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Washington, D.C. 20554

In the Matter of

Preparation for International Telecommunication Union World Radiocommunication Conferences	)))	IC Docket No. 94-31

SECOND NOTICE OF INQUIRY

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By the Commission

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I. INTRODUCTION

1. By this Second Notice of Inquiry (Second NOI), the Commission reviews comments and replies submitted in response to the Notice of Inquiry (Notice)[1] in this proceeding and reviews the recommendations of the WRC-95 Industry Adivisory Committee (IAC). It also seeks comment on preliminary proposals for the 1995 World Radiocommunication Conference (WRC) and future WRCs.

2. The International Telecommunication Union (ITU) will convene WRC-95 from October 23, to November 17, 1995, at its headquarters in Geneva, Switzerland. The agenda for the conference includes substantive topics such as facilitating the introduction of global mobile-satellite services (MSS) and simplifying the international Radio Regulations. It also includes further consideration of an agenda for the next conference, WRC-97, and drafting a preliminary agenda for WRC-99. Presentation of the Commission's preliminary views on these topics is intended to stimulate discussions and is part of an overall effort to achieve early consensus on U.S. proposals to WRC-95. The preliminary proposals described below are subject to modification, however, and the Commission's further development of its proposals will include consideration of comments received in response to this Second NOI and of additional recommendations of the IAC. The Commission's ultimate recommendations for U.S. proposals will be released in a Final Report prior to WRC-95.

II. BACKGROUND

3. World Radiocommunication Conference (WRC) Schedule. In the Notice,[2] we described the ITU's adoption (in conjunction with a major restructuring) of a four-year planning cycle for WRCs -- that are now to be convened every two years to consider radiocommunication matters of worldwide character, including frequency allocations and allotment plans.[3] Each WRC also develops, subject to the approval of Council, an agenda for the next conference and recommends a preliminary agenda for the WRC four years hence.[4] Thus, in addition to the substantive topics to be covered at WRC-95, U.S. proposals are now being developed to propose additional

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[1] Notice of Inquiry, IC Docket No. 94-31, 9 FCC Rcd 2430 (1994).

[2] Id. at 2430.

[3] See Article 4B, Convention of the ITU, Final Acts of the Additional Plenipotentiary Conference (Geneva, 1992).

[4] See Resolution No. 9, Final Acts of the Additional Plenipotentiary Conference, (Geneva, 1992).

items for the [illegible] WRC-99, which could include initial [illegible]

[illegible] and regulatory matters [illegible] assist the Commission [illegible] the initial Notice [illegible] recommendations for WRC-95, including [illegible] of the Voluntary Group [illegible] bands allocated at WARC-92 [illegible] selected topics, including [illegible] these matters and also on [illegible] discussion might best start [illegible] in light of the ITU [illegible] and effective planning [illegible]

[illegible] the release of the initial Notice [illegible] independent private [illegible] dealt with this proceeding [illegible] and includes [illegible] Groups (IWGs) studying [illegible] GHz MSS above [illegible] agendas. IAC and [illegible] members of the [illegible] Report was released [illegible] where appropriate [illegible] by the Commission [illegible] Commerce's National Telecommunications [illegible] Department of State [illegible]

[illegible] released May 25, 1994 [illegible]

[illegible] Radiocommunication Conference [illegible] Interim Report has been [illegible] released January 30

III. DISCUSSION

6. WRC-95 will be the first conference under the ITU's new conference planning cycle to discuss substantive spectrum allocation and regulatory matters. This conference represents a significant opportunity to build a foundation for advancing near and long-term United States telecommunications goals. In particular, WRC-95 is critical to a new commercial telecommunications industry -- the mobile-satellite services (MSS) industry, that includes low-Earth orbit (LEO) MSS systems.[8] LEO systems can provide voice, data and other services at relatively low cost and will be a critical component in achieving the Commission's goals of universal service, open access and competition in the provision of services. They will also be part of a new seamless, nationwide (and eventually global) communication network. The new MSS industry also promises to stimulate significant economic growth both domestically and abroad.[9] The proposals here are intended to facilitate implementing competitve MSS operations by easing international technical and regulatory constraints and providing additional spectrum allocations.

7. In addition to seeking comment on specific MSS proposals, we invite input on other subjects raised in the first Notice. These topics include: various space service allocation matters; review of Appendices 30 and 30A; availability of high frequency broadcasting bands (HFBC); the Final Report of the VGE; and agendas for WRC-97 and for the 1999 and 2001 WRCs.[10] Commenters should also consider the long-range planning aspects of the ITU's conference cycle -- the two-year WRC schedule and four-year WRC planning cycle. In that regard, parties should comment on topics not addressed in the first Notice, or here, that may be appropriate for conferences beyond WRC-97. Further comment is also sought on the Commission's conference preparatory methods in light of the ITU's new conference and planning cycle.

A. Mobile Satellite Service Issues

8. At WRC-95, the United States will have the opportunity to improve the use of existing MSS bands by eliminating technical, operational, and regulatory barriers; by making available adequate, useable feeder link spectrum to support MSS user links; and by adopting limited new MSS allocations. These measures should

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[8] See Report and Order in CC Docket No. 92-166, Amendment of the Commission's Rules to Establish Rules and Policies Pertaining to a Mobile Satellite Service in the 1610-1626.5/2483.5-2500 MHz Frequency Bands (Big LEO Report), 9 FCC Rcd 5936 (1994).

[9] Id. at 5940-41.

[10] See WRC Notice, at 2431.

provide significant relief to MSS proponents worldwide. In the Notice, we solicited comment on these points without addressing specific details.[11] Identification of specific concerns was left to interested parties and the IAC. Since then, ITU Radiocommunication Sector (ITU-R) Task Groups 8/3 and 4/5, that addressed MSS and MSS feeder links respectively, have concluded their work and will report to the 1995 Conference Preparatory Meeting (CPM) technical and procedural bases for consideration of MSS issues at WRC-95.[12] For each major issue, discussion is broken down into issues relative to MSS Below 1 GHz followed by issues relative to MSS Between 1 and 3 GHz.[13]

9. This Second NOI includes discussion and consideration of some frequency bands that are allocated exclusively for federal government use and other bands that are shared co-equally between the private sector and the federal government agencies. Opposition to preliminary non-government MSS proposals for some of these bands has been expressed by NTIA and, through NTIA's Interdepartment Radio Advisory Committee (IRAC), by the government agencies. FCC WRC-95 proposals for these bands will be the subject of detailed discussions between the Commission and NTIA. U.S. proposals to WRC-95 and to future WRCs ultimately require agreement among the FCC, NTIA and the Department of State.

10. WRC-95 provides an opportunity to review technical constraints associated with MSS frequency bands below 3 GHz and to review any associated provisions, resolutions and recommendations. Parties to this proceeding, relevant ITU-R Task Groups and the IAC have identified such constraints whose removal or modification would improve the use of frequency bands allocated for MSS.

11. Constraints identified thus far fall into general categories: 1) technical constraints, such as those that specify the maximum power a satellite beam can produce at the Earth's surface[14] -- devised presumably to assist sharing spectrum with other services, or to determine if and where coordination with services of other

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[11] See id. at 2433-35. An exception to our general solicitation is the issue of RR 2613 that addresses the status of non-Geostationary (NGSO) MSS feeder link use of FSS spectrum (id. at 2434, para. 24).

[12] Task Group 8/3, Study Group 8 Preparation for Conference Preparatory Meeting 1995 (CPM-95), met from Nov. 17 to 25, 1994. Task Group 4/5, Feeder Links for the Mobile Satellite Service, met from Nov. 24 to 30, 1994. During the same period Task Group 2/2, that deals with interservice sharing issues, addressed some aspects of MSS sharing with other services.

[13] The exception is the discussion of feeder link issues. Feeder link issues here are germane only to MSS Between 1 and 3 GHz.

[14] Stated in terms of power flux density (PFD)

administrations is required; or, constraints that limit the radiated power emitted from MSS earth stations; 2) allocation constraints on existing MSS allocations, such as those that limit MSS networks to a lower allocation status, to certain categories of service or to certain geographic areas;[15] and 3) regulatory/procedural constraints, particularly those relating to non-geostationary orbit (NGSO) MSS coordination procedures. Our discussion on these issues is divided into two sections. Parties should bring to our attention any constraints not identified whose removal would ease use of frequencies for MSS (either below 1 GHz or between 1 and 3 GHz).

1. Constraints on MSS Below 1 GHz

12. Technical Constraints. Radio Regulation No. 608A (RR 608A) requires that the power flux density (PFD) of MSS mobile earth terminals (METs) operating in the 148-149.9 MHz band not exceed -150 dB ($W/m^2/4kHz$) outside of the licensing administration's borders. This restraint poses both operational and regulatory difficulties. The limit as written cannot be complied with strictly, yet it appears that this is an absolute limit on the acceptable PFD of the METs instead of a coordination trigger.

13. As in the case of footnote RR 608A, RR 608B imposes a PFD limit of -150 dB ($W/m^2/4kHz$) for METs in the 149.9-150.05 MHz band. This limit was devised to protect terrestrial fixed and mobile services from harmful interference from MET operations. This band, however, has no terrestrial allocations, and is shared with no terrestrial services.

14. Below 1 GHz MSS proponents suggest that the United States work to remove both the RR 608A and RR 608B PFD limits. STARSYS Global Positioning. Inc. (Starsys) states that because radiofrequency transmissions do not stop at international borders, the RR 608A and 608B requirements are impractical. Starsys contends that those requirements should either be removed or apply in instances where potential interference situations cannot be resolved between administrations.[16] The IAC proposes that the -150 dB ($W/m^2/4kHz$) PFD limit be eliminated, and replaced with an appropriate coordination triggering mechanism. Specifically, the IAC recommends that countries wishing to implement MSS systems be compelled to coordinate MET operations with administrations falling within a specified threshold distance of the implementing country's borders [17] With regard to RR 608B, the IAC

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[15] These types of constraints are discussed briefly and also are summarized in the MSS spectrum allocation proposal tables in paragraphs 56 and 57.

[16] Starsys comments at 5.

[17] A method for calculating the threshold distance is described in ITU-R Document 8-3/TEMP/45-E (Geneva, 1994)

notes that this limit was devised to protect terrestrial fixed and mobile services from harmful interference from MET operations. This band, however, has no terrestrial allocations, and is shared with no terrestrial services. Accordingly, the IAC states that this footnote is unnecessary and recommends that it be eliminated.[18]

15. We agree that RR 608A and RR 608B would cause unnecessary difficulties in implementing NVNG systems. We believe in this case that PFD limits would be best negotiated between affected admistrations and would likely vary depending on the circumstance. We accept the IAC's recommendation and propose to eliminate RR 608A in favor of the coordination threshold distance methodology referenced above, and we propose to modify RR 608B as set forth in Proposal No. 2/L-LEO, Appendix 1.

16. Allocation Constraints. Within the band 137-138 MHz space research and meteorological satellite (MetSat) operations have primary status. MSS has co-primary status in the 137-137.025 MHz and 137.175-137.825 band segments, and secondary status elsewhere. In the U.S., the National Oceanic and Atmospheric Administration (NOAA) has indicated it has worldwide commitments to operate in these bands at least until the year 2006 and will have continuing operations until around the year 2010.[19]

17. The IAC recommends phasing out MetSat operations in the 137.175-137.825 MHz segments of the 137-138 MHz band where MSS now has co-primary status. It proposes a new footnote to the international table that will provide a co-primary status for MetSats until 2006 and a secondary status until 2010. This recommendation would provide for MetSat needs while later providing less encumbered spectrum for MSS. We note that the situation is similar for the 137-137.025 MHz portion of the band. We accept the IAC's recommendation, but also extend the IAC's proposal to the 137-137.025 MHz band, noting that the time frame for migrating MetSats has not been finalized. We invite comment on this proposal set forth in Proposal No. 2/L-LEO, Appendix 1. We also invite parties to comment on whether there is continued need for the space operation and space research alloctaions that also have co-primary status throughout the 137-138 MHz band.

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[18] IAC Interim Report at 62.

[19] In October 1994, Congress mandated that DoD and NOAA combine their polar orbiting meteorological satellite programs. This convergence, as well as the potential convergence with similar European meteorological satellite programs, is in the planning stage and the characteristics and frequencies of operation of new satellites are not defined. Consequently, the time frame for migrating meteorological satellites from the 137-137.025 MHz and 137.175-137.825 MHz band segments is still under discussion. Therefore, the years 2006 and 2010, referenced in the text above, appear in square brackets in the attached proposal for the 137-138 MHz band.

18. At WARC-92 the band 149.9-150.05 MHz was allocated to the land mobile-satellite service on a co-primary basis. The IAC has recommended that this allocation be redesignated to a generic mobile-satellite service. Below 1 GHz MSS proponents have noted that services they intend to provide would extend beyond strictly "land mobile" offerings and could include maritime and possibly aeronaurical offerings. Their view is that potential service offerings should not be limited needlessly.[20]

19. We continue to believe that generic MSS allocations afford operators maximum flexibility in introducing needed services. This is particularly important in the case of a service such as MSS that require a large initial capital outlay. Without the flexibility of generic allocations, providers may not find it economically feasible to launch systems devoted strictly to discrete applications. In addition, we note that this proposal aligns with the VGE's recommendations that service allocations be made as broadly as possible.[21] Therefore, we accept the IAC's recommendation and propose that the 149.9 - 150.05 MHz band be allocated to MSS generically as given in Proposal No. 2/L-LEO. Comment is invited.

2. Constraints on MSS Between 1 and 3 GHz

20. Technical Constraints. In the band 1610-1626.5 MHz, RR 731E stipulates that MSS mobile earth stations (MES) shall protect stations operating in accordance with RR 730 and RR 732. To protect stations operating pursuant to RR 732,[22] MESs are limited to an e.i.r.p. of -15 dB (W/4 kHz) in those parts of the band where such stations operate. In other parts of the band, MESs can operate up

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[20] Orbcomm comments at 10-11.

[21] In this regard we note that the IAC recommends that, in light of recent sharing techniques identified in TG 8/3, countries should reconsider the need for RR 608C. This footnote to the 148-149.9 MHZ bands states that MSS shall not cause harmful interference to, nor claim protection from stations of the fixed or mobile services in approximately 70 countries. Eliminating RR 608C would align with the VGE's attempt to eliminate country-specific footnotes to the Table of Frequency Allocations. We request comment on this recommendation. See IAC Interim Report at 62. Additionally, there is a consequential change to RR 599B. This change removes the 'land mobile-satellite' limitation.

[22] RR 732 reserves the 1610-1626.5 MHz band on a worldwide basis for the use and development of air navigation and directly associated terrestrial or satellite-based facilities. It also provides that any satellite use of the band is subject to agreement under the procedures of Article 14 of the international Radio Regulations. Pursuant to the international Radio Regulations, MSS stations may not cause harmful interference to or claim protection from stations operating in accordance with RR 732.

to an eirp of - 3 dB (W/4kHz). However, RR 731E does not specify whether these levels correspond to peak or mean values.

21. TG-8/3 noted that there is a need to clarify the e.i.r.p. density limits of RR 731E. Its view is that the limits should be in terms of the mean e.i.r.p. in a reference bandwidth of 4 kHz.[23] The IAC, in its Interim Report endorses that view.[24]

22. RR 731E also provides that mobile-satellite stations shall not cause harmful interference to, nor claim protection from stations in the aeronautical radionavigation service, stations operating in accordance with RR No. 732 and fixed stations operating in accordance with RR No. 730. MSS parties state that this provision effectively places co-primary MSS operations in a secondary status relative to stations operating pursuant to RR 732 and 730.[25] In its Interim Report, the IAC argues that RR No. 953 provides sufficient recognition of the need to protect radionavigation services operating in the band.[26] The MSS parties and the IAC recommend that this apparently contradictory text be deleted.

23. We intend to clarify footnote RR 731E by proposing that the e.i.r.p. density limit be expressed in terms of a "mean" rather than a "peak" value.[27] We also agree that RR No. 953 provides appropriate and sufficient recognition of the need to protect safety services operating in accordance with RR No. 732. With regard to fixed services operating in accordance with RR No. 730, we believe that sufficient protection can be afforded to these services in the coordination process. Consequently, we propose to delete the last sentence of RR 731E and replace it with text noting that the application of RR No. 953 applies in the 1610-1626.5 MHz band. See attached Proposal No. 3/B-LEO, Appendix 1.

24. RR 733E states that stations of the radiodetermination-satellite and mobile-satellite services shall not cause harmful interference to stations of the radio

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[23] See ITU-R Document 8-3/TEMP/58-E (Geneva, 24 November 1994).

[24] IAC Interim Report at 119.

[25] RR 730 provides an additional primary fixed service allocation in 16 countries. Pursuant to the international Radio Regulations, MSS stations may not cause harmful interference to or claim protection from stations operating in accordance with RR 730.

[26] Radio Regulation 953 of Article 9 cautions administrations that special heed be given to the safety aspects of radionavigation and other safety services when making assignments in bands in which those services operate.

[27] Parties are invited to provide or develop a method for calculating a mean value appropriate for this situation.

astronomy service (RAS) in the 1610.6-1613.8 MHz band.[28] MSS parties contend that RR 733E creates ambiguity in the status of 1.6 GHz MSS networks. Constellation argues that the RR 733E requirement that MSS not cause harmful interference to RAS is an apparent contradiction to MSS's primary status in the table of frequency allocations.[29]

25. The consensus of MSS participants in the IAC is that RR 733E should be suppressed. In its Interim Report, the IAC states that RR 733E was originally adopted at WARC-87 to protect RAS when RAS had a secondary status worldwide and RDSS was being introduced on a secondary basis. The IAC claims that since RAS has been made primary in the subject bands by WARC-92, special recognition bestowed upon RAS by WARC-87 is no longer needed. Further, it claims that RR 733E creates confusion and ambiguity with regard to the status of MSS and RDSS in the 1610.6-1626.5 MHz band. It also notes that in its Big LEO Report, the FCC has adopted sufficient protection for RAS in the 1610.6-1613.8 MHz band.[30]

26. RAS interests who participated in the IAC oppose suppression of RR 733E. The RAS community maintains that RR 733E is a flag that reminds other spectrum users of the need to use special coordination measures when operating in the 1610.6-1613.8 MHz band. They note that the special needs of RAS have been recognized by several WARCs, the VGE and the Commission in its Big LEO Report.[31]

27. We will not propose to suppress RR 733E at this time. We note that the rules for protecting RAS we adopted in the Big LEO Report were based on those agreed to by MSS and RAS interests who participated in the Commission's Above 1 GHz MSS Negotiated Rulemaking Committee.[32] One solution might be to suppress RR 733E and propose a new international footnote that incorporates the RAS

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[28] Radio Astronomy is allocated worldwide in the 1610-1613.8 MHz band. However, RR 733E applies the 1610-1626.5 MHz frequency range.

[29] Constellation comments at 5.

[30] See Big LEO Report, at paras. 100-113.

[31] IAC Interim Report at 105.

[32] Big LEO Report, supra.

protection rules embodied in the Big Leo Report.[33] We request comment on this suggestion, and also invite alternative proposals.

28. RR 753F subjects the radiodetermination-satellite and mobile-satellite services in the 2483.5-2500 MHz band to the coordination and notification procedures of Res. 46. With respect to terrestrial stations, coordination is required only if the space station PFDs at the Earth's surface exceed limits established in RR No. 2566.

29. NGSO MSS proponents contend that RR No.2566 PFD values should be regarded as a "trigger" value for coordination rather than absolute limits. Further, those proponents argue that the current PFD levels should be increased, as it is likely that their systems can operate at higher PFD levels without causing interference to terrestrial systems.[34]

30. The IAC notes that since RR 753F was adopted at WARC-92, substantial analyses have been undertaken that show the RR No. 2566 PFD limits are unduly restrictive. It contends that relaxing these limits would ease introducing NGSO MSS systems and would still provide sufficient protection for fixed terrestrial systems. Additionally, it contends that relaxing PFD limits would eliminate unnecessary coordinations that impact both MSS and fixed system providers.[35] The

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[33] In this regard, we disagree with the RAS community's inference that the Big LEO Report reaffirms retention of RR 733E. In that order, the Commission's concern was that RAS be protected in the 1610.6-1613.8 MHz band. To that end, it adopted a fixed-protection zone method. See 9 FCC Rcd at paras. 101-109; see also 47 C.F.R. § 25.213 (a). We note that modification of international regulations are agreed upon at conferences and, therefore, we did not modify RR 733E in the domestic proceeding.

[34] For example, with regard to specifying the RR 2566 limits as coordination triggers, Constellation states that above 1 GHz NGSO MSS operators intend to operate globally and that therefore it is desirable to set a coordination trigger at a level that would obviate the need for operational systems to coordinate with every country in the world. Constellation comments at 5. With regard to revision of PFD levels, Loral contends that its recent analysis shows that a typical CDMA NGSO MSS system operating at PFD levels higher than those specified in RR 2566 would not cause interference to terrestrial services. Loral proposes to replace the reference to RR 2566 in RR 753F with PFD values it provides in its comments. Loral comments at 13.

[35] The IAC claims that the current PFD levels specified in RR 2566 would result in required coordination with virtually every ITU member-nation. IAC Interim Report at 106.

IAC recommends that we propose to revise RR 753F by striking the reference to RR No. 2566 and providing increased PFD limits that are specific to RR 753F.[36]

31. Our concern is that MSS operators not be forced into unnecessary coordinations because of restrictive or unnecessary technical limits. We also believe that, in general, absolute PFD limits should be developed between administrations in the coordination process or be based on technical justifications relative to specific sharing or coordination cases. We concur with the IAC's recommendation and incorporate it in Proposal No. 3/B-LEO, Appendix 1. Comments are invited.

32. Allocation Constraints. The 1525-1559 MHz and 1626.5-1660.5 MHz bands are allocated to MSS, but have a structure that allocates various portions of the bands to mobile-satellite service, maritime-mobile satellite service, aeronautical mobile-satellite (R) service and the land mobile-satellite service. At past conferences the U.S. has consistently proposed generic allocations for MSS. However, our efforts have not met with total success.[37]

33. MSS proponents and the IAC recommend that the United States propose a generic MSS allocation throughout these bands with appropriate footnotes to provide safeguards and priority access for aeronautical and maritime safety services.[38] We continue to believe that generic MSS allocations offer the most cost and spectrum efficient use of spectrum allocated to satellite services. Consequently, consistent with our action for all proposed MSS allocations, we propose to make a generic MSS allocations in the referenced band and to include the appropriate safeguards for aeronautical and maritime safety services. See Proposal No. 3/B-LEO, Appendix 1.

34. The 1675-1710 MHz band is allocated to, among other services, the meteorological-satellite (MetSats) and meteorological aids (MetAids) services on a primary basis. In Region 2 there is a co-primary allocation for MSS. However,

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[36] The IAC contends that these increased limits would facilitate the introduction of NGSO MSS networks worldwide, while providing sufficient protection to analog point-to-multipoint fixed systems. See, e.g., ITU Radiocommunication Study Groups, Document 2-2/TEMP/89 (Rev. 1), (Geneva, 13 September 1994). On new digital fixed systems, of which few now exist, there could be significant impact. However, techniques to mitigate potential interference exist. Id. at 107. ITU-R Task Group 2/2 at its final meeting in December 1994, adopted a new recommendation to relax these PFD limits. Parties are invited to comment in this regard.

[37] In its Interim Report, the IAC provides a brief discussion of previous U.S. efforts to obtain generic MSS allocations in this frequency range. Id. at 26.

[38] See e.g., AMSC comments at 9-10; IAC Interim Report at 26-27.

footnote RR 735A provides that MSS shall not cause interference to, nor constrain the development of MetSats in this spectrum.

35. The IAC notes that Task Group 8/3 ITU-R Working Party 7C has completed a draft new recommendation regarding sharing between MetSats and MSS in the 1675-1710 MHz band.[39] It points out that sharing may be possible given certain conditions relating to sharing between earth stations and space stations in the two services, co-channel separation distances and how the band is used by meteorological satellite operators.[40] The IAC recommends proposing this band in WRC-95. We include this band as a preliminary draft FCC proposal for co-primary MSS in all three Regions. See Proposal No. 3/B-LEO, Appendix 1. We invite comment on this proposal, recognizing that the 1675-1700 MHz portion of the band is also allocated on a co-primary basis for meteorological aids for which additional sharing studies will be required.

3. Review of Regulatory/Procedural Constraints

36. The WRC-95 agenda includes a broad review of technical constraints associated with the frequency bands allocated below 3 GHz to MSS -- including associated provisions, resolutions, and recommendations. The Notice observed that this agenda item could include a wide range of subjects, including regulatory and procedural issues, and requested parties to identify and address constraints that might hinder advancement of worldwide MSS networks.[41] The IAC and commenting parties identify regulatory and procedural constraints, specifically those relating to Resolution 46 (WARC-92) (Res. 46) and RR No. 2613. In that regard, they propose remedies to address deficiencies in these procedures. These are enumerated below and are divided into issues identified by parties for Below 1 GHz MSS and for MSS Between 1 and 3 GHz.

37. Regulatory/Procedural Constraints - MSS Below 1 GHz. Resolution 46 (WARC-92) (Res. 46) provides an interim procedure for the coordination and notification of non-geostationary satellite networks with other services in spectrum

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[39] See Sharing of the 1675-1710 MHz Band Between the MetSat (Space-to-Earth) and the MSS (Earth-to-Space), ITU-R Doc. 7C/TEMP/4(Rev.2) and associated annexes contained in 7C/TEMP/5(Rev.2). If the draft new Recommendation is approved by the Radiocommunication assembly or prior to WRC-95, the MetSat service could be suppressed from footnote 735A. Sharing between MetAids and MSS is also being addressed in Working Party 7C. If the appropriate sharing criteria are developed and approved for this situation, MetAids could also be suppressed. However, that work remains to be completed.

[40] IAC Interim Report at 22.

[41] WRC Notice, 9 FCC Rcd at 2433.

they share. Res. 46 recognizes that specific criteria and calculation methods necessary for coordination of these systems are undergoing development. Although band specific footnotes dictate where Res. 46 applies and offer some guidance for determining when coordination is necessary, parties have indicated that specific improvements to Resolution 46 would ease coordinating MSS networks and therefore, could speed introducing MSS service.[42]

38. The IAC has identified several areas of Res. 46 for improvement that would affect Below 1 GHz MSS. Specifically, the IAC notes that Res. 46 requires coordinations to take place on the basis of identified frequency overlap of services. However, the IAC contends that even in such cases coordination may be unnecessary if certain space-to-Earth PFD levels are not exceeded. The IAC has indicated that the present requirements of Appendix 3[43] do not give information sufficient for calculating PFD levels precisely. It claims this could lead to an overestimation of the potential for interference into other systems and services. The IAC has recommended that the information requirements of Appendix 3 be expanded so that instantaneous PFD levels can be calculated as a function of the elevation angle from a point on the earth.[44] We believe that more accurately determining PFD levels could reduce the number of space and terrestrial systems of other administrations with whom an administration must coordinate its proposed NVNG MSS system. We invite parties to comment on this point and to provide specific proposals for expanding Appendix 3 requirements.

39. Section 2.8 of Res. 46 requires administrations that do not agree with the bringing into use of a frequency assignment shall, within a six month period of the notification of the requesting administration, send technical details and other information on its systems upon which its disagreement is based. The IAC has stated that in the experience of its members, this provision is not being followed.[45] It notes that without more detailed technical information on potentially affected systems, administrations cannot determine in a given situation whether coordination is actually necessary. The IAC recommends that to facilitate a more effective and efficient

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[42] For example, Orbcomm states that current Res. 46 procedures are workable and have the advantages of avoiding the need for country-by-country notification and establishing a date certain for potentially affected administrations to coordinate. However, it also remarks that clarifications of some aspects of Res. 46 would be helpful. Orbcomm comments at 7.

[43] Appendix 3 of the Radio Regulations contains information on notices relating to space radiocommunications and radio astronomy stations

[44] IAC Interim Report at 69.

[45] Id.

process, it may be useful to provide an Appendix to Res. 46 that specifies detailed information that should be provided.

40. The Radiocommunication Bureau (BR) in its analysis of Res. 46 determined that it should take into account the modulation and type of multiple access employed by NGSO systems. In addition, in Res. 46, the BR has identified technical terms for which definitions should be provided.[46] We invite parties to identify additional information necessary to address these points.

41. Regulatory/Procedural Constraints - MSS Between 1 and 3 GHz. In its Interim Report, the IAC states that Resolution 46 may need further refinement based on experience gained since its adoption in 1992.[47] The IAC proposes changes to the Radio Regulations associated with specific 1-3 GHz MSS allocations and relating to the regulatory procedures of Resolution 46 and it suggests the following improvements to current Resolution 46 footnotes concerning technical and operational matters and coordination:[48] Some of the technically-oriented proposals listed below were addressed previously and are included below for completeness.[49]

- Modify footnotes to replace PFD thresholds of RR 2566 to reflect different pfd thresholds for specific frequency bands identified by Task Group 2/2;[50]

- Modify RR 731E to specify that the maximum e.i.r.p. density limits are based on the use of average (as opposed to peak) values;[51]

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[46] The technical terms for which definitions are requested are:

1. Active service arc;
2. Sub-satellite active area; and
3. Coordination region.

Parties are requested to develop definitions for these terms.

[47] IAC Interim Report at 89.

[48] Id. at 118. Loral states that the U.S. should ensure that Res. 46 and other procedures not impede implementation of NGSO MSS systems. Loral comments at 15.

[49] See infra at paras. 19-29.

[50] Id. at 118. See also Constellation comments at 4-6.

[51] IAC Interim Report at 119.

- Replace Section 2.5 of Resolution 46 (coordination with terrestrial services) with new methodology to be used to determine which Administration is to be coordinated with when the PFD limit for a specific 1-3 GHz MSS allocation is exceeded;[52]

- Modify Resolution 46 to provide a specific method to calculate coordination regions for purposes of paragraphs 2.1 and 2.2 which direct Administrations to effect coordination of satellite networks and stations of terrestrial networks "where assignments might be affected;"[53]

- Revise Note 1 of Resolution 46, Section III to replace current definition of coordination area with a new methodology contained in Recommendation ITU-R IS 847 (except in the case of aircraft stations);[54]

42. The IAC also identifies in general terms several areas where further improvement to Resolution 46 is in order, but it does not propose specific solutions:

- Current provisions fail to protect existing MSS systems from excessive interference caused by fixed service transmitters;

- Information provided in Appendix 3 is insufficient to perform necessary calculations relating to NGSO MSS satellite networks including: (a) orientation of satellite transmitting antenna beams necessary for PFD calculations, (b) specification of what data is to be included for purposes of coordination and agreements between Administrations set forth in Section 2.8; and (3) the type of multiple access and modulation and the maximum and average beam peak e.i.r.p./4 KHz and e.i.r.p./1 MHz for each beam should be submitted to better represent interference potential.[55]

43. Finally, the IAC Interim Report references Reservation 79 taken by the United States and the United Kingdom to the Final Acts of WARC-92. This reservation provides that the two Administrations will not apply Resolution 46 to

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[52] Id. at 119; see also ITU-R Doc. 8D/TEMP/1 (Rev. 1.), Geneva, 1994.

[53] Id at 119.

[54] In the case of aircraft stations, the coordination distance should be 500 km and the method of ITU-R IS 850 should be employed. The IAC notes that this approach has been approved by TG 2/2 and WP 8D. Id. at 119

[55] Id. at 120.

geostationary satellite systems in certain frequency bands, *e.g.*, the 1525-1559/1626.5-1660.5 MHz bands, in order to ensure that systems already in coordination (such as AMSC and INMARSAT) are not subject to additional coordination procedures.[56] The IAC recommends that this position be clarified at WRC-95 by appropriate footnotes to the Table of Allocations.[57]

44. We will not make specific proposals that modify Res. 46 at this time. We note that as part of its effort to simplify the Radio Regulations the VGE has suggested changes that could substantially modify Res. 46.[58] We also note that the IAC is continuing its ongoing analysis of MSS regulatory/procedural issues and of the work of the VGE.[59] Recognizing the continuing work of the IAC and NTIA's RCS, parties are invited to comment on the issues we identify above and to provide further comment on potential modifications to Res. 46. In particular, we note that various

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[56] See Final Protocol No. 679, WARC-92 Final Acts, which provides:

> Referring to statements relating to the frequency range below 3 GHz concerning mobile-satellite services, it is necessary to highlight an oversight in drafting and reading texts which could lead to a new and unnecessary burden of coordination between geostationary space stations and terrestrial services in certain frequency bands. Accordingly, the above Administrations will not accept any commitment for this form of coordination arising from the omission of the term "non-geostationary" in the text of certain footnotes, *e.g.*, Footnote Nos. 726x and 7xx, to the Table of Frequency Allocations in Article 8. This reservation is made on behalf of all national and international organizations for whose frequency assignments the two countries are the notifying administrations.

See also AMSC comments at 16-17.

[57] IAC Interim Report at 121.

[58] See e.g., Report by the Voluntary Group of Experts to Study Allocation and Improved Use of the Radio Frequency Spectrum and Simplification of the Radio Regulations (VGE Final Report), at 88, 106 (1994).

[59] In that regard, IWG-1 of the IAC was tasked with coordinating the regulatory aspects of all issues under consideration by the other IAC IWGs (particularly, those relating to MSS). In its section of the Interim Report, IWG-1 indicates that input from the other groups has been sparse. We note that IWG-2 and IWG-3 of the IAC have addressed certain aspects of regulatory/procedural provisions, however, their work has not been reconciled. Indeed, that work continues. We encourage all parties to continue their analysis of regulatory/procedural issues and to assess the impact of specific proposed changes on the overall application of these regulatory/procedural issues.

MSS interests suggest specific revisions to Res. 46. We request that those parties note all proposed revisions to Res. 46 and that they develop a comprehensive Res. 46 revision "package." We also invite interested parties to examine closely the potential effect of the VGE work in this regard.

Mobile Satellite Feeder Links

45. MSS Feeder Link Regulatory Provisions. Current international provisions permit operation of NGSO MSS feeder links in the Fixed-Satellite Service (FSS) subject to certain regulatory provisions contained in Articles 8, 11, and 29 of the Radio Regulations -- including RR 2613.[60] These provisions, however, do not provide a commonly agreed interpretation for accommodation of NGSO MSS feeder link networks.[61] RR 2613 seeks to protect GSO FSS systems from unacceptable interference caused by space radiocommunication services using NGSO systems. This appears to place the burden of interference avoidance primarily on the NGSO MSS network, even where interference is the result of a later-established GSO FSS system. In addition, since unacceptable interference is fixed by agreement between administrations concerned, there needs to be provisions for correspondence and/or discussions between affected administrations to agree on what constitutes unacceptable interference. Thus RR 2613 has been interpreted as placing NGSO MSS feeder link networks at decided disadvantage.[62]

46. Accommodating NGSO MSS feeder links in FSS bands has been addressed by parties to this proceeding, the IAC and ITU-R Task Groups 8/3 and 4/5. These groups have identified specific spectrum use, technical and regulatory issues that point to actions needed to satisfy NGSO MSS feeder link spectrum requirements.

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[60] Radio Regulation 2613 (WARC-92) provides:

> Non-geostationary space stations shall cease or reduce to a negligible level their emissions, and their associated earth stations shall not transmit to them, whenever there is insufficient angular separation between non-geostationary satellites and geostationary satellites resulting in unacceptable interference' to geostationary-satellite space systems in the fixed-satellite service operating in accordance with these Regulations.
>
> The level of accepted interference shall be fixed by agreement between the administrations concerned, using the relevant CCIR Recommendation as a guide

[61] IAC Interim Report at 159.

[62] Id.

Task Group 4/5 recently concluded: "[t]here is a general recognition that both the GSO FSS satellite networks and NGSO MSS feeder link networks must have a regulatory base which permits their orderly operation without any regulatory uncertainties to their full operational life."[63]

47. Task Group 4/5 noted that additional uncertainty results from the ITU Radiocommunication Bureau's non-application of RR 2613 in connection with its examination of systems under RR 1503.[64] TG-4/5 noted further that since NGSO MSS feeder links and NGSO/FSS systems are not subject to Res. 46 coordination procedures, there exists no procedure for providing protection to NGSO/FSS systems, including feeder links for NGSO MSS, from existing and future GSO/FSS systems.

48. The IAC encourages consideration of changes to Article 8, as recommended by Task Group 4/5, to qualify many FSS allocations to accommodate NGSO MSS feeder link networks on a more equal basis. Specifically, in bands below 17.7 GHz, due to the difficulty of co-directional sharing of frequencies between NGSO MSS feeder links and GSO FSS networks, the IAC proposes that regulatory changes be made to give NGSO MSS feeder links priority status over GSO FSS networks in specific reverse transmission directions[65] in certain bands allocated to FSS networks.[66] In any FSS allocations where this priority approach could not be applied, particularly in bands now heavily used by GSO FSS systems, RR 2613 would be maintained, but modified to clarify its specific application.[67] In addition. Res. 46 (possibly modified by WRC-95) would apply to coordination between GSO FSS and NGSO FSS networks, between multiple NGSO FSS networks and between NGSO FSS networks and terrestrial services.[68] These revisions would be

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[63] ITU-R Doc. 4-5/TEMP/32(Rev.1)-E, Geneva, 1994; accord IAC Interim Report at 159.

[64] Specifically, the BR does not apply RR 2613 in its examination of Appendix 3 notifications.

[65] Reverse transmission NGSO MSS feeder links are those that operate in a direction opposite that indicated in the allocation table for FSS bands.

[66] Id. at 161. However, this priority would not extend to NGSO feeder links that operate co-directionally in FSS bands

[67] Id. at 161

[68] We question whether the current Appendix 28 coordination procedures might be more appropriate for coordinating NGSO FSS Earth stations with terrestrial services instead of a modified Res. 46 procedure. We invite comment in this regard.

accomplished by adding suitable footnotes to the Table of Frequency Allocations in the relevant bands.[69]

49. In bands above 17.7 GHz, where in many instances it appears that co-directional sharing between GSO FSS and NGSO MSS feeder link networks is feasible (with appropriate constraints), TG -4/5 identified a potential method for accommodating NGSO MSS feeder links in specific frequency sub-bands.[70] This method would apply to bands used relatively lightly by GSO FSS systems. It would provide a footnote attendant to such bands that would place competing NGSO FSS networks on an equal regulatory status with GSO FSS networks. NGSO networks would be exempt from RR 2613 and would be coordinated using Res. 46 or Article 11, modified suitably. Successfully coordinated systems would have full protection rights from other users. As in the below 17.7 GHz case, these revisions would be accomplished by adding suitable footnotes to the relevant bands.[71]

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[69] In FSS bands where NGSO MSS feeder link networks are given priority status, the following footnotes would apply:

792BX The use of the band [xxxx] by the fixed-satellite service (direction) is limited to non-geostationary mobile-satellite service feeder links (feeder link direction). The provisions of RR 2613 do not apply for this fixed-satellite service (direction) allocation.

Note: the feeder link direction specified would vary according to whether co-directional or reverse direction feeder links are specified for a particular band.

To direct coordination, the following footnote would be added:

792BY The use of the band [xxxx] by the fixed-satellite service is subject to the application of the coordination and notification procedures set forth in Resolution 46 (as modified), for the coordination between geostationary networks (direction) and non-geostationary networks (direction), between non-geostationary networks (direction) and between non-geostationary (direction) and terrestrial services.

Directions for feeder link transmissions and for fixed-satellite service transmissions would be band specific and would be determined accordingly.

[70] See ITU-R Document 4-5/Temp/32 (Rev.1)-E at 3. The IAC endorses these options in its Interim Report.

[71] Id.

50. The IAC also noted possible revisions to Article 8 and Resolution 46 identified by TG-4/5 that would make all coordination procedures applied to GSO FSS networks also applicable to NGSO MSS feeder link networks in those bands identified for co-primary use. Specifically, Article 8 would be revised to state clearly frequency bands and directions of transmission, whether bands are limited to NGSO MSS feeder links or are shared on a co-equal basis with GSO FSS networks and whether Resolution 46 would apply. Additionally, text would be added to the Annex to Resolution 46 to cover the cases of coordination between NGSO MSS feeder link stations and GSO earth stations operating in opposite transmission directions.

51. Finally, the IAC indicates that a key factor in accommodating NGSO MSS feeder links in FSS bands is how the BR takes the current RR 2613 (Art. 29) into account when evaluating GSO FSS and NGSO MSS feeder link networks. It notes that in addition to the possible revisions discussed above, it may be necessary to modify RR 2613 and other relevant provisions to make NGSO MSS feeder link access to FSS bands easier. The IAC notes that for any allocations where NGSO MSS feeder links would operate in the space-to-Earth direction, there is a need to include appropriate satellite PFD limits to protect terrestrial networks and GSO FSS space stations operating in the opposite direction of transmission. The IAC suggests that WRC-95 decide what modifications may be required.

52. Obtaining sufficient NGSO feeder link spectrum for 1.6/2.4 GHz 'Big LEO' MSS networks is critical for the introduction of those networks in the U.S. and globally.[72] Introducing additional such systems in, for instance, an expanded 2 GHz MSS allocation, will require even more NGSO feeder link spectrum. Consequently, spectrum must be made available for NGSO feeder link use either exclusively or on regulatory/procedural parity with GSO FSS networks. Therefore, in conjunction with

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[72] U.S. Big LEO applicants have requested the following spectrum for feeder link use:

Motorola:	19.4 - 19.6 GHz (space-to-Earth) 29.1 - 29.3 GHz (Earth-to-Space)
Constellation	5050 - 5250 MHz (Earth-to-Space) 6825 - 7025 MHz (space-to-Earth)
Ellipsat:	15.4 - 15.7 GHz (Earth-to-Space) 6725 - 7025 MHz (space-to-Earth)
TRW:	29.7 - 30.0 GHz (Earth-to-Space) 19.8 - 20.1 GHz (space-to-Earth)
Loral/Qualcomm:	5.025 - 5.250 GHz (Earth-to-space) 6.875 - 7.025 GHz (space-to-Earth)

the IAC we are developing specific regulatory/procedural revisions that align with the preliminary findings of the IAC and of TG-4/5 discussed above. These proposals would include footnotes to frequency bands identified for use exclusively by NGSO feeder link networks,[73] and any associated revisionary text to Articles 11 and the Annex to Resolution 46. We invite parties to comment on the above topics and to provide specific alternative proposals to modify RR 2613 to accommodate NGSO MSS feeder links and to eliminate the current ambiguity in its general application for NGSO FSS and GSO FSS networks.[74]

53. MSS Feeder Link Spectrum Requirements. In order to implement the NGSO MSS systems currently proposed in the United States and elsewhere, it is critical that sufficient suitable spectrum be identified and made available for use for NGSO MSS feeder links. The IAC estimated the spectrum requirements for several frequency bands in the 4-31 GHz range given in the table below. These estimates agree with conclusions reached by Task Group 8/3.[75] Final spectrum requirements will be based on each NGSO MSS system's specific design and its operator's service objectives. The table assumes that the satellite systems' antennas will be able to use dual polarization for the frequency bands below 16 GHz which serves to reduce the amount of spectrum required.[76]

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[73] In the following section on feeder link spectrum requirements, the bands to which these proposed footnotes apply are identified in Table 5.

[74] Parties should note that Teledesic Corporation (Teledesic) has requested that RR 2613 be modified so that NGSO systems providing FSS receive equal priority in FSS bands. Teledesic contends that coordinations that are neutral to system type should be adopted. Teledesic comments at 4-5. Teledesic is proposing a constellation of NGSO satellites to provide service to fixed locations. RR 2613 does not address clearly how NGSO FSS should be considered.

[75] See ITU-R Document 8-3/TEMP/53 (Rev.1)-E, Geneva, Nov. 24, 1994.

[76] IAC Interim Report at 146-147.

Table 1.

Current Estimates for Feeder Link Spectrum Requirements for First Generation[77] NGSO MSS Systems in the 1-3 GHz Band

Frequency Range	Spectrum (each direction) Sharing Possible*	Spectrum (each direction) No Sharing
4-8 GHz	200 MHz*	400 MHz*
8-16 GHz	200 MHz*	400 MHz*
16-30 GHz	200 MHz**	500 MHz**

*Use of dual polarization assumed
**Dual polarization not feasible[78]

The commenters generally express support with the above estimates.[79] Further comment on this matter is welcome.

54. MSS Feeder Link Spectrum Allocations. The following frequency bands have been identified by the IAC and the Commission staff as potentially suitable for sharing by NGSO MSS feeder links in the direction(s) indicated. Some bands are identified as candidates for U.S. proposals.[80] See Proposal No. 1/FL-MSS. Other

[77] These estimates would likely just satisfy requirements for current 1.6/2.4 GHz NGSO MSS systems. New NGSO MSS systems, or any additional such systems in future 2 GHz MSS allocations would likely necessitate setting aside more spectrum.

[78] IAC Interim Report at 146-147; The spectrum requirement estimates identified in Table 4 do not include requirements for future generation NGSO MSS systems due, in part, to the difficulty to project accurately such requirements for future designs. Id. at 147-148.

[79] See, e.g., Constellation Comments at 10; Motorola Comments at 16; but see COMSAT Mobile Comments at 14-15.

[80] Parties should note that, due to time constraints, IWG-4 of the IAC did not propose specific bands in its contribution to the Interim Report. However, it did endorse candidate bands identified by Task Group-4/5. See IAC Interim Report at 166. Our table includes those bands as well as bands identified as candidates by the Commission staff.

bands might remain under consideration at this time.[81] Certain bands are identified as being candidates for pairings with other bands in the table. We request comment on these pairings. In cases where one part of a proposed pairing has more spectrum than the other, but has relatively high existing service use, we invite comment and proposals on alternatives (e.g. band segmentation in the larger band; specific frequency pairings;[82] etc.) for linking the two bands. Additional comments are requested on all of the candidate bands, including their sharing possibilities.[83] Interested parties should also note bands to which the regulatory provisions discussed in the preceding section could apply

55. Some bands are identified for feeder link transmissions using reverse band working (RBW).[84] Generally, these are bands below 17.7 GHz.[85] Task Group 4/5 studied the possibility of reverse band operation of NGSO MSS feeder links in FSS bands. It concluded that RBW appeared promising in the C and Ku bands.[86] For the C and Ku cases, Task Group- 4/5 developed NGSO PFD limits (applied at the geostationary orbit) designed to protect GSO networks and eliminate the need to coordinate RBW feeder links. The limit is:

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[81] Note: if bands that correspond to the FSS Allotment Plan (cite) are considered for new allocations, modification to and/or protection of the plan must be considered. Additional proposals may be required.

[82] For example, we are proposing to pair the 250 MHz of spectrum in the 5-5.25 GHz band for uplink transmissions with spectrum in the 6.525-7.075 GHz band for downlink transmissions. Initially, we are proposing to pair the 6.825-6.775 GHz portion of that band. We invite comment on whether an alternative downlink pairing would be preferable.

[83] When developing comments, parties should take note of the IAC's discussion of NGSO MSS feeder link sharing with other services and with other feeder link networks. See IAC Interim Report at 150-157. Parties should also note that in some bands there are domestic allocations that could limit feeder link use. For example, in the 6.425-7.125 GHz range there is significant use by the broadcast auxiliary service; in the 10 GHz and 18/19 GHz bands there is use by the digital electronic messaging service.

[84] In proposed "RBW" bands, NGSO MSS feeder links would transmit in a direction opposite that specified for FSS in the Table of Frequency Allocations.

[85] RBW operation in Ka band could be difficult if large numbers of VSATs and mobile earth terminals that do not require licensing or coordination are implemented -- particularly if they are in the 29.5-30 GHz band.

[86] Co-directional sharing in these bands is possible. However, in bands with large numbers of GSO FSS systems, significant operational constraints on NGSO MSS feeder links would be required to reduce the percentage of time where interference between systems occurs. See, e.g., IAC Interim Report at 150-151