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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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In the Matter of	)	
	)	
Petition for Rulemaking to Allocate the 5.1 - 5.35 MHz Band and Adopt Service Rules for a Shared Unlicensed Personal Radio Network	)	RM-8648
	)	
Petition to Allocate Spectrum in the 5 GHz Band to Establish a Wireless Component of the National Information Infrastructure	)	RM-8653

OPPOSITION OF LORAL/QUALCOMM PARTNERSHIP, L.P.

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EXECUTIVE SUMMARY

Loral/QUALCOMM Partnership, L.P., licensee of the GLOBALSTAR Big LEO MSS system, urges the Commission to dismiss the petitions of WINForum and Apple Computer, Inc. to allocate spectrum in the 5 GHz band for an unlicensed and protected high-speed wireless data communications services. The Commission and the U.S. government are proposing allocation of portions of the 5 GHz band for non-GSO MSS feeder uplinks for use by GLOBALSTAR and other global non-GSO MSS systems. The Commission recently declined to propose international allocations for high-speed data communications in the 5 GHz band.

Achieving allocations for non-GSO MSS feeder links at WRC-95 is a paramount objective for the United States. This objective should not be undercut by consideration of additional allocations in the bands prior to obtaining these allocations or before implementation of Big LEO systems which will provide telecommunications in currently unserved and underserved areas of the world.

The high-speed wireless data communications service proposed by WINForum and Apple should not be permitted to operate in the 5 GHz band because large numbers of unlicensed units are likely to cause unacceptable interference into the 5 GHz satellite receivers of non-GSO MSS systems, including GLOBALSTAR. Moreover, non-GSO MSS feeder uplinks could cause interference into the high-speed wireless data communications service. Separation of the two systems is impractical and unenforceable.

Finally, the Commission should not consider additional allocations for wireless data communications services until WINForum and Apple provide appropriate sharing analyses regarding sharing with other services as well as information concerning use of the substantial amount of spectrum currently available for wireless data systems.

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OPPOSITION OF LORAL/QUALCOMM PARTNERSHIP, L.P.

Loral/QUALCOMM Partnership, L.P. ("LQP"), by its attorneys, hereby opposes the rulemaking petitions filed by the Wireless Information Forum ("WINForum") and Apple Computer, Inc. ("Apple") seeking the allocation of at least 250 megahertz of spectrum at 5.1-5.35 GHz for a new unlicensed radio service.[1] Neither WINForum nor Apple has provided adequate justification for this enormous spectrum allocation, nor have they offered information as to why spectrum now available for such unlicensed radio services would be inadequate for the proposed services. Accordingly, LQP opposes the allocation of the 5.1-5.25 GHz band for this service as unnecessary and also incompatible with the operation of the uplink feeder links to be used in LQP's Globalstar satellite system.

LQP was recently licensed by the Commission to construct, launch and operate a 48-satellite non-geostationary mobile satellite system (MSS) for

[1] WINForum seeks allocation of 5100-5350 MHz. Apple seeks allocation of 5150-5300 MHz and 5725-5875 MHz, a total of 300 MHz.

provision of voice, data and facsimile service throughout the world.[2] LQP is authorized to operate its service links in the 1610-1626.5 MHz/2483.5-2500 MHz bands on a shared basis.[3] Thus, LQP will provide communications service in the United States sharing 33 MHz of user link spectrum with at least two other U.S.-licensed systems, and possibly several other systems worldwide. In its license, LQP was authorized to construct, at its own risk, the Globalstar feeder links in the 5 GHz band. LQP's use of a portion of the 5 GHz band for its feeder uplinks requires allocation for MSS feeder links in this band at the upcoming WRC-95; the Commission has taken the position of supporting this allocation.[4]

In contrast, the Commission declined to support consideration of an international allocation for high-speed wireless data networks, as sought by AT&T and others, for inclusion on the WRC-97 agenda. The Commission states its conclusion "that consideration of HSWDS would complicate the issue of sharing 5 GHz spectrum between aeronautical radionavigation and NGSO MSS feeder

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[2] Loral/QUALCOMM Partnership, L.P., 10 FCC Rcd 2333 (Int'l. Bur. 1995).

[3] TRW Inc and Motorola Satellite Communications, Inc. were authorized simultaneously with LQP on January 31, 1995. TRW Inc., 10 FCC Rcd 2263 (Int'l. Bur. 1995) and Motorola Satellite Communications, Inc., 10 FCC Rcd 2268 (Int'l. Bur. 1995). The Commission also found that applicants Constellation and MCHI required additional time to establish financial qualifications and deferred further consideration of their applications until January, 1996. Constellation Communications, Inc., 10 FCC Rcd 2258 (Int'l. Bur. 1995); Mobile Communications Holdings, Inc., 10 FCC Rcd 2274 (Int'l Bur. 1995). The remaining applicant, AMSC, deferred its financial showing until January, 1996.

[4] See Preparation for International Telecommunication Union World Radiocommunication Conferences, (WRC-95 Report), IC Docket No. 94-31, FCC 95-245, released June 15, 1995, at paras. 49-51, and Appendix 1, Section C, pages 2-5.

links."[5] The Commission has thus already declined to support an international allocation for the service proposed by Apple and WINForum.

Apart from the allocation issue, LQP is concerned about the feasibility of non-GSO MSS feeder uplinks operating co-frequency with HSWDS. Depending on the quantity of high-speed wireless radios and the extent of outdoor deployment, these systems could cause unacceptable interference into the feeder uplinks of LQP's GLOBALSTAR system. If such HSWDS systems were widely implemented as Apple and WINForum suggest, it would be infeasible and virtually impossible to identify and control such interference. Sharing analyses have already concluded that the NGSO MSS feeder uplinks could cause harmful interference into the high-speed wireless systems.[6] WINForum and Apple suggest that sharing may be feasible depending on siting of the feeder link earth stations. However, because of the proposed ubiquitous operation of the wireless systems, gateway earth station site selection, even if feasible, could not provide sufficient assurance that unacceptable interference would not be caused to the HSWDS.

Consequently, LQP believes that the rulemaking petitions of WINForum and Apple should be dismissed, at least with regard to the 5.1-5.25 GHz band where the feeder uplinks for non-geostationary MSS systems are planning to operate.

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[5] Supra, at para. 97. The Commission further observes that "HSWDS would also be required to demonstrate their ability to share with ARNS systems in the band." Id, at ftnte. 162.

[6] See Document 4-5/85-E, 8 November 1994, submitted by the United Kingdom to ITU Radiocommunication Sector Working Party 4/5.

I. WINFORUM AND APPLE RECOGNIZE SHARING DIFFICULTIES FOR THEIR PROPOSED UNLICENSED SERVICE

WINForum asks the Commission to allocate the 5.1-5.35 GHz band and to adopt service rules for use by unlicensed wireless devices, at data rates of up to 20 Mbp/s. WINForum envisions the establishment of a new high speed Shared Unlicensed Personal Radio Network ("SUPERNet"). As WINForum states in its petition, the system would "allow wireless access to the full range of data communications capabilities now being deployed in landline networks to support multimedia and other resource-intensive applications."[7] Thus, the proposed service clearly is intended to provide a replacement for wired networks. WINForum suggests that this wireless capability is needed to support public access "to the full capabilities of the broadband wired network for data, voice, graphics, teleconferencing, videoconferencing, and multimedia products."[8]

Similarly, Apple asks the Commission to allocate 300 MHz of spectrum in the 5150-5300 MHz band and the 5725-5875 MHz band for high capacity, unlicensed wireless data. In this self-described "NII Band," Apple seeks bandwidth to support high-speed applications (up to 24 Mbp/s or higher) and large numbers of users, a "Part 16" protected spectrum approach with technical rules developed by the information industry, equal access to the spectrum for compliant devices and all types of communications, and longer distance communications (10-15 km or more) for unlicensed community networks.[9] Apple envisions allocation of spectrum in which the proposed service would operate on a protected basis. Apple states that this service would "promote the full deployment of a National

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[7] WINForum Petition, at page 1.

[8] Supra, at p. 2.

[9] Apple Petition, at Summary.

Information Infrastructure ("NII")," permitting high-bandwidth access and interaction, on a networked and ad hoc basis.

WINForum and Apple assert that the 5 GHz band can be utilized for the proposed unlicensed service because the FAA is de-emphasizing its use of the Microwave Landing System in favor of GPS. WINForum and Apple claim that the proposed service can operate without unacceptable interference to MSS feeder uplinks, and that, utilizing separation distances, MSS feeder uplinks will not cause interference into the high-speed wireless data systems.[10] Both petitioners rely on a study conducted by the European Telecommunications Standards Institute (ETSI) and the CEPT, which indicates that there is only a negligible interference threat from HIPERLANs (a similar service) to MSS feeder links and that interference from MSS feeder links to HIPERLANS can be addressed through site selection for the gateway earth stations. Neither petitioner provides any study of its own of sharing between non-GSO MSS feeder links and the proposed high-speed wireless service. Nor do Apple and WINForum provide any analysis of the ability of the high-speed wireless data systems to share with possible other aeronautical radionavigation systems which the aviation community may seek to develop in the 5150-5250 MHz band despite the certainty that such analysis will be required.[11]

Both Apple and WINForum request that no restrictions be placed on the services to be provided. However, in such an unrestricted environment, Apple

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[10] WINForum Petition, at p. 16, Apple Petition, at pp. 30-31.

[11] AT&T, in a submission to the Commission's WRC-95 Industry Advisory Committee, states, "Sharing analysis with aeronautical radionavigation systems has been conducted with a result that co-channel, co-geographical sharing is not feasible." Submission of AT&T to IWG-6, dated March 10, 1995.

recognizes that the value of the NII Band "could be undermined...by telephony, entertainment-video, or other connection-based services."[12]

II. THE UNITED STATES HAS ALREADY MADE A POLICY DECISION TO SUPPORT NGSO MSS FEEDER UPLINKS, NOT WIRELESS UNLICENSED USES, IN THE 5 GHZ BAND

The Commission recently adopted a recommended U.S. proposal for WRC-95 that would permit use of portions of the 5000-5250 MHz for commercial non-GSO MSS systems on a global basis. Developing this policy consensus to support sharing between aeronautical radionavigation services and non-GSO MSS feeder uplinks has taken more than five years. During this period the Commission has worked intensively with Big LEO applicants such as LQP, with other United States government agencies, and within international fora such as the ITU and the International Civil Aviation Organization (ICAO) to recommend this allocation in order to help make global non-GSO MSS systems a reality.

This recommendation represents a well-considered policy decision recognizing the importance of the Big LEO systems in providing telecommunications infrastructure where none now exists and improving telecommunications where it is sparsely available. In adopting its licensing and service rules for Big LEO systems, the Commission stated that "[T]his new mobile satellite service -- 'the MSS Above 1 GHz' or 'Big LEO' satellite service -- has the potential to provide not only a variety of new services to users in the United States, but to provide integrated communication services to all parts of the world, including those that are now grossly underserved." Big LEO Rules Order, 9 FCC Rcd 5936 (1994), at para. 1.

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[12] Supra, at p. 27.

Big LEO systems, such as GLOBALSTAR, will provide dial tone and access to basic telephony. The systems will provide low-cost extensions to existing wired and wireless networks, will enable travelers and business people to have access to communications no matter wherever they go. Such capabilities will promote economic development in many underdeveloped areas because investment and commerce are difficult to attract when basic communications facilities do not exist. Thus, the Big LEO systems will provide an integral part of the global information infrastructure.

In order to achieve these benefits efficiently and effectively, LQP has worked closely with the United States government to ascertain the feasibility of sharing the 5 GHz band with aeronautical radionavigation, to develop alternate spectrum use plans for the Microwave Landing System, and to reach consensus within the United States to support the current WRC-95 proposal for the use of 160 MHz of the 5 GHz band for non-GSO MSS feeder uplinks. LQP also has worked within the aviation community, including the RTCA and ICAO, and submitted technical papers on MSS feeder link operation within the ITU Radiocommunication Sector to develop a technical basis for the proposed allocation. These efforts have culminated in the U.S. proposal as well as the report of the WRC-95 Conference Preparatory Meeting which discusses how non-GSO MSS feeder link operations can be accommodated in the 5 GHz band.[13]

Gaining an international spectrum allocation for non-GSO MSS feeder links at 5 GHz at WRC-95 is a key objective for the United States. As the Commission states in the WRC-95 Report, "[O]btaining spectrum for NGSO MSS feeder links is critical for initiating Big LEO services. Identifying candidate bands for feeder

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[13]Report of the Conference Preparatory Meeting on Technical, Operational and Regulatory/Procedural Matters to Be Considered by the 1995 World Radiocommunication Conference, May, 1995, at Chapter 2, Section 1, Part C, Section 3.7.1.

links has been one of the most contentious areas in the Commission's preparations for WRC-95."[14] Moreover, adoption of these allocations is essential to achieving the Commission's primary goal at WRC-95 -- "facilitating the introduction and future expansion of new mobile-satellite technologies."[15]

In contrast, the Commission declined to support consideration of an international allocation for high-speed wireless data networks, as sought by AT&T and others, for inclusion on the WRC-97 agenda. The Commission recognized that "consideration of HSWDS would complicate the issue of sharing 5 GHz spectrum between ARNS and non-GSO MSS feeder links."[16] The Commission thus has recognized that this is not the right time to propose additional allocations for wireless data services.

With this record, there are very good reasons for rejecting the WINForum and Apple petitions. First, WINForum and Apple have not completed the research efforts on sharing with other uses that could support an allocation either in the U.S. or globally. The networking which WINForum and Apple seek to accomplish will no doubt develop in the future. The time to consider such an allocation is when the studies of its feasibility and ability to share with other services have been completed.

Second, the immediate, vital goal of the United States is obtaining feeder link allocations at 5 GHz for non-GSO MSS feeder uplinks, and in supporting the implementation of the GLOBALSTAR system using those frequencies. These goals, now imminent, should not be undermined by consideration of allocation of

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[14] WRC-95 Report, at para. 47.

[15] Supra, at para. 6.

[16] WRC-95 Report, at para. 97.

the same frequencies for an unlicensed but protected high-speed wireless data service.

Accordingly, the WINForum and Apple petitions should be dismissed or at least deferred until after WRC-95, and preferably after LQP and other MSS systems using the 5 GHz band obtain uplink authorizations throughout the world.[17]

III. ADDITIONAL SHARING ANALYSES ARE REQUIRED TO PROVIDE ASSURANCE THAT HIGH-SPEED WIRELESS DATA NETWORKS WOULD NOT CAUSE UNACCEPTABLE INTERFERENCE TO NGSO MSS FEEDERLINKS

Both the WINForum and Apple petitions rely on an outdated and possibly incorrect analysis of the potential for co-frequency sharing between non-GSO MSS feeder uplinks and HSWDS. Before any action could be taken on the petitions, it would be necessary to perform additional sharing analyses which take into account the actual technical characteristics of the GLOBALSTAR feeder uplinks as well as the technical characteristics of HSWDS as proposed by WINForum and Apple. The analysis used by WINForum and Apple only considered the characteristics of a European-developed data service called HIPERLAN.

As detailed in the attached Engineering Declaration, there are a number of current parameters for the GLOBALSTAR system which differ from those used in the prior sharing analyses. These parameters include: (a) gateway antenna gain of 47.5 dB for a 5.5 meter antenna (in contrast to the 3.5 meter antenna assumed in the prior analysis); (b) a satellite receive antenna gain at nadir of

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[17] In addition to LQP, Constellation Communications, Inc. and ICO-P Communications, Inc. propose to use portions of the 5000-5250 MHz band for feeder uplinks. See, Special Section No. AR11/A/1223, RES46/A/105, issued by the ITU Radiocommunication Bureau on February 7, 1995. Moreover, a system advanced published by Russia, Elekon-STR, also plans to use 5 GHz feeder links, in the space-to-Earth direction.

approximately +1 dB (not -1 dB as expressed in the table of the WINForum Appendix B) and the antenna is quasi-isoflux; (c) the value given for the satellite C/I is invalid and information is not provided as to whether the C value is per user or a composite value; and (d) the GLOBALSTAR modulation is CDMA, not CSMA, as given in the WINForum Appendix.

Furthermore, clarification is required concerning the HSWDS technical parameters. For example, the Table at 3.2) HSWDS of the WINForum Appendix states a typical transmitter power level of -10 dBW. It is critical to know if this value is EIRP and whether it represents an average value for all elevation angles and azimuths. Moreover, it would be extremely helpful to know whether there would be a difference between indoor and outdoor units. An antenna pattern would also provide useful information for the purpose of an analysis.

As discussed in the attached Engineering Declaration, LQP has performed an analysis, using corrected GLOBALSTAR characteristics. This analysis demonstrates, that in the event 50 million HSWDS units were operating, then the interference from HSWDS into the 5 GHz satellite receive antenna would be on the order of 12 dB higher. Such an increase in interference would degrade the uplink noise floor by approximately 4 dB, resulting in an unacceptable degradation of the forward link of the MSS transmission. This degradation would further increase if the percentage of units operating outdoors was higher than the one percent estimate.

This analysis also demonstrates that in order to protect GLOBALSTAR satellite receivers, the number of HSDWS units with the characteristics described by WINForum would have to be limited, along with constraints on outdoor use. Given the demand expected by WINForum and Apple for this service, this suggests that the 5 GHz band should not be used for the proposed unlicensed service.

IV. IF NGSO MSS FEEDER UPLINKS CAUSE UNACCEPTABLE INTERFERENCE TO HIGH-SPEED WIRELESS DATA NETWORKS, DEVELOPMENT OF SHARING STRATEGIES WILL BE DIFFICULT

The sharing study between non-GSO MSS feeder links and HIPERLANS submitted by WINForum demonstrates that interference could be caused to the high-speed wireless data networks within a large geographical area. The WINForum analysis concludes that non-GSO MSS feeder link transmitters "will interfere with indoor HSWDS receivers at ranges up to 8.7 km" and that "HSWDSs within line of sight of the ground station will suffer interference at up to 40.3 km from the ground station." This analysis indicates that separation between the non-GSO MSS feeder gateways and both indoor and outdoor HSWDS would be required. While it may be feasible to develop separation rules regarding the indoor HSWDS operations, LQP does not believe it would be feasible the develop separation rules for the outdoor HSWDS operations, since the service would be unlicensed and unconstrained as to geographical scope of operation.

Moreover, LQP cannot agree with imposing siting requirements on non-GSO MSS feeder uplinks based on potential and speculative conflicts with HSWDS. At the present time, LQP is selecting its sites in the United States for its gateway earth stations. This process involves many considerations, including coordination with the FAA. Because it is currently unknown what frequencies HSWDS will utilize, the scope of operation, potential numbers of units, and the distribution of such units between indoors and outdoors, LQP objects to the imposition of any siting constraints based on the possible use of the 5 GHz band by HSWDS.
If HSWDS were implemented in these bands, the GLOBALSTAR system might be subject to future interference as well as pressure to protect the HSWDS devices as a result of widespread proliferation of such systems. For these reasons, LQP believes that HSWDS should not be permitted to operated in the 5 GHz band used by non-GSO MSS feeder uplinks.

V. SPECTRUM ALREADY ALLOCATED FOR UNLICENSED WIRELESS DATA SERVICES SHOULD BE UTILIZED PRIOR TO CONSIDERATION OF ADDITIONAL ALLOCATIONS

Before the Commission considers allocating additional spectrum for unlicensed wireless data services, WINForum and Apple must demonstrate how they are utilizing the spectrum now available for such services, especially spectrum recently made available.

Wireless communications applications currently have access to substantial amounts of spectrum. The bands available for unlicensed services operating in accordance with Part 15 of the Commission's rules include 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz. In fact, Part 15 of the Commission's rules also permits very low-power operation in various bands "through the entire radio spectrum up to 38.6 GHz, except for certain restricted bands."[18]

In addition to spectrum available for use on an unlicensed basis pursuant to Part 15, the Commission recently has allocated substantial spectrum for use on a dedicated basis for data-PCS applications. Within the PCS proceeding, the Commission allocated 1910-1930 MHz specifically for unlicensed wireless data applications. This 20 MHz segment was divided into two general categories of unlicensed devices. The 1910-1920 MHz band is devoted to "asynchronous" applications such as wireless data communications and the 1920-1930 MHz segment is designated for "isochronous" uses such as cordless telephones.[19]

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[18] See Kobb, Bennett, Spectrum Guide, New Signals Press, 1994, 1995, at p. 99.

[19] See Establishment of New Personal Communications Services, Third Report and Order, GEN Docket No. 90-314, 9 FCC Rcd 1337 (1994), appeals remanded sub. nom. Pacific Bell v. FCC, No. 94-1148 (D.C. Cir., July 26, 1994, remanded).

All of the spectrum newly allocated for PCS, both for the licensed and unlicensed services, is used by other services, primarily point-to-point microwave. These incumbent users must be moved to new spectrum to enable the implementation of both voice and data PCS. The data PCS community was allocated the segment which contains the fewest incumbent microwave users of the entire 1850-1990 MHz band allocated for PCS.[20] Thus, this spectrum should provide substantial capacity for introduction of wireless data communications systems in the U.S.

Apart from the spectrum newly allocated for data-PCS as a part of the Commission's emerging technologies initiatives, the Commission also recently allocated for unlicensed services 25 MHz of the 50 MHz of spectrum made available from the transfer of spectrum from the federal government to private sector use.[21] The Commission also has proposed substantial allocations for wireless data above 40 GHz.[22]

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[20] Spectrum Guide, cited supra, at p. 136.

[21] See Allocation of Spectrum below 5 GHz Transferred from Federal Government Use, First Report and Order and Second Notice of Proposed Rulemaking, ET Docket No. 94-32, FCC 95-47, released February 17, 1995.

[22] See Amendment of Parts 2 and 15 of the Commission's Rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications, ET DOcket No. 94-124, 9 FCC Rcd 7078 (1994). In the Notice of Proposed Rulemaking the Commission proposes extensive allocations available for "development of short-range wireless radio systems with communications capacities approaching that now achievable only with coaxial and optical fiber cable. Such systems could support many short-range applications that require very high bandwidth or data transfer rates. Users could include applications involving the National Information Infrastructure (NII); educational or medical applications such as remote wireless access to libraries or other information databases...The proposed rules provide for the operations of such systems on both a licensed and an unlicensed basis." Notice, at para. 2.

At a minimum, WINForum and Apple should provide information concerning the use of the 2 GHz Data-PCS allocation as well as the spectrum made available in ET Docket No. 94-32 prior to Commission consideration of additional allocations for wireless data applications.

VI. CONCLUSION

The Commission, and the United States, have made a substantial commitment to obtaining an allocation at WRC-95 for non-GSO MSS feeder links in the 5 GHz band. This allocation, as well as implementation of MSS systems utilizing the 5 GHz band, should be achieved prior to consideration of sharing with other telecommunications services. In addition, substantial analysis of sharing between high-speed wireless data services and other services is required, as well as information on the use of current allocations for wireless data. The Commission should dismiss the petitions for rulemaking filed by WINForum and Apple Computer, Inc.

Respectfully submitted,

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July 10, 1995

ENGINEERING DECLARATION

I, Charles Windett, hereby state as follows:

(1) I am presently Manager of Regulatory Engineering for Loral/QUALCOMM Partnership, L.P. ("LQP"). LQP is the licensee of the Globalstar low-earth orbit satellite telecommunications system. I am technically qualified to comment on the feasibility of spectrum sharing between non-GSO MSS feeder uplinks and high-speed wireless data networks in the 5.1-5.25 GHz band.

(2) WINForum, in support of its Petition for Rulemaking, bases its claim that co-frequency sharing is feasible between non-GSO MSS feeder uplinks and high-speed data networks on the analysis submitted by AT&T to the Commission's WRC-95 Industry Advisory Committee. The AT&T analysis was based on studies performed by ETSI with regard to sharing feasibility between the European HIPERLAN system and non-GSO MSS feeder links (Appendix B of the WINForum Petition).

(3) The potential for frequency overlap is the 5100-5250 MHz portion of the proposed allocation for high-speed wireless data systems.

(4) The sharing analysis in the WINForum Appendix B was performed using not current technical parameters for the LEO-48 (Globalstar) system. Some of these corrected parameters are: (a) gateway transmit antenna gain of 47.5 dB for a 5.5 meter antenna (the existing number in the table of Appendix B is 3.5 meter antenna); (b) the satellite receive antenna gain at nadir is approximately +1 dB (not -1 dB as expressed in the table) and is "quasi-isoflux"; (c) the value given for the satellite C/I is invalid and information is not provided as to whether the C value is per user or a composite value; (d) the LEO-48 modulation is CDMA, not CSMA.

(5) Clarification also is required concerning the HSWDS technical parameters. For example, the Table at 3.2 HSWDS of the Appendix states a typical transmitter power level of -10 dBW. It is essential to know if this value is EIRP and whether it represents an average value for all elevation angles and azimuths. In addition, it is important to know whether there would be a difference between indoor and outdoor units. While recognizing that the service is many years from implementation, it would be useful if an antenna pattern could be provided. Additional information on HSWDS is required before interference from Globalstar gateways into HSWDS can be analyzed.

(6) For purposes of the attached analysis of impact from HSWDS into non-GSO MSS feeder uplinks in the case of LEO-48, it is assumed that 50 million HSWDS users would be approximately evenly distributed over the three channels overlapping with non-GSO MSS feeder links at any one time.

(7) The attached analysis of LQP demonstrates that for a little over 3 million HSWDS units, the increase in noise temperature $\Delta T/T$ at the 5 GHz satellite receive antenna output port will be 10 percent. In the event 50 million units were operating (the assumption used in the analysis relied on by WINForum), then the interference from HSWDS into the 5 GHz satellite receive antenna would be on the order of 12 dB higher. This would increase the interference contribution in the MSS system from 100 K to over 1500 K. Such an increase in interference would degrade the uplink noise floor by approximately 4 dB resulting in an unacceptable degradation of the forward link of the MSS transmission. This degradation would further increase if the percentage of units operating outdoors was higher than the one percent estimate.

(8) With regard to potential interference from non-GSO MSS feeder uplinks into the HSWDS, WINForum's Appendix B concludes that the non-GSO MSS feeder link transmitters "will interfere with indoor HSWDS receivers at ranges up to 8.7 km" and that "HSWDSs within line of sight of the ground station will suffer interference at up to 40.3 km from the ground station." This analysis indicates that separation between both indoor and outdoor HSWDS and non-GSO MSS feeder gateways would be required. While it may be feasible to develop separation rules regarding the indoor HSWDS operations, LQP does not believe it would be feasible to develop separation rules for the outdoor HSWDS operations, since the service would be unlicensed.

I declare the foregoing is true and correct to the best of my knowledge, information and belief.

Signed this 7th day of July, 1995 in San Jose, CA.

Charles Windett

Charles Windett

Attachment - Analysis

MSS/HSWDS Sharing Analysis

This analysis estimates the interference from HSWDS into Globalstar feeder uplinks and will be based upon a ÆT/T approach. A typical ITU approach is to allow for a 10 percent increase in system noise temperature due to multiple sources of interference. For this analysis the entire 10 percent will be assumed to emanate from the HSWDS.

ΔT/T Approach

The interference from HSWDS into the Globalstar feeder uplinks comes from both the indoor and outdoor HSWDS units or:

$$I_{\text{All HSWDS}} = I_{\text{All Indoor}} + I_{\text{All Outdoor}}$$

where the number of outdoor units is 1 percent of all HSWDS units and the RF level from indoor systems is attenuated by 20 dB, a factor of 100. Therefore, the effective interference from the indoor systems is about equal to the interference from the outdoor systems. This composite interference will be defined as:

$$I_H = I_{\text{All Indoor}} + I_{\text{All Outdoor}}$$

where

$$I_{\text{All Indoor}} = I_{\text{All Outdoor}}$$

and

$$I_H = 2 \text{ times } I_{\text{All Outdoor}}$$

or

$$I_H = 2 \text{ times } I_{\text{All Indoor}}.$$

This interference emanates from all HSWDS units within a 10 degree ground elevation angle field of view to the C-Band receive antenna. This land area encompasses about 10 million square miles which is about three times larger than

the area of the United States. Full field of view from the satellite to the horizon encompasses about 18 million square miles.

The EIRP of a single HSWDS unit is assumed to be -10 dBW with hemispherical coverage. Assuming a uniform spread over the 24 MHz this provides an EIRP density, $EIRP_0$, of -24 dBW/MHz or -84 dBW/Hz per HSWDS unit. Since the HSWDS signal bandwidth is 24 MHz and any Globalstar sub-band is about 16.5 MHz with guardband spacings of about 3 MHz, the bandwidth ratio factor will be close to unity (less than an effect of one dB). Also, since the satellite 5 GHz receive antenna is approximately iso-flux, the composite HSWDS interference power at the antenna output port is determined by:

$$I_H = 10 \text{ Log}(2N) + EIRP_0 - L \text{ (space loss)} + G \text{ (antenna receive gain)}$$

where N is the number of outdoor units

$$= 3 \text{ dB} + 10 \text{ Log}(N) - 84 \text{ dBW/Hz} - 169 \text{ dB} + 1 \text{ dB}$$

$$= 10 \text{ Log}(N) - 249 \text{ dBW/Hz}$$

The nominal value for the C-Band receive system noise temperature is close to 1000 K which is equivalent to a noise density N_0 = -198.6 dBW/Hz. A ÆT/T of 10 percent means that ÆT is only 100 K, and I_H must be 10 dB lower than N_0 and therefore:

$$I_H = -208.6 \text{ dBW/Hz}$$
$$= 10 \text{ Log}(N) - 249 \text{ dBW/Hz}$$

therefore,

$$10 \text{ Log}(N) = 249 \text{ dBW/Hz} - 208.6 \text{ dBW/Hz}$$
$$10 \text{ Log}(N) = 40.4 \text{ dB}$$

or

N Å 11,000 outdoor HSWDS units per channel or 33,000 total outdoor HSWDS units which means that there could only be about 1.1 million indoor HSWDS units per channel or about 3.3 million indoor HSWDS units total.

This is considerably below the 50 million assumed in the WINForum Appendix B. If there were 50 million units operating, then the HSWDS interference

would increase by about 12 dB. This would increase the noise due to interference from 100 K (per the 10 percent allocation of system temperature) to over 1500 K and would raise the effective noise floor of the receiver by a factor of 2.5, or a 4 dB degradation.

Additional concerns

The above estimate is based upon several stated assumptions. Of major concern is the assumed EIRP level of the HSWDS units. Another two are the actual quantity of indoor and outdoor units and the assumed building attenuation factor used in this and the WINForum analysis. Variation in any of these values could greatly affect results.

CERTIFICATE OF SERVICE

I, Andrew F. Taylor, hereby certify that on this 10th day of July, 1995, copies of the foregoing "Opposition of Loral/QUALCOMM Partnership, L.P." were mailed, postage prepaid, to the following:

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