

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

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

In the Matter of)
)
Amendment of the Commission's Rules to) ET Docket No. 96-102
Provide for Unlicensed NII/SUPERNet) RM-8648
Operations in the 5 GHz Frequency Range) RM-8653

To: The Commission

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REPLY COMMENTS OF
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SUMMARY

The comments filed in this proceeding demonstrate widespread and broadly-based support for the Commission's proposal to make 350 MHz of spectrum available for unlicensed NII/SUPERNet technologies. Quite literally, more than 300 individuals and organizations speaking on behalf of industry, educational and library interests, governments at local, state and federal levels, the public interest community, and the general public have expressed support for Apple's NII Band Petition for Rulemaking and the NPRM in this proceeding. The record now presents a compelling case for the benefits that an unlicensed, wireless NII/SUPERNet band offer to those requiring high-capacity local area networks and longer-distance "community network" connections.

Since filing its NII Band Petition for Rulemaking, Apple has modified its initial NII Band proposal to accommodate the reasonable concerns of the Commission and other users and potential users of the 350 MHz at 5 GHz that has been proposed for NII/SUPERNet technologies. Apple also has modified its initial proposal to deal with less reasonable concerns which, in Apple's view, amount simply to the Commission's and other parties' fears of the unknown represented by community networks.

To address the reasonable concerns of the MSS and ITS services about sharing, as well as several parties' desire to have adequate spectrum devoted solely to very high rate ("VHR") NII/SUPERNet applications, Apple has proposed a band plan that would dedicate 150 MHz of NII/SUPERNet spectrum solely to the indoor operation of VHR devices. By creating VHR sub-bands and placing them in spectrum shared with the MSS and, potentially, ITS services, Apple's band plan would assure a favorable sharing environment for the MSS and ITS services, as well as easing potential sharing issues between VHR and non-VHR NII/SUPERNet technologies.

To address the fears of the unknown — including concerns that community networking would lead to a "tragedy of the commons" or subject other users of the 5 GHz band to objectionable interference — Apple has agreed to accept a lower output power limit for NII/SUPERNet devices (0.316 watts for fixed devices and 0.1 watt for personal/portable equipment, as opposed to the 1 watt proposed in its Petition). In addition, if the Commission decides it must

adopt some form of restricted eligibility for community networking devices, Apple has proposed a system under which only non-profit “designated eligibles” — libraries, educational entities, local or regional government agencies, health care providers, and other charitable and non-profit groups, or non-profit agents selected by the eligibles — would be allowed to use antennas with a gain greater than currently is permitted under Section 15.247 of the Commission’s rules.

By restricting the community networking function to designated eligibles, the Commission would be able to create a relatively homogeneous group of users, who could be relied upon to engage in cooperative efforts to maximize efficient shared use of the spectrum and whose use of the NII/SUPERNet band does not raise even potential problems of regulatory parity. This alternative would help to alleviate the fear that free access to the community networking function would open a Pandora’s box of interference and spectrum inefficiency problems, as well as create issues of regulatory parity.

Apple will not, and the Commission should not, go any further to distort the regulatory environment for community networks or rob them of their usefulness to the individuals and groups for whom they represent the best, clear chance to participate in the national information infrastructure. The Commission and the Administration have made extraordinary progress in a short time to identify and allocate the spectrum resources necessary to extend the NII to every citizen and to place a unique technology directly into the hands of educators, health care providers, community groups, and all levels of state and local governments without the need for and expense of carrier-intermediaries.

The Commission and Administration should continue on this bold course and not shrink from the goal that they have identified — a goal that is no less than to prepare the way for the telecommunications technologies that all Americans will use in the opening decades of the new millennium.

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REPLY COMMENTS OF APPLE COMPUTER, INC.

Apple Computer, Inc. ("Apple") hereby submits these reply comments regarding the Notice of Proposed Rulemaking ("NPRM") issued in the above proceeding on May 6, 1996.

The comments almost uniformly commend the Commission's proposal to create an unlicensed NII/SUPERNet band at 5 GHz. With rare exceptions, industry, the public interest community, and individuals strongly supported this effort to create a new unlicensed band capable of providing high capacity connections within user groups and between user groups and the National Information Infrastructure ("NII").

The comments also reflected a consensus on certain core principles to which the Commission should adhere in this proceeding. Most importantly, the comments demonstrated that the NII/SUPERNet band *must* accommodate longer distance community networking links if it is to respond adequately to the needs of schools, libraries, hospitals, community groups, and other users. In addition, the record of this proceeding shows that:

- 350 MHz of spectrum is the appropriate amount of spectrum for NII/SUPERNet devices.
- Community networking applications must not be subjected to either licensing or auctions.

- The Commission should adopt only minimal technical rules and, specifically, must not adopt the proposed “interim” listen-before-talk rules imported from Part 15, Subpart D.
- Additional sharing rules — whether explicit, agreed-upon standards or more informal preferences, practices, recommendations, or understandings — should be developed through an open industry process that reflects and responds to the views of a broad constituency, including potential users of the band, including community network interests. The Commission should not empower a single group to “own” the process or to exclude others from the process.
- Sharing rules between NII/SUPERNet devices and other services in the 5 GHz band should be designed to provide suitable protection to existing services and should not unduly impede the development or deployment of NII/SUPERNet networks.
- In order to promote the development and widespread use of NII/SUPERNet devices, the Commission should ensure that its rules create a reliable, secure, and flexible environment within which these devices can operate.¹

I. THE COMMENTS CONFIRM THE NEED FOR AT LEAST 350 MHZ OF SPECTRUM AND, THUS, THE IMPORTANCE OF ACCOMMODATING NII/SUPERNET OPERATIONS IN BOTH THE 5150-5350 MHZ AND 5725-5875 MHZ BANDS.

A wide range of potential manufacturers of NII/SUPERNet devices, many of whom are established companies with a long history in the telecommunications industry, joined in urging the Commission to make available 350 MHz for the proposed NII/SUPERNet band. Citing recent developments in the use of digital devices, including multimedia applications, the resulting need for high-speed computer-to-computer links, the potential for U.S. export

¹ Apple expresses no comment on SuperNet, Inc.’s objection to the Commission’s use of the “SUPERNet” name based on SNI’s alleged proprietary rights in the “SUPERNET” name. Apple, however, will continue to refer to “NII/SUPERNet” unless and until an alternative name is designated by the Commission.

opportunities and technological leadership, and the inadequacies of currently available alternatives to meet the present and future needs of users, these companies made a strong case for the proposed 350 MHz NII/SUPERNet band.²

Of even greater significance, organizations and individuals involved in education and other public interest activities — activities that would particularly benefit from the NII/SUPERNet band — came together in support of the NII/SUPERNet allocation for both in-building LANs and outdoor longer-reach community networks.³ These comments illustrated the grassroots need for an unlicensed band capable of supporting high-bandwidth links for those in rural areas and for classrooms, libraries, health care providers, and other governmental and non-profit institutions.

For example, NII/SUPERNet devices will make it possible for users to create high-capacity local area networks where wiring would not be feasible (for example, in schools buildings laden with asbestos), to support *ad hoc* networking among temporary work groups, to link classroom computers to the Internet at a low cost, and to create links to rural communities that currently are bypassed by wired and licensed-wireless networks. By expanding the range of individuals and entities who have a viable, affordable communications option available to them, unlicensed NII/SUPERNet networks will extend access to information and

² See, e.g., BSA Comments at 1; HP Comments at 2; ITI Comments at 3-5, 8-9; Lucent Comments at 2-3; Metricom Comments at 1; Microsoft Comments at 2-3; Motorola Comments at 2; Nortel Comments at 3; Rockwell Comments at 2; WINForum Comments at 12-14; 3Com Comments at 1-2.

³ E.g., Department of Electrical and Computer Engineering, Carnegie Mellon University, Comments at 1; Connectivity for Learning Coalition Comments at 1; Joint Commenters' Comments at 3-4 (National School Boards Association, Media Access Project, National Education Association, American Association of School Administrators, and People for the American Way); Joint Comments of Educators at 1-4 (California State University, Education Network of Maine, University of Maine System, Network for Instructional TV, Inc., San Diego County Superintendent of Schools, South Carolina Budget and Control Board — Office of Information Resource Management, South Carolina Educational Television Commission, and State of Wisconsin — Educational Communications Board); North American Catholic Educational Programming Foundation, Inc. Comments at 1; Jean Armour Polly Comments at 1. In addition, approximately 50 individuals and entities — students, educators, library trustees, library and school administrators, parents, representatives of Internet service providers (many operating in rural areas and/or seeking to meet the needs of educators, libraries, and other public interest organizations), and others — filed in support of the proposal to reserve spectrum for shared public use.

help to assure that segments of our population are not disenfranchised in the information revolution.

Two developments in the year since Apple and WINForum filed their petitions for rulemaking buttress the need for a 350 MHz allocation. First, it has become clear that neither Apple nor WINForum fully recognized when they filed their petitions the tremendous range of applications that could be served using this new spectrum. Technical developments, as well as the outpouring of interest from hundreds of individuals and organizations, have demonstrated the enormous appetite for new communications options and caused the Commission and the NII/SUPERNet proponents to re-think the original NII/SUPERNet spectrum predications.⁴

Second, it has become increasingly clear that the NII/SUPERNet band should be divided into two subsets, one devoted to very high rate (“VHR”) operations and one open to a wider range of technologies.⁵ This subdivision of the band will expand somewhat the aggregate bandwidth required to assure that, at each location, sufficient spectrum is available to meet users’ collective communications needs.

In addition to confirming the Commission’s wisdom in proposing to create a 350 MHz home for NII/SUPERNet devices, the comments also made clear that the NII/SUPERNet concept is ripe for prompt implementation. Manufacturers stated their interest in the band and their desire to develop NII/SUPERNet devices as soon as spectrum for these devices is made available by the Commission. Users indicated their frustration with currently-available options and their wish promptly to place NII/SUPERNet devices into service in a wide variety of applications.

Even a brief glimpse at the dramatic growth in computing technologies — whether in terms of the applications they are able to support, the bandwidth they require, or the extent to which they are relied on throughout our society — illustrate that, in the computer/communications field, predictions that may

⁴ E.g. WINForum Comments at 12-13.

⁵ See Section III(A)(5), *infra*.

appear bold often actually understate true growth. If communications technologies and, particularly, wireless solutions are to keep pace with developments in the computer industry, steps must be taken now to ensure that future developments in computing technologies can be accommodated by the communications infrastructure. In the wireless arena, that means that a very high capacity unlicensed band must be created now.

Those who would deny NII/SUPERNet devices access to 350 MHz of spectrum generally misunderstand the nature of this band or the factors that distinguish it from other wired, licensed-wireless, and unlicensed options. For example, neither the unlicensed PCS bands, the more recent unlicensed allocation at 59-64 GHz, nor any other unlicensed spectrum is capable of supporting support the mix of high bandwidth connections and longer-distance links envisioned for the NII/SUPERNet band.⁶ Similarly, more traditional wired options are simply too expensive in many locations, even with the discounts promised by the Telecommunications Act of 1996,⁷ and do not provide the mobility and flexibility many users require.⁸ Licensed wireless options offer a fundamentally different set of tradeoffs between cost, reliability, coverage, and features from unlicensed operation.⁹

⁶ See, e.g., Nortel Comments at 4.

⁷ The Telecommunications Act's universal service provisions will shift the cost for at least some connections away from schools, libraries, and hospitals. It will not, however, change the fact that these connections are enormously expensive and must be paid for by somebody. For example, the Joint Comments of Educators provided new data on the costs of creating local area networks within schools, which range from \$20,000 to \$120,000 per school (excluding computers) and translate into potential expenditures of millions of dollars for a single county. Joint Comments of Educators at 3. Jean Armour Polly, a professional librarian, Internet Society Trustee emerita, and co-principal investigator in the landmark study "Project GAIN: Connecting Rural Public Libraries to the Internet," explained that in the Project GAIN study long distance charges for rural libraries averaged \$150-200 per month and increased as users became familiar with the Internet's offerings — an extraordinary burden for a library with an annual total budget of only \$20,000. Comments of Jean Armour Polly at 1-2.. Ms. Polly also highlighted the important distinction between infrastructure costs, for which public institutions can budget, and recurring costs, which cannot be budgeted for because they are usage sensitive. *Id.*

⁸ See, e.g., Nortel Comments at 4;

⁹ See, e.g., Motorola Comments at 1-2.

Several opponents of an adequate initial NII/SUPERNet spectrum allocation mistakenly assume that NII/SUPERNet spectrum could be “rationed out” a bit at a time. An initial, 350 MHz spectrum band is required to assure that sufficient spectrum is available to meet the needs of multiple users at common locations and to provide an environment within which robust development and growth can occur. This is particularly true given the need to share the NII/SUPERNet band with other licensed and unlicensed services and, in the upper band, with ISM emitters. Once devices are deployed, it is generally infeasible, and sometimes impossible, to re-fit them to use new spectrum to avoid overcrowding. In addition, a spectrum rationing approach would stifle the development of new products and services by creating undesired and unnecessary levels of uncertainty.

Finally, several existing and potential users of the 5 GHz band argued that the NII/SUPERNet band should be reduced in size to exclude “their” spectrum from any sharing obligation. These protectionist views should not be credited. The NII/SUPERNet band represents a unique opportunity to add new spectrum uses onto “encumbered” spectrum, thereby enhancing efficient spectrum use and promoting the public interest. Incumbent users cannot be permitted to veto new technologies and new applications for wireless communications when sharing will not interfere with the incumbents’ radio systems.¹⁰ Moreover, while each service group argues that adequate spectrum will be available even if “its” spectrum is excluded from the NII/SUPERNet band, in the aggregate these claims would deny NII/SUPERNet devices access to virtually all of the 5 GHz band.

¹⁰ Many of those using or planning to use the 5 GHz band themselves agree that the NII/SUPERNet concept should be accommodated. *See, e.g.,* Comments of the Federal Highway Administration at 1 (NII/SUPERNet “is a sound concept with many benefits to the public community and commercial sector”); Comments of ITS America at 1 (“ITS America recognizes the exciting potential of NII/SUPERNet and supports making spectrum available for its use”); Comments of AirTouch Communications at 1 (“AirTouch supports the goals of the Commission in allocating spectrum in an effort to promote the emergence of new services, enhanced efficiency, and expanded manufacturing opportunities”). However, they generally take a protectionist, “not in my back yard” view of what spectrum should be used to support NII/SUPERNet operations.

For all of these reasons, the Commission should reject the claims of those who would thwart the development of the NII/SUPERNet band by denying it adequate, suitable spectrum . Generally, these parties are attempting to protect their own operations from competition or from even the most remote possibility of interference. Their doomsday predictions about the need for NII/SUPERNet devices or the suitability of the 5 GHz band for NII/SUPERNet operations understate the true value this band would bring to consumers, manufacturers, and the American economy and should be rejected.

II. THE COMMENTS DEMONSTRATE A COMPELLING NEED FOR LONGER-DISTANCE COMMUNITY NETWORK LINKS.

A. Many Users Require Longer Distance Connections To The NII.

Those speaking on behalf of the intended beneficiaries of the NII/SUPERNet band — schools, libraries, hospitals, government users, and other public interest entities — confirmed in clear terms that community networking *must* be provided for if the promise of the NII/SUPERNet band is to be realized fully.¹¹ In addition, many companies and organizations in the telecommunications and information industries agreed that a community networking function should be provided for within the NII/SUPERNet band.¹² These statements

¹¹ E.g., Connectivity for Learning Coalition Comments at 1-4.; Joint Commenters' Comments at 4-7; Jean Armour Polly Comments *passim*. See also the many comments filed by Internet access providers serving rural areas and public interest entities, as well as those filed by individual users, school and library administrators, and others — which collectively are too numerous to cite — urging the Commission to support longer-distance links. Finally, see the many comments that were filed by public interest organizations and individuals in support of community networking in response to Apple's NII Band Petition for Rulemaking.

¹² E.g., BSA Comments at 2-3 (“In order to overcome the information isolation imposed upon so many, the Commission should take an active role in the enabling of community networks throughout the entire NII/SUPERNet band”); California Wireless Comments at 1 (the Commission should remember the original motivation behind the NII Band proposal to provide community networking, an important use of this band); CEMA Comments at 5 (“The Commission should not deny consumers the added value of NII/SUPERNet units which can transmit at the higher power levels Apple has proposed”; “In rural and semi-rural areas, such higher power NII/SUPERNet devices will be essential”); ITI Comments at 5 (“Interconnection across distances of up to 10 km, via low power wireless transmission, is a critical linkage to the NII for many prospective users, particularly in the education community”); Metricom Comments at 3-4, 7-8 (“If they are to be truly useful and of benefit to the public at large, [NII/SUPERNet] systems must allow for such ‘community-type’ communications on a wireless basis”) (emphasis

made clear that the Commission has, to date, taken an overly cautious and narrow view of community networking and that community networking should be permitted broadly within the NII/SUPERNet band.

For example, the National School Boards Association, the Media Access Project, the National Education Association, the American Association of School Administrators, and People for the American Way argued that “many of the potential benefits of making [the NII/SUPERNet band] available...will be realized *only* if [the band] is available for longer-range operations,” and the Commission’s proposal not to allow such operations “is shortsighted and sharply [will] reduce the public benefits this visionary proposal could provide.”¹³ Similarly, the Connectivity for Learning Coalition — an *ad hoc* group formed expressly to address concerns regarding school and library connections to the NII — stated that the NPRM took “far too narrow a view of education and other public interest applications and, as a result, will not achieve its intended result.”¹⁴

As these parties recognized, while local area networking functions are important, they are only a small part of the picture. Because “the education and library communities extend beyond the outside walls of a school or library building” and “into the homes and workplaces of parents, teachers, students, librarians, administrators, and others,” NII/SUPERNet devices must provide for longer-distance communications if they are truly to serve the education and library communities.¹⁵ If the Commission fails to provide adequately for

in original); Microsoft Comments at 3-4 (the Commission should permit output powers of up to 1 watt to accommodate longer range community network applications in the upper band); Motorola Comments at iii (the Commission should allow for both on-site and community network communications solutions); Mulcay Consulting Comments at 1, 3 (“wireless access devices will have to communicate over distances in excess of 10 km” and the proposed rules — including power limits — must be modified to permit such operation); WINForum Comments at 32-33 (“community networks are a necessary and desirable component of next generation networks” and changes should be made to the proposed rules to support such operation).

¹³ Joint Commenters’ Comments at 4 (emphasis added); see also *id.* at 5 (without moderate-distance operations, the advantages of the NII/SUPERNet band will be “severely limited”) and 9 (moderate-distance links offer the “most potential” to help obtain universal service goals).

¹⁴ Connectivity for Learning Coalition Comments at 1-2.; see also *id.* at 3 (the NPRM’s proposal falls “far short of meeting the needs of the education and library communities”).

¹⁵ Connectivity for Learning Coalition Comments at 2.

community networking “the potential to hook up rural areas, to connect institutions to each other, to create easily accessible information banks in libraries and community computing centers, and for many other creative applications will be lost.”¹⁶

The comments also described some of the potential uses for longer-range unlicensed connections and their particular benefits for those in rural areas, including the following:

- Connecting schools, medical clinics, and community centers to facilitate the transfer of school assignments, health care information, electronic mail, and more;
- Connecting outlying institutions and residences to a community network where wired service is unavailable or prohibitively expensive;
- Connecting outlying schools in a school system to a central computing site providing access to the Internet and other services;
- Creating links between public libraries and schools and other public institutions, thereby expanding access to the libraries’ special databases and information resources;
- Providing families in remote areas who are schooling their children at home with access to a variety of educational resources;
- Enabling teachers developing lesson plans at home to obtain access to on-line resources;
- Providing parents access to school and library bulletin boards, homework hotlines, and information about their children’s performance in school;
- Making it possible to educate a disabled or sick child at home while assuring access to curriculum resources via a wireless link to the school’s computer network;

¹⁶ Joint Commenters’ Comments at 5-6.

- Providing other students working at home with access to homework hotlines and information resources at the school and community libraries; and
- Allowing school administrators to use NII/SUPERNet devices to communicate with their colleagues and schools principals.¹⁷

The Commission should heed the words of those who see most acutely the shortcomings of existing wired and wireless offerings and seize this opportunity to “add a flexible, low-cost, creative tool to the toolbox of options for ensuring that all citizens have quality access to the information resources and services that are becoming essential to American life.”¹⁸

B. Those Who Oppose “Community Networking” Underestimate The Importance Of These Links, Overestimate Their Interference Potential, Or Otherwise Misunderstand The Nature Of These Connections.

1. Currently Permitted Technologies Cannot Adequately Satisfy The Need For Community Networks.

No currently permitted technology can satisfy the need for community networks, and those who allege that they can either ignore the fundamental requirements of this function or overstate the capabilities of other technologies.

First, licensed fixed microwave systems are not a substitute for community networks. These systems, in which each link costs in the range of hundreds of thousands of dollars, are simply too expensive for many of the users and applications that would be served by unlicensed, low cost community networks. Those who do not need or cannot afford the reliability and throughput of licensed, fixed microwave systems should not be denied a more suitable option.

Second, Part 15.247 spread spectrum systems are a similarly imperfect solution for many users. Contrary to the claims of three manufacturers and one

¹⁷ Joint Commenters’ Comments at 5; Connectivity for Learning Coalition Comments at 2-3.

¹⁸ Joint Commenters’ Comments at 6.

group currently experimenting with this technology,¹⁹ spread spectrum is not a “magic bullet” that can solve the needs of every educator, library, health care provider, and other potential community network user across the country.

Spread spectrum modulation schemes allowed by Section 15.247 have attributes that differ from non-spread schemes. Depending upon the local spectrum environment, spread spectrum may be favored over other technologies for a particular communications path or paths. For this reason, Apple has maintained throughout this proceeding that spread spectrum not only must be allowed, but must not be handicapped — either intentionally or unintentionally — throughout the portions of the NII/SUPERNet band open to non-VHR devices.

The fact that spread spectrum technologies are useful in some applications and should continue to be permitted, however, does not mean that manufacturers employing this technology should be able to prohibit other manufacturers electing to use alternative technologies from competing in the market. In fact, the array of challenges facing users is such that there must be a powerful array of solutions, and the market must be able to make the (right) choice.

In particular, spread spectrum systems are limited by the fact that they require additional signal processing and /or overhead. In addition, they can be difficult to implement in certain applications, as the IEEE’s six years of effort to develop standards for spread spectrum LANs indicates. Historically, the popularity of spread spectrum systems has been more a function of their legal right to use up to 1 watt of transmit power rather than of any inherent superiority to other, non-spread technologies.

In addition, with respect to the potential for interference, spread spectrum systems do not offer the only solution — despite the extravagant claims of some spread spectrum proponents. The sometimes invoked shorthand that signal spreading reduces the power density of a signal at any frequency within the

¹⁹ See, Cylink Comments at 3-4; Western Multiplex Comments at 2; Larus Comments at 1; Wireless Field Test Comments at 2.

transmitted bandwidth and, thereby, reduces the probability of causing interference to other signals occupying the same spectrum ignores that identical spread spectrum devices, even those using orthogonal CDMA, are capable of interfering with one another at a distant point of reception unless there are provisions for received-amplitude control.²⁰

There is, therefore, no valid reason for prohibiting non-spread technologies from gaining access to the 5.8 GHz band on the ground that existing Part 15 users, including longer-distance spread spectrum systems, provide a complete solution and are all “hospitable neighbors,” while new non-spread spectrum users are unneeded and would introduce the potential for interference and “pollute” the band.

2. Community Networks Will Not Cause Objectionable Interference To Other 5 GHz Services Or To Other NII/SUPERNet Devices.

Several entities using or proposing to use the 5 GHz band oppose community networks on the ground that these links will inevitably cause fatal interference to their service. These claims are groundless.²¹

With respect to the MSS service, Apple has proposed to permit only very high rate, indoor systems to operate in the spectrum shared with this service.²² Accordingly, MSS proponents have no basis for objecting to community networking generally, or to outdoor or 0.316 watt transmissions specifically, since these applications will not be permitted in any spectrum shared with MSS uplinks.²³

²⁰ The Commission recognized the interference potential of spread spectrum systems when it proposed not to permit spread spectrum systems operating in the 2.4 GHz ISM band to use unlimited antenna directionality due to the presence of a large number of other unlicensed users in this band. See Amendment of Parts 2 and 15 of the Commission’s Rules Regarding Spread Spectrum Transmitters, Notice of Proposed Rule Making, ET Docket No. 96-8 , 11 FCC Rcd 3068 (released Feb. 5, 1996).

²¹ Notably, many potential co-users of the 5 GHz band — including the FAA, Constellation Communications, manufacturers of ISM devices, the aeronautical radionavigation community, [OTHERS?]- did not file comments objecting to creation of the NII/SUPERNet band or to community networks.

²² See Section III(A)(5), *infra*.

²³ Some MSS comments opposed outdoor or 1 watt community network links throughout the 5150-5350 MHz band or even throughout the 5 GHz band. See

With respect to others users of the 5 GHz band, including both existing Part 15 users and amateur service operators as well as local area NII/SUPERNet systems, the comments confirmed that enabling community networking will not increase the risk of interference. Most importantly, directional antennas limit potential interference to a relatively narrow "lane," reducing the probability that multiple devices will compete for spectrum in overlapping areas.²⁴ For this reason, the Commission's assumption that the creation of community networks through the use of directional antennas poses additional interference threats is incorrect. In addition, each of the licensed and unlicensed systems sharing spectrum with community networks would operate at power levels at least as high as those permitted for longer-distance NII/SUPERNet links and, in the case of the amateur service, at substantially higher power levels.

3. The Limitations Of Community Networks Do Not Undermine Their Substantial Value.

A small number of commenting parties suggested that community networks will not be useful in all situations and, therefore, should not be permitted.²⁵

To a significant extent, the factual premises underlying the conclusions stated in these comments are incorrect. For example, contrary to the Benton Foundation's statement, Apple never has proposed that community network links be limited to a general power limit of 0.1 watt.²⁶ Apple agrees that this power level would be impracticable for longer-distance links and, therefore, originally proposed a power of 1 watt and, in its comments in this proceeding, acquiesced in a transmitter power of 0.316 watts for fixed devices and 0.1 watt for personal/portable equipment.

Comments of Comsat Corporation and ICO Global Communications at 1, 5. These parties, however, did not explain how community network links above 5250 MHz could adversely affect their operations. Accordingly, their opposition with respect to the 5250 - 5350 MHz band should be ignored.

²⁴ E.g., Nortel Comments at 9; Motorola Comments at 9.

²⁵ Benton Foundation Comments at 3-7; see also Wireless Field Test Comments.

Notably, the Benton Foundation attacks the Commission's proposal for LANs as well as Apple's proposed community networks, arguing in both cases that the functions that have been described cannot be achieved in light of the proposed technical characteristics for the band.

²⁶ See Benton Foundation Comments at 6.

Moreover, to the extent that these comments identify certain limitations on community networking, they place an unreasonable burden on the community networking function by arguing, in essence, that if it is not a complete solution it is no solution at all. Apple never has argued that community networks will provide a "100% solution" to the communications needs of every element of our society — in many cases, wired, licensed wireless, or other types of unlicensed networks will be preferable and will continue to be used. For some users, however, these options are unavailable, prohibitively expensive, or otherwise unworkable, and it is these users whose needs will be met only if community networking is permitted in the NII/SUPERNet band.²⁷

4. Longer-Reach Community Networks Will Not Bring About A "Tragedy Of The Commons" Or Threaten Regulatory Parity.

A small number of commenting parties opposed community networks on the ground that they would lead to a "tragedy of the commons." Others, not fully comprehending the limits of unlicensed operation, opposed this solution based upon the mistaken premise that it would devalue their costly spectrum property rights or give community network operators an unfair "leg up" over common carriers operating in licensed bands. Each of these claims is mistaken.

The Commission raised the notion of a "tragedy of the commons" in the NPRM and some commenting parties seized upon concerns about spectrum inefficiency to justify their support for the licensing of longer paths and, potentially, the auctioning of mutually-exclusive licenses.²⁸

As Apple demonstrated in its comments, however, the basic premise of a potential tragedy of the commons is flawed. Apple will not repeat those comments here, other than to note the substantial agreement in the comments that the use of directional antennas to create longer distance links does not

²⁷ See Joint Commenters' Comments at 6-7 (while wireless community networking will not be the ultimate solution to all the challenges of universal access to telecommunications networks, it will provide a cheaper and easier alternative in numerous situations and will be the only feasible solution in some difficult circumstances).

²⁸ NPRM at ¶ 56; see, e.g., Pacific Telesis Comments at 3-4; AT&T Comments at 5.

increase a system's interference potential and, therefore, does not increase the potential for inefficient spectrum usage.²⁹

Apple believes the assumption that users employing shorter distance connections voluntarily will cooperate to coordinate their use, while users employing longer distance connections will lack either the means or the incentive to engage in such efforts, is simply incorrect. As described in previous Apple filings in this proceeding, technical and administrative "channel assessment" methods can be used to create the means for informal longer distance coordination, without replicating the costs and burdens associated with formal frequency coordination and site licensing.³⁰ Once the information hurdle is

²⁹ E.g., Nortel Comments at 9; Microsoft Comments at 5-6; Motorola Comments at 9.

³⁰ Specifically, Apple has proposed that manufacturers be required to give a unique identifier to each NII/SUPERNet device. In addition, a user-accessible data base of local practice, perhaps maintained at the national level, could be established that would offer at least a gross view of usage and, in some communities, definitive records. The data bases would be maintained on a voluntary basis; while users would not be required to submit information to the database, Apple believes they would do so given their motivation to establish and preserve a reduced interference condition. The database would contain information including: location and orientation of fixed community network point-to-point links (which might be established by GPS or map references); bandwidths; likely times and duration of operation; imbedded device IDs and an indication of how the manufacturer has provided for other devices to receive those IDs "in the clear" or "decoding" them; a designated "responsible party" for, at least, the initial purchase or installation, and a notation of what channel assessment process, in general terms, would be used. Contributions to the data base would occur initially at the point of sale, including for mail-order sales, and subsequent updates could be provided when a user alters its system configuration or type of use. Retail and specialty suppliers could offer registration assistance to purchasers: these entities would not themselves require or collect the necessary information but, rather, would provide assistance to purchasers who would then use mail-in (including E-mail) forms provided by equipment makers. Users would not be submit proprietary information but would submit basic usage and ID information, such as currently are collected with respect to many radio services. Registration would not convey rights similar to those conveyed in the fixed microwave licensing process. For example, early registering parties would not have preferential rights to use the shared spectrum, nor would users be limited to operation during the times stated in their registration.

Apple is willing to help support establishing and, to some extent maintaining, national-level data base (hardware) resources if a competent entity without commercial affiliation, participation, or motivation assumes the primary role in this process. There are a number of appropriate public interest groups supporting development of the NII/SUPERNet band who could be looked to to perform such a role. Alternatively, governmental and quasi-governmental users could step forward to take a lead in their individual communities.

overcome, Apple believes the incentive to engage in cooperative efforts is identical whether the interfering signal is coming from one floor or several blocks away.

The Commission should not adopt draconian solutions such a licensing to address the possibility that, in some locations at some moments in time, users' demand will exceed the capacity of the NII/SUPERNet band. As a group of public interest organizations stated:

[The Commission should] risk tolerating some uncertainty and potential for conflicts if necessary to allow the wireless community networking concept to go forward. It seems counterproductive for the FCC not to allow moderate-distance operations for public use on the grounds that they might be too popular.... [W]e believe the potential benefits promised by moderate-distance operations outweigh the risk of problems from interference, and that the wireless community networking concept should go forward and be given a chance to prove itself even if it appears to have limitations."³¹

Given the demonstrated need for community networks among educational and community non-profit groups, rather than outlaw community networks the Commission should accept the suggestion that Apple made in a paper entitled "Implementing the NII Band: Suggested Technical Rules," which was filed in late March 1995 for inclusion in the record of this proceeding. While Apple does not believe such a step is necessary, if the Commission wishes to test the risks of the "tragedy of the commons" among community networks, a possible approach would be to permit antennas with a gain greater than is currently permitted under Section 15.247 to be made available only to certain "designated eligibles," such as libraries, educational entities, local or regional government agencies, health care providers, and other charitable and non-profit groups, or non-profit agents selected by the eligibles, who would be responsible for proper operation and for "best-effort" coordination and registration.

The above approach would avoid the costs and delays of a more formal, mandatory coordination and licensing process and would promote efficient spectrum use by making it possible for a variety of relatively low volume or sporadic users — many of whom's use may not fall into predictable patterns — to share available spectrum.

³¹ Joint Commenters' Comments at 6-7.

“Designated eligible” status could be granted through a “postcard” application process. In this way, the people who need community networks the most would not be deprived of the opportunity to use them because of fears that commercial entities would occupy the NII Band and create chaotic conditions that would prevent anybody from communicating on these frequencies.³² In addition, a user group would be created that would largely homogeneous and would be particularly likely to engage in informal, cooperative efforts — not unlike the amateur radio community, who’s processes are reflected in the interference resolution provisions of Section 97.205 of the Commission’s rules.³³ Such a restriction on eligibility also would calm the fears of AT&T and other telephone companies that community networks will be used to compete unfairly with their for-profit, common carrier operations.

Even if the Commission does not restrict use of community networks to non-profit entities, however, use of such networks would not create problems of regulatory parity for common carriers and other profit-making service providers. Those electing to use unlicensed bands accept the fact that they will not control their spectrum environment, will be limited to very low power levels, and will not have a monopoly or near-monopoly in providing a service in a given geographic region; in exchange, they will be freed from the costs and burdens associated with licensing.

All potential service providers will have an equal opportunity to make this tradeoff between licensed and unlicensed spectrum. For many, particularly those whose service requires a guaranteed quality-of-service, reliable access to a large amount of spectrum, and/or power levels that are sufficient to support wide area mobile operations — *i.e.*, for potential PCS providers, wireless cable systems, and others who have recently purchased spectrum at auction — unlicensed spectrum does not provide a viable option and service providers will

³² Cf. Joint Commenters’ Comments at 7-8 (in dedicating the public spectrum, the Commission should give priority to non-profit and public interest uses).

³³ See FHWA Comments at 2-3 (“We feel that if local and regional government agencies are the only organizations allowed to be ‘designated eligibles,’ that they can effectively oversee installation of ... NII/SUPERNet community networks”).

continue to choose to operate within a licensed band. Others, however, should retain the freedom to choose an unlicensed alternative.³⁴

Today, a number of entities are providing services using unlicensed spectrum. These services range from carrier-type transmission systems to private systems, such as utility meter reading systems. In this sense, there is nothing novel about the NII/SUPERNet proposal that requires licensing of community networks, a prohibition on such networks, or a different regulatory treatment for these networks.³⁵ As Apple stated in its comments, if service rules are to be imposed upon operators using the unlicensed bands and “regulatory parity” between these service rules and those that apply to operators using licensed spectrum is required, this question should be addressed comprehensively with respect to all unlicensed services, rather than singling out community networks for unique regulatory burdens.

C. Licensing And Auctions Would Destroy The Value Of Community Networking.

The comments confirm that any effort by the Commission to license — and, in particular, to auction — rights to create longer-distance community network links will destroy much or all of the potential benefits these connections could offer. Licensed links are “not an adequate substitute” for true community networking functions: “once under the control of a licensed provider, the spectrum likely will lose many of its advantages in terms of cost, flexibility, and the opportunity for creative and innovative applications.”³⁶

³⁴ See, e.g., Motorola Comments at 1-2 (discussing the inherent differences between licensed and unlicensed operation and the benefits provided by the Commission’s use of a variety of “regulatory ground rules”); Metricom Comments at 16-17 (“licensing implies a property right which runs contrary to one of the primary benefits of unlicensed spectrum — efficient spectrum use through sharing”); Cylink Comments at 9-10; ITI Comments at 5.

³⁵ See Metricom Comments at 16 (noting the similarities between community networking and existing unlicensed operations and questioning “why the Commission has even raised this issue [of licensing]” Community Networks).

³⁶ Joint Commenters’ Comments at 7; see also ITI Comments at 5 (“If the spectrum were licensed, its use could be restricted or subjected to fees or centralized administration that could reduce innovation or increase the cost and effort to use wireless data transmission. Consequently, unlicensed operations solve a variety of communications needs that may not be met if free and open access to spectrum were not available.”); BSA Comments at 3 (the Commission should reject any proposal to force longer distance unlicensed links

Licensing is not required to prevent interference and avoid a “tragedy of the commons” or to achieve regulatory parity. As noted above, however, the Commission may wish to consider a form of licensing by restricting the use of community networks to designated eligibles simply to calm fears of the unknown regarding community networks and to permit their use by those entities who desire and need community networks the most. Such “licensing,” however, must not carry with it a requirement for auctions. Once restricted to non-profit use, auctions would be unnecessary as well as inappropriate.

D. Community Networks Should Not Be Relegated To The Upper 5 GHz Band.

While the Commission proposed to allow community networking, if at all, only in the upper portion of the 5 GHz band, Apple’s comments illustrated that a more workable solution — from the perspective of both NII/SUPERNet users and other users of the 5 GHz band — can be achieved by permitting longer-distance links to operate across the entire NII/SUPERNet band, with the exception of dedicated VHR sub-bands.³⁷ Apple’s proposed band plan will promote opportunities for sharing, both within the NII/SUPERNet service and between this service and other spectrum users, and will assure that very high rate NII/SUPERNet operations will have access to a large, dedicated band of 5 GHz spectrum.

At the same time, Apple’s proposed band plan will preserve access to the lower 5 GHz band for some devices that do not meet the rigorous and, for some applications, unreachable minimum criteria associated with VHR systems, will not arbitrarily limit minimum bandwidths, and will not preclude manufacturers and users from making appropriate tradeoffs between power, bandwidth, and

into a “rigid, costly, and cumbersome licensing system”); CEMA Comments at 5,6 (supporting community networks but opposing any licensing and, in particular, auctioning of the NII/SUPERNet spectrum and noting that “[t]he Commission would frustrate the community networking goals of NII/SUPERNet devices if it were to impose a licensing obligation on these devices, particularly if that obligation were coupled with spectrum auctions”); Metricom Comments at 16-17 ((licensing “would dramatically reduce the number of users in the band, thus reducing the public benefit,” “defeat the purpose of unlicensed community networks,” and “deny educators the type of networks they need, at prices they can afford); Microsoft Comments at 7 (opposing licensing); WINForum Comments at 32-33 (discussing myriad problems associated with licensing).

³⁷ See Section III(A)(5), *infra*.

distance in order to meet the needs of different user groups. As a result, Apple's proposed band plan will serve the needs of those who may desire to locate narrower-bandwidth or longer-range systems in the 5 GHz band because, for example, these operations will be integrated with 5 GHz VHR devices or because other unlicensed spectrum, including the 2 GHz unlicensed PCS band, cannot support the combination of bandwidth and distance they require.³⁸

The parties opposing community networking in the lower band largely echoed the Commission's mistaken premises and, of necessity, did not take into account Apple's proposed band plan.³⁹ Their comments should be rejected in favor of Apple's band plan for the reasons set forth herein and in Apple comments.

III. THE COMMENTS CLARIFY THE APPROPRIATE SCOPE OF FCC TECHNICAL RULES AND THE BEST MEANS FOR INDUSTRY DEVELOPMENT OF SHARING RULES.

A. The Commission Should Adopt Only Minimal Technical Standards.

1. Generally.

The comments reflected broad support for the Commission's proposal to adopt only minimal technical regulations for the NII/SUPERNet band. This support came from manufacturers and from potential users, who recognize the value of not establishing technical standards that will constrain unnecessarily the range of devices available to them.

2. Power Levels.

The comments also confirmed Apple's prior statements that higher power levels than the 0.1 watt proposed in the NPRM are required not only for longer distance community network links, but also for shorter range applications. As

³⁸ The Data-PCS band is well suited for intermediate-bandwidth applications but cannot accommodate longer distance links. Unlicensed spread spectrum systems may, in some cases, be able to satisfy users' needs for longer distance links (if the current limitation on the use of directional antennas is repealed, as the Commission has proposed) but suffer from other constraints that will prevent them from being used in many community networking applications, as discussed in these reply comments.

³⁹ E.g., Nortel Comments at 9.