



**World Office Products  
FCC Part 15, Certification Application  
F238250 F238 / F250**

**June 3, 2008**

**Number of Pages in this report: 47**

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## MEASUREMENT/TECHNICAL REPORT

COMPANY NAME: **World Office Products**

MODEL: **F238/250**

FCC ID: **VSK-F250F238**

DATE: **June 3, 2008**

This report concerns (check one): Original grant X  
Class II change \_\_\_\_\_

Equipment type: **2.4 GHz Transmitter (NOT a Spread Spectrum Radio)**

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? yes \_\_\_\_\_ No X

If yes, defer until: \_\_\_\_\_  
date

N.A. agrees to notify the Commission by N.A.  
date

of the intended date of announcement of the product so that the grant can be issued on that date.

Report prepared by:

US Tech  
3505 Francis Circle  
Alpharetta, GA 30004

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## **1 General Information**

### **1.1 Product Description**

The Equipment Under Test (EUT) is the World Office Products, Model F238/250 F250 / F238. The EUT is a motion activated outdoor light with wireless camera. The EUT operates in the 2400 MHz to 2483.5 MHz ISM band at the following frequencies: 2413 MHz, 2432 MHz, 2451 MHz and 2470 MHz. The EUT is not a Spread Spectrum System.

### **1.2 Related Submittal(s)/Grant(s)**

The EUT will be used with part of a system to send/receive data. The transmitter presented in this report will be used with a receiver.

The EUT is subject to the following authorizations:

- a) Certification as a transmitter
- b) Verification as a class B Digital Device.

The information contained in this report is presented for the certification authorization for the EUT.

## **2 Tests and Measurements**

### **2.1 Configuration of Tested System**

The EUT was configured as shown in the following block diagram(s) and photograph(s). The sample was tested per ANSI C63.4, *Methods of Measurement from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz* (2003). Conducted and radiated emissions data were taken with the spectrum analyzer's resolution bandwidth adjusted to 9 kHz and 120 kHz, respectively. All measurements are peak unless stated otherwise. The video filter on the spectrum analyzer was OFF throughout the evaluation process. Interconnecting cables were manipulated as necessary to maximize emissions.

The sample used for testing was received by US Tech on October 26, 2007 in good condition.

### **2.2 Test Facility**

Testing was performed at US Tech's measurement facility at 3505 Francis Circle, Alpharetta, GA. This site has been fully described and registered with the FCC, under designation number US5117. Additionally this site has also been fully described and submitted to Industry Canada (IC), and has been approved under file number 2982A-1.

### **2.3 Test Equipment**

Table 2 describes test equipment used to evaluate this product.

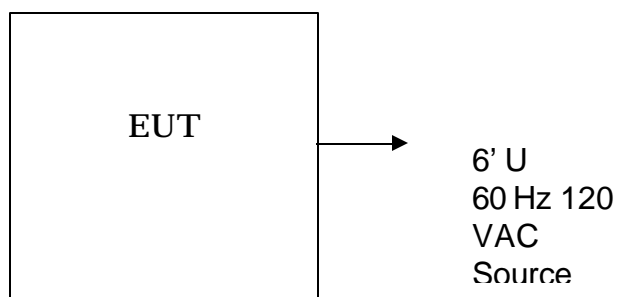
### **2.4 Modifications**

No modifications were made by US Tech to bring the EUT into compliance with FCC Part 15 limits for either the transmitter portion of the EUT or the Class B Digital Device Requirements.

## 2.5 Test Procedure

The sample was tested per ANSI C63.4, *Methods of Measurement from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz* (2003) for Conducted emissions, paragraph 7 and for radiated emissions per paragraph 8. Conducted and radiated emissions data were taken with the spectrum analyzer's resolution bandwidth adjusted to 9 kHz and 120 kHz, respectively. All measurements are peak unless stated otherwise. The video filter associated with the spectrum analyzer was off throughout the evaluation process. Interconnecting cables were manipulated as necessary to maximize emissions. The EUT was rotated more than 360 degrees about its vertical axis in an effort to find its maximum radiated emissions. Also, the test antenna was raised and lowered from 1 to 4 meters in an effort to find its maximum emissions. When a signal of interest was discovered and maximized as just described, the signal was measured and recorded along with all pertinent EUT position information and test antenna distance, height and polarization. A block diagram of the tested system is shown in Figure 1. Test configuration photographs for spurious and fundamental emissions are shown in Figure 2.

**Figure 1. Test Configuration**

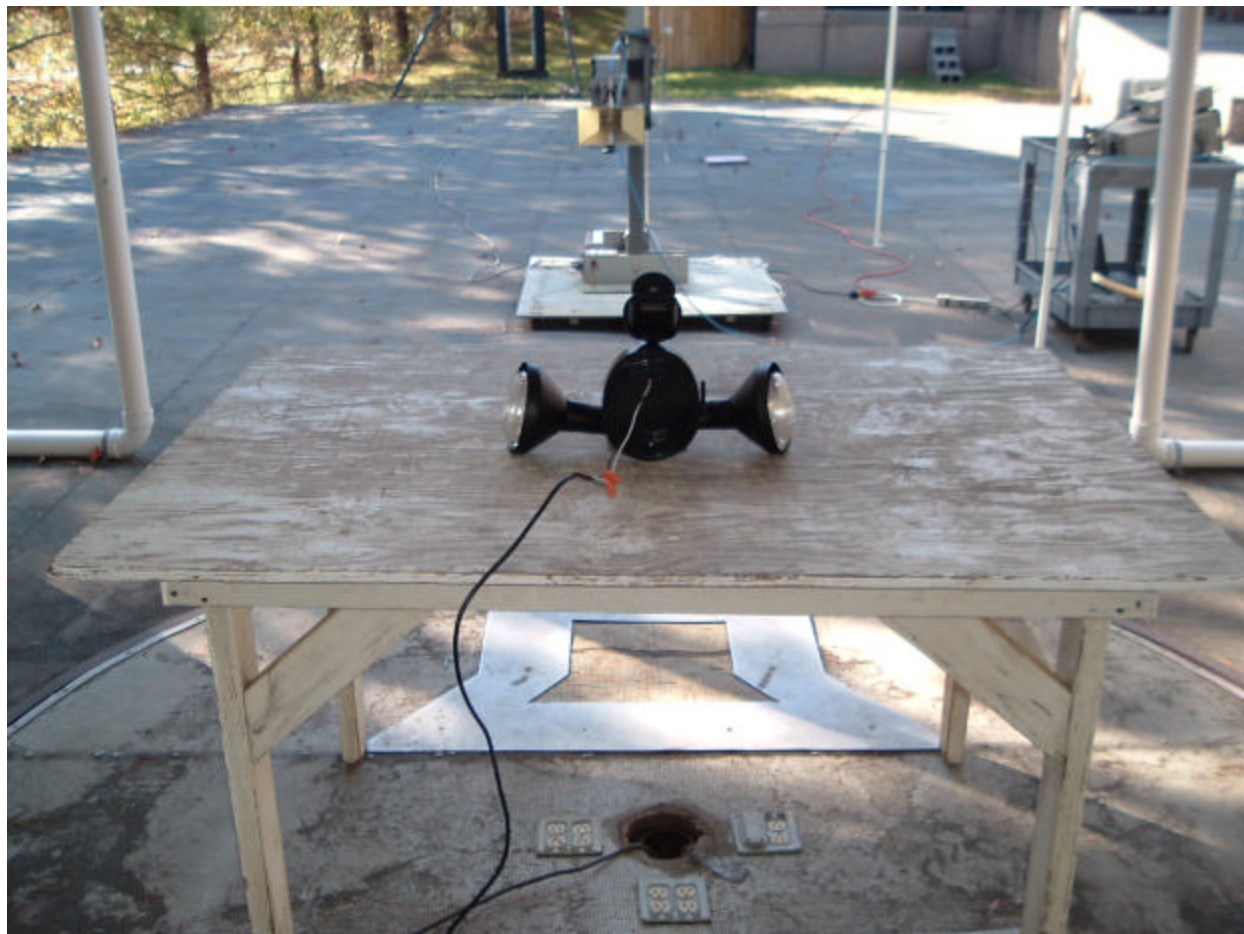




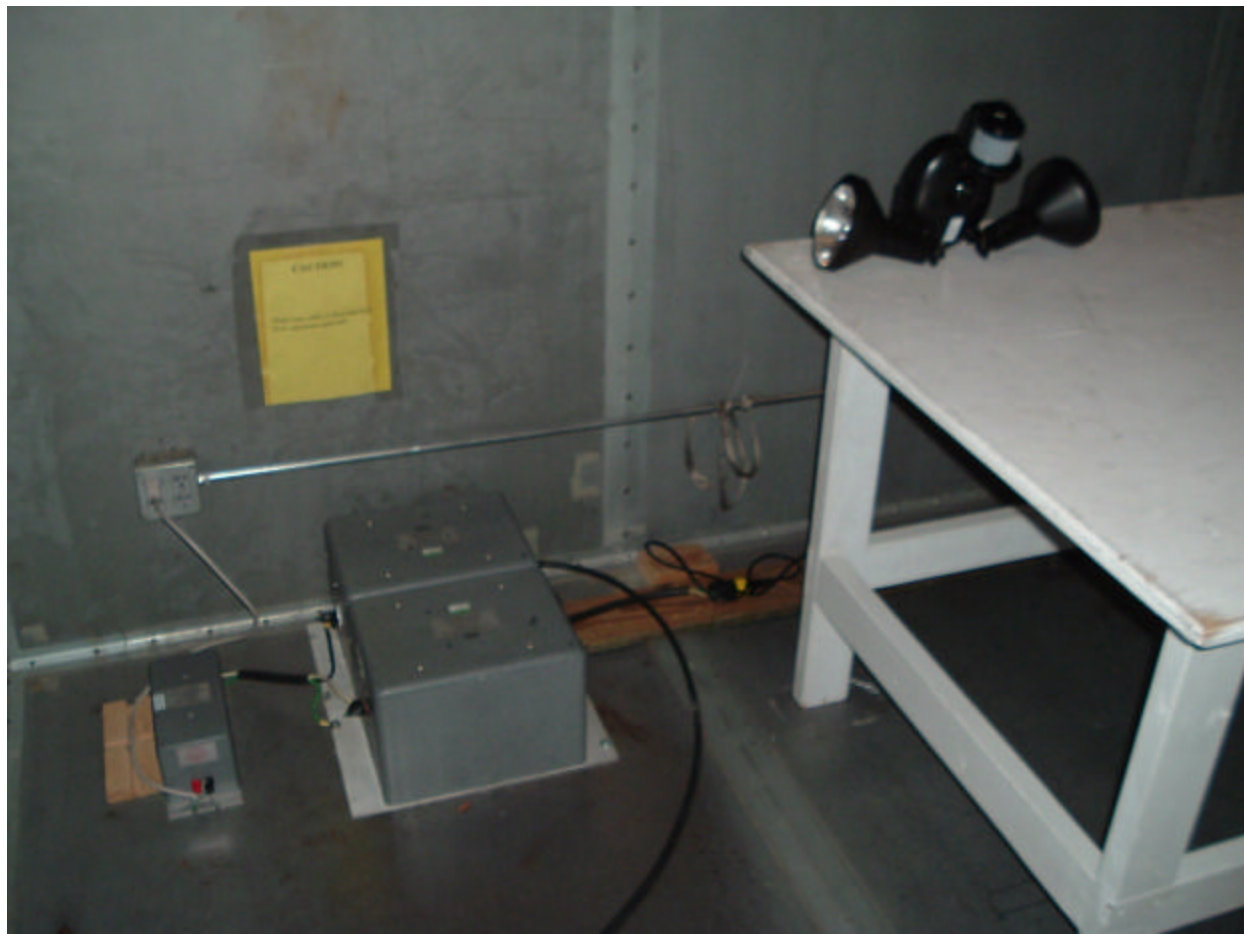
**Figure 2.**  
**Photograph(s) for Spurious and Fundamental Emissions (Front)**



**Figure 3.**  
**Photograph(s) for Spurious and Fundamental Emissions (Back)**



**Figure 4.**  
**Photograph(s) for Conducted Emissions**



**Table 1.**  
**EUT and Peripherals**

PERIPHERAL MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID:	CABLES P/D
Transmitter World Office Products (EUT)	F238250 F250 / F238	None	VSK-F250F238 (Pending)	None

**Table 2.**  
**Test Instruments**

TYPE	MANUFACTURER	MODEL	SN.	Cal Date.
SPECTRUM ANALYZER	HEWLETT-PACKARD	8593E	3205A00124	1/15/08
RF PREAMP	HEWLETT-PACKARD	8447D	1937A03355	6/14/07
RF PREAMP	HEWLETT-PACKARD	8449B	3008A00480	8/21/07
HORN ANTENNA	EMCO	3115	3723	10/16/06 2 Year
BICONICAL ANTENNA	EMCO	3110	9307-1431	11/15/07
LOG PERIODIC ANTENNA	EMCO	3146	9110-3600	8/24/07
LISN	SOLAR ELECTRONICS	8028	910495 & 910494	5/10/07

## 2.6 Antenna Description (Paragraph 15.203)

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

The Model World Office Products F238/250 incorporates a permanently attached antenna only.

Manufacturer: Bondale Industries Ltd.  
E-2 10/F, Hoi Bun Industrial Bldg., 6  
Wing Yip Street  
Kwun Tong, Kowloon, Hong Kong

Type: Monopole

Model Number: G-RA-94051(DG105-001/I)

Gain: 2.1 dBi

Connector: Integral

World Office Products will sell the F238/250 with the following antenna:

Antenna description for Models F238/250 and F238/250 Transceivers

MANUFACTURER	MODEL	GAIN dBi
Bondale Industries Ltd.	G-RA-94051(DG105-001/I)	2.1

\*For antenna specifications, please see the following pages.

## **2.7 Field Strength of Fundamental within the Band 2.4 – 2.4835 GHz per FCC Section 15.249(a)**

Peak power within the band 2.4 – 2.4835 GHz has been measured with a spectrum analyzer. Since the fundamental emission is above 1000 MHz, both a peak and average limit are specified. Peak measurements were made using a peak detector. Average emissions were measured by lowering the VBW to 10 Hz and taking a peak measurement.

The results of the measurements for peak fundamental emissions are given in Table 3 and Figures 8 through 10. The results for average measurements are given in Table 4.

### **Duty Cycle Correction During 100 msec:**

The operating mode of the transmitter is 100% analog modulation as declared by the manufacturer. Therefore, it was not necessary to apply a duty cycle correction factor.



**Table 3.**  
**Field Strength of Fundamental Emission Peak**

Peak Radiated Emissions for Fundamentals									
Test By:  DA	Test: FCC Part 15				Client: World Office Products				
	Project: 07-0269			Class: B		Model: F238250 F250 / F238			
Frequency	Test Data	AF	Test Data	AF+CA-AMP	Results	Limits	Distance /	Margin	Average
(MHz)	(dBm)	Table	(dBuV)	(dB)	(uV/m)	(uV/m)	Polarity	(dB)	
<b>LOW</b>									
2411.90	-56.3	1HN3mV	50.7	31.9	13490.7	500000.0	3m./VERT	<b>31.4</b>	<b>PK</b>
<b>MID</b>									
2451.25	-55.2	1HN3mV	51.8	32.0	15430.9	500000.0	3m./VERT	<b>30.2</b>	<b>PK</b>
<b>HIGH</b>									
2470.25	-57.3	1HN3mV	49.7	32.0	12190.2	500000.0	3m./VERT	<b>32.3</b>	<b>PK</b>

**SAMPLE CALCULATIONS:**

**RESULTS uV/m @ 3m = Antilog ((50.7 + 31.9 + 107)/20) = 13490.7**  
**CONVERSION FROM dBm TO dBuV = 107 dB**

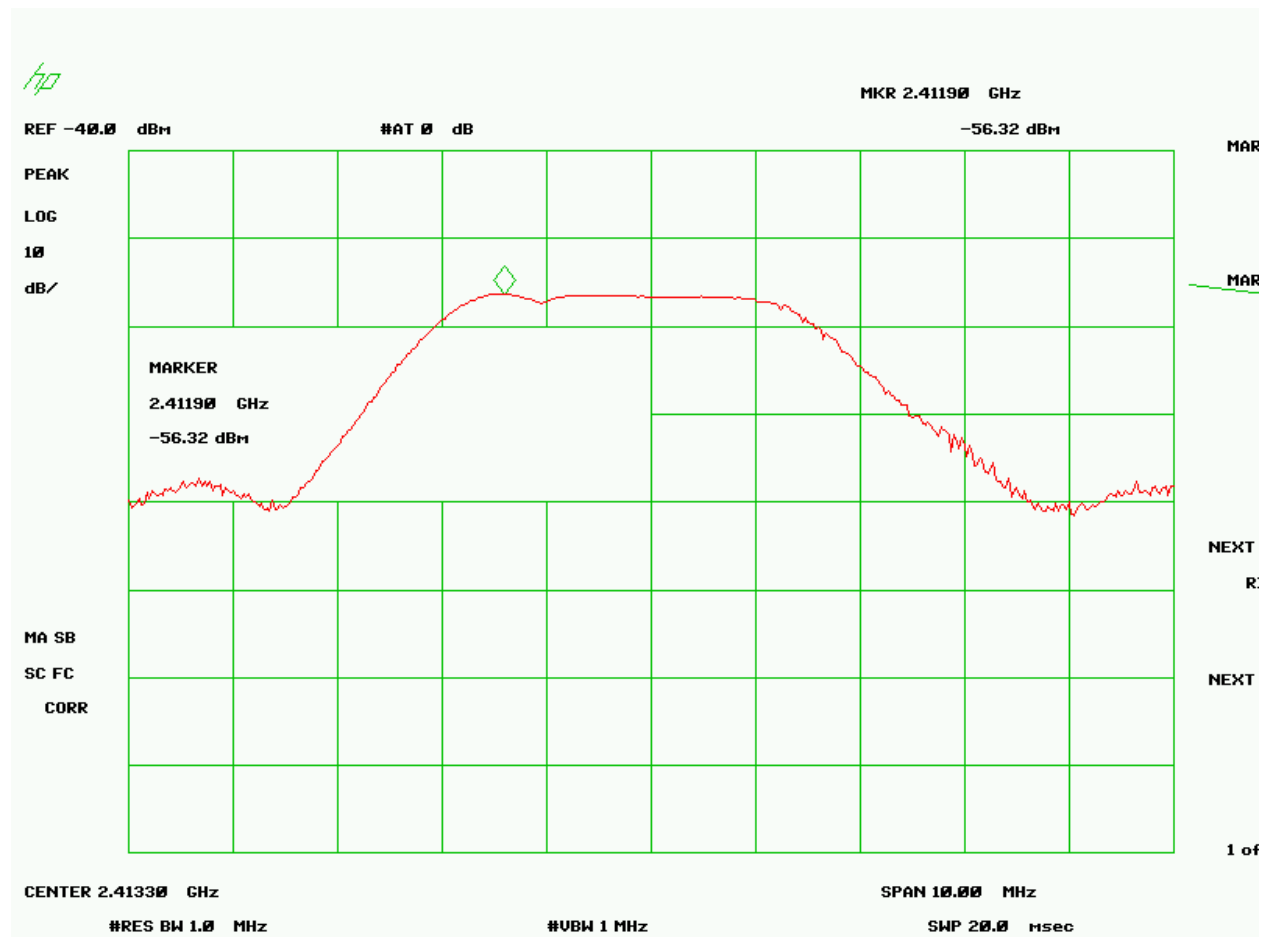
Test Results  
Reviewed By: \_\_\_\_\_

*Daniel Aparaschivei*

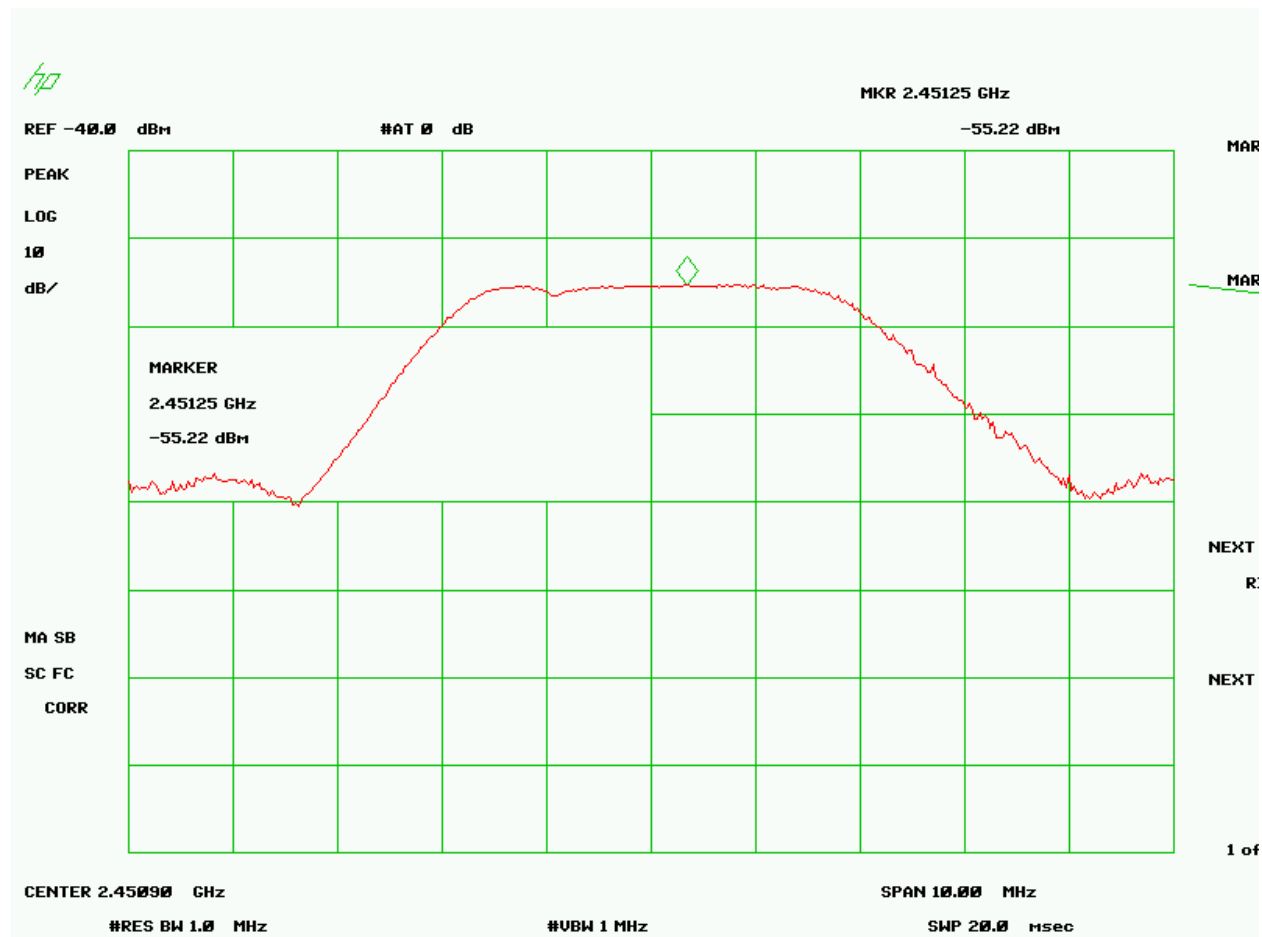
Name: Daniel Aparaschivei



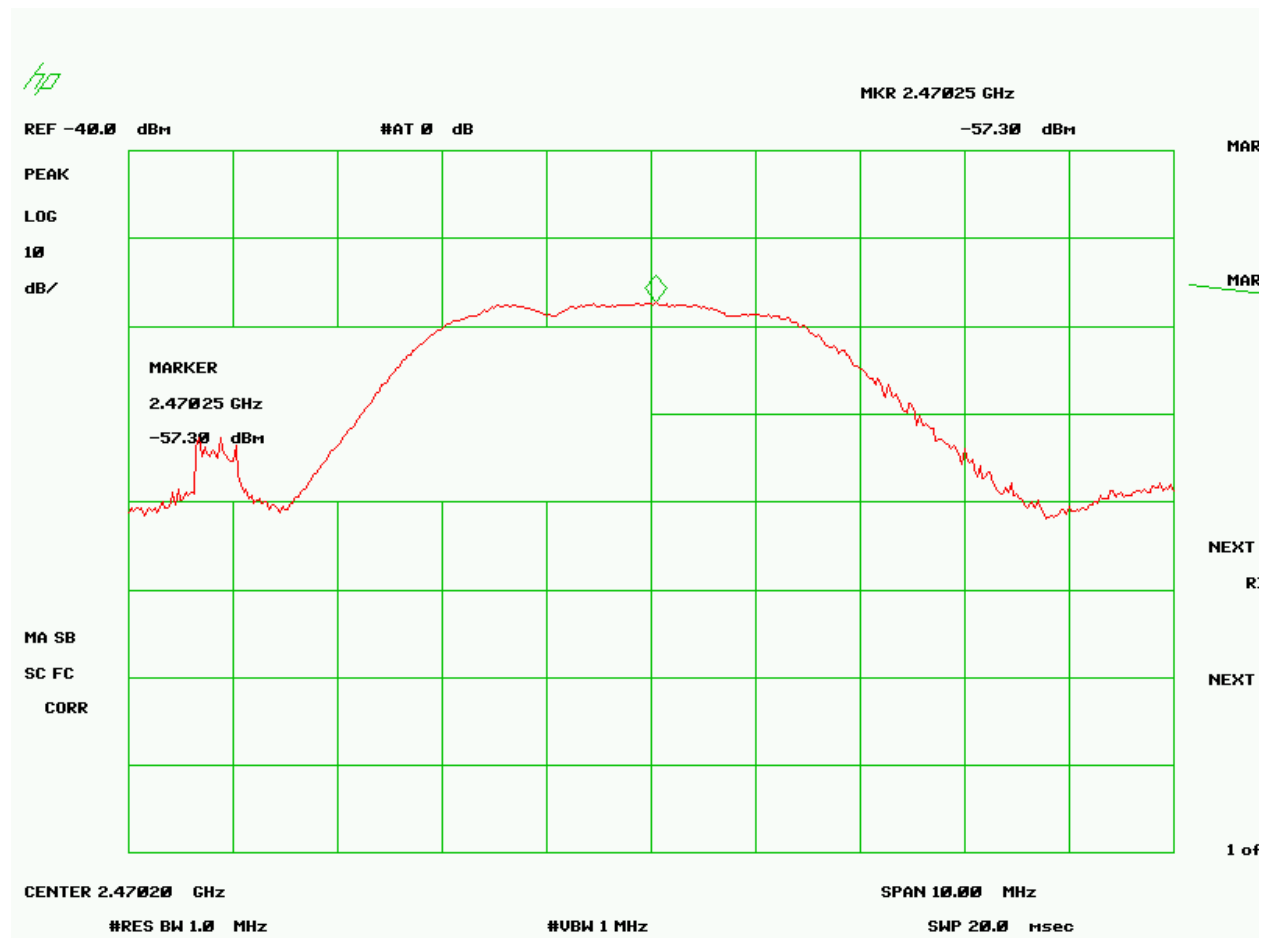
**Figure 5.**  
**Field Strength of Fundamental Emissions 15.249(a) (Low)**



**Figure 6.**  
**Field Strength of Fundamental Emissions 15.249(a) (Mid)**



**Figure 7.**  
**Field Strength of Fundamental Emissions 15.249(a) (High)**



**Table 4.**  
**Field Strength of Fundamental Emission Average**

Average Radiated Emissions for Fundamentals									
Test By:  DA	Test: FCC Part 15				Client: World Office Products				
	Project: 07-0269			Class:		Model: F238250 F250 / F238			
Frequency (MHz)	Test Data (dBm)	AF Table	Test Data (dBuV)	AF+CA- AMP (dB)	Results (uV/m)	Limits (uV/m)	Distance / Polarity	Margin (dB)	Average
<b>LOW</b>									
2411.90	-56.3	1HN3mV	50.7	31.9	13490.7	50000.0	3m./VERT	11.4	PK
<b>MID</b>									
2451.25	-55.2	1HN3mV	51.8	32.0	15430.9	50000.0	3m./VERT	10.2	PK
<b>HIGH</b>									
2470.25	-57.3	1HN3mV	49.7	32.0	12190.2	50000.0	3m./VERT	12.3	PK

**SAMPLE CALCULATIONS:**

**RESULTS = Antilog  $((50.7 + 31.9 + 107)/20)$  = 13490.7 uV/m @ 3m**

**CONVERSION FROM dBm TO dBuV = 107 dB**

Test Results

Reviewed By: \_\_\_\_\_

*Daniel Aparaschivei*

Name: Daniel Aparaschivei

## **2.8 Peak Radiated Spurious Emission in the Frequency Range 30 MHz - 25000 MHz (FCC Section 15.249(c))**

A preliminary scan was performed on the EUT to determine frequencies that were caused by the transmitter portion of the product. Significant emissions that fell within restricted bands were then measured on an OATS site. Radiated measurements below 1 GHz were tested with the RBW set to 120 kHz. Radiated measurements above 1 GHz were measured with the RBW and VBW both set to at least 1 MHz. The results of peak radiated spurious emissions falling within restricted bands are given in Table 5 and in Figure 11. All unreported radiated spurious or harmonic emissions were lower than 20 dB below the allowable limit.

**Table 5. Peak Radiated Spurious Emissions**

Peak Radiated Emissions for Harmonics and other Spurious									
Test By: DA	Test: FCC Part 15.249				Client: World Office Products				
	Project: 07-0269			Class:		Model: F238350 F250 F238			
Frequency	Test Data	AF	Test Data	AF+CA-AMP	Results	Limits	Distance /	Margin	Average
(MHz)	(dBm)	Table	(dBuV)	(dB)	(uV/m)	(uV/m)	Polarity	(dB)	
LOW									
2411.90	-56.3	1HN3mV	50.7	31.9	13490.7	500000.0	3m./VERT	31.4	PK
*4825.85	-56.6	1HN3mV	50.4	5.3	609.2	5000.0	3m./VERT	18.3	PK
*7238.15	-71.2	1HN3mH	35.8	9.9	193.5	5000.0	3m./HORZ	28.2	PK
9650.4	-71.1	1HN3mV	35.9	13.1	283.0	5000.0	3m./VERT	24.9	PK
MID									
2451.25	-55.2	1HN3mV	51.8	32.0	15430.9	500000.0	3m./VERT	30.2	PK
*4901.75	-54.9	1HN3mV	52.1	5.6	760.4	5000.0	3m./VERT	16.4	PK
*7351.65	-67.4	1HN3mV	39.6	9.9	301.3	5000.0	3m./VERT	24.4	PK
9802.65	-59.3	1HN3mV	47.7	13.3	1128.8	5000.0	3m./VERT	12.9	PK
HIGH									
2470.25	-57.3	1HN3mV	49.7	32.0	12190.2	500000.0	3m./VERT	32.3	PK
*4939.9	-53.0	1HN3mV	54.0	5.7	963.8	5000.0	3m./VERT	14.3	PK
*7409.75	-68.5	1HN3mH	38.5	10.4	277.2	5000.0	3m./HORZ	25.1	PK
9880.05	-63.3	1HN3mV	43.7	13.5	717.2	5000.0	3m./VERT	16.9	PK

\* Falls within restricted band.

**SAMPLE CALCULATIONS:**

RESULTS = Antilog ((50.4 + 5.3 + 107)/20) = 609.2 uV/m @ 3m

CONVERSION FROM dBm TO dBuV = 107 dB

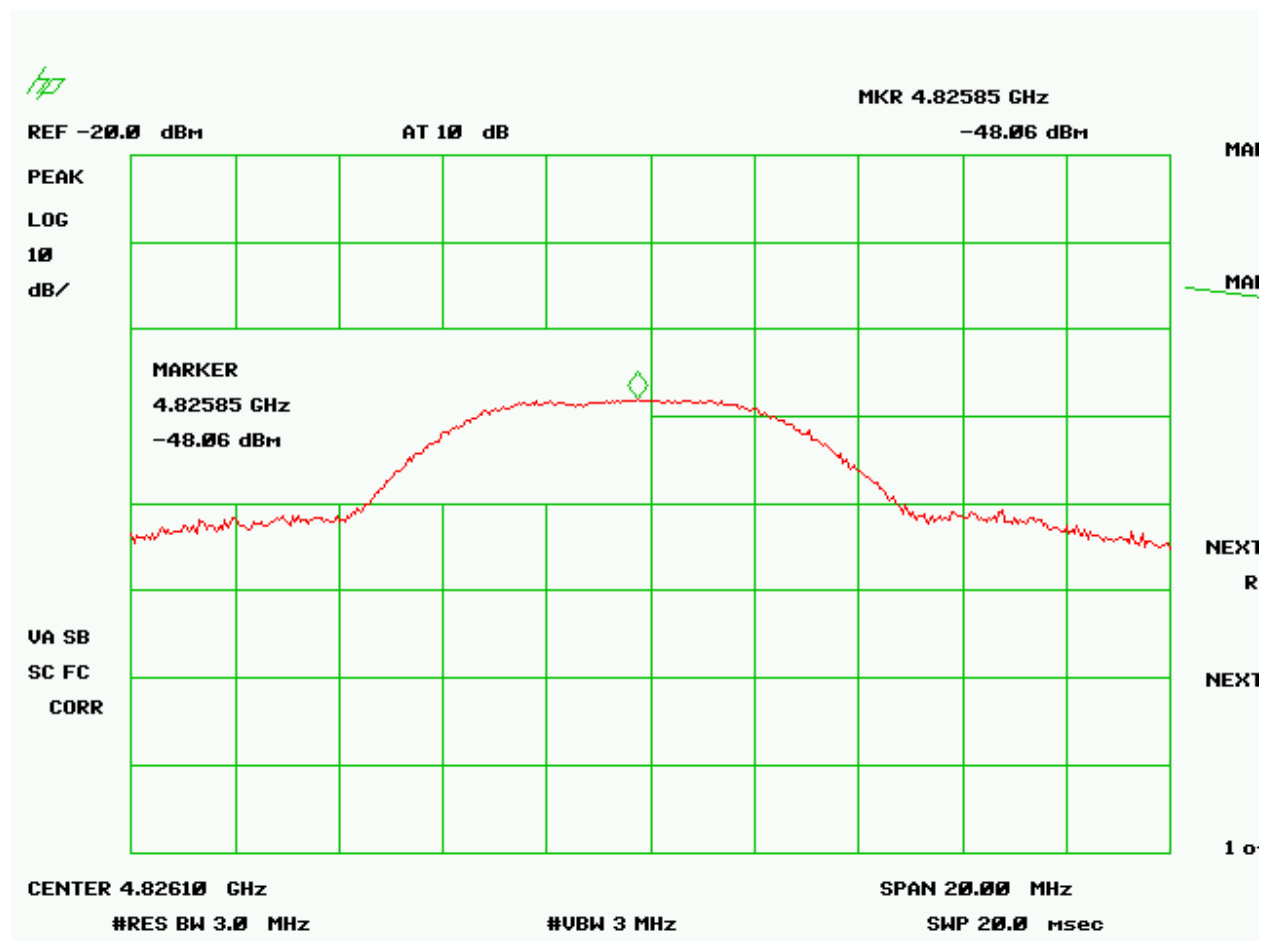
Test Results  
Reviewed By:

*Daniel Aparaschivei*

Name: Daniel Aparaschivei

Figure 8.

Peak Radiated Spurious Emission 15.247(c) Representative Plot



## **2.9 Average Spurious Emissions in the Frequency Range 30 MHz - 25000 MHz (FCC Section 15.249(c))**

Because the EUT has a duty cycle of 100 percent, video averaging techniques were used, the video bandwidth was reduced to 10 Hz for the reading. The results of the average radiated spurious emissions are given in Table 6 and Figure 12.



**Table 6. Average Radiated Spurious Emissions**

Average Radiated Emissions for Harmonics and other Spurious									
Test By: DA	Test: FCC Part 15.249				Client: World Office Products				
	Project: 07-0269			Class:		Model: F238250 F250 / F238			
Frequency	Test Data	AF	Test Data	AF+CA-AMP	Results	Limits	Distance /	Margin	Average
(MHz)	(dBm)	Table	(dBuV)	(dB)	(uV/m)	(uV/m)	Polarity	(dB)	
<b>LOW</b>									
2411.90	-56.3	1HN3mV	50.7	31.9	13490.7	50000.0	3m./VERT	11.4	AVG
4826.2	-60.8	1HN1mV	46.2	6.1	411.0	500.0	1m./VERT	1.7	AVG
7238.15	-71.2	1HN1mH	35.8	10.7	211.6	500.0	1m./HORZ	7.5	AVG
9650.4	-71.1	1HN1mV	35.9	13.6	299.1	500.0	1m./VERT	4.5	AVG
<b>MID</b>									
2451.25	-55.2	1HN3mV	51.8	32.0	15430.9	50000.0	3m./VERT	10.2	AVG
4901.75	-62.3	1HN1mV	44.8	6.4	360.9	500.0	1m./VERT	2.8	AVG
7351.65	-67.4	1HN1mV	39.6	10.9	335.9	500.0	1m./VERT	3.5	AVG
9802.65	-71.5	1HN1mV	35.5	13.8	292.0	500.0	1m./VERT	4.7	AVG
<b>HIGH</b>									
2470.25	-57.3	1HN3mV	49.7	32.0	12190.2	50000.0	3m./VERT	12.3	AVG
4940	-60.1	1HN3mH	46.9	5.9	433.4	500.0	3m./HORZ	1.2	AVG
7409.75	-68.5	1HN1mH	38.5	11.1	302.1	500.0	1m./HORZ	4.4	AVG
9879.85	-73.9	1HN1mV	33.1	13.9	224.1	500.0	1m./VERT	7.0	AVG

**SAMPLE CALCULATIONS:**

**RESULTS uV/m @ 3m = Antilog ((46.2 + 6.1 + 107)/20) = 411.0**

**CONVERSION FROM dBm TO dBuV = 107 dB**

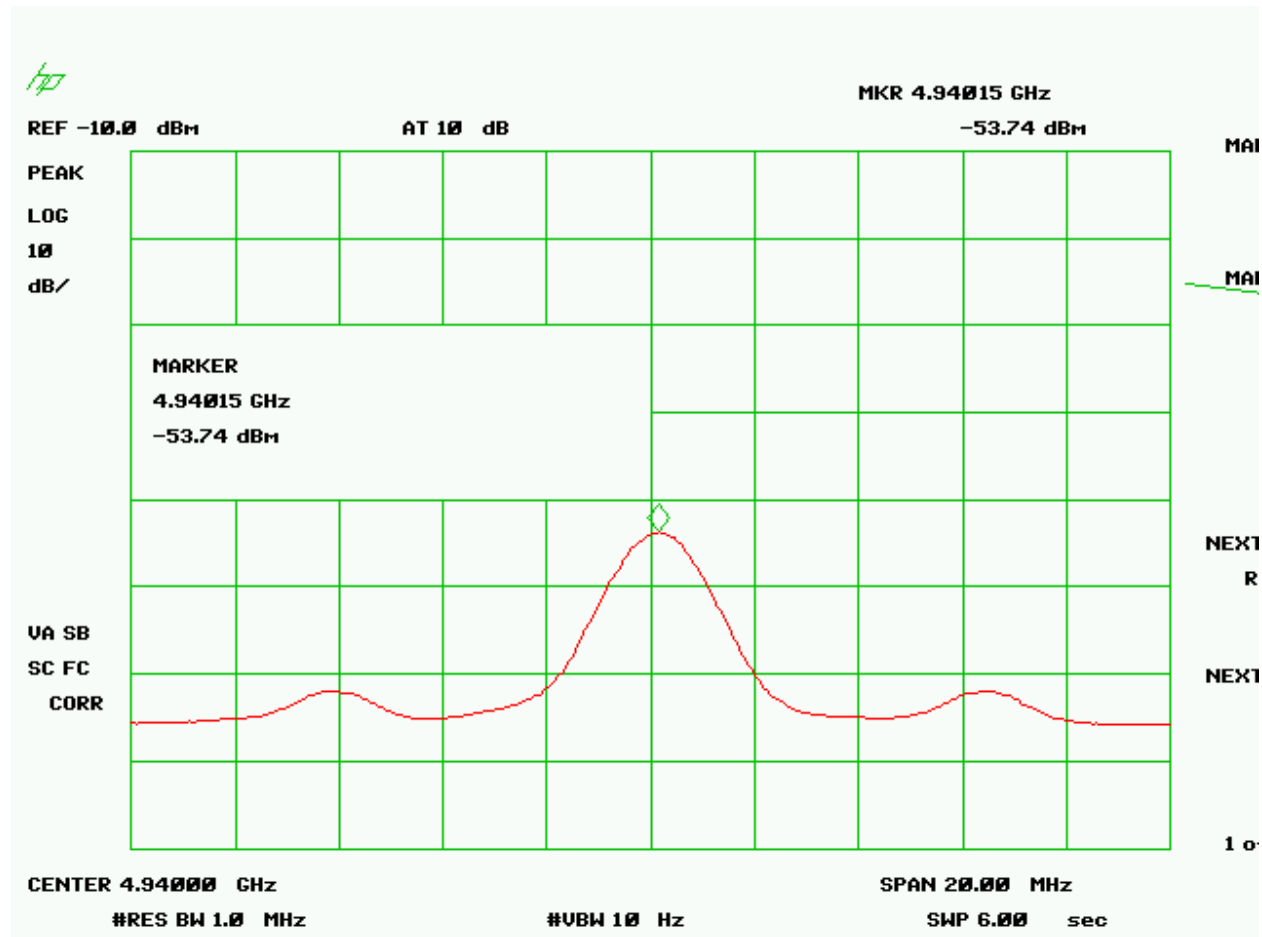
Test Results

Reviewed By: \_\_\_\_\_

*Daniel Aparaschivei*

Name: Daniel Aparaschivei

**Figure 9.**  
**Average Radiated Spurious Emission 15.247(c) Representative Plot**



## **2.10 Out of Band Measurements (CFR 15.249(d))**

Out of band measurements were made between the Low Channel and High Channel peaks and the respective lower and upper band edges. A peak measurement was made of the fundamental. A RBW of  $> 1\%$  of the emission bandwidth was used.

The plots shown in Figures 10 and 11 were verified using a Horn Antenna. No preamplifier was used.

Because the Delta measured is 47.68 dB, the unit doesn't comply with the 50 dB criteria, however, the 15.149 limits were derived as follows:

### **2.10.1 High Band-Edge**

The Section 15.249 limit is 500 uV/m immediately above 2483.5 MHz = -53.02 dBm/m

Fundamental peak measured at High Channel from Table 3: -25.3 dBm/m

Delta from measurement of peak fundamental to upper band edge: -47.68 dB

Result = -25.3 dBm/m - 47.68 = -72.98 dBm/m, which is less than the -53.02 dBm/m limit

### **2.10.2 Low Band-Edge**

The Section 15.249 limit is 500 uV/m immediately below 2400.0 MHz = - 53.02 dBm/m

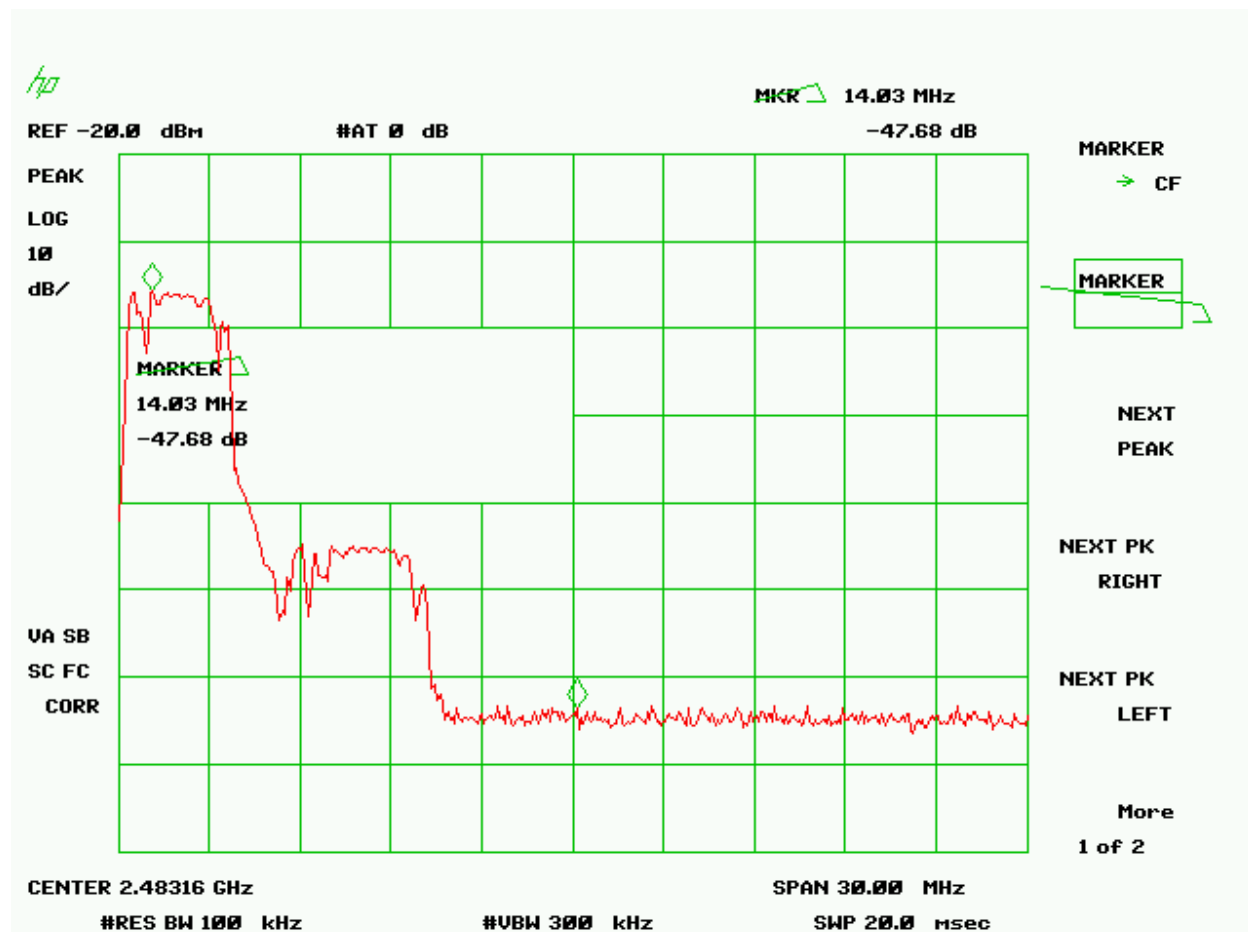
Fundamental measured at Low Channel from Table 3: -24.4 dBm/m

Delta from measurement of peak fundamental to lower band edge: -47.22 dB

Result = -24.4 - 47.22 = -71.62 dBm/m, which is less than the -53.02 dBm/m limit.

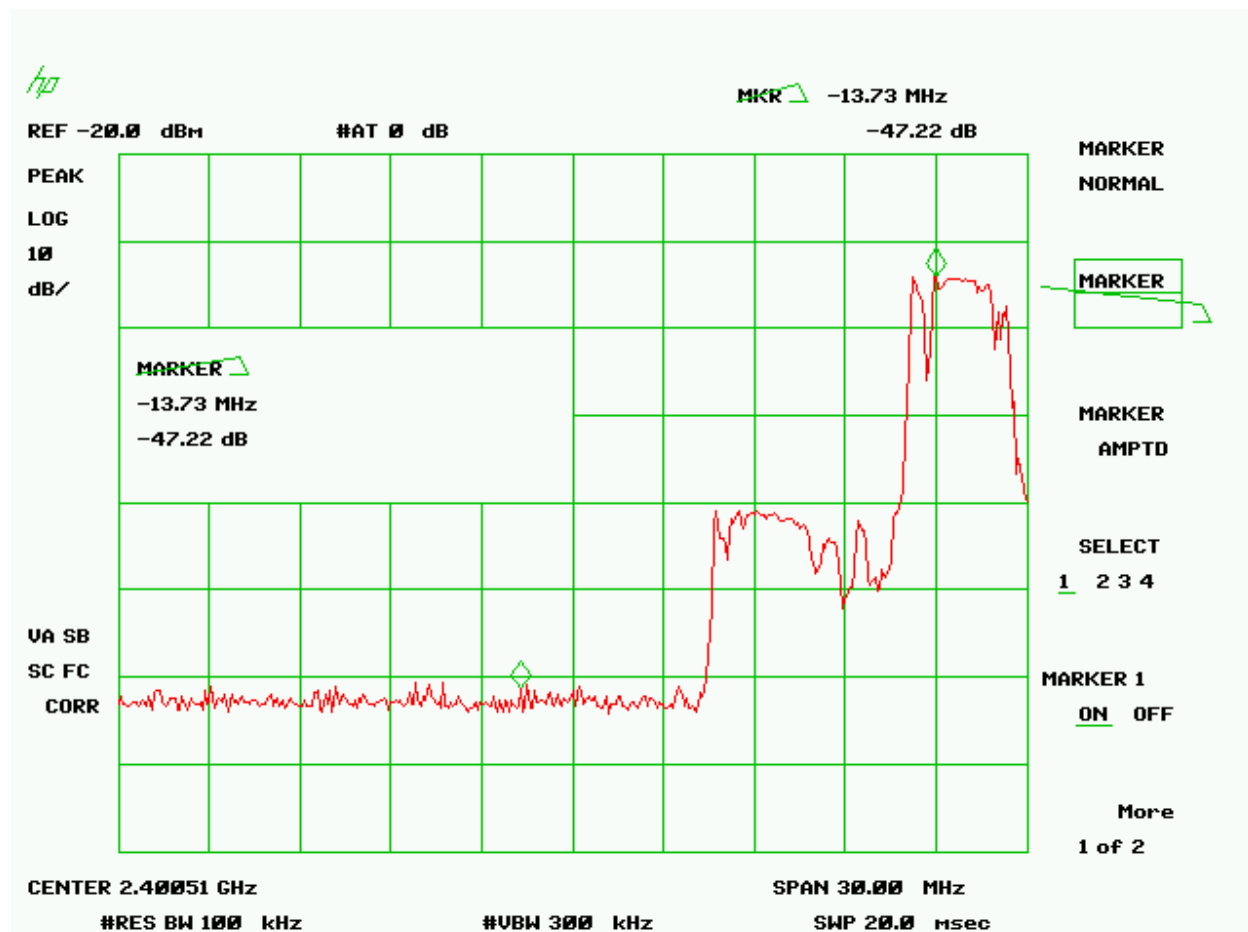
## 2.10 Out of Band Measurements

Figure 10. Out of Band Measurements Compliance  
Radiated Emissions, High Channel



## 2.10 Out of Band Measurements

Figure 11. Out of Band Measurements Compliance  
Radiated Emissions, Low Channel



## **2.11 Power Line Conducted Emissions for Transmitter FCC Section 15.207**

The conducted voltage measurements have been carried out in accordance with ANSI C63.4 paragraph 7. A spectrum analyzer was connected to an LISN and the EUT placed into a continuous mode of transmit. The results are given in Table 7.

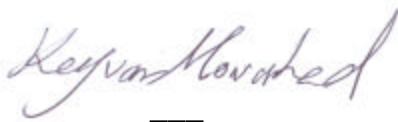
**Table 7. Conducted Emissions Data,  
CFR15.207.**

Conducted Emissions									
<b>Test By:</b>  <b>KM</b>	<b>Test:</b> FCC Part 15.207				<b>Client:</b> World Office Products, Incorporated				
	<b>Project:</b> 07-0269				<b>Model:</b> F238250 F250 / F238				
Frequency	Test Data	AF	Test Data	AF+CA-AMP	Results	Limits	Distance /	Margin	PK = n
(MHz)	(dBm)	Table	(dBuV)	(dB)	(dBuV)	(dBuV)	Polarity	(dB)	/ QP
0.24	-64.5	LISNP	42.5	-0.1	42.4	52.6	Phase	10.2	QP
0.3284	-66.3	LISNP	40.7	-0.1	40.6	49.6	Phase	9.0	QP
0.6863	-67.1	LISNP	39.9	0.0	39.9	46.0	Phase	6.1	QP
1.04	-66.7	LISNP	40.3	0.2	40.5	46.0	Phase	5.5	QP
9.687	-73.4	LISNP	33.6	0.4	34.0	50.0	Phase	16.0	PK
16.5	-67.2	LISNP	39.9	0.6	40.4	50.0	Phase	9.6	PK
25.8	-69.9	LISNP	37.1	0.6	37.7	50.0	Phase	12.3	PK
0.1771	-63.2	LISNN	43.8	-0.1	43.7	55.6	Neutral	11.9	QP
0.3635	-61.1	LISNN	45.9	-0.1	45.8	49.0	Neutral	3.2	QP
0.5363	-65.0	LISNN	42.0	0.0	42.0	46.0	Neutral	4.0	QP
1.24	-68.1	LISNN	38.9	0.2	39.1	46.0	Neutral	6.9	QP
9.575	-67.1	LISNN	40.0	0.4	40.4	50.0	Neutral	9.6	PK
14.65	-69.0	LISNN	38.0	0.5	38.6	50.0	Neutral	11.4	PK
20.4	-71.2	LISNN	35.8	0.6	36.5	50.0	Neutral	13.5	PK

**SAMPLE CALCULATIONS: @ 240 kHz, - 64.5dbm + (-0.1) dB = - 64.6 dBm = 42.4 dBuV**

**Test Results**

**Reviewed By:**



**Name: Keyvan Movahed**

## **2.12 Radiated Emissions (47 CFR 15.109a)**

Radiated emissions were evaluated from 30 MHz to 12 GHz per the test method of ANSI C63.4, paragraph 8. Measurements were made with the analyzer's RBW set to 120 kHz for measurements made up to 1 GHz and to 1 MHz for measurements made above 1 GHz. Results are shown in Table 8.



## Table 8. Radiated Emissions Data

### Class B

30 MHz – 12 GHz

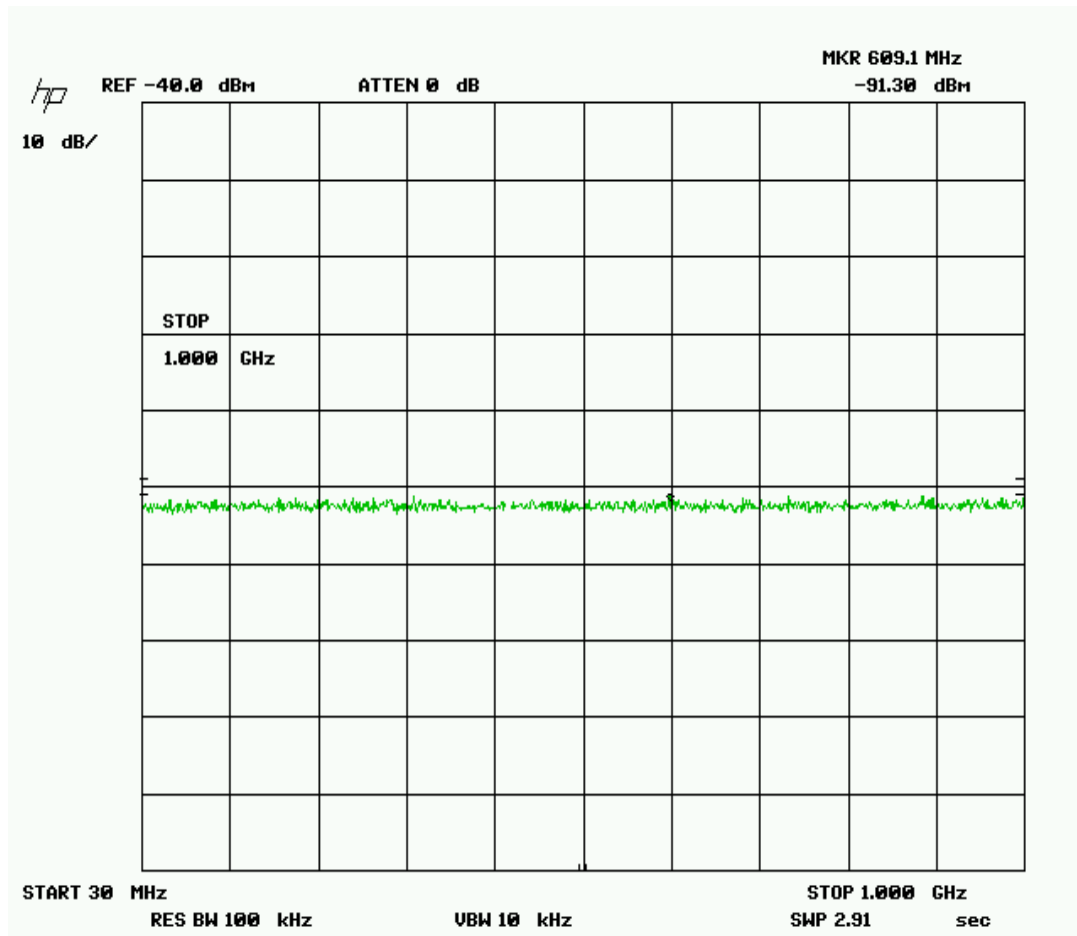
Radiated Emissions for Digital Device									
Test By: DA	Test: FCC Part 15				Client: World Office Products, Incorporated				
	Project: 07-0269			Class: B		Model: F238250 F250 / F238			
Frequency (MHz)	Test Data (dBm)	Test Data (dBuV)	Transducer Table	AF+CL-PA (dB)	Results (uV/m)	Limits (uV/m)	Distance / Polarity	Margin (dB)	Detector
No Emissions measured within 20 dB of the FCC Part 15 Class B Limit.									

Test Results  
Reviewed By: \_\_\_\_\_

*Daniel Aparaschivei*

Name: Daniel Aparaschivei

**Figure 12. Pre-scan Spectrum Representative Plot for Digital Emissions of Transmitter 30 MHz to 1 GHz, Vertical Polarity**



## **5 Photographs**

### **Photos of The Tested EUT**

- 5.1 EUT, Front View
- 5.2 EUT, Bottom View
- 5.3 EUT, Bottom View Cover Removed Transmitter and Digital boards Solder Side
- 5.4 EUT, Transmitter and Digital boards Component Side
- 5.5 EUT, Sensor Cover Removed
- 5.6 EUT, Sensor boards Component Side
- 5.7 EUT, Sensor boards Solder Side