

Testing Tomorrow's Technology

**Application
For**

**Title 47 USC, Part 2, Subpart J, Paragraph 2.902, Equipment Authorization of
Verification for an Unintentional Radiator per Part 15, Subpart B, Paragraphs
15.107 and 15.109**

And

**Part 2, Subpart J, Paragraph 2.907 Equipment Authorization of Certification for an
Intentional Radiator per Part 15, Subpart C, paragraph 15.247**

For the

**Acuity Brands Technology Services, Inc
ROAM
Model: ROAMMOD0001**

**FCC ID: UJX-ROAMMOD0001
IC: 6715A-ROAMMOD0001**

**UST Project: 12-0300
Issue Date: August 10, 2012**

Total Pages: 59

3505 Francis Circle Alpharetta, GA 30004
PH: 770-740-0717 Fax: 770-740-1508
www.ustech-lab.com



Testing Tomorrow's Technology

I certify that I am authorized to sign for the Test Agency and that all of the statements in this report and in the Exhibits attached hereto are true and correct to the best of my knowledge and belief:

US TECH (Agent Responsible For Test):

By: Alan Ghasiani

Name: Alan Ghasiani

Title: Compliance Engineer – President

Date August 10, 2012

This report shall not be reproduced except in full. This report may be copied in part only with the prior written approval of US Tech. The results contained in this report are subject to the adequacy and representative character of the sample provided.

3505 Francis Circle Alpharetta, GA 30004
PH: 770-740-0717 Fax: 770-740-1508
www.ustech-lab.com

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

MEASUREMENT TECHNICAL REPORT

COMPANY NAME: Acuity Brands
MODEL: ROAMMOD0001
FCC ID: UJX-ROAMMOD0001
IC ID: 6715A-ROAMMOD0001
DATE: August 10, 2012

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

Equipment type: 2.4 GHz Transmitter Module

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? yes _____ No

If yes, defer until: _____ N/A _____
date

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

Phone Number: (770) 740-0717
Fax Number: (770) 740-1508

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

Table of Contents

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
1	General Information	7
1.1	Purpose of this Report	7
1.2	Characterization of Test Sample	7
1.3	Product Description	7
1.4	Configuration of Tested System	8
1.5	Test Facility	8
1.6	Related Submittal(s)/Grant(s)	8
2	Tests and Measurements	10
2.1	Test Equipment	10
2.2	Modifications to EUT Hardware	10
2.3	Number of Measurements for Intentional Radiators (15.31(m))	11
2.4	Frequency Range of Radiated Measurements (Part 15.33)	11
2.4.1	Intentional Radiator	11
2.4.2	Unintentional Radiator	11
2.5	Measurement Detector Function and Bandwidth (CFR 15.35)	12
2.5.1	Detector Function and Associated Bandwidth	12
2.5.2	Corresponding Peak and Average Requirements	12
2.5.3	Pulsed Transmitter Averaging	12
2.6	EUT Antenna Requirements (CFR 15.203)	13
2.7	Restricted Bands of Operation (Part 15.205)	15
2.8	Transmitter Duty Cycle (CFR 35 (c))	15
2.9	Intentional Radiator, Power Lines Conducted Emissions (CFR 15.207)	17
2.10	Intentional Radiator, Radiated Emissions (Antenna Conducted) (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a))	19
2.11	Six (6) dB Bandwidth per CFR 15.247(a)(2), (IC RSS 210, A8.2(a))	36
2.12	Maximum Peak Conducted Output Power (CFR 15.247 (b) (3))	40
2.13	Power Spectral Density (CFR 15.247(e)) (IC RSS 210 A8.5)	44
2.14	Band Edge Measurements – (CFR 15.247 (d))	48
2.15	20 dB Bandwidth Measurement per CFR 15.247, 99% Occupied Bandwidth (IC RSS 210, A8.1)	52
2.16	Unintentional Radiator Power Lines Conducted Emissions (CFR 15.207) 56	
2.17	Unintentional Radiator, Radiated Emissions (CFR 15.209)	58

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

List of Figures

<u>Figures</u>	<u>Title</u>	<u>Page</u>
Figure 1- Test Configuration.....		14
Figure 2 - Duty Cycle		16
Figure 3 - Antenna Conducted Spurious Emissions – CFR 15.247 (d) - Low Channel, Part 1		21
Figure 4 - Antenna Conducted Spurious Emissions – CFR 15.247 (d) - Low Channel, Part 2		22
Figure 5 - Antenna Conducted Spurious Emissions – CFR 15.247 (d) - Low Channel, Part 3		23
Figure 6 - Antenna Conducted Spurious Emissions – CFR 15.247 (d) - Mid Channel, Part 1		24
Figure 7 - Antenna Conducted Spurious Emissions – CFR 15.247 (d) - Mid Channel, Part 2		25
Figure 8 - Antenna Conducted Spurious Emissions – CFR 15.247 (d) - Mid Channel, Part 3		26
Figure 9 - Antenna Conducted Spurious Emissions – CFR 15.247 (b) - High Channel, Part 1		27
Figure 10 - Antenna Conducted Spurious Emissions - CFR 15.247 (d), High Channel, Part 2		28
Figure 11 - Antenna Conducted Spurious Emissions - CFR 15.247 (d), High Channel, Part 3		29
Figure 12 - Six (6) dB Bandwidth - 15.247 (a) (2) - Low Channel		37
Figure 13 – Six dB Bandwidth - 15.247 (a) (2) - Mid Channel		38
Figure 14 - Six dB Bandwidth - 15.247 (a) (2) - High Channel.....		39
Figure 15 - Peak Antenna Conducted Output Power, Low Channel		41
Figure 16 - Peak Antenna Conducted Output Power, Mid Channel		42
Figure 17 - Peak Antenna Conducted Output Power, High Channel		43
Figure 18. Peak Power Spectral Density - Part 15.247 (e) - Low Channel		45
Figure 19. Power Spectral Density - Part 15.247 (e) - Mid Channel.....		46
Figure 20. Peak Power Spectral Density - Part 15.247 (e) - High Channel.....		47
Figure 21. Band Edge Compliance – Low Channel Delta - Peak.....		50
Figure 22. Band Edge Compliance – High Channel Delta - Peak.....		51
Figure 23. Low Channel 99% Bandwidth		53
Figure 24. Mid Channel 99% Bandwidth		54
Figure 25. High Channel 99% Bandwidth		55

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

List of Tables

<u>Table</u>	<u>Title</u>	<u>Page</u>
Table 1 - EUT and Peripherals		9
Table 2 - Test Instruments		10
Table 3 - Number of Test Frequencies for Intentional Radiators		11
Table 4 - Allowed Antenna(s)		13
Table 5 – Transmitter Power Line Conducted Emissions Test Data, Part 15.207		18
Table 6 – Antenna 1 - Peak Radiated Harmonic & Spurious Emissions		30
Table 7 – Antenna 1 - Average Radiated Spurious		31
Table 8 – Antenna 2- Peak Radiated Harmonic & Spurious Emissions		32
Table 9 – Antenna 2 - Average Radiated Spurious		33
Table 10 – Antenna 3- Peak Radiated Harmonic & Spurious Emissions		34
Table 11 – Antenna 3- Average Radiated Spurious		35
Table 12. Six (6) dB Bandwidth		36
Table 13 - Peak Antenna Conducted Output Power per Part 15.247 (b) (3) (Same as EIRP).....		40
Table 14. Power Spectral Density for Low, Mid and High Bands		44
Table 15. Upper Band Edge - Radiated Emissions		49
Table 16. 20 dB Bandwidth and 99% Occupied Bandwidth.....		52
Table 17. Power Line Conducted Emissions Data, Class B Part 15.107, Peak Measurement vs. Avg. Limits		57
Table 18. Unintentional Radiator, Radiated Emissions.....		59

List of Attachments

- Agency Agreement
- Application Forms
- Letter of Confidentiality
- Equipment Label
- Block Diagram(s)
- Schematic(s)
- Test Configuration Photographs
- Internal Photographs
- Theory of Operation
- RF Exposure
- User's Manual

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

1 General Information

1.1 Purpose of this Report

This report is prepared as a means of conveying test results information concerning the suitability of this exact product for public distribution according to the FCC Rules and Regulations Part 15, Section 247.

1.2 Characterization of Test Sample

The sample used for testing was received by US Tech on July 10, 2012 in good operating condition.

1.3 Product Description

The Equipment under Test (EUT) is the Acuity Brands Technology Services, Inc. herein referred to as Acuity Brands, ROAM model ROAMMOD0001 which is a 2.4 GHZ Transmitter Module. The ROAMMOD0001 is a wireless 2.4 GHz radio module that operates in the 2400 MHz band. The EUT employs 802.15.4 radio module technology and the main use for this radio is to be installed in a device that will be used in streetlight control applications. The radio will typically be installed on top of 30' street lighting utility poles to send and receive data.

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

1.4 Configuration of Tested System

The Test Sample was tested per *ANSI C63.4, Methods of Measurement of Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (2003)* for FCC subpart B Digital equipment Verification requirements and per FCC KDB Publication number 558074 for Digital Transmission Systems Operating Under section 15.247. Also, FCC, KDB Publication No. 558074 was used as a test procedure guide.

Digital RF conducted and radiated verification emissions data (FCC 15.107 and 109) below 1 GHz were taken with the measuring receiver (or spectrum analyzer's) resolution bandwidth adjusted to 9 kHz and 120 kHz, respectively. All measurements performed above 1.0 GHz were made with a RBW of 1 MHz. All measurements are peak unless stated otherwise. The video filter associated with the spectrum analyzer was off throughout the evaluation process.

A list of EUT and Peripherals is found in Table 1 below. A block diagram of the tested system is shown in Figure 1. Test configuration photographs for spurious and fundamental emissions are provided in separate Appendices.

1.5 Test Facility

Testing was performed at US Tech's measurement facility at 3505 Francis Circle, Alpharetta, GA 30004. This site has been fully described and registered with the FCC. Its designation number is US5117. Additionally this site has also been fully described and submitted to Industry Canada (IC), and has been approved under file number 2982A-1.

1.6 Related Submittal(s)/Grant(s)

The EUT will be used to wirelessly send/receive data. The transceiver presented in this report will be used with other like transceivers:

The EUT is subject to the following FCC Equipment Authorizations:

- a) Certification of the transmitter (with modular approval), see test data presented herein.
- b) Verification as a class B digital device.

The manufacturer desires to seek a limited modular approval on this device.

US Tech Test Report,

FCC ID:

Test Report Number:

Issue Date:

Customer:

Model:

FCC Part 15 Certification

UJX-ROAMMOD0001

12-0300

August 10, 2012

Acuity Brands

ROAMMOD0001

Table 1 - EUT and Peripherals

PERIPHERAL MANUFACTURER.	MODEL NUMBER	SERIAL NUMBER	FCC ID:	CABLES P/D
2.4 GHz radio Acuity Brands (EUT)	ROAMMOD 0001	Engineering Sample	Pending: UJX-ROAMMOD0001	1.5 m U Power cable
Antenna See antenna details	--	--	--	--
RF Sniffer Acuity Brands	ROAM	00350D9	Various	3m U Data cable
Laptop Various	Various	Various	Various	1.5m U Power cable

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2 Tests and Measurements

2.1 Test Equipment

Table 2 below lists test equipment used to evaluate this product. Model numbers, serial numbers and their calibration status are included herein.

Table 2 - Test Instruments

TEST INSTRUMENT	MODEL NUMBER	MANUFACTURER	SERIAL NUMBER	DATE OF LAST CALIBRATION
SPECTRUM ANALYZER	8593E	HEWLETT-PACKARD	3205A00124	10/26/11
SPECTRUM ANALYZER	8566B	HEWLETT-PACKARD	2410A00109	11/04/11
RF PREAMP 100 kHz to 1.3 GHz	8447D	HEWLETT-PACKARD	2944A06291	10/06/11
LOOP ANTENNA	SAS-200/562	A. H. Systems	142	08/09/11 2 yr cycle
BICONICAL ANTENNA	3110B	EMCO	9306-1708	04/29/11
LOG PERIODIC	3146	EMCO	3110-3236	06/05/12
HORN ANTENNA	3115	EMCO	9107-3723	08/10/11 2 yr cycle
HORN ANTENNA	3116	EMCO	9505-2255	08/09/12 2yr cycle
PREAMP	8449B	HEWLETT-PACKARD	3008A00480	11/15/11
CALCULATION PROGRAM	N/A	N/A	Ver. 6.0	N/A

Note: The calibration interval of the above test instruments are 12 months unless stated otherwise and all calibrations are traceable to NIST/USA.

2.2 Modifications to EUT Hardware

No modifications were made by US Tech in order to bring the EUT into compliance with FCC Part 15, Subpart C Intentional Radiator Limits for the transmitter portion of the EUT or the Subpart B Unintentional Radiator Limits (Receiver and Digital Device) Requirements.

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.3 Number of Measurements for Intentional Radiators (15.31(m))

Measurements of intentional radiators or receivers shall be performed and reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in Table 3 as follows:

Table 3 - Number of Test Frequencies for Intentional Radiators

Frequency Range over which the device operates	Number of Frequencies	Location in the Range of operation
1 MHz or less	1	Middle
1 to 10 MHz	2	1 near the top 1 near the bottom
Greater than 10 MHz	3	1 near top 1 near middle 1 near bottom

Because the EUT operates over 2.4 GHz to 2.4835 GHz, 3 test frequencies will be used.

2.4 Frequency Range of Radiated Measurements (Part 15.33)

2.4.1 Intentional Radiator

The spectrum shall be investigated for the intentional radiator from the lowest RF signal generated in the EUT, without going below 9 kHz to the 10th harmonic of the highest fundamental frequency generated or 40 GHz, whichever is the lowest.

2.4.2 Unintentional Radiator

For the digital device, an unintentional radiator, the frequency range shall be 30 MHz to 1000 MHz, or to the range specified in 2.4.1 above, whichever is the higher range of investigation.

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.5 Measurement Detector Function and Bandwidth (CFR 15.35)

The radiated and conducted emissions limits shown herein are based on the following:

2.5.1 Detector Function and Associated Bandwidth

On frequencies below 1000 MHz, the limits herein are based upon measurement equipment employing a CISPR Quasi-peak detector function and related measurement bandwidths (i.e. 9 kHz from 150 kHz to 30 MHz and 120 kHz from 30 MHz to 1000 MHz). Alternatively, measurements may be made with equipment employing a peak detector function as long as the same bandwidths specified for the Quasi-peak device are used.

2.5.2 Corresponding Peak and Average Requirements

Above 1000 MHz, radiated limits are based on measuring instrumentation employing an average detector function. When average radiated emissions are specified there is also a corresponding Peak requirement, as measured using a peak detector, of 20 dB greater than the average limit. For all measurements above 1000 MHz the Resolution Bandwidth shall be at least 1 MHz.

2.5.3 Pulsed Transmitter Averaging

When the radiated emissions limit is expressed as an average value, and the transmitter is pulsed, the measured field strength shall be determined by applying a Duty Cycle Correction Factor based upon dividing the total ON time during the first 100 ms period by 100 ms (or by the period if less than 100 ms). The duty cycle may also be expressed logarithmically in dB. Please see section 2.8 herein for details.

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.6 EUT Antenna Requirements (CFR 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. Only the antenna(s) listed in Table 4 will be used with this module.

Table 4 - Allowed Antenna(s)

MANUFACTURER	TYPE OF ANTENNA	MODEL	REPORT REFERENCE	GAIN dB _i	TYPE OF CONNECTOR
Antenova	Mica/PCB	A5645	Antenna 1	1.9	Surface mount
Laird Inc	Monopole	OD24M-5	Antenna 2	5.0	N type to reverse sex SMA connector
Sheehan Intl	Integral 1/4 wave whip	ROAM custom	Antenna 3	2.0	Solder mount

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

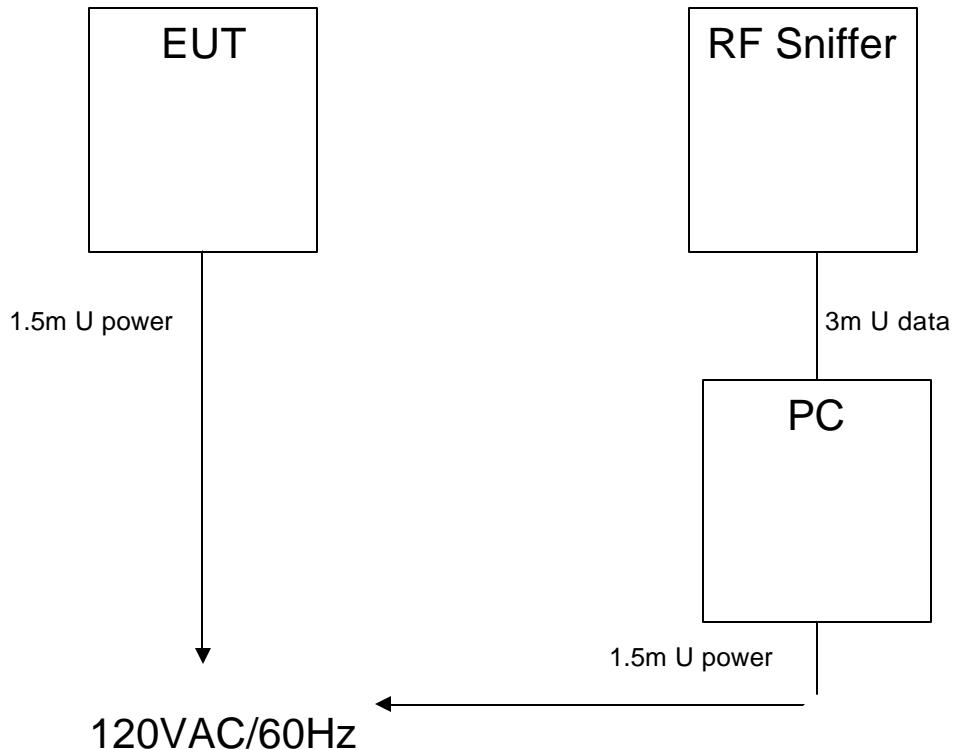


Figure 1- Test Configuration

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.7 Restricted Bands of Operation (Part 15.205)

Only spurious emissions can fall in the frequency bands of CFR 15.205. The field strength of these spurious cannot exceed the limits of 15.209. Radiated harmonics and other Spurious are examined for this requirement see paragraph 2.10.

2.8 Transmitter Duty Cycle (CFR 35 (c))

The transmitter is capable of sending three types of transmissions. They are listed below, along with their pulse-width duration:

	Phy. overhead	Data length	TX len	Tx duration (μs)	Warm up (μs)	Sw delay (μs)	Total TX (μs)
Nack	8	15	23	736	144	20	900
ACK	8	24	32	1024	144	20	1188
Msg	8	125	133	4256	144	20	4420

The duty cycle de-rating factor used in the calculation of average radiated limits (per CFR 15.209 and 15.35(c)) is described below. This factor was calculated by first determining the worst case scenario for system operation.

The worst-case scenario in any 125 ms timeslot, along with all transmission lengths, will be as follows:

Transmitter Activity	Duration (μs)
Rcv message	
Send nack	736
Rcv message	
Send nack	736
Rcv message	
Send nack	736
Rcv message	
Send nack	736
Rcv message	
Send nack	736
Send message	4256
Rcv ACK	
Total:	7936

The duty cycle is computed as follows (in any 100 ms period):

$$\text{Duty Cycle} = (7936/100000) = 0.07936 \sim 0.08 = 8\%$$

$$\text{Correction Factor} = 20\log_{10}(0.08) = -21.9 \text{ dB}$$

-21.9 dB

US Tech Test Report,

FCC ID:

Test Report Number:

Issue Date:

Customer:

Model:

FCC Part 15 Certification

UJX-ROAMMOD0001

12-0300

August 10, 2012

Acuity Brands

ROAMMOD0001

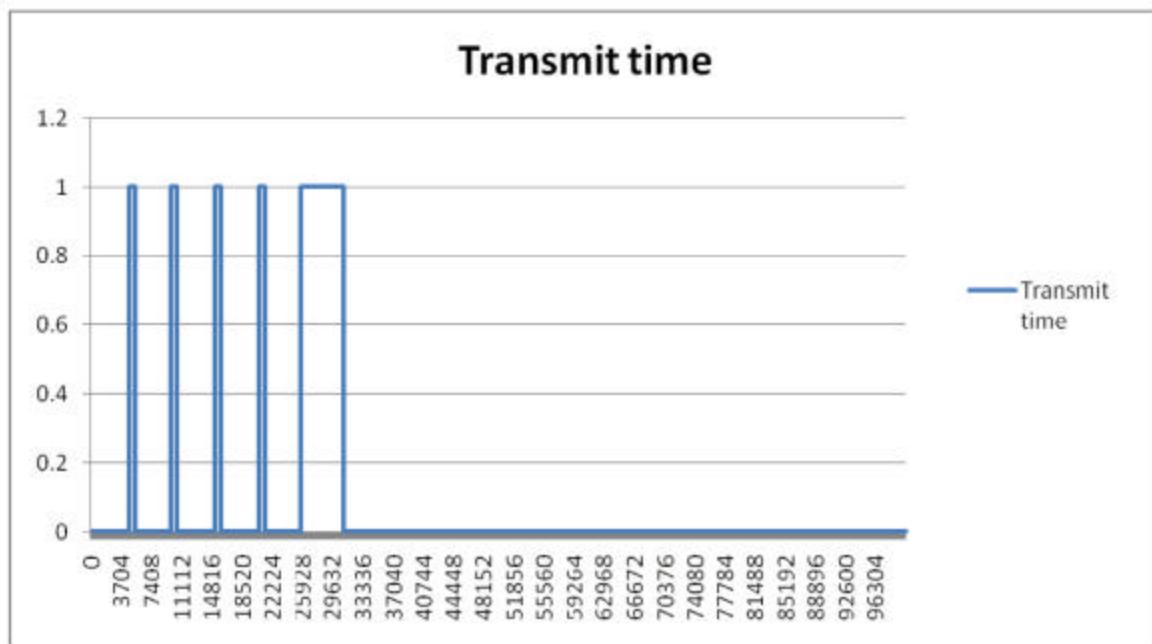


Figure 2 - Duty Cycle

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.9 Intentional Radiator, Power Lines Conducted Emissions (CFR 15.207)

The power line conducted voltage emission measurements have been carried out in accordance with CFR 15.207, per ANSI C63.4:2003, Paragraph 7, with a spectrum analyzer connected to an LISN and the EUT placed into a continuous mode of transmission.

The worst-case results for conducted emissions were determined to be produced when the EUT was operating under continuous transmission. The worst case measurement occurred on the Phase line at 25.71 MHz. The emission level was 2.3 dB from the applicable limit. All other emissions were at least 3.0 dB from the limit. Those results are given in Table 5 below.

US Tech Test Report,
 FCC ID:
 Test Report Number:
 Issue Date:
 Customer:
 Model:

FCC Part 15 Certification
 UJX-ROAMMOD0001
 12-0300
 August 10, 2012
 Acuity Brands
 ROAMMOD0001

Table 5 – Transmitter Power Line Conducted Emissions Test Data, Part 15.207

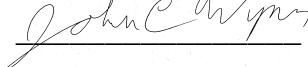
CONDUCTED EMISSIONS 150 kHz to 30 MHz						
Tested By: JW	Specification Requirement: FCC Part 15.207 Class B		Project No.: 12-0300	Manufacturer/Model: Acuity Brands Model ROAMMOD0001		
Frequency (MHz)	Test Data (dBuV)	LISN+CL-PA (dB)	Corrected Results (dBuV)	Avg Limits (dBuV)	Margin (dB)	Detector
120 VAC, 60 Hz, Phase Line						
0.1575	56.20	1.57	57.77	65.6*	7.8	PK
0.1575	31.40	1.57	32.97	55.6	22.6	AVG
0.8276	42.90	0.47	43.37	56.0*	12.6	PK
0.8276	27.80	0.47	28.27	46.0	17.7	AVG
2.0920	50.50	0.48	50.98	56.0*	5.0	PK
2.0920	36.00	0.48	36.48	46.0	9.5	AVG
5.5800	43.10	0.59	43.69	50.0	6.3	PK
10.2500	37.00	0.72	37.72	50.0	12.3	PK
25.7100	46.60	1.11	47.71	50.0	2.3	PK
120 VAC, 60 Hz, Neutral Line						
0.1694	52.70	1.39	54.09	65.0*	10.9	PK
0.1694	30.60	1.39	31.99	55.0	23.0	AVG
0.7430	46.60	0.46	47.06	56.0*	8.9	PK
0.7430	27.20	0.46	27.66	46.0	18.3	AVG
2.0830	41.30	0.48	41.78	56.0*	14.2	QP
2.0830	33.70	0.48	34.18	46.0	11.8	AVG
5.2400	43.30	0.57	43.87	50.0	6.1	PK
10.2400	38.90	0.71	39.61	50.0	10.4	PK
25.7900	45.90	1.10	47.00	50.0	3.0	PK

(*)= Quasi-Peak limit used

SAMPLE CALCULATIONS: At 0.1575 MHz, = 56.20 + (1.57) = 57.77 dBuV

Test Date: July 12, 2012

Tested By

Signature: 

Name: John Wynn

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.10 Intentional Radiator, Radiated Emissions (Antenna Conducted) (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a))

The EUT was put into a continuous -transmit mode of operation and tested per FCC KDB Publication 558074 for conducted out of band emissions emanating from the antenna port over the frequency range of 30 MHz to 25 GHz. A conducted scan was performed on the EUT to identify and record spurious signals that were related to the transmitter. Antenna Conducted Emissions of a significant magnitude that fell within restricted bands were then measured as radiated emissions on the OATS. The conducted emissions graphs are found in Figures 3 through 8 below. The limit for antenna conducted power is 1 Watt (30 dBm) per 15.247 (b)(3).

For radiated measurements, the EUT was set into a continuous transmission mode. Below 1 GHz, the RBW of the measuring instrument was set equal to 120 kHz. Peak measurements above 1 GHz were measured using a RBW = 1 MHz, with a VBW = RBW. The results of peak radiated spurious emissions falling within restricted bands are given in Table 6 below.

For Average Voltage measurements above 1 GHz, the emissions were measured using RBW = 1 MHz and VBW = 10 Hz. For a pulse-modulated transmitter, the EUT's average emissions are further modified by adding to them the worst-case duty cycle, determined by adding the EUT's total pulse widths (on time) over a 100 ms period and dividing by 100 ms.

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.10 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).

On the OATS, the EUT was mounted on top of a non-conductive table, 80 cm above the floor, by placing it in the X-Z plane along the Z axis with its bottom cover in parallel with the ground. The front of the EUT faced the measurement antenna located 3 meters away. Each signal measured was maximized by raising and lowering the receive antenna between 1 and 4 meters in height while monitoring the ever changing spectrum analyzer display (with channel A in the Clear-Write mode and channel B in the Max-Hold mode) for the largest signal visible. That exact antenna height where the signal was maximized was recorded for reproducibility purposes. Also, the EUT was rotated about its Y-axis while monitoring the Spectrum Analyzer display for maximum. The EUT azimuth was recorded for reproducibility purposes. The EUT was measured when both maxima were simultaneously satisfied.

The test data is detailed below in for this section. Several radiated emissions above 1 GHz were measured at a distance of 1 meter. The measured value at 1 meter was then extrapolated to the resultant at 3 meters using an inverse distance extrapolation factor of -20 dB/decade. There were no test failures.

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.10 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).

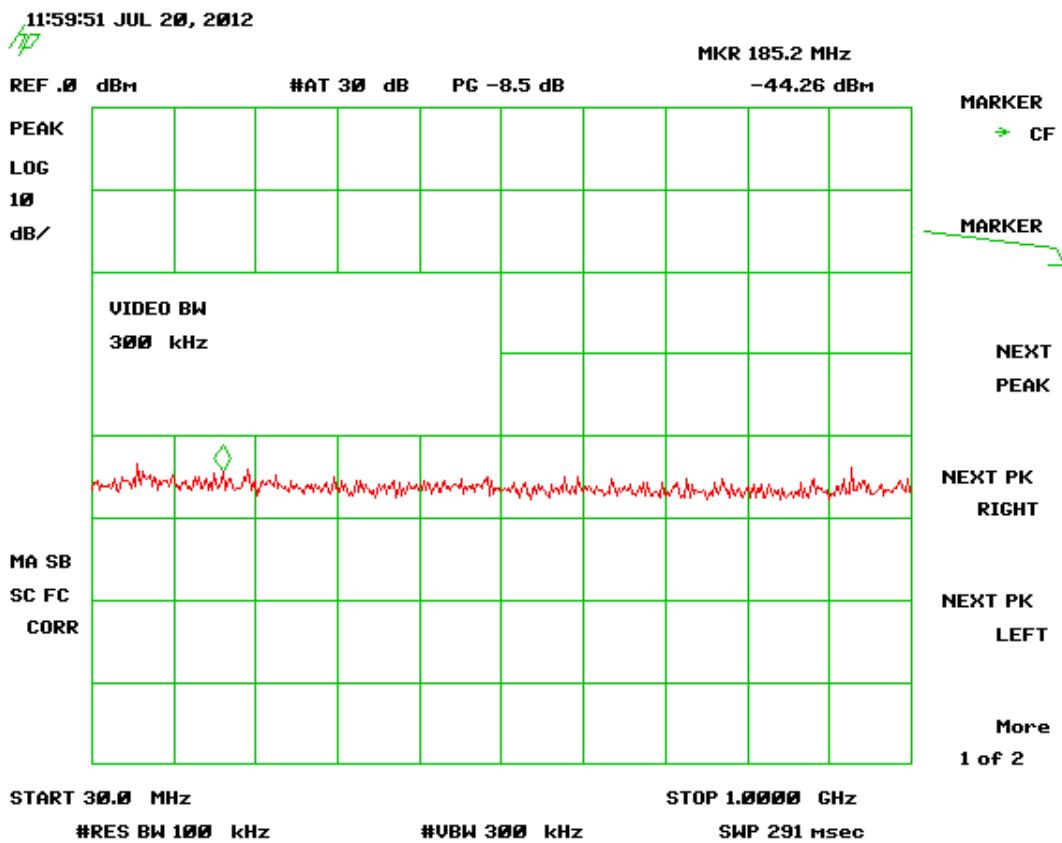


Figure 3 - Antenna Conducted Spurious Emissions – CFR 15.247 (d) - Low Channel, Part 1

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.10 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).

Note: Large Signal shown is Fundamental Frequency

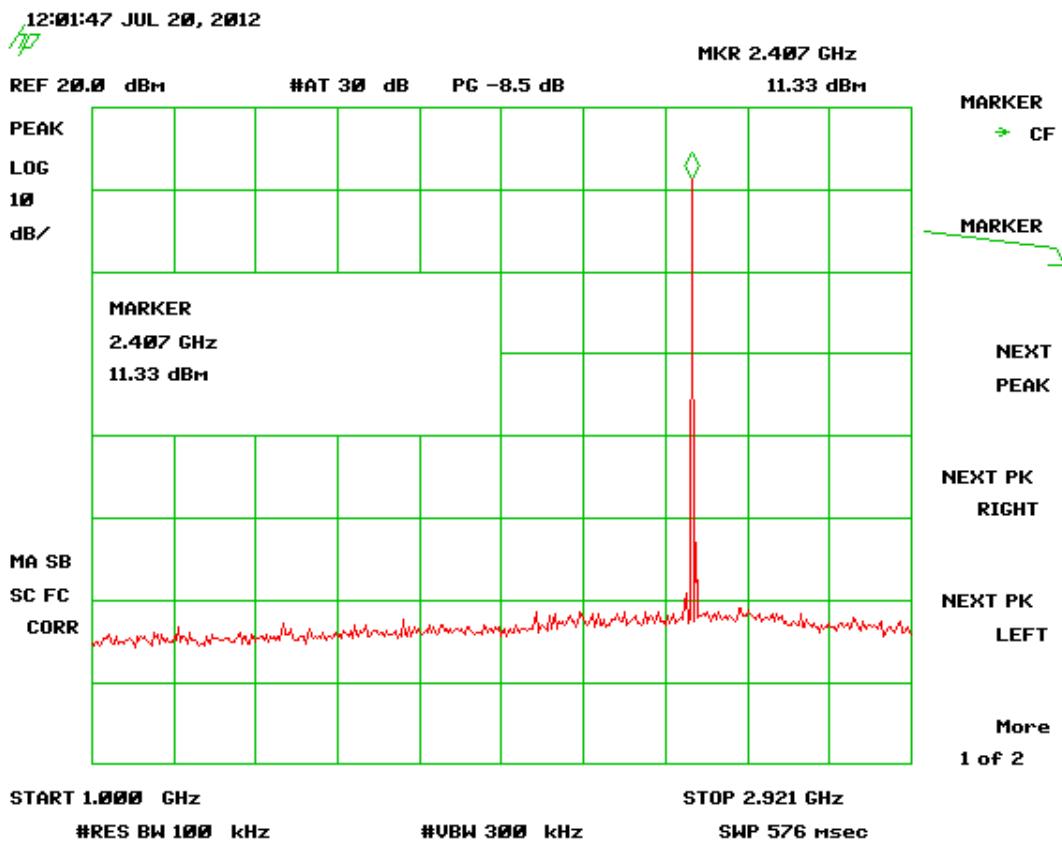


Figure 4 - Antenna Conducted Spurious Emissions – CFR 15.247 (d) - Low Channel, Part 2

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.10 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).

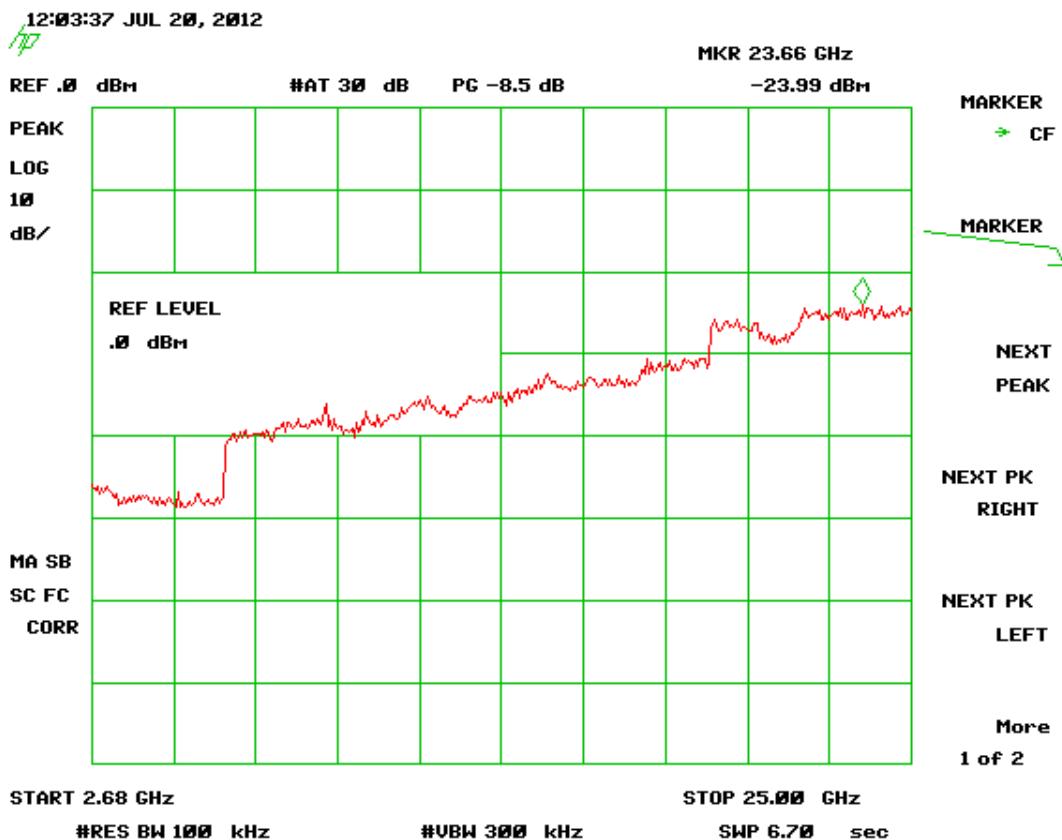


Figure 5 - Antenna Conducted Spurious Emissions – CFR 15.247 (d) - Low Channel, Part 3

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.10 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).

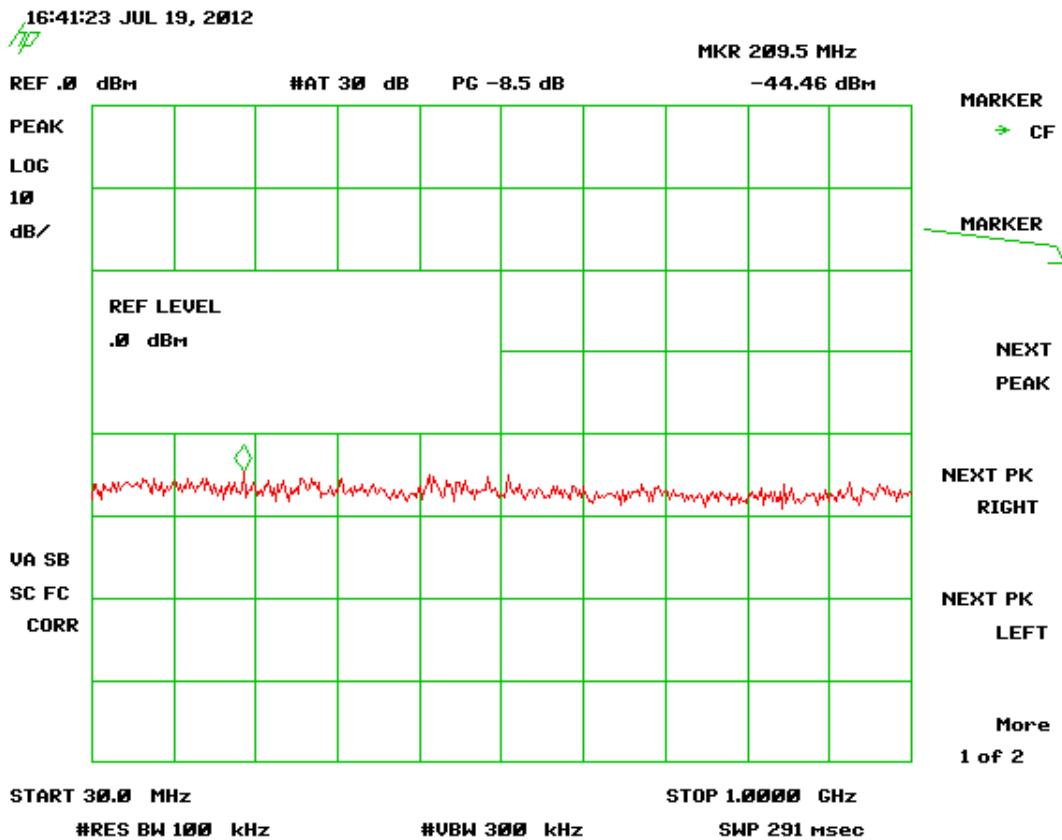


Figure 6 - Antenna Conducted Spurious Emissions – CFR 15.247 (d) - Mid Channel, Part 1

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.10 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).

Note: Signal shown represents Fundamental Frequency

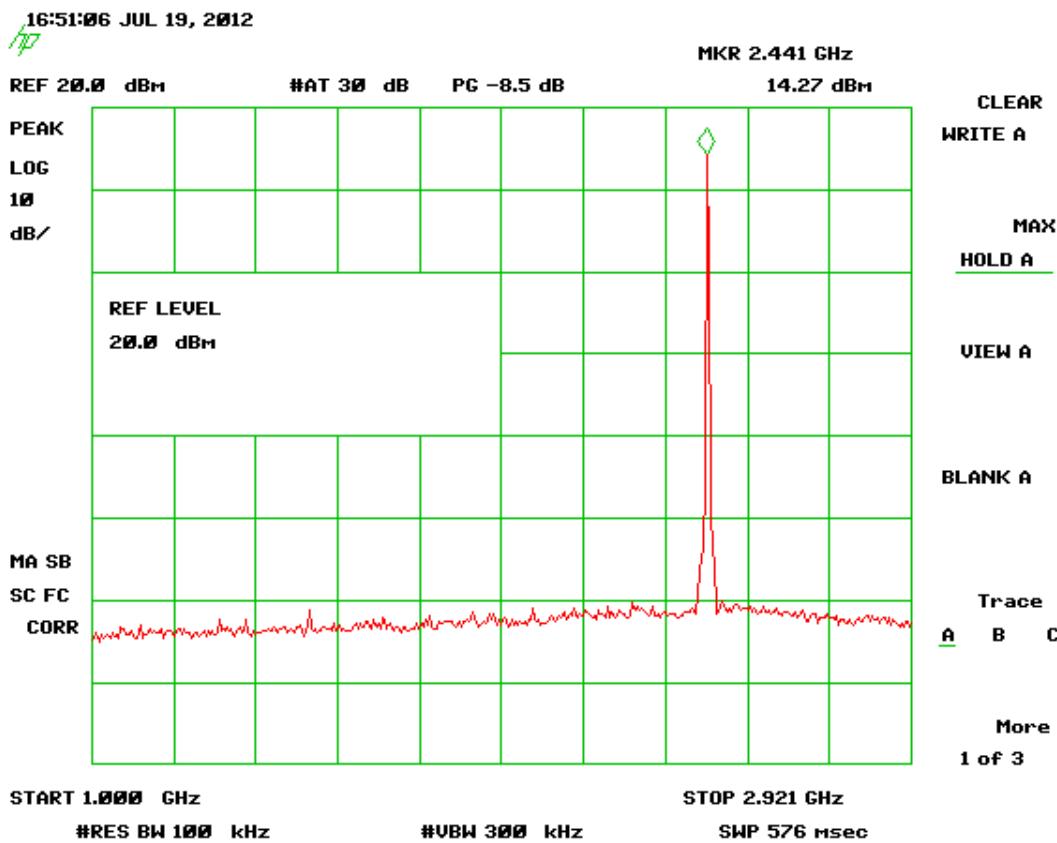


Figure 7 - Antenna Conducted Spurious Emissions – CFR 15.247 (d) - Mid Channel, Part 2

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.10 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).

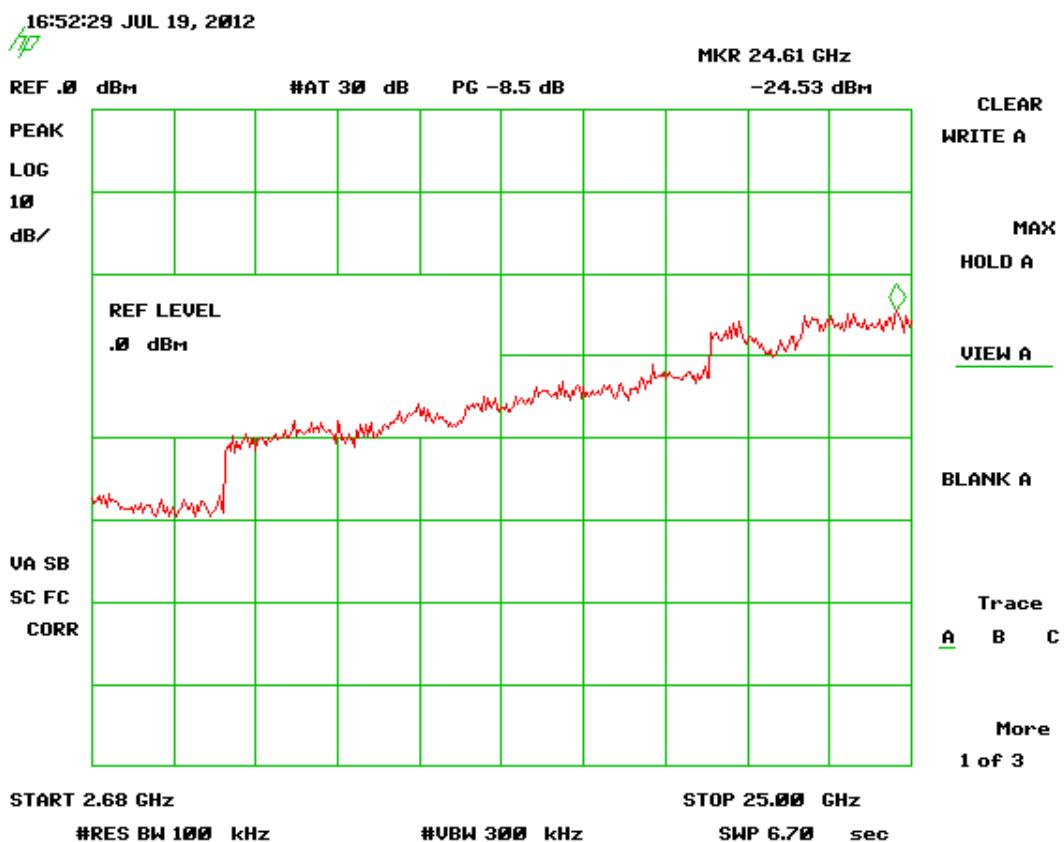


Figure 8 - Antenna Conducted Spurious Emissions – CFR 15.247 (d) - Mid Channel, Part 3

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.10 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd)

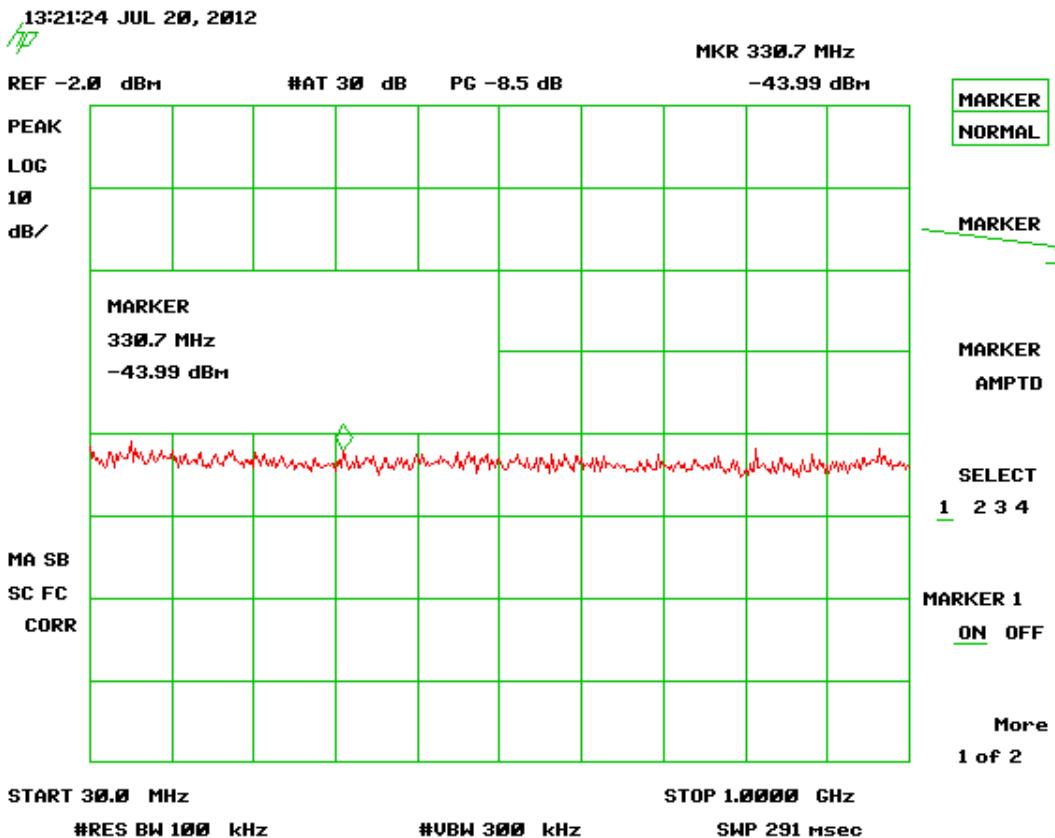


Figure 9 - Antenna Conducted Spurious Emissions – CFR 15.247 (b) - High Channel, Part 1

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.10 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd)

Note: Large Signal shown is Fundamental Frequency

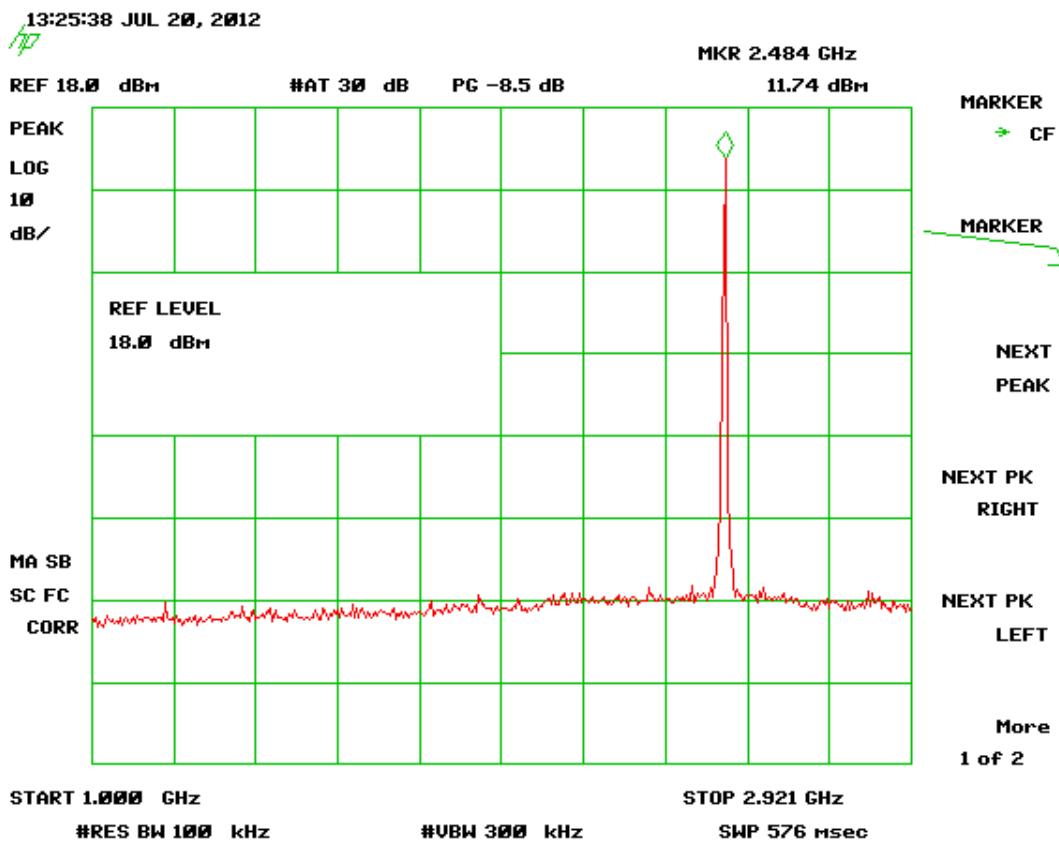


Figure 10 - Antenna Conducted Spurious Emissions - CFR 15.247 (d), High Channel, Part 2

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.10 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).

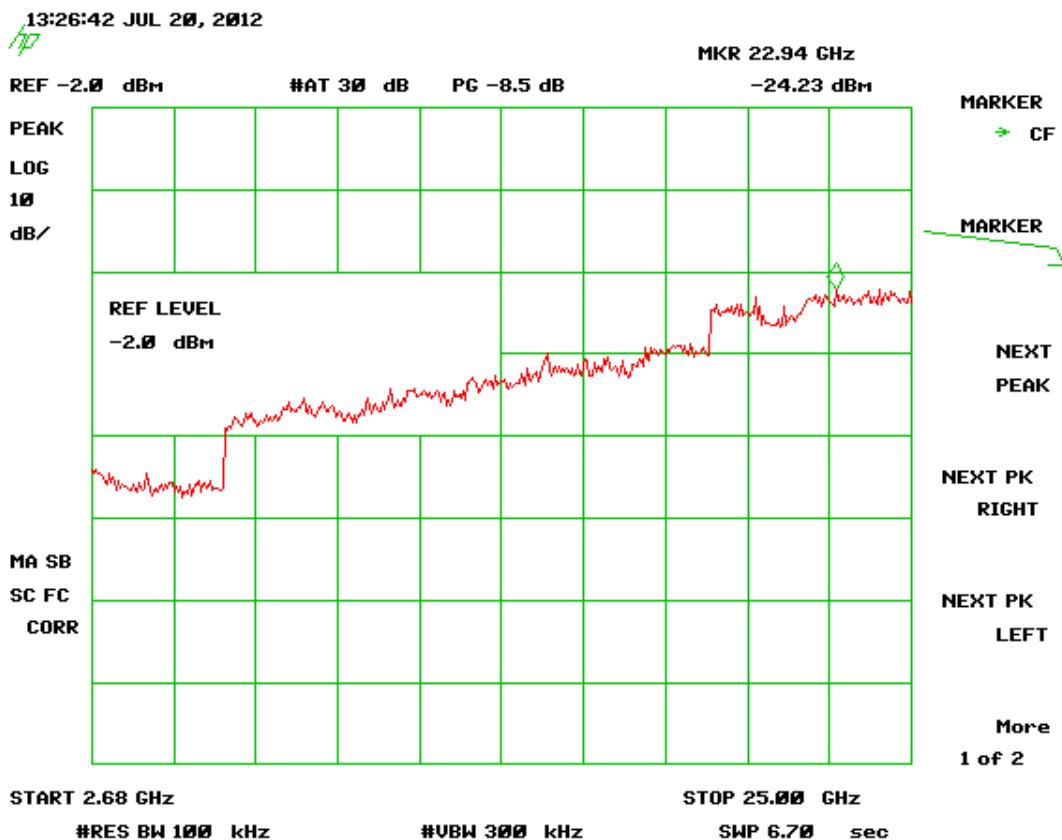


Figure 11 - Antenna Conducted Spurious Emissions - CFR 15.247 (d), High Channel, Part 3

US Tech Test Report,
 FCC ID:
 Test Report Number:
 Issue Date:
 Customer:
 Model:

FCC Part 15 Certification
 UJX-ROAMMOD0001
 12-0300
 August 10, 2012
 Acuity Brands
ROAMMOD0001

2.10 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd)

Table 6 – Antenna 1- Peak Radiated Harmonic & Spurious Emissions

Radiated Harmonic and Spurious Emissions, Tested from 30 MHz – 25 GHz							
Tested By: JW	Test: FCC Part 15, Para 15.247(d) Project: 12-0300		Client: Acuity Brands Model: ROAMMOD0001				
Frequency (MHz)	Test Data (dBuV)	AF+CL-PA (dB/m)	Corrected Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Pass Margin (dB)	Detector PK / AVG
LOW BAND - PEAK							
2405.00	71.34	31.10	102.44		1Hn3mH		PK
4808.00	45.99	3.36	40.81	74.0	1Hn1mV	33.2	PK
MID BAND- PEAK							
2440.53	70.99	31.10	102.09		1Hn3mH		PK
4878.93	46.20	3.36	41.02	74.0	1Hn1mV	33.0	PK
HIGH BAND- PEAK							
2480.04	71.39	31.42	102.81		1Hn3mH		PK
4961.00	46.50	3.66	41.62	74.0	1Hn1mV	32.4	PK

1. (*) Falls within the restricted bands of CFR 15.205. Limits based on CFR15.209 & 20 dB relaxation of CFR 15.35.

2. No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic (25GHz using EMCO 3116 Horn Antenna)

3. Measurements taken at 1 meter distance were extrapolated to 3 meter using a factor of (-9.5 dB).

4. 1 dB loss factor is added for all measurement using the high pass filter.

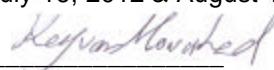
RESULTS: At 4808.00 MHz: = 45.99 dBuV+ (-9.5)+(1) +3.36 dB/m = 40.81 dBuV/m @ 3m

Margin = (74.0 – 40.81) = 33.2 dB

Test Date: July 16, 2012 & August 10, 2010

Tested By

Signature:



Name: Keyvan Muvahhid

US Tech Test Report,
 FCC ID:
 Test Report Number:
 Issue Date:
 Customer:
 Model:

FCC Part 15 Certification
 UJX-ROAMMOD0001
 12-0300
 August 10, 2012
 Acuity Brands
ROAMMOD0001

2.10 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).

Table 7 – Antenna 1- Average Radiated Spurious

Radiated Spurious Emissions, Tested from 30 MHz – 25 GHz							
Tested By: JW	Test: FCC Part 15, Para 15.247(d)		Client: Acuity Brands				
	Project: 12-0300		Model: ROAMMOD0001				
Frequency (MHz)	Test Data (dBuV)	AF+CL-PA+DC (dB/m)	Corrected Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Pass Margin (dB)	Detector PK / AVG
LOW BAND - PEAK							
2405.00	71.34	11.10	82.44		1Hn3mH		PK
4808.00	45.99	-16.64	20.81	54.0	1Hn1mV	33.2	PK
MID BAND- PEAK							
2440.53	70.99	11.10	82.09		1Hn3mH		PK
4878.93	46.20	-16.64	21.02	54.0	1Hn1mV	33.0	PK
HIGH BAND- PEAK							
2480.04	71.39	11.42	82.81		1Hn3mH		PK
4961.00	46.50	-16.34	21.62	54.0	1Hn1mV	32.4	PK

1. (*) Falls within the restricted bands of CFR 15.205.
2. No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic (25GHz using EMCO 3116 Horn Antenna)
3. Test data values measured at 1 meter include a factor of -9.54 dB for distance extrapolation from a test distance of 1 meter to 3 meters.
4. Additional factors include a Duty Cycle, DC = -20.0 dB and filter factor of +1.0 dB.

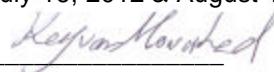
SAMPLE CALCULATION:

RESULTS: At 4808.00 MHz: = 45.99 dBuV + (-9.5) + (1) + (-16.64) dB/m = 40.81 dBuV/m @ 3m
 Margin = (54.0 – 20.81) = 33.2 dB

Test Date: July 16, 2012 & August 10, 2012

Tested By

Signature:



Name: Keyvan Muvahhid

US Tech Test Report,
 FCC ID:
 Test Report Number:
 Issue Date:
 Customer:
 Model:

FCC Part 15 Certification
 UJX-ROAMMOD0001
 12-0300
 August 10, 2012
 Acuity Brands
ROAMMOD0001

2.10 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd)

Table 8 – Antenna 2- Peak Radiated Harmonic & Spurious Emissions

Radiated Harmonic and Spurious Emissions, Tested from 30 MHz – 25 GHz							
Tested By: JW	Test: FCC Part 15, Para 15.247(d) Project: 12-0300		Client: Acuity Brands Model: ROAMMOD0001				
Frequency (MHz)	Test Data (dBuV)	AF+CL-PA (dB/m)	Corrected Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Pass Margin (dB)	Detector PK / AVG
LOW BAND - PEAK							
2405.35	87.19	31.31	118.50		1hn3mV		PK
4811.00	45.57	3.45	40.48	74.0	1hn1mV	33.5	PK
7219.05	46.69	7.79	45.94	74.0	1hn1mV	28.1	PK
9621.95	55.84	8.52	55.82	74.0	1hn1mV	18.2	PK
12028.13	51.07	11.24	53.77	74.0	1hn1mV	20.2	PK
MID BAND- PEAK							
2440.45	88.96	31.31	120.27		1hn3mV		PK
4878.93	43.10	3.36	37.92	74.0	1hn1mV	36.1	PK
7321.53	49.35	7.98	48.79	74.0	1hn1mV	25.2	PK
9762.10	60.35	8.69	60.50	74.0	1hn1mV	13.5	PK
12202.55	54.45	11.38	57.29	74.0	1hn1mV	16.7	PK
HIGH BAND- PEAK							
2480.43	87.91	31.40	119.31		1hn3mV		PK
4959.18	45.13	3.66	40.25	74.0	1hn1mV	33.8	PK
7441.40	56.19	7.89	55.54	74.0	1hn1mV	18.5	PK
9921.92	58.06	8.80	58.32	74.0	1hn1mV	15.7	PK
12397.53	52.04	11.48	54.98	74.0	1hn1mV	19.0	PK

1. (*) Falls within the restricted bands of CFR 15.205. Limits based on CFR15.209 & 20 dB relaxation of CFR 15.35.
2. No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic (25GHz using EMCO 3116 Horn Antenna)
3. Measurements taken at 1 meter distance were extrapolated to 3 meter using a factor of (-9.5 dB).
4. 1 dB loss factor is added for all measurement using the high pass filter.

RESULTS: At 4811.00 MHz: = 45.57 dBuV+ (-9.5)+ (1)+3.45 dB/m = 40.48 dBuV/m @ 3m
 Margin = (74.0 – 40.48) = 33.5 dB

Test Date: July 17, 2012 & August 10, 2012

Tested By
 Signature: 

Name: George Yang

US Tech Test Report,
 FCC ID:
 Test Report Number:
 Issue Date:
 Customer:
 Model:

FCC Part 15 Certification
 UJX-ROAMMOD0001
 12-0300
 August 10, 2012
 Acuity Brands
ROAMMOD0001

2.10 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).

Table 9 – Antenna 2- Average Radiated Spurious

Radiated Spurious Emissions, Tested from 30 MHz – 25 GHz							
Tested By: JW	Test: FCC Part 15, Para 15.247(d) Project: 12-0300		Client: Acuity Brands Model: ROAMMOD0001				
Frequency (MHz)	Test Data (dBuV)	AF+CL- PA+DC (dB/m)	Corrected Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Pass Margin (dB)	Detector PK / AVG
LOW BAND - PEAK							
2405.35	87.19	11.31	98.50		1hn3mV		PK
4811.00	45.57	-16.55	20.48	54.0	1hn1mV	33.5	PK
7219.05	46.69	-12.21	25.94	54.0	1hn1mV	28.1	PK
9621.95	55.84	-11.48	35.82	54.0	1hn1mV	18.2	PK
12028.13	51.07	-8.76	33.77	54.0	1hn1mV	20.2	PK
MID BAND- PEAK							
2440.45	88.96	11.31	100.27		1hn3mV		PK
4878.93	43.10	-16.64	17.92	54.0	1hn1mV	36.1	PK
7321.53	49.35	-12.02	28.79	54.0	1hn1mV	25.2	PK
9762.10	60.35	-11.31	40.50	54.0	1hn1mV	13.5	PK
12202.55	54.45	-8.62	37.29	54.0	1hn1mV	16.7	PK
HIGH BAND- PEAK							
2480.43	87.91	11.40	99.31		1hn3mV		PK
4959.18	45.13	-16.34	20.25	54.0	1hn1mV	33.8	PK
7441.40	56.19	-12.11	35.54	54.0	1hn1mV	18.5	PK
9921.92	58.06	-11.20	38.32	54.0	1hn1mV	15.7	PK
12397.53	52.04	-8.52	34.98	54.0	1hn1mV	19.0	PK

1. (*) Falls within the restricted bands of CFR 15.205.
2. No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic (25GHz using EMCO 3116 Horn Antenna)
3. Test data values measured at 1 meter include a factor of -9.54 dB for distance extrapolation from a test distance of 1 meter to 3 meters.
4. Additional factors include a Duty Cycle, DC = -20.0 dB and filter factor of +1.0 dB.

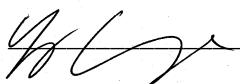
SAMPLE CALCULATION:

RESULTS: At 4811.00 MHz: = 45.57 dBuV + (-9.5) + (1) + 16.55 dB/m = 20.48 dBuV/m @ 3m

Margin = (54.0 – 20.48) = 33.5 dB

Test Date: July 17, 2012 & August 10, 2012

Tested By

Signature: 

Name: George Yang

US Tech Test Report,
 FCC ID:
 Test Report Number:
 Issue Date:
 Customer:
 Model:

FCC Part 15 Certification
 UJX-ROAMMOD0001
 12-0300
 August 10, 2012
 Acuity Brands
ROAMMOD0001

2.10 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd)

Table 10 – Antenna 3- Peak Radiated Harmonic & Spurious Emissions

Radiated Harmonic and Spurious Emissions, Tested from 30 MHz – 25 GHz							
Tested By: JW	Test: FCC Part 15, Para 15.247(d)		Client: Acuity Brands				
	Project: 12-0300		Model: ROAMMOD0001				
Frequency (MHz)	Test Data (dBuV)	AF+CL-PA (dB/m)	Corrected Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Pass Margin (dB)	Detector PK / AVG
LOW BAND - PEAK							
2405.38	75.72	31.31	107.03		1hn3mV		PK
4810.90	45.21	3.45	40.12	74.0	1hn1mV	33.9	PK
7216.80	47.36	7.95	46.77	74.0	1hn1mH	27.2	PK
9621.97	58.60	8.51	58.57	74.0	1hn1mH	15.4	PK
12022.20	54.63	11.28	57.37	74.0	1hn1mH	16.6	PK
MID BAND- PEAK							
2440.18	77.08	31.31	108.39		1hn3mV		PK
4879.08	45.56	3.45	40.47	74.0	1hn1mH	33.5	PK
7321.40	49.44	8.08	48.98	74.0	1hn1mH	25.0	PK
9758.17	61.89	8.71	62.06	74.0	1hn1mH	11.9	PK
12202.30	55.48	11.34	58.28	74.0	1hn1mH	15.7	PK
HIGH BAND- PEAK							
2479.58	77.60	31.40	109.00		1hn3mV		PK
4960.78	52.42	3.80	47.68	74.0	1hn1mH	26.3	PK
7441.48	55.21	7.89	54.56	74.0	1hn1mV	19.4	PK
9918.07	61.26	8.75	61.47	74.0	1hn1mV	12.5	PK
12402.48	54.46	11.47	57.39	74.0	1hn1mV	16.6	PK

1. (*) Falls within the restricted bands of CFR 15.205. Limits based on CFR15.209 & 20 dB relaxation of CFR 15.35.

2. No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic (25GHz using EMCO 3116 Horn Antenna)

3. Measurements taken at 1 meter distance were extrapolated to 3 meter using a factor of (-9.5 dB).

4. 1 dB loss factor is added for all measurement using the high pass filter.

RESULTS: At 4810.90 MHz: = 45.21 dBuV+ (-9.5)+ (1)+ 3.45 dB/m = 40.12 dBuV/m @ 3m
 Margin = (74.0 – 40.12) = 33.9 dB

Margin = (54.0 – 20.48) = 33.5 dB

Test Date: July 17, 2012 & August 10, 2012

Tested By

Signature: 

Name: George Yang

US Tech Test Report,
 FCC ID:
 Test Report Number:
 Issue Date:
 Customer:
 Model:

FCC Part 15 Certification
 UJX-ROAMMOD0001
 12-0300
 August 10, 2012
 Acuity Brands
ROAMMOD0001

2.10 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).

Table 11 – Antenna 3- Average Radiated Spurious

Radiated Spurious Emissions, Tested from 30 MHz – 25 GHz							
Tested By: JW	Test: FCC Part 15, Para 15.247(d)		Client: Acuity Brands				
	Project: 12-0300		Model: ROAMMOD0001				
Frequency (MHz)	Test Data (dBuV)	AF+CL-PA+DC (dB/m)	Corrected Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Pass Margin (dB)	Detector PK / AVG
LOW BAND - PEAK							
2405.38	75.72	11.31	87.03		1hn3mV		PK
4810.90	45.21	-16.55	20.12	54.0	1hn1mV	33.9	PK
7216.80	47.36	-12.05	26.77	54.0	1hn1mH	27.2	PK
9621.97	58.60	-11.49	38.57	54.0	1hn1mH	15.4	PK
12022.20	54.63	-8.72	37.37	54.0	1hn1mH	16.6	PK
MID BAND- PEAK							
2440.18	77.08	11.31	88.39		1hn3mV		PK
4879.08	45.56	-16.55	20.47	54.0	1hn1mH	33.5	PK
7321.40	49.44	-11.92	28.98	54.0	1hn1mH	25.0	PK
9758.17	61.89	-11.29	42.06	54.0	1hn1mH	11.9	PK
12202.30	55.48	-8.66	38.28	54.0	1hn1mH	15.7	PK
HIGH BAND- PEAK							
2479.58	77.60	11.40	89.00		1hn3mV		PK
4960.78	52.42	-16.20	27.68	54.0	1hn1mH	26.3	PK
7441.48	55.21	-12.11	34.56	54.0	1hn1mV	19.4	PK
9918.07	61.26	-11.25	41.47	54.0	1hn1mV	12.5	PK
12402.48	54.46	-8.53	37.39	54.0	1hn1mV	16.6	PK

1. (*) Falls within the restricted bands of CFR 15.205.
2. No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic (25GHz using EMCO 3116 Horn Antenna)
3. Test data values measured at 1 meter include a factor of -9.54 dB for distance extrapolation from a test distance of 1 meter to 3 meters.
4. Additional factors include a Duty Cycle, DC = -20.0 dB and filter factor of +1.0 dB.

SAMPLE CALCULATION:

RESULTS: At 4810.90 MHz: = 45.21 dBuV + (-9.5) + (1) + (-16.55) dB/m = 20.12 dBuV/m @ 3m
 Margin = (54.0 – 20.12) = 33.9 dB

Test Date: July 17, 2012 & August 10, 2012

Tested By

Signature: 

Name: George Yang

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.11Six (6) dB Bandwidth per CFR 15.247(a)(2), (IC RSS 210, A8.2(a))

The EUT antenna port was connected to a spectrum analyzer having a 50 ? input impedance. Measurements were performed similar to the method of FCC, KDB Publication No. 558074 for a bandwidth of 6 dB. The RBW was set to approximately 1/100 of the manufacturers claimed RBW and with the VBW = RBW. The results of this test are given in Table 12 and Figures 12 through 14.

Table 12. Six (6) dB Bandwidth

Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum FCC Bandwidth (MHz)
2405	1.53	0.5
2440	1.58	0.5
2480	1.53	0.5

Test Date: July 19, 2012

Tested By

Signature:



Name: George Yang

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.11 Six dB Bandwidth per CFR 15.247(a)(2), (IC RSS 210, A8.2(a))

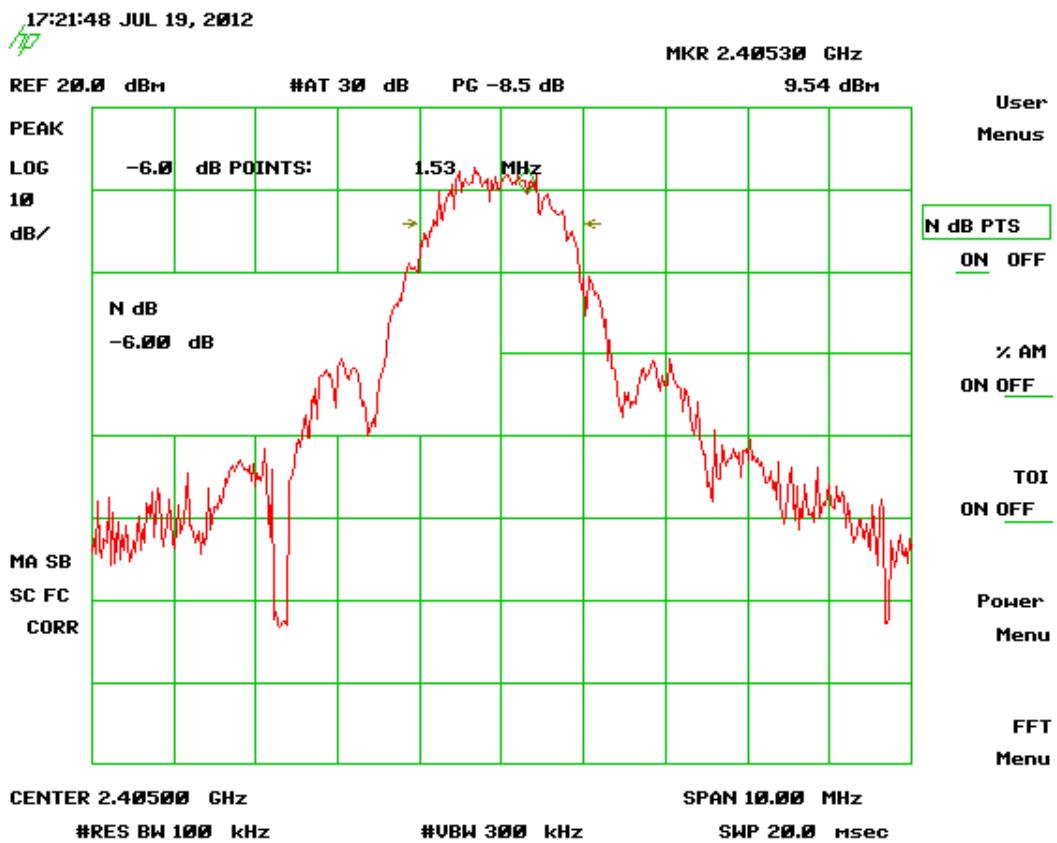


Figure 12 - Six (6) dB Bandwidth - 15.247 (a) (2) - Low Channel

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.11 Six dB Bandwidth per CFR 15.247(a)(2), (IC RSS 210, A8.2(a))

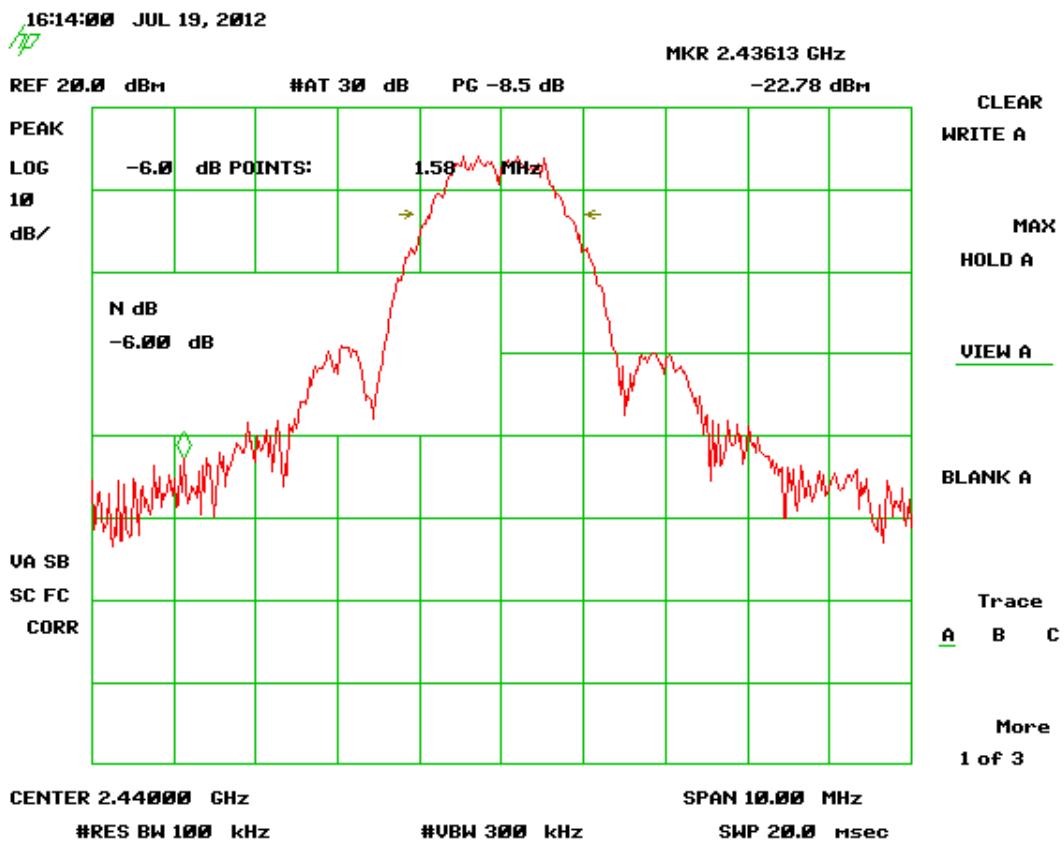


Figure 13 – Six dB Bandwidth - 15.247 (a) (2) - Mid Channel

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.11 Six dB Bandwidth per CFR 15.247(a)(2), (IC RSS 210, A8.2(a))

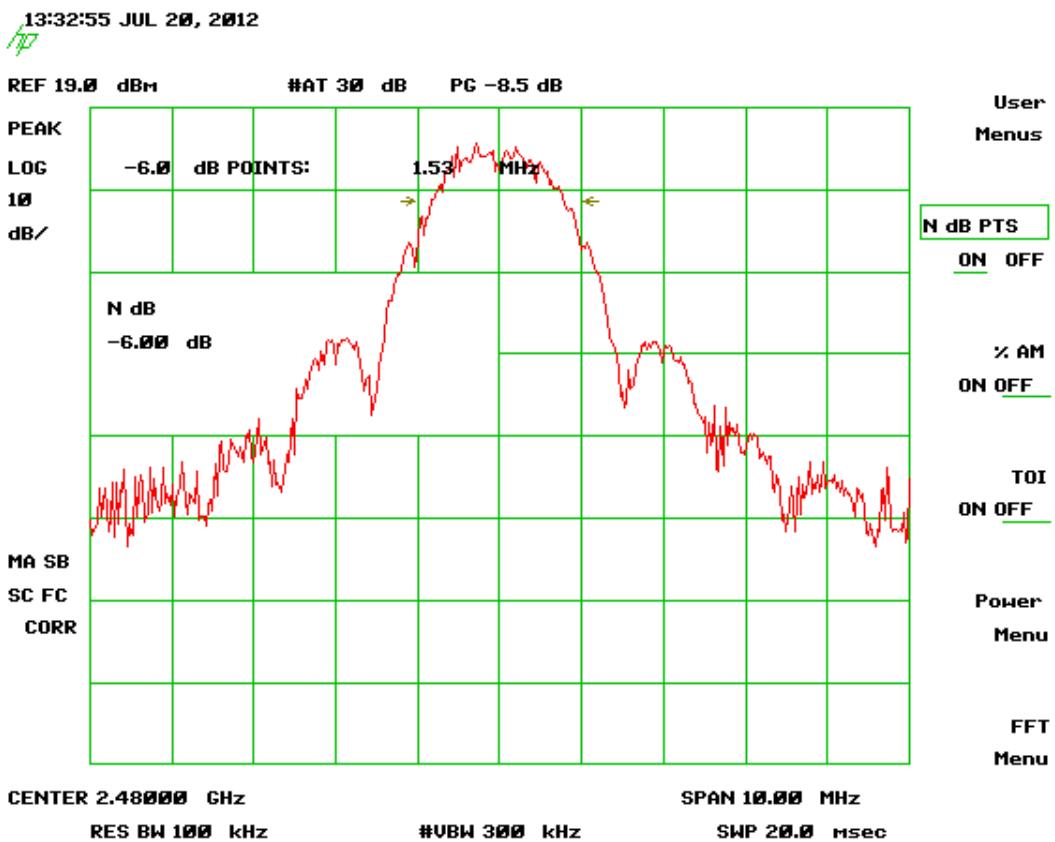


Figure 14 - Six dB Bandwidth - 15.247 (a) (2) - High Channel

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.12 Maximum Peak Conducted Output Power (CFR 15.247 (b) (3))

For the ROAMMOD0001 module, the transmitter was programmed to operate at a maximum of +20 dBm across the bandwidth.

Peak power within the band 2400 MHz to 2483.5 MHz was measured per FCC KDB Publication 558074 as an Antenna Conducted test with a spectrum analyzer by connecting the spectrum analyzer directly, via a short RF cable, to the antenna output terminals on the EUT. The spectrum analyzer was set for an impedance of 50 ? with the RBW set greater than the 6 dB bandwidth of the EUT, and the VBW = RBW. The loss of the short cable is 0.5 dB, and addition of an attenuator, 8.0 dB and the final corrected measurements were determined by adding 8.5 dB to the raw data measured values of Figures 15 to 17. Peak antenna conducted output power is tabulated in Table 9 below.

Antenna Conducted Output Power was measured at Low Channel, Mid Channel and High Channel frequencies. See Figures 15 to 17 above. The 0.5 dB loss for the RF wire is taken into consideration here (Corrected Measurement column).

**Table 13 - Peak Antenna Conducted Output Power per Part 15.247 (b) (3)
(Same as EIRP)**

Frequency of Fundamental (MHz)	Raw Test Data dBm	Corrected Measurement (dBm) (mW)		FCC Limit (mW Maximum)
2405	18.10	18.10	65.0	1000
2440	19.73	19.73	94.0	1000
2480	19.59	19.59	91.0	1000

Note: reference adjusted for correction factor, 8.5 dB for attenuator and cable loss.

Test Date: July 19, 2012

Tested By

Signature:

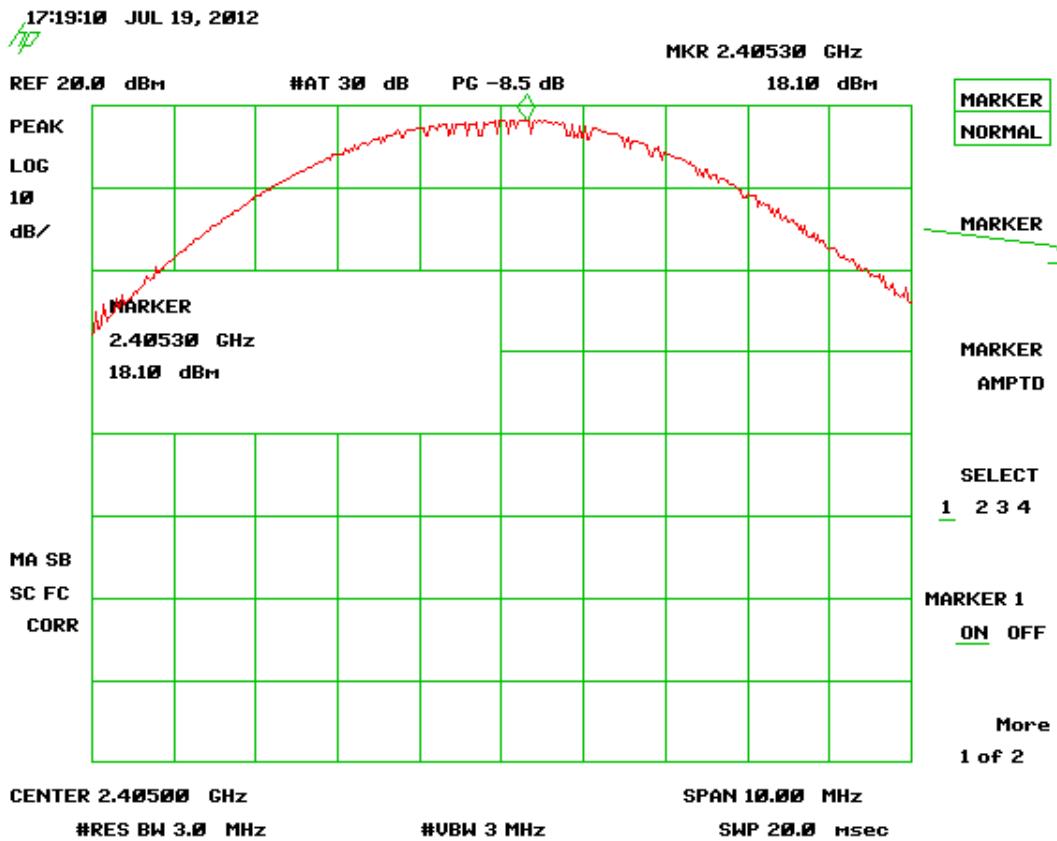


Name: George Yang

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.12 Peak Power Output (CFR 15.247 (b)(3))



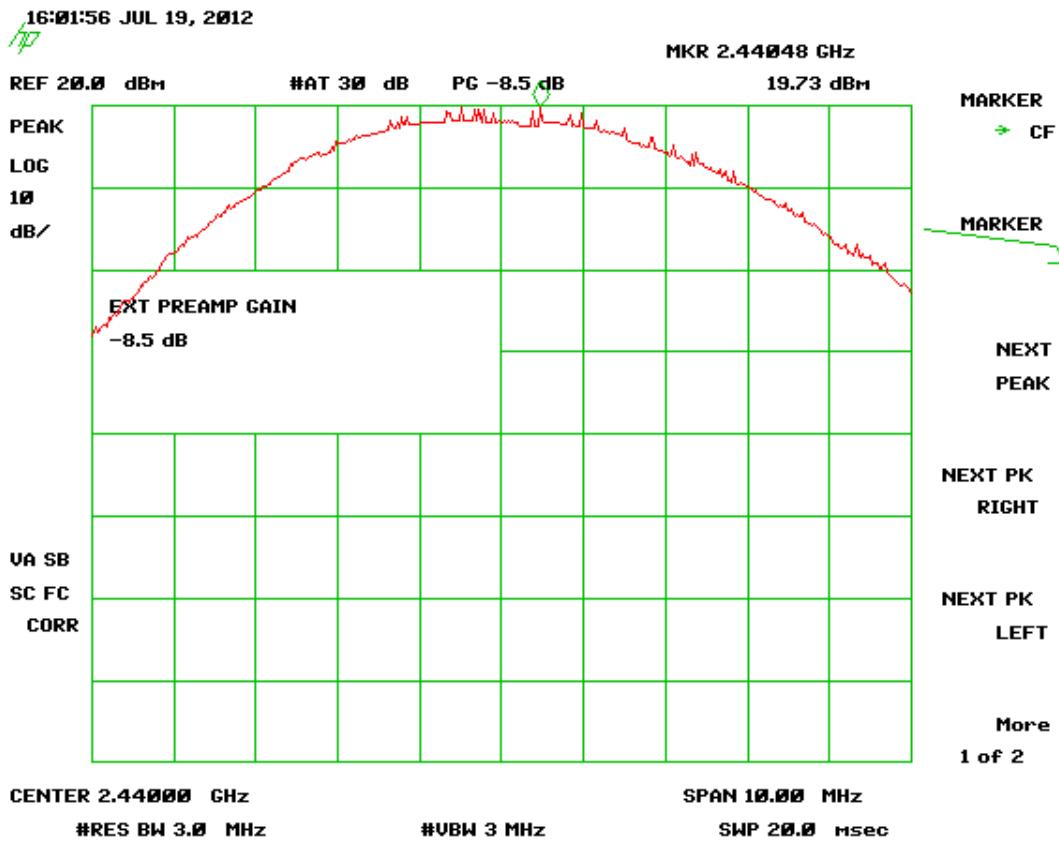
Note: reference adjusted for correction factor.

Figure 15 - Peak Antenna Conducted Output Power, Low Channel

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

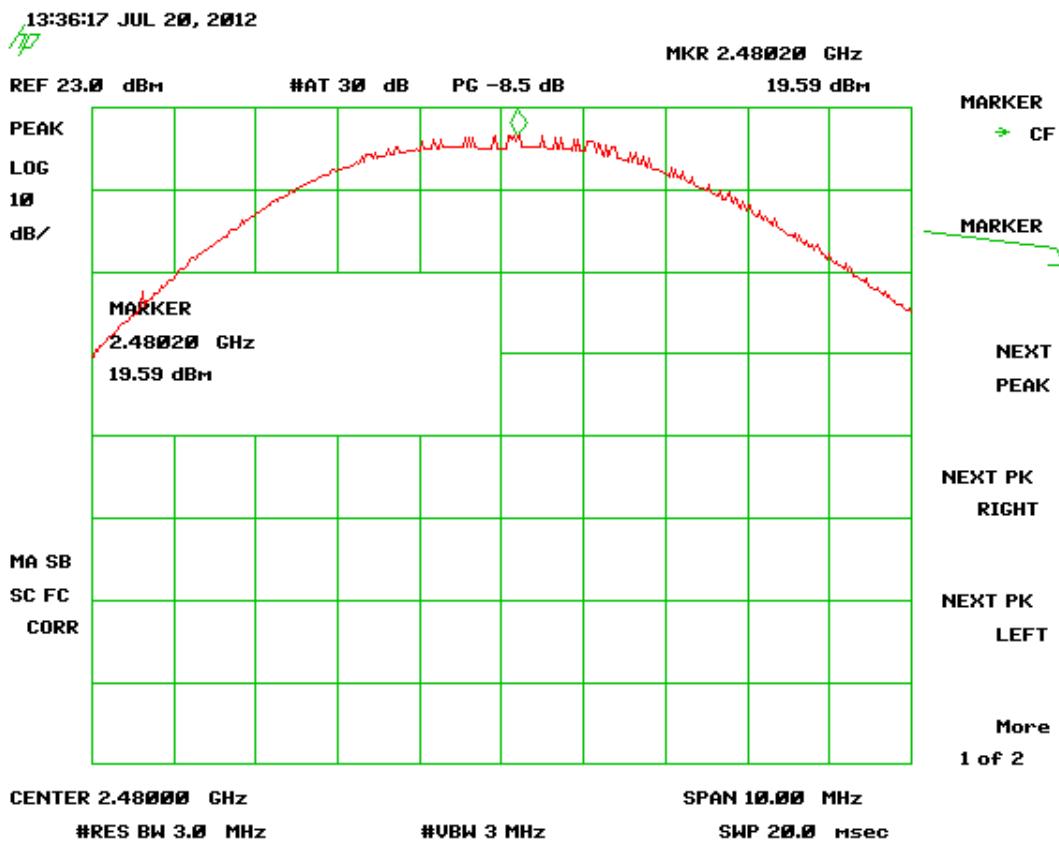
2.12 Peak Power Output (CFR 15.247 (b)(3))



Note: reference adjusted for correction factor.

Figure 16 - Peak Antenna Conducted Output Power, Mid Channel

2.12 Peak Power Output (CFR 15.247 (b)(3))



Note: reference adjusted for correction factor.

Figure 17 - Peak Antenna Conducted Output Power, High Channel

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.13 Power Spectral Density (CFR 15.247(e)) (IC RSS 210 A8.5)

The transmitter was placed into a continuous mode of operation at all applicable frequencies. The measurements were performed per the procedures of FCC KDB Procedure 558074. The RBW was set to 3 kHz and the Video Bandwidth was set to = RBW. The trace capture time was set to (Span/3 kHz).

In accordance with 15.247 (e), the power spectral density shall be no greater than +8 dBm per any 3 kHz band.

Results are shown in table 14 and Figures 18 through 20 below. Results are corrected by adding 0.5 dB to the measured value to account for the cable loss. All are less than +8 dBm per 3 kHz band.

Table 14. Power Spectral Density for Low, Mid and High Bands

Frequency (MHz)	Test Data (dBm/3 kHz)	Results (dBm/3 kHz)	FCC Limit (dBm/3 kHz)
Low-2405	3.40	3.40	+8.0
Mid-2440	5.40	5.40	+8.0
High-2475	5.90	5.90	+8.0

Note: reference adjusted for correction factor, 8.5 dB for attenuator and cable loss.

Test Date: July 20, 2012

Tested By

Signature: 

Name: George Yang

US Tech Test Report,

FCC ID:

Test Report Number:

Issue Date:

Customer:

Model:

FCC Part 15 Certification

UJX-ROAMMOD0001

12-0300

August 10, 2012

Acuity Brands

ROAMMOD0001

2.13 Power Spectral Density (CFR 15.247(e)) (IC RSS 210 A8.5)

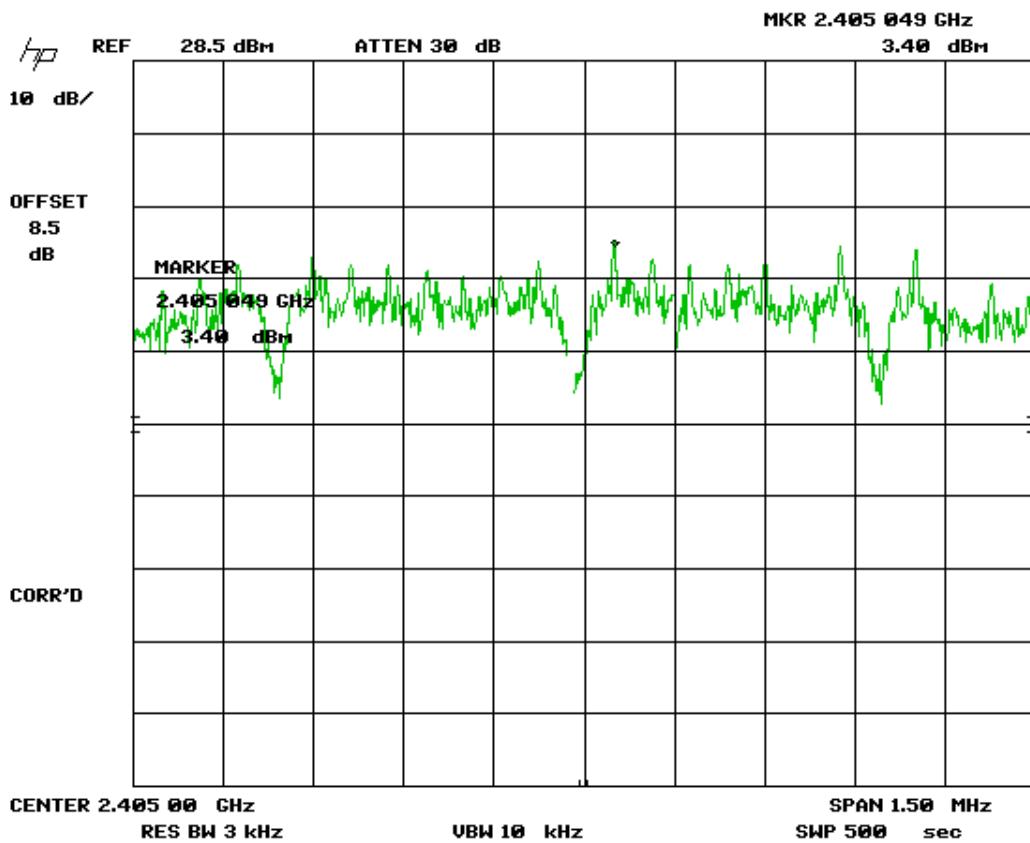


Figure 18. Peak Power Spectral Density - Part 15.247 (e) - Low Channel

Note: reference adjusted for correction factor, 8.5 dB for attenuator and cable loss.

2.13 Power Spectral Density (CFR 15.247(e)) (IC RSS 210 A8.5)

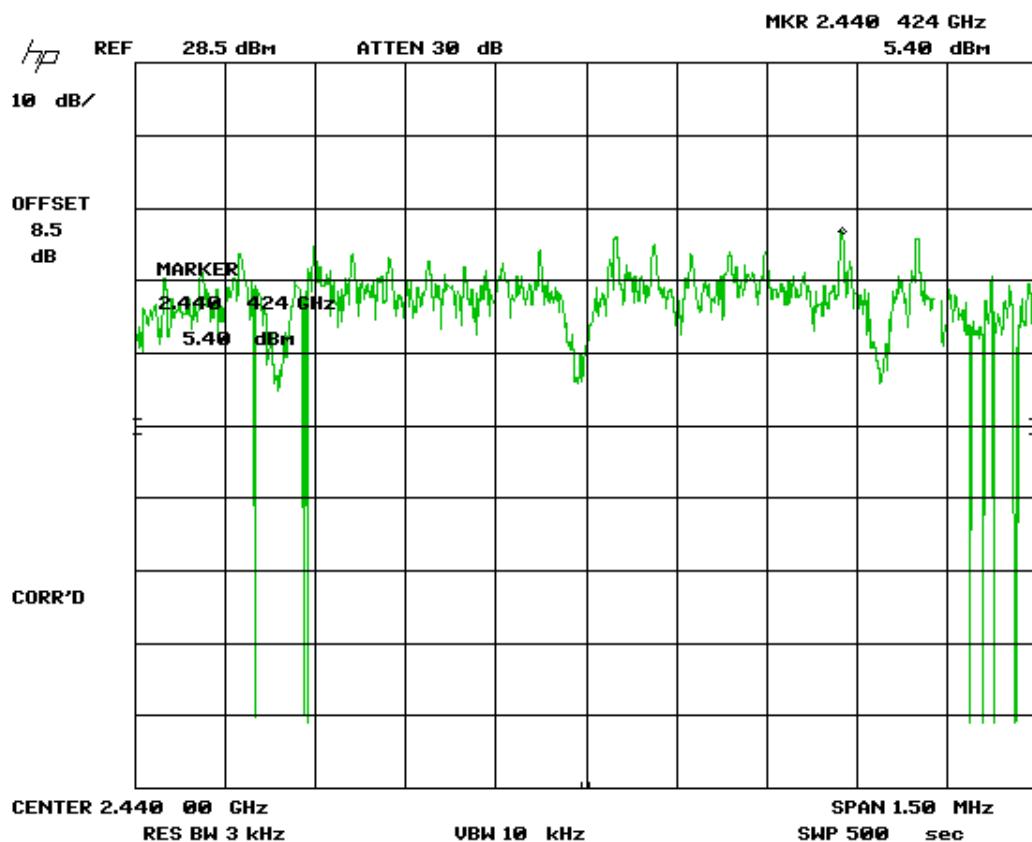


Figure 19. Power Spectral Density - Part 15.247 (e) - Mid Channel

Note: reference adjusted for correction factor, 8.5 dB for attenuator and cable loss.

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.13 Power Spectral Density (CFR 15.247(e)) (IC RSS 210 A8.5)

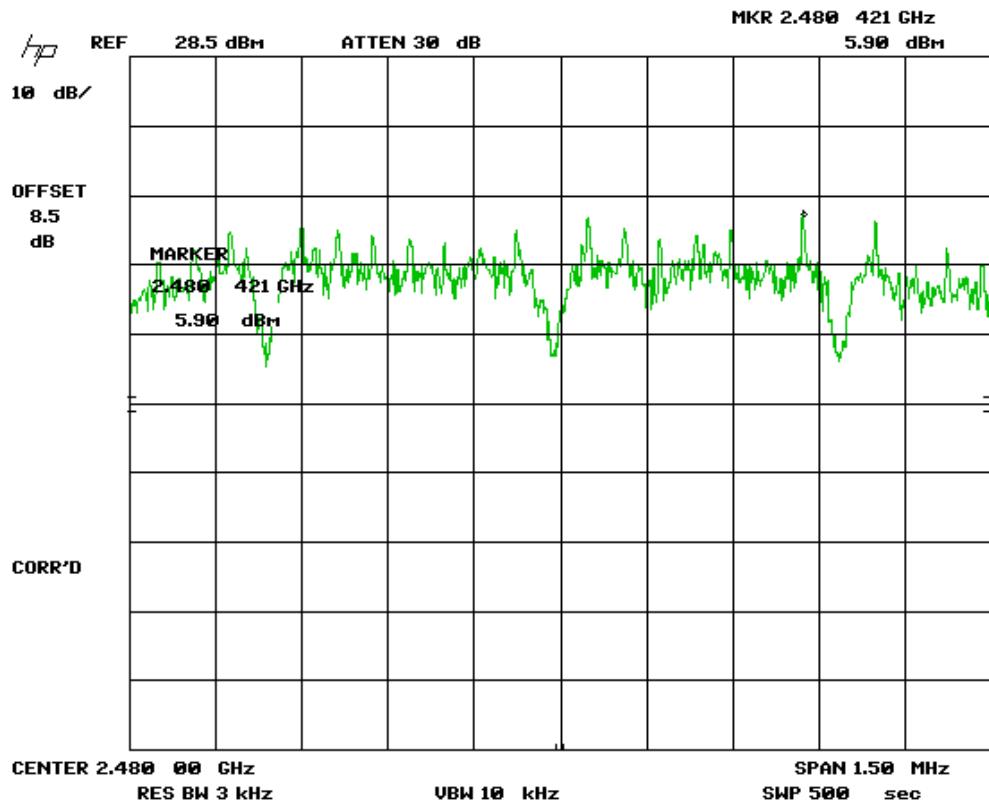


Figure 20. Peak Power Spectral Density - Part 15.247 (e) - High Channel

Note: reference adjusted for correction factor, 8.5 dB for attenuator and cable loss.

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.14 Band Edge Measurements – (CFR 15.247 (d))

Band Edge measurements are made following the guidelines in FCC KDB Publication No. 558074 with the EUT initially operating on the Lowest Channel and then operating on the Highest Channel within its band of operation. Antenna port conducted measurements are performed to demonstrate compliance with the requirement of 15.247(d) that all emissions outside of the band edges be attenuated by at least 20 dB when compared to its highest in-band value (contained in a 100 kHz band). Because these frequencies occur above 1000 MHz they have both a peak and average requirement.

To capture the band edge set the Spectrum Analyzer frequency span large enough (usually around 10 MHz) to capture the peak level of the emission operating on the channel closest to the band edge as well as any modulation products falling outside of the authorized band of operation. Conducted measurements are performed with RBW =1% of the frequency span. In all cases, the VBW is set = RBW. See figure 24 and 25 below.

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.14 Band Edge (Cont'd)

Table 15. Upper Band Edge - Radiated Emissions

Peak Radiated Higher Band Edge Measurements							
Test By: GY	Test: FCC Part 15.247			Client: Acuity Brands			
	Project: 12-0300	Class:	Model: ROAMMOD0001				
Frequency (MHz)	Test data	AF+CA- AMP+DC dB/m	Corrected Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarity	Margin (dB)	Detector PK / AVG
Internal Antenna							
Fundamental 2480.43	87.91	11.40	99.31		1hn3mV	PK	2480.43
Band Edge 2483.5	(99.31- 37.94)	--	61.37 61.37+(DC)	74.0 PK 54.0 AVG	3m./	See calculation below	PK

Note: row two shows the calculation process using the corrected fundamental value from row one.

Test Date: July 20, 2012

Tested By

Signature: 

Name: George Yang

The limit for the average value of radiated emissions in a Restricted Band is 54 dBuV/m. To compute the average values of the band edge emissions, the duty cycle correction factor of -20.0 dB is applied to the values in the Corrected Results column. After this correction the EUT is found to have met the restrictions placed on average radiated emissions in Restricted Bands. The worst-case measurement is computed below.

CALCULATION OF WORST-CASE AVERAGE UPPER BAND EDGE MEASUREMENT:

Results = Peak Corrected Results + Duty Cycle Correction Factor

Results = 99.31 dBuV/m -(?37.94 dB)= 61.37 dBuV/m + (DC-20.0 dB)= 41.37 dBuV/m

Margin = Limit – Results = 54 – 41.37 = 12.63 dB

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

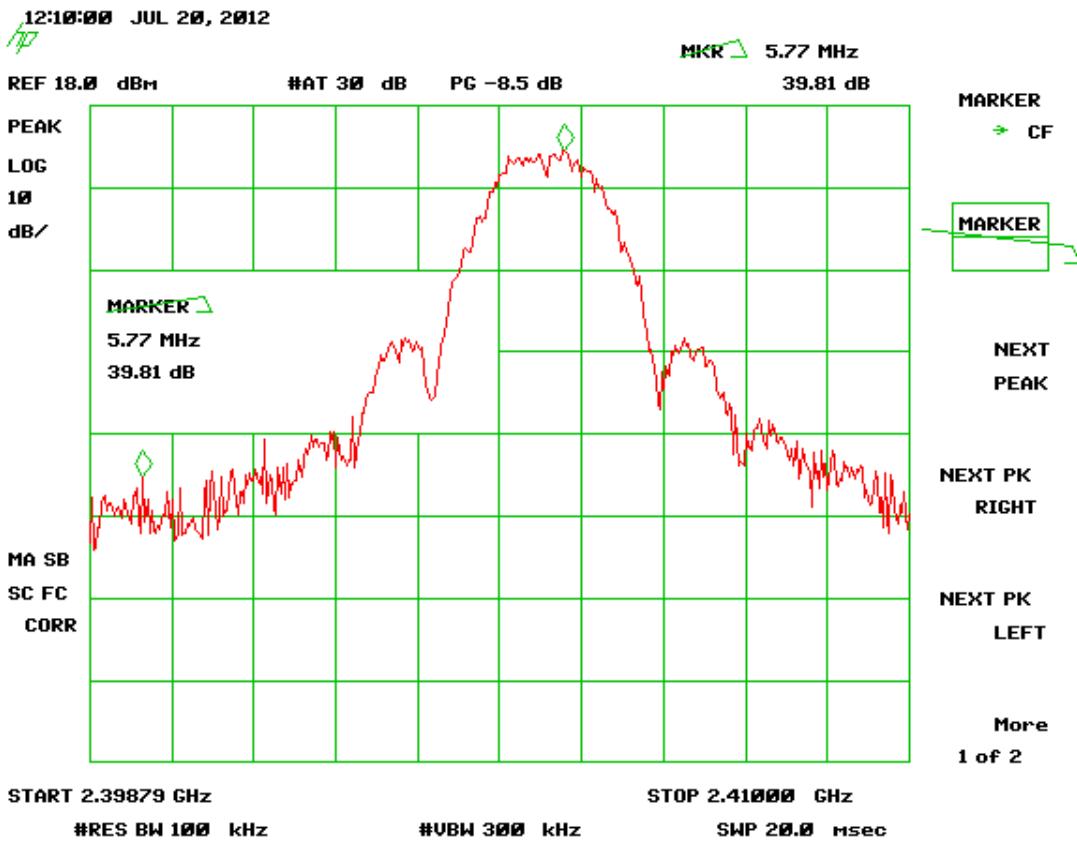


Figure 21. Band Edge Compliance – Low Channel Delta - Peak

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

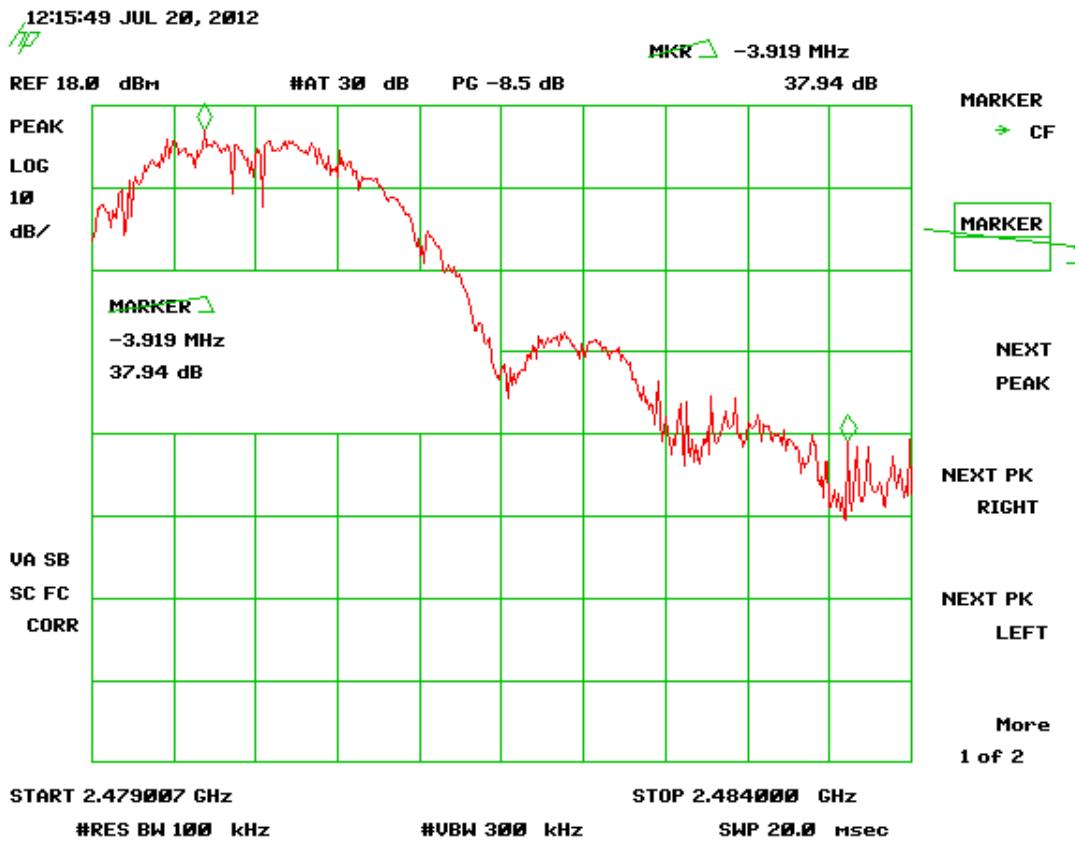


Figure 22. Band Edge Compliance – High Channel Delta - Peak

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.15 20 dB Bandwidth Measurement per CFR 15.247, 99% Occupied Bandwidth (IC RSS 210, A8.1)

The EUT antenna port was connected to a spectrum analyzer having a 50 Ω input impedance. Measurements were performed similar to the method of FCC, KDB Publication No. 558074 for a bandwidth of 20 dB. The RBW was set to approximately 1/100 of the manufacturers claimed RBW and with the VBW = RBW. The results of this test are given in Table 16 and Figures 23 through 25.

Table 16. 20 dB Bandwidth and 99% Occupied Bandwidth

Frequency (MHz)	20 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
2405.0	2.65	2.65
2440.0	2.65	2.65
2480.0	2.63	2.63

Test Date: July 20, 2012

Tested By

Signature:



Name: George Yang

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

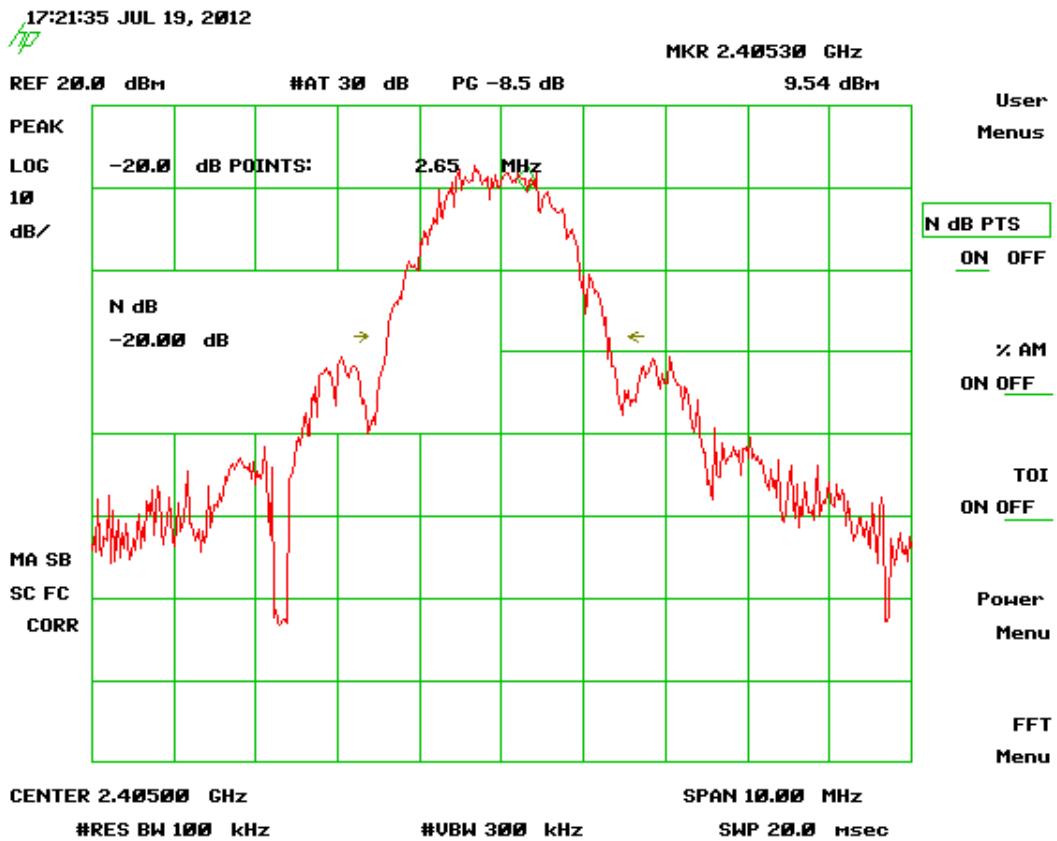


Figure 23. Low Channel 99% Bandwidth

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

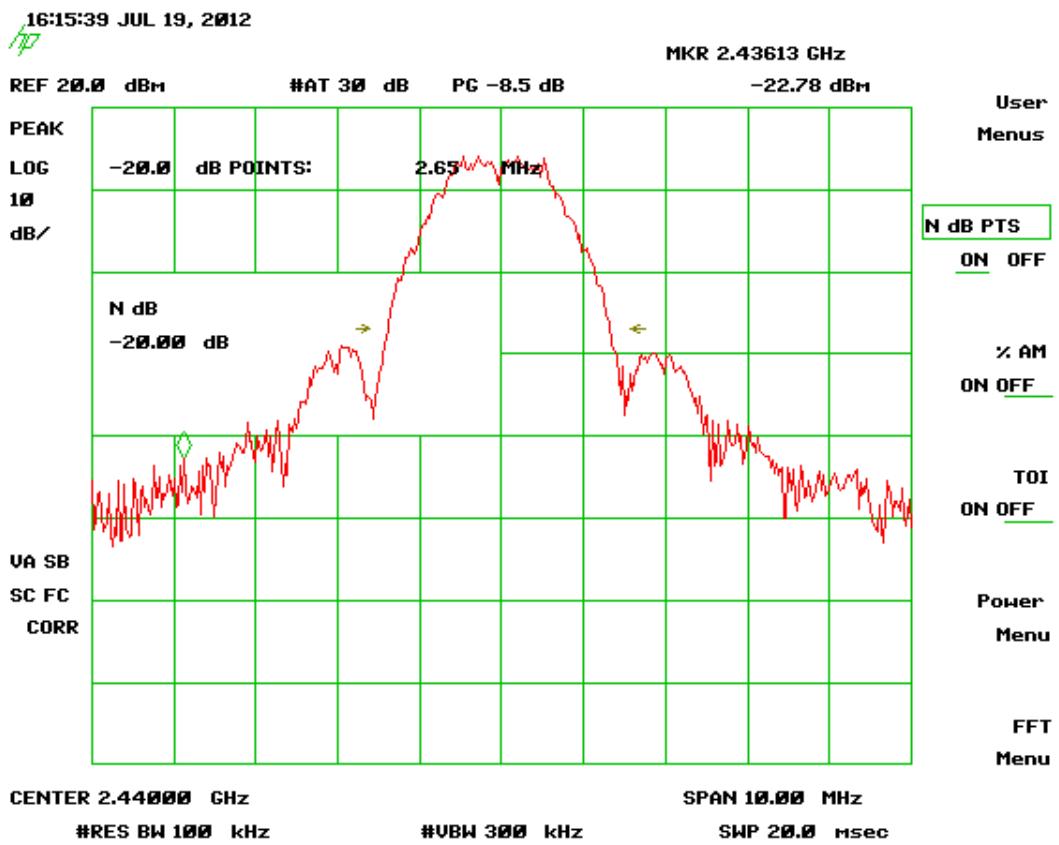


Figure 24. Mid Channel 99% Bandwidth

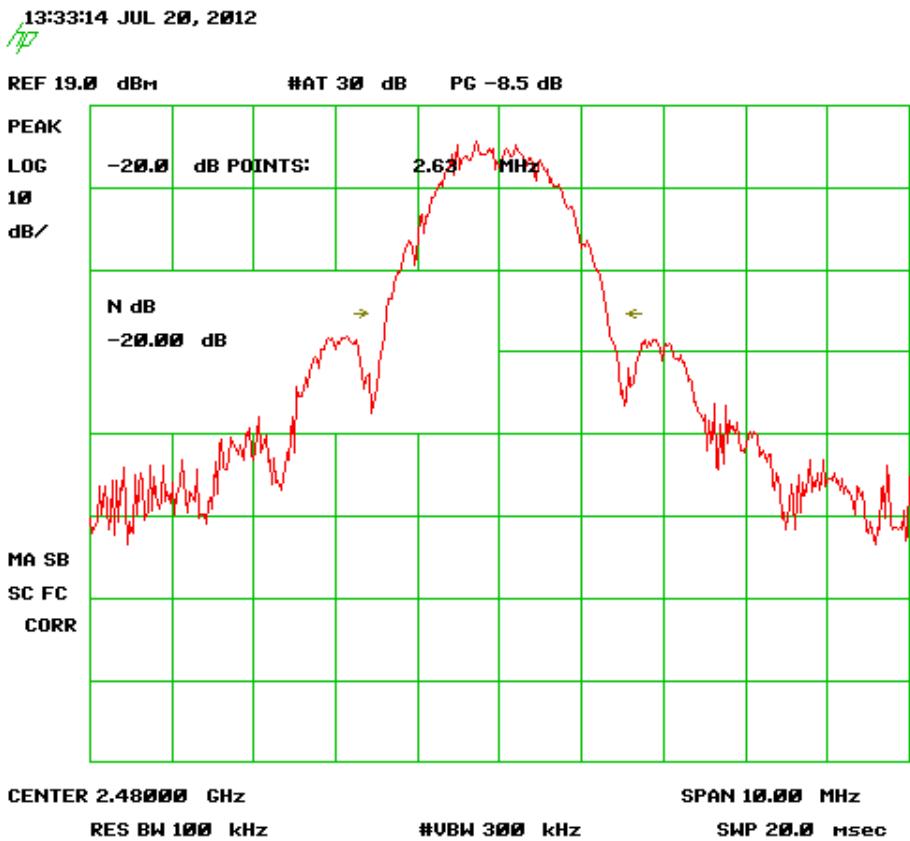


Figure 25. High Channel 99% Bandwidth

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.16 Unintentional Radiator Power Lines Conducted Emissions (CFR 15.207)

The test data provided herein is to support the Verification requirement for the digital apparatus. The power line conducted voltage measurements for Receiver and Digital Devices have been carried out in accordance with CFR 15.207 and ANSI C63.4:2003, Paragraph 7, with a spectrum analyzer connected to an LISN and the EUT placed into an idle condition or a continuous mode of receive (non-transmitting). Please refer to the results as shown in Table 17 below.

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.16 Unintentional Radiator Power Lines Conducted Emissions (Cont'd)

Table 17. Power Line Conducted Emissions Data, Class B Part 15.207, Peak Measurement vs. Avg. Limits

CONDUCTED EMISSIONS 150 kHz to 30 MHz						
Tested By: JW	Specification Requirement: FCC Part 15.207		Project No.: 12-0300	Manufacturer/Model: Acuity Brands Model ROAMMOD0001		
Frequency (MHz)	Test Data (dBuV)	LISN+CL-PA (dB)	Corrected Results (dBuV)	Avg Limits (dBuV)	Margin (dB)	Detector
120 VAC, 60 Hz, Phase Line						
0.1575	56.20	1.57	57.77	65.6*	7.8	PK
0.1575	31.40	1.57	32.97	55.6	22.6	AVG
0.8276	42.90	0.47	43.37	56.0*	12.6	PK
0.8276	27.80	0.47	28.27	46.0	17.7	AVG
2.0920	50.50	0.48	50.98	56.0*	5.0	PK
2.0920	36.00	0.48	36.48	46.0	9.5	AVG
5.5800	43.10	0.59	43.69	50.0	6.3	PK
10.2500	37.00	0.72	37.72	50.0	12.3	PK
25.7100	46.60	1.11	47.71	50.0	2.3	PK
120 VAC, 60 Hz, Neutral Line						
0.1694	52.70	1.39	54.09	65.0*	10.9	PK
0.1694	30.60	1.39	31.99	55.0	23.0	AVG
0.7430	46.60	0.46	47.06	56.0*	8.9	PK
0.7430	27.20	0.46	27.66	46.0	18.3	AVG
2.0830	41.30	0.48	41.78	56.0*	14.2	QP
2.0830	33.70	0.48	34.18	46.0	11.8	AVG
5.2400	43.30	0.57	43.87	50.0	6.1	PK
10.2400	38.90	0.71	39.61	50.0	10.4	PK
25.7900	45.90	1.10	47.00	50.0	3.0	PK

Tested from 150 kHz to 30 MHz

SAMPLE CALCULATIONS: At 0.1575 MHz, = 56.20 + (1.57) = 57.77 dBuV

Test Date: July 10, 2012

Tested By

Signature: 

Name: John Wynn

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

2.17 Unintentional Radiator, Radiated Emissions (CFR 15.209)

The test data provided herein is to support the verification requirement for digital devices. Radiated emissions coming from the EUT in a non-transmit state per 15.109 were evaluated from 30 MHz to 12.5 GHz as well as radiated emission coming for the EUT in a transmitting state per 15.209 and were investigated from 9kHz or the lowest operating clock frequency to 25 GHz and tested as detailed in ANSI C63.4, Paragraph 8. The worst case is presented in Table 18 below.

Radiated emissions within the band of 9 kHz to 30 MHz were investigated using a calibrated Loop Antenna and per the requirements of ANSI C63.4:2006.

Measurements were made with the analyzer's resolution bandwidth set to 120 kHz for measurements made below 1 GHz and 1 MHz for measurements made above 1 GHz. The video bandwidth was set to three times the resolution bandwidth; 1 MHz RBW and 3 MHz VBW. The test data were maximized for magnitude by rotating the turn-table through 360 degrees and raising and lowering the receiving antenna between 1 to 4 meters in height as a part of the measurement procedure.

All measured signals were at least 1.8 dB below the specification limit. The results are shown in Table 18 below. Those results are meant to show that this EUT's digital device portion has meet both the verification requirements under CFR Part 15.109 as an unintentional transmitter and to show that the EUT as an intentional transmitter has meet the requirements of CFR Part 15.209.

US Tech Test Report,
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15 Certification
UJX-ROAMMOD0001
12-0300
August 10, 2012
Acuity Brands
ROAMMOD0001

Table 18. Unintentional Radiator, Radiated Emissions

Unintentional Radiator, Radiated Emissions							
Test By: JW	Test: FCC Part 15.109/15.209		Client: Acuity Brands				
	Project: 12-0300 Class A		Model: ROAMMOD0001				
Frequency (MHz)	Test Data (dBuV)	AF+CL-PA (dB)	Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Margin (dB)	DETECTOR PK / QP
Tested from 9 kHz to 25 GHz							
126.0000	49.35	-12.47	36.88	43.5	GBI3mH	6.6	PK
77.4300	54.85	-19.95	34.91	40.0	GBI3mH	5.1	QP
165.0000	38.00	-9.61	28.39	43.5	GBI3mV	15.1	PK
78.9800	57.70	-19.55	38.16	40.0	GBI3mV	1.8	QP
330.0000	34.00	-8.83	25.17	46.0	1LP3mV	20.8	PK
549.0000	35.55	-5.59	29.96	46.0	1LP3mV	16.0	PK

No other emissions detected within 20 dB of the FCC Part 15.109/15.209 limits
AF is antenna factor. CL is cable loss. PA is preamplifier gain

SAMPLE CALCULATION: At 126.00 MHz: $= 49.35 + (-12.47) = 36.88$ dBuV/m @
3m
Margin = $(43.5 - 36.88) = 6.6$ dB

Test Date: July 10, 2012 & August 10, 2012

Tested By Signature: John C Wynn

Name: John Wynn