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Test Report issued under the responsibility of:

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TEST REPORT

FCC Part 15
Radio Frequency Devices
Subpart C – Intentional Radiators

Report Reference No. ..... :	ETRB20813, Rev. B
Compiled by (+ signature) ..... :	Kevin Johnson.
Approved by (+ signature) ..... :	Vincent W. Greb
Date of issue ..... :	20 August 2013
Report Revision ..... :	Rev. B
Total number of pages ..... :	76
Testing Laboratory ..... :	EMC Integrity, Inc.
Address ..... :	1736 Vista View Drive. Longmont, CO 80504 USA
	Tel: +1 303-776-7249 Fax: +1 303-776-7314
Applicant's name ..... :	Crucial Innovation, LLC
Address..... :	5445 Conestoga Court, Suite 100, Boulder, CO 80301.
Model(s) Tested..... :	VANTAGE
Test specification:	
Standard ..... :	FCC Part 15, Subpart C
Test procedure..... :	ANSI C63.4:2009
Non-standard test method ..... :	N/A
TRF Revision..... :	20 August 2013

Revision History

#	Description	Date
-	Original Report Release	7 May 2013.
A	Revised per TCB comments	23 July 2013
B	Revised per TCB comments	20 August 2013

Notices:

1. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.
2. The test results presented in this report relate only to the object tested.
3. The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.
4. "(see Enclosure #)" refers to additional information appended to the report.
5. Throughout this report a point is used as the decimal separator.
6. Dimensions in English units for convenience only, metric units prevail.

Table of Contents

Normative References

The following document(s) have been appropriately considered in the performance of the test results detailed in this report.

CFR Title 47, Part 15
Radio Frequency Devices

ANSI C63.4: 2009
American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

RSS 210, Issue 8
License-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

RSS-Gen, Issue 3:2010
General Requirements and Information for the Certification of Radio Apparatus

Equipment Under Test (EUT)

Details:

Test item description:

Model ..... :	VANTAGE
Serial Number ..... :	1
Production Status ..... :	☒ Production* ☐ Pre-Production ☐ Prototype *Production unit was specially modified with USB Connector so that a standard USB cable could be used to power the EUT during testing.
Other Status Info ..... :	N/A.
EUT Received Date ..... :	15 August 2012
Ratings ..... :	4 Vdc ☐ 1ϕ ☐ 3ϕ ☒ USB

General product description:

- This module is designed specifically for VANTAGE hardware. The Vantage CCD, Harness, Probe and USB dongle all utilize the VANTAGE PCB and communicate on 1 of 16 possible channels in the frequency range in the 2.450GHz frequency band. Power is provided to each VANTAGE module via USB.

Modifications to the EUT required for compliance:

There have been no modifications to the EUT as a result of this evaluation. However, as stated above, a USB connector was soldered onto the board to allow the EUT to be powered during testing.

Deviations from Test Methodology:

There have been no deviations, additions to, or exclusions from the specified test standard.

Engineering Judgements:

It should be noted that although this product does transmit using ZigBee (IEEE 802.15.4), its maximum RF output power is less than 1 mW (0 dBm). Thus, FCC 15.249 was used for certification.

Approved by (+ signature) ..... : Vincent W. Greb

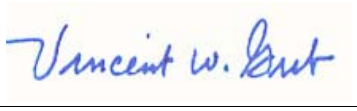


Table 1 – EUT Internal Operating Frequencies

Frequency (MHz)	Description	Frequency (MHz)	Description
0.032768	Watchdog Timer		
16.000	Unknown		
24.000	RF oscillator and clock generator		
2,400	Tx frequency		

Table 2 – EUT Operating Modes Used During Testing

Mode #	Description
1	Transmit mode – Low Band w/o modulation
2	Transmit mode – Low Band w/ modulation
3	Transmit mode – Mid Band w/o modulation
4	Transmit mode – Mid Band w/ modulation
5	Transmit mode – High Band w/o modulation
6	Transmit mode – High Band w/ modulation
7	Receive mode

EUT Configuration

A minimum representative configuration, as defined by the manufacturer, has been used for the testing performed herein. The selection of hardware (including interface ports), software, and cables were chosen by the manufacturer as being representative of the product's intended use. The interconnection of various articles of equipment and the types of cables used has also been defined by the manufacturer.

Testing was performed for all three orthogonal axes of the UUT, and the worst-case orientation was used for the final measurements. The final placement of the equipment under test has been, to the extent practical, arranged to maximize emissions. The UUT was operated using a continuous (i.e., 100%) duty cycle for all testing.

Cables, of the type and length specified by the manufacturer, were connected to at least one of each type of interface port provided by the EUT and if practical, were terminated by a device typical of actual usage. For multiple ports of the same type, the addition of cables did not significantly affect the emission level (i.e. < 2B variation).

The arrangement of external power supply units was as follows:

a) If the mains input cable of the external power supply unit is greater than 0,8 m, the external power supply unit shall be placed on the tabletop, with a nominal 0,1 m separation from the host unit.
b) If the external power supply unit has a mains input cable that is less than 0,8 m, the external power supply unit shall be placed at a height above the ground plane such that its power cable is fully extended in the vertical direction.
c) If the external power supply unit is incorporated into the mains power plug, it shall be placed on the tabletop. An extension cable shall be used between the external power supply unit and the source of power . The extension cable should be connected in a manner such that it takes the most direct path between the external power supply unit and the source of power.

Figure 1 - EUT Configuration Diagram

SYSTEM BLOCK DIAGRAM

The following is the Vantage RF Module USB Dongle system level block diagram.

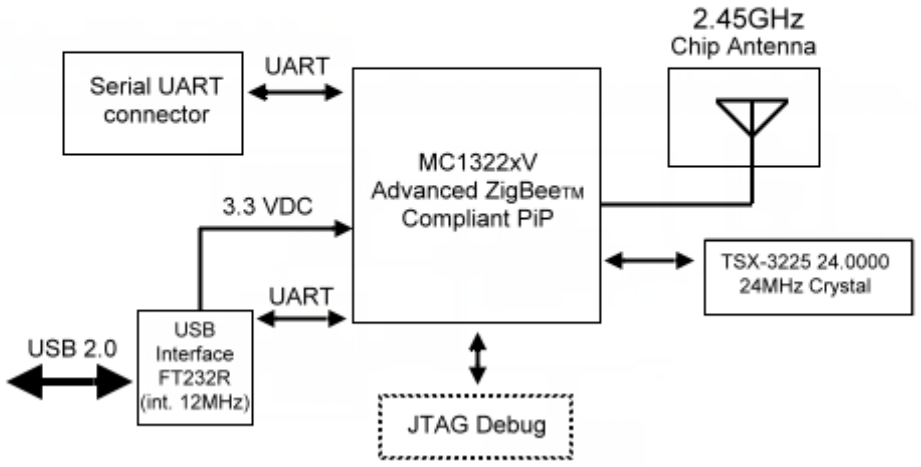


Table 3 – EUT & Auxiliary Equipment List

Item	Use*	Product Type	Manufacturer	Model	Serial No.
AA	EUT	Communication Module	Crucial Innovations, Inc.	VANTAGE	1
BB	AE	AC Power Adapter	HTC	TC U250	79H00095-01M
C					
D					
E					
F					

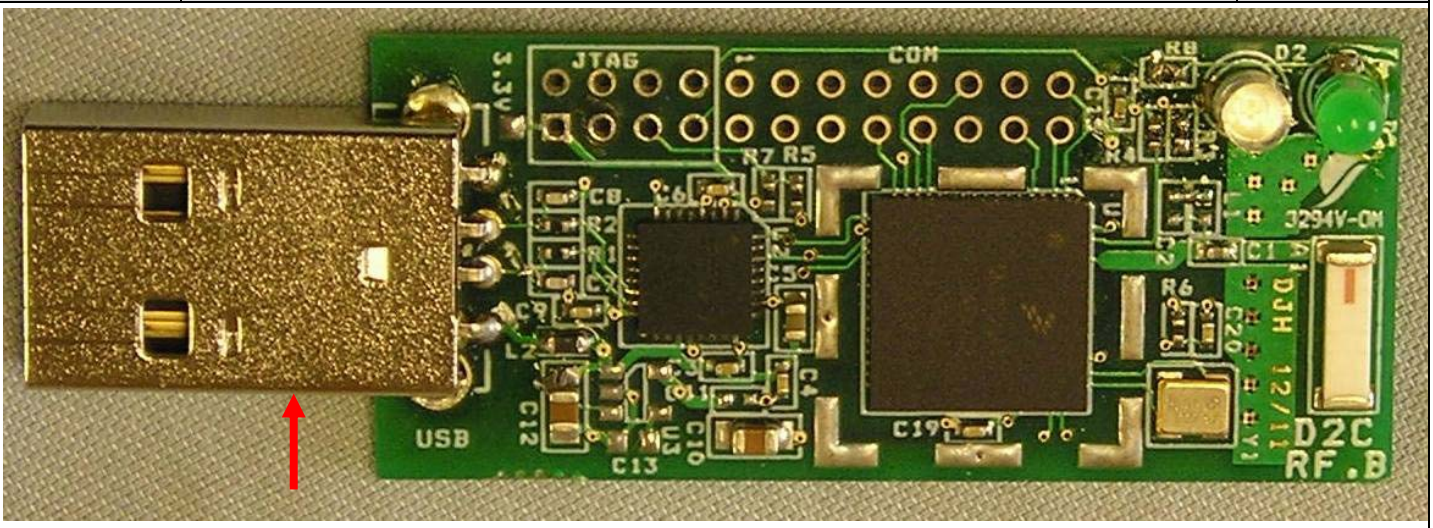
Note:
* Use = EUT - Equipment Under Test,
AE - Auxiliary/Associated Equipment, or
SIM - Simulator (Not Subjected to Test)

Table 4 - Interconnecting Cables List

Item	Use*	Cable Type
1		
2		
3		
4		
5		
6		
7		

EUT Photo(s)

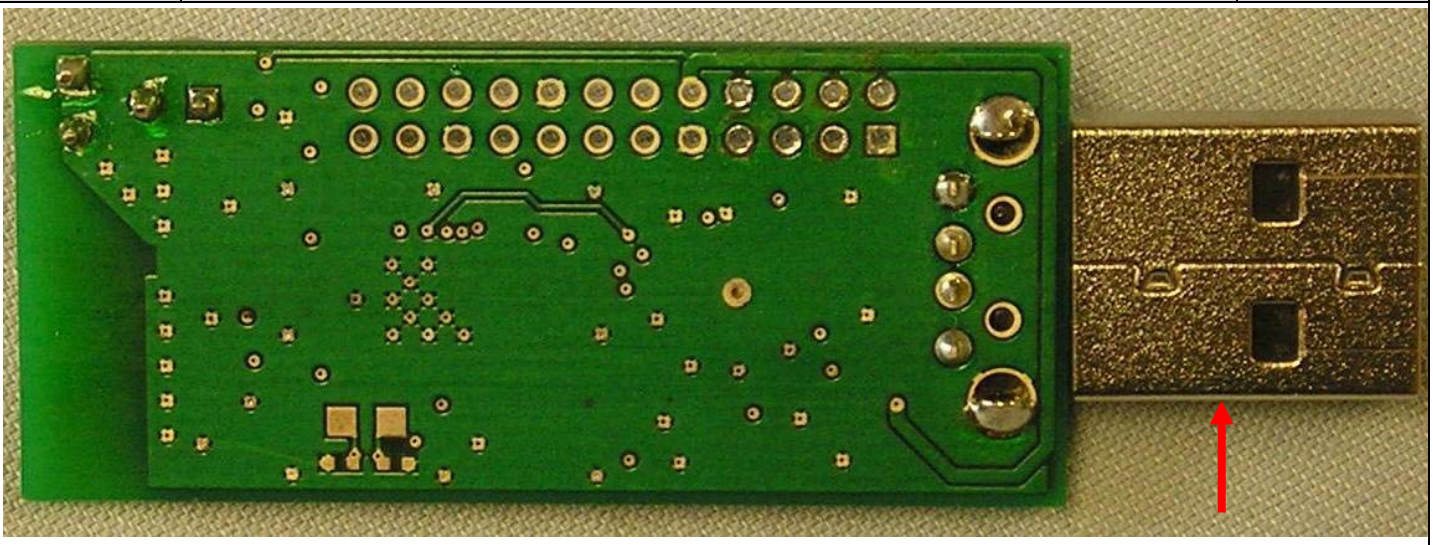
Photo 1	EUT Photo – Front View	



Supplemental Information:

It should be noted that the USB connector (red arrow) was added to facilitate powering the device during testing.

Photo 2	**EUT Photo – Bottom View**	



Supplemental Information:

It should be noted that the USB connector (red arrow) was added to facilitate powering the device during testing.

Summary of Testing

Possible test case verdicts:

- test case does not apply to the test object : N/A
- test object does meet the requirement .....: P (Pass)
- test object does not meet the requirement : F (Fail)
- not tested (not part of this evaluation) .....: NT

Date(s) of performance of tests .....: 27, 28 and 29 August, 2012.

Clause	Test Description	Verdict	Comment
47 CFR			
15.203	Antenna Requirement	P	
15.207	Conducted Emissions - Mains	P	
15.209	Radiated Emissions – Restricted Bands	P	
15.249 (a)	Field Strength of Fundamental	P	
15.249(a)	Field Strength of Harmonics	P	
15.249(c)	Spurious/Out of Band Emissions	P	
15.249(c)	Band Edge	P	
2.1029	20 dB Occupied Bandwidth	P	
RSS 210			
RSS GEN 7.2.4	Conducted Emissions - Mains	P	See Note
RSS GEN 7.2.2	Radiated Emissions – Restricted Bands	P	
A8.1	20 dB Occupied Bandwidth	P	
A8.4	Peak RF Output Power	P	
A8.5	Spurious Emissions	P	
RSS GEN 5.6	RF Exposure	P	

Notes:

Conducted emissions testing was performed on the AC input of a device which converted line voltage to 5 Vdc for USB power. Testing was performed with the EUT in Tx Low, Tx Mid, Tx High and Rx modes.

General remarks:

Summary of compliance with national requirements:

Compliance with this standard provides a means of conformity with the United States Federal Communication Commission (FCC) verification, certification, or declaration of conformity authorization procedures and Industry Canada (IC) rules.

Testing Location			
Testing Laboratory:			
Testing location/ address	:	EMC Integrity, Inc. 1736 Vista View Drive Longmont, CO 80504	
Testing procedure: TMP			
Tested by (name + signature)	:	Kevin Johnson	
Approved by (+ signature)	:	Vincent W. Greb	
Testing location/ address	:	EMC Integrity, Inc. 1736 Vista View Drive Longmont, CO 80504	
Supplemental Information:			
Testing results contained herein were performed at the location(s) listed above.			

Procedural Requirements

The following requirements are taken from the appropriate rules, other rules may apply and the manufacturer should consult the full text of the appropriate laws prior to marketing any device.

United States

Mandated procedures for digital devices are defined in 47 CFR 15.201, *Equipment authorization requirement*. Details of the authorization procedures (verification, declaration of conformity, and certification) can be found in 47 CFR, Part 2, Subpart J, *Equipment Authorization Procedures*.

Canada

Standard RSS-GEN contains the procedural requirements.

Information to the User and Labeling Requirements

The following requirements are taken from the appropriate rules, other rules may apply and the manufacturer should consult the full text of the appropriate laws prior to marketing any device.

United States

Labeling

47 CFR 2.925

(a) Each equipment covered in an application for equipment authorization shall bear a nameplate or label listing the following:

(1) FCC Identifier consisting of the two elements in the exact order specified in §2.926. The FCC Identifier shall be preceded by the term *FCC ID* in capital letters on a single line, and shall be of a type size large enough to be legible without the aid of magnification.

Example: FCC ID XXX123. XXX—Grantee Code 123—Equipment Product Code

47 CFR 15.19

(a) In addition to the requirements in part 2 of this chapter, a device subject to certification, or verification shall be labeled as follows:

(3) All other devices shall bear the following statement in a conspicuous location on the device:

> This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

47 CFR 15.19(b)(2) Label text and information should be in a size of type large enough to be readily legible, consistent with the dimensions of the equipment and the label. However, the type size for the text is not required to be larger than eight point.

47 CFR 15.19(b)(3): When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (b)(1) of this section on it, such as for a CPU board or a plug-in circuit board peripheral device, the text associated with the logo may be placed in a prominent location in the instruction manual or pamphlet supplied to the user. However, the unique identification (trade name and model number) and the logo must be displayed on the device.

47 CFR 15.19(b)(4): The label shall not be a stick-on, paper label. The label on these products shall be permanently affixed to the product and shall be readily visible to the purchaser at the time of purchase, as described in §2.925(d) of this chapter. “Permanently affixed” means that the label is etched, engraved, stamped, silkscreened, indelibly printed, or otherwise permanently marked on a permanently attached part of the equipment or on a nameplate of metal, plastic, or other material fastened to the equipment by welding, riveting, or a permanent adhesive. The label must be designed to last the expected lifetime of the equipment in the environment in which the equipment may be operated and must not be readily detachable.

Information to User

47 CFR 15.21: The user’s manual or instruction manual for an intentional or unintentional radiator shall caution the user that:

> Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.

Canada

Labeling

RSS –GEN 5.2: Every unit of Category I radio apparatus certified for marketing and use in Canada shall bear a permanent label on which is indelibly displayed the model number and Industry Canada certification number of the equipment model (transmitter, receiver, or inseparable combination thereof). Each model shall be identified by a unique combination of a model number and a certification number, which are assigned as described below in this section. The label shall be securely affixed to a permanently attached part of the device, in a location where it is visible or easily accessible to the user, and shall not be readily detachable. The label shall be sufficiently durable to remain fully legible and intact on the device in all normal conditions of use throughout the device's expected lifetime. These requirements may be met either by a separate label or nameplate permanently attached to the device or by permanently imprinting or impressing the label directly onto the device.

The label text shall be legible without the aid of magnification, but is not required to be larger than 8-point font size. If the device is too small to meet this condition, the label information may be included in the user manual upon agreement with Industry Canada.

The model number is assigned by the applicant and shall be unique to each model of radio apparatus under that applicant's responsibility. The model number shall be displayed on the label preceded by the text: "Model:", so it appears as follows:

Model: model number assigned by applicant

The certification number is made up of a Company Number (CN) assigned by Industry Canada's Certification and Engineering Bureau followed by the Unique Product Number (UPN), assigned by the applicant.

The certification number shall appear as follows:

IC: XXXXXX-YYYYYYYYYYY

where:

XXXXXX-YYYYYYYYYYY is the certification number;

XXXXXX is the Company Number (CN) assigned by Industry Canada, made of at most 6 alphanumeric characters (A-Z, 0-9), including a letter at the end of the CN to distinguish between different company addresses;

YYYYYYYYYYY is the Unique Product Number (UPN) assigned by the applicant, made of at most 11 alphanumeric characters (A-Z, 0-9); and the letters "IC" (Industry Canada) are to indicate the Industry Canada certification number, but are not part of the certification number.

Permitted alphanumerical characters used in the CN and UPN are limited to capital letters (A-Z) and numerals (0-9). Example: A company has been assigned a CN of "21A" and wishes to use a UPN of "WILAN3" for one of its products. The full Industry Canada certification number of this product would thus be: IC: 21A-WILAN3.

Category I equipment that is not labeled with the model number and the certification number as described above is not considered certified.

Notices to the User

RSS-GEN 5.3: Radio apparatus shall comply with the requirements to include required notices or statements to the user of equipment with each unit of equipment model offered for sale.

The required notices are specified in the RSS documents (including RSS-Gen) applicable to the equipment model. These notices are required to be shown in a conspicuous location in the user manual for the equipment,

or to be displayed on the equipment model. If more than one notice is required, the equipment model(s) to which each notice pertains should be identified. Suppliers of radio apparatus shall provide notices and user information in both English and French.

RSS-GEN 7.1.3: User manuals for licence-exempt radio apparatus shall contain the following or equivalent notice in a conspicuous location in the user manual or alternatively on the device or both.

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

User manuals for transmitters shall display the following notice in a conspicuous location:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number, or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi) and required impedance for each.

Technical Requirements

The testing requirements, as appropriate, were derived from ANSI C63.4; 47 CFR, Subpart A, RSS 210 and RSS GEN.

Conducted Emissions

The mains cable of the EUT or EUT host unit was connected to the LISN defined in this standard and is bonded to the reference plane. Where applicable, remaining auxiliary equipment was powered through an additional LISN (also bonded to the reference plane), using a multi-socket outlet strip if necessary. The LISNs were at least 0.8m away from the EUT. A vertical ground plane was used while the table-top EUTs were placed on a wooden table 0.8m high. Floor-standing EUTs were insulated from the ground plane and grounded according to the manufacturer's instructions.

Signal cables were positioned for their entire lengths, as far as possible, at a nominal distance of 0.4 m from the ground reference plane. Where the mains cable supplied by the manufacturer was longer than 1 m, the excess was folded at the centre into a bundle no longer than 0.4 m, so that its length is shortened to 1 m. If the 1 m cable length cannot be achieved owing to physical limitations of the EUT arrangement, the cable length shall be as near to 1 m as possible.

All telecommunication and signal ports were correctly terminated using either appropriate associated equipment or a representative termination during the measurement of the conducted disturbances at the mains. If an ISN is connected to a telecommunications port during the measurement of conducted disturbances at the mains port, then the ISN receiver port was terminated in 50Ω. The ISNs were at least 0.8m away from the EUT.

Mains

Any power cable(s) from the equipment under test that were directly connected to the AC Mains have been tested. In the event that the equipment under test had no direct connection to the Mains, that is, it was connected to a Host unit (example: USB powered); then conducted emissions was performed on the Mains of the Host unit. Battery powered equipment was not tested for conducted emissions; however, if the equipment makes provisions for connections to a battery charger that is connected to the Mains, then conducted emissions were performed on the battery charger.

Table 5 – Class B Conducted Emissions Limits - Mains

Frequency	Limits (dBµV)	
	Quasi-peak	Average
150 kHz – 500 kHz	66 - 56	5-46
500 kHz – 5 MHz	56	46
5 MHz – 30 MHz	60	50
NOTE 1: The lower limit shall apply at the transition frequency. NOTE 2: The limit decreases linearly with the logarithm of the frequency in the range 150 kHz to 500 kHz.		

Radiated Emissions – Restricted Bands

The arrangement of the equipment is typical of a normal installation practice and as was practical, the arrangement was varied and emissions investigated for maximum amplitude. Final measurements were performed in a semi-anechoic chamber. The equipment was rotated 360° and the antenna height has been varied between 1m and 4m. Measurements were taken at both horizontal and vertical antenna polarities. The receiver bandwidth was set to 120 kHz for measurements below 1 GHz, and 1 MHz for measurements above 1 GHz. A peak detector is used to detect an emission; a quasi-peak detector may be used to record a final measurement below 1 GHz and an average detector may be used above 1 GHz. An inverse proportionality factor of 20 dB/decade (10 dB) was used, as noted in 15.31(f)(1), to normalize the measured data to the specified test distance for determining compliance.

Frequency range of radiated measurements (15.33(a)):

Operating frequency of intentional radiator	Lowest frequency searched	Highest frequency searched
Below 10 GHz	9 kHz or lowest operating frequency generated in the device, whichever is highest	10th harmonic of highest fundamental frequency or 40 GHz, whichever is lower
10 – 30 GHz	9 kHz or lowest operating frequency generated in the device, whichever is highest	5th harmonic of highest fundamental frequency or 100 GHz, whichever is lower
At or above 30 GHz	9 kHz or lowest operating frequency generated in the device, whichever is highest	5th harmonic of highest fundamental frequency or 200 GHz, whichever is lower

Restricted Bands 47 CFR 15.205

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
[1]0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	([2])
13.36–13.41			

Restricted Bands RSS GEN

MHz	MHz	MHz	GHz
0.090-0.110	12.57675-12.57725	960-1427	9.0-9.2
2.1735-2.1905	13.36-13.41	1435-1626.5	9.3-9.5
3.020-3.026	16.42-16.423	1645.5-1646.5	10.6-12.7
4.125-4.128	16.69475-16.69525	1660-1710	13.25-13.4
4.17725-4.17775	16.80425-16.80475	1718.8-1722.2	14.47-14.5
4.20725-4.20775	25.5-25.67	2200-2300	15.35-16.2
5.677-5.683	37.5-38.25	2310-2390	17.7-21.4
6.125-6.218	73-74.6	2655-2900	22.01-23.12
6.6775-6.26825	74.8-75.2	3260-3267	23.6-24.0
6.31175-6.31225	108-138	3332-3339	31.2-31.8
8.291-8.294	156.52475-156.52525	3345.8-3358	36.43-36.5
8.362-8.366	156.7-156.9	3500-4400	Above 38.6
8.37625-8.38675	240-285	4500-5150	
8.41425-8.41475	322-335.4	5350-5460	
12.29-12.293	399.9-410	7250-7750	
12.51975-12.52025	608-614	8025-8500	

Radiated Emission Limit – Restricted Bands

Reading on the measuring receiver showing fluctuations close to the limit, were observed for at least 15 s at each measurement frequency; the highest reading was recorded.

Table 6 – Radiated Emissions Limits per 47 CFR 15.209(a) & RSS-GEN 7.2.5

Frequency Range	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance (m)
9 kHz – 490 kHz	2400/F(kHz)	48.5 – 13.8	300
490 kHz – 1.705 MHz	24000/F(kHz)	33.6 – 23.0	30
1.705 MHz – 30 MHz	30	29.5	30
30 MHz – 88 MHz	100	40.0	3
88 MHz – 216 MHz	150	43.5	3
216 MHz – 960 MHz	200	46.0	3
Above 960 MHz	500	54.0	3

Field Strength Limits – Fundamental and Harmonics

Table 7 – Field Strength Limits (Fundamental & Harmonics) per 47 CFR 15.249

Fundamental	Field Strength of Fundamental (mV/m)	Field Strength of Harmonics (μV/m)	Measurement Distance (m)
902 - 928 MHz	50	500	3
2400 – 2483.5 MHz	50	500	3
5725 - 5875 MHz	50	500	3
24.0 – 24.25 GHz	250	2500	3

Table 8 – Field Strength Limits (Fundamental & Harmonics) per 47 CFR 15.249

Fundamental	Field Strength of Fundamental (dBμV/m)	Field Strength of Harmonics (dBμV/m)	Measurement Distance (m)
902 - 928 MHz	94	54	3
2400 – 2483.5 MHz	94	54	3
5725 - 5875 MHz	94	54	3
24.0 – 24.25 GHz	108	68	3

20 dB Occupied Bandwidth

The 20 dB Occupied Bandwidth is measured at low, mid, and high channels and with each modulation mode.

Spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel

RBW ≥ 1% of the 20 dB bandwidth

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Spurious Emissions

15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits is not required. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits specified.

Spectrum analyzer settings (Below 1 GHz):

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

RBW = 100 kHz

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Spectrum analyzer settings (Above 1 GHz):

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

RBW = 1 MHz

VBW = 3 MHz

Sweep = auto

Detector function = peak

Trace = max hold

Band edge spurious emissions:

Measurement shall be made in the following bands:

2310 – 2390 MHz

2483.5 – 2500 MHz

Span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation

RBW ≥ 1% of the span

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Measurement Uncertainty

Determining compliance with the limits in these standards was based on the results of the measurement, and does not take into account the measurement instrumentation uncertainty.

Referencing the measurement instrumentation uncertainty considerations contained in CISPR 16-4-2, the expanded measurement uncertainty is ±4.67 dB for radiated emissions, ±3.04 dB for mains conducted emissions, and ±4.30 dB for telecommunication ports conducted emissions.

List of Test Equipment

The following test equipment was used in the performance of the testing herein. Table 7 shows the equipment used for the initial testing in August of 2012, while Table 8 shows the equipment used for the conducted emissions re-testing performed in August of 2013.

Table 7 – Test Equipment Used (August 2012)

Asset Tag	Manufacturer	Description	Model	Serial Number	Cal. Date	Cal. Due
1197	EMCO	DRG Horn 18-40 GHz	00040962	00040962	10/25/2012	10/25/2013
1215	Hewlett Packard	9kHz-40GHz Portable Spectrum Analyzer	3943A01645	3943A01645	02/06/2013	02/06/2014
1220	LNA, 10 - 2000 MHz, 30 dB	Mini-Circuits	ZKL-2	NA	03/07/2013	03/07/2014
1229	Hewlett Packard	RF Preselector	3010A01077	3010A01077	01/04/2013	01/04/2014
1253	Narda West	18 to 40 GHz Preamplifier, 40dB Gain Nominal	010-100	010-100	03/11/2013	03/11/2014
1062	Tektronix	Digital Oscilloscope (500 MHz Bandwidth)	TDS3052	B014233	10/31/2012	10/31/2013
1255	EMCO	Active Loop Antenna, 10kHz to 30MHz	6502	9105-2619	04/22/2012	04/22/2013
1263	Hewlett Packard	Spectrum Analyzer, 100 Hz to 22 GHz	3014A06873	3014A06873	01/04/2013	01/04/2014
1264	Hewlett Packard	Spectrum Analyzer Display	2848A18247	2848A18247	01/04/2013	01/04/2014
1265	Hewlett Packard	Quasi-Peak Adapter	2521A00641	2521A00641	01/04/2013	01/04/2014

Asset Tag	Manufacturer	Description	Model	Serial Number	Cal. Date	Cal. Due
1392	Sunol	1-18 GHz Double-Ridged Horn Antenna	A020311	A020311	01/30/2013	01/30/2014
1396	CIR Enterprises	10m Chamber with 4m turntable	002	002	06/12/2012	06/12/2013
1403	Ciao Wireless	Preamp Assembly, 1-18 GHz, 56 dB gain	105+106	105+106	08/30/2012	08/30/2013
1405	EXTECH Instruments	Hygro-Thermometer	N/A	N/A	08/13/2012	08/13/2013
1410	Sunol Sciences	System Controller 10meter #2	021611-1	021611-1	NA	NA
1470	Sunol Sciences	10 Meter #2 Turn table, 4 Meter Table	NA	NA	08/10/2012	08/10/2013

Table 8 – Test Equipment Used (August 2013)

ID Number	Manufacturer	Model #	Serial #	Description	Cal Date	Cal Due
1017	Pacific Power	TMX 140	0256	4 kVA, 50 Hz Power Source	NA	NA
1195	Solar	9252-50-R-24-BNC	042013	LISN	04/10/2013	04/10/2014
1200	Agilent Technology	11947A	3107A03807	Transient Limiter, 9 kHz to 200 MHz	01/21/2013	01/21/2014
1223	Hewlett Packard	85650A	3303A01859	Quasi-Peak Adaptor	03/12/2013	03/12/2014
1335	Hewlett Packard	85662A	2542A10937	Spectrum Analyzer Display	03/12/2013	03/12/2014
1336	Hewlett Packard	8566B	2532A02062	Spectrum Analyzer RF Section	03/12/2013	03/12/2014
1338	Hewlett Packard	85685A	3506A01551	RF Preselector	03/12/2013	03/12/2014

Test Results – Conducted Emissions

emc integrity incorporated

Conducted Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4 GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15.207	Date:	August 16, 2013
Temperature:	22˚C Humidity: 52%	Pressure:	841mb
Input Voltage:	120Vac/60Hz	Verdict:	P
Configuration of Unit:	Tx Low		
Test Engineer:	Kevin Johnson		
Assets:	1017, 1195, 1200, 1223, 1335, 1336, 1338		

Type	Frequency (MHz)	Level (dBuV)	Transducer (dB)	Gain / Loss (dB)	Final (dBuV)	Test Point	Margin: FCC Class B AV (dB)	Margin: FCC Class B QP (dB)
AV	0.417	9.6	-0.3	16.1	25.4	Line 1	22.98	-
QP	0.417	20.9	-0.3	16.1	36.7	Line 1	-	21.67
AV	0.458	22.4	-0.3	16.1	38.2	Line 1	9.04	-
QP	0.458	32.4	-0.3	16.1	48.2	Line 1	-	8.99
AV	0.520	17.8	-0.3	16.1	33.6	Line 1	12.38	-
QP	0.520	28.8	-0.3	16.1	44.7	Line 1	-	11.35
AV	1.382	7.5	-0.2	16.1	23.4	Line 1	22.55	-
QP	1.382	17.7	-0.2	16.1	33.6	Line 1	-	22.43
AV	2.014	6.9	-0.3	16.2	22.8	Line 1	23.20	-
QP	2.014	17.0	-0.3	16.2	32.9	Line 1	-	23.08
AV	6.426	5.0	-0.1	16.1	21.0	Line 1	29.00	-
QP	6.426	15.0	-0.1	16.1	31.0	Line 1	-	29.04
AV	0.429	9.2	-0.3	16.1	25.1	Neutral	22.98	-
QP	0.429	23.1	-0.3	16.1	38.9	Neutral	-	19.16
AV	0.457	23.4	-0.3	16.1	39.2	Neutral	7.97	-
QP	0.457	32.0	-0.3	16.1	47.8	Neutral	-	9.43
AV	0.515	21.9	-0.3	16.1	37.8	Neutral	8.23	-
QP	0.515	29.1	-0.3	16.1	44.9	Neutral	-	11.12
AV	2.944	7.2	-0.3	16.2	23.1	Neutral	22.85	-
QP	2.944	18.1	-0.3	16.2	34.0	Neutral	-	22.05
AV	4.636	8.6	-0.2	16.1	24.5	Neutral	21.51	-
QP	4.636	20.0	-0.2	16.1	35.9	Neutral	-	20.07
AV	11.041	8.5	0.2	15.9	24.6	Neutral	25.41	-
QP	11.041	18.8	0.2	15.9	34.9	Neutral	-	25.09

The highest emission measured was at **0.457 MHz,** which was **7.97 dB** below the limit.

- "Type" refers to the type of measurement performed. The type of measurement made is based on the requirements of the particular standard:
  - PK = Peak Measurement: RBW is 9 kHz, VBW is 3 MHz
  - QP = Quasi-Peak Measurement: RBW is 9 kHz, VBW is 3 MHz, and QP Detection is ENABLED
  - AV = Video Average Measurement: RBW is 9 kHz, VBW is 10 Hz
- The "Final" emissions level is attained by taking the "Level" and adding the "Transducer" factor and the "Gain/Loss" factor. (Sample Calculation: 40.2 dBuV + 1.6 dB + 16.3 dB = 58.1 dBuV. **Important Note**: This is a sample calculation only for the purpose of demonstration, and does not reflect data in this report.)
- The "TestPoint" indicates which AC or DC input power line or which I/O cable the measurement was made on.
- The "Margin" is with reference to the emissions limit. A positive number indicates that the emission measurement is below the limit. A negative number indicates that the emission measurement exceeds the limit.
- The PRESCAN is a peak measurement and is performed with the RBW set to 9 kHz, and the VBW set to 3 MHz

emc integrity incorporated

Conducted Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4 GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15.207	Date:	August 16, 2013

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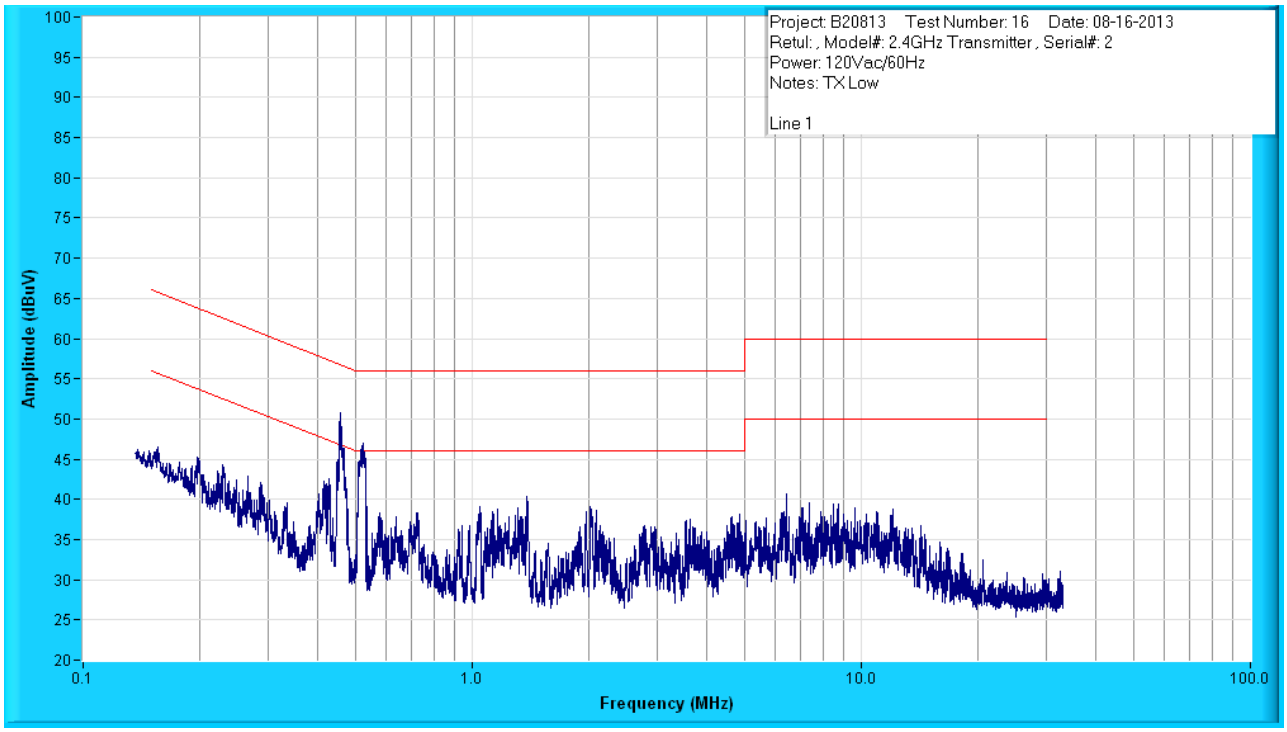

Figure 1: Conducted Emissions Prescan, Line 1, 0.150MHz to 30MHz, Peak Measurements

emc integrity incorporated

Conducted Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4 GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15.207	Date:	August 16, 2013

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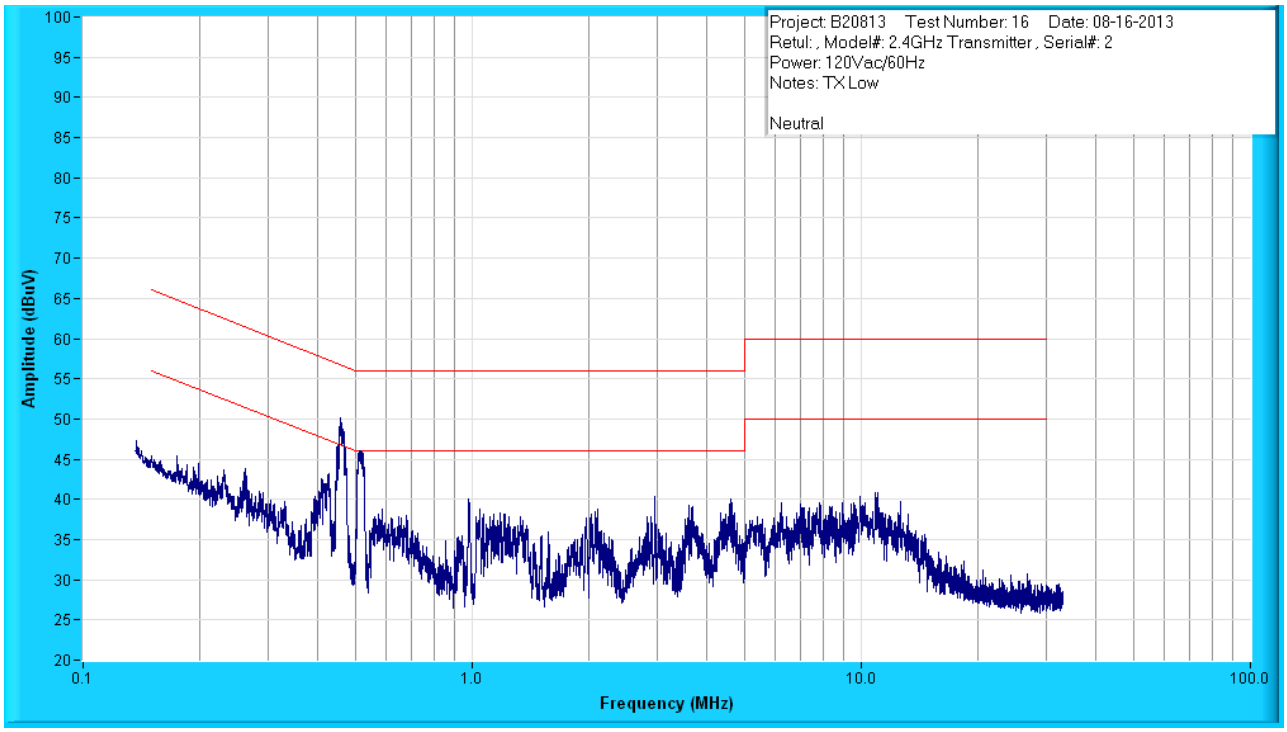

Figure 2: Conducted Emissions Prescan, Neutral, 0.150MHz to 30MHz, Peak Measurements

emc integrity incorporated

Conducted Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4 GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15.207	Date:	August 16, 2013
Temperature:	22˚C Humidity: 52%	Pressure:	841mb
Input Voltage:	120Vac/60Hz	Verdict:	P
Configuration of Unit:	System tracking 8 LEDs		
Test Engineer:	Kevin Johnson		
Assets:	1017, 1195, 1200, 1223, 1335, 1336, 1338		

Type	Frequency (MHz)	Level (dBuV)	Transducer (dB)	Gain / Loss (dB)	Final (dBuV)	Test Point	Margin: FCC Class B AV (dB)	Margin: FCC Class B QP (dB)
AV	0.415	10.8	-0.3	16.1	26.6	Line 1	21.83	-
QP	0.415	21.2	-0.3	16.1	37.0	Line 1	-	21.45
AV	0.459	23.1	-0.3	16.1	38.9	Line 1	8.26	-
QP	0.459	32.3	-0.3	16.1	48.1	Line 1	-	9.10
AV	0.520	17.1	-0.3	16.1	33.0	Line 1	13.03	-
QP	0.520	28.8	-0.3	16.1	44.6	Line 1	-	11.42
AV	2.104	3.1	-0.3	16.2	19.1	Line 1	26.95	-
QP	2.104	13.2	-0.3	16.2	29.1	Line 1	-	26.94
AV	3.726	5.8	-0.2	16.2	21.8	Line 1	24.18	-
QP	3.726	17.2	-0.2	16.2	33.2	Line 1	-	22.81
AV	10.328	6.8	0.1	15.9	22.9	Line 1	27.12	-
QP	10.328	17.8	0.1	15.9	33.8	Line 1	-	26.18
AV	0.431	8.8	-0.3	16.1	24.6	Neutral	23.36	-
QP	0.431	22.0	-0.3	16.1	37.8	Neutral	-	20.16
AV	0.463	25.0	-0.3	16.1	40.8	Neutral	6.26	-
QP	0.463	31.5	-0.3	16.1	47.3	Neutral	-	9.79
AV	0.517	21.1	-0.3	16.1	36.9	Neutral	9.08	-
QP	0.517	28.7	-0.3	16.1	44.5	Neutral	-	11.46
AV	3.867	8.2	-0.2	16.2	24.1	Neutral	21.86	-
QP	3.867	16.6	-0.2	16.2	32.5	Neutral	-	23.45
AV	4.646	8.1	-0.2	16.1	24.0	Neutral	22.01	-
QP	4.646	17.6	-0.2	16.1	33.6	Neutral	-	22.41
AV	5.369	9.4	-0.2	16.1	25.4	Neutral	24.61	-
QP	5.369	18.1	-0.2	16.1	34.1	Neutral	-	25.92

The highest emission measured was at **0.463 MHz,** which was **6.26 dB** below the limit.

- "Type" refers to the type of measurement performed. The type of measurement made is based on the requirements of the particular standard:
  - PK = Peak Measurement: RBW is 9 kHz, VBW is 3 MHz
  - QP = Quasi-Peak Measurement: RBW is 9 kHz, VBW is 3 MHz, and QP Detection is ENABLED
  - AV = Video Average Measurement: RBW is 9 kHz, VBW is 10 Hz
- The "Final" emissions level is attained by taking the "Level" and adding the "Transducer" factor and the "Gain/Loss" factor. (Sample Calculation: 40.2 dBuV + 1.6 dB + 16.3 dB = 58.1 dBuV. **Important Note**: This is a sample calculation only for the purpose of demonstration, and does not reflect data in this report.)
- The "TestPoint" indicates which AC or DC input power line or which I/O cable the measurement was made on.
- The "Margin" is with reference to the emissions limit. A positive number indicates that the emission measurement is below the limit. A negative number indicates that the emission measurement exceeds the limit.
- The PRESCAN is a peak measurement and is performed with the RBW set to 9 kHz, and the VBW set to 3 MHz

emc integrity incorporated

Conducted Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4 GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15.207	Date:	August 16, 2013

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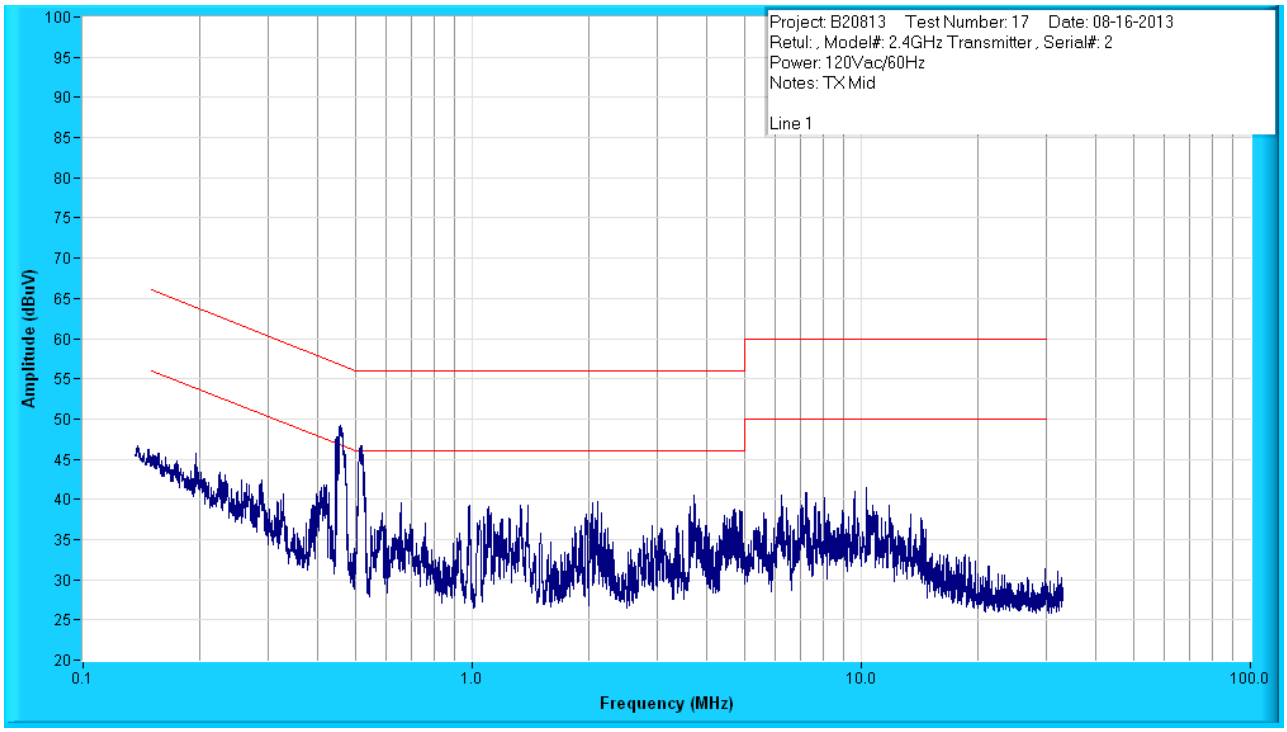

Figure 3: Conducted Emissions Prescan, Neutral, 0.150MHz to 30MHz, Peak Measurements

emc integrity incorporated

Conducted Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4 GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15.207	Date:	August 16, 2013

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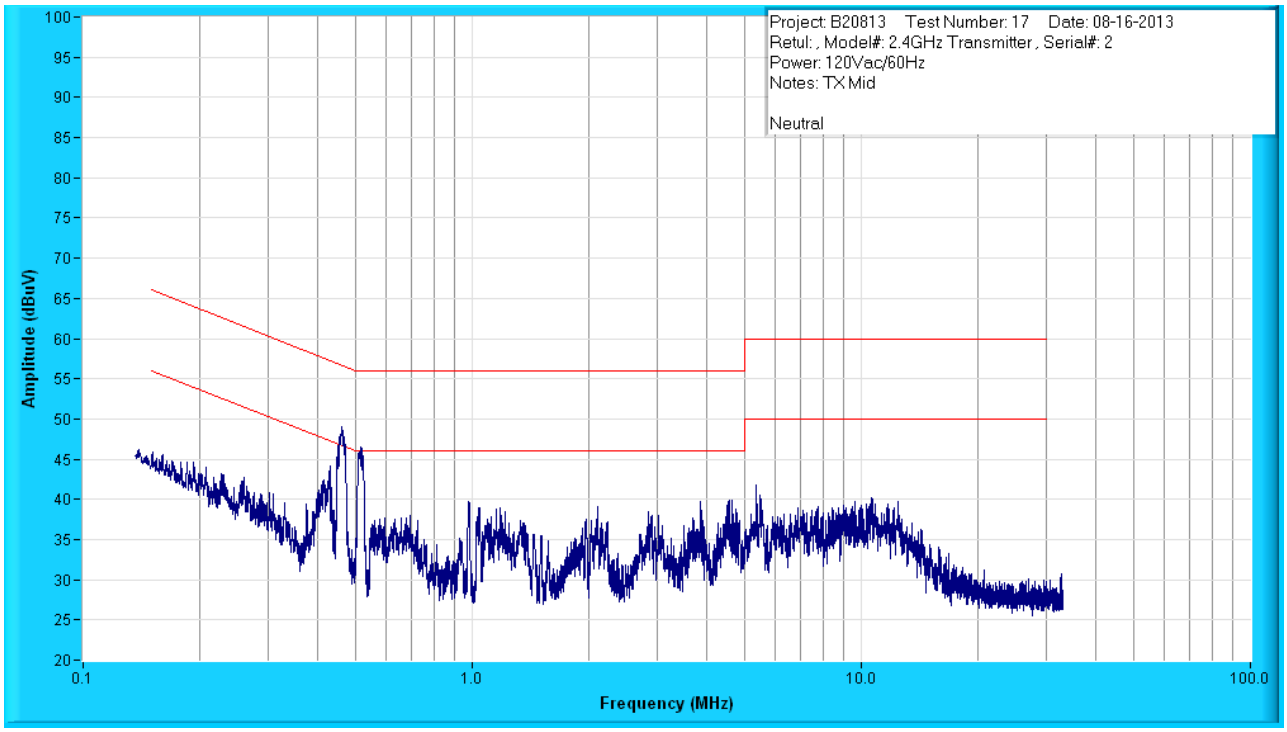

Figure 4: Conducted Emissions Prescan, Neutral, 0.150MHz to 30MHz, Peak Measurements

emc integrity incorporated

Conducted Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4 GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15.207	Date:	August 16, 2013
Temperature:	23˚C Humidity: 48%	Pressure:	841mb
Input Voltage:	120Vac/60Hz	Verdict:	P
Configuration of Unit:	System tracking 8 LEDs		
Test Engineer:	Kevin Johnson		
Assets:	1017, 1195, 1200, 1223, 1335, 1336, 1338		

Type	Frequency (MHz)	Level (dBuV)	Transducer (dB)	Gain / Loss (dB)	Final (dBuV)	Test Point	Margin: FCC Class B AV (dB)	Margin: FCC Class B QP (dB)
AV	0.426	8.2	-0.3	16.1	24.0	Line 1	24.13	-
QP	0.426	20.6	-0.3	16.1	36.4	Line 1	-	21.71
AV	0.450	10.1	-0.3	16.1	25.9	Line 1	21.57	-
QP	0.450	27.1	-0.3	16.1	42.9	Line 1	-	14.55
AV	0.517	19.9	-0.3	16.1	35.8	Line 1	10.23	-
QP	0.517	28.9	-0.3	16.1	44.8	Line 1	-	11.24
AV	3.731	5.2	-0.2	16.2	21.2	Line 1	24.83	-
QP	3.731	15.2	-0.2	16.2	31.2	Line 1	-	24.79
AV	4.524	5.5	-0.2	16.1	21.4	Line 1	24.60	-
QP	4.524	14.6	-0.2	16.1	30.5	Line 1	-	25.48
AV	10.562	6.0	0.2	15.9	22.1	Line 1	27.94	-
QP	10.562	16.9	0.2	15.9	33.0	Line 1	-	27.00
AV	0.419	12.1	-0.3	16.1	27.9	Neutral	20.43	-
QP	0.419	24.0	-0.3	16.1	39.8	Neutral	-	18.52
AV	0.457	21.4	-0.3	16.1	37.2	Neutral	9.98	-
QP	0.457	32.1	-0.3	16.1	47.9	Neutral	-	9.33
AV	0.520	16.6	-0.3	16.1	32.4	Neutral	13.58	-
QP	0.520	27.7	-0.3	16.1	43.5	Neutral	-	12.46
AV	1.957	11.9	-0.3	16.2	27.9	Neutral	18.15	-
QP	1.957	19.7	-0.3	16.2	35.6	Neutral	-	20.43
AV	9.084	8.2	-0.1	16.1	24.2	Neutral	25.85	-
QP	9.084	18.7	-0.1	16.1	34.7	Neutral	-	25.33
AV	11.820	8.4	0.1	15.8	24.4	Neutral	25.61	-
QP	11.820	18.6	0.1	15.8	34.5	Neutral	-	25.48

The highest emission measured was at **0.457 MHz,** which was **9.98 dB** below the limit.

- "Type" refers to the type of measurement performed. The type of measurement made is based on the requirements of the particular standard:
  - PK = Peak Measurement: RBW is 9 kHz, VBW is 3 MHz
  - QP = Quasi-Peak Measurement: RBW is 9 kHz, VBW is 3 MHz, and QP Detection is ENABLED
  - AV = Video Average Measurement: RBW is 9 kHz, VBW is 10 Hz
- The "Final" emissions level is attained by taking the "Level" and adding the "Transducer" factor and the "Gain/Loss" factor. (Sample Calculation: 40.2 dBuV + 1.6 dB + 16.3 dB = 58.1 dBuV. **Important Note**: This is a sample calculation only for the purpose of demonstration, and does not reflect data in this report.)
- The "TestPoint" indicates which AC or DC input power line or which I/O cable the measurement was made on.
- The "Margin" is with reference to the emissions limit. A positive number indicates that the emission measurement is below the limit. A negative number indicates that the emission measurement exceeds the limit.
- The PRESCAN is a peak measurement and is performed with the RBW set to 9 kHz, and the VBW set to 3 MHz

emc integrity incorporated

Conducted Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4 GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15.207	Date:	August 16, 2013

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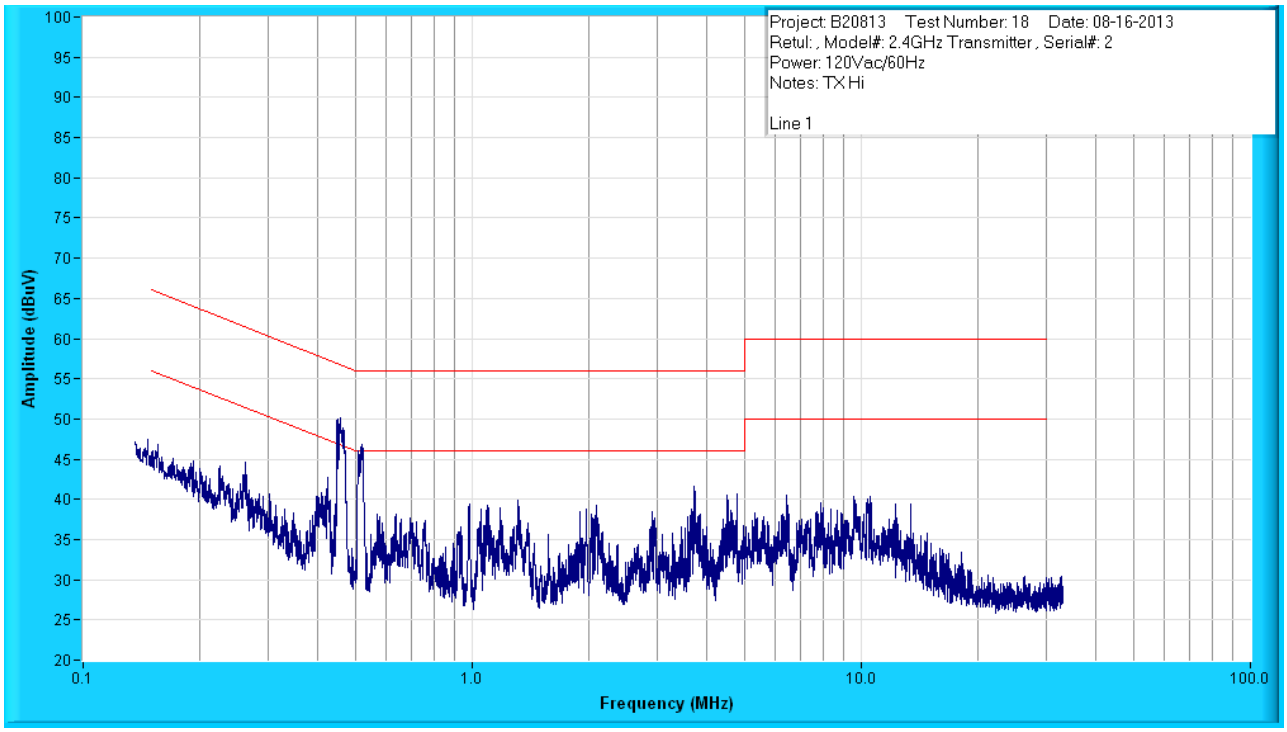

Figure 5: Conducted Emissions Prescan, Line 1, 0.150MHz to 30MHz, Peak Measurements

emc integrity incorporated

Conducted Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4 GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15.207	Date:	August 16, 2013

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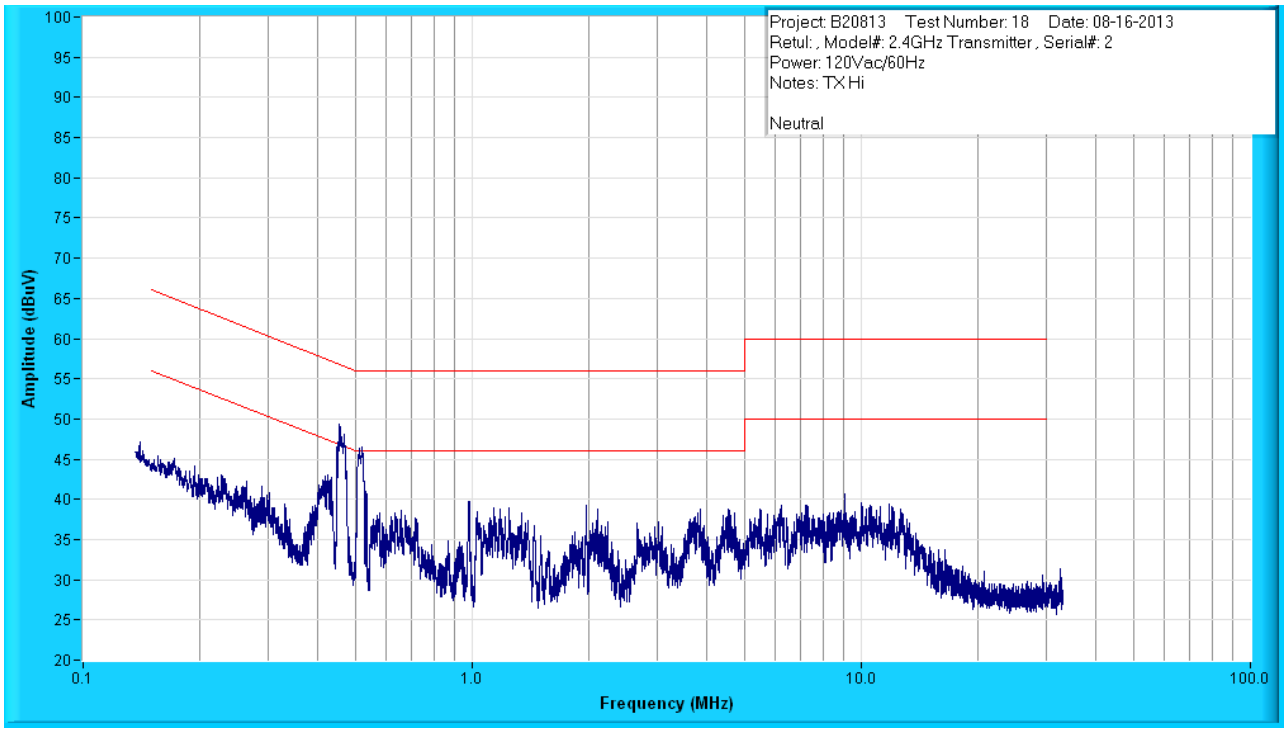

Figure 6: Conducted Emissions Prescan, Neutral, 0.150MHz to 30MHz, Peak Measurements

emc integrity incorporated

Conducted Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4 GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15.207	Date:	August 16, 2013
Temperature:	23˚C Humidity: 48%	Pressure:	841mb
Input Voltage:	120Vac/60Hz	Verdict:	P
Configuration of Unit:	System tracking 8 LEDs		
Test Engineer:	Kevin Johnson		
Assets:	1017, 1195, 1200, 1223, 1335, 1336, 1338		

Type	Frequency (MHz)	Level (dBuV)	Transducer (dB)	Gain / Loss (dB)	Final (dBuV)	Test Point	Margin: FCC Class B AV (dB)	Margin: FCC Class B QP (dB)
AV	0.422	9.8	-0.3	16.1	25.6	Line 1	22.59	-
QP	0.422	21.8	-0.3	16.1	37.6	Line 1	-	20.64
AV	0.457	18.8	-0.3	16.1	34.6	Line 1	12.63	-
QP	0.457	31.9	-0.3	16.1	47.7	Line 1	-	9.53
AV	0.520	13.8	-0.3	16.1	29.6	Line 1	16.43	-
QP	0.520	28.1	-0.3	16.1	44.0	Line 1	-	12.04
AV	3.623	4.5	-0.2	16.2	20.4	Line 1	25.59	-
QP	3.623	15.5	-0.2	16.2	31.4	Line 1	-	24.58
AV	4.814	4.2	-0.2	16.1	20.1	Line 1	25.88	-
QP	4.814	14.3	-0.2	16.1	30.2	Line 1	-	25.75
AV	9.696	6.3	0.0	16.0	22.3	Line 1	27.65	-
QP	9.696	17.0	0.0	16.0	33.0	Line 1	-	27.04
AV	0.426	10.7	-0.3	16.1	26.5	Neutral	21.63	-
QP	0.426	24.4	-0.3	16.1	40.2	Neutral	-	17.98
AV	0.461	24.8	-0.3	16.1	40.5	Neutral	6.56	-
QP	0.461	31.6	-0.3	16.1	47.4	Neutral	-	9.73
AV	0.515	21.6	-0.3	16.1	37.5	Neutral	8.53	-
QP	0.515	29.0	-0.3	16.1	44.8	Neutral	-	11.19
AV	0.978	14.3	-0.2	16.1	30.2	Neutral	15.75	-
QP	0.978	22.3	-0.2	16.1	38.2	Neutral	-	17.77
AV	5.325	8.7	-0.2	16.1	24.6	Neutral	25.42	-
QP	5.325	17.9	-0.2	16.1	33.8	Neutral	-	26.16
AV	7.661	8.5	-0.2	16.1	24.4	Neutral	25.57	-
QP	7.661	18.1	-0.2	16.1	34.1	Neutral	-	25.95

The highest emission measured was at **0.461 MHz,** which was **6.56dB** below the limit.

- "Type" refers to the type of measurement performed. The type of measurement made is based on the requirements of the particular standard:
  - PK = Peak Measurement: RBW is 9 kHz, VBW is 3 MHz
  - QP = Quasi-Peak Measurement: RBW is 9 kHz, VBW is 3 MHz, and QP Detection is ENABLED
  - AV = Video Average Measurement: RBW is 9 kHz, VBW is 10 Hz
- The "Final" emissions level is attained by taking the "Level" and adding the "Transducer" factor and the "Gain/Loss" factor. (Sample Calculation: 40.2 dBuV + 1.6 dB + 16.3 dB = 58.1 dBuV. **Important Note**: This is a sample calculation only for the purpose of demonstration, and does not reflect data in this report.)
- The "TestPoint" indicates which AC or DC input power line or which I/O cable the measurement was made on.
- The "Margin" is with reference to the emissions limit. A positive number indicates that the emission measurement is below the limit. A negative number indicates that the emission measurement exceeds the limit.
- The PRESCAN is a peak measurement and is performed with the RBW set to 9 kHz, and the VBW set to 3 MHz

emc integrity incorporated

Conducted Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4 GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15.207	Date:	August 16, 2013

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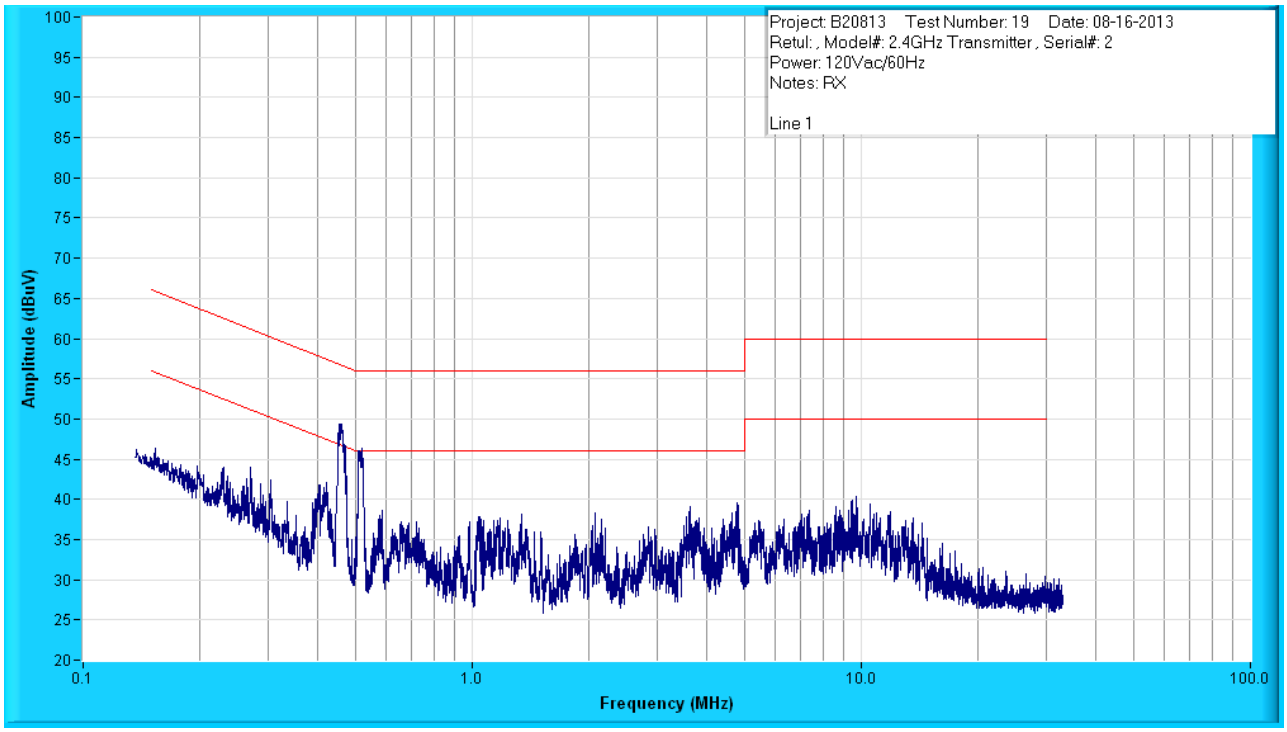

Figure 7: Conducted Emissions Prescan, Line 1, 0.150MHz to 30MHz, Peak Measurements

emc integrity incorporated

Conducted Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4 GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15.207	Date:	August 16, 2013

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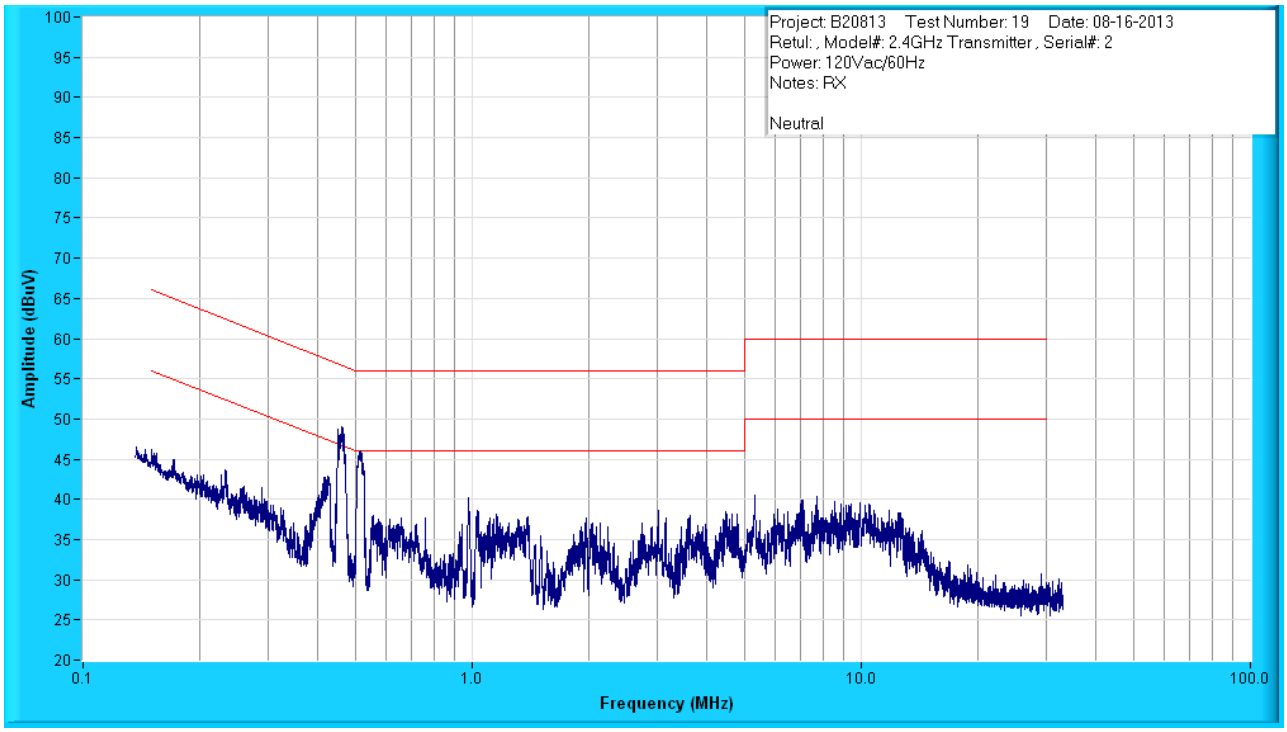
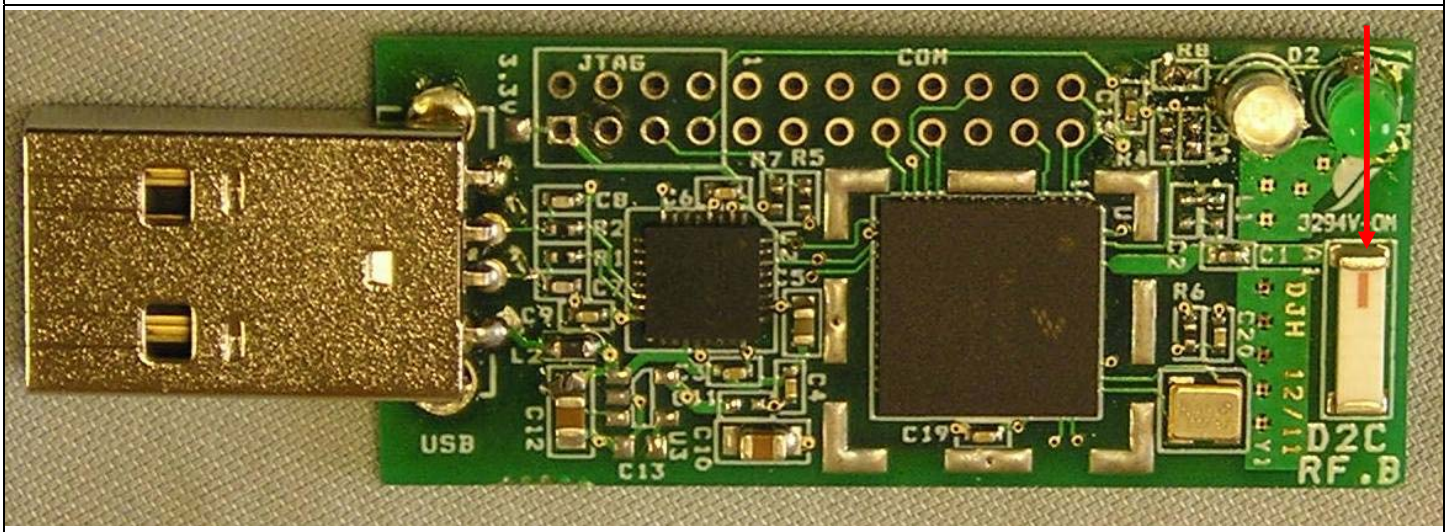


Figure 8: Conducted Emissions Prescan, Neutral, 0.150MHz to 30MHz, Peak Measurements

Test Results – Antenna Requirement

Table No. 1	Antenna requirement	Verdict
		P

Type of antenna connection	☐ Integral antenna	☒ Permanently attached	☐ Unique connector
Type of unique connector	No rf connector		
Method of permanent connection	PCB antenna		



Supplemental Information:

Red arrow points to chip antenna which is soldered onto PCBA (i.e., permanently attached)

Tested by (+ signature) .....: Kevin Johnson.

Test Results – Radiated Emissions – Restricted Bands

emc integrity incorporated

Radiated Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15	Date:	August 28, 2012
Temperature:	23°C Humidity: 47%	Pressure:	843mb
Input Voltage:	4.0 Vdc	Verdict:	P
Configuration of Unit:	Normal Operating Mode		
Test Engineer:	Kevin Johnson		
Asset Numbers:	1030, 1219, 1233, 1234, 1238, 1239, 1246, 1276, 1342, 1344, 1345, 1381, 1405		

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Type	Frequency (MHz)	Level (dBuV)	Transducer (dB/m)	Gain / Loss (dB)	Final (dBuV/m)	Azm(deg)/Pol /Hgt(m)	Margin: FCC Class B QP (dB)	Margin: FCC Class B AV (dB)
TX Low								
QP	30.075	22.7	21.3	-29.5	14.5	166/V-Pole/1.00	15.02	-
QP	122.743	24.9	13.9	-28.6	10.2	228/V-Pole/1.00	22.87	-
QP	191.369	24.6	11.6	-28.4	7.8	142/H-Pole/1.91	25.27	-
QP	196.588	26.3	12.1	-28.4	10.0	318/V-Pole/2.24	23.00	-
QP	614.310	30.2	18.2	-27.2	21.2	238/H-Pole/2.42	14.36	-
QP	644.310	27.5	19.2	-27.1	19.6	158/V-Pole/1.05	15.99	-
QP	759.047	24.5	20.5	-26.6	18.4	168/V-Pole/1.06	17.18	-
QP	860.595	23.8	21.1	-26.1	18.7	181/V-Pole/1.00	16.82	-
TX Mid								
QP	30.416	22.7	21.0	-29.5	14.2	225/H-Pole/1.02	15.33	-
QP	119.881	24.7	13.9	-28.6	9.9	195/H-Pole/1.77	23.12	-
QP	183.260	23.9	11.2	-28.5	6.6	4/V-Pole/3.99	26.43	-
QP	269.421	24.6	12.8	-28.2	9.1	242/V-Pole/1.28	26.42	-
QP	362.795	24.8	14.8	-28.0	11.6	86/V-Pole/3.28	23.95	-
QP	614.310	25.6	18.2	-27.2	16.6	237/V-Pole/2.40	18.97	-
QP	687.489	24.7	19.5	-26.9	17.3	168/V-Pole/1.00	18.22	-
QP	719.772	24.3	19.8	-26.8	17.4	284/H-Pole/3.16	18.17	-
TX High								
QP	30.101	23.1	21.3	-29.5	14.9	178/V-Pole/1.03	14.66	-
QP	123.920	24.9	14.0	-28.6	10.2	22/V-Pole/2.78	22.81	-
QP	141.897	24.2	12.7	-28.5	8.4	328/V-Pole/4.00	24.62	-
QP	289.337	27.4	13.4	-28.1	12.7	10/V-Pole/3.58	22.83	-
QP	422.067	25.0	15.8	-27.9	12.8	192/H-Pole/2.20	22.69	-

emc integrity incorporated

Radiated Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15	Date:	August 28, 2012
Temperature:	23°C Humidity: 47%	Pressure:	843mb
Input Voltage:	4.0 Vdc	Verdict:	P
Configuration of Unit:	Normal Operating Mode		
Test Engineer:	Kevin Johnson		
Asset Numbers:	1030, 1219, 1233, 1234, 1238, 1239, 1246, 1276, 1342, 1344, 1345, 1381, 1405		

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Type	Frequency (MHz)	Level (dBuV)	Transducer (dB/m)	Gain / Loss (dB)	Final (dBuV/m)	Azm(deg)/Pol /Hgt(m)	Margin: FCC Class B QP (dB)	Margin: FCC Class B AV (dB)
QP	538.707	25.4	18.0	-27.4	16.0	88/H-Pole/3.67	19.53	-
QP	593.362	25.1	18.0	-27.3	15.9	29/H-Pole/1.90	19.67	-
QP	932.567	24.3	21.8	-25.8	20.3	3/V-Pole/1.00	15.27	-
RX Spurious Emissions								
QP	30.273	22.8	21.1	-29.5	14.4	235/H-Pole/1.01	15.10	-
QP	109.954	25.0	12.7	-28.7	9.0	179/H-Pole/3.13	24.05	-
QP	133.686	25.0	13.5	-28.6	10.0	254/V-Pole/2.96	23.08	-
QP	301.377	28.1	13.3	-28.1	13.3	227/V-Pole/3.98	22.24	-
QP	548.252	25.5	18.0	-27.4	16.1	130/H-Pole/1.00	19.43	-
QP	655.507	24.8	19.1	-27.1	16.8	262/H-Pole/1.21	18.75	-
QP	724.640	24.5	19.9	-26.8	17.6	110/H-Pole/2.74	17.91	-
QP	789.338	24.0	20.3	-26.5	17.9	189/V-Pole/2.51	17.66	-

Type	Frequency (MHz)	Level (dBuV)	Transducer (dB/m)	Gain / Loss (dB)	Final (dBuV/m)	Azm(deg)/Pol/Hgt(m)	Margin: FCC Class B >1GHz PK (dB)	Margin: FCC Class B >1GHz AV (dB)
TX Low								
AV	4809.002	62.6	33.2	-59.1	36.7	338/H-Pole/1.59	-	17.24
PK	4809.002	73.3	33.2	-59.1	47.4	338/H-Pole/1.59	26.59	-
AV	11458.696	64.5	39.0	-52.1	51.3	347/H-Pole/1.49	-	2.61
PK	11458.696	77.0	39.0	-52.1	63.8	347/H-Pole/1.49	10.11	-
AV	11926.568	54.5	39.3	-52.6	41.2	330/V-Pole/1.42	-	12.80
PK	11926.568	68.3	39.3	-52.6	55.0	330/V-Pole/1.42	19.00	-
AV	14791.986	50.9	41.5	-49.9	42.4	224/V-Pole/3.39	-	11.51
PK	14791.986	63.3	41.5	-49.9	54.8	224/V-Pole/3.39	19.11	-
TX Mid								
AV	4879.003	59.1	33.3	-59.1	33.4	20/H-Pole/1.57	-	20.58
PK	4879.003	71.4	33.3	-59.1	45.6	20/H-Pole/1.57	28.33	
AV	11458.383	66.7	39.0	-52.1	53.5	202/H-Pole/1.49	-	0.41
PK	11458.383	78.9	39.0	-52.1	65.7	202/H-Pole/1.49	8.21	
AV	11728.058	56.0	39.1	-55.0	40.1	80/H-Pole/1.58	-	13.84
PK	11728.058	68.6	39.1	-55.0	52.8	80/H-Pole/1.58	21.19	
AV	14991.210	50.4	41.0	-51.0	40.4	83/H-Pole/2.06	-	13.53
PK	14991.210	63.5	41.0	-51.0	53.6	83/H-Pole/2.06	20.38	
TX High								
AV	4960.002	61.5	33.5	-59.1	36.0	360/V-Pole/2.39	-	18.00
PK	4960.002	70.5	33.5	-59.1	44.9	360/V-Pole/2.39	29.05	
AV	11458.293	65.3	39.0	-52.1	52.2	203/H-Pole/1.50	-	1.77
PK	11458.293	78.6	39.0	-52.1	65.4	203/H-Pole/1.50	8.52	
AV	11700.766	59.0	39.1	-54.6	43.6	225/H-Pole/1.35	-	10.35
PK	11700.766	72.5	39.1	-54.6	57.1	225/H-Pole/1.35	16.90	
AV	14858.401	50.0	41.3	-50.3	41.1	332/H-Pole/2.62	-	12.85
PK	14858.401	63.1	41.3	-50.3	54.2	332/H-Pole/2.62	19.80	
RX Spurious Emissions								
AV	11458.375	66.7	39.0	-52.1	53.5	215/H-Pole/1.70	-	0.46
PK	11458.375	79.1	39.0	-52.1	65.9	215/H-Pole/1.70	8.01	
AV	11729.088	56.4	39.1	-55.0	40.5	279/H-Pole/1.35	-	13.45
PK	11729.088	69.1	39.1	-55.0	53.3	279/H-Pole/1.35	20.70	
AV	14317.849	50.1	41.9	-50.7	41.3	342/H-Pole/1.32	-	12.64
PK	14317.849	63.7	41.9	-50.7	54.9	342/H-Pole/1.32	19.04	
AV	14796.601	50.3	41.5	-49.9	41.8	189/H-Pole/1.93	-	12.14
PK	14796.601	63.2	41.5	-49.9	54.7	189/H-Pole/1.93	19.24	

The highest emission measured was at **11458.383 MHz,** which was **0.41 dB** below the limit.

- "Type" refers to the type of **FINAL** measurement performed. The type of **FINAL** measurement made is based on the requirements of the particular standard:
  - PK = Peak Measurement: RBW is 120kHz, VBW is 3 MHz
  - QP = Quasi-Peak Measurement: RBW is 120kHz, VBW is 3 MHz, and QP Detection is ENABLED
  - AV = Video Average Measurement: RBW is 1 MHz, VBW is 10 Hz
- The "Final" emissions level is attained by taking the "Level" and adding the "Transducer" factor and the "Gain/Loss" factor. Final measurements are made with the Azimuth, Polarity, Height, and EUT Cables positioned for maximum radiation. If applicable, cables positions are noted in the test log. (Sample Calculation: 49.6 dBuV + 11.4 dB/m – 28.8 dB = 32.2 dBuV/m. **Important Note**: This is a sample calculation only for the purpose of demonstration, and does not reflect data in this report.)
- The "Azm/Pol/Hgt" indicates the turn-table *azimuth*, the antenna *polarity*, and the antenna *height* where the maximum emissions level was measured.
- The "Margin" is with reference to the emissions limit. A positive number indicates that the emission measurement is below the limit. A negative number indicates that the emission measurement exceeds the limit.
- The **PRESCAN** is a **PEAK** measurement and is performed with the RBW set to 120 kHz, VBW set to 3 MHz (30 MHz to 1 GHz), and the RBW set to 1 MHz, VBW set to 100 kHz (> 1 GHz)

emc integrity incorporated

Radiated Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15	Date:	August 28, 2012

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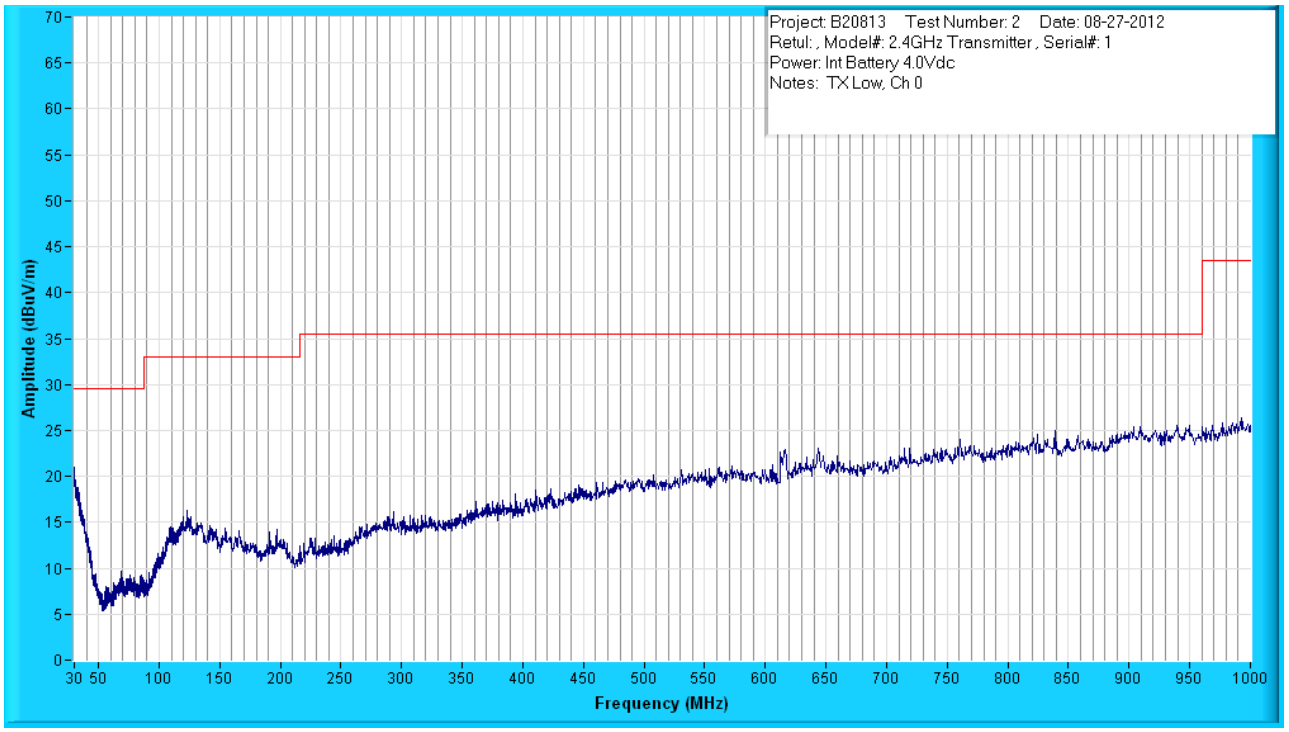

Figure A1: Radiated Emissions Prescan, 30MHz to 1000MHz, TX Low, Channel 0, Peak Measurements at 10m Distance

emc integrity incorporated

Radiated Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15	Date:	August 28, 2012

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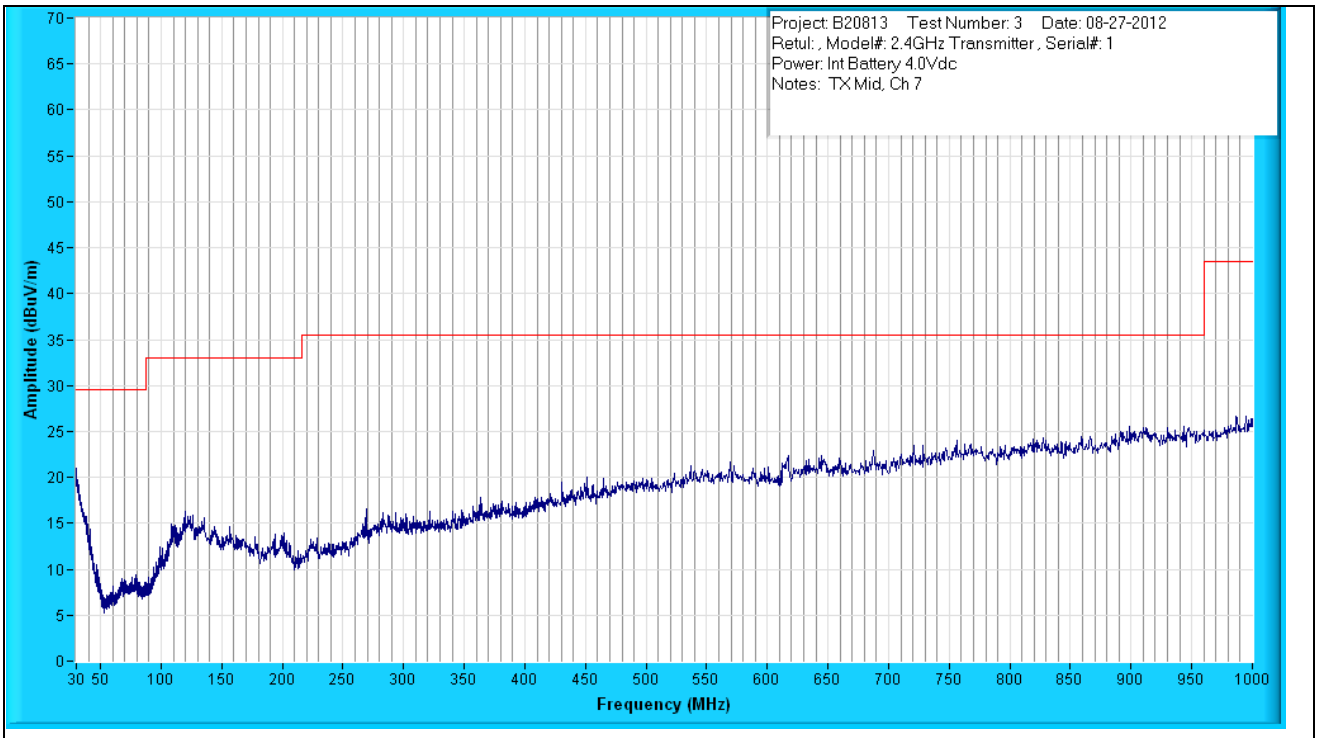

Figure A2: Radiated Emissions Prescan, 30MHz to 1000MHz, TX Mid, Channel 7, Peak Measurements at 10m Distance

emc integrity incorporated

Radiated Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15	Date:	August 28, 2012

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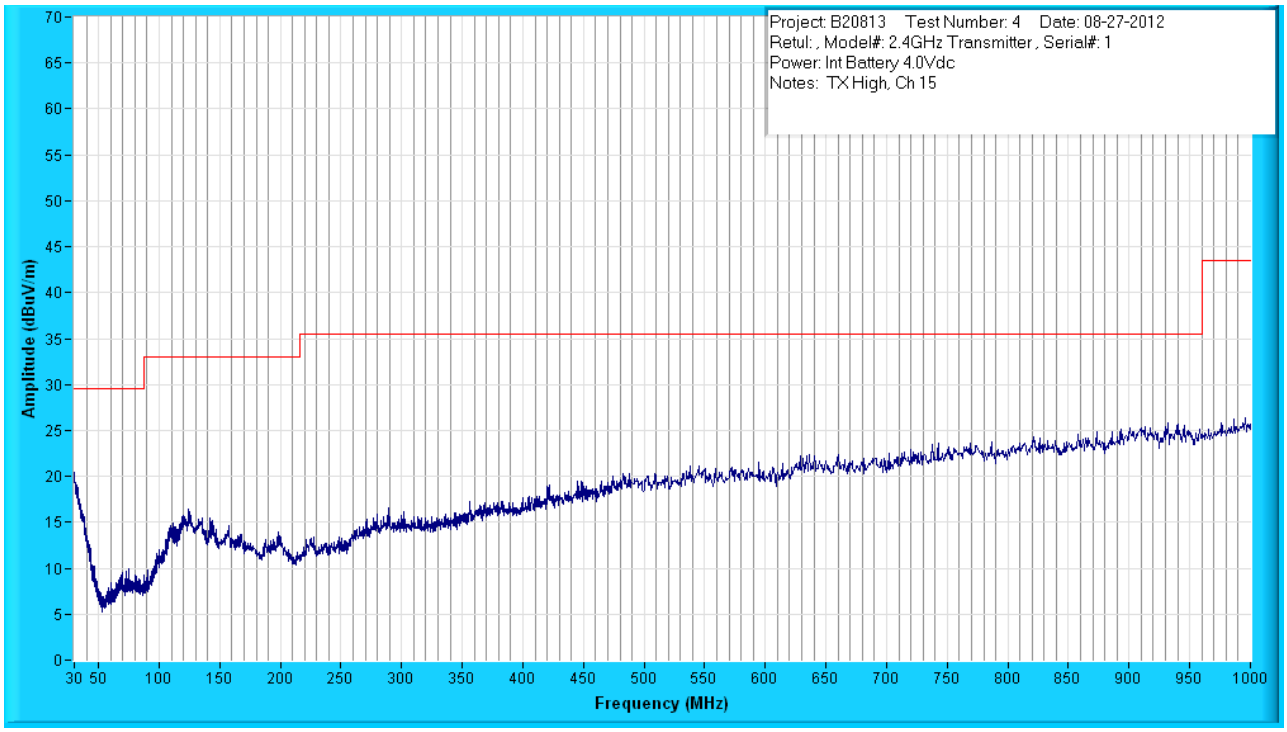

Figure A3: Radiated Emissions Prescan, 30MHz to 1000MHz, TX High, Channel 15, Peak Measurements at 10m Distance

emc integrity incorporated

Radiated Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15	Date:	August 28, 2012

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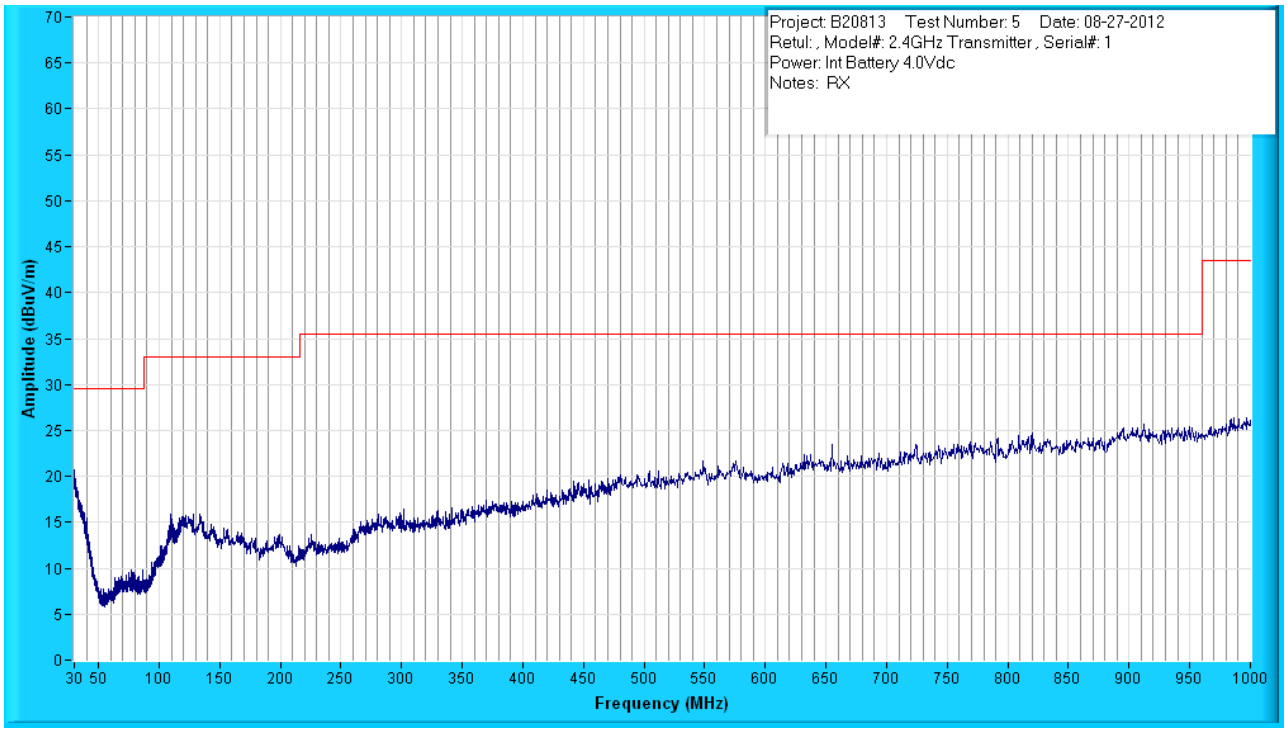

Figure A4: Radiated Emissions Prescan, 30MHz to 1000MHz, RX, Peak Measurements at 10m Distance

emc integrity incorporated

Radiated Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15	Date:	August 28, 2012

B20813-22-RE.doc FR0100

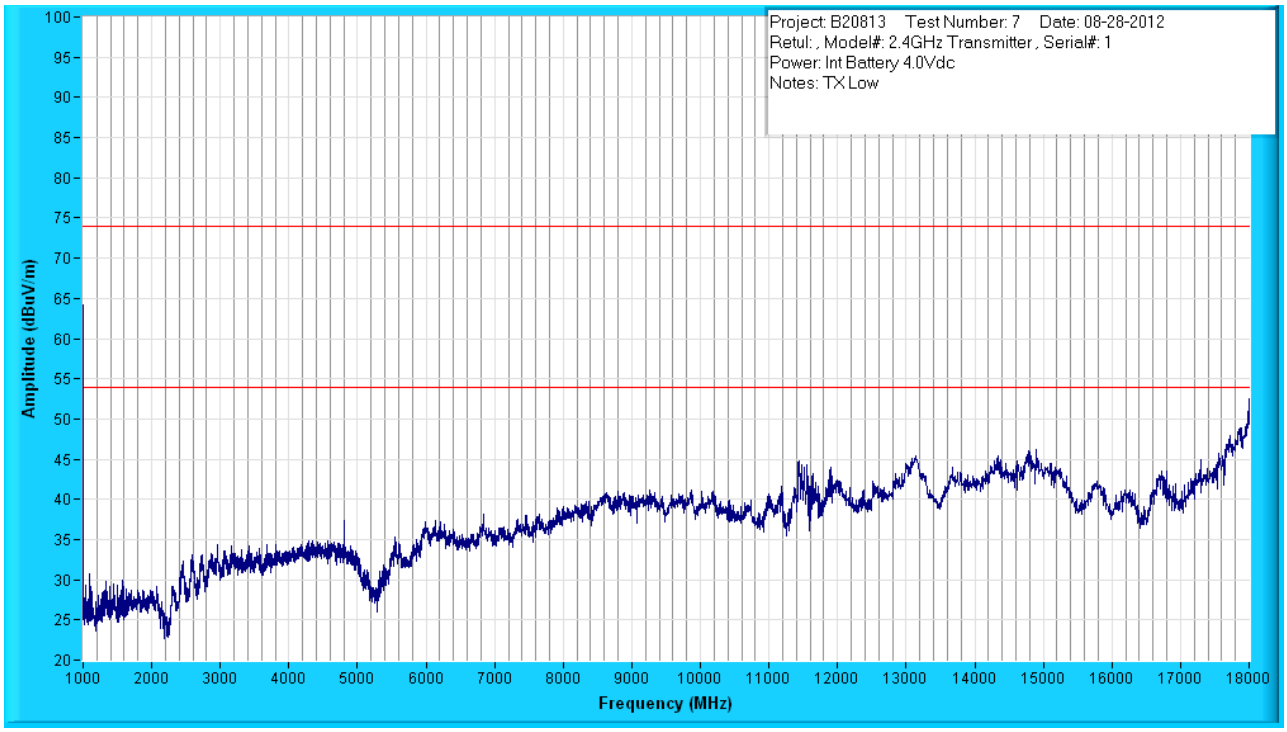

Figure A5: Radiated Emissions Prescan, 1GHz to 18GHz, TX Low, Channel 0, Peak Measurements at 3m Distance

emc integrity incorporated

Radiated Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15	Date:	August 28, 2012

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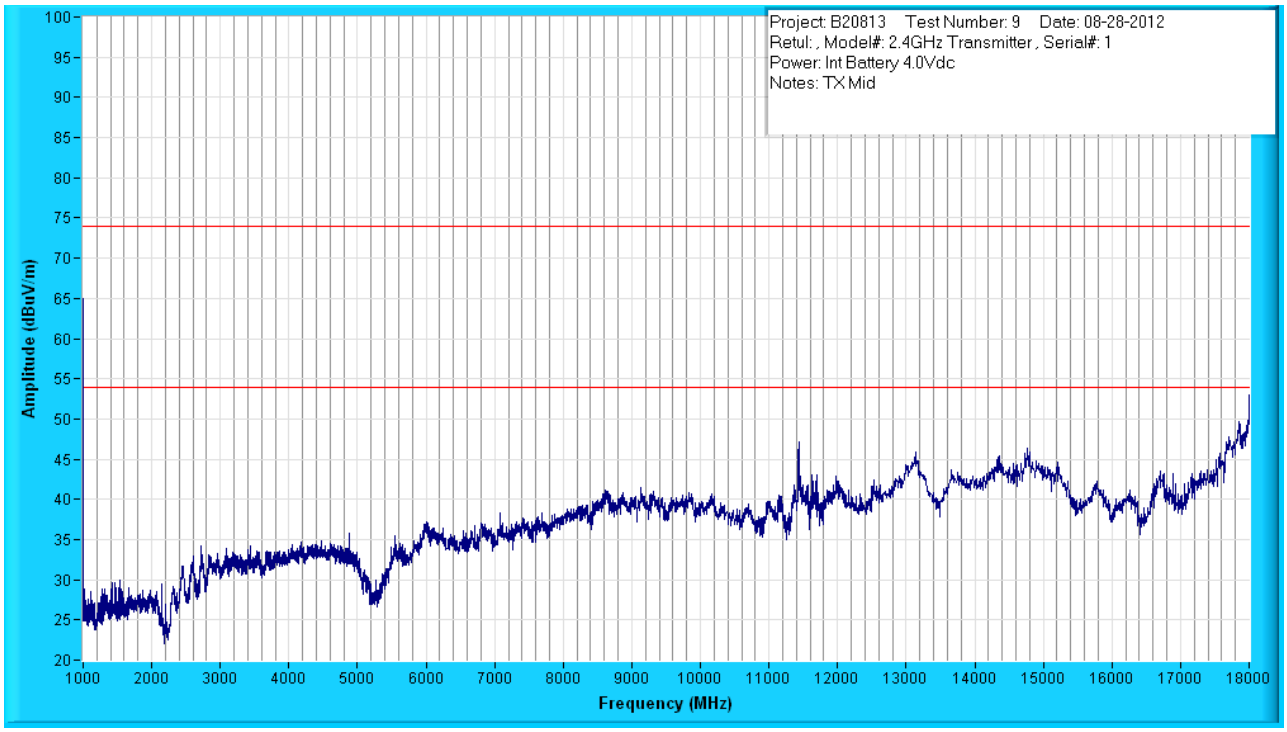

Figure A6: Radiated Emissions Prescan, 1GHz to 18GMHz, TX Mid, Channel 7, Peak Measurements at 3m Distance

emc integrity incorporated

Radiated Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15	Date:	August 28, 2012

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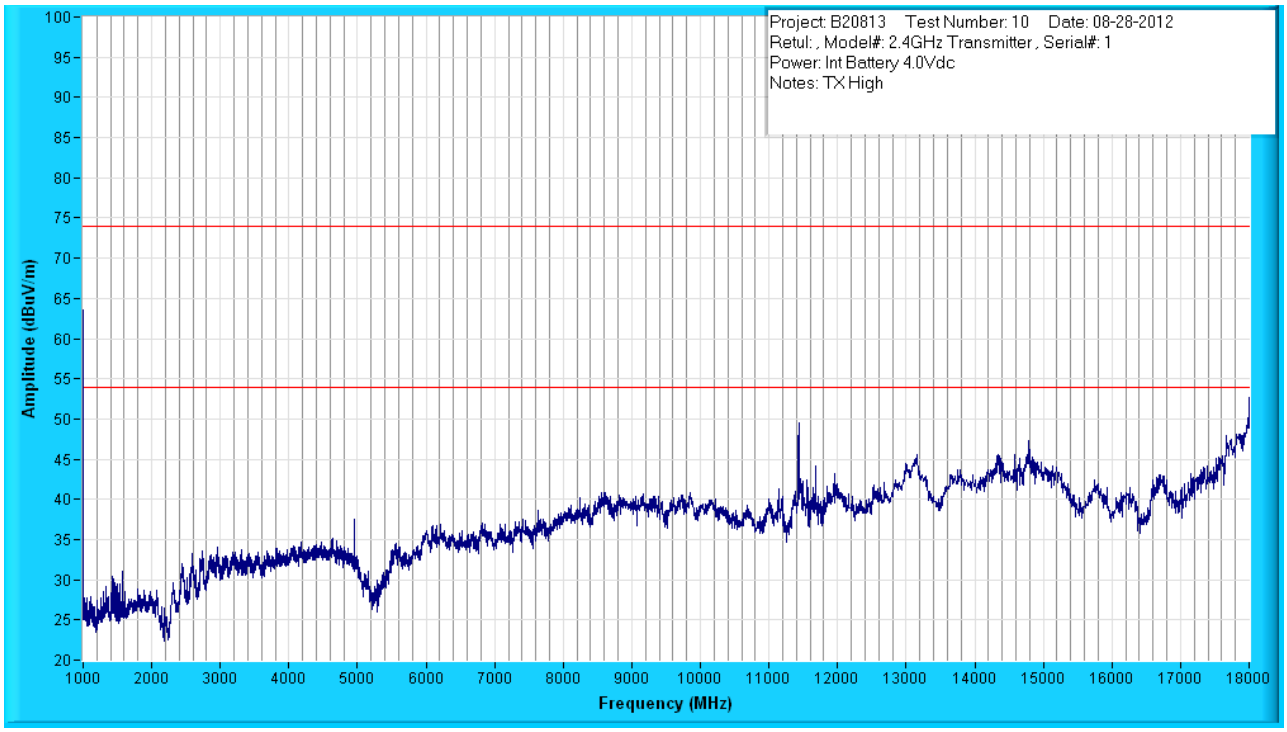

Figure A7: Radiated Emissions Prescan, 1GHz to 18GHz, TX High, Channel 15, Peak Measurements at 3m Distance

emc integrity incorporated

Radiated Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15	Date:	August 28, 2012

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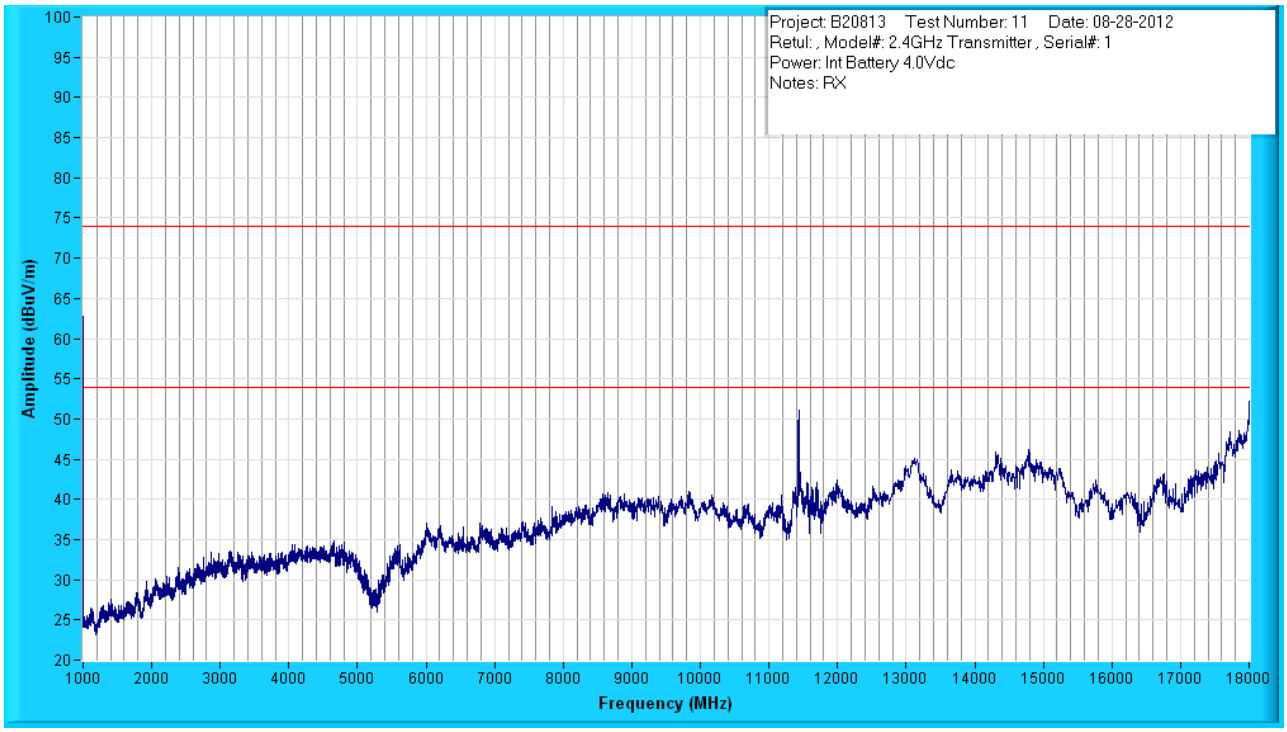

Figure A8: Radiated Emissions Prescan, 1GHz to 18GHz, RX, Channel 15, Peak Measurements at 3m Distance

emc integrity incorporated

Radiated Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15	Date:	August 28, 2012

B20813-22-RE.doc FR0100

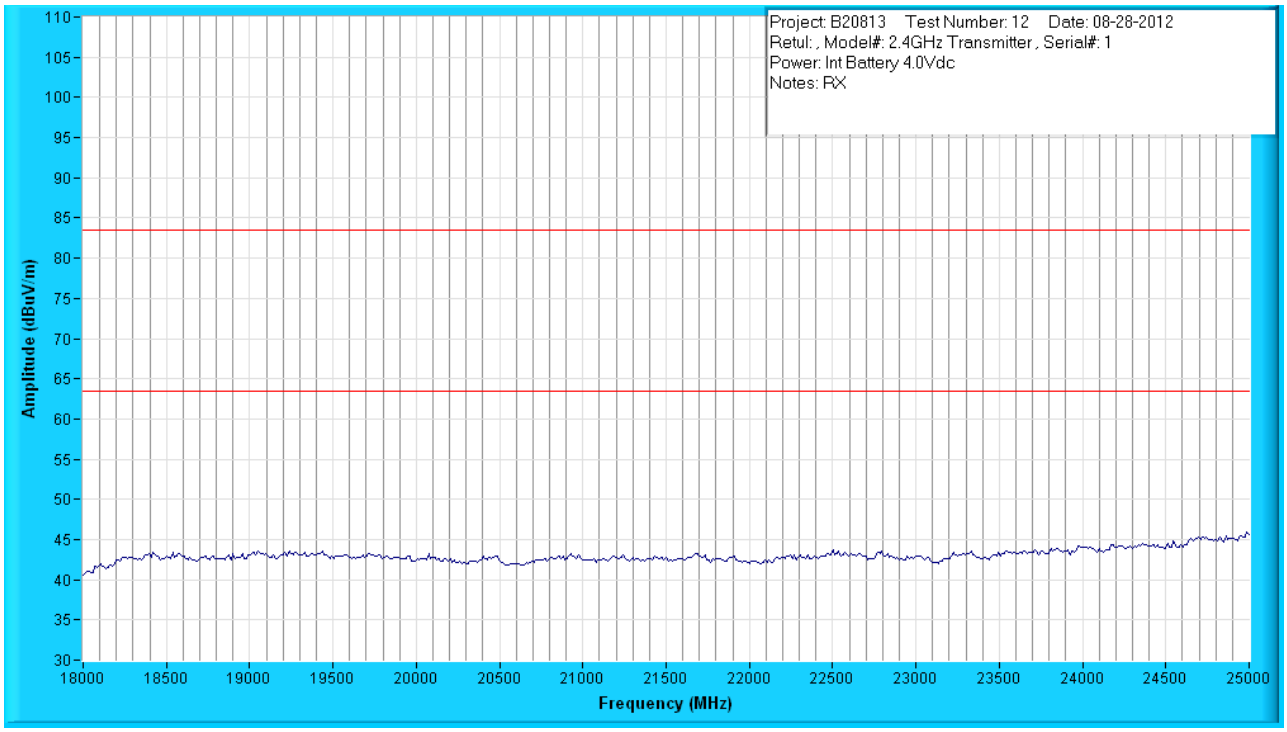

Figure A9: Radiated Emissions Prescan, 18GHz to 25GHz, RX, Channel 15, Peak Measurements at 1m Distance

emc integrity incorporated

Radiated Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15	Date:	August 28, 2012

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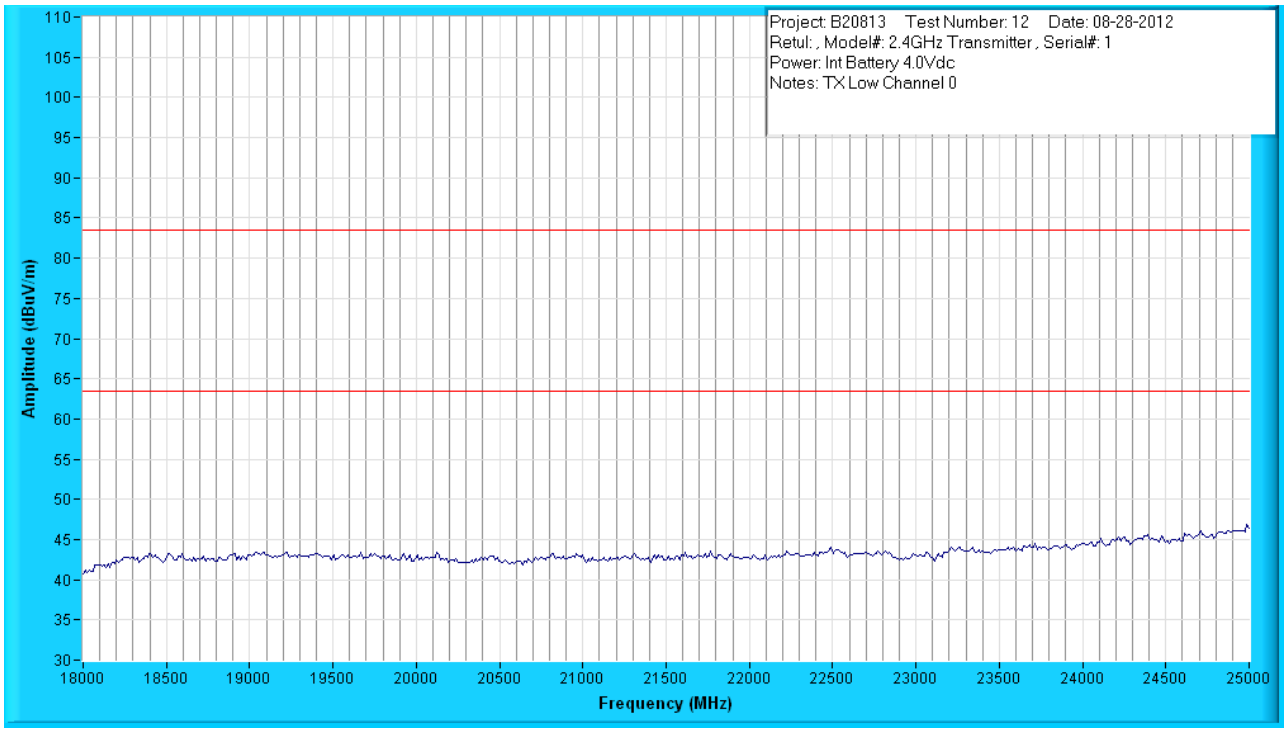


Figure A10: Radiated Emissions Prescan, 18GHz to 25GHz, TX Low, Channel 0, Peak Measurements at 1m Distance

emc integrity incorporated

Radiated Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15	Date:	August 28, 2012

B20813-22-RE.doc FR0100

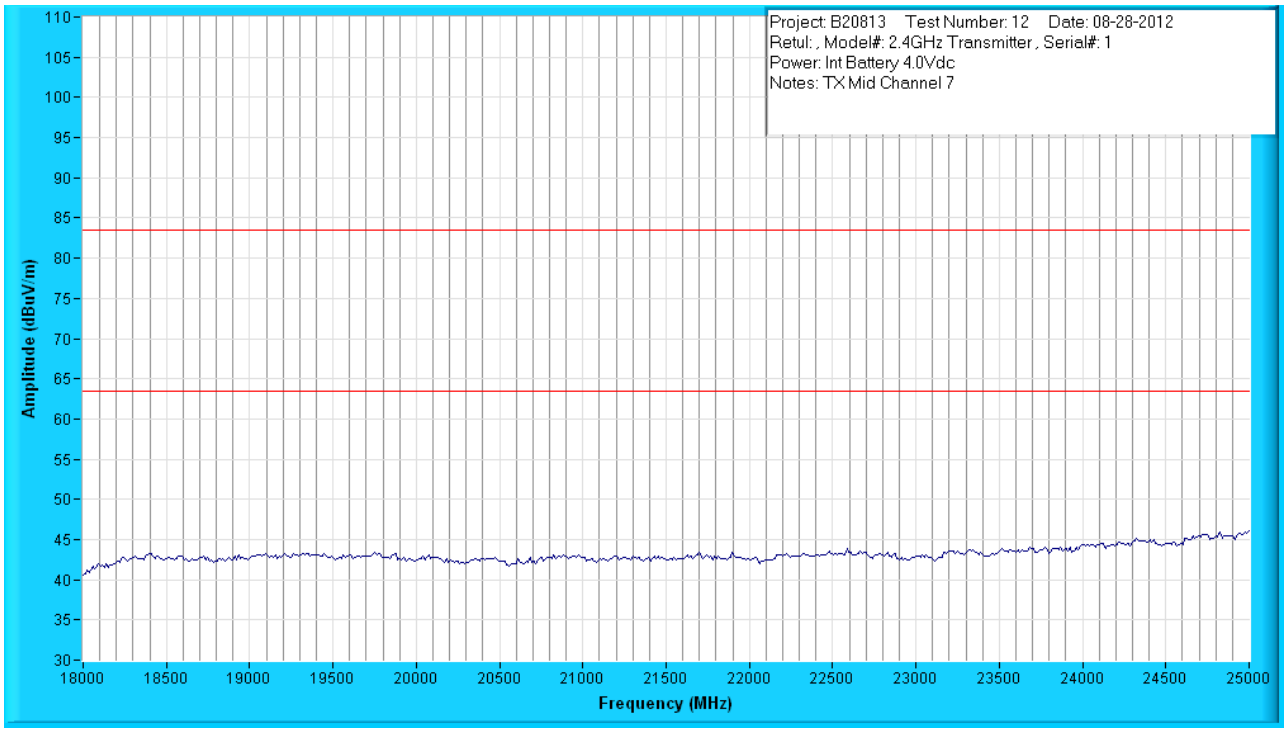


Figure A11: Radiated Emissions Prescan, 18GHz to 25GHz, TX Mid, Channel 7, Peak Measurements at 1m Distance

emc integrity incorporated

Radiated Emissions, FCC Part 15

Manufacturer:	Retul	Project Number:	B20813
Customer Representative:	Cliff Simms	Test Area:	10m1
Model:	2.4GHz Transmitter	S/N:	1
Standard Referenced:	FCC Part 15	Date:	August 28, 2012

B20813-22-RE.doc FR0100

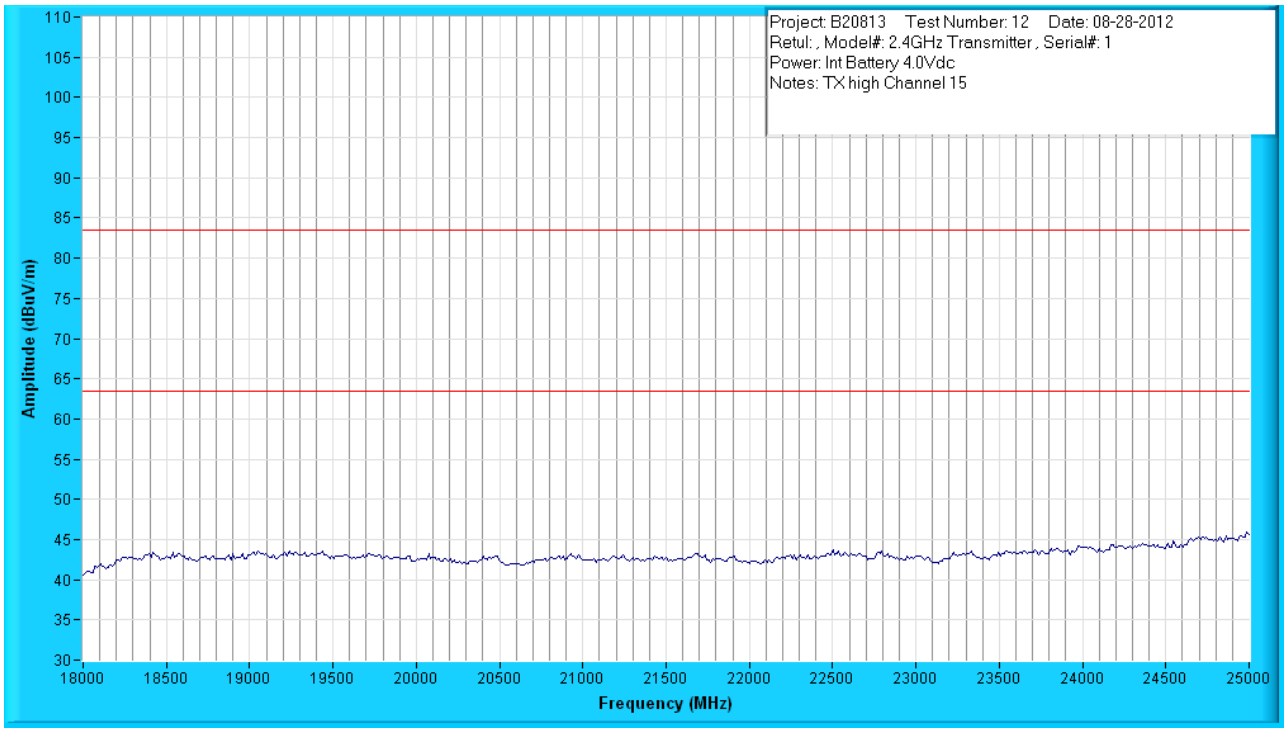
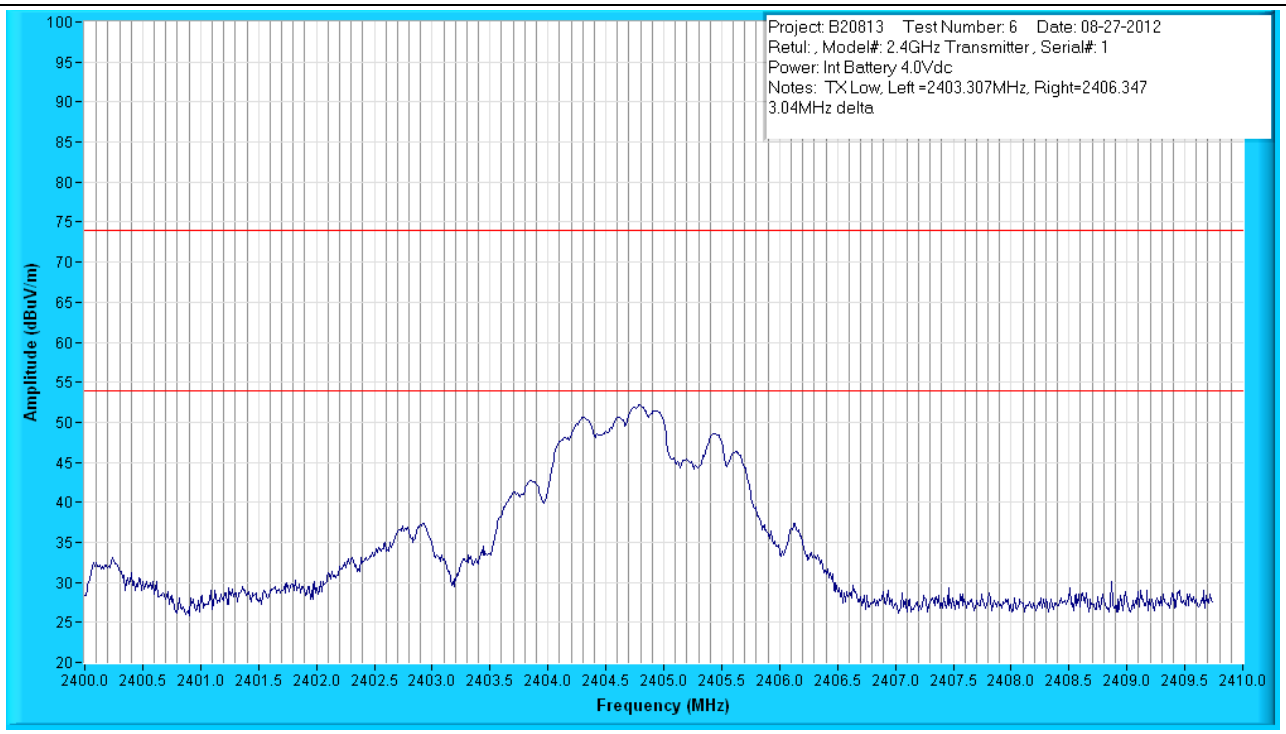


Figure 12: Radiated Emissions Prescan, 18GHz to 25GHz, TX High, Channel 15, Peak Measurements at 1m Distance

Test Results – 20 dB Occupied Bandwidth

Table No. 2	20 dB Occupied Bandwidth – Lowest Channel	Verdict
		P

Test Method	ANSI C63.4
EUT Configuration	Tx Low with modulation
Power Input	4 Vdc
Test Date	27 August 2012
Temperature	23 deg Celcius
Asset Numbers:	1030, 1219, 1233, 1234, 1238, 1239, 1246, 1276, 1342, 1344, 1345, 1381, 1405



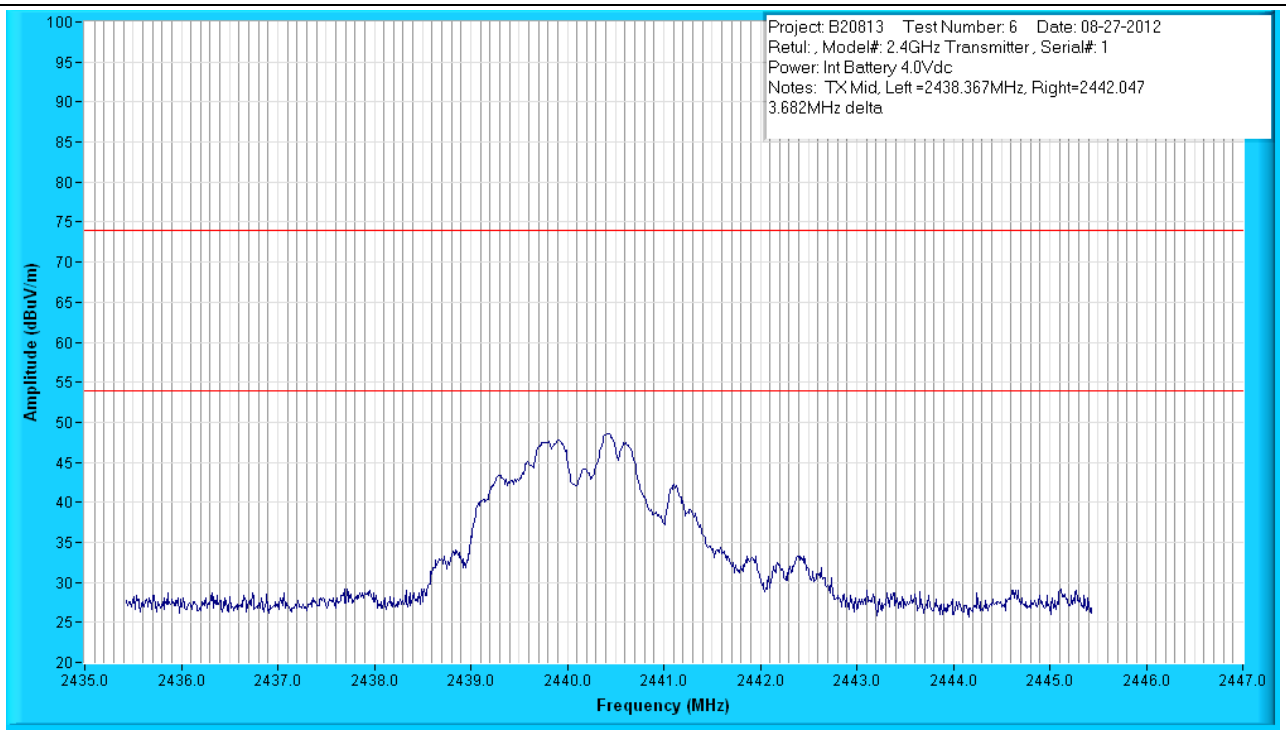
Supplemental Information:

20 dB occupied bandwidth for Tx Low = 3.04 MHz

Tested by (+ signature) .....: Kevin Johnson.

Table No. 3	20 dB Occupied Bandwidth – Middle Channel	Verdict
		P

Test Method	ANSI C63.4
EUT Configuration	Tx Mid with modulation
Power Input	4 Vdc
Test Date	27 August 2012
Temperature	23 deg Celcius
Asset Numbers:	1030, 1219, 1233, 1234, 1238, 1239, 1246, 1276, 1342, 1344, 1345, 1381, 1405



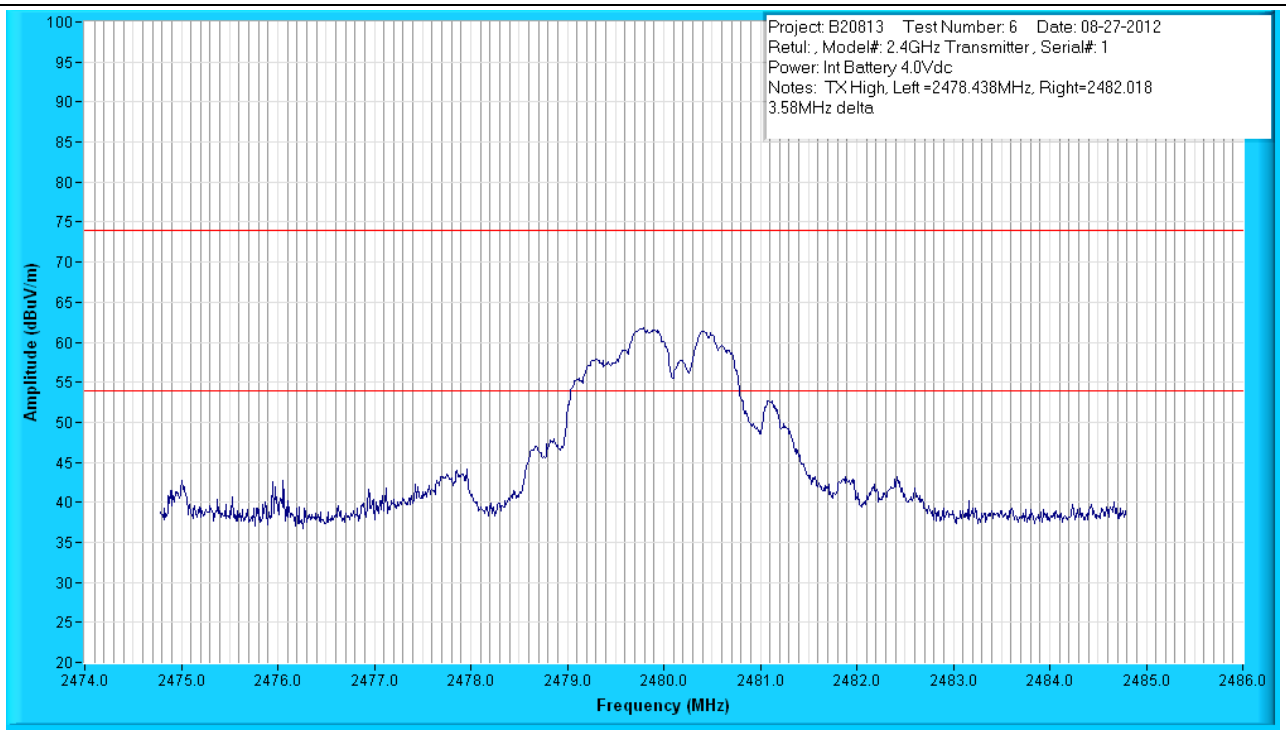
Supplemental Information:

20 dB occupied bandwidth for Tx Mid = 3.682 MHz

Tested by (+ signature) .....: Kevin Johnson.

Table No. 4	20 dB Occupied Bandwidth – Highest Channel	Verdict
		P

Test Method	ANSI C63.4
EUT Configuration	Tx High with modulation
Power Input	4 Vdc
Test Date	27 August 2012
Temperature	23 deg Celcius
Asset Numbers:	1030, 1219, 1233, 1234, 1238, 1239, 1246, 1276, 1342, 1344, 1345, 1381, 1405



Supplemental Information:

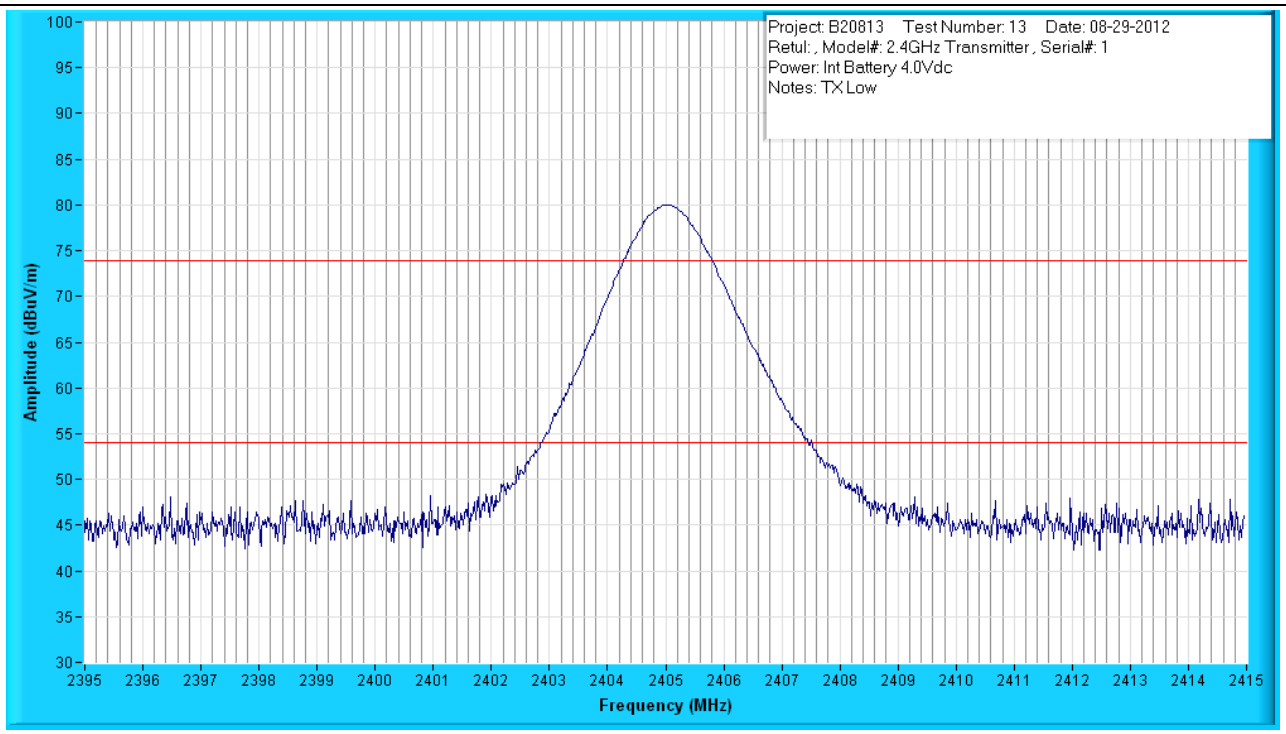
20 dB occupied bandwidth for Tx High = 3.58 MHz

Tested by (+ signature) .....: Kevin Johnson.

Test Results - Field Strength of Fundamental

Table No. 5	Field Strength of Fundamental – Lowest Channel	Verdict
		P

Test Method	ANSI C63.4
EUT Configuration	Tx Low without modulation
Power Input	4 Vdc
Test Date	27 August 2012
Temperature	23 deg Celcius
Asset Numbers:	1030, 1219, 1233, 1234, 1238, 1239, 1246, 1276, 1342, 1344, 1345, 1381, 1405



Type	Frequency (MHz)	Level (dBuV)	Transducer (dB/m)	Gain / Loss (dB)	Final (dBuV/m)	Azm(deg)/Pol/ Hgt(m)	FCC 15.249 Ave. Limit @ 3 meters (dBuV/m)	Margin: FCC 15.249 Limit @ 3 meters (dB)
PK	2404.950	103.3	28.5	-51.4	80.4	230/H-Pole/1.83	94	13.6
AV	2404.950	102.5	28.5	-51.4	79.7	230/H-Pole/1.83	94	14.3
TX Fundamental Low								

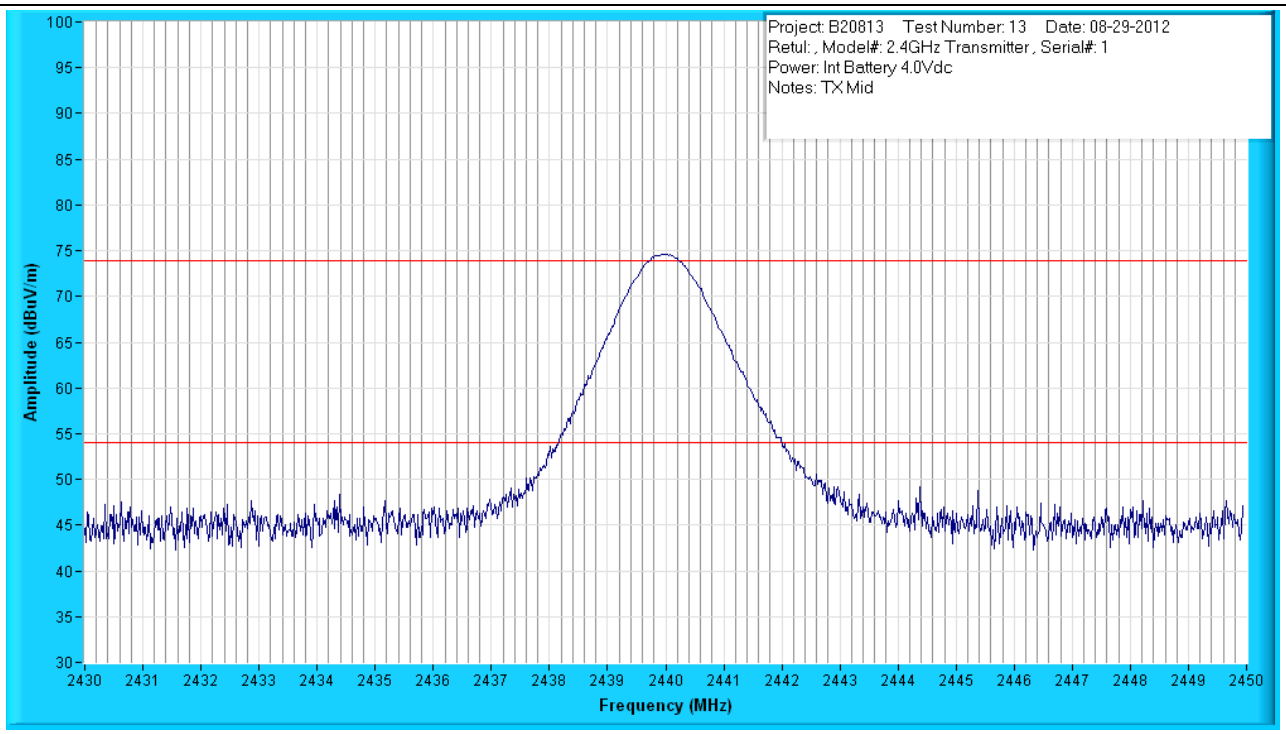
Supplemental Information:

Maximized emission for fundamental field strength (Tx Low) was 80.4 dBuV/m @ 3m, which complied with FCC 15.249 limit with 13.6 dB margin. Unmodulated emissions yielded worst-case results.

Tested by (+ signature) .....: Kevin Johnson.

Table No. 6	Field Strength of Fundamental – MIddle Channel	Verdict
		P

Test Method	ANSI C63.4
EUT Configuration	Tx Mid without modulation
Power Input	4 Vdc
Test Date	27 August 2012
Temperature	23 deg Celcius
Asset Numbers:	1030, 1219, 1233, 1234, 1238, 1239, 1246, 1276, 1342, 1344, 1345, 1381, 1405



Type	Frequency (MHz)	Level (dBuV)	Transducer (dB/m)	Gain / Loss (dB)	Final (dBuV/m)	Azm(deg)/Pol/ Hgt(m)	FCC 15.249 Ave. Limit @ 3 meters (dBuV/m)	Margin: FCC 15.249 Limit @ 3 meters (dB)
PK	2439.930	98.5	28.6	-51.4	75.7	200/H-Pole/2.43	94	18.3
AV	2439.930	97.3	28.6	-51.4	74.6	200/H-Pole/2.43	94	19.4
TX Fundamental Mid								

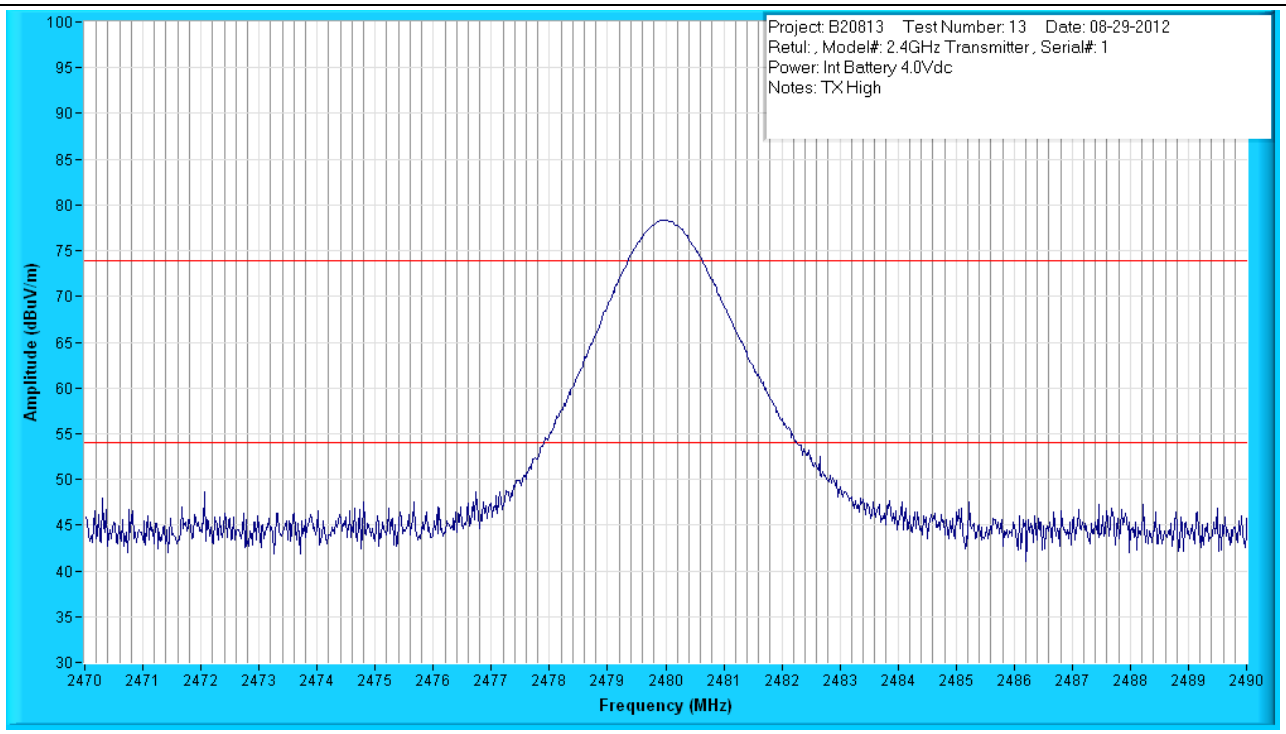
Supplemental Information:

Maximized emission for fundamental field strength (Tx Low) was 75.7 dBuV/m @ 3m, which complied with FCC 15.249 limit with 18.3 dB margin. Unmodulated emissions yielded worst-case results.

Tested by (+ signature) .....: Kevin Johnson.

Table No. 7	Field Strength of Fundamental – Highest Channel	Verdict
		P

Test Method	ANSI C63.4
EUT Configuration	Tx High without modulation
Power Input	4 Vdc
Test Date	27 August 2012
Temperature	23 deg Celcius
Asset Numbers:	1030, 1219, 1233, 1234, 1238, 1239, 1246, 1276, 1342, 1344, 1345, 1381, 1405



Type	Frequency (MHz)	Level (dBuV)	Transducer (dB/m)	Gain / Loss (dB)	Final (dBuV/m)	Azm(deg)/Pol/ Hgt(m)	FCC 15.249 Ave. Limit @ 3 meters (dBuV/m)	Margin: FCC 15.249 Limit @ 3 meters (dB)
PK	2479.970	102.0	28.7	-51.9	78.8	224/H-Pole/1.82	94	15.2
AV	2479.970	100.7	28.7	-51.9	77.5	224/H-Pole/1.82	94	16.5
TX Fundamental High								

Supplemental Information:

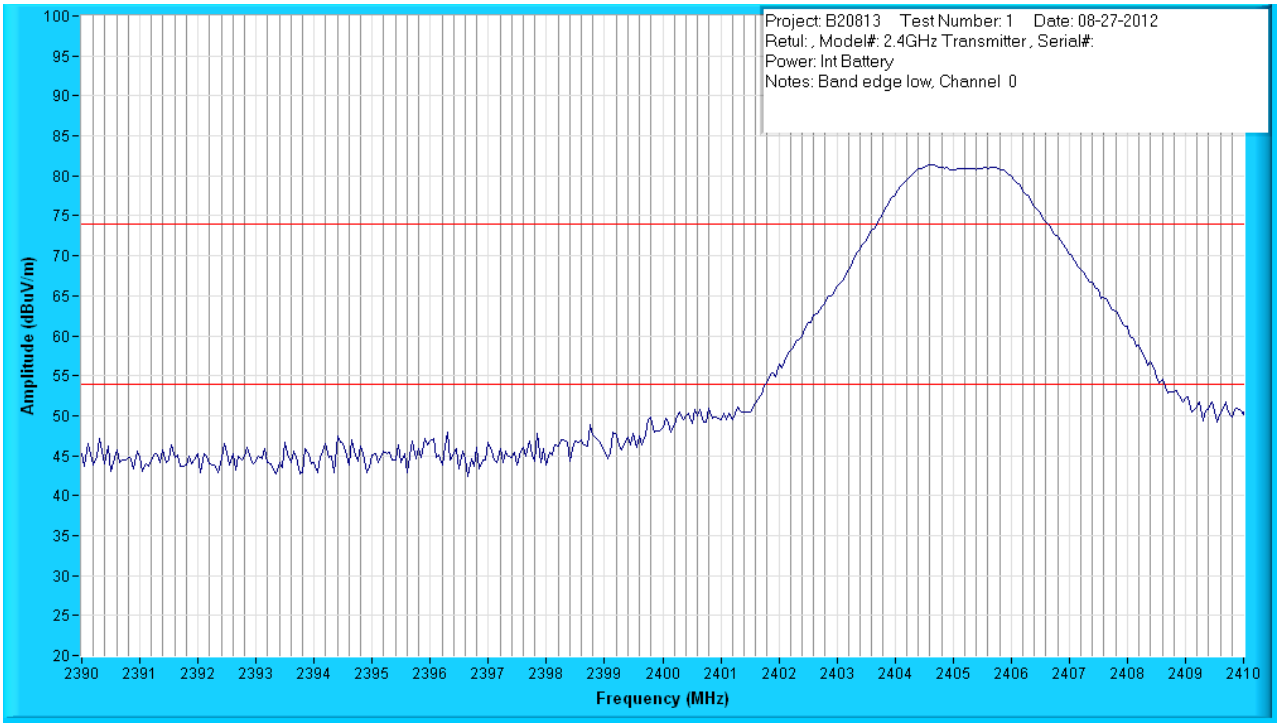
Maximized emission for fundamental field strength (Tx Low) was 78.8 dBuV/m @ 3m, which complied with FCC 15.249 limit with 15.2 dB margin. Unmodulated emissions yielded worst-case results.

Tested by (+ signature) .....: Kevin Johnson.

Test Results – Band Edge

Table No. 8	Band Edge – Lowest Channel	Verdict
		P

Test Method	ANSI C63.4
EUT Configuration	Tx Low with modulation
Power Input	4 Vdc
Test Date	27 August 2012
Temperature	23 deg Celcius
Asset Numbers:	1030, 1219, 1233, 1234, 1238, 1239, 1246, 1276, 1342, 1344, 1345, 1381, 1405



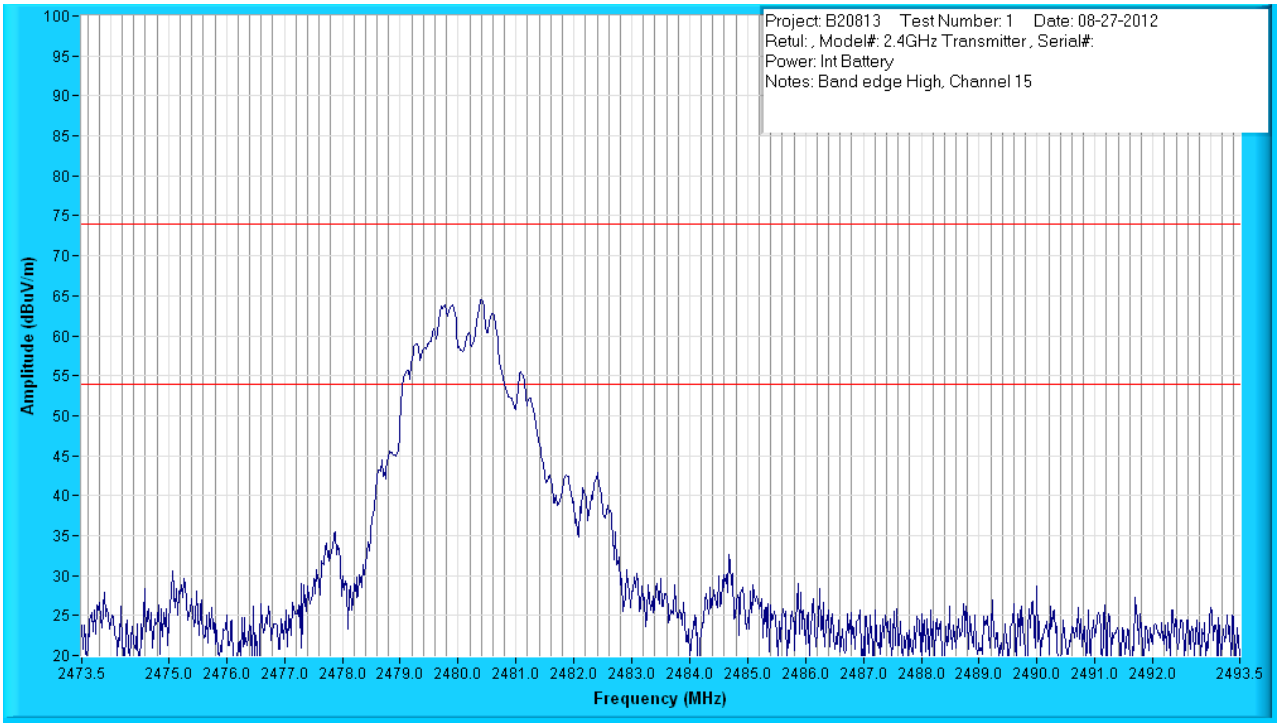
Supplemental Information:

When tuned to its lowest channel (Channel 0), the EUT complied with the lower band edge requirement with a margin of 9.68 dB.

Tested by (+ signature) .....: Kevin Johnson.

Table No. 9	Band Edge – Highest Channel	Verdict
		P

Test Method	ANSI C63.4
EUT Configuration	Tx High with modulation
Power Input	4 Vdc
Test Date	27 August 2012
Temperature	23 deg Celcius
Asset Numbers:	1030, 1219, 1233, 1234, 1238, 1239, 1246, 1276, 1342, 1344, 1345, 1381, 1405



Supplemental Information:

When tuned to its highest channel (Channel 15), the EUT complied with the upper band edge requirement with a margin of 14.37 dB below the AVERAGE limit. At 2483.5 MHz, the PEAK reading shown in the maximized scan above shows the emission at this frequency has greater than 40 dB of margin to the peak limit. Further data may be found in the emission plots in the Restricted Band appendix of this report.

Tested by (+ signature) .....: Kevin Johnson.

Test Results - Spurious/Out-of Band Emissions

Note: All data for Spurious/Out-of-Band Emissions may be found in the emissions data for Restricted Bands, found on page 28 of this report.

Test Results – RF Exposure

Table No. 10	Prediction of MPE – Lowest Channel	Verdict
		P

Test Method..... : ANSI C63.4

EUT Configuration ..... : Tx Low (worst-case)

Power Input..... : 4.Vdc, 1□ 3□

Test Date ..... : 29 August 2012

Temperature ..... : 23°C Relative Humidity .....: 34 %

Test Equipment Asset Tag List ..... : 1030, 1219, 1233, 1234, 1238, 1239, 1246, 1276, 1342, 1344, 1345,

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

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

where: S = power density

P = power input to the antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal:	3.7	(dBm)	*
Maximum peak output power at antenna input terminal:	2.3	(mW)	
Antenna gain(maximum):	5.3	(dBi)	*
Maximum antenna gain:	3.39	(numeric)	
Time Averaging:	100	(%)	*
Prediction distance:	20	(cm)	*
Prediction frequency:	2480	(MHz)	*
MPE limit for uncontrolled exposure at prediction frequency:	1.000	(mW/cm^2)	
Power density at prediction frequency:	0.0016	(mW/cm^2)	

Supplemental Information:

Tested by (+ signature) ..... : Kevin Johnson

Setup Photos

Photo 3	**Test Setup – Radiated Emissions (Front)**	

Supplemental Information:

Photo 4	**Test Setup – Radiated Emissions (Back)**	

Supplemental Information:

Photo 5	**Test Setup – Conducted Emissions (Front)**	

Supplemental Information:

Photo 6	**Test Setup – Conducted Emissions (Side)**	

Supplemental Information: