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

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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

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**REPLY COMMENTS OF THE WIRELESS INFORMATION NETWORKS FORUM**

**WIRELESS INFORMATION  
NETWORKS FORUM**

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Dated: August 14, 1996

*JRC*

## SUMMARY

The Wireless Information Networks Forum ("WINForum") believes the record in this proceeding strongly supports the Commission's proposal to allocate 5 GHz spectrum for new NII/SUPERNet devices operating on an unlicensed basis. The comments filed in this proceeding provide substantial evidence that 350 MHz of spectrum is necessary to support multimedia wireless networks; that NII/SUPERNet devices can co-exist with MSS, MLS, Amateur Radio Service, ISM, and other users in the 5.15-5.35 GHz and 5.725-5.875 GHz bands; and that allocating those bands for NII/SUPERNet operation has tremendous public interest benefits for schools, hospitals, businesses, industries, and consumers generally. WINForum accordingly urges the Commission to rapidly finalize the allocations and encourage expeditious development of sharing rules for the band.

In order to maximize the public interest benefits of the proposed allocation, WINForum, as well as the majority of commenters, further supports adoption of minimal technical rules designed to avoid interference and to promote fair, efficient, and effective use of the band. Specifically, WINForum urges the Commission to:

- ▶ Adopt a power limit for the 5.15-5.35 GHz band on the order of 100-250 mW transmitter output power, and allow the use of directional antennas;
- ▶ Adopt power and antenna regulations for the 5.725-5.875 GHz band that provide technological parity with the limits adopted in ET Docket No. 96-8 for spread spectrum Part 15 devices in that band;
- ▶ Adopt power measurement rules consistent with ANSI C63 SC7's recommendations for unlicensed PCS devices;
- ▶ Adopt a policy of requiring minimum -- not maximum -- channel spacing on the order

of 25 MHz, while allowing industry to ultimately set specific limits in the context of developing sharing rules;

- ▶ Forgo, at this time, adopting a modulation efficiency requirement and allow industry groups to consider a spectral efficiency metric that is measurable and takes into consideration frequency re-use characteristics;
- ▶ Adopt WINForum's proposed definitions and measurement techniques for out-of-band emissions;
- ▶ Adopt the proposed "safe harbor" for NII/SUPERNet devices, with modifications as necessary in view of the ultimately adopted power and antenna limitations; and,
- ▶ Allow, subject to the constraints of sharing rules, implementation of any technologically feasible systems, including community networks.

To the extent the Commission permits interim deployment, WINForum also requests deletion of any "listen-before-talk" requirements, and strongly urges the FCC to limit interim deployment to 50 MHz in the 5.8 GHz band, with a date certain changeover, to avoid preclusory effects on devices using a later-developed, more efficient sharing system.

WINForum also strongly urges the Commission to reject any proposals to license or, even worse, auction any parts of the NII/SUPERNet allocations. In addition to slowing deployment of beneficial new technologies, such regulatory requirements would defeat the primary benefit of unlicensed technologies by limiting free and open access to the band by all devices.

With the modifications suggested herein, WINForum believes the Commission will be able to achieve the promise of multimedia wireless networking in the 5 GHz band. The Commission's proposal, with the minor changes offered by WINForum, will create an environment where manufacturers and developers can create a broad range of diverse and

innovative products designed to address the advanced wireless networking needs of schools, libraries, hospitals, businesses, and consumers generally. WINForum accordingly urges the Commission, consistent with these reply comments, to rapidly act on the *Notice* proposals and open the door for all Americans to enjoy the benefits of next generation unlicensed technologies.

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**REPLY COMMENTS OF THE WIRELESS INFORMATION NETWORKS FORUM**

The Wireless Information Networks Forum ("WINForum") herewith submits its reply to comments filed in response to the above-captioned notice of proposed rulemaking ("*Notice*").<sup>1</sup> In its original comments, WINForum applauded the Commission's proposals to allocate the 5.15-5.35 GHz and 5.725-5.875 GHz bands and to establish technical rules and policies for the use of these bands by NII/SUPERNet devices on an unlicensed basis.<sup>2</sup> WINForum did, however, suggest some minor alterations to the *Notice* proposals with regard to the 5.8 GHz band and provided detailed comments in response to a number of technical issues left open in the *Notice*. WINForum further noted that it was establishing a new subcommittee to draft proposed rules to ensure fair and open access to spectrum resources in the band by all types of unlicensed devices. The record in this proceeding strongly supports WINForum's proposed actions. WINForum therefore urges the Commission to rapidly adopt its proposals, as modified and clarified herein.

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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>Comments of the Wireless Information Networks Forum ("WINForum Comments"), ET Docket No. 96-102 (July 15, 1996).

**I. THE RECORD DEMONSTRATES SUBSTANTIAL PUBLIC BENEFITS IN RAPIDLY PROCEEDING WITH THE PROPOSED ALLOCATION FOR NII/SUPERNet DEVICES**

In the *Notice*, the Commission noted that providing additional spectrum for unlicensed NII/SUPERNet devices "would benefit a vast number of users, including educational, medical, business, and industrial users."<sup>3</sup> WINForum's comments in this docket echoed these sentiments, lauding the "litany of benefits and new uses" the allocation of spectrum would provide.<sup>4</sup> Specifically, WINForum noted that the proposed allocation holds significant potential to improve the quality and reduce the costs of medical care in the United States; it has the potential to provide access to electronic resources for students and to improve the functioning of libraries; it also will likely create jobs, foster economic growth, and improve access to communications by industry and the American public, and enable domestic manufacturers to seize a leadership role in global communications products markets.<sup>5</sup>

A host of other commenters similarly applauded the depth and breadth of public benefits that will result from the proposed allocation. Northern Telecom ("Nortel") stated that the allocation will result in "new services, enhanced efficiency and expanded manufacturing opportunities [that] will serve the public interest."<sup>6</sup> AT&T observed that the allocation will

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<sup>3</sup>*Notice* at ¶ 33.

<sup>4</sup>WINForum Comments at 9.

<sup>5</sup>*Id.* at 10-12.

<sup>6</sup>Comments of Northern Telecom, Inc. ("Nortel Comments"), ET Docket No. 96-102 (July 15, 1996) at

"advance education and business,"<sup>7</sup> and Bell Atlantic argued that the allocation is in the public interest because it will provide "schools, libraries, health care facilities and other buildings" with wireless access to a variety of advanced telecommunications services that otherwise would be prohibitively expensive.<sup>8</sup>

Additionally, Microsoft acknowledged that the allocation "holds much promise for improving the quality of our lives by permitting the implementation of new services quickly and cost-efficiently."<sup>9</sup> Microsoft emphasized several of these new services, including access to the information superhighway and a variety of educational and medical applications.<sup>10</sup> The Federal Highway Administration dubbed the allocation "a sound concept with many benefits to the public community and commercial sector."<sup>11</sup> And, the Media Access Project supported the Commission's "visionary proposal," citing its potential to bring "telecommunications information services to rural areas" and to enhance "access to advanced information technologies by schools, libraries, health care institutions, and other community service providers" at low-cost.<sup>12</sup>

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<sup>7</sup>Comments of AT&T Corp. ("AT&T Comments"), ET Docket No. 96-102 (July 15, 1996) at 2.

<sup>8</sup>Comments of Bell Atlantic ("Bell Atlantic Comments"), ET Docket No. 96-102 (July 15, 1996) at 1.

<sup>9</sup>Comments of Microsoft Corporation ("Microsoft Comments"), ET Docket No. 96-102 (July 15, 1996) at 2.

<sup>10</sup>*Id.*

<sup>11</sup>Comments of the Federal Highway Administration ("FHA Comments"), ET Docket No. 96-102 (July 15, 1996) at 1.

<sup>12</sup>Joint Comments of the National School Boards Association, Media Access Project, National Education Association, American Association of School Administrators, and People for the American Way ("MAP Comments"), ET Docket No. 96-102 (July 15, 1996) at 1.

WINForum believes these comments provide a strong basis for expeditiously acting on the Commission's proposals. Allocating the 5 GHz bands for new NII/SUPERNet devices will demonstrably benefit all Americans and provide needed advanced capabilities where no facilities currently exist.

**II. THE COMMENTS DEMONSTRATE THAT THE COMMISSION SHOULD ALLOCATE THE 5.15-5.35 GHz AND 5.725-5.875 GHz BANDS FOR NII/SUPERNet DEVICES**

The allocation of the 5.15-5.35 GHz and 5.725-5.875 GHz bands to NII/SUPERNet devices was broadly supported in the record. Indeed, the only dissents were expressed by incumbent, or near incumbent, users with vested interests in preserving the status quo. Overall, however, the commenters believed that the size of allocation was appropriate, or somewhat conservative, given the overall demand for NII/SUPERNet devices, and that NII/SUPERNet devices could co-exist harmoniously with existing and planned users in the targeted bands. Based upon this record, WINForum urges the Commission to move forward expeditiously to allocate both the 5.15-5.35 GHz and 5.725-5.875 GHz bands for unlicensed NII/SUPERNet operations.

**A. The Comments Support Allocating 350 MHz of Spectrum for New Unlicensed NII/SUPERNet Systems**

The record in this proceeding establishes that a minimum of 350 MHz of spectrum should be allocated for NII/SUPERNet devices.<sup>13</sup> As Rockwell International Corporation ("Rockwell") notes, "[i]f adopted, the Commission's proposal for 350 MHz for NII/SUPERNet operations would provide the overall spectrum and channel bandwidths necessary to inexpensively and flexibly deliver multimedia and high speed data to . . . mobile users who currently are not served by the broadband wireline infrastructure."<sup>14</sup> Hewlett-Packard Company ("H-P") similarly notes that it is "particularly enthusiastic about the possibilities of such an allocation in providing people everywhere with an array of new high-capacity wireless products and services," and states that "[a]ccess to the band will certainly make possible easier, faster and less costly methods for multiple users to access and exchange information from any location, without . . . bandwidth limitations of lower frequency unlicensed allocations."<sup>15</sup>

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<sup>13</sup>Comments of 3Com Corporation ("3Com Comments"), ET Docket No. 96-102 (July 15, 1996) at 1-2; Comments of Apple Computer, Inc., ET Docket No. 96-102 (July 15, 1996) at i; Comments of the Business Software Alliance ("BSA Comments"), ET Docket No. 96-102 (July 18, 1996) at 1; Comments of the Radio Equipment and Systems Telecommunications and Post Department, European Telecommunications Standards Institute ("ETSI Comments"), ET Docket No. 96-102 (July 15, 1996) at 2; Comments of Hewlett-Packard Company ("H-P Comments"), ET Docket No. 96-102 (July 15, 1996) at 2; Comments of the Information Technology Industry Council ("ITIC Comments"), ET Docket No. 96-102 (July 15, 1996) at 2-5; Comments of Chandos A. Rypinski, President, LACE, Inc. ("LACE Comments"), ET Docket No. 96-102 (July 15, 1996) at 32; Comments of Lucent Technologies, Inc. ("Lucent Comments"), ET Docket No. 96-102 (July 15, 1996) at 2-3; Microsoft Comments at 2-3; Comments of Motorola, Inc. ("Motorola Comments"), ET Docket No. 96-102 (July 15, 1996) at 1-2; MAP Comments at 2-4; Nortel Comments at 3-5; Comments of Rockwell International Corporation ("Rockwell Comments"), ET Docket No. 96-102 (July 15, 1996) at 1; Comments of the Wireless LAN Alliance ("WLANA Comments"), ET Docket No. 96-102 (July 15, 1996) at 2;

<sup>14</sup>Rockwell Comments at 1.

<sup>15</sup>H-P Comments at 2.

WINForum itself also previously documented the need for significantly more than 350 MHz, arguing that a substantial core allocation should be made immediately and that additional spectrum above 5.35 GHz should be reserved for future NII/SUPERNet operations.<sup>16</sup>

WINForum's estimates were also confirmed by similar demand studies by the European Telecommunications Standards Institute ("ETSI"), which predicted a need for over 450 MHz of spectrum for advanced wireless networks.<sup>17</sup> Given the encumbered nature of some of the spectrum proposed for NII/SUPERNet devices and the additional "community networks" usage enabled in the 5.8 GHz band that was not taken into consideration in WINForum's original demand model, the 350 MHz proposal in the *Notice* is a conservative, but necessary, starting point for the launch of NII/SUPERNet systems.<sup>18</sup> Accordingly, WINForum urges the Commission both to make the proposed allocation of 350 MHz and to remain open to further expansion of the NII/SUPERNet band above 5.35 GHz as the offerings mature and demand continues.

**B. NII/SUPERNet Devices Can Co-Exist With Existing and Planned Uses in the 5.15-5.35 GHz Band**

At present, the 5.15-5.35 GHz band proposed for NII/SUPERNet devices overlaps with an aeronautical radionavigation band at 5.15-5.25 GHz and a government radiolocation band at 5.25-5.35 GHz. Notably, there were no concerns expressed with regard to either the

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<sup>16</sup>Petition for Rulemaking of the Wireless Information Networks Forum ("SUPERNet Petition"), RM-8648 (May 15, 1996) at Appendix A.

<sup>17</sup>ETSI Comments at 2.

<sup>18</sup>Lucent Comments at 3.

ability of NII/SUPERNet devices to co-exist with government radiolocation systems above 5.25 GHz or the ability of NII/SUPERNet devices to operate in spectrum adjacent to Microwave Landing Systems ("MLS") operating below 5.15 GHz.<sup>19</sup> Indeed, the only objections to the Commission's proposal were from a handful of mobile satellite service ("MSS") interests that opposed, or sought heavy restrictions on, NII/SUPERNet implementation in the 5.15-5.25 GHz band.<sup>20</sup> As discussed below, however, these concerns are highly overstated.

The 5.15-5.25 GHz band was an "expansion band" associated with a larger primary allocation for MLS implementation. As a result of changes in domestic policy, the 5.15-5.25 GHz band will not be used in the United States for MLS, but rather to support MSS feeder uplink operations. The MSS interests that are licensed, or seeking licenses, to use that band now allege that co-channel operation of NII/SUPERNet devices should not be permitted or, if permitted, subject to extreme technical constraints. L/Q Licensee Corp. ("L/Q"), for example, argues that the "coordination threshold" of its feeder uplinks will be reached if the noise temperature of the satellite receiver by is raised as little as 0.1 percent -- an almost immeasurable amount.<sup>21</sup>

The claims of interference to MSS systems in the 5.15-5.25 GHz band from NII/SUPERNet devices should be viewed with some skepticism. As the FCC observed in the

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<sup>19</sup>The only commenters to address MLS adjacent channel co-existence concluded that no harmful interference would be caused. *See* Nortel Comments at 6; WINForum Comments at 16-17.

<sup>20</sup>Comments of AirTouch Communications, Inc., ET Docket No. 96-102 (July 15, 1996) at 5-7; Comments of ICO Global Communications and COMSAT Corporation, ET Docket No. 96-102 (July 15, 1996) at 2-5; Comments of L/Q Licensee Corp. ("L/Q Comments"), ET Docket No. 96-102 (July 15, 1996) at 8-11.

<sup>21</sup>L/Q Comments at 8.

*Notice*, an ITU study predicted that HIPERLAN systems would be able to co-exist with MSS feeder uplinks in Europe, which has significantly greater population densities.<sup>22</sup> While L/Q attempts to discount the ITU study by indicating that certain technical parameters of its operations have changed since the study,<sup>23</sup> HIPERLAN is moving forward in Europe and L/Q *must* co-exist with widespread deployment of HIPERLAN devices operating at 1 watt if it intends to offer MSS on a global basis.

The common sense conclusion that MSS feeder uplinks must be able to co-exist with broad deployment of unlicensed devices is also supported by more thoroughly examining the characteristics of NII/SUPERNet devices. L/Q alleges that only 1070 NII/SUPERNet devices can be operated in the United States before the "coordination" threshold (0.1 percent  $\Delta T/T$ ) is reached.<sup>24</sup> This calculation, however, assumes: (i) that the satellite has line-of-sight to each device;<sup>25</sup> (ii) that the devices are all on at the same time; and, (iii) that "harmful" interference would occur with a 0.004 dB degradation of noise margin.<sup>26</sup>

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<sup>22</sup>*Notice* at ¶¶17, 35.

<sup>23</sup>L/Q Comments at 10.

<sup>24</sup>*Id.* at Attachment 1, pp. 2-3.

<sup>25</sup>L/Q describes the satellite antenna as having an antenna pattern which causes the receiver to sense all devices on the continent as if they were at about the same effective distance (the ISO-flux pattern). *Id.* However, even with this pattern there will be additional attenuation to the emissions of the distant devices and the effective area will be less than that of the full continent.

Devices at great distance from the satellite will have at a low pointing angle toward the satellite and even outside NII/SUPERNet devices at or near continental distance will experience excess attenuation relative to line-of-sight. This effect will add considerable mean attenuation to a continent wide collection of devices. For example, a satellite over the dense population area of the east coast will have a grazing angle to the devices in the dense population area on the west coast of under 20 degrees. West coast devices will thus have considerable excess attenuation due to scattering and blockage near the devices. Devices outside buildings will be at low elevation and will thus experience higher excess attenuation due to this effect.

<sup>26</sup>*Id.* at Attachment 1.

None of the enumerated L/Q assumptions underlying its "interference analysis" are valid. First, the ITU study predicted that only 1 percent of the devices would be outside, and that devices operated indoors would have 20 dB of excess attenuation over line-of-sight.<sup>27</sup> Second, as WINForum discussed in prior comments, even the ITU study, which was highly conservative, assumed that only 1 percent of all devices would be transmitting at any time.<sup>28</sup> Finally, the ITU study used a more reasonable 10 dB margin, which reduces the actual performance margin by 0.41 dB rather than 0.004 dB. Based upon these more realistic criteria, over 540 million NII/SUPERNet devices could be deployed without causing harmful interference to the MSS uplink system of L/Q or any other MSS provider.

In this regard, WINForum notes that it has requested the Commission to authorize the use of directional antennas and potentially to permit operation at up to 250 mW. Neither of these changes, however, should affect the analysis of potential interference to MSS systems. First, as WINForum discussed in its prior comments, the use of directional antennas by large numbers of devices with quasi-random orientations tends to be self-canceling; *i.e.*, the increase in radiated power in one direction attributable to a device is offset by the reduced power radiated in the direction of the satellite by large numbers of other devices.<sup>29</sup> Indeed, given that

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<sup>27</sup>L/Q attempts to discount the ITU's assumption of a 100:1 indoor/outdoor device ratio by stating merely that the assumption "is unrealistic since it would be impossible to regulate whether a terminal was deployed indoors or outdoors and the amount of attenuation would vary from building to building." L/Q Comments at Attachment 1, p. 6. Given the very large number of NII/SUPERNet devices that could exist, however, assumptions regarding average use characteristics are quite valid. Moreover, assuming an excess attenuation of 20 dB over line-of-sight for indoor devices is *very* conservative.

<sup>28</sup>Reply Comments of the Wireless Information Networks Forum, RM-8648, RM-8653 (July 25, 1996) at Appendix A. Although L/Q's technical analysis explicitly notes "a ratio of active to inactive terminals of 100," L/Q ignores this assumption without any explanation. L/Q Comments at Attachment 1, p. 6.

<sup>29</sup>WINForum Comments at 17-18.

NII/SUPERNet devices are designed for terrestrial communications, orientation is only "random" in the horizontal plane. Thus, the use of directional antennas will generally tend to suppress, rather than increase or maintain constant, the radiation perceived by satellite above the user in the vertical plane -- in fact, low gain antennas could well be the "worst case" from the MSS perspective.<sup>30</sup> Second, even if the Commission were to allow operation at 250 mW, WINForum notes that it is requesting a minimum channel bandwidth of approximately 25 MHz.<sup>31</sup> Since the L/Q study assumed a 100 mW transmission in a 10 MHz bandwidth,<sup>32</sup> WINForum's proposed power change would not alter the overall power spectral density, and therefore would not alter the interference calculation.

Thus, NII/SUPERNet devices can co-exist harmoniously with MSS feeder uplinks in the 5.15-5.25 GHz band. WINForum therefore urges the Commission to expedite the allocation of the 5.15-5.35 GHz band and make the benefits of NII/SUPERNet technology available to the public.

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<sup>30</sup>The horizontal plane will only point to the vicinity of the satellite when the NII/SUPERNet devices are at great earth distance from below the satellite. The minimum angle relative to the earth is about 20 degrees at continental distance. As stated in fn xx, the excess distance attenuation will alleviate directional antenna effects in this case.

<sup>31</sup>*Id.* at 26-27.

<sup>32</sup>L/Q Comments at Attachment 1, p. 4. WINForum notes that, L/Q mistakenly assumes 10 MHz channels and mistakenly analyzes only 100 MHz of the band proposed for NII/SUPERNet operations, mistakes that are ultimately self-canceling for purposes of the interference analysis. Ultimately, the only relevant parameter is the energy density in the band, which is basically the same for 10 channels of 10 MHz at 100 mW and 10 channels of 25 MHz at 250 mW.

**C. NII/SUPERNet Devices Can Co-Exist With Existing and Planned Uses of the 5.8 GHz Band**

The 5.8 GHz band is currently overlaid with several allocations, overlapping an ISM/Part 15 allocation at 5.8 GHz  $\pm$  75 MHz, an Amateur Radio Service band at 5.725-5.850 GHz, and a proposed intelligent transportation service ("ITS") allocation at 5.850-5.875 GHz. Each of these classes of users, with some notable exceptions, have advocated caution in allowing new use of the band by NII/SUPERNet devices. After analyzing the record, WINForum does not believe that interference concerns expressed with regard to any the overlapping allocations provides a sound basis for delaying, much less halting, the proposed allocation.

Indeed, WINForum notes that the Commission currently permits the use of the 5.8 GHz band on a Part 15 basis by spread spectrum systems operating at 1 watt with 6 dB of antenna gain and a spreading bandwidth of only 500 kHz.<sup>33</sup> There is also a pending docket at the Commission that proposes to increase these limits substantially.<sup>34</sup> As discussed in Section IV.B, WINForum believes that the Part 15 regulations governing the 5.8 GHz band should operate on a technology-neutral basis. Specifically, WINForum proposes that NII/SUPERNet devices using non-spread spectrum modulations would be permitted to emit the same energy density limits as spread spectrum Part 15 users are authorized in ET Docket No. 96-8. By rendering the interference profile of NII/SUPERNet devices analogous to systems that are

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<sup>33</sup>47 C.F.R. §15.247(a)(2).

<sup>34</sup>Spread Spectrum Devices, ET Docket No. 96-8, FCC 96-36 (Feb. 6, 1996).

already authorized in the band, the Commission would at once promote technology-neutral policies while mooting claims of potential interference to other users.

### **III. THE RECORD PROVIDES SUBSTANTIAL SUPPORT FOR LIMITED USE OF THE NII/SUPERNet BAND UNDER INTERIM RULES PENDING DEVELOPMENT OF INDUSTRY CONSENSUS SHARING RULES**

In its original comments in this docket, WINForum concurred with the Commission's proposal to allow interim operation of NII/SUPERNet devices pending development of industry consensus sharing rules.<sup>35</sup> Importantly, however, WINForum noted the potential preclusive effect of extensive interim device deployment on products incorporating a later-developed, but more efficient, sharing system.<sup>36</sup> Accordingly, WINForum urged the Commission to constrain interim device deployment by allowing interim device use only in 50 MHz of the 5.8 GHz band, and establishing a date certain transition where interim devices would be required to transition to obeying later-developed sharing rules.<sup>37</sup>

WINForum's concern regarding the preclusive potential of interim device deployment was echoed by several other commenters. Specifically, Hewlett-Packard noted that if the Commission adopts a limited interim etiquette, "companies would be deterred from designing multi-media system until they could be certain that such systems could operate with the desired performance in the NII/SUPERNet band", and that "any newer etiquette developed by industry

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<sup>35</sup>WINForum comments at 19-22.

<sup>36</sup>*Id.*

<sup>37</sup>*Id.*

would have to be 'backwardly compatible' with th[e] interim etiquette."<sup>38</sup> Lucent, for its part, noted more directly that "interim sharing rules . . . will both hinder the introduction of future systems that are optimized more and also inhibit the process of developing and industry consensus for spectrum sharing rules."<sup>39</sup> Other parties, such as Apple, have suggested that it would be more appropriate to forego interim deployment entirely, and instead adopting policies encouraging the development of final sharing rules as early as possible.<sup>40</sup> On balance, if interim device deployment is permitted at all, WINForum strongly urges the Commission to limit deployment as it suggested in its original comments in this docket.

WINForum also suggested in its comments eliminating the "listen-before-talk" requirement for interim device deployment.<sup>41</sup> Like WINForum, Apple also noted that "[t]he 'interim rules' proposed by the Commission and derived from the rules in Subpart D, . . . are not appropriate for use [in the 5 GHz band], even on an interim basis."<sup>42</sup> ETSI, Hewlett-Packard, and others have similarly argued against a "listen-before-talk" requirement as being incompatible with HIPERLAN and inconsistent with use of isochronous data transmissions in a multimedia environment.<sup>43</sup> WINForum thus urges the Commission, if it adopts interim rules permitting early deployment, to eliminate any "listen-before-talk" requirement.

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<sup>38</sup>H-P Comments at 4.

<sup>39</sup>Lucent Comments at 5.

<sup>40</sup>Apple Comments at 26.

<sup>41</sup>*Id.*

<sup>42</sup>Apple Comments at 26.

<sup>43</sup>ETSI Comments at 2; H-P Comments at 3-5; Lucent Comment at 5; Nortel Comments at ii.

#### **IV. TECHNICAL STANDARDS FOR NII/SUPERNET DEVICES SHOULD MAXIMIZE EFFICIENCY AND UTILITY FOR ALL USERS**

To protect against harmful interference to incumbent and future users and to minimize undesirable interactions between NII/SUPERNet devices, the Commission requested comment on a series of technical issues including power, channelization, modulation efficiency, sharing rules, and out-of-band emissions. The Commission also solicited input on the appropriate technical parameters for a "safe harbor" for NII/SUPERNet devices. These rules generated considerable interest among commenters, ranging from comprehensive regulatory proposals to more generalized input. Given the interdependent nature of many of these criteria, WINForum believes that the public would benefit if these issues were resolved through an industry consensus process in conjunction with the sharing rules effort. Nonetheless, WINForum understands the need to finalize rules rapidly to stimulate further development activity, and has provided below its input on these issues. WINForum continues to urge the Commission, however, to provide flexibility to consider modifications to the technical rules at the time the sharing rules effort is completed.

Like other commenters and the Commission itself, WINForum also favors minimal technical regulations.<sup>44</sup> The Computer Equipment Manufacturers Association ("CEMA"), for example, notes that "the utility of this new technology -- and, more importantly, consumer

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<sup>44</sup>3Com Comments at 2-3; Apple Comments at iv; BSA Comments at 2; Comments of the Computer Equipment Manufacturers Association ("CEMA Comments"), ET Docket No. 96-102 (July 15, 1996) at 4; Comments of the Telecommunications Industry Association, Fixed Point-to-Point Microwave Section, ET Docket No. 96-102 (July 15, 1996) at 9; ITIC Comments at 6-8; Comments of Metricom, Inc. ("Metricom Comments"), ET Docket No. 96-102 (July 15, 1996) at 4-5; Microsoft Comments at 3; Motorola Comments at ii; Nortel Comments at ii; Rockwell Comments at 1; Comments of Western Microwave Corporation, ET Docket 96-102 (July 15, 1996) at 4.

choice -- will be maximized by adopting flexible rules governing the operation of NII/SUPERNet devices."<sup>45</sup> The Information Technology Industry Association similarly notes that "[t]he fewer restrictions established *a priori*, the more freedom industry will have to develop innovative products, technologies and applications for high-speed, multimedia, wireless networks."<sup>46</sup>

**A. Power and Antenna Regulations for Devices Operating in the 5.15-5.25 GHz Band**

In the *Notice*, the Commission proposed a power limit of 100 mW EIRP for NII/SUPERNet devices operating in the 5.15-5.35 GHz band to protect other co-channel and adjacent channel users. WINForum, for its part, argued for a transmitter output power (not EIRP) limit in the range of 100-250 mW, flexibility to utilize up to 6 dB of antenna gain, and a "dB for dB" adjustment of output power for antenna gains higher than 6 dB. WINForum's comments demonstrated that the use of directionalized antennas for NII/SUPERNet devices would increase the utility of such devices, lead to more efficient spectrum use, and not increase any potential interference to other users.

WINForum believes its suggested modifications provide the proper balance between maximizing utility for unlicensed devices users and ensuring non-interference with other devices, whether those devices are NII/SUPERNet, MLS, or MSS systems. While WINForum believes the transmitter output power limit could be raised to 1 watt to be

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<sup>45</sup>CEMA Comments at 4.

<sup>46</sup>ITIC Comments at 7.

consistent with HIPERLAN specifications, as suggested by Nortel and Mulcay,<sup>47</sup> a limit in the 100-250 mW range would appear to provide sufficient in-building penetration and propagation distance to meet the on-premises needs of users. The few suggestions for lower power limits, such as L/Q's argument that all NII/SUPERNet devices in aggregate should be limited to 0 dBW/MHz across the United States, are patently biased to ensure that NII/SUPERNet is technically infeasible.<sup>48</sup>

WINForum also believes that its proposal to allow use of directional antennas is consistent with the majority of commenting parties. WINForum's comments conservatively suggested authorizing antenna gains of 6 dB, but WINForum sees significant benefits in permitting even higher gains, as suggested by Motorola.<sup>49</sup> Allowing the use of directional antennas provides manufacturers with additional technical flexibility to create a host of new and innovative offerings for the public and, indeed, should reduce interference between NII/SUPERNet devices in the band, resulting in higher overall efficiency.<sup>50</sup> At the same time, as WINForum has discussed in Section II.B, the use of directional antennas by a large number of quasi-randomly oriented mobiles will tend to result in the same energy density being transmitted along any radial (and thus the same interference potential) as the same number of transmitters without directional antennas.

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<sup>47</sup>Nortel Comments at 9; Comments of Mulcay Consulting Associates, ET Docket No. 96-102 (July 15, 1996) at 2-4; *see also* Comments of Fundamental Research Corp. ("FRC Comments"), ET Docket No. 96-102 (July 15, 1996) at 1.

<sup>48</sup>L/Q Comments at Attachment 1, p. 4.

<sup>49</sup>Motorola Comments at 8-10.

<sup>50</sup>*Id.*

**B. Power and Antenna Regulations for Devices Operating in the 5.725-5.875 GHz Band**

WINForum requested modifications to the *Notice* power limit proposal for the 5.8 GHz band to achieve technological parity with other Part 15 users in the band. As other commenters have observed, the proposed limit of 100 mW EIRP, and even the potential limit of 1 W EIRP, offer significantly less design options than the limits available to spread spectrum equipment manufacturers using the same band.<sup>51</sup> Specifically, spread spectrum users may employ 1 watt of transmitter power coupled with up to 6 dB of antenna gain and a spreading bandwidth of at least 500 kHz. Moreover, the Commission has a pending docket proposing to increase these limits substantially.

WINForum urges the Commission to adopt rules that would allow NII/SUPERNet devices using non-spread spectrum modulations to emit the same energy density limits as spread spectrum Part 15 users in the band, consistent with ET Docket No. 96-8. This action would provide rough parity between spread spectrum systems and other designs, as long as energy is sufficiently dispersed across the band. Such rules would also eliminate interference concerns to other users by rendering the interference profile of NII/SUPERNet devices similar to systems that are already authorized in the band.

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<sup>51</sup>See, e.g., Metricom Comments at 7.

### C. Measurement of Power

In its original comments in this docket, WINForum suggests defining "transmit power" by rule as "[t]he total energy transmitted over a time interval of at most  $30/B$  (where  $B$  is the emission bandwidth of the signal), divided by the interval duration." This definition would be consistent with ANSI C63 SC7's draft standard for verifying compliance of Unlicensed PCS devices with FCC Part 15, Subpart D, for which SC7 has developed measurement techniques. As WINForum's comments argued, its proposed definition will control the interference potential of devices without compromising the value of advanced digital modulation techniques that may be used to optimize spectrum utilization.<sup>52</sup> WINForum urges the Commission to adopt the proposed definition for NII/SUPERNet devices.

### D. Channelization Plan

While WINForum is an advocate of minimal technical regulations, the establishment of minimum channel spacings for the NII/SUPERNet bands is necessary to ensure efficient use of the radio spectrum. The *Notice*, however, proposes to establish maximum -- not minimum -- channel bandwidths. As WINForum explained in its original comments, the 5 GHz band, and especially the spectrum from 5.15-5.35 GHz, represents a unique opportunity to dedicate spectrum for unlicensed wideband systems. While WINForum believes that narrower bandwidth applications are highly important to the National Information Infrastructure, other

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<sup>52</sup>In effect, the choice of measurement interval balances the power penalty for variable envelope signals on the one hand and limitations on the interference on the other. The  $30/B$  interval proposed by WINForum is approximately the time needed to send 20 digital symbols (*e.g.*, 40 bits with 4 level signaling), yet is too short for a transmitter to gain a power level advantage by, for example, sending short bursts of high power.

Part 15 allocations, including 30 MHz of unlicensed PCS spectrum, are available for narrower bandwidth applications.

As WINForum explains in the technical attachment at Tab A, wideband devices with high signaling speed requirements suffer disproportionately from interference by narrow bandwidth devices with low signaling speed requirements and complex rules would be required to correct the imbalance. Thus, broadband systems will never flourish and develop if commingled with relatively narrowband systems, even though broadband systems are the only means for achieving the data rates needed for true multimedia applications. This basic tenet was, in fact, recognized by numerous commenters in this proceeding, including 3Com, Hewlett-Packard, Lucent, Nortel, and others.<sup>53</sup> As these companies also recognize, the issue of channel size implicates complex compatibility questions and other issues that should be resolved through a deliberative industry consensus process, even though a detailed channelization plan is unnecessary. In the interim, WINForum urges the Commission to formally clarify that NII/SUPERNet devices should operate with a minimum channel spacing on the order of 25 MHz, and that channel combining will be permitted. At a minimum, the Commission should ensure that minimum channel spacing regulations apply in the 5.15-5.35 GHz band, with any narrower bandwidth experimentation conducted in the 5.8 GHz band.

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<sup>53</sup>3Com Comments at 4-5; H-P Comments at 5-6; Lucent Comments at 3; Nortel Comments at 10; *see also*, Comments of California Wireless Inc., ET Docket No. 96-102 (July 15, 1996) at 2; LACE Comments at 33.