

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

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**JUL 25 1995**

**FEDERAL COMMUNICATIONS COMMISSION  
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In the Matter of: )  
)  
Wireless Information Networks Forum ) **RM-8648**  
Petition for Rulemaking To Allocate )  
the 5.1 - 5.35 GHz Band and Adopt )  
Service Rules for a Shared Unlicensed )  
Personal Radio Network )  
)  
Apple Computer, Inc. Petition for ) **RM-8653**  
Rulemaking To Allocate Spectrum in )  
the 5 GHz Band To Establish a Wireless )  
Component of the National Information )  
Infrastructure )

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

**WIRELESS INFORMATION  
NETWORKS FORUM**

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## SUMMARY

WINForum, Apple, and the great majority of commenters in this proceeding have documented the immediate, growing need for a substantial new allocation in the 5 GHz band for unlicensed technologies supporting wireless multimedia computing. Specifically, the record demonstrates consensus on the following basic points:

- There is an immediate need for a new spectrum allocation to support wireless, high speed multimedia computing;
- The bandwidth demands of multimedia, including voice, data, graphics, audio, and video, will require a minimum of 250 MHz of spectrum and the allocation should provide flexibility to expand as demand grows;
- To maximize benefits for all Americans, equipment for deployment in the band should be low cost and hold the potential for widespread consumer applications;
- To enable development of lower cost devices and promote interoperability, the new allocation in the United States should build off of work already completed in Europe with respect to HIPERLAN;
- To support the needs of wireless computer users and maximize the benefits of the allocation for all users, the new allocation should be unlicensed and users should be able to deploy devices freely and without constraint;
- To ensure that unlicensed devices do not create unnecessary mutually-harmful interference and to ensure the most effective and efficient use of the band, use of the new allocation should be limited to equipment transmitting packet data under a specific industry-developed etiquette; and,
- To provide for the most flexible deployment and use of the spectrum, the spectrum etiquette governing the band should support centralized medium access (*i.e.*, communications with a fixed point of control) as well as *ad hoc* networking (*i.e.*, networking between users without any fixed control points).

The consensus expressed on this conceptual fundamental framework for a 5 GHz allocation provides a strong record basis for moving ahead expeditiously with a Notice of Proposed Rulemaking in this docket. Indeed, there was a high degree of uniformity on most technical issues and, to the extent any technical differences have been raised, such issues are appropriate for resolution in an industry consensus committee to develop the spectrum etiquette.

Notwithstanding the vast benefits of a 5 GHz unlicensed device allocation, there were a few comments in opposition to the WINForum and Apple concept. These oppositions, however, are misconceived or fundamentally misinterpret the proposals. First, the record and technical data in this proceeding clearly demonstrate that SUPERNet cannot be accommodated in any existing or proposed allocations. Second, WINForum's choice of spectrum bands relied on prior statements by the FAA that aeronautical MLS operations were being curtailed. WINForum intends to work with the FAA to ensure that spectrum is available to meet the needs of both aeronautical and unlicensed users. Third, WINForum believes, and has provided a record basis for determining, that a 5 GHz SUPERNet allocation can harmoniously share with MSS feeder uplinks. Finally, WINForum clarifies that it believes that a SUPERNet etiquette should accommodate devices based on the HIPERLAN standard.

In sum, the record in this proceeding provides a strong basis for expeditiously moving forward with a Notice of Proposed Rulemaking. There is consensus on the basic framework for the allocation that can be refined in technical committees as the allocation proceeding matures. WINForum thus urges the Commission to proceed quickly to bring the vast benefits of broadband wireless data to the public.

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

Wireless Information Networks Forum (“WINForum”), by its attorneys, herewith submits its reply to comments filed on the above-captioned petitions for rulemaking.<sup>1</sup> As discussed below, the comments filed in response to the WINForum and Apple Petitions are overwhelmingly supportive of a substantial new allocation for unlicensed devices in the 5 GHz band to accommodate the demands of mobile multimedia computer users. As these comments note, there is uniform consensus in these petitions on the most important, and basic, elements

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<sup>1</sup> Wireless Information Networks Forum Petition for Rulemaking To Allocate the 5.1 - 5.35 GHz Band and Adopt Service Rules for a Shared Unlicensed Personal Radio Network, RM-8648 (filed May 15, 1995) (“WINForum Petition”); 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”).

of a new allocation. WINForum accordingly urges the Commission to expeditiously adopt a Notice of Proposed Rule Making setting forth this basic framework.

**I. THE COMMENTS STRONGLY SUPPORT THE NEED FOR ADDITIONAL UNLICENSED SPECTRUM IN THE 5 GHz BAND**

**A. The WINForum and Apple Petitions Are Fundamentally Consistent And Share the Goal of an Additional Unlicensed Spectrum Allocation At 5 GHz**

In view of the explosive growth in the use of multimedia technology in the United States and the progress of the High PERFORMANCE Local Area Network ("HIPERLAN") in European forums, WINForum filed a petition for rulemaking on May 15, 1995, seeking the allocation of spectrum in the 5 GHz band for a Shared Unlicensed PERSONAL Radio Network ("SUPERNet"). Shortly thereafter, Apple filed a substantially similar petition seeking spectrum for National Information Infrastructure connectivity. Both of these petitions were placed upon public notice by the Commission and, on July 10, 1995, a large number of comments were filed by parties supporting the benefits of -- and need for -- a new unlicensed allocation for wireless multimedia computing.

As discussed in WINForum's prior comments, the WINForum and Apple concepts are conceptually interchangeable at the most important, and most basic, level. As Compaq notes, "both [petitions] rest upon a common vision of the central importance of unlicensed, wireless service in the emerging National Information Infrastructure."<sup>2</sup> In its petition, WINForum set

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<sup>2</sup> Compaq Comments at 1.

forth a number of basic principles. These principles have been supported by Apple and numerous other commenters:

- There is an immediate need for a new spectrum allocation to support wireless, high speed multimedia computing;<sup>3</sup>
- The bandwidth demands of multimedia, including voice, data, graphics, audio, and video, will require a minimum of 250 MHz of spectrum and the allocation should provide flexibility to expand as demand grows;<sup>4</sup>
- To maximize benefits for all Americans, equipment for deployment in the band should be low cost and hold the potential for widespread consumer applications;<sup>5</sup>
- To enable development of lower cost devices and promote interoperability, the new allocation in the United States should build off of work already completed in Europe with respect to HIPERLAN;<sup>6</sup>
- To support the needs of wireless computer users and maximize the benefits of the allocation for all users, the new allocation should be unlicensed and users should be able to deploy devices freely and without constraint;<sup>7</sup>
- To ensure that unlicensed devices do not create unnecessary mutually-harmful interference and to ensure the most effective and efficient use of the band, use

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<sup>3</sup> Apple Comments at 19; Motorola Comments at 4; Northern Telecom (“Nortel”) Comments at 3.

<sup>4</sup> Apple Comments at 20; AT&T Comments at 3; Information Technology Industry Council (“ITIC”) Comments at 2; Microsoft Comments at 4; Motorola Comments at 2.

<sup>5</sup> Apple Comments at 2.

<sup>6</sup> Apple Comments at 21.

<sup>7</sup> Apple Comments at 19, Microsoft Comments at 3; Motorola Comments at 2; Nortel Comments at 5; Part 15 Coalition Comments at 2.

of the new allocation should be limited to equipment transmitting packet data under a specific industry-developed etiquette;<sup>8</sup> and,

- To provide for the most flexible deployment and use of the spectrum, the spectrum etiquette governing the band should support centralized medium access (*i.e.*, communications with a fixed point of control) as well as *ad hoc* networking (*i.e.*, networking between users without any fixed control points).<sup>9</sup>

All of these most fundamental points are reiterated -- and supplemented -- in the Apple petition and in Apple's comments.

Based upon these fundamental design goals, both WINForum and Apple concluded that the 5 GHz band provided the best hope for meeting the nation's unlicensed communications needs.<sup>10</sup> Both WINForum and Apple noted the Federal Aviation Administration's statements that it was deemphasizing the use of aeronautical Microwave Landing Systems ("MLS") in the 5.0-5.25 GHz band, and crafted proposed spectrum allocations that would utilize more, or less, of this spectrum. Both companies also observed that some Mobile Satellite Service ("MSS") interests were seeking use of the 5.15-5.25 GHz band for MSS feeder uplinks, but noted studies conducted in Europe that demonstrated comparable systems would not interfere with satellite use of the band. Apple, for its part, also sought allocation of an additional 150 MHz of spectrum centered at 5.8 GHz that is currently used for Industrial, Scientific, and Medical ("ISM") devices as well as amateur operations.

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<sup>8</sup> Apple Comments at 20; Center for Democracy and Technology Comments at 6-7; Motorola Comments at 3; Nortel Comments at 5.

<sup>9</sup> Apple Comments at 20; Nortel Comments at 2-3.

<sup>10</sup> *See also* ITIC Comments at 2.

**B. The Comments Strongly Support the Need for the Spectrum Allocation Requested By WINForum and Apple**

The comments in response to WINForum and Apple's efforts were nearly unanimously supportive.<sup>11</sup> Based on the explosive growth of multimedia technology, and commensurate demands on transmission infrastructures, as well as the growing demand for tetherless access, commenters argued that unlicensed allocations are uniquely positioned "to provide benefits to 'virtually every person and business in the nation'"<sup>12</sup> and that "[n]ew interactive media . . . have tremendous potential to stimulate improvements in the economic, cultural, educational, and political life of our country."<sup>13</sup> Parties also substantiated the benefits described by WINForum and Apple for educational, medical, library, industrial, and business users, and requested expeditious action by the FCC to make a 5 GHz unlicensed allocation a reality.

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<sup>11</sup> In addition to supporting comments by the American Library Association, Apple, AT&T, the Center for Democracy and Technology, Compaq, the Council of Chief State School Officials; ITIC, Microsoft, Motorola, the National Educational Telecommunications Organization/Educational Satellite Institute, Nortel, the Part 15 Coalition, the Triangle Coalition for Science and Technology Education, and the United States Department of Veteran's Affairs, literally scores of e-mail, letter, and postcard comments were filed by individuals supporting an unlicensed device allocation in the 5 GHz band. These comments continue to pour in daily.

<sup>12</sup> Part 15 Coalition Comments at 3 (quoting PCS First R&O, p32).

<sup>13</sup> Center for Democracy and Technology Comments at 2.

**1. The comments demonstrate the need for additional unlicensed spectrum allocations**

As commenters have noted, unlicensed spectrum allocations are uniquely positioned to serve the public interest.<sup>14</sup> Unlicensed device allocations, being available to all Americans at little or no cost for use of the spectrum, constitute a common resource that is arguably closest to achieving the Commission's overriding goal of serving the public good. Moreover, as discussed below, this type of allocation is singularly capable of meeting the emerging bandwidth and mobility needs of wireless computer networks.

As Microsoft notes, "[t]he nature of data is changing rapidly."<sup>15</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 digital video."<sup>16</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>17</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.

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<sup>14</sup> Apple Comments at 4-10; ITIC Comments at 3; Part 15 Coalition Comments at 3.

<sup>15</sup> Microsoft Comments at 2.

<sup>16</sup> *Id.*

<sup>17</sup> *Id.*

The comments also demonstrate that tetherless access is a critical component of the National Information Infrastructure (“NII”).<sup>18</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>19</sup> The unlicensed allocation proposed by WINForum and Apple 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>20</sup> At this time, existing wireless systems are simply not capable of providing the 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 that, by necessity, must recover the costs of a substantial fixed infrastructure.<sup>21</sup> Finally, unlicensed technologies can ameliorate the current inequities in information availability by providing low-cost premises networking capabilities for users than cannot be served by alternative means.<sup>22</sup>

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<sup>18</sup> Apple Comments at 3; ITIC Comments at 3.

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

<sup>20</sup> ITIC Comments at 3.

<sup>21</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>22</sup> ITIC Comments at 3; Part 15 Coalition at 3-4.

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>23</sup> Indeed, the benefits of unlicensed technologies has been noted both by the FCC,<sup>24</sup> and NTIA, which stated “[T]he critical importance of [unlicensed] wireless systems . . . to the future development of the [NII] is well recognized and supported.”<sup>25</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 the kind of broadband, high speed, highly reliable communications services necessary for the development of the NII.”<sup>26</sup>

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<sup>23</sup> Part 15 Coalition at 3.

<sup>24</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. 9 FCC Rcd 7078. First R&O quotes.

<sup>25</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).

<sup>26</sup> Part 15 Coalition Comments at 2.

**2. The comments substantiate the vast benefits of an unlicensed allocation for all educational, medical, library, business, and industrial users**

Both WINForum and Apple described in their petitions the substantial benefits for the public of a new unlicensed allocation at 5 GHz. Providing compelling evidence of the pent up demand for, and practical uses of, unlicensed technologies, the commenters in this proceeding have both substantiated the litany of benefits described by WINForum and Apple, as well as describing additional, new uses for such an allocation.<sup>27</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 Offer Substantial Benefits for Educational Users.* Both the WINForum and Apple petitions documented the benefits of a broadband, wireless NII component for schools.<sup>28</sup> 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

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<sup>27</sup> See, e.g., United States Department of Veterans Affairs (describing numerous applications for persons with disabilities, including streetsigns and ATMs that “talk” to personal devices for the community with disabilities).

<sup>28</sup> See also Apple Comments at 11; Council of Chief State School Officials Comments at 1-2; Microsoft Comments at 3; Nortel Comments at 3; see also Comments of Bruce Umbaugh, Ass’t Professor of Philosophy, Webster University; Comments of Roger Hendricks, University of Florida; Comments of Mark D. LeBlanc, Wheaton College; Comments of Bart Preecs.

desktop is phenomenal,”<sup>29</sup> 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>30</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>31</sup>

The importance of the last link to the student cannot be understated. As Apple notes, 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>32</sup> For many schools, information resources are available, but effectively underused, since “[u]ntil information can be delivered to, used in, and transmitted from the particular locations in which people work or study, it will be of limited utility.”<sup>33</sup> Thus, for educational institutions, “[u]nlicensed services

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<sup>29</sup> Microsoft Comments at 3. *See also* Apple Comments at 12 (estimating the cost of wiring America’s K-12 schools at \$30 billion); Council of Chief State School Officials at 2 (noting wiring schools is “prohibitively expensive” and that “some systems have chosen to tear down and rebuild schools rather than wire them for the communications and computing age”).

<sup>30</sup> Microsoft Comments at 3.

<sup>31</sup> *See, e.g.*, National Educational Telecommunications Organization/Educational Satellite Institute Comments at 1; Triangle Coalition for Science and Technology Education Comments at 1.

<sup>32</sup> Apple Comments at 11 (emphasis in original).

<sup>33</sup> *Id.*

. . . offer a range of services at substantially lower costs than wired and licensed-wireless networks, and . . . provide their users with greater flexibility and control to design and implement networks that meet their unique needs.”<sup>34</sup>

*The Proposed Allocation Will Provide Substantial Benefits for Medical Users.* In its petition, WINForum also noted that broadband wireless networking also holds significant potential to improve the quality, and reduce the costs, of medical care in the United States. In particular, WINForum noted that 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 enabling “group diagnosis[,] resulting in better and more efficient diagnosis of complex cases without the need for the relevant experts to physically get together.”<sup>35</sup> Microsoft, for its part, similarly notes 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>36</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.

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<sup>34</sup> *Id.* at 12. See also National Educational Telecommunications Organization/Educational Satellite Institute Comments at 2-3.

<sup>35</sup> WINForum petition at 4.

<sup>36</sup> Microsoft Comments at 3.

*The Proposed Allocation Will Have Substantial Benefits for Libraries, with Commensurate Benefits for All Information Users.* In addition to the applications cited by WINForum, Apple and other also note that wireless networks have the potential to significantly improve the delivery of services by, and the functioning of, libraries.<sup>37</sup> Apple notes a recent Business Week article that 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>38</sup> However, library funding is being "slashed"<sup>39</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>40</sup>

*The Proposed Allocation Will Provide Substantial Benefits for Business and Industrial Users.* As WINForum and others have noted,<sup>41</sup> broadband networks will "create jobs, foster economic growth, and improve access to communications by industry and the American

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<sup>37</sup> American Library Association Comments; Apple Comments at 12-15; Comments of Chris Mays.

<sup>38</sup> Apple at 15; Comments of Gary Fisher.

<sup>39</sup> *Id.*

<sup>40</sup> *Id.*

<sup>41</sup> Nortel at 3.

public.”<sup>42</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.

**3. The comments urge prompt action by the FCC to make this unlicensed allocation a reality**

Numerous commenters have joined WINForum and Apple in calling for expeditious action by the FCC to realize these benefits for the public.<sup>43</sup> As ITIC observes, “a 5 GHz unlicensed allocation will augment existing unlicensed allocations, satisfy demands that cannot be met with other existing and proposed services . . . , and provide a path toward full use of higher spectrum bands. . . . [but,] [i]f these benefits are to be made available in the near term, and in order for U.S. efforts to proceed in harmony with European HIPERLAN

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<sup>42</sup> Emerging Technologies 5 GHz at p.1.

<sup>43</sup> Apple Comments at 19; Council of Chief State School Officials at 2; ITIC Comments at 6; Nortel Comments at 3.

developments, . . . the FCC must act promptly.”<sup>44</sup> Similarly, Apple notes that “[i]f NII Band devices are to be available in a timely manner,” and “to assure that the United States is not left in a ‘catch-up’ position,” “[t]he Commission should act promptly to adopt [an] NPRM and to authorize a 5 GHz unlicensed band, as proposed in the Petitions.”<sup>45</sup>

## **II. THE FEW CRITICISMS OF THE WINFORUM AND APPLE PETITIONS ARE MISPLACED OR FUNDAMENTALLY MISINTERPRET THE PROPOSED ALLOCATION**

Notwithstanding the strong support for the WINForum and Apple petitions, a few commenters took issue with some minor aspects of one or another of the proposals. However, at least with respect to the issues implicated by the WINForum petition, these criticisms are largely unfounded or are based on a fundamental misinterpretation of the proposed allocation. Each of these criticisms is discussed briefly below.

### **A. Existing Spectrum Allocations Cannot Accommodate the Critical Needs that Will Be Supported By the SUPERNet Allocation**

A few commenters have argued that SUPERNet or Apple’s proposal could be accommodated in alternative bands. However, the choice of 5 GHz by both WINForum and Apple was not happenstance or lightly undertaken. All other allocations and potential

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<sup>44</sup> ITIC Comments at 7.

<sup>45</sup> Apple at 19.

allocations were carefully considered and, for various reasons, rejected.<sup>46</sup> As other commenters have recognized, the 5 GHz proposals address a problem that cannot be solved using any other existing or proposed allocation.

As an initial matter, unlicensed device allocations provide solutions that cannot, or will not, be provided by licensed networks. The 20 mbps data rates envisioned by WINForum as needed to support multimedia technology will require channel bandwidths on the order of 20 MHz. Licensed wireless carriers simply cannot dedicate the bandwidth necessary to offer such services on a widespread basis. In addition, unlicensed devices are not constrained by the economics dictating where or when licensed services are provided -- they can be deployed anywhere at anytime. As a final matter, *only* unlicensed devices will provide virtually unlimited access without recurring costs. This factor is critically important for institutions like schools and hospitals where the cost of airtime would rapidly subsume the budgets of even the most well-funded institutions.

Commenters have noted, however, that there are other existing and proposed allocations for unlicensed devices. Most of these allocations, unfortunately, suffer constraints that would preclude efficient, high speed, broadband use. The existing unlicensed PCS allocations in the 1.9 GHz and 2.3 GHz bands, for example, simply do not have sufficient spectrum to allow the widespread use of 20 mbps devices. Even if that were not the case, the WINForum and Apple concept is more than "seek[ing] more spectrum for [unlicensed

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<sup>46</sup>

*See also* ITIC Comments at 5-6; Apple Comments at 16-18.

PCS].”<sup>47</sup> Although unlicensed PCS is a remarkable and necessary advance in wireless telecommunications, the spectrum etiquette governing unlicensed PCS devices is optimized to provide efficiency under the existing data dichotomy that separates information into voice and data. The SUPERNet and Apple concepts are designed to accommodate the applications that are now emerging where data is *information*, whether audio, text, graphics, video, or a combination thereof.

Nor are other existing Part 15 allocations any more suitable. As noted in the comments of the Part 15 Coalition:

Under Part 15, unlicensed technologies must not cause interference to other non-Part 15 users of the spectrum and they are not themselves protected from interference. As a result, many advanced applications, and those requiring extremely high reliability, have so far remained wired or, where they require wireless connections, have not developed at all. As Part 15 technologies become more sophisticated and ubiquitous, this lack of interference protection will become more critical.<sup>48</sup>

Both WINForum and Apple have independently recognized that to achieve the level of efficiency and interference-free operation necessary for high speed applications, devices must operate under a common etiquette. However, given the congestion in existing Part 15 bands, as well as the impossibility of attempting to impose an etiquette on non-intentional radiators,

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<sup>47</sup> Compaq Comments at 2.

<sup>48</sup> Part 15 Coalition Comments at 4.

the rigors of an etiquette cannot be imposed in existing Part 15 bands.<sup>49</sup> Moreover, given the valuable benefits served by these bands, “converting” an existing Part 15 band would also detrimentally impact the availability of other wireless solutions for the public.

The comments also properly observe that the licensed allocations at 18 GHz for digital electronic messaging services (“DEMS”) are also unsuitable for conversion into unlicensed spectrum for broadband data.<sup>50</sup> As an initial matter, there is only 100 MHz of spectrum available in the private and common carrier DEMS bands combined. As shown in the WINForum Petition, at least 250 MHz of spectrum will be needed to accommodate the bandwidth and information transmission density predicted for multimedia applications. Moreover, a domestic allocation for such uses in the 18 GHz band would defeat the goal of attempting to achieve spectrum compatibility with HIPERLAN developments in Europe.

WINForum also notes that there is a pending proposal to allocate a significant amount of spectrum above 40 GHz for computer-to-computer communications. As WINForum noted in its prior comments, it supports the reservation of additional frequencies for broadband unlicensed use and believes such spectrum will be critical in meeting future demand. However, at this time, the state of radio technology is not sufficiently advanced to permit the use of millimeter wave frequencies for widespread, short range, high speed data use. There are substantial propagation penalties attendant with the use of above 40 GHz frequencies that would require resorting to significantly higher power or smart antenna systems. Neither of

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<sup>49</sup> See, e.g., Part 15 Coalition Comments at 5.

<sup>50</sup> ITIC Comments at 4 n.5.

these options is currently feasible for widespread, wireless applications where cost and battery life are critical to success. Moreover, as noted by the Part 15 Coalition, "due to oxygen absorption effects at higher frequencies, these bands are not well suited for medium-range, high-speed, outdoor data links."<sup>51</sup>

In sum, the allocation proposed by WINForum and Apple for high speed, broadband data is not an extension of, and cannot be accommodated in, any existing or proposed frequency band. Rather, as commenters have noted, the 5 GHz proposal is a necessary component within the overall matrix of unlicensed allocations designed for very specific, verifiable needs. As such, it is not a replacement for existing allocations nor intended to supplant the need for additional allocations in the future.

**B. WINForum's Choice of Spectrum Was Driven By the FAA's Prior Statements Regarding the Use of MLS and Is Not Intended To Preempt Necessary Aeronautical Needs**

Both WINForum and Apple selected similar lower band 5 GHz frequencies owing to the FAA's prior statements that MLS was being deemphasized in favor of differential GPS.<sup>52</sup> In their recently filed comments, however, the FAA now states that MLS will move forward in some instances, and accordingly they oppose any use of the 5.0-5.15 GHz band for

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<sup>51</sup> Part 15 Coalition Comments at 5.

<sup>52</sup> See, e.g., "FAA Won't Develop New Landing System; U.S. Spent 27 Years, \$400 Million on Project," *Washington Post* at Section B1 (June 3, 1994); "FAA Backs Off Plans to Develop New System for Plane Landings," *Los Angeles Times* at A16 (June 3, 1994).

unlicensed devices. The FAA also expresses doubts about resolving potential adjacent channel interference from unlicensed device use of the 5.15-5.25 GHz MLS expansion band.

WINForum has no interest in impairing the deployment of necessary systems to assure the health and safety of airline passengers. Nonetheless, WINForum understood that the U.S. position at WRC was that MLS transition plans contemplated "initial operations in the 5030-5090 MHz band and subsequent expansion (subject to need) into the 5000-5150 MHz band."<sup>53</sup> WINForum believed that substantial amounts of the 250 MHz allocated for MLS and MLS expansion could be freed for alternative uses if MLS deployment will not be widespread. Moreover, WINForum noted that technical studies have demonstrated that adjacent channel interference from SUPERNet-type devices will *not* harm MLS systems.<sup>54</sup>

WINForum notes that its original petition requested allocation of the 5.1-5.35 GHz bands, with the potential for further expansion into the 5.35-5.5 GHz bands if sharing with government radiolocation systems in that portion of the spectrum proved feasible.

WINForum's request for such spectrum recognized that there are substantial benefits to the

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<sup>53</sup> United States Proposals for the World Radiocommunication Conference (Geneva, 1995) at App. C, p. 3 (June 14, 1995).

<sup>54</sup> Because MLS deployment in Europe in the 5.1-5.15 GHz band is proceeding, extensive studies have been conducted to assess the potential for adjacent channel interference to MLS systems from HIPERLAN devices operating in the 5.15-5.30 GHz band. The ERC work on MLS compatibility concluded that, with HIPERLAN constrained to -30 dBm/100 kHz power outside its band, MLS systems in the adjacent band would not be affected -- not even when HIPERLAN systems would be deployed directly between the approach path of an airport. See Exhibit B. Because, at least from an emissions perspective, SUPERNet will be analogous to HIPERLAN, these studies should provide the FAA with sufficient assurances that SUPERNet will be a compatible adjacent channel allocation.

public in obtaining a large, contiguous block of spectrum for wireless LANs owing to lower equipment costs. If, as the FAA states, the spectrum in the 5.1-5.15 GHz band is critical for other applications necessary for safety, the availability of additional spectrum in the 5.35-5.5 GHz band could potentially provide a feasible solution. WINForum has already undertaken initial discussions on the potential for reallocation of 5 GHz bands with NTIA, and looks forward to working with both the FAA and NTIA in ensuring spectrum is available to meet both aeronautical and SUPERNet needs.

**C. The SUPERNet Allocation Can Harmoniously Share With MSS Uses**

Constellation Communications, Inc. ("Constellation") and Loral/Qualcomm Partnership, L.P. ("Loral"),<sup>55</sup> both MSS interests, have opposed moving forward with a Notice of Proposed Rulemaking based on assertions that an unlicensed device allocation in the 5 GHz band could detrimentally impact their satellite feeder uplinks stations.<sup>56</sup> Both argue that

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<sup>55</sup> Comments of Constellation Communications, Inc. ("Constellation"); Opposition of Loral/Qualcomm, L.P. ("Loral"), *but see*, Comments of Andrew Huang, Qualcomm, Inc. (supporting 5 GHz proposals).

<sup>56</sup> Loral also makes the argument that the U.S. has "already declined to support an international allocation for the service proposed by Apple and WINForum," and therefore that the Commission has already set a broad policy of favoring MSS over wireless LANs in the 5 GHz band. Loral at 3, 6-9. While the Commission has declined to add a wireless LAN proposal to the WRC agenda for 1997, the door has been left open in future WRC proceedings, "if necessary." Preparation for International Telecommunication Union Radiocommunication Conferences, IC Docket No. 94-31, FCC 95-256 (June 15, 1995) at ¶97. The Commission also indicated that a wireless LAN proposal may *never be needed* at WRC conferences, stating that "it has yet to be demonstrated that an international allocation is necessary to implement [SUPERNet] in the U.S." *Id.*

WINForum and Apple “do not present . . . any convincing sharing analyses to demonstrate that harmful interference will not be caused.”<sup>57</sup>

WINForum believes that wireless LANs can coexist harmoniously with MSS feeder uplinks. Indeed, 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, preliminary studies in Europe have concluded that MSS feeder uplinks and HIPERLAN deployment are compatible and, while Loral and Constellation argue that these studies should not apply to a domestic 5 GHz wireless LAN proposal,<sup>58</sup> they concede that SUPERNet is “a similar service” to HIPERLAN.<sup>59</sup> In any event, the mere speculative potential for interference alleged by interested parties should not constitute sufficient grounds for “rejecting the WINForum and Apple petitions.”<sup>60</sup> Interference concerns, to the extent they may exist at all, can be addressed in the context of a domestic allocation and rulemaking proceeding.

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<sup>57</sup> Constellation Opposition at 2. See also Loral at 5 (stating “[n]either petitioner provides any study of its own of sharing between non-GSO MSS feeder links and the proposed high-speed wireless service.”).

<sup>58</sup> Loral’s engineering study to the contrary makes at least one fundamental error in that it assumes all SUPERNet devices will be activated at the same time. As discussed in Exhibit A, assuming a 1 percent activation level is extremely conservative and anything higher is contrary to engineering logic.

<sup>59</sup> Loral at 5.

<sup>60</sup> Loral at 8.