FCC MAIL SECTION

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

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In the matter of	)	
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Modification of Parts 2 and 15 of the Commission's Rules for unlicensed devices and equipment approval.	)))	ET Docket No. 03-201

REPORT AND ORDER

Adopted: July 8, 2004 **Released: July 12, 2004**

By the Commission: Chairman Powell issuing a statement.

I. INTRODUCTION

1. By this action, the Commission adopts changes to several technical rules for unlicensed radiofrequency devices contained in Parts 2, and 15 of its rules. These rule changes will allow device manufacturers to develop expanded applications for unlicensed devices and will allow unlicensed device operators, including wireless Internet service providers (WISPs), greater flexibility to modify or substitute parts as long as the overall system operation is unchanged. WISPs use unlicensed devices to provide broadband service for rural and underserved areas, and also to provide an alternative broadband service in metropolitan areas. The increased flexibility in our technical rules for unlicensed devices will encourage and facilitate an environment that stimulates investment and innovation in broadband technology and services.

2. The changes adopted herein also remove unnecessary regulatory impediments to the deployment of advanced technologies for unlicensed wireless networking. For example, the amended rules will specifically provide for the use of advanced antenna technologies such as sectorized and phased array antenna systems. These "smart antennas" focus their radio transmissions according to the geographic locations of their users. Use of these advanced antenna technologies provide for increased spectrum efficiency because they allow for greater re-use of the same radio frequencies. The use of smart antennas will also allow WISPs to pattern their coverage areas in a way that will best suit the needs of their customers.

3. The rule changes adopted herein should prove beneficial to manufacturers and users of unlicensed technology, including those who provide services to rural communities. We believe that the increased flexibility allowed by these changes will help to foster viable last mile solutions for the delivery of Internet services, other data applications, video, and voice services to underserved, rural, and other isolated communities.

II. BACKGROUND

4. Part 15 of the Commission's rules governs the operation of unlicensed radiofrequency devices. As a general condition of operation, Part 15 devices may not cause harmful interference to authorized radio services and must accept any interference that they receive.[1] In recent years, there has been a significant increase in the number and types of devices operating under the Part 15 rules. Examples of common Part 15 devices include cordless phones, computers, wireless baby monitors, and garage door openers. Such devices are widely used in everyday consumer functions. Another prominent sub-category of unlicensed technology includes devices that employ spread spectrum and other digital modulation techniques governed by Section 15.247 of our rules.[2] A wide variety of devices have been introduced under these rules for business and consumer use, including improved cordless telephones and computer local area networks. Moreover, the introduction of industry standards, such as IEEE 802.11 and Bluetooth, promise to increase both the number and variety of devices that will operate on an unlicensed basis.[3] Overall, the Part 15 rules have been highly successful in fostering the development of new unlicensed devices while protecting authorized users of the radio spectrum from harmful interference.

5. The Commission released the *Notice of Proposed Rulemaking* ("*Notice*") in this proceeding on September 17, 2003.[4] The *Notice* proposed various changes to update the rules to promote more efficient sharing of spectrum used by unlicensed devices and remove unnecessary regulations that inhibit such sharing. More than sixty parties filed comments in response to the *Notice*. With the exception of the proposed rule changes to permit the separate marketing of power amplifiers and establish a spectrum etiquette for the unlicensed bands, the comments were generally supportive of the Commission's proposals.[5] Many of the comments included suggested modifications to our specific proposals and were intended to clarify certain rule provisions or simplify implementation under our rules. By incorporating some of these suggestions, the Commission developed final rules consistent with our goals of increasing spectrum flexibility and fostering technological innovation.

III. DISCUSSION

A. Revisions to Part 15

1. Advanced Antenna Technologies

6. In the *Notice,* the Commission proposed to update Section 15.247 of the rules to allow the use of more efficient antenna technologies with unlicensed devices. The regulations in effect at the time

[1] 47 C.F.R § 15.5.

[2] The term "spread spectrum" devices as used herein also includes digitally modulated intentional radiators that comply with the rules in Section 15.247 of the Commission's rules, 47 C.F.R. § 15.247.

[3] Unlicensed spread spectrum (digital) devices, generally operate in the following bands: 902-928 MHz (915 MHz), 2400-2483.5 MHz (2.4 GHz) and 5725-5850 MHz (5.7 GHz) bands. These bands are also referred to as the "ISM" bands because they are designated for industrial, scientific, and medical (ISM) applications in the Table of Frequency allocations in Part 2 of the rules. Portions of the band are also used by licensed services (*See* 47 C.F.R. § 2.106). All services and devices, including spread spectrum devices, operating in the ISM bands must accept any interference received from industrial, scientific and medical equipment and licensed services and must not cause harmful interference.

[4] *See Notice of Proposed Rulemaking* in ET Docket 03-201, released September 17, 2003, 68 Fed Reg. 68823 (2003).

[5] Sirius Satellite submitted comments expressing its concern that too much flexibility in the rules for unlicensed devices will result in significant interference to licensees operating in adjacent bands. Sirius is particularly concerned about the 2320.0 – 2332.5 MHz band where it is licensed to provide Broadcasting Satellite Services.

allowed only omnidirectional and directional antennas to be used with such devices.[6] However, systems employing advanced antenna designs such as sectorized antennas and phased array adaptive antennas are now being used, or contemplated for use, as part of wide area network systems operating in the 2.4 GHz band. To date, the Commission has not generally authorized the operation of sectorized antennas by spread spectrum systems, but, by individual interpretation of its rules, we have allowed a few phased array systems to operate.[7] Sectorized antenna systems take a traditional omnidirectional coverage area and subdivide it into fixed sectors that are each covered using a single beam or antenna element to transmit desired information to all devices in the sector. For example, a sectorized system can be made from two individual antennas, each covering 60° of azimuth around the antenna structure, resulting in 120° of coverage. Operationally, each sector is treated as a different cell, the range of which is greater than that of a system using a single omnidirectional antenna. A phased array antenna system consists of a group of radiating elements arranged and driven in such a way that their radiated fields add in some directions and cancel in others. The combined fields can produce a single beam, or multiple beams pointing in a various directions while minimizing radiation in other areas. Properties of the resultant beams such as intensity, direction, or beamwidth can be adjusted by altering the input signal to each radiating element.

7. Sectorized and phased array antennas are used to create dynamic communication links with associated mobile or fixed devices in any direction around an antenna structure. This enables an application like a broadband local area network to serve a number of spatially separated clients from a single antenna system. These antennas allow systems to use spectrum more efficiently by making it possible to re-use a given frequency to communicate unique information with different devices along non-overlapping paths.

8. In the *Notice*, the Commission proposed to clarify that sectorized or phased array antenna systems must be capable of forming at least two discrete beams with a total simultaneous beamwidth radiating from the antenna structure no greater than 120°, regardless of the number of beams formed. The 120° of beamwidth was not intended to be continuous and was assumed to be divided among various independent beams pointing in different directions around the antenna structure. In this implementation, a sector system or phased array could be designed to transmit simultaneously in 2 beams of 60°, 10 beams of 12°, or any other combination not exceeding a total of 120° beamwidth. The Commission stated that such a requirement would prevent abuse of our rules by banning antenna systems which, in an extreme case, may be able to form beams of 1° width simultaneously along 360 radials around an antenna structure, emulating an omni-directional antenna but operating at power levels far in excess of those authorized for omni-directional systems.

9. In addition, the Commission proposed to allow sectorized and phased array systems to operate at the same power levels permitted for point-to-point directional antennas by limiting the total power that may be applied to each individual beam to the level specified in Section 15.247(b), *i.e.*, 0.125 Watt or 1 watt, depending upon the type of modulation used.[8] This change implies that when operating along multiple paths, the aggregate power in all beams could exceed the output power permitted for a single point-to-point system. We proposed, therefore, to limit the aggregate power transmitted simultaneously on all beams to 8 dB above the limit for an individual beam. This added restriction will allow a maximum of six individual beams to operate simultaneously at the maximum permitted power. If

[6] *See, generally* 47 C.F.R. § 15.247.

[7] *See* equipment authorizations for Vivato, Inc., FCC ID Nos. QLN-DP2310P0001 and QLNVLJ24WFSW. See also equipment authorization for Navini Networks, Inc., FCC ID No. PL6-ISM-BTS-R1. Information pertaining to these grants can be accessed via the FCC's database at https://gullfoss2.fcc.gov/prod/oet/cf/eas/reports/GenericSearch.cfm.

[8] 47 C.F.R. § 15.247(b).

more than six individual beams are used, then the aggregate power must be adjusted to fall within the 8 dB limit. Finally, the Commission proposed that the transmitter output power be reduced by 1 dB for each 3 dB that the directional antenna gain of the complete system exceeds 6 dBi. This requirement is similar to the present rules for point-to-point operation in the 2.4 GHz band.

10. Furthermore, the Commission asked questions regarding the operation of advanced antenna systems. Specifically, should there be an additional power reduction required whenever two or more beams of an advanced antenna system overlap? The Commission also asked if there is any need to modify the compliance testing requirements for systems that employ multiple antennas or radiating elements.

11. Commenters generally agree with the Commission's proposal to allow the use of advanced antenna technologies with unlicensed devices operating under Section 15.247. There was general concern that any rules adopted not be technology specific in any way that could preclude the development of future systems that use technology such as MIMO or Space Time Coding.[9] There were mixed opinions regarding the 120° total beamwidth limitation. Navini notes that the 120° requirement would prevent its system from being authorized because the system's aggregate beamwidth exceeds 120° at times. Bandspeed, Inc. argues that the 120° beamwidth limitation is arbitrary and while it would not effectively prevent a sectorized antenna from creating harmful interference, it would preclude the application of certain antenna technologies.[10] On the other hand, while Alvarion does not object to the 120° limit, it suggests that the limit should apply to each channel or frequency used by the system.[11] Nortel suggests an alternative method for determining the total beamwidth used. Commenters who disagree with our proposal, including Adam Stuhr, Jeffrey N. Houle, and Ryan D. Konwinski, state that new high-powered sectorized or phased array systems would cause interference to existing 802.11b operations not affiliated with an advanced antenna system.

12. We continue to believe that it is appropriate to revise Section 15.247 to permit the use of advanced antenna systems in the 2.4 GHz band. We are adopting our proposals with certain modifications based on the comments. First, we are allowing advanced antenna systems, including sectorized and adaptive array systems, to operate with an aggregate transmit output power transmitted simultaneously on all beams of up to 8 dB above the limit for an individual beam.

13. Second, we are adopting a requirement that the total EIRP on any beam may not exceed the EIRP limits for conventional point-to-point operation. We are aware that during the course of normal operation it is possible that two beams may overlap while tracking associated mobile units. Because the effective radiated power along the path of overlap might exceed the power level permitted by a single beam, we will require that the aggregate power transmitted simultaneously on overlapping beams be reduced to ensure that EIRP in the area of overlap does not exceed the limit for a single beam. Applications for equipment authorization must include the algorithm that will produce the maximum gain to ensure that the requirement will be met. For example, consider an antenna system that forms two separate beams both operating at the maximum permitted power. If the two beams were to overlap coverage area, then the power in each beam must be reduced in any proportion relative to the other in such a way that the total power in the overlap area does not exceed the maximum power allowed for one beam.

[9] For example, see comments of Bandspeed, IEEE 802.11, and Intel. MIMO, short for multiple in multiple out, refers to communication systems with multiple antennas at the transmitter or receiver side. Space-time coding can be achieved by transmitting signals from different antennas at different times. The signals of such systems would be coded in order to protect from random errors.

[10] Bandspeed comments at 5.

[11] Alvarion comments at 3.

14. We are not adopting a rule to restrict advanced antenna systems to 120° beamwidth. We conclude that the EIRP limits, including the areas of overlap, will ensure that interference potential of the system is minimized, regardless of the beamwidth employed.

15. The rules we adopt herein are technologically neutral and will permit operation of various new and developing antenna technologies. Although the *Notice* identified only sectorized and phased array systems as those that the Commission would consider under the revised rules, commenters have noted that other advanced antenna technologies are either under development or in use for various applications. Systems using technologies such as MIMO, space-time coding, and switched beam devices will be accommodated under the new rules.

16. We are grandfathering existing advanced antenna systems that have already received an equipment authorization. These systems may continue to operate in accordance with the terms of the equipment authorization. New systems must comply with the rules adopted herein.

17. The use of advanced antenna systems will benefit service providers in both rural and high-density areas. In rural communities, these new regulations will allow service providers to use higher powers to reach distant customers. Conversely, in urban communities these new antenna systems will allow providers to re-use spectrum more efficiently and thereby serve multiple clients with minimal interference risk.

2. Replacement Antennas for Unlicensed Devices

18. Section 15.203 requires that intentional radiators be designed such that no antenna other than that supplied can be used with the device.[12] The rules state that the device can be designed to permit a broken antenna to be replaced by the user; however, the use of a standard antenna jack or electrical connector is prohibited. These rules are intended to prevent both intentional and unintentional circumvention of the Part 15 emission limits by replacing a device's authorized antenna with an antenna having higher gain characteristics.

19. In order to support more flexible antenna requirements for unlicensed devices, the Commission proposed to allow that devices be authorized for use with multiple antennas. In the *Notice,* it proposed to achieve this goal by requiring testing only with the highest gain antenna of each type (*i.e.* yagi antenna vs. a horn antenna) that would be used with the transmitter at the maximum output power of that transmitter. Any antenna of a similar type that did not exceed the antenna gain of tested antennas could be used without retesting. Manufacturers would be expected to supply a list of acceptable antenna types with applications for equipment authorization. This change would enable consumers to more easily replace a broken antenna and save manufacturers both time and expense in building devices.

20. Commenting parties generally believe that the Commission should permit the use of replacement antennas. However, instead of authorizing replacements by antenna type, commenters suggest that the Commission should consider antenna gain and radiation pattern in determining if an alternate antenna is acceptable. For example, the Consumer Electronics Association (CEA) states that, generally antenna patterns vary more by gain than by type. Therefore, testing with the highest gain antenna would best illustrate interference potential.[13] Globespan Virata, Inc. adds that antenna gain must be considered for both in-band and out-of-band emissions. For example replacement antennas with dissimilar out-of-band characteristics than the original may cause the device to function in violation of the Commission's rules. Globespan suggests that the Commission add a condition requiring that any replacement antenna maintain the same or lower gain both in band and out of band emissions.

[12] 47 C.F.R. § 15.203.

[13] CEA comments at 5.

21. Commenters also suggest that the Commission eliminate the requirement for unique connectors. They argue that the rule is ineffective because it has no impact on ordinary consumers and does not deter those who want to modify unlicensed devices. Additionally, Cisco states that the unique connector requirement burdens manufacturers due to the need to find new "unique" connectors once its current connector becomes widely marketed to other manufacturers.[14] Similarly, Cisco, Intel, and others request that the integral antenna rule of Section 15.407(d) for U-NII devices in the 5.15 GHz – 5.25 GHz band should be eliminated.[15] This rule, like the Section 15.203 requirement, was instituted in order to prevent unauthorized tampering resulting in emissions from an unlicensed device causing harmful interference to licensed services. However, according to these commenters, the integral antenna rule increases complexity and costs while not satisfying the original intent.

22. We agree with commenters regarding the need to make modifications to Part 15 to permit the use of a variety of replacement antennas. A change in this requirement will enable greater design flexibility for manufacturers and allow consumers ease of replacement. Although we proposed to modify Section 15.203 to implement the modifications, we believe that the changes are better suited for Section 15.204. Accordingly, we modify Section 15.204 to permit intentional radiators to be authorized with multiple antennas of similar in and out-of-band gain and radiation pattern. Compliance testing for the intentional radiator must be performed using the highest gain antenna that will be used with the device. The manufacturer must supply a list of other acceptable antennas in the literature delivered to the customer.

23. We are not convinced, however, that the unique connector requirement should be eliminated. Thus, all replacement antennas authorized for use with an intentional radiator must incorporate a non-standard connector which uniquely couples with that intentional radiator. We remain concerned that removing this requirement could make it easier for parties to attach unauthorized high gain antennas or linear amplifiers to unlicensed devices in violation of the rules. Of even greater importance, however, is our concern that removing this requirement might have the unintended consequence of allowing uninformed consumers to inadvertently attach an antenna which causes the device to emit at levels in excess of the limits for human exposure to radio emissions. For these reasons, we will continue to require that unlicensed devices use non-standard antenna connectors as currently required in Section 15.203.

24. As suggested by commenters, we will also remove the Section 15.407(d) requirement that devices designed to operate in the 5.15 GHz – 5.25 GHz U-NII band incorporate an integrated antenna. In light of the fact that manufacturers are designing equipment that is capable of operating across multiple unlicensed bands, we conclude that it is impractical to maintain separate antenna requirements for each band in which a device my operate. Removal of this requirement will not present a significant interference risk because the modified Section 15.204 rules will ensure that any replacement antenna used with a device will not cause emissions to exceed authorized levels. Furthermore, the requirement that U-NII band devices incorporate a non-standard connector which couples only to the transmitter with which it is authorized will provide assurance that unauthorized antennas will not be used with the devices.

3. Flexible Equipment Authorization for Radio Transmission Systems

25. Section 15.205 of the rules prohibits marketing of external radio frequency amplifiers, except as part of a complete transmission system consisting of an intentional radiator, external radio frequency amplifier and antenna.[16] In the *Notice*, we proposed to allow marketing of separate radio frequency

[14] Cisco comments at footnote 4.

[15] *See* 47 C.F.R. § 15.407(d). *See* for example, Cisco comments at 4, Intel at 4, The Information Technology Industry Council at 2, and Nortel Networks at 8.

[16] 47 C.F.R. § 15.204.

power amplifiers on a limited basis. We proposed to restrict such marketing to amplifiers that are only capable of operation under the digitally modulated devices rules in Section 15.247 and under the U-NII rules for the 5750 – 5850 MHz band. These are the rules under which most unlicensed wireless broadband devices operate.[17] Further, we proposed to require that the parties responsible for such amplifiers obtain an equipment authorization (certification) and demonstrate that the device cannot operate with an output power of more than 1 Watt, the maximum power permitted under the rules. Consumers and businesses would then have the ability to obtain a separate amplifier if they find the device they have purchased has insufficient operating range to meet their needs. We invited comment as to whether we should instead provide only a more narrow relaxation to allow separate marketing of power amplifiers that are designed in a way such that they can only be used with a specific system that is covered by an equipment authorization, such as through use of a unique connector or via an electronic handshake with a host device. We also noted that frequency hopping systems that employ fewer than 75 hops are limited to an output power of 125 mW and invited comment as to whether the unique connector requirement may be necessary to ensure that 1 Watt amplifiers are not used with devices that are limited to 125 mW. We invited comment on these proposals and solicited views on other ways the rules might be modified to provide added flexibility without creating undue risk of interference to radio services or unlicensed devices.

26. Many parties oppose allowing RF power amplifiers to be sold separately if there are no safeguards to ensure that a system will continue to operate in compliance with the rules after an amplifier is installed. Alvarion states the improper installation and operation of RF amplifiers can cause interference such that other equipment attempting to share the band will suffer in performance and or range.[18] Cisco states that although the technical specifications of amplifiers may appear similar, the amplifiers may interact differently with other components to which they are matched. In other words, an amplifier inserted at the final stage of a system with which it has not been tested can produce system RF emission characteristics that could not otherwise be predicted by the amplifier's specifications. Alvarion and others suggest steps that can be taken to ensure that separately sold amplifiers can be marketed and used successfully.[19]

27. Alvarion states that if RF power amplifiers are tested to comply with the FCC rules as a system, as they are in the current rules, and if such devices are sold independently with a list of the FCC IDs with which the equipment can legally be operated, then compliance with the FCC rules can be maintained. CEA recommends that to limit the potential for any interference, the Commission should ensure that the amplifiers can be added only to equipment authorized to operate with 1 watt of output power, and not with equipment that is restricted by the rules to 125 mW.[20]

28. We agree with the commenters that combining RF amplifiers with systems that they have not been tested and shown to be in compliance with should not be permitted due to the high risk of potential interference. We also agree with Alvarion that with the proper constraints, amplifiers that have been shown to operate within the rules with a given system should be allowed to be separately marketed. Accordingly, we are adopting rules to allow external amplifiers to be marketed separately if they are designed in such a way that they can only be used with a specific system that is covered by an equipment authorization, such as through use of a unique connector or via an electronic handshake with a host

[17] We did not propose to allow radio frequency amplifiers in the 5150 – 5350 MHz U-NII band. We note that the 5150-5250 MHz band is restricted to indoor operation only. Further, we understand that some WISPs offer service using the 5250 – 5350 MHz U-NII band, however, because the output power is limited to only 200 mW there is little need to use external radio frequency amplifiers in this spectrum.

[18] Alvarion comments at 7.

[19] See, generally, comments of Alvarion, CEA, Cisco Systems, Globespan Virata, and YDI Wireless, Inc.

[20] *Id.* at 6.

device. The amplifiers must have a proprietary connection both into the amplifier and into the associated routers and access points with which they are FCC approved to work so that consumers with any other routers or access points cannot use them. The output power of such an amplifier must not exceed the maximum permitted output power of the system with which it is authorized. In addition, we are requiring that the amplifiers will be sold with a notice that they are to be used only in conjunction with the routers and access points for which they have been approved. A description or listing of the devices with which the amplifier can be used must appear on the outside packaging as well as in the user manual for the amplifier. The amplifiers must not be used to circumvent regulations regarding output power. For example, an amplifier may not be used to increase the output power of a system that is otherwise limited to 125 mW to a higher power. The party responsible for ensuring compliance with Commission regulations shall illustrate, during the equipment authorization process, the method used to prohibit unauthorized power increases. The marketing of RF amplifiers that are not FCC certified to be used as part of a specific system will continue to be prohibited.

29. In the *Notice*, the Commission proposed a number of rule changes to enable WISPs to customize their transmission systems without the need to obtain a new equipment authorization for every combination of components.[21] Specifically, we proposed to allow professional radio system installers to substitute technically equivalent components in systems that have been granted equipment authorization.[22] We invited comment as to whether specific criteria are necessary to qualify as a professional radio system installer or commercial service provider, and if so, what those criteria should be. Because we are retaining the unique antenna connector requirement and the requirement that external RF amplifiers be marketed only to operate with systems for which they have been certified to operate with, there is no need to require a professional installer to make antenna and amplifier substitutions. The connection and marketing provisions provide sufficient assurance that unauthorized power amplifiers will not be able to be used with an unlicensed transmitter. We are, therefore, not adopting a professional installer definition or requirement in this proceeding.

4. Measurement Procedures for Digital Modulation Systems

30. In the *Notice*, the Commission explained that unlicensed devices designed to use digital modulation techniques may be authorized under either the U-NII rules (Subpart E) or Section 15.247 of Part 15. When operating under either of these requirements the devices are limited to 1 watt maximum output power. However, the method used to determine the maximum power varies for U-NII and spread spectrum devices. Specifically, the output power measurement required under the Commission's U-NII device test procedure is an RMS average measurement, while the output power measurement required under the Commission's digitally-modulated spread spectrum device test procedure is a measurement of the overall peak emission. In adopting the U-NII rules, the Commission recognized that digital modulation techniques often display short duration peaks that do not cause increased interference to other operations. Measuring the peak level of short duration spikes overestimates interference potential. Accordingly, the Commission established measurement procedures for digital U-NII devices which allow for averaging output power in order to disregard these insignificant spikes.[23]

[21] Organizations such as WISPs or colleges and universities that provide radio services for a fee will be eligible to make use of the flexibility we propose herein.

[22] In concert with proposing allowing external RF amplifiers to be marketed and installed separately in the field, the Commission also sought comment on the specific criteria necessary to qualify as a professional radio system installer. *See Notice* at para 19.

[23] *See* 47 C.F.R. §§ 15.407(a)(4) – (a)(6). *See* also, "Measurement Procedure Updated for Peak Transmit Power in the Unlicensed National Information Infrastructure (U-NII) Bands," DA 02-2138, August 30, 2002. The emissions are averaged over a time interval of no greater than 30/(26 dB emission bandwidth) or the transmission pulse duration, whichever is less.

31. In the *Notice*, the Commission noted that the current rules may lead to inconsistent treatment of similar devices. Accordingly, it proposed to harmonize the measurement procedures for digital modulation devices authorized under Section 15.247 with the digital U-NII devices authorized under Section 15.407. Specifically, we proposed to allow entities performing compliance testing for Section 15.247 devices to use an average, rather than overall peak, emission as provided by Section 15.407, paragraphs (a)(4) and (a)(5) when measuring transmit power. We proposed this change for devices using digital modulation that operate in the 915 MHz, 2.4 GHz and 5.7 GHz bands.

32. Most commenters agree that the measurement procedures for digital devices under Sections 15.247 and 15.407 should be harmonized. Most also prefer to use an average power measurement as provided for in the U-NII regulations. Nortel Networks agrees that the harmonization by using the measure of the average emission power for both 15.247 and UNII devices would benefit the industry. It states that this change will not have a detrimental effect on existing systems. Nortel Networks submits that it is appropriate to choose spectrum occupancy characteristics that are commonly used by many RLAN systems already in use in these bands. Matsushita Electric Corporation of America ("Matsushita") states that the Commission should permit, as an option, the use of the measurement procedures utilized in the U-NII rules for 15.247 devices. It contends that providing for the use of both the existing and proposed procedures would allow manufacturers and designers the maximum degree of flexibility to design their equipment using existing and future technologies.[24]

33. Cisco Systems, Inc. cautions that aligning the measurement procedures without also aligning the out-of-band emissions masks could be detrimental to installed devices because of the potential for increase in out-of-band emissions. For example, Cisco illustrates that alignment of the measurement procedure alone would allow the out-of-band emissions from a device which currently must be authorized under the U-NII rules to increase by as much as 10 dB if it were to be authorized under the Section 15.247 regulations.[25] Cisco states that the Commission can avoid such increases by changing the out-of-band emission limits of Section 15.247(c) from -20 dB to -30 dB. Itron opposes applying any new measurement procedure to devices in the 902 – 928 MHz band because of potential harm caused to existing devices in the band.

34. As discussed above, we believe that it is important to maintain consistent treatment of similar technologies regardless of the rule section under which it is authorized. Therefore, as proposed in the *Notice*, we will modify Section 15.247 to permit the determination of the output power of a digitally modulated system by the same methods used to determine output power of systems operating pursuant to the U-NII rules. This measurement, in both cases, may be taken as an average power measurement as described in the Public Notice, "Measurement Procedure Updated for Peak Transmit Power in the Unlicensed National Information Infrastructure (U-NII) Bands," DA 02-2138.[26]

35. We are not removing the existing measurement requirements for Section 15.247 devices from the rules; instead, the new measurement procedure can be used optionally for digitally modulated Section 15.247 devices. However, in order to address the concern of increased out-of-band emissions from devices authorized under Section 15.247, we will require that if emissions are measured using the average power procedure, then out-of-band emission must be reduced to 30 dB below the level of the device's fundamental frequency.

36. The optional measurement procedure will be applicable to digitally modulated devices in the 915 MHz, 2.4 GHz and 5.7 GHz bands. We are not persuaded by Itron's comments to exclude the

[24] Matsushita comments at 4.

[25] Cisco comments at 6.

[26] *See* Public Notice, DA 02-2138, released August 30, 2002; 17 FCC Record 16521 (2002).

915 MHz band. Itron argues that using an average rather than peak power output measurement would result in higher-power devices being permitted to operate in the band.[27] It states that changing the testing procedure could be detrimental to tens of millions of devices operating in the 915 MHz band.[28] We find that Itron has not made a significant showing to warrant exclusion of the 915 MHz band from the revised regulations. We continue to believe that these changes will benefit operators in the 915 MHz band equally as well as operators in the 2.4 GHz and 5.7 GHz bands without resulting in increased risk of interference.

37. We note that Sirius Satellite requests that we establish a new limit for out-of-band emissions that fall over the satellite DARS band. It states that the current general limit of Part 15 emissions is many times higher than the level of the received satellite signal. Sirius proposes a new limit of 8.6 uV/m for emissions from Part 15 devices falling into the DARS band. Sirius' specific concern is not at issue in this proceeding. As the Telecommunications Industry Association correctly states in its replies, the Commission has addressed, and denied, a virtually identical proposal by Sirius in the *Report and Order* in ET Docket No. 99-231.[29] No new information has been submitted by Sirius in this proceeding that would warrant further consideration of this proposal.

38. Along with aligning measurement procedures, we also make clarifications to the definitions of transmit power to more effectively reflect how this measurement should be taken when the transmit power is delivered to an antenna system which may have one or multiple elements. We make this clarification by replacing the term "peak transmit power" in the U-NII rules with "maximum conducted output power." The maximum conducted output power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level.[30]

39. In the *Notice,* the Commission asked whether it should amend the spectrum occupancy rules for Section 15.247 and U-NII devices to apply the same limits to both types of devices.[31] Itron and Tropos Networks filed contrasting comments with regard to this question. Itron believes that all devices authorized under Section 15.247 should be required to limit spectral occupancy to 17 dBm in any 1 MHz band, as provided by Section 15.407.[32] Tropos Networks, on the other hand, states that the spectral occupancy limit in Section 15.407 should be changed to 8 dBm in any 3 kHz to match the current limit in Section 15.247. We do not believe that there has been sufficient discussion on this topic to justify modifying the requirement either way. Therefore, at this time, we will leave the spectrum occupancy limits for both Section 15.247 and U-NII devices unchanged. We will consider addressing this subject at a later date should we gather additional information with regard to the affects of modifying the spectrum occupancy limits.

5. Frequency Hopping Channel Spacing Requirements

40. In the *Notice* the Commission reaffirmed its commitment to promote spectrally efficient technologies and, in response to a request by the Bluetooth Special Interest Group (Bluetooth SIG), proposed to modify the frequency hopping spacing requirements for certain systems in the 2.4 GHz band. By way of background, Section 15.247(a)(1) of the rules currently require that frequency hopping systems

[27] Itron, Inc. comments at 5.

[28] *Id.*

[29] *See Second Report and Order* in ET Docket No. 99-231, released May 30, 2002, 17 FCC Rcd. 10755 (2002).

[30] *See* Appendix A at Section 15.403, *infra.*

[31] *NPRM* at paragraph 24.

[32] Itron comments at 5.

have hopping channel center frequencies separated by either a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.[33] The Bluetooth SIG requested that this channel spacing requirement be modified to allow hopping channel carrier frequencies to be more closely spaced. In particular, it asked that we modify the requirement to allow a separation of a minimum of 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater. Although the request did not specify the operating band to which the changes should apply, we interpret the request as being applicable to devices operating in the 2.4 GHz band because the Bluetooth product line operates in the 2.4 GHz band.

41. The Bluetooth SIG requested this modification to accommodate next generation Bluetooth technology that will use advanced modulation schemes capable of higher data rates than existing Bluetooth devices.[34] Specifically, Bluetooth devices conforming to the present rules operate at a data rate of up to 1 Mbps. Second generation Bluetooth devices employing new modulation techniques will be capable of data rates of up to 3 Mbps. This improvement will enable future Bluetooth devices to be used for more data intensive applications like wireless local area networks.

42. The Bluetooth SIG states that the current hopping channel spacing requirements are met using modulation techniques such as frequency shift keying, which is characterized by signals with relatively high signal peaks and steep drop-offs. However, its new modulation technique has a relatively low signal peak with more gradual signal drop-off. The resulting hopping channel bandwidths are slightly wider than the channel bandwidths of systems using older modulation techniques. The Bluetooth SIG states that it selected this new modulation technique for its second generation product because the technique is backward compatible with existing modulation schemes.[35] It states that the new devices would not increase interference potential because they would use a reduced number of hopping channels and limit output power to 125 mW.

43. In accordance with this request, we proposed to modify the frequency hopping spacing requirement to permit certain systems in the 2.4 GHz band to utilize hopping channels separated by either 25 KHz or two-thirds of the 20 dB bandwidth, whichever is greater. We stated that although a single device's channels will not overlap in time, the operation of multiple devices using the new modulation technique simultaneously in a given area may cause the spectral occupancy and power density to increase, leading to an increased risk of interference. Therefore, we sought comment on the interference potential of new waveforms with more gradual roll-off and potentially higher spectral power densities at the channel band edges.

44. We noted that the current rules place output power limitations on frequency hopping systems based upon the number of hopping channels used. Specifically, systems in the 2.4 GHz band that use at least 75 hopping channels are allowed 1 watt output power.[36] However, systems that use fewer than 75 hopping channels are limited to 125 mW output power.[37] In general, many systems that employ fewer than 75 hopping channels use hopping channels that are wider than those that use 75 or more channels. In allowing these wider hopping channels, the Commission recognized that a reduction in the maximum permitted output power was needed in order to minimize any potential interference risk.[38] In the *Notice*,

[33] *See* 47 C.F.R. § 15.247(a)(1). The bandwidth of a hopping channel is determined by measuring the bandwidth between points on both sides of the maximum power frequency at which the power drops to 20 dB below the maximum power.

[34] *See* Comments of the Bluetooth SIG, filed in DA 02-2152.

[35] *See* Bluetooth SIG comments at 4.

[36] 47 C.F.R. § 15.247(b)(1).

[37] *Id.*

[38] *See First Report and Order* in ET Docket 99-231, 15 FCC Rcd 16244(2000) at paragraph 15.

we tentatively concluded that an output power limit of no more than 125 mW is also appropriate for those systems that use more narrowly spaced channels than currently permitted. In line with previous Commission findings, we stated our belief that this restriction would ensure that systems using the narrow-spaced, slightly wider hopping channels will not overcrowd the 2.4 GHz band with relatively high-power emissions and sought comment on this proposal. The proposed rule in Appendix A of the *Notice* contained an additional restriction that was not proposed or discussed in the text of the *Notice*. Specifically, it restricted this proposal to systems that employ fewer than 75 hopping channels.[39]

45. Commenters including CEA, Globespan, and IEEE 802 support our proposal to modify the frequency hopping spacing requirement in the 2.4 GHz band. CEA states that relaxing the hopping channel spacing requirement in the current rules and reducing the associated power limit is appropriate given the utility of unlicensed devices using this type of modulation and their limited potential to cause interference because of the generally short range over which they communicate.[40]

46. The IEEE 802 recommends allowing the two-thirds rule for all frequency hopping systems in the 2.4 GHz band operating at an output power no greater than 125 mW, regardless of the number of hopping channels employed, as opposed to the proposed limitations.[41] The Wi-Fi Alliance states that the net effect of the 2/3 bandwidth rules would be to increase the number of available hopping channels, improving the interference immunity of any frequency hopping implementation. The Wi-Fi Alliance further states that restricting the proposed rule change to systems operating with less than 75 hopping channels would deny the benefits of the 2/3 rule to a wider range of systems without any clear benefit to coexistence between different systems.[42]

47. ITI, Matsushita, and Motorola also recommend deleting the 75 hopping channel or less requirement.[43] To implement this change, ITI suggests the following change to the proposed text for Section 15.247(a)(1), "frequency hopping systems in the 2.4 GHz band may have hopping channel carrier frequencies separated by a minimum of 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW."[44] ITI believes that this change would have no adverse impact on interference between systems and would allow a Bluetooth system operating with the next generation Bluetooth modulation scheme to use the same number of hopping channels as current generation Bluetooth systems.

48. Pegasus supports the two-thirds of 20 dB bandwidth channel separation for frequency hopping systems for both the 915 and the 2.4 GHZ band.[45] In contrast, Itron opposes the application of this proposal to the 915 MHz band, stating that the *Notice* did not propose to apply the new rules to the 915 MHz band and that the Commission should state that any changes will not apply to the band. Itron states that due to the prevalence of low power devices in the 915 MHz band, reducing channel spacing poses a greater probability of interference among these devices.[46]

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[39] *See* NPRM, Appendix A: Proposed Rule Changes, § 15.247(a)(1).

[40] CEA comments at 7-8.

[41] IEEE 802 comments at para 19.

[42] Wi-Fi Alliance at para 14.

[43] Matsushita comments at 5-6; Motorola comments at 3.

[44] ITI comments at 6.

[45] Pegasus comments at 2.

[46] Itron at 3-5.

49. We believe that our proposal to modify the frequency hopping spacing requirement in the 2.4 GHz band will provide for more spectrally efficient technologies. We are therefore adopting our proposal. We agree with the commenters that the relaxed frequency hopping spacing requirement proposed should not be limited to systems using 75 or fewer channels. We are therefore adopting the language, as suggested by ITI, that will not limit flexibility to systems using 75 or fewer channels. Frequency hopping systems that operate under the revised spacing rules will be limited to an output power of 125 mW.

50. We are not extending this provision to the 915 MHz band as requested by Pegasus. There are additional concerns with regard to altering the separation distances for frequency hopping systems in the 915 MHz band. In particular, the 915 MHz band has only 28 megahertz of available spectrum as opposed to 83.5 megahertz of spectrum in the 2.4 GHz band. Because there is less spectrum available, wider skirts would have a greater impact. We do not have sufficient information about the affects that modifying the spacing requirements would have on existing users of the band. Therefore, we are not changing the channel spacing requirements for the 915 MHz band at this time.

6. Improving Sharing in the Unlicensed Bands

51. In the *Notice,* we invited comment on whether we should consider any other methods to ensure efficient spectrum usage by unlicensed devices and pointed to the "spectrum etiquette," or sharing conditions, developed by the industry for the operation of Unlicensed PCS devices operating under Part 15 of its rules.[47] The spectrum etiquette establishes a set of steps that a device must follow before it may access the spectrum.[48] It requires that devices monitor the spectrum in which they intend to operate. A device may begin transmission only if no signal above a specified threshold is detected.[49]

52. We invited comment on a number of issues regarding the possibility of implementing a spectrum sharing etiquette for devices that operate on an unlicensed basis in bands other than the Unlicensed PCS band. Generally, we sought comment on who should develop any such etiquette, to which bands would an etiquette apply, and how effective would such an etiquette imposed on new entrants be in improving spectrum sharing.

53. Most parties commenting on this issue believe that a spectrum etiquette would be undesirable in the unlicensed bands because it would tend to limit development. For example, Pegasus Technologies, Inc. ("Pegasus") states that imposing spectrum etiquette on existing bands would limit future development of the bands. It refers to the 915 MHz and 2.4 GHz bands specifically where it states that the increased design complexity needed to implement a spectrum etiquette would hinder the continued introduction of low-cost devices designed to operate in the bands. However, on a foreword looking basis, Pegasus suggests that if the Commission makes additional unlicensed bands available, then an etiquette may be feasible in at least a few of the new bands.[50] Intel Corporation adds that, at this point, spectrum sharing etiquettes have not been shown to be necessary. It argues that if we were to mandate etiquettes, it would likely delay new services and impede innovation.[51] On the other hand, Itron supports a sharing etiquette, particularly for devices in the 902 -928 MHz band. Itron suggests that we could best promote sharing and efficiency in the 902 – 928 MHz band by establishing a limit on the transmit duty cycle of

[47] *See* 47 C.F.R. Part 15, Subpart D – Unlicensed Personal Communications Service Devices.

[48] *See* 47 C.F.R. §§ 15.319, 15.321 and 15.323.

[49] 47 C.F.R. § 15.321(c)(1) – (7).

[50] Pegasus comments at 3. Pegasus states that an etiquette would be useful for toll WISPs in new unlicensed spectrum. It states that the WISPs would presumably be able to afford the more complex equipment needed to implement a spectrum etiquette.

[51] Intel comments at 5.

Section 15.247 digital modulation devices.[52] Also in support of some form of spectrum sharing requirements, Microsoft Corporation ("Microsoft") presented several suggested requirements which it believes could help to ensure that the bands available for unlicensed operation do not become overcrowded. Microsoft recommends that spectrum sharing be facilitated by requiring devices to cease transmissions if there is no information to be sent, allowing unlicensed devices to transmit only they can do so without causing interference to other devices already using the channel, and requiring unlicensed devices to incorporate dynamic range control which would force a device to use the minimum transmit power necessary to complete a communications link.[53]

54. We decline to impose any type of spectrum etiquette for the Part 15 bands that are the subject of this proceeding because they are already heavily used. We believe that design flexibility has helped industry to develop efficient sharing and modulation schemes. It appears that the existing regulations have resulted in very efficient use of available unlicensed spectrum. However, we also find that the recommendations advanced by Microsoft have merit and should be taken under consideration. In particular, we find that Microsoft's suggestions may prove beneficial as we proceed in making additional spectrum available for unlicensed operation. For example, we now have under consideration a *Notice of Proposed Rulemaking* seeking comment on issues related to allowing unlicensed devices to operate in unused portions, or "White Spaces," in the TV broadcast spectrum.[54] We note that a device operating in accordance with the suggested guidelines could more effectively share the broadcast band, minimizing the risk of interference to both TV stations and other unlicensed devices. The Commission will take into consideration possible requirements such as these as it contemplates making additional spectrum available for the operation of unlicensed devices.

7. Part 15 Unlicensed Modular Transmitter Approvals

55. In the *Notice* we also proposed to clarify the equipment authorization requirements for modular transmitters. However, because there are complex and evolving issues associated with modular transmitters, we determined that further information is needed before reasonable guidelines can be developed. Accordingly, we will address this matter in a later Commission action.

8. Special Temporary Authority

56. In the *Notice,* we proposed to delete the provisions in Section 15.7 of the rules for obtaining a Special Temporary Authority (STA) to operate intentional or unintentional radiation devices not conforming to the Part 15 rules.[55] We noted that the Office of Engineering and Technology has not granted any STAs under Part 15 nor had any formal requests for an STA under these rules in the last 10 years. We further noted that this need is being met through the allowances for STAs under the provisions in Part 5 for experimental licenses.

57. Only Globespan Virata filed comments on this subject. It expresses support for removing the Special Temporary Authority provisions.[56] We conclude that the STA provisions of Part 15 are no longer needed. The lack of interested parties commenting on this topic provides a further indication that the rule section has outlived its usefulness. Therefore, as proposed in the *Notice*, we delete Section 15.7 from the rules. STAs to operate intentional or unintentional radiation devices not conforming to the Part 15 rules will continue to be granted, as appropriate, under the experimental licensing provisions of Part 5.

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[52] *See* Itron comments at 8.

[53] *See* Microsoft comments at 5, 6.

[54] *See Notice of Proposed Rulemaking* in ET Docket 04-186, released May 25, 2004, 19 FCC Rcd. 10018 (2004).

[55] 47 C.F.R. § 15.7.

[56] Globespan comments at 16.

B. Revisions to Part 2

1. Import Conditions

58. Section 2.1204 of the rules limits the importation of radio frequency devices that have not yet received equipment authorization and are not intended for operation within one of the Commission's licensed services to 200 or fewer units for testing and evaluation, and 10 or fewer units for demonstration at industry trade shows, provided the devices will not be offered for sale or marketed.[57] Devices intended for use in a licensed service can be imported in greater numbers; 2000 or fewer for testing and evaluation and 200 or fewer for demonstration purposes.[58] We have found that devices used in licensed services are easier to track and therefore need not be as tightly restricted.

59. In a comment filed in response to the 2002 Regulatory Flexibility Act Review, Hewlett-Packard Company (HP) asked that we increase the number of devices not intended for use in a licensed service that may be imported to 2000 or fewer for testing and evaluation and 100 or fewer for demonstration purposes. HP further requests that the modified rules be expanded to permit demonstration prototypes to be used, in addition to trade shows, for any other purpose designed to build market awareness. As an alternative to the suggested rule changes, HP states that we could consider combining Sections 2.1204(a)(3) and 2.1204(a)(4) to create a limit of 2100 devices for all pre-authorized units to be used for, "design refinement, software development, marketing and customer support program development, or any other needed product development purpose, including promoting market awareness."[59] HP contends that this relaxation of the import regulations would more accurately reflect the manufacturing and marketing procedures in use today.[60]

60. In the *Notice*, we proposed to relax the import restrictions as requested by HP. However, we also expressed concerned that increasing the limit as HP requests might encourage some manufacturers to import far more devices than necessary and to request an exception to import an even greater number of devices, without sufficient cause. We sought comment on both the necessity of increasing the importation limit and the possibility of abuse of a revised rule.

61. Commenting parties generally contend that the current import limits are not reflective of the marketing environment. They support HP's proposal to increase the limits.[61] Cisco, for example, states that raising the current limits will reduce the administrative burden on both the Commission and industry, without any real risk of interference.[62] Likewise, the Wi-Fi Alliance states that it is reasonable to allow the use of demonstration equipment for market development activities outside of trade shows.[63]

62. We do not believe, however, that commenters have made a compelling argument supporting the need for a modification to the importation regulations. As noted in the *Notice*, the Commission routinely receives requests to import products in greater numbers than provided for in the current rules. Such requests are generally processed with little delay. To be more specific, our Office of Engineering and Technology Laboratory processes, on average, only about twenty-five such requests per year. This limited number of

[57] *See* 47 C.F.R. §§ 2.1204(3)(ii) and 2.1204(4)(ii).

[58] *Id.*

[59] HP comments at footnote 7.

[60] *See NPRM* at paragraphs 48, 49.

[61] *See* generally, comments of Ashebir Gebre; Globespan Virata, Inc.; IEEE 802; The Bluetooth SIG, The Information Technology Industry Council.

[62] Cisco comments at 16.

[63] The Wi-Fi Alliance comments at paragraph 29.

requests does not impose a significant administrative burden on the Commission. Furthermore, the requests are useful to our staff because they indicate how many devices are being imported prior to authorization. We remain concerned that relaxation of the import rules might result in an unnecessary influx of excess equipment and increase the likelihood that manufacturers will lose track of unauthorized devices.[64] Accordingly, we decline to modify the Section 2.1204 importation regulations.

2. Electronic Filing

63. In the *Notice,* we proposed three changes which we believed would streamline our filing process by reducing paperwork burdens and further our efforts to comply with the E-Government initiative.[65] Specifically, we proposed to 1) delete the provisions for a paper filing of an application for Certification in Section 2.913, noting that no requests to submit paper filings had been received in the past five years; 2) modify Section 2.926(c) to require electronic filing for all grantee code assignment requests, and; 3) modify Sections 2.929(c) and (d) to require electronic filing for all changes in address, company name, contact person, and control/sale of the grantee.[66]

64. All parties commenting on this issue support these proposals.[67] For example, Cisco believes that virtually everyone who would file for equipment certification or for a grantee code has access to both a computer and the Internet. Cisco also supports these proposals because they will relieve the Commission of the administrative burden of handling paper filings.[68] ITI supports these changes because it believes that electronic filing speeds up application processing and therefore supports the Commission in further streamlining to reduce cost and increase efficiency.[69]

65. With the support of commenters, we conclude that the paper filing provisions in Sections 2.913(c), 2.926(c), 2.929(c), and 2.929(d) of the rules are unnecessary and outdated. The proposed revisions would facilitate more efficient document filing and processing. Therefore, we will make the changes to Sections 2.913(c), 2.926(c), 2.929(c), and 2.929(d) as proposed in the *NPRM* and summarized above.

3. Accreditation of Test Laboratories

66. In the *Notice,* we observed that the rules do not address re-evaluation intervals for laboratories that test devices for Part 15 and Part 18 compliance.[70] Accrediting bodies that evaluate the laboratories generally determine these intervals themselves. While domestic laboratories are generally re-evaluated at two-year intervals, some Accrediting Bodies reassess foreign laboratories only every 7 years. We indicated that it is important that all laboratories, both foreign and domestic, be re-certified on a common interval. Therefore, we proposed to modify Section 2.948 to clarify that all test sites, both

[64] The rules prohibit the sale or lease of such devices prior to authorization.

[65] *See* the E-Government Act of 2002, Public Law No: 107-347. The law aims to enhance the management and promotion of electronic Government services and processes by, among other things, establishing a broad framework of measures that require using Internet-based information technology to enhance citizen access to Government information and services. E-Government uses improved Internet-based technology to make it easy for citizens and businesses to interact with the government, save taxpayer dollars, and streamline citizen-to-government communications.

[66] *See* 47 C.F.R. §§ 2.913, 2.926(c), 2.929(c) and 2.929(d); respectively.

[67] *See* comments of Cisco, Globespan Virata, and ITI.

[68] *See* Cisco comments at 16.

[69] ITI comments at 9.

[70] *See Erratum*, DA 03-3729, released November 20, 2003, 18 FCC Rcd. 24329 (2003).

foreign and domestic, must be reassessed by their Accrediting Body every two years. We proposed to modify Section 2.962(e)(1) to clarify that every Telecommunications Certification Body must be re-accredited every 2 years for continued accreditation.

67. Globespan Virata, Inc. supports the laboratory re-accreditation proposals. It notes that because equipment technology, test methods, and regulations change frequently, the Commission should have assurances that all testing labs are properly equipped and knowledgeable of current practices.[71] HP states that it supports our intent to maintain a level playing field globally for test labs offering measurement equipment authorization.[72] For the reasons indicated above, we will modify the rules as proposed. Specifically, we are modifying Section 2.948 to clarify that all test sites must be reassessed by their Accrediting Body every two years. Additionally, we are modifying Section 2.962 by adding a new paragraph (c)(7) to clarify that every Telecommunications Certification Body must be reassessed on two-year intervals.

C. Miscellaneous

68. Finally, we make an editorial change to Section 15.31(a)(3) to update the reference to ANSI C63.4 to its newest version. Specifically, we are replacing "ANSI C63.4–2001" with "ANSI C63.4–2003." The Note to paragraph (a)(3) remains unchanged.

IV. PROCEDURAL MATTERS

69. Final Regulatory Flexibility Analysis. The Final Regulatory Flexibility Analysis, required by the Regulatory Flexibility Act, *see* 5 U.S.C. § 604, is contained in Appendix B.

70. Paperwork Reduction Act. This Report & Order contains modified information collections subject to the Paperwork Reduction Act of 1995 (PRA), Public Law 104-13. It will be submitted to the Office of Management and Budget (OMB) for review under Section 3507(d) of the PRA. OMB, the general public, and other Federal agencies are invited to comment on the new or modified information collection(s) contained in this proceeding.

V. ORDERING CLAUSES

71. Accordingly, IT IS ORDERED that Parts 2 and 15 of the Commission's Rules ARE AMENDED as specified in Appendix A, effective 30 days after publication in the Federal Register. This action is taken pursuant to the authority contained in Sections 4(i), 301, 302, 303(e), 303(f), and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154(i), 301, 302, 303(e), 303(f), and 303(r).

72. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this Report and Order, including the Final Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

[71] Globespan Virata comments at 17.

[72] HP comments at 9.

73. For further information regarding this Report and Order, contact Neal McNeil, Office of Engineering and Technology, (202) 418-2408, TTY (202) 418-2989, e-mail Neal.McNeil@fcc.gov.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

APPENDIX A: RULE CHANGES

Part 2 of Title 47 of the Code of Federal Regulations is amended as follows:

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 2.913 is amended by revising paragraphs (a), (b), and (c) to read as follows:

§ 2.913 Submittal of equipment authorization application or information to the Commission.

(a) All applications for equipment authorization must be filed electronically via the Internet. Information on the procedures for electronically filing equipment authorization applications can be obtained from the address in paragraph (c) of this section and from the Internet at https://gullfoss2.fcc.gov/prod/oet/cf/eas/index.cfm.

(b) Unless otherwise directed, fees for applications for the equipment authorization, pursuant to section 1.1103 of this chapter, must be submitted either electronically via the Internet at https://gullfoss2.fcc.gov/prod/oet/cf/eas/index.cfm or by following the procedures described in section 0.401(b) of this chapter. The address for fees submitted by mail is: Federal Communications Commission, Equipment Approval Services, P.O. Box 358315, Pittsburgh, PA 15251-5315. If the applicant chooses to make use of an air courier/package delivery service, the following address must appear on the outside of the package/envelope: Federal Communications Commission, c/o Mellon Bank, Mellon Client, Service Center, 500 Ross Street - Room 670, Pittsburgh, PA 15262-0001.

(c) Any equipment samples requested by the Commission pursuant to the provisions of subpart J of this part shall, unless otherwise directed, be submitted to the Federal Communications Commission Laboratory, 7435 Oakland Mills Road, Columbia, Maryland, 21046.

3. Section 2.926 is amended by revising paragraph (c) to read as follows:

§ 2.926 FCC identifier.

* * * * *

(c) A grantee code will have three characters consisting of Arabic numerals, capital letters, or combination thereof. A prospective grantee or his authorized representative may receive a grantee code electronically via the Internet at https://gullfoss2.fcc.gov/prod/oet/cf/eas/index.cfm. The code may be obtained at any time prior to submittal of the application for equipment authorization. However, the fee required by section 1.1103 of this chapter must be submitted and validated within 30 days of the issuance of the grantee code, or the code will be removed from the Commission's records and a new grantee code will have to be obtained.

* * * * *

4. Section 2.929 is proposed to be amended by revising paragraphs (c) and (d) to read as follows:

§ 2.929 Changes in name, address, ownership or control of grantee.

* * * * *

(c) Whenever there is a change in the name and/or address of the grantee of an equipment authorization, notice of such change(s) shall be submitted to the Commission via the Internet at https://gullfoss2.fcc.gov/prod/oet/cf/eas/index.cfm within 30 days after the grantee starts using the new name and/or address.

(d) In the case of transactions affecting the grantee, such as a transfer of control or sale to another company, mergers, or transfer of manufacturing rights, notice must be given to the Commission via the Internet at https://gullfoss2.fcc.gov/prod/oet/cf/eas/index.cfm within 60 days after the consummation of the transaction. Depending on the circumstances in each case, the Commission may require new applications for equipment authorization. In reaching a decision the Commission will consider whether the acquiring party can adequately ensure and accept responsibility for continued compliance with the regulations. In general, new applications for each device will not be required. A single application for equipment authorization may be filed covering all the affected equipment.

5. Section 2.948 is amended by revising paragraphs (a)(2) and (d) and by deleting paragraph (d)(3) to read as follows:

§ 2.948 Description of measurement facilities.

(a) * * *

* * * * *

(d) A laboratory that has been accredited with a scope covering the required measurements shall be deemed competent to test and submit test data for equipment subject to verification, Declaration of Conformity, and certification. Such a laboratory shall be accredited by an approved accreditation organization based on the International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) Standard 17025, "General Requirements for the Competence of Calibration and Testing Laboratories." The organization accrediting the laboratory must be approved by the Commission's Office of Engineering and Technology, as indicated in § 0.241 of this chapter, to perform such accreditation based on ISO/IEC 58, "Calibration and Testing Laboratory Accreditation Systems--General Requirements for Operation and Recognition." The frequency for revalidation of the test site and the information that is required to be filed or retained by the testing party shall comply with the requirements established by the accrediting organization. However, in all cases, test site revalidation shall occur on an interval not to exceed two years.

(1) * * *

(2) * * *

6. Section 2.962 is amended by revising paragraphs (c)(3), (c)(4), adding a new paragraph (c)(7), and revising paragraphs (e), (f)(1), (f)(3), and (g)(3) to read as follows:

§ 2.962 Requirements for a Telecommunications Certification Body.

* * * * *

(c) * * *

(3) The TCB shall have the technical expertise and capability to test the equipment it will certify and shall also be accredited in accordance with ISO/IEC Standard 17025 to demonstrate it is competent to perform such tests.

(4) The TCB shall demonstrate an ability to recognize situations where interpretations of the regulations or test procedures may be necessary. The appropriate key certification and laboratory personnel shall demonstrate a knowledge of how to obtain current and correct technical regulation interpretations. The competence of the Telecommunication Certification Body shall be demonstrated by assessment. The general competence, efficiency, experience, familiarity with technical regulations and products included in those technical regulations, as well as compliance with applicable parts of the ISO/IEC Standard 17025 and Guide 65, shall be taken into consideration.

* * * * *

(7) A TCB shall be reassessed for continued accreditation on intervals not exceeding two years.

(e) *Designation of a TCB.*

(f) * * *

(1) A TCB shall certify equipment in accordance with the Commission's rules and policies.

(2) * * *

(3) A TCB may establish and assess fees for processing certification applications and other tasks as required by the Commission.

* * * * *

(g) * * *

(3) If during post market surveillance of a certified product, a TCB determines that a product fails to comply with the applicable technical regulations, the Telecommunication Certification Body shall immediately notify the grantee and the Commission. A follow-up report shall also be provided within thirty days of the action taken by the grantee to correct the situation

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Part 15 of Title 47 of the Code of Federal Regulations is proposed to be amended as follows:

7. The authority citation of Part 15 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 302, 303, 304, 307, 336, and 544A.

8. Section 15.7 is deleted.

9. Section 15.31 is amended by revising paragraph (a)(3) to read as follows:

Section 15.31 Measurement standards.

(a) * * *

(3) Other intentional and unintentional radiators are to be measured for compliance using the following procedure excluding sections 4.1.5.2, 5.7, 9 and 14: ANSI C63.4–2003: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by reference, see § 15.38). This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51.

11. Section 15.38 is amended by revising paragraph (b)(6) to read as follows:

Section 15.38 Incorporation by reference.

* * * * *

(b)(6) ANSI C63.4-2003: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz," 2003, IBR approved for § 15.31, except for sections 4.1.5.2, 5.7, 9 and 14.

* * * * *

12. Section 15.204 is amended by revising paragraphs (a), (b), and (c) and adding a new paragraph (d) to read as follows:

§ 15.204 External radio frequency power amplifiers and antenna modifications.

(a) Except as otherwise described in paragraph (b) and (d) of this section, no person shall use, manufacture, sell or lease, offer for sale or lease (including advertising for sale or lease), or import, ship, or distribute for the purpose of selling or leasing, any external radio frequency power amplifier or amplifier kit intended for use with a Part 15 intentional radiator.

(b) A transmission system consisting of an intentional radiator, an external radio frequency power amplifier, and an antenna, may be authorized, marketed and used under this part. Except as described otherwise in this section, when a transmission system is authorized as a system, it must always be marketed as a complete system and must always be used in the configuration in which it was authorized.

(c) An intentional radiator may be operated only with the antenna with which it is authorized. If an antenna is marketed with the intentional radiator, it shall be of a type which is authorized with the intentional radiator. An intentional radiator may be authorized with multiple antenna types.

(1) The antenna type, as used in this paragraph, refers to antennas that have similar in-band and out-of-band radiation patterns.

(2) Compliance testing shall be performed using the highest gain antenna for each type of antenna to be certified with the intentional radiator. During this testing, the intentional radiator shall be operated at its maximum available output power level.

(3) Manufacturers shall supply a list of acceptable antenna types with the application for equipment authorization of the intentional radiator.

(4) Any antenna that is of the same type and of equal or less directional gain as an antenna that is authorized with the intentional radiator may be marketed with, and used with, that intentional radiator. No retesting of this system configuration is required. The marketing or use of a system configuration that employs an antenna of a different type, or that operates at a higher gain, than the

antenna authorized with the intentional radiator is not permitted unless the procedures specified in Section 2.1043 of this chapter are followed.

(d) Except as described in this paragraph, an external radio frequency power amplifier or amplifier kit shall be marketed only with the system configuration with which it was approved and not as a separate product.

(1) An external radio frequency power amplifier may be marketed for individual sale provided it is intended for use in conjunction with a transmitter that operates in the 902 – 928 MHz, 2400 – 2483.5 MHz, and 5725 – 5850 MHz bands pursuant to § 15.247 of this part or a transmitter that operates in the 5.725 – 5.825 GHz band pursuant to § 15.407 of this part. The amplifier must be of a design such that it can only be connected as part of a system in which it has been previously authorized. (The use of a non-standard connector or a form of electronic system identification is acceptable.) The output power of such an amplifier must not exceed the maximum permitted output power of its associated transmitter.

(2) The outside packaging and user manual for external radio frequency power amplifiers sold in accordance with paragraph (d)(1) must include notification that the amplifier can be used only in a system which it has obtained authorization. Such a notice must identify the authorized system by FCC Identifier.

13. Section 15.247 is amended by modifying paragraphs (a), (b), (c), (d), and (e) and adding a new paragraph (i) as follows:

§ 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

(a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudorandomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

(ii) Frequency hopping systems operating in the 5725-5850 MHz band shall use at least 75 hopping frequencies. The maximum 20 dB bandwidth of the hopping channel is 1 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

(2) Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:

(1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

(2) For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(c) Operation with directional antenna gains greater than 6 dBi.

(1) Fixed point-to-point operation:

(i) Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

(ii) Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted output power.

(iii) Fixed, point-to-point operation, as used in paragraphs (c)(4)(i) and (c)(4)(ii) of this section, excludes the use of point-to-multipoint systems, omnidirectional applications, and multiple

co-located intentional radiators transmitting the same information. The operator of the spread spectrum or digitally modulated intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.

(2) In addition to the provisions in paragraphs (b)(1), (b)(3), (b)(4) and (c)(1)(i) of this section, transmitters operating in the 2400-2483.5 MHz band that emit multiple directional beams, simultaneously or sequentially, for the purpose of directing signals to individual receivers or to groups of receivers provided the emissions comply with the following:

(i) Different information must be transmitted to each receiver.

(ii) If the transmitter employs an antenna system that emits multiple directional beams but does not do emit multiple directional beams simultaneously, the total output power conducted to the array or arrays that comprise the device, i.e., the sum of the power supplied to all antennas, antenna elements, staves, etc. and summed across all carriers or frequency channels, shall not exceed the limit specified in paragraph (b)(1) or (b)(3) of this section, as applicable. However, the total conducted output power shall be reduced by 1 dB below the specified limits for each 3 dB that the directional gain of the antenna/antenna array exceeds 6 dBi. The directional antenna gain shall be computed as follows:

(A) The directional gain shall be calculated as the sum of 10 log (number of array elements or staves) plus the directional gain of the element or stave having the highest gain.

(B) A lower value for the directional gain than that calculated in paragraph (c)(2)(ii)(A) of this section will be accepted if sufficient evidence is presented, e.g., due to shading of the array or coherence loss in the beamforming.

(iii) If a transmitter employs an antenna that operates simultaneously on multiple directional beams using the same or different frequency channels, the power supplied to each emission beam is subject to the power limit specified in paragraph (c)(2)(ii) of this section. If transmitted beams overlap, the power shall be reduced to ensure that their aggregate power does not exceed the limit specified in paragraph (c)(2)(ii) of this section. In addition, the aggregate power transmitted simultaneously on all beams shall not exceed the limit specified in paragraph (c)(2)(ii) of this section by more than 8 dB.

(iv) Transmitters that emit a single directional beam shall operate under the provisions of paragraph (c)(1) of this section.

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

(f) * * *

(g) * * *

(h) * * *

(i) Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. *See* § 1.1307(b)(1) of this Chapter.

14. Section 15.403 is amended by revising paragraph (n), deleting paragraph (r), and re-naming paragraphs (s) and (t) to (r) and (s); respectively as follows:

§ 15.403 Definitions.

* * *

(n) Maximum Conducted Output Power. The total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

* * *

(r) 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.

(s) 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.

15. Section 15.407 is amended by replacing the term "peak transmit power" with "maximum conducted output power," in paragraphs (a)(1) – (a)(6) and re-designating paragraph (d) as [Reserved], as follows:

§ 15.407 General technical requirements.

(a) Power limits:

(1) For the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output 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.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10log 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 maximum conducted output 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.

(3) For the band 5.725-5.825 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 1 W or 17 dBm + 10log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 17 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output 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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain up to 23 dBi without any corresponding reduction in the transmitter peak output power or peak power spectral density. For fixed, point-to-point U-NII transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in peak transmitter power and peak power spectral density for each 1 dB of antenna gain in excess of 23 dBi would be required. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

NOTE: The Commission strongly recommends that parties employing U-NII devices to provide critical communications services should determine if there are any nearby Government radar systems that could affect their operation.

(4) The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement conforming to the above definitions for the emission in question.

(5) The peak power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A resolution bandwidth less than the measurement bandwidth can be used, provided that the measured power is integrated to show total power over the measurement bandwidth. If the resolution bandwidth is approximately equal to the measurement bandwidth, and much less than the emission bandwidth of the equipment under test, the measured results shall be corrected to account for any difference between the resolution bandwidth of the test instrument and its actual noise bandwidth.

(6) The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

* * * * *

(d) [Reserved]

* * * * *

APPENDIX B: FINAL REGULATORY FLEXIBILITY ANALYSIS

As required by the Regulatory Flexibility Act ("RFA"),[73] an Initial Regulatory Flexibility Analysis ("IRFA") was incorporated in the *Notice of Proposed Rule Making* ("*Notice*") in this docket, ET Docket 03-201. The Commission sought written public comment on the proposals in the *Notice*, including comment on the IRFA. As described more fully below, we find that the rules we adopt in the Report and Order will not have a significant economic impact on a substantial number of small entities.[74] We have nonetheless provided this Final Regulatory Flexibility Analysis ("FRFA") to provide a fuller record in this proceeding. This FRFA conforms to the RFA.[75]

A. Need for, and Objectives of, the Report and Order

Section 11 of the Communications Act of 1934, as amended, and Section 202(h) of the Telecommunications Act of 1996 require the Commission (1) to review biennially its regulations pertaining to telecommunications service providers and broadcast ownership; and (2) to determine whether economic competition has made those regulations no longer necessary in the public interest. The Commission is directed to modify or repeal any such regulations that it finds are no longer in the public interest.

On September 6, 2002, the Commission released a *Public Notice* seeking comments regarding Commission rules which may be outdated and in need of revision.[76] The *Public Notice* identified a number of rule sections in Parts 2 and 15 as candidates for review, and encouraged interested parties to provide comment on these rules. Subsequently, on September 26, 2002, the Commission released a separate *Public Notice* seeking suggestions as to which rule parts administered by the Commission's Office of Engineering and Technology should be modified or repealed as part of the 2002 biennial review.[77] Some of the comments filed in response to these *Public Notices* were addressed by *Notice*. The *Notice* also addressed other issues raised as a result of recent changes in technology.

The *Notice* proposed several changes to Parts 2, 15 and other Parts of the rules. Specifically, it proposed to:

1) modify the rules to permit the use of advanced antenna technologies with spread spectrum devices in the 2.4 GHz band;
2) modify the replacement antenna restriction for Part 15 devices;
3) modify the equipment authorization procedures to provide more flexibility to configure transmission systems without the need to obtain separate authorization for every combination of system components;
4) harmonize the measurement procedures for digital modulation systems authorized pursuant to Section 15.247 of the rules with those for similar U-NII devices authorized under Sections 15.401- 15.407 of the rules;[78]

[73] *See* 5 U.S.C. § 603. The RFA, *see* 5 U.S.C. § 601 - 612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

[74] Thus, we could certify that an analysis is not required. *See* 5 U.S.C. § 605(b).

[75] *See* 5 U.S.C. § 604.

[76] *See Public Notice, "FCC Seeks Comment Regarding Possible Revision or Elimination of Rules Under The Regulatory Flexibility Act, 5 U.S.C. § 610,"* released September 6, 2002, DA 02-2152.

[77] *See Public Notice, "The Commission Seeks Public Comment in the 2002 Biennial Review of Telecommunications Regulations within the Purview of the Office of Engineering and Technology,"* released September 26, 2002, ET Docket No. 02-312.

[78] 47 C.F.R. § 15.247

5) modify the channel spacing requirements for frequency hopping spread spectrum devices in the 2.4 GHz band in order to remove barriers to the introduction of new technology that uses wider bandwidths;
6) clarify the equipment authorization requirements for modular transmitters; and
7) make other changes to update or correct Parts 2 and 15 of our rules.

These proposals would prove beneficial to manufacturers and users of unlicensed technology, including those who provide services to rural communities. Specifically, we noted that a growing number of service providers are using unlicensed devices within wireless networks to serve the varied needs of industry, government, and general consumers alike. One of the more interesting developments is the emergence of wireless Internet service providers or "WISPs." Using unlicensed devices, WISPs around the country are providing an alternative high-speed connection in areas where cable or DSL services have been slow to arrive. We believe that the increased flexibility proposed in the *Notice* would help to foster a viable last mile solution for delivering Internet services, other data applications, or even video and voice services to underserved, rural, or isolated communities.

B. Summary of Significant Issues Raised by Public Comments in Response to the IRFA

No comments were filed in response to the IRFA.

C. Description and Estimate of the Number of Small Entities To Which the 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.[79] 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.[80] 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 may additional criteria established by the Small Business Administration (SBA).[81]

The rules adopted in this Report and Order pertain to manufacturers of unlicensed communications devices. The appropriate small business size standard is that which the SBA has established for radio and television broadcasting and wireless communications equipment manufacturing. This category encompasses entities that primarily manufacture radio, television, and wireless communications equipment.[82] Under this standard, firms are considered small if they have 750 or fewer employees.[83] Census Bureau data for 1997 indicate that, for that year, there were a total of 1,215 establishments[84] in this category.[85] Of those, there were 1,150 that had employment under 500, and an additional 37 that had

[79] *See* U.S.C. § 603(b)(3).

[80] *Id.* § 601(3).

[81] *Id.* § 632.

[82] NAICS code 334220.

[83] *Id.*

[84] The number of "establishments" is a less helpful indicator of small business prevalence in this context than would be the number of "firms" or "companies," because the latter take into account the concept of common ownership or control. Any single physical location for an entity is an establishment, even though that location may be owned by a different establishment. Thus, the numbers given may reflect inflated numbers of businesses in this category, including the numbers of small businesses. In this category, the Census breaks-out data for firms or companies only to give the total number of such entities for 1997, which was 1,089.

[85] U.S. Census Bureau, 1997 Economic Census, Industry Series: Manufacturing, "Industry Statistics by Employment Size," Table 4, NAICS code 334220 (issued August 1999).

employment of 500 to 999. The percentage of wireless equipment manufacturers in this category is approximately 61.35%,[86] so the Commission estimates that the number of wireless equipment manufacturers with employment under 500 was actually closer to 706, with and additional 23 establishments having employment of between 500 and 999. Given the above, the Commission estimates that the great majority of wireless communications equipment manufacturers are small businesses.

D. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements

Part 15 transmitters are already required to be authorized under the Commission's certification procedure as a prerequisite to marketing and importation. *See* 47 C.F.R. §§ 15.101, 15.201, 15.305, and 15.405. The changes proposed in this proceeding would not change any of the current reporting or recordkeeping requirements. Further, the proposed regulations add permissible measurement techniques and methods of operation. The proposals would not require the modification of any existing products.

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: (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.

At this time, the Commission does not believe the rule changes contained in this Report and Order will have a significant economic impact on small entities. The Report and Order does not impose new device design standards. Instead, it relaxes the rules with respect to the types of devices which are allowed to operate pursuant to the Commission's regulations. There is no burden of compliance with the changes. Manufacturers may continue to produce devices which comply with the former rules and, if desired, design devices to comply with the new regulations. The rules will apply equally to large and small entities. Therefore, there is no inequitable impact on small entities. Finally, this Report and Order does not include a deadline for implementation. We believe that the rules are relatively simple and do not require a transition period to implement. An entity desiring to take advantage of the relaxed regulations may do so at any time.

For the reasons stated above we find that the rule changes contained in this Report and Order will not present a significant economic burden to small entities.

Report to Congress. The Commission will send a copy of the Report and Order, including this FRFA, in a report to Congress pursuant to the Congressional Review Act.[87] In addition, the Commission will send a copy of the Report and Order, including the FRFA, to the Chief Counsel for Advocacy of the SBA. A copy of the Report and Order and FRFA (or summaries thereof) will also be published in the Federal Register.[88]

[86] *Id.* Table 5, "Industry Statistics by Industry and Primary Product Class Specialization: 1997."

[87] *See* 5 U.S.C. § 801(a)(1)(A).

[88] *See* 5 U.S.C. § 605(b).

Appendix C: Parties Filing Comments

1. Adam Stuhr
2. Agere Systems
3. Alvarion
4. Andrew J. Wagner
5. ArrayComm, Inc.
6. Ashebir Gebre
7. Assa Abloy ITG, HID Corporation, Indala Corporation
8. Atheros Communications, Inc.
9. Bandspeed, Inc.
10. Barrington Smith
11. Barry Adler
12. Butch Evans
13. Chadd Thompson
14. Cisco Systems, Inc.
15. Consumer Electronics Association
16. Dell, Inc.
17. Derrick Klund
18. Ed Liu
19. Gabriel Ramuglia
20. Globespan Virata, Inc.
21. Hewlett-Packard Company
22. IEEE 802
23. IEEE 802.18
24. Information Technology Industry Council – ITI
25. Intel Corporation
26. Itron, Inc.
27. James W. Pearce
28. Jason Dandl
29. Jeffrey N. Houle
30. Licensed-Exempt Alliance
31. Logan Zvolena
32. Marlon K. Schafer
33. Matsushita Electric Corporation of America
34. Matt Harambasic
35. Microsoft Corporation
36. Mike McCamon, The Bluetooth SIG
37. Motorola, Inc.
38. NARTE
39. Navini Networks, Inc.
40. Near You Networks
41. Nichoals Prahl
42. Nick Kolovos, ITI
43. PART-15.ORG
44. Raymond L. Strassburger
45. Ryan D. Konwinski
46. Ryan M. O'Shea
47. Sirius Satellite Radio, Inc.
48. SkyPilot Network, Inc
49. Symbol Technologies, Inc.
50. Telecommunications Industry Association
51. Teletronics International, Inc.

52. Teresa A. Severt
53. The Wi-Fi Alliance
54. Tom Johnson
55. Tropos Networks
56. Vivato, Inc.
57. WaveRider Communications
58. Wireless Communications Association International, Inc.
59. Wireless Internet Service Provider's Association
60. Works d'Arndt Wireless Consultant
61. YDI Wireless, Inc.

STATEMENT OF
CHAIRMAN MICHAEL K. POWELL

Re: Modification of Parts 2 and 15 of the Commission's Rules for Unlicensed Devices and Equipment Approval (ET Docket No. 03-201) Report and Order.

Today's Order furthers the Commission's goals to increase spectrum flexibility, promote spectrum efficiency and foster technological innovation. These rules affect nearly every American household. Use of unlicensed devices such as cordless phones, computers, wireless baby monitors and garage door openers have increased significantly in recent years. By creating greater flexibility in our technical rules for unlicensed devices we will encourage and facilitate an environment that stimulates investment and innovation in broadband technology and services. These changes also remove unnecessary regulatory encumbrances that hamper the deployment of advanced technologies for unlicensed wireless networking.

Newly-authorized smart antennas provide for increased spectrum efficiency because they allow for greater re-use of the same radio frequencies. They also will allow Wireless Internet Service Providers to pattern their coverage areas in a way that will best suit the needs of their customers in both rural and high-density areas.

In addition to the changes made to the rules involving advanced antenna technology, today's Order also makes several amendments that will give greater flexibility in the use of unlicensed devices. Modification to the replacement antenna requirements, accommodations for the marketing of separate power amplifiers to complete system upgrades, and harmonization of the measurement procedures for digital modulation devices will all help to create a more streamlined and efficient use of the spectrum for unlicensed devices.

Overall, the amendments adopted today will help to ensure that as our homes and lives become more dependent on new unlicensed technologies, these technologies will continue to serve in the most efficient and helpful way possible.