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FCC TEST REPORT (15.407)

REPORT NO.: RF970821H05-1

MODEL NO.: WMP-ND02, WMP-N08, WMP-N10

RECEIVED: Aug. 21, 2008

TESTED: Oct. 25 to Nov. 17, 2008

ISSUED: Jan. 16, 2009

APPLICANT: Alpha Networks Inc.

ADDRESS: No. 8 Li-shing 7th Rd., Science-based
Industrial Park, Hsinchu, Taiwan, R.O.C.

ISSUED BY: Bureau Veritas Consumer Products Services
(H.K.) Ltd., Taoyuan Branch

TEST LOCATION: No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung
Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien
307, Taiwan

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1. CERTIFICATION

PRODUCT: 11N Wireless LAN CARD
BRAND NAME: Alpha
MODEL NO.: WMP-ND02, WMP-N08, WMP-N10
TEST SAMPLE: MASS-PRODUCTION
TESTED: Oct. 25 to Nov. 17, 2008
APPLICANT: Alpha Networks Inc.
STANDARDS: FCC Part 15, Subpart E (Section 15.407),
ANSI C63.4-2003

The above equipment (Model: WMP-ND02) 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 : Sunny Wen , **DATE:** Jan. 16, 2009
(Sunny Wen, Specialist)

TECHNICAL ACCEPTANCE : Hank Chung , **DATE:** Jan. 16, 2009
Responsible for RF (Hank Chung, Deputy Manager)

APPROVED BY : May Chen , **DATE:** Jan. 16, 2009
(May Chen, Deputy Manager)

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 -14.56dB at 3.824MHz
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 -0.69dB at 797.93MHz
15.407(a/1/2/3)	Peak 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.

NOTE:

1. The EUT was operating in 2400 ~ 2483.5MHz, 5.15~5.25GHz and 5.725~5.85GHz frequencies band. This report was recorded the RF parameters including 5.15~5.25GHz. For the 2400 ~ 2483.5MHz and 5.725~5.85GHz 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:

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

Measurement	Value
Conducted emissions	2.44 dB
Radiated emissions (30MHz-1GHz)	3.94 dB
Radiated emissions (1GHz -18GHz)	2.49 dB
Radiated emissions (18GHz -40GHz)	2.70 dB



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3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	11N Wireless LAN CARD
MODEL NO.	WMP-ND02, WMP-N08, WMP-N10
FCC ID	RRK-WMPND02A1
POWER SUPPLY	DC 3.3V $\pm$ 5% from host equipment
MODULATION TYPE	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
MODULATION TECHNOLOGY	DSSS, OFDM
TRANSFER RATE	802.11b: 11 / 5.5 / 2 / 1Mbps 802.11g: 54 / 48 / 36 / 24 / 18 / 12 / 9 / 6Mbps 802.11a: 54 / 48 / 36 / 24 / 18 / 12 / 9 / 6Mbps HT20 MCS0~7 (800ns GI): 65 / 58.5 / 52 / 39 / 26 / 19.5 / 13 / 6.5Mbps. HT20 MCS8~15 (800ns GI): 130 / 117 / 104 / 78 / 52 / 39 / 26 / 13Mbps. HT40 MCS0~7 (800ns GI): 135 / 121.5 / 108 / 81 / 54 / 40.5 / 27 / 13.5Mbps. HT40 MCS8~15 (800ns GI): 270 / 243 / 216 / 162 / 108 / 81 / 54 / 27Mbps. HT20 MCS0~7 (400ns GI): 72.2 / 65 / 57.8 / 43.3 / 28.9 / 21.7 / 14.4 / 7.2 HT20 MCS8~15 (400ns GI): 144.444 / 130 / 115.556 / 86.667 / 57.778 / 43.333 / 28.889 / 14.444 HT40 MCS0~7 (400ns GI): 150 / 135 / 120 / 90 / 60 / 45 / 30 / 15 HT40 MCS8~15 (400ns GI): 300 / 270 / 240 / 180 / 120 / 90 / 60 / 30
FREQUENCY RANGE	For 15.407
	802.11a: 5.18 ~ 5.24GHz
	For 15.247
	802.11b & 802.11g: 2412 ~ 2462MHz 802.11a: 5.745 ~ 5.825GHz

NUMBER OF CHANNEL	For 15.407 4 for 802.11a, draft 802.11n (20MHz) 2 for draft 802.11n (40MHz)
	For 15.247(2.4GHz) 11 for 802.11b, 802.11g, draft 802.11n (20MHz) 7 for draft 802.11n (40MHz)
	For 15.247(5GHz) 5 for 802.11a, draft 802.11n (20MHz) 2 for draft 802.11n (40MHz)
MAXIMUM OUTPUT POWER	For 15.407 802.11a: 18.836mW draft 802.11n (20MHz): 29.251mW draft 802.11n (40MHz): 28.533mW For 15.247(2.4GHz) 802.11b: 134.276mW 802.11g: 302.691mW draft 802.11n (20MHz): 549.592mW draft 802.11n (40MHz): 422.715mW For 15.247(5GHz) 802.11a: 206.538mW draft 802.11n (20MHz): 238.593mW draft 802.11n (40MHz): 235.215mW
ANTENNA TYPE	Please see note 2
DATA CABLE	NA
I/O PORT	NA
ASSOCIATED DEVICES	NA

NOTE:

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

Brand	Model No.	Difference
Alpha	WMP-ND02	For IEEE 802.11a/b/g/n
	WMP-N08	For IEEE 802.11b/g/n, Via Software to disable 11a/n function
	WMP-N10	For IEEE 802.11a/n, Via Software to disable 11b/g/n function

From the above models, model: **WMP-ND02** was selected as representative model for the test and its data were recorded in this report.



2. There are five set antennas provided to this EUT, please refer to the following table:

Set No.	Transmitter Circuit	Antenna Gain	For 2.4GHz Gain (dBi)	For 5.15~5.25GHz Gain (dBi)	For 5.725~5.850GHz Gain (dBi)	Cable Length (cm)
Set. 1	Chain(0), Chain(1), Chain(2)	Gain (dBi)	2.31	2.26	3.91	18
		Cable Loss (dB)	1.48	1.45	1.53	
		Net Gain (dB)	0.83	0.81	2.38	
Set 2	Chain(0)	Gain (dBi)	2.31	2.26	3.91	40
		Cable Loss (dB)	1.51	2.16	2.29	
		Net Gain (dB)	0.8	0.1	1.62	
	Chain(1)	Gain (dBi)	2.31	2.26	3.91	18
		Cable Loss (dB)	1.48	1.45	1.53	
		Net Gain (dB)	0.83	0.81	2.38	
	Chain(2)	Gain (dBi)	2.31	2.26	3.91	27
		Cable Loss (dB)	1.16	1.17	1.87	
		Net Gain (dB)	1.15	1.09	2.04	
Set 3	Chain(0), Chain(1)	Gain (dBi)	3.72	3.55	2.76	25.5
		Cable Loss (dB)	0.52	0.82	1.00	
		Net Gain (dB)	3.2	2.73	1.76	
	Chain(2)	Gain (dBi)	3.72	3.55	2.76	12
		Cable Loss (dB)	0.51	0.75	0.90	
		Net Gain (dB)	3.21	2.8	1.86	
Set 4	Chain(0)	Gain (dBi) involve cable loss	2.65	NA	NA	11
	Chain(1), Chain(2)	Gain (dBi) involve cable loss	2.49	NA	NA	10
Set 5	Chain(0), Chain(1), Chain(2)	Gain (dBi) involve cable loss	2.43	NA	NA	6

Set No.	Transmitter Circuit	Antenna Type	Manufacture	Model No.	Antenna Connector
Set 1	Chain(0)	Dipole	WANSHIH ELECTRONIC CO., LTD.	WSS001	RP-SMA(M)
	Chain(1)				
	Chain(2)				
Set 2	Chain(0)	Dipole	WANSHIH ELECTRONIC CO., LTD.	WSS001	RP-SMA(M)
	Chain(1)				
	Chain(2)				
Set 3	Chain(0)	Dipole	WHA YU INDUSTRIAL CO., LTD.	C056-510399-A	SMA Plug Reverse
	Chain(1)				
	Chain(2)				
Set 4	Chain(0)	PCB	WHA YU GROUP	C037-510934-A (SSR-83320)	I-PEX
	Chain(1)			C037-510935-A (SSR-83347)	
	Chain(2)			C037-510935-A (SSR-83347)	
Set 5	Chain(0)	PCB	WHA YU GROUP	C037-510953-A (SSR-84244)	MHF Plug
	Chain(1)				
	Chain(2)				

From the above antennas, the worst case was found in set no. 3. Therefore only the test data of the mode was recorded in this report individually.

3. The EUT incorporates a MIMO function with 802.11a, 802.11b, 802.11g, draft 802.11n. Physically, the EUT provides two completed transmits and three completed receivers.
4. The EUT is 2 * 3 spatial MIMO (2Tx & 3Rx) without beam forming function. The antenna configurations are two transmitter antennas and three receiver antennas, as there are 3 Dipole or PCB antennas. Spatial multiplexing modes for simultaneous transmission using 2 antennas, and for simultaneous receiver using 3 antennas. The 11a and 11bg legacy mode is limited to single transmitter only.
5. When the EUT operating in draft 802.11n, the software operation, which is defined by manufacturer, MCS (Modulation and Coding Schemes) from 0 to 15.
6. The EUT complies with draft 802.11n standards and backwards compatible with 802.11a, 802.11b, 802.11g products.
7. The above EUT information was declared by 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 draft 802.11n (20MHz):

CHANNEL	FREQUENCY
1	5180 MHz
2	5200 MHz
3	5220 MHz
4	5240 MHz

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

CHANNEL	FREQUENCY
1	5190 MHz
2	5230 MHz

3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL:

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	PLC	RE < 1G	RE ³ 1G	APCM	
-	√	√	√	√	-

Where PLC: Power Line Conducted Emission

RE < 1G: Radiated Emission below 1GHz

RE ³ 1G: Radiated Emission above 1GHz

APCM: Antenna Port Conducted Measurement

ANTENNA COMBINATION MODE:

COMBINATION MODE	OPERATION MODE	CHAIN(0) (TX)	CHAIN(1) (TX)
A	802.11a	√	
B	DRAFT 802.11n(20MHz)	√	√
C	DRAFT 802.11n(40MHz)	√	√

Note:

- The above information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.
- Antenna 1~3 are Dipole antennas.

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)	TX COMBINATION
For 5 GHz Draft 802.11n (20MHz)	1 to 4	1	OFDM	BPSK	13	B

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)	TX COMBINATION
802.11a	1 to 4	4	OFDM	BPSK	6	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)	TX COMBINATION
802.11a	1 to 4	1, 2, 4	OFDM	BPSK	6	A
For 5 GHz Draft 802.11n (20MHz)	1 to 4	1, 2, 4	OFDM	BPSK	13	B
For 5 GHz Draft 802.11n (40MHz)	1 to 2	1, 2	OFDM	BPSK	27	C

BANDEDGE 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)	TX COMBINATION
802.11a	1 to 4	1, 4	OFDM	BPSK	6	A
For 5 GHz Draft 802.11n (20MHz)	1 to 4	1, 4	OFDM	BPSK	13	B
For 5 GHz Draft 802.11n (40MHz)	1 to 2	1, 2	OFDM	BPSK	27	C

ANTENNA PORT CONDUCTED 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)	TX COMBINATION
802.11a	1 to 4	1, 2, 4	OFDM	BPSK	6	A
For 5 GHz Draft 802.11n (20MHz)	1 to 4	1, 2, 4	OFDM	BPSK	13	B
For 5 GHz Draft 802.11n (40MHz)	1 to 2	1, 2	OFDM	BPSK	27	C

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a 11N Wireless LAN CARD. 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

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



3.4 DESCRIPTION OF SUPPORT UNITS

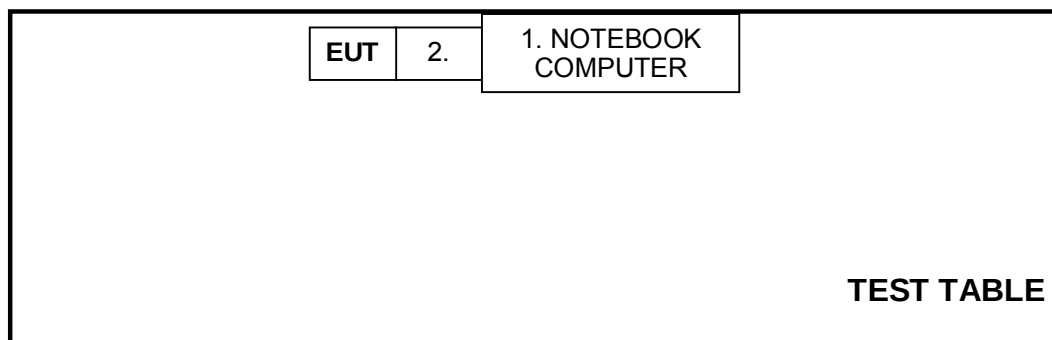
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER	DELL	PP01L	TW-09C748-12800-165-3171	DoC
2	MPCI EXTEND CARD	Alpha	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



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

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver	ESCS 30	847124/029	Feb. 29, 2008	Feb. 28, 2009
Line-Impedance Stabilization Network (for EUT)	ENV-216	100071	Nov. 27, 2007	Nov. 26, 2008
Line-Impedance Stabilization Network (for Peripheral)	ESH3-Z5	848773/004	Nov. 05, 2008	Nov. 04, 2009
RF Cable (JYEBAO)	5DFB	COBCAB-001	July 24, 2008	July 23, 2009
50 ohms Terminator	50	3	Nov. 05, 2008	Nov. 04, 2009
Software	BV ADT_Cond_V7.3.6	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. B.
3. The VCCI Con B Registration No. is C-2193.

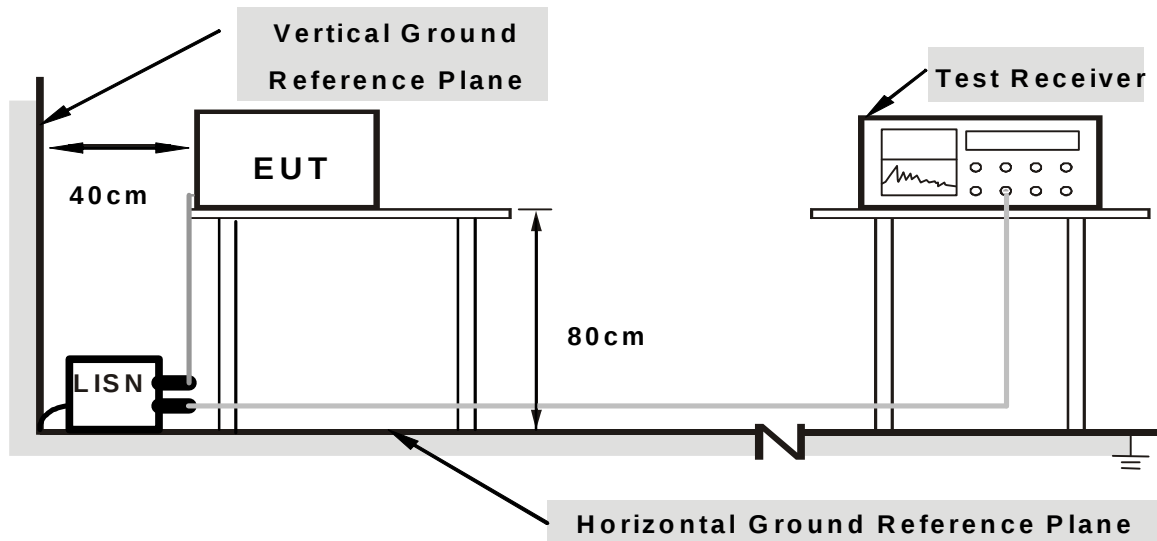
4.1.3 TEST PROCEDURES

- 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 cm 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

- Plug the EUT into the support unit 1 (Personal computer) which placed on a testing table.
- Support unit 1 (Personal computer) run test program “Ralink ATE TEST Utility V 0.0.2.3” to enable EUT under transmission condition continuously at specific channel frequency.

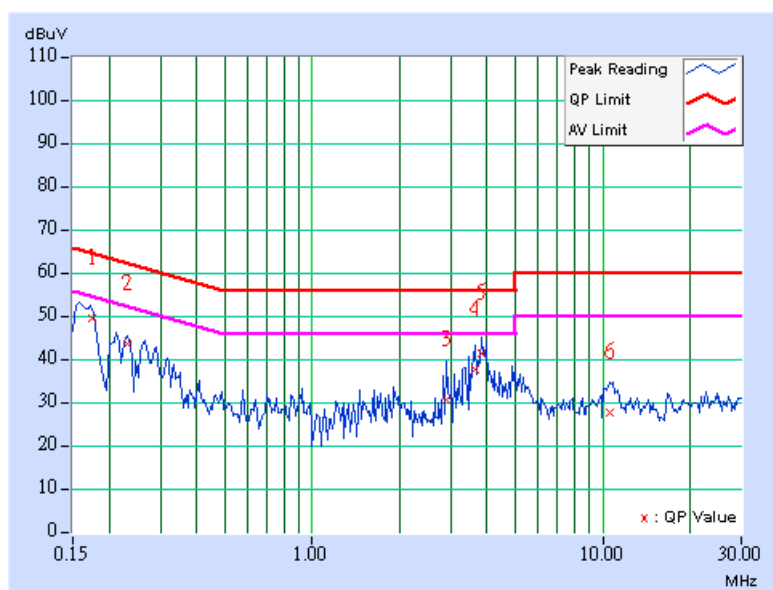
4.1.7 TEST RESULTS

802.11a OFDM MODULATION:

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	PHASE	Line (L)
MODULATION TYPE	BPSK	6dB BANDWIDTH	9 kHz
TRANSFER RATE	6Mbps	INPUT POWER (SYSTEM)	120Vac, 60 Hz
ENVIRONMENTAL CONDITIONS	25deg. C, 69%RH, 965hPa	TESTED BY	Phoenix Huang

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	0.176	9.69	39.87	-	49.56	-	64.68	54.68	-15.13	-
2	0.232	9.74	33.95	-	43.69	-	62.37	52.37	-18.68	-
3	2.910	9.74	20.77	-	30.51	-	56.00	46.00	-25.49	-
4	3.637	9.75	27.87	-	37.62	-	56.00	46.00	-18.38	-
5	3.824	9.76	31.68	-	41.44	-	56.00	46.00	-14.56	-
6	10.574	9.86	18.07	-	27.93	-	60.00	50.00	-32.07	-

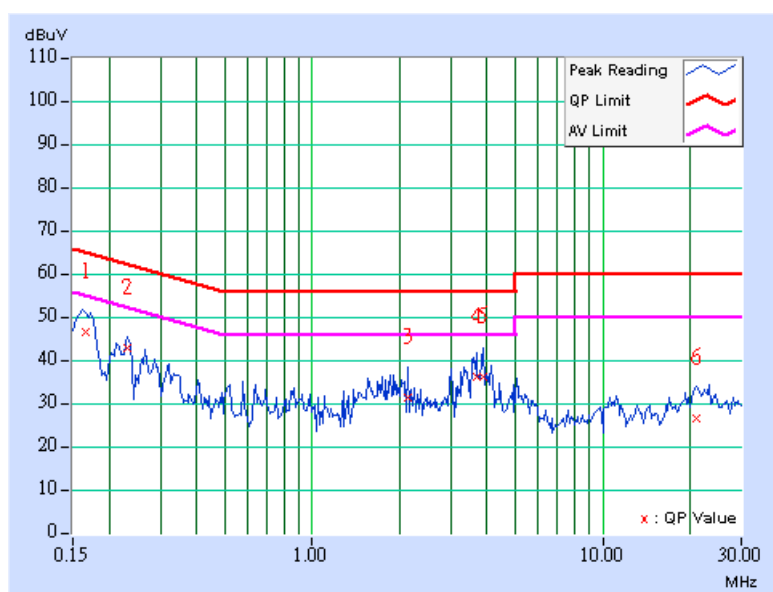
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value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



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	PHASE	Neutral (N)
MODULATION TYPE	BPSK	6dB BANDWIDTH	9 kHz
TRANSFER RATE	6Mbps	INPUT POWER (SYSTEM)	120Vac, 60 Hz
ENVIRONMENTAL CONDITIONS	25deg. C, 69%RH, 965hPa	TESTED BY	Phoenix Huang

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	0.166	9.68	36.69	-	46.37	-	65.15	55.15	-18.78	-
2	0.232	9.74	32.83	-	42.57	-	62.38	52.38	-19.81	-
3	2.137	9.72	21.46	-	31.18	-	56.00	46.00	-24.82	-
4	3.699	9.75	26.22	-	35.97	-	56.00	46.00	-20.03	-
5	3.891	9.76	26.36	-	36.12	-	56.00	46.00	-19.88	-
6	20.957	10.10	16.65	-	26.75	-	60.00	50.00	-33.25	-

- REMARKS:** 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Correction factor = Insertion loss + Cable loss
6. 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.

4.2.2 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

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

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4.2.3 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
ADVANTEST Spectrum Analyzer	R3271A	85060311	July 16, 2008	July 15, 2009
HP Pre_Amplifier	8449B	3008A01922	Sep. 25, 2008	Sep. 24, 2009
ROHDE & SCHWARZ Test Receiver	ESCS30	100375	April 01, 2008	Mar. 31, 2009
SCHWARZBECK TRILOG Broadband Antenna	VULB 9168	138	April 30, 2008	April 29, 2009
Schwarzbeck Horn_Antenna	BBHA9120	D124	Dec. 17, 2007	Dec. 16, 2008
Schwarzbeck Horn_Antenna	BBHA 9170	BBHA9170153	Jan. 28, 2008	Jan. 27, 2009
RF Switches	EMH-011	08009	Oct. 07, 2008	Oct. 06, 2009
RF CABLE (Chaintek)	SF102	22054-2	Dec. 07, 2007	Dec. 06, 2008
RF Cable	8DFB	STCCAB-30M-1GHz	Oct. 07, 2008	Oct. 06, 2009
Software	ADT_Radiated_V7.6.15.9.2	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, HP preamplifier (model: 8449B) and Spectrum Analyzer (model: R3271A) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in Open Site No. C.
4. The FCC Site Registration No. is 656396.
5. The VCCI Site Registration No. is R-1626.
6. The CANADA Site Registration No. is IC 7450G-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 a 3 meter semi-anechoic chamber. 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 antenna is a broadband antenna, and its height 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 Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

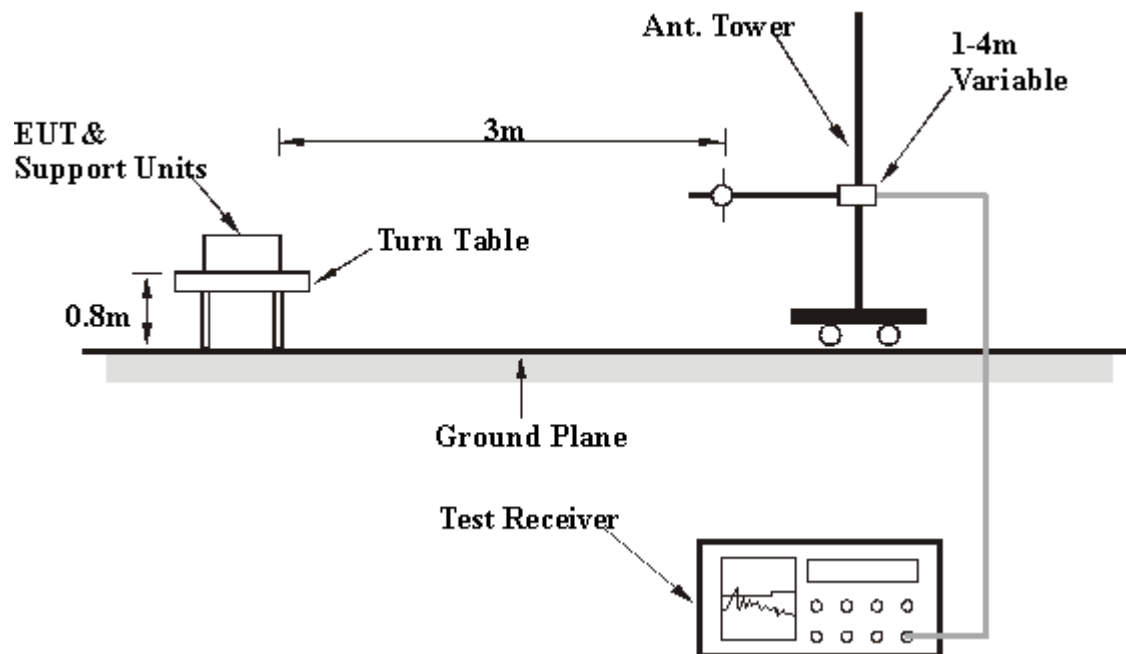
NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and 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



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Below 1GHz Test Data

4.2.8 TEST RESULTS

BELOW 1GHz WORST-CASE DATA : 802.11a OFDM MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 4	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH 965hPa	TESTED BY	Eric Lee

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	132.56	27.25 QP	43.50	-16.25	1.25 H	26	12.70	14.55
2	166.36	26.30 QP	43.50	-17.20	1.00 H	25	10.88	15.42
3	265.53	25.31 QP	46.00	-20.69	1.67 H	52	9.38	15.93
4	300.01	24.51 QP	46.00	-21.49	1.75 H	54	7.49	17.02
5	398.99	42.65 QP	46.00	-3.35	1.65 H	356	21.55	21.10
6	399.99	31.68 QP	46.00	-14.32	1.62 H	193	10.54	21.14
7	500.02	36.11 QP	46.00	-9.89	1.63 H	191	13.45	22.66
8	797.93	45.31 QP	46.00	-0.69	2.00 H	265	15.43	29.88
9	800.02	33.28 QP	46.00	-12.72	1.76 H	56	3.34	29.94
10	999.99	42.51 QP	54.00	-11.49	1.98 H	63	9.81	32.70
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	133.33	25.32 QP	43.50	-18.18	2.54 V	21	10.72	14.60
2	166.04	26.72 QP	43.50	-16.78	1.02 V	51	11.26	15.46
3	265.55	26.02 QP	46.00	-19.98	1.72 V	6	10.09	15.93
4	300.01	22.14 QP	46.00	-23.86	1.55 V	296	5.12	17.02
5	398.96	28.45 QP	46.00	-17.55	1.36 V	62	7.35	21.10
6	400.01	31.88 QP	46.00	-14.12	1.60 V	360	10.74	21.14
7	500.01	33.25 QP	46.00	-12.75	1.60 V	326	10.59	22.66
8	797.91	42.62 QP	46.00	-3.38	1.02 V	236	12.74	29.88
9	1000.00	43.58 QP	54.00	-10.42	1.54 V	74	10.88	32.70

- 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 Test Data

4.2.9 TEST RESULTS

802.11a OFDM MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH 965hPa	TESTED BY	Rex Huang

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	4144.00	55.70 PK	74.00	-18.30	1.49 H	11	21.71	33.99
2	4144.00	44.20 AV	54.00	-9.80	1.49 H	11	10.21	33.99
3	5150.00	54.38 PK	74.00	-19.62	1.00 H	209	18.38	36.00
4	5150.00	41.33 AV	54.00	-12.67	1.00 H	209	5.33	36.00
5	*5180.00	95.70 PK			1.00 H	209	59.65	36.05
6	*5180.00	85.50 AV			1.00 H	209	49.45	36.05
7	#10360.00	55.90 PK	68.30	-12.40	1.24 H	76	9.98	45.92
8	15540.00	60.50 PK	74.00	-13.50	1.11 H	314	12.57	47.93
9	15540.00	46.40 AV	54.00	-7.60	1.11 H	314	-1.53	47.93
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	4144.00	56.56 PK	74.00	-17.44	1.13 V	189	22.57	33.99
2	4144.00	48.29 AV	54.00	-5.71	1.13 V	189	14.30	33.99
3	5150.00	63.56 PK	74.00	-10.44	1.10 V	192	27.56	36.00
4	5150.00	48.26 AV	54.00	-16.74	1.10 V	192	7.26	36.00
5	*5180.00	111.59 PK			1.15 V	190	75.54	36.05
6	*5180.00	101.04 AV			1.15 V	190	64.99	36.05
7	#10360.00	56.90 PK	68.30	-11.40	1.40 V	71	10.98	45.92
8	15540.00	60.01 PK	74.00	-13.99	1.09 V	67	12.08	47.93
9	15540.00	48.63 AV	54.00	-5.37	1.09 V	67	0.70	47.93

- 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 2	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH 965hPa	TESTED BY	Rex Huang

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	4160.00	55.20 PK	74.00	-18.80	1.62 H	15	21.16	34.04
2	4160.00	44.20 AV	54.00	-9.80	1.62 H	15	10.16	34.04
3	*5200.00	94.90 PK			1.00 H	208	58.82	36.08
4	*5200.00	84.50 AV			1.00 H	208	48.42	36.08
5	#10400.00	56.20 PK	68.30	-12.10	1.25 H	84	10.21	45.99
6	15600.00	59.10 PK	74.00	-14.90	1.06 H	308	11.32	47.78
7	15600.00	44.90 AV	54.00	-9.10	1.06 H	308	-2.88	47.78
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	4160.00	56.23 PK	74.00	-17.77	1.26 V	250	22.19	34.04
2	4160.00	46.70 AV	54.00	-7.30	1.26 V	250	12.66	34.04
3	*5200.00	112.30 PK			1.09 V	175	76.22	36.08
4	*5200.00	102.13 AV			1.09 V	175	66.05	36.08
5	#10400.00	57.10 PK	68.30	-11.20	1.38 V	69	11.11	45.99
6	15600.00	61.45 PK	74.00	-12.55	1.11 V	264	13.67	47.78
7	15600.00	47.89 AV	54.00	-6.11	1.11 V	264	0.11	47.78

- 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.



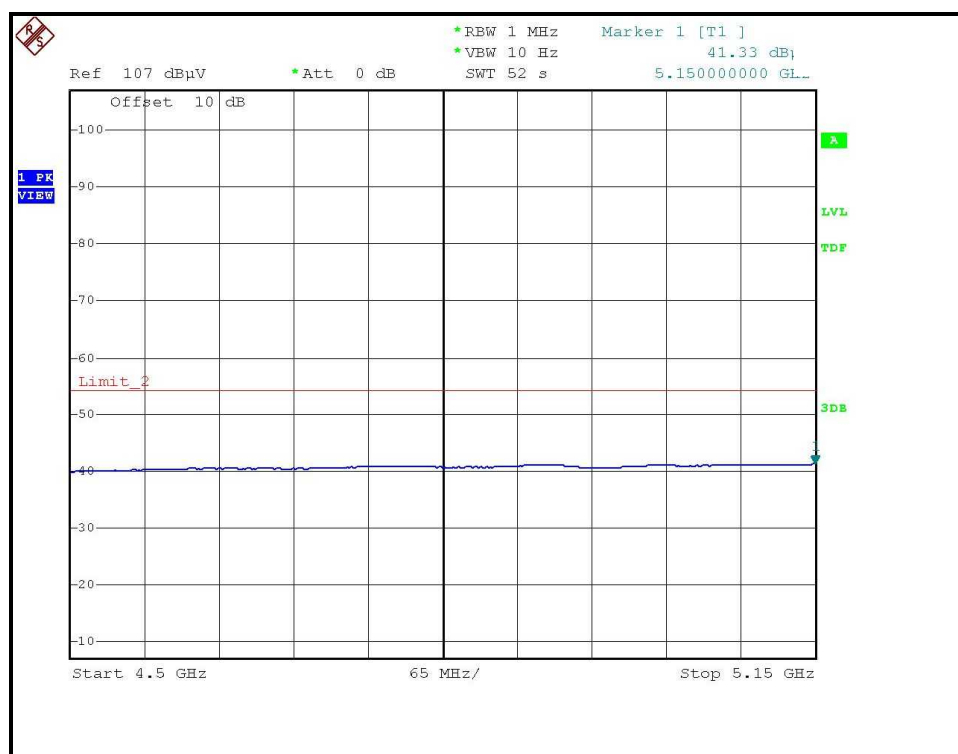
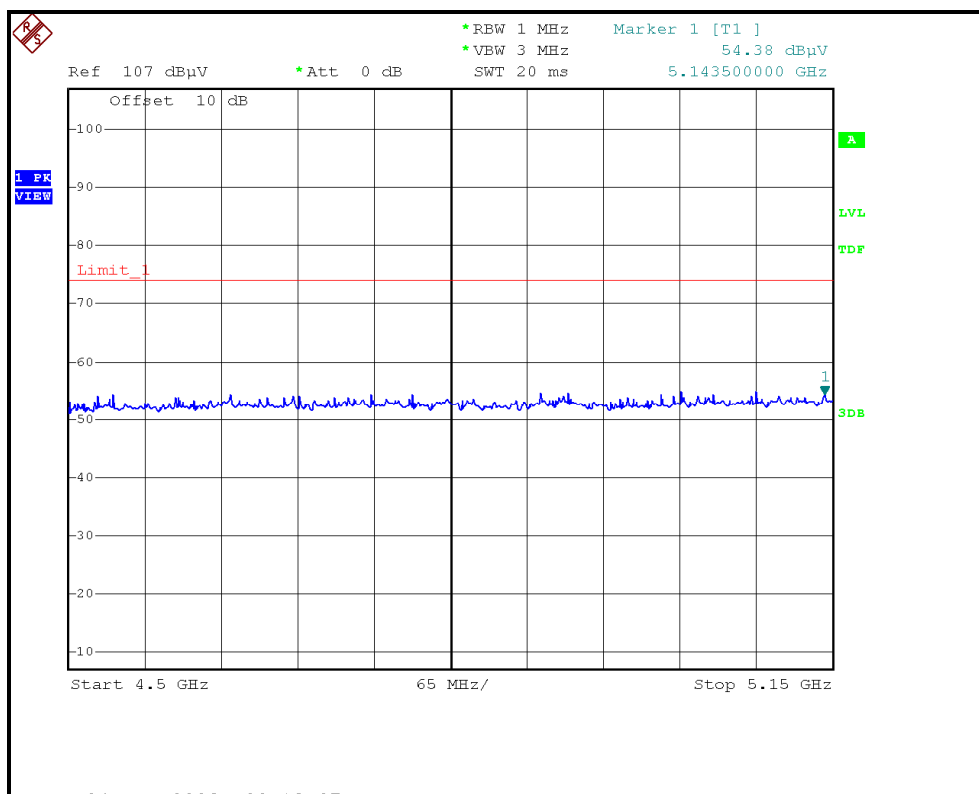
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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 4	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH 965hPa	TESTED BY	Rex Huang

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	4192.00	55.40 PK	74.00	-18.60	1.64 H	9	21.28	34.12
2	4192.00	44.30 AV	54.00	-9.70	1.64 H	9	10.18	34.12
3	*5240.00	95.80 PK			1.00 H	206	59.66	36.14
4	*5240.00	85.10 AV			1.00 H	206	48.96	36.14
5	5350.00	56.66 PK	74.00	-17.34	1.19 H	206	20.34	36.32
6	5350.00	41.71 AV	54.00	-12.29	1.19 H	206	5.39	36.32
7	#10480.00	56.10 PK	68.30	-12.20	1.29 H	97	9.98	46.12
8	15720.00	58.40 PK	74.00	-15.60	1.04 H	293	10.92	47.48
9	15720.00	44.30 AV	54.00	-9.70	1.04 H	293	-3.18	47.48
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	4192.00	59.44 PK	74.00	-14.56	1.03 V	16	25.32	34.12
2	4192.00	50.85 AV	54.00	-3.15	1.03 V	16	16.73	34.12
3	*5240.00	111.10 PK			1.19 V	175	74.96	36.14
4	*5240.00	101.52 AV			1.19 V	175	65.38	36.14
5	5353.70	62.52 PK	74.00	-11.48	1.16 V	180	26.19	36.33
6	5353.70	47.10 AV	54.00	-6.90	1.16 V	180	10.77	36.33
7	#10480.00	56.50 PK	68.30	-11.80	1.29 V	313	10.38	46.12
8	15720.00	60.43 PK	74.00	-13.57	1.08 V	167	12.95	47.48
9	15720.00	48.01 AV	54.00	-5.99	1.08 V	167	0.53	47.48

- 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.

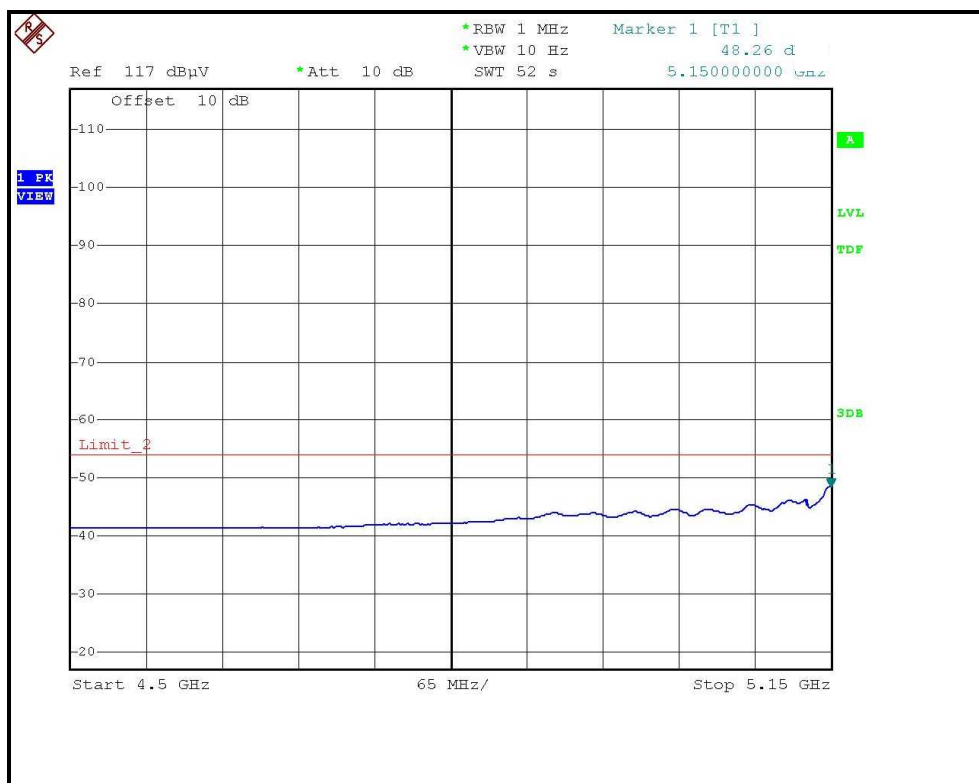
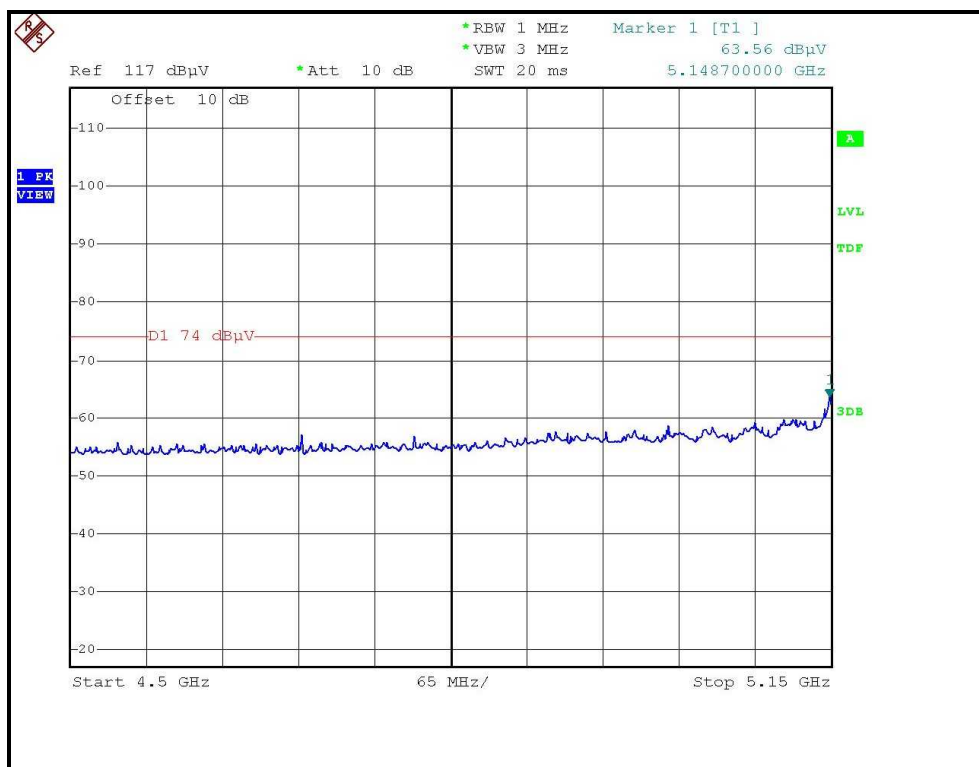
RESTRICTED BANDEDGE (802.11a MODE, CH1, HORIZONTAL)



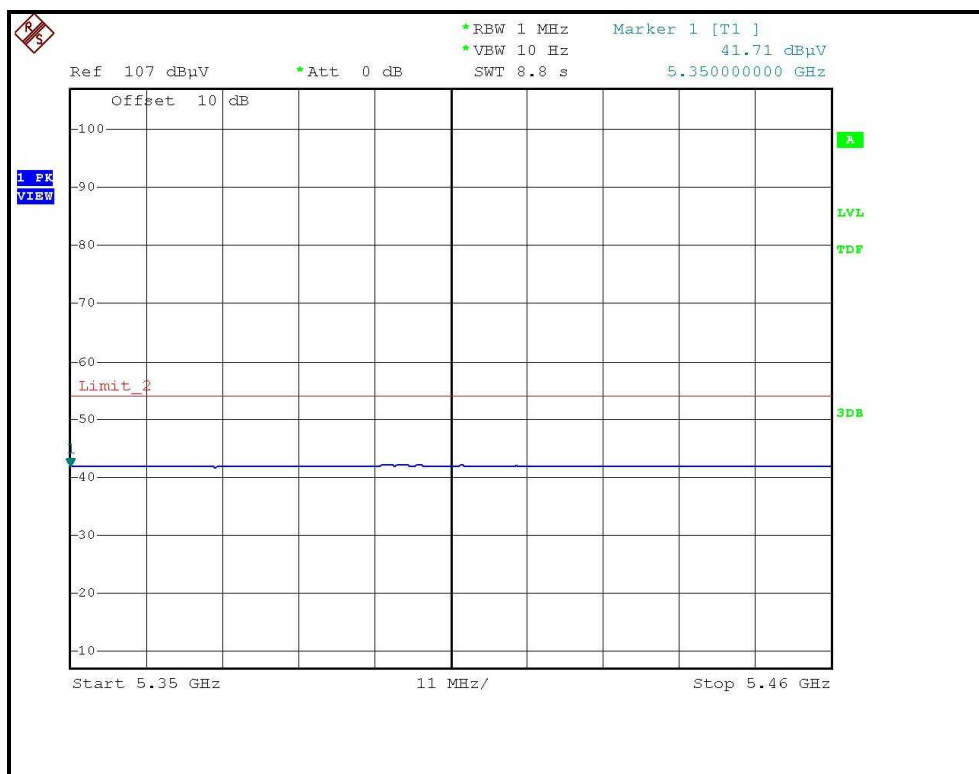
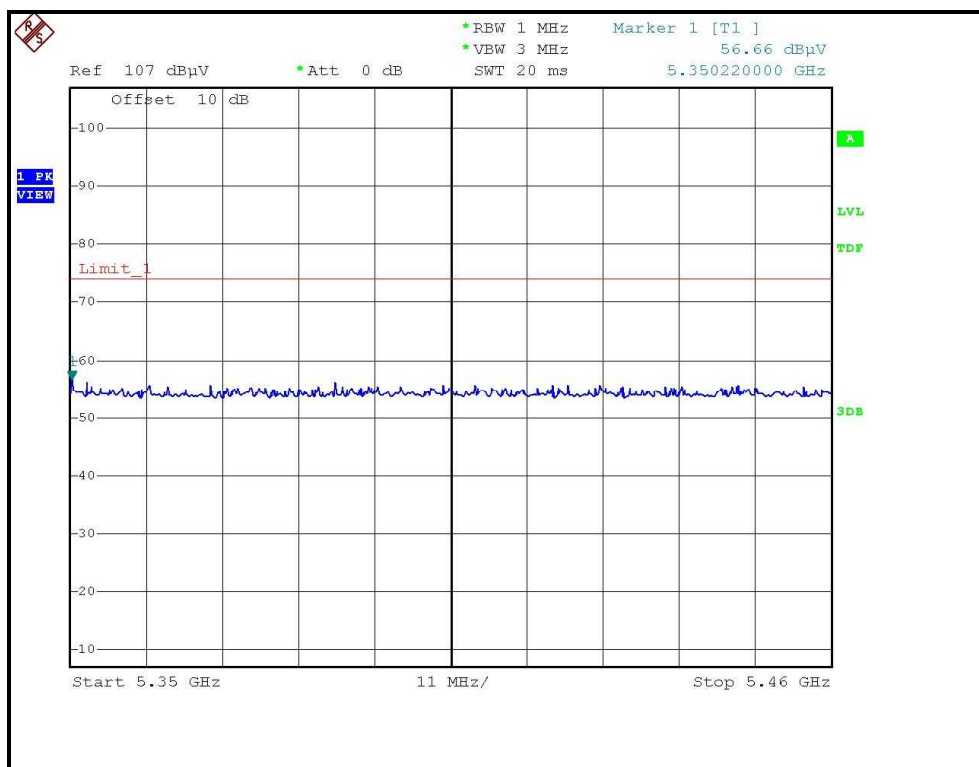


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RESTRICTED BANDEDGE (802.11a MODE, CH1, VERTICAL)



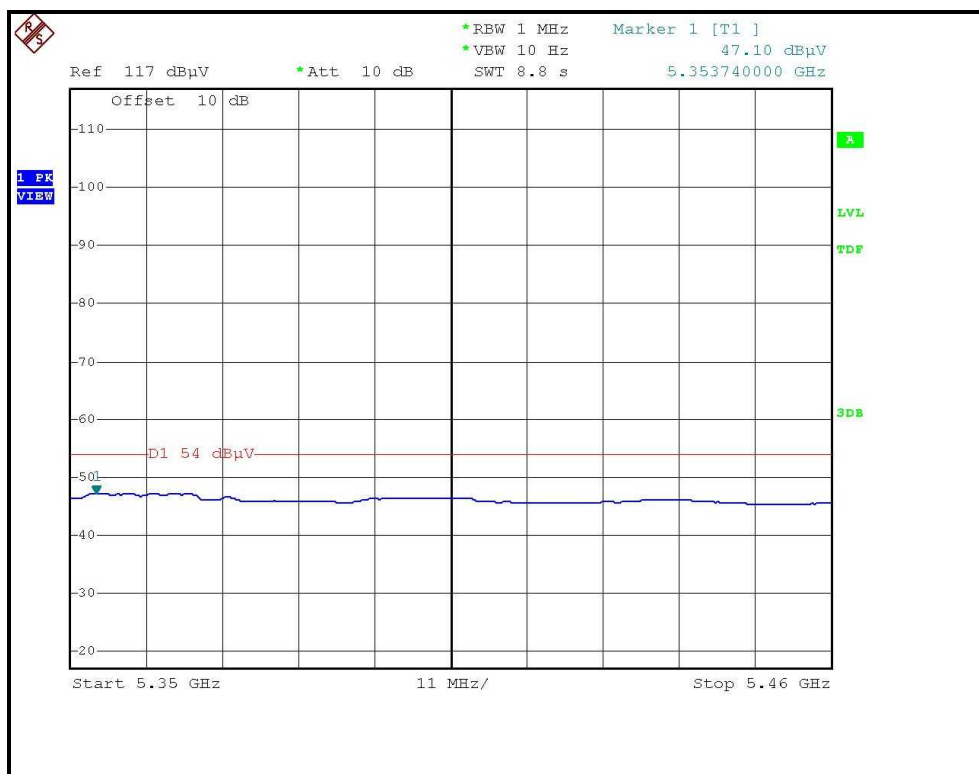
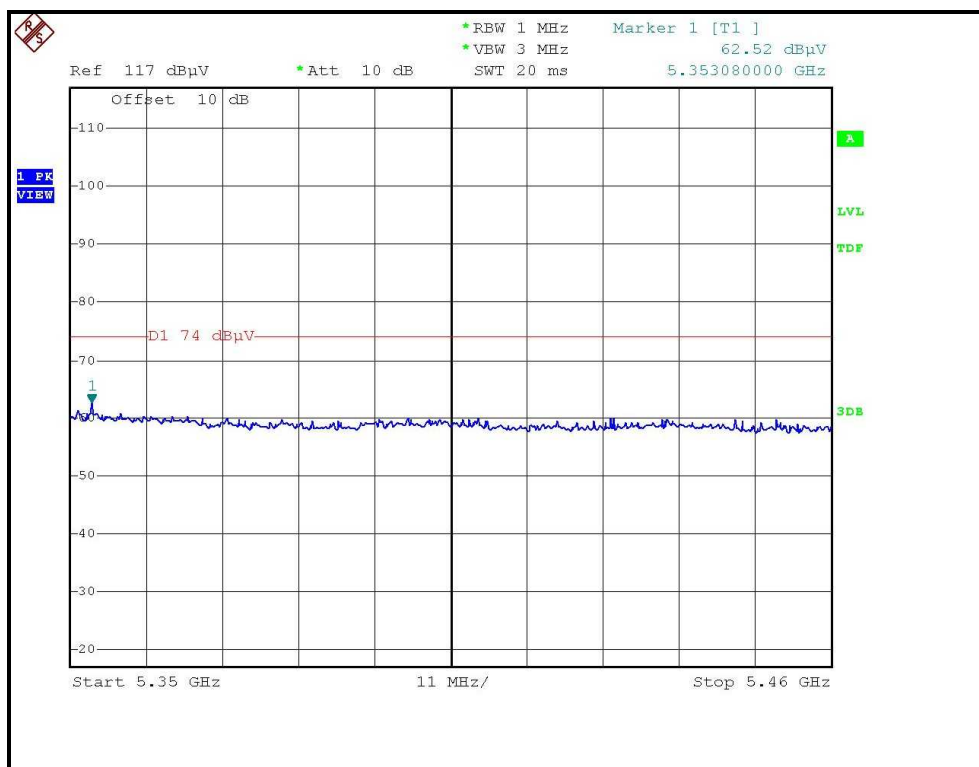
RESTRICTED BANDEDGE (802.11a MODE, CH4, HORIZONTAL)





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RESTRICTED BANDEDGE (802.11a MODE, CH4, VERTICAL)



DRAFT 802.11n (20MHz) OFDM MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH 965hPa	TESTED BY	Rex Huang

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	4144.00	54.50 PK	74.00	-19.50	1.39 H	21	20.51	33.99
2	4144.00	42.10 AV	54.00	-11.90	1.39 H	21	8.11	33.99
3	5150.00	54.95 PK	74.00	-19.05	1.30 H	193	18.95	36.00
4	5150.00	41.30 AV	54.00	-12.70	1.30 H	193	5.30	36.00
5	*5180.00	97.70 PK			1.30 H	193	61.65	36.05
6	*5180.00	86.60 AV			1.30 H	193	50.55	36.05
7	#10360.00	58.90 PK	68.30	-9.40	1.46 H	355	12.98	45.92
8	15540.00	58.00 PK	74.00	-16.00	1.15 H	179	10.07	47.93
9	15540.00	44.10 AV	54.00	-9.90	1.15 H	179	-3.83	47.93
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	4144.00	55.00 PK	74.00	-19.00	1.11 V	173	21.01	33.99
2	4144.00	52.50 AV	54.00	-1.50	1.11 V	173	18.51	33.99
3	5129.20	61.25 PK	74.00	-12.75	1.18 V	253	25.28	35.97
4	5129.20	47.47 AV	54.00	-6.53	1.18 V	253	11.50	35.97
5	*5180.00	113.10 PK			1.05 V	187	77.05	36.05
6	*5180.00	101.60 AV			1.05 V	187	65.55	36.05
7	#10360.00	64.00 PK	68.30	-4.30	1.39 V	63	18.08	45.92
8	15540.00	60.20 PK	74.00	-13.80	1.03 V	158	12.27	47.93
9	15540.00	46.60 AV	54.00	-7.40	1.03 V	158	-1.33	47.93

- 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 2	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH 965hPa	TESTED BY	Rex Huang

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	4160.00	54.60 PK	74.00	-19.40	1.40 H	24	20.56	34.04
2	4160.00	42.30 AV	54.00	-11.70	1.40 H	24	8.26	34.04
3	*5200.00	98.70 PK			1.34 H	195	62.62	36.08
4	*5200.00	87.80 AV			1.34 H	195	51.72	36.08
5	#10400.00	58.20 PK	68.30	-10.10	1.43 H	354	12.21	45.99
6	15600.00	57.60 PK	74.00	-16.40	1.16 H	181	9.82	47.78
7	15600.00	43.70 AV	54.00	-10.30	1.16 H	181	-4.08	47.78
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	4160.00	57.50 PK	74.00	-16.50	1.12 V	341	23.46	34.04
2	4160.00	52.10 AV	54.00	-1.90	1.12 V	341	18.06	34.04
3	*5200.00	112.20 PK			1.18 V	267	76.12	36.08
4	*5200.00	100.70 AV			1.18 V	267	64.62	36.08
5	#10400.00	59.40 PK	68.30	-8.90	1.49 V	43	13.41	5.99
6	15600.00	59.00 PK	74.00	-15.00	1.00 V	40	11.22	47.78
7	15600.00	45.50 AV	54.00	-8.50	1.00 V	40	-2.28	47.78



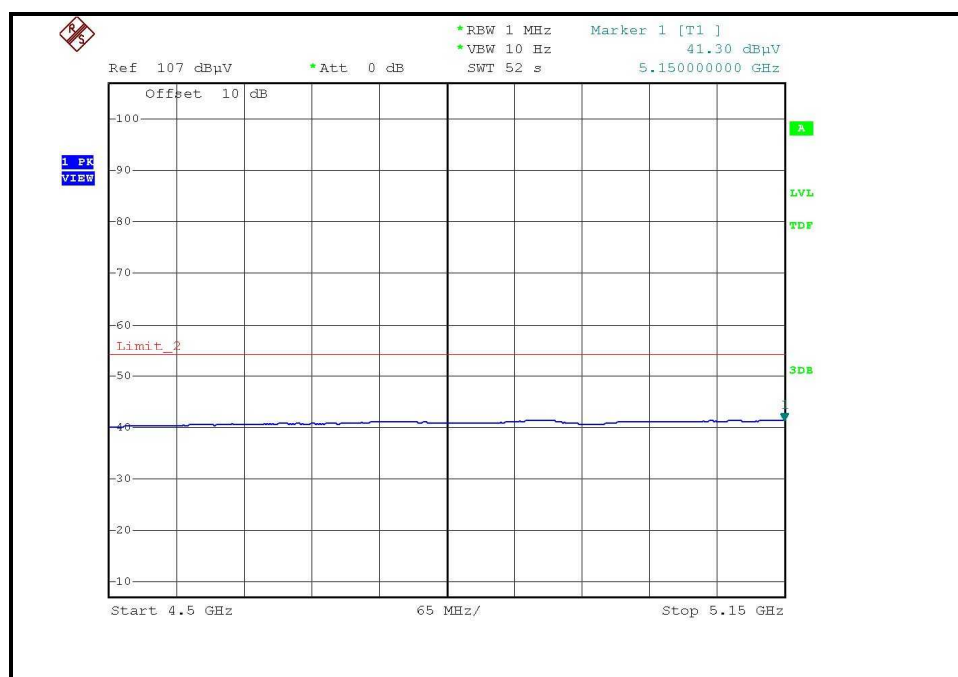
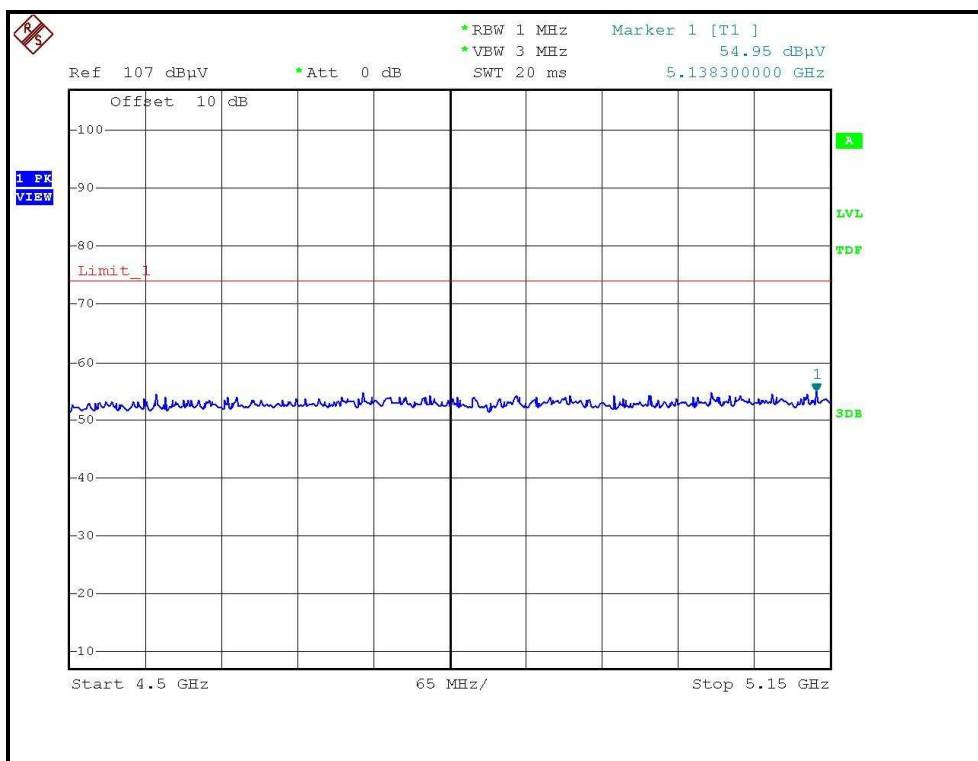
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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 4	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH 965hPa	TESTED BY	Rex Huang

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	4192.00	55.10 PK	74.00	-18.90	1.37 H	13	20.98	34.12
2	4192.00	42.70 AV	54.00	-11.30	1.37 H	13	8.58	34.12
3	*5240.00	98.50 PK			1.33 H	197	62.36	36.14
4	*5240.00	87.60 AV			1.33 H	197	51.46	36.14
5	5350.00	56.14 PK	74.00	-17.86	1.34 H	200	19.82	36.32
6	5350.00	41.81 AV	54.00	-12.19	1.34 H	200	5.49	36.32
7	#10480.00	57.80 PK	68.30	-10.50	1.41 H	356	11.68	46.12
8	15720.00	57.70 PK	74.00	-16.30	1.15 H	172	10.22	47.48
9	15720.00	43.80 AV	54.00	-10.20	1.15 H	172	-3.68	47.48
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	4192.00	57.10 PK	74.00	-16.90	1.08 V	349	22.98	34.12
2	4192.00	52.00 AV	54.00	-2.00	1.08 V	349	17.88	34.12
3	*5240.00	113.10 PK			1.15 V	275	76.96	36.14
4	*5240.00	101.50 AV			1.15 V	275	65.36	36.14
5	5372.66	61.86 PK	74.00	-12.14	1.14 V	272	25.50	36.36
6	5372.66	47.52 AV	54.00	-6.48	1.14 V	272	11.16	36.36
7	#10480.00	57.90 PK	68.30	-10.40	1.48 V	36	11.78	46.12
8	15720.00	57.70 PK	74.00	-16.30	1.00 V	66	10.22	47.48
9	15720.00	44.50 AV	54.00	-9.50	1.00 V	66	-2.98	47.48

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 (DRAFT 802.11n (20MHz) MODE,CH1, HORIZONTAL)



REF 107 dBuV *Att 0 dB *REW 1 MHz *VBW 3 MHz SWT 20 ms Marker 1 [T1] 61.25 dBuV

Offset 10 dB

1 PK VIEW

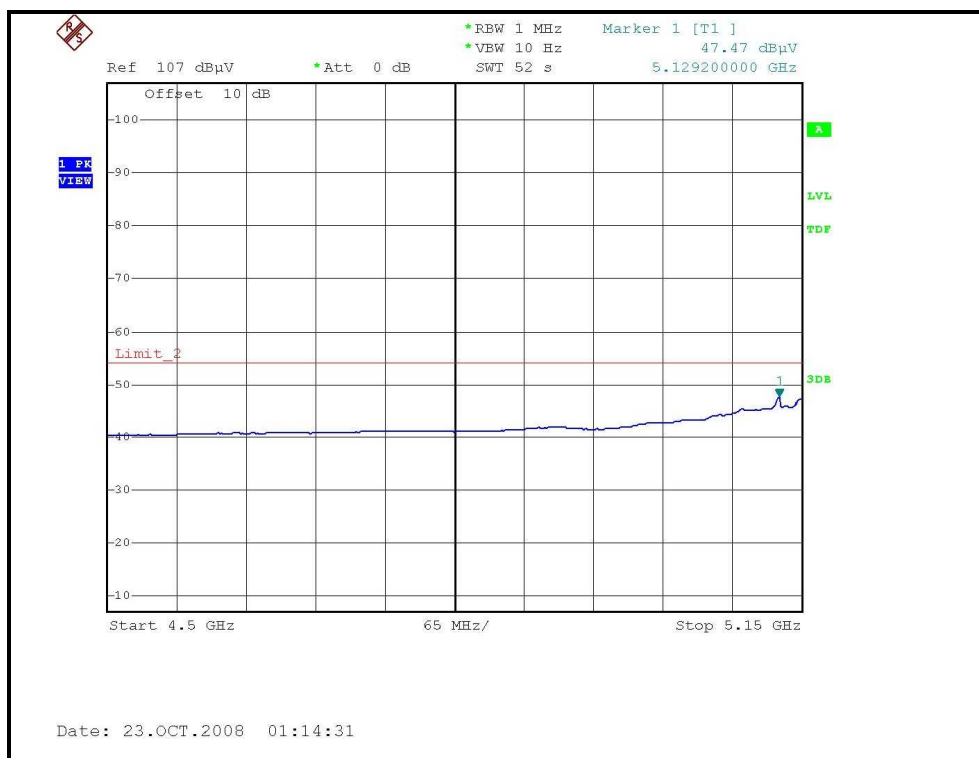
Limit_1

1

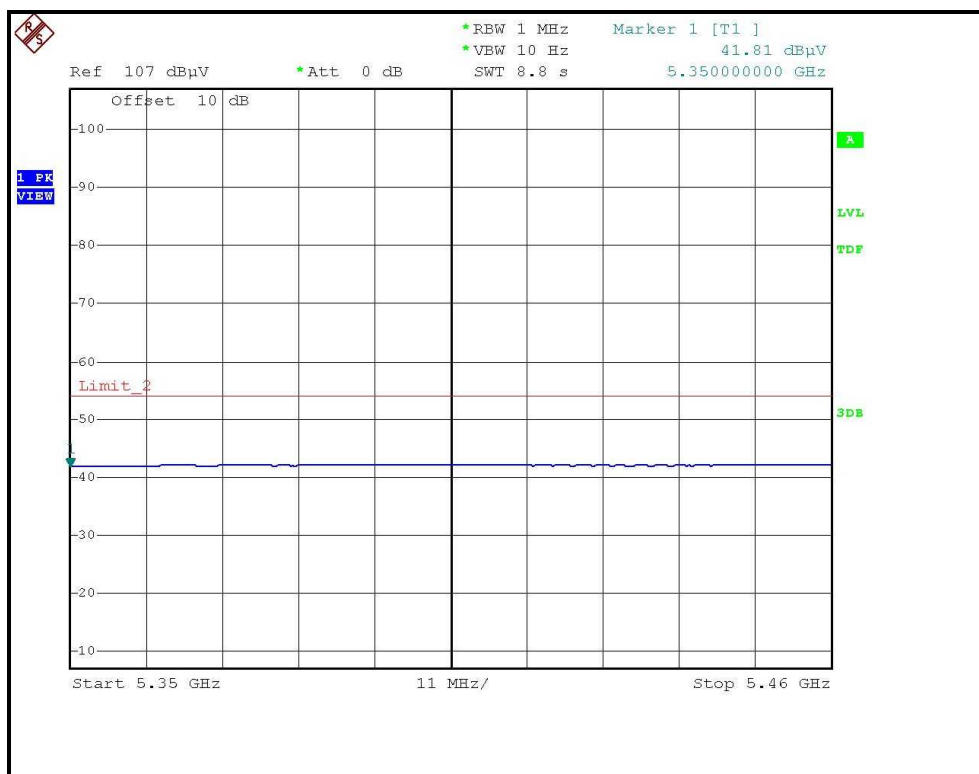
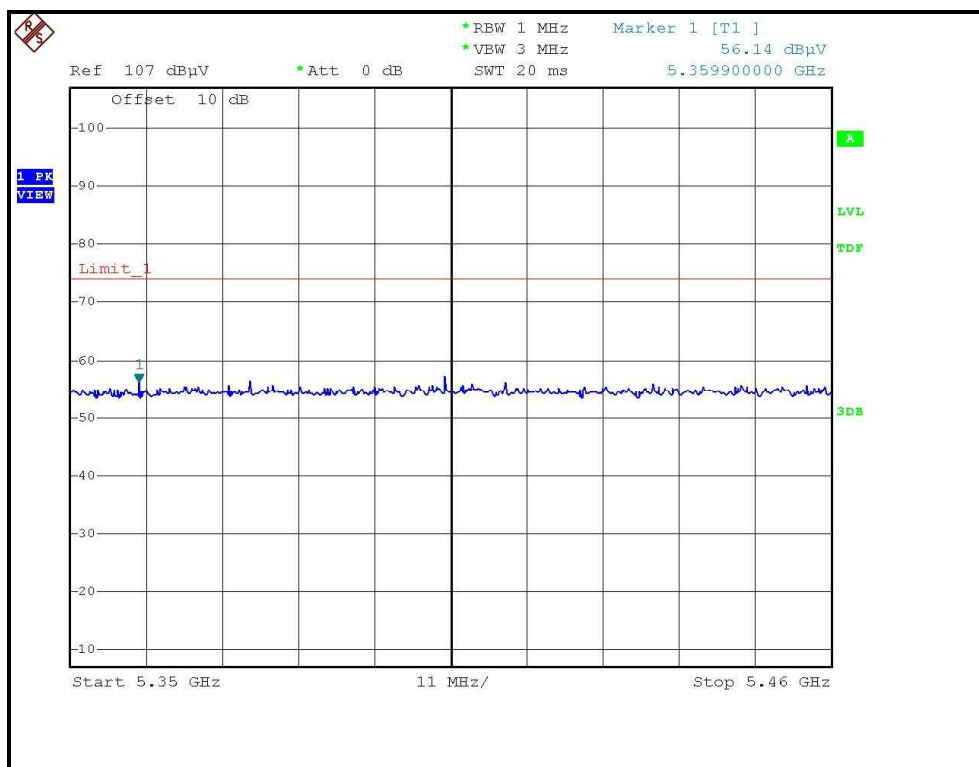
3dB

Start 4.5 GHz 65 MHz/ Stop 5.15 GHz

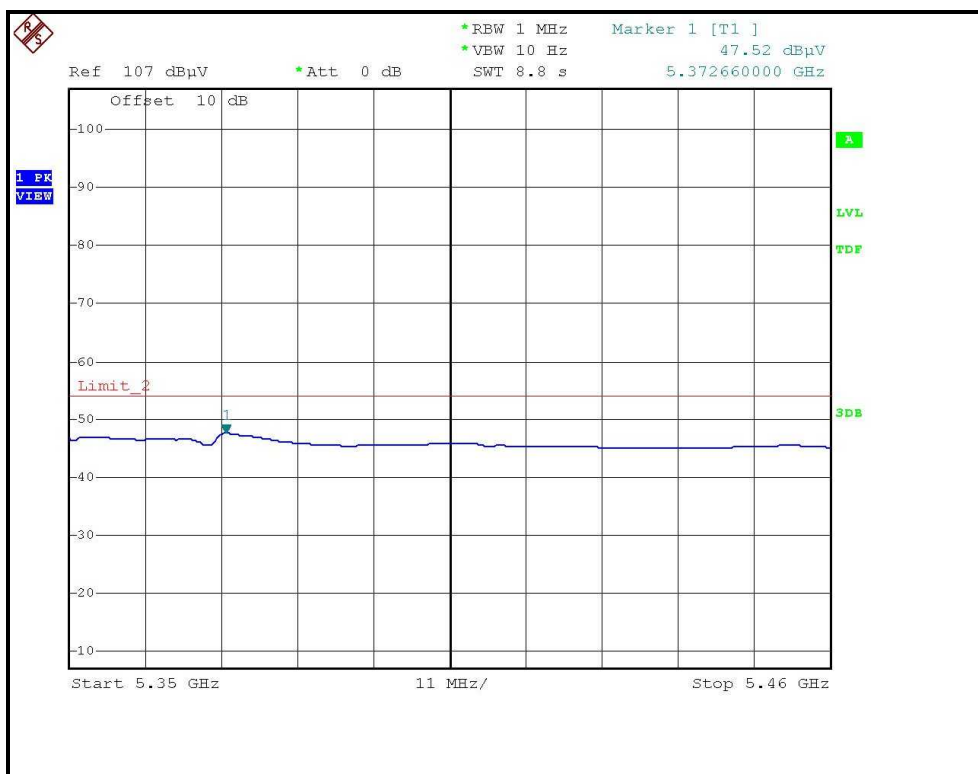
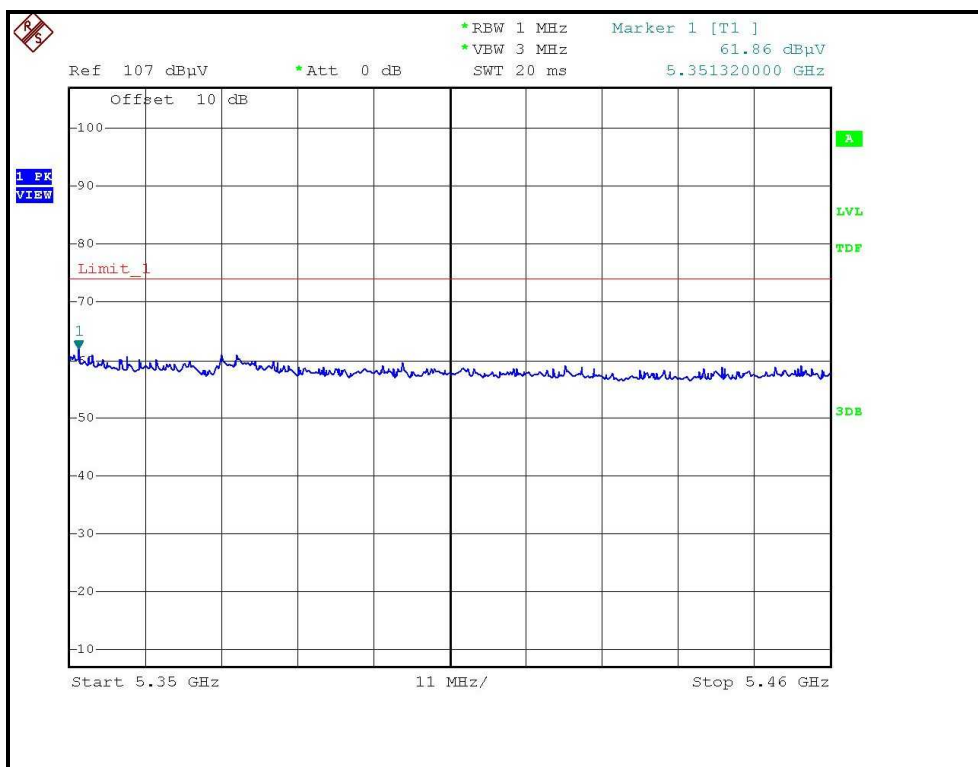
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RESTRICTED BANDEDGE (DRAFT 802.11n (20MHz) MODE,CH4, HORIZONTAL)



RESTRICTED BANDEDGE (DRAFT 802.11n (20MHz) MODE,CH4, VERTICAL)





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DRAFT 802.11n (40MHz) OFDM MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH 965hPa	TESTED BY	Rex Huang

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	4152.00	54.30 PK	74.00	-19.70	1.29 H	228	20.28	34.02
2	4152.00	40.10 AV	54.00	-13.90	1.29 H	228	6.08	34.02
3	5150.00	54.78 PK	74.00	-19.22	1.49 H	197	18.78	36.00
4	5150.00	41.69 AV	54.00	-12.31	1.49 H	197	5.69	36.00
5	*5190.00	95.40 PK			1.49 H	197	59.34	36.06
6	*5190.00	84.20 AV			1.49 H	197	48.14	36.06
7	#10380.00	57.40 PK	68.30	-10.90	1.45 H	354	11.44	45.96
8	15570.00	57.78 PK	74.00	-16.22	1.16 H	177	9.93	47.85
9	15570.00	43.90 AV	54.00	-10.10	1.16 H	177	-3.95	47.85
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	4152.00	56.60 PK	74.00	-17.40	1.07 V	19	22.58	34.02
2	4152.00	47.50 AV	54.00	-6.50	1.07 V	19	13.48	34.02
3	5150.00	65.41 PK	74.00	-8.59	1.18 V	276	29.41	36.00
4	5150.00	48.55 AV	54.00	-5.45	1.18 V	276	12.55	36.00
5	*5190.00	109.70 PK			1.17 V	268	73.64	36.06
6	*5190.00	97.70 AV			1.17 V	268	61.64	36.06
7	#10380.00	58.10 PK	68.30	-10.20	1.46 V	45	12.14	45.96
8	15570.00	59.90 PK	74.00	-14.10	1.12 V	87	12.05	47.85
9	15570.00	45.80 AV	54.00	-8.20	1.12 V	87	-2.05	47.85

- 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.



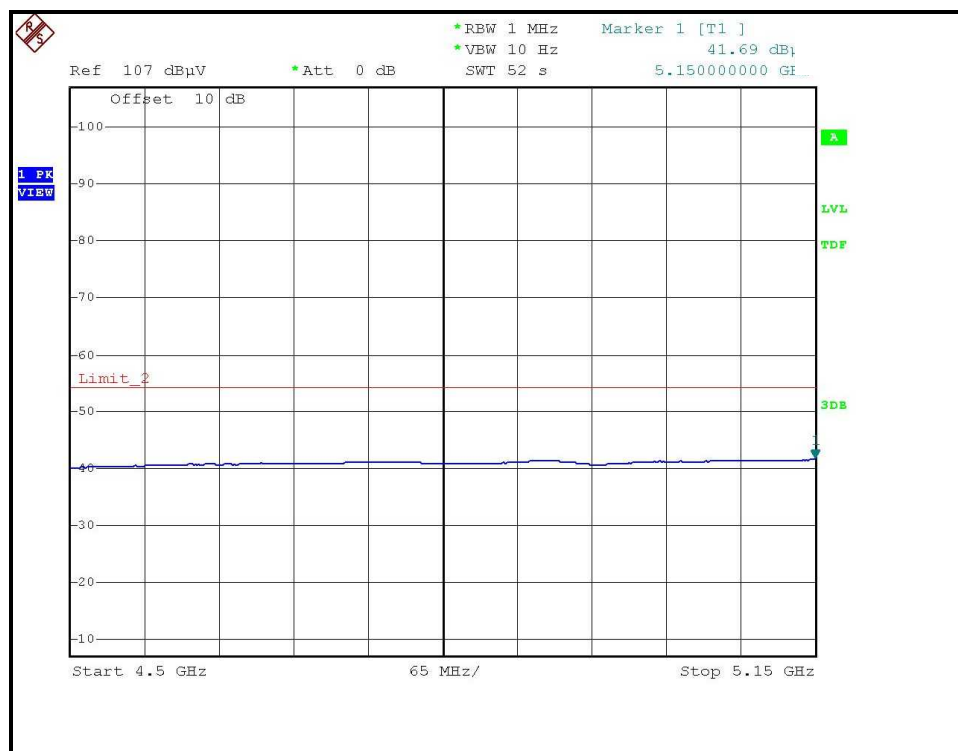
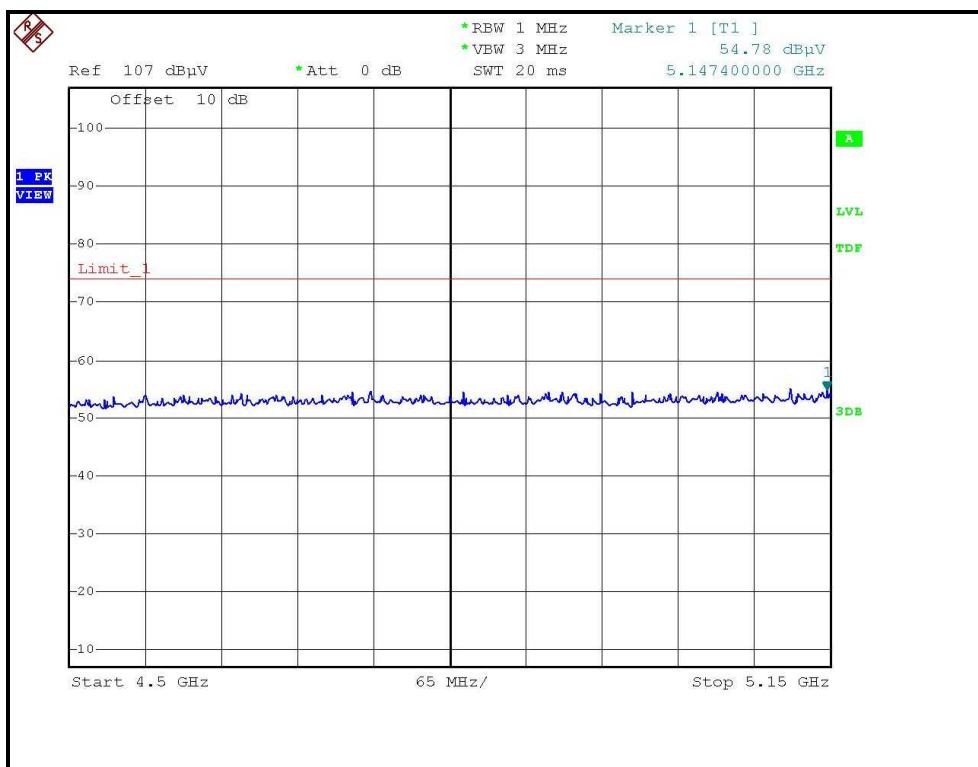
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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 2	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH 965hPa	TESTED BY	Rex Huang

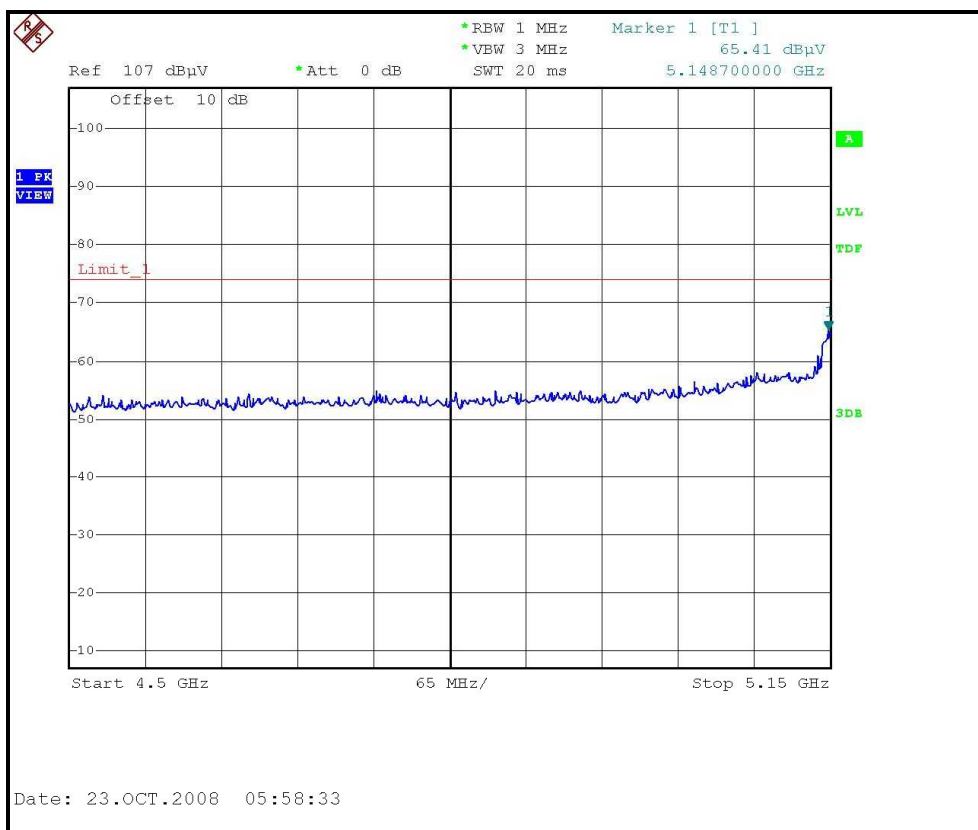
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	4184.00	54.50 PK	74.00	-19.50	1.25 H	225	20.40	34.10
2	4184.00	41.70 AV	54.00	-12.30	1.25 H	225	7.60	34.10
3	*5230.00	96.10 PK			1.48 H	196	59.97	36.13
4	*5230.00	85.20 AV			1.48 H	196	49.07	36.13
5	5350.00	56.51 PK	74.00	-17.49	1.50 H	198	20.19	36.32
6	5350.00	42.03 AV	54.00	-11.97	1.50 H	198	5.71	36.32
7	#10460.00	57.00 PK	68.30	-11.30	1.39 H	357	10.91	46.09
8	15960.00	58.60 PK	74.00	-15.40	1.18 H	174	11.72	46.88
9	15960.00	44.80 AV	54.00	-9.20	1.18 H	174	-2.08	46.88
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	4184.00	56.20 PK	74.00	-17.80	1.06 V	19	22.10	34.10
2	4184.00	47.20 AV	54.00	-6.80	1.06 V	19	13.10	34.10
3	*5230.00	109.90 PK			1.16 V	274	73.77	36.13
4	*5230.00	98.30 AV			1.16 V	274	62.17	36.13
5	5350.00	64.21 PK	74.00	-9.79	1.14 V	271	27.89	36.32
6	5350.00	47.94 AV	54.00	-6.06	1.14 V	271	11.62	36.32
7	#10460.00	57.50 PK	68.30	-10.80	1.39 V	49	11.41	46.09
8	15690.00	57.50 PK	74.00	-16.50	1.17 V	109	9.94	47.56
9	15690.00	43.50 AV	54.00	-10.50	1.17 V	109	-4.06	47.56

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 (DRAFT 802.11n (40MHz) MODE, CH1, HORIZONTAL)



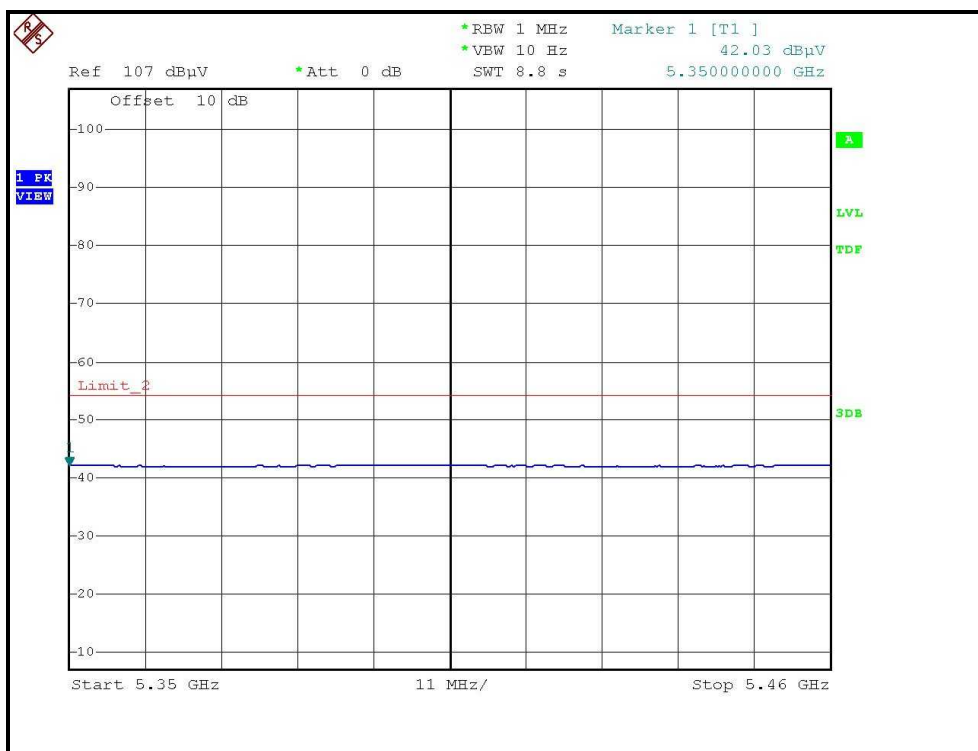
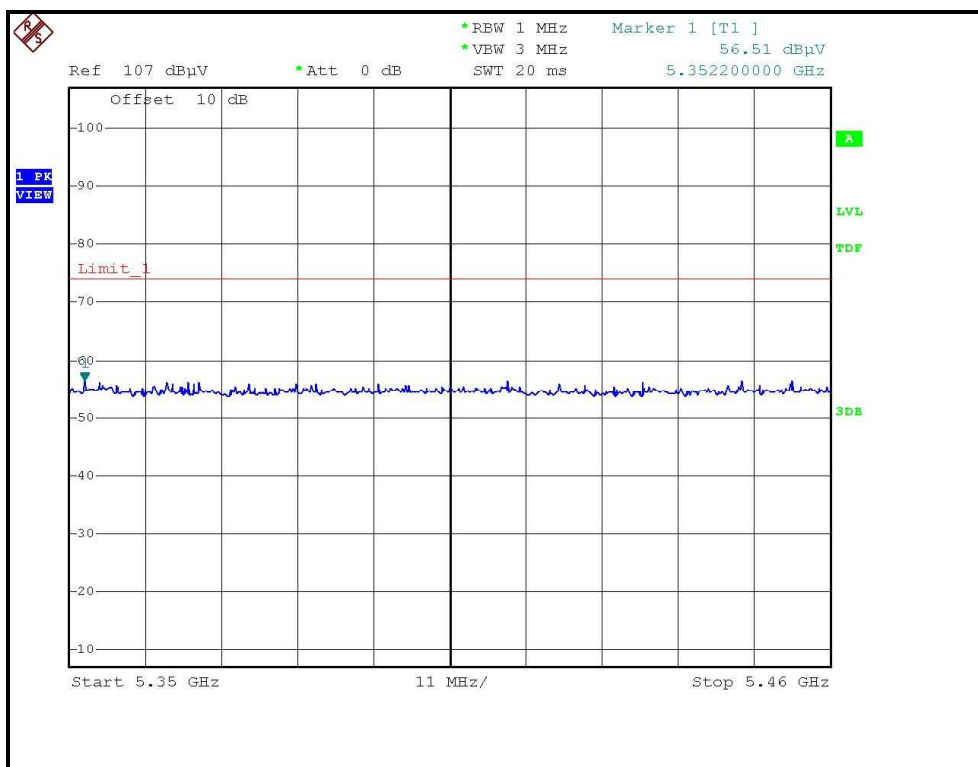
RESTRICTED BANDEDGE (DRAFT 802.11n (40MHz) MODE,CH1, VERTICAL)





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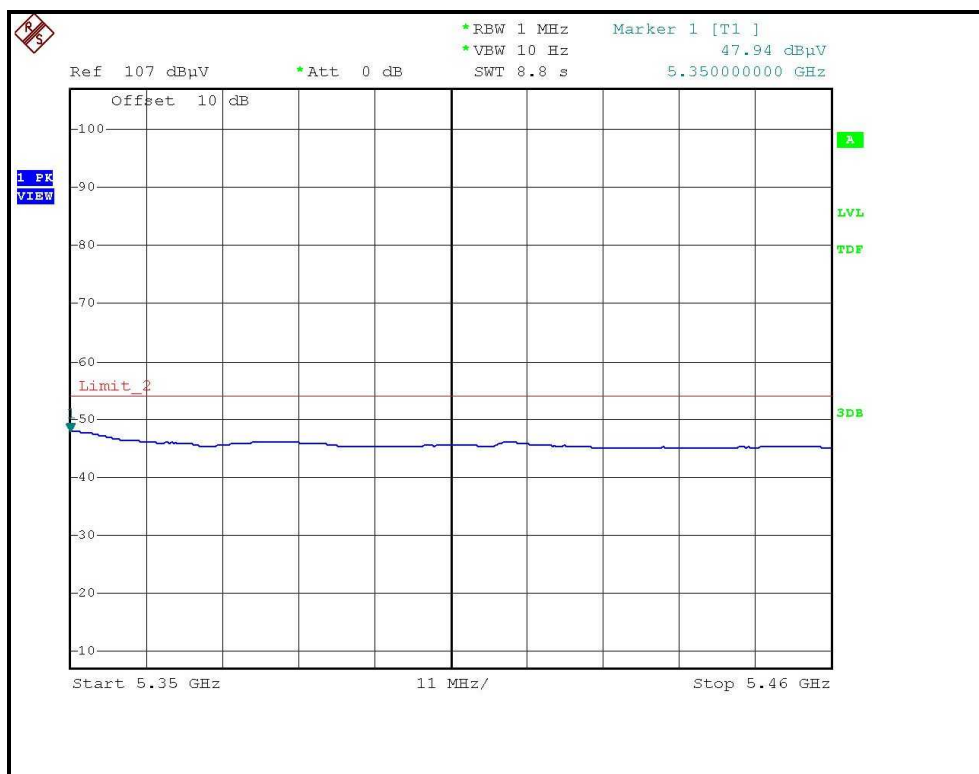
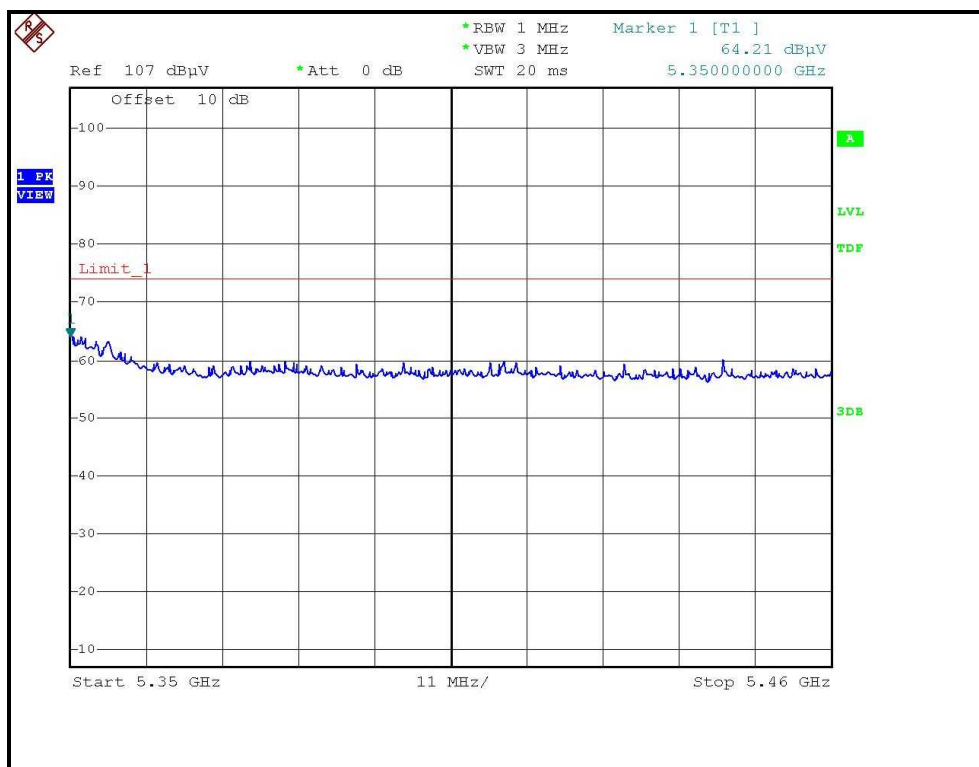
RESTRICTED BANDEDGE (DRAFT 802.11n (40MHz) MODE, CH2, HORIZONTAL)





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RESTRICTED BANDEDGE (DRAFT 802.11n (40MHz) MODE, CH2, VERTICAL)



4.3 PEAK TRANSMIT POWER MEASUREMENT

4.3.1 LIMITS OF PEAK 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

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
ADVANTEST SPECTRUM ANALYZER	U3772	160100280	July 26, 2008	July 25, 2009

NOTE:

- 1.The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81.
- 2.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

1. The transmitter output was connected to the spectrum analyzer.
2. Set span to encompass the entire emission bandwidth of the signal.
3. Set RBW to 1MHz, VBW to 300kHz.
4. Using the spectrum analyzer's channel power measurement function to measure the output power.

NOTE:

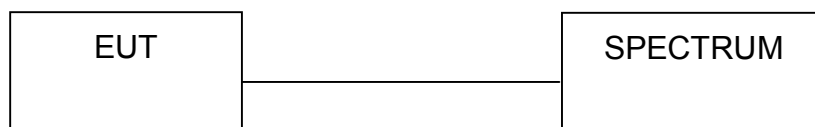
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output operates continuously therefore Method # 1 is used.

4.3.4 DEVIATION FROM TEST STANDARD

No deviation

4.3.5 TEST SETUP



4.3.6 EUT OPERATING CONDITIONS

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

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4.3.7 TEST RESULTS

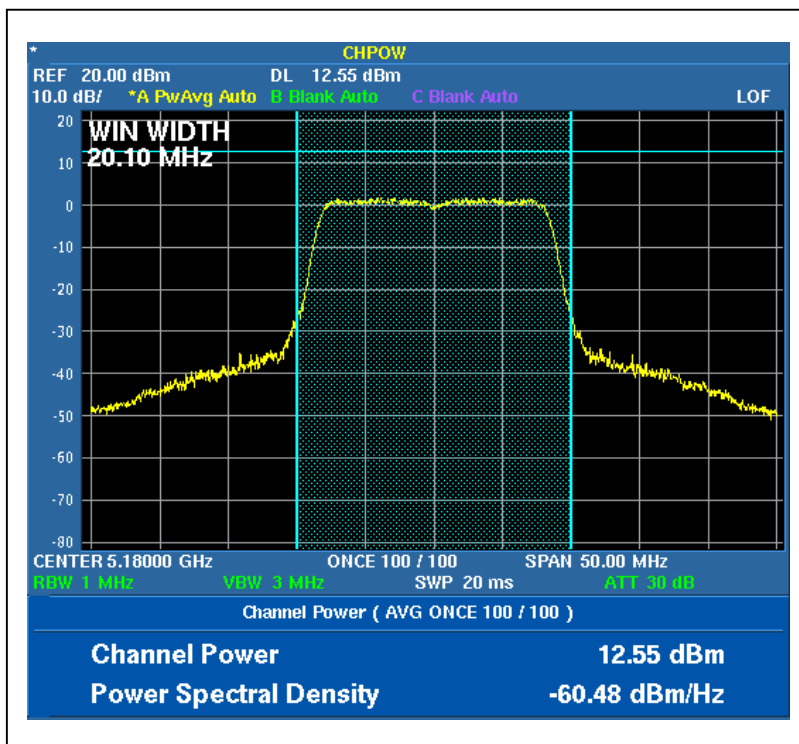
802.11a OFDM MODULATION:

MODULATION TYPE	BPSK	TRANSFER RATE	6Mbps
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	25deg.C, 60%RH, 965hPa
TESTED BY	Rex Huang		

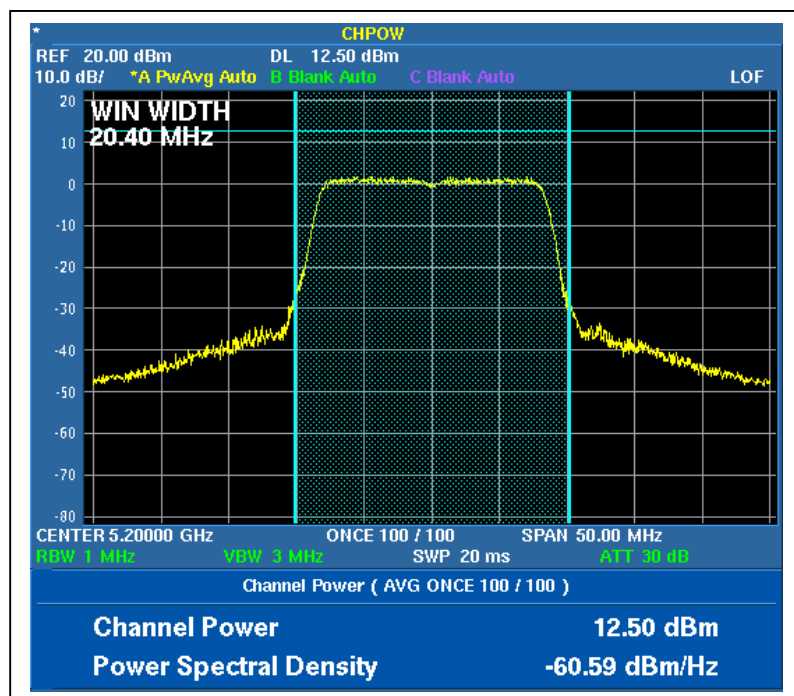
CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)	PEAK POWER OUTPUT (mW)	PEAK POWER LIMIT (dBm)	26dBc Occupied Bandwidth (MHz)	PASS/FAIL
1	5180	12.55	17.989	17	20.1	PASS
2	5200	12.50	17.783	17	20.4	PASS
4	5240	12.75	18.836	17	20.0	PASS

NOTE: The 26dBc Occupied Bandwidth plot, please refer to the following pages.

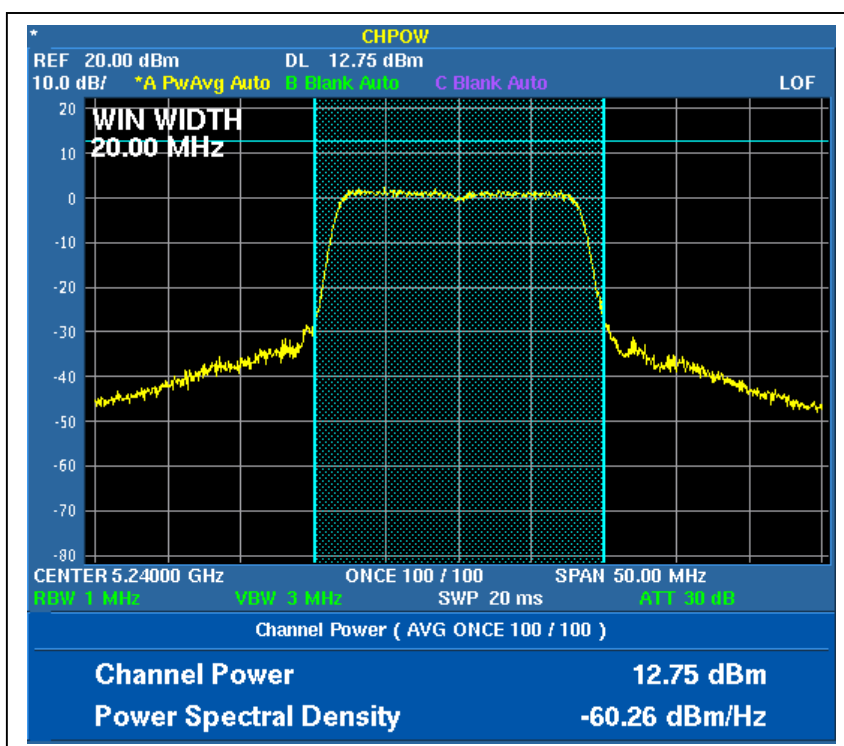
Peak Power Output: CH1



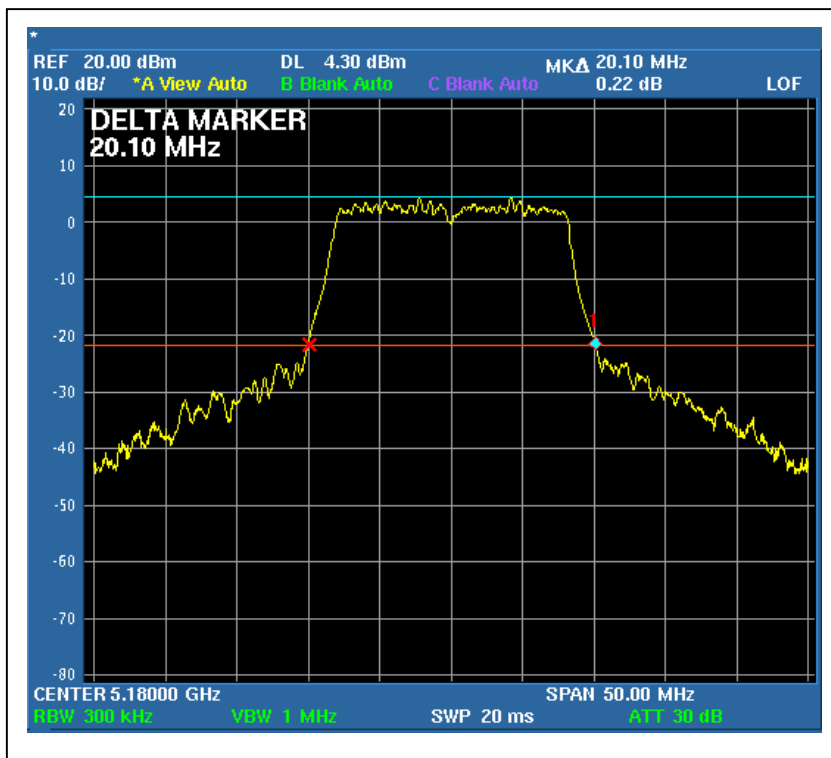
CH2



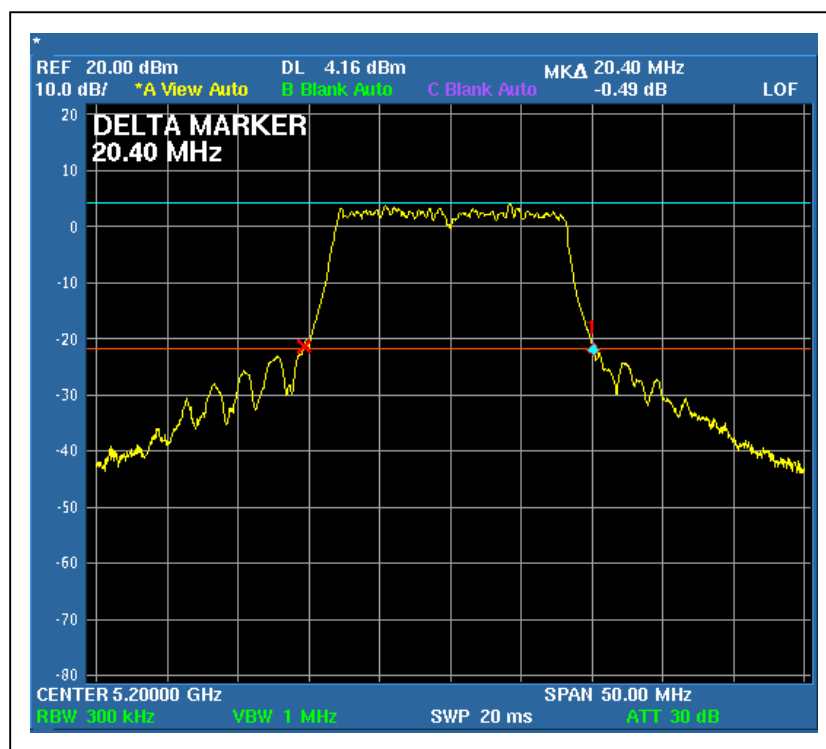
CH4



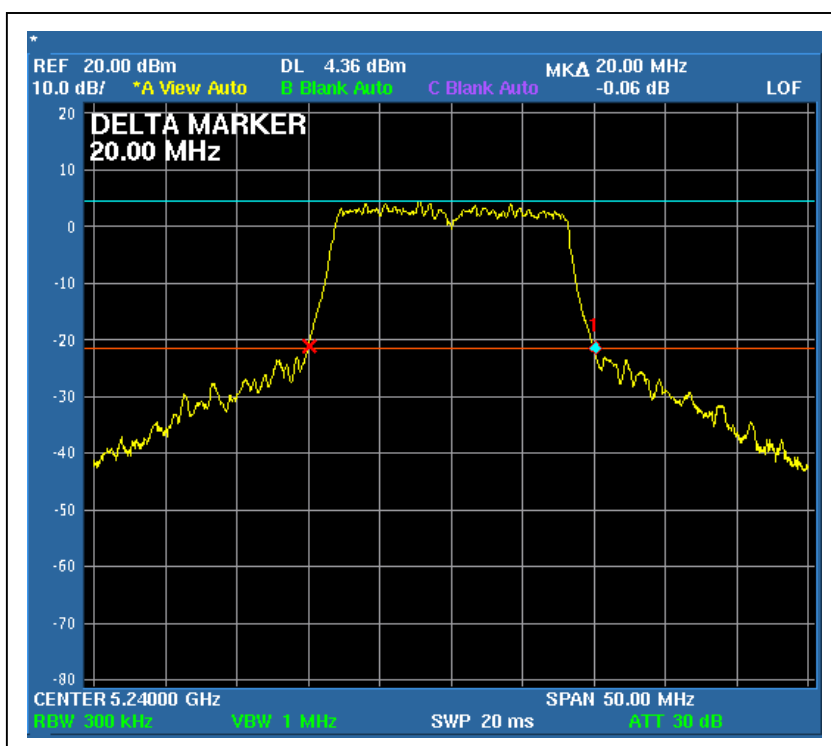
26dB Occupied Bandwidth:
CH1



CH2



CH4





A D T

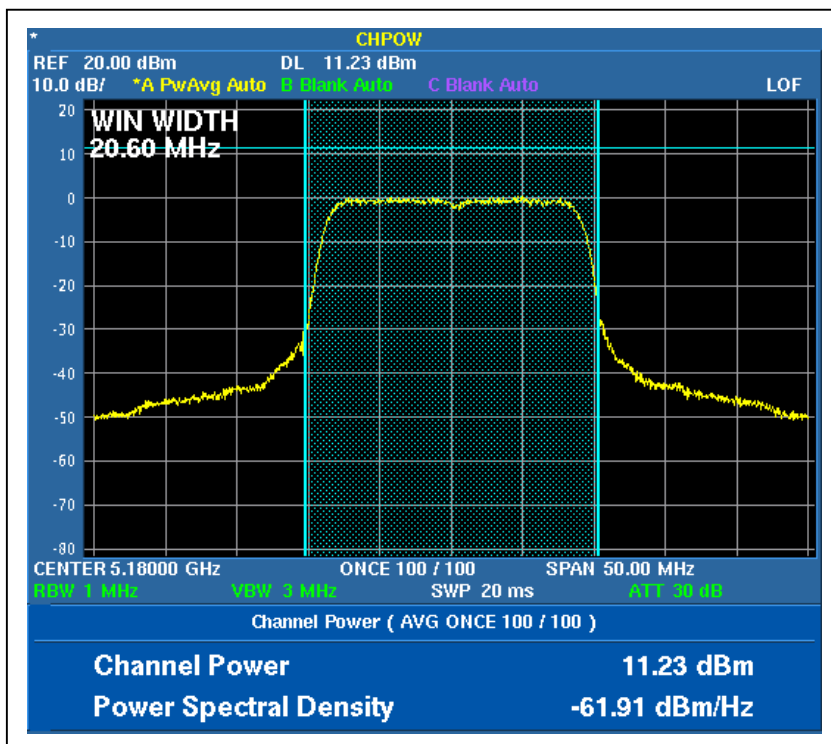
DRAFT 802.11n (20MHz) OFDM modulation:

MODULATION TYPE	BPSK	TRANSFER RATE	13Mbps
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	25deg.C, 60%RH, 965hPa
TESTED BY	Rex Huang		

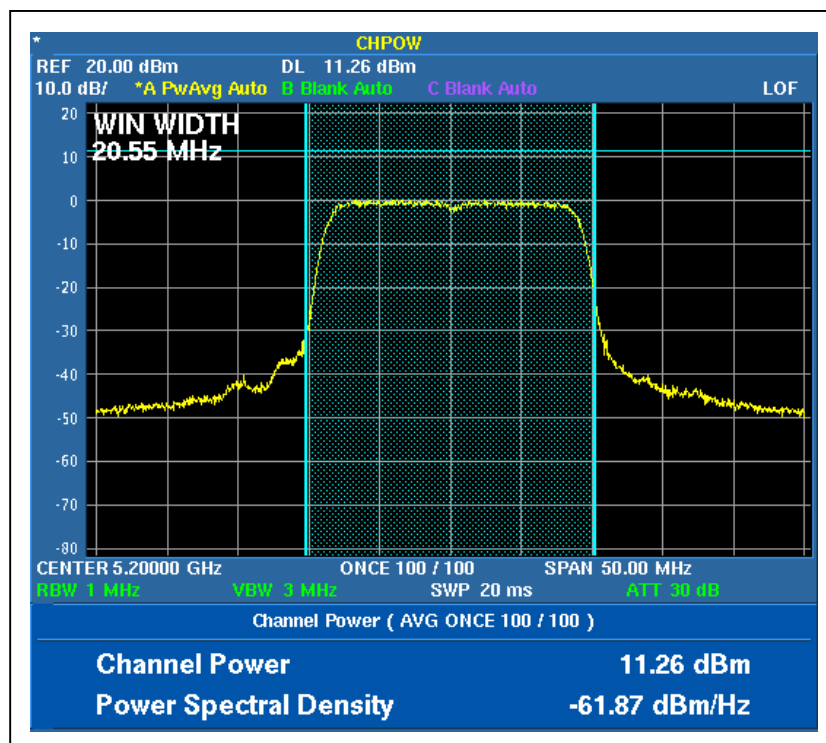
CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)		PEAK POWER OUTPUT (mW)		TOTAL PEAK POWER (dBm)	TOTAL PEAK POWER (mW)	PEAK POWER LIMIT (dBm)	26dBc Occupied Bandwidth (MHz)		PASS/ FAIL
		Chain 0	Chain 1	Chain 0	Chain 1				Chain 0	Chain 1	
1	5180	11.23	11.89	13.274	15.453	14.58	28.727	17.00	20.6	20.1	PASS
2	5200	11.26	12.01	13.366	15.885	14.66	29.251	17.00	20.55	20.1	PASS
4	5240	11.53	11.70	14.223	14.791	14.63	29.014	17.00	20.55	20.05	PASS

NOTE: The 26dBc Occupied Bandwidth plot, please refer to the following pages.

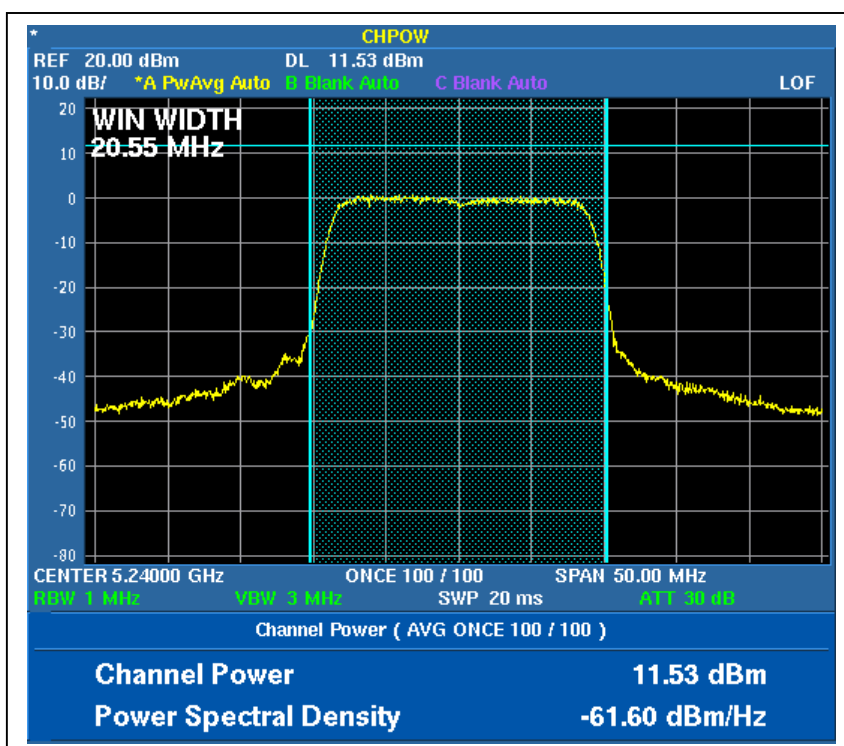
Peak Power Output:
For Chain (0) :CH1



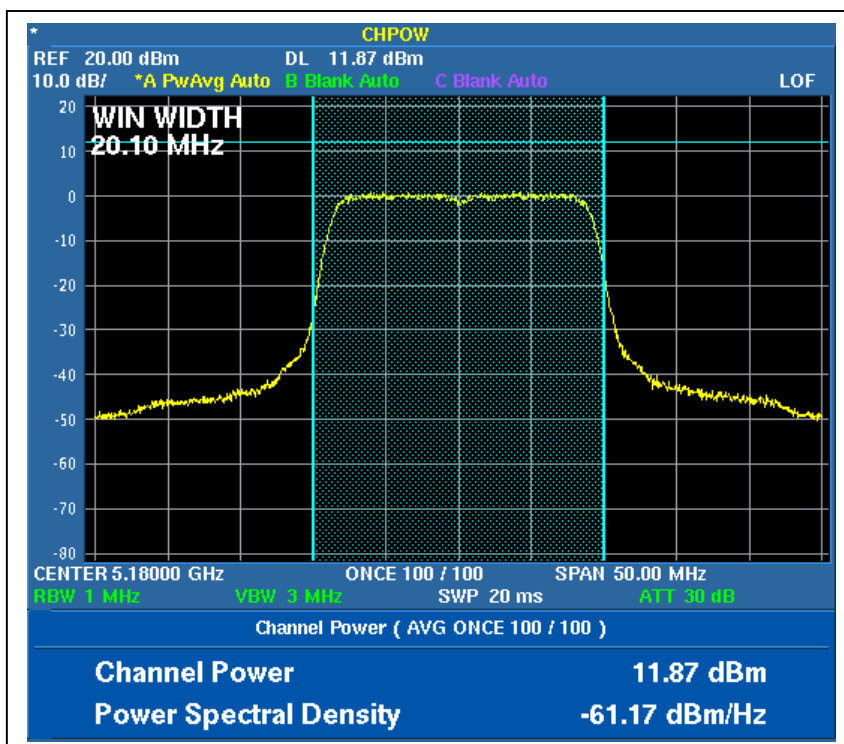
CH2



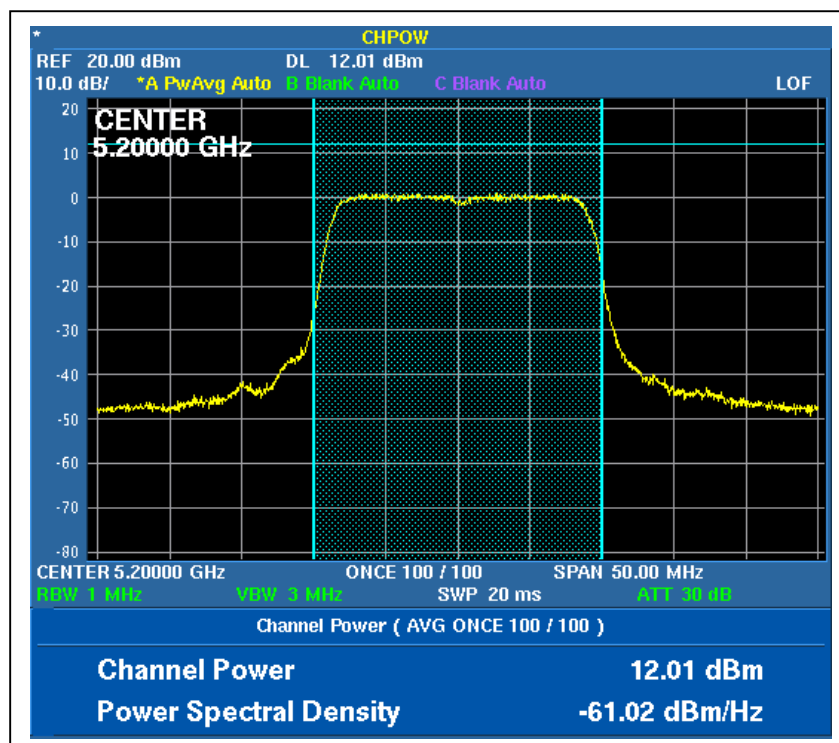
CH4



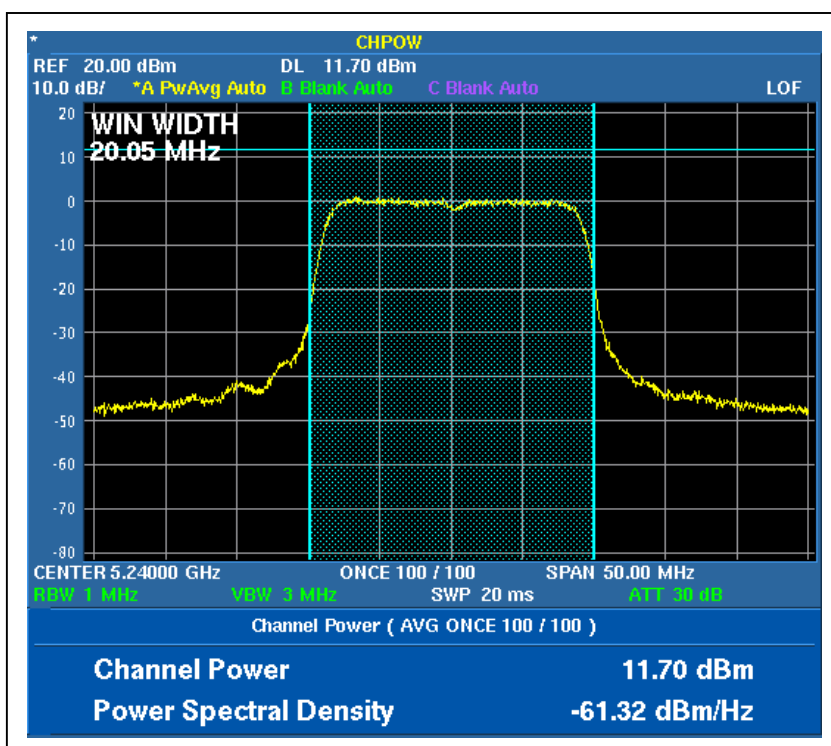
For Chain (1) :CH1



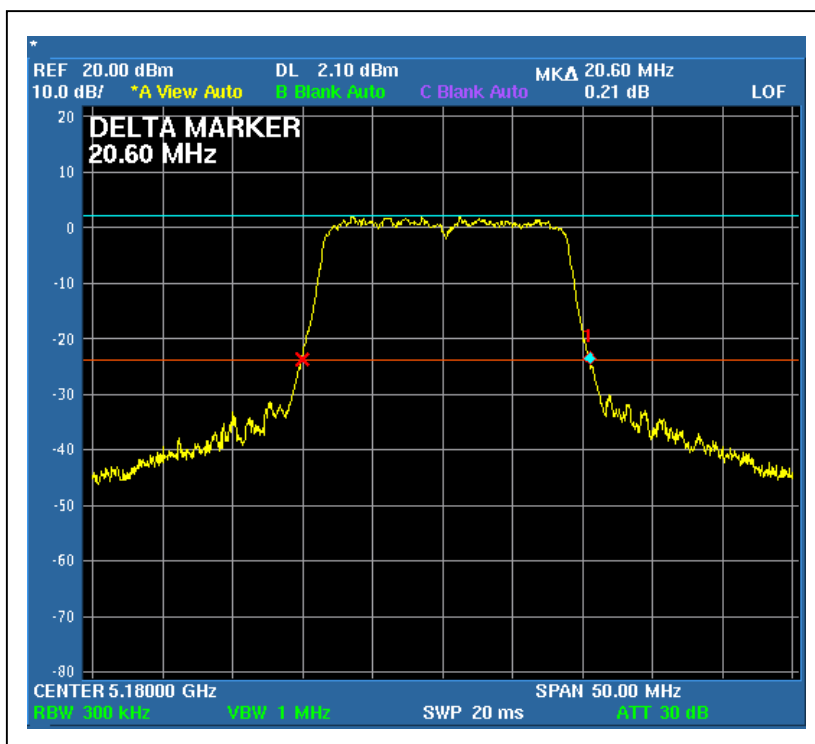
CH2



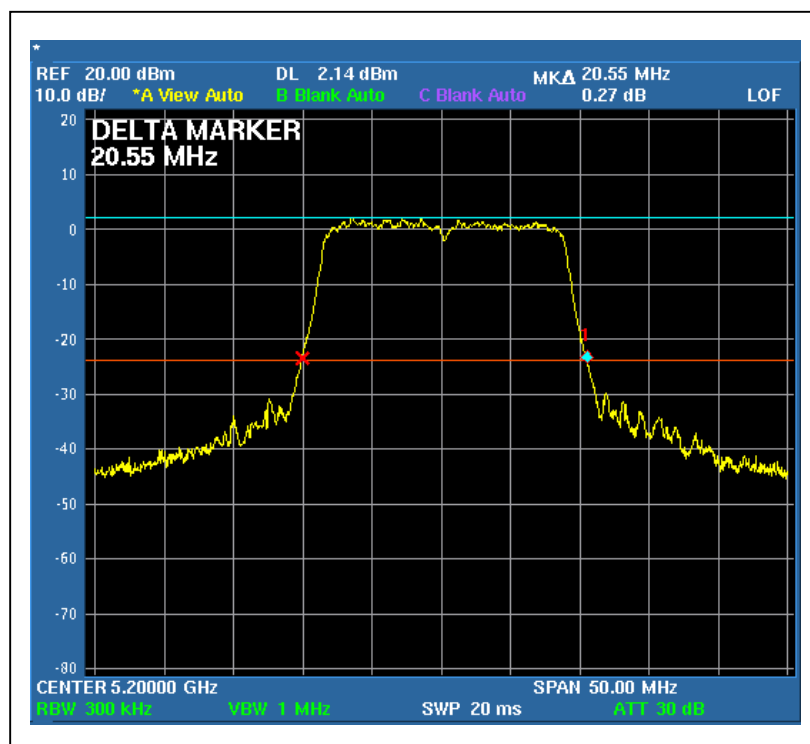
CH4



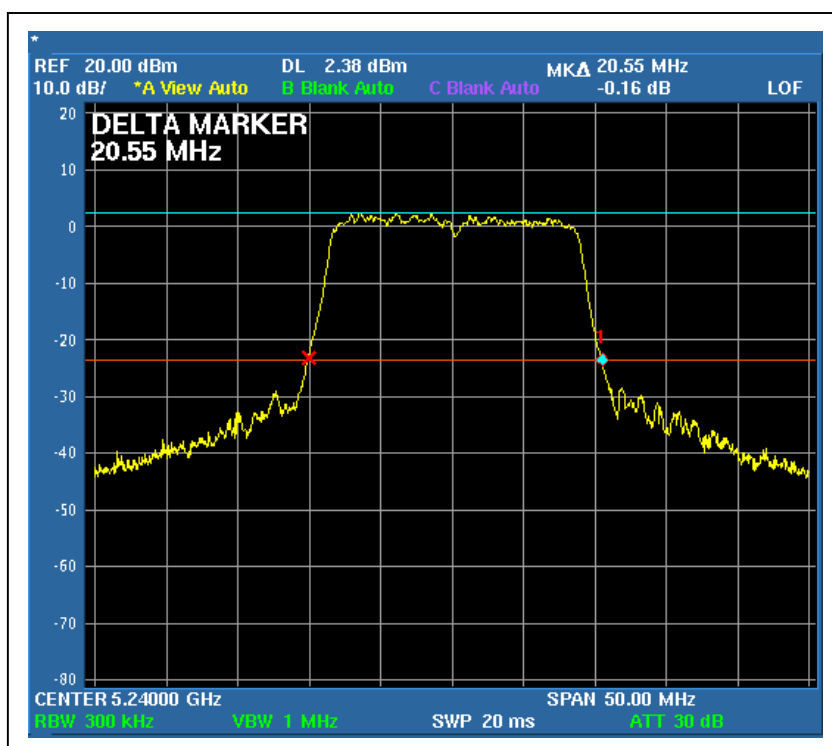
26dB Occupied Bandwidth:
For Chain (0) :CH1



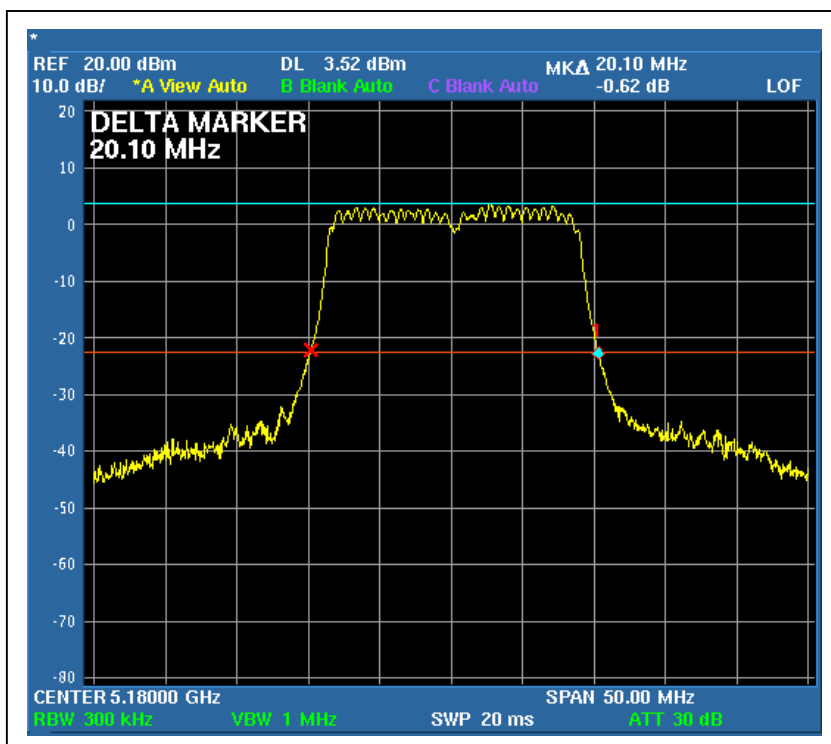
CH2



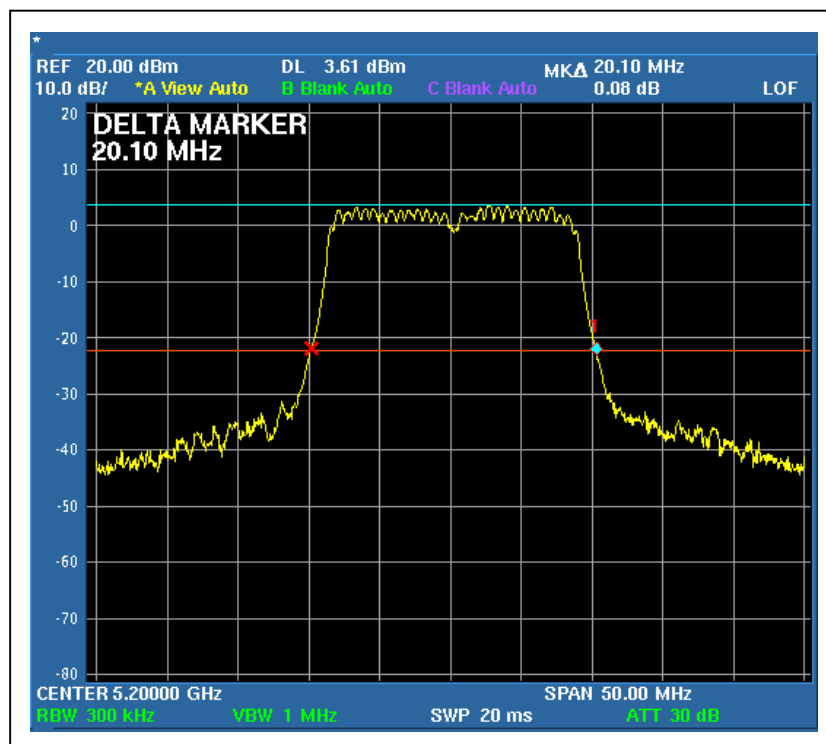
CH4



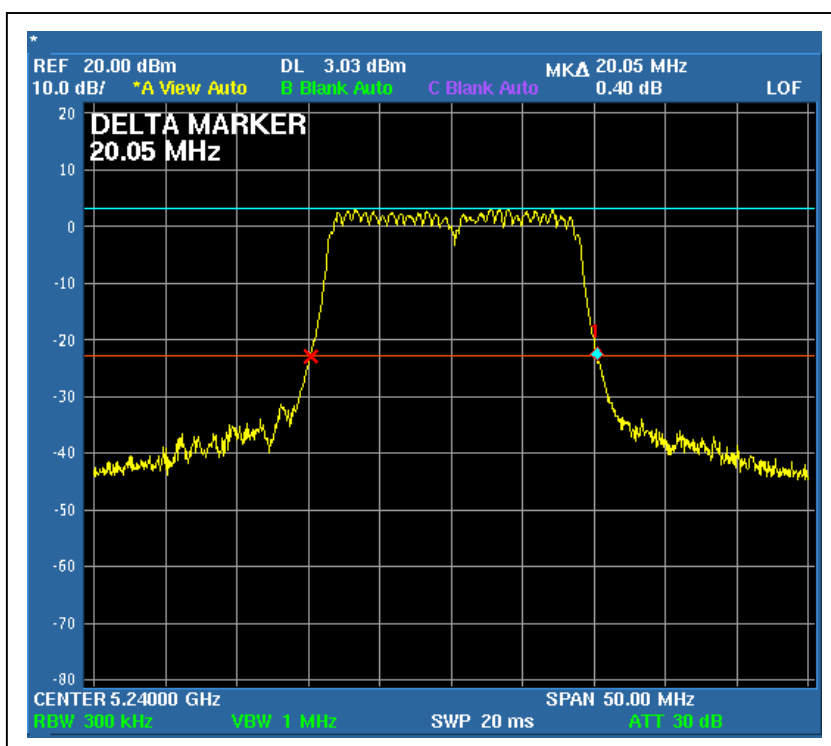
For Chain (1) :CH1



CH2



CH4



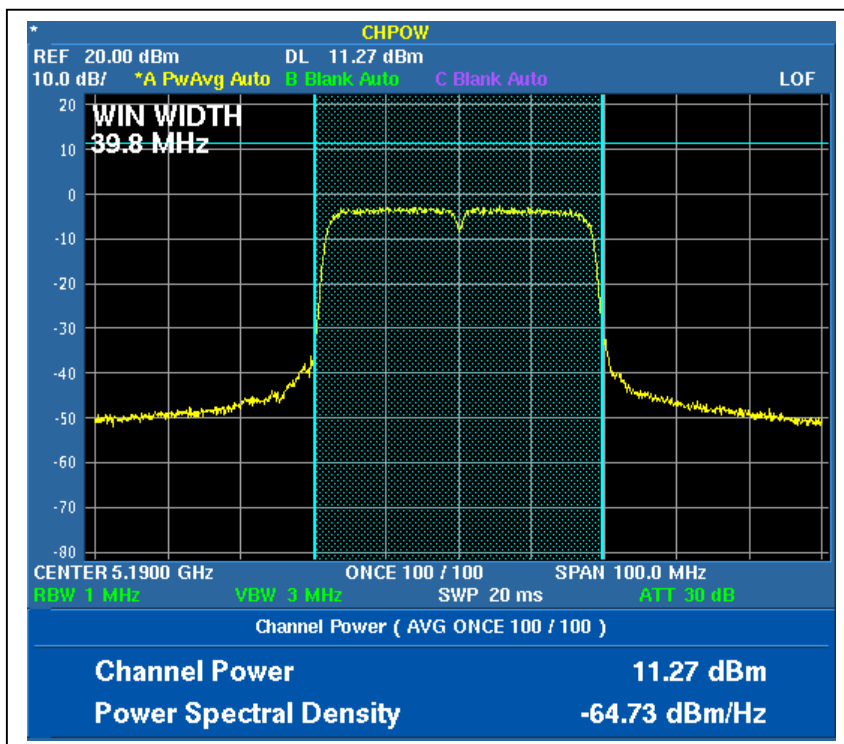
**A D T****DRAFT 802.11n (40MHz) OFDM MODULATION:**

MODULATION TYPE	BPSK	TRANSFER RATE	27Mbps
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	25deg.C, 60%RH, 965hPa
TESTED BY	Rex Huang		

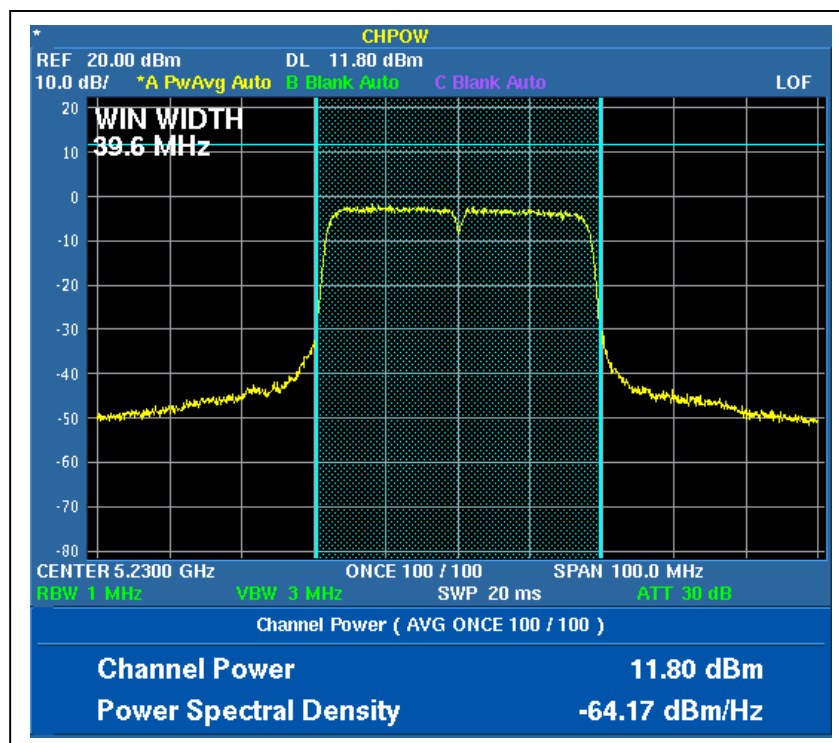
CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)		PEAK POWER OUTPUT (mW)		TOTAL PEAK POWER (dBm)	TOTAL PEAK POWER (mW)	PEAK POWER LIMIT (dBm)	26dBc Occupied Bandwidth (MHz)		PASS/ FAIL
		Chain 0	Chain 1	Chain 0	Chain 1				Chain 0	Chain 1	
1	5190	11.27	11.41	13.397	13.836	14.35	27.233	17.00	39.8	39.5	PASS
2	5230	11.80	11.27	15.136	13.397	14.55	28.533	17.00	39.6	39.5	PASS

NOTE: The 26dBc Occupied Bandwidth plot, please refer to the following pages.

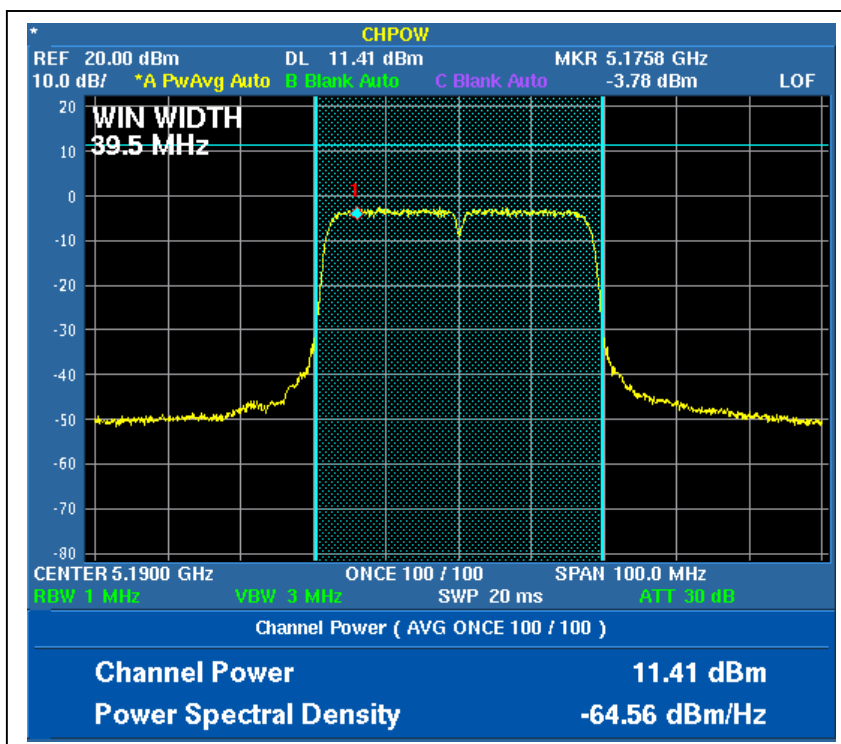
Peak Power Output:
For Chain (0) :CH1



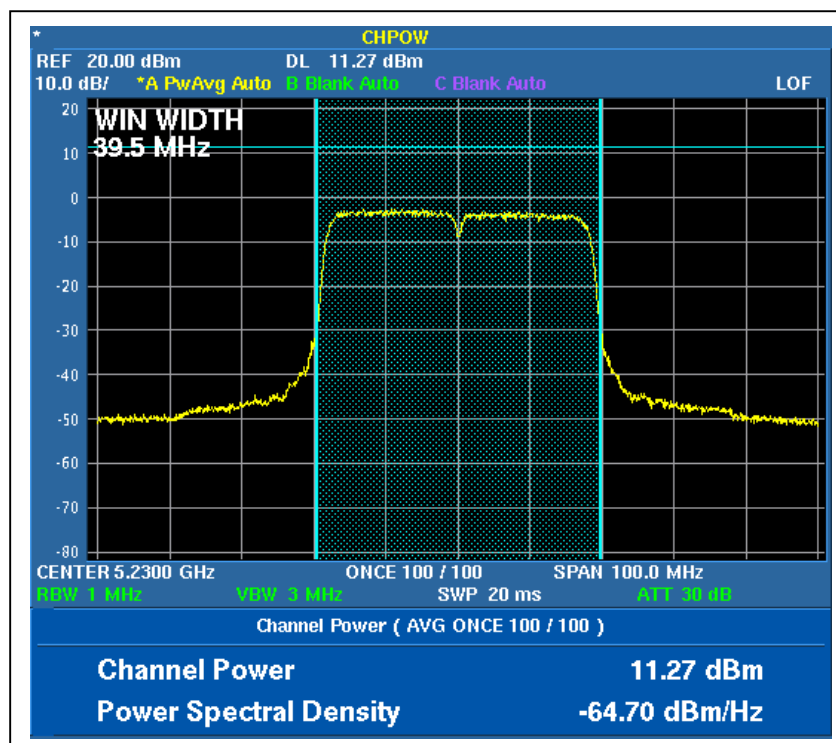
CH2



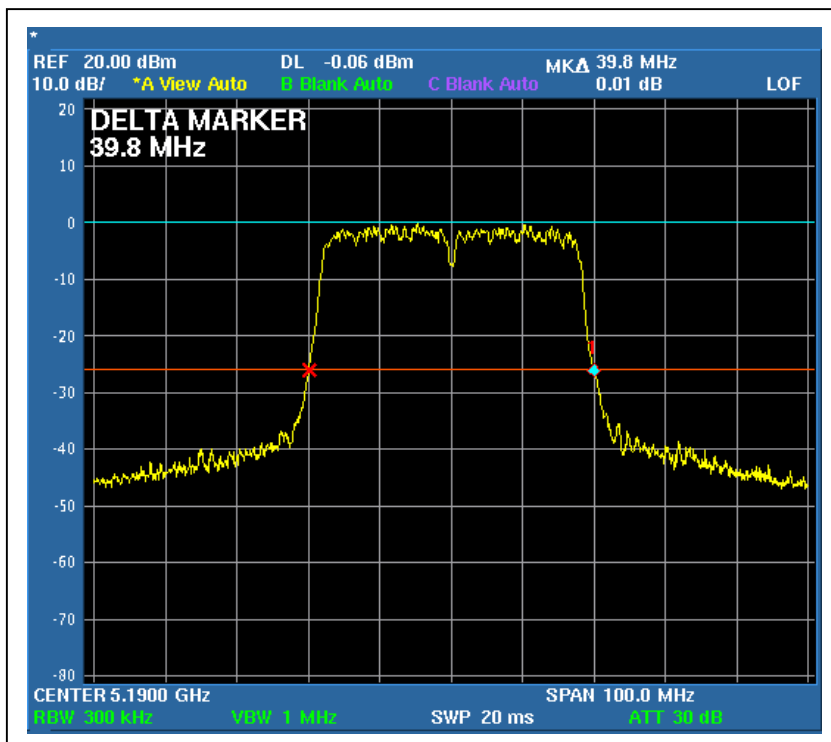
For Chain (1) :CH1



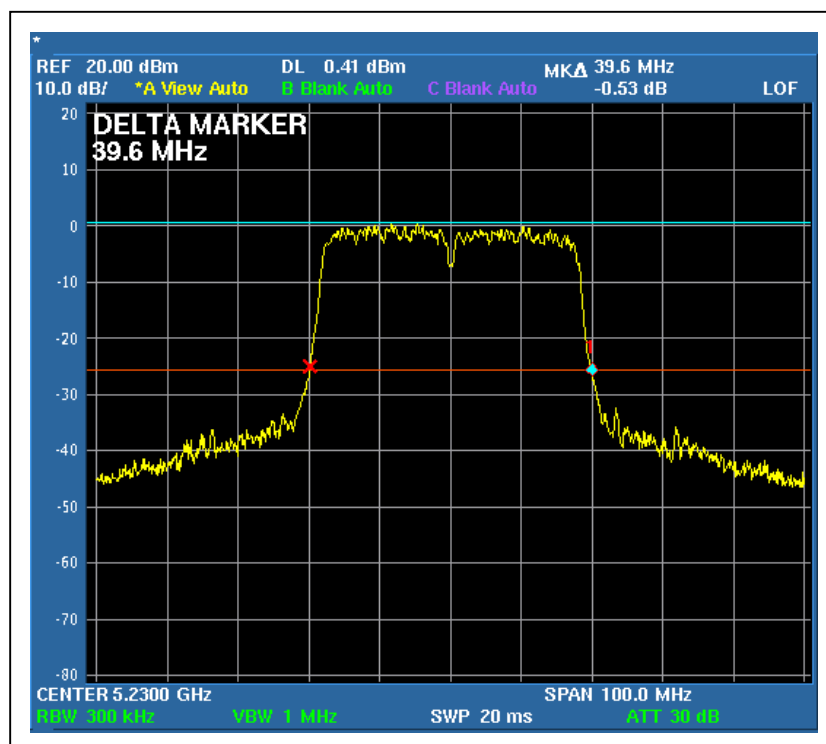
CH2



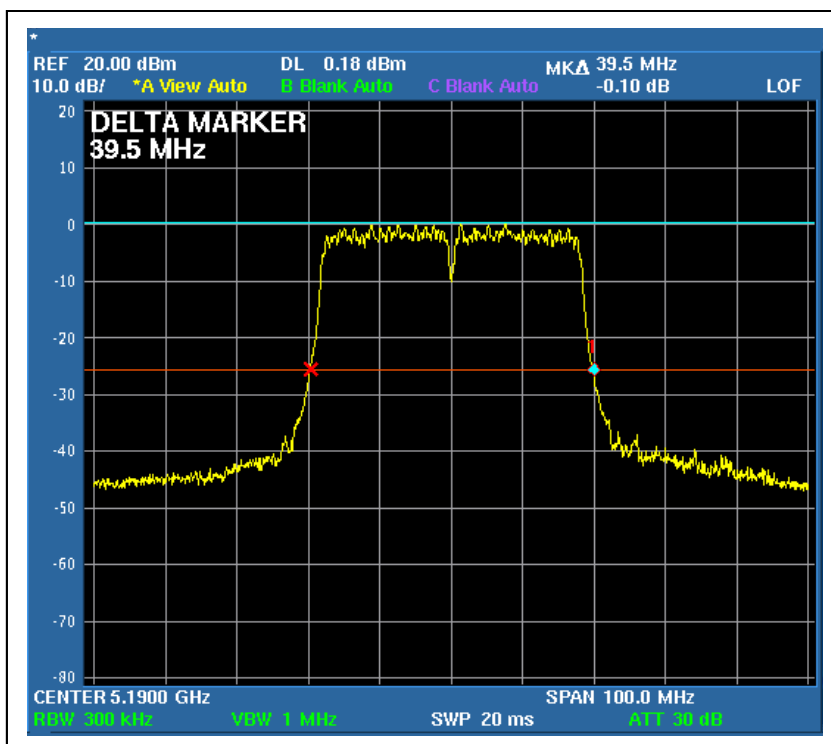
26dB Occupied Bandwidth:
For Chain (0) :CH1



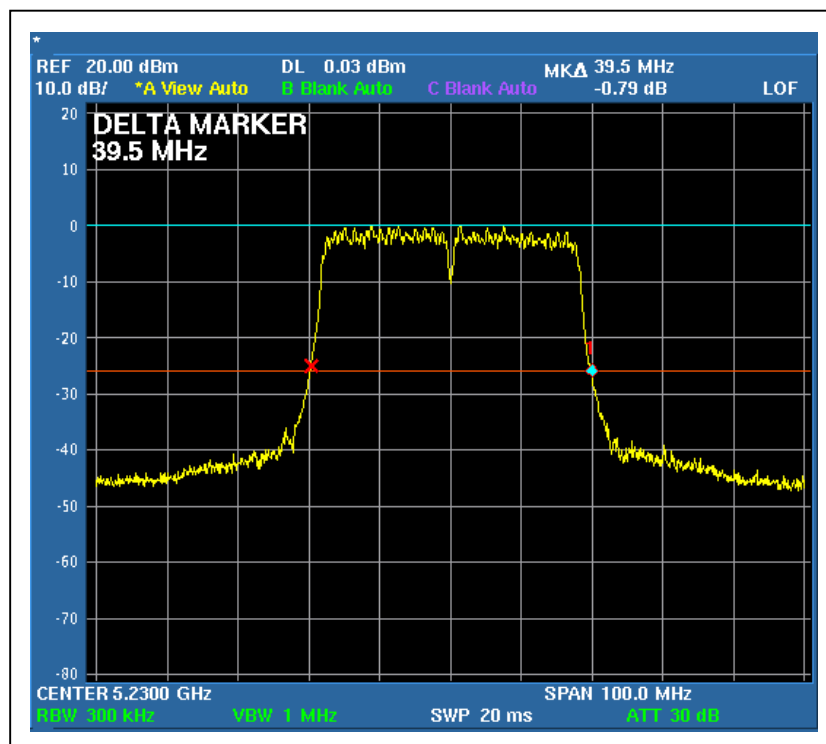
CH2



For Chain (1) :CH1



CH2





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

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100037	Aug. 09, 2008	Aug. 08, 2009

NOTE:

- 1.The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
- 2.The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

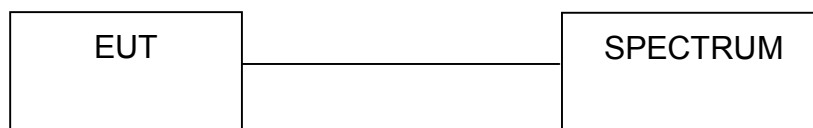
4.4.3 TEST PROCEDURE

1. The transmitter output was connected to the spectrum analyzer.
2. Set the spectrum bandwidth span to view the entire spectrum.
3. Using peak detector and Max-hold function for Trace 1 (RB=1MHz, VB=3MHz) and 2 (RB=1MHz, VB=300KHz).
4. The largest difference between Trace 1 and Trace 2 in any 1MHz band on any frequency was recorded.

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.



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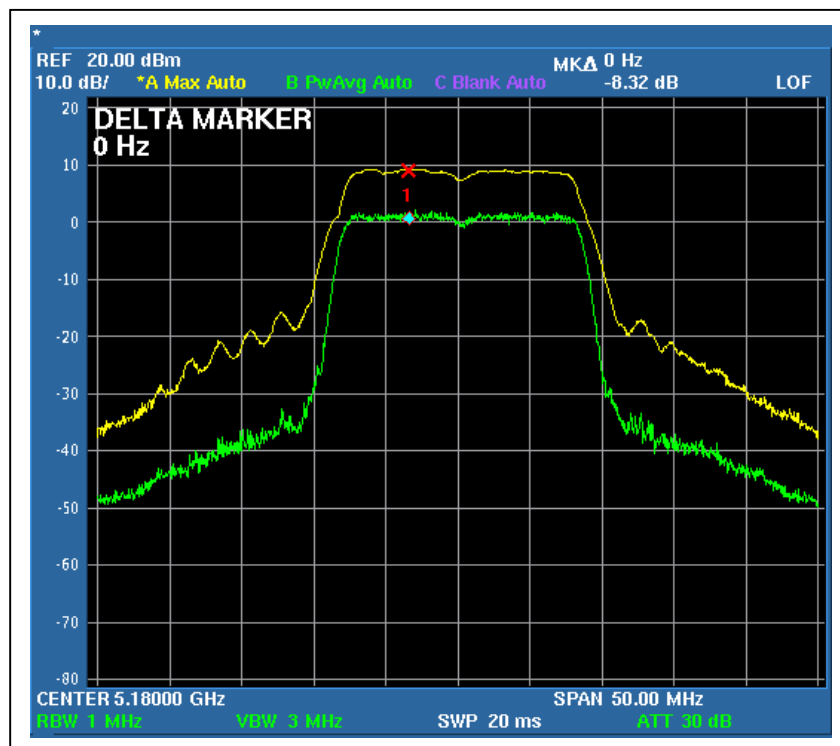
4.4.7 TEST RESULTS

802.11a OFDM modulation

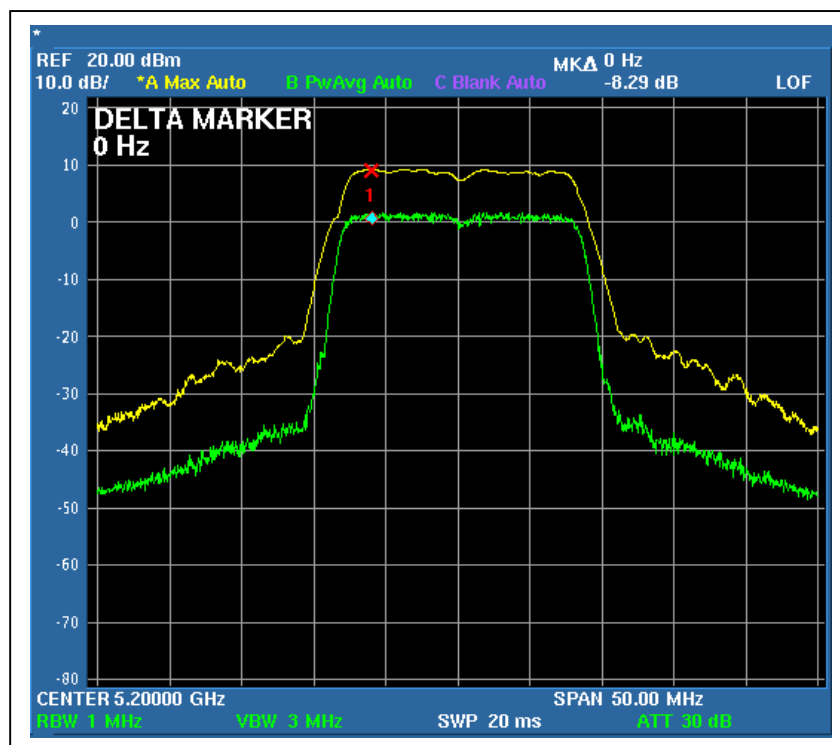
MODULATION TYPE	BPSK	TRANSFER RATE	6Mbps
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	25deg.C, 60%RH, 965hPa
TESTED BY	Rex Huang		

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER EXCURSION (dB)	PEAK to AVERAGE EXCURSION LIMIT (dB)	PASS/FAIL
1	5180	8.32	13	PASS
2	5200	8.29	13	PASS
4	5240	8.53	13	PASS

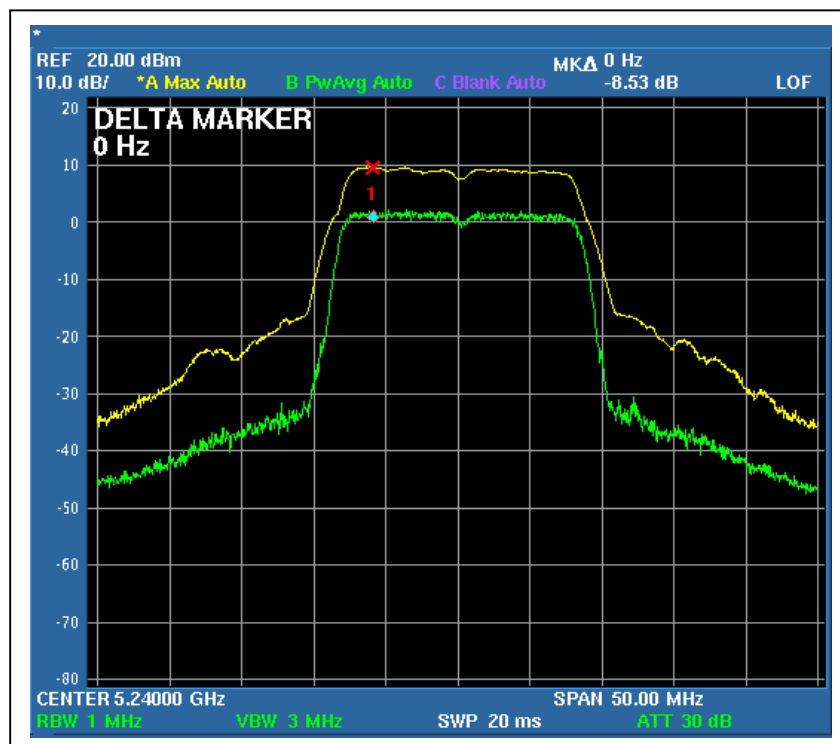
CH1



CH2



CH4

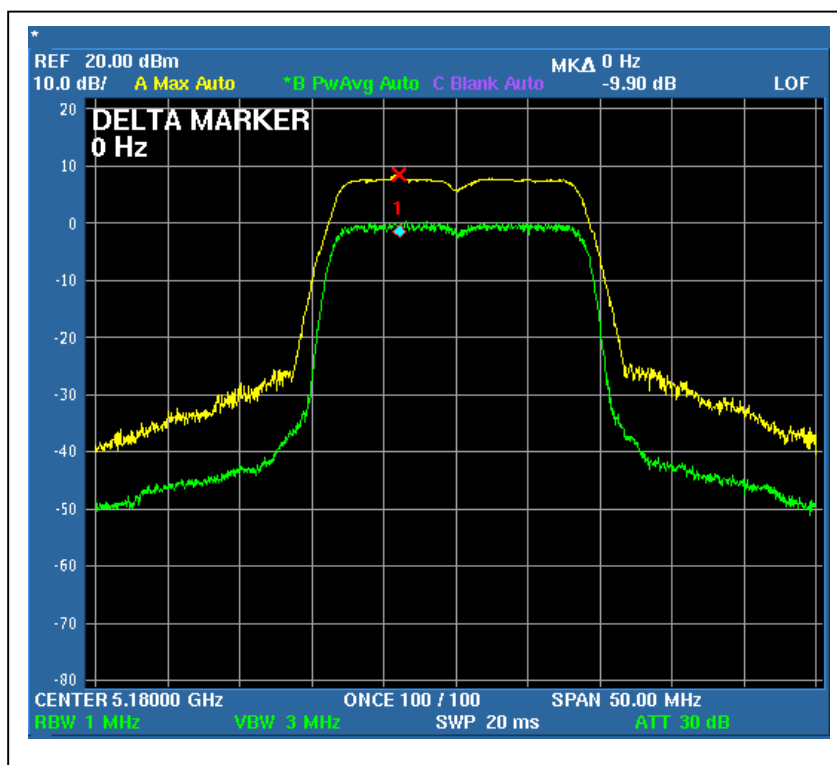


**A D T****DRAFT 802.11n (20MHz) OFDM MODULATION:**

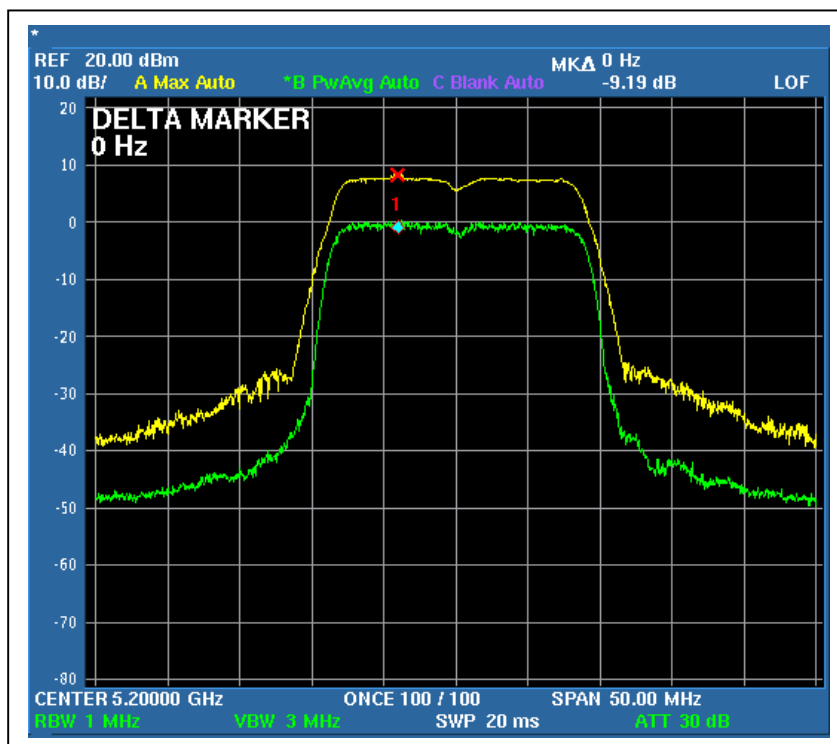
MODULATION TYPE	BPSK	TRANSFER RATE	13Mbps
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	25deg.C, 60%RH, 965hPa
TESTED BY	Rex Huang		

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER EXCURSION (dB)		PEAK to AVERAGE EXCURSION LIMIT (dB)	PASS/FAIL
		Chain (0)	Chain(1)		
1	5180	9.90	9.65	13	PASS
2	5200	9.19	8.44	13	PASS
4	5240	8.82	9.42	13	PASS

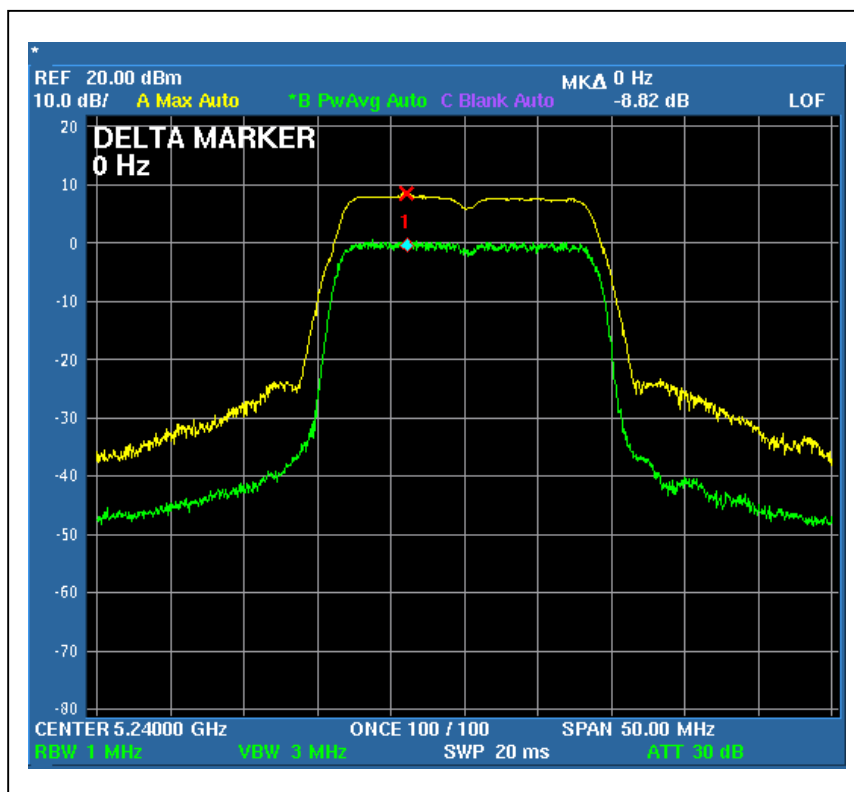
For Chain (0) : CH1



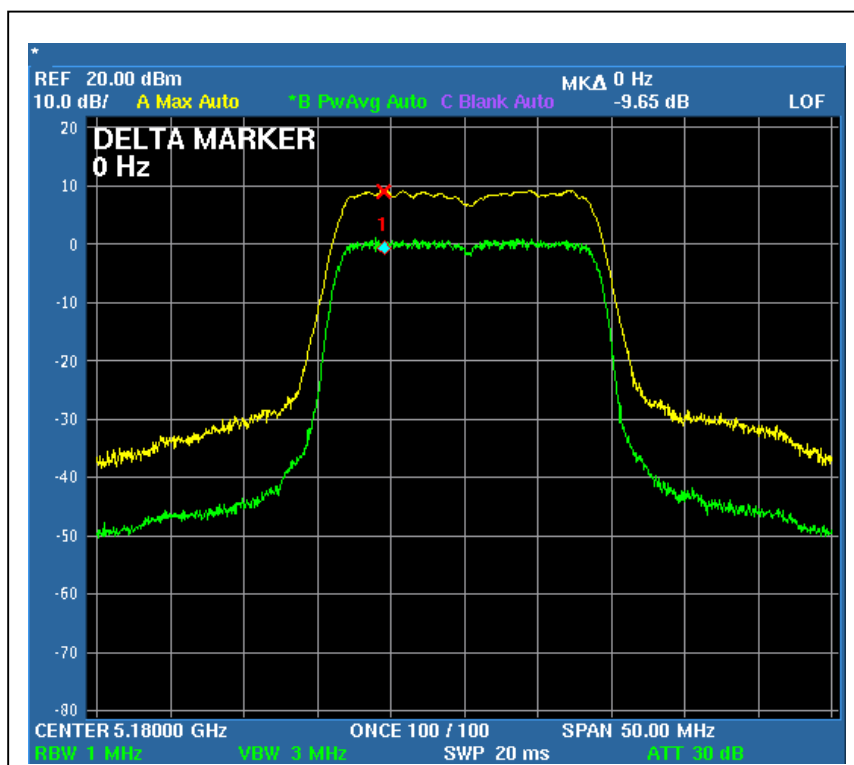
CH2



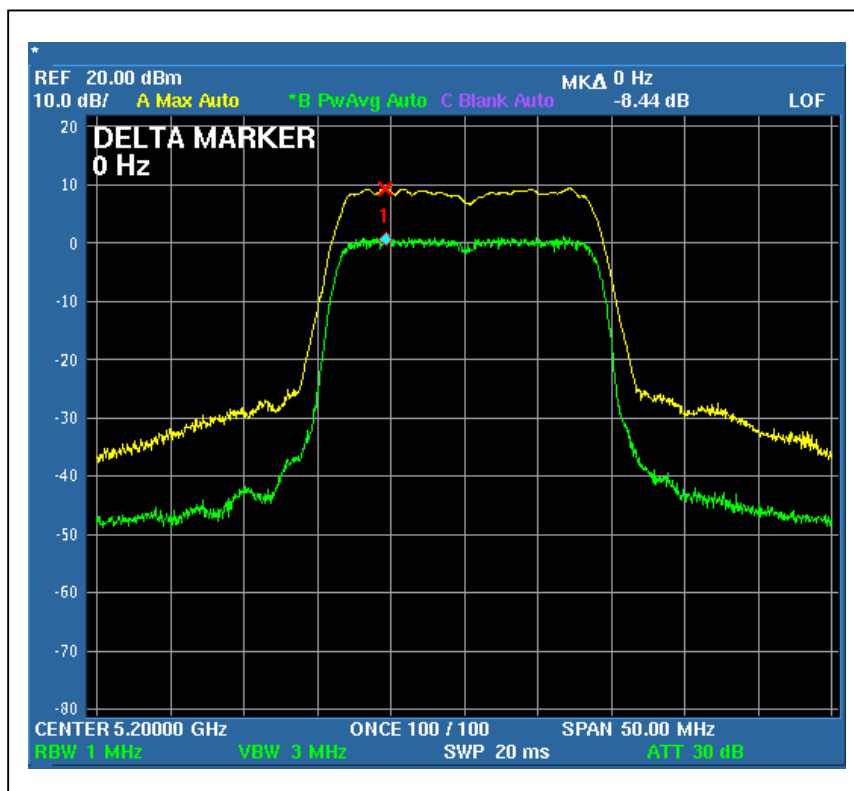
CH4



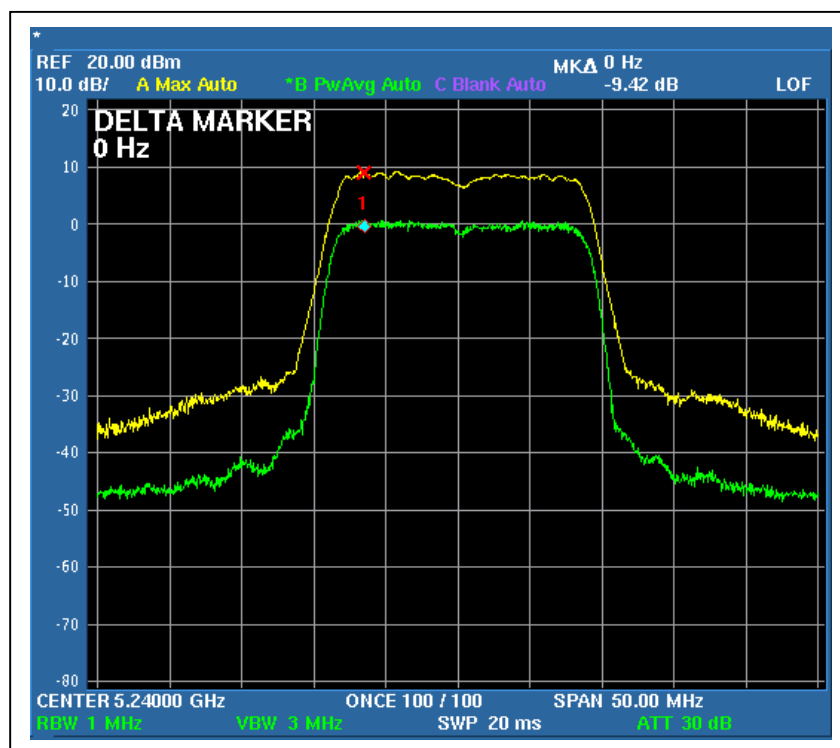
For Chain (1) : CH1



CH2



CH4

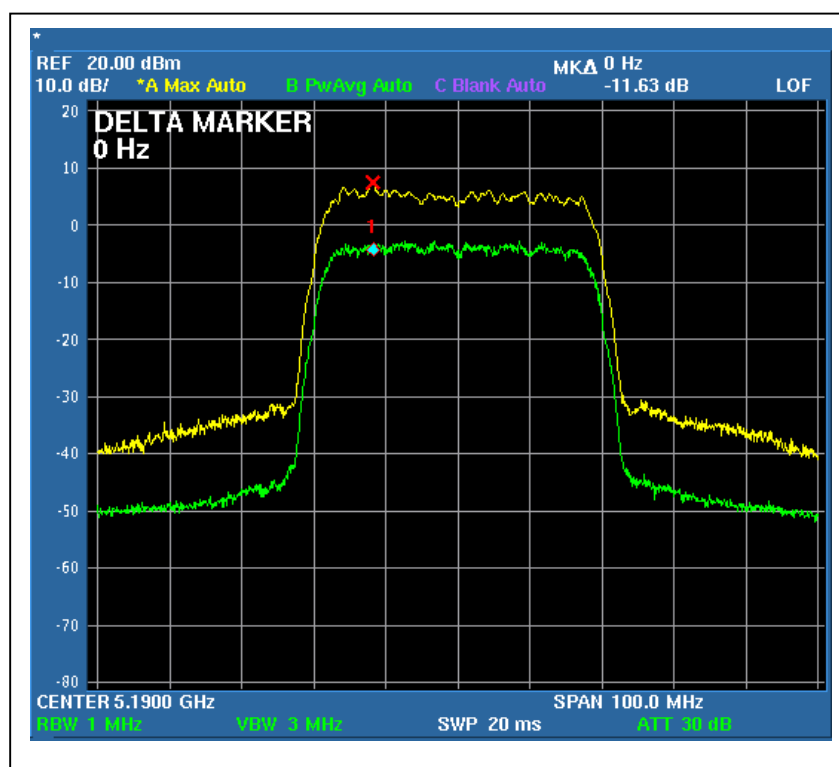


**A D T****DRAFT 802.11n (40MHz) OFDM MODULATION:**

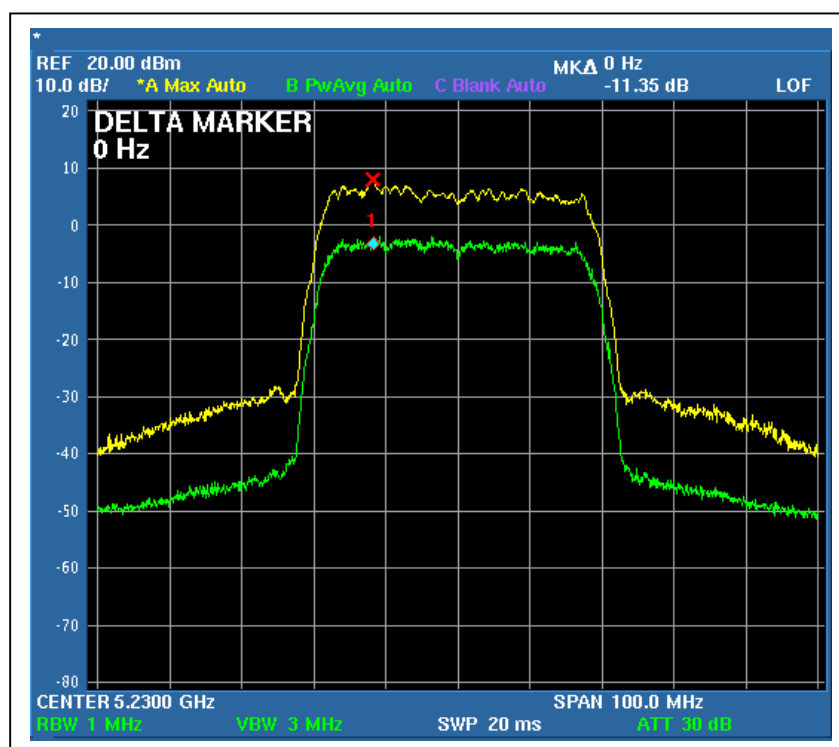
MODULATION TYPE	BPSK	TRANSFER RATE	27Mbps
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	25deg.C, 60%RH, 965hPa
TESTED BY	Rex Huang		

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER EXCURSION (dB)		PEAK to AVERAGE EXCURSION LIMIT (dB)	PASS/FAIL
		Chain (0)	Chain(1)		
1	5190	11.63	9.23	13	PASS
2	5230	11.35	9.12	13	PASS

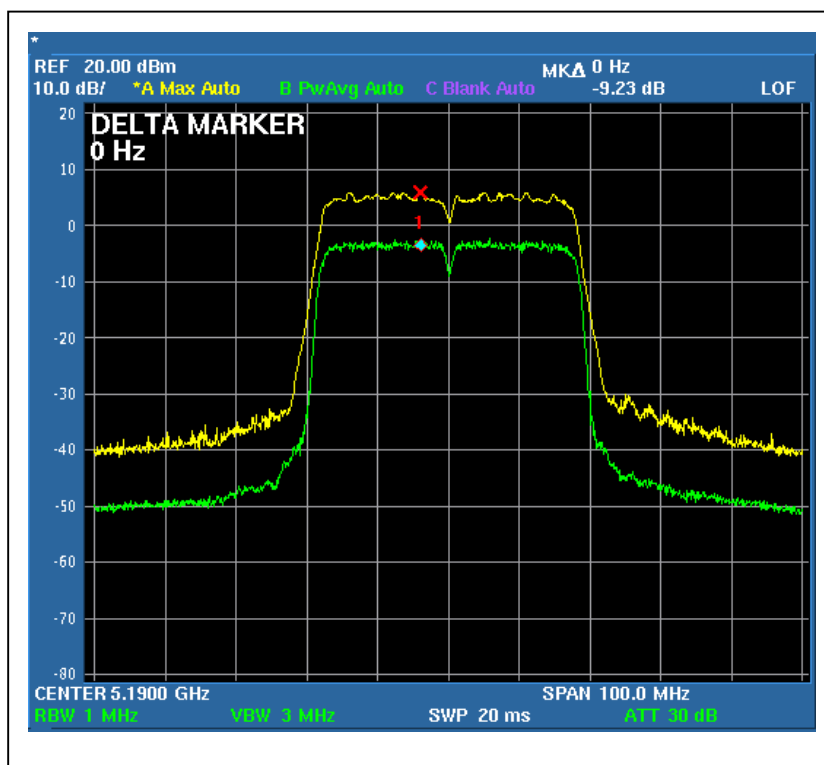
For Chain (0) : CH1



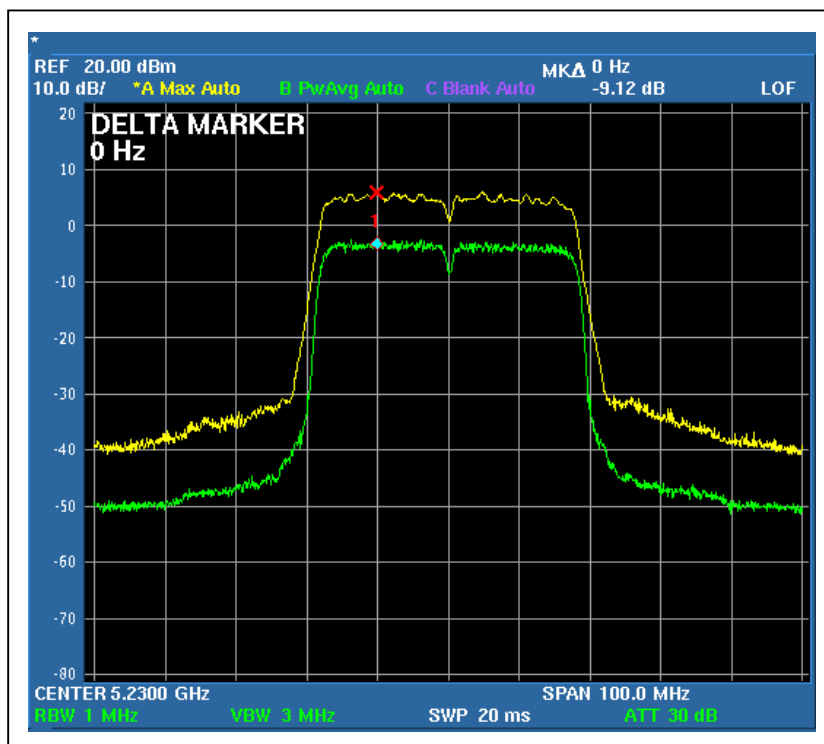
CH2



For Chain (1) : CH1



CH2



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

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100037	Aug. 09, 2008	Aug. 08, 2009

NOTE:

- 1.The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
- 2.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



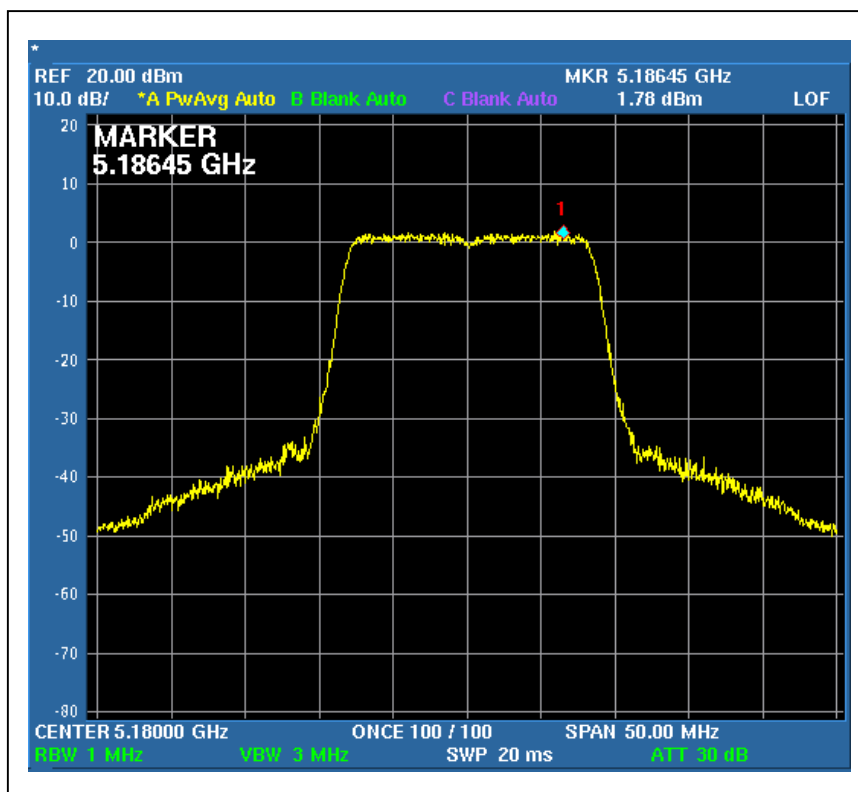
4.5.7 TEST RESULTS

802.11a OFDM modulation

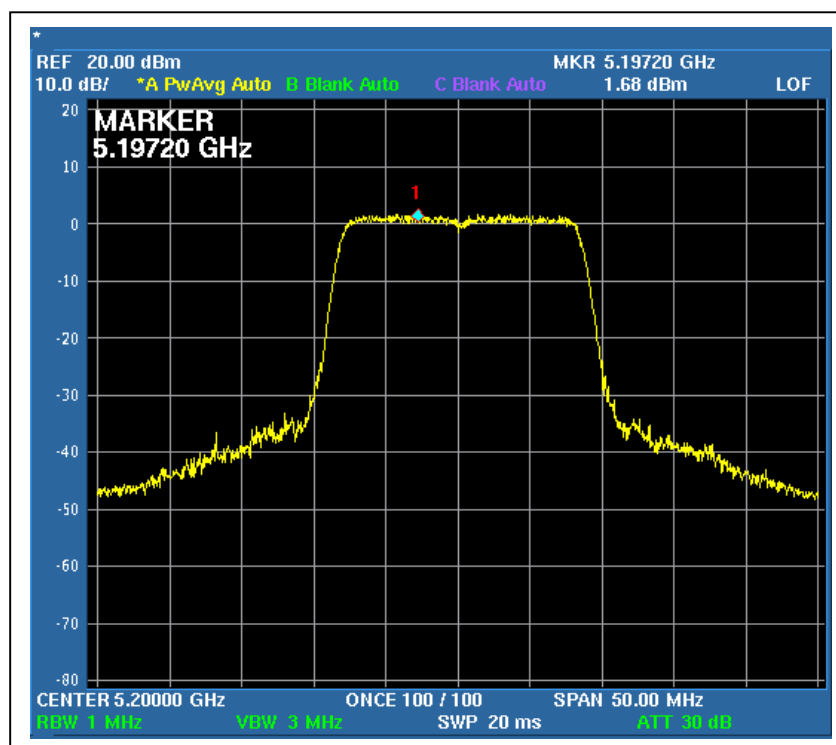
MODULATION TYPE	BPSK	TRANSFER RATE	6Mbps
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	25deg.C, 60%RH, 965hPa
TESTED BY	Rex Huang		

CHANNEL	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL IN 1MHz BW (dBm)	MAXIMUM LIMIT (dBm)	PASS/FAIL
1	5180	1.78	4	PASS
2	5200	1.68	4	PASS
4	5240	2.01	4	PASS

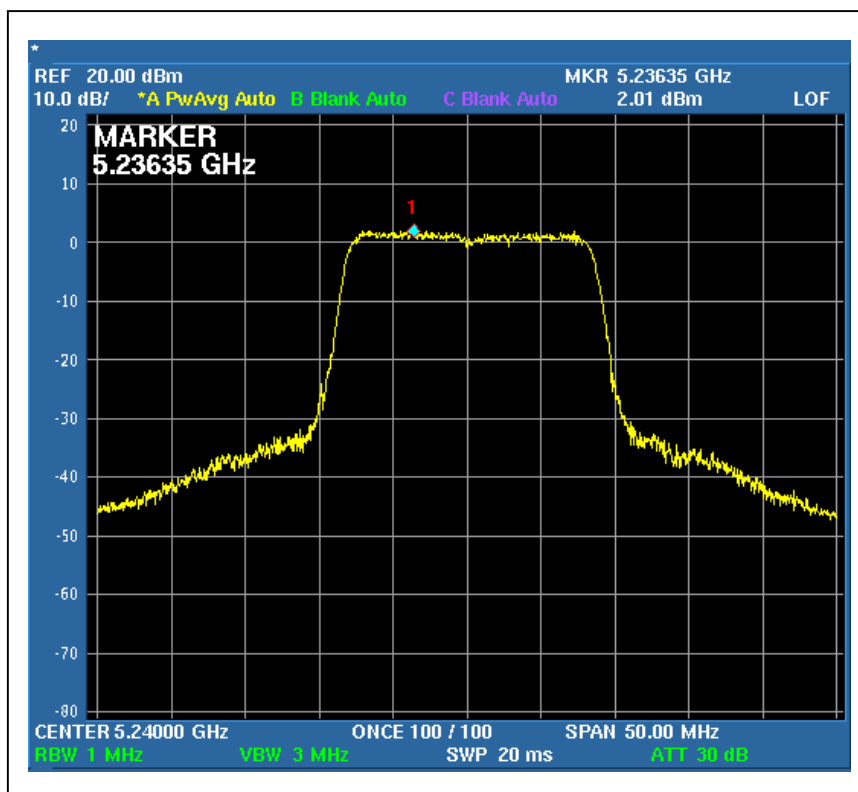
CH1



CH2



CH4





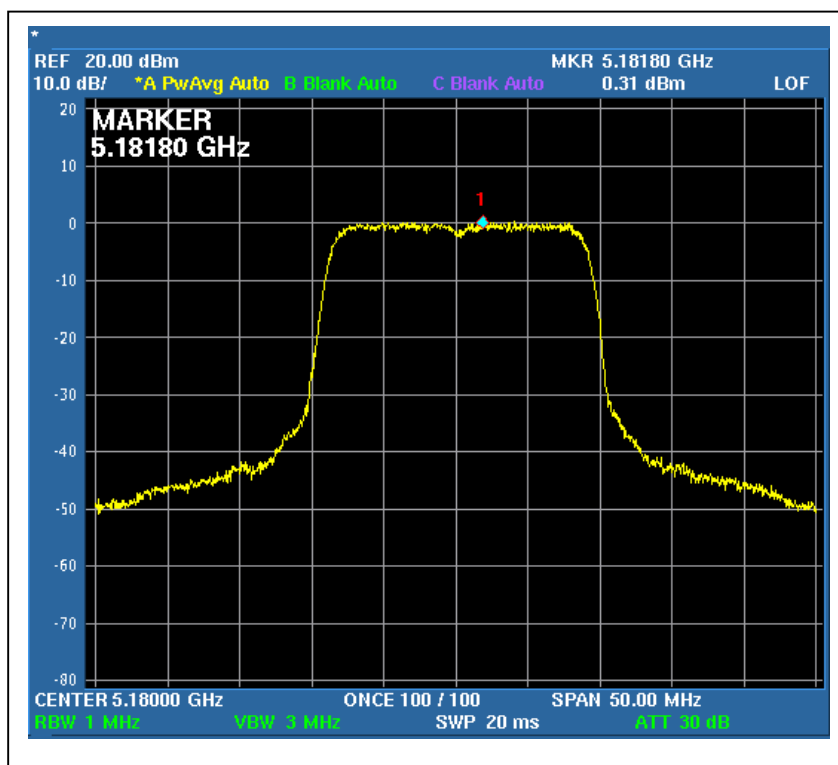
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DRAFT 802.11n (20MHz) OFDM MODULATION:

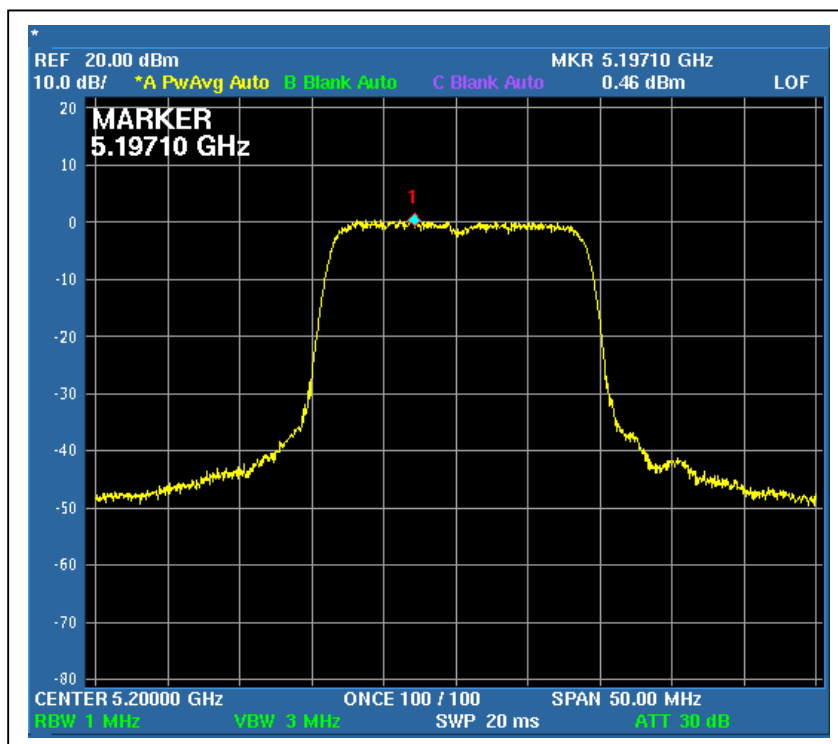
MODULATION TYPE	BPSK	TRANSFER RATE	13Mbps
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	25deg.C, 60%RH, 965hPa
TESTED BY	Rex Huang		

CHANNEL	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL IN 1MHz BW (dBm)		TOTAL OUTPUT POWER DENSITY (dBm)	MAXIMUM LIMIT (dBm)	PASS/FAIL
		Chain (0)	Chain(1)			
1	5180	0.31	0.71	3.53	4	PASS
2	5200	0.46	1.07	3.79	4	PASS
4	5240	0.77	0.80	3.79	4	PASS

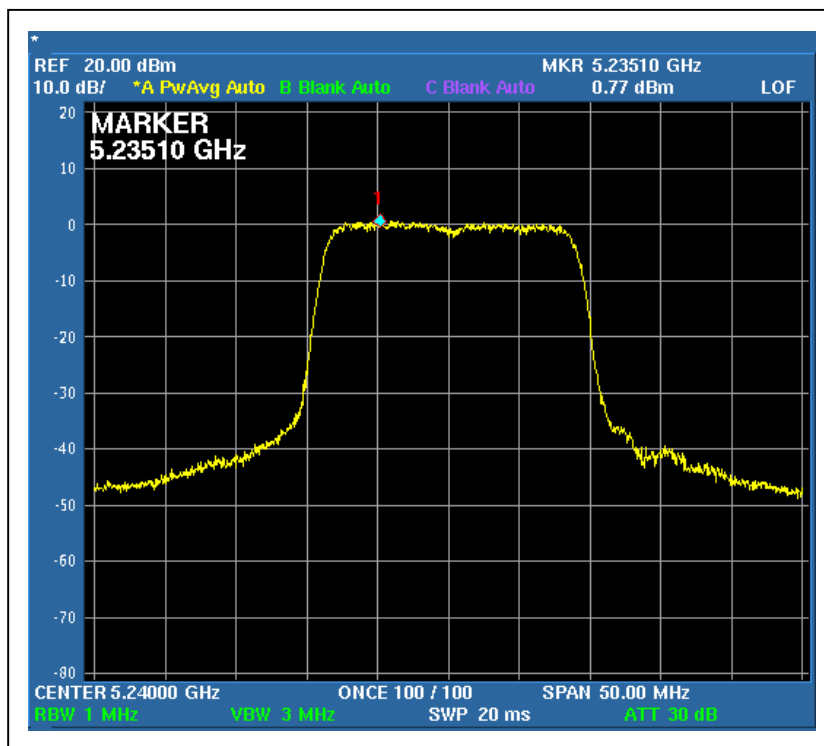
For Chain (0) : CH1



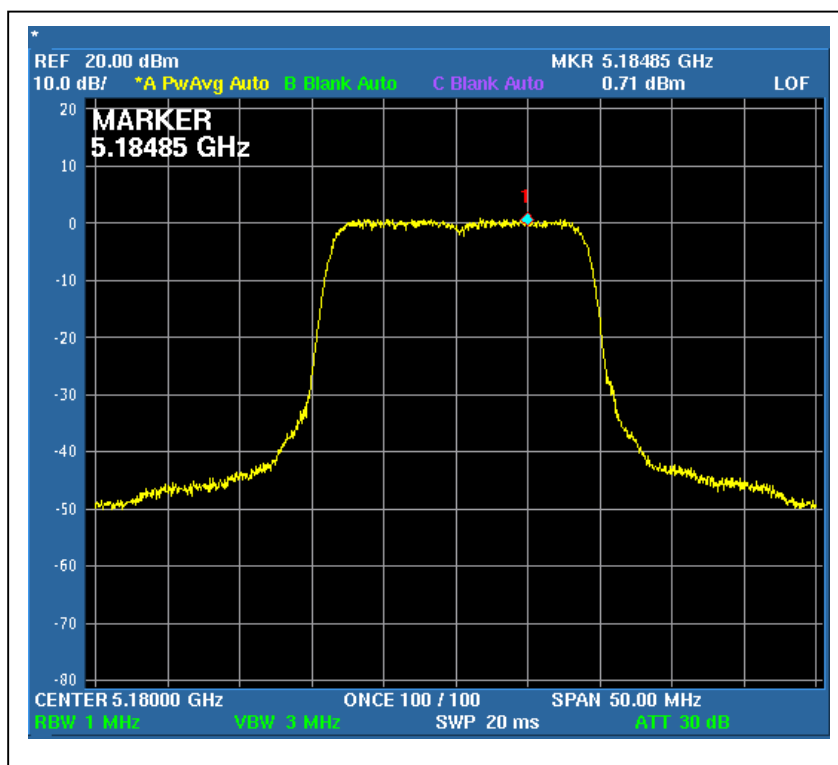
CH2



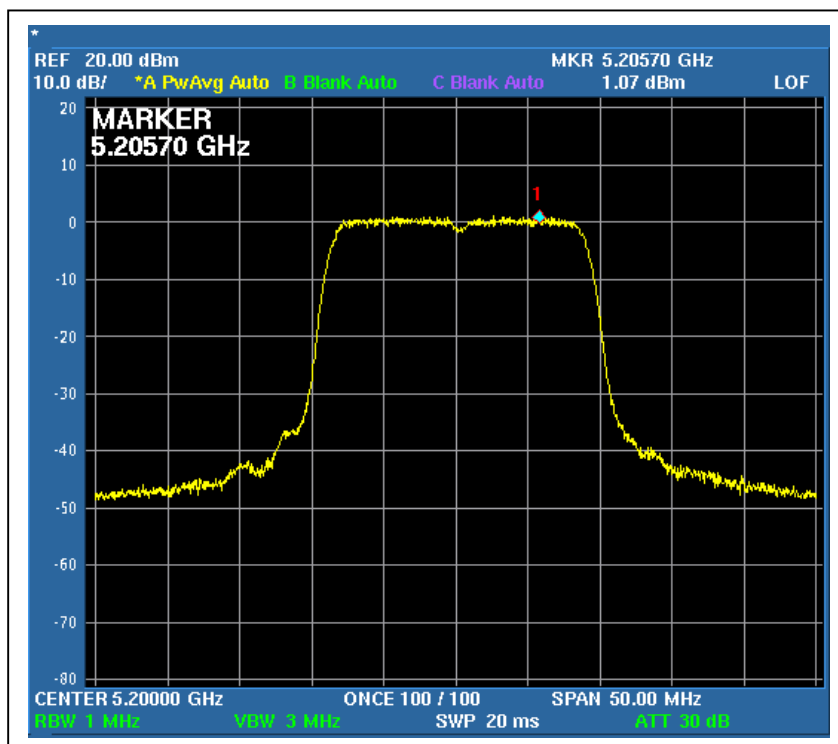
CH4



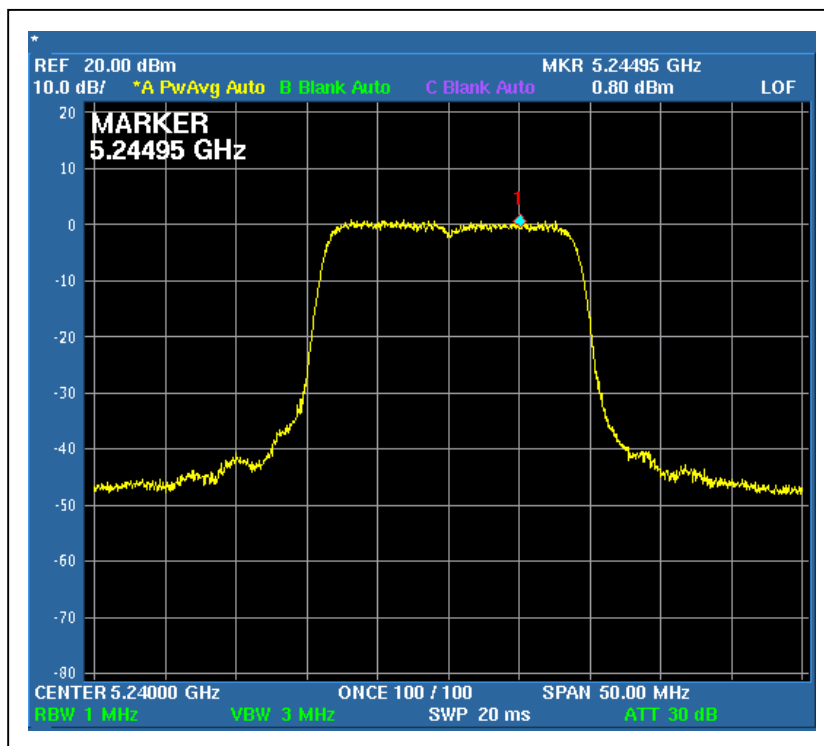
For Chain (1) : CH1



CH2



CH4





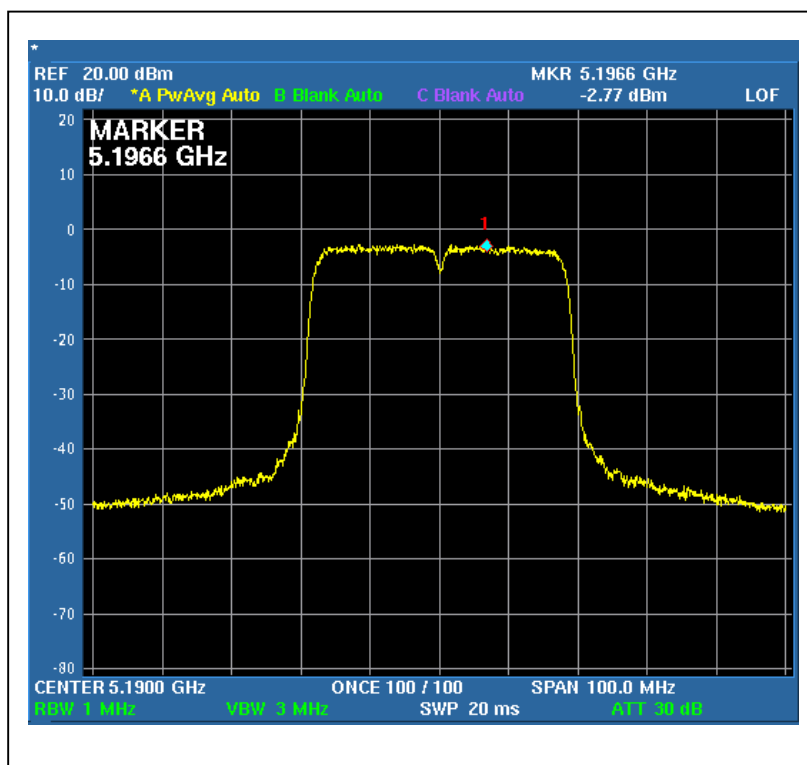
A D T

DRAFT 802.11n (40MHz) OFDM MODULATION:

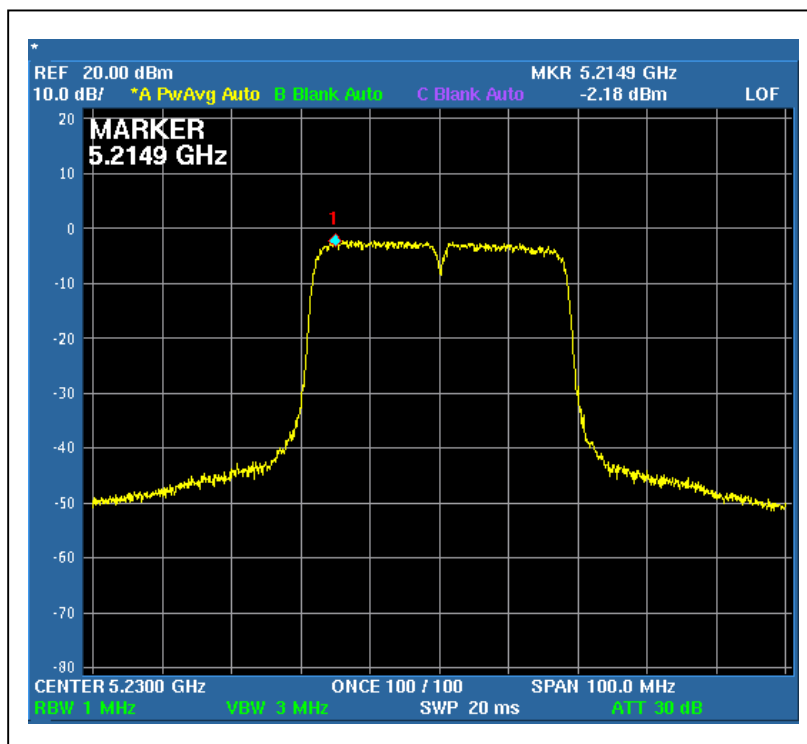
MODULATION TYPE	BPSK	TRANSFER RATE	27Mbps
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	25deg.C, 60%RH, 965hPa
TESTED BY	Rex Huang		

CHANNEL	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL IN 1MHz BW (dBm)		TOTAL OUTPUT POWER DENSITY (dBm)	MAXIMUM LIMIT (dBm)	PASS/FAIL
		Chain (0)	Chain(1)			
1	5190	-2.77	-2.50	0.37	4	PASS
2	5230	-2.18	-2.54	0.65	4	PASS

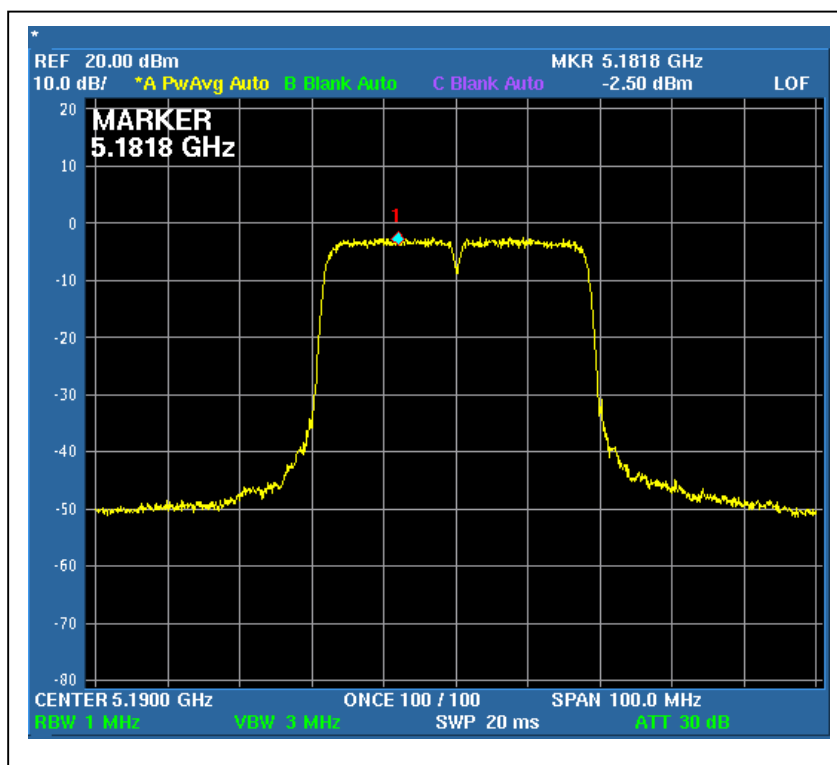
For Chain (0) : CH1



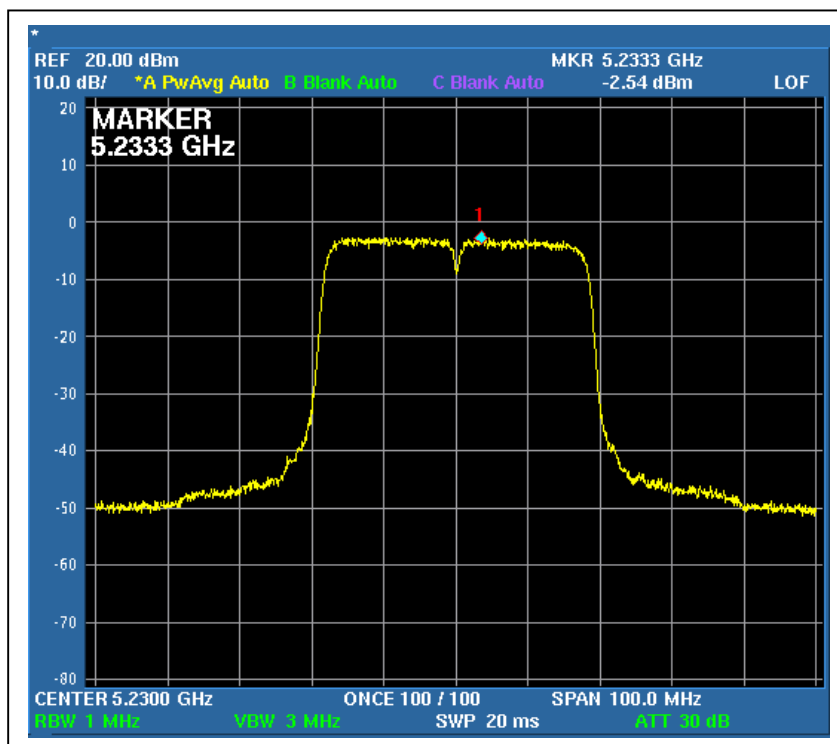
CH2



For Chain (1) : CH1



CH2



4.6 FREQUENCY STABILITY

4.6.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.02\%$ 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

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100037	Aug. 09, 2008	Aug. 08, 2009

NOTE:

1. The measurement uncertainty is less than $\pm 2.6\text{dB}$, which is calculated as per the NAMAS document NIS81. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

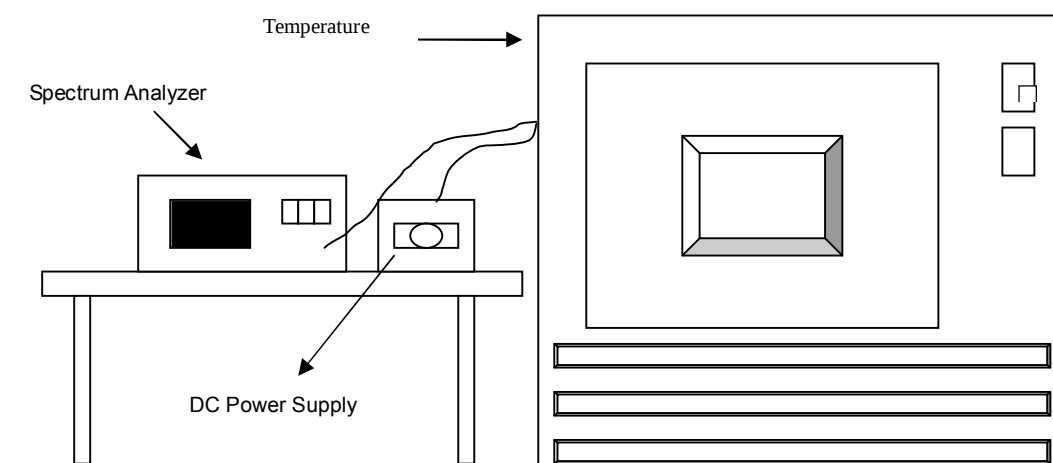
4.6.3 TEST PROCEDURE

1. The EUT was placed inside the environmental test chamber and powered by nominal DC 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				Limit : $\pm 0.02\%$			
Temp. (°C)	Power supply (VAC)	2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	126.5	5179.985	0.000290	5179.9847	0.000295	5179.9845	0.000299
	110	5179.985	0.000290	5179.9849	0.000292	5179.9846	0.000297
	93.5	5179.985	0.000290	5179.9847	0.000295	5179.9844	0.000301
40	126.5	5179.9809	0.000369	5179.9904	0.000185	5179.9901	0.000191
	110	5179.981	0.000367	5179.9904	0.000185	5179.9903	0.000187
	93.5	5179.9909	0.000176	5179.9907	0.000180	5179.9900	0.000193
30	126.5	5180.0292	0.000564	5180.0295	0.000569	5180.0296	0.000571
	110	5180.0292	0.000564	5180.0294	0.000568	5180.0296	0.000571
	93.5	5180.0294	0.000568	5180.0292	0.000564	5180.0296	0.000571
20	126.5	5180.0158	0.000305	5180.0108	0.000208	5180.0108	0.000208
	110	5180.0158	0.000305	5180.0138	0.000266	5180.0118	0.000228
	93.5	5180.0138	0.000266	5180.0108	0.000208	5180.0108	0.000208
10	126.5	5180.0044	0.000085	5180.0039	0.000075	5180.0036	0.000069
	110	5180.0044	0.000085	5180.0041	0.000079	5180.0039	0.000075
	93.5	5180.0044	0.000085	5180.0039	0.000075	5180.0036	0.000069
0	126.5	5180.0234	0.000452	5180.0218	0.000421	5180.0198	0.000382
	110	5180.0232	0.000448	5180.0238	0.000459	5180.0218	0.000421
	93.5	5180.0232	0.000448	5180.0208	0.000402	5180.0198	0.000382
-10	126.5	5180.0052	0.000100	5180.005	0.000097	5180.0047	0.000091
	110	5180.0052	0.000100	5180.005	0.000097	5180.0049	0.000095
	93.5	5180.0052	0.000100	5180.0049	0.000095	5180.0046	0.000089
-20	126.5	5180.0228	0.000440	5180.0178	0.000344	5180.0138	0.000266
	110	5180.0228	0.000440	5180.0208	0.000402	5180.0168	0.000324
	93.5	5180.0228	0.000440	5180.0168	0.000324	5180.0148	0.000286
-30	126.5	5179.9999	0.000002	5179.9996	0.000008	5179.9993	0.000014
	110	5180	0.000000	5180	0.000000	5179.9997	0.000006
	93.5	5179.9999	0.000002	5179.9996	0.000008	5179.9993	0.000014

4.7 CONDUCTED OUT-BAND EMISSION MEASUREMENT

4.7.1 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100037	Aug. 09, 2008	Aug. 08, 2009

NOTE:

- 1.The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
- 2.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 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.

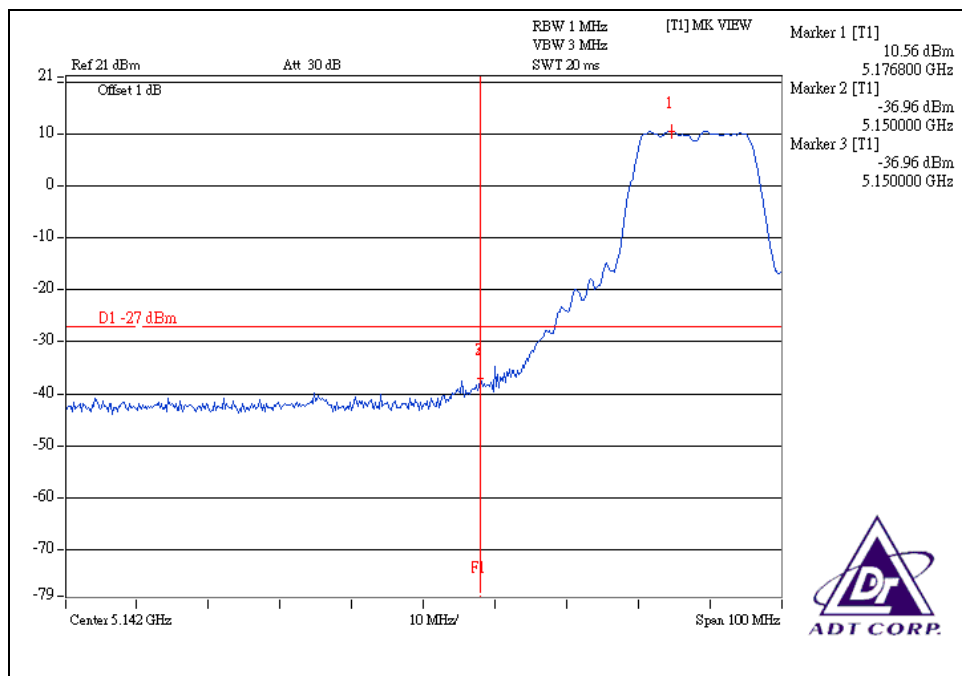
4.7.4 TEST RESULTS

For 5.15 to 5.25GHz band:

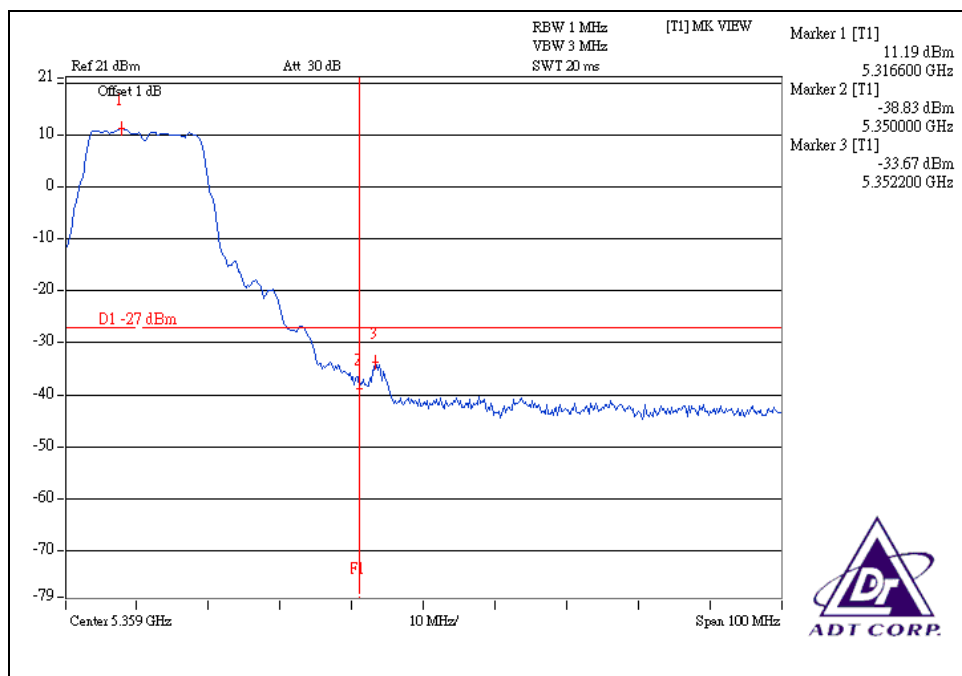
The spectrum plots (Peak RBW=1MHz, VBW=3MHz) are attached on the following pages.

802.11a OFDM modulation

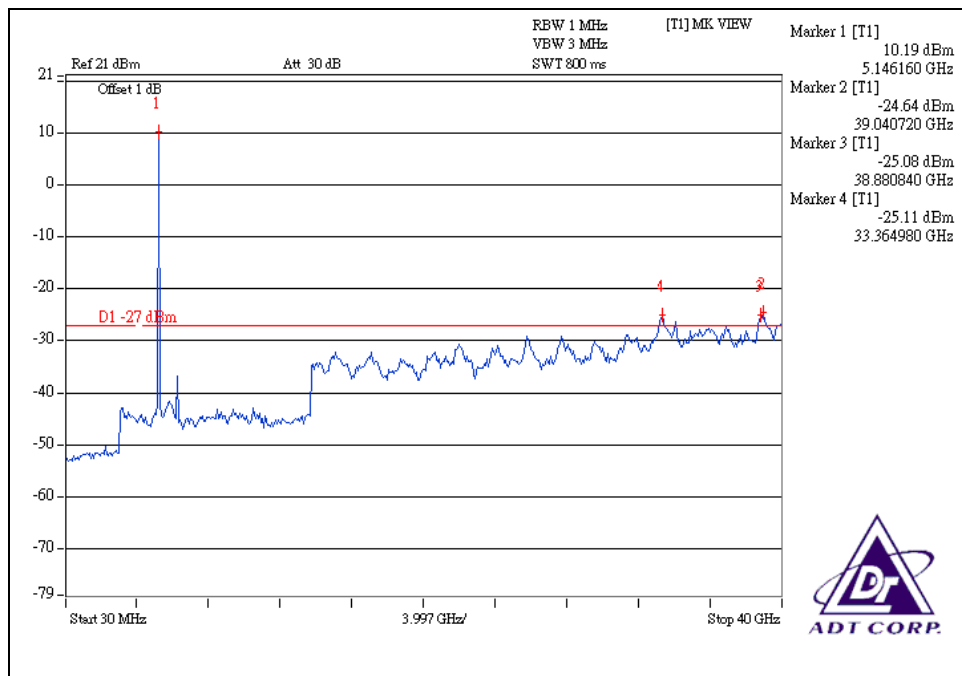
CH 1



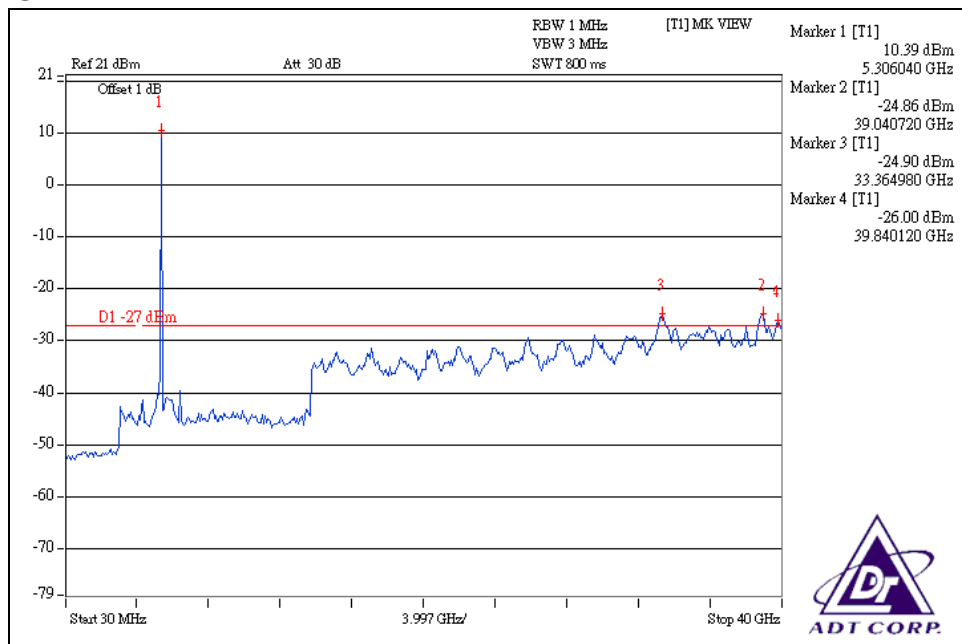
CH 4



CH 1



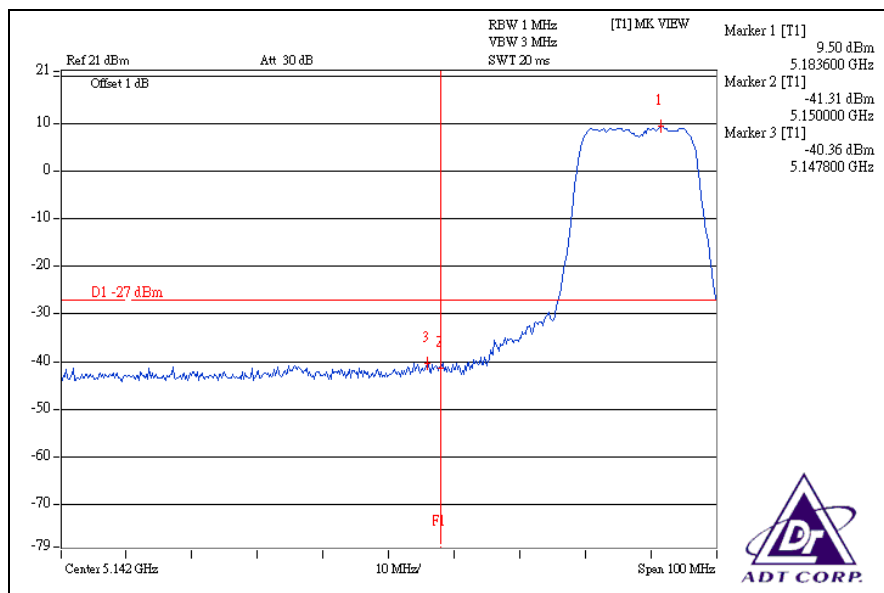
CH 4



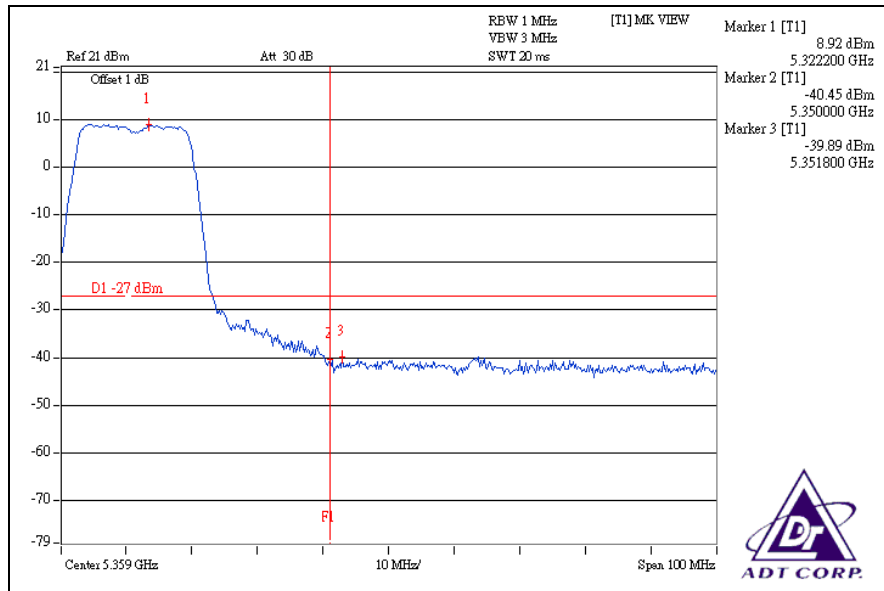
DRAFT 802.11n (20MHz) OFDM MODULATION:

For chain (0):

CH1

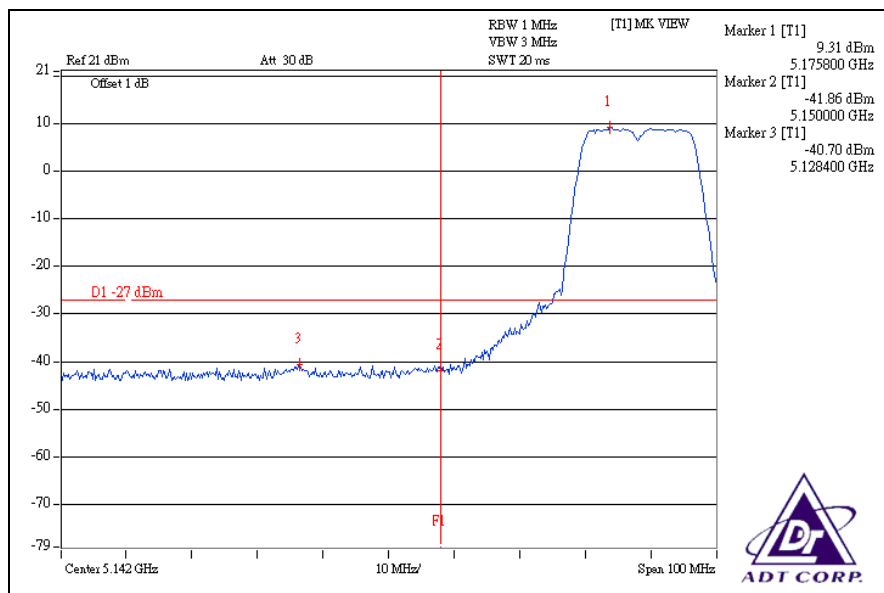


CH4

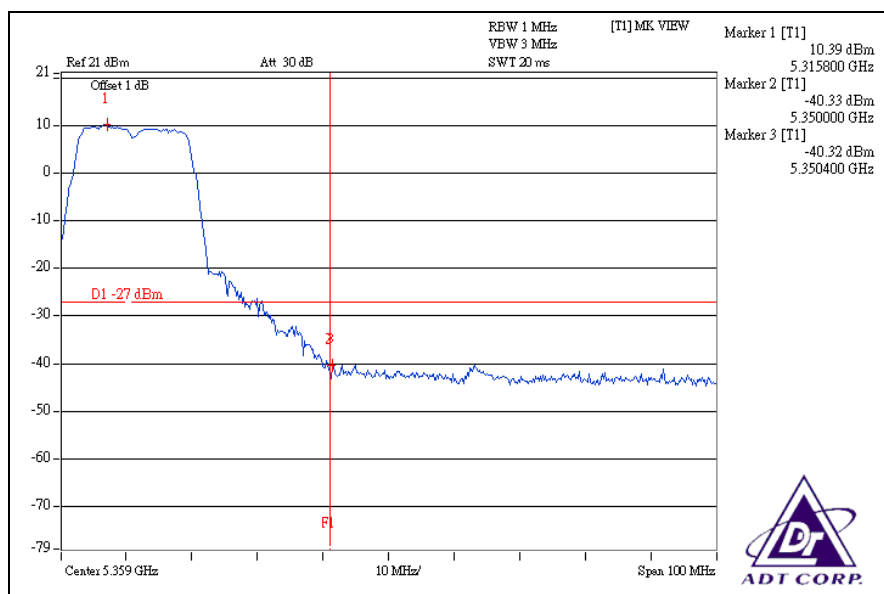


For chain (1):

CH1

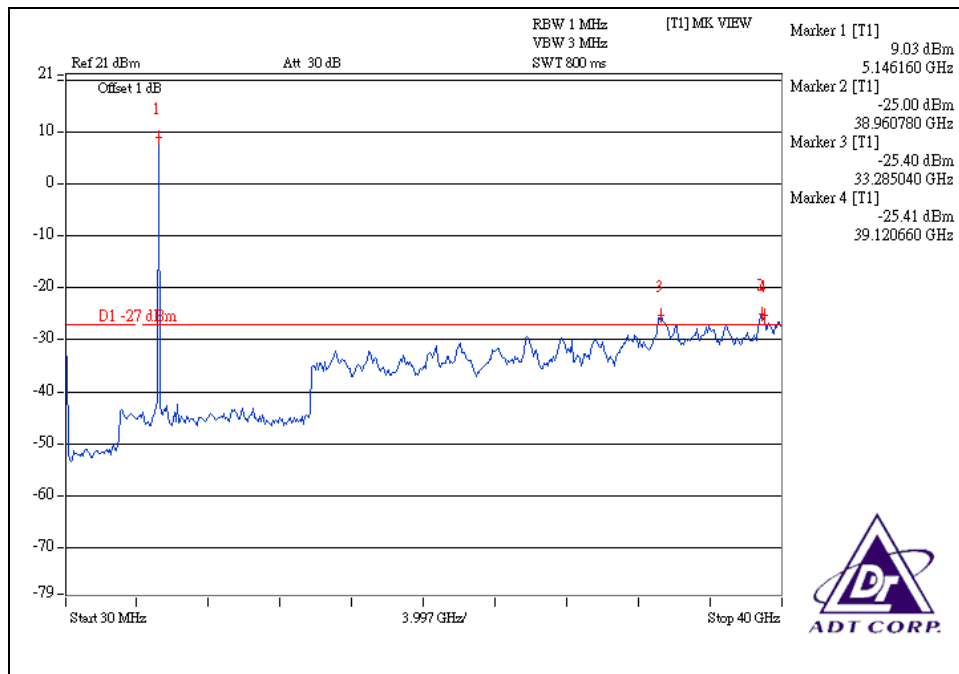


CH4

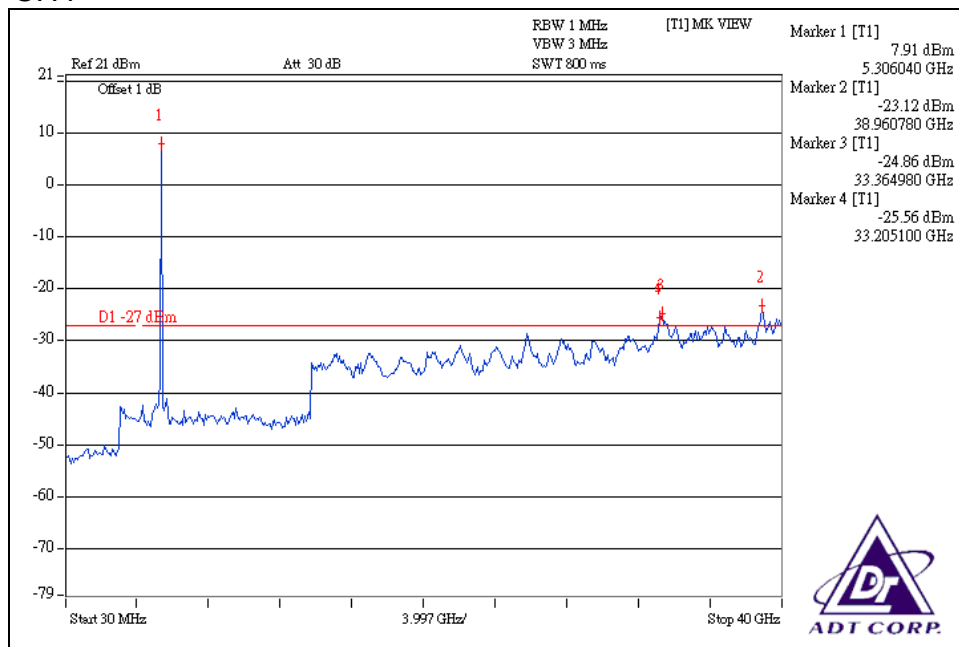


For chain (0):

CH1

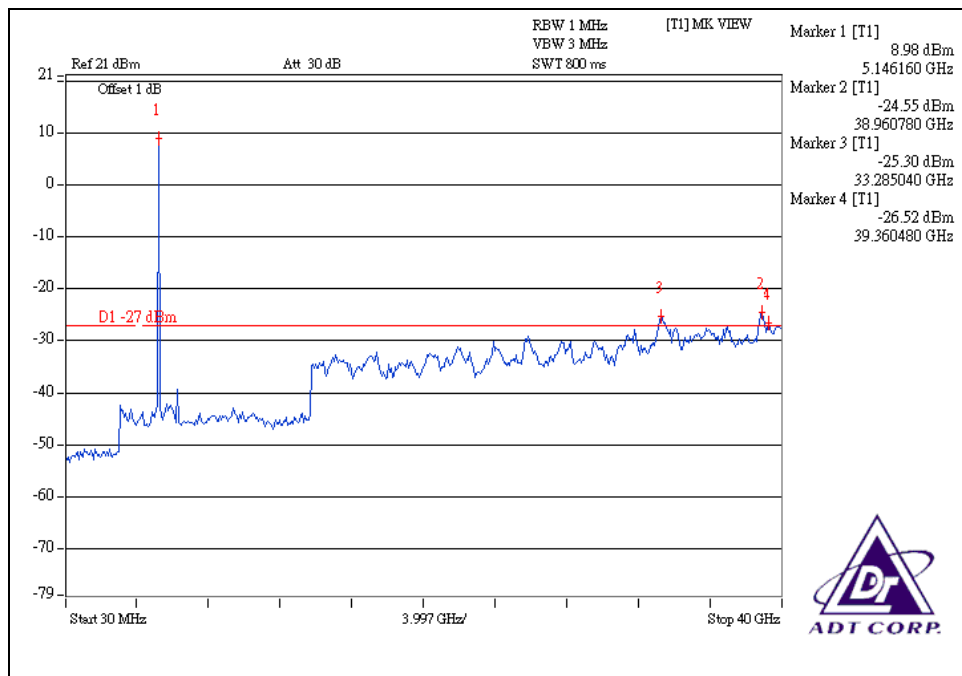


CH4

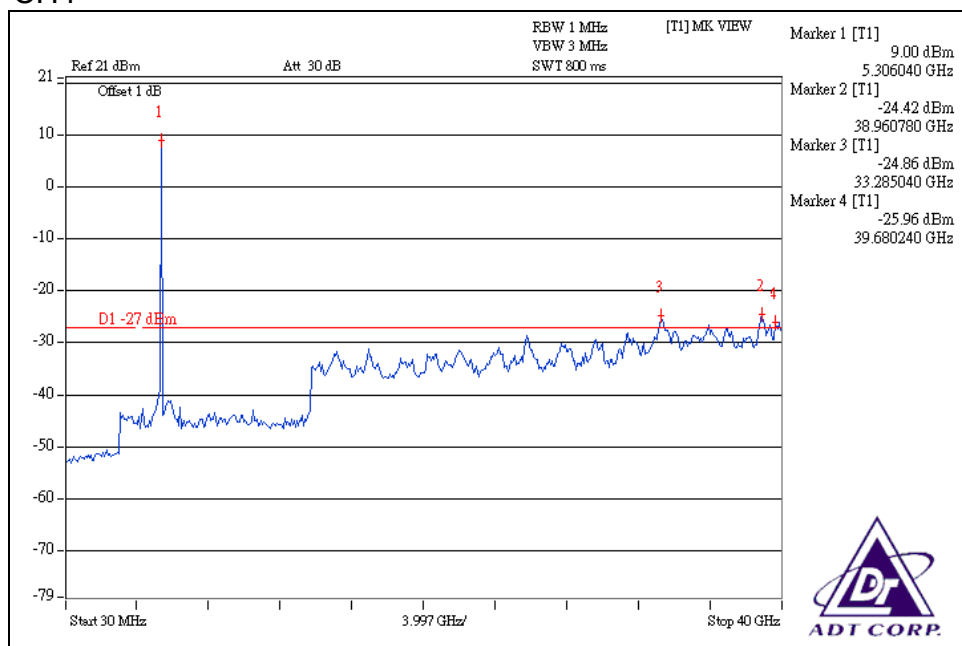


For chain (1):

CH1



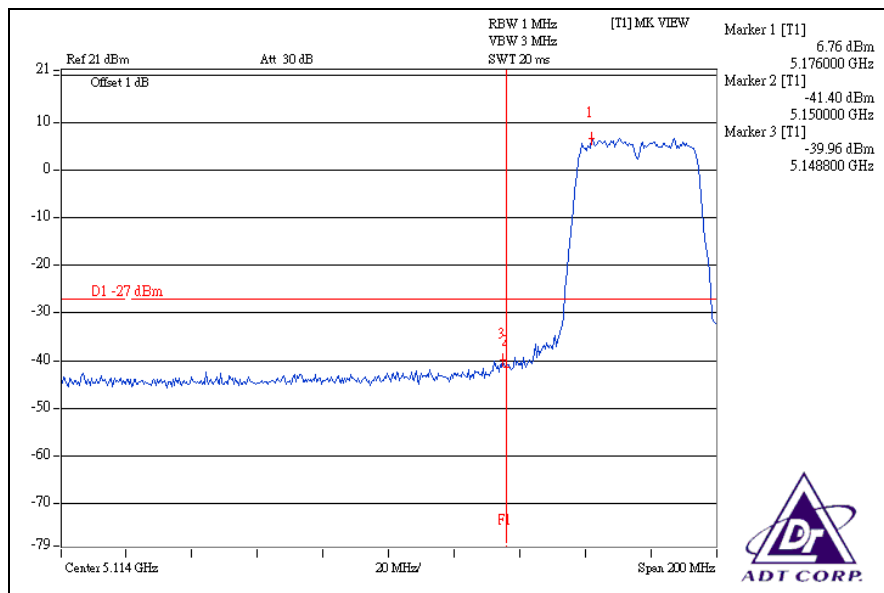
CH4



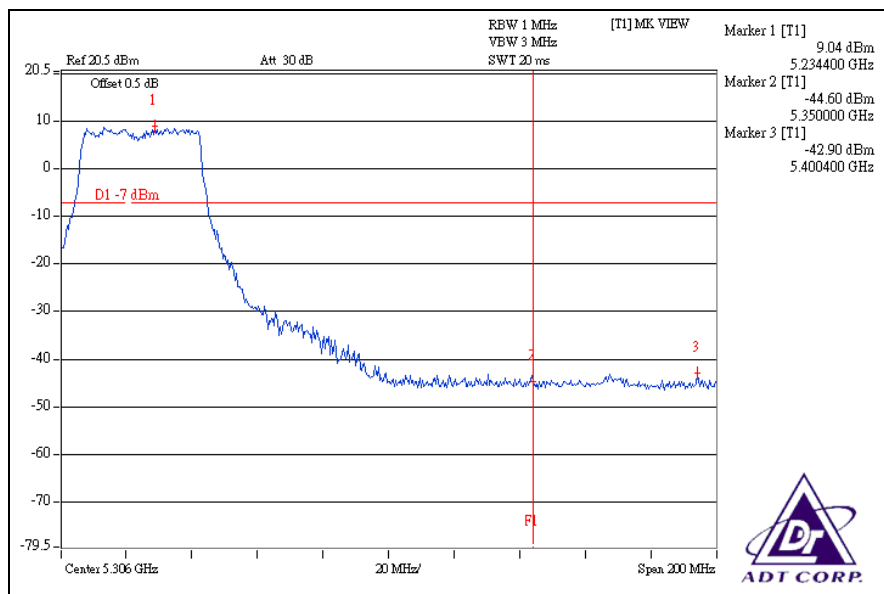
DRAFT 802.11n (40MHz) OFDM MODULATION:

For chain (0):

CH1

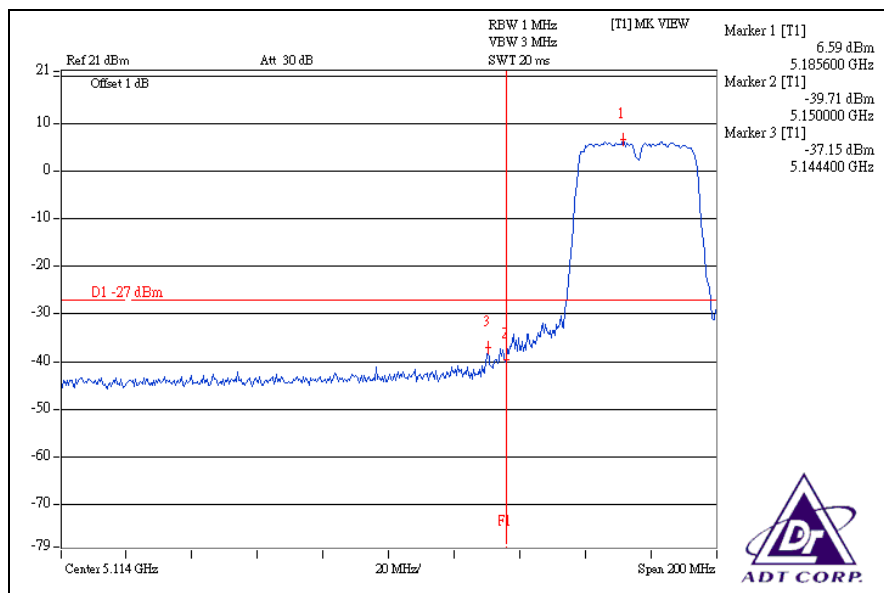


CH2

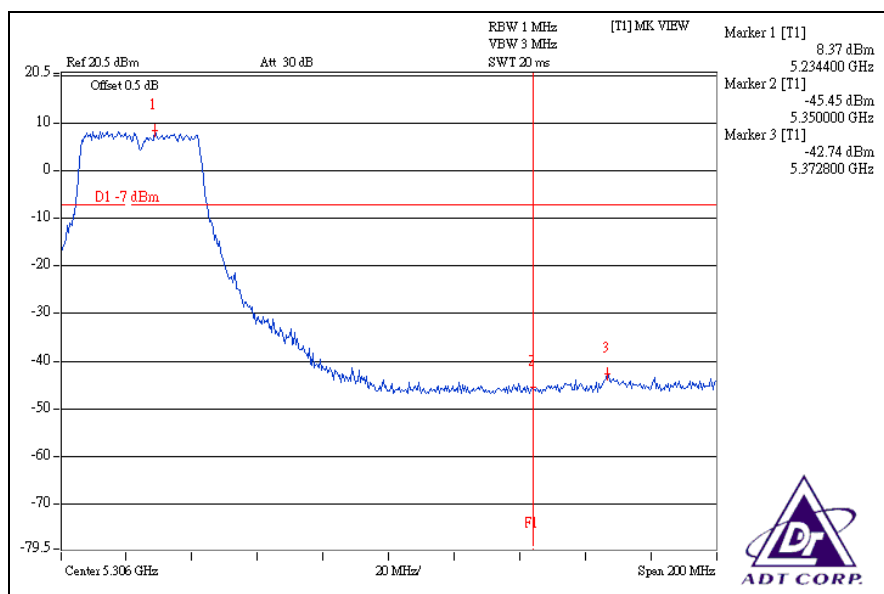


For chain (1):

CH1

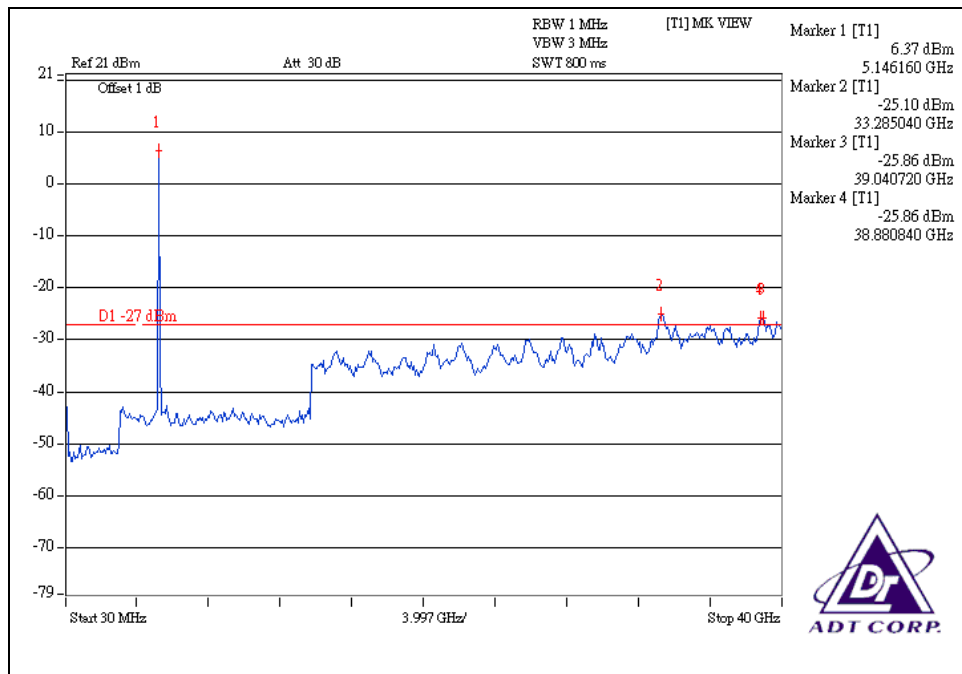


CH2

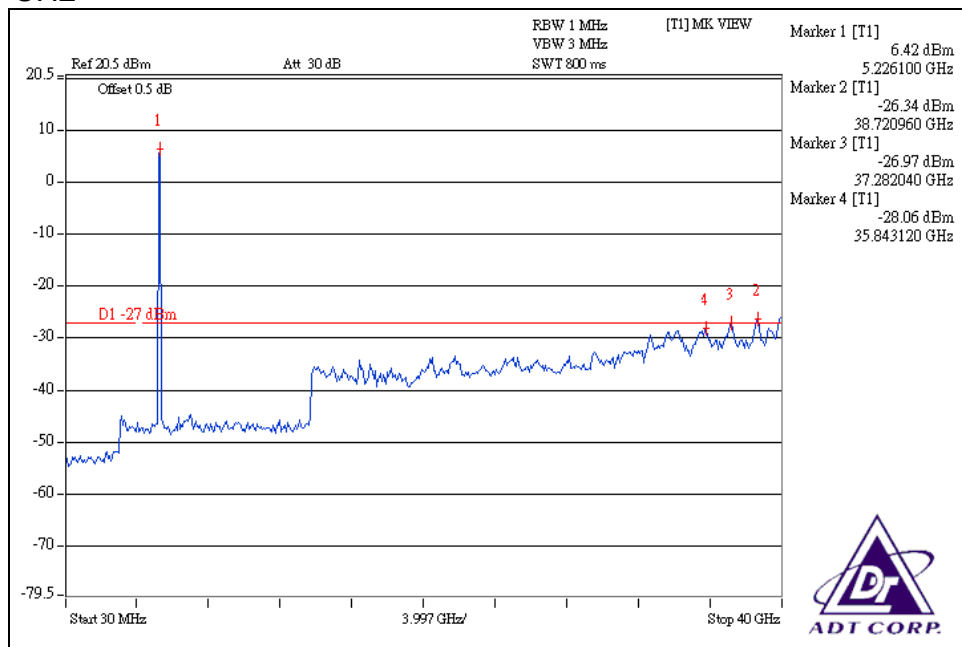


For chain (0):

CH1

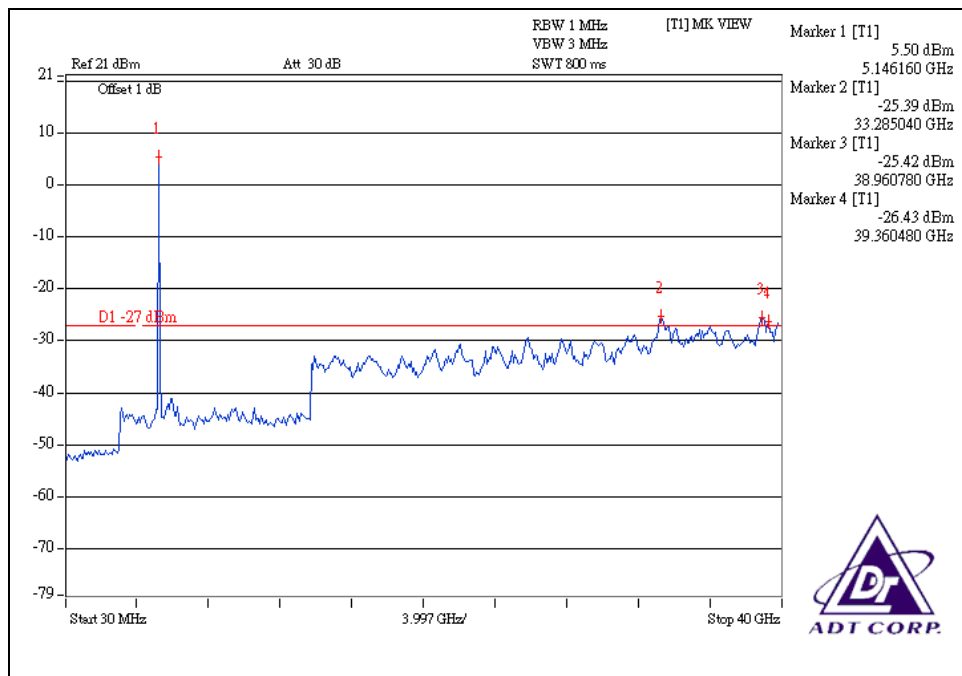


CH2

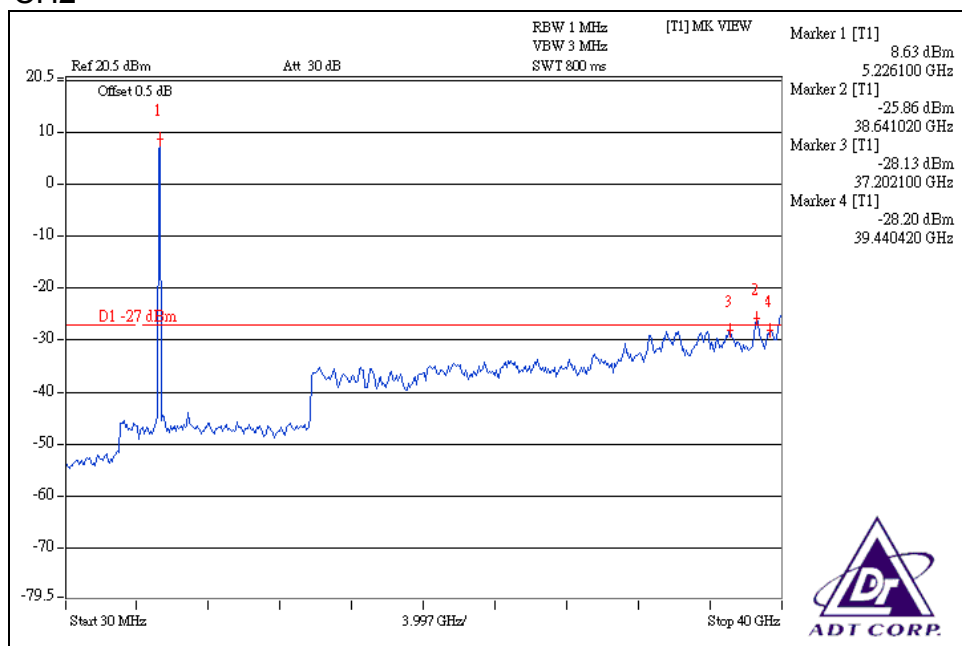


For chain (1):

CH1



CH2





4.8 ANTENNA REQUIREMENT

4.8.1 STANDARD APPLICABLE

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.407(a), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

4.8.2 ANTENNA CONNECTED CONSTRUCTION

There are five set antennas provided to this EUT, please refer to the following table:

Set No.	Transmitter Circuit	Antenna Gain	For 2.4GHz Gain (dBi)	For 5.15~5.25GHz Gain (dBi)	For 5.725~5.850GHz Gain (dBi)	Cable Length (cm)
Set. 1	Chain(0), Chain(1), Chain(2)	Gain (dBi)	2.31	2.26	3.91	18
		Cable Loss (dB)	1.48	1.45	1.53	
		Net Gain (dB)	0.83	0.81	2.38	
Set 2	Chain(0)	Gain (dBi)	2.31	2.26	3.91	40
		Cable Loss (dB)	1.51	2.16	2.29	
		Net Gain (dB)	0.8	0.1	1.62	
	Chain(1)	Gain (dBi)	2.31	2.26	3.91	18
		Cable Loss (dB)	1.48	1.45	1.53	
		Net Gain (dB)	0.83	0.81	2.38	
	Chain(2)	Gain (dBi)	2.31	2.26	3.91	27
		Cable Loss (dB)	1.16	1.17	1.87	
		Net Gain (dB)	1.15	1.09	2.04	
Set 3	Chain(0), Chain(1)	Gain (dBi)	3.72	3.55	2.76	25.5
		Cable Loss (dB)	0.52	0.82	1.00	
		Net Gain (dB)	3.2	2.73	1.76	
	Chain(2)	Gain (dBi)	3.72	3.55	2.76	12
		Cable Loss (dB)	0.51	0.75	0.90	
		Net Gain (dB)	3.21	2.8	1.86	
Set 4	Chain(0)	Gain (dBi) involve cable loss	2.65	NA	NA	11
	Chain(1), Chain(2)	Gain (dBi) involve cable loss	2.49	NA	NA	10
Set 5	Chain(0), Chain(1), Chain(2)	Gain (dBi) involve cable loss	2.43	NA	NA	6



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Set No.	Transmitter Circuit	Antenna Type	Manufacture	Model No.	Antenna Connector
Set 1	Chain(0)	Dipole	WANSHIH ELECTRONIC CO., LTD.	WSS001	RP-SMA(M)
	Chain(1)				
	Chain(2)				
Set 2	Chain(0)	Dipole	WANSHIH ELECTRONIC CO., LTD.	WSS001	RP-SMA(M)
	Chain(1)				
	Chain(2)				
Set 3	Chain(0)	Dipole	WHA YU INDUSTRIAL CO., LTD.	C056-510399-A	SMA Plug Reverse
	Chain(1)				
	Chain(2)				
Set 4	Chain(0)	PCB	WHA YU GROUP	C037-510934-A (SSR-83320)	I-PEX
	Chain(1)			C037-510935-A (SSR-83347)	
	Chain(2)			C037-510935-A (SSR-83347)	
Set 5	Chain(0)	PCB	WHA YU GROUP	C037-510953-A (SSR-84244)	MHF Plug
	Chain(1)				
	Chain(2)				

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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 by the following approval agencies according to ISO/IEC 17025:

USA	FCC, NVLAP
Germany	TUV Rheinland
Japan	VCCI
Norway	NEMKO
Canada	INDUSTRY CANADA, CSA
R.O.C.	TAF, BSMI, NCC
Netherlands	Telefication
Singapore	GOST-ASIA(MOU)
Russia	CERTIS(MOU)

Copies of accreditation 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

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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