Israel Testing Laboratories

ACCREDITED
Cert. No. 1152.01
Electrical (EMC)

DATE: 18 August 2008

I.T.L. (PRODUCT TESTING) LTD.

FCC Test Report

for

Visonic Inc.

Equipment under test:

Wireless Temperature Detector

MCT-560

Written by: _____
E. Ever, Documentation

Approved by: _____
T. Schwartz, Test Engineer

Approved by: _____
I. Raz, EMC Laboratory Manager

Israel Testing Laboratories

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Measurement/Technical Report for

Visonic Inc.

Wireless Temperature Detector

MCT-560

FCC ID: GSAMCT560

IC ID: 1467C-MCT560

18 August 2008

This report concerns: Original Grant x Class II change

Class I change _____ Class II change_____

Equipment type: Direct Sequence Spread Spectrum Transmitter

Limits used:
47 CFR Part 15 Subpart B, C

Measurement procedure used is ANSI C63.4-2003.

Application for Certification
prepared by:
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Applicant for this device:
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1. General Information

1.1 Administrative Information

Manufacturer:	Visonic Inc.
Manufacturer's Address:	Habarzel 24 Tel Aviv Israel 69710 Tel: +936-03-6456789 Fax: +936-03-6456788
Manufacturer's Representative:	Arik Elshtein
Equipment Under Test (E.U.T):	Wireless Temperature Detector
Equipment Model No.:	MCT-560
Equipment Serial No.:	1908008634
Date of Receipt of E.U.T:	12/07/2008
Start of Test:	13/07/2008
End of Test:	28/07/2008
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	See Section 2

1.2 List of Accreditations

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), Registration No. 90715.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-1350, R-1285.
5. Industry Canada (Canada), File No. IC 4025.
6. TUV Product Services, England, ASLLAS No. 97201.
7. Nemko (Norway), Authorization No. ELA 207.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

1.3 Product Description

The MCT-560 is a fully supervised wireless PowerCode detector used with the PowerMax Pro (Ver. 5), PowerMax COMPLETE, and Amber alarm systems. The detector alerts the alarm system control panel upon detecting critical indoor or outdoor temperatures.

1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4: 2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

The tests were performed at I.T.L.'s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing August 22, 2006).

1.6 Measurement Uncertainty

Radiated Emission

The Open Site complies with the ±4 dB Normalized Site Attenuation requirements of ANSI C63.4-2003. In accordance with Paragraph 5.4.6.1 of this standard, this tolerance includes instrumentation calibration errors, measurement technique errors, and errors due to site anomalies.

2. System Test Configuration

2.1 Justification

Radiated emission screening was performed in 3 orthogonal orientations. The worst-case orientation was the horizontal position.

2.2 EUT Exercise Software

Manufacturing software was used for the tests.

2.3 Special Accessories

No accessories were needed.

2.4 Equipment Modifications

In order to meet the requirements the manufacturer attenuated the unit by changing R9 from 0 Ω to 1 kΩ.

2.5 Configuration of Tested System

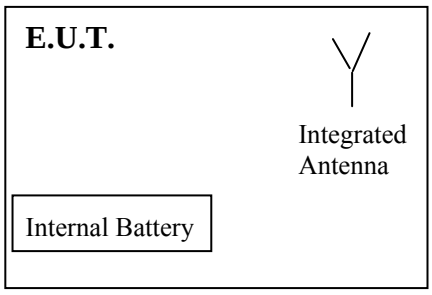


Figure 1. Configuration of Tested System

3. Theory of Operation

3.1 Theory of Operation

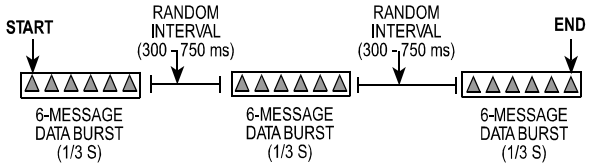
The MCT-560 generates an alarm message when its sensor detects that the temperature has reached a certain temperature point. A restore message is generated when it crosses back the threshold temperature point. There are a total of four fixed temperature points and the user can enable one or more temperature points. The MCT-560 can be used in instances where temperature detection is critical.

Other examples of detector usage are as follows:

- Activating and deactivating pipe heaters at locations where low temperatures may cause the water pipes to freeze.
- Warn of possible electrical device malfunction due to high or low temperature levels.

During the tests the EUT was operated at 315.04 MHz in “normal” mode. The type of transmission/modulation is ASK On/Off Keying.

To overcome message collisions at the receiving end, PowerCode transmitters transmit 3 data bursts at random intervals, with 6 repetitions of the same message in each burst. This redundancy improves the probability of reception.



Note: Periodic supervision messages are an exception to this rule - they consist of a single 6-message burst.

Figure 2. Radiated Emission

4. Setup Photograph

Figure 3. Radiated Emission

5. Periodic Operation Requirements

5.1 Test Specification

F.C.C., Part 15, Subpart C, Section 15.231 (a) (1-5)

5.2 Test Procedure

The EUT was set up as shown in Figure 3. The spectrum analyzer center frequency was adjusted to the EUT carrier, the span was set to zero and the video triggered for transmissions. The transmitter was activated manually until it was fully functional. The tamper switch for activation was released and the transmission time was captured.

The EUT was verified for compliance with periodic operation requirements.

1. Continuous transmissions was not permitted.
2. A mutually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
3. Periodic transmission, excluding polling or supervision transmissions, at regular predetermined intervals are not permitted.

The rationale for compliance with the above requirements was determined by test results and a supplier declaration.

5.3 Test Data

JUDGEMENT: Passed

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 15.231 (a) (1-5) specification.

The EUT was found not to operate continuously and it deactivated within 4.7 seconds of being released. The EUT did not have periodic transmission, excluding polling or supervision transmissions, at regular predetermined intervals

TEST PERSONNEL:

Tester Signature: _____ Date: 25.08.2008

Typed/Printed Name: T. Schwartz

Periodic Operation Requirements

E.U.T Description	Wireless Temperature Detector
Type	MCT-560
Serial Number:	1908008634

Specification: FCC Part 15, Subpart C, Section 15.231 (a)(1-5)

Center Frequency: 315.04 MHz
Detectors: Peak

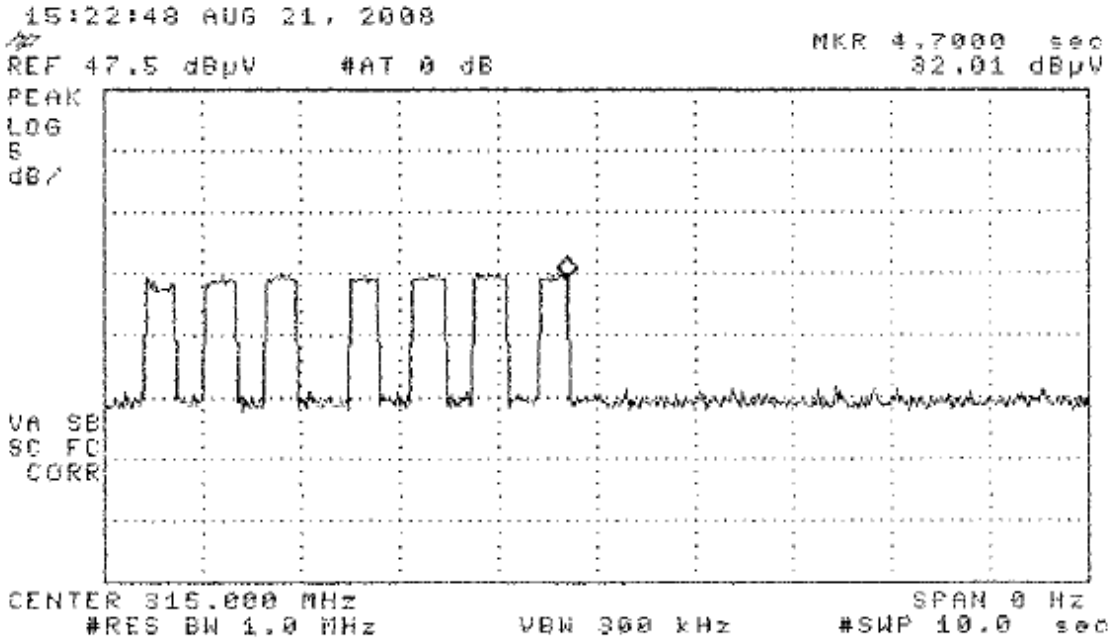


Figure 4. Transmitter Shut Down Result

5.4 Test Instrumentation Used

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Spectrum Analyzer	HP	8594E	3809403785	November 12, 2007	1 year

6. Field Strength of Fundamental

6.1 Test Specification

F.C.C., Part 15, Subpart C, Section 15.231 (b)

6.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

The E.U.T. was placed on a non-conductive table, 0.8 meters above the O.A.T.S. ground plane.
The EMI receiver was set to the E.U.T. Fundamental Frequency (315.04 MHz).
The distance between the E.U.T. and test antenna was 3 meters.

The turntable and antenna were adjusted for maximum level reading on the EMI receiver.

6.3 Measured Data

JUDGEMENT: Passed by 8.1 dB

The EUT met the FCC Part 15, Subpart C, Section 15.231 (b) specification requirements.

The details of the highest emissions are given in *Figure 5*.

TEST PERSONNEL:

Tester Signature: _____ Date: 25.08.2008

Typed/Printed Name: T. Schwartz

Field Strength of Fundamental

E.U.T Description	Wireless Temperature Detector
Model Number	MCT-560
Serial Number:	1908008634

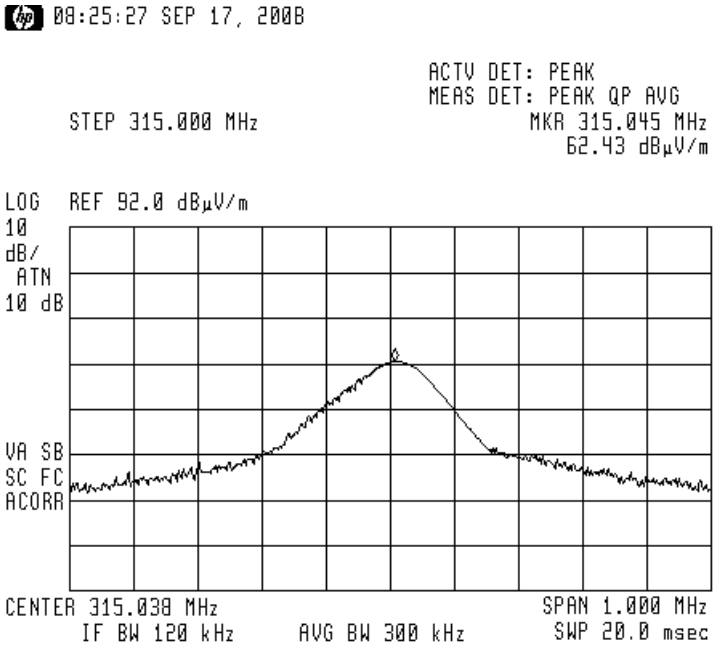


Figure 5. Field Strength of Fundamental (Horizontal)
Detector: Peak

Test Result: 62.4 dBµV/m

Corrected Test Result: 58.0 dBµV/m (Average Calculation)

Limit: 75.6 dBµV/m (Average Detector)

Notes:

- **Detector used:** Peak
- **Average Factor Formula:** 20log (time on/time total), changing Peak to Average measurements in periodic signals.
- **Average Factor:** 20log [(0.788/1.2)X(91.75/100)]= - 4.4dB (See *APPENDIX A – Average Factor Calculation*)
- **Carrier Average Specification**: [(41.67*315.00 MHz)] – 7083 = 6043 µV/m
- **Limit of Carrier** = 20log(6043) = 75.6 dBµV

Field Strength of Fundamental

E.U.T Description	Wireless Temperature Detector
Model Number	MCT-560
Serial Number:	1908008634

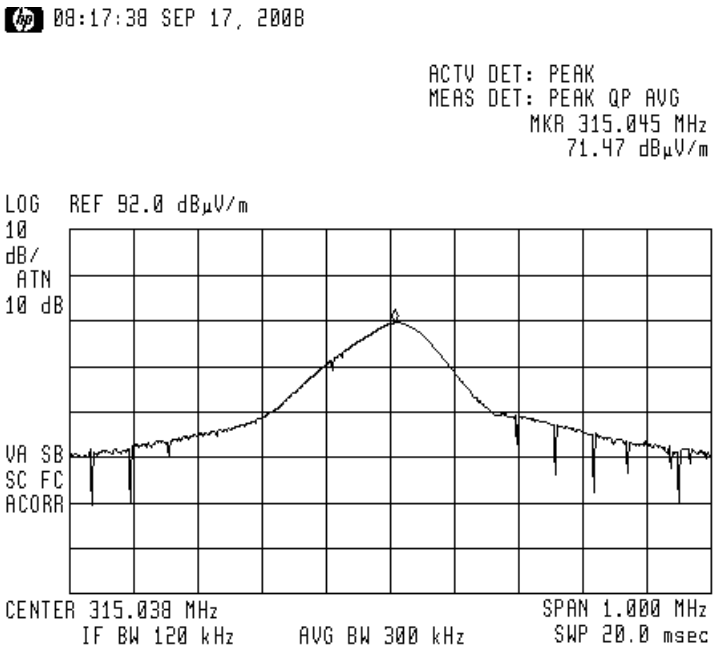


Figure 6. Field Strength of Fundamental (Vertical)
Detector: Peak

Test Result: 71.5 dBµV/m

Corrected Test Result: 67.1 dBµV/m (Average Calculation)

Limit: 75.6 dBµV/m (Average Detector)

Notes:

- **Detector used:** Peak
- **Average Factor Formula:** 20log (time on/time total), changing Peak to Average measurements in periodic signals.
- **Average Factor:** 20log [(0.788/1.2)X(91.75/100)]= - 4.4dB (See *APPENDIX A – Average Factor Calculation*)
- **Carrier Average Specification**: [(41.67*315.00 MHz)] – 7083 = 6043 µV/m
- **Limit of Carrier** = 20log(6043) = 75.6 dBµV

6.4 Test Instrumentation Used

Instrument	Manufacturer	Model	Serial Number	Last Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 12, 2007	1 year
RF Section	HP	85420E	3705A00248	November 12, 2007	1 year
Antenna-Log Periodic	A.H.System	SAS-200/511	253	February 26, 2008	2 years
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A

7. Spurious Radiated Emission in the Restricted Band

7.1 Test Specification

9kHz-3,150 MHz, F.C.C., Part 15, Subpart C, Section 15.231 (b)

7.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

See Section 3.1 Justification of the System Test Configuration concerning the E.U.T. orientation for this test.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 3.1.

The frequency range 9 kHz-3,150 MHz was scanned, and the list of the highest emissions was verified and updated accordingly.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 9 kHz-30 MHz, the loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter.

In the frequency range 1-2.9 GHz, a computerized EMI receiver complying to CISPR 16 requirements was used.
In the frequency range 2.9-3,150 MHz, a spectrum analyzer including a low noise amplifier was used. During average measurements, the IF bandwidth was 1 MHz and the video bandwidth was 100Hz. During peak measurements, the IF bandwidth was 1 MHz and the video bandwidth was 3 MHz.

In the frequency range 30-3,150 MHz, the readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

Verification of the E.U.T emissions was based on the following methods:

Turning the E.U.T on and off.
Using a frequency span less than 10 MHz.
Observation of the signal level during turntable rotation. Background noise is not affected by the rotation of the E.U.T.

7.3 Test Data

JUDGEMENT: Passed

For the operation frequency of 315.04 MHz, the margin between the emission level and the specification limit is 5.2 dB in the worst case at the frequency of 945.00 MHz, horizontal polarization.

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 15.231 (b) specification.

TEST PERSONNEL:

Tester Signature: _____ Date: 25.08.2008

Typed/Printed Name: T. Schwartz

Spurious Radiated Emission

E.U.T Description	Wireless Temperature Detector
Type	MCT-560
Serial Number:	1908008634

Specification: FCC, Part 15, Subpart C, Section 15.231 (b)

Antenna Polarization: Horizontal/Vertical Frequency range: 9 MHz to 3150 MHz

Test Distance: 3 meters Detector: Peak

Frequency (MHz)	POL (V/H)	Peak Amp (dBµV/m)	Average Factor (dB)	Average Amp (dBµV/m)	Average Specification (dBµV/m)	Margin (dB)	Pass/ Fail
630.00	V	39.6	-4.4	35.2	55.6	-20.4	PASS
945.00	H	54.8	-4.4	50.4	55.6	-5.2	PASS
1260.00	H	52.5	-4.4	48.1	55.6	-7.5	PASS
1575.00	V	51.0	-4.4	46.6	60.0	-13.4	PASS

Figure 7. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL, Detector: Peak, Average

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

- **Detector used:** Peak
- **Average Factor Formula:** 20log (time on/time total), changing Peak to Average measurements in periodic signals.
- **Average Factor:** 20log [(0.788/1.2)X(91.75/100)]= - 4.4dB (See *APPENDIX A – Average Factor Calculation*)
- **Carrier Average Specification**: [(41.67*315.00 MHz)] – 7083 = 6043 µV/m
- **Limit of Carrier** = 20log(6043) = 75.6 dBµV
- **Spurious Average Specification:** Limit of Carrier – 20dB
- **Duty cycle:** TX on = 91.75 msec (100 msec period), TX total = 100 msec. (See *APPENDIX A – Average Factor Calculation*)
- Testing was performed to the 10th harmonic.

7.4 Test Instrumentation Used

Instrument	Manufacturer	Model	Serial Number	Last Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 12, 2007	1 year
RF Section	HP	85420E	3705A00248	November 12, 2007	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	March 23, 2008	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 22, 2007	1 year
Spectrum Analyzer	HP	8593EM	3536A00120	February 26, 2008	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

8. Occupied Bandwidth

8.1 Test Specification

F.C.C. Part 15, Subpart C: 15.231(c)

8.2 Test procedure

The transmitter unit operated with normal modulation. The spectrum analyzer was set to 120 kHz resolution BW and center frequency of the transmitter fundamental. The spectrum bandwidth of the transmitter unit was measured and recorded. The BW was measured at 20 dBc points.

The EUT was set up as shown in *Figure 1* and *Figure 3*, and its proper operation was checked. The transmitter occupied bandwidth was measured with the EMI receiver as frequency delta between reference points on the modulation envelope.

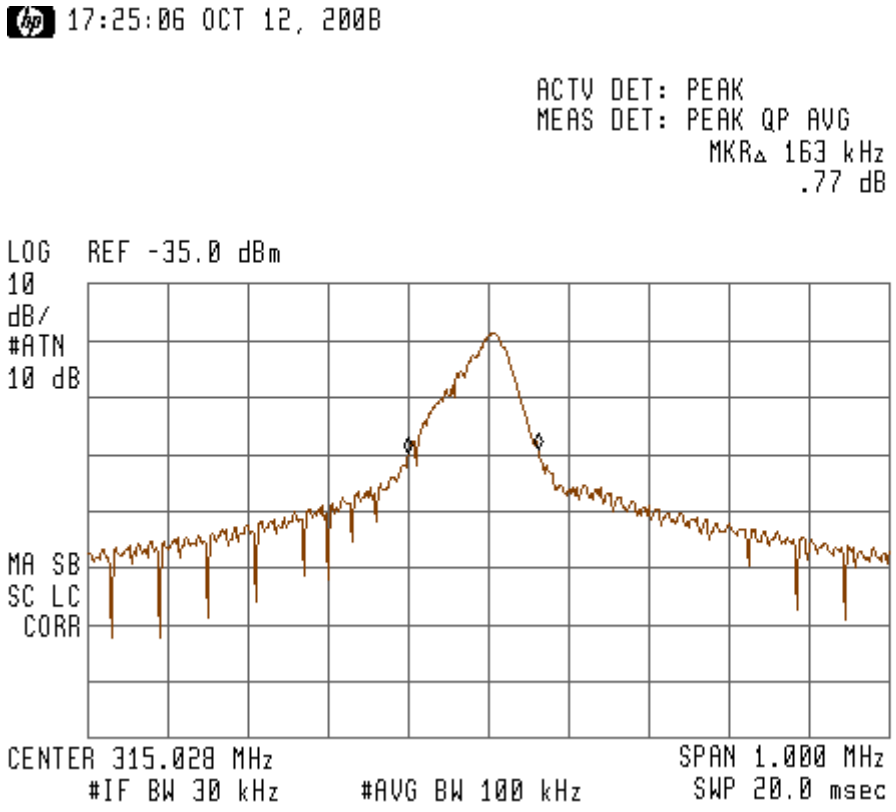


Figure 8. 315.04 MHz Center Frequency

8.3 Test Data

E.U.T Description: Wireless Temperature Detector
Model: MCT-560
Serial Number: 1908008634

Bandwidth Reading (MHz)	Specification (1) (MHz)	Margin (MHz)
0.163	< 0.787 MHz	-0.624

Figure 9 Test Results

JUDGEMENT: Passed by 0.624 MHz

TEST PERSONNEL:
Tester Signature: _____ Date: 25.08.2008
Typed/Printed Name: T. Schwartz

(1) 0.25% of the E.U.T. fundamental frequency, Section 15.231(c).

8.4 Test Equipment Used.

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 12, 2007	1 year
RF Section	HP	85420E	3705A00248	November 12, 2007	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 22, 2007	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

9. APPENDIX A – Average Factor Calculation

To overcome message collisions at the receiving end, Power Code transmitters transmit 3 data bursts at random intervals, with 6 repetitions of the same message in each burst. This redundancy improves the probability of reception.

Transmitting in 100msec: 42.75 ms + 44 ms+5 ms = 91.75ms (See *Figure 10* to *Figure 12*)
|**Pulse Duration =** 788 µs (See *Figure 13*)
Pulse Period: (1 plot) = 1.2 ms (See *Figure 14*)
Average factor: 20log [(0.788/1.2) x (91.75/100)] = - 4.4dB

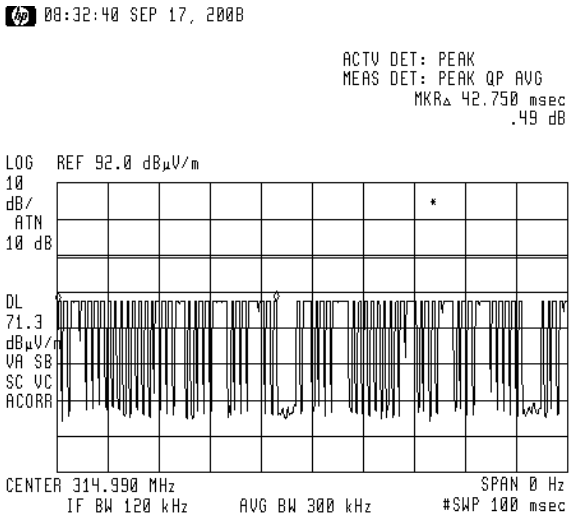


Figure 10 Center 314.99 MHz, 42.75 msec.

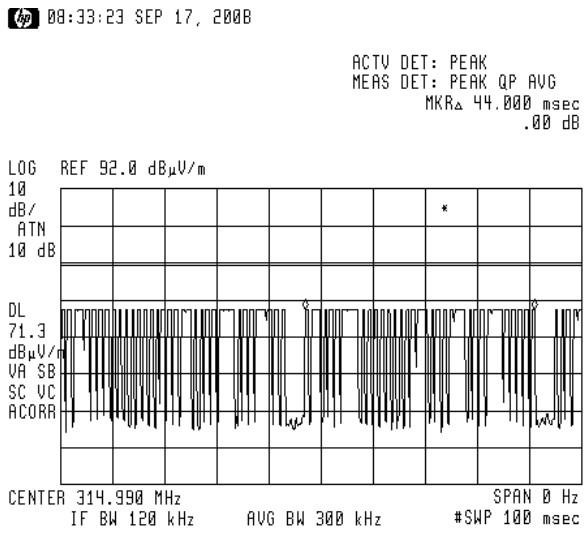


Figure 11 Center 314.990 MHz, 44.00 ms

APPENDIX A – Average Factor Calculation (Cont'd)

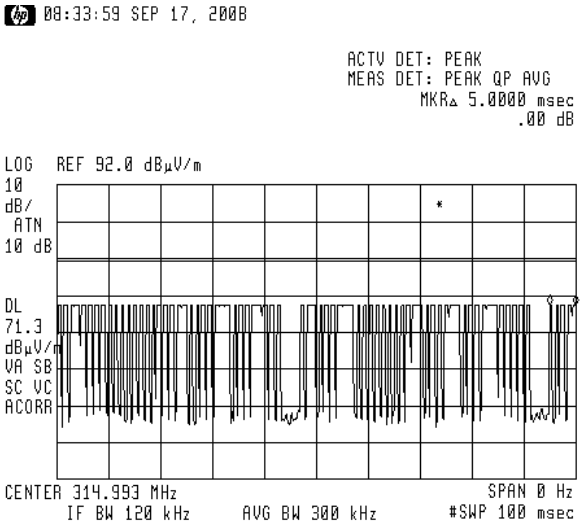


Figure 12 Center 314.993 MHz, 5.00 msec.

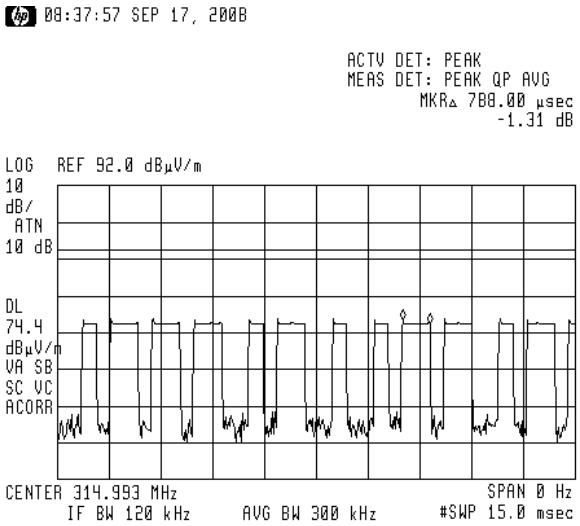


Figure 13 Pulse duration: = 788µsec

APPENDIX A – Average Factor Calculation (Cont'd)

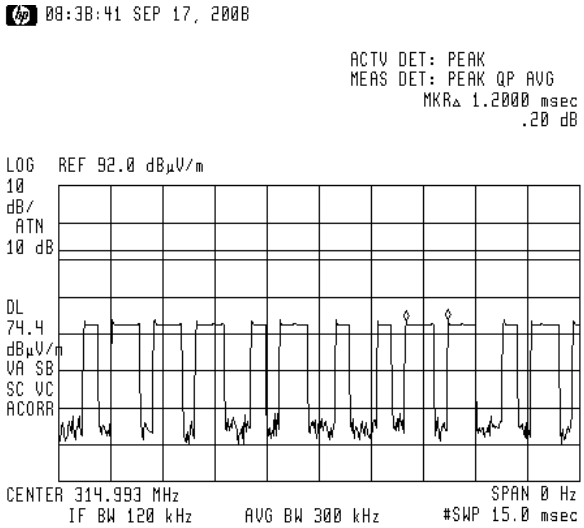


Figure 14 Pulse period: (1 plot) = 1.2msec

10. APPENDIX B - CORRECTION FACTORS

10.1 Correction factors for CABLE

from EMI receiver to test antenna at 3 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3
20.0	0.6
30.0	0.8
40.0	0.9
50.0	1.1
60.0	1.2
70.0	1.3
80.0	1.4
90.0	1.6
100.0	1.7
150.0	2.0
200.0	2.3
250.0	2.7
300.0	3.1
350.0	3.4
400.0	3.7
450.0	4.0
500.0	4.3
600.0	4.7
700.0	5.3
800.0	5.9
900.0	6.3
1000.0	6.7

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
1200.0	7.3
1400.0	7.8
1600.0	8.4
1800.0	9.1
2000.0	9.9
2300.0	11.2
2600.0	12.2
2900.0	13.0

NOTES:

1. The cable type is RG-214.

2. The overall length of the cable is 27 meters.

3. The above data is located in file 27MO3MO.CBL on the disk marked "Radiated Emission Tests EMI Receiver".

10.2 Correction factors for CABLE

from EMI receiver to test antenna at 3 meter range.

FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.2
2.0	1.6
3.0	2.0
4.0	2.4
5.0	3.0
6.0	3.4
7.0	3.8
8.0	4.2
9.0	4.6
10.0	5.0
12.0	5.8

NOTES:

1. The cable type is RG-8.

2. The overall length of the cable is 10 meters.

10.3 Correction factors for CABLE

from spectrum analyzer to test antenna above 2.9 GHz

FREQUENCY (GHz)	CORRECTION FACTOR (dB)	FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.9	14.0	9.1
2.0	2.7	15.0	9.5
3.0	3.5	16.0	9.9
4.0	4.2	17.0	10.2
5.0	4.9	18.0	10.4
6.0	5.5	19.0	10.7
7.0	6.0	20.0	10.9
8.0	6.5	21.0	11.2
9.0	7.0	22.0	11.6
10.0	7.5	23.0	11.9
11.0	7.9	24.0	12.3
12.0	8.3	25.0	12.6
13.0	8.7	26.0	13.0

NOTES:

1. The cable type is SUCOFLEX 104 E manufactured by SUHNER.

2. The cable is used for measurements above 2.9 GHz.

3. The overall length of the cable is 10 meters.

12.6 Correction factors for LOG PERIODIC ANTENNA

Type LPD 2010/A
at 3 and 10 meter ranges.

Distance of 3 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.1
250.0	10.2
300.0	12.5
400.0	15.4
500.0	16.1
600.0	19.2
700.0	19.4
800.0	19.9
900.0	21.2
1000.0	23.5

Distance of 10 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.0
250.0	10.1
300.0	11.8
400.0	15.3
500.0	15.6
600.0	18.7
700.0	19.1
800.0	20.2
900.0	21.1
1000.0	23.2

NOTES:

1. *Antenna serial number is 1038.*
2. *The above lists are located in file number 38M3O.ANT for a 3 meter range, and file number 38M100.ANT for a 10 meter range.*
3. *The files mentioned above are located on the disk marked "Radiated Emission Test EMI Receiver".*

10.4 Correction factors for LOG PERIODIC ANTENNA

Type SAS-200/511
at 3 meter range.

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
1.0	24.9
1.5	27.8
2.0	29.9
2.5	31.2
3.0	32.8
3.5	33.6
4.0	34.3
4.5	35.2
5.0	36.2
5.5	36.7
6.0	37.2
6.5	38.1

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
7.0	38.6
7.5	39.2
8.0	39.9
8.5	40.4
9.0	40.8
9.5	41.1
10.0	41.7
10.5	42.4
11.0	42.5
11.5	43.1
12.0	43.4
12.5	44.4
13.0	44.6

NOTES:

1. *Antenna serial number is 253.*
2. *The above lists are located in file number SAS3M0.ANT for a 3 meter range.*
3. *The files mentioned above are located on the disk marked "Antenna Factors".*

10.5 Correction factors for BICONICAL ANTENNA

Type BCD-235/B,
at 3 meter range

FREQUENCY (MHz)	AFE (dB/m)
20.0	19.4
30.0	14.8
40.0	11.9
50.0	10.2
60.0	9.1
70.0	8.5
80.0	8.9
90.0	9.6
100.0	10.3
110.0	11.0
120.0	11.5
130.0	11.7
140.0	12.1
150.0	12.6
160.0	12.8
170.0	13.0
180.0	13.5
190.0	14.0
200.0	14.8
210.0	15.3
220.0	15.8
230.0	16.2
240.0	16.6
250.0	17.6
260.0	18.2
270.0	18.4
280.0	18.7
290.0	19.2
300.0	19.9
310	20.7
320	21.9
330	23.4
340	25.1
350	27.0

NOTES:

1. Antenna serial number is 1041.

2. The above list is located in file 19BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".