



FCC TEST REPORT (15.407)

REPORT NO.: RF111005C22-1

MODEL NO.: EMP7618-FT, EMP7618

FCC ID: TVE-0120201

RECEIVED: Oct. 05, 2011

TESTED: Nov. 09 to 19, 2011

ISSUED: Nov. 30, 2011

APPLICANT: Fortinet, Inc.

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ISSUED BY: Bureau Veritas Consumer Products Services
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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF111005C22-1	Original release	Nov. 30, 2011



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1. CERTIFICATION

PRODUCT: 802.11 abgn RF Module Card
BRAND NAME: Fortinet
MODEL NO.: EMP7618-FT, EMP7618
TEST SAMPLE: ENGINEERING SAMPLE
APPLICANT: Fortinet, Inc.
TESTED: Nov. 09 to 19, 2011
STANDARDS: FCC Part 15, Subpart E (Section 15.407)
ANSI C63.4-2003
ANSI C63.10-2009

The above equipment (Model: EMP7618-FT) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY :  , **DATE:** Nov. 30, 2011
(Claire Kuan, Specialist)

APPROVED BY :  , **DATE:** Nov. 30, 2011
(May Chen, Deputy Manager)



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2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

For [802.11a](#)

APPLIED STANDARD: FCC Part 15, Subpart E (Section 15.407)			
Standard Section	Test Type	Result	Remark
15.407(b)(5)	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -7.99dB at 0.189MHz
15.407(b)(1/2/3) (b)(5)	Electric Field Strength Spurious Emissions, 30MHz ~ 40000MHz	PASS	Meet the requirement of limit. Minimum passing margin is -0.9dB at 5150.00MHz
15.407(a)(1/2/3)	Output Transmit Power	PASS	Meet the requirement of limit.
15.407(a)(6)	Peak Power Excursion	PASS	Meet the requirement of limit.
15.407(a)(1/2/3)	Peak Power Spectral Density	PASS	Meet the requirement of limit.
15.407(g)	Frequency Stability	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	Antenna connector is RSMA not standard connector.

NOTE:

1. The EUT was operating in 2400 ~ 2483.5MHz, 5.15~5.25GHz and 5.725~5.850GHz frequencies band. This report was recorded the RF parameters including 5.15~5.25GHz. For the 2400 ~ 2483.5MHz and 5.725~5.850GHz RF parameters was recorded in another test report.



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2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Measurement	Value
Conducted emissions	2.45 dB
Radiated emissions (30MHz-1GHz)	3.89 dB
Radiated emissions (1GHz -18GHz)	2.19 dB
Radiated emissions (18GHz -40GHz)	2.56 dB



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3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	802.11 abgn RF Module Card
MODEL NO.	EMP7618-FT, EMP7618
FCC ID	TVE-0120201
POWER SUPPLY	3.3Vdc (Host equipment)
MODULATION TYPE	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
MODULATION TECHNOLOGY	DSSS, OFDM
TRANSFER RATE	802.11b:11.0/ 5.5/ 2.0/ 1.0Mbps 802.11g: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0Mbps 802.11a: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0Mbps 802.11n: up to 300.0Mbps
OPERATING FREQUENCY	For 15.407 5GHz: 5.18 ~ 5.24GHz For 15.247 2.4GHz: 2.412 ~ 2.462GHz 5GHz: 5.745 ~ 5.825GHz
NUMBER OF CHANNEL	For 15.407 4 for 802.11a, 802.11n (20MHz) 2 for 802.11n (40MHz) For 15.247(2.4GHz) 11 for 802.11b, 802.11g, 802.11n (20MHz) 7 for 802.11n (40MHz) For 15.247(5GHz) 5 for 802.11a, 802.11n (20MHz) 2 for 802.11n (40MHz)
MAXIMUM OUTPUT POWER	For 15.407 802.11a: 21.9mW 802.11n (20MHz): 31.4mW 802.11n (40MHz): 46.9mW For 15.247(2.4GHz) 802.11b: 41.6mW 802.11g: 423.0mW 802.11n (20MHz): 390.4mW 802.11n (40MHz): 135.3mW For 15.247(5GHz) 802.11a: 219.3mW 802.11n (20MHz): 234.5mW 802.11n (40MHz): 290.9mW
ANTENNA TYPE	Refer to note for more details

DATA CABLE	NA
I/O PORTS	Refer to user's manual
ASSOCIATED DEVICES	NA

NOTE:

- The EUT has two model names which are identical to each other in all aspects except for the following table:

Brand	Model Name	Description
Fortinet	EMP7618-FT	For marketing requirement
	EMP7618	

From the above models, model: **EMP7618-FT** was selected as representative model for the test and its data was recorded in this report.

- The frequency bands used in this EUT are listed as below.

Frequency Band (MHz)	2412~2462	5180~5240	5745~5825
802.11b	√	-	-
802.11g	√	-	-
802.11a	-	√	√
802.11n (20MHz)	√	√	√
802.11n (40MHz)	√	√	√

- The EUT incorporates a MIMO function. Physically, the EUT provides 2 completed transmitters and 2 receivers.

MODULATION MODE	TX FUNCTION
802.11b	2TX
802.11g	2TX
802.11a	2TX
802.11n (20MHz)	2TX
802.11n (40MHz)	2TX

- There are three sets antennas provided to this EUT, please refer to the following table:

SET	TRANSMITTER CIRCUIT	ANTENNA TYPE	ANTENNA CONNECTOR	GAIN (dBi)	
				2.4GHz BAND	5.0GHz BAND
1	Chain (0)	Dipole	RSMA	2	4.5
	Chain (1)	Dipole	RSMA	2	4.5
2	Chain (0)	Dipole	RSMA	2	1
	Chain (1)	Dipole	RSMA	2	1
3	Chain (0)	Dipole	RSMA	2	2
	Chain (1)	Dipole	RSMA	2	2

From above antennas, **Set 1** was chosen for final test.

- 2.4GHz and 5GHz technology can not transmit at same time.
- The EUT incorporates CDD function with 802.11a, 802.11b, 802.11g.



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7. The above EUT information was declared by the manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.2 DESCRIPTION OF TEST MODES

Operated in 5150MHz ~ 5250MHz bands:

Four channels are provided for 802.11a and 802.11n (20MHz):

CHANNEL	FREQUENCY
36	5180 MHz
40	5200 MHz
44	5220 MHz
48	5240 MHz

Two channels are provided for 802.11n (40MHz):

CHANNEL	FREQUENCY
38	5190 MHz
46	5230 MHz

3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL:

EUT CONFIGURE MODE	APPLICABLE TO					DESCRIPTION
	PLC	RE < 1G	RE ≥ 1G	APCM	OB	
-	√	√	√	√	√	-

Where **PLC**: Power Line Conducted Emission **RE < 1G**: Radiated Emission below 1GHz
RE ≥ 1G: Radiated Emission above 1GHz **APCM**: Antenna Port Conducted Measurement
OB: Conducted Out-Band Emission Measurement

POWER LINE CONDUCTED EMISSION TEST:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11n (20MHz)	36 to 48	36	OFDM	BPSK	6.5

RADIATED EMISSION TEST (BELOW 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11n (20MHz)	36 to 48	36	OFDM	BPSK	6.5

RADIATED EMISSION TEST (ABOVE 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11a	36 to 48	36, 40, 48	OFDM	BPSK	6
802.11n (20MHz)	36 to 48	36, 40, 48	OFDM	BPSK	6.5
802.11n (40MHz)	38 to 46	38, 46	OFDM	BPSK	13.5

ANTENNA PORT CONDUCTED MEASUREMENT:

- This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11a	36 to 48	36, 40, 48	OFDM	BPSK	6
802.11n (20MHz)	36 to 48	36, 40, 48	OFDM	BPSK	6.5
802.11n (40MHz)	38 to 46	38, 46	OFDM	BPSK	13.5

CONDUCTED OUT-BAND EMISSION MEASUREMENT:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11a	36 to 48	36, 40, 48	OFDM	BPSK	6
802.11n (20MHz)	36 to 48	36, 40, 48	OFDM	BPSK	6.5
802.11n (40MHz)	38 to 46	38, 46	OFDM	BPSK	13.5



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TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
PLC	26deg. C, 61%RH	120Vac, 60Hz	Kent Liu
RE ³ 1G	24deg. C, 63%RH	120Vac, 60Hz	Nick Chang
RE<1G	24deg. C, 67%RH	120Vac, 60Hz	Nelson Teng
APCM	25deg. C, 60%RH	120Vac, 60Hz	Rex Huang
OB	25deg. C, 60%RH	120Vac, 60Hz	Rex Huang



3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart E (15.407)

ANSI C63.4-2003

ANSI C63.10-2009

All test items have been performed and recorded as per the above standards.



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3.4 DESCRIPTION OF SUPPORT UNITS

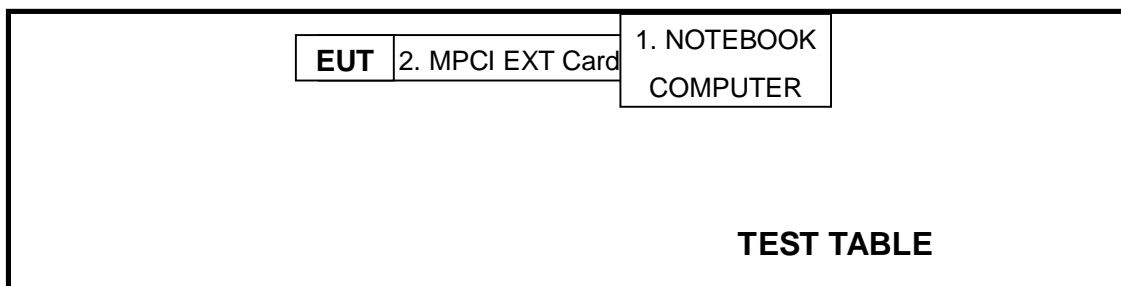
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER	DELL	PP32LA	GSLB32S	FCC DoC
2	MPCI EXT CARD	Senao	NA	NA	NA

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA
2	NA

NOTE: All power cords of the above support units are non shielded (1.8m).

3.5 CONFIGURATION OF SYSTEM UNDER TEST





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4. TEST TYPES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

- NOTE:**
1. The lower limit shall apply at the transition frequencies.
 2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
 3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.1.2 TEST INSTRUMENTS

Test date: Nov. 18, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver	ESCS 30	100375	Mar. 09, 2011	Mar. 08, 2012
Line-Impedance Stabilization Network (for EUT)	NSLK 8127	8127-522	Sep. 07, 2011	Sep. 06, 2012
Line-Impedance Stabilization Network (for Peripheral)	ESH3-Z5	848773/004	Nov. 01, 2011	Oct. 31, 2012
RF Cable (JYEBAO)	5DFB	COCCAB-002	Aug. 29, 2011	Aug. 28, 2012
50 ohms Terminator	50	3	Nov. 02, 2011	Nov. 01, 2012
Software	BV ADT_Cond_V7.3.7	NA	NA	NA

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Shielded Room No. C.
3. The VCCI Con C Registration No. is C-3611.



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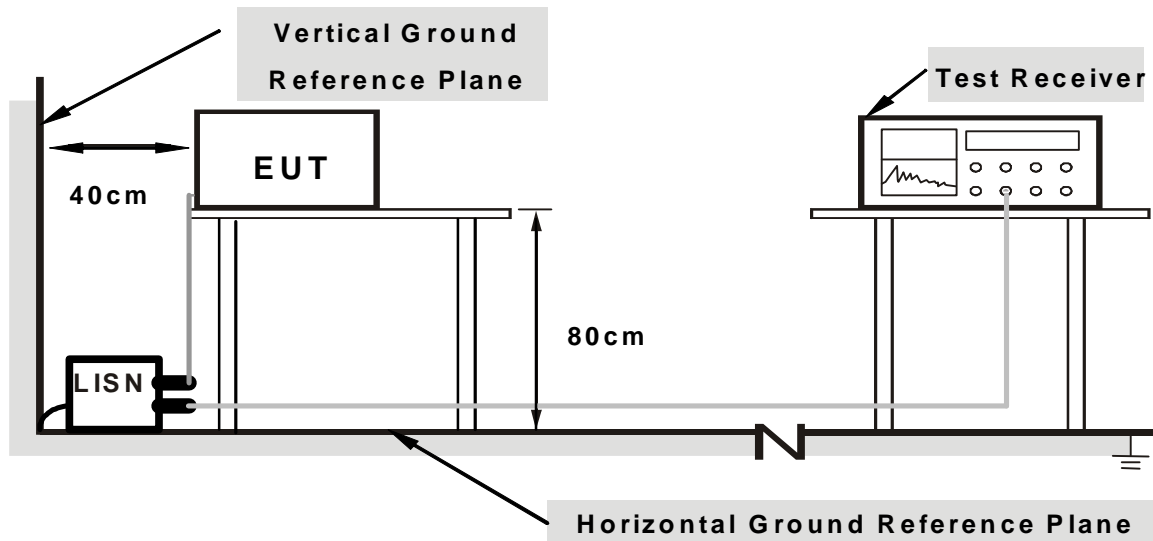
4.1.3 TEST PROCEDURES

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs
- b. provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- c. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- d. The frequency range from 150kHz to 30MHz was searched. Emission level under (Limit – 20dB) was not recorded.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 TEST SETUP



Note: 1. Support units were connected to second LISN.

2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.1.6 EUT OPERATING CONDITIONS

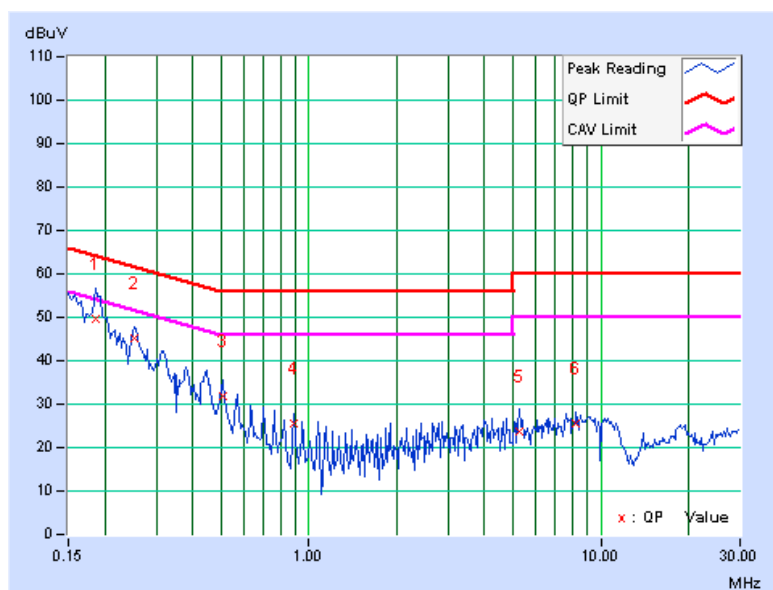
1. Connect the EUT with the support unit 1 (Notebook Computer) which is placed on a testing table.
2. The communication partner run test program “artgui.exe” to enable EUT under transmission/receiving condition continuously at specific channel frequency.

4.1.7 TEST RESULTS

PHASE	Line (L)	6dB BANDWIDTH	9 kHz
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No	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
	[MHz]	Factor (dB)	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.185	0.10	49.68	40.56	49.78	40.66	64.25	54.25	-14.48	-13.60
2	0.252	0.10	44.91	37.65	45.01	37.75	61.71	51.71	-16.69	-13.95
3	0.505	0.12	31.59	25.23	31.71	25.35	56.00	46.00	-24.29	-20.65
4	0.888	0.14	25.27	23.17	25.41	23.31	56.00	46.00	-30.59	-22.69
5	5.258	0.37	23.42	16.82	23.79	17.19	60.00	50.00	-36.21	-32.81
6	8.238	0.48	24.99	19.61	25.47	20.09	60.00	50.00	-34.53	-29.91

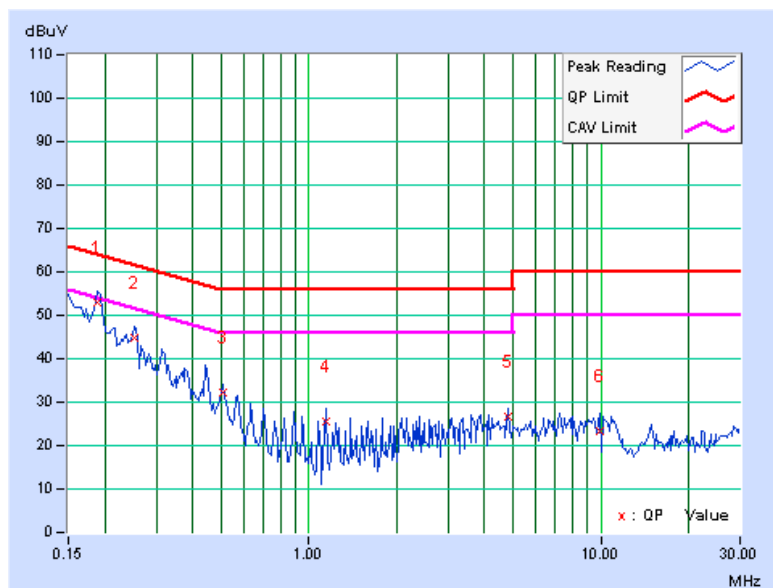
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. The emission levels of other frequencies were very low against the limit.
 3. Margin value = Emission level - Limit value
 4. Correction factor = Insertion loss + Cable loss
 5. Emission Level = Correction Factor + Reading Value.



PHASE	Neutral (N)	6dB BANDWIDTH	9 kHz
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.189	0.09	52.72	46.00	52.81	46.09	64.08	54.08	-11.27	-7.99
2	0.252	0.10	44.64	37.06	44.74	37.16	61.71	51.71	-16.97	-14.55
3	0.505	0.11	32.25	26.14	32.36	26.25	56.00	46.00	-23.64	-19.75
4	1.141	0.14	25.59	22.73	25.73	22.87	56.00	46.00	-30.27	-23.13
5	4.816	0.26	26.28	20.21	26.54	20.47	56.00	46.00	-29.46	-25.53
6	9.953	0.41	23.02	17.56	23.43	17.97	60.00	50.00	-36.57	-32.03

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. The emission levels of other frequencies were very low against the limit.
 3. Margin value = Emission level - Limit value
 4. Correction factor = Insertion loss + Cable loss
 5. Emission Level = Correction Factor + Reading Value.



4.2 RADIATED EMISSION MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

Frequencies (MHz)	Field strength (microvolts/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

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.
4. Section 15.205 restricted bands of operation shall compliance with the limits in Section 15.209.



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4.2.2 LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS

Frequencies (MHz)	EIRP Limit (dBm)	Equivalent Field Strength at 3m (dB μ V/m) *note 3
5150~5250	-27	68.3
5250~5350	-27	68.3
5470~5725	-27	68.3
5725~5825	-27 *note 1	68.3
	-17 *note 2	78.3

NOTE:

1. For frequencies 10MHz or greater above or below the band edge.
2. All emissions within the frequency range from the band edge to 10MHz above or below the band edge.
3. The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength

$$E = \frac{1000000\sqrt{30P}}{3} \mu\text{V/m, where P is the eirp (Watts)}$$



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4.2.3 TEST INSTRUMENTS

Test date: Nov. 09 to 10, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Agilent Spectrum Analyzer	E4446A	MY48250253	Aug. 29, 2011	Aug. 28, 2012
Agilent Pre-Selector	N9039A	MY46520310	Aug. 29, 2011	Aug. 28, 2012
Agilent Signal Generator	N5181A	MY49060347	July 25, 2011	July 24, 2012
Mini-Circuits Pre-Amplifier	ZFL-1000VH2B	AMP-ZFL-04	Nov. 16, 2010	Nov. 15, 2011
Agilent Pre-Amplifier	8449B	3008A02465	Feb. 28, 2011	Feb. 27, 2012
Miteq Pre-Amplifier	AFS33-1800265 0-30-8P-44	881786	Nov. 16, 2010	Nov. 15, 2011
SCHWARZBECK Trilog Broadband Antenna	VULB 9168	9168-361	Apr. 14, 2011	Apr. 13, 2012
AISI Horn_Antenna	AIH.8018	0000220091110	Nov. 22, 2010	Nov. 21, 2011
SCHWARZBECK Horn_Antenna	BBHA 9170	9170-424	Oct. 07, 2011	Oct. 06, 2012
RF CABLE	NA	RF104-205 RF104-207 RF104-202	Dec. 28, 2010	Dec. 27, 2011
RF Cable	NA	CHHCAB_001	Oct. 08, 2011	Oct. 07, 2012
Software	ADT_Radiated_ V8.7.05	NA	NA	NA
CT Antenna Tower & Turn Table	NA	NA	NA	NA

- Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in 966 Chamber No. H.
4. The FCC Site Registration No. is 797305.
5. The CANADA Site Registration No. is IC 7450H-3.

4.2.4 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meters chamber test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

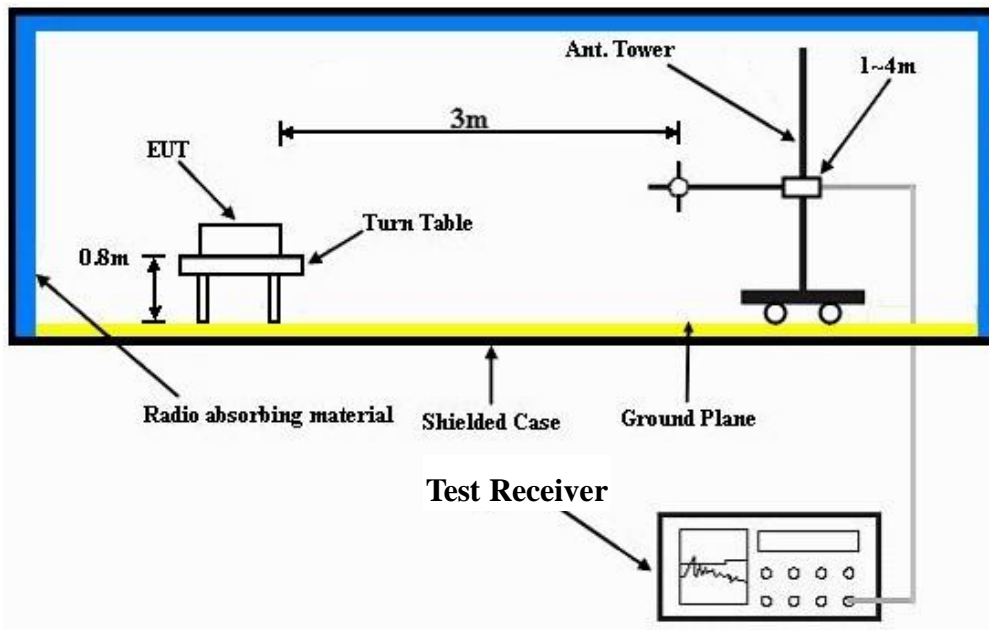
NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.

4.2.5 DEVIATION FROM TEST STANDARD

No deviation

4.2.6 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.2.7 EUT OPERATING CONDITION

1. Connect the EUT with the support unit 1 (Notebook Computer) which is placed on a testing table.
2. The communication partner run test program “artgui.exe” to enable EUT under transmission/receiving condition continuously at specific channel frequency.

4.2.8 TEST RESULTS

BELOW 1GHz WORST-CASE DATA : 802.11n (20MHz) OFDM MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 36	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	24deg. C, 67%RH	TESTED BY	Nelson Teng

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	91.64	36.7 QP	43.5	-6.8	1.25 H	360	28.13	8.58
2	177.00	37.4 QP	43.5	-6.1	1.00 H	90	24.20	13.23
3	433.55	37.8 QP	46.0	-8.2	1.90 H	22	19.31	18.48
4	496.53	40.1 QP	46.0	-5.9	1.50 H	40	20.13	19.98
5	600.55	42.6 QP	46.0	-3.4	1.00 H	285	20.35	22.25
6	793.46	41.5 QP	46.0	-4.5	1.25 H	11	16.14	25.40
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	36.44	31.4 QP	40.0	-8.6	1.00 V	360	17.81	13.63
2	299.53	32.5 QP	46.0	-13.5	1.00 V	330	17.16	15.38
3	365.70	34.1 QP	46.0	-11.9	1.75 V	199	17.25	16.88
4	428.90	36.9 QP	46.0	-9.1	1.25 V	250	18.57	18.37
5	794.83	42.6 QP	46.0	-3.4	1.75 V	0	17.21	25.43
6	955.37	40.6 QP	46.0	-5.4	1.50 V	150	12.88	27.74

- REMARKS:**
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
 2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.



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ABOVE 1GHz WORST-CASE DATA

802.11a OFDM MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 36	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 63%RH	TESTED BY	Nick Chang

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	61.7 PK	74.0	-12.3	2.00 H	242	19.98	41.72
2	5150.00	47.8 AV	54.0	-6.2	2.00 H	242	6.08	41.72
3	*5180.00	99.3 PK			2.00 H	242	57.54	41.76
4	*5180.00	89.3 AV			2.00 H	242	47.54	41.76
5	#10360.00	58.1 PK	68.3	-10.2	1.42 H	40	9.58	48.52
6	15540.00	61.9 PK	74.0	-12.1	1.32 H	153	7.83	54.07
7	15540.00	49.5 AV	54.0	-4.5	1.32 H	153	-4.57	54.07

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	67.2 PK	74.0	-6.8	1.17 V	76	25.48	41.72
2	5150.00	50.6 AV	54.0	-3.4	1.17 V	76	8.88	41.72
3	*5180.00	112.2 PK			1.05 V	273	70.44	41.76
4	*5180.00	103.0 AV			1.05 V	273	61.24	41.76
5	#10360.00	63.8 PK	68.3	-4.5	1.46 V	86	15.28	48.52
6	15540.00	61.9 PK	74.0	-12.1	1.00 V	101	7.83	54.07
7	15540.00	49.4 AV	54.0	-4.6	1.00 V	101	-4.67	54.07

- REMARKS:**
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
 2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. “ * “: Fundamental frequency.
 6. "#":The radiated frequency is out the restricted band.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 40	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 63%RH	TESTED BY	Nick Chang

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	98.9 PK			1.99 H	246	57.12	41.78
2	*5200.00	89.1 AV			1.99 H	246	47.32	41.78
3	#10400.00	58.0 PK	68.3	-10.3	1.40 H	25	9.32	48.68
4	15600.00	62.0 PK	74.0	-12.0	1.29 H	147	8.42	53.58
5	15600.00	49.3 AV	54.0	-4.7	1.29 H	147	-4.28	53.58
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	111.8 PK			1.11 V	275	70.02	41.78
2	*5200.00	102.5 AV			1.11 V	275	60.72	41.78
3	#10400.00	63.6 PK	68.3	-4.7	1.47 V	75	14.92	48.68
4	15600.00	61.3 PK	74.0	-12.7	1.03 V	85	7.72	53.58
5	15600.00	49.2 AV	54.0	-4.8	1.03 V	85	-4.38	53.58

- REMARKS:**
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
 2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. “ * “: Fundamental frequency.
 6. “#”:The radiated frequency is out the restricted band.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 48	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 63%RH	TESTED BY	Nick Chang

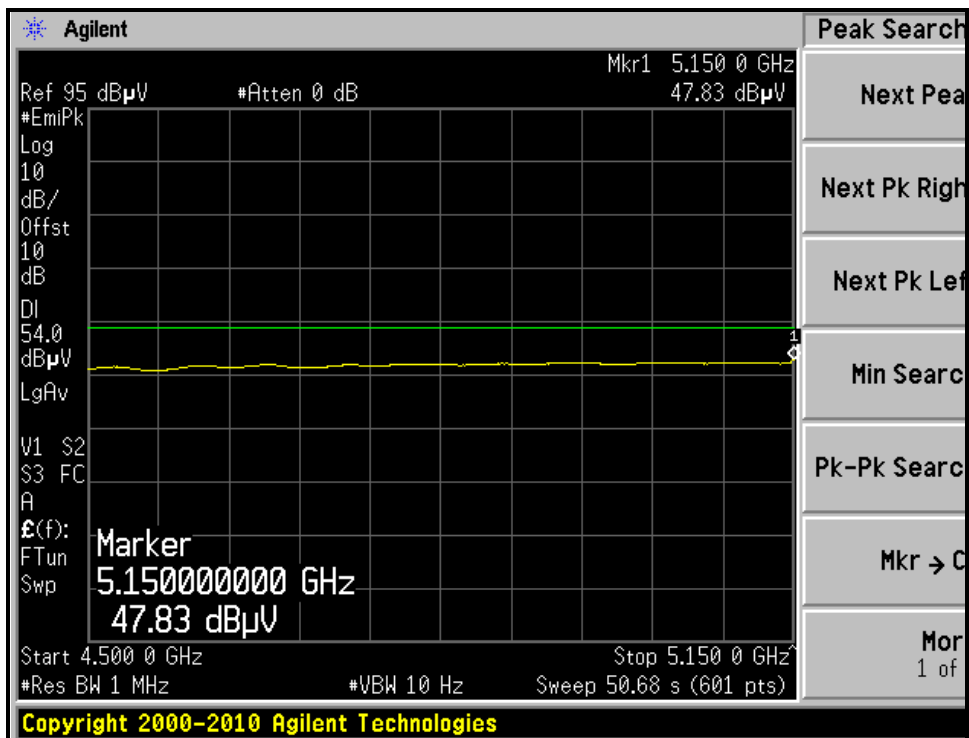
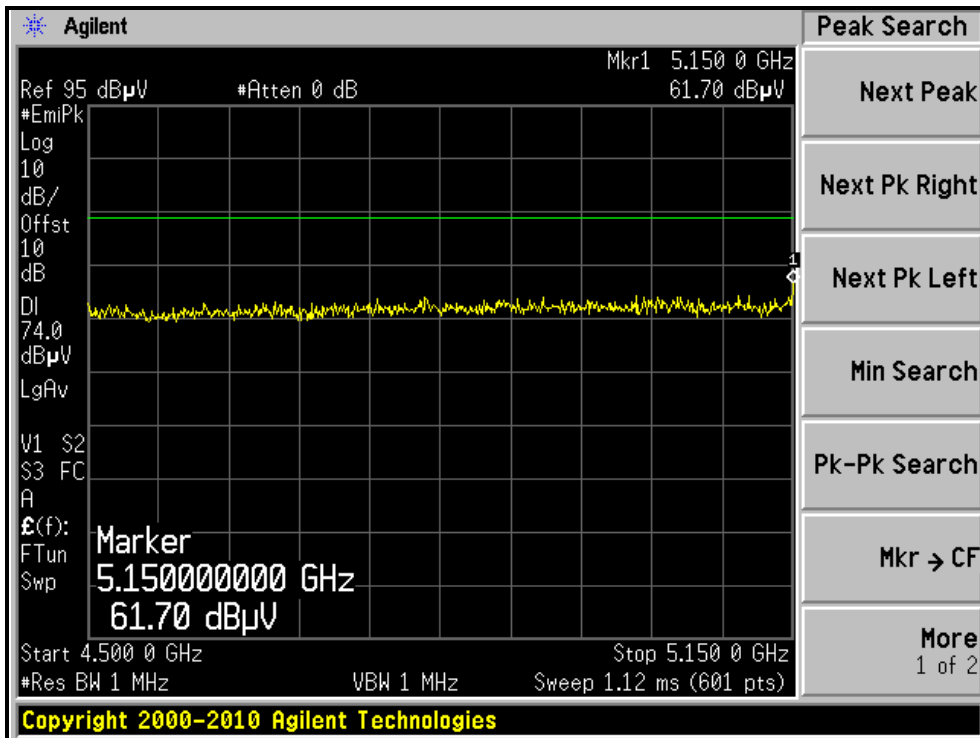
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NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	99.1 PK			1.94 H	241	57.23	41.87
2	*5240.00	88.7 AV			1.94 H	241	46.83	41.87
3	5403.50	59.9 PK	74.0	-14.1	1.94 H	241	17.72	42.18
4	5403.50	47.8 AV	54.0	-6.2	1.94 H	241	5.62	42.18
5	#10480.00	58.3 PK	68.3	-10.0	1.46 H	26	9.68	48.62
6	15720.00	61.5 PK	74.0	-12.5	1.35 H	28	7.64	53.86
7	15720.00	49.4 AV	54.0	-4.6	1.35 H	28	-4.46	53.86
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	113.2 PK			1.11 V	274	71.33	41.87
2	*5240.00	103.6 AV			1.11 V	274	61.73	41.87
3	5399.00	58.5 PK	74.0	-15.5	1.11 V	278	16.32	42.18
4	5399.00	48.4 AV	54.0	-5.6	1.11 V	278	6.22	42.18
5	#10480.00	63.4 PK	68.3	-4.9	1.50 V	91	14.78	48.62
6	15720.00	63.3 PK	74.0	-10.7	1.00 V	99	9.44	53.86
7	15720.00	49.4 AV	54.0	-4.6	1.00 V	99	-4.46	53.86

- REMARKS:**
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
 2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. “ * “: Fundamental frequency.
 6. “#“: The radiated frequency is out the restricted band.



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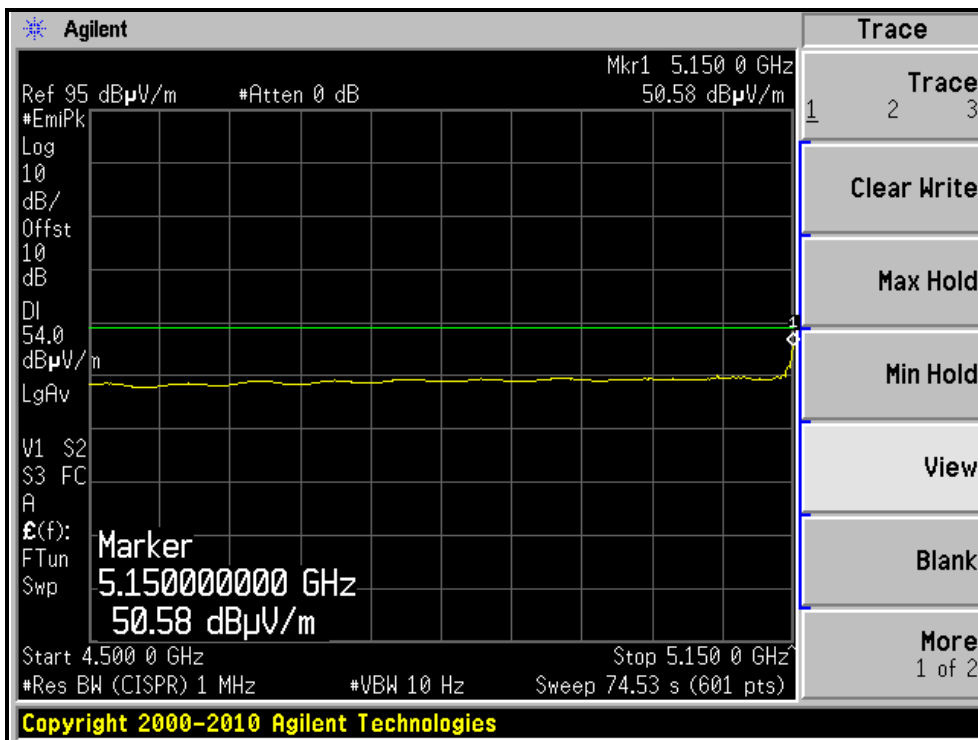
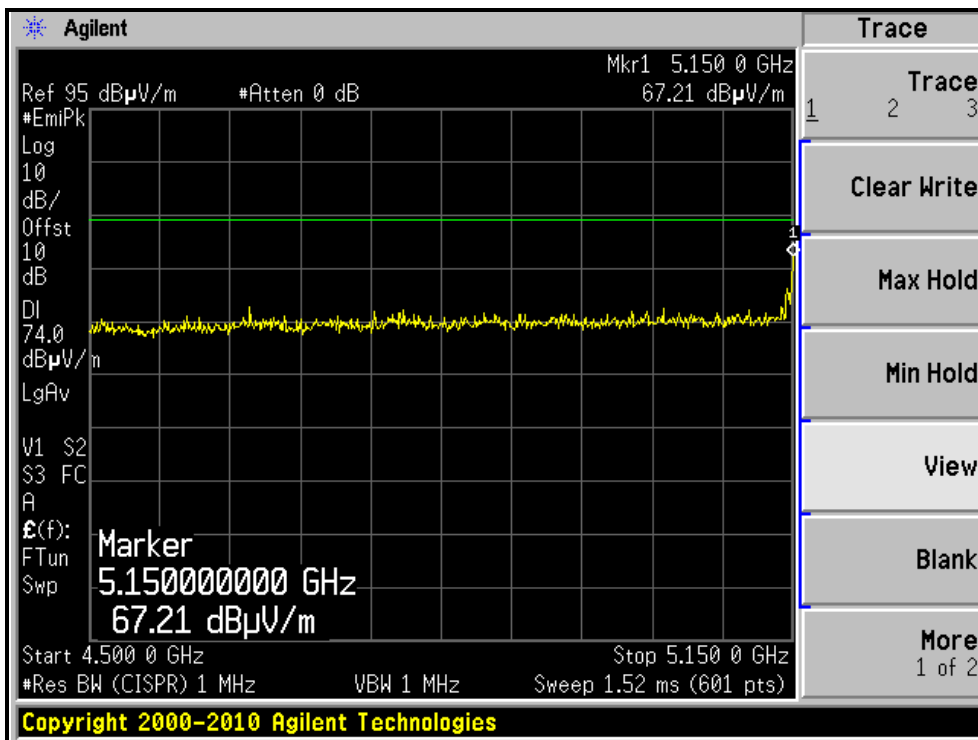
RESTRICTED BANDEDGE (802.11a MODE, CH36, HORIZONTAL)





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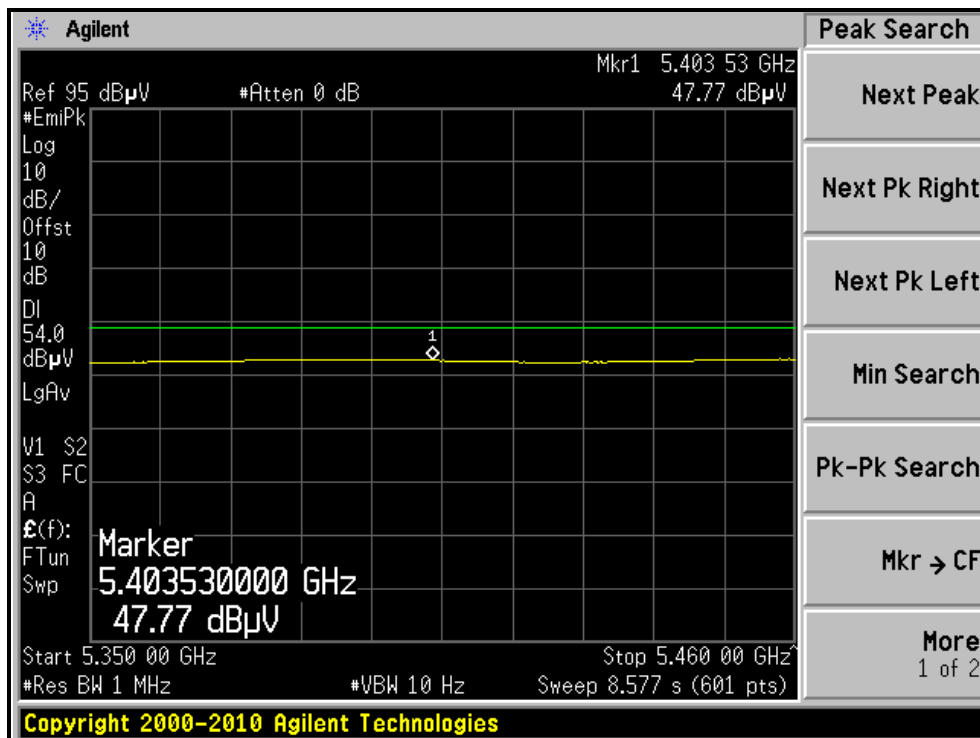
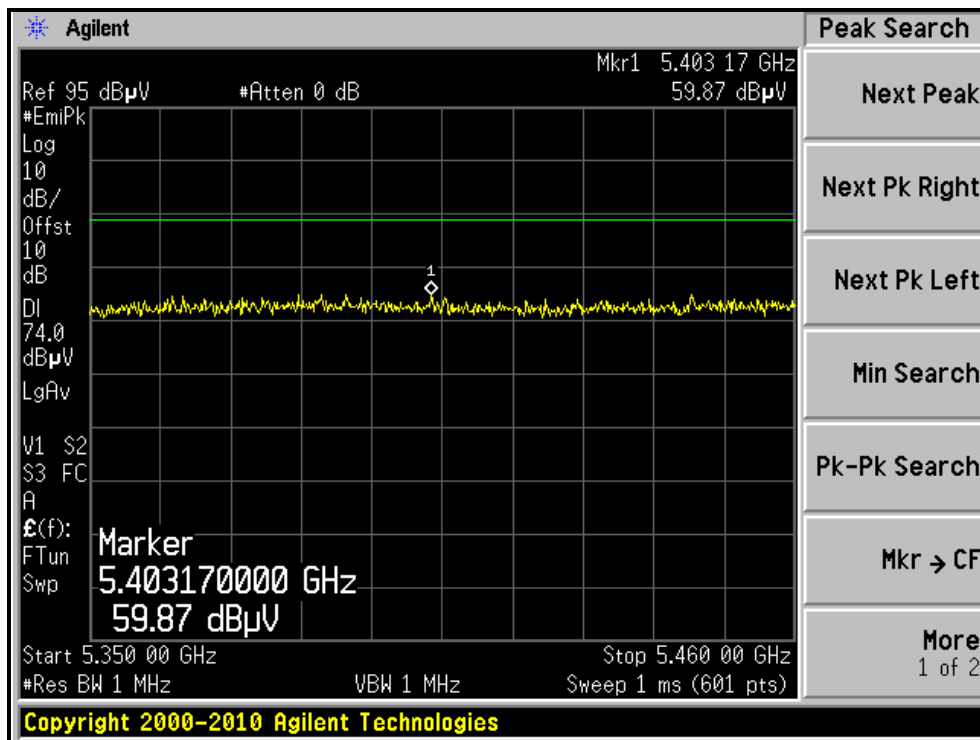
RESTRICTED BANDEDGE (802.11a MODE, CH36, VERTICAL)



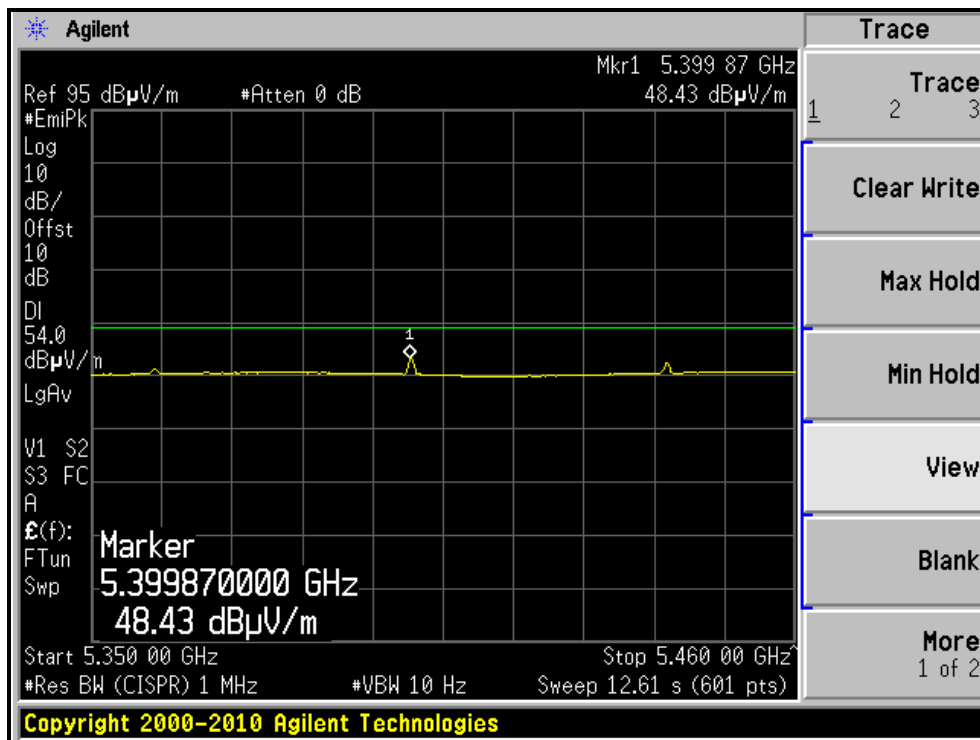
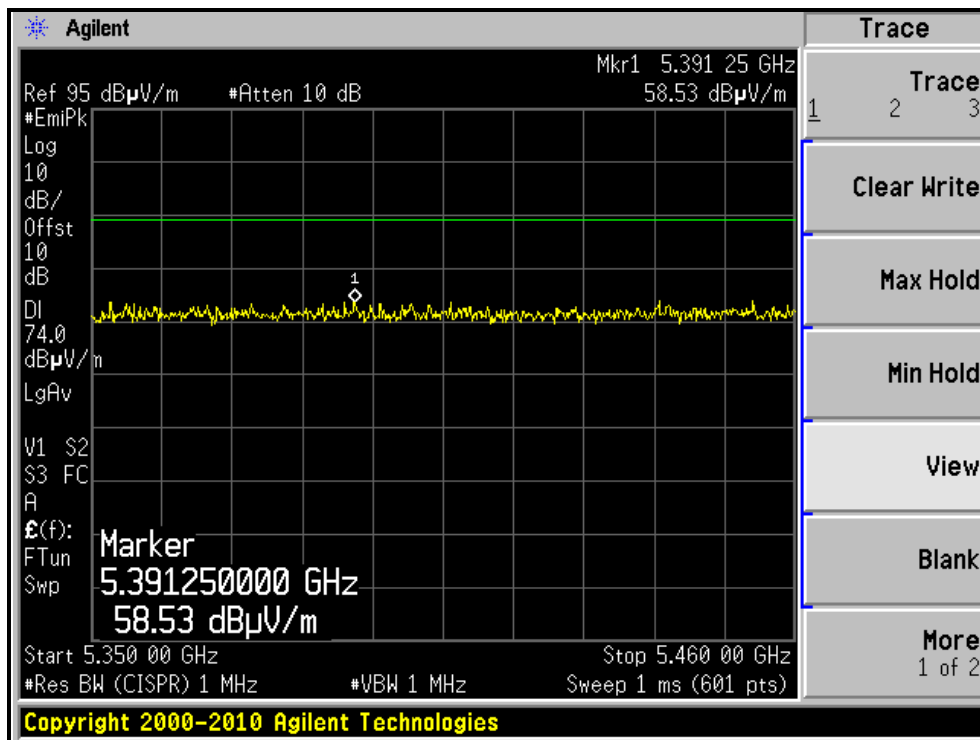


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RESTRICTED BANDEDGE (802.11a MODE, CH48, HORIZONTAL)



RESTRICTED BANDEDGE (802.11a MODE, CH48, VERTICAL)





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802.11n (20MHz) OFDM MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 36	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 63%RH	TESTED BY	Nick Chang

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5147.00	60.7 PK	74.0	-13.3	1.59 H	230	18.98	41.72
2	5147.00	47.3 AV	54.0	-6.7	1.59 H	230	5.58	41.72
3	*5180.00	99.6 PK			1.59 H	230	57.84	41.76
4	*5180.00	89.6 AV			1.59 H	230	47.84	41.76
5	#10360.00	57.9 PK	68.3	-10.4	1.45 H	22	9.38	48.52
6	15540.00	61.3 PK	74.0	-12.7	1.30 H	33	7.23	54.07
7	15540.00	49.3 AV	54.0	-4.7	1.30 H	33	-4.77	54.07

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	68.0 PK	74.0	-6.0	1.15 V	255	26.28	41.72
2	5150.00	53.1 AV	54.0	-0.9	1.15 V	255	11.38	41.72
3	*5180.00	112.8 PK			1.13 V	276	71.04	41.76
4	*5180.00	103.7 AV			1.13 V	276	61.94	41.76
5	#10360.00	61.1 PK	68.3	-7.2	1.27 V	83	12.58	48.52
6	15540.00	61.5 PK	74.0	-12.5	1.00 V	103	7.43	54.07
7	15540.00	49.4 AV	54.0	-4.6	1.00 V	103	-4.67	54.07

- REMARKS:**
- Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
 - Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 - The other emission levels were very low against the limit.
 - Margin value = Emission level – Limit value.
 - * *: Fundamental frequency.
 - # #: The radiated frequency is out the restricted band.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 40	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 63%RH	TESTED BY	Nick Chang

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	99.5 PK			1.55 H	229	57.72	41.78
2	*5200.00	89.4 AV			1.55 H	229	47.62	41.78
3	#10400.00	58.3 PK	68.3	-10.0	1.40 H	9	9.62	48.68
4	15600.00	61.4 PK	74.0	-12.6	1.29 H	13	7.82	53.58
5	15600.00	49.7 AV	54.0	-4.3	1.29 H	13	-3.88	53.58
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	113.3 PK			1.13 V	275	71.52	41.78
2	*5200.00	103.8 AV			1.13 V	275	62.02	41.78
3	#10400.00	61.3 PK	68.3	-7.0	1.31 V	91	12.62	48.68
4	15600.00	61.6 PK	74.0	-12.4	1.07 V	102	8.02	53.58
5	15600.00	50.8 AV	54.0	-3.2	1.07 V	102	-2.78	53.58

- REMARKS:**
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
 2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. “ * “: Fundamental frequency.
 6. “ # “: The radiated frequency is out the restricted band.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 48	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 63%RH	TESTED BY	Nick Chang

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	98.8 PK			1.60 H	231	56.93	41.87
2	*5240.00	88.2 AV			1.60 H	231	46.33	41.87
3	5381.90	59.9 PK	74.0	-14.1	1.60 H	231	17.75	42.15
4	5381.90	47.5 AV	54.0	-6.5	1.60 H	231	5.35	42.15
5	#10480.00	58.5 PK	68.3	-9.8	1.43 H	35	9.88	48.62
6	15720.00	61.6 PK	74.0	-12.4	1.33 H	157	7.74	53.86
7	15720.00	49.2 AV	54.0	-4.8	1.33 H	157	-4.66	53.86

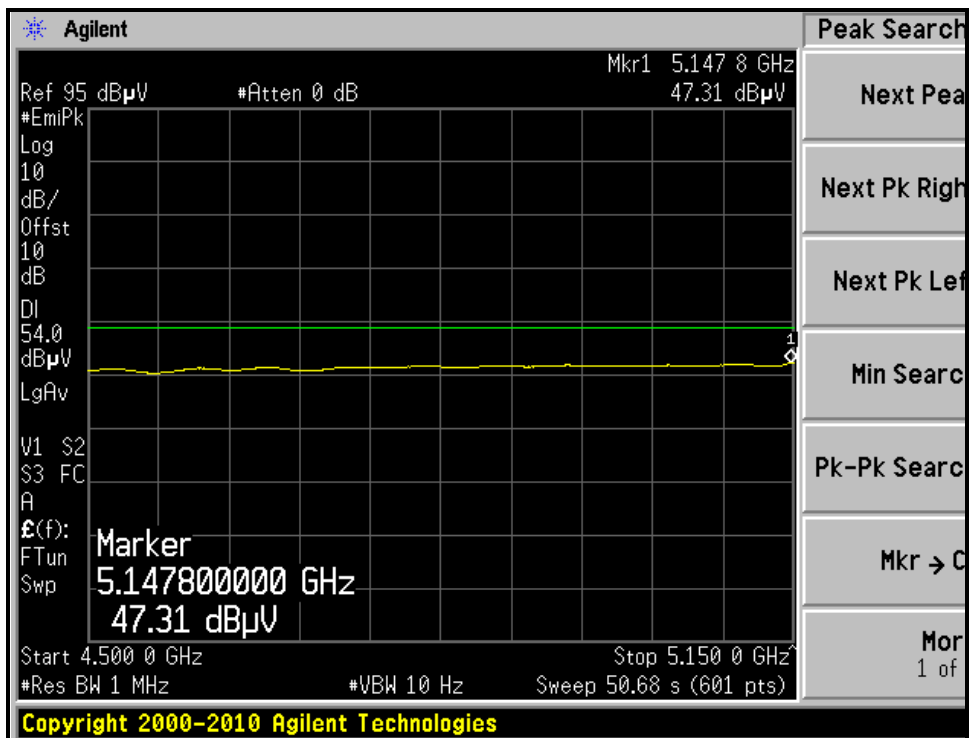
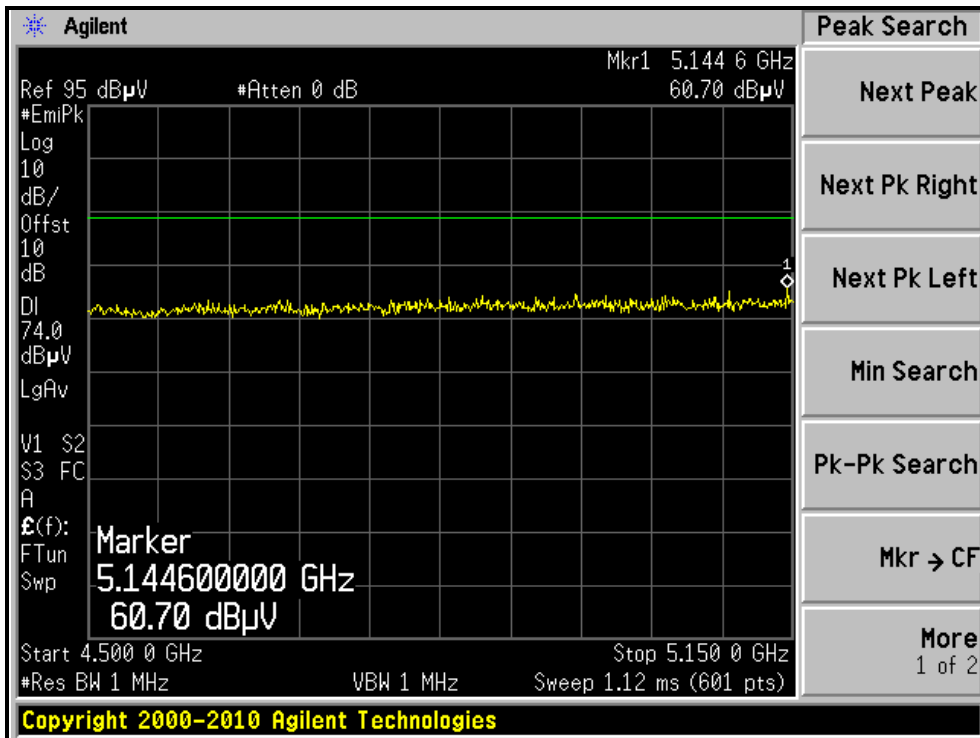
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NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	112.4 PK			1.14 V	274	70.53	41.87
2	*5240.00	103.2 AV			1.14 V	274	61.33	41.87
3	5399.00	58.6 PK	74.0	-15.4	1.13 V	275	16.42	42.18
4	5399.00	48.5 AV	54.0	-5.5	1.13 V	275	6.32	42.18
5	#10480.00	61.4 PK	68.3	-6.9	1.26 V	105	12.78	48.62
6	15720.00	61.9 PK	74.0	-12.1	1.02 V	98	8.04	53.86
7	15720.00	51.3 AV	54.0	-2.7	1.02 V	98	-2.56	53.86

- REMARKS:**
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
 2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. “ * “: Fundamental frequency.
 6. “ # “: The radiated frequency is out the restricted band.

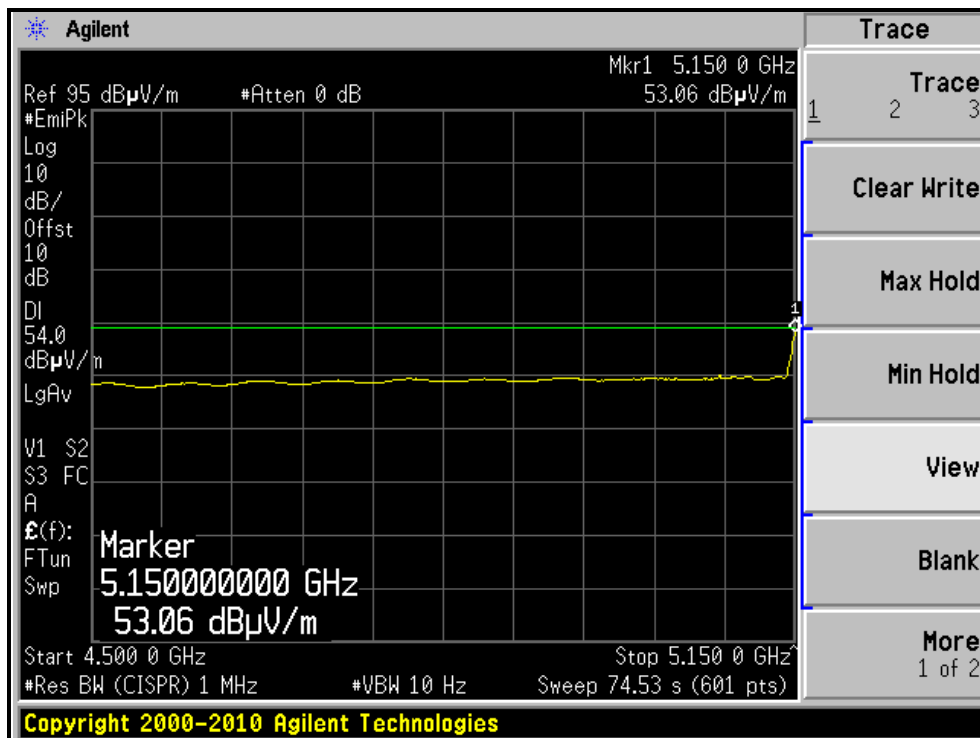
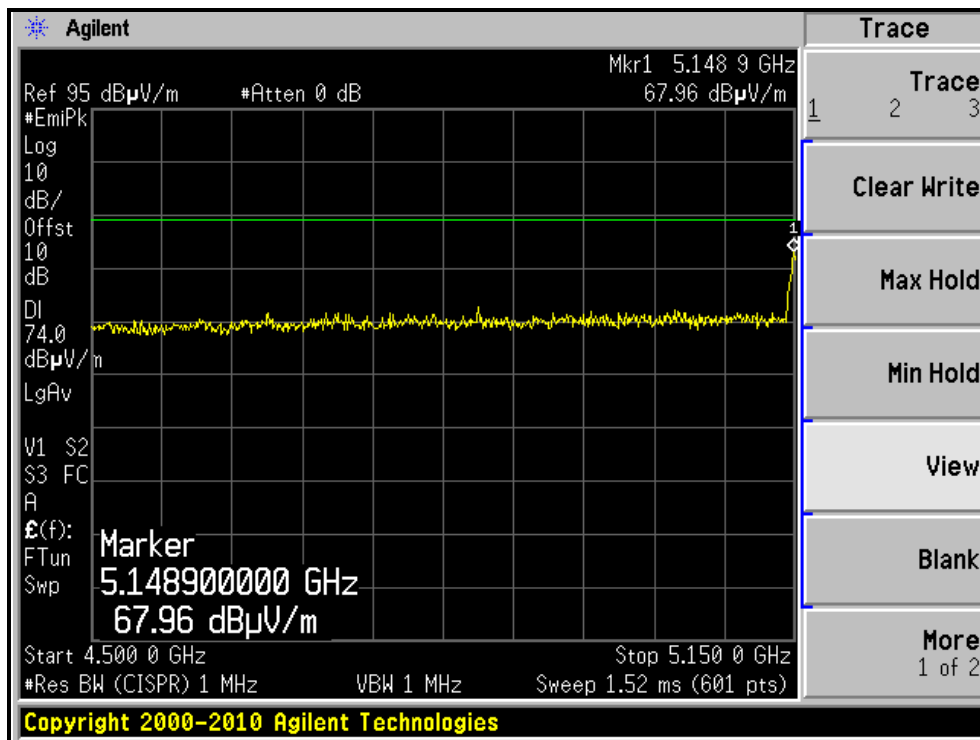


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RESTRICTED BANDEDGE (802.11n (20MHz) MODE,CH36, HORIZONTAL)



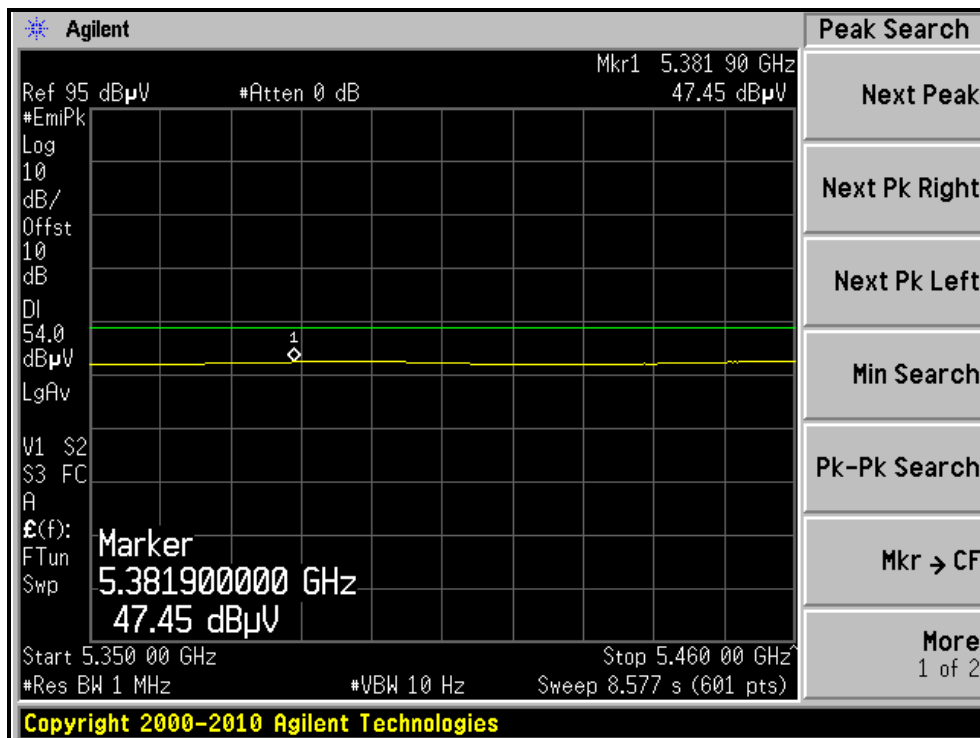
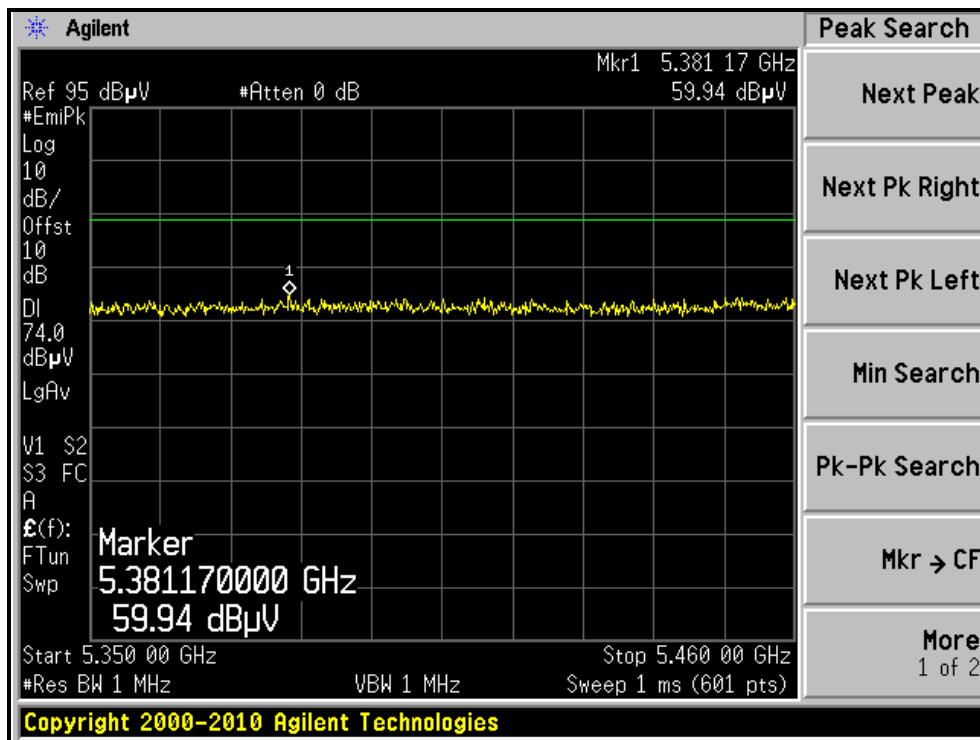
RESTRICTED BANDEDGE (802.11n (20MHz) MODE,CH36, VERTICAL)





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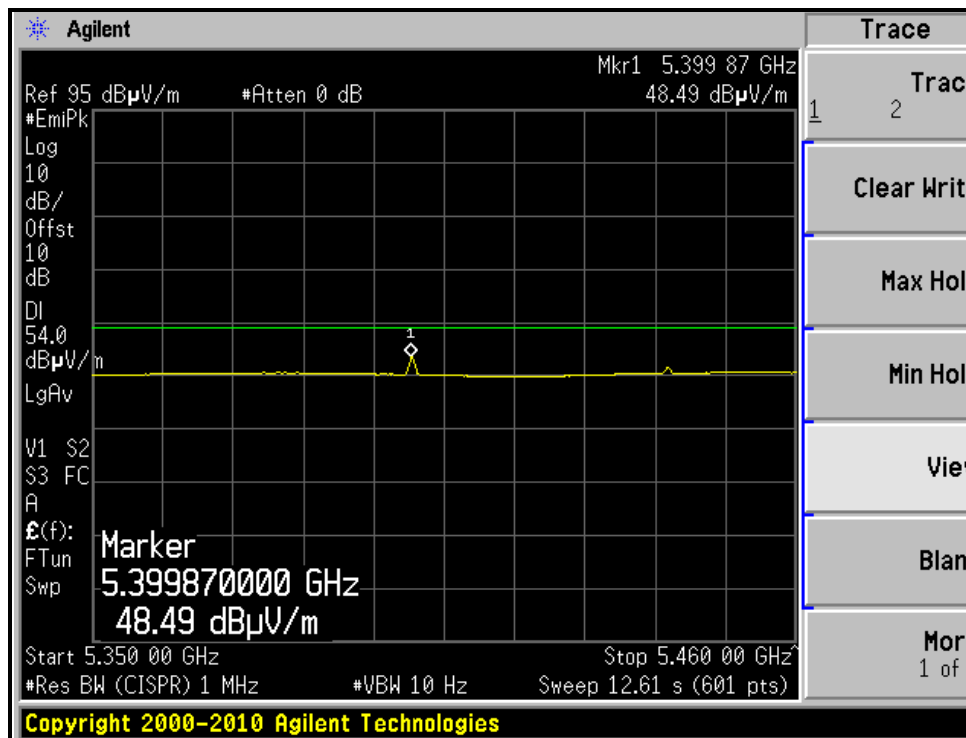
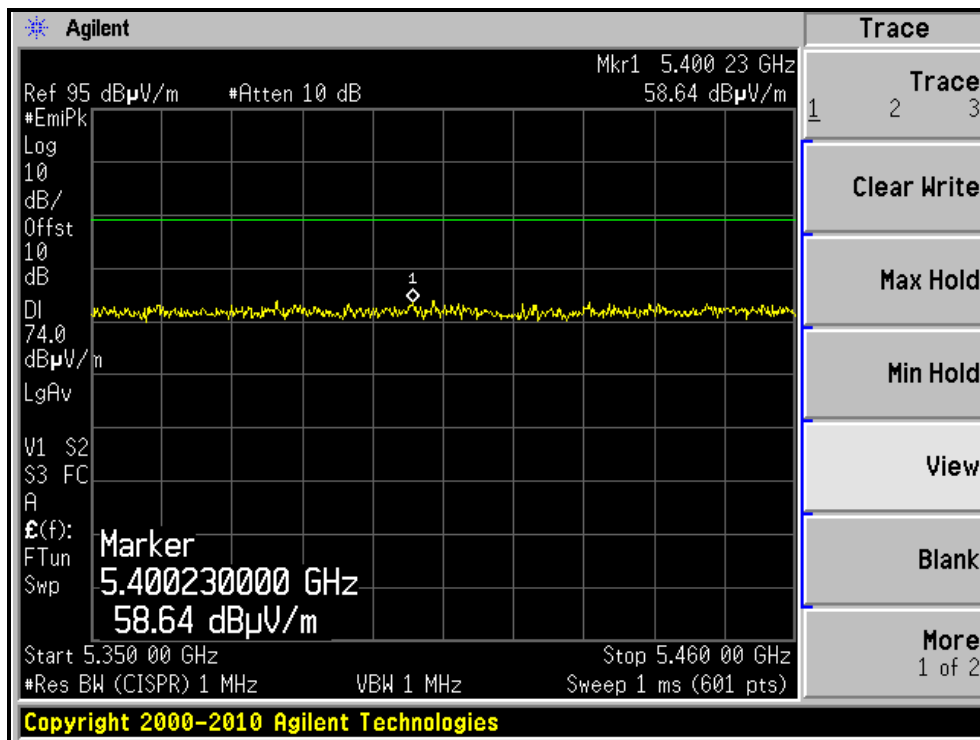
RESTRICTED BANDEDGE (802.11n (20MHz) MODE,CH48, HORIZONTAL)





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RESTRICTED BANDEDGE (802.11n (20MHz) MODE,CH48, VERTICAL)





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802.11n (40MHz) OFDM MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 38	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 63%RH	TESTED BY	Nick Chang

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	59.8 PK	74.0	-14.2	1.57 H	222	18.08	41.72
2	5150.00	47.2 AV	54.0	-6.8	1.57 H	222	5.48	41.72
3	*5190.00	85.5 PK			1.57 H	222	43.73	41.77
4	*5190.00	75.3 AV			1.57 H	222	33.53	41.77
5	#10380.00	56.3 PK	68.3	-12.0	1.39 H	28	7.70	48.60
6	15570.00	62.0 PK	74.0	-12.0	1.31 H	145	8.18	53.82
7	15570.00	49.0 AV	54.0	-5.0	1.31 H	145	-4.82	53.82

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	65.2 PK	74.0	-8.8	1.07 V	252	23.48	41.72
2	5150.00	52.1 AV	54.0	-1.9	1.07 V	252	10.38	41.72
3	*5190.00	103.9 PK			1.12 V	269	62.13	41.77
4	*5190.00	94.5 AV			1.12 V	269	52.73	41.77
5	#10380.00	63.1 PK	68.3	-5.2	1.44 V	85	14.50	48.60
6	15570.00	61.7 PK	74.0	-12.3	1.00 V	101	7.88	53.82
7	15570.00	49.4 AV	54.0	-4.6	1.00 V	101	-4.42	53.82

- REMARKS:**
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
 2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. “ * “: Fundamental frequency.
 6. "#":The radiated frequency is out the restricted band.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 46	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 63%RH	TESTED BY	Nick Chang

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5230.00	95.7 PK			1.64 H	233	53.85	41.85
2	*5230.00	84.4 AV			1.64 H	233	42.55	41.85
3	5394.00	59.9 PK	74.0	-14.1	1.66 H	239	17.73	42.17
4	5394.00	47.9 AV	54.0	-6.1	1.66 H	239	5.73	42.17
5	#10460.00	59.1 PK	68.3	-9.2	1.43 H	31	10.47	48.63
6	15690.00	61.6 PK	74.0	-12.4	1.31 H	33	7.79	53.81
7	15690.00	49.8 AV	54.0	-4.2	1.31 H	33	-4.01	53.81

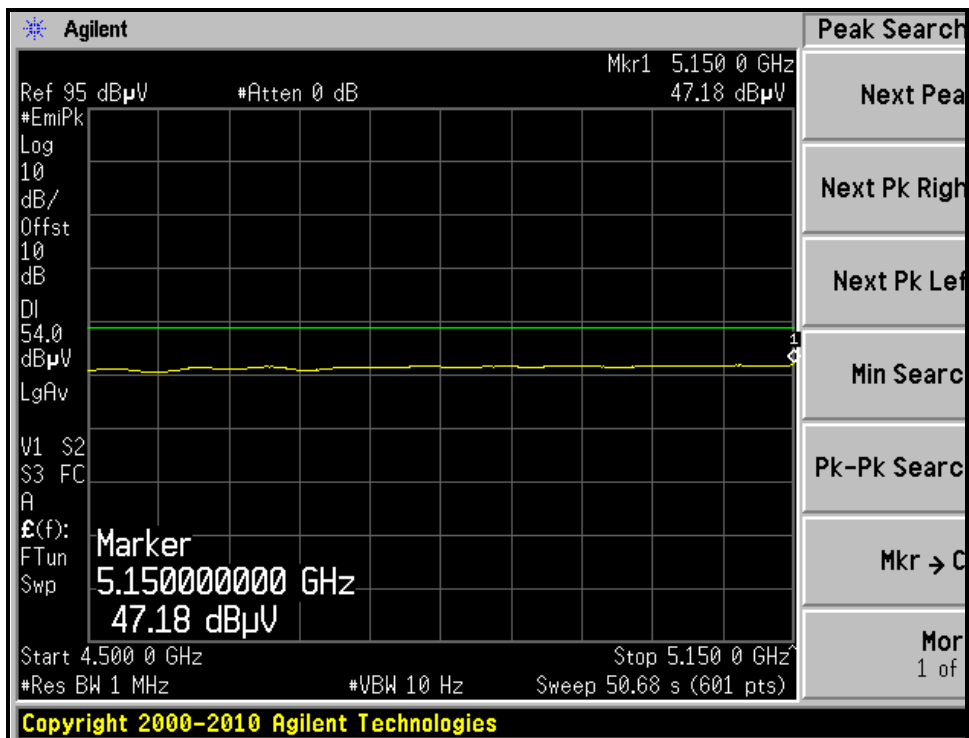
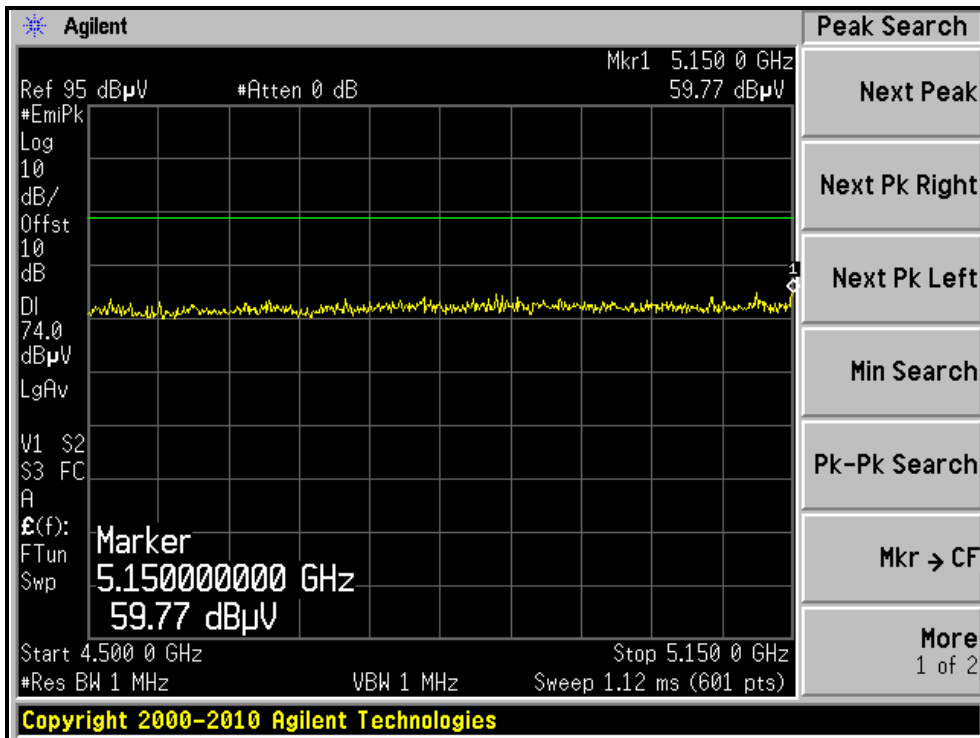
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5230.00	110.7 PK			1.14 V	243	68.85	41.85
2	*5230.00	101.5 AV			1.14 V	243	59.65	41.85
3	5399.00	57.2 PK	74.0	-16.8	1.13 V	245	15.02	42.18
4	5399.00	47.8 AV	54.0	-6.2	1.13 V	245	5.62	42.18
5	#10460.00	64.3 PK	68.3	-4.0	1.29 V	91	15.67	48.63
6	15690.00	62.7 PK	74.0	-11.3	1.00 V	107	8.89	53.81
7	15690.00	49.1 AV	54.0	-4.9	1.00 V	107	-4.71	53.81

- REMARKS:**
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
 2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. “ * “: Fundamental frequency.
 6. "#":The radiated frequency is out the restricted band.



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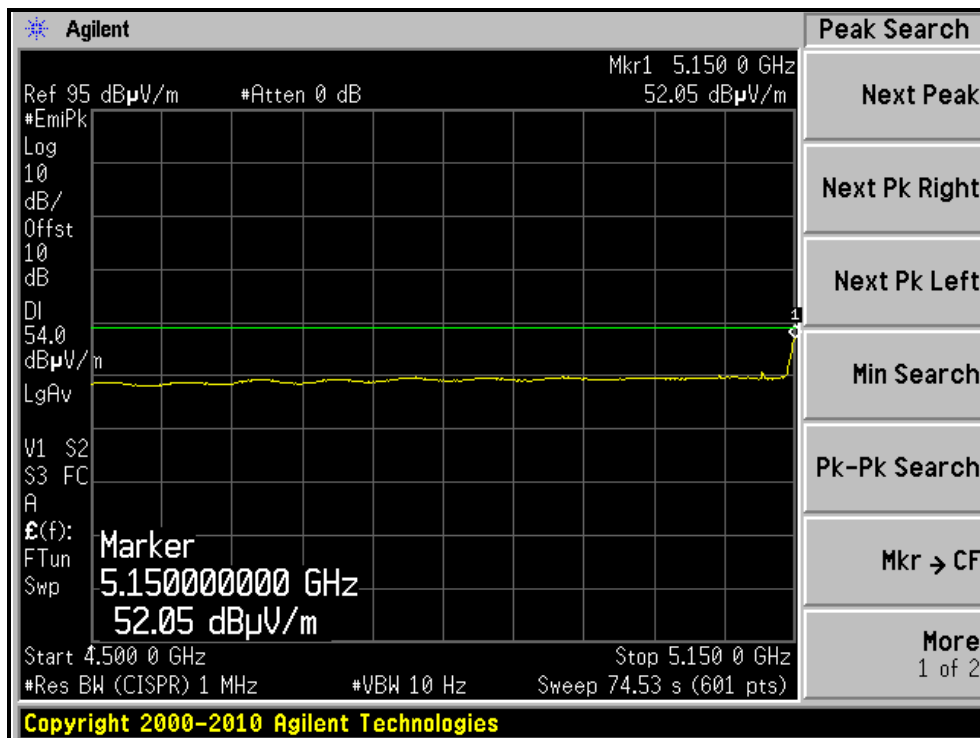
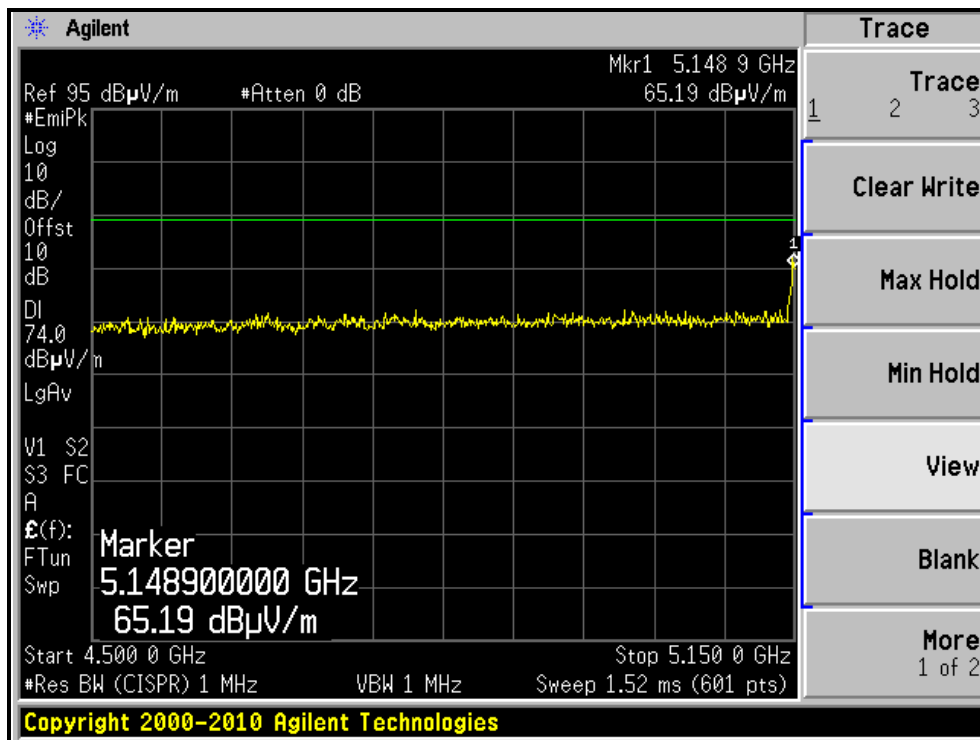
RESTRICTED BANDEDGE (802.11n (40MHz) MODE, CH38, HORIZONTAL)





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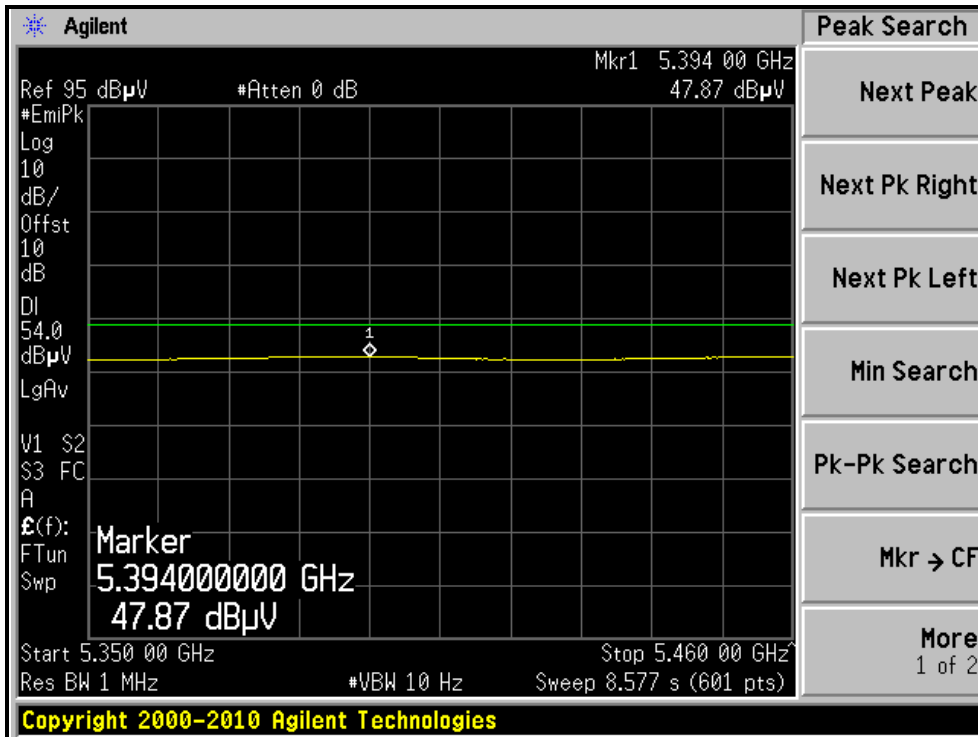
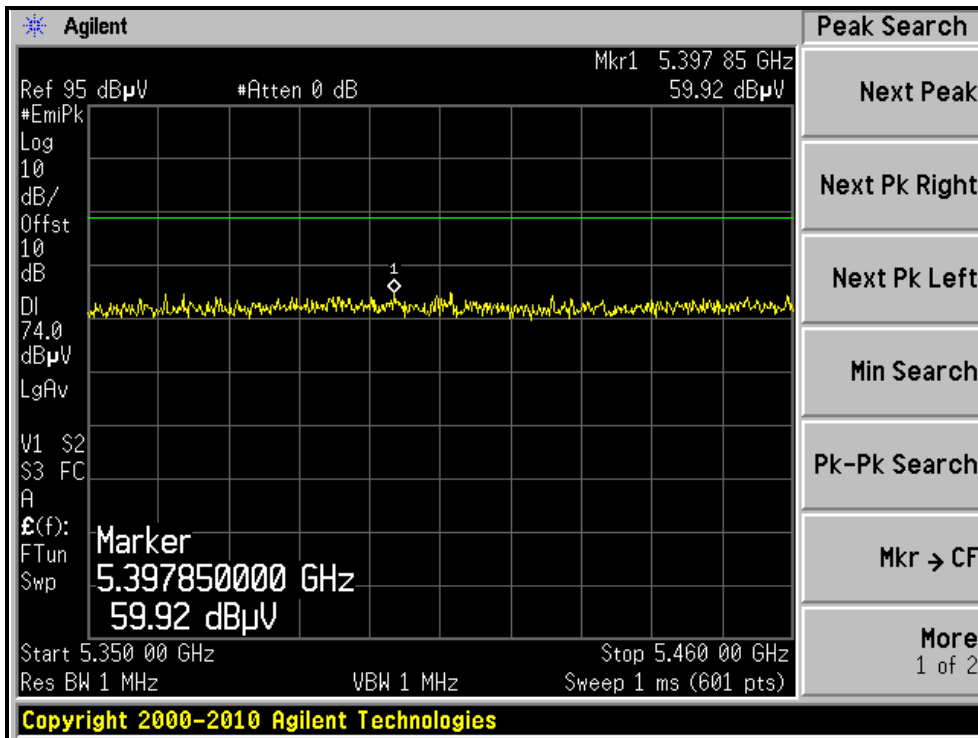
RESTRICTED BANDEDGE (802.11n (40MHz) MODE,CH38, VERTICAL)





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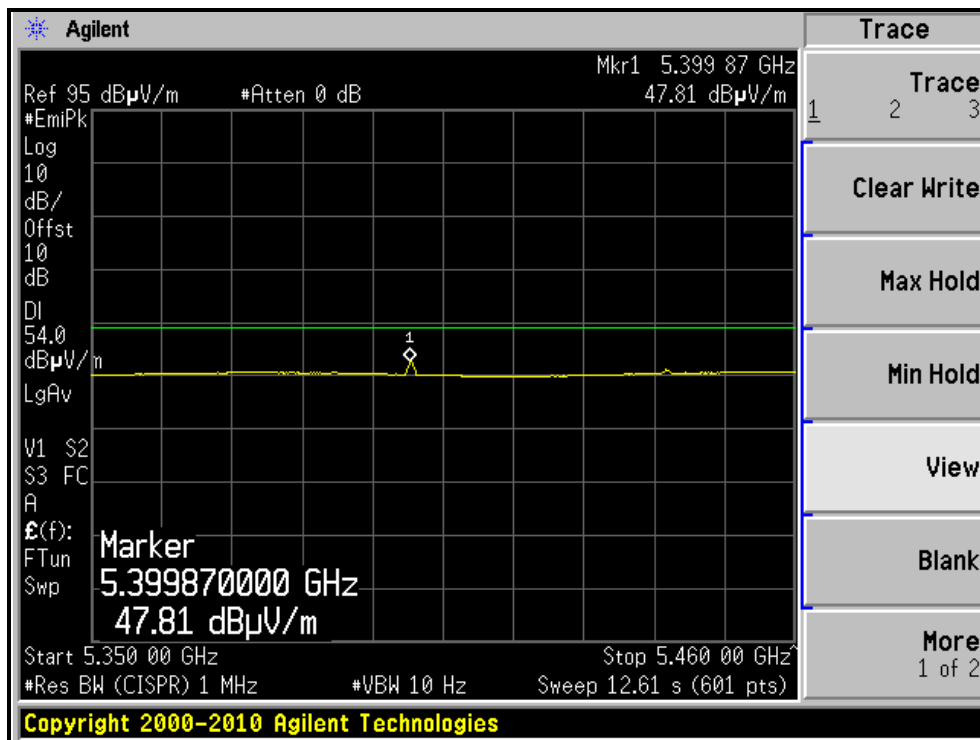
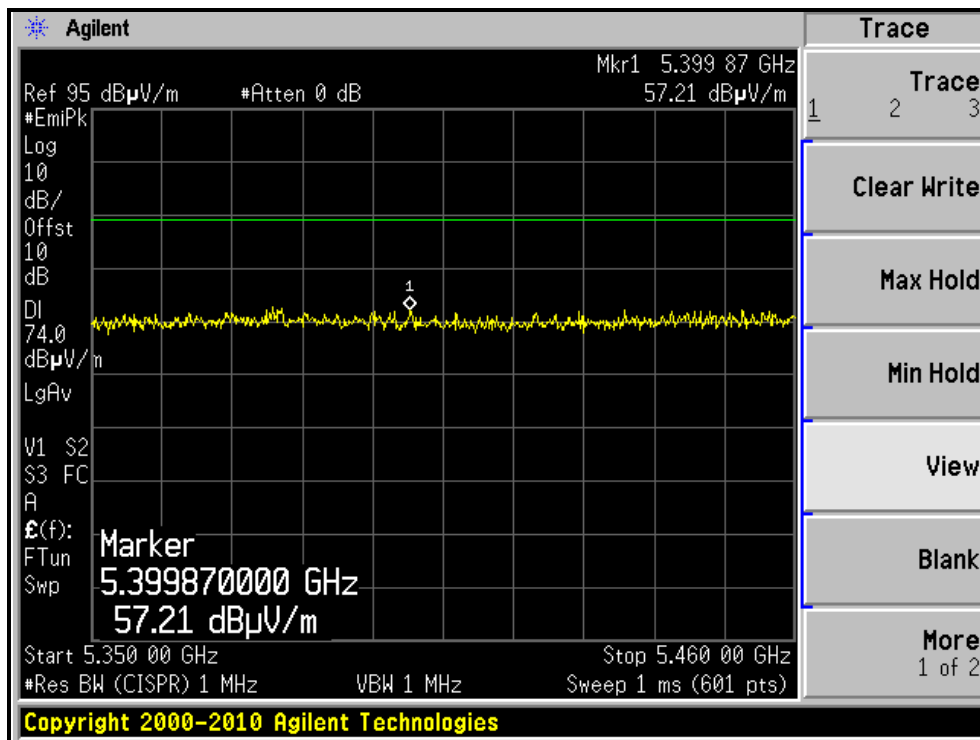
RESTRICTED BANDEDGE (802.11n (40MHz) MODE, CH46, HORIZONTAL)





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RESTRICTED BANDEDGE (802.11n (40MHz) MODE, CH46, VERTICAL)





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4.3 OUTPUT TRANSMIT POWER MEASUREMENT

4.3.1 LIMITS OF OUTPUT TRANSMIT POWER MEASUREMENT

Frequency Band	Limit
5.15 – 5.25GHz	The lesser of 50mW (17dBm) or 4dBm + 10logB
5.25 – 5.35GHz	The lesser of 250mW (24dBm) or 11dBm + 10logB
5.47 – 5.725GHz	The lesser of 250mW (24dBm) or 11dBm + 10logB
5.725 – 5.825GHz	The lesser of 1W (30dBm) or 17dBm + 10logB

NOTE: Where B is the 26dB emission bandwidth in MHz.

4.3.2 TEST INSTRUMENTS

FOR POWER OUTPUT MEASUREMENT

Test date: Nov. 19, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Peak Power Meter	ML2495A	0824006	May 04, 2011	May 03, 2012
Power Sensor	MA2411B	0738172	May 03, 2011	May 02, 2012

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

FOR 26dB OCCUPIED BANDWIDTH

Test date: Nov. 19, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer	E4446A	MY48250254	July 12, 2011	July 11, 2012

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.3.3 TEST PROCEDURE

FOR POWER OUTPUT MEASUREMENT

A power sensor was used on the output port of the EUT. A power meter was used to read the response of the power sensor. Record the power level.

FOR 26dB OCCUPIED BANDWIDTH

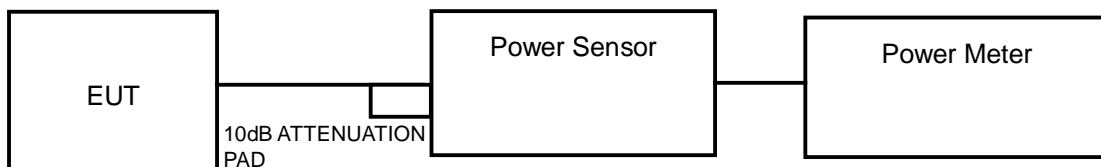
The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 300kHz RBW and 1MHz VBW. The 26dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 26dB.

4.3.4 DEVIATION FROM TEST STANDARD

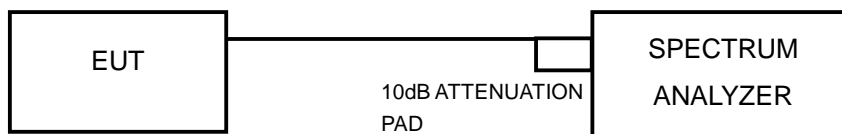
No deviation

4.3.5 TEST SETUP

FOR POWER OUTPUT MEASUREMENT



FOR 26dB OCCUPIED BANDWIDTH



4.3.6 EUT OPERATING CONDITIONS

The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.

4.3.7 TEST RESULTS

802.11a OFDM MODULATION:

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)		TOTAL PEAK POWER (mW)	TOTAL PEAK POWER (dBm)	PEAK POWER LIMIT (dBm)	PASS / FAIL
		CHAIN(0)	CHAIN(1)				
36	5180	10.4	10.2	21.4	13.3	15.5	PASS
40	5200	10.3	10.5	21.9	13.4	15.5	PASS
48	5240	10.7	10.0	21.7	13.4	15.5	PASS

Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2]$

Effective Legacy Gain (dBi) = 7.5

The effective legacy gain is 7.5dBi, therefore the limit needs to reduce.

802.11n (20MHz) OFDM MODULATION:

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)		TOTAL PEAK POWER (mW)	TOTAL PEAK POWER (dBm)	PEAK POWER LIMIT (dBm)	PASS / FAIL
		CHAIN(0)	CHAIN(1)				
36	5180	11.6	12.3	31.4	15.0	17	PASS
40	5200	11.7	12.1	31.0	14.9	17	PASS
48	5240	11.8	11.5	29.3	14.7	17	PASS

802.11n (40MHz) OFDM modulation:

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)		TOTAL PEAK POWER (mW)	TOTAL PEAK POWER (dBm)	PEAK POWER LIMIT (dBm)	PASS / FAIL
		CHAIN(0)	CHAIN(1)				
38	5190	6.2	7.0	9.2	9.6	17	PASS
46	5230	13.9	13.5	46.9	16.7	17	PASS

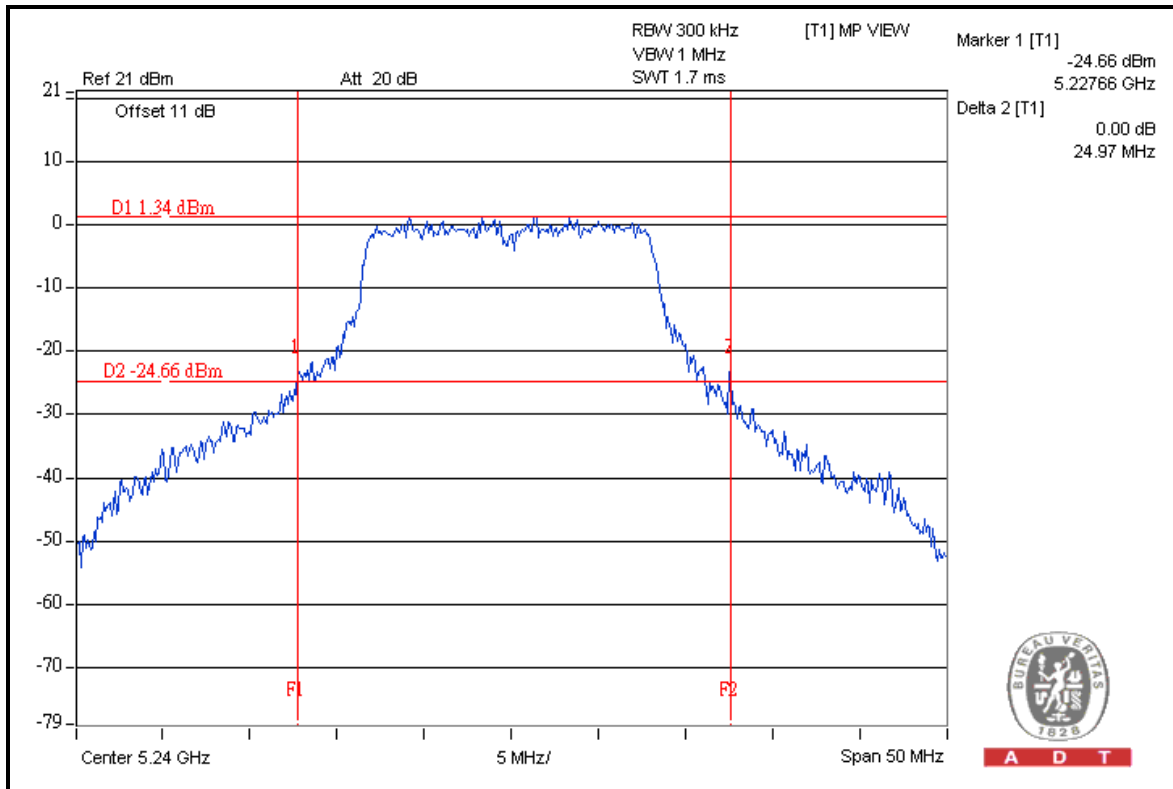


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26dB OCCUPIED BANDWIDTH: 802.11a

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc OCCUPIED BANDWIDTH (MHz)	
		CHAIN (0)	CHAIN (1)
36	5180	24.08	24.26
40	5200	23.72	23.17
48	5240	24.97	23.36

CHAIN (0)CH 48



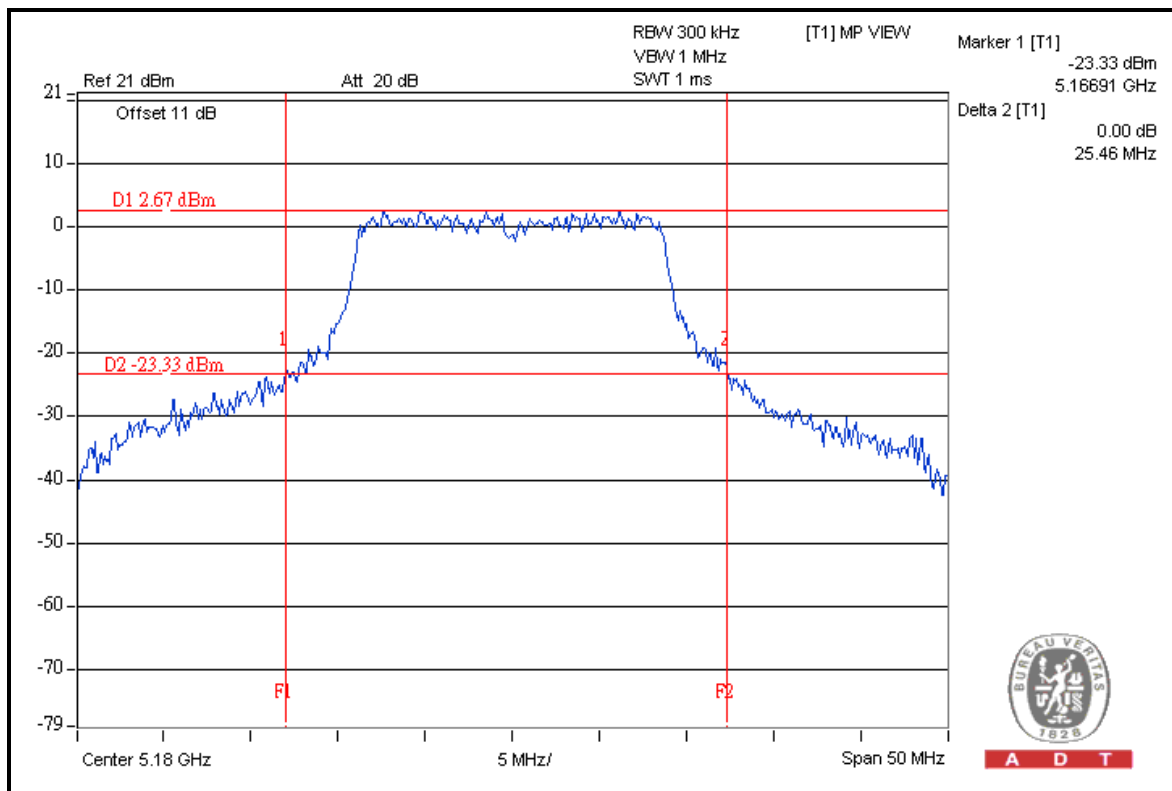


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802.11n (20MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc OCCUPIED BANDWIDTH (MHz)	
		CHAIN (0)	CHAIN (1)
36	5180	24.56	25.46
40	5200	25.29	25.19
48	5240	24.69	24.58

FOR CHAIN (1): CH 36



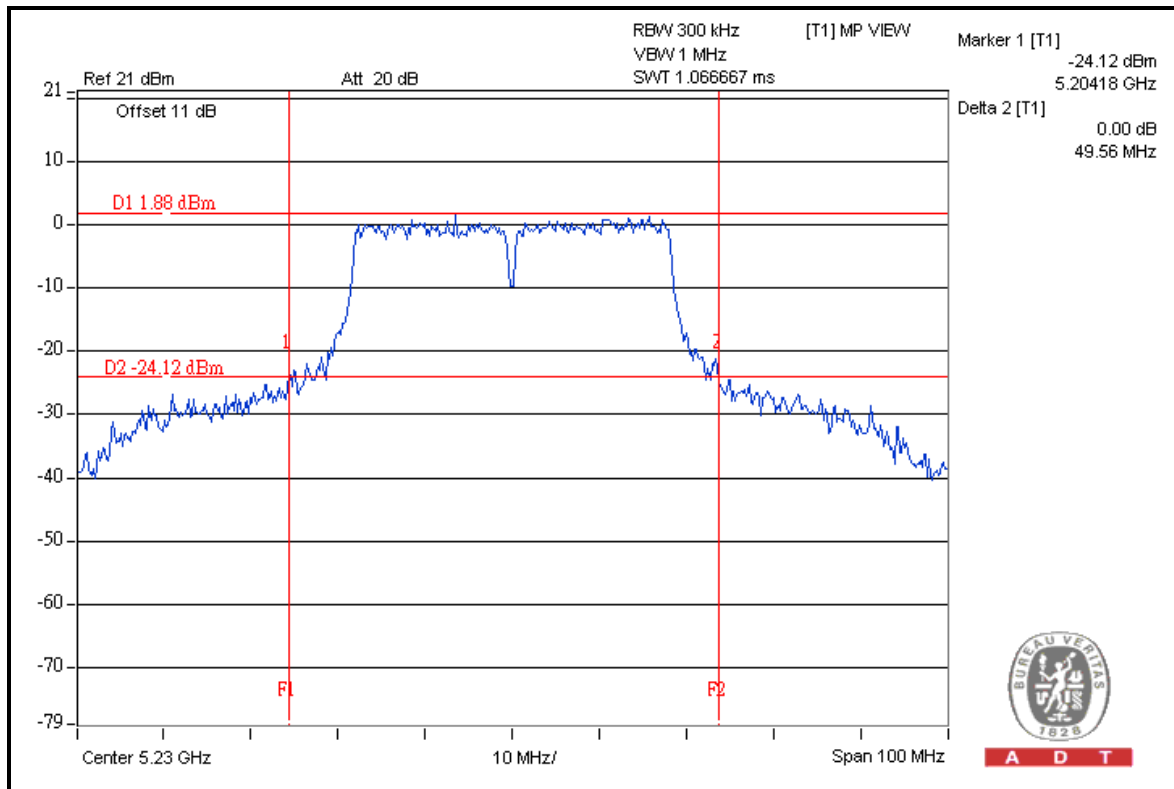


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802.11n (40MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc OCCUPIED BANDWIDTH (MHz)	
		CHAIN (0)	CHAIN (1)
38	5190	45.34	47.70
46	5230	49.56	47.65

FOR CHAIN (0): CH 46



4.4 PEAK POWER EXCURSION MEASUREMENT

4.4.1 LIMITS OF PEAK POWER EXCURSION MEASUREMENT

Frequency Band	Limit
5.15 – 5.25 GHz	13dB
5.25 – 5.35 GHz	13dB
5.47 – 5.725GHz	13dB
5.725 – 5.825 GHz	13dB

4.4.2 TEST INSTRUMENTS

Test date: Nov. 19, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer	E4446A	MY48250254	July 12, 2011	July 11, 2012

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

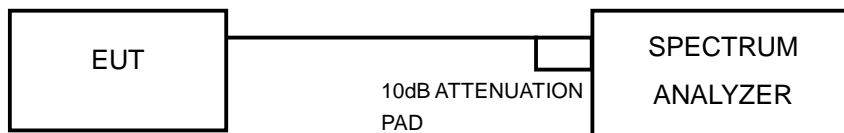
4.4.3 TEST PROCEDURE

1. Connect the cable from the spectrum analyzer to the EUT antenna port using an appropriate RF attenuator.
2. Verify the antenna port selected is the active one if the system has more than one antenna.
3. Verify the unlicensed wireless device is set to operate at 100 % duty cycle at the maximum allowed power for operation.
4. Testing shall be done on the center frequency of each U-NII band.
5. Set the spectrum analyzer span to view the entire emission bandwidth. The largest difference between the following two traces must be 13 dB for all frequencies across the emission bandwidth.
 - a. First trace: set RBW = 1 MHz, VBW = 3 MHz with peak detector and max hold settings.
 - b. Second trace: set RBW = 1 MHz, VBW = 3 MHz with sample detector and trace average across 100 traces in power averaging mode.

4.4.4 DEVIATION FROM TEST STANDARD

No deviation

4.4.5 TEST SETUP



4.4.6 EUT OPERATING CONDITIONS

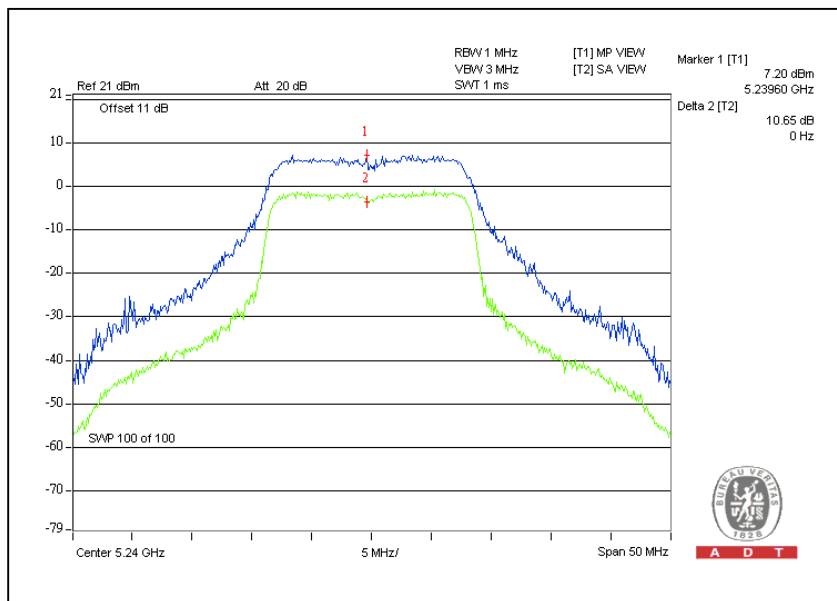
The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.

4.4.7 TEST RESULTS

802.11a OFDM MODULATION

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER EXCURSION (dB)		PEAK to AVERAGE EXCURSION LIMIT (dB)	PASS/FAIL
		CHAIN(0)	CHAIN(1)		
36	5180	8.7	10.0	13	PASS
40	5200	8.7	9.3	13	PASS
48	5240	8.8	10.7	13	PASS

For CHAIN(1)
CH48



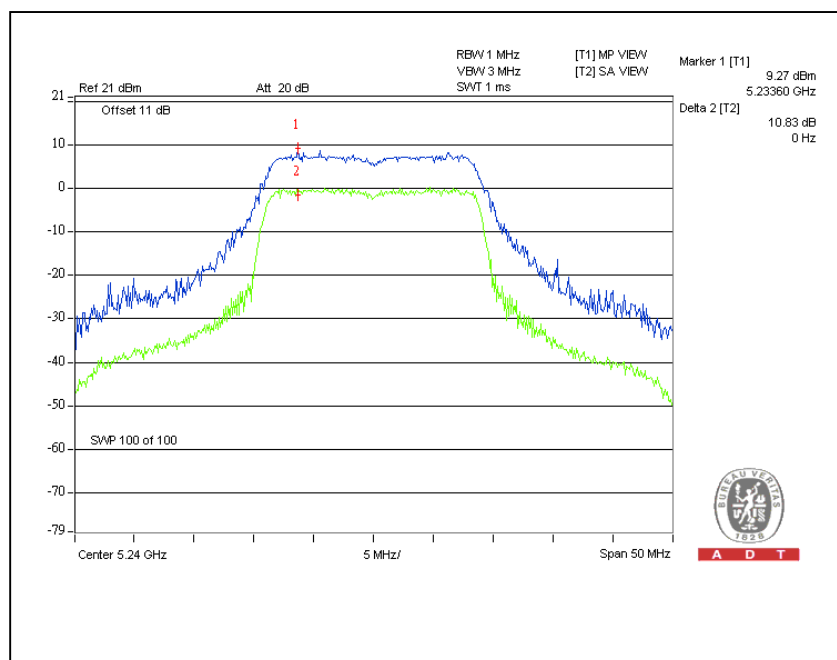


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802.11n (20MHz) OFDM MODULATION:

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER EXCURSION (dB)		PEAK to AVERAGE EXCURSION LIMIT (dB)	PASS/FAIL
		CHAIN(0)	CHAIN(1)		
36	5180	8.9	10.2	13	PASS
40	5200	9.1	9.7	13	PASS
48	5240	8.1	10.8	13	PASS

For CHAIN(1)
CH48



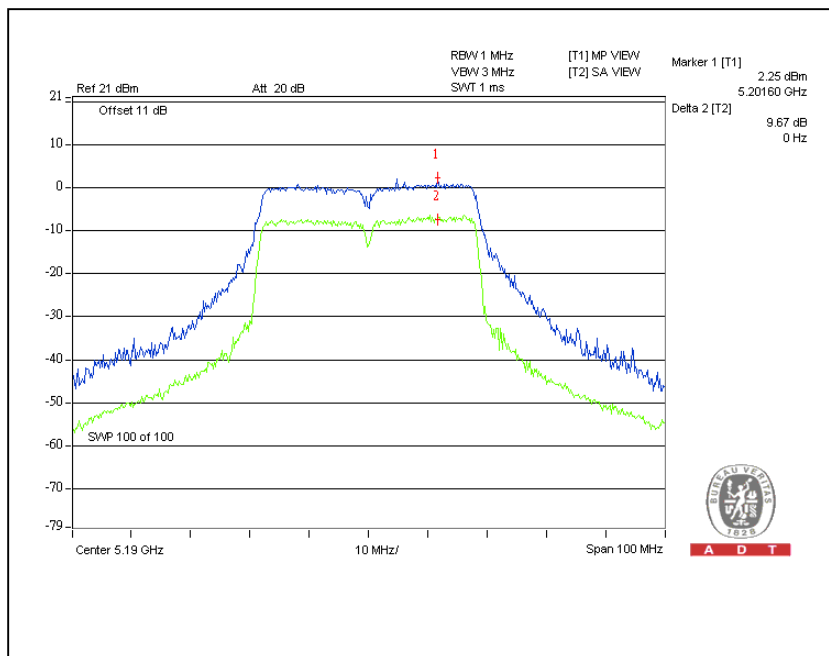


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802.11n (40MHz) OFDM MODULATION:

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER EXCURSION (dB)		PEAK to AVERAGE EXCURSION LIMIT (dB)	PASS/FAIL
		CHAIN(0)	CHAIN(1)		
38	5190	9.4	9.7	13	PASS
46	5230	7.9	9.0	13	PASS

For CHAIN(1)
CH38



4.5 PEAK POWER SPECTRAL DENSITY MEASUREMENT

4.5.1 LIMITS OF PEAK POWER SPECTRAL DENSITY MEASUREMENT

Frequency Band	Limit
5.15 ~ 5.25GHz	4dBm
5.25 ~ 5.35GHz	11dBm
5.47 – 5.725GHz	11dBm
5.725 ~ 5.825GHz	17dBm

4.5.2 TEST INSTRUMENTS

Test date: Nov. 19, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer	E4446A	MY48250254	July 12, 2011	July 11, 2012

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

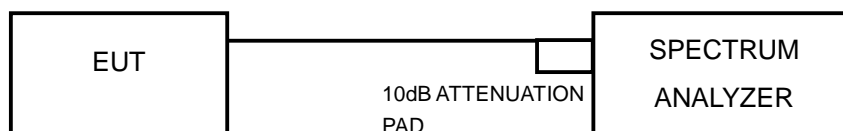
4.5.3 TEST PROCEDURES

1. The transmitter output was connected to the spectrum analyzer.
2. Set RBW=1MHz, VBW=3MHz. The PPSD is the highest level found across the emission in any 1MHz band.

4.5.4 DEVIATION FROM TEST STANDARD

No deviation

4.5.5 TEST SETUP



4.5.6 EUT OPERATING CONDITIONS

Same as 4.3.6

4.5.7 TEST RESULTS

802.11a OFDM MODULATION

CHAN.	CHAN. FREQ. (MHz)	RF POWER LEVEL IN 3kHz BW (dBm)		TOTAL POWER DENSITY (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN (0)	CHAIN (1)			
36	5180	-0.7	-0.5	2.1	2.5	PASS
40	5200	-0.7	-0.3	2.3	2.5	PASS
48	5240	-0.3	-0.8	2.4	2.5	PASS

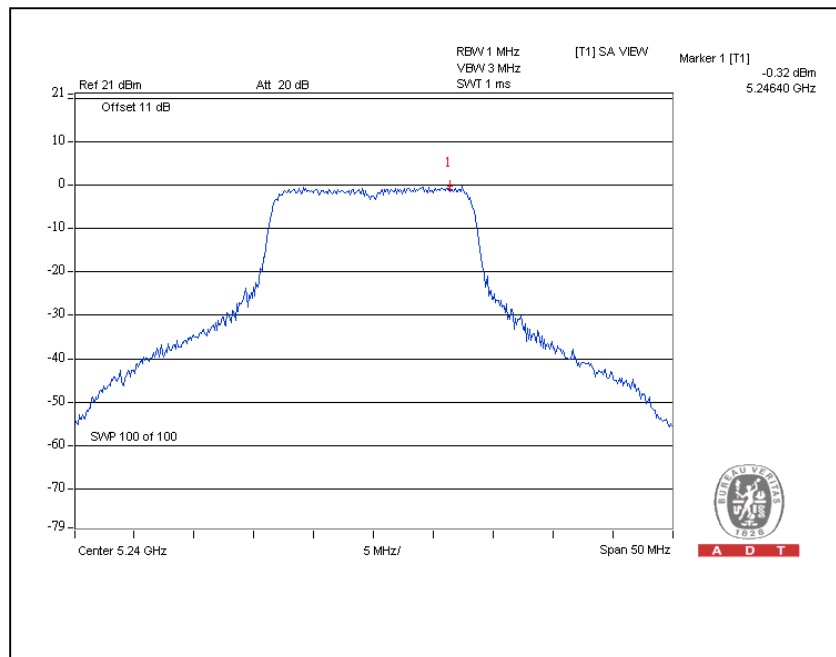
Note: Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer

$$\text{Directional gain} = 10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2]$$

Effective Legacy Gain (dBi) = 7.5

The effective legacy gain is 7.5dBi, therefore the limit doesn't reduce.

For CHAIN(0)
CH48

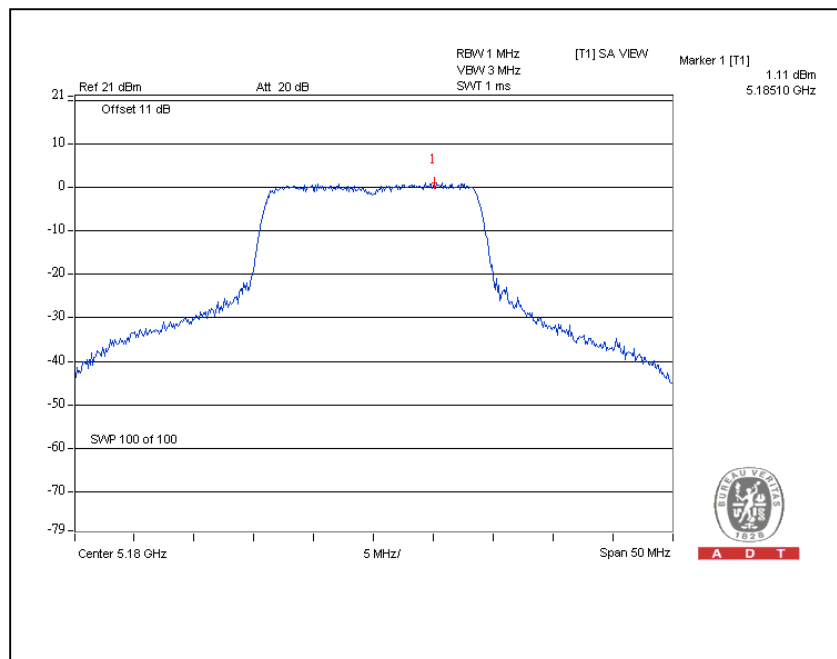


802.11n (20MHz) OFDM MODULATION:

CHAN.	CHAN. FREQ. (MHz)	RF POWER LEVEL IN 3kHz BW (dBm)		TOTAL POWER DENSITY (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN (0)	CHAIN (1)			
36	5180	0.4	1.1	3.4	4	PASS
40	5200	0.3	0.8	3.5	4	PASS
48	5240	0.6	0.3	3.3	4	PASS

Note: Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer

For CHAIN(1)
CH36

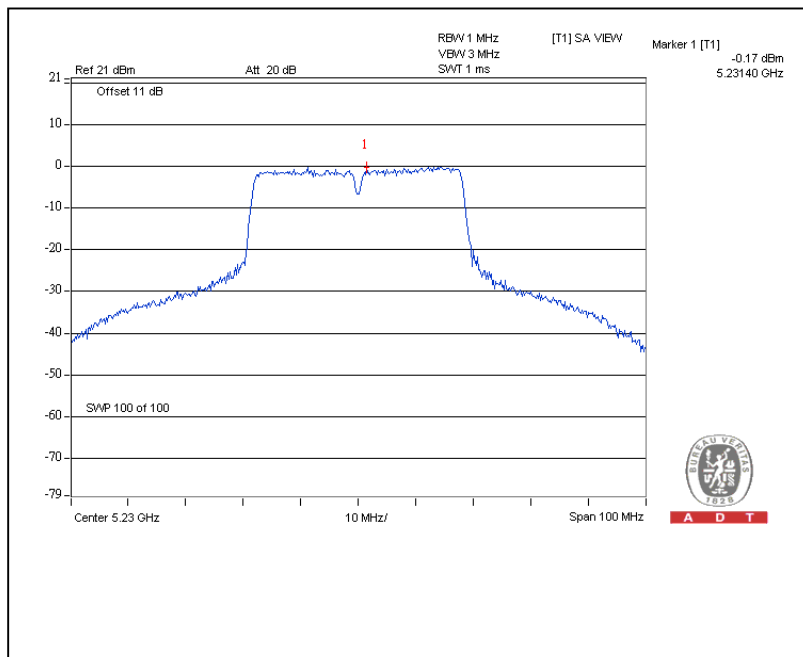


802.11n (40MHz) OFDM MODULATION:

CHAN.	CHAN. FREQ. (MHz)	RF POWER LEVEL IN 3kHz BW (dBm)		TOTAL POWER DENSITY (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN (0)	CHAIN (1)			
38	5190	-8.2	-6.4	-4.4	4	PASS
46	5230	-0.2	-0.4	2.4	4	PASS

Note: Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer

For CHAIN(0)
CH46



4.6 FREQUENCY STABILITY

4.6.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

The frequency tolerance of the carrier signal shall be maintained within the band of the operating frequency over a temperature variation of –30 degrees to 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

4.6.2 TEST INSTRUMENTS

Test date: Nov. 19, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP 40	100060	May 11, 2011	May 10, 2012

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

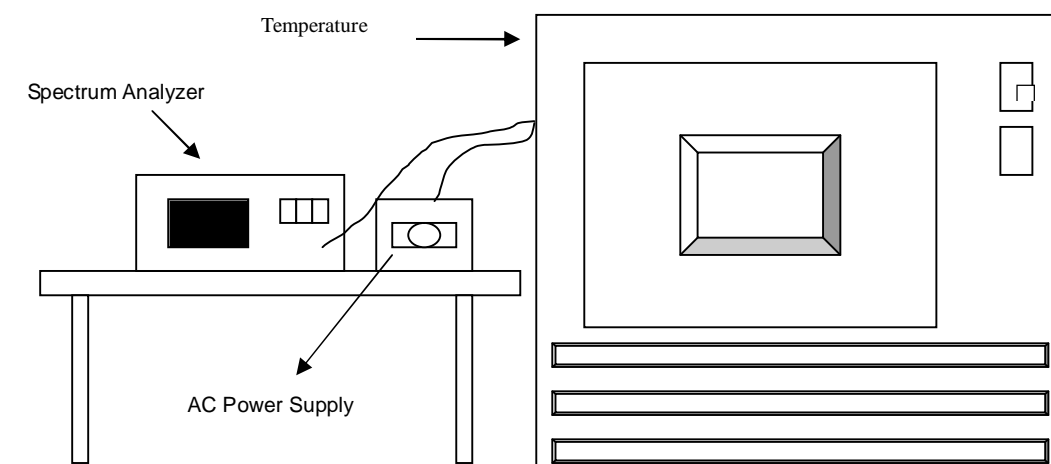
4.6.3 TEST PROCEDURE

1. The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.
2. Turn the EUT on and couple its output to a spectrum analyzer.
3. Turn the EUT off and set the chamber to the highest temperature specified.
4. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
5. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
6. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

4.6.4 DEVIATION FROM TEST STANDARD

No deviation

4.6.5 TEST SETUP



4.6.6 EUT OPERATING CONDITION

The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.



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4.6.7 TEST RESULTS

Operating frequency: 5180MHz									
Temp. (°C)	Power supply (VAC)	0 minute		2 minute		5 minute		10 minute	
		(MHz)	(ppm)	(MHz)	(ppm)	(MHz)	(ppm)	(MHz)	(ppm)
50	138	5179.9854	-2.8185	5179.9875	-2.4131	5179.9855	-2.7992	5179.9821	-3.4556
	120	5179.9857	-2.7606	5179.9873	-2.4517	5179.9856	-2.7799	5179.9814	-3.5907
	102	5179.9855	-2.7992	5179.9869	-2.5290	5179.9848	-2.9344	5179.9814	-3.5907
40	138	5179.9932	-1.3127	5179.9984	-0.3089	5179.9958	-0.8108	5179.9966	-0.6564
	120	5179.9948	-1.0039	5179.9976	-0.4633	5179.9957	-0.8301	5179.9972	-0.5405
	102	5179.9941	-1.1390	5179.9976	-0.4633	5179.9962	-0.7336	5179.9972	-0.5405
30	138	5180.0107	2.0656	5180.0116	2.2394	5180.0125	2.4131	5180.0074	1.4286
	120	5180.0099	1.9112	5180.01	1.9305	5180.0128	2.4710	5180.0075	1.4479
	102	5180.0091	1.7568	5180.01	1.9305	5180.0116	2.2394	5180.007	1.3514
20	138	5179.9807	-3.7259	5179.9812	-3.6293	5179.9816	-3.5521	5179.9861	-2.6834
	120	5179.9802	-3.8224	5179.983	-3.2819	5179.9826	-3.3591	5179.9872	-2.4710
	102	5179.9794	-3.9768	5179.983	-3.2819	5179.981	-3.6680	5179.987	-2.5097
10	138	5179.984	-3.0888	5179.9881	-2.2973	5179.991	-1.7375	5179.9893	-2.0656
	120	5179.9852	-2.8571	5179.9889	-2.1429	5179.9906	-1.8147	5179.9897	-1.9884
	102	5179.9853	-2.8378	5179.9883	-2.2587	5179.9913	-1.6795	5179.9889	-2.1429
0	138	5179.9996	-0.0772	5179.9996	-0.0772	5179.995	-0.9653	5179.9966	-0.6564
	120	5180.0011	0.2124	5179.9997	-0.0579	5179.9961	-0.7529	5179.9968	-0.6178
	102	5180.0002	0.0386	5179.9994	-0.1158	5179.996	-0.7722	5179.9967	-0.6371
-10	138	5179.9961	-0.7529	5179.9913	-1.6795	5179.993	-1.3514	5179.9924	-1.4672
	120	5179.9966	-0.6564	5179.9911	-1.7181	5179.994	-1.1583	5179.9923	-1.4865
	102	5179.9957	-0.8301	5179.9922	-1.5058	5179.993	-1.3514	5179.9907	-1.7954
-20	138	5180.0082	1.5830	5180.0034	0.6564	5179.9994	-0.1158	5179.9952	-0.9266
	120	5180.0071	1.3707	5180.0047	0.9073	5179.9994	-0.1158	5179.9954	-0.8880
	102	5180.0078	1.5058	5180.0038	0.7336	5179.9995	-0.0965	5179.9951	-0.9459
-30	138	5179.9915	-1.6409	5179.9895	-2.0270	5179.9867	-2.5676	5179.9839	-3.1081
	120	5179.9925	-1.4479	5179.9893	-2.0656	5179.9866	-2.5869	5179.9842	-3.0502
	102	5179.9913	-1.6795	5179.989	-2.1236	5179.9865	-2.6062	5179.984	-3.0888



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4.7 CONDUCTED OUT-BAND EMISSION MEASUREMENT

4.7.1 TEST INSTRUMENTS

Test date: Nov. 19, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer	FSP 40	100060	May 11, 2011	May 10, 2012

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.7.2 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low loss cable. Set RBW of spectrum analyzer to 1MHz with suitable frequency span including 100MHz or 200MHz bandwidth from band edge. The band edges was measured and recorded.

4.7.3 EUT OPERATING CONDITION

The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.

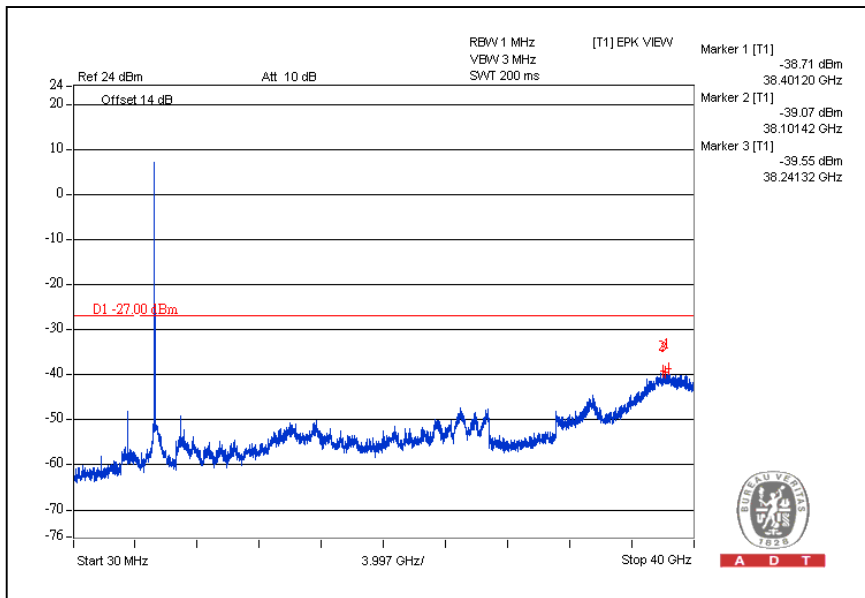
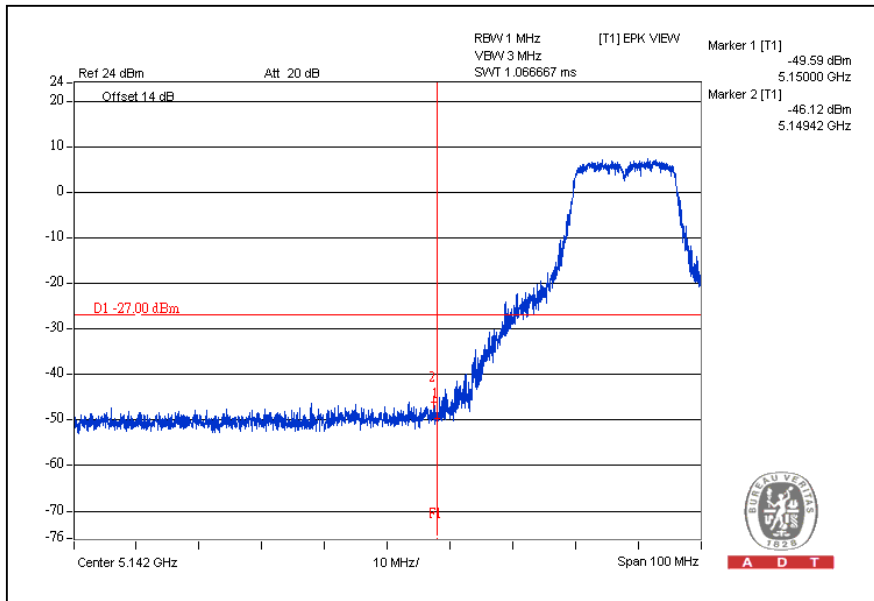
4.7.4 TEST RESULTS

For 5.15 to 5.25GHz band:

The spectrum plots (Peak RBW=1MHz, VBW=3MHz) are attached on the following pages.

Performing measurements: Measure and add 10 log(N) dB 802.11a OFDM modulation

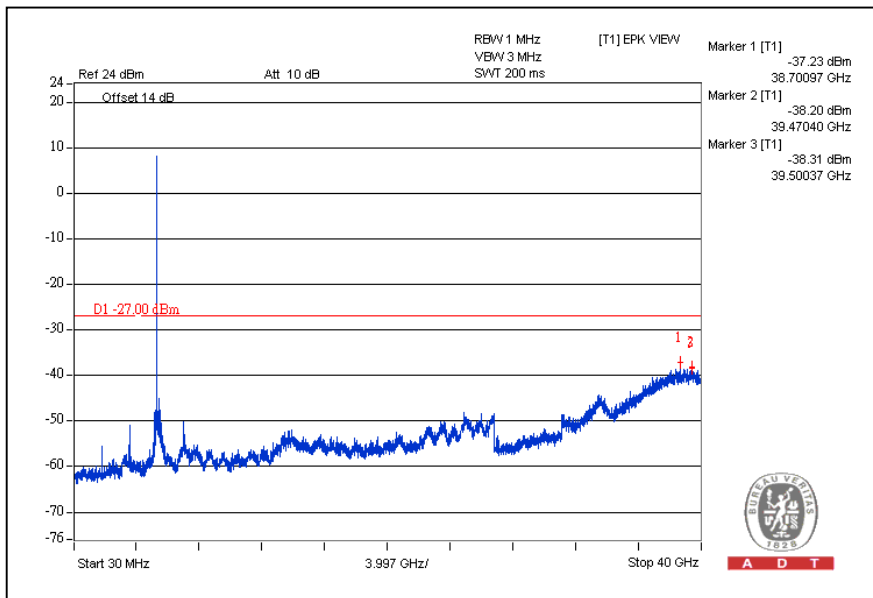
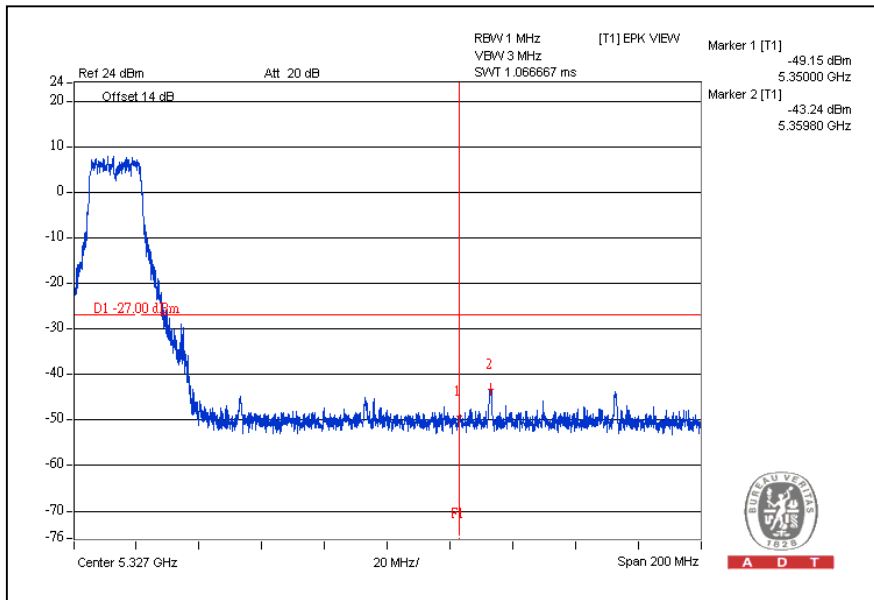
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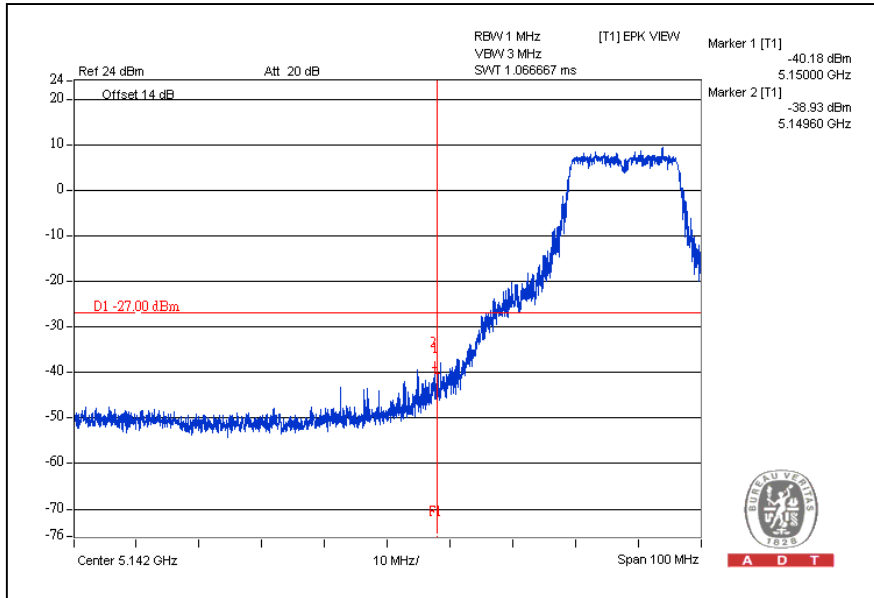




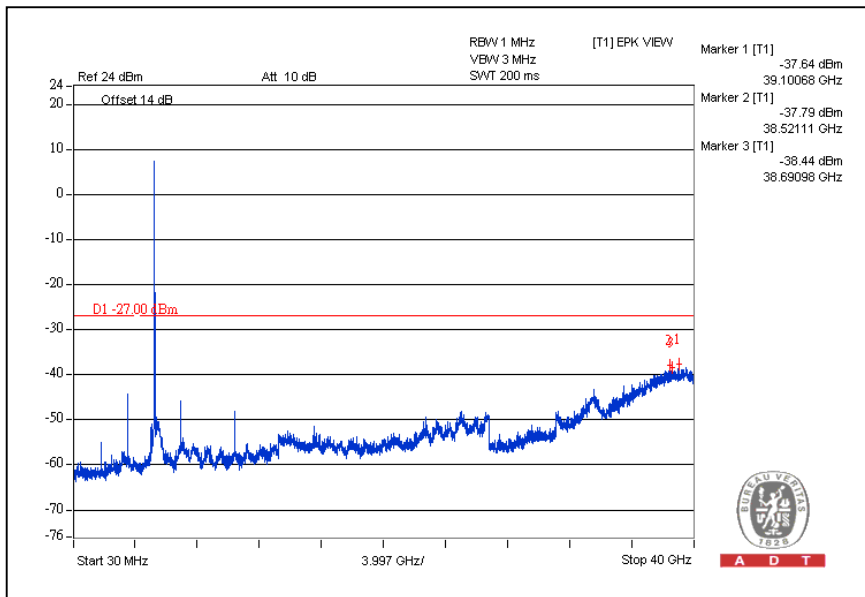
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802.11n (20MHz) OFDM MODULATION:

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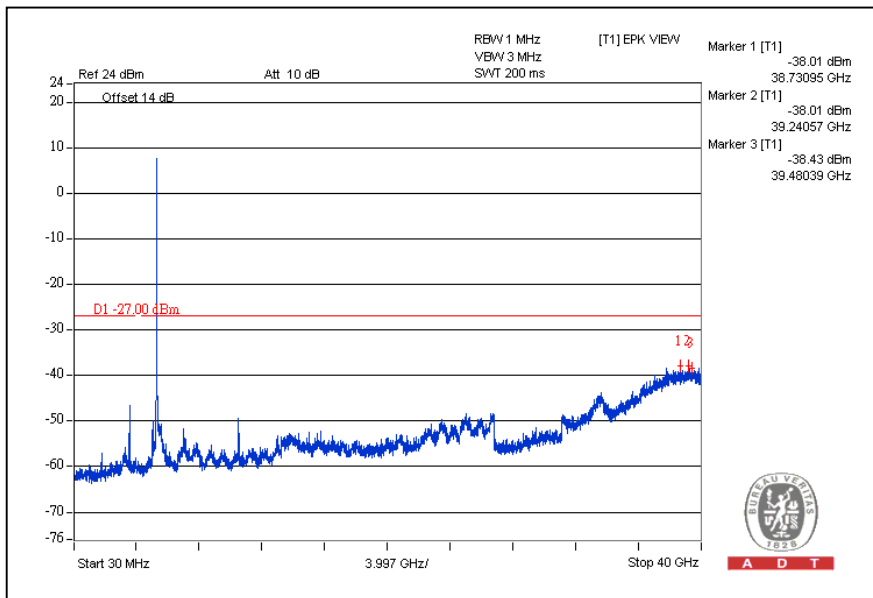
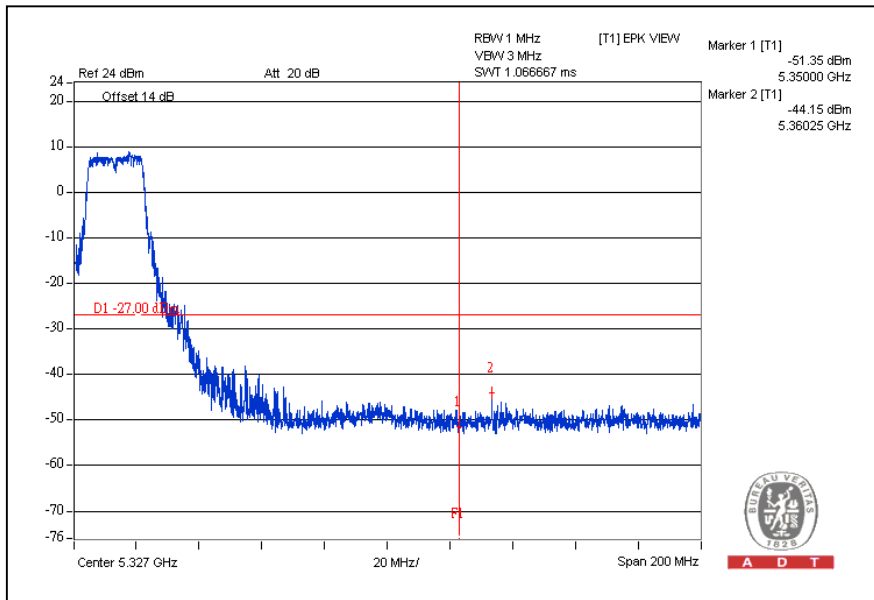


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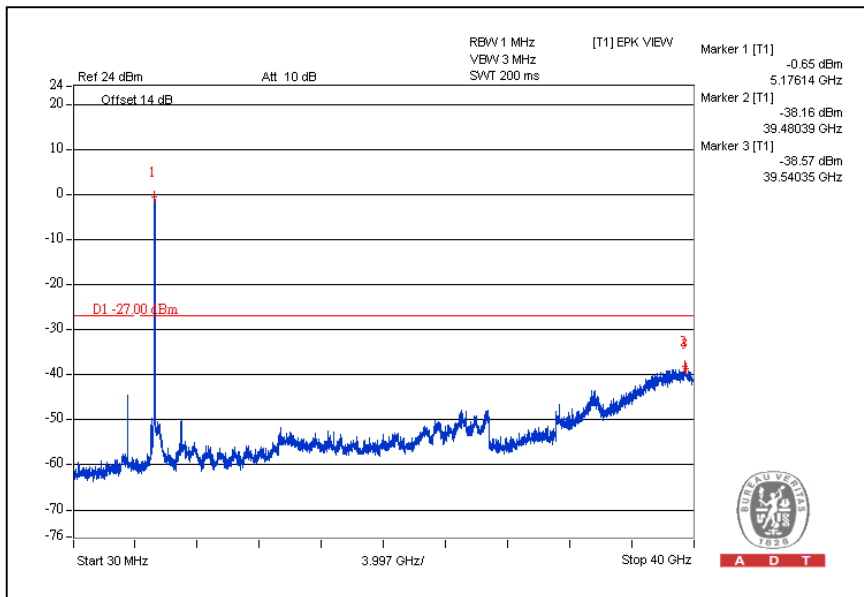
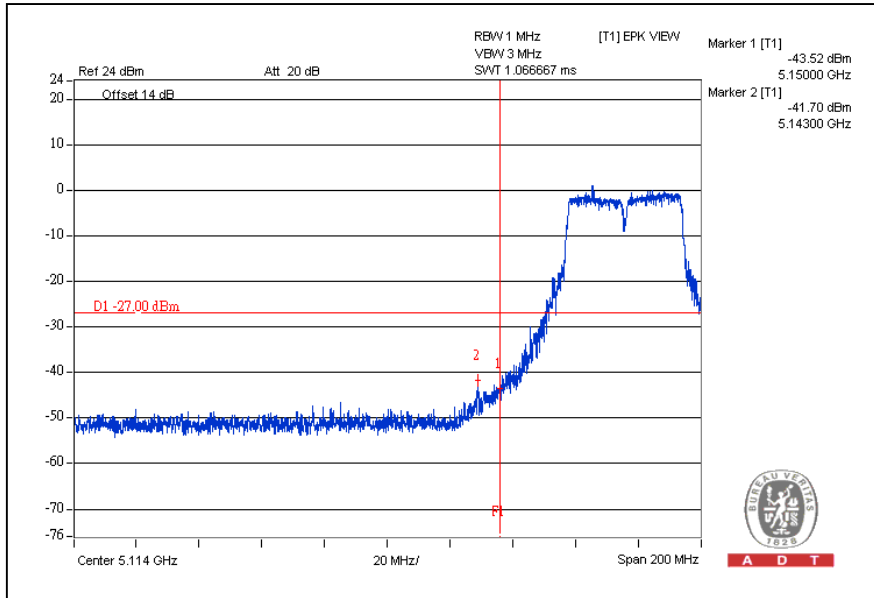




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802.11n (40MHz) OFDM MODULATION:

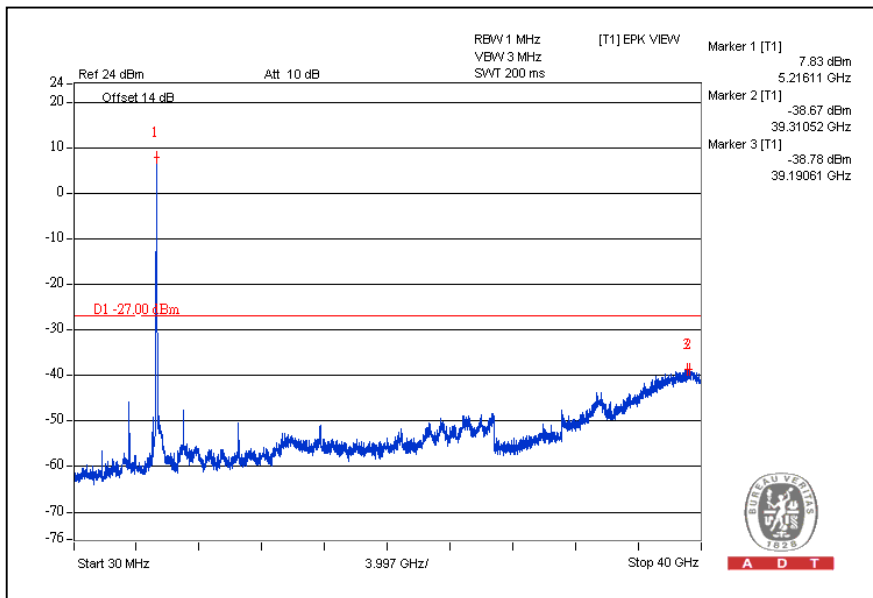
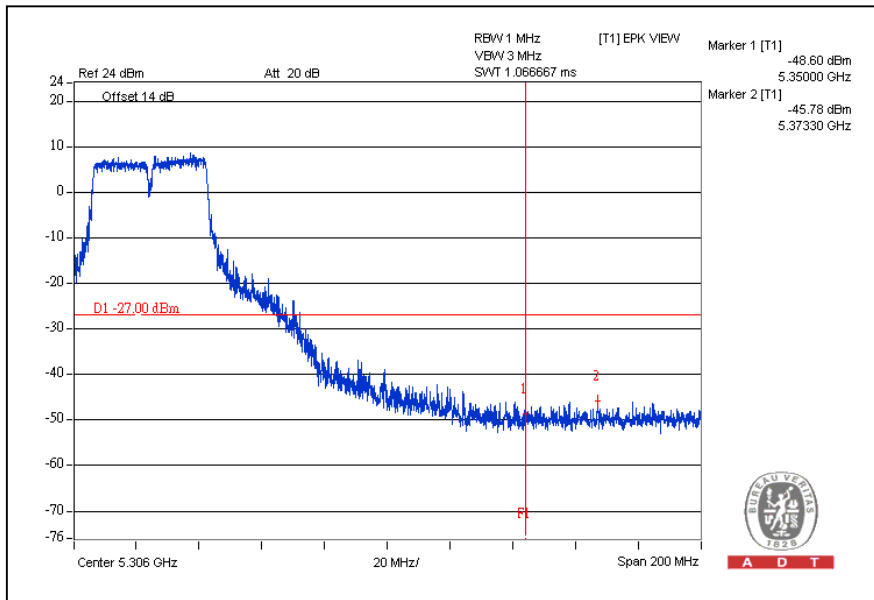
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5. INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

Copies of accreditation and authorization certificates of our laboratories obtained from approval agencies can be downloaded from our web site:

www.adt.com.tw/index.5.phtml. If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab:

Tel: 886-2-26052180

Fax: 886-2-26052943

Hsin Chu EMC/RF Lab:

Tel: 886-3-5935343

Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety/Telecom Lab:

Tel: 886-3-3183232

Fax: 886-3-3185050

Email: service.adt@tw.bureauveritas.com

Web Site: www.adt.com.tw

The address and road map of all our labs can be found in our web site also.



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6.APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

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