



CERTIFICATION TEST REPORT
FOR THE
WIRELESS FENCE TRANSMITTER, WF-020
FCC PART 15 SUBPART C
COMPLIANCE

DATE OF ISSUE: MARCH 30, 2000

PREPARED FOR:

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Date of test: March 23 & 24, 2000

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ADMINISTRATIVE INFORMATION

DATE OF TEST: March 23 & 24, 2000

PURPOSE OF TEST: To demonstrate the compliance of the Wireless Fence Transmitter, WF-020, with the requirements for FCC Part 15 Subpart C devices.

MANUFACTURER: Innotek Pet Products, Inc.
One Innoway
Garrett, IN 46738

REPRESENTATIVE: Pete Johnson

TEST LOCATION: CKC Laboratories, Inc.
22105 Wilson River Hwy
Tillamook, OR 97141

TEST PERSONNEL: Mike Wilkinson

TEST METHOD: ANSI C63.4 1992 & FCC Parts 15.209, 15.215 & 15.227

FREQUENCY RANGE TESTED: 9 kHz - 1000 MHz

EQUIPMENT UNDER TEST:

Wireless Fence Transmitter
Manuf: Innotek Pet Products, Inc.
Model: WF-020
Serial: N/A
FCC ID: KBS050238 (pending)

SUMMARY OF RESULTS

The Innotek Pet Products, Inc. Wireless Fence Transmitter, WF-020, was tested in accordance with ANSI C63.4 1992 for compliance with FCC Part 15 Subpart C.

As received, the above equipment was found to be fully compliant with the limits of FCC Part 15 Subpart C. The results in this report apply only to the items tested, as identified herein.

EQUIPMENT UNDER TEST (EUT) DESCRIPTION

Short range transmitter used to create a confinement field.

MEASUREMENT UNCERTAINTY

Associated with data in this report is a ± 4 dB measurement uncertainty.

PERIPHERAL DEVICES

The EUT was tested not tested with peripheral devices.

REPORT OF MEASUREMENTS

The following tables report the highest worst case levels recorded during the tests performed on the Wireless Fence Transmitter, WF-020. All readings taken are peak readings unless otherwise noted by a “Q” or “A”. The data sheets from which these tables were compiled are contained in Appendix B.

Table 1: Fundamental Radiated Emission Levels									
FREQUENCY	METER READING	CORRECTION FACTORS				CORRECTED READING	SPEC LIMIT	MARGIN	NOTES
		Mag Ant dB	Amp dB	Cable dB	Dist dB				
MHz	dB μ V					dB μ V/m	dB μ V/m	dB	
0.016	83.1	14.7		0.1		97.9	123.3	-25.4	N
27.140	69.3	9.2		0.5		79.0	80.0	-1.0	NA

Test Method:
Spec Limit :
Test Distance:

ANSI C63.4 1992
FCC Part 15.227(A)
3 Meters

NOTES: H = Horizontal Polarization
V = Vertical Polarization
N = No Polarization
D = Dipole Reading
Q = Quasi Peak Reading
A = Average Reading

COMMENTS: EUT is transmitting continuously at 27.141 MHz and 16.45 kHz. The transmitter was set to maximum (fully clockwise). EUT power is from integral solar cells. The test was performed with a fully charged EUT. EUT was placed on the test table in the vertical position on an 8" metal post with the solar panel facing up. The temperature was 68°F and the humidity was 49%.

Table 2: Six Highest Radiated Emission Levels - 9kHz-1000MHz

FREQUENCY	METER READING	CORRECTION FACTORS				CORRECTED READING	SPEC LIMIT	MARGIN	NOTES
		Mag/ Bilog Ant dB	Amp dB	Cable dB	Dist dB				
MHz	dBμV					dBμV/m	dBμV/m	dB	
54.298	48.8	7.1	-27.9	1.2		29.2	40.0	-10.8	V
135.720	50.9	11.4	-27.5	2.0		36.8	43.5	-6.7	VQ
162.883	49.0	10.4	-27.5	2.1		34.0	43.5	-9.5	VQ
190.011	47.6	9.0	-27.3	2.3		31.6	43.5	-11.9	VQ
271.445	48.2	12.9	-26.9	3.0		37.2	46.0	-8.8	VQ
298.588	45.3	13.3	-26.9	3.3		35.0	46.0	-11.0	H

Test Method:
Spec Limit :
Test Distance:

ANSI C63.4 1992
FCC Part 15.227(B)
3 Meters

NOTES: H = Horizontal Polarization
V = Vertical Polarization
N = No Polarization
D = Dipole Reading
Q = Quasi Peak Reading
A = Average Reading

COMMENTS: EUT is transmitting continuously at 27.141 MHz and 16.45 kHz. The transmitter was set to maximum (fully clockwise). EUT power is from integral solar cells. The test was performed with a fully charged EUT. EUT was placed on the test table in the vertical position on an 8" metal post with the solar panel facing up. The temperature was 68°F and the humidity was 49%.

TABLE A

LIST OF TEST EQUIPMENT

Tillamook site C

1. Spectrum Analyzer, Hewlett Packard, Model No. 8568A S/N 2235A02426. Calibration date: April 21, 1999. Calibration due date: April 21, 2000.
2. Quasi-Peak Adapter, Hewlett Packard, Model No. 85650A, S/N 2430A00433. Calibration date: April 21, 1999. Calibration due date: April 21, 2000.
3. Preamp, Hewlett Packard, Model No. 8447D, S/N 2727A05432. Calibration date: June 11, 1999. Calibration due: June 11, 2000.
4. Bilog, Chase, Model No. CBL6111C, S/N 2456. Calibration date: August 30, 1999. Calibration due date: August 30, 2000.
5. Magnetic Loop Antenna, Electro Metric, Model No. 6502, S/N 2156. Calibration date: August 4, 1999. Calibration due date: August 4, 2000.
6. 3/10 Meter Cable, Andrews, Asset No. 01017, 01018 & 01019. Calibration date: July 11, 1999. Calibration due date: July 11, 2000.
7. Tillamook Site C. Calibration date: October 25, 1999. Calibration due date: October 25, 2000.
8. Test software, EMI Test 3.09.

EUT SETUP

The equipment under test (EUT) was set up in a manner that represented its normal use. Any special conditions required for the EUT to operate normally are identified in the comments that accompany Tables 1 for fundamental radiated emissions and Table 2 for radiated emissions. Additionally, a complete description of the EUT is included on the information sheets contained in Appendix A.

During radiated emissions testing, the EUT was mounted on a nonconductive, rotating table 80 cm above the conductive grid. The nonconductive table dimensions were 1 meter by 1.5 meters. This configuration is typical for radiated emissions testing of table top devices.

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed in Table A were used to collect the radiated emissions data for the Wireless Fence Transmitter, WF-020. For frequencies below 30 MHz the mag loop antenna was used. For radiated measurements from 30 to 1000 MHz, the bilog antenna was used. All antennas were located at a distance of 3 meters from the edge of the EUT.

The HP spectrum analyzer was used for all measurements. Table B shows the analyzer bandwidth settings that were used in designated frequency bands. During radiated testing, the measurements were made with 0 dB of attenuation, a reference level of 97 dB μ V, and a vertical scale of 10 dB per division.

TABLE B : ANALYZER BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz

SPECTRUM ANALYZER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in Tables 1 and 2 indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "Peak" mode. Whenever a "Quasi-Peak" or "Average" reading is listed as one of the highest readings, this is indicated as a "Q" or an "A" in the appropriate table. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data for the Wireless Fence Transmitter, WF-020.

Peak

In this mode, the Spectrum Analyzer or test engineer recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature of the analyzer called "peak hold," the analyzer had the ability to measure transients or low duty cycle transient emission peak levels. In this mode the analyzer made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

When the true peak values exceeded or were within 2 dB of the specification limit, quasi-peak measurements were taken using the HP Quasi-Peak Adapter for the HP Spectrum Analyzer. The detailed procedure for making quasi peak measurements contained in the HP Quasi-Peak Adapter manual were followed.

Average

When the frequencies were less than 30 MHz, average measurements may be made using the spectrum analyzer. To make these measurements, the test engineer reduces the video bandwidth on the analyzer until the modulation of the signal is filtered out. At this point the analyzer is set into the linear mode and the scan time is reduced.

TEST METHODS

The radiated emissions data of the Wireless Fence Transmitter, WF-020, was taken with the HP Spectrum Analyzer. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the "Sample Calculations". The corrected data was then compared to the FCC Part 15, Subpart C emissions limits to determine compliance.

Preliminary and final measurements were taken in order to better ensure that all emissions from the EUT were found and maximized.

Radiated Emissions Testing

During the preliminary radiated scan, the EUT was powered up and operating in its defined FCC test mode. Frequencies below 30 MHz was scanned using the mag loop antenna. The frequency range of 30 MHz - 1000 MHz was then scanned with the bilog antenna located about 1.5 meter above the ground plane in the vertical polarity. During this scan, the turntable was rotated and all peaks, which were at or near the limit, were recorded. Lastly, a scan of the FM band from 88 - 110 MHz was made, using a reduced resolution bandwidth and a reduced frequency span. The bilog antenna was changed to the horizontal polarity and the above steps were repeated. Care was taken to ensure that no frequencies were missed within the FM and TV bands. An analysis was performed to determine if the signals that were at or near the limit were caused by an ambient transmission. If unable to determine by analysis, the equipment was powered down to make the final determination if the EUT was the source of the emission.

For the final radiated scan, the equipment was again positioned facing the antenna. A thorough scan of all frequencies was manually made using a small frequency span, rotating the turntable as needed. Comparison with the previously recorded measurements was then made.

Using the peak readings from both scans as a guide, the test engineer then maximized the readings with respect to the table rotation and antenna height. Photographs showing the final worst case configuration of the EUT are contained in Appendix A.

FCC Part 15.215- Occupied Bandwidth Measurements

In accordance with Part 15.215(c), the fundamental frequency was kept within the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Frequency Range of Transmitter: 27 MHz

In accordance with Part 15.227(a), the field strength of the emissions within the 26.96-27.28 MHz band did not exceed 10,000 microvolts/meter at 3 meters. The emission limit was based on the measurement instrumentation employing an average detector. The provisions in 15.35 for limiting peak emissions apply.

SAMPLE CALCULATIONS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in Tables 1 and 2. For radiated emissions in dB μ V/m, the spectrum analyzer reading in dB μ V was corrected by using the following formula:

$$\begin{aligned}
 & \text{Meter reading (dB}\mu\text{V)} \\
 & + \text{Antenna Factor (dB)} \\
 & + \text{Cable Loss (dB)} \\
 & - \text{Distance Correction (dB)} \\
 & - \text{Pre-amplifier Gain (dB)} \\
 \\
 & = \text{Corrected Reading (dB}\mu\text{V/m)}
 \end{aligned}$$

This reading was then compared to the applicable specification limit to determine compliance.

A typical data sheet will display the following in column format:

#	Freq MHz	Rdng dB μ V	Cable	Amp	Bilog Ant	Mag Ant	Dist	Corr dB μ V/m	Spec	Margin	Polar
---	----------	-----------------	-------	-----	-----------	---------	------	-------------------	------	--------	-------

means reading number

Freq MHz is the frequency in MHz of the obtained reading.

Rdng dB μ V is the reading obtained on the spectrum analyzer in dB μ V.

Amp is short for the preamplifier factor or gain in dB.

Bilog Ant is the biconilog antenna factor in dB.

Mag Ant is the mag loop antenna factor in dB.

Cable is the cable loss in dB of the coaxial cable on the OATS.

Dist is the distance factor (in dB). It is used when testing at a different test distance than the one stated in the spec.

Corr dB μ V/m is the corrected reading which is now in dB μ V/m (field strength).

Spec is the specification limit (dB) stated in the agency's regulations.

Margin is the closeness to the specified limit in dB; + is over and - is under the limit.

Polar is the Polarity of the antenna with respect to earth.

APPENDIX A
INFORMATION ABOUT THE EQUIPMENT UNDER TEST

INFORMATION ABOUT THE EQUIPMENT UNDER TEST	
Test Software/Firmware:	N/A
CRT was displaying:	N/A
Power Supply Manufacturer:	N/A
Power Supply Part Number:	N/A
AC Line Filter Manufacturer:	N/A
AC Line Filter Part Number:	N/A
Line voltage used during testing:	N/A

I/O PORTS	
Type	#
N/A	

CRYSTAL OSCILLATORS	
Type	Freq In MHz
Clock, uController	2.00 MHz
RF Transmitter	27.145 MHz

PRINTED CIRCUIT BOARDS				
Function	Model & Rev	Clocks, MHz	Layers	Location
Transmitter	A0238 Rev A	See above	2	

REQUIRED EUT CHANGES TO COMPLY:
None.

PHOTOGRAPH SHOWING RADIATED EMISSIONS



Radiated Emissions - Front View

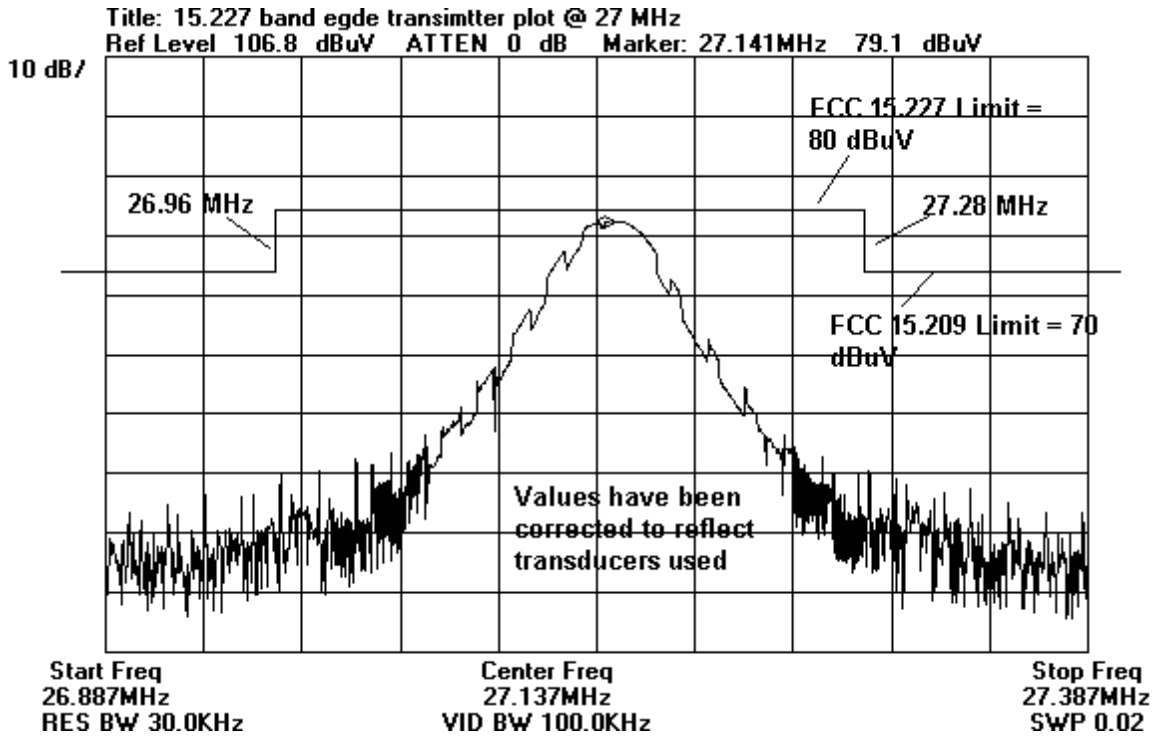
PHOTOGRAPH SHOWING RADIATED EMISSIONS



Radiated Emissions - Back View

APPENDIX B
MEASUREMENT DATA SHEETS

Occupied Bandwidth Plot Part 15.215



Test Location: CKC Laboratories, Inc. • 22105 Wilson River Hwy • Tillamook, OR 97141 • 800 500-4EMC

Customer: **Innotek Pet Products, Inc.**

Specification: **FCC15.227A**

Work Order #: **73919**

Date: 3/24/2000

Test Type: **Maximized Emissions**

Time: 10:59:42

Equipment: **Wireless Fence Transmitter**

Sequence#: 1

Manufacturer: Innotek Pet Products

Tested By: Mike Wilkinson

Model: WF-020

S/N:

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Wireless Fence Transmitter*	Innotek Pet Products	WF-020	

Support Devices:

Function	Manufacturer	Model #	S/N
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Test Conditions / Notes:

COMMENTS: EUT is transmitting continuously at 27.141 MHz and 16.45 kHz. The transmitter was set to maximum (fully clockwise). EUT power is from integral solar cells. The test was performed with a fully charged EUT. EUT was placed on the test table in the vertical position on an 8" metal post with the solar panel facing up. The temperature was 68°F and the humidity was 49%.

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV	Cable		Mag Ant		Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
			dB	dB	dB	dB					
1	27.140M	69.3	+0.5	+9.2			+0.0	79.0	80.0	-1.0	None
Ave											
^	27.141M	69.6	+0.5	+9.2			+0.0	79.3	80.0	-0.7	None
3	16.450k	83.1	+0.1	+14.7			+0.0	97.9	123.3	-25.4	None

Test Location: CKC Laboratories, Inc. • 22105 Wilson River Hwy • Tillamook, OR 97141 • 800 500-4EMC

Customer: **Innotek Pet Products, Inc.**

Specification: **FCC15.227B**

Work Order #: **73919**

Date: 03/24/2000

Test Type: **Maximized Emissions**

Time: 12:51:06

Equipment: **Wireless Fence Transmitter**

Sequence#: 2

Manufacturer: Innotek Pet Products

Tested By: Mike Wilkinson

Model: WF-020

S/N:

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Wireless Fence Transmitter*	Innotek Pet Products	WF-020	

Support Devices:

Function	Manufacturer	Model #	S/N
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Test Conditions / Notes:

COMMENTS: EUT is transmitting continuously at 27.141 MHz and 16.45 kHz. The transmitter was set to maximum (fully clockwise). EUT power is from integral solar cells. The test was performed with a fully charged EUT. EUT was placed on the test table in the vertical position on an 8" metal post with the solar panel facing up. The temperature was 68°F and the humidity was 49%.

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV	Cables		Mag	Amp	Bilog	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
			cb10c dB	Ant dB	Ant dB	Ant dB						
1	135.720M	50.9	+0.0	+0.0	-27.5	+11.4	+0.0	36.8	43.5	-6.7	Vert	
	QP		+2.0									
2	271.445M	48.2	+0.0	+0.0	-26.9	+12.9	+0.0	37.2	46.0	-8.8	Vert	
	QP		+3.0									
3	162.883M	49.0	+0.0	+0.0	-27.5	+10.4	+0.0	34.0	43.5	-9.5	Vert	
	QP		+2.1									
4	54.298M	48.8	+0.0	+0.0	-27.9	+7.1	+0.0	29.2	40.0	-10.8	Vert	
			+1.2									
5	298.588M	45.3	+0.0	+0.0	-26.9	+13.3	+0.0	35.0	46.0	-11.0	Horiz	
			+3.3									
6	81.444M	46.6	+0.0	+0.0	-27.7	+7.8	+0.0	28.1	40.0	-11.9	Horiz	
			+1.4									
7	190.011M	47.6	+0.0	+0.0	-27.3	+9.0	+0.0	31.6	43.5	-11.9	Vert	
	QP		+2.3									
8	244.304M	45.3	+0.0	+0.0	-27.0	+12.2	+0.0	33.2	46.0	-12.8	Vert	
	QP		+2.7									
9	54.258M	46.7	+0.0	+0.0	-27.9	+7.1	+0.0	27.1	40.0	-12.9	Horiz	
			+1.2									
10	244.288M	44.6	+0.0	+0.0	-27.0	+12.2	+0.0	32.5	46.0	-13.5	Horiz	
			+2.7									
11	651.581M	35.0	+0.0	+0.0	-28.4	+20.5	+0.0	32.2	46.0	-13.8	Horiz	
			+5.1									
12	352.876M	40.4	+0.0	+0.0	-27.2	+14.7	+0.0	31.7	46.0	-14.3	Vert	
	QP		+3.8									
13	298.594M	41.9	+0.0	+0.0	-26.9	+13.3	+0.0	31.6	46.0	-14.4	Vert	
	QP		+3.3									

14	461.459M	37.2	+0.0 +4.1	+0.0	-27.8	+17.3	+0.0	30.8	46.0	-15.2	Horiz
15	325.752M	39.4	+0.0 +3.6	+0.0	-27.1	+14.0	+0.0	29.9	46.0	-16.1	Horiz
16	705.868M	31.6	+0.0 +5.3	+0.0	-28.6	+20.7	+0.0	29.0	46.0	-17.0	Horiz
17	515.750M	34.2	+0.0 +4.3	+0.0	-28.2	+18.7	+0.0	29.0	46.0	-17.0	Vert
18	108.588M	39.3	+0.0 +1.9	+0.0	-27.7	+10.7	+0.0	24.2	43.5	-19.3	Horiz
19	16.560k	83.1	+0.2 +0.0	+14.7	+0.0	+0.0	+0.0	98.0	123.2 16 kHz Transmitter Fundamental	-25.2	None
20	100.880k	53.4	+0.0 +0.0	+10.1	+0.0	+0.0	+0.0	63.5	107.5	-44.0	None