

FCC 47 CFR PART 15 SUBPART C RF Test Report

Applicant : Tecom Co Ltd
Applicant Address : 23, R&D Road 2 Science Based Ind Park, Hsin-Chu Taiwan
Product Type : G.hn PLC
Trade Name : TECOM, MOCET, N/A
Model Number : HD3010-US
Applicable Standard : FCC 47 CFR PART 15 SUBPART C: Oct., 2014
ANSI C63.10:2009
Receive Date : Feb. 25, 2015
Test Period : Mar. 10 ~ Apr. 26, 2015
Issue Date : May 04, 2015

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	May 04, 2015	Initial Issue	

Verification of Compliance

Issued Date: 05/04/2015

Applicant : Tecom Co Ltd
Address Applicant : 23, R&D Road 2 Science Based Ind Park, Hsin-Chu Taiwan
Product Type : G.hn PLC
Trade Name : TECOM, MOCET, N/A
Model Number : HD3010-US
FCC ID : D6XHD3010
EUT Rated Voltage : 100-240Vac, 50/60Hz, 0.1A
Test Voltage : 120 Vac / 60 Hz
Applicable Standard : FCC 47 CFR PART 15 SUBPART C: Oct., 2014
ANSI C63.10:2009
Test Result : Complied
Performing Lab. : A Test Lab Techno Corp.

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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	-----
-----	99 % Occupied Bandwidth	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	-----
15.247(d)	Band Edge Measurement	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 ~ 30MHz		± 2.02
Radiated Emission	30MHz ~ 1000MHz	Horizontal	± 3.98
		Vertical	± 3.62
	1000MHz ~ 18000MHz	Horizontal	± 3.11
		Vertical	± 3.07
	18000MHz ~ 40000MHz	Horizontal	± 3.66
		Vertical	± 3.54

2 EUT Description

Applicant	Tecom Co Ltd
Applicant Address	23, R&D Road 2 Science Based Ind Park, Hsin-Chu Taiwan
Manufacturer	Tecom Co Ltd
Manufacturer Address	23, R&D Road 2 Science Based Ind Park, Hsin-Chu Taiwan
Product Type	G.hn PLC
Trade Name	TECOM, MOCET, N/A
Model Number	HD3010-US
FCC ID	D6XHD3010
Operate Band	IEEE 802.11b / 802.11g / 802.11n 2.4GHz 20MHz & 40MHz
Frequency Range	IEEE 802.11b / 802.11g / 802.11n 2.4GHz 20MHz: 2412 ~ 2462 MHz IEEE 802.11n 2.4GHz 40MHz: 2422 ~ 2452 MHz
Modulation Type	IEEE 802.11b:DSSS IEEE 802.11g:DSSS + OFDM IEEE 802.11n 2.4GHz 20MHz: OFDM IEEE 802.11n 2.4GHz 40MHz: OFDM
Antenna Delivery	IEEE 802.11b/g: 1TX + 1RX IEEE 802.11n 2.4GHz 20MHz / 40MHz: 2TX + 2RX
Antenna Type	LTCC Chip Antenna
Antenna Gain	2 dBi
RF Output Power	IEEE 802.11b: 0.042 W / 16.28 dBm IEEE 802.11g: 0.262 W / 24.19 dBm IEEE 802.11n 2.4GHz 20MHz: 0.303 W / 24.82 dBm IEEE 802.11n 2.4GHz 40MHz: 0.271 W / 24.33 dBm

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	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	TX/RX Function	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	1, 6, 11	6
Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode	2TX / 2RX	1, 6, 11	13
Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode	2TX / 2RX	3, 6, 9	27

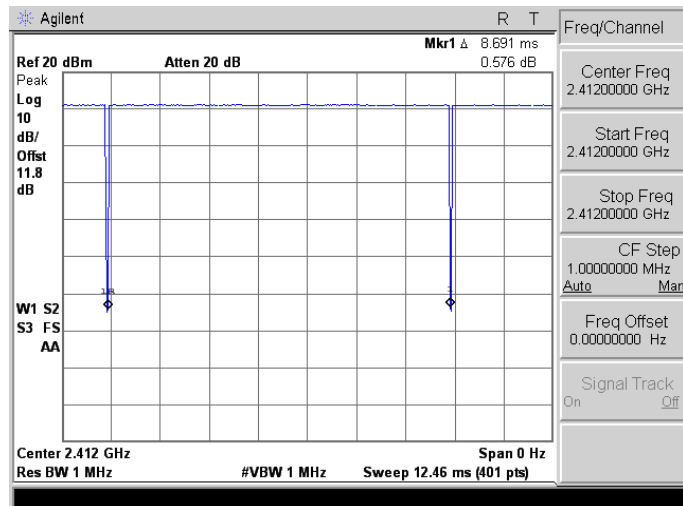
Duty cycle of test signal is >98%

Test Mode	Frequency (MHz)	on time (ms)	on+off time (ms)	Duty cycle (%)
Mode 2: IEEE 802.11b link mode	2412.0	8.691	8.722	99.645
Mode 3: IEEE 802.11g link mode	2412.0	8.650	8.700	99.425
Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode	2412.0	8.650	8.675	99.712
Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode	2422.0	8.675	8.700	99.713

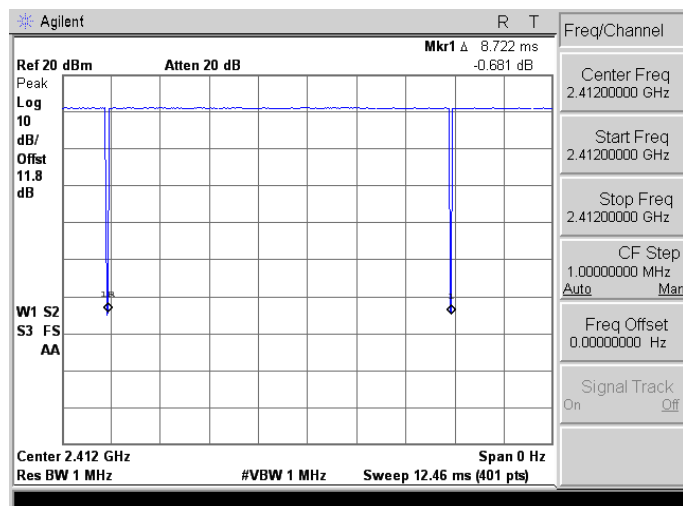
Duty Cycle Graphs

Mode 2: IEEE 802.11b link mode

On time

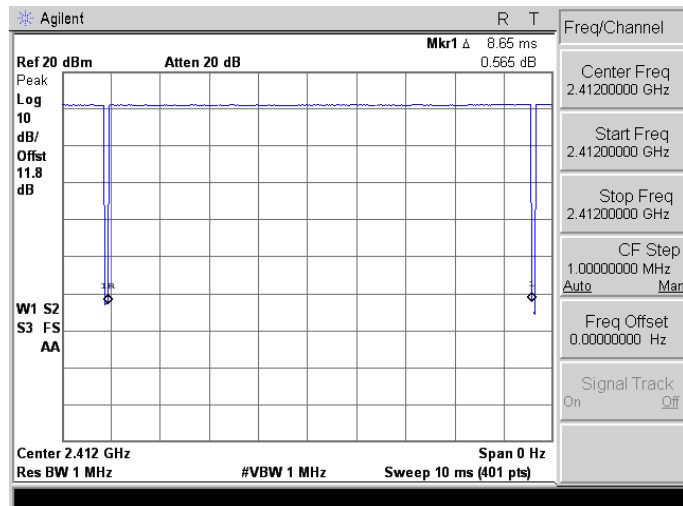


On+off time

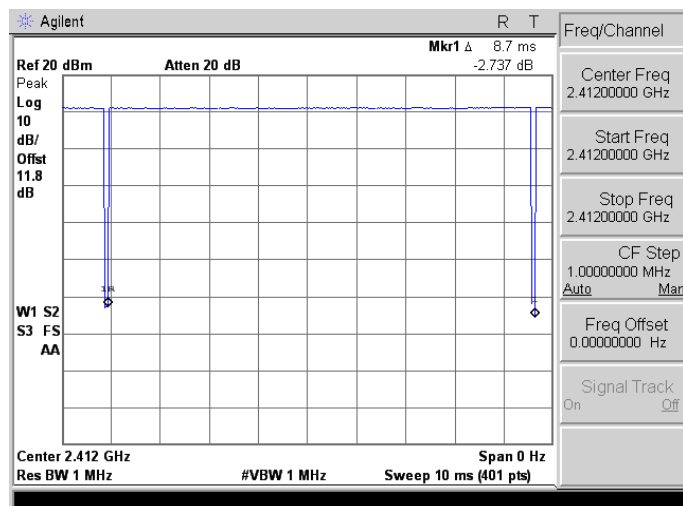


Mode 3: IEEE 802.11g Mode

On time

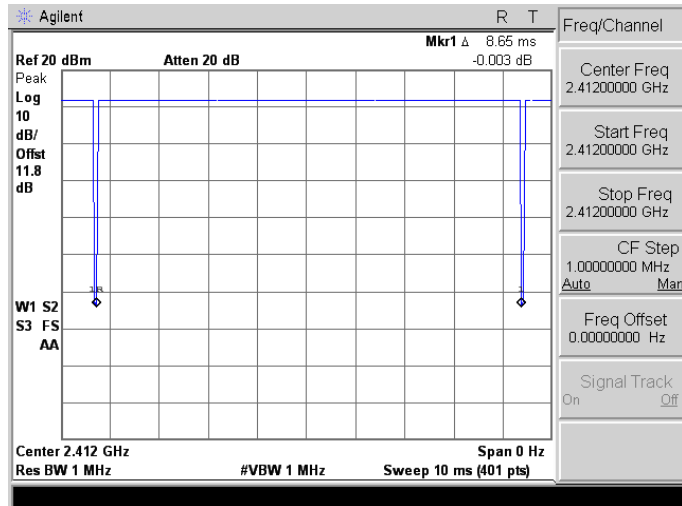


On+off time

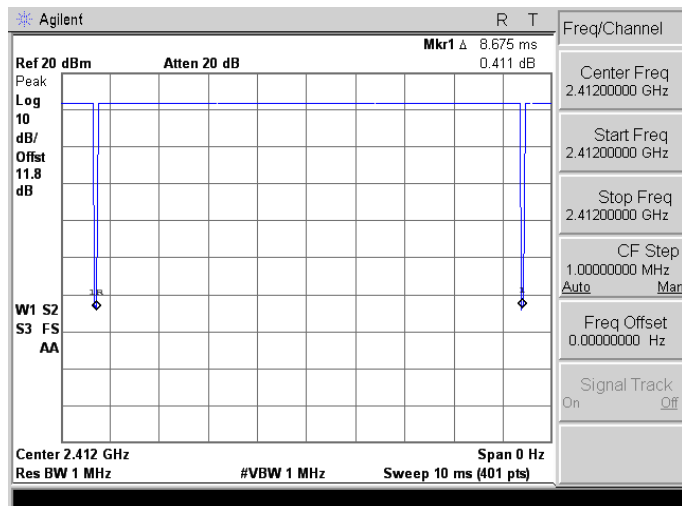


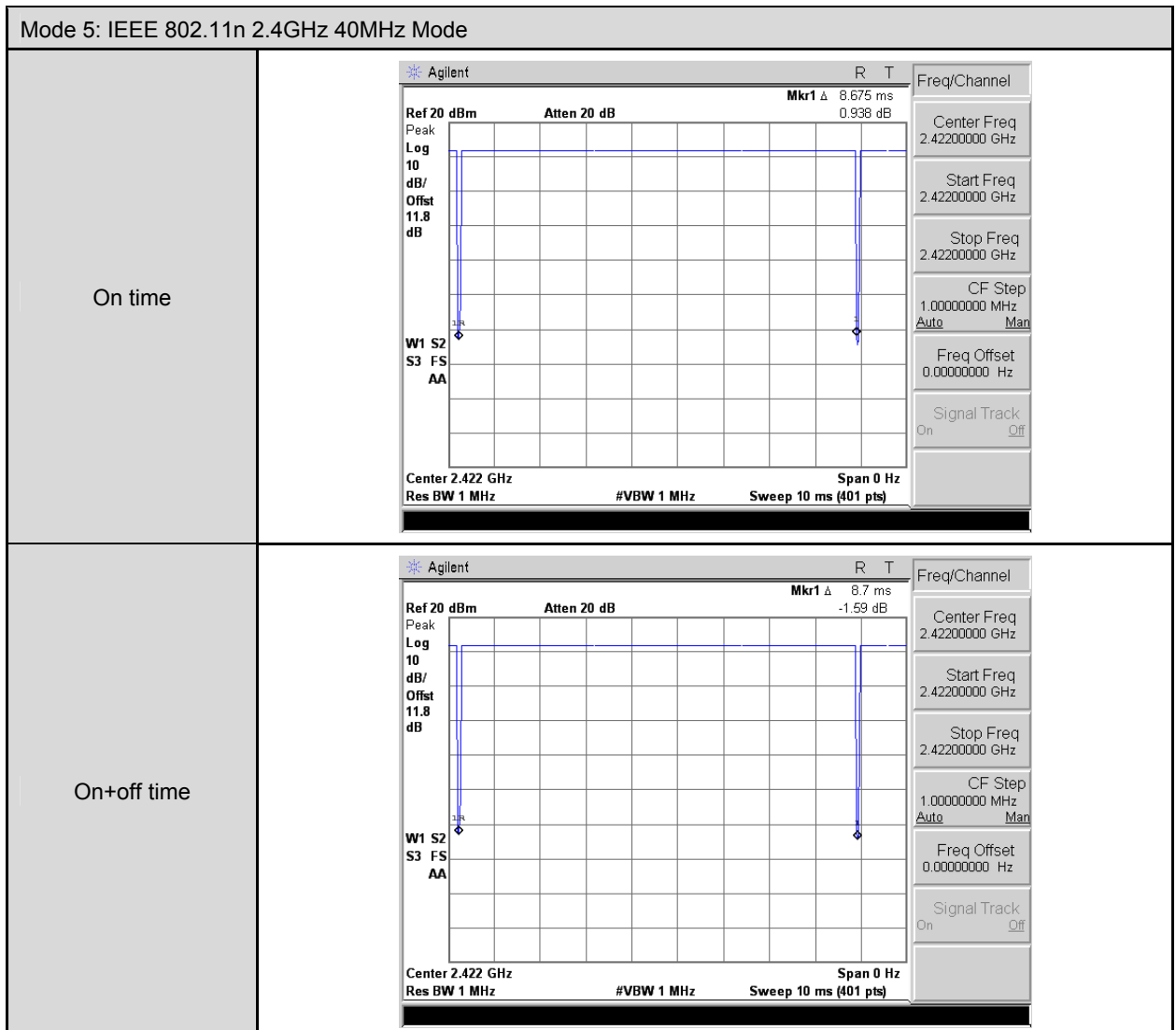
Mode 4: IEEE 802.11n 2.4GHz 20MHz Mode

On time



On+off time



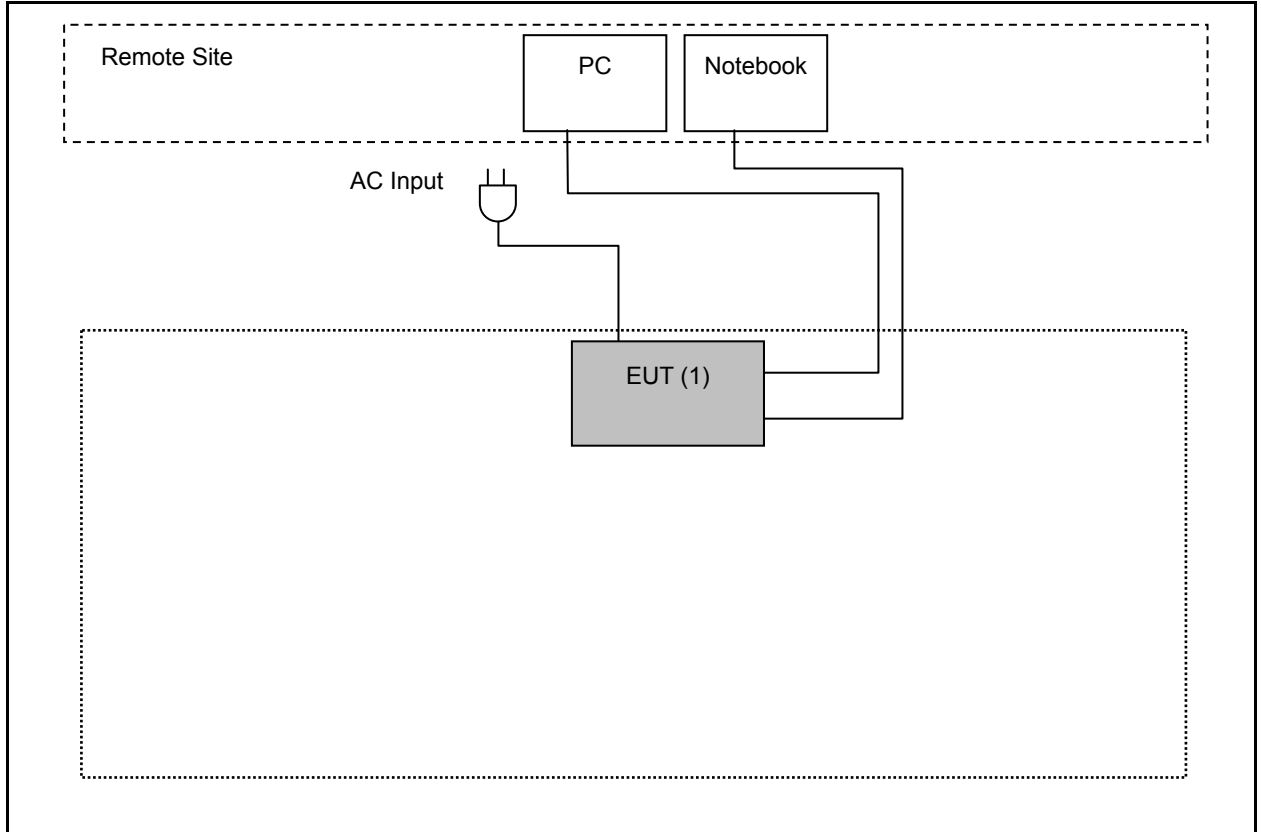


3.2. EUT Exercise Software

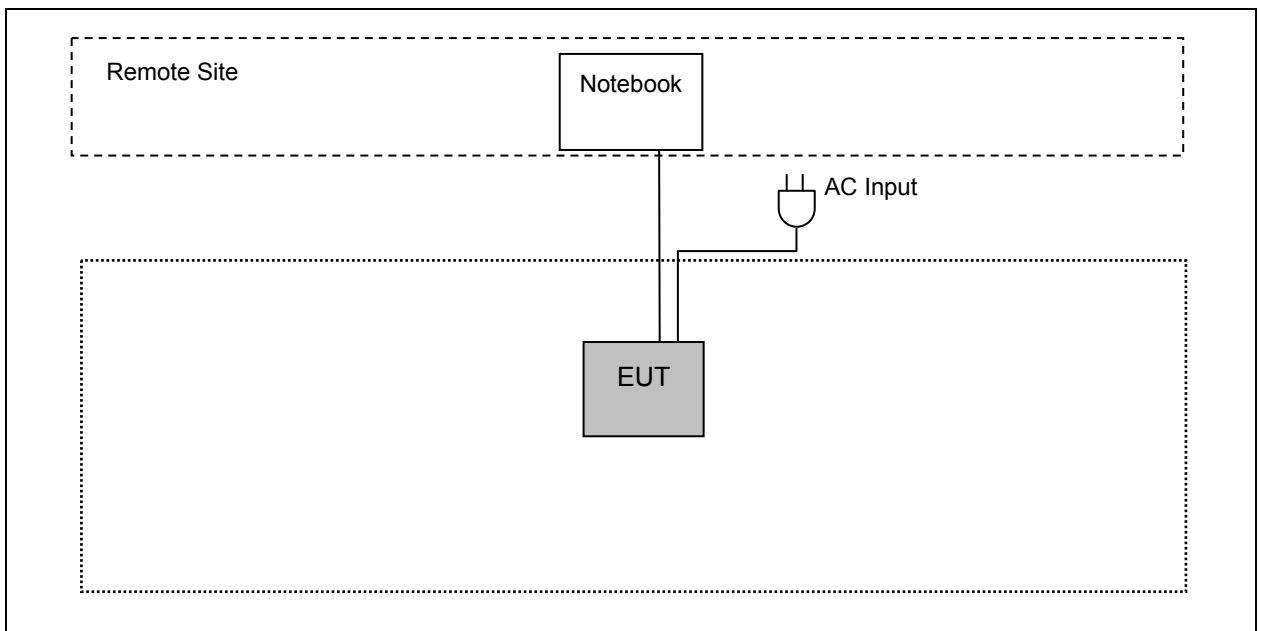
- | |
|--|
| 1. Setup the EUT shown on 3.3. |
| 2. Turn on the power of all equipment. |
| 3. Turn on Wi-Fi function. |
| 4. EUT run test program. |

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

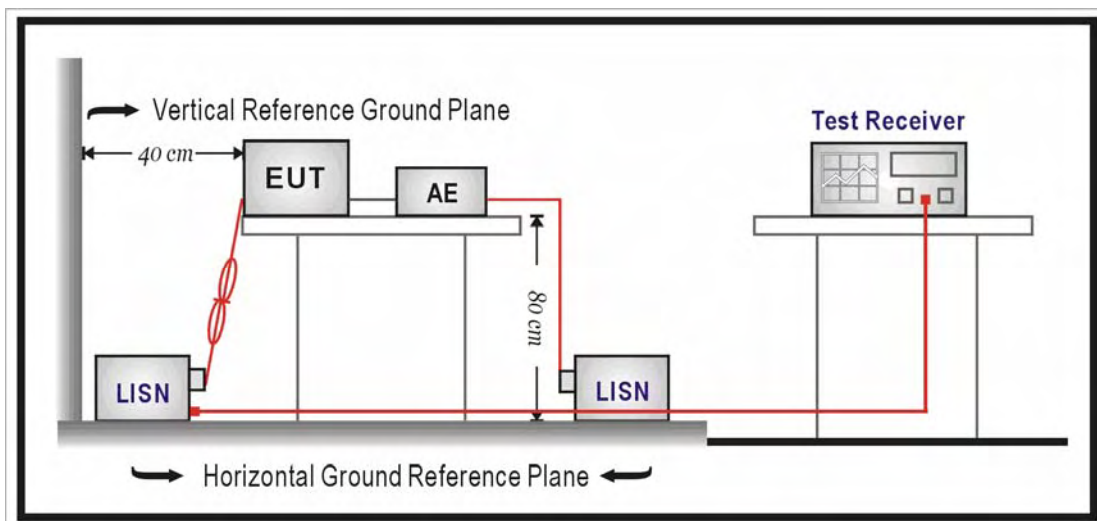
4.2. Test Instruments

Describe	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Test Receiver	R&S	ESCI	100367	06/12/2014	(1)
LISN	R&S	ENV216	101040	03/10/2015	(1)
LISN	R&S	ENV216	101041	03/06/2015	(1)
RF Cable	EMCI	RG 214/U	TE-02	06/30/2014	(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

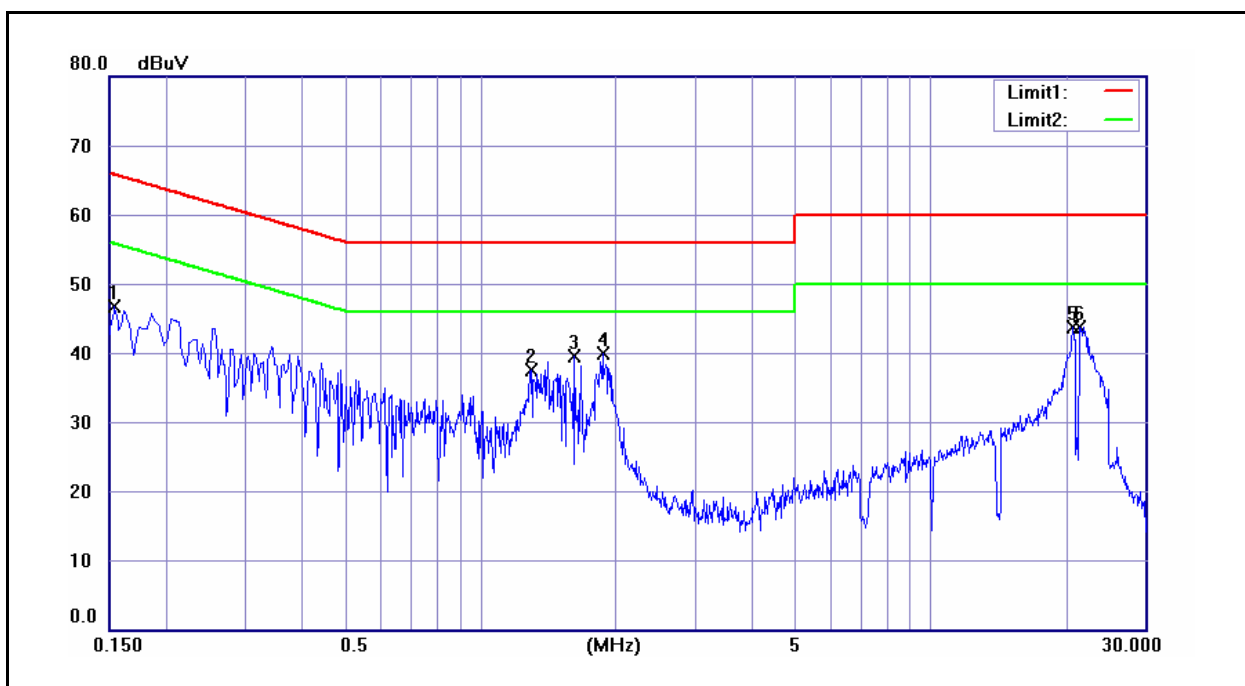
The power line conducted emission measurements were performed in a shielded enclosure. The EUT was assembled on a wooden table which is 80 centimeters high, was placed 40 centimeters from the back wall and at least 1 meter from the sidewall.

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:	HD3010-US	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Mode:	Mode 1	Date:	04/26/2015
		Test By:	Eric Ou Yang
Description:			



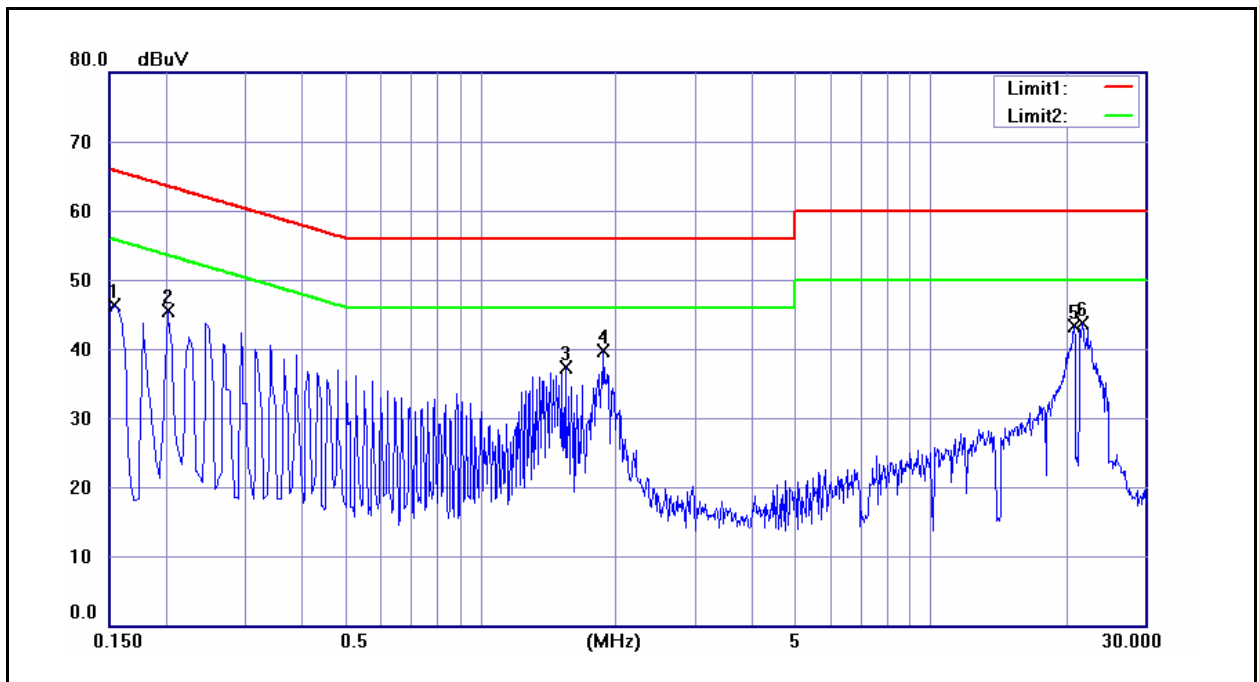
No.	Frequency (MHz)	QP reading (dBuV)	AVG reading (dBuV)	Correction factor (dB)	QP result (dBuV)	AVG result (dBuV)	QP limit (dBuV)	AVG limit (dBuV)	QP margin (dB)	AVG margin (dB)	Remark
1	0.1540	32.04	18.43	9.60	41.64	28.03	65.78	55.78	-24.14	-27.75	Pass
2	1.2980	20.93	10.04	9.66	30.59	19.70	56.00	46.00	-25.41	-26.30	Pass
3	1.6220	18.10	5.69	9.67	27.77	15.36	56.00	46.00	-28.23	-30.64	Pass
4	1.8740	27.11	15.50	9.68	36.79	25.18	56.00	46.00	-19.21	-20.82	Pass
5	20.7540	26.25	5.98	10.26	36.51	16.24	60.00	50.00	-23.49	-33.76	Pass
6	21.4940	25.86	7.81	10.25	36.11	18.06	60.00	50.00	-23.89	-31.94	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:	HD3010-US	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Mode:	Mode 1	Date:	04/26/2015
		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	0.1540	31.91	18.50	9.60	41.51	28.10	65.78	55.78	-24.27	-27.68	Pass
2	0.2020	29.35	16.17	9.60	38.95	25.77	63.53	53.53	-24.58	-27.76	Pass
3	1.5460	19.94	8.32	9.68	29.62	18.00	56.00	46.00	-26.38	-28.00	Pass
4	1.8820	26.11	15.04	9.70	35.81	24.74	56.00	46.00	-20.19	-21.26	Pass
5	20.8900	25.82	6.42	10.25	36.07	16.67	60.00	50.00	-23.93	-33.33	Pass
6	21.8260	27.08	7.99	10.27	37.35	18.26	60.00	50.00	-22.65	-31.74	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 ($\mu\text{V/m}$ 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.

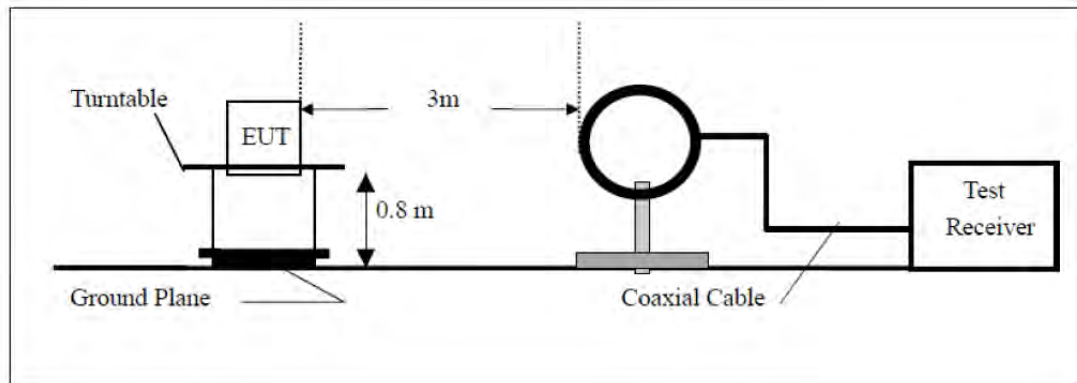
5.2. Test Instruments

3 Meter Chamber					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
RF Pre-selector	Agilent	N9039A	MY46520256	01/06/2015	(1)
Spectrum Analyzer	Agilent	E4446A	MY46180578	01/06/2015	(1)
Pre Amplifier	Agilent	8449B	3008A02237	02/24/2015	(1)
Pre Amplifier	Agilent	8447D	2944A10961	02/24/2015	(1)
Broadband Antenna (30MHz~1GHz)	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	9163-270	07/22/2014	(1)
Horn Antenna (1~18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	9120D-550	06/11/2014	(1)
Horn Antenna (18~40GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9170	9170-320	07/02/2014	(1)
Loop Antenna	COM-POWER CORPORATION	AL-130	121014	02/02/2015	(1)
Microwave Cable	EMCI	EMC-104-SM-S M-14000	140202	02/24/2015	(1)
Microwave Cable	EMCI	EMC104-SM-S M-600	140301	02/24/2015	(1)
Test Site	ATL	TE01	888001	08/28/2014	(1)

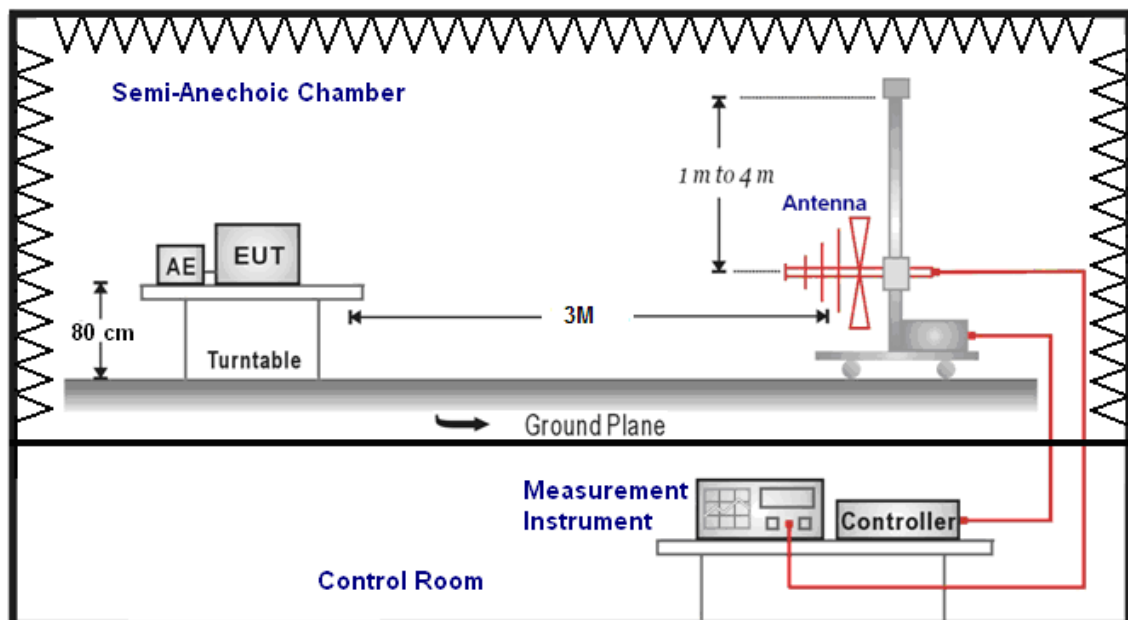
Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.

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

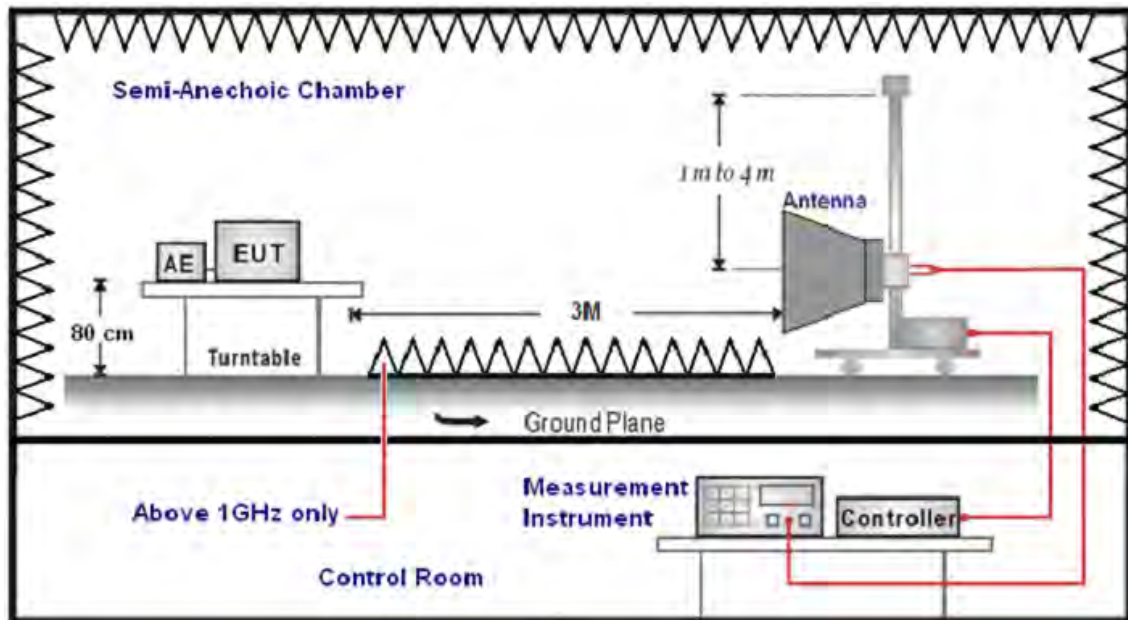
5.3. Setup



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 meters height, 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.

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 (model 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 1 meter. 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 per 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 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:		HD3010-US		Temp.(℃)/Hum.(%RH):		26(℃)/60%RH	
Mode:		Mode 1		Date:		03/20/2015	
				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
141.0000	26.99	-12.29	14.70	43.50	-28.80	QP	H
288.5000	26.70	-10.85	15.85	46.00	-30.15	QP	H
428.5000	28.06	-7.93	20.13	46.00	-25.87	QP	H
579.5000	27.63	-4.82	22.81	46.00	-23.19	QP	H
737.0000	28.27	-1.73	26.54	46.00	-19.46	QP	H
858.5000	27.25	0.56	27.81	46.00	-18.19	QP	H
151.0000	25.95	-12.07	13.88	43.50	-29.62	QP	V
269.0000	25.90	-11.75	14.15	46.00	-31.85	QP	V
491.5000	30.95	-6.72	24.23	46.00	-21.77	QP	V
600.0000	27.69	-4.25	23.44	46.00	-22.56	QP	V
782.0000	27.14	-0.83	26.31	46.00	-19.69	QP	V
873.0000	28.81	0.82	29.63	46.00	-16.37	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:		HD3010-US		Temp.(°C)/Hum.(%RH):		26(°C)/60%RH	
Mode:		Mode 2		Date:		03/20/2015	
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
3219.000	42.37	3.17	45.54	74.00	-28.46	peak	H
4824.000	47.32	6.47	53.79	74.00	-20.21	peak	H
4824.000	45.87	6.47	52.34	54.00	-1.66	AVG	H
6656.000	36.00	9.24	45.24	74.00	-28.76	peak	H
3219.000	42.14	3.17	45.31	74.00	-28.69	peak	V
4824.000	50.35	6.47	56.82	74.00	-17.18	peak	V
4824.000	47.24	6.47	53.71	54.00	-0.29	AVG	V
7237.000	37.00	9.58	46.58	74.00	-27.42	peak	V

Standard:		FCC Part 15C		Test Distance:		3m	
Test item:		Radiated Emission		Power:		AC 120V/60Hz	
Model Number:		HD3010-US		Temp.(°C)/Hum.(%RH):		26(°C)/60%RH	
Mode:		Mode 2		Date:		03/20/2015	
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
3247.000	40.97	3.21	44.18	74.00	-29.82	peak	H
4874.000	43.51	6.54	50.05	74.00	-23.95	peak	H
6817.000	36.04	9.39	45.43	74.00	-28.57	peak	H
3247.000	40.88	3.21	44.09	74.00	-29.91	peak	V
4874.000	48.72	6.54	55.26	74.00	-18.74	peak	V
4874.000	46.60	6.54	53.14	54.00	-0.86	AVG	V
6698.000	36.34	9.27	45.61	74.00	-28.39	peak	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	HD3010-US			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 2			Date:	03/20/2015		
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
3282.000	41.28	3.27	44.55	74.00	-29.45	peak	H
4924.000	43.82	6.61	50.43	74.00	-23.57	peak	H
6621.000	36.03	9.21	45.24	74.00	-28.76	peak	H
3128.000	39.67	3.03	42.70	74.00	-31.30	peak	V
4924.000	44.23	6.61	50.84	74.00	-23.16	peak	V
6530.000	35.99	9.12	45.11	74.00	-28.89	peak	V

Standard:		FCC Part 15C		Test Distance:		3m	
Test item:		Radiated Emission		Power:		AC 120V/60Hz	
Model Number:		HD3010-US		Temp.(℃)/Hum.(%RH):		26(℃)/60%RH	
Mode:		Mode 3		Date:		03/20/2015	
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
3219.000	39.84	3.17	43.01	74.00	-30.99	peak	H
4824.000	40.28	6.47	46.75	74.00	-27.25	peak	H
7236.000	38.24	9.58	47.82	74.00	-26.18	peak	H
3086.000	39.58	2.97	42.55	74.00	-31.45	peak	V
4824.000	45.48	6.47	51.95	74.00	-22.05	peak	V
7236.000	39.74	9.58	49.32	74.00	-24.68	peak	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	HD3010-US			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 3			Date:	03/21/2015		
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
3247.000	40.65	3.21	43.86	74.00	-30.14	peak	H
4874.000	41.00	6.54	47.54	74.00	-26.46	peak	H
6600.000	35.29	9.19	44.48	74.00	-29.52	peak	H
2960.000	39.51	2.77	42.28	74.00	-31.72	peak	V
4874.000	44.07	6.54	50.61	74.00	-23.39	peak	V
7311.000	40.94	9.59	50.53	74.00	-23.47	peak	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	HD3010-US			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 3			Date:	03/21/2015		
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
3079.000	39.44	2.96	42.40	74.00	-31.60	peak	H
4924.000	40.23	6.61	46.84	74.00	-27.16	peak	H
6614.000	34.95	9.21	44.16	74.00	-29.84	peak	H
3037.000	39.40	2.90	42.30	74.00	-31.70	peak	V
4924.000	41.66	6.61	48.27	74.00	-25.73	peak	V
6565.000	35.52	9.16	44.68	74.00	-29.32	peak	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	HD3010-US			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 4			Date:	03/21/2015		
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	38.99	3.03	42.02	74.00	-31.98	peak	H
4661.000	37.04	6.23	43.27	74.00	-30.73	peak	H
6201.000	35.06	8.75	43.81	74.00	-30.19	peak	H
2960.000	38.42	2.77	41.19	74.00	-32.81	peak	V
4824.000	43.86	6.47	50.33	74.00	-23.67	peak	V
7236.000	38.88	9.58	48.46	74.00	-25.54	peak	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	HD3010-US			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 4			Date:	03/21/2015		
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
3086.000	38.45	2.97	41.42	74.00	-32.58	peak	H
4605.000	36.72	6.16	42.88	74.00	-31.12	peak	H
7006.000	34.85	9.55	44.40	74.00	-29.60	peak	H
3114.000	39.25	3.01	42.26	74.00	-31.74	peak	V
4874.000	45.07	6.54	51.61	74.00	-22.39	peak	V
7311.000	40.27	9.59	49.86	74.00	-24.14	peak	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	HD3010-US			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 4			Date:	03/21/2015		
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	40.12	2.99	43.11	74.00	-30.89	peak	H
4924.000	39.15	6.61	45.76	74.00	-28.24	peak	H
7386.000	38.14	9.60	47.74	74.00	-26.26	peak	H
3107.000	39.15	3.00	42.15	74.00	-31.85	peak	V
4924.000	39.92	6.61	46.53	74.00	-27.47	peak	V
7386.000	41.56	9.60	51.16	74.00	-22.84	peak	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	HD3010-US			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 5			Date:	03/21/2015		
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
3226.000	40.03	3.18	43.21	74.00	-30.79	peak	H
4843.000	37.12	6.49	43.61	74.00	-30.39	peak	H
7384.000	35.67	9.60	45.27	74.00	-28.73	peak	H
3086.000	39.42	2.97	42.39	74.00	-31.61	peak	V
4654.000	37.04	6.23	43.27	74.00	-30.73	peak	V
7139.000	34.71	9.56	44.27	74.00	-29.73	peak	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	HD3010-US			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 5			Date:	03/21/2015		
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
3100.000	39.53	2.99	42.52	74.00	-31.48	peak	H
4647.000	37.14	6.22	43.36	74.00	-30.64	peak	H
7531.000	34.92	9.64	44.56	74.00	-29.44	peak	H
3170.000	38.77	3.09	41.86	74.00	-32.14	peak	V
4528.000	36.68	6.05	42.73	74.00	-31.27	peak	V
7419.000	36.04	9.61	45.65	74.00	-28.35	peak	V

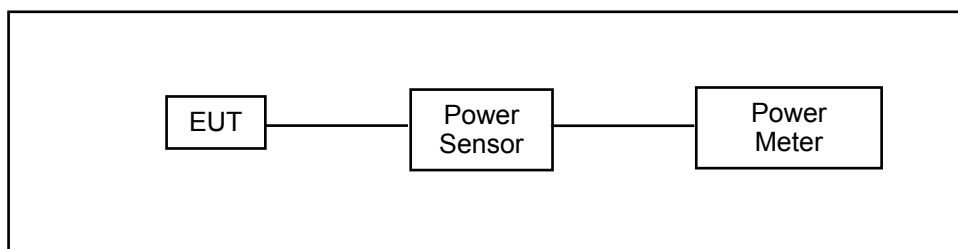
Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	HD3010-US			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 5			Date:	03/21/2015		
Frequency:	2452MHz			Test By:	Eric Ou Yang		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
3086.000	40.04	2.97	43.01	74.00	-30.99	peak	H
4563.000	37.31	6.10	43.41	74.00	-30.59	peak	H
7349.000	35.78	9.60	45.38	74.00	-28.62	peak	H
3009.000	39.16	2.85	42.01	74.00	-31.99	peak	V
4647.000	37.24	6.22	43.46	74.00	-30.54	peak	V
7510.000	35.12	9.63	44.75	74.00	-29.25	peak	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	Remark
Power Sensor	Anritsu	MA2411B	1126022	08/21/2014	(1)
Power Meter	Anritsu	ML2495A	1135009	08/21/2014	(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	HD3010-US					
Test Item	Maximum Conducted Output Power					
Test Mode	Mode 2: IEEE 802.11b link mode					
Date of Test	03/20/2015				Test Site	TE05
Frequency (MHz)	Data Rate	Peak Output Power				Limit (dBm)
		ANT-0		ANT-1		
		(dBm)	(W)	(dBm)	(W)	
2412	1M	16.18	0.041	15.85	0.038	< 30
2437		16.20	0.042	15.87	0.039	< 30
2462		16.28	0.042	15.95	0.039	< 30
2437	2M	16.03	0.040	15.70	0.037	< 30
2437	5.5M	15.96	0.039	15.63	0.037	< 30
2437	11M	15.81	0.038	15.48	0.035	< 30

Model Number	HD3010-US					
Test Item	Maximum Conducted Output Power					
Test Mode	Mode 3: IEEE 802.11g link mode					
Date of Test	03/20/2015				Test Site	TE05
Frequency (MHz)	Data Rate	Peak Output Power				Limit (dBm)
		ANT-0		ANT-1		
		(dBm)	(W)	(dBm)	(W)	
2412	6M	24.19	0.262	23.86	0.243	< 30
2437		23.84	0.242	23.51	0.224	< 30
2462		23.77	0.238	23.44	0.221	< 30
2437	9M	23.66	0.232	23.33	0.215	< 30
2437	12M	23.64	0.231	23.31	0.214	< 30
2437	18M	23.59	0.229	23.26	0.212	< 30
2437	24M	23.61	0.230	23.28	0.213	< 30
2437	36M	23.62	0.230	23.29	0.213	< 30
2437	48M	23.58	0.228	23.25	0.211	< 30
2437	54M	23.56	0.227	23.23	0.210	< 30

Model Number	HD3010-US							
Test Item	Maximum Conducted Output Power							
Test Mode	Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode							
Date of Test	03/20/2015					Test Site		TE05
Frequency (MHz)	Data Rate	Peak Output Power						Limit (dBm)
		ANT-0		ANT-1		ANT-0+1		
		(dBm)	(W)	(dBm)	(W)	(dBm)	(W)	
2412	13M	21.03	0.127	22.47	0.177	24.82	0.303	< 30
2437		20.87	0.122	21.21	0.132	24.05	0.254	< 30
2462		20.74	0.119	21.02	0.126	23.89	0.245	< 30
2437	26M	20.72	0.118	21.06	0.128	23.90	0.246	< 30
2437	39M	20.70	0.117	21.04	0.127	23.88	0.245	< 30
2437	52M	20.67	0.117	21.01	0.126	23.85	0.243	< 30
2437	78M	20.65	0.116	20.99	0.126	23.83	0.242	< 30
2437	104M	20.58	0.114	20.92	0.124	23.76	0.238	< 30
2437	117M	20.55	0.114	20.89	0.123	23.73	0.236	< 30
2437	130M	20.61	0.115	20.95	0.124	23.79	0.240	< 30

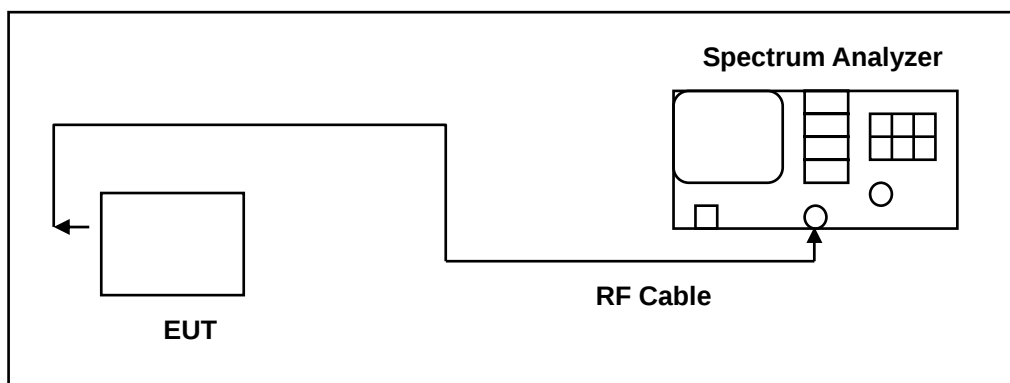
Model Number	HD3010-US							
Test Item	Maximum Conducted Output Power							
Test Mode	Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode							
Date of Test	03/20/2015					Test Site		TE05
Frequency (MHz)	Data Rate	Peak Output Power						Limit (dBm)
		ANT-0		ANT-1		ANT-0+1		
		(dBm)	(W)	(dBm)	(W)	(dBm)	(W)	
2422	27M	20.94	0.124	21.66	0.147	24.33	0.271	< 30
2437		20.49	0.112	21.48	0.141	24.02	0.253	< 30
2452		20.34	0.108	21.22	0.132	23.81	0.241	< 30
2437	54M	20.31	0.107	21.30	0.135	23.84	0.242	< 30
2437	81M	20.35	0.108	21.34	0.136	23.88	0.245	< 30
2437	108M	20.25	0.106	21.24	0.133	23.78	0.239	< 30
2437	162M	20.19	0.104	21.18	0.131	23.72	0.236	< 30
2437	216M	20.27	0.106	21.26	0.134	23.80	0.240	< 30
2437	243M	20.28	0.107	21.27	0.134	23.81	0.241	< 30
2437	270M	20.24	0.106	21.23	0.133	23.77	0.238	< 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	12/16/2014	(1)
Test Site	ATL	TE05	TE05	N.C.R.	-----

dRemark: (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 RES BW 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.

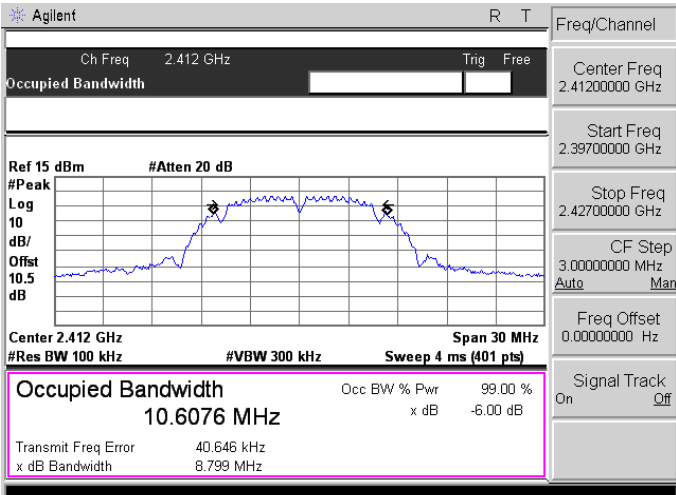
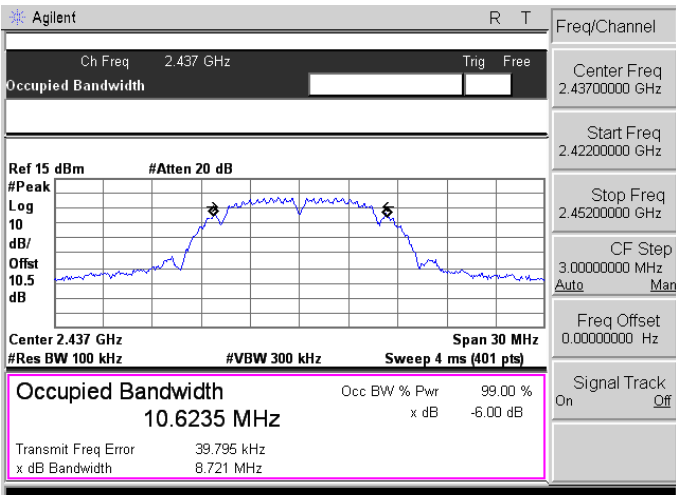
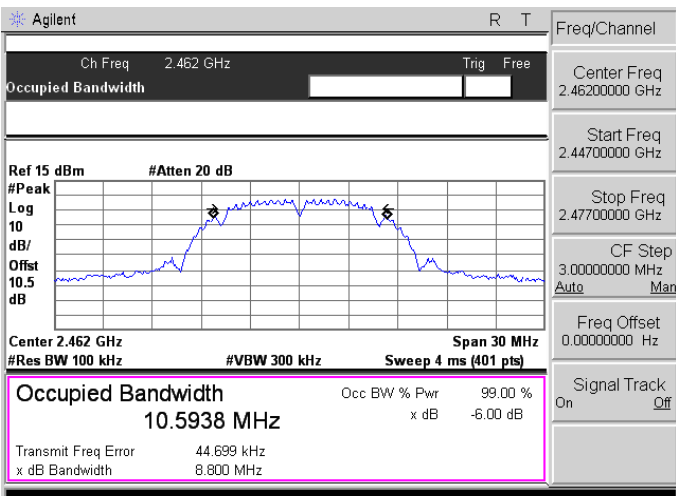
The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.

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

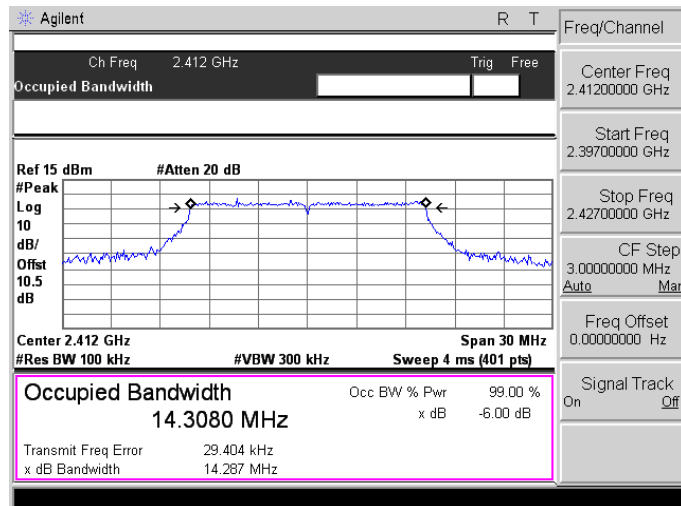
Model Number	HD3010-US			
Test Item	6dB RF Bandwidth			
Test Mode	Mode 2: IEEE 802.11b link mode Mode 3: IEEE 802.11g link mode Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode			
Date of Test	03/23/2015		Test Site	TE05
Test Mode	Frequency (MHz)	Measurement (MHz)		Limit (MHz)
Mode 2	2412	8.799		> 0.500
	2437	8.721		> 0.500
	2462	8.800		> 0.500
Mode 3	2412	14.287		> 0.500
	2437	14.275		> 0.500
	2462	14.206		> 0.500
Test Mode	Frequency (MHz)	Measurement (MHz)		Limit (MHz)
		ANT-0	ANT-1	
Mode 4	2412	15.010	14.899	> 0.500
	2437	15.068	15.236	> 0.500
	2462	15.118	14.831	> 0.500
Mode 5	2422	31.407	31.486	> 0.500
	2437	31.287	31.431	> 0.500
	2452	31.406	31.449	> 0.500

7.6. Test Graphs

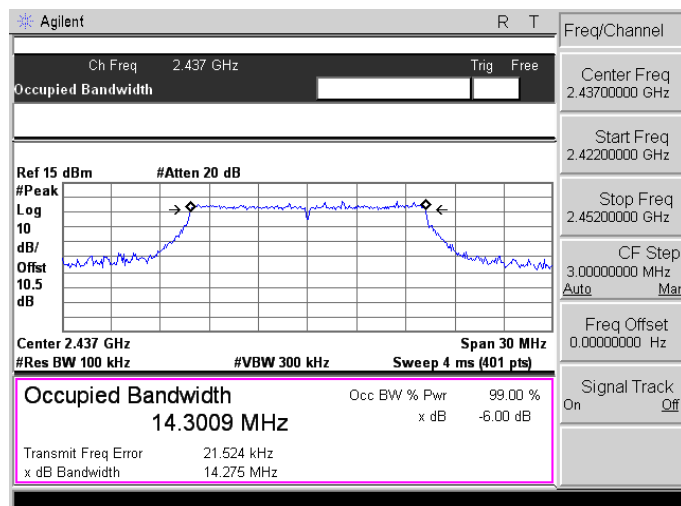
Mode 2: IEEE 802.11b link mode_ANT-0	
2412	 Agilent R T Ch Freq 2.412 GHz Trig Free Occupied Bandwidth Ref 15 dBm #Atten 20 dB #Peak Log 10 dB/Offset 10.5 dB Center 2.412 GHz Span 30 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts) Occupied Bandwidth 10.6076 MHz Occ BW % Pwr 99.00 % x dB -6.00 dB Transmit Freq Error 40.646 kHz x dB Bandwidth 8.799 MHz Freq/Channel Center Freq 2.41200000 GHz Start Freq 2.39700000 GHz Stop Freq 2.42700000 GHz CF Step 3.00000000 MHz Auto Man Freq Offset 0.00000000 Hz Signal Track On Off
2437	 Agilent R T Ch Freq 2.437 GHz Trig Free Occupied Bandwidth Ref 15 dBm #Atten 20 dB #Peak Log 10 dB/Offset 10.5 dB Center 2.437 GHz Span 30 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts) Occupied Bandwidth 10.6235 MHz Occ BW % Pwr 99.00 % x dB -6.00 dB Transmit Freq Error 39.795 kHz x dB Bandwidth 8.721 MHz Freq/Channel Center Freq 2.43700000 GHz Start Freq 2.42200000 GHz Stop Freq 2.45200000 GHz CF Step 3.00000000 MHz Auto Man Freq Offset 0.00000000 Hz Signal Track On Off
2462	 Agilent R T Ch Freq 2.462 GHz Trig Free Occupied Bandwidth Ref 15 dBm #Atten 20 dB #Peak Log 10 dB/Offset 10.5 dB Center 2.462 GHz Span 30 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts) Occupied Bandwidth 10.5938 MHz Occ BW % Pwr 99.00 % x dB -6.00 dB Transmit Freq Error 44.699 kHz x dB Bandwidth 8.800 MHz Freq/Channel Center Freq 2.46200000 GHz Start Freq 2.44700000 GHz Stop Freq 2.47700000 GHz CF Step 3.00000000 MHz Auto Man Freq Offset 0.00000000 Hz Signal Track On Off

Mode 3: IEEE 802.11g link mode_ANT-0

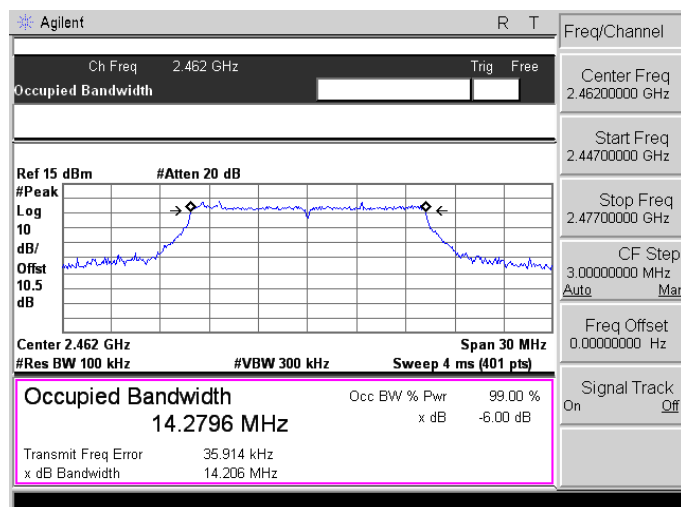
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2437

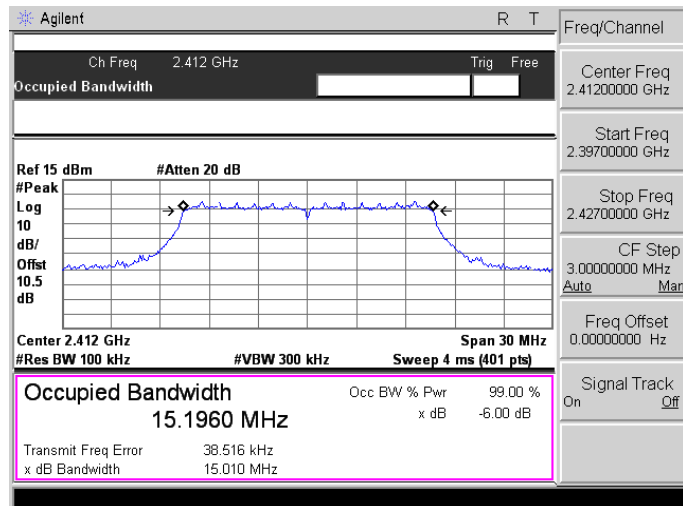


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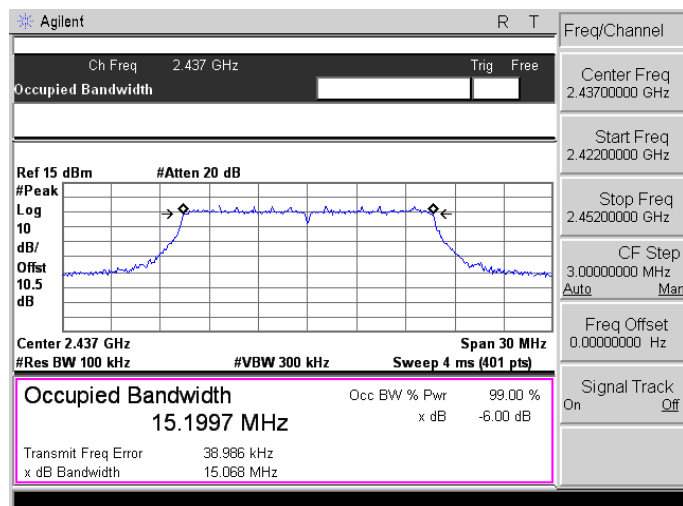


Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode_ANT-0

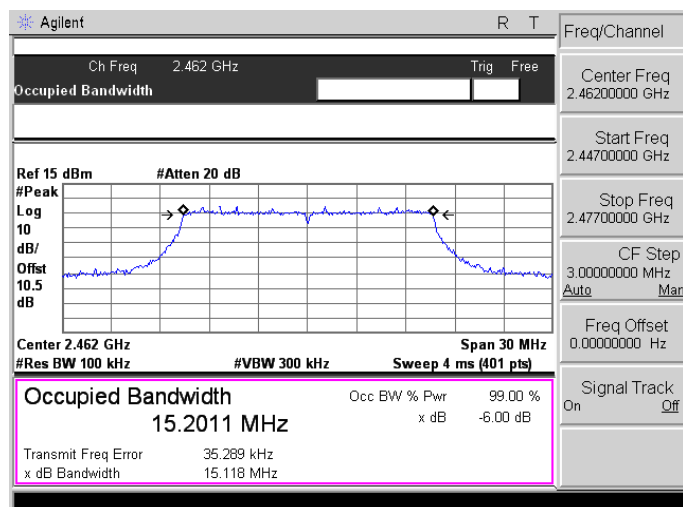
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2437

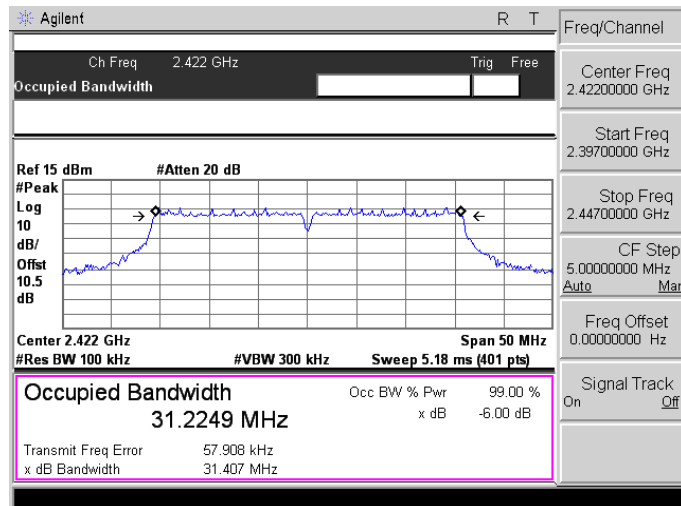


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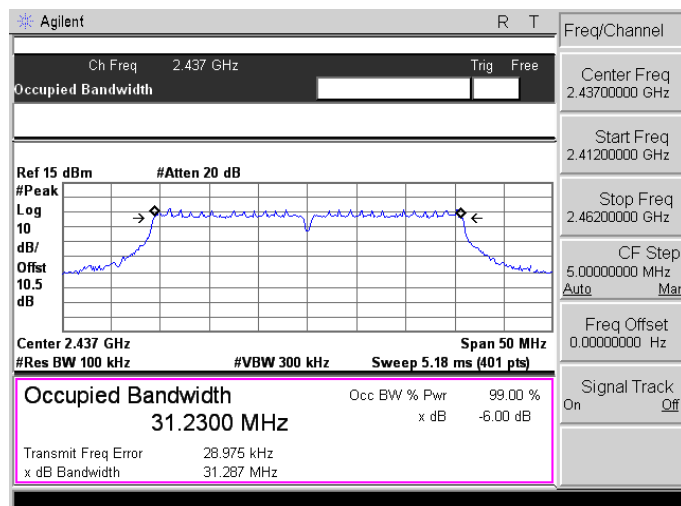


Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode_ANT-0

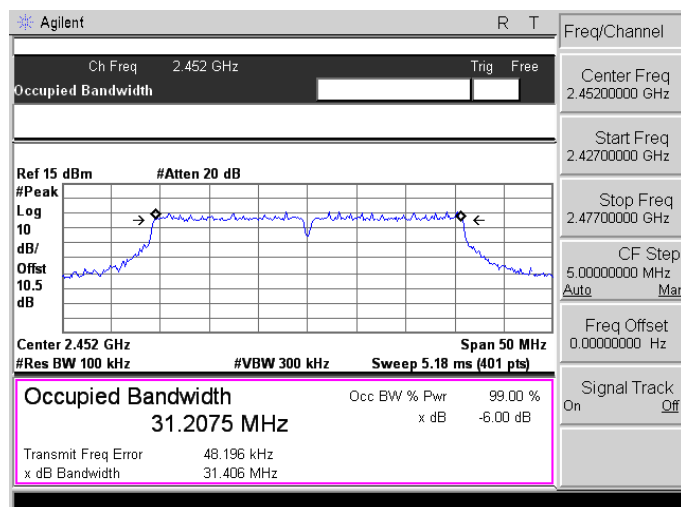
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2437

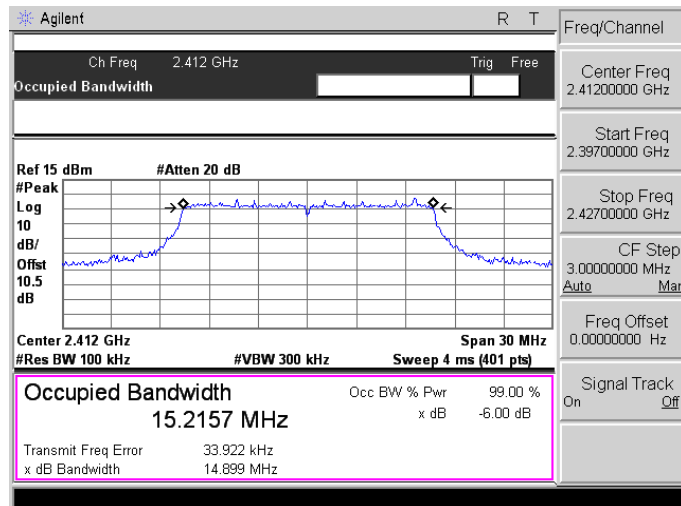


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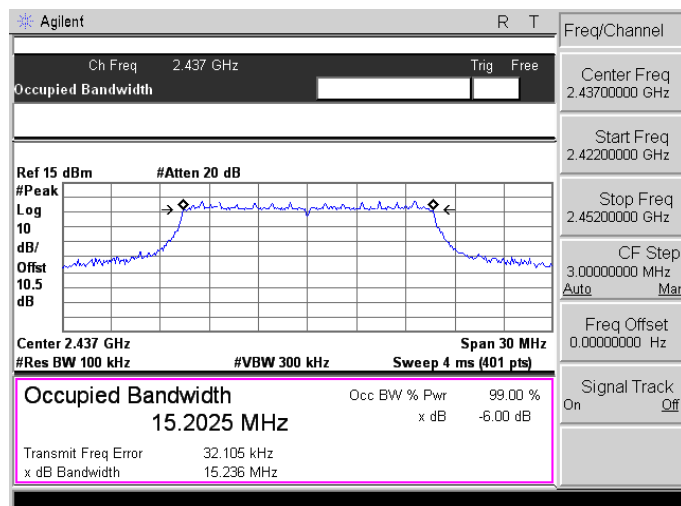


Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode_ANT-1

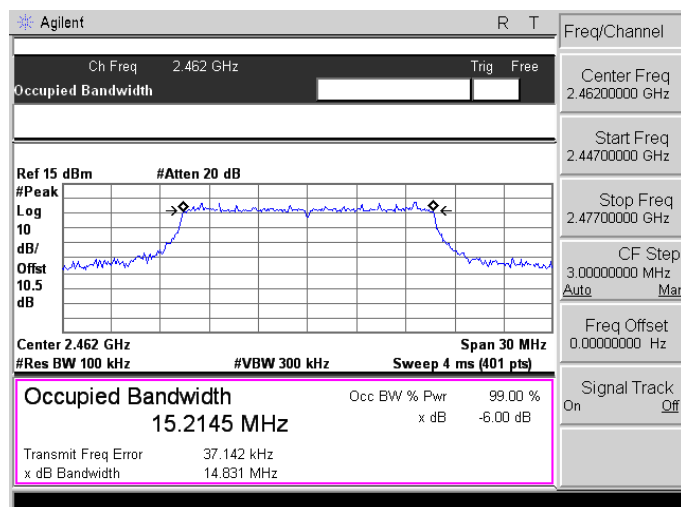
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2437

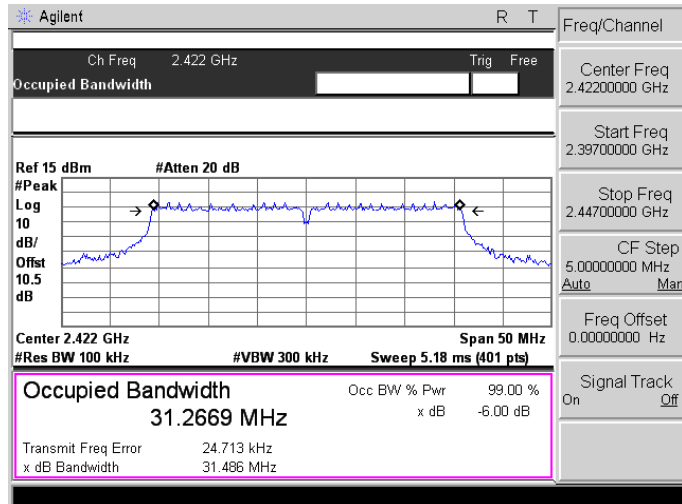


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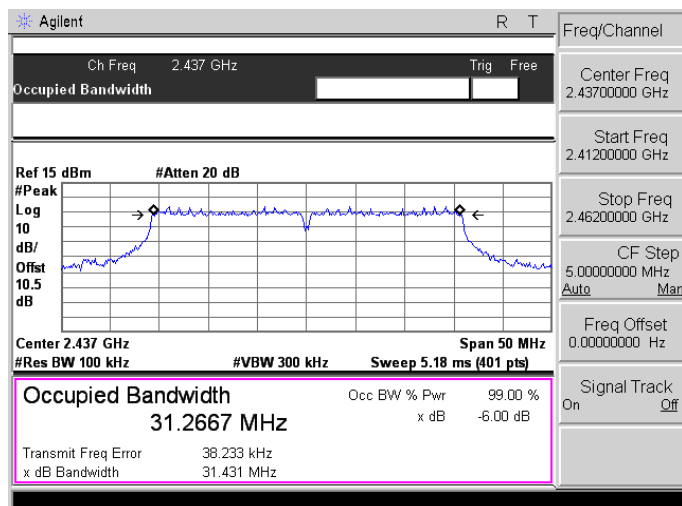


Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode_ANT-1

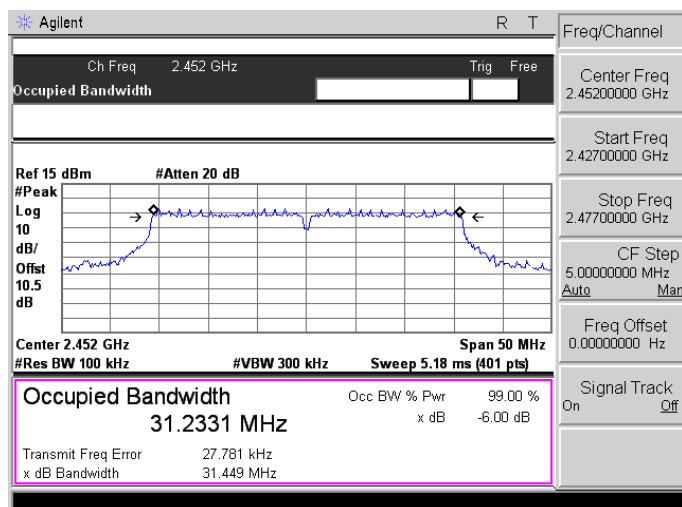
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2437



2452

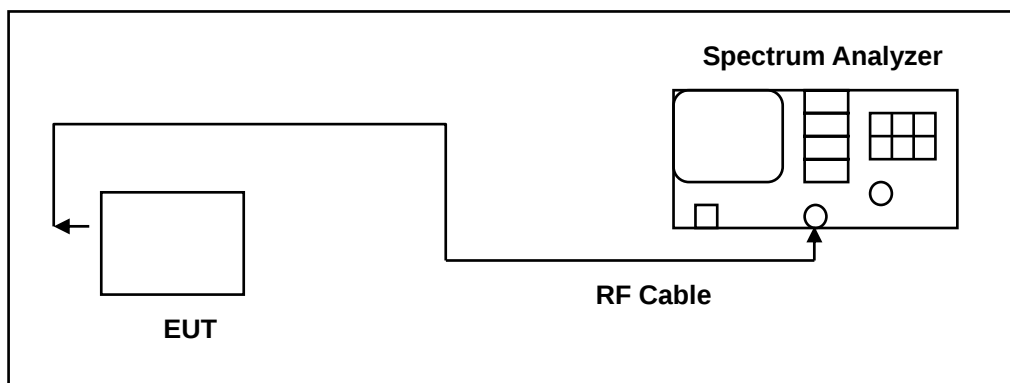


8 Maximum Power Density Measurement

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	12/16/2014	(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.

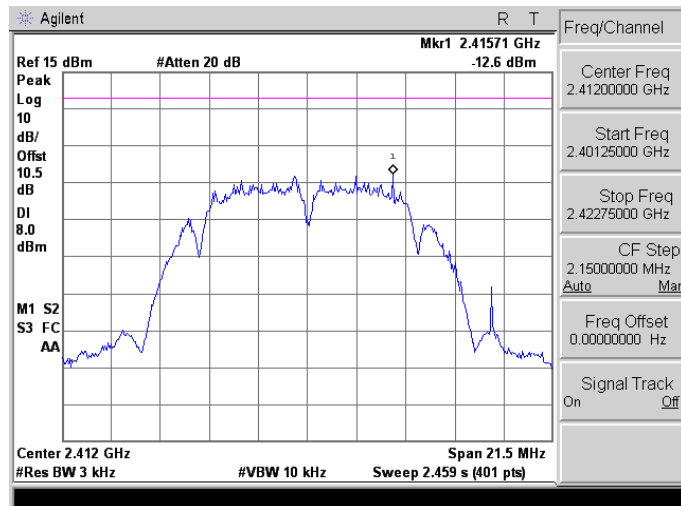
8.5. Test Result

Model Number	HD3010-US				
Test Item	Maximum Power Density				
Test 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				
Date of Test	03/20/2015			Test Site	TE05
Test Mode	Frequency (MHz)	Measurement (dBm/3KHz)			Limit (dBm/3KHz)
Mode 2	2412	-12.60			< 8
	2437	-13.75			< 8
	2462	-11.21			< 8
Mode 3	2412	-12.87			< 8
	2437	-12.84			< 8
	2462	-13.08			< 8
Test Mode	Frequency (MHz)	Measurement (dBm/3KHz)			Limit (dBm/3KHz)
		ANT-0	ANT-1	ANT-0+1	
Mode 4	2412	-14.54	-12.76	-10.55	< 8
	2437	-15.36	-12.23	-10.51	< 8
	2462	-15.25	-12.62	-10.73	< 8
Mode 5	2422	-19.02	-16.45	-14.54	< 8
	2437	-18.77	-16.26	-14.33	< 8
	2452	-18.75	-15.98	-14.14	< 8

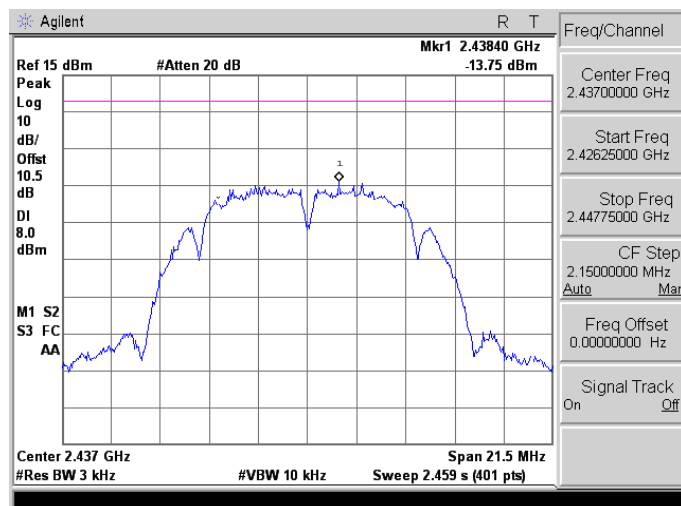
8.6. Test Graphs

Mode 2: IEEE 802.11b link mode_ANT-0

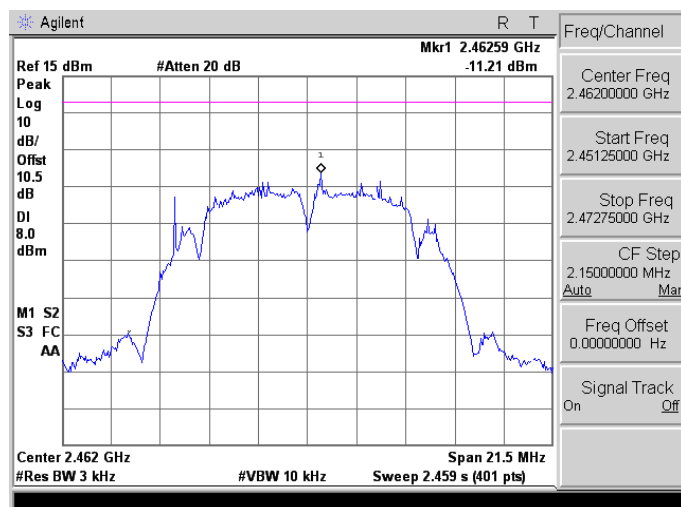
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2437

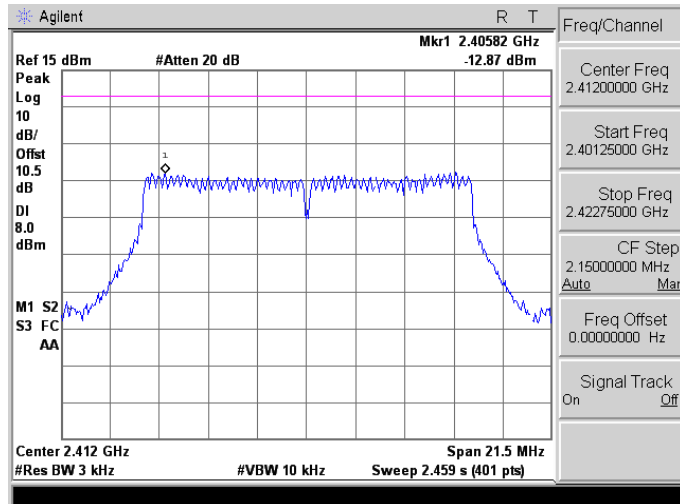


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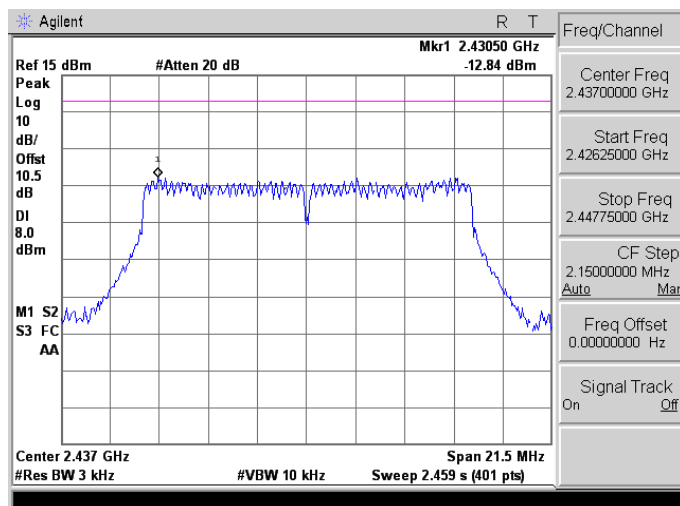


Mode 3: IEEE 802.11g link mode_ANT-0

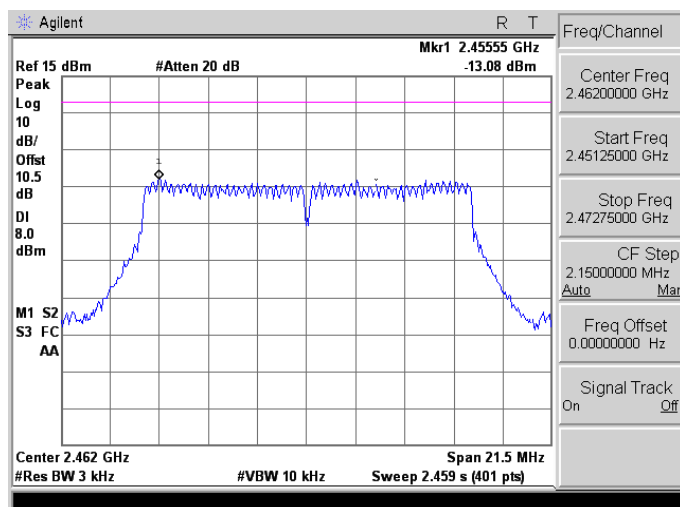
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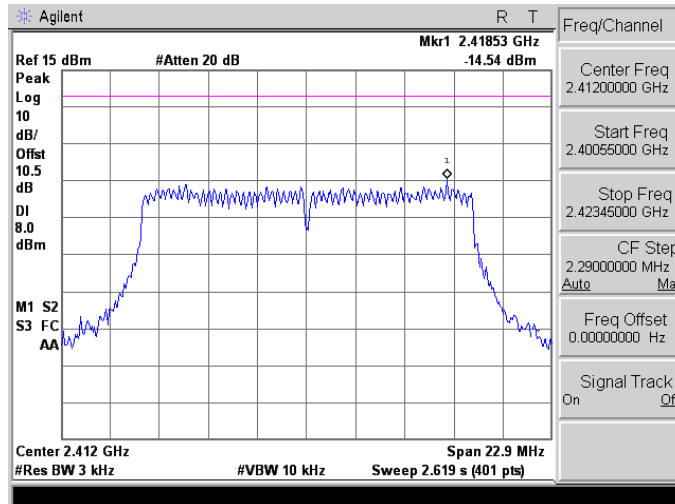


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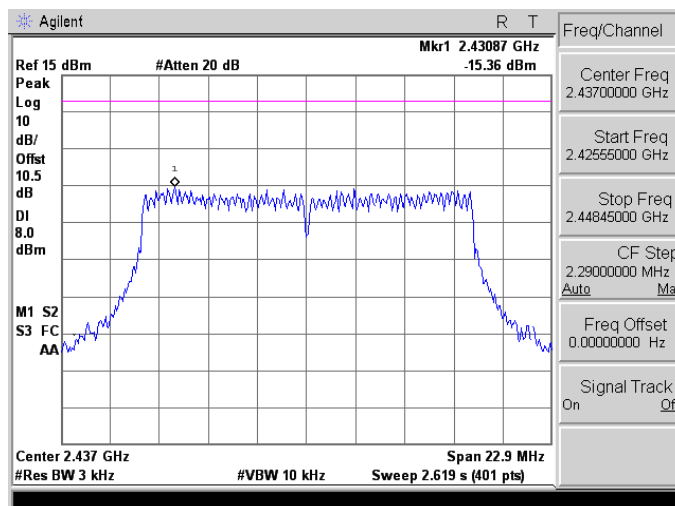


Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode_ANT-0

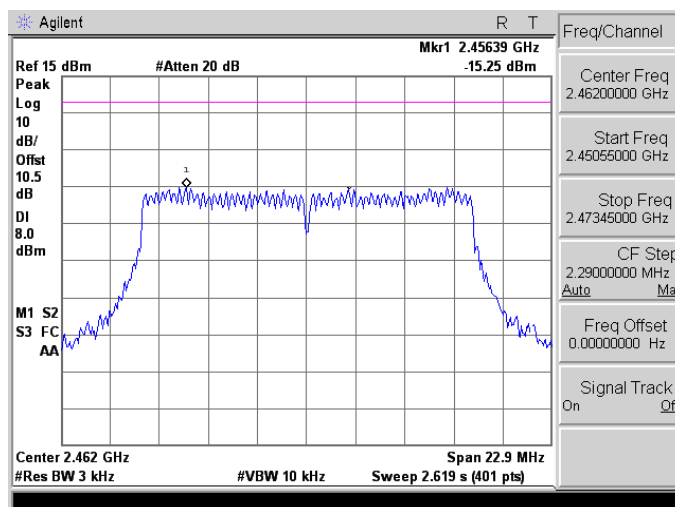
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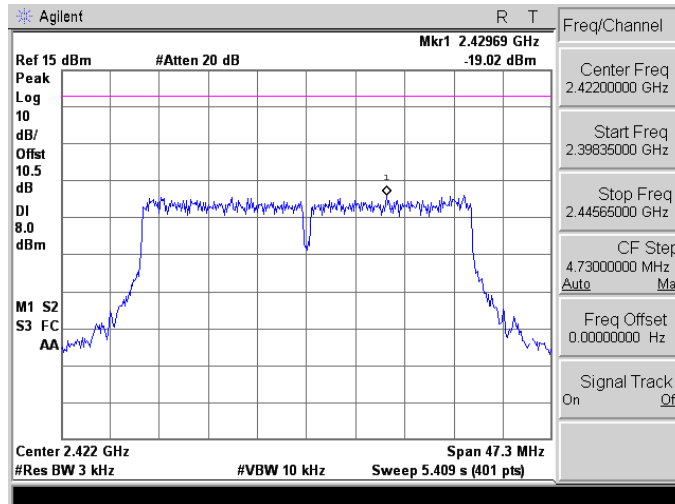


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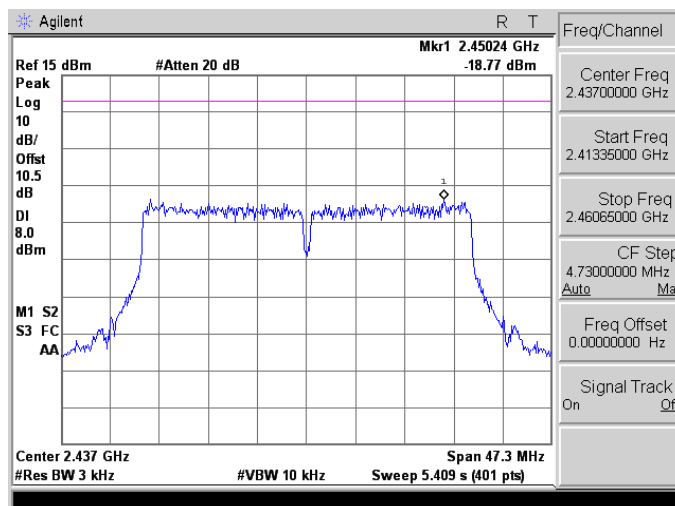


Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode_ANT-0

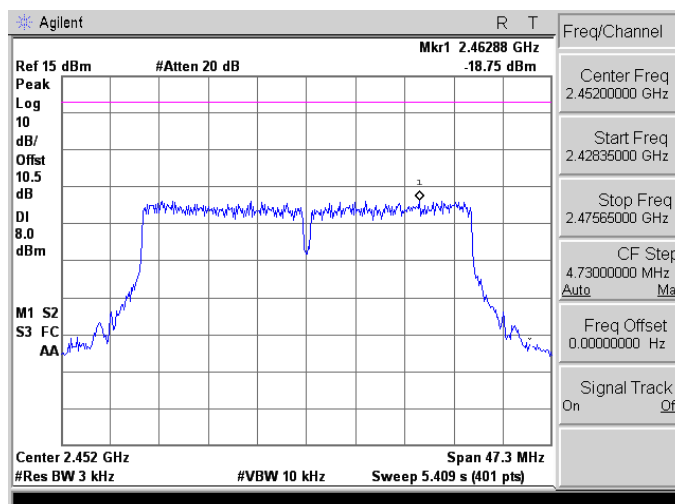
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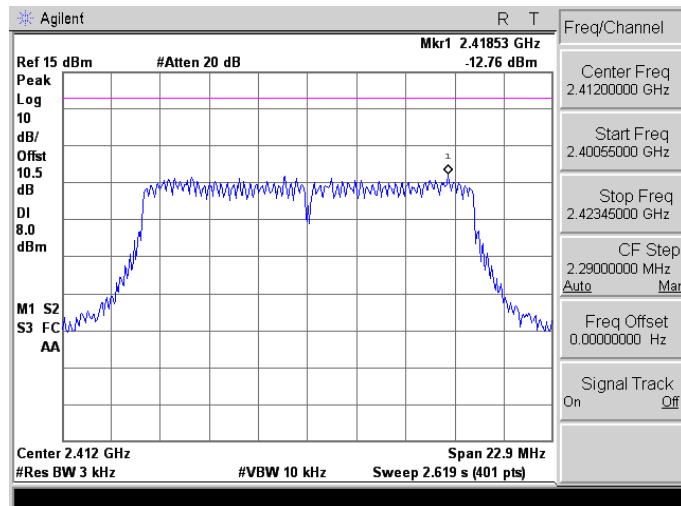


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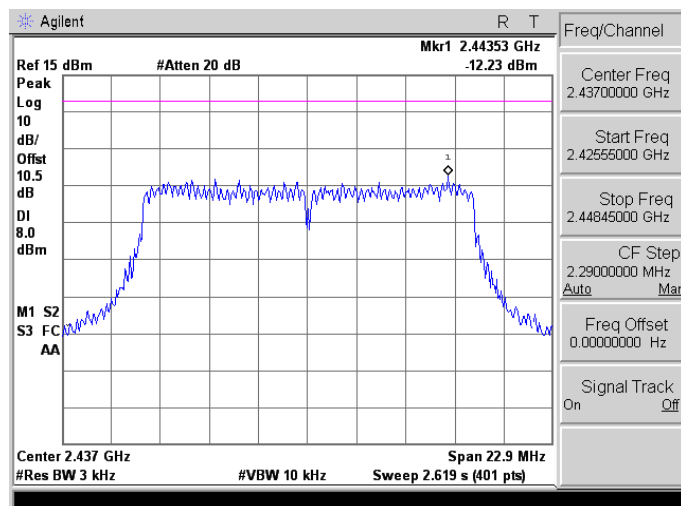


Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode_ANT-1

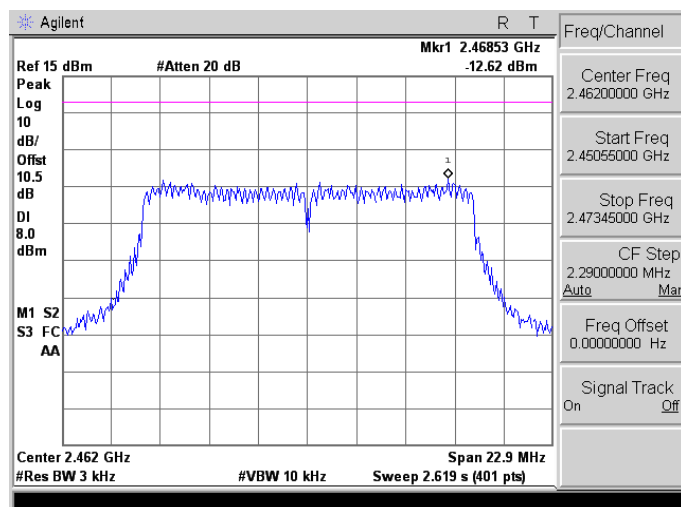
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2437

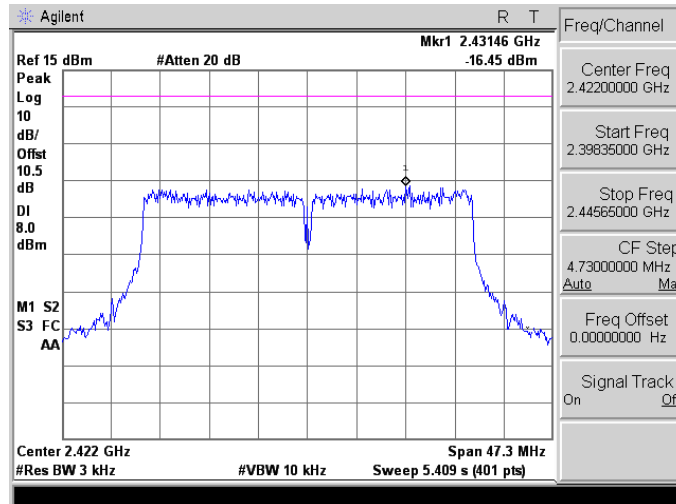


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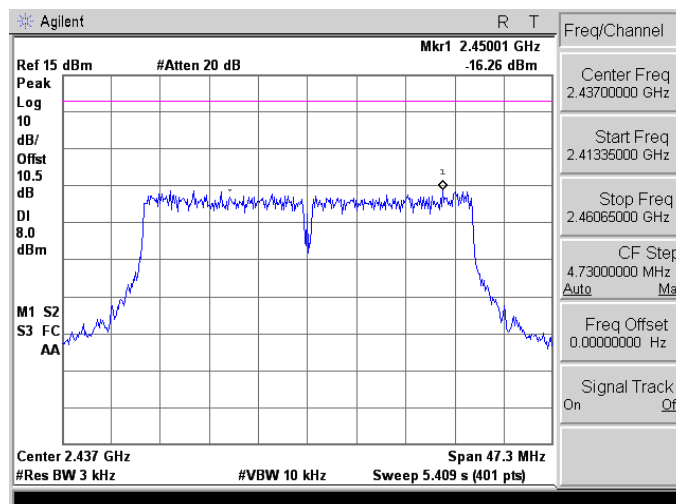


Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode_ANT-1

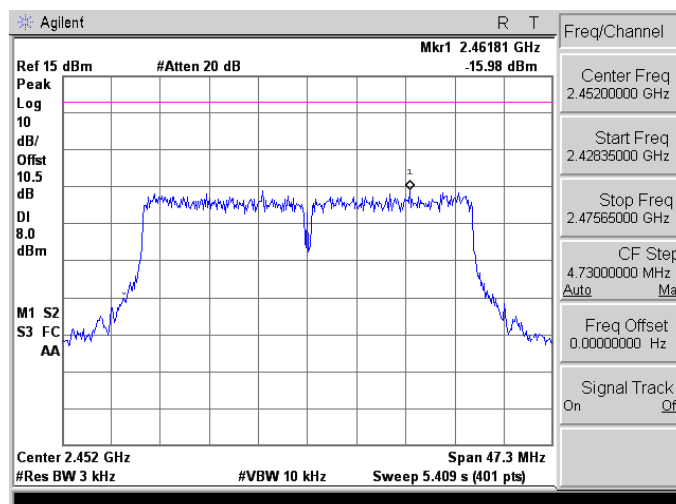
2422



2437



2452

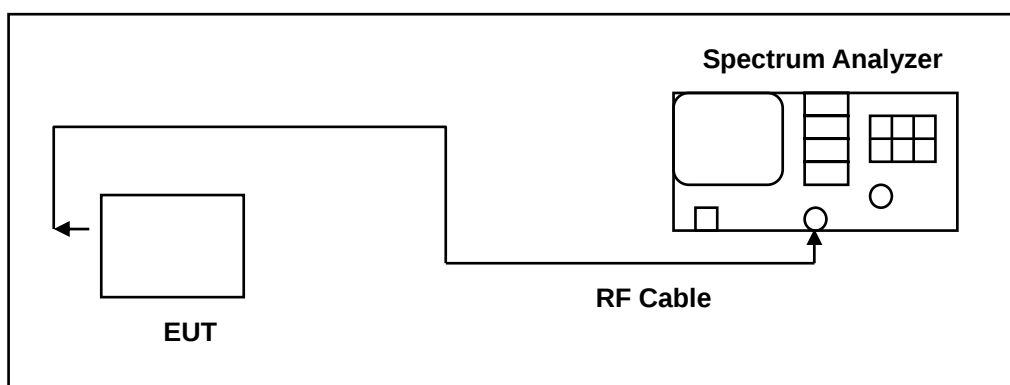


9 Out of Band Conducted Emissions Measurement

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 30 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	12/16/2014	(1)
Spectrum Analyzer	Agilent	E4408B	MY45107753	07/24/2014	(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.

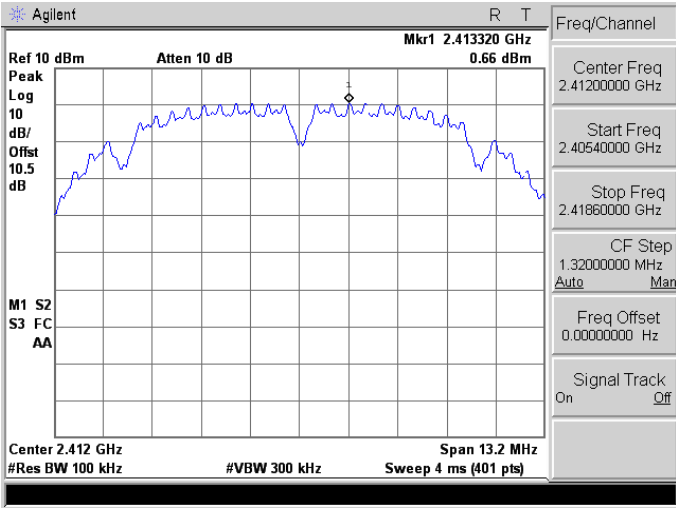
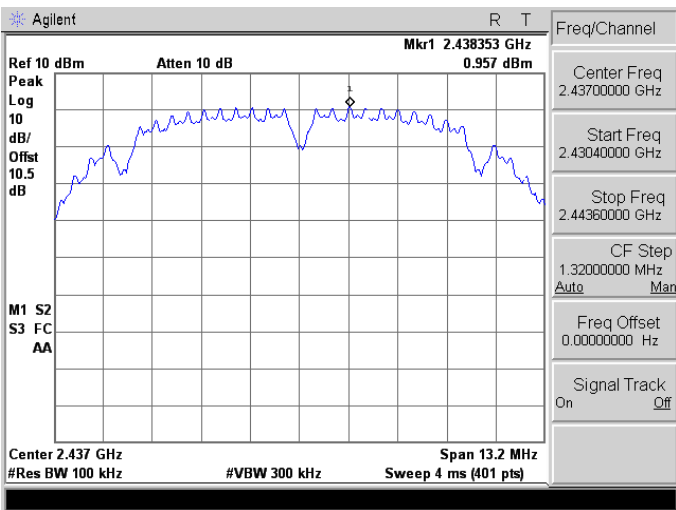
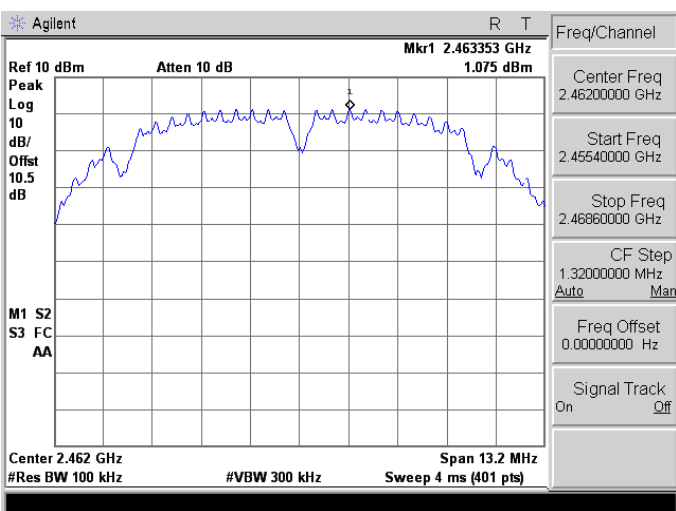
9.4. Test Procedure

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 30 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

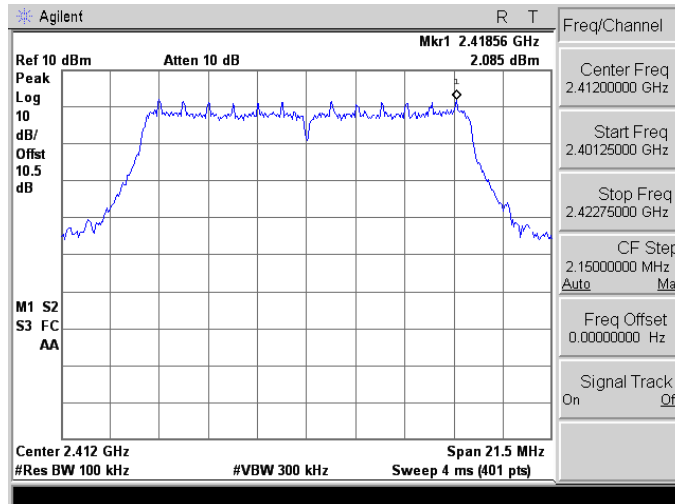
Reference level

Mode 2: IEEE 802.11b link mode_ANT-0

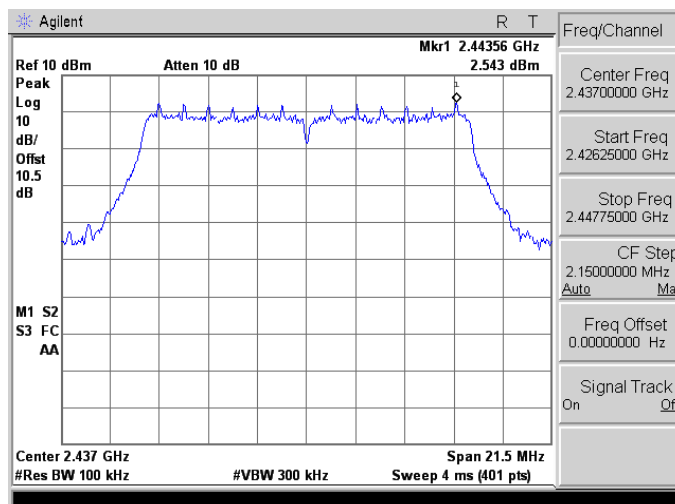
2412	 Agilent R T Ref 10 dBm Atten 10 dB Mkr1 2.413320 GHz 0.66 dBm Peak Log 10 dB/Offset 10.5 dB M1 S2 S3 FC AA Center 2.412 GHz Span 13.2 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts) Freq/Channel Center Freq 2.41200000 GHz Start Freq 2.40540000 GHz Stop Freq 2.41860000 GHz CF Step 1.32000000 MHz Auto Man Freq Offset 0.00000000 Hz Signal Track On Off
2437	 Agilent R T Ref 10 dBm Atten 10 dB Mkr1 2.438353 GHz 0.957 dBm Peak Log 10 dB/Offset 10.5 dB M1 S2 S3 FC AA Center 2.437 GHz Span 13.2 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts) Freq/Channel Center Freq 2.43700000 GHz Start Freq 2.43040000 GHz Stop Freq 2.44360000 GHz CF Step 1.32000000 MHz Auto Man Freq Offset 0.00000000 Hz Signal Track On Off
2462	 Agilent R T Ref 10 dBm Atten 10 dB Mkr1 2.463353 GHz 1.075 dBm Peak Log 10 dB/Offset 10.5 dB M1 S2 S3 FC AA Center 2.462 GHz Span 13.2 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts) Freq/Channel Center Freq 2.46200000 GHz Start Freq 2.45540000 GHz Stop Freq 2.46860000 GHz CF Step 1.32000000 MHz Auto Man Freq Offset 0.00000000 Hz Signal Track On Off

Mode 3: IEEE 802.11g link mode_ANT-0

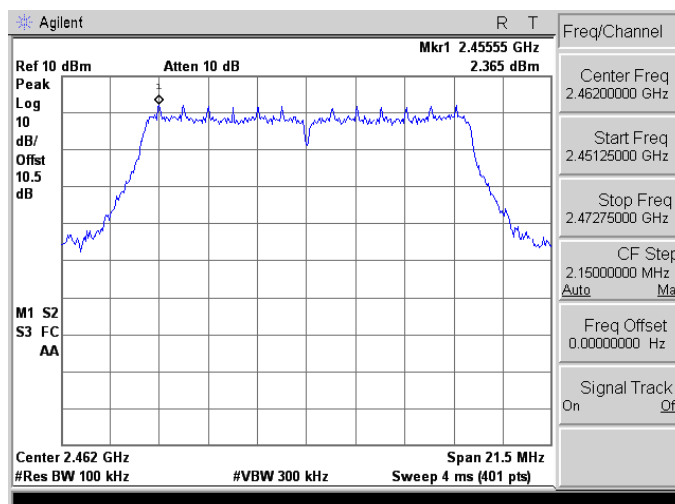
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2437

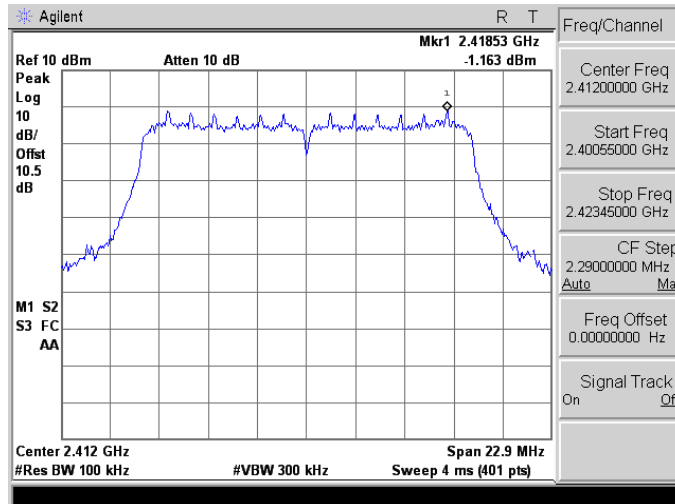


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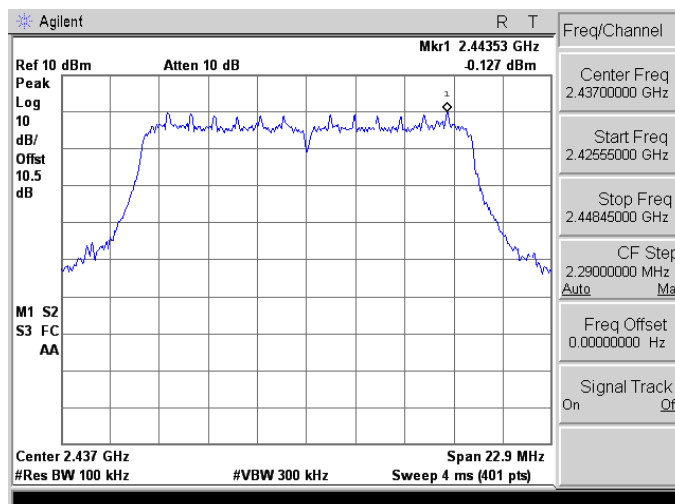


Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode_ANT-0

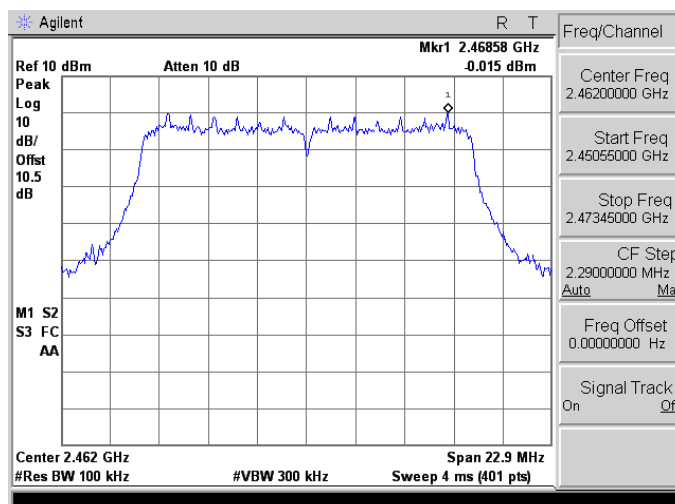
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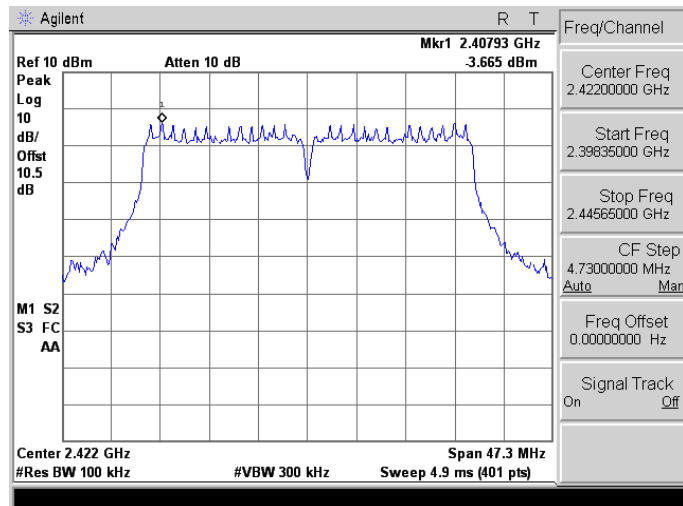


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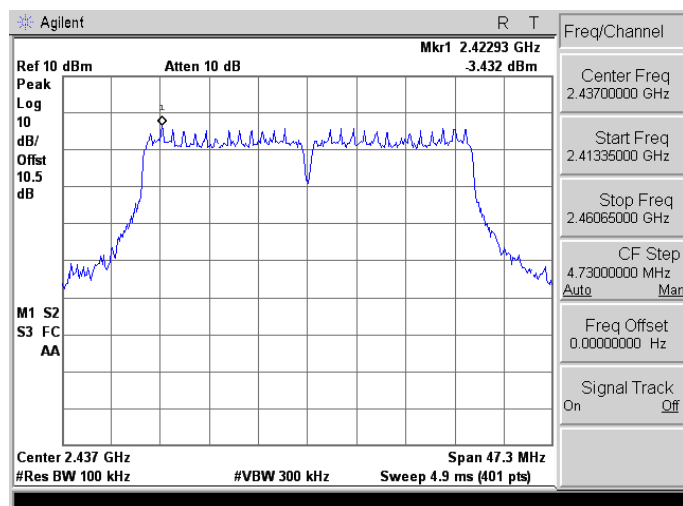


Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode_ANT-0

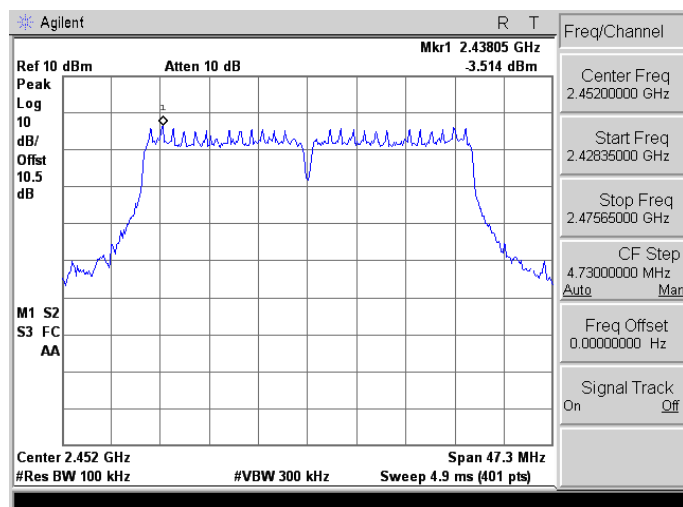
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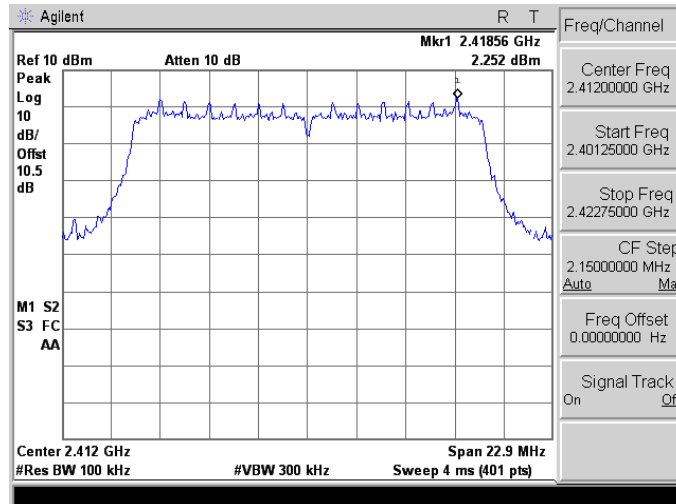


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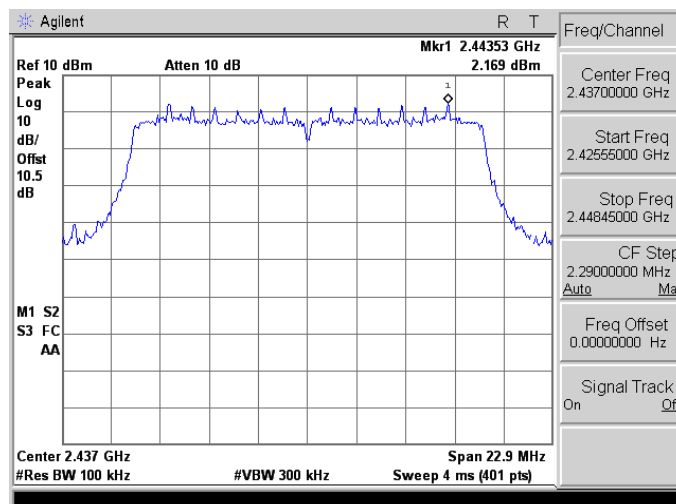


Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode_ANT-1

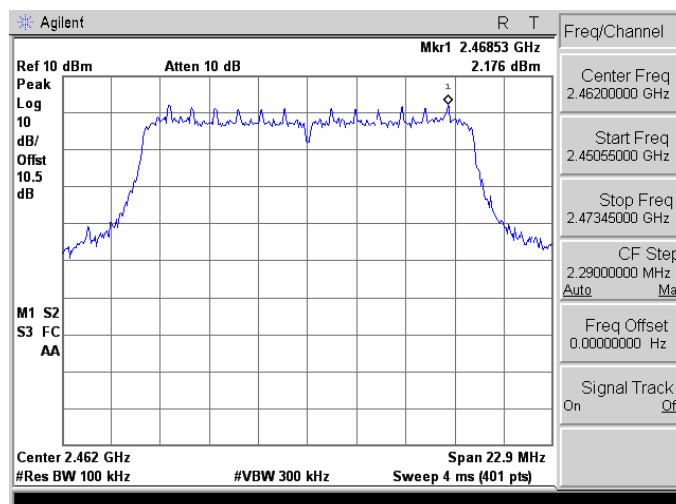
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2437

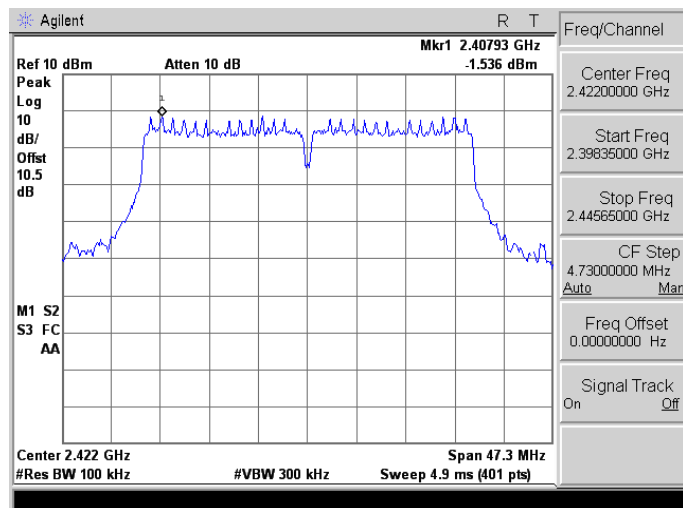


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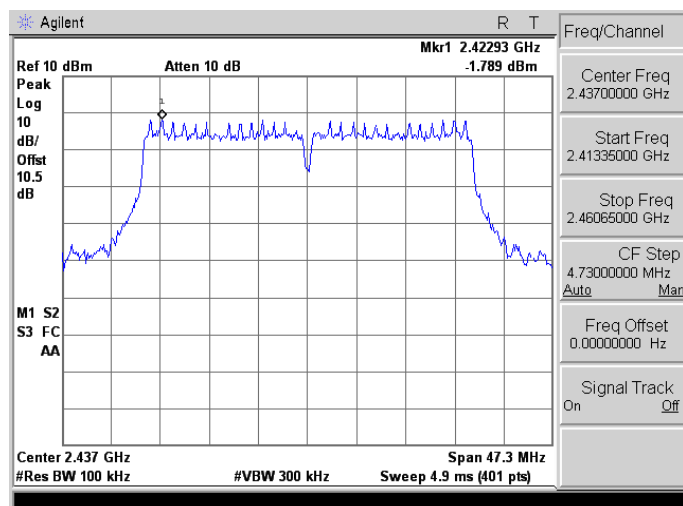


Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode_ANT-1

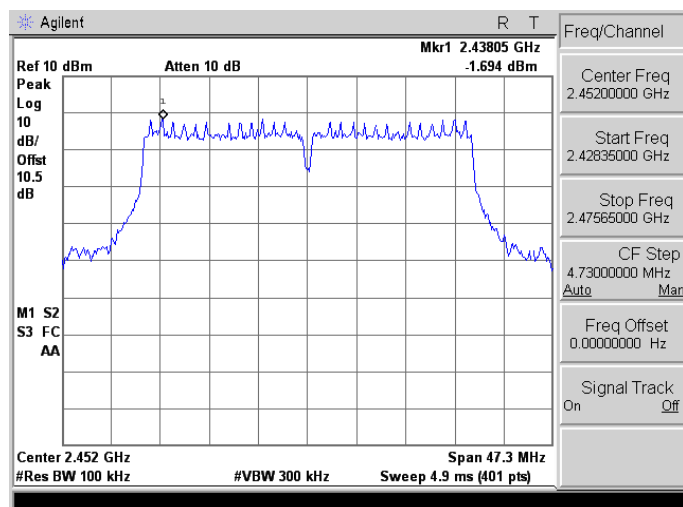
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2437



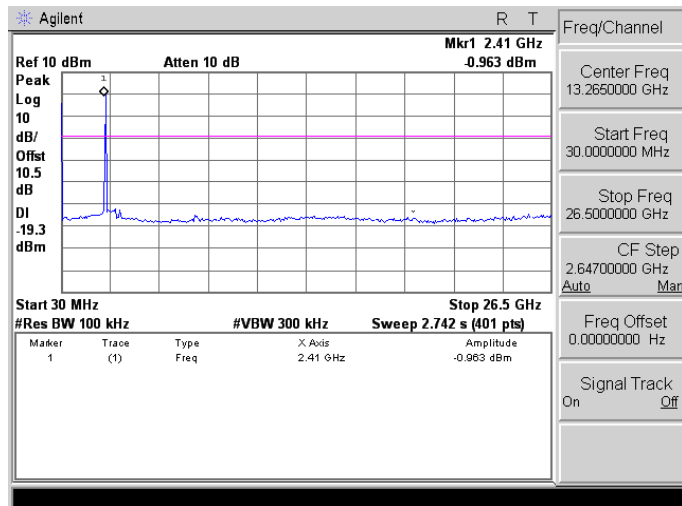
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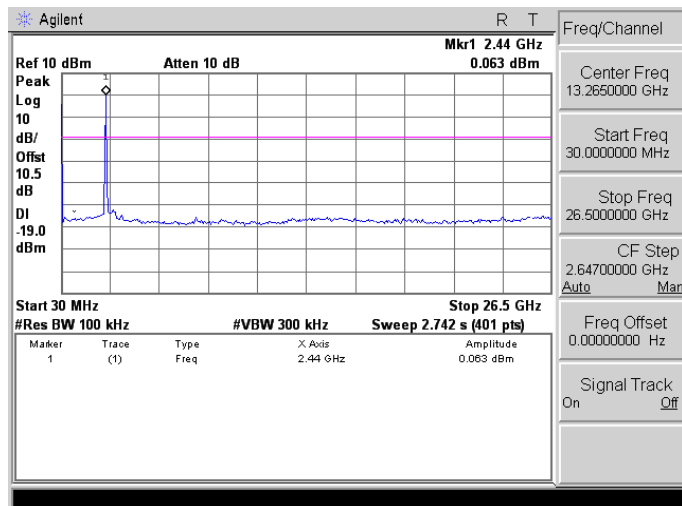
Out of Band Conducted Emissions

Mode 2: IEEE 802.11b link mode_ANT-0

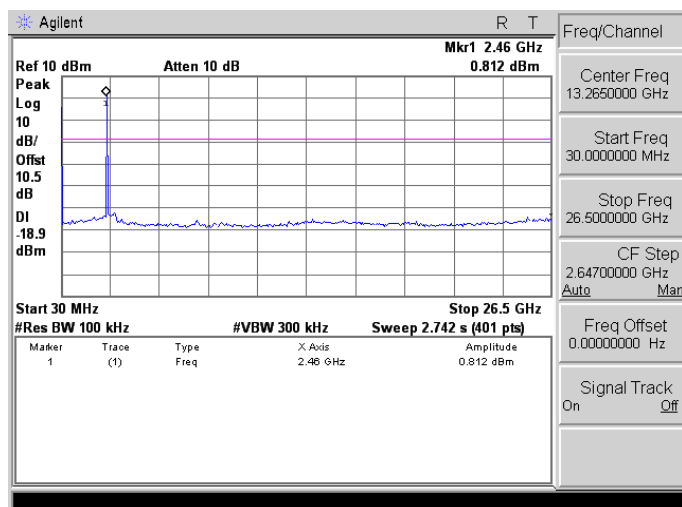
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2437

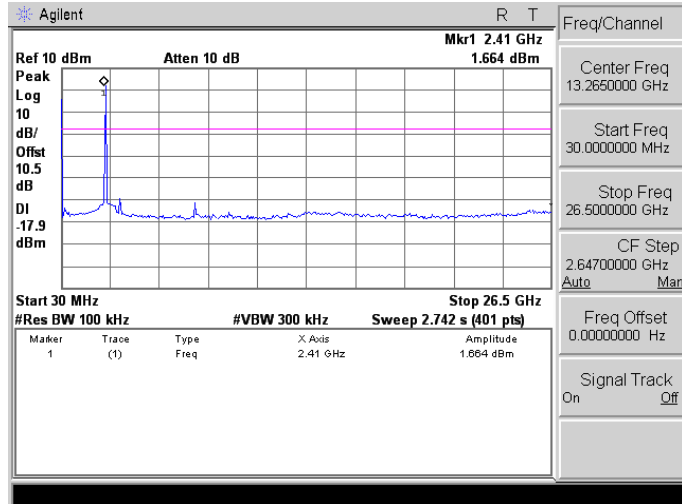


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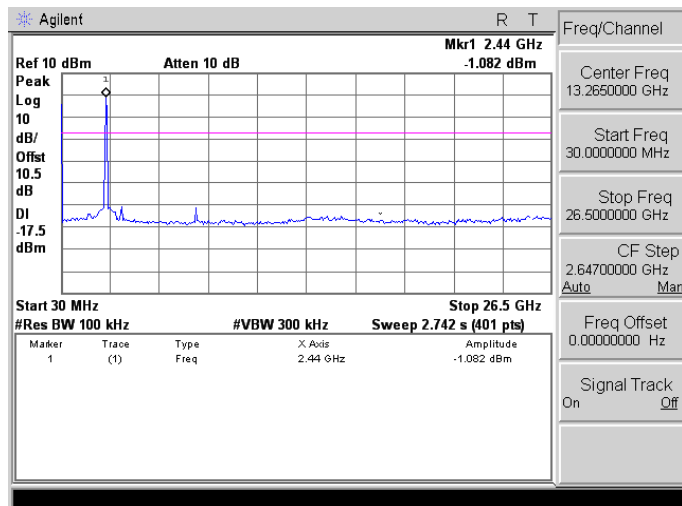


Mode 3: IEEE 802.11g link mode_ANT-0

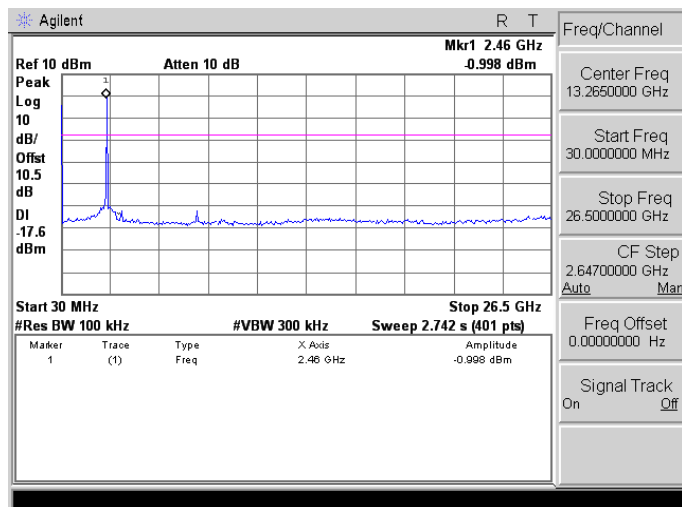
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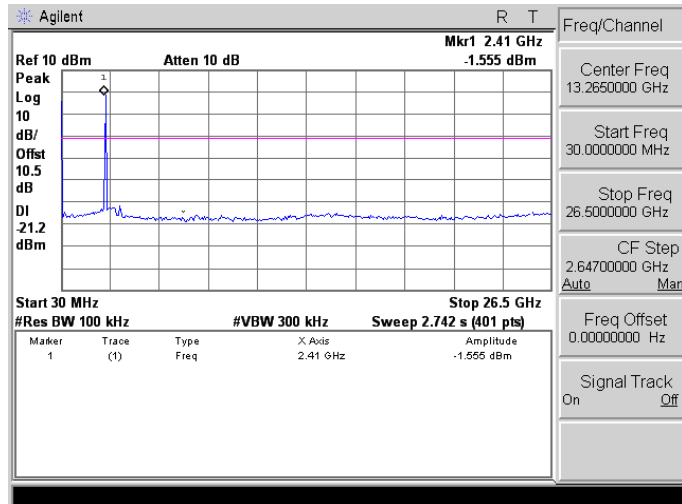


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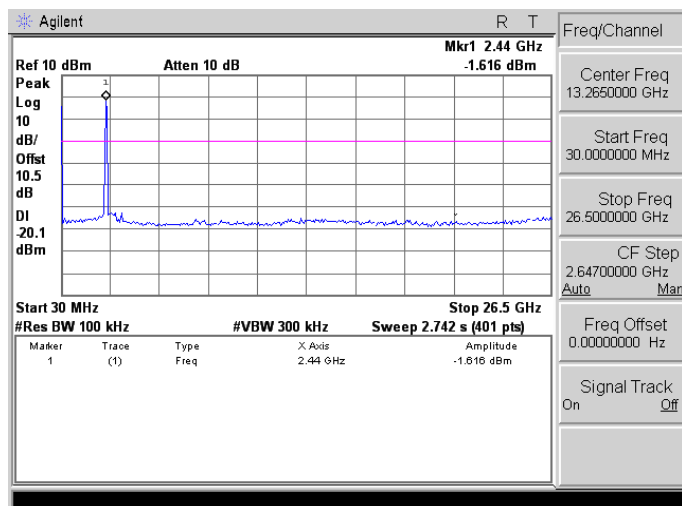


Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode_ANT-0

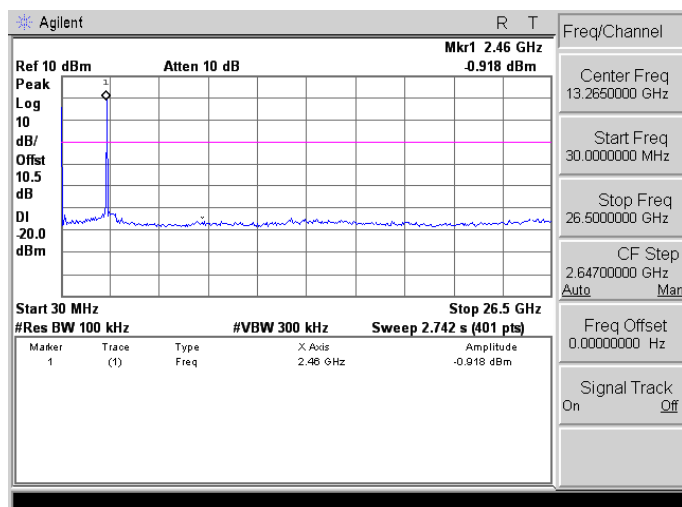
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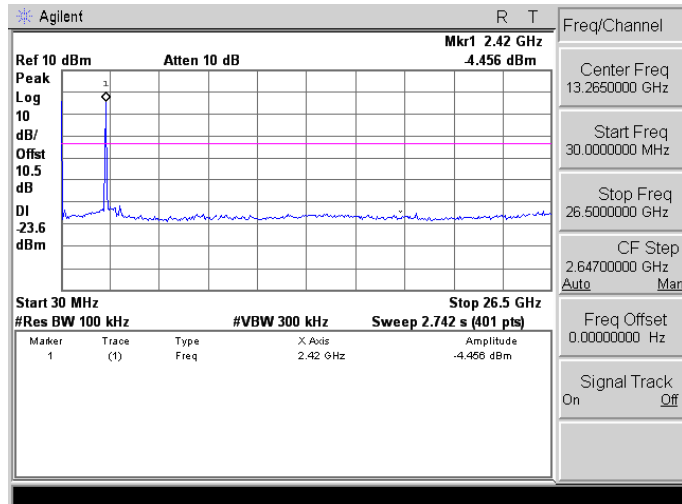


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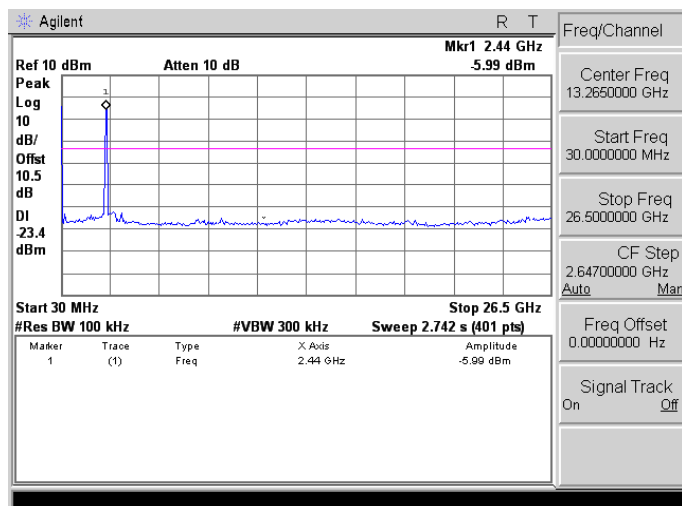


Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode_ANT-0

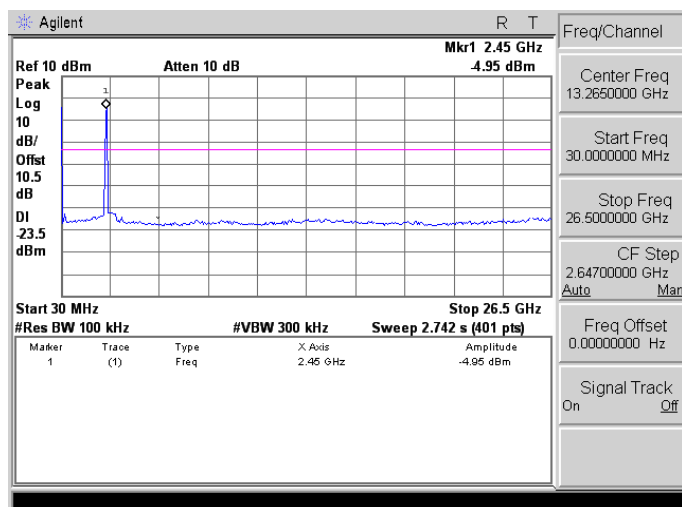
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2437

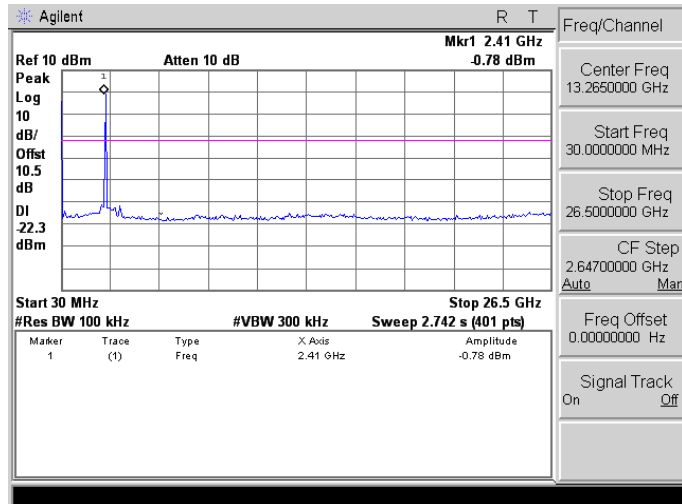


2452

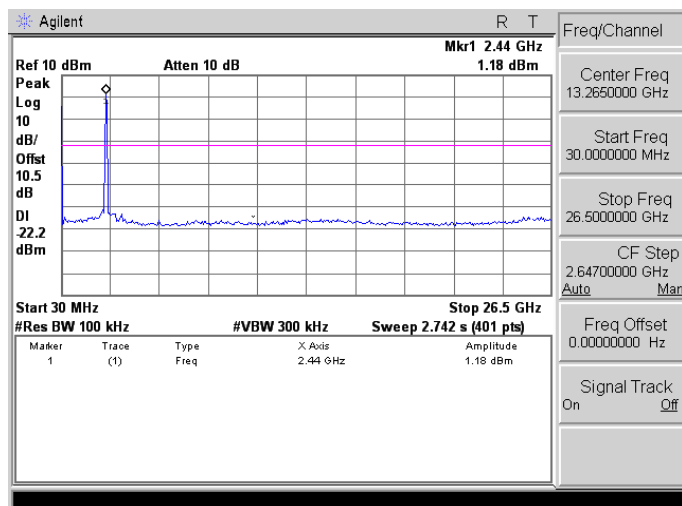


Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode_ANT-1

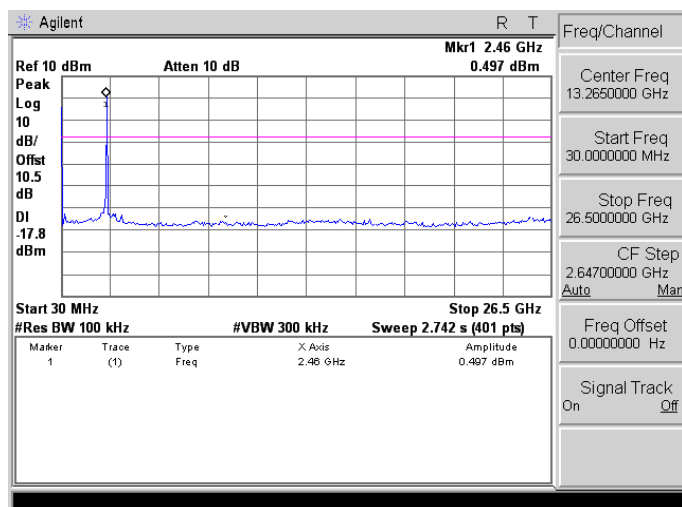
2412



2437

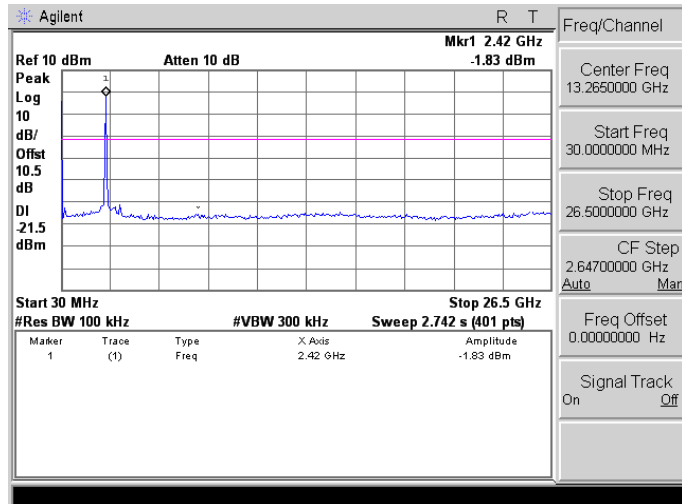


2462

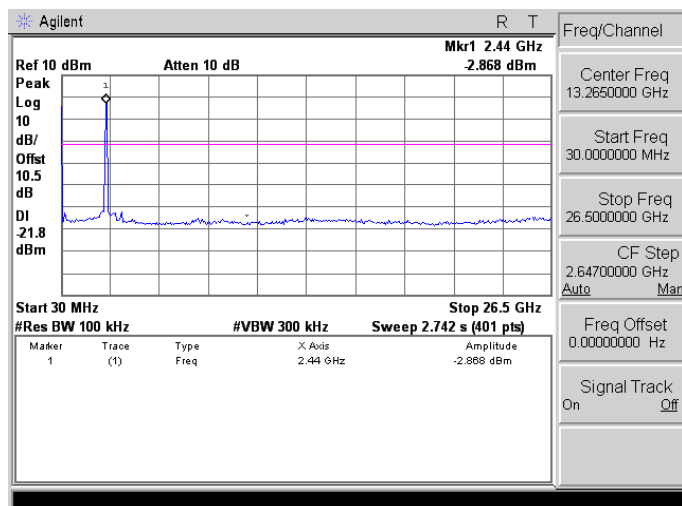


Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode_ANT-1

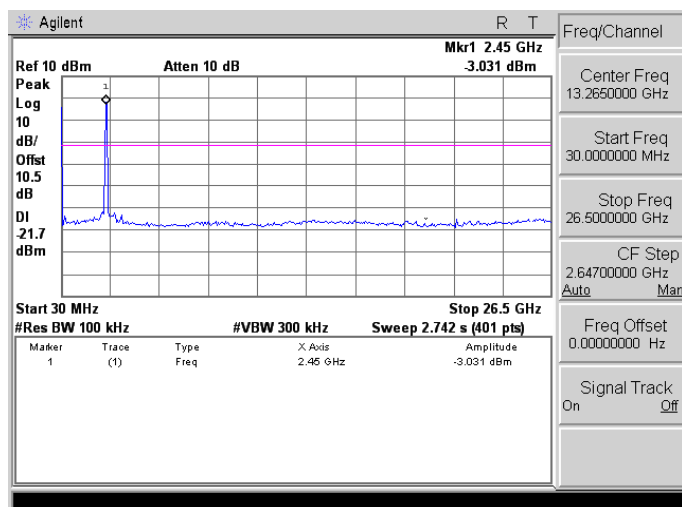
2422



2437



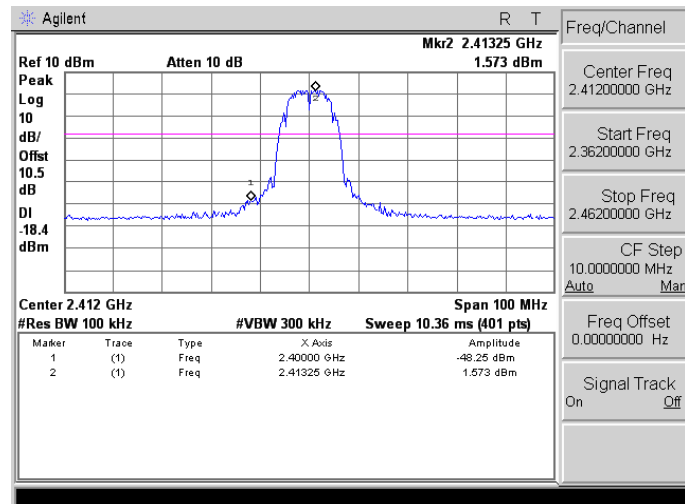
2452



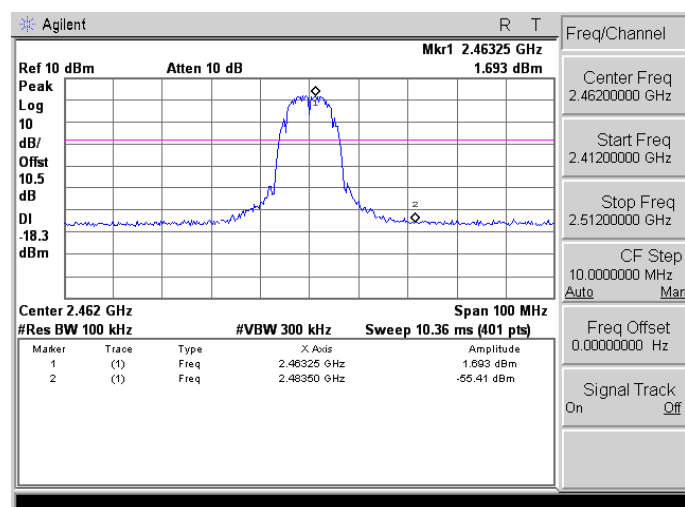
Conducted Band Edge

Mode 2: IEEE 802.11b link mode_ANT-0

2412

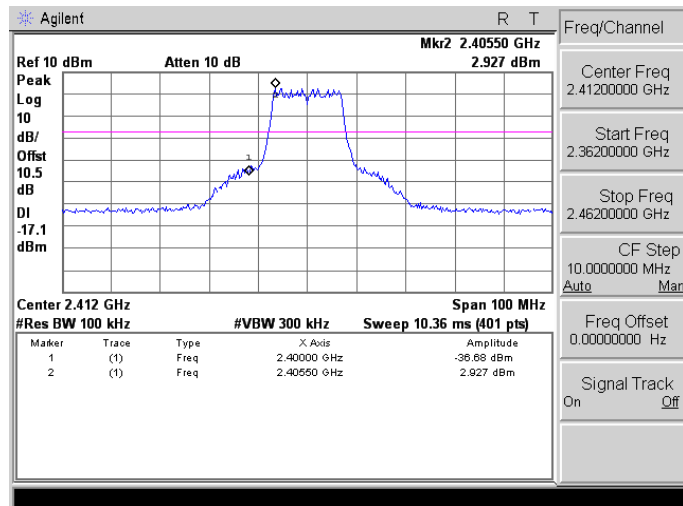


2462

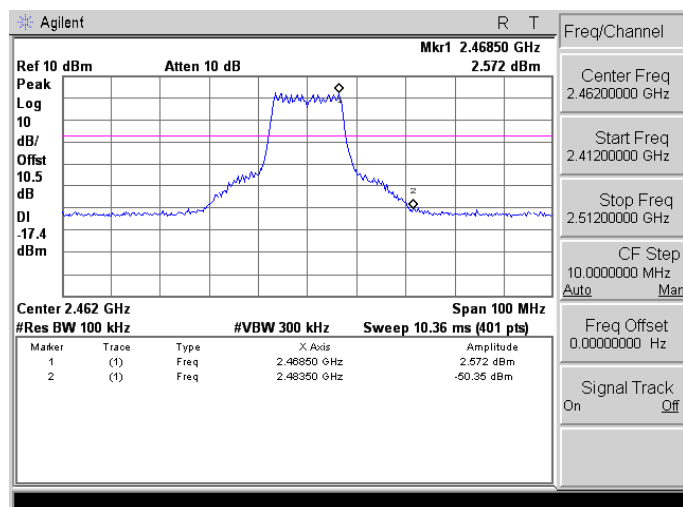


Mode 3: IEEE 802.11g link mode_ANT-0

2412

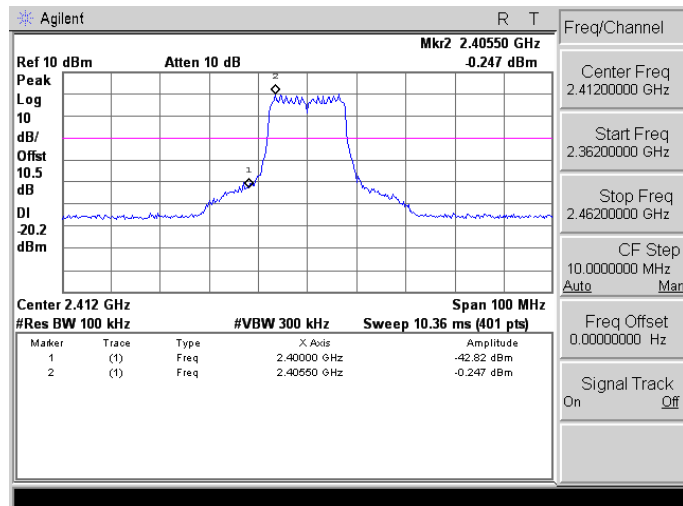


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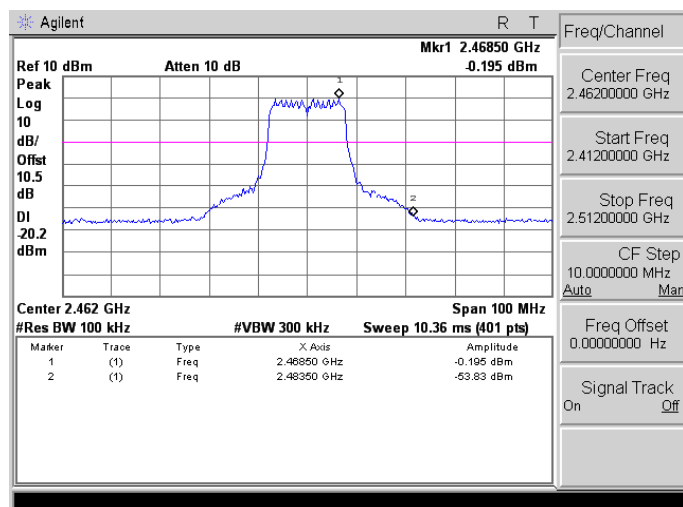


Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode_ANT-0

2412

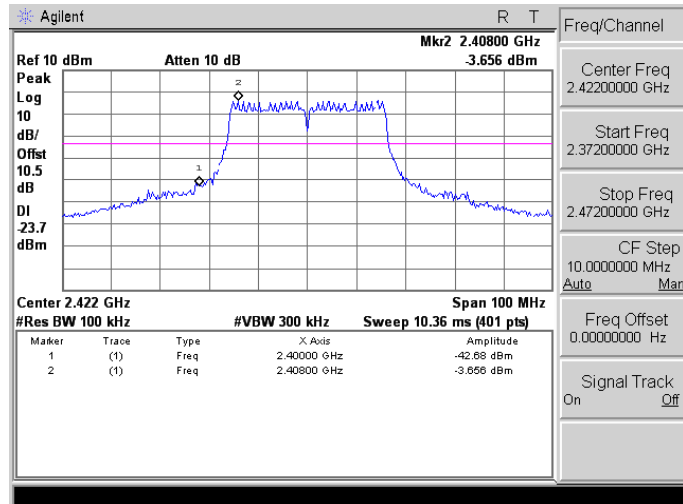


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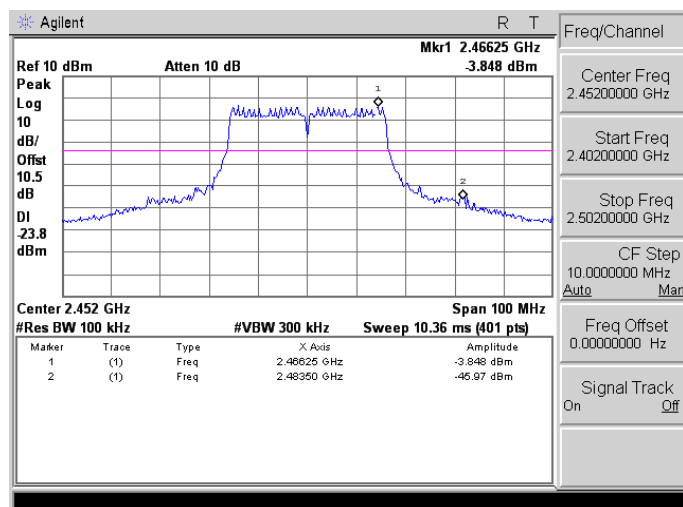


Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode_ANT-0

2422

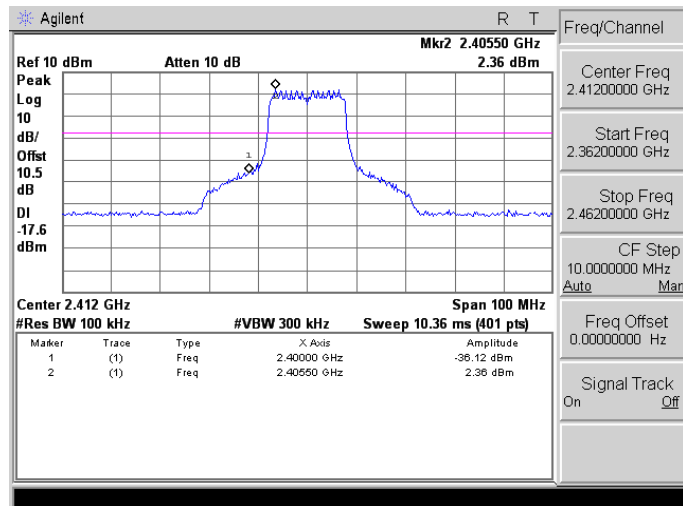


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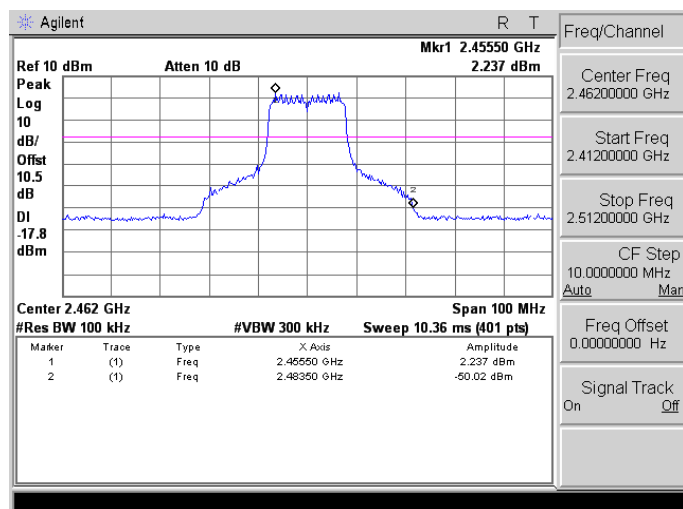


Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode_ANT-1

2412

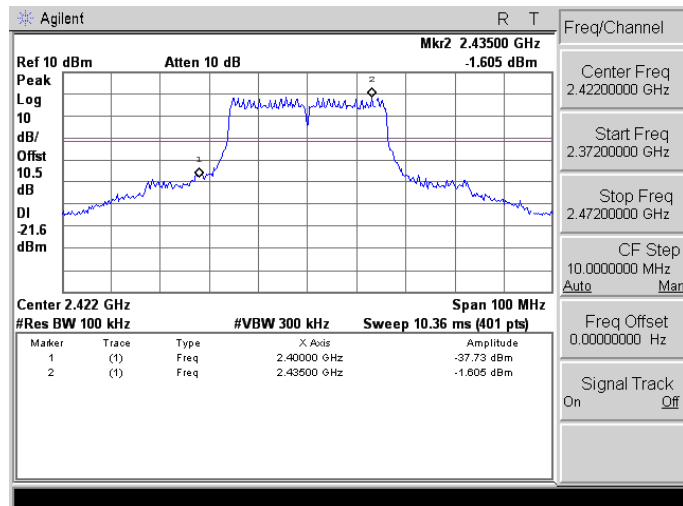


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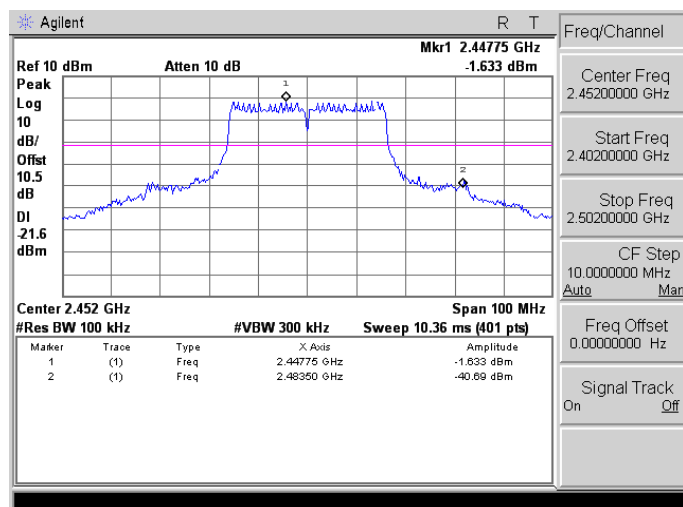


Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode_ANT-1

2422



2452

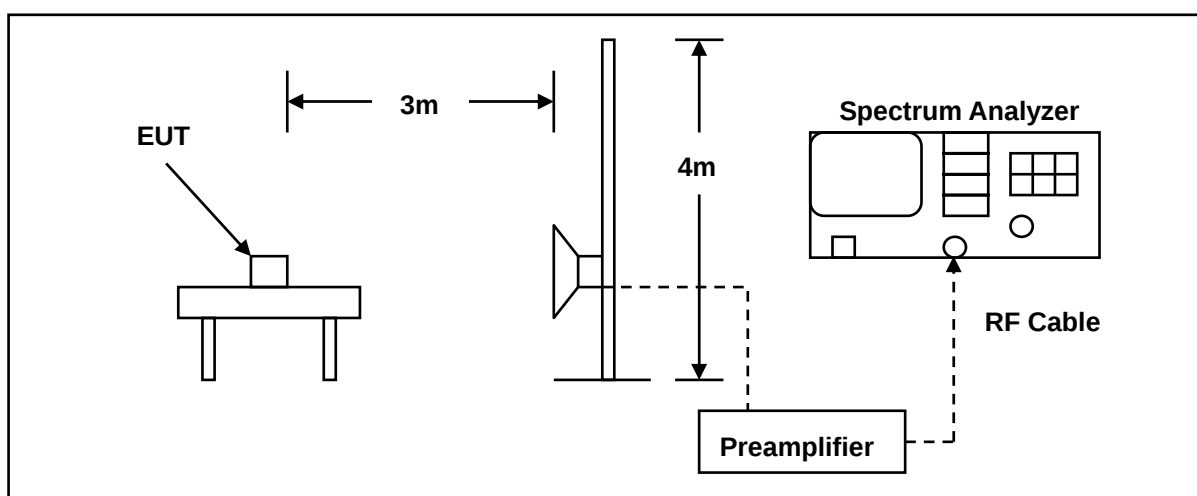


10 Band Edges Measurement

10.1.Limit

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 30 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

10.2.Test Setup



10.3.Test Instruments

3 Meter Chamber					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
RF Pre-selector	Agilent	N9039A	MY46520256	01/06/2015	(1)
Spectrum Analyzer	Agilent	E4446A	MY46180578	01/06/2015	(1)
Pre Amplifier	Agilent	8449B	3008A02237	02/24/2015	(1)
Pre Amplifier	Agilent	8447D	2944A10961	02/24/2015	(1)
Horn Antenna (1~18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	9120D-550	06/11/2014	(1)
Microwave Cable	EMCI	EMC-104-SM-S M-14000	140202	02/24/2015	(1)
Microwave Cable	EMCI	EMC104-SM-S M-600	140301	02/24/2015	(1)
Test Site	ATL	TE01	888001	08/28/2014	(1)

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

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

10.4. Test Procedure

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

The emissions on the harmonics frequencies, the limits, and the margin of compliance are presented. These tests were made when the transmitter was in full radiated power. The additional test was performed to show compliance with the requirement at the band-edge frequency 2483.5 MHz and up to 2500 MHz and at 2390.0 MHz.

The transmitter was configured with the worst case antenna and setup to transmit at the highest channel. Then the field strength was measured at 2483.5 MHz.

The transmitter was then configured with the worst case antenna and setup to transmit at the lowest channel. Then the field strength was measured at 2390.0 MHz. These tests were performed at 4 different bit rates.

For measurements 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.

10.5. Test Result

Standard:	FCC Part 15C	Test Distance:	3m				
Test item:	Radiated Emission	Power:	AC 120V/60Hz				
Model Number:	HD3010-US	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH				
Mode:	Mode 2	Date:	03/20/2015				
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
2382.050	50.00	1.48	51.48	74.00	-22.52	peak	H
2390.000	50.46	1.51	51.97	74.00	-22.03	peak	H
2344.540	49.71	1.36	51.07	74.00	-22.93	peak	V
2390.000	48.32	1.51	49.83	74.00	-24.17	peak	V

Standard:		FCC Part 15C		Test Distance:		3m	
Test item:		Radiated Emission		Power:		AC 120V/60Hz	
Model Number:		HD3010-US		Temp.(℃)/Hum.(%RH):		26(℃)/60%RH	
Mode:		Mode 2		Date:		03/20/2015	
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	44.40	1.82	46.22	74.00	-27.78	peak	H
2484.080	45.92	1.82	47.74	74.00	-26.26	peak	H
2483.500	46.86	1.82	48.68	74.00	-25.32	peak	V
2483.720	48.98	1.82	50.80	74.00	-23.20	peak	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	HD3010-US			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 3			Date:	03/20/2015		
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
2389.530	67.55	1.51	69.06	74.00	-4.94	peak	H
2389.530	48.35	1.51	49.86	54.00	-4.14	AVG	H
2390.000	66.81	1.51	68.32	74.00	-5.68	peak	H
2390.000	49.30	1.51	50.81	54.00	-3.19	AVG	H
2389.530	70.79	1.51	72.30	74.00	-1.70	peak	V
2389.530	51.15	1.51	52.66	54.00	-1.34	AVG	V
2390.000	69.55	1.51	71.06	74.00	-2.94	peak	V
2390.000	52.08	1.51	53.59	54.00	-0.41	AVG	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	HD3010-US			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 3			Date:	03/20/2015		
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	64.78	1.82	66.60	74.00	-7.40	peak	H
2483.500	49.13	1.82	50.95	54.00	-3.05	AVG	H
2484.400	68.55	1.82	70.37	74.00	-3.63	peak	H
2484.400	47.38	1.82	49.20	54.00	-4.80	AVG	H
2483.500	70.55	1.82	72.37	74.00	-1.63	peak	V
2483.500	51.47	1.82	53.29	54.00	-0.71	AVG	V
2484.280	70.98	1.82	72.80	74.00	-1.20	peak	V
2484.280	49.87	1.82	51.69	54.00	-2.31	AVG	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	HD3010-US			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 4			Date:	03/20/2015		
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
2388.980	71.40	1.51	72.91	74.00	-1.09	peak	H
2388.980	49.00	1.51	50.51	54.00	-3.49	AVG	H
2390.000	71.39	1.51	72.90	74.00	-1.10	peak	H
2390.000	50.17	1.51	51.68	54.00	-2.32	AVG	H
2389.420	72.16	1.51	73.67	74.00	-0.33	peak	V
2389.420	50.68	1.51	52.19	54.00	-1.81	AVG	V
2390.000	71.92	1.51	73.43	74.00	-0.57	peak	V
2390.000	51.58	1.51	53.09	54.00	-0.91	AVG	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	HD3010-US			Temp.(℃)/Hum.(%RH):	26(℃)/60%RH		
Mode:	Mode 4			Date:	03/20/2015		
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	65.69	1.82	67.51	74.00	-6.49	peak	H
2483.500	49.16	1.82	50.98	54.00	-3.02	AVG	H
2484.320	69.75	1.82	71.57	74.00	-2.43	peak	H
2484.320	48.08	1.82	49.90	54.00	-4.10	AVG	H
2483.500	70.08	1.82	71.90	74.00	-2.10	peak	V
2483.500	51.47	1.82	53.29	54.00	-0.71	AVG	V
2484.920	72.11	1.82	73.93	74.00	-0.07	peak	V
2484.920	49.57	1.82	51.39	54.00	-2.61	AVG	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	HD3010-US			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 5			Date:	03/20/2015		
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
2386.920	71.03	1.50	72.53	74.00	-1.47	peak	H
2386.920	48.63	1.50	50.13	54.00	-3.87	AVG	H
2390.000	69.12	1.51	70.63	74.00	-3.37	peak	H
2390.000	49.42	1.51	50.93	54.00	-3.07	AVG	H
2385.960	70.15	1.49	71.64	74.00	-2.36	peak	V
2385.960	50.60	1.49	52.09	54.00	-1.91	AVG	V
2390.000	68.12	1.51	69.63	74.00	-4.37	peak	V
2390.000	51.65	1.51	53.16	54.00	-0.84	AVG	V

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60Hz		
Model Number:	HD3010-US			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 5			Date:	03/20/2015		
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	55.50	1.82	57.32	74.00	-16.68	peak	H
2483.500	49.64	1.82	51.46	54.00	-2.54	AVG	H
2495.200	52.58	1.85	54.43	74.00	-19.57	peak	H
2495.200	48.49	1.85	50.34	54.00	-3.66	AVG	H
2483.500	54.16	1.82	55.98	74.00	-18.02	peak	V
2483.500	49.80	1.82	51.62	54.00	-2.38	AVG	V
2488.600	57.24	1.84	59.08	74.00	-14.92	peak	V
2488.600	50.33	1.84	52.17	54.00	-1.83	AVG	V

11 Antenna Measurement

11.1.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.

11.2.Antenna Connector Construction

The antenna used in this product is LTCC Chip Antenna. And the maximum Gain of this antenna is only 2 dBi.