

FCC TEST REPORT (15.407)

REPORT NO.: RF990622C09B-1

MODEL NO.: DNXA-H1

FCC ID: NKR- DNXAH1

RECEIVED: Jun. 22, 2010

TESTED: Oct. 27 ~ Nov. 15, 2010

ISSUED: Nov. 24, 2010

APPLICANT: Wistron NeWeb Corp.

ADDRESS: 20 Park Avenue II, Hsinchu Science Park,
Hsinchu 308, Taiwan, R.O.C.

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

LAB ADDRESS: No. 47, 14th Ling, Chia Pau Tsuen, Lin Kou
Hsiang, Taipei Hsien 244, Taiwan, R.O.C.

TEST LOCATION: No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei
Shan Hsiang, Taoyuan Hsien 333, Taiwan,
R.O.C.

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1. CERTIFICATION

PRODUCT: PCIe 802.11n WiFi module

MODEL: DNXA-H1

BRAND: WNC

APPLICANT: Wistron NeWeb Corp.

TEST SAMPLE: ENGINEERING SAMPLE

TESTED: Oct. 27 ~ Nov. 15, 2010

STANDARDS: FCC Part 15, Subpart E (Section 15.407)

ANSI C63.4-2003

The above equipment (Model: DNXA-H1) 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 : Ivy Lin , **DATE:** Nov. 24, 2010
Ivy Lin / Specialist

TECHNICAL ACCEPTANCE : Long Chen , **DATE:** Nov. 24, 2010
Responsible for RF Long Chen / Senior Engineer

APPROVED BY : Gary Chang , **DATE:** Nov. 24, 2010
Gary Chang / Assistant 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 AND LIMIT	RESULT	REMARK
15.407(b)(5)	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -11.15dB at 0.181MHz.
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 -1.3dB at 5150.00MHz.
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.
15.203	Antenna Requirement	PASS	Antenna connector is U.FL

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:

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	150kHz~30MHz	2.44 dB
Radiated emissions	30MHz ~ 200MHz	3.34 dB
	200MHz ~1000MHz	3.35 dB
	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	1.94 dB

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

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

EUT	PCIe 802.11n WiFi module
MODEL NO.	DNXA-H1
FCC ID	NKR- DNXAH1
POWER SUPPLY	3.3Vdc
MODULATION TYPE	64QAM, 16QAM, QPSK, BPSK for OFDM
MODULATION TECHNOLOGY	OFDM
TRANSFER RATE	802.11a: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0Mbps 802.11n: up to 450.0Mbps
OPERATING FREQUENCY	5180.0 ~ 5240.0MHz
NUMBER OF CHANNEL	4 for 802.11a, 802.11n (20MHz) 2 for 802.11n (40MHz)
OUTPUT POWER	36.2mW
ANTENNA TYPE	PIFA Antenna with 7.02dBi gain
ANTENNA CONNECTOR	U.FL
DATA CABLE	NA
I/O PORTS	NA
ACCESSORY DEVICES	NA

NOTE:

1. The EUT is a PCIe 802.11n WiFi module. The test data are separated into following test reports.

	TEST STANDARD	REFERENCE REPORT
WLAN 802.11b/g, 802.11n	FCC Part 15, Subpart C (Section 15.247)	RF990622C09B
WLAN 802.11a, 802.11n (5745~5825 MHz)		
WLAN 802.11a, 802.11n (5180~5240MHz)	FCC Part 15, Subpart E (Section 15.407)	RF990622C09B-1

2. The frequency bands used in this EUT are listed as follows:

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

3. The EUT incorporates a MIMO function. Physically, the EUT provides three completed transmitters and three receivers or two completed transmitter and two receivers.

MODULATION MODE	TX FUNCTION
802.11b	3TX/ 2TX
802.11g	3TX/ 2TX
802.11a	3TX/ 2TX
802.11n (20MHz) (MCS 0-7)	3TX/ 2TX
802.11n (20MHz) (MCS 8-15)	3TX/ 2TX
802.11n (20MHz) (MCS 16-23)	3TX
802.11n (40MHz) (MCS 0-7)	3TX/ 2TX
802.11n (40MHz) (MCS 8-15)	3TX/ 2TX
802.11n (40MHz) (MCS 16-23)	3TX

4. The antenna uses in EUT, which is not used for point to point operation.
5. 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

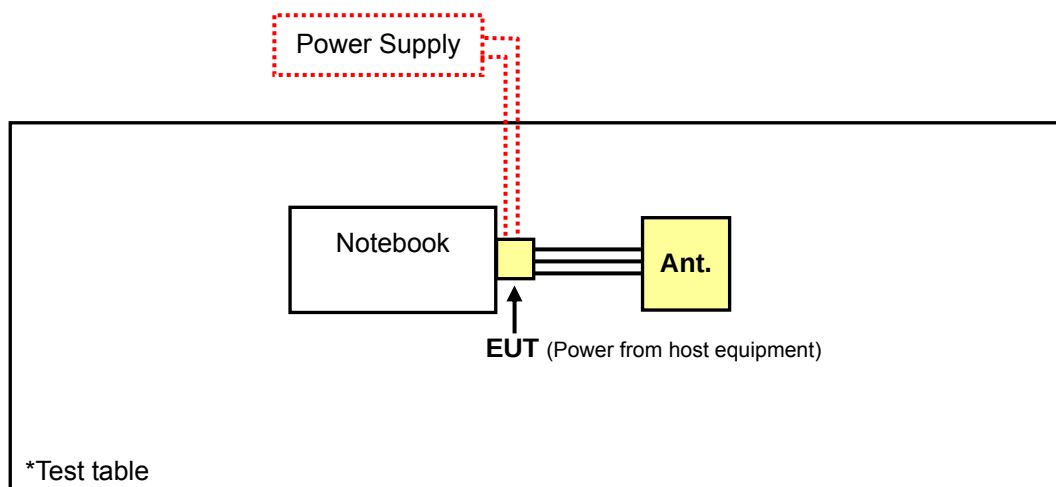
4 channels are provided for 802.11a, 802.11n (20MHz):

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

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

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
38	5190MHz	46	5230MHz

3.2.1 CONFIGURATION OF SYSTEM UNDER TEST



3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE $\geq$ 1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

Where **RE $\geq$ 1G**: Radiated Emission above 1GHz **RE<1G**: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **APCM**: Antenna Port Conducted Measurement

RADIATED EMISSION TEST (ABOVE 1GHz):

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

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)	AXIS
-	802.11a	36 to 48	36, 40, 48	OFDM	BPSK	6.0	Z
-	802.11n (20MHz)	36 to 48	36, 40, 48	OFDM	BPSK	7.2	Z
-	802.11n (40MHz)	38 to 46	38, 46	OFDM	BPSK	15.0	Z

RADIATED EMISSION TEST (BELOW 1GHz):

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

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)	AXIS
-	802.11n (20MHz)	36 to 48	36	OFDM	BPSK	7.2	Z

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.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11n (20MHz)	36 to 48	36	OFDM	BPSK	7.2

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.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)	AXIS
-	802.11a	36 to 48	36, 48	OFDM	BPSK	6.0	Z
-	802.11n (20MHz)	36 to 48	36, 48	OFDM	BPSK	7.2	Z
-	802.11n (40MHz)	38 to 46	38, 46	OFDM	BPSK	15.0	Z

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.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11a	36 to 48	36, 40, 48	OFDM	BPSK	6.0
-	802.11n (20MHz)	36 to 48	36, 40, 48	OFDM	BPSK	6.5
-	802.11n (40MHz)	38 to 46	38, 46	OFDM	BPSK	13.5

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE≥1G	25deg. C, 68%RH, 1015hPa	120Vac, 60Hz	Sun Lin, Mark Liao
RE<1G	26deg. C, 66%RH, 1014hPa	120Vac, 60Hz	Brad Wu
PLC	26deg. C, 65%RH, 1016hPa	120Vac, 60Hz	Frank Wang
APCM	26deg. C, 66%RH, 1014hPa	120Vac, 60Hz	Mark Liao

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

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

FCC Part 15, Subpart E (15.407)

ANSI C63.4-2003

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

NOTE: The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

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	DELL	D820	21498926752	NA
2	DC POWER SUPPLY	TOP WARD	TF-6306A	727263	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).

4. TEST TYPES AND RESULTS

4.1 RADIATED EMISSION MEASUREMENT

4.1.1 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.

4.1.2 LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS

FREQUENCIES (MHz)	EIRP LIMIT (dBm)	EQUIVALENT FIELD STRENGTH AT 3m (dBμV/m) *NOTE 3
	PK	PK
5150 ~ 5250	-27	68.3

NOTE: The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

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

4.1.3 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESIB7	100188	Dec. 21, 2009	Dec. 20, 2010
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Dec. 31, 2009	Dec. 30, 2010
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Apr. 27, 2010	Apr. 26, 2011
HORN Antenna SCHWARZBECK	9120D	9120D-405	Feb. 03, 2010	Feb. 02, 2011
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170243	Dec. 25, 2009	Dec. 24, 2010
Preamplifier Agilent	8447D	2944A10633	Nov. 02, 2010	Nov. 01, 2011
Preamplifier Agilent	8449B	3008A01964	Nov. 02, 2010	Nov. 01, 2011
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	238141/4	May 14, 2010	May 13, 2011
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	12738/6	May 14, 2010	May 13, 2011
Software ADT.	ADT_Radiated_ V7.6.15.9.2	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller inn-co GmbH	CO2000	017303	NA	NA
Turn Table ADT.	TT100.	TT93021703	NA	NA
Turn Table Controller ADT.	SC100.	SC93021703	NA	NA
26GHz ~ 40GHz Amplifier	EM26400	07026401	Aug. 25, 2010	Aug. 24, 2011

- 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 HwaYa Chamber 3.
3. The horn antenna and WNC preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site Registration No. is 988962.
5. The IC Site Registration No. is IC 7450F-3.

4.1.4 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.

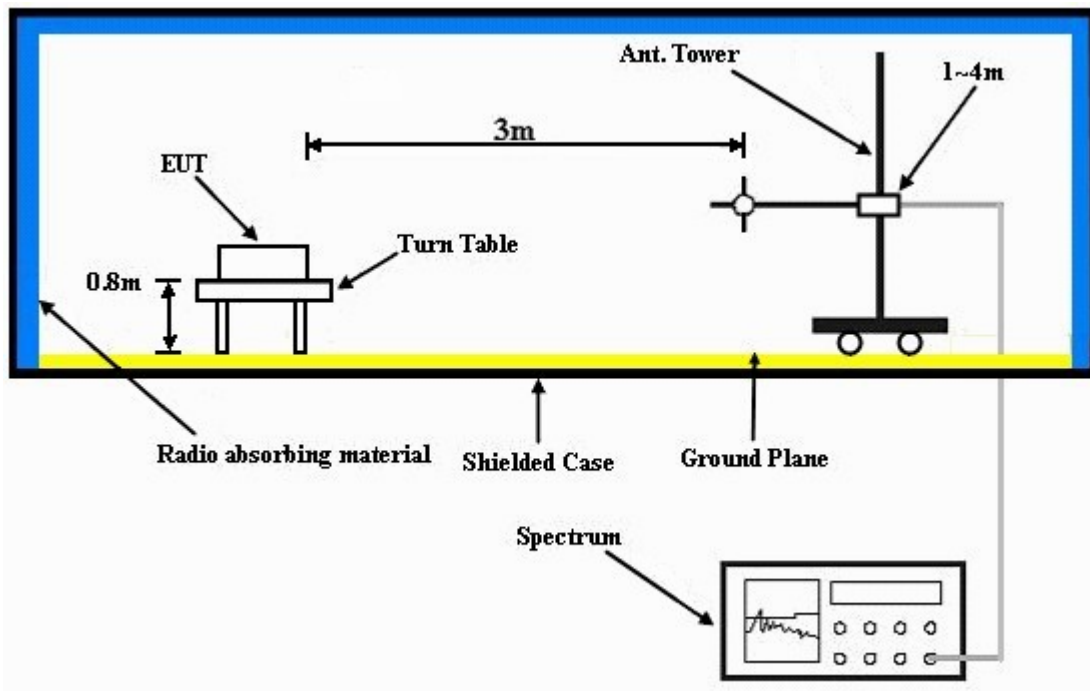
NOTE:

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 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 1kHz for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.5 DEVIATION FROM TEST STANDARD

No deviation.

4.1.6 TEST SETUP



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.7 EUT OPERATING CONDITION

The notebook system ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.

4.1.8 TEST RESULTS

802.11a

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 36	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120 Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 68%RH 1015 hPa	TESTED BY	Mark Liao

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	4780.00	54.5 PK	74.0	-19.5	1.09 H	176	18.40	36.10
2	4780.00	41.8 AV	54.0	-12.2	1.09 H	176	5.70	36.10
3	5150.00	54.1 PK	74.0	-19.9	1.31 H	331	17.40	36.70
4	5150.00	42.5 AV	54.0	-11.5	1.31 H	331	5.80	36.70
5	*5180.00	103.0 PK			1.12 H	251	66.20	36.80
6	*5180.00	90.3 AV			1.12 H	251	53.50	36.80
7	5400.00	57.6 PK	74.0	-16.4	1.00 H	17	20.40	37.20
8	5400.00	46.9 AV	54.0	-7.1	1.00 H	17	9.70	37.20
9	#10360.00	56.5 PK	68.3	-11.8	1.12 H	254	8.60	47.90
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	4780.00	56.5 PK	74.0	-17.5	1.00 V	252	20.40	36.10
2	4780.00	46.3 AV	54.0	-7.7	1.00 V	252	10.20	36.10
3	5150.00	55.1 PK	74.0	-18.9	1.41 V	276	18.40	36.70
4	5150.00	42.9 AV	54.0	-11.1	1.41 V	276	6.20	36.70
5	*5180.00	106.0 PK			1.03 V	299	69.20	36.80
6	*5180.00	93.7 AV			1.03 V	299	56.90	36.80
7	5400.00	58.2 PK	74.0	-15.8	1.08 V	311	21.00	37.20
8	5400.00	46.6 AV	54.0	-7.4	1.08 V	311	9.40	37.20
9	#10360.00	56.5 PK	68.3	-11.8	1.16 V	57	8.60	47.90

- 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)	120 Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 68%RH 1015 hPa	TESTED BY	Sun Lin

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	4840.00	57.0 PK	74.0	-17.0	1.00 H	25	20.90	36.10
2	4840.00	49.8 AV	54.0	-4.2	1.00 H	25	13.70	36.10
3	*5200.00	103.2 PK			1.12 H	49	66.40	36.80
4	*5200.00	90.4 AV			1.12 H	49	53.60	36.80
5	5440.00	60.5 PK	74.0	-13.5	1.04 H	50	23.20	37.30
6	5440.00	51.5 AV	54.0	-2.5	1.04 H	50	14.20	37.30
7	#10400.00	55.4 PK	68.3	-12.9	1.08 H	358	7.30	48.10
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	4840.00	58.6 PK	74.0	-15.4	1.31 V	7	22.50	36.10
2	4840.00	51.2 AV	54.0	-2.8	1.31 V	7	15.10	36.10
3	*5200.00	105.8 PK			1.00 V	352	69.00	36.80
4	*5200.00	93.8 AV			1.00 V	352	57.00	36.80
5	5440.00	60.2 PK	74.0	-13.8	1.33 V	43	22.90	37.30
6	5440.00	51.2 AV	54.0	-2.8	1.33 V	43	13.90	37.30
7	#10400.00	57.8 PK	68.3	-10.5	1.08 V	8	9.70	48.10

- 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 48	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120 Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 68%RH 1015 hPa	TESTED BY	Sun Lin

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	103.3 PK			1.18 H	69	66.40	36.90
2	*5240.00	90.4 AV			1.18 H	69	53.50	36.90
3	5360.00	53.1 PK	74.0	-20.9	1.37 H	113	15.90	37.20
4	5360.00	45.2 AV	54.0	-8.8	1.37 H	113	8.00	37.20
5	5440.00	59.6 PK	74.0	-14.4	1.27 H	114	22.30	37.30
6	5440.00	50.5 AV	54.0	-3.5	1.27 H	114	13.20	37.30
7	#10480.00	57.2 PK	68.3	-11.1	1.17 H	63	8.90	48.30
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	106.2 PK			1.00 V	354	69.30	36.90
2	*5240.00	94.0 AV			1.00 V	354	57.10	36.90
3	5360.00	53.2 PK	74.0	-20.8	1.12 V	341	16.00	37.20
4	5360.00	46.2 AV	54.0	-7.8	1.12 V	341	9.00	37.20
5	5440.00	59.6 PK	74.0	-14.4	1.32 V	40	22.30	37.30
6	5440.00	50.4 AV	54.0	-3.6	1.32 V	40	13.10	37.30
7	#10480.00	57.5 PK	68.3	-10.8	1.09 V	21	9.20	48.30

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.

802.11n (20MHz)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 36	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120 Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 68%RH 1015 hPa	TESTED BY	Mark Liao

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	4960.00	56.7 PK	74.0	-17.3	1.28 H	85	20.30	36.40
2	4960.00	45.8 AV	54.0	-8.2	1.28 H	85	9.40	36.40
3	5150.00	64.2 PK	74.0	-9.8	1.32 H	306	27.50	36.70
4	5150.00	45.1 AV	54.0	-8.9	1.32 H	306	8.40	36.70
5	*5180.00	108.2 PK			1.09 H	310	71.40	36.80
6	*5180.00	95.7 AV			1.09 H	310	58.90	36.80
7	5400.00	59.4 PK	74.0	-14.6	1.33 H	103	22.20	37.20
8	5400.00	51.0 AV	54.0	-3.0	1.33 H	103	13.80	37.20
9	#10360.00	55.7 PK	68.3	-12.6	1.22 H	152	7.80	47.90
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	4960.00	58.8 PK	74.0	-15.2	1.03 V	24	22.40	36.40
2	4960.00	48.5 AV	54.0	-5.5	1.03 V	24	12.10	36.40
3	5150.00	66.2 PK	74.0	-7.8	1.10 V	11	29.50	36.70
4	5150.00	48.1 AV	54.0	-5.9	1.10 V	11	11.40	36.70
5	*5180.00	110.3 PK			1.19 V	63	73.50	36.80
6	*5180.00	98.0 AV			1.19 V	63	61.20	36.80
7	5400.00	58.9 PK	74.0	-15.1	1.11 V	37	21.70	37.20
8	5400.00	50.8 AV	54.0	-3.2	1.11 V	37	13.60	37.20
9	#10360.00	55.1 PK	68.3	-13.2	1.12 V	254	7.20	47.90

- 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)	120 Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 68%RH 1015 hPa	TESTED BY	Mark Liao

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	5000.00	56.7 PK	74.0	-17.3	1.29 H	100	20.20	36.50
2	5000.00	46.6 AV	54.0	-7.4	1.29 H	100	10.10	36.50
3	*5200.00	108.3 PK			1.03 H	69	71.50	36.80
4	*5200.00	95.8 AV			1.03 H	69	59.00	36.80
5	5400.00	58.0 PK	74.0	-16.0	1.31 H	112	20.80	37.20
6	5400.00	47.6 AV	54.0	-6.4	1.31 H	112	10.40	37.20
7	#10400.00	55.9 PK	68.3	-12.4	1.22 H	55	7.80	48.10
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	5000.00	58.9 PK	74.0	-15.1	1.25 V	27	22.40	36.50
2	5000.00	48.5 AV	54.0	-5.5	1.25 V	27	12.00	36.50
3	*5200.00	110.4 PK			1.13 V	25	73.60	36.80
4	*5200.00	98.2 AV			1.13 V	25	61.40	36.80
5	5400.00	57.8 PK	74.0	-16.2	1.09 V	339	20.60	37.20
6	5400.00	47.6 AV	54.0	-6.4	1.09 V	339	10.40	37.20
7	#10400.00	55.9 PK	68.3	-12.4	1.13 V	91	7.80	48.10

- 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 48	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120 Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 68%RH 1015 hPa	TESTED BY	Mark Liao

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	108.5 PK			1.18 H	77	71.60	36.90
2	*5240.00	95.9 AV			1.18 H	77	59.00	36.90
3	5360.00	57.1 PK	74.0	-16.9	1.25 H	111	19.90	37.20
4	5360.00	47.2 AV	54.0	-6.8	1.25 H	111	10.00	37.20
5	#10480.00	56.9 PK	68.3	-11.4	1.08 H	94	8.60	48.30
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	110.5 PK			1.03 V	25	73.60	36.90
2	*5240.00	98.3 AV			1.03 V	25	61.40	36.90
3	5360.00	57.0 PK	74.0	-17.0	1.08 V	345	19.80	37.20
4	5360.00	46.3 AV	54.0	-7.7	1.08 V	345	9.10	37.20
5	#10480.00	56.4 PK	68.3	-11.9	1.22 V	69	8.10	48.30

- 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.

802.11n (40MHz)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 38	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120 Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH 1015 hPa	TESTED BY	Mark Liao

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	67.2 PK	74.0	-6.8	1.47 H	289	30.50	36.70
2	5150.00	49.6 AV	54.0	-4.4	1.47 H	289	12.90	36.70
3	*5190.00	104.9 PK			1.13 H	301	68.10	36.80
4	*5190.00	92.1 AV			1.13 H	301	55.30	36.80
5	#10380.00	57.3 PK	68.3	-11.0	1.09 H	66	9.30	48.00
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	68.9 PK	74.0	-5.1	1.00 V	2	32.20	36.70
2	5150.00	52.7 AV	54.0	-1.3	1.00 V	2	16.00	36.70
3	*5190.00	107.4 PK			1.13 V	142	70.60	36.80
4	*5190.00	95.9 AV			1.13 V	142	59.10	36.80
5	#10380.00	57.6 PK	68.3	-10.7	1.06 V	3	9.60	48.00

- 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)	120 Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH 1015 hPa	TESTED BY	Mark Liao

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	104.5 PK			1.11 H	291	67.60	36.90
2	*5230.00	91.8 AV			1.11 H	291	54.90	36.90
3	5360.00	58.6 PK	74.0	-15.4	1.06 H	43	21.40	37.20
4	5360.00	47.5 AV	54.0	-6.5	1.06 H	43	10.30	37.20
5	#10460.00	57.9 PK	68.3	-10.4	1.02 H	255	9.60	48.30
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	107.1 PK			1.11 V	121	70.20	36.90
2	*5230.00	95.6 AV			1.11 V	121	58.70	36.90
3	5360.00	58.7 PK	74.0	-15.3	1.08 V	337	21.50	37.20
4	5360.00	47.6 AV	54.0	-6.4	1.08 V	337	10.40	37.20
5	#10460.00	58.3 PK	68.3	-10.0	1.10 V	25	10.00	48.30

- 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.

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

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 36	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120 Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	26deg. C, 66%RH 1014 hPa	TESTED BY	Brad Wu

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	99.89	30.3 QP	43.5	-13.2	1.50 H	10	20.20	10.10
2	199.05	40.3 QP	43.5	-3.2	1.00 H	43	30.00	10.30
3	232.11	33.1 QP	46.0	-12.9	1.00 H	88	21.20	11.90
4	527.64	32.2 QP	46.0	-13.8	1.50 H	151	11.70	20.50
5	665.68	38.9 QP	46.0	-7.1	1.00 H	142	15.80	23.10
6	928.16	33.2 QP	46.0	-12.8	1.50 H	46	6.80	26.40
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	199.05	32.7 QP	43.5	-10.8	1.50 V	109	22.40	10.30
2	333.21	26.9 QP	46.0	-19.1	1.50 V	148	11.40	15.50
3	461.53	29.3 QP	46.0	-16.7	2.00 V	10	10.50	18.80
4	529.58	30.3 QP	46.0	-15.7	1.50 V	10	9.80	20.50
5	665.68	40.6 QP	46.0	-5.4	1.00 V	193	17.50	23.10
6	924.27	35.4 QP	46.0	-10.6	1.00 V	10	9.10	26.30

- 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.

4.2 CONDUCTED EMISSION MEASUREMENT

4.2.1 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 0.50MHz.
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.

4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCS30	100289	Nov. 23, 2009	Nov. 22, 2010
RF signal cable Woken	5D-FB	Cable-HYCO2-01	Dec. 31, 2009	Dec. 30, 2010
LISN ROHDE & SCHWARZ	ESH2-Z5	100100	Dec. 25, 2009	Dec. 24, 2010
LISN ROHDE & SCHWARZ	ESH3-Z5	100311	Jul. 08, 2010	Jul. 07, 2011
Software ADT	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 HwaYa Shielded Room 2.
3. The VCCI Site Registration No. is C-2047.

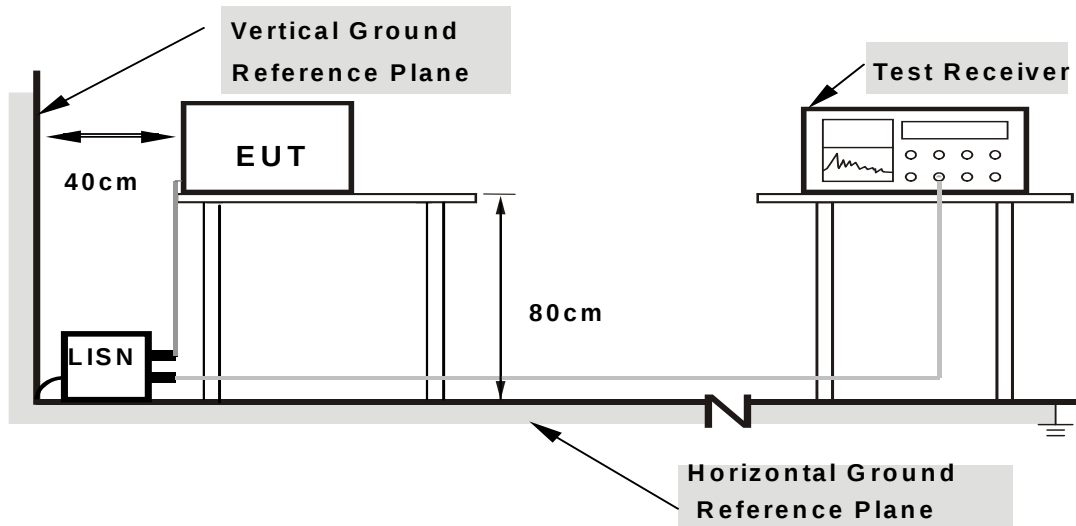
4.2.3 TEST PROCEDURES

- 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 provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

4.2.5 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 attached file (Test Setup Photo).

4.2.6 EUT OPERATING CONDITIONS

Same as 4.1.6.

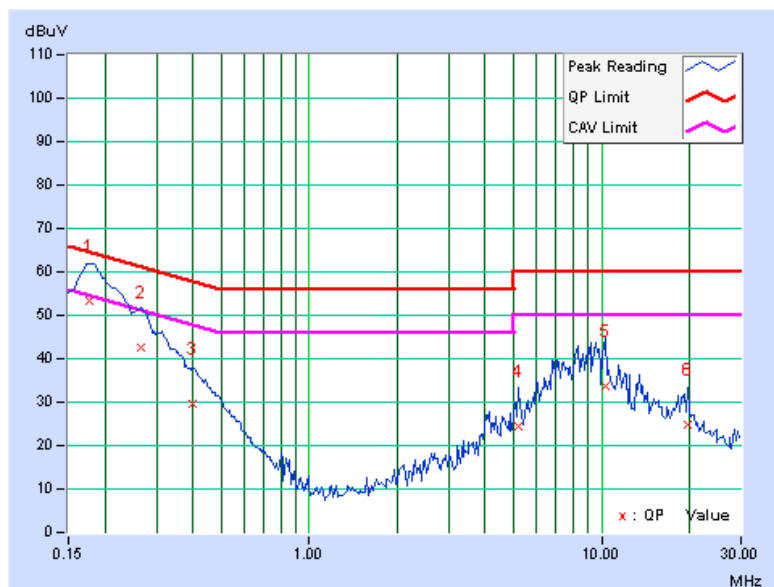
4.2.7 TEST RESULTS

CONDUCTED WORST-CASE DATA : 802.11n (20MHz)

PHASE	Line 1	6dB BANDWIDTH	9kHz
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No	Freq. [MHz]	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor (dB)	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.177	0.16	53.29	-	53.45	-	64.61	54.61	-11.16	-
2	0.267	0.17	42.41	-	42.58	-	61.20	51.20	-18.63	-
3	0.400	0.18	29.59	-	29.77	-	57.85	47.85	-28.08	-
4	5.172	0.35	24.10	-	24.45	-	60.00	50.00	-35.55	-
5	10.344	0.36	33.48	-	33.84	-	60.00	50.00	-26.16	-
6	19.645	0.68	24.09	-	24.77	-	60.00	50.00	-35.23	-

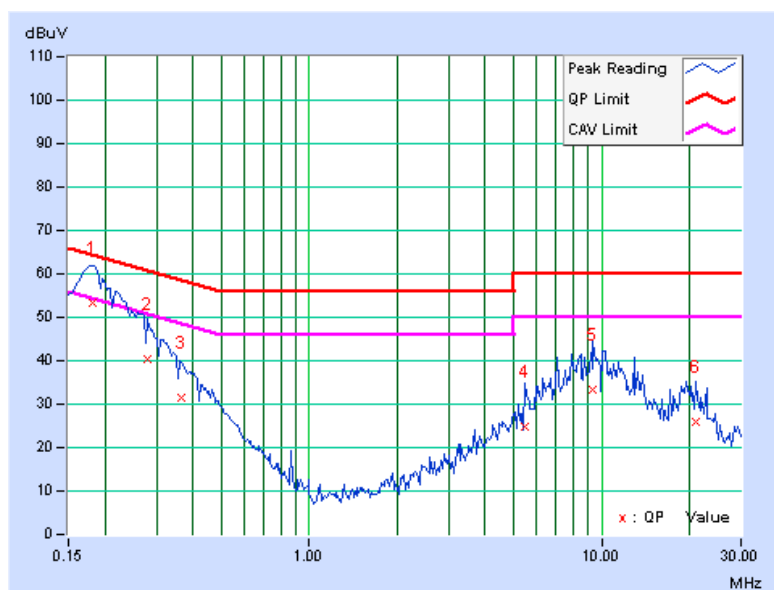
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value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



PHASE	Line 2	6dB BANDWIDTH	9kHz
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No	Freq. [MHz]	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor (dB)	[dB (uV)] Q.P.	AV.	[dB (uV)] Q.P.	AV.	[dB (uV)] Q.P.	AV.	(dB) Q.P.	AV.
1	0.181	0.13	53.15	-	53.28	-	64.43	54.43	-11.15	-
2	0.279	0.14	40.41	-	40.55	-	60.85	50.85	-20.30	-
3	0.365	0.15	31.36	-	31.51	-	58.62	48.62	-27.10	-
4	5.469	0.38	24.56	-	24.94	-	60.00	50.00	-35.06	-
5	9.371	0.43	32.85	-	33.28	-	60.00	50.00	-26.72	-
6	21.102	0.91	25.02	-	25.93	-	60.00	50.00	-34.07	-

- 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.



4.3 CONDUCTED POWER MEASUREMENT

4.3.1 LIMITS OF CONDUCTED POWER MEASUREMENT

FREQUENCY BAND	LIMIT
5.15 ~ 5.25GHz	The lesser of 50mW (17dBm) or 4dBm + 10logB

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

4.3.2 TEST INSTRUMENTS

FOR POWER OUTPUT MEASUREMENT

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
High Speed Peak Power Meter	ML2495A	0842014	Apr. 21, 2010	Apr. 20, 2011
Power Sensor	MA2411B	0738404	Apr. 21, 2010	Apr. 20, 2011

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. Measurement Bandwidth of ML2495A is 65MHz greater than 26dB bandwidth of emission.

FOR 26dB OCCUPIED BANDWIDTH

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
R&S SPECTRUM ANALYZER	FSP40	100039	Jan. 11, 2010	Jan. 10, 2011

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

4.3.3 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

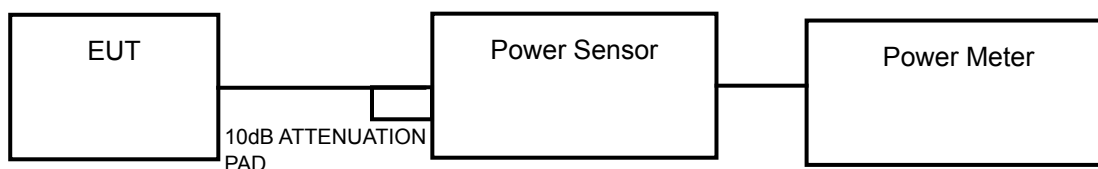
The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 300kHz RBW and 1MHz VBW. The 26dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 26dB.

4.3.4 DEVIATION FROM TEST STANDARD

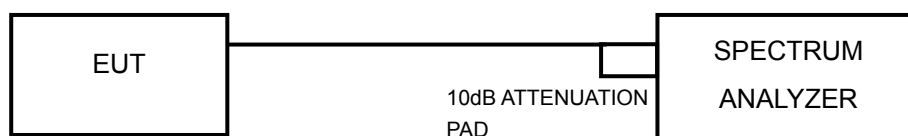
No deviation.

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

POWER OUTPUT: 802.11a

CHAN.	CHAN. FREQ. (MHz)	POWER OUTPUT (dBm)			TOTAL POWER (mW)	TOTAL POWER (dBm)	POWER LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1	CHAIN 2				
36	5180	5.3	6.2	6.1	11.6	10.7	11.2	PASS
40	5200	5.2	6.1	6.1	11.5	10.6	11.2	PASS
48	5240	5.2	6.0	6.0	11.3	10.5	11.2	PASS

NOTE:

1. The antenna is not used for point to point operation.
2. Directional gain = $7.02\text{dBi} + 10\log(3) = 11.79\text{dBi} > 6\text{dBi}$, so the conducted power limit shall be reduced to $17 - (11.79 - 6) = 11.2\text{dBm}$

802.11n (20MHz)

CHAN.	CHAN. FREQ. (MHz)	POWER OUTPUT (dBm)			TOTAL POWER (mW)	TOTAL POWER (dBm)	POWER LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1	CHAIN 2				
36	5180	9.8	11.3	11.2	36.2	15.6	16.0	PASS
40	5200	9.7	11.2	11.1	35.4	15.5	16.0	PASS
48	5240	9.6	11.1	11.2	35.2	15.5	16.0	PASS

NOTE: According to 15.407 (a) (1) (2) (3), the maximum antenna gain 7.02dBi is higher than 6dBi, so the limit of conducted power limit shall be reduced by 1.02dB.

802.11n (40MHz)

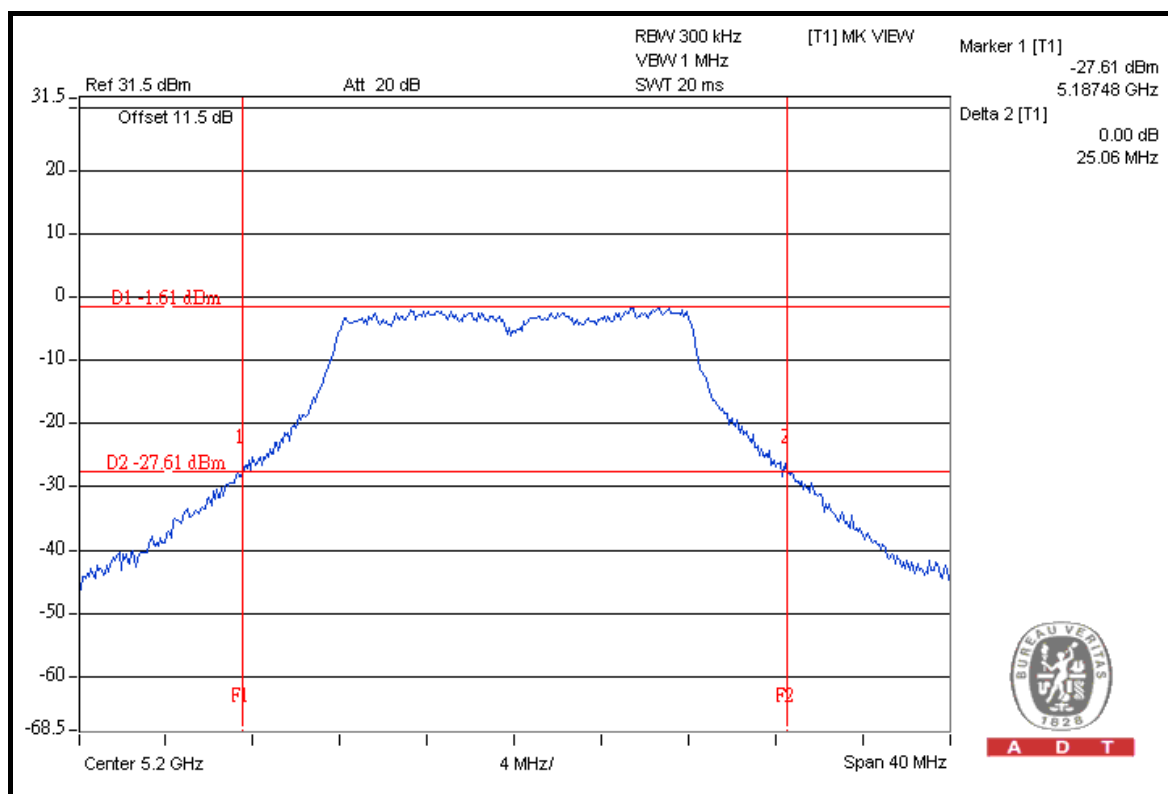
CHAN.	CHAN. FREQ. (MHz)	POWER OUTPUT (dBm)			TOTAL POWER (mW)	TOTAL POWER (dBm)	POWER LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1	CHAIN 2				
36	5180	9.6	11.3	10.7	34.4	15.4	16.0	PASS
40	5200	9.7	11.2	10.8	34.5	15.4	16.0	PASS

NOTE: According to 15.407 (a) (1) (2) (3), the maximum antenna gain 7.02dBi is higher than 6dBi, so the limit of conducted power limit shall be reduced by 1.2dB.

26dB OCCUPIED BANDWIDTH: 802.11a

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc OCCUPIED BANDWIDTH (MHz)			PASS / FAIL
		CHAIN 0	CHAIN 1	CHAIN 2	
36	5180	24.87	24.91	23.78	PASS
40	5200	25.06	24.51	24.19	PASS
48	5240	24.70	24.32	24.10	PASS

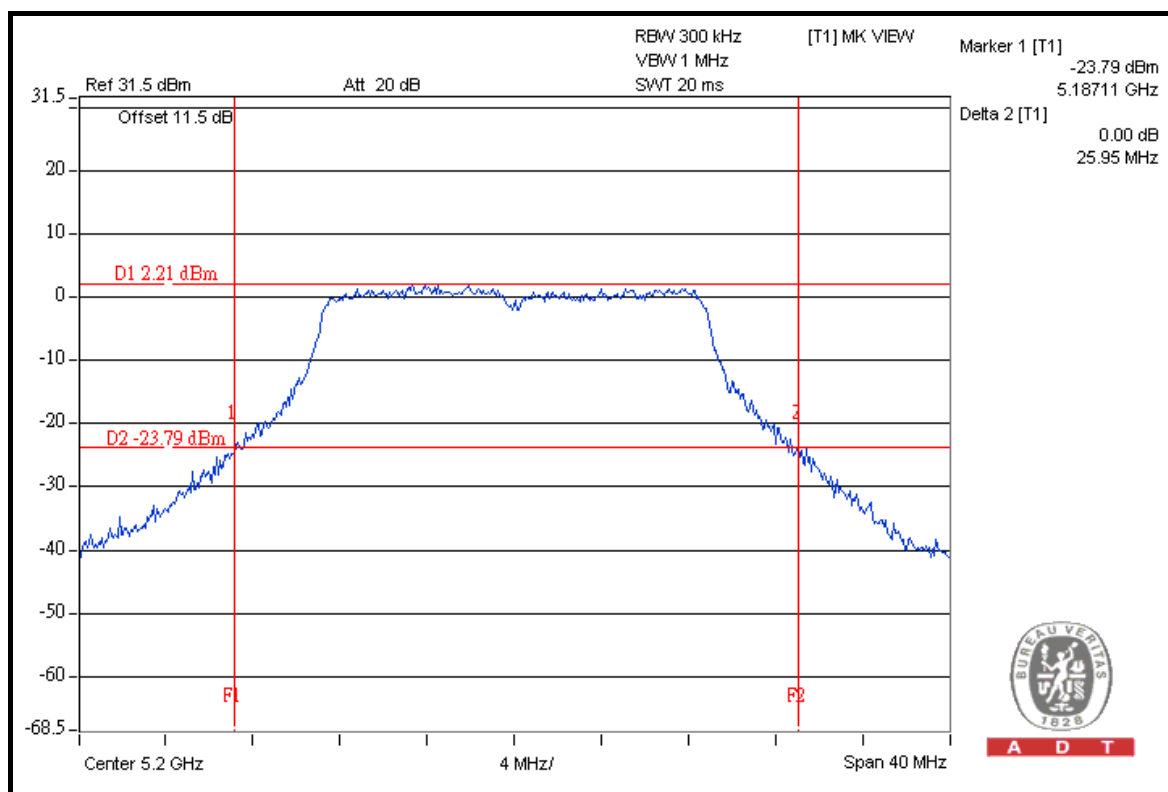
FOR CHAIN 0: CH 40



802.11n (20MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc OCCUPIED BANDWIDTH (MHz)			PASS / FAIL
		CHAIN 0	CHAIN 1	CHAIN 2	
36	5180	25.86	25.58	24.90	PASS
40	5200	25.95	25.92	25.18	PASS
48	5240	25.74	24.85	24.97	PASS

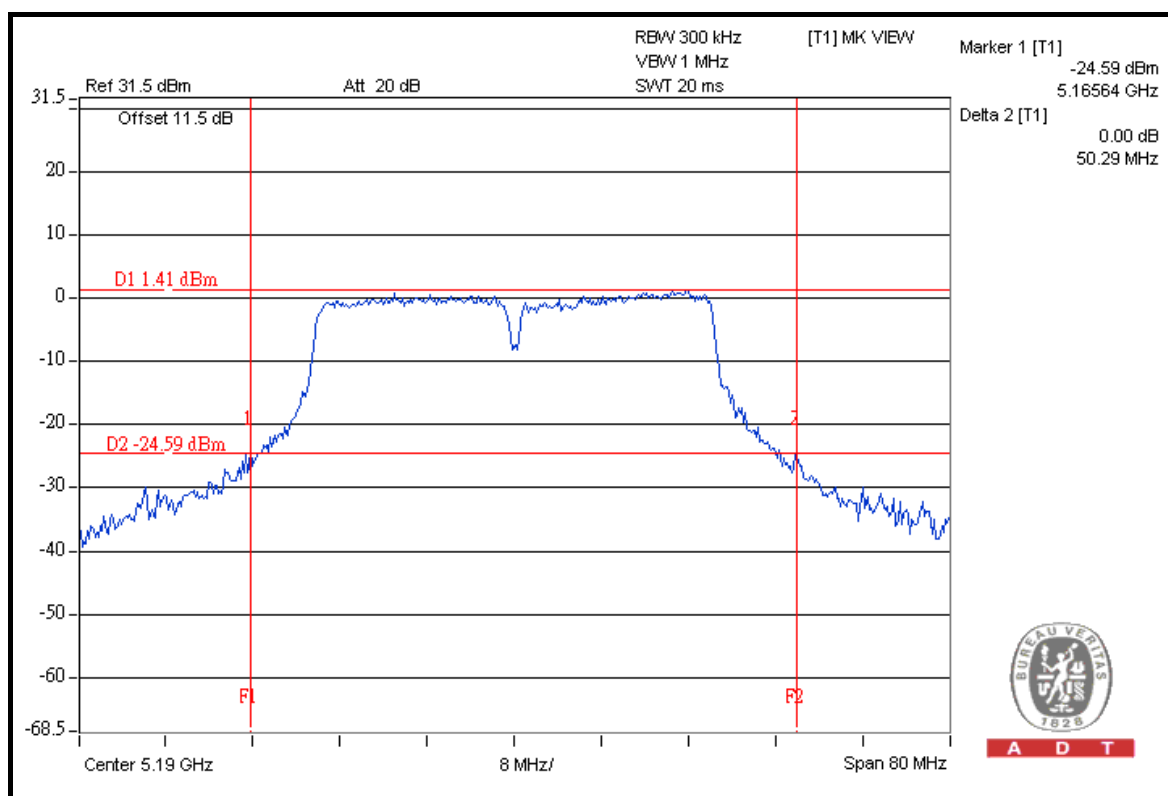
FOR CHAIN 0: CH 40



802.11n (40MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc OCCUPIED BANDWIDTH (MHz)			PASS / FAIL
		CHAIN 0	CHAIN 1	CHAIN 2	
38	5190	49.74	50.29	48.77	PASS
46	5230	48.72	48.01	47.79	PASS

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 ~ 5.25GHz	13dB

4.4.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
R&S SPECTRUM ANALYZER	FSP40	100039	Jan. 11, 2010	Jan. 10, 2011

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

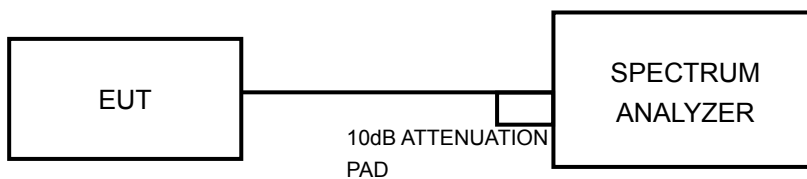
4.4.3 TEST PROCEDURE

- The transmitter output was connected to the spectrum analyzer.
- Set the spectrum bandwidth span to view the entire spectrum.
- Using peak detector and Max-hold function for Trace 1 (RB = 1MHz, VB = 3MHz) and 2 (RB = 1MHz, VB = 300kHz).
- The differences between Trace1 and Trace 2 in any 1MHz band at f1 to f2 range were recorded and showed to another trace.

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

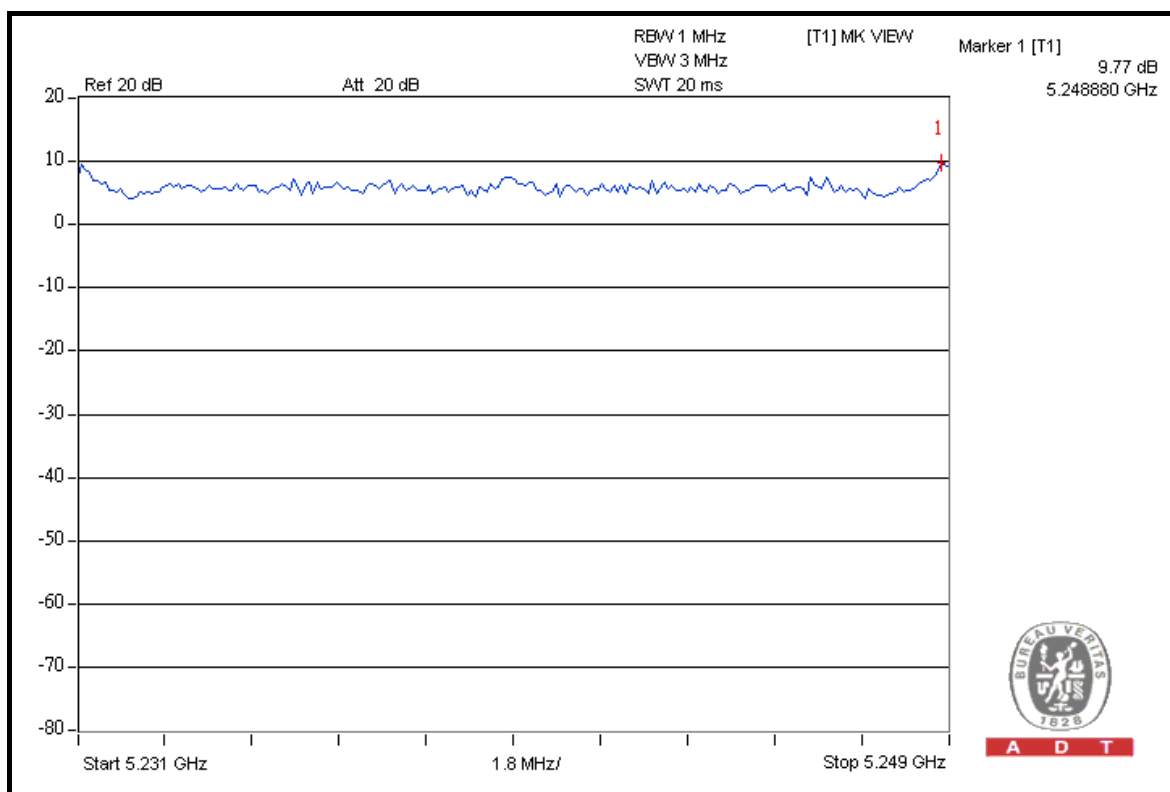
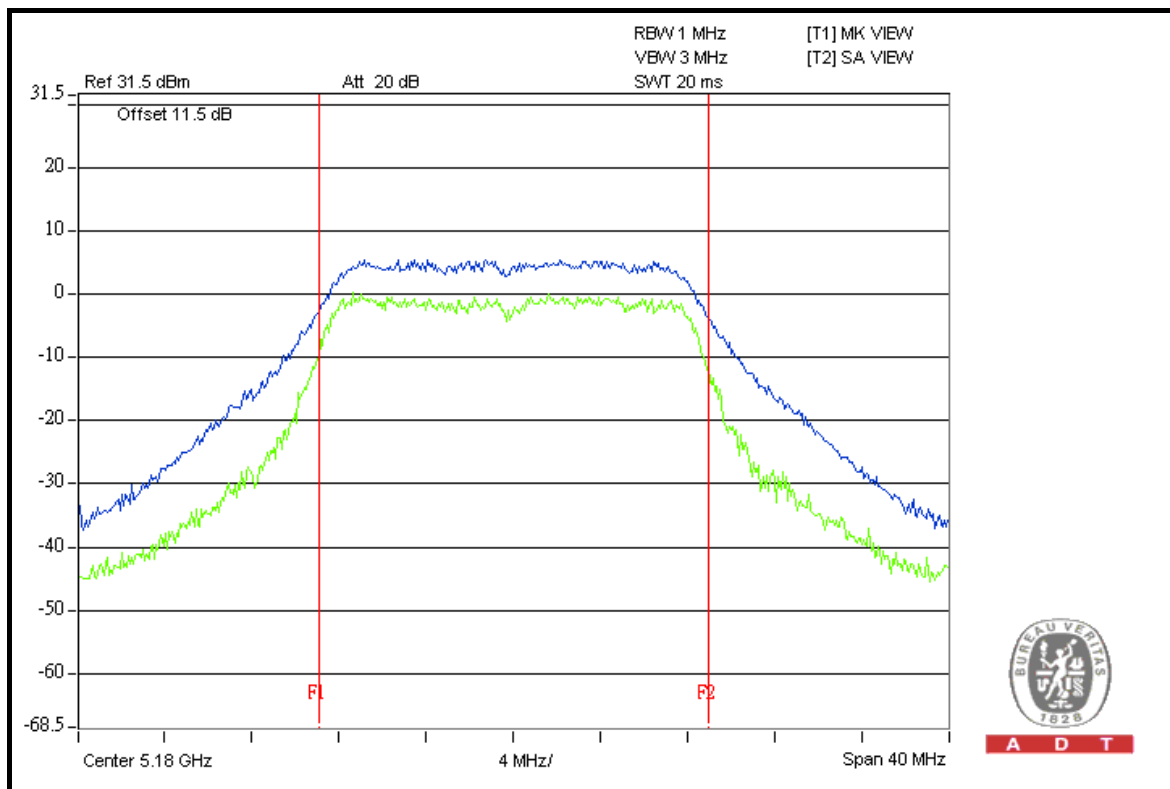
802.11a

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER EXCURSION (dB)			PEAK to AVERAGE EXCURSION LIMIT (dB)	PASS/FAIL
		CHAIN 0	CHAIN 1	CHAIN 2		
36	5180	8.49	9.53	8.66	13	PASS
40	5200	8.58	9.38	8.37	13	PASS
48	5240	9.77	8.95	8.82	13	PASS



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FOR CHAIN 0: CH 48



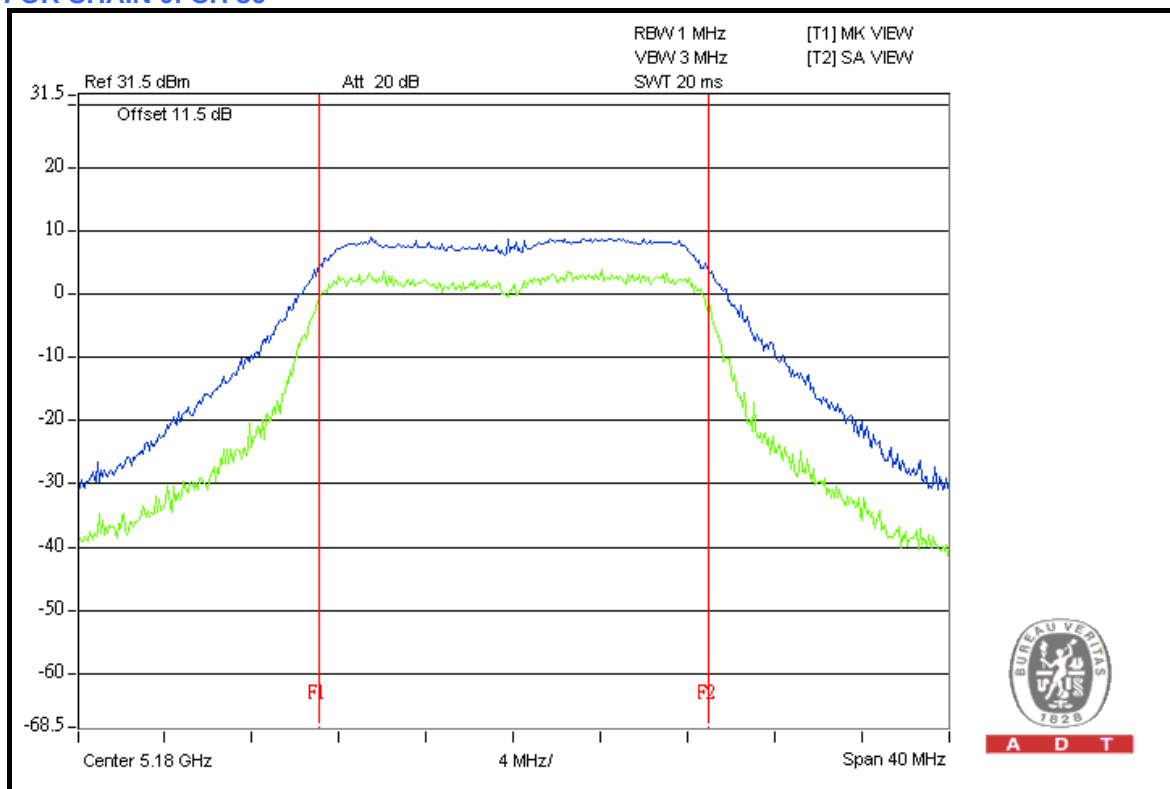
802.11n (20MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER EXCURSION (dB)			PEAK to AVERAGE EXCURSION LIMIT (dB)	PASS/FAIL
		CHAIN 0	CHAIN 1	CHAIN 2		
36	5180	8.99	8.14	8.32	13	PASS
40	5200	7.58	7.55	7.96	13	PASS
48	5240	7.98	7.25	8.03	13	PASS

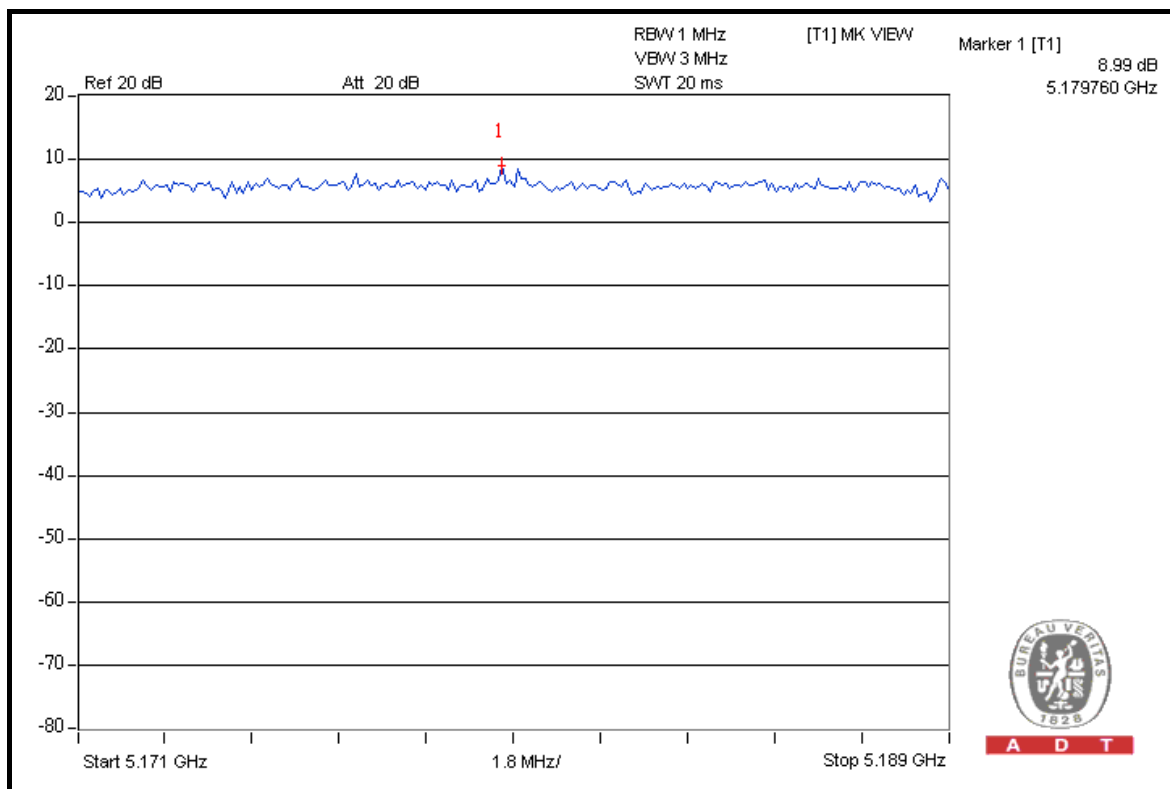


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FOR CHAIN 0: CH 36



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A D T



A D T

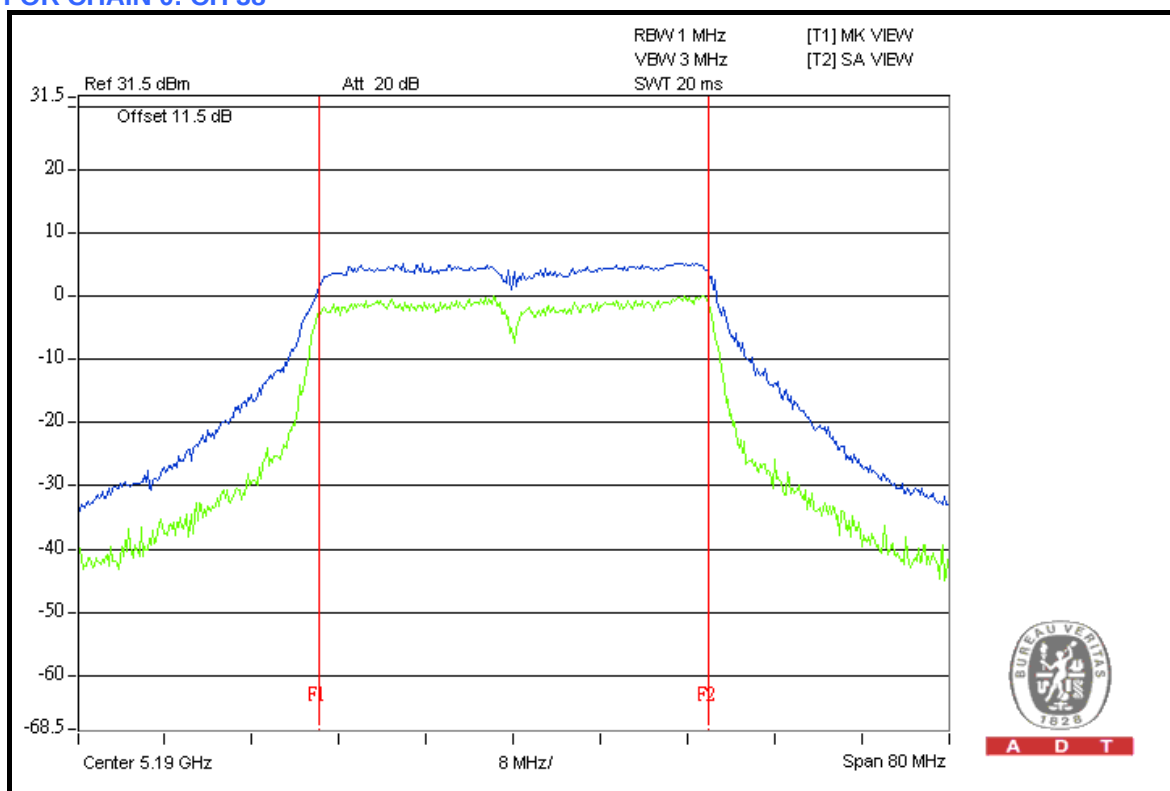
802.11n (40MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER EXCURSION (dB)			PEAK to AVERAGE EXCURSION LIMIT (dB)	PASS/FAIL
		CHAIN 0	CHAIN 1	CHAIN 2		
38	5190	11.39	10.28	9.00	13	PASS
46	5230	8.71	11.25	9.88	13	PASS

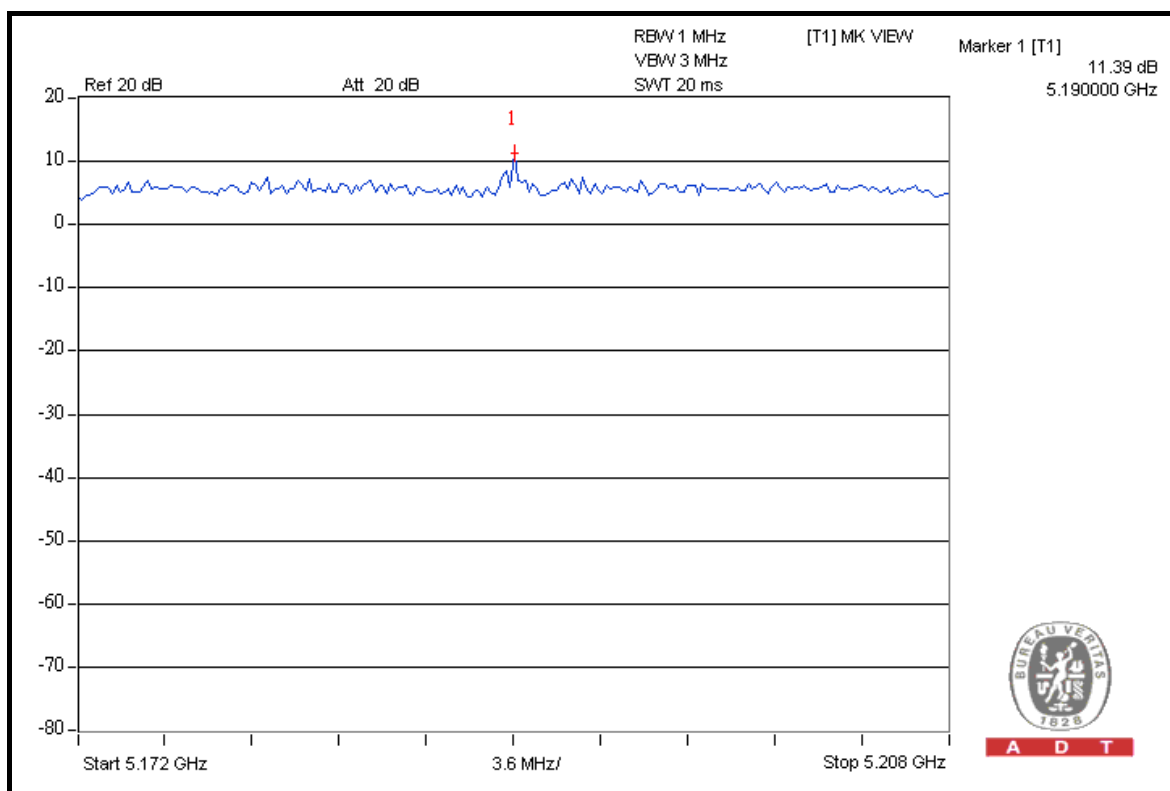


A D T

FOR CHAIN 0: CH 38



A D T



A D T

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

4.5.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
R&S SPECTRUM ANALYZER	FSP40	100039	Jan. 11, 2010	Jan. 10, 2011

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

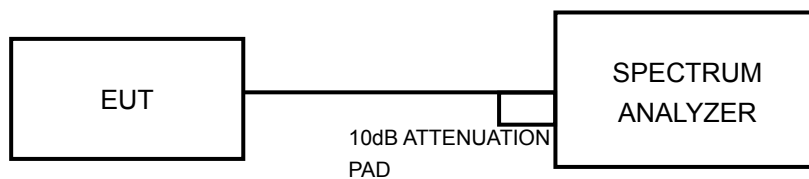
4.5.3 TEST PROCEDURES

- The transmitter output was connected to the spectrum analyzer.
- 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

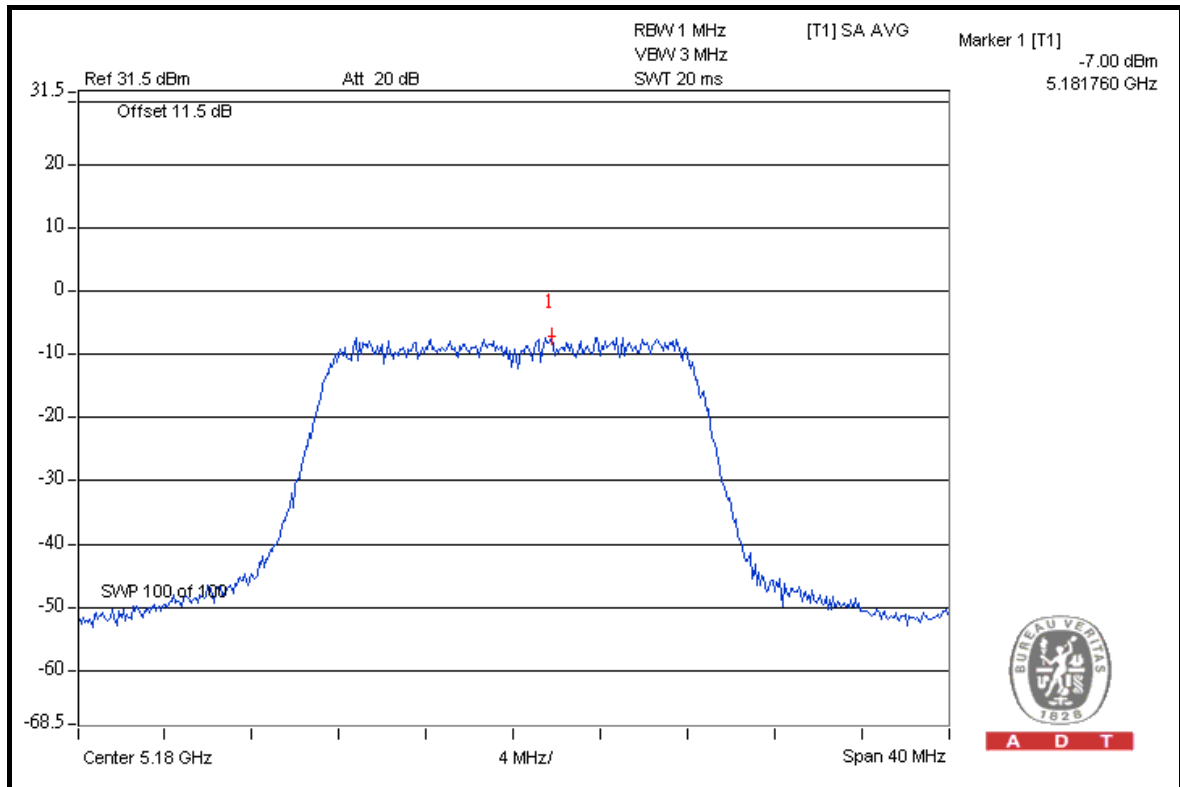
802.11a

CHAN.	CHAN. FREQ. (MHz)	RF POWER LEVEL IN 1MHz BW (dBm)			TOTAL POWER DENSITY (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1	CHAIN 2			
36	5180	-7.7	-7.0	-7.1	-2.5	-1.8	PASS
40	5200	-7.8	-7.0	-7.2	-2.6	-1.8	PASS
48	5240	-7.8	-7.3	-7.2	-2.7	-1.8	PASS

NOTE:

1. The antenna is not used for point to point operation.
2. Directional gain = $7.02\text{dBi} + 10\log(3) = 11.79\text{dBi} > 6\text{dBi}$, so the power spectral density limit shall be reduced to $4 - (11.79 - 6) = -1.8\text{dBm}$

FOR CHAIN 1: CH 36

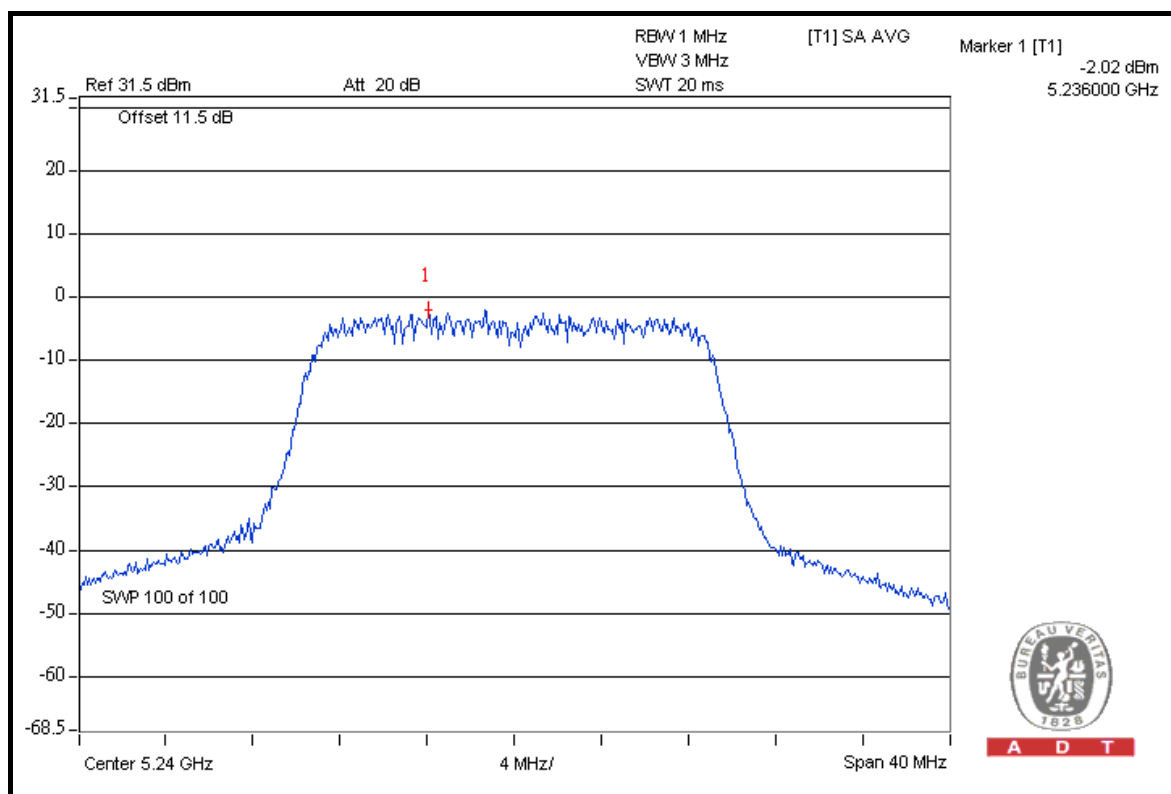


802.11n (20MHz)

CHAN.	CHAN. FREQ. (MHz)	RF POWER LEVEL IN 1MHz BW (dBm)			TOTAL POWER DENSITY (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1	CHAIN 2			
36	5180	-3.5	-2.2	-2.1	2.2	2.98	PASS
40	5200	-3.5	-2.3	-2.4	2.1	2.98	PASS
48	5240	-3.4	-2.0	-2.0	2.3	2.98	PASS

NOTE: According to 15.407 (a) (1) (2) (3), the maximum antenna gain 7.02dBi is higher than 6dBi, so the limit of peak power spectral density shall be reduced by 1.02dB.

FOR CHAIN 2: CH 48

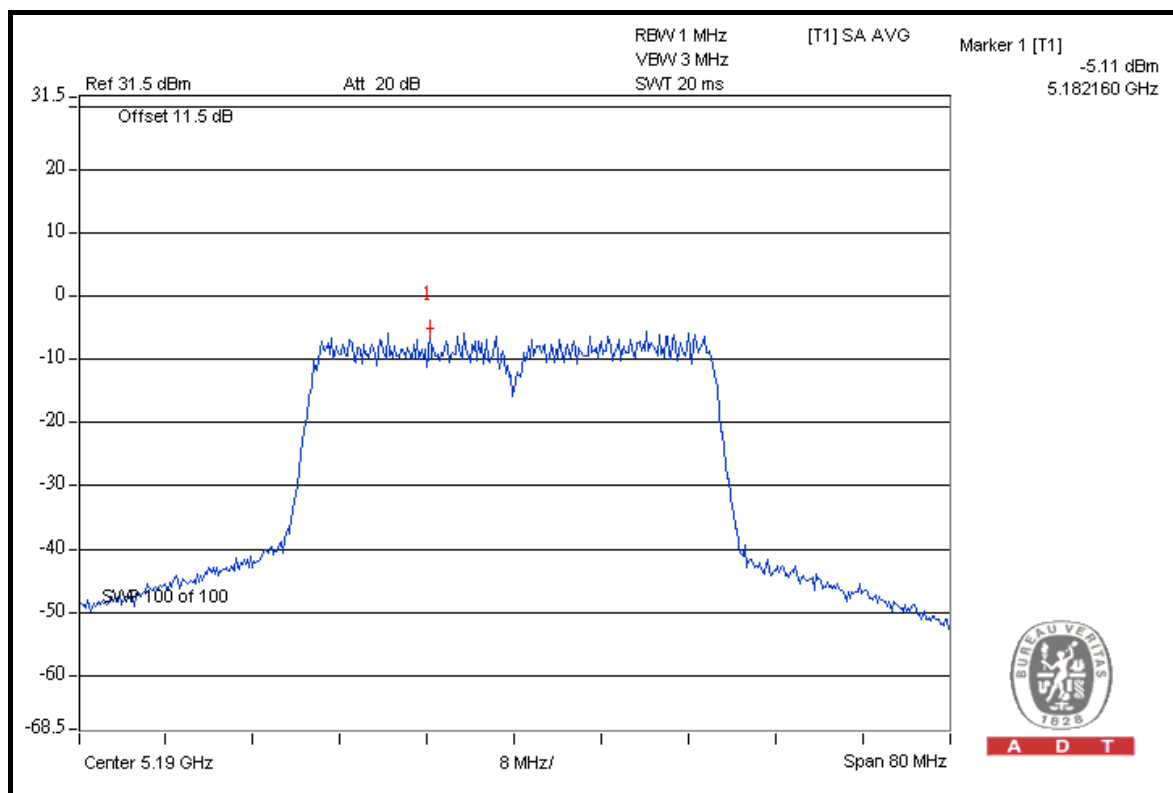


802.11n (40MHz)

CHAN.	CHAN. FREQ. (MHz)	RF POWER LEVEL IN 1MHz BW (dBm)			TOTAL POWER DENSITY (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1	CHAIN 2			
38	5190	-7.6	-5.1	-5.9	-1.3	2.98	PASS
46	5230	-7.5	-5.3	-5.9	-1.3	2.98	PASS

NOTE: According to 15.407 (a) (1) (2) (3), the maximum antenna gain 7.02dBi is higher than 6dBi, so the limit of peak power spectral density shall be reduced by 1.02dB.

FOR CHAIN 1: CH 38



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 operation 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.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
R&S SPECTRUM ANALYZER	FSP40	100039	Jan. 11, 2010	Jan. 10, 2011
WIT STANDARD TEMPERATURE AND HUMIDITY CHAMBER	TH-4S-C	W981030	Jun. 28, 2010	Jun. 27, 2011

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

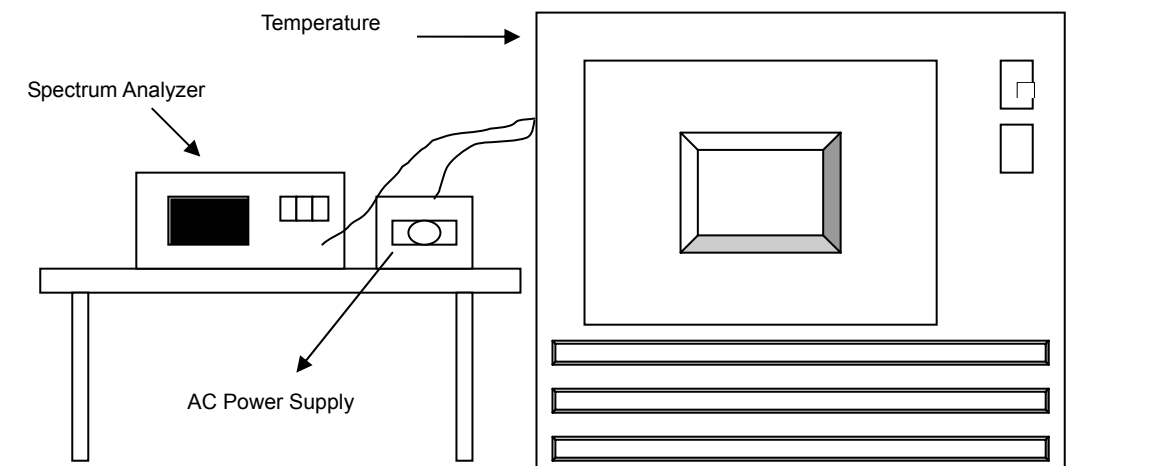
4.6.3 TEST PROCEDURE

- The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.
- Turn the EUT on and couple its output to a spectrum analyzer.
- Turn the EUT off and set the chamber to the highest temperature specified.
- 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.
- Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
- 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

Same as Item 4.1.6.

4.6.7 TEST RESULTS

FREQUENCY STABILITY VERSUS TEMP.									
OPERATING FREQUENCY: 5200MHz									
TEMP. (°C)	POWER SUPPLY (Vdc)	0 MINUTE		2 MINUTE		5 MINUTE		10 MINUTE	
		Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)
50	3.3	5200.013884	2.670	5200.014044	2.701	5200.014414	2.772	5200.014198	2.730
40	3.3	5200.013442	2.585	5200.013371	2.571	5200.013649	2.625	5200.013221	2.543
30	3.3	5199.996129	-0.744	5199.995843	-0.799	5199.996002	-0.769	5199.996709	-0.633
20	3.3	5199.976138	-4.589	5199.976227	-4.572	5199.976856	-4.451	5199.976717	-4.477
10	3.3	5200.006507	1.251	5200.006873	1.322	5200.007098	1.365	5200.007061	1.358
0	3.3	5200.006902	1.327	5200.006478	1.246	5200.007554	1.453	5200.006688	1.286
-10	3.3	5199.972331	-5.321	5199.972215	-5.343	5199.972552	-5.278	5199.972276	-5.332
-20	3.3	5200.020483	3.939	5200.020475	3.938	5200.020806	4.001	5200.020867	4.013
-30	3.3	5199.991114	-1.709	5199.991662	-1.603	5199.991710	-1.594	5199.991638	-1.608

FREQUENCY STABILITY VERSUS VOLTAGE									
OPERATING FREQUENCY: 5200MHz									
TEMP. (°C)	POWER SUPPLY (Vdc)	0 MINUTE		2 MINUTE		5 MINUTE		10 MINUTE	
		Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)
20	2.8	5199.976280	-4.562	5199.976219	-4.573	5199.976154	-4.586	5199.976595	-4.501
	3.3	5199.976088	-4.598	5199.976072	-4.602	5199.976129	-4.591	5199.976431	-4.532
	3.8	5199.976293	-4.559	5199.976372	-4.544	5199.976466	-4.526	5199.976240	-4.569

4.7 BAND EDGES MEASUREMENT

4.7.1 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESIB7	100188	Dec. 21, 2009	Dec. 20, 2010
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Dec. 31, 2009	Dec. 30, 2010
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Apr. 27, 2010	Apr. 26, 2011
HORN Antenna SCHWARZBECK	9120D	9120D-405	Feb. 03, 2010	Feb. 02, 2011
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170243	Dec. 25, 2009	Dec. 24, 2010
Preamplifier Agilent	8447D	2944A10633	Nov. 02, 2010	Nov. 01, 2011
Preamplifier Agilent	8449B	3008A01964	Nov. 02, 2010	Nov. 01, 2011
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	238141/4	May 14, 2010	May 13, 2011
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	12738/6	May 14, 2010	May 13, 2011
Software ADT.	ADT_Radiated_ V7.6.15.9.2	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller inn-co GmbH	CO2000	017303	NA	NA
Turn Table ADT.	TT100.	TT93021703	NA	NA
Turn Table Controller ADT.	SC100.	SC93021703	NA	NA
26GHz ~ 40GHz Amplifier	EM26400	07026401	Aug. 25, 2010	Aug. 24, 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

- 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. Set both RBW and VBW of spectrum analyzer to 1MHz and 3MHz with suitable frequency span including 100MHz bandwidth from band edge. The band edges was measured and recorded.

NOTE: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 1kHz for Average detection (AV) at frequency above 1GHz

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 signals in the restricted bands above and below the 5.15 to 5.25GHz allocated band a measurement was made of the amplitude of the spurious emissions with respect to the intentional signals. The relative amplitude, in dBc, was applied to the average and peak field strength of the intentional signal made on the OATS to calculate the field strength of the unintentional signals.

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

802.11a

RESTRICT BAND (4500 ~ 5150 MHz)

FREQUENCY (MHz)	FUNDAMENTAL EMISSION (dBuV/m)	DELTA (dB)	MAXIMUM FIELD STRENGTH IN RESTRICT BAND (dBuV/m)	LIMIT (dBuV/m)
5180.00 (PK)	106.0	44.01	61.99	74.00
5180.00 (AV)	93.7	45.75	47.95	54.00

RESTRICT BAND (5350 ~ 5460 MHz)

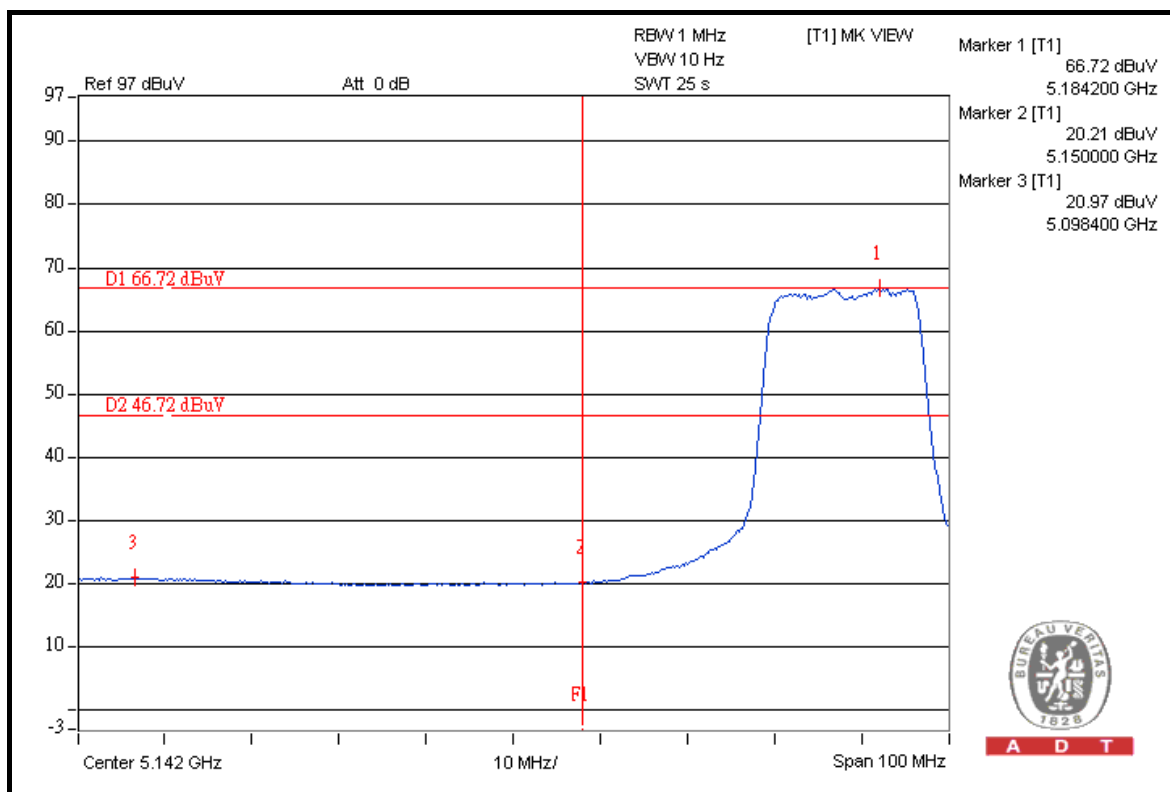
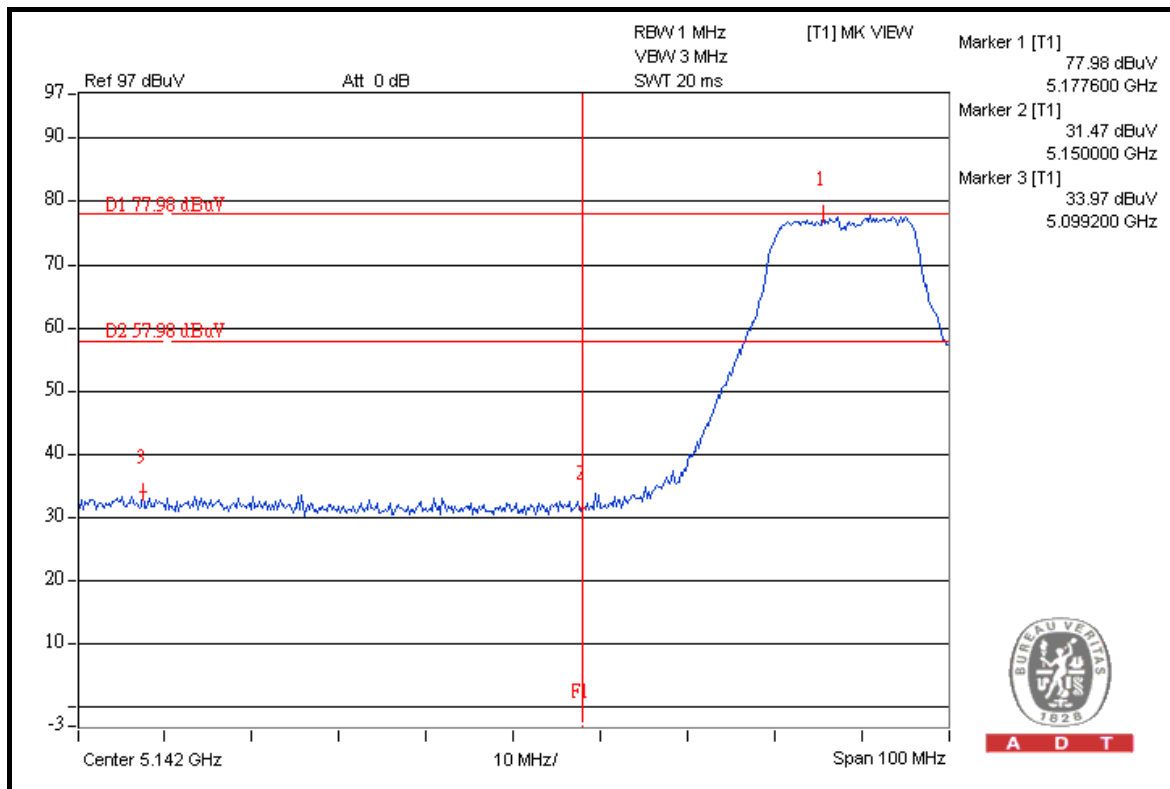
FREQUENCY (MHz)	FUNDAMENTAL EMISSION (dBuV/m)	DELTA (dB)	MAXIMUM FIELD STRENGTH IN RESTRICT BAND (dBuV/m)	LIMIT (dBuV/m)
5240.00 (PK)	106.2	45.45	60.75	74.00
5240.00 (AV)	94.0	45.97	48.03	54.00

NOTE:

1. Delta = Amplitude between the peak of the fundamental and the peak of the band edge emission. Please check following 3 pages.
2. Maximum field strength in restrict band = Fundamental emission – Delta.

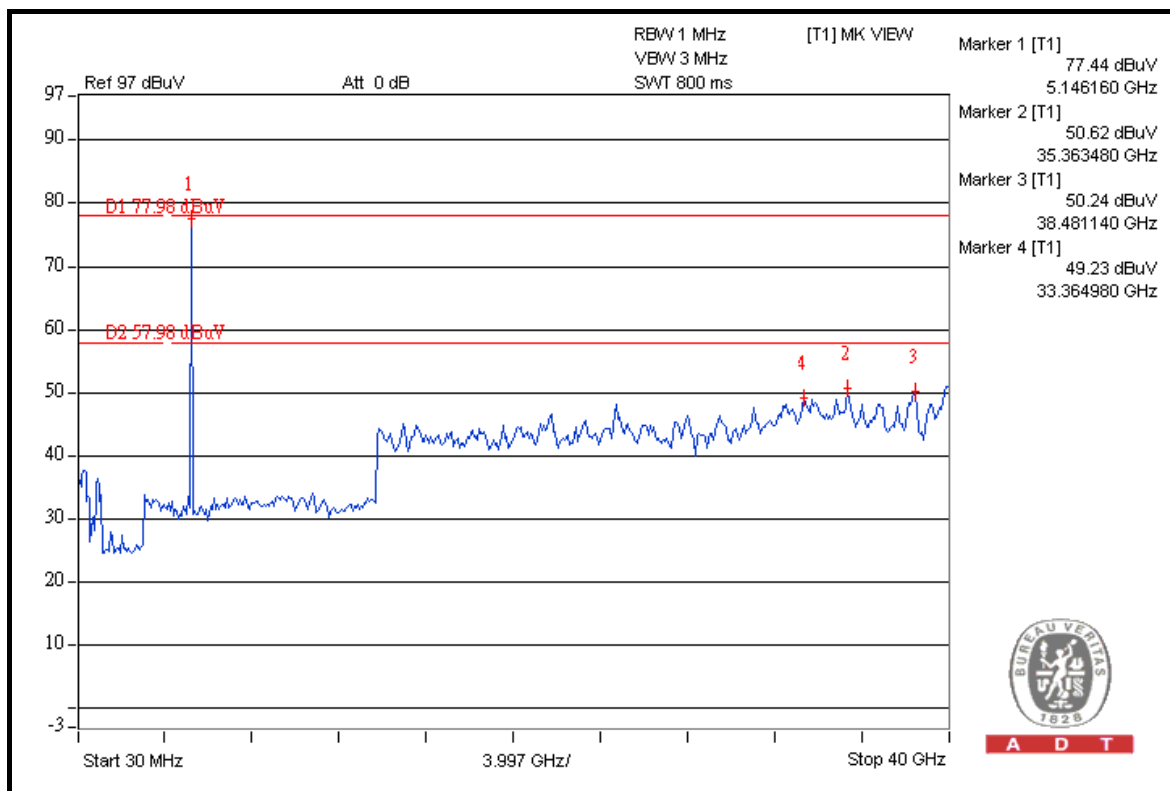


A D T

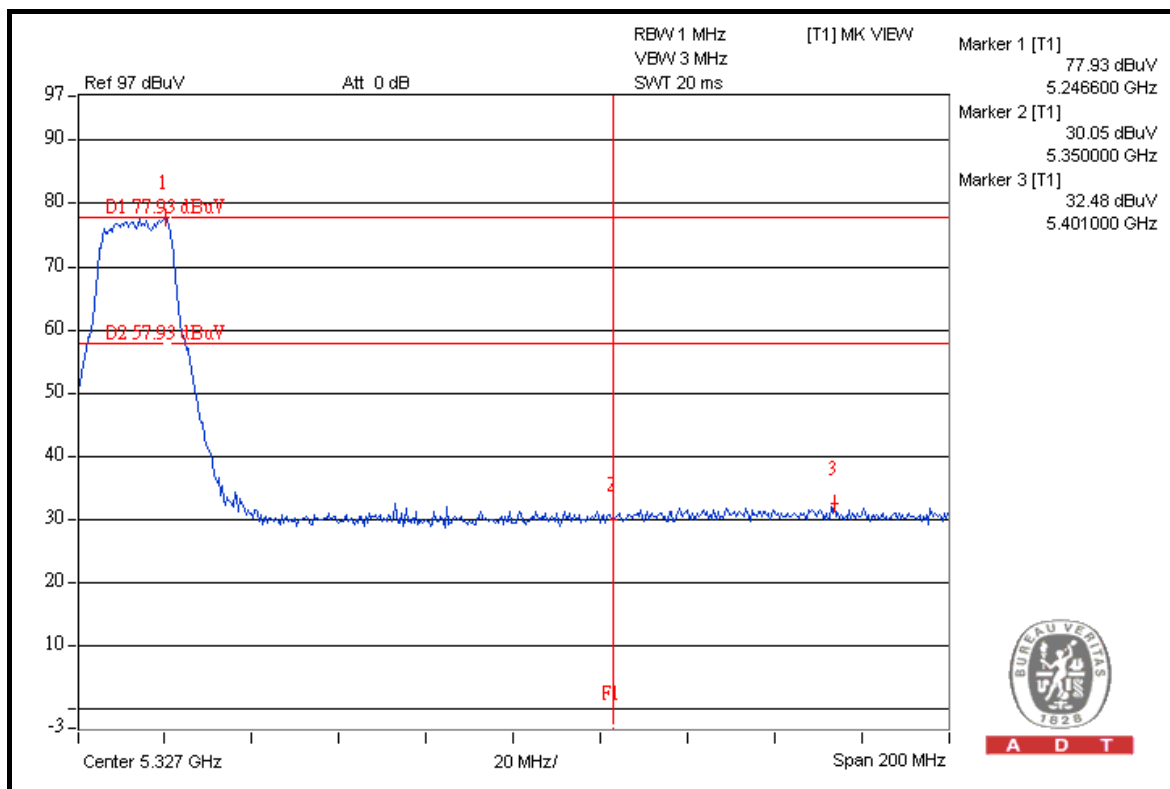




A D T



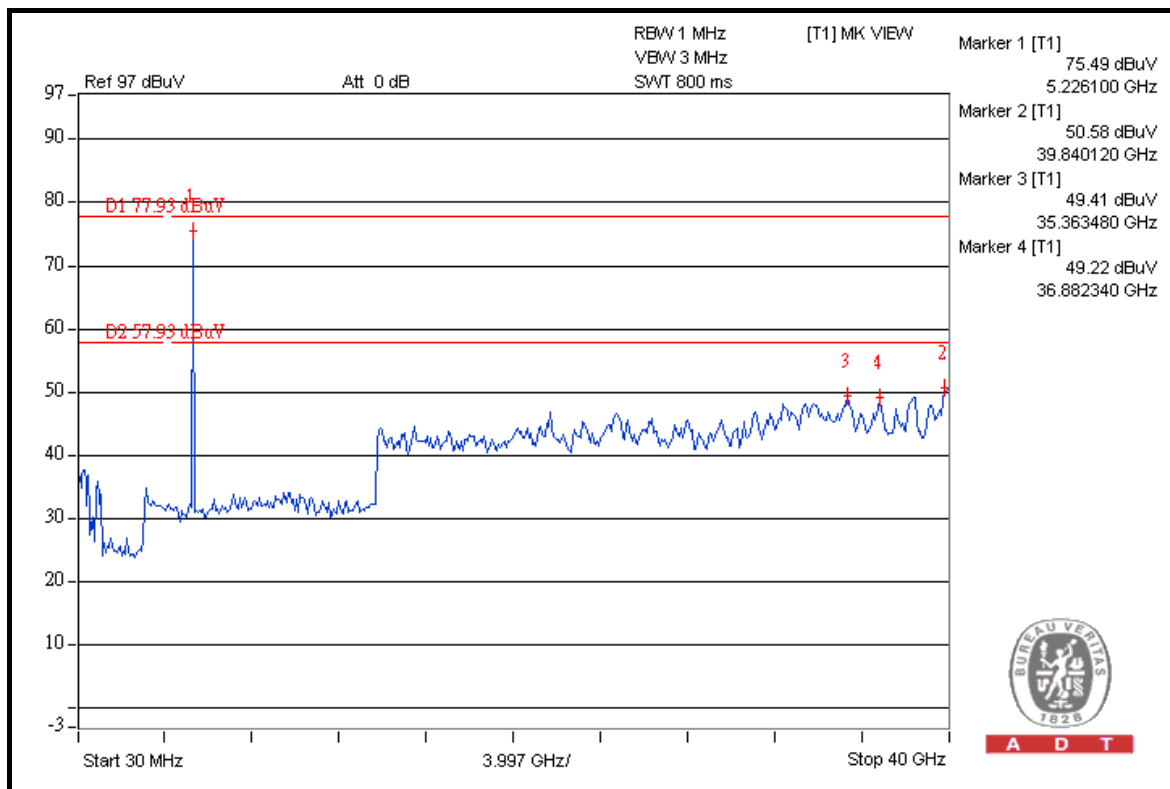
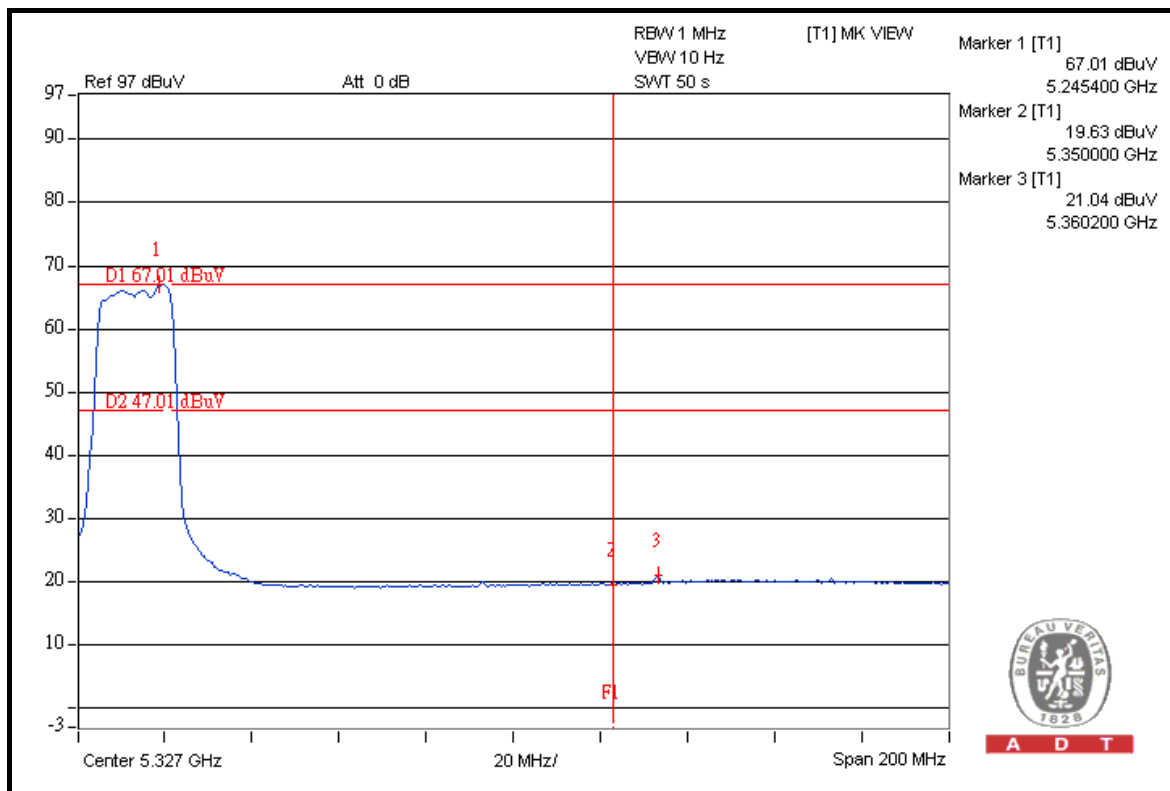
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A D T



A D T



802.11n (20MHz)

RESTRICT BAND (4500 ~ 5150 MHz)

FREQUENCY (MHz)	FUNDAMENTAL EMISSION (dBuV/m)	DELTA (dB)	MAXIMUM FIELD STRENGTH IN RESTRICT BAND (dBuV/m)	LIMIT (dBuV/m)
5180.00 (PK)	110.3	48.06	62.24	74.00
5180.00 (AV)	98.0	49.92	48.08	54.00

RESTRICT BAND (5350 ~ 5460 MHz)

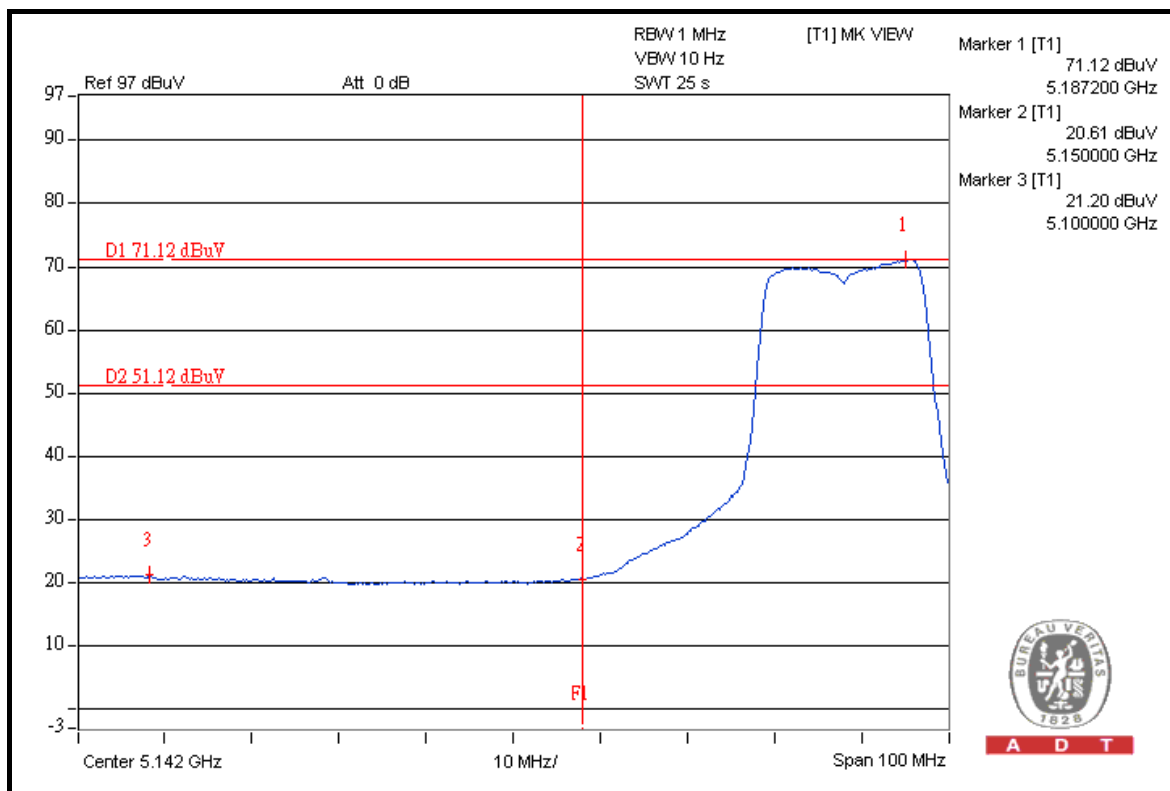
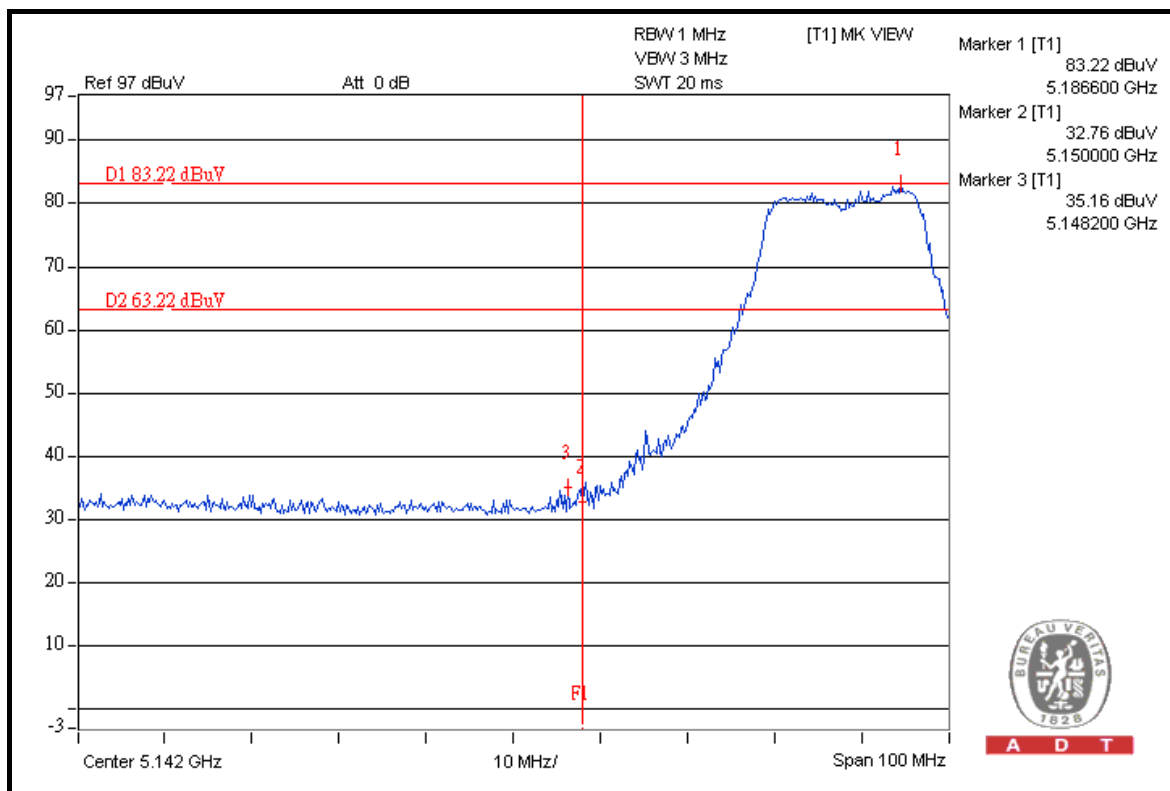
FREQUENCY (MHz)	FUNDAMENTAL EMISSION (dBuV/m)	DELTA (dB)	MAXIMUM FIELD STRENGTH IN RESTRICT BAND (dBuV/m)	LIMIT (dBuV/m)
5240.00 (PK)	110.5	49.98	60.52	74.00
5240.00 (AV)	98.3	49.19	49.11	54.00

NOTE:

1. Delta = Amplitude between the peak of the fundamental and the peak of the band edge emission.
Please check following 3 pages.
2. Maximum field strength in restrict band = Fundamental emission – Delta.

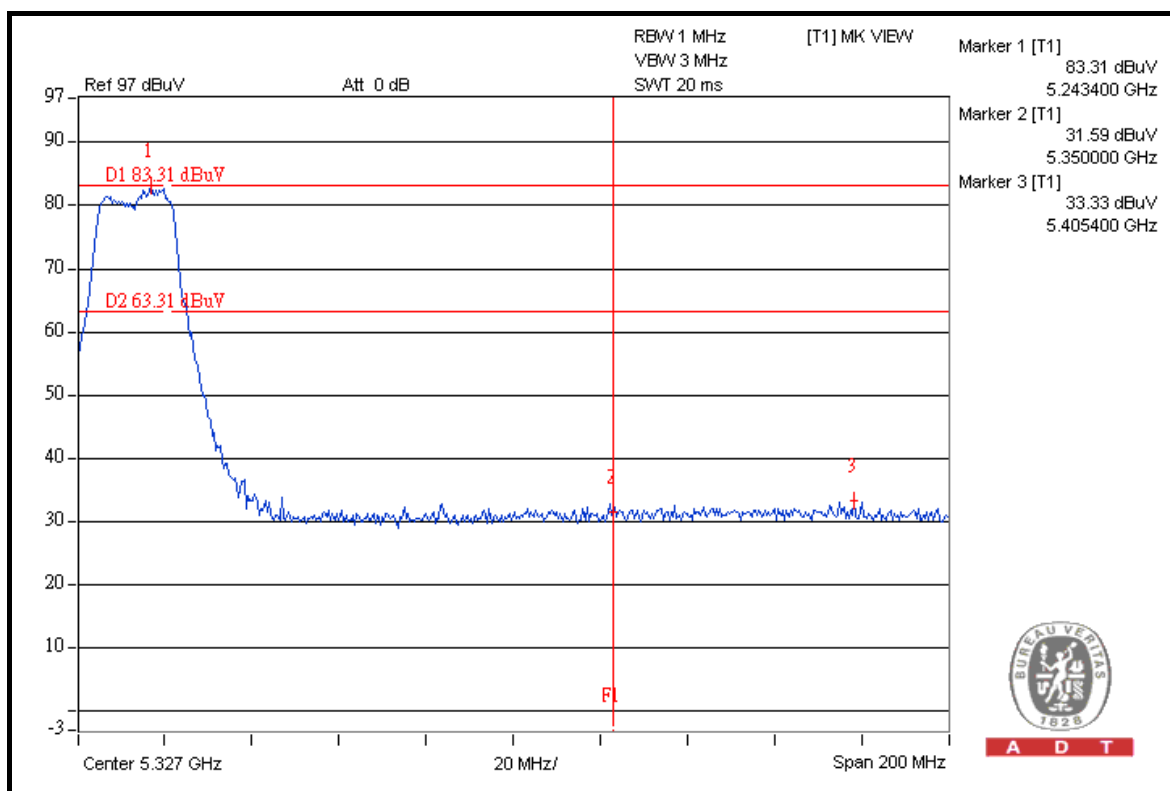
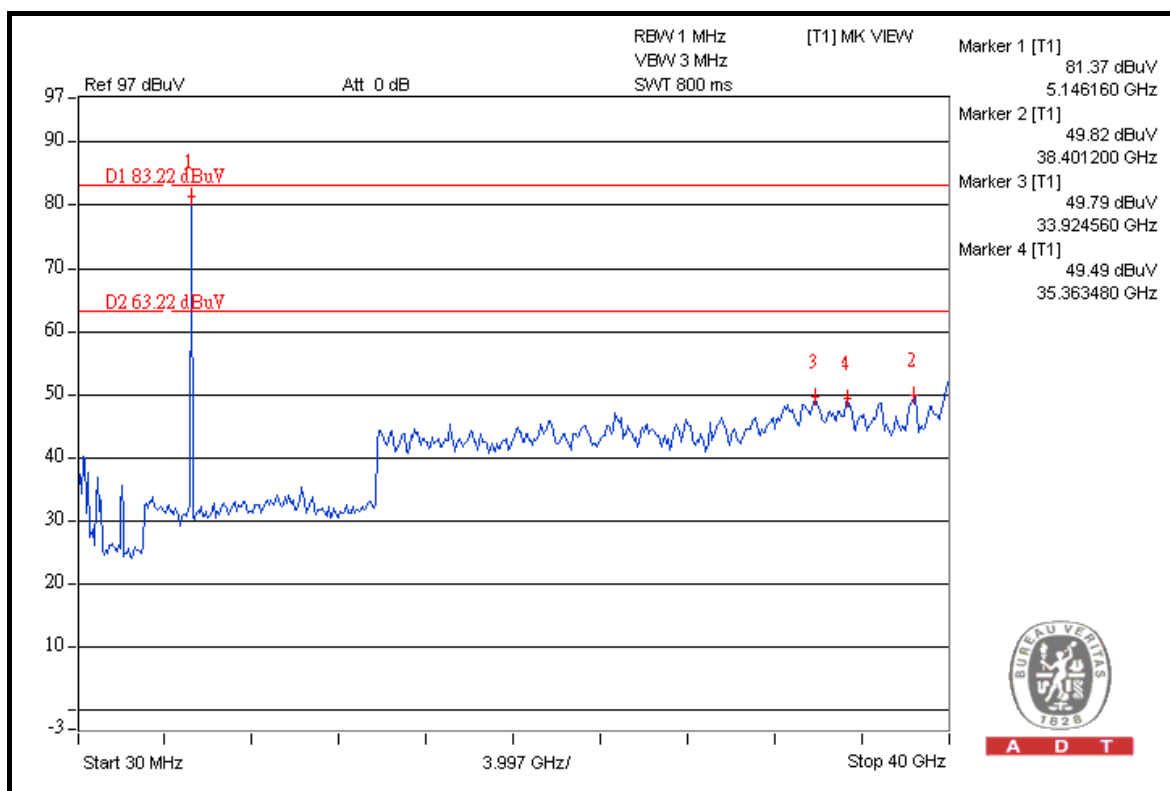


A D T



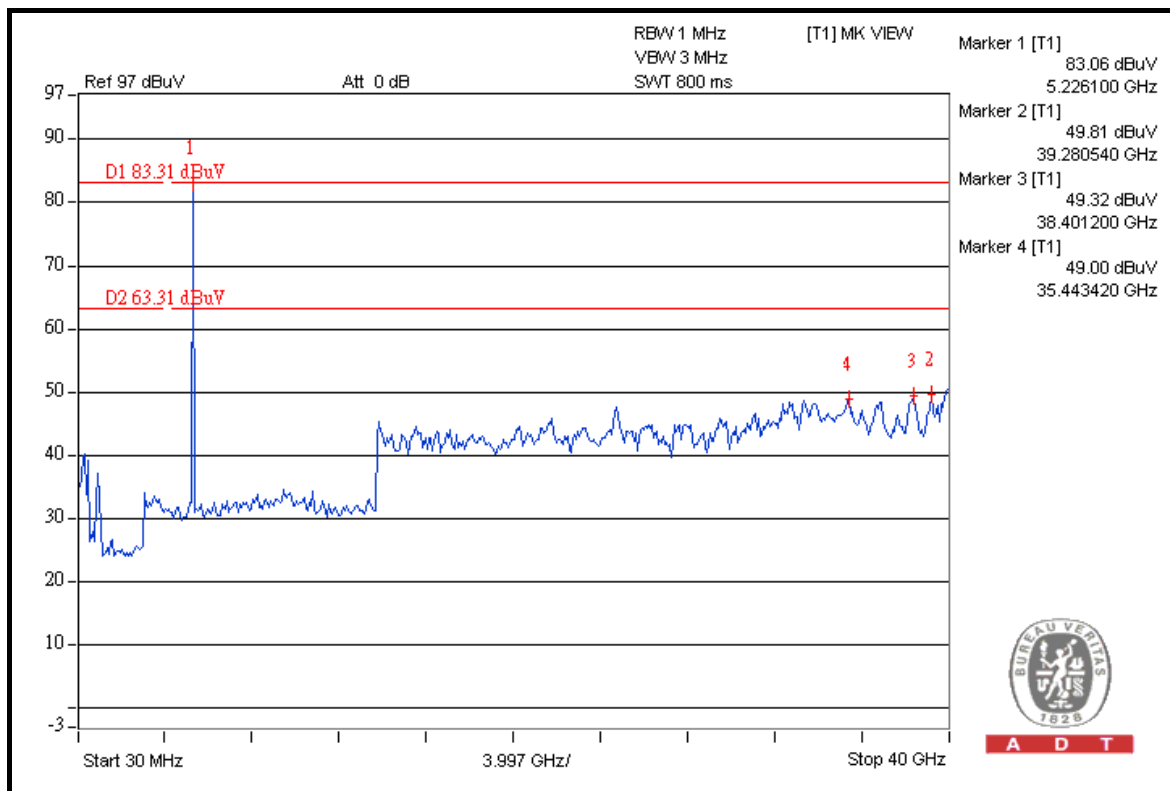
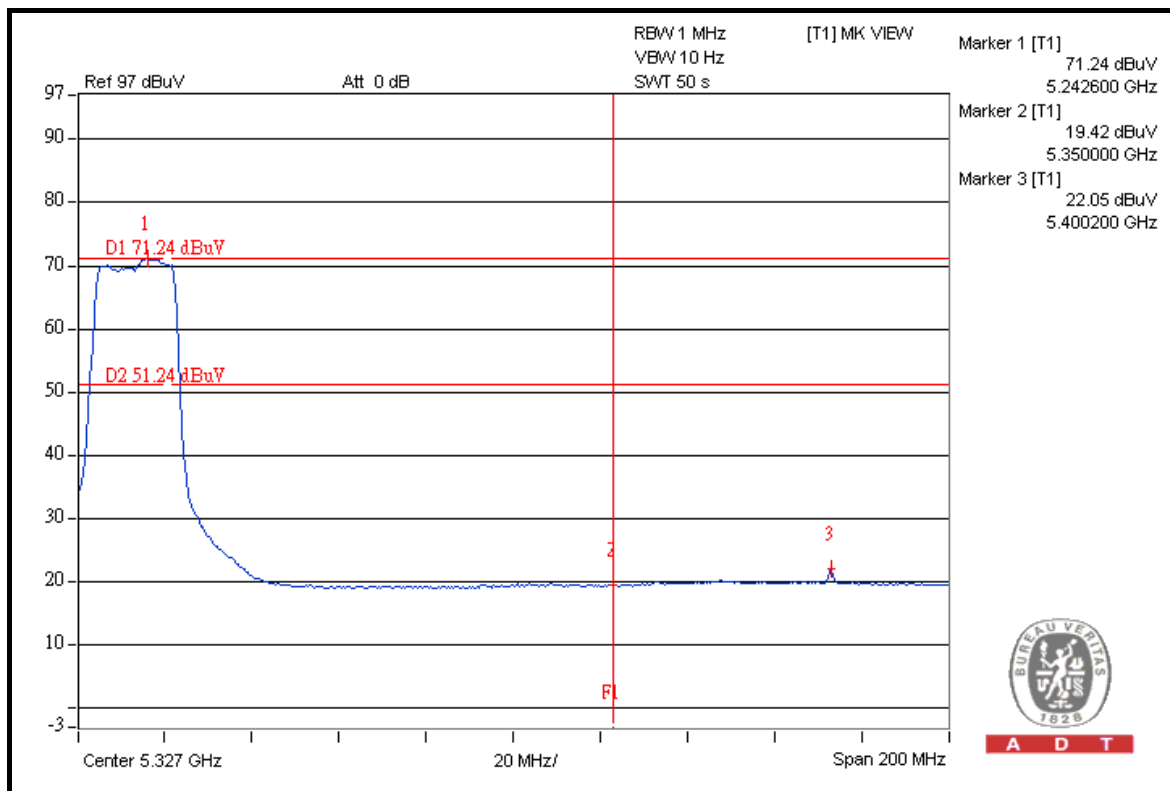


A D T





A D T



802.11n (40MHz)

RESTRICT BAND (4500 ~ 5150 MHz)

FREQUENCY (MHz)	FUNDAMENTAL EMISSION (dBuV/m)	DELTA (dB)	MAXIMUM FIELD STRENGTH IN RESTRICT BAND (dBuV/m)	LIMIT (dBuV/m)
5190.00 (PK)	107.4	38.10	69.30	74.00
5190.00 (AV)	95.9	43.24	52.66	54.00

RESTRICT BAND (5350 ~ 5460 MHz)

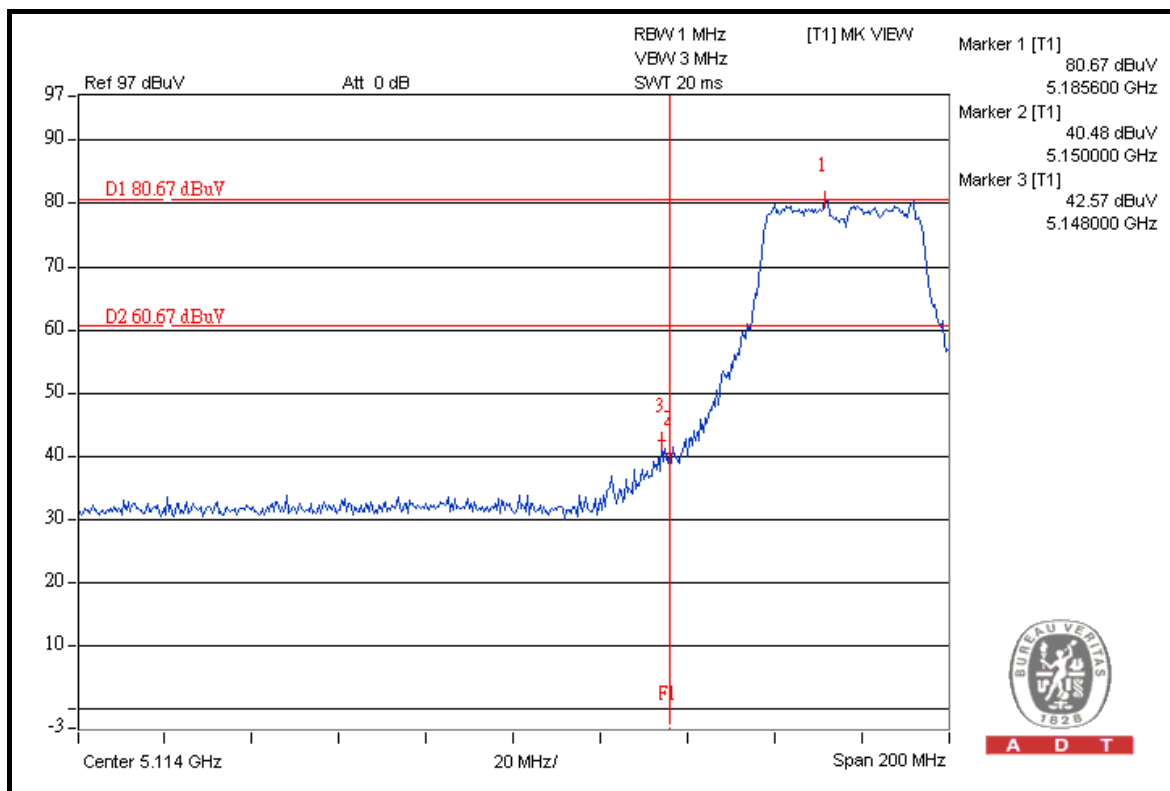
FREQUENCY (MHz)	FUNDAMENTAL EMISSION (dBuV/m)	DELTA (dB)	MAXIMUM FIELD STRENGTH IN RESTRICT BAND (dBuV/m)	LIMIT (dBuV/m)
5230.00 (PK)	107.1	47.43	59.67	74.00
5230.00 (AV)	95.6	46.86	48.74	54.00

NOTE:

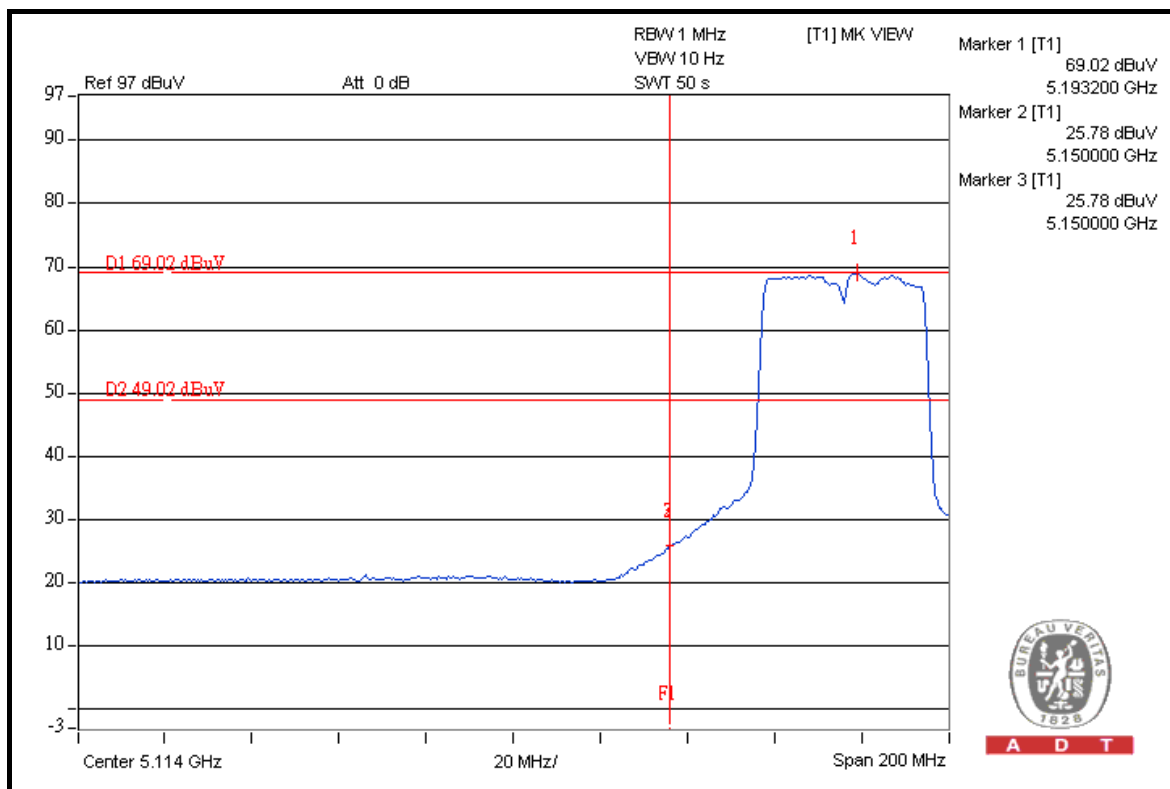
- Delta = Amplitude between the peak of the fundamental and the peak of the band edge emission. Please check following 3 pages.
- Maximum field strength in restrict band = Fundamental emission – Delta.



A D T



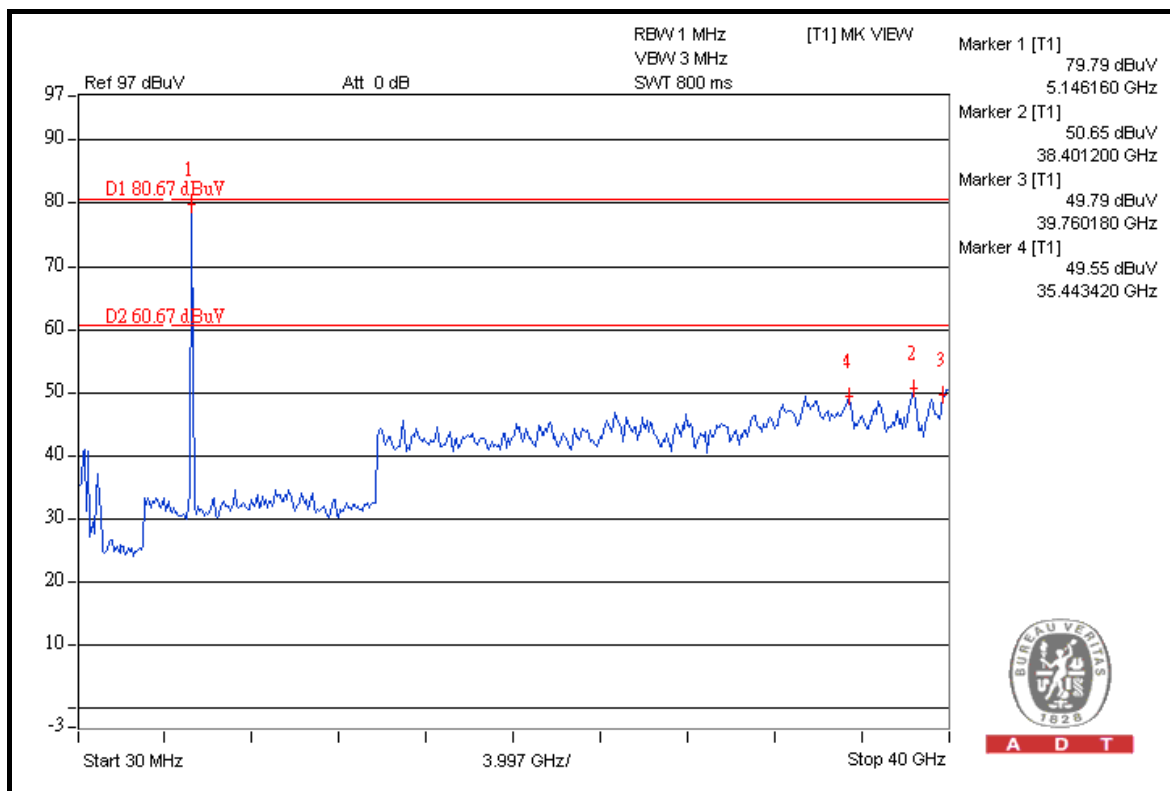
A D T



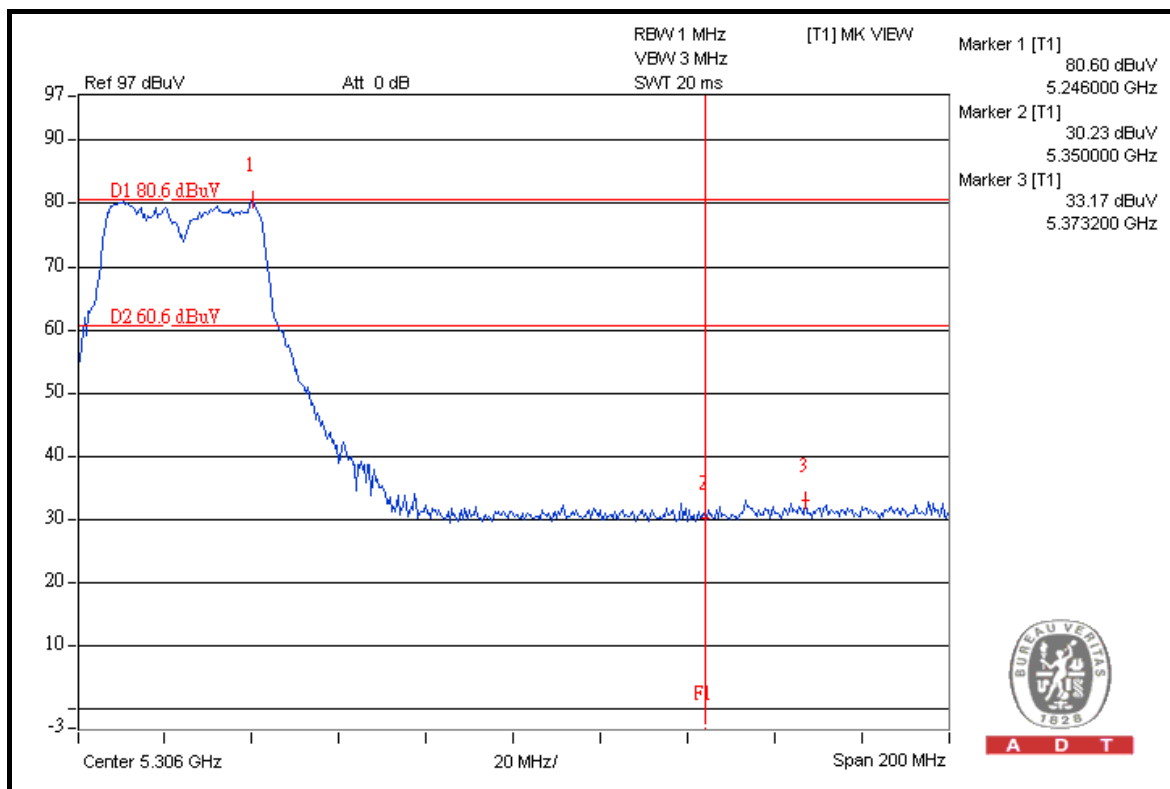
A D T



A D T



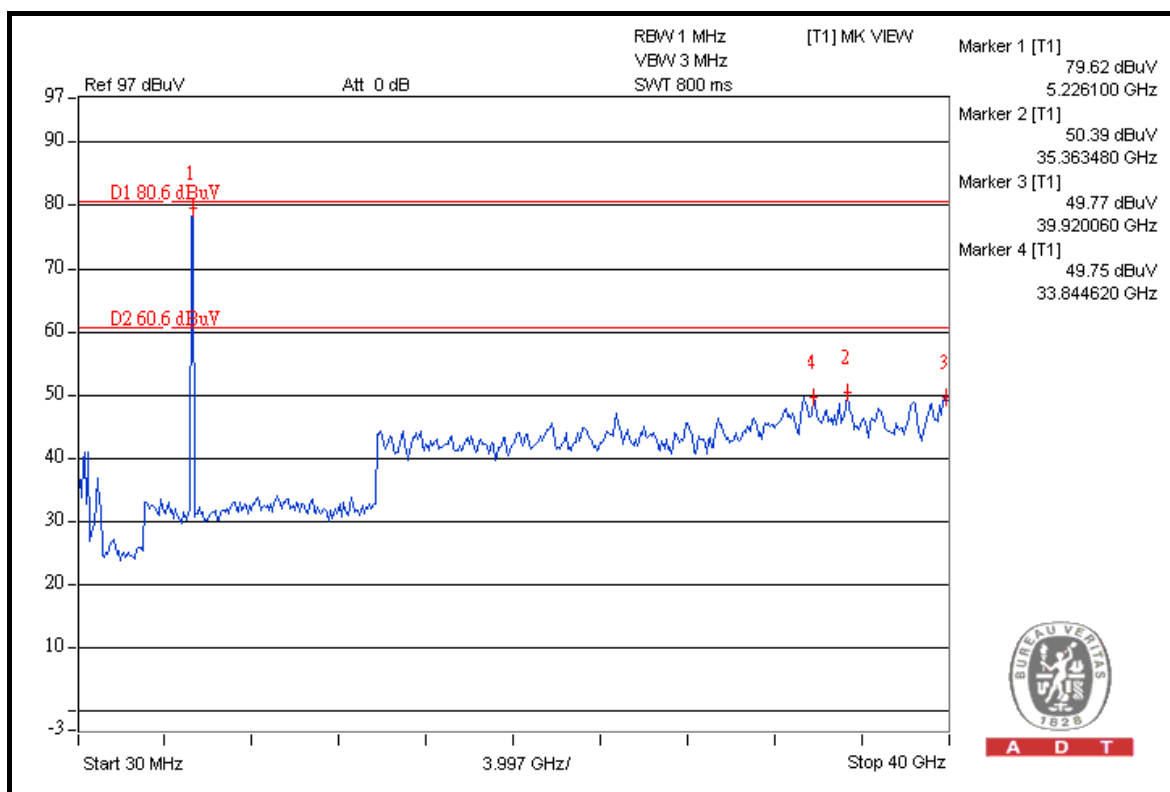
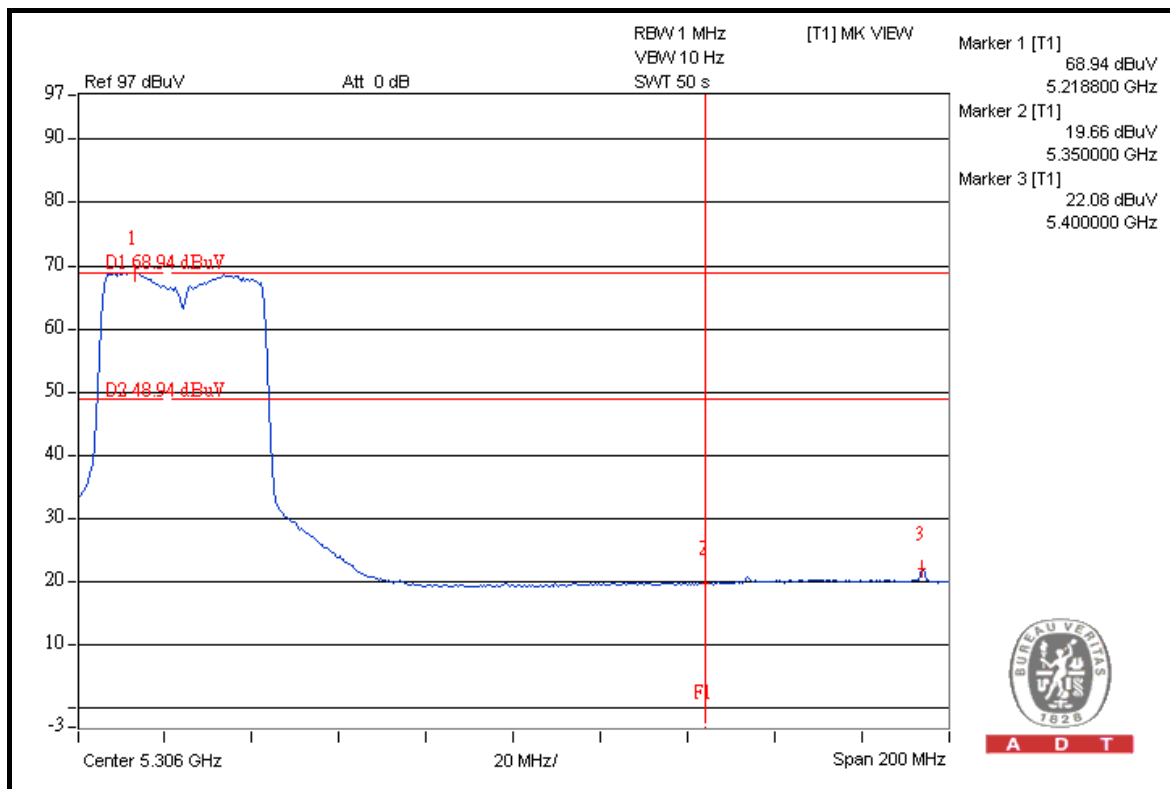
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A D T



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5. PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).

6. 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 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: 886-2-26051924

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.

7. 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.

---END---