
APPENDIX B: EXPOSURE LIMITS FOR ANSI 1982, ANSI/IEEE 1992 AND NCRP

For information and comparison, Tables 1-3 summarize the maximum permissible exposure (MPE) limits of the 1982 and 1992 standards of the Institute of Electrical and Electronics Engineers, Inc. (IEEE) and American National Standards Institute (ANSI), and the 1986 exposure criteria of the National Council on Radiation Protection and Measurements (NCRP).

TABLE 1. ANSI C95.1-1982 RADIOFREQUENCY PROTECTION GUIDES

Frequency Range (MHz)	Electric Field Strength E^2 (V^2/m^2)	Magnetic Field Strength H^2 (A^2/m^2)	Power Density (S) E-field; H-field (mW/cm^2)	Averaging Time (minutes) $ E ^2$; S; or $ H ^2$
0.3-3	400,000	2.5	100	6
3-30	4,000 ($900/f^2$)	0.025 ($900/f^2$)	$900/f^2$	6
30-300	4,000	0.025	1.0	6
300-1500	4,000 ($f/300$)	0.025($f/300$)	$f/300$	6
1500-100,000	20,000	0.125	5.0	6

f = frequency in megahertz (MHz) E^2 = electric field strength squared

H^2 = magnetic field strength squared

V^2/m^2 = volts squared per meter squared

A^2/m^2 = amperes squared per meter squared

mW/cm^2 = milliwatts per centimeter squared

NOTES for ANSI C95.1-1982:

(1) The squares of the field strengths or the power density, as applicable, are to be averaged over any six-minute period, and these time-averaged values should not exceed the values given in the table.

(2) For near field exposures, the only applicable protection guides are the mean squared electric and magnetic field strengths as given in the table above, columns 2 and 3. For convenience, these guides may be expressed as the equivalent plane-wave power density, given in the last column of the table.

(3) The 1982 ANSI guidelines incorporate exposure criteria for localized SAR (e.g., from hand-held devices) of 8 watts/kg (W/kg) and exclude low-power devices with input powers of 7 watts or less (frequency range of 300 kHz to 1 GHz).

(4) As noted, these guidelines have been replaced by the ANSI/IEEE C95.1-1992 (IEEE C95.1-1991) guidelines in Table 2.

TABLE 2. ANSI/IEEE C95.1-1992 (IEEE C95.1-1991) RADIOFREQUENCY PROTECTION GUIDES

(A) MAXIMUM PERMISSIBLE EXPOSURE (MPE): CONTROLLED ENVIRONMENTS

ELECTROMAGNETIC FIELDS

Frequency Range (MHz)	Electric Field Strength E (V/m)	Magnetic Field Strength H (A/m)	Power Density (S) E-field; H-field (mW/cm ²)	Averaging Time (minutes) E ² ; S; or H ²
0.003-0.1	614	163	(100; 1,000,000)*	6
0.1-3.0	614	16.3/f	(100; 10,000/f ²)*	6
3.0-30	1842/f	16.3/f	(900/f ² ; 10,000/f ²)*	6
30-100	61.4	16.3/f	(1.0; 10,000/f ²)*	6
100-300	61.4	0.163	1.0	6
300-3000	--	--	f/300	6
3000-15,000	--	--	10	6
15,000-300,000	--	--	10	616,000/f ^{1.2}

* Plane-wave equivalent power density; not appropriate for near-field conditions, but used for comparison.

f = frequency in megahertz (MHz)

A/m = amperes per meter

V/m = volts per meter

mW/cm² = milliwatts per centimeter squared

INDUCED AND CONTACT RADIOFREQUENCY CURRENTS

Frequency Range (MHz)	Maximum Current (milliamps)		Contact Current
	Through both feet	Through each foot	
0.003-0.1	2000f	1000f	1000f
0.1-100	200	100	100

TABLE 2. ANSI/IEEE C95.1-1992 (IEEE C95.1-1991) RADIOFREQUENCY PROTECTION GUIDES (continued)

(B) MAXIMUM PERMISSIBLE EXPOSURE (MPE) FOR UNCONTROLLED ENVIRONMENTS

ELECTROMAGNETIC FIELDS

Frequency Range (MHz)	Electric Field Strength E (V/m)	Magnetic Field Strength H (A/m)	Power Density (S) E-field; H-field (mW/cm ²)	Averaging Time (minutes)	
				E ² ; S;	H ²
0.003-0.1	614	163	(100; 1,000,000)*	6	6
0.1-1.34	614	16.3/f	(100; 10,000/f ²)*	6	6
1.34-3.0	823.8/f	16.3/f	(180/f ² ; 10,000/f ²)*	f ² /0.3	6
3.0-30	823.8/f	16.3/f	(180/f ² ; 10,000/f ²)*	30	6
30-100	27.5	158.3/f ^{1.668}	(0.2; 940,000/f ^{3.336})*	30	0.0636f ^{1.337}
100-300	27.5	0.0729	0.2	30	30
300-3000	--	--	f/1500	30	--
3000-15,000	--	--	f/1500	90,000/f	--
15,000-300,000	--	--	10	616,000/f ^{1.2}	--

* Plane-wave equivalent power density; not appropriate for near-field conditions, but sometimes used for comparison purposes.

f = frequency in megahertz (MHz)

V/m = volts per meter

A/m = amperes per meter

mW/cm² = milliwatts per centimeter squared

INDUCED AND CONTACT RADIOFREQUENCY CURRENTS

Frequency Range (MHz)	Maximum Current (milliamps)		Contact Current
	Through both feet	Through each foot	
0.003-0.1	900f	450f	450f
0.1-100	90	45	45

NOTES FOR ANSI/IEEE C95.1-1992

(1) "Controlled Environments" are defined as "locations where there is exposure that may be incurred by persons who are aware of the potential for exposure as a concomitant of employment, by other cognizant persons, or as the incidental result of transient passage through areas where analysis shows the exposure levels may be above those shown in [(B) above] but do not exceed those in [(A) above] . . ."

(2) "Uncontrolled Environments" are defined as "locations where there is the exposure of individuals who have no knowledge or control of their exposure. The exposures may occur in living quarters or workplaces where there are no expectations that the exposure levels may exceed those shown in [(B) above] . . ."

(3) Various periods of time are specified for averaging exposures.

TABLE 3. NCRP EXPOSURE CRITERIA FOR RF FIELDS (1986)

(A) OCCUPATIONAL EXPOSURE:

(IDENTICAL TO ANSI C95.1-1982 - SEE TABLE 1)

(B) GENERAL PUBLIC EXPOSURE:

Frequency Range (MHz)	Electric Field Strength E^2 (V^2/m^2)	Magnetic Field Strength H^2 (A^2/m^2)	Power Density (S) E-field; H-field (mW/cm^2)	Averaging Time (minutes) $ E ^2$; S; or $ H ^2$
0.3-1.342	400,000	2.5	100	30
1.342-30	4,000 ($180/f^2$)	0.025 ($180/f^2$)	$180/f^2$	30
30-300	800	0.005	0.2	30
300-1500	4000 ($f/1500$)	0.025($f/1500$)	$f/1500$	30
1500-100,000	4,000	0.025	1.0	30

f = frequency in megahertz (MHz)

 E^2 = electric field strength squared H^2 = magnetic field strength squared V^2/m^2 = volts squared per meter squared A^2/m^2 = amperes squared per meter squared mW/cm^2 = milliwatts per centimeter squaredNOTES FOR NCRP EXPOSURE CRITERIA:

(1) Unlike ANSI/IEEE 1992, NCRP guidelines do not include criteria for induced and contact currents.

(2) For localized exposure (e.g., from hand-held devices) NCRP recommends the same limits as ANSI C95.1-1982 for occupational exposure (8 W/kg as averaged over 1 gram of tissue). For exposure of the general public NCRP recommends generally one-fifth of that level (1.6 W/kg) as averaged over 1 gram. This latter value is the same as that recommended by ANSI/IEEE C95.1-1992 for "uncontrolled" environments. NCRP guidelines do not incorporate exclusion criteria based on radiated power alone as do both the 1982 and 1992 ANSI/IEEE guidelines.

APPENDIX C: Final Rules

Title 47 of the Code of Federal Regulations, parts 1, 2, 15, 24 and 97 are amended as follows:

Part 1 - PRACTICE AND PROCEDURE

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

AUTHORITY: 47 U.S.C. 151, 154, 303 and 309(j) unless otherwise noted.

2. Section 1.1307 is amended by revising paragraph (b), by removing notes 1, 2 and 3 following paragraph (b), and by adding new paragraphs (b)(1), (b)(2), (b)(3), (b)(4), and (e) to read as follows:

§ 1.1307 Actions which 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 construction permits, licenses to transmit or renewals thereof, equipment authorizations or modifications in existing facilities, require the preparation of an Environmental Assessment (EA) if the particular facility, operation or transmitter would cause human exposure to levels of radiofrequency radiation in excess of the limits in § 1.1310 and § 2.1093 of this chapter. Applications to the Commission for construction permits, licenses to transmit or renewals thereof, equipment authorizations or modifications in existing facilities must contain a statement confirming compliance with the limits unless the facility, operation, or transmitter is categorically excluded, as discussed below. Technical information showing the basis for this statement must be submitted to the Commission upon request.

(1) The exposure limits in § 1.1310 are generally applicable to all facilities, operations and transmitters regulated by the Commission. However, a determination of compliance with the exposure limits in § 1.1310 (routine environmental evaluation), and preparation of an EA if the limits are exceeded, is necessary only for facilities, operations and transmitters that fall into the categories listed in Table 1, or those specified in paragraph (b)(2) of this section. All other facilities, operations and transmitters are categorically excluded from making such studies or preparing an EA, except as indicated in paragraphs (c) and (d) of this section. For purposes of Table 1, "rooftop" means the roof or otherwise outside, topmost level or levels of a building structure that is occupied as a workplace or residence and where either workers or the general public may have access. The term "power" in column 2 of Table 1

refers to total operating power of the transmitting operation in question in terms of effective radiated power (ERP), equivalent isotropically radiated power (EIRP), or peak envelope power (PEP), as defined in § 2.1 of this chapter. For the case of the Cellular Radiotelephone Service, subpart H of part 22 of this chapter; the Personal Communications Service, part 24 of this chapter and covered Specialized Mobile Radio Service operations, part 90 of this chapter, the phrase "total power of all channels" in column 2 of Table 1 means the sum of the ERP or EIRP of all co-located simultaneously operating transmitters of the facility. When applying the criteria of Table 1, radiation in all directions should be considered. For the case of transmitting facilities using sectorized transmitting antennas, applicants and licensees should apply the criteria to all transmitting channels in a given sector, noting that for a highly directional antenna there is relatively little contribution to ERP or EIRP summation for other directions.

TABLE 1: TRANSMITTERS, FACILITIES AND OPERATIONS SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION

SERVICE (TITLE 47 CFR RULE PART)	EVALUATION REQUIRED IF:
Experimental Radio Services (part 5)	power > 100W ERP (164W EIRP)
Radio Frequency Devices (part 15)	millimeter wave devices operating in one of the following bands 46.7-46.8 GHz, 59.0-64.0 GHz or 76.0-77.0 GHz (see §§ 15.253 and 15.255 of this chapter) unlicensed personal communications service devices operating under subpart D of this chapter
Multipoint Distribution Service (subpart K of part 21)	<u>non-rooftop antennas</u> : height above ground level to radiation center < 10 m <u>and</u> power > 1640 W EIRP <u>rooftop antennas</u> : power > 1640W EIRP

TABLE 1 (contd.)

SERVICE (TITLE 47 CFR RULE PART)	EVALUATION REQUIRED IF:
Paging and Radiotelephone Service (subpart E of part 22)	<u>non-rooftop antennas</u> : height above ground level to radiation center < 10 m <u>and</u> power > 1000W ERP (1640 W EIRP) <u>rooftop antennas</u> : power > 1000W ERP (1640W EIRP)
Cellular Radiotelephone Service (subpart H of part 22)	<u>non-rooftop antennas</u> : height above ground level to radiation center < 10 m <u>and</u> total power of all channels > 1000W ERP (1640 W EIRP) <u>rooftop antennas</u> : total power of all channels > 1000W ERP (1640W EIRP)
Personal Communications Services (part 24)	(1) Narrowband PCS (subpart D): <u>non-rooftop antennas</u> : height above ground level to radiation center <10 m <u>and</u> total power of all channels > 1000W ERP (1640 W EIRP) <u>rooftop antennas</u> : total power of all channels > 1000W (1640W EIRP) (2) Broadband PCS (subpart E): <u>non-rooftop antennas</u> : height above ground level to radiation center <10 m <u>and</u> total power of all channels > 2000W ERP (3280 W EIRP) <u>rooftop antennas</u> : total power of all channels > 2000W (3280W EIRP)
Satellite Communications (part 25)	all included

TABLE 1 (contd.)

SERVICE (TITLE 47 CFR RULE PART)	EVALUATION REQUIRED IF:
Radio Broadcast Services (part 73)	all included
Experimental, auxiliary, and special broadcast and other program distributional services (part 74)	subparts A, G, L: power > 100W ERP subpart I: <u>non-rooftop antennas</u> : height above ground level to radiation center < 10 m <u>and</u> power > 1640 W EIRP <u>rooftop antennas</u> : power > 1640W EIRP
Stations in the Maritime Services (part 80)	ship earth stations only
Private Land Mobile Radio Services Paging Operations (part 90)	<u>non-rooftop antennas</u> : height above ground level to radiation center < 10 m <u>and</u> power > 1000W ERP (1640 W EIRP) <u>rooftop antennas</u> : power > 1000W ERP (1640W EIRP)
Private Land Mobile Radio Services Specialized Mobile Radio ("covered" providers only - see below)* (part 90)	<u>non-rooftop antennas</u> : height above ground level to radiation center < 10 m <u>and</u> total power of all channels > 1000W ERP (1640 W EIRP) <u>rooftop antennas</u> : total power of all channels > 1000W ERP (1640W EIRP)
Amateur Radio Service (part 97)	transmitter output power > 50W PEP

* Note: "Covered" SMR providers includes geographic area SMR licensees in the 800 MHz and 900 MHz bands that offer real-time, two-way switched voice service that is interconnected

with the public switched network and Incumbent Wide Area SMR licensees, as defined in § 20.3 of this chapter.

(2) Mobile and portable transmitting devices that operate in the Cellular Radiotelephone Service, the Personal Communications Services (PCS), the Satellite Communications Services, the Maritime Services (ship earth stations only) and covered Specialized Mobile Radio Service providers authorized under subpart H of part 22, part 24, part 25, part 80, and part 90 of this chapter are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use, as specified in §§ 2.1091 and 2.1093 of this chapter. All unlicensed PCS and millimeter wave devices are also subject to routine environmental evaluation for RF exposure prior to equipment authorization or use, as specified in § 15.253(f), § 15.255(g), and § 15.319(i) of this chapter. All other mobile, portable, and unlicensed transmitting devices are categorically excluded from routine environmental evaluation for RF exposure under §§ 2.1091 and 2.1093 of this chapter except as specified in paragraphs (c) and (d) of this section.

(3) In general, when the guidelines specified in § 1.1310 are exceeded in an accessible area due to the emissions from multiple fixed transmitters, actions necessary to bring the area into compliance with the guidelines are the shared responsibility of all licensees whose transmitters produce field strengths or power density levels at the area in question in excess of 1% of the exposure limits applicable to their particular transmitter.

(i) Applicants for proposed (not otherwise excluded) transmitters, facilities or modifications 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 transmitter or facility would result in a field strength or power density at the area in question that exceeds 1% of the exposure limit applicable to that transmitter or facility.

(ii) Renewal applicants whose (not otherwise excluded) transmitters or facilities contribute to the field strength or power density at an accessible area not in compliance with the limits specified in § 1.1310 must submit an EA if emissions from the applicant's transmitter or facility results in a field strength or power density at the area in question that exceeds 1% of the exposure limit applicable to that transmitter or facility.

(4) Transition Provisions. For applications filed with the Commission prior to January 1, 1997, Commission actions granting construction permits, licenses to transmit or renewals thereof, equipment authorizations, or modifications in existing facilities require the preparation of an Environmental Assessment if the particular facility, operation or transmitter would cause human exposure to levels of radiofrequency radiation that are in excess of the requirements contained in paragraphs (4) (i) - (4)(iii) of this section. These transition provisions do not apply to applications for equipment authorization of mobile, portable, and

unlicensed devices specified in paragraph (2) of this section.

(i) For facilities and operations licensed or authorized under parts 5, 21 (subpart K), 25, 73, 74 (subparts A, G, I, and L), and 80 of this chapter, the "Radio Frequency Protection Guides" recommended in "American National Standard Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300 kHz to 100 GHz", (ANSI C95.1-1982), issued by the American National Standards Institute (ANSI) and copyright 1982 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York shall apply. With respect to subpart K of part 21 and subpart I of Part 74 of this chapter, these requirements apply only to multipoint distribution service and instructional television fixed service stations transmitting with an equivalent isotropically radiated power (EIRP) in excess of 200 watts. With respect to subpart L of part 74 of this chapter, these requirements apply only to FM booster and translator stations transmitting with an effective radiated power (ERP) in excess of 100 watts. With respect to part 80 of this chapter, these requirements apply only to ship earth stations.

(ii) For facilities and operations licensed or authorized under part 24 of this chapter, licensees and manufacturers are required to ensure that their facilities and equipment comply with IEEE C95.1-1991 (ANSI/IEEE C95.1-1992), "Safety Levels With Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz." Measurement methods are specified in IEEE C95.3-1991, "Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields -- RF and Microwave." Copies of these standards are available from IEEE Standards Board, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331. Telephone: 1-800-678-4333. The limits for both "controlled" and "uncontrolled" environments, as defined by IEEE C95.1-1991, will apply to all PCS base and mobile stations, as appropriate.

(iii) Applications for all other types of facilities and operations are categorically excluded from routine RF radiation evaluation except as provided in paragraphs (c) and (d) of this section.

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(e) No State or local government or instrumentality thereof may regulate the placement, construction, and modification of personal wireless service facilities on the basis of the environmental effects of radio frequency emissions to the extent that such facilities comply with the regulations contained in this chapter concerning the environmental effects of such emissions. For purposes of this paragraph:

(1) The term "personal wireless service" means commercial mobile services, unlicensed wireless services, and common carrier wireless exchange access services;

(2) The term "personal wireless service facilities" means facilities for the provision of personal wireless services;

(3) The term "unlicensed wireless services" means the offering of telecommunications services using duly authorized devices which do not require individual licenses, but does not mean the provision of direct-to-home satellite services; and

(4) The term "direct-to-home satellite services" means the distribution or broadcasting of programming or services by satellite directly to the subscriber's premises without the use of ground receiving or distribution equipment, except at the subscriber's premises or in the uplink process to the satellite.

3. A new Section 1.1310 is added to read as follows:

§ 1.1310 Radiofrequency radiation exposure limits.

The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in § 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of § 2.1093 of this chapter. Further information on evaluating compliance with these limits can be found in the FCC's OST/OET Bulletin Number 65, "Evaluating Compliance with FCC-Specified Guidelines for Human Exposure to Radiofrequency Radiation."

NOTE TO INTRODUCTORY PARAGRAPH: These limits are generally based on recommended exposure guidelines published by the National Council on Radiation Protection and Measurements (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 NCRP, 1986, Bethesda, Maryland 20814. In the frequency range from 100 MHz to 1500 MHz, exposure limits for field strength and power density are also generally based on guidelines recommended by the American National Standards Institute (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 C95.1-1992, Copyright 1992 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017.

Table 1. Limits for Maximum Permissible Exposure (MPE)

(A) Limits for Occupational/Controlled Exposure

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Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
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

—
f = frequency in MHz

* = Plane-wave equivalent power density

(B) Limits for General Population/Uncontrolled Exposure

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Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
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

NOTE 1 TO TABLE 1: Occupational/controlled 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 an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

Part 2 - FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

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

AUTHORITY: Sec. 4, 302, 303 and 307 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154, 302, 303 and 307, unless otherwise noted.

2. A new Section 2.1091 is added to read as follows:

§2.1091 Radiofrequency radiation exposure evaluation: mobile and unlicensed devices.

(a) Requirements of this section are a consequence of Commission responsibilities under the National Environmental Policy Act to evaluate the environmental significance of its actions. See subpart I of part 1 of this chapter, in particular § 1.1307(b).

(b) For purposes of this section mobile devices are defined as transmitters 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 radiating antennas and the body of the user or nearby persons.

(c) Mobile devices that operate in the Cellular Radiotelephone Service, the Personal Communications Services, the Satellite Communications Services, the Maritime Services and the Specialized Mobile Radio Service authorized under subpart H of part 22 of this chapter, part 24 of this chapter, part 25 of this chapter, part 80 of this chapter (ship earth station devices only) and part 90 of this chapter ("covered" SMR devices only, as defined in the note to Table 1 of §1.1307(b)(1) of this chapter), are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use if their effective radiated power (ERP) is 1.5 watts or more. Unlicensed personal communications service and unlicensed millimeter wave

devices authorized under § 15.253, § 15.255 and subpart D of part 15 of this chapter are also subject to routine environmental evaluation for RF exposure prior to equipment authorization or use, regardless of their power used, unless they meet the definition of a portable device as specified in § 2.1093(b). All other mobile and unlicensed transmitting devices are categorically excluded from routine environmental evaluation for RF exposure prior to equipment authorization, except as specified in §§ 1.1307(c) and 1.1307(d) of this chapter. Applications for equipment authorization of mobile and unlicensed transmitting devices subject to routine environmental evaluation must contain a statement confirming compliance with the limits specified in paragraph (d) of this section as part of their application. Technical information showing the basis for this statement must be submitted to the Commission upon request.

(d) The limits to be used for evaluation are specified in § 1.1310 of this chapter. All unlicensed personal communications service (PCS) 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 guidelines may be used in conjunction with typical maximum duty factors to determine maximum likely exposure levels.

(2) Time-averaging provisions may not be used in determining typical 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 or duty-cycle of a device 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. In general, maximum average power levels must be used to determine compliance.

(3) Compliance with exposure guidelines for mobile and unlicensed devices can be accomplished by the use of warning labels and by providing users with information concerning minimum separation distances from transmitting structures and proper installation of antennas.

4. A new section 2.1093 is added to read as follows:

§ 2.1093 Radiofrequency radiation exposure evaluation: portable devices.

(a) Requirements of this section are a consequence of Commission responsibilities under the National Environmental Policy Act to evaluate the environmental significance of its actions. See subpart I of Part 1 of this chapter, in particular § 1.1307(b).

(b) For purposes of this section portable devices are defined as transmitters designed to be used within 20 centimeters of the body of the user.

(c) Portable devices that operate in the Cellular Radiotelephone Service, the Personal Communications Services, the Satellite Communications services, the Maritime Services and the Specialized Mobile Radio Service authorized under subpart H of part 22 of this chapter, part 24 of this chapter, part 25 of this chapter, part 80 of this chapter (ship earth station devices only), part 90 of this chapter ("covered" SMR devices only, as defined in the note to Table 1 of § 1.1307(b)(1) of this chapter), and portable unlicensed personal communication service and millimeter wave devices authorized under § 15.253, § 15.255 or subpart D of part 15 of this chapter are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use. All other portable transmitting devices are categorically excluded from routine environmental evaluation for RF exposure prior to equipment authorization, except as specified in §§ 1.1307(c) and 1.1307(d) of this chapter. Applications for equipment authorization of portable transmitting devices subject to routine environmental evaluation must contain a statement confirming compliance with the limits specified in paragraph (d) of this section as part of their application. Technical information showing the basis for this statement must be submitted to the Commission upon request.

(d) The limits to be used for evaluation are based generally on criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate ("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 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 NCRP, 1986, Bethesda, Maryland 20814. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards. The criteria to be used are specified in paragraphs (d)(1) and (d)(2) of this section.

(1) Limits for Occupational/Controlled exposure: 0.4 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 8 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 20 W/kg, as averaged over an 10 grams of tissue (defined as a tissue volume in the shape of a cube). Occupational/Controlled limits apply when persons are exposed as a consequence of their employment provided these persons are fully aware of and exercise control over their exposure. Awareness of exposure can be accomplished by use of warning labels or by specific training or education through appropriate means, such as an RF safety program in a work environment.

(2) Limits for General Population/Uncontrolled exposure: 0.08 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 1.6 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 4 W/kg, as averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). General Population/Uncontrolled limits apply when the general public may be exposed, or when persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or do not exercise control over their exposure. Warning labels placed on consumer devices such as cellular telephones will not be sufficient reason to allow these devices to be evaluated subject to limits for occupational/controlled exposure in paragraph (d)(1) of this section.

(3) Compliance with SAR limits can be demonstrated by either laboratory measurement techniques or by computational modeling. Methodologies and references for SAR evaluation are described in numerous technical publications including "IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave," IEEE C95.3-1991.

(4) For purposes of analyzing portable transmitting devices under the occupational/controlled criteria, the time-averaging provisions of the MPE guidelines identified in § 1.1310 of this chapter can be used in conjunction with typical maximum duty factors to determine maximum likely exposure levels.

(5) Time-averaging provisions of the MPE guidelines identified in § 1.1310 of this chapter may not be used in determining typical exposure levels for portable devices intended for use by consumers, such as hand-held cellular telephones, that are considered to operate in general population/uncontrolled environments as defined above. However, "source-based" time-averaging based on an inherent property or duty-cycle of a device 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. In general, maximum average power levels must be used to determine compliance.

Part 15 - RADIO FREQUENCY DEVICES

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

AUTHORITY: Secs. 4, 302, 303, 304, 307 and 624A of the Communications Act of 1934, as amended, 47 U.S.C. 154, 302, 303, 307 and 544A.

2. Section 15.253 is amended by revising paragraph (f) to read as follows:

§ 15.253 Operation within the bands 46.7-46.9 GHz and 76.0-77.0 GHz.

* * * * *

(f) Regardless of the power density levels permitted under this section, devices operating under the provisions of this section are subject to the radiofrequency radiation exposure requirements specified in § 1.1307(b), § 2.1091 and § 2.1093 of this chapter, as appropriate. Applications for equipment authorization of 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.

3. Section 15.255 is amended by revising paragraph (g) to read as follows:

§ 15.255 Operation within the band 59.0-64.0 GHz.

* * * * *

(g) Regardless of the power density levels permitted under this section, devices operating under the provisions of this section are subject to the radiofrequency radiation exposure requirements specified in § 1.1307(b), § 2.1091 and § 2.1093 of this chapter, as appropriate. Applications for equipment authorization of 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.

4. Section 15.319 is amended by revising paragraph (i), to read as follows:

§ 15.319 General technical requirements.

* * * * *

(i) Unlicensed PCS devices are subject to the radiofrequency radiation exposure requirements specified in § 1.1307(b), § 2.1091 and § 2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a "general population/uncontrolled" environment. Applications for equipment authorization of 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 24 - PERSONAL COMMUNICATIONS SERVICES

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

AUTHORITY: 47 U.S.C. 154, 301, 302, 303, 309, and 332, unless otherwise noted.

2. Section 24.52 is revised to read as follows:

§ 24.52 RF hazards.

Licensees and manufacturers are subject to the radiofrequency radiation exposure requirements specified in § 1.1307(b), § 2.1091 and § 2.1093 of this chapter, as appropriate. 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 97 - AMATEUR RADIO SERVICE

1. 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.

2. Section 97.13 is amended by adding paragraph (c) to read as follows:

§ 97.13 Restrictions on station location.

* * * * *

(c) Before causing or allowing an amateur station to transmit from any place where the operation of the station could cause human exposure to levels of radiofrequency (RF) radiation in excess of that allowed under § 1.1310 of this chapter, the licensee is required to take certain actions. A routine RF radiation evaluation, as discussed in § 1.1307(b) of this chapter, is required if the transmitter power exceeds 50 watts peak envelope power; otherwise the operation is categorically excluded from routine RF radiation evaluation except as specified in § 1.1307(c) and § 1.1307(d) of this chapter. Where the routine evaluation indicates that the RF radiation could be in excess of the limits contained in § 1.1310 of this chapter, the licensee must take action to prevent such an occurrence. Further information on evaluating compliance with these limits can be found in the FCC's OST/OET Bulletin Number 65, "Evaluation Compliance with FCC-Specified Guidelines for Human Exposure to Radiofrequency Radiation."

3. Section 97.503 is amended by revising paragraphs (b)(1), (b)(2), and (b)(3), and adding paragraph (c)(10) to read as follows:

§ 97.503 Element standards.

* * * * *

(b) * * *

(1) Element 2: 35 questions concerning the privileges of a Novice Class operator license. The minimum passing score is 26 questions answered correctly.

(2) Element 3(A): 30 questions concerning the privileges of a Technician Class operator license. The minimum passing score is 22 questions answered correctly.

(3) Element 3(B): 30 questions concerning the privileges of a General Class operator license. The minimum passing score is 22 questions answered correctly.

* * * * *

(c) * * *

Topics:	Element: 2	3(A)	3(B)	4(A)	4(B)
(10) Radiofrequency environmental safety practices at an amateur station	5	5	5	0	0

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