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

RECEIVED

JUL 25 1995

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

In the Matter of	)	
	)	
Petitions for Rulemaking to Allocate	)	
the 5 GHz Band and Adopt	)	RM-8648
Service Rules for a Shared Unlicensed	)	RM-8653
Personal Radio Network	)	

To: The Commission

DOCKET FILE COPY ORIGINAL

REPLY COMMENTS

FIXED POINT-TO-POINT COMMUNICATIONS
SECTION, NETWORK EQUIPMENT DIVISION
OF THE TELECOMMUNICATIONS
INDUSTRY ASSOCIATION

GEORGE M. KIZER, CHAIRMAN
DENIS COUILLARD, VICE CHAIRMAN
ERIC SCHIMMEL, VICE PRESIDENT OF TIA
2500 Wilson Blvd., Suite 300
Arlington, Virginia 22201
(703) 907-7700

Of Counsel:

Robert J. Miller
Gardere & Wynne, L.L.P.
1601 Elm Street, Suite 3000
Dallas, Texas 75201
(214) 999-3000

July 24, 1995

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

TABLE OF CONTENTS

SUMMARY i

APPLE PROPOSES AN UNNECESSARY UNLICENSED SHORT HOP CAPACITY FOR ITS HSWDS 3

A. The 5 GHz Band is Inappropriate For Short Hop HSWDS Links. 3

B. Serious Interference Problems Would Be Caused By Short Hop Unlicensed HSWDS Links. 6

C. Alternative Bands Must Be Considered. 8

SERIOUS QUESTIONS ARE RAISED OVER THE FEASIBILITY OF BAND SHARING TO ACCOMMODATE NEW UNLICENSED SERVICES 10

CONCLUSION 12

SUMMARY

Apple Computer, Inc. ("Apple") and Wireless Information Networks Forum ("WINForum") each propose reallocating segments of the 5 GHz band to accommodate unlicensed high-speed wireless digital services ("HSWDS"). The Fixed Point-to-Point Communications Section, Network Equipment Division of the Telecommunications Industry Association ("TIA"), as well as several other parties in this proceeding, have serious questions about certain elements of these proposals:

- Apple's proposal, which contemplates unlicensed "community wide" networks with 10-15 km long paths, unnecessarily: (i) would cause harmful interference to other users; (ii) would usurp valuable spectrum in the 5 GHz band for short hop HSWDS links where alternative bands are available for such users; and (iii) would duplicate licensed fixed point-to-point microwave networks.

- Necessary band sharing with existing services has not been demonstrated to be attainable.

Neither Apple nor WINForum answers these questions. TIA considers HSWDS a valuable potential service and encourages its development consistent with international standards. However, it is premature to even consider proposing allocation of the 5 GHz band for this service until the foregoing questions are answered, especially with respect to Apple's proposals for unlicensed 10-15 km short hop HSWDS links. Thus, TIA recommends that the Commission adopt a Notice of Inquiry so that a formal proceeding would be established to determine if the issues raised in the Apple and WINForum proposals can be resolved.

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

In the Matter of	)	
	)	
Petitions for Rulemaking to Allocate	)	
the 5 GHz Band and Adopt	)	RM-8648
Service Rules for a Shared Unlicensed	)	RM-8653
Personal Radio Network	)	

To: The Commission

REPLY COMMENTS

Pursuant to Section 1.405 of the Commission's Rules,[1] the Fixed Point-to-Point Communications Section, Network Equipment Division of the Telecommunications Industry Association ("TIA"),[2] hereby replies to certain comments filed on the above-captioned Petitions for Rulemaking (the "Petitions").

Both Petitions involve a different proposed reallocation of the 5 GHz band to accommodate unlicensed high-speed wireless digital services ("HSWDS"). In RM-8648, the Wireless Information Networks Forum ("WINForum") filed a Petition for Rulemaking ("WINForum Petition") requesting that the 5.10-5.35 GHz band be reallocated for its Shared Unlicensed PErsonal Radio Network ("SUPERNet"). Similarly, in RM-8653, Apple Computer, Inc. ("Apple") filed a Petition for

[1]47 C.F.R. Section 1.405 (1994).

[2]TIA is the principal industry association representing fixed point-to-point microwave ("FS") radio manufacturers. TIA members serve, among others, companies, including telephone carriers, utilities, railroads, state and local governments, and cellular carriers, licensed by the Commission to use private and common carrier bands for provision of important and essential telecommunications services.

Rulemaking ("Apple Petition") requesting that the 5.15-5.30 and 5.725-5.875 GHz bands be reallocated for its "NII Band."[3]

In its comments, TIA supported further consideration of an allocation for new HSWDS. However, TIA was quite concerned that Apple's proposal, which contemplates unlicensed "community wide" networks with 10-15 km long paths, unnecessarily: (i) would cause harmful interference to other users; (ii) would usurp valuable spectrum in the 5 GHz band for short hop HSWDS links where alternative bands are available for such users; and (iii) would duplicate licensed FS networks. Thus, TIA recommended that the proposed 5 GHz band reallocations must not be adopted until: (i) restrictions on point-to-point paths are imposed; (ii) appropriate Effective Isotropic Radiated Power ("EIRP") limitations are established; and (iii) necessary band sharing with existing services is demonstrated to be attainable.[4]

TIA's concerns are shared by several other parties. Regrettably, however, answers to its questions have not been provided by Apple or by WINForum. Neither party justifies the extensive amount of spectrum requested in the 5 GHz band or the capability of its proposed HSWDS to share this band with incumbent users.[5] Nor does Apple submit any compelling reason why the 5 GHz band should be used for unlicensed 10-15 km links when such short hop network facilities can be

---

[3]See Order Extending Time (DA 95-1254, released June 8, 1995) in which the Chief, Office of Engineering and Technology, consolidated the WINForum Petition and the Apple Petition and established July 25, 1995, as the date for reply comments on both Petitions.

[4]TIA at 2.

[5]See, e.g., Constellation Communications, Inc. ("Constellation") at 2-3; AT&T Corp. ("AT&T") at 5; Loral/Qualcomm Partnership, L.P. ("LQP") at 1; The American Radio Relay League, Incorporated ("ARRL") at 2-3, 8-13; Federal Aviation Administration ("FAA") at 1-3; Harris Corporation-Farinon Division ("Harris") at 4.

provided in other bands and by other users, including FS licensees.[6] Until these answers are provided, based upon the record of this proceeding, the proposed reallocation must not be adopted.

APPLE PROPOSES AN UNNECESSARY UNLICENSED SHORT HOP CAPACITY FOR ITS HSWDS

Apple contemplates that the NII Band would be used to provide point-to-point and other services over distances of 10-15 km or more:

> [T]he NII Band rules will permit much larger distances for unlicensed operation outdoors. With NII Band devices, it will be possible to communicate at distances on the order of 10 to 15 km or more, depending, of course, on terrain, bandwidth, and other factors.[7]

Rejection of Apple's proposal is recommended by several parties. For example, in its comments, AT&T vehemently opposes Apple's long-range network:

> Apple's high power, long range, community network proposal will likely resemble a licensed service, and will threaten the development of licensed PCS services and the ability of [mobile-satellite service] feeder links to operate in the band. Moreover, the Apple concept is spectrally inefficient and limits user choice of technology and applications.[8]

TIA agrees with AT&T because the 5 GHz band is inappropriate for short hop HSWDS links, serious interference problems would be caused by such short hop links, and alternative bands are available for these links.

A. The 5 GHz Band is Inappropriate For Short Hop HSWDS Links.

Under the Commission's FS allocations, short-distance (or short hop) point-to-point paths have been assigned to the higher bands above 10 GHz. The bands below 10 GHz have been limited to long-haul point-to-point paths. These lower frequency bands, however, are quite congested.

---

[6] See, e.g., AT&T at 2; Harris at 4; ARRL at 6-7.

[7] Apple Petition at 18.

[8] AT&T at 2.

Recent Commission actions, such as the 2 GHz band clearance for PCS, only will make matters worse.[9]

Given these circumstances, the Commission must exercise great caution before taking away a scarce resource from proven services, such as FS, and allocating it to a new, unproven service, such as the proposed HSWDS.[10] In this regard, Apple's proposal is more problematic than WINForum's proposal because it would allocate valuable spectrum in the 5 GHz band for 10-15 km short hops.

---

[9]To accommodate PCS, FS users have been required to clear the 2 GHz band and to relocate in bands above 3 GHz. Redevelopment of Spectrum to Encourage Innovation In the Use of New Telecommunications Technologies, Second Report and Order, ET Docket No. 92-9, 8 FCC Rcd 6495, 6519-20 (1993), modified, Memorandum Opinion and Order, 9 FCC Rcd 1943 (1994). However, the bands designated for the relocating 2 GHz FS users, primarily the 6 and 11 GHz bands, already are very congested. These bands could become largely unusable if the Commission's recent recommendation, to reallocate the upper 6, 11 and 18 GHz bands so that FS users are co-primary with non-geostationary ("NGSO") mobile-satellite service ("MSS") feeder links, is adopted at WRC-95. Preparation for International Telecommunication Union World Radiocommunication Conferences, Report, IC Docket No. 94-31 (FCC 95-256, released June 15, 1995) at paras. 43-45. Unfortunately, needed relief from this spectrum congestion is not provided in other recent Commission allocation decisions. Newly available spectrum in the 4 GHz band from the Federal government will not be allocated so that this band is feasible as a substitute for the FS users being migrated off the 2 GHz band. Allocation of Spectrum Below 5 GHz Transferred from Federal Government Use, First Report and Order and Second Notice of Proposed Rule Making, 77 Rad. Reg. (P&F) 2d 314 (1995). A currently pending proposal to channelize the 27.5-29.5 GHz band for the co-primary FS users is unlikely to be adopted. See Joint Petition for Rulemaking, filed February 9, 1995, by Harris and Digital Microwave Corporation ("DMC") to re-channelize the 28 GHz band for FS users. Indeed, the Commission recently proposed reallocating the 28 GHz band only for Local Multipoint Distribution Service systems, Fixed Satellite Service and MSS system feeder links. See FCC Proposes Band Plan For LMDS, FSS and MSS, News Release, Report No. DC 95-100 (Mimeo No. 54826, released July 13, 1995). The 38 GHz band, which is allocated for FS, already is saturated with PCS applicants needing backhaul support. Proposals are pending to reallocate the 37 GHz band and the bands above 40 GHz for FS, but there is great uncertainty whether such allocations ever will be made. Amendments of Parts 21 and 94 of the Commission's Rules to Establish a Channel Plan and Technical Rules for the 37.0-38.6 GHz Band, RM-8553, filed September 9, 1994, by TIA; Amendment of Parts 2 and 15 of the Commission's Rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications, Notice of Proposed Rule Making, 9 FCC Rcd 7078 (1994) ("40 GHz Rule Making").

[10]In its comments, Pulson Communications ("Pulson") advocates its ultra-wideband ("UWB") technology as being the preferable approach for implementing HSWDS. It requests that the Commission reject Apple's proposal and, instead, establish rules for use of UWB systems on the 2.5-8.5 GHz band. Pulson at 7. TIA opposes Pulson's proposal because its technology is unproven and because its sizeable allocation is totally unjustified.

To safeguard against the unnecessary loss of this spectrum, the Commission must consider all alternative bands for the short hop HSWDS paths before using the 5 GHz bands. As demonstrated below, the record clearly supports such caution.

DMC argues that Apple's proposal to reallocate the 5 GHz band, instead of the higher frequency bands, is inappropriate because of its significant interference potential and because such short hop links more properly should be licensed for use in the 18, 23 and 38 GHz bands:

> DMC calls the Commission's attention to its establishment of the 18, 23, and 38 GHz bands for "short hop" point-to-point communications. Rather than place such operations in the 5 GHz band, where the spectrum is much more desirable for other purposes, point-to-point links supporting the unlicensed services could and should be placed in the higher bands. The advantage would be fourfold, viz, (1) harmful interference to and from the unlicensed services would be avoided, (2) more spectrum at 5 GHz would be available for the unlicensed networks, (3) the unlicensed networks would be able to depend on the reliability of its supporting point-to-point links because they would be licensed and the spectrum used coordinated to avoid interference, and, finally, (4) manufacturers are already producing the needed point-to-point equipments.[11]

Harris concurs with DMC. It strongly recommends that such links should be located in the higher bands:

> Harris would also underscore the importance of the 5 GHz band as a valuable national resource. For some time the Commission has limited the use of spectrum below 10 GHz for short paths. Instead the Commission has allocated spectrum in the 18 GHz, 23 GHz, and 38 GHz bands for use on short paths and manufacturers have been producing equipment for this purpose. Harris urges, therefore, that in accommodating unlicensed local wireless networks in the 5 GHz band that the point-to-point services needed to support those local networks be in separate higher bands where the spectrum usage would be coordinated, licensed, and where power authorizations would be sufficient to provide the desired service. Operations of point-to-point services to support the unlicensed local networks for distances beyond one kilometer would be this category. Within the one kilometer limitation unlicensed mobile and transportable networks, generally described as local area networks, could function provided EIRP limitations are established to protect equal access to all who desire to enter the unlicensed band.[12]

---

[11]DMC at 2-3. See also Alcatel Network Systems, Inc. at 1-2.

[12]Harris at 3.

AT&T also objects to Apple's plan. In particular, AT&T strenuously opposes using the 5 GHz band for short hop HSWDS links:

> Apple's "community networks" proposal for the NII band allows "groups of users" to create a "community-wide network" which would "as a unit" interconnect with the broader infrastructure . . . and which presumably would have to be centrally managed and controlled. The unlicensed NII Band proposed by Apple will resemble a licensed service and thus could conflict with the Commission's objectives in the recently completed auction of spectrum to be used for licensed PCS service.
>
> * * * * * * * *
>
> The Commission should not seriously devalue the spectrum it has already sold or intends to sell by permitting the offering of similar service by parties who paid nothing for use of spectrum.
>
> * * * * * * * *
>
> Unlicensed operations cannot be coordinated with licensed services, but such coordination would be very important in the case of the significant outdoor use and relatively high EIRP required to achieve the range contemplated by Apple. On the other hand, the lower powered, shorter range, equipment specified by WINForum will not have to be coordinated with the MSS feeder links.[13]

It is important to note the difference between the Apple and WINForum proposals. As AT&T points out, unlike Apple's proposal, WINForum proposes establishing HSWDS that involve lower power and shorter range. Coordination with licensed service would be unnecessary. Thus, TIA prefers WINForum's approach over Apple's approach.

B. Serious Interference Problems Would Be Caused By Short Hop Unlicensed HSWDS Links.

Operation of the contemplated HSWDS will involve numerous unlicensed transmitters. If Apple's NII Band is implemented, links of 10-15 km in length would be established. Permitting such unlicensed HSWDS short hops, however, would create significant harmful interference.[14]

---

[13]AT&T at 6-8 (citation and footnote omitted).

[14]TIA at 4. Unlicensed point-to-point hops exceeding 1 km do exist in the 2.5 and 5.9 GHz ISM bands, however. These unlicensed hops are designed to be compatible with the licensed ISM services sharing those bands. In contrast, under Apple's proposal, the unlicensed short hop 10-15 km HSWDS

Apprehension over this harmful interference is echoed by numerous commenters. DMC expresses serious concern over this threat:

> A study of both Petitions indicate[s] that point-to-point links will be needed to support the unlicensed network communications envisaged. As a matter of fact, Apple refers to links of up to 10 and 15 kilometers in length. DMC has considerable reservations about operation of point-to-point microwave links beyond one kilometer in length in an unlicensed mode. The power required to provide longer "hop" services could create harmful interference and, if used in an unlicensed mode, could create serious operational problems.[15]

Similarly, Harris criticizes Apple's proposal because "[i]f higher powers are permitted costly filtering requirements will have to be imposed that would defeat the purpose of establishing cost effective local area networks."[16]

Constellation, a MSS applicant, urges the Commission to reject Apple's proposal because it threatens harmful interference to feeder link operations:

> [T]he petitioners do not address the more fundamental technical problem with unlicensed operations that there is adequate control to insure that the aggregate EIRP limit is not exceeded by these systems operations. To make matters worse, Apple contemplates the use of unlicensed outdoor links with path lengths on the order of 10 km or more. Such operations could increase transmit powers (and thus interference) by factor of 25 dB or more. Thus, before unlicensed operations can be permitted in this band, the Commission must require petitioners to make a convincing technical (or some other technical mechanism) showing that internal interference levels among the wireless transmission users will in fact limit the aggregate EIRP to a level that does not cause harmful interference . . . .[17]

---

links would exclude, rather than be compatible with, licensed services in the 5 GHz band. Carving out such a separate spectrum segment for unlicensed paths exceeding 1 km is unnecessary and certainly has not been justified by Apple.

[15]DMC at 2.

[16]Harris at 3.

[17]Constellation at 4 (footnote omitted).

C. Alternative Bands Must Be Considered.

Instead of using the 5 GHz band for short hop HSWDS, the Commission should consider alternative bands. Underlying Apple's "community wide" proposal is the "premise that microwave links will be important to support successfully the network operations being envisaged . . . ."[18] The 18 GHz, 23 GHz, and 38 GHz bands certainly are viable candidates for licensed short hops to support HSWDS.[19] While TIA agrees with the need to establish such wider area networks for HSWDS, the Commission must not forget that the "18, 23 and 38 GHz bands have specifically been allocated . . . for such short haul, low, medium, or high capacity applications."[20] ARRL agrees:

> [T]he longer-distance communications described in the Apple petition should be accomplished by use of licensed services, such as point-to-point microwave, for community networking and similar applications.[21]

Other bands also could be used either for unlicensed or licensed "community wide" HSWDS networks. LQP and ARRL recommend that the Commission consider using the millimeter wave frequencies in the bands above 40 GHz currently being considered for reallocation.[22] Furthermore, LQP recommends use of the recently reallocated 50 MHz of federal spectrum[23] and ARRL suggests that the Commission look at private FS licensed facilities, licensed and unlicensed PCS

---

[18]Harris at 4.

[19]See DMC at 2; Harris at 3.

[20]Harris at 4.

[21]ARRL at 7.

[22]LQP at 13; ARRL at 3. See 40 GHz Rule Making, 9 FCC Rcd at 7078.

[23]LQP at 13.

facilities in the 2 GHz band, and existing wireline facilities.[24] Failure by the Commission to examine all these potential alternatives would be arbitrary and capricious and thus unlawful.[25]

Apple claims that certain of these other bands might not be appropriate for HSWDS. It states that the 18 GHz band is not acceptable because it is licensed, less total bandwidth is available, and propagation characteristics are unacceptable.[26] Apple also disputes the availability of the millimeter wave bands, alleging that they are more susceptible to being blocked by walls and thus unsuitable for in-building use.[27] Apple's claims, however, are totally unsubstantiated. Before such a valuable parcel of spectrum as the 5 GHz band is allocated for HSWDS, Apple's claims must be tested fully and must be proven.

Furthermore, 10-15 km unlicensed short hops have little to do with in-building applications. Present 18 GHz and 23 GHz microwave systems provide superior quality links at speeds even higher than those proposed for the HSWDS. Thus, these higher bands are preferable for such applications.

---

[24]ARRL at 3.

[25]It is well settled that the Commission has a "duty to consider representative alternatives to its chosen policy and to give a reasoned explanation for its rejection of such alternatives." City of Brookings Municipal Telephone Company v. F.C.C., 822 F.2d 1153, 1169 (D.C. Cir. 1987) (citing Farmers Union Central Exchange, Inc. v. FERC, 734 F.2d 1486, 1511 (D.C. Cir.), cert. denied, 469 U.S. 1034 (1984) (footnote omitted)). Failure by an agency, like the Commission, to consider all elements in promulgating rules, breaches its responsibility for exercising expertise in a reasoned manner. City of Brookings, 822 F.2d at 1169 n.46. Thus, it would be "arbitrary and capricious if the [Commission] . . . entirely failed to consider an important aspect" of a rulemaking. Motor Vehicle Mfrs. Ass'n v. State Farm Mutual Auto Ins. Co., 463 U.S. 29, 43-44, 103 S.Ct. 2856, 2866-67 (1983). Advocating reallocation of the 5 GHz band for short hop HSWDS links, without full consideration of potential alternatives, would be such an arbitrary and capricious failure to consider an important aspect of the reallocation issue.

[26]Apple at 17-18.

[27]Apple at 17.

SERIOUS QUESTIONS ARE RAISED OVER THE FEASIBILITY OF BAND SHARING TO ACCOMMODATE NEW UNLICENSED SERVICES

To accommodate the proposed new unlicensed services, certain band sharing would be necessary. WINForum believes that its SUPERNet could share spectrum with MSS feeder uplinks, if pending allocations are adopted for such links at WRC-95, and with government radiolocation systems.[28] Apple claims that its NII Band could be co-primary with microwave landing systems, MSS feeder uplinks, amateur operators, existing Part 15 devices, and ISM products.[29]

In its comments, TIA questions these claims because neither WINForum nor Apple provide any analysis or other documentation to support their assumptions that co-primary band sharing is possible. Other parties agree. ARRL sharply rebukes Apple's claim that sharing is achievable:

> The use of directional antennas and long-distance paths is envisioned, yet there will be no access or entry point regulation at all. Despite the obvious inability to regulate, or even determine the source of interference, Apple contends that there will be compatibility with "most" current and anticipated use of the bands proposed. The petition utterly fails to explain how this will come about, or on what basis the compatibility exists. The power levels, use of directional antennas, and path lengths discussed in the Apple petition are commensurate with licensed radio services, not with unlicensed part 15 use.[30]

The FAA warns that the band sharing proposed in the Petitions threatens "safety of life."[31] It declares that the WINForum SUPERNet categorically could not share the 5 GHz band with existing radiolocation and microwave landing systems.[32] It also demonstrates that Apple's NII Band could not share the 5150-5250 MHz band with radionavigation and weather detection services.[33]

---

[28]WINForum Petition at 15-16.

[29]Apple Petition at 28-33.

[30]ARRL at 8 (footnote omitted).

[31]FAA at 1.

[32]FAA at 1-2.

[33]FAA at 3.

ARRL demonstrates that Apple could not use the 5725-5875 MHz band without interfering with critical amateur operations.[34] LQP, AT&T and Constellation all demonstrate that sharing between MSS feeder links and HSWDS in the 5 GHz band is highly unlikely.[35] Specifically, Constellation rejects the Apple and WINForum claims that HSWDS would be benign because they do not provide any supporting data:

> No specific technical regulations have been proposed and no convincing technical studies have been submitted to demonstrate that such operations are compatible with LEO MSS feeder links. In particular, technical studies are needed to determine appropriate power limits on wireless transmitters and the aggregate EIRP density needed to protect satellite uplinks, together with the technical means of ensuring that such limits will be complied with in practice if the facilities are unlicensed.[36]

AT&T firmly disagrees with Apple's contention that its NII Band could share the 5725-5825 MHz band with ISM equipment.[37]

In addition to ensuring that any allocation for HSWDS is compatible with domestic allocations, the Commission must guarantee that it is consistent with international spectrum allocations. This approach enhances U.S. trade, as equipment manufacturers and other related businesses would have greater opportunities to export product and greater incentives to develop new product. Harmonization with the European HIPERLAN, for example, is promoted by several parties, such as Harris and DMC.[38]

---

[34]ARRL at 10-12. See also Southern California Repeater and Remote Base Association at 8-16.

[35]LQP at 1; AT&T at 2; Constellation at 5. See also Harris at 4.

[36]Constellation at 5.

[37]AT&T at 4.

[38]Harris at 3; DMC at 2.

CONCLUSION

TIA supports the concept of establishing a HSWDS. Nevertheless, much needs to be done before spectrum should be allocated for such a service.

Issues involving unlicensed short hop HSWDS links, interference protection, and band sharing must be addressed. These issues are fundamental to the proposed spectrum allocation and must be resolved before rules for a new HSWDS are even proposed. Consequently, TIA recommends that the Commission incorporate these issues into a Notice of Inquiry so that a necessary record regarding the WINForum and Apple proposals could be developed.

Respectfully submitted,

FIXED POINT-TO-POINT COMMUNICATIONS
SECTION, NETWORK EQUIPMENT DIVISION
OF THE TELECOMMUNICATIONS
INDUSTRY ASSOCIATION

George M. Kizer /RJM

GEORGE M. KIZER, CHAIRMAN
DENIS COUILLARD, VICE CHAIRMAN
ERIC SCHIMMEL, VICE PRESIDENT OF TIA

2500 Wilson Blvd., Suite 300
Arlington, Virginia 22201

(703) 907-7700

Of Counsel:

Robert J. Miller
Gardere & Wynne, L.L.P.
1601 Elm Street, Suite 3000
Dallas, Texas 75201
(214) 999-3000

July 24, 1995

221535/gw03

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing Reply Comments was sent via first class mail, postage prepaid, to the following parties on the 24th day of July, 1995.

Henry Goldberg, Esq.
Goldberg, Godles, Wiener & Wright
1229 19th Street, N.W.
Washington, D.C. 20036
Counsel for Apple Computer, Inc.

R. Michael Senkowski, Esq.
Wiley, Rein & Fielding
1776 K Street, N.W.
Washington, D.C. 20006
Counsel for Wireless Information Networks Forum

Robert A. Mazer, Esq.
Rosenman & Colin
1300 19th Street, N.W., Suite 200
Washington, D.C. 20005
Counsel for Constellation Communications, Inc.

Mark C. Rosenblum, Esq.
AT&T Corp.
Room 3252F3
295 North Maple Avenue
Basking Ridge, New Jersey 07920

John T. Scott, III, Esq.
Crowell & Moring
1001 Pennsylvania Avenue, N.W.
Washington, D.C. 20004-2505
Counsel for Loral/Qualcomm Partnership, L.P.

Leonard Robert Raish, Esq.
Fletcher, Heald & Hildreth, P.L.C.
1300 North 17th Street, 11th Floor
Rosslyn, Virginia 22209-3801
Counsel for Digital Microwave Corporation and
Harris Corporation-Farinon Division

Christopher D. Imlay, Esq.
Booth, Freret & Imlay
1233 20th Street, N.W., Suite 204
Washington, D.C. 20036
Counsel for the American Radio Relay League, Inc.

Gerald J. Markey
Program Director for Spectrum Policy & Management
U.S. Department of Transportation, Federal
Aviation Administration
800 Independence Avenue, S.W.
Washington, D.C. 20591

Stuart Overby
Motorola, Inc.
1250 I Street, N.W., Suite 400
Washington, D.C. 20005

Stephen L. Goodman, Esq.
Halprin, Temple & Goodman
1100 New York Avenue, N.W.
Suite 650, East Tower
Washington, D.C. 20005
Counsel for Northern Telecom, Inc.

Charles Brown
Tetherless Access Ltd.
2468 Embarcadero Way
Palo Alto, California 94303

Joseph Tasker, Jr., Esq.
Vice President and Assistant General Counsel
Federal Governmental Affairs
Compaq Computer Corporation
1330 I Street, N.W., 490 East
Washington, D.C. 20005

Catherine Wang, Esq.
Swidler & Berlin, Chartered
3000 K. Street, N.W., Suite 300
Washington, D.C. 20007
Counsel for Andrew Corporation

Stanley M. Gorinson, Esq.
Preston, Gates, Ellis & Rouvelas Meeds
1735 New York Avenue, N.W., Suite 500
Washington, D.C. 20006-4759
Counsel for Microsoft Corporation

M. Robin Critchell
Southern California Repeater and
Remote Base Association
P.O. Box 5967
Pasadena, California 91117

Fiona J. Branton, Esq.
Director, Government Relations & Regulatory Counsel
Information Technology Industry Council
1250 I Street, N.W., Suite 200
Washington, D.C. 20005

Henrietta Wright, Esq.
Goldberg, Godles, Wiener & Wright
1229 19th Street, N.W.
Washington, D.C. 20036
Counsel for The Part 15 Coalition

Henry M. Rivera, Esq.
Ginsburg, Feldman & Bress, Chtd.
1250 Connecticut Avenue, N.W.
Washington, D.C. 20036
Counsel for Metricom, Inc.

John E. Cunningham, President
Pulson Communications
Suite 1800
200 Galleria Parkway
Atlanta, Georgia 30339

July 24, 1995

Deborah Traughber

Deborah Traughber

221892/gw03