Nemko Test Report:	5L0233RUS1Rev2
Applicant:	MPH Industries 316 East 9th St. Owensboro, KY 42303
Equipment Under Test: (E.U.T.)	DS4 990946
FCC ID:	CJR-SDRR-K01
In Accordance With:	**FCC Part 15, Subpart C** For Operation Within The Bands 902-928 MHz, 2435-2465 MHz, 5785-5815 MHz, 10500-10550 MHz, 24075-24175 MHz Intentional Radiators Used As Field Disturbance Sensors Excluding Perimeter Protection Systems
Tested By:	Nemko Dallas Inc. 802 N. Kealy Lewisville, Texas 75057-3136
Authorized By:	David Light, Wireless Engineer
Date:	26 September, 2005
Total Number of Pages:	25

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Section 1. Summary of Test Results

Manufacturer: MPH Industries

Model No.: DS4 990946

Serial No.: DS4946000001

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C, Paragraph 15.245. All tests were conducted using measurement procedure ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

☒ New Submission ☐ Production Unit

☐ Class II Permissive Change ☐ Pre-Production Unit

F	D	S

Speed Sensor Radar

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.
See " Summary of Test Data".

NVLAP LAB CODE: 100351-0

TESTED BY: __Kevin Rose_____ DATE: __2 June, 2005_____

Summary Of Test Data

Name of Test	Paragraph Number	Results
Radiated Emissions	15.245	Complies
Powerline Conducted Emissions	15.207	Not Applicable

Footnotes: Powerline Conducted Emission testing was not performed. The device operates on an automotive battery.

Section 2. Equipment Under Test (E.U.T.)

General Equipment Information

Frequency Range:	24,150 MHz
Operating Frequency(ies) of Sample:	24, 150 MHz
Type of Emission:	Frequency modulated signal. Deviation +/- 100kHz. No information transmitted.
Emission Designator:	FON
Supply Power Requirement:	12 Vdc automotive battery supply
Duty Cycle Calculation:	Not Applicable. The device generates a continuous signal. The rf signal is not pulsed.

Description of E.U.T.

The DS4™ Speed, Direction, & Range Sensing Radar is used to measure speed, direction, and range of motor vehicles. The device uses the Doppler shift principle.

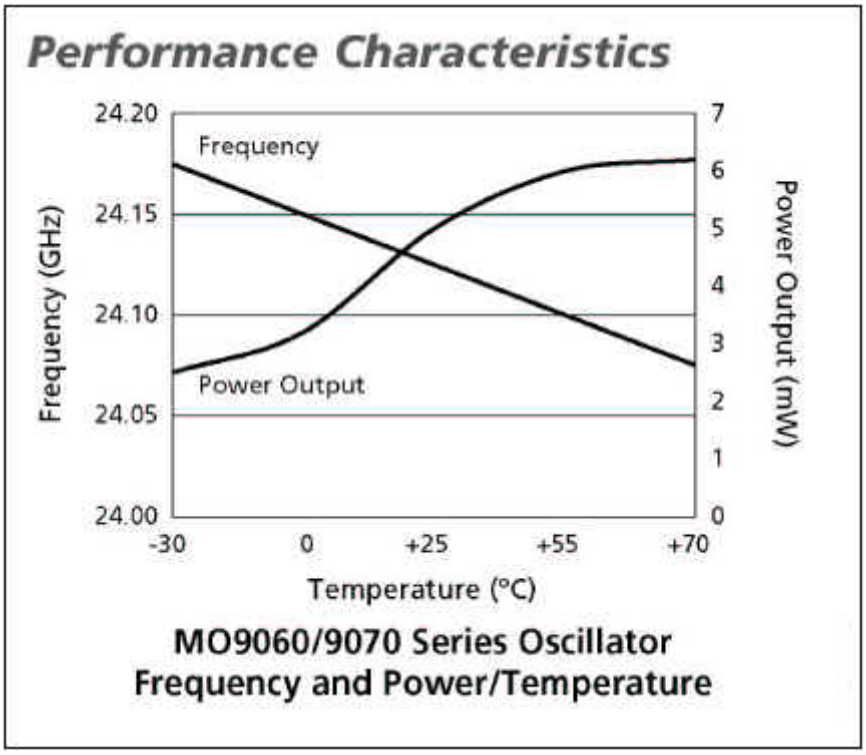
Modifications Incorporated in E.U.T.

The EUT has not been modified from what is described by the brand name and unique type identification stated above.

Theory of Operation

The DS4™ is a self-contained device consisting of a Gunn oscillator, a transmit and receive antenna, and an integral signal processing unit. The device is housed in a NEMA type enclosure with one eight pin circular connector through which power and RS232 communication signals are passed.

The DS4™ is not housed in a waterproof enclosure but a typical application would be to house the DS4™ module in an outdoor enclosure that would be located beside a roadway to measure and report the speed of passing vehicles.



Justification

The E.U.T. was configured for testing as per typical installation.

The following combinations were investigated to establish worst-case configuration:

(1) Tested as supplied by the manufacturer with maximum rf power output with 6 dBi antenna.

Exercise Program

The E.U.T. exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to typical use.

Exercise mode:

(1) The device was operated as supplied by the manufacturer. The device was configured as per normal installation.

Section 3. Equipment Configuration

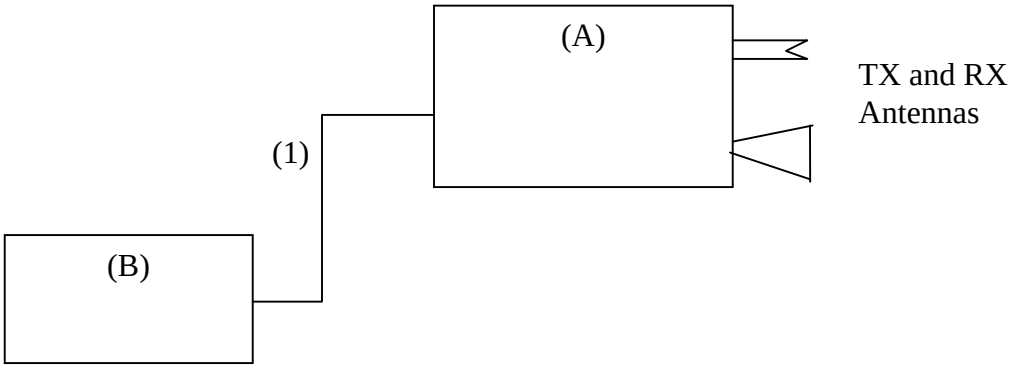
Equipment Configuration List:

Item	Description	Model No.	Serial.
(A)	DS4 radar	DS4 990946	DS4946000001
(B)	Lab power supply		

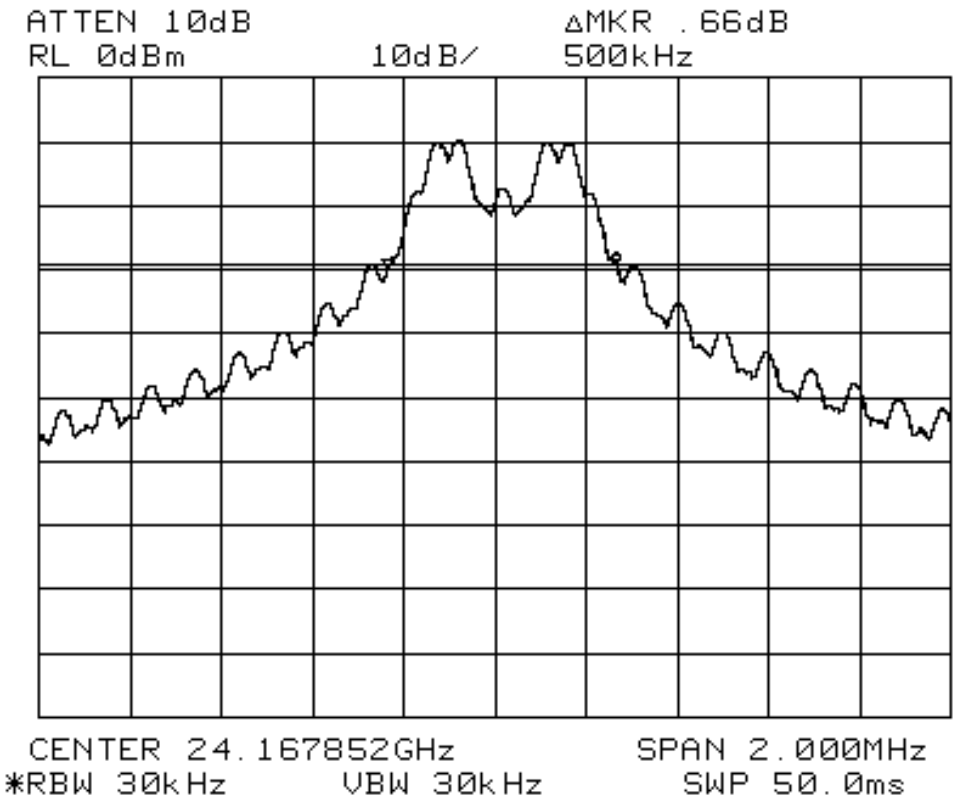
Inter-connection Cables:

Item	Description	Length (m)
(1)	Power/RS232 interconnection cable	0.5

Configuration of the Equipment Under Test (E.U.T)



Waveguide antennas are permanently attached.


ATTEN 10dB
ΔMKR .66dB
RL 0dBm
10dB/
500kHz
CENTER 24.167852GHz
SPAN 2.000MHz
*RBW 30kHz
VBW 30kHz
SWP 50.0ms

99% OBW PLOT

Section 4. Radiated Emissions

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.245
TESTED BY: Kevin Rose	DATE: 2 June, 2005

Minimum Standard: See Annex B

Test Results: Complies. The worst-case emission level is 87.6 dBμV/m @ 3m at 48,336 MHz. This is 0.4 dB below the specification limit.

Test Data: See attached table.

Above 1 GHz a spectrum analyzer and low noise amplifier are used to measure emission levels. The spectrum analyzer resolution bandwidth was set to 1 MHz and video bandwidth was 3 MHz.

Above 26.5 GHz microwave harmonic mixers are used to extend the frequency range of the spectrum analyzer.

The device was mounted with the standard orientation using the mounting hardware provided.

The supply voltage was varied between 10 Vdc and 14.5 Vdc with no change in field strength noted.

Test Data - Radiated Emissions

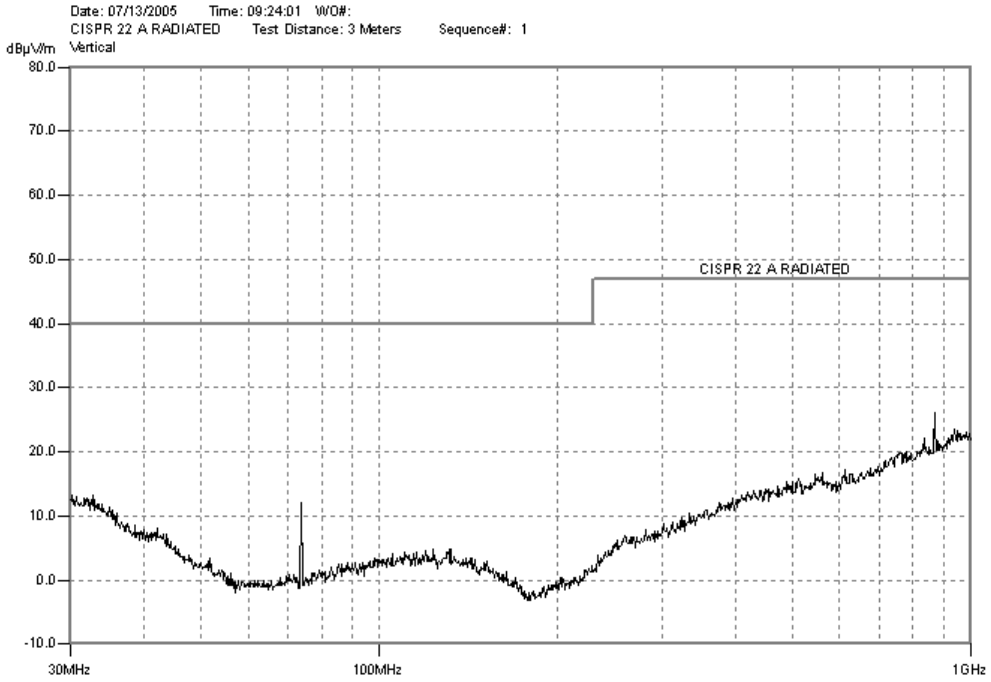
Range: A		Test Distance (meters) : Fundamental: 1m Spurious: 0.5				RBW 1 MHz, VBW 3 MHz		Detector: 1464			
Freq. (MHz)	**Ant. ***	**Pol. (V/H)**	**Ant. HGT. (m)**	**Table (deg.)**	**RCVD Level (dBμV)**	**Ant. Factor (dB)****	**Amp. Gain (dB)*****	**Dist. Corr. (dB)**	**Field Strength (dBμV/m)**	**Limit (dBμV/m)**	**Margin (dB)**
24168	H	V	1	0	92.3	40.4	0	9.5	123.2	128	4.8
48336	H	V	1	0	65.0	38.2	0	15.6	87.6	88	0.4

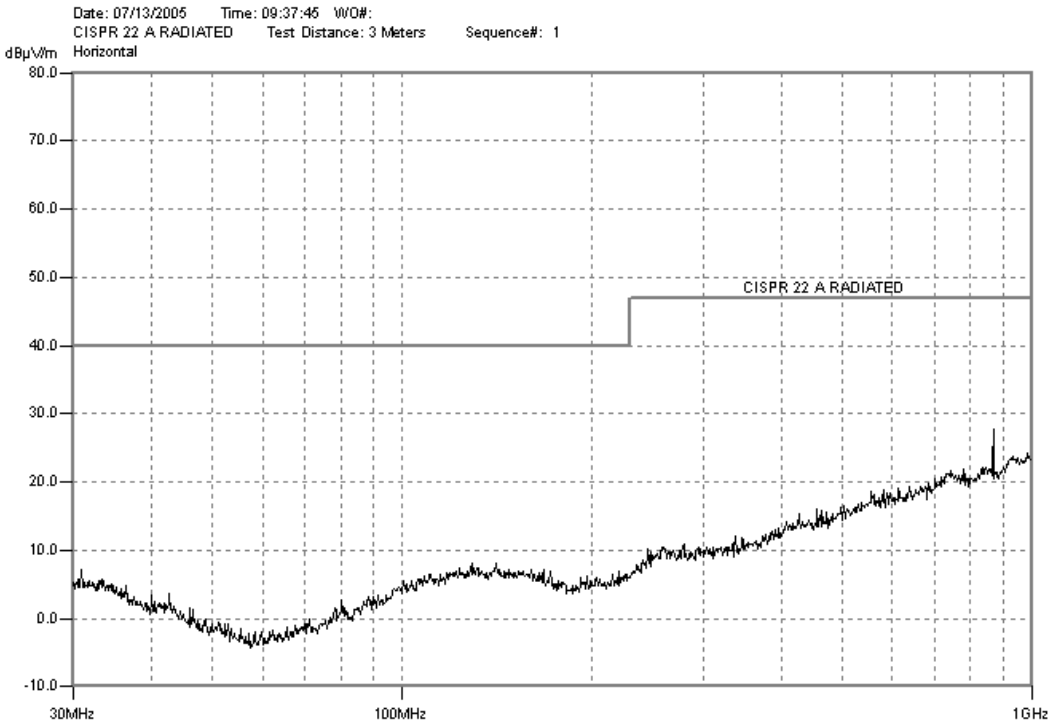
Notes:
B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole
* Re-measured using dipole antenna.
** Includes cable loss when amplifier is not used.
*** Includes cable loss.
( ) Denotes failing emission level.

Above 26.5 GHz harmonic mixers were used. The conversion loss is programmed in the spectrum analyzer allowing for a direct measurement of received signal level.

The receive antenna polarization and height are not absolute. When a signal was detected, an imaginary plane at the indicated test distance was carefully searched by slowly moving the receive antenna within this imaginary plane, orienting the receive antenna position and polarization to achieve maximum received signal level.

The spectrum was searched up to 110 GHz. The minimum threshold of detection is sufficient to detect signals within 10 dB of the specification limit.


Date: 07/13/2005 Time: 09:24:01 WO#:
CISPR 22 A RADIATED Test Distance: 3 Meters Sequence#: 1
dBµV/m Vertical
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
CISPR 22 A RADIATED
30MHz
100MHz
1GHz


Date: 07/13/2005 Time: 09:37:45 WO#:
CISPR 22 A RADIATED Test Distance: 3 Meters Sequence#: 1
dBµV/m Horizontal
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
CISPR 22 A RADIATED
30MHz
100MHz
1GHz

Radiated Photographs (Worst Case Configuration)

FRONT VIEW

REAR VIEW

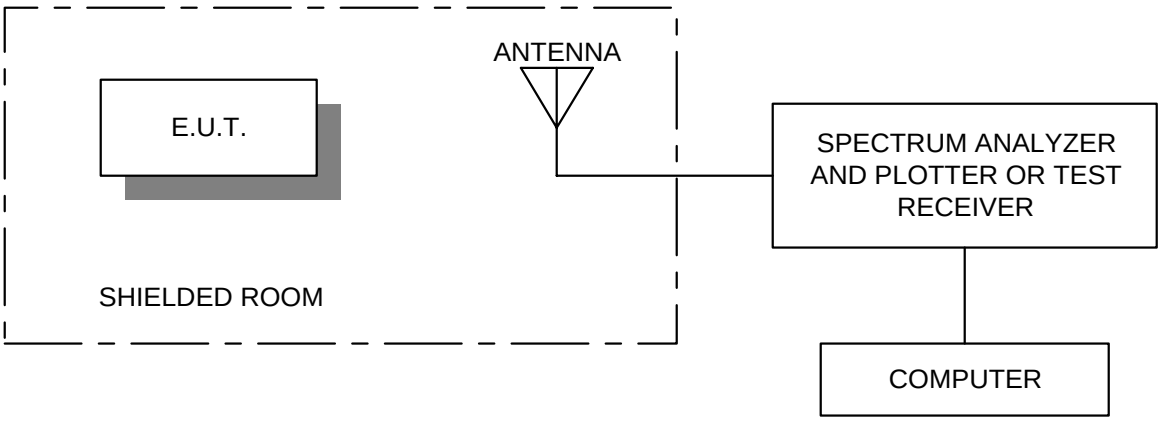

5L0235E
REHE-701

Section 5. Powerline Conducted Emissions

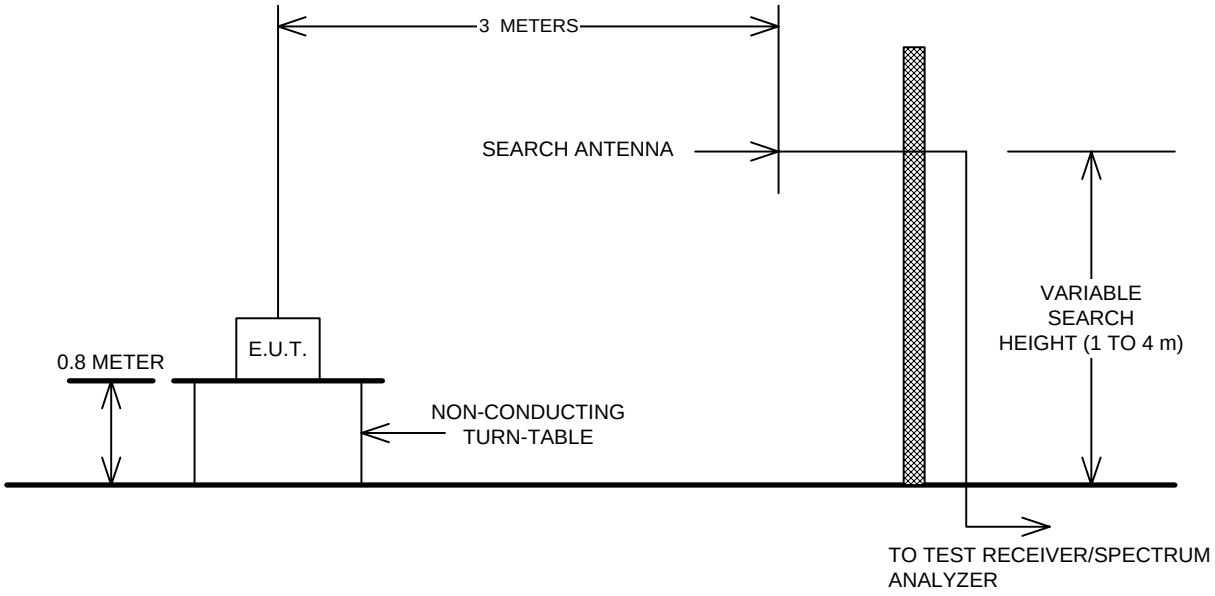
Not Applicable. The device is battery powered.

Section 6. Block Diagrams

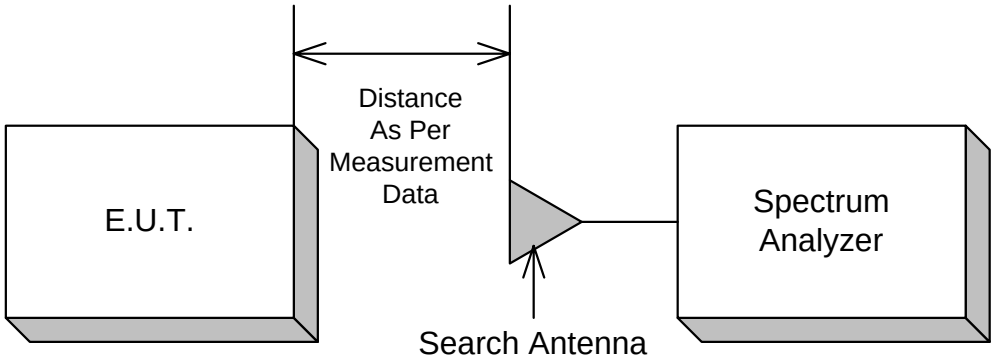
Radiated Prescan



Outdoor Test Site For Radiated Emissions



Indoor Measurement Setup for Emissions Above 10 GHz



Section 7. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/14/05	01/15/07
1081	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	08/26/04	08/26/05
283	Environmental Chamber with controller # 1189006	ENVIROTRONICS SH27 & 2030-22844	129010083	05/22/05	05/22/06
984	HORN ANTENNA	MILLITECH NONE	NONE	CNR	CNR
985	HORN ANTENNA	MILLITECH NONE	NONE	CNR	CNR
990	HORN ANTENNA	MILLITECH NONE	NONE	CNR	CNR
991	Horn antenna	EMCO 3160-10	9704-1049	CNR	CNR
989	HARMONIC MIXER	Hewlett Packard 11970U	2332A00116	01/22/05	01/22/06
988	HARMONIC MIXER	Hewlett Packard 11970A	2332A01929	01/22/05	01/22/06
986	HARMONIC MIXER	Hewlett Packard 11970V	2521A01222	01/22/05	01/22/06
987	HARMONIC MIXER	Hewlett Packard 5356D	2521A00583	01/22/05	01/22/06

ANNEX A

RESTRICTED BANDS

Section A Restricted Bands of Operation

(a) Except as shown in paragraph (d) of this section , only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42-16.423	399.9-410	4.5-5.15
0.49 - 0.51	16.69475-16.69525	608-614	5.35-5.46
2.1735 - 2.1905	16.80425-16.80475	960-1240	7.25-7.75
3.020 - 3.026	25.5-25.67	1300-1427	8.025-8.5
4.125 - 4.128	37.5-38.25	1435-1626.6	9.0-9.2
4.17725 - 4.17775	73-74.6	1645.5-1646.5	9.3-9.5
4.20725 - 4.20775	74.8-75.2	1660-1710	10.6-12.7
6.215 - 6.218	108-121.94	1718.8-1722.2	13.25-13.4
6.31175 - 6.31225	123-138	2220-2300	14.47-14.5
8.291 - 8.294	149.9-150.05	2310-2390	15.35-16.2
8.362 - 8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625 - 8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425 - 8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29 - 12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975 - 12.52025	240-285	3345.8-3358	36.43-36.5
12.57675 - 12.57725	322-335.4	3600-4400	Above 38.6
13.36 - 13.41			

ANNEX B

RADIATED EMISSION LIMITS

Radiated Emission Limits

§15.245 Operation within the bands 902-928 MHz, 2435-2465 MHz, 5785-5815 MHz, 10500-10550 MHz and 24075-24175 MHz.

(a) Operation under the provision of this section is limited to intentional radiators used as field disturbance sensors, excluding perimeter protection systems.

(b) The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency (MHz)	Field Strength Of Fundamental (millivolts/meter)	Field Strength of Harmonics (millitvolts/meter)
902-928	500	1.6
2435-2465	500	1.6
5785-5815	500	1.6
10500-10550	2500	25.0
24075-24175	2500	25.0

(1) Regardless of the limits shown in the above table, harmonic emissions in the restricted bands below 17.7 GHz, as specified in §15.205, shall not exceed the field strength limits shown in §15.209. Harmonic emissions in the restricted bands at and above 17.7 GHz shall not exceed the following field strength limits:

(i) For field disturbance sensors designed for use only within a building or to open building doors, 25 mV/m.

(ii) For all other field disturbance sensors, 7.5 mV/m.

(iii) Field disturbance sensors designed to be used in motor vehicles or aircraft must include features to prevent continuous operation unless their emissions in the restricted bands fully comply with the limits given in §15.209. Continuous operation of field disturbance sensors designed to be used in farm equipment; vehicles such as fork-lifts that are intended primarily for use indoors or for very specialized operations. Or railroad locomotives, railroad cars and other equipment which travel on fixed tracks is permitted. A field disturbance sensor will be considered not to be operating in a continuous mode if its operation is limited to specific activities of limited duration (e.g. putting a vehicle in reverse gear, activating a turn signal, etc.).

§15.245, continued

(2) Field strength limits are specified at a distance of 3 meters.

(3) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

(4) The emission limits shown above are based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

§15.209 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 (millivolts/meter)	Measurement Distance (meters)
0.009-0.490	2400/F (kHz)	300
0.490-1.705	2400/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