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

FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF SECRETARY

In the Matter of )

)  
Amendment of the Commission 's Rules to )  
Provide for Unlicensed NII/SUPERNet )  
Operations in the 5 GHz Frequency Range )

) ET Docket No. 96-102  
) RM-8648  
) RM-8653  
)

**COMMENTS OF THE WIRELESS INFORMATION NETWORKS FORUM**

WIRELESS INFORMATION  
NETWORKS FORUM

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Dated: July 15, 1996

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## SUMMARY

The Wireless Information Networks Forum ("WINForum") strongly supports the Commission's proposal to allocate 5 GHz spectrum for new NII/SUPERNet devices operating on an unlicensed basis. Due to demands for ever increasing data rates, the proposed allocation is critical to satisfy the wireless needs of educational, medical, business, and consumer users in the United States. WINForum accordingly urges the Commission to finalize the proposed allocations expeditiously and thereby realize the substantial promise of unlicensed technologies.

As discussed in WINForum's comments, WINForum has recently formed a subcommittee to undertake development of draft sharing rules for the 5 GHz band. This subcommittee will hold its first meeting on July 30, 1996, and hopes to have an initial set of draft rules by the end of the year. Due to the interrelationship at 5 GHz between power, bandwidth, antenna directionality and the ability of devices to share spectrum on a non-interfering basis, WINForum believes that the Commission should retain the flexibility to consider alterations to the technical rules if the sharing subcommittee later determines that such modifications would facilitate communications without increasing the potential for interference to other spectrum users.

WINForum also recommends a few additional, minor alterations to the proposed rules. These proposed changes would not impact the ability of NII/SUPERNet devices to co-exist with other spectrum users in the proposed bands and would provide additional technical flexibility to implement high quality, high speed unlicensed systems. Specifically, WINForum

recommends:

- ▶ Adopting a transmitter output power limit for the 5.15-5.35 GHz band on the order of 100 milliWatts and permitting the use of directional antennas with up to 6 dB of gain;
- ▶ Adopting power spectral density and antenna directionality limits for the 5.725-5.875 GHz band that will provide technical parity with changes to the Part 15 spread spectrum rules adopted in ET Docket 96-8;
- ▶ Defining measurement criteria for power, consistent with recommended changes to the unlicensed PCS rules, that control the potential for interference without compromising the ability of manufacturers to utilize novel and innovative modulation techniques;
- ▶ Developing channelization rules with *minimum* -- not *maximum* -- channel spacings on the order of 20 MHz and permitting channel combining to facilitate efficient use of the radio spectrum; and,
- ▶ Specifying out-of-band emissions rules that: (1) specify the limit in terms of an absolute value independent of the power of the fundamental emission; (2) specify the power as the burst average power with a 100 kHz measurement bandwidth; and (3) set a power limit of -33 dBm/100 kHz.

WINForum also believes that interim deployment, while beneficial, may constrain the use of subsequently-developed sharing rules that allow more efficient use of the spectrum. Under the circumstances, WINForum suggests limiting interim deployment to a 50 MHz subset of the 5.8 GHz band and specifying a date certain for such devices to come into compliance with the later-adopted sharing rules. WINForum also suggests deleting the "listen-before-talk" protocol for interim devices, since those regulations were optimized for use in a band with a vastly different interference environment.

WINForum also supports community networks as a desirable and necessary component of next generation unlicensed products. With the changes recommended by

WINForum, however, deployment of these systems should be technically feasible in the 5.8 GHz band. WINForum also objects strongly to the use of any competitive bidding mechanisms for unlicensed allocations as a policy and a practical matter. This objection extends to any attempt to "license" community network systems at 5.8 GHz.

With these modifications, WINForum believes the NII/SUPERNet allocation will realize immense benefits for the citizens of the United States. NII/SUPERNet devices promise educational, medical, business, and consumer users advanced communications capabilities in a simple, low-cost, and easy to use form. WINForum thus urges the Commission to rapidly finalize the allocations proposed in the *Notice* and expedite the availability of NII/SUPERNet devices.

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**COMMENTS OF THE WIRELESS INFORMATION NETWORKS FORUM**

Wireless Information Networks Forum ("WINForum"), by its attorneys, herewith submits its initial comments in response to the above-captioned Notice of Proposed Rulemaking.<sup>1</sup> As the original proponent of a broadband allocation for unlicensed devices,<sup>2</sup> WINForum strongly supports the Commission's proposal to allow the operation of NII/SUPERNet devices in 350 MHz of the 5 GHz band. These devices will bring advanced communications within the reach of educational, medical, business, and other users without causing harmful interference to existing or proposed uses of the 5 GHz band. Accordingly, with the modifications to the technical rules suggested herein, WINForum urges the Commission to adopt the *Notice* proposals and rapidly finalize the 5 GHz NII/SUPERNet allocation.

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<sup>1</sup>Amendment of the Commission 's Rules to Provide for Unlicensed NII/SUPERNet Operations in the 5 GHz Frequency Range, ET Docket No. 96-102 (May 6, 1996) ("*Notice*").

<sup>2</sup>Wireless Information Networks Petition for Rulemaking To Allocate the 5.1 - 5.35 GHz Band and To Adopt Service Rules for a Shared Unlicensed Personal Radio Network, RM-8648 (filed May 15, 1995) ["SUPERNet Petition"].

## **I. INTRODUCTION**

WINForum is a joint computer and communication industry technical forum to promote wireless information networking. WINForum's members span a diverse range of sizes and interests within these industries, all united by a common belief in the vast benefits of unlicensed radio technologies. Throughout its existence, WINForum has strived to bring these benefits to the American public through joint FCC action, technical interaction, and standards development.

Prior to 1995, WINForum's main focus was the development of unlicensed, "User PCS" devices operating in the 2 GHz bands. In addition to supporting the allocation before the FCC, the WINTech subcommittee of WINForum was also the principal developer of the spectrum etiquette that allows the unlicensed PCS spectrum to be shared efficiently among a broad range of users and devices with differing requirements. This etiquette was adopted by the FCC into Subpart D of Part 15 of the Commission's rules. WINForum also instigated the formation of UTAM, Inc., a collective industry non-profit body formally chartered by the FCC to relocate existing microwave users out of the Unlicensed PCS bands. WINTest, a subcommittee of WINForum, has also worked extensively in conjunction with Subcommittee 7 of the American National Standards Institute Committee C63 to develop a test standard to ensure that devices designed for the 2 GHz band comply with Subpart D of the Commission's rules.

In early 1995, WINForum turned its attention to next generation wireless networks capable of supporting the bandwidth demands of emerging multimedia computer applications.

This effort culminated with WINForum's May 15, 1995 petition for rulemaking for SUPERNet, a high speed unlicensed allocation in the 5 GHz band. This petition was rapidly followed by a similar, but wholly independent, petition by Apple Computer, Inc., filed on May 23, 1995.<sup>3</sup> These petitions both agreed on the fundamentals of a 5 GHz unlicensed allocation, and, accordingly, on February 29, 1996, WINForum and Apple collectively filed a letter with the FCC harmonizing the petitions and jointly lobbied the FCC to move forward "expeditiously to issue a Notice of Proposed Rulemaking for 5 GHz unlicensed systems."<sup>4</sup>

Now, less than one year after the filing of WINForum's original petition, the FCC has proposed to make the 5 GHz unlicensed device allocation a reality. WINForum strongly supports the FCC's action and commends the FCC for proceeding with such speed to propose regulations for the NII/SUPERNet device allocation. WINForum now urges to FCC to expedite the availability of advanced wireless networking capabilities to the American public by rapidly finalizing the *Notice* proposals.

In this regard, to assure the similarly rapid development of the sharing rules for devices operating in the 5 GHz band, WINForum has now committed to drafting proposed sharing rules. Throughout the proceeding leading up to this *Notice*, WINForum and Apple have both advocated industry consensus technical rules for the 5 GHz allocation. Now that a formal

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<sup>3</sup>Apple Computer, Inc. Petition for Rulemaking To Allocate Spectrum in the 5 GHz Band To Establish a Wireless Component of the National Information Infrastructure, RM-8648 (filed May 24, 1995) ("Apple Petition").

<sup>4</sup>Letter to Mr. William S. Caton, Acting Secretary, Federal Communications Commission, from James M. Burger, Senior Director of Government Affairs, Apple Computer, Inc., and R. Michael Senkowski, Counsel, WINForum dated February 29, 1996 (filed as an *ex parte* in RM-8648 and RM-8653).

rulemaking has commenced, WINForum announced the formation of a new subcommittee, the 5 GHz Sharing Rules Drafting committee, to develop proposed rules governing access to and use of the spectrum resources devoted to NII/SUPERNet devices. As discussed in its June 13, 1996 letter to the Commission, WINForum has charged the subcommittee with drafting "practical, equitable, technically justifiable, and cost-effective" sharing rules and has actively solicited the participation of any interested entities in achieving this goal. WINForum hopes to present the Commission with its draft proposal for comprehensive technical sharing rules by the end of this year.

**II. AS WINFORUM AND OTHERS HAVE DOCUMENTED, THERE ARE VAST POTENTIAL BENEFITS TO THE AMERICAN PUBLIC FROM THE ALLOCATION OF SPECTRUM FOR NEXT GENERATION UNLICENSED DEVICES**

Unlicensed systems are among the most valuable, most exciting, and most widely needed technologies today. Using existing bands, manufacturers have developed a range of products that make efficient, cost-effective use of the radio spectrum for millions of users on a shared basis. Unfortunately, no current unlicensed allocations are capable of supporting the demands imposed by new and emerging multimedia applications. As discussed below, the ability to access new multimedia functionalities on a wireless basis, however, is critical to the development of the nation's communications infrastructure and will provide substantial benefits to educational, medical, business, industrial, and consumer users.

**A. Today's Unlicensed Devices Are Critical to the National Information Infrastructure and Provide Many Capabilities That Are Unserved By Any Licensed Service**

Unlicensed systems already span a broad spectrum of products, ranging from simple devices designed to address niche applications for specific users to handheld devices that harness the power of the National Information Infrastructure in simple, powerful packages. These existing products include advanced, interference-free extended range cordless telephones; wireless data collection and point-of-sale devices; untethered Personal Digital Assistants; and, complex campus-area and in-office PBX systems and wireless computer networks. What these devices share in common are:

- They are designed largely to address the everyday communications needs of American businesses, industries, and consumers by providing high levels of functionality in an extremely cost-effective manner, without airtime fees.
- They are designed to allow immediate, rapid deployment without the need for time-consuming licensing procedures; the construction of complex, carrier-provided infrastructures; the deployment of expensive internal wiring and rewiring; or massive start-up investments.
- They can be deployed anywhere, whether in the home, in an office building, on a factory floor, in a school, and in rural and urban areas alike.
- They are highly efficient, sharing the radio spectrum as a common good and operating in a manner that minimizes potential interference and allows all devices equal access to the spectrum.
- They are provided by a host of manufacturers developing competing products with innovative new functionalities.

Thus, even today, these devices are reshaping the way that American businesses and consumers communicate by offering unparalleled flexibility and functionality at low cost.

For a number of reasons, however, spectrum and other constraints have prevented today's unlicensed technologies from reaching their full potential. Existing unlicensed bands, for example, are heavily utilized and no broadband spectrum is available. These allocations are also often layered under other classes of uses and users, operating at the bottom rung of the Commission's spectrum allocation ladder without any interference protection. Even with these disadvantages, however, they have emerged as a necessary component of the National Information Infrastructure. Now, due to the continuing demand for increasingly high data rates, the existing allocations cannot support the next generation of unlicensed products. The *Notice* proposals are thus critical to achieve the full promise of unlicensed technologies.

**B. Emerging Multimedia Trends in Computing Are Driving Requirements for Higher Capacity Networks**

As valuable as today's unlicensed products are, these systems are only the tip of the iceberg. As the Commission recognizes, "recent developments in a number of different digital technologies have greatly increased the need for business, industry, and consumers to transfer large amounts of data from one network or system to another."<sup>5</sup> Whereas once computers were generally only exchanging textual information, "as we entered the digital age, information migrated to the multimedia realm, incorporating text, images, digital audio and

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<sup>5</sup>*Notice* at ¶31 (noting "the digitization and compression of large amounts of voice, video, imaging, and data information, which can be transmitted as 'data packets' from one place to another"; "faster central processing units and substantially increased memory capabilities, which have further increased the demand for devices that can more quickly transfer larger amounts of data"; the capability of digital equipment to "switch[] and direct[] large amounts of information within networks"; and the "substantial growth in the use, size, and complexity of digital networks").

digital video."<sup>6</sup> Even with data compression schemes, "the bandwidth requirements for computer data networking have increased by orders of magnitude, [and] [s]pectrum allocations designed for wireless data must reflect these bandwidth realities."<sup>7</sup> Multimedia technologies are upon us now, yet there is no current wireless infrastructure capable of supporting the intense bandwidth demands posed by these advanced information systems.

It is also apparent that tetherless access is a critical component of the National Information Infrastructure.<sup>8</sup> As ITIC observes, recent trends in communications have shown that "individuals increasingly will choose the flexibility and freedom associated with wireless communications to meet an ever-expanding range of communications needs."<sup>9</sup> The unlicensed allocation proposed in the *Notice* is designed specifically to satisfy the demand of providing sufficient bandwidth for wireless access to multimedia applications, as well as enabling "new creations made possible by technological developments."<sup>10</sup> At this time, existing wireless systems are simply not capable of providing the over 20 megabit/second ("mbps") data rates necessary to support multimedia applications. Moreover, unlicensed devices are uniquely positioned to offer a price/performance capability level that cannot be matched by licensees

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<sup>6</sup>Microsoft Corp. Comments, RM-8648, RM-8653 (filed July 10, 1995) at 2.

<sup>7</sup>*Id.*

<sup>8</sup>Apple Computer, Inc. Comments, RM-8648, RM-8653 (filed July 10, 1995) at 3 ("Apple Comments"); Information Technologies Industry Coalition Comments, RM-8648, RM-8653 (filed July 10, 1995) at 3 ("ITIC Comments").

<sup>9</sup>ITIC Comments at 3

<sup>10</sup>ITIC Comments at 3.

that, by necessity, must recover the costs of a substantial fixed infrastructure.<sup>11</sup> Finally, unlicensed technologies can ameliorate the current inequities in information availability by providing low-cost premises networking capabilities for users that cannot be served by alternative means.<sup>12</sup>

The recent growth in unlicensed technologies is a testament to the unique market served by the devices. "[W]hat may once have seemed little more than a niche service" now "is comprised of millions of devices, hundreds of applications, scores of different technologies, and countless hundreds of millions of dollars of investment."<sup>13</sup> Indeed, the benefits of unlicensed technologies has been noted both by the FCC,<sup>14</sup> and NTIA, which stated "the critical importance of [unlicensed] wireless systems . . . to the future development of the [NII] is well recognized and supported."<sup>15</sup> As the Part 15 Coalition correctly observes, "[o]nly if dedicated spectrum is available for unlicensed use will wireless technologies be able to provide

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<sup>11</sup>ITIC Comments at 3 n.3 (discussing the success of cordless phones -- an unlicensed technology -- at meeting demands currently not served by licensed wireless system).

<sup>12</sup>ITIC Comments at 3; Part 15 Coalition Comments, RM-8648, RM-8653 (filed July 10, 1995) at 3-4 ("Part 15 Coalition Comments").

<sup>13</sup>Part 15 Coalition Comments at 3.

<sup>14</sup>The FCC noted, for example, that "some service that would be provided in unlicensed bands may not be optimally provided in licensed bands because they have the characteristics of a public good." See 9 FCC Rcd at 7078.

<sup>15</sup>Letter to Reed E. Hundt, Chairman, Federal Communications Commission, from Larry Irving, Assistant Secretary, U.S. Department of Commerce, ET Docket No. 94-32, ET Docket No. 94-124, PR Docket No. 93-61 (Dec. 12, 1994) at 1 (cited in Apple Petition at 11).

the kind of broadband, high speed, highly reliable communications services necessary for the development of the NII."<sup>16</sup>

**C. Next Generation Unlicensed NII/SUPERNet Products Are Necessary To Serve Many Unmet Educational, Medical, Business, and Industrial Needs**

As the Commission recognizes in the *Notice*, NII/SUPERNet devices can "offer new opportunities for providing advanced telecommunications services to educational institutions, health care providers, libraries, businesses, and other users."<sup>17</sup> WINForum, Apple, and a host of other commenters have provided a litany of benefits and new uses for such an allocation.<sup>18</sup>

The comments demonstrate that an unlicensed allocation in the 5 GHz band would benefit educational, medical, library, business, and industrial users uniformly:

- *The Proposed Allocation Will Provide Substantial Benefits for Medical Users.* Broadband wireless networking holds significant potential to improve the quality, and reduce the costs, of medical care in the United States by providing physicians with usable tools that offer clinical data at the point of care, improve reimbursement through better data collection, and eliminate or refine expensive and time consuming manual processes. For example, the efficiency of medical staff could be improved by giving them "on the spot, real time access to patient data, including x-ray and MRI images, video recordings, medical charts, and other records" and by enabling "group diagnosis[,] resulting in better and more efficient diagnosis of complex cases without the need for the relevant experts to

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<sup>16</sup>Part 15 Coalition Comments at 2.

<sup>17</sup>*Notice* at ¶2.

<sup>18</sup>*See, e.g.*, United States Department of Veterans Affairs Comment, RM-8648, RM-8653 (filed July 10, 1995) (describing numerous applications for persons with disabilities, including street signs and ATMs that "talk" to personal devices for the community with disabilities).

physically get together."<sup>19</sup> Microsoft also noted that wireless networks "will permit physicians to review digitally-transmitted X-rays, computer aided-tomography, full-motion ultra-sound imaging studies, and magnetic [resonance] imaging diagnostics while at the patient's bedside."<sup>20</sup> Due to the transitory nature of patients while in a hospital and the continual reshuffling of patients through various departments, wireless connectivity may again be the only sufficiently flexible solution for giving physicians, medical staff, and patients access to needed multimedia applications.

- *NII/SUPERNet systems have a tremendous potential to provide access to electronic resources for students. As the Commission noted in the Notice, NII/SUPERNet devices can "encourag[e] the provision of 'advanced telecommunications capabilities to all Americans[,] including, in particular, elementary and secondary schools and classrooms[,] as set forth in the Telecommunications Act of 1996."*<sup>21</sup> Indeed, many educational institutions in the United States are, unfortunately, characterized by an outdated physical plant in conjunction with a lack of financial resources. Since "[t]he cost of physically wiring a network tap to every child's desktop is phenomenal," a wireless broadband network is potentially the only means of multimedia data dissemination within a classroom and perhaps the only economically feasible means of providing students with at-the-desk access to not only the school library, but also "a multimedia array of services [available on] the Internet."<sup>22</sup> The importance of the last link to the student cannot be understated. Even though "thirty to fifty percent of America's *schools* have access to the Internet, . . . only two to five percent of America's *classrooms* have such access."<sup>23</sup> Notably, providing cost-effective access to the Internet for educational institutions also has the beneficial effect of equalizing the resources available to students whether they attend elite, well-funded private schools or one-room schoolhouses in rural America.<sup>24</sup>

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<sup>19</sup>Microsoft Comments at 3.

<sup>20</sup>*Id.*

<sup>21</sup>*Notice* at ¶2 (citations omitted).

<sup>22</sup>*Id.*

<sup>23</sup>Apple Comments at 11 (emphasis in original).

<sup>24</sup>*See, e.g.,* National Educational Telecommunications Organization/Educational Satellite Institute Comments, RM-8648 (filed July 10, 1995) at 1; Triangle Coalition for Science and Technology Education Comments, RM-8648 (filed July 10, 1995) at 1.

- ***The Proposed Allocation Will Have Substantial Benefits for Libraries, with Commensurate Benefits for All Information Users.*** Wireless networks have the potential to significantly improve the delivery of services by, and the functioning of, libraries.<sup>25</sup> A recent Business Week article, for example, described libraries' efforts to "digitiz[e] collections for delivery to local, national, and even global audiences; provid[e] public terminals that enable individuals to connect to the Internet; creat[e] on-line collections of hundreds of thousands of pieces of sheet music; and creat[e] electronic card catalogs that index both the library's own materials and material on the Internet."<sup>26</sup> However, library funding is being "slashed"<sup>27</sup> and low cost wireless systems may be the only answer if libraries are to "thrive as key resources on the Internet and as public on-ramps to the Information Superhighway."<sup>28</sup>
- ***The Proposed Allocation Will Provide Substantial Benefits for Business and Industrial Users.*** Broadband networks will "create jobs, foster economic growth, and improve access to communications by industry and the American public."<sup>29</sup> In order to compete successfully domestically and in global markets, business and industry must be flexible, responsive, and highly efficient. Increasingly, businesses and industries have turned to wireless solutions to achieve these goals, which invariably involves pushing greater data gathering and processing capabilities downstream closer to the customer or the process at the core of the enterprise. These kinds of applications demand the flexibility offered by wireless solutions in conjunction with the speed and work-saving ability of the most advanced multimedia technologies. Indeed, WINForum believes that these entities may be the earliest adopters of this new technology, which provides a substantial manufacturing base to distribute development costs and reduce costs for all other institutions.
- ***Rapid Action on the Notice Proposals Will Allow Domestic Manufacturers to Seize a Leadership Role in Global Communications Products Markets.*** Finally, as recognized in the *Notice*, expeditious action on the proposed NII/SUPERNet allocation will "promote the ability of U.S. manufacturers to compete globally

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<sup>25</sup>American Library Association Comments, RM-8648 (filed July 10, 1995); Apple Comments at 12-15; Comments of Chris Mays, RM-8648 (filed July 10, 1995).

<sup>26</sup>Apple Comments at 15; Comments of Gary Fisher, RM-8648 (filed July 10, 1995).

<sup>27</sup>*Id.*

<sup>28</sup>*Id.*

<sup>29</sup>*Allocation of Spectrum Below 5 GHz*, 78 R.R.2d 1173 (1995).

by enabling them to develop unlicensed digital communications products for the world market."<sup>30</sup> WINForum anticipates that the sharing rules for the NII/SUPERNet band will be compatible with HIPERLAN developments in Europe. By rapidly acting in this proceeding, domestic manufacturers will realize increased global sales and American consumers will benefit through lower product prices due to cost spreading.

### **III. WINFORUM STRONGLY SUPPORTS THE COMMISSION'S PROPOSAL TO ALLOCATE SPECTRUM IN THE 5 GHz BAND FOR UNLICENSED NII/SUPERNET DEVICES**

#### **A. 350 MHz of Spectrum in the 5 GHz Band Is Necessary To Support Next Generation Unlicensed Devices**

As the Commission recognizes, "the spectrum currently allocated for existing wireless networks and devices is not adequate to meet the demands of today's broadband network data transmission services."<sup>31</sup> Specifically, the *Notice* notes that "the available bandwidth in the current allocations is not sufficiently wide to permit existing wireless services to take advantage of new technologies currently available on wired networks."<sup>32</sup> Nonetheless, the *Notice* solicits comment on "whether 350 MHz of spectrum is necessary to provide this service in the 5 GHz range."<sup>33</sup>

WINForum believes that the 350 MHz proposed in the *Notice* is the minimum necessary to support NII/SUPERNet technologies. In order to assess the spectrum

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<sup>30</sup>*Notice* at ¶2.

<sup>31</sup>*Id.* at ¶32.

<sup>32</sup>*Id.*

<sup>33</sup>*Id.* at ¶34.

requirements for SUPERNet in its original petition, WINForum relied upon the same spectrum usage model employed previously to determine the spectrum requirements for unlicensed PCS devices.<sup>34</sup> For the *SUPERNet Petition*, however, the model was altered to reflect the video demands of multimedia applications. Specifically, WINForum assumed that a good quality video session will require approximately one mbps and that typically four people take part in a single session at the same location.<sup>35</sup> Notably, WINForum did not modify the existing WINForum spectrum estimates to take into account other emerging new applications with higher capacity requirements or the need to share capacity between neighboring networks.

Based upon WINForum's calculations, which were attached as Appendix A to its SUPERNet Petition, WINForum estimated that the total spectrum requirement for multimedia applications is approximately 400 MHz in high density areas. Realistically, taking into account the already allocated unlicensed bands, existing use of the 5.8 GHz ISM band, and anticipated deployment scenarios, the initial allocation proposed for NII/SUPERNet is the minimum amount of spectrum necessary to support needed new services.

WINForum, as it noted in its original petition, also believes that additional spectrum for NII/SUPERNet systems in the bands above 5.35 GHz should be considered for future reallocation as deployment becomes more widespread. The spectrum band above 5.35 GHz is

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<sup>34</sup>See SUPERNet Petition at Appendix A. The original WINForum analysis did not include the requirements of interworking with infrastructure networks or the additional requirements of multimedia communications, and arrived at estimated spectrum requirements ranging from 20 to 50 MHz in order to satisfy *existing* applications and usage patterns.

<sup>35</sup>Although it may be assumed that, with time, more efficient compression schemes will reduce the demands of video bandwidth, the increase in use is likely to offset any gains from compression.

currently used by government radiolocation systems. Based upon WINForum's initial research and evaluation, WINForum believes that NII/SUPERNet devices could co-exist easily with such systems above 5.35 GHz. Because WINForum's spectrum estimates show that additional spectrum for broadband unlicensed devices will eventually be needed, WINForum urges the Commission not to take any actions on the bands above 5.35 GHz that would be prejudicial to extending the NII/SUPERNet allocation above 5.35 GHz.

**B. WINForum Supports the Commission's Proposal To Allocate the 5.15-5.35 GHz and 5.725-5.875 GHz Bands for NII/SUPERNet Devices**

WINForum also concurs with the *Notice* that the 5.15-5.35 GHz and 5.725-5.875 GHz bands are appropriate to reallocate to NII/SUPERNet devices. WINForum's original petition, in fact, requested allocation of the 5.1-5.35 GHz band, but was modified in response to FAA and NTIA concerns to commence at 5.15 GHz to avoid potential interference with Microwave Landing Services. The *Notice* proposal is thus generally consistent with WINForum's petition, as modified.

The addition of the 5.8 GHz ISM band, as suggested by Apple, also provides a good environment for NII/SUPERNet devices and goes further toward satisfying the ultimate spectrum anticipated to be needed for such devices. The spectrum at 5.8 GHz is, however, currently occupied by existing Industrial, Scientific, and Medical users and Part 15 spread spectrum devices. In light of the other existing uses of the band, as discussed in Section V(A) below, WINForum urges the Commission to consider conforming the proposed NII/SUPERNet rules to allow NII/SUPERNet devices to operate with on a technology-neutral

basis with respect to other Part 15 spread spectrum users. This could potentially be accomplished by using power spectral density and antenna directionality limits consistent with whatever rules are adopted for Part 15 spread spectrum devices in ET Docket No. 96-8; *i.e.*, a limit on EIRP per MHz similar to the maximum allowed for direct sequence systems. Such a modification would substantially increase the ability of NII/SUPERNet devices to co-exist in the band and, at the same time, should not pose a significant interference threat to existing operations.

As the Commission has noted in the *Notice*, the opportunity presented in the 5 GHz band is unique. Spectrum below 5 GHz is simply "too congested" to create the type of broad bandwidth systems necessary to support multimedia systems. Moreover, use of spectrum above 5 GHz, as recognized by the Commission, "would both increase the cost of equipment and would have even more limited propagation characteristics."<sup>36</sup> Thus, the proposed allocations properly balance spectrum resources and need and should be finalized.

**C. NII/SUPERNet Devices Can Co-Exist Harmoniously With Existing and Planned Uses of the 5 GHz Band**

As discussed below, prior studies have shown that NII/SUPERNet devices can co-exist with existing and planned uses of the 5 GHz band, even at power limits substantially greater than 100 mW. Thus, operation at the approximate limits suggested in the *Notice* for the 5.15-5.35 GHz band provides a very high degree of protection to existing and planned users operating in that band. In the 5.8 GHz band, however, WINForum believes NII/SUPERNet

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<sup>36</sup>*Notice* at ¶34.

devices should be afforded additional flexibility to enable them to operate in an environment populated with other Part 15 devices utilizing substantially higher powers.

**1. *NII/SUPERNet devices will provide protection to aeronautical radionavigation systems adjacent to the 5.15-5.35 GHz band***

As stated in the *Notice*, the Commission is "persuaded at this time that NII/SUPERNet devices could operate above 5 15 GHz without causing interference to aeronautical radionavigation if . . . appropriate out-of-band emission and power limits [are adopted]."<sup>37</sup> In a CEPT study titled "Co-existence of Radio Local Area Networks with the Microwave Landing System"<sup>38</sup> Despite assuming a higher maximum EIRP of 30 dBm and "minimum separation distances . . . calculated with pessimistic propagation parameters," the study concluded:

This study has shown that MLS and radio LANS . . . will be able to co-exist in adjacent bands provided that there is a radio LAN exclusion zone of approximately 15 [meters] around the MLS equipment on an aircraft. However, it would be more appropriate to impose a restriction prohibiting the use of radio LANs in aircraft to ensure that there would be no significant interference problem.

This is consistent with the authorization of HIPERLAN in Europe at one Watt, which co-exists with a far greater number of MLS installations on adjacent channels in Europe. At a EIRP

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<sup>37</sup>*Id.* at ¶35.

<sup>38</sup>Conference of Postal and Telecommunications Administrations (CEPT), ERC Report 14 (Madrid October 1992) at 5.

limit of approximately 0.1 Watt (20 dBm), the potential for adjacent channel interference would be reduced.

**2. *NII/SUPERNet devices can share spectrum with MSS feederlinks in the 5.15-5.25 GHz band***

The Commission has indicated that it "believe[s] that . . . NII/SUPERNet devices can successfully share spectrum with the MSS feeder links which are expected to operate in the 5.15 - 5.25 GHz band."<sup>39</sup> Once again, WINForum concurs, especially considering the power limitation on NII/SUPERNet systems. As WINForum previously noted, because the MSS operations proposed in the band are global, the feeder uplinks by necessity *must* coexist with HIPERLAN in Europe, regardless of any design changes to the MSS systems. Moreover, the preliminary studies in Europe previously cited by WINForum assumed a power level of one Watt, ten times that proposed for NII/SUPERNet systems.<sup>40</sup> Under these circumstances, very large numbers of NII/SUPERNet devices operating at approximately 0.1 Watt in the 5.15-5.35 GHz band will pose no threat to MSS feeder stations.

WINForum also notes that it is proposing to allow use of directional transmit antennas with gains of up to +6 dBi in this band. Because WINForum's calculation of potential interference both to MSS and MLS systems relies upon averaging large numbers of randomly

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<sup>39</sup>Notice at ¶35.

<sup>40</sup>While Appendix B of WINForum's SUPERNet Petition did utilize -10 dBW as a reference, that figure was intended to represent the average power of a SUPERNet device for calculations involving a very large number of devices, taking into account automatic gain control and antenna gain decreases due to the high angle of reception to a satellite.

placed mobile units, any directionality of the transmit antennas cancels out due to the random orientation of mobile units. As a result, even with directional transmit antennas, the transmitter power (100 mW) is the predominant factor in assessing interference. Because the studies show no potential for harmful interference even at one Watt, operation of NII/SUPERNet devices at 100 mW with 6 dB of antenna gain poses no threat to either MLS or MSS co-existence.

**3. *NII/SUPERNet devices can co-exist with other users in the 5.8 GHz ISM band***

The 5.725-5.875 GHz band proposed in the *Notice* for NII/SUPERNet devices is contemplated to be shared with a number of existing and proposed systems. The band is currently used by amateurs, ISM users, and Part 15 devices. In addition, the 5.85-5.925 GHz band, which overlaps the contemplated upper 5 GHz NII/SUPERNet allocation by 25 MHz, is used by Fixed Satellite Service ("FSS") uplinks.<sup>41</sup> As detailed below, WINForum believes that NII/SUPERNet devices can co-exist with these users without harmful interference even if the rules for NII/SUPERNet devices were revised to allow operation at power limits and antenna gains comparable to what will be adopted for Part 15 spread spectrum systems in ET Docket No. 96-8, as suggested in Section V(A).

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<sup>41</sup>As the Commission notes, regulatory developments are underway that would also authorize Intelligent Transportation System ("ITS") use of the 5.85-5.925 GHz band, but the issue of sharing with ITS operations "is beyond the scope of this proceeding and [should] be addressed in future rulemakings as appropriate." *Notice* at ¶35.

Currently, deployment of direct sequence spread spectrum systems is permitted in the 5.8 GHz ISM band on a Part 15 basis. These devices can operate under the existing rules at a transmitter power of one Watt with 6 dB of antenna gain and with a 6 dB bandwidth of 500 kHz. WINForum also notes that in ET Docket No. 96-8, the Commission has proposed changes to the operating rules for the 5.8 GHz band that would allow spread spectrum users to operate at significantly higher powers and antenna gains. Because, from an interference standpoint, the most technology-neutral criteria appears to be power spectral density, WINForum urges the Commission to consider revising the 5.8 GHz rules for NII/SUPERNet to allow such users to operate with a power spectral density on par with whatever limits are adopted in ET Docket No. 96-8.

**IV. INTERIM RULES MUST CAREFULLY BALANCE THE BENEFITS OF EARLY DEPLOYMENT WITH THE POTENTIAL FOR INCOMPATIBILITY WITH FUTURE, MORE ROBUST SYSTEMS**

"In order to expedite the development and introduction of NII/SUPERNet devices," the Commission has proposed "to adopt a basic 'listen-before-talk' standard . . . [as sharing rules to] serve on an interim basis until an etiquette is developed by industry."<sup>42</sup> While WINForum supports measure to expedite the availability of advanced telecommunications products for the public, any interim deployment of NII/SUPERNet devices must carefully balance the benefits of rapid access by the public to new technology and the potential effects of interim uses on later-developed systems. Specifically, WINForum is concerned that the deployment of a

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<sup>42</sup>Notice at ¶52.