FEDERAL COMMUNICATIONS COMMISSION

47 CFR Parts 1, 2, 15, 24, 25, 27, 73, 90, 95, 97, and 101

[ET Docket Nos. 03–137 and 13–84; FCC 13–39]

Reassessment of Exposure to Radiofrequency Electromagnetic Fields Limits and Policies

AGENCY: Federal Communications Commission.

ACTION: Proposed rule.

SUMMARY: This document seeks comment on proposals developed in the course of the Federal Communications Commission's (Commission's) proceeding regarding compliance with our guidelines for human exposure to RF electromagnetic fields. The Commission's further proposals reflect an effort to provide more efficient, practical, and consistent application of evaluation procedures to ensure compliance with its guidelines limiting human exposure to RF energy from Commission-regulated transmitters and devices. In addition the Commission has initiated a *Notice of Inquiry* (*NOI*) in a new proceeding to determine whether there is a need for reassessment of the Commission radiofrequency (RF) exposure limits and policies. The NOI acknowledges the research that has occurred in recent years and the changing nature of RF devices and their uses, and focuses on the propriety of the Commission's existing standards and policies, including its fundamental exposure guidelines and aspects of its equipment authorization process and policies as they relate to RF exposure in light of these changes since its rules were adopted.

DATES: Comments must be filed on or before September 3, 2013, and reply comments must be filed on or before November 1, 2013.

FOR FURTHER INFORMATION CONTACT: Ed Mantiply, email: *ed.mantiply@fcc.gov*; Martin Doczkat, email: *martin.doczkat@fcc.gov*; the Commission's RF Safety Program, *rfsafety@fcc.gov;* or call the Office of Engineering and Technology at (202) 418–2470.

SUPPLEMENTARY INFORMATION: This is a summary of the Commission's Further Notice of Proposed Rulemaking, ET Docket No. 03–137, and Notice of Inquiry, ET Docket No. 13–84, FCC 13–39, adopted March 27, 2012 and released March 29, 2012. 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 complete text of this document also may be purchased from the Commission's copy contractor, Best Copy and Printing, Inc., 445 12th Street, SW., Room, CY–B402, Washington, DC 20554. The full text may also be downloaded at: *www.fcc.gov.* 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).

Summary of Further Notice of Proposed Rulemaking and Notice of Inquiry

1. The *Further Notice of Proposed Rulemaking* (*Further NPRM*) focuses on specific proposals to the Commission's RF safety rules not acted upon in the *Report and Order* (*Order*) in this proceeding, that have either been raised or have evolved significantly since the *NPRM, 68 FR 52879, September 8, 2003.* In the *Further NPRM,* the Commission's intent is to appropriately protect the public without imposing an undue burden on industry, and it seeks comment on the costs and benefits related to this issue in its proposals. For each cost or benefit addressed, the Commission asks that commenters provide specific data and information such as actual or estimated dollar figures, including a description of how the data or information was calculated or obtained and any supporting documentation. Vague or unsupported assertions regarding costs or benefits generally will be less persuasive than the more specific and supported statements.

I. Notice of Proposed Rulemaking (Further NPRM)

A. Definition of Terms Related to the Commission's Further Proposals

2. With respect to the Commission's use of varied definitions for ''power'' in its RF-exposure related rules, it is proposing explicit and consistent power definitions appropriate for the conditions of use and underlying exposure limits. The Commission clarifies for the purposes of its proposals here the definitions that it will use consistently throughout this *Further NPRM.* The ''maximum time-averaged ERP'' for a fixed RF source is the product of the maximum delivered power to the antenna and its maximum gain as averaged over any 30 minute time period; the ''available maximum time-averaged power'' is the maximum available power as averaged over any 30 minute time period; and the ''delivered maximum time-averaged power'' is the net maximum delivered or supplied power as averaged over any 30 minute time period.

3. The Commission is also proposing a modification to the terminology it uses in the context of providing for ''exclusions'' from routine evaluation. Section 1.1306 of the Commission's NEPA procedures, 47 CFR 1.1306, establishes a categorical ''exclusion'' for actions not specifically defined by § 1.1307(a) or (b), or determined by the processing bureau under § 1.1307(c) or (d), to have a potentially significant environmental impact that requires the applicant or license to prepare an EA. The Commission is proposing a change in the language used in its rules, so that an ''exemption'' will refer to an exemption from performing a routine RF evaluation, while the term ''exclusion'' will continue to be used in the context of an exclusion from preparation of any EA or other additional environmental document.

B. Exemption: Power and Distance Criteria to Streamline Determination of Compliance

4. The Commission proposes here to adopt general exemption criteria applying to single RF sources and then further generalized to multiple RF sources in § 1.1307(b) of its proposed revised rules, based on power, distance, and frequency, for all services using fixed, mobile, and portable transmitters, including implants. These exemption thresholds proposed in the *Further NPRM* are based on the general population exposure limits.

5. In the event that RF sources in fact cause human exposure to levels of RF radiation in excess of the Commission's limits, a routine RF evaluation or exemption from such an evaluation would not be sufficient to show that there is no significant effect on the quality of the human environment or that the RF sources are categorically excluded from environmental processing. Further, RF sources are subject to review under §§ 1.1307(c) and 1.1307(d) of the rules regardless of whether those RF sources have either been determined to be exempt from routine RF evaluation or have been satisfactorily evaluated for compliance.

1. Blanket 1 mW Exemption

6. The Commission proposes in§ 1.1307(b)(1) of its proposed revised rules an exemption from routine environmental evaluation for a single transmitter operating with up to one milliwatt available maximum time-

averaged power, independent of frequency and service type. The Commission seeks comment specifically on whether the 1-mW exemption threshold will be useful in streamlining approval of very-low-power implanted and body-mounted medical devices that operate intermittently and with a low transmitter duty cycle.

7. The Commission conservatively proposes two centimeters as a required separation distance between any portion of a blanket exempt radiating structure and the nearest portion of any other radiating structure in order to qualify for the 1-mW blanket exemption. Conversely, for the case of multiple transmitters having antennas within two centimeters of each other, the Commission proposes that the power from all such transmitters be added together, treated conservatively as a single transmitting antenna, and compared with the blanket 1-mW exemption. The Commission seeks comment on whether additive multiple transmitters operating at 1 mW at least two centimeters apart could under normal operating conditions exceed the exposure limits; on whether addition of a blanket exempt transmitter could cause its exposure limits to be exceeded when other compliant transmitters are present, exempt or not; and on whether the blanket exemption as proposed may not be adequate to prevent exposure over its limits, for example, in a situation involving multiple high-gain millimeter-wave radiators.

2. MPE-Based Exemption of Fixed, Mobile, and Portable RF Sources

8. Instead of defining an invariant power threshold beyond a certain distance, the Commission proposes herein to establish varying exemption criteria based on MPE limits for fixed, mobile, and portable RF sources so long as the separation distance for the operating frequency is beyond the distance where the reactive near-field dominates (*i.e.,* at distances beyond $\lambda/2\pi$, where λ is the free-space operating wavelength).

a. Single Transmitters

9. Rather than identifying power, distance, and frequency criteria by service, as has been done in the past, the Commission is proposing a revised table in § 1.1307(b)(1)(i) of its rules for single fixed, mobile, and portable antennas that specifies power and distance criteria for each of the five frequency bands used for the MPE limits, that would apply regardless of service category. The Commission proposes to apply these criteria to single fixed, mobile, and portable RF sources at separation distances from any part of the radiating structure of at least $\lambda/2\pi$ in all service categories and to use them to determine whether routine evaluation is necessary. The proposed thresholds in Table 1 in the proposed § 1.1307(b)(1)(i) are based on the general population maximum permissible exposure (MPE) limits with a single perfect reflection, outside of the reactive near-field, and in the main beam of the radiator, to be compared with the maximum time-averaged ERP.

10. In the context of the proposed Table 1, the Commission proposes to define ERP, as the product of the maximum time-averaged power delivered to the antenna and its maximum gain in any direction relative to a half-wave dipole. The maximum gain is the largest far-field total power gain relative to a dipole in any direction for all transverse polarization components. The maximum time-averaged power delivered to the antenna is averaged over any 30 minute time period for fixed sources and is averaged over a period inherent to the device transmission characteristics for mobile and portable sources. The term ''separation distance'' in Table 1 is defined as the minimum distance in any direction, from any part of the radiating structure of a transmitting antenna or antenna array, to the body of a nearby person. For these exemptions to apply, the Commission proposes that separation distance shall be required to be maintained for all persons, including those occupationally exposed, during operation at the ERP used for comparison to the applicable formula in the table above. Table 1 would strictly apply only to single transmitters.

11. With respect to the Commission's initial proposal in the *NPRM* to exempt low-power single fixed transmitters, it now proposes to delete the existing mobile power exemptions in § 2.1091(c) and apply the new proposed general fixed transmitter power exemptions to mobile and portable devices as well.

12. The Commission proposes to delete the special exemptions from evaluation in the Amateur Radio Service in § 97.13(c) of its rules, to avoid specific exemptions for particular services and maintain consistency. Application of the general exemptions proposed here to amateur radio installations would preclude the possibility of overexposure and require further evaluation only when necessary, giving guidance for both fixed and mobile transmitting antennas. Parties that support maintaining the current exemption based on power alone are requested to explain how it provides adequate assurance that the public is protected against exposure to RF energy in excess of the Commission's limits and the extent of the burden imposed by this proposal.

b. Multiple Fixed Transmitters

13. To quantitatively exempt multiple transmitting antenna configurations and transmitters where ambient exposure determined from a previous evaluation (measured or computed) may be significant, the Commission proposes to apply Table 1 in § 1.1307(b)(1)(i) of its proposed rules to multiple antennas operating in the same 30-minute time averaging period as follows: a summation of the fractional contributions to the exemption threshold for each antenna may be determined by calculating the ratio of the maximum time-averaged ERP for the antenna to the appropriate frequency- and distance-dependent exemption threshold calculated using either the formulas in Table 1 of the proposed § 1.1307(b)(1)(i) or the formulas in the proposed § 1.1307(b)(1)(ii) in the *Further NPRM,* summing these ratios, and adding any contributions from RF sources with known SAR as well as any significant ambient exposure (expressed as the ''ambient exposure quotient,'' (AEQ), *i.e.,* a fraction of the MPE that exists in the environment prior to considering the relevant sources) at a specific location, as defined below. An AEQ greater than 0.05 is considered significant. If the total is 1 or more, further evaluation would be required. In addition to ERP, if the configuration of a fixed RF source operating between 300 MHz and 6 GHz in frequency permits a minimum separation distance between 0.5 cm and 40 cm or less than $\lambda/2\pi$, the Commission also proposes alternatively to the MPE-based exemption criteria that the SAR-based exemption criteria may be used.

c. Summation for RF Sources Without Definable Physical Relationships Is Not Required

14. While it is reasonable to sum exposure due to all well-characterized sources, the Commission sees no practical method to quantitatively determine compliance for multiple RF sources that have no fixed physical relationship to one another. Examples where a physical relationship would not be well defined are between a fixed wireless base station and a mobile or portable device, or between two mobile or portable devices, but not between multiple transmitters within the same device or between some classes of dependent devices (such as USB dongles). For multiple exempt RF sources without an inherent spatial

relationship, it is not likely that the localized or whole-body SAR limits would be exceeded. The Commission therefore proposes to not require exemption summations where there is no inherent spatial relationship between RF sources. However, the Commission emphasizes that it will continue to routinely consider summation of multiple mobile and portable transmitters (including modular transmitters that may be installed) for the purpose of evaluation and/or FCC Laboratory test reduction procedures as long as these transmitters are within a single device and a clear spatial relationship among multiple transmitters within this single device is apparent. Notwithstanding this policy, the Commission emphasizes § 1.1307(c) and (d) of the Commission rules would require further environmental processing if the staff determined, on its own or based upon the allegations of an interested party in a written petition, that the particular use of a device(s) ordinarily exempt from routine RF evaluation exceed(s) the applicable exposure limits.

3. SAR-Based Exemption of Fixed, Mobile, and Portable RF Sources

15. Here the Commission proposes to establish additional exemption criteria for various transmitter configurations based primarily on SAR limits for fixed, mobile, and portable RF sources near a human body, when the separation distance may be less than $\lambda/2\pi$. These proposed additional exemption criteria are applicable between 300 MHz and 6 GHz in frequency and between 0.5 cm and 40 cm in separation distance.

a. Single Transmitters

16. The Commission recognizes that there are other important variables besides frequency, distance, and power that affect SAR; these variables include antenna type and impedance (and its relationship to RF current) and must be treated conservatively in order to define thresholds that will avoid exemption of devices with unusual antenna configurations that could result in a SAR above the limit. To qualify for this proposed exemption, the Commission would require both the ERP and matched or available conducted power to be less than the threshold to avoid problems with high gain or poorly matched antennas. The Commission proposes general frequency and separation distance dependent maximum time-averaged power thresholds for any RF source (*i.e.,* portable, mobile, and fixed) in § 1.1307(b)(1)(ii) of its rules to support an exemption from SAR testing between 300 MHz and 6 GHz in frequency and between 0.5 cm and 20 cm in separation distance. Additionally, in this same frequency range, the Commission proposes to extend the values obtained at exactly 20 cm from that distance to 40 cm for mobile devices so that the thresholds will be continuous with the exemption criteria in Table 1 in § 1.1307(b)(1)(i) of the proposed rules at 40 cm.

17. The proposed formulas in the proposed § 1.1307(b)(1)(ii) define the proposed SAR-based exemption thresholds in general for either available maximum time-averaged power or maximum time-averaged ERP, whichever is greater. If the ERP of a portable device is not easily obtained, the Commission proposes that available power may be used (*i.e.,* without consideration of ERP) for comparison with the proposed criteria below only if the device antenna(s) or radiating structure(s) do not exceed an electrical length of $\lambda/4$. As for devices such as ''leaky'' coaxial distribution systems, RF heating equipment, and devices in general where the gain is not well defined but always less than that of a half-wave dipole, the Commission proposes that the RF power generated by the device may be used in place of the ERP.

18. The proposed exemption threshold, P_{th}, is defined in accordance with the source-based time averaging requirements described in § 2.1093(d)(5). Time-averaged power measurements are necessary to determine if the maximum output of a transmitter is above or below the proposed threshold for exemption or routine SAR evaluation. The power measurement and SAR test procedures required to determine the number and types of SAR tests necessary to demonstrate device compliance will be available in procedures established by the OET Laboratory at *www.fcc.gov/oet/ea.*

b. Multiple Portable Transmitters

19. To determine whether a device with multiple transmitters is exempt, the Commission proposes that the individual contributions from each transmitter in the device be summed, and if the sum is less than 100% of the exemption threshhold then the device would be exempt. See the proposed revised rule §§ 2.1093(c)(1), 2.1093(c)(2), and 1.1307(b)(1)(v) for the proposed exemption summation formulas. The ratios proposed to determine these individual contributions are defined by dividing the maximum time-averaged power (either available power or ERP, whichever is greater) for each transmitter by the appropriate frequency- and distance-dependent threshold calculated using the formulas in the proposed § 1.1307(b)(1)(ii). If the ratios for all transmitters operating in the same time averaging period are included in the sum and the sum is less than one (*i.e.,* 100%), the device (*i.e.,* all transmitters within the device) is proposed to be exempt from routine evaluation.

20. For the case where one or more transmitters are being added to a device containing existing transmitters that already required SAR evaluation, the Commission is proposing that the remaining SAR margin be used to potentially exempt the additional transmitter(s). If the sum of the previously measured maximum 1-gram average SAR for the existing transmitters is less than 1.6 W/kg and the sum of the above defined ratios for the transmitters to be added is less than the ratio of the SAR margin to 1.6 W/kg, then the additional transmitters are proposed to be exempt from further SAR evaluation. The Commission also proposes that, in order to use exemption criteria for multiple transmitters, each additional transmitter being added to a device must also be exempt from evaluation for this to apply to avoid small incremental contributions that might approach the exposure limit.

21. Conventionally, the use of maximum time-averaged power requires that the power (and SAR) of multiple transmitters operating in the same time averaging period be summed even if they do not transmit at the same instant. For the purpose of implementing exemption thresholds of products that can operate with multiple transmitters, the proposed formula below must take into consideration all transmitters that can operate at the same time and transmit with or without overlapping transmissions to determine if evaluation exemption applies. The proposed values for P_i and SAR_j are determined according to the source-based time averaging requirements of § 2.1093(d)(5), and summing these values represents conservatively the maximum calculated exposure. As the extent of overlapping transmissions may vary among individual products and host configurations, the details of how to conduct evaluations and determine compliance are generally addressed in FCC Laboratory test procedures.

22. The proposed summation scheme for multiple transmitters makes the conservative assumption that antennas that are at the same body-to-antenna or radial distance are also at the same location. The Commission seeks

comment on this proposal. For some specific types of equipment where certain FCC Laboratory procedures apply, consideration of lateral separation has already been implemented in these procedures to streamline evaluation requirements, and this will continue. However, since the necessary lateral antenna-to-antenna or SAR peak location separation distance to avoid significant SAR overlap is a complex function of the radial antenna-to-body distance and antenna characteristics, the Commission is proposing not to allow a general exemption from routine evaluation based on lateral distance at this time. The Commission encourages further development and implementation of more efficient evaluation procedures in this area by the Laboratory and others.

c. Multiple Portable and Mobile Transmitters

23. A device may contain a combination of portable and mobile transmitters, that is, some at less than 20 cm and some at greater than 20 cm separation distances from the body, respectively. Other devices may contain either only mobile or only portable transmitters. In any case, the fractional contributions to the threshold can be determined according to this proposal by calculating for each transmitter the ratio of the maximum time-averaged power (matched conducted power and/or ERP, as appropriate) for the transmitter and comparing to the appropriate frequency- and distance-dependent threshold using the equations in Table 1 of the proposed § 1.1307(b)(1)(i) and the formulas in the proposed § 1.1307(b)(1)(ii) and then summing those ratios. If the ratios for all transmitters in a device operating in the same time averaging period are included in the sum and the sum is less than one, the device (*i.e.* all transmitters within the device) is proposed to be exempt from routine evaluation. The Commission proposes that all transmitters must be included in the summation of multiple transmitters in a device, including those that may be added subsequently under its permissive change authorization procedures.

24. For devices that have already been evaluated for compliance based on SAR, if one or more portable transmitters are being added, the additional transmitters are proposed to be exempt from further evaluation if all of the following conditions apply: (1) The summation of the ratios of either the available maximum time-averaged power or the ERP, whichever is greater, for the portable transmitters to be added and existing portable transmitters that do not require SAR evaluation to the threshold powers according to the formulas in the proposed § 1.1307(b)(1)(ii); (2) the ratio of the summation of previously measured maximum 1-gram average SAR for the existing portable transmitters to 1.6 W/kg; and (3) the summation of the ratios of the maximum time-averaged ERP for mobile transmitters to the exemption thresholds according to either the formulas in the proposed § 1.1307(b)(1)(ii) or Table 1of the proposed § 1.1307(b)(1)(i), as applicable—all sum to less than one.

25. The values for P_i, SAR_j, and ERP_k, where applicable, are proposed to be determined according to the source-based time averaging requirements of §§ 2.1093(d)(5) and 2.1091(d)(2), and the sum of those values represents conservatively the total calculated exposure. The proposed formula may be used even if some of the three terms do not apply (*i.e.,* where those terms would be zero). As the extent of overlapping transmissions may vary among individual products and host configurations, FCC Laboratory test procedures may address the details of how to conduct evaluations and determine compliance for specific types of devices.

26. The ambient exposure quotient (AEQ) proposed to be applicable in the summation of multiple fixed sources is not proposed to be applicable in the summation of multiple mobile and portable sources, because AEQ could vary significantly depending on the spatial location of the device and is thus indeterminate.

d. Portable Transmitters With Operating Frequencies Above Six Gigahertz or at Distances Greater Than $\lambda/2\pi$

27. The Commission proposes that above 6 GHz, the more conservative exemptions using the equations proposed in Table 1 of § 1.1307(b)(1)(i) must be used for portable devices if the separation distance is greater than $\lambda/2\pi$, again using only the third term involving ERP in the formula above. In general, the Commission proposes that any RF source operating above 6 GHz may use only the blanket 1 mW exemption and the MPE-based exemption in Table 1.

B. Evaluation of Portable Devices

28. The Commission proposes to remove material from the rules, as specifically described, that is more properly addressed by its guidance on evaluation procedures by measurement and computation. This guidance would continue to be updated as necessary in the Commission's Bulletins and in other supplemental materials such as the KDB.

1. Consistency in Usage of Any Valid Method for SAR Computation

29. The Commission is proposing to modify the language in §§ 1.1307(b)(2) and 95.1221 to allow any valid computational method by removing from its rules specific references to FDTD.

2. Removal of Minimum Evaluation Distance Requirement From Rules for Frequencies Above Six Gigahertz

30. There is no apparent reason why measurement or calculation to demonstrate compliance with MPE field strength or power density limits could not be achieved at distances of less than five centimeters as stated in § 2.1093(d) of the Commission's rules, provided, of course, that proper equipment and techniques are used. The 5-cm minimum distance appears to be no longer appropriate, and the Commission therefore proposes to remove it and document it in the Commission's Bulletins or other supplemental materials.

3. Technical Evaluation References in Rules

31. The Commission proposes to eliminate references in its rules to outside documents or specific editions of OET Bulletins and supplements when offering guidance on acceptable procedures for evaluating compliance. Thus, the Commission specifically proposes to remove the reference to IEEE Std C95.3–1991 in § 24.51(c). However, the Commission also notes and seeks comment on the potential implication of this overarching general proposal as it may affect cross-references by other federal agencies that may utilize its existing guidance that it is proposing to discontinue. Specifically, the Commission notes Federal Railroad Administration, Department of Transportation, 49 CFR part 236, Appendix E, section (h)(2).

C. Mitigation

32. Post-evaluation procedures to ensure that the Commission's exposure limits are not exceeded include labels, signs, barriers, occupational training, and enforcement. Here the Commission reviews in detail its definitions related to power and clarify issues related to exposure classification and time averaging. Additionally, the Commission proposes to provide further guidance on specific mitigation actions such as proximity restriction and disclosure requirements for fixed RF

sources. We proposed to define fixed RF sources in our proposed revised rules as transmitters which are physically attached to one location, sometimes temporarily, and are not able to be easily moved to another location while transmitting.

1. Transient Exposure in Controlled Environments Near Fixed RF Sources

33. The Commission seeks to clarify the applicability of transient exposure and how to apply its exposure limits in controlled environments with respect to averaging time near fixed transmitter sites in a controlled environment, and proposes a clarification of averaging time.

34. The Commission interprets the terms ''transient'' and ''brief'' in the context of human exposure to RF energy to imply that the general population exposure limits would apply to transient individuals near fixed RF sources within controlled environments, considering a time-averaging period of 30 minutes. In a controlled environment and with supervision, ''behavior-based'' time averaging such as moving through a specific area promptly would be feasible, while the Commission has not found it to be generally feasible in an uncontrolled environment. Thus, the Commission proposes the definition of transient exposure with respect to averaging time to mean general population/''controlled,'' that is, transient exposure should not exceed the general population limit considering 30-minute time averaging in a controlled environment. Additionally, the Commission proposes that transient exposure should not exceed the continuous occupational limit at any time, accounting for source-based time averaging. In other words, the Commission proposes that behavior-based time averaging may be used in controlled situations to maintain compliance with the general population exposure limits (this is the essence of the Commission's transient exposure interpretation), while behavior-based time averaging may not be used to maintain compliance with the occupational exposure limits for individuals classified as transient.

35. The Commission clarifies herein that transient individuals in a controlled area may be any individual who would normally be subject to the general population exposure limits in uncontrolled environments, including occupational personnel that have not received training. In the context of satisfying the requirement to present written and/or verbal information to transient individuals and occupational personnel within controlled environments, the Commission also clarifies here that written information may include signs, maps, or diagrams showing where exposure limits are exceeded, and verbal information may include prerecorded messages. Averaging time is an intrinsic part of the existing exposure limits, and as such, the Commission's intent is that averaging time may be used whenever there is adequate control over time of exposure. As the Commission has proposed here for transient exposure, where the general population limit is exceeded (but not the occupational limit) and adequate controls are in place, averaging time may be used to comply with the general population limit. The Commission seeks comment on all of these proposals to better define transient exposure conditions beyond what has already been adopted. Specifically, the Commission solicits comment on the expected cost associated with requiring supervision of transient individuals, where licensees would benefit from compliance certainty.

2. Proximity Restriction and Disclosure Requirements for Fixed RF Sources

36. The Commission proposes training, access restriction, and signage requirements for fixed transmitter sites considering recent standards activity working toward defining industrial RF safety programs. In particular, the Commission uses, in part, a combination of certain concepts, programs, specifications, and actions contained in IEEE Std C95.7–2005, IEEE Std C95.2–1999, NCRP 2002 Letter Report, and Chapter 2.4 of the NAB Engineering Handbook, in the derivation of these proposed rules. The Commission realizes that rigid requirements may not be practical in all cases, but clear rules that can be followed where feasible can help avoid both inadvertent over-exposure and unnecessary public concern. The Commission notes that fixed radio transmitters are no longer located only on towers or facilities such as utility poles. Radio transmitters and their antennas have been deployed in a wide variety of forms, often designed as trees, chimneys, or panels on a building for aesthetic reasons, and their presence therefore might not be obvious. The Commission realizes that each transmitter site is different and that a wide range of exposure environments may exist, and so it seeks comment on how to simultaneously provide flexibility and certainty to licensees and site owners while at the same time ensuring enforceable compliance with the exposure limits.

37. Relating terminology of Commission exposure limits to IEEE Std C95.7–2005 for the purpose of this discussion, the general term ''action level'' used in the IEEE standard should be considered equivalent to the Commission exposure limit for the general population in an uncontrolled environment; similarly, the general term ''exposure limit'' used by the IEEE should be considered equivalent to the Commission exposure limit for occupational personnel in a controlled environment. The Commission emphasizes that the general population exposure limit is a legal limit enforced by the Commission and should not be considered as merely action guidance, nor does this proposal suggest any different exposure limit than those currently in effect. The proposed mitigation actions in this section are meant to supplement the exposure limits themselves by facilitating compliance with them.

38. The Commission proposes to unambiguously define boundaries between each category based on the maximum time-averaged power over the appropriate time averaging period (six minutes for occupational or 30 minutes for general population).

39. The Commission seeks comment on how potential equipment failures or non-routine or auxiliary operation that may cause exposure over the exposure limits should be considered in the determination of these categories. The Commission also proposes and seeks comment on the feasibility of requiring positive access control for Category Two and the advisability of continuing the ''remote'' designation. The question becomes one of determining whether an area can be considered ''remote.'' Evidence of public access, such as litter and trails, has been used by the Commission in past inspections to show that an area is not ''remote.'' The Commission further seeks comment on how to better encourage cooperation between property owners, managers, and licensees in the implementation of RF safety programs, since it is ultimately the licensee that is responsible for compliance.

40. The Commission maintains that accurate placement of appropriate signage is important and that such placement should make clear both where limits are exceeded and where limits are not exceeded. The Commission has observed inappropriate postings that imply that occupational limits are exceeded far outside areas that approach the general population limit. Such ''over-signage'' may result in undue alarm, confusion, and subsequent disregard of meaningful postings. Since

each situation is different, the Commission proposes that those responsible for the placement of signs consider the potential implications of over-signage, and it will consider compliance with these proposed rules on a case-by-case basis. Unnecessary public concern may also arise from placement of a sign with an inappropriate signal word. For example, placement of a sign that says ''DANGER'' or ''WARNING'' in a location where RF fields may only approach the general population exposure limit might raise unnecessary alarm despite compliance in the area, since the words ''danger'' and ''warning'' imply conditions leading to imminent or likely physical harm.

41. Regarding training and verbal information, the Commission proposes to consider the topics outlined in Annex A of IEEE Std C95.7–2005 as guidance to be referenced in a future revision of OET Bulletin 65. The Commission proposes that training is optional only for transient individuals who must be supervised, and training would be required for all other controlled situations in Category Two and higher categories. Training may include effective web-based or similar programs. The Commission proposes that either spoken word or pre-recorded audio from an authorized individual qualified to provide such instructions on how to remain compliant would be acceptable as forms of verbal information.

42. The Commission has used the environmental categories and guidance provided in IEEE Std C95.7–2005 to develop the following specific proposals that the categories below require the specified control actions:

• Category One—INFORMATION (Below General Population Exposure Limit):

No signs or positive access controls are proposed to be required; optionally a green ''INFORMATION'' sign may offer information to the public that a transmitting source of RF energy is nearby but that it is compliant with Commission exposure limits regardless of duration or usage. Labels or signs would not be required for fixed transmitters that can determine that the transmitter is ''intrinsically compliant'' with the general population exposure limit.

• Category Two—NOTICE (Exceeds General Population Exposure Limit but Less Than the Occupational Exposure Limit):

Signs and positive access control are proposed to be required surrounding the areas in which the general population exposure limit is exceeded, with the appropriate signal word ''NOTICE'' and associated color (blue) on the sign. Signs must contain the content described below. However, the Commission proposes to allow under certain controlled conditions, such as on a rooftop with limited access (*e.g.,* a locked door with appropriate signage), ''[a] label or small sign attached directly to the surface of an antenna . . . if it specifies a minimum approach distance,'' to be sufficient signage. Allowing a label or sign to be affixed to an antenna is consistent with the Commission's policy for certain low-power fixed transmitters operating with a minimum separation distance more than 20 centimeters from the body of persons under normal operating conditions and with its labeling requirements for fixed consumer subscriber antennas. Of course, a label affixed to an antenna would be considered sufficient only if it is legible at least at the separation distance required for compliance with the general population exposure limit in § 1.1310 of the rules. The Commission proposes appropriate training to be required for any occupational personnel with access to the controlled area where the general population exposure limit is exceeded, and transient individuals to be supervised by occupational personnel with appropriate training upon entering any of these areas. Use of time averaging would be required for transient individuals in the area in which the general population exposure limit is exceeded to ensure compliance with the time-averaged general population limit. Use of personal RF monitors in the areas in which the general population exposure limit is exceeded would be recommended but not required.

• Category Three—CAUTION (Exceeds Occupational Exposure Limit but by No More Than Ten Times):

In addition to the mitigation actions required within those areas designated as Category Two, additional signs (with the appropriate signal word ''CAUTION'' and associated color (yellow) on the signs), controls, or indicators (*e.g.,* chains, railings, contrasting paint, diagrams) are proposed to be required surrounding the area in which the exposure limit for occupational personnel in a controlled environment is exceeded. A label or small sign may be attached directly to the surface of an antenna within a controlled environment if it specifies a minimum approach distance where the occupational exposure limit is exceeded. The Commission proposes that transient individuals would not be permitted in any area in which the occupational exposure limit is exceeded. Additionally, appropriate training would be required for any occupational personnel with access to the controlled area where the general population exposure limit is exceeded. Use of personal RF monitors in the areas in which the general population exposure limit is exceeded is recommended but not proposed to be required. Use of personal protective gear (such as properly-worn RF protective suits) is recommended for occupational individuals in the areas in which the occupational exposure limit is exceeded.

• Category Four—WARNING/DANGER (Exceeds Ten Times Occupational Exposure Limit or Serious Contact Injury Possible):

In addition to the mitigation actions required within those areas designated as Category Three, ''WARNING'' signs with the associated color (orange) are proposed to be required where the occupational limit could be exceeded by a factor of ten, and ''DANGER'' signs with the associated color (red) are proposed to be required where immediate and serious injury will occur. For example, ''DANGER'' signs would be required at the base of AM broadcast towers, where serious injuries due to contact burns may occur. If power reduction would not sufficiently protect against the relevant exposure limit in the event of human presence considering the optional additional use of personal protective equipment, lockout/tagout procedures must be followed to ensure human safety.

43. The Commission also proposes to require the following in the content of the sign, adapted from § 2.4 of the National Association of Broadcasters Engineering Handbook, 10th Edition. Specifically, RF exposure advisory signs are proposed to include at least the following components:

• Appropriate signal word and associated color in accord with IEEE Std C95.2–1999 (*e.g.,* ''DANGER,'' ''WARNING,'' ''CAUTION,'' or ''NOTICE'')

• RF energy advisory symbol (Figure A.3 of C95.2–1999)

• An explanation of the RF source (*e.g.,* transmitting antennas)

• Behavior necessary to comply with the exposure limits (*e.g.,* do not climb tower while antennas are energized)

• Contact information (*e.g.,* phone number or email address resulting in a timely response)

44. For the optional information sign discussed in Category One, the Commission recommends that it include at least the following information:

- Appropriate signal word (*e.g.,* ''INFORMATION'') and associated color (green)
- An explanation of safety precaution
- Contact information
- Reminder to obey all postings and boundaries (if higher categories are nearby)

45. Note that the inclusion of the RF energy advisory symbol and directions on how to avoid a potential hazard are excluded from these recommendations on the optional ''INFORMATION'' sign, since inclusion of these aspects on a sign where the general public exposure limit is not exceeded may cause confusion or unnecessary public alarm. If, for example, a member of the general public proceeds past an information sign and continues toward a source of RF energy, only at the point where that individual approaches the general population exposure limit should there be information on how to remain in areas where RF field levels are less than the public limit. Once this individual approaches the boundary where the general population exposure limit is exceeded, then the ''NOTICE'' sign would explain how to avoid exceeding the limits and positive access control would keep the individual from doing so. The Commission proposes that the use of language(s) other than English on an ''INFORMATION'' sign would be particularly advisable since the information sign would not include the universal RF energy symbol.

D. Review and Update All RF Safety Text in Parts 1 and 2 for Clarity and Consistency

46. The Commission takes this opportunity to propose a careful rewording of some of its rules in §§ 1.1307(b), 1.1310, 2.1091, and 2.1093 as necessary to ensure clarity and consistency, as described in its proposed rules. Changes to specific sections of parts 15, 24, 25, 27, 73, 90, 95, 97, and 101 are necessarily dependent on the Commission's proposed changes in parts 1 and 2.

II. Notice of Inquiry (NOI)

47. The first Commission's *Notice of Inquiry* (*1979 NOI*) on the subject of biological effects of radiofrequency radiation occurred in 1979 in response to the need for the Commission to implement the National Environmental Policy Act (NEPA) of 1969. The most recent proceeding inviting comment on exposure limits was initiated in 1993 and culminated in a Report and Order in 1996, which resulted in the Commission's present limits. The instant rulemaking that is underway, initiated with the 2003 *NPRM,* 68 FR 52879, September 8, 2003, specifically excludes consideration of the exposure limits themselves. The Commission continues to have confidence in the current exposure limits, and notes that more recent international standards have a similar basis. At the same time, given the fact that much time has passed since the Commission last sought comment on exposure limits, as a matter of good government, the Commission wishes to develop a current record by opening a new docket with this *Notice of Inquiry* (*NOI*), and seeks comment on whether its limits should be more restrictive, less restrictive, or remain the same.

48. The Commission recognizes the ubiquity of device adoption as well as advancements in technology and developments in the international standards arena since establishing the Commission's present policies in 1996 warrant an inquiry to gather information to determine whether its general regulations and policies limiting human exposure to radiofrequency (RF) radiation are still appropriately drawn. In considering whether there is a need for changes to its RF exposure limit rules, the Commission's intent is to adequately protect the public without imposing an undue burden on industry. While acknowledging the potential difficulty of quantifying benefits and burdens in considering the overall costs of the regulation, the Commission needs to be mindful of its fundamental responsibility to provide for the appropriate protection of consumers, workers, and other members of the public. The Commission therefore requests comment on a wide range of questions that will enable it to weigh those costs and benefits. The Commission also requests comment on the most cost-effective approach for modifying existing exposure limit policies and practices, if such modifications are needed, to achieve its goals. For each cost or benefit addressed, the Commission asks that commenters provide specific data and information such as actual or estimated dollar figures, including a description of how the data or information was calculated or obtained and any supporting documentation. Vague or unsupported assertions regarding costs or benefits generally will receive less weight and be less persuasive than more specific and supported statements.

50. Although the Commission is aware of recent scientific and technical standard publications, it is important to gather additional pertinent information and authoritative expert views to ensure the Commission is meeting its regulatory responsibilities. Continued use of the Commission's present exposure limits is currently supported by statements from significant qualified expert organizations and governmental entities. Some critics of the Commission's exposure limits have contrasting opinions, and it is aware of the general concerns raised some members of the public. The purpose of this NOI is to open a science-based examination of the efficacy, currency, and adequacy of the Commission's exposure limits for RF electromagnetic fields. The Commission underscores that in conducting this review it will work closely with and rely heavily—but not exclusively—on the guidance of other federal agencies with expertise in the health field. This approach will ensure that the Commission will have fully discharged its regulatory responsibility and also will be appropriately responsive to the public's interest in knowing that its RF exposure guidelines are based on the most current information, analysis, and expertise available.

51. As already noted, the Commission is guided by the expertise of federal safety, health, and environmental agencies and institutes that, subject to any budgetary constraints, perform regular reviews of scientific research and periodically recommend any appropriate changes to, or reaffirm the validity of, the Commission's exposure criteria. Nonetheless, the Commission is confident of its own ability to remain abreast of scientific developments and research, and to participate in standards development and implementation, as is necessary to make an independent determination as to the adequacy of its exposure limits in the absence of affirmative input from agencies with more health and safety expertise. Because the Commission does not claim expertise as a *de facto* health agency, it necessarily considers the views of federal health and safety agencies and institutes that continue to address RF exposure issues in formulating such judgments. The Commission notes that the international community has been active in this area, with the World Health Organization (WHO) initiating its electromagnetic fields (EMF) program in 1996 and continuing its broad efforts in this area. The International Commission on Non-Ionizing Radiation Protection (ICNIRP) published exposure guidelines in 1998, and the Institute of Electrical and Electronics Engineers (IEEE) published a major revision to its RF exposure standard in 2006. Although the National Council on Radiation Protection and Measurements (NCRP) has not updated its criteria since its

1986 release, NCRP did subsequently issue comments supporting it in 2002. As the Commission continues to monitor such activity and information, it seeks comment on the appropriate consideration of the evaluations of research conducted by international organizations or by activities in other countries. Moreover, the Commission seeks comment from federal agencies and institutes as to whether there may be any additional information or resources that could be provided by the Commission to support their ongoing activities.

1. Exposure Limits

52. *Introduction.* The more recent limits developed by ICNIRP (supported by WHO) and IEEE are based on the avoidance of known adverse health effects. The adjustments underlying these newer limits are primarily due to significant developments in dosimetry. Also, several other exposure variables in the more recent standards more clearly specify various evaluation requirements, such as spatial averaging, spatial peak field limits, time averaging, overlapping frequency range for heating and shock effects, *etc.* While there has been increasing public discussion about the safety of wireless devices, to date organizations with expertise in the health field, such as the FDA, have not suggested that there is a basis for changing the Commission's standards or similar standards applied in other parts of the world.

53. The Commission asks generally whether its current standards should be modified in any way, notwithstanding the detailed discussion. The Commission specifically solicits information on the scientific basis for such changes as well as the advantages and disadvantages and the associated costs of doing so. In addition to seeking input from federal health and safety agencies and institutes, the Commission solicits comment from national and international standards organizations (specifically including NCRP and IEEE) on the currency of their exposure limits and supporting documents in light of recent research and the international Agency for Research on Cancer (IARC)'s announcement on its classification of RF fields. The Commission notes that IARC's detailed monograph on this classification recently became available, to inform the Commission's consideration during the course of this proceeding, and it invites parties to comment in the Commission's record on the IARC monograph during the comment period established for this *NOI.* Although IEEE Std 1528–2003, which the Commission uses to determine the compliance of devices such as cell phones intended to be used against the head, states that the mannequin in its measurement test setup ''represents a conservative case for men, women, and children'' alike, the Commission specifically seeks comment as to whether its current limits are appropriate as they relate to device use by children.

54. *Partial-body and Whole-body averaging of exposure.* For localized SAR, both the ICNIRP and the newest IEEE standard limit exposure to 2.0 W/kg averaged over 10 grams of tissue as opposed to the Commission's existing localized SAR limit of 1.6 W/kg averaged over 1 gram. (The definitions of the 10-gram averaging volume differ slightly between ICNIRP and IEEE.) Depending on the exposure criteria used internationally, SAR would be the metric between 100 kHz and upper frequencies varying from 3 to 10 GHz (the exact upper limit depends on the particular exposure standard being applied), while power density is the metric at higher frequencies. The Commission requests comment on the significance, if any, of the differences between these standards.

55. *Averaging Area.* The NCRP criteria and Commission regulations do not specify an averaging area for power density or a spatial maximum power density limit, while both the ICNIRP guidelines and the IEEE standards specify a spatial maximum power density, at least at higher frequencies (*e.g.,* between 3 and 10 GHz) of 20 times the whole-body MPE limit, generally averaged over 1 cm^2. In addition, IEEE Std C95.1–2005 specifies frequency-dependent averaging areas for power density above 3 GHz. The Commission invites comment on whether it should change or clarify spatial averaging requirements and spatial maximum power density limits, at least at higher frequencies, either in its rules limiting human exposure to RF energy or in its non-mandatory materials. More generally, the Commission seeks comment on whole-body spatial averaging techniques, particularly as applied to children at any frequency.

56. *Averaging Time.* While different time averaging periods are defined in the various exposure standards, all use time averaging to demonstrate compliance with both SAR and MPE limits. The Commission's exposure limits are intended for continuous exposure, that is, for indefinite time periods. The limits may be applied generally without time averaging, where the limits listed (typically in tables) would then be considered continuous exposure limits. While the averaging time for the Commission's exposure limits is six minutes for occupational and 30 minutes for general population exposure, the ICNIRP guidelines specify six minutes in both cases. IEEE Std C95.1–2005 specifies six minutes for occupational and 30 minutes for general population exposure at frequencies between 3 MHz and 3 GHz. The Commission notes that C95.1–2005 is more restrictive at lower and higher frequencies (*i.e.,* shorter time averaging periods are specified above and below those frequency limits). Below 3 MHz, the Commission's MPE limits, extracted from the 1986 NCRP criteria, could allow for a higher short-term exposure for the general population than for a short-term occupational exposure of the same duration when accounting for averaging times. However, such scenarios are of limited practical importance given that such time averaging near fixed sources would not be applicable for the general population. Moreover, contact burns are the primary issue at such low frequencies and high fields, as discussed below. The Commission invites comment on whether it should modify its time averaging periods. If so, should the Commission comport with recent standards activities? Alternatively from a precautionary perspective, should the Commission consider any potential risk due to long-term exposure as relevant to its time averaging periods, and if so, what scientific evidence supports this?

57. In §§ 2.1091(d)(2) and 2.1093(d)(5) of its existing rules, portable and mobile consumer devices may not use the 30-minute averaging time specified in § 1.1310. However, ''source-based'' time averaging may be used for these consumer products based on inherent transmission properties of a device. Since ''source-based'' averaging often involves consideration of transmit periodicity to determine the time interval over which to average at the maximum power achievable by the device, a 30-minute time averaging interval containing many identical periods at maximum power would result in the same average power as one period. For ''source-based'' time averaging the time period for evaluation is less than 30 minutes. Thus, if the periodicity of a device exceeds 30 minutes, then the largest ''source-based'' time averaging interval to be used for evaluation is 30 minutes. Notwithstanding its current policy, the Commission requests comment on whether consumers would prefer to be given an informed choice to behave in such a manner that may result in

somewhat exceeding the exposure limits.

58. *Peak Pulsed RF Fields.* The present Commission rules do not include limits on peak pulsed RF fields, and independent standard-setting bodies have adopted differing standards applicable to such fields. There is a lack of harmonization among these standards due to limited information about the biological effects of peak pulsed fields. The Commission requests comment on whether it should adopt peak pulsed field limits for RF sources regulated by the Commission.

59. *Contact Currents.* Contact currents can be a safety issue in the vicinity of AM broadcast facilities. The Commission is not aware of similar hazards near other transmitters operated by Commission licensees aside from those used by AM stations. Considering the wavelengths necessary to induce significant currents on large objects, it is not expected that higher frequency RF sources would cause comparable problems, especially given the lack of complaints at these frequencies. The Commission requests comment on the appropriate strategy to promote awareness for construction and maintenance project contractors and planners where the potential for contact RF burns, whether serious or minor, could occur. For example, would it be beneficial for the Commission to provide publicly available maps showing areas where electric fields exceed 10 V/m from AM broadcast stations? If so, the Commission invites comment as to whether AM broadcast stations currently have this information and, if not, to explain the impact of collecting this information and making it available to the Commission. How much time should be required to do so and what would be the costs and benefits? The Commission seeks comment on whether the cost of dealing with potential AM burn hazards as they arise should be the responsibility of the station, the affected party, or both. The Commission also seeks comment as to whether it is the appropriate body to address this issue. While contact burns are a universally recognized hazard of variable severity, adoption of numerical limits on contact RF currents over a broad frequency range may not be effective in avoiding situations where burns actually occur. The Commission requests comment on the feasibility, efficacy, and burden of contact current limits versus other, perhaps informational, approaches such as mapping.

60. *Frequency Range.* The *1979 NOI* opened discussion of exposure limits over the 0 to 300 GHz frequency range, but the limits eventually adopted in 1996 included only frequencies between 100 kHz and 100 GHz as this was the extent of the frequency scope of the standards the Commission adopted and there were few sources of considerable significance outside of this scope at that time. The IEEE and ICNIRP guidelines also encompass the frequency range between 0 and 300 GHz. The Commission requests comment on whether, in addition to the limits already established for RF fields between 100 kHz and 100 GHz, it should also explore actions to control exposure outside of this frequency range (e.g., in the range between 0 and 100 kHz and/or 100 and 300 GHz) due to sources authorized by the Commission. The Commission notes that some wireless inductive chargers operate at frequencies below its current frequency scope, and all terahertz (THz) sources operate at frequencies above its current frequency scope. The Commission also requests comment on whether explicitly controlling exposure in these additional frequency ranges may have a broader impact on or be in conflict with the Commission's rules and what the relative costs and benefits would be. The Commission notes that at frequencies not explicitly within the scope of its existing limits there are still general compliance obligations under §§ 1.1307(c) and (d) for sources it regulates.

60. *Conductive Implanted Objects.* Electrically conductive objects in or on the body may interact with sources of RF energy in ways that are not easily predicted. Examples of conductive objects *in* the body include implanted metallic objects. Examples of conductive objects *on* the body include eyeglasses, jewelry, or metallic accessories. The Commission seeks comment on whether the present volume-averaged SAR limits are protective for the more localized SAR that may occur near the tip of a conductive object such as the end of an implanted wire. In general, the Commission seeks comment on whether high levels of RF exposure may cause internal thermal injury at the site of conductive implants. Commenters are specifically advised to provide scientific research or analysis to support their arguments and to propose practical and effective regulatory responses for any such assertion, and the Commission seeks comment on the costs and benefits of any such approach.

2. Consumer Information

61. The Commission has continually provided information to the general public regarding the potential hazards of radiofrequency electromagnetic fields. The information provided regarding RF safety includes the Commission's Office of Engineering and Technology (OET) Bulletins 56 and 65 (and their Supplements), the *Local Official's Guide,* the Consumer and Governmental Affairs Bureau (CGB) Consumer Guides, and other information (including links to external resources) on its Web site. OET Bulletin 56 was designed to answer general non-technical questions about biological effects of RF fields and explain the exposure limits, and OET Bulletin 65 is intended to be a technical document with supplements designed to provide practical guidance on determining compliance with the Commission's exposure limits. In contrast to the general information provided in OET Bulletin 56, CGB FCC Consumer Guides provide information on specific topics on which the Commission has received numerous inquiries, such as cellular base stations, mobile antennas, wireless devices, and specific absorption rate (SAR). *The Local Official's Guide* provides a framework for local and state governments and wireless service providers to cooperate in the determination of compliance with the Commission's RF exposure limits. The Commission requests comment on what additional information should be provided to consumers and in what format to assist in making decisions about reducing exposure. The Commission also specifically seeks comment on how it can ensure that such information is presented in formats that are accessible to people with disabilities.

62. The Commission continues to receive inquiries on various subjects related to RF exposure, particularly as infrastructure is deployed to support new wireless technologies. Some of those inquirers perceive deployment of fixed transmitters to support a wireless network as an action that may affect them involuntarily (as opposed to use of a cell phone, which is a voluntary activity and exposure). For example, even though exposures generated by fixed wireless base stations (and fixed RF sources in general) are typically orders of magnitude less than those from cell phones and other portable devices (due to proximity), exposures due to fixed RF sources are both involuntary and long-term. However, even if continuous exposure is assumed from wireless base stations, the total energy absorbed from a nearby base station is typically much less on average than that due to using a cell phone. The Commission seeks comment on what

additional information it should develop relating to exposures from common fixed sources.

63. The Consumers Union suggests that the Commission ''mandate that the SAR information included with phones be more consistent.'' The Commission agrees that there is inconsistency in the supplemental information voluntarily provided in the manuals provided with portable and mobile devices. The Commission also notes that for a variety of reasons, the maximum SAR value that is normally supplied is not necessarily a reliable indicator of typical exposure and may not be useful for comparing different devices. The Commission requests comment on whether the Commission should consistently require either disclosure of the maximum SAR value or other more reliable exposure data in a standard format, perhaps in manuals, at point-of-sale, or on a Web site.

64. Information on the SAR of a particular device is available from the Commission's Web site if an individual knows the FCC ID, which is printed on every device. The Commission recognizes that it is not always easy for some to access the SAR information, because the FCC ID is not tied to the model number or marketing name of the device, and there may be multiple records for each FCC ID, potentially creating confusion. Given that private organizations have already linked FCC IDs to device model numbers, the Commission requests comment on whether the Commission should also take actions that would better enable consumers to correlate the make and model number of their device to an FCC ID. If so, how could this be accomplished and what would be the impact on industry? The Commission requests comment in general on the information discussed that would be most useful to provide precautionary guidance to consumers.

3. Exposure Reduction Policies

65. The Commission has a responsibility to ''provide a proper balance between the need to protect the public and workers from exposure to potentially harmful RF electromagnetic fields and the requirement that industry be allowed to provide telecommunications services to the public in the most efficient and practical manner possible.'' The intent of the Commission's exposure limits is to provide a cap that both protects the public based on scientific consensus and allows for efficient and practical implementation of wireless services. The present Commission exposure limit is a ''bright-line rule.'' That is, so long as exposure levels are below a specified limit value, there is no requirement to further reduce exposure. The limit is readily justified when it is based on known adverse health effects having a well-defined threshold, and the limit includes prudent additional safety factors (*e.g.,* setting the limit significantly below the threshold where known adverse health effects may begin to occur). The Commission's current RF exposure guidelines are an example of such regulation, including a significant ''safety'' factor, whereby the exposure limits are set at a level on the order of 50 times below the level at which adverse biological effects have been observed in laboratory animals as a result of tissue heating resulting from RF exposure. This ''safety'' factor can well accommodate a variety of variables such as different physical characteristics and individual sensitivities—and even the potential for exposures to occur in excess of the Commission's limits without posing a health hazard to humans.

66. Despite this conservative bright-line limit, there has been discussion of going even further to guard against the possibility of risks from non-thermal biological effects, even though such risks have not been established by scientific research. As such, some parties have suggested measures of ''prudent avoidance''—undertaking only those avoidance activities which carry modest costs. For example, New Zealand has not set a specific precautionary environmental limit beyond its adoption of the ICNIRP guidelines, opting instead to minimize, ''as appropriate, RF exposure which is unnecessary or incidental to achievement of service objectives or process requirements, provided that this can be readily achieved at modest expense.'' However, the environmental exposure levels from fixed transmitters, such as broadcast facilities and cellular base stations, are normally not only far below the MPE limit, but also well below exposure from a portable device such as a cell phone. Thus, the adoption and enforcement of considerably more restrictive MPE limits might have little, or no, practical effect under most environmental exposure scenarios, but may significantly increase infrastructure costs which would ultimately be paid by consumers. Nonetheless, some countries have implemented extra ''precautionary'' environmental limits for fixed transmitters far below the prevailing scientifically-based values, sometimes limited to specific locations. The SAR limits for portable devices, however, have not been correspondingly reduced by these considerations because of various practical limitations on device design.

67. In this regard, the Commission stresses that while it must be cognizant of and considerate of other countries' standards or agencies' activities or recommendations, it would be guided by them only to the extent it would have confidence in the research, analysis, and principles upon which they are based, as well as the tangible benefits they would provide. Additionally, the concept of ''prudent avoidance'' encourages a balance between exposure reduction and cost. Imposing additional precautionary restrictions on device design and/or on the siting of fixed transmitting facilities to reduce exposure may entail significant costs that licensees and equipment manufacturers would need to consider when developing communications systems or designing equipment. Nevertheless, the Commission notes, some jurisdictions have adopted precautionary restrictions or comparable requirements. For example, the California Public Utilities Commission requires utility companies to allocate a small percentage of total project cost to ELF field exposure reduction actions during power line construction. The Commission requests comment on whether any general technical approach to reduce exposure below its limits in some situations is appropriate or feasible, particularly in cases in which there is no specific quantitative goal for improvement.

68. There are natural trade-offs that come into play when considering extra precautionary aspects of system design. For example, increased antenna height tends to reduce exposure levels nearby at ground level, but taller towers may increase cost, may possibly have a greater environmental impact, and may be inconsistent with community zoning goals. In addition, higher mounting of antennas could negatively impact system architecture, constraining the provision of service. Local efforts to avoid placement of fixed wireless base stations in particular areas can unintentionally result in increased exposure to users of portable devices within those areas where personal portable devices would transmit using greater power in order to communicate with distant base stations, thus increasing the RF emissions and consequent exposure from the device itself. Finally, distributed antenna systems (DAS) can offer more advanced services from multiple carriers with a single physical network of less visually intrusive lower profile antenna installations and may likely reduce

exposure to device users, but the Commission seeks comment on whether such installations reduce or increase environmental exposures.

69. Given the complexity of the information on research regarding non-thermal biological effects, taking extra precautions in this area may fundamentally be qualitative and may not be well-served by the adoption of lower specific exposure limits without any known, underlying biological mechanism. Additionally, adoption of extra precautionary measures may have the unintended consequence of ''opposition to progress and the refusal of innovation, ever greater bureaucracy, . . . [and] increased anxiety in the population.'' Nevertheless, the Commission invites comment as to whether precautionary measures may be appropriate for certain locations which would not affect the enforceability of its existing exposure limits, as well as any analytical justification for such measures. Parties advocating such measures should suggest specific situations in which more restrictive limits (and corresponding thresholds) or alternative requirements should be applied, and provide their scientific basis and substantive information as to the tangible benefits and corresponding costs. If such action were taken, the Commission solicits views as to whether it should it be applied only prospectively or also to existing situations, and if so, what would be the impact on existing systems in terms of costs and performance and what period of time should be afforded for compliance?

70. The Commission seeks comment on the possibility that there may be other precautionary measures not involving reduction of time-averaged SAR that could possibly reduce potential risk, without necessarily assuming that such risks are known. For example, such precautionary measures could include limitations on characteristics that have little or no impact on performance, such as ELF fields, peak pulsed RF fields, or modulation. The Commission requests comment on what aspects of extra precautionary measures could be effective, what aspects may be counterproductive or unnecessary, and what other extra precautionary measures could be efficiently and practically implemented at modest cost.

71. The Commission significantly notes that extra precautionary efforts by national authorities to reduce exposure below recognized scientifically-based limits is considered by the WHO to be unnecessary but acceptable so long as such efforts do not undermine exposure limits based on known adverse effects. Along these lines, the Commission notes that although it supplies information to consumers on methods to reduce exposure from cell phones, it has also stated that it does not endorse the need for nor set a target value for exposure reduction and it seeks comment on whether these policies are appropriate. The Commission also observes that the FDA has stated that, ''available scientific evidence—including World Health Organization (WHO) findings released May 17, 2010—shows no increased health risk due to radiofrequency (RF) energy, a form of electromagnetic radiation that is emitted by cell phones.'' At the same time, the FDA has stated that ''[a]lthough the existing scientific data do not justify FDA regulatory actions, FDA has urged the cell phone industry to take a number of steps, including … [d]esign[ing] cell phones in a way that minimizes any RF exposure to the user.'' The Commission seeks information on other similar hortatory efforts and comment on the utility and propriety of such messaging as part of this Commission's regulatory regime.

72. While the Commission may not take further action related to the regulatory concepts discussed here, it requests comment on the financial impact and the introduction of regulatory uncertainty due to any initiative to minimize exposure beyond scientifically-established specific limits.

4. Evaluation

73. Evaluation is a rapidly evolving area, keeping pace with technological changes, that is most effectively guided by good engineering practice rather than specific regulations. The Commission uses the term ''evaluation'' here to mean the determination of compliance with its exposure limits by measurement or computation. Evaluation is objectively verifiable in principle, even when various methods are used. However, engineering decisions or assumptions are sometimes required based on limited information. These assumptions are generally argued to be conservative, but verification of these assumptions is not always straightforward. On occasion, some prior presumably conservative assumption is later found to be questionable and warrants further analysis. While non-mandatory evaluation techniques are referenced and reflected in OET Bulletins and in the FCC Laboratory Knowledge Database (KDB), development of them is the result of international engineering efforts by standards setting groups of the IEEE and International Electrotechnical Commission (IEC) and is generally self-correcting as information and analysis becomes more readily available. These are often dosimetric issues that can be resolved by the Commission's reliance on SAR as a primary metric for compliance. However, SAR measurement and modeling methods themselves are complex and continue to evolve to achieve greater accuracy. In particular, SAR evaluation for portable devices (*e.g.,* cell phones) has been a significant undertaking and standards development in this area is a continuous process.

74. Except for the extremities, the Commission's SAR limits for the general public are 0.08 W/kg, as averaged over the whole body, and a peak spatial-average SAR of 1.6 W/kg, averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and refer to continuous exposure over time. Evaluation with respect to the SAR limits must demonstrate compliance with both the whole-body and peak spatial-average limits using technically supportable methods and exposure conditions in advance of authorization (licensing or equipment certification) and in a manner that permits independent assessment. While these regulations refer to a cube of tissue, measurement standards have used simplified adult human models, and computational methods may be subject to errors where modeling requirements are not standardized. Most evaluations submitted to the Commission are based on measurement using the standardized specific anthropomorphic mannequin (SAM). The SAM does not model children, tissue layers, or a hand holding the device but SAM was designed to be conservative relative to these factors. Computational standards can in principle more realistically model a range of variables not present using mannequins. Various numerical models of humans (both male and female of different age groups) have been developed, and presumably CAD models of devices can also be made available. However, using this information to produce accurate and practical computational models for individual devices to evaluate SAR on a routine basis may not be ideal for all situations. Since it is not possible to measure the SAR in a 1-gram cube of tissue within the head of a real human being, and given that each human being is different, the Commission requests comment on the pros and cons of measurement versus computation, as well as standardization of human models in general, and the significance of these issues in comparison with procedures that have already been

standardized. The Commission recognizes that a measurement model is standardized by IEEE with the SAM for the head and a flat model for the body; however it seeks comment on whether computation should use the same modeling and test configurations as used for measurement to maintain consistency of results and/or whether more complex human models should be used for computation.

75. The Commission has recently established both whole-body and localized SAR as primary metrics for exposure compliance in the frequency range from 100 kHz to 6 GHz. Other than in the area of portable devices, development of standard procedures for SAR evaluation is more limited. While the Commission generally states that it requires appropriate practices using technically supportable methods for all cases, because of the lack of standard procedures, it requests comment on how SAR evaluation methods should be supported for fixed and mobile RF sources. The Commission also realizes that there may be limitations with any approach to evaluation of SAR due to fixed RF sources, and that the existing MPE limits may not ensure SAR compliance in all cases, in particular where whole-body spatial averaging is used. While this dosimetric issue may be resolved in newer versions of standards, the Commission mentions it here because of its close connection with evaluation using SAR. The Commission requests information to address these issues. Since no OET Bulletin 65 supplement has yet focused on measurement procedures (or SAR evaluation) near fixed RF sources, the Commission requests comment on whether it should develop a future technical supplement to OET Bulletin 65 for fixed evaluation including SAR recognizing the development of the IEC 62232 base station standard. Additionally, the Commission asks interested parties for suggestions for changes to OET Bulletin 56, 65, and the KDB.

5. Proximity Restriction and Disclosure Requirements for Portable RF Sources

76. Since 2001, Supplement C of OET Bulletin 65, Edition 01–01, (Supplement C) has recommended maintaining a body-worn device separation distance up to 2.5 cm (about one inch) during testing of consumer portable devices, since accessories such as holsters would normally be used to wear devices on the body and maintain this distance. Note that, in contrast to the body-worn testing configuration, for consumer portable devices intended to be held against the head during normal use, the device must be placed directly against a head mannequin during testing. Manufacturers have been encouraged since 2001 to include information in device manuals to make consumers aware of the need to maintain the body-worn distance—by using appropriate accessories if they want to ensure that their actual exposure does not exceed the SAR measurement obtained during testing. The testing data for body-worn configurations would not be applicable to situations in which a consumer disregards this information on separation distance and maintains a device closer to the body than the distance at which it is tested. In such situations, it could be possible that exposure in excess of the Commission's limits might result, but only with the device transmitting continuously and at maximum power—such as might happen during a call with a headset and the phone in a user's pocket at the fringe of a reception area.

77. Handsets and wireless technologies have evolved significantly since the release of Supplement C. Body-worn accessories such as holsters have become a matter of consumer choice and are not always supplied with the device. The availability of low power Bluetooth headsets has enabled cell phones to be used away from the head, which may reduce exposure to the head. However, because today's cell phones are smaller and typically have no external antenna, the phone may be placed in a shirt or pants pocket against the body without the consumer appreciating that it is still transmitting. Handsets may also include wireless router functions that require simultaneous transmission of multiple transmitters to support unattended body-worn operations where, unlike with a traditional voice call, users are unaware that transmissions are occurring. With the introduction of LTE technologies (4G), handsets are operating with multiple higher-output power transmitters, which enable simultaneous voice and data connections in both next-to-ear and body-worn use configurations.

78. As devices have continued to evolve, so too have the Commission's policies. Portable devices must comply with the localized SAR limits as they are normally used. In fact, the Commission has established evaluation procedures for newer technologies with reduced body-worn separation distances as small as 0.5 centimeters. Manufacturers have achieved compliance using various methods. Some have used proximity sensors to reduce power when close to the body of the user, although device power reduction in general may degrade performance. Others have simply reduced the power of the device or changed its design. The manual should include operating instructions and advisory statements so that users are aware of the body-worn operating requirements for RF exposure compliance. This allows users to make informed decisions on the type of body-worn accessories and operating configurations that are appropriate for the device.

79. Commission calculations suggest that some devices may not be compliant with its exposure limits without the use of some spacer to maintain a separation distance when body-worn, although this conclusion is not verifiable for individual devices since a test without a spacer has not been routinely performed during the body-worn testing for equipment authorization. Yet, the Commission has no evidence that this poses any significant health risk. Commission rules specify a pass/fail criterion for SAR evaluation and equipment authorization. However, exceeding the SAR limit does not necessarily imply unsafe operation, nor do lower SAR quantities imply ''safer'' operation. The limits were set with a large safety factor, to be well below a threshold for unacceptable rises in tissue temperature. As a result, exposure well above the specified SAR limit should not create an unsafe condition. The Commission notes that, even if a device is tested without a spacer, there are already certain separations built into the SAR test setup, such as the thickness of the mannequin shell, the thickness of the device exterior case, *etc.,* so the Commission seeks comment on the implementation of evaluation procedures without a spacer for the body-worn testing configuration. The Commission also realizes that SAR measurements are performed while the device is operating at its maximum capable power, so that given typical operating conditions, the SAR of the device during normal use would be less than tested. In sum, using a device against the body without a spacer will generally result in actual SAR below the maximum SAR tested; moreover, a use that possibly results in non-compliance with the SAR limit should not be viewed with significantly greater concern than compliant use.

80. In sum, there could be certain circumstances where test configurations may not reflect actual use, and newer technological solutions may exist to allow for devices to be evaluated as close as is feasible to a simulated human under a body-worn configuration. Accordingly, the Commission invites

comment as to what steps, if any, the Commission should take relative to its policies for testing of devices on the basis of an expectation of some separation from the body, including whether it is appropriate to consider ''zero'' spacing, or actual contact with the body when testing. The Commission also seeks comment on the potential negative impacts of such measuring protocols on the design and performance of portable devices and, by extension, network architecture. Alternatively, the Commission seeks comment on whether both requiring that advisory information be more prominent and detailed and supplying accessories to the consumer could be an effective means to ensure adequate awareness and capability to ensure adherence to the SAR standards under all potential usage conditions. Given the considerable safety margin in the Commission's requirements, would the potential number of occurrences resulting from inattention to manual instruction and the extent of resulting exposure constitute a health hazard? The Commission requests information on the costs and benefits of these or other options that will help it progress on this front.

Initial Regulatory Flexibility Analysis

81. As required by the Regulatory Flexibility Act of 1980 (RFA),[1] the Commission has prepared this Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on small entities by the policies and rules proposed in this *Further Notice of Proposed Rule Making* (*Further 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 the *Further NPRM.* The Commission will send a copy of this *Further NPRM,* including this IRFA, to the Chief Counsel for Advocacy of the Small Business Administration (SBA).[2]

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

82. The National Environmental Policy Act of 1969 (NEPA) requires agencies of the Federal Government to evaluate the effects of their actions on the quality of the human environment.[3] To meet its responsibilities under NEPA, the Commission has adopted requirements for evaluating the environmental impact of its actions. One of several environmental factors addressed by these requirements is human exposure to radiofrequency (RF) energy emitted by FCC-regulated transmitters, facilities and devices.[4]

83. The *Further NPRM* proposes to amend parts 1, 2, 15, 24, 25, 27, 73, 90, 95, 97, and 101 of our rules relating to the compliance of FCC-regulated transmitters, facilities, and devices with the guidelines for human exposure to radiofrequency (RF) energy adopted by the Commission in l996 and 1997. Specifically we are proposing to make certain revisions in our rules that we believe will result in more efficient, practical and consistent application of compliance procedures.

B. Legal Basis

84. The proposed action is authorized under Sections 1, 4(i), 4(j), 301, 303(r), 307, 308, 309, 332(a)(1), 332(c)(7)(B)(iv), and 403 of the Communications Act of 1934, as amended, 47 U.S.C. 151, 154(i), 154(j), 301, 303(r), 307, 308, 309, 332(a)(1), 332(c)(7)(B)(iv), 403; the National Environmental Policy Act of 1969, 42 U.S.C. 4321, *et seq.;* section 704(b) of the Telecommunications Act of 1996, Public Law 104–104; and section 553 of the Administrative Procedure Act, 5 U.S.C. 553.

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

85. 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 and policies, if adopted.[5] The RFA generally defines the term ''small entity'' as having the same meaning as the terms ''small business,'' ''small organization,'' and ''small governmental jurisdiction.''[6] In addition, the term ''small business'' has the same meaning as the term ''small business concern'' under the Small Business Act.[7] A ''small business 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.[8]

Small Businesses. Nationwide, there are a total of approximately 29.6 million small businesses, according to the SBA.[9]

Small Businesses, Small Organizations, and Small Governmental Jurisdictions. Our action may, over time, affect small entities that are not easily categorized at present. We therefore describe here, at the outset, three comprehensive, statutory small entity size standards.[10] First, nationwide, there are a total of approximately 27.5 million small businesses, according to the SBA.[11] In addition, a ''small organization'' is generally ''any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.''[12] Nationwide, as of 2007, there were approximately 1,621,315 small organizations.[13] Finally, the term ''small governmental jurisdiction'' is defined generally as ''governments of cities, towns, townships, villages, school districts, or special districts, with a population of less than fifty thousand.''[14] Census Bureau data for 2011 indicate that there were 89,476 local governmental jurisdictions in the United States.[15] We estimate that, of this total, as many as 88, 506 entities may qualify as ''small governmental jurisdictions.''[16] Thus,

[1] *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), Public Law 104–121, 110 Stat. 857 (1996).

[2] *See* 5 U.S.C. 603(a).

[3] National Environmental Policy Act of 1969, as amended, 42 U.S.C. 4321–4335.

[4] *See* 47 CFR 1.1307(b).

[5] 5 U.S.C. 603(b)(3).

[6] 5 U.S.C. 601(6).

[7] 5 U.S.C. 601(3) (incorporating by reference the definition of ''small-business concern'' in the Small Business Act, 15 U.S.C. 632). Pursuant to 5 U.S.C. 601(3), 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**.''

[8] 15 U.S.C. 632.

[9] *See* SBA, Office of Advocacy, ''Frequently Asked Questions,'' *http://web.sba.gov/faqs* (accessed Jan. 2009).

[10] *See* 5 U.S.C. 601(3)–(6).

[11] *See* SBA, Office of Advocacy, ''Frequently Asked Questions,'' *web.sba.gov/faqs* (last visited May 6,2011; figures are from 2009).

[12] 5 U.S.C. 601(4).

[13] Independent Sector, The New Nonprofit Almanac & Desk Reference (2010).

[14] 5 U.S.C. 601(5).

[15] U.S. Census Bureau, Statistical Abstract of the United States: 2011, Table 427 (2007).

[16] The 2007 U.S. Census data for small governmental organizations indicate that there were 89, 476 ''Local Governments'' in 2007. (U.S. CENSUS BUREAU, STATISTICAL ABSTRACT OF THE UNITED STATES 2011, Table 428.) The criterion by which the size of such local governments is determined to be small is a population of 50,000. However, since the Census Bureau does not specifically apply that criterion, it cannot be determined with precision how many of such local governmental organizations is small. Nonetheless, the inference seems reasonable that substantial number of these governmental organizations has a population of less than 50,000. To look at Table 428 in conjunction with a related set of data in Table 429 in the Census's Statistical Abstract of the U.S., that inference is further supported by the fact that in both Tables, many entities that may well be small are included in the 89,476 local governmental organizations, e.g. county, municipal, township and town, school district and special district entities. Measured by a criterion of a population of 50,000 many specific sub-entities in this category seem more likely than larger county-level governmental organizations to have small populations. Accordingly, of the 89,746

we estimate that most governmental jurisdictions are small.

Experimental Radio Service (Other Than Broadcast). The majority of experimental licenses are issued to companies such as Motorola and Department of Defense contractors such as Northrop, Lockheed and Martin Marietta. Businesses such as these may have as many as 200 licenses at one time. The majority of these applications are from entities such as these. Given this fact, the remaining 30 percent of applications, we assume, for purposes of our evaluations and conclusions in this FRFA, will be awarded to small entities, as that term is defined by the SBA.

The Commission processes approximately 1,000 applications a year for experimental radio operations. About half or 500 of these are renewals and the other half are for new licenses. We do not have adequate information to predict precisely how many of these applications will be impacted by our rule revisions. However, based on the above figures we estimate that as many as 300 of these applications could be from small entities and potentially could be impacted.

International Broadcast Stations. Commission records show that there are 19 international high frequency broadcast station authorizations. We do not request nor collect annual revenue information, and are unable to estimate the number of international high frequency broadcast stations that would constitute a small business under the SBA definition. Since all international broadcast stations operate using relatively high power levels, it is likely that they could all be impacted by our proposed rule revisions.

Satellite Telecommunications Providers. Two economic census categories address the satellite industry. The first category has a small business size standard of $15 million or less in average annual receipts, under SBA rules.[17] The second has a size standard of $25 million or less in annual receipts.[18]

The category of Satellite Telecommunications ''comprises establishments primarily engaged in providing telecommunications services to other establishments in the telecommunications and broadcasting industries by forwarding and receiving communications signals via a system of satellites or reselling satellite telecommunications.'' [19] Census Bureau data for 2007 show that 512 Satellite Telecommunications firms that operated for that entire year.[20] Of this total, 464 firms had annual receipts of under $10 million, and 18 firms had receipts of $10 million to $24,999,999.[21] Consequently, the Commission estimates that the majority of Satellite Telecommunications firms are small entities that might be affected by our proposals.

The second category, i.e. ''All Other Telecommunications'' comprises ''establishments primarily engaged in providing specialized telecommunications services, such as satellite tracking, communications telemetry, and radar station operation. This industry also includes establishments primarily engaged in providing satellite terminal stations and associated facilities connected with one or more terrestrial systems and capable of transmitting telecommunications to, and receiving telecommunications from, satellite systems. Establishments providing Internet services or voice over Internet protocol (VoIP) services via client-supplied telecommunications connections are also included in this industry.'' [22] For this category, Census Bureau data for 2007 shows that there were a total of 2,383 firms that operated for the entire year.[23] Of this total, 2,347 firms had annual receipts of under $25 million and 12 firms had annual receipts of $25 million to $49,999,999.[24] Consequently, the Commission estimates that the majority of All Other Telecommunications firms are small entities that might be affected by our action.

Fixed Satellite Transmit/Receive Earth Stations. There are approximately 4,303 earth station authorizations, a portion of which are Fixed Satellite Transmit/Receive Earth Stations. We do not request nor collect annual revenue information, and are unable to estimate the number of the earth stations that would constitute a small business under the SBA definition. However, the majority of these stations could be impacted by our proposed rules.

Fixed Satellite Small Transmit/Receive Earth Stations. There are approximately 4,303 earth station authorizations, a portion of which are Fixed Satellite Small Transmit/Receive Earth Stations. We do not request nor collect annual revenue information, and are unable to estimate the number of fixed small satellite transmit/receive earth stations that would constitute a small business under the SBA definition. However, the majority of these stations could be impacted by our proposed rules.

Fixed Satellite Very Small Aperture Terminal (VSAT) Systems. These stations operate on a primary basis, and frequency coordination with terrestrial microwave systems is not required. Thus, a single ''blanket'' application may be filed for a specified number of small antennas and one or more hub stations. There are 492 current VSAT System authorizations. We do not request nor collect annual revenue information, and are unable to estimate the number of VSAT systems that would constitute a small business under the SBA definition. However, it is expected that many of these stations could be impacted by our proposed rules.

Mobile Satellite Earth Stations. There are 19 licensees. We do not request nor collect annual revenue information, and are unable to estimate the number of mobile satellite earth stations that would constitute a small business under the SBA definition. However, it is expected that many of these stations could be impacted by our proposed rules.

Wireless Telecommunications Carriers (except satellite). This industry comprises establishments engaged in operating and maintaining switching and transmission facilities to provide communications via the airwaves. Establishments in this industry have spectrum licenses and provide services using that spectrum, such as cellular phone services, paging services, wireless Internet access, and wireless video services.[25] The appropriate size standard under SBA rules is for the category Wireless Telecommunications Carriers. The size standard for that category is that a business is small if it has 1,500 or fewer employees.[26] Under the present and prior categories, the SBA has deemed a wireless business to be small if it has 1,500 or fewer

small governmental organizations identified in the 2007 Census, the Commission estimates that a substantial majority is small. 16 13 CFR 121.201, NAICS code 517110.

[17] 13 CFR 121.201, NAICS code 517410.

[18] 13 CFR 121.201, NAICS code 517919.

[19] U.S. Census Bureau, 2007 NAICS Definitions, 517410 Satellite Telecommunications.

[20] *See http://factfinder.census.gov/servlet/IBQTable?_bm=y&-geo_id=&-_skip=900&-ds_name=EC0751SSSZ4&-_lang=en.*

[21] *See http://factfinder.census.gov/servlet/IBQTable?_bm=y&-geo_id=&-_skip=900&-ds_name=EC0751SSSZ4&-_lang=en.*

[22] *http://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=517919&search=2007%20NAICS%20Search.*

[23] *http://factfinder.census.gov/servlet/IBQTable?_bm=y&-geo_id=&-_skip=900&-ds_name=EC0751SSSZ4&-_lang=en.*

[24] *http://factfinder.census.gov/servlet/IBQTable?_bm=y&-geo_id=&-_skip=900&-ds_name=EC0751SSSZ4&-_lang=en.*

[25] *http://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=517210&search=2007%20NAICS%20Search.*

[26] 13 CFR 121.201, NAICS code 517210.

employees.[27] For this category, census data for 2007 show that there were 1,383 firms that operated for the entire year.[28] Of this total, 1,368 firms had employment of 999 or fewer employees and 15 had employment of 1000 employees or more.[29] Thus under this category and the associated small business size standard, the Commission estimates that the majority of wireless telecommunications carriers (except satellite) are small entities that may be affected by our proposed action.[30]

Licenses Assigned by Auctions. Initially, we note that, as a general matter, the number of winning bidders that qualify as small businesses at the close of an auction does not necessarily represent the number of small businesses currently in service. Also, the Commission does not generally track subsequent business size unless, in the context of assignments or transfers, unjust enrichment issues are implicated.

Paging Services. Neither the SBA nor the FCC has developed a definition applicable exclusively to paging services. However, a variety of paging services is now categorized under Wireless Telecommunications Carriers (except satellite).[31] This industry comprises establishments engaged in operating and maintaining switching and transmission facilities to provide communications via the airwaves. Establishments in this industry have spectrum licenses and provide services using that spectrum, such as cellular phone services, paging services, wireless Internet access, and wireless video services. Illustrative examples in the paging context include paging services, except satellite; two-way paging communications carriers, except satellite; and radio paging services communications carriers. The SBA has deemed a paging service in this category to be small if it has 1,500 or fewer employees.[32] For this category, census data for 2007 show that there were 1,383 firms that operated for the entire year.[33] Of this total, 1,368 firms had employment of 999 or fewer employees and 15 had employment of 1000 employees or more.[34] Thus under this category and the associated small business size standard, the Commission estimates that the majority of paging services in the category of wireless telecommunications carriers (except satellite) are small entities that may be affected by our proposed action.[35]

In addition, in the Paging Second Report and Order, the Commission adopted a size standard for ''small businesses'' for purposes of determining their eligibility for special provisions such as bidding credits.[36] A small business is an entity that, together with its affiliates and controlling principals, has average gross revenues not exceeding $15 million for the preceding three years.[37] The SBA has approved this definition.[38] An initial auction of Metropolitan Economic Area (''MEA'') licenses was conducted in the year 2000. Of the 2,499 licenses auctioned, 985 were sold.[39] Fifty-seven companies claiming small business status won 440 licenses.[40] A subsequent auction of MEA and Economic Area (''EA'') licenses was held in the year 2001. Of the 15,514 licenses auctioned, 5,323 were sold.[41] One hundred thirty-two companies claiming small business status purchased 3,724 licenses. A third auction, consisting of 8,874 licenses in each of 175 EAs and 1,328 licenses in all but three of the 51 MEAs, was held in 2003. Seventy-seven bidders claiming small or very small business status won 2,093 licenses.[42] A fourth auction of 9,603 lower and upper band paging licenses was held in the year 2010. 29 bidders claiming small or very small business status won 3,016 licenses.

2.3 GHz Wireless Communications Services. This service can be used for fixed, mobile, radiolocation, and digital audio broadcasting satellite uses. The Commission defined ''small business'' for the wireless communications services (''WCS'') auction as an entity with average gross revenues of $40 million for each of the three preceding years, and a ''very small business'' as an entity with average gross revenues of $15 million for each of the three preceding years.[43] The SBA approved these definitions.[44] The Commission conducted an auction of geographic area licenses in the WCS service in 1997. In the auction, seven bidders that qualified as very small business entities won 31 licenses, and one bidder that qualified as a small business entity won a license.

1670–1675 MHz Services. This service can be used for fixed and mobile uses, except aeronautical mobile.[45] An auction for one license in the 1670–1675 MHz band was conducted in 2003. The Commission defined a ''small business'' as an entity with attributable average annual gross revenues of not more than $40 million for the preceding three years, which would thus be eligible for a 15 percent discount on its winning bid for the 1670–1675 MHz band license. Further, the Commission defined a ''very small business'' as an entity with attributable average annual gross revenues of not more than $15 million for the preceding three years, which would thus be eligible to receive a 25 percent discount on its winning bid for the 1670–1675 MHz band license. The winning bidder was not a small entity.

Wireless Telephony. Wireless telephony includes cellular, personal

[27] 13 CFR 121.201, NAICS code 517210. The now-superseded, pre-2007 C.F.R. citations were 13 CFR 121.201, NAICS codes 517211 and 517212 (referring to the 2002 NAICS).

[28] U.S. Census Bureau, Subject Series: Information, Table 5, ''Establishment and Firm Size: Employment Size of Firms for the United States: 2007 NAICS Code 517210'' (issued Nov. 2010).

[29] *Id.* Available census data do not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees; the largest category provided is for firms with ''100 employees or more.''

[30] *See http://factfinder.census.gov/servlet/IBQTable?_bm=y&-fds_name=EC0700A1&-geo_id=&-_skip=600&-ds_name=EC0751SSSZ5&-_lang=en*

[31] U.S. Census Bureau, 2007 NAICS Definitions, ''517210 Wireless Telecommunications Categories (Except Satellite)''; *http://www.census.gov/naics/2007/def/ND517210.HTM#N517210.*

[32] U.S. Census Bureau, 2007 NAICS Definitions, ''517210 Wireless Telecommunications Categories (Except Satellite)''.

[33] U.S. Census Bureau, Subject Series: Information, Table 5, ''Establishment and Firm Size: Employment Size of Firms for the United States: 2007 NAICS Code 517210'' (issued Nov. 2010).

[34] *Id.* Available census data do not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees; the largest category provided is for firms with ''100 employees or more.''

[35] *See http://factfinder.census.gov/servlet/IBQTable?_bm=y&-fds_name=EC0700A1&-geo_id=&-_skip=600&-ds_name=EC0751SSSZ5&-_lang=en.*

[36] *Revision of Part 22 and Part 90 of the Commission's Rules to Facilitate Future Development of Paging Systems,* Second Report and Order, 12 FCC Rcd 2732, 2811–2812, paras. 178–181 (''*Paging Second Report and Order*''); *see also Revision of Part 22 and Part 90 of the Commission's Rules to Facilitate Future Development of Paging Systems,* Memorandum Opinion and Order on Reconsideration, 14 FCC Rcd 10030, 10085–10088, paras. 98–107 (1999).

[37] *Paging Second Report and Order,* 12 FCC Rcd at 2811, para. 179.

[38] *See* Letter from Aida Alvarez, Administrator, SBA, to Amy Zoslov, Chief, Auctions and Industry Analysis Division, Wireless Telecommunications Bureau (''WTB''), FCC (Dec. 2, 1998) (''*Alvarez Letter 1998*'').

[39] *See* ''*929 and 931 MHz Paging Auction Closes,*'' Public Notice, 15 FCC Rcd 4858 (WTB 2000).

[40] *See id.*

[41] *See* ''*Lower and Upper Paging Band Auction Closes,*'' Public Notice, 16 FCC Rcd 21821 (WTB 2002).

[42] *See* ''Lower and Upper Paging Bands Auction Closes,'' Public Notice, 18 FCC Rcd 11154 (WTB 2003). The current number of small or very small business entities that hold wireless licenses may differ significantly from the number of such entities that won in spectrum auctions due to assignments and transfers of licenses in the secondary market over time. In addition, some of the same small business entities may have won licenses in more than one auction.

[43] *Amendment of the Commission's Rules to Establish Part 27, the Wireless Communications Service (WCS),* Report and Order, 12 FCC Rcd 10785, 10879, para. 194 (1997).

[44] *See Alvarez Letter 1998.*

[45] 47 CFR 2.106; *see generally* 47 CFR 27.1–.70.

communications services, and specialized mobile radio telephony carriers. As noted, the SBA has developed a small business size standard for Wireless Telecommunications Carriers (except Satellite).[46] Under the SBA small business size standard, a business is small if it has 1,500 or fewer employees.[47] Census data for 2007 shows that there were 1,383 firms that operated that year.[48] Of those 1,383, 1,368 had fewer than 100 employees, and 15 firms had more than 100 employees. Thus under this category and the associated small business size standard, the majority of firms can be considered small. According to Trends in Telephone Service data, 434 carriers reported that they were engaged in wireless telephony.[49] Of these, an estimated 222 have 1,500 or fewer employees and 212 have more than 1,500 employees.[50] Therefore, approximately half of these entities can be considered small. Similarly, according to Commission data, 413 carriers reported that they were engaged in the provision of wireless telephony, including cellular service, Personal Communications Service (PCS), and Specialized Mobile Radio (SMR) Telephony services.[51] Of these, an estimated 261 have 1,500 or fewer employees and 152 have more than 1,500 employees.[52] Consequently, the Commission estimates that approximately half or more of these firms can be considered small. Thus, using available data, we estimate that the majority of wireless firms can be considered small.

Broadband Personal Communications Service. The broadband personal communications services (PCS) spectrum is divided into six frequency blocks designated A through F, and the Commission has held auctions for each block. The Commission initially defined a ''small business'' for C- and F-Block licenses as an entity that has average gross revenues of $40 million or less in the three previous years.[53] For F-Block licenses, an additional small business size standard for ''very small business'' was added and is defined as an entity that, together with its affiliates, has average gross revenues of not more than $15 million for the preceding three years.[54] These small business size standards, in the context of broadband PCS auctions, have been approved by the SBA.[55] No small businesses within the SBA-approved small business size standards bid successfully for licenses in Blocks A and B. There were 90 winning bidders that claimed small business status in the first two C-Block auctions. A total of 93 bidders that claimed small and very small business status won approximately 40 percent of the 1,479 licenses in the first auction for the D, E, and F Blocks.[56] On April 15, 1999, the Commission completed the re-auction of 347 C-, D-, E-, and F-Block licenses in Auction No. 22.[57] Of the 57 winning bidders in that auction, 48 claimed small business status and won 277 licenses.

On January 26, 2001, the Commission completed the auction of 422 C and F Block Broadband PCS licenses in Auction No. 35. Of the 35 winning bidders in that auction, 29 claimed small business status.[58] Subsequent events concerning Auction 35, including judicial and agency determinations, resulted in a total of 163 C and F Block licenses being available for grant. On February 15, 2005, the Commission completed an auction of 242 C-, D-, E-, and F-Block licenses in Auction No. 58. Of the 24 winning bidders in that auction, 16 claimed small business status and won 156 licenses.[59] On May 21, 2007, the Commission completed an auction of 33 licenses in the A, C, and F Blocks in Auction No. 71.[60] Of the 14 winning bidders in that auction, six claimed small business status and won 18 licenses.[61] On August 20, 2008, the Commission completed the auction of 20 C-, D-, E-, and F-Block Broadband PCS licenses in Auction No. 78.[62] Of the eight winning bidders for Broadband PCS licenses in that auction, six claimed small business status and won 14 licenses.[63]

Advanced Wireless Services. In 2006, the Commission conducted its first auction of Advanced Wireless Services licenses in the 1710–1755 MHz and 2110–2155 MHz bands (''AWS–1''), designated as Auction 66.[64] For the AWS–1 bands, the Commission has defined a ''small business'' as an entity with average annual gross revenues for the preceding three years not exceeding $40 million, and a ''very small business'' as an entity with average annual gross revenues for the preceding three years not exceeding $15 million.[65] In 2006, the Commission conducted its first auction of AWS–1 licenses.[66] In that initial AWS–1 auction, 31 winning bidders identified themselves as very small businesses won 142 licenses.[67] Twenty-six of the winning bidders identified themselves as small businesses and won 73 licenses.[68] In a subsequent 2008 auction, the Commission offered 35 AWS–1

[46] 13 CFR 121.201, NAICS code 517210.

[47] *Id.*

[48] U.S. Census Bureau, 2007 Economic Census, Sector 51, 2007 NAICS code 517210 (rel. Oct. 20, 2009), *http://factfinder.census.gov/servlet/IBQTable?_bm=y&-geo_id=&-fds_name=EC0700A1&-_skip=700&-ds_name=EC0751SSSZ5&-_lang=en.*

[49] *Trends in Telephone Service,* at tbl. 5.3.

[50] Id.

[51] *See Trends in Telephone Service,* at tbl. 5.3.

[52] *See id.*

[53] *See Amendment of Parts 20 and 24 of the Commission's Rules—Broadband PCS Competitive Bidding and the Commercial Mobile Radio Service Spectrum Cap; Amendment of the Commission's Cellular/PCS Cross-Ownership Rule,* WT Docket No. 96–59, GN Docket No. 90–314, Report and Order, 11 FCC Rcd 7824, 7850–52, paras. 57–60 (1996) (''*PCS Report and Order*''); *see also* 47 CFR 24.720(b).

[54] *See PCS Report and Order,* 11 FCC Rcd at 7852, para. 60.

[55] *See Alvarez Letter 1998.*

[56] *See Broadband PCS, D, E and F Block Auction Closes,* Public Notice, Doc. No. 89838 (rel. Jan. 14, 1997).

[57] *See C, D, E, and F Block Broadband PCS Auction Closes,* Public Notice, 14 FCC Rcd 6688 (WTB 1999). Before Auction No. 22, the Commission established a very small standard for the C Block to match the standard used for F Block. *Amendment of the Commission's Rules Regarding Installment Payment Financing for Personal Communications Services (PCS) Licensees,* WT Docket No. 97–82, Fourth Report and Order, 13 FCC Rcd 15743, 15768 para. 46 (1998).

[58] *See C and F Block Broadband PCS Auction Closes; Winning Bidders Announced,* Public Notice, 16 FCC Rcd 2339 (2001).

[59] *See Broadband PCS Spectrum Auction Closes; Winning Bidders Announced for Auction No. 58,* Public Notice, 20 FCC Rcd 3703 (2005).

[60] *See Auction of Broadband PCS Spectrum Licenses Closes; Winning Bidders Announced for Auction No. 71, Public Notice, 22 FCC Rcd 9247 (2007).*

[61] *Id.*

[62] *See Auction of AWS–1 and Broadband PCS Licenses Closes; Winning Bidders Announced for Auction* 78, Public Notice, 23 FCC Rcd 12749 (WTB 2008).

[63] *Id.*

[64] *See* Auction of Advanced Wireless Services Licenses Scheduled for June 29, 2006; Notice and Filing Requirements, Minimum Opening Bids, Upfront Payments and Other Procedures for Auction No. 66, AU Docket No. 06–30, *Public Notice,* 21 FCC Rcd 4562 (2006) (''*Auction 66 Procedures Public Notice*'');

[65] *See* Service Rules for Advanced Wireless Services in the 1.7 GHz and 2.1 GHz Bands, *Report and Order,* 18 FCC Rcd 25,162, App. B (2003), *)modified by* Service Rules for Advanced Wireless Services In the 1.7 GHz and 2.1 GHz Bands, *Order on Reconsideration,* 20 FCC Rcd 14,058, App. C (2005).

[66] *See Auction of Advanced Wireless Services Licenses Scheduled for June 29, 2006; Notice and Filing Requirements, Minimum Opening Bids, Upfront Payments and Other Procedures for Auction No. 66,* AU Docket No. 06–30, Public Notice, 21 FCC Rcd 4562 (2006) (''*Auction 66 Procedures Public Notice*'').

[67] *See* Auction of Advanced Wireless Services Licenses Closes; Winning Bidders Announced for Auction *No. 66,* Public Notice, 21 FCC Rcd 10,521 (2006) (''*Auction 66 Closing Public Notice*'').

[68] *See id.*

licenses.[69] Four winning bidders identified themselves as very small businesses, and three of the winning bidders identifying themselves as a small businesses won five AWS–1 licenses.[70]

Narrowband Personal Communications Services. In 1994, the Commission conducted two auctions of Narrowband PCS licenses. For these auctions, the Commission defined a ''small business'' as an entity with average annual gross revenues for the preceding three years not exceeding $40 million.[71] Through these auctions, the Commission awarded a total of 41 licenses, 11 of which were obtained by four small businesses.[72] To ensure meaningful participation by small business entities in future auctions, the Commission adopted a two-tiered small business size standard in the *Narrowband PCS Second Report and Order.*[73] A ''small business'' is an entity that, together with affiliates and controlling interests, has average gross revenues for the three preceding years of not more than $40 million.[74] A ''very small business'' is an entity that, together with affiliates and controlling interests, has average gross revenues for the three preceding years of not more than $15 million.[75] The SBA has approved these small business size standards.[76] A third auction of Narrowband PCS licenses was conducted in 2001. In that auction, five bidders won 317 (Metropolitan Trading Areas and nationwide) licenses.[77] Three of the winning bidders claimed status as a small or very small entity and won 311 licenses.

Lower 700 MHz Band Licenses. The Commission previously adopted criteria for defining three groups of small businesses for purposes of determining their eligibility for special provisions such as bidding credits.[78] The Commission defined a ''small business'' as an entity that, together with its affiliates and controlling principals, has average gross revenues not exceeding $40 million for the preceding three years.[79] A ''very small business'' is defined as an entity that, together with its affiliates and controlling principals, has average gross revenues that are not more than $15 million for the preceding three years.[80] Additionally, the Lower 700 MHz Service had a third category of small business status for Metropolitan/Rural Service Area (''MSA/RSA'') licenses —''entrepreneur''— which is defined as an entity that, together with its affiliates and controlling principals, has average gross revenues that are not more than $3 million for the preceding three years.[81] The SBA approved these small size standards.[82] An auction of 740 licenses was conducted in 2002 (one license in each of the 734 MSAs/RSAs and one license in each of the six Economic Area Groupings (EAGs)). Of the 740 licenses available for auction, 484 licenses were won by 102 winning bidders. Seventy-two of the winning bidders claimed small business, very small business, or entrepreneur status and won a total of 329 licenses.[83] A second auction commenced on May 28, 2003, closed on June 13, 2003, and included 256 licenses.[84] Seventeen winning bidders claimed small or very small business status and won 60 licenses, and nine winning bidders claimed entrepreneur status and won 154 licenses.[85] In 2005, the Commission completed an auction of 5 licenses in the lower 700 MHz band (Auction 60). All three winning bidders claimed small business status.

In 2007, the Commission reexamined its rules governing the 700 MHz band in the *700 MHz Second Report and Order.*[86] An auction of A, B and E block licenses in the Lower 700 MHz band was held in 2008.[87] Twenty winning bidders claimed small business status (those with attributable average annual gross revenues that exceed $15 million and do not exceed $40 million for the preceding three years). Thirty three winning bidders claimed very small business status (those with attributable average annual gross revenues that do not exceed $15 million for the preceding three years). In 2011, the Commission conducted Auction 92, which offered 16 lower 700 MHz band licenses that had been made available in Auction 73 but either remained unsold or were licenses on which a winning bidder defaulted. Two of the seven winning bidders in Auction 92 claimed very small business status, winning a total of four licenses.

Upper 700 MHz Band Licenses. In the 700 MHz Second Report and Order, the Commission revised its rules regarding Upper 700 MHz licenses.[88] On January 24, 2008, the Commission commenced Auction 73 in which several licenses in the Upper 700 MHz band were available for licensing: 12 Regional Economic Area Grouping licenses in the C Block, and one nationwide license in the D Block.[89] The auction concluded on March 18, 2008, with 3 winning bidders claiming very small business status (those with attributable average annual gross revenues that do not exceed $15 million for the preceding three years) and winning five licenses.

700 MHz Guard Band Licenses. In 2000, the Commission adopted the *700 MHz Guard Band Report and Order,* in which it established rules for the A and B block licenses in the Upper 700 MHz

[69] *See AWS–1 and Broadband PCS Procedures Public Notice,* 23 FCC Rcd at 7499. Auction 78 also included an auction of broadband PCS licenses.

[70] *See Auction of AWS–1 and Broadband PCS Licenses Closes, Winning Bidders Announced for Auction 78, Down Payments Due September 9, 2008, FCC Forms 601 and 602 Due September 9, 2008, Final Payments Due September 23, 2008, Ten-Day Petition to Deny Period,* Public Notice, 23 FCC Rcd 12,749 (2008).

[71] Implementation of Section 309(j) of the Communications Act—Competitive Bidding Narrowband PCS, Third Memorandum Opinion and Order and Further Notice of Proposed Rulemaking, 10 FCC Rcd 175, 196, para. 46 (1994).

[72] *See* ''Announcing the High Bidders in the Auction of Ten Nationwide Narrowband PCS Licenses, Winning Bids Total $617,006,674,'' *Public Notice,* PNWL 94–004 (rel. Aug. 2, 1994); ''Announcing the High Bidders in the Auction of 30 Regional Narrowband PCS Licenses; Winning Bids Total $490,901,787,'' *Public Notice,* PNWL 94–27 (rel. Nov. 9, 1994).

[73] *Amendment of the Commission's Rules to Establish New Personal Communications Services,* Narrowband PCS, Second Report and Order and Second Further Notice of Proposed Rule Making, 15 FCC Rcd 10456, 10476, para. 40 (2000) (''*Narrowband PCS Second Report and Order*'').

[74] *Narrowband PCS Second Report and Order,* 15 FCC Rcd at 10476, para. 40.

[75] *Id.*

[76] *See Alvarez Letter 1998.*

[77] *See* ''Narrowband PCS Auction Closes,'' *Public Notice,* 16 FCC Rcd 18663 (WTB 2001).

[78] See *Reallocation and Service Rules for the 698–746 MHz Spectrum Band (Television Channels 52–59),* Report and Order, 17 FCC Rcd 1022 (2002) (''*Channels 52–59 Report and Order*'').

[79] *See Channels 52–59 Report and Order,* 17 FCC Rcd at 1087–88, para. 172.

[80] *See* id.

[81] See *id,* 17 FCC Rcd at 1088, para. 173.

[82] *See* Letter from Aida Alvarez, Administrator, SBA, to Thomas Sugrue, Chief, WTB, FCC (Aug. 10, 1999) (''*Alvarez Letter 1999*'').

[83] *See* ''Lower 700 MHz Band Auction Closes,'' *Public Notice,* 17 FCC Rcd 17272 (WTB 2002).

[84] *See* Lower 700 MHz Band Auction Closes, *Public Notice,* 18 FCC Rcd 11873 (WTB 2003).

[85] *See id.*

[86] Service Rules for the 698–746, 747–762 and 777–792 MHz Band, WT Docket No. 06–150, *Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems,* CC Docket No. 94–102, § 68.4(a) of the Commission's rules Governing Hearing Aid-Compatible Telephone, WT Docket No. 01–309, Biennial Regulatory Review—Amendment of parts 1, 22, 24, 27, and 90 to Streamline and Harmonize Various rules Affecting Wireless Radio Services, WT Docket No. 03–264, Former Nextel Communications, Inc. Upper 700 MHz Guard Band Licenses and Revisions to part 27 of the Commission's Rules, WT Docket No. 06–169, *Implementing a Nationwide, Broadband Interoperable Public Safety Network in the 700 MHz Band,* PS Docket No. 06–229, *Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State, and Local Public Safety Communications Requirements Through the Year 2010,* WT Docket No. 96–86, Second Report and Order, 22 FCC Rcd 15289 (2007) (''*700 MHz Second Report and Order*'').

[87] *See* Auction of 700 MHz Band Licenses Closes, *Public Notice,* 23 FCC Rcd 4572 (WTB 2008).

[88] *700 MHz Second Report and Order,* 22 FCC Rcd 15289.

[89] *See Auction of 700 MHz Band Licenses Closes,* Public Notice, 23 FCC Rcd 4572 (WTB 2008).

band, including size standards for ''small businesses'' and ''very small businesses'' for purposes of determining their eligibility for special provisions such as bidding credits.[90] A small business in this service is an entity that, together with its affiliates and controlling principals, has average gross revenues not exceeding $40 million for the preceding three years.[91] Additionally, a very small business is an entity that, together with its affiliates and controlling principals, has average gross revenues that are not more than $15 million for the preceding three years.[92] SBA approval of these definitions is not required.[93] An auction of these licenses was conducted in 2000.[94] Of the 104 licenses auctioned, 96 licenses were won by nine bidders. Five of these bidders were small businesses that won a total of 26 licenses. A second auction of 700 MHz Guard Band licenses was held in 2001. All eight of the licenses auctioned were sold to three bidders. One of these bidders was a small business that won a total of two licenses.[95]

Specialized Mobile Radio. The Commission adopted small business size standards for the purpose of determining eligibility for bidding credits in auctions of Specialized Mobile Radio (SMR) geographic area licenses in the 800 MHz and 900 MHz bands. The Commission defined a ''small business'' as an entity that, together with its affiliates and controlling principals, has average gross revenues not exceeding $15 million for the preceding three years.[96] The Commission defined a ''very small business'' as an entity that, together with its affiliates and controlling principals, has average gross revenues not exceeding $3 million for the preceding three years.[97] The SBA has approved these small business size standards for both the 800 MHz and 900 MHz SMR Service.[98] The first 900 MHz SMR auction was completed in 1996. Sixty bidders claiming that they qualified as small businesses under the $15 million size standard won 263 licenses in the 900 MHz SMR band. In 2004, the Commission held a second auction of 900 MHz SMR licenses and three winning bidders identifying themselves as very small businesses won 7 licenses.[99] The auction of 800 MHz SMR licenses for the upper 200 channels was conducted in 1997. Ten bidders claiming that they qualified as small or very small businesses under the $15 million size standard won 38 licenses for the upper 200 channels.[100] A second auction of 800 MHz SMR licenses was conducted in 2002 and included 23 BEA licenses. One bidder claiming small business status won five licenses.[101]

The auction of the 1,053 800 MHz SMR licenses for the General Category channels was conducted in 2000. Eleven bidders who won 108 licenses for the General Category channels in the 800 MHz SMR band qualified as small or very small businesses.[102] In an auction completed in 2000, a total of 2,800 Economic Area licenses in the lower 80 channels of the 800 MHz SMR service were awarded.[103] Of the 22 winning bidders, 19 claimed small or very small business status and won 129 licenses. Thus, combining all four auctions, 41 winning bidders for geographic licenses in the 800 MHz SMR band claimed to be small businesses.

In addition, there are numerous incumbent site-by-site SMR licensees and licensees with extended implementation authorizations in the 800 and 900 MHz bands. We do not know how many firms provide 800 MHz or 900 MHz geographic area SMR pursuant to extended implementation authorizations, nor how many of these providers have annual revenues not exceeding $15 million. One firm has over $15 million in revenues. In addition, we do not know how many of these firms have 1500 or fewer employees.[104] We assume, for purposes of this analysis, that all of the remaining existing extended implementation authorizations are held by small entities, as that small business size standard is approved by the SBA.

220 MHz Radio Service—Phase I Licensees. The 220 MHz service has both Phase I and Phase II licenses. Phase I licensing was conducted by lotteries in 1992 and 1993. There are approximately 1,515 such non-nationwide licensees and four nationwide licensees currently authorized to operate in the 220 MHz band. The Commission has not developed a small business size standard for small entities specifically applicable to such incumbent 220 MHz Phase I licensees. To estimate the number of such licensees that are small businesses, the Commission applies the small business size standard under the SBA rules applicable. The SBA has deemed a wireless business to be small if it has 1,500 or fewer employees.[105] For this service, the SBA uses the category of Wireless Telecommunications Carriers (except Satellite). Census data for 2007, which supersede data contained in the 2002 Census, show that there were 1,383 firms that operated that year.[106] Of those 1,383, 1,368 had fewer than 100 employees, and 15 firms had more than 100 employees. Thus under this category and the associated small business size standard, the majority of firms can be considered small.

220 MHz Radio Service—Phase II Licensees. The 220 MHz service has both Phase I and Phase II licenses. The Phase II 220 MHz service licenses are assigned by auction, where mutually exclusive applications are accepted. In the *220 MHz Third Report and Order,* the Commission adopted a small business size standard for defining ''small'' and ''very small'' businesses for purposes of determining their eligibility for special provisions such as bidding credits.[107] This small business standard indicates that a ''small business'' is an entity that, together with its affiliates

[90] *See Service Rules for the 746–764 MHz Bands, and Revisions to part 27 of the Commission's rules,* Second Report and Order, 15 FCC Rcd 5299 (2000) (''*700 MHz Guard Band Report and Order*'').

[91] *See 700 MHz Guard Band Report and Order,* 15 FCC Rcd at 5343, para. 108.

[92] *See id.*

[93] *See id.,* 15 FCC Rcd 5299, 5343, para. 108 n.246 (for the 746–764 MHz and 776–794 MHz bands, the Commission is exempt from 15 U.S.C. 632, which requires Federal agencies to obtain SBA approval before adopting small business size standards).

[94] *See* ''700 MHz Guard Bands Auction Closes: Winning Bidders Announced,'' *Public Notice,* 15 FCC Rcd 18026 (2000).

[95] *See* ''700 MHz Guard Bands Auction Closes: Winning Bidders Announced,'' *Public Notice,* 16 FCC Rcd 4590 (WTB 2001).

[96] 47 CFR 90.810, 90.814(b), 90.912.

[97] 47 CFR 90.810, 90.814(b), 90.912.

[98] *See Alvarez Letter 1999.*

[99] *See* 900 MHz Specialized Mobile Radio Service Spectrum Auction Closes: Winning Bidders Announced,'' *Public Notice,* 19 FCC Rcd. 3921 (WTB 2004).

[100] *See* ''Correction to Public Notice DA 96–586 'FCC Announces Winning Bidders in the Auction of 1020 Licenses to Provide 900 MHz SMR in Major Trading Areas,''' *Public Notice,* 18 FCC Rcd 18367 (WTB 1996).

[101] *See* ''Multi-Radio Service Auction Closes,'' *Public Notice,* 17 FCC Rcd 1446 (WTB 2002).

[102] *See* ''800 MHz Specialized Mobile Radio (SMR) Service General Category (851–854 MHz) and Upper Band (861–865 MHz) Auction Closes; Winning Bidders Announced,'' *Public Notice,* 15 FCC Rcd 17162 (2000).

[103] *See,* ''800 MHz SMR Service Lower 80 Channels Auction Closes; Winning Bidders Announced,'' *Public Notice,* 16 FCC Rcd 1736 (2000).

[104] *See generally* 13 CFR 121.201, NAICS code 517210.

[105] 13 CFR 121.201, NAICS code 517210 (2007 NAICS). The now-superseded, pre-2007 CFR citations were 13 CFR 121.201, NAICS codes 517211 and 517212 (referring to the 2002 NAICS).

[106] U.S. Census Bureau, 2007 Economic Census, Sector 51, 2007 NAICS code 517210 (rel. Oct. 20, 2009), *http://factfinder.census.gov/servlet/IBQTable?_bm=y&-geo_id=&-fds_name=EC0700A1&-_skip=700&-ds_name=EC0751SSSZ5&-_lang=en.*

[107] *Amendment of Part 90 of the Commission's Rules to Provide For the Use of the 220–222 MHz Band by the Private Land Mobile Radio Service, Third Report and Order, 12 FCC Rcd 10943, 11068–70 paras. 291–295 (1997).*

and controlling principals, has average gross revenues not exceeding $15 million for the preceding three years.[108] A ''very small business'' is defined as an entity that, together with its affiliates and controlling principals, has average gross revenues that do not exceed $3 million for the preceding three years.[109] The SBA has approved these small size standards.[110] Auctions of Phase II licenses commenced on and closed in 1998.[111] In the first auction, 908 licenses were auctioned in three different-sized geographic areas: three nationwide licenses, 30 Regional Economic Area Group (EAG) Licenses, and 875 Economic Area (EA) Licenses. Of the 908 licenses auctioned, 693 were sold.[112] Thirty-nine small businesses won 373 licenses in the first 220 MHz auction. A second auction included 225 licenses: 216 EA licenses and 9 EAG licenses. Fourteen companies claiming small business status won 158 licenses.[113] A third auction included four licenses: 2 BEA licenses and 2 EAG licenses in the 220 MHz Service. No small or very small business won any of these licenses.[114] In 2007, the Commission conducted a fourth auction of the 220 MHz licenses, designated as Auction 72.[115] Auction 72, which offered 94 Phase II 220 MHz Service licenses, concluded in 2007.[116] In this auction, five winning bidders won a total of 76 licenses. Two winning bidders identified themselves as very small businesses won 56 of the 76 licenses. One of the winning bidders that identified themselves as a small business won 5 of the 76 licenses won.

Private Land Mobile Radio (''PLMR''). PLMR systems serve an essential role in a range of industrial, business, land transportation, and public safety activities. These radios are used by companies of all sizes operating in all U.S. business categories, and are often used in support of the licensee's primary (non-telecommunications) business operations. For the purpose of determining whether a licensee of a PLMR system is a small business as defined by the SBA, we use the broad census category, Wireless Telecommunications Carriers (except Satellite). This definition provides that a small entity is any such entity employing no more than 1,500 persons.[117] The Commission does not require PLMR licensees to disclose information about number of employees, so the Commission does not have information that could be used to determine how many PLMR licensees constitute small entities under this definition. We note that PLMR licensees generally use the licensed facilities in support of other business activities, and therefore, it would also be helpful to assess PLMR licensees under the standards applied to the particular industry subsector to which the licensee belongs.[118]

As of March 2010, there were 424,162 PLMR licensees operating 921,909 transmitters in the PLMR bands below 512 MHz. We note that any entity engaged in a commercial activity is eligible to hold a PLMR license, and that any revised rules in this context could therefore potentially impact small entities covering a great variety of industries.

Fixed Microwave Services. Microwave services include common carrier,[119] private-operational fixed,[120] and broadcast auxiliary radio services.[121] They also include the Local Multipoint Distribution Service (''LMDS''),[122] the Digital Electronic Message Service (''DEMS''),[123] and the 24 GHz Service,[124] where licensees can choose between common carrier and non-common carrier status.[125] The Commission has not yet defined a small business with respect to microwave services. For purposes of this IRFA, the Commission will use the SBA's definition applicable to Wireless Telecommunications Carriers (except satellite)—*i.e.,* an entity with no more than 1,500 persons is considered small.[126] For the category of Wireless Telecommunications Carriers (except Satellite), Census data for 2007 shows that there were 1,383 firms that operated that year.[127] Of those 1,383, 1,368 had fewer than 100 employees, and 15 firms had more than 100 employees. Thus under this category and the associated small business size standard, the majority of firms can be considered small. The Commission notes that the number of firms does not necessarily track the number of licensees. The Commission estimates that virtually all of the Fixed Microwave licensees (excluding broadcast auxiliary licensees) would qualify as small entities under the SBA definition.

39 GHz Service. The Commission adopted small business size standards for 39 GHz licenses. A ''small business'' is defined as an entity that, together with its affiliates and controlling principals, has average gross revenues not exceeding $40 million in the preceding three years.[128] A ''very small business'' is defined as an entity that, together with its affiliates and controlling principals, has average gross revenues of not more than $15 million for the preceding three years.[129] The SBA has approved these small business size standards.[130] In 2000, the Commission conducted an auction of 2,173 39 GHz licenses. A total of 18 bidders who claimed small or very small business status won 849 licenses.

Local Multipoint Distribution Service. Local Multipoint Distribution Service (''LMDS'') is a fixed broadband point-to-multipoint microwave service that provides for two-way video

[108] *Id.* at 11068 para. 291.

[109] *Id.*

[110] *See* Letter to Daniel Phythyon, Chief, Wireless Telecommunications Bureau, Federal Communications Commission, from Aida Alvarez, Administrator, Small Business Administration, dated January 6, 1998 (*Alvarez to Phythyon Letter 1998*).

[111] *See generally 220 MHz Service Auction Closes,* Public Notice, 14 FCC Rcd 605 (WTB 1998).

[112] *See FCC Announces It is Prepared to Grant 654 Phase II 220 MHz Licenses After Final Payment is Made,* Public Notice, 14 FCC Rcd 1085 (WTB 1999).

[113] See Phase II 220 MHz Service Spectrum Auction Closes, Public Notice, 14 FCC Rcd 11218 (WTB 1999).

[114] *See Multi-Radio Service Auction Closes,* Public Notice, 17 FCC Rcd 1446 (WTB 2002).

[115] *See* ''Auction of Phase II 220 MHz Service Spectrum Scheduled for June 20, 2007, Notice and Filing Requirements, Minimum Opening Bids, Upfront Payments and Other Procedures for Auction 72, *Public Notice,* 22 FCC Rcd 3404 (2007).

[116] *See Auction of Phase II 220 MHz Service Spectrum Licenses Closes, Winning Bidders Announced for Auction 72, Down Payments due July 18, 2007, FCC Forms 601 and 602 due July 18, 2007, Final Payments due August 1, 2007, Ten-Day Petition to Deny Period,* Public Notice, 22 FCC Rcd 11573 (2007).

[117] *See* 13 CFR 121.201, NAICS code 517210.

[118] *See generally* 13 CFR 121.201.

[119] See 47 CFR part 101, subparts C and I.

[120] *See id.* subparts C and H.

[121] Auxiliary Microwave Service is governed by part 74 of Title 47 of the Commission's rules. *See* 47 CFR part 74. Available to licensees of broadcast stations and to broadcast and cable network entities, broadcast auxiliary microwave stations are used for relaying broadcast television signals from the studio to the transmitter, or between two points such as a main studio and an auxiliary studio. The service also includes mobile TV pickups, which relay signals from a remote location back to the studio.

[122] *See* 47 CFR part 101, subpart L.

[123] *See id.* Subpart G.

[124] *See id.*

[125] *See* 47 CFR 101.533, 101.1017.

[126] 13 CFR 121.201, NAICS code 517210.

[127] U.S. Census Bureau, 2007 Economic Census, Sector 51, 2007 NAICS code 517210 (rel. Oct. 20, 2009), *http://factfinder.census.gov/servlet/IBQTable?_bm=y&-geo_id=&-fds_name=EC0700A1&-_skip=700&-ds_name=EC0751SSSZ5&-_lang=en.*

[128] *See Amendment of the Commission's Rules Regarding the 37.0–38.6 GHz and 38.6–40.0 GHz Bands,* ET Docket No. 95–183, Report and Order, 12 FCC Rcd 18600 (1997).

[129] *Id.*

[130] *See* Letter from Aida Alvarez, Administrator, SBA, to Kathleen O'Brien Ham, Chief, Auctions and Industry Analysis Division, WTB, FCC (Feb. 4, 1998); *see* Letter from Hector Barreto, Administrator, SBA, to Margaret Wiener, Chief, Auctions and Industry Analysis Division, WTB, FCC (Jan. 18, 2002).

telecommunications.[131] The Commission established a small business size standard for LMDS licenses as an entity that has average gross revenues of less than $40 million in the three previous years.[132] An additional small business size standard for ''very small business'' was added as an entity that, together with its affiliates, has average gross revenues of not more than $15 million for the preceding three years.[133] The SBA has approved these small business size standards in the context of LMDS auctions.[134] There were 93 winning bidders that qualified as small entities in the LMDS auctions. A total of 93 small and very small business bidders won approximately 277 A Block licenses and 387 B Block licenses. In 1999, the Commission re-auctioned 161 licenses; there were 32 small and very small businesses winning that won 119 licenses.

218–219 MHz Service. The first auction of 218–219 MHz Service (previously referred to as the Interactive and Video Data Service or IVDS) licenses resulted in 170 entities winning licenses for 594 Metropolitan Statistical Areas (''MSAs'').[135] Of the 594 licenses, 557 were won by 167 entities qualifying as a small business. For that auction, the Commission defined a small business as an entity that, together with its affiliates, has no more than a $6 million net worth and, after federal income taxes (excluding any carry over losses), has no more than $2 million in annual profits each year for the previous two years.[136] In the *218–219 MHz Report and Order and Memorandum Opinion and Order,* the Commission revised its small business size standards for the 218–219 MHz Service and defined a small business as an entity that, together with its affiliates and persons or entities that hold interests in such an entity and their affiliates, has average annual gross revenues not exceeding $15 million for the preceding three years.[137] The Commission defined a ''very small business'' as an entity that, together with its affiliates and persons or entities that hold interests in such an entity and its affiliates, has average annual gross revenues not exceeding $3 million for the preceding three years.[138] The SBA has approved these definitions.[139]

Location and Monitoring Service (''LMS''). Multilateration LMS systems use non-voice radio techniques to determine the location and status of mobile radio units. For auctions of LMS licenses, the Commission has defined a ''small business'' as an entity that, together with controlling interests and affiliates, has average annual gross revenues for the preceding three years not exceeding $15 million.[140] A ''very small business'' is defined as an entity that, together with controlling interests and affiliates, has average annual gross revenues for the preceding three years not exceeding $3 million.[141] These definitions have been approved by the SBA.[142] An auction of LMS licenses was conducted in 1999. Of the 528 licenses auctioned, 289 licenses were sold to four small businesses.

Rural Radiotelephone Service. The Commission has not adopted a size standard for small businesses specific to the Rural Radiotelephone Service.[143] A significant subset of the Rural Radiotelephone Service is the Basic Exchange Telephone Radio System (''BETRS'').[144] For purposes of its analysis of the Rural Radiotelephone Service, the Commission uses the SBA small business size standard for the category Wireless Telecommunications Carriers (except satellite),'' which is 1,500 or fewer employees.[145] Census data for 2007 shows that there were 1,383 firms that operated that year.[146] Of those 1,383, 1,368 had fewer than 100 employees, and 15 firms had more than 100 employees. Thus under this category and the associated small business size standard, the majority of firms in the Rural Radiotelephone Service can be considered small.

Air-Ground Radiotelephone Service.[147] The Commission has previously used the SBA's small business definition applicable to Wireless Telecommunications Carriers (except Satellite), *i.e.,* an entity employing no more than 1,500 persons.[148] There are approximately 100 licensees in the Air-Ground Radiotelephone Service, and under that definition, we estimate that almost all of them qualify as small entities under the SBA definition. For purposes of assigning Air-Ground Radiotelephone Service licenses through competitive bidding, the Commission has defined ''small business'' as an entity that, together with controlling interests and affiliates, has average annual gross revenues for the preceding three years not exceeding $40 million.[149] A ''very small business'' is defined as an entity that, together with controlling interests and affiliates, has average annual gross revenues for the preceding three years not exceeding $15 million.[150] These definitions were approved by the SBA.[151] In 2006, the Commission completed an auction of nationwide commercial Air-Ground Radiotelephone Service licenses in the 800 MHz band (Auction 65). The auction closed with two winning bidders winning two Air-Ground Radiotelephone Services licenses. Neither of the winning bidders claimed small business status.

Aviation and Marine Radio Services. Small businesses in the aviation and marine radio services use a very high frequency (''VHF'') marine or aircraft radio and, as appropriate, an emergency position-indicating radio beacon (and/or radar) or an emergency locator

[131] *See* Rulemaking to Amend parts 1, 2, 21, 25, of the Commission's rules to Redesignate the 27.5–29.5 GHz Frequency Band, Reallocate the 29.5–30.5 Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services, *CC Docket No. 92–297, Second Report and Order, Order on Reconsideration, and Fifth Notice of Proposed Rule Making, 12 FCC Rcd 12545, 12689–90*, para. 348 (1997) (''*LMDS Second Report and Order*'').

[132] *See LMDS Second Report and Order, 12 FCC Rcd at 12689–90*, para. 348.

[133] *See id.*

[134] *See Alvarez to Phythyon Letter 1998.*

[135] See ''*Interactive Video and Data Service (IVDS) Applications Accepted for Filing,''* Public Notice, 9 FCC Rcd 6227 (1994).

[136] *Implementation of Section 309(j) of the Communications Act—Competitive Bidding,* Fourth Report and Order, 9 FCC Rcd 2330 (1994).

[137] *Amendment of part 95 of the Commission's rules to Provide Regulatory Flexibility in the 218–219 MHz Service,* Report and Order and Memorandum Opinion and Order, 15 FCC Rcd 1497 (1999).

[138] *Id.*

[139] *See Alvarez to Phythyon Letter 1998.*

[140] *Amendment of part 90 of the Commission's rules to Adopt Regulations for Automatic Vehicle Monitoring Systems,* Second Report and Order, 13 FCC Rcd 15182, 15192, para. 20 (1998) (''*Automatic Vehicle Monitoring Systems Second Report and Order*''); *see also* 47 CFR 90.1103.

[141] *Automatic Vehicle Monitoring Systems Second Report and Order,* 13 FCC Rcd at 15192, para. 20; *see* also 47 CFR 90.1103.

[142] *See Alvarez Letter 1998.*

[143] The service is defined in § 22.99 of the Commission's rules.

[144] BETRS is defined in §§ 22.757 and 22.759 of the Commission's rules.

[145] 13 CFR 121.201, NAICS code 517210.

[146] U.S. Census Bureau, 2007 Economic Census, Sector 51, 2007 NAICS code 517210 (rel. Oct. 20, 2009), *http://factfinder.census.gov/servlet/IBQTable?_bm=y&-geo_id=&-fds_name=EC0700A1&-_skip=700&-ds_name=EC0751SSSZ5&-_lang=en.*

[147] The service is defined in § 22.99 of the Commission's rules.

[148] 13 CFR 121.201, NAICS codes 517210.

[149] *Amendment of part 22 of the Commission's Rules to Benefit the Consumers of Air-Ground Telecommunications Services, Biennial Regulatory Review—Amendment of parts 1, 22, and 90 of the Commission's Rules, Amendment of parts 1 and 22 of the Commission's rules to Adopt Competitive Bidding Rules for Commercial and General Aviation Air-Ground Radiotelephone Service,* WT Docket Nos. 03–103 and 05–42, Order on Reconsideration and Report and Order, 20 FCC Rcd 19663, paras. 28–42 (2005).

[150] *Id.*

[151] *See* Letter from Hector V. Barreto, Administrator, SBA, to Gary D. Michaels, Deputy Chief, Auctions and Spectrum Access Division, WTB, FCC (Sept. 19, 2005).

transmitter. The Commission has not developed a small business size standard specifically applicable to these small businesses. For purposes of this analysis, the Commission uses the SBA small business size standard for the category Wireless Telecommunications Carriers (except satellite),'' which is 1,500 or fewer employees.[152] Census data for 2007 shows that there were 1,383 firms that operated that year.[153] Of those 1,383, 1,368 had fewer than 100 employees, and 15 firms had more than 100 employees. Thus under this category and the associated small business size standard, the majority of firms can be considered small.

Offshore Radiotelephone Service. This service operates on several UHF television broadcast channels that are not used for television broadcasting in the coastal areas of states bordering the Gulf of Mexico.[154] There are presently approximately 55 licensees in this service. The Commission is unable to estimate at this time the number of licensees that would qualify as small under the SBA's small business size standard for the category of Wireless Telecommunications Carriers (except Satellite) under that standard.[155] Under that SBA small business size standard, a business is small if it has 1,500 or fewer employees.[156] Census data for 2007 shows that there were 1,383 firms that operated that year.[157] Of those 1,383, 1,368 had fewer than 100 employees, and 15 firms had more than 100 employees. Thus under this category and the associated small business size standard, the majority of firms can be considered small.

Multiple Address Systems (''MAS''). Entities using MAS spectrum, in general, fall into two categories: (1) Those using the spectrum for profit-based uses, and (2) those using the spectrum for private internal uses. The Commission defines a small business for MAS licenses as an entity that has average gross revenues of less than $15 million in the preceding three years.[158] A very small business is defined as an entity that, together with its affiliates, has average gross revenues of not more than $3 million for the preceding three years.[159] The SBA has approved these definitions.[160] The majority of these entities will most likely be licensed in bands where the Commission has implemented a geographic area licensing approach that would require the use of competitive bidding procedures to resolve mutually exclusive applications. The Commission's licensing database indicates that, as of March 5, 2010, there were over 11,500 MAS station authorizations. In 2001, an auction of 5,104 MAS licenses in 176 EAs was conducted.[161] Seven winning bidders claimed status as small or very small businesses and won 611 licenses. In 2005, the Commission completed an auction (Auction 59) of 4,226 MAS licenses in the Fixed Microwave Services from the 928/959 and 932/941 MHz bands. Twenty-six winning bidders won a total of 2,323 licenses. Of the 26 winning bidders in this auction, five claimed small business status and won 1,891 licenses.

With respect to entities that use, or seek to use, MAS spectrum to accommodate internal communications needs, we note that MAS serves an essential role in a range of industrial, safety, business, and land transportation activities. MAS radios are used by companies of all sizes, operating in virtually all U.S. business categories, and by all types of public safety entities. For the majority of private internal users, the small business size standard developed by the SBA would be more appropriate. The applicable size standard in this instance appears to be that of Wireless Telecommunications Carriers (except Satellite). This definition provides that a small entity is any such entity employing no more than 1,500 persons.[162] The Commission's licensing database indicates that, as of January 20, 1999, of the 8,670 total MAS station authorizations, 8,410 authorizations were for private radio service, and of these, 1,433 were for private land mobile radio service.

1.4 GHz Band Licensees. The Commission conducted an auction of 64 1.4 GHz band licenses in the paired 1392–1395 MHz and 1432–1435 MHz bands, and in the unpaired 1390–1392 MHz band in 2007.[163] For these licenses, the Commission defined ''small business'' as an entity that, together with its affiliates and controlling interests, had average gross revenues not exceeding $40 million for the preceding three years, and a ''very small business'' as an entity that, together with its affiliates and controlling interests, has had average annual gross revenues not exceeding $15 million for the preceding three years.[164] Neither of the two winning bidders claimed small business status.[165]

Incumbent 24 GHz Licensees. This analysis may affect incumbent licensees who were relocated to the 24 GHz band from the 18 GHz band, and applicants who wish to provide services in the 24 GHz band. For this service, the Commission uses the SBA small business size standard for the category ''Wireless Telecommunications Carriers (except satellite),'' which is 1,500 or fewer employees.[166] To gauge small business prevalence for these cable services we must, however, use the most current census data. Census data for 2007 shows that there were 1,383 firms that operated that year.[167] Of those 1,383, 1,368 had fewer than 100 employees, and 15 firms had more than 100 employees. Thus under this category and the associated small business size standard, the majority of firms can be considered small. The Commission notes that the Census' use of the classifications ''firms'' does not track the number of ''licenses''. The Commission believes that there are only two licensees in the 24 GHz band that were relocated from the 18 GHz band, Teligent [168] and TRW, Inc. It is our understanding that Teligent and its related companies have less than 1,500 employees, though this may change in the future. TRW is not a small entity. Thus, only one incumbent licensee in

[152] 13 CFR 121.201, NAICS code 517210.

[153] U.S. Census Bureau, 2007 Economic Census, Sector 51, 2007 NAICS code 517210 (rel. Oct. 20, 2009), *http://factfinder.census.gov/servlet/IBQTable?_bm=y&-geo_id=&-fds_name=EC0700A1&-_skip=700&-ds_name=EC0751SSSZ5&-_lang=en.*

[154] This service is governed by subpart I of part 22 of the Commission's rules. *See* 47 CFR 22.1001–22.1037.

[155] 13 CFR 121.201, NAICS code 517210.

[156] *Id.*

[157] U.S. Census Bureau, 2007 Economic Census, Sector 51, 2007 NAICS code 517210 (rel. Oct. 20, 2009), *http://factfinder.census.gov/servlet/IBQTable?_bm=y&-geo_id=&-fds_name=EC0700A1&-_skip=700&-ds_name=EC0751SSSZ5&-_lang=en.*

[158] *See Amendment of the Commission's rules Regarding Multiple Address Systems,* Report and Order, 15 FCC Rcd 11956, 12008, para. 123 (2000).

[159] *Id.*

[160] *See Alvarez Letter 1999.*

[161] *See* ''*Multiple Address Systems Spectrum Auction Closes,*'' Public Notice, 16 FCC Rcd 21011 (2001).

[162] *See* 13 CFR 121.201, NAICS code 517210.

[163] *See* ''*Auction of 1.4 GHz Band Licenses Scheduled for February 7, 2007,*'' Public Notice, 21 FCC Rcd 12393 (WTB 2006); ''*Auction of 1.4 GHz Band Licenses Closes; Winning Bidders Announced for Auction No. 69,*'' Public Notice, 22 FCC Rcd 4714 (2007) (''Auction No. 69 Closing PN'').

[164] *Auction No. 69 Closing PN,* Attachment C.

[165] See Auction No. 69 Closing PN.

[166] 13 CFR 121.201, NAICS code 517210.

[167] U.S. Census Bureau, 2007 Economic Census, Sector 51, 2007 NAICS code 517210 (rel. Oct. 20, 2009), *http://factfinder.census.gov/servlet/IBQTable?_bm=y&-geo_id=&-fds_name=EC0700A1&-_skip=700&-ds_name=EC0751SSSZ5&-_lang=en.*

[168] Teligent acquired the DEMS licenses of FirstMark, the only licensee other than TRW in the 24 GHz band whose license has been modified to require relocation to the 24 GHz band.

the 24 GHz band is a small business entity.

Future 24 GHz Licensees. With respect to new applicants for licenses in the 24 GHz band, for the purpose of determining eligibility for bidding credits, the Commission established three small business definitions. An ''entrepreneur'' is defined as an entity that, together with controlling interests and affiliates, has average annual gross revenues for the three preceding years not exceeding $40 million.[169] A ''small business'' is defined as an entity that, together with controlling interests and affiliates, has average annual gross revenues for the three preceding years not exceeding $15 million.[170] A ''very small business'' in the 24 GHz band is defined as an entity that, together with controlling interests and affiliates, has average gross revenues not exceeding $3 million for the preceding three years.[171] The SBA has approved these small business size standards.[172] In a 2004 auction of 24 GHz licenses, three winning bidders won seven licenses.[173] Two of the winning bidders were very small businesses that won five licenses.

Broadband Radio Service and Educational Broadband Service. Broadband Radio Service systems, previously referred to as Multipoint Distribution Service (''MDS'') and Multichannel Multipoint Distribution Service (''MMDS'') systems, and ''wireless cable,'' transmit video programming to subscribers and provide two-way high speed data operations using the microwave frequencies of the Broadband Radio Service (''BRS'') and Educational Broadband Service (''EBS'') (previously referred to as the Instructional Television Fixed Service (''ITFS'').[174] In connection with the 1996 BRS auction, the Commission established a small business size standard as an entity that had annual average gross revenues of no more than $40 million in the previous three years.[175] The BRS auctions resulted in 67 successful bidders obtaining licensing opportunities for 493 Basic Trading Areas (''BTAs''). Of the 67 auction winners, 61 met the definition of a small business. BRS also includes licensees of stations authorized prior to the auction. At this time, we estimate that of the 61 small business BRS auction winners, 48 remain small business licensees. In addition to the 48 small businesses that hold BTA authorizations, there are approximately 392 incumbent BRS licensees that are considered small entities.[176] After adding the number of small business auction licensees to the number of incumbent licensees not already counted, we find that there are currently approximately 440 BRS licensees that are defined as small businesses under either the SBA or the Commission's rules. In 2009, the Commission conducted Auction 86, the sale of 78 licenses in the BRS areas.[177] The Commission offered three levels of bidding credits: (i) A bidder with attributed average annual gross revenues that exceed $15 million and do not exceed $40 million for the preceding three years (small business) will receive a 15 percent discount on its winning bid; (ii) a bidder with attributed average annual gross revenues that exceed $3 million and do not exceed $15 million for the preceding three years (very small business) will receive a 25 percent discount on its winning bid; and (iii) a bidder with attributed average annual gross revenues that do not exceed $3 million for the preceding three years (entrepreneur) will receive a 35 percent discount on its winning bid.[178] Auction 86 concluded in 2009 with the sale of 61 licenses.[179] Of the ten winning bidders, two bidders that claimed small business status won 4 licenses; one bidder that claimed very small business status won three licenses; and two bidders that claimed entrepreneur status won six licenses.

In addition, the SBA's Cable Television Distribution Services small business size standard is applicable to EBS. There are presently 2,032 EBS licensees. All but 100 of these licenses are held by educational institutions. Educational institutions are included in this analysis as small entities.[180] Thus, we estimate that at least 1,932 licensees are small businesses. Since 2007, Cable Television Distribution Services have been defined within the broad economic census category of Wired Telecommunications Carriers; that category is defined as follows: ''This industry comprises establishments primarily engaged in operating and/or providing access to transmission facilities and infrastructure that they own and/or lease for the transmission of voice, data, text, sound, and video using wired telecommunications networks. Transmission facilities may be based on a single technology or a combination of technologies.'' [181] For these services, the Commission uses the SBA small business size standard for the category ''Wireless Telecommunications Carriers (except satellite),'' which is 1,500 or fewer employees.[182] To gauge small business prevalence for these cable services we must, however, use the most current census data. According to Census Bureau data for 2007, there were a total of 955 firms in this previous category that operated for the entire year.[183] Of this total, 939 firms employed 999 or fewer employees, and 16 firms employed 1,000 employees or more.[184] Thus, the majority of these firms can be considered small.

Television Broadcasting. This Economic Census category ''comprises establishments primarily engaged in broadcasting images together with sound. These establishments operate television broadcasting studios and facilities for the programming and transmission of programs to the

[169] *Amendments to parts 1, 2, 87 and 101 of the Commission's rules To License Fixed Services at 24 GHz,* Report and Order, 15 FCC Rcd 16934, 16967 para. 77 (2000) (''24 GHz Report and Order''); *see also* 47 CFR 101.538(a)(3).

[170] *24 GHz Report and Order,* 15 FCC Rcd at 16967 para. 77 ; *see also* 47 CFR 101.538(a)(2).

[171] 24 GHz Report and Order, 15 FCC Rcd at 16967 para. 77; *see also* 47 CFR 101.538(a)(1).

[172] *See* Letter to Margaret W. Wiener, Deputy Chief, Auctions and Industry Analysis Division, Wireless Telecommunications Bureau, FCC, from Gary M. Jackson, Assistant Administrator, SBA (July 28, 2000).

[173] Auction of 24 GHz Service Spectrum Auction Closes, Winning Bidders Announced for Auction 56, Down Payments Due August 16, 2004, Final Payments Due August 30, 2004, Ten-Day Petition to Deny Period, Public Notice, 19 FCC Rcd 14738 (2004).

[174] *Amendment of parts 21 and 74 of the Commission's Rules with Regard to Filing Procedures in the Multipoint Distribution Service and in the Instructional Television Fixed Service and Implementation of Section 309(j) of the Communications Act—Competitive Bidding,* MM Docket No. 94–131, PP Docket No. 93–253, Report and Order, 10 FCC Rcd 9589, 9593 para 7 (1995).

[175] 47 CFR 21.961(b)(1).

[176] 47 U.S.C. 309(j). Hundreds of stations were licensed to incumbent MDS licensees prior to implementation of section 309(j) of the Communications Act of 1934, 47 U.S.C. 309(j). For these pre-auction licenses, the applicable standard is SBA's small business size standard of 1500 or fewer employees.

[177] *Auction of Broadband Radio Service (BRS) Licenses, Scheduled for October 27, 2009, Notice and Filing Requirements, Minimum Opening Bids, Upfront Payments, and Other Procedures for Auction 86,* Public Notice, 24 FCC Rcd 8277 (2009).

[178] *Id.* at 8296.

[179] *Auction of Broadband Radio Service Licenses Closes, Winning Bidders Announced for Auction 86, Down Payments Due November 23, 2009, Final Payments Due December 8, 2009, Ten-Day Petition to Deny Period,* Public Notice, 24 FCC Rcd 13572 (2009).

[180] The term ''small entity'' within SBREFA applies to small organizations (nonprofits) and to small governmental jurisdictions (cities, counties, towns, townships, villages, school districts, and special districts with populations of less than 50,000). 5 U.S.C. 601(4)–(6). We do not collect annual revenue data on EBS licensees.

[181] U.S. Census Bureau, 2007 NAICS Definitions, 517110 Wired Telecommunications Carriers, (partial definition), *www.census.gov/naics/2007/def/ND517110.HTM#N517110.*

[182] 13 CFR 121.201, NAICS code 517210.

[183] U.S. Census Bureau, 2007 Economic Census, Subject Series: Information, Table 5, Employment Size of Firms for the United States: 2007, NAICS code 5171102 (issued November 2010).

[184] *Id.*

public.'' [185] The SBA has created the following small business size standard for Television Broadcasting firms: Those having $14 million or less in annual receipts.[186] The Commission has estimated the number of licensed commercial television stations to be 1,387.[187] In addition, according to Commission staff review of the BIA Advisory Services, LLC's *Media Access Pro Television Database* on March 28, 2012, about 950 of an estimated 1,300 commercial television stations (or approximately 73 percent) had revenues of $14 million or less.[188] We therefore estimate that the majority of commercial television broadcasters are small entities.

We note, however, that in assessing whether a business concern qualifies as small under the above definition, business (control) affiliations [189] must be included. Our estimate, therefore, likely overstates the number of small entities that might be affected by our action because the revenue figure on which it is based does not include or aggregate revenues from affiliated companies. In addition, an element of the definition of ''small business'' is that the entity not be dominant in its field of operation. We are unable at this time to define or quantify the criteria that would establish whether a specific television station is dominant in its field of operation. Accordingly, the estimate of small businesses to which rules may apply does not exclude any television station from the definition of a small business on this basis and is therefore possibly over-inclusive to that extent.

In addition, the Commission has estimated the number of licensed noncommercial educational (NCE) television stations to be 396.[190] These stations are non-profit, and therefore considered to be small entities.[191]

In addition, there are also 2,528 low power television stations, including Class A stations (LPTV).[192] Given the nature of these services, we will presume that all LPTV licensees qualify as small entities under the above SBA small business size standard.

Radio Broadcasting. This Economic Census category ''comprises establishments primarily engaged in broadcasting aural programs by radio to the public. Programming may originate in their own studio, from an affiliated network, or from external sources.'' [193] The SBA has established a small business size standard for this category, which is: Such firms having $7 million or less in annual receipts.[194] According to Commission staff review of BIA Advisory Services, LLC's *Media Access Pro Radio Database* on March 28, 2012, about 10,759 (97%) of 11,102 commercial radio stations had revenues of $7 million or less. Therefore, the majority of such entities are small entities.

We note, however, that in assessing whether a business concern qualifies as small under the above size standard, business affiliations must be included.[195] In addition, to be determined to be a ''small business,'' the entity may not be dominant in its field of operation.[196] We note that it is difficult at times to assess these criteria in the context of media entities, and our estimate of small businesses may therefore be over-inclusive.

Auxiliary, Special Broadcast and Other Program Distribution Services. This service involves a variety of transmitters, generally used to relay broadcast programming to the public (through translator and booster stations) or within the program distribution chain (from a remote news gathering unit back to the station). The Commission has not developed a definition of small entities applicable to broadcast auxiliary licensees. The applicable definitions of small entities are those, noted previously, under the SBA rules applicable to radio broadcasting stations and television broadcasting stations.[197]

The Commission estimates that there are approximately 6,099 FM translators and boosters.[198] The Commission does not collect financial information on any broadcast facility, and the Department of Commerce does not collect financial information on these auxiliary broadcast facilities. We believe that most, if not all, of these auxiliary facilities could be classified as small businesses by themselves. We also recognize that most commercial translators and boosters are owned by a parent station which, in some cases, would be covered by the revenue definition of small business entity discussed above. These stations would likely have annual revenues that exceed the SBA maximum to be designated as a small business ($7.0 million for a radio station or $14.0 million for a TV station). Furthermore, they do not meet the Small Business Act's definition of a ''small business concern'' because they are not independently owned and operated.[199]

Multichannel Video Distribution and Data Service. MVDDS is a terrestrial fixed microwave service operating in the 12.2–12.7 GHz band. The Commission adopted criteria for defining three groups of small businesses for purposes of determining their eligibility for special provisions such as bidding credits. It defines a very small business as an entity with average annual gross revenues not exceeding $3 million for the preceding three years; a small business as an entity with average annual gross revenues not exceeding $15 million for the preceding three years; and an entrepreneur as an entity with average annual gross revenues not exceeding $40 million for the preceding three years.[200] These definitions were approved by the SBA.[201] On January 27, 2004, the Commission completed an auction of 214 MVDDS licenses (Auction No. 53). In this auction, ten

[185] U.S. Census Bureau, 2007 NAICS Definitions, ''515120 Television Broadcasting'' (partial definition); *http://www.census.gov/naics/2007/def/ND515120.HTM#N515120.*

[186] 13 CFR 121.201, NAICS code 515120 (updated for inflation in 2010).

[187] *See FCC News Release,* ''Broadcast Station Totals as of December 31, 2011,'' dated January 6, 2012; *http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC–311837A1.pdf.*

[188] We recognize that BIA's estimate differs slightly from the FCC total given *supra.*

[189] ''[Business concerns] are affiliates of each other when one concern controls or has the power to control the other or a third party or parties controls or has to power to control both.'' 13 CFR 21.103(a)(1).

[190] *See FCC News Release,* ''Broadcast Station Totals as of December 31, 2011,'' dated January 6, 2012; *http://transition.fcc.gov/Daily_Releases/Daily_Business/2012/db0106/DOC–311837A1.pdf.*

[191] *See generally* 5 U.S.C. 601(4), (6).

[192] See *FCC News Release,* ''Broadcast Station Totals as of December 31, 2011,'' dated January 6, 2012; *http://transition.fcc.gov/Daily_Releases/Daily_Business/2012/db0106/DOC–311837A1.pdf.*

[193] U.S. Census Bureau, 2007 NAICS Definitions, ''515112 Radio Stations''; *http://www.census.gov/naics/2007/def/ND515112.HTM#N515112.*

[194] 13 CFR 121.201, NAICS code 515112 (updated for inflation in 2010).

[195] ''Concerns and entities are affiliates of each other when one controls or has the power to control the other, or a third party or parties controls or has the power to control both. It does not matter whether control is exercised, so long as the power to control exists.'' 13 CFR 121.103(a)(1) (an SBA regulation).

[196] 13 CFR 121.102(b) (an SBA regulation).

[197] 13 CFR 121.201, NAICS codes 515112 and 515120.

[198] *See FCC News Release,* ''Broadcast Station Totals as of December 31, 2011,'' dated January 6, 2012; *http://transition.fcc.gov/Daily_Releases/Daily_Business/2012/db0106/DOC–311837A1.pdf.*

[199] *See* 15 U.S.C. 632.

[200] *Amendment of parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range; Amendment of the Commission's rules to Authorize Subsidiary Terrestrial Use of the 12.2–12.7 GHz Band by Direct Broadcast Satellite Licenses and their Affiliates; and Applications of Broadwave USA, PDC Broadband Corporation, and Satellite Receivers, Ltd. to provide A Fixed Service in the 12.2–12.7 GHz Band,* ET Docket No. 98–206, Memorandum Opinion and Order and Second Report and Order, 17 FCC Rcd 9614, 9711, para. 252 (2002).

[201] *See* Letter from Hector V. Barreto, Administrator, U.S. Small Business Administration, to Margaret W. Wiener, Chief, Auctions and Industry Analysis Division, WTB, FCC (Feb.13, 2002).

winning bidders won a total of 192 MVDDS licenses.[202] Eight of the ten winning bidders claimed small business status and won 144 of the licenses. The Commission also held an auction of MVDDS licenses on December 7, 2005 (Auction 63). Of the three winning bidders who won 22 licenses, two winning bidders, winning 21 of the licenses, claimed small business status.[203]

Amateur Radio Service. These licensees are held by individuals in a noncommercial capacity; these licensees are not small entities.

Personal Radio Services. Personal radio services provide short-range, low power radio for personal communications, radio signaling, and business communications not provided for in other services. The Personal Radio Services include spectrum licensed under part 95 of our rules.[204] These services include Citizen Band Radio Service (''CB''), General Mobile Radio Service (''GMRS''), Radio Control Radio Service (''R/C''), Family Radio Service (''FRS''), Wireless Medical Telemetry Service (''WMTS''), Medical Implant Communications Service (''MICS''), Low Power Radio Service (''LPRS''), and Multi-Use Radio Service (''MURS'').[205] There are a variety of methods used to license the spectrum in these rule parts, from licensing by rule, to conditioning operation on successful completion of a required test, to site-based licensing, to geographic area licensing. Under the RFA, the Commission is required to make a determination of which small entities are directly affected by the rules being proposed. Since all such entities are wireless, we apply the definition of Wireless Telecommunications Carriers (except Satellite), pursuant to which a small entity is defined as employing 1,500 or fewer persons.[206] Many of the licensees in these services are individuals, and thus are not small entities. In addition, due to the mostly unlicensed and shared nature of the spectrum utilized in many of these services, the Commission lacks direct information upon which to base an estimation of the number of small entities under an SBA definition that might be directly affected by our proposed actions.

Public Safety Radio Services. Public Safety radio services include police, fire, local government, forestry conservation, highway maintenance, and emergency medical services.[207] There are a total of approximately 127,540 licensees in these services. Governmental entities [208] as well as private businesses comprise the licensees for these services. All governmental entities with populations of less than 50,000 fall within the definition of a small entity.[209]

IMTS Resale Carriers. Providers of IMTS resale services are common carriers that purchase IMTS from other carriers and resell it to their own customers. Under that size standard, such a business is small if it has 1,500 or fewer employees.[210] Census data for 2007 show that 1,523 firms provided resale services during that year. Of that number, 1,522 operated with fewer than 1000 employees and one operated with more than 1,000.[211] Thus under this category and the associated small business size standard, the majority of these local resellers can be considered small entities. According to Commission data, 213 carriers have reported that they are engaged in the provision of local resale services.[212] Of these, an estimated 211 have 1,500 or fewer employees and two have more than 1,500 employees.[213] Consequently, the Commission estimates that the majority of IMTS resellers are small entities that may be affected by our proposed actions.

Wireless Carriers and Service Providers. Included among the providers of IMTS resale are a number of wireless carriers that also provide wireless telephony services domestically. The Commission classifies these entities as providers of Commercial Mobile Radio Services (CMRS). At present, most, if not all, providers of CMRS that offer IMTS provide such service by purchasing IMTS from other carriers to resell it to their customers. The Commission has not developed a size standard specifically for CMRS providers that offer resale IMTS. Such entities would fall within the larger category of wireless carriers and service providers. For those services subject to auctions, the Commission notes that, as a general matter, the number of winning bidders that qualify as small businesses at the close of an auction does not necessarily represent the number of small businesses currently in service. Also, the Commission does not generally track subsequent business size unless, in the context of assignments or transfers, unjust enrichment issues are implicated.

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

86. The proposals being made in this *Further Notice,* may require additional analysis and mitigation activities regarding compliance with our RF exposure limits for certain facilities, operations and transmitters, such as some wireless base stations, particularly those on rooftops, and some antennas at multiple transmitter sites. In other cases, current analytical requirements are being relaxed.

E. Steps Taken To Minimize Significant Economic Impact on Small Entities, and Significant Alternatives Considered

87. The RFA requires an agency to describe any significant alternatives that it has considered in reaching its proposed approach, which may include the following four alternatives (among others): (1) The establishment of

[202] *See* ''*Multichannel Video Distribution and Data Service Auction Closes,*'' Public Notice, 19 FCC Rcd 1834 (2004).

[203] See ''Auction of Multichannel Video Distribution and Data Service Licenses Closes; Winning Bidders Announced for Auction No. 63,'' Public Notice, 20 FCC Rcd 19807 (2005).

[204] 47 CFR part 90.

[205] The Citizens Band Radio Service, General Mobile Radio Service, Radio Control Radio Service, Family Radio Service, Wireless Medical Telemetry Service, Medical Implant Communications Service, Low Power Radio Service, and Multi-Use Radio Service are governed by subpart D, subpart A, subpart C, subpart B, subpart H, subpart I, subpart G, and subpart J, respectively, of part 95 of the Commission's rules. *See generally* 47 CFR part 95.

[206] 13 CFR 121.201, NAICS Code 517210.

[207] With the exception of the special emergency service, these services are governed by subpart B of part 90 of the Commission's rules, 47 CFR 90.15–90.27. The police service includes approximately 27,000 licensees that serve state, county, and municipal enforcement through telephony (voice), telegraphy (code) and teletype and facsimile (printed material). The fire radio service includes approximately 23,000 licensees comprised of private volunteer or professional fire companies as well as units under governmental control. The local government service is presently comprised of approximately 41,000 licensees that are state, county, or municipal entities that use the radio for official purposes not covered by other public safety services. There are approximately 7,000 licensees within the forestry service which is comprised of licensees from state departments of conservation and private forest organizations who set up communications networks among fire lookout towers and ground crews. The approximately 9,000 state and local governments are licensed for highway maintenance service to provide emergency and routine communications to aid other public safety services to keep main roads safe for vehicular traffic. The approximately 1,000 licensees in the Emergency Medical Radio Service (''EMRS'') use the 39 channels allocated to this service for emergency medical service communications related to the delivery of emergency medical treatment. 47 CFR 90.15–90.27. The approximately 20,000 licensees in the special emergency service include medical services, rescue organizations, veterinarians, handicapped persons, disaster relief organizations, school buses, beach patrols, establishments in isolated areas, communications standby facilities, and emergency repair of public communications facilities. 47 CFR 90.33–90.55.

[208] 47 CFR 1.1162.

[209] 5 U.S.C. 601(5).

[210] 13 CFR 121.201, NAICS code 517911.

[211] *http://factfinder.census.gov/servlet/IBQTable?_bm=y&-geo_id=&-_skip=800&-ds_name=EC0751SSSZ5&-_lang=en.*

[212] *See Trends in Telephone Service,* at tbl. 5.3.

[213] *Id.*

differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance or reporting requirements under the rule for small entities; (3) the use of performance, rather than design, standards; and (4) an exemption from coverage of the rule, or any part thereof, for small entities.[214] In this proceeding, our proposals are consistent with (2), in that our goal is making our RF rules more consistent and clarifying certain areas that have created confusion in the past. In addition, due to our revisions in our policy on categorical exclusions, we are providing exemptions from routine RF evaluation for many small entities that should reduce the overall impact on small entities (see number 4 above).

F. Federal Rules That May Duplicate, Overlap, or Conflict With the Proposed Rule

88. None.

Federal Communications Commission.

Marlene H. Dortch,

Secretary.

Proposed Rules

For the reasons set forth in the preamble the Federal Communications Commission proposes to amend 47 CFR parts 1, 2, 15, 24, 25, 27, 73, 90, 95, 97, and 101 as follows:

PART 1—PRACTICE AND PROCEDURE

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

Authority: 15 U.S.C. 79 *et seq.;* 47 U.S.C. 151, 154(i), 154(j), 155, 157, 225, 227, 303(r), and 309, Cable Landing License Act of 1921, 47 U.S.C. 35–39, and the Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. 112–96.

■ 2. Section 1.1307 is amended by revising paragraph (b) to read as follows:

§ 1.1307 Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared.

* * * * *

(b) In addition to the actions listed in paragraph (a) of this section, Commission actions granting or modifying construction permits, licenses or renewals thereof, temporary authorities, equipment authorizations, or any other authorizations for radiofrequency (RF) sources require the preparation of an Environmental Assessment (EA) if those RF sources would cause human exposure to levels of RF radiation in excess of the limits in § 1.1310 of this chapter. Applications to the Commission for construction permits, licenses or renewals thereof, temporary authorities, equipment authorizations, or any other authorizations requesting either approval or modification of RF sources must contain a statement confirming compliance by RF evaluation with the limits in § 1.1310 of this chapter unless those RF sources are exempt from such RF evaluation, as discussed below. Technical information showing the basis for compliance with the limits in § 1.1310 of this chapter, either by RF evaluation or exemption, must be submitted to the Commission upon request. Notwithstanding the above, in the event that RF sources cause human exposure to levels of RF radiation in excess of the limits in § 1.1310 of this chapter, such RF evaluations and exemptions are not deemed sufficient to show that there is no significant effect on the quality of the human environment or that the RF sources are categorically excluded from environmental processing.

(1) Evaluation of compliance with the exposure limits in § 1.1310 of this chapter is required only for RF sources not exempt from such evaluation. Evaluation of compliance with the exposure limits may be based on either computation or measurement in accordance with § 1.1310 of this chapter. Exemption from evaluation may be based on frequency, power, and separation distance. However, all single RF sources having less than an available maximum time-averaged power of 1 mW are exempt from evaluation, as specified in paragraph (b)(1)(iii) of this section. The ''available maximum time-averaged power'' for a fixed RF source is the maximum available power as averaged over any 30 minute time period, and for a mobile or portable RF source is the maximum available power as averaged over a period inherent from device transmission characteristics. Evaluation of compliance with the exposure limits in § 1.1310 of this chapter is necessary for single fixed, mobile, or portable RF sources above 1 mW and having an ERP greater than listed in Table 1 specified in paragraph (b)(1)(i) of this section or single fixed, mobile, or portable RF sources greater than the threshold P_{th} for separation distances between 0.5 cm and 20 cm (inclusive) or ERP_{20cm} for separation distances of at least 20 cm up to 40 cm as listed in paragraph (b)(1)(ii) of this section. Mobile devices, as defined in § 2.1091(b) of this chapter, and portable devices, as defined in § 2.1093(b) of this chapter, with multiple RF sources shall refer to §§ 2.1091(c) and 2.1093(c), respectively, for relevant exemption criteria. For the purposes of this section, a fixed RF source is defined as one that is physically secured at one location, even temporarily, and is not able to be easily moved to another location.

(i) Evaluation of compliance with the exposure limits in § 1.1310 of this chapter, and preparation of an EA if the limits are exceeded, is necessary for single RF sources either above an available maximum time-averaged power of 1 mW or above the ERP listed in Table 1 below, whichever is greater. The ERP, defined as the product of the maximum antenna gain and the maximum delivered time-averaged power summed over all polarizations, shall be used for comparison with the value calculated from the applicable formula in Table 1, where the term ''maximum antenna gain'' is the largest far-field total power gain relative to a dipole in any direction for all transverse polarization components and the term ''delivered maximum time-averaged power'' is the largest net power delivered or supplied to the antenna as averaged over any 30 minute time period for fixed sources and as averaged over a period inherent from device transmission characteristics for mobile and portable sources. The term ''separation distance,'' R in Table 1, is defined as the minimum distance in any direction from any part of the radiating structure of a transmitting antenna or antenna array to the body of a nearby person.

[214] 5 U.S.C. 603(c).

TABLE 1—SINGLE RF SOURCES SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION

Transmitter frequency (MHz)	Threshold ERP (watts)
Regardless of ERP, evaluation is required if the separation distance R is less than $\lambda/2\pi$ from the radiating structure, where λ is the free-space operating wavelength, unless the available maximum time-averaged power is less than one milliwatt. In addition, evaluation is required if the ERP in watts is greater than the value given by the formula below for the appropriate frequency, f, in MHz at the separation distance, R, in meters.	
0.3–1.34	ERP ≥ 1,920 R^2
1.34–30	ERP ≥ 3,450 R^2/f^2
30–300	ERP ≥ 3.83 R^2
300–1,500	ERP ≥ 0.0128 R^2f
1,500–100,000	ERP ≥ 19.2R^2

(ii) Evaluation of compliance with the exposure limits in § 1.1310 of this chapter is necessary for single RF sources not exempted by paragraph (b)(1)(i) of this section if either its available maximum time-averaged power or effective radiated power (ERP) is greater than the threshold P_{th} listed in the formula below, which shall only be used at distances from 0.5 to 20 centimeters and at frequencies from 0.3 to 6 GHz. For distances from 20 to 40 centimeters at frequencies from 0.3 to 6 GHz, evaluation of compliance with the exposure limits in § 1.1310 of this chapter is necessary if the ERP is greater than ERP_{20cm} in the formula below. If the ERP of a single RF source at distances from 0.5 to 40 centimeters and at frequencies from 0.3 to 6 GHz is not easily obtained, then the available maximum time-averaged power may be used (*i.e.,* without consideration of ERP) in comparison with the formula below only if the device antenna(s) or radiating structure(s) do not exceed the electrical length of $\lambda/4$.

P_{th} (mW) = ERP_{20cm} $(d/20\ cM)^x$

Where

$$x = -\log_{10}\left(\frac{60}{ERP_{20cm}\sqrt{f}}\right) \text{ and } f \text{ is in GHz;}$$

$$ERP_{20cm}\ (\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases}$$

d = the minimum separation distance in any direction from any part of the device antenna(s) or radiating structure(s) to the body of the device user.

(iii) In order for the 1 mW exemption criterion in paragraph (b)(1) of this section to apply, a separation distance of two centimeters is required between any portion of a radiating structure operating at less than 1 mW and the nearest portion of any other radiating structure in the same device.

(iv) A routine RF evaluation of compliance with the exposure limits in § 1.1310 of this chapter is necessary for single fixed RF sources that exceed the thresholds defined in paragraph (b)(1) introductory text, (b)(1)(i), or (b)(1)(ii) of this section. Multiple fixed RF sources require evaluation of compliance with the exposure limits in § 1.1310 of this chapter if the sum of the fractional contributions to the applicable ERP thresholds and the ambient exposure quotient (AEQ) is greater than or equal to 1 as indicated in the following equation:

$$\sum_{i=1}^{a}\frac{P_i}{P_{th,i}} + \frac{\sum_{j=1}^{b} SAR_j}{1.6\ \text{W/kg}} + \sum_{k=1}^{c}\frac{ERP_k}{ERP_{th,k}} + \text{AEQ} \ge 1$$

Where

a = number of fixed RF sources using paragraph (b)(1)(ii) of this section.

b = number of existing fixed RF sources with known SAR.

c = number of fixed RF sources using ERP, either according to (b)(1)(i) or (b)(1)(ii) of this section.

P_i = the available maximum time-averaged power or the ERP, whichever is greater, for RF source i.

$P_{th,i}$ = the threshold power according to the formula in (b)(1)(ii) of this section for RF source i.

SAR_j = the maximum SAR reported from the jth fixed RF source.

ERP_k = ERP of RF source k.

$ERP_{th,k}$ = exemption threshold ERP for RF source k, either according to (b)(1)(ii) of this section or (b)(1)(i) of this section, as applicable.

AEQ = the ambient exposure quotient (AEQ) for the general population/uncontrolled limit from an existing evaluation of exposure at the site from fixed sources not included in the summations. An AEQ less than 0.05 may be considered insignificant.

(v) Where applicable, for multiple mobile or portable RF sources within a device operating in the same time averaging period, evaluation is required if:

$$\sum_{i=1}^{a}\frac{P_i}{P_{th,i}}+\frac{\sum_{j=1}^{b}SAR_j}{1.6W/kg}+\sum_{k=1}^{c}\frac{ERP_k}{ERP_{th,k}}\geq 1$$

Where

a = number of mobile or portable transmitters that use P_{th}, including existing transmitters and those being added.

b = number of existing mobile or portable transmitters with known SAR.

c = number of mobile or portable transmitters using ERP, according to either (b)(1)(i) or (b)(1)(ii) of this section, including existing transmitters and those being added.

P_i = the available maximum time-averaged power or the ERP, whichever is greater, for mobile or portable transmitter i.

$P_{th,i}$ = the threshold power according to the formula in § 1.1307(b)(1)(ii) for mobile or portable transmitter i.

SAR_j = the maximum SAR reported for equipment certification from the jth mobile or portable transmitter in the device.

ERP_k = ERP of mobile or portable transmitter k.

$ERP_{th,k}$ = exemption threshold ERP for mobile or portable transmitter k, either according to (b)(1)(ii) of this section or (b)(1)(i) of this section, as applicable.

(vi) Unless otherwise specified in this chapter, any other single or multiple RF source(s) is exempt from routine environmental evaluation for RF exposure prior to authorization (licensing or equipment certification), except as specified in paragraphs (c) and (d) of this section.

(2) Specific mitigation actions are required for fixed RF sources in order to ensure compliance with our exposure limits, including the implementation of an RF safety plan, restriction of access to those RF sources, and disclosure of spatial regions where exposure limits are exceeded. For the purpose of this section, Category One described in paragraph (b)(2)(i) of this section is defined as compliant with the general population exposure limit in § 1.1310 of this chapter at any separation distance; Category Two described in paragraph (b)(2)(ii) of this section is defined as above the general population exposure limit but compliant with the occupational exposure limit in § 1.1310 of this chapter within its defined spatial region; Category Three described in paragraph (b)(2)(iii) of this section is defined as above the occupational exposure limit but no more than ten times the occupational exposure limit in § 1.1310 of this chapter within its defined spatial region; and Category Four described in paragraph (b)(2)(iv) of this section is defined as more than ten times the occupational exposure limit in § 1.1310 of this chapter within its defined spatial region.

(i) *Category One—INFORMATION.* No mitigation actions are required. Optionally a green ''INFORMATION'' sign may offer information to those persons who might be approaching RF sources. This optional sign should include at least the following information: appropriate signal word ''INFORMATION'' and associated color (green) in accord with section 5.8 of IEEE Std C95.2–1999, a specification of the RF source, contact information, and a reminder to obey all postings and boundaries.

(ii) *Category Two—NOTICE.* Mitigation actions are required in the form of signs and positive access control surrounding the areas in which the general population exposure limit is exceeded, with the appropriate signal word ''NOTICE'' and associated color (blue) on the signs. Signs must contain the components discussed in paragraph (b)(2)(v) of this section. Under certain controlled conditions, such as on a rooftop with limited access, a sign containing the components discussed in paragraph (b)(2)(v) of this section attached directly to the surface of an antenna will be considered a sufficient mitigation action if the sign specifies and is legible at the separation distance required for compliance with the general population exposure limit in § 1.1310 of this chapter. Appropriate training is required for any occupational personnel with access to controlled areas within restrictive barriers where the general population exposure limit is exceeded, and transient individuals must be supervised by trained personnel upon entering any of these areas. Use of time averaging is required for transient individuals in the area in which the general population exposure limit is exceeded to ensure compliance with the time-averaged general population exposure limit.

(iii) *Category Three—CAUTION.* In addition to the mitigation actions required within those areas designated as Category Two, further signs, controls, or indicators are required surrounding the area in which the occupational exposure limit is exceeded, with the appropriate signal word ''CAUTION'' and associated color (yellow) on the signs. If signs are used at the occupational exposure limit boundary, they must contain the components discussed in paragraph (b)(2)(v) of this section. If the boundaries between Category Two and Three are such that placement of both Category Two and Three signs would be in the same location, then the Category Two sign is optional. A label or small sign may be attached directly to the surface of an antenna within a controlled environment if it specifies a minimum approach distance where the occupational exposure limit is exceeded. If signs are not used at the occupational exposure limit boundary, controls or indicators (*e.g.,* chains, railings, contrasting paint, diagrams, *etc.*) must designate the spatial regions where the occupational exposure limit is exceeded. Transient individuals are not permitted in any area for any period of time in which the occupational exposure limit is exceeded. Further mitigation by reducing exposure time in accord with six minute time averaging is required for occupational personnel in the area in which the occupational exposure limit is exceeded. However, proper use of RF personal protective equipment may be considered sufficient in lieu of time averaging for occupational personnel in the areas in which the occupational exposure limit is exceeded.

(iv) *Category Four—WARNING/DANGER.* In addition to the mitigation actions required within those areas designated as Category Three, ''WARNING'' signs with the associated color (orange) are required where the occupational limit is exceeded by a factor of ten, and ''DANGER'' signs with the associated color (red) are required where immediate and serious injury will occur on contact. Signs must contain the components discussed in paragraph (b)(2)(v) of this section. If the boundaries between Category Three and Four are such that placement of both Category Three and Four signs would be in the same location, then the Category Three sign is optional. If power reduction, and therefore Category reduction, is not feasible, then lockout/tagout procedures in 29 CFR 1910.147 must be followed.

(v) *RF exposure advisory signs.* RF exposure advisory signs must include at least the following five components:

(A) Appropriate signal word and associated color {*i.e.,* ''DANGER'' (red),

''WARNING'' (orange), ''CAUTION,'' (yellow) ''NOTICE'' (blue)} in accord with IEEE Std C95.2–1999, ''IEEE Standard for Radio-Frequency Energy and Current-Flow Symbols,'' copyright 1999 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017

(B) RF energy advisory symbol (Figure A.3 of IEEE Std C95.2–1999)

(C) An explanation of the RF source

(D) Behavior necessary to comply with the exposure limits

(E) Contact information

(3) In general, when the exposure limits specified in § 1.1310 are exceeded in an accessible area due to the emissions from multiple fixed RF sources, actions necessary to bring the area into compliance or preparation of an Environmental Assessment as specified in § 1.1311 are the shared responsibility of all licensees whose RF sources produce, at the area in question, levels that exceed 5% of the applicable exposure limit. Field strengths must be squared to be proportional to SAR or power density. Specifically, these compliance requirements apply if the square of the electric or magnetic field strength exposure level applicable to a particular RF source exceeds 5% of the square of the electric or magnetic field strength limit at the area in question where the levels due to multiple fixed RF sources exceed the exposure limit. Site owners and managers are expected to allow applicants and licensees to take reasonable steps to comply with the requirements contained in § 1.1307(b) and, where feasible, should encourage co-location of RF sources and common solutions for controlling access to areas where the RF exposure limits contained in § 1.1310 might be exceeded. Additionally, applicants for proposed RF sources and applicants for renewal of licenses for RF sources shall inform other licensees at a site in question of evaluations indicating possible non-compliance with the exposure limits.

(i) Applicants for proposed RF sources that would cause non-compliance with the limits specified in § 1.1310 at an accessible area previously in compliance must submit an EA if emissions from the applicant's RF source would produce, at the area in question, levels that exceed 5% of the applicable exposure limit. Field strengths must be squared if necessary to be proportional to SAR or power density.

(ii) Renewal applicants whose RF sources would cause non-compliance with the limits specified in § 1.1310 at an accessible area previously in compliance must submit an EA if emissions from the applicant's RF source would produce, at the area in question, levels that exceed 5% of the applicable exposure limit. Field strengths must be squared if necessary to be proportional to SAR or power density.

* * * * *

■ 3. Section 1.1310 is revised to read as follows:

§ 1.1310 Radiofrequency radiation exposure limits.

(a) Specific absorption rate (SAR) shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in § 1.1307(b) within the frequency range of 100 kHz to 6 GHz (inclusive).

(b) The SAR limits for occupational/controlled exposure are 0.4 W/kg, as averaged over the whole body, and a peak spatial-average SAR of 8 W/kg, averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the parts of the human body treated as extremities, such as hands, wrists, feet, ankles, and pinnae, where the peak spatial-average SAR limit for occupational/controlled exposure is 20 W/kg, averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). Exposure may be averaged over a time period not to exceed 6 minutes to determine compliance with occupational/controlled SAR limits.

(c) The SAR limits for general population/uncontrolled exposure are 0.08 W/kg, as averaged over the whole body, and a peak spatial-average SAR of 1.6 W/kg, averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the parts of the human body treated as extremities, such as hands, wrists, feet, ankles, and pinnae, where the peak spatial-average SAR limit is 4 W/kg, averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). Exposure may be averaged over a time period not to exceed 30 minutes to determine compliance with general population/uncontrolled SAR limits.

(d)(1) Evaluation with respect to the SAR limits in this section must demonstrate compliance with both the whole-body and peak spatial-average limits using technically supported measurement or computational methods and exposure conditions in advance of authorization (licensing or equipment certification) and in a manner that facilitates enforcement. Numerical computation of SAR must be supported by adequate documentation showing that the numerical method as implemented in the computational software has been fully validated; in addition, the equipment under test and exposure conditions must be modeled according to protocols established by numerical computation standards or available FCC procedures for the specific computational method.

(2) For operation within the frequency range of 300 kHz and 6 GHz (inclusive), the limits for maximum permissible exposure (MPE), derived from whole-body SAR limits and listed in Table 1 of paragraph (e) of this section, may be used instead of whole-body SAR limits as set forth in paragraphs (a) through (c) of this section to evaluate the environmental impact of human exposure to RF radiation as specified in § 1.1307(b), except for portable devices as defined in § 2.1093 as these evaluations shall be performed according to the SAR provisions in § 2.1093 of this chapter.

(3) At operating frequencies above 6 GHz, the MPE limits listed in Table 1 of paragraph (e) of this section shall be used in all cases to evaluate the environmental impact of human exposure to RF radiation as specified in § 1.1307(b).

(4) Both the MPE limits listed in Table 1 of paragraph (e) of this section and the SAR limits as set forth in paragraphs (a) through (c) of this section are for continuous exposure, that is, for indefinite time periods. Exposure levels higher than the limits are permitted for shorter exposure times, as long as the average exposure over the specified averaging time in Table 1 is less than the exposure limits. Detailed information on our policies regarding procedures for evaluating compliance with all of these exposure limits can be found in the most current edition of FCC's OET Bulletin 65, ''Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields,'' and its supplements, all available at the FCC's Internet Web site: *http://www.fcc.gov/oet/rfsafety.*

Note to Paragraphs (a) through (d): SAR is a measure of the rate of energy absorption due to exposure to RF electromagnetic energy. These SAR limits to be used for evaluation are based generally on criteria published by the American National Standards Institute (ANSI) for localized SAR in section 4.2 of ''IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz,'' ANSI/IEEE Std C95.1–1992, copyright 1992 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017. These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in ''Biological Effects and Exposure

Criteria for Radiofrequency Electromagnetic Fields,'' NCRP Report No. 86, section 17.4.5, copyright 1986 by NCRP, Bethesda, Maryland 20814. Limits for whole body SAR and peak spatial-average SAR are based on recommendations made in both of these documents. The MPE limits in Table 1 are based generally on criteria published by the NCRP in ''Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields,'' NCRP Report No. 86, sections 17.4.1, 17.4.1.1, 17.4.2 and 17.4.3, copyright 1986 by NCRP, Bethesda, Maryland 20814. In the frequency range from 100 MHz to 1500 MHz, these MPE exposure limits for field strength and power density are also generally based on criteria recommended by the ANSI in section 4.1 of ''IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz,'' ANSI/IEEE Std C95.1–1992, copyright 1992 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017.

(e) Table 1 in this paragraph sets forth limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*($900/f^2$)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz.
* = Plane-wave equivalent power density.

(1) Occupational/controlled exposure limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when a person is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure. The phrase *fully aware* in the context of applying these exposure limits means that an exposed person has received written and/or verbal information fully explaining the potential for RF exposure resulting from his or her employment. With the exception of *transient* persons, this phrase also means that an exposed person has received appropriate training regarding work practices relating to controlling or mitigating his or her exposure. *See* § 1.1307(b)(2) of this chapter. The phrase exercise control means that an exposed person is allowed and also knows how to reduce or avoid exposure by administrative or engineering work practices, such as use of personal protective equipment or time averaging of exposure.

(2) General population/uncontrolled exposure limits apply in situations in which the general public may be exposed, or in which persons who are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure. For example, RF sources intended for consumer use shall be subject to the limits for general population/uncontrolled exposure in this section.

§ 1.4000 [Amended]

■ 4. Section 1.4000 is amended by removing paragraph (c) and redesignating paragraphs (d) through (h) as paragraphs (c) through (g).

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

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

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

■ 6. Section 2.1091 is amended by revising paragraphs (b), (c), (d) introductory text, (d)(1), and (d)(2) to read as follows:

§ 2.1091 Radiofrequency radiation exposure evaluation: mobile devices.

* * * * *

(b) For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. In this context, the term ''fixed location'' means that the device is physically secured at one location and is not able to be easily moved to another location while transmitting. Transmitting devices designed to be used by consumers or workers that can be easily re-located, such as wireless devices associated with a personal desktop computer, are considered to be mobile devices if they meet the 20 centimeter separation requirement.

(c) Evaluation of compliance with the exposure limits in § 1.1310 of this chapter, and preparation of an EA if the limits are exceeded, is necessary for mobile devices with single RF sources either more than an available maximum time-averaged power of 1 mW or more than the ERP listed in Table 1 of § 1.1307(b)(1)(i) of this chapter, whichever is greater. For mobile devices not exempt by § 1.1307(b)(1)(i) at distances from 20 to 40 centimeters and frequencies from 0.3 to 6 GHz, evaluation of compliance with the exposure limits in § 1.1310 of this chapter is necessary if the ERP of the device is greater than ERP_{20cm} in the formula below. If the ERP of a single RF source at distances from 20 to 40 centimeters and frequencies from 0.3 to 6 GHz is not easily obtained, then the available maximum time-averaged RF output power may be used (*i.e.,* without

consideration of ERP) in comparison with the formula below only if the device antenna(s) or radiating structure(s) do not exceed the electrical length of λ/4.

$$ERP_{20cm}\,(\mathrm{mW}) = \begin{cases} 2040f & 0.3\,\mathrm{GHz} \le f < 1.5\,\mathrm{GHz} \\ 3060 & 1.5\,\mathrm{GHz} \le f \le 6\,\mathrm{GHz} \end{cases}$$

(1) For multiple mobile RF sources within a device operating in the same time averaging period, when all transmitting antennas are at a separation distance of at least 20 centimeters, evaluation is required if:

$$\sum_{i=1}^{a} \frac{P_i}{P_{th,i}} + \frac{\sum_{j=1}^{b} SAR_j}{1.6\ \mathrm{W/kg}} + \sum_{k=1}^{c} \frac{ERP_k}{ERP_{th,k}} \ge 1$$

Where

a = number of mobile transmitters that use P_{th}, including existing transmitters and those being added.

b = number of existing mobile transmitters with known SAR.

c = number of mobile transmitters using ERP, according to either § 1.1307(b)(1)(i) or § 1.1307(b)(1)(ii) of this chapter, including existing transmitters and those being added.

P_i = the available maximum time-averaged power or the ERP, whichever is greater, for mobile transmitter i.

$P_{th,i}$ = the threshold power according to the formula in § 1.1307(b)(1)(ii) of this chapter for mobile transmitter i.

SAR_j = the maximum SAR reported for equipment certification from the j^{th} mobile transmitter in the device.

ERP_k = ERP of mobile transmitter k.

$ERP_{th,k}$ = exemption threshold ERP for mobile transmitter k, either according to § 1.1307(b)(1)(ii) of this chapter or § 1.1307(b)(1)(i) of this chapter, as applicable.

(2) For multiple mobile or portable RF sources within a device operating in the same time averaging period, routine environmental evaluation is required if the formula in § 2.1093(c)(2) of this chapter is applied to determine the exemption ratio and the result is greater than or equal to 1.

(3) Unless otherwise specified in this chapter, any other single mobile or multiple mobile and portable RF source(s) associated with a device is exempt from routine environmental evaluation for RF exposure prior to equipment authorization or use, except as specified in § 1.1307(c) and (d) of this chapter.

(d) Applications for equipment authorization of mobile transmitting devices subject to routine environmental evaluation must contain a statement confirming compliance with the limits specified in § 1.1310 of this chapter as part of their application. Technical information showing the basis for this statement must be submitted to the Commission upon request. In general, maximum time-averaged power levels must be used for evaluation. All unlicensed personal communications service (PCS) devices and unlicensed NII devices shall be subject to the limits for general population/uncontrolled exposure.

(1) For purposes of analyzing mobile transmitting devices under the occupational/controlled criteria specified in § 1.1310 of this chapter, time averaging provisions of the limits may be used in conjunction with maximum duty factor to determine maximum time-averaged exposure levels under normal operating conditions.

(2) Such time averaging provisions based on maximum duty factor may not be used in determining exposure levels for devices intended for use by consumers in general population/uncontrolled environments as defined in § 1.1310 of this chapter. However, ''source-based'' time averaging based on an inherent property of the RF source is allowed. An example of this is the determination of exposure from a device that uses digital technology such as a time-division multiple-access (TDMA) scheme for transmission of a signal.

* * * * *

■ 7. Section 2.1093 is amended by revising paragraphs (c) and (d) to read as follows:

§ 2.1093 Radiofrequency radiation exposure evaluation: portable devices.

* * * * *

(c) Evaluation of compliance with the exposure limits in § 1.1310 of this chapter, and preparation of an EA if the limits are exceeded, is necessary for portable devices with single RF sources with more than an available maximum time-averaged power of 1 mW, more than the ERP listed in Table 1 of § 1.1307(b)(1)(i), or more than the P_{th} in the formula below, whichever is greater. The formula below shall only be used in conjunction with portable devices not exempt by § 1.1307(b)(1)(i) at distances from 0.5 to 20 centimeters and frequencies from 0.3 to 6 GHz. If the ERP of a single RF source at distances from 0.5 to 20 centimeters and frequencies from 0.3 to 6 GHz is not easily obtained, then available maximum time-averaged power may be used (*i.e.,* without consideration of ERP) in comparison with the formula below only if the device antenna(s) or radiating structure(s) do not exceed the electrical length of λ/4.

$P_{th}\ (\mathrm{mW}) = ERP_{20cm}\ (d / 20\ \mathrm{cm})^x$

Where

$$x = -\log_{10}\left(\frac{60}{ERP_{20cm}\sqrt{f}}\right) \text{ and } f \text{ is in GHz;}$$

$$ERP_{20cm}\,(\text{mW}) = \begin{cases} 2040f & 0.3\,\text{GHz} \le f < 1.5\,\text{GHz} \\ 3060 & 1.5\,\text{GHz} \le f \le 6\,\text{GHz} \end{cases}$$

d = the minimum separation distance in any direction from any part of the device antenna(s) or radiating structure(s) to the body of the device user

(1) For multiple portable RF sources within a device operating in the same time averaging period, when all transmitting antennas are at a separation distance of up to 20 centimeters, evaluation is required if:

$$\sum_{i=1}^{a}\frac{P_i}{P_{th,i}} + \frac{\sum_{j=1}^{b} SAR_j}{1.6\ \text{W/kg}} + \sum_{k=1}^{c}\frac{ERP_k}{ERP_{th,k}} \ge 1$$

Where

a = number of portable transmitters that use P_{th}, including existing transmitters and those being added.

b = number of existing portable transmitters with known SAR.

c = number of portable transmitters using ERP, according to either § 1.1307(b)(1)(i) or § 1.1307(b)(1)(ii) of this chapter, including existing transmitters and those being added.

P_i = the available maximum time-averaged power or the ERP, whichever is greater, for portable transmitter i.

$P_{th,i}$ = the threshold power according to the formula in § 1.1307(b)(1)(ii) of this chapter for portable transmitter i.

SAR_j = the maximum SAR reported for equipment certification from the j^{th} portable transmitter in the device.

ERP_k = ERP of portable transmitter k.

$ERP_{th,k}$ = exemption threshold ERP for portable transmitter k, either according to § 1.1307(b)(1)(ii) of this chapter or § 1.1307(b)(1)(i) of this chapter, as applicable.

(2) For multiple mobile or portable RF sources within a device operating in the same time averaging period, evaluation is required if:

$$\sum_{i=1}^{a}\frac{P_i}{P_{th,i}} + \frac{\sum_{j=1}^{b} SAR_j}{1.6W/kg} + \sum_{k=1}^{c}\frac{ERP_k}{ERP_{th,k}} \ge 1$$

Where

a = number of mobile or portable transmitters that use P_{th}, including existing transmitters and those being added.

b = number of existing mobile or portable transmitters with known SAR.

c = number of mobile or portable transmitters using ERP, according to either § 1.1307(b)(1)(i) or § 1.1307(b)(1)(ii) of this chapter, including existing transmitters and those being added.

P_i = the available maximum time-averaged power or the ERP, whichever is greater, for mobile or portable transmitter i.

$P_{th,i}$ = the threshold power according to the formula in § 1.1307(b)(1)(ii) of this chapter for mobile or portable transmitter i.

SAR_j = the maximum SAR reported for equipment certification from the jth mobile or portable transmitter in the device.

ERP_k = ERP of mobile or portable transmitter k.

$ERP_{th,k}$ = exemption threshold ERP for mobile or portable transmitter k, either according to § 1.1307(b)(1)(ii) of this chapter or § 1.1307(b)(1)(i) of this chapter, as applicable.

(3) Unless otherwise specified in this chapter, any other single portable or multiple mobile and portable RF source(s) associated with a device is exempt from routine environmental evaluation for RF exposure prior to equipment authorization or use, except as specified in §§ 1.1307(c) and 1.1307(d) of this chapter.

(d) Applications for equipment authorization of portable transmitting devices subject to routine environmental evaluation must contain a statement confirming compliance with the limits specified in § 1.1310 of this chapter as part of their application. The limits to be used for evaluation shall apply for portable devices transmitting in the frequency range from 100 kHz to 6 GHz in terms of the SAR limits specified in § 1.1310(a) through (c) of this chapter. The device must be evaluated at a separation distance applicable to the operating configurations and exposure conditions of the device. Portable devices that transmit at frequencies above 6 GHz are to be evaluated in terms of the MPE limits specified in Table 1 of § 1.1310(e) of this chapter. Technical information showing the basis for this statement must be submitted to the Commission upon request. In general, maximum time-averaged power levels must be used for evaluation. All unlicensed personal communications service (PCS) devices and unlicensed NII devices shall be subject to the limits for general population/uncontrolled exposure.

(1) Evaluation of compliance with the SAR limits can be demonstrated by either laboratory measurement techniques or by computational modeling. The latter must be supported by adequate documentation showing that the numerical method as implemented in the computational software has been fully validated; in addition, the equipment under test and exposure conditions must be modeled according to protocols established by numerical computation standards or available FCC procedures for the specific computational method.

Guidance regarding SAR measurement techniques can be found in the Office of Engineering and Technology (OET) Laboratory Division Knowledge Database (KDB). The staff guidance provided in the KDB does not necessarily represent the only acceptable methods for measuring RF exposure or emissions, and is not binding on the Commission or any interested party.

(2) For purposes of analyzing portable transmitting devices under the occupational/controlled SAR criteria specified in § 1.1310 of this chapter, the time averaging provisions of these SAR criteria may be used to determine maximum time-averaged exposure levels under normal operating conditions.

(3) The time averaging provisions for occupational/controlled SAR criteria, based on maximum duty factor, may not be used in determining typical exposure levels for portable devices intended for use by consumers, such as cellular telephones, that are considered to operate in general population/uncontrolled environments as defined in § 1.1310 of this chapter. However, ''source-based'' time averaging based on an inherent property of the RF source is allowed. An example of this would be the determination of exposure from a device that uses digital technology such as a time-division multiple-access (TDMA) scheme for transmission of a signal.

(4) Visual advisories (such as labeling, embossing, or on an equivalent electronic display) on portable devices designed only for occupational use can be used as part of an applicant's evidence of the device user's awareness of occupational/controlled exposure limits. Such visual advisories shall be legible and clearly visible to the user from the exterior of the device. Visual advisories must indicate that the device is for occupational use only, refer the user to specific information on RF exposure, such as that provided in a user manual and note that the advisory and its information is required for FCC RF exposure compliance. Such instructional material must provide the user with information on how to use the device in order to ensure compliance with the occupational/controlled exposure limits. A sample of the visual advisory, illustrating its location on the device, and any instructional material intended to accompany the device when marketed, shall be filed with the Commission along with the application for equipment authorization. Details of any special training requirements pertinent to limiting RF exposure should also be submitted. Holders of grants for portable devices to be used in occupational settings are encouraged, but not required, to coordinate with end-user organizations to ensure appropriate RF safety training.

(5) General population/uncontrolled exposure limits defined in § 1.1310 of this chapter apply to portable devices intended for use by consumers or persons who are exposed as a consequence of their employment and may not be fully aware of the potential for exposure or cannot exercise control over their exposure. No communication with the consumer including either visual advisories or manual instructions will be considered sufficient to allow consumer portable devices to be evaluated subject to limits for occupational/controlled exposure specified in § 1.1310 of this chapter.

PART 15—RADIO FREQUENCY DEVICES

■ 8. 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.

■ 9. Section 15.709 is amended by revising paragraph (d) to read as follows:

§ 15.709 General technical requirements.

* * * * *

(d) *Compliance with radio frequency exposure requirements.* TVBDs shall ensure compliance with the Commission's radio frequency exposure requirements in §§ 1.1307(b), 2.1091 and 2.1093 of this chapter, where applicable.

PART 24—PERSONAL COMMUNICATIONS SERVICES

■ 10. The authority citation for part 24 continues to read as follows:

Authority: 47 U.S.C. 154, 301, 302, 303, 309 and 332.

§ 24.51 [Amended]

■ 11. Section 24.51 is amended by removing and reserving paragraph (c).

■ 12. Section 24.52 is amended to read as follows:

§ 24.52 RF exposure.

Licensees and manufacturers shall ensure compliance with the Commission's radio frequency exposure requirements in § 1.1307(b) of this chapter. An environmental assessment may be required if RF radiation from the proposed facilities would, in combination with radiation from other sources, cause RF power density or field strength in an accessible area to exceed the applicable limits specified in § 1.1310 of this chapter. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

PART 25—SATELLITE COMMUNICATIONS

■ 13. The authority citation for part 25 continues to read as follows:

Authority: 47 U.S.C. 701–744. Interprets or applies sections 4, 301, 302, 303, 307, 309 and 332 of the Communications Act, as amended, 47 U.S.C. 154, 301, 302a, 303, 307, 309 and 332, unless otherwise noted.

■ 14. Section 25.115 is amended by adding paragraph (j) to read as follows:

§ 25.115 Application for earth station authorizations.

* * * * *

(j) The licensee and grantees shall ensure compliance with the Commission's radio frequency exposure requirements in § 1.1307(b) of this chapter. An environmental assessment may be required if RF radiation from the proposed facilities would, in combination with radiation from other sources, cause RF power density or field strength in an accessible area to exceed the applicable limits specified in § 1.1310 of this chapter. See § 1.1307(b)(3)(i).

■ 15. Section 25.117 is amended by revising paragraph (g) to read as follows:

§ 25.117 Modification of station license.

* * * * *

(g) The licensee and grantees shall ensure compliance with the Commission's radio frequency exposure requirements in § 1.1307(b) of this chapter. An environmental assessment may be required if RF radiation from the proposed facilities would, in combination with radiation from other sources, cause RF power density or field strength in an accessible area to exceed the applicable limits specified in § 1.1310 of this chapter. *See* § 1.1307(b)(3)(ii).

■ 16. Section 25.129 is amended by revising paragraph (c) to read as follows:

§ 25.129 Equipment authorization for portable earth-station transceivers.

* * * * *

(c) In addition to the information required by § 2.1033(c) of this chapter, applicants for certification required by this section shall submit any additional equipment test data necessary to demonstrate compliance with pertinent

standards for transmitter performance prescribed in §§ 25.138, 25.202(f), 25.204, 25.209, and 25.216, and shall ensure compliance with the Commission's radio frequency exposure requirements in § 1.1307(b) of this chapter. An environmental assessment may be required if RF radiation from the proposed facilities would, in combination with radiation from other sources, cause RF power density or field strength in an accessible area to exceed the applicable limits specified in § 1.1310 of this chapter. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

* * * * *

■ 17. Section 25.149 is amended by revising paragraph (c)(3) to read as follows:

§ 25.149 Application requirements for ancillary terrestrial components in the Mobile-Satellite Service networks operating in the 1.5/1.6 GHz, 1.6/2.4 GHz and 2 GHz Mobile-Satellite Service.

* * * * *

(c) * * *

(3) Licensees and manufacturers shall ensure compliance with the Commission's radio frequency exposure requirements in § 1.1307(b) of this chapter. An environmental assessment may be required if RF radiation from the proposed facilities would, in combination with radiation from other sources, cause RF power density or field strength in an accessible area to exceed the applicable limits specified in § 1.1310 of this chapter. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

* * * * *

■ 18. Section 25.226 is amended by revising paragraph (b)(8) to read as follows:

§ 25.226 Blanket Licensing provisions for domestic, U.S. Vehicle-Mounted Earth Stations (VMESs) receiving in the 10.95–11.2 GHz (space-to-Earth), 11.45–11.7 GHz (space-to-Earth), and 11.7–12.2 GHz (space-to-Earth) bands and transmitting in the 14.0–14.5 GHz (Earth-to-space) band, operating with Geostationary Satellites in the Fixed-Satellite Service.

* * * * *

(b) * * *

(8) All VMES applicants shall ensure compliance with the Commission's radio frequency exposure requirements in § 1.1307(b) of this chapter. An environmental assessment may be required if RF radiation from the proposed facilities would, in combination with radiation from other sources, cause RF power density or field strength in an accessible area to exceed the applicable limits specified in § 1.1310 of this chapter. VMES applicants with VMES terminals that will exceed the guidelines in § 1.1310 of this chapter for radio frequency radiation exposure shall provide, with their environmental assessment, a plan for mitigation of radiation exposure to the extent required to meet those guidelines. All VMES licensees shall ensure installation of VMES terminals on vehicles by qualified installers who have an understanding of the antenna's radiation environment and the measures best suited to maximize protection of the general public and persons operating the vehicle and equipment. A VMES terminal exhibiting radiation exposure levels exceeding 1.0 mW/cm^2 in accessible areas, such as at the exterior surface of the radome, shall have a label attached to the surface of the terminal warning about the radiation hazard and shall include thereon a diagram showing the regions around the terminal where the radiation levels could exceed 1.0 mW/cm^2. All VMES applicants shall demonstrate that their VMES terminals are capable of automatically ceasing transmissions upon the loss of synchronization or within 5 seconds of loss of reception of the satellite downlink signal, whichever is the shorter timeframe.

* * * * *

PART 27—MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES

■ 19. The authority citation for part 27 continues to read as follows:

Authority: 47 U.S.C. 154, 301, 302a, 303, 307, 309, 332, 336, and 337 unless otherwise noted.

■ 20. Section 27.52 is revised to read as follows:

§ 27.52 RF exposure.

Licensees and manufacturers shall ensure compliance with the Commission's radio frequency exposure requirements in § 1.1307(b) of this chapter. An environmental assessment may be required if RF radiation from the proposed facilities would, in combination with radiation from other sources, cause RF power density or field strength in an accessible area to exceed the applicable limits specified in § 1.1310 of this chapter. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

PART 73—RADIO BROADCAST SERVICES

■ 21. The authority citation for part 73 continues to read as follows:

Authority: 47 U.S.C. 154, 303, 334, 336, and 339.

■ 22. Section 73.404 is amended by revising paragraph (e)(10) to read as follows:

§ 73.404 Interim hybrid IBOC DAB operation.

* * * * *

(e) * * *

(10) Licensees and permittees shall ensure compliance with the Commission's radio frequency exposure requirements in § 1.1307(b) of this chapter. An environmental assessment may be required if RF radiation from the proposed facilities would, in combination with radiation from other sources, cause RF power density or field strength in an accessible area to exceed the applicable limits specified in § 1.1310 of this chapter.

PART 90—PRIVATE LAND MOBILE RADIO SERVICES

■ 23. The authority citation for part 90 continues to read as follows:

Authority: Sections 4(i), 11, 303(g), 303(r), and 332(c)(7) of the Communications Act of 1934, as amended, 47 U.S.C. 154(i), 161, 303(g), 303(r), and 332(c)(7), and Title VI of the Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. 112–96, 126 Stat. 156.

■ 24. Section 90.1217 is revised to read as follows:

§ 90.1217 RF exposure.

Licensees and manufacturers shall ensure compliance with the

Commission's radio frequency exposure requirements in § 1.1307(b) of this chapter. An environmental assessment may be required if RF radiation from the proposed facilities would, in combination with radiation from other sources, cause RF power density or field strength in an accessible area to exceed the applicable limits specified in § 1.1310 of this chapter. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

PART 95—PERSONAL RADIO SERVICES

■ 25. The authority citation for part 95 continues to read as follows:

Authority: Secs. 4, 303, 48 Stat. 1066, 1082, as amended; 47 U.S.C. 154, 303.

■ 26. Section 95.628 is amended by revising paragraph (f) to read as follows:

§ 95.628 MedRadio transmitters in the 413–419 MHz, 426–432 MHz, 438–444 MHz, and 451–457 MHz and 2360–2400 MHz bands.

* * * * *

(f) *Measurement procedures.* (1) MedRadio transmitters shall be tested for frequency stability, radiated emissions and EIRP limit compliance in accordance with paragraphs (f)(2) and (3) of this section.

(2) Frequency stability testing shall be performed over the temperature range set forth in (d) of this section.

(3) Radiated emissions and EIRP measurements may be determined by measuring the radiated field from the equipment under test at 3 meters and calculating the EIRP. The equivalent radiated field strength at 3 meters for 1 milliwatt, 25 microwatts, 250 nanowatts, and 100 nanowatts EIRP is 115.1, 18.2, 1.8, or 1.2 mV/meter, respectively, when measured on an open area test site; or 57.55, 9.1, 0.9, or 0.6 mV/meter, respectively, when measured on a test site equivalent to free space such as a fully anechoic test chamber. Compliance with the maximum transmitter power requirements set forth in § 95.639(f) shall be based on measurements using a peak detector function and measured over an interval of time when transmission is continuous and at its maximum power level. In lieu of using a peak detector function, measurement procedures that have been found to be acceptable to the Commission in accordance with § 2.947 of this chapter may be used to demonstrate compliance.

(i) For a transmitter intended to be implanted in a human body, radiated emissions and EIRP measurements for transmissions by stations authorized under this section may be made in accordance with a Commission-approved human body simulator and test technique. The reference to be used for dielectric properties of the tissue-equivalent material for the body simulator is in 2.1093(d)(1) of this chapter.

(ii) [RESERVED]

■ 27. Section 95.1125 is revised to read as follows:

§ 95.1125 RF exposure.

Portable devices as defined in § 2.1093(b) of this chapter operating in the WMTS shall ensure compliance with the Commission's radio frequency exposure requirements in § 1.1307(b) of this chapter. An environmental assessment may be required if RF radiation from the proposed facilities would, in combination with radiation from other sources, cause RF power density or field strength in an accessible area to exceed the applicable limits specified in § 1.1310 of this chapter. Applications for equipment authorization of WMTS devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

■ 28. Section 95.1221 is revised to read as follows:

§ 95.1221 RF exposure.

A MedRadio medical implant device or medical body-worn transmitter is subject to the radiofrequency radiation exposure requirements specified in §§ 1.1307(b) and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of devices operating under this section must demonstrate compliance with these requirements using either computational modeling or laboratory measurement techniques. Where a showing is based on computational modeling, the Commission retains the discretion to request that supporting documentation and/or specific absorption rate (SAR) measurement data be submitted, as described in 2.1093(d)(1).

PART 97—AMATEUR RADIO SERVICE

■ 29. The authority citation for part 97 continues to read as follows:

Authority: 48 Stat. 1066, 1082, as amended; 47 U.S.C. 154, 303. Interpret or apply 48 Stat. 1064–1068, 1081–1105, as amended; 47 U.S.C. 151–155, 301–609, unless otherwise noted.

■ 30. Section 97.13 is amended by revising paragraph (c)(1) to read as follows:

§ 97.13 Restrictions on station location.

* * * * *

(c) * * *

(1) The licensee shall ensure compliance with the Commission's radio frequency exposure requirements in §§ 1.1307(b), 2.1091 and 2.1093 of this chapter, where applicable. In lieu of evaluation with the general population/uncontrolled exposure limits, amateur licensees may evaluate their operation with respect to members of his or her immediate household using the occupational/controlled exposure limits in § 1.1310, provided appropriate training and information has been supplied to the amateur licensee and members of his/her household. Other nearby persons who are not members of the amateur licensee's household must be evaluated with respect to the general population/uncontrolled exposure limits. Appropriate methodologies and guidance for evaluating amateur radio service operation is described in the Office of Engineering and Technology (OET) Bulletin 65, Supplement B.

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PART 101—FIXED MICROWAVE SERVICE

■ 31. The authority citation for part 101 continues to read as follows:

Authority: 47 U.S.C. 154, 303.

■ 32. Section 101.1425 is revised to read as follows:

§ 101.1425 RF exposure.

MVDDS stations in the 12.2–12.7 GHz frequency band shall ensure compliance with the Commission's radio frequency exposure requirements in § 1.1307(b) of this chapter. An environmental assessment may be required if RF radiation from the proposed facilities would, in combination with radiation from other sources, cause RF power density or field strength in an accessible area to exceed the applicable limits specified in § 1.1310 of this chapter.

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