

## FCC 47 CFR PART 15 SUBPART C

### RF Test Report

Applicant : Comtrend Corporation  
Product Type : Multi-DSL Wireless Router  
Trade Name : COMTREND  
Model Number : VR-3033u, VR-3033  
Applicable Standard : FCC 47 CFR PART 15 SUBPART C  
ANSI C63.10:2013  
Receive Date : Jan. 08, 2016  
Test Period : Jan. 08 ~ Feb. 17, 2016  
Issue Date : Mar. 31, 2016

#### Issue by

A Test Lab Techno Corp.  
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Taiwan Accreditation Foundation accreditation number: 1330

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**Revision History**

Rev.	Issue Date	Revisions	Revised By
00	Mar. 31, 2016	Initial Issue	Snow Wang

## Verification of Compliance

Issued Date: Mar. 31, 2016

Applicant : Comtrend Corporation  
Product Type : Multi-DSL Wireless Router  
Trade Name : COMTREND  
Model Number : VR-3033u, VR-3033  
FCC ID : L9VVR-3033U  
EUT Rated Voltage : DC 12V, 1A  
Test Voltage : 120 Vac / 60 Hz  
Applicable Standard : FCC 47 CFR PART 15 SUBPART C  
ANSI C63.10:2013  
Test Result : Complied  
Performing Lab. : A Test Lab Techno Corp.

No. 140-1, Changan Street, Bade District,  
Taoyuan City 33465, Taiwan (R.O.C)  
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Taiwan Accreditation Foundation accreditation number: 1330  
<http://www.atl-lab.com.tw/e-index.htm>

A Test Lab Techno Corp. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by A Test Lab Techno Corp. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Approved By



(Manager)

(Fly Lu)

Reviewed By



(Testing Engineer)

(Eric Ou Yang)

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## 1 General Information

### 1.1 Summary of Test Result

Standard	Item	Result	Remark
15.247			
15.207	AC Power Conducted Emission	PASS	-----
Standard	Item	Result	Remark
15.247			
15.247(d)	Transmitter Radiated Emissions	PASS	-----
15.247(b)(3)	Max. Output Power	PASS	-----
15.247(a)(2)	6dB RF Bandwidth	PASS	-----
15.247(e)	Power Spectral Density	PASS	-----
15.247(d)	Out of Band Conducted Spurious Emission	PASS	-----
15.203	Antenna Requirement	PASS	-----

The test results of this report relate only to the tested sample(s) identified in this report. Manufacturer or whom it may concern should recognize the pass or fail of the test result.

### 1.2 Measurement Uncertainty

Test Item	Frequency Range	Uncertainty (dB)
Conducted Emission	9kHz ~ 150KHz	2.7
	150kHz ~ 30MHz	2.8
Radiated Emission	9kHz ~ 30MHz	1.457
	30MHz ~ 1000MHz	6.300
	1000MHz ~ 18000MHz	5.474
	18000MHz ~ 26500MHz	5.630
	26500MHz ~ 40000MHz	5.054

## 2 EUT Description

Applicant	Comtrend Corporation 3F-1, No. 10, Lane 609, Chung Hsin Road, Section 5, San Chung Dist, New Taipei City 24159, Taiwan			
Manufacturer	Comtrend Corporation 3F-1, No. 10, Lane 609, Chung Hsin Road, Section 5, San Chung Dist, New Taipei City 24159, Taiwan			
Product Type	Multi-DSL Wireless Router			
Trade Name	COMTREND			
Model Number	VR-3033u, VR-3033			
Different Description	Those number models differ from each other in selling region			
FCC ID	L9VVR-3033U			
Operate Freq. Band	Frequency Range (MHz)	Modulation	Channel Bandwidth	Data Rate 400 GI (ns)
IEEE 802.11b	2412 ~ 2462	DSSS	20MHz	Up to 11Mbps
IEEE 802.11g	2412 ~ 2462	OFDM (16/64QAM)	20MHz	Up to 54Mbps
IEEE 802.11n 2.4GHz 20MHz	2412 ~ 2462	OFDM (16/64QAM)	20MHz	Up to 144.4Mbps
IEEE 802.11n 2.4GHz 40MHz	2422 ~ 2452	OFDM (16/64QAM)	40MHz	Up to 300Mbps
Antenna Delivery	See section 3.1			
Antenna information	ANT Port	Model Name	Type	Max. Gain (dBi)
	ANT-0	EDA-1313-2G4C1-B4	External Antenna	2.59 dBi
	ANT-1	EDA-1313-2G4C1-B3		2.63 dBi

Frequency Band	Max. RF Output Power (W)
IEEE 802.11b	0.136
IEEE 802.11g	0.415
IEEE 802.11n 2.4GHz 20MHz	0.782
IEEE 802.11n 2.4GHz 40MHz	0.632

### 3 Test Methodology

#### 3.1. Mode of Operation

Decision of Test ATL has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode 1: Normal operation mode
Mode 2: IEEE 802.11b link mode
Mode 3: IEEE 802.11g link mode
Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode
Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode

Software used to control the EUT for staying in continuous transmitting mode was programmed.

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz and power line conducted emissions below 30MHz, which worst case was in normal link mode only.

Test Mode	ANT-0	ANT-1	ANT-0+1
Mode 2: IEEE 802.11b link mode	V	---	---
Mode 3: IEEE 802.11g link mode	V	V	---
Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode	V	V	V
Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode	V	V	V

Test Mode	Antenna Delivery	Test Channel	Data Rate
Mode 2: IEEE 802.11b link mode	1TX / 1RX	1, 6, 11	1
Mode 3: IEEE 802.11g link mode	1TX / 1RX_Diversity	1, 6, 11	6
Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode	2TX / 2RX_MIMO	1, 6, 11	13
Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode	2TX / 2RX_MIMO	3, 6, 9	27

#### Duty cycle

Test Mode	Frequency (MHz)	on time (ms)	on+off time (ms)	Duty cycle	Duty Factor (dB)	1/T Minimum VBW (kHz)
Mode 2: IEEE 802.11b link mode	2412.0	12.600	12.680	0.994	0.027	0.010
Mode 3: IEEE 802.11g link mode	2412.0	2.125	2.375	0.895	0.483	0.471
Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode	2412.0	1.050	1.275	0.824	0.843	0.952
Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode	2422.0	0.525	0.775	0.677	1.691	1.905

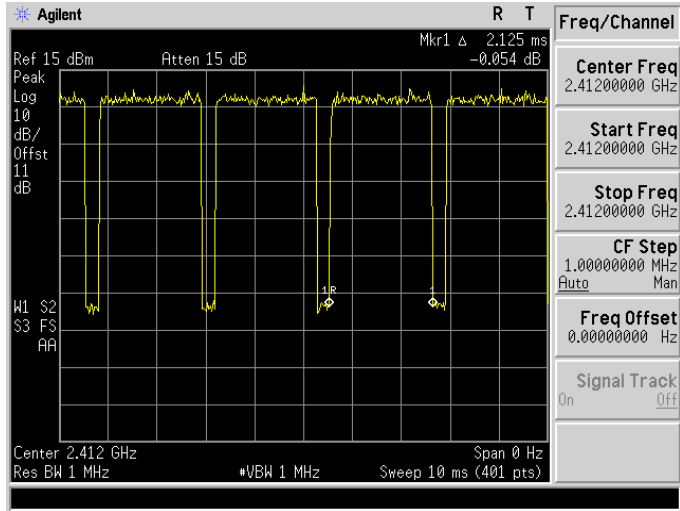


**Duty Cycle Graphs**

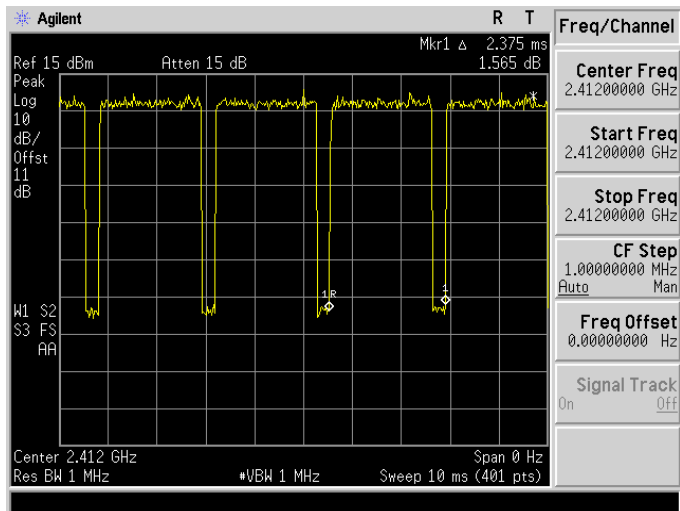
Mode 2: IEEE 802.11b link mode	
On time	<p>Agilent R T            Ref 15 dBm Atten 15 dB Mkr1 Δ 12.6 ms            Peak 0.712 dB            Log 10            dB/ Offst 11            dB            W1 S2            S3 FS            AA            Center 2.412 GHz Span 0 Hz            Res BW 1 MHz *VBW 1 MHz Sweep 30 ms (401 pts)</p>
On+off time	<p>Agilent R T            Ref 15 dBm Atten 15 dB Mkr1 Δ 12.68 ms            Peak -0.063 dB            Log 10            dB/ Offst 11            dB            W1 S2            S3 FS            AA            Center 2.412 GHz Span 0 Hz            Res BW 1 MHz *VBW 1 MHz Sweep 30 ms (401 pts)</p>

Mode 3: IEEE 802.11g Mode

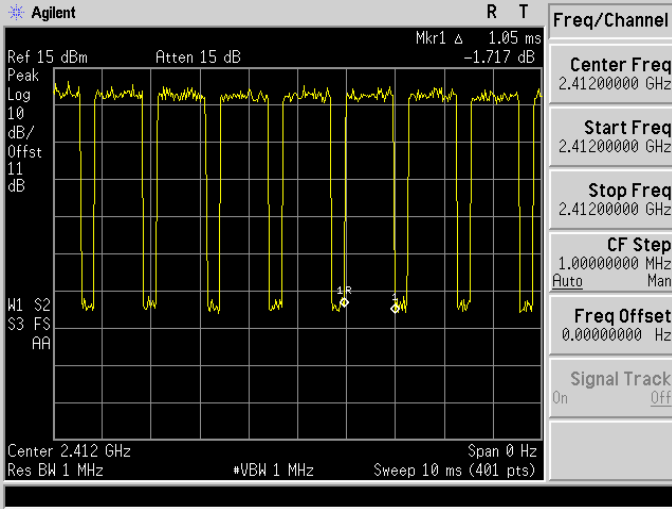
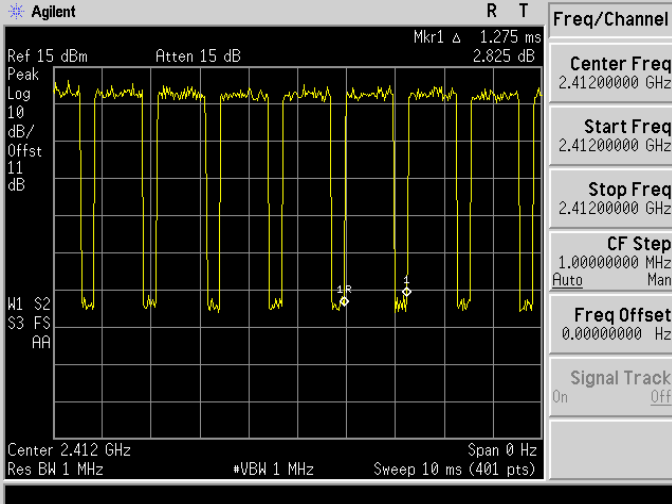
On time



On+off time



Mode 4: IEEE 802.11n 2.4GHz 20MHz Mode

<p>On time</p>	 <p>Agilent R T</p> <p>Ref 15 dBm Atten 15 dB Mkr1 Δ 1.05 ms -1.717 dB</p> <p>Peak Log 10 dB/Offst 11 dB</p> <p>W1 S2 S3 FS AA</p> <p>Center 2.412 GHz Res BW 1 MHz *VBW 1 MHz Sweep 10 ms (401 pts) Span 0 Hz</p> <p>Freq/Channel</p> <p>Center Freq 2.41200000 GHz</p> <p>Start Freq 2.41200000 GHz</p> <p>Stop Freq 2.41200000 GHz</p> <p>CF Step 1.00000000 MHz Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p>
<p>On+off time</p>	 <p>Agilent R T</p> <p>Ref 15 dBm Atten 15 dB Mkr1 Δ 1.275 ms 2.825 dB</p> <p>Peak Log 10 dB/Offst 11 dB</p> <p>W1 S2 S3 FS AA</p> <p>Center 2.412 GHz Res BW 1 MHz *VBW 1 MHz Sweep 10 ms (401 pts) Span 0 Hz</p> <p>Freq/Channel</p> <p>Center Freq 2.41200000 GHz</p> <p>Start Freq 2.41200000 GHz</p> <p>Stop Freq 2.41200000 GHz</p> <p>CF Step 1.00000000 MHz Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p>

Mode 5: IEEE 802.11n 2.4GHz 40MHz Mode	
On time	<p>The screenshot shows a spectrum analyzer with a signal trace. The display includes the following information:           <ul style="list-style-type: none"> <li>Reference level: 15 dBm</li> <li>Attenuation: 15 dB</li> <li>Marker 1 (Mkr1): 525 <math>\mu</math>s, 1.129 dB</li> <li>Center frequency: 2.422 GHz</li> <li>Resolution Bandwidth (Res BW): 1 MHz</li> <li>Video Bandwidth (*VBW): 1 MHz</li> <li>Sweep time: 10 ms (401 pts)</li> <li>Span: 0 Hz</li> <li>Frequency/Channel settings: Center Freq 2.42200000 GHz, Start Freq 2.42200000 GHz, Stop Freq 2.42200000 GHz, CF Step 1.00000000 MHz (Auto), Freq Offset 0.00000000 Hz.</li> </ul> </p>
On+off time	<p>The screenshot shows a spectrum analyzer with a signal trace. The display includes the following information:           <ul style="list-style-type: none"> <li>Reference level: 15 dBm</li> <li>Attenuation: 15 dB</li> <li>Marker 1 (Mkr1): 775 <math>\mu</math>s, 0.091 dB</li> <li>Center frequency: 2.422 GHz</li> <li>Resolution Bandwidth (Res BW): 1 MHz</li> <li>Video Bandwidth (*VBW): 1 MHz</li> <li>Sweep time: 10 ms (401 pts)</li> <li>Span: 0 Hz</li> <li>Frequency/Channel settings: Center Freq 2.42200000 GHz, Start Freq 2.42200000 GHz, Stop Freq 2.42200000 GHz, CF Step 1.00000000 MHz (Auto), Freq Offset 0.00000000 Hz.</li> </ul> </p>

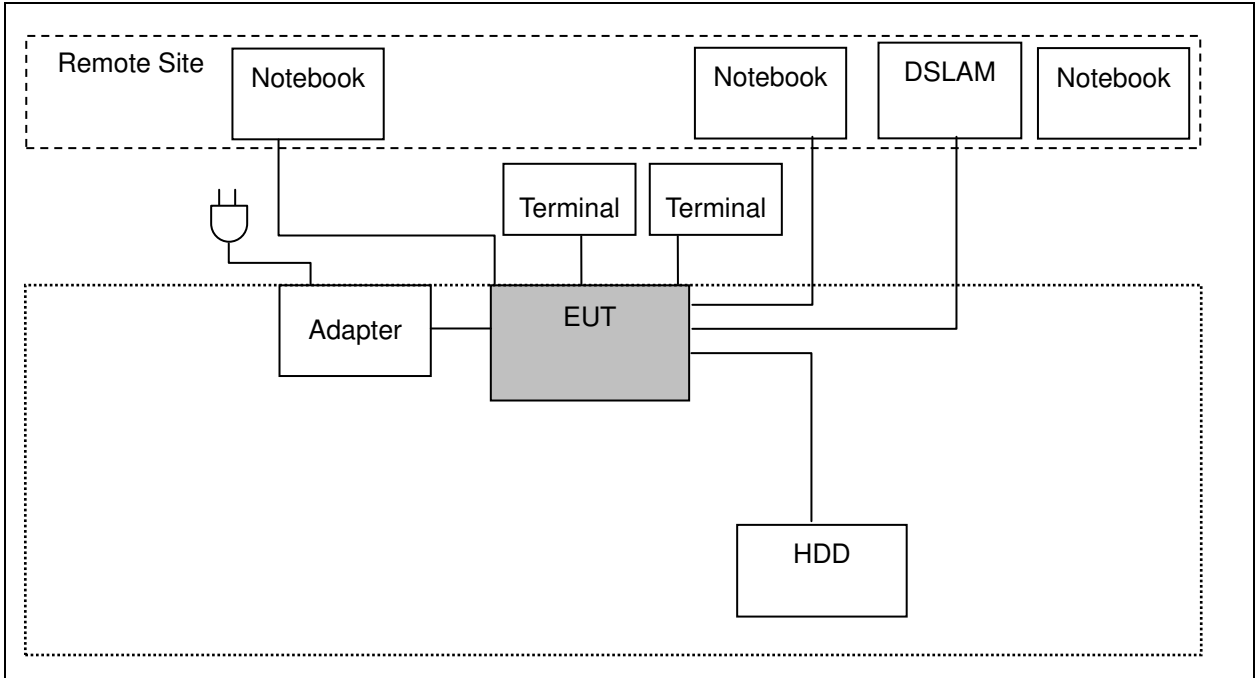
### 3.2. EUT Exercise Software

1.	Setup the EUT shown on 3.3.
2.	Turn on the power of all equipment.
3.	Turn on Wi-Fi function.
4.	EUT run test program.

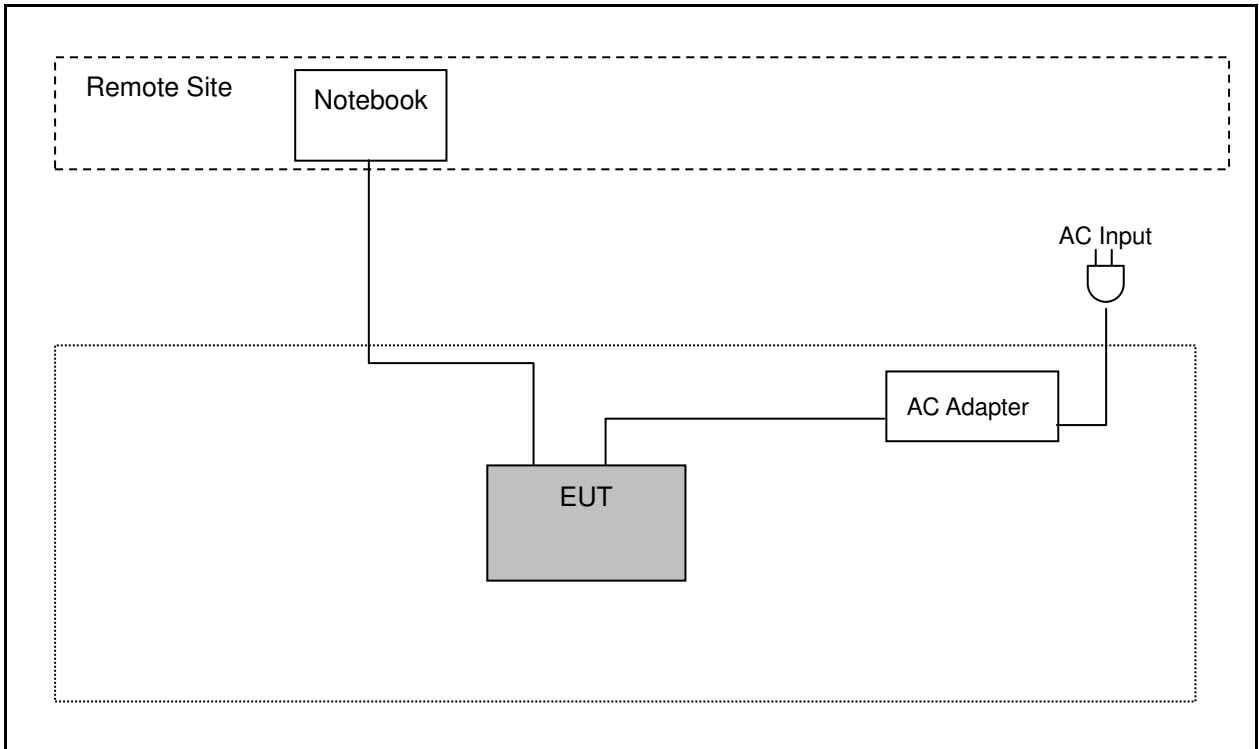
Measurement Software	
1	EZ-EMC Ver. ATL-03A1-1
2	EZ-EMC Ver ATL-ITC-3A1-1

### 3.3. Configuration of Test System Details

#### Conducted Emissions



#### Radiated Emissions



**3.4. Test Site Environment**

Items	Required (IEC 60068-1)	Actual
Temperature (°C)	15-35	26
Humidity (%RH)	25-75	60
Barometric pressure (mbar)	860-1060	950

## 4 Conducted Emission Measurement

### 4.1. Limit

Frequency (MHz)	Quasi-peak	Average
0.15 - 0.5	66 to 56	56 to 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

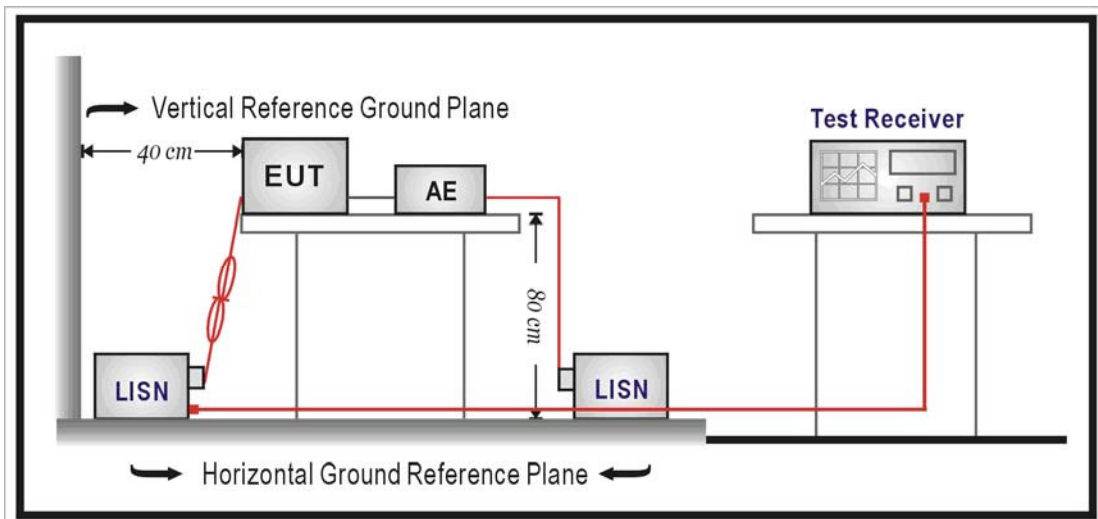
### 4.2. Test Instruments

Describe	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Test Receiver	R&S	ESCI	100367	06/25/2015	(1)
LISN	R&S	ENV216	101040	03/10/2015	(1)
LISN	R&S	ENV216	101041	03/06/2015	(1)
RF Cable	Woken	00100D1380194M	TE-02-02	06/26/2015	(1)
Test Site	ATL	TE02	TE02	N.C.R.	-----

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.

Note: N.C.R. = No Calibration Request.

### 4.3. Test Setup



#### 4.4. Test Procedure

The power line conducted emission measurements were performed in a shielded enclosure. The EUT was assembled on a wooden table which is 80 centimeters high, was placed 40 centimeters from the back wall and at least 1 meter from the sidewall.

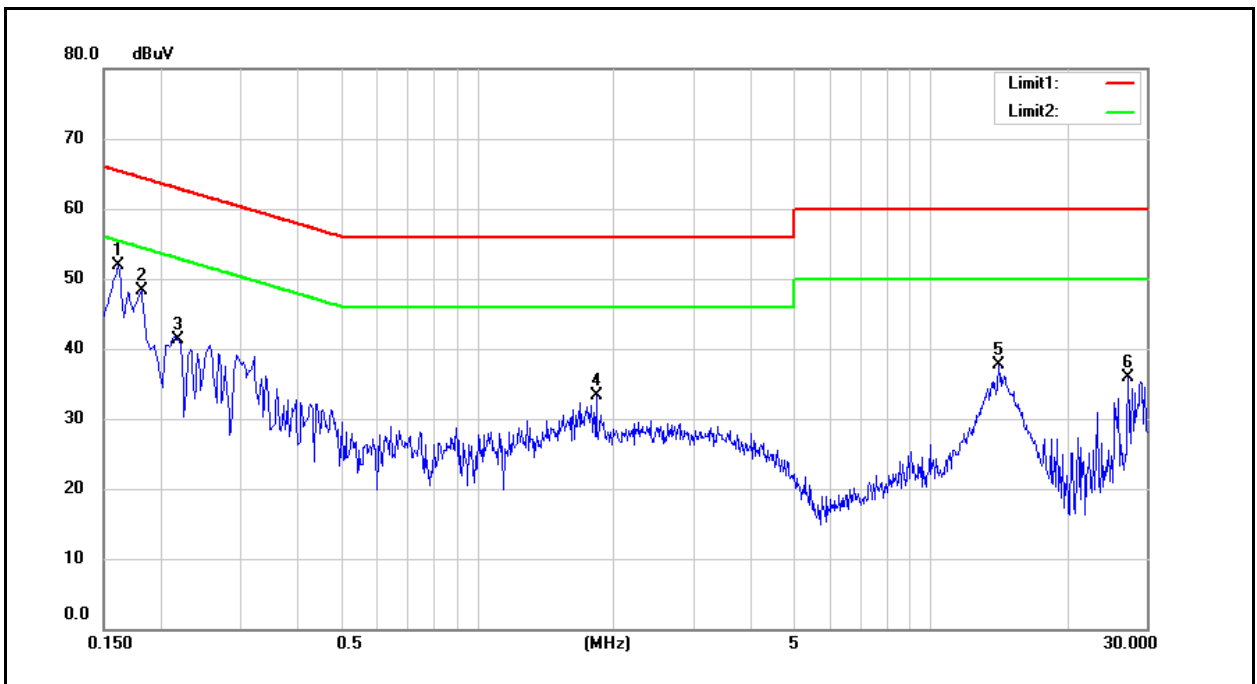
Power was fed to the EUT from the public utility power grid through a line filter and EMCO Model 3162/2 SH Line Impedance Stabilization Networks (LISN). The LISN housing, measuring instrumentation case, ground plane, etc., were electrically bonded together at the same RF potential. The Spectrum analyzer was connected to the AC line through an isolation transformer. The 50-ohm output of the LISN was connected to the spectrum analyzer directly. Conducted emission levels were in the CISPR quasi-peak detection mode. The analyzer's 6 dB bandwidth was set to 9 KHz. No post-detector video filter was used.

The spectrum was scanned from 150 KHz to 30 MHz. The physical arrangement of the test system and associated cabling was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude and frequency. All spurious emission frequencies were observed. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in paragraph 4.1.



#### 4.5. Test Result

Standard:	FCC Part 15C	Line:	L1
Test item:	Conducted Emission	Power:	AC 120V/60Hz
Model Number:	VR-3033u	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Mode:	Mode 1	Date:	01/08/2016
		Test By:	Eric Ou Yang
Description:			

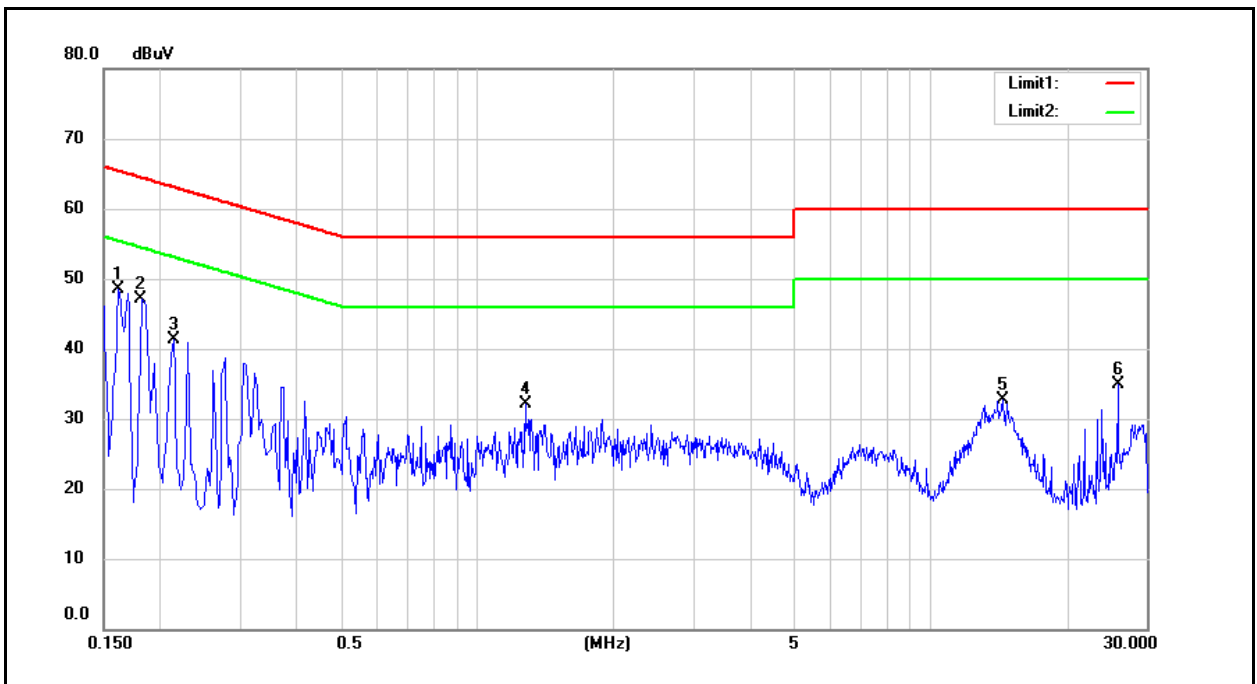


No.	Frequency (MHz)	QP reading (dBuV)	AVG reading (dBuV)	Correction factor (dB)	QP result (dBuV)	AVG result (dBuV)	QP limit (dBuV)	AVG limit (dBuV)	QP margin (dB)	AVG margin (dB)	Remark
1	0.1620	32.19	9.83	9.69	41.88	19.52	65.36	55.36	-23.48	-35.84	Pass
2	0.1820	35.32	17.17	9.68	45.00	26.85	64.39	54.39	-19.39	-27.54	Pass
3	0.2208	30.53	15.05	9.68	40.21	24.73	62.79	52.79	-22.58	-28.06	Pass
4	1.8340	17.42	9.58	9.76	27.18	19.34	56.00	46.00	-28.82	-26.66	Pass
5	14.2020	20.25	12.49	10.01	30.26	22.50	60.00	50.00	-29.74	-27.50	Pass
6	27.3580	17.84	3.85	10.06	27.90	13.91	60.00	50.00	-32.10	-36.09	Pass

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

Standard:	FCC Part 15C	Line:	N
Test item:	Conducted Emission	Power:	AC 120V/60Hz
Model Number:	VR-3033u	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Mode:	Mode 1	Date:	01/08/2016
		Test By:	Eric Ou Yang
Description:			



No.	Frequency (MHz)	QP reading (dBuV)	AVG reading (dBuV)	Correction factor (dB)	QP result (dBuV)	AVG result (dBuV)	QP limit (dBuV)	AVG limit (dBuV)	QP margin (dB)	AVG margin (dB)	Remark
1	0.1620	31.46	8.96	9.66	41.12	18.62	65.36	55.36	-24.24	-36.74	Pass
2	0.1820	34.76	16.77	9.65	44.41	26.42	64.39	54.39	-19.98	-27.97	Pass
3	0.2140	30.61	15.42	9.65	40.26	25.07	63.05	53.05	-22.79	-27.98	Pass
4	1.2780	17.72	10.46	9.70	27.42	20.16	56.00	46.00	-28.58	-25.84	Pass
5	14.4940	17.58	10.84	10.06	27.64	20.90	60.00	50.00	-32.36	-29.10	Pass
6	25.9540	18.78	2.99	10.21	28.99	13.20	60.00	50.00	-31.01	-36.80	Pass

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

## 5 Radiated Emission Measurement

### 5.1. Limit

According to §15.209(a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength ( $\mu\text{V}/\text{m}$ at meter)	Measurement Distance (meters)
0.009 – 0.490	2400 / F (kHz)	300
0.490 – 1.705	24000 / F (kHz)	30
1.705 – 30.0	30	30
30 - 88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

### 5.2. Test Instruments

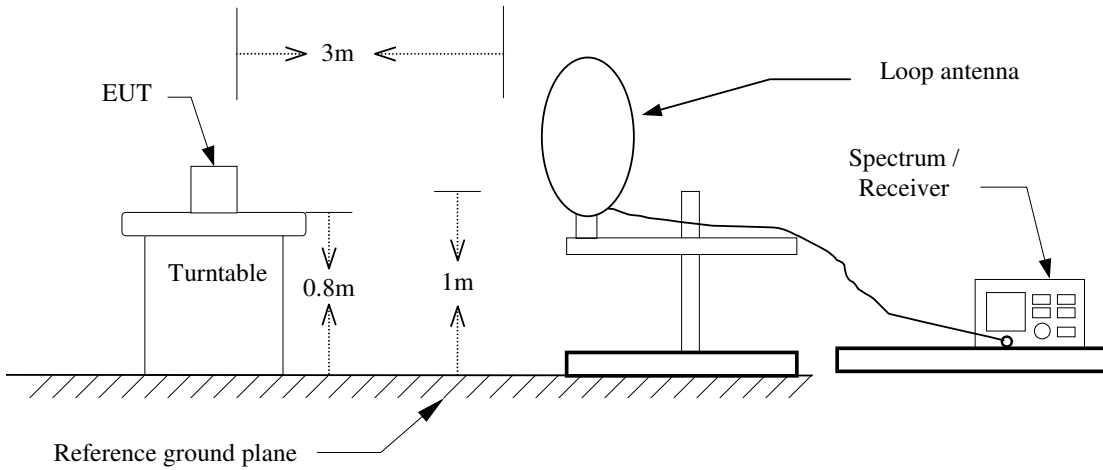
3 Meter Chamber					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
RF Pre-selector	Agilent	N9039A	MY46520256	01/08/2016	(1)
Spectrum Analyzer	Agilent	E4446A	MY46180578	01/08/2016	(1)
Pre Amplifier	Agilent	8449B	3008A02237	10/07/2015	(1)
Pre Amplifier	Agilent	8447D	2944A10961	02/24/2015	(1)
Broadband Antenna (30MHz~1GHz)	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	9163-270	08/11/2015	(1)
Horn Antenna (1~18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	9120D-550	06/12/2015	(1)
Horn Antenna (18~40GHz)	ETS	3116	86467	09/01/2015	(1)
Loop Antenna	COM-POWER CORPORATION	AL-130	121014	02/01/2016	(1)
Microwave Cable	EMCI	EMC102-KM-K M-14000	151001	10/15/2015	(1)
Microwave Cable	EMCI	EMC-104-SM-S M-14000	140202	10/15/2015	(1)
Microwave Cable	EMCI	EMC104-SM-S M-600	140301	10/15/2015	(1)
Test Site	ATL	TE01	888001	08/27/2015	(1)

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.

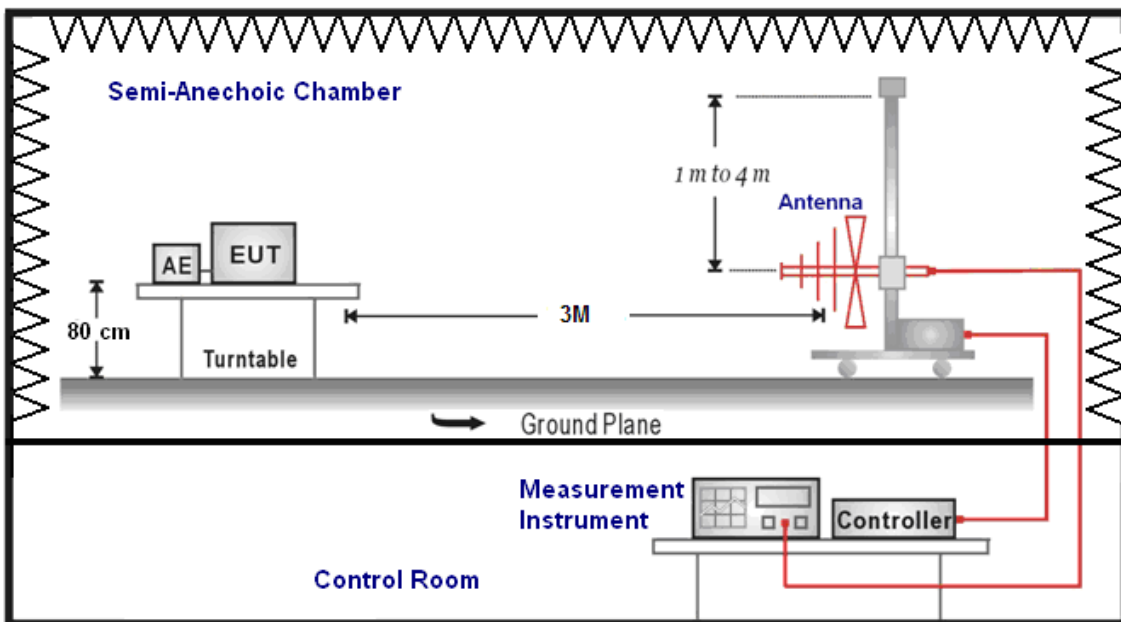
Note: N.C.R. = No Calibration Request.

### 5.3. Setup

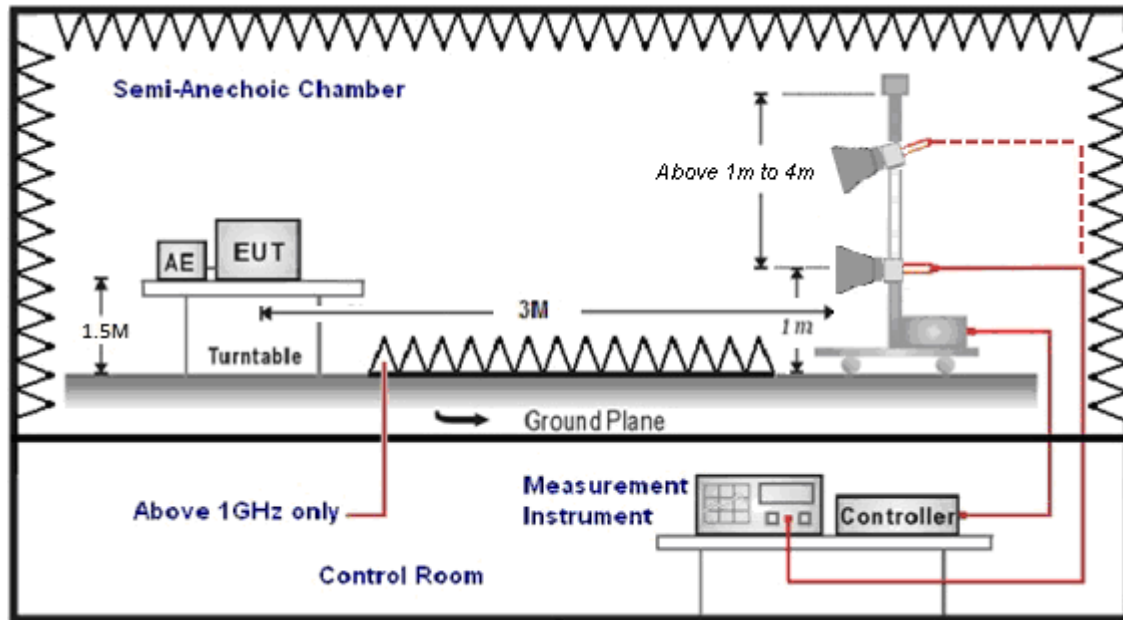
9kHz ~ 30MHz



Below 1GHz



Above 1GHz



#### 5.4. Test Procedure

Final radiation measurements were made on a three-meter, Semi Anechoic Chamber. The EUT system was placed on a nonconductive turntable which is 0.8 or 1.5 meters height (below 1GHz use 0.8m turntable / above 1GHz use 1.5m turntable), top surface 1.0 x 1.5 meter. The spectrum was examined from 250 MHz to 2.5 GHz in order to cover the whole spectrum below 10th harmonic which could generate from the EUT. During the test, EUT was set to transmit continuously & Measurements spectrum range from 9 kHz to 26.5 GHz is investigated.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements when Duty cycle >0.98 / 1/T for average measurements when Duty cycle <0.98. A nonconductive material surrounded the EUT to supporting the EUT for standing on three orthogonal planes. At each condition, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

SCHWARZBECK MESS-ELEKTRONIK Biconilog Antenna (mode VULB9163) at 3 Meter and the SCHWARZBECK Double Ridged Guide Antenna (model BBHA9120D&9170) was used in frequencies 1 –26.5 GHz at a distance of 3 meter. The antenna at an angle toward the source of the emission. All test results were extrapolated to equivalent signal at 3 meters utilizing an inverse linear distance extrapolation Factor (20dB/decade).

For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. No post – detector video filters were used in the test.

The spectrum analyzer's 6 dB bandwidth was set to 1 MHz, and the analyzer was operated in the peak detection mode, for frequencies both below and up 1 GHz. The average levels were obtained by subtracting the duty cycle correction factor from the peak readings.

The following procedures were used to convert the emission levels measured in decibels referenced to 1 microvolt (dBuV) into field intensity in micro volts pre meter (uV/m).

The actual field intensity in decibels referenced to 1 microvolt in to field intensity in micro volts per meter (dBuV/m).

The actual field intensity in decibels referenced to 1 microvolt per meter (dBuV/m) is determined by algebraically adding the measured reading in dBuV, the antenna factor (dB), and cable loss (dB) and Subtracting the gain of preamplifier (dB) is auto calculate in spectrum analyzer.

(1)  $\text{Amplitude (dBuV/m)} = \text{FI (dBuV)} + \text{AF (dBuV)} + \text{CL (dBuV)} - \text{Gain (dB)}$

FI= Reading of the field intensity.

AF= Antenna factor.

CL= Cable loss.

P.S Amplitude is auto calculate in spectrum analyzer.

(2)  $\text{Actual Amplitude (dBuV/m)} = \text{Amplitude (dBuV)} - \text{Dis(dB)}$

The FCC specified emission limits were calculated according the EUT operating frequency and by following linear interpolation equations:

(a) For fundamental frequency : Transmitter Output < +30dBm

(b) For spurious frequency : Spurious emission limits = fundamental emission limit /10

Data of measurement within this frequency range without mark in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

## 5.5. Test Result

### Below 1GHz

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	VR-3033u	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Mode:	Mode 1	Date:	02/15/2016
		Test By:	Eric Ou Yang

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
143.4900	40.47	-11.27	29.20	43.50	-14.30	QP	H
299.6600	41.23	-9.23	32.00	46.00	-14.00	QP	H
494.6300	40.68	-5.42	35.26	46.00	-10.74	QP	H
600.3600	38.38	-3.15	35.23	46.00	-10.77	QP	H
800.1800	33.94	0.54	34.48	46.00	-11.52	QP	H
948.5900	27.64	3.37	31.01	46.00	-14.99	QP	H
159.0100	47.46	-11.11	36.35	43.50	-7.15	QP	V
236.6100	43.55	-11.48	32.07	46.00	-13.93	QP	V
497.5400	46.65	-5.36	41.29	46.00	-4.71	QP	V
522.7600	47.95	-4.80	43.15	46.00	-2.85	QP	V
600.3600	46.27	-3.15	43.12	46.00	-2.88	QP	V
800.1800	31.19	0.54	31.73	46.00	-14.27	QP	V

Note: No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).

**Above 1GHz**

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	VR-3033u			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 2			Date:	02/15/2016		
Frequency:	2412MHz			Test By:	Eric Ou Yang		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
3149.000	54.24	-12.40	41.84	74.00	-32.16	peak	H
4822.000	56.99	-7.91	49.08	74.00	-24.92	peak	H
6698.000	50.76	-2.94	47.82	74.00	-26.18	peak	H
3051.000	54.81	-12.82	41.99	74.00	-32.01	peak	V
4824.000	60.87	-7.90	52.97	74.00	-21.03	peak	V
4824.000	57.88	-7.90	49.98	54.00	-4.02	AVG	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	VR-3033u			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 2			Date:	02/15/2016		
Frequency:	2437MHz			Test By:	Eric Ou Yang		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
3177.000	53.77	-12.29	41.48	74.00	-32.52	peak	H
4874.000	55.86	-7.75	48.11	74.00	-25.89	peak	H
6698.000	50.60	-2.94	47.66	74.00	-26.34	peak	H
3114.000	54.31	-12.56	41.75	74.00	-32.25	peak	V
4874.000	58.94	-7.75	51.19	74.00	-22.81	peak	V
6656.000	50.80	-3.07	47.73	74.00	-26.27	peak	V



Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	VR-3033u			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 2			Date:	02/15/2016		
Frequency:	2462MHz			Test By:	Eric Ou Yang		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
3100.000	54.00	-12.61	41.39	74.00	-32.61	peak	H
4668.000	53.54	-8.39	45.15	74.00	-28.85	peak	H
6600.000	51.48	-3.24	48.24	74.00	-25.76	peak	H
3282.000	55.00	-11.84	43.16	74.00	-30.84	peak	V
4924.000	57.06	-7.59	49.47	74.00	-24.53	peak	V
6726.000	51.68	-2.85	48.83	74.00	-25.17	peak	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	VR-3033u			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 3			Date:	02/15/2016		
Frequency:	2412MHz			Test By:	Eric Ou Yang		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
3184.000	53.39	-12.26	41.13	74.00	-32.87	peak	H
4824.000	53.85	-7.90	45.95	74.00	-28.05	peak	H
6642.000	50.27	-3.11	47.16	74.00	-26.84	peak	H
3023.000	54.65	-12.95	41.70	74.00	-32.30	peak	V
4824.000	59.03	-7.90	51.13	74.00	-22.87	peak	V
6957.000	50.39	-2.14	48.25	74.00	-25.75	peak	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	VR-3033u			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 3			Date:	02/15/2016		
Frequency:	2437MHz			Test By:	Eric Ou Yang		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
3198.000	54.29	-12.19	42.10	74.00	-31.90	peak	H
4668.000	52.47	-8.39	44.08	74.00	-29.92	peak	H
6698.000	50.83	-2.94	47.89	74.00	-26.11	peak	H
3107.000	54.15	-12.58	41.57	74.00	-32.43	peak	V
4874.000	56.09	-7.75	48.34	74.00	-25.66	peak	V
6537.000	51.13	-3.43	47.70	74.00	-26.30	peak	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	VR-3033u			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 3			Date:	02/15/2016		
Frequency:	2462MHz			Test By:	Eric Ou Yang		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
3023.000	54.40	-12.95	41.45	74.00	-32.55	peak	H
4402.000	52.78	-9.09	43.69	74.00	-30.31	peak	H
6628.000	50.90	-3.15	47.75	74.00	-26.25	peak	H
3065.000	54.43	-12.76	41.67	74.00	-32.33	peak	V
4924.000	55.20	-7.59	47.61	74.00	-26.39	peak	V
6649.000	51.26	-3.09	48.17	74.00	-25.83	peak	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	VR-3033u			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 4			Date:	02/15/2016		
Frequency:	2412MHz			Test By:	Eric Ou Yang		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
3128.000	54.07	-12.50	41.57	74.00	-32.43	peak	H
4824.000	53.74	-7.90	45.84	74.00	-28.16	peak	H
6677.000	51.30	-3.01	48.29	74.00	-25.71	peak	H
3037.000	54.56	-12.89	41.67	74.00	-32.33	peak	V
4824.000	55.85	-7.90	47.95	74.00	-26.05	peak	V
6691.000	50.60	-2.96	47.64	74.00	-26.36	peak	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	VR-3033u			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 4			Date:	02/15/2016		
Frequency:	2437MHz			Test By:	Eric Ou Yang		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2939.000	54.30	-13.19	41.11	74.00	-32.89	peak	H
4486.000	53.10	-8.94	44.16	74.00	-29.84	peak	H
6705.000	51.12	-2.91	48.21	74.00	-25.79	peak	H
2960.000	55.63	-13.14	42.49	74.00	-31.51	peak	V
4874.000	56.12	-7.75	48.37	74.00	-25.63	peak	V
6474.000	51.75	-3.66	48.09	74.00	-25.91	peak	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	VR-3033u			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 4			Date:	02/15/2016		
Frequency:	2462MHz			Test By:	Eric Ou Yang		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
3100.000	54.94	-12.61	42.33	74.00	-31.67	peak	H
4472.000	53.33	-8.96	44.37	74.00	-29.63	peak	H
6789.000	51.65	-2.66	48.99	74.00	-25.01	peak	H
3282.000	54.02	-11.84	42.18	74.00	-31.82	peak	V
4924.000	54.23	-7.59	46.64	74.00	-27.36	peak	V
6691.000	50.85	-2.96	47.89	74.00	-26.11	peak	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	VR-3033u			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 5			Date:	02/15/2016		
Frequency:	2422MHz			Test By:	Eric Ou Yang		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
3121.000	54.18	-12.53	41.65	74.00	-32.35	peak	H
4844.000	53.03	-7.83	45.20	74.00	-28.80	peak	H
6628.000	50.99	-3.15	47.84	74.00	-26.16	peak	H
3044.000	55.14	-12.86	42.28	74.00	-31.72	peak	V
4844.000	54.39	-7.83	46.56	74.00	-27.44	peak	V
6698.000	51.44	-2.94	48.50	74.00	-25.50	peak	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	VR-3033u			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 5			Date:	02/15/2016		
Frequency:	2437MHz			Test By:	Eric Ou Yang		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2953.000	54.59	-13.17	41.42	74.00	-32.58	peak	H
4675.000	53.24	-8.37	44.87	74.00	-29.13	peak	H
6698.000	51.32	-2.94	48.38	74.00	-25.62	peak	H
3212.000	54.88	-12.15	42.73	74.00	-31.27	peak	V
4874.000	53.28	-7.75	45.53	74.00	-28.47	peak	V
6614.000	50.72	-3.19	47.53	74.00	-26.47	peak	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	VR-3033u			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 5			Date:	02/15/2016		
Frequency:	2452MHz			Test By:	Eric Ou Yang		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
3023.000	53.93	-12.95	40.98	74.00	-33.02	peak	H
4682.000	52.20	-8.34	43.86	74.00	-30.14	peak	H
6740.000	50.28	-2.82	47.46	74.00	-26.54	peak	H
3268.000	55.54	-11.91	43.63	74.00	-30.37	peak	V
4787.000	52.92	-8.01	44.91	74.00	-29.09	peak	V
6754.000	50.91	-2.77	48.14	74.00	-25.86	peak	V

**Band Edge**

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	VR-3033u			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 2			Date:	02/15/2016		
Frequency:	2412 MHz			Test By:	Eric Ou Yang		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2376.660	53.46	-0.38	53.08	74.00	-20.92	peak	H
2376.660	45.83	-0.38	45.45	54.00	-8.55	AVG	H
2390.000	51.46	-0.33	51.13	74.00	-22.87	peak	H
2387.770	58.27	-0.33	57.94	74.00	-16.06	peak	V
2387.770	46.90	-0.33	46.57	54.00	-7.43	AVG	V
2390.000	56.50	-0.33	56.17	74.00	-17.83	peak	V
2390.000	47.45	-0.33	47.12	54.00	-6.88	AVG	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	VR-3033u			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 2			Date:	02/15/2016		
Frequency:	2462 MHz			Test By:	Eric Ou Yang		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2483.500	53.30	0.03	53.33	74.00	-20.67	peak	H
2483.500	45.64	0.03	45.67	54.00	-8.33	AVG	H
2490.440	55.45	0.06	55.51	74.00	-18.49	peak	H
2490.440	44.29	0.06	44.35	54.00	-9.65	AVG	H
2483.500	58.64	0.03	58.67	74.00	-15.33	peak	V
2483.500	48.10	0.03	48.13	54.00	-5.87	AVG	V
2489.440	60.12	0.05	60.17	74.00	-13.83	peak	V
2489.440	47.77	0.05	47.82	54.00	-6.18	AVG	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	VR-3033u			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 3			Date:	02/15/2016		
Frequency:	2412 MHz			Test By:	Eric Ou Yang		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2389.750	58.22	-0.33	57.89	74.00	-16.11	peak	H
2389.750	44.43	-0.33	44.10	54.00	-9.90	AVG	H
2390.000	59.21	-0.33	58.88	74.00	-15.12	peak	H
2390.000	44.59	-0.33	44.26	54.00	-9.74	AVG	H
2388.100	58.30	-0.33	57.97	74.00	-16.03	peak	V
2388.100	44.71	-0.33	44.38	54.00	-9.62	AVG	V
2390.000	58.23	-0.33	57.90	74.00	-16.10	peak	V
2390.000	45.23	-0.33	44.90	54.00	-9.10	AVG	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	VR-3033u			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 3			Date:	02/15/2016		
Frequency:	2462 MHz			Test By:	Eric Ou Yang		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2483.500	53.35	0.03	53.38	74.00	-20.62	peak	H
2483.500	44.42	0.03	44.45	54.00	-9.55	AVG	H
2484.240	53.86	0.03	53.89	74.00	-20.11	peak	H
2484.240	44.23	0.03	44.26	54.00	-9.74	AVG	H
2483.500	56.32	0.03	56.35	74.00	-17.65	peak	V
2483.500	45.16	0.03	45.19	54.00	-8.81	AVG	V
2483.840	58.26	0.03	58.29	74.00	-15.71	peak	V
2483.840	45.05	0.03	45.08	54.00	-8.92	AVG	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	VR-3033u			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 4			Date:	02/15/2016		
Frequency:	2412 MHz			Test By:	Eric Ou Yang		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2389.750	58.06	-0.33	57.73	74.00	-16.27	peak	H
2389.750	45.25	-0.33	44.92	54.00	-9.08	AVG	H
2390.000	55.47	-0.33	55.14	74.00	-18.86	peak	H
2390.000	45.39	-0.33	45.06	54.00	-8.94	AVG	H
2389.530	63.15	-0.33	62.82	74.00	-11.18	peak	V
2389.530	47.83	-0.33	47.50	54.00	-6.50	AVG	V
2390.000	61.77	-0.33	61.44	74.00	-12.56	peak	V
2390.000	47.91	-0.33	47.58	54.00	-6.42	AVG	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	VR-3033u			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 4			Date:	02/15/2016		
Frequency:	2462 MHz			Test By:	Eric Ou Yang		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2483.500	52.35	0.03	52.38	74.00	-21.62	peak	H
2483.500	45.07	0.03	45.10	54.00	-8.90	AVG	H
2484.840	55.41	0.03	55.44	74.00	-18.56	peak	H
2484.840	44.82	0.03	44.85	54.00	-9.15	AVG	H
2483.500	57.55	0.03	57.58	74.00	-16.42	peak	V
2483.500	47.09	0.03	47.12	54.00	-6.88	AVG	V
2489.840	59.96	0.05	60.01	74.00	-13.99	peak	V
2489.840	46.92	0.05	46.97	54.00	-7.03	AVG	V



Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	VR-3033u			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 5			Date:	02/15/2016		
Frequency:	2422 MHz			Test By:	Eric Ou Yang		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2386.680	61.12	-0.34	60.78	74.00	-13.22	peak	H
2386.680	45.97	-0.34	45.63	54.00	-8.37	AVG	H
2390.000	56.85	-0.33	56.52	74.00	-17.48	peak	H
2390.000	45.79	-0.33	45.46	54.00	-8.54	AVG	H
2386.560	65.17	-0.34	64.83	74.00	-9.17	peak	V
2386.560	47.76	-0.34	47.42	54.00	-6.58	AVG	V
2390.000	60.75	-0.33	60.42	74.00	-13.58	peak	V
2390.000	47.59	-0.33	47.26	54.00	-6.74	AVG	V

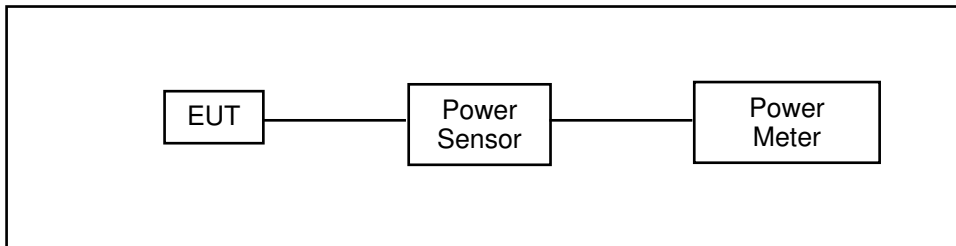
Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	VR-3033u			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 5			Date:	02/15/2016		
Frequency:	2452 MHz			Test By:	Eric Ou Yang		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2483.500	53.72	0.03	53.75	74.00	-20.25	peak	H
2483.500	45.62	0.03	45.65	54.00	-8.35	AVG	H
2484.600	55.48	0.03	55.51	74.00	-18.49	peak	H
2484.600	45.38	0.03	45.41	54.00	-8.59	AVG	H
2483.500	61.07	0.03	61.10	74.00	-12.90	peak	V
2483.500	48.60	0.03	48.63	54.00	-5.37	AVG	V
2485.900	62.54	0.03	62.57	74.00	-11.43	peak	V
2485.900	47.51	0.03	47.54	54.00	-6.46	AVG	V

## 6 Maximum Conducted Output Power Measurement

### 6.1. Limit

For systems using digital modulation in the 2400-2483.5MHz, the limit for maximum output power is 30dBm.

### 6.2. Test Setup



### 6.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Single Channel PK Power Sensor	Agilent	N1911A	MY45101619	12/11/2015	(1)
Wideband Power Meter	Agilent	N1921A	MY45241957	12/11/2015	(1)
Microwave Cable	EMCI	EMC104-SM-SM-1500	140303	02/24/2015	(1)
Test Site	ATL	TE05	TE05	N.C.R.	-----

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.

Note: N.C.R. = No Calibration Request.

### 6.4. Test Procedure

The tests below are run with the EUT's transmitter set at high power in TX mode. The EUT is needed to force selection of output power level and channel number. While testing, EUT was set to transmit continuously. Remove the Subjective device's antenna and connect the RF output port to power sensor. The maximum output power shall not exceed 1 watt.

Use a direct connection between the antenna port of transmitter and the power sensor, for prevent the power sensor input attenuation 40-50 dB. Set the RBW Bandwidth of the emission or use a channel power meter mode.

For antennas with gains of 6 dBi or less, maximum allowed transmitter output is 1 watt (+30 dBm). For antennas with gains greater than 6 dBi, transmitter output level must be decreased by an amount equal to (GAIN - 6)/3 dBm.

The antenna port of the EUT was connected to the input of a power sensor. Power was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.

**6.5. Test Result**

Model Number	VR-3033u						
Test Item	Maximum Conducted Output Power						
Date of Test	01/08/2016						
ANT-0							
Test Mode	Frequency (MHz)	Data Rate	Average Output Power		Peak Output Power		
			Measurement Results		Measurement Results		Limit
			dBm	W	dBm	W	dBm
Mode 2	2412	1M	17.26	0.053	21.25	0.133	< 30
	2437		17.30	0.054	<b>21.33</b>	<b>0.136</b>	< 30
	2462		17.16	0.052	21.12	0.129	< 30
	2437	2M	17.25	0.053	21.23	0.133	< 30
	2437	5.5M	17.21	0.053	21.18	0.131	< 30
	2437	11M	17.14	0.052	21.08	0.128	< 30
Mode 3	2412	6M	16.15	0.041	<b>26.18</b>	<b>0.415</b>	< 30
	2437		15.98	0.040	26.00	0.398	< 30
	2462		15.86	0.039	25.90	0.389	< 30
	2437	9M	15.95	0.039	25.98	0.396	< 30
	2437	12M	15.93	0.039	25.97	0.395	< 30
	2437	18M	15.88	0.039	25.94	0.393	< 30
	2437	24M	15.80	0.038	25.86	0.385	< 30
	2437	36M	15.75	0.038	25.83	0.383	< 30
	2437	48M	15.72	0.037	25.81	0.381	< 30
	2437	54M	15.66	0.037	25.78	0.378	< 30

Model Number	VR-3033u						
Test Item	Maximum Conducted Output Power						
Date of Test	01/08/2016						
ANT-0							
Test Mode	Frequency (MHz)	Data Rate	Average Output Power		Peak Output Power		
			Measurement Results		Measurement Results		Limit
			dBm	W	dBm	W	dBm
Mode 4	2412	13M	16.39	0.044	26.47	0.444	< 30
	2437		16.25	0.042	26.30	0.427	< 30
	2462		15.93	0.039	25.96	0.394	< 30
	2437	26M	16.21	0.042	26.25	0.422	< 30
	2437	39M	16.14	0.041	26.16	0.413	< 30
	2437	52M	16.10	0.041	26.14	0.411	< 30
	2437	78M	16.07	0.040	26.10	0.407	< 30
	2437	104M	16.02	0.040	26.08	0.406	< 30
	2437	117M	15.99	0.040	26.02	0.400	< 30
	2437	130M	15.95	0.039	25.98	0.396	< 30
Mode 5	2422	27M	15.14	0.033	25.28	0.337	< 30
	2437		14.91	0.031	25.10	0.324	< 30
	2452		15.05	0.032	25.17	0.329	< 30
	2437	54M	14.89	0.031	25.06	0.321	< 30
	2437	81M	14.82	0.030	25.01	0.317	< 30
	2437	108M	14.76	0.030	24.95	0.313	< 30
	2437	162M	14.74	0.030	24.90	0.309	< 30
	2437	216M	14.68	0.029	24.84	0.305	< 30
	2437	243M	14.62	0.029	24.75	0.299	< 30
	2437	135M	14.57	0.029	24.65	0.292	< 30

Model Number	VR-3033u						
Test Item	Maximum Conducted Output Power						
Date of Test	01/08/2016						
ANT-1							
Test Mode	Frequency (MHz)	Data Rate	Average Output Power		Peak Output Power		
			Measurement Results		Measurement Results		Limit
			dBm	W	dBm	W	dBm
Mode 3	2412	6M	15.27	0.034	25.45	0.351	< 30
	2437		15.07	0.032	25.20	0.331	< 30
	2462		14.84	0.030	25.04	0.319	< 30
	2437	9M	15.03	0.032	25.16	0.328	< 30
	2437	12M	15.00	0.032	25.15	0.327	< 30
	2437	18M	14.95	0.031	25.13	0.326	< 30
	2437	24M	14.93	0.031	25.11	0.324	< 30
	2437	36M	14.87	0.031	25.04	0.319	< 30
	2437	48M	14.85	0.031	25.02	0.318	< 30
	2437	54M	14.81	0.030	24.99	0.316	< 30
Mode 4	2412	13M	15.15	0.033	25.30	0.339	< 30
	2437		14.81	0.030	25.00	0.316	< 30
	2462		14.63	0.029	24.78	0.301	< 30
	2437	26M	14.79	0.030	24.97	0.314	< 30
	2437	39M	14.76	0.030	24.94	0.312	< 30
	2437	52M	14.71	0.030	24.88	0.308	< 30
	2437	78M	14.67	0.029	24.82	0.303	< 30
	2437	104M	14.63	0.029	24.77	0.300	< 30
	2437	117M	14.60	0.029	24.72	0.296	< 30
	2437	130M	14.55	0.029	24.61	0.289	< 30
Mode 5	2422	27M	14.59	0.029	24.69	0.294	< 30
	2437		14.25	0.027	24.33	0.271	< 30
	2452		14.28	0.027	24.38	0.274	< 30
	2437	54M	14.20	0.026	24.26	0.267	< 30
	2437	81M	14.17	0.026	24.21	0.264	< 30
	2437	108M	14.15	0.026	24.20	0.263	< 30
	2437	162M	14.11	0.026	24.15	0.260	< 30
	2437	216M	14.08	0.026	24.12	0.258	< 30
	2437	243M	14.02	0.025	24.08	0.256	< 30
	2437	135M	13.96	0.025	24.01	0.252	< 30

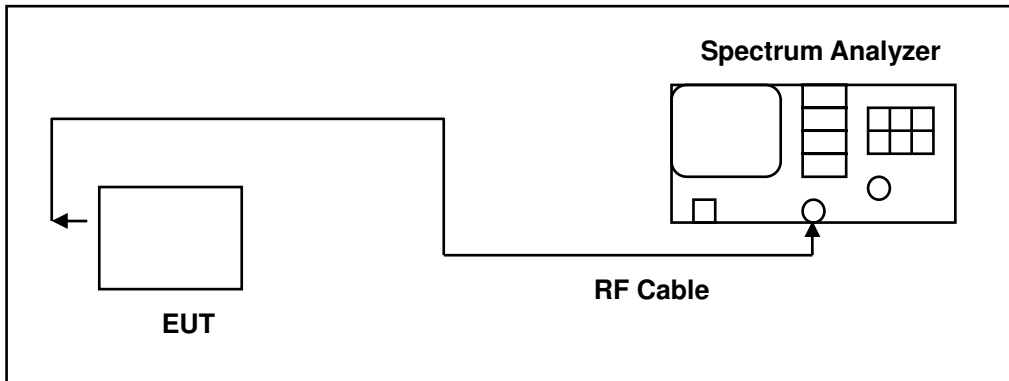
Model Number	VR-3033u						
Test Item	Maximum Conducted Output Power						
Date of Test	01/08/2016						
ANT-0+1							
Test Mode	Frequency (MHz)	Data Rate	Average Output Power		Peak Output Power		
			Measurement Results		Measurement Results		Limit
			dBm	W	dBm	W	dBm
Mode 4	2412	13M	18.82	0.076	<b>28.93</b>	<b>0.782</b>	< 30
	2437		18.60	0.072	28.71	0.743	< 30
	2462		18.34	0.068	28.42	0.695	< 30
	2437	26M	18.57	0.072	28.67	0.736	< 30
	2437	39M	18.51	0.071	28.60	0.725	< 30
	2437	52M	18.47	0.070	28.57	0.719	< 30
	2437	78M	18.44	0.070	28.52	0.711	< 30
	2437	104M	18.39	0.069	28.48	0.705	< 30
	2437	117M	18.36	0.069	28.43	0.696	< 30
	2437	130M	18.32	0.068	28.36	0.685	< 30
Mode 5	2422	27M	17.88	0.061	<b>28.01</b>	<b>0.632</b>	< 30
	2437		17.60	0.058	27.74	0.595	< 30
	2452		17.69	0.059	27.80	0.603	< 30
	2437	54M	17.57	0.057	27.69	0.587	< 30
	2437	81M	17.52	0.056	27.64	0.581	< 30
	2437	108M	17.48	0.056	27.60	0.576	< 30
	2437	162M	17.45	0.056	27.55	0.569	< 30
	2437	216M	17.40	0.055	27.51	0.563	< 30
	2437	243M	17.34	0.054	27.44	0.554	< 30
	2437	135M	17.29	0.054	27.35	0.544	< 30

## 7 6dB RF Bandwidth Measurement

### 7.1. Limit

6dB RF Bandwidth: Systems using digital modulation techniques may operate in the 2400–2483.5 MHz bands. The minimum 6 dB band-width shall be at least 500 kHz.

### 7.2. Test Setup



### 7.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	E4445A	MY45300744	12/15/2015	(1)
Microwave Cable	EMCI	EMC104-SM-SM-1500	140303	02/24/2015	(1)
Test Site	ATL	TE05	TE05	N.C.R.	-----

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.

Note: N.C.R. = No Calibration Request.

### 7.4. Test Procedure

The EUT tested to DTS test procedure of KDB558074D01 for compliance to FCC 47CFR 15.247 requirements.

6dB RF Bandwidth: The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RBW was set to 100 kHz. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A peak output reading was taken, a DISPLAY line was drawn 6 dB lower than peak level. The 6 dB bandwidth was determined from where the channel output spectrum intersected the display line.

The test was performed at 3 channels (Channel low, middle, high)

99 % Occupied Bandwidth: The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.

The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded.

**7.5. Test Result**

Model Number	VR-3033u		
Test Item	6dB RF Bandwidth		
Date of Test	02/17/2016		
ANT-0			
Test Mode	Frequency (MHz)	Measurement Results	Limit
		kHz	kHz
Mode 2	2412	8100	> 500
	2437	8556	> 500
	2462	7665	> 500
Mode 3	2412	16420	> 500
	2437	16468	> 500
	2462	16431	> 500
Mode 4	2412	17424	> 500
	2437	17590	> 500
	2462	17746	> 500
Mode 5	2422	35418	> 500
	2437	34015	> 500
	2452	35172	> 500
ANT-1			
Test Mode	Frequency (MHz)	Measurement Results	Limit
		kHz	kHz
Mode 4	2412	17654	> 500
	2437	17653	> 500
	2462	17621	> 500
Mode 5	2422	35869	> 500
	2437	35163	> 500
	2452	35236	> 500



**7.6. Test Graphs**

Mode 2: IEEE 802.11b link mode_ANT-0	
2412 MHz	<p>Agilent R T</p> <p>Ch Freq 2,412 GHz Trig Free</p> <p>Center Freq 2,41200000 GHz</p> <p>Start Freq 2,39700000 GHz</p> <p>Stop Freq 2,42700000 GHz</p> <p>CF Step 3,00000000 MHz Auto Man</p> <p>Freq Offset 0,00000000 Hz</p> <p>Signal Track On Off</p> <p>Ref 15 dBm Atten 15 dB</p> <p>#Peak Log 10 dB/Offst 11 dB</p> <p>Center 2,412 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts)</p> <p><b>Occupied Bandwidth 10.0421 MHz</b></p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -12.922 kHz</p> <p>x dB Bandwidth 8.100 MHz</p>
2437 MHz	<p>Agilent R T</p> <p>Ch Freq 2,437 GHz Trig Free</p> <p>Center Freq 2,43700000 GHz</p> <p>Start Freq 2,42200000 GHz</p> <p>Stop Freq 2,45200000 GHz</p> <p>CF Step 3,00000000 MHz Auto Man</p> <p>Freq Offset 0,00000000 Hz</p> <p>Signal Track On Off</p> <p>Ref 15 dBm Atten 15 dB</p> <p>#Peak Log 10 dB/Offst 11 dB</p> <p>Center 2,437 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts)</p> <p><b>Occupied Bandwidth 10.0827 MHz</b></p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -15.480 kHz</p> <p>x dB Bandwidth 8.556 MHz</p>
2462 MHz	<p>Agilent R T</p> <p>Ch Freq 2,462 GHz Trig Free</p> <p>Center Freq 2,46200000 GHz</p> <p>Start Freq 2,44700000 GHz</p> <p>Stop Freq 2,47700000 GHz</p> <p>CF Step 3,00000000 MHz Auto Man</p> <p>Freq Offset 0,00000000 Hz</p> <p>Signal Track On Off</p> <p>Ref 15 dBm Atten 15 dB</p> <p>#Peak Log 10 dB/Offst 11 dB</p> <p>Center 2,462 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts)</p> <p><b>Occupied Bandwidth 10.0667 MHz</b></p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -8.682 kHz</p> <p>x dB Bandwidth 7.665 MHz</p>

Mode 3: IEEE 802.11g link mode_ANT-0	
2412 MHz	<p>Agilent R T</p> <p>Ch Freq 2,412 GHz Trig Free</p> <p>Center Freq 2.4120000 GHz</p> <p>Start Freq 2.39700000 GHz</p> <p>Stop Freq 2.42700000 GHz</p> <p>CF Step 3.0000000 MHz Auto Man</p> <p>Freq Offset 0.0000000 Hz</p> <p>Signal Track On Off</p> <p>Ref 15 dBm Atten 15 dB</p> <p>#Peak Log 10 dB/ Offst 11 dB</p> <p>Center 2,412 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts)</p> <p><b>Occupied Bandwidth 16.4949 MHz</b></p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -5.596 kHz</p> <p>x dB Bandwidth 16.420 MHz</p>
2437 MHz	<p>Agilent R T</p> <p>Ch Freq 2,437 GHz Trig Free</p> <p>Center Freq 2.4370000 GHz</p> <p>Start Freq 2.42200000 GHz</p> <p>Stop Freq 2.45200000 GHz</p> <p>CF Step 3.0000000 MHz Auto Man</p> <p>Freq Offset 0.0000000 Hz</p> <p>Signal Track On Off</p> <p>Ref 15 dBm Atten 15 dB</p> <p>#Peak Log 10 dB/ Offst 11 dB</p> <p>Center 2,437 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts)</p> <p><b>Occupied Bandwidth 16.5104 MHz</b></p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -11.114 kHz</p> <p>x dB Bandwidth 16.468 MHz</p>
2462 MHz	<p>Agilent R T</p> <p>Ch Freq 2,462 GHz Trig Free</p> <p>Center Freq 2.4620000 GHz</p> <p>Start Freq 2.44700000 GHz</p> <p>Stop Freq 2.47700000 GHz</p> <p>CF Step 3.0000000 MHz Auto Man</p> <p>Freq Offset 0.0000000 Hz</p> <p>Signal Track On Off</p> <p>Ref 15 dBm Atten 15 dB</p> <p>#Peak Log 10 dB/ Offst 11 dB</p> <p>Center 2,462 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts)</p> <p><b>Occupied Bandwidth 16.4801 MHz</b></p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -14.845 kHz</p> <p>x dB Bandwidth 16.431 MHz</p>

Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode_ANT-0	
2412 MHz	<p>Agilent R T</p> <p>Ch Freq 2.412 GHz Trig Free</p> <p>Center Freq 2.4120000 GHz</p> <p>Start Freq 2.3970000 GHz</p> <p>Stop Freq 2.4270000 GHz</p> <p>CF Step 3.0000000 MHz Auto Man</p> <p>Freq Offset 0.0000000 Hz</p> <p>Signal Track On Off</p> <p>Ref 15 dBm Atten 15 dB</p> <p>#Peak Log 10 dB/ Offst 11 dB</p> <p>Center 2.412 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts)</p> <p><b>Occupied Bandwidth 17.6170 MHz</b></p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -11.859 kHz</p> <p>x dB Bandwidth 17.424 MHz</p>
2437 MHz	<p>Agilent R T</p> <p>Ch Freq 2.437 GHz Trig Free</p> <p>Center Freq 2.4370000 GHz</p> <p>Start Freq 2.4220000 GHz</p> <p>Stop Freq 2.4520000 GHz</p> <p>CF Step 3.0000000 MHz Auto Man</p> <p>Freq Offset 0.0000000 Hz</p> <p>Signal Track On Off</p> <p>Ref 15 dBm Atten 15 dB</p> <p>#Peak Log 10 dB/ Offst 11 dB</p> <p>Center 2.437 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts)</p> <p><b>Occupied Bandwidth 17.6441 MHz</b></p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -20.275 kHz</p> <p>x dB Bandwidth 17.590 MHz</p>
2462 MHz	<p>Agilent R T</p> <p>Ch Freq 2.462 GHz Trig Free</p> <p>Center Freq 2.4620000 GHz</p> <p>Start Freq 2.4470000 GHz</p> <p>Stop Freq 2.4770000 GHz</p> <p>CF Step 3.0000000 MHz Auto Man</p> <p>Freq Offset 0.0000000 Hz</p> <p>Signal Track On Off</p> <p>Ref 15 dBm Atten 15 dB</p> <p>#Peak Log 10 dB/ Offst 11 dB</p> <p>Center 2.462 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts)</p> <p><b>Occupied Bandwidth 17.6501 MHz</b></p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -13.237 kHz</p> <p>x dB Bandwidth 17.746 MHz</p>

Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode_ANT-0	
2422 MHz	<p>Agilent R T</p> <p>Ch Freq 2.422 GHz Trig Free</p> <p>Center Freq 2.4220000 GHz</p> <p>Start Freq 2.3970000 GHz</p> <p>Stop Freq 2.4470000 GHz</p> <p>CF Step 5.0000000 MHz Auto Man</p> <p>Freq Offset 0.0000000 Hz</p> <p>Signal Track On Off</p> <p>Ref 15 dBm Atten 15 dB</p> <p>#Peak Log 10 dB/Offst 11 dB</p> <p>Center 2.422 GHz Span 50 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 5.18 ms (401 pts)</p> <p><b>Occupied Bandwidth 35.9411 MHz</b></p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error 12.324 kHz</p> <p>x dB Bandwidth 35.418 MHz</p>
2437 MHz	<p>Agilent R T</p> <p>Ch Freq 2.437 GHz Trig Free</p> <p>Center Freq 2.4370000 GHz</p> <p>Start Freq 2.4120000 GHz</p> <p>Stop Freq 2.4620000 GHz</p> <p>CF Step 5.0000000 MHz Auto Man</p> <p>Freq Offset 0.0000000 Hz</p> <p>Signal Track On Off</p> <p>Ref 15 dBm Atten 15 dB</p> <p>#Peak Log 10 dB/Offst 11 dB</p> <p>Center 2.437 GHz Span 50 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 5.18 ms (401 pts)</p> <p><b>Occupied Bandwidth 35.8787 MHz</b></p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -47.267 kHz</p> <p>x dB Bandwidth 34.015 MHz</p>
2452 MHz	<p>Agilent R T</p> <p>Ch Freq 2.452 GHz Trig Free</p> <p>Center Freq 2.4520000 GHz</p> <p>Start Freq 2.4270000 GHz</p> <p>Stop Freq 2.4770000 GHz</p> <p>CF Step 5.0000000 MHz Auto Man</p> <p>Freq Offset 0.0000000 Hz</p> <p>Signal Track On Off</p> <p>Ref 15 dBm Atten 15 dB</p> <p>#Peak Log 10 dB/Offst 11 dB</p> <p>Center 2.452 GHz Span 50 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 5.18 ms (401 pts)</p> <p><b>Occupied Bandwidth 35.9238 MHz</b></p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -5.096 kHz</p> <p>x dB Bandwidth 35.172 MHz</p>

Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode_ANT-1	
2412 MHz	<p>Agilent R T</p> <p>Ch Freq 2.412 GHz Trig Free</p> <p>Center Freq 2.4120000 GHz</p> <p>Start Freq 2.3970000 GHz</p> <p>Stop Freq 2.4270000 GHz</p> <p>CF Step 3.0000000 MHz Auto Man</p> <p>Freq Offset 0.0000000 Hz</p> <p>Signal Track On Off</p> <p>Ref 15 dBm Atten 15 dB</p> <p>#Peak Log 10 dB/Offst 11 dB</p> <p>Center 2.412 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts)</p> <p><b>Occupied Bandwidth 17.6208 MHz</b></p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -12.393 kHz</p> <p>x dB Bandwidth 17.654 MHz</p>
2437 MHz	<p>Agilent R T</p> <p>Ch Freq 2.437 GHz Trig Free</p> <p>Center Freq 2.4370000 GHz</p> <p>Start Freq 2.4220000 GHz</p> <p>Stop Freq 2.4520000 GHz</p> <p>CF Step 3.0000000 MHz Auto Man</p> <p>Freq Offset 0.0000000 Hz</p> <p>Signal Track On Off</p> <p>Ref 15 dBm Atten 15 dB</p> <p>#Peak Log 10 dB/Offst 11 dB</p> <p>Center 2.437 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts)</p> <p><b>Occupied Bandwidth 17.5811 MHz</b></p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -8.399 kHz</p> <p>x dB Bandwidth 17.653 MHz</p>
2462 MHz	<p>Agilent R T</p> <p>Ch Freq 2.462 GHz Trig Free</p> <p>Center Freq 2.4620000 GHz</p> <p>Start Freq 2.4470000 GHz</p> <p>Stop Freq 2.4770000 GHz</p> <p>CF Step 3.0000000 MHz Auto Man</p> <p>Freq Offset 0.0000000 Hz</p> <p>Signal Track On Off</p> <p>Ref 15 dBm Atten 15 dB</p> <p>#Peak Log 10 dB/Offst 11 dB</p> <p>Center 2.462 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts)</p> <p><b>Occupied Bandwidth 17.6175 MHz</b></p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -31.678 kHz</p> <p>x dB Bandwidth 17.621 MHz</p>

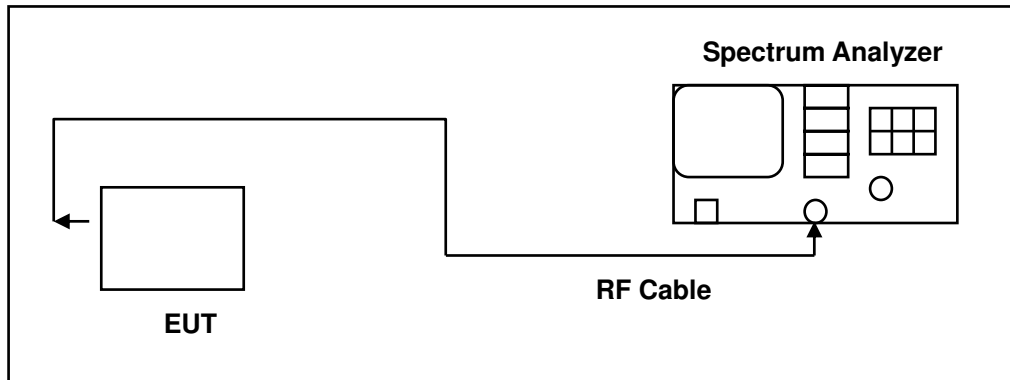
Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode_ANT-1	
2422 MHz	<p>Agilent R T</p> <p>Ch Freq 2,422 GHz Trig Free</p> <p>Center Freq 2,422,000,000 GHz</p> <p>Start Freq 2,397,000,000 GHz</p> <p>Stop Freq 2,447,000,000 GHz</p> <p>CF Step 5,000,000,000 MHz Auto Man</p> <p>Freq Offset 0,000,000,000 Hz</p> <p>Signal Track On Off</p> <p>Ref 15 dBm Atten 15 dB</p> <p>#Peak Log 10 dB/Offst 11 dB</p> <p>Center 2,422 GHz Span 50 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 5,18 ms (401 pts)</p> <p><b>Occupied Bandwidth 35.9131 MHz</b></p> <p>Occ BW % Pwr 99,00 % x dB -6,00 dB</p> <p>Transmit Freq Error -27,134 kHz</p> <p>x dB Bandwidth 35,869 MHz</p>
2437 MHz	<p>Agilent R T</p> <p>Ch Freq 2,437 GHz Trig Free</p> <p>Center Freq 2,437,000,000 GHz</p> <p>Start Freq 2,412,000,000 GHz</p> <p>Stop Freq 2,462,000,000 GHz</p> <p>CF Step 5,000,000,000 MHz Auto Man</p> <p>Freq Offset 0,000,000,000 Hz</p> <p>Signal Track On Off</p> <p>Ref 15 dBm Atten 15 dB</p> <p>#Peak Log 10 dB/Offst 11 dB</p> <p>Center 2,437 GHz Span 50 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 5,18 ms (401 pts)</p> <p><b>Occupied Bandwidth 35.9705 MHz</b></p> <p>Occ BW % Pwr 99,00 % x dB -6,00 dB</p> <p>Transmit Freq Error -6,278 kHz</p> <p>x dB Bandwidth 35,163 MHz</p>
2452 MHz	<p>Agilent R T</p> <p>Ch Freq 2,452 GHz Trig Free</p> <p>Center Freq 2,452,000,000 GHz</p> <p>Start Freq 2,427,000,000 GHz</p> <p>Stop Freq 2,477,000,000 GHz</p> <p>CF Step 5,000,000,000 MHz Auto Man</p> <p>Freq Offset 0,000,000,000 Hz</p> <p>Signal Track On Off</p> <p>Ref 15 dBm Atten 15 dB</p> <p>#Peak Log 10 dB/Offst 11 dB</p> <p>Center 2,452 GHz Span 50 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 5,18 ms (401 pts)</p> <p><b>Occupied Bandwidth 35.9234 MHz</b></p> <p>Occ BW % Pwr 99,00 % x dB -6,00 dB</p> <p>Transmit Freq Error -20,841 kHz</p> <p>x dB Bandwidth 35,236 MHz</p>

## 8 Maximum Power Density Measurement

### 8.1. Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### 8.2. Test Setup



### 8.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	E4445A	MY45300744	12/15/2015	(1)
Microwave Cable	EMCI	EMC104-SM-SM-1500	140303	02/24/2015	(1)
Test Site	ATL	TE05	TE05	N.C.R.	-----

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.

Note: N.C.R. = No Calibration Request.

### 8.4. Test Procedure

The EUT tested to DTS test procedure of KDB558074D01 for compliance to FCC 47CFR 15.247 requirements.

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
4. Set the VBW  $\geq 3 \times \text{RBW}$ .
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

**8.5. Test Result**

Model Number	VR-3033u		
Test Item	Maximum Power Density		
Date of Test	02/17/2016		
ANT-0			
Test Mode	Frequency (MHz)	Measurement Results (dBm/3KHz)	Limit (dBm/3KHz)
Mode 2	2412	-4.597	< 8
	2437	-3.016	< 8
	2462	-4.722	< 8
Mode 3	2412	-8.923	< 8
	2437	-8.824	< 8
	2462	-8.994	< 8
Mode 4	2412	-8.500	< 8
	2437	-8.415	< 8
	2462	-4.683	< 8
Mode 5	2422	-12.230	< 8
	2437	-11.240	< 8
	2452	-13.280	< 8
ANT-1			
Test Mode	Frequency (MHz)	Measurement Results (dBm/3KHz)	Limit (dBm/3KHz)
Mode 4	2412	-10.490	< 8
	2437	-10.690	< 8
	2462	-8.825	< 8
Mode 5	2422	-12.470	< 8
	2437	-13.790	< 8
	2452	-13.400	< 8



**8.6. Test Graphs**

Mode 2: IEEE 802.11b link mode_ANT-0															
2412 MHz	<p>Agilent R T            Ref 15 dBm Atten 15 dB Mkr1 2.4113175 GHz -4.597 dBm            Peak            Log            10 dB/Offst            11 dB            DI 8.0 dBm            M1 S2            S3 FC            AR</p> <p>Center 2.412 GHz Span 13 MHz            #Res BW 3 kHz #VBW 10 kHz Sweep 1.487 s (401 pts)</p> <table border="1"> <tr><th colspan="2">Freq/Channel</th></tr> <tr><td>Center Freq</td><td>2.41200000 GHz</td></tr> <tr><td>Start Freq</td><td>2.40550000 GHz</td></tr> <tr><td>Stop Freq</td><td>2.41850000 GHz</td></tr> <tr><td>CF Step</td><td>1.30000000 MHz Auto Man</td></tr> <tr><td>Freq Offset</td><td>0.00000000 Hz</td></tr> <tr><td>Signal Track</td><td>On Off</td></tr> </table>	Freq/Channel		Center Freq	2.41200000 GHz	Start Freq	2.40550000 GHz	Stop Freq	2.41850000 GHz	CF Step	1.30000000 MHz Auto Man	Freq Offset	0.00000000 Hz	Signal Track	On Off
Freq/Channel															
Center Freq	2.41200000 GHz														
Start Freq	2.40550000 GHz														
Stop Freq	2.41850000 GHz														
CF Step	1.30000000 MHz Auto Man														
Freq Offset	0.00000000 Hz														
Signal Track	On Off														
2437 MHz	<p>Agilent R T            Ref 15 dBm Atten 15 dB Mkr1 2.4377150 GHz -3.016 dBm            Peak            Log            10 dB/Offst            11 dB            DI 8.0 dBm            M1 S2            S3 FC            AR</p> <p>Center 2.437 GHz Span 13 MHz            #Res BW 3 kHz #VBW 10 kHz Sweep 1.487 s (401 pts)</p> <table border="1"> <tr><th colspan="2">Freq/Channel</th></tr> <tr><td>Center Freq</td><td>2.43700000 GHz</td></tr> <tr><td>Start Freq</td><td>2.43050000 GHz</td></tr> <tr><td>Stop Freq</td><td>2.44350000 GHz</td></tr> <tr><td>CF Step</td><td>1.30000000 MHz Auto Man</td></tr> <tr><td>Freq Offset</td><td>0.00000000 Hz</td></tr> <tr><td>Signal Track</td><td>On Off</td></tr> </table>	Freq/Channel		Center Freq	2.43700000 GHz	Start Freq	2.43050000 GHz	Stop Freq	2.44350000 GHz	CF Step	1.30000000 MHz Auto Man	Freq Offset	0.00000000 Hz	Signal Track	On Off
Freq/Channel															
Center Freq	2.43700000 GHz														
Start Freq	2.43050000 GHz														
Stop Freq	2.44350000 GHz														
CF Step	1.30000000 MHz Auto Man														
Freq Offset	0.00000000 Hz														
Signal Track	On Off														
2462 MHz	<p>Agilent R T            Ref 15 dBm Atten 15 dB Mkr1 2.4642100 GHz -4.722 dBm            Peak            Log            10 dB/Offst            11 dB            DI 8.0 dBm            M1 S2            S3 FC            AR</p> <p>Center 2.462 GHz Span 13 MHz            #Res BW 3 kHz #VBW 10 kHz Sweep 1.487 s (401 pts)</p> <table border="1"> <tr><th colspan="2">Freq/Channel</th></tr> <tr><td>Center Freq</td><td>2.46200000 GHz</td></tr> <tr><td>Start Freq</td><td>2.45550000 GHz</td></tr> <tr><td>Stop Freq</td><td>2.46850000 GHz</td></tr> <tr><td>CF Step</td><td>1.30000000 MHz Auto Man</td></tr> <tr><td>Freq Offset</td><td>0.00000000 Hz</td></tr> <tr><td>Signal Track</td><td>On Off</td></tr> </table>	Freq/Channel		Center Freq	2.46200000 GHz	Start Freq	2.45550000 GHz	Stop Freq	2.46850000 GHz	CF Step	1.30000000 MHz Auto Man	Freq Offset	0.00000000 Hz	Signal Track	On Off
Freq/Channel															
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Start Freq	2.45550000 GHz														
Stop Freq	2.46850000 GHz														
CF Step	1.30000000 MHz Auto Man														
Freq Offset	0.00000000 Hz														
Signal Track	On Off														

Mode 3: IEEE 802.11g link mode\_ANT-0

<p>2412 MHz</p>	
<p>2437 MHz</p>	
<p>2462 MHz</p>	

Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode\_ANT-0

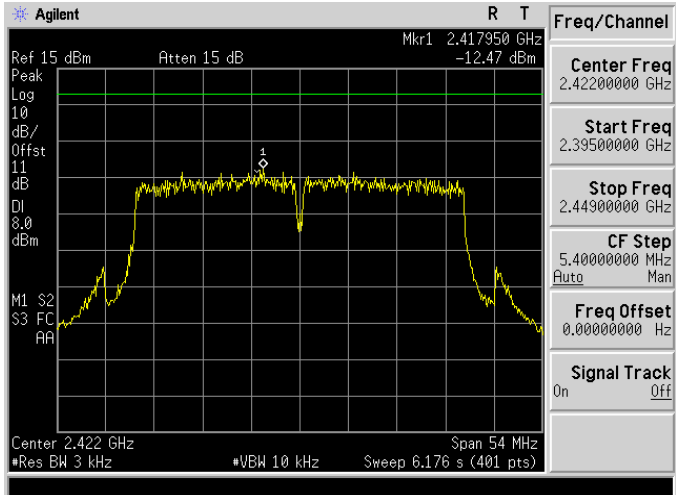
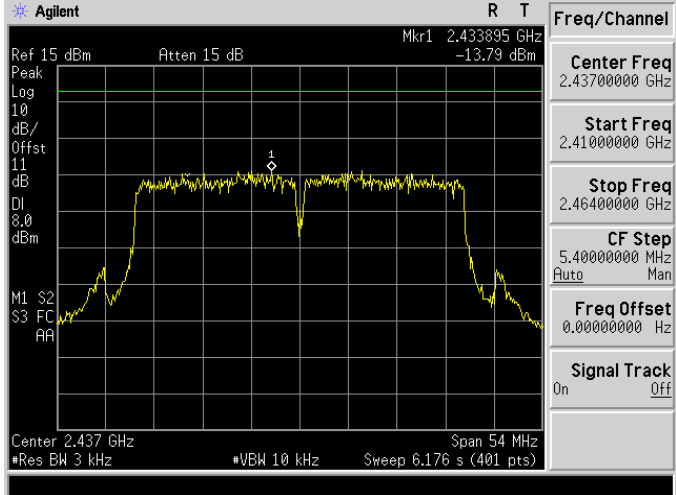
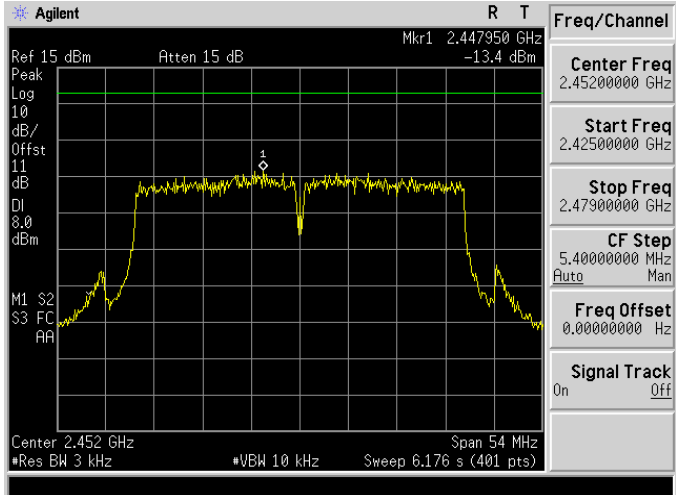
<p>2412 MHz</p>	
<p>2437 MHz</p>	
<p>2462 MHz</p>	

Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode_ANT-0	
2422 MHz	
2437 MHz	
2452 MHz	

Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode\_ANT-1

<p>2412 MHz</p>	<p>Agilent R T Mkr1 2.4075450 GHz -10.49 dBm</p> <p>Ref 15 dBm Atten 15 dB</p> <p>Peak Log 10 dB/ Offst 11 dB DI 8.0 dBm</p> <p>M1 S2 S3 FC AR</p> <p>Center 2.412 GHz Span 27 MHz #Res BW 3 kHz #VBW 10 kHz Sweep 3.088 s (401 pts)</p> <table border="1"> <thead> <tr> <th colspan="2">Freq/Channel</th> </tr> </thead> <tbody> <tr> <td>Center Freq</td> <td>2.4120000 GHz</td> </tr> <tr> <td>Start Freq</td> <td>2.3985000 GHz</td> </tr> <tr> <td>Stop Freq</td> <td>2.4255000 GHz</td> </tr> <tr> <td>CF Step</td> <td>2.7000000 MHz Auto Man</td> </tr> <tr> <td>Freq Offset</td> <td>0.0000000 Hz</td> </tr> <tr> <td>Signal Track</td> <td>On Off</td> </tr> </tbody> </table>	Freq/Channel		Center Freq	2.4120000 GHz	Start Freq	2.3985000 GHz	Stop Freq	2.4255000 GHz	CF Step	2.7000000 MHz Auto Man	Freq Offset	0.0000000 Hz	Signal Track	On Off
Freq/Channel															
Center Freq	2.4120000 GHz														
Start Freq	2.3985000 GHz														
Stop Freq	2.4255000 GHz														
CF Step	2.7000000 MHz Auto Man														
Freq Offset	0.0000000 Hz														
Signal Track	On Off														
<p>2437 MHz</p>	<p>Agilent R T Mkr1 2.4388900 GHz -10.69 dBm</p> <p>Ref 15 dBm Atten 15 dB</p> <p>Peak Log 10 dB/ Offst 11 dB DI 8.0 dBm</p> <p>M1 S2 S3 FC AR</p> <p>Center 2.437 GHz Span 27 MHz #Res BW 3 kHz #VBW 10 kHz Sweep 3.088 s (401 pts)</p> <table border="1"> <thead> <tr> <th colspan="2">Freq/Channel</th> </tr> </thead> <tbody> <tr> <td>Center Freq</td> <td>2.4370000 GHz</td> </tr> <tr> <td>Start Freq</td> <td>2.4235000 GHz</td> </tr> <tr> <td>Stop Freq</td> <td>2.4505000 GHz</td> </tr> <tr> <td>CF Step</td> <td>2.7000000 MHz Auto Man</td> </tr> <tr> <td>Freq Offset</td> <td>0.0000000 Hz</td> </tr> <tr> <td>Signal Track</td> <td>On Off</td> </tr> </tbody> </table>	Freq/Channel		Center Freq	2.4370000 GHz	Start Freq	2.4235000 GHz	Stop Freq	2.4505000 GHz	CF Step	2.7000000 MHz Auto Man	Freq Offset	0.0000000 Hz	Signal Track	On Off
Freq/Channel															
Center Freq	2.4370000 GHz														
Start Freq	2.4235000 GHz														
Stop Freq	2.4505000 GHz														
CF Step	2.7000000 MHz Auto Man														
Freq Offset	0.0000000 Hz														
Signal Track	On Off														
<p>2462 MHz</p>	<p>Agilent R T Mkr1 2.4651050 GHz -8.825 dBm</p> <p>Ref 15 dBm Atten 15 dB</p> <p>Peak Log 10 dB/ Offst 11 dB DI 8.0 dBm</p> <p>M1 S2 S3 FC AR</p> <p>Center 2.462 GHz Span 27 MHz #Res BW 3 kHz #VBW 10 kHz Sweep 3.088 s (401 pts)</p> <table border="1"> <thead> <tr> <th colspan="2">Freq/Channel</th> </tr> </thead> <tbody> <tr> <td>Center Freq</td> <td>2.4620000 GHz</td> </tr> <tr> <td>Start Freq</td> <td>2.4485000 GHz</td> </tr> <tr> <td>Stop Freq</td> <td>2.4755000 GHz</td> </tr> <tr> <td>CF Step</td> <td>2.7000000 MHz Auto Man</td> </tr> <tr> <td>Freq Offset</td> <td>0.0000000 Hz</td> </tr> <tr> <td>Signal Track</td> <td>On Off</td> </tr> </tbody> </table>	Freq/Channel		Center Freq	2.4620000 GHz	Start Freq	2.4485000 GHz	Stop Freq	2.4755000 GHz	CF Step	2.7000000 MHz Auto Man	Freq Offset	0.0000000 Hz	Signal Track	On Off
Freq/Channel															
Center Freq	2.4620000 GHz														
Start Freq	2.4485000 GHz														
Stop Freq	2.4755000 GHz														
CF Step	2.7000000 MHz Auto Man														
Freq Offset	0.0000000 Hz														
Signal Track	On Off														

Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode\_ANT-1

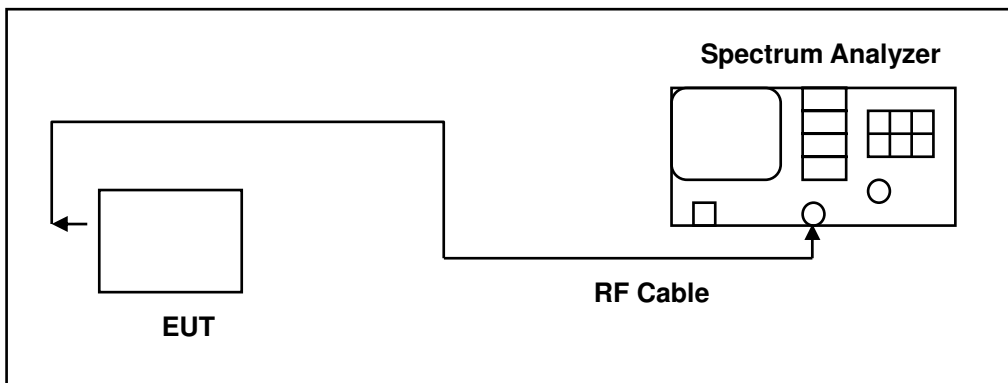
<p>2422 MHz</p>	 <p>Agilent R T Freq/Channel</p> <p>Ref 15 dBm Atten 15 dB Mkr1 2.417950 GHz -12.47 dBm</p> <p>Center Freq 2.4220000 GHz</p> <p>Start Freq 2.3950000 GHz</p> <p>Stop Freq 2.4490000 GHz</p> <p>CF Step 5.4000000 MHz Auto Man</p> <p>Freq Offset 0.0000000 Hz</p> <p>Signal Track On Off</p> <p>Center 2.422 GHz Span 54 MHz</p> <p>#Res BW 3 kHz #VBW 10 kHz Sweep 6.176 s (401 pts)</p>
<p>2437 MHz</p>	 <p>Agilent R T Freq/Channel</p> <p>Ref 15 dBm Atten 15 dB Mkr1 2.433895 GHz -13.79 dBm</p> <p>Center Freq 2.4370000 GHz</p> <p>Start Freq 2.4100000 GHz</p> <p>Stop Freq 2.4640000 GHz</p> <p>CF Step 5.4000000 MHz Auto Man</p> <p>Freq Offset 0.0000000 Hz</p> <p>Signal Track On Off</p> <p>Center 2.437 GHz Span 54 MHz</p> <p>#Res BW 3 kHz #VBW 10 kHz Sweep 6.176 s (401 pts)</p>
<p>2452 MHz</p>	 <p>Agilent R T Freq/Channel</p> <p>Ref 15 dBm Atten 15 dB Mkr1 2.447950 GHz -13.4 dBm</p> <p>Center Freq 2.4520000 GHz</p> <p>Start Freq 2.4250000 GHz</p> <p>Stop Freq 2.4790000 GHz</p> <p>CF Step 5.4000000 MHz Auto Man</p> <p>Freq Offset 0.0000000 Hz</p> <p>Signal Track On Off</p> <p>Center 2.452 GHz Span 54 MHz</p> <p>#Res BW 3 kHz #VBW 10 kHz Sweep 6.176 s (401 pts)</p>

## 9 Out of Band Conducted Emissions Measurement

### 9.1. Limit

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

### 9.2. Test Setup



### 9.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	E4445A	MY45300744	12/15/2015	(1)
Spectrum Analyzer	Agilent	E4408B	MY45107753	07/27/2015	(1)
Microwave Cable	EMCI	EMC104-SM-SM-1500	140303	02/24/2015	(1)
Test Site	ATL	TE05	TE05	N.C.R.	-----

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.

Note: N.C.R. = No Calibration Request.

### 9.4. Test Procedure

In any 100 kHz bandwidth outside the EUT pass band, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20 dB below that of the maximum in-band 100 kHz emission, antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function. All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the pass band. The test was performed at 3 channels.

**9.5. Test Graphs**

Reference level	
Mode 2: IEEE 802.11b link mode_ANT-0	
2412 MHz	
2437 MHz	
2462 MHz	

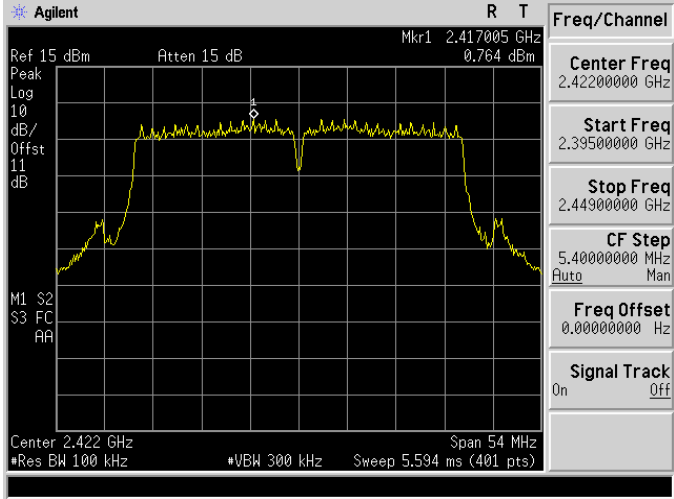
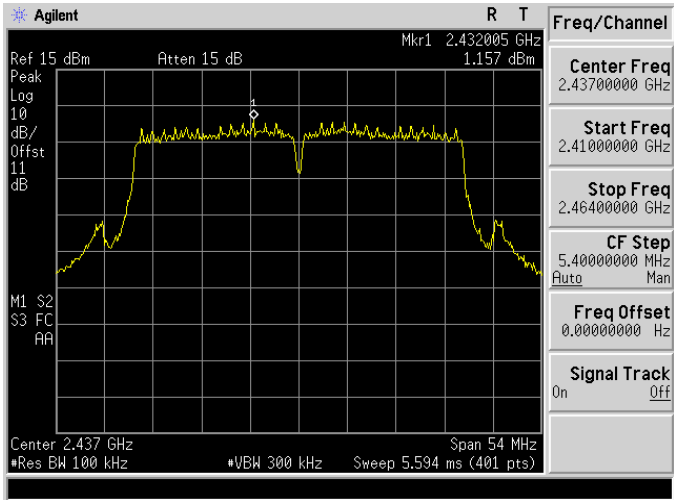
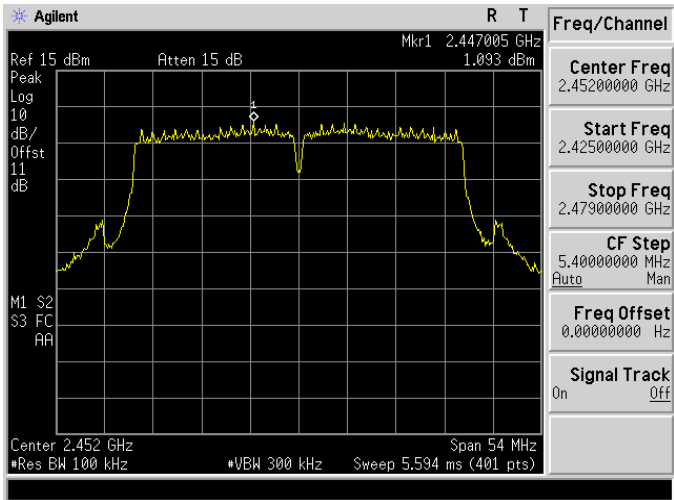


Reference level															
Mode 3: IEEE 802.11g link mode_ANT-0															
2412 MHz	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><th colspan="2">Freq/Channel</th></tr> <tr><td>Center Freq</td><td>2.41200000 GHz</td></tr> <tr><td>Start Freq</td><td>2.39950000 GHz</td></tr> <tr><td>Stop Freq</td><td>2.42450000 GHz</td></tr> <tr><td>CF Step</td><td>2.50000000 MHz</td></tr> <tr><td>Freq Offset</td><td>0.00000000 Hz</td></tr> <tr><td>Signal Track</td><td>On Off</td></tr> </table>	Freq/Channel		Center Freq	2.41200000 GHz	Start Freq	2.39950000 GHz	Stop Freq	2.42450000 GHz	CF Step	2.50000000 MHz	Freq Offset	0.00000000 Hz	Signal Track	On Off
Freq/Channel															
Center Freq	2.41200000 GHz														
Start Freq	2.39950000 GHz														
Stop Freq	2.42450000 GHz														
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Out of Band Conducted Spurious Emission	
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Amplitude 3.733 dBm																																											
Freq/Channel																																											
Center Freq	13.2650000 GHz																																										
Start Freq	30.0000000 MHz																																										
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CF Step	2.64700000 GHz																																										
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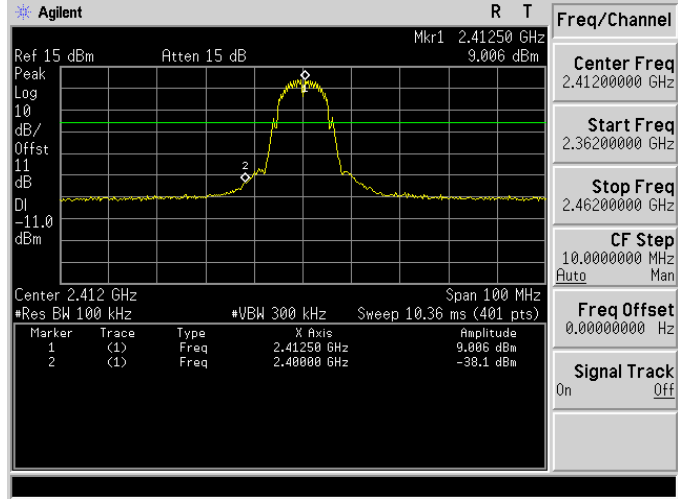
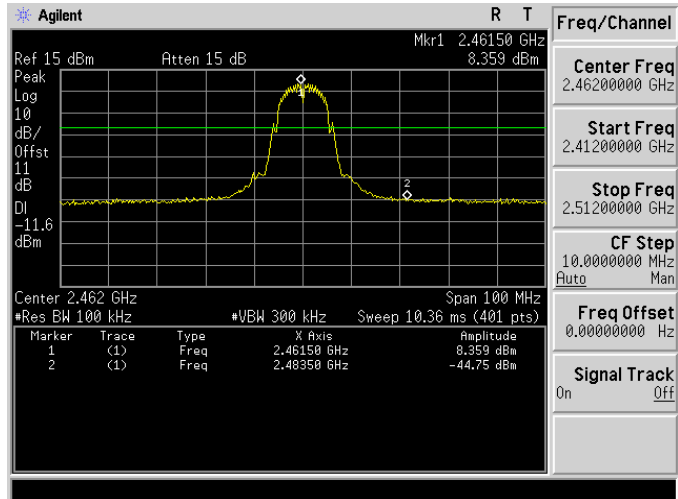
Out of Band Conducted Spurious Emission

Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode\_ANT-0

<p>2422 MHz</p>	<p>Agilent R T Mkr1 2.42 GHz 0.747 dBm</p> <p>Ref 15 dBm Atten 15 dB</p> <p>Peak Log 10 dB/Offst 11 dB DI -18.6 dBm</p> <p>Start 30 MHz Stop 26.5 GHz *Res BW 100 kHz *VBW 300 kHz Sweep 2.742 s (401 pts)</p> <table border="1"> <thead> <tr> <th>Marker</th> <th>Trace</th> <th>Type</th> <th>X Axis</th> <th>Amplitude</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>(1)</td> <td>Freq</td> <td>2.42 GHz</td> <td>0.747 dBm</td> </tr> </tbody> </table> <p>Freq/Channel Center Freq 13.2650000 GHz Start Freq 30.0000000 MHz Stop Freq 26.5000000 GHz CF Step 2.64700000 GHz Auto Man Freq Offset 0.00000000 Hz Signal Track On Off</p>	Marker	Trace	Type	X Axis	Amplitude	1	(1)	Freq	2.42 GHz	0.747 dBm
Marker	Trace	Type	X Axis	Amplitude							
1	(1)	Freq	2.42 GHz	0.747 dBm							
<p>2437 MHz</p>	<p>Agilent R T Mkr1 2.44 GHz -1.913 dBm</p> <p>Ref 15 dBm Atten 15 dB</p> <p>Peak Log 10 dB/Offst 11 dB DI -18.7 dBm</p> <p>Start 30 MHz Stop 26.5 GHz *Res BW 100 kHz *VBW 300 kHz Sweep 2.742 s (401 pts)</p> <table border="1"> <thead> <tr> <th>Marker</th> <th>Trace</th> <th>Type</th> <th>X Axis</th> <th>Amplitude</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>(1)</td> <td>Freq</td> <td>2.44 GHz</td> <td>-1.913 dBm</td> </tr> </tbody> </table> <p>Freq/Channel Center Freq 13.2650000 GHz Start Freq 30.0000000 MHz Stop Freq 26.5000000 GHz CF Step 2.64700000 GHz Auto Man Freq Offset 0.00000000 Hz Signal Track On Off</p>	Marker	Trace	Type	X Axis	Amplitude	1	(1)	Freq	2.44 GHz	-1.913 dBm
Marker	Trace	Type	X Axis	Amplitude							
1	(1)	Freq	2.44 GHz	-1.913 dBm							
<p>2452 MHz</p>	<p>Agilent R T Mkr1 2.45 GHz -2.42 dBm</p> <p>Ref 15 dBm Atten 15 dB</p> <p>Peak Log 10 dB/Offst 11 dB DI -18.8 dBm</p> <p>Start 30 MHz Stop 26.5 GHz *Res BW 100 kHz *VBW 300 kHz Sweep 2.742 s (401 pts)</p> <table border="1"> <thead> <tr> <th>Marker</th> <th>Trace</th> <th>Type</th> <th>X Axis</th> <th>Amplitude</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>(1)</td> <td>Freq</td> <td>2.45 GHz</td> <td>-2.42 dBm</td> </tr> </tbody> </table> <p>Freq/Channel Center Freq 13.2650000 GHz Start Freq 30.0000000 MHz Stop Freq 26.5000000 GHz CF Step 2.64700000 GHz Auto Man Freq Offset 0.00000000 Hz Signal Track On Off</p>	Marker	Trace	Type	X Axis	Amplitude	1	(1)	Freq	2.45 GHz	-2.42 dBm
Marker	Trace	Type	X Axis	Amplitude							
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Out of Band Conducted Spurious Emission																	
Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode_ANT-1																	
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Out of Band Conducted Spurious Emission																	
Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode_ANT-1																	
2422 MHz	<p>Agilent R T            Ref 15 dBm Atten 15 dB Mkr1 2.42 GHz            Peak -2.841 dBm            Log            10 dB/            Offst 11 dB            DI -19.2 dBm            Start 30 MHz Stop 26.5 GHz            #Res BW 100 kHz #VBW 300 kHz Sweep 2.742 s (401 pts)            Marker 1 Trace (1) Type Freq X Axis 2.42 GHz Amplitude -2.841 dBm</p> <table border="1"> <tr><th colspan="2">Freq/Channel</th></tr> <tr><td>Center Freq</td><td>13.2650000 GHz</td></tr> <tr><td>Start Freq</td><td>30.0000000 MHz</td></tr> <tr><td>Stop Freq</td><td>26.5000000 GHz</td></tr> <tr><td>CF Step</td><td>2.64700000 GHz</td></tr> <tr><td></td><td>Auto Man</td></tr> <tr><td>Freq Offset</td><td>0.00000000 Hz</td></tr> <tr><td>Signal Track</td><td>On Off</td></tr> </table>	Freq/Channel		Center Freq	13.2650000 GHz	Start Freq	30.0000000 MHz	Stop Freq	26.5000000 GHz	CF Step	2.64700000 GHz		Auto Man	Freq Offset	0.00000000 Hz	Signal Track	On Off
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2437 MHz	<p>Agilent R T            Ref 15 dBm Atten 15 dB Mkr1 2.44 GHz            Peak -2.232 dBm            Log            10 dB/            Offst 11 dB            DI -18.8 dBm            Start 30 MHz Stop 26.5 GHz            #Res BW 100 kHz #VBW 300 kHz Sweep 2.742 s (401 pts)            Marker 1 Trace (1) Type Freq X Axis 2.44 GHz Amplitude -2.232 dBm</p> <table border="1"> <tr><th colspan="2">Freq/Channel</th></tr> <tr><td>Center Freq</td><td>13.2650000 GHz</td></tr> <tr><td>Start Freq</td><td>30.0000000 MHz</td></tr> <tr><td>Stop Freq</td><td>26.5000000 GHz</td></tr> <tr><td>CF Step</td><td>2.64700000 GHz</td></tr> <tr><td></td><td>Auto Man</td></tr> <tr><td>Freq Offset</td><td>0.00000000 Hz</td></tr> <tr><td>Signal Track</td><td>On Off</td></tr> </table>	Freq/Channel		Center Freq	13.2650000 GHz	Start Freq	30.0000000 MHz	Stop Freq	26.5000000 GHz	CF Step	2.64700000 GHz		Auto Man	Freq Offset	0.00000000 Hz	Signal Track	On Off
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2452 MHz	<p>Agilent R T            Ref 15 dBm Atten 15 dB Mkr1 2.45 GHz            Peak -2.429 dBm            Log            10 dB/            Offst 11 dB            DI -18.9 dBm            Start 30 MHz Stop 26.5 GHz            #Res BW 100 kHz #VBW 300 kHz Sweep 2.742 s (401 pts)            Marker 1 Trace (1) Type Freq X Axis 2.45 GHz Amplitude -2.429 dBm</p> <table border="1"> <tr><th colspan="2">Freq/Channel</th></tr> <tr><td>Center Freq</td><td>13.2650000 GHz</td></tr> <tr><td>Start Freq</td><td>30.0000000 MHz</td></tr> <tr><td>Stop Freq</td><td>26.5000000 GHz</td></tr> <tr><td>CF Step</td><td>2.64700000 GHz</td></tr> <tr><td></td><td>Auto Man</td></tr> <tr><td>Freq Offset</td><td>0.00000000 Hz</td></tr> <tr><td>Signal Track</td><td>On Off</td></tr> </table>	Freq/Channel		Center Freq	13.2650000 GHz	Start Freq	30.0000000 MHz	Stop Freq	26.5000000 GHz	CF Step	2.64700000 GHz		Auto Man	Freq Offset	0.00000000 Hz	Signal Track	On Off
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Conducted Band Edge	
Mode 2: IEEE 802.11b link mode_ANT-0	
2412 MHz	
2462 MHz	

Conducted Band Edge																
Mode 3: IEEE 802.11g link mode_ANT-0																
2412 MHz	<p>Agilent R T</p> <p>Ref 15 dBm Atten 15 dB Mkr1 2.41575 GHz 4.71 dBm</p> <p>Peak Log 10 dB/Offst 11 dB DI -15.3 dBm</p> <p>Center 2.412 GHz Span 100 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 10.36 ms (401 pts)</p> <table border="1"> <thead> <tr> <th>Marker</th> <th>Trace</th> <th>Type</th> <th>X Axis</th> <th>Amplitude</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>(1)</td> <td>Freq</td> <td>2.41575 GHz</td> <td>4.71 dBm</td> </tr> <tr> <td>2</td> <td>(1)</td> <td>Freq</td> <td>2.40000 GHz</td> <td>-29.72 dBm</td> </tr> </tbody> </table> <p>Freq/Channel</p> <p>Center Freq 2.41200000 GHz</p> <p>Start Freq 2.36200000 GHz</p> <p>Stop Freq 2.46200000 GHz</p> <p>CF Step 10.0000000 MHz Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p>	Marker	Trace	Type	X Axis	Amplitude	1	(1)	Freq	2.41575 GHz	4.71 dBm	2	(1)	Freq	2.40000 GHz	-29.72 dBm
Marker	Trace	Type	X Axis	Amplitude												
1	(1)	Freq	2.41575 GHz	4.71 dBm												
2	(1)	Freq	2.40000 GHz	-29.72 dBm												
2462 MHz	<p>Agilent R T</p> <p>Ref 15 dBm Atten 15 dB Mkr1 2.46450 GHz 4.011 dBm</p> <p>Peak Log 10 dB/Offst 11 dB DI -16.0 dBm</p> <p>Center 2.462 GHz Span 100 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 10.36 ms (401 pts)</p> <table border="1"> <thead> <tr> <th>Marker</th> <th>Trace</th> <th>Type</th> <th>X Axis</th> <th>Amplitude</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>(1)</td> <td>Freq</td> <td>2.46450 GHz</td> <td>4.011 dBm</td> </tr> <tr> <td>2</td> <td>(1)</td> <td>Freq</td> <td>2.48350 GHz</td> <td>-45.89 dBm</td> </tr> </tbody> </table> <p>Freq/Channel</p> <p>Center Freq 2.46200000 GHz</p> <p>Start Freq 2.41200000 GHz</p> <p>Stop Freq 2.51200000 GHz</p> <p>CF Step 10.0000000 MHz Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p>	Marker	Trace	Type	X Axis	Amplitude	1	(1)	Freq	2.46450 GHz	4.011 dBm	2	(1)	Freq	2.48350 GHz	-45.89 dBm
Marker	Trace	Type	X Axis	Amplitude												
1	(1)	Freq	2.46450 GHz	4.011 dBm												
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Conducted Band Edge																
Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode_ANT-0																
2412 MHz	<p>Agilent R T Freq/Channel</p> <p>Ref 15 dBm Atten 15 dB Mkr1 2.41575 GHz Peak 4.899 dBm Log 10 dB/Offst 11 dB DI -15.1 dBm</p> <p>Center 2.412 GHz Span 100 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 10.36 ms (401 pts)</p> <table border="1"> <thead> <tr> <th>Marker</th> <th>Trace</th> <th>Type</th> <th>X Axis</th> <th>Amplitude</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>(1)</td> <td>Freq</td> <td>2.41575 GHz</td> <td>4.899 dBm</td> </tr> <tr> <td>2</td> <td>(1)</td> <td>Freq</td> <td>2.40000 GHz</td> <td>-29.67 dBm</td> </tr> </tbody> </table> <p>Center Freq 2.41200000 GHz Start Freq 2.36200000 GHz Stop Freq 2.46200000 GHz CF Step 10.0000000 MHz (Auto/Man) Freq Offset 0.00000000 Hz Signal Track On/Off</p>	Marker	Trace	Type	X Axis	Amplitude	1	(1)	Freq	2.41575 GHz	4.899 dBm	2	(1)	Freq	2.40000 GHz	-29.67 dBm
Marker	Trace	Type	X Axis	Amplitude												
1	(1)	Freq	2.41575 GHz	4.899 dBm												
2	(1)	Freq	2.40000 GHz	-29.67 dBm												
2462 MHz	<p>Agilent R T Freq/Channel</p> <p>Ref 15 dBm Atten 15 dB Mkr1 2.45700 GHz Peak 4.03 dBm Log 10 dB/Offst 11 dB DI -16.0 dBm</p> <p>Center 2.462 GHz Span 100 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 10.36 ms (401 pts)</p> <table border="1"> <thead> <tr> <th>Marker</th> <th>Trace</th> <th>Type</th> <th>X Axis</th> <th>Amplitude</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>(1)</td> <td>Freq</td> <td>2.45700 GHz</td> <td>4.03 dBm</td> </tr> <tr> <td>2</td> <td>(1)</td> <td>Freq</td> <td>2.48350 GHz</td> <td>-46.14 dBm</td> </tr> </tbody> </table> <p>Center Freq 2.46200000 GHz Start Freq 2.41200000 GHz Stop Freq 2.51200000 GHz CF Step 10.0000000 MHz (Auto/Man) Freq Offset 0.00000000 Hz Signal Track On/Off</p>	Marker	Trace	Type	X Axis	Amplitude	1	(1)	Freq	2.45700 GHz	4.03 dBm	2	(1)	Freq	2.48350 GHz	-46.14 dBm
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Conducted Band Edge																
Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode_ANT-0																
2422 MHz	<p>Agilent R T            Ref 15 dBm Atten 15 dB Mkr1 2.42575 GHz 1.11 dBm            Peak Log            10 dB/Offst            11 dB            DI -18.9 dBm            Center 2.422 GHz Span 100 MHz            #Res BW 100 kHz #VBW 300 kHz Sweep 10.36 ms (401 pts)</p> <table border="1"> <thead> <tr> <th>Marker</th> <th>Trace</th> <th>Type</th> <th>X Axis</th> <th>Amplitude</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>(1)</td> <td>Freq</td> <td>2.42575 GHz</td> <td>1.11 dBm</td> </tr> <tr> <td>2</td> <td>(1)</td> <td>Freq</td> <td>2.40000 GHz</td> <td>-26.91 dBm</td> </tr> </tbody> </table> <p>Freq/Channel            Center Freq 2.42200000 GHz            Start Freq 2.37200000 GHz            Stop Freq 2.47200000 GHz            CF Step 10.0000000 MHz            Freq Offset 0.00000000 Hz            Signal Track On Off</p>	Marker	Trace	Type	X Axis	Amplitude	1	(1)	Freq	2.42575 GHz	1.11 dBm	2	(1)	Freq	2.40000 GHz	-26.91 dBm
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2452 MHz	<p>Agilent R T            Ref 15 dBm Atten 15 dB Mkr1 2.45700 GHz 0.885 dBm            Peak Log            10 dB/Offst            11 dB            DI -19.1 dBm            Center 2.452 GHz Span 100 MHz            #Res BW 100 kHz #VBW 300 kHz Sweep 10.36 ms (401 pts)</p> <table border="1"> <thead> <tr> <th>Marker</th> <th>Trace</th> <th>Type</th> <th>X Axis</th> <th>Amplitude</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>(1)</td> <td>Freq</td> <td>2.45700 GHz</td> <td>0.885 dBm</td> </tr> <tr> <td>2</td> <td>(1)</td> <td>Freq</td> <td>2.48350 GHz</td> <td>-44.83 dBm</td> </tr> </tbody> </table> <p>Freq/Channel            Center Freq 2.45200000 GHz            Start Freq 2.40200000 GHz            Stop Freq 2.50200000 GHz            CF Step 10.0000000 MHz            Freq Offset 0.00000000 Hz            Signal Track On Off</p>	Marker	Trace	Type	X Axis	Amplitude	1	(1)	Freq	2.45700 GHz	0.885 dBm	2	(1)	Freq	2.48350 GHz	-44.83 dBm
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Conducted Band Edge																
Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode_ANT-1																
2412 MHz	<p>Agilent R T Freq/Channel</p> <p>Ref 15 dBm Atten 15 dB Mkr1 2.41700 GHz Peak 3.572 dBm Log 10 dB/ Offst 11 dB DI -16.4 dBm</p> <p>Center 2.412 GHz Span 100 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 10.36 ms (401 pts)</p> <table border="1"> <thead> <tr> <th>Marker</th> <th>Trace</th> <th>Type</th> <th>X Axis</th> <th>Amplitude</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>(1)</td> <td>Freq</td> <td>2.41700 GHz</td> <td>3.572 dBm</td> </tr> <tr> <td>2</td> <td>(1)</td> <td>Freq</td> <td>2.40000 GHz</td> <td>-30.26 dBm</td> </tr> </tbody> </table> <p>Center Freq 2.41200000 GHz Start Freq 2.36200000 GHz Stop Freq 2.46200000 GHz CF Step 10.0000000 MHz (Auto/Man) Freq Offset 0.00000000 Hz Signal Track On/Off</p>	Marker	Trace	Type	X Axis	Amplitude	1	(1)	Freq	2.41700 GHz	3.572 dBm	2	(1)	Freq	2.40000 GHz	-30.26 dBm
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2462 MHz	<p>Agilent R T Freq/Channel</p> <p>Ref 15 dBm Atten 15 dB Mkr1 2.46700 GHz Peak 3.253 dBm Log 10 dB/ Offst 11 dB DI -16.7 dBm</p> <p>Center 2.462 GHz Span 100 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 10.36 ms (401 pts)</p> <table border="1"> <thead> <tr> <th>Marker</th> <th>Trace</th> <th>Type</th> <th>X Axis</th> <th>Amplitude</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>(1)</td> <td>Freq</td> <td>2.46700 GHz</td> <td>3.253 dBm</td> </tr> <tr> <td>2</td> <td>(1)</td> <td>Freq</td> <td>2.48350 GHz</td> <td>-46.7 dBm</td> </tr> </tbody> </table> <p>Center Freq 2.46200000 GHz Start Freq 2.41200000 GHz Stop Freq 2.51200000 GHz CF Step 10.0000000 MHz (Auto/Man) Freq Offset 0.00000000 Hz Signal Track On/Off</p>	Marker	Trace	Type	X Axis	Amplitude	1	(1)	Freq	2.46700 GHz	3.253 dBm	2	(1)	Freq	2.48350 GHz	-46.7 dBm
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Conducted Band Edge																
Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode_ANT-1																
2422 MHz	<p>Agilent R T            Ref 15 dBm Atten 15 dB Mkr1 2.41700 GHz 0.967 dBm            Peak Log            10 dB/Offst            11 dB            DI -19.0 dBm            Center 2.422 GHz Span 100 MHz            #Res BW 100 kHz #VBW 300 kHz Sweep 10.36 ms (401 pts)</p> <table border="1"> <thead> <tr> <th>Marker</th> <th>Trace</th> <th>Type</th> <th>X Axis</th> <th>Amplitude</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>(1)</td> <td>Freq</td> <td>2.41700 GHz</td> <td>0.967 dBm</td> </tr> <tr> <td>2</td> <td>(1)</td> <td>Freq</td> <td>2.40000 GHz</td> <td>-26.87 dBm</td> </tr> </tbody> </table> <p>Freq/Channel            Center Freq 2.42200000 GHz            Start Freq 2.37200000 GHz            Stop Freq 2.47200000 GHz            CF Step 10.0000000 MHz            Freq Offset 0.00000000 Hz            Signal Track On Off</p>	Marker	Trace	Type	X Axis	Amplitude	1	(1)	Freq	2.41700 GHz	0.967 dBm	2	(1)	Freq	2.40000 GHz	-26.87 dBm
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1	(1)	Freq	2.41700 GHz	0.967 dBm												
2	(1)	Freq	2.40000 GHz	-26.87 dBm												
2452 MHz	<p>Agilent R T            Ref 15 dBm Atten 15 dB Mkr1 2.44700 GHz 0.66 dBm            Peak Log            10 dB/Offst            11 dB            DI -19.3 dBm            Center 2.452 GHz Span 100 MHz            #Res BW 100 kHz #VBW 300 kHz Sweep 10.36 ms (401 pts)</p> <table border="1"> <thead> <tr> <th>Marker</th> <th>Trace</th> <th>Type</th> <th>X Axis</th> <th>Amplitude</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>(1)</td> <td>Freq</td> <td>2.44700 GHz</td> <td>0.66 dBm</td> </tr> <tr> <td>2</td> <td>(1)</td> <td>Freq</td> <td>2.48350 GHz</td> <td>-43.13 dBm</td> </tr> </tbody> </table> <p>Freq/Channel            Center Freq 2.45200000 GHz            Start Freq 2.40200000 GHz            Stop Freq 2.50200000 GHz            CF Step 10.0000000 MHz            Freq Offset 0.00000000 Hz            Signal Track On Off</p>	Marker	Trace	Type	X Axis	Amplitude	1	(1)	Freq	2.44700 GHz	0.66 dBm	2	(1)	Freq	2.48350 GHz	-43.13 dBm
Marker	Trace	Type	X Axis	Amplitude												
1	(1)	Freq	2.44700 GHz	0.66 dBm												
2	(1)	Freq	2.48350 GHz	-43.13 dBm												

## 10 Antenna Measurement

### 10.1.Limit

For intentional device, according to 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.

And According to 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

### 10.2.Antenna Description

See section 2 – antenna information.

### 10.3.Directiona Gain Calculated

$$\text{Directional Gain} = 10 \cdot \log \left[ \frac{(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2}{N_{\text{ANT}}} \right]$$

Operate Freq. Band	Directional Gain (dBi)
IEEE 802.11n 2.4GHz 20MHz	5.62
IEEE 802.11n 2.4GHz 40MHz	5.62