RECEIVED
NOV 19 1998
FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of

Redesignation of the 17.7-19.7 GHz Frequency Band, Blanket Licensing of Satellite Earth Stations in the 17.7-20.2 GHz and 27.5-30.0 GHz Frequency Bands, and the Allocation of Additional Spectrum in the 17.3-17.8 GHz and 24.75-25.25 GHz Frequency Bands for Broadcast Satellite-Service Use

IB Docket No. 98-172
RM-9005
RM-9118

COMMENTS OF MOTOROLA, INC.

Michael D. Kennedy
Corporate Vice President and Director
Global Spectrum and
Telecommunications Policy
Barry Lambergman
Manager, Satellite Regulatory Affairs
Motorola, Inc.
1350 I Street, N.W.
Washington, D.C. 20005
(202) 371-6900

Philip L. Malet
James M. Talens
Steptoe & Johnson LLP
1330 Connecticut Avenue, N.W.
Washington, DC 20036
(202) 429-3000

Counsel for Motorola, Inc.

November 19, 1998

No. of Copies rec'd 0+4
List A B C D E

SUMMARY

Motorola, Inc. ("Motorola") hereby submits these Comments in response to the Commission's Notice of Proposed Rulemaking in IB Docket No. 98-172, which addresses, among other matters, blanket licensing in the 17.7-20.2 GHz and 27.5-30.0 GHz bands ("Ka-band").

First, while Motorola enthusiastically supports the Commission's proposals on blanket licensing in the 18.8-19.5 GHz and 28.6-29.1 GHz bands, the Commission has not gone far enough in proposing blanket licensing for Non-Geostationary Orbit Fixed Satellite Service ("NGSO/FSS") systems. The Commission must correct this oversight and allow for blanket licensing for NGSO/FSS terminals in other portions of the Ka-band where small NGSO/FSS terminals are likely to operate, i.e., in the 19.7-20.2 and 29.5-30.0 GHz bands. Following the work done at WRC-97 and in subsequent ITU-R Joint Task Group 4-9-11 meetings, it appears likely that EPFD and APFD limits will be adopted at WRC-00 that will assure an environment in which Geostationary Orbit Fixed Satellite Service ("FSO/FSS") and NGSO/FSS terminals can coexist in certain portions of the Ka-band. Indeed, the absence of Fixed Service ("FS") and Mobile Satellite Service "(MSS") designations in these bands removes the potential for harmful interference between these services and allows ubiquitous NGSO/FSS and GSO/FSS terminal licensing.

Second, Motorola supports the majority of the Commission's technical standards for GSO/FSS and NGSO/FSS terminals. With regard to the EIRP uplink density limit at 2 degrees off-axis, however, Motorola supports the lowest clear sky uplink level possible. Moreover, aligning the Commission's Rules with international standards, such as the European

Telecommunications Standards Institute and the ITU, would alleviate much of the complication associated with international Ka-band coordination.

Motorola supports the Commission's proposal that the uplink power density envelope be imposed only in the plane of the GSO orbit, and that in all other directions a 3 dB relaxation for elliptical and offset-fed antenna sidelobe performance be used. Motorola also supports the Commission's proposal that applicants for Earth station blanket licenses submit a technical description of how they will comply with the requirements of Section 25.204 of the Rules, which requires that all Ka-band FSS/ Earth stations employ adaptive uplink power control or other methods of fade compensation. Motorola recommends that for the 29.5-30.0 GHz band a maximum rain fade EIRP level be determined and applied to all blanket licenses.

Motorola also supports a maximum downlink PFD threshold in the 19.7-20.2 GHz band, where there is no FS interference potential. Further, it supports a requirement for coordination by any non-blanket licensee not complying with the uplink EIRP density and downlink PFD threshold values with adjacent GFSO/FSS systems along a total of 12 degrees of orbital arc. As to antenna pointing, Motorola supports a dual requirement for all Earth terminals, i.e., use of a pilot tone from the satellite which, if not received by the Earth terminal above some threshold level due to off-axis pointing, would preclude transmission by the Earth station; and automatic transmitter identification on all uplink signals.

TABLE OF CONTENTS

I. INTRODUCTION 2

II. THE COMMISSION MUST ALLOW FOR THE BLANKET LICENSING OF NGSO/FSS EARTH STATIONS AS WELL AS GSO/FSS EARTH STATIONS IN THE 19.7-20.2 GHZ AND 29.5-30.0 GHZ BANDS 3

A. It Is Likely That The WRC-00 Will Adopt Final EPFD And APFD Limits In These Bands To Facilitate Use By NGSO/FSS Systems 5

B. The Most Efficient and Effective Means of Demonstrating Coexistence of NGSO and GSO FSS Systems in These Bands is through the Implementation of Uplink APFD and Downlink EPFD Limits to be Finalized at WRC-00 7

C. The Commission Correctly Recognizes That the Most Flexible and Efficient Use of Spectrum Resources Contemplates NGSO/FSS Systems and Blanket Licensing in Portions of the Ka-Band 8

D. The Existing and Proposed Designations in the 19.7-20.2 GHz and 29.5-30.0 GHz Bands Provides a Suitable Environment for Ubiquitous NGSO and GSO FSS Terminals 8

III. MOTOROLA SUPPORTS MOST OF THE COMMISSION'S TECHNICAL STANDARDS FOR GSO/FSS AND NGSO/FSS TERMINALS 9

A. A Nominal EIRP Uplink Density Limit At 2 Degrees Off-Axis Is Acceptable 10

B. International Coordination May Require a Lower Uplink EIRP Level 11

C. Restriction of Elliptical and Offset-Fed Antennas Producing High EIRP Levels Outside the Plane of the GSO Orbit Is Warranted 14

D. Current Commission Rules Governing Uplink Adaptive Power Control Are Adequate As a Framework for the Ka-Band 14

E. A Maximum Downlink PFD Threshold of -120 dBW/m^2/MHz Averaged Over Any Continuous 40 MHz and -118 dBW/m^2/MHz at Any 1 MHz is Acceptable 16

F. Non-Compliant Earth Stations Should be Permitted 16

G. Antenna Pointing Requirements Are Needed 17

IV. MOTOROLA SUPPORTS BLANKET LICENSING IN THE 18.8-19.3 AND 28.6-29.1 GHZ NGSO/FSS BANDS 18

V. MOTOROLA SUPPORTS THE COMMISSION'S TENTATIVE CONCLUSIONS ON INTERSERVICE SHARING IN THE 19.3-19.7 GHZ AND 29.25-29.5 GHZ BANDS 19

VI. CONCLUSION 20

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of **Redesignation of the 17.7-19.7 GHz Frequency Band, Blanket Licensing of Satellite Earth Stations in the 17.7-20.2 GHz and 27.5-30.0 GHz Frequency Bands, and the Allocation of Additional Spectrum in the 17.3-17.8 GHz and 24.75-25.25 GHz Frequency Bands for Broadcast Satellite-Service Use**	**IB Docket No. 98-172** **RM-9005** **RM-9118**

COMMENTS OF MOTOROLA, INC.

Motorola, Inc. ("Motorola"), licensee and applicant in the Fixed-Satellite Service ("FSS") in the Ka-band, hereby submits these Comments in response to the Commission's Notice of Proposed Rulemaking ("NPRM") in the above-captioned proceeding.[1] Motorola supports blanket licensing in the Ka-band where Non-Geostationary Orbit Fixed Satellite Service ("NGSO/FSS") systems are authorized, including the segmentation of FSS and Fixed Service ("FS") in those portions of the band where blanket licensing is proposed. Motorola also supports most of the Commission's technical standards for Geostationary Orbit Fixed Satellite Service ("GSO/FSS") and NGSO/FSS terminals, and it supports the Commission's tentative conclusions

[1] 63 Fed. Reg. 54,100 (October 8, 1998).

on blanket licensing in the Mobile Satellite Service ("MSS") feeder link bands.[2] However, in certain respects, Motorola believes that the Commission needs to modify its proposed rules to better serve the public interest.

I. INTRODUCTION

In late 1996, Lockheed Martin Corporation, AT&T Corp., Hughes Communications, Inc., Loral Space & Communications, Ltd., and GE American Communications, Inc. (collectively "Petitioners") submitted a petition to the Commission to commence a rulemaking proceeding to revise Part 25 of the Commission's Rules to provide for routine licensing of large numbers of small antenna Earth stations in the Ka-band for the GSO/FSS, i.e., in the 19.7-20.2 GHz, 28.35-28.6 GHz and 29.5-30.0 GHz bands.[3] In its comments in response to this petition, Teledesic Corporation ("Teledesic"), then an applicant for an NGSO/FSS license in the Ka-band, urged the Commission also to consider blanket licensing in the 18.7-19.3 GHz and 28.6-29.1 GHz bands.

Since these pleadings were filed, Teledesic was issued a license for an NGSO/FSS system in the 18.8-19.3 GHz and 28.6-29.1 GHz bands;[4] the Bureau authorized

---

[2] Space System License, Inc. is the licensee of the Iridium System, and is a wholly owned subsidiary of Motorola, Inc. See Motorola Satellite Communications, Inc., Order and Authorization, 10 FCC Rcd. 2268 (Int'l Bur. 1995) recon. denied 11 FCC Rcd. 18502 (1996); Letter from Thomas S. Tycz to Brent Weingardt, Numbered 0800B3 (Jan. 7, 1998); Letter from Brent Weingardt to Magalie Roman Salas (Jan 27, 1998).

[3] RM-9005.

[4] See In the Matter of Teledesic Corporation Application for Authority to Construct, Launch, and Operate a Low Earth Orbit Satellite System in the Domestic and International Fixed Satellite Service, 12 FCC Rcd 3154 (International Bur., Mar. 14, 1997), recon. pending.

thirteen companies to construct, launch, and operate GSO/FSS systems in portions of the Ka-band;[5] and the Bureau issued a Public Notice seeking additional comment on the appropriateness of instituting blanket licensing procedures for the Ka-band.[6] Based on the record of this proceeding, including comments filed in response to the Public Notice, the Commission has issued an NPRM in the above-captioned proceeding.

II. THE COMMISSION MUST ALLOW FOR THE BLANKET LICENSING OF NGSO/FSS EARTH STATIONS AS WELL AS GSO/FSS EARTH STATIONS IN THE 19.7-20.2 GHZ AND 29.5-30.0 GHZ BANDS

Motorola is the licensee of the Millennium System, a constellation of four GSO/FSS satellites assigned orbital locations in the Ka-band suitable for serving North American, Central America and South America. It also has two Ka-band system applications pending before the Commission: The Celestri™ Multimedia LEO System, an NGSO/FSS network, and the Celestri™ GEO System, a constellation of five GSO satellites that will complement the Millennium System to provide global broadband broadcast, multicast and other data distribution services at extremely high data rates. All three systems have proposed operation of thousands of small Earth terminals in the 19.7-20.2 GHz and 29.5-30.0 GHz bands. Other NGSO/FSS systems have also been proposed in these bands.[7]

---

5 *E.g.*, *Comm, Inc.*, 12 FCC Rcd 23001 (Int'l Bur. 1997). Motorola, Inc. is now the licensee of the Millennium System, *see* Letter from Thomas S. Tycz to Michael Nilsson (July 10, 1998).

6 Public Notice, IN Report No. 97-27 (September 5, 1997) ("Public Notice"). The Bureau further sought comment on the feasibility of co-frequency sharing between Fixed-Service ("FS") and FSS in the 17.7-19.7 GHz band.

7 For example, applications have been filed by Lockheed Martin, SkyBridge II LLC, @Contact, LLC., and TRW, Inc.

As Motorola indicated in its comments in RM-9005, successful implementation of the FSS in the Ka-band requires distribution of Earth terminals to geographically diverse users.[8] The only practical means for achieving such broad Earth terminal distribution is through blanket licensing. Blanket licensing will permit the routine grant of large numbers of small antenna Earth stations for use with FSS systems, permitting Earth terminals to be sold and installed with the same ease that cellular telephones are marketed and used today. Motorola therefore agrees with the Commission's tentative conclusion that blanket licensing is in the public interest in the Ka-band.[9] However, the NPRM does not go far enough in proposing blanket licensing for NGSO/FSS systems in that it proposes such licensing only in those portions of the Ka-band where they are designated primary. The Commission must correct this oversight and allow for blanket licensing for NGSO/FSS terminals in other portions of the Ka-band where small NGSO/FSS terminals are likely to operate, i.e., in the 19.7-20.2 and 29.5-30.0 GHz bands.

NGSO/FSS licensing in the 19.7-20.2 GHz and 29.5-30.0 GHz bands will be facilitated by the power limits, i.e., EPFD and APFD limits,[10] under the provisions of Resolution 130 (WRC-97) that are likely to be adopted at the World Radiocommunication Conference in the

---

8 Motorola Comments in RM-9005 at 5.

9 NPRM at ¶43.

10 The EPFD, equivalent power flux-density, is defined as the sum of the power flux-densities produced at a point of the Earth's surface by all space stations within an NGSO system, taking into account the off-axis discrimination of a reference receiving antenna assumed to be pointing towards the GSO orbit. The APFD, aggregate power flux-density, is defined as the summation of the power flux-densities produced at a point in the GSO orbit by all the Earth stations of an NGSO/FSS system. In order to more accurately reflect the actual interference level seen by the GSO/FSS satellite, the APFD is to be revised by incorporating the satellite antenna pattern. See ITU-R Resolution 130, Annex 1.

year 2000 ("WRC-00"). This conference will refine the provisional EPFD and APFD limits adopted at WRC-97 to promote coexistence of NGSO/FSS and GSO/FSS systems in certain frequency bands. The Commission itself recognizes that the most flexible and efficient use of spectrum resources contemplates NGSO/FSS and GSO/FSS systems in these bands.[11] Indeed, the absence of FS terminals in these bands makes them ideally suited for both NGSO/FSS and GSO/FSS blanket licensing.

A. It Is Likely That the WRC-00 Will Adopt Final EPFD and APFD Limits in These Bands to Facilitate Use by NGSO/FSS Systems

Following the work done at WRC-97 and in subsequent ITU-R Joint Task Group 4-9-11 ("JTG 4-9-11") meetings, it appears likely that EPFD and APFD limits will be adopted at WRC-00. Such limits will assure that NGSO/FSS systems can operate without causing unacceptable interference to GSO/FSS systems in the 19.7-20.2 and 29.5-30.0 GHz bands, as required by the Commission,[12] and facilitate blanket licensing for all satellite users in these bands.

WRC-97 addressed the matter of spectrum sharing between GSO/FSS and NGSO/FSS systems in the Ka-band, and other bands. Resolution 130 (WRC-97), Use of Non-Geostationary Systems in the Fixed-Satellite Service in Certain Frequency Bands, refers to NGSO/FSS provisional EPFD and APFD limits that provide protection to GSO/FSS systems in

---

[11] NPRM at ¶55.

[12] NGSO/FSS is secondary to GSO/FSS in the 19.7-20.2 GHz and 29.5-30.0 GHz bands in the U.S. See Rulemaking to Amend Parts 1, 2, 2, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services, Third Report and Order, 62 Fed. Reg. 61,448 (Nov. 18, 1997) at ¶¶39-49.

several frequency bands, including the 19.7-20.2 GHz and 29.5-30.0 GHz bands.[13] These provisional power limits are outlined in Article S22 and Annex 1 of Resolution 130 (WRC-97) and are considered the permissible EPFD and APFD levels from an NGSO/FSS system into GSO/FSS systems.[14]

Resolution 130 (WRC-97) also requested the ITU-R to conduct the appropriate technical, operational and regulatory studies to review the regulatory conditions relating to the co-existence of NGSO/FSS and GSO/FSS systems. The ITU-R JTG 4-9-11 was assigned the responsibility for reporting the results of those studies and preparing Conference Preparatory Meeting ("CPM") text for WRC-00. Two international meetings of the JTG 4-9-11 have been held and another two are scheduled before CPM-00. All of the work of this group must be completed before WRC-00. Included on the WRC-00 agenda is review of the provisional limits indicated in Resolutions 130 (WRC-97), 131 (WRC-97) and 538 (WRC-97).[15]

---

[13] NPRM at ¶55.

[14] Article S22.2 § 2(1) states that non-geostationary-satellite systems shall not cause unacceptable interference to geostationary-satellite systems in the fixed-satellite service. Resolution 130 specifies that the provisional power limits in Article S22 and in Annex 1 "correspond[ing] to permissible levels of interference from a non-GSO system into a GSO system...." Resolution 130, Resolves 3. Thus, any NGSO FSS system that complies with the applicable provisional (or revised by WRC-00) EPFD and AFPD limits of Resolution 130 will not be viewed as causing unacceptable interference to GSO/FSS systems in the Ka-band.

[15] Among the issues are review and, if appropriate, revision of the power limits appearing in Articles S21 and S22 in relation to the sharing conditions among NGSO/FSS, GSO/FSS, GSO/BSS, space sciences and terrestrial services. See Resolution 130 Agenda for the World Radiocommunication Conference (WRC-2000), ITU-R Study Groups, Section 1.13, 18 September 1998.

B. The Most Efficient and Effective Means of Demonstrating Coexistence of NGSO and GSO FSS Systems in These Bands is through the Implementation of Uplink APFD and Downlink EPFD Limits to be Finalized at WRC-00

In the NPRM, the Commission requested comment on the most efficient and effective way to demonstrate that secondary use of the 17.7-20.2 GHz band will not cause interference to users operating on a primary basis, and that such use can accept interference from primary service operations.[16] As this question relates to the 19.7-20.2 and 29.5-30.0 GHz bands, the answer is quite straightforward. The provisional APFD and EPFD permissible levels of Article S22.2 define the limit of acceptable interference into a GSO/FSS system from an NGSO/FSS system in the same band. Thus, by definition, so long as an NGSO/FSS system's APFD and EPFD remain below these permissible limits, it will not cause unacceptable interference to GSO/FSS systems. Conversely, the blanket licensing parameters that will be developed for GSO/FSS system Earth terminals in these bands will define the limits of potential GSO/FSS interference into NGSO/FSS systems in the 19.7-20.2 and 29.5-30.0 GHz bands.[17]

Accordingly, implementation of APFD and EPFD limits in conjunction with GSO/FSS sharing criteria will clear the way for blanket licensing for all satellite users in the Ka-band.

---

[16] NPRM at ¶33.

[17] There are no similar domestic or international regulations or power limits in the 18.8-19.7 GHz and 28.6-29.5 GHz bands, and none is anticipated in the WRC-00 agenda.

C. The Commission Correctly Recognizes That the Most Flexible and Efficient Use of Spectrum Resources Contemplates NGSO/FSS Systems and Blanket Licensing in Portions of the Ka-Band

The Commission states that "we believe that it is in the public interest to provide for the most flexible and efficient use of spectrum resources possible" to permit NGSO/FSS sharing with GSO/FSS systems in portions of the Ka-band.[18] Indeed, the concern expressed by the Commission with regard to the GSO/FSS uplink power density envelope in directions other than the plane of the geostationary orbit correctly recognizes that this "could facilitate sharing with NGSO/FSS systems . . . ."[19] Thus, there appears to be no reason to limit NGSO/FSS blanket licensing only to the 18.8-19.3 GHz and 28.6-29.1 GHz bands. As noted in Motorola's earlier discussion concerning APFD and EPFD limits, the development of such power limits would allow co-existence of ubiquitous GSO/FSS and NGSO/FSS terminals in the 19.7-20.2 GHz and 29.5-30.0 GHz bands.[20]

D. The Existing and Proposed Designations in the 19.7-20.2 GHz and 29.5-30.0 GHz Bands Provides a Suitable Environment for Ubiquitous NGSO and GSO FSS Terminals

The current Allocation Table as set forth in Section 2.106 of the Commission's Rules designates no FS or MSS operation in the 19.7-20.2 GHz or 29.5-30.0 GHz bands. The

---

18 Id. at ¶55.

19 Id.

20 Id. at n.83.

Commission's proposed designation changes, as reflected in the NPRM, similarly do not contemplate FS or MSS operation in these bands. Thus, there is no potential for harmful interference between FS and FSS or MSS and FSS. Accordingly, the Commission should proceed expeditiously with blanket licensing of NGSO and GSO FSS terminals in the 19.7-20.2 GHz and 29.5-30.0 GHz bands once technical standards for GSO/FSS operation are established, including PFD and EIRP limits and antenna off-axis limits.

III. MOTOROLA SUPPORTS MOST OF THE COMMISSION'S TECHNICAL STANDARDS FOR GSO/FSS AND NGSO/FSS TERMINALS

Motorola finds that the majority of the Commission's technical proposals are reasonable and will support the earliest implementation of ubiquitous Ka-band Earth terminals in the United States. To that end, Motorola reluctantly supports the 25 dBW/MHz EIRP uplink density limit at 2 degrees off-axis for GSO systems, consistent with the composite curve described in the NPRM.[21] In order to minimize intra-system interference, however, Motorola prefers the lowest possible EIRP level in these bands.[22] Motorola also supports use of a standard antenna mask, as the Commission proposes.

Elliptical and offset-fed GSO/FSS antennas producing higher EIRP levels outside the plane of the geostationary orbit should be restricted, as suggested by the Commission, because higher values would limit the potential for sharing with NGSO/FSS networks in these bands. The Commission's current rule for systems operating above 10 GHz employing uplink

---

[21] NPRM at ¶53.

[22] Unfortunately, the GSO FSS industry was unable to reach a consensus on an EIRP uplink density limit.

adaptive power control is generally suitable for the 29-5-30.0 GHz band because typical rain fades are only 7-8 dB. A maximum rain faded EIRP level should be adopted as an upper bound to possible transmit power.

Motorola also supports the downlink PFD thresholds as noted in the NPRM, and it supports the Commission's proposal for non-compliant Earth stations that require all potentially affected parties to acknowledge and not to object to the proposed operation. Lastly, Motorola agrees that antenna pointing requirements are necessary to ensure that blanket licensing is compatible with GSO/FSS sharing in the Ka-band.

A. A Nominal EIRP Uplink Density Limit at 2 Degrees Off-Axis is Acceptable

In order to prevent unacceptable interference between GSO/FSS systems in the 29.5-30.0 GHz band in an environment of ubiquitous GSO/FSS Earth terminals, a limit to the clear sky EIRP uplink density level is necessary. Motorola originally proposed a clear sky uplink EIRP density of 15 dBW/MHz at 2.2 degrees off-axis, a figure that was intended to limit the level of interference from adjacent satellite networks' Earth terminals to no more than a 6% increase in uplink system noise temperature. Informal discussions among the GSO/FSS licensees in the Ka-band have led to a range of proposed clear sky uplink EIRP densities, from 20 to 26 dBW/MHz at 2 degrees off-axis.[23] Motorola, an active participant in those discussions, has been flexible regarding its requirement in order to accommodate the other licensees' needs and reluctantly agrees to a level of 25 dBW/MHz at 2 degrees off-axis. However, the higher uplink level proposed by the Commission may mean that all GSO/FSS systems will experience

---

[23] NPRM at ¶52-54.

more than a 6% increase in uplink noise temperature, leading to more difficult international coordinations. Motorola believes that the lowest number which can be generally agreed upon will best limit intersystem interference and hasten the implementation of Ka-band services to the public. Accordingly, Motorola supports the lowest achievable clear sky uplink EIRP off-axis level.

Motorola also agrees with the Commission's proposal for a composite antenna curve for uplink EIRP levels. This curve should follow the roll-off pattern of an antenna conforming to the 29 – 25 log (θ) formula. As the Commission noted, this antenna pattern will result in a slight increase in the cost of the antennas but it is a pattern that most manufacturers indicated during their presentations at the GSO/FSS informal discussions could be mass produced.

It should be noted that off-axis EIRP levels are determined by the amount of power supplied to the input of the antenna and the roll-off pattern of the antenna's side lobes. Because antenna manufacturers have indicated that a 29 – 25 log (θ) roll-off is reasonably achievable, the only remaining independent variable is the power level into the antenna. Thus, if the Commission reduces the off-axis EIRP level to below 25 dBW/MHz, some system operators may find it necessary to use larger antennas.

B. International Coordination May Require a Lower Uplink EIRP Level

Because many of the Ka-band GSO/FSS licensees and applicants propose to offer service to the United States and other countries, the issue of coordination becomes very important. Such coordination would be aided were the Commission's Rules aligned with international standards. For example, the European Telecommunications Standards Institute

("ETSI") and the ITU are developing proposed standards for Earth terminals operating in the 29.5-30.0 GHz band. The ITU is currently considering changes to ITU-R Recommendations S.524 and S.728[24]; the ETSI is proposing technical characteristics of Satellite Interactive Terminals ("SIT") operating as part of satellite networks.[25]

At the October 1998 WP-4A meeting in Geneva, several proposals were made in relation to ITU-R Recommendations S.524 and S.728. After considerable discussion of a variety of proposals from both the U.S. and other countries, WP-4A decided on a Preliminary Revision to Recommendation S.524. WP-4A decided to modify Recommendation S.524 so that the maximum EIRP limit is 19 – 25 log (θ) dBW/40 kHz for GSO/FSS Earth terminals operating in the 27.5-30.0 GHz band. This value was supported by contributions from France, Luxembourg and the U.K., with general support based on a common interest in "grandfathering" existing international systems.[26]

The current ETSI proposed standard with regard to EIRP levels for SITs operating in the 29.5-30.0 GHz band provides an off-axis EIRP level similar to that being proposed in WP-

---

24 Recommendation ITU-R S.524 addresses maximum permissible levels of off-axis EIRP density from GSO/FSS Earth stations transmitting in the 6, 14, and 30 GHz bands, as revised by WP-4A in October 1998. Recommendation ITU-R S.728 proposes maximum permissible levels of off-axis EIRP density from very small aperture terminals ("VSATs"). WP-4A decided to update ITU-R S.524 because it has wider application; ITU-R S.728 will be addressed at the following WP-4A meeting.

25 ETSI prEN 301 263 v0.4.4 (1998-04).

26 It should be noted that the EIRP value is for clear air operations and it is expected that operational measures will be implemented to compensate for uplink fading due to rain. The 19 – 25 log(θ) dBW/40 kHz level includes any additional margins above the minimum clear sky level necessary for the implementation of power control.

4A, except the EIRP levels for SITs are not to be exceeded under any condition. The ETSI proposal provides:

> The following specifications apply to the SIT transmitting at EIRPs up to $EIRP_{max}$. The maximum EIRP in any 40 kHz band within the nominated bandwidth of the co-polarized component in any direction ϕ degrees from the antenna main beam axis shall not exceed the following limits:
>
> | | | | |
> |---|---|---|---|
> | $19 - 25 \log \phi - 10 \log N$ | dBW | for | $1.8 \leq \phi \leq 7.0$ |
> | $-2 - 10 \log N$ | dBW | for | $7.0 < \phi \leq 9.2$ |
> | $22 - 25 \log \phi - 10 \log N$ | dBW | for | $9.2 < \phi \leq 48$ |
> | $-10 - 10 \log N$ | dBW | for | $\phi > 48$ |
>
> Where ϕ is the angle, in degrees, between the main beam axis and the direction considered, and N is the maximum number of SITs which may transmit simultaneously in the same carrier frequency band. This number shall be declared by the manufacturer. In addition, the maximum EIRP in any 40 kHz band within the nominated bandwidth of the cross-polarized component in any direction ϕ degrees from the antenna main beam axis shall not exceed the following limits:
>
> | | | | |
> |---|---|---|---|
> | $9 - 25 \log \phi - 10 \log N$ | dBW | for | $1.8 \leq \phi \leq 7.0$ |
> | $-12 - 10 \log N$ | dBW | for | $7.0 < \phi \leq 9.2$ |
>
> where ϕ is the angle, in degrees, between the main beam axis and the direction considered, and N is the maximum number of SITs which may transmit simultaneously in the same carrier frequency band. This number shall be declared by the manufacturer.[27]

To the extent these international uplink EIRP off-axis levels outside the U.S. differ from the Commission's proposed levels, international coordination of GSO/FSS networks will be complicated. The Commission should take cognizance of these developments in determining the off-axis EIRP level that it defines for purposes of GSO/FSS Earth terminal blanket licensing.

---

[27] Id.

C. Restriction of Elliptical and Offset-Fed Antennas Producing High EIRP Levels Outside the Plane of the GSO Orbit Is Warranted

The Commission proposes that the uplink power density envelope be imposed only in the plane of the GSO orbit, and that in all other directions a more relaxed EIRP density envelope under clear sky conditions be permitted.[28] Motorola supports the 3 dB relaxation for elliptical and offset-fed antenna sidelobe performance proposed by the Commission.

By establishing limits for GSO/FSS Earth terminals in directions outside the plane of the GSO orbit, sharing between the GSO/FSS systems in the orbital arc and outside it will be facilitated. As Motorola has shown in both WP-4A and JTG 4-9-11 papers, in order for inclined orbit GSO/FSS systems to achieve the same level of mutual protection as they would were they not in inclined orbits, an EIRP limit outside the orbital arc is needed.[29] Importantly, limiting the relaxation outside the orbital arc to 3 dB also provides protection to NGSO FSS systems planning to operate in the 29.5-30.0 GHz band. For these reasons, Motorola supports the Commission's proposal with regard to elliptical and off-set fed antenna limits outside the orbital arc.

D. Current Commission Rules Governing Uplink Adaptive Power Control Are Adequate As a Framework for the Ka-Band

The Commission has proposed that all applicants for Earth station blanket licenses submit a technical description of how they will comply with the recently adopted Section 25.204 of the Rules, which requires that all Ka-band FSS Earth stations employ adaptive

---

28 NPRM at ¶53.

29 See Permissible Levels of Off-Axis EIRP Density From Very Small Apertures in the Band 29.5-30.0 GHz, U.S. JTG 4-9-11/50 and U.S. WP-4A/12.

uplink power control or other methods of fade compensation.[30] The Commission seeks comment on whether this technical demonstration would help avoid mutual-interference events among Ka-band GSO satellites or whether it would place an unnecessary burden on applicants.[31] Motorola supports the Commission's proposal.

Section 25.204 governs use of uplink adaptive power control at the Ka-band and permits an increase in uplink power only to the extent that the PFD at the satellite does not exceed the PFD level under clear sky conditions. The Commission correctly notes, however, that rain fades in the Ka-band can be much more significant than in the Ku-band, which could lead to elevated power levels and unacceptable interference to adjacent satellites under Section 25.204. The Commission therefore seeks adjustments to Section 25.204 to accommodate these rain fade differences. Most operators in the 29.5-30.0 GHz band are currently designing systems to overcome rain fade in the range of 6-7 dB, based on a 99.5% link availability criterion.

Motorola believes that Section 25.204(e) is adequate as a framework to accommodate power control for systems in the 29.5-30.0 GHz band. However, because the EIRP value that the Commission is likely adopt is predicated on clear air conditions, it should include an additional margin above the minimum clear air level necessary for the implementation of power control. The clear air power levels on most systems will be set so that power control will be invoked after a rain fade of a few dB.

Currently, Section 25.204(e) states that the maximum power level for power control shall be coordinated between and among adjacent satellite operators. Because the 29.5-

---

30 NPRM at ¶¶57-58.

31 Id. at ¶57.

30.0 GHz band is likely to feature blanket licensing, it is not appropriate or practical that the maximum power level be left undefined. Motorola recommends that for the 29.5-30.0 GHz band, a maximum rain fade EIRP level be determined and applied to all blanket licensees. If an operator should choose to exceed this level, coordination will all other licensees would be necessary.

E. A Maximum Downlink PFD Threshold of –120 dBW/m^2/MHz Averaged Over Any Continuous 40 MHz and –118 dBW/m^2/MHz at Any 1 MHz is Acceptable

At present, in the band 19.7-20.2 GHz, there is no PFD limit either domestically or in the international Radio Regulations. This is due to the fact that there are no Fixed Services ("FS") in the band. However, to obtain the objectives of blanket licensing, a threshold value is necessary. Motorola supports the values suggested in the NPRM of –120 dBW/m^2 averaged over any continuous 40 MHz and –118 dBW/m^2 per any 1 MHz. These threshold values will permit the possibility of coordinated higher values. Establishing such values will also provide a boundary condition for the implementation of blanket licensing for NGSO/FSS terminals.

F. Non-Compliant Earth Stations Should be Permitted

The matter of non-compliant Earth stations was the subject of discussion during the informal blanket licensing industry meetings attended by the Ka-band GSO/FSS licensees.[32] There were concerns expressed that blanket licensing would be at risk if even one licensee operated outside the generally-accepted range of uplink EIRP density and downlink PFD

---

[32] NPRM at ¶60.

threshold values. However, the licensees agreed that the same kind of flexibility that obtains in the Ku-band should apply to the Ka-band. By this approach, any non-compliant Earth station would be required to coordinate with adjacent GSO/FSS systems along a total of 12 degrees of orbital arc, i.e., 6 degrees on either side of its own GSO/FSS location. Once such agreements are obtained, the non-compliant Earth station operator would be permitted to transmit at the coordinated levels, and the adjacent operators would be bound by their agreement.

G. Antenna Pointing Requirements Are Needed

The Commission has sought comment on antenna pointing integrity, a key practical problem that will face the deployment of blanket licensed Earth stations operating in the Ka-band. Unlike wireless and wireline telephones, directionality of the uplink signal in the Ka-band is critical to avoid interference with adjacent licensed systems, including those GSO/FSS satellites located in adjacent orbital slots and NGSO/FSS systems sharing that portion of the Ka-band. Indeed, an errant uplink transmitter could cause significant loss of service capacity for a neighboring GSO/FSS system and have a similar adverse impact on an NGSO/FSS system. It is not prudent to rely on the lack of human error to assure that thousands of Earth terminals are installed to within one degree or less of orbital arc.

A far better approach is to require that every Earth station antenna be pointed to within a defined angular excursion from its serving satellite as a condition to its operation. The notion of a mandatory pilot signal threshold as proposed by the Commission makes the most sense and represents an automatic, self-correcting installation protocol for terminals that will be marketed on a national (if not international) basis. In order to prevent a pilot signal-based

installation protocol failure, however, there must be automatic transmitter identification data associated with all uplink transmissions.

Accordingly, Motorola supports a dual requirement for all Earth terminals, i.e., use of a pilot tone from the satellite which, if not received by the Earth terminal above some threshold level due to off-axis pointing, would preclude transmission by the Earth station; and automatic transmitter identification on all uplink signals. With these two protocols in place, there would be no need for requiring Earth terminal installation by trained technicians, and the risk of mispointing would be virtually eliminated. The cost of this approach to the service provider, amortized over the many thousands of Earth terminals installed, would be less burdensome than dealing with perpetual interference problems caused by mispointed terminals.

IV. MOTOROLA SUPPORTS BLANKET LICENSING IN THE 18.8-19.3 AND 28.6-29.1 GHZ NGSO/FSS BANDS

Motorola agrees with the Commission that the reasons for instituting blanket licensing procedures are the same for both GSO/FSS and NGSO/FSS and that developing blanket licensing procedures for NGSO/FSS systems in the 18.8-19.3 GHz and 28.6-29.1 GHz bands is in the public interest.[33] Accordingly, Motorola supports the expeditious development of standards that will accompany such blanket licensing.[34]

---

[33] NPRM at ¶¶66-69.

[34] Indeed, Motorola recently filed an Opposition to the Petition for Interim Relief filed in this docket by the Fixed Point-to-Point Communications Section, Wireless Communications Division of the Telecommunications Industry Association, in which Motorola urged the Commission to strike an appropriate balance between terrestrial and satellite interests by preserving terrestrial operators' secondary status in certain 18 GHz bands while this rulemaking is pending. See Opposition of Motorola, Inc. (filed Nov. 9, 1998).

V. MOTOROLA SUPPORTS THE COMMISSION'S TENTATIVE CONCLUSIONS ON INTERSERVICE SHARING IN THE 19.3-19.7 GHZ AND 29.25-29.5 GHZ BANDS

The Commission asks for comment on the efficiency of continued sharing of the 19.3-19.7 GHz band by terrestrial fixed service ("FS") and MSS/FL operations.[35] Motorola believes that the current FS/FSS sharing rules pertaining to this band are adequate for the foreseeable future, providing FS with opportunities for deployment on a coordinated basis with the Iridium System's gateway Earth stations.

The Commission has also tentatively proposed not to implement blanket licensing in the 29.25-29.5 GHz band, where GSO/FSS is co-primary with MSS/FL operations.[36] Sharing between ubiquitous GSO/FSS and MSS/FL has not been shown to be possible in this band, and it is unlikely that with continued development of NGSO MSS systems there is any likelihood of a change.[37] More specifically, in no industry forum in the last year has there been any indication that revised antenna performance standards, power limits or geographic restrictions could be adopted to permit blanket licensing of GSO/FSS Earth stations in this band. Accordingly, Motorola supports the Commission's tentative conclusion that there should be no blanket licensing in the 29.25-29.5 GHz band.

---

35 NPRM at ¶34.

36 NPRM at ¶63.

37 Iridium Comments at 3; id..

VI. CONCLUSION

Motorola supports blanket licensing in the Ka-band where NGSO/FSS systems are authorized, including the segmentation of FSS and FS in those portions of the band where blanket licensing is proposed. Motorola also supports the majority of the Commission's technical proposals for GSO/FSS and NGSO/FSS Earth terminals, including the need to promulgate antenna pointing requirements and restrictions on elliptical and offset-fed antennas producing high EIRP levels outside the plane of the GSO orbit in bands where APFD and EPFD limits apply. Certain technical rule proposals, however, would benefit from revision or refinement, including proposals concerning adaptive power control, use of non-compliant Earth stations, and selection of a lower uplink EIRP level for Earth stations. Lastly, Motorola supports the Commission's tentative conclusions on blanket licensing in the 18.8-19.3 GHz and 28.6-29.1 GHz bands.

Respectfully submitted,

James M. Talens

Philip L. Malet
James M. Talens
Steptoe & Johnson LLP
1330 Connecticut Avenue, N.W.
Washington, DC 20036
(202) 429-3000

Counsel for Motorola, Inc.

Michael D. Kennedy
Corporate Vice President and Director
Global Spectrum and
Telecommunications Policy
Barry Lambergman
Manager, Satellite Regulatory Affairs
Motorola, Inc.
1350 I Street, N.W.
Washington, D.C. 20005
(202) 371-6900

November 19, 1998