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FCC TEST REPORT (WLAN 15.247)

REPORT NO.: RF141124D08

MODEL NO.: EA2750

FCC ID: Q87-EA2750

RECEIVED: Nov. 24, 2014

TESTED: Jan. 9 ~ 16, 2015

ISSUED: Feb. 12, 2015

APPLICANT: Linksys LLC

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

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TABLE OF CONTENTS

RELEASE CONTROL RECORD	4
1. CERTIFICATION.....	5
2. SUMMARY OF TEST RESULTS	6
2.1 MEASUREMENT UNCERTAINTY	6
3. GENERAL INFORMATION	7
3.1 GENERAL DESCRIPTION OF EUT	7
3.2 DESCRIPTION OF TEST MODES	9
3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL.....	10
3.3 DUTY CYCLE OF TEST SIGNAL	12
3.4 DESCRIPTION OF SUPPORT UNITS	13
3.4.1 CONFIGURATION OF SYSTEM UNDER TEST.....	14
3.5 GENERAL DESCRIPTION OF APPLIED STANDARDS.....	15
4. TEST TYPES AND RESULTS	16
4.1 RADIATED EMISSION AND BANDEDGE MEASUREMENT	16
4.1.1 LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT	16
4.1.2 TEST INSTRUMENTS.....	17
4.1.3 TEST PROCEDURES	18
4.1.4 DEVIATION FROM TEST STANDARD.....	18
4.1.5 TEST SETUP.....	19
4.1.6 EUT OPERATING CONDITIONS	20
4.1.7 TEST RESULTS	21
4.2 CONDUCTED EMISSION MEASUREMENT.....	34
4.2.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT	34
4.2.2 TEST INSTRUMENTS.....	34
4.2.3 TEST PROCEDURES	35
4.2.4 DEVIATION FROM TEST STANDARD.....	35
4.2.5 TEST SETUP.....	35
4.2.6 EUT OPERATING CONDITIONS	35
4.2.7 TEST RESULTS	36
4.3 6DB BANDWIDTH MEASUREMENT	38
4.3.1 LIMITS OF 6DB BANDWIDTH MEASUREMENT	38
4.3.2 TEST SETUP.....	38
4.3.3 TEST INSTRUMENTS.....	38
4.3.4 TEST PROCEDURE.....	38
4.3.5 DEVIATION FROM TEST STANDARD.....	38
4.3.6 EUT OPERATING CONDITIONS	38
4.3.7 TEST RESULTS	39



A D T

4.4	CONDUCTED OUTPUT POWER.....	41
4.4.1	LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT.....	41
4.4.2	TEST SETUP.....	41
4.4.3	TEST INSTRUMENTS.....	41
4.4.4	TEST PROCEDURES.....	41
4.4.5	DEVIATION FROM TEST STANDARD.....	41
4.4.6	EUT OPERATING CONDITIONS.....	41
4.4.7	TEST RESULTS - FOR PEAK POWER.....	42
4.4.8	TEST RESULTS - FOR AVERAGE POWER.....	43
4.5	POWER SPECTRAL DENSITY MEASUREMENT.....	44
4.5.1	LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT.....	44
4.5.2	TEST SETUP.....	44
4.5.3	TEST INSTRUMENTS.....	44
4.5.4	TEST PROCEDURE.....	44
4.5.5	DEVIATION FROM TEST STANDARD.....	44
4.5.6	EUT OPERATING CONDITION.....	44
4.5.7	TEST RESULTS.....	45
4.6	CONDUCTED OUT OF BAND EMISSION MEASUREMENT.....	47
4.6.1	LIMITS OF CONDUCTED OUT OF BAND EMISSION MEASUREMENT.....	47
4.6.2	TEST SETUP.....	47
4.6.3	TEST INSTRUMENTS.....	47
4.6.4	TEST PROCEDURE.....	47
4.6.5	DEVIATION FROM TEST STANDARD.....	48
4.6.6	EUT OPERATING CONDITION.....	48
4.6.7	TEST RESULTS.....	48
5.	PHOTOGRAPHS OF THE TEST CONFIGURATION.....	55
6.	INFORMATION ON THE TESTING LABORATORIES.....	56
7.	APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB.....	57



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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF141124D08	Original release	Feb. 12, 2015



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1. CERTIFICATION

PRODUCT: Wireless Network
BRAND NAME: Linksys
MODEL NO.: EA2750
APPLICANT: Linksys LLC
TESTED: Jan. 9 ~ 16, 2015
TEST SAMPLE: ENGINEERING SAMPLE
STANDARDS: FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10-2009

The above equipment 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 : Annie Chang , **DATE:** Feb. 12, 2015
(Annie Chang / Supervisor)

APPROVED BY : Rex Lai , **DATE:** Feb. 12, 2015
(Rex Lai / Assistant Manager)

2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.247)			
STANDARD SECTION	TEST TYPE	RESULT	REMARK
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -7.02dB at 0.35313MHz.
15.205 & 15.209	Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -6.0dB at 4924.00MHz.
15.247(d)	Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -1.1dB at 2390.00 & 2483.50MHz.
15.247(d)	Antenna Port Emission	PASS	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted power	PASS	Meet the requirement of limit.
15.247(e)	Power Spectral Density	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used.

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	3.43 dB
Radiated emissions	30MHz ~ 1GHz	4.00 dB
	Above 1GHz	3.36 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	Wireless Network
MODEL NO.	EA2750
POWER SUPPLY	12V, 1A
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 802.11n: up to 300Mbps
OPERATING FREQUENCY	2412 ~ 2462MHz
NUMBER OF CHANNEL	11 for 802.11b, 802.11g, 802.11n (20MHz) 7 for 802.11n (40MHz)
OUTPUT POWER	614.2mW
ANTENNA TYPE	Dipole antenna with 1.76dBi gain
ANTENNA CONNECTOR	N/A
DATA CABLE	N/A
I/O PORTS	Refer to user's manual
ACCESSORY DEVICES	Adapter
DRIVE VERSION	1.1.5.165608

NOTE:

1. The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and two receivers.

Modulation Mode	Tx Function
802.11b	1TX
802.11g	1TX
802.11n (20MHz)	2TX
802.11n (40MHz)	2TX

2. Both of the 2.4GHz & 5GHz can transmit simultaneously.



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3. The EUT uses following adapter.

Adapter	Brand	Model	AC I/P Power	DC O/P Power	Plug Type	Power Line
1	DVE	DSA-12G-12 FUS 120120	100-240V, 50/60Hz, 0.3A	+12V, 1A	US	Non-shielded DC cable (1.0m)
2	DVE	DSA-12G-12 FEU 120120	100-240V, 50/60Hz, 0.3A	+12V, 1A	EU	
3	DVE	DSA-12G-12 FUK 120120	100-240V, 50/60Hz, 0.3A	+12V, 1A	UK	
4	DVE	DSA-12G-12 FAU 120120	100-240V, 50/60Hz, 0.3A	+12V, 1A	AUS	
5	DVE	DSA-12PFE-12BUS	100-240V, 50/60Hz, 0.3A	+12V, 1A	US	
6	DVE	DSA-12CA-12 120100	100-240V, 50/60Hz, 0.3A	+12V, 1A	US	
7					EU	
8					UK	
9	LEI	MU12AB120100-A1	100-240V, 50/60Hz, 0.4A	+12V, 1A	US	
10	LEI	IU18-2120100-WP	100-240V, 50/60Hz, 0.6A	+12V, 1A	US	
11					EU	
12					UK	

After pre-tested, **Adapter 6** was the worst case, therefore, only its test data was recorded in this report.

4. The above EUT information is 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

11 channels are provided for 802.11b, 802.11g and 802.11n (20MHz):

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
1	2412MHz	7	2442MHz
2	2417MHz	8	2447MHz
3	2422MHz	9	2452MHz
4	2427MHz	10	2457MHz
5	2432MHz	11	2462MHz
6	2437MHz		

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

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
3	2422MHz	7	2442MHz
4	2427MHz	8	2447MHz
5	2432MHz	9	2452MHz
6	2437MHz		

3.2.1 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

NOTE: The EUT had been pre-tested on the positioned of each X, Y axis. The worst case was found when positioned on X-plane.

RADIATED EMISSION TEST (ABOVE 1GHz):

- ☒ 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)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
-	802.11n (20MHz)	1 to 11	1, 6, 11	OFDM	BPSK	13
-	802.11n (40MHz)	3 to 9	3, 6, 9	OFDM	BPSK	27

RADIATED EMISSION TEST (BELOW 1GHz):

- ☒ 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)
-	802.11g	1 to 11	1	OFDM	BPSK	6

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)
-	802.11g	1 to 11	1	OFDM	BPSK	6

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)
-	802.11b	1 to 11	1, 11	DSSS	DBPSK	1
-	802.11g	1 to 11	1, 11	OFDM	BPSK	6
-	802.11n (20MHz)	1 to 11	1, 11	OFDM	BPSK	13
-	802.11n (40MHz)	3 to 9	3, 9	OFDM	BPSK	27

ANTENNA PORT CONDUCTED MEASUREMENT:

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

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
-	802.11n (20MHz)	1 to 11	1, 6, 11	OFDM	BPSK	13
-	802.11n (40MHz)	3 to 9	3, 6, 9	OFDM	BPSK	27

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	23deg. C, 75% RH	120Vac, 60Hz	Aaron You
RE<1G	23deg. C, 75% RH	120Vac, 60Hz	Aaron You
PLC	26deg. C, 74% RH	120Vac, 60Hz	Justin Liu
APCM	25deg. C, 60% RH	120Vac, 60Hz	Saxon Lee

3.3 DUTY CYCLE OF TEST SIGNAL

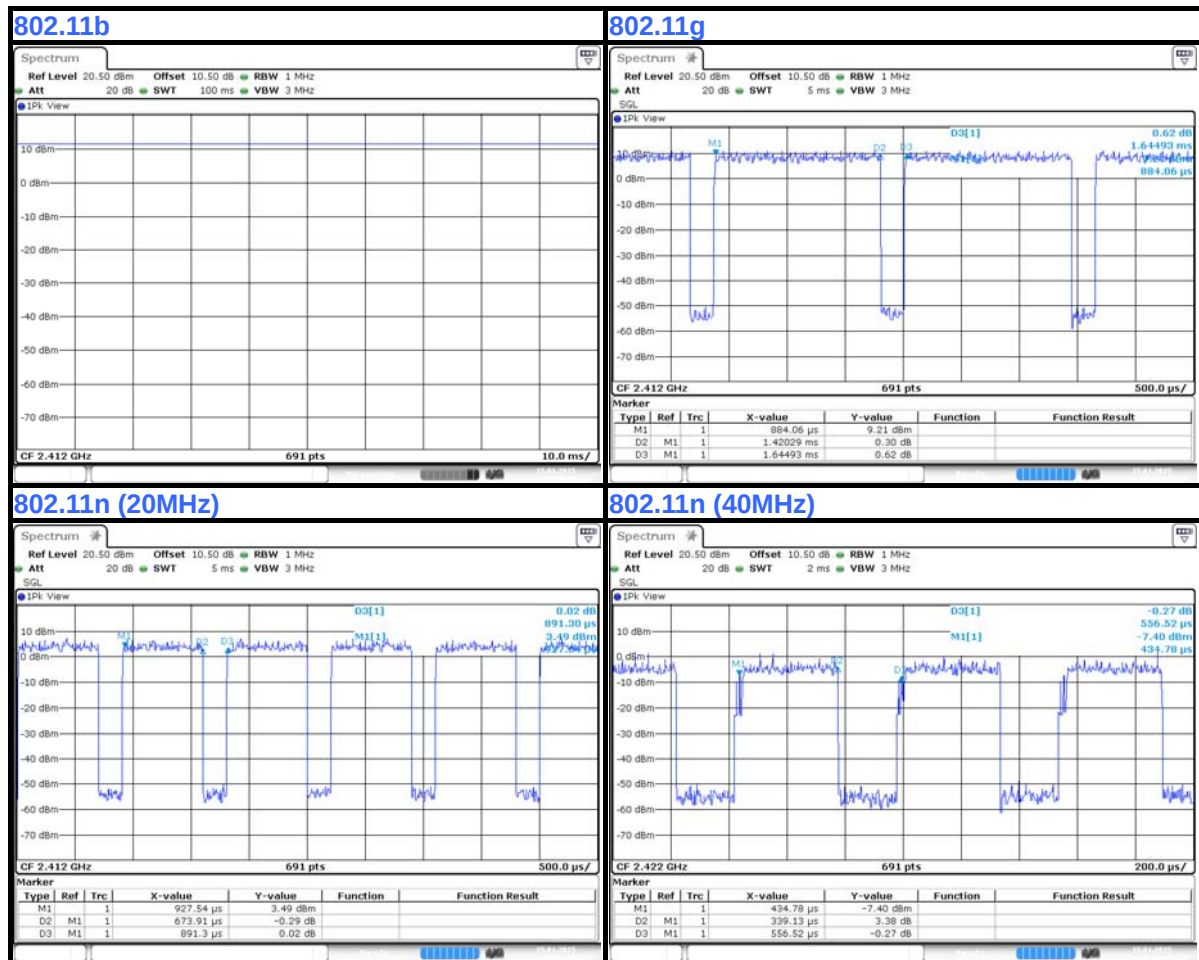
Duty cycle is < 98%, duty factor shall be considered (Duty cycle of test signal of 802.11b is > 98 %).

802.11b: Duty cycle of test signal is 100 %

802.11g: Duty cycle = $1.420/1.644 = 0.864$, Duty factor = $10 * \log(1/0.864) = 0.63$

802.11n (20MHz): Duty cycle = $0.673/0.891 = 0.755$, Duty factor = $10 * \log(1/0.755) = 1.22$

802.11n (40MHz): Duty cycle = $0.339/0.556 = 0.610$, Duty factor = $10 * \log(1/0.610) = 2.15$





3.4 DESCRIPTION OF SUPPORT UNITS

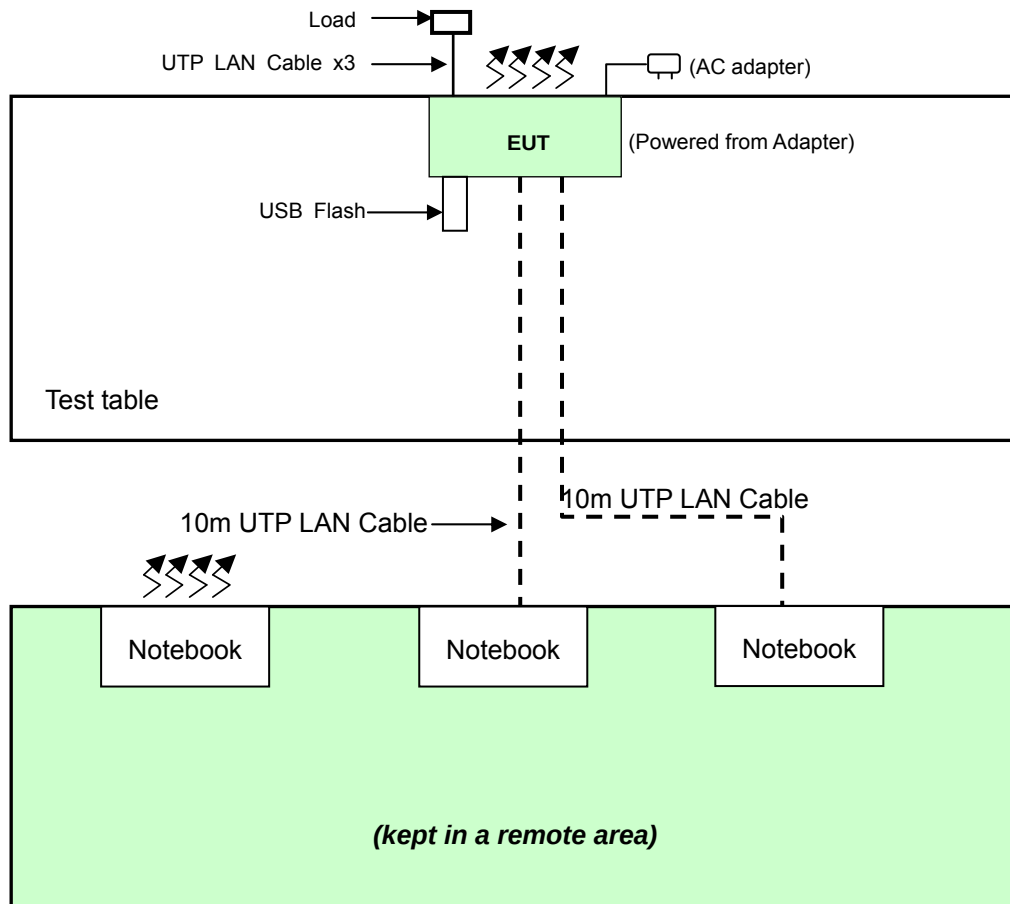
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	USB 3.0 Flash Drive	HP	v250w	N/A	FCC DoC Approved
2	NOTEBOOK COMPUTER	DELL	PP04X	1W9ZZ1S	FCC DoC Approved
3	NOTEBOOK COMPUTER	DELL	PP27L	9SNZ12S	FCC DoC Approved
4	NOTEBOOK COMPUTER	DELL	PP04X	6C1VY1S	FCC DoC Approved
5	LAN Load	N/A	N/A	N/A	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	N/A
2	10m UTP LAN cable
3	10m UTP LAN cable
4	Wireless transmission
5	1.8m UTP LAN cable x3

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

3.4.1 CONFIGURATION OF SYSTEM UNDER TEST





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3.5 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 C (15.247)

558074 D01 DTS Meas Guidance v03r02

662911 D01 Multiple Transmitter Output v02r01

ANSI C63.10-2009

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

NOTE: The product has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

4. TEST TYPES AND RESULTS

4.1 RADIATED EMISSION AND BANDEDGE MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

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. 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 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
HP Preamplifier	8447D	2432A03504	Feb. 26, 2014	Feb. 25, 2015
HP Preamplifier	8449B	3008A01201	Feb. 26, 2014	Feb. 25, 2015
MITEQ Preamplifier	AMF-6F-260400-3 3-8P	892164	Mar. 01, 2014	Feb. 28, 2015
Agilent Spectrum	E4446A	MY51100050	Oct. 24, 2014	Oct. 23, 2015
Agilent TEST RECEIVER	N9038A	MY51210129	Jan. 20, 2015	Jan. 19, 2016
Schwarzbeck Antenna	VULB 9168	139	Feb. 24, 2014	Feb. 23, 2015
Schwarzbeck Antenna	VHBA 9123	480	May 29, 2013	May 28, 2015
Schwarzbeck Horn Antenna	BBHA-9170	212	Aug. 26, 2014	Aug. 25, 2015
Schwarzbeck Horn Antenna	BBHA 9120-D1	D130	Aug. 26, 2014	Aug. 25, 2015
ADT. Turn Table	TT100	0306	NA	NA
ADT. Tower	AT100	0306	NA	NA
Software	ADT_Radiated_V7. 6.15.9.4	NA	NA	NA
SUHNER RF cable	SF104	CABLE-CH6	Aug. 15, 2014	Aug. 14, 2015
SUHNER RF cable	SF102	Cable-CH8-3.6m	Aug. 15, 2014	Aug. 14, 2015
EMCO Horn Antenna	3115	00028257	Aug. 28, 2014	Aug. 27, 2015
Highpass filter Wainwright Instruments	WHK 3.1/18G-10SS	SN 8	NA	NA
ROHDE & SCHWARZ Spectrum Analyzer	FSV40	101042	Sep. 29, 2014	Sep. 28, 2015
Anritsu Power Sensor	MA2411B	0738404	Apr. 21, 2014	Apr. 20, 2015
Anritsu Power Meter	ML2495A	0842014	Apr. 21, 2014	Apr. 20, 2015

- NOTE:** 1. The calibration interval of the above test instruments is 12/24 months. And the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in Chamber No. 6.
4. The Industry Canada Reference No. IC 7450E-6.
5. The FCC Site Registration No. is 447212.

4.1.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters 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 lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE:

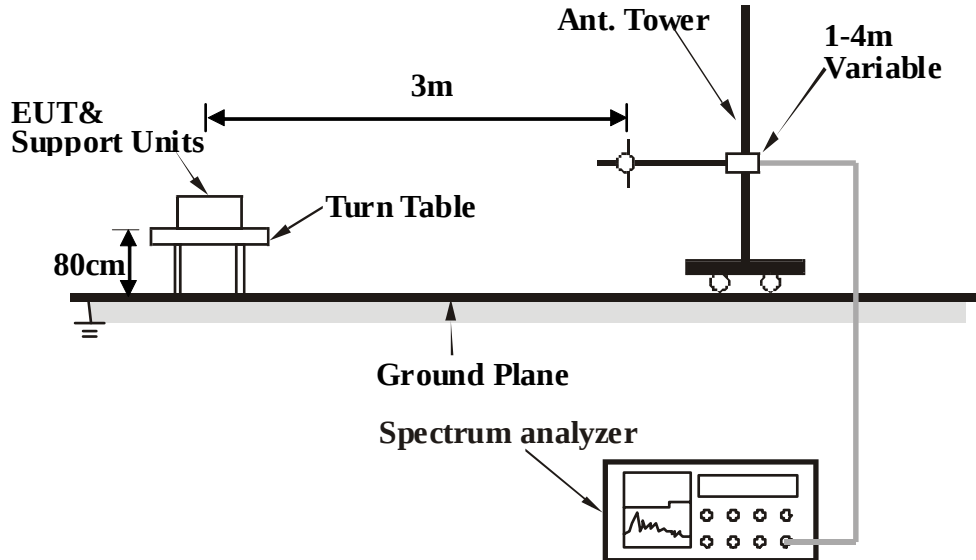
1. For emission measurements above 1 GHz, the EUT shall be placed at a height of 1.5 m above the ground at 3 meter chamber room for test
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or 10Hz (Duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 DEVIATION FROM TEST STANDARD

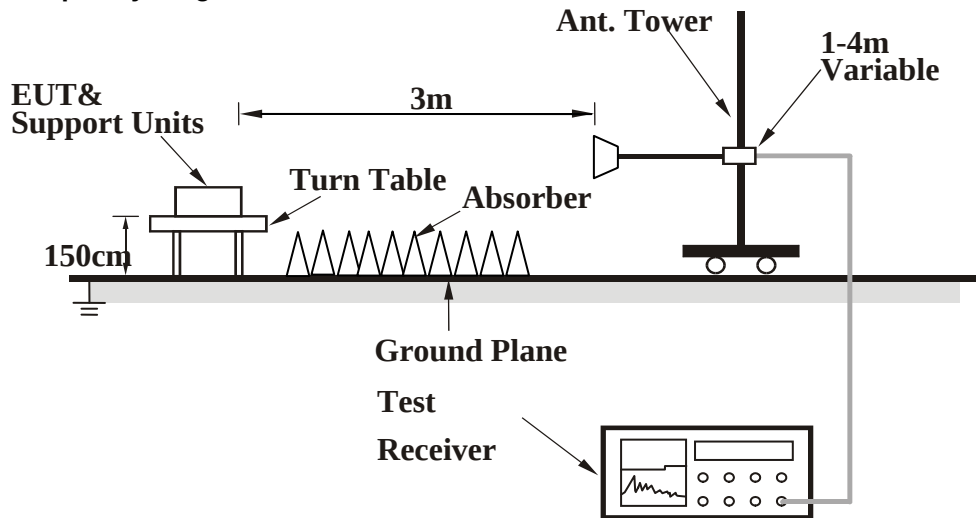
No deviation.

4.1.5 TEST SETUP

Frequency range 30MHz~1GHz



Frequency range above 1GHz



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

4.1.6 EUT OPERATING CONDITIONS

- a. Turned on the power of all equipment.
- b. Notebook PC ran a test program to enable all functions.
- c. EUT sent and received messages from Notebook PC (kept in a remote area) via a wireless transmission.
- d. EUT sent and received messages to/ from Notebook PCs (kept in a remote area) via two UTP LAN cables (10m each).
- e. Notebook PCs (kept in a remote area) sent and received messages to/ from USB flash via EUT with an UTP LAN cable (10m).
- f. Repeated steps c-e.

4.1.7 TEST RESULTS

ABOVE 1GHz DATA

802.11b

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	2390.00	53.1 PK	74.0	-20.9	1.20 H	37	57.31	-4.20
2	2390.00	40.1 AV	54.0	-13.9	1.20 H	37	44.28	-4.20
3	*2412.00	96.9 PK			1.20 H	37	101.02	-4.09
4	*2412.00	93.3 AV			1.20 H	37	97.35	-4.09
5	4824.00	50.6 PK	74.0	-23.4	1.03 H	252	48.25	2.38
6	4824.00	45.4 AV	54.0	-8.6	1.03 H	252	42.99	2.38
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	2390.00	62.2 PK	74.0	-11.8	1.00 V	57	66.38	-4.20
2	2390.00	51.3 AV	54.0	-2.7	1.00 V	57	55.54	-4.20
3	*2412.00	109.8 PK			1.00 V	57	113.92	-4.09
4	*2412.00	106.2 AV			1.00 V	57	110.27	-4.09
5	4824.00	51.8 PK	74.0	-22.2	1.03 V	316	49.42	2.38
6	4824.00	47.9 AV	54.0	-6.1	1.03 V	316	45.51	2.38

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.



A D T

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	*2437.00	105.4 PK			1.09 H	284	109.37	-3.97
2	*2437.00	101.6 AV			1.09 H	284	105.60	-3.97
3	4874.00	51.6 PK	74.0	-22.4	1.02 H	249	49.15	2.46
4	4874.00	46.4 AV	54.0	-7.6	1.02 H	249	43.92	2.46
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	*2437.00	109.9 PK			1.00 V	27	113.86	-3.97
2	*2437.00	106.1 AV			1.00 V	27	110.09	-3.97
3	4874.00	53.2 PK	74.0	-20.8	1.56 V	309	50.70	2.46
4	4874.00	47.7 AV	54.0	-6.4	1.56 V	309	45.19	2.46

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.



A D T

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	*2462.00	103.8 PK			1.11 H	283	107.41	-3.58
2	*2462.00	100.0 AV			1.11 H	283	103.61	-3.58
3	2483.50	61.5 PK	74.0	-12.5	1.11 H	283	64.99	-3.50
4	2483.50	48.8 AV	54.0	-5.2	1.11 H	283	52.30	-3.50
5	4924.00	51.3 PK	74.0	-22.7	1.05 H	250	48.46	2.87
6	4924.00	45.4 AV	54.0	-8.6	1.05 H	250	42.55	2.87
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	*2462.00	110.9 PK			1.00 V	189	114.51	-3.58
2	*2462.00	107.0 AV			1.00 V	189	110.55	-3.58
3	2483.50	67.2 PK	74.0	-6.8	1.00 V	189	70.71	-3.50
4	2483.50	52.9 AV	54.0	-1.1	1.00 V	189	56.38	-3.50
5	4924.00	54.6 PK	74.0	-19.4	1.01 V	175	51.73	2.87
6	4924.00	48.0 AV	54.0	-6.0	1.01 V	175	45.10	2.87

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.



A D T

802.11g

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	2390.00	61.4 PK	74.0	-12.6	1.12 H	217	65.58	-4.20
2	2390.00	43.9 AV	54.0	-10.1	1.12 H	217	48.09	-4.20
3	*2412.00	102.9 PK			1.12 H	217	107.03	-4.09
4	*2412.00	92.2 AV			1.12 H	217	96.31	-4.09
5	4824.00	46.4 PK	74.0	-27.6	1.00 H	257	43.98	2.38
6	4824.00	34.5 AV	54.0	-19.5	1.00 H	257	32.13	2.38
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	2390.00	68.1 PK	74.0	-5.9	1.00 V	53	72.31	-4.20
2	2390.00	52.9 AV	54.0	-1.2	1.00 V	53	57.05	-4.20
3	*2412.00	111.7 PK			1.00 V	53	115.75	-4.09
4	*2412.00	101.3 AV			1.00 V	53	105.36	-4.09
5	4824.00	48.1 PK	74.0	-25.9	1.02 V	307	45.74	2.38
6	4824.00	35.3 AV	54.0	-18.7	1.02 V	307	32.88	2.38

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.



A D T

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	*2437.00	107.9 PK			1.13 H	284	111.91	-3.97
2	*2437.00	97.3 AV			1.13 H	284	101.29	-3.97
3	4874.00	47.3 PK	74.0	-26.7	1.02 H	260	44.83	2.46
4	4874.00	36.1 AV	54.0	-17.9	1.02 H	260	33.62	2.46
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	*2437.00	112.3 PK			1.00 V	58	116.31	-3.97
2	*2437.00	102.6 AV			1.00 V	58	106.57	-3.97
3	4874.00	49.4 PK	74.0	-24.6	1.05 V	298	46.98	2.46
4	4874.00	37.6 AV	54.0	-16.4	1.05 V	298	35.14	2.46

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.



A D T

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	*2462.00	106.7 PK			1.10 H	282	110.59	-3.86
2	*2462.00	96.1 AV			1.10 H	282	99.94	-3.86
3	2483.50	69.2 PK	74.0	-4.8	1.10 H	282	72.96	-3.77
4	2483.50	49.4 AV	54.0	-4.6	1.10 H	282	53.15	-3.77
5	4924.00	46.3 PK	74.0	-27.7	1.00 H	243	43.79	2.54
6	4924.00	35.9 AV	54.0	-18.1	1.00 H	243	33.35	2.54
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	*2462.00	110.7 PK			1.00 V	24	114.52	-3.86
2	*2462.00	99.7 AV			1.00 V	24	103.60	-3.86
3	2483.50	72.1 PK	74.0	-1.9	1.00 V	24	75.88	-3.77
4	2483.50	52.0 AV	54.0	-2.0	1.00 V	24	55.79	-3.77
5	4924.00	47.9 PK	74.0	-26.1	1.09 V	175	45.39	2.54
6	4924.00	38.5 AV	54.0	-15.5	1.09 V	175	35.92	2.54

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.



A D T

802.11n (20MHz)

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	2390.00	57.6 PK	74.0	-16.4	1.00 H	217	61.79	-4.20
2	2390.00	44.5 AV	54.0	-9.5	1.00 H	217	48.66	-4.20
3	*2412.00	100.8 PK			1.00 H	217	104.85	-4.09
4	*2412.00	88.6 AV			1.00 H	217	92.73	-4.09
5	4824.00	46.3 PK	74.0	-27.7	1.24 H	110	43.88	2.38
6	4824.00	34.9 AV	54.0	-19.1	1.24 H	110	32.51	2.38
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	2390.00	68.8 PK	74.0	-5.2	1.00 V	17	73.02	-4.20
2	2390.00	52.8 AV	54.0	-1.2	1.00 V	17	57.03	-4.20
3	*2412.00	112.2 PK			1.00 V	17	116.28	-4.09
4	*2412.00	100.6 AV			1.00 V	17	104.66	-4.09
5	4824.00	47.6 PK	74.0	-26.4	1.10 V	119	45.22	2.38
6	4824.00	36.7 AV	54.0	-17.3	1.10 V	119	34.34	2.38

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.



A D T

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	*2437.00	102.1 PK			1.02 H	212	106.07	-3.97
2	*2437.00	89.7 AV			1.02 H	212	93.68	-3.97
3	4874.00	45.8 PK	74.0	-28.3	1.00 H	110	43.29	2.46
4	4874.00	34.5 AV	54.0	-19.5	1.00 H	110	32.05	2.46
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	*2437.00	112.6 PK			1.00 V	20	116.57	-3.97
2	*2437.00	100.8 AV			1.00 V	20	104.80	-3.97
3	4874.00	48.5 PK	74.0	-25.5	1.19 V	103	46.08	2.46
4	4874.00	36.7 AV	54.0	-17.3	1.19 V	103	34.25	2.46

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.



A D T

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	*2462.00	102.0 PK			1.10 H	216	105.84	-3.86
2	*2462.00	90.7 AV			1.10 H	216	94.58	-3.86
3	2483.50	63.1 PK	74.0	-10.9	1.10 H	216	66.90	-3.77
4	2483.50	45.9 AV	54.0	-8.1	1.10 H	216	49.64	-3.77
5	4924.00	47.4 PK	74.0	-26.6	1.00 H	122	44.87	2.54
6	4924.00	36.6 AV	54.0	-17.4	1.00 H	122	34.03	2.54
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	*2462.00	112.3 PK			1.00 V	20	116.17	-3.86
2	*2462.00	99.8 AV			1.00 V	20	103.67	-3.86
3	2483.50	68.3 PK	74.0	-5.7	1.00 V	20	72.08	-3.77
4	2483.50	52.8 AV	54.0	-1.2	1.00 V	20	56.60	-3.77
5	4924.00	48.8 PK	74.0	-25.2	1.13 V	107	46.27	2.54
6	4924.00	38.4 AV	54.0	-15.6	1.13 V	107	35.82	2.54

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.



A D T

802.11n (40MHz)

CHANNEL	TX Channel 3	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	2390.00	59.4 PK	74.0	-14.6	1.10 H	215	63.59	-4.20
2	2390.00	43.9 AV	54.0	-10.1	1.10 H	215	48.11	-4.20
3	*2422.00	97.1 PK			1.10 H	215	101.15	-4.03
4	*2422.00	82.6 AV			1.10 H	215	86.58	-4.03
5	4884.00	46.2 PK	74.0	-27.8	1.02 H	226	43.76	2.47
6	4884.00	34.5 AV	54.0	-19.6	1.02 H	226	31.98	2.47
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	2390.00	68.9 PK	74.0	-5.1	1.00 V	16	73.10	-4.20
2	2390.00	52.9 AV	54.0	-1.1	1.00 V	16	57.11	-4.20
3	*2422.00	108.3 PK			1.00 V	16	112.35	-4.03
4	*2422.00	92.9 AV			1.00 V	16	96.89	-4.03
5	4844.00	48.3 PK	74.0	-25.7	1.24 V	105	45.88	2.40
6	4844.00	37.0 AV	54.0	-17.0	1.24 V	105	34.59	2.40

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.



A D T

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	*2437.00	99.9 PK			1.00 H	212	103.82	-3.97
2	*2437.00	84.8 AV			1.00 H	212	88.75	-3.97
3	4874.00	46.4 PK	74.0	-27.6	1.00 H	332	43.96	2.46
4	4874.00	34.9 AV	54.0	-19.1	1.00 H	332	32.40	2.46
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	*2437.00	108.9 PK			1.00 V	18	112.91	-3.97
2	*2437.00	94.7 AV			1.00 V	18	98.66	-3.97
3	4874.00	49.0 PK	74.0	-25.0	1.30 V	112	46.51	2.46
4	4874.00	38.5 AV	54.0	-15.5	1.30 V	112	36.02	2.46

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.



A D T

CHANNEL	TX Channel 9	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	*2452.00	97.8 PK			1.05 H	213	101.70	-3.90
2	*2452.00	82.5 AV			1.05 H	213	86.37	-3.90
3	2483.50	62.8 PK	74.0	-11.2	1.05 H	213	66.56	-3.77
4	2483.50	45.7 AV	54.0	-8.4	1.05 H	213	49.42	-3.77
5	4904.00	46.6 PK	74.0	-27.4	1.09 H	85	44.07	2.51
6	4904.00	34.1 AV	54.0	-19.9	1.09 H	85	31.62	2.51
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	*2452.00	107.5 PK			1.00 V	21	111.41	-3.90
2	*2452.00	92.1 AV			1.00 V	21	96.03	-3.90
3	2483.50	71.3 PK	74.0	-2.8	1.00 V	21	75.02	-3.77
4	2483.50	52.2 AV	54.0	-1.8	1.00 V	21	55.93	-3.77
5	4904.00	48.3 PK	74.0	-25.7	1.08 V	114	45.81	2.51
6	4904.00	37.7 AV	54.0	-16.3	1.08 V	114	35.20	2.51

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

BELOW 1GHz WORST-CASE DATA: 802.11g

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

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	161.86	25.2 QP	43.5	-18.3	2.57 H	268	38.66	-13.42
2	208.34	26.0 QP	43.5	-17.5	2.41 H	85	42.10	-16.07
3	300.00	32.9 QP	46.0	-13.1	1.83 H	245	45.03	-12.09
4	500.02	32.3 QP	46.0	-13.7	1.15 H	300	40.61	-8.35
5	846.17	38.0 QP	46.0	-8.0	1.00 H	73	40.29	-2.32
6	874.95	37.9 QP	46.0	-8.1	1.00 H	196	39.79	-1.92
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	36.99	32.5 QP	40.0	-7.6	1.24 V	17	47.32	-14.87
2	300.07	27.8 QP	46.0	-18.2	1.15 V	66	39.87	-12.09
3	500.02	32.8 QP	46.0	-13.2	2.06 V	211	41.18	-8.35
4	624.96	34.1 QP	46.0	-11.9	2.64 V	254	39.86	-5.79
5	750.01	33.3 QP	46.0	-12.7	1.93 V	227	36.99	-3.68
6	874.95	32.9 QP	46.0	-13.1	2.88 V	148	34.82	-1.92

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier 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 (dBμV)	
	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.

4.2.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
ROHDE & SCHWARZ TEST RECEIVER	ESCS 30	100292	Dec. 18, 2014	Dec. 17, 2015
ROHDE & SCHWARZ Artificial Mains Network (for EUT)	ESH2-Z5	100104	Dec. 04, 2014	Dec. 03, 2015
LISN With Adapter (for EUT)	AD10	C09Ada-001	Dec. 04, 2014	Dec. 03, 2015
ROHDE & SCHWARZ Artificial Mains Network (for peripherals)	ESH3-Z5	847265/023	Oct. 21, 2014	Oct. 20, 2015
SCHWARZBECK Artificial Mains Network (For EUT)	NNLK8129	8129229	May 08, 2014	May 07, 2015
Software	ADT_Cond_V7.3.7	NA	NA	NA
RF cable (JYEBAO)	5D-FB	Cable-C09.01	Feb. 20, 2014	Feb. 19, 2015
SUHNTER Terminator (For ROHDE & SCHWARZ LISN)	65BNC-5001	E1-010789	May 20, 2014	May 19, 2015
ROHDE & SCHWARZ Artificial Mains Network (For TV EUT)	ESH3-Z5	100220	Nov. 20, 2014	Nov. 19, 2015
LISN With Adapter (for TV EUT)	100220	N/A	Nov. 20, 2014	Nov. 19, 2015

- Notes: 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. 9.
 3. The VCCI Site Registration No. C-1312.

4.2.3 TEST PROCEDURES

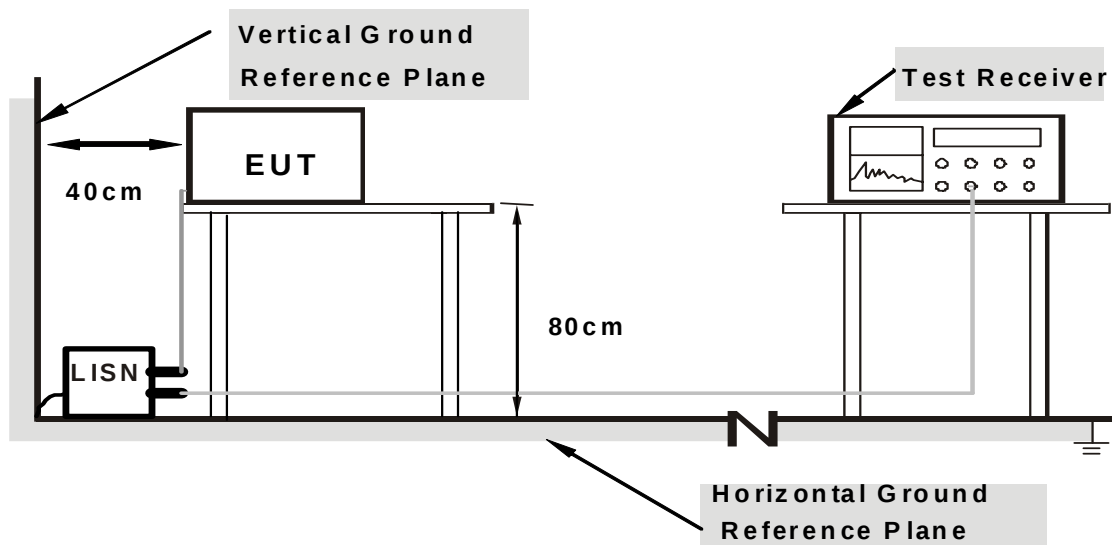
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

NOTE: All modes of operation were investigated and the worst-case emissions are reported.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

4.2.5 TEST SETUP



Note: Support units were connected to second LISN.

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

4.2.6 EUT OPERATING CONDITIONS

Same as item 4.1.6.

4.2.7 TEST RESULTS

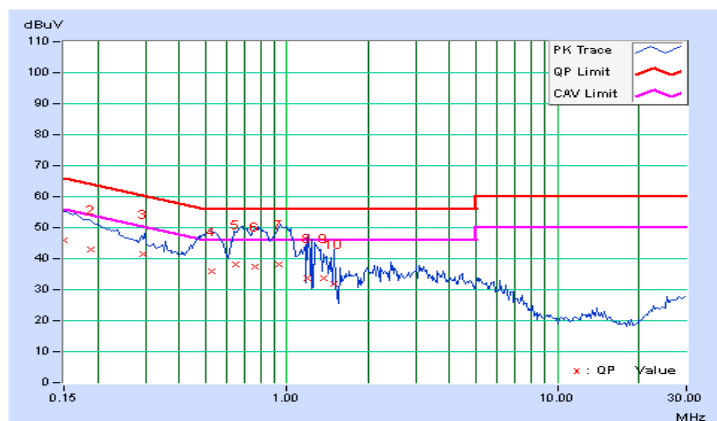
CONDUCTED WORST-CASE DATA :

PHASE	Line 1	6dB BANDWIDTH	9kHz
-------	--------	---------------	------

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.21	45.75	24.86	45.96	25.07	66.00	56.00	-20.04	-30.93
2	0.18915	0.23	42.65	21.93	42.88	22.16	64.07	54.07	-21.20	-31.92
3	0.29463	0.25	41.33	38.80	41.58	39.05	60.39	50.39	-18.81	-11.34
4	0.52736	0.28	35.49	24.97	35.77	25.25	56.00	46.00	-20.23	-20.75
5	0.64832	0.30	37.96	28.71	38.26	29.01	56.00	46.00	-17.74	-16.99
6	0.76739	0.31	37.13	27.35	37.44	27.66	56.00	46.00	-18.56	-18.34
7	0.93911	0.33	37.76	32.39	38.09	32.72	56.00	46.00	-17.91	-13.28
8	1.18933	0.36	33.25	21.27	33.61	21.63	56.00	46.00	-22.39	-24.37
9	1.36358	0.38	33.34	23.70	33.72	24.08	56.00	46.00	-22.28	-21.92
10	1.49609	0.39	31.64	17.52	32.03	17.91	56.00	46.00	-23.97	-28.09

Remarks:

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

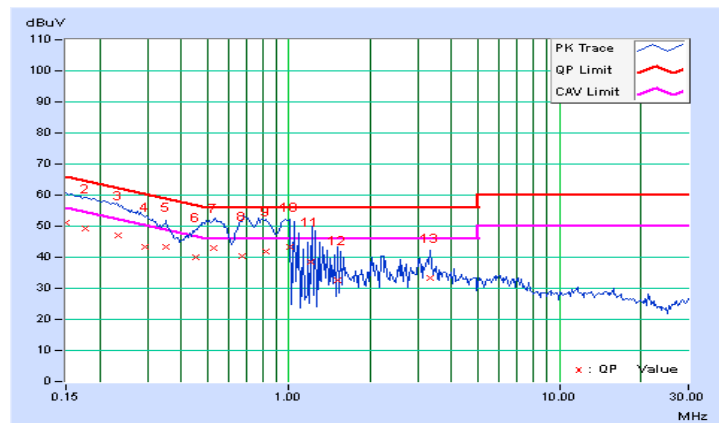


PHASE	Line 2	6dB BANDWIDTH	9kHz
-------	--------	---------------	------

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBUV)		Emission Level (dBUV)		Limit (dBUV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.21	50.89	28.74	51.10	28.95	66.00	56.00	-14.90	-27.05
2	0.17800	0.22	48.99	33.83	49.21	34.05	64.58	54.58	-15.37	-20.53
3	0.23445	0.24	46.76	36.55	47.00	36.79	62.29	52.29	-15.29	-15.50
4	0.29367	0.25	43.01	38.05	43.26	38.30	60.42	50.42	-17.16	-12.12
5	0.35313	0.27	42.88	41.60	43.15	41.87	58.89	48.89	-15.74	-7.02
6	0.45431	0.29	39.69	20.96	39.98	21.25	56.80	46.80	-16.82	-25.55
7	0.52899	0.30	42.81	33.83	43.11	34.13	56.00	46.00	-12.89	-11.87
8	0.67314	0.31	39.97	35.96	40.28	36.27	56.00	46.00	-15.72	-9.73
9	0.82571	0.33	41.59	27.84	41.92	28.17	56.00	46.00	-14.08	-17.83
10	1.00593	0.35	42.96	18.42	43.31	18.77	56.00	46.00	-12.69	-27.23
11	1.20704	0.37	38.09	15.52	38.46	15.89	56.00	46.00	-17.54	-30.11
12	1.51953	0.39	32.29	21.93	32.68	22.32	56.00	46.00	-23.32	-23.68
13	3.31641	0.49	32.70	23.59	33.19	24.08	56.00	46.00	-22.81	-21.92

Remarks:

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

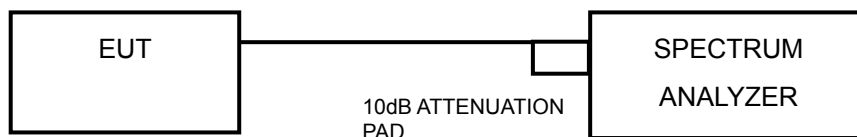


4.3 6dB BANDWIDTH MEASUREMENT

4.3.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 TEST SETUP



4.3.3 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.3.4 TEST PROCEDURE

- Set resolution bandwidth (RBW) = 100kHz
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

4.3.5 DEVIATION FROM TEST STANDARD

No deviation.

4.3.6 EUT OPERATING CONDITIONS

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

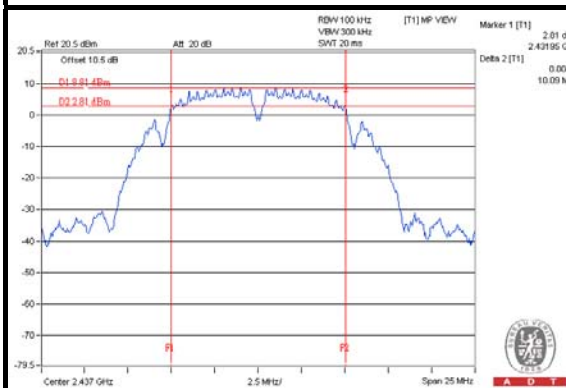
4.3.7 TEST RESULTS

CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
802.11b				
1	2412	10.08	0.5	PASS
6	2437	10.09	0.5	PASS
11	2462	9.83	0.5	PASS
802.11g				
1	2412	16.41	0.5	PASS
6	2437	16.39	0.5	PASS
11	2462	16.40	0.5	PASS

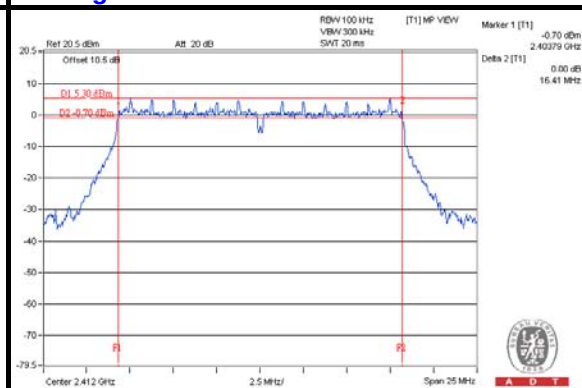
CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (MHz)		MINIMUM LIMIT (MHz)	PASS / FAIL
		CHAIN 0	CHAIN 1		
802.11n (20MHz)					
1	2412	17.60	17.56	0.5	PASS
6	2437	17.60	17.59	0.5	PASS
11	2462	17.60	17.61	0.5	PASS
802.11n (40MHz)					
3	2422	35.82	36.39	0.5	PASS
6	2437	35.83	36.41	0.5	PASS
9	2452	35.84	36.39	0.5	PASS

SPECTRUM PLOT OF WORST VALUE

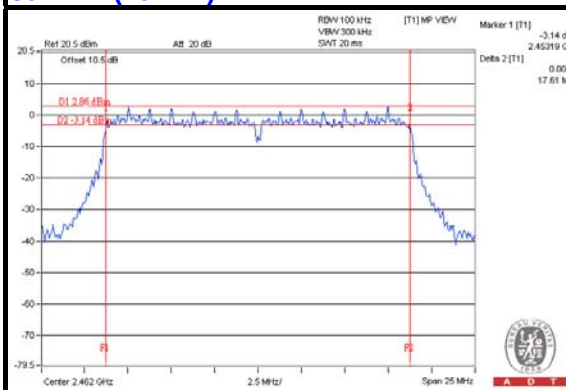
802.11b



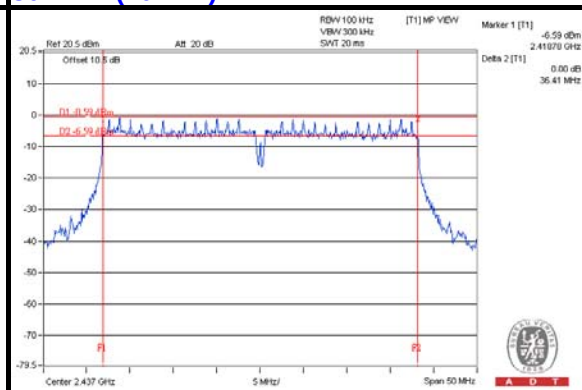
802.11g



802.11n (20MHz)



802.11n (40MHz)



4.4 CONDUCTED OUTPUT POWER

4.4.1 LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT

For systems using digital modulation: 1 Watt (30dBm)

Per KDB 662911 D01 Multiple Transmitter Output Method of conducted output power measurement on IEEE 802.11 devices,

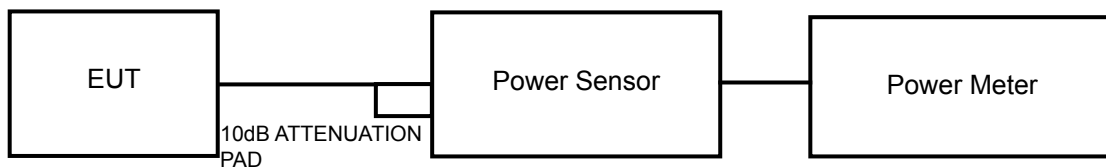
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT} ;

Array Gain = $5 \log(N_{ANT}/N_{SS})$ dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.

For power measurements on all other devices: Array Gain = $10 \log(N_{ANT}/N_{SS})$ dB.

4.4.2 TEST SETUP



4.4.3 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.4.4 TEST PROCEDURES

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

4.4.5 DEVIATION FROM TEST STANDARD

No deviation.

4.4.6 EUT OPERATING CONDITIONS

Same as Item 4.3.6.

4.4.7 TEST RESULTS - FOR PEAK POWER

CHANNEL	FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	LIMIT (dBm)	PASS/FAIL
802.11b					
1	2412	22.19	165.6	30	PASS
6	2437	22.85	192.8	30	PASS
11	2462	21.37	137.1	30	PASS
802.11g					
1	2412	25.54	358.1	30	PASS
6	2437	27.35	543.3	30	PASS
11	2462	25.70	371.5	30	PASS

CHAN.	FREQ. (MHz)	PEAK POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
802.11n (20MHz)							
1	2412	23.81	23.91	486.5	26.87	30	PASS
6	2437	23.47	24.36	495.2	26.95	30	PASS
11	2462	23.69	24.17	495.1	26.95	30	PASS
802.11n (40MHz)							
3	2422	23.70	23.27	446.7	26.50	30	PASS
6	2437	24.46	25.25	614.2	27.88	30	PASS
9	2452	23.11	23.48	427.5	26.31	30	PASS

4.4.8 TEST RESULTS - FOR AVERAGE POWER

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (dBm)
802.11b		
1	2412	18.56
6	2437	19.31
11	2462	17.73
802.11g		
1	2412	17.12
6	2437	19.74
11	2462	17.28

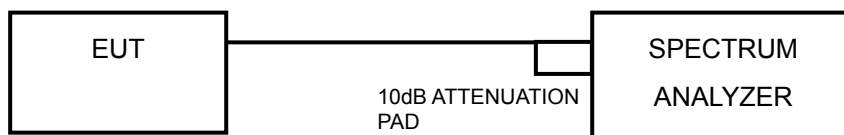
CHAN.	FREQUENCY (MHz)	AVG. POWER (dBm)		TOTAL POWER (dBm)
		CHAIN 0	CHAIN 1	
802.11n (20MHz)				
1	2412	15.54	15.92	18.74
6	2437	15.92	16.12	19.03
11	2462	15.21	16.59	18.96
802.11n (40MHz)				
3	2422	14.07	14.89	17.51
6	2437	15.79	15.93	18.87
9	2452	13.94	14.82	17.41

4.5 POWER SPECTRAL DENSITY MEASUREMENT

4.5.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm.

4.5.2 TEST SETUP



4.5.3 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.5.4 TEST PROCEDURE

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- d) Set the VBW $\geq 3 \times \text{RBW}$.
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.

4.5.5 DEVIATION FROM TEST STANDARD

No deviation.

4.5.6 EUT OPERATING CONDITION

Same as Item 4.3.6

4.5.7 TEST RESULTS

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
802.11b				
1	2412	-11.17	8	PASS
6	2437	-10.40	8	PASS
11	2462	-11.64	8	PASS
802.11g				
1	2412	-10.32	8	PASS
6	2437	-8.10	8	PASS
11	2462	-9.02	8	PASS

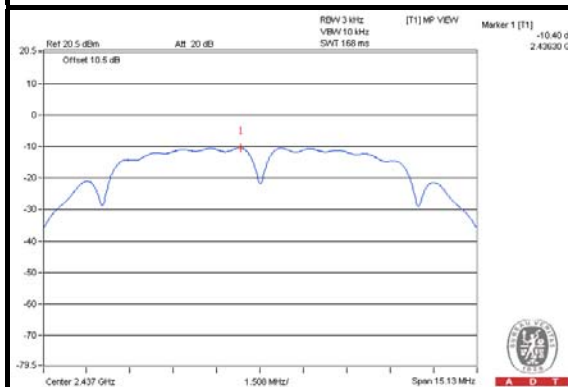
TX chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
802.11n (20MHz)							
0	1	2412	-14.90	3.01	-11.89	8	PASS
	6	2437	-13.22	3.01	-10.21	8	PASS
	11	2462	-14.11	3.01	-11.10	8	PASS
1	1	2412	-14.77	3.01	-11.76	8	PASS
	6	2437	-11.30	3.01	-8.29	8	PASS
	11	2462	-11.50	3.01	-8.49	8	PASS
802.11n (40MHz)							
0	3	2422	-19.58	3.01	-16.57	8	PASS
	6	2437	-13.31	3.01	-10.30	8	PASS
	9	2452	-19.76	3.01	-16.75	8	PASS
1	3	2422	-16.35	3.01	-13.34	8	PASS
	6	2437	-11.61	3.01	-8.60	8	PASS
	9	2452	-13.03	3.01	-10.02	8	PASS

NOTE:

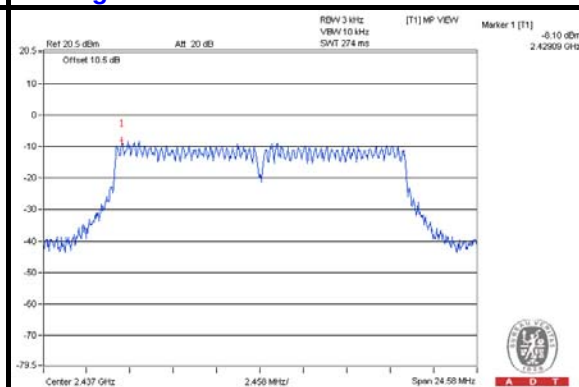
- Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
- Directional gain = 1.76dBi + 10log(2) = 4.77dBi < 6dBi, so the power spectral density limit is not reduced.

SPECTRUM PLOT OF WORST VALUE

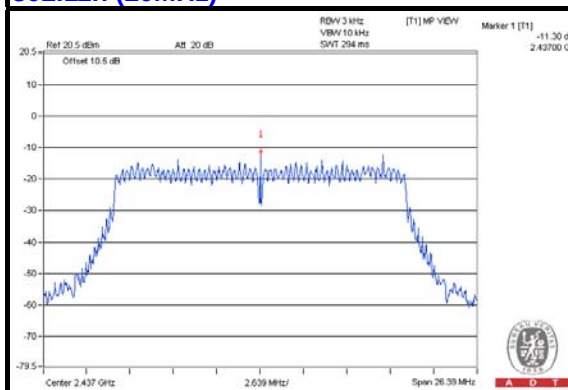
802.11b



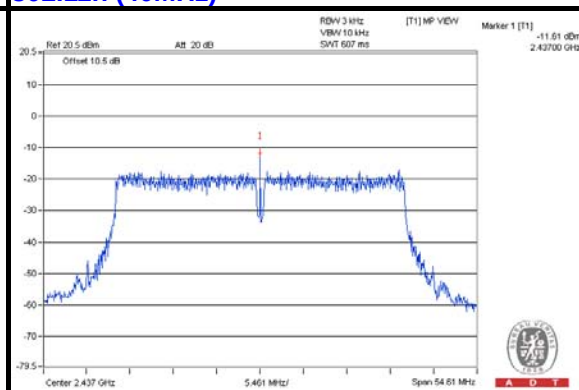
802.11g



802.11n (20MHz)



802.11n (40MHz)

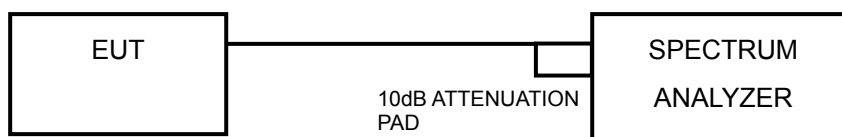


4.6 CONDUCTED OUT OF BAND EMISSION MEASUREMENT

4.6.1 LIMITS OF CONDUCTED OUT OF BAND EMISSION MEASUREMENT

Below -20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

4.6.2 TEST SETUP



4.6.3 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.6.4 TEST PROCEDURE

MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW $\geq$ 300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOB

1. Set RBW = 100 kHz.
2. Set VBW $\geq$ 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

4.6.5 DEVIATION FROM TEST STANDARD

No deviation.

4.6.6 EUT OPERATING CONDITION

Same as Item 4.3.6

4.6.7 TEST RESULTS

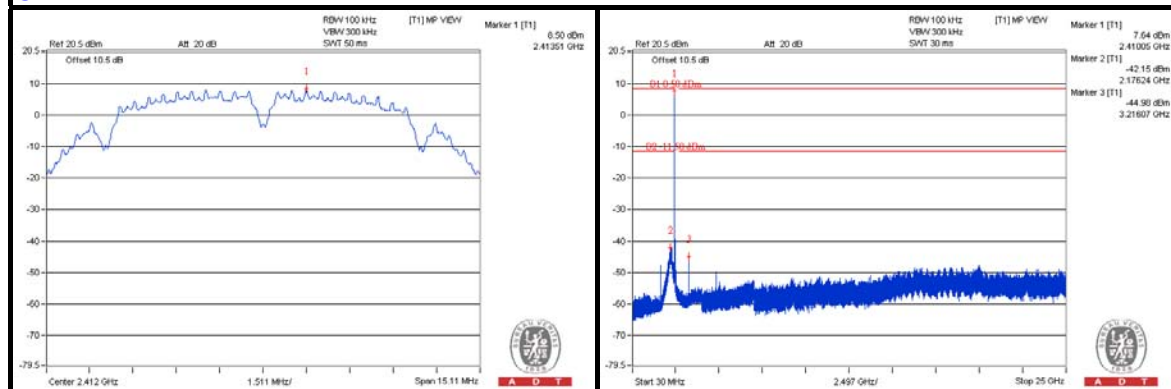
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.



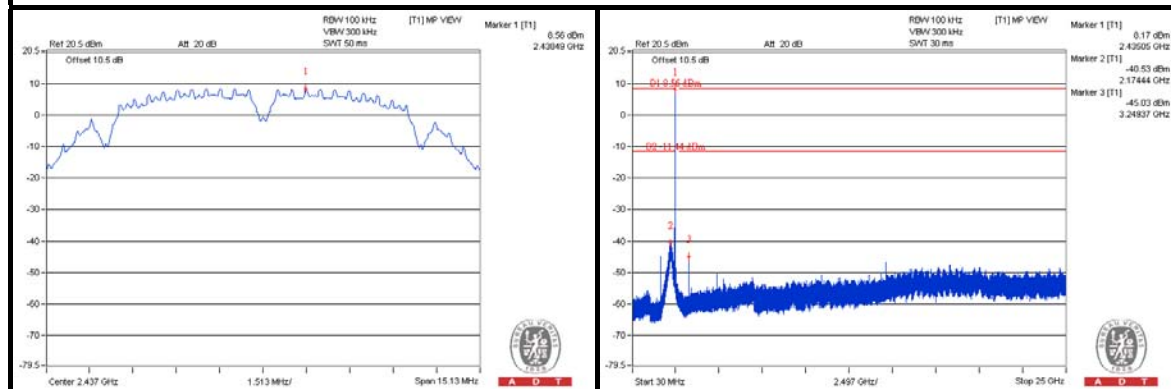
A D T

802.11b

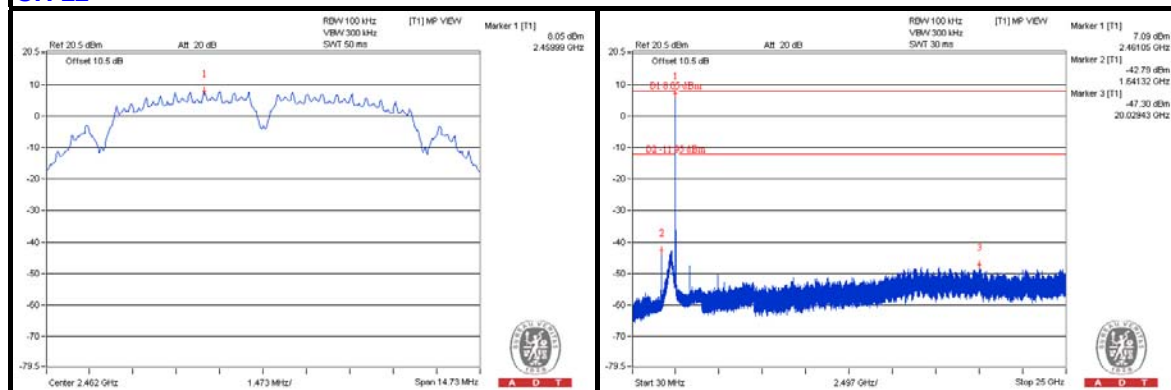
CH 1



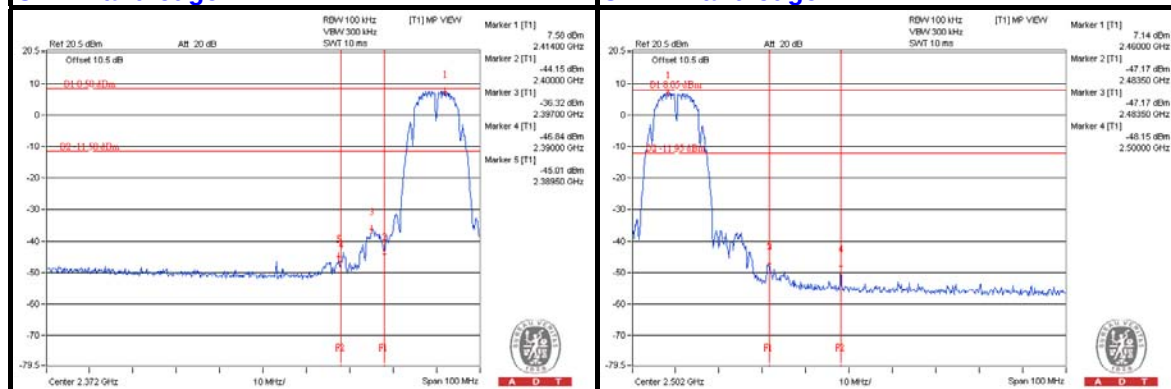
CH 6



CH 11



CH 1 Band edge

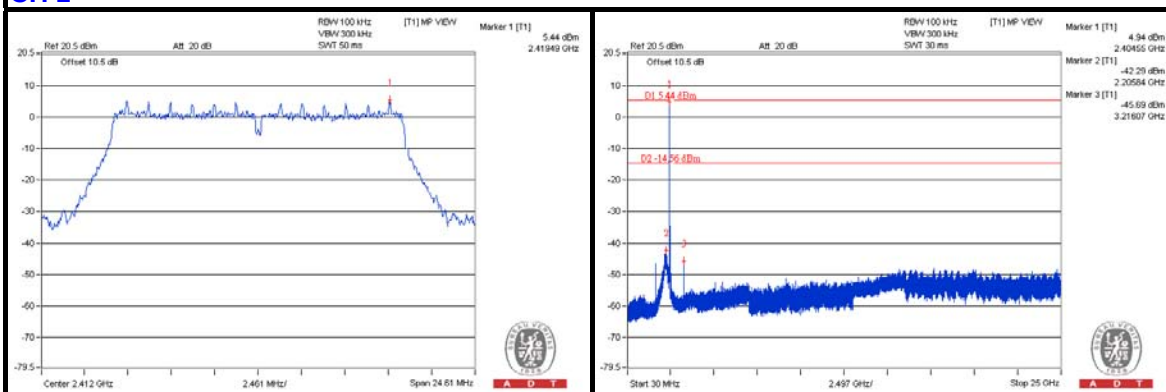




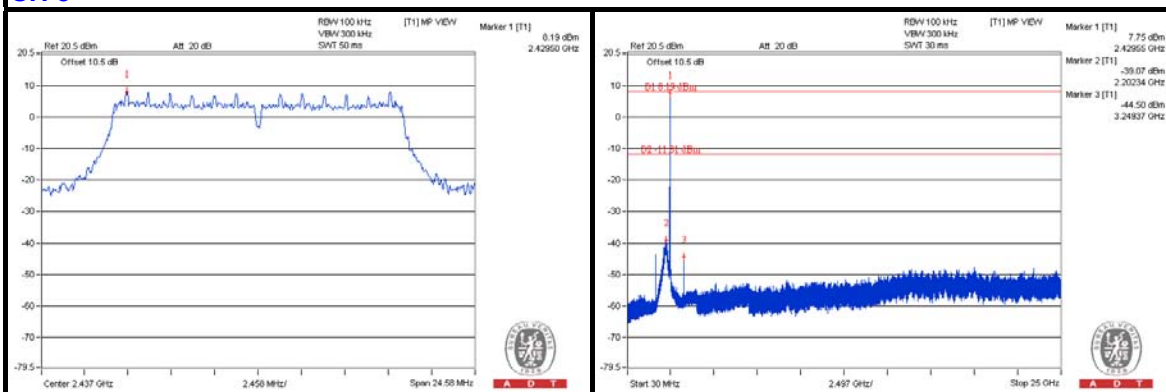
A D T

802.11g:

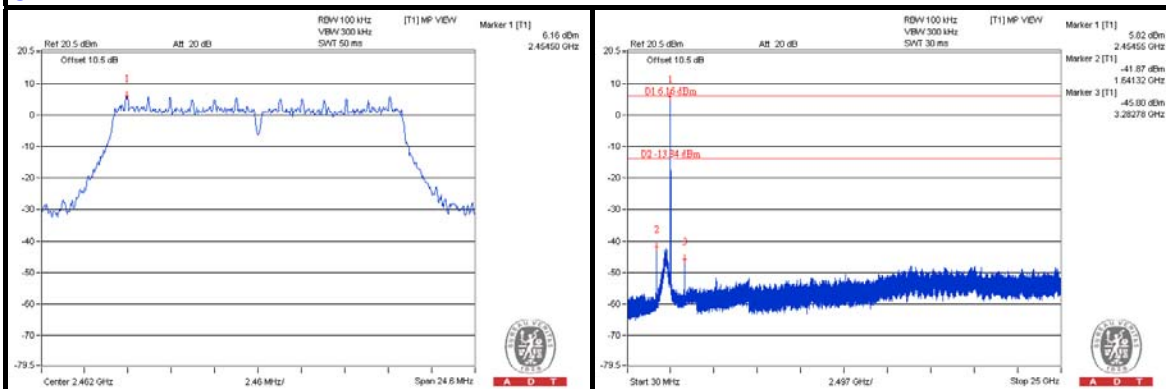
CH 1



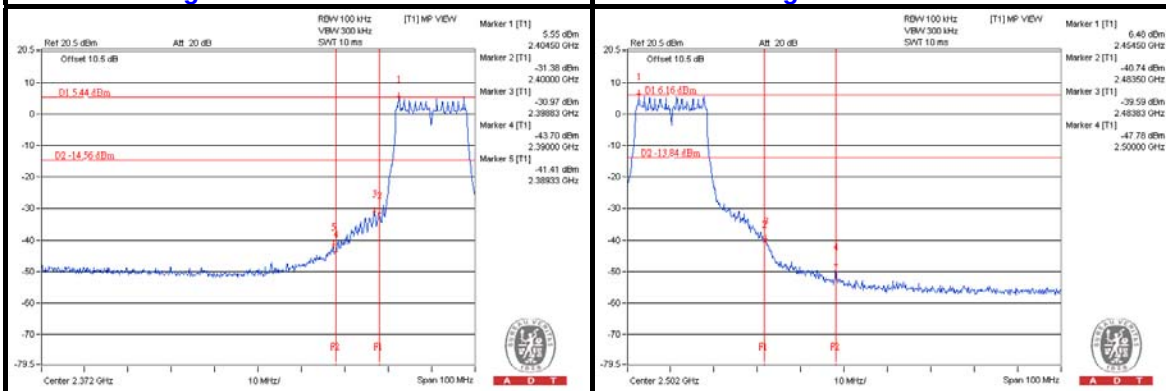
CH 6



CH 11



CH 1 Band edge

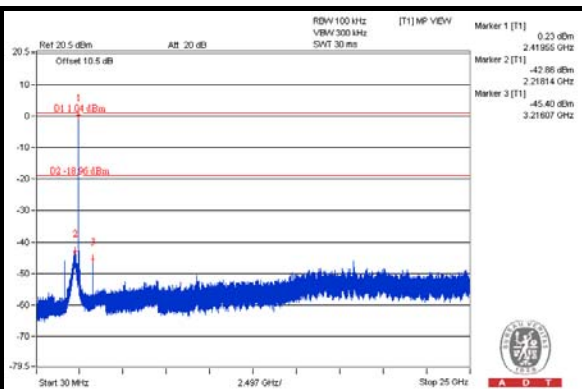
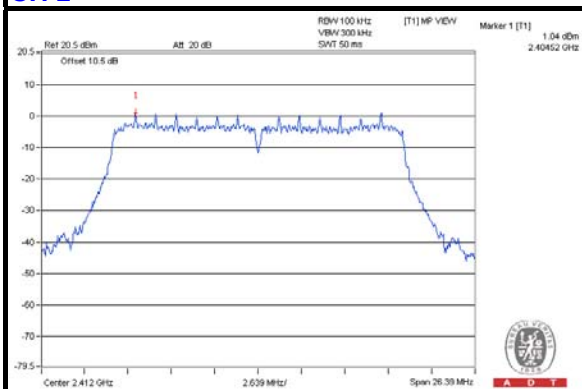




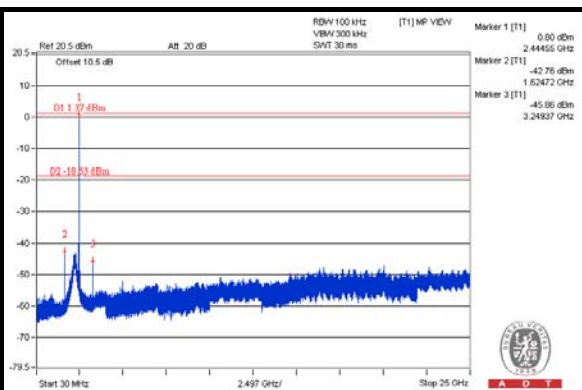
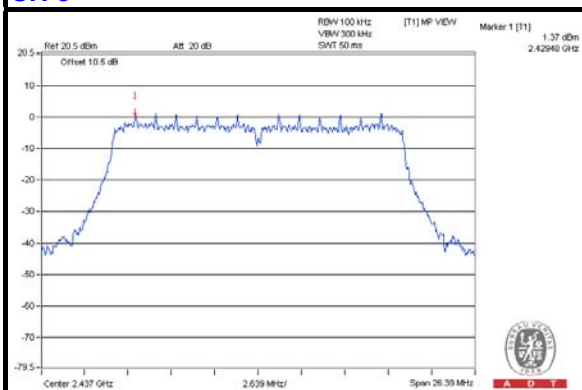
A D T

802.11n (20MHz): Chain 0

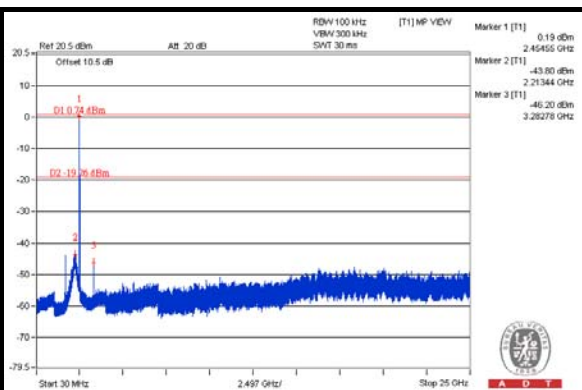
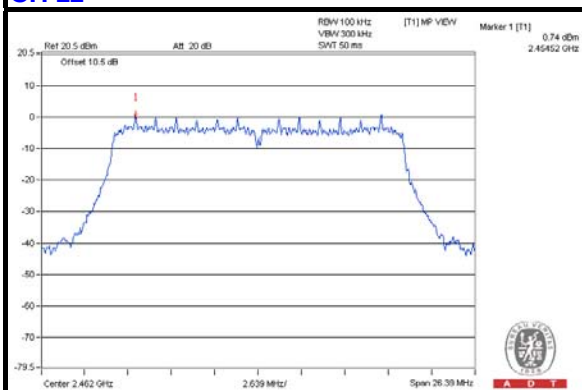
CH 1



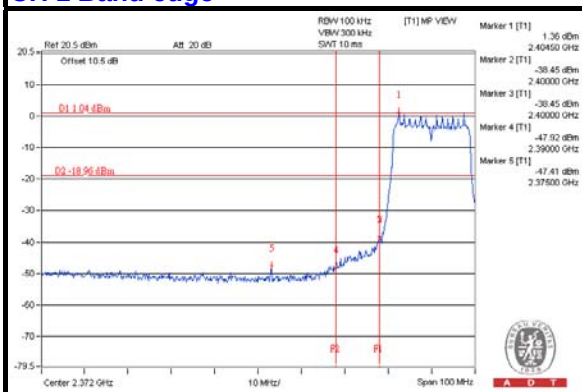
CH 6



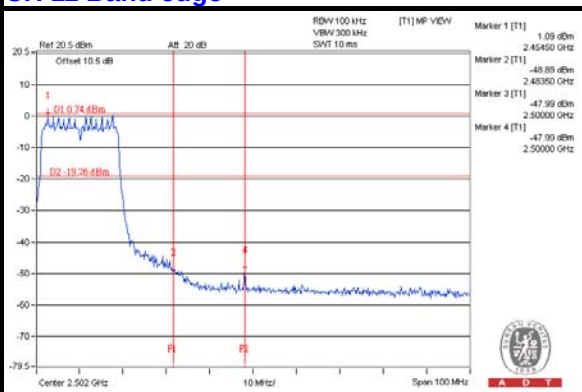
CH 11



CH 1 Band edge



CH 11 Band edge

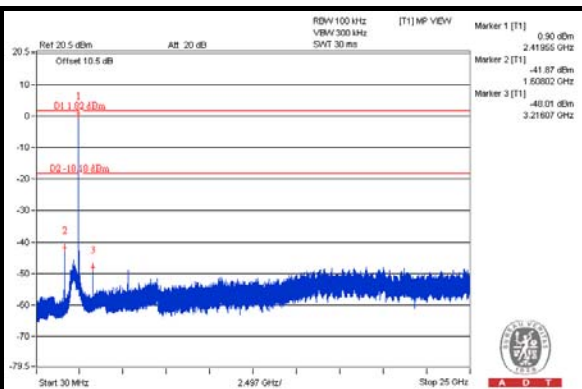
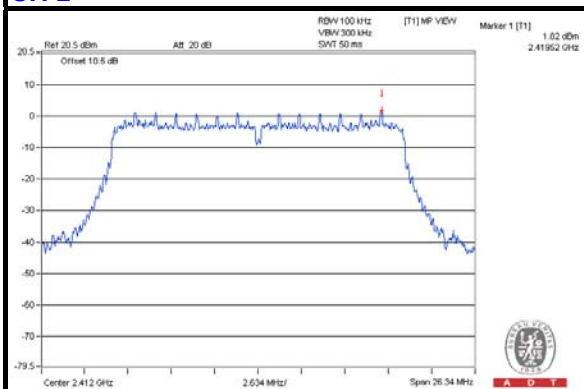




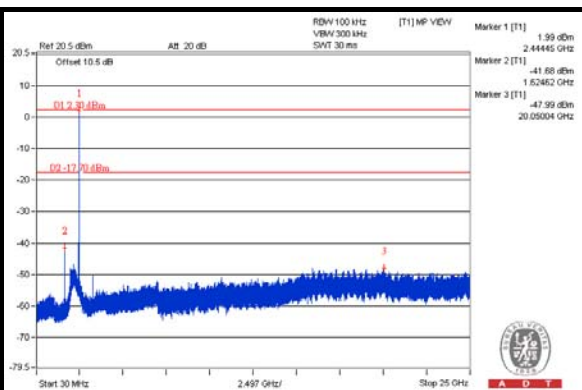
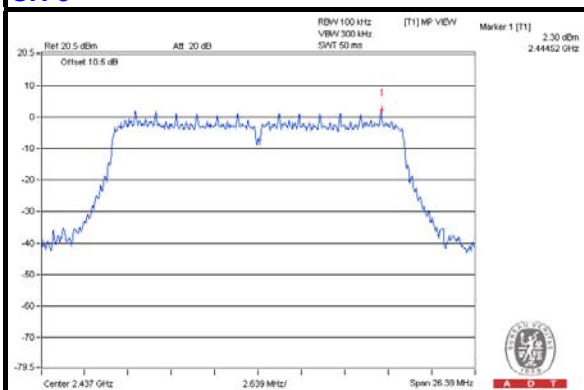
A D T

802.11n (20MHz): Chain 1

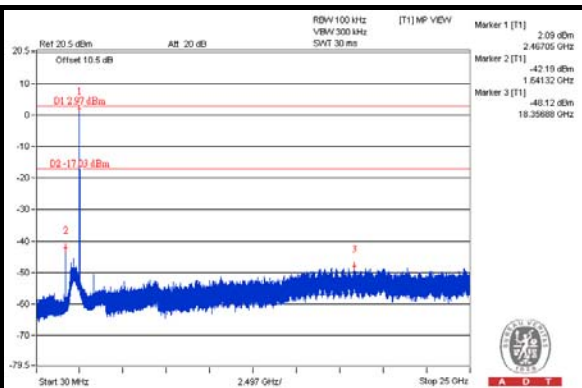
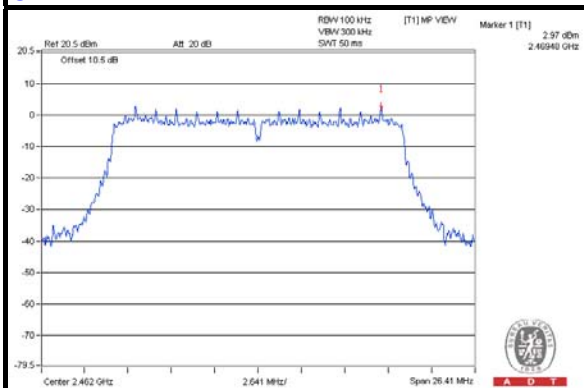
CH 1



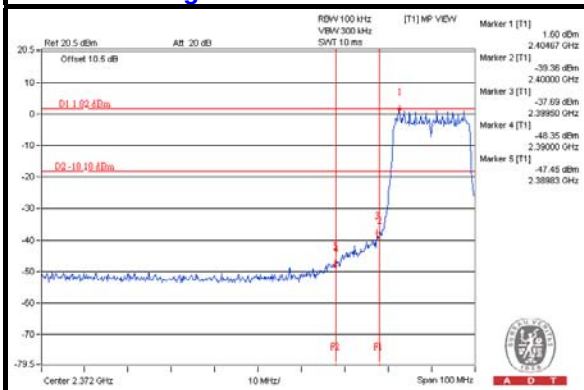
CH 6



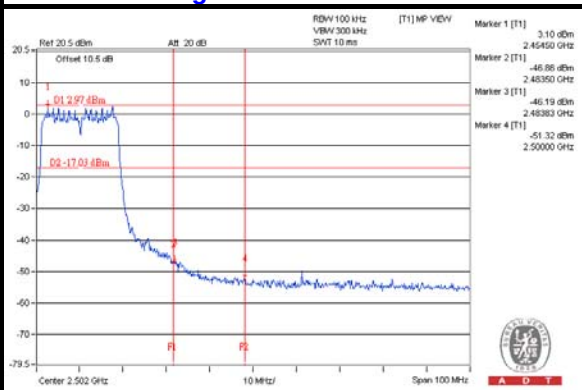
CH 11



CH 1 Band edge



CH 11 Band edge

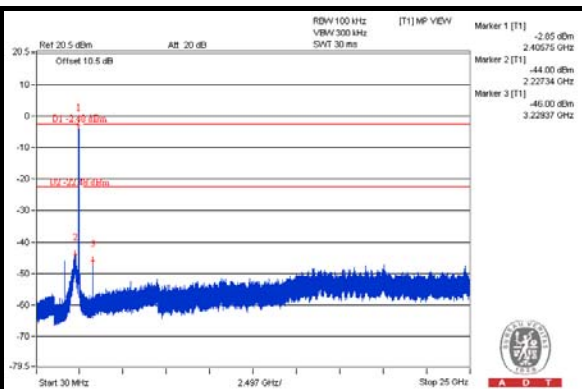
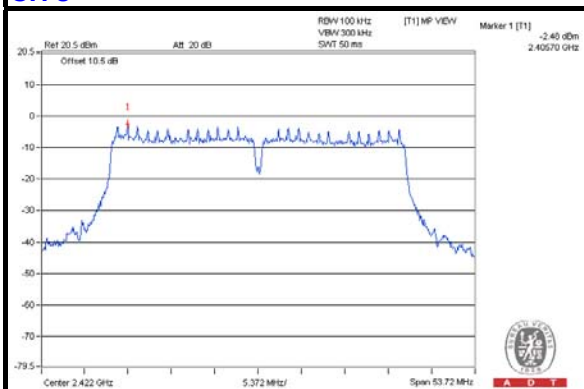




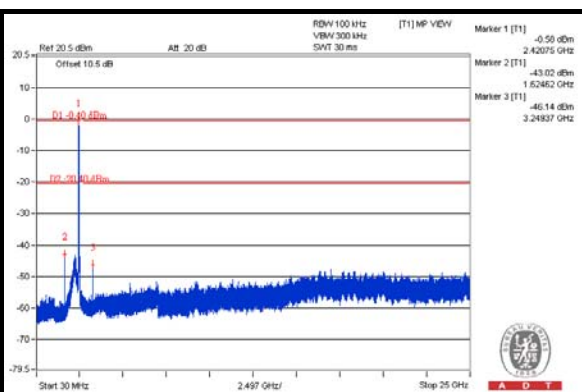
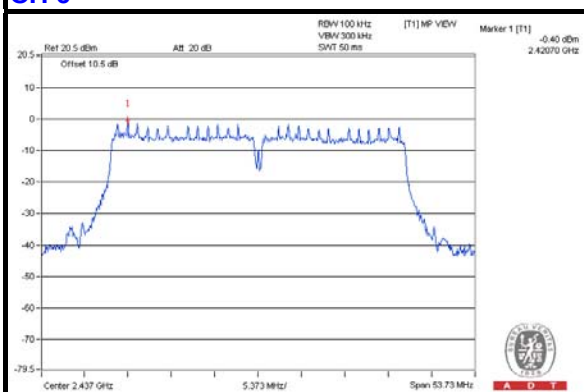
A D T

802.11n (40MHz): Chain 0

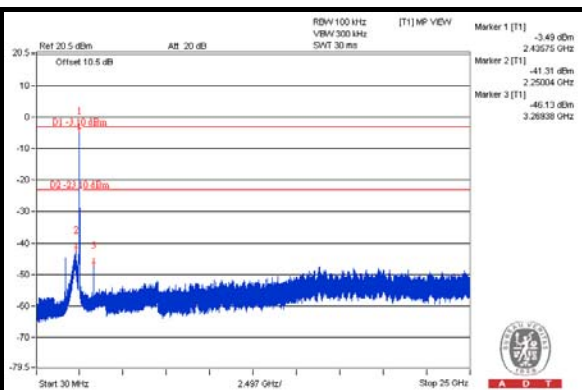
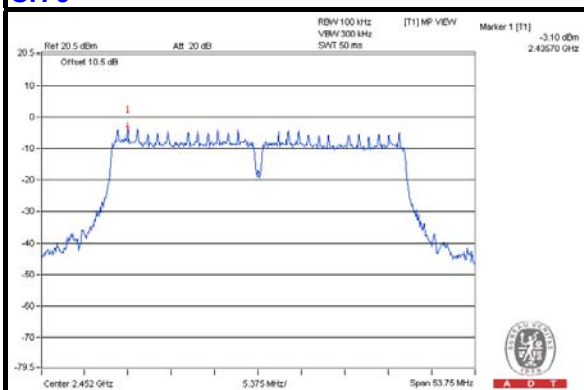
CH 3



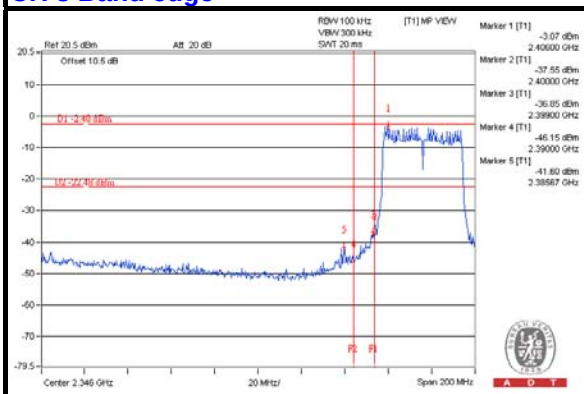
CH 6



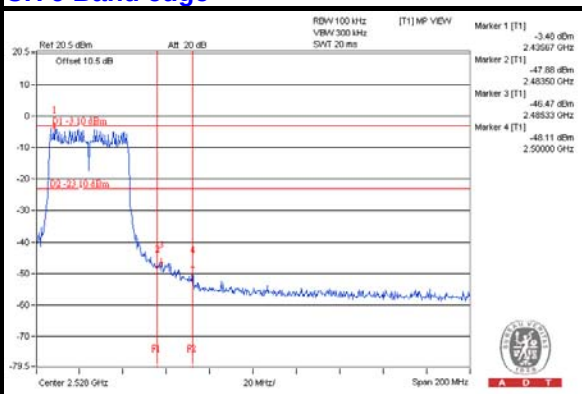
CH 9



CH 3 Band edge



CH 9 Band edge

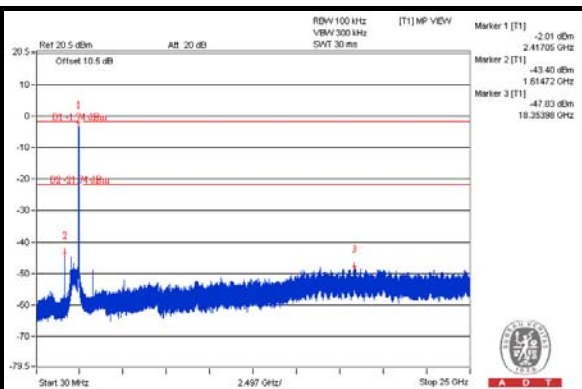
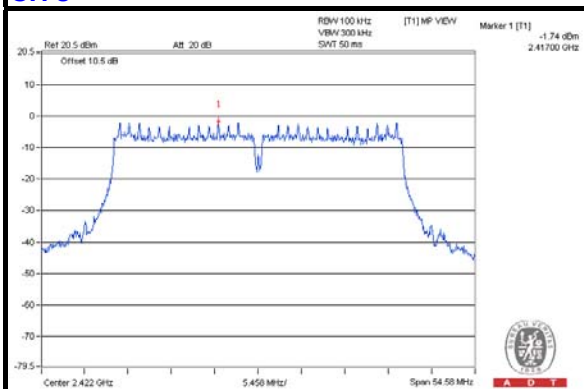




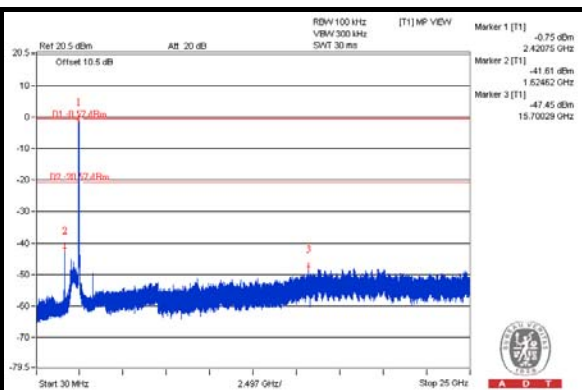
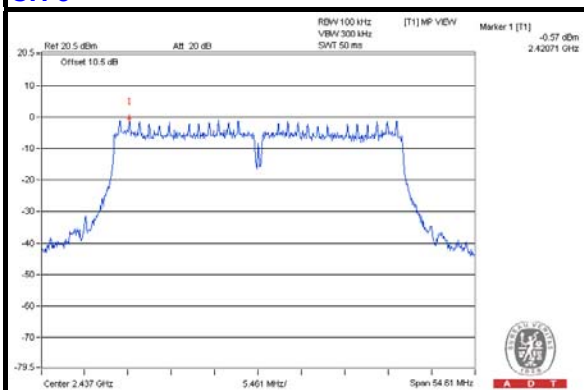
A D T

802.11n (40MHz): Chain 1

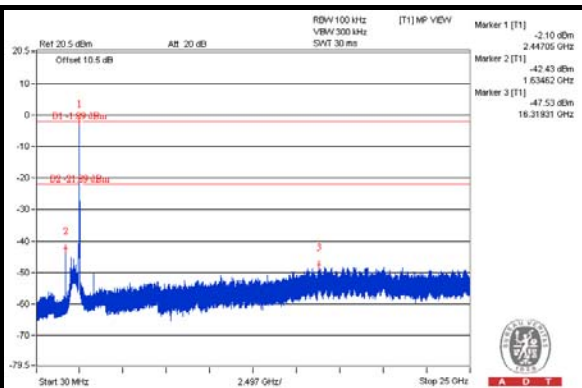
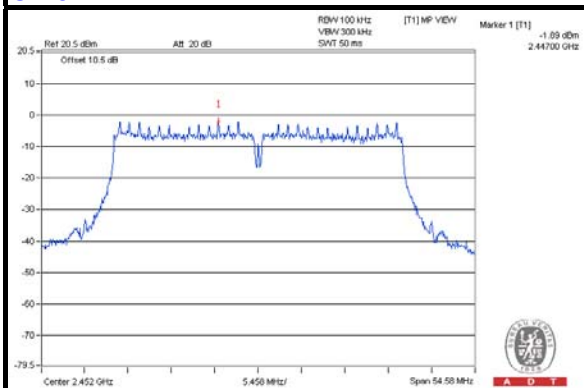
CH 3



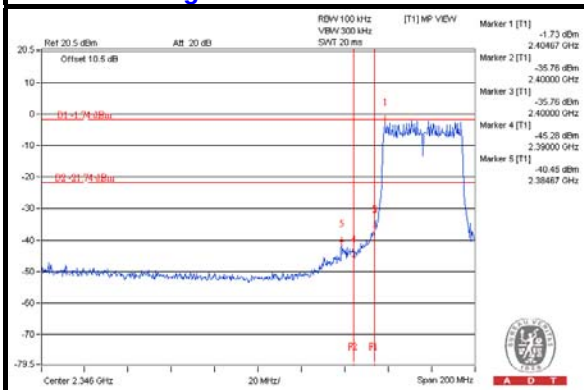
CH 6



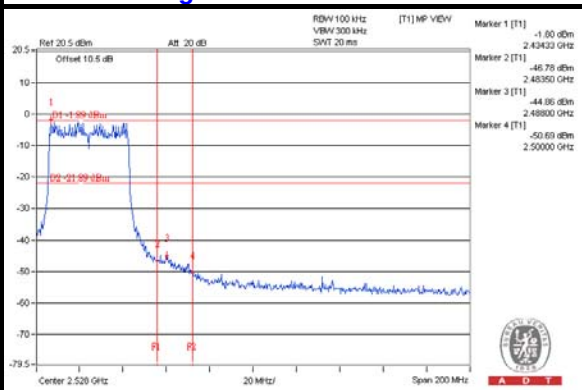
CH 9



CH 3 Band edge



CH 9 Band edge





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5. PHOTOGRAPHS OF THE TEST CONFIGURATION

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



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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.

If you have any comments, please feel free to contact us at the following:

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Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-5935343

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Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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



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7. APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

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

---END---