

CGMS-XXX JPN-WP-07
Prepared by JAPAN
Agenda Item: I/1
Discussed in WG I

RADIO FREQUENCY ISSUES

This document provides a summary of reports from the 4th meeting of the Asia Pacific Telecommunity (APT) and JMA activities for the preparation for the 2003 World Radiocommunication Conference (WRC-2003), focusing upon items regarding radio frequency allocation to the meteorological satellite service (MetSat).

RADIO FREQUENCY ISSUES

1 INTRODUCTION

The 2003 World Radiocommunication Conference (WRC-2003) will be held in Geneva during June/July of 2003, and the Conference Preparatory Meeting (CPM) of the International Telecommunication Union (ITU) for WRC-2003 is scheduled in Geneva for 18 November to 1 December 2003.

In order to protect and obtain necessary frequency bands for meteorological services, especially meteorological satellites and earth exploration satellites, JMA has carried out various activities with CGMS and WMO since WARC-02 in accordance with the framework of WMO recommendation.

This document reports on recent JMA activities regarding the frequency matters and the preparation for WRC-2003, focusing upon items regarding the meteorological satellite service (MetSat) in the preliminary agenda for WRC-2003 and informs common provisional views from Asia Pacific Telecommunity relevant to Meteorological Satellite Service (Metsat) and Earth Exploration Satellite Service (EESS) in the WRC-2003 agendas.

2 SUMMARY OF JMA's ACTIVITIES FOR THE PREPARATION FOR WRC-2003

2.1 International Related Activities

(1) WMO/CBS/SG-RFC

JMA dispatched an expert to the meeting for WMO/CBS/SG-RFC held in Geneva in February 2002, and exchanged views on the protection of necessary frequency bands for all meteorological services with SG-RFC members. JMA reconfirmed the immeasurable importance of the cooperative relationship among WMO members. And JMA contributed to the appealing the importance of the radio frequency protection for meteorological activities by attending as a host, the session D Wind Profiler Radars in the Workshop on Radio Frequencies for Meteorology in Geneva in October 2002.

(2) ITU-R WP 7C

JMA attended a meeting of the Working Party 7C of ITU-R that was held in February 2002 as one of the Japanese delegations, and urged the protection of frequency bands for meteorological satellite service, especially the band 1683-1690 MHz not only for S-VISSR receiving stations in the region 3 of ITU-R but also GVAR stations in the region 2 at the meeting with WMO and CGMS members.

(3) Cooperation with Australia

The Australian Bureau of Meteorology (BoM) and JMA have continued to keep our good relationship on GMS operation. Regarding radio frequency issues, BoM and JMA have closely exchanged views on preparation for WRC-2003 and technical information on GMS S-VISSR

each other.

BoM provided information on the status of S-VISSR receiving stations in Australia as a GMS data user at the last SG-RFC meeting held in February 2002, and presented that the protection of the frequency band 1683-1690 MHz was necessary for weather forecast and analysis not only in Australia but also in the South Pacific Area.

(4) Cooperation with NOAA

As GOES and GMS/MTSAT use the same frequency band for GVAR and S-VISSR/HRIT respectively, in order to protect the band 1683-1690 MHz from MSS, which is one of the Agenda Item 1.31 in WRC-2003, NOAA and JMA should closely exchange relevant information furthermore.

2.2 Activities to Japanese Administration

As one of main preparations of WRC-2003, JMA is continuing to urge the protection of frequency bands 1683-1690 MHz and 1670-1675 MHz for MetSat in the Region 3 of ITU-R to the Ministry of Public Management, Home Affairs, Posts and Telecommunications, which is the Telecommunications Administration of Japan.

3 RESULT OF THE ASIA PACIFIC TELECOMMUNITY (APT) CONFERENCE

The 4th APT Conference Preparatory Group for WRC-03 in Busan, Republic of Korea in August 2003. The APT common proposals for WRC-2003 were discussed at the conference. The extracted Common Provisional Views on WRC-03 Agenda Items related to MetSat and EESS are shown in ANNEX 1 as an information for CGMS members.

4 JAPANESE VIEW FOR CPM

Regarding the Agenda Item 1.31 in WRC-2003, as a result of discussion between the Telecommunications Administration of Japan and JMA, Japanese view for the Agenda Item 1.31 for CPM is as follows.

The existing pfd limits stipulated in Radio Regulations should be retained to protect the mobile service in the band 1518-1525 MHz.

Careful considerations should be made on the allocation in the frequency bands 1683-1690 MHz and 1670-1675 MHz to the mobile-satellite service since co-frequency sharing between the mobile-satellite service and the meteorological aids and meteorological-satellite services is difficult.

Sufficient studies should be made on compatibility with the radio astronomy service allocated in the adjacent frequency band 1660-1670 MHz.

As for other bands in the 1-3 GHz range, sufficient studies on sharing with existing services should be made in response to each specific proposal.

The extracted Draft CPM Report related to the Agenda Item 1.31 is attached as ANNEX 2 in

this working paper. The sharing of 1670-1675 MHz and 1683-1690 MHz by MetSat and MSS would be discussed at WG I in CGMS-XXX.

5 FUTURE ACTIVITY

IMMARSAT and its supporting countries have still requested strongly that both of 1683-1690 MHz and 1670-1675 MHz bands should be allocated to MSS at WRC-2003. Therefore, we cannot guess about the outcome of WRC-2003.

In order to protect radio frequency bands for GMS-5 S-VISSR and MTSAT HiRID/HRIT that are indispensable for meteorological service not only in Asia Pacific area but also in the world, it is very important that CGMS members continue to exchange related necessary information frequently on this matter.

JMA will continuously encourage the Telecommunications Administration of Japan to protect the radio frequency bands for all meteorological activities including meteorological satellite service.

ANNEX 1**APT Conference Preparatory Group for WRC-03
Working Party 2**

Extracted Common Provisional Views on WRC-03 Agenda Items

Agenda Item 1.12-Allocations and regulatory issues related to space science services and a review of all EESS and SRS allocations in the 35-38 GHz rangeSummary of discussion

APT members generally support the intent of ITU-R Resolution 723(Rev. WRC-2000) related to science service allocation proposals outlined in resolves 1 to 4. Good progress has been made toward establishing national positions for most items. However, final positions will be established by APG2003-5.

Republic of Korea proposes to tabulate each frequency matters included in the agenda item 1.12, because this agenda item has very complex structures dealing with different seven issues. Meeting agreed to this approach.

As to the resolves 1 of Resolution 723, Australia and Islamic Republic of Iran support Method A in the CPM report i.e. no change. No other administrations express a view.

As to the resolves 2 of Resolution 723, Australia and Islamic Republic of Iran support this agenda item of incorporation in the Table of frequency Allocations of the existing primary allocation (under footnote No. 5.460) to the space research service in the band 7145-7235 MHz, as described in Method of the draft CPM Report.

Islamic Republic of Iran suggested that the appropriate provisions of Section III and IV of RR Article 21 should be applied to space research service earth station in the band 7145-7235 MHz to facilitate sharing with the fixed and mobile services.

As to the resolves 3 of Resolution 723, Australia and Islamic Republic of Iran support the one possible solution to delete the ISS allocation in the 32-32.3 GHz band. No other administrations express a view.

As to the resolves 4 of Resolution 723, Islamic Republic of Iran suggests Method B or Method C of Draft CPM report for 15 GHz as possible solution. Concerning 26 GHz, Australia and Islamic Republic of Iran support the addition of a primary allocation to SRS(space-to-Earth) in the 25.5-27 GHz band as proposed in the draft CPM report.

In considering allocations to the Earth exploration satellite service and space research service between 35-38 GHz, taking into account Resolution 730(WRC-2000), the APT supports the establishment of conditions which would allow sharing.

In relation to these bands, Japan has emphasized importance of these frequency bands, for implementation of the Global Precipitation Measurement (GPM) project, using dual-frequency precipitation radar (DPR) in combination of Ku-band (13.8 GHz) and Ka-band (35.5 GHz), and spaceborne passive sensing using microwave radiometers, such as AMSR(ADEOS-II), AMSR-E(AQUA), MWRI(FY-3), MEGHA TROPIC, etc. around 36 GHz.

Concerning the frequency range 35.5-36 GHz, the suppression of, at least, 35.5-35.6 GHz of the footnote No. 5.551A is generally supported by most APT members. Islamic Republic of Iran also supports Method B of draft CPM report. Some administrations are still to finalize their position.

Concerning 36-37 GHz band, Republic of Korea supports Method B of the draft CPM report. While Japan identifies benefits in Method B and therefore initially favors this approach, the final position is to be developed.

As to 37.5-38 GHz, there remained sharing issue between SRS (s-E) and FSS(s-E). APT members will assess the results of JCG4A-7B study, when available.

Provisional views on the agenda item

APT members generally support the CPM proposals in agenda item 1.12 and are making good progress in converging towards agreed proposals on most aspects of resolves 1 to 4 of ITU-R Res. 723 (Rev. WRC-2000).

Most APT members, in considering allocation between 35-38 GHz, taking into account Resolution 730 (WRC-2000), generally support the removal of restriction by footnote No. 5.551A on spaceborne precipitation radars operating in the Earth exploration-satellite service, at least, in the band 35.5-35.6 GHz.

View/proposal for CPM related to the agenda item

APT members agreed that the introduction of agenda item 1.12 could be improved by consolidating the many aspects of agenda item into a tabular form.

Agenda Item 1.20 – MSS below 1 GHz

Summary of Discussion

The Meeting has considered the proposals and views contributed by Members as contained in the above-mentioned documents.

Some members provided a highlight of the crucial needs for additional allocations for the MSS below 1 GHz, pointing out the lack of low cost data communication on a global and national basis, and more importantly for under-served or un-served areas in most of the developing countries particularly with vast and sparsely populated areas and difficult terrains. Taking also into account that the WTDC-02 had elaborated and the Plenipotentiary of 2002 is

expected to take serious steps to solve this widening gap and the imbalance of telecommunication facilities which would deprive the harmonious development of the global community, they indicated their views for the necessity of additional allocations to secure the future of the MSS below 1 GHz as an economical and affordable system, while at the same time protecting their existing services.

Some members have the view that since WRC-2000 there were no input documents to the ITU-R to support additional allocations to the MSS service links below 1 GHz thereby indicating that there was no need for additional allocation. In addition, no evidence of spectrum congestion of the MSS service links below 1 GHz has been shown in the ITU-R. Moreover the result of the ITU-R studies, contained in the draft CPM report, indicates that sharing and/or compatibility between non-GSO MSS and the existing services are not feasible. Accordingly no additional allocations are required and Resolution **214 (Rev. WRC-2000)** should be suppressed at WRC-2003. Furthermore, the experience of MSS below 1 GHz has demonstrated that the growth of the traffic could be accommodated in the existing frequency bands without requirement for an additional allocation.

Studies conducted by the ITU-R between narrow-band, FDMA MSS uplinks and mobile service have produced conflicting results. Some studies showed low probabilities of interference to the mobile service, but others resulted in significantly higher interference probabilities. This discrepancy is caused by general lack of agreement of the parameters and models used. Sharing studies did not consider sharing between narrow-band, FDMA MSS uplinks and fixed service. In addition, there are other specific cases that have not been studied, such as the network aspects of the land mobile service.

Some members have the view that Resolution **214 (Rev. WRC-2000)** takes into consideration the shortfall of service link spectrum for non-voice non-geostationary (NVNG) MSS below 1 GHz service links. This shortfall would inhibit its full system deployment to become an economically affordable system for most of the population in developing countries. However, APT Members have the view that additional allocations for the MSS service links below 1 GHz still require further studies by ITU-R to protect the existing services.

Provisional Views on this agenda item

- 1) APT Members are generally of the view that new allocation to the service links of MSS below 1 GHz could not be supported, taking into account the study results by the ITU-R. APT Members generally feel that these technical conclusions are unlikely to change in a foreseeable future.
- 2) Recognizing that some Members expressed their needs to allocate new frequencies to the MSS service link below 1 GHz, APT members agreed that this matter could be reviewed when sufficient techniques to mitigate harmful interference have been available to protect existing services.
- 3) APT members have not yet decided whether or not to suppress Resolution **214 (Rev. WRC-2000)**.

Proposal for the CPM related to the Agenda Item

APT Members after considering the two proposals submitted by six Members and the diversity of views, agreed not to submit a proposal to the CPM.

Agenda Item 1.31 – to consider the additional allocations to the mobile-satellite service in the 1-3 GHz band, in accordance with resolution 226(WRC-2000) and 227 (WRC-2000)

Summary of discussion

It was noted from the input documents that most papers expressed a condition that any new allocation to MSS should provide adequate protection to existing services.

On paper, APG-2003-4/7, stated that sufficient studies should be conducted on compatibility with radio astronomy service allocated in the adjacent frequency band 1660-1670 MHz. Careful considerations should be made on the allocation in the frequency bands 1683-1690 MHz and 1670-1675 MHz to the MSS since co-frequency sharing between the MSS and the meteorological aids and meteorological satellite is difficult. In other documents (APG-2003-4/28 and APG-2003-4/33) it was indicated that protections have been identified to existing services and the studies have been conducted in the ITU-R Working Party 8D, 8B and 7C.

The Japanese delegate commented that there was no liaison statement to WP-7D containing method and parameters used by WP-8D in their calculation. Therefore, coordination between WP-7D and WP-8D has not been completed. It was agreed sharing might be possible on case-by-case basis, but detailed methodology and calculation results need to be reviewed by WP-7D. This was leading to the discussion that the option A for Resolution 226 and option 1 for Resolution 227 might proceed to be an option to satisfy agenda item. Additional proposal in the document APG-2003-4/35 was discussed as another option for satisfying the agenda item. This option called option C proposes a phased introduction of MSS allocation starting with an initial allocation of 5 MHz in both directions (1520-1525 MHz and 1670-1675 MHz). Further 2 MHz subject to completion of studies and decision by next conference. Some members did not agree with the above because of there is a lack of practical knowledge at this time for the MSS earth station deployment.

Careful considerations should be made on the allocation in the frequency bands 1683-1690 MHz and 1670-1675 MHz to the MSS since co-frequency sharing between the MSS and the meteorological aids and meteorological satellite is difficult.

As a results of discussion, it was therefore encouraged to all APT members to provide the specific number of MetAids stations and MetSat earth stations being used in each administration in the band 1670-1675 MHz. It was conclude by ITU-R studies that there might be only a few countries using this band for these services.

Further discussion was focused on the idea of introducing a new method/option to satisfy the agenda item 1.31. There is no common view agreed on the discussion to endorse the proposal recorded in the document APG-2003-4/35.

Provisional views of the APT on the agenda item

Resolution 226 (WRC 2000)

- It is the view of the APT that existing services in bands under consideration pursuant to Resolution 226 (WRC 2000) should be appropriately protected if any new allocation is made to the MSS.
- It was recommended that APT administrations check whether they have services operating in this band to determine whether MSS allocation would have any effect in their country.
- It was recommended that the APT administrations study all the option in draft CPM report and technical justification on each option.

Resolution 227 (WRC 2000)

- APT Members are of the view that the study between ITU-R WP7D and 8D need to be completed.
- APT Members are of the view that existing services in bands under consideration pursuant to Resolution 227 (WRC 2000) should be appropriately protected if any new allocation is made to the MSS.
- APT administrations would be better placed to make a decision on this matter if feedback was provided to the next meeting regarding the actual number of MetAids and MetSat earth stations in the band 1670-1675 MHz.

Agenda Item 1.38: Up to 6 MHz to EESS (active) between 420 and 470 MHz

Summary of Discussion

Australia supports Method A1 of the draft CPM text, subject to an allocation to EESS(active) in the band of 432-438 MHz being compliant with DRR ITU-R SA. 1260 which would be incorporated by reference.

Republic of Korea proposes deletion of Method A2, because 6 MHz allocation within the range of 420-470 MHz may cause harmful interference to compactly-used existing services in 420-430 and 440-450 MHz.

Islamic Republic of Iran and Socialist Republic of Vietnam expressed their opinions that no new allocation to Earth exploration-satellite service(active) in the band 420-470 MHz is supported, considering the sharing issues between EESS(active) and other existing services.

Provisional views on the agenda item

Some administrations support Method A1, and some other administrations support Method B.

Views/proposals on CPM related to the agenda item

None.

ANNEX 2

Extracted Draft CPM Report

2.8 Agenda item 1.31

"to consider the additional allocations to the mobile-satellite service in the 1-3 GHz band, in accordance with Resolutions 226 (WRC-2000) and 227 (WRC-2000)"

2.8.2 Resolution 227 (WRC-2000)

"Sharing studies for, and possible additional allocations to, the mobile-satellite service (Earth-to-space) in the 1-3 GHz range, including consideration of the band 1 683-1 690 MHz"

Resolution 227 invites ITU-R to assess, with the participation of WMO, the current and future spectrum requirements on the MetAids service in the band 1 683-1 690 MHz, taking into account improved characteristics, and the MetSat service in the band 1 683-1 690 MHz, taking into account future developments. Resolution 227 also resolves that in the event that studies of the specific frequency band 1 683-1 690 MHz lead to an unsatisfactory conclusion, to carry out studies in order to recommend alternative MSS (Earth-to-space) frequency bands in the 1-3 GHz range.

ITU-R has considered frequency sharing between MetAids and MSS (Earth-to-space) in the band 1 668.4-1 700 MHz. This had led to a proposed revision of Recommendation ITU-R SA.1264.

ITU-R has also considered frequency sharing between the MetSat (space-to-Earth) service and the MSS (Earth-to-space) in the band 1 670-1 710 MHz, including sharing with GVAR/S-VISSR MetSat earth stations which operate in the range 1 683-1 690 MHz. These studies have led to a proposed revision of Recommendation ITU-R SA.1158.

Studies submitted prior to WRC-2000 concluded that sharing between MetAids and MSS in the bands 1 675-1 683 MHz and between MetSat and MSS in the band 1 690-1 710 MHz is considered not feasible as reflected in Resolution 227.

2.8.2.1 Band 1 683-1 690 MHz

The band 1 683-1 690 MHz is allocated on a primary basis to the MetAids, the MetSat (space-to-Earth), the fixed, and the mobile services in all three Regions and to the mobile-satellite service in Region 2.

2.8.2.1.1 Summary of technical and operational studies, including a list of relevant ITU-R Recommendations

ITU-R has conducted several studies regarding separation distances required between MSS and MetSat earth stations considering in particular GVAR/S-VISSR earth stations. The studies have been based on a range of MSS system characteristics and a range of different

deployment scenarios of MetSat Main and GVAR/S-VISSR stations. An attempt was made to avoid best and worst-case assumptions by considering system and shielding assumptions ranging from favorable to unfavorable conditions. The studies revealed that shielding conditions had the most significant impact on the required separation distances. The following results were obtained for a range of MSS system parameters where the terms "favorable, typical and unfavorable" refer primarily to the MetSat deployment and shielding conditions. The lower separation distances are mainly due to favorable MSS parameters whereas the higher separation distances are obtained for unfavorable MSS parameters:

	MetSat main stations: favorable-unfavorable MSS parameters	GVAR/S-VISSR stations: favorable-unfavorable MSS parameters
Favorable conditions:	< 20-35 km	20-100 km
Typical conditions:	< 20-45 km	35-300 km
Unfavorable conditions:	75-320 km	70-370 km

At this point in time, GVAR MetSat stations are mostly deployed in many Region 2 countries and S-VISSR MetSat stations are mostly deployed in many Region 3 countries. In Region 1 countries there are a few MetSat GVAR/S-VISSR stations. More than 15 MetSat Main stations are deployed throughout all three Regions. It is expected that the MetSat service will make more extensive use of this band in the future. However, there are also transportable GVAR/S VISSR stations in Regions 2 and 3. Exclusion zones are required but cannot be practically established around transportable earth stations that may be periodically relocated.

ITU-R has also reviewed the studies regarding MetAids use of the band 1 683-1 690 MHz and concluded that the relatively few MetAids systems operated in the band 1 683-1 690 MHz can be concentrated in the range 1 675-1 683 MHz if sufficient time for transition is provided. Relevant Recommendations ITU-R: SA.1264 and SA.1158.

2.8.2.1.2 Analysis of sharing studies

a) Sharing between MSS and MetAids

Sharing studies indicate that co-channel sharing between MetAids and MSS in the band 1 675-1683 MHz is not feasible due to unacceptable levels of interference to both systems. Studies also indicate that time-sharing between MetAids and MSS is also not feasible due to the operational nature of both services. The band 1 683-1 690 MHz is also allocated to the MetSat service on a co-primary basis. Studies and operational experience have shown that co-frequency sharing between MetAids and MetSat downlinks is not feasible. Therefore, MetAids operations are mainly concentrated in the range 1 675-1 683 MHz in many parts of the world (Regions 2 and 3) to avoid interference to GVAR/S-VISSR (also see section b below) MetSat downlinks. WMO has identified future requirements for narrow-band MetAids operations as 1 675-1 683 MHz. However some administrations continue to use wideband systems that should not exceed a requirement of 12 MHz, which is consistent with national spectrum availability in those countries. In reviewing the available study results, an MSS allocation in the band 1 683-1 690 MHz will most affect MetAids operations in ITU Region 1 in those locations where the limited number of MetSat stations does not prevent their use in 1 683-1 690 MHz.

b) Sharing between MSS and MetSat

Sharing the band 1 683-1 690 MHz would require the establishment of geographical separation between MSS earth stations and co-frequency MetSat stations. There are currently more than 15 main earth stations operated in all three Regions and more than 400 registered data user stations operated mostly in Regions 2 and 3, with some also in Region 1. The number of registered data user stations is increasing and the actual number of existing stations is expected to be in excess of 1 000. The studies concluded that, even though feasible in some areas of the world, implementation of sharing would be subject to such practical constraints and limitations for the MSS that it should not be considered suitable for providing MSS spectrum on a global basis.

Appendix 7 contains the methodology and parameters to determine the coordination area for mobile earth stations with respect to MetSat earth stations. The coordination area is the service area of the mobile earth stations extended by the coordination distance. For operation of MSS in the territory of one administration, it would be necessary to coordinate with MetSat stations operated by other administrations if the MetSat earth station is located within the coordination area of the MSS terminals. The available study results show that for the most favorable climatic zone, A2, the required coordination distances are often in excess of several hundred kilometers and would cause a significant coordination burden for the MSS. The extent of the coordination burden would depend on the number and location of MetSat stations affected. The problem increases for coastal areas where coordination distances above 1 000 km could be required in a few cases. Coordination would also be required between MSS and MetSat earth stations within the territory of a given administration but would be a domestic rather than an international matter.

In addition to the coordination requirement, available studies have concluded that the actual required separation distances are typically 70-105 km, but can be up to 400 kilometers. This would in some cases cause large service areas not being available to the MSS; rendering typical features of this service such as global or regional coverage as well as unrestricted mobility, unavailable without the use of selectable frequency agility. Resolution 227 also recognizes that the use of the data user stations is on the increase and given the implications of No. 5.377, this would mean an unpredictable risk for any MSS operator to lose service areas in addition to those unavailable today. As an additional system burden, the MES locations would have to be determined with sufficient accuracy to comply with the required separation distances. However, there are current operational MSS systems that implement spot beam configurations (150-300 spot beams), frequency reuse and position determination capabilities. In combination with spectrum availability outside of the band 1 683-1 690 MHz, selectable frequency agility would increase the possibility of sharing this band between the MSS and MetSat.

In addition to in-band interference in the band 1 683-1 690 MHz, the problem of adjacent band interference to thousands of meteorological earth stations operating in the band 1 690-1 698 MHz requires either a guardband below 1 690 MHz or a limitation of out-of-band emissions. Studies have shown that the out-of-band emission limits contained in Recommendation ITU-R M.1480 (and proposed revisions to this Recommendation), if extended to MESs operating in 1 683-1 690 MHz, could be adequate to protect MetSat earth stations operating above 1 690 MHz. Further study may be required.

Assuming the band 1 670-1 675 MHz would be allocated to the MSS, finding an additional 2 MHz of spectrum in the range 1 683-1 690 MHz would be difficult on a global basis. In the range 1 683-1 688 MHz, service areas in many countries, in particular Region 2, will be constrained by current and future GVAR operations and not available where transportable MetSat earth stations are deployed. In the range 1 688-1 690 MHz, in all Region 2 countries, GVARs do not operate

and hence there are few constraints on sharing and sharing may be feasible depending on final conclusions regarding the necessity of guardbands. Around 1 687 MHz, up to 6 MHz are not available in major parts of Region 3 due to S-VISSR operations. In countries where few MetSat earth stations are deployed, it is likely to be possible to identify additional spectrum which could be used for the MSS with minor constraints. MSS systems would have to be sufficiently flexible to use frequencies available at each earth station location, taking into account future deployment of MetSat stations.

With regard to sharing between MSS space stations and MetSat space stations, ITU-R studies have shown that sharing between MetSat space stations and MSS space stations is feasible except for some very close GSO constellations.

2.8.2.2 Alternative frequency band 1 670-1 675 MHz in response to Resolution 227

Due to the sharing difficulties between the MSS and MetSat service in the band 1 683-1 690 MHz in Regions 2 and 3, ITU-R studied the band 1 670-1 675 MHz as an alternative band for an MSS allocation. The band 1 670-1 675 MHz is allocated to meteorological aids, fixed, meteorological-satellite (space-to-Earth) and mobile services. The mobile service is intended for aeronautical public correspondence (through No. 5.380). The adjacent band, 1 660-1 670 MHz has a primary allocation to the radio astronomy service.

2.8.2.2.1 Summary of technical and operational studies, including a list of relevant ITU-R Recommendations

Sharing between the relatively few MetSat main earth stations and MSS uplinks in the band 1 670-1 675 MHz is feasible provided the MSS protect the few MetSat main earth stations through the use of exclusion zones and position determination. Sharing between the MSS earth stations and the MetAids service is feasible if protection is provided to MetAids operations in those countries where there is a continuing requirement to use 1 670-1 675 MHz. However, sharing between MetAids and MSS space stations is not feasible if the MSS space station antenna coverage area and the area used by MetAids coincide. Providing protection to MetAids systems operating in the few countries requiring use of 1 670-1 675 MHz may limit MSS use within those countries and in neighboring countries. The relevant ITU-R Recommendations are SA.1264 and SA.1158.

Studies into the effect of out-of-band emissions from MESs into radio astronomy stations have been conducted, taking into account Recommendation ITU-R M.1480 (and proposed revisions to this Recommendation), and Recommendation ITU-R RA.769. The studies estimated the separation distances required between MESs and radio astronomy stations.

2.8.2.2.2 Analysis of sharing studies

a) Sharing between MSS and MetAids

Although co-channel sharing between MetAids and MSS is not feasible due to mutual interference, in most countries there is a low use or no use of the band 1 670-1 675 MHz for MetAids operations which allows for sharing based on geographical separation. Globally, the majority of MetAids operations are concentrated in the frequency range 1 675-1 683 MHz. A survey of band usage indicates that MetAids frequency requirements can be satisfied with the

spectrum available above 1 675 MHz. Most of those countries using 1 670-1 675 MHz for MetAids operations can transfer operations to 1 675-1 683 MHz over a period. There are a few countries operating MetAids systems that will continue to require use of the band 1 670-1 675 MHz where sharing may not be feasible.

b) Sharing between MSS and MetSat

Sharing is feasible in the band 1 670-1 675 MHz if an appropriate separation distance is maintained at all times between the few MetSat main earth stations and mobile earth stations, as determined pursuant to coordination under No. 9.17A. The mobile earth stations locations will have to be determined with sufficient accuracy to ensure the required separation distances are maintained. The use of mobile earth stations in this band would therefore be subject to the ability of MSS systems to respect these separation distances through location determination capabilities.

c) Sharing between MSS and MS

With regard to Aeronautical Public Correspondence, it appears that no systems are implemented in this band. The band was intended for use on the ground-to-air link.

d) Adjacent band compatibility between MSS and RAS

Studies have been conducted regarding out-of-band emissions for mobile earth stations into radio astronomy receivers operating below 1 670 MHz. Taking the out-of-band emission limits of Recommendation ITU-R M.1480 as a guide to the expected emissions for MESs, separation distances in the range of about 20 to 58 km are required to meet the protection requirements of Recommendation ITU-R RA.769. Hence, exclusion zones would be required with regard to radio astronomy stations. In practice, these should be defined on a case-by-case basis, taking into account the appropriate characteristics of the radio astronomy station, the surrounding terrain and the characteristics of the MSS system. From these results it can be concluded that adjacent band operations are feasible.

2.8.2.3 Methods to satisfy the agenda item and their advantages and disadvantages

2.8.2.3.1 Method A

A primary worldwide MSS (Earth-to-space) allocation would be created in the band 1 670-1 675 MHz, with the necessary protection of existing services.

Since MSS operations may not be possible in the few countries that continue to use the band 1 670-1 675 MHz for MetAids operations, the Conference could consider curtailing the long-term use of the band for MetAids. As a consequence of making a worldwide MSS allocation at 1 670-1 675 MHz, the Conference may further consider aligning the Region 2 MSS allocation by suppressing the allocations in all or parts of the band 1 675-1 710 MHz taking into account in particular the conclusions of Recommendations ITU-R SA.1264 for the sub-band 1 675-1 683 MHz and SA.1158 for the sub-band 1 690-1 710 MHz. In addition, the status of the current mobile allocation will need consideration.

Advantage:

The MSS would be provided additional spectrum. Protection of the few MetSat main earth stations and radio astronomy stations in the adjacent band will place little constraint on the MSS.

Subject to limited sharing constraints with MetSat, MetAids, fixed and mobile services, a global allocation would be available to the MSS (Earth-to-space).

Disadvantage:

This allocation would be limited to 5 MHz. MSS operations may not be possible in the few countries that continue to use the band 1 670-1 675 MHz for MetAids operations.

2.8.2.3.2 Method B

In addition to the 5 MHz of spectrum identified in Method A, an additional allocation, with a spectrum of about 2 MHz, could be created in other bands in the vicinity of the existing allocations around 1.6 GHz taking into consideration the conclusions of studies.

Advantage:

The spectrum requirement for a total of 7 MHz could be met.

Disadvantage:

The MSS will be constrained by the requirement to protect existing services in some countries in case sharing proves to be feasible.

2.8.2.3.3 Method C

A worldwide MSS allocation would be created in the band 1 683-1 690 MHz, taking into account that WRC-2000 confirmed the requirement for continued protection of MetSat and MetAids services under No. 5.377.

As a consequence of making a worldwide MSS allocation at 1 683-1 690 MHz, the Conference may consider aligning the Region 2 MSS allocation by suppressing the allocations in parts of the band 1 675-1 710 MHz taking into account in particular the conclusions of Recommendation ITU-R SA.1264 for the sub-band 1 675-1 683 MHz and Recommendation ITU-R SA.1158 for the sub-band 1 690-1 710 MHz.

Advantages:

The MSS would be allocated additional spectrum.

Disadvantages:

In many countries, MSS operations would be restricted by the operation of a large and increasing number of MetSat earth stations including transportable stations. Protection of existing and future MetSat earth stations would result in a significant coordination burden. The required separation distances would make large areas not available for the MSS. Coordination with transportable MetSat earth stations is not practicable. The constraint of No. 5.377 renders this band barely usable for MSS earth stations. Future deployment of MetSat earth stations would result in further reduction of MSS service areas. The whole 7 MHz MSS allocation would not be usable on a global basis.

2.8.2.3.4 Method D

This option is to make no additional allocations within the range 1 670-1 710 MHz to accommodate the MSS.

Advantage:

This option would ensure no impact to existing services.

Disadvantage:

The spectrum requirements for MSS would not be met in this frequency band.

2.8.2.4 Regulatory and procedural considerations

If a worldwide allocation is made in the band 1 670-1 675 MHz, stations in the MSS shall be subject to coordination. It would be necessary to require coordination under No. 9.11A for MSS in this band.

Coordination between earth stations in bidirectionally allocated bands is currently provided through No. 9.17A. However, this provision is limited to specific earth stations and may therefore require modification (or an alternative provision) to permit coordination of typical MESs, which may also be considered under agenda item 1.30.

If a worldwide MSS allocation is made in the band 1 683-1 690 MHz, protection of the incumbent MetSat and MetAids services could be ensured by the application of No. 5.377, which would require revision to reflect the actual band limits of the MSS allocation, protection of MSS space stations which are deployed prior to new MetSat space stations at orbital locations different from ones already used, and other regulatory measures. In addition, a proper footnote could be required for which the following text could be considered:

"Mobile-satellite systems using the 1 683-1 690 MHz band shall not cause harmful interference to earth stations of the meteorological-satellite service and No. 5.43 shall not apply. To avoid causing harmful interference, mobile earth stations shall not operate, except on a non-interfering signalling channel, within the zones around the meteorological earth stations defined in the coordination process. The mobile-satellite system shall have position determination capabilities to ensure compliance with this provision."

Appropriate regulatory provisions may be required to ensure protection of MetSat user stations operating above 1 690 MHz from out-of-band emissions from MESs operating in the range 1683-1 690 MHz.