SPECIES EXTINCTION?

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NOVEMBER 8, 1994

This is the Law of the Yukon,
that only the strong shall thrive;
That surely the weak shall perish,
and only the fit survive.

Robert Service, The Law of the Yukon

I. INTRODUCTION

The 802.11 Committee[1] has been working on, *inter alia*, a standard for wireless LANs that operate in the "ISM Bands," under Parts 15.247 and 15.249 of the FCC's Rules. Two current and separate proceedings of the FCC could result in impairment of these bands for Part 15 devices, or even make them unavailable. Members of the Committee should be aware of these possibilities, as well as what can be done to influence the FCC's decisions. Without substantive, immediate action by the Committee, unlicensed wireless LANs of the nature addressed by IEEE 802.11 may never develop.

II. BACKGROUND

Part 15 (unlicensed) devices and systems use the bands on a secondary basis to federal government devices including mobile and fixed radiolocation services, Industrial, Scientific, and Medical (ISM) devices, early versions of automatic vehicle monitoring (AVM) stations, and amateur radio operations. Part 15 operations are "secondary" to these other uses; *i.e.*, they must accept interference from the "primary" users and can cause no interference to them. As a practical matter Part 15 devices must cease operations when they cause interference.

To date, few unlicensed devices are known to have caused or received interference with primary users. This is consistent with the relatively small number of unlicensed devices that have been deployed as well as to the meager number of licensed systems activated to date.

Both the interference and usage status of the 900 and 2400 MHz "ISM bands" can change soon, as the result of FCC actions. Marketing may have to be stopped, manufacturers may have to issue recalls for equipment already in the hands of customers, and in all likelihood there will be no alternative frequencies to move to. However, concerted competent action by the Committee and its members may prevent these changes from coming about.

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[1] The author herein uses the terms Committee, 802.11 Committee, and variations to refer to the group that is developing the wireless LAN standard. Formal filings to the FCC have been under the rubric of "The IEEE Project 802 Local and Metropolitan Area Network Standards Committee."

The purpose of this submission is twofold: 1) To bring about discussion during the week of this IEEE 802.11 membership meeting, including identification of actions that can be taken by individual members, and 2) to bring before the group the issues so that the members can decide whether a submission by the Committee to the FCC is possible, or even critical if we are to avoid extinction.

III. The Bands at Risk

A) 902-928 MHz.

In addition to industrial, scientific and medical uses of RF energy in this band, the FCC now intends to implement permanent rules for Automatic Vehicle Monitoring (AVM), that heretofore have been operating in limited numbers under interim rules that have been on the books for almost 20 years. The FCC has proposed to make the interim rules permanent and to expand monitoring beyond vehicles and beyond the 16 MHz already allocated to AVM (the new service would be known as the Location and Monitoring Service ("LMS")). Under the proposal, virtually all Part 15 operation would be shut down, either by interference or, more ominously, by regulatory fiat. Currently, all sides are attempting to find compromises or other resolutions that would permit deployment of AVM/LMS without shutdown of other uses.

More than 5,600 AVM/LMS licenses have already been issued, but few stations are on the air. With the evolution of AVM into LMS, and with numerous other services being planned by the holders of these licenses, it now seems that the primary objective of the AVM providers is not tracking vehicles, but rather the ability to provide a mobile messaging service — a sort of PCS — without participating in auctions to get PCS licenses (some people portray this as a "spectrum grab"). Such operation would be at the expense of unlicensed products supported by the forthcoming IEEE 802.11 standard.

Unfortunately, it is difficult to find a compromise that works for Part 15 users in the face of a higher-priority, higher-powered technology that is itself vulnerable to interference. Furthermore, the AVM/LMS proponents seem unwilling or unable to address band-sharing among the divergent forms of AVM/LMS, resulting in a requirement for separate bands for each of several AVM/LMS technologies, adding up to tens of MHz, leaving Part 15 devices, particularly those relying on spread spectrum modulation, very little room to operate in the band.[2]

Because Part 15 use will remain secondary, it is not clear that Part 15 devices can survive a requirement of operating without causing interference to AVM/LMS systems or potentially being disabled by interference from their many high-power transmitters. The FCC staff may take the course of limiting its definition of what they deem "harmful interference" to interference from certain types of Part 15 uses, but many unlicensed applications now implemented or contemplated in the 900 MHz band would not fall under such exemptions.

[2] At a minimum, the frequency-hopping requirements in §15.247 would have to be changed if parts of the band are made unavailable.

No "compromise" is currently getting widespread support. However, the FCC appears committed to bringing this proceeding to a conclusion by the end of 1994 and a ruling is expected at the December meeting of the FCC. If so, the "sunshine" period preceding the FCC meeting could commence in early December, and contact with the FCC on this matter would then be forbidden.

B) 2400-2483.5 MHz

As previously reported, the NTIA turned over 2390-2400, 2402-2417 and 4660-4685 MHz to the FCC for administration and reallocation, consistent with a congressional mandate to release at least 50 MHz immediately and a further 150 MHz later.[3] The NTIA noted that the lower 15 MHz of the 2400 MHz ISM band is least impacted by microwave ovens and other ISM devices. While many criticized the NTIA for choosing a well-used segment within the ISM band, the NTIA's action of itself simply represented an agreement that the federal government will not make use of this band. Further action with respect to this band is now in the hands of the FCC.

In its early response to NTIA's action,[4] the FCC spoke out emphatically about the disadvantages of this band, saying:

> "Reallocation of the 2402-2417 MHz band presents little or no additional benefit to the public. This band is already used for non-Government services, by the amateur radio community and by Part 15 devices. It will be extremely difficult to provide a licensed service in this band because of its heavy use by ISM equipment. . . . It is unlikely that a licensed service would be able to share this band with these (Part 15) devices . . . (and) reallocation of this band would jeopardize the significant private sector investment already made in developing new technologies operating under Part 15."[5]

Based on these earlier FCC statements, it was surprising that the FCC subsequently adopted a Notice of Proposed Rulemaking[6] that contemplates reallocation of 2402-2417 MHz to licensed services and suggests strongly that the licenses will be auctioned.[7] Considerable press coverage[8] and Internet dialog has ensued, with varying degrees of accuracy but all containing outcries against these risks to unlicensed spectrum.

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[3] Preliminary Spectrum Reallocation Report, NTIA Special Publication 94-27, February, 1994.

[4] Report from the Federal Communications Commission to Ronald H. Brown . . . Regarding the Preliminary Spectrum Allocation Report" ("FCC Report"). FCC 94-213, August 9, 1994.

[5] FCC Report at 39 and 49-51.

[6] Notice of Proposed Rulemaking ("The NPRM"), ET Docket No. 94-124, RM 8308. October 20, 1994. Full text of the FCC NPRM was released November 8, 1994. All subsequent references in this submission denote the pertinent numbered paragraph of the NPRM.

[7] This new threat to the band follows on the heels of the well-publicized rollout in October of microwave-powered lighting systems developed by Fusion Lighting, Inc., that can appear as full-time wide band 2400-2500 MHz multiwatt transmitters in the workplace and public areas (described in detail in this author's IEEE 802.11 submission entitled Darwinism and the ISM Bands, March, 1994). See The Washington Post, "Energy Department Brings Dazzling Bulb to Light," October 21, 1994, p. A1 and continuation at p. A22 under subhead "Energy Dept. is Aglow About New Bulb." Also, San Jose Mercury News, "Energy Department Plugs "super bulb," October 21, 1994, p 8A. Also, The Washington Post, "A New Kind of Illumination That Burns Brightly, but Not Out," October 24, 1994, P A3 (Science and Engineering section). The last of these has particularly illuminating technical comments and graphics.

[8] Network World, "FCC draws fire on its plan to auction public radio spectrum.," October 24, 1994, p. 12. and, Time, "Battling for a Slice of Thin Air," November 7, 1994, pp. 58-59.

In its NPRM, the FCC gives full attention to the uses of these bands by ISM devices, hams, and Part 15 unlicensed communications devices such as wireless LANs.[9] As one result of previous filings from companies whose employees partake in the 802 Committee's activities, the Commission is aware that "the presence of ISM equipment, unlicensed devices (particularly spread spectrum devices . . .), and other non-Government users present a particularly challenging environment in which to implement new radio services. **Any equipment operating in this band must use transmission schemes that are extremely robust and versatile.**"[10]

The central point of the NPRM is the FCC's query: "(W)e request comment on retaining future use of this band by Part 15 equipment. **Possibilities include eliminating this band from Part 15 use in order to avoid any potential conflicts with future licensed services, maintaining Part 15 use of this band and also implementing licensed services, or maintaining Part 15 use of this band while limiting licensed use of the band.**"[11]

To these solicitations by the FCC about the 2402-2417 MHz band, the IEEE Committee has only one reasonable response: the band must not be reallocated for licensed services, nor should any additional service be given primary status over unlicensed operation in the band.[12]

The FCC's NPRM urgently asks for commentary on these issues. The Committee and its members should submit a forceful response, to preclude disabling of the 902-928 and 2400-2483.5 MHz bands.

Each being, at some period of its life,
during some season of the year, during each
generation or at intervals, has to struggle for life

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9 "(T)he 2402-2417 MHz band is affected by emissions from ISM devices, including millions of household microwave ovens. In addition, a growing number of unlicensed Part 15 devices are also operating in this band." NPRM at 11.

10 NPRM at 18. Emphasis added. The requirement for robustness is Apple's primary reason for developing wireless LAN technologies that include powerful resources to prevail in a hostile environment. See the author's Darwinism and the ISM Bands, op cit., at V. : "Survival is the Issue."

11 NPRM at 18. Emphasis added. The Commission also asks for comment on "providing licensed services in this band that are subject to technical rules that are similar to the rules for unlicensed Part 15 devices." AT&T, in Comments to the FCC on June 15 and cited by the Commission in Footnote 9 to paragraph 4 of Appendix D to the NPRM asserted that LANs operating in the low end of the 2400 MHz band "would not be seriously impacted by ISM devices. . . that produce little interference between 2402 and 2417 MHz" and that (microwave) "interference occurs only in very brief bursts, permitting local area networks to avoid them and, where avoidance does not occur, to retransmit adversely affected data." AT&T thus seems unaware of microwave lighting and other ISM operations that have been previously described in detail, that are not restrained to "very brief bursts."

12 Those who have followed this process are aware that as a result of Apple's initiative for license-free Data-PCS frequencies, the FCC has been enjoined by Congress from auctioning any unlicensed spectrum. Spectrum allocation and usage per se, not auctioning per se, is the primary issue that the Committee must address.

and to suffer great destruction. The vigorous, the healthy, and the happy survive and multiply.

Charles R. Darwin, On the Origin of the Species.

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If you have not read the FCC's NPRM, you should do so. I'll happily provide copies of all documents cited herein upon request from companies lacking Washington offices.

JFL

FCC 94-272

Before the
FEDERAL COMMUNICATIONS COMMISSION Washington, DC 20554

In the Matter of	)	
	)	
Allocation of Spectrum Below	)	ET Docket No. 94-32
5 GHz Transferred from	)	
Federal Government Use	)	

NOTICE OF PROPOSED RULE MAKING

Adopted: October 20, 1994 Released: November 8, 1994

Comment Date: December 19, 1994
Reply Comment Date: January 3, 1995

By the Commission:

I. INTRODUCTION

1. By this action, we propose allocations for 50 megahertz of spectrum that was identified by the Department of Commerce for transfer from Federal Government to private sector use. The spectrum we are considering is at the bands 2390-2400 MHz, 2402-2417 MHz, and 4660-4685 MHz.[13] We believe that the allocations proposed herein will benefit the public by providing for the introduction of new services and the enhancement of existing services. These new and enhanced services will create new jobs, foster economic growth, and improve access to communications by industry and the American public.

[13] By letter dated October 27, 1994, the President of the United States notified the Chairman of the Commission that Federal Government frequency assignments in these bands have been withdrawn and that the National Table of Frequency Allocations has been modified to reflect the reallocation of these bands.

II. BACKGROUND

2. On August 10, 1993, the Omnibus Budget Reconciliation Act of 1993[14] (Reconciliation Act) was signed into law. The Reconciliation Act required that the Secretary of Commerce identify 200 megahertz of spectrum currently allocated for use by Federal Government agencies, for transfer to the FCC for use by the private sector. All of the 200 megahertz of spectrum recommended for reallocation must be located below 5 gigahertz, with at least 100 megahertz of this being below 3 gigahertz. The Reconciliation Act also required the Secretary of Commerce to issue within six months of its enactment a report making a preliminary identification of reallocatable bands of frequencies and to issue within 18 months a final report recommending the spectrum for reallocation.[15] In its report making a preliminary identification of spectrum, the Department of Commerce was required to identify at least 50 megahertz of spectrum for immediate reallocation.[16] The remaining spectrum is to be made available over a ten-year period.[17]

3. On February 10, 1994, the Department of Commerce released its report making a preliminary identification of spectrum for reallocation (Preliminary Report).[18] The frequency bands identified for reallocation in the Preliminary Report are listed in Appendix A. Three of these frequency bands, 2390-2400 MHz, 2402-2417 MHz, and 4660-4685 MHz, were identified for immediate reallocation. The Reconciliation Act also requires that the Commission allocate, and propose regulations to assign, the 50 megahertz of spectrum that is immediately available no later than 18 months after its enactment.[19]

4. Accordingly, on May 4, 1994, we released a Notice of Inquiry (NOI) in this proceeding seeking information on potential applications for the 50 megahertz of spectrum that is being transferred immediately from Federal Government to private sector use.[20] We stated in the NOI that spectrum reallocated for private sector use has the potential to provide for the continued growth and development of advanced communications and technologies, thereby creating new high technology jobs and economic growth. Although the spectrum considered in this proceeding has some characteristics that will affect its future use by non-Government applications, we believe that all of the spectrum can be used to promote advanced technologies

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[14] Omnibus Budget Reconciliation Act of 1993, Pub. L. No. 103-66, 107 Stat. 312 (approved August 10, 1993).

[15] See Reconciliation Act § 6001(a)(3), as codified at 47 U.S.C. § 923.

[16] The President must withdraw the assignment to a Federal Government station of any frequency recommended for immediate reallocation within 6 months of release of the preliminary report so that the spectrum is then available for exclusive non-Federal use. At least one-half of the 50 megahertz identified for immediate reallocation must be below 3 gigahertz and all of it must be identified for exclusive non-Federal use.

[17] Reconciliation Act § 6001(a)(3), as codified at 47 U.S.C. § 923(e)(2)(A).

[18] Preliminary Spectrum Reallocation Report, U.S. Department of Commerce, NTIA Special Publication 94-27, February, 1994.

[19] Reconciliation Act § 6001(a)(3), as codified at 47 U.S.C. § 925(a).

[20] Notice of Inquiry, 9 FCC Rcd 2175 (1994).

and provide economic growth.[21] In response to our NOI, we received 77 comments and 17 reply comments.[22] These comments are summarized in Appendix D.

5. Internationally, 2390-2400 MHz is allocated in Region 2[23] on a primary basis to the fixed, mobile, and radiolocation services, and on a secondary basis to the amateur service.[24] Domestically, this band is currently allocated on a secondary basis to the amateur service. In its Preliminary Report, the Department of Commerce expresses concern over the effect of future non-Government use on the National Astronomy and Ionospheric Center, which operates a planetary research radar at Arecibo, Puerto Rico at 2380 MHz. To protect these radio astronomy operations, the Department of Commerce states that the 2390-2400 MHz band should not be used for airborne or space-to-Earth links, and that restrictions on terrestrial operations in the vicinity of the Puerto Rico planetary research radar facility may be necessary.[25]

6. The 2402-2417 MHz band is allocated internationally in Region 2 on a primary basis to the fixed, mobile, and radiolocation services, and on a secondary basis to the amateur service.[26] Domestically, the band is currently allocated on a secondary basis to the amateur service.[27] The 2402-2417 MHz band lies within the 2400-2500 MHz band that is available for use by industrial, scientific, and medical (ISM) applications.[28] Radio services operating within this band must accept harmful interference that may be caused by ISM devices, which include a large number of microwave ovens commonly used in households. In addition, the 2400-2483.5 MHz band is available domestically for use by equipment authorized under Part 15 of the Rules.[29]

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[21] In the Conference Report on the Reconciliation Act the Conferees expressed their belief that low power biomedical telemetry devices may improve the quality and decrease the cost of health care services and stated that the NTIA and the FCC should consider the spectrum needs for such devices in making allocation decisions pursuant to the Reconciliation Act. In its comments, however, the Critical Care Telemetry Group states that biomedical telemetry devices must operate on frequencies below 1 GHz and that, therefore, none of the spectrum under consideration in this proceeding is appropriate for biomedical telemetry use. Critical Care Telemetry Group comments at 1-3.

[22] See Appendices B and C.

[23] See 47 C.F.R. 2.104(b)(2) for a description of Region 2.

[24] See Table of Frequency Allocations, 47 C.F.R. § 2.106.

[25] Preliminary Report, section 4 at 14-17.

[26] See Table of Frequency Allocations, 47 C.F.R. § 2.106.

[27] The Preliminary Report identified the 2400-2402 MHz band as being currently used for the Amateur Satellite Service and, therefore, did not identify this segment for reallocation. Preliminary Report at 4-16.

[28] See Table of Frequency Allocations, 47 C.F.R. § 2.106. See also 47 C.F.R. Part 18.

[29] Part 15 provides for operation of unlicensed low-power devices.

7. Internationally, 4660-4685 MHz is allocated in Region 2 on a primary basis for fixed, fixed-satellite, and mobile services.[30] This band is allocated domestically on a primary basis for non-government fixed-satellite service space-to-Earth links, with use limited to international inter-continental systems.[31] However, there is currently no non-Government use of this band. An agreement with Canada requires that certain United States Government terrestrial line of sight and troposcatter systems be coordinated with Canada. This agreement also permits use of this band by airborne or other mobile stations but requires that such stations protect Canadian systems.[32]

III. DISCUSSION

8. We are now considering allocating the spectrum at 2390-2400 MHz, 2402-2417 MHz and 4660-4685 MHz for new or developing services, or to provide spectrum to reaccommodate existing services. In response to our NOI initiating this proceeding we received a number of competing and generally mutually exclusive proposals and requests, many of which might benefit the public. Our principal objective in making this spectrum allocation decision is to ensure that the spectrum is put to its best and most valued use and that the greatest benefit to the public is attained. We believe that the way to achieve this goal is to adopt a broad and general allocation. Such an approach would allow for flexible use of these bands so that licensees would be able to offer a wide range of services employing varying technologies. This approach is similar to one taken in ET Docket No. 92-9, where we redesignated spectrum in the 2 GHz range for emerging technologies.[33] In that proceeding, we allocated 220 megahertz of spectrum to Fixed and Mobile services and identified it for use by emerging technologies. Later, we provided for the personal communications services (PCS) to use 140 megahertz of this spectrum. The remainder is available for future use.[34]

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30 See Table of Frequency Allocations, 47 C.F.R. § 2.106. Use of the fixed-satellite service (space-to-earth) at 4500-4800 MHz is subject to an allotment plan contained at Appendix 30B of the international Radio Regulations.

31 See Table of Frequency Allocations, 47 C.F.R. § 2.106. The fixed-satellite service in this band is also subject to case-by-case electromagnetic compatibility analyses. See U.S. allocation footnote 245.

32 See Sharing Arrangement Between the Department of Communications of Canada and the National Telecommunications and Information Administration of the United States Concerning the Use of the Band 4400-5000 MHz, signed August 29, 1986.

33 See generally Redevelopment of Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies, ET Docket No. 92-9, First Report and Order and Third Notice of Proposed Rule Making, 7 FCC Rcd 6886 (1992), Second Report and Order, 8 FCC Rcd 6495 (1993), Third Report and Order and Memorandum Opinion and Order, 8 FCC Rcd 6589 (1993), Memorandum Opinion and Order, 9 FCC Rcd 1943 (1994).

34 See generally Amendment of the Commission's Rules to Establish New Personal Communications Services, GEN Docket No. 90-314, Memorandum Opinion and Order, 9 FCC Rcd 5031 (1994).

9. We therefore request comment on an allocation approach that would designate the 2390-2400 MHz, 2402-2417 MHz and 4660-4685 MHz bands for general Fixed and Mobile services, rather than specify these frequency bands for particular uses. In this context, we believe such a flexible allocation that relies substantially on market forces may be appropriate.[35] We also believe that under such an approach most of the services to be provided in this spectrum would likely meet the statutory criteria for auctions.[36] Therefore, we are proposing to make licenses for this spectrum available though competitive bidding, to the extent possible and practicable. We also believe it is important to provide for a market structure that provides for competition in the provision of new services. A competitive market structure would promote economical prices for users and provide operators with incentives to develop and introduce innovative service features and technologies. One approach for developing a competitive market structure would be to divide the spectrum into channel blocks of one to two megahertz. Licensees would be given exclusive use of these channels within a specified geographic area. We request comment on this approach and the appropriate amount of spectrum to specify for a channel block and the extent of the geographic areas to which channel blocks would be licensed.

10. We propose to allow technical flexibility in the provision of services. In particular, we propose to allow users freedom to choose the channelization, signal strength, modulation techniques and antenna characteristics they employ in providing service, consistent with not causing interference to other users. Interference to operations in adjacent service areas would be controlled through power limits at the service area boundaries. Licensees would also be free to negotiate and develop agreements for interference conditions at the boundaries between their service areas. We request comment on these proposals for the rules for technical operation. We particularly request comment on what the appropriate interference standards should be under such an approach. For personal communications services (PCS), we have adopted a standard that requires that the predicted or measured mean field strength at any location on the border of the PCS service area not exceed 47 dBuV/m unless the parties agree to a higher field strength.[37] We request comment on whether this standard would be appropriate for use in these bands.

11. While we believe that the above plan for allocation to Fixed and Mobile services would ensure that the spectrum is used for services that are most highly valued by the public, we also recognize that such an approach may be difficult to implement given certain factors that are unique to these bands. For example, there are incumbent amateur users in the 2390-2400 MHz and 2402-2417 MHz bands and the 2402-2417 MHz band is affected by emissions from ISM devices, including millions of household microwave ovens. In addition, a growing number of

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[35] See Amendment of Parts 2 and 22 of the Commission's Rules, 2 FCC Rcd 1825 (1986) (subsequent history omitted).

[36] Section 309(j)(1) of the Communications Act of 1934, as amended, 47 U.S.C. § 309(j)(1), permits auctions only where mutually exclusive applications for initial licenses or construction permits are accepted for filing by the Commission and where the principal use of the spectrum will involve or is reasonably likely to involve the receipt by the licensee of compensation from subscribers in return for enabling those subscribers to receive or transmit communications signals. We also note that the Commission's authority under Section 309(j) to use competitive bidding is limited to awarding licenses and is not to be used for allocating spectrum.

[37] See 47 C.F.R. § 24.236.

unlicensed Part 15 devices are also operating in this band. Accordingly, we believe it is appropriate also to solicit comment on identifying specific communications services as an alternative to relying only upon the general allocation. A number of such proposals were presented in the comments to the NOI and are discussed below.

12. In the 2390-2400 MHz band, In-Flight Phone Corporation (In-Flight) proposed an allocation for an aeronautical audio/visual service (AAVS). In-Flight's AAVS proposal has the potential to furnish commercial air travelers with real time video and audio information and entertainment services. According to In-Flight, the AAVS would be able to share spectrum with the Amateur and other services and, because it would be a ground-to-air service, would not present an interference problem for adjacent channel space research and radioastronomy operations.[38]

13. Another alternative for the 2390-2400 MHz band is a proposal from Southwestern Bell that this band be paired with the 2300-2310 MHz band and be used for wireless local loop service. As described by Southwestern Bell, a wireless local loop service would be enable a Local Exchange Carrier (LEC) to provide telephone service to the home via radio links rather than through a copper or fiber cable to each home. According to Southwestern Bell, the benefits of a wireless local loop service include reduced costs in providing telephone service to new customers, reduced telephone service maintenance costs, and rapid deployment of telephone service to new customers. Southwestern Bell further states that because of the high density of use in any particular area, a wireless local loop service would not be compatible with Amateur use of the spectrum.

14. We observe that this spectrum also could be used to provide unlicensed PCS or Multipoint Distribution Service (MDS). One possibility would be to provide unlicensed PCS services in either or both of the 2300-2310 MHz and 2390-2400 MHz bands.[39] Alternatively, the 2300-2310 MHz and 2390-2400 MHz bands could be used to accommodate the MDS currently operating at 2150-2160 MHz, freeing that spectrum for unlicensed PCS.[40]

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[38] See comments of Cornell University and the National Research Council. These organizations stress the need for appropriate limits on use of the 2390-2400 and 2402-2417 MHz bands to protect highly sensitive radio astronomy operations being carried out on 2380 MHz at the Arecibo Observatory in Puerto Rico. In particular, these parties stress the need to not permit aeronautical or space-to-Earth use of the 2390-2400 MHz band, to restrict terrestrial use in the vicinity of the Arecibo Observatory, and to limit spurious emissions from equipment operating in these bands.

[39] We made a commitment to seek additional spectrum for unlicensed PCS in the PCS proceeding. See Memorandum Opinion and Order, GEN Docket No. 90-314, 9 FCC Rcd 5031 (1994).

[40] MDS currently operates in the 2150-2160 MHz band nationwide. This 10 megahertz provides one 6 megahertz wide channel and one 4 megahertz wide channel. In the top 50 markets, however, the 4 megahertz channel may be combined with 2 megahertz at 2160-2162 MHz. See 47 C.F.R. § 21.901(c). If we were to allocate 6 megahertz from each of the 2300-2310 MHz and 2390-2400 MHz bands, we could fully reaccommodate MDS. The remaining 4 megahertz in each band could be used for other purposes. As promised in the PCS Reconsideration MO&O,

15. There may also be benefit in using either the 2390-2400 MHz or the 2300-2310 MHz band for intelligent vehicle highway systems (IVHS). Motorola suggests that spectrum under consideration in this proceeding may be suitable for short range IVHS services.

16. In response to the NOI, we received several other suggestions for use of the 2390-2400 MHz band. These uses include interactive video in rural areas, low power communications, mobile-satellite service (MSS), and advanced private communications. We believe, however, that most of these uses are already adequately accommodated in other bands, could be accommodated under our general allocation proposal for these bands, or may not be suitable for the 2390-2400 MHz band. We request comments on our conclusions regarding these other alternatives. We invite comments on any other services that might be provided in this spectrum. Parties supporting alternative proposals for this band should address the compatibility of the proposed service with the Amateur and other services. Commenting parties should also provide a cost/benefit analysis for the service, along with specific information regarding operating parameters and any other relevant information. We also note that, while we have not specifically identified spectrum for advanced private communications as requested by the Coalition of Private Users of Emerging Multimedia Technologies (COPE), private users can receive service from commercial service providers and can compete in obtaining spectrum on the same basis as commercial providers. Additionally, we will continue to consider COPE's request for spectrum as we determine uses for additional spectrum being reallocated from Federal Government use under the Reconciliation Act.

17. Several of the alternatives for allocating the 2390-2400 MHz band discussed above also consider use of 2300-2310 MHz. The 2300-2310 MHz band was identified for reallocation in the Department of Commerce's Preliminary Report to be available in January 1996. However, in our August 9, 1994, report to the Secretary, U.S. Department of Commerce we suggested that this band be made available for private sector use immediately. Also, in the NOI in this proceeding, we requested comment on the benefits of pairing this band with the 2390-2400 MHz band. Because this band has only preliminarily been identified for reallocation, and is subject to change in the Department of Commerce's final report, we may request further comment later on the allocation of 2300-2310 MHz. Nevertheless, if we determine that it is in the public interest, we may allocate this band in the Report and Order in this proceeding adopting allocations for the 50 megahertz of spectrum already made available. Accordingly, we ask parties to comment on how we should allocate the 2300-2310 MHz band as well.

18. In the 2402-2417 MHz band, the presence of ISM equipment, unlicensed devices (particularly spread spectrum devices authorized under 47 C.F.R. § 15.247), and other non-Government users present a particularly challenging environment in which to implement new radio services. Any equipment operating in this band must use transmission schemes that are extremely robust and versatile. Commenters to our NOI indicate that many of the companies currently manufacturing unlicensed Part 15 equipment for the 902-928 MHz band have begun to develop or modify this equipment for use at 2400-2483.5 MHz and several firms are selling

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supra n. 22, in the near future we will address in separate proceedings the specific issue of providing additional spectrum for unlicensed PCS and the mobile-satellite service.

devices for use in this band. We also note that Part 15 use is consistent with a number of suggestions for use of this spectrum, such as in-building voice and data systems, and small area communications. All of these uses can be accommodated under Part 15 of our rules. In light of this we request comment on retaining future use of this band by Part 15 equipment. Possibilities include eliminating this band from Part 15 use in order to avoid any potential conflicts with future licensed services, maintaining Part 15 use of this band and also implementing licensed services, or maintaining Part 15 use of this band while limiting licensed use of the band.

19. We request further comment on other suggestions received for use of the 2402-2417 MHz band, including providing licensed services in this band that are subject to technical rules that are similar to the rules for unlicensed Part 15 devices, or use of the band for MSS. MSS providers appear pessimistic regarding the utility 2402-2417 MHz for MSS. However, Loral/Qualcomm states that it is continuing to evaluate the possibility of providing MSS in this band.

20. Both the 2390-2400 MHz and 2402-2417 MHz bands are currently available for secondary use by the amateur service. The Reconciliation Act directed the Department of Commerce to seek to avoid excessive disruption of the amateur service and to determine the extent to which, in general, commercial users could share the frequency with amateur radio licensees.[41] The Department identified spectrum for transfer in light of this directive, and concluded that these two bands could be made available for commercial use without severely affecting the amateur service. However, in their comments, the amateur service community argues that the Department failed to meet the criteria of the Reconciliation Act. We recognize the importance of the amateur service and, in making our allocation decisions, we will take into account existing use of the spectrum by the amateur service. We therefore solicit information on several options. One approach for accommodating amateur service use of these bands is to maintain a secondary allocation for the amateur service in all or part of this spectrum. Another approach is to make the amateur service the primary user in a portion of this spectrum while either maintaining a secondary allocation in the remaining portions of the bands or eliminating the other portions from the amateur service. We also solicit information on the degree of disruption to the Amateur service that would result if all or part of this spectrum was removed from the amateur service. We request comment on these options, including the ability of various radio services to share spectrum with the amateur service.

21. For the 4660-4685 MHz band, several parties representing broadcast interests request that we allocate this band for broadcast auxiliary service (BAS). These parties state that broadcasters need additional spectrum to meet increasing needs for auxiliary communications, especially electronic news gathering. They argue that existing BAS spectrum is already congested and that advanced television and cable services will further increase demand. We request comment on this proposal and in particular the extent to which this band could accommodate both existing and new broadcast auxiliary requirements.

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[41] Reconciliation Act § 6001(a)(3), as codified at 47 U.S.C. §§ 923(c)(1)(C)(iii) and 923(c)(3)(C).

22. Other suggestions for use of the 4660-4685 MHz band include spectrum for fixed microwave systems that will be displaced from 1850-1990 MHz by PCS, MSS feeder links and in-building voice and data systems. We believe that the issue of reaccommodating fixed microwave operations has been adequately addressed in our proceeding on emerging technologies, so that is not necessary to reallocate additional spectrum for this purpose.[42] Further, while we recognize the importance of providing spectrum for MSS, including spectrum for feeder links, we note that the Report of the MSS Above 1 GHz Negotiated Rulemaking Committee, found that the existence of the FSS Allotment Plan for the 4500-4800 MHz band raises significant regulatory and policy issues regarding use of this band for feeder links.[43] With regard to the suggestion that 4660-4685 MHz be used for in-building communications and some limited outdoor use, we believe that such services can generally be accommodated in spectrum allocated for use by unlicensed PCS devices.[44] We request comment on our tentative conclusions regarding these alternative proposals.

23. We request comment on any other services that might be provided in these three frequency bands. Commenters should provide us with as much information as possible with regard to how any proposed service provides benefit to the public. Commenters should also describe their proposed service in as much detail as possible, including the most appropriate licensing areas, limitations on eligibility, and any technical constraints or parameters that should be imposed on use of these bands. Commenters should recognize that each band has slightly different circumstances that may affect its use and should address these circumstances appropriately. Commenters that support identifying specific services for these bands should discuss why this specificity is necessary and its impact upon future flexibility as technology continues to advance and new services become available. Parties should also provide a cost/benefit analysis for their proposal, and compare their proposal to other proposals under consideration. Finally, parties should discuss licensing mechanisms for the proposed service, including whether the service meets the criteria for competitive bidding.[45]

IV. PROCEDURAL MATTERS

Ex Parte Rules - Non-Restricted Proceeding

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[42] See generally, Second Report and Order, ET Docket No. 92-9, 8 FCC Rcd 6495 (1993), Third Report and Order, ET Docket No 92-9, 8 FCC Rcd 6589 (1993), and Memorandum Opinion and Order, ET Docket No. 92-9, 59 Fed Reg. 19642 (4/25/94).

[43] Report of the MSS Above 1 GHz Negotiated Rulemaking Committee, at 31.

[44] See Memorandum Opinion and Order, GEN Docket No. 90-314, 9 FCC Rcd 5031 (1994).

[45] Whether a service does or does not meet the criteria for competitive bidding will not be a factor in our allocation decision making process. This information will, however, assist us in judging the competitive nature of a service for the purpose of proposing licensing and service rules. We will offer licenses through competitive bidding if a service meets the criteria for doing so. See Section 309(j)(2) of the Communication Act of 1934 , as amended. See also PP Docket No. 93-253.

24. This is a non-restricted notice and comment rule making proceeding. Ex parte presentations are permitted, except during the Sunshine Agenda period, provided they are disclosed as provided in Commission rules. See generally 47 C.F.R. §§ 1.1202, 1.1203, and 1.1206(a).

Initial Regulatory Flexibility Analysis

25. The analysis required by the Regulatory Flexibility Act of 1980, 5 U.S.C. Section 608, is contained in Appendix E.

Comment Dates

26. Pursuant to applicable procedures set forth in Sections 1.415 and 1.419 of the Commission's Rules, 47 C.F.R. §§ 1.415 and 1.419, interested parties may file comments on or before December 19, 1994, and reply comments on or before January 3, 1995. To file formally in this proceeding, you must file an original and four copies of all comments, reply comments, and supporting comments. If you want each Commissioner to receive a personal copy of your comments, you must file an original plus nine copies. You should send comments and reply comments to Office of the Secretary, Federal Communications Commission, Washington, DC 20554. Comments and reply comments will be available for public inspection during regular business hours in the FCC Reference Center, Room 239, 1919 M Street, N.W., Washington, DC 20554.

Ordering Clause

27. Authority for issuance of this Notice of Proposed Rule Making is contained in Sections 4(i), 303(g), 303(r), 332(a), and 403 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 303(g), 303(r), 332(a), and 403.

Contact Person

28. For further information concerning this proceeding, contact Steve Sharkey, Office of Engineering and Technology, (202) 653-8151.

FEDERAL COMMUNICATIONS COMMISSION

William F. Caton
Acting Secretary

Appendix A

NTIA Preliminary Spectrum Reallocation Plan

Bands Identified for Reallocation	Reallocation Status	Reallocation Schedule
1390-1400 MHz	Exclusive	January 1999
1427-1432 MHz	Exclusive	January 1999*
1670-1675 MHz	Mixed	January 1999**
1710-1755 MHz	Mixed	January 2004
2300-2310 MHz	Exclusive	January 1996
2390-2400 MHz	Exclusive	Immediate
2402-2417 MHz	Exclusive	Immediate
3650-3700 MHz	Mixed	January 1999
4635-4660 MHz	Exclusive	January 1997*
4660-4685 MHz	Exclusive	Immediate

* Protection for a limited number of facilities would be required for an additional period of time.

** Limited immediate use of this spectrum would be considered.

Appendix B

Comments filed in Response to NOI in ET Docket No. 94-32

1 Alcatel Network Systems, Inc.
2 Amateur Television Network
3 Amateur Radio Council of Arizona
4 American Petroleum Institute
5 American Mobile Satellite Corporation
6 American Assoc. of State Highway and Transportation Officials
7 American Radio Relay League, Inc.
8 Apple Computer, Inc.
9 Association of Public-Safety Communications Officials-Inter
10 Association for Maximum Service Television, inc.
11 AT&T Corp.
12 California Public-Safety Radio Association, Inc.
13 Coalition of Private users of Multimedia Technologies
14 Cornell University/National Astronomy and Ionosphere Center
15 County of Kern
16 County of Orange, California
17 E. V. Williams Co., Inc.
18 First Nations Development Institute
19 Forestry-Conservation Communications Association
20 GEC Plessey Semiconductors
21 GTE Service Corporation
22 Herb D. Twitchell
23 Industrial Telecommunications Association, Inc.
24 Interdigital Communications Corp.
25 International Association of Chiefs of Police
26 Itron, Inc.
27 James W. Tittle
28 John Eramo & Sons, Inc.
29 Ken Bellmard
30 King County, Washington
31 Leaco Rural Telephone Cooperative, Inc.
32 Loral/Qualcomm Partnership, L.P.
33 Major Cities Police Chiefs Association
34 Maricopa Adult Probation Department
35 Motorola, Inc.
36 National Communications System
37 National Association of Business and Educational Radio, Inc.
38 New York City Transit Police Department
39 North Carolina Smartnet User's Network
40 Northern Amateur Relay Council of California, Inc.
41 Pacific Bell and Nevada Bell

42 Part 15 Coalition
43 Radio Amateur Satellite Corporation
44 Robert L. Greene
45 San Bernardino Microwave Society
46 Southern California Repeater and Remote Base Association
47 Southwestern Bell
48 Symbol Technologies, Inc.
49 Telecommunication Industry Association
50 The Critical Care Telemetry Group
51 The Southern Company
52 Utah VHF Society
53 Utilities Telecommunications Council
54 Valley Communications Center
55 Western Multiplex Corporation
56 Western States VHF-Microwave Society
57 William Burns

Late filed Comments in ET Docket 94-32

1 Cactus Intertie System/Cactus Radio Club, Inc.
2 City and County of Durham, North Carolina
3 County of Tulare
4 Florida Fruit & Vegetable Association
5 Kent Britain
6 Kerr-McGee Corporation
7 Mitchell Energy & Development Corp.
8 National Research Council
9 National Propane Gas Association
10 National Utility Contractors Association
11 Phelps Sungas, Inc.
12 Pillsbury Company
13 Ready Mix Concrete Corporation
14 Rochester VHF Group
15 Sun Services Corporation
16 Superior Asphalt Company, Inc.
17 Vann Gin Co., Inc.
18 Visalia Fire Department
19 Webber Energy Fuels
20 Westbank Electric, Inc.

Appendix C

Reply Comments filed in ET Docket No. 94-32

1. Alcatel Network Systems
2. American Petroleum Institute
3. American Radio Relay League, Incorporated
4. AT&T Corp.
5. Capital Cities/ABC Inc.
6. COMSAT Corporation
7. Industrial Telecommunications Association, Inc.
8. International Business Machines Corporation
9. Loral/Qualcomm Partnership, L.P.
10. Metricom, Inc.
11. National Association of Broadcasters
12. National Broadcasting Company, Inc.
13. National Association of Business and Educational Radio, Inc.
14. Radio Amateur Satellite Corporation
15. Southwestern Bell Corporation
16. Western Multiplex Corporation

Late Filed Reply Comments filed in ET Docket No. 94-32

1. In-Flight Phone Corporation

Appendix D

1. In the NOI in this proceeding, we requested information on potential services that could be accommodated in the 50 megahertz of spectrum at 2390-2400 MHz, 2402-2417 MHz, and 4660-4685 MHz that the Department of Commerce has identified for immediate reallocation. In response to our NOI we received 77 comments and 17 reply comments. This appendix provides a summary of these comments.

2. **2390-2400 MHz** The 2390-2400 MHz band lies within the 2300-2450 MHz frequency range, which is referred to as the 13 cm band by the amateur service community. The Department of Commerce has proposed reallocating 35 megahertz of spectrum, at 2300-2310 MHz, 2390-2400 MHz, and 2402-2417 MHz, out of the total 70 megahertz of spectrum currently available for use by the Amateur service in the 13 cm band.[46] This would leave 35 megahertz of spectrum remaining available for use by Amateurs on a secondary basis to Government operations.[47] Amateur service licensees contend that the Department of Commerce erred in identifying frequencies in this range for reallocation without accurately determining the effect that reallocation will have on the Amateur service, or to what extent commercial users could share the frequencies with the Amateur service.[48] These commenters dispute the Department of Commerce's assertion that Amateur service spectrum requirements can be satisfied by the 35 megahertz of spectrum that would remain allocated for use by the Amateur service in the 13 cm band. They state that the reallocation will leave insufficient spectrum for Amateur Satellite operations, will prevent full duplex point-to-point operations in the 13 cm band, will eliminate weak signal operations carried out in this band, and will crowd Amateur Service operations in the 13 cm band into the least desirable spectrum near the center of the ISM band at 2450 MHz.[49]

3. Many Amateur Service commenters state that sharing between commercial licensees and the Amateur Radio Service is not possible because, unlike Government users which are generally located in remote areas, commercial users are likely to be located in the same urban areas as Amateur radio users.[50] Amateur service commenters also point out that the Commission

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[46] Preliminary Report at Section 5.

[47] The remaining 35 megahertz of spectrum is at 2400-2402 MHz and 2417-2450 MHz.

[48] Comments of Amateur Radio Council of Arizona at 2, American Radio Relay League, Inc. at 3-5, Northern Amateur Relay Council of California at 1-2, San Bernardino Microwave Society at 3, Southern California Repeater and Remote Base Association at 6-8 and 10-11, Utah VHF Society at 2, Cactus Intertie System/Cactus Radio Club, Inc. at 4-5. Sec. 113(c)(1)(C)(iii) of the Reconciliation Act requires that, in identifying whether a band of frequencies should be transferred to the private sector, the Department of Commerce consider "excessive disruption of existing use of Federal Frequencies by amateur radio licensees", and Sec. 113(c)(3)(C) states that the Department of Commerce must analyze the, "extent to which, in general, commercial users could share the frequency with amateur radio licensees."

[49] See Generally, comments of Amateur Television Network, Amateur Radio Council of Arizona, American Radio Relay League, Inc., Northern Amateur Relay Council of California, San Bernardino Microwave Society, Southern California Repeater and Remote Base Association, Utah VHF Society, and Radio Amateur Satellite Corporation.

[50] Amateur Television Network comments at 2; Amateur Radio Council comments at 2; Northern Amateur Relay Council of California comments at 3-5; Southern California Repeater and Remote Base Association comments at 8, 10-11; and Utah VHF Society comments at 2.

has used the continued availability to Amateurs of the 13 cm band to justify reallocating Amateur spectrum in lower bands to commercial services and that it would therefore be unjust for the Commission to now allocate this spectrum for commercial uses.[51] Accordingly, these commenters request that the frequencies reallocated from Federal Government use either be made available for the primary use of the Amateur radio service or that displaced Amateur Service users be accommodated in alternative bands.[52]

4. A number of comments were received by manufacturers of equipment authorized under Part 15 of our Rules (Part 15 devices). Although the majority of these focused on the 2402-2417 MHz band, several parties discussed the potential for use of the 2390-2400 MHz band for unlicensed devices under Part 15 of the Rules or for licensed services subject to technical rules similar to the Part 15 rules. GEC Plessey suggests that the entire 2390-2417 MHz band be allocated for use by spread spectrum systems that could support services such as wireless wide-area networks and point-to-point services.[53] To provide compatibility between licensed and unlicensed services, GEC Plessey and AT&T suggest that we adopt technical rules for licensed services that are similar to the rules for unlicensed Part 15 devices.[54] However, Western Multiplex believes that restrictions stemming from a need to protect space research operations in adjacent spectrum would make it difficult to accommodate unlicensed operations in the 2390-2400 MHz band. Instead, Western Multiplex suggests that the 2390-2400 MHz band would be best used to support private mobile and fixed operations, possibly to fulfill some of the spectrum requirements described in the COPE petition.[55]

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[51] American Radio Relay League comments at 11-12; SCRRBA comments at 12; and Cactus Intertie System/Cactus Radio Club comments at 5.

[52] A number of commenters have suggested that the Department of Commerce make available portions of the 2310-2390 MHz band for use by the Amateur Radio Service to accommodate displaced Amateur users or that the portions of 2300-2310 MHz band not be reallocated in exchange for spectrum above and adjacent to 2417 MHz. Reallocation of additional or alternative spectrum must be addressed by the Department of Commerce and is outside the scope of this proceeding. We note, however, that in our August 9th report to the Secretary of Commerce, FCC 94-213, we provided an analysis of comments received in response to the Preliminary Report along with our own comments and recommendations for consideration by the Department of Commerce for incorporation in its final report.

[53] GEC Plessey comments at 1-3. GEC Plessey suggests that the 2400-2402 MHz band be included in the reallocation of spectrum. Such a reallocation is outside the scope of this proceeding.

[54] GEC Plessey comments at 1-2, AT&T comments at 3-4.

[55] Western Multiplex comments at 3-4. Western Multiplex also provides a band plan for the 2390-2400 MHz band. The COPE petition is a Petition for Rule Making, filed December 23, 1993, by the Coalition of Private Users of Emerging Multimedia Technologies (COPE) that has been included for consideration in this proceeding. COPE is a group consisting of a broad range of private land mobile users and user associations, such as the American Petroleum Institute, the Association of Public-Safety Communication Officials-International, Inc., the National Association of Business and Educational Radio, Inc., and the Utilities Telecommunications Council. In its petition, COPE argues that a need exists for an allocation of 75 megahertz of spectrum below 3 GHz for the development of an "Advanced Private Land Mobile

5. Pacific Bell and Nevada Bell (PB/NB) believe that while the 2390-2400 MHz band and the 2402-2417 MHz bands are too close to be paired and used for full duplex operations, the two megahertz separating the bands also makes it difficult to use them as a single band. PB/NB therefore believe that these bands would be best used for time division duplex operations[56] to provide in-building voice and data systems and some limited outdoor use.[57] PB/NB notes the importance of paired operation for two way communication and, noting that the 2300-2310 MHz and the 2390-2400 MHz bands are the only bands identified in the Preliminary Report that can be easily paired, states that it would be appropriate to delay licensing the 2390-2400 MHz in order to allow it to be licensed with 2300-2310 MHz on a paired basis, possibly for public safety services.[58]

6. Southwestern Bell also urges that the 2390-2400 MHz and the 2300-2310 MHz bands be paired. It requests that these bands be allocated for use by local exchange telephone companies to provide wireless local loop service. Southwestern Bell states that such a service could replace wired local loops for providing basic telephone service and would facilitate the introduction of new technologies such as remote meter reading and rapid recovery systems for natural disasters.[59]

7. Leaco Rural Telephone Cooperative (Leaco) believes that the Commission has neglected its duty to consider rural areas in allocating spectrum for radio-based communications services and states that both the 2390-2400 MHz and 2402-2417 MHz bands are suited to providing interactive video, voice and data service in rural areas.[60] Several commenters also state that services to rural areas would be enhanced by allocating all, or most of, the 50 megahertz of spectrum for the exclusive use of Native Americans.[61]

Communications Service", which would accommodate the needs of private land mobile radio user communities for new operations such as advanced wireless imaging and decision processing/remote file access systems. COPE specifically suggests that spectrum be reallocated from the Federal Government, and it states that the most likely source of spectrum to accommodate private emerging technology needs lies in the spectrum to be reallocated under the requirements of the Reconciliation Act.

[56] Time Division Duplex operations provide two-way communications by transmitting in only a single direction at any moment in time. This is compared to Frequency Division Duplex where bands of frequencies that are sufficiently separated are paired to allow simultaneous, bi-directional communications.

[57] Pacific Bell and Nevada Bell comments at 4.

[58] Pacific Bell and Nevada Bell comments at 2-3, 6.

[59] Southwestern Bell comments at 1-7.

[60] Leaco comments at 3-9. Contrary to Leaco's contention that we have not fulfilled our obligation to rural telephone companies, in adopting rules for competitive bidding we have included these companies as designated entities that receive bidding preferences. See Generally, PP Docket No. 93-253.

[61] Comments of First Nation Development Institute, Ken Ballard, and Robert L. Greene. These commenters do not, however, describe what services the spectrum should be used for or how Native Americans would use the spectrum outside of remote areas. We decline to propose to set

8. Loral/Qualcomm and the American Mobile Satellite Corporation (AMSC) are evaluating the possibility of using the 2390-2400 MHz band for the Mobile Satellite Service (MSS).[62] AMSC states that, although the spectrum identified for reallocation has "very limited utility for MSS," it is analyzing the possible utility of the 2390-2400 MHz band for MSS downlinks. Further, in its comments in response to our Notice of Inquiry in preparation for the 1995 World Radiocommunications Conference, AMSC states that the 2390-2400 MHz band should be considered as a candidate for an MSS downlink allocation.[63] Loral/Qualcomm cites the Commission's previous recognition of the potential for the MSS service to stimulate economic growth as evidence of the relative importance of MSS to the future telecommunications infrastructure, and urges that the 2390-2400 MHz and 2402-2417 MHz bands be allocated for MSS uplinks.[64] However, AMSC states that these bands would have no utility for providing MSS uplinks because of interference from ISM devices and Part 15 equipment operating in the 2400-2500 MHz band.[65] Motorola also urges consideration for the possible use of this spectrum for MSS[66] and COMSAT has filed reply comments also supporting use of this spectrum for MSS.[67]

9. A number of comments were received in support of the Petition for Rule Making from COPE. In its comments, COPE requests that the 2390-2400 MHz band be allocated for advanced private communications services.[68] The Utilities Telecommunications Council (UTC), the Association of Public-Safety Communications Officials (APCO), and the Forestry-Conservation Communications Association filed separate comments expressing their belief that the 2390-2400 MHz band can be used to satisfy private emerging technology spectrum requirements for advanced mobile or fixed communications.[69] The Industrial Telecommunications Association, Inc. (ITA) argues that the 2390-2400 MHz band is more suitable for private rather then commercial systems because the area and intensity of use of privately operated systems is generally more controlled than commercial systems and would be able to accommodate any restrictions imposed due to Government operations in adjacent bands.[70] On the other hand, a number of commenters believe that, because of the existing non-Government use (e.g., amateur use), restrictions on potential use, or the frequency range of the

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this spectrum aside for exclusive use by Native Americans. In our recent decision to auction spectrum for PCS and IVDS we made specific provisions to assist minorities in obtaining licenses. See Generally, PP Docket No. 93-253. If we find that similar provisions are warranted in issuing licenses for spectrum reallocated from the Federal Government we will take such action.

62 Loral/Qualcomm comments at 5, AMSC comments at 1-2.

63 AMSC comments filed in response to the Notice of Inquiry, IC Docket No. 94-31 at 15-16.

64 Loral/Qualcomm comments at 1-5.

65 AMSC comments at 1-2.

66 Motorola comments at 10.

67 COMSAT reply comments at 1-2.

68 COPE comments at 4-6.

69 UTC comments at 6-7, APCO comments at 5-6, Forestry-Conservation Communications Association comments at 2.

70 ITA comments at 4-7.

bands, none of the spectrum being considered in this proceeding is suitable for use by private users for emerging technologies.[71]

10. In late filed reply comments, In-Flight Phone Corporation (In-Flight) seeks to have the 2390-2400 MHz band allocated for use by an aeronautical audio/visual service (AAVS). In-Flight states that AAVS would be a ground-to-air service that would provide live multi-channel audio and video programming for airline passengers. In-Flight contends that the 10 megahertz of spectrum at 2390-2400 MHz could provide four channels of live video and 18 channels of live audio entertainment to the average 1.36 million people that fly on commercial aircraft each day.[72]

11. **2402-2417 MHz** The 2402-2417 MHz band also lies within the Amateur service 13 cm band. Amateur comments regarding reallocation of portions of the 13 cm band have already been discussed in the preceding paragraphs,[73] and the points made with regard to reallocation of 2390-2400 MHz apply to this band as well.

12. Several manufacturers of Part 15 devices submitted comments concerning this band, noting the variety and importance of devices developed under Part 15. The Part 15 Coalition points out that such devices include "digital cordless telephones, electronic article surveillance equipment, utility metering devices, fire and security alarm devices, wireless bar code readers, airborne and marine collision avoidance systems, local area networks..."[74] Other commenters note that the 2400-2500 MHz band is allocated internationally for ISM use and that, consequently, Part 15 devices manufactured in the United States can be marketed abroad, adding to the international competitiveness of U.S. companies.[75] Generally, the commenters note that it was only recently that the Commission encouraged development of spread spectrum systems in the 902-928 MHz, 2400-2483.5 MHz, and the 5700-5825 MHz bands and argued that the Commission should not now allocate 2402-2417 MHz for services that would be incompatible with continued Part 15 development and use of the 2400-2483.5 MHz band.[76]

13. There is some disagreement, however, on what uses would be incompatible with Part 15 use of the 2402-2417 MHz band. Apple, Interdigital, the Part 15 Coalition, the Southern Company, and Western Multiplex argue that any commercial licensed service would be incompatible with Part 15 operation and that 2402-2417 MHz should not, therefore, be

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71 Comments of California Public-Safety Radio Association at 3, County of Orange, California at 2, International Association of Chiefs of Police at 4-7, King County, Washington at 1, Major Cities Police Chiefs Associations at 3, New York Transit Police Department at 1, Telecommunications Industry Association at 5-6, Valley Communications Center at 1.

72 In-Flight reply comments at 8.

73 Paras. 6-7, supra.

74 Part 15 Coalition comments at 2.

75 Apple Computer comments at 3; AT&T comments at 3; and GEC Plessey comments at 2-3

76 In 1990, we encouraged the further development and implementation of the "exciting new family of [spread spectrum] technologies" by modifying Part 15 of the Rules to maximize the flexibility of spread spectrum devices. Spread spectrum systems may operate with up to one watt of transmitter output power. Report and Order, Gen. Docket No, 89-354, 5 FCC Rcd 4123, 4124 (1990).

considered for any licensed service.[77] Other commenters, on the other hand, believe that Part 15 operations are compatible with some licensed services. Symbol Technologies states that spread spectrum Part 15 devices are compatible with virtually all conventional narrowband services.[78] GEC Plessey suggests that 2400-2402 MHz also be reallocated from Federal Government to private sector use and that the entire 2390-2417 MHz band then be allocated for use by spread spectrum systems that could support services such as wireless wide-area networks, and point-to-point systems, including telephony trunks.[79] To provide compatibility between licensed and unlicensed services, GEC Plessey and AT&T would adopt technical rules for licensed services that are similar to the rules for unlicensed Part 15 devices.[80]

14. PB/NB believes that the 2402-2417 MHz band would be best used for time division duplex operations to provide in-building voice and data systems and some limited outdoor use.[81] Loral/Qualcomm states that it is evaluating the possibility of using 2402-2417 MHz for an MSS uplink.[82] AMSC, however, believes that the noise generated by ISM equipment operating in this band eliminates it consideration for MSS use, especially as an uplink.[83]

15. Parties that filed comments in support of allocating the 2390-2400 MHz band to meet the advanced communications needs of private radio users, as described in the COPE petition, generally also supported allocating the 2402-2417 MHz band for this purpose.[84] APCO states that any difficulty in using this band arising from noise from ISM devices could be overcome through geographic limitations, higher power levels, or the use of spread spectrum technology.[85]

16. **4660-4685 MHz** Alcatel Network Systems (Alcatel) believes that the 4660-4685 MHz band is suitable for non-Government use by the fixed microwave service. Alcatel contends, however, that an additional 75 megahertz of spectrum is needed to meet the needs of fixed microwave users and that 100 megahertz of spectrum should be reallocated.[86] API, and the American Association of State Highway and Transportation Officials (AASHTO), believe that this band should be allocated for the use of private fixed microwave systems that will be displaced from the 1850-1990 MHz band by PCS.[87] The Forestry-Conservation Communications Association, the National Association of Business and Educational Radio, Inc. (NABER), and Western Multiplex also believe that private users can make some use of this

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[77] Apple comments at 1-3; Interdigital comments at 4; Part 15 Coalition comments at 3-4; Southern Company comments at 6-7; Western Multiplex comments at 5-7.

[78] Symbol Technologies comments at 8-9.

[79] GEC Plessey believes that such terrestrial use would have a minimal effect on Amateur Satellite operations at 2400-2402 MHz. GEC Plessey comments at 1-3.

[80] GEC Plessey comments at 1-2, AT&T comments at 3-4.

[81] Pacific Bell and Nevada Bell comments at 4.

[82] Loral/Qualcomm comments at 5.

[83] AMSC comments at 1-2.

[84] COPE comments at 4-6, UTC comments at 6-7, APCO comments at 5-6, Forestry-Conservation Communications Association comments at 2.

[85] APCO comments at 5-6.

[86] Alcatel comments at 1-3.

[87] API comments at 17. ASSHTO comments at 3.

band.[88] However, most parties filing comments in support of the COPE petition regard the 4660-4685 MHz band as too high in the spectrum to meet the needs of private users for advanced mobile services.

17. As with the 2390-2400 MHz and 2402-2417 MHz bands, PB/NB believe that the 4660-4685 MHz band would be best used for time division duplex operations to provide in-building voice and data systems and possibly some limited outdoor use.[89] Loral/Qualcomm suggests using the 4660-4685 MHz band for MSS service links or feeder links, in either the space-to-Earth or Earth-to-Space direction.[90] COMSAT supports using this band for non-geostationary satellite system feeder links.[91]

18. The Association for Maximum Service Television (MSTV) believes that the 4660-4685 MHz band would be appropriate for support of wideband advanced digital video services and proposes that the band be allocated to terrestrial fixed and mobile auxiliary broadcast operations.[92] MSTV states that increased use of broadcast auxiliary services, particularly for mobile electronic news gathering (ENG) operations, has resulted in congestion in the bands that are currently available for such operations. Further, MSTV asserts that demand for broadcast auxiliary spectrum routinely surpasses the amount of spectrum that is available, especially in major metropolitan areas. MSTV argues that the added spectrum requirements of advanced television (ATV) will result in even greater spectrum congestion. Accordingly, MSTV argues that the 4660-4685 MHz band should be allocated to meet the growing demands of the broadcast auxiliary service.[93] MSTV's proposal is supported by Capital Cities/ABC, Inc. (ABC), the National Association of Broadcasters (NAB), and the National Broadcasting Company, Inc. (NBC). and is opposed by the American Petroleum Institute, and NABER.[94]

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[88] Forestry-Conservation Communications Association comments at 1-2 and 5. NABER at comments 16. Western Multiplex comments at 7.

[89] Pacific Bell and Nevada Bell comments at 5.

[90] Loral/Qualcomm comments at 6.

[91] COMSAT reply comments at 2.

[92] MSTV comments at 6-7.

[93] MSTV also points out that allocating this band for auxiliary services offers the potential for future expansion of broadcast auxiliary services in the adjacent 4635-4660 MHz band, which was identified for reallocation in the Preliminary Report and is to be available in 1997. MSTV comments at 2-8.

[94] Reply comments of ABC at 1-4, NAB at 1-4, NBC 1-4, API at 8-9, and NABER at 4-5.

Appendix E

INITIAL REGULATORY FLEXIBILITY ANALYSIS

1. Reason for Action: The changes to Part 2 of the Commission's Rules proposed herein are for use of the spectrum that is being reallocated from Federal Government to non-Government use. This reallocation of spectrum is required by the Omnibus Budget Reconciliation Act of 1993.

2. Objectives: The Commission seeks to allocate the spectrum for services that present the greatest potential to provide benefit to the public by providing for the introduction of new services and the enhancement of existing services. These new and enhanced services will create new jobs, foster economic growth, and improve access to communications by industry and the American public.

3. Legal Basis: The legal basis for these rule changes is found in Sections 4(i), 303(g), 303(r), and 332(a) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 303(g), 303(r), and 332(a).

4. Reporting, Recordkeeping, and Other Compliance Requirements: No reporting, recordkeeping, or other compliance requirements are proposed in this item.

5. Federal Rules Which Overlap, Duplicate or Conflict With These Rules: None.

6. Description, Potential Impact, and Number of Small Entities Involved: Many small entities could be positively affected by this proposal because the allocations proposed will foster new technologies resulting in new jobs, economic growth, and improved access to communications by industry, including small entities. The number of small entities that will be affected is unknown.

7. Any Significant Alternatives Minimizing the Impact on Small Entities Consistent with the Stated Objectives: This Notice of Proposed Rule Making solicits comments on a variety of alternatives. Additionally, all significant alternatives presented in response to the Notice of Inquiry in this proceeding have been addressed in this Notice of Proposed Rule Making.

Appendix F

A. Title 47 Code of Federal Regulations, Part 2, is proposed to be amended as follow:

PART 2 - FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AN REGULATIONS

1. The authority citation for Part 2 continues to read as follows:

Authority: Sec. 4, 302, 303, and 307 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154, 154(i), 30, 303, 303(r), and 307, unless otherwise noted.

2. Section 2.106 is amended by revising columns 4 through 7 of the table for the frequencies 2390-2450 MHz and 4500-4800 MHz, revising footnote G2, and adding new footnote G122, and to read as follows:

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United States table		FCC use designators	
Government	Non-Government	Rule part(s)	Special-use frequencies
Allocation MHz	Allocation MHz		
(4)	(5)	(6)	(7)
2390-2400 G122	2390-2400 FIXED. MOBILE. Amateur.	Amateur (97).	
2400-2402 RADIOLOCATIO N. 664 752 G2	2400-2402 Amateur. 664 752	Amateur (97).	
2402-2417 664 752 G122	2402-2417 FIXED. MOBILE. Amateur. 664 752	Amateur (97).	
2417-2450 RADIOLOCATIO N. 664 752 G2	2417-2450 Amateur. 664 752	Amateur (97).	

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4500-4660 FIXED. MOBILE. US245	4500-4660 FIXED-SATELLITE (space-to-Earth). 792A US245		
4660-4685 G122	4660-4685 FIXED. FIXED-SATELLITE (space-to-Earth). MOBILE. 792A US245		
4685-4800 FIXED. MOBILE. US245	4685-4800 FIXED-SATELLITE (space-to-Earth). 792A US245		

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G2 In the bands 216-225, 420-450 (except as provided by US 217), 890-902, 928-942, 1300-1400, 2300-2390, 2400-2402, 2417-2450, 2700-2900, 5650-5925, and 9000-9200 MHz, the Government radiolocation is limited to the military services.

* * *

G122 The bands 2390-2400, 2402-2417 and 4660-4685 MHz were identified for immediate reallocation, effective August 10, 1994, for exclusive non-Government use under Title VI of the Omnibus Budget Reconciliation Act of 1993. Effective August 10, 1994, any Government operations in these bands are on a non-interference basis to authorized non-Government operations and shall not hinder the implementation of any non-Government operations.

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