

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)	
)	
Revision of Parts 2 and 15 of the Commission's)	ET Docket No. 03-122
Rules to Permit Unlicensed National Information)	RM - 10371
Infrastructure (U-NII) devices in the 5 GHz band)	
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NOTICE OF PROPOSED RULEMAKING

Adopted: May 15, 2003

Released: June 4, 2003

Comments date: [120 days from date of publication in the Federal Register]

Reply comments date: [150 days from date of publication in the Federal Register]

By the Commission: Chairman Powell, Commissioners Abernathy and Adelstein issuing separate statements; Commissioners Copps and Martin issuing a joint statement.

INTRODUCTION

1. By this action, we propose to amend Part 15 of our rules governing the operation of unlicensed National Information Infrastructure (U-NII) devices,¹ including Radio Local Area Networks (RLANs), to make available an additional 255 megahertz of spectrum in the 5.47–5.725 GHz band.² This will increase the spectrum available to unlicensed devices in the 5 GHz region of the spectrum by nearly 80%, and, it represents a significant increase in the spectrum available for unlicensed devices across the overall radio spectrum. This action responds to the petition for rule making submitted by the Wireless Ethernet Compatibility Alliance (WECA – now known as the Wi-Fi Alliance).³ We believe that the increased available capacity gained from access to an additional 255 megahertz of spectrum, coupled with the ease of deployment and operational flexibility provided by our U-NII rules, will foster the development of a wide range of new and innovative unlicensed devices and lead to increased wireless broadband access and investment.⁴ Also, this proposal would align the frequency bands used by U-NII

¹ U-NII devices are “[i]ntentional radiators operating in the frequency bands 5.15-5.35 GHz and 5.725-5.825 GHz that use wideband digital modulation techniques and provide a wide array of high data rate mobile and fixed communications for individuals, businesses, and institutions.” 47 C.F.R. § 15.403(i).

² See 47 C.F.R. Part 15 Subpart E – Unlicensed National Information Infrastructure Devices.

³ See WECA Petition for Rulemaking, RM-10371, filed on January 15, 2002, Public Notice Report No. 2527; Jan. 29, 2002.

⁴ We note that the Spectrum Policy Task Force Report issued last fall recommended that the Commission act to promote more flexible, innovative, and market driven uses of the radio spectrum, and, indeed, the report specifically recommended that the Commission allocate additional spectrum for unlicensed use. This action advances the policies set forth in the report.

devices with those in other parts of the world, thus decreasing development and manufacturing costs for U.S. manufacturers by allowing for the same digital communications products to be used in most other parts of the world.⁵

2. In addition to proposing to make more spectrum available for use by U-NII devices, we propose several other changes to the Table of Frequency Allocations to accommodate the needs of other radio services operating in the 5 GHz region of the spectrum. Specifically, we propose to modify the U.S. Table of Frequency Allocations in Part 2 of the rules to upgrade the status of the Federal Government Radiolocation service to primary in the 5.46-5.65 GHz band.⁶ We also propose to upgrade the status of the non-Federal Government radiolocation to primary in the 5.47-5.65 GHz band. We further propose to add primary allocations for the Federal Government and secondary allocations for the non-Federal Government Space Research Service (active) (SRS) in the 5.35-5.57 GHz band and the Earth Exploration-Satellite Service (active) (EESS) in the 5.46-5.57 GHz band.⁷ We also propose to modify certain technical requirements for U-NII devices in the Part 15 rules to protect various radio services against harmful interference.⁸ Our proposals are consistent with the U.S. World Radiocommunication Conference 2003 (WRC-03) position regarding this band.⁹

BACKGROUND

3. Under the current FCC Part 15 rules, U-NII devices are permitted to operate in a total of 300 megahertz of spectrum in the 5.150-5.250 GHz, 5.250-5.350 GHz and 5.725-5.825 GHz bands. The technical and operational requirements are different in each of these bands.¹⁰ Many of the devices presently operating under these rules are designed to meet an industry standard for wireless local area networks called IEEE 802.11(a), which is sometimes referred to as a Wi-Fi (Wireless-Fidelity) standard.¹¹

⁵ Allowing RLANs to operate in the same spectrum used by products built to the European HIPERLAN standard will foster American industry's flexibility to create products for both markets, promote economies of scale in production, increase convenience for traveling users and facilitate seamless user applications.

⁶ The U.S. Table of Frequency Allocations is set forth in Section 2.106 of the Commission's rules, 47 C.F.R. § 2.106.

⁷ The Commission previously proposed primary Federal Government EESS (active) and SRS (active) allocations in the 5.25-5.35 GHz band and a Federal Government EESS (active) allocation in the 5.35-5.46 GHz band. *See Amendment of Parts 2, 25, and 87 of the Commission's Rules to Implement Decisions from World Radio communication Conferences concerning Frequency Bands Between 28 MHz and 36 GHz and to Otherwise Update the Rules in this Frequency Range*, ET Docket No. 02-305, 17 FCC Rcd 19756 (2002) ("Above 28 MHz Notice").

⁸ The rules we are proposing herein are those deemed necessary to protect incumbent users from interference. Industry standards being developed by IEEE or others may contain more detailed technical requirements.

⁹ *See* U.S. Department of Commerce, National Telecommunications and Information Administration, "Agreement Reached Regarding U.S. Position on 5 GHz Wireless Access Devices," ("WRC-03 Agreement"), rel. Jan. 31, 2003, (available at <http://www.ntia.doc.gov/ntiahome/press/2003/5ghzagreement.htm>.) The World Radiocommunication Conference 2003 (WRC-03) is scheduled for June 9 - July 4, 2003, in Geneva, Switzerland. In Agenda Item 1.5, WRC-03 will consider spectrum allocations for the mobile, fixed, EESS, and SRS, and the upgrade of the radiolocation service in the frequency range 5.15-5.725 GHz.

¹⁰ *See* 47 C.F.R Part 15 Subpart E.

¹¹ The term Wi-Fi was originally applied to unlicensed wireless devices operating in the 2.4 GHz region of the spectrum in accordance with the Institute of Electrical and Electronics Engineers (IEEE) 802.11(b) standard. More recently, the term has also been applied to unlicensed wireless devices operating in the 5 GHz region under in accordance with IEEE 802.11(a). The IEEE standards contain specific implementation requirements for systems
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4. On January 15, 2002, WECA submitted a petition for rule making seeking an additional 255 megahertz of spectrum for use by U-NII devices in the 5.470-5.725 GHz band. WECA argues that this additional spectrum is needed to accommodate growing demand for unlicensed radio local area networks (RLANs) that are capable of operating at data rates of up to 54 million bits per second (54 Mbps). WECA states that RLANs can offer a low-cost method to meet business and consumer needs for broadband communication devices and services. WECA argues that a key condition for continued market acceptance of RLANs is the availability of sufficient spectrum to allow a high quality user experience in the presence of large numbers of uncoordinated users.¹² Additionally, WECA states that its proposal would align the U.S. U-NII spectrum with the European allocations for HiperLANs, thereby permitting the use of common products in both the U.S. and Europe and increasing economies of scale.¹³

5. In response to WECA's petition, seventeen comments and ten reply comments were filed. The overwhelming majority of the commenters support WECA's proposal for increasing the amount of spectrum available for U-NII equipment, citing both the benefits of additional system capacity and the promise of new technologies capable of providing higher data rates than currently available.¹⁴ Three commenters oppose the petition, stating that WECA has not demonstrated a need for more unlicensed U-NII spectrum.¹⁵ ARRL further argues that WECA has not demonstrated that U-NII devices operating in the 5.650-5.725 GHz band will not cause interference to the Amateur Radio service, which operates on a secondary basis in this band.¹⁶

6. The WRC-03 will consider allocations for wireless access systems including RLANs, radar systems, and other services in the 5 GHz region of the spectrum. Specifically, WRC-03 Agenda Item 1.5 considers several issues that either interrelate or overlap with the expansion of spectrum used for the deployment of RLANs internationally. These issues are as follows: 1) whether to upgrade the Radiolocation service allocation in the 5.350-5.650 GHz band to primary; 2) whether to add an allocation for the Earth Exploration-Satellite Service (EESS) and Space Research Services (SRS) in the 5.460-5.570 GHz band; and 3) whether to add a Mobile allocation for wireless access systems including RLANs, in the 5.150-5.350 GHz and 5.470-5.725 GHz bands.¹⁷

7. The 5.350-5.650 GHz band portion of the spectrum that is the subject of the WECA petition is currently allocated internationally to the Radiolocation service on a secondary basis. The U.S. Department of Defense (DoD) uses this band for a number of radar systems, including systems used for national security. DoD is concerned that RLAN systems will cause interference to its radar systems. In

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and are consistent with our more general requirements. The Commission does not require devices operating in either the 2.4 GHz or 5 GHz bands to meet the IEEE standards.

¹² See WECA petition.

¹³ The European High Performance Radio Local Area Networks (HiperLANs) operate in the 5.15-5.35 GHz and 5.475-5.725 GHz bands.

¹⁴ See comments of Actiontec, Agere, Atheros, Compaq, Intel, Intersil, Dennis Kuwahara, Lincom Wireless, Motorola, Nokia, Proxim, Konrad Roeder, Sharp Labs, and WCA.

¹⁵ See comments of the Amherst Alliance and ARD, ARRL, and Nicklaus Legget.

¹⁶ See ARRL comments at 8.

¹⁷ WRC Agenda Item 1.5 also includes a provision adding an allocation to the Fixed Service for Fixed Wireless Access in Region 3, which includes Asia, Australia, and the Pacific Islands. In addition, WRC Agenda Item 1.6 is closely related to Agenda Item 1.5. Agenda Item 1.6 addresses the provisions of regulatory measures to protect Mobile Satellite Service ("MSS") feeder links operating in the 5150-5250 MHz band.

addition, DoD is concerned that, should the WRC-03 establish a primary Mobile allocation for RLANs, DoD's radar systems would be compelled to accept interference from RLANs. DoD therefore believes it is vital to national security to elevate the Radiolocation service allocation from secondary to primary status. Additionally, the National Aeronautical and Space Administration has supported allocating additional spectrum for SRS in the 5.35-5.57 GHz band and EESS in the 5.46-5.57 GHz band.

8. In preparing for WRC-03 the National Telecommunications and Information Administration (NTIA), FCC, NASA and DOD, working closely with industry, reached the following agreement on U.S. proposals for the WRC-03 Agenda Item 1.5:¹⁸

1. Upgrade the Radiolocation service to primary status within the 5.350-5.650 GHz band to protect sensitive DoD operations;
2. Add an allocation for the SRS in the 5.35-5.46 GHz band and for the EESS and SRS in the 5.46-5.57 GHz band;¹⁹
3. Add a Mobile allocation to the 5.150-5.350 GHz and 5.470-5.725 GHz bands; and
4. Require U-NII or HiperLAN users in the 5.250-5.350 GHz and 5.470-5.725 GHz bands to employ dynamic frequency selection (DFS),²⁰ a listen-before-transmit mechanism, using the following thresholds: -64 dBm for devices that operate with an e.i.r.p. of 200 mW to 1 W and -62 dBm for devices that operate with less than 200 mW e.i.r.p.²¹ Additional technical requirements are also needed.²²

9. Taken together, these WRC-03 proposals would expand the spectrum available for the deployment of U-NII devices, including RLANs, while protecting other spectrum users. Our proposals for implementing these changes are discussed below.

DISCUSSION

10. We believe that the rules we are proposing will encourage the growth of unlicensed wireless broadband devices and networks to the benefit of the American public. Further, our proposed rules will ensure that incumbent radio services are protected against harmful interference. We request comments on the proposals addressed in this Notice. Further, we encourage commenters to address any other issues that may not have been identified in this Notice.

11. We agree with WECA that the spectrum currently available for U-NII devices is insufficient to support long-term growth for unlicensed wireless broadband devices and networks. Ample evidence

¹⁸ See WRC-03 Agreement.

¹⁹ The SRS allocation in the 5.35-5.46 GHz band was agreed to at the CITEL (Inter-American Telecommunication Commission) conference held in Orlando, Florida in February 2003.

²⁰ Dynamic Frequency Selection (DFS) is a mechanism that detects the presence of signals from other systems, notably radar systems, and avoids co-channel operation.

²¹ See WRC-03 Agreement.

²² *Id.*

exists of the enormous growth in the demand for such devices and services.²³ As detailed in a recent White Paper by the Commission staff, market projections indicate that unlicensed wireless network products grew rapidly over the past two years and that future sales volumes are predicted to increase even more dramatically when market conditions improve. For example, the Synergy Research Group reported that the Wireless LAN market posted its eighth consecutive quarter of double-digit growth and has grown at a rate of more than 150 percent since 2000.²⁴ Further, the revenue from W-LAN shipments is projected to rise to \$2.8 billion in 2003 and will continue to grow for the foreseeable future.²⁵ Although estimates vary, the consensus seems to be that worldwide W-LAN sales, including Wi-Fi equipment, ranged between \$1.7 and \$2.0 billion in 2002. The Wireless LAN Association foresees W-LAN equipment sales reaching \$5.2 billion by 2005.²⁶

12. We also observe that a number of service providers are currently offering or have announced plans to deploy commercial unlicensed wireless broadband networks.²⁷ These networks offer significant benefits for American consumers and businesses. For example, such networks offer the possibility of increased competition with other providers of broadband service, including cable and digital subscriber line (DSL) broadband services. We also note that unlicensed wireless devices and networks may provide an available option for broadband service in areas that are unserved by other broadband providers. We further note that the existing U-NII bands are shared with other services and that providing additional spectrum would give devices and networks increased flexibility to avoid causing or receiving interference, thereby improving the quality of service experienced by consumers. In addition, we believe that the availability of additional spectrum will provide certainty that unlicensed wireless broadband networks will have room to grow, thereby further stimulating investment. For these reasons, we tentatively conclude that an additional 255 megahertz should be made available under the U-NII rules to meet the growing demand for new high data rate devices and services and to enable equipment to use spectrum that is harmonized with the European HiperLAN standards. Our proposals, as discussed below, are based on the U.S. government-industry agreement and the U.S. position for WRC-03.²⁸

Proposed Changes to the Table of Frequency Allocations

13. We are proposing to implement the following allocations consistent with the U.S. proposals to the WRC-03. First, we propose to modify the U.S. Table of Frequency Allocations in Part 2 of the rules to upgrade the status of the Federal Government Radiolocation service to primary in the 5.46–5.65 GHz band.²⁹ We will similarly upgrade the status of the non-Federal Government Radiolocation

²³ Joint Office of Engineering and Technology and Office of Spectrum Policy White Paper on Unlicensed Spectrum Devices and the Associated Regulatory Issues (*OET-OSP Unlicensed White Paper*). Available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-234741A1.pdf

²⁴ *Id.* at 31. See also Comments of Consumer Electronics Association, Docket No. 02-135, p. 3.

²⁵ “ARCchart, LTD., Blueprint Wi-Fi, 73 percent WLAN Growth in 2002, Issue 7, at 6 (Sept. 26, 2002).

²⁶ Jeff Abramowitz, “Wireless LANs – Poised for untethered Growth.” Available at http://www.wlan.org/df/wlan_industry.pdf.

²⁷ See *OET-OSP Unlicensed White Paper* at 34-35.

²⁸ The United States has supported a regional proposal to the WRC-03 adopted at the recent CITEL (Inter-American Telecommunication Commission) conference held in Orlando, Florida in February 2003. The CITEL proposal is largely consistent with the U.S. government-industry agreement. However, the CITEL proposal also requires that devices operating in the 5.470-5.725 GHz band employ Transmit Power Control (TPC) as an interference protection mechanism for EESS systems and other satellite services.

²⁹ The band 5.35–5.46 GHz is allocated on a secondary basis for radiolocation internationally, however, radiolocation is already allocated on a primary basis in the United States.

service to co-primary in the 5.47–5.65 GHz band so that we do not disadvantage non-Government licensees. These bands are used by non-Federal Government broadcast weather radar stations. We note that the Federal Radiolocation service already has a primary allocation in the 5.35-5.46 GHz band. The elevation in status for Federal Government Radiolocation along with the requirement for DFS as described below will ensure that these existing services are protected from interference from U-NII devices. We further propose to add primary allocations for the Federal Government and secondary allocations for the non-Federal Government for the Space Research Service (active) (SRS) in the 5.35-5.57 GHz band and the Earth Exploration-Satellite Service (active) (EESS) in the 5.46-5.57 GHz band.³⁰ We seek comment on these proposals.

14. In the U.S., Part 15 unlicensed devices including U-NII devices operate on a non-interference basis and do not operate within radio services listed in the Table of Frequency Allocations. Instead, Part 15 devices share spectrum with radio services on the basis that they may not cause any harmful interference and must accept any interference that may be received. Although the WECA petition and comments request an allocation of spectrum for unlicensed U-NII devices, they also request operation under Part 15 of the rules. We thus propose to modify our Part 15 rules to allow U-NII devices to operate in the 5.470-5.725 GHz band on a non-interference basis, and seek comment on this proposal. We note that WRC-03 is considering a Mobile allocation for the 5.150-5.350 GHz and 5.470-5.725 GHz bands and that some administrations would need a Mobile allocation in the international Table of Frequency Allocations for RLANs or HiperLANs to operate in the bands. Therefore, the U.S. position for WRC-03 supports adoption of an international Mobile allocation so that these devices may operate throughout the world.

15. Table 1 below summarizes all the allocation proposals herein. We seek comment on these proposed changes to the Table of Frequency Allocations. Commenters are requested to provide a technical analysis to substantiate any claims of interference which may be caused by operations of U-NII devices under these proposed rules.

³⁰ See Proposed § 2.106 Table of Frequency Allocations in Appendix B.

Table 1: Existing U.S. Allocations and Unlicensed Use vs. Proposals for Realigned Allocations and Unlicensed Use		
Existing U.S. Allocation and Unlicensed Use	Proposed U.S. Allocation and Unlicensed Use	Summary of Changes
5150-5350 MHz No change.		
5350-5460 MHz AERONAUTICAL RADIONAVIGATION 5.449 Federal RADIOLOCATION G56 non-Federal Radiolocation US48	5350-5460 MHz AERONAUTICAL RADIONAVIGATION 5.449 Federal RADIOLOCATION G56 non-Federal radiolocation Federal SPACE RESEARCH (active) non-Federal space research (active) US48	Additional 110 MHz for Federal (primary) and non-Federal (secondary) SRS (active).
5460-5470 MHz RADIONAVIGATION 5.449 Federal Radiolocation G56 non-Federal Radiolocation US49 US65	5460-5470 MHz Federal EARTH EXPLORATION-SATELLITE (active) non-Federal Earth exploration-satellite (active) RADIONAVIGATION 5.449 Federal RADIOLOCATION G56 non-Federal radiolocation Federal SPACE RESEARCH (active) non-Federal space research (active) US49 US65	Additional 10 MHz for Federal (primary) and non-Federal (secondary) EESS (active) and SRS (active). Upgrade 10 MHz for Federal radiolocation to primary status.
5470-5600 MHz MARITIME RADIONAVIGATION Federal Radiolocation G56 non-Federal Radiolocation US50 US65	5470-5570 MHz Federal EARTH EXPLORATION-SATELLITE (active) non-Federal Earth exploration-satellite (active) MARITIME RADIONAVIGATION Federal RADIOLOCATION G56 non-Federal RADIOLOCATION Federal SPACE RESEARCH (active) non-Federal space research (active) Part 15 U-NII* US50 US65	Additional 100 MHz for Federal (primary) and non-Federal (secondary) EESS (active) and SRS (active). Upgrade 100 MHz for Federal and non-Federal radiolocation to primary status. Additional 100 MHz for Part 15 U-NII.
5600-5650 MHz MARITIME RADIONAVIGATION METEOROLOGICAL AIDS Federal Radiolocation US51 G56 non-Federal Radiolocation US51 5.452 US65	5600-5650 MHz MARITIME RADIONAVIGATION METEOROLOGICAL AIDS Federal RADIOLOCATION US51 G56 non-Federal RADIOLOCATION US51 Part 15 U-NII* 5.452 US65	Upgrade 30 MHz for Federal and non-Federal radiolocation to primary status. Additional 30 MHz for Part 15 U-NII.
5650-5725 MHz Federal RADIOLOCATION G2 Amateur 5.282	5650-5725 MHz Federal RADIOLOCATION G2 Amateur Part 15 U-NII* 5.282	Additional 75 MHz for Part 15 U-NII.

(* - denotes unlicensed use)

Proposed Changes to U-NII Rules

16. *Technical requirements.* Under the existing Part 15 U-NII rules, there are three different frequency sub-bands available to U-NII devices, each with its own set of technical requirements (e.g., transmit power and antenna gain), based on its sharing environment.³¹ U-NII devices operating in the 5.150-5.250 GHz sub-band are restricted to indoor operations and a power limit of 200 mW e.i.r.p. in order to protect co-channel Mobile Satellite Service (MSS) feeder links.³² Because of the relatively low power limit and indoor usage requirement, this sub-band is most suitable for U-NII devices providing communications links between devices separated by short distances indoors, such as between computing devices within a room or in adjoining rooms. The 5.250-5.350 GHz sub-band may be used indoors and outdoors and is limited to 1 watt e.i.r.p. This sub-band is shared with the Federal Government Radiolocation Service, Earth Exploration Satellite Service and Space Research Service. This U-NII sub-band is suitable for communications links both within and between buildings such as for campus-wide local area networks. The 5.725-5.825 GHz sub-band may be used indoors and outdoors with power levels up to 4 watts e.i.r.p. This U-NII sub-band is shared with Federal Government Radiolocation, Amateur, ISM, and other Part 15 devices and is suitable for communications links within and among buildings and over long distances through use of high-gain antennas.³³

17. Motorola, Agere, Intel, Atheros and other commenters support WECA's proposal to extend the U-NII rules governing the 5.250-5.350 GHz band to the new 5.470-5.725 GHz band. WECA states that the envisioned uses for the proposed U-NII 5.470-5.725 GHz band are most similar to those in the 5.250-5.350 GHz sub-band. WECA further states that because MSS feeder links are not present at 5.470-5.725 GHz, there is no basis for imposing the stricter limits of the 5.15-5.25 GHz U-NII sub-band on the proposed new U-NII band. They also state that devices operating in the proposed new U-NII band will not have to contend with overlapping higher-powered ISM uses, and thus the higher limits established for the 5.725-5.825 GHz U-NII sub-band may inadvertently limit the capacity of RLAN networks by increasing the potential for intraband interference with other U-NII devices. However, Lincom, WCA, Air2LAN, and Airband see a pressing need for more power, especially for point to multipoint applications, and therefore argue that the Commission should apply the requirements of the 5.725-5.825 GHz sub-band to the new spectrum.

18. Consistent with the agreements cited earlier, we propose to add the 5.470-5.725 GHz band to the U-NII bands with the same technical requirements that apply to the existing 5.250-5.350 GHz U-NII sub-band. This is consistent with the WECA petition and the U.S. position for the upcoming WRC-03. The Federal Government believes that the power must be limited to 1 watt e.i.r.p. to protect incumbent systems.³⁴ We also believe that this will best provide for communications among devices within and among buildings where demand is greatest. We expect that the 100 MHz of spectrum that is already available at 5.725-5.825 GHz will remain sufficient for higher power operations. We note in particular

³¹ See 47 C.F.R. § 15.407.

³² See 47 C.F.R. Subpart E and *Report and Order* in ET Docket 96-102, 12 FCC Rcd 1576 (1997).

³³ Amendment of the Commission's Rules to Provide for Operation of Unlicensed NII Devices in the 5 GHz Frequency Range, 47 C.F.R. § 15.247, which provides for unlicensed frequency hopping and digital transmission devices operating in the 5.725-5.850 GHz band.

³⁴ The Federal Government performed an analysis of interference to radiolocation systems based on a maximum transmit power of 1 watt e.i.r.p. There is a direct relationship between the maximum transmit power and the derived DFS thresholds. If higher power were permitted, the DFS levels would need to be reduced as well, which industry has generally found to be unworkable because the DFS mechanism would be so sensitive to stray radio noise that it would effectively prevent access to the spectrum.

that operations over longer distances employ directional antennas that allow for high reuse and sharing of the spectrum, which mitigates the need for additional spectrum for these types of operations. We seek comment on this analysis.

19. ARRL argues that WECA, in its petition, has not demonstrated that U-NII devices operating in the 5.650-5.725 GHz band will avoid causing interference to the Amateur Radio service, which operates on a secondary basis in this band.³⁵ Our review of ARRL's web site indicates that amateur use of this band is limited to propagation beacons and possibly some limited satellite use. Roeder comments that there is little ready made Amateur equipment for this band and that there are only a few rare mountain top users of this band.³⁶ We observe that amateurs already share the 5.725-5.825 GHz band with U-NII devices and we are unaware of any complaints of interference. Further, as noted below, we are proposing to permit a lower e.i.r.p. for U-NII devices operating in the 5.470-5.725 GHz band (*i.e.*, 1 watt e.i.r.p.) than for the existing 5.725-5.825 GHz band (*i.e.*, 4 watts e.i.r.p.). Therefore, we believe that U-NII devices can operate in 5.650-5.725 GHz band without causing interference. Finally, U-NII devices in this band would continue to operate under Part 15 of our rules and would be required to eliminate any harmful interference that may occur to the Amateur Radio service. We tentatively conclude that the proposals herein are adequate to protect the Amateur Radio service from interference. We seek comment on this tentative conclusion.

20. In addition to applying the existing technical requirements for the 5.250-5.350 GHz sub-band to the new 5.470-5.725 GHz band, to ensure protection to existing vital DoD radar operations, we are proposing that U-NII devices operating in both the existing 5.250-5.350 GHz sub-band and the new 5.470-5.725 GHz sub-band employ a listen-before-talk mechanism called dynamic frequency selection (DFS). DFS is an interference avoidance mechanism. Prior to the start of any transmissions, and through constant monitoring, the device (*e.g.*, RLAN) equipped with such a mechanism monitors the radio environment for a radar's presence. If the U-NII device determines that a radar is present, it either moves to another channel or enters a sleep mode if no channels are available. We propose that U-NII devices be required to continuously monitor their environment for the presence of radars both prior to and during operation.³⁷ The proposed rules contained in Appendix B include detailed specifications for DFS. DoD concurs that the use of DFS at the thresholds proposed will provide the necessary protection for its vital radar systems.³⁸

21. The DFS mechanism detects a radar signal above a minimum DFS detection threshold of -62 dBm for devices with a maximum e.i.r.p. less than 200 mW and -64 dBm for devices with a maximum e.i.r.p. between 200 mW and 1 W averaged over 1 μ s. The DFS detection threshold is defined as the received signal strength (RSS) in dBm (or some other metric of received signal format), referenced to the output of a 0 dBi receive antenna. These signal levels are referenced to a 1 MHz bandwidth. There is no bandwidth correction factor involved if the receive bandwidth of the U-NII device is greater than 1 MHz (*i.e.*, radar's signal bandwidth). However, if the RSS is to be measured correctly by a U-NII device having a receive bandwidth less than 1 MHz, a bandwidth correction factor must be taken into account. We seek comment on whether $10 \cdot \log(BW/1\text{MHz})$ (where BW is the U-NII device's bandwidth) should be used as the appropriate correction factor for U-NII devices that have a bandwidth less than 1 MHz.

22. For systems, where multiple devices operate under a central controller, we propose that only

³⁵ See ARRL comments at 8.

³⁶ See Konrad Roeder comments at 1.

³⁷ IEEE website: IEEE802.org (P802.11h/d3.3)

³⁸ See WRC-03 Agreement.

the central controller be required to have DFS capability. We recognize that there may be devices or architectures developed, where remote devices are not under the control of a master device. We seek comment on requiring such devices to have DFS. We also invite comment on how to identify remote units that operate only under the control of a central controller.

23. The U-NII device's ability to reliably detect a radar's presence in the channel depends greatly on the pulse characteristics of the radar. The time for which the radar occupies the U-NII channel (dwell time) also influences the detection probability. The problem arises when the dwell time is very short as is the case for frequency hopping radars. In this case, the subject radar signal is characterized as a receive signal strength (RSS) equal to or greater than the DFS detection threshold level within the U-NII device's channel bandwidth (*e.g.*, typically 18 MHz for devices operating under IEEE 802.11(a)). The radar signal has a bandwidth of 1 MHz and a pulse repetition rate (PRR) in the range 200-4000 pulses/s, where the nominal pulse width is in the range of 1 to 20 microseconds. We seek comment on the minimum number of pulses and the observation time required for reliable detection.

24. We are also proposing to require a transmit power control (TPC) mechanism in the 5.470-5.725 GHz band to further reduce the potential for impact on EESS and SRS operations. TPC is a feature intended to adjust the transmitter's output power based on the signal level at the receiver. TPC will allow the transmitter to operate at less than the maximum power for most of the time. As the signal level at the receiver rises or falls, the transmit power will be decreased or increased as needed. Because TPC equipped devices adjust their transmit power to the minimum necessary to achieve the desired performance, the average interference power from a large number of devices is reduced, the power consumption is minimized and network capacity is increased. Consistent with the U.S. proposals to the WRC-03, we are proposing that U-NII devices employ a TPC mechanism that will ensure a 6 dB drop in power when triggered. We seek comment on what the appropriate triggering mechanism will be. For example, should TPC seek to keep a receiver parameter such as received signal strength, bit error rate, or block error rate below a certain threshold? How long will a pair of U-NII devices have to adjust their link powers? Will it be necessary to require U-NII devices to employ TPC if their maximum power is 3 dB or more below the maximum permitted under the rules? How should TPC be applied to system configurations where multiple devices may operate under the control of a central device.

25. *Test procedures.* We seek comment on appropriate test procedures needed to ensure compliance with the DFS and TPC requirements proposed in this proceeding. We note that the operational requirements for DFS are well defined in the applicable industry standards.³⁹ We observe that while TPC has been agreed to as a general requirement, its operational details are still under development. Therefore, we particularly seek comment on the means by which devices can be tested for compliance with TPC requirements to implement reduced power without placing unnecessary restrictions on device design. We also seek comment on the extent to which devices under development that may have unique or novel transmission waveforms may require special measurement instrumentation settings (*e.g.*, integration times) that differ from those used for measuring compliance for existing U-NII band devices.

26. *Transition period for U-NII equipment operating in the 5.250-5.350 GHz band.* U-NII devices currently operate in this band without DFS capability. As a result, we recognize that some period of time will be needed to implement the new DFS requirement for U-NII equipment operating in the 5.250-5.350 GHz band. We propose that the DFS requirement for the 5.250-5.350 GHz band effective for U-NII equipment that is certified after one year from the date of publication of the Report and Order in this proceeding in the Federal Register. We believe that this should be sufficient time for equipment

³⁹ IEEE website: IEEE802.org (P802.11h/3.3)

manufacturers to incorporate DFS into their new designs. We also propose to require that all U-NII devices operating in the 5.250-5.350 GHz band that are imported or shipped in interstate commerce on or after two years from the date of publication in the Federal Register comply with these standards. We believe that most affected products will be redesigned within this three-year time frame and that compliance with this proposal would not cause an unreasonable burden on industry. Comments are requested on these proposed transition provisions. We are proposing to require that U-NII equipment operating in the new spectrum at 5.470–5.725 GHz meet all the technical requirements, including DFS and TPC, on the effective date of these rules.

CONCLUSION

27. In this Notice of Proposed Rulemaking, we propose to amend the regulations to add 255 MHz to the 300 MHz of spectrum that is already available for U-NII devices in the 5 GHz region of the spectrum. We anticipate that this 80% increase in available spectrum for unlicensed devices at 5 GHz will provide increased opportunity for the development and deployment of a wide variety of unlicensed wireless devices, and in particular for broadband wireless devices. The proposals in this Notice respond to a petition from WECA and are consistent with the United States position for the upcoming WRC. We also propose technical rules that we believe will protect all incumbent radio services, both Government and non-Government, against harmful interference. We request comments on these proposals.

PROCEDURAL MATTERS

Initial Regulatory Flexibility Analysis

28. As required by Section 603 of the Regulatory Flexibility Act, 5 U.S.C. § 603, the Commission has prepared an Initial Regulatory Flexibility Analysis ("IRFA") of the possible significant economic impact on small entities of the proposals suggested in this document. The IRFA is set forth in Appendix A. Written public comments are requested on the IRFA. These comments must be filed in accordance with the same filing deadlines as comments filed in this *Notice of Proposed Rule Making*. Comments must have a separate and distinct heading designating them as responses to the IRFA.

Initial Paperwork Reduction Act of 1995 Analysis

29. This *Notice* contains a proposed information collection subject to the Paperwork Reduction Act of 1995 (PRA). As part of its continuing effort to reduce paperwork burdens, we invite the general public and the Office of Management and Budget ("OMB") to take this opportunity to comment on the information collections contained in this *Notice*, as required by the Paperwork Reduction Act of 1995, Public Law 104-13. Public and agency comments are due at the same time as other comments on this *Notice*.

30. In addition to filing comments with the Secretary, a copy of any comments on the information collection(s) contained herein should be submitted to Judith B. Herman, Federal Communications Commission, Room 1-C804, 445 12th Street, SW, Washington, DC 20554, or via the Internet to jboley@fcc.gov and to Kim Johnson, OMB Desk Officer, Room 10236, 725 17th Street, NW, Washington, DC 20503 or via the Internet to Kim.A.Johnson@omb.eop.gov.

A. *Ex Parte* Rules - - Permit-But-Disclose Proceeding.

31. This is a permit-but-disclose notice and comment rule making proceeding. *Ex parte* presentations are permitted, except during the Sunshine Agenda period, provided they are disclosed as provided in the Commission's rules. *See generally* 47 C.F.R. §§ 1.1202, 1.1203, and 1.2306(a).

B. Comments

32. Pursuant to Sections 1.415 and 1.419 of the Commission's rules, 47 C.F.R. §§ 1.415 and 1.419, interested parties may file comments on or before [120 days from date of publication in the Federal Register] and reply comments on or before [150 days from date of publication in the Federal Register]. Comments may be filed using the Commission's Electronic Comment Filing System ("ECFS"), <http://www.fcc.gov/e-file/ecfs.html>, or by filing paper copies. *See Electronic Filing of Documents in Rulemaking Proceedings*, 63 Fed. Reg. 23,121 (1998).

33. Comments filed through the ECFS can be sent as an electronic file via the Internet to <http://www.fcc.gov/e-file/ecfs.html>. Generally, only one copy of an electronic submission must be filed. If multiple docket or rulemaking numbers appear in the caption of this proceeding, however, commenters must transmit one electronic copy of the comments to each docket or rulemaking number referenced in the caption. In completing the transmittal screen, commenters should include their full name, U.S. Postal Service mailing address, and the applicable docket or rulemaking number. Parties may also submit an electronic comment by Internet e-mail. To get filing instructions for e-mail comments, commenters should send an e-mail to ecfs@fcc.gov, and should include the following words in the body of the message, "get form <your e-mail address.>" A sample form and directions will be sent in reply. Parties who choose to file by paper must file an original and four copies of each filing. If more than one docket or rulemaking number appear in the caption of this proceeding, commenters must submit two additional copies for each additional docket or rulemaking number.

34. Filings can be sent by hand or messenger delivery, by commercial overnight courier, or by first-class or overnight U.S. Postal Service mail (although we continue to experience delays in receiving U.S. Postal Service mail). The Commission's contractor, Vistrionix, Inc., will receive hand-delivered or messenger-delivered paper filings for the Commission's Secretary at 236 Massachusetts Avenue, N.E., Suite 110, Washington, D.C. 20002. The filing hours at this location are 8:00 a.m. to 7:00 p.m. All hand deliveries must be held together with rubber bands or fasteners. Any envelopes must be disposed of before entering the building. Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9300 East Hampton Drive, Capitol Heights, MD 20743. U.S. Postal Service first-class mail, Express Mail, and Priority Mail should be addressed to 445 12th Street, SW, Washington, D.C. 20554. All filings must be addressed to the Commission's Secretary, Office of the Secretary, Federal Communications Commission.

35. Parties who choose to file by paper should also submit their comments on diskette. Such a submission should be on a 3.5-inch diskette formatted in an IBM compatible format using Microsoft Word or compatible software. The diskette should be accompanied by a cover letter and should be submitted in "read only" mode. The diskette should be clearly labeled with the commenter's name, proceeding (including the lead docket number, type of pleading (comment or reply comment), date of submission, and the name of the electronic file on the diskette. The label should also include the following phrase "Disk Copy – Not an Original." Each diskette should contain only party's pleading, preferably in a single electronic file. In addition, commenters must send diskette copies to the Commission's copy contractor, Qualex International, Portals II, 445 12th Street, SW, Room CY-B402, Washington, DC, 20554.

36. Alternative formats (computer diskette, large print, audio cassette and Braille) are available to persons with disabilities by contacting Brian Millin at (202) 418-7426, TTY (202) 418-2555, or via e-mail to bmillin@fcc.gov. This Notice can also be downloaded at <http://www.fcc.gov/oet>.

C. Contact Person

37. For further information concerning this rule making proceeding contact Ahmed Lahjouji at (202) 418-2061, Ahmed.lahjouji@fcc.gov, Office of Engineering and Technology.

ORDERING CLAUSES

38. Accordingly, IT IS ORDERED that pursuant to Sections 1, 4, 301, 302(a), 303, 307, 309, 316, and 332 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 151, 154, 301, 302(a), 303, 307, 309, 316, 332, 334, and 336, the notice of proposed rule making is hereby adopted.

39. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this notice of proposed rule making, including the Initial Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

Initial Regulatory Flexibility Analysis

Initial Regulatory Flexibility Analysis

As required by the Regulatory Flexibility Act of 1980 as amended,⁴⁰ the Commission has prepared this present Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on small entities by the policies and rules proposed in this *Notice of Proposed Rulemaking* (“*Notice*”). Written public comments are requested on this IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadlines for comments on the *Notice* provided 31 of the item. The Commission will send a copy of this *Notice*, including the IRFA, to the Chief Counsel for Advocacy of the Small Business Administration (SBA).⁴¹ In addition, the *Notice* and IFRA (or summaries thereof) will be published in the Federal Register.⁴²

A. Need for, and Objectives of, the Proposed Rules.

This Notice proposes to amend Part 15 of our rules governing the operation of unlicensed National Information Infrastructure (U-NII) devices, including Radio Local Area Networks (RLANs), to make available an additional 255 megahertz of spectrum in the 5.47–5.725 GHz band for the growth and development of unlicensed wireless broadband networks. This action responds to the petition for rule making submitted by the Wireless Ethernet Compatibility Alliance (WECA – now known as Wi-Fi Alliance).⁴³

In addition to proposing to make more spectrum available for use by U-NII devices, the Notice also proposes several other rules changes in the 5 GHz band that will further facilitate the use of this band for U-NII devices, while at the same time ensuring sufficient protection for various incumbents in the band. Specifically, it proposes to modify the U.S. Table of Frequency Allocations in Part 2 of the rules to upgrade the status of the Federal Government Radiolocation service to primary in the 5.46–5.65 GHz band. It similarly proposes to upgrade the non-Federal Government radiolocation service to primary in the 5.47–5.65 GHz band. It further proposes to add primary allocations for the Federal Government and the non-Federal Government Space Research Service (active) (SRS) in the 5.35–5.46 GHz band and the Earth Exploration-Satellite Service (active) (EESS) and SRS (active) in the 5.46–5.57 GHz band..

The Notice also proposes to modify certain technical requirements for U-NII devices in the Part 15 rules. In addition to applying the existing technical requirements for the 5.250–5.350 GHz sub-band to the new 5.470–5.725 GHz band, it proposes that U-NII devices operating in both the existing 5.250–5.350 GHz sub-band and the new 5.470–5.725 GHz sub-band employ a listen-before-talk mechanism called dynamic frequency selection (DFS). DFS is an interference avoidance mechanism. Prior to start of any transmissions, and through constant monitoring, the device (*e.g.*, RLAN) equipped with such a mechanism monitors the radio environment for a radar’s presence. If the U-NII device determines that a radar signal is present, it either moves to another channel or enters a sleep mode if no

⁴⁰ See 5 U.S.C. § 603. The RFA, *see* 5 U.S.C. § 601 *et. seq.* has been amended by the Contract With America Advancement Act of 1996, Pub. L. No. 104-112, 110 Stat. 847 (1996)(“CWAAA”). Title II of the CWAAA is the Small Business Regulatory Enforcement Fairness Act of 1996 (“SBREFA”).

⁴¹ See 5 U.S.C. § 603(a).

⁴² See 5 U.S.C. § 603(a).

⁴³ See WECA Petition for Rulemaking, RM-10371, filed on January 15, 2002, Public Notice Report No. 2527, January 29, 2002.

channels are available. The Notice seeks comments regarding alternative DFS requirements for various U-NII operating conditions. For example, in point-to-multi-point systems, it may not be necessary that DFS be required for both the controlling station and slaves (*e.g.*, devices designed as clients only) as long as the DFS' timing requirements are met. The Notice invites comments on whether DFS should be applied to the controlling stations (*e.g.*, Hub, AP) as well as to slaves.

The Notice also proposes to require a transmit power control (TPC) mechanism in the 5.470-5.725 GHz band to further reduce the potential for impact on EESS and SRS operations. TPC is a feature intended to adjust the transmitter's output power based on the signal level at the receiver. TPC will allow the transmitter to operate at less than the maximum power for most of the time. As the signal level at the receiver rises or falls, the transmit power will be decreased or increased as needed. Because TPC equipped devices adjust their transmit power to the minimum necessary to achieve the desired performance, the average interference power from a large number of devices is reduced, the power consumption is minimized and network capacity is increased. The Notice seeks comments regarding what the appropriate triggering mechanism might be and how long the U-NII device might need to adjust its power? It also asks for comments on the necessity of requiring all U-NII devices to employ TPC. For example, in some point-to-multipoint system configurations, U-NII devices may be designed to function only with a particular controller or hub. Should only the controlling point or hub be required to employ TPC in this configuration? Some U-NII devices will be designed to operate with a maximum e.i.r.p. below what the rules allow. Should these devices be exempt from the TPC requirement?

The Notice seeks comment on appropriate test procedures needed to ensure compliance with the DFS and TPC requirements proposed in this proceeding. It notes that the operational requirements for DFS are well defined in the applicable industry standards.⁴⁴ It particularly seeks comment on means by which devices can be tested for compliance with TPC requirements to implement reduced power without placing unnecessary restrictions on device design. It also seeks comment on the extent to which devices under development with unique and novel transmission waveforms may require special measurement instrumentation settings (*e.g.*, integration times) that differ from those used for measuring compliance for existing U-NII band devices.

U-NII devices currently operate in the 5.250-5.350 GHz band without DFS capability. As a result, some period of time will be needed to implement the new DFS requirement for U-NII equipment operating in the 5.250-5.350 GHz band. The Notice proposes that the DFS requirement for the 5.250-5.350 GHz band effective for U-NII equipment that is certified after one year from the date of publication of the Report and Order in this proceeding in the Federal Register. It also proposes to require that all U-NII devices operating in the 5.250-5.350 GHz band that are imported or shipped in interstate commerce on or after three years from the date the adopted rules are published in the Federal Register comply with these standards. The Commission believes that most affected products will be redesigned within this three-year time frame and that compliance with this proposal would not cause an unreasonable burden on industry. Comments are requested on these proposed transition provisions. The Notice proposes that U-NII equipment operating in the new spectrum at 5.470–5.725 GHz meet all the technical requirements, including DFS and TPC, on the effective date of these rules.

⁴⁴ See *supra* note 36.

B. Legal Basis.

This action is taken pursuant to Sections 1, 4, 301, 302(a), 303, 307, 309, 316, 332, 334, and 336 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 151, 154, 301, 302(a), 303, 307, 309, 316, 332, 334, and 336.

C. Description and Estimate of the Number of Small Entities to Which the Proposed Rules Will Apply.

The RFA directs agencies to provide a description of, and, where feasible, an estimate of the number of small entities that may be affected by the proposed rules, if adopted.⁴⁵ The RFA defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small business concern” under Section 3 of the Small Business Act.⁴⁶ Under the Small Business Act, a “small business concern” is one that: (1) is independently owned and operated; (2) is not dominant in its field of operations; and (3) meets any additional criteria established by the Small Business Administration (SBA).⁴⁷

A small organization is generally “any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.”⁴⁸ Nationwide, as of 1992, there were approximately 275,801 small organizations.⁴⁹ The term “small governmental jurisdiction” is defined as “governments of cities, counties, towns, townships, villages, school districts, or special districts, with a population of less than fifty thousand.”⁵⁰ As of 1997, there were approximately 87,453 governmental jurisdictions in the United States.⁵¹ This number includes 39,044 counties, municipal governments, and townships, of which 27,546 have populations of fewer than 50,000 and 11,498 counties, municipal governments, and townships have populations of 50,000 or more. Thus, we estimate that the number of small governmental jurisdictions is approximately 75,955 or fewer.

The Commission has not developed a definition of small entities applicable to unlicensed communications devices manufacturers. Therefore, we will utilize the SBA definition application to manufacturers of Radio and Television Broadcasting and Communications Equipment. According to the SBA regulations, unlicensed transmitter manufacturers must have 750 or fewer employees in order to qualify as a small business concern.⁵² Census Bureau indicates that there are 858 U.S. companies that manufacture radio and television broadcasting and communications equipment, and the 778 of these firms have fewer than 750 employees and would be classified as small entities.⁵³ We do not believe this action

⁴⁵ See U.S.C. § 603(b)(3).

⁴⁶ *Id.* § 601(3).

⁴⁷ *Id.* § 632.

⁴⁸ 5 U.S.C. § 601(4).

⁴⁹ 1992 Economic Census, U.S. Bureau of the Census, , Table 6 (special tabulation of data under contract to Office of Advocacy of the U.S. Small Business Administration).

⁵⁰ 5 U.S.C. § 601(5).

⁵¹ 1995 Census of Governments, U.S. Census Bureau, United States Department of Commerce, Statistical Abstract of the United States (2000).

⁵² See 13 C.F.R. § 121.201, NAICS Code 334220 (SIC Code 3663). Although SBA now uses the NAICS classifications, instead of SIC, the size standard remains the same.

⁵³ See U.S. Dept. of Commerce, *1992 census of Transportation, Communications and Utilities* (issued May 1995), SIC category 3663 (NAICS Code 334220).

would have a negative impact on small entities that manufacture unlicensed U-NII devices. Indeed, we believe the actions should benefit small entities because it should make available increased business opportunities to small entities. We request comment on these assessments.

D. Description of Projected Reporting, Record keeping and Other Compliance Requirements.

Part 15 transmitters are already required to be authorized under the Commission's certification procedures as a prerequisite to marketing and importation. Under the proposals in the *Notice*, manufacturers will be required to demonstrate that U-NII devices operating in the bands 5.250-5.350 GHz and 5.470-5.725 GHz have Dynamic Frequency Selection Capabilities. Additionally, U-NII devices operating in the 5.470-5.725 GHz band must exhibit Transmit Power Control capabilities. The reporting and recordkeeping requirements associated with these equipment authorizations would not be changed by the rule revisions proposed in this *Notice*.

E. Steps taken to Minimize Significant Economic Impact on Small Entities and Significant Alternatives Considered.

The RFA requires an agency to describe any significant alternatives that it has considered in reaching its proposed approach, which may include the following four alternatives (among others): (1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance or reporting requirements under the rule for small entities; (3) the use of performance, rather than design, standards; and (4) an exemption from coverage of the rule, or any part thereof, for small entities.⁵⁴

We also note that we have proposed a transition period for the U-NII devices, operating in the 5.25-5.35 GHz band.⁵⁵ For devices equipped with DFS, we have proposed a transition period of one year, which imported equipment or equipment shipped in interstate comply within 2 years. We seek comment on these time frames, and especially encourage small entities to comment on whether alternative deadlines are more appropriate.

F. Federal Rules that May Duplicate, Overlap, or Conflict with the Proposed Rules.

None.

⁵⁴ 5 U.S.C. § 603(c).

⁵⁵ See paragraph 26, *Supra*

APPENDIX B**(PROPOSED RULES)**

For the reasons discussed in the preamble, the Federal Communications Commission proposes to amend 47 C.F.R. parts 2 and 15 as follows:

**PART 2 – FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL
RULES AND REGULATIONS**

1. The authority citation for part 2 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 302a, 303, and 336, unless otherwise noted.

2. Section 2.106, the Table of Frequency Allocations, is proposed to be amended by revising pages 56 and 57.

§ 2.106 Table of Frequency Allocations.

The proposed revisions and additions read as follows:

* * * * *

5150-5250 AERONAUTICAL RADIONAVIGATION FIXED-SATELLITE (Earth-to-space) 5.447A		5150-5250 AERONAUTICAL RADIO- NAVIGATION US260 FIXED-SATELLITE (Earth-to-space) 5.447A US344	
5.446 5.447 5.447B 5.447C	5.367 US211 US307 US344 US370	5.447C US211 US307	
5250-5255 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH 5.447D	5250-5350 RADIOLOCATION 5.333 US110 G59	5250-5350 Radiolocation 5.333 US110	Private Land Mobile (90)
5.448 5.448A			
5255-5350 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) 5.448 5.448A			
5350-5460 EARTH EXPLORATION-SATELLITE (active) 5.448B AERONAUTICAL RADIONAVIGATION 5.449 Radiolocation	5350-5460 AERONAUTICAL RADIO- NAVIGATION 5.449 RADIOLOCATION G56 SPACE RESEARCH (active) US48	5350-5460 AERONAUTICAL RADIO- NAVIGATION 5.449 Radiolocation Space research (active) US48	Aviation (87) Private Land Mobile (90)
5460-5470 RADIONAVIGATION 5.449 Radiolocation	5460-5470 EARTH EXPLORATION- SATELLITE (active) RADIOLOCATION G56 RADIONAVIGATION 5.449 SPACE RESEARCH (active) US49 US65	5460-5470 RADIONAVIGATION 5.449 Radiolocation Earth exploration- satellite (active) Space research (active) US49 US65	Private Land Mobile (90)

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5470-5650 MARITIME RADIONAVIGATION Radiolocation		5470-5570 MARITIME RADIONAVIGATION EARTH EXPLORATION- SATELLITE (active). RADIOLOCATION G56 SPACE RESEARCH (active)	5470-5570 MARITIME RADIONAVIGATION RADIOLOCATION Earth exploration- satellite (active) Space research (active)	Maritime (80) Private Land Mobile (90)
		US50 US65	US50 US65	
		5570-5600 MARITIME RADIONAVIGATION RADIOLOCATION G56	5570-5600 MARITIME RADIONAVIGATION RADIOLOCATION	
		US50 US65	US50 US65	
		5600-5650 MARITIME RADIONAVIGATION METEOROLOGICAL AIDS RADIOLOCATION US51	5600-5650 MARITIME RADIONAVIGATION METEOROLOGICAL AIDS RADIOLOCATION US51	
		G56 5.452 US65	5.452 US65	
5.450 5.451 5.452				
5650-5725 RADIOLOCATION Amateur Space research (deep space)		5650-5925 RADIOLOCATION G2	5650-5830 Amateur	
5.282 5.451 5.453 5.454 5.455			5.150 5.282	
5725-5830 FIXED-SATELLITE (Earth-to-space) RADIOLOCATION Amateur	5725-5830 RADIOLOCATION Amateur		5830-5850 Amateur Amateur-satellite (space-to-Earth)	ISM Equipment (18) Amateur (97)
5.150 5.451 5.453 5.455 5.456	5.150 5.453 5.455			
5830-5850 FIXED-SATELLITE (Earth-to-space) RADIOLOCATION Amateur Amateur-satellite (space-to-Earth)	5830-5850 RADIOLOCATION Amateur Amateur-satellite (space-to-Earth)			
5.150 5.451 5.453 5.455 5.456	5.150 5.453 5.455	5.150 US245	5.150	

* * * * *

PART 15 – RADIO FREQUENCY DEVICES

3. The authority citation for part 15 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 302, 303, 304, 307 and 544A.

4. Section 15.37 is proposed to be amended by adding paragraph (l), to read as follows:

§15.37 Transition provisions for compliance with the rules.

(l) U-NII Equipment operating in the 5.25 – 5.35 GHz band that are authorized under the certification procedure on or after **[1 year after publication of R&O in ET Docket No. 03-122 in the Federal Register]** shall comply with the DFS requirement specified in Section 15.407 of this part. All U-NII Equipment operating in the 5.25 – 5.35 GHz band that are manufactured or imported on or after **[2 years from publication of R&O in ET Docket No. 03-122 in the Federal Register]** shall comply with the DFS requirement specified in Section 15.407 of this part. Equipment authorized, imported or manufactured prior to these dates shall comply with the requirements for U-NII Equipment operating in the 5.25-5.35 GHz band that were in effect immediately prior to **[60 days after publication of R&O in ET Docket No. 03-122 in the Federal Register]**.

5. Section 15.401 is proposed to be amended as follows:

§15.401 Scope.

This subpart sets out the regulations for unlicensed National Information Infrastructure (U-NII) devices operating in the 5.15 - 5.35 GHz, 5.47 - 5.725 GHz and 5.725 - 5.825 GHz bands.

6. Section 15.403 is proposed to be revised to read as follows:

§15.403 Definitions.

(a) Access Point (AP). A U-NII transceiver that operates either as a bridge in a peer-to-peer connection or as a connector between the wired and wireless segments of the network.

(b) Available Channel. A radio channel on which a *Channel Availability Check* has not identified the presence of a radar.

(c) Average Symbol Envelope Power. The average symbol envelope power is the average, taken over all symbols in the signaling alphabet, of the envelope power for each symbol.

(d) Channel Availability Check. A check during which the U-NII device listens on a particular radio channel to identify whether there is a radar operating on that radio channel.

(e) Channel Move Time. The time needed by a U-NII device to cease all transmissions on the Operating Channel upon detection of a signal above the DFS detection threshold. Transmissions during this period will consist of intermittent management and control signals required to facilitate vacating the Operating Channel.

(f) Digital modulation. The process by which the characteristics of a carrier wave are varied among a set of predetermined discrete values in accordance with a digital modulating function as specified in document ANSI C63.17-1998.

(g) Dynamic Frequency Selection (DFS) is a mechanism that detects signals from other systems and avoids co-channel operation with these systems, notably radar systems. The DFS process shall be required to provide a uniform spreading of the loading over all the available channels.

(h) DFS Detection Threshold. The required detection level defined by detecting a received signal strength (RSS) that is greater than a threshold specified, within the U-NII device channel bandwidth.

(i) Emission bandwidth. For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

(j) In-Service Monitoring. Monitoring of the *Operating Channel* to check that a co-channel radar has not moved or started operation within range of the U-NII device.

(k) Non-Occupancy Period. The required period in which, once a channel has been recognized as containing a radar signal by a U-NII device, the channel will not be selected as an available channel.

(l) Operating Channel. Once a U-NII device starts to operate on an *Available Channel* then that channel becomes the *Operating Channel*.

(m) Peak Power Spectral Density. The peak power spectral density is the maximum power spectral density, within the specified measurement bandwidth, within the U-NII device operating band.

(n) Peak Transmit Power. The maximum transmit power as measured over an interval of time of at most 30/B (where B is the 26 dB emission bandwidth of the signal in hertz) or the transmission pulse duration of the device, whichever is less, under all conditions of modulation.

(o) Power Spectral Density. The power spectral density is the total energy output per unit bandwidth from a pulse or sequence of pulses for which the transmit power is at its peak or maximum level, divided by the total duration of the pulses. This total time does not include the time between pulses during which the transmit power is off or below its maximum level.

(p) Pulse. A pulse is a continuous transmission of a sequence of modulation symbols, during which the average symbol envelope power is constant.

(q) RLAN. Radio Local Area Network.

(r) Transmit Power. The total energy transmitted over a time interval of at most $30/B$ (where B is the 26 dB emission bandwidth of the signal in hertz) or the duration of the transmission pulse, whichever is less, divided by the interval duration.

(s) Transmit Power Control (TPC). A feature that enables a U-NII device to dynamically switch between several transmission power levels in the data transmission process.

(t) U-NII devices. Intentional radiators operating in the frequency bands 5.15 - 5.35 GHz and 5.470 - 5.825 GHz that use wideband digital modulation techniques and provide a wide array of high data rate mobile and fixed communications for individuals, businesses, and institutions.

7. Section 15.407 is proposed to be amended by revising paragraphs (a)(2) and (b)(4)-(7) by adding a new paragraph (b)(3), and redesignating paragraphs (b)(3)-(6) as paragraphs (b)(4)-(7), and by adding paragraph (h) to read as follows:

§15.407 General Technical Requirements.

(a) Power limits:

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the peak transmit power over the frequency bands of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10\log B$, where B is the 26 dB emission bandwidth in megahertz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(b) Undesirable Emission Limits:

(3) For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz.

(h) Transmit Power Control (TPC) and Dynamic Frequency Selection (DFS).

1) *Transmit power control (TPC)*. U-NII devices operating in the 5.47-5.725 GHz band shall employ a TPC mechanism. The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm.

- 2) *Dynamic Frequency Selection (DFS)*. U-NII devices operating in the 5.25-5.35 GHz and 5.47-5.725 GHz bands shall employ a DFS mechanism to detect the presence of radar systems and to avoid co-channel operation with radar systems. The minimum DFS detection threshold for devices with a maximum e.i.r.p. of 200 mW to 1 W is -64 dBm. For devices that operate with less than 200 mW e.i.r.p. the minimum detection threshold is -62 dBm. The detection threshold is the received power averaged over 1 microsecond referenced to a 0 dBi antenna.
- a) *Operational Modes*. The DFS requirement applies to the following operational modes:
- i) The requirement for channel availability check time applies in the master operational mode.
 - ii) The requirement for channel move time applies in both the master and slave operational modes.
- b) *Channel Availability Check Time*. A U-NII device shall check if there is a radar system already operating on the channel before it can initiate a transmission on a channel and when it has to move to a new channel. The U-NII device may start using the channel if no radar signal with a power level greater than the interference threshold values listed above is detected within 60 seconds.
- c) *Channel Move Time*. After a radar's presence is detected, all transmissions shall cease on the operating channel within 10 seconds. Transmissions during this period will consist of normal traffic for typically less than 100 ms and a maximum of 200ms after detection of the radar signal. In addition, intermittent management and control signals can be sent during the remaining time to facilitate vacating the operating channel. The aggregate time of the intermittent management and control signals are typically less than 20 ms.
- d) *Non-occupancy Period*. A channel that has been flagged as containing a radar system, either by a channel availability check or in-service monitoring, is subject to a non-occupancy period of at least 30 minutes. The non-occupancy period starts at the time when the radar system is detected.

**SEPARATE STATEMENT OF
CHAIRMAN MICHAEL K. POWELL**

Re: *Revisions to Parts 2 and 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices; Notice of Proposed Rulemaking; ET Docket No. 03-122.*

Our action today furthers twin goals of the Spectrum Policy Task Force: promoting spectrum access and furthering development of unlicensed technologies. Once the backwater of baby monitors and cordless telephones, the unlicensed sector has developed into a hotbed of growth and innovation. Earlier this week, I was privileged to see first-hand the fruits of this entrepreneurial activity at the Wireless Innovations Technology Showcase sponsored by the Commerce and State Departments and the FCC. The innovators on display at the Showcase are eager to run in new spectrum pastures – today we open a large new field for these thoroughbreds of innovation.

The Notice proposes to make available an additional 255 MHz of spectrum for unlicensed use – nearly *doubling* the amount of spectrum available for unlicensed operations in the 5 GHz band. Moreover, we propose to forego exclusive-use licensing, allowing market forces to determine how the band will be used, and providing potential users the greatest possible flexibility.

The Commission's action would not be possible without the assiduous efforts of our colleagues at NTIA and the Department of Defense. Assistant Secretary Victory and Deputy Assistant Secretary Price demonstrated exceptional leadership in negotiating a compromise that will allow unlicensed devices and military radars to share the 5 GHz band. In this regard, our Office of Engineering and Technology, our International Bureau and the commercial interests in this band also deserve particular credit for shaping the compromise that is before us today.

Our work is not yet complete, however. Our proposal does create the possibility of aligning the frequency bands used for U-NII devices domestically with those in other parts of the world, creating the potential for economies of scale for equipment manufacturers and a declining cost structure for consumers. But global harmonization is not yet a reality. That task falls to Ambassador Obuchowski and her fine WRC team, including Commissioners Copps and Abernathy. I am optimistic about the prospects for global harmonization and look forward to working with the delegation to move us closer to the dawn of a new era of unlicensed wireless innovation at 5.8 GHz.

**SEPARATE STATEMENT OF
COMMISSIONER KATHLEEN Q. ABERNATHY**

Re: *Revision of Parts 2 and 15 of the Commission's Rules to Permit Unlicensed National Infrastructure (U-NII) Devices, Notice of Proposed Rulemaking ET Docket No. 03-122.*

I believe that this NPRM serves two very important goals. First, it begins the process of making available an additional 255 MHz of spectrum for the growth and development of unlicensed wireless broadband networks on a harmonized basis. Second, it is an example of the Commission's commitment to move swiftly when acting on items of national importance that are addressed at the World Radiocommunications Conference (WRC).

More specifically, I believe that this item promotes the deployment of broadband services via wi-fi technology. This will prove tremendously valuable in promoting the core statutory goals of broadband deployment and facilities-based competition. As I have previously stated, the true key to achieving Congress's objective of a deregulatory and procompetitive framework lies in moving beyond duopoly towards a world where *multiple* facilities-based providers compete in the broadband arena. Examining the provision of additional spectrum for RLANs holds great promise in bringing us closer towards fulfillment of that goal.

There is also significant benefit to internationally harmonizing unlicensed bands where practicable and where it is in the public interest. Unlicensed bands may be able to benefit from the scale and scope that international harmonization can provide. Therefore, in this NRPM the FCC is proposing to provide access to spectrum for RLANs in frequency bands that are consistent with use in other parts of the world. The ability of U.S. manufacturers to capture the synergies of developing equipment in these frequency bands on a global basis should result in lower costs to consumers and the availability of increasingly innovative equipment.

Finally, I would like to applaud the staff for moving so quickly on this item. By issuing this NPRM prior to the commencement of the 2003 WRC, the Commission will be in a position to move quickly on a final order following the conclusion of the Conference. I look forward to working on this issue while attending the WRC in Geneva.

**JOINT STATEMENT OF COMMISSIONERS
MICHAEL J. COPPS AND KEVIN J. MARTIN**

Re: *Revision of Parts 2 and 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices; Notice of Proposed Rulemaking, ET Docket No. 03-122.*

We would like to commend the Bureau for making new spectrum available for unlicensed services. This item reflects the important agreement reached between NTIA, DOD, NASA, the FCC, and various industry groups including the Wi-Fi alliance. The underlying agreement demonstrates that hard work and public-private sector cooperation can achieve great results.

Unlicensed services are already demonstrating their great potential for consumers in other bands, from cordless phones to wireless broadband connections, such as 802.11b and Bluetooth.. We are particularly excited about the use of unlicensed networking devices to serve rural America. We have now moved well beyond demonstration projects, and unlicensed networks are bringing broadband access to places that other services have left behind. We are also hopeful that unlicensed operations will, as some have suggested, eventually provide a last-mile application to connect people's homes to the Internet, offering a real alternative to telephone wires, cable, and satellite connections.

Finally, we want to note that this item will give the American delegation to the WRC an important tool in promoting these and other wireless applications around the globe. Thank you for your hard work.

**SEPARATE STATEMENT OF
COMMISSIONER JONATHAN S. ADELSTEIN**

Re: *Revision of Parts 2 and 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices; Notice of Proposed Rulemaking; ET Docket No. 03-122.*

The evolution of unlicensed wireless devices over the past decade has been amazing. What was once the province of garage door openers, baby monitors, and cordless phones now is also the home of wireless LANs, hotspots, and cyber cafés.

I support this item because it continues the Commission's effort to promote the development of unlicensed devices and services. The tremendous growth of WiFi in the 2.4 GHz band was facilitated by the licensing (or more appropriately the "unlicensing") approach initially adopted by the Commission for this band. Our unlicensed service rules allow manufacturers to develop technologies that anyone can use without a license. In proposing to add spectrum in the 5.8 GHz band for unlicensed use, we must continue this regulatory approach so that we encourage as many avenues as possible for broadband and other important services to reach consumers, no matter where they live.

My goal as a policymaker is to maximize the services and information that flow over our airwaves. A regulatory framework for innovation can provide the necessary conditions that support the growth and development of spectrum-based services, including future use of the 5.8 GHz band. Such a framework functions in a manner akin to a greenhouse, in which plants are protected from the elements by a structure and are nurtured so that they can thrive on their own within it.

I believe that in the NPRM adopted today, the Commission properly strives for such an approach to spectrum management. We want to build a structure that encourages the growth of the unlicensed industries, but also controls the elements, like harmful interference that may impact incumbent operators. The issue of harmful interference is so important in this case because of the existing use of the 255 megahertz by Department of Defense radar systems. I applaud all of the parties who were involved in preparing the US position on Agenda Item 1.5 at next month's World Radiocommunications Conference, which also serves as blueprint for this NPRM.

Just as a greenhouse can support different types of plant forms, our framework for the U-NII bands must do the same – it must be flexible enough to accommodate all different kinds of technologies. Our framework should not choose which technology will survive, and which will not, but it must create an environment that allows the different seeds of technology to truly have an opportunity to grow and develop on their own. I believe that we have proposed such an approach here, and I am optimistic that our framework for innovation will enable new technologies in the unlicensed space to meet the public's demand for broadband more efficiently.