



Resolution SFCG 36-1R3

**SFCG OBJECTIVES FOR
WORLD RADIOCOMMUNICATION CONFERENCES**

The SFCG,

CONSIDERING

- a) that its member agencies are vitally interested in having provisions in the ITU Radio Regulations which enhance future system operations in the space science services;
- b) that Earth observation data has a significant role to play in the United Nations Sustainable Development Goals (SDG), directly contributing to 40 of the 169 Targets;
- c) that 30 of the 232 SDG indicators depend directly on satellite-based observations;
- d) that it is critical to ensure the availability and protection of the frequency bands necessary for spaceborne Earth observation applications and in particular:
 - meteorology and climatology;
 - global warming and climate change monitoring;
 - disaster prediction, detection and mitigation;
- e) that increased demand for spectrum by non-space science services is placing increased pressure on many of the bands most relied upon by SFCG member agencies;
- f) that several SFCG member agencies are interested in human exploration of the Moon and Mars and are actively planning for such missions;
- g) that several SFCG member agencies are also interested in space research satellite missions to investigate the characteristics of our solar system, the physical phenomena taking place in space and the structure of the universe;
- h) that changes to the Radio Regulations can only be accomplished at World Radiocommunication Conferences (WRCs);

- i) that on the agendas of these WRCs, items of interest to SFCG member agencies may be included;
- j) that the agenda for WRC-19 is given in Resolution **809 (WRC-15)**;
- k) that the preliminary agenda for WRC-2023 is given in Resolution **810 (WRC-15)** that it is essential for SFCG member agencies to coordinate their Conference preparations and to provide the necessary rationale for their requirements in order to achieve the desired results at WRCs;

NOTING

that consideration of the frequency allocations required to operate space systems to be used for environmental (including weather and climate) monitoring, in disaster prediction, disaster detection and disaster mitigation is critical for public safety and property protection;

RESOLVES

1. that the SFCG WRC Objectives identified in Annex 1, for the next and subsequent competent World Radiocommunication Conferences shall be actively pursued by Member Agencies through participation at the relevant national, regional and ITU meetings;
2. that, in preparation for WRCs, Annexes 1 and 2 shall be updated in the light of Conference agendas, evolving Objectives, and changing status of studies;
3. that Annex 2 shall list items of interest to SFCG members for consideration at a future conference, but not yet sufficiently mature for inclusion in Annex 1;
4. that member agencies will urge their Administrations to make proposals to competent WRCs which satisfy these Objectives.

Annex 1 to SFCG Resolution 36-1R3

SFCG WRC-19 Objectives

Introduction

This Annex presents the objectives of SFCG members concerning issues affecting space science services on the agenda of the World Radiocommunication Conference 2019 (WRC-19). The contents may be used by SFCG members to inform their Administrations and regional groups, and to facilitate conference preparation and WRC consideration.

The presentation is organized to align with the Agenda for the WRC-19 as presented in Resolution **809 (WRC-15)**. Not all the items in that Agenda are of interest to the SFCG and therefore only those specific agenda items, relating to SFCG issues, are discussed herein.

The SFCG is concerned with the effective use and management of those radio frequency bands that are allocated by the Radio Regulations (RR) of the ITU to the Space Research, Space Operations, Earth Exploration Satellite, and Meteorological Satellite services. SFCG promotes spectrum efficiency and recognizes the need for and the value of sharing frequency bands between more than one radio service, in cases where mutually agreed sharing and protection criteria have been established based upon the results of ITU-R studies.

However, in frequency bands allocated to the space science services, and where sharing has been shown to be infeasible, the SFCG holds the view that such sharing should not be implemented. In such cases, the SFCG would support any review by Administrations that might lead to a reduction in the number of such infeasible sharing situations in the Table of Frequency Allocations contained in the ITU Radio Regulations.

SFCG attaches a particular importance to the protection of frequency bands used by space-based passive sensors to provide vital ecological and environmental data that is unobtainable by any other means. The successful operation of these passive sensors depends on the use of specific frequency bands that are defined by physical laws.

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Agenda Item 1.2 to consider in-band power limits for earth stations operating in the mobile-satellite service, meteorological-satellite service and Earth exploration-satellite service in the frequency bands 401-403 MHz and 399.9-400.05 MHz, in accordance with Resolution **765 (WRC-15)**;

This agenda item was created because of the significant recent increase in use of these frequency bands for telemetry, tracking and command (TT&C) purposes. This increase is largely attributable to increased interest by educational institutions in operating research satellites and private and commercial entities seeking to operate large constellations of satellites. The proliferation of such TT&C usage potentially poses a significant impact upon the large number of existing lower power data collection system (DCS) stations communicating to sensitive receivers on GSO and non-GSO satellites. Tens of thousands of DCS stations are deployed worldwide for collecting essential weather and climate data. Work under this item is to determine the potential impact of high-power TT&C operations and to determine what, if any, power limitations are appropriate to protect the vital DCS operations.

SFCG Objective

For the 399.9-400.05 MHz band, SFCG supports the establishment of a 5 dBW in-band e.i.r.p limit, in the whole band as well as in any 4 kHz, for earth stations operating in the mobile-satellite service, specifically Method C in the CPM Report.

Similarly for the 401-403 MHz band, SFCG supports the establishment of, in the whole band as well as in any 4 kHz, a 22 dBW in-band e.i.r.p limit for geostationary systems and non-geostationary systems within the EESS with an orbit of apogee equal or greater than 35 786 km and a 7 dBW in-band e.i.r.p. limit for non-geostationary systems within the EESS with an orbit of apogee lower than 35 786 km. This corresponds to CPM Report Method E.

In addition, for both frequency bands, SFCG supports the implementation of the transitional measures described in Methods C and E for the application of the corresponding limits to satellite systems, for which complete notification information has been received by the Radiocommunication Bureau and brought into use prior to 22 November 2019. For the end of the transition period related to the band 401-403 MHz, SFCG could consider various options between 22 November 2024 and 22 November 2029.

SFCG supports a maximum e.i.r.p. limit of 12 dBW for non-geostationary satellite systems operating within the 401.898-402.522 MHz band for which complete notification information has been received by the Radiocommunication Bureau before 28 April 2007.

SFCG does not support the use of e.i.r.p. density limits as the only mechanism for ensuring compatibility.

Finally, SFCG does not support any use of the part of the band 401-403 MHz designated to GSO DCS operation (Recommendation ITU-R SA.2045) by non-GSO telecommand uplinks. Thus,

SFCG is opposed to Method F of the CPM Report.

Status

This agenda item was the responsibility of ITU-R WP 7B. WP 7B developed Report ITU-R SA.2430, on technical studies for establishing in-band power limits for earth stations operating in the frequency ranges 399.9-400.05 MHz and 401-403 MHz within the MSS, EESS and MetSat services. This Report describes the use by DCS of the bands under consideration as well as relevant e.i.r.p. limits. Distinction is made between DCS systems based on LEO and MEO satellites and DCS systems based on GSO and HEO satellites, due to the different e.i.r.p. levels required.

There have been ITU-R contributions proposing higher e.i.r.p. limits to accommodate small satellite systems that have low gain space station antennas. The results of the ITU-R compatibility studies show that these higher proposed e.i.r.p. levels are not compatible with typical low power DCS operations.

The CPM Report contains four methods for the 399.9-400.05 MHz frequency band and three methods for the 401-403 MHz frequency band.

It is noted that this agenda item does not deal with the development of suitable regulatory provisions that would allow satellite networks and associated earth stations unable to operate under proposed e.i.r.p. limits in these bands to migrate to alternative spectrum.

Agenda Item 1.3 to consider possible upgrading of the secondary allocation to the meteorological-satellite service (space-to-Earth) to primary status and a possible primary allocation to the Earth exploration-satellite service (space-to-Earth) in the frequency band 460-470 MHz, in accordance with Resolution **766 (WRC-15)**;

This agenda item is related to downlink communications for the data collection system (DCS) networks, meteorological-satellite service (MetSat), whose uplinks are considered under WRC-19 Agenda item 1.2. The DCS system downlinks have been operating globally under a secondary allocation and on a primary basis in some countries under RR No. **5.290** subject to the agreement by administrations under RR No. **9.21**. These regulatory conditions pose a barrier to implementation of essential DCS components on a global basis. WRC-19 Agenda item 1.3 seeks to remedy the status quo by studying and developing criteria which would allow the meteorological-satellite service to operate globally on a co-primary basis with terrestrial based operations in the fixed and mobile services, while not constraining such terrestrial operations. RR No. **5.289** also allows EESS space-to-Earth communications on a non-interference basis but constrains such operations to also be secondary to the MetSat operations permitted under that same footnote. In view of a growing usage of this spectrum by EESS satellite networks, WRC-19 Agenda item 1.3 seeks to consider creating a co-primary allocation with respect to the terrestrial services but maintaining it as secondary to the MetSat operations.

A primary allocation to the MetSat service and EESS (downlink) in the frequency band 460-470

MHz would provide regulatory certainty/stability for meteorological and space agencies involved in satellite data collection programs, and the public sectors funding the development and operation of such systems, to be able to provide long-term continuity for this service of public interest.

SFCG Objective

SFCG supports raising the regulatory status of MetSat service (space-to-Earth) and providing a new primary allocation to EESS (space-to-Earth) in the 460-470 MHz band as proposed by Method C of the CPM Report. However, SFCG has concerns regarding *resolves 5* of the draft Resolution proposed under this method as this will restrict the future development of MetSat service and EESS in the frequency band. The SFCG supports the deletion of *resolves 5*.

Status

This agenda item was the responsibility of ITU-R WP 7B. WP7B developed Report ITU-R SA.2429 on studies related to proposed change in 460-470 MHz secondary allocation for MetSat (space-to-Earth) to primary and the addition of a primary allocation to EESS (space-to-Earth).

The CPM Report contains three Methods to solve this Agenda item. Method A is for “no change.” Regarding Method B, it should be noted that the p.f.d. mask for GSO satellites in No. **5.B13** contains two options, for which Option 2 does not provide protection to the fixed and mobile services. Method B also does not adequately address the situation of existing MetSat space stations that do not meet the p.f.d. mask relative to new MetSat space stations which can meet the p.f.d. mask.

Agenda Item 1.5 to consider the use of the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space) by earth stations in motion communicating with geostationary space stations in the fixed-satellite service and take appropriate action, in accordance with Resolution **158 (WRC-15)**;

Resolution **158 (WRC-15)** resolves to invite ITU-R to study:

- “the technical and operational characteristics and user requirements of different types of earth stations in motion that operate or plan to operate within geostationary FSS allocations in the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz, including the use of spectrum to provide the envisioned services to various types of earth station in motion and the degree to which flexible access to spectrum can facilitate sharing with services identified in *recognizing further a) to n)*”;
- “sharing and compatibility between earth stations in motion operating with geostationary FSS networks and current and planned stations of existing services allocated in the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz to ensure protection of, and not impose undue constraints on, services allocated in those frequency bands, and taking into account *recognizing further a) to n)*”.

The band 18.6-18.8 GHz is allocated to the Earth exploration-satellite service (passive) on a primary basis in all three Regions and to the space research service (passive) on a secondary basis in Regions 1 and 3 and on a primary basis in Region 2.

SFCG Objective

SFCG does not oppose the use of the 17.7-19.7 GHz by earth stations in motion communicating with geostationary space stations in the fixed-satellite service as per Method B of the CPM Report provided that the protection of the EESS (passive) is ensured. SFCG notes that the introduction of ESIM for maritime and aeronautical use in the sub-band 18.6-18.8 GHz may change the sharing environment with EESS (passive) over ocean areas due to the reflections of FSS signals off of the sea.

Status

This agenda item was the responsibility of ITU-R WP 4A. Given that this agenda item focuses solely on earth stations that are receive-only in the 17.7-19.7 GHz frequency band, ITU-R WP 7C concluded that there would be no impact to the EESS (passive) as long as the satellite system downlinks comply with the established limits under the Radio Regulations.

It should be noted that WPs 3J and 7C have begun investigating potential interference from FSS downlinks in the 18.6- 18.8 GHz frequency band. Initial data indicates that reflections off bodies of water may result in a higher level of interference than originally anticipated at the time of WRC-2000.

Agenda Item 1.6 to consider the development of a regulatory framework for non-GSO FSS satellite systems that may operate in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space), in accordance with Resolution **159 (WRC-15)**;

Resolution **159 (WRC-15)** invites the ITU-R, *inter alia*, to conduct and complete, in time for WRC-19 studies of possible necessary revisions to Resolution **750 (Rev.WRC-15)** to ensure protection of the EESS (passive) in the frequency bands 36-37 GHz and 50.2-50.4 GHz from non-GSO FSS transmission, including study of aggregate FSS interference effects from networks and systems operating or planned to operate in the frequency bands 37.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space).

SFCG Objective

The CPM Report breaks this agenda item into Issue 1 (compatibility between non-GSO FSS and GSO networks) and Issue 2 (protection of EESS (passive)). Issue 1 does not relate to the concerns of the SFCG.

For Issue 2, SFCG supports the revision of the current limits in Resolution **750 (Rev. WRC-15)** for the band 50.2-50.4 GHz to protect EESS (passive) for both NGSO and GSO FSS systems, considering that studies have demonstrated that the current limits in Resolution **750 (Rev. WRC-15)** do not sufficiently protect passive services in the band. Application of other mitigation techniques proposed by the FSS community to protect EESS passive sensors would require new methodologies and corresponding regulatory mechanisms which have neither been studied nor developed. Therefore, SFCG does not support these types of mitigation techniques and is of the view that strict limits in Resolution **750 (Rev. WRC-15)** should be applied to ensure compatibility.

SFCG supports Option B in the CPM Report. However, it should be noted that this option in the CPM Report contains a number of unwanted emission limits as “*TBD*”. Based on sharing study results, SFCG supports the following unwanted emission limits:

GSO FSS:

Gateways:

- –37 dBW into the 200 MHz of the EESS (passive) band for GSO for stations with elevation angles less than 80°
- –52 dBW into the 200 MHz of the EESS (passive) band for GSO for stations with elevation angles greater than 80°

User terminals:

- –58 dBW into the 200 MHz of the EESS (passive) band for GSO user terminals.

Non-GSO FSS:

- –48 dBW into the 200 MHz of the EESS (passive) band for non-GSO gateways
- –51 dBW into the 200 MHz of the EESS (passive) band for non-GSO user terminals.

Further consideration of apportionment, based on the outcome of other agenda items in the same band, may be needed.

Concerning the date of applicability of the revised limits in Resolution **750 (Rev. WRC-15)** for FSS systems, SFCG prefers Option 1, making those limits apply to FSS systems brought into use after the date of entry into force of the Final Acts of WRC-19.

Studies have shown that compatibility between EESS (passive) and NGSO FSS in the band 36-37 GHz is achieved for most planned FSS NGSO constellations, noting however that these studies did not address the cold calibration channel. SFCG is of the view that additional consideration is required to assess the impact into EESS (passive) in the band 36-37 GHz from very low (e.g. 350 km altitude) Earth orbit constellations with a large (e.g. up to several thousand satellites) number of satellites.

It is to be noted that sharing studies for SRS and EESS earth stations in the bands 37.5-38 GHz and 40-40.5 GHz are not listed in Resolution **159 (WRC-15)**. SFCG believes that these studies have to be addressed by WP 7B through the revision of Report ITU-R SA.2307 and Recommendation ITU-R SA.2079 for the band 37.5-38 GHz, and through the development of a new Report and/or Recommendation for the band 40-40.5 GHz.

Status

This agenda item was the responsibility of ITU-R WP 4A with WP 7B and 7C as contributing groups. ITU-R WP 4A conducted studies in accordance by Resolution **159 (WRC-15)**. The results of sharing and compatibility studies with the EESS (passive) and radio astronomy service are contained in Preliminary Draft New Report ITU-R S.[50/40 GHz ADJACENT BAND STUDIES].

Studies in Working Party 4A originally indicated that there were no compatibility issues for the 36-37 GHz band due to the opposite direction of the FSS links; however, this would need to be confirmed in cases where administrations deploy FSS systems with larger constellations and lower altitudes than those previously considered. No studies were conducted by Working Party 4A related to the SRS (space-Earth) in the 37-38 GHz band and EESS (Earth-space) and SRS (Earth-space) in the 40-40.5 GHz band since they were not identified in Resolution **159 (WRC-15)**.

With respect to the 50.2-50.4 GHz band, compatibility studies in WP 4A between non-GSO FSS systems and EESS (passive) show that the limits currently in Resolution **750 (WRC-15)** are not sufficient for the protection of EESS (passive) in the adjacent 50.2-50.4 GHz band.

Some administrations and sector members support revising GSO limits under this agenda item, while other administrations and sector members feel any changes to GSO FSS systems are outside the scope of the agenda item.

Agenda Item 1.7 to study the spectrum needs for telemetry, tracking and command in the space operation service for non-GSO satellites with short duration missions, to assess the suitability of existing allocations to the space operation service and, if necessary, to consider new allocations, in accordance with Resolution **659 (WRC-15)**;

Resolution **659 (WRC-15)** calls for study of the spectrum needs for telemetry, tracking and command in the space operation service for non-GSO satellites with short duration missions (SD), to assess the suitability of existing allocations to the space operation service and, if necessary, to consider new allocations within the frequency ranges 150.05-174 MHz and 400.15-420 MHz.

SFCG Objective

SFCG recognises the need for a viable solution for NGSO short duration missions. Method A of the CPM Report would not meet the spectrum requirements of NGSO SD missions.

SFCG is of the opinion that Method C would not adversely impact SFCG Members' missions and operations.

SFCG does not support Methods B1/B2 due to the large number of radiosondes that operate in the frequency range 403-406 MHz and their susceptibility to harmful interference by the NGSO SD missions. This conclusion is based on studies on the suitability of existing allocations to the space operation service below 1 GHz, and additional sharing studies on possible new and/or

upgraded allocations, as documented in Report ITU-R SA.2427.

In addition, any new regulatory measures under this agenda item should include an unambiguous definition about what constitutes “satellites with short duration missions”.

Status

Three ITU-R reports were developed by Working Party 7B:

1. Report ITU-R SA.2425 – Studies to accommodate spectrum requirements in the space operation service for non-geostationary satellites with short duration missions. This Report contains studies that determine the spectrum requirements for short duration non-GSO systems, based on the protection criteria as outlined in Recommendation ITU-R SA.363-5. Based on the results, spectrum needs range from 0.625 MHz to 2.5 MHz in the space-to-Earth direction and from 0.682 MHz to 0.938 MHz in the Earth-to-space direction, depending on the operational scenario.
2. Report ITU-R SA.2426 – Technical characteristics for telemetry, tracking and command in the space operation service below 1 GHz for non-GSO satellites with short duration missions. This Report contains the technical and operational parameters of short duration non-GSO tracking, telemetry, and command systems. These parameters were developed to perform sharing and compatibility studies with incumbent services; the results of these studies are contained in Report ITU-R SA.2427.
3. Report ITU-R SA.2427 – Studies on the suitability of existing allocations to the space operation service below 1 GHz and additional sharing studies on possible new and/or upgraded allocations. This Report contains the results of the sharing and compatibility studies performed so far in the bands identified in the agenda item as well as in the bands where SOS currently has a secondary allocation. There were two studies from CEPT countries that indicated a possible new SOS allocation in the 403-404 MHz and 404-405 MHz; however, there were questionable assumptions, they neglected to consider all the radiosonde system types in their studies and did not apply the appropriate percentage of time based on Recommendation ITU-R RS.1263.

While all SOS frequency allocations in the Earth-to-space direction below 1 GHz are subject to RR No. **9.21**, some studies proposed that the 148-149.9 MHz frequency band would become a candidate to accommodate short duration mission requirements if the application of RR No. **9.21** is removed. The impact of removing RR No. **9.21** is under investigation.

Additionally, some studies found that spectrum needs for short duration missions could be most suitably met in the existing 137-138 MHz SOS (space-to-Earth) allocation. However, some studies are still ongoing in WP 7B on sharing and compatibility between short duration missions and in-band and adjacent band services (Annex 2 to Doc. 7B/407).

Agenda Item 1.11 to take necessary actions, as appropriate, to facilitate global or regional harmonized frequency bands to support railway radiocommunication systems between train and trackside within existing mobile service allocations, in accordance with Resolution **236 (WRC-**

15);

Resolution **236 (WRC-15)** calls for “necessary action” to facilitate global or regional harmonized frequency bands, to the extent possible, for the implementation of railway radiocommunication systems between train and trackside, within existing mobile service allocations. Depending on the results of ITU-R studies this may include the identification and/or allocation of appropriate spectrum.

SFCG Objective

SFCG supports no change to the Article **5** of Radio Regulations under this agenda item (Method A). Railway radiocommunication systems between train and trackside may continue to operate in existing allocations to the mobile service. Harmonization can be achieved through ITU-R Recommendations or Reports encouraging administrations to use globally or regionally harmonized bands.

SFCG is concerned by the consideration for harmonized use for railway communications of frequency bands which would impact important bands for scientific services (400-406 MHz, 460-470 MHz, 86-92 GHz and 100-102 GHz).

Status

This agenda item was the responsibility of ITU-R WP 5A.

WP 7C has been working cooperatively with WP 5A on the issue of potential out-of-band (OOB) interference into EESS (active) systems in the 94-94.1 GHz frequency band from railway systems (RSTT) proposed to operate in adjacent bands of 92-94 GHz and 94.1-100 GHz. WP 5A considers this aspect of RSTT to be outside the scope of AI 1.11. Nevertheless, the SFCG will continue its work on this compatibility issue as a separate item outside of WRC-19 preparation process.

WP 5A developed a Working Document Towards a Preliminary Draft New Report ITU-R M.[90GHZ.RSTT.COEXIST] on coexistence of railway radiocommunication system between train and trackside operating in the frequency bands 92-94 GHz, 94.1-100 GHz and 102-109.5 GHz, and active and passive services (Annex 8 to Document 5A/1065). This Report was not be completed prior to WRC-19.

Agenda Item 1.12 to consider possible global or regional harmonized frequency bands, to the maximum extent possible, for the implementation of evolving Intelligent Transport Systems (ITS) under existing mobile service allocations, in accordance with Resolution **237 (WRC-15)**;

Resolution **237 (WRC-15)** calls for WRC-19 to consider possible global or regional harmonized frequency bands for the implementation of evolving ITS under existing mobile service allocations.

SFCG Objective

SFCG supports “no change” under this agenda item in accordance with CPM Report Method A.

ITS may continue to operate in existing allocations for the mobile service. Harmonization can be achieved through ITU-R Recommendations or Reports encouraging administrations to use globally or regionally harmonized bands.

Status

This agenda item was the responsibility of ITU-R WP 5A. The CPM Report proposes three Methods to satisfy this agenda item. All three Methods include no change to Article 5 of Radio Regulations. However, two of the Methods propose a Resolution encouraging administrations to use globally and regionally harmonized frequency bands. It is believed that ITS may continue to operate in existing mobile service allocations and that harmonization can be achieved through the preparation of ITU-R Recommendations or Reports.

Agenda Item 1.13 to consider identification of frequency bands for the future development of International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution **238 (WRC-15)**;

Resolution **238 (WRC-15)** resolves that the appropriate sharing and compatibility studies are to take “into account the protection of services to which the band is allocated on a primary basis, for the frequency bands:

- 24.25-27.5 GHz, 37-40.5 GHz, 42.5-43.5 GHz, 45.5-47 GHz, 47.2-50.2 GHz, 50.4-52.6 GHz, 66-76 GHz and 81-86 GHz, which have allocations to the mobile service on a primary basis; and
- 31.8-33.4 GHz, 40.5-42.5 GHz and 47-47.2 GHz, which may require additional allocations to the mobile service on a primary basis.”

The appropriate sharing and compatibility studies were to include studies with respect to services in adjacent bands, as appropriate. “When conducting studies in the band 24.5-27.5 GHz the need to ensure the protection of existing earth stations and the deployment of future receiving earth stations under the EESS (space-to-Earth) and SRS (space-to-Earth) allocation in the frequency band 25.5- 27 GHz will be taken under account.”

The consideration of the frequency bands targeted by WRC-19 agenda item 1.13 involves several adjacent bands used by passive sensing instruments for which the possible impact of unwanted emissions into the passive bands need to be studied. The following table shows which passive sensing bands could be affected by such unwanted emissions of 5G (IMT-2020) deployments:

| EESS (passive) band | 5G (IMT-2020) band |
|---------------------|--------------------|
| 23.6-24 GHz | 24.25-27.5 GHz |

| | |
|----------------|-------------------------------|
| 31.3-31.8 GHz | 31.8-33.4 GHz |
| 36-37 GHz | 37-43.5 GHz |
| 50.2-50.4 GHz | 47.2-50.2 GHz & 50.4-52.6 GHz |
| 52.6-54.25 GHz | 50.4-52.6 GHz |
| 86-92 GHz | 81-86 GHz |

SFCG Objective

SFCG supports the protection of existing space science service allocations. No new allocation/identification of spectrum to support mobile broadband systems (IMT-2020) should be made in or adjacent to bands allocated to space science services unless acceptable criteria and mandatory conditions are developed and implemented that ensure the protection and future usability of the concerned bands by those services. SFCG does not support consideration of any frequency band that is not included in the list of potential candidate bands as identified in Resolution **238 (WRC-15)**.

Regarding the issue of in-band sharing, a particularly critical situation concerns the band 25.5- 27 GHz which constitutes the only frequency band allocated to EESS and SRS (space-to-Earth) that allows for the transmission of the large data volume required by many current and future EESS and SRS satellite missions. As recognized in Resolution **238 (WRC-15)** (footnote 2 of *resolves 2*) for the 25.5-27 GHz band, it is important for SFCG Member Agencies to be assured that EESS and SRS earth stations will continue to be able to expand in the future both in terms of number of satellites serviced and number of earth stations. Licenses for these earth stations, which inherently provide protection from interference by IMT-2020 systems, must not be denied or restricted on the basis that such action may limit the IMT-2020 operational areas. Negative licensing experiences in the past with earlier cellular mobile systems in the band 2110-2120 MHz must not be repeated.

Internationally agreed mandatory mechanisms and criteria should therefore be identified to ensure the future availability of these earth station licences. It is necessary to ensure, through an ITU-R review process, that the main characteristics of IMT-2020 deployment will be consistent with those assumed in all compatibility studies. Further, protection of earth stations needs to be codified in the ITU-R to ensure consistency across administrations; protection of earth stations should not be considered as strictly a domestic issue.

In addition, SFCG is of the view that provision of RR No. **5.536A**, which states that “*Administrations operating earth stations in the Earth exploration-satellite service or the space research service shall not claim protection from stations in the fixed and mobile services operated by other administrations*” should not apply to IMT-2020 stations in the mobile service.

Protection of the various EESS (passive) bands potentially impacted by IMT-2020 under this Agenda Item (23.6-24 GHz, 31.3-31.8 GHz, 36-37 GHz, 50.2-50.4 GHz, 52.6-54.25 GHz and

86-92 GHz) must be ensured. The SFCG therefore is of the view that appropriate mandatory unwanted emission limits for IMT-2020 devices must be established. For most of these bands, RR No. **5.340** applies.

All studies presented in ITU-R confirm that only a significant reduction in the IMT-2020 unwanted emissions levels provided by WP 5D (in particular, in the band 23.6-24 GHz) can ensure protection of EESS (passive). The SFCG is concerned that the current operational specifications for IMT-2020 indicate that the IMT-2020 systems will be unable to comply with the unwanted emission levels determined in the studies. The SFCG is of the view that an IMT allocation/identification should not be made unless the proponents of IMT-2020 clearly demonstrate the ability to comply with the needed unwanted emission limits to ensure the protection of the EESS (passive). Relevant unwanted emission limits will have to be implemented in the Radio Regulations, either by inclusion in Table 1 of Resolution **750 (Rev.WRC-15)** for the passive bands covered by RR No. **5.340**, or by inclusion in the Resolution applicable to IMT-2020 for the band 36-37 GHz.

SFCG supports studies by SFCG Member Agencies submitted to TG 5/1 which concluded that unwanted emission limits in the range of -55 to -49 dBW/200 MHz for base stations and -51 to -45 dBW/200 MHz for user equipment would be required to protect EESS (passive) in the band 23.6-24 GHz.

For the frequency band 24.25-27.5 GHz, SFCG is strongly opposed to the CPM Report Option 4 (deletion of Table 1-2 of ITU-R Resolution **750 (Rev.WRC-15)**) because it is in total contradiction with the intent and scope of WRC-19 Agenda item 1.13).

SFCG is also opposed to all options that state “no condition is necessary” for the protection of EESS (passive) bands since it is inconsistent with all ITU-R study results.

Other specific concerns of SFCG are:

- Protection of the 25.25-27.5 GHz band allocated to inter-satellite service (ISS) on primary basis, used for data relay satellite return links;
- Protection of the 31.8-32.3 GHz band allocated to SRS deep space (s-E) on primary basis, used for transmitting data to the Earth from distant locations in space;
- Protection of the 37-38 GHz band allocated to SRS (space-to-Earth), and the 40-40.5 GHz band allocated to EESS/SRS (Earth-to-space).

SFCG also considers that frequency overlaps with other WRC-19 Agenda items (1.6 and 1.14) needs to be taken into account.

Status

ITU-R TG 5/1 was the responsible group for this agenda item with WPs 7B and 7C as contributing groups. This group finalized technical studies and draft CPM Text during its last meeting in August 2018. These studies did not lead to any ITU-R Report or Recommendations but are only included in the TG 5/1 Report (document 5-1/478). Studies on many sharing and compatibility cases were not concluded and a variety of studies are included in the TG 5/1 Report.

All studies were required to use typical values of technical parameters (as given in Annex 1 of document 5-1/478) except for sensitivity analyses that were performed based on alternate base station power level, antenna size and population-based deployment. However, doubts about some parameters used in TG 5/1 are still present, such as the IMT-2020 antenna pattern in the unwanted emissions domain.

SFCG members performed site-specific studies pertaining to meeting EESS and SRS earth station protection criteria which resulted in significant differences in required separation distances when compared to other non-site-specific studies. These studies have identified the need for separation distances or exclusion zones to protect EESS and SRS earth stations. WP 7B developed Draft New Recommendation ITU-R SA.[IMT-EES/SRS COORDINATION] providing methodologies for calculating coordination zones around EESS and SRS earth stations to avoid harmful interference from IMT-2020 systems in the frequency bands 25.5-27 GHz and 37-38 GHz. This Recommendation was agreed by Study Group 7 in June 2019.

Regarding the issue of the IMT-2020 unwanted emissions into the EESS (passive) bands, it should be noted that the unwanted emission levels for the IMT-2020 devices provided by WP 5D are much higher than would be expected from these types of devices; therefore, at these levels IMT-2020 devices would cause harmful interference to all EESS (passive) systems operating in bands adjacent to the bands under consideration for IMT-2020.

A large number of studies have been submitted by administrations and sector members to TG 5/1 on the compatibility between IMT-2020 and EESS (passive) in all frequency bands and in particular in relation to the protection of the 23.6-24 GHz band. All studies confirm that only a significant reduction in IMT-2020 unwanted emissions can ensure protection of EESS (passive), although conclusions of these studies depict a huge range of values, in particular in the band 23.6-24 GHz (e.g., -26 to -55 dBW/200 MHz for Base Stations). It should be noted that most study results are based on the most restrictive sensor, F3, but results obtained for the sensors F2 and F8 are similar.

For the 23.6-24 GHz band, when using the TG 5/1 agreed baseline assumptions (i.e., IMT 2020 single element pattern, baseline BS distribution, apportionment of EESS (passive) protection criteria), studies depict very similar results, leading to the following range of necessary IMT-2020 stations unwanted emissions levels:

- For base station (BS): from -42 to -49 dBW/200 MHz
- For user equipment (UE): from -38 to -45 dBW/200 MHz

Analysis of the TG 5/1 conclusions makes it clear that the differences with studies presenting higher allowable unwanted emission levels are due to differences in assumptions, departing from the baseline agreed in TG 5/1. This is the case for the IMT-2020 antenna pattern for which IMT industry and some administrations have been claiming that the M.2101 “beamformed” model should apply, in contradiction with elements proposed by WP 5D, without any evidence. Also, IMT industry and some administrations are denying the necessary apportionment of the EESS (passive) protection criteria, even though it has been duly justified and requested by WP 7C.

Two ISS interorbital return link studies that used the typical value parameter set showed minimum positive protection margins on the order of 10 dB. Other studies showed much larger margins. One administration put forth an initial study that included the effect of intra-system interference from

an adjacent DRS resulted in a negative protection margin.

CPM19-2 further addressed the CPM text on agenda item 1.13 but produced a highly confusing and bulky text that is rather difficult to summarize and containing an incredible amount of views.

Agenda Item 1.14 to consider, on the basis of ITU-R studies in accordance with Resolution **160 (WRC-15)**, appropriate regulatory actions for high-altitude platform stations (HAPS), within existing fixed service allocations;

Resolution **160 (WRC-15)** calls for studies to be conducted to facilitate access to broadband applications delivered by HAPS, including additional spectrum needs for gateway and fixed terminal links for HAPS. One of the tasks under WRC-19 agenda item 1.14 is to undertake studies to assess the spectrum needs of HAPS in the frequency bands of 38-39.5 GHz on a global level and 21.4-22 GHz and 24.25-27.5 GHz in Region 2.

In addition, agenda item 1.14 calls for a review of the existing identifications for HAPS in order to facilitate the use of HAPS links on a global or regional level. This includes consideration of some bands of SFCG interest: 6440-6520 MHz, 6560-6640 MHz and 31-31.3 GHz.

It is to be noted that HAPS downlinks will have a more severe impact to EESS and SRS receiving earth stations than HAPS uplinks. However, HAPS uplinks may have potential impact on adjacent band EESS (passive) sensor operations.

SFCG Objective

SFCG prefers Method A, “no change” for all bands under consideration.

Any change in the conditions for HAPS in the bands 6440-6520 MHz and 6560-6640 MHz should not adversely impact the passive sensor measurements operated as per RR No. **5.458**. Similarly, conditions for HAPS in the 31-31.3 GHz band should provide adequate protection to EESS passive in the 31.3-31.8 GHz band. Identification of the band 38-39.5 GHz for HAPS should also consider the protection of SRS earth stations in the 37-38 GHz band.

If ITU-R studies show a need for identification of additional spectrum for HAPS in Region 2, SFCG does not support the identification of frequency bands in 21.4-22 GHz and 24.25-27.5 GHz for HAPS unless acceptable sharing conditions are agreed upon that do not adversely impact the space research, Earth exploration-satellite, or inter-satellite services. Further, it is the view of SFCG that conditions for the protection of the EESS passive bands 21.2-21.4 GHz, 22.21-22.5 GHz and 23.6-24 GHz should be established.

As with WRC-19 Agenda item 1.13, a particularly critical situation concerns the band 25.25-27.5 GHz which is heavily used globally for high data volume downlinks by many current and future EESS and SRS satellite missions. Within this band, inter-satellite links must also remain protected. This band is indicated as a candidate band for HAPS identification only for Region 2. If such an identification is made, it should be accompanied by a WRC-19 Resolution which includes

adequate protection for the ISS, EESS and SRS. In addition, SFCG is of the view that provision of RR No. **5.536A** should not apply to HAPS stations in the fixed service in Region 2.

Status

This agenda item was the responsibility of ITU-R WP 5C and WP 7B and 7C were contributing groups. The CPM Report provides several methods to address the issue in different bands, including the bands currently identified for HAPS.

These methods propose an identification of certain bands on a primary basis, or on a secondary basis, with additional appropriate provisions to protect incumbent services, including science services. The protection of EESS (passive) either in-band (6 GHz) or in adjacent bands has been addressed and EIRP masks have been defined and included in the relevant draft Resolutions to this effect.

The protection of EESS and SRS data links at 26 GHz from HAPS in the same band would be ensured through the establishment of pfd masks to be met at the earth station locations. The protection of SRS data links at 37 GHz from HAPS operating above 38 GHz would be ensured through a specific provision identifying the required SRS protection criterion. The WP 5C work on WRC-19 Agenda item 1.14 resulted in the development of:

- Report ITU-R F.2439 – Deployment and technical characteristics of broadband high-altitude platform stations in the bands 6 440-6 520 MHz, 6 560-6 640 MHz, 21.4-22.0 GHz, 24.25-27.5 GHz, 27.9-28.2 GHz, 31.0-31.3 GHz, 38.0-39.5 GHz, 47.2-47.5 GHz and 47.9-48.2 GHz to be used in sharing and compatibility studies;
- Report ITU-R F.2438 – Spectrum needs of high-altitude platform stations (HAPS) broadband links operating in the fixed service.

The following draft new ITU-R Reports on HAPS system sharing and compatibility have been developed (one per frequency band addressed):

- F.[HAPS-6 GHz],
- F.[HAPS-21 GHz],
- F.[HAPS-25 GHz],
- F.[HAPS-31 GHz],
- F.[HAPS-39 GHz],
- F.[HAPS-47 GHz].

Agenda Item 1.15 to consider identification of frequency bands for use by administrations for the land-mobile and fixed services applications operating in the frequency range 275-450 GHz, in accordance with Resolution **767 (WRC-15)**;

Resolution **767 (WRC-15)** calls for sharing and compatibility studies regarding the introduction of land-mobile and fixed services into the frequency range 275-450 GHz. RR No. **5.565** identifies nine of the bands in this frequency range for use by administrations for EESS (passive) and SRS (passive) applications: 275-286 GHz, 296-306 GHz, 313-356 GHz, 361-365 GHz, 369-392 GHz,

397-399 GHz, 409-411 GHz, 416-434 GHz and 439-467 GHz.

SFCG Objective

SFCG supports the conclusions of the technical studies performed in ITU- R showing that a large amount of spectrum within the 275-450 GHz range could be identified for FS and MS applications, except for the bands 296-306 GHz, 313-318 GHz and 333-356 GHz that, as a result of ITU-R compatibility studies, were deemed incompatible with the existing Earth exploration-satellite service (passive).

Therefore, SFCG supports methods which provide identification for land-mobile and fixed service use of the frequency bands outside of the bands 296-306 GHz, 313-318 GHz and 333-356 GHz. SFCG highlights that this could lead to more than 137 GHz of spectrum identified for LMS and FS applications which far exceeds their stated spectrum requirements.

SFCG opposes any regulatory solution which does not include specific regulatory means to protect EESS (passive) and which is not proven to be effective. Consequently, SFCG opposes Method C and Method F of the CPM Report.

Status

This agenda item was the responsibility of ITU-R WP 1A and WP 7C was a contributing group.

WP 7C provided WP 1A input stating that pending confirmation of the compatibility studies results the ranges 275-296 GHz and 399-416 GHz would represent the two largest contiguous pieces of spectrum where MS and FS applications could compatibly operate. This conclusion was based on bands where limb sounding was conducted, and compatibility issues would be less significant. Other frequency bands where vertical sounding is conducted would likely result in more significant compatibility issues. To support the work of this agenda item WP 7C developed Report ITU-R RS.2431, which provides the characteristics of the passive systems operating in the 275-450 GHz frequency range.

The CPM Report contains 7 methods to satisfy the agenda item. All methods, except for the NOC method, proposed some variation of either modifying the current RR No. **5.565** and/or adding a new footnote to designate frequency bands for operation of the fixed and mobile services.

WP 5A and WP 5C have finalized the reference Reports providing the necessary parameters of land mobile service (LMS) and fixed service (FS) applications to be used for sharing and compatibility studies that have been approved by Study Group 5:

- Report ITU-R M.2417 on “Technical and operational characteristics of land mobile service applications in the frequency range 275-450 GHz”;
- Report ITU-R F.2416 on “Technical and operational characteristics and applications of the point-to-point fixed service applications operating in the frequency band 275-450 GHz”.

Studies from ESA/EUMETSAT, Russia and the US included in Report ITU- R SM. 2450, indicate

that the 275-296 GHz, 306-313 GHz, 320-330 GHz and 356-450 GHz ranges could be identified for land mobile and/or fixed service applications without the need for regulatory provisions such as power limits, elevation angle restrictions etc.

Studies presented in Report ITU-R SM. 2450 have shown that in the ranges 296-306 GHz, 313-318 GHz and 333-356 GHz, FS and MS applications will not be compatible with EESS (passive) nadir and conical scan instruments and are therefore not suitable for FS/MS identification.

Agenda Item 1.16 to consider issues related to wireless access systems, including radio local area networks (WAS/RLAN), in the frequency bands between 5 150 MHz and 5 925 MHz, and take the appropriate regulatory actions, including additional spectrum allocations to the mobile service, in accordance with Resolution **239 (WRC-15)**;

The 5250-5570 MHz portion of the band is allocated worldwide on a primary basis to the EESS (active) and SRS (active) services and the 5350-5470 MHz portion currently has no mobile allocation. The EESS (active) allocation in 5350-5470 MHz supports several Earth observation missions including Sentinel-1, Sentinel-3, Sentinel-6, JASON, SCA, Radarsat-2, and Radarsat-3. Part of the work of WRC-19 agenda item 1.16 is to conduct further sharing studies to identify RLAN mitigation techniques that may facilitate sharing between WAS/RLAN systems and incumbent services in the 5150-5350 MHz, 5350-5470 MHz, 5725-5850 MHz, and 5850-5925 MHz bands. This includes studies to identify mitigation techniques that may allow sharing between WAS/RLAN systems and EESS (active) and SRS (active) systems in the 5350-5470 MHz band.

SFCG Objective

The primary SFCG frequency bands of interest under this agenda item are 5250-5350 MHz and 5350-5470 MHz. With respect to these two bands, SFCG supports “no change” to the Radio Regulations, which are Methods B and C of the CPM Report for these two bands.

Studies have shown that a change of RLAN technical conditions in 5250-5350 MHz and a new mobile service allocation for RLAN in 5350 -5470 MHz would not be compatible with all EESS (active) instrument types (altimeters, scatterometers and SAR).

Status

This agenda item was the responsibility of ITU-R WP 5A with WP 7C as a contributing group. WP 5A reached consensus for a “no change” method for the 5250-5350 MHz and 5350-5470 MHz frequency bands reflecting a practically unanimous view that no mitigation techniques have been found for the protection of EESS or the radiodetermination service.

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)**, in order to facilitate rational, efficient and

economical use of radio frequencies and any associated orbits, including the geostationary-satellite orbit;

This standing agenda item to the WRC deals with any possible changes to the Radio Regulations affecting the advance publication, coordination, notification and recording of satellite networks.

SFCG Objective

SFCG supports possible changes to the Radio Regulations to improve the handling of the advance publication, coordination, notification and recording procedures for satellite networks. SFCG shall monitor all the issues covered under this agenda item to ensure that any possible change will not adversely impact space science services.

There are currently issues A through K under this Agenda Item. SFCG has identified Issues A, D, H and I of specific interest to space science services:

Issue A: This issue involves development of a general definition of: 1) bringing into use (BIU) for NGSO systems and 2) the implementation of a milestone-based deployment approach for specific services and bands.

SFCG does not support the adoption of revisions that would impose undue constraints in operation of satellites in the space science services.

SFCG is of the opinion that the proposed changes should only be applicable to FSS or MSS non-GSO constellations or systems subject to coordination under Section II of Article 9.

The CPM Report contains a single Method to satisfy this issue under Agenda Item 7. However, there are several options for changes to the BIU and several options for the FSS and MSS milestone approach.

With respect to the BIU of NGSO systems, the SFCG supports either Option C (no requirement for a fixed period before confirming BIU) or option D (a period less than or equal to 90 days for the BIU of frequency assignments subject to section II of Article 9 of the RR, but no fixed period otherwise) of the CPM text. SFCG opposes any changes in BIU which require a continuous deployment period of more than 30 days for the space science services.

Further, with respect to the milestone-based deployment approach, SFCG is of the opinion that the proposed changes should only be applicable to FSS or MSS non-GSO constellations or systems subject to coordination under Section II of Article 9. SFCG opposes inclusion of the space science services in the milestone-based approach.

Additionally, under Issue A is consideration of the orbital tolerances for the inclination, apogee, perigee and argument of perigee. The consideration of these tolerances is opposed by SFCG unless there is a clear understanding of how this will impact missions in the space science services which do not require or do not have the adequate propulsion resources to perform station keeping and

whose orbit will degrade over time.

Issue D: This issue relates to the publication of a list of potentially affected networks at the time of coordination which may be useful for SFCG members.

SFCG supports either Method D1 or D2 of the CPM Report.

Under method D1, it is proposed to add the requirements to have:

- a pre-compiled list of potentially affected satellite networks and/or systems, published for information only, included in the CR/C Special Section for coordination under RR Nos. **9.12**, **9.12A** and **9.13**, by stipulating it in RR No. **9.36.1**;
- the definitive list of affected satellite networks or systems to be considered when effecting coordination under RR Nos. **9.12**, **9.12A** and **9.13** to be included in the CR/D Special Section by stipulating it in RR No. **9.53A**.

Under method D2, it is proposed to add the requirements to have the list of satellite networks or systems potentially affected included in the CR/C Special Section for coordination under RR Nos. **9.12**, **9.12A** and **9.13** for information only, by stipulating it in RR No. **9.36.1**.

Issue H: This issue introduces additional orbital data in the NGSO API describing a non-GSO satellite when submitting an API and/or CR/C filing. It proposes in particular a new mandatory item within the Appendix 4 to specify whether the orbit is sun synchronous or not, and an optional item, providing the local time of the ascending node (LTAN) for sun-synchronous orbits.

This would allow the proper modelling of the orbit of new satellite network filings and may also be of use to SFCG members. SFCG supports the initiative which is the only Method in the CPM Report.

Issue I: This issue involves a simplified regulatory regime for short duration missions, defined specifically as mission with less than [10/TBD] satellites with period of validity less than three years. SFCG can support modifying the procedures for filing satellites under RR Articles **9** and **11** as long as there is sufficient safeguards in place to ensure a simplified and/or expedited filing process cannot be exploited nor impact the space science services.

SFCG does not support any simplification of the Radio Regulations that would have a negative impact on the use of the bands such as the 2 GHz data links bands for EESS and SRS.

Status of all AI 7 issues:

Agenda item 7 was the responsibility of ITU-R WP 4A. WP 4A identified and discussed multiple issues for this agenda item:

Issue A – This Issue addresses bringing into use (BIU) for non-GSO FSS or MSS networks/systems, and a milestone approach for large constellations in specific bands. It is noted that some of the methods proposed would also have an impact on the BIU of other NGSO systems

such as EESS and SRS, including a proposed general definition of BIU for NGSO systems that would apply to all NGSO systems in all band and services. The proposed definition is:

A frequency assignment to a space station in a non-geostationary-satellite orbit shall be considered as having been brought into use when a space station in the non-geostationary-satellite orbit with the capability of transmitting or receiving that frequency assignment has been deployed and maintained on one of the notified orbital planes of the non-geostationary satellite system for a continuous period of X days ...

where the proposals for X are X=0, $0 \leq X \leq 90$ and X=90.

Issue A also includes consideration of mandatory orbital tolerances for the inclination, apogee, perigee and argument of perigee. This may be problematic for SFCG member missions that do not have adequate propulsion resources and whose orbit will degrade over time.

In addition, there was consideration of an option to apply the milestone-based deployment approach to all co-primary allocated services in the specific bands, which if adopted would affect several bands where space sciences services have primary allocations.

Issue D – “Identification of those specific satellite networks and systems with which coordination needs to be effected under RR Nos. **9.12**, **9.12A** and **9.13**”.

This issue addresses the Bureau’s identification of coordination requirements under RR Nos. **9.12**, **9.12A**, **9.13**, and possibly **9.21**. Specifically, this Issue seeks to align the provisions of: RR No. **9.36.1** under which the BR publishes a list of potentially affected administrations only and RR No. **9.36.2** under which a specific list of potentially affected networks or earth stations is published.

The CPM Report identifies 2 cases where the Bureau compiles a list including all the specific networks, systems and earth stations where coordination is required. The analysis highlights that only a list of administrations potentially affected, and not a list of potentially affected GSO networks or non-GSO systems for which those administrations are responsible, are in the CR/C Special Section covered under RR Nos. **9.12**, **9.12A** and **9.13**, and that this list is for information purposes only. Three tasks that each potentially affected administrations need to carry out are identified and that these tasks should be carried out within four months from the date of publication of the BR IFIC. There is further consideration to require the potentially affected administrations to identify in their comments the list of the affected satellite networks or systems on the basis of the lists published in the CR/C Special Section, and two main advantages are included for providing comments.

There are two methods to satisfy the agenda item:

- The first (D1) would add the requirements to have a) a pre-compiled list of potentially affected satellite networks and/or systems, published for information only, included in the CR/C Special Section for coordination under RR Nos. **9.12**, **9.12A** and **9.13**, by stipulating it in RR No. 9.36.1; b) the definitive list of affected satellite networks or systems to be considered when effecting coordination under RR Nos. **9.12**, **9.12A** and **9.13** to be included in the CR/D Special Section by stipulating it in RR No. **9.53A**.

- The second (D2) would add the requirements to have the list of satellite networks or systems potentially affected included in the CR/C Special Section for coordination under RR Nos. **9.12**, **9.12A** and **9.13** for information only, by stipulating it in RR No. **9.36.1**. As opposed to Method D1, no further action will be required from the notifying administrations for the list of satellite networks/systems following the publication of the R/C.

Issue H – “Modifications to RR Appendix 4 items to be provided for non-geostationary satellite systems not subject to the procedures of Section II of RR Article 9” modifies the RR Appendix 4 data elements which are to be provided for non-geostationary satellite networks/systems. In the CPM Report, “issue H relates to the need to ensure that enough orbital characteristics are provided in the advance publication information (API) for frequency assignments to non-geostationary (non-GSO) satellite systems in bands not subject to coordination under Section II of RR Article 9 which would allow potentially affected administrations to model a non-GSO satellite system as soon as the API is published.”

There is one method to satisfy issue H under this agenda item. This method proposed new RR Appendix 4 data elements be added to APIs and notifications for frequency assignments to non-GSO satellite systems in bands not subject to coordination under Section II of RR Article 9. The regulatory and procedural considerations include modifying Table A of Annex 2 under Appendix 4.

Issue I – “Simplified regulatory regime for non-GSO satellite systems with short duration missions.”

The CPM Report includes information on how experimental licensing is being used or misused, the definition of launch, the definition of non-GSO satellite systems with short duration missions, what provisions in RR Article 11 apply including those systems that are outside of the provisions of RR Article 9 Section II, the BR’s role and notification timing, and the current regulatory impact on small, developing nations.

The outcome of these discussions is included in the CPM Report, which includes under the Method to satisfy the issue, a Draft New Resolution. This new WRC Resolution, which together with an associated regulatory regime for non-GSO satellite systems with short duration missions is a proposed Modifications to RR Article 9, Article 11, and Annex 2 Table A (Characteristics of satellite networks, earth stations or radio astronomy stations) to address a frequency assignment to a non-GSO satellite system with short duration missions are included. The purpose of this document is to accelerate the process for non-GSO satellite systems with short duration missions and address the issues of modification to the existing regulatory procedures. This Resolution requires the BR to publish these missions in a new special section within two months, and urges administrations submit comments to the submitting administrations as soon as possible but not later than 4 months. It also defines the BIU for these mission as the launch date and exempts these types of mission from certain provisions in RR Article 11, **11.47** and **11.49** etc.

Agenda Item 9.1 (Issue 9.1.1) Resolution 212 (Rev.WRC-15) - Implementation of International Mobile Telecommunications in the frequency bands 1 885-2 025 MHz and 2 110-

2200 MHz

Resolution **212 (Rev.WRC-15)** calls for the study of measures to ensure compatibility between the MSS and IMT networks using the above bands. One of these bands is adjacent to the downlink band 2 200-2 290 MHz which is widely used by the space science services. Recommendations ITU-R M.2070 and M.2071 dealing with unwanted emissions from base and mobile IMT stations respectively as well as Recommendation ITU-R M.1036 dealing with frequency arrangements do recognize the requirement to protect the adjacent band without specifying limits.

SFCG Objective

SFCG should continue to monitor the proposals addressing this issue that could degrade the use of the 2200-2290 MHz and 2025-2110 MHz bands by the space science services. It is to be noted that unwanted emissions by SRS/EESS/SOS (Earth- to-space) may in turn interfere with terrestrial IMT and satellite-based IMT (MSS) in the 1885- 2025 MHz band.

Status

This issue was the responsibility of ITU-R WPs 4C and 5D. Preliminary studies by WP 4C show that coexistence in co-coverage between terrestrial IMT and MSS (IMT satellite component) is not feasible. It appears that compatibility problems exist also when the terrestrial IMT implementation is taking place in countries adjacent to countries where MSS operates.

Agenda Item 9.1 (Issue 9.1.4) Resolution 763 (WRC-15) - Stations on board sub-orbital vehicles

Resolution **763 (WRC-15)** invites administrations to conduct studies to identify any required technical and operational measures, in relation to stations on board sub-orbital vehicles, that could assist in avoiding harmful interference between radiocommunication services, and to determine any spectrum requirements for sub-orbital vehicles. The Resolution notes that developments related to aircraft and other vehicles has resulted in a situation where these craft may fly beyond the nominally accepted boundary between Earth's atmosphere and space (100 km altitude), crossing the boundary between space communications and terrestrial communications. These vehicles have communications requirements (such as telemetry, tracking, control and voice communications) that are not adequately covered by the current regulatory provisions and procedures for terrestrial and space services. Resolution **763 (WRC-15)** further notes that the spectrum requirements for TT&C and voice communications on stations on board sub-orbital vehicles have not been studied.

SFCG Objective

SFCG supports “no change” to the Radio Regulation under this issue. However, SFCG supports a new Agenda Item for WRC-23 under WRC-19 Agenda Item 10 to allow revisions to the Radio

Regulations, to provide regulations for radiocommunications for sub-orbital vehicles and to facilitate the safe integration of sub-orbital vehicles into the existing air traffic management system.

Status

This issue was the responsibility of ITU-R WP 5B with WP 7B as a concerned group. Working Party 5B has sent for approval to Study Group 5 a Draft Report ITU-R M.[Suborbital Vehicles] which defines the technical and operational characteristics of suborbital vehicles.

The CPM Report on WRC-19 Agenda Item 9.1, Issue 9.1.4 concludes that at this stage “no change” is required to the Radio Regulations because further operational, technical and regulatory issues need to be addressed. No recommendation was made to retain, revise or suppress Resolution 763 (WRC-15).

Agenda Item 9.1 (Issue 9.1.9) Resolution 162 (WRC-15) - Studies relating to spectrum needs and possible allocation of the frequency band 51.4-52.4 GHz to the fixed-satellite service (Earth-to-space)

Resolution **162 (WRC-15)** states in *considering* d) "that fixed-satellite applications in spectrum above 30 GHz, such as feeder links, should be easier to share with other radiocommunication services than high-density fixed-satellite service (HDFSS) applications".

SFCG Objective

The SFCG believes that new allocations should not be made as result of consideration of BR Director’s Report.

The SFCG objective is to ensure that any allocation in the band 51.4-52.4 GHz will not adversely impact the EESS (passive) allocations in the bands 52.6-54.25 GHz and 50.2-50.4 GHz (both covered under RR No. **5.340**).

SFCG is of the view that any new FSS allocation in the band 51.4-52.4 GHz can only be made provided that Resolution **750 (Rev. WRC-15)** is revised to include appropriate unwanted emission levels to protect EESS (passive).

Status

This issue was the responsibility of ITU-R WP 4A and WP 7C was a concerned group.

ITU-R WP 4A, as the responsible group for WRC-19 agenda item 9.1, issue 9.1.9, has conducted studies required by Resolution **162 (WRC-15)**. The results of analysis of additional spectrum needs are contained in Report ITU-R S.[7/65]. The results of sharing and compatibility studies with incumbent services including the FS, the MS, the EESS (passive), RAS, and sharing with potential IMT-2020 applications are contained in DN Report ITU-R S.[7/67]. Both Reports were

approved by SG 4 at its 5 July meeting.

Agenda Item 10

To recommend to the Council items for inclusion in the agenda for the next WRC, and to give its views on the preliminary agenda for the subsequent conference and on possible agenda items for future conferences, in accordance with Article 7 of the Convention.

SFCG Objective

General principles

It is very important to ensure that before any new agenda item is agreed at WRC-19, the following elements are already available:

1. Clear demonstration and quantification of the spectrum requirements.
2. Technical and operational parameters of the new systems for which modification of the RR is proposed.
3. Identification of the exact bands to be considered for regulatory changes.
4. Preliminary studies on the feasibility of sharing in these bands.

Taking into account Resolution **804 (rev. WRC-12)**, SFCG is of the view that adherence to these principles should be made conditional for adoption of any new WRC agenda item. It should be noted that application of these principles by the space sciences community is demonstrated in the WRC-23 preliminary agenda items 2.2 and 2.3 discussed below.

Preliminary Agenda WRC-23 (Resolution 810)

Agenda Item 2.2 to conduct, and complete in time for WRC-23, studies for a possible new allocation to the Earth exploration-satellite (active) service for spaceborne radar sounders within the range of frequencies around 45 MHz, taking into account the protection of incumbent services, in accordance with Resolution **656 (WRC-15)**;

The topic of this WRC-23 Agenda item has been on prior SFCG Objectives lists of items of interest for consideration at future World Radio Conferences. The frequency range under consideration has incumbents which include fixed, mobile, and broadcasting services on a primary basis, as well as space research service as a secondary service. Country footnotes for the 40-50 MHz frequency range provide primary allocations for the aeronautical radionavigation and radiolocation services in certain parts of the world.

SFCG Objective

The SFCG supports studies examining the compatibility of the proposed EESS (active) operations around 45 MHz with the incumbents. SFCG supports inclusion of this agenda item in the WRC-

23 agenda.

Status

This draft agenda item was the responsibility of ITU-R WP 7C. Using characteristics of incumbent systems provided by the contributing groups, WP 7C has begun work on the required sharing studies. A revision of Recommendation ITU-R RS.2042 on typical technical and operating characteristics for spaceborne radar sounder systems using the 40-50 MHz frequency band has been completed.

SG 7 approved Report ITU-R RS 2455 describing the status of the studies on the results of sharing between a 45 MHz radar sounder and incumbent fixed, mobile, broadcasting and space research services operating in the 40-50 MHz frequency range.

Agenda Item 2.3 in accordance with Resolution **657 (WRC-15)**, to review the results of studies relating to the technical and operational characteristics, spectrum requirements and appropriate radio service designations for space weather sensors, with a view to providing appropriate recognition and protection in the Radio Regulations without placing additional constraints on incumbent services;

For over 60 years, the study of solar-terrestrial relationships has evolved from an exploratory mode into an operational mode. While the observational aspects have evolved from exploratory into operational use, the regulatory underpinning which may be needed to protect space weather observations has not.

SFCG Objective

The SFCG supports studies under this agenda item to determine appropriate recognition and protection for space weather sensors in the Radio Regulations without placing additional constraints on incumbent services. SFCG supports inclusion of this agenda item in the WRC-23 agenda with appropriate revision of Resolution **657 (WRC-15)**.

Status

This agenda item was the responsibility of ITU-R WP 7C. WP 7C completed development of Report ITU-R RS. 2456 “Space weather sensor systems using radio spectrum”.

Agenda Item 2.4 study of spectrum needs and possible new allocations to the fixed-satellite service in the frequency band 37.5-39.5 GHz (Earth-to-space), in accordance with Resolution **161 (WRC-15)**;

The fixed-satellite service community has expressed interest in facilitating the delivery of broadband services at frequencies above 30 GHz. The frequency band 37.5-38 GHz is allocated to SRS on a primary basis in the space-to-Earth direction. The frequency band 37.5-39.5 GHz is allocated to EESS on a secondary basis in the space-to-Earth direction. The frequency band 36-37

GHz is allocated on a primary basis to the EESS (passive) and the SRS (passive).

SFCG Objective

SFCG does not support this agenda item being placed on the final WRC-23 agenda, because sufficient consideration has not been given to the protection of the space science service bands during the WRC-19 study cycle.

In addition, considering the activities carried out under WRC-19 agenda item 9.1, issue 9.1.9, the requirement for additional spectrum for FSS in the frequency band 37.5-39.5 GHz (Earth-to-space, limited to FSS feeder links only) would need to be justified.

Status

This agenda item was the responsibility of ITU-R WP 4A. There is a Working Document towards a PDN Report on spectrum needs associated with agenda item 2.4, but it is substantially incomplete.

Possible new WRC-23 Agenda items

SFCG also supports the inclusion of the following items on the WRC-23 agenda:

Agenda Item X.X1 to consider a new EESS (Earth-to-space) allocation in the band 22.55-23.15 GHz.

Similar to what has been achieved under WRC-12 Agenda item 1.11 with a primary allocation to the space research service (Earth-to-space) in the band 22.55-23.15 GHz, it is proposed to investigate a possible new primary allocation to the EESS (Earth-to-space) in the same band. Such an allocation would provide a companion earth-to-space allocation to the existing EESS (space-to-Earth) allocation in 25.5-27 GHz to provide the associated command and control links. It should also not constrain the use and the development of the space research service (Earth-to-space) in this band.

SFCG Objective

The SFCG supports studies examining the possibility for a new EESS (Earth-to-space) allocation in the band 22.55-23.15 GHz, whilst not constraining the use and the development of the space research service (Earth-to-space) in this band.

Agenda Item X.X2 to review and consider possible adjustments of the existing primary frequency allocations to EESS (passive) in the range 231.5 – 252 GHz, to ensure alignment with more up-to-date remote sensing observation requirements.

WRC-2000 agreed, under its agenda item 1.16, on a number of allocations, including to the Earth exploration-satellite passive service, EESS (passive), above 71 GHz. Currently there is a need to review the allocations at higher frequencies, specifically in the 231.5-252 GHz frequency range, taking into account the scientific and technology developments for passive microwave sensor measurements, as is the case in Europe with the development of the Ice Cloud Imager (ICI) instrument of the second generation of the EUMETSAT Polar System (EPS-SG)).

The proposed agenda item is intended to review the existing primary allocations to the EESS (passive) in the range 231.5 – 252 GHz, to analyze if these allocations are aligned with the spectral needs defined by more recent passive microwave sensors, and to propose necessary adjustments in the Table of Frequency Allocations. An important aspect will be the study of the potential impact that any changes could have on the other primary services.

SFCG Objective

The SFCG supports studies to review and consider possible adjustments of the existing primary frequency allocations to EESS (passive) in the range 231.5 – 252 GHz.

Agenda Item X.X3 to consider regulatory provisions to facilitate radiocommunications for sub-orbital vehicles.

WRC-15 adopted Resolution 763 (WRC 15) to deal with stations on board suborbital vehicles. Further, in 2015 the ITU-R formulated Question ITU-R 259/5, "Operational and radio regulatory aspects for planes operating in the upper level of the atmosphere." Studies in the framework of that Question are related to Resolution 763 (WRC-15). In particular, decides 3 of the Question asks, "What radio links will be required to support space planes' operations and under what radiocommunication service definition will they fall?"

The ITU-R performed technical and operational analyses of stations on-board suborbital vehicles. The studies concluded that, while no new spectrum allocations are necessary, a WRC-23 agenda item is necessary to modify definitions to ease introducing sub-orbital vehicle radiocommunications.

There are planned developments for sub-orbital flight based on various types of technologies and vehicles. The approaches vary between those using a single vehicle and those that use a launch vehicle that carries the spacecraft up to an intermediate height before releasing the spacecraft to accelerate away and into a suborbital spaceflight.

SFCG Objective

The SFCG supports studies to consider future revisions to the Radio Regulations, to provide regulations for radiocommunications for sub-orbital vehicles and to facilitate the safe integration

of sub-orbital vehicles into the existing air traffic management system and the inclusion of this item on the agenda of WRC-23.

Agenda Item X.X4 to consider possible upgrade of the allocation of the 14.8-15.35 GHz band to the space research service.

Development of space research missions requires installing modern science equipment on satellites. This equipment creates tremendous amount of data, which have to be transmitted to earth stations either directly in space-to-Earth links or through inter-satellite relay links. To ensure long-term possibilities of development and ensuring access to radiofrequency spectrum during development of new and upgrading of existing space systems there is need for frequency bands allocated to space research service on a primary basis. Currently allocated on a secondary basis frequency band 14.8-15.35 GHz is heavily used by data relay satellites in inter-satellite links, which allows establishing connection with non-geostationary orbit (NGSO) satellites, including manned missions as well as high-bandwidth data transfer links from existing NGSO satellites in space research service and in planned space research missions. This frequency band is also considered for much higher usage due to moon missions.

Minding previously carried out compatibility studies in this frequency band with other services have shown possible usage of space research systems on a primary basis while introducing relevant technical conditions (see Rec. ITU-R SA.1626-1). Modern modulation techniques along with usage of filtering, used in high-bandwidth data transfer links, allow to significantly reduce out-of-band emissions, minimizing possible interference to stations in adjacent bands. This creates possibility for upgrade of allocation to space research service in 14.8-15.35 GHz.

SFCG Objective

The SFCG supports studies to consider the possible upgrade of the allocation of the 14.8-15.35 GHz band to the space research service.

Agenda Item X.X5 to consider the possibility to use space-to-space links within existing FSS and MSS allocations as well as possible new allocations to the inter-satellite service within existing FSS and MSS bands.

As satellites with scientific missions generate increasing volumes of data and requirements for reduced data latency become more restrictive, the space science community would benefit if their future missions could make use of existing satellites in the fixed and mobile-satellite services to operate as data relays. The definitions of the fixed and mobile-satellite services allow for operations between spacecraft. However, there are currently no fixed or mobile-satellite service allocations with a “(space-to-space)” directional indicator.

Studies to consider space-to-space transmissions in the fixed and mobile-satellite services have been initiated in Working Parties 4A and 4C, respectively, during the 2016-2019 ITU-R Study Cycle. However, these studies have not yet considered all scenarios. Because frequency bands allocated to the fixed and mobile-satellite services are used for links between space stations and earth stations, it is necessary to analyze the use of the same bands for satellite-to-satellite links to

ensure compatibility and avoid harmful interference.

SFCG Objective

The SFCG supports studies to consider the possibility to use space-to-space links within existing FSS and MSS allocations as well as possible new allocations to the inter-satellite service within existing FSS and MSS bands.

Annex 2 to Resolution SFCG 36-1R3

Other Items of interest to SFCG members for consideration at future World Radiocommunication Conferences.

1. Upgrade from secondary to primary the allocation to EESS (active) in the band 24.05-24.25 GHz.
2. Revision of limits in Resolution **750** for GSO FSS networks in the bands 47.2-50.2 GHz (Earth-to- space) and 50.4-51.4 GHz (Earth-to-space) for the protection of EESS (passive) in the band 50.2-50.4 GHz if this cannot be achieved under WRC-19 AI 1.6.
3. Coexistence between aeronautical mobile service and EESS and SRS in the bands 22 and 26 GHz. Attempts were made to address this in WP 5B for many years, but due to 5.536A no coordination is possible today.

Potential additional agenda items for WRC-27/28

- Primary allocation to Earth exploration-satellite service (space-to-Earth) in the band 37-37.5 GHz and upgrade of the secondary allocation to Earth exploration-satellite service (space-to- Earth) in the band 37.5-40 (40.5) GHz to primary status.
- 5 GHz of primary allocation to Earth exploration-satellite service (space-to-Earth) in the 70- 80 GHz range.