FCC Test Report

Report No.:	RF150427C42
FCC ID:	TE7TDW9970V1
Test Model:	TD-W9970
Received Date:	Apr. 27, 2015
Test Date:	May 25 ~ May 30, 2015
Issued Date:	Jun. 05, 2015
Applicant:	TP-LINK TECHNOLOGIES CO., LTD.
Address:	Building 24 (floors 1,3,4,5) and 28 (floors1-4) Central Science and Technology Park,Shennan Rd, Nanshan, Shenzhen,China
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan, R.O.C.
Test Location:	No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)

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Release Control Record

Issue No.	Description	Date Issued
RF150427C42	Original release	Jun. 05, 2015

1 Certificate of Conformity

Product:	300Mbps Wireless N USB VDSL2 Modem Router
Brand:	TP-LINK
Test Model:	TD-W9970
Sample Status:	PROTOTYPE
Applicant:	TP-LINK TECHNOLOGIES CO., LTD.
Test Date:	May 25 ~ May 30, 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 : _____ , **Date:** Jun. 05, 2015

Ivy Lin / Specialist

Approved by : _____ , **Date:** Jun. 05, 2015

Ken Liu / Senior Manager

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 -15.77dB at 0.52130MHz
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -0.1dB at 2390.00MHz.
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	Antenna connector is WELD not a standard connector.

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	Expended Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.44 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.63 dB
	200MHz ~1000MHz	3.64 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	300Mbps Wireless N USB VDSL2 Modem Router
Brand	TP-LINK
Test Model	TD-W9970
Status of EUT	PROTOTYPE
Power Supply Rating	12Vdc (Adapter)
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	255.27mW
Antenna Type	Ant. 0: Omnidirectional antenna with 3.81dBi gain Ant. 1: Omnidirectional antenna with 4.75dBi gain
Antenna Connector	WELD
Accessory Device	Adapter
Data Cable Supplied	NA

Note:

1. 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

* 802.11b and 802.11g fixed at chain 0 to transmit.

2. The EUT consumes power from the following adapter.

Brand	TP-LINK TECHNOLOGIES CO.,LTD.
Model	T120100-2B1
Input Power	100-240Vac, 50/60Hz, 0.3A
Output Power	12Vdc, 1A
Power Line	1.5m DC cable without core attached on adapter

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		

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)
-	802.11g	1 to 11	6	OFDM	BPSK	6.0

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	6	OFDM	BPSK	6.0

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	25deg. C, 65%RH	120Vac, 60Hz	Match Tsui , Ted Chang
RE<1G	25deg. C, 65%RH	120Vac, 60Hz	Match Tsui
PLC	25deg. C, 65%RH	120Vac, 60Hz	Ted Chang
APCM	24deg. C, 64%RH	120Vac, 60Hz	Match Tsui

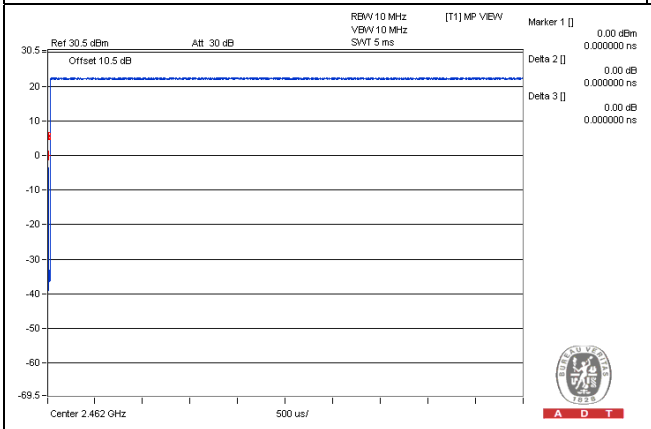
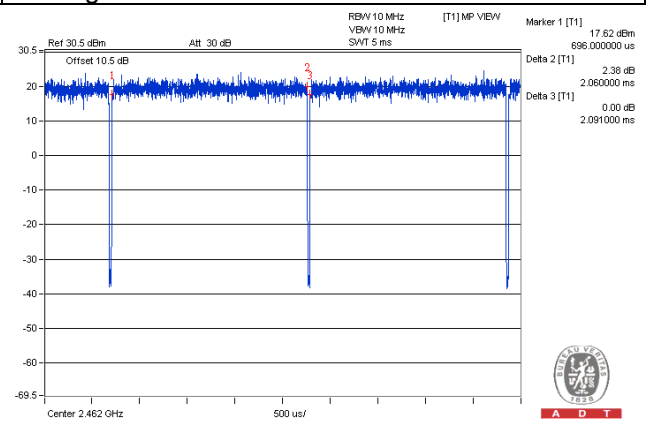
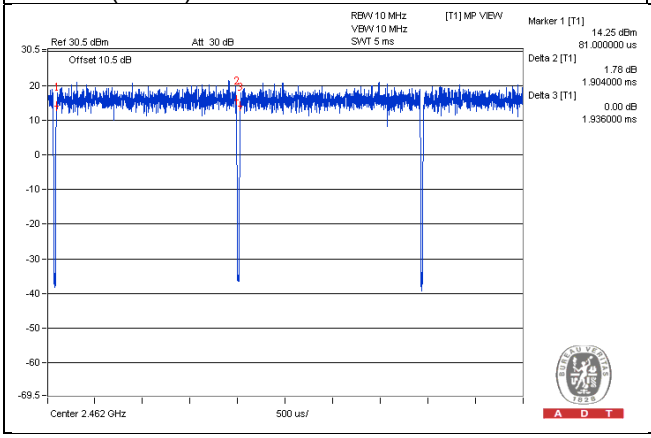
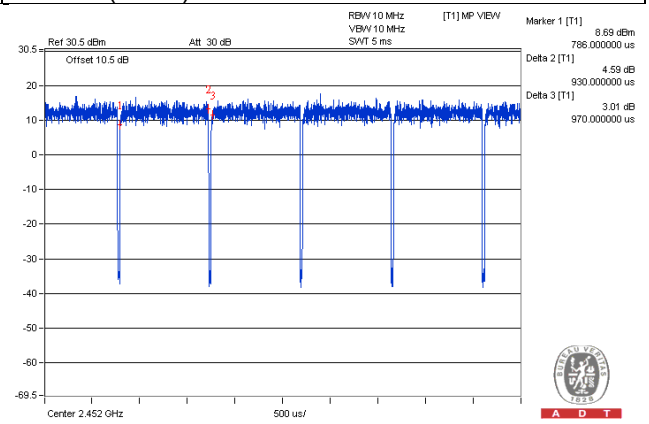
3.3 Duty Cycle of Test Signal

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

802.11b: Duty cycle of test signal is 100 %, duty factor is not required.
802.11g: Duty cycle = 2.060/2.091 = 0.985
802.11n (HT20): Duty cycle = 1.904/1.936 = 0.983

Duty cycle of test signal is < 98%, duty factor shall be considered.

802.11n (HT40): Duty cycle = 0.930/0.970 = 0.959, Duty factor = 10 * log(1/0.959) = 0.18

802.11b	802.11g
	
802.11n (HT20)	**802.11n (HT40)**
	

3.4 Description of Support Units

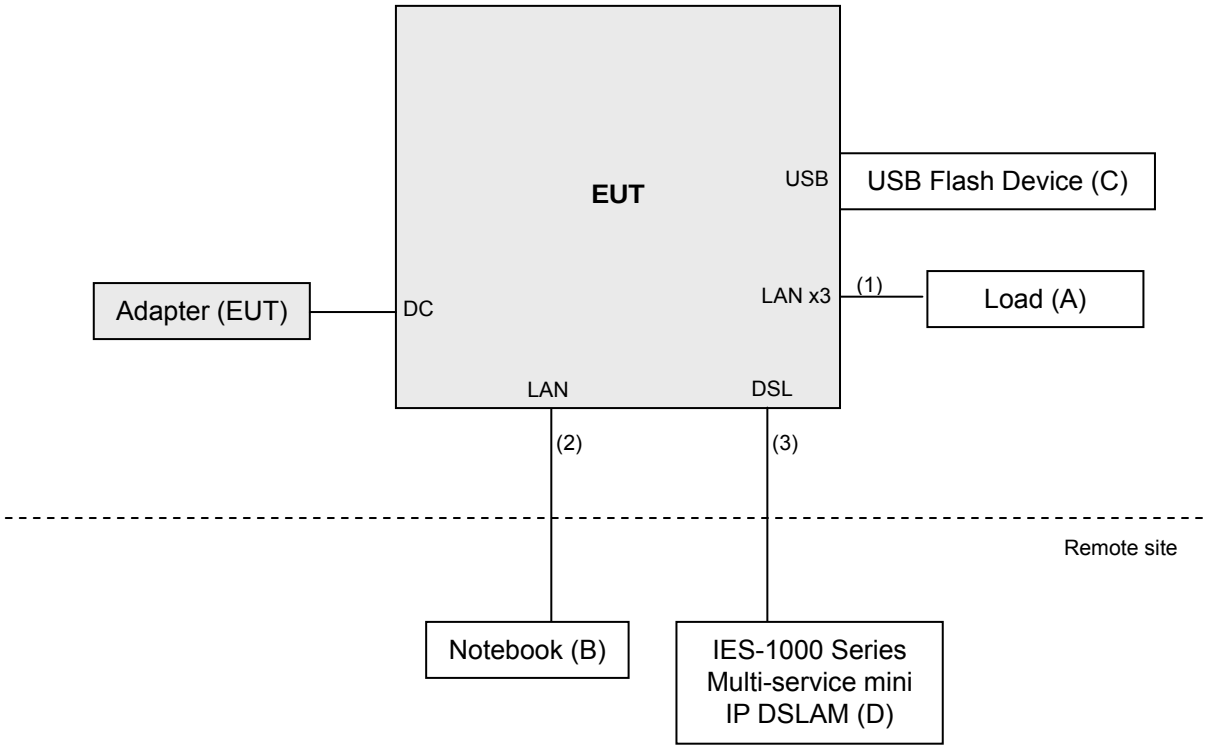
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Load	NA	NA	NA	NA	-
B.	Notebook	DELL	E5420	BPQ7MQ1	FCC DoC Approved	-
C.	USB Flash Device	Transcend	V85	538455 4489	FCC DoC Approved	-
D.	IES-1000 Series Multi-service mini IP DSLAM	ZyXEL	IES-1000	S0700Z21012913	NA	-

Note:
1. All power cords of the above support units are non-shielded (1.8m).
2. Items B, D acted as a communication partners to transfer data.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ45	3	1.8	N	0	-
2.	RJ45	1	3	N	0	-
3.	RJ11	1	3	N	0	-

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.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCS30	100289	Dec. 01, 2014	Nov. 30, 2015
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Jul. 25, 2014	Jul. 24, 2015
BILOG Antenna SCHWARZBECK	VULB9168	9168-156	Feb. 06, 2015	Feb. 05, 2016
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Feb. 09, 2015	Feb. 08, 2016
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Feb. 09, 2015	Feb. 08, 2016
Preamplifier Agilent	8449B	3008A01911	Aug. 09, 2014	Aug. 08, 2015
Preamplifier Agilent	8447D	2944A10638	Aug. 09, 2014	Aug. 08, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	248780/4 309222/4 274092/4	Aug. 09, 2014	Aug. 08, 2015
RF signal cable Worken	8D-FB	Cable-CH9-01	Aug. 11, 2014	Aug. 10, 2015
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower &Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	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 9.
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 215374.
5. The IC Site Registration No. is IC 7450F-9.

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:

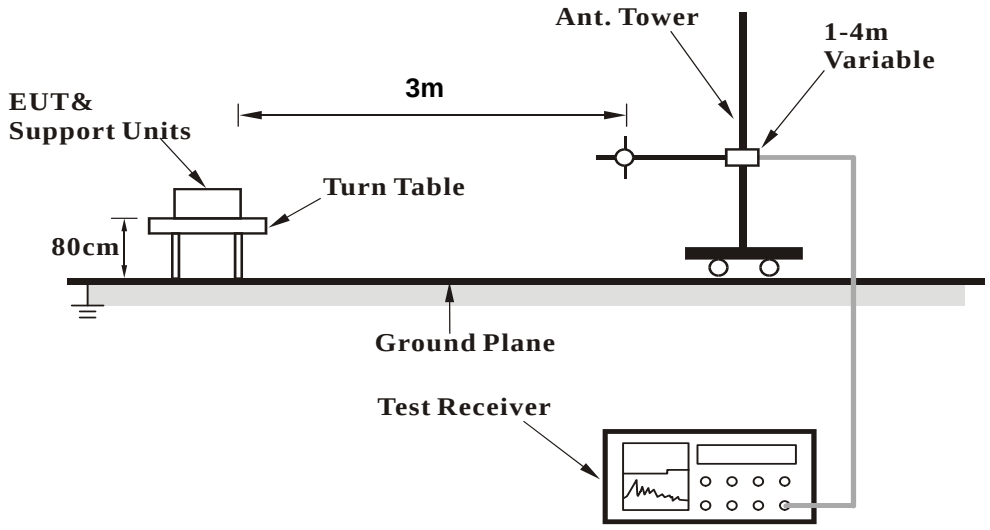
1. For emission measurements above 1 GHz, the EUT shall be placed at a height of 1.5 m above the ground at 3 meter chamber room for test
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
3. The resolution 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/duty cycle)).
5. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle ≥ 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

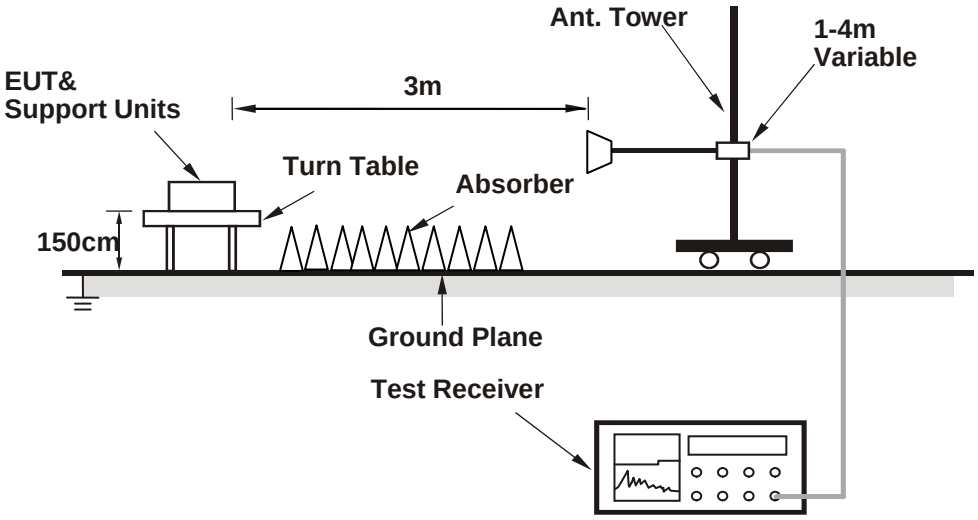
No deviation.

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

a. Placed the EUT on the testing table.
b. Prepared a notebook and IES-1000 Series Multi-service mini IP DSLAM to act as a communication partners and placed them outside of testing area.
c. The communication partner 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.
d. The communication partner sent data to EUT by command "PING".

4.1.7 Test Results

Above 1GHz Worst-Case Data:

802.11b

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

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	54.0 PK	74.0	-20.0	1.22 H	78	21.00	33.00
2	2390.00	43.6 AV	54.0	-10.4	1.22 H	78	10.60	33.00
3	*2412.00	92.2 PK			1.08 H	59	59.10	33.10
4	*2412.00	88.7 AV			1.08 H	59	55.60	33.10
5	4824.00	46.5 PK	74.0	-27.5	1.27 H	259	44.70	1.80
6	4824.00	35.8 AV	54.0	-18.2	1.27 H	259	34.00	1.80
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	2390.00	61.5 PK	74.0	-12.5	1.69 V	215	28.50	33.00
2	2390.00	53.7 AV	54.0	-0.3	1.69 V	215	20.70	33.00
3	*2412.00	108.4 PK			1.62 V	207	75.30	33.10
4	*2412.00	104.6 AV			1.62 V	207	71.50	33.10
5	4824.00	47.8 PK	74.0	-26.2	1.62 V	213	46.00	1.80
6	4824.00	39.8 AV	54.0	-14.2	1.62 V	213	38.00	1.80

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.

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

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	91.7 PK			1.29 H	89	58.40	33.30
2	*2437.00	87.7 AV			1.29 H	89	54.40	33.30
3	4874.00	51.3 PK	74.0	-22.7	1.00 H	130	49.40	1.90
4	4874.00	46.8 AV	54.0	-7.2	1.00 H	130	44.90	1.90
5	7311.00	52.9 PK	74.0	-21.1	1.00 H	0	44.40	8.50
6	7311.00	38.7 AV	54.0	-15.3	1.00 H	0	30.20	8.50
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	107.6 PK			1.66 V	26	74.30	33.30
2	*2437.00	104.0 AV			1.66 V	26	70.70	33.30
3	4874.00	56.4 PK	74.0	-17.6	1.68 V	173	54.50	1.90
4	4874.00	53.8 AV	54.0	-0.2	1.68 V	173	51.90	1.90
5	7311.00	54.8 PK	74.0	-19.2	1.21 V	166	46.30	8.50
6	7311.00	46.2 AV	54.0	-7.8	1.21 V	166	37.70	8.50

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) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	88.9 PK			1.29 H	92	55.50	33.40
2	*2462.00	84.8 AV			1.29 H	92	51.40	33.40
3	2483.50	55.5 PK	74.0	-18.5	1.29 H	92	22.10	33.40
4	2483.50	43.7 AV	54.0	-10.3	1.29 H	92	10.30	33.40
5	4924.00	46.5 PK	74.0	-27.5	1.00 H	132	44.50	2.00
6	4924.00	35.6 AV	54.0	-18.4	1.00 H	132	33.60	2.00
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	106.1 PK			1.80 V	102	72.70	33.40
2	*2462.00	102.3 AV			1.80 V	102	68.90	33.40
3	2483.50	61.8 PK	74.0	-12.2	1.65 V	106	28.40	33.40
4	2483.50	53.5 AV	54.0	-0.5	1.65 V	106	20.10	33.40
5	4924.00	47.4 PK	74.0	-26.6	1.50 V	205	45.40	2.00
6	4924.00	39.3 AV	54.0	-14.7	1.50 V	205	37.30	2.00

REMARKS:

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

802.11g

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

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	1.00 H	142	26.40	33.00
2	2390.00	47.0 AV	54.0	-7.0	1.00 H	142	14.00	33.00
3	*2412.00	97.7 PK			1.00 H	142	64.60	33.10
4	*2412.00	85.8 AV			1.00 H	142	52.70	33.10
5	4824.00	47.3 PK	74.0	-26.7	1.54 H	96	45.50	1.80
6	4824.00	35.3 AV	54.0	-18.7	1.54 H	96	33.50	1.80
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	2390.00	72.4 PK	74.0	-1.6	1.54 V	341	39.40	33.00
2	**2390.00**	**53.9 AV**	**54.0**	**-0.1**	**1.54 V**	**341**	**20.90**	**33.00**
3	*2412.00	108.9 PK			1.54 V	341	75.80	33.10
4	*2412.00	98.0 AV			1.54 V	341	64.90	33.10
5	4824.00	45.8 PK	74.0	-28.2	1.00 V	20	44.00	1.80
6	4824.00	32.9 AV	54.0	-21.1	1.00 V	20	31.10	1.80

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.

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	59.4 PK	74.0	-14.6	1.00 H	141	26.40	33.00
2	2390.00	47.1 AV	54.0	-6.9	1.00 H	141	14.10	33.00
3	*2437.00	102.1 PK			1.00 H	141	68.80	33.30
4	*2437.00	91.7 AV			1.00 H	141	58.40	33.30
5	2483.50	63.2 PK	74.0	-10.8	1.00 H	141	29.80	33.40
6	2483.50	47.1 AV	54.0	-6.9	1.00 H	141	13.70	33.40
7	4874.00	47.6 PK	74.0	-26.4	1.54 H	96	45.70	1.90
8	4874.00	34.4 AV	54.0	-19.6	1.54 H	96	32.50	1.90
9	7311.00	54.5 PK	74.0	-19.5	1.96 H	64	46.00	8.50
10	7311.00	42.0 AV	54.0	-12.0	1.96 H	64	33.50	8.50
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	70.5 PK	74.0	-3.5	1.52 V	345	37.50	33.00
2	2390.00	52.6 AV	54.0	-1.4	1.52 V	345	19.60	33.00
3	*2437.00	111.8 PK			1.52 V	345	78.50	33.30
4	*2437.00	102.0 AV			1.52 V	345	68.70	33.30
5	2483.50	71.8 PK	74.0	-2.2	1.52 V	345	38.40	33.40
6	2483.50	53.5 AV	54.0	-0.5	1.52 V	345	20.10	33.40
7	7311.00	58.3 PK	74.0	-15.7	1.21 V	327	49.80	8.50
8	7311.00	45.0 AV	54.0	-9.0	1.21 V	327	36.50	8.50

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) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	93.8 PK			1.00 H	140	60.40	33.40
2	*2462.00	83.4 AV			1.00 H	140	50.00	33.40
3	2483.50	59.9 PK	74.0	-14.1	1.00 H	140	26.50	33.40
4	2483.50	46.8 AV	54.0	-7.2	1.00 H	140	13.40	33.40
5	4924.00	47.9 PK	74.0	-26.1	1.54 H	88	45.90	2.00
6	4924.00	35.2 AV	54.0	-18.8	1.54 H	88	33.20	2.00
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	104.8 PK			2.02 V	2	71.40	33.40
2	*2462.00	94.9 AV			2.02 V	2	61.50	33.40
3	2483.50	71.5 PK	74.0	-2.5	2.02 V	2	38.10	33.40
4	2483.50	53.4 AV	54.0	-0.6	2.02 V	2	20.00	33.40
5	4924.00	48.6 PK	74.0	-25.4	1.52 V	74	46.60	2.00
6	4924.00	35.5 AV	54.0	-18.5	1.52 V	74	33.50	2.00

REMARKS:

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

802.11n (HT20)

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

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	63.0 PK	74.0	-11.0	1.24 H	109	30.00	33.00
2	2390.00	47.6 AV	54.0	-6.4	1.24 H	109	14.60	33.00
3	*2412.00	96.3 PK			1.24 H	109	63.20	33.10
4	*2412.00	86.4 AV			1.24 H	109	53.30	33.10
5	4824.00	47.7 PK	74.0	-26.3	1.49 H	50	45.90	1.80
6	4824.00	35.6 AV	54.0	-18.4	1.49 H	50	33.80	1.80
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	2390.00	71.5 PK	74.0	-2.5	1.50 V	353	38.50	33.00
2	2390.00	53.6 AV	54.0	-0.4	1.50 V	353	20.60	33.00
3	*2412.00	108.6 PK			1.53 V	351	75.50	33.10
4	*2412.00	98.9 AV			1.53 V	351	65.80	33.10
5	4824.00	46.6 PK	74.0	-27.4	1.00 V	20	44.80	1.80
6	4824.00	33.2 AV	54.0	-20.8	1.00 V	20	31.40	1.80

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.

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

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	55.8 PK	74.0	-18.2	1.07 H	154	22.80	33.00
2	2390.00	45.2 AV	54.0	-8.8	1.07 H	154	12.20	33.00
3	*2437.00	101.8 PK			1.07 H	154	68.50	33.30
4	*2437.00	91.7 AV			1.07 H	154	58.40	33.30
5	2483.50	55.1 PK	74.0	-18.9	1.07 H	154	21.70	33.40
6	2483.50	45.8 AV	54.0	-8.2	1.07 H	154	12.40	33.40
7	7311.00	56.1 PK	74.0	-17.9	2.00 H	72	47.60	8.50
8	7311.00	43.4 AV	54.0	-10.6	2.00 H	72	34.90	8.50
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	64.4 PK	74.0	-9.6	2.09 V	319	31.40	33.00
2	2390.00	50.2 AV	54.0	-3.8	2.09 V	319	17.20	33.00
3	*2437.00	113.0 PK			2.29 V	351	79.70	33.30
4	*2437.00	103.7 AV			2.29 V	351	70.40	33.30
5	2483.50	63.5 PK	74.0	-10.5	2.09 V	343	30.10	33.40
6	2483.50	53.5 AV	54.0	-0.5	2.09 V	343	20.10	33.40
7	7311.00	59.1 PK	74.0	-14.9	1.19 V	300	50.60	8.50
8	7311.00	45.7 AV	54.0	-8.3	1.19 V	300	37.20	8.50

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) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	95.0 PK			1.22 H	150	61.60	33.40
2	*2462.00	85.6 AV			1.22 H	150	52.20	33.40
3	2483.50	61.9 PK	74.0	-12.1	1.22 H	150	28.50	33.40
4	2483.50	47.1 AV	54.0	-6.9	1.22 H	150	13.70	33.40
5	4924.00	48.5 PK	74.0	-25.5	1.48 H	100	46.50	2.00
6	4924.00	36.1 AV	54.0	-17.9	1.48 H	100	34.10	2.00
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	106.9 PK			2.03 V	342	73.50	33.40
2	*2462.00	97.4 AV			2.03 V	342	64.00	33.40
3	2483.50	71.1 PK	74.0	-2.9	2.01 V	344	37.70	33.40
4	2483.50	53.8 AV	54.0	-0.2	2.01 V	344	20.40	33.40
5	4924.00	49.3 PK	74.0	-24.7	1.49 V	69	47.30	2.00
6	4924.00	36.2 AV	54.0	-17.8	1.49 V	69	34.20	2.00

REMARKS:

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

802.11n (HT40)

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

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	55.2 PK	74.0	-18.8	1.56 H	303	22.20	33.00
2	2390.00	45.4 AV	54.0	-8.6	1.56 H	303	12.40	33.00
3	*2422.00	89.5 PK			1.56 H	303	56.30	33.20
4	*2422.00	79.3 AV			1.56 H	303	46.10	33.20
5	4844.00	46.9 PK	74.0	-27.1	1.40 H	101	45.10	1.80
6	4844.00	35.0 AV	54.0	-19.0	1.40 H	101	33.20	1.80
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	2390.00	69.7 PK	74.0	-4.3	1.37 V	343	36.70	33.00
2	2390.00	53.6 AV	54.0	-0.4	1.37 V	343	20.60	33.00
3	*2422.00	103.2 PK			1.55 V	344	70.00	33.20
4	*2422.00	94.0 AV			1.55 V	344	60.80	33.20
5	4844.00	47.8 PK	74.0	-26.2	1.00 V	41	46.00	1.80
6	4844.00	34.4 AV	54.0	-19.6	1.00 V	41	32.60	1.80

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.

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

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	54.4 PK	74.0	-19.6	1.23 H	338	21.40	33.00
2	2390.00	45.5 AV	54.0	-8.5	1.23 H	338	12.50	33.00
3	*2437.00	92.6 PK			1.23 H	338	59.30	33.30
4	*2437.00	81.8 AV			1.23 H	338	48.50	33.30
5	2483.50	55.1 PK	74.0	-18.9	1.23 H	338	21.70	33.40
6	2483.50	46.8 AV	54.0	-7.2	1.23 H	338	13.40	33.40
7	7311.00	52.9 PK	74.0	-21.1	1.00 H	90	44.40	8.50
8	7311.00	39.4 AV	54.0	-14.6	1.00 H	90	30.90	8.50
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	66.6 PK	74.0	-7.4	1.34 V	209	33.60	33.00
2	2390.00	53.1 AV	54.0	-0.9	1.34 V	209	20.10	33.00
3	*2437.00	104.4 PK			1.44 V	216	71.10	33.30
4	*2437.00	95.1 AV			1.44 V	216	61.80	33.30
5	2483.50	68.7 PK	74.0	-5.3	1.38 V	203	35.30	33.40
6	2483.50	53.6 AV	54.0	-0.4	1.38 V	203	20.20	33.40
7	7311.00	52.4 PK	74.0	-21.6	1.42 V	183	43.90	8.50
8	7311.00	39.8 AV	54.0	-14.2	1.42 V	183	31.30	8.50

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

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	90.7 PK			1.21 H	153	57.40	33.30
2	*2452.00	79.9 AV			1.21 H	153	46.60	33.30
3	2483.50	57.0 PK	74.0	-17.0	1.21 H	153	23.60	33.40
4	2483.50	47.0 AV	54.0	-7.0	1.21 H	153	13.60	33.40
5	4904.00	46.0 PK	74.0	-28.0	1.00 H	360	44.00	2.00
6	4904.00	33.2 AV	54.0	-20.8	1.00 H	360	31.20	2.00
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	*2452.00	101.4 PK			1.51 V	345	68.10	33.30
2	*2452.00	91.5 AV			1.51 V	345	58.20	33.30
3	2483.50	70.3 PK	74.0	-3.7	1.48 V	344	36.90	33.40
4	2483.50	53.7 AV	54.0	-0.3	1.48 V	344	20.30	33.40
5	4904.00	45.5 PK	74.0	-28.5	1.00 V	188	43.50	2.00
6	4904.00	32.8 AV	54.0	-21.2	1.00 V	188	30.80	2.00

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – 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 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	136.70	33.5 QP	43.5	-10.0	1.99 H	283	48.50	-15.00
2	173.56	32.6 QP	43.5	-10.9	1.49 H	254	47.10	-14.50
3	224.00	35.8 QP	46.0	-10.2	1.49 H	254	52.00	-16.20
4	299.66	36.7 QP	46.0	-9.3	1.00 H	276	49.30	-12.60
5	749.74	41.2 QP	46.0	-4.8	1.99 H	10	44.90	-3.70
6	837.04	34.8 QP	46.0	-11.2	1.99 H	336	37.10	-2.30
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	49.40	39.0 QP	40.0	-1.0	1.50 V	211	53.50	-14.50
2	72.68	27.1 QP	40.0	-12.9	1.00 V	29	44.10	-17.00
3	299.66	33.0 QP	46.0	-13.0	1.50 V	31	45.60	-12.60
4	450.98	35.5 QP	46.0	-10.5	1.00 V	14	44.80	-9.30
5	600.36	36.1 QP	46.0	-9.9	1.00 V	103	42.50	-6.40
6	749.74	34.9 QP	46.0	-11.1	1.00 V	124	38.60	-3.70
7	800.18	33.8 QP	46.0	-12.2	1.00 V	183	36.60	-2.80

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

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.	Cal. Date	Cal. Due
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)	ESH3-Z5	835239/001	Mar. 02, 2015	Mar. 01, 2016
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

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 HwaYa Shielded Room 1.
3. The VCCI Site Registration No. is C-2040.

4.2.3 Test Procedures

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

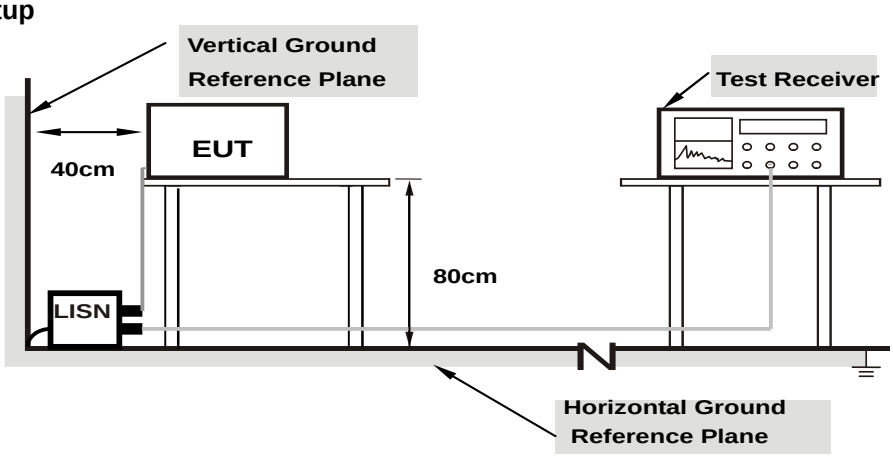
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) were not recorded.

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.

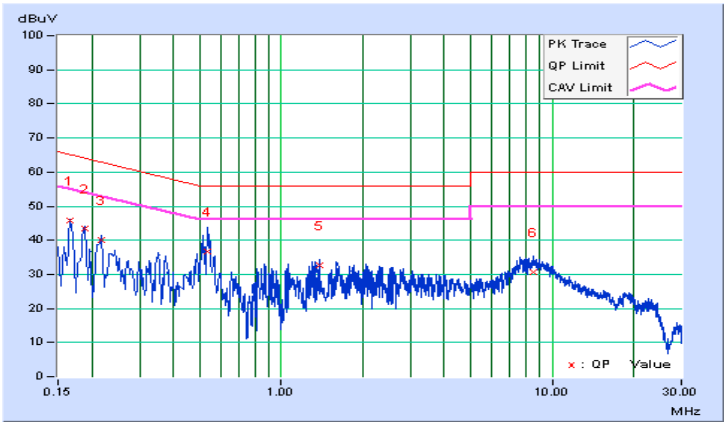
4.2.7 Test Results

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

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16569	0.05	45.58	37.81	45.63	37.86	65.17	55.17	-19.54	-17.31
2	0.18853	0.06	43.44	36.54	43.50	36.60	64.10	54.10	-20.60	-17.50
3	0.21621	0.06	39.84	33.46	39.90	33.52	62.96	52.96	-23.06	-19.44
4	0.53318	0.06	36.69	27.78	36.75	27.84	56.00	46.00	-19.25	-18.16
5	1.38557	0.10	32.57	24.51	32.67	24.61	56.00	46.00	-23.33	-21.39
6	8.52913	0.39	30.36	23.68	30.75	24.07	60.00	50.00	-29.25	-25.93

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.

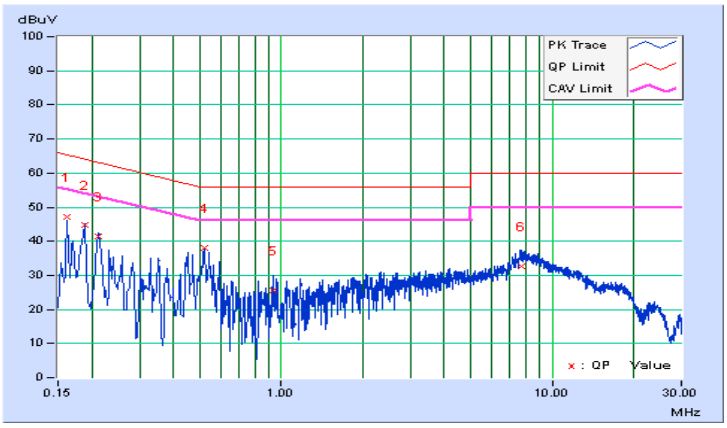


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16173	0.05	47.25	35.74	47.30	35.79	65.37	55.37	-18.07	-19.58
2	0.18903	0.05	44.78	33.85	44.83	33.90	64.08	54.08	-19.25	-20.18
3	0.21256	0.05	41.47	31.17	41.52	31.22	63.10	53.10	-21.58	-21.88
4	**0.52130**	**0.06**	**38.12**	**30.17**	**38.18**	**30.23**	**56.00**	**46.00**	**-17.82**	**-15.77**
5	0.93591	0.08	25.54	17.46	25.62	17.54	56.00	46.00	-30.38	-28.46
6	7.70021	0.33	32.42	25.78	32.75	26.11	60.00	50.00	-27.25	-23.89

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.

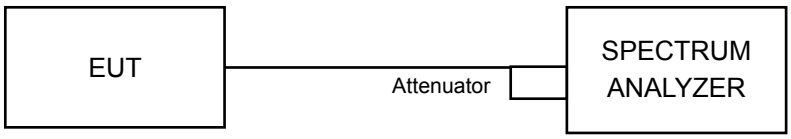


4.3 6dB Bandwidth Measurement

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

a. Set resolution bandwidth (RBW) = 100kHz

b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.

c. Trace mode = max hold.

d. Sweep = auto couple.

e. 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	8.12	0.5	PASS
6	2437	8.11	0.5	PASS
11	2462	8.12	0.5	PASS

802.11g

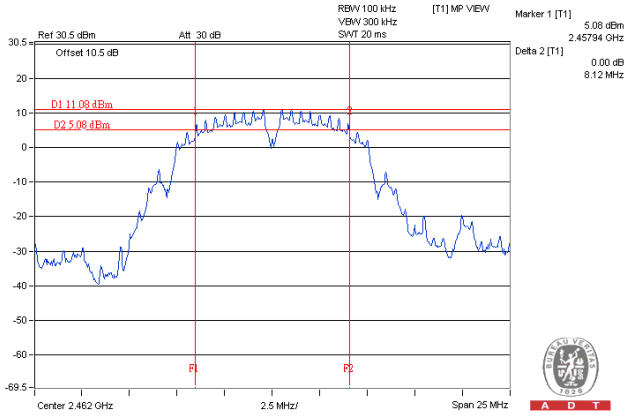
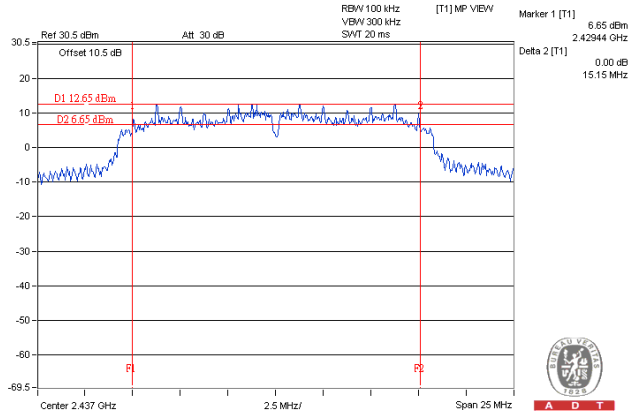
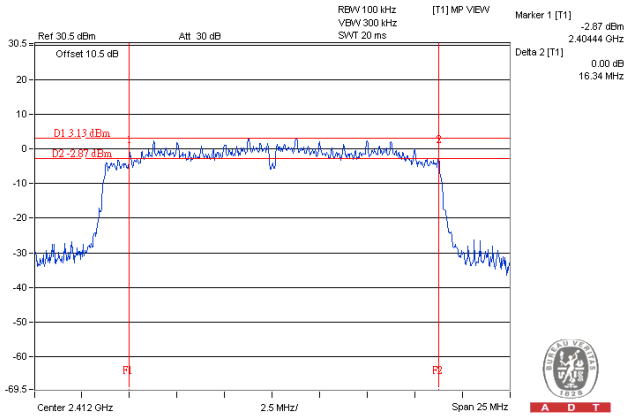
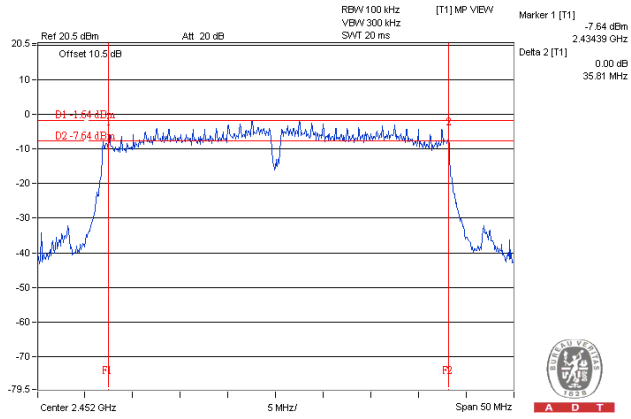
Channel	Frequency (MHz)	6db Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	15.15	0.5	PASS
6	2437	15.15	0.5	PASS
11	2462	15.11	0.5	PASS

802.11n (HT20)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		CHAIN 0	CHAIN 1		
1	2412	16.34	15.14	0.5	Pass
6	2437	15.70	15.14	0.5	Pass
11	2462	16.34	15.12	0.5	Pass

802.11n (HT40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		CHAIN 0	CHAIN 1		
3	2422	35.77	35.29	0.5	Pass
6	2437	35.77	35.26	0.5	Pass
9	2452	35.81	35.13	0.5	Pass

Spectrum Plot of Worst Value	
802.11b_ CH1	802.11g_ CH6
	
802.11n (HT20)_CHAIN 0/ CH1	802.11n (HT40)_CHAIN 0/ CH9
	

4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

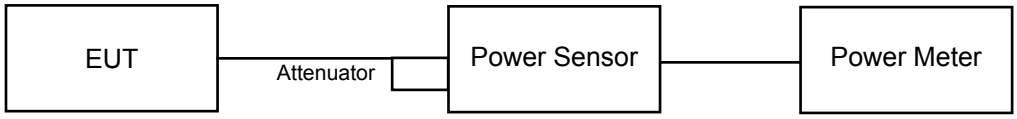
For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

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 NANT ≤ 4;
Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any NANT;
Array Gain = 5 log(NANT/NSS) dB or 3 dB, whichever is less for 20-MHz channel widths with NANT ≥ 5.

For power measurements on all other devices: Array Gain = 10 log(NANT/NSS) 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

802.11b

Chan.	Freq. (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	124.738	20.96	30	Pass
6	2437	180.302	22.56	30	Pass
11	2462	118.577	20.74	30	Pass

802.11g

Chan.	Freq. (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	63.533	18.03	30	Pass
6	2437	**255.27**	24.07	30	Pass
11	2462	50.933	17.07	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	16.07	17.52	96.952	19.87	30	Pass
6	2437	19.88	20.81	217.779	23.38	30	Pass
11	2462	13.65	14.85	53.723	17.30	30	Pass

802.11n (HT40)

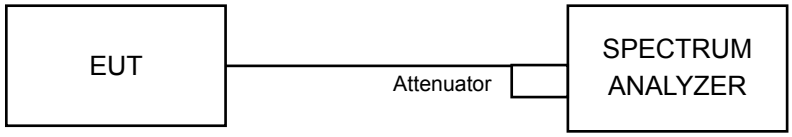
Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	12.67	13.08	38.817	15.89	30	Pass
6	2437	15.93	16.06	79.539	19.01	30	Pass
9	2452	12.73	13.35	40.377	16.06	30	Pass

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

For AVG. power (duty cycle ≥ 98%)

a) Set instrument center frequency to DTS channel center frequency.
b) Set span to at least 1.5 times the OBW.
c) Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d) Set VBW ≥3 x RBW.
e) Detector = power averaging (RMS) or sample detector (when RMS not available).
f) Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
g) Sweep time = auto couple.
h) Employ trace averaging (RMS) mode over a minimum of 100 traces.
i) Use the peak marker function to determine the maximum amplitude level.

For AVG. power (duty cycle < 98%)

a) Measure the duty cycle (x).
b) Set instrument center frequency to DTS channel center frequency.
c) Set span to at least 1.5 times the OBW.
d) Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
e) Set VBW ≥3 x RBW.
f) Detector = power averaging (RMS) or sample detector (when RMS not available).
g) Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
h) Sweep time = auto couple.
i) Do not use sweep triggering. Allow sweep to “free run”.
j) Employ trace averaging (RMS) mode over a minimum of 100 traces.
k) Use the peak marker function to determine the maximum amplitude level.
l) Add 10 log (1/x), where x is the duty cycle measured in step (a, to the measured PSD to compute the average PSD during the actual transmission time.

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	-8.16	8	Pass
6	2437	-6.77	8	Pass
11	2462	-8.45	8	Pass

802.11g

Channel	Freq. (MHz)	PSD (dBm)	Limit (dBm)	Pass /Fail
1	2412	-13.06	8	Pass
6	2437	-6.76	8	Pass
11	2462	-13.45	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	-15.80	3.01	-12.79	6.70	Pass
	6	2437	-11.46	3.01	-8.45	6.70	Pass
	11	2462	-17.25	3.01	-14.24	6.70	Pass
1	1	2412	-15.11	3.01	-12.10	6.70	Pass
	6	2437	-10.30	3.01	-7.29	6.70	Pass
	11	2462	-16.19	3.01	-13.18	6.70	Pass

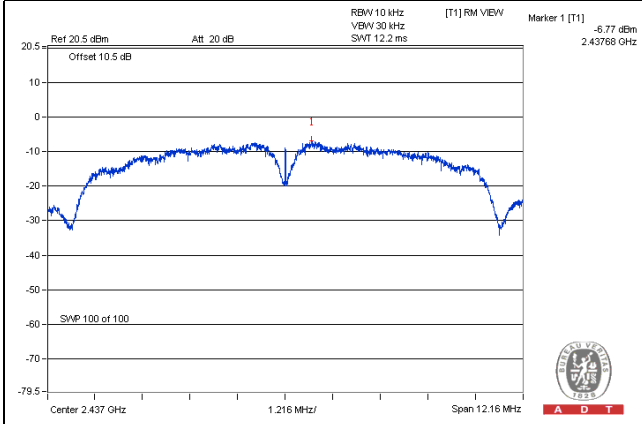
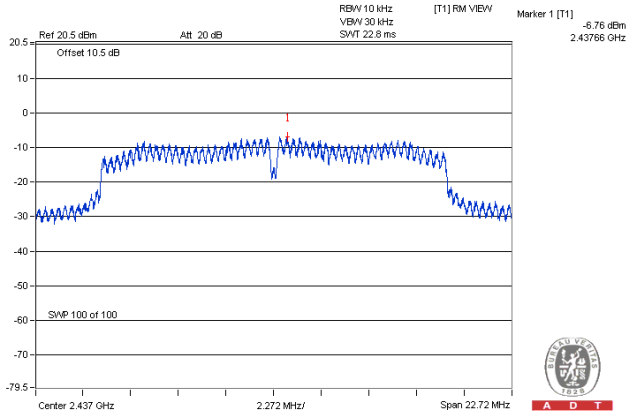
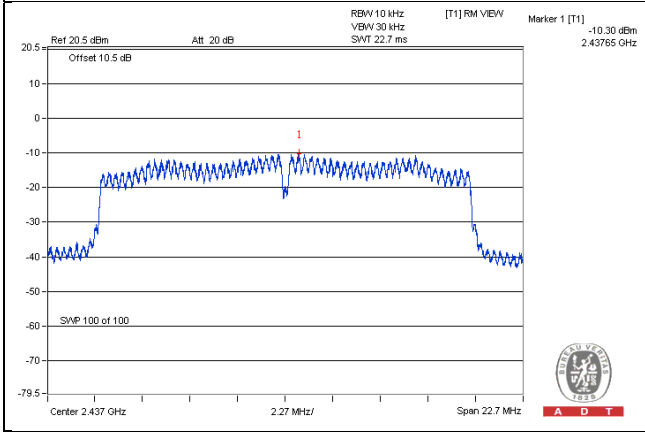
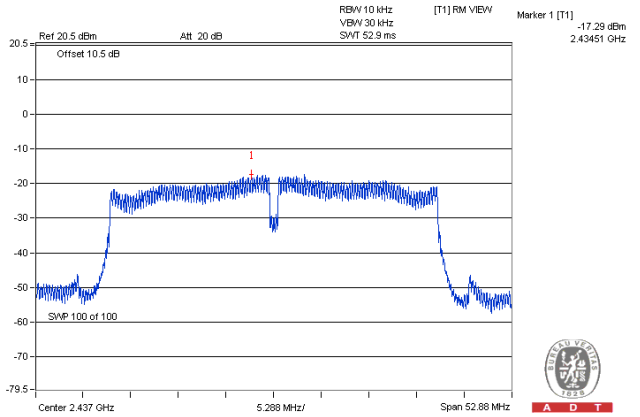
NOTE: Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2$] = 7.30dBi > 6dBi , so the power density limit shall be reduced to 8-(7.30-6) = 6.70dBm.

802.11n (HT40)

TX chain	Channel	Freq. (MHz)	PSD w/o Duty factor (dBm)	10 log (N=2) dB	Duty Factor	PSD with Duty Factor (dBm)	Limit (dBm)	PASS /FAIL
0	3	2422	-21.03	3.01	0.18	-17.84	6.70	Pass
	6	2437	-17.92	3.01	0.18	-14.73	6.70	Pass
	9	2452	-21.16	3.01	0.18	-17.97	6.70	Pass
1	3	2422	-20.22	3.01	0.18	-17.03	6.70	Pass
	6	2437	-17.29	3.01	0.18	-14.10	6.70	Pass
	9	2452	-20.81	3.01	0.18	-17.62	6.70	Pass

NOTE:

1. Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2$] = 7.30dBi > 6dBi , so the power density limit shall be reduced to 8-(7.30-6) = 6.70dBm.
2. Refer to section 3.3 for duty cycle spectrum plot.

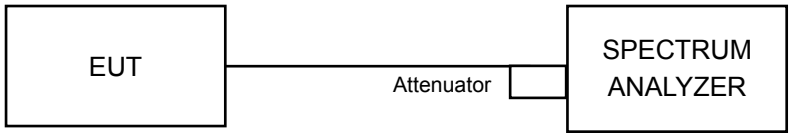
Spectrum Plot of Worst Value	
802.11b_ CH6	802.11g_CH6
	
802.11n (HT20)_CHAIN 1/ CH6	802.11n (HT40)_CHAIN 1/ CH6
	

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 ≥ 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 OOBE

558074 D01 DTS Meas Guidance v03r02 section 11.3

1. Set RBW = 100 kHz.
2. Set VBW ≥ 300 kHz.
3. Ensure that the number of measurement points ≥ 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.

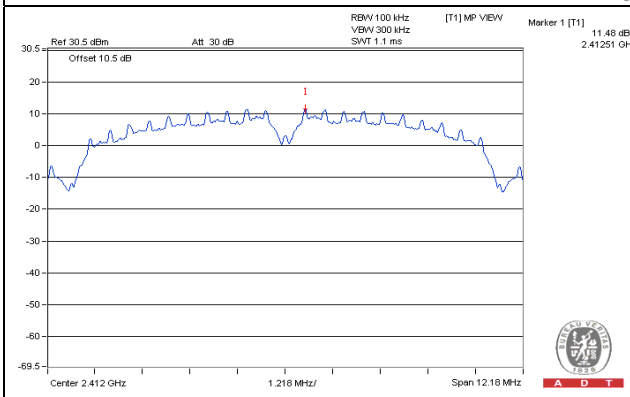
4.6.6 EUT Operating Condition

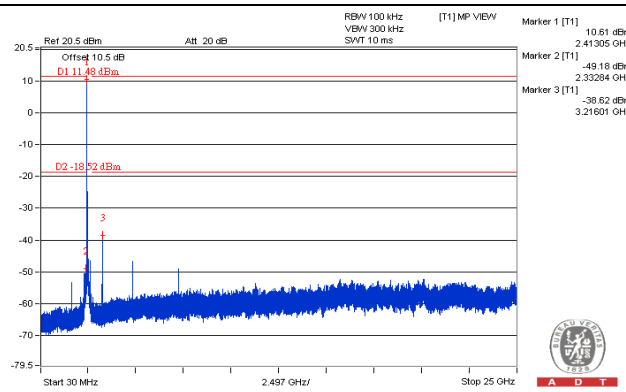
Same as Item 4.3.6

4.6.7 Test Results

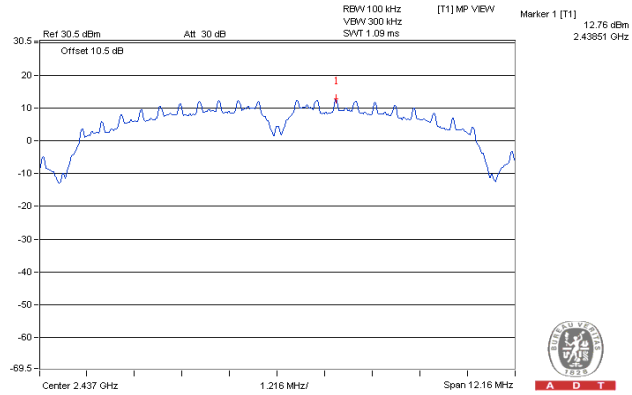
802.11b

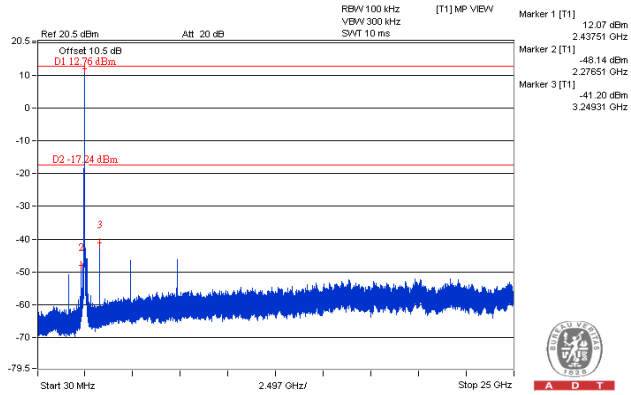
CH 1



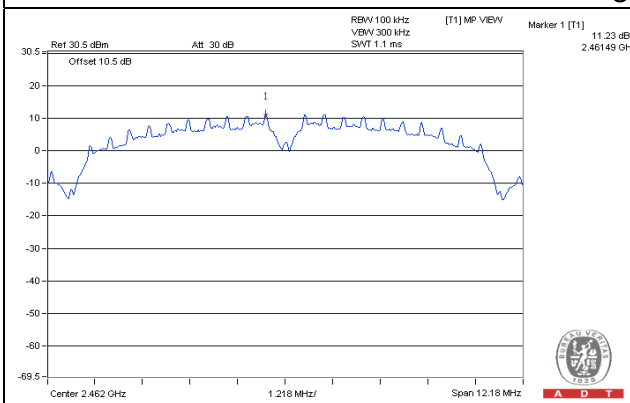


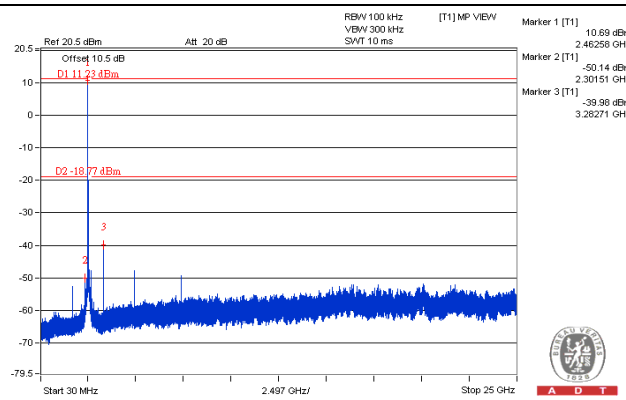
CH 6



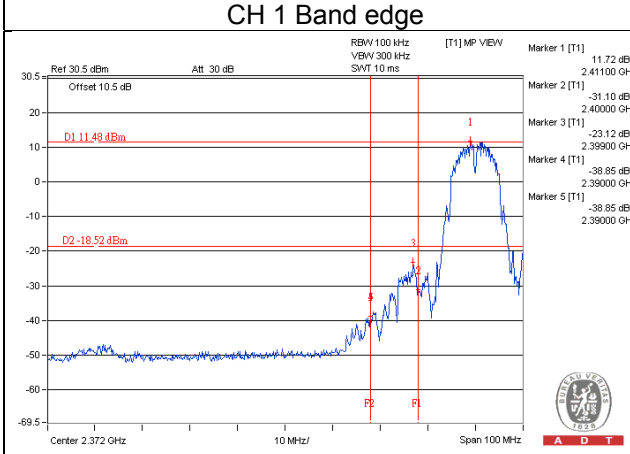


CH 11

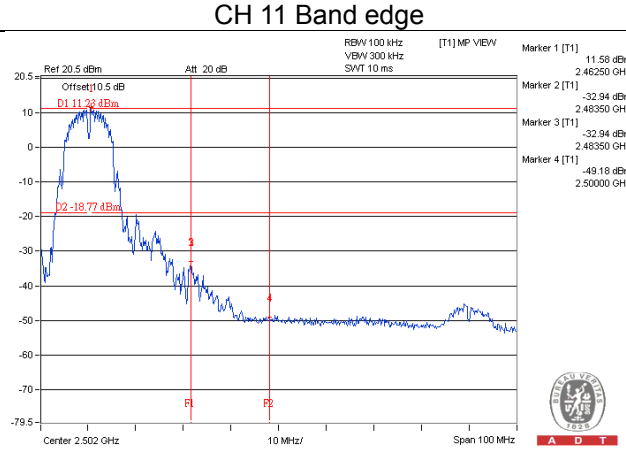




CH 1 Band edge

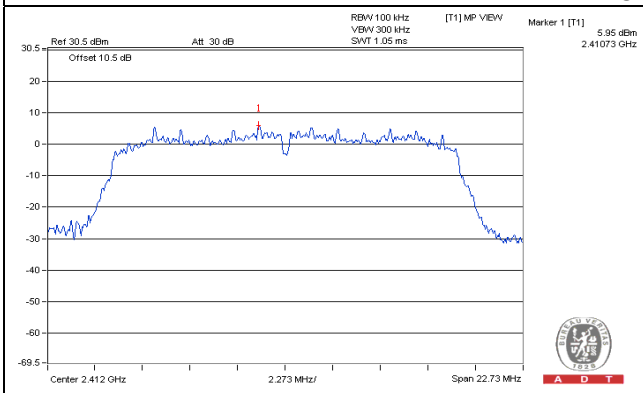


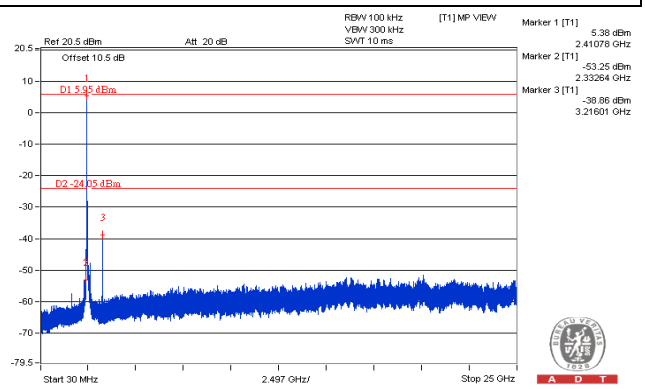
CH 11 Band edge



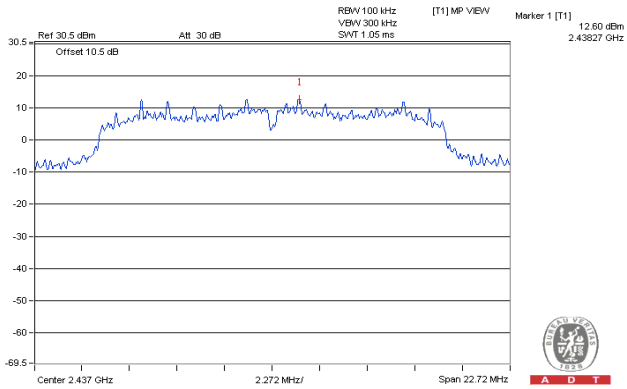
802.11g

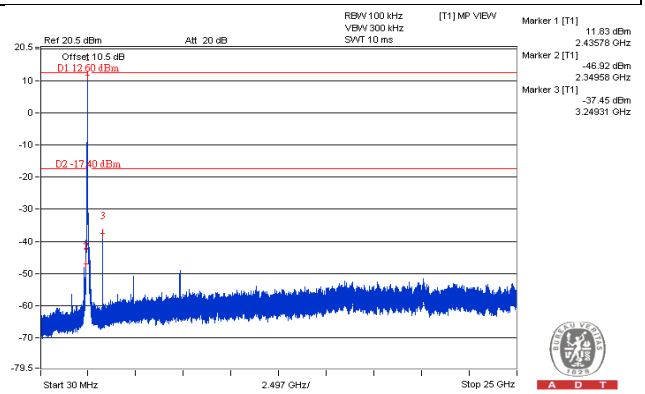
CH 1



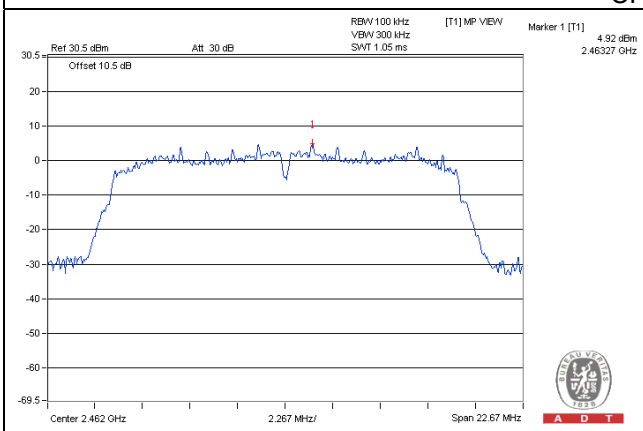


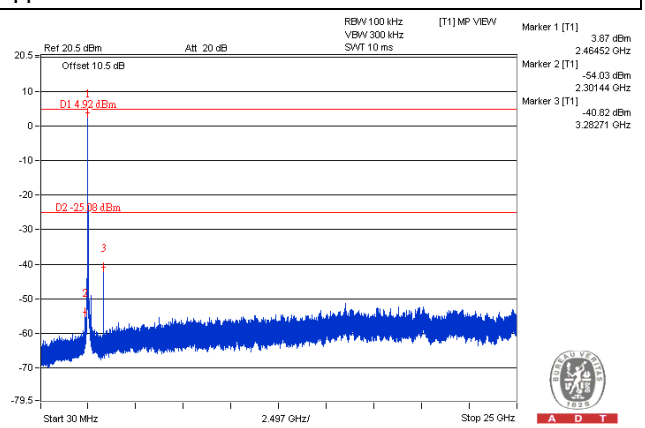
CH 6



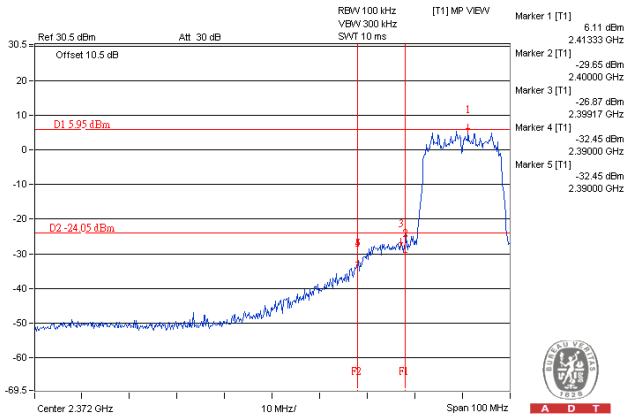


CH 11

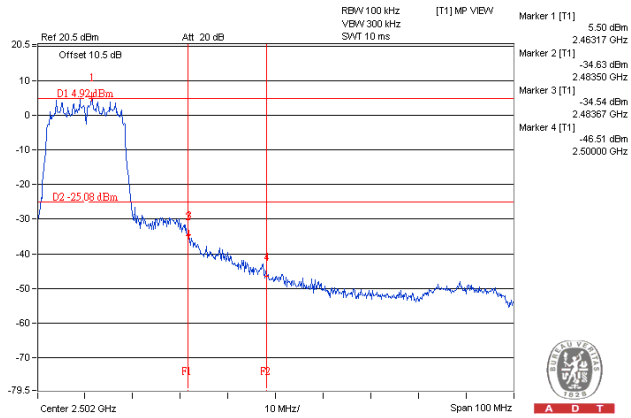




CH 1 Band edge

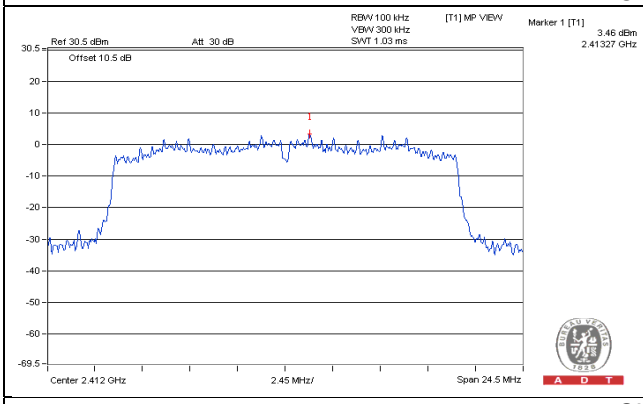


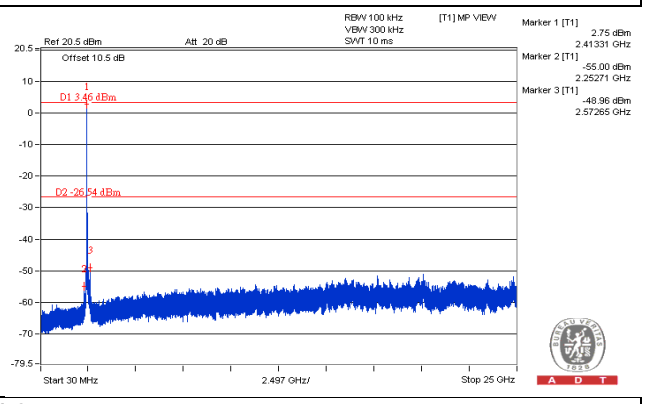
CH 11 Band edge



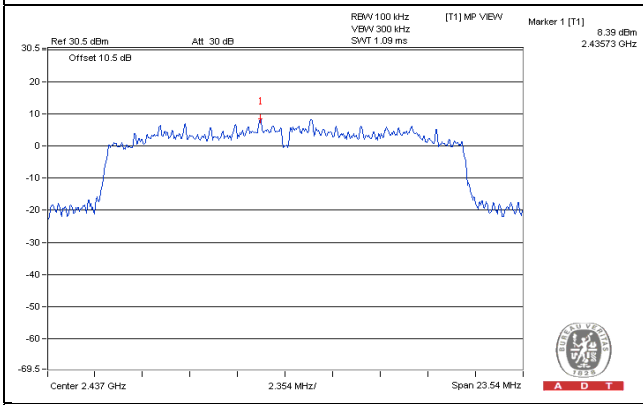
802.11n (HT20)_CHAIN 0

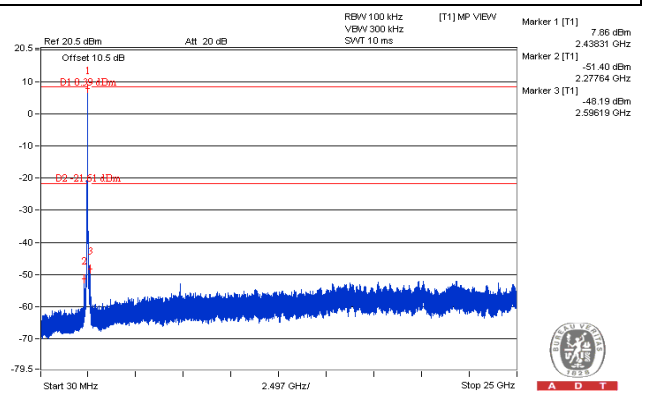
CH 1



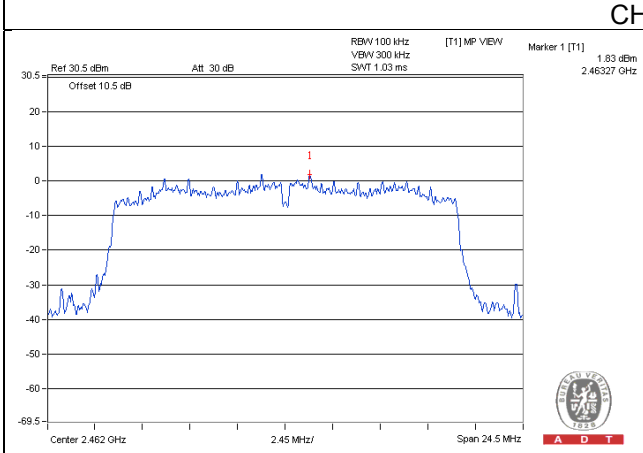


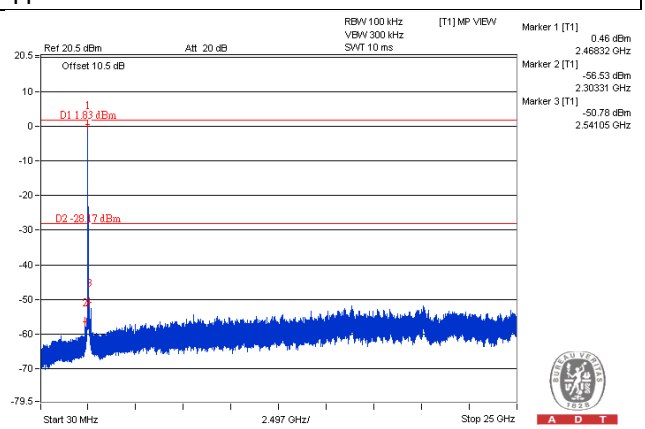
CH 6



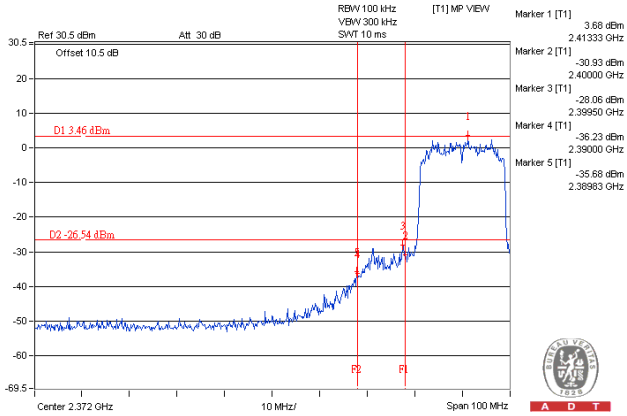


CH 11

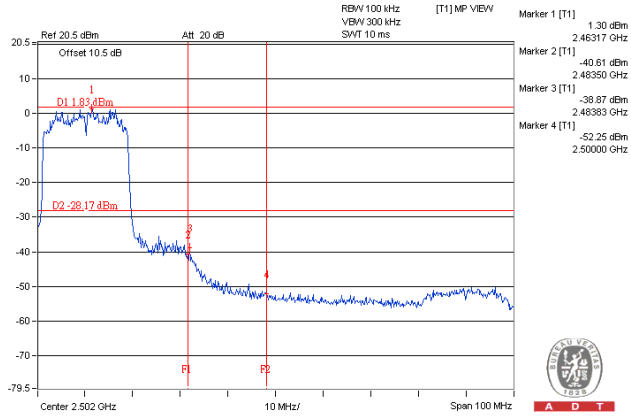




CH 1 Band edge

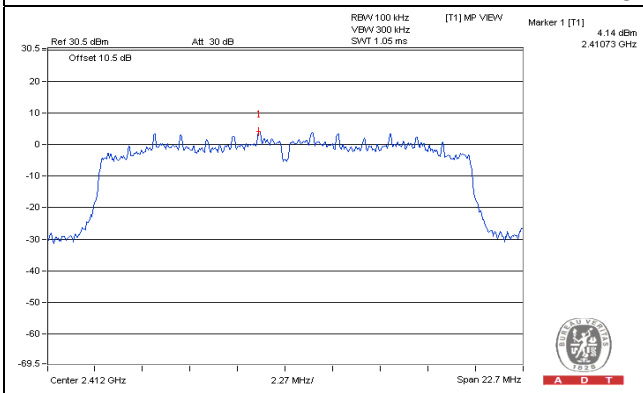


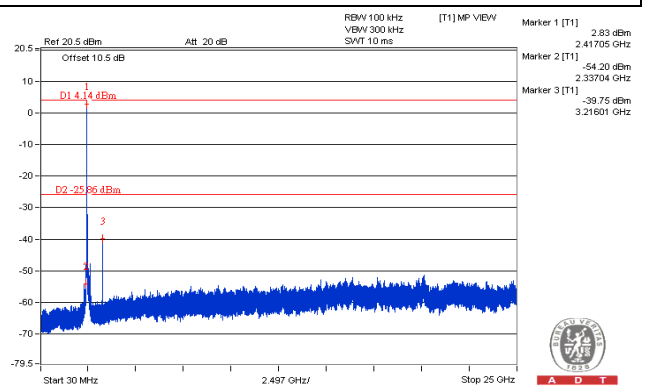
CH 11 Band edge



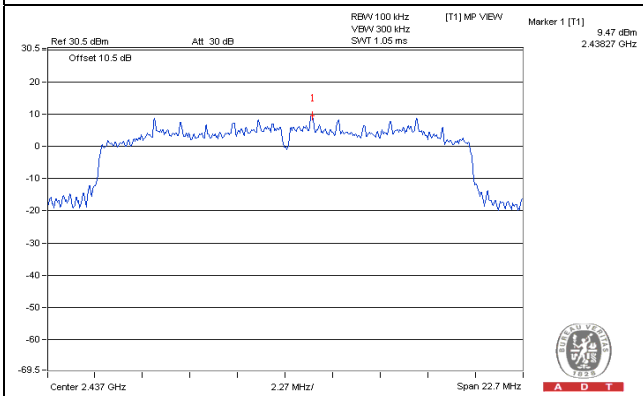
CHAIN 1

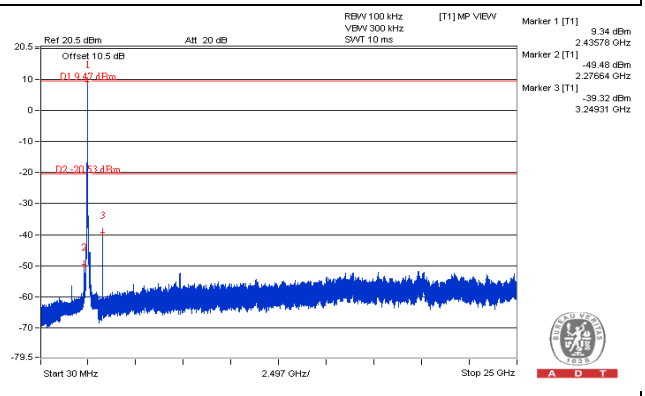
CH 1



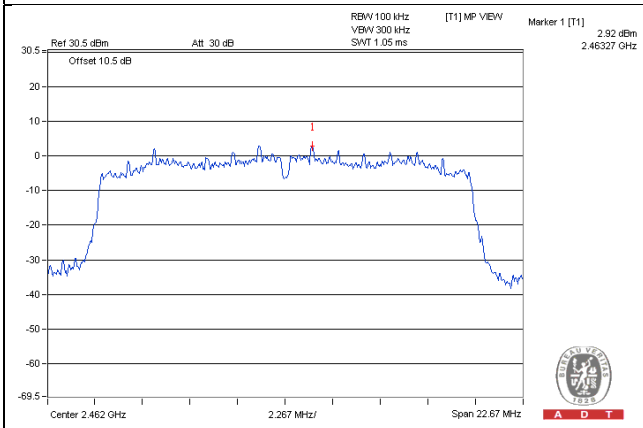


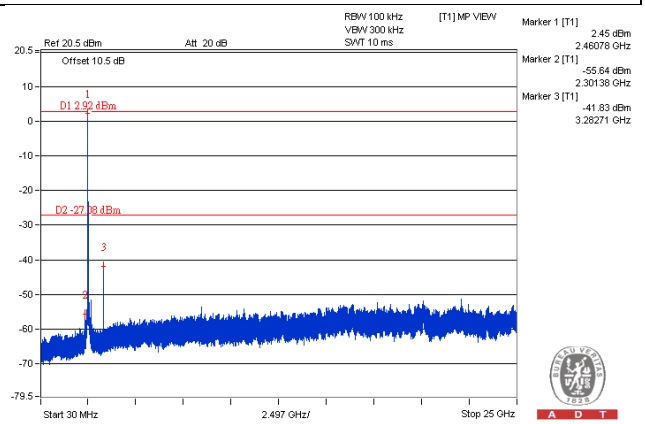
CH 6



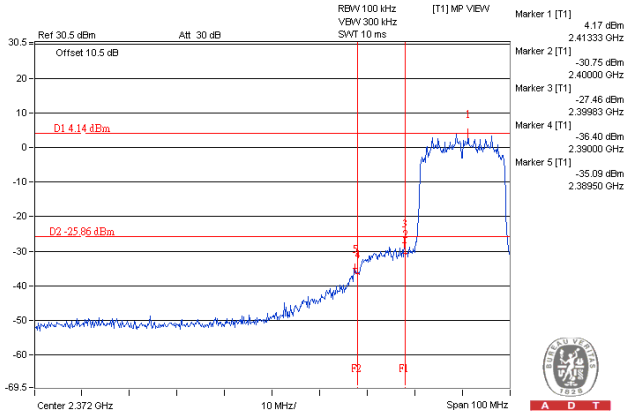


CH 11

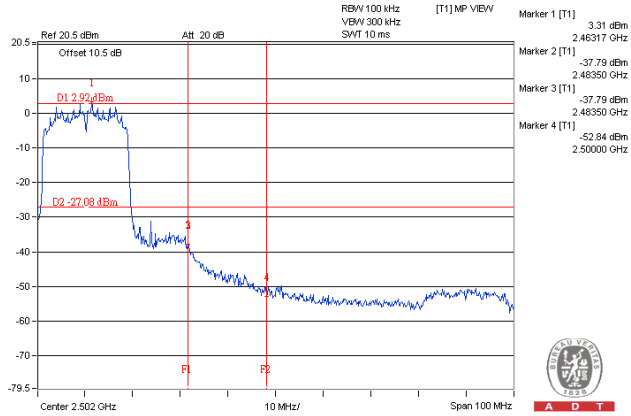




CH 1 Band edge

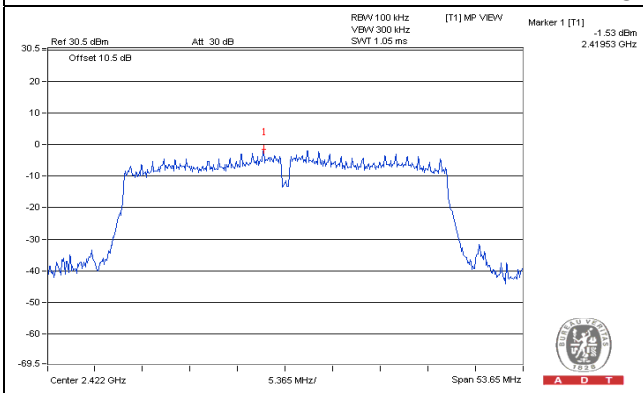


CH 11 Band edge

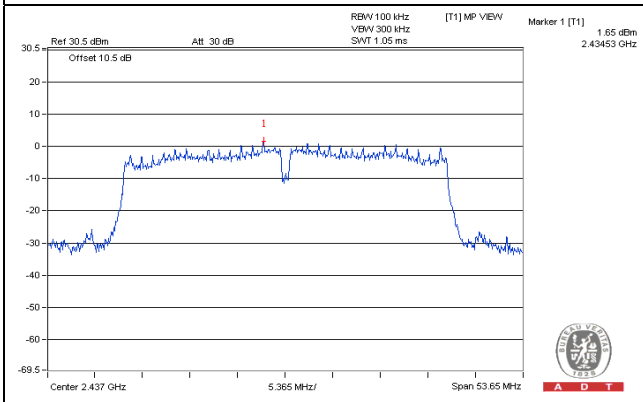


802.11n (HT40)_CHAIN 0

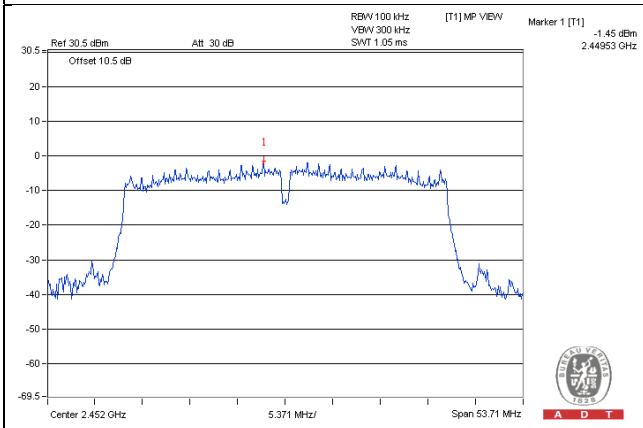
CH 3



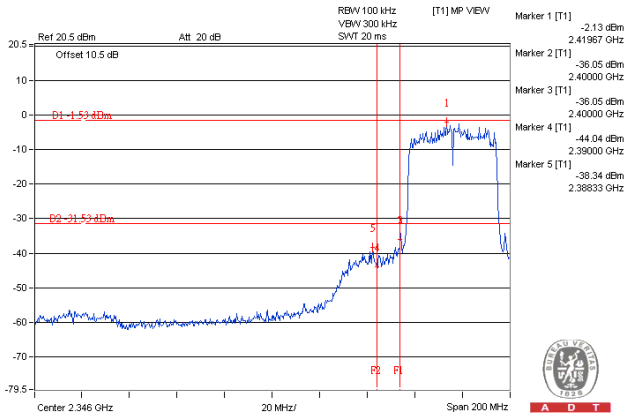
CH 6



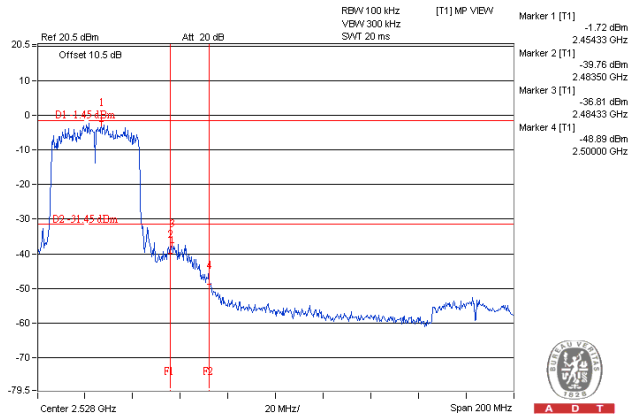
CH 9



CH 3 Band edge

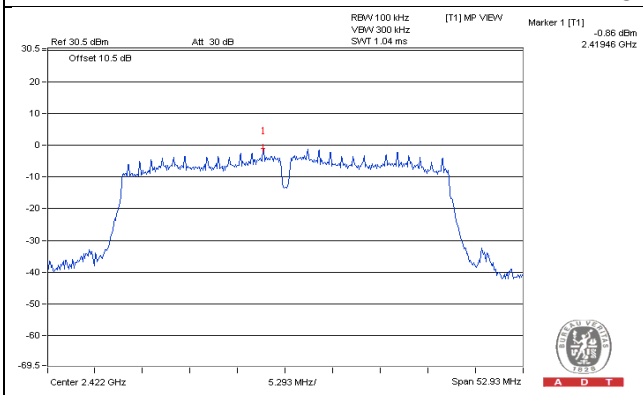


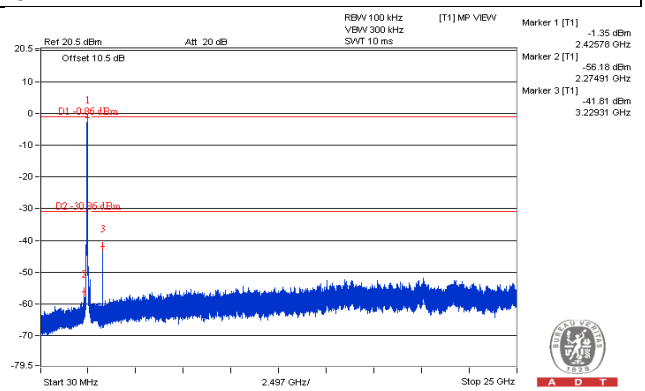
CH 9 Band edge



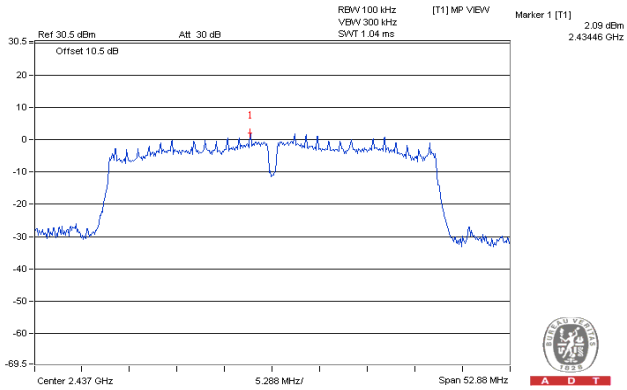
CHAIN 1

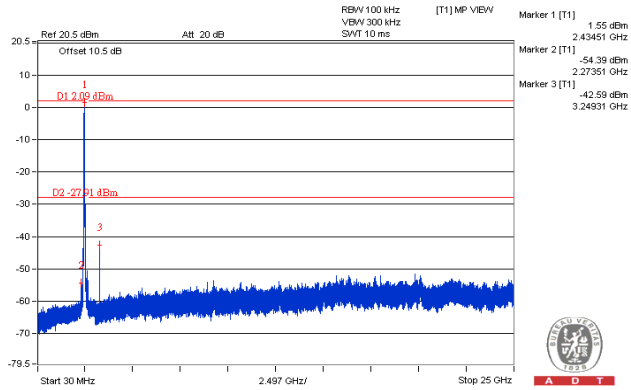
CH 3



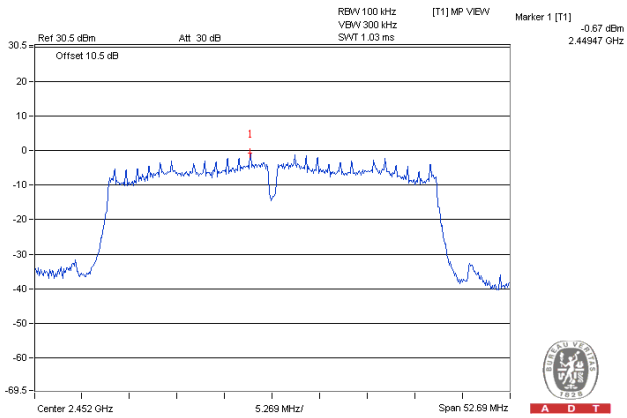


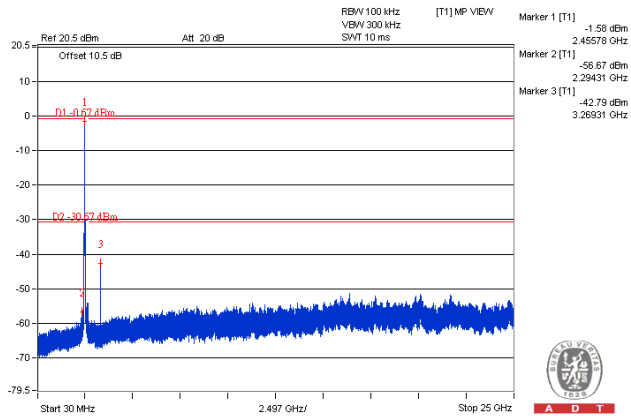
CH 6



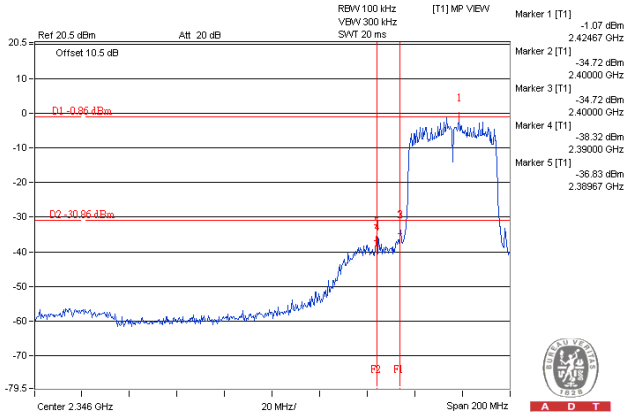


CH 9

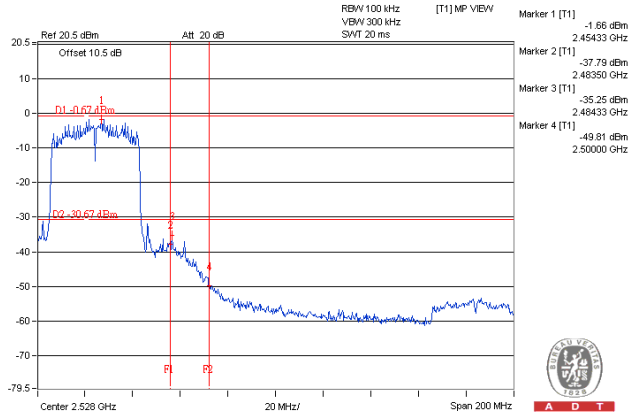




CH 3 Band edge



CH 9 Band edge



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:

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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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