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

In the Matter of	
Revision of Parts 2 and 15 of the Commission's Rules and the Petition for Rulemaking to Permit Unlicensed National Information Infrastructure Devices to Operate in the 5.470-5.725 GHz Band	ET Docket No. 03-122 RM-10371
To: The Commission	

REPLY COMMENTS OF NEXTWEB, Inc. AND THE WIRELESS BAY AREA NETWORK COORDINATION (BANC) GROUP

Introduction

We hereby reply to the Rulemaking and previous comments concerning the above-referenced FCC's Notice of Proposed Rulemaking ("NPRM") in response to the petition from WECA for wireless LAN service. The NPRM not only proposes new rules for 225 MHz additional spectrum in the 5 GHz band, but it also modifies the rules for some of the current 5 GHz spectrum and changes the status of primary and secondary allocations in parts of the 5 GHz band.

Discussion

Firstly, we applaud the FCC for creating this NPRM as it contains a very welcome and significant amount of license-exempt spectrum. It is, of course, very encouraging to see the FCC continue to pioneer worldwide regulations for license-exempt spectrum that has been so successful in regenerating a major segment of the US wireless industry.

Next, we also want to emphasize that the NPRM contains a good set of design rules for wireless LAN (WLAN) service that is generally indoors and communicates over short distances to individual users. We think that the RF power limitations (EIRP and ATPC), and frequency selection algorithms (DFS) should present no major problems for the needs of the

wireless LAN market, where interference is not a major issue, radar signals generally isolated by building shielding loss and individual users do not expect highly reliable, "always-on" connections.

However, the same rules in the NPRM are widely recognized to result in an extremely weak set of criteria for use by the wireless WAN market that is outdoors with distances generally from 1-10 miles: i.e. "the last mile". The wireless WAN market requires an "always-on" connection with a much higher level of reliability, capable of supporting a whole set of users, and with directional antennas, monitoring systems and network administrators handling the far higher demands of outdoor interference protection.

Therefore, while we understand that the NPRM is a compromise between the needs of the industry on one hand, and the constraints of the DoD and international administrators on the other, we are very concerned that with this generous grant of spectrum for wireless LAN services; there will not be any room for a well-deserved, subsequent and comparable grant of spectrum for wireless WAN services. Further, if the current rules in this NPRM are implemented with no identified future spectrum with rules designed for wireless LAN users, then we may well in fact be worse off than we were before this NPRM because of the retroactive impact to the UNII mid band (5.25 – 5.35 GHz). In other words, we feel that the FCC does not appreciate the on-going needs of the last mile service providers for license-exempt spectrum and that we may be subject to the undesirable effect known as the "tyranny of the majority," in part because the WECA asserts that outdoor service only comprises 1% of the total number of devices.

"Last-mile" wireless WAN operations

License-exempt operation in the wireless WAN ("last mile") environment is a complex challenge. There is no doubt that NextWeb and BANC would very much like a technical solution that provides us with automatic interference-free operation in the license-exempt bands. However, just because wireless LAN products currently contain DFS circuits in order to channel spread devices and check for the quality of each channel, does not mean that there is a viable technology to automatically eliminate interference in outdoor "last mile" service. Therefore, we are very concerned that the FCC is attempting to regulate these bands with the assumption that such technology exists, when in fact it does not – at least, not yet.

To better appreciate the regulations desirable for the license-exempt wireless WAN market and the need for future frequencies to better serve this expanding market, we wish to share the operational and technical features that are currently successful.

For wireless WAN (or "last mile") use, products need to operate in a manner that permits a high level of dependability in order to provide a trusted "level of service" to the user and the customer. Wireless WAN services must sustain high levels of consistent throughput in a manner that the service to the user/customer will more likely operate without interruption – the "always-on" connection. Wireless ISPs like NextWeb and other BANC members, as well as other wireless WAN users, require a "level of service" that can be managed and

trusted to operate at a service level of 99.99% or better – even if operating in Part 15 license-exempt frequencies. There is no "sleep mode" for a last-mile wireless WAN device!

Today, the typical wireless WAN customer is a small to medium-sized enterprise (SME) who needs a minimum of a T1 speed (~1.5 Mbps symmetrical) connection to the Internet. Many higher scale business customers need 2-6 more T1s of Internet connection speed (3-10 Mbps). These customers expect that their service will be as reliable as or better than equivalent wire-line services – and for the most part, we are meeting this expectation today.

There are also those companies that require even higher bandwidth, but those speeds (DS-3 or similar and higher) are generally better provided using point-to-point licensed microwave products operating under Part 101.

Generally, license-exempt operators meet these customer expectations using point-to-multipoint base stations serving line-of-sight fixed customers up to 10 miles from the base station with ISM or UNII radios having a preset frequency and directional subscriber antennas. The primary band for this service is the 5.725 – 5.825 GHz (upper 5 GHz) band. However, due to the need to coordinate frequency use and avoid interference, many operators also use the 5.25 – 5.35 GHz (mid 5 GHz) band for a substantial part of their operations, despite the reduced level permitted in EIRP RF output. The frequencies are always scanned to find the best clear channel immediately prior to installation and operation of a new AP at the base station.

There are three key elements that allow all this to be successful:

1) Adequate system gain resulting from sufficient RF output power (either 15.247 Rules, or the upper U-NII 15.407 Rules) to cover "the last mile" customers, which may in fact be 10 miles from the base station;
2) A means of predetermining open channels, such as a built-in spectrum analyzer ; and
3) The freedom to deploy without undue restrictions to avoid specific interference as it arises.

License-exempt does NOT have to mean uncoordinated

NextWeb and others listed, are part of the wireless BANC (Bay Area Network Coordination) group who maintain communication (such as use of the web and email) to coordinate their use of the U-NII bands in the San Francisco Bay Area. The BANC is where we make deposits and withdrawals of the finite shared frequencies in order to offer each of our customers a high level of reliability on their wireless connection. By maintaining a high level of coordination, we have been able to avoid service interruption and interference not only for our own businesses, but also for those new operators who have also have made an attempt to collocate equipment. A sign on the equipment room door at each shared base station location has a phone number to call to get assistance. This assistance can be provided by any member with regard to the frequency channel, azimuth direction, and antenna polarization, with specific antennas options, that might be available to the new tenant.

It all began with an invitation to meet and decide on a set of workable rules in order to assure each other of a manageable method to grow their businesses and deliver a high quality of service. Importantly, more than just communicating with each other before turning on or redirecting a transmitter/transceiver, our coordination process allows for keeping costs to a manageable level and not burdening each business with the high expense of chasing down every new case of interference.

Differences between Wireless LANs and "last-mile" Wireless WANs

While it is true that many wireless LAN devices may be used for 'last-mile" applications at 5 GHz, there are a significant and growing number of major networks using proprietary products for "last-mile" wireless WAN applications. These devices work completely differently from wireless LANs at 5 GHz with regard to fixed locations, directional antennas, always-on requirements, received signal levels and LOS (line-of-sight). It is important to note that the technology termed Wi-Fi is essentially a commercial, public, wireless LAN with an access point and an external WAN (a T1, DSL, or a wireless WAN) connection to the Internet rather than being itself a "last-mile" wireless WAN technology. In comparison therefore:

1) Wireless WANs generally operate with fixed subscriber locations, wireless LANs generally operate with portable or mobile clients.

2) Wireless WANs generally operate with directional antennas (for example, 18 dBi) compared to wireless LAN devices that generally have omni-directional antennas.

3) Because traffic through wireless WANs is delivered to multiple end-users, transmitter duty cycle, throughput distribution, and latency cannot be assumed to follow the same pattern or model as for wireless LANs.

4) Generally, wireless WANs are operated at 5 GHz with clear line-of-sight (LOS) between the base station AP (access point) and SU (subscriber unit) with little or no building shielding or excess path losses.

5) Because wireless WANs operate in the "last-mile" arena generally with good LOS but with low EIRP power in order to achieve adequate coverage, they operate much closer to their physical threshold than wireless LANs. This is generally acceptable because there is typically little fading with path lengths up to 7 – 10 miles at 5 GHz and many connections are reliably established with less than 6 dB of fade margin. In contrast, wireless LANs operate over shorter distances with much higher signals received over multiple paths. A higher excess receive signal is also needed for wireless LANS because there is greater path variation due to the non-LOS and "moveable" nature of the distance between the AP and client.

As a result, technologies used in wireless LAN devices and their interference models must be adapted for use in wireless WAN applications.

Wireless WANs and Radar

There is no question that for wireless WAN devices (just as with wireless LAN devices), in the case of radar interference, there will always be a higher radar signal received into the wireless device compared to the wireless signal received into the radar receiver. This is primarily due to the massive difference in transmitter EIRP levels (especially in the case of ground-based radar facilities.)

When this is coupled with the need for wireless WANs to be always-on, and the elimination of much of the building shielding and excess path losses, it is clear that wireless WANs just cannot operate in the presence of radar signals. In fact, there is probably no need to regulate this issue because network administrators must keep their wireless WANs clear of all radar signals and other interference in order to preserve the reliability of their networks. At the slightest sign of packet loss, the wireless WAN administrator will commence defensive measures long before there is any degradation of the radar in operation. As a result, we believe that the need for, and the benefit of DFS is greatly overestimated.

Wireless WANs and DFS

There are several specific issues regarding the DFS proposal in the NPRM (Section 15.407 (h) 2)) that we are concerned will not work for wireless WAN applications (however much we may wish for them to work)!

The first major issue is the widespread use of the phrase “radar signal,” such as “to detect the presence of radar signals” and “if there is a radar system already operating.” U-NII devices do not yet have the capability to determine if a signal is a radar signal or not. So, the DFS mechanism will essentially be required to operate for any signal detected above threshold (except the desired link signal, of course).

Therefore, in regard to the DFS threshold measurement, this must be a reliable sustainable measurement. Clearly there needs to be a bandwidth correction factor over the current proposal with a 1W threshold coming in at –82 dBm with an 18 dBi antenna (which is well below the practical system limit for many point-to-multipoint wireless WAN systems). Assuming a 10 log B1/B2 formula, then the correction for a 20 MHz bandwidth system would be 13 dB for a 1 MHz radar signal, allowing a more realistic –69 dBm detection threshold, for example.

The next issue is essentially in regard to operational modes. Because this proposal appears to be primarily a documentation of current wireless LAN protocols, it is much too specific for other proprietary wireless WAN systems. Specifically, the concern is that in an area with multiple coordinated service providers, the operational mode algorithms may cause units to switch frequency upon any noise that is detected. In practice, control for this must reside in the base station AP. Now, in the WAN environment, the proposed automatic frequency switching is liable to cause chaos not only to adjacent sectors and base stations, but also to

other service providers in the area. For example, with the proposed DFS scheme, any radar hit or signal from company/product X would cause company/product Y to shift frequency, thereby causing company Z to likewise move and start an uncontrollable domino-effect of product-chasing due to the survivable mandate to automatically shift to another frequency. This calamity would be due to a particular dB threshold that could have all started with the wrong reason (hardware malfunction or a simple stray in-band signal). Even worse, a hand-held device that creates an in-band signal could well look like radar interference and cause and upset with all wireless WAN networks in the area (not unlike getting a virus). This type of event would look and respond at a level unacceptable to the WAN market because its automatic action could not be trusted for any degree for the necessary "quality of service."

Finally, the requirement for a 30 minute non-occupancy period flies in the face of an "always-on" need for wireless WAN services. While we would certainly like to have a DFS feature which works, we would be extremely concerned if we were to be constrained to avoid using this new spectrum. This is because it was not possible for vendors to develop a reliable last-mile wireless WAN product that meets these particular DFS specifications.

Further, because part of our networks currently use the 5.25 – 5.35 GHz mid U-NII band, we would be especially worried that this band would be closed to us in future. We would be forced to move back to the crowded 5.725 – 5.825 GHz upper-UNII band because products might not arrive in time (if ever) to meet the retroactive requirements of this NPRM in this existing U-NII band for the reasons mentioned above.

As a result, we believe that wireless WAN devices should receive either an exemption from this DFS requirement, or a modified specification should be thoroughly considered for wireless WAN devices and additional time allowed for implementation.

Wireless WANs and TPC

Because, as noted above, wireless WAN devices frequently operate closer to threshold; a 6 dB transmit power control (TPC) would have a major impact on system performance. In fact, most of the SUs and probably all of the APs would be in full power mode all the time and the TPC reduction would likely never be realized. However, whether realized or not, it would need to be implemented seamlessly so that the continuous wireless WAN traffic was not interrupted by any transitions that were not pre-managed.

As a result, we believe that wireless WAN devices should receive either an exemption from this TPC requirement, or a modified specification should be thoroughly considered for wireless WAN devices.

Wireless WANs and EIRP

As also noted above, there is no excess transmit power wasted by wireless WAN devices! While we do not seek any increase in the 1W transmitter power output limit, we respectfully suggest that directional antennas should be encouraged and that EIRP should not be limited

for wireless WAN devices in the 5.25 – 5.3 and 5.47 .-5.725 U-NII bands. In fact, should the DFS specifications, as they currently stand, be implemented; it would in fact be entirely appropriate to allow a higher EIRP as this would be consistent with the lower DFS threshold specification when directional antennas are employed. In fact, not to do so would be a contradiction.

Additionally, in rural areas where there is a need for further distances and where there are no other users, it seems obvious to reconsider the proposed EIRP limits. A modest increase of 6 dB will provide a valuable yield of twice the range and four times the coverage area.

Additional Frequency Bands for License-exempt, wireless WANs

Given that the proposed NPRM is probably a "done deal" with international approval at WRC 03 and considering that proposed rules may not work well for license-exempt, wireless WAN service; it may be appropriate for the FCC to consider possible additional bands for this application.

Additional frequency bands for license-exempt service are needed in dense urban environments because of increasing congestion in the 5.725 – 5.825 U-NII band which is also shared with the 5.725 – 5.85 GHz ISM band (Part 15.247). We would propose that the rules for any new band would be simply the same as for the 5.725 – 5.825 U-NII band.

We would like to draw the Commission's attention to the current availability of both US manufactured point-to-multipoint products as well as international frequency assignments in the 3.4 – 3.6 GHz and 10.15 – 10.65 GHz bands, for example.

Summary

We respectively request the FCC to consider that this proposed rulemaking contains elements that do not meet the needs of wireless WAN ("last mile") service and may prove unworkable as currently proposed for service providers of last-mile wireless WAN networks. There is no doubt that NextWeb and the BANC would very much like a technical solution that provides us with interference-free operation in license-exempt bands. However, we are very concerned that the FCC is attempting to regulate these bands with the assumption that such technology exists, when in fact it does not.

Therefore, specifically, we request relaxing of the implementation deadlines for DFS, TPC and EIRP specifications for the new 5.47 – 5.725 GHz band to allow more work on the specifications and algorithms for last-mile wireless WANs. We also respectively request that the current U-NII Rules Part 15.407 remain unchanged with respect to the proposed retroactive DFS and TPC contained in the NPRM for the 5.25 – 5.35 GHz U-NII band.

Alternatively, we propose that the FCC consider an additional frequency band, below 11 GHz optimally regulated for license-exempt, last-mile, wireless WAN service.

Finally, we observe that specific rules of operation may well be unnecessary and superfluous. Considering that Part 15 devices already operate on a secondary basis where they are required to both accept interference and avoid causing interference to other users – and especially considering the proposed new primary status allocations for radiolocation.

Sincerely,

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