(12) Instead of complying with section 9 of ASTM F1917–12, comply with the following:

(i) 9. Instructional Literature

(ii) 9.1. Instructions shall be provided with the product and shall be easy to read and understand, and shall be in the English language at a minimum. These instructions shall include information on assembly, installation, maintenance, cleaning, and use, where applicable.

(iii) 9.2. The instructions shall include all warnings specified in 8.6, where applicable.

(iv) 9.3. The warnings in the instructions shall meet the requirements specified in 8.5.4, 8.5.5 and 8.5.6, except that sections 6.4 and 7.2–7.6.3 of ANSI Z535.4 need not be applied. However, the signal word and safety alert symbol shall contrast with the background of the signal word panel, and the warnings shall contrast with the background of the instructional literature.

Note 7 to paragraph (b)(12)(iv). For example, the signal word, safety alert symbol, and the warnings may be black letters on a white background, white letters on a black background, navy blue letters on an off-white background, or some other high-contrast combination.

Note 8 to paragraph (b)(12)(iv). For additional guidance on the design of warnings for instructional literature, please refer to ANSI Z535.6, American National Standard: Product Safety Information in Product Manuals, Instructions, and Other Collateral Materials.

(v) 9.4. Any instructions provided in addition to those required by this section shall not contradict or confuse the meaning of the required information, or be otherwise misleading to the consumer.

Alberta E. Mills,

Secretary, Consumer Product Safety Commission.

[FR Doc. 2020–06142 Filed 4–2–20; 8:45 am]

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FEDERAL COMMUNICATIONS COMMISSION

47 CFR Part 15

[ET Docket No. 20–36; FCC 20–17; FRS 16585]

Unlicensed White Space Device Operations in the Television Bands

AGENCY: Federal Communications Commission.

ACTION: Proposed rule.

SUMMARY: In this document, the Commission proposes to revise our rules to provide additional opportunities for unlicensed white space devices operating in the broadcast television bands (TV Bands) to deliver wireless broadband services in rural areas and applications associated with the Internet of Things (IOT). Therefore, the Commission offers several proposals to spur continued growth of the white space device ecosystem, especially for providing affordable broadband service to rural and underserved communities that can help close the digital divide.

DATES: Comments are due on or before May 4, 2020; reply comments are due on or before June 2, 2020.

ADDRESSES: You may submit comments, identified by ET Docket No. 20–36, by any of the following methods:

- *Federal Communications Commission's Website: http://apps.fcc.gov/ecfs/.* Follow the instructions for submitting comments.
- *People with Disabilities:* Contact the FCC to request reasonable accommodations (accessible format documents, sign language interpreters, CART, etc.) by email: *FCC504@fcc.gov* or phone: 202–418–0530 or TTY: 202–418–0432.

For detailed instructions for submitting comments and additional information on the rulemaking process, see the **SUPPLEMENTARY INFORMATION** section of this document.

FOR FURTHER INFORMATION CONTACT: Hugh Van Tuyl, Office of Engineering and Technology, 202–418–7506, *Hugh.VanTuyl@fcc.gov.*

SUPPLEMENTARY INFORMATION: This is a summary of the Commission's Notice of Proposed Rulemaking, ET Docket No. 20–36, FCC 20–17, adopted on February 28, 2020, and released on March 2, 2020. The full text of this document is available for inspection and copying during normal business hours in the FCC Reference Center (Room CY–A257), 445 12th Street SW, Washington, DC 20554. The full text may also be downloaded at: *https://transition.fcc.gov/Daily_Releases/Daily_Business/2018/db0223/FCC-18-18A1.pdf.*

People with Disabilities: To request materials in accessible formats for people with disabilities (braille, large print, electronic files, audio format), send an email to *fcc504@fcc.gov* or call the Consumer & Governmental Affairs Bureau at 202–418–0530 (voice), 202–418–0432 (tty).

Synopsis

1. *Background.* Unlicensed white space devices can be used to provide a variety of wireless services, including broadband data. Fixed white space devices are being deployed today by Wireless Internet Service Providers (WISPs) to provide internet connectivity in rural and underserved areas, including for schools and libraries. The Commission's Part 15 rules allow unlicensed white space devices to operate at locations where frequencies are not in use by licensed services.

2. In 2008, the Commission first authorized unlicensed white space device operations, both fixed and personal/portable, in portions of the VHF and UHF broadcast television bands (TV bands) that were not being used by TV broadcasters and associated services. In 2010, 2012, and 2015, the Commission took steps to promote additional opportunities for unlicensed white space devices to use spectrum in the TV bands. To prevent harmful interference to broadcast television reception and other protected users, white space devices obtain a list of available channels and operating power levels that may be used at their particular location from databases administered by private entities approved by the Commission. Fixed white space devices must incorporate a geo-location capability and a means to access a database. Portable white space devices can either acquire a list of available channels via another device (Mode I), or themselves include geo-location and database access capabilities (Mode II).

3. In the 2015 *White Spaces Order,* the Commission took additional action to promote white space device usage in the repacked TV bands following the broadcast TV spectrum incentive auction, and it also authorized white space device operations in the 600 MHz duplex gap, in unused spectrum in the 600 MHz service band (at locations where 600 MHz service licensees had not commenced operations), and unused portions of television channel 37 (in areas that would not interfere with Radio Astronomy Service and Wireless Medical Telemetry Service incumbents).

4. In an effort to promote more flexibility for white space device operators in rural areas, the Commission permitted fixed white space devices, which under then-existing rules were limited to no more than 4 watts EIRP, to operate at higher power levels of up to 10 watts EIRP in ''less congested'' areas, which are defined as those areas where at least half the television channels are unused for broadcast services and available for white space use. In that order, the Commission retained the existing requirement that fixed devices operate on antennas that are no more than 30 meters above

ground and no more than 250 meters height above average terrain (HAAT). Most recently, in March 2019, the Commission adopted the *White Spaces Report and Order and Order on Reconsideration,* in which it provided additional flexibility for fixed white space devices to operate at up to 100 meters above ground in ''less congested'' areas, but retained the 250 meter HAAT limitation based on the record before it.

5. On May 3, 2019, Microsoft Corporation filed a petition for rulemaking requesting that the Commission provide additional flexibility for white space device operations in the TV bands. Specifically, Microsoft requests that the Commission: (1) Permit fixed devices in ''less congested'' areas to operate at higher radiated power, up to 16 watts EIRP, to support expansion of broadband in rural America, (2) permit fixed devices to operate with higher HAAT, up to 500 meters, to improve rural coverage, (3) examine the possibility of authorizing higher-power operations on first-adjacent channels to TV operations, with appropriate safeguards to prevent harmful interference, (4) permit higher power mobile operations within geo-fenced areas, and (5) adjust the rules to support narrowband IoT white space devices.

6. The Commission sought comment on the petition, and 21 parties filed comments and 16 parties filed reply comments. These commenters include several proponents of white space device operations generally supporting Microsoft's proposals, the National Association of Broadcasters (NAB), commenters concerned about protecting Wireless Medical Telemetry Service operations on Channel 37, and commenters concerned about the potential effect of Microsoft's proposals on wireless microphone users that also operate on TV broadcast spectrum not being used by other authorized services.

7. *Discussion.* The Commission proposes targeted changes to the white space device rules in the TV bands to provide improved broadband coverage that will benefit American consumers in rural and underserved areas. Specifically, the Commission proposes to permit higher transmit power and higher antenna HAAT for fixed white space devices in ''less congested'' geographic areas. In addition, the Commission proposes to permit higher power mobile operation within ''geo-fenced'' areas. The Commission also proposes rule revisions designed to facilitate the development of new and innovative narrowband IoT services. The Commission also seeks comment on methods that could be used to allow higher power operation by white space devices when operating within the service contour of an adjacent channel TV station. The Commission do not propose any rule revisions for white space device operations above TV channel 35, including in the 600 MHz duplex gap or 600 MHz service band.

8. *Fixed white space devices in rural areas in the TV Bands.* The Commission proposes rule changes for fixed white space devices that operate in the TV bands in order to enable improved broadband service in rural areas and underserved areas, defined as ''less congested'' areas in our rules. Specifically, the Commission proposes to increase the maximum permissible radiated power from 10 to 16 watts EIRP in these areas, and to increase the maximum permissible antenna HAAT from 250 meters to 500 meters. Because the maximum transmission range of a white space device is a function of both the power and antenna HAAT, these changes will enable white space devices to provide broadband service over larger areas. Given these proposed revisions, the Commission also proposes to protect other users of the TV bands by increasing the minimum required separation distances from protected TV service contours and other protected services for white space devices operating at the proposed higher power and antenna height limits, and continue to protect Wireless Medical Telemetry Service and Radio Astronomy Service operations by maintaining the current power and HAAT limits on Channel 36. The Commission seeks comment on the benefits or costs of these proposed changes with respect to white space device users and to authorized users.

9. *High power limits.* The rules currently permit fixed white space devices in the TV bands to operate with a maximum of four watts EIRP in any area, provided the device meets minimum separation distances from co-channel and adjacent channel users in the band. In addition, a fixed white space device may operate with a higher power of up to 10 watts EIRP in the TV bands (except Channel 36) in ''less congested'' areas, defined as those areas where at least half the television channels in the band of operation (*i.e.,* low VHF, high VHF or UHF) are not in use, and the fixed device complies with increased separation distances from other users in the band. Fixed white space devices are limited to one-watt maximum conducted transmitter power requiring radiated power levels above one-watt EIRP to use an antenna with directional gain, *e.g.,* 6 dBi to produce four watts EIRP, and 10 dBi to produce 10 watts EIRP.

10. In its petition, Microsoft requests that the Commission increase the radiated limit to permit fixed device operation with a maximum of 16 watts EIRP in ''less congested'' areas. Advocates of white space device operations support this request. NAB, commenting on behalf of potentially affected broadcasters, indicates that it does not oppose this proposal provided appropriate separation distances are established to protect broadcasters. Similarly, Sennheiser does not oppose revision provided the separation distances are revised to protect microphone operations. Commenters supporting Wireless Medical Telemetry Service (WMTS) operations on Channel 37 oppose any revision that would change the existing power limits for white space device operations either on Channel 37 or on adjacent Channels 36 and 38.

11. The Commission proposes to permit fixed devices to operate in the TV bands, up to Channel 35, with a maximum 16 watts EIRP (12 dBW) in ''less congested'' areas. This change will permit fixed devices used in less congested, including rural, areas to reach users at greater distances, thus enabling improved broadband coverage at less cost in these hard-to-reach areas. Higher power will also enable signals to better penetrate foliage, buildings, and other obstacles, thus providing improved coverage at locations where there is not a direct line-of-sight to the transmitter.

12. Specifically, the Commission proposes to maintain the one-watt transmitter conducted power limit for fixed devices and require that the higher power be achieved by using higher gain antennas, *i.e.,* 12 dBi to produce 16 watts EIRP with one-watt transmitter power. Because higher gain antennas are more highly directional, this proposed requirement will improve spectrum efficiency by ensuring that less white space device energy is directed outside the main antenna beam than would be the case if the Commission permitted higher transmitter power using lower gain, less directional antennas. The Commission also proposes that in cases where an antenna with a gain higher than 12 dB is used, the transmitter power must be reduced below one-watt by the amount in dB that the antenna gain exceeds 12 dBi. This requirement will ensure that the EIRP from a fixed device does not exceed the proposed 16-watt limit if a very high gain antenna is used. To maintain protection for Wireless Medical Telemetry Service and radio astronomy operations on Channel

37, the Commission do not propose to revise our current rules to permit higher power operations in Channel 36 or higher at this time.

13. The Commission seeks comment on our proposal for permitting higher power operations in the TV bands (Channels 2–35). Should we allow the maximum radiated power level to increase from 10 watts EIRP to 16 watts EIRP in less congested areas? Would a different maximum from that proposed be more appropriate to enable service to rural areas? Should we allow even higher power levels under certain circumstances, and if so, what power levels and under what circumstances? How does the proposed antenna gain requirement affect the ability to serve rural areas? Should that requirement be relaxed or tightened? What are the trade-offs, both technically and economically, regarding the potential for causing interference versus the ability to serve more areas?

14. *Higher antenna height above average terrain limits.* The rules currently permit fixed white space devices to operate with a maximum 250-meter antenna HAAT. If a fixed white space device antenna HAAT exceeds 250 meters, the white space database will not provide a list of available channels to the device and the device is not permitted to operate. This requirement was adopted to limit the distance at which interference to other users of the TV bands could occur. However, an antenna HAAT limit also precludes white space devices from operating at certain locations, *e.g.,* those where the ground HAAT already exceeds 250 meters. In the *White Spaces Order on Reconsideration,* the Commission upheld its previous decision to maintain a 250-meter antenna HAAT limit but stated that it might consider increasing the limit in the future if there were a more complete record addressing this issue.

15. The Commission now revisits the issue based on a more complete record. Microsoft argues that a higher HAAT limit subject to certain coordination conditions would reduce the likelihood of harmful interference. NAB expresses support for such a change provided that the Commission adopts a special coordination requirement for all fixed white space device operations above 250 meters HAAT and also adjusts the separation distances to protect broadcasters. Sennheiser does not oppose this revision provided the separation distances are revised to protect microphone operations. WMTS interests do not oppose an HAAT limit provided it does not apply on Channel 37 or adjacent Channels 36 and 38.

16. The Commission proposes to increase the maximum permissible antenna HAAT for fixed white space devices operating on channels 2–35 from 250 meters to 500 meters and seek comment on appropriate procedures that may be necessary to ensure that broadcaster operations and other entities in the TV bands are protected. As commenters note, increasing permissible antenna HAAT will improve broadband coverage in rural areas by enabling signals to reach greater distances and will enable fixed white space devices to operate at locations where they are not currently permitted due to the 250-meter HAAT limit, such as existing towers located at higher elevations. We also note that Microsoft, NAB and wireless interests agree that 500 meters is an appropriate maximum HAAT for fixed white space devices. In addition, operation from a higher antenna site can help increase coverage by permitting devices to operate above the tree line to avoid signal losses through leaves and to avoid clutter such as buildings. To protect Wireless Medical Telemetry Service and radio astronomy operations on Channel 37, the Commission do not propose to revise our rules to permit operation with a higher HAAT in Channel 36 or higher.

17. The Commission seeks comment on this proposal. What are the benefits of a higher HAAT limit in terms of improved rural coverage and increased transmitter site availability in high elevation areas? Will the increased fixed white space device transmission range associated with higher HAATs limit opportunities for spectrum sharing with other white space devices? Would an upper HAAT limit other than 500 meters be more appropriate? Should white space device operations at HAATs greater than 250 meters be limited to less congested areas?

18. The Commission also seeks comment on whether, as suggested by Microsoft, it should require a coordination procedure between white space devices and broadcast licensees when white space devices operate with HAATs exceeding 250 meters. Microsoft's proposed coordination procedures comprise several steps including notifying a white space administrators, notifying broadcast licensees, operating on a test basis on a 30 days trial authorization, as well as a process to submit claims of harmful interference, investigate such claims, and upon satisfactorily addressing any such claims, permit authorization on a permanent basis. While the Commission recognizes that this proposed procedure is designed to address NAB's concerns that white space devices operating at higher power and antenna heights could cause harmful interference to TV service, the Commission are concerned about the procedure's complexity and whether such procedures are even warranted given the existing obligations of unlicensed devices to protect authorized radio services.

19. The Commission believes that a simpler alternative to Microsoft's suggested coordination procedure could be used to achieve the same results. Specifically, an alternative procedure could require a party wishing to operate a fixed white space device at HAATs greater than 250 meters to notify potentially affected protected entities of their intended operation at least 48 hours in advance. The notification would include the prospective white space device operator's contact information, geographic coordinates of the antenna, antenna height above ground and average terrain, EIRP and channel(s) of operation. While entities would be expected to acknowledge receipt of the notification, if a response is not received within 48 hours, the party installing the fixed white space device would be permitted to commence operation. Operators of fixed white space devices with HAATs greater than 250 meters would be required to provide information upon request to a potentially affected protected entity on the white space devices' operational hours to help licensees determine whether a white space device was causing harmful interference. For notification purposes, the Commission would define a potentially affected station consistent with Microsoft's proposal—*i.e.,* a station would receive notification that its broadcast contour was within the separation distance corresponding to an assumed HAAT 50 meters higher than the actual deployment. To accommodate actual deployments exceeding 450 meters where Microsoft did not provide a separation distance, the Commission would add an additional row to the table of separation distances with relevant values.

20. The Commission seeks comment on this procedure. As a threshold, is such a procedure even necessary? If so, would the proposed procedure strike the proper balance between ensuring interference protection for protected entities and providing white space device operators with the ability to deploy devices with high HAATs in a timely manner? Are there other alternatives that would satisfy the same requirements? Should protected entities be defined as described above or is there a better definition? What method of

communication should a white space device operator use to contact licensees, *e.g.,* email or other electronic messaging, written mail, fax, telephone, etc.? How would any of these coordination/notification procedures affect the white space database operation? Could they be implemented quickly? What costs would be involved?

21. Under any coordination and/or notification procedure, previously coordinated devices would require new coordination/notification if a fixed white space device is moved more than 100 meters, or when an increase is made to the EIRP or HAAT that increases the minimum required separation distance from the contours of co-channel or adjacent channel TV stations. These proposed requirements are for the purpose of determining when a white space device operator must notify potentially affected stations of changes in the operating parameters of a device with an HAAT above 250 meters; the Commission are not proposing to alter the current requirement that a fixed white space device must notify the database of changes in location of greater than 50 meters or in the antenna height above ground. The fixed white space device would need to obtain a new list of available channels when moved more than 100 meters. The Commission recognizes that Microsoft proposed to base new coordination requirements on a 50 meter distance (consistent with existing rules), but because Microsoft's proposed distances in the tables of required separations from TV station contours are rounded to the nearest 0.1 kilometer (100 meters), the Commissions see no reason to require a new coordination for changes less than this amount. The Commission also notes that the HAAT levels in the proposed table of separation distances is defined in 50-meter steps for HAAT's above 250 meters. Thus, there would be no need to require new coordination/notification for small HAAT increases within a 50-meter step. The Commission seeks comment on this proposal.

22. The Commission is not proposing that white space devices operate during a specific test or trial period as suggested by Microsoft. White space devices, like all other unlicensed devices, must not cause harmful interference to authorized services and must cease interference if harmful interference occurs. Additionally, licensees can bring claims of harmful interference to the Commission or the party operating unlicensed devices at any time, so the Commission do not believe that a 30-day trial period is necessary. The Commission seeks comment on this view.

23. *Antenna height above ground.* In a related matter, the Commission seeks comment on whether the Commission should increase or remove the limit on antenna height above ground level. The Commission previously increased the maximum permissible antenna height above ground from 30 meters to 100 meters in ''less congested'' areas in the *White Spaces Order on Reconsideration.* The Commission took this action to improve wireless broadband service to persons in rural and other underserved areas, noting that a 100-meter antenna height above ground limit will benefit wireless broadband providers and users by permitting antennas to be mounted on towers or other structures at heights sufficient to clear intervening obstacles such as trees and hills that would attenuate the transmitted signal, thereby increasing the range at which the signal can be received. The Commission made no changes to the rule limiting maximum antenna HAAT to 250 meters at that time.

24. In light of our proposal to increase the maximum antenna HAAT to 500 meters in this *NPRM,* the Commission believes it is appropriate to re-examine the antenna height above ground limit. Antenna heights above ground and average terrain are directly related, in that any change to a station's antenna height above ground changes its HAAT by the same amount, *e.g.,* a 30-meter increase in height above ground increases the HAAT by 30 meters. However, the Commission notes that limiting the antenna height above ground may also limit the maximum achievable HAAT in areas where the terrain is flat since in those areas the HAAT will be approximately the same as, or not significantly higher than, the antenna height above ground. Therefore, the antenna height above ground limit (30 or 100 meters) may preclude white space device operators from taking advantage of the higher HAAT limit we are proposing, or even the current 250-meter limit. Moreover, the Commission notes that the distance separation rules to protect TV reception are based on HAAT, not antenna height above ground level.

25. Accordingly, the Commission seeks comment on whether they should make any changes to the antenna height above ground limit. Does the current antenna above ground limit restrict flexibility to design and deploy white space networks? Should the Commission increase the antenna height above ground limit, and if so, by how much? Should the Commission remove the height above ground level limit completely and rely only on HAAT? Given that the separation distances are based only on HAAT and not the antenna height above ground, what effect, if any, would such a change have on the potential of causing harmful interference to a protected service? If the Commission modifies or remove the antenna height above ground limit, should the modified rules apply across the entire U.S. or only in certain areas (*e.g.,* ''less congested areas'')

26. *Separation distance.* Because white space device operations must protect other authorized services from harmful interference, with our proposed increases in fixed white space device maximum permissible radiated power and antenna HAAT in the TV bands, we also propose increases in the minimum required separation distances between white space devices operating at higher power/HAAT in order to protect these other authorized services from harmful interference.

27. The Commission seeks comment on these proposals. Do the proposed separation distances for the higher power and antenna HAAT levels provide adequate protection to co-channel and adjacent channel TV service? Are any other changes necessary to protect TV service in light of the proposed power and HAAT levels?

28. *Protection of other operations in the TV bands.* In addition to the broadcast television service, white space devices must protect certain other operations in the TV bands. These include TV translator receive sites, Low Power TV (including Class A) receive sites, Multi-channel Video Programming Distributor (MVPD) receive sites, fixed Broadcast Auxiliary Service (BAS) links, the private land mobile radio and commercial mobile radio services (PLMRS/CMRS), and Low Power Auxiliary Station services (referenced herein as licensed wireless microphones). When the Commission increased the maximum power for fixed white space devices operating in less congested areas from 4 watts EIRP to 10 watts EIRP in the *White Spaces Order* in 2015, it also slightly increased the minimum required separation distances from TV translator receive sites, PLMRS/CMRS, and temporary BAS links. Because we are now proposing to increase the maximum fixed white space device EIRP from 10 watts to 16 watts, and the maximum HAAT from 250 meters to 500 meters, we are proposing to make additional changes to the protection criteria for operations in the TV bands other than broadcasting.

29. The Commission proposes changes to the keyhole shaped exclusion zone that is specified to protect the receive sites of TV

translators, low power TV stations, Class A TV stations, MVPDs, and BAS facilities from white space devices. Under the current rules, white space devices are prohibited from operating co-channel and adjacent channel to the TV channel(s) being received by these facilities over an arc of ±30 degrees from a line between the receive site and each associated transmitter. The protection zone extends to a maximum distance of 80 kilometers from the protected receiver toward its associated transmitter for co-channel operations and to 20 kilometers for adjacent channel operation. In addition, to prevent interference from white space device signals outside the main beam of the protected receive antenna, white space devices are prohibited from operating within a circular area of 10.2 kilometers co-channel and 2.5 kilometers adjacent channel from the receive sites in all directions off the ±30 degree arc when a white space device operates at an EIRP between four and ten watts. The Commission believes the 80-kilometer co-channel and 20-kilometer adjacent channel protection distances are large enough to sufficiently protect these protected receive sites from interference from fixed devices operating at 16 watts EIRP. However, to protect these sites from white space devices that are located outside the main beam, the Commission believes a modest increase in distance is necessary. The Commission are therefore proposing to adjust those distances to prohibit fixed devices operating with EIRPs greater than 10 watts from operating within 16.6 kilometers co-channel and 3.5 kilometers adjacent channel outside the ±30 degree arc of the protected received site. The Commission seeks comment on this proposal. Is an increase in separation distances necessary within the main beam of the antenna, and if so, what are the appropriate distances and how should they be calculated? Are increased separation distances necessary to protect receive sites outside the main beam of the receive antenna, and are the proposed separation distances appropriate?

30. The Commission also proposes changes to the protection criteria for the private land mobile radio services and commercial mobile radio services (PLMRS/CMRS). These services operate on TV channels 14–20 in 11 major markets and in some additional areas under rule waivers. PLMRS/CMRS operations are protected from interference from white space devices through a circular exclusion zone extending from the center of each market, or from specific geographic coordinates for operations under a waiver. These exclusion zones are based on the Commission's methodology described in the *White Spaces Second Report and Order.* Using the same methodology the Commission previously used to determine the protection zones, the Commission proposes that fixed white space devices operating at more than 10 watts EIRP in less congested areas may not operate within a circular exclusion zone of 139.2 kilometers co-channel and 132.2 kilometers adjacent channel of the 11 major markets where PLMRS/CMRS stations are permitted to operate and within 59.2 kilometers co-channel and 52.2 kilometers adjacent channel of PLMRS/CMRS base stations operating outside the 11 major markets under a waiver. The Commission seeks comment on these proposals. Are the proposed separation distances appropriate to protect PLMRS/CMRS operations? Should we define three sets of exclusion zones based on power levels, *e.g.,* up to four watts, between four and ten watts, and greater than ten watts, or should we combine two or more tiers for simplicity as there is not a large difference between them? What effect might these proposals have on implementing the statutory directive for the Commission to transition public safety operations out of T-Band and auction the spectrum for use by other services?

31. With regard to licensed wireless microphones, the Commission proposes to increase the minimum required separation distance from fixed white space devices operating at power levels greater than 10 watts from one kilometer to 1.3 kilometers. This proposed change is intended to provide the same protection level to licensed wireless microphones as the current rules. The Commission calculated this increased distance using the conservative assumption of free space propagation. The Commission seeks comment on this proposal. Is it necessary to increase the minimum required separation distance from licensed wireless microphones, and is our proposed distance appropriate?

32. The Commission seeks comment on whether any changes are necessary to the definition of ''less congested'' area given the revised rules that the Commission are proposing in this NPRM. Is the current definition appropriate, *i.e.,* that half the channels in the band of operation be vacant? If not, what is an appropriate metric for defining ''less congested'' area? Because the number of vacant channels at a location can vary based on the EIRP and HAAT of a white space device, should we define vacant channels at a particular antenna height and power level? Nominet expressed concern that because the required separation distances from TV station contours vary according to white space device HAAT, it can be difficult to determine the precise number of channels that may be vacant in any given area. Nominet proposes that the Commission revise the definition to one based on population density, which would make it easier to determine where devices that operate with higher power or antenna height can be deployed to serve more rural areas. Should the Commission instead base the definition of ''less congested'' on the population density of an area where the white space device is located as suggested by Nominet? If the Commission were to adopt a definition of ''less congested'' based on population density, what is the appropriate population density and how would the white space database determine whether a location meets the definition? How would such changes affect the availability of ''less congested'' areas compared to those available today? Would such areas be more pervasive? Or less? Are there other technical requirements the Commission could adopt in conjunction with a change to the definition of ''less congested'' areas to reduce the potential of causing harmful interference when higher EIRP and HAATs are used? Finally, the Commission requests comment on the benefits or costs of any changes to the Commission's current definition.

33. *Higher power mobile operation within ''geo-fenced'' areas.* The white space rules permit two general classes of devices, fixed devices and personal/portable devices. As noted above, under the current rules fixed white space devices may operate with up to four watts EIRP generally, and up to 10 watts in ''less congested'' areas. Personal/portable devices may operate with a maximum EIRP of 100 milliwatts, may load channel availability information for multiple locations from the white space database and use that information to define a geographic area within which it can operate on a mobile basis on the same available channels at all locations, and they must contact the database again if they move beyond the boundary of the area where the channel availability data is valid.

34. In its petition, Microsoft requests that the Commission permit the use of fixed devices on mobile platforms, such as school buses or agricultural equipment, within ''geo-fenced'' areas, *i.e.,* defined geographic areas over which a mobile device is permitted to

operate. This proposal is analogous in many respects to the rules for personal/portable devices that are permitted to operate within a defined geographic area. Microsoft, however, proposes to permit mobile white space devices to operate at higher power levels than the rules currently permit for personal/portable devices (*i.e.,* at the same power level as is permitted for fixed white space devices), and proposes specific additional restrictions to prevent harmful interference to users of the TV bands. Advocates of white space device operations generally support Microsoft's proposal.

35. The Commission proposes to allow white space devices to operate on TV Channels 2–35 on mobile platforms within geo-fenced areas at higher power levels than the rules currently permit for portable devices, and proposes to limit such operations to ''less congested'' areas to limit their potential for causing harmful interference. Microsoft suggests that the Commission permits fixed devices to operate on mobile platforms. However, because fixed stations, by definition, are stations that communicate between fixed points (*i.e.,* stations that do not move), the Commission are instead proposing to allow mobile Mode II personal/portable white space devices to operate at higher power levels commensurate with that allowed for fixed devices within ''less congested'' areas and limited to pre-cleared geo-fenced areas. These types of geo-fenced operations could benefit persons in rural areas by enabling improved communications on moving vehicles such as school buses and agricultural equipment, and for applications such as monitoring roaming livestock. The Commission seeks comment on the benefits or costs of this proposal with respect to white space device users or other authorized users of the TV band spectrum.

36. The Commission proposes to permit a higher power Mode II white space device installed on a movable platform to load channel availability information for multiple locations in the vicinity of its current location and to use that information to define a geo-fenced area within which it can operate on the same available channels at all locations. Consistent with the requirements for Mode II personal/portable devices, The Commission proposes to require that the white space device's location be checked at least once every 60 seconds while in operation, except while in sleep mode, *i.e.,* in a mode in which the device is inactive but is not powered-down. The Commission recognizes, however, that checks every 60 seconds may be insufficient to protect services in locations where coverage contours and usage of wireless microphones varies rapidly from one location to the next. To limit the potential of movable devices to cause harmful interference, we propose that a device may not use channel availability information for multiple locations if/when it moves closer than 1.6 kilometers to the boundary of the geo-fenced area in which the device operates, or at any point outside that boundary. This proposed limitation is designed to ensure that a device moving at 60 miles per hour (1.6 kilometers per minute) does not cross outside the boundary between device re-checks of its location. We further propose, as recommended by NAB, to prohibit operation on board aircraft or satellites to limit the range at which interference could occur.

37. The Commission seeks comment on these proposals. Should the Commission allow Mode II portable devices to operate at higher power in ''less congested'' areas, and how would such operations benefit persons in those areas? Should the Commission instead permit devices operating under the fixed device rules to operate on mobile platforms as suggested by Microsoft and others? What effect would either approach have on the equipment approval process for white space devices? For example, could portable Mode II devices be approved at the higher power level for general usage because the database would limit the amount of power that they could use for operations in any specific area? What antenna requirements should apply to higher power mobile devices? The Commission notes that under the current rules, fixed devices may use detachable antennas with high gain, whereas portable devices must use permanently attached antennas, which can have the effect of limiting antenna size and gain. Should the Commission allow higher power mobile devices to use detachable, higher gain antennas as we permit for fixed devices? Can technologies such as electronically steerable beams allow mobile devices to operate with higher gain, and therefore more highly directional, antennas? If the Commission permits use of detachable antennas for higher power mobile white space devices, should the Commission create a new class of white space devices, such as mobile white space devices, to distinguish such devices from personal/portable white space devices? Are there other rules that need to be modified or limitations that should be imposed for such use?

38. The Commission also seeks comment on other requirements for higher power mobile white space devices. Are the proposed operational limitations sufficient to protect other users of the TV bands, including television, cable headends, translator receive sites and wireless microphone users? Do the Commission need to place limitations on the size of the area over which a higher power mobile device could operate? Is four watts an appropriate maximum power to permit for such operations or should a different maximum power level be permitted (*e.g.,* 10 watts or 16 watts EIRP)? Would mobile devices operating at higher power levels be able to comply with the Commission's RF safety requirements? Do the Commission need to specify how information on an area will be provided to the white space database? Are any other safeguards needed to ensure that higher power mobile devices do not cause harmful interference to protected operations, especially operations that are close to, but outside, the edge of a pre-cleared geo-fenced area? Are there concerns about coexistence between higher power mobile white space devices and other mobile or fixed white space devices? Is there a need to prohibit operation on board aircraft and satellites or any other mobile platforms such as trains and boats? Should the Commission limit operation of higher power mobile devices to less congested areas as we propose and as suggested by some commenters? Are any changes to the white space databases needed to permit the proposed operation?

39. *Narrowband IoT operations.* Fixed white space devices operating with four watts or greater EIRP must comply with a power spectral density (PSD) limit of 12.6 dBm per 100 kilohertz, which limits total conducted power within any 6-megahertz television channel to 30 dBm. The PSD limit is proportionally lower for devices operating at lower EIRP levels. The Commission established PSD limits to prevent multiple white space devices from operating at the maximum allowable power with transmit bandwidths less than six megahertz within a single television channel, which would result in a total transmitted power within that channel significantly greater than the limit. These PSD limits were calculated based upon a single white space device spreading its energy uniformly across a 6-megahertz television channel bandwidth. The limits serve to limit the maximum power of white space devices with bandwidths of less than 6-megahertz, *e.g.,* a white space device that operates with a bandwidth of half a television channel would be limited to

half the power of a device that operates across a full channel.

40. The Commission proposes to modify the white space rules to facilitate the deployment of narrowband IoT devices. TV band frequencies are better able to penetrate foliage and other obstacles than higher frequencies, thus providing improved transmission range for IoT devices. Specifically, we propose to define a ''narrowband white space device'' as a type of fixed or personal/portable white space device operating in a bandwidth of no greater than 100 kHz. We also propose that narrowband white space devices be client devices that communicate with a fixed or Mode II master device that contacts the white space database to obtain a list of available channels and operating powers at its location.

41. The Commission proposes to permit narrowband white space devices to operate with a conducted PSD of up to 12.6 dBm/100 kHz, which is the same level permitted for fixed devices that operate with the maximum permissible one-watt conducted power in a six megahertz channel, and to require narrowband devices to comply with the same maximum antenna gain requirements as fixed devices. The Commission further proposes to require narrowband white space devices to comply with an emission limit of −42.8 dBm into adjacent channels, *i.e.,* outside of the six-megahertz channel in which they operate. These proposed requirements will clarify that a white space device can operate with a single or several narrowband carriers rather than having to spread all of its energy across a six megahertz channel and will ensure that narrowband white space devices have no greater interference potential than wider bandwidth devices operating under the current rules. To ensure that the total energy in a single TV channels does not cause harmful interference, the Commission proposes to limit each transmitter to a total operation of ten seconds per hour. The Commission believes that this proposal will prevent narrowband IoT devices from being used for data intensive applications, including continuous transmissions, transmissions of audio and video or remote control of toys.

42. The Commission proposes to require narrowband devices to use a channel plan that limits total transmitted power in a six-megahertz channel to no higher than the existing limits for a four-watt EIRP broadband white space device. Specifically, we propose to require narrowband white space devices to operate at least 250 kilohertz from the edge of a six-megahertz TV channel, unless the adjacent channel is also vacant, and to permit narrowband white space devices to operate only on channels centered at integral multiples of 100 kHz between the 250 kHz guard bands. The net effect of these proposed requirements is that narrowband devices could operate within 55 possible 100-kilohertz channels in the center 5.5 megahertz of each six-megahertz channel. Even in the event that all 55 narrowband channels within a six-megahertz channel were occupied simultaneously by devices operating at maximum power, the maximum conducted and radiated power within that six-megahertz channel would be no greater than for a fixed device operating with one-watt conducted power and four watts EIRP.

43. The Commission seeks comment on these proposals. Is the proposed definition of narrowband white space device appropriate for the intended IoT applications? Should narrowband personal/portable devices be subject to lower emission limits than those proposed since the proposed limits are based on four-watt EIRP fixed devices? Is it necessary for the Commission to require a listen-before-talk spectrum access mechanism to prevent harmful interference to protected services in the TV bands? If the Commission were to require such a mechanism, what parameters would it need to specify, *e.g.,* monitoring threshold, monitoring time, receiver bandwidth, receive antenna specifications? If we require narrowband devices to operate as clients to a fixed device that contacts the white space database, is there a need to increase the minimum separation distances from co-channel and adjacent channel TV station contours as we require for personal/portable devices operating as clients? Are the proposed maximum PSD, out-of-band emission and antenna gain limits appropriate for narrowband devices? Is the proposed data transmission limit of ten seconds per hour necessary to prevent data intensive operations? Is a channelization plan necessary, and if so, is the proposed plan appropriate? Are any other revisions to the proposed rules appropriate to protect licensed wireless microphone operations given that such operations would be protected when registered in the white spaces database? Finally, are there any other revisions to the rules for narrowband operations that should be adopted to protect any other authorized service that operate in the TV bands from harmful interference by narrowband white space devices?

44. *Higher power on adjacent channels.* Among the requirements for white space device operations are that operations above 40 milliwatts EIRP must generally operate outside the protected contours of adjacent channel TV stations. That's because a strong signal on an adjacent channel can cause interference to the reception of a channel being viewed. The general requirement that all fixed white space devices avoid operation within adjacent channel protected contours means that, as a practical matter, a white space device may operate only at locations where there are three contiguous vacant channels, *i.e.,* the channel used by the white space device plus both adjacent channels. The Commission's rules do, however, provide an exception for operation of low power white space devices on adjacent channels because of the shorter distances at which interference to the adjacent channel TV station could occur. Specifically, fixed white space devices may operate within the protected contour of adjacent channel TV stations with a power level of 100 milliwatts EIRP when the white space device operates in a six-megahertz band centered on the boundary of two contiguous vacant channels, *i.e.,* 50 milliwatts within a three-megahertz band in each channel.

45. The Commission seeks comment on the ideas suggested by Microsoft and others to develop a record on this issue. Could more sophisticated computer models, such as Longley-Rice, be used to permit higher power unlicensed operations on adjacent channels? If so, how? Are they sufficiently precise to identify areas where the desired TV signal strength is sufficiently high that interference from adjacent channel white space devices is unlikely? What specific technical parameters would need to be considered or specified in such calculations, *e.g.,* desired TV signal strength, appropriate grid size for determining where interference could occur, desired-to-undesired signal ratios, white space device power and antenna height? Is there any information available on adjacent channel selectivity and interference rejection capabilities of next generation TV receivers, such as manufacturers' specifications or actual measurement results? Is there any indication that next generation TV receivers will in fact have better adjacent channel interference rejection than current receivers? The Commission notes that while some parties advocated for tighter out-of-band emission limits for white space devices, others believe that the current limits are already too stringent. Would tighter out-of-band emission limits for white space devices result in any reduction in the potential for interference to adjacent channel TV

reception? Are there other factors we can consider or steps that users or white space databases can take to provide for more widespread use of white space devices near or within the contour of first adjacent television channels? Commenters should provide technical detail and analysis supporting their position on this issue.

Procedural Matters

46. *Paperwork Reduction Act Analysis.* This document contains proposed new or modified information collection requirements. The Commission, as part of its continuing effort to reduce paperwork burdens, invites the general public and the Office of Management and Budget (OMB) to comment on the information collection requirements contained in this document, as required by the Paperwork Reduction Act of 1995, Public Law 104–13. In addition, pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107–198, *see* 44 U.S.C. 3506(c)(4), we seek specific comment on how we might further reduce the information collection burden for small business concerns with fewer than 25 employees.

47. *Initial Regulatory Flexibility Analysis.* As required by the Regulatory Flexibility Act, the Commission has prepared an Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on a substantial number of small entities of the proposals addressed in this Notice. The Full IRFA is found in Appendix C at *https://docs.fcc.gov/public/attachments/FCC-20-17A1.pdf.* The Commission requests written public comment on the IRFA. Comments must be filed in accordance with the same filing deadlines as comments filed in response to the NPRM and must have a separate and distinct heading designating them as responses to the IRFA. The Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, will send a copy of this Notice, including the IRFA, to the Chief Counsel for Advocacy of the Small Business Administration, in accordance with the Regulatory Flexibility Act.

48. *Filing Requirements.* Pursuant to §§ 1.415 and 1.419 of the Commission's rules, 47 CFR 1.415, 1.419, interested parties may file comments and reply comments on or before the dates indicated on the first page of this document. Comments may be filed using the Commission's Electronic Comment Filing System (ECFS). *See Electronic Filing of Documents in Rulemaking Proceedings,* 63 FR 24121 (1998).

- Electronic Filers: Comments may be filed electronically using the internet by accessing the ECFS: *http://www.fcc.gov/ecfs/.*
- Paper Filers: Parties who choose to file by paper must file an original and one copy of each filing. If more than one docket or rulemaking number appears in the caption of this proceeding, filers must submit two additional copies for each additional docket or rulemaking number.

Filings can be sent by hand or messenger delivery, by commercial overnight courier, or by first-class or overnight U.S. Postal Service mail. All filings must be addressed to the Commission's Secretary, Office of the Secretary, Federal Communications Commission.

- All hand-delivered or messenger-delivered paper filings for the Commission's Secretary must be delivered to FCC Headquarters at 445 12th St. SW, Room TW–A325, Washington, DC 20554. The filing hours are 8:00 a.m. to 7:00 p.m. All hand deliveries must be held together with rubber bands or fasteners. Any envelopes and boxes 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 9050 Junction Drive, Annapolis Junction, MD 20701.
- U.S. Postal Service first-class, Express, and Priority mail must be addressed to 445 12th Street SW, Washington, DC 20554.

49. *People with Disabilities.* To request materials in accessible formats for people with disabilities (braille, large print, electronic files, audio format), send an email to *fcc504@fcc.gov* or call the Consumer & Governmental Affairs Bureau at 202–418–0530 (voice), 202–418–0432 (tty).

50. *Additional Information.* For additional information on this proceeding, contact Hugh L. Van Tuyl, *Hugh.VanTuyl@fcc.gov,* (202) 418–7506.

Ordering Clauses

51. *It is ordered,* pursuant to the authority found in sections 4(i), 201, 302, and 303 of the Communications Act of 1934, as amended, 47 U.S.C. 154(i), 201, 302a, 303, and §§ 1.407 and 1.411 of the Commission's Rules, 47 CFR 1.407 and 1.411, that this *Notice of Proposed Rulemaking is hereby adopted.* The petition for rulemaking of Microsoft Corporation, ET Docket No. 14–165 and RM–11840, is hereby *granted* to the extent discussed herein, and shall be consolidated into ET Docket No. 20–36.

52. *It is further ordered* that *notice is hereby given* of the proposed regulatory changes described in this *Notice of Proposed Rulemaking,* and that comment is sought on these proposals.

53. *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 Rulemaking,* including the Initial Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

List of Subjects in 47 CFR Part 15

Communications equipment and Reporting recordkeeping requirements.

Federal Communications Commission.

Cecilia Sigmund,

Federal Register Liaison Officer, Office of the Secretary.

Proposed Rules

For the reasons discussed in the preamble, the Federal Communications Commission proposes to amend 47 CFR part 15 as follows:

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

PART 15—RADIO FREQUENCY DEVICES

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

Authority: 47 U.S.C. 154, 302a, 303, 304, 307, 336, 544a, and 549.

■ 1. Amend § 15.703 by removing the paragraph designations and adding a new definition in alphabetical order to read as follows:

§ 15.703 Definitions.

* * * * *

Narrowband white space device. A fixed or personal/portable white space device operating in a bandwidth of no greater than 100 kHz.

* * * * *

■ 2. Amend § 15.707 by adding paragraph (c) to read as follows:

§ 15.707 Permissible channels of operation.

* * * * *

(c) Narrowband white space devices may only operate on frequencies below 608 MHz.

■ 3. Amend § 15.709 by:

■ a. Revising paragraphs (a)(2), (b)(1)(ii) and (iii),

■ b. Adding paragraph (b)(4) and

■ c. Revising paragraphs (c)(2) and (g)(1)(ii).

The additions and revisions read as follows:

§ 15.709 General technical requirements.

(a) * * *

(2) *TV bands and 600 MHz service band.* (i) (A) Fixed devices in the TV bands below 602 MHz: Up to 4 W (36 dBm) EIRP, and up to 16 W (42 dBm) EIRP in less congested areas. Fixed devices in the 602–608 MHz band may operate with up to 4 W (36 dBm) EIRP.

(B) Fixed devices in the 600 MHz service bands above 620 MHz: Up to 4 W (36 dBm) EIRP, and up to 10 W (40 dBm) EIRP in less congested areas. Fixed devices that operate in any portion of the 614–620 MHz band may operate with up to 4 W (36 dBm) EIRP.

* * * * *

(b) * * *

(1) * * *

(ii) For operation at EIRP levels of 36 dBm (4,000 mW) or less, fixed white space devices may operate at EIRP levels between the values shown in the table in paragraph (b)(1)(iii) of this section provided that the conducted power and the conducted power spectral density (PSD) limits are linearly interpolated between the values shown and the adjacent channel emission limit of the higher value shown in the table is met. Operation at EIRP levels above 36 dBm (4000 mW) but not greater than 40 dBm (10,000 mW) shall follow the requirements for 40 dBm (10,000 mW). Operation at EIRP levels above 40 dBm (10,000 mW) shall follow the requirements for 42 dBm (16,000 mW).

(iii) The conducted power spectral density from a fixed white space device shall not be greater than the values shown in the table in this paragraph (b)(1)(iii) when measured in any 100 kHz band during any time interval of continuous transmission.

TABLE 1 TO PARAGRAPH (b)(1)(iii)

EIRP (6 MHz)	Conducted power limit (6 MHz)	Conducted PSD limit [1] (100 kHz)	Conducted adjacent channel emission limit (100 kHz)
16 dBm (40 mW)	10 dBm (10 mW)	−7.4 dBm	−62.8 dBm.
20 dBm (100 mW)	14 dBm (25 mW)	−3.4 dBm	−58.8 dBm.
24 dBm (250 mW)	18 dBm (63 mW)	0.6 dBm	−54.8 dBm.
28 dBm (625 mW)	22 dBm (158 mW)	4.6 dBm	−50.8 dBm.
32 dBm (1600 mW)	26 dBm (400 mW)	8.6 dBm	−46.8 dBm.
36 dBm (4000 mW)	30 dBm (1000 mW)	12.6 dBm	−42.8 dBm.
40 dBm (10000 mW)	30 dBm (1000 mW)	12.6 dBm	−42.8 dBm.
42 dBm (16000 mW)	30 dBm (1000 mW)	12.6 dBm	−42.8 dBm.

* * * * *

(4) *Narrowband white space devices.*

(i) Narrowband white space devices shall operate on channel sizes that are no more than 100 kHz. The edge of a narrowband channel shall be offset from the upper and lower edge of the 6 MHz channel in which it operates by at least 250 kHz, except in the case where bonded 6 MHz channels share a common band edge. Narrowband channels of operation shall be at integral multiples of 100 kHz beginning at a 250 kHz offset from a 6 MHz channel's edge, or with no offset at the common band edge of two bonded 6 MHz channels.

(ii) The conducted power limit is 12.6 dBm in a 100 kHz segment. The EIRP limit is 18.6 dBm in a 100 kHz segment. The conducted power spectral density limit is 12.6 dBm in any 100 kHz band during any time interval of continuous transmission.

(iii) Conducted adjacent channel emissions shall be limited to −42.8 dBm in 100 kHz in a first adjacent 6 MHz channel, starting at the edge of the 6 MHz channel within which the narrowband device is operating. This limit shall not apply between the edge of the narrowband channel and the edge of the 6 MHz channel that contains it.

(iv) If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted power output shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(v) Total channel occupancy shall be limited to 10 seconds per hour.

(c) * * *

(2) The conducted power, PSD and adjacent channel limits for fixed white space devices operating at greater than 36 dBm (4000 milliwatts) EIRP shown in the table in paragraph (b)(1) of this section are based on a maximum transmitting antenna gain of 12 dBi. If transmitting antennas of directional gain greater than 12 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 12 dBi.

* * * * *

(g) * * *

(1) * * *

(ii) *Height above average terrain (HAAT).* For operation in the 602–608 MHz band and the 600 MHz service bands, the transmit antenna shall not be located where its height above average terrain exceeds 250 meters. For operation in the TV bands below 602 MHz, the transmit antenna shall not be located where its height above average terrain exceeds 250 meters generally, or 500 meters in less congested areas. The HAAT is to be calculated by the white space database using the methodology in § 73.684(d) of this chapter. For HAAT greater than 250 meters the following coordination procedures are required:

(A) The installing party must contact a white space database and identify all TV broadcast station contours that would be potentially affected by operation at the planned HAAT and EIRP. A potentially affected TV station is one where the protected service contour would be within the applicable separation distance if the white space device was operating at a HAAT of 50 meters above the planned height at the proposed power level.

(B) The installing party must notify each of these licensees and provide the geographic coordinates of the white space device, relevant technical parameters of the proposed deployment, and contact information.

(C) No earlier than 48 hours after this notification, the installing party may commence operations.

(D) Upon request, the installing party must provide each potentially affected licensee with information on the time periods of operations.

(E) If the installing party seeks to modify its operations by increasing its power level, by moving more than 100 meters horizontally from its location, or by making an increase in the HAAT or EIRP of the white space device that results in an increase in the minimum required separation distances from co-channel or adjacent channel TV station contours, it must conduct a new coordination.

* * * * *

■ 4. Amend § 15.711 by adding paragraph (c)(3) to read as follows:

§ 15.711 Interference avoidance methods.

* * * * *

(c) * * *

(3) A Mode II device installed on a movable platform in less congested areas may load channel availability information for multiple locations in the vicinity of its current location. It may use that information to define a geographic area within which it can operate on the same available channels at all locations. A device may not use channel availability information for multiple locations if/when it moves within 1.6 km of the boundary of the area where the channel availability data is valid, or outside that boundary. The location must be checked at least once every 60 seconds while the white space device is in operation except while in sleep mode, *i.e.,* in a mode in which the device is inactive but is not powered-down. Operation on board aircraft or satellites is prohibited.

* * * * *

■ 5. Amend § 15.712 by:

■ a. Revising the introductory text and paragraphs (a)(2), (b)(3)(ii) and (iii),

■ b. Adding new paragraphs (b)(3)(iv);

■ c. Revising paragraph (c)(2)(ii);

■ d. Adding paragraph (c)(2)(iii) and

■ e. Revising paragraphs (d), (f), and (i)(1)

The additions and revisions read as follows:

§ 15.712 Interference protection requirements.

The separation distances in this section apply to fixed and personal/portable white space devices with a location accuracy of ±50 meters. These distances must be increased by the amount that the location uncertainty of a white space device exceeds ±50 meters. Narrowband white space devices shall comply with the separation distances applicable to a fixed white space device operating with 30 dBm conducted power and 36 dBm EIRP across a 6 MHz channel.

(a) * * *

(2) *Required separation distance.* White space devices must be located outside the contours indicated in paragraph (a)(1) of this section of co-channel and adjacent channel stations by at least the minimum distances specified in the tables in paragraph (a)(2)(v).

(i) If a device operates between two defined power levels, it must comply with the separation distances for the higher power level.

(ii) White space devices operating at 40 mW EIRP or less are not required to meet the adjacent channel separation distances.

(iii) Fixed white space devices operating at 100 mW EIRP or less per 6 megahertz across multiple contiguous TV channels with at least 3-megahertz separation between the frequency band occupied by the white space device and adjacent TV channels are not required to meet the adjacent channel separation distances.

(iv) Fixed white space devices may only operate above 4 W EIRP in less congested areas as defined in § 15.703.

(v) The following are the tables of minimum required separation distances outside the contours of co-channel and adjacent channel stations that white space devices must meet.

TABLE 2 TO SECTION 15.712(a)(2)(v)

Mode II personal/portable white space devices

	Required separation in kilometers from co-channel digital or analog TV (full service or low power) protected contour	
	16 dBm (40 mW)	20 dBm (100 mW)
Communicating with Mode II or Fixed device	1.3	1.7
Communicating with Mode I device	2.6	3.4

TABLE 3 TO SECTION 15.712(a)(2)(v)

Fixed white space devices

Antenna height above average terrain of unlicensed devices (meters)	Required separation in kilometers from co-channel digital or analog TV (full service or low power) protected contour *							
	16 dBm (40 mW)	20 dBm (100 mW)	24 dBm (250 mW)	28 dBm (625 mW)	32 dBm (1600 mW)	36 dBm (4 W)	40 dBm (10 W)	42 dBm (16 W)
Less than 3	1.3	1.7	2.1	2.7	3.3	4.0	4.5	5.0
3–10	2.4	3.1	3.8	4.8	6.1	7.3	8.5	9.4
10–30	4.2	5.1	6.0	7.1	8.9	11.1	13.9	15.3
30–50	5.4	6.5	7.7	9.2	11.5	14.3	19.1	20.9
50–75	6.6	7.9	9.4	11.1	13.9	18.0	23.8	26.2
75–100	7.7	9.2	10.9	12.8	17.2	21.1	27.2	30.1
100–150	9.4	11.1	13.2	16.5	21.4	25.3	32.3	35.5
150–200	10.9	12.7	15.8	19.5	24.7	28.5	36.4	39.5
200–250	12.1	14.3	18.2	22.0	27.3	31.2	39.5	42.5
250–300	13.9	16.4	20.0	23.9	29.4	35.4	42.1	45.9
300–350	15.3	17.9	21.7	25.7	31.4	37.6	44.5	48.4
350–400	16.6	19.3	23.2	27.3	33.3	39.7	46.9	51.0
400–450	17.6	20.4	24.4	28.7	35.1	41.9	49.4	53.8
450–500	18.3	21.4	25.5	30.1	36.7	43.7	51.4	55.9

* When communicating with Mode I personal/portable white space devices, the required separation distances must be increased beyond the specified distances by 1.3 kilometers if the Mode I device operates at power levels no more than 40 mW EIRP or 1.7 kilometers if the Mode I device operates at power levels above 40 mW EIRP.

TABLE 4 TO SECTION 15.712(a)(2)(v)

Personal/portable white space devices	
	Required separation in kilometers from adjacent channel digital or analog TV (full service or low power) protected contour
	20 dBm (100 mW)
Communicating with Mode II or Fixed device	0.1
Communicating with Mode I device	0.2

TABLE 5 TO SECTION 15.712(a)(2)(v)

Fixed white space devices							
Antenna height above average terrain of unlicensed devices (meters)	Required separation in kilometers from adjacent channel digital or analog TV (full service or low power) protected contour *						
	20 dBm (100 mW)	24 dBm (250 mW)	28 dBm (625 mW)	32 dBm (1600 mW)	36 dBm (4 W)	40 dBm (10 W)	42 dBm (16 W)
Less than 3	0.1	0.1	0.1	0.1	0.2	0.2	0.3
3–10	0.1	0.2	0.2	0.2	0.3	0.4	0.5
10–30	0.2	0.3	0.3	0.4	0.5	0.6	0.7
30–50	0.3	0.3	0.4	0.5	0.7	0.8	1.0
50–75	0.3	0.4	0.5	0.7	0.8	0.9	1.0
75–100	0.4	0.5	0.6	0.8	1.0	1.1	1.3
100–150	0.5	0.6	0.8	0.9	1.2	1.3	1.5
150–200	0.5	0.7	0.9	1.1	1.4	1.5	1.7
200–250	0.6	0.8	1.0	1.2	1.5	1.7	1.9
250–300	0.7	0.8	1.0	1.3	1.6	2.1	2.3
300–350	0.7	0.9	1.1	1.4	1.8	2.2	2.4
350–400	0.8	1.0	1.2	1.5	1.9	2.4	2.7
400–450	0.8	1.0	1.3	1.6	2.1	2.6	2.9
450–500	0.8	1.1	1.4	1.7	2.1	2.7	2.9

* When communicating with a Mode I personal/portable white space device that operates at power levels above 40 mW EIRP, the required separation distances must be increased beyond the specified distances by 0.1 kilometers.

(3) *Fixed white space device antenna height.* Fixed white space devices must comply with the requirements of § 15.709(g) of this part.

* * * * *

(b) * * *

(3) * * *

(ii) White space devices operating with more than 4 watts EIRP and up to 10 watts EIRP may not operate within 10.2 kilometers from the receive site for co-channel operation and 2.5 kilometers from the receive site for adjacent channel operation.

(iii) White space devices operating with more than 10 watts EIRP may not operate within 16.6 kilometers from the receive site for co-channel operation and 3.5 kilometers from the receive site for adjacent channel operation.

(iv) For purposes of this section, a TV station being received may include a full power TV station, TV translator station or low power TV/Class A TV station.

(c) * * *

(2) * * *

(ii) White space devices operating with more than 4 watts EIRP and up to 10 watts EIRP may not operate within 10.2 km from the receive site for co-channel operation and 2.5 km from the receive site for adjacent channel operation.

(iii) White space devices operating with more than 10 watts EIRP may not operate within 16.6 kilometers from the receive site for co-channel operation and 3.5 kilometers from the receive site for adjacent channel operation.

(d) *PLMRS/CMRS operations.* (1) White space devices may not operate at distances less than those specified in the table below from the coordinates of the metropolitan areas and on the channels listed in § 90.303(a) of this chapter.

TABLE 6 TO SECTION 15.712(d)(1)

White space device transmitter power	Required separation in kilometers from areas specified in § 90.303(a) of this chapter	
	Co-channel operation	Adjacent channel operation
4 watts EIRP or less	134	131
Greater than 4 watts and less than 10 watts EIRP	136	131.5

TABLE 6 TO SECTION 15.712(d)(1)—Continued

White space device transmitter power	Required separation in kilometers from areas specified in § 90.303(a) of this chapter	
	Co-channel operation	Adjacent channel operation
Greater than 10 watts EIRP	139.2	132.2

(2) White space devices may not operate at distances less than those specified in the table below from PLMRS/CMRS operations authorized by waiver outside of the metropolitan areas listed in § 90.303(a) of this chapter.

TABLE 7 TO SECTION 15.712(d)(2)

White space device transmitter power	Required separation in kilometers from areas specified in § 90.303(a) of this chapter	
	Co-channel operation	Adjacent channel operation
4 watts EIRP or less	54	51
Greater than 4 watts and less than 10 watts EIRP	56	51.5
Greater than 10 watts EIRP	59.2	52.2

* * * * *

(f) *Low power auxiliary services, including wireless microphones.* White space devices are not permitted to operate within the following distances of the coordinates of registered low power auxiliary station sites on the registered channels during the designated times they are used by low power auxiliary stations.

(1) Fixed white space devices with 10 watts EIRP or less: 1 kilometer

(2) Fixed white space devices with greater than 10 watts EIRP: 1.3 kilometers

(3) Personal/portable white space devices: 400 meters

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(i) * * *

(1) Fixed white space devices may only operate above 4 W EIRP in less congested areas as defined in § 15.703.

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