

Test Report

Project Number: 01071-10

Prepared for:

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TYPE CERTIFICATION TEST REPORT

418 MHz Home Security Transmitter
Door/Window Sensor
Model Number XDS125

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1. EUT Description

The Equipment Under Test (EUT) is the **Core Technology wireless sensor Transmitter**. The **Wireless Transmitter** is

Specific test requirements for this device include the following:

47 CFR 15.231	Fundamental Transmit Power
47 CFR 15.231 & 15.205	Spurious Radiated Power
47 CFR 15.231	Occupied Bandwidth
47 CFR 15.203	Antenna Requirement
47 CFR 15.207	Conducted Emissions

The system tested consisted of the following:

Manufacturer & Model	FCC ID #	Description
Core Technology	OU4-XDS125	Wireless Transmitter

1.1. EUT Operation

The **418 MHz Wireless Door/Window Sensor** was tested with the wireless link active and fully modulated. Setup and operational modes cover worst case configuration and operational modes for the device.

2. Radiated Emissions Testing

Professional Testing (EMI), Inc. (PTI), follows the guidelines of NIST for all uncertainty calculations, estimates and expressions thereof for EMC testing. Radiated emission measurements were made of the Fundamental and Spurious Emission levels for the **418 MHz Wireless Door/Window Sensor**. Measurements of the occupied bandwidth were also made for the equipment.

Measurements of the maximum emission levels for the fundamental and the spurious/harmonic emissions of the **418 MHz Wireless Door/Window Sensor** were made at the Professional Testing "Open Field" Site 3, located in Marble Falls, Texas to determine the radio noise radiated from the EUT. A "Description of Measurement Facilities" has been submitted to the FCC and approved pursuant to Section 2.948 of CFR 47 of the FCC rules.

Tests of the fundamental for the device were performed to determine the worst case polarization of the devices. The fundamental emissions of the device were

measured with the antennas of the devices vertical and horizontal to the ground plane.

2.1. Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The table was centered on a motorized turntable which allows 360 degree rotation. For measurements of the fundamental signal, a measurement antenna was positioned at a distance of 3 meters as measured from the closest point of the EUT. For spurious/harmonic measurements above 1GHz, the measurement antenna was placed 1 meter from the EUT. The radiated emissions were maximized by configuring the EUT, by rotating the EUT, and by raising and lowering the antenna from 1 to 4 meters.

A Spectrum Analyzer with peak detection was used to find the maximums of the radiated emissions during the variability testing. A drawing showing the test setup is given as Figure 1.

2.2. Test Criteria

The FCC Part 15.231 radiated limits are given below for an intentional radiator operating in the 902 to 928 MHz band. The reference distance for each limit is also shown in this table.

Signal Type	Test Distance	Field Strength	
		$\mu\text{V/m}$	$\text{dB } \mu\text{V/m}$
Fundamental	3	50,000	93.9
Spurious/Harmonics	3	500	53.9
Spurious/Harmonics	1	1,500	63.5

In addition to these requirements, the EUT must meet the restricted emission band requirements of §15.205. For this frequency range, the unintentional radiated emission limits of §15.231 for a 902 to 928 MHz radiator and the restricted band limits of §15.205 are identical. Measurements of the harmonic were performed to the 10th harmonic of the fundamental.

2.3. Test Results

The radiated test data is included as Appendix B. The emissions were maximized at each frequency and the highest emissions identified were measured using peak detection. The radiated emissions generated by the **418 MHz Wireless Door/Window Sensor** are below the FCC Part 15.231 maximum emission criteria.

3. Occupied Bandwidth Measurements

Measurements of the occupied bandwidth for the fundamental signals of the of the **418 MHz Wireless Door/Window Sensor** were made at the Professional Testing's Round Rock, Texas laboratory. All measurements were made in a controlled indoor environment in a configuration which did not present measurement distortion or ambient interference.

3.1. Test Procedure

1. The EUT was placed on a non-conductive table 0.8 meters above the floor. The table was rotated to an angle that presented the highest signal level.
2. The Spectrum Analyzer was set to a resolution bandwidth of 100 kHz. Peak detection was used for all tests. The display was set with the maximum amplitude near the displayed center frequency and with a display width sufficient to view the occupied bandwidth.
3. The occupied bandwidth was measured based on a 20 dB criteria (20 dB down either side of the emission from the nominal center of the emission).

A drawing showing the test setup is given as Figure 1.

3.2. Test Criteria

The FCC rules specify the limit of occupied bandwidth for 47 CFR 15.231 devices operating between 70 - 900 MHz to 0.25% of the center frequency. For a center frequency of 418 MHz the occupied bandwidth requirement is 1.045 MHz.

Measurement of the occupied bandwidth was performed to verify that the emission bandwidth did not change beyond what is typically seen for the **418 MHz Wireless Door/Window Sensor**.

3.3. Test Results

The occupied bandwidth test data is included in Appendix C. The occupied bandwidth for the fundamental frequency (418 MHz) is 52.4 kHz. The figure is typical for the 418 MHz Wireless Door/Window Sensor.

The fundamental signal generated by the **418 MHz Wireless Door/Window Sensor** is within the band allowed under FCC Part 15.231 emission band criteria.

4. Antenna Requirement

An analysis of the **418 MHz Wireless Door/Window Sensor** was performed to determine compliance with Section 15.203 of the Rules. This section requires specific handling and control of antennas used for devices subject to regulation under the Intentional Radiator portions of Part 15.

4.1. Evaluation Procedure

The structure and application of the **418 MHz Wireless Door/Window Sensor** were analyzed with respect to the rules. The antenna for this unit is permanently attached to the unit and is not accessible by the user and an auxiliary antenna port is not present.

4.2. Evaluation Criteria

Section 15.203 of the rules states that the subject device must meet at least one of the following criteria:

- (a) Antenna be permanently attached to the unit.
- (b) Antenna must use a unique type of connector to attach to the EUT.
- (c) Unit must be professional installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

4.3. Evaluation Results

The **418 MHz Wireless Door/Window Sensor** meets the criteria of this rule by virtue of having an antenna permanently attached to the unit. The EUT is therefore compliant with §15.203.

5. Modifications to Equipment

There were no modifications made on the **418 MHz Wireless Door/Window Sensor** during the performance of the test program in order to meet the FCC criteria.

6. List of Test Equipment

A list of the test equipment utilized to perform the testing is given below. The date of calibration is given for each.

Electromagnetic Emissions Test Equipment		
Device Description	Date Last Calibration	Date Calibrated Due
HP 8566B Spectrum Analyzer	07/22/00	07/22/01
HP 85650A Quasi Peak Adapter	07/22/00	07/22/01
HP 8447E Preamp	11/11/99	11/11/00
EMCO 3146 Log Antenna	12/21/99	12/21/00
EMCO 3115 Microwave Antenna	5/21/00	5/21/01
MITEQ Preamp 1-20 GHz	5/10/00	5/10/01
Advantest R3265 Spectrum Analyzer	11/5/00	11/5/01

Tektronix 2706 Preselector	11/5/00	11/5/01
Compliance Design B-100 Biconical Antenna	11/5/00	11/5/01

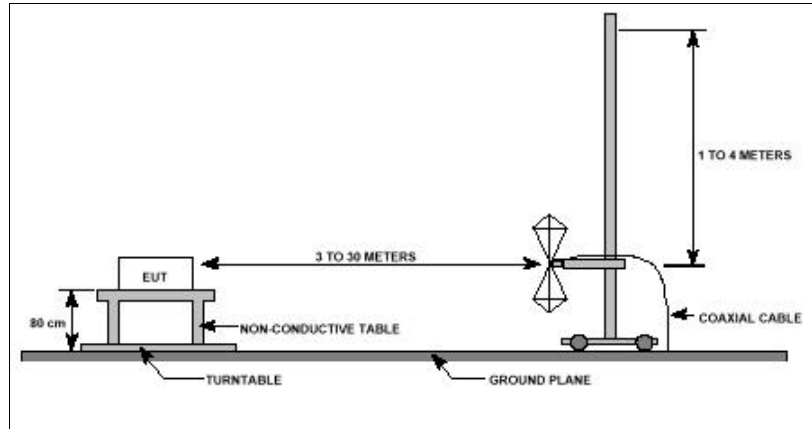


FIGURE 1: Radiated Emissions Test Setup

7. Appendix A: Fundamental Radiated Emissions Data

Grantee: Core Technology
Model: 418 MHz Wireless Door/Window Sensor
M/N: XDS125
S/N: 001
Project: 01071-10

Date: 10/9/00
Measurement Distance (m): 3
Detector Function: Quasi-Peak

Antenna Polarization - Vertical

Frequency	EUT Dir.	Ant. Height	Rec. Level	Ant. Factor	Cable Loss	Corrected Level	Limit	Margin
MHz	Deg.	m	dB \bar{V}	dB/m	dB	dB \bar{V} /m	dB \bar{V} /m	dB
418.0	45	1.4	52.6	15.1	5.7	73.4	80.3	6.9

Antenna Polarization - Horizontal

Frequency	EUT Dir.	Ant. Height	Rec. Level	Ant. Factor	Cable Loss	Corrected Level	Limit	Margin
MHz	Deg.	m	dB \bar{V}	dB/m	dB	dB \bar{V} /m	dB \bar{V} /m	dB
418.0	275	2.0	49.1	15.1	5.7	69.9	80.3	10.4

8. Appendix B: Spurious Radiated Emissions

Grantee: Core Technology
Model: 418 MHz Wireless Door/Window Sensor
M/N: XDS125
S/N: 001
Project: 01071-10

Date: 10/9/00
Measurement Distance (m): 3
Detector Function: Quasi-Peak

Antenna Polarization - Vertical

Frequency	EUT Dir.	Ant. Height	Rec. Level	Ant. Factor	Cable Loss	Corrected Level	Limit	Margin
MHz	Deg.	m	dB μ V	dB/m	dB	dB μ V/m	dB μ V/m	dB
836.0	45	1.2	28.4	21.3	9.7	59.4	60.3	0.9

Antenna Polarization - Horizontal

Frequency	EUT Dir.	Ant. Height	Rec. Level	Ant. Factor	Cable Loss	Corrected Level	Limit	Margin
MHz	Deg.	m	dB μ V	dB/m	dB	dB μ V/m	dB μ V/m	dB
836.0	45	2.0	25.4	21.3	9.7	56.4	60.3	3.9

Date: 10/9/00
Measurement Distance (m): 1
Detector Function: Peak

Antenna Polarization - Horizontal

Frequency	EUT Dir.	Rec. Level	Correction Factor	Corrected Level	Limit	Margin
MHz	Deg.	dB μ V	dB	dB μ V/m	dB μ V/m	dB
1254	270	58.6	4.8	53.8	69.8	-16.0
1672	285	45.1	5.0	40.1	69.8	-29.7
2090	190	59.3	4.4	54.9	69.8	-14.9
2508	330	45.0	4.1	40.9	69.8	-28.9
2926	20	53.4	3.1	50.3	69.8	-19.5
3344	20	65.7	1.9	63.8	69.8	-6.0

3762	320	66.6	0.3	66.3	69.8	-3.5
4180	0	58.0	-0.9	58.9	69.8	-10.9

Date: 10/9/00

Measurement Distance (m): 1

Detector Function: Peak

Antenna Polarization - Vertical

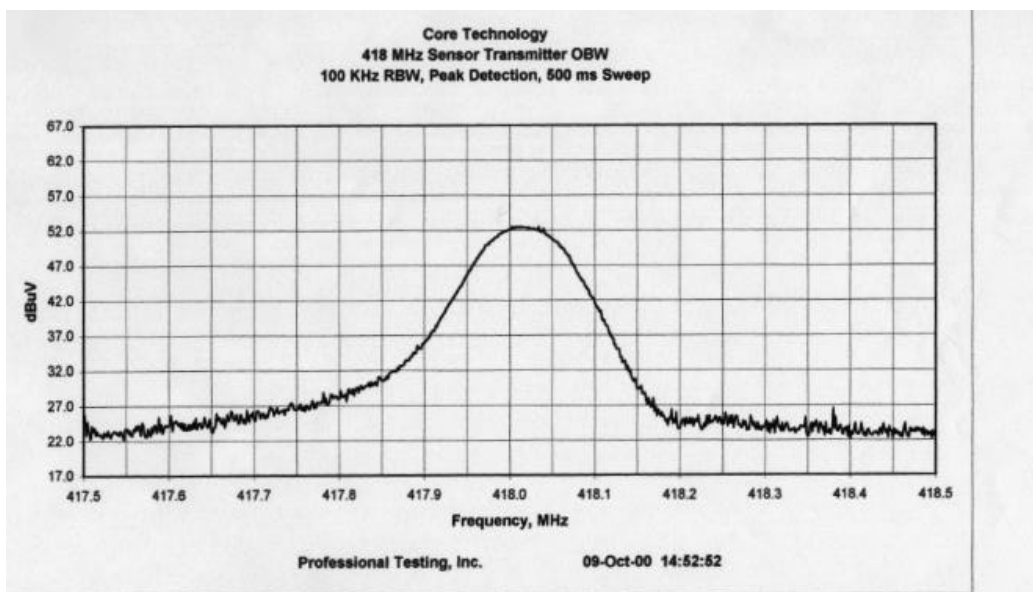
Frequency	EUT Dir.	Rec. Level	Correction Factor	Corrected Level	Limit	Margin
MHz	Deg.	dB μ V	dB/m	dB μ V/m	dB μ V/m	dB
1254	90	63.0	4.8	58.2	69.8	-11.6
1672	190	58.9	5.0	53.9	69.8	-15.9
2090	170	61.5	4.4	57.1	69.8	-12.7
2508	280	44.6	4.1	40.5	69.8	-29.3
2926	90	56.3	3.1	53.2	69.8	-16.6
3344	270	60.7	1.9	58.8	69.8	-11.0
3762	75	62.8	0.3	62.5	69.8	-7.3
4180	340	51.7	-0.9	52.6	69.8	-17.2

9. Appendix C: Occupied Bandwidth

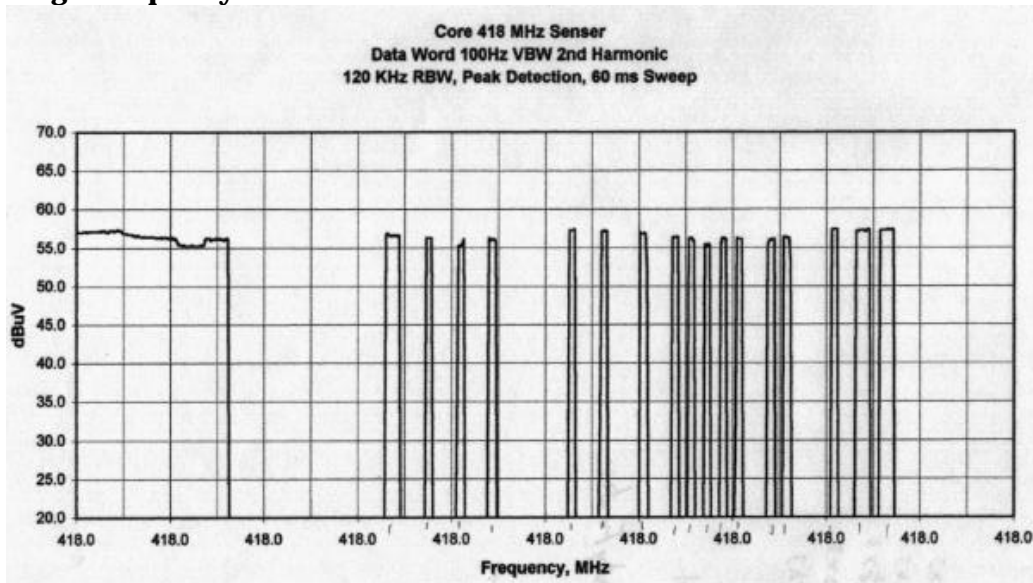
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Model: 418 MHz Wireless Door/Window Sensor
M/N: XDS125
S/N: 001
Project: 01071-10

Date: 7/18/00

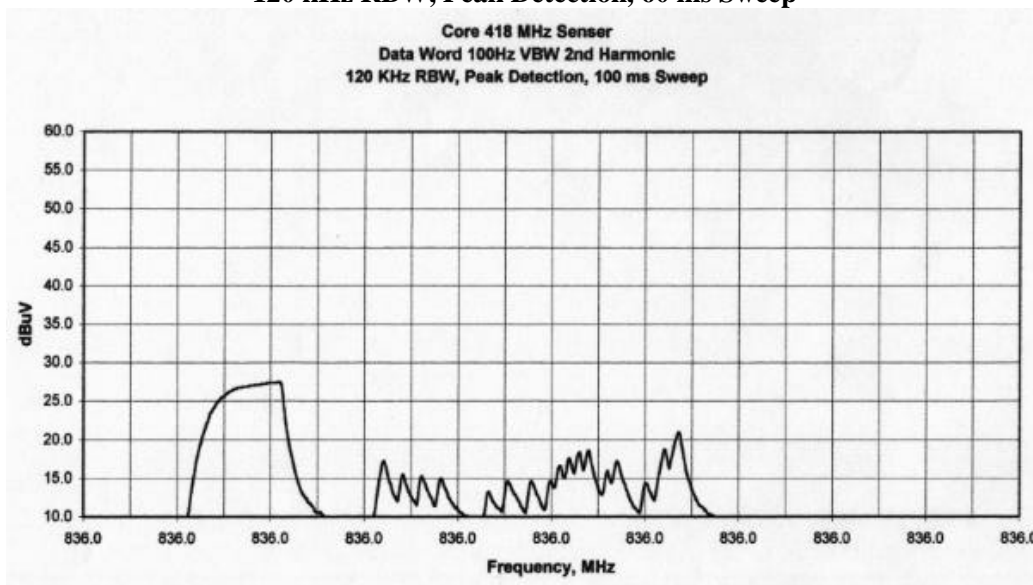
20 dB Bandwidth: 280 kHz
Duty Factor: .41



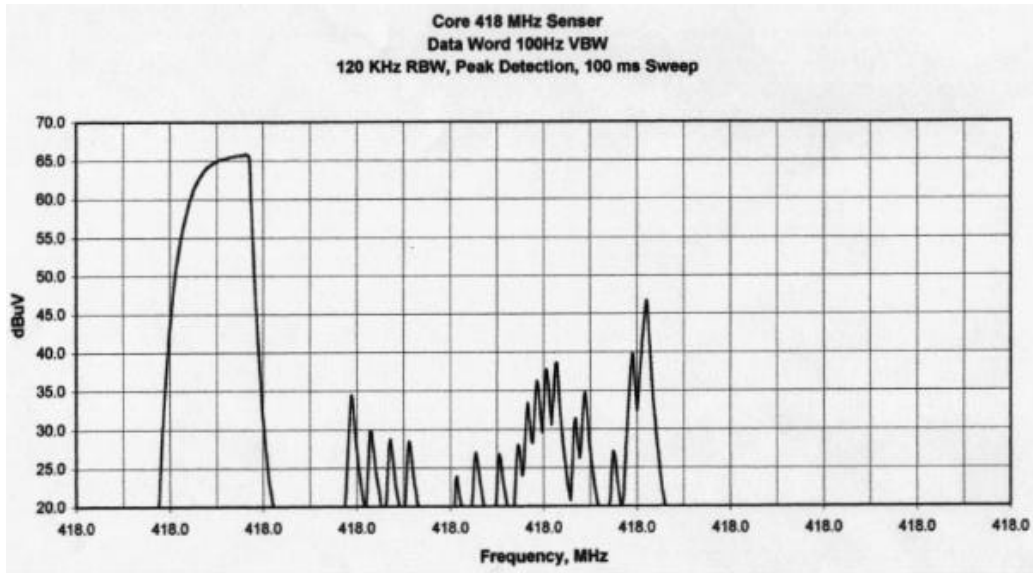
Single Frequency Time Scans



120 kHz RBW, Peak Detection, 60 ms Sweep



120 kHz RBW, Peak Detection, 100 ms Sweep



120 kHz RBW, Peak Detection, 100 ms Sweep

10. Appendix D: Applicable Sections of FCC Part 15

10.1. 47CFR15.209 - Radiated emission limits, general requirements

(a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other Sections within this Part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

(e) The provisions in Sections 15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this Part.

(f) In accordance with Section 15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in Section 15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in Section 15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in Section 15.109 that are applicable to the incorporated digital device.

(g) Perimeter protection systems may operate in the 54-72 MHz and 76-88 MHz bands under the provisions of this section. The use of such perimeter protection systems is limited to industrial, business and commercial applications.

10.2. 47CFR15.231 - Periodic operation in the band 40.66 - 40.70 MHz and above 70 MHz

(a) The provisions of this Section are restricted to periodic operation within the band 40.66 - 40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this Section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Radio control of toys is not permitted. Continuous transmissions, such as voice or video, and data transmissions are not permitted. The prohibition against data transmissions does not preclude the use of recognition codes. Those codes are used to identify the sensor that is activated or to identify the particular component as being part of the system. The following conditions shall be met to comply with the provisions for this periodic operation:

(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions to determine system integrity of transmitters used in security or safety applications are allowed if the periodic rate of transmission does not exceed one transmission of not more than one second duration per hour for each transmitter.

(4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

(b) In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	2,250	225
70 - 130	1,250	125
130 - 174	1,250 to 3,750 **	125 to 375 **
174 - 260	3,750	375
260 - 470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12,500	1,250

** linear interpolations

[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, uV/m at 3 meters = $56.81818(F) - 6136.3636$; for the band 260-470 MHz, uV/m at 3 meters = $41.6667(F) - 7083.3333$. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this Section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in Section 15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of Section 15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in Section 15.209, whichever limit permits a higher field strength.

(c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

(d) For devices operating within the frequency band 40.66 - 40.70 MHz, the bandwidth of the emission shall be confined within the band edges and the frequency tolerance of the carrier shall be $\pm 0.01\%$. This frequency tolerance shall be maintained for a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

(e) Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) and may be employed for any type of operation, including operation prohibited in paragraph (a), provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this Section, except the field strength table in paragraph (b) is replaced by the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emission (microvolts/meter)
40.66 - 40.70	1,000	100
70 - 130	500	50
130 - 174	500 to 1,500 **	50 to 150 **
174 - 260	1,500	150
260 - 470	1,500 to 5,000 **	150 to 500 **
Above 470	5,000	500

** linear interpolations

[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, $\mu\text{V}/\text{m}$ at 3 meters = $22.72727(F) - 2454.545$; for the band 260-470 MHz, $\mu\text{V}/\text{m}$ at 3 meters = $16.6667(F) - 2833.3333$. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.