S.2109 and Report ITU-R M.2109) and 4 500-4 800 MHz bands (Report ITU-R M.2109) could not share in the same geographical area with FSS, when the FSS or IMT was deployed in a ubiquitous manner and/or with no individual licensing of earth stations, since no minimum separation can be guaranteed. Sharing was found to be feasible only when the location of the receiving earth station was known and under the condition that the minimum required separation distance together with the criteria mutually agreed between the concerned administrations were observed.

Working Party 5D recently provided the JTG with the final list of parameters for IMT-technology and network deployment information to be used in sharing studies in support of

WRC-15 agenda item 1.1. Consequently, additional sharing studies are being initiated in the ITU-R to evaluate the compatibility of these IMT networks, including small cell deployments, with existing services.

**U.S. VIEW:**

The United States believes the results derived from the studies given in Report ITU-R M.2109 are valid for the cases considered. The United States supports additional studies based on the information recently provided to the Joint Task Group 4-5-6-7 by WP 5D on IMT parameters and deployment information. The studies should assess compatibility with existing services in accordance with Resolution **233 (WRC-12)**.

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**IWG-2 Recommendation**

**US Proposal on WRC-15 Agenda Item 1.1 (470-698 MHz)**

**Agenda Item 1.1** to consider additional spectrum allocations to the mobile service on a primary basis and identification of additional frequency bands for International Mobile Telecommunications (IMT) and related regulatory provisions, to facilitate the development of terrestrial mobile broadband applications, in accordance with Resolution **233 (WRC-12)**

Following considerable discussion and a number of iterations of possible U.S. proposals for WRC-15 Agenda Item 1.1, IWG-2 members were unable to reach agreement on a single recommended U.S. proposal addressing the 470-698 MHz band. Some members of IWG-2 expressed a view that they were not in a position to progress a view and indicated their wish to submit their views to FCC. Other members indicated they were in a position to provide a recommended view for the 470-698 MHz band under WRC-15 Agenda Item 1.1 for consideration at the January 27, 2014 WAC meeting.

In light of this impasse, the IWG-2 provides the following non-consensus recommendations:

Recommendation A (contained in Attachment A to this document) is supported by NAB, CBS, and Fox, and reflects the views of these entities. Note that IWG-2 as a whole did not review or approve the text provided in Attachment A.

Recommendation B (contained in Attachment B to this document) was supported by Alcatel-Lucent, AT&T, Ericsson, Intel, Motorola Mobility, Nokia, Samsung, Sprint-Nextel, Telecommunications Management Group, and Verizon and reflects the views of these entities. IWG-2 as a whole did review but did not approve the text provided in Attachment B.

# Attachment A

Recommendation A supported by NAB, CBS and Fox

January 20, 2014

## VIEWS OF CBS, FOX AND NAB TO THE WRC-15 ADVISORY COMMITTEE

CBS, FOX and NAB strongly object to document, IWG-2\_027 Rev.2, and believe that this document should not go forward as a United States proposal, for the reasons given below:

- Document 027 ignores the basic technical sharing issues between Digital Terrestrial Television Broadcasting and IMT.
- Document 027 erroneously asserts that this allocation change will allow administration “flexibility” to either “operate existing services, such as broadcasting, or utilize portions of the UHF band for the implementation of new mobile broadband applications, such as IMT, as they deem appropriate based on their domestic priorities” without any regard to interference concerns to other administrations. In fact, not one study or any technical evidence was submitted to support such a “flexibility” position as espoused in this document.

The assertions made in document 027 that administrations can merely implement either broadcast or IMT without regard to international interference concerns are simply not true. The current footnote allocations to the mobile service in Region 2 (5.292, 5.293 and 5.297) recognize this fact and require that any administration desiring to implement a mobile services in the UHF bands may do so only subject to an agreement obtained under Article 9.21, a requirement not recognized or contained in document 027.

Studies submitted to the ITU-R Joint Task Group 4-5-6-7 indicate that sharing in the UHF band between IMT and DTTB is “difficult and may not be practical due to the large distance and frequency separations required.” These studies indicate that co-channel sharing between IMT base stations and a DTTB receiver may require separation distances of approximately 100 km for co-channel operation and 20 km for adjacent channel operation. Studies submitted in the FCC’s Incentive Auction proceeding by both broadcast and wireless interests suggest that sharing between high power TV transmitters and broadband base station receivers may require significantly greater co-channel and adjacent channel separations.<sup>1</sup> Finally, the real-world difficulties of sharing even adjacent channel operations between broadcast and wireless are well

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<sup>1</sup> It should be noted that TV in the United States operates with contiguous 6 MHz channels and IMT is generally based on 5 MHz channelization or multiples of 5 MHz. In other parts of the world TV operates with 8 MHz channels. In any case, this means that IMT channels would generally not align with television channels. As a result, for example, a single IMT 5 MHz channel would in most instances be co-channel to two TV channels and **vice versa**. This difference in channelization means that the larger co-channel interference distances would apply in most instances.

documented with the Commission with regard to interference from TV channel 51 to wireless operations on former TV channel 52. The technical fact that large distance or frequency separations are required between TV and IMT to prevent interference has not been disputed by any party in IWG-2.

The current document 027 would simply have the United States ignore these technical facts and essentially mislead the rest of the world by asserting that cross border sharing is not an issue. Contrary to the basic tenets of spectrum engineering and the existing ITU allocation and requirements and despite the fact that large distance and frequency separations are required between TV and IMT to prevent interference, the current document 027 proposes that no agreements would now be required under Article 9.21 for the implementation of new mobile services anywhere in the UHF band. Such a proposal is technically flawed and not one technical study or evidence has been submitted to support such a “flexibility” position as espoused in the document. On the contrary, both international and domestic studies, some of which actually have been filed by supporters of this document with the FCC in the Incentive Auction proceeding, Gen. Dkt. No. 12-268, have all indicated that sharing between these two incompatible services is difficult and will require large separations in both frequency and distance. These parties are keenly aware that implementation of mobile systems cannot be done without new international coordination agreements between neighboring countries due to the significant interference separation distances required to prevent interference.

CBS, FOX and NAB believe for the Advisory Committee (WAC) to ignore these technical facts and suggest that coordination is no longer required as proposed in document 027, would undercut the technical leadership and veracity of the United States. Therefore, we recommend that the current document IWG-2 027 not be approved as a U.S. position.

In addition to the technical flaws identified above, CBS, FOX and NAB also point out other deficiencies in the document below:

- Document 027 also mischaracterizes the state of the broadcast television service in the United States.

The paper suggests that over-the-air viewing is declining and that television viewing audience has moved to other sources such as satellite and cable, for example. What the paper fails to acknowledge is that the vast majority of television programming distributed by cable and satellite is received over-the-air at cable head ends and satellite distribution points. In fact, about 75% of cable head ends receive television signals over-the-air and it is these over-the-air signals that are then retransmitted over the cable to system to their subscribers. Applied to 56 million cable video customers in 2014 with an average of approximately 2.5 persons per household, this means more than 100 million Americans receive broadcast television signals via cable using over-the-air broadcast channels.

However, the very premise that over-the-air viewing is declining is incorrect. An independent 2013 study done by Gfk shows that over-the-air reception has grown from 14% in 2010 to 19.3% of all U.S. TV households in 2013, representing around 22 million homes and almost 60 million

people.<sup>2</sup> This study also found that around 6 percent of U.S. households have “cut the cord” and no longer subscribe to cable or satellite TV service. The GfK study also found that minorities represent 41 percent of all antenna-only households. In fact, the majority of Latino households that speak primarily Spanish now use an antenna to get their TV programming, with only 49 percent of those households subscribing to a pay-TV service. Also, 28 percent of all households with a head of household under the age of 35 use an antenna instead of a pay-TV subscription. This trend of minorities, low income families and younger demographics increasingly relying on over-the-air television has been reported by a number of sources. Gigaom, a leading independent voice on emerging technologies, reported the number of households relying solely on OTA reception is growing, and that this growth is especially strong among younger households, lower-income families and minorities. USA Today noted similar trends when it reported on a study of increasing cable rates by the NPD Group.<sup>3</sup>

- Document 027 ignores current development activities on next generation television systems.

In this regard, efforts are also underway in the United States and worldwide to develop the next generation of terrestrial broadcast systems. One such initiative, the Future of Broadcast Television Initiative (FoBTV) is a worldwide effort to define requirements, recommend technologies and request standardization for such systems. A key element of any next generation broadcast system recognized by the FoBTV Initiative is: “The importance of mobility in future broadcast systems and the desire for mobile, handheld and portable devices to be capable of working across borders ...”. Within the United States, work on the development of these next generation standards has already begun. “The Advanced Television Systems Committee (ATSC) has received 11 initial proposals from 20 organizations for the Physical Layer of the new “ATSC 3.0” broadcast television standard.” “A primary goal of the ATSC 3.0 Physical Layer is to provide TV service to both fixed and mobile devices. Key considerations include efficiency and robust service, increased data rates to support new services such as Ultra High-Definition services, and enabling a smooth transition from existing systems for both broadcasters and consumers.”<sup>4</sup>

- Document 027 ignores the role of broadcasters as “first informers” in times of emergencies and recent recognition of the importance of broadcasting by the ITU.

The importance of broadcasting in emergencies has been recognized and highlighted in a recent draft ITU Report.<sup>5</sup> As stated in this report, “television broadcasting is a critically important medium for information dissemination to the public in times of emergencies. The intrinsic one-

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<sup>2</sup> GfK was established in 1934 and is Germany’s largest market research institute, and the fourth largest market research organization in the world. For information on the GfK study, see, <http://www.nab.org/documents/newsroom/pressRelease.asp?id=3168>; and <http://www.tvtechnology.com/news/0086/survey--million-americans-rely-on-broadcast-tv/220019#sthash.goYzKWzV.dpuf>.

<sup>3</sup> See, <http://www.npd.com>. See also, “*Cord Cutters*” turning to online video and OTA antennas, TV Technology, June 27, 2013.

<sup>4</sup> <http://atsc.org/cms>.

<sup>5</sup> See, [www.itu.int/go/ITU-R/RWP6A-2013](http://www.itu.int/go/ITU-R/RWP6A-2013).

to-many broadcast architecture and the geographic diversity of terrestrial broadcast transmission facilities provide high service reliability during crises of all types. ... The case studies in this report represent only a few of countless examples that attest to the global importance of terrestrial broadcasting, helping to protect and save lives during local, national and international emergencies.”<sup>6</sup>

- Document 027 ignores the economic impact on United States exports of broadcast content

Television broadcast programming constitutes a very large export category for the United States, most recently estimated at \$14.3 billion, and a category that has a positive balance of trade with nearly every country in the world.<sup>7</sup> Document 027 seriously jeopardizes the sale of these products produced in the United States through the reduction of spectrum outlets in major markets throughout Region 1, South America in Region 2, and Region 3. The current Radio Regulations offers sufficient flexibility for the United States to achieve its internal objectives without injury to existing foreign markets for content.

### **Recommendation:**

We recommend that the WAC not forward non-consensus document IWG-2 027 as a proposed US position. Secondly, we recommend that the WAC send document IWG-2 027 back to IWG-2 and instruct IWG-2 to address the concerns that have been raised in this paper and develop a consensus document before resubmitting it for WAC consideration. Until such time that that the WAC can consider, support, and advance a consensus document on this matter, the position of the United States should be no change (**NOC**) relative to the UHF band from 470 to 698 MHz consistent with the Commission’s current decision on this matter in ET Docket No. 10-235.

If the WAC advances the proposal contained in document IWG-2 027 without achieving consensus, we recommend that the concerns that have been raised in this paper be attached to the advanced document so that it represents the complete US position.

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<sup>6</sup> See, Proposed Draft New Report on the Importance of Terrestrial Broadcasting in Providing Emergency Information to the Public, Document 6/156-E, Document 6A/301-A, 28 October 2013, at p. 12.

<sup>7</sup> See, for example, <http://www.mpaa.org/Resources/92be6469-1d3c-4955-b572-1d3f40f80787.pdf>.

DRAFT

UNITED STATES OF AMERICA

## **PROPOSALS FOR THE WORK OF THE CONFERENCE**

### **Introduction**

In this document, the United States of America makes a proposal under WRC-15 Agenda Item 1.1. Specifically, the United States proposes adding a co-primary allocation to the Mobile Service in the 694/698 - 890MHz frequency range, along with a corresponding identification for International Mobile Telecommunications (IMT). The United States of America also proposes the retention of the primary allocation for the Broadcasting Service, explicit protection of these systems via Article No. 9.21, and support for the consideration of the development of world-wide next generation television broadcast systems on frequencies allocated to the Broadcasting Service below 694/698 MHz.

### **Background**

Mobile broadband recently has seen significant growth and recognizing this development the 2012 World Radiocommunication Conference adopted WRC-15 Agenda Item 1.1, to provide additional spectrum for the mobile broadband services and in particular for IMT. In considering the global spectrum requirements under WRC-15 Agenda Item 1.1, it is important to acknowledge, as reflected in *recognizing d* of Resolution **233 (WRC-12)**, that the spectrum below 1 GHz is exceptionally suited for mobile broadband applications. In particular, the unique propagation characteristics of the bands below 1 GHz allow for wider area coverage which in turn requires less infrastructure and facilitates service delivery to rural or sparsely populated areas, as reflected in *recognizing c* of Resolution **233 (WRC-12)**. At the same time, this wider area coverage and less infrastructure and facilities means that bands below 1 GHz provide less data and service capacity making the use of bands less desirable in urban environments where there is the need for high data capacity and the requirement to serve dense user populations.

The 470-890 MHz frequency range is allocated to the broadcasting service on a primary basis in all three Regions and spectrum in this region is used predominantly for the delivery of broadcast television. Broadcasting continues to be an important service as broadcast television stations provide information and video programming that is responsive to the needs and interests of the communities they serve. Moreover, broadcast television itself continues to evolve to keep pace with technological and marketplace changes. Many television broadcasters now pursue a three-screen approach, sharing their programming online and on mobile devices, in addition to providing it over the air. In fact, providing mobile access to broadcast television content is one of the key contributors to the increase in mobile data traffic that is driving demand for mobile spectrum and a compelling factor in the development of future DTTB systems.

In this regard, efforts are also underway in the United States and worldwide to develop the next generation of terrestrial broadcast systems. One such initiative, the Future of Broadcast Television Initiative (FoBTV) is a worldwide effort to define requirements, recommend technologies and request standardization for such systems. A key element of any next generation broadcast system recognized by the FoBTV Initiative is: “The importance of mobility in future broadcast systems and the desire for mobile, handheld and portable devices to be capable of working across borders ...”. Within the United States, work on the development of these next generation standards has already begun. “The Advanced Television Systems Committee (ATSC) has received 11 initial proposals from 20 organizations for the Physical Layer of the new “ATSC 3.0” broadcast television standard.” “A primary goal of the ATSC 3.0 Physical Layer is to provide TV service to both fixed and mobile devices. Key considerations include efficiency and robust service, increased data rates to support new services such as Ultra High-Definition services, and enabling a smooth transition from existing systems for both broadcasters and consumers.”<sup>1</sup> These developments will place additional requirements on broadcast use of UHF spectrum where smaller antenna form factors are required for mobile applications and dictate the use of UHF spectrum.

The importance of broadcasting in emergencies has been recognized and highlighted in a recent draft ITU Report.<sup>2</sup> As stated in this report, “television broadcasting is a critically important medium for information dissemination to the public in times of emergencies. The intrinsic one-to-many broadcast architecture and the geographic diversity of terrestrial broadcast transmission facilities provide high service reliability during crises of all types. ... The case studies in this report represent only a few of countless examples that attest to the global importance of terrestrial broadcasting, helping to protect and save lives during local, national and international emergencies.”<sup>3</sup>

Potential interference between broadcasting and mobile operations also needs to be taken into account. The protection of the broadcasting service is an important consideration. Studies submitted to ITU-R Joint Technical Group 4-5-6-7 indicate that sharing in the UHF band between IMT and DTTB is difficult and may not be practical due to the large distance and frequency separations required. These studies indicate that co-channel sharing between IMT base stations and a DTTB receiver may require separation distances of approximately 100 km. These separation distances decrease to approximately 20 km for adjacent channel (6 MHz) operation.<sup>4</sup> Studies conducted in the United States suggest that sharing between high power DTTB transmitters and IMT base station receivers may require significantly greater co-channel and adjacent channel distances. To address these interference concerns, the United States emphasizes the mandatory application of Article 9.21, which would require explicit coordination agreement for implementation of mobile systems.

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<sup>1</sup> <http://atsc.org/cms/>

<sup>2</sup> [www.itu.int/go/ITU-R/RWP6A-2013](http://www.itu.int/go/ITU-R/RWP6A-2013)

<sup>3</sup> See, Proposed Draft New Report on the Importance of Terrestrial Broadcasting in Providing Emergency Information to the Public, Document 6/156-E, Document 6A/301-A, 28 October 2013, at p. 12.

<sup>4</sup> It should be noted that DTTB in the United States operates with contiguous 6 MHz channels and IMT is general based on contiguous 5 MHz channelization. Accordingly, IMT 5 MHz channels would generally not align with 6 MHz television channels; and therefore, a single IMT 5 MHz channel would in most instances be co-channel to two DTTB channels and the larger co-channel distances would apply to both channels.

Recognizing the growing need for mobile spectrum below 1 GHz, the current deployment and future development of broadcasting systems, and the differing national priorities of the member states as regards UHF broadcasting, it is necessary for WRC-15 to adopt a regulatory solution that would:

- (a) Enable administrations to preserve and protect broadcasting and other services in the UHF range,
- (b) Consider ways to facilitate the development of future broadcasting systems, and
- (c) Allow administrations flexibility to address the mobile spectrum shortage consistent with their domestic requirements.

To achieve these objectives, the United States proposes modifications to the Radio Regulations that would add an allocation to the mobile services and an identification for IMT in the range 694/698-890 MHz. The United States also proposes retention of the primary allocation to the Broadcasting Service in the 470-890 MHz frequency range, including the mandatory application of Article Number 9.21, which would ensure that the existing services, such as broadcasting, maintain coordination priority (i.e., retain their first-in time primary status or remain super-primary) vis-à-vis IMT systems.

The WRC-15 proposals presented below provide these changes to Article 5 of the Radio Regulations.

#### Agenda Item 1.1

- 1.1 to consider additional spectrum allocations to the mobile service on a primary basis and identification of additional frequency bands for International Mobile Telecommunications (IMT) and related regulatory provisions, to facilitate the development of terrestrial mobile broadband applications, in accordance with Resolution 233 (WRC-12)

#### **Proposal:**

#### ARTICLE 5

### **Frequency allocations**

#### **Section IV – Table of Frequency Allocations**

(See No.2.1)



**Reasons:** Globally harmonized allocations to the mobile service above 694/698 MHz frequency range would enable introduction of wireless broadband services while preserving access to spectrum for the existing services, such as broadcasting. Under the proposed allocation arrangements, administrations may continue to operate existing services, such as broadcasting, or utilize portions of the UHF band for the implementation of new mobile broadband applications, such as IMT, as they deem appropriate based on their domestic priorities, taking into account potential interference considerations.

**MOD** USA/AI 1.1/2

**5.317A** Those parts of the band 694/698-960 MHz which are allocated to the mobile service on a primary basis are identified for use by administrations wishing to implement International Mobile Telecommunications (IMT) – see Resolutions **224 (Rev.WRC-12)** and **749 (Rev.WRC-12)**, as appropriate. This identification does not preclude the use of these bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations. (WRC-15) Use of such frequencies by the mobile service is on condition no interference is caused to the broadcast or other existing services that are in operation and that any mobile use shall be subject to agreement obtained under 5.YYY.

**Reasons:** Globally harmonized allocations to the mobile service in the 694/698-960 MHz frequency range would enable introduction of wireless broadband services, such as IMT, while preserving access to spectrum for the existing services, such as broadcasting.

**ADD** USA/AI 1.1/3

**5.YYY** Prior authorized primary services need interference protection. The operation of stations in the mobile service for the implementation of International Mobile Telecommunications (IMT) in the frequency band above 694/698- MHz shall be subject to agreement obtained under No. 9.21”

**Reasons:** The application of coordination article No. 9.21 requires the explicit agreement of the affected administrations. The mandatory application of article No. 9.21, therefore, would ensure the protection of incumbent systems such as broadcasting vis-à-vis IMT systems. The above provision would also facilitate the development of future broadcasting systems. Global harmonization is an important factor for broadcast television services and will become even more so as mobile broadcast services are implemented that will facilitate the use of portable television broadcast devices.

# Attachment B

Recommendation B supported by Alcatel-Lucent, AT&T, Ericsson, Intel, Motorola Mobility, Nokia, Samsung, Sprint-Nextel, Telecommunications Management Group and Verizon

IWG-2/027r3 (20.01.14)

DRAFT

UNITED STATES OF AMERICA

PROPOSALS FOR THE WORK OF THE CONFERENCE

## Introduction

In this document the United States of America makes some proposals under WRC-15 Agenda Item 1.1. It is anticipated that the United States of America will submit at a later date additional proposals including proposals for future Conferences.

## Background

According to a recent ITU report, mobile-broadband subscriptions have climbed from 268 million in 2007 to 2.1 billion in 2013. This reflects an average annual growth rate of 40%, making mobile broadband the most dynamic ICT market.<sup>1</sup> The same report shows that, in developing countries, the number of mobile broadband subscriptions more than doubled from 2011 to 2013 (from 472 million to 1.16 billion) and surpassed those in the developed countries in 2013.<sup>2</sup> Mobile broadband access has become a key driver of global economic growth, job creation and competitiveness. In developing countries, where mobile wireless is often the only means to achieve ubiquitous broadband access, it has become an economic imperative. Africa, for example, has experienced the highest growth, with mobile-broadband penetration increasing from 2% in 2010 to 11% in 2013. This dramatic growth in mobile-broadband traffic, with mobile video comprising over 50% and growing, has resulted in an acute need for additional spectrum. The 2012 World Radiocommunication Conference recognized this need and adopted WRC-15 Agenda Item 1.1, in an effort to address the looming spectrum shortage for the mobile broadband services.

In considering the global spectrum requirements under WRC-15 Agenda Item 1.1, it is important to acknowledge, as reflected in *recognizing* d of Resolution **233 (WRC-12)**, that the spectrum below 1 GHz is exceptionally suited for mobile broadband applications. In particular, the unique propagation characteristics of the bands below 1 GHz allow for wider area coverage which in

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<sup>1</sup> The World in 2013-ICT Facts and Figures, ITU, <http://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2013.pdf>

<sup>2</sup> Ibid.

turn requires less infrastructure and facilitates service delivery to rural or sparsely populated areas, as reflected in *recognizing c* of Resolution **233 (WRC-12)**.

The 470-806/862 MHz frequency range is allocated to the broadcasting service on a primary basis in all three Regions and used predominantly for the delivery of broadcast television. Broadcast television stations have provided video programming that is responsive to the needs and interests of the communities they serve for generations. In many countries, over-the-air television broadcast remains the primary source for video programming service. At the same time, in other countries, the viewing audience has been moving to other sources such as satellite, cable, internet, etc. In the United States, for example, only 10 percent of the television households rely solely on over-the-air broadcast television service.<sup>3</sup> Moreover, broadcast television itself continues to evolve to keep pace with technological and marketplace changes. Many television broadcasters now pursue a three-screen approach, sharing their programming online and on mobile devices, in addition to providing it over the air. Providing mobile access to broadcast television content is one of the contributors to the increase in mobile data traffic that is driving demand for mobile spectrum.

Recognizing the growing need for mobile spectrum below 1 GHz and the different national priorities of the member states as regards UHF broadcasting, it is necessary for WRC-15 to adopt a regulatory solution that would:

- (a) Enable administrations to preserve broadcasting and other services in the UHF range and,
- (b) Allow administrations flexibility to address the mobile spectrum shortage consistent with their domestic requirements.

To achieve these objectives, the United States proposes modifications to the Radio Regulations that would make the Broadcasting and Mobile services co-primary in the range 470-806/862 MHz. The WRC-15 proposals presented below provide changes to Article **5** of the Radio Regulations to provide this flexibility.

### **Agenda Item 1.1**

1.1 to consider additional spectrum allocations to the mobile service on a primary basis and identification of additional frequency bands for International Mobile Telecommunications (IMT) and related regulatory provisions, to facilitate the development of terrestrial mobile broadband applications, in accordance with Resolution **233 (WRC-12)**

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<sup>3</sup> Nielsen Company, Nielsen National Universe Estimates, January 1, 2012. Several factors contribute to the decrease in reliance on over-the-air broadcast television, including high cable penetration rates and the fact that consumers increasingly turn to online and mobile broadband platforms to access news, information and video programming.

**Proposal:**

**ARTICLE 5**

**Frequency allocations**

**Section IV – Table of Frequency Allocations**

(See No.2.1)

**MOD** USA/1.1/1

**460-890 MHz**

Allocation to services			
Region 1	Region 2	Region 3	
<b>470-790</b> BROADCASTING <u>MOBILE ADD 5.317A</u>           5.149 5.291A 5.294 5.296 5.300 5.304 5.306 5.311A 5.312 5.312A	<b>470-512</b> BROADCASTING Fixed <u>MOBILE ADD 5.317A</u> Mobile 5.292 <del>MOD 5.293</del> 5.293	<b>470-585</b> FIXED <u>MOBILE ADD 5.317A</u> BROADCASTING  5.291 5.298	
	<b>512-608</b> BROADCASTING <u>MOBILE ADD 5.317A</u> <u>MOD 5.297</u>		<b>585-610</b> FIXED <u>MOBILE ADD 5.317A</u> BROADCASTING RADIONAVIGATION 5.149 5.305 5.306 5.307
	5.149 5.291A 5.294 5.296 5.300 5.304 5.306 5.311A 5.312 5.312A	<b>608-614</b> RADIO ASTRONOMY <u>MOBILE ADD 5.317A ; ADD</u> <u>5.XXX</u> Mobile-satellite except aeronautical mobile-satellite (Earth-to-space)	<b>610-890</b> FIXED MOBILE 5.313A <u>MOD 5.317A</u> BROADCASTING
		<b>614-698</b> BROADCASTING Fixed <u>MOBILE ADD 5.317A</u> Mobile <u>MOD 5.293 5.309 5.311A</u>	
		<b>698-806</b> MOBILE 5.313B <u>MOD 5.317A</u> BROADCASTING Fixed  <u>MOD 5.293 5.309 5.311A</u>	
		<b>806-890</b> FIXED MOBILE <u>MOD 5.317A</u> BROADCASTING	
<b>790-862</b> FIXED MOBILE except aeronautical mobile 5.316B <u>MOD 5.317A</u> BROADCASTING 5.312 5.314 5.315 5.316 5.316A 5.319			

<b>862-890</b> FIXED MOBILE except aeronautical mobile <u>MOD 5.317A</u> BROADCASTING 5.322  5.319 5.323	5.317 5.318	5.149 5.305 5.306 5.307 5.311A 5.320
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**Reasons:** Globally harmonized allocations to the mobile service in the 470-698 MHz band would enable introduction of innovative broadband services while preserving access to spectrum for the existing services, such as broadcasting. A new allocation to the mobile service would provide administrations with the flexibility to maximize spectrum utilization consistent with their domestic timetables, requirements, and objectives. Under the proposed allocation arrangements, administrations may continue to operate existing services, such as broadcasting, or utilize portions of the UHF band for the implementation of new mobile broadband applications, such as IMT, as they deem appropriate based on their domestic priorities.

**MOD** USA/AI 1.1/2

**5.317A** Those parts of the band ~~470-698-960 MHz in Region 2 and the band 790-960 MHz in Regions 1 and 3~~ that which are allocated to the mobile service on a primary basis are identified for use by administrations wishing to implement International Mobile Telecommunications (IMT) – see Resolutions **224 (Rev.WRC-12)** and **749 (Rev.WRC-12)**, as appropriate. This identification does not preclude the use of these bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations. (WRC-152)

**Reasons:** Globally harmonized allocations to the mobile service in the 470-960 MHz band would enable introduction of innovative broadband services, such as IMT, while preserving access to spectrum for the existing services, such as broadcasting. The new allocation to the mobile service would provide administrations with the necessary flexibility to maximize spectrum utilization consistent with their domestic timetables, requirements and objectives.

**MOD** USA/AI 1.1/3

**5.293** Different category of service: in Canada, Chile, Cuba, the United States, Guyana, Honduras, Jamaica, Mexico, Panama and Peru, the allocation of the bands 470-512 MHz and 614-806 MHz to the fixed service is on a primary basis (see No. 5.33), subject to agreement obtained under No. 9.21. ~~In Canada, Chile, Cuba, the United States, Guyana, Honduras, Jamaica, Mexico, Panama and Peru, the allocation of the bands 470-512 MHz and 614-698 MHz to the mobile service is on a primary basis (see No. 5.33), subject to agreement obtained under No. 9.21.~~ In Argentina and Ecuador, the allocation of the band 470-512 MHz to the fixed and mobile

services is on a primary basis (see No. 5.33), subject to agreement obtained under No. 9.21.  
(WRC-15~~2~~)

**Reasons:** Consequential change. Proposed allocation to Mobile service supersedes allocation(s) by footnote.

**MOD** USA/AI 1.1/4

**5.297** Additional allocation: in Canada, Costa Rica, Cuba, El Salvador, the United States, Guatemala, Guyana, Honduras, Jamaica and Mexico, the band 512-608 MHz is also allocated to the fixed ~~and mobile~~ services on a primary basis, subject to agreement obtained under No. 9.21.  
(WRC-15)

**Reasons:** Consequential change. Proposed allocation to Mobile service supersedes allocation(s) by footnote.

**ADD** USA/AI 1.1/5

**5.XXX** In making assignments to stations in the mobile service in the band 608-614 MHz administrations shall take all practicable steps to protect the radio astronomy service operations from harmful interference. (WRC-15)

**Reasons:** Compatibility between mobile and radio astronomy stations is a localized issue that can best be addressed by administrations in the application of domestic regulations.

**Draft**

**United States of America**

**PROPOSALS FOR THE WORK OF THE CONFERENCE**

**AGENDA ITEM 1.1**

**Introduction**

In this document the United States of America makes a proposal under WRC-15 Agenda Item 1.1.

**Background**

The band 1435 MHz – 1525 MHz (and subsets of the band) have been identified as “suitable frequency ranges” for IMT; they have also been addressed in sharing studies conducted within Joint Task Group JTG 4-5-6-7 in preparation for the 2015 World Radio Conference. The band has been and continues to be used widely in the United States and other Region 2 Administrations for aeronautical mobile telemetry (i.e. “AMT,” or “flight test”).

The 1435 – 1525 MHz band is essential for aerospace research and development, and for the certification of aircraft prior to commercial use. Interference-free, real-time use of the band is essential to the protection of test aircraft, payloads, flight crews, and persons and property located beneath flight test airspace. The continued use of the band 1435 - 1525 MHz on an interference-free basis is essential for the aerospace manufacturing industries and their many suppliers in Region 2, including Administrations in both North and South America.

Based on the studies introduced to date in the JTG, AMT sharing of the band with interference-limited IMT services has been demonstrated as infeasible.<sup>1</sup> The studies concluded independently that co-frequency operation of AMT and IMT operations requires exclusion zones in excess of 100 km with respect to interference from IMT to AMT ground stations, and over 350 km for interference from AMT aircraft to IMT systems on the ground. The latter distance is measured with respect to the flight test ground station that is supervising the flight test aircraft. Flight test aircraft routinely fly several hundred kilometers in all directions from their AMT ground

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<sup>1</sup> See JTG 4-5-6-7/ Docs 156 (July 2013) and 4-5-6-7/291 (October 2013).

stations. This extends the impact of signals from aircraft transmitters to IMT users to distances that are well beyond the radio line of sight from the IMT user to the AMT ground station.

Radio Regulation 5.343 prescribes that “In Region 2, the use of the band 1435-1535 MHz by the aeronautical mobile service for telemetry has priority over other uses by the mobile service.”

The United States proposes to retain this footnote in Region 2 in order to protect the flight safety aspects of AMT operations from domestic and cross-border interference.

RR 5.343 is important for the avoidance of cross-border interference to and from flight test operations in Region 2. The footnote does not preclude administrations from implementing any mobile service systems within their own territories; rather, it ensures that in sensitive border areas administrations take proper account of long-established AMT operations.

For the foregoing reasons, the 1435 – 1525 MHz band should not be identified for IMT use in Region 2.

**Agenda Item 1.1**

1.1 to consider additional spectrum allocations to the mobile service on a primary basis and identification of additional frequency bands for International Mobile Telecommunications (IMT) and related regulatory provisions, to facilitate the development of terrestrial mobile broadband applications, in accordance with Resolution **233 (WRC-12)**

**ARTICLE 5**

**Frequency allocations**

**Section IV – Table of Frequency Allocations**  
(See No. 2.1)

**NOC** USA/1.1/XX

**1 300-1 525 MHz**

<b>Allocation to Services</b>		
* * *	<b>Region 2</b>	* * *
	<b>1 429-1 452</b> FIXED MOBILE 5.343  5.338A 5.341	
	<b>1 452-1 492</b> FIXED MOBILE 5.343 BROADCASTING BROADCASTING-SATELLITE 5.208B  5.341 5.344 5.345	
	<b>1 492-1 518</b> FIXED MOBILE 5.343  5.341 5.344	
	<b>1 518-1 525</b> FIXED MOBILE 5.343 MOBILE-SATELLITE (space-to-Earth) 5.348 5.348A 5.348B 5.351A  5.341 5.344	

**Reason:** Sharing studies show that co-frequency sharing between IMT and AMT is not feasible. Consequently, the 1435 – 1525 MHz band should not be identified for IMT use in Region 2.

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**DRAFT**

**United States of America**

**PROPOSALS FOR THE WORK OF THE CONFERENCE**

**AGENDA ITEM 1.1**

**Introduction**

In this document the United States of America makes a proposal under WRC-15 Agenda Item 1.1 for a primary allocation to the mobile service regarding the 5350-5470 MHz frequency range to facilitate the development of terrestrial mobile broadband applications.

**Background**

The World Radiocommunication Conference 2012 (WRC-12) adopted WRC-15 Agenda Item 1.1 in an effort to meet the dramatic increase in demand for mobile broadband applications. Radio Local Area Networks (RLANs) have become an important component of broadband connectivity for consumers and businesses.

The World Radiocommunication Conference-2003 (WRC-03) allocated the bands 5150-5350 MHz and 5470-5725 MHz on a primary basis to the mobile service for the implementation of wireless access systems including RLANs, subject to Resolution **229 (Rev. WRC-12)** (see **No.5446A**). Resolution **229 (Rev. WRC-12)** establishes the regulatory, operational and technical provisions that ensure compatibility with the primary services in the subject bands. The WRC-03 action has enabled significant growth of RLANs while ensuring protection of other services.

Since the allocation in 2003, RLANs have been utilized in the 5 GHz frequency range to provide local area access to the Internet. Over that period, RLAN technology has evolved to provide higher data rates than those supported in 2003. However, the capacity of wired and wireless broadband connections into the home or business also has increased at the same time as fiber is now closer to the premise, 3G deployments are being replaced by LTE, etc. Therefore, it is crucial for RLAN technology to continue to evolve to support the increased data rates consumers have come to expect.

The newest RLAN evolution, IEEE 802.11ac, can support data rates with a theoretical maximum of 3.5 Gbps and actual throughputs for end users of greater than 2 Gbps utilizing four antennas. However, these throughputs depend on the availability of wide spectrum channels. IEEE 802.11ac utilizes 80 to 160 MHz wide channels compared to 20-40 MHz channels utilized by the RLAN technologies in 2003.

In addition to distributing local area internet traffic and providing offloading of data for mobile networks, RLANs can also be utilized for direct device to device connectivity. For example, content can be streamed over RLANs from a smart device to a larger screen or support data back-up directly to servers.

The increasing data traffic on RLAN networks necessitates wider channel sizes to support higher data rates. Considering existing allocations in the adjacent bands (5150-5350 MHz and 5470-5725 MHz), the 5350-5470 MHz bands are particularly attractive for RLANs.

The United States recognizes that protection of the existing services is a prerequisite for the introduction of RLANs in the 5350-5470 MHz bands. The proposal presented below establishes the international regulatory framework to protect the existing services. Under the proposed framework, the domestic regulators have the flexibility to implement varying combinations of technical, operational and regulatory techniques for the protection of all existing services in the band 5350-5470 MHz consistent with their national priorities.

**Agenda item 1.1**

1.1 to consider additional spectrum allocations to the mobile service on a primary basis and identification of additional frequency bands for International Mobile Telecommunications (IMT) and related regulatory provisions, to facilitate the development of terrestrial mobile broadband applications, in accordance with Resolution **233 (WRC-12)**;

**ARTICLE 5**

**Frequency allocations**

**Section IV – Table of Frequency Allocations**

(See No. 2.1)

**MOD** USA/1.1/1

**4 800-5 570 MHz**

<b>Allocation to services</b>		
<b>Region 1</b>	<b>Region 2</b>	<b>Region 3</b>
<b>5 150-5 250</b>	FIXED-SATELLITE (Earth-to-space) 5.447A MOBILE except aeronautical mobile 5.446A 5.446B AERONAUTICAL RADIONAVIGATION 5.446 5.446C 5.447 5.447B 5.447C	
<b>5 250-5 255</b>	EARTH EXPLORATION-SATELLITE (active) MOBILE except aeronautical mobile 5.446A 5.447F RADIOLOCATION SPACE RESEARCH 5.447D 5.447E 5.448 5.448A	

<b>5 255-5 350</b>	EARTH EXPLORATION-SATELLITE (active) MOBILE except aeronautical mobile 5.446A 5.447F RADIOLOCATION SPACE RESEARCH (active) 5.447E 5.448 5.448A
<b>5 350-5 460</b>	EARTH EXPLORATION-SATELLITE (active) 5.448B RADIOLOCATION 5.448D AERONAUTICAL RADIONAVIGATION 5.449 SPACE RESEARCH (active) 5.448C MOBILE except aeronautical mobile 5.XXX
<b>5 460-5 470</b>	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION 5.448D RADIONAVIGATION 5.449 SPACE RESEARCH (active) MOBILE except aeronautical mobile 5.XXX 5.448B
<b>5 470-5 570</b>	EARTH EXPLORATION-SATELLITE (active) MOBILE except aeronautical mobile 5.446A 5.450A RADIOLOCATION 5.450B MARITIME RADIONAVIGATION SPACE RESEARCH (active) 5.448B 5.450 5.451

**Reasons:** A new international allocation to the Mobile service for 5350-5470 MHz would facilitate contiguous spectrum for RLANs, which would increase the number of non-overlapping channels available for use. The contiguous spectrum would enable more efficient use of the spectrum. Additionally, these bands are adjacent to other bands where RLANs operate which would facilitate the possibility of reduced equipment cost and complexity.

**ADD** USA/1.1/2

**5.XXX** In the bands 5 350-5 460 and 5460-5470 MHz, stations in the mobile service shall not claim protection from stations in the radiolocation and radionavigation services and space stations in the earth-exploration-satellite (active) and space research (active) services, and No. **5.43A** shall apply. (WRC-15)

**MOD** USA/1.1/3

5.448C The space research service (active) operating in the band 5 350-5 460 MHz shall not cause harmful interference to nor claim protection from other services to which this band is allocated. This provision does not apply to the mobile service, see 5.XXX.

**Reasons:** The proposed provision would mandate protection of the existing services in the 5 350-5 470 MHz bands. In order to comply with this provision, the domestic regulators are compelled to adopt a combination of technical, operational and regulatory techniques for the protection of all existing services in the bands 5350-5470 MHz consistent with national priorities and based on ITU-R Recommendations and Reports.

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**DRAFT**

**UNITED STATES OF AMERICA**

**PROPOSALS FOR THE WORK OF THE CONFERENCE**

**Background information**

Resolution **649 (WRC-12)** invites WRC-15 “to consider, based on the results of the ITU-R studies referred to in invites ITU-R below, the possibility of making an allocation of an appropriate amount of spectrum, not necessarily contiguous, to the amateur service on a secondary basis within the band 5 250-5 450 kHz.”

The amateur service continues to grow, with more than three million licensed operators worldwide, and more than 717,000 of them in the United States. Radio amateurs utilize allocations to the amateur service to engage in scientific investigation and experimentation, provide communication in the wake of natural disasters, provide non-commercial public service communications, and conduct other activities to advance technical education, develop radio operating technique, and enhance international goodwill.

The radio amateur’s ability to accomplish these goals depends on access to frequency bands throughout the radio spectrum. In order to maintain effective and reliable communications capability throughout the sunspot cycle, allocations at regular intervals are desirable, in order to permit operation as close to the maximum usable frequency as possible. The interval between the 3.5 and 7 MHz bands varies from 1.84 to 1 in ITU Region 1 to 1.75 to 1 in ITU Region 2, which is considerably larger than the intervals between other allocations to amateur service in the HF range.

Incumbent services in the 5 250-5 450 kHz range include the fixed, mobile, and radiolocation services. Prior work in ITU-R has shown that amateur service operation is incompatible with HF radiolocation for oceanographic applications, so the 5 250-5 275 kHz range is not suitable to satisfy this agenda item. The amateur service has a longstanding secondary allocation at 10 100-10 150 kHz, with no reported unsolvable interference to primary service operations. Some administrations, including the United States, have permitted amateur service licensees privileges within the 5 275-5 450 kHz range under Radio Regulations No. 4.4. Again, no cases of unresolvable interference are known under this arrangement.

A secondary allocation across the remaining frequency range would reduce the interval between HF frequency bands in the amateur service to a desirable level and maximize the flexibility of

amateur service stations to effectively communicate within the secondary allocation and fulfil their obligations to avoid harmful interference to primary services.

**Agenda Item 1.4:** to consider possible new allocation to the amateur service on a secondary basis within the band 5 250-5 450 kHz in accordance with Resolution **649 (WRC-12)**

**Proposal:**

**ARTICLE 5**

**Frequency allocations**

**Section IV – Table of Frequency Allocations**

(See No.2.1)

**MOD USA/1.4/1**

**5 003-7 450 kHz**

<b>Allocation to services</b>		
<b>Region 1</b>	<b>Region 2</b>	<b>Region 3</b>
<b>5 250-5 275</b> FIXED MOBILE except aeronautical mobile Radiolocation 5.132A <b>5.133A</b>	<b>5 250-5 275</b> FIXED MOBILE except aeronautical mobile RADIOLOCATION 5.132A	<b>5 250-5 275</b> FIXED MOBILE except aeronautical mobile Radiolocation 5.132A
<b>5 275-5 450</b>	FIXED MOBILE except aeronautical mobile <u>Amateur</u>	

**Reasons:** A secondary allocation from 5 275-5 450 kHz avoids the unsuitable segment allocated to the radiolocation service, reduces the interval between HF amateur allocations below 10 MHz to permit reliable operation throughout the sunspot cycle, and maximizes the flexibility of amateur service stations to effectively communicate within the secondary allocation and fulfil their obligations to avoid harmful interference to primary services.

## **Space Services**

**2015 WORLD RADIOCOMMUNICATION CONFERENCE**

**DRAFT PROPOSALS FOR THE WORK OF THE CONFERENCE**

**AGENDA ITEM 1.5:** *to consider the use of frequency bands allocated to the fixed-satellite service not subject to Appendices 30,30A and 30B for the control and non-payload communications of unmanned aircraft systems (UAS) in non-segmented airspace in accordance with Resolution 153 (WRC-12).*

**BACKGROUND:** This agenda item is to support the addition of technical and regulatory provisions to enable use of portions of bands allocated to the fixed satellite service (FSS) for unmanned aircraft system (UAS) control and non-payload communications (CNPC) links in non-segregated airspace, if studies demonstrate compatibility with incumbent services and that the requirements of aviation authorities are satisfied without supporting the addition of an aeronautical mobile satellite (route) service (AMS(R)S) allocation to the FSS bands used for this purpose.

In the context of this agenda item, a UAS consists of an unmanned aircraft (UA) with an Earth station on-board to interconnect the UA and the associated unmanned aircraft control station (UACS) with its own Earth station through a satellite operating in the FSS. UA are aircraft that do not carry a human pilot but that are piloted remotely, i.e. through a reliable communication link (CNPC) from outside the aircraft. UAS operations up to now have been limited to segregated airspace. However, it is planned to expand UAS deployment outside of segregated airspace.

The development of UAS is based on recent technological advances in aviation, electronics and structural materials, making the economics of UAS operations more favorable, particularly for more repetitive, routine and long-haul duration applications. The current state of the art in UAS design and operation, is leading to the rapid development of UAS applications to fill many diverse requirements. There are a large variety of existing and envisioned applications of UAS in the fields of economy, public safety and science. Further details on UAS applications in non-segregated airspace can be found in Report ITU-R M.2171. The operation of UA outside segregated airspace requires addressing the same issues as manned aircraft, namely safe and efficient integration into the air traffic control system.

A huge number of satellite communication networks operate on frequency bands allocated to the FSS. Report ITU-R M.2171 identifies a large variety of prospects for remotely piloted (Unmanned) aircraft that would need to fly long-distances (worldwide) through airspaces controlled by civil air traffic control (ATC). Immediate access to this globally existing capacity

would provide great advantages for UA fleet operators fostering new applications, enabling faster developments of new markets, while providing planning stability for significant investments. Studies under this agenda item investigated the link feasibilities and sharing conditions for using CNPC over typical frequency spectrum allocated in several FSS allocations under which such applications could be authorized.

Report ITU-R M.2233 contains examples of technical characteristics for UA CNPC including FSS systems operating in portions of the frequency ranges 10.95-14.5 GHz and 17.3-30.0 GHz. These examples indicated that it may be possible to operate UAS CNPC links in these bands while meeting the desired link performance. It is recognized that a further Report may be available by the time of WRC-15.

The proposal found below sets forth the basis for accomplishing this objective. It includes text for a footnote to the appropriate FSS bands which points to a Resolution that spells out the conditions of use for supporting safe and efficient operation of UAS.

**Proposal:**

**USA/1.5/1**

**ADD**

**ARTICLE 5**

**Frequency allocations**

**Section IV – Table of Frequency Allocations  
(See No. 2.1)**

**10-11.7 GHz**

<b>Allocation to services</b>		
<b>Region 1</b>	<b>Region 2</b>	<b>Region 3</b>
<b>10.7-11.7</b> FIXED FIXED-SATELLITE (space-to-Earth) 5.441 5.484A <u>5.XXX</u> (Earth-to-space) 5.484 MOBILE except aeronautical mobile	<b>10.7-11.7</b> FIXED FIXED-SATELLITE (space-to-Earth) 5.441 5.484A <u>5.XXX</u> MOBILE except aeronautical mobile	

## 11.7-14 GHz

<b>Allocation to services</b>		
<b>Region 1</b>	<b>Region 2</b>	<b>Region 3</b>
<b>11.7-12.5</b> FIXED MOBILE except aeronautical mobile BROADCASTING BROADCASTING-SATELLITE 5.492	<b>11.7-12.1</b> FIXED 5.486 FIXED-SATELLITE (space-to-Earth) 5.484A 5.488 <u>5.XXX</u> Mobile except aeronautical mobile 5.485	<b>11.7-12.2</b> FIXED MOBILE except aeronautical mobile BROADCASTING BROADCASTING-SATELLITE 5.492
	<b>12.1-12.2</b> FIXED-SATELLITE (space-to-Earth) 5.484A 5.488 <u>5.XXX</u> 5.485 5.489	
	<b>12.2-12.7</b> FIXED MOBILE except aeronautical mobile BROADCASTING BROADCASTING-SATELLITE 5.492	<b>12.2-12.5</b> FIXED FIXED-SATELLITE (space-to-Earth) <u>5.XXX</u> MOBILE except aeronautical mobile BROADCASTING 5.484A 5.487
	5.487 5.487A	<b>12.5-12.75</b> FIXED-SATELLITE (space-to-Earth) 5.484A <u>5.XXX</u> (Earth-to-space)
<b>12.5-12.75</b> FIXED-SATELLITE (space-to-Earth) 5.484A <u>5.XXX</u> (Earth-to-space)	5.487A 5.488 5.490	
5.494 5.495 5.496	<b>12.7-12.75</b> FIXED FIXED-SATELLITE (Earth-to-space) MOBILE except aeronautical mobile	
<b>13.75-14</b>	FIXED-SATELLITE (Earth-to-space) 5.484A <u>5.XXX</u> RADIOLOCATION Earth exploration-satellite Standard frequency and time signal-satellite (Earth-to-space) Space research 5.499 5.500 5.501 5.502 5.503	

## 14-14.5 GHz

<b>Allocation to services</b>		
<b>Region 1</b>	<b>Region 2</b>	<b>Region 3</b>
<b>14-14.25</b>	FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B <u>5.XXX</u> RADIONAVIGATION 5.504 Mobile-satellite (Earth-to-space) 5.504B 5.504C 5.506A Space research 5.504A 5.505	
<b>14.25-14.3</b>	FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B <u>5.XXX</u> RADIONAVIGATION 5.504 Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.508A Space research 5.504A 5.505 5.508	
<b>14.3-14.4</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B <u>5.XXX</u> MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.509A Radionavigation-satellite 5.504A	<b>14.3-14.4</b> FIXED-SATELLITE (Earth-to-space) 5.457A 5.484A 5.506 5.506B <u>5.XXX</u> Mobile-satellite (Earth-to-space) 5.506A Radionavigation-satellite  5.504A	<b>14.3-14.4</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.484A 5.506 5.506B <u>5.XXX</u> MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.509A Radionavigation-satellite 5.504A
<b>14.4-14.47</b>	FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B <u>5.XXX</u> MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.509A Space research (space-to-Earth) 5.504A	
<b>14.47-14.5</b>	FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B <u>5.XXX</u> MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.509A Radio astronomy 5.149 5.504A	

**17.3-18.4 GHz**

<b>Allocation to services</b>		
<b>Region 1</b>	<b>Region 2</b>	<b>Region 3</b>
<b>17.3-17.7</b> FIXED-SATELLITE (Earth-to-space) 5.516 (space-to-Earth) 5.516A 5.516B <u>5.XXX</u> Radiolocation 5.514	<b>17.3-17.7</b> FIXED-SATELLITE (Earth-to-space) 5.516 BROADCASTING-SATELLITE Radiolocation  5.514 5.515	<b>17.3-17.7</b> FIXED-SATELLITE (Earth-to-space) 5.516 Radiolocation  5.514
<b>17.7-18.1</b> FIXED FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516 MOBILE	<b>17.7-17.8</b> FIXED FIXED-SATELLITE (space-to-Earth) 5.517 (Earth-to-space) 5.516 BROADCASTING-SATELLITE Mobile 5.515	<b>17.7-18.1</b> FIXED FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516 MOBILE
	<b>17.8-18.1</b> FIXED FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516 MOBILE 5.519	
<b>18.1-18.4</b>	FIXED FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B <u>5.XXX</u> (Earth-to-space) 5.520 MOBILE 5.519 5.521	

### 18.4-20.2 GHz

Allocation to services		
Region 1	Region 2	Region 3
<b>18.4-18.6</b> FIXED FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B <u>5.XXX</u> MOBILE		
<b>18.6-18.8</b> EARTH EXPLORATION-SATELLITE (passive) FIXED FIXED-SATELLITE (space-to-Earth) 5.522B <u>5.XXX</u> MOBILE except aeronautical mobile Space research (passive) 5.522A 5.522C	<b>18.6-18.8</b> EARTH EXPLORATION-SATELLITE (passive) FIXED FIXED-SATELLITE (space-to-Earth) 5.516B 5.522B <u>5.XXX</u> MOBILE except aeronautical mobile SPACE RESEARCH (passive) 5.522A	<b>18.6-18.8</b> EARTH EXPLORATION-SATELLITE (passive) FIXED FIXED-SATELLITE (space-to-Earth) 5.522B <u>5.XXX</u> MOBILE except aeronautical mobile Space research (passive) 5.522A
<b>19.7-20.1</b> FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B <u>5.XXX</u> Mobile-satellite (space-to-Earth) 5.524		
<b>19.7-20.1</b> FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B <u>5.XXX</u> MOBILE-SATELLITE (space-to-Earth) 5.524 5.525 5.526 5.527 5.528 5.529		
<b>19.7-20.1</b> FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B <u>5.XXX</u> Mobile-satellite (space-to-Earth) 5.524		
<b>20.1-20.2</b> FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B <u>5.XXX</u> MOBILE-SATELLITE (space-to-Earth) 5.524 5.525 5.526 5.527 5.528		

**27.5-29.9 GHz**

<b>Allocation to services</b>		
<b>Region 1</b>	<b>Region 2</b>	<b>Region 3</b>
<b>27.5-28.5</b>	FIXED 5.537A FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 <u>5.XXX</u> MOBILE 5.538 5.540	
<b>28.5-28.629.1</b>	FIXED FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.523A 5.539 <u>5.XXX</u> MOBILE Earth exploration-satellite (Earth-to-space) 5.541 5.540	
<b>28.6-29.1</b>	FIXED FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.523A 5.539 MOBILE Earth exploration-satellite (Earth-to-space) 5.541 5.540	
***		
<b>29.5-29.9</b> FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 <u>5.XXX</u> Earth exploration-satellite (Earth-to-space) 5.541 Mobile-satellite (Earth-to-space)  5.540 5.542	<b>29.5-29.9</b> FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 <u>5.XXX</u> MOBILE-SATELLITE (Earth-to-space) Earth exploration-satellite (Earth-to-space) 5.541 5.525 5.526 5.527 5.529 5.540 5.542	<b>29.5-29.9</b> FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 <u>5.XXX</u> Earth exploration-satellite (Earth-to-space) 5.541 Mobile-satellite (Earth-to-space)  5.540 5.542

**29.9-30 GHz**

<b>Allocation to services</b>		
<b>Region 1</b>	<b>Region 2</b>	<b>Region 3</b>
<b>29.9-30</b>	FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 <u>5.XXX</u> MOBILE-SATELLITE (Earth-to-space) Earth exploration-satellite (Earth-to-space) 5.541 5.543 5.525 5.526 5.527 5.538 5.540 5.542	

**Reasons:** To provide a footnote allowing the use of UAS CNPC links in the fixed-satellite service not subject to Appendices 30, 30A and 30B.

## **USA/1.5/2**

### **ADD**

5.XXX This band may also be used for the control and non-payload communication (CNPC) of unmanned aircraft systems. Such systems shall be operated under provisions of Resolution [FSS-UA-CNPC] (WRC-15).

## **USA/1.5/3**

### **ADD**

### **DRAFT RESOLUTION [FSS-UA-CNPC] (WRC-15)**

#### **Provision related to Earth stations on board unmanned aircraft which operate with geostationary satellites in the fixed-satellite service for the control and non-payload communications (CNPC) of unmanned aircraft systems in non-segregated airspaces**

The World Radiocommunication Conference (Geneva, 2015),

considering,

- a)* that there is a demand for the control of unmanned aircraft systems (UAS) via satellite communication networks while operating in non-segregated airspace;
- b)* that worldwide use of unmanned aircraft systems (UAS) is expected to increase significantly in the near future;
- c)* that unmanned aircraft (UA) need to operate seamlessly with piloted aircraft in non-segregated airspace and that there is a need to provide global harmonized spectrum for that purpose;
- d)* that the operation of UAS in non-segregated airspace requires reliable communication links, in particular to relay the air traffic control communications and for the remote pilot to control the flight;
- e)* that, in accordance with the Convention on International Civil Aviation, all aeronautical systems must meet standards and recommended practices (SARPs);

f) that SARPs are applicable to the use of frequency spectrum to support the safe operation of aeronautical systems;

g) that satellite radiocommunications are an essential part of UAS operations, in particular to relay transmissions beyond the horizon and include links between the unmanned aircraft and the satellite, and links between the UA Control Station (UACS) and the satellite;

h) that appropriate Article 11 notification status of a FSS network is a pre-requisite for the use of FSS space system (channel) for UA CNPC links;

*considering further*

a) that there is a need to limit the number of communication equipments onboard a UA;

b) that, as a dedicated satellite system for UAS is not likely, it is necessary to take into account the existing and future satellite systems to accommodate the growth of the use of UAS;

c) that there are various technical methods that may be used to increase the reliability of digital communication links, e.g. modulation, coding, redundancy, etc. that can be used to ensure safe operations of UAS in non-segregated air space;

d) that for UAS communications used for the control of UA, relay of air traffic control voice communications, and sense and avoid, relate to the safe operation of UAS and have certain technical, operational, and regulatory requirements;

e) that the requirements in *considering further d)* can be specified for UAS use of FSS networks,

recognizing

a) that Report ITU-R M.2171 provides information on the vast number of applications for Unmanned Aircraft needing access to non-segregated airspaces;

b) that Recommendation **724 (WRC-07)** notes that FSS is not, intrinsically, a safety service;

c) that agenda item 1.5 calls for the safe operation of UAS in non-segregated air space,

resolves

1 that UA control and non-payload communication shall operate under the regulatory and operational provisions contained in Annex 1;

2 that the use of such links shall be operated in accordance with procedures established by the International Civil Aviation Organization (ICAO),

3. that a fixed satellite service earth station on an unmanned aircraft shall be considered as an earth station operating in the fixed satellite service,

4. that the provisions of this Resolution shall apply to FSS links in the indicated frequency bands being used for CNPC of UAS in non-segmented air space as indicated in the Figure 1 of Annex 2,

5. that the FSS stations operating in frequency bands supporting these CNPC links shall conform to the applicable technical provisions of the radio regulations,

*encourages concerned administrations*

1 to cooperate with administrations which license UA CNPC while seeking agreement under the abovementioned provisions,

*instructs the Secretary-General*

to bring this Resolution to the attention of the Secretary-General of the International Civil Aviation Organization (ICAO).

## ANNEX 1 TO RESOLUTION [FSS-UA-CNPC] (WRC-15)

### **Regulatory and operational provisions for UA CNPC links operating through satellite systems operated in the FSS frequency bands**

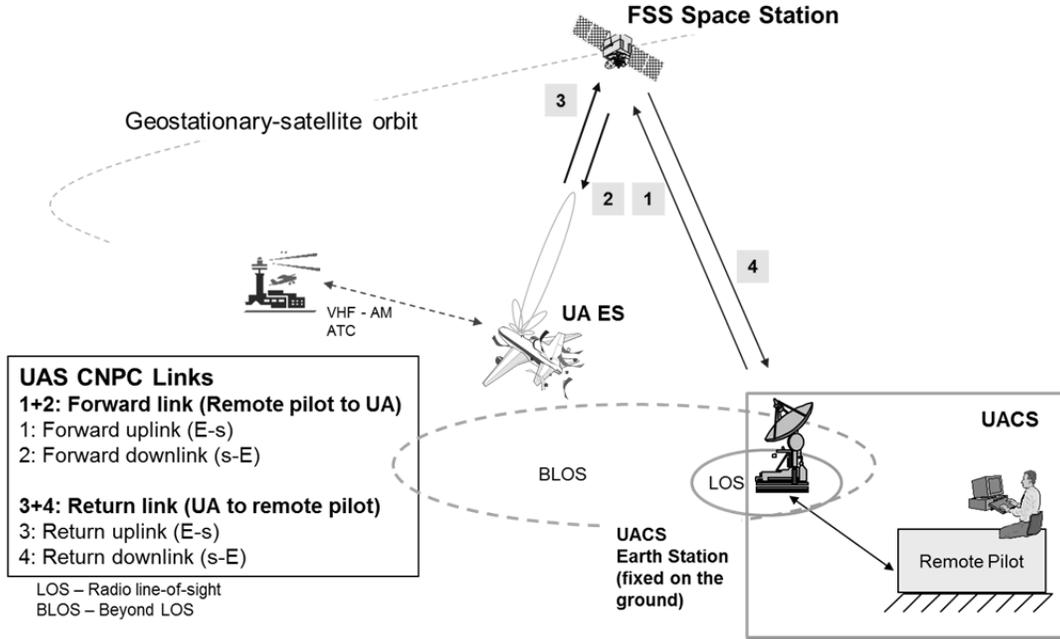
- 1 It is anticipated that ICAO will develop associated standards and recommended practices (SARPs), taking into account the above.
- 2 Conformity with the Radio Regulations is ensured by application of Articles **9** and **11**. In the course of this action, the BR always checks the consistency of any frequency assignment with the relevant technical and regulatory provisions contained in the RR, thus meeting the requirement in the ICAO conditions Any UAS CNPC link will operate under the protection provided by the registered FSS frequency assignments.
- 3 FSS frequencies used for UAS will use frequency assignments that are “successfully coordinated”. Satellite operators and administrations are required to carry out coordination of their FSS frequency assignments in accordance with the provisions contained in Article 9 of the Radio Regulations. The application of such provisions ensures that FSS frequency assignments can operate free from harmful interference caused by and to other systems. The efficiency of those rules is proven by the fact that FSS frequency assignments have been successfully operated for many years.
- 4 When the coordination process is completed, the BR will be notified (according to the provisions of RR Article 11) by the administration proposing the new system and the frequency assignments will be recorded in the MIFR. If a frequency assignment is recorded in the MIFR under RR 11.41, such an assignment is still entitled to protect and be protected against frequency assignments of other networks with which coordination has been successfully completed. The FSS operator then has to make sure that the outstanding coordination issues are examined to determine if UAS CNPC operations can take place within the ICAO requirements. This would be done for example by determining whether the affected network with which coordination has not been achieved is actually in operation and if so what the operational parameters are (e.g. orbital location and filed power levels) to ensure that any resultant impact would be acceptable.
- 5 Predicting interference risks, planning solutions for potential interference scenarios, adopting measures to solve the interference issues and reporting on the interference cases, are elements which are well known to FSS operators and which should be included in the specific agreements between FSS operators and UAS operators with guidance from Aviation Authorities (some of which could be included in SARPs).
- 6 Innovative ways to detect and prosecute the interference cases are being developed nowadays at international level, in order to gain further experience and contribute to harmonized and transparent reporting mechanisms of interference cases.
- 7 The ITU and ICAO will carry out their mutual responsibilities in a cooperative manner. It is important that the respective roles of ICAO and the ITU be fully understood to ensure appropriate separation of regulatory needs to be addressed in the RR and operational issues to be addressed by ICAO processes. In this context, ITU will develop the typical conditions for operation of CNPC links, and then, ICAO will develop further operational conditions to ensure safe operation.

ANNEX 2 TO RESOLUTION [FSS-UA-CNPC] (WRC-15)

**UA CNPC FSS Links**

FIGURE 1

**Typical BLOS CNPC links in an unmanned aircraft system**



The forward and return (UAS) links via an FSS network

**2015 WORLD RADIOCOMMUNICATION CONFERENCE**

**DRAFT PROPOSALS FOR THE WORK OF THE CONFERENCE**

**AGENDA ITEM 1.6.1** *To consider possible additional primary allocations to the fixed-satellite service (Earth-to-space and space-to-Earth) of 250 MHz in the range between 10 GHz and 17 GHz in Region 1 and review the regulatory provisions on the current allocations to the fixed-satellite service within this range, taking into account the results of ITU-R studies, in accordance with Resolution **151 (WRC-12)***

**AGENDA ITEM 1.6.2** *To consider possible additional primary allocations to the fixed-satellite service (Earth-to-space) of 250 MHz in Region 2 and 300 MHz in Region 3 within the range 13-17 GHz; and review the regulatory provisions on the current allocations to the fixed-satellite service within each range, taking into account the results of ITU R studies, in accordance with Resolution **152 (WRC 12)***

**ISSUE:** This proposal addresses the frequency band 14.5-15.35 GHz in the uplink direction in all three Regions under agenda items 1.6.1 and 1.6.2.

**BACKGROUND:**

This agenda item studies the unplanned fixed-satellite service (FSS) imbalance in the Earth-to-space direction within the three ITU Regions. Specifically, agenda item 1.6.1 considers allocating an additional 250 MHz in the uplink and downlink directions between 10 and 17 GHz in Region 1, while Agenda item 1.6.2 considers allocating an additional 250 MHz and 300 MHz FSS (Earth-to-space) within the range 13.0-17.0 GHz in Region 2 and Region 3, respectively. ITU-R sharing studies for this agenda item shall exclude the frequency band 13.0-13.25 GHz from consideration, in accordance with resolves 4 of Resolution **151 (WRC-12)** and resolves 3 of Resolution **152 (WRC-12)**. As a result, studies in the ITU-R must demonstrate compatibility with incumbent services prior to WRC-15 allocating any additional spectrum to the FSS. This proposal addresses the Earth-to-space (uplink) portion of agenda items 1.6.1 and 1.6.2 in order to achieve a globally harmonized allocation.

The existing unplanned FSS bands in the 10-15 GHz frequency range are extensively used for a myriad of applications. The very small aperture terminal (VSAT) services, video distribution, broadband networks, internet services, satellite newsgathering, and backhaul links have triggered the rapid rise in the demand. Satellite traffic is typically symmetrical in a large variety of applications, i.e. similar amounts of Earth-to-space (uplink) and space-to-Earth (downlink) traffic are transmitted. However, in ITU Regions 2 and 3, there are asymmetrical Earth-to-space and space-to-Earth FSS allocations that are used for these services.

The 250 MHz spectrum asymmetry in Region 2 and 300 MHz in Region 3 translates to approximately 10 and 14 transponders for each respective Region, considering a transponder bandwidth of 36 MHz in both polarizations. Some satellite networks are designed with an additional uplink beam which has sufficient geographical isolation with the uplink beam within the intended service area. The satellites currently

deployed have been registered in all of the available non-planned bands in Regions 2 and 3, both in the uplink and the downlink. Faced with the current congestion and spectrum asymmetry, it is challenging for satellite operators to effectively expand their communication services within this frequency range to meet the growing market demands.

In order to address this spectrum shortage and imbalance, WRC-12 adopted agenda item 1.6.2 to consider additional primary allocations to the fixed-satellite service in the range 13-17 GHz and review regulatory provisions for existing FSS allocations, taking into account ITU-R studies in accordance with Resolution **152 (WRC-12)**. Resolution **152 (WRC-12)** invites the ITU-R to complete, for WRC-15, sharing and compatibility studies towards additional allocations to the fixed-satellite service in the Earth-to-space direction of 250 MHz in Region 2 and 300 MHz in Region 3 within the band 13-17 GHz, focusing on the frequency range that is contiguous (or near contiguous) to the existing fixed satellite service allocations, while protecting existing primary services within these bands. This Resolution also calls for studies considering utilization of existing allocations to the FSS in the Earth-to-space direction through a review of regulatory provisions, except for Nos. **5.502** and **5.503** and Resolution **144 (Rev. WRC-07)**.

In Region 1, while there are equal allocations between uplink and downlink spectrum, there is a difference of 250 and 300 MHz of unplanned FSS spectrum when compared with Regions 2 and 3. In order to facilitate efficient use of spectrum for satellite services and address the shortage of FSS spectrum in Region 1 as compared to FSS allocations in other Regions, Agenda Item 1.6.1 sets out to consider additional primary allocations to the FSS in the range 10-17 GHz in Region 1 (Earth-to-space and space-to-Earth) and a review of the regulatory provisions for existing FSS allocations, taking into account ITU-R studies in accordance with Resolution **151 (WRC-12)**.

It should be noted that a world-wide allocation for the FSS has a significant advantage over a regional one. For example, the same and/or equal FSS allocations for Regions 1, 2 and 3 is important in terms of planning and construction of satellite networks and the efficient use of the orbit/spectrum resource.

Within portions of the band 10-17 GHz are primary allocations to the fixed, mobile, mobile except aeronautical mobile, radiolocation, Earth exploration-satellite (active), Earth exploration-satellite (passive), fixed-satellite (Earth-to-space), radio astronomy, space research, space research (passive), radionavigation, and aeronautical radionavigation services. In accordance with Resolutions **151 (WRC-12)** and **152 (WRC-12)**, the ITU-R should conduct sharing studies to address the protection of existing in-band primary services and compatibility studies to address interference.

The United States also maintains extensive mobile service operations in the band 14.5-15.35 GHz, which will require in-depth study with the proposed FSS operations. As noted in Resolution **152 (WRC-12)**, *further recognizing e*, the band 15.35-15.4 GHz is allocated to passive services and No. **5.340** applies.

| The studies in Working Party 4A (contained in Preliminary Draft New Reports ITU-R S.[R1.FSS] and ITU-R S.[R2R3.FSS]) consider the FSS characteristics provided by the membership in the compatibility analyses. The analyses conducted between the FSS (Earth-to-space) and mobile and aeronautical mobile services in the 14.5-15.35 GHz band demonstrate that interference can occur at distances of 50 to 470 km. This is consistent with the predetermined coordination distance that is described in Table 10 of Appendix 7 of the Radio Regulations for the FSS (Earth-to-space) and the mobile service that currently shares co-primary status in the 14.5-14.8 GHz band. Statistical analyses demonstrate that interference within the 50 to 470 km distances is likely to occur only 10-15% of the time. This result suggests coordination between the FSS (Earth-to-space) and mobile and aeronautical mobile services would be a feasible approach to achieve compatibility. With respect to sharing with the secondary space research allocation, the sharing studies indicate that sharing with data relay feeder links in the Earth-to-space direction currently operating in 14.5-14.8 GHz can be achieved through regular coordination.

In order to address resolves 2 of Resolution **151 (WRC-12)** and **152 (WRC-12)**, provisions are added to ensure the integrity and adequate protection of the Regions 1 and 3 feeder-link Plan and List. Specifically, required coordination procedures between Appendix 30A networks and the new fixed-satellite service utilization of the bands are identified.

**PROPOSAL:**

**ARTICLE 5**

**FREQUENCY ALLOCATIONS**

\* \* \* \* \*

**Section IV – Table of Frequency Allocations  
(See No. 2.1)**

\* \* \* \* \*

**MOD** USA/1.6.2/1

14-15.4 GHz

<b>Allocation to services</b>		
<b>Region 1</b>	<b>Region 2</b>	<b>Region 3</b>
<b>14-14.25</b>	FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B RADIONAVIGATION 5.504 Mobile-satellite (Earth-to-space) 5.504B 5.504C 5.506A Space research 5.504A 5.505	
<b>14.25-14.3</b>	FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B RADIONAVIGATION 5.504 Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.508A Space research 5.504A 5.505 5.508	

<b>14.3-14.4</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.509A Radionavigation-satellite 5.504A	<b>14.3-14.4</b> FIXED-SATELLITE (Earth-to-space) 5.457A 5.484A 5.506 5.506B Mobile-satellite (Earth-to-space) 5.506A Radionavigation-satellite  5.504A	<b>14.3-14.4</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.484A 5.506 5.506B MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.509A Radionavigation-satellite 5.504A
<b>14.4-14.47</b>	FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.509A Space research (space-to-Earth) 5.504A	
<b>14.47-14.5</b>	FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.509A Radio astronomy 5.149 5.504A	
<b>14.5-14.8</b>	FIXED FIXED-SATELLITE (Earth-to-space) 5.510 <u>5.FSSA 5.FSSB</u> MOBILE Space research	
<b>14.8-15.35</b>	FIXED MOBILE FIXED-SATELLITE (Earth-to-space) <u>5.FSSA 5.FSSB</u> Space research 5.339	
<b>15.35-15.4</b>	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.511	

**Reasons:** to add a fixed-satellite service allocation to 14.8-15.35 GHz in order to alleviate the spectrum imbalance and allow full use of the downlink fixed-satellite service spectrum in 10.7-12.7 GHz.

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**MOD** USA/1.6.2/2

**5.510** The use of the band 14.5-14.8 GHz by the fixed-satellite service (Earth-to-space) for is limited to feeder links for the broadcasting-satellite service is governed by Appendix 30A. This use is reserved for countries outside Europe.

**Reasons:** to clarify which uses of 14.5-14.8 GHz are governed by Appendix 30A.

\* \* \* \* \*

**ADD** USA/1.6.2/3

5.FSSA For other uses of the band 14.5-14.8 GHz by the fixed-satellite service (Earth-to-space) not covered by No. **5.510** and for use of the band 14.8-15.35 GHz by the fixed-satellite service (Earth-to-space), the fixed-satellite service earth stations shall have a minimum earth station diameter of 1.2 meters.

**Reasons:** to include limitations on use of the 14.5-14.8 GHz by non-BSS feeder links and for use of the band 14.8-15.35 GHz in order to facilitate sharing with the mobile and fixed services.

**ADD** USA/1.6.2/4

5.FSSB In the band 14.5-14.8 GHz, satellite networks in fixed-satellite service (Earth-to-space) not subject to No. **5.510** shall coordinate under No. 9.7 with Earth-to-space links to geostationary satellite networks in the secondary space research service for which coordination requests were submitted prior to 27 November 2015.

**Reasons:** to ensure coordination with existing secondary space research service networks operating in this frequency band, while at the same time ensuring these new provisions do not apply to the Appendix 30A Plan and List.

APPENDIX 7 (Rev.WRC-152)

\* \* \* \* \*

MOD USA/1.6.2/5

TABLE 7b (Rev.WRC-155)

Parameters required for the determination of coordination distance for a transmitting earth station

Transmitting space radiocommunication service designation		Fixed-satellite, mobile-satellite	Aero-nautical mobile-satellite (R) service	Aero-nautical mobile-satellite (R) service	Fixed-satellite	Fixed-satellite	Fixed-satellite	Fixed-satellite	Space operation, space research	Fixed-satellite, mobile-satellite, meteorological-satellite	Fixed-satellite	Fixed-satellite	Fixed-satellite	Fixed-satellite <sup>3</sup>	Fixed-satellite	Fixed-satellite <sup>3</sup>						
Frequency bands (GHz)		2.655-2.690	5.030-5.091	5.030-5.091	5.091-5.150	5.091-5.150	5.725-5.850	5.725-7.075	7.100-7.235 <sup>5</sup>	7.900-8.400	10.7-11.7	12.5-15.354-8	13.75-14.3	15.43-15.65	17.7-18.4	19.3-19.7						
Receiving terrestrial service designations		Fixed, mobile	Aeronautical radio-navigation	Aeronautical mobile (R)	Aeronautical radio-navigation	Aeronautical mobile (R)	Radiolocation	Fixed, mobile	Fixed, mobile	Fixed, mobile	Fixed, mobile	Fixed, mobile	Radiolocation radionavigation (land only)	Aeronautical radionavigation	Fixed, mobile	Fixed, mobile						
Method to be used		§ 2.1	§ 2.1, § 2.2	§ 2.1, § 2.2			§ 2.1	§ 2.1	§ 2.1, § 2.2	§ 2.1	§ 2.1	§ 2.1, § 2.2	§ 2.1		§ 2.1, § 2.2	§ 2.2						
Modulation at terrestrial station <sup>1</sup>		A					A	N	A	N	A	N	A	N	–	N	N					
Terrestrial station interference parameters and criteria	$P_O$ (%)	0.01					0.01	0.005	0.01	0.005	0.01	0.005	0.01	0.005	0.01	0.005	0.005					
	$n$	2					2	2	2	2	2	2	2	2	1	2	2					
	$p$ (%)	0.005					0.005	0.0025	0.005	0.0025	0.005	0.0025	0.005	0.0025	0.01	0.0025	0.0025					
	$N_L$ (dB)	0					0	0	0	0	0	0	0	0	0	0	0					
	$M_s$ (dB)	26 <sup>2</sup>						33	37	33	37	33	37	33	40	33	40	1	25	25		
$W$ (dB)	0						0	0	0	0	0	0	0	0	0	0	0	0	0			
Terrestrial station parameters	$G_x$ (dBi) <sup>4</sup>	49 <sup>2</sup>	6	10	6	6		46	46	46	46	46	46	46	50	50	52	52	36		48	48
	$T_e$ (K)	500 <sup>2</sup>						750	750	750	750	750	750	750	1 500	1 100	1 500	1 100	2 636		1 100	1 100
Reference bandwidth	$B$ (Hz)	$4 \times 10^3$	$150 \times 10^3$	$37.5 \times 10^3$	$150 \times 10^3$	$10^6$		$4 \times 10^3$	$10^6$	$4 \times 10^3$	$10^6$	$4 \times 10^3$	$10^6$	$4 \times 10^3$	$10^6$	$4 \times 10^3$	$10^6$	$10^7$		$10^6$	$10^6$	
Permissible interference power	$P_f(p)$ (dBW) in $B$	-140	-160	-157	-160	-143		-131	-103	-131	-103	-131	-103	-128	-98	-128	-98	-131		-113	-113	

<sup>1</sup> A: analogue modulation; N: digital modulation.

<sup>2</sup> The parameters for the terrestrial station associated with transhorizon systems have been used. Line-of-sight radio-relay parameters associated with the frequency band 5 725-7 075 MHz may also be used to determine a supplementary contour with the exception that  $G_x = 37$  dBi.

- 3 Feeder links of non-geostationary-satellite systems in the mobile-satellite service.
- 4 Feeder losses are not included.
- 5 Actual frequency bands are 7 100-7 155 MHz and 7 190-7 235 MHz for space operation service and 7 145-7 235 MHz for the space research service.

**Reasons:** To provide a coordination mechanism between transmitting earth stations in 14.5-15.35 GHz and fixed and mobile earth stations. Aeronautical mobile stations are already addressed through Table 10 of Appendix 7.

\* \* \* \* \*

APPENDIX 30A (REV.WRC-125)\*

**Provisions and associated Plans and List<sup>1</sup> for feeder links for the broadcasting-satellite service (11.7-12.5 GHz in Region 1, 12.2-12.7 GHz in Region 2 and 11.7-12.2 GHz in Region 3) in the frequency bands 14.5-14.8 GHz<sup>2</sup> and 17.3-18.1 GHz in Regions 1 and 3, and 17.3-17.8 GHz in Region 2** (Rev. WRC-0315)

(See Articles 9 and 11) (WRC-03)

\* \* \* \* \*

ARTICLE 4 (REV.WRC-1503)

**Procedures for modifications to the Region 2 feeder-link Plan or for additional uses in Regions 1 and 3**

USA/1.6/6

MOD

**4.1 Provisions applicable to Regions 1 and 3**

4.1.1 An administration proposing to include a new or modified assignment in the feeder-link List shall seek the agreement of those administrations whose services are considered to be affected, i.e. administrations<sup>4,5</sup>:

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\* The expression “frequency assignment to a space station”, wherever it appears in this Appendix, shall be understood to refer to a frequency assignment associated with a given orbital position. (WRC-03)

<sup>1</sup> The Regions 1 and 3 feeder-link List of additional uses is annexed to the Master International Frequency Register (see Resolution 542 (WRC-2000)\*\*). (WRC-03)

<sup>2</sup> This use of the band 14.5-14.8 GHz is reserved for countries outside Europe.

\*\* *Note by the Secretariat:* This Resolution was abrogated by WRC-03.

*Note by the Secretariat: Reference to an Article with the number in roman is referring to an Article in this Appendix.*

<sup>4</sup> Agreement with administrations having a frequency assignment in the bands 14.5-14.8 GHz or 17.7-18.1 GHz to a terrestrial station, or having a frequency assignment in the band 17.7-18.1 GHz to an earth station in the fixed-satellite service (space-to-Earth), or having a frequency assignment in the band 17.3-17.8 GHz in the broadcasting-satellite service shall be sought under No. 9.17, No. 9.17A or No. 9.19, respectively.

<sup>5</sup> Coordination under Nos. 9.17 or 9.17A is not required for an earth station of an administration on the territory of which this earth station is located and for which the procedures of former § 4.2.1.2 and 4.2.1.3 of Appendix 30A

- a) of Regions 1 and 3 having a feeder-link frequency assignment in the fixed-satellite service (Earth-to-space) to a space station in the broadcasting-satellite service which is included in the Regions 1 and 3 feeder-link Plan with a necessary bandwidth, any portion of which falls within the necessary bandwidth of the proposed assignment; *or*
- b) of Regions 1 and 3 having a feeder-link frequency assignment included in the feeder-link List or for which complete Appendix 4 information has been received by the Radiocommunication Bureau in accordance with the provisions of § 4.1.3, and any portion of which falls within the necessary bandwidth of the proposed assignment; *or*
- c) of Region 2 having a feeder-link frequency assignment in the fixed-satellite service (Earth-to-space) to a space station in the broadcasting-satellite service which is in conformity with the Region 2 feeder-link Plan, or in respect of which proposed modifications to that Plan have already been received by the Bureau in accordance with the provisions of § 4.2.6 with a necessary bandwidth, any portion of which falls within the necessary bandwidth of the proposed assignment; *or*
- d) having a feeder-link frequency assignment in the band 17.8-18.1 GHz in Region 2 in the fixed-satellite service (Earth-to-space) to a space station in the broadcasting-satellite service or a frequency assignment in the band 14.5-14.8 GHz in the fixed-satellite service (Earth-to-space) not subject to the Regions 1 and 3 feeder-link Plan or List -which is recorded in the Master Register or which has been coordinated or is being coordinated under the provisions of No. 9.7, or under § 7.1 of Article 7, with a necessary bandwidth, any portion of which falls within the necessary bandwidth of the proposed assignment. (Rev. WRC-03-15)

**Reasons:** to add mechanisms for coordination between fixed-satellite service allocation in 14.5-14.8 GHz with the Regions 1 and 3 feeder-link Plan or List as requested in resolves 2 of Resolution 151 (WRC-12) and 152 (WRC-12).

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**MOD** USA/1.6/7

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(WRC-97) have been successfully applied by that administration before 3 June 2000 in respect of terrestrial stations or earth stations operating in the opposite direction of transmission. (WRC-03)

ARTICLE 7 (REV.WRC-152)

**Coordination, notification and recording in the Master International Frequency Register of frequency assignments to stations in the fixed-satellite service (space-to-Earth) in Region 1 in the band 17.3-18.1 GHz and in Regions 2 and 3 in the band 17.7-18.1 GHz, to stations in the fixed-satellite service (Earth-to-space) in Region 2 in the band 17.8-18.1 GHz, to stations in the fixed-satellite service (Earth-to-space) in any region in the band 14.5-14.8 GHz where those stations are not subject to the Regions 1 and 3 feeder-link Plan or List and to stations in the broadcasting-satellite service in Region 2 in the band 17.3-17.8 GHz when frequency assignments to feeder links for broadcasting-satellite stations in the 17.3-18.1 GHz band in Regions 1 and 3 or in the band 17.3-17.8 GHz in Region 2 are involved<sup>28</sup>**

**Section I – Coordination of transmitting space or earth stations in the fixed-satellite service or transmitting space stations in the broadcasting-satellite service with assignments to broadcasting-satellite service feeder links**

7.1 The provisions of No. **9.7**<sup>29</sup> and the associated provisions under Articles **9** and **11** are applicable to transmitting space stations in the fixed-satellite service in Region 1 in the band 17.3-18.1 GHz, to transmitting space stations in the fixed-satellite service in Regions 2 and 3 in the band 17.7-18.1 GHz, to transmitting earth stations in the fixed-satellite service in Region 2 in the band 17.8-18.1 GHz, to transmitting earth stations in the fixed-satellite service in any region in the band 14.5-14.8 GHz where those stations are not subject to the Regions 1 and 3 feeder-link Plan or List and to transmitting space stations in the broadcasting-satellite service in Region 2 in the band 17.3-17.8 GHz. (Rev. WRC-03<sup>15</sup>)

7.2 In applying the procedures referred to in § 7.1, the provisions of Appendix **5** are replaced by the following:

7.2.1 The frequency assignments to be taken into account are:

- a) the assignments in conformity with the appropriate Regional feeder-link Plan in Appendix **30A**;
- b) the assignments included in the Regions 1 and 3 feeder-link List;

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<sup>28</sup> These provisions do not replace the procedures prescribed in Articles **9** and **11** when stations other than those for feeder links in the broadcasting-satellite service subject to a Plan are involved. (WRC-03)

<sup>29</sup> The provisions of Resolution **33 (Rev.WRC-97)**\* are applicable to space stations in the broadcasting-satellite service for which the advance publication information or the request for coordination has been received by the Bureau prior to 1 January 1999.

\* *Note by the Secretariat:* This Resolution was revised by WRC-03.

- c) the assignments for which the procedure of Article 4 has been initiated as from the date of receipt of the complete Appendix 4 information under § 4.1.3 or 4.2.6. (WRC-03)

7.2.2 The criteria to be applied are those given in Annex 4.

**Reasons:** to add mechanisms for coordination between fixed-satellite service allocation in 14.5-14.8 GHz with the Regions 1 and 3 feeder-link Plan or List as requested in resolves 2 of Resolution 151 (WRC-12) and 152 (WRC-12).

\* \* \* \* \*

MOD USA/1.6/8

## ANNEX 1

**Limits for determining whether a service of an administration is considered to be affected by a proposed modification to the Region 2 feeder-link Plan or by a proposed new or modified assignment in the Regions 1 and 3 feeder-link List or when it is necessary under this Appendix to seek the agreement of any other administration** (Rev.WRC-1503)

\* \* \* \* \*

**6 Limits applicable to protect a frequency assignment in the band 17.8-18.1 GHz (Region 2) to a receiving feeder-link space station in the fixed-satellite service (Earth-to-space) or a frequency assignment in the band 14.5-14.8 GHz (any region where the frequency assignment is not subject to the Regions 1 and 3 feeder-link Plan or List) to a receiving space station in the fixed-satellite service (Earth-to-space)** (Rev. WRC-1503)

With respect to § 4.1.1 d) of Article 4, an administration is considered affected by a proposed new or modified assignment in the Regions 1 and 3 feeder-link List when the power flux-density arriving at the receiving space station of a broadcasting-satellite feeder-link in Region 2 or at the receiving space station of the unplanned fixed-satellite service uplinks in any region of that administration would cause an increase in the noise temperature of the receiving ~~feeder-link~~ space station which exceeds the threshold value of  $\Delta T/T$  corresponding to 6%, where  $\Delta T/T$  is calculated in accordance with the method given in Appendix 8, except that the maximum power densities per hertz averaged over the worst 1 MHz are replaced by power densities per hertz averaged over the necessary bandwidth of the ~~feeder-link~~ uplink carriers. (Rev. WRC-1503)

**Reasons:** to extend the existing coordination trigger for unplanned services and the Plan/List to coordination between fixed-satellite service allocation in 14.5-14.8 GHz with the Regions 1 and

3 feeder-link Plan or List, in order to address the request in resolves 2 of Resolution **151 (WRC-12)** and **152 (WRC-12)**.

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**MOD** USA/1.6/9

#### ANNEX 4 (REV.WRC-~~1503~~)

### Criteria for sharing between services

- 1 Threshold values for determining when coordination is required between, on one hand, transmitting space stations in the fixed-satellite service or the broadcasting-satellite service and, on the other hand, a receiving space station in the feeder-link Plan or List or a proposed new or modified receiving space station in the List, in the frequency bands 17.3-18.1 GHz (Regions 1 and 3) and in the feeder-link Plan or a proposed modification to the Plan in the frequency band 17.3-17.8 GHz (Region 2)** (WRC-03)

With respect to § 7.1, Article 7, coordination of a transmitting space station in the fixed-satellite service or in the broadcasting-satellite service with a receiving space station in a broadcasting-satellite service feeder link in the Regions 1 and 3 feeder-link Plan or List, or a proposed new or modified receiving space station in the List, or in the Region 2 feeder-link Plan or proposed modification to the Plan is required when the power flux-density arriving at the receiving space station of a broadcasting-satellite service feeder link of another administration would cause an increase in the noise temperature of the feeder-link space station which exceeds a threshold value of  $\Delta T_s / T_s$  corresponding to 6%.  $\Delta T_s / T_s$  is calculated in accordance with Case II of the method given in Appendix 8. (WRC-03)

- 2 Threshold values for determining when coordination is required between, on one hand, transmitting feeder-link earth stations in the fixed-satellite service in Region 2, in 17.8-18.1 GHz or transmitting earth stations in the fixed-satellite service in 14.5-14.8 GHz not subject to the Regions 1 and 3 feeder-link Plan or List and, on the other hand, a receiving space station in the Regions 1 and 3 feeder-link Plan or List or a proposed new or modified receiving space station in the List, in the frequency bands 14.5-14.8 GHz or 17.8-18.1 GHz** (Rev. WRC-~~1503~~)

With respect to § 7.1, Article 7, coordination of a transmitting ~~feeder-link~~ earth station in the fixed-satellite service with a receiving space station in a broadcasting-satellite feeder link in the Regions 1 and 3 feeder-link Plan or List, or a proposed new or modified receiving space station in the List, is required when the power flux density arriving at the receiving space station of a broadcasting-satellite service feeder link of another administration would cause an increase in the noise temperature of the feeder-link space station which exceeds a threshold value of  $\Delta T/T$  corresponding to 6%, where  $\Delta T/T$  is calculated in accordance with the method given in Appendix 8, except that the maximum power densities per hertz averaged over the worst 1 MHz are replaced by power densities per hertz averaged over the necessary bandwidth of the feeder-link carriers. (Rev. WRC-0315)

**Reasons:** to extend the existing coordination trigger for unplanned services and the Plan/List to coordination between fixed-satellite service allocation in 14.5-14.8 GHz with the Regions 1 and 3 feeder-link Plan or List, in order to address the request in resolves 2 of Resolution 151 (WRC-12) and 152 (WRC-12).

**2015 WORLD RADIOCOMMUNICATION CONFERENCE**

**DRAFT PROPOSALS FOR THE WORK OF THE CONFERENCE**

**AGENDA ITEM 1.7:** *to review the use of the band 5 091-5 150 MHz by the fixed-satellite service (Earth-to-space) (limited to feeder links of the non-geostationary mobile-satellite systems in the mobile-satellite service) in accordance with Resolution 114 (Rev.WRC-12)*

**ISSUE:** This agenda item invites the ITU-R to conduct appropriate studies to review the use of the band 5 091-5 150 MHz by feeder links (Earth-to-space) of non-geostationary mobile-satellite systems with respect to the aeronautical radionavigation service in accordance with Resolution 114 (WRC-12).

**BACKGROUND:** At WRC-95, a Primary allocation, subject to **5.444A**, was made to the fixed-satellite service in the 5 091-5 150 MHz band for feeder links to non-GSO mobile-satellite service systems, in the Earth-to-space direction.

The 5 091-5 150 MHz band was originally designated for expansion of the international standard Microwave Landing System (MLS) and Recommendation ITU-R S.1342 describes a method for determining coordination distances between international standard MLS stations operating in the band 5 030-5 090 MHz and FSS stations providing Earth-to-space feeder links in the 5 091-5 150 MHz band.

At WRC-07, an additional allocation subject to **5.444B** was made, in the 5 091-5 150 MHz band, to the aeronautical mobile service (AMS) for use by surface applications at airports, aeronautical telemetry transmissions from aircraft stations and aeronautical security transmissions. The latter application was suppressed by WRC-12. Compatibility between the newly allocated aeronautical mobile service planned usage and the existing fixed-satellite service usage was demonstrated by extensive studies carried out by the ITU-R in the lead up to WRC-07.

The fixed-satellite service allocation at 5 091-5 150 MHz is currently used by the HIBLEO-4FL and HIBLEO-X systems and has been used compatibly with other services since 1 998. The extensive studies undertaken in preparation for WRC-07 resulted in the creation of **No. 5.444B** and Resolutions **748(WRC-07)**, **418(WRC-07)** and **419(WRC-07)** and demonstrated compatibility between the fixed-satellite service and each of the aeronautical mobile (route) service applications.

The operator of the HIBLEO-4FL and HIBLEO-X systems has completed initial phase of the replenishment of its satellite constellation. As these new spacecraft are replacements for existing equipment, they will also utilize the 5 091-5 150 MHz range for feeder links in the Earth-to-space direction. The replacement satellites are expected to remain in service beyond the year 2025.

As a result of these developments, continued FSS use of the 5 091-5 150 MHz band for feeder links of the MSS, Earth-to-space, is required. Taking into account the time constraints contained in **5.444A**, it is necessary to comply with Resolution **114 (WRC-03)** prior to 2018. Recognizing the considerable effort expended in studying the compatibility between the Earth-to-space feeder links of the MSS systems and the Aeronautical Mobile Service in preparation for WRC-07, and since the interference budgets and scenarios studied before remain the same for the HIBLEO-4FL and HIBLEO-X replacement spacecraft, study of technical and operational issues can and should be limited to the sharing of this band between new systems of the aeronautical radionavigation service (ARNS) and the FSS providing feeder links of the non-GSO systems in the MSS.

The continued use of this allocation by feeder uplinks is of great importance in providing ongoing service by MSS systems to developing countries, under-served areas and critical response in the event of natural disasters and other civil emergencies.

Note: Since Resolution **748 (Rev. WRC-12)** and Recommendation ITU-R M.1827 are parts of the Radio Regulations, modifications to these documents are included in this proposal.

**Proposal:**

**USA/1.7/1**

**MOD**

**4 800-5 570 MHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>5 091-5-150</b>	AERONAUTICAL MOBILE 5.444B AERONAUTICAL MOBILE-SATELLITE (R) 5.443AA AERONAUTICAL RADIONAVIGATION <del>5.444-5.444A</del> <u>FIXED-SATELLITE (Earth-to-space) 5.444A</u>	
<b>5 150-5 250</b>	FIXED-SATELLITE (Earth-to-space) 5.447A MOBILE except aeronautical mobile 5.446A 5.446B AERONAUTICAL RADIONAVIGATION 5.446 5.446C 5.447 5.447B 5.447C	

**Reasons:** Consequential to rendering the fixed-satellite service allocation without time limits.

**USA/1.7/2**

**MOD**

**5.444A** *Additional allocation:* ~~the band 5 091-5 150 MHz is also allocated to the fixed-satellite service (Earth-to-space) on a primary basis. This~~ The allocation to the fixed-satellite service (Earth-to-space) in the band 5 091-5 150 MHz is limited to feeder links of non-geostationary

satellite systems in the mobile-satellite service and is subject to coordination under No. **9.11A**.  
The use of the band 5 091-5 150 MHz by feeder links of non-geostationary satellite systems in the mobile-satellite service shall be subject to application of Resolution **114 (Rev.WRC-15)**.

~~————— In the band 5 091-5 150 MHz, the following conditions also apply:~~

~~————— prior to 1 January 2018, the use of the band 5 091-5 150 MHz by feeder links of non-geostationary satellite systems in the mobile-satellite service shall be made in accordance with Resolution **114 (Rev.WRC-03)**<sup>‡</sup>;~~

~~————— after 1 January 2016, no new assignments shall be made to earth stations providing feeder links of non-geostationary mobile-satellite systems;~~

~~————— after 1 January 2018, the fixed-satellite service will become secondary to the aeronautical radionavigation service.~~

In the band 5 091-5 150 MHz, the following conditions apply:

- to ensure that the aeronautical radionavigation service is protected from harmful interference, coordination is required for feeder-link earth stations of non-geostationary satellite systems in the mobile-satellite service which are separated by less than 450 km (243 nmi) from ground stations operating in the aeronautical radionavigation service and that Appendix 7 of the Radio Regulations be used for the determination of the coordination area.

**Reasons:** to remove time limits from the fixed-satellite service allocation (limited to feeder links of non-geostationary systems in the mobile-satellite service), while keeping all the other applicable regulatory provisions, i.e. No. **9.11A** and Resolution **114 (Rev.WRC-15)**.

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<sup>‡</sup> ~~Note by the Secretariat: This Resolution was revised by WRC 12.~~

USA/1.7/3

MOD

Appendix 7

TABLE 7b (Rev.WRC-12)

Parameters required for the determination of coordination distance for a transmitting earth station

Transmitting space radiocommunication service designation		Fixed-satellite, mobile-satellite	Aero-nautical mobile-satellite (R) service	Aero-nautical mobile-satellite (R) service	Fixed-satellite	Fixed-satellite	Fixed-satellite	Fixed-satellite	Space operation, space research	Fixed-satellite, mobile-satellite, meteorological-satellite	Fixed-satellite	Fixed-satellite	Fixed-satellite	Fixed-satellite <sup>3</sup>	Fixed-satellite	Fixed-satellite <sup>3</sup>					
Frequency bands (GHz)		2.655-2.690	5.030-5.091	5.030-5.091	5.091-5.150	5.091-5.150	5.725-5.850	5.725-7.075	7.100-7.235 <sup>5</sup>	7.900-8.400	10.7-11.7	12.5-14.8	13.75-14.3	15.43-15.65	17.7-18.4	19.3-19.7					
Receiving terrestrial service designations		Fixed, mobile	Aeronautical radio-navigation	Aeronautical mobile (R)	Aeronautical radio-navigation	Aeronautical mobile (R)	Radiolocation	Fixed, mobile	Fixed, mobile	Fixed, mobile	Fixed, mobile	Fixed, mobile	Fixed, mobile	Radiolocation radionavigation (land only)	Aeronautical radionavigation	Fixed, mobile	Fixed, mobile				
Method to be used		§ 2.1	§ 2.1, § 2.2	§ 2.1, § 2.2	§ 2.2		§ 2.1	§ 2.1	§ 2.1, § 2.2	§ 2.1	§ 2.1	§ 2.1, § 2.2	§ 2.1		§ 2.1, § 2.2	§ 2.2					
Modulation at terrestrial station <sup>1</sup>		A					A	N	A	N	A	N	A	N	–	N	N				
Terrestrial station interference parameters and criteria	$p_O$ (%)	0.01					0.01	0.005	0.01	0.005	0.01	0.005	0.01	0.005	0.01		0.005	0.005			
	$n$	2					2	2	2	2	2	2	2	2	2	1		2	2		
	$p$ (%)	0.005					0.005	0.0025	0.005	0.0025	0.005	0.0025	0.005	0.0025	0.005	0.0025		0.0025	0.0025		
	$N_L$ (dB)	0					0	0	0	0	0	0	0	0	0	0		0	0		
	$M_S$ (dB)	26 <sup>2</sup>						33	37	33	37	33	37	33	40	33	40	1		25	25
$W$ (dB)	0						0	0	0	0	0	0	0	0	0	0		0	0		
Terrestrial station parameters	$G_X$ (dBi) <sup>4</sup>	49 <sup>2</sup>	6	10	6	6		46	46	46	46	46	46	50	50	52	52	36		48	48
	$T_e$ (K)	500 <sup>2</sup>						750	750	750	750	750	750	1 500	1 100	1 500	1 100	2 636		1 100	1 100
Reference bandwidth	$B$ (Hz)	$4 \times 10^3$	$150 \times 10^3$	$37.5 \times 10^3$	$150 \times 10^3$	$10^6$		$4 \times 10^3$	$10^6$	$4 \times 10^3$	$10^6$	$4 \times 10^3$	$10^6$	$4 \times 10^3$	$10^6$	$4 \times 10^3$	$10^6$	$10^7$		$10^6$	$10^6$
Permissible interference power	$P_{f(p)}$ (dBW) in $B$	-140	-160	-157	-160	-143		-131	-103	-131	-103	-131	-103	-128	-98	-128	-98	-131		-113	-113

<sup>1</sup> A: analogue modulation; N: digital modulation.

- <sup>2</sup> The parameters for the terrestrial station associated with transhorizon systems have been used. Line-of-sight radio-relay parameters associated with the frequency band 5 725-7 075 MHz may also be used to determine a supplementary contour with the exception that  $G_x = 37$  dBi.
- <sup>3</sup> Feeder links of non-geostationary-satellite systems in the mobile-satellite service.
- <sup>4</sup> Feeder losses are not included.
- <sup>5</sup> Actual frequency bands are 7 100-7 155 MHz and 7 190-7 235 MHz for space operation service and 7 145-7 235 MHz for the space research service.

**Reasons:** to reflect the method of coordination that is to be used between earth stations of the fixed-satellite service and stations of the aeronautical radio navigation service.

USA/1.7/4

MOD

RESOLUTION 114 (REV.WRC-1215)

**Studies on eCompatibility between new systems of the aeronautical radionavigation service and the fixed-satellite service (Earth-to-space) (limited to feeder links of the non-geostationary mobile-satellite systems in the mobile-satellite service) in the frequency band 5 091-5 150 MHz**

The World Radiocommunication Conference (Geneva, ~~2012~~2015),

*considering*

- a) the current allocation of the frequency band 5 000-5 250 MHz to the aeronautical radionavigation service;
- b) the requirements of both the aeronautical radionavigation and the fixed-satellite (FSS) (Earth-to-space) (limited to feeder links of non-geostationary satellite (non-GSO) systems in the mobile-satellite service (MSS)) services in the above-mentioned band,

*recognizing*

- a) that priority must be given to the microwave landing system (MLS) in accordance with No. **5.444** and to other international standard systems of the aeronautical radionavigation service in the frequency band 5 030-5 150 MHz;
- b) that, in accordance with Annex 10 of the Convention of the International Civil Aviation Organization (ICAO) on international civil aviation, it may be necessary to use the frequency band 5 091-5 150 MHz for the MLS if its requirements cannot be satisfied in the frequency band 5 030-5 091 MHz;
- c) that the FSS providing feeder links for non-GSO systems in the MSS will need access to the frequency band 5 091-5 150 MHz in the ~~short~~long term,

*noting*

- a) that Recommendation ITU-R S.1342 describes a method for determining coordination distances between international standard MLS stations operating in the band 5 030-5 091 MHz and FSS earth stations providing Earth-to-space feeder links in the band 5 091-5 150 MHz;
- b) the small number of FSS stations to be considered;
- ~~c) the development of new systems that will provide supplemental navigation information integral to the aeronautical radionavigation service,~~

*resolves*

- 1 that administrations authorizing stations providing feeder links for non-GSO systems in the MSS in the frequency band 5 091-5 150 MHz shall ensure that they do not cause harmful interference to stations of the aeronautical radionavigation service;

~~2 — that the allocation to the aeronautical radionavigation service and the FSS in the frequency band 5 091-5 150 MHz should be reviewed at a future competent conference prior to 2018;~~

~~3 — that studies be undertaken on compatibility between new systems of the aeronautical radionavigation service and systems of the FSS providing feeder links of the non-GSO systems in the MSS (Earth-to-space),~~

*invites administrations*

~~when assigning frequencies in the band 5 091-5 150 MHz before 1 January 2018 to stations of the aeronautical radionavigation service or to stations of the FSS providing feeder links of the non-GSO systems in the MSS (Earth-to-space), to take all practicable steps to avoid mutual interference between them,~~

*invites ITU-R*

~~to study the technical and operational issues relating to sharing of this band between new systems of the aeronautical radionavigation service and the FSS providing feeder links of the non-GSO systems in the MSS (Earth-to-space),~~

*invites*

~~1 — ICAO to supply technical and operational criteria suitable for sharing studies for new aeronautical systems;~~

~~2 — all Members of the Radiocommunication Sector, and especially ICAO, to participate actively in such studies,~~

*instructs the Secretary-General*

~~to bring this Resolution to the attention of ICAO.~~

**Reasons:** Consequential changes as a result of rendering the fixed-satellite service allocation (limited to feeder links of non-geostationary systems in the mobile-satellite service) without time limits.

USA/1.7/5

MOD

RESOLUTION 748 (REV. WRC-~~12~~15)

Compatibility between the aeronautical mobile (R) service and the fixed-satellite service (Earth-to-space) in the band 5 091-5 150 MHz

The World Radiocommunication Conference (Geneva, ~~2012~~2015),

*considering*

- a) that the allocation of the 5 091-5 150 MHz band to the fixed-satellite service (FSS) (Earth-to-space) is limited to feeder links of non-geostationary-satellite (non-GSO) systems in the mobile-satellite service (MSS);
- b) that the frequency band 5 000-5 150 MHz is currently allocated to the aeronautical mobile-satellite (R) service (AMS(R)S), subject to agreement obtained under No. **9.21**, and to the aeronautical radionavigation service (ARNS);
- c) that WRC-07 allocated the band 5 091-5 150 MHz to the aeronautical mobile service (AMS) on a primary basis subject to No. 5.444B;
- d) that the International Civil Aviation Organization (ICAO) is in the process of identifying the technical and operating characteristics of new systems operating in the AM(R)S in the band 5 091-5 150 MHz; (*Editor's note: to be reviewed based on ICAO information.*)
- e) that the compatibility of one AM(R)S system, to be used by aircraft operating on the airport surface, and the FSS has been demonstrated in the 5 091-5 150 MHz band;
- f) that ITU-R studies have examined potential sharing among ~~AMS~~aeronautical applications and the FSS in the band 5 091-5 150 MHz and have shown that the aggregate interference from aeronautical telemetry and AM(R)S should total no more than 3%  $\Delta T_{\#}/T_{\#}$ ;
- g) that the frequency band 117.975-137 MHz currently allocated to the AM(R)S is reaching saturation in certain areas of the world, and therefore that band would not be available to support additional surface applications at airports;
- h) that this new allocation is intended to support the introduction of applications and concepts in air traffic management which are data intensive, and which will support data links that carry safety-critical aeronautical data,

*recognizing*

- a) that in the frequency band 5 030-5 091 MHz priority is to be given to the microwave landing system (MLS) in accordance with No. **5.444**;
- b) that ICAO publishes recognized international aeronautical standards for AM(R)S systems;
- c) that Resolution **114 (Rev. WRC-~~12~~15)** applies to the sharing conditions between the FSS and ARNS in the 5 091-5 150 MHz band,

*noting*

- a) that the number of FSS transmitting stations required may be limited;
- b) that the use of the band 5 091-5 150 MHz by the AM(R)S needs to ensure protection of the current or planned use of this band by the FSS (Earth-to-space);
- c) that ITU-R studies describe methods for ensuring compatibility between the AM(R)S and FSS operating in the band 5 091-5 150 MHz, and compatibility has been demonstrated for the AM(R)S system referred to in *considering e*),

*resolves*

- 1 that any AM(R)S systems operating in the band 5 091-5 150 MHz shall not cause harmful interference to, nor claim protection from, systems operating in the ARNS;
- 2 that any AM(R)S systems operating in the frequency band 5 091-5 150 MHz shall meet the SARPs requirements published in Annex 10 of the ICAO Convention on International Civil Aviation and the requirements of Recommendation ITU-R M.1827-1, to ensure compatibility with FSS systems operating in that band;
- 3 that, in part to meet the provisions of No. **4.10**, the coordination distance with respect to stations in the FSS operating in the band 5 091-5 150 MHz shall be based on ensuring that the signal received at the AM(R)S station from the FSS transmitter does not exceed -143 dB(W/MHz), where the required basic transmission loss shall be determined using the methods described in Recommendations ITU-R P.525-2 and ITU-R P.526-11,

*invites*

- 1 administrations to supply technical and operational criteria necessary for sharing studies for the AM(R)S, and to participate actively in such studies;
- 2 ICAO and other organizations to actively participate in such studies,

*instructs the Secretary-General*

to bring this Resolution to the attention of ICAO.

**Reasons:** to improve the operational flexibility of the aeronautical-mobile (Route) service and to reflect the revision of Recommendation ITU-R M.1827.

NOTE 1: This method relies on the appropriate revision of Recommendation ITU-R M.1827 by ITU-R prior to WRC-15.

NOTE 2: Resolution **748 (Rev.WRC-12)** is referred to in *recognizing c*) of Resolution **418 (Rev.WRC-12)**. Should WRC-15 revise Resolution **748 (Rev.WRC-12)**, a consequential update of the reference would be need in Resolution **418 (Rev.WRC-12)**.

## WAC/073(27.01.14)

### PROPOSED EDITS TO NTIA DRAFT PROPOSAL ON WRC-15 AI 1.12 (REF. WAC/059(27.01.14))

#### UNITED STATES OF AMERICA

#### DRAFT PROPOSALS FOR THE WORK OF THE CONFERENCE

**Agenda Item 1.12:** *to consider an extension of the current worldwide allocation to the Earth exploration-satellite (active) service in the frequency band 9 300 – 9 900 MHz by up to 600 MHz within the frequency bands 8 700 – 9 300 MHz and/or 9 900 – 10 500 MHz, in accordance with Resolution 651 (WRC-12)*

**Background Information:** This agenda item considers extending the current Earth exploration-satellite service (EESS) (active) allocation in the range 9 300 – 9 900 MHz by an additional 600 MHz within portions of the range 8 700 – 10 500 MHz.

Incumbent services in the 9 900 – 10 500 MHz range include the radiolocation, fixed, mobile, amateur, and amateur-satellite services. The radiolocation service is primary worldwide throughout the band. The fixed service is secondary worldwide from 9 900 – 10 000 MHz. The fixed and mobile services are primary in ITU Regions 1 and 3 from 10 000 – 10 450 MHz. The amateur service is secondary at 10 000 – 10 500 MHz worldwide, and the amateur-satellite service is secondary at 10 450 – 10 500 MHz worldwide.

Currently, the 9 000 – 9 300 MHz range contains primary allocations to aeronautical and maritime radionavigation safety services. It is imperative to protect these safety service operations from harmful interference. There is potential interference to stations operating in the adjacent 10.5 – 10.7 GHz frequency range if the extension is made in the upper 9 900 – 10 500 MHz range, including stations in passive services (radio astronomy, Earth exploration-satellite (passive), and space research (passive)). Similarly, there is potential interference to stations operating in the space research service in the band 8 400 – 8 500 MHz if the EESS allocation is extended to the lower 8 700 – 9 300 MHz frequency range.

In accordance with Resolution 651 (WRC-12), the ITU conducted sharing studies to ensure the protection of existing in-band services and compatibility studies to address interference due to unwanted emissions into the services in the 10 600 – 10 700 MHz frequency range and the space research service in the 8 400 – 8 500 MHz band.

Studies have demonstrated that sharing is possible under certain conditions between EESS (active) and the existing services in the 9 900 – 10 500 MHz frequency range and that passive services in the 10 600 – 10 700 MHz frequency range can be protected from unwanted emissions from a new EESS (active) allocation. Given the results of sharing studies, this proposal supports

an allocation of an additional 600 MHz to the EESS (active) as a ~~primary~~ secondary allocation in the frequency range 9 900 – 10 500 MHz. This proposal extends the protections for ~~incumbent services~~ the radiolocation service in No. 5.476A to the new frequency allocations by virtue of the secondary status of the EESS allocation. The ~~proposal~~ and indicates that the use of this frequency allocation extension ~~may~~ shall be limited to systems requiring a necessary bandwidth of 1 200 MHz that cannot be fully accommodated within the 9 300 – 9 900 MHz band, ~~pending the results of ITU-R studies.~~ This proposal supports no change to allocations in the 8 700 – 9 300 MHz frequency range because ITU-R studies show feasibility to make the entire 600 MHz extension to the EESS (active) in frequencies above the existing EESS (active) allocation 9 300 – 9 900 MHz.

**Proposal:**

**ARTICLE 5**

**Frequency allocations**

**Section IV – Table of Frequency Allocations**

(See No. 2.1)

**MOD** USA/AI 1.12/1

**9 500-10 000 MHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>9 500-9 800</b>	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION RADIONAVIGATION SPACE RESEARCH (active) 5.476A	
<b>9 800-9 900</b>	RADIOLOCATION Earth exploration-satellite (active) Fixed Space research (active) 5.477 5.478 5.478A 5.478B	
<b>9 900-10 000</b>	<del>EARTH EXPLORATION-SATELLITE (active) ADD 5A.112</del> RADIOLOCATION <u>Earth Exploration-Satellite (active) ADD 5A.112</u> Fixed 5.477 5.478 5.479 <del>ADD 5B.112</del>	

**Reasons:** Studies have shown that sharing between the EESS (active) and other services in the frequency range of 9 900 – 10 500 MHz is feasible.

MOD

USA/AI 1.12/2

10-10.5 GHz

Allocation to services		
Region 1	Region 2	Region 3
<b>10-10.45</b> <del>EARTH EXPLORATION-SATELLITE (active) ADD 5.A112</del> FIXED MOBILE RADIOLOCATION Amateur <del>Earth Exploration-Satellite (active) ADD 5.A112</del> <del>5.479-ADD 5.B112</del>	<b>10-10.45</b> <del>EARTH EXPLORATION-SATELLITE (active) ADD 5.A112</del> RADIOLOCATION Amateur <del>Earth Exploration-Satellite (active) ADD 5.A112</del> 5.479 5.480- <del>ADD 5.B112</del>	<b>10-10.45</b> <del>EARTH EXPLORATION-SATELLITE (active) ADD 5.A112</del> FIXED MOBILE RADIOLOCATION Amateur <del>Earth Exploration-Satellite (active) ADD 5.A112</del> <del>5.479-ADD 5.B112</del>
<b>10.45-10.5</b>	<del>EARTH EXPLORATION-SATELLITE (active) ADD 5.A112</del> RADIOLOCATION Amateur Amateur-satellite Earth Exploration-Satellite ADD 5.A112 <del>5.481-ADD 5.B112</del>	

**Reasons:** Studies have shown that sharing between the EESS (active) and other services in the frequency range of 9 900 – 10 500 MHz is feasible.

ADD

USA/AI 1.12/3

**5.A112** The use of the frequency range 9 900 – 10 500 MHz by the Earth exploration-satellite service (active) is limited to systems requiring necessary bandwidths ~~{of 1 200 MHz, if greater than 600 MHz that cannot be fully accommodated within the 9 300-9 900 MHz band.}~~  
(~~WRC-WRC-15~~)

**Reasons:** To limit the use of the extension to the existing allocation to systems employing very wide bandwidths in order to protect incumbent services.

~~ADD~~

~~USA/AI 1.12/4~~

~~**5.B112** In the bands 9 900 – 10 000 MHz, 10 – 10.45 GHz, and 10.45 – 10.5 GHz stations in the Earth exploration-satellite service (active) shall not cause harmful interference to, nor claim protection from, stations of the radiolocation service. (WRC-15)~~

**Reasons:** ~~To extend the same protections to the radiolocation service for the new allocation to the Earth exploration satellite service (active) in the bands 9 900 – 10 000 MHz, 10 – 10.45 GHz, and 10.45 – 10.5 GHz as in the 9 300 – 9 800 MHz band.~~

**NOC** USA/AI 1.12/5

**8 650-9 300 MHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>8 650-8 750</b>	RADIOLOCATION 5.468 5.469	
<b>8 750-8 850</b>	RADIOLOCATION AERONAUTICAL RADIONAVIGATION 5.470 5.471	
<b>8 850-9 000</b>	RADIOLOCATION MARITIME RADIONAVIGATION 5.472 5.473	
<b>9 000-9 200</b>	RADIOLOCATION AERONAUTICAL RADIONAVIGATION 5.337 5.471 5.473A	
<b>9 200-9 300</b>	RADIOLOCATION MARITIME RADIONAVIGATION 5.472 5.473 5.474	

**Reasons:** Because it has been shown to be feasible to allocate the entire 600 MHz extension to the EESS (active) in frequencies above the existing EESS (active) allocation at 9 300 – 9 900 MHz, no change to allocations in the 8 700 – 9 300 MHz frequency range is needed.

**SUP** USA/AI 1.12/6

**RESOLUTION 651 (WRC-12)**

**Possible extension of the current worldwide allocation to the Earth exploration-satellite (active) service in the frequency band 9 300-9 900 MHz by up to 600 MHz within the frequency bands 8 700-9 300 MHz and/or 9 900-10 500 MHz**

**Reasons:** The required studies have been completed and this resolution is no longer needed.

## **Regulatory Issues**

**UNITED STATES OF AMERICA**

**DRAFT PRELIMINARY VIEWS FOR WRC-15**

**Agenda Item 7:** *to consider possible changes, and other options, in response to Resolution 86 (rev. Marrakesh, 2002) of the Plenipotentiary Conference, an advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks, in accordance with Resolution 86 (Rev. WRC-07) to facilitate rational efficient, and economical use of radio frequencies and any associated orbits, including the geostationary –satellite orbit*

**ISSUE:** Considering whether the orbital position limitations found in Appendix 30 to the Radio Regulations are still relevant to ensure equitable access to the orbital/spectrum resource between the Regions

**BACKGROUND:** There are existing provisions in the Radio Regulations addressing inter-regional sharing criteria between the fixed-satellite service (FSS) and the broadcasting-satellite service (BSS) in the 11.7-12.7 GHz bands where FSS (or unplanned BSS) serves one Region and planned BSS serves another Region using shared portions of the orbital arc in the same frequency band. Working Party 4A has initiated a review of the expanded use of the orbital arc since the last WRC that updated these provisions.

Appendix 30 to the Radio Regulations has detailed provisions and associated coordination triggers both for modifications to the Plans and/or List. In particular, the relevant provisions and associated technical criteria are:

- Article 4 of Appendix 30 → procedure for proposed modifications to the BSS Plan or List to coordinate with unplanned FSS or BSS
- Article 7 of Appendix 30 → procedure for unplanned BSS or FSS networks to coordinate with BSS Plan or List assignments or previously filed modifications to the Plan or List
- Annex 1 to Appendix 30 → criteria to determine if a proposed modification to the BSS Plan or List needs to coordinate with unplanned FSS or BSS networks
  - The criteria here is a power-flux density (pfd) mask.
- Annex 4 to Appendix 30 → criteria to determine if an unplanned FSS or BSS network needs to coordinate with the BSS Plan or List assignments or previously filed modifications to the Plan or List

- The criteria here is a pfd mask.
- Annex 6 to Appendix 30 → summary of the assumptions used to develop the power flux density (pfd) levels contained in Annexes 1 and 4 to Appendix 30
- Annex 7 to Appendix 30 → orbital position limitations on modifications to the BSS Plan or List; specifically applicable to Region 2 BSS in 12.2-12.7 GHz and to Region 1 BSS in 11.7-12.2 GHz. Annex 7 also contains associated EIRP limits for Region 1 BSS in a portion of the arc.

Annex 6 is particularly useful in understanding the derivation of the Annex 1 and 4 pfd limits, with respect to the earth stations considered and the desired  $\Delta T/T$  value.

The following Recommendations and Reports are also relevant:

- Recommendation ITU-R BO.1697, “Power flux-density values in the band 11.7-12.7 GHz and associated calculation methodology which may be used for bilateral coordination when the power flux-density values in § 3 of Annex 1 to Appendix 30 or Annex 4 to Appendix 30 of the Radio Regulations are exceeded“, adopted in 2005. This Recommendation further expands upon the information in Annex 6 to Appendix 30, and generally breaks down the pfd levels in Annexes 1 and 4 for inter-regional sharing by wanted earth station size.
- Report ITU-R BO.809, “Inter-regional sharing of the 11.7 to 12.75 GHz frequency band between the broadcasting-satellite service and the fixed-satellite service“, adopted in 1990. While this Report is over 20 years old, it does note that the inhomogenous nature of FSS and BSS makes sharing more difficult.

In particular, it is interesting to consider the relationship between Annexes 1, 4, 6 and 7, and to assess the factors that may have driven adoption of those provisions as well as noting factors that may have changed since WRC-03.

Some comments on the relationship between Annexes 1, 4, 6 and 7 of Appendix 30:

- Section 1 of Annex 1 to Appendix 30 includes a hard limit of  $-103.6 \text{ dBW/m}^2/27 \text{ MHz}$  for additional assignments in the Regions 1 and 3 BSS List. This is equivalent to roughly a peak EIRP of  $58.5 \text{ dBW}/27 \text{ MHz}$ .
- Similarly, the highest operating power flux density (pfd) level without triggering coordination of FSS in any Region vis a vis BSS under Annex 4 to Appendix 30 (or, for BSS vis a vis seeking agreement with FSS in Section 6 of Annex 1 to Appendix 30) is also  $-103.6 \text{ dBW/m}^2/27 \text{ MHz}$ .
- Annex 7 allows use of certain orbital positions by Regions 1 and 3 BSS List assignments in the shared part of the arc between Regions 1 and 2 if the BSS peak EIRP level does not exceed  $56 \text{ dBW}/27 \text{ MHz}$ , which is several dB lower than that in Section 1/Annex 1 and Annex 4.
- Different minimum and maximum earth station sizes for FSS and BSS (see Annex 6) led to different mask for protecting each service.

- For close orbital separations, larger earth station antennas could lead to more stringent allowed pfd levels
- For larger orbital separations, smaller earth station antennas could lead to more stringent allowed pfd levels

Other factors that likely related to development of the sharing criteria:

- Different expected operating EIRP levels for FSS and BSS
  - Larger discrepancies could lead to more interference to FSS and larger orbital separations needed.
- Difference in coverage areas and associated beam roll off between networks serving the different regions
  - Greater geographic separation facilitates sharing, which could at least be taken into account between Regions 1 and 2.

Working Party 4A is currently assessing the above considerations.

**U.S. VIEW:**

The United States supports studies to evaluate the orbital position limitations contained in Annex 7 to Appendix 30 of the Radio Regulations, with a view to to evaluate actual use since WRC-03 of the shared orbital arc resource, and to identify any new trends as more satellite networks have been implemented and planned in the shared part of the orbital arc, for example, between Regions 1 and 2 that could lead to some potential relaxation to those orbital position limitations.

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