

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

In the Matter of
Revision of the Commission's Rules Regarding
Operation in the 57-64 GHz Band
ET Docket No. 07-113
RM-11104

NOTICE OF PROPOSED RULE MAKING

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By the Commission:

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I. INTRODUCTION

1. By this Notice of Proposed Rule Making ("Notice"), we propose to amend the requirements in Part 15 of the Commission's rules applicable to transmitters operating on an unlicensed basis in the 57-64 GHz frequency range ("the 60 GHz band"). Specifically, we grant the Petition for Rule Making submitted by the Wireless Communications Association (WCA) and propose to increase the fundamental radiated emission limit for unlicensed 60 GHz transmitters with very high gain antennas, specify the emission limit as an equivalent isotropically radiated power ("EIRP") level, and eliminate the requirement for a transmitter identification for 60 GHz transmitters. In particular, we propose to increase the current Part 15 average power EIRP level from 40 dBm to a new level of 82 dBm minus 2 dB for every dB that antenna gain is below 51 dBi. We also propose to increase the current Part 15 peak power EIRP level from 43 dBm to a new level of 85 dBm minus 2 dB for every dB that the antenna gain is below 51 dBi. These increases would be limited to 60 GHz transmitters located outdoors or those located indoors with emissions directed outdoors, e.g. through a window. The proposed changes would allow longer communication ranges for unlicensed point-to-point 60 GHz broadband digital systems and thereby extend the ability of such systems to supply very high speed broadband service to office buildings and other commercial facilities. We believe these proposals would encourage broader deployment of point-to-point digital systems in this band without increasing the potential for harmful interference, and thereby further the Commission's objective of promoting the availability of broadband connectivity to all Americans.

II. BACKGROUND

2. Part 15 of the Commission's regulations permits the operation of radio frequency ("RF") devices without a license from the Commission or the need for frequency coordination. The technical standards contained in Part 15 are designed to ensure that there is a low probability that such devices will cause harmful interference to other users of the radio spectrum. Unlicensed transmitter operation within

1 See Petition for Rule Making submitted by WCA, RM-11104.

2 See 47 C.F.R. §§ 15.1 et seq.

3 The primary operating conditions under Part 15 are that the operator must accept whatever interference is received and must correct whatever harmful interference is caused. Should harmful interference occur, the operator is

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the 60 GHz band is permitted under Section 15.255.<sup>4</sup> The 60 GHz band is part of the spectrum often termed “millimeter wave” spectrum.<sup>5</sup> The propagation of millimeter wave radio signals is more limited than that of radio signals at lower frequencies, as they are significantly affected by the presence of oxygen and water vapor within the atmosphere. Absorption and scattering caused by oxygen and water vapor around these frequencies limit the useful range of millimeter wave transmission to a few kilometers. Attenuation caused by oxygen in particular increases dramatically at frequencies around 60 GHz and 120 GHz.<sup>6</sup> These attenuating factors make the 60 GHz band particularly suited for general unlicensed devices because they limit the potential for interference.

3. Any type of operation within the 60 GHz band is permitted under Part 15 of the rules, with the exception of operation onboard aircraft or a satellite. Except for fixed field disturbance sensors, the rules limit the average power density of any emission in this band to  $9 \mu\text{W}/\text{cm}^2$  and the peak power density to  $18 \mu\text{W}/\text{cm}^2$ , both as measured at a distance of 3 meters from the radiating structure.<sup>7</sup> These average and peak power density limits are equivalent to average and peak EIRP limits of 10 W (40 dBm) and 20 W (43 dBm), respectively.<sup>8</sup> The rules also limit the peak transmitter output power to 500 mW.<sup>9</sup> For emissions by 60 GHz devices that emanate from inside a building, the rules also require the transmission of an identification signal in order to permit other users experiencing interference from indoor wireless local area network (“LAN”) transmitters to more accurately identify the source of the interference.<sup>10</sup>

4. Since the rules for unlicensed devices in the 60 GHz band were adopted 12 years ago, only a relatively few products have been introduced for operation in this spectrum.<sup>11</sup> All of the devices that have been developed thus far for 60 GHz operation have been high speed (100 Mbps or greater) short range point-to-point systems that are intended to provide connectivity to other distribution networks rather than

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required to immediately correct the interference problem, even if correction of the problem requires ceasing operation of the Part 15 system causing the interference. See 47 C.F.R. § 15.5.

<sup>4</sup> See 47 C.F.R. § 15.255; see also *Amendment of Parts 2, 15 and 97 of the Commission’s Rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications, First Report and Order and Second Notice of Proposed Rule Making*, ET Docket No. 94-124 (*First R&O/Second NPRM in ET Docket No. 94-124*), 11 FCC Rcd 4481 (1995), at 5 and 15.

<sup>5</sup> The term “millimeter wave” is taken from the fact that the wavelength of radio signals for frequencies between 30 GHz and 300 GHz ranges from 10 millimeters down to 1 millimeter. The 60 GHz band is allocated on a primary basis to the Federal Government mobile, fixed, inter-satellite and radiolocation services and to non-Federal Government include fixed, mobile and radiolocation services. Currently there are no licensed Federal Government or non-Federal Government services operating in the 60 GHz band. Under Part 18 of the rules, unlicensed Industrial, Scientific and Medical (ISM) equipment may also operate in the 60 GHz band at  $61.25 \text{ GHz} \pm 250 \text{ MHz}$ .

<sup>6</sup> See *Attenuation by Atmospheric Gases*, International Telecommunications Union, *Reports of the CCIR*, 1990, Vol V, Report 719-3, at pg. 189.

<sup>7</sup> See 47 C.F.R. § 15.255(b).

<sup>8</sup> Power density ( $P_D$ ), EIRP and field strength (E) are readily converted through the following formula:  $P_D = E^2/120(\text{Pi}) = \text{EIRP}/(4 \text{ Pi } D^2)$ , where D is the separation distance in meters, provided measurements are performed in the far field.

<sup>9</sup> The 500 mW peak transmitter output level applies to transmitters with an emission bandwidth of at least 100 MHz and is reduced for systems that employ narrower bandwidths. See 47 C.F.R. § 15.255(e).

<sup>10</sup> See 47 C.F.R. § 15.255(i).

<sup>11</sup> See *First R&O/Second NPRM in ET Docket No. 94-124*.

individual users.<sup>12</sup> These systems are particularly suitable for relatively short links (on the order of a kilometer or less), where installation barriers and high cost make other options less attractive. Applications for such systems include extending the reach of fiber optic networks to serve adjacent structures; broadband backhaul links between cellular networks base stations; and interconnection links between buildings in campus environments.<sup>13</sup>

5. As indicated above, the Wireless Communications Association International, Inc. filed a Petition for Rulemaking requesting that the Commission amend its rules for 60 GHz devices to implement certain changes related to operation with very high gain antennas. WCA requests that the average emission limit for point-to-point systems employing very high gain antennas be specified in EIRP and that the limits be increased to 82 dBm less 2 dB for every dB that the systems' antenna gain is below 51 dBi.<sup>14</sup> It submits that the proposed higher EIRP levels for 60 GHz equipment with an antenna exceeding a specific amount of gain would foster the development of products with longer operating range that could offer high speed communications to compete with, complement, or extend the broadband services provided on existing media. It states that under the existing rules, outdoor link distances are effectively limited to 700 meters in most cities.<sup>15</sup> WCA states that operation at the higher EIRP level it requests would enable an increase in operating range, on the order of 1.5 kilometers, that would permit the delivery of multi-gigabit broadband services to an "exponentially larger number of office buildings and other commercial properties."<sup>16</sup> It further submits that specification of the power limit in EIRP units would remove confusion in measurements involving very high gain antennas. WCA states that 60 GHz devices could comply with either the EIRP specification or the existing power density standards. In addition, WCA requests that the Commission eliminate the transmitter identification requirement for "window links," *i.e.*, for transmitters that are located indoors but direct their emissions through a window to the outside, which would reduce installation costs for 60 GHz products. In response to the WCA petition, six parties filed comments.<sup>17</sup>

### III. DISCUSSION

6. As we discuss in detail below, we propose to allow operation at higher power levels by 60 GHz unlicensed equipment with an antenna exceeding a specific gain. We believe that this has the potential to foster the development of a variety of products with longer operating ranges than are achieved under the current rules and promote the 60 GHz band's potential as a vehicle for broadband transmission links in addition to services offered by incumbent providers. This would promote the development of very high speed wireless products for environments where obstacles such as highways, parking lots, etc.,

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<sup>12</sup> The Commission's equipment authorization data base shows that currently 14 certifications have been granted for unlicensed 60 GHz point-to-point transmitter systems.

<sup>13</sup> See, e.g., Fiber Leap Series Products User's manual, Telaxis Communications Corporation, FCC ID No. P57-FL60-1250, at 5; Fiber Connection Series Products, Unique Broadband Systems, Inc., FCC ID No. PWL3260, at 1.2.

<sup>14</sup> See 47 C.F.R § 15.255(b). WCA does not request a limit on peak EIRP.

<sup>15</sup> WCA petition at 10-11.

<sup>16</sup> WCA petition at 7. In the wireless industry, a rule of thumb is that the number of building pairs served increases with the square of the distance of the link, since the area of a circle increases with the square of the radius. *Id.*, at footnote 20.

<sup>17</sup> See Public Notice No. 2679, *In the Matter of Amendment of the Commission's Rules for the License-Exempt 59-64 GHz band*, RM-11104, released on Oct. 29, 2004. Agilent Technologies (Agilent), BridgeWave Communications, CSG Wireless, Inc., and Yipes Enterprise Services, Inc. filed comments. SiBEAM, Inc. (SiBEAM), IEEE 802, and Agilent filed *ex parte* communications.

prevent extension of fiber or wireline connections, or as a means to serve as broadband link or backhaul for an entire building or campus, where adding new cables could result in major construction costs. We also propose to adopt for 60 GHz equipment a radiated emission limit specified in EIRP for 60 GHz equipment using very high gain antennas that would facilitate emission measurements. We further propose to allow emission measurements in EIRP as an alternative for all other 60 GHz devices. Finally, we propose to eliminate the transmitter identification requirement for indoor 60 GHz transmitters whose emissions are directed outdoors, and we seek comment on eliminating the transmitter identification requirement for all indoor 60 GHz transmitters.<sup>18</sup> We believe that these proposals would promote greater utility for the 60 GHz band without increasing the interference risk to existing services in the band and would encourage a more flexible development of broadband data products. We also note that 60 GHz consumer applications are now being developed and our proposals herein would help bring valuable new services to consumers, and advance economic opportunities for the American public, consistent with the Commission's objectives.<sup>19</sup>

7. *Emission Limits.* As indicated above, the Part 15 rules currently limit 60 GHz band transmitters to an average power density limit of  $9 \mu\text{W}/\text{cm}^2$ , which is equivalent to 40 dBm EIRP.<sup>20</sup> Agilent opposes WCA's request for a power increase for devices with very high gain antennas, arguing that the current power density limits were established to prevent interference between unlicensed devices. Further, according to Agilent, the 500 mW peak transmitter power limit was established to permit omnidirectional base stations to operate at the allowed power densities. Agilent states that the intent of the Commission in developing the 60 GHz rules was to preserve the band for short range, point-to-point links operating at low power levels, and that other bands, such as the 71-76 GHz licensed band,<sup>21</sup> are more appropriate for achieving the longer ranges sought by WCA.<sup>22</sup> Agilent and SiBEAM also argue that the increased power and operating range could raise potential interference to low power unlicensed operations within the 60 GHz band.<sup>23</sup> SiBEAM, which manufactures 60 GHz consumer equipment, claims that its low cost products can only operate at modest radiated power levels.<sup>24</sup> WCA responds that the absorption and scattering of signals at 60 GHz due to oxygen and water vapor limit their range and, combined with extremely narrow antenna beamwidths, make interference from 60 GHz equipment with very high gain antennas to other devices unlikely. Further, WCA notes that since 60 GHz signals do not effectively penetrate room walls or partitions, any incremental interference will typically be limited to the transmitter's vicinity, making interference resolution manageable.<sup>25</sup> Finally, WCA indicates that the manufacturing costs and link prices for products using the 70/80/90 GHz band are four times higher than

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<sup>18</sup> The specific proposed changes to the regulations are shown in Appendix B.

<sup>19</sup> Since 2005, IEEE 802 (IEEE Local and Metropolitan Area Networks Standards Committee) has been working on a 60 GHz wireless personal area network standard to support high bandwidth applications such as high definition television connectivity, video gaming and file transfer. On April 9, 2007, IEEE 802 filed ex parte comments reporting on discussions it has held with WCA and other interested parties concerning WCA's rulemaking petition. Although IEEE 802 states that the parties reached consensual agreement on some issues, IEEE 802 continues to be concerned about the effects increased transmitter power will have on personal area networks. *See also, e.g.*, <http://www.wirelesshd.org/technology.html>.

<sup>20</sup> The existing average power density limit of  $9 \mu\text{W}/\text{cm}^2$  at 3 meters is equivalent to an EIRP of 10 W or 40 dBm. 47 C.F.R. § 15.255(b).

<sup>21</sup> *See* 47 C.F.R. §§ 101.1501 *et seq.*

<sup>22</sup> Comments of Agilent at 2-3.

<sup>23</sup> Comments of Agilent at 3.

<sup>24</sup> Comments of SiBEAM at 2.

<sup>25</sup> Reply comments of WCA at 4.

for the 60 GHz band, which would adversely affect small operators and enterprises users.<sup>26</sup>

8. As requested by WCA, we are proposing to increase the average emission limit for point-to-point systems employing very high gain antennas and for the reasons discussed in the following section, to specify this higher limit in EIRP units. Specifically, we are proposing to increase the average EIRP power limit for systems employing very high gain antennas to 82 dBm less 2 dB for every dB that the systems' antenna gain is below 51 dBi. We further propose that this increase in the emission level be limited to 60 GHz transmitters located outdoors or those located indoors with emissions directed outdoors, *e.g.* through a window. This proposal would allow eligible devices to operate with as much as a 42 dB increase in their emission level. As WCA states, with higher power 60 GHz devices will be able to increase link distances to provide very high speed wireless service to a greater number of locations than is currently possible.<sup>27</sup> We believe that allowing higher power operations by systems with very high gain antennas would foster the development of high speed communication products with longer operating range and lower costs, and thereby promote the availability of broadband services.

9. We believe that several factors will offset any increase in the interference potential between equipment with very high gain antennas and other devices in the 60 GHz band. First, the very high gain antennas used would be highly directional, reducing the probability that a low power, omnidirectional system would be located within its beamwidth. Second, it is likely that low power devices primarily will operate indoors because of their shorter range, whereas, very high gain, directional systems, which have a longer emission range, primarily will be located outdoors or will have their signals directed outdoors. Thus, the emissions from directional systems, as seen by lower power indoors devices, will be attenuated significantly from intervening objects, such as building walls. Third, oxygen and water vapor absorption and scattering should further reduce ranges at which the radiated emission levels from 60 GHz equipment with very high gain antennas could cause interference. To reduce the interference risk between very high gain and other of 60 GHz devices, we propose to require that equipment with very high gain antennas operating under the proposed high power limit only operate outdoors or direct their emissions outdoors, *e.g.*, through a window. Thus, we believe that the risk of interference from higher power, directional 60 GHz transmission systems to lower power, omnidirectional systems will be minimal. While we anticipate that consumer applications for wireless interconnections in the 60 GHz band are forthcoming, the 60 GHz devices are now being marketed are intended for enterprise and commercial use, therefore, there is no immediate risk of interference to 60 GHz unlicensed consumer devices.

10. We believe however that a limit on the peak radiated emission level should continue to apply to 60 GHz emissions. Under the current standards, the peak power density may not exceed  $18 \mu\text{W}/\text{cm}^2$  at 3 meters (43 dBm EIRP).<sup>28</sup> This is 3 dB higher than the average power density limit. We believe that a similar 3 dB relationship between the maximum peak and average emission limits should apply to all 60 GHz systems, whether they comply with a limit based on power density or on EIRP. Accordingly, we are proposing to apply a peak limit of 85 dBm minus 2 dB for every dB that the antenna gain is less than 51 dBi to 60 GHz systems operating under the higher proposed average power limit. We also are proposing to retain the existing limits on spurious emissions and peak transmitter output power.

11. Comments are requested on the various aspects of this proposal to modify the emission limit for 60 GHz equipment with very high gain antennas. We request comments accompanied by analysis on any interference concerns along with methods that may be suitable for mitigating such concerns. We also

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<sup>26</sup> *Ex parte* presentation of WCA, June 30, 2005. See also, *Allocations And Service Rules For The 71-76 GHz, 81-86 GHz And 92-95 GHz Bands, Report and Order*, WTB Docket 02-146, 18 FCC Rcd 23318 (2004).

<sup>27</sup> Petition of WCA at 7.

<sup>28</sup> See 47 C.F.R. §§ 15.255(b)(4)-(5).

request comments on the feasibility of using extremely high antenna gains, *e.g.*, greater than 51 dBi.

12. *Specifications of Emission Limits in EIRP.* The Part 15 rules currently specify that the average power density and the peak power density limits shall not be exceeded, for devices operating in the 60 GHz band, as measured at a distance of 3 meters from the radiating structure.<sup>29</sup> WCA notes that the specified 3 meter separation distance is within the near field when a very high gain antenna is used.<sup>30</sup> WCA states that there is substantial difficulty in obtaining accurate power density measurements in the near field and that such measurements do not necessarily reflect the true RF exposure near the antenna.<sup>31</sup> Further, when measured in the near field, the maximum power density is lower from a very high gain antenna than it is from a lower gain antenna.<sup>32</sup> WCA adds that because the specified 3 meters measurement distance is within the near field, power densities produced by very high gain antennas should be measured at longer distances and the measured values extrapolated to 3 meters. However, WCA contends that such measurements may not approximate the actual power density at 3 meters and do not necessarily reflect the true RF exposure risk near the antenna. Instead, WCA states that the extrapolation to 3 meters would necessitate that transmitters using very high gain antennas operate at power densities far below those permitted under the Commission's RF exposure limits and would effectively require equipment vendors to reduce the transmitted power well below the level permitted under the current rules.<sup>33</sup> According to WCA, this requirement to reduce the peak transmitter output level results in shorter transmission link distances than would otherwise be permitted and constrains the

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<sup>29</sup> See 47 C.F.R. § 15.255(b) and (e). These limits apply to equipment other than fixed field disturbance sensors.

<sup>30</sup> The near field is the region in which the electric and magnetic fields do not have a substantially plane-wave character but vary considerably from point to point. Conversely, the far field, that region of the field of an antenna where the angular field distribution is essentially independent of the distance from the antenna, has a predominantly plane-wave character where there is a locally uniform distribution of electric field strength and magnetic field strength in planes transverse to the direction of propagation. In the near field of the main beam, the power density can reach a maximum before it begins to decrease with distance. The power density in the transition region between the near and far fields decreases inversely with distance from the antenna and the power density in the far field decreases inversely as the square of the distance. The near field for a 48 inch (1.22 meter) antenna operating at 60 GHz extends to 74 meters, the transition region extends from 74 meters to 178 meters, and the far field starts at 178 meters. For a 12 inch (0.3 meter) antenna, the near field extends to 4.6 meters, the transition region extends from 4.6 to 11 meters and the far field starts at 11 meters. See OET Bulletin 65, *Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields*, August 1997, at 27-29.

<sup>31</sup> As described in OET Bulletin 65 and IEEE C95.3, the Maximum Permissible Exposure Limits (MPE) for RF exposure are based on plane wave equivalent power density limits where measurements may be made using instruments calibrated with respect to plane wave equivalent power density at distances more than 20 cm from the radiator; in some cases, as close as 5 cm. Spatially averaged measurements are used to determine RF exposure compliance.

<sup>32</sup> For RF exposure as calculated under OET Bulletin 65, the calculated maximum on-axis power density in the near field for a 48 inch antenna operating at 55 dBi and an EIRP of 82 dBm is 0.09 mW/cm<sup>2</sup> with a maximum antenna surface power density of 0.17 mW/cm<sup>2</sup>. The calculated maximum on-axis power density in the near field for a 12 inch antenna operating at 42 dBi and an EIRP of 64 dBm is 0.4 mW/cm<sup>2</sup> and the maximum antenna surface power density is 0.8 mW/cm<sup>2</sup>. These exposure levels are based on the use of Cassegrain antennas (antennas in which the feed radiator is mounted at or near the surface of a concave main reflector and is aimed at a convex secondary reflector slightly inside the focus of the main reflector; in these antennas, energy from the feed unit illuminates the secondary reflector, which reflects it back to the main reflector, which then forms the desired forward beam) and the emission levels will vary with other antenna configurations. See OET Bulletin 65, *supra*.

<sup>33</sup> See 47 C.F.R. § 15.255(e). The level of the RF exposure at a specific distance is dependent not only on the output power but also on the specific antenna design. Applicants for certification are required to demonstrate that the resultant system, based on its operating standards, application, and installation, ensures that the public is not exposed to excessive levels of RF energy.

development of 60 GHz unlicensed devices. WCA asserts that this problem will be alleviated if we specify the emission limit in EIRP. This EIRP level would be an alternative to the current power density specification which WCA believes was established to facilitate the operation of indoors, lower power local area network deployments.

13. Agilent argues that the existing rules contain provisions to permit measurements in the far field for systems employing very high gain antennas and that there is no need to modify the existing rules.<sup>34</sup> WCA responds that when it adopted the existing rules, the Commission did not anticipate the use of very high gain antennas for point-to-point links. WCA indicates that the requirement to measure in the far field and extrapolate the power density at 3 meters always results in transmitters employing very high gain antennas having to operate below the maximum transmitter peak power output limit.

14. We understand WCA's concern that there is substantial difficulty in obtaining accurate power density measurements for very high gain antennas in the near field. While we recognize Agilent's point that the rules already contain provisions to permit measurements to be performed in the far field and extrapolated to the distance specified in the rules, such measurements must be made in the far field, which can be at a distance much farther than 3 meters. We also observe that the distance to the point where the far field begins is variable depending on the size and configuration of the transmitting antenna. On the other hand, EIRP is easily calculated as the antenna input power times the antenna gain. This simplifies the determination of radiated emissions by eliminating the need to consider near and far field measurement issues, particularly where relatively large diameter antennas are employed.<sup>35</sup> Thus, we believe that the specification of emission limits for unlicensed 60 GHz devices in EIRP units will eliminate possible confusion in determining whether such devices comply with those limits. We also believe that the measurement concerns that WCA raises are generally relevant to measurements of emissions from unlicensed 60 GHz transmitters that employ lower gain antennas. That is, specification of emission levels in EIRP could simplify the determination of radiated emission levels for all unlicensed 60 GHz devices. Accordingly, we propose to amend Section 15.255(b)(1) of the rules to specify that emission limits for all unlicensed 60 GHz devices in EIRP.

15. Because the far field of a 60 GHz device with a very high gain antenna begins at a distance much farther than the 3 meters measurement distance specified in the rules, we believe it is appropriate to specify the emission limits for those devices only in EIRP. However, in the case of devices with lower gain antennas, the far field distance is generally closer to the 3 meters measurement distance. We also recognize that some parties may still wish to demonstrate compliance of devices with lower gain antennas under the existing power density limits and measurement procedures.<sup>36</sup> We therefore propose to maintain the existing power density limits for devices other than very high gain systems as an alternative to the EIRP limits. We seek comment on this proposal and on the amount of antenna gain above which use of the EIRP limits would be mandatory. Comments are requested on the various aspects of this proposal to express the emission limits as EIRPs as alternatives to the existing power density standards. Comments are also requested on whether we should continue to specify measurements using the existing power density limits as an alternative to measurements using the proposed EIRP limits or if we should delete the power density limits in favor of EIRP limits.

16. *Antenna Substitution.* Section 15.204(c)(4) of the rules allows intentional radiators to be

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<sup>34</sup> See 47 C.F.R. § 15.31(f)(1).

<sup>35</sup> For example, the far field for a four-foot antenna (1.22 meter) starts at 178 meters.

<sup>36</sup> As permitted under 47 C.F.R. § 15.31(f)(1), measurements may continue to be performed at a distance greater than 3 meters when necessary to avoid performing measurements within the near field and extrapolated to 3 meters using an extrapolation factor of 20 dB/decade.

marketed and used with any antenna that is of the same type and of equal or less directional gain as the antenna authorized with the equipment.<sup>37</sup> We note that the comments contained considerable discussion regarding the Commission's emission limits for the 60 GHz band and their relationship to the RF exposure guidelines at the time the emission limits were adopted.<sup>38</sup> We are concerned here that the emission levels we are proposing in this proceeding continue to remain below the current RF exposure guidelines.<sup>39</sup> Intentional radiators must be designed to ensure that the public is not exposed to RF energy in excess of the Commission's guidelines. In some cases, this could require that transmitters operate at a lower emission level than the maximum limit specified in the rules. We note that the near field and antenna surface RF exposure levels may increase as the size of the antenna decreases.<sup>40</sup> Thus, the use of a lower gain antenna could result in a transmission system that is more likely to exceed the RF exposure guidelines. In addition, the proposed rule changes would require that the maximum EIRP decrease as the antenna gain is reduced below 51 dBi. Because of these considerations, we believe that 60 GHz systems operating under the higher power EIRP standards should be marketed and used only with the specific model antenna(s) with which the transmitter is certified.<sup>41</sup> For these reasons, we propose to specify that the provisions contained in Section 15.204(c) of the rules permitting antenna substitutions not apply to 60 GHz transmission systems operating under the proposed higher EIRP limits. We request comment on this proposal.

17. *Transmitter Identification.* Section 15.255(i) of the rules requires a transmitter identification on 60 GHz unlicensed emissions that emanate from inside a building in order to permit users experiencing interference from indoors wireless local area network ("LAN") transmitters to more accurately identify the source of the interference.<sup>42</sup> This requirement does not apply to transmitters located outdoors.<sup>43</sup>

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<sup>37</sup> 47 C.F.R. § 15.204(c)(4).

<sup>38</sup> The current RF exposure guidelines for the 60 GHz band had not been adopted by the Commission at the time when it adopted the 60 GHz limits. The 60 GHz emission limits were based on industry recommendations that the Commission believed would not expose the public to RF fields in excess of the safety standards. *See First Report and Order and Second Notice of Proposed Rule Making* in ET Docket No. 94-124, *supra*, at 18-19. *See also*, 47 C.F.R. § 15.255(g).

<sup>39</sup> *See* 47 C.F.R. § 1.1310. *See also, Guidelines for Evaluation the Environmental Effects of Radiofrequency Radiation, Report and Order*, ET Docket 93-62, 11 FCC Rcd 15123 (1996).

<sup>40</sup> When well matched to body tissues impedance, a small antenna has the tendency to produce a denser "hot spot" (where energy is concentrated) than a larger antenna that covers a larger volume or exposure region where the energy is spread out. In near-field exposure conditions where the antenna is in close proximity to persons, energy coupling and impedance matching typically play a major role in the exposure.

<sup>41</sup> Generally, Part 15 transmitters are permitted to use any antenna that is of the same type and of equal or less gain than the antenna with which the transmitter was certified. *See* 47 C.F.R. § 15.204(c).

<sup>42</sup> The Commission adopted the transmitter identification requirement based on a spectrum etiquette submitted by the Millimeter Wave Communications Working Group (MWCWG), to which there was no objection. *See Amendment Of Parts 2, 15 And 97 Of The Commission's Rules To Permit Use Of Radio Frequencies Above 40 GHz For New Radio Applications, Third Report and Order*, ET Docket 94-124, 13 FCC Rcd 15074 (1998) at 4. *See also*, 47 C.F.R. § 15.255(i).

<sup>43</sup> *See Amendment Of Parts 2, 15 And 97 Of The Commission's Rules To Allocate Additional Spectrum To The Inter-Satellite, Fixed, And Mobile Services And To Permit Unlicensed Devices To Use Certain Segments in the 50.2-50.4 GHz and 51.4-71.0 GHz Bands, Report and Order*, ET Docket 99-261, 15 FCC Rcd 25264 (2000) at 17-18. The Commission states that the victim of interference from outdoors equipment would not be able to determine the identity of the manufacturer in order to get its instructions on how to detect and decode its transmitter ID, and thus, the victim could not decode the transmitter ID without first identifying the manufacturer. The Commission went on to note that with outdoors point-to-point systems, the need to identify and decode the transmitter ID is unlikely to be a problem. *Id.*, at 18.

WCA requests that the Commission clarify that this transmitter identification requirement does not apply to indoor systems when the emissions from the antennas are directed outdoors through a window, *i.e.*, that the transmitter identification requirement does not apply to transmitters used as window links. WCA believes that there is some confusion over whether the current identification requirement applies to window links. It argues that window links pose no greater risk of interference than outdoor links and should be exempt from the identification requirement applied to indoors systems. WCA adds that such a change will accelerate the deployment of window links, which significantly reduce installation costs for shorter-range outdoor links and are essential for providing service where a property owner refuses to give permission for rooftop or other common area installations.<sup>44</sup>

18. Both Agilent and SiBEAM argue that the operation of window link systems results in the reflection of emissions from the glass and that these reflected signals can cause interference problems.<sup>45</sup> For this reason, Agilent and SiBEAM request that the Commission continue to require transmitter identification for window link units. WCA responds that 60 GHz signals do not effectively penetrate room walls or partitions and that any interference would be limited to the transmitter's immediate vicinity which, if necessary, can easily be mitigated by the user.

19. We propose not to require transmitter identification for any indoors transmitters whose emissions are directed outdoors, *e.g.*, through a window, and seek comment on this proposal. We believe that any interference potential likely will be localized around a window link, and that any 60 GHz emissions that are reflected from the glass in a window link will be attenuated by the walls and other surrounding objects and will not impact operations in adjacent areas, primarily affecting equipment located in the same room as the window link. In most cases, all equipment within the same room will be under the control of the same user. Thus, potential interference to other co-located units appears to be a frequency management problem that should be addressed by the equipment user. Because of this, it appears that the source of any such interference could be easily identified without the need for a transmitter identification signal. Further, we believe that it is more likely that any 60 GHz emissions that are reflected from the glass in a window link will be attenuated by the walls and other surrounding objects and will not impact operations in adjacent areas. We seek comment on this proposal.

20. We also seek comment on whether the transmitter identification requirement should be eliminated for all 60 GHz systems. We believe that the proximity of indoors co-located equipment should allow the user to identify the interfering transmitter to other indoors devices without having to use the transmitter identification feature. If interference should be experienced from a transmitter that is not co-located, we question whether the 60 GHz receiver experiencing the interference would be able to detect and demodulate an identification signal from a transmitter that may be operating using a different modulation format. Because manufacturers may voluntarily choose to incorporate the transmitter identification and specifications for transmitter identification could reside in industry standards, we question the need to maintain a requirement that adds costs to equipment design and installation.<sup>46</sup>

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<sup>44</sup> WCA petition at 15.

<sup>45</sup> Agilent calculates that the signal reflected from uncoated window glass is about 4 percent of the incident signal level.

<sup>46</sup> The Commission decided to retain the transmitter identification requirements for indoors systems at the time it decided to exempt outdoors systems from the requirement because indoors equipment is under the control of the system operator who knows its equipment and thus can decode the ID information and find out which transmitter is interfering with the rest of its system. *See Amendment Of Parts 2, 15 And 97 Of The Commission's Rules To Allocate Additional Spectrum To The Inter-Satellite, Fixed, And Mobile Services And To Permit Unlicensed Devices To Use Certain Segments in the 50.2-50.4 GHz and 51.4-71.0 GHz Bands, Report and Order*, ET Docket 99-261, 15 FCC Rcd 25264 (2000) at 18-19.

#### IV. PROCEDURAL MATTERS

21. *Initial Regulatory Flexibility Analysis for the Notice of Proposed Rule Making.* As required by Section 603 of the Regulatory Flexibility Act, 5 U.S.C. § 603, the Commission has prepared an Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on small entities of the proposals suggested in this document. The IRFA is set forth in Appendix A.

22. *Initial Paperwork Reduction Analysis.* The *Notice of Proposed Rule Making* does not contain proposed new or modified information collection requirements.

23. *Comments.* Pursuant to Sections 1.415 and 1.419 of the Commission's rules, 47 C.F.R. §§ 1.415, 1.419, interested parties may file comments on or before [ **insert date 90 days from publication in Federal Register** ], and reply comments on or before [ **insert date 120 days from publication in Federal Register** ]. Comments may be filed using the Commission's Electronic Comment Filing System (ECFS) or by filing paper copies. See *Electronic Filing of Documents in Rulemaking Proceedings*, 63 Fed. Reg. 24121 (1998).

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

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

26. *Further Information.* For further information, contact Anh Wride, Office of Engineering and Technology, at (202) 418-0577, or via the Internet at [anh.wride@fcc.gov](mailto:anh.wride@fcc.gov).

#### V. ORDERING CLAUSES

27. IT IS ORDERED that pursuant to Sections 1, 4(i), 7(a), 301, 303(f), 303(g), 303(r), 307(e) and 332 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 151, 154(i), 157(a), 301, 303(f), 303(g), 303(r), 307(e), and 332, this *Notice of Proposed Rule Making* IS ADOPTED and the Petition for Rule Making by the Wireless Communications Association filed on September 30, 2004, is hereby GRANTED to the extent described herein.

28. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this *Notice of Proposed Rule Making*, including the Initial Regulatory Flexibility Analysis to the Chief Counsel for Advocacy of the Small Business Administration.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch  
Secretary

## APPENDIX A

### Initial Regulatory Flexibility Analysis

As required by the Regulatory Flexibility Act of 1980, as amended (RFA),<sup>47</sup> the Commission has prepared this present Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on a substantial number of small entities by the policies and rules proposed in this *Notice of Proposed Rule Making (NPRM)*. Written public comments are requested on this IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadlines for comments provided in paragraph 23 of this *NPRM*. The Commission will send a copy of this *NPRM*, including this IRFA, to the Chief Counsel for Advocacy of the Small Business Administration (SBA).<sup>48</sup> In addition, the *NPRM* and IRFA (or summaries thereof) will be published in the Federal Register.<sup>49</sup>

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

This rule making proposal is initiated to obtain comments regarding proposed changes to the regulations for radio frequency devices that do not require a license to operate. The Commission seeks to determine if the standards should be amended to permit an increase in the allowable emitted signal level for systems using very high gain directional antennas, to permit the emissions from 60 GHz systems to be measured as an equivalent isotropically radiated power instead of as a power density, and to eliminate the need for all 60 GHz systems to emit a transmitter identification signal.

#### B. Legal Basis.

The proposed action is taken pursuant to Sections 4(i), 301, 302, 303(e), 303(f), 303(r), 304 and 307 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154(i), 301, 302, 303(e), 303(f), 303(r), 304 and 307.

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

The RFA directs agencies to provide a description of and, where feasible, an estimate of the number of small entities that may be affected by the proposed rules, if adopted.<sup>50</sup> The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."<sup>51</sup> In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act.<sup>52</sup> A small business

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<sup>47</sup> 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. 847 (1996).

<sup>48</sup> See 5 U.S.C. § 603(a).

<sup>49</sup> *Id.*

<sup>50</sup> 5 U.S.C. § 603(b)(3).

<sup>51</sup> 5 U.S.C. § 601(6).

<sup>52</sup> 5 U.S.C. § 601(3) (incorporating by reference the definition of "small business concern" in 15 U.S.C. § 632). Pursuant to the RFA, the statutory definition of a small business applies "unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register." 5 U.S.C. § 601(3).

concern is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the SBA.<sup>53</sup>

We do not expect that the rules proposed in this *Notice of Proposed Rule Making* will have a significant negative economic impact on small businesses.

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

Part 15 transmitters already are required to be authorized under the Commission's certification procedure as a prerequisite to marketing and importation. The reporting and recordkeeping requirements associated with these equipment authorizations would not be changed by the proposals contained in this *Notice*. The changes to the regulations would permit operation at a higher emission level, would permit a new method of measuring compliance with the emission limits, and would eliminate the need for transmitters in the 60 GHz band to incorporate a transmitter identification system.

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

None.

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<sup>53</sup> Small Business Act, 15 U.S.C. § 632 (1996).

## APPENDIX B

## Proposed Rule Changes

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

1. The authority citation for Part 15 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 202, 303, 304, 307 and 544A.

2. Section 15.204 is proposed to be amended by revising paragraph (c) to read as follows:

Section 15.204 External radio frequency power amplifiers and antenna modifications.

\* \* \* \* \*

(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. Exceptions to the following provisions, if any, are noted in the rule section under which the transmitter operates, e.g., see Section 15.255(b)(1)(ii) of this part.

\* \* \* \* \*

3. Section 15.255 is proposed to be amended by revising paragraphs (b)(1), (c)(3), (e) and removing paragraph (i) to read as follows:

Section 15.255 Operation within the band 57-64 GHz.

\* \* \* \* \*

(b) Within the 57-64 GHz band, emission levels shall not exceed the following:

(1) Products other than fixed field disturbance sensors shall comply with one of the following emission limits, as measured during the transmit interval:

(i) The average power density of any emission shall not exceed  $9 \mu\text{W}/\text{cm}^2$  and the peak power density of any emission shall not exceed  $18 \mu\text{W}/\text{cm}^2$ , both as measured at 3 meters from the radiating structure provided, however, that 3 meters is in the far field of the emission. If 3 meters is not in the far field, the measurements shall be performed at whatever greater distance is necessary to result in the measurement being performed in the far field and the results shall be extrapolated to a distance of 3 meters, as specified in Section 15.31(f)(1) of this part. As an alternative to these spectral density emission limits, the average power density of any emission shall not exceed an equivalent isotropically radiated power (EIRP) level of 40 dBm and the peak power density of any emission shall not exceed an EIRP of 43 dBm.

(ii) As an alternative to paragraph (b)(1)(i) of this section, for transmitters located outdoors or located indoors with emissions directed outdoors, e.g. through a window, the average power density of any emission shall not exceed an EIRP level of 82 dBm minus 2 dB for every dB that the antenna gain is less than 51 dBi. The peak power density of any emission shall not exceed 85 dBm minus 2 dB for every dB that the antenna gain is less than 51 dBi. The provisions of Section 15.204(c) of this part that permit the use of different antennas of the same type and of equal or less directional gain do not

apply to intentional radiator systems operating under this provision. In lieu thereof, intentional radiator systems shall be certified using the specific antenna(s) with which the system will be marketed and operated. Compliance testing shall be performed using the highest gain and the lowest gain antennas for which certification is being sought. Testing shall be performed with the intentional radiator operated at its maximum available output power level. The responsible party, as defined in Section 2.909 of this chapter, shall supply a list of acceptable antennas with the application for certification.

\* \* \* \* \*

(c) \* \* \*

\* \* \* \* \*

(3) Between 40 GHz and 200 GHz, the level of these emissions shall not exceed an EIRP of -10 dBm or, alternatively, a power density of 90 pW/cm<sup>2</sup> at a distance of 3 meters. If a power density measurement is performed and 3 meters is not within the far field, the measurements shall be performed at whatever greater distance is necessary to result in the measurement being in the far field and the results shall be extrapolated to a distance of 3 meters as specified in Section 15.31(f)(1) of this part.

\* \* \* \* \*

(e) Except as specified below, the total peak transmitter output power shall not exceed 500 mW. Depending on the gain of the antenna, it may be necessary to operate the intentional radiator using a lower peak transmitter output power in order to comply with the power density limits or EIRP limits specified in paragraph (b) of this section.

\* \* \* \* \*