

FCC Test Report

Report No.: RF150129C16

FCC ID: I88WRE2206

Test Model: WRE2206

Received Date: Jan. 29, 2015

Test Date: Feb. 26 ~ Apr. 27, 2015

Issued Date: Apr. 30, 2015

Applicant: ZyXEL Communications Corporation

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Release Control Record

Issue No.	Description	Date Issued
RF150129C16	Original release	Apr. 30, 2015

1 Certificate of Conformity

Product: Wireless N300 Range Extender

Brand: ZyXEL

Test Model: WRE2206

Sample Status: Engineering sample

Applicant: ZyXEL Communications Corporation

Test Date: Feb. 26 ~ Apr. 27, 2015

Standards: 47 CFR 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 :


Maggie Wu / Specialist

Date:

Apr. 30, 2015

Approved by :


Ken Liu / Senior Manager

Date:

Apr. 30, 2015

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -15.72dB at 0.58401MHz
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -0.7dB at 2390.0MHz.
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	Expanded Uncertainty (k=2) ($\pm$)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.44 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.86 dB
	200MHz ~1000MHz	3.87 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Wireless N300 Range Extender
Brand	ZyXEL
Test Model	WRE2206
Status of EUT	Engineering sample
Power Supply Rating	100-240Vac
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: 11.0/ 5.5/ 2.0/ 1.0Mbps 802.11g: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0Mbps 802.11n: up to 300.0Mbps
Operating Frequency	2412 ~ 2462MHz
Number of Channel	802.11b, 802.11g, 802.11n (HT20): 11 802.11n (HT40): 7
Output Power	493.776mW
Antenna Type	PIFA antenna with 2dBi gain
Antenna Connector	N/A
Accessory Device	N/A
Data Cable Supplied	N/A

Note: The EUT incorporates a MIMO function. Physically, the EUT provides 2 completed transmitter and 2 receivers.

Modulation Mode	TX Function
802.11b	1TX
802.11g	1TX
802.11n (HT20)	2TX
802.11n (HT40)	2TX

3.2 Description of Test Modes

11 channels are provided for 802.11b, 802.11g and 802.11n (HT20):

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 (HT40):

Channel	Frequency	Channel	Frequency
3	2422MHz	7	2442MHz
4	2427MHz	8	2447MHz
5	2432MHz	9	2452MHz
6	2437MHz		

Power Setting

802.11b

Channel	Frequency (MHz)	Power Setting
1	2412	39
6	2437	39
11	2462	39

802.11g

Channel	Frequency (MHz)	Power Setting
1	2412	48
6	2437	48
11	2462	49

802.11n (HT20)

Channel	Frequency (MHz)	Power Setting	
		CHAIN 0	CHAIN 1
1	2412	43	38
6	2437	44	38
11	2462	45	39

802.11n (HT40)

Channel	Frequency (MHz)	Power Setting	
		CHAIN 0	CHAIN 1
3	2422	48	40
6	2437	46	39
9	2452	48	40

3.2.1 Test Mode Applicability and Tested Channel Detail

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

Where **RE≥1G**: Radiated Emission above 1GHz & Bandedge Measurement

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 3 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	1.0
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
-	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	7.2
-	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	15.0

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)
-	802.11n (HT20)	1 to 11	6	OFDM	BPSK	7.2

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 (HT20)	1 to 11	6	OFDM	BPSK	7.2

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.

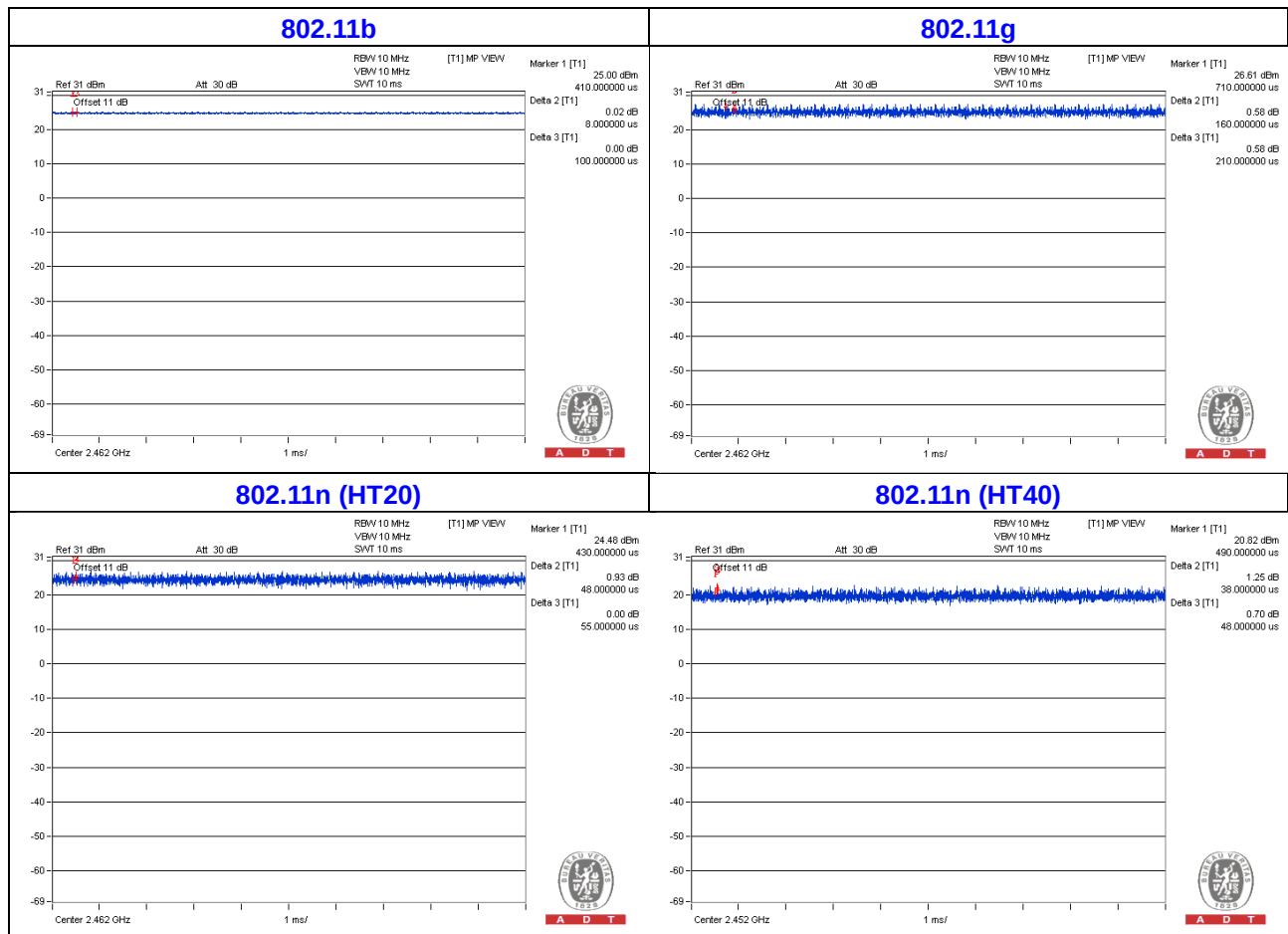
EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
-	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	7.2
-	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	15.0

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE _≥ 1G	18deg. C, 72%RH 20deg. C, 72%RH	120Vac, 60Hz	Jones Chang
RE<1G	18deg. C, 72%RH	120Vac, 60Hz	Nick Hsu
PLC	18deg. C, 72%RH	120Vac, 60Hz	Nick Hsu
APCM	25deg. C, 60%RH	120Vac, 60Hz	Leo Tsai

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is > 98 %, duty factor is not required.



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.

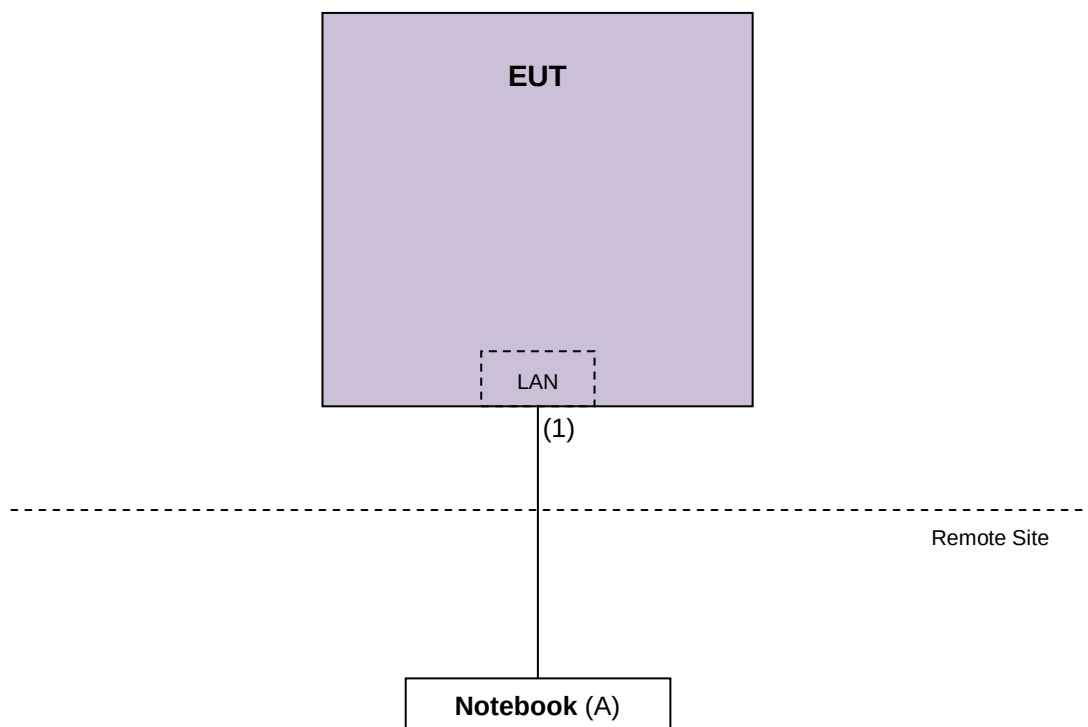
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E5410	1HC2XM1	FCC DoC Approved	-

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item A acted as a communication partner to transfer data.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ45 cable	1	3	N	0	Cat5e

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards

The EUT is a RF Product. According to the specification of the EUT declared by 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 EUT 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 30dB 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 30dB under any condition of modulation.

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration	Due Date Of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Oct. 06, 2014	Oct. 05, 2015
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100041	Aug. 29, 2014	Aug. 28, 2015
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Feb. 05, 2015	Feb. 04, 2016
HORN Antenna SCHWARZBECK	9120D	209	Feb. 09, 2015	Feb. 08, 2016
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Feb. 09, 2015	Feb. 08, 2016
Preamplifier Agilent	8447D	2944A10738	Oct.18, 2014	Oct. 17, 2015
Preamplifier Agilent	8449B	3008A01964	Aug. 22, 2014	Aug. 21, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	214378/4	Aug. 22, 2014	Aug. 21, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 106	12738/6 +309224/4	Aug. 22, 2014	Aug. 21, 2015
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	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 BV ADT	TT100	TT93021703	NA	NA
Turn Table Controller BV ADT	SC100	SC93021703	NA	NA
High Speed Peak Power Meter	ML2495A	0824011	Jul. 26, 2014	Jul. 25, 2015
Power Sensor	MA2411B	0738171	Jul. 26, 2014	Jul. 25, 2015

- 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 HP 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.

4.1.3 Test Procedures

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

Note:

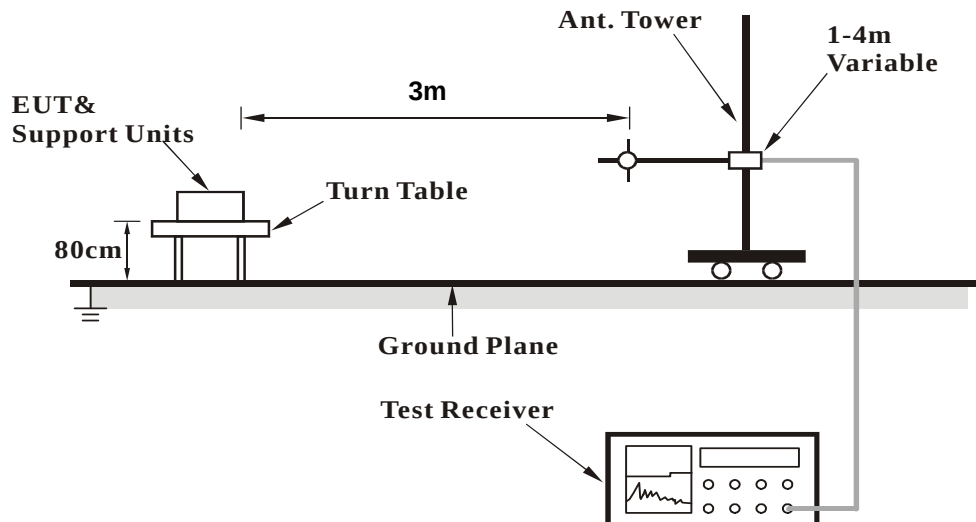
1. For emission measurements above 1 GHz, the EUT shall be placed at a height of 1.5 m above the ground at 3 meter chamber room for test
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (Duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ($10 \log(1/\text{duty cycle})$).
5. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.
6. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

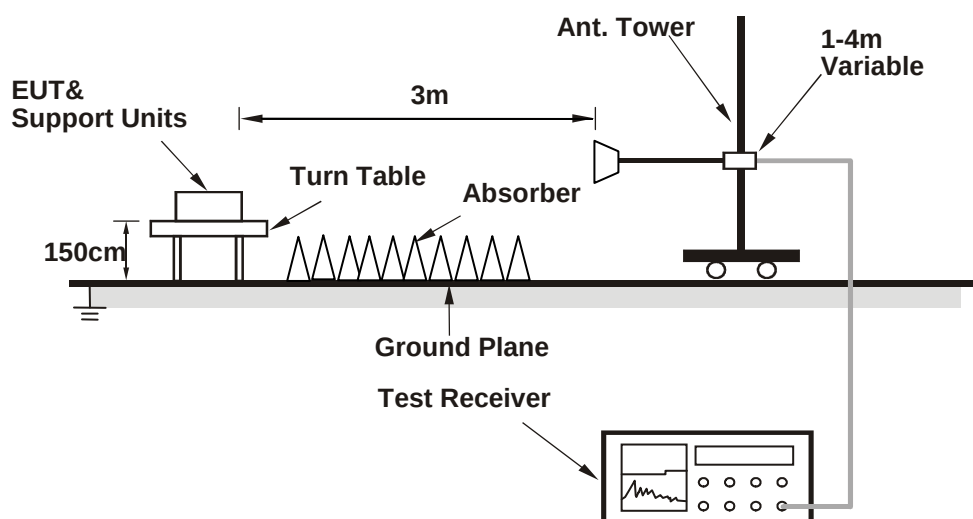
No deviation.

4.1.5 Test Set Up

<Frequency Range below 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

- Placed the EUT on the testing table.
- Prepared a notebook to act as a communication partner and placed it outside of testing area.
- The communication partner was connected with EUT via a RJ45 cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
- The communication partner sent data to EUT by command "PING".

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	58.7 PK	74.0	-15.3	1.50 H	70	26.20	32.50
2	2390.00	47.9 AV	54.0	-6.1	1.50 H	70	15.40	32.50
3	*2412.00	112.3 PK			1.50 H	73	79.70	32.60
4	*2412.00	108.6 AV			1.50 H	73	76.00	32.60
5	4824.00	53.6 PK	74.0	-20.4	2.00 H	110	47.70	5.90
6	4824.00	49.1 AV	54.0	-4.9	2.00 H	110	43.20	5.90
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	2390.00	59.8 PK	74.0	-14.2	1.12 V	300	27.30	32.50
2	2390.00	47.1 AV	54.0	-6.9	1.12 V	300	14.60	32.50
3	*2412.00	108.2 PK			1.18 V	300	75.60	32.60
4	*2412.00	104.3 AV			1.18 V	300	71.70	32.60
5	4824.00	56.1 PK	74.0	-17.9	1.70 V	206	50.20	5.90
6	4824.00	53.1 AV	54.0	-0.9	1.70 V	206	47.20	5.90

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)
– 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.

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	112.2 PK			1.07 H	16	79.50	32.70
2	*2437.00	108.3 AV			1.07 H	16	75.60	32.70
3	4874.00	55.7 PK	74.0	-18.3	2.10 H	112	49.80	5.90
4	4874.00	52.2 AV	54.0	-1.8	2.10 H	112	46.30	5.90
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	*2437.00	110.0 PK			1.70 V	305	77.30	32.70
2	*2437.00	105.9 AV			1.70 V	305	73.20	32.70
3	4874.00	56.4 PK	74.0	-17.6	1.15 V	200	50.50	5.90
4	4874.00	53.0 AV	54.0	-1.0	1.15 V	200	47.10	5.90

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)
– 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.

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	111.1 PK			1.54 H	145	78.50	32.60
2	*2462.00	107.3 AV			1.54 H	145	74.70	32.60
3	2483.50	62.0 PK	74.0	-12.0	1.60 H	140	29.30	32.70
4	2483.50	51.9 AV	54.0	-2.1	1.60 H	140	19.20	32.70
5	4924.00	54.1 PK	74.0	-19.9	1.80 H	140	48.10	6.00
6	4924.00	50.2 AV	54.0	-3.8	1.80 H	140	44.20	6.00
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	*2462.00	110.0 PK			1.58 V	310	77.40	32.60
2	*2462.00	106.1 AV			1.58 V	310	73.50	32.60
3	2483.50	58.8 PK	74.0	-15.2	1.48 V	320	26.10	32.70
4	2483.50	47.8 AV	54.0	-6.2	1.48 V	320	15.10	32.70
5	4924.00	57.0 PK	74.0	-17.0	1.04 V	210	51.00	6.00
6	4924.00	53.2 AV	54.0	-0.8	1.04 V	210	47.20	6.00

REMARKS:

- Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
- Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
– Pre-Amplifier Factor(dB)
- The other emission levels were very low against the limit.
- Margin value = Emission Level – Limit value
- " * ": Fundamental frequency.

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	71.1 PK	74.0	-2.9	1.54 H	154	38.60	32.50
2	2390.00	53.3 AV	54.0	-0.7	1.54 H	154	20.80	32.50
3	*2412.00	110.0 PK			1.53 H	146	77.40	32.60
4	*2412.00	101.4 AV			1.53 H	146	68.80	32.60
5	4824.00	48.5 PK	74.0	-25.5	1.00 H	119	42.60	5.90
6	4824.00	35.6 AV	54.0	-18.4	1.00 H	119	29.70	5.90
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	2390.00	68.8 PK	74.0	-5.2	1.80 V	307	36.30	32.50
2	2390.00	52.0 AV	54.0	-2.0	1.80 V	307	19.50	32.50
3	*2412.00	105.6 PK			1.80 V	320	73.00	32.60
4	*2412.00	97.0 AV			1.80 V	320	64.40	32.60
5	4824.00	49.1 PK	74.0	-24.9	1.70 V	300	43.20	5.90
6	4824.00	36.5 AV	54.0	-17.5	1.70 V	300	30.60	5.90

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)
– 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.

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	2390.00	63.2 PK	74.0	-10.8	1.67 H	65	30.70	32.50
2	2390.00	48.4 AV	54.0	-5.6	1.67 H	65	15.90	32.50
3	*2437.00	114.8 PK			1.00 H	275	82.10	32.70
4	*2437.00	106.1 AV			1.00 H	275	73.40	32.70
5	4874.00	54.4 PK	74.0	-19.6	1.71 H	109	48.50	5.90
6	4874.00	41.2 AV	54.0	-12.8	1.71 H	109	35.30	5.90
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	2390.00	58.8 PK	74.0	-15.2	1.56 V	310	26.30	32.50
2	2390.00	47.5 AV	54.0	-6.5	1.56 V	310	15.00	32.50
3	*2437.00	113.1 PK			1.51 V	311	80.40	32.70
4	*2437.00	104.1 AV			1.51 V	311	71.40	32.70
5	4874.00	51.4 PK	74.0	-22.6	1.53 V	316	45.50	5.90
6	4874.00	37.2 AV	54.0	-16.8	1.53 V	316	31.30	5.90

REMARKS:

- Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
- Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
– Pre-Amplifier Factor(dB)
- The other emission levels were very low against the limit.
- Margin value = Emission Level – Limit value
- " * ": Fundamental frequency.

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	111.1 PK			1.40 H	270	78.50	32.60
2	*2462.00	101.7 AV			1.40 H	270	69.10	32.60
3	2483.50	73.1 PK	74.0	-0.9	1.40 H	250	40.40	32.70
4	2483.50	53.2 AV	54.0	-0.8	1.40 H	250	20.50	32.70
5	4924.00	49.7 PK	74.0	-24.3	1.60 H	320	43.70	6.00
6	4924.00	37.0 AV	54.0	-17.0	1.60 H	320	31.00	6.00
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	*2462.00	108.1 PK			1.25 V	300	75.50	32.60
2	*2462.00	99.7 AV			1.25 V	300	67.10	32.60
3	2483.50	69.5 PK	74.0	-4.5	1.26 V	320	36.80	32.70
4	2483.50	52.2 AV	54.0	-1.8	1.26 V	320	19.50	32.70
5	4924.00	49.3 PK	74.0	-24.7	1.47 V	300	43.30	6.00
6	4924.00	36.2 AV	54.0	-17.8	1.47 V	300	30.20	6.00

REMARKS:

- Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
- Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
– Pre-Amplifier Factor(dB)
- The other emission levels were very low against the limit.
- Margin value = Emission Level – Limit value
- " * ": Fundamental frequency.

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	71.6 PK	74.0	-2.4	1.13 H	100	39.10	32.50
2	2390.00	53.3 AV	54.0	-0.7	1.33 H	100	20.80	32.50
3	*2412.00	111.8 PK			1.20 H	149	79.20	32.60
4	*2412.00	102.5 AV			1.20 H	149	69.90	32.60
5	4824.00	48.3 PK	74.0	-25.7	1.10 H	300	42.40	5.90
6	4824.00	34.7 AV	54.0	-19.3	1.10 H	300	28.80	5.90
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	2390.00	61.6 PK	74.0	-12.4	1.50 V	330	29.10	32.50
2	2390.00	49.1 AV	54.0	-4.9	1.50 V	330	16.60	32.50
3	*2412.00	106.1 PK			1.53 V	310	73.50	32.60
4	*2412.00	96.9 AV			1.53 V	310	64.30	32.60
5	4824.00	48.0 PK	74.0	-26.0	1.10 V	202	42.10	5.90
6	4824.00	34.8 AV	54.0	-19.2	1.10 V	202	28.90	5.90

REMARKS:

- Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
- Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
– Pre-Amplifier Factor(dB)
- The other emission levels were very low against the limit.
- Margin value = Emission Level – Limit value
- " * ": Fundamental frequency.

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	116.6 PK			1.00 H	251	83.90	32.70
2	*2437.00	107.3 AV			1.00 H	251	74.60	32.70
3	4874.00	49.6 PK	74.0	-24.4	1.22 H	159	43.70	5.90
4	4874.00	36.6 AV	54.0	-17.4	1.22 H	159	30.70	5.90
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	*2437.00	111.8 PK			1.87 V	324	79.10	32.70
2	*2437.00	102.4 AV			1.87 V	324	69.70	32.70
3	4874.00	52.0 PK	74.0	-22.0	1.03 V	99	46.10	5.90
4	4874.00	39.8 AV	54.0	-14.2	1.03 V	99	33.90	5.90

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)
– 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.

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	110.2 PK			1.36 H	150	77.60	32.60
2	*2462.00	100.4 AV			1.36 H	150	67.80	32.60
3	2483.50	69.8 PK	74.0	-4.2	1.39 H	151	37.10	32.70
4	2483.50	53.2 AV	54.0	-0.8	1.39 H	151	20.50	32.70
5	4924.00	50.5 PK	74.0	-23.5	1.10 H	220	44.50	6.00
6	4924.00	38.0 AV	54.0	-16.0	1.10 H	220	32.00	6.00
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	*2462.00	109.6 PK			1.80 V	280	77.00	32.60
2	*2462.00	99.7 AV			1.80 V	280	67.10	32.60
3	2483.50	66.1 PK	74.0	-7.9	1.80 V	287	33.40	32.70
4	2483.50	51.4 AV	54.0	-2.6	1.80 V	287	18.70	32.70
5	4924.00	47.9 PK	74.0	-26.1	1.00 V	156	41.90	6.00
6	4924.00	35.0 AV	54.0	-19.0	1.00 V	156	29.00	6.00

REMARKS:

- Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
- Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
– Pre-Amplifier Factor(dB)
- The other emission levels were very low against the limit.
- Margin value = Emission Level – Limit value
- " * ": Fundamental frequency.

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	68.7 PK	74.0	-5.3	1.40 H	192	36.20	32.50
2	2390.00	53.2 AV	54.0	-0.8	1.40 H	192	20.70	32.50
3	*2422.00	107.5 PK			1.40 H	153	74.90	32.60
4	*2422.00	97.9 AV			1.40 H	253	65.30	32.60
5	4844.00	49.0 PK	74.0	-25.0	1.02 H	100	43.10	5.90
6	4844.00	35.1 AV	54.0	-18.9	1.02 H	100	29.20	5.90
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	2390.00	58.9 PK	74.0	-15.1	1.45 V	150	26.40	32.50
2	2390.00	47.8 AV	54.0	-6.2	1.45 V	150	15.30	32.50
3	*2422.00	102.5 PK			1.47 V	325	69.90	32.60
4	*2422.00	93.3 AV			1.47 V	325	60.70	32.60
5	4844.00	48.1 PK	74.0	-25.9	1.20 V	100	42.20	5.90
6	4844.00	35.2 AV	54.0	-18.8	1.20 V	100	29.30	5.90

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)
– 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.

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	2390.00	69.7 PK	74.0	-4.3	1.42 H	253	37.20	32.50
2	2390.00	53.3 AV	54.0	-0.7	1.42 H	253	20.80	32.50
3	*2437.00	110.4 PK			1.40 H	259	77.70	32.70
4	*2437.00	101.0 AV			1.40 H	259	68.30	32.70
5	4874.00	48.9 PK	74.0	-25.1	1.50 H	170	43.00	5.90
6	4874.00	36.7 AV	54.0	-17.3	1.50 H	170	30.80	5.90
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	2390.00	59.5 PK	74.0	-14.5	1.35 V	140	27.00	32.50
2	2390.00	48.4 AV	54.0	-5.6	1.35 V	140	15.90	32.50
3	*2437.00	104.4 PK			1.39 V	137	71.70	32.70
4	*2437.00	95.6 AV			1.39 V	137	62.90	32.70
5	4874.00	47.0 PK	74.0	-27.0	1.06 V	9	41.10	5.90
6	4874.00	35.4 AV	54.0	-18.6	1.06 V	9	29.50	5.90

REMARKS:

- Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
- Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
– Pre-Amplifier Factor(dB)
- The other emission levels were very low against the limit.
- Margin value = Emission Level – Limit value
- " * ": Fundamental frequency.

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	108.4 PK			1.40 H	250	75.70	32.70
2	*2452.00	99.0 AV			1.40 H	250	66.30	32.70
3	2483.50	65.7 PK	74.0	-8.3	1.39 H	240	33.00	32.70
4	2483.50	53.1 AV	54.0	-0.9	1.39 H	240	20.40	32.70
5	4904.00	48.9 PK	74.0	-25.1	1.26 H	170	43.10	5.80
6	4904.00	35.1 AV	54.0	-18.9	1.26 H	170	29.30	5.80
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	104.6 PK			1.44 V	310	71.90	32.70
2	*2452.00	95.0 AV			1.44 V	310	62.30	32.70
3	2483.50	58.9 PK	74.0	-15.1	1.44 V	312	26.20	32.70
4	2483.50	48.0 AV	54.0	-6.0	1.44 V	312	15.30	32.70
5	4904.00	49.1 PK	74.0	-24.9	1.00 V	105	43.30	5.80
6	4904.00	35.2 AV	54.0	-18.8	1.00 V	105	29.40	5.80

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: 802.11n (HT20)

CHANNEL	TX Channel 6	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	57.07	32.4 QP	40.0	-7.6	2.00 H	133	47.00	-14.60
2	148.26	26.7 QP	43.5	-16.8	2.00 H	98	40.70	-14.00
3	249.17	24.9 QP	46.0	-21.1	1.01 H	260	39.30	-14.40
4	309.32	24.2 QP	46.0	-21.8	1.01 H	279	36.50	-12.30
5	499.48	29.0 QP	46.0	-17.0	1.51 H	105	37.40	-8.40
6	714.86	42.5 QP	46.0	-3.5	1.51 H	91	46.80	-4.30
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	35.72	27.6 QP	40.0	-12.4	1.00 V	265	43.20	-15.60
2	57.07	27.9 QP	40.0	-12.1	1.00 V	346	42.50	-14.60
3	124.98	26.7 QP	43.5	-16.8	1.00 V	320	42.80	-16.10
4	249.17	22.1 QP	46.0	-23.9	1.49 V	16	36.50	-14.40
5	499.48	26.1 QP	46.0	-19.9	1.00 V	178	34.50	-8.40
6	714.86	40.5 QP	46.0	-5.5	1.00 V	108	44.80	-4.30

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)
– 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 (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	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.	Date Of Calibration	Due Date Of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 11, 2014	Nov. 10, 2015
RF signal cable Woken	5D-FB	Cable-HYC01-01	Dec. 26, 2014	Dec. 25, 2015
LISN ROHDE & SCHWARZ (EUT)	ENV216	100072	Jun. 10, 2014	Jun. 09, 2015
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 21, 2014	Jul. 20, 2015
Software ADT	BV ADT_Cond_ V7.3.7.3	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 1.
3. The VCCI Site Registration No. is C-2040.

4.2.3 Test Procedures

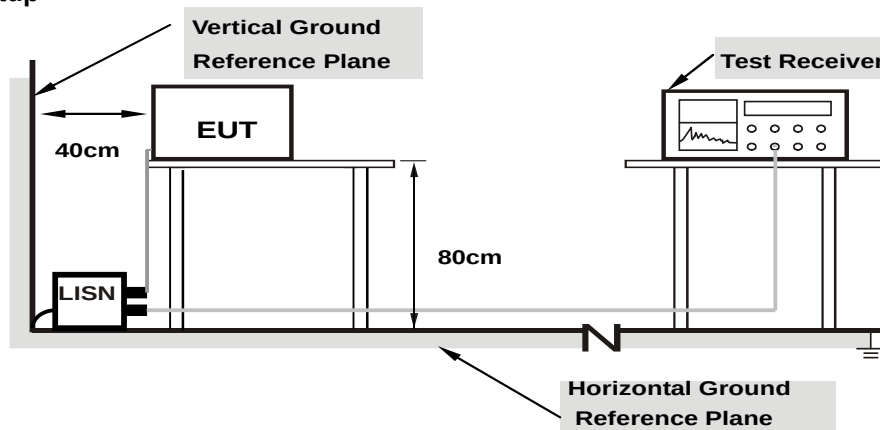
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance 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) were not recorded.

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1.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 4.1.6.

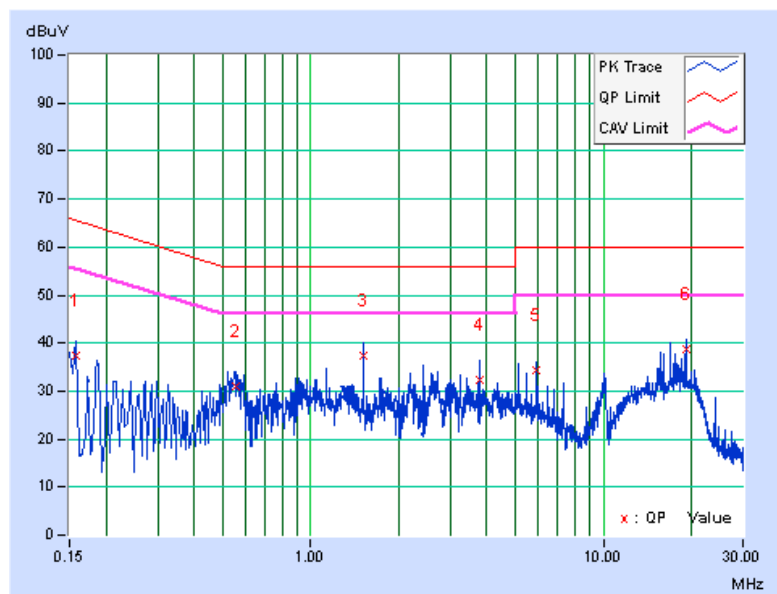
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
-------	----------	-------------------	--------------------------------

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15760	9.57	27.88	19.12	37.45	28.69	65.59	55.59	-28.14	-26.90
2	0.55241	9.56	21.38	14.69	30.94	24.25	56.00	46.00	-25.06	-21.75
3	1.51850	9.57	27.96	18.10	37.53	27.67	56.00	46.00	-18.47	-18.33
4	3.77066	9.58	22.81	16.60	32.39	26.18	56.00	46.00	-23.61	-19.82
5	5.93680	9.59	24.84	15.72	34.43	25.31	60.00	50.00	-25.57	-24.69
6	19.22689	9.64	29.10	21.60	38.74	31.24	60.00	50.00	-21.26	-18.76

REMARKS:

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

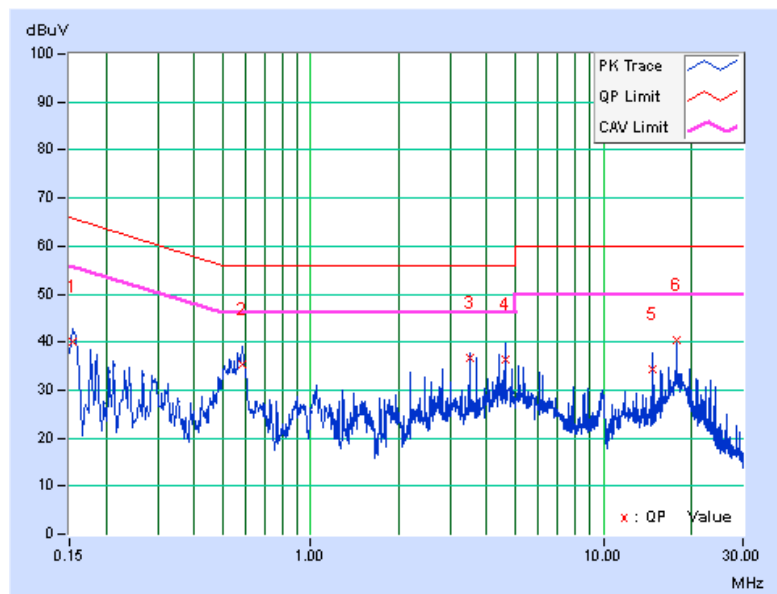


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
-------	-------------	-------------------	--------------------------------

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	9.56	30.61	23.37	40.17	32.93	65.79	55.79	-25.62	-22.86
2	0.58401	9.56	25.89	20.72	35.45	30.28	56.00	46.00	-20.55	-15.72
3	3.51651	9.58	27.10	17.77	36.68	27.35	56.00	46.00	-19.32	-18.65
4	4.60740	9.58	26.82	17.52	36.40	27.10	56.00	46.00	-19.60	-18.90
5	14.81250	9.64	24.61	15.28	34.25	24.92	60.00	50.00	-25.75	-25.08
6	17.80756	9.65	30.90	19.72	40.55	29.37	60.00	50.00	-19.45	-20.63

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.

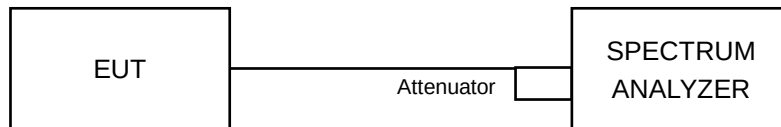


4.3 6dB Bandwidth Measurement

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

558074 D01 DTS Meas Guidance v03r02 section 8.1

- 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 Result

802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	10.11	0.5	Pass
6	2437	10.12	0.5	Pass
11	2462	10.11	0.5	Pass

802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	16.65	0.5	Pass
6	2437	16.60	0.5	Pass
11	2462	16.63	0.5	Pass

802.11n (HT20)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		CHAIN 0	CHAIN 1		
1	2412	17.88	17.86	0.5	Pass
6	2437	17.89	17.89	0.5	Pass
11	2462	17.87	17.86	0.5	Pass

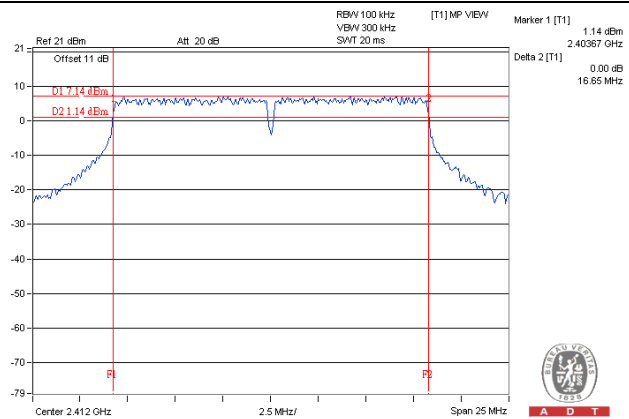
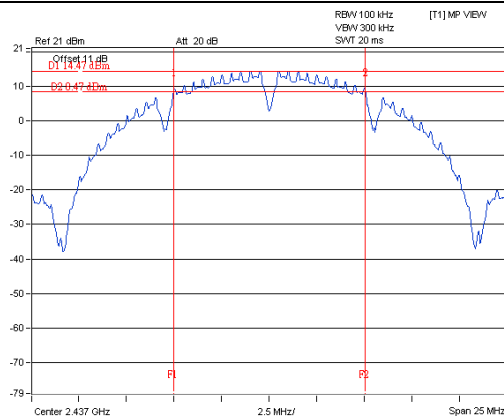
802.11n (HT40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		CHAIN 0	CHAIN 1		
3	2422	36.55	36.56	0.5	Pass
6	2437	36.53	36.53	0.5	Pass
9	2452	36.53	36.54	0.5	Pass

Spectrum Plot of Worst Value

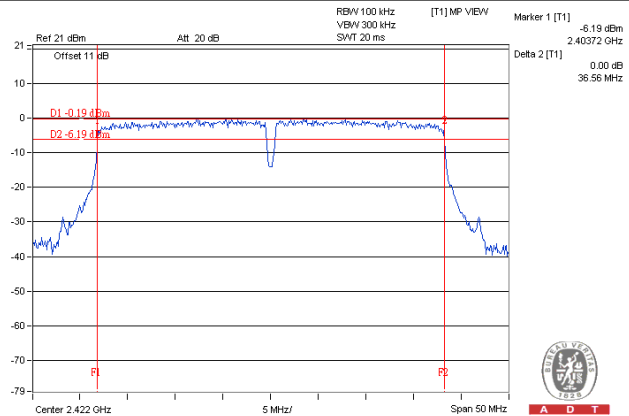
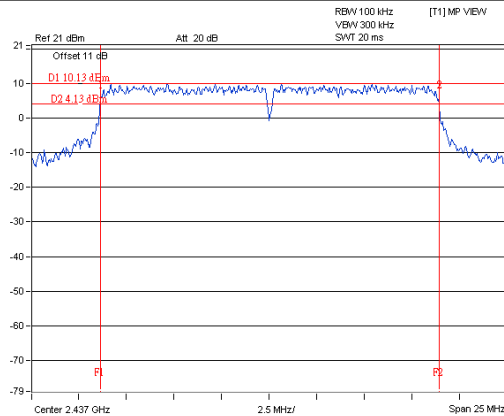
802.11b

802.11g



802.11n (HT20)

802.11n (HT40)



4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

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

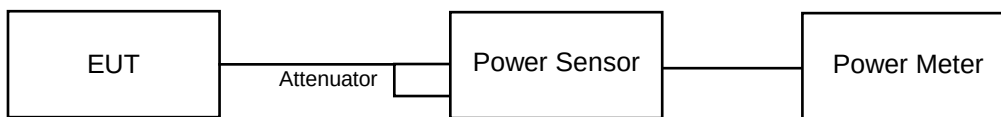
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

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

558074 D01 DTS Meas Guidance v03r02 section 9.2.3.2

An average power sensor was used on the output port of the EUT. A power meter was used to read the response of the average power sensor. Record the 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 AVERAGE POWER

802.11b

Chan.	Freq. (MHz)	Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	260.615	24.16	30	Pass
6	2437	308.319	24.89	30	Pass
11	2462	253.513	24.04	30	Pass

802.11g

Chan.	Freq. (MHz)	Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	137.088	21.37	30	Pass
6	2437	374.111	25.73	30	Pass
11	2462	133.045	21.24	30	Pass

802.11n (HT20)

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	20.94	20.86	246.064	23.91	30	Pass
6	2437	23.92	23.93	493.776	26.94	30	Pass
11	2462	20.81	20.47	231.933	23.65	30	Pass

802.11n (HT40)

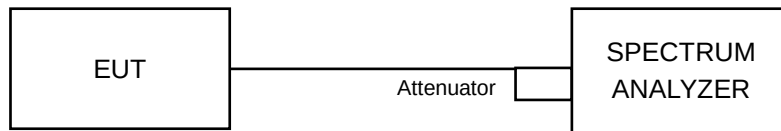
Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	18.27	18.33	135.220	21.31	30	Pass
6	2437	20.10	19.78	197.389	22.95	30	Pass
9	2452	18.03	18.06	127.506	21.06	30	Pass

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

558074 D01 DTS Meas Guidance v03r02 section 10.3

- Set instrument center frequency to DTS channel center frequency.
- Set span to at least 1.5 times the OBW.
- Set RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set VBW $\geq 3 \times \text{RBW}$.
- Detector = power averaging (RMS) or sample detector (when RMS not available).
- Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span}/\text{RBW}$.
- Sweep time = auto couple.
- Employ trace averaging (RMS) mode over a minimum of 100 traces.
- Use the peak marker function to determine the maximum amplitude level.

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

802.11b

Channel	Freq. (MHz)	PSD (dBm)	Limit (dBm)	PASS /FAIL
1	2412	-3.61	8	PASS
6	2437	-3.39	8	PASS
11	2462	-4.65	8	PASS

802.11g

Channel	Freq. (MHz)	PSD (dBm)	Limit (dBm)	PASS /FAIL
1	2412	-8.61	8	PASS
6	2437	-4.13	8	PASS
11	2462	-8.62	8	PASS

802.11n (HT20)

TX chain	Channel	Freq. (MHz)	PSD (dBm)	10 log (N=2) dB	Total PSD (dBm)	Limit (dBm)	PASS /FAIL
0	1	2412	-9.42	3.01	-6.41	8.00	Pass
	6	2437	-5.88	3.01	-2.87	8.00	Pass
	11	2462	-9.13	3.01	-6.12	8.00	Pass
1	1	2412	-10.92	3.01	-7.91	8.00	Pass
	6	2437	-7.22	3.01	-4.21	8.00	Pass
	11	2462	-10.96	3.01	-7.95	8.00	Pass

NOTE: Directional gain = 2dBi + 10log(2) = 5.01dBi < 6dBi , so the power density limit isn't reduced.

802.11n (HT40)

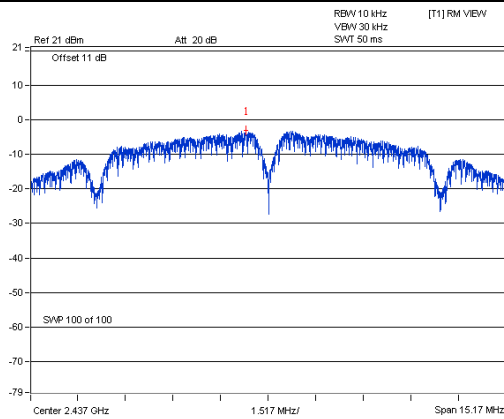
TX chain	Channel	Freq. (MHz)	PSD (dBm)	10 log (N=2) dB	Total PSD (dBm)	Limit (dBm)	PASS /FAIL
0	3	2422	-15.09	3.01	-12.08	8.00	Pass
	6	2437	-12.64	3.01	-9.63	8.00	Pass
	9	2452	-14.03	3.01	-11.02	8.00	Pass
1	3	2422	-16.72	3.01	-13.71	8.00	Pass
	6	2437	-14.21	3.01	-11.20	8.00	Pass
	9	2452	-15.55	3.01	-12.54	8.00	Pass

NOTE: Directional gain = 2dBi + 10log(2) = 5.01dBi < 6dBi , so the power density limit isn't reduced.

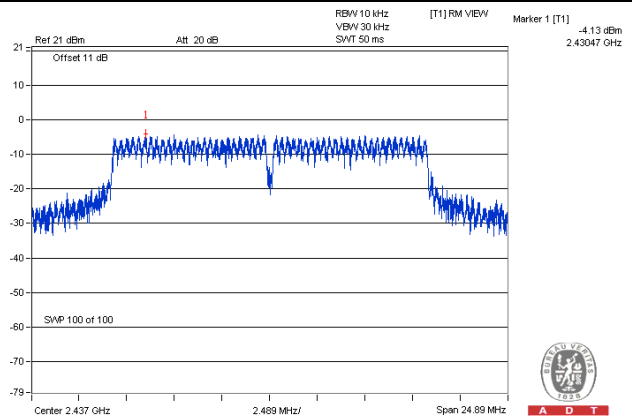
Spectrum Plot of Worst Value

802.11b

802.11g



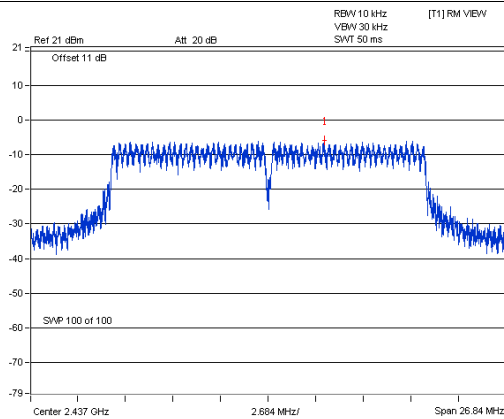
A D T



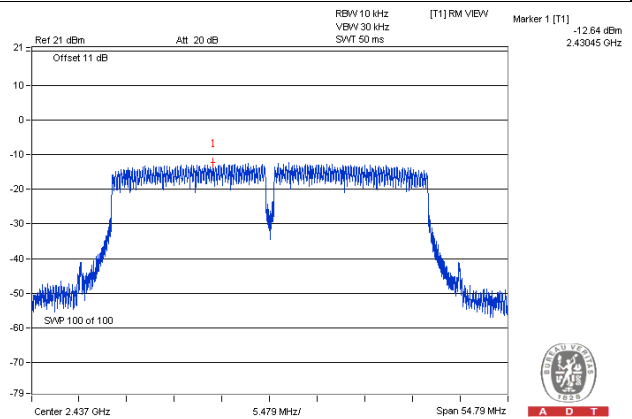
A D T

802.11n (HT20)

802.11n (HT40)



A D T



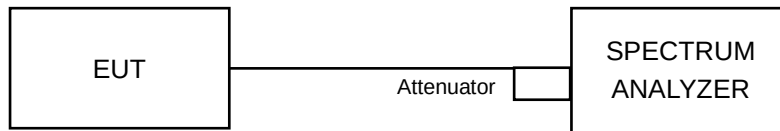
A D T

4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

Below 30dB 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

558074 D01 DTS Meas Guidance v03r02 section 11.2

1. Set the RBW = 100 kHz.
2. Set the VBW $\geq$ 300 kHz.
3. Detector = average.
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

558074 D01 DTS Meas Guidance v03r02 section 11.3

1. Set RBW = 100 kHz.
2. Set VBW $\geq$ 300 kHz.
3. Ensure that the number of measurement points $\geq$ span/RBW
4. According to measurement points to set differ measurement span.
5. Detector = peak.
6. Trace Mode = max hold.
7. Sweep = auto couple.

4.6.5 Deviation from Test Standard

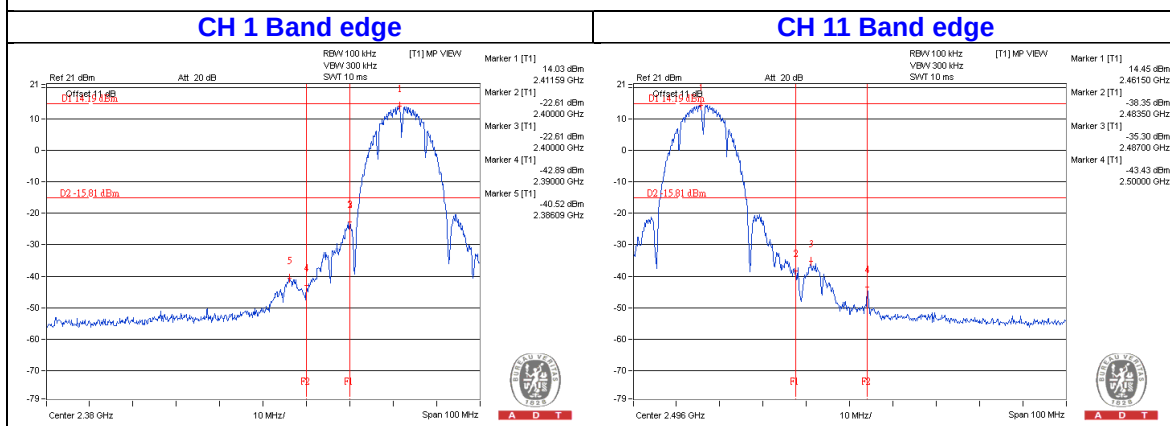
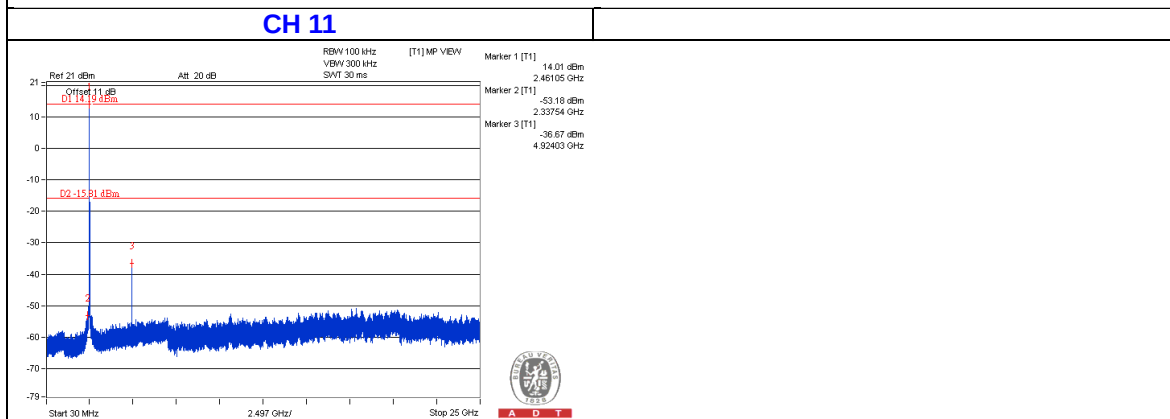
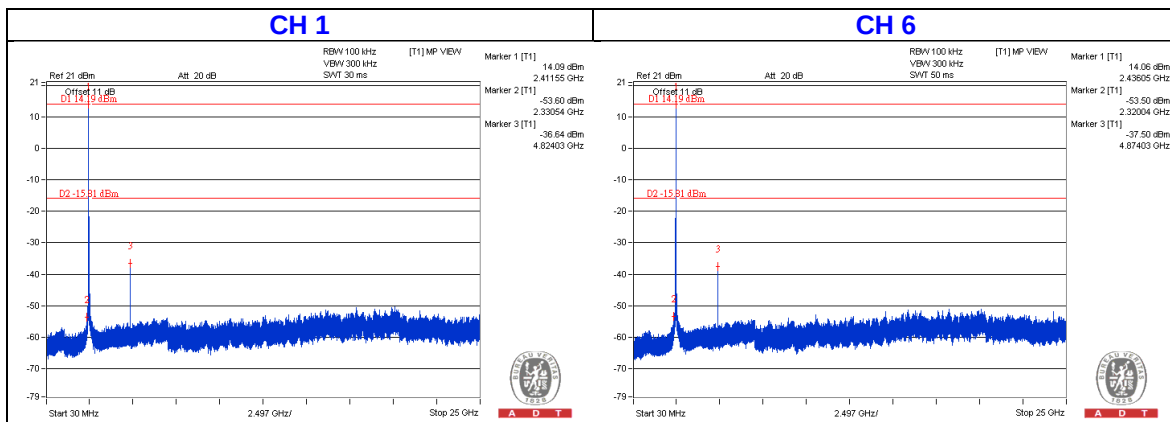
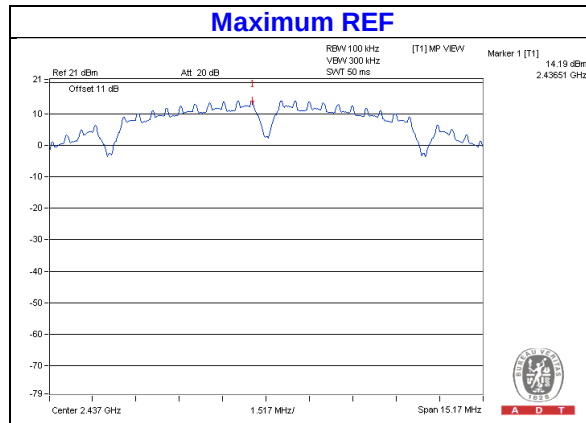
No deviation.

4.6.6 EUT Operating Condition

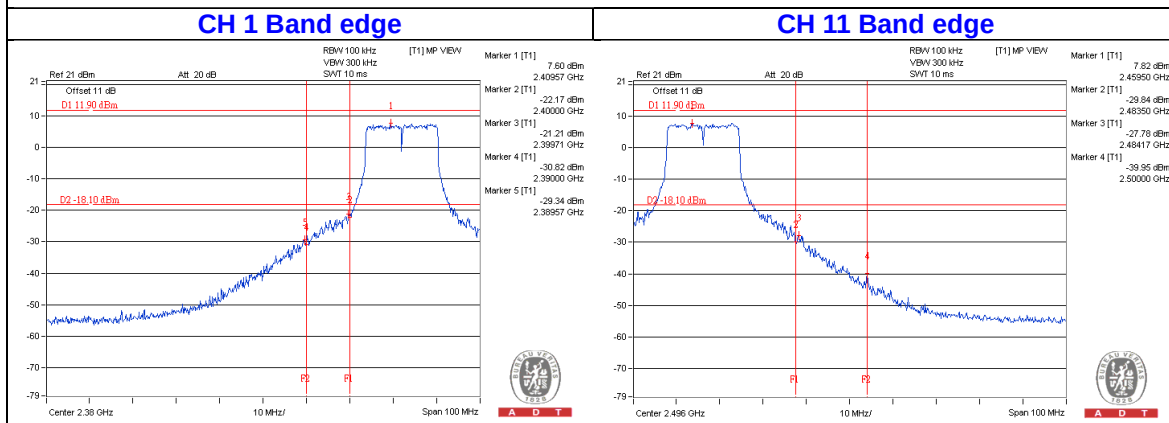
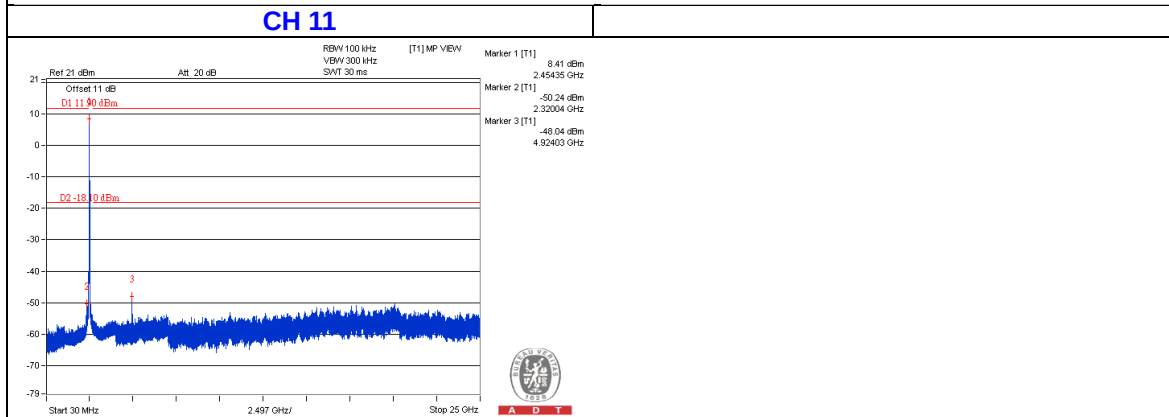
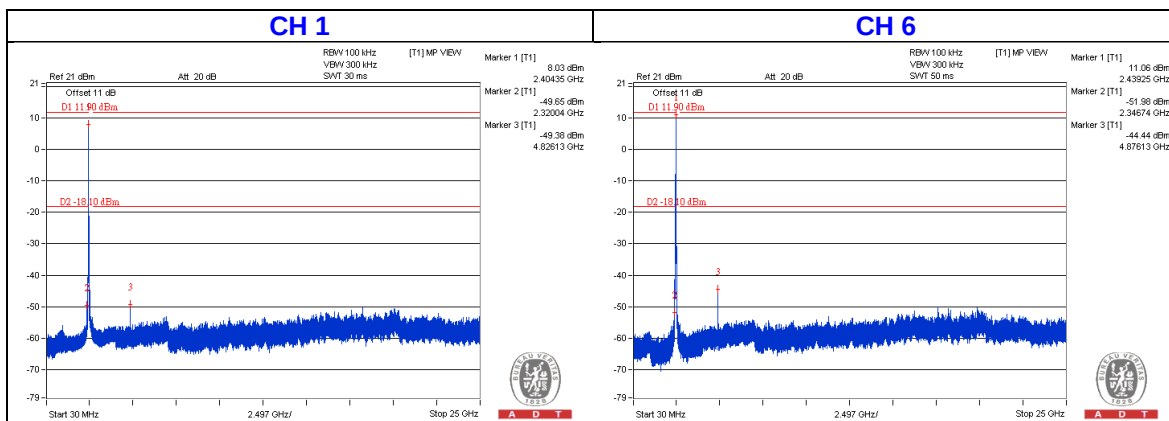
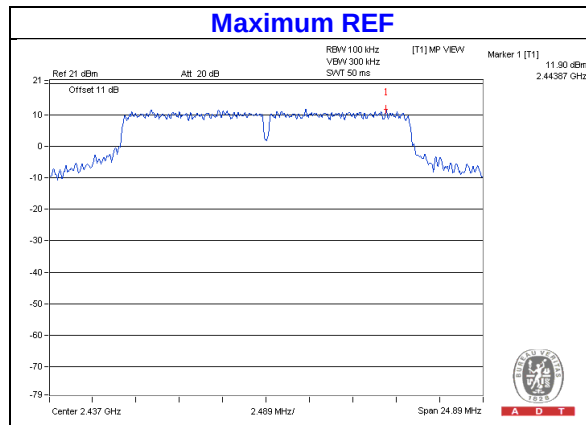
Same as Item 4.3.6

4.6.7 Test Results

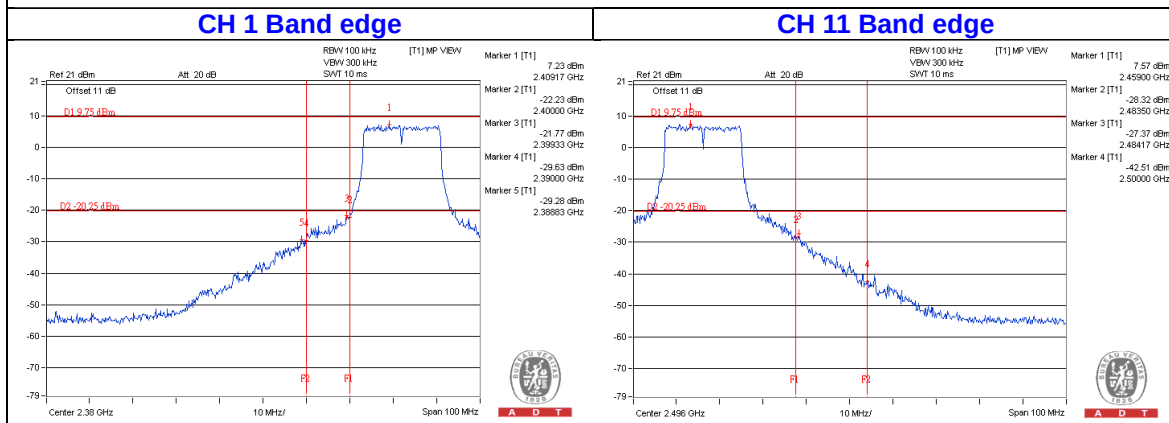
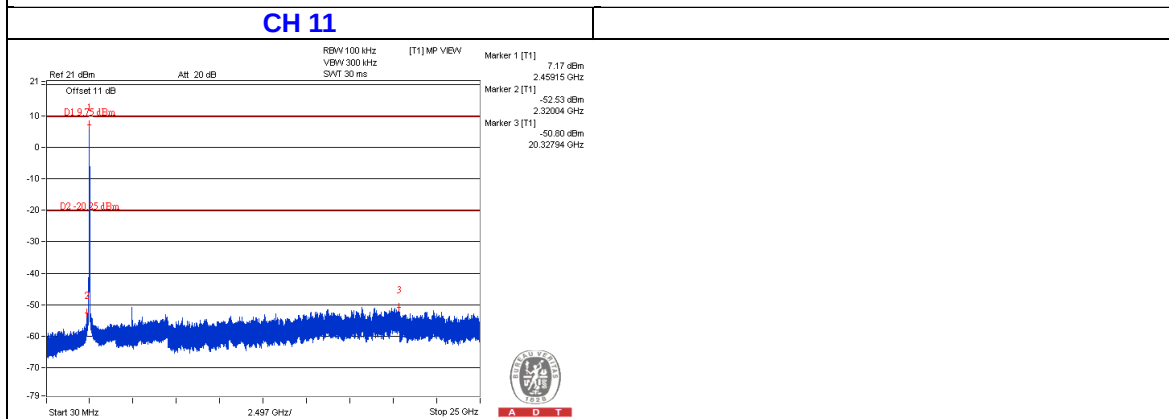
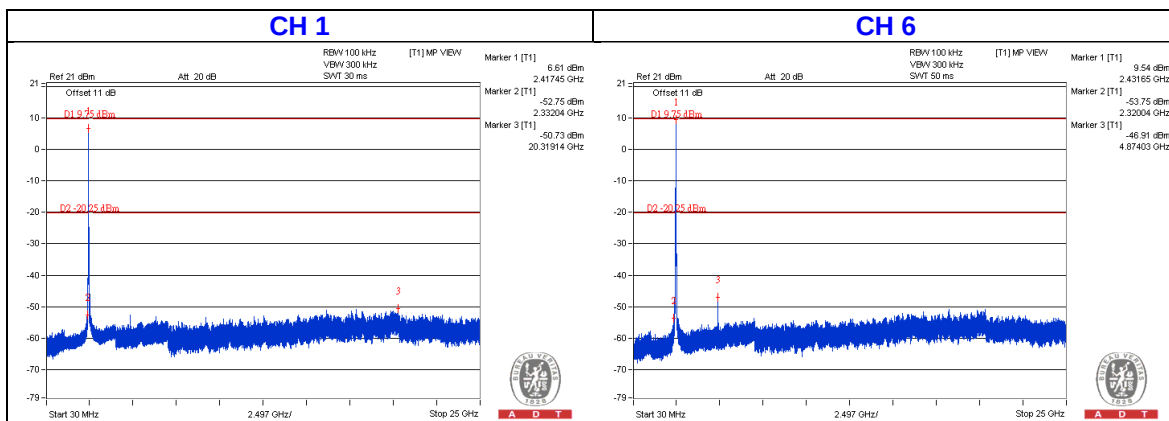
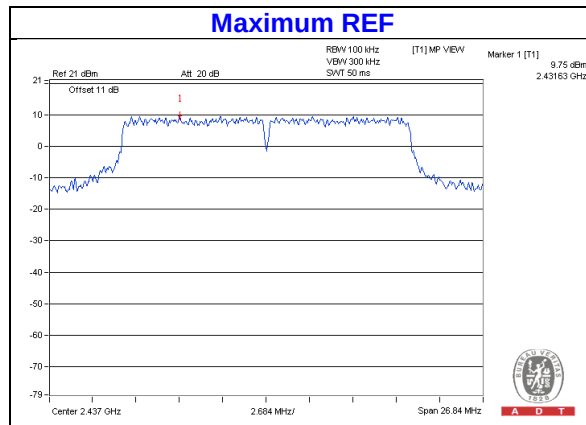
802.11b



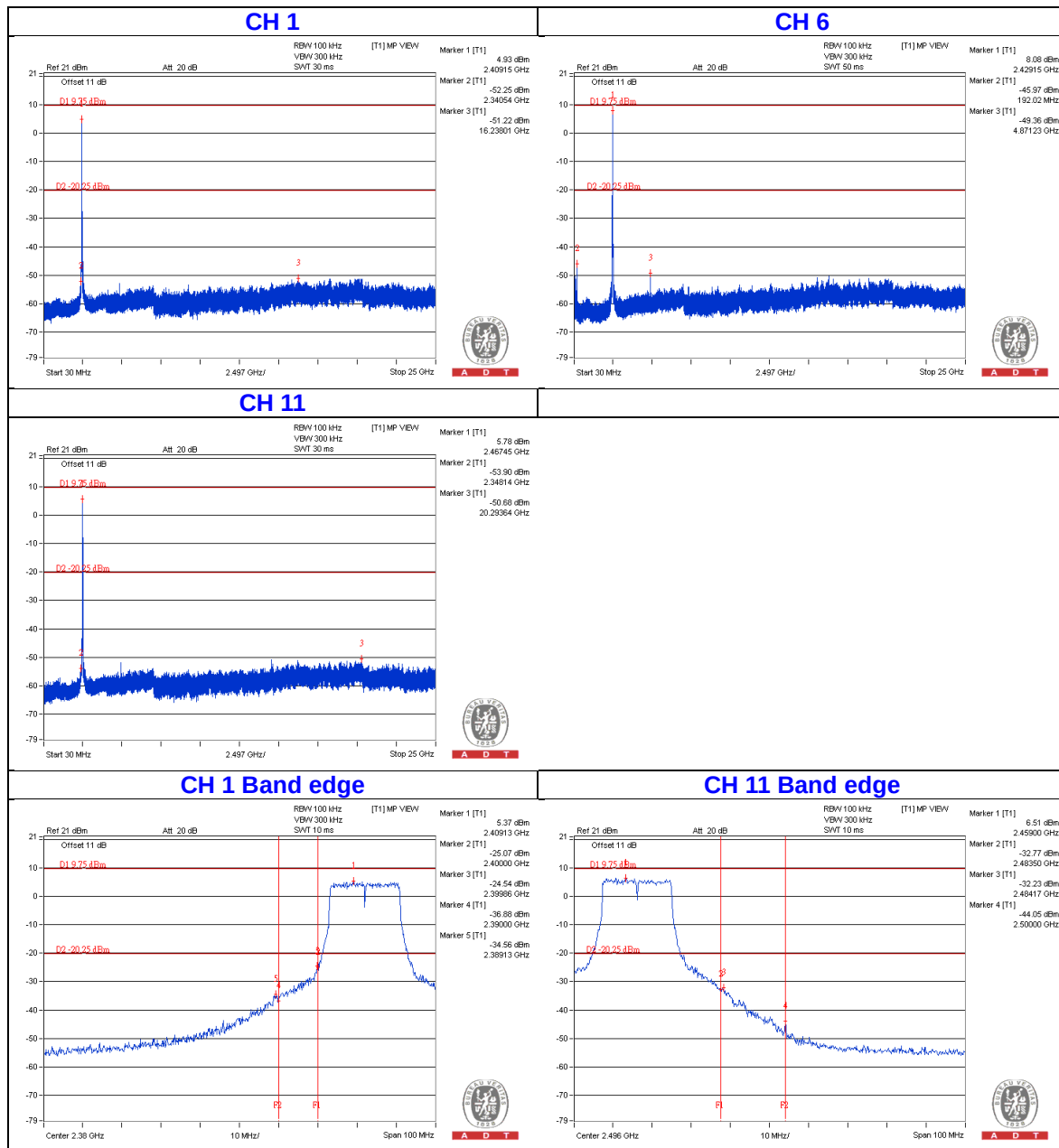
802.11g



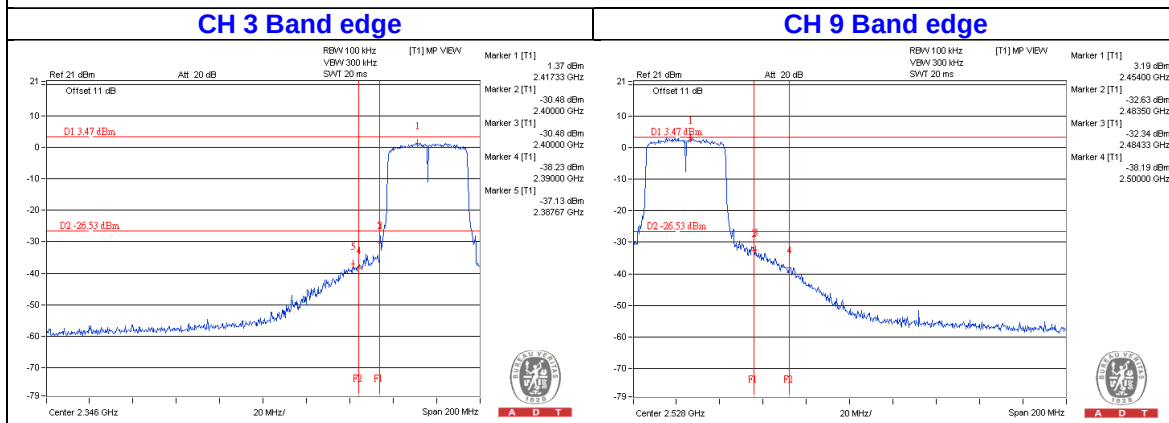
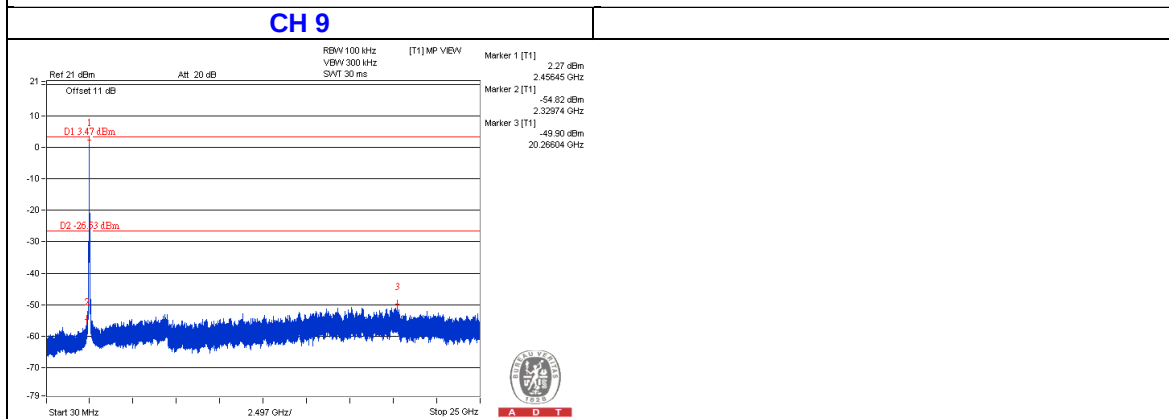
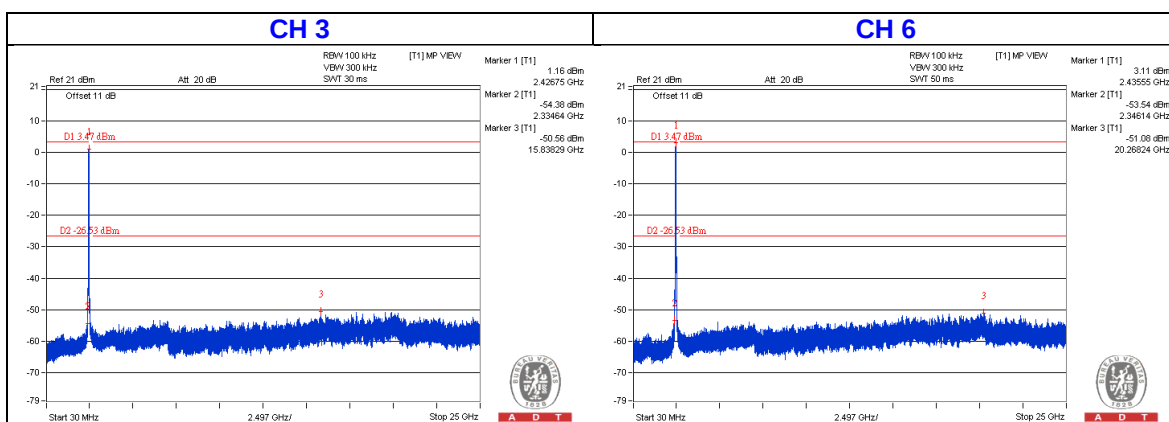
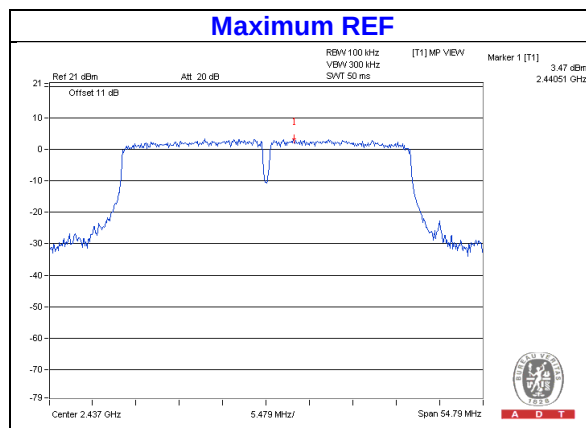
802.11n (HT20)_CHAIN 0



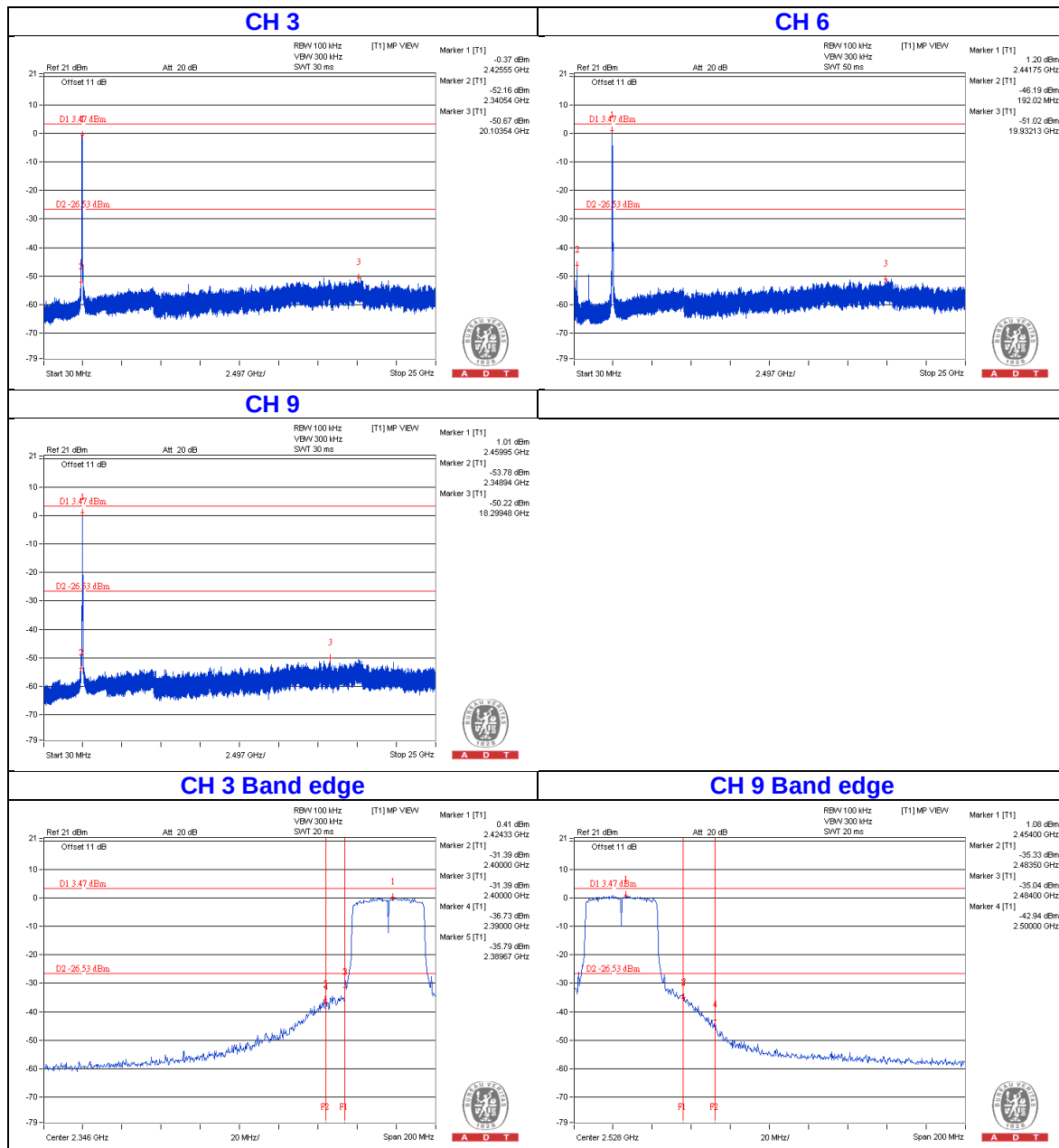
CHAIN 1



802.11n (HT40)_CHAIN 0



CHAIN 1



5 Pictures of Test Arrangements

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

Appendix – 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:

Linko EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-5935343

Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

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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