

FCC TEST REPORT (15.407)

REPORT NO.: RF110913E01A-1

MODEL NO.: WUS-ND12A

FCC ID: RRK-WUSND12A

RECEIVED: Sep. 13, 2011

TESTED: Oct. 04 to Dec. 06, 2011

ISSUED: Dec. 15, 2011

APPLICANT: Alpha Networks Inc.

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ISSUED BY: Bureau Veritas Consumer Products Services (H.K.)
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A D T

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF110913E01A-1	Original release	Dec. 15, 2011

1. CERTIFICATION

PRODUCT: 802.11a/b/g/n USB module
BRAND NAME: Alpha
MODEL NO.: WUS-ND12A
TEST SAMPLE: MASS-PRODUCTION
APPLICANT: Alpha Networks Inc.
TESTED: Oct. 04 to Dec. 06, 2011
STANDARDS: FCC Part 15, Subpart E (Section 15.407)
ANSI C63.4-2003
ANSI C63.10-2009

The above equipment (Model: WUS-ND12A) 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:** Dec. 15, 2011
(Lori Chung, Specialist)

APPROVED BY :  , **DATE:** Dec. 15, 2011
(May Chen, Deputy Manager)

2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

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 -8.66dB at 2.102MHz
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 -0.5dB at 10640MHz & 10600MHz
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	No antenna connector is used.

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 2400 ~ 2483.5MHz and 5.725~5.850GHz. For the 5.15~5.25GHz RF parameters was recorded in another test report.

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)	3.81 dB
Radiated emissions (1GHz -18GHz)	2.19 dB
Radiated emissions (18GHz -40GHz)	2.56 dB

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	802.11a/b/g/n USB module
MODEL NO.	WUS-ND12A
FCC ID	RRK-WUSND12A
POWER SUPPLY	DC 5V \pm 10% from host equipment
MODULATION TYPE	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
MODULATION TECHNOLOGY	DSSS, OFDM
TRANSFER RATE	802.11b: up to 11Mbps 802.11g: up to 54Mbps 802.11n (20MHz, 800ns GI): up to 130Mbps 802.11n (40MHz, 800ns GI): up to 270Mbps 802.11n (20MHz, 400ns GI): up to 144.444Mbps 802.11n (40MHz, 400ns GI): up to 300Mbps
OPERATING FREQUENCY	For 15.407 802.11a: 5.18 ~ 5.24GHz
	For 15.247 802.11b & 802.11g: 2.412 ~ 2.462GHz 802.11a: 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: 32.4mW 802.11n (20MHz): 27.6mW 802.11n (40MHz): 47.7mW For 15.247(2.4GHz) 802.11b: 114.82mW 802.11g: 416.9mW 802.11n (20MHz): 709.8mW 802.11n (40MHz): 355.8mW For 15.247(5GHz) 802.11a: 251.2mW 802.11n (20MHz): 458.3mW 802.11n (40MHz): 486.1mW
ANTENNA TYPE	Please see note
DATA CABLE	USB Cable x 1(shielded, 0.97m)
I/O PORTS	NA
ASSOCIATED DEVICES	NA

NOTE:

1. There are two antennas provided to this EUT, please refer to the following table:

Transmitter Circuit	Manufacture	Antenna Type	Gain (dBi)	Antenna Connector
Chain (0)	Alpha	PCB Printed	2.4GHz : 0.7 5.15~5.25GHz: 2.97 5.25~5.35GHz: 3.27 5.47~5.725GHz :2.60 5.725~5.850GHz :2.60	NA
Chain (1)	Alpha	PCB Printed	2.4GHz : 1.39 5.15~5.25GHz: 3.61 5.25~5.35GHz: 3.98 5.47~5.725GHz :2.87 5.725~5.850GHz :2.87	NA

2. 2.4GHz & 5GHz technology cannot transmit at same time.
3. The EUT is 2 * 2 spatial MIMO (2Tx & 2Rx) without beam forming function. The 11a, 11b and 11g legacy mode is limited to single transmitter only.
4. When the EUT operating in 802.11n, the software operation, which is defined by manufacturer, MCS (Modulation and Coding Schemes) from 0 to 15.

5. The EUT was pre-tested in chamber as the following test modes:

Pre-test Mode	Description
Mode A	X-Y plane
Mode B	X-Z plane
Mode C	Y-Z plane

From the above modes, the worst radiated test was found in **Mode A**. Therefore only the test data of the mode was recorded in this report.

6. 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

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

ANTENNA COMBINATION MODE:

COMBINATION MODE	OPERATION MODE	TX CHAIN(0)	TX CHAIN(1)
A	802.11 a	√	-
B	802.11n(20MHz) for MCS0~15	√	√
C	802.11n(40MHz) for MCS0~15	√	√
Note: 1. The above information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.			

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)	COMBINATION
802.11a	36 to 48	36	OFDM	BPSK	6.5	A

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)	COMBINATION
802.11a	36 to 48	36	OFDM	BPSK	6.5	A

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)	COMBINATION
802.11a	36 to 48	36, 40, 48	OFDM	BPSK	6	A
For 5 GHz 802.11n (20MHz)	36 to 48	36, 40, 48	OFDM	BPSK	6.5	B
For 5 GHz 802.11n (40MHz)	38 to 46	38, 46	OFDM	BPSK	13.5	C

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)	COMBINATION
802.11a	36 to 48	36, 40, 48	OFDM	BPSK	6	A
For 5 GHz 802.11n (20MHz)	36 to 48	36, 40, 48	OFDM	BPSK	6.5	B
For 5 GHz 802.11n (40MHz)	38 to 46	38, 46	OFDM	BPSK	13.5	C

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)	COMBINATION
802.11a	36 to 48	36, 40, 48	OFDM	BPSK	6	A
For 5 GHz 802.11n (20MHz)	36 to 48	36, 40, 48	OFDM	BPSK	6.5	B
For 5 GHz 802.11n (40MHz)	38 to 46	38, 46	OFDM	BPSK	13.5	C

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
PLC	25deg. C, 68%RH	120Vac, 60Hz	Frank Liu
RE<1G	27deg. C, 72%RH	120Vac, 60Hz	Frank Liu
RE ³ 1G	25deg. C, 69%RH	120Vac, 60Hz	Nelson Teng
APCM	27deg. C, 60%RH	120Vac, 60Hz	Rex Huang
OB	27deg. 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 (Section 15.407)

ANSI C63.4-2003

ANSI C63.10-2009

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

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.

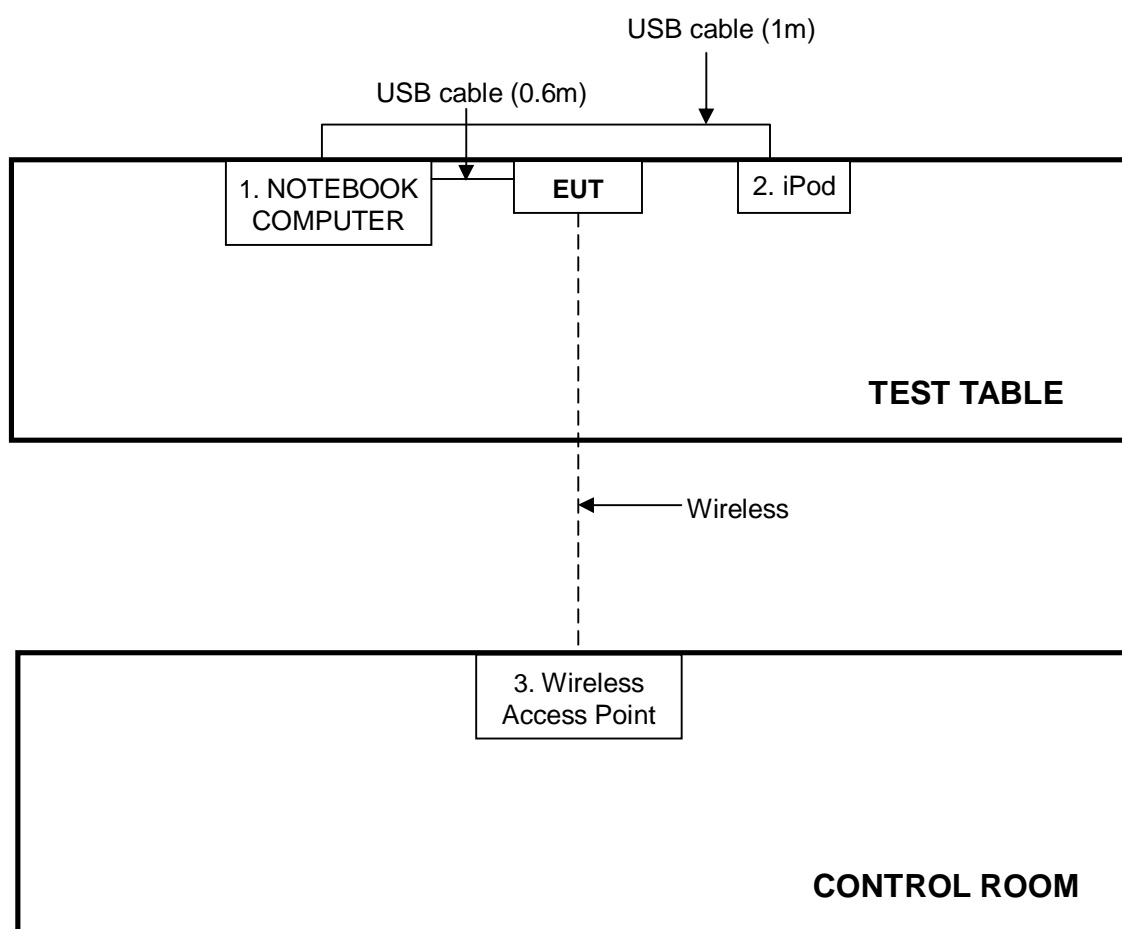
For Conducted emission test					
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER	DELL	PP18L	4799903248	FCC DoC
2	iPod	Apple	A1199	6U6426MTVQS	FCC DoC
3	Wireless Access Point	Air Station	WLA-G54	NA	NA
For other test item					
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER	DELL	PP32LA	FSLB32S	FCC DoC

For Conducted emission test	
NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	USB cable (0.6m)
2	USB cable (1m)
3	NA
For other test item	
NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	USB cable (0.25m)

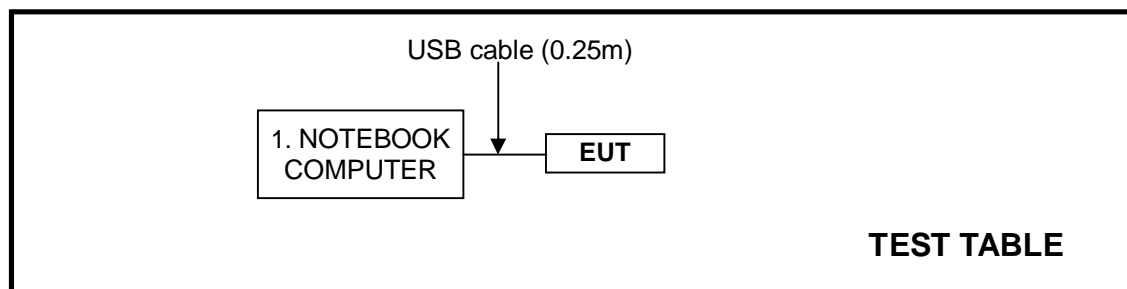
NOTE: All power cords of the above support units are non shielded (1.8m).

3.5 CONFIGURATION OF SYSTEM UNDER TEST

For conducted emission test:



For other test item:



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.

4.1.2 TEST INSTRUMENTS

Test date: Nov. 24, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
ROHDE & SCHWARZ Test Receiver	ESCS 30	100287	Mar. 02, 2011	Mar. 01, 2012
Line-Impedance Stabilization Network (for EUT)	NSLK 8127	8127-523	Sep. 20, 2011	Sep. 19, 2012
Line-Impedance Stabilization Network (for Peripheral)	ENV-216	100072	June 10, 2011	June 09, 2012
RF Cable (JYEBAO)	5DFB	CONCAB-003	Aug. 05, 2011	Aug. 04, 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. A.
3. The VCCI Con A Registration No. is C-817.

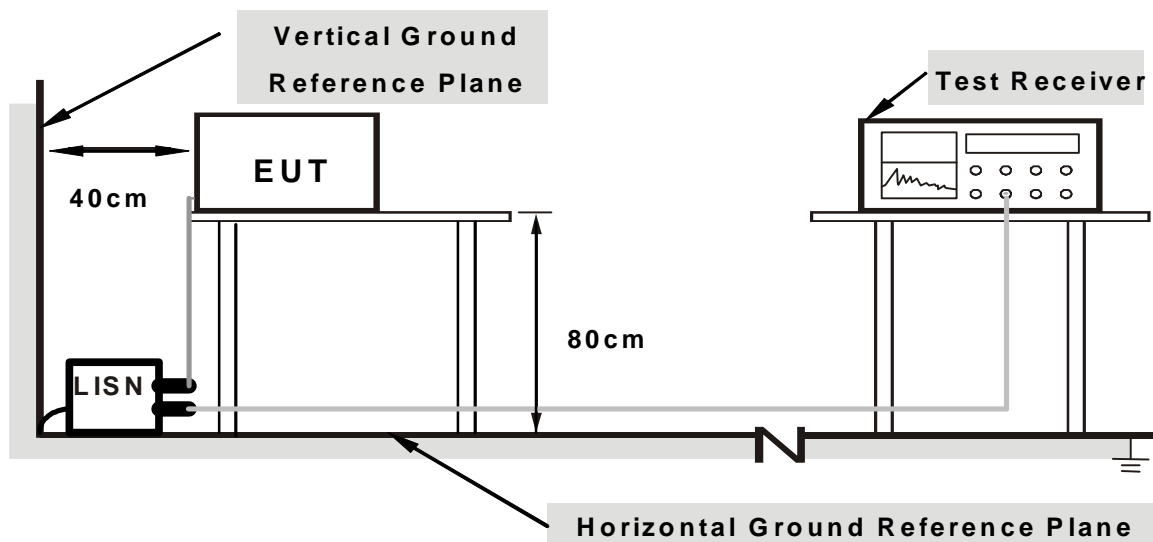
4.1.3 TEST PROCEDURES

- 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.
- b. The two LISNs 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

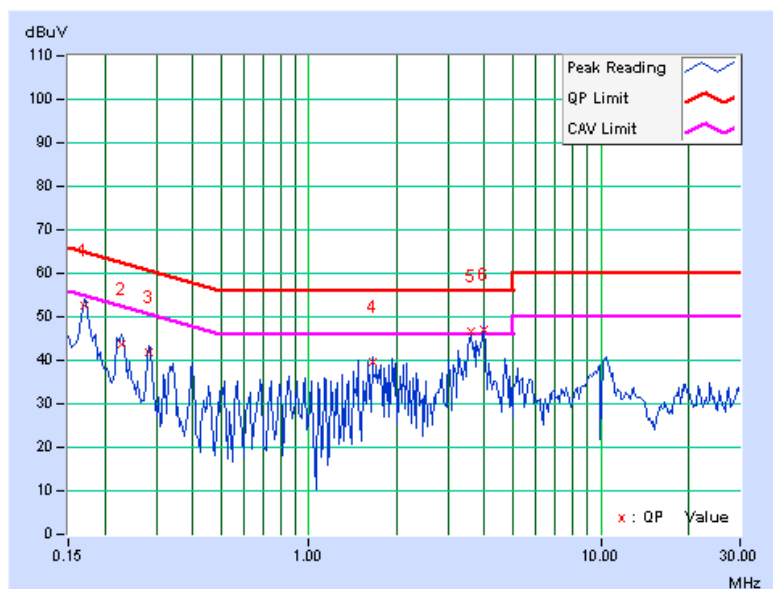
1. Connect the EUT with the support unit 1 (Notebook Computer) which is placed on a testing table.
2. Support unit 1 (Notebook Computer) ran test program “Ping.exe” to enable EUT under transmission/receiving condition continuously via wireless

4.1.7 TEST RESULTS

PHASE	Line (L)	6dB BANDWIDTH	9 kHz
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.170	0.06	52.43	44.51	52.49	44.57	64.98	54.98	-12.49	-10.41
2	0.228	0.06	43.73	38.47	43.79	38.53	62.52	52.52	-18.73	-13.99
3	0.283	0.06	41.61	36.69	41.67	36.75	60.73	50.73	-19.06	-13.98
4	1.650	0.14	39.42	35.63	39.56	35.77	56.00	46.00	-16.44	-10.23
5	3.582	0.23	46.27	34.28	46.50	34.51	56.00	46.00	-9.50	-11.49
6	3.980	0.24	46.97	33.99	47.21	34.23	56.00	46.00	-8.79	-11.77

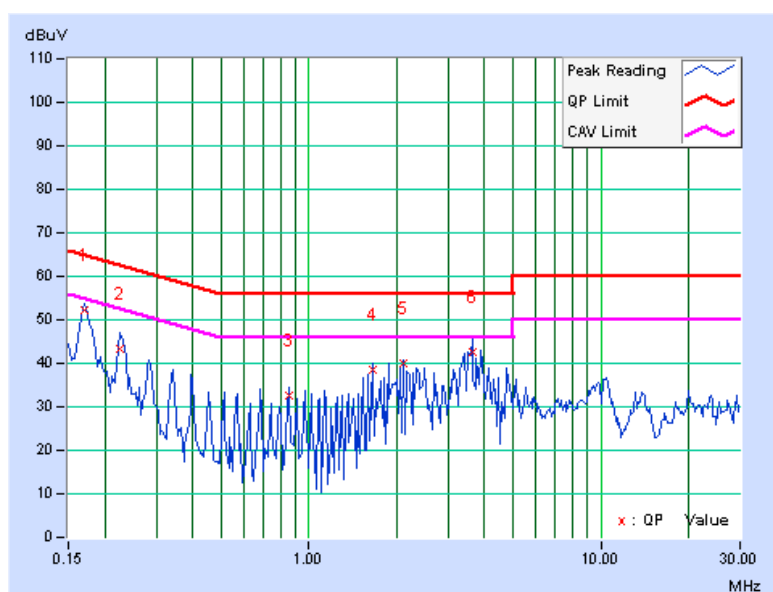
- REMARKS:** 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor +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



PHASE	Neutral (N)	6dB BANDWIDTH	9 kHz
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	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
No		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.170	0.07	52.25	44.57	52.32	44.64	64.98	54.98	-12.66	-10.34
2	0.224	0.07	43.35	38.29	43.42	38.36	62.66	52.66	-19.24	-14.30
3	0.853	0.09	32.40	28.05	32.49	28.14	56.00	46.00	-23.51	-17.86
4	1.648	0.14	38.47	35.39	38.61	35.53	56.00	46.00	-17.39	-10.47
5	2.102	0.16	39.80	37.18	39.96	37.34	56.00	46.00	-16.04	-8.66
6	3.637	0.21	42.28	33.00	42.49	33.21	56.00	46.00	-13.51	-12.79

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.

4.2.2 LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS

Frequencies (MHz)	EIRP Limit (dBm)	Equivalent Field Strength at 3m (dBμV/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:

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

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



A D T

4.2.3 TEST INSTRUMENTS

For below 1GHz: Test date: Nov. 25, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Agilent Spectrum Analyzer	E4446A	MY48250254	July 12, 2011	July 11, 2012
Agilent Pre-Selector	N9039A	MY46520311	July 12, 2011	July 11, 2012
Agilent Signal Generator	N5181A	MY49060517	July 12, 2011	July 11, 2012
Mini-Circuits Pre-Amplifier	ZFL-1000VH2B	AMP-ZFL-03	Nov. 15, 2011	Nov. 14, 2012
Agilent Pre-Amplifier	8449B	3008A02578	July 04, 2011	July 03, 2012
Miteq Pre-Amplifier	AFS33-1800265 0-30-8P-44	881786	Nov. 15, 2011	Nov. 14, 2012
SCHWARZBECK Trilog Broadband Antenna	VULB 9168	9168-360	Apr. 14, 2011	Apr. 13, 2012
AISI Horn_Antenna	AIH.8018	0000320091110	Nov. 11, 2011	Nov. 10, 2012
SCHWARZBECK Horn_Antenna	BBHA 9170	9170-424	Oct. 07, 2011	Oct. 06, 2012
RF CABLE	NA	RF104-201 RF104-203 RF104-204	Dec. 27, 2010	Dec. 26, 2011
RF Cable	NA	CHGCAB_001	Oct. 11, 2011	Oct. 10, 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. G.

4. The FCC Site Registration No. is 966073.

5. The VCCI Site Registration No. is G-137.

6. The CANADA Site Registration No. is IC 7450H-2.



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For above 1GHz: Test date: Oct. 04, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Agilent Spectrum Analyzer	E4446A	MY48250254	July 12, 2011	July 11, 2012
Agilent Pre-Selector	N9039A	MY46520311	July 12, 2011	July 11, 2012
Agilent Signal Generator	N5181A	MY49060517	July 12, 2011	July 11, 2012
Mini-Circuits Pre-Amplifier	ZFL-1000VH2B	AMP-ZFL-03	Nov. 16, 2010	Nov. 15, 2011
Agilent Pre-Amplifier	8449B	3008A02578	July 04, 2011	July 03, 2012
Miteq Pre-Amplifier	AFS33-1800265 0-30-8P-44	881786	Nov. 16, 2010	Nov. 15, 2011
SCHWARZBECK Trilog Broadband Antenna	VULB 9168	9168-360	Apr. 14, 2011	Apr. 13, 2012
AISI Horn_Antenna	AIH.8018	0000320091110	Nov. 12, 2010	Nov. 11, 2011
SCHWARZBECK Horn_Antenna	BBHA 9170	9170-424	Oct. 08, 2010	Oct. 07, 2011
RF CABLE	NA	RF104-201 RF104-203 RF104-204	Dec. 27, 2010	Dec. 26, 2011
RF Cable	NA	CHGCAB_001	Oct. 12, 2010	Oct. 11, 2011
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. G.
4. The FCC Site Registration No. is 966073.
5. The VCCI Site Registration No. is G-137.
6. The CANADA Site Registration No. is IC 7450H-2.

4.2.4 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters chamber room. 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.
- b. 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.
- c. 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.

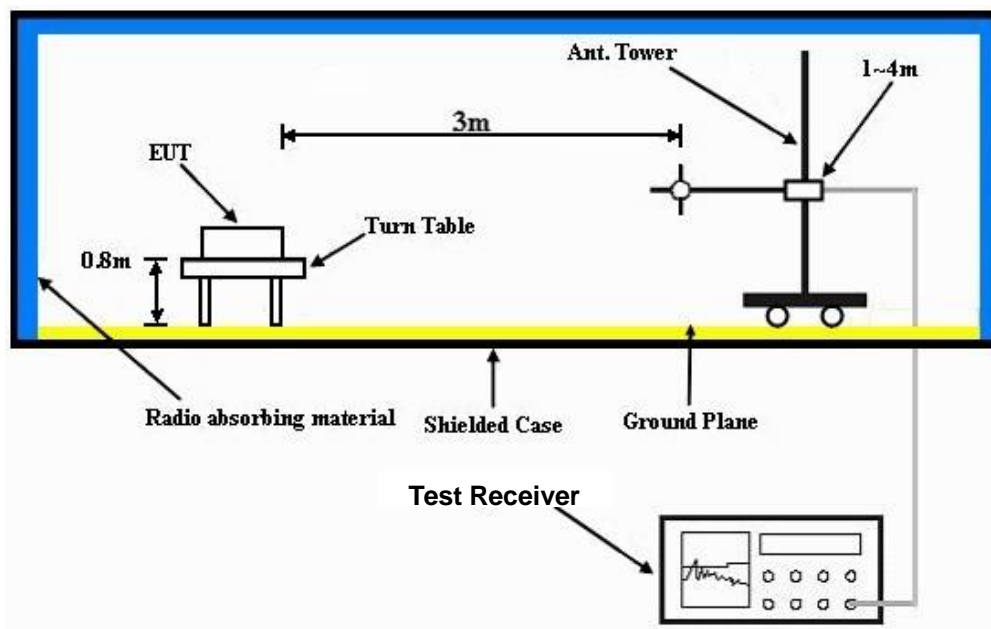
NOTE:

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

Same as 4.1.6

4.2.8 TEST RESULTS

BELOW 1GHz WORST-CASE DATA : 802.11a 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	18deg. C, 70%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	156.86	37.8 QP	43.5	-5.7	2.00 H	258	23.14	14.65
2	286.10	42.1 QP	46.0	-3.9	2.00 H	213	27.36	14.77
3	327.61	42.5 QP	46.0	-3.5	2.00 H	188	26.49	16.04
4	480.01	41.3 QP	46.0	-4.7	1.50 H	272	21.44	19.84
5	600.01	42.7 QP	46.0	-3.3	1.50 H	154	20.09	22.58
6	719.99	42.2 QP	46.0	-3.8	1.00 H	255	18.59	23.60
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	39.46	36.9 QP	40.0	-3.1	1.00 V	211	22.91	13.98
2	95.98	38.7 QP	43.5	-4.8	1.00 V	287	29.61	9.12
3	200.68	38.7 QP	43.5	-4.8	1.00 V	79	27.32	11.42
4	321.00	38.9 QP	46.0	-7.1	1.00 V	157	23.06	15.87
5	499.77	34.3 QP	46.0	-11.7	1.00 V	201	14.03	20.30
6	703.01	36.0 QP	46.0	-10.0	1.50 V	342	12.86	23.13

- 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.

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	25deg. C, 69%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	5127.00	57.9 PK	74.0	-16.1	1.20 H	358	17.66	40.24
2	5127.00	46.7 AV	54.0	-7.3	1.20 H	358	6.46	40.24
3	*5180.00	105.3 PK			1.31 H	171	64.97	40.33
4	*5180.00	95.8 AV			1.31 H	171	55.47	40.33
5	#10360.00	54.4 PK	68.3	-13.9	1.18 H	245	7.57	46.83
6	15540.00	62.0 PK	74.0	-12.0	1.00 H	243	9.79	52.21
7	15540.00	49.3 AV	54.0	-4.7	1.00 H	243	-2.91	52.21
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	5127.00	61.5 PK	74.0	-12.5	1.21 V	278	21.26	40.24
2	5127.00	53.3 AV	54.0	-0.7	1.21 V	278	13.06	40.24
3	*5180.00	110.8 PK			1.18 V	75	70.47	40.33
4	*5180.00	100.4 AV			1.18 V	75	60.07	40.33
5	#10360.00	50.4 PK	68.3	-17.9	1.21 V	200	3.57	46.83
6	15540.00	62.4 PK	74.0	-11.6	1.00 V	55	10.19	52.21
7	15540.00	47.3 AV	54.0	-6.7	1.00 V	55	-4.91	52.21

- 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.

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	25deg. C, 69%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	*5200.00	103.5 PK			1.26 H	327	63.14	40.36
2	*5200.00	93.8 AV			1.26 H	327	53.44	40.36
3	#10400.00	54.6 PK	68.3	-13.7	1.13 H	245	7.70	46.90
4	15600.00	62.4 PK	74.0	-11.6	1.00 H	251	10.48	51.92
5	15600.00	49.6 AV	54.0	-4.4	1.00 H	251	-2.32	51.92
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	108.6 PK			1.16 V	73	68.24	40.36
2	*5200.00	98.4 AV			1.16 V	73	58.04	40.36
3	#10400.00	50.3 PK	68.3	-18.0	1.24 V	200	3.40	46.90
4	15600.00	62.1 PK	74.0	-11.9	1.00 V	12	10.18	51.92
5	15600.00	47.6 AV	54.0	-6.4	1.00 V	12	-4.32	51.92

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.



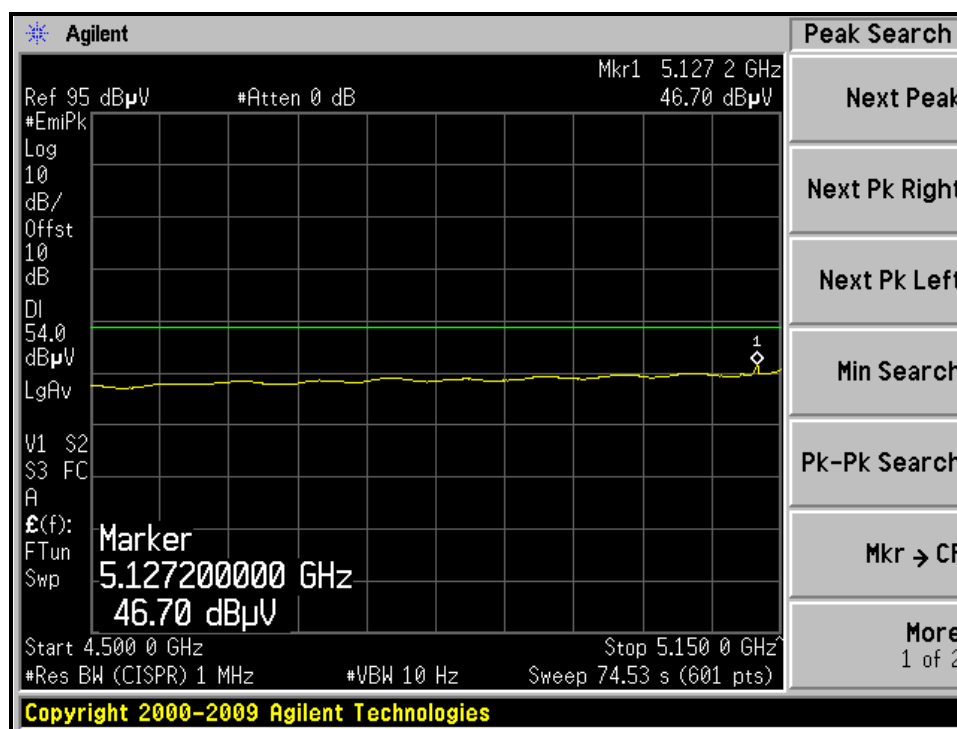
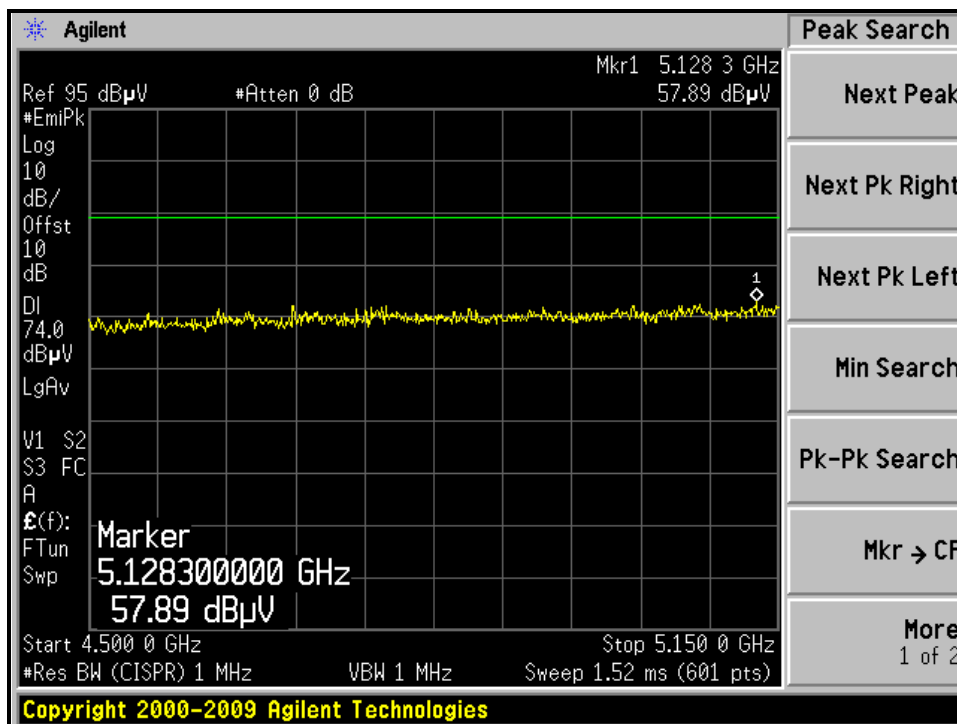
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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 48	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 69%RH	TESTED BY	Frank Liu

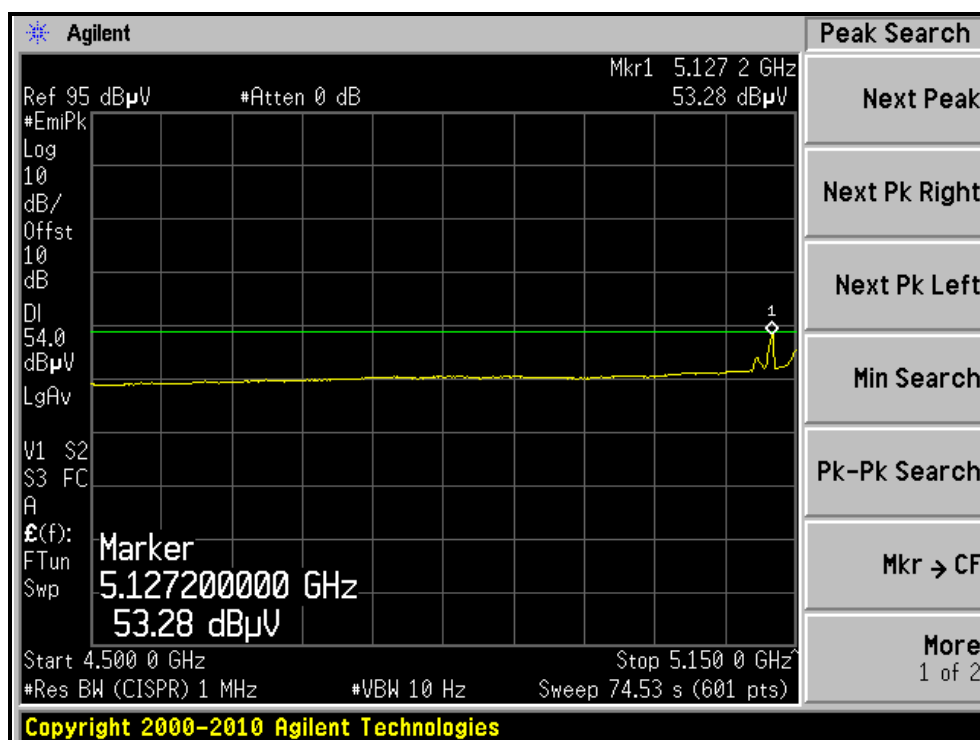
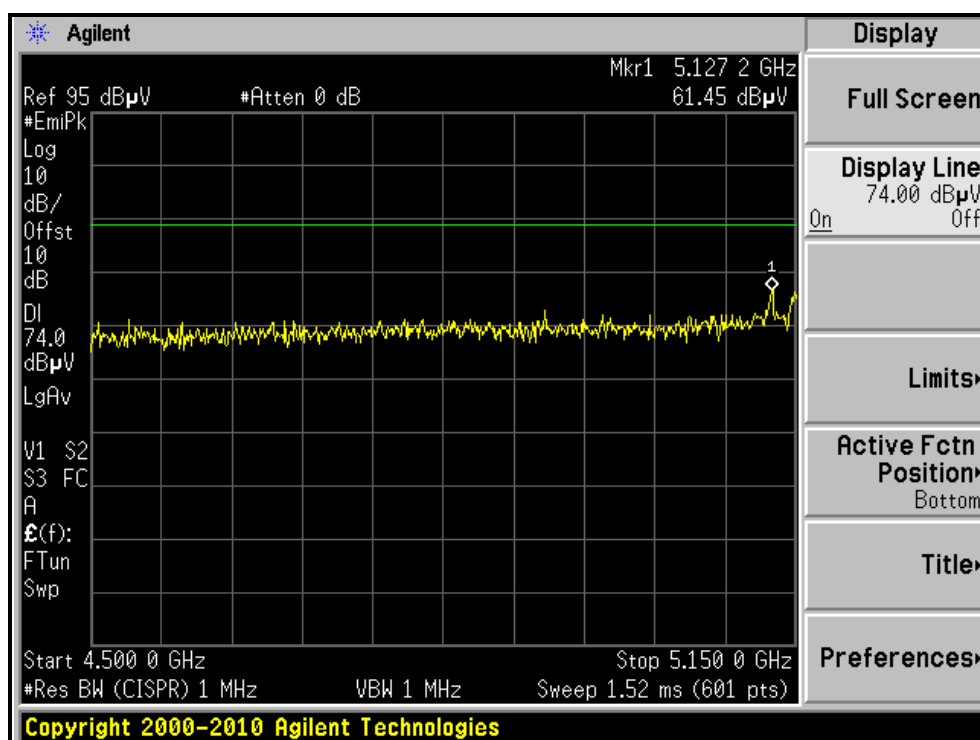
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NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	103.2 PK			1.25 H	331	62.69	40.51
2	*5240.00	93.7 AV			1.25 H	331	53.19	40.51
3	5350.00	56.6 PK	74.0	-17.4	1.25 H	331	15.74	40.86
4	5350.00	45.7 AV	54.0	-8.3	1.25 H	331	4.85	40.86
5	#10480.00	55.0 PK	68.3	-13.3	1.08 H	247	8.09	46.91
6	15720.00	63.6 PK	74.0	-10.4	1.08 H	27	11.69	51.91
7	15720.00	53.2 AV	54.0	-0.8	1.08 H	27	1.29	51.91
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	108.3 PK			1.17 V	72	67.79	40.51
2	*5240.00	98.3 AV			1.17 V	72	57.79	40.51
3	5350.00	57.1 PK	74.0	-16.9	1.17 V	72	16.23	40.86
4	5350.00	45.7 AV	54.0	-8.3	1.17 V	72	4.86	40.86
5	#10480.00	50.6 PK	68.3	-17.7	1.21 V	213	3.69	46.91
6	15720.00	62.4 PK	74.0	-11.6	1.00 V	7	10.49	51.91
7	15720.00	47.3 AV	54.0	-6.7	1.00 V	7	-4.61	51.91

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.

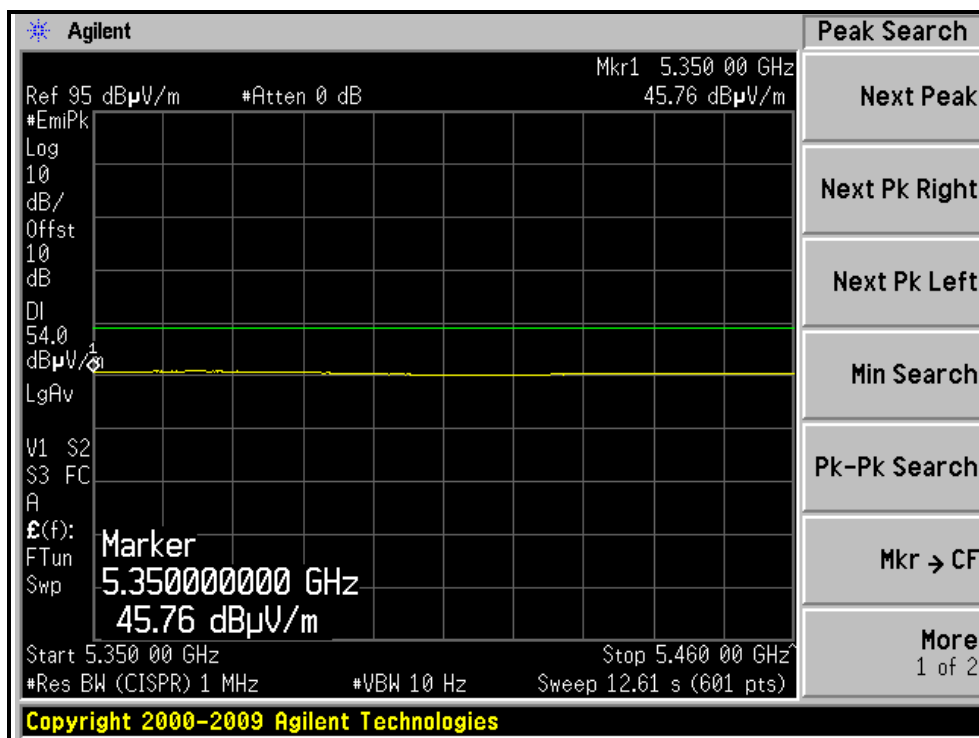
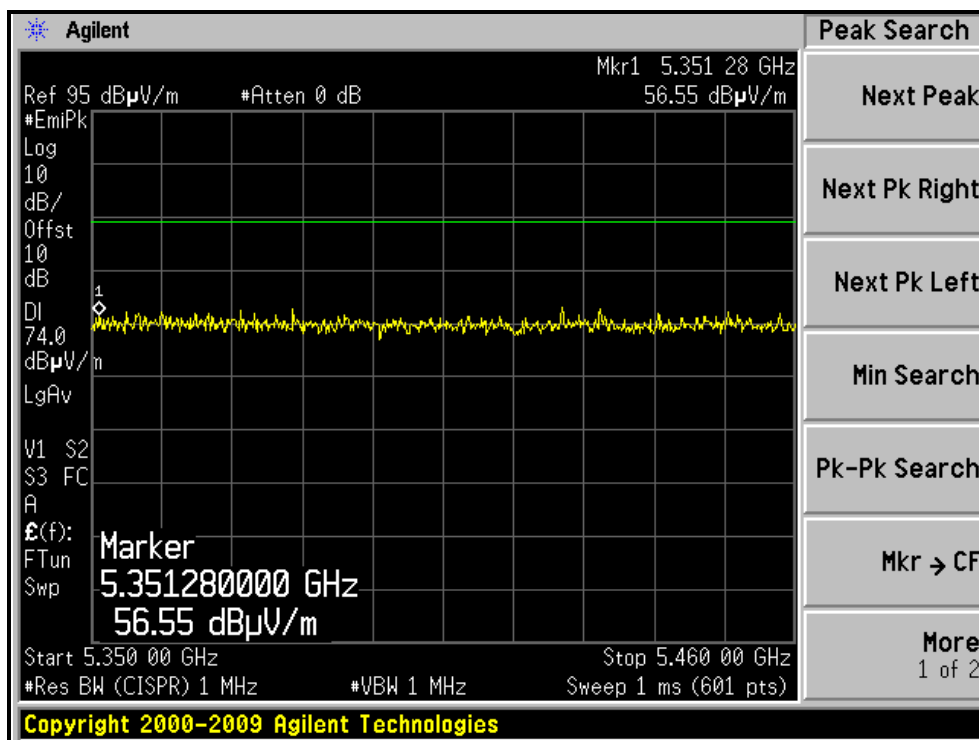
RESTRICTED BANDEDGE (802.11a MODE, CH36, HORIZONTAL)



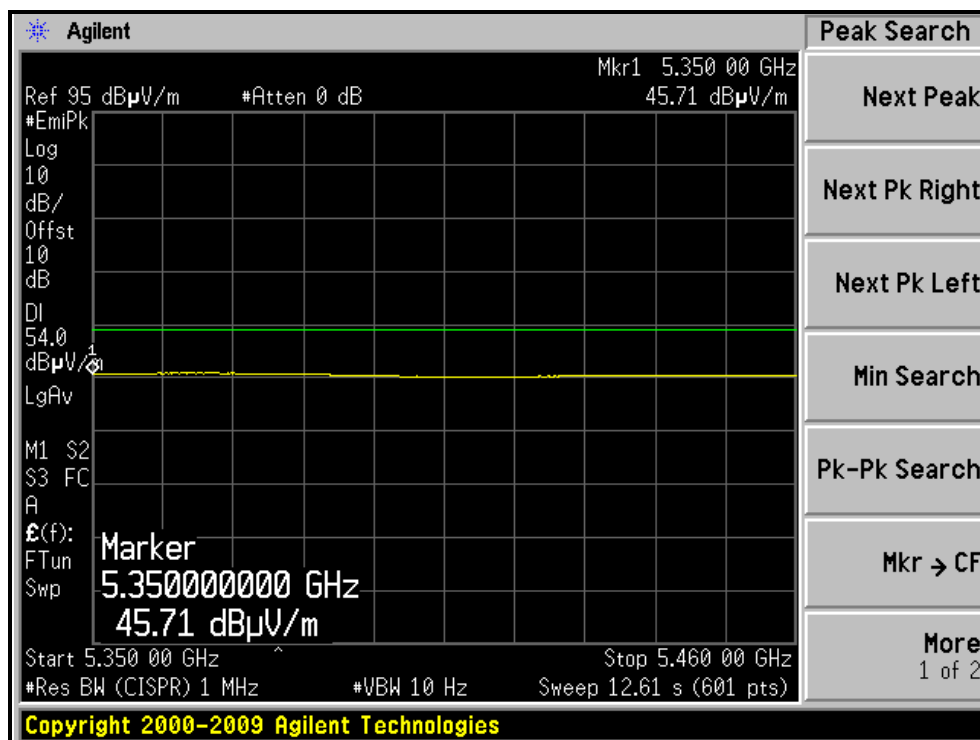
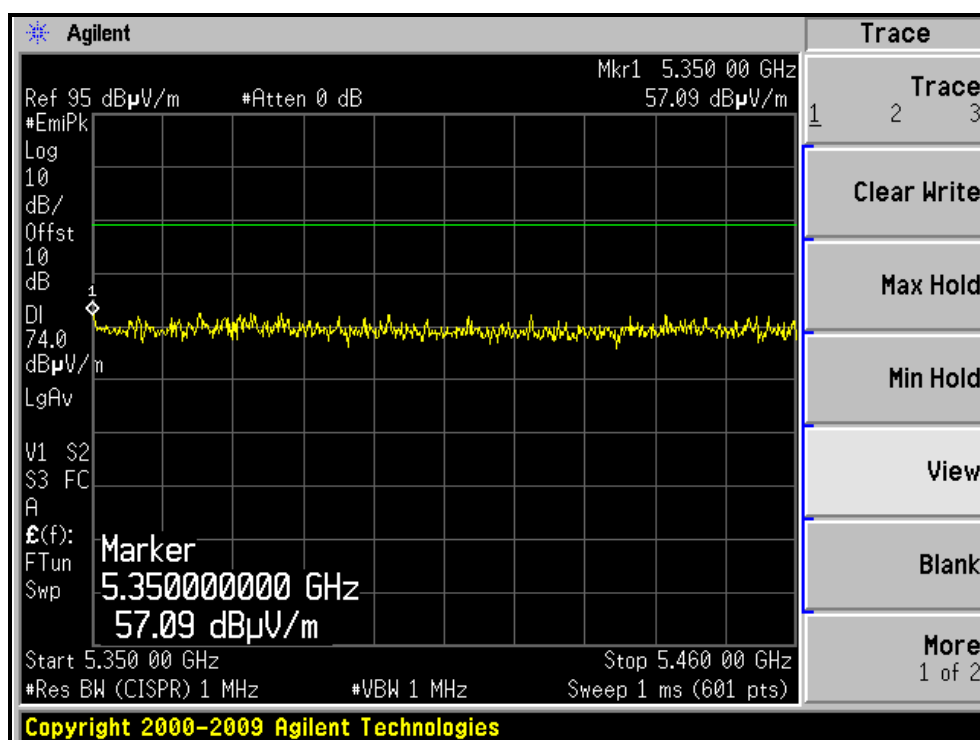
RESTRICTED BANDEDGE (802.11a MODE, CH36, VERTICAL)



RESTRICTED BANDEDGE (802.11a MODE, CH48, HORIZONTAL)



RESTRICTED BANDEDGE (802.11a MODE, CH48, VERTICAL)



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	25deg. C, 69%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	5128.30	58.8 PK	74.0	-15.2	1.26 H	4	18.56	40.24
2	5128.30	49.2 AV	54.0	-4.8	1.26 H	4	8.96	40.24
3	*5180.00	102.2 PK			1.40 H	30	61.87	40.33
4	*5180.00	92.3 AV			1.40 H	30	51.97	40.33
5	#10360.00	53.4 PK	68.3	-14.9	1.15 H	10	6.57	46.83
6	15540.00	59.1 PK	74.0	-14.9	1.00 H	26	6.89	52.21
7	15540.00	49.5 AV	54.0	-4.5	1.00 H	26	-2.71	52.21
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	5128.30	62.8 PK	74.0	-11.2	1.18 V	261	22.56	40.24
2	5128.30	52.9 AV	54.0	-1.1	1.18 V	261	12.66	40.24
3	*5180.00	110.3 PK			1.28 V	315	69.97	40.33
4	*5180.00	100.2 AV			1.28 V	315	59.87	40.33
5	#10360.00	48.3 PK	68.3	-20.0	1.04 V	208	1.47	46.83
6	15540.00	59.3 PK	74.0	-14.7	1.00 V	26	7.09	52.21
7	15540.00	49.4 AV	54.0	-4.6	1.00 V	26	-2.81	52.21

- 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.

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	25deg. C, 69%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	*5200.00	102.4 PK			1.41 H	42	62.04	40.36
2	*5200.00	92.4 AV			1.41 H	42	52.04	40.36
3	#10400.00	53.2 PK	68.3	-15.1	1.15 H	24	6.30	46.90
4	15600.00	59.2 PK	74.0	-14.8	1.01 H	16	7.28	51.92
5	15600.00	49.4 AV	54.0	-4.6	1.01 H	16	-2.52	51.92
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	110.6 PK			1.27 V	314	70.24	40.36
2	*5200.00	100.4 AV			1.27 V	314	60.04	40.36
3	#10400.00	48.8 PK	68.3	-19.5	1.04 V	205	1.90	46.90
4	15600.00	59.3 PK	74.0	-14.7	1.00 V	35	7.38	51.92
5	15600.00	49.6 AV	54.0	-4.4	1.00 V	35	-2.32	51.92

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.



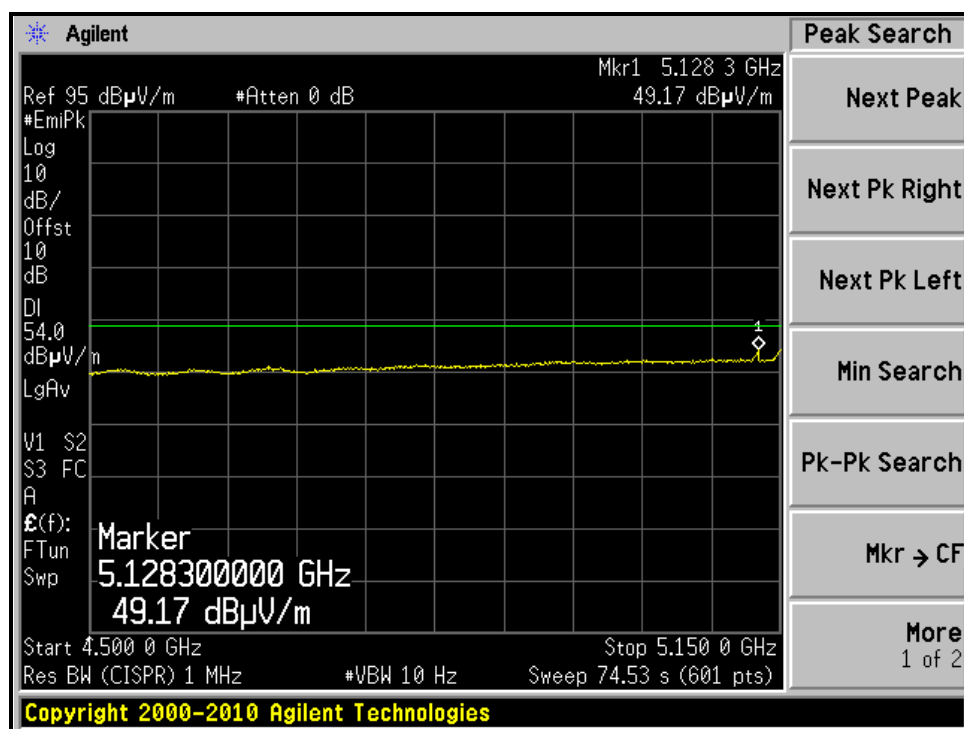
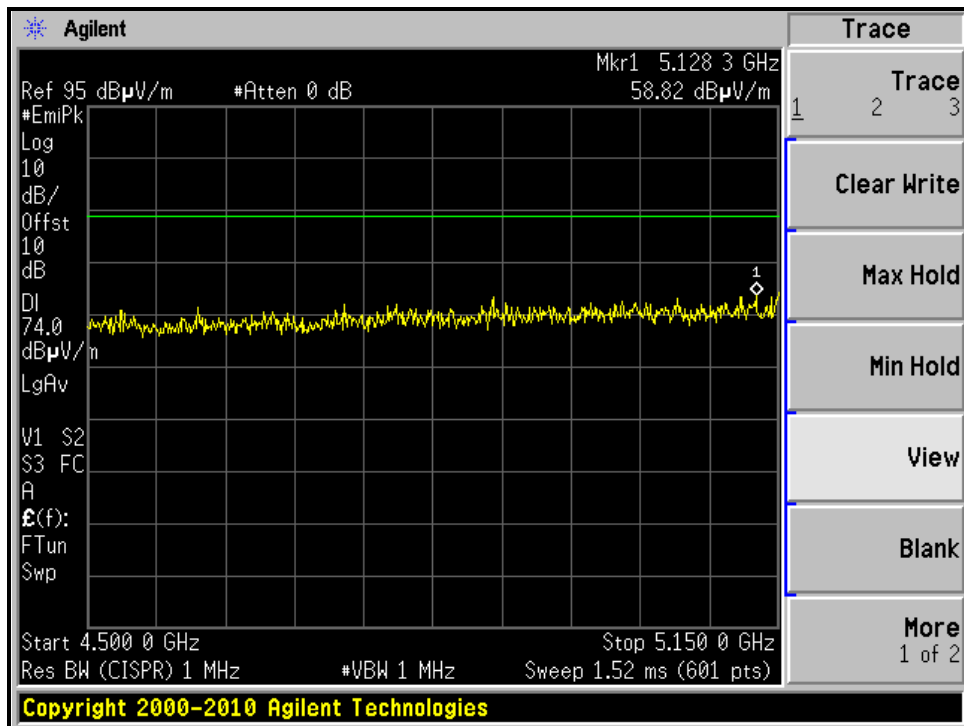
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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 48	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 69%RH	TESTED BY	Frank Liu

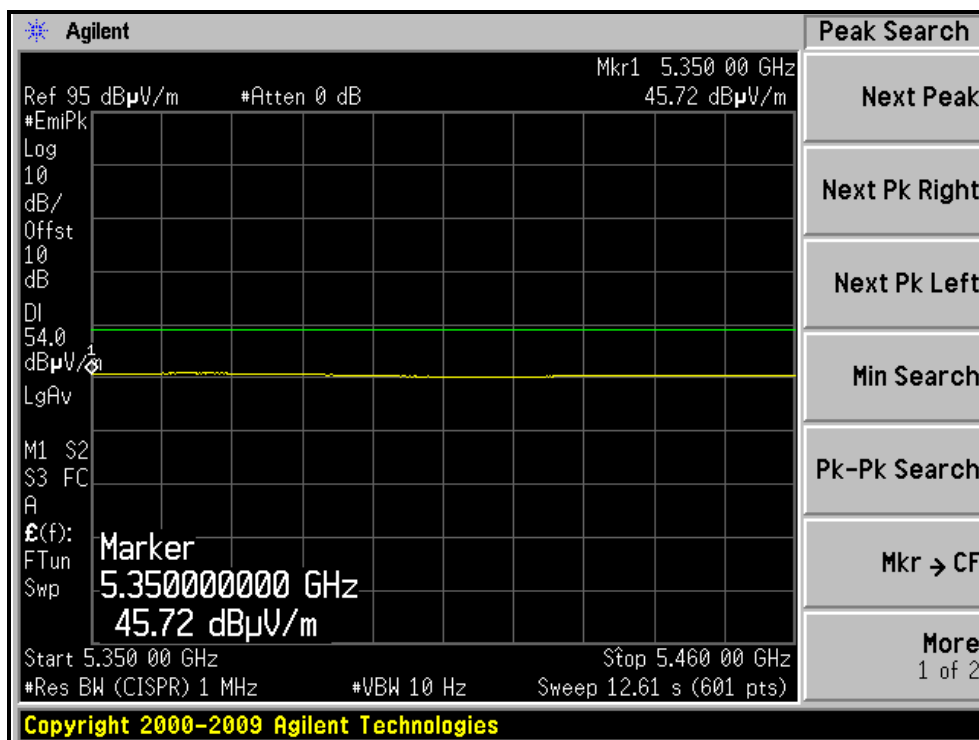
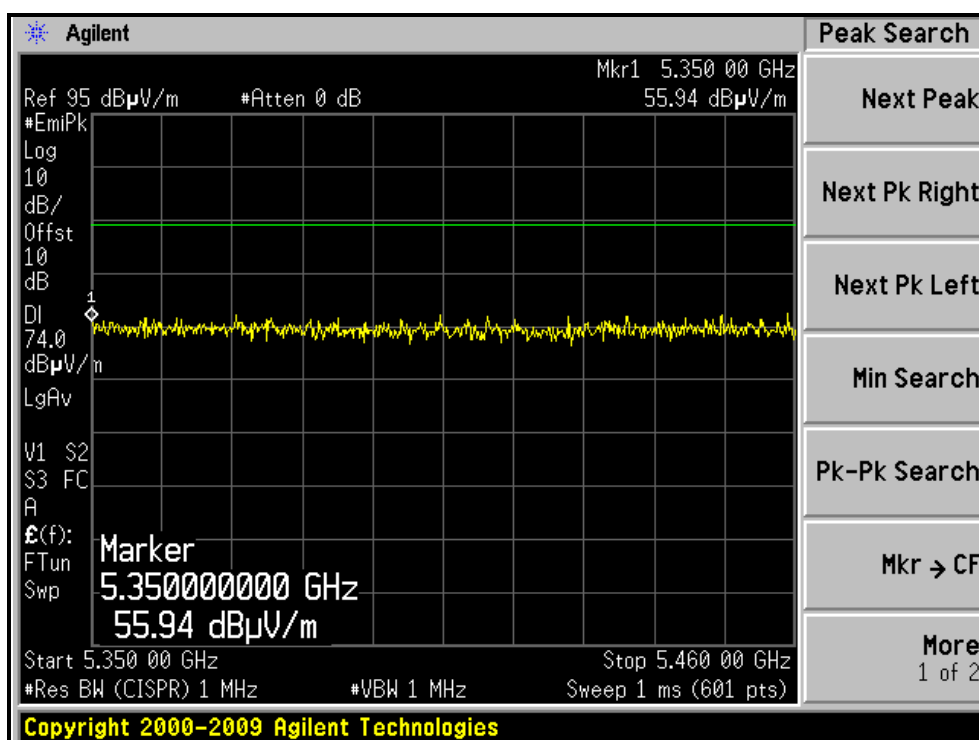
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	102.6 PK			1.46 H	46	62.09	40.51
2	*5240.00	92.3 AV			1.46 H	46	51.79	40.51
3	5350.00	55.9 PK	74.0	-18.1	1.46 H	46	15.08	40.86
4	5350.00	45.7 AV	54.0	-8.3	1.46 H	46	4.86	40.86
5	#10480.00	53.3 PK	68.3	-15.0	1.17 H	20	6.39	46.91
6	15720.00	59.6 PK	74.0	-14.4	1.01 H	19	7.69	51.91
7	15720.00	49.5 AV	54.0	-4.5	1.01 H	19	-2.41	51.91
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	110.7 PK			1.24 V	319	70.19	40.51
2	*5240.00	100.2 AV			1.24 V	319	59.69	40.51
3	5350.00	56.5 PK	74.0	-17.5	1.24 V	319	15.64	40.86
4	5350.00	45.7 AV	54.0	-8.3	1.24 V	319	4.84	40.86
5	#10480.00	49.3 PK	68.3	-19.0	1.01 V	197	2.39	46.91
6	15720.00	59.8 PK	74.0	-14.2	1.00 V	36	7.89	51.91
7	15720.00	50.1 AV	54.0	-3.9	1.00 V	36	-1.81	51.91

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.

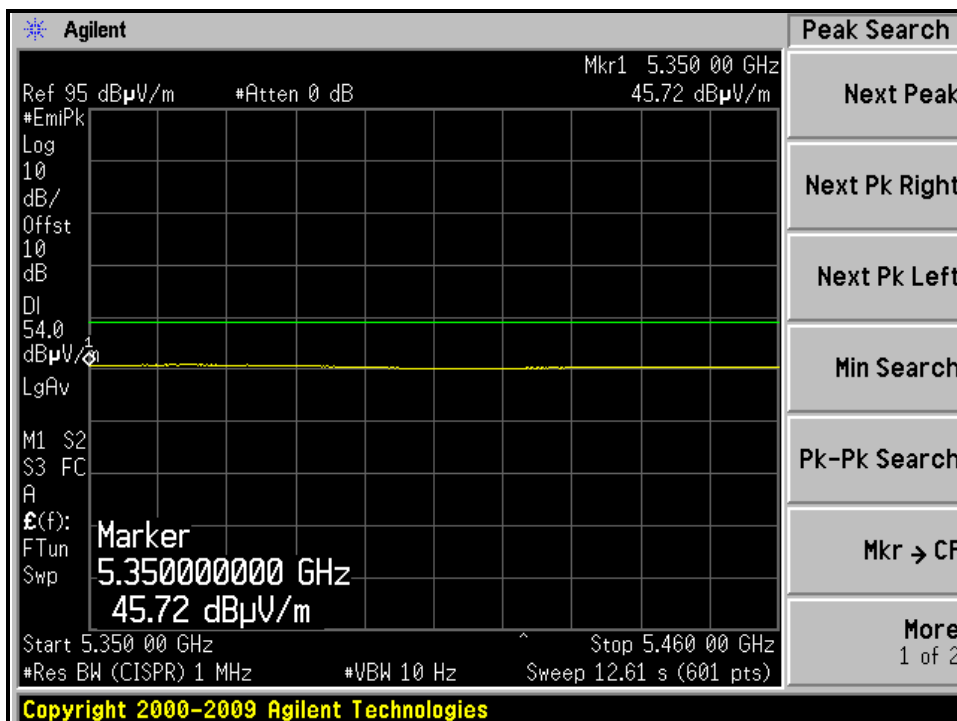
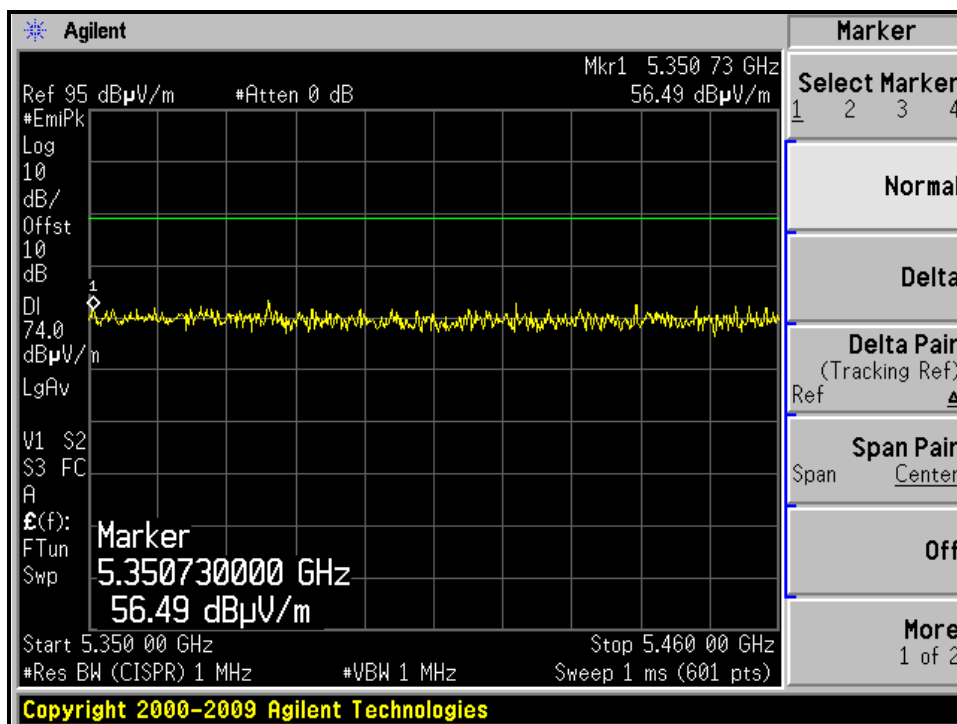
RESTRICTED BANDEDGE (802.11n (20MHz) MODE,CH36, HORIZONTAL)



RESTRICTED BANDEDGE (802.11n (20MHz) MODE,CH 48, HORIZONTAL)



RESTRICTED BANDEDGE (802.11n (20MHz) MODE,CH 48, VERTICAL)



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	25deg. C, 69%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	5150.00	61.0 PK	74.0	-13.0	1.43 H	162	20.73	40.27
2	5150.00	50.0 AV	54.0	-4.0	1.43 H	162	9.73	40.27
3	*5190.00	98.6 PK			1.45 H	154	58.26	40.34
4	*5190.00	88.4 AV			1.45 H	154	48.06	40.34
5	#10380.00	53.1 PK	68.3	-15.2	1.15 H	14	6.24	46.86
6	15570.00	59.4 PK	74.0	-14.6	1.00 H	243	7.33	52.07
7	15570.00	49.2 AV	54.0	-4.8	1.00 H	243	-2.87	52.07
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	64.0 PK	74.0	-10.0	1.19 V	262	23.73	40.27
2	5150.00	53.4 AV	54.0	-0.6	1.19 V	262	13.13	40.27
3	*5190.00	102.0 PK			1.18 V	278	61.66	40.34
4	*5190.00	92.2 AV			1.18 V	278	51.86	40.34
5	#10380.00	50.3 PK	68.3	-18.0	1.31 V	204	3.44	46.86
6	15570.00	59.4 PK	74.0	-14.6	1.00 V	56	7.33	52.07
7	15570.00	49.1 AV	54.0	-4.9	1.00 V	56	-2.97	52.07

REMARKS:

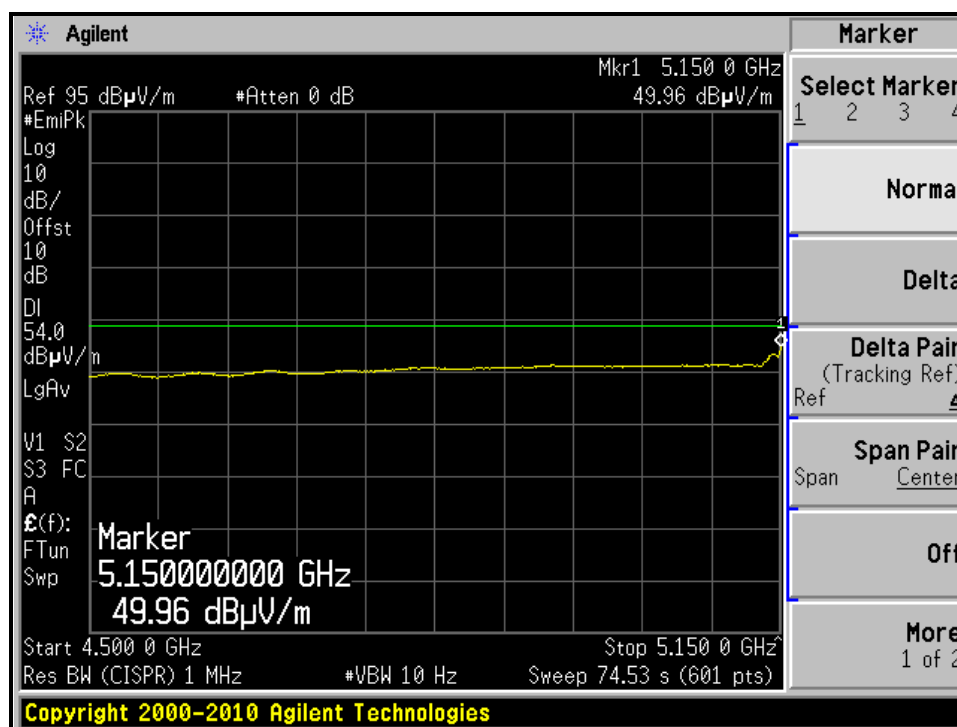
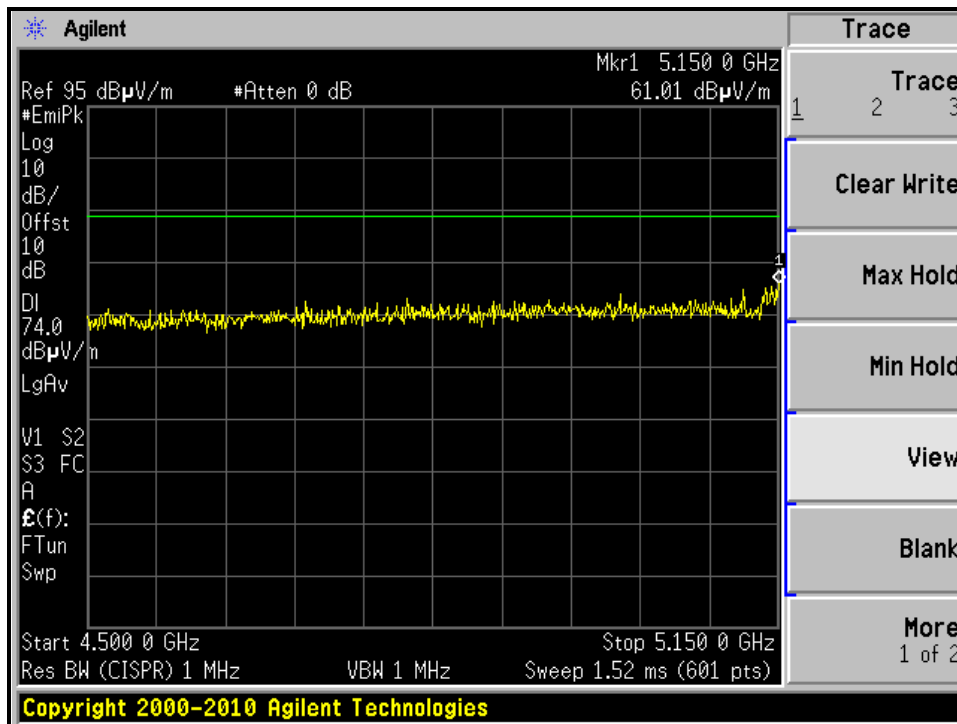
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “ * “: Fundamental frequency.
6. “#”:The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

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	25deg. C, 69%RH	TESTED BY	Frank Liu

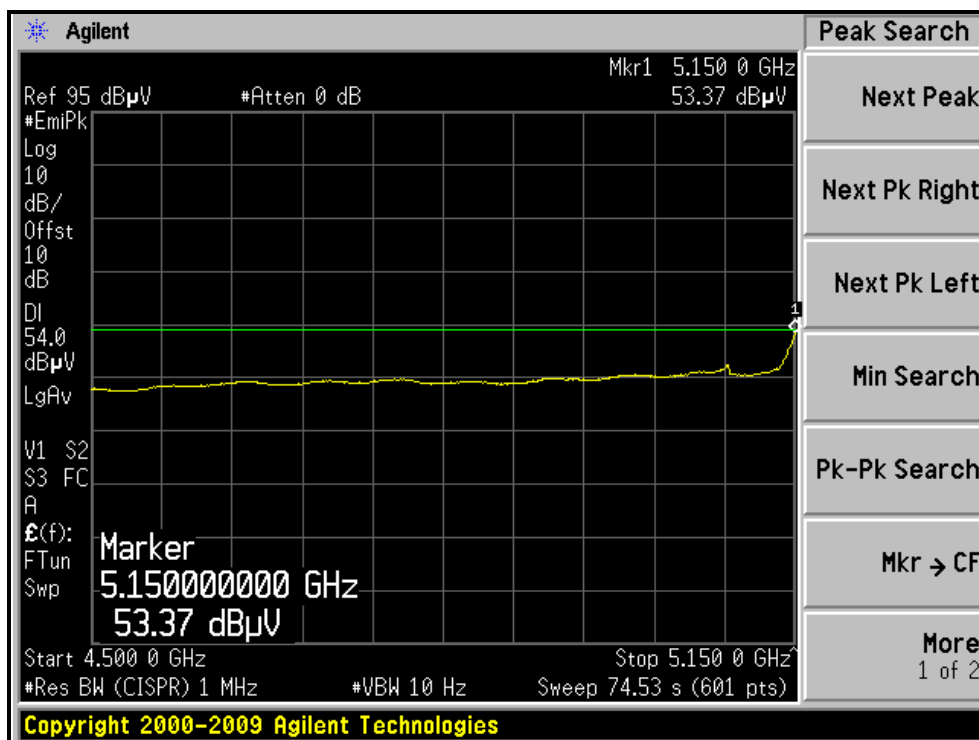
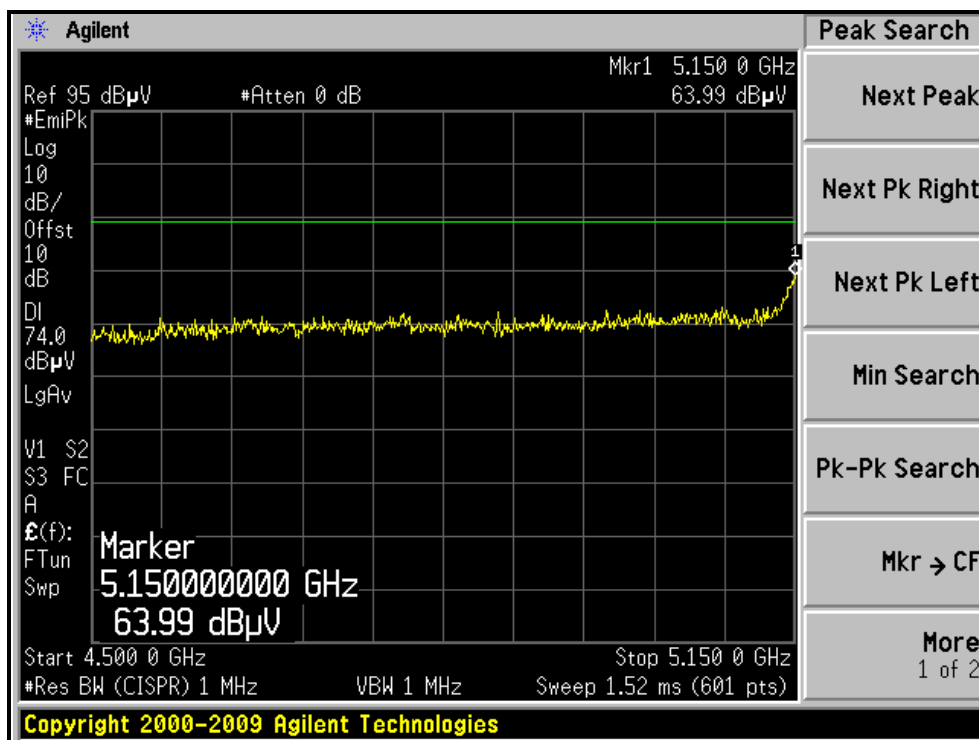
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5230.00	103.4 PK			1.42 H	157	61.55	41.85
2	*5230.00	93.1 AV			1.42 H	157	51.25	41.85
3	5350.00	55.8 PK	74.0	-18.2	1.42 H	157	13.71	42.09
4	5350.00	45.7 AV	54.0	-8.3	1.42 H	157	3.61	42.09
5	#10460.00	53.4 PK	68.3	-14.9	1.13 H	26	4.77	48.63
6	15690.00	59.6 PK	74.0	-14.4	1.00 H	253	5.79	53.81
7	15690.00	49.3 AV	54.0	-4.7	1.00 H	253	-4.51	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	107.4 PK			1.13 V	274	66.93	40.47
2	*5230.00	97.3 AV			1.13 V	274	56.83	40.47
3	5350.00	57.8 PK	74.0	-16.2	1.13 V	274	16.94	40.86
4	5350.00	45.8 AV	54.0	-8.2	1.13 V	274	4.94	40.86
5	#10460.00	50.4 PK	68.3	-17.9	1.32 V	201	3.49	46.91
6	15690.00	59.7 PK	74.0	-14.3	1.00 V	63	7.87	51.83
7	15690.00	49.2 AV	54.0	-4.8	1.00 V	63	-2.63	51.83

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.

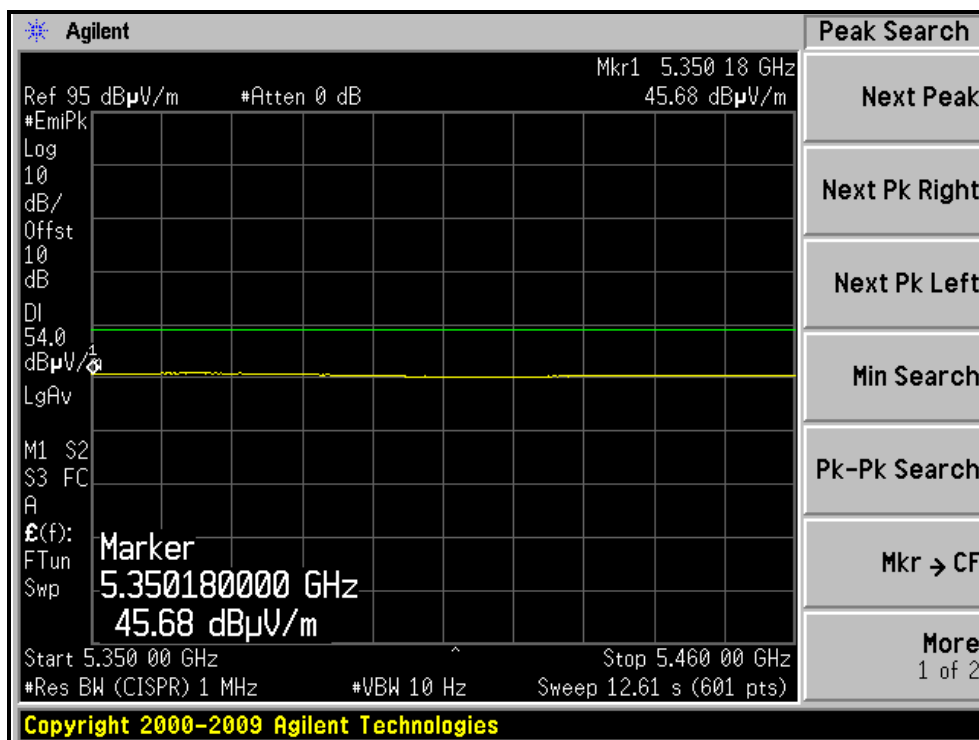
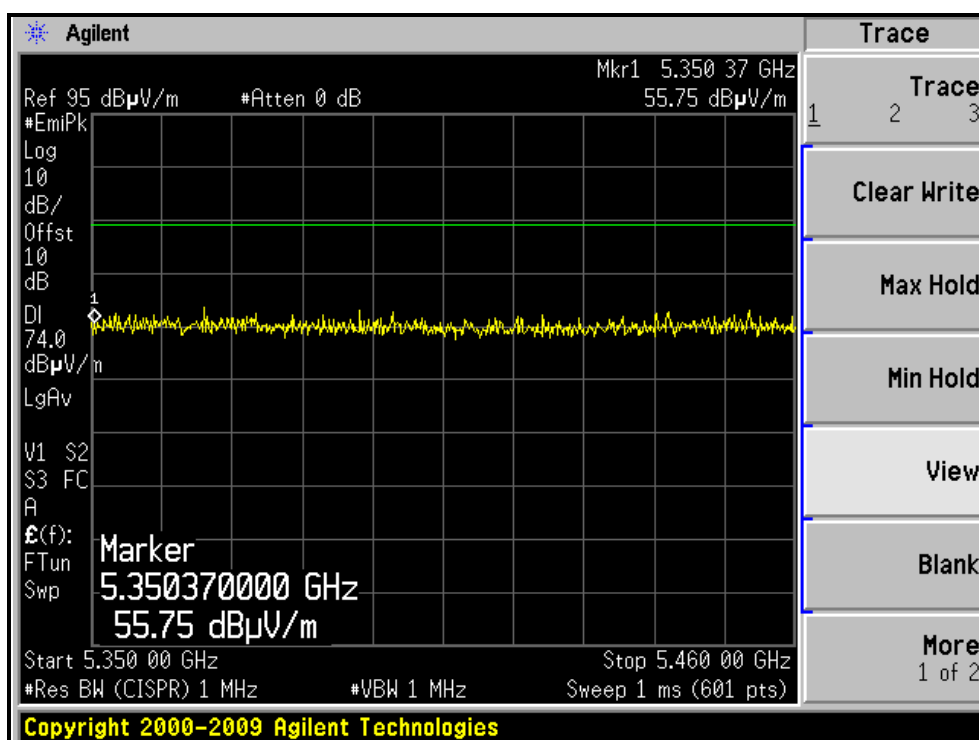
RESTRICTED BANDEDGE (802.11n (40MHz) MODE, CH38, HORIZONTAL)



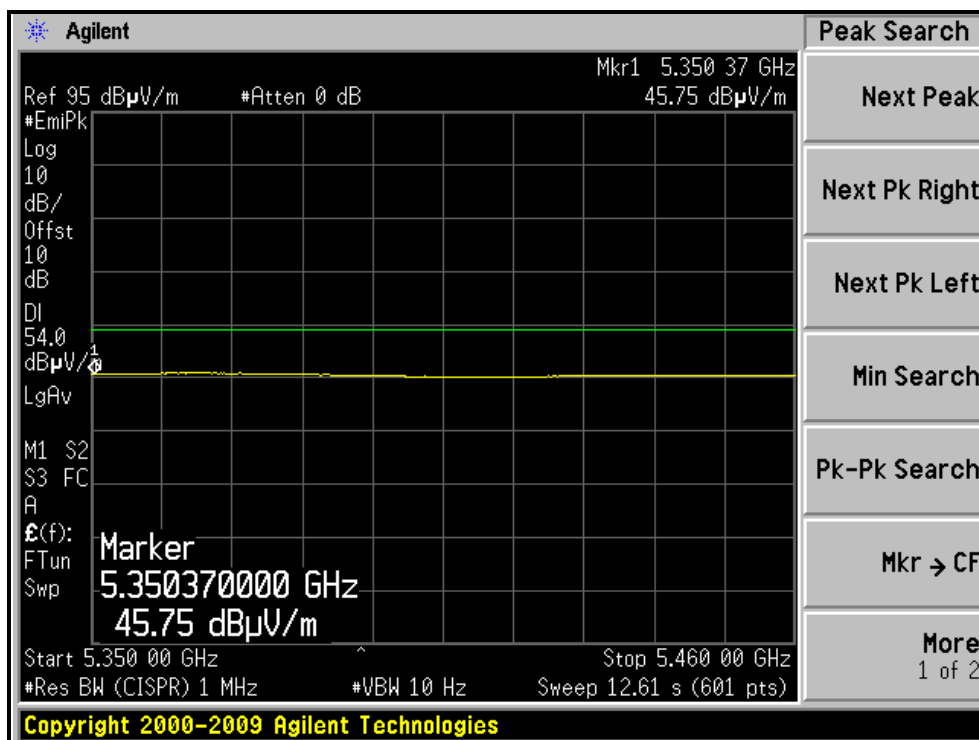
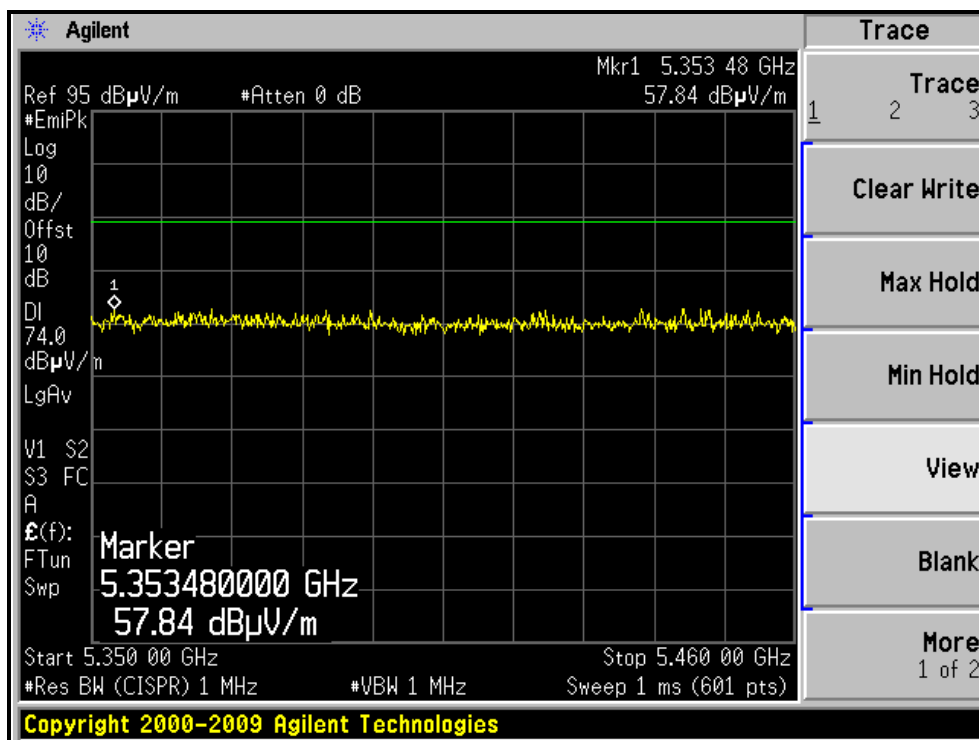
RESTRICTED BANDEDGE (802.11n (40MHz) MODE,CH38, VERTICAL)



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



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



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

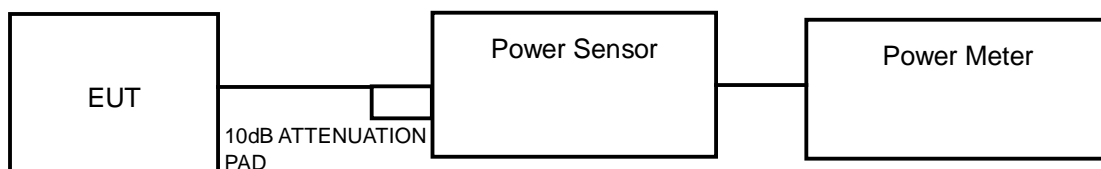
The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 300kHz RBW and 1MHz VBW. The 26dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 26dB.

4.3.4 DEVIATION FROM TEST STANDARD

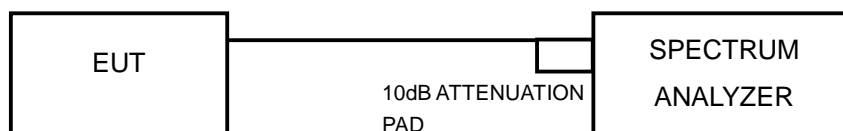
No deviation

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 (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	PASS/FAIL
36	5180	32.4	15.1	17	PASS
40	5200	28.8	14.6	17	PASS
48	5240	30.9	14.9	17	PASS

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	11.1	11.1	25.8	14.1	17	PASS
40	5200	11.4	11.4	27.6	14.4	17	PASS
48	5240	11.7	10.8	26.8	14.3	17	PASS

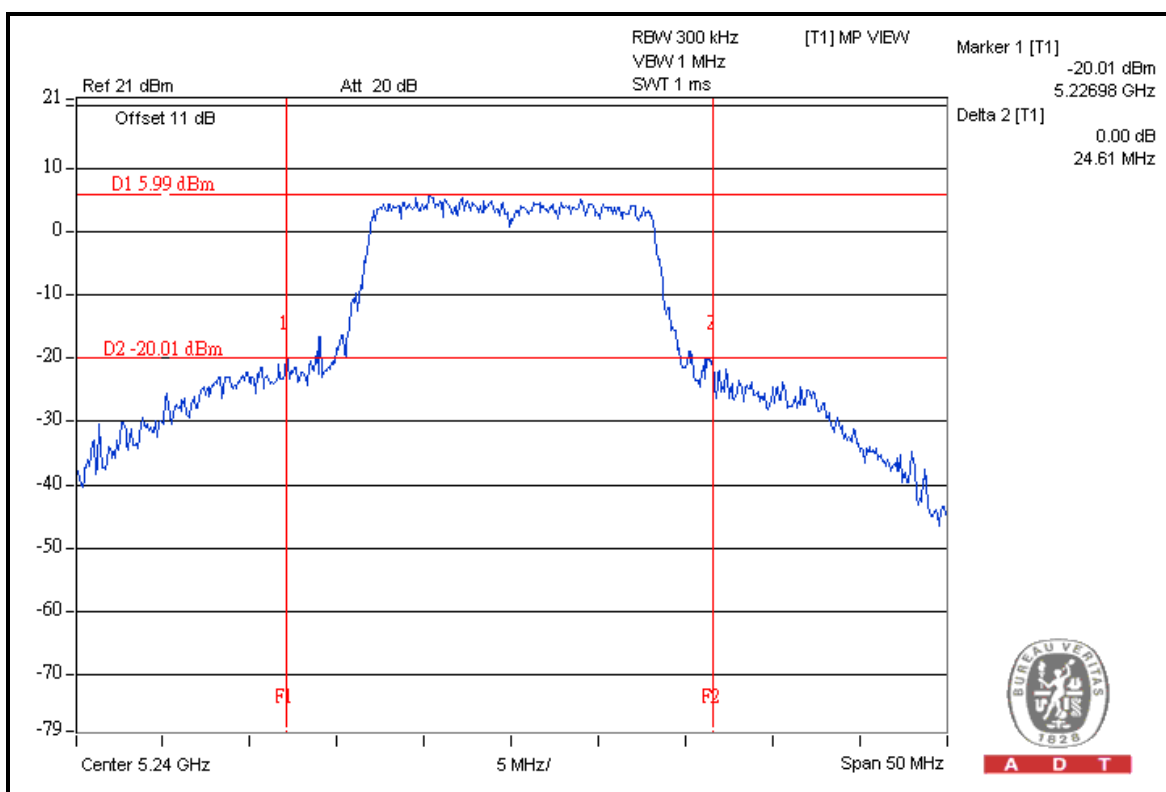
802.11n (40MHz) OFDM modulation:

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	9.1	8.5	15.2	11.8	17	PASS
46	5230	14.2	13.3	47.7	16.8	17	PASS

26dB OCCUPIED BANDWIDTH: 802.11a

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc OCCUPIED BANDWIDTH (MHz)
36	5180	21.71
40	5200	19.24
48	5240	24.61

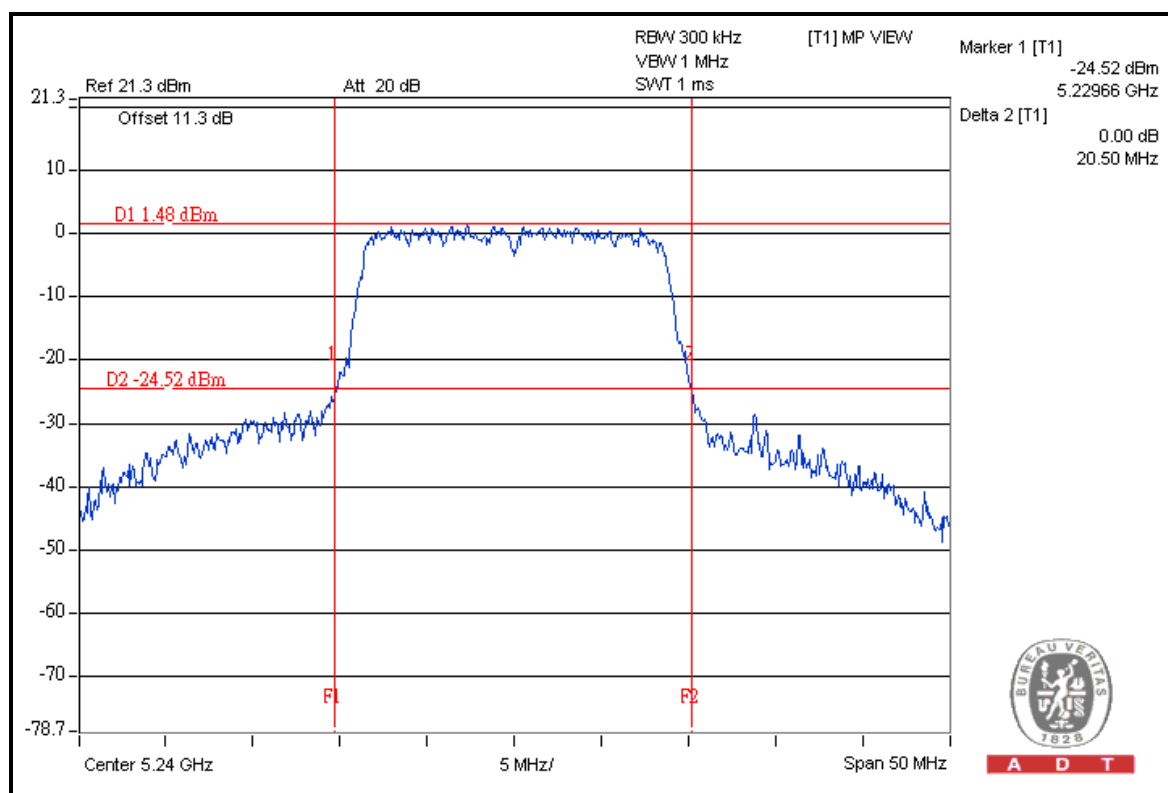
CH 48



802.11n (20MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc OCCUPIED BANDWIDTH (MHz)	
		CHAIN (0)	CHAIN (1)
36	5180	20.02	20.24
40	5200	19.84	20.31
48	5240	20.50	20.01

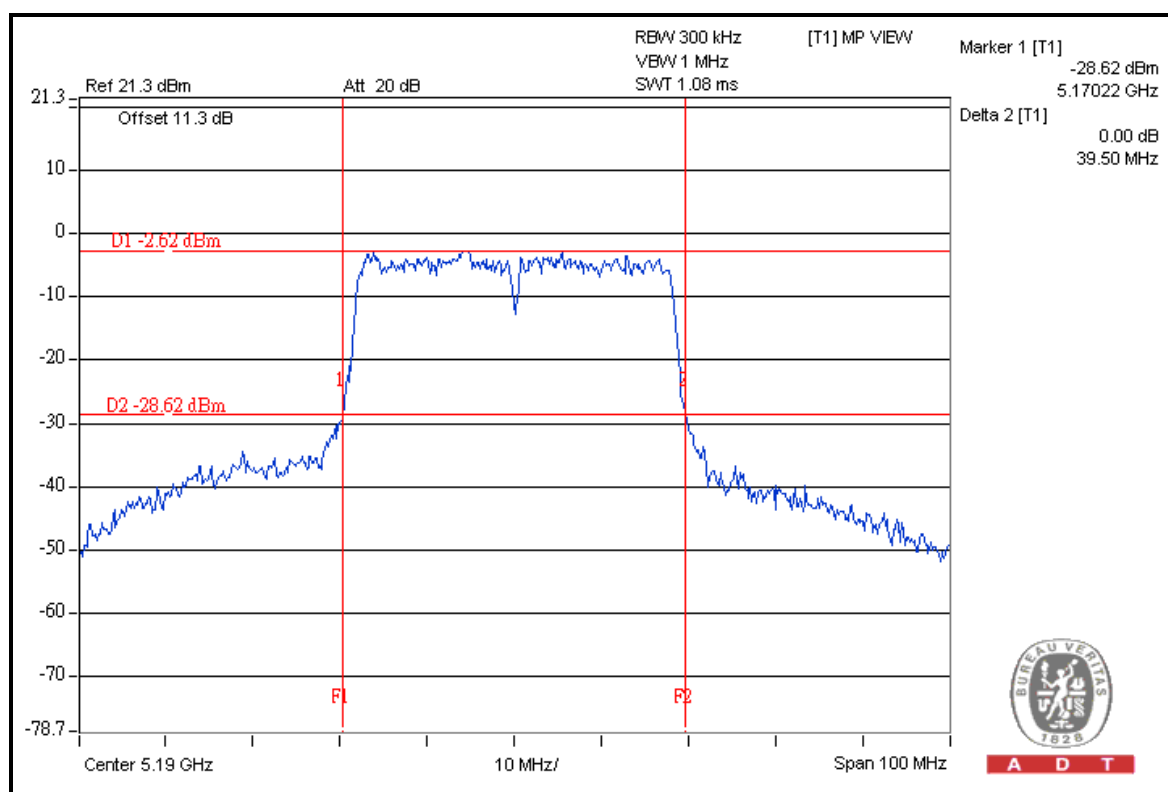
FOR CHAIN (0): CH 48



802.11n (40MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc OCCUPIED BANDWIDTH (MHz)	
		CHAIN (0)	CHAIN (1)
38	5190	39.26	39.50
46	5230	38.93	38.79

FOR CHAIN (1): CH 38



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. 30, 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.

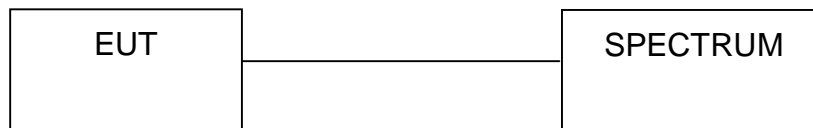
4.4.3 TEST PROCEDURE

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

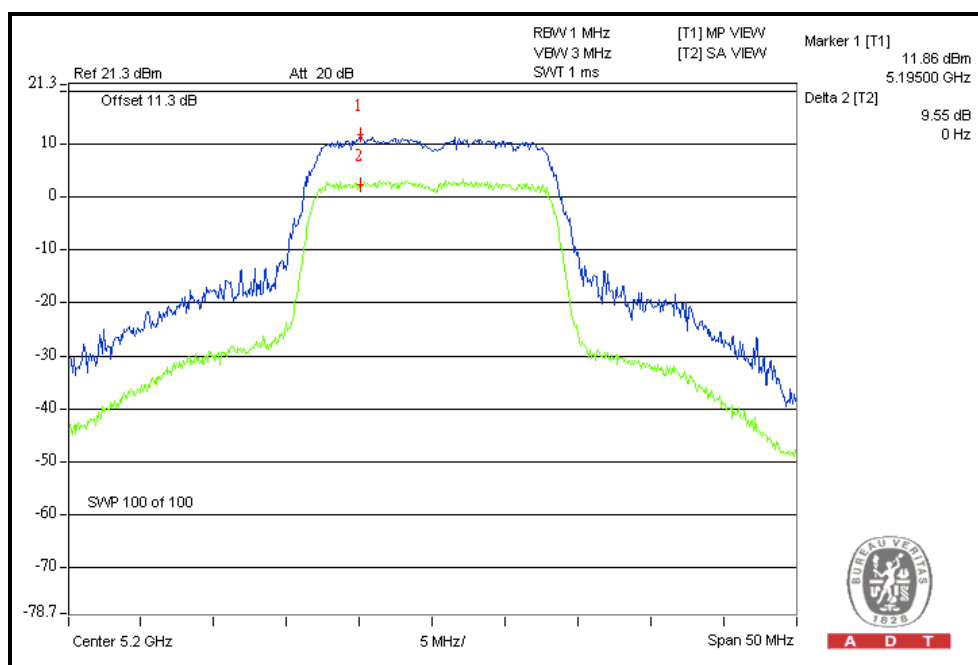
The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.

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
36	5180	9.1	13	PASS
40	5200	9.6	13	PASS
48	5240	9.3	13	PASS

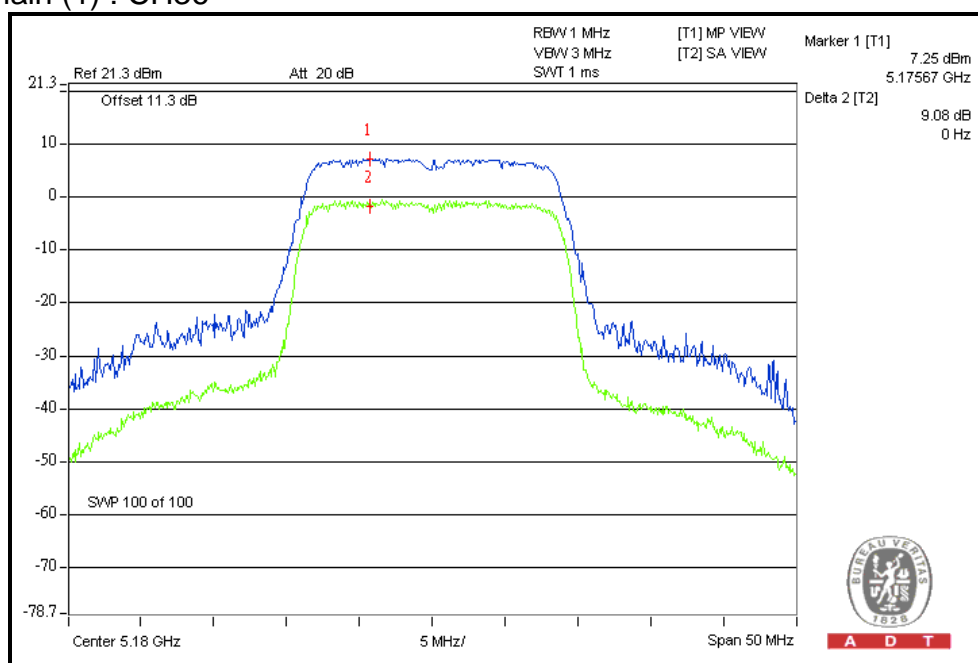
CH40



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	8.2	9.1	13	PASS
40	5200	8.0	8.3	13	PASS
48	5240	8.9	8.4	13	PASS

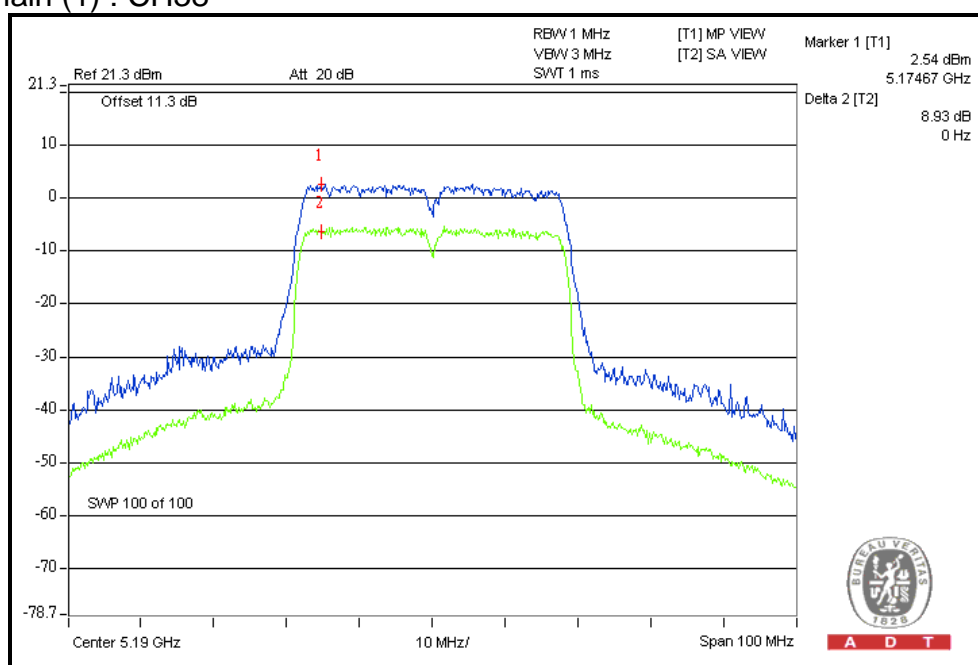
For Chain (1) : CH36



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	8.0	8.9	13	PASS
46	5230	8.6	8.8	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. 30, 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.

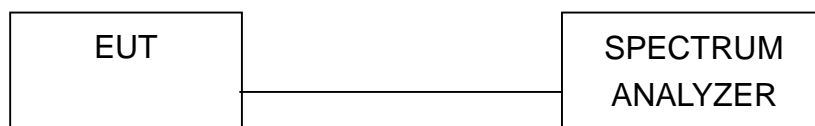
4.5.3 TEST PROCEDURES

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

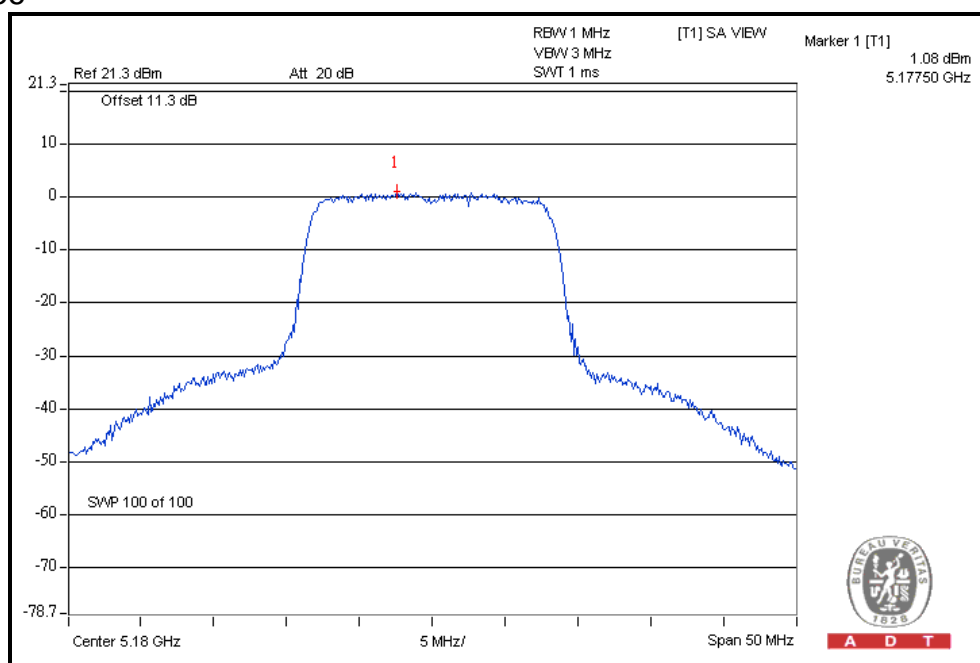
Same as 4.3.6

4.5.7 TEST RESULTS

802.11a OFDM MODULATION

CHANNEL	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL IN 3kHz BW (dBm)	MAXIMUM LIMIT (dBm)	PASS / FAIL
36	5180	1.1	4	PASS
40	5200	1.0	4	PASS
48	5240	0.2	4	PASS

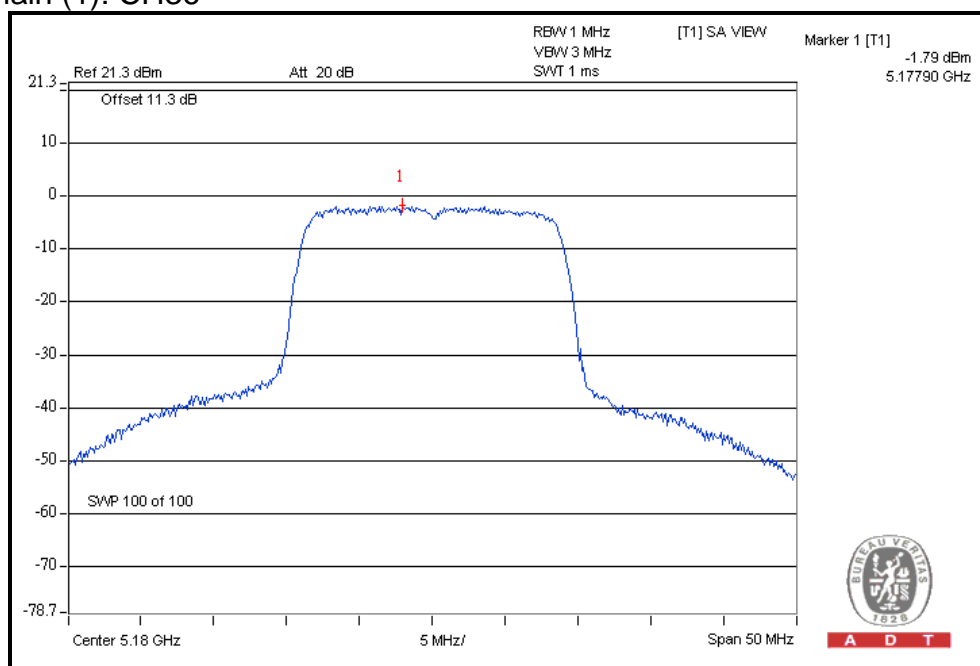
CH36



802.11n (20MHz) OFDM MODULATION:

CHANNEL	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL IN 3kHz BW (dBm)		TOTAL POWER DENSITY (dBm)	MAXIMUM LIMIT (dBm)	PASS / FAIL
		CHAIN(0)	CHAIN(1)			
36	5180	-2.8	-1.8	0.6	4	PASS
40	5200	-1.9	-2.5	0.6	4	PASS
48	5240	-2.4	-4.2	-0.4	4	PASS

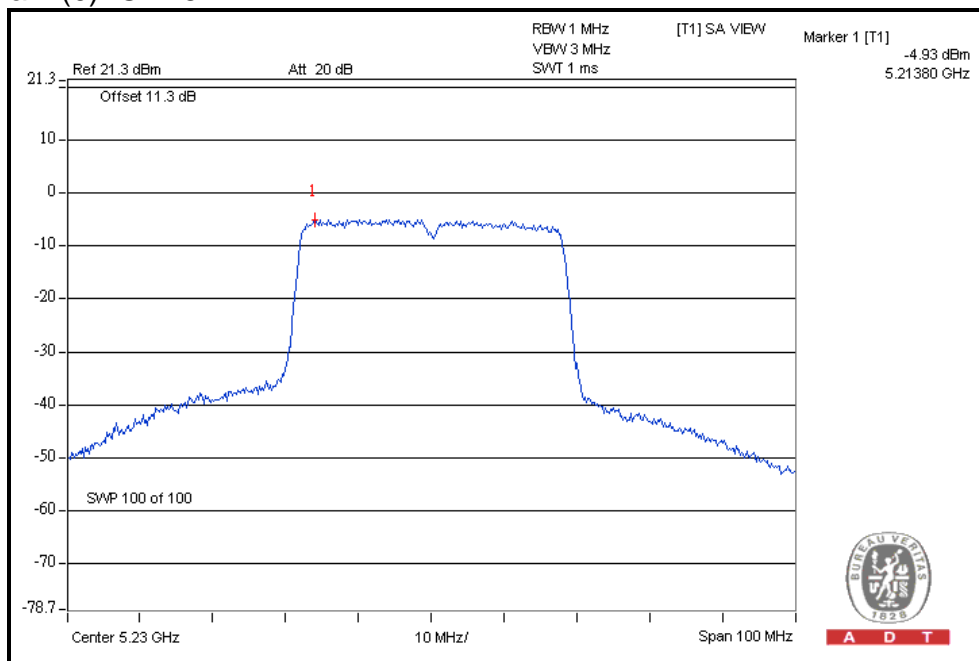
For Chain (1): CH36



802.11n (40MHz) OFDM MODULATION:

CHANNEL	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL IN 3kHz BW (dBm)		TOTAL POWER DENSITY (dBm)	MAXIMUM LIMIT (dBm)	PASS / FAIL
		CHAIN(0)	CHAIN(1)			
38	5190	-5.1	-5.2	-2.3	4	PASS
46	5230	-4.9	-5.9	-2.6	4	PASS

For Chain (0): CH46





A D T

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. 30, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP40	100036	Dec. 08, 2010	Dec. 07, 2011

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

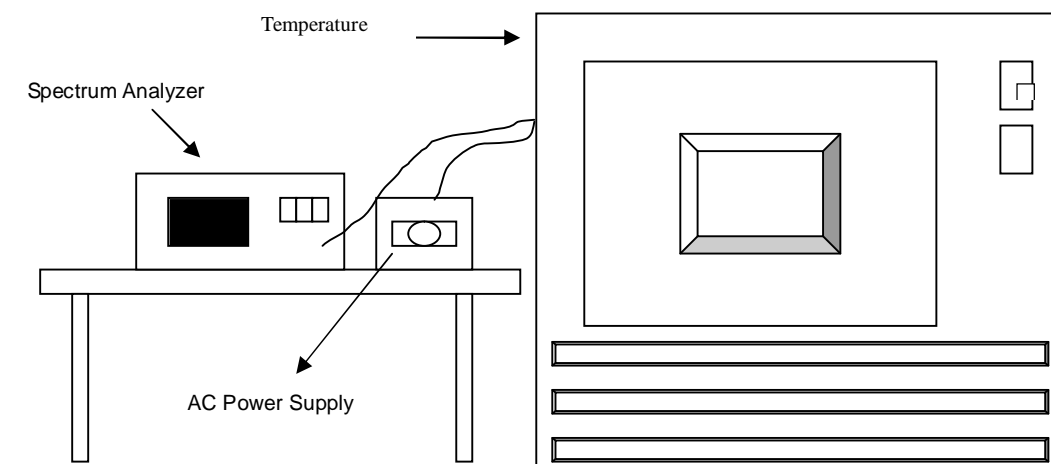
4.6.3 TEST PROCEDURE

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.

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	5179.9809	-3.6873	5179.9796	-3.9382	5179.9775	-4.3436	5179.9724	-5.3282
	120	5179.9798	-3.8996	5179.9805	-3.7645	5179.9765	-4.5367	5179.9722	-5.3668
	102	5179.9801	-3.8417	5179.981	-3.6680	5179.9772	-4.4015	5179.9729	-5.2317
40	138	5179.9958	-0.8108	5179.9977	-0.4440	5180.001	0.1931	5180.0035	0.6757
	120	5179.9964	-0.6950	5179.9978	-0.4247	5180.0021	0.4054	5180.0041	0.7915
	102	5179.9963	-0.7143	5179.9964	-0.6950	5180.0008	0.1544	5180.0038	0.7336
30	138	5179.9876	-2.3938	5179.9903	-1.8726	5179.9949	-0.9846	5179.9963	-0.7143
	120	5179.9865	-2.6062	5179.9896	-2.0077	5179.9948	-1.0039	5179.9966	-0.6564
	102	5179.9875	-2.4131	5179.99	-1.9305	5179.9939	-1.1776	5179.9964	-0.6950
20	138	5180.0116	2.2394	5180.0163	3.1467	5180.0176	3.3977	5180.0203	3.9189
	120	5180.0118	2.2780	5180.0161	3.1081	5180.0173	3.3398	5180.0206	3.9768
	102	5180.0135	2.6062	5180.0147	2.8378	5180.0184	3.5521	5180.0194	3.7452
10	138	5179.9891	-2.1042	5179.991	-1.7375	5179.987	-2.5097	5179.9883	-2.2587
	120	5179.9902	-1.8919	5179.9901	-1.9112	5179.987	-2.5097	5179.9874	-2.4324
	102	5179.9906	-1.8147	5179.9907	-1.7954	5179.9867	-2.5676	5179.9884	-2.2394
0	138	5179.9984	-0.3089	5179.9981	-0.3668	5179.9961	-0.7529	5179.9932	-1.3127
	120	5180.0002	0.0386	5179.9971	-0.5598	5179.9975	-0.4826	5179.9941	-1.1390
	102	5180.0001	0.0193	5179.9976	-0.4633	5179.9962	-0.7336	5179.9936	-1.2355
-10	138	5179.9838	-3.1274	5179.9813	-3.6100	5179.98	-3.8610	5179.9764	-4.5560
	120	5179.9833	-3.2239	5179.9813	-3.6100	5179.9784	-4.1699	5179.9755	-4.7297
	102	5179.9843	-3.0309	5179.9808	-3.7066	5179.9783	-4.1892	5179.9756	-4.7104
-20	138	5180.0119	2.2973	5180.0137	2.6448	5180.0158	3.0502	5180.0163	3.1467
	120	5180.0103	1.9884	5180.0137	2.6448	5180.0156	3.0116	5180.0158	3.0502
	102	5180.0112	2.1622	5180.0154	2.9730	5180.015	2.8958	5180.0164	3.1660
-30	138	5179.982	-3.4749	5179.9779	-4.2664	5179.9798	-3.8996	5179.9762	-4.5946
	120	5179.9827	-3.3398	5179.978	-4.2471	5179.9789	-4.0734	5179.9753	-4.7683
	102	5179.9825	-3.3784	5179.9789	-4.0734	5179.9794	-3.9768	5179.9747	-4.8842

4.7 CONDUCTED OUT-BAND EMISSION MEASUREMENT

4.7.1 TEST INSTRUMENTS

Test date : Nov. 30, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP40	100036	Dec. 08, 2010	Dec. 07, 2011

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 100 MHz or 200 MHz 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

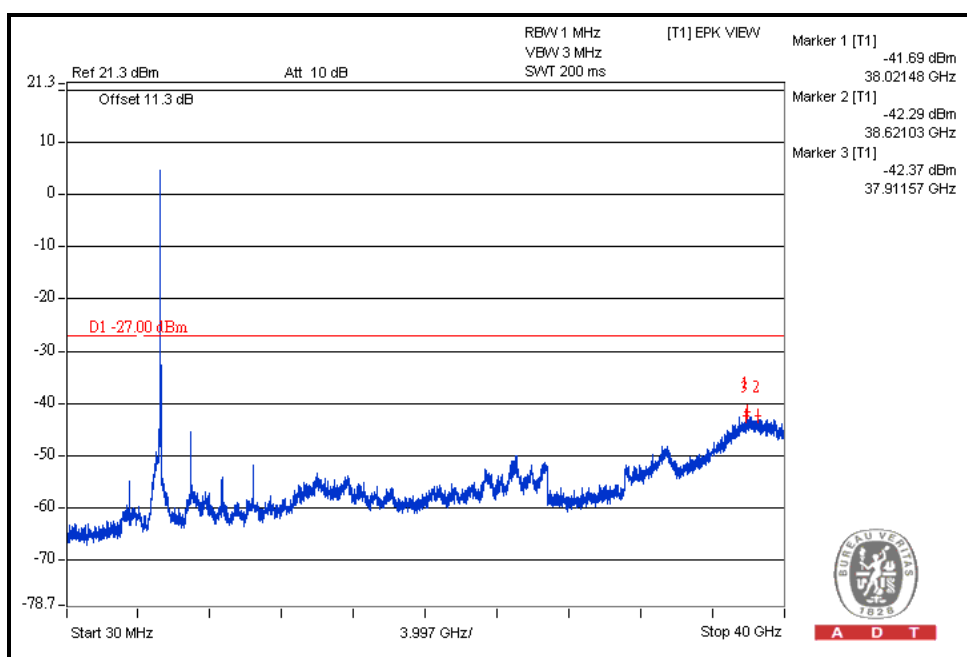
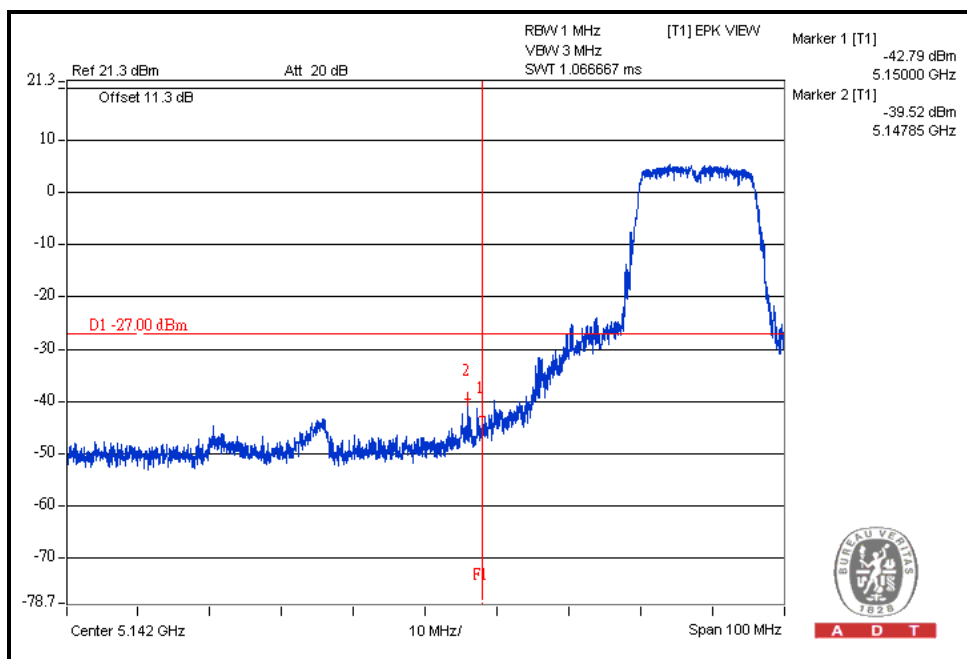
For 5.15 to 5.25GHz band:

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

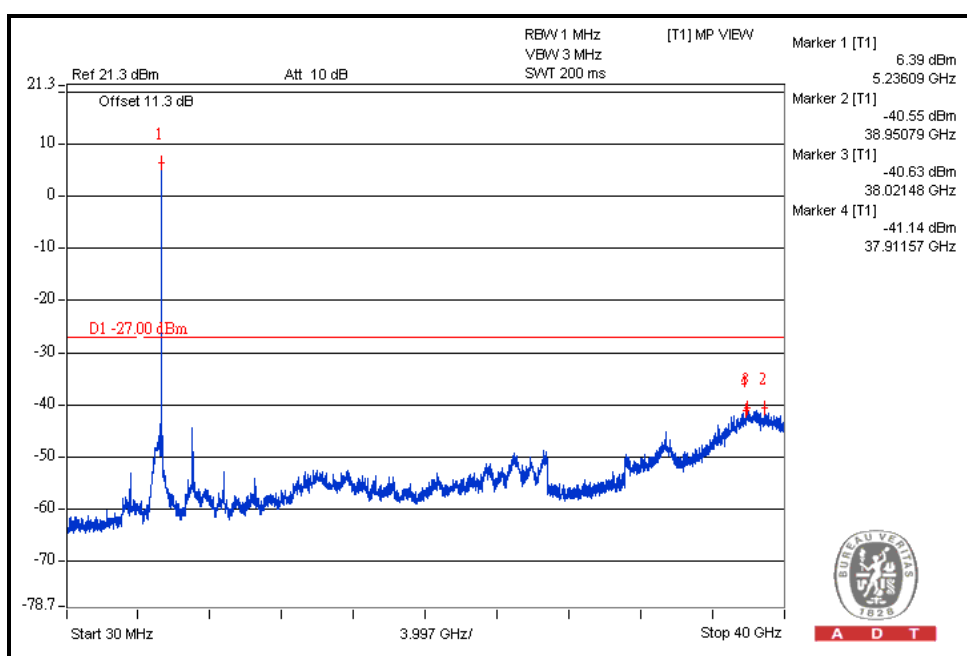
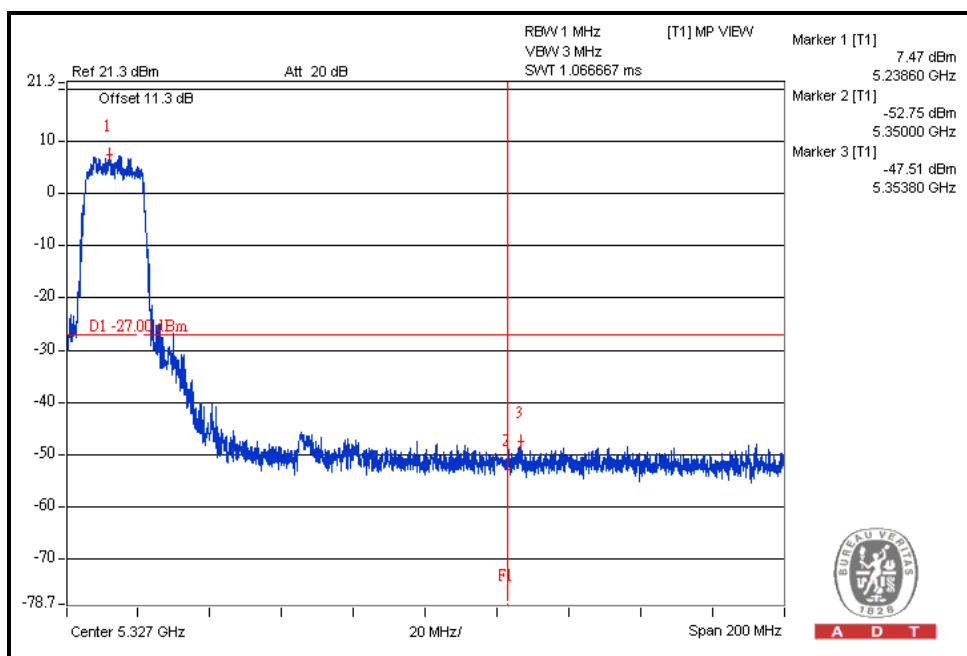
Performing measurements: Measure and add 10 log(N) dB

802.11a OFDM MODULATION

CH36

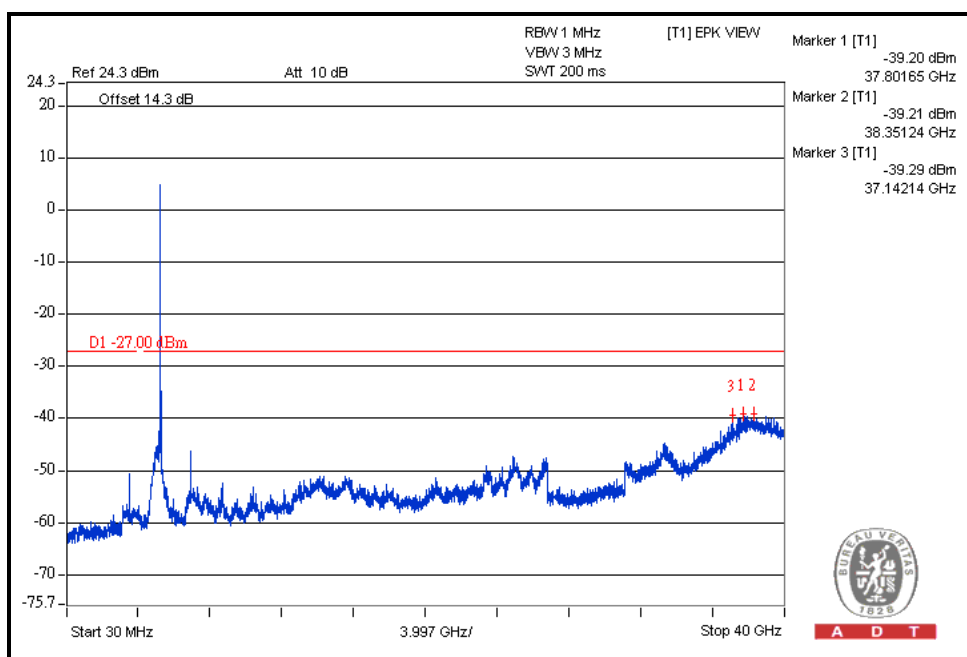
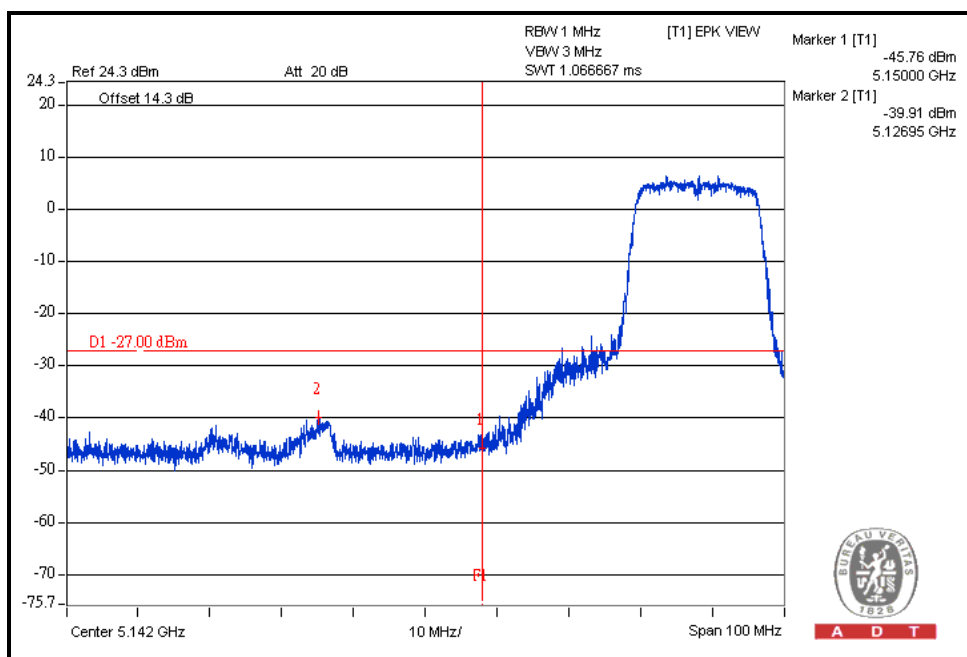


CH48

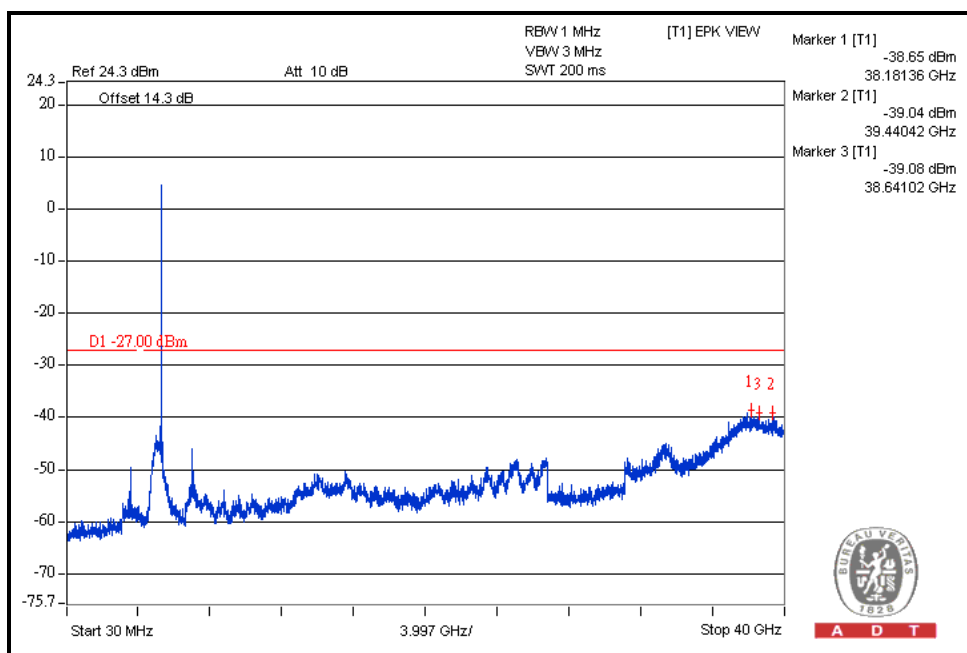
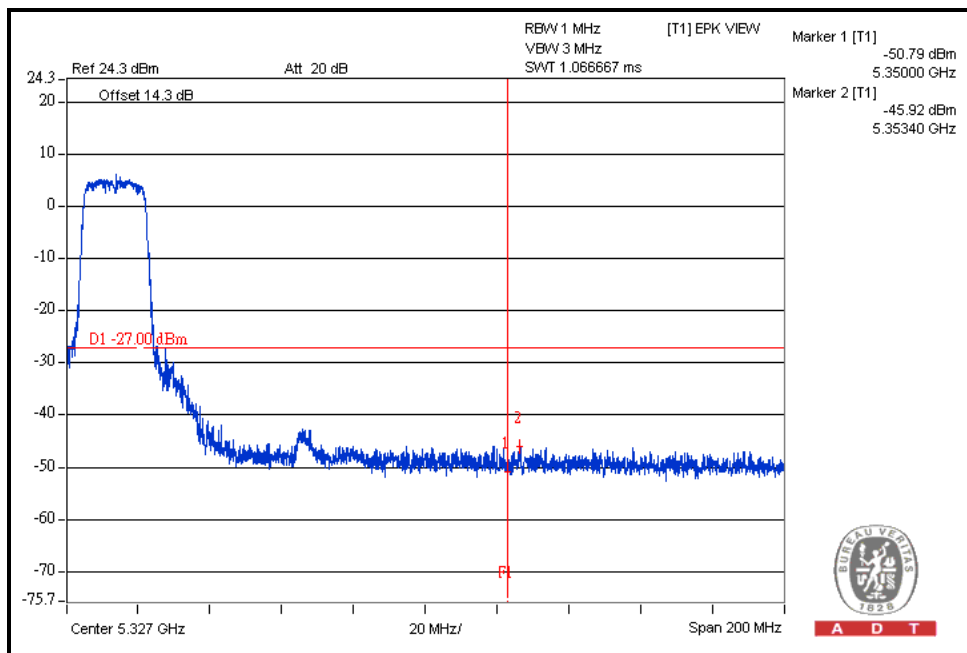


802.11n (20MHz) OFDM MODULATION:

CH36

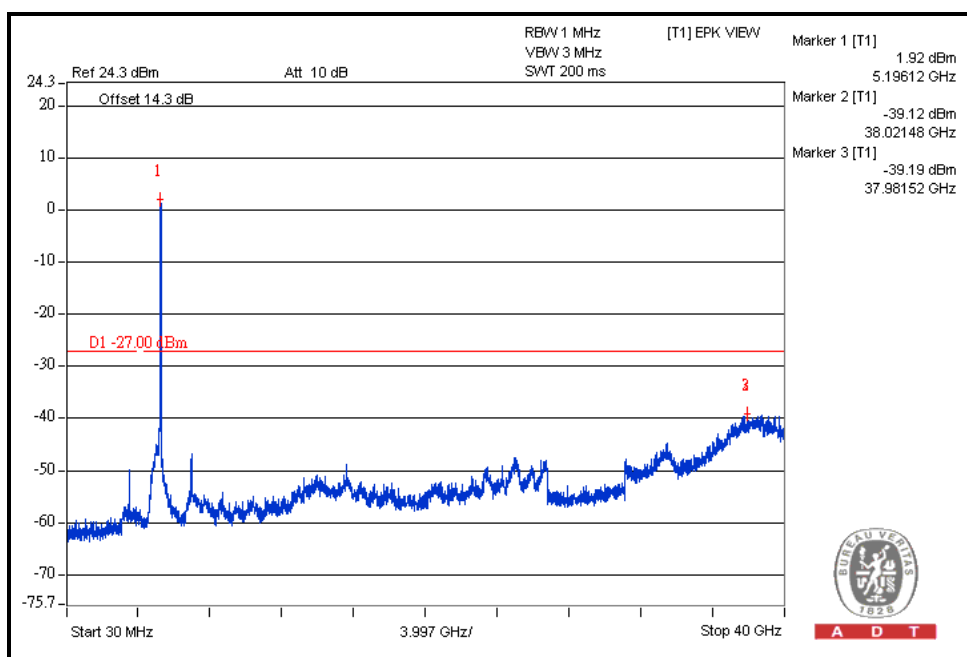
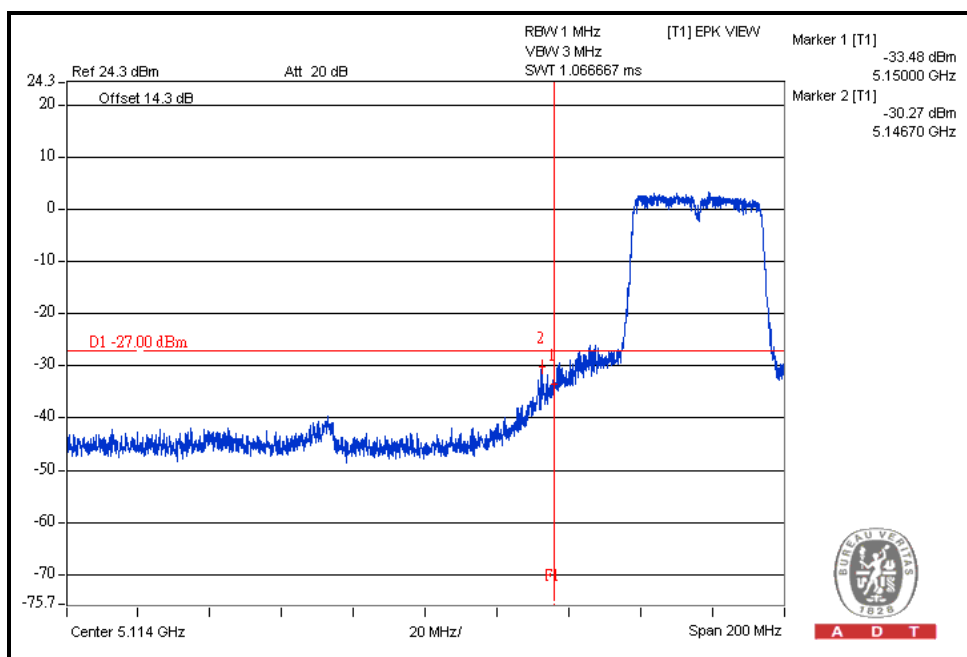


CH48

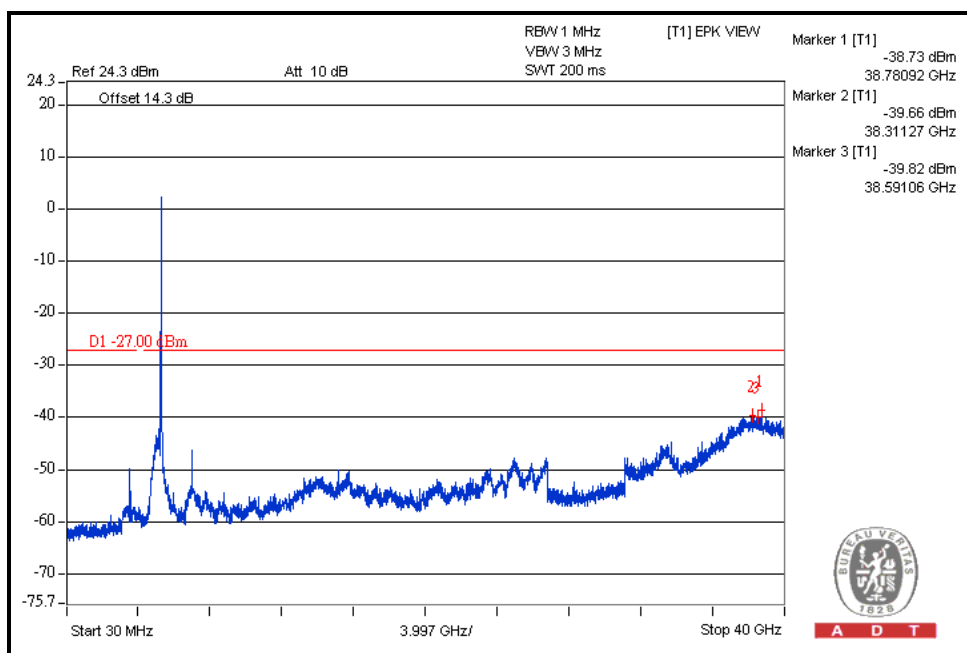
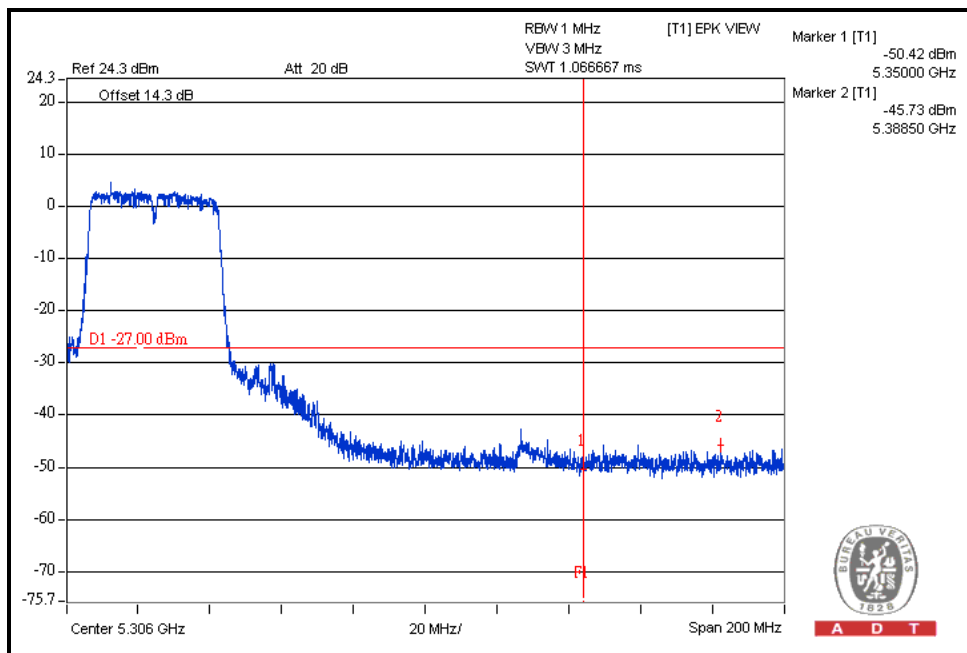


802.11n (40MHz) OFDM MODULATION:

CH38



CH46



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:

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Web Site: www.adt.com.tw

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



A D T

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

No modifications were made to the EUT by the lab during the test.

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