

DATE: 18 November 2010

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

FCC Radio Test Report

for

Orpak Systems Ltd.


Equipment under test:

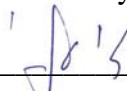
Wireless Gateway Terminal

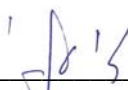
WGT Consisting of

a. PCB ASSY.WGT CPU (VIS)

b. PCB ASSY. WGT RF 3 (VIS) (AT) x 2

Written by: 
D. Shidlow, Documentation

Approved by: For/ 
A. Sharabi, Test Engineer

Approved by: 
I. Raz, EMC Laboratory Manager

This report must not be reproduced, except in full, without the written permission of I.T.L. (Product Testing) Ltd.

This report relates only to items tested.

Measurement/Technical Report for Orpak Systems Ltd.

Wireless Gateway Terminal

WGT Consisting of

a. PCB ASSY.WGT CPU (VIS)

b. PCB ASSY. WGT RF 3 (VIS) (AT) x 2

FCC ID: W8F819539370

IC: 8264A-819539370

This report concerns:	Original Grant:	X
	Class I Change:	
	Class II Change:	

Equipment type: Digital Transmission System

Limits used:
47CFR15 Section 15.247

Measurement procedure used is ANSI C63.4-2003.

Application for Certification
prepared by:
Ishaishou Raz
ITL (Product Testing) Ltd.
Kfar Bin Nun
D.N. Shimshon 99780
Israel
e-mail Sraz@itl.co.il

Applicant for this device:
(different from "prepared by")
Gideon Segal
Orpak Systems Ltd.
31 Lechi St.
P.O.B. 1461
Bnei-Brak 5114
Israel
Tel: +972- 3 - 577 - 6868
Fax: +972- 6 - 579 - 6310
e-mail: gidi@orpak .com

TABLE OF CONTENTS

1.	GENERAL INFORMATION-----	5
1.1	Administrative Information.....	5
1.2	List of Accreditations	6
1.3	Product Description	7
1.4	Test Methodology	7
1.5	Test Facility	7
1.6	Measurement Uncertainty	7
2.	SYSTEM TEST CONFIGURATION-----	8
2.1	Justification.....	8
2.2	EUT Exercise Software	8
2.3	Special Accessories	8
2.4	Equipment Modifications	8
2.5	Configuration of Tested System.....	9
3.	TEST SETUP PHOTOS-----	10
4.	CONDUCTED EMISSION DATA-----	14
4.1	Test Specification	14
4.2	Test Procedure.....	14
4.3	Test Results	14
4.4	Test Instrumentation Used, Conducted Measurement	19
5.	6DB MINIMUM BANDWIDTH-----	20
5.1	Test Specification	20
5.2	Test procedure	20
5.3	Test Results 6dB Minimum Bandwidth	22
5.4	Test Equipment Used 6dB Minimum Bandwidth.....	23
6.	26DB MINIMUM BANDWIDTH -----	24
6.1	Test Specification	24
6.2	Test procedure	24
6.3	Test Results	26
6.4	Test Equipment Used 26dB Bandwidth	27
7.	RADIATED POWER OUTPUT-----	28
7.1	Test Specification	28
7.2	Test procedure	28
7.3	Test Results Calculation	31
7.4	Test Equipment Used Radiated Maximum Power Output	32
8.	BAND EDGE -----	33
8.1	Test procedure	33
8.2	Test Results	35
8.3	Test Equipment Used Band edge Spectrum.....	36
9.	RADIATED EMISSION, 9 KHZ – 30 MHZ -----	37
9.1	Test Specification	37
9.2	Test Procedure.....	37
9.3	Test Results	37
9.4	Test Instrumentation Used, Radiated Measurements	38
9.5	Field Strength Calculation	38
10.	SPURIOUS RADIATED EMISSION 30 MHZ – 25.0 GHZ -----	39
10.1	Test Specification	39
10.2	Test Procedure.....	39
10.3	Test Results	40
10.4	Test Instrumentation Used, Radiated Measurements	43
10.5	Field Strength Calculation 30 MHz - 2.9 GHz	44

11.	RADIATED POWER SPECTRAL DENSITY -----	45
11.1	Test procedure	45
11.2	Test Results	48
11.3	Test Equipment Used Transmitted Power Density	49
12.	ANTENNA GAIN/INFORMATION-----	50
13.	R.F EXPOSURE/SAFETY-----	51
14.	INTERMODULATION TESTS-----	52
15.	APPENDIX B - CORRECTION FACTORS -----	54
15.1	Correction factors for CABLE	54
15.2	Correction factors for CABLE	55
15.3	Correction factors for CABLE	56
15.4	Correction factors for LOG PERIODIC ANTENNA	57
15.5	Correction factors for LOG PERIODIC ANTENNA	58
15.6	Correction factors for BICONICAL ANTENNA	59
15.7	Correction factors for Double-Ridged Waveguide Horn	60
15.8	Correction factors for Horn Antenna	61
15.9	Correction factors for Horn Antenna	62
15.10	Correction factors for ACTIVE LOOP ANTENNA	63
16.	COMPARISON INDUSTRY CANADA REQUIREMENTS WITH FCC-----	64

1. General Information

1.1 Administrative Information

Manufacturer: Orpak Systems Ltd.

Manufacturer's Address: 31 Lechi St.
Bnei-Brak 51114
Israel
Tel: +972-3-577-6868
Fax: +972-3-579-6310

Manufacturer's Representative: Rami Zamir

Equipment Under Test (E.U.T): Wireless Gateway Terminal

Equipment Model No.: WGT Consisting of
a. PCB ASSY.WGT CPU (VIS)
b. PCB ASSY. WGT RF 3 (VIS) (AT) x 2

Equipment Part No.: a. 919539300 b. 819539370

Date of Receipt of E.U.T: 30.12.09

Start of Test: 30.12.09

End of Test: 07.01.10

Test Laboratory Location: I.T.L (Product Testing) Ltd.
Kfar Bin Nun,
ISRAEL 99780

Test Specifications: FCC Part 15 Subpart C

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), IC File No.: 46405-4025; Site No. IC 4025B-1.
6. TUV Product Services, England, ASLLAS No. 97201.

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 Wireless Gateway Terminal (WGT) is an electronic unit, part of Orpak Wireless Vehicle Identification Solution (wVIS) for vehicle identification based fueling solution for gas stations.

As part of the solution, one or several WGT units are installed in gas stations to form a wireless network communication data from the vehicle units to the station controller through short range RF communication (very low power) in the ISM 2.4 GHz band. The number of WGT units mainly depends on station size and number of dispensers covered. In each station one of the WGTs is set to be Master WGT and it will be connected to the forecourt controller (FCC) via LAN. The rest of the WGTs in the station will be “routers” with no LAN connection.

The WGT can be installed in several locations:

- In enclosed and non explosive environment inside the station controller box (OrIC8 or OrIT8) or in the station office.
- On a pole or wall mounted configuration which requires using the WGT outdoor box.

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 radiated emissions 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 September 3, 2009).

I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

1.6 Measurement Uncertainty

Conducted Emission

The uncertainty for this test is ± 2 dB.

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

To select the worst case host to be tested for Limited Modular Approval certification, an exploratory radiated emission test was performed inside the shielded room.

Hosts MWGT and MWGT OUTDOOR UNIT UL-W/P.S., with the radio device transmitting a CW signal at 2440 MHz, were placed on a 0.8 meter high wooden table, 1 meter from the tests antenna, which was 1 m high. Hosts OrIC and OrIC8, with the radio device transmitting a CW signal at 2440 MHz, were placed on the floor, 1 meter from the tests antenna, which was 1 m high.

The results of the exploratory radiated emission tests are shown in the table below.

Enclosures		
Host	Fundamental Result (dB μ V/m)	2 nd Harmonic Result (dB μ V/m)
OrIC 8	65.0	54.5
OrIC	64.05	54.0
MWGT OUTDOOR UNIT UL-W/P.S.	64.27	53.7
MWGT Indoor	64.75	47.36

Based on the above exploratory radiated emission test, the OrIC 8 was selected as the “worst case” host.

Both the OrIC and OrIC 8 contain the OrPT Panel which contains a 13.56 MHz transmitter which transmits in CW mode. The WGT consists of a PCB and two identical 2.4 GHz transmitters which do not transmit simultaneously with each other but each one does transmit simultaneously with the OrPT Panel 13.56 MHz transmitter. Intermodulation testing was performed for one 2.4 GHz transmitter transmitting simultaneously with the OrPT Panel.

2.2 EUT Exercise Software

Hyper Terminal, Web Browser, Nozzle reader, and Fuelopass software was used for the tests.

2.3 Special Accessories

No special accessories were required to achieve compliance.

2.4 Equipment Modifications

No modifications were needed in order to achieve compliance

2.5 Configuration of Tested System

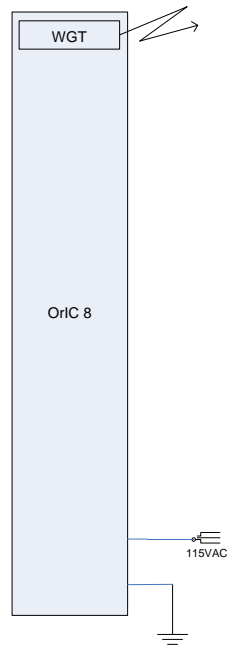


Figure 1. Configuration of Tested System

3. Test Setup Photos

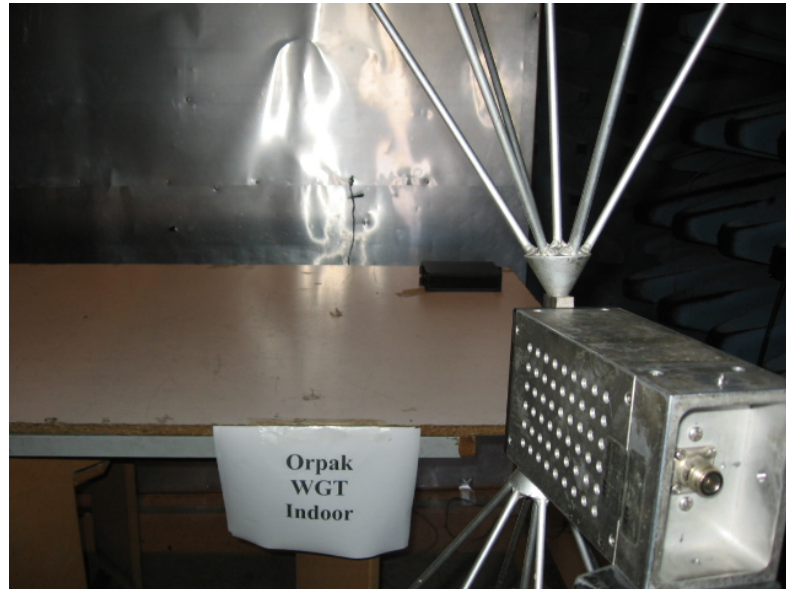


Figure 2. MWGT Screening Test Setup

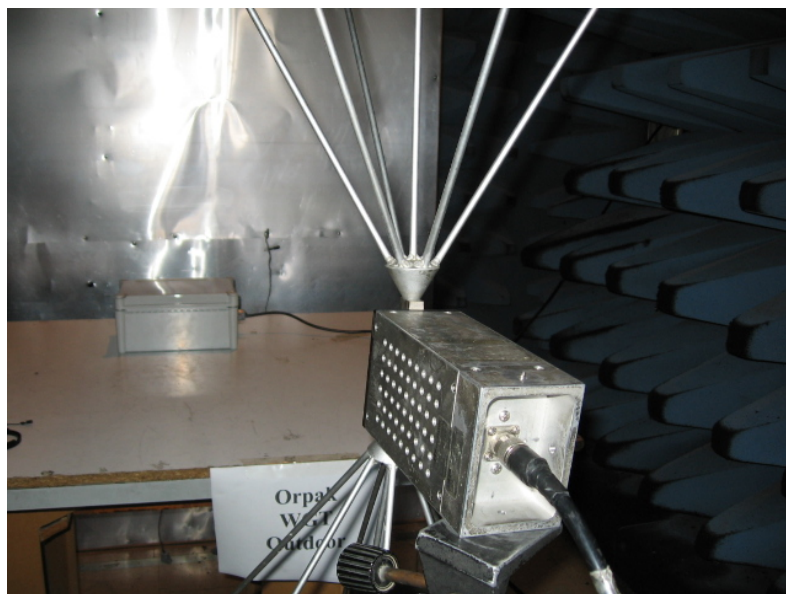


Figure 3. MWGT Outdoor Screening Test Setup

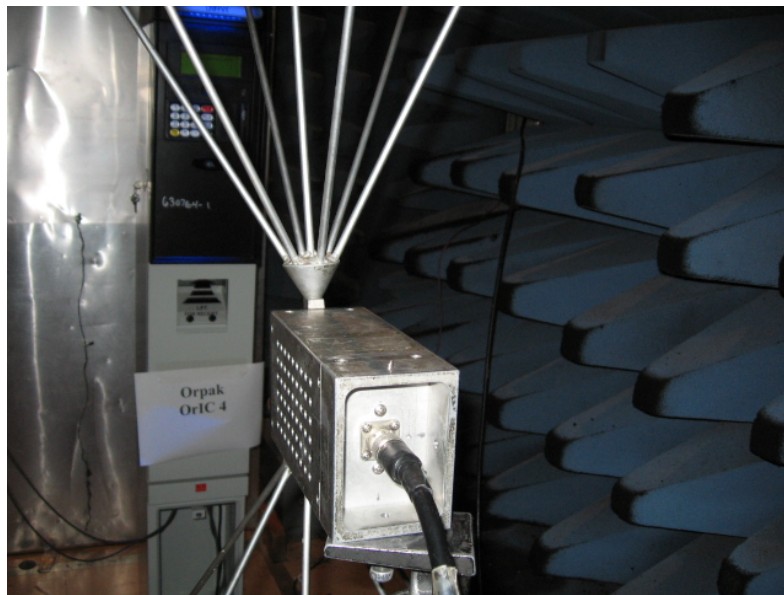


Figure 4. OrIC Screening Test Setup



Figure 5. OrIC8 Screening Test Setup

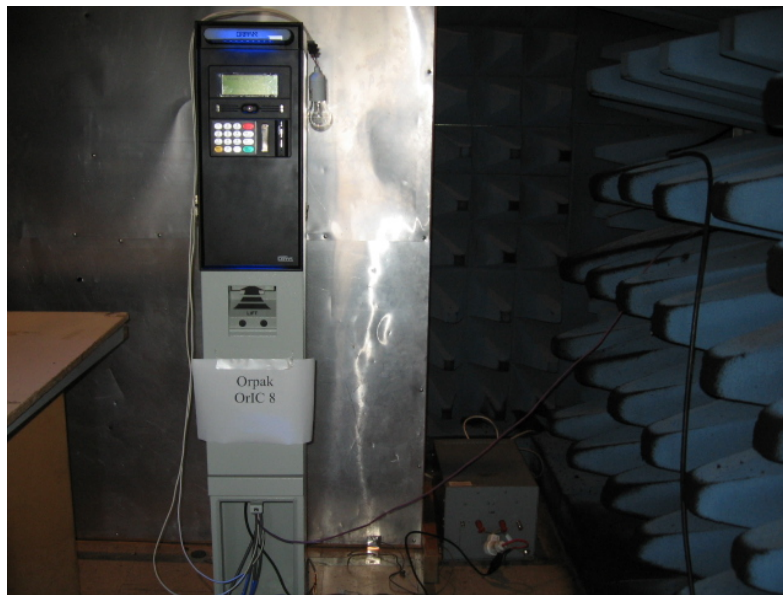


Figure 6. Conducted Emission Test Setup



Figure 7. Radiated Emission Test Setup (9 kHz – 30 MHz)



Figure 8. Radiated Emission Test Setup (30 – 1000 MHz)



Figure 9. Radiated Emission Test Setup (Above 1 GHz)

4. Conducted Emission Data

4.1 Test Specification

F.C.C., Part 15, Subpart C

4.2 Test Procedure

The E.U.T operation mode and test set-up are as described in Section 3. In order to minimize background noise interference, the conducted emission testing was performed inside a shielded room, with the E.U.T placed on an 0.8 meter high wooden table, 0.4 meter from the room's vertical wall.

The E.U.T was powered from 115 V AC / 60 Hz via a 50 Ohm / 50 μ Hn Line Impedance Stabilization Network (LISN) on the phase and neutral lines. The LISN's were grounded to the shielded room ground plane (floor), and were kept at least 0.8 meters from the nearest boundary of the E.U.T

The center of the E.U.T AC cable was folded back and forth, in order to form a bundle less than 0.40 meters and a total cable length of 1 meter.

The emission voltages at the LISN's outputs were measured using a computerized receiver, complying with CISPR 16 requirements. The specification limits are loaded to the receiver via a 3.5" floppy disk and are displayed on the receiver's spectrum display.

A frequency scan between 0.15 and 30 MHz was performed at 9 kHz I.F. band width, and using peak detection.

The spectral components having the highest level on each line were measured using a quasi-peak and average detector.

4.3 Test Results

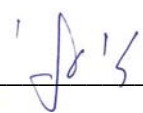
JUDGEMENT: Passed by 0.6 dB

The margin between the emission levels and the specification limit is, in the worst case, 0.6 dB for the phase line at 2.49 MHz and 0.9 dB at 2.65 MHz for the neutral line.

The EUT met the F.C.C. Part 15, Subpart C specification requirements.

The details of the highest emissions are given in *Figure 10* to *Figure 13*.

TEST PERSONNEL:

Tester Signature: For/ 

Date: 16.11.10

Typed/Printed Name: A. Sharabi

Conducted Emission

E.U.T Description Wireless Gateway Terminal
 Type WGT Consisting of
 a. PCB ASSY.WGT CPU (VIS)
 b. PCB ASSY. WGT RF 3 (VIS) (AT) x 2
 Part Number: a. 919539300 b. 819539370

Specification: F.C.C., Part 15, Subpart C
 Lead: Phase
 Detectors: Peak, Quasi-peak, Average

Signal Number	Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Delta L 1 (dB)	Avg (dBuV)	Av Delta L 2 (dB)	Corr (dB)
1	0.156136	53.3	47.0	-18.7	13.8	-41.9	0.0
2	0.177504	49.4	42.9	-21.8	11.3	-43.4	0.0
3	0.664113	33.5	32.3	-23.7	28.9	-17.1	0.0
4	2.488024	46.6	45.7	-10.3	45.4	-0.6	0.0
5	3.647627	47.1	45.4	-10.6	42.6	-3.4	0.0
6	8.583371	41.3	37.8	-22.2	33.2	-16.8	0.0

Figure 10. Detectors: Peak, Quasi-peak, AVERAGE .

Note: QP Delta/Av Delta refer 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.

Conducted Emission

E.U.T Description Wireless Gateway Terminal
 Type WGT Consisting of
 a. PCB ASSY.WGT CPU (VIS)
 b. PCB ASSY. WGT RF 3 (VIS) (AT) x 2
 Part Number: a. 919539300 b. 819539370

 Specification: F.C.C., Part 15, Subpart C
 Lead: Phase
 Detectors: Peak, Quasi-peak, Average

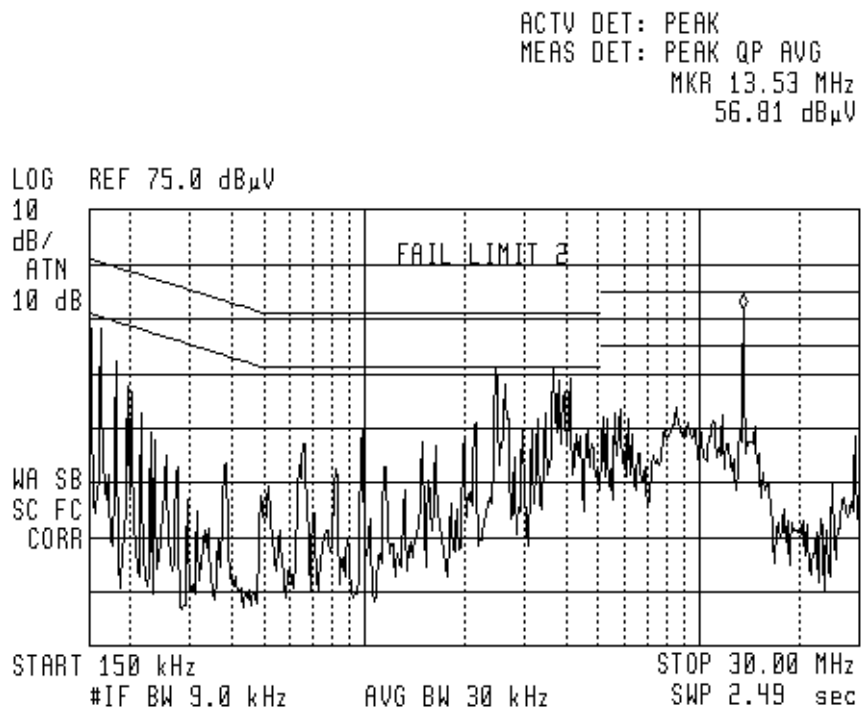


Figure 11. Detectors: Peak, Quasi-peak, Average

Note: Fail indication on the spectral plot results from peak detector level reading above the limit. This indication is for information only and it should not be interpreted as a test failure.

Conducted Emission

E.U.T Description Wireless Gateway Terminal
 Type WGT Consisting of
 a. PCB ASSY.WGT CPU (VIS)
 b. PCB ASSY. WGT RF 3 (VIS) (AT) x 2
 Part Number: a. 919539300 b. 819539370

Specification: F.C.C., Part 15, Subpart C
 Lead: Neutral
 Detectors: Peak, Quasi-peak, Average

Signal Number	Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Delta L 1 (dB)	Avg (dBuV)	Av Delta L 2 (dB)	Corr (dB)
1	0.161971	53.5	46.9	-18.5	18.2	-37.3	0.0
2	0.663042	32.8	32.2	-23.8	29.8	-16.2	0.0
3	0.995095	33.5	32.3	-23.7	31.7	-14.3	0.0
4	2.651720	47.9	46.7	-9.3	45.1	-0.9	0.0
5	4.145511	43.8	42.2	-13.8	40.8	-5.2	0.0
6	7.539570	38.5	39.5	-20.5	36.5	-13.5	0.0

Figure 12. Detectors: Peak, Quasi-peak, AVERAGE

Note: QP Delta/Av Delta refer 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.

Conducted Emission

E.U.T Description Wireless Gateway Terminal
 Type WGT Consisting of
 a. PCB ASSY.WGT CPU (VIS)
 b. PCB ASSY. WGT RF 3 (VIS) (AT) x 2
 Part Number: a. 919539300 b. 819539370

 Specification: F.C.C., Part 15, Subpart C
 Lead: Neutral
 Detectors: Peak, Quasi-peak, Average

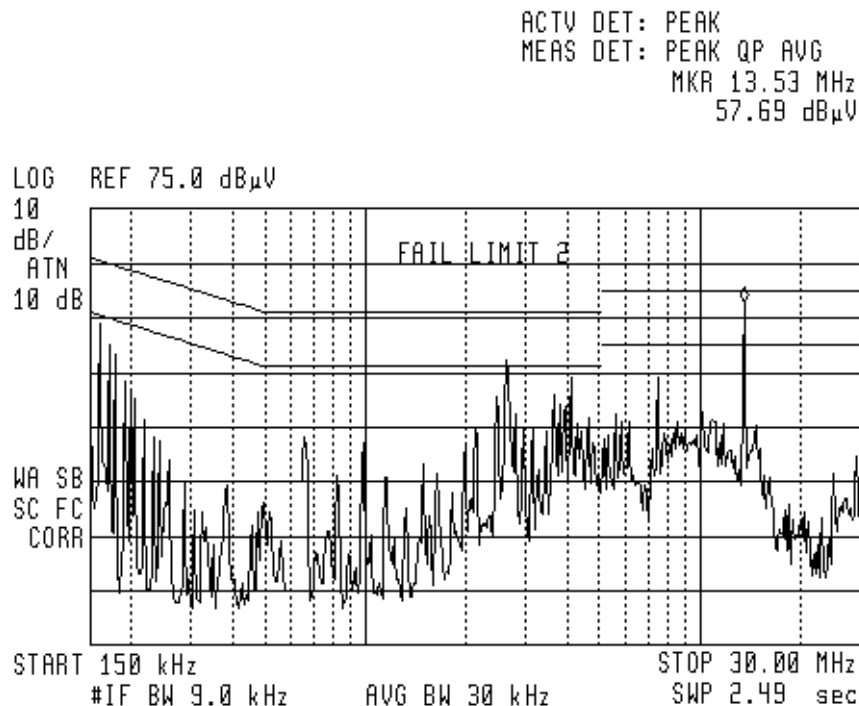


Figure 13 Conducted Emission: NEUTRAL
Detectors: Peak, Quasi-peak, Average

Note: Fail indication on the spectral plot results from peak detector level reading above the limit. This indication is for information only and it should not be interpreted as a test failure.

4.4 Test Instrumentation Used, Conducted Measurement

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
LISN	Fischer	FCC-LISN-2A	127	March 3, 2009	1 Year
LISN	Fischer	FCC-LISN-2A	128	March 3, 2009	1 Year
EMI Receiver	HP	85422E	3906A00276	November 10, 2009	1 Year
RF Filter Section	HP	85420E	3705A00248	November 10, 2009	1 Year
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

5. 6dB Minimum Bandwidth

5.1 Test Specification

F.C.C. Part 15, Subpart C: 15.247(a)(2)

5.2 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters. The transmitter unit operated with normal modulation. The EMI receiver was set to 100 kHz resolution BW. The spectrum bandwidth of the transmitter unit was measured and recorded. The test was performed to measure the transmitter occupied bandwidth. The EUT was set up as shown in 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 modulation envelope. The E.U.T. was tested at 2410 and 2475 MHz. The E.U.T. was tested in three operating channels and frequencies (11 (2.405 GHz); 18 (2.440 GHz); 26 (2.480 GHz)).

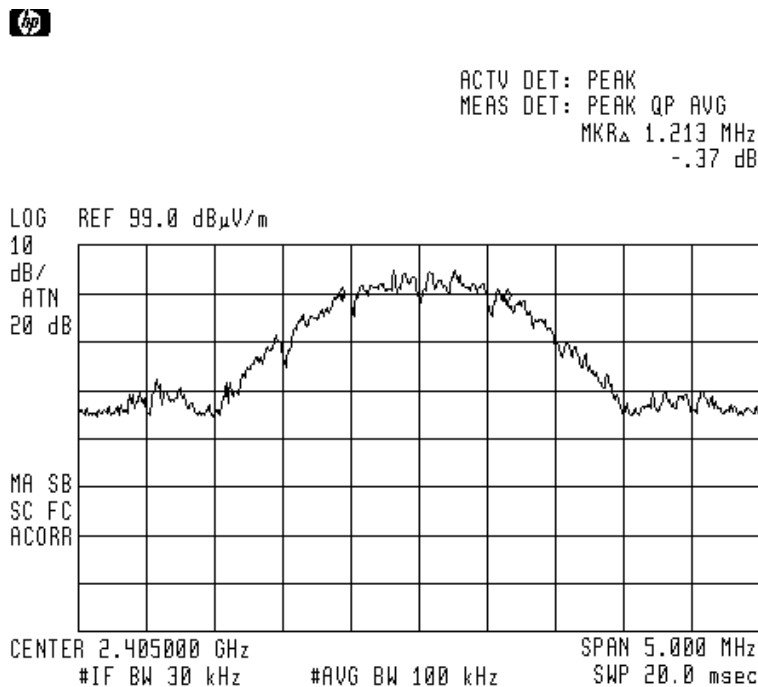


Figure 14. 2405 MHz



ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR Δ 1.288 MHz
 -.29 dB

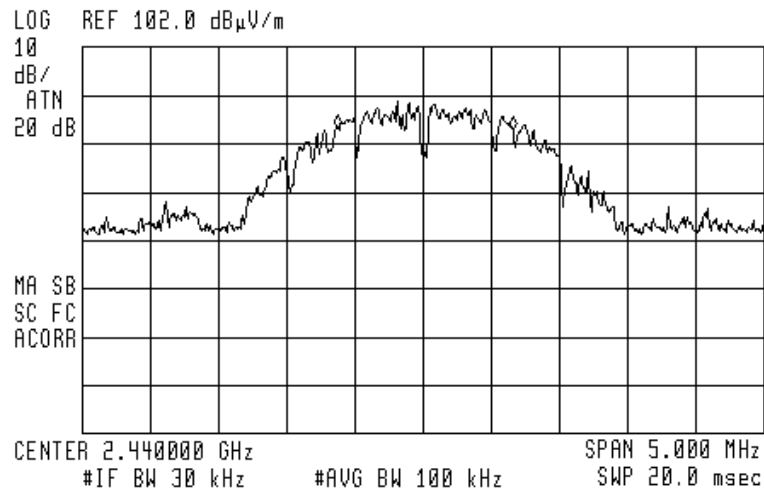


Figure 15. 2440 MHz



ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR Δ 1.450 MHz
 -.55 dB

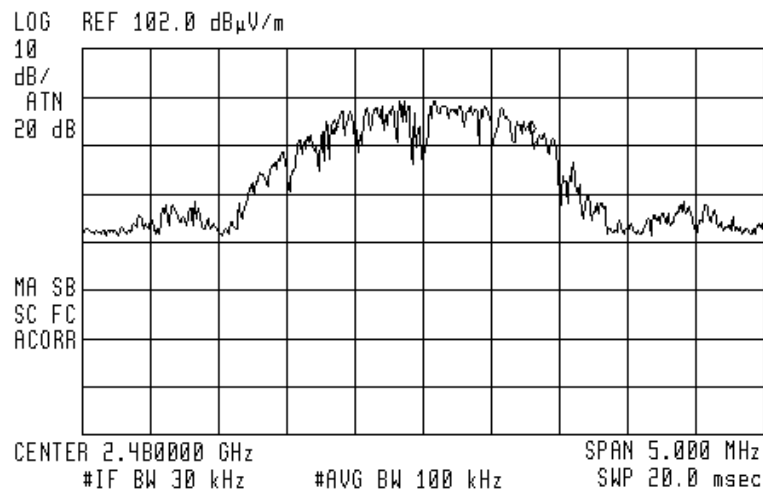


Figure 16. 2480 MHz

5.3 Test Results 6dB Minimum Bandwidth

E.U.T Description: Wireless Gateway Terminal

Model: WGT Consisting of

a. PCB ASSY.WGT CPU (VIS)

b. PCB ASSY. WGT RF 3 (VIS) (AT) x 2

Part Number: a. 919539300 b. 819539370

Operation Frequency (MHz)	Bandwidth Reading (MHz)	Specification (MHz)
2405.00	1.213	>0.5
2440.00	1.288	>0.5
2480.00	1.450	>0.5

Figure 17 Test Results

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: For/ 

Date: 16.11.10

Typed/Printed Name: A. Sharabi

5.4 Test Equipment Used 6dB Minimum Bandwidth

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 10, 2009	1 year
RF Section	HP	85420E	3705A00248	November 10, 2009	1 year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 29, 2009	2 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

Figure 18 Test Equipment Used

6. 26dB Minimum Bandwidth

6.1 Test Specification

F.C.C. Part 15, Subpart C: 15.247(a)(2)

6.2 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters. The transmitter unit operated with normal modulation. The EMI receiver was set to 100 kHz resolution BW. The spectrum bandwidth of the transmitter unit was measured and recorded. The test was performed to measure the transmitter occupied bandwidth. The EUT was set up as shown in 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 modulation envelope. The E.U.T. was tested at 2410 and 2480 MHz. The E.U.T. was tested in three operating channels and frequencies (11 (2.405 GHz); 18 (2.440 GHz); 26 (2.480 GHz)).

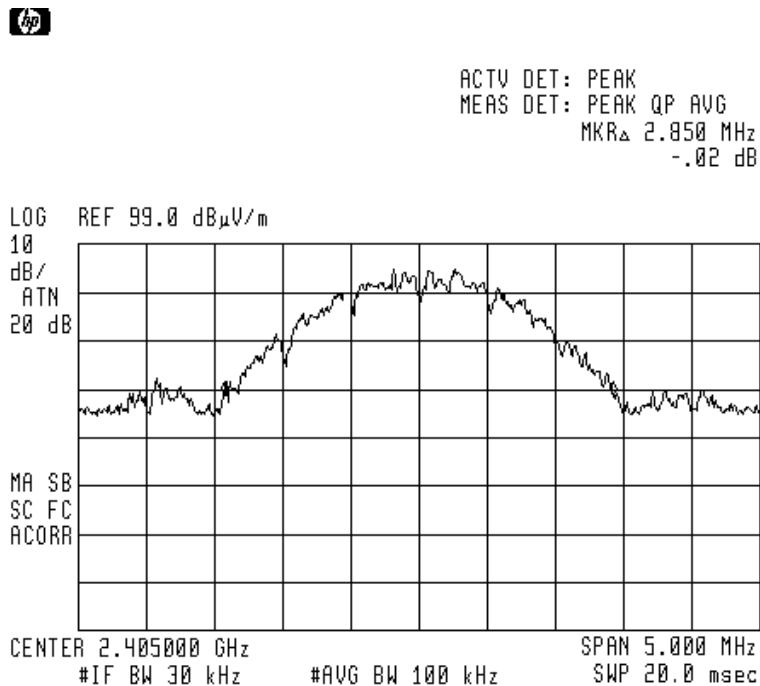


Figure 19. 2405 MHz



ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR Δ 2.825 MHz
 .02 dB

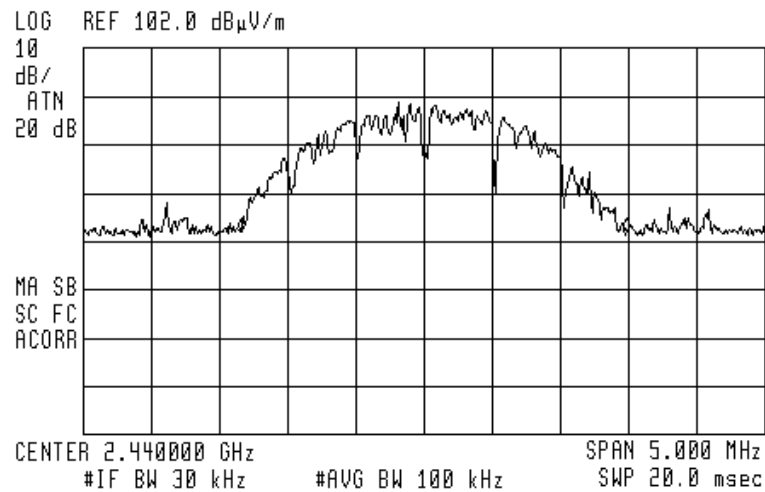


Figure 20. 2440 MHz



ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR Δ 2.800 MHz
 -.52 dB

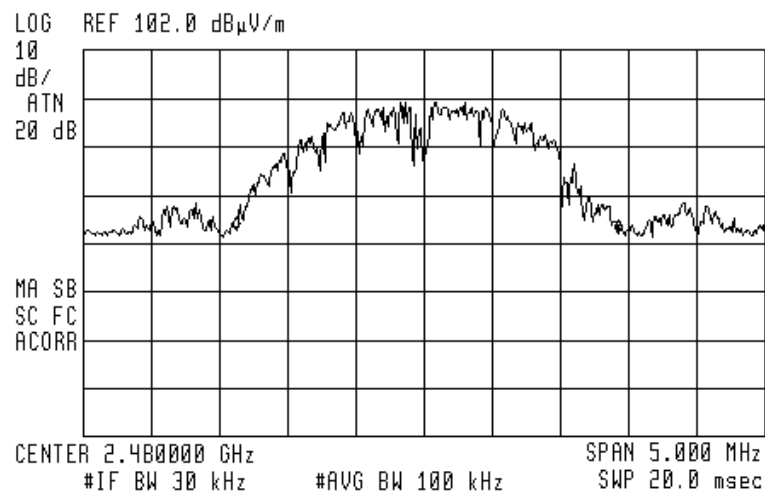


Figure 21. 2480 MHz

6.3 Test Results

E.U.T Description: Wireless Gateway Terminal

Model: WGT Consisting of

a. PCB ASSY.WGT CPU (VIS)

b. PCB ASSY. WGT RF 3 (VIS) (AT) x 2

Part Number: a. 919539300 b. 819539370

Operation Frequency (MHz)	Bandwidth Reading (MHz)
2405.00	2.850
2440.00	2.825
2480.00	2.800

Figure 22 Test Results

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: For/ 

Date: 16.11.10

Typed/Printed Name: A. Sharabi

6.4 Test Equipment Used 26dB Bandwidth

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 10, 2009	1 year
RF Section	HP	85420E	3705A00248	November 10, 2009	1 year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 29, 2009	2 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

Figure 23 Test Equipment Used

7. Radiated Power Output

7.1 Test Specification

F.C.C. Part 15, Subpart C: 15.247(b)

7.2 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters.

The transmitter unit operated with normal modulation. The EMI receiver was set to 1 MHz resolution BW. The EUT was set up as shown in Figure 3, and its proper operation was checked.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

The E.U.T. was tested in three operating channels and frequencies (11 (2.405 GHz); 18 (2.440 GHz); 26 (2.480 GHz)).

Radiated output power levels were measured at selected operation frequencies and the results were converted to power level according to the formula as shown below:

$$P = \frac{(E_{V/m} \times d)^2}{(30 \times G)} [\text{W}]$$

The E.U.T. was tested at 2405, 2440, and 2480 MHz with QPSK modulation.



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.405400 GHz
102.05 dB μ V/m

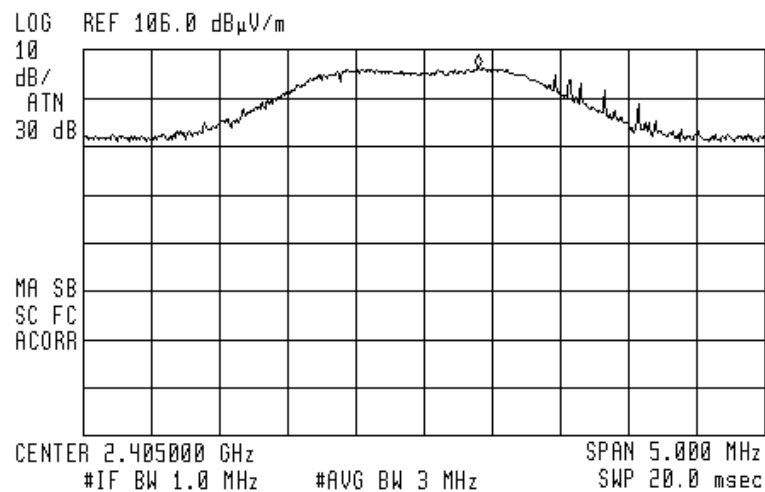


Figure 24 2405 MHz



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.440513 GHz
100.29 dB μ V/m

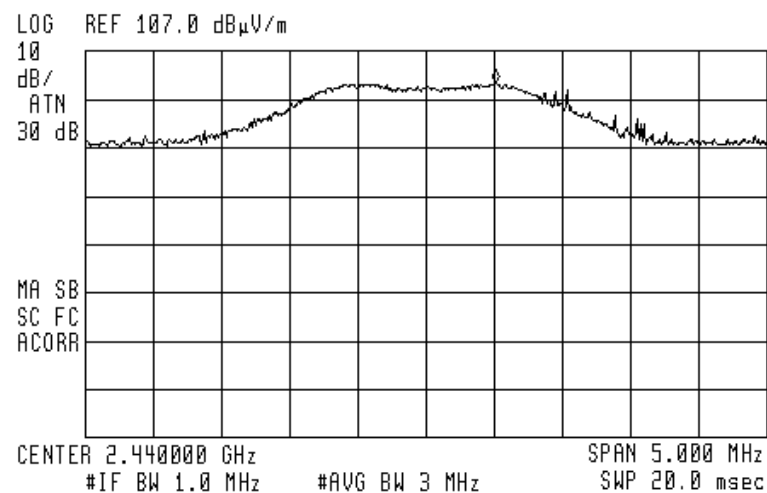


Figure 25 2440 MHz



ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR 2.479513 GHz
 101.26 dB μ V/m

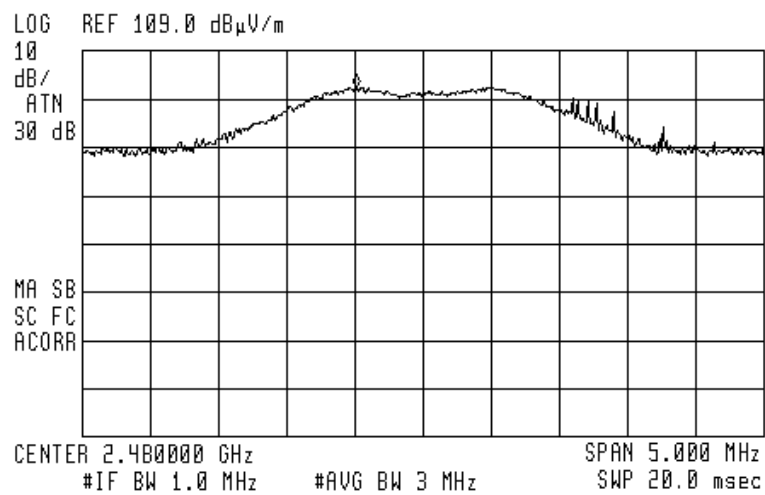


Figure 26 2480 MHz

7.3 Test Results Calculation

E.U.T. Description: Wireless Gateway Terminal

Model No.: WGT Consisting of

a. PCB ASSY.WGT CPU (VIS)

b. PCB ASSY. WGT RF 3 (VIS) (AT) x 2

Part Number: a. 919539300 b. 819539370

Specification: F.C.C. Part 15, Subpart C

Frequency	E	E	Antenna Gain	Antenna Distance	Calculated Results	Limit	Margin
(MHz)	(db μ V/m)	(V/m)	(dBi)	(m)	(mW)	(W)	(mW)
2405.00	102.05	0.13	0	3	5.07	1	994.93
2440.00	100.29	0.10	0	3	3.00	1	997.00
2480.00	101.26	0.12	0	3	4.32	1	995.68

Figure 27 Test Results

JUDGEMENT:

Passed by 994.9 mW

TEST PERSONNEL:

Tester Signature: For/ 

Date: 16.11.10

Typed/Printed Name: A. Sharabi

7.4 Test Equipment Used Radiated Maximum Power Output

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Receiver	HP	85422E	3906A00276	November 10, 2009	1 year
RF Section	HP	85420E	3705A00248	November 10, 2009	1 year
Antenna-Log Periodic	A.H.System	SAS-200/511	253	January 29, 2009	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
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

Figure 28 Test Equipment Used

8. Band Edge

[In Accordance with section 15.247(d)]

8.1 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters.

The transmitter unit operated with normal modulation. The EMI receiver was set to 1 MHz resolution BW. The EUT was set up as shown in Figure 3, and its proper operation was checked.

The EMI receiver was adjusted to the transmission channel at the maximum radiated level. The display line was set to 20 dBc and the EMI receiver was set to the band edge frequencies.

Maximum power level below 2400 MHz and above 2483.5 MHz was measured relative to power level at 2405 MHz, and 2480 MHz correspondingly.

The E.U.T. was tested in 2 operating channels and frequencies (11 (2.405 GHz); 26 (2.480 GHz)).

The E.U.T. was tested at 2405 and 2480 MHz with QPSK modulation.

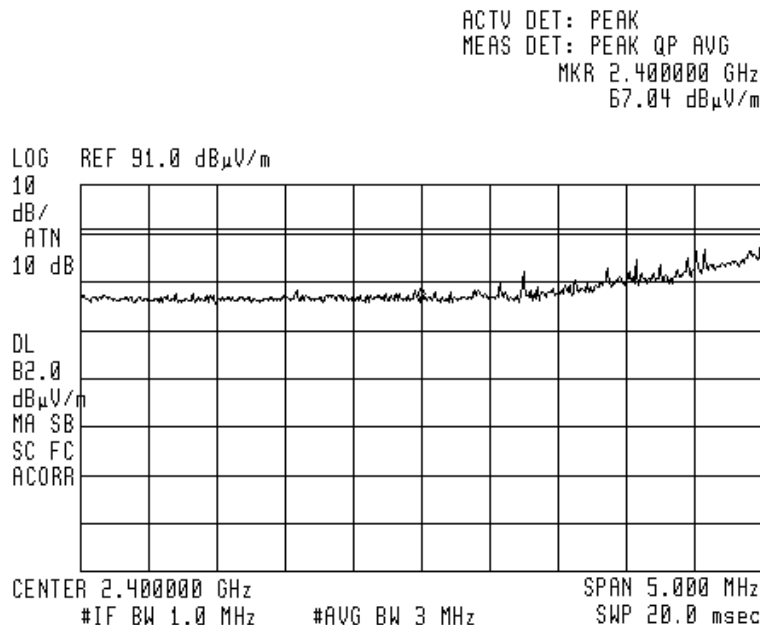


Figure 29 — 2405 MHz



ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR 2.483500 GHz
 70.27 dB μ V/m

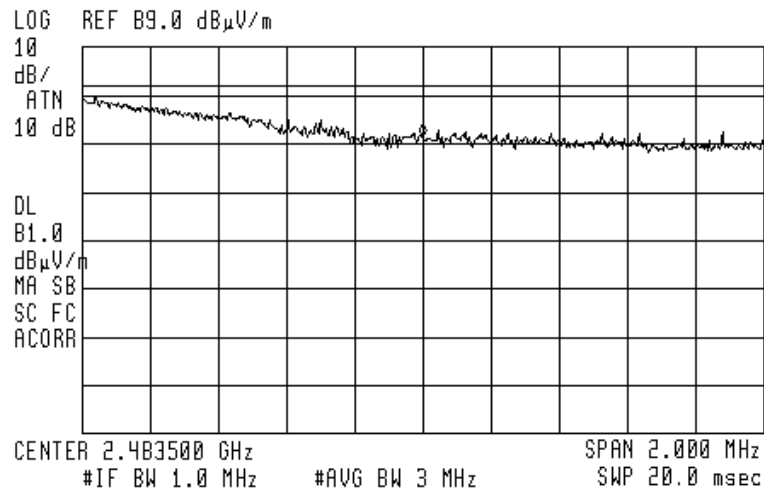


Figure 30 — 2480 MHz

8.2 Test Results

E.U.T. Description: Wireless Gateway Terminal

Model No.: WGT Consisting of

a. PCB ASSY.WGT CPU (VIS)

b. PCB ASSY. WGT RF 3 (VIS) (AT) x 2

Part Number: a. 919539300 b. 819539370

Specification: F.C.C. Part 15, Subpart C (15.247 (d))

Operation Frequency (MHz)	Band Edge Frequency (MHz)	Spectrum Level (dBuV/m)	Specification (dBc)	Margin (dB)
2405.00	2400.00	67.04	-20.0	-47.04
2480.00	2483.50	70.27	-20.0	-50.27

Figure 31 Band Edge

JUDGEMENT:

Passed by 47.04 dB

TEST PERSONNEL:

Tester Signature: For/ 

Date: 16.11.10

Typed/Printed Name: A. Sharabi

8.3 Test Equipment Used Band edge Spectrum

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Receiver	HP	85422E	3906A00276	November 10, 2009	1 year
RF Section	HP	85420E	3705A00248	November 10, 2009	1 year
Antenna-Log Periodic	A.H.System	SAS-200/511	253	January 29, 2009	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
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

Figure 32 Test Equipment Used

9. Radiated Emission, 9 kHz – 30 MHz

9.1 Test Specification

9 kHz-30 MHz, FCC, Part 15, Subpart C, Section 209

9.2 Test Procedure

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

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-30 MHz was scanned.

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-30MHz, the loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter at a distance of 3 meters.

The E.U.T. was operated at the frequency of kHz. This frequency was measured using a peak detector.

The E.U.T. was tested in three operating channels and frequencies (11 (2.405 GHz); 18 (2.440 GHz); 26 (2.480 GHz)).

9.3 Test Results

JUDGEMENT: Passed

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 209 specification.

The results for all three channels were the same.

No signals were detected in the frequency range of 9 kHz – 30 MHz.

TEST PERSONNEL:

Tester Signature: For/ 

Date: 16.11.10

Typed/Printed Name: A. Sharabi

9.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 10, 2009	1 year
RF Section	HP	85420E	3705A00248	November 10, 2009	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 19, 2009	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

9.5 Field Strength Calculation

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$FS = RA + AF + CF$$

FS: Field Strength [dB μ V/m]

RA: Receiver Amplitude [dB μ V]

AF: Receiving Antenna Correction Factor [dB/m]

CF: Cable Attenuation Factor [dB]

Example: FS = 30.7 dB μ V (RA) + 14.0 dB (AF) + 0.9 dB (CF) = 45.6 dB μ V

No external pre-amplifiers are used.

10. Spurious Radiated Emission 30 MHz – 25.0 GHz

10.1 Test Specification

30 MHz-25.0 GHz, F.C.C., Part 15, Subpart C

10.2 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 frequency range 30 MHz – 25.0 GHz 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.

In the frequency range 1-2.9 GHz, a computerized EMI receiver complying to CISPR 16 requirements was used.

In the frequency range 2.9-25.0 GHz, 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.

The test distance was 3 meters.

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.)

The E.U.T. was tested in three operating channels and frequencies (11 (2.405 GHz); 18 (2.440 GHz); 26 (2.480 GHz)).

10.3 Test Results

The EUT met the requirements of the F.C.C. Part 15, Subpart C, specification.
The results for all three operation channels were the same.

The signals in the band 30 MHz – 1.0 GHz were below the spectrum analyzer noise level, at least 20 dB below the specification limit.

For the operation channel 11 (2.405 GHz), the margin between the emission level and the specification limit is 11.8 dB in the worst case at the frequency of 2390.00 MHz, vertical polarization.

For the operation channel 18 (2.440 GHz), the margin between the emission level and the specification limit is 12.1 dB in the worst case at the frequency of 4880.00 MHz, horizontal polarization.

For the operation channel 26 (2.480 GHz), the margin between the emission level and the specification limit is 9.5 dB in the worst case at the frequency of 2483.50 MHz, vertical polarization.

JUDGEMENT: Passed by 10.6 dB

TEST PERSONNEL:

Tester Signature: For/ 

Date: 16.11.10

Typed/Printed Name: A. Sharabi

Radiated Emission 30 MHz- 25.0 GHz

E.U.T Description Wireless Gateway Terminal
 Type WGT Consisting of
 a. PCB ASSY.WGT CPU (VIS)
 b. PCB ASSY. WGT RF 3 (VIS) (AT) x 2
 Part Number: a. 919539300 b. 819539370

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical Frequency range: 1.0 GHz to 25.0 GHz
 Test Distance: 3 meters Detector: Peak

Operation Frequency	Freq.	Polarity	Peak Reading*	Peak. Specification	Peak. Margin
(MHz)	(MHz)	(H/V)	(dBμV/m)	(dB μV/m)	(dB)
2405.00	2390.00	H	54.0	74.0	-20.0
2405.00	2390.00	V	52.9	74.0	-21.1
2405.00	4810.00	H	61.0	74.0	-13.0
2405.00	4810.00	V	58.7	74.0	-15.3
2440.00	4880.00	H	61.9	74.0	-12.1
2440.00	4880.00	V	57.5	74.0	-16.5
2480.00	2483.50	H	53.9	74.0	-20.1
2480.00	2483.50	V	54.5	74.0	-19.5
2480.00	4960.00	H	63.4	74.0	-10.6
2480.00	4960.00	V	60.0	74.0	-14.0

**Figure 33. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL.
 Detector: Peak**

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.

*"Peak Reading" includes correction factor.

"Correction Factor" = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

Radiated Emission Above 1 GHz

E.U.T Description Wireless Gateway Terminal
 Type WGT Consisting of
 a. PCB ASSY.WGT CPU (VIS)
 b. PCB ASSY. WGT RF 3 (VIS) (AT) x 2
 Part Number: a. 919539300 b. 819539370

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical

Frequency range: 1.0 GHz to 25.0 GHz

Test Distance: 3 meters

Detector: Average

Operation Frequency (MHz)	Freq. (MHz)	Polarity (H/V)	Average Reading* (dBμV/m)	Average Specification (dB μV/m)	Average Margin (dB)
2405.00	2390.00	H	40.5	54.0	-13.5
2405.00	2390.00	V	42.2	54.0	-11.8
2405.00	4810.00	H	39.9	54.0	-14.1
2405.00	4810.00	V	38.9	54.0	-15.1
2440.00	4880.00	H	39.8	54.0	-14.2
2440.00	4880.00	V	39.0	54.0	-15.0
2480.00	2483.50	H	43.6	54.0	-10.4
2480.00	2483.50	V	44.5	54.0	-9.5
2480.00	4960.00	H	39.8	54.0	-14.2
2480.00	4960.00	V	39.6	54.0	-14.4

**Figure 34. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL.
 Detector: 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.

*"Average Reading" includes correction factor.

Correction Factor = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

10.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 10, 2009	1 year
RF Section	HP	85420E	3705A00248	November 10, 2009	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	March 25, 2009	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 26, 2009	1 year
Double Ridged Waveguide Horn Antenna	EMCO	3115	29845	March 16, 2008	2 Years
Horn Antenna	ARA	SWH-28	1008	December 23, 2008	2 Years
Horn Antenna	Narda	V637	0410	December 23, 2008	2 Years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS- 0411N313	013	January 7, 2009	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	January 9, 2009	1 Year
Low Noise Amplifier	MK Milliwave	MKT6-3000 4000-30-13P	A0399	January 15, 2009	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	March 17, 2009	1 Year
Spectrum Analyzer	HP	8546E	3442A00275	December 15, 2009	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	JPKG19982	N/A	N/A

10.5 Field Strength Calculation 30 MHz - 2.9 GHz

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$[\text{dB}\mu\text{V/m}] \text{ FS} = \text{RA} + \text{AF} + \text{CF}$$

FS:	Field Strength [dB $\mu\text{V/m}$]
RA:	Receiver Amplitude [dB μV]
AF:	Receiving Antenna Correction Factor [dB/m]
CF:	Cable Attenuation Factor [dB]

Example: $\text{FS} = 30.7 \text{ dB}\mu\text{V (RA)} + 14.0 \text{ dB (AF)} + 0.9 \text{ dB (CF)} = 45.6 \text{ dB}\mu\text{V}$

No external pre-amplifiers are used.

11. Radiated Power Spectral Density

[In accordance with section 15.247(e)]

11.1 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters.

The transmitter unit operated with normal modulation. The EMI receiver was set to 1 MHz resolution BW. The EUT was set up as shown in Figure 3, and its proper operation was checked.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

The E.U.T. was tested in three operating channels and frequencies (11 (2.405 GHz); 18 (2.440 GHz); 26 (2.480 GHz)).

Then the EMI receiver was set to 3 kHz resolution BW, span of 300.0 kHz, and sweep time of 100 seconds. The spectrum peaks were located at each of the 3 operating frequencies.

Radiated peak output power levels were converted to power level according to the formula as shown below:

$$P = \frac{(E_{V/m} \times d)^2}{(30 \times G)} [\text{W}]$$



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.4045890 GHz
88.99 dB μ V/m

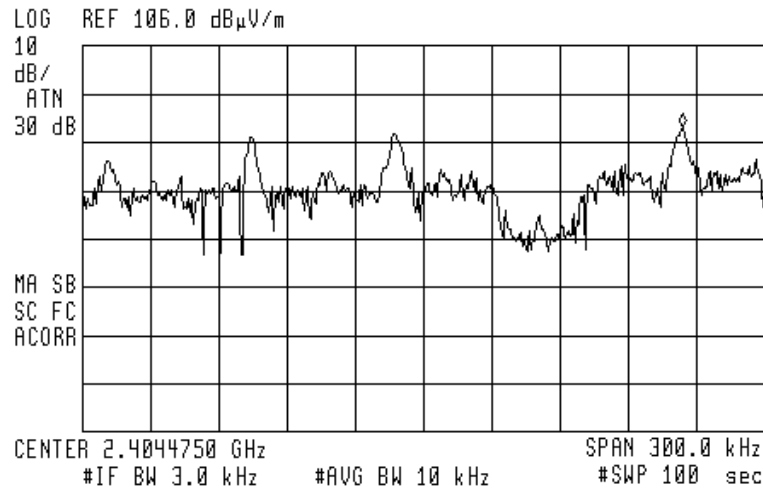


Figure 35 — 2405 MHz



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.4404623 GHz
88.42 dB μ V/m

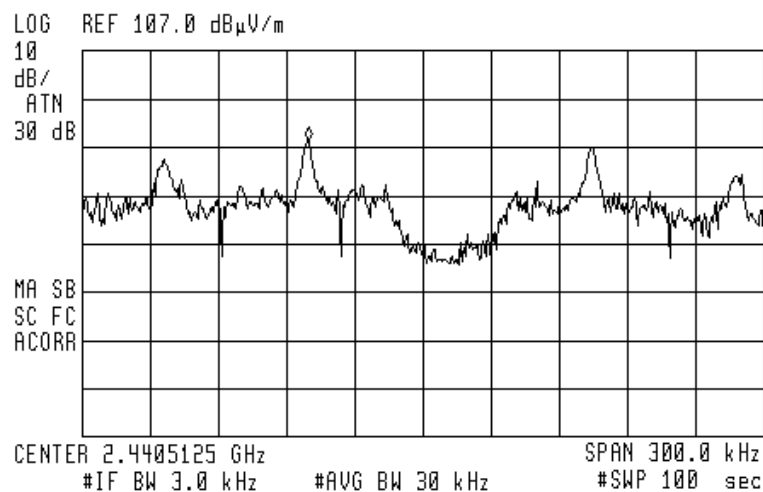


Figure 36 — 2440 MHz



ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR 2.4796490 GHz
 88.73 dB μ V/m

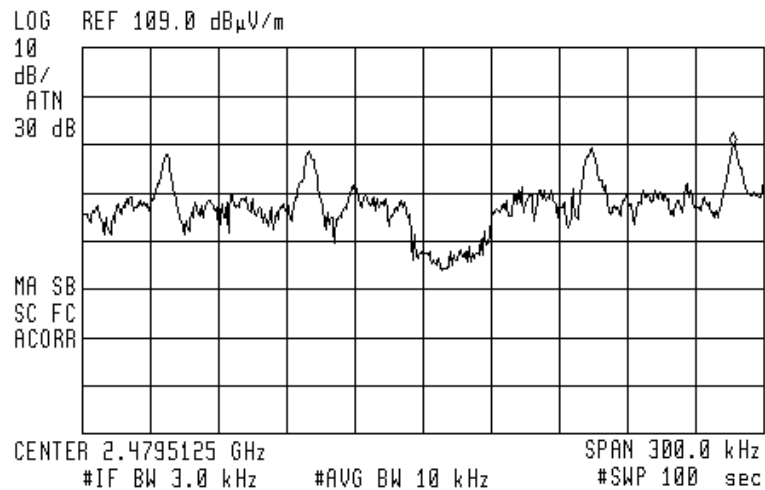


Figure 37 — 2480 MHz

11.2 Test Results

E.U.T. Description: Wireless Gateway Terminal

Model No.: WGT Consisting of

a. PCB ASSY.WGT CPU (VIS)

b. PCB ASSY. WGT RF 3 (VIS) (AT) x 2

Part Number: a. 919539300 b. 819539370

Specification: F.C.C. Part 15, Subpart C (15.247(e))

Frequency	E	Spectral Density Result	Antenna Gain	Antenna Distance	Calculated Results	Spec.	Margi n
(MHz)	(db μ V/m)	(V/m)	(dBi)	(m)	(mW)	(mW)	(mW)
2405	88.99	0.03	0	3	0.27	6.3	-6.03
2440	88.42	0.03	0	3	0.27	6.3	-6.03
2480	88.73	0.03	0	3	0.27	6.3	-6.03

Figure 38 Test Results

JUDGEMENT: Passed by 6.03 mW

TEST PERSONNEL:

Tester Signature: For/ 

Date: 16.11.10

Typed/Printed Name: A. Sharabi

11.3 Test Equipment Used Transmitted Power Density

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 10, 2009	1 year
RF Section	HP	85420E	3705A00248	November 10, 2009	1 year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 29, 2009	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
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

Figure 39 Test Equipment Used

12. Antenna Gain/Information

The antenna gain is 0 dBi simulated.

13. R.F Exposure/Safety

Typical use of the E.U.T. is vehicle identification at fuel pumps. The typical placement of the E.U.T. is either wall mounted or inside an Orpak Island Fuel Controller. The typical distance between the E.U.T. and the user in the worst case application, is <20 cm .

Calculation of Maximum Permissible Exposure (MPE)

Based on Section 1.1307(b)(1) Requirements

(a) FCC limits at 2440 MHz is: $1 \frac{mW}{cm^2}$

Using table 1 of Section 1.1310 limit for general population/uncontrolled exposures, the above level is an average over 30 minutes.

(b) The power density produced by the E.U.T. is

$$S = \frac{P_t G_t}{4\pi R^2}$$

P_t- Transmitted Power 5.07 mw (Peak)

G_T- Antenna Gain, 0 dBi = 1 (Numeric)

R- Distance from Transmitter using 20 cm worst case

(c) The peak power density (time averaging) is :

$$S_p = \frac{5.07 \times 1}{4\pi(20)^2} = 1.0 \times 10^{-3} \frac{mW}{cm^2}$$

(d) This is below the FCC limit.

14. Intermodulation Tests

14.1 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 2.

The E.U.T host was placed on a remote-controlled turntable on the open area test site.

The frequency range 30 MHz – 25.0 GHz 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.

In the frequency range 1-2.9 GHz, a computerized EMI receiver complying to CISPR 16 requirements was used.

In the frequency range 2.9-25.0 GHz, 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.

The test distance was 3 meters.

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.)

The E.U.T. was tested for intermodulation.

14.2 Test Results

All results were below the results of the 2.4 GHz transmitter spurious radiated emission test results.

TEST PERSONNEL:

Tester Signature: For/ 

Date: 16.11.10

Typed/Printed Name: A. Sharabi

14.3 Test Instrumentation Used, Intermodulation

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 10, 2009	1 year
RF Section	HP	85420E	3705A00248	November 10, 2009	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	March 25, 2009	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 26, 2009	1 year
Double Ridged Waveguide Horn Antenna	EMCO	3115	29845	March 16, 2008	2 Years
Horn Antenna	ARA	SWH-28	1008	December 23, 2008	2 Years
Horn Antenna	Narda	V637	0410	December 23, 2008	2 Years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS- 0411N313	013	January 7, 2009	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	January 9, 2009	1 Year
Low Noise Amplifier	MK Milliwave	MKT6-3000 4000-30-13P	A0399	January 15, 2009	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	March 17, 2009	1 Year
Spectrum Analyzer	HP	8546E	3442A00275	December 15, 2009	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	JPKG19982	N/A	N/A

15. APPENDIX B - CORRECTION FACTORS

15.1 Correction factors for CABLE

from EMI receiver
to test antenna
at 3 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)	FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3	1200.0	7.3
20.0	0.6	1400.0	7.8
30.0	0.8	1600.0	8.4
40.0	0.9	1800.0	9.1
50.0	1.1	2000.0	9.9
60.0	1.2	2300.0	11.2
70.0	1.3	2600.0	12.2
80.0	1.4	2900.0	13.0
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		

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".

15.2 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.

15.3 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.

15.4 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 38M30.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".

15.5 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".

15.6 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".

15.7 Correction factors for Double-Ridged Waveguide Horn

**Model: 3115, S/N 29845
at 3 meter range.**

FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENN A Gain (dBi)	FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)
1.0	24.8	5.4	10.0	38.8	11.4
1.5	26.1	7.6	10.5	38.9	11.8
2.0	28.6	7.7	11.0	39.0	12.1
2.5	29.8	8.4	11.5	39.6	11.8
3.0	31.4	8.4	12.0	39.8	12.0
3.5	32.4	8.7	12.5	39.6	12.5
4.0	33.7	8.6	13.0	40.0	12.5
4.5	33.4	9.9	13.5	39.8	13.0
5.0	34.5	9.7	14.0	40.2	13.0
5.5	35.1	9.9	14.5	40.6	12.9
6.0	35.4	10.4	15.0	41.3	12.4
6.5	35.6	10.8	15.5	39.5	14.6
7.0	36.2	10.9	16.0	38.8	15.5
7.5	37.3	10.4	16.5	40.0	14.6
8.0	37.7	10.6	17.0	41.4	13.4
8.5	38.3	10.5	17.5	44.8	10.3
9.0	38.5	10.8	18.0	47.2	8.1
9.5	38.7	11.1			

15.8 Correction factors for

Horn Antenna
Model: SWH-28
at 1 meter range.

FREQUENCY (GHz)	APE (dB /m)	Gain (dBi)
18.0	40.3	16.1
19.0	40.3	16.3
20.0	40.3	16.1
21.0	40.3	16.3
22.0	40.4	16.8
23.0	40.5	16.4
24.0	40.5	16.6
25.0	40.5	16.7
26.0	40.6	16.4

15.9 Correction factors for

Horn Antenna Model: V637

FREQUENCY (GHz)	APE (dB /m)	Gain (dB1)
26.0	43.6	14.9
27.0	43.7	15.1
28.0	43.8	15.3
29.0	43.9	15.5
30.0	43.9	15.8
31.0	44.0	16.0
32.0	44.1	16.2
33.0	44.1	16.4
34.0	44.1	16.7
35.0	44.2	16.9
36.0	44.2	17.1
37.0	44.2	17.4
38.0	44.2	17.6
39.0	44.2	17.8
40.0	44.2	18.0

15.10 Correction factors for ACTIVE LOOP ANTENNA

Model 6502

S/N 9506-2950

FREQUENCY	Magnetic Antenna Factor	Electric Antenna Factor
(MHz)	(dB)	(dB)
.009	-35.1	16.4
.010	-35.7	15.8
.020	-38.5	13.0
.050	-39.6	11.9
.075	-39.8	11.8
.100	-40.0	11.6
.150	-40.0	11.5
.250	-40.0	11.6
.500	-40.0	11.5
.750	-40.1	11.5
1.000	-39.9	11.7
2.000	-39.5	12.0
3.000	-39.4	12.1
4.000	-39.7	11.9
5.000	-39.7	11.8
10.000	40.2	11.3
15.000	-40.7	10.8
20.000	-40.5	11.0
25.000	-41.3	10.2
30.000	42.3	9.2

16. Comparison Industry Canada Requirements With FCC

Wireless Gateway terminal
M/N : WGT Consisting of
a. PCB ASSY.WGT CPU (VIS)
b. PCB ASSY. WGT RF 3 (VIS) (AT) x 2
IC: 8264A- FCC ID: W8F

Test	FCC	IC
Radiated Power Output	15.247(b)	RSS 210 Issue 7 A8.4(4)
6dB BW	15.247(a)2	RSS 210 Issue 7 A8.2a
Power density	15.247(e)	RSS 210 Issue 7 A8.2b
Spurious radiated emission in the restricted band	15.205(c)	RSS 210 Issue 7 2.7(Table2)
Band edge spectrum	15.247(d)	RSS 210 Issue 7 A8.5
RF Exposure Limits	1.1307(b)(1)	RSS 102 4.4