



Engineering and Testing for EMC and Safety Compliance



Accredited under A2LA certificate # 2653.01

### Certification Application Report FCC Part 15.249 & Industry Canada RSS-210

<b>Test Lab:</b> Rhein Tech Laboratories, Inc.    Tel: 703-689-0368 360 Herndon Parkway                Fax: 703-689-2056 Suite 1400 Herndon, VA 20170 E-Mail: atcbinfo@rheintech.com http://www.rheintech.com		<b>Applicant:</b> Fleetwood Group, Inc.    Tel: 616-820-8271 11832 James Street        Fax: 616-820-8300 Holland, MI 49424 Contact: Harry Derks Email: <a href="mailto:harryd@fleetwoodgroup.com">harryd@fleetwoodgroup.com</a>	
<b>FCC ID/IC:</b>	FBRN240D/ 1859A-N240D	<b>Test Report Date:</b>	November 11, 2007
<b>Platform:</b>	N/A	<b>RTL Work Order #:</b>	2007270
<b>Model:</b>	N240D	<b>RTL Quote #:</b>	QRTL07-304
<b>American National Standard Institute:</b>	ANSI C63.4-2003: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz		
<b>FCC Classification:</b>	DXT – Part 15 Low Power Transceiver		
<b>FCC Rule Part(s)/Guidance:</b>	15.249: Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz, October 1, 2006		
<b>Industry Canada:</b>	RSS-210 Issue 7: Low Power License-Exempt Communications Devices		
<b>Digital Interface Information:</b>	Digital Interface was found to be compliant		
<b>Frequency Range (MHz)</b>	<b>Output Power (W)</b>	<b>Frequency Tolerance</b>	<b>Emission Designator</b>
2401 – 2475	N/A	N/A	812KFXD

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards. Furthermore, there was no deviation from, additions to, or exclusions from, the applicable parts of FCC Part 2, FCC Part 15 and ANSI C63.4.

Signature:

Date: November 11, 2007

Typed/Printed Name: Desmond A. Fraser

Position: President

*This report may not be reproduced, except in full, without the written approval of Rhein Tech Laboratories, Inc. and Fleetwood Group, Inc. The test results relate only to the item(s) tested.*

## Table of Contents

---

1	General Information .....	4
1.1	Scope .....	4
1.2	Description of EUT.....	4
1.3	Test Facility .....	4
1.4	Related Submittal(s)/Grant(s).....	4
1.5	Modifications.....	4
2	Test Information .....	5
2.1	Description of Test Modes .....	5
2.2	Exercising the EUT .....	5
2.3	Test Result Summary .....	5
2.4	Test System Details.....	6
2.5	Configuration of Tested System .....	6
3	Duty Cycle Calculation - FCC §15.35(c), RSS-Gen 4.3 .....	6
4	20 dB Bandwidth – IC RSS-Gen .....	7
4.1	20 dB Bandwidth Test Procedure .....	7
4.2	20 dB Modulated Bandwidth Test Data .....	7
4.3	20 dB Bandwidth Plots.....	8
5	Radiated Emissions - §15.209, 15.249(a); RSS-210 §6.2.1.....	11
5.1	Limits of Radiated Emissions Measurement.....	11
5.2	Radiated Emissions Measurement Test Procedure.....	11
5.3	Radiated Emissions Test Results .....	13
5.3.1	Radiated Emissions Digital Test Data.....	13
5.3.2	Radiated Emissions Harmonics/Spurious Test Data .....	13
6	Conclusion .....	15

---

## Figure Index

---

Figure 2-1:	Configuration of System Under Test.....	6
-------------	---	---

---

## Table Index

---

Table 2.1:	Channels Tested.....	5
Table 2.2:	Test Result Summary – FCC Part 15, Subpart C (Section 15.249) .....	5
Table 2.3:	Equipment Under Test.....	6
Table 4.1:	20 dB Bandwidth Test Equipment.....	7
Table 4.2:	20 dB Modulated Bandwidth Test Data.....	7
Table 5.1:	Radiated Emissions Test Equipment .....	12
Table 5.2:	Radiated Emissions .....	13
Table 5.3:	Digital/Receiver Radiated Emissions Test Data.....	13
Table 5.4:	Radiated Emissions Harmonics/Spurious - 2401 MHz.....	13
Table 5.5:	Radiated Emissions Harmonics/Spurious - 2437 MHz.....	14
Table 5.6:	Radiated Emissions Harmonics/Spurious - 2475 MHz.....	14

---

## Plot Index

---

Plot 4-1:	20 dB Bandwidth Channel 1 .....	8
Plot 4-2:	20 dB Bandwidth Channel 37.....	9
Plot 4-3:	20 dB Bandwidth Channel 75.....	10

---

## Appendix Index

---

Appendix A:	FCC Part 1.1307, 1.1310, 2.1091, 2.1093; IC RSS-Gen: RF Exposure .....	16
Appendix B:	Agency Authorization Letter.....	17
Appendix C:	FCC Confidentiality Request Letter .....	18
Appendix D:	FCC Modular Approval Request.....	19
Appendix E:	IC Letters .....	20
Appendix F:	IC Confidentiality Request Letter.....	21
Appendix G:	IC Modular Approval Request.....	22
Appendix H:	Label and Label Location .....	23
Appendix I:	Technical Operational Description .....	24
Appendix J:	Schematics .....	25
Appendix K:	Block Diagram .....	26
Appendix L:	Manual.....	27
Appendix M:	Test Photographs .....	28
Appendix N:	External Photographs .....	30

---

## Photograph Index

---

Photograph 1:	Radiated Testing – Front View .....	28
Photograph 2:	Radiated Testing – Back View .....	29
Photograph 3:	N240D Front.....	30
Photograph 4:	N240D Back .....	31

## 1 General Information

### 1.1 Scope

This is an original certification application request.

Applicable Standards:

- FCC Part 15.249: Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz
- Industry Canada RSS-210: Low Power License-Exempt Communications Devices

### 1.2 Description of EUT

<b>Equipment Under Test</b>	Keypad
<b>Model</b>	N240D
<b>Power Supply</b>	Battery 1 – CR2032 battery (3 VDC)
<b>Modulation Type</b>	GFSK
<b>Frequency Range</b>	2401 – 2475 MHz
<b>Antenna Connector Type</b>	PCB Inverted F type
<b>Antenna Type</b>	Internal

### 1.3 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4-2003).

### 1.4 Related Submittal(s)/Grant(s)

This is an original application for **modular approval** for Fleetwood Group, Inc., Model: N240D, FCC ID: FBRN240D, IC: 1859A-N240D.

### 1.5 Modifications

No modifications were made to the equipment during testing in order to achieve compliance with these standards.

## 2 Test Information

### 2.1 Description of Test Modes

In accordance with FCC 15.31(m), and because the EUT utilizes an operating band greater than 10 MHz, the following frequencies were tested:

**Table 2.1: Channels Tested**

Channel	Frequency
Low	2401
Middle	2437
High	2475

### 2.2 Exercising the EUT

The EUT was supplied with test firmware programmed with a high, mid, and low channel for testing, as well as in a configuration for hopping mode. The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. The EUT was provided with software to continuously transmit during testing. The carrier was also checked to verify that information was being transmitted. Four power levels were available for testing and the high and low powers are presented in this report.

### 2.3 Test Result Summary

**Table 2.2: Test Result Summary – FCC Part 15, Subpart C (Section 15.249)**

Standard	Test	Pass/Fail or N/A
FCC 15.207	AC Power Conducted Emissions	N/A
FCC 15.209	Radiated Emissions	Pass
FCC 15.249(a)	Field Strength of Fundamental and Harmonics	Pass
RSS-Gen	20 dB Bandwidth	N/A

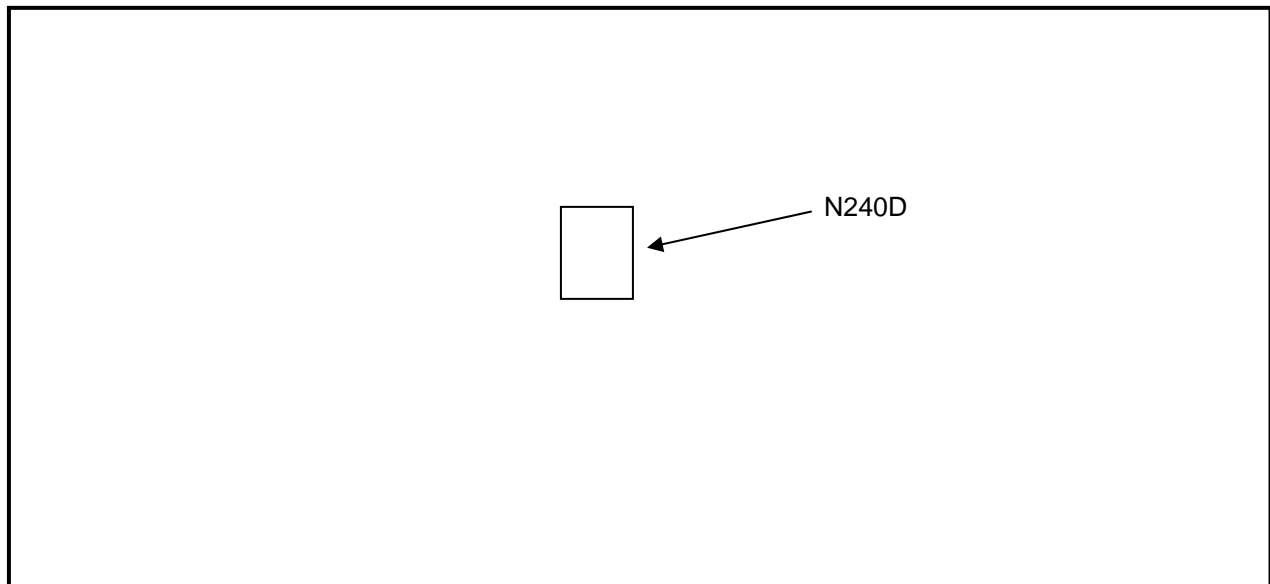
## 2.4 Test System Details

The test samples were received on October 12, 2007. The FCC identifiers for all applicable equipment, plus descriptions of all cables used in the tested system, are identified in the following table.

**Table 2.3: Equipment Under Test**

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
Keypad	Fleetwood Group Inc.	N240D	F1	FBRN240D	N/A	18155
Keypad	Fleetwood Group Inc.	N240D	F2	FBRN240D	N/A	18154

## 2.5 Configuration of Tested System



**Figure 2-1: Configuration of System Under Test**

## 3 Duty Cycle Calculation - FCC §15.35(c), RSS-Gen 4.3

A standard transmission consists of a 1.028 ms data packet, with a 432.5 ms transmission period. Therefore, the aggregate on time within a transmission period of 100 ms is 1.028 ms, or  $20\text{Log}(1.028/100) = 39.8$  dB or 20 dB, which is the maximum allowed.

The duty cycle correction is 20 dB.

#### 4 20 dB Bandwidth – IC RSS-Gen

##### 4.1 20 dB Bandwidth Test Procedure

The minimum 20 dB bandwidths per RSS-210 were measured using a 50 ohm spectrum analyzer. The modulated carrier was adjusted on the analyzer so that it was displayed entirely on the spectrum analyzer. The sweep time was auto and allowed through several sweeps with the max hold function used in peak detector mode. The resolution bandwidth was set to 30 kHz, and the video bandwidth set to 300 kHz. The spectrum analyzer auto-measurement was set to -20 dB for x dB. The table below contains the bandwidth measurement results.

**Table 4.1: 20 dB Bandwidth Test Equipment**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	6/13/08

##### 4.2 20 dB Modulated Bandwidth Test Data

**Table 4.2: 20 dB Modulated Bandwidth Test Data**

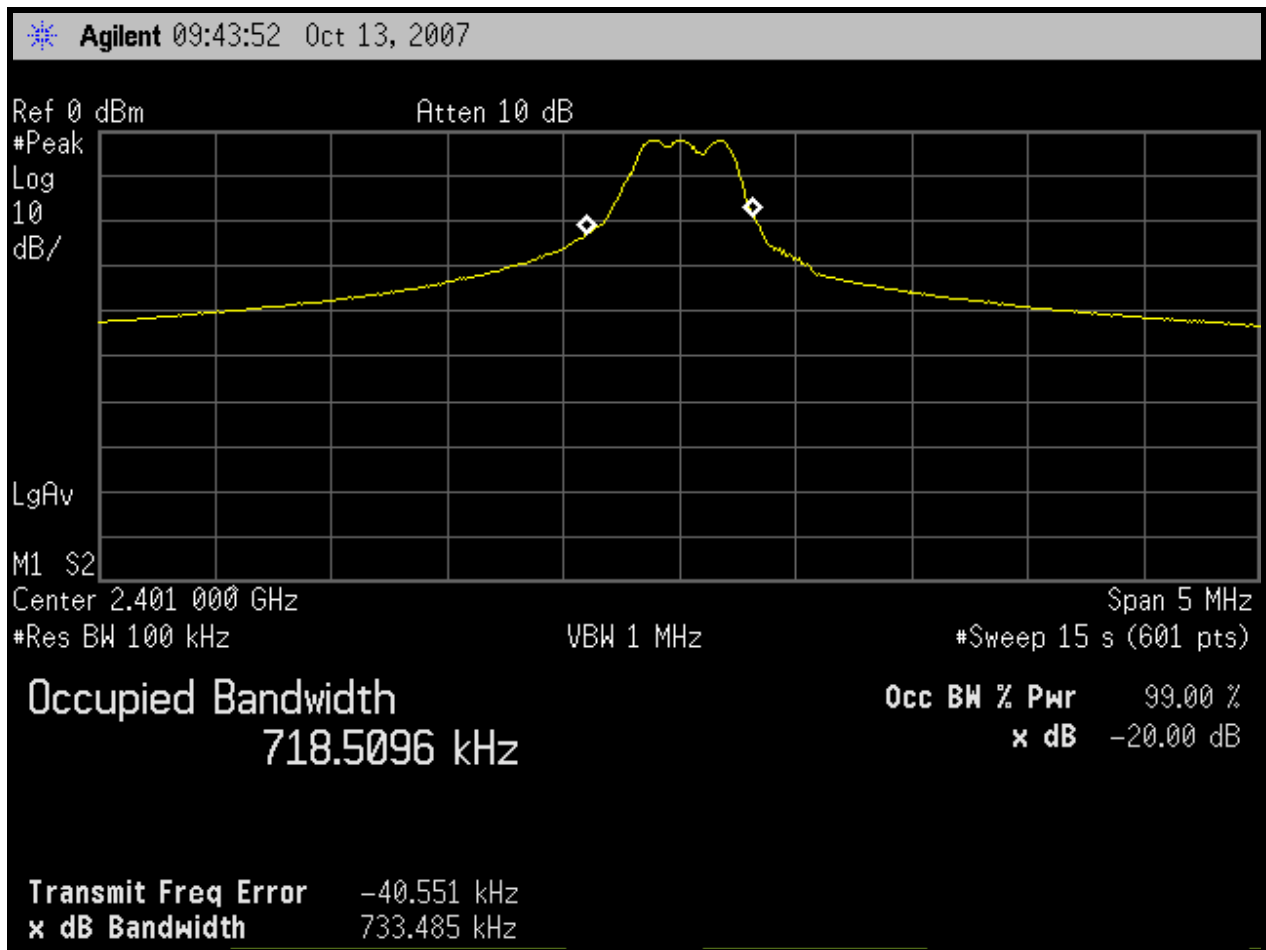
**Minimum 20 dB bandwidths**

Channel	20 dB Bandwidth (kHz)
1	733.5
37	742.4
75	812.0

### 4.3 20 dB Bandwidth Plots

Channel: 1  
Channel Frequency (MHz): 2401  
Resolution Bandwidth (kHz): 100  
Video Bandwidth (MHz): 1  
Span (MHz): 5

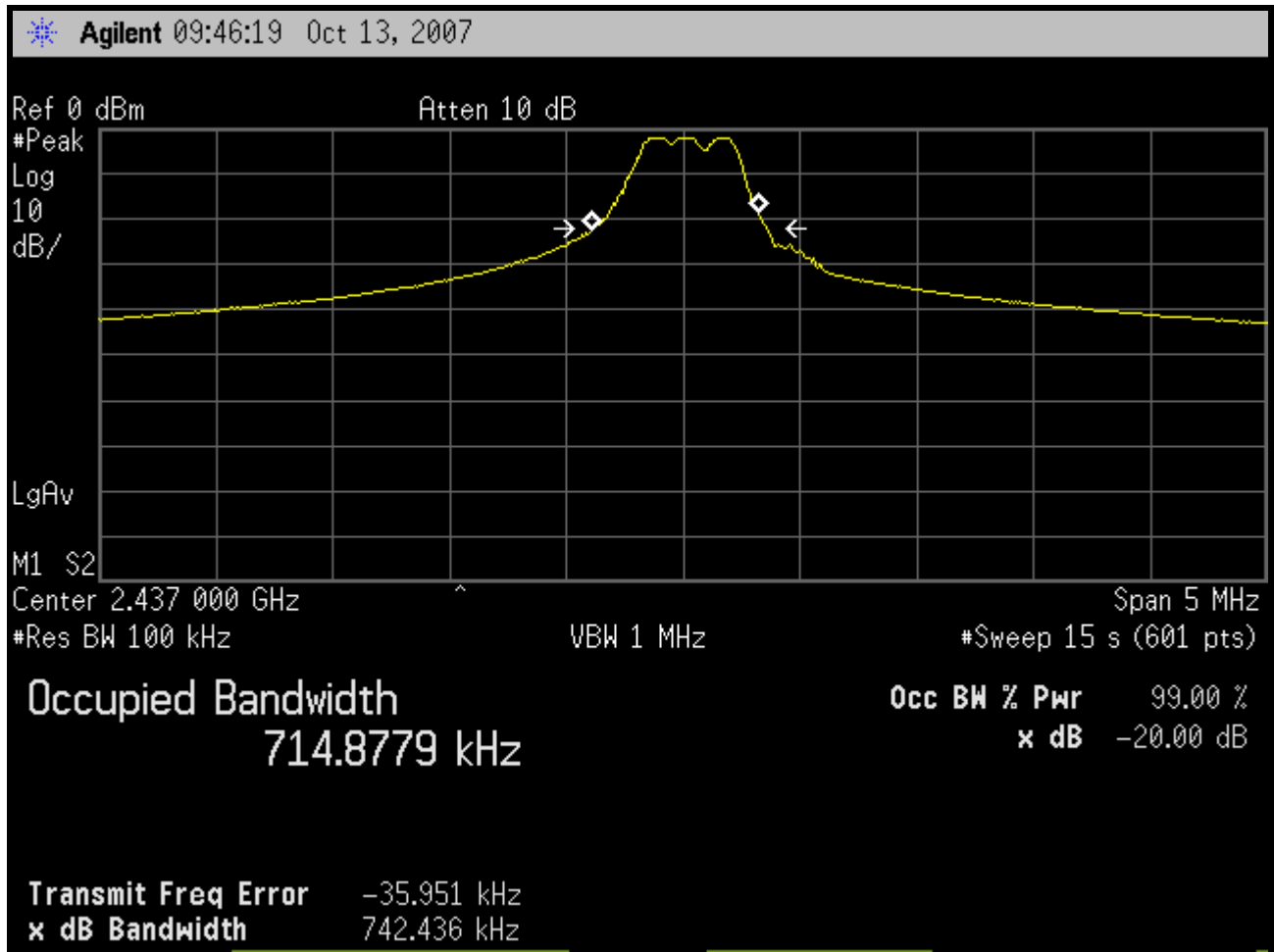
Plot 4-1: 20 dB Bandwidth Channel 1





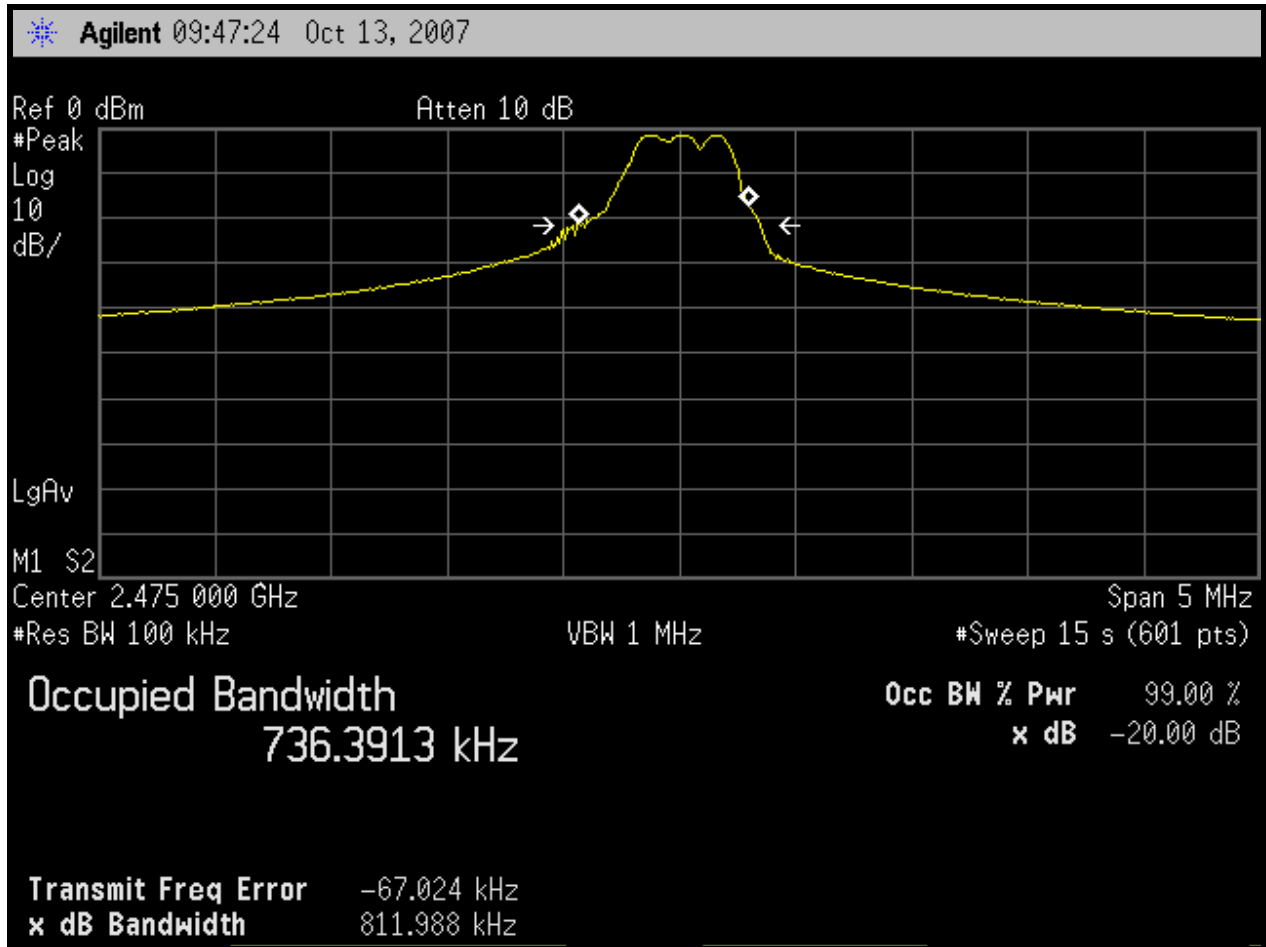
**Channel:** 37  
**Channel Frequency (MHz):** 2437  
**Resolution Bandwidth (kHz):** 100  
**Video Bandwidth (MHz):** 1  
**Span (MHz):** 5

**Plot 4-2: 20 dB Bandwidth Channel 37**



Channel: 75  
Channel Frequency (MHz): 2475  
Resolution Bandwidth (kHz): 100  
Video Bandwidth (MHz): 1  
Span (MHz): 5

Plot 4-3: 20 dB Bandwidth Channel 75



Test Personnel:

Daniel W. Baltzell  
Test Engineer

Signature

October 13, 2007  
Date Of Test

## 5 Radiated Emissions - §15.209, 15.249(a); RSS-210 §6.2.1

### 5.1 Limits of Radiated Emissions Measurement

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009-0.490	2400/f (kHz)	300
0.490-1.705	2400/f (kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

As shown in 15.35(b), for frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any circumstances of modulation.

### 5.2 Radiated Emissions Measurement Test Procedure

Before final measurements of radiated emissions were made on the open-field three/ten meter range, the EUT was scanned indoors at one and three meter distances. This was done in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to ensure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three/ten-meter, open-field test site. The EUT was placed on a nonconductive turntable 0.8 meters above the ground plane. The spectrum was examined from 9 kHz to the 10<sup>th</sup> harmonic of the highest fundamental transmitter frequency (24.8 GHz).

At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations. For frequencies between 30 and 1000 MHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. For emissions above 1000 MHz, emissions are measured using the average detector function with a minimum resolution bandwidth of 1 MHz. No video filter less than 10 times the resolution bandwidth was used. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

**Table 5.1: Radiated Emissions Test Equipment**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900151	Rohde and Schwarz	HFH2-Z2	Loop Antenna (9 kHz - 30 MHz)	827525/019	9/15/09
901365	Rhein Tech Laboratories	PR-1040	Preamplifier (1 - 26.5 GHz)	N/A	10/08/08
901281	Rhein Tech Laboratories	PR-1040	Amplifier (10 MHz - 2 GHz)	1004	1/19/08
900878	Rhein Tech Laboratories	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901425	Insulated Wire, Inc.	KPS-1503-2400-KPS	RF cable, 20'	NA	10/5/08
901424	Insulated Wire Inc.	KPS-1503-360-KPS	RF cable 36"	NA	10/5/08
901242	Rhein Tech Laboratories	WRT-000-0003	Wood rotating table	N/A	Not Required
900913	Hewlett Packard	85462A	EMI Receiver RF Section (9 kHz – 6.5 GHz)	3325A00159	3/21/08
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	06/13/08
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	06/14/10
900321	EMCO	3161-03	Horn Antenna (4.0 - 8.2 GHz)	9508-1020	06/14/10
900323	EMCO	3160-07	Horn Antenna (8.2 - 12.4 GHz)	9605-1054	06/14/10
900356	EMCO	3160-08	Horn Antenna (12.4 - 18 GHz)	9607-1044	06/14/10
900325	EMCO	3160-9	Horn Antennas (18 - 26.5 GHz)	9605-1051	06/14/10

### 5.3 Radiated Emissions Test Results

**Table 5.2: Radiated Emissions**

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (-20 dB)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2401	95.7	75.7	-2.8	72.9	94.0	-21.1
2437	98.0	78.0	-2.9	75.1	94.0	-18.9
2475	98.4	78.4	-2.7	75.7	94.0	-18.3

#### 5.3.1 Radiated Emissions Digital Test Data

**Table 5.3: Digital/Receiver Radiated Emissions Test Data**

Temperature: 69°F Humidity: 23.7%										
Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/Fail
32.000	Qp	H	0	1.0	31.3	-12.8	18.5	40.0	-21.5	Pass
48.000	Qp	H	0	1.0	33.6	-18.8	14.8	40.0	-25.2	Pass
155.000	Qp	H	0	1.0	33.7	-18.2	15.5	43.5	-28.0	Pass
250.000	Qp	V	0	1.0	28.9	-15.1	13.8	46.0	-32.2	Pass
560.000	Qp	H	0	1.0	16.9	-6.7	10.2	46.0	-35.8	Pass
576.000	Qp	V	0	1.0	26.1	-6.6	19.5	46.0	-26.5	Pass

#### 5.3.2 Radiated Emissions Harmonics/Spurious Test Data

**Table 5.4: Radiated Emissions Harmonics/Spurious - 2401 MHz**

Fundamental amplitude = 72.9 dBuV/m

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (-20 dB)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4802.0	52.2	32.2	4.8	37.0	54.0	-17.0
7203.0	48.9	28.9	6.6	35.5	52.9	-17.4
9604.0	36.7	16.7	13.8	30.5	52.9	-22.4
12005.0	37.0	17.0	14.8	31.8	54.0	-22.2
14406.0	35.8	15.8	18.5	34.3	52.9	-18.6
16807.0	34.7	14.7	18.5	33.2	52.9	-19.7

**Table 5.5: Radiated Emissions Harmonics/Spurious - 2437 MHz**

Fundamental amplitude = 75.1 dBuV/m

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (-20 dB)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4874.0	53.7	33.7	4.8	38.5	54.0	-15.5
7311.0	47.1	27.1	6.3	33.4	54.0	-20.6
9748.0	40.6	20.6	13.6	34.2	55.1	-20.9
12185.0	36.3	16.3	15.3	31.6	54.0	-22.4
14622.0	36.4	16.4	18.1	34.5	55.1	-20.6
17059.0	43.9	23.9	19.2	43.1	55.1	-12.0

**Table 5.6: Radiated Emissions Harmonics/Spurious - 2475 MHz**

Fundamental amplitude = 75.7 dBuV/m

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (-20 dB)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4950.0	52.5	32.5	5.1	37.6	54.0	-16.4
7425.0	47.1	27.1	7.3	34.4	54.0	-19.6
9900.0	38.9	18.9	14.0	32.9	55.7	-22.8
12375.0	36.1	16.1	14.9	31.0	55.7	-24.7
14850.0	35.9	15.9	18.2	34.1	55.7	-21.6
17325.0	34.8	14.8	18.7	33.5	55.7	-22.2

**Test Personnel:**

Daniel W. Baltzell  
 Test Engineer



Signature

October 13 and 24, 2007  
 Date Of Test

Rhein Tech Laboratories, Inc.  
360 Herndon Parkway  
Suite 1400  
Herndon, VA 20170  
<http://www.rheintech.com>

Client: Fleetwood Group, Inc.  
Model: N240D  
Standards: FCC 15.249/IC RSS-210  
FCC/IC ID: FBRN240D/1859A-N240D  
Report #: 2007270

## **6 Conclusion**

The data in this measurement report shows that the EUT as tested, Fleetwood Group, Inc., Model: N240D, FCC ID: FBRN240D, IC: 1859A-N240D, complies with all the applicable requirements of Parts 2 and 15 of the FCC Rules and Regulations and IC RSS-210.