



FCC TEST REPORT

(WLAN 15.247)

REPORT NO.: RF141024C24

MODEL NO.: FORTIAP-224Dxxxxxx, FortiAP-224Dxxxxxx,
FAP-224Dxxxxxx (Refer to 3.1 for more details)

FCC ID: TVE-24122013

RECEIVED: Oct. 24, 2014

TESTED: Nov. 07 to 25, 2014

ISSUED: Dec. 15, 2014

APPLICANT: Fortinet Inc.

ADDRESS: 899 Kifer Road Sunnyvale, CA 94086, USA

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

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Table of Contents

RELEASE CONTROL RECORD.....	4
1. CERTIFICATION	5
2. SUMMARY OF TEST RESULTS.....	6
2.1 MEASUREMENT UNCERTAINTY	7
3. GENERAL INFORMATION.....	8
3.1 GENERAL DESCRIPTION OF EUT.....	8
3.2 DESCRIPTION OF TEST MODES.....	11
3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL.....	12
3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS	15
3.4 DUTY CYCLE OF TEST SIGNAL.....	16
3.5 DESCRIPTION OF SUPPORT UNITS	17
3.6 CONFIGURATION OF SYSTEM UNDER TEST	18
4. TEST TYPES AND RESULTS	20
4.1 CONDUCTED EMISSION MEASUREMENT	20
4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT.....	20
4.1.2 TEST INSTRUMENTS	20
4.1.3 TEST PROCEDURES	21
4.1.4 DEVIATION FROM TEST STANDARD	21
4.1.5 TEST SETUP	21
4.1.6 EUT OPERATING CONDITIONS	22
4.1.7 TEST RESULTS (MODE 1).....	23
4.1.8 TEST RESULTS (MODE 2).....	25
4.2 RADIATED EMISSION AND BANDEDGE MEASUREMENT.....	27
4.2.1 LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT	27
4.2.2 TEST INSTRUMENTS	28
4.2.3 TEST PROCEDURES	30
4.2.4 DEVIATION FROM TEST STANDARD	31
4.2.5 TEST SETUP	31
4.2.6 EUT OPERATING CONDITIONS	31
4.2.7 TEST RESULTS	32
4.3 6DB BANDWIDTH MEASUREMENT.....	45
4.3.1 LIMITS OF 6DB BANDWIDTH MEASUREMENT	45
4.3.2 TEST INSTRUMENTS	45
4.3.3 TEST PROCEDURE	45
4.3.4 DEVIATION FROM TEST STANDARD	45
4.3.5 TEST SETUP	45
4.3.6 EUT OPERATING CONDITIONS	45
4.3.7 TEST RESULTS	46
4.4 CONDUCTED OUTPUT POWER MEASUREMENT	48
4.4.1 LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT.....	48
4.4.2 TEST INSTRUMENTS	48
4.4.3 TEST PROCEDURES	48
4.4.4 DEVIATION FROM TEST STANDARD	49
4.4.5 TEST SETUP	49
4.4.6 EUT OPERATING CONDITIONS	49
4.4.7 TEST RESULTS	50
4.5 POWER SPECTRAL DENSITY MEASUREMENT.....	52
4.5.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT	52
4.5.2 TEST INSTRUMENTS	52
4.5.3 TEST PROCEDURE	52
4.5.4 DEVIATION FROM TEST STANDARD	52



A D T

4.5.5	TEST SETUP	52
4.5.6	EUT OPERATING CONDITION	52
4.5.7	TEST RESULTS	53
4.6	CONDUCTED OUT-BAND EMISSION MEASUREMENT.....	56
4.6.1	LIMITS OF CONDUCTED OUT-BAND EMISSION MEASUREMENT	56
4.6.2	TEST INSTRUMENTS	56
4.6.3	TEST PROCEDURE	56
4.6.4	DEVIATION FROM TEST STANDARD	57
4.6.5	TEST SETUP	57
4.6.6	EUT OPERATING CONDITION	57
4.6.7	TEST RESULTS	57
5.	PHOTOGRAPHS OF THE TEST CONFIGURATION.....	66
6.	INFORMATION ON THE TESTING LABORATORIES	67
7.	APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB.....	68



RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF141024C24	Original release	Dec. 15, 2014

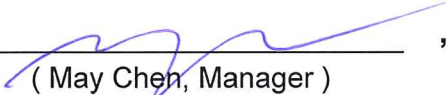


1. CERTIFICATION

PRODUCT: Secured Wireless Access Point
BRAND NAME: Fortinet
MODEL NO.: FORTIAP-224Dxxxxxx, FortiAP-224Dxxxxxx,
FAP-224Dxxxxxx (Refer to 3.1 for more details)
TEST SAMPLE: ENGINEERING SAMPLE
APPLICANT: Fortinet Inc.
TESTED: Nov. 07 to 25, 2014
STANDARDS: **FCC Part 15, Subpart C (Section 15.247)**
ANSI C63.10-2009

The above equipment (Model: FAP-224D) 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:** Dec. 15, 2014
(Lori Chung, Specialist)

Approved By :  , **Date:** Dec. 15, 2014
(May Chen, Manager)



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2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.247)			
STANDARD SECTION	TEST TYPE	RESULT	REMARK
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -8.96dB at 0.55234MHz
15.247(d) 15.209	Radiated Emissions & Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.9dB at 2390.00MHz & 2288.00MHz
15.247(a)(2)	6dB bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted Output 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 R-SMA not a standard connector.

NOTE: 1. The EUT was operating in 2.400 ~ 2.4835GHz and 5.725~5.850GHz frequencies band. This report was recorded the RF parameters including 2.400 ~ 2.4835GHz. For the 5.725~5.850GHz RF parameters was recorded in another test report.

2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

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

Measurement	Value
Conducted emissions	2.86 dB
Radiated emissions (30MHz-1GHz)	5.37 dB
Radiated emissions (1GHz -6GHz)	3.65 dB
Radiated emissions (6GHz -18GHz)	3.88 dB
Radiated emissions (18GHz -40GHz)	4.11 dB



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3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Secured Wireless Access Point
MODEL NO.	FORTIAP-224Dxxxxxx, FortiAP-224Dxxxxxx, FAP-224Dxxxxxx (Refer to Note for more details)
POWER SUPPLY	DC 12V from power adapter or DC 48V from POE
MODULATION TYPE	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
MODULATION TECHNOLOGY	DSSS,OFDM
TRANSFER RATE	802.11b: up to 11Mbps 802.11a / g: up to 54Mbps 802.11n: up to 300Mbps
OPERATING FREQUENCY	For 15.407 5.745 ~ 5.825GHz For 15.247 2.412 ~ 2.462GHz
NUMBER OF CHANNEL	For 15.407 5 for 802.11a, 802.11n (HT20) 2 for 802.11n (HT40) For 15.247 11 for 802.11b, 802.11g, 802.11n (HT20) 7 for 802.11n (HT40)
MAXIMUM OUTPUT POWER	For 15.407 802.11a: 103.561mW 802.11n (HT20): 112.877mW 802.11n (HT40): 76.775mW For 15.247 802.11b: 59.78mW 802.11g: 589.39mW 802.11n (HT20): 651.287mW 802.11n (HT40): 366.933mW
ANTENNA TYPE	Please see Note
DATA CABLE	NA
I/O PORTS	Refer to user's manual
ASSOCIATED DEVICES	POE x 1



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Note:

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

Brand Name	Model Name	Description
Fortinet	FORTIAP-224Dxxxxxx	where “x” can be used as “A-Z” , or “0-9” , or “- “ , or blank for software changes or marketing purposes only
	FortiAP-224Dxxxxxx	
	FAP-224Dxxxxxx	

From the above models, model: **FAP-224D** was selected as the representative model for the test and its data is recorded in this report.

- The EUT must be supplied with a power adapter or an POE as below table:

Adapter 1 (test only, not for sale)		
Brand	Model No.	Spec.
Powertron Electronics Corp.	PA1015-2I PA1015-2I120125	Input: 100-240V, 0.4A, 50-60Hz Output: 12V, 1.25A, 15W Max DC output cable(unshielded,1.5m)
Adapter 2 (test only, not for sale)		
Brand	Model No.	Spec.
DELTA ELECTRONICS, INC.	EADP-30HB B PA1015-2I120125	Input: 100-240V, 1A, 50-60Hz Output: 12V, 2.5A DC output cable(unshielded,1.5m)
POE*		
Brand	Model No.	Spec.
Fortinet	EPE-5818Gaf	DC48V, 0.375A

* The POE must be supplied with the following adapter:

Brand	Model No.	Spec.
Powertron Electronics Corp.	PA1040-480IB080	Input: 100-240V, 1.5A, 50-60Hz AC input cable(unshielded, 1.55m with 1 core) Output: 48V, 0.8A, 38.4W Max

- The antennas provided to the EUT, please refer to the following table:

For 2.4GHz used						
Ant. No.	Transmitter Circuit	Model No.	Ant. Gain (dBi) Include cable loss	Frequency range (MHz to MHz)	Ant. Type	Connector Type
1	Chain (0)	98141MRSX003	5	2400~2483.5	Dipole	R-SMA
2	Chain (1)	98141MRSX003	5	2400~2483.5	Dipole	R-SMA
For 5GHz used						
Ant. No.	Transmitter Circuit	Model No.	Ant. Gain (dBi) Include cable loss	Frequency range (MHz to MHz)	Ant. Type	Connector Type
1	Chain (0)	98141URSX002	5	5150~5850	Dipole	R-SMA
2	Chain (1)	98141URSX002	5	5150~5850	Dipole	R-SMA

4. The EUT incorporates a MIMO function.

For 2.4G Band		
MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION
802.11b	1 ~ 11Mbps	2TX / 2RX
802.11g	6 ~ 54Mbps	2TX / 2RX
802.11n (HT20) & 802.11n (HT40)	MCS 0~7	2TX / 2RX
	MCS 8~15	2TX / 2RX
For 5G Band		
802.11a	6 ~ 54Mbps	2TX / 2RX
802.11n (HT20) & 802.11n (HT40)	MCS 0~7	2TX / 2RX
	MCS 8~15	2TX / 2RX

5. EUT has been pre-tested under following pre-test modes.

Pre-test Mode	Power
A	Adapter
B	POE

From the above modes, the radiated emission worse case was found in **Mode A**. Therefore only the test data of the mode was recorded in this report.

6. The emission of the simultaneous operation (2.4GHz & 5GHz) has been evaluated and no non-compliance was found.
7. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.



3.2 DESCRIPTION OF TEST MODES

11 channels are provided for 802.11b, 802.11g, 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
	PLC	RE < 1G	RE ≥ 1G	APCM	OB	
1	√	√	√	√	√	Adapter mode
2	√	-	-	-	-	POE mode

Where **PLC**: Power Line Conducted Emission **RE < 1G**: Radiated Emission below 1GHz
RE ≥ 1G: Radiated Emission above 1GHz **APCM**: Antenna Port Conducted Measurement
OB: Conducted Out-Band Emission Measurement

NOTE: 1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Y-plane** (for below 1GHz) and **Z-plane** (for above 1GHz).

POWER LINE CONDUCTED EMISSION TEST:

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

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11g	1 to 11	6	OFDM	BPSK	6

RADIATED EMISSION TEST (BELOW 1 GHz):

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

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11g	1 to 11	6	OFDM	BPSK	6



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RADIATED EMISSION TEST (ABOVE 1 GHz):

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

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

ANTENNA PORT CONDUCTED MEASUREMENT:

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

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

CONDUCTED OUT-BAND EMISSION MEASUREMENT:

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

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5



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TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
PLC	24deg. C, 68,%RH	120Vac, 60Hz	Wythe Lin
	26deg. C, 67,%RH	120Vac, 60Hz	Wythe Lin
RE<1G	26deg. C, 68%RH	120Vac, 60Hz	Tim Ho
RE≥1G	24deg. C, 69%RH	120Vac, 60Hz	Robert Cheng
APCM	25deg. C, 60%RH	120Vac, 60Hz	Anderson Chen
OB	25deg. C, 60%RH	120Vac, 60Hz	Anderson Chen

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

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

FCC Part 15, Subpart C (15.247)

558074 D01 DTS Meas Guidance v03r02

662911 D01 Multiple Transmitter Output v02r01

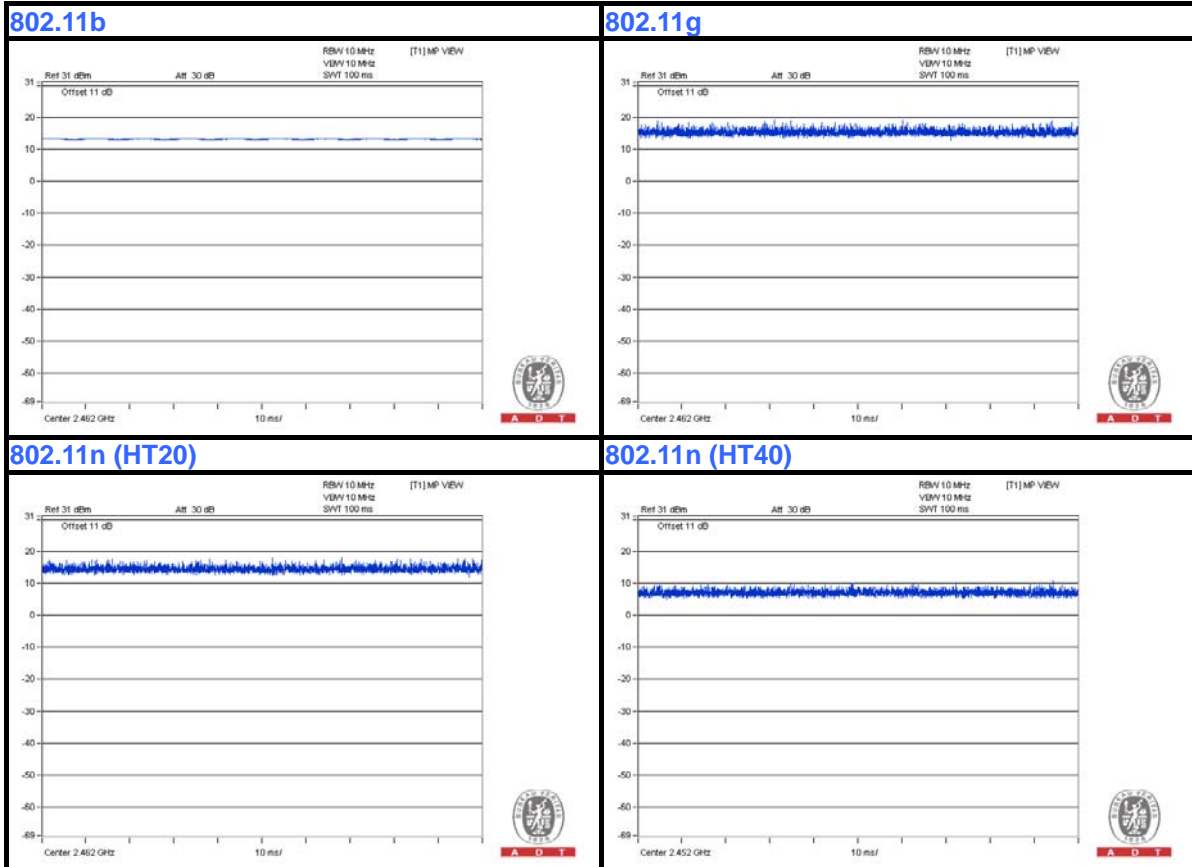
ANSI C63.10-2009

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.

3.4 DUTY CYCLE OF TEST SIGNAL

Duty cycle of test signal is 100 %, duty factor is not required.





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3.5 DESCRIPTION OF SUPPORT UNITS

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

No.	Product	Brand	Model No.	Serial No.	FCC ID	Remark
A	NOTEBOOK COMPUTER	DELL	E5430	GM1SKV1	FCC DoC	Provided by Lab
B	Adapter (for conducted test)	DELTA ELECTRONICS, INC.	EADP-30HB B PA1015-21120 125	NA	NA	Supplied by Client
	Adapter (for other test)	Powertron Electronics Corp.	PA1015-2I PA1015-21120 125	NA	NA	Supplied by Client

NOTE:

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

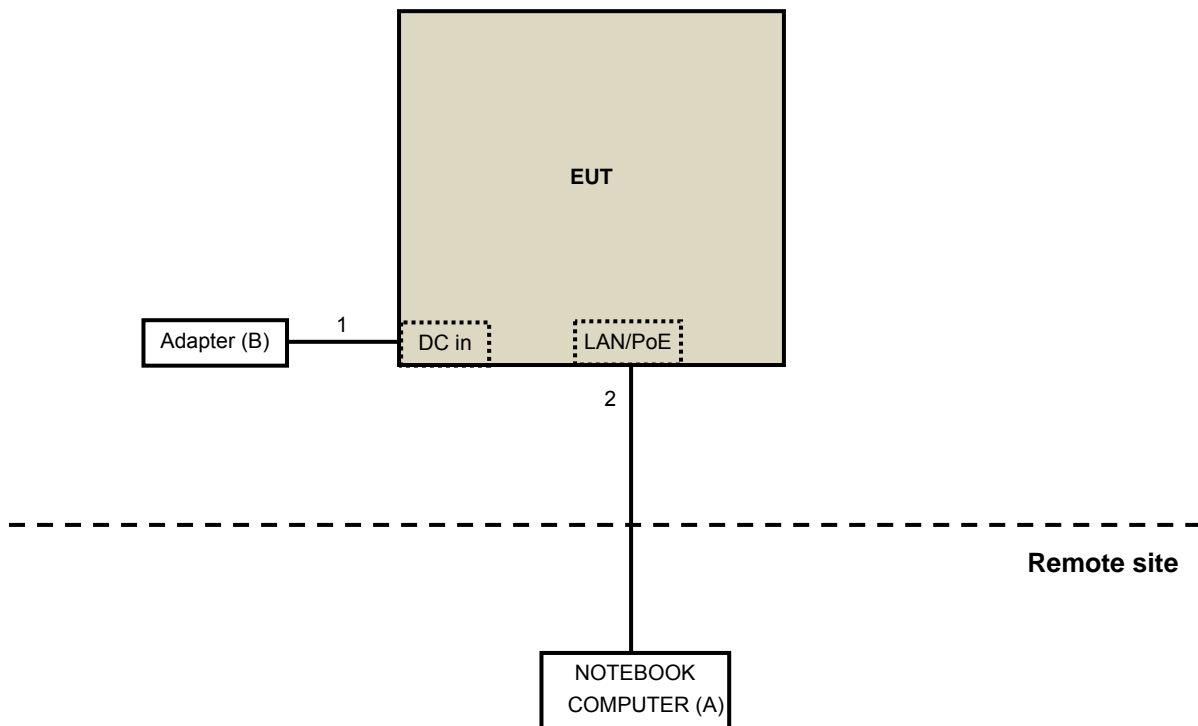
No.	Cable	Qty.	Length (m)	Shielded (Yes/ No)	Cores (Number)	Remark
1.	DC	1	1.5	No	0	Supplied by Client
2.	RJ-45	1	10	No	0	Provided by Lab
3.	DC	1	1.55	No	1	Supplied by Client
4.	GND	1	1.6	No	0	Provided by Lab
5.	RJ-45	1	3	No	0	Provided by Lab

NOTE:

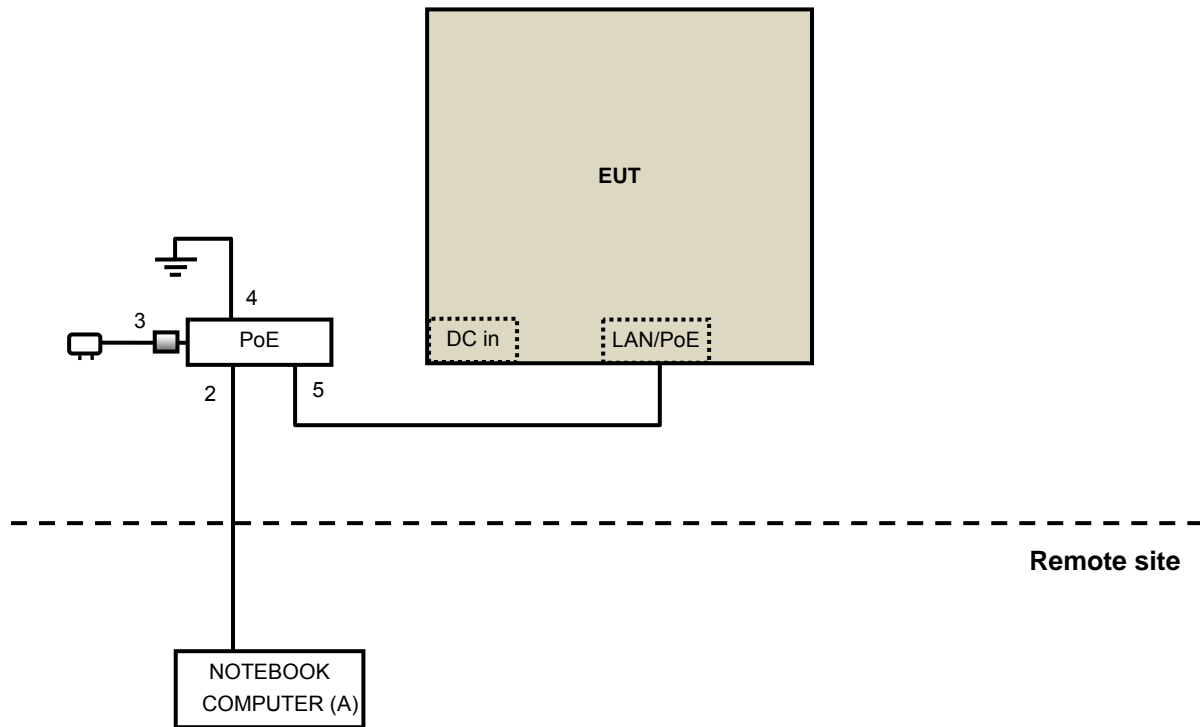
1. The core(s) is(are) originally attached to the cable(s).

3.6 CONFIGURATION OF SYSTEM UNDER TEST

For Adapter Mode:



For PoE Mode:



4. TEST TYPES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

- NOTE:**
1. The lower limit shall apply at the transition frequencies.
 2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver ROHDE & SCHWARZ	ESCS 30	100375	Apr. 29, 2014	Apr. 28, 2015
Line-Impedance Stabilization Network (for EUT) SCHWARZBECK	NSLK-8127	8127-522	Sep. 15, 2014	Sep. 14, 2015
Line-Impedance Stabilization Network (for Peripheral) ROHDE & SCHWARZ	ENV216	100071	Nov. 10, 2014	Nov. 09, 2015
RF Cable (JYEBAO)	5DFB	COCCAB-001	Mar. 10, 2014	Mar. 09, 2015
50 ohms Terminator	N/A	EMC-03	Sep. 22, 2014	Sep. 21, 2015
50 ohms Terminator	N/A	EMC-02	Sep. 30, 2014	Sep. 29, 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 Shielded Room No. C.
3. The VCCI Con C Registration No. is C-3611.
4. Tested Date: Nov. 25, 2014

4.1.3 TEST PROCEDURES

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

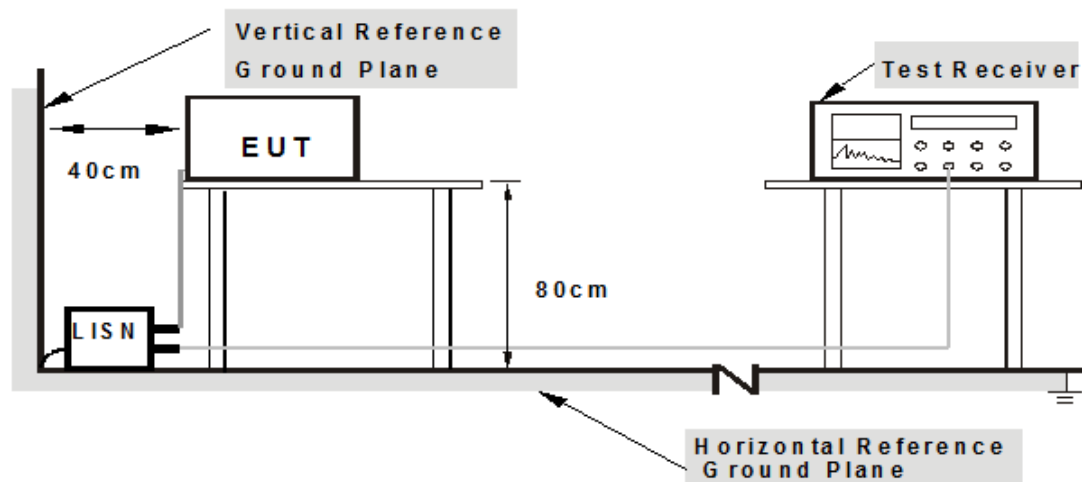
NOTE:

1. The resolution bandwidth of test receiver is 9kHz for Quasi-peak detection (QP) & Average detection (AV).

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 TEST SETUP



Note: 1. Support units were connected to second LISN.

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.1.6 EUT OPERATING CONDITIONS

1. Connect the EUT with the support unit A (Notebook Computer) which is placed on table in remote site.
2. Controlling software (artgui.exe) has been activated to set the EUT on specific status.

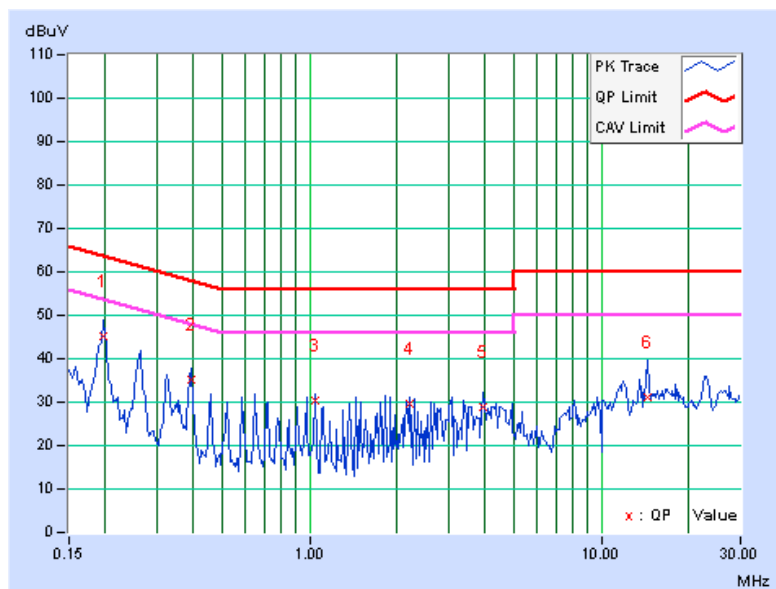
4.1.7 TEST RESULTS (MODE 1)

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	0.19687	0.07	44.94	34.54	45.01	34.61	63.74
2	0.39219	0.09	35.23	29.72	35.32	29.81	58.02	48.02	-22.70	-18.21
3	1.04297	0.13	30.15	28.41	30.28	28.54	56.00	46.00	-25.72	-17.46
4	2.21484	0.19	29.57	27.53	29.76	27.72	56.00	46.00	-26.24	-18.28
5	3.91016	0.25	28.79	25.21	29.04	25.46	56.00	46.00	-26.96	-20.54
6	14.33594	0.57	30.53	24.46	31.10	25.03	60.00	50.00	-28.90	-24.97

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

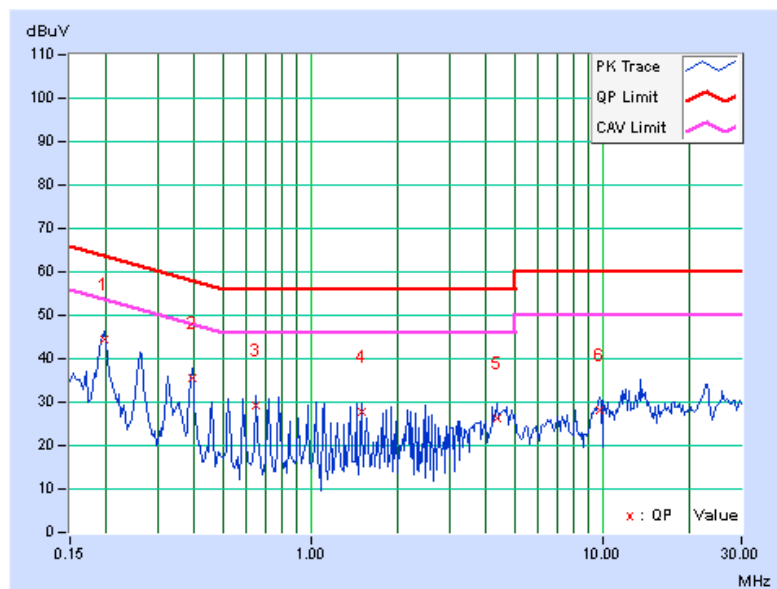


PHASE	Neutral (N)	DETECTOR FUNCTION	Quasi-Peak (QP) / Average (AV)
--------------	-------------	--------------------------	--------------------------------

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	0.19687	0.06	44.31	33.35	44.37	33.41	63.74
2	0.39219	0.09	35.32	30.20	35.41	30.29	58.02	48.02	-22.61	-17.73
3	0.65391	0.11	29.05	27.41	29.16	27.52	56.00	46.00	-26.84	-18.48
4	1.50000	0.15	27.73	25.59	27.88	25.74	56.00	46.00	-28.12	-20.26
5	4.36719	0.27	26.12	21.91	26.39	22.18	56.00	46.00	-29.61	-23.82
6	9.78516	0.45	27.66	23.78	28.11	24.23	60.00	50.00	-31.89	-25.77

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



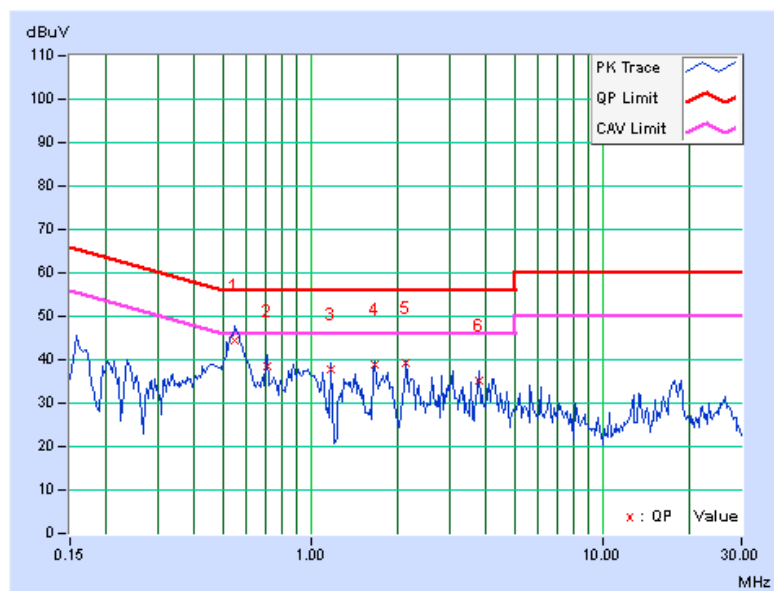
4.1.8 TEST RESULTS (MODE 2)

PHASE	Line (L)	DETECTOR FUNCTION	Quasi-Peak (QP) / Average (AV)
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No	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
	[MHz]	Factor (dB)	[dB (uV)]	[dB (uV)]	[dB (uV)]	[dB (uV)]	[dB (uV)]	[dB (uV)]	(dB)	(dB)
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.55234	0.10	44.35	36.94	44.45	37.04	56.00	46.00	-11.55	-8.96
2	0.70859	0.11	38.31	35.58	38.42	35.69	56.00	46.00	-17.58	-10.31
3	1.17969	0.14	37.49	35.70	37.63	35.84	56.00	46.00	-18.37	-10.16
4	1.65347	0.16	38.72	36.79	38.88	36.95	56.00	46.00	-17.12	-9.05
5	2.12500	0.18	38.91	36.48	39.09	36.66	56.00	46.00	-16.91	-9.34
6	3.77734	0.24	35.12	33.01	35.36	33.25	56.00	46.00	-20.64	-12.75

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

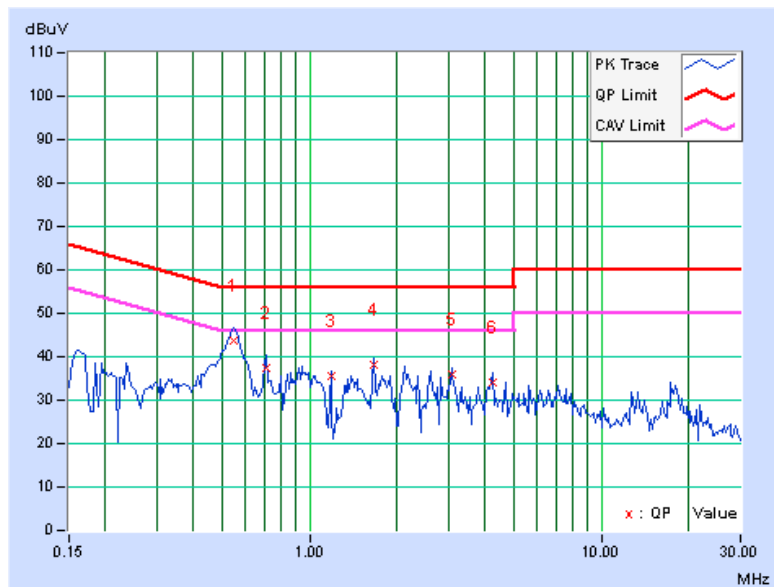


PHASE	Neutral (N)	DETECTOR FUNCTION	Quasi-Peak (QP) / Average (AV)
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No	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
	[MHz]	Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.54844	0.10	43.52	35.53	43.62	35.63	56.00	46.00	-12.38	-10.37
2	0.70859	0.11	37.31	34.69	37.42	34.80	56.00	46.00	-18.58	-11.20
3	1.18359	0.14	35.59	34.21	35.73	34.35	56.00	46.00	-20.27	-11.65
4	1.65450	0.16	38.09	35.92	38.25	36.08	56.00	46.00	-17.75	-9.92
5	3.07031	0.22	35.79	33.30	36.01	33.52	56.00	46.00	-19.99	-12.48
6	4.25391	0.27	33.63	30.89	33.90	31.16	56.00	46.00	-22.10	-14.84

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



4.2 RADIATED EMISSION AND BANDEGE MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION AND BANDEGE MEASUREMENT

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

Frequencies (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.



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4.2.2 TEST INSTRUMENTS

For Below 1GHz:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
MXE EMI Receiver Agilent	N9038A	MY51210105	July 21, 2014	July 20, 2015
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-03	Nov. 13, 2013	Nov. 12, 2014
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-360	Feb. 26, 2014	Feb. 25, 2015
RF Cable	NA	CHGCAB_001	Oct. 04, 2014	Oct. 03, 2015
Horn_Antenna AISL	AIH.8018	0000320091110	Aug. 27, 2014	Aug. 26, 2015
Pre-Amplifier Agilent	8449B	3008A02578	June 24, 2014	June 23, 2015
RF Cable	NA	131205 131214 SNMY23684/4	Jan. 17, 2014	Jan. 16, 2015
Spectrum Analyzer R&S	FSV40	100964	July 05, 2014	July 04, 2015
Pre-Amplifier EMCI	EMC184045	980143	Jan. 17, 2014	Jan. 16, 2015
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Aug. 26, 2014	Aug. 25, 2015
RF Cable	NA	RF104-121 RF104-204	Dec. 12, 2013	Dec. 11, 2014
Antenna Tower & Turn Table CT	NA	NA	NA	NA

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
- 3 The test was performed in 966 Chamber No. G.
4. The FCC Site Registration No. is 966073.
- 5 The VCCI Site Registration No. is G-137.
- 6 The CANADA Site Registration No. is IC 7450H-2.
- 7 Tested Date: Nov. 07, 2014



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For Above 1GHz:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
MXE EMI Receiver Agilent	N9038A	MY51210105	July 21,2014	July 20,2015
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-03	Nov. 12, 2014	Nov. 11, 2015
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-360	Feb. 26, 2014	Feb. 25, 2015
RF Cable	NA	CHGCAB_001	Oct. 04, 2014	Oct. 03, 2015
Horn_Antenna AISI	AIH.8018	0000320091110	Aug. 27, 2014	Aug. 26, 2015
Pre-Amplifier Agilent	8449B	3008A02578	June 24, 2014	June 23, 2015
RF Cable	NA	131205 131214 SNMY23684/4	Jan. 17, 2014	Jan. 16, 2015
Spectrum Analyzer R&S	FSV40	100964	July 05, 2014	July 04, 2015
Pre-Amplifier EMCI	EMC184045	980143	Jan. 17, 2014	Jan. 16, 2015
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Aug. 26, 2014	Aug. 25, 2015
RF Cable	NA	RF104-121 RF104-204	Dec. 12, 2013	Dec. 11, 2014
Antenna Tower & Turn Table CT	NA	NA	NA	NA

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in 966 Chamber No. G.
4. The FCC Site Registration No. is 966073.
5. The VCCI Site Registration No. is G-137.
6. The CANADA Site Registration No. is IC 7450H-2.
7. Tested Date: Nov. 24, 2014

4.2.3 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:

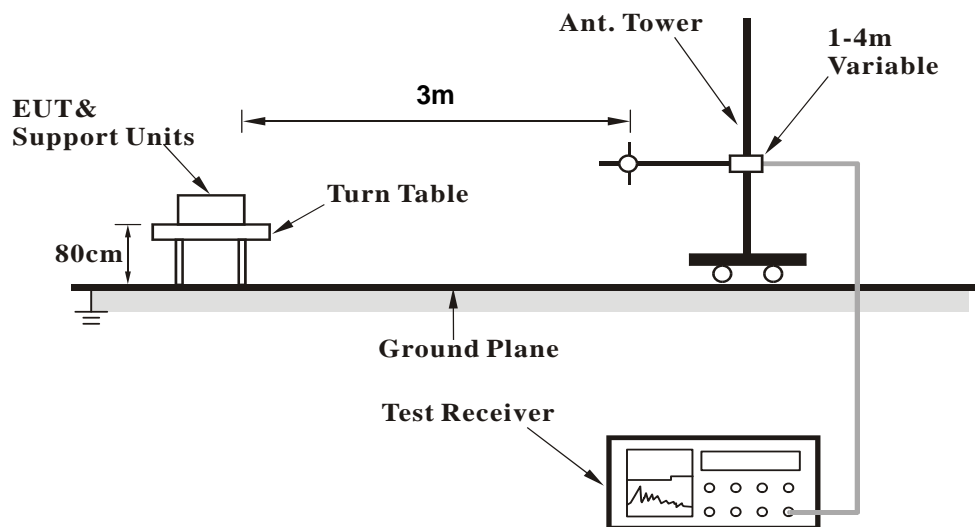
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 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 ($10 \log(1/\text{duty cycle})$).
4. 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.
5. All modes of operation were investigated and the worst-case emissions are reported.

4.2.4 DEVIATION FROM TEST STANDARD

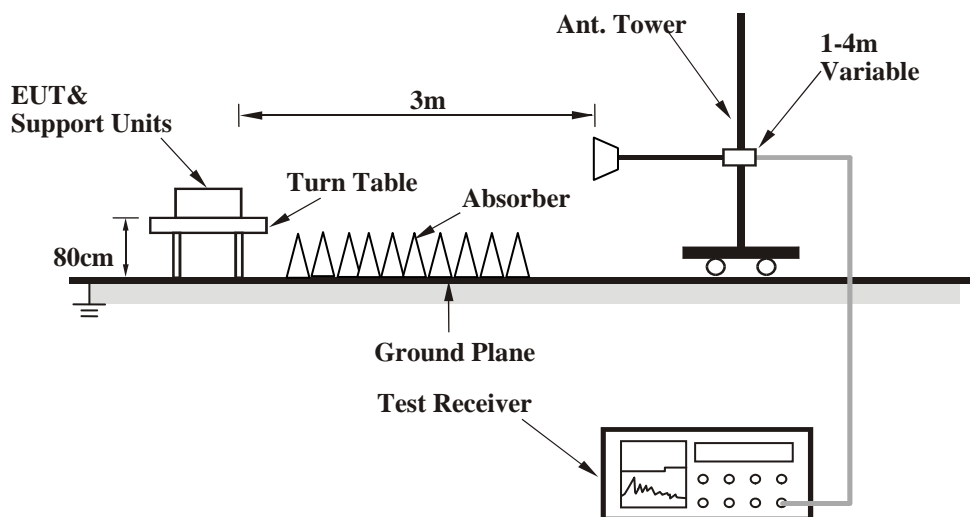
No deviation

4.2.5 TEST SETUP

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.2.6 EUT OPERATING CONDITIONS

Same as 4.1.6

4.2.7 TEST RESULTS

BELOW 1GHz WORST-CASE DATA

802.11g

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	Below 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	41.45	32.0 QP	40.0	-8.1	1.50 H	251	45.78	-13.83
2	125.01	34.1 QP	43.5	-9.4	1.50 H	290	49.19	-15.10
3	256.20	40.1 QP	46.0	-5.9	1.00 H	29	54.37	-14.23
4	262.95	41.4 QP	46.0	-4.6	1.00 H	360	55.33	-13.96
5	625.00	35.7 QP	46.0	-10.3	1.00 H	360	40.04	-4.31
6	833.89	41.9 QP	46.0	-4.1	1.00 H	354	42.59	-0.67
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	38.24	37.9 QP	40.0	-2.1	1.00 V	282	51.88	-14.02
2	70.84	35.7 QP	40.0	-4.3	1.00 V	81	51.55	-15.87
3	125.01	39.5 QP	43.5	-4.0	1.00 V	345	54.59	-15.10
4	261.15	42.1 QP	46.0	-3.9	1.50 V	9	56.17	-14.04
5	625.00	43.3 QP	46.0	-2.8	1.50 V	0	47.56	-4.31
6	834.08	43.9 QP	46.0	-2.2	1.50 V	1	44.52	-0.67

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

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	2288.00	58.9 PK	74.0	-15.1	1.54 H	154	61.82	-2.92
2	2288.00	53.1 AV	54.0	-0.9	1.54 H	154	56.02	-2.92
3	2327.00	58.2 PK	74.0	-15.8	1.52 H	163	60.95	-2.75
4	2327.00	49.1 AV	54.0	-4.9	1.52 H	163	51.85	-2.75
5	2360.00	60.1 PK	74.0	-13.9	1.20 H	167	62.70	-2.60
6	2360.00	50.8 AV	54.0	-3.2	1.20 H	167	53.40	-2.60
7	*2412.00	111.2 PK			1.23 H	10	113.57	-2.37
8	*2412.00	108.7 AV			1.23 H	10	111.07	-2.37
9	4824.00	51.2 PK	74.0	-22.8	1.24 H	313	45.49	5.71
10	4824.00	45.1 AV	54.0	-8.9	1.24 H	313	39.39	5.71

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	2327.00	64.0 PK	74.0	-10.0	1.02 V	273	66.75	-2.75
2	2327.00	42.3 AV	54.0	-11.7	1.02 V	273	45.05	-2.75
3	2360.00	54.0 PK	74.0	-20.0	1.00 V	147	56.60	-2.60
4	2360.00	41.9 AV	54.0	-12.1	1.00 V	147	44.50	-2.60
5	*2412.00	100.0 PK			1.02 V	273	102.37	-2.37
6	*2412.00	97.2 AV			1.02 V	273	99.57	-2.37
7	4824.00	50.2 PK	74.0	-23.8	1.06 V	82	44.49	5.71
8	4824.00	38.2 AV	54.0	-15.8	1.06 V	82	32.49	5.71

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.



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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	2288.00	57.9 PK	74.0	-16.1	1.53 H	152	60.82	-2.92
2	2288.00	53.0 AV	54.0	-1.0	1.53 H	152	55.92	-2.92
3	*2437.00	109.5 PK			1.20 H	5	111.75	-2.25
4	*2437.00	106.8 AV			1.20 H	5	109.05	-2.25
5	4874.00	51.5 PK	74.0	-22.5	1.23 H	324	45.60	5.90
6	4874.00	45.6 AV	54.0	-8.4	1.23 H	324	39.70	5.90
7	7311.00	54.1 PK	74.0	-19.9	1.02 H	0	40.93	13.17
8	7311.00	40.9 AV	54.0	-13.1	1.02 H	0	27.73	13.17

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	2288.00	50.1 PK	74.0	-23.9	1.00 V	319	53.02	-2.92
2	2288.00	44.5 AV	54.0	-9.5	1.00 V	319	47.42	-2.92
3	*2437.00	101.1 PK			1.04 V	261	103.35	-2.25
4	*2437.00	97.9 AV			1.04 V	261	100.15	-2.25
5	4874.00	50.0 PK	74.0	-24.0	1.03 V	38	44.10	5.90
6	4874.00	37.9 AV	54.0	-16.1	1.03 V	38	32.00	5.90
7	7311.00	53.4 PK	74.0	-20.6	1.00 V	147	40.23	13.17
8	7311.00	41.1 AV	54.0	-12.9	1.00 V	147	27.93	13.17

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.



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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	2288.00	57.1 PK	74.0	-16.9	1.54 H	154	60.02	-2.92
2	2288.00	52.9 AV	54.0	-1.1	1.54 H	154	55.82	-2.92
3	*2462.00	110.1 PK			1.19 H	9	112.24	-2.14
4	*2462.00	107.2 AV			1.19 H	9	109.34	-2.14
5	2483.50	65.3 PK	74.0	-8.7	1.19 H	9	67.33	-2.03
6	2483.50	43.6 AV	54.0	-10.4	1.19 H	9	45.63	-2.03
7	4924.00	52.4 PK	74.0	-21.6	1.23 H	313	46.29	6.11
8	4924.00	45.9 AV	54.0	-8.1	1.23 H	313	39.79	6.11
9	7386.00	54.7 PK	74.0	-19.3	1.00 H	13	41.52	13.18
10	7386.00	41.3 AV	54.0	-12.7	1.00 H	13	28.12	13.18

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	101.1 PK			1.05 V	258	103.24	-2.14
2	*2462.00	98.1 AV			1.05 V	258	100.24	-2.14
3	2483.50	63.2 PK	74.0	-10.8	1.05 V	258	65.23	-2.03
4	2483.50	41.8 AV	54.0	-12.2	1.05 V	258	43.83	-2.03
5	4924.00	49.6 PK	74.0	-24.4	1.19 V	88	43.49	6.11
6	4924.00	37.8 AV	54.0	-16.2	1.19 V	88	31.69	6.11
7	7386.00	54.4 PK	74.0	-19.6	1.00 V	157	41.22	13.18
8	7386.00	42.0 AV	54.0	-12.0	1.00 V	157	28.82	13.18

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)
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	73.1 PK	74.0	-0.9	1.43 H	172	75.57	-2.47
2	2390.00	52.8 AV	54.0	-1.2	1.43 H	172	55.27	-2.47
3	*2412.00	113.9 PK			1.43 H	172	116.27	-2.37
4	*2412.00	101.9 AV			1.43 H	172	104.27	-2.37
5	4824.00	45.2 PK	74.0	-28.8	1.00 H	348	39.49	5.71
6	4824.00	34.3 AV	54.0	-19.7	1.00 H	348	28.59	5.71

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	63.7 PK	74.0	-10.3	1.01 V	263	66.17	-2.47
2	2390.00	42.2 AV	54.0	-11.8	1.01 V	263	44.67	-2.47
3	*2412.00	103.6 PK			1.01 V	263	105.97	-2.37
4	*2412.00	92.8 AV			1.01 V	263	95.17	-2.37
5	4824.00	49.6 PK	74.0	-24.4	1.10 V	63	43.89	5.71
6	4824.00	37.9 AV	54.0	-16.1	1.10 V	63	32.19	5.71

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.



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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	2288.00	57.7 PK	74.0	-16.3	1.15 H	175	60.62	-2.92
2	2288.00	51.4 AV	54.0	-2.6	1.15 H	175	54.32	-2.92
3	2390.00	72.6 PK	74.0	-1.4	1.15 H	4	75.07	-2.47
4	2390.00	51.7 AV	54.0	-2.3	1.15 H	4	54.17	-2.47
5	*2437.00	119.4 PK			1.15 H	4	121.65	-2.25
6	*2437.00	107.8 AV			1.15 H	4	110.05	-2.25
7	2483.50	72.1 PK	74.0	-1.9	1.15 H	4	74.13	-2.03
8	2483.50	51.4 AV	54.0	-2.6	1.15 H	4	53.43	-2.03
9	4874.00	48.3 PK	74.0	-25.7	1.00 H	256	42.40	5.90
10	4874.00	36.7 AV	54.0	-17.3	1.00 H	256	30.80	5.90
11	7311.00	54.1 PK	74.0	-19.9	1.00 H	241	40.93	13.17
12	7311.00	41.8 AV	54.0	-12.2	1.00 H	241	28.63	13.17

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	63.8 PK	74.0	-10.2	1.01 V	263	66.27	-2.47
2	2390.00	42.2 AV	54.0	-11.8	1.01 V	263	44.67	-2.47
3	*2437.00	110.1 PK			1.01 V	263	112.35	-2.25
4	*2437.00	98.7 AV			1.01 V	263	100.95	-2.25
5	2483.50	63.6 PK	74.0	-10.4	1.01 V	263	65.63	-2.03
6	2483.50	42.1 AV	54.0	-11.9	1.01 V	263	44.13	-2.03
7	4874.00	50.4 PK	74.0	-23.6	1.14 V	75	44.50	5.90
8	4874.00	38.2 AV	54.0	-15.8	1.14 V	75	32.30	5.90
9	7311.00	53.8 PK	74.0	-20.2	1.00 V	154	40.63	13.17
10	7311.00	41.6 AV	54.0	-12.4	1.00 V	154	28.43	13.17

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.



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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	111.6 PK			1.15 H	6	113.74	-2.14
2	*2462.00	100.7 AV			1.15 H	6	102.84	-2.14
3	2483.50	73.0 PK	74.0	-1.0	1.15 H	6	75.03	-2.03
4	2483.50	51.4 AV	54.0	-2.6	1.15 H	6	53.43	-2.03
5	4924.00	45.3 PK	74.0	-28.7	1.00 H	353	39.19	6.11
6	4924.00	34.3 AV	54.0	-19.7	1.00 H	353	28.19	6.11
7	7386.00	55.7 PK	74.0	-18.3	1.00 H	328	42.52	13.18
8	7386.00	41.4 AV	54.0	-12.6	1.00 H	328	28.22	13.18

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	101.1 PK			1.00 V	253	103.24	-2.14
2	*2462.00	90.2 AV			1.00 V	253	92.34	-2.14
3	2483.50	64.1 PK	74.0	-9.9	1.00 V	253	66.13	-2.03
4	2483.50	42.5 AV	54.0	-11.5	1.00 V	253	44.53	-2.03
5	4924.00	44.9 PK	74.0	-29.1	1.00 V	81	38.79	6.11
6	4924.00	32.7 AV	54.0	-21.3	1.00 V	81	26.59	6.11
7	7386.00	55.3 PK	74.0	-18.7	1.21 V	62	42.12	13.18
8	7386.00	42.0 AV	54.0	-12.0	1.21 V	62	28.82	13.18

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)
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	2288.00	58.9 PK	74.0	-15.1	1.24 H	155	61.82	-2.92
2	2288.00	52.5 AV	54.0	-1.5	1.24 H	155	55.42	-2.92
3	2390.00	73.0 PK	74.0	-1.0	1.20 H	9	75.47	-2.47
4	2390.00	52.7 AV	54.0	-1.3	1.20 H	9	55.17	-2.47
5	*2412.00	112.8 PK			1.20 H	9	115.17	-2.37
6	*2412.00	101.1 AV			1.20 H	9	103.47	-2.37
7	4824.00	45.7 PK	74.0	-28.3	1.00 H	358	39.99	5.71
8	4824.00	34.7 AV	54.0	-19.3	1.00 H	358	28.99	5.71

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	58.1 PK	74.0	-15.9	1.00 V	274	60.57	-2.47
2	2390.00	39.3 AV	54.0	-14.7	1.00 V	274	41.77	-2.47
3	*2412.00	101.6 PK			1.00 V	274	103.97	-2.37
4	*2412.00	90.9 AV			1.00 V	274	93.27	-2.37
5	4824.00	45.6 PK	74.0	-28.4	1.00 V	58	39.89	5.71
6	4824.00	33.6 AV	54.0	-20.4	1.00 V	58	27.89	5.71

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.



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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	2288.00	60.1 PK	74.0	-13.9	1.26 H	156	63.02	-2.92
2	2288.00	53.1 AV	54.0	-0.9	1.26 H	156	56.02	-2.92
3	2390.00	71.0 PK	74.0	-3.0	1.19 H	18	73.47	-2.47
4	2390.00	53.0 AV	54.0	-1.0	1.19 H	18	55.47	-2.47
5	*2437.00	120.3 PK			1.19 H	18	122.55	-2.25
6	*2437.00	108.0 AV			1.19 H	18	110.25	-2.25
7	2483.50	70.8 PK	74.0	-3.2	1.19 H	18	72.83	-2.03
8	2483.50	50.3 AV	54.0	-3.7	1.19 H	18	52.33	-2.03
9	4874.00	47.6 PK	74.0	-26.4	1.01 H	253	41.70	5.90
10	4874.00	36.3 AV	54.0	-17.7	1.01 H	253	30.40	5.90
11	7311.00	53.2 PK	74.0	-20.8	1.00 H	239	40.03	13.17
12	7311.00	40.7 AV	54.0	-13.3	1.00 H	239	27.53	13.17

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	63.8 PK	74.0	-10.2	1.00 V	261	66.27	-2.47
2	2390.00	42.6 AV	54.0	-11.4	1.00 V	261	45.07	-2.47
3	*2437.00	111.4 PK			1.00 V	261	113.65	-2.25
4	*2437.00	98.8 AV			1.00 V	261	101.05	-2.25
5	2483.50	64.0 PK	74.0	-10.0	1.00 V	261	66.03	-2.03
6	2483.50	42.4 AV	54.0	-11.6	1.00 V	261	44.43	-2.03
7	4874.00	44.6 PK	74.0	-29.4	1.00 V	67	38.70	5.90
8	4874.00	32.7 AV	54.0	-21.3	1.00 V	67	26.80	5.90
9	7311.00	54.4 PK	74.0	-19.6	1.23 V	50	41.23	13.17
10	7311.00	41.3 AV	54.0	-12.7	1.23 V	50	28.13	13.17

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.



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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	111.8 PK			1.16 H	12	113.94	-2.14
2	*2462.00	100.1 AV			1.16 H	12	102.24	-2.14
3	2483.50	72.9 PK	74.0	-1.1	1.16 H	12	74.93	-2.03
4	2483.50	52.1 AV	54.0	-1.9	1.16 H	12	54.13	-2.03
5	4924.00	45.6 PK	74.0	-28.4	1.00 H	360	39.49	6.11
6	4924.00	34.6 AV	54.0	-19.4	1.00 H	360	28.49	6.11
7	7386.00	55.6 PK	74.0	-18.4	1.00 H	354	42.42	13.18
8	7386.00	41.2 AV	54.0	-12.8	1.00 H	354	28.02	13.18

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	102.5 PK			1.02 V	264	104.64	-2.14
2	*2462.00	90.6 AV			1.02 V	264	92.74	-2.14
3	2483.50	63.6 PK	74.0	-10.4	1.02 V	264	65.63	-2.03
4	2483.50	41.8 AV	54.0	-12.2	1.02 V	264	43.83	-2.03
5	4924.00	45.5 PK	74.0	-28.5	1.00 V	85	39.39	6.11
6	4924.00	32.9 AV	54.0	-21.1	1.00 V	85	26.79	6.11
7	7386.00	54.4 PK	74.0	-19.6	1.12 V	44	41.22	13.18
8	7386.00	41.3 AV	54.0	-12.7	1.12 V	44	28.12	13.18

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.



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802.11n (HT40)

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	71.8 PK	74.0	-2.2	1.22 H	5	74.27	-2.47
2	2390.00	53.1 AV	54.0	-0.9	1.22 H	5	55.57	-2.47
3	*2422.00	107.1 PK			1.22 H	5	109.42	-2.32
4	*2422.00	95.2 AV			1.22 H	5	97.52	-2.32
5	4844.00	44.4 PK	74.0	-29.6	1.00 H	360	38.62	5.78
6	4844.00	34.2 AV	54.0	-19.8	1.00 H	360	28.42	5.78
7	7266.00	54.8 PK	74.0	-19.2	1.00 H	346	41.60	13.20
8	7266.00	41.0 AV	54.0	-13.0	1.00 H	346	27.80	13.20

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	63.7 PK	74.0	-10.3	1.00 V	279	66.17	-2.47
2	2390.00	42.2 AV	54.0	-11.8	1.00 V	279	44.67	-2.47
3	*2422.00	97.9 PK			1.00 V	279	100.22	-2.32
4	*2422.00	84.1 AV			1.00 V	279	86.42	-2.32
5	4844.00	44.4 PK	74.0	-29.6	1.00 V	79	38.62	5.78
6	4844.00	32.2 AV	54.0	-21.8	1.00 V	79	26.42	5.78
7	7266.00	54.9 PK	74.0	-19.1	1.18 V	78	41.70	13.20
8	7266.00	41.6 AV	54.0	-12.4	1.18 V	78	28.40	13.20

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.



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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	72.4 PK	74.0	-1.6	1.20 H	0	74.87	-2.47
2	2390.00	53.0 AV	54.0	-1.0	1.20 H	0	55.47	-2.47
3	*2437.00	110.0 PK			1.20 H	0	112.25	-2.25
4	*2437.00	98.2 AV			1.20 H	0	100.45	-2.25
5	2483.50	69.4 PK	74.0	-4.6	1.20 H	0	71.43	-2.03
6	2483.50	49.8 AV	54.0	-4.2	1.20 H	0	51.83	-2.03
7	4874.00	45.2 PK	74.0	-28.8	1.00 H	352	39.30	5.90
8	4874.00	34.4 AV	54.0	-19.6	1.00 H	352	28.50	5.90
9	7311.00	54.9 PK	74.0	-19.1	1.00 H	356	41.73	13.17
10	7311.00	40.4 AV	54.0	-13.6	1.00 H	356	27.23	13.17

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	62.6 PK	74.0	-11.4	1.04 V	258	65.07	-2.47
2	2390.00	41.4 AV	54.0	-12.6	1.04 V	258	43.87	-2.47
3	*2437.00	101.1 PK			1.04 V	258	103.35	-2.25
4	*2437.00	89.1 AV			1.04 V	258	91.35	-2.25
5	2483.50	64.1 PK	74.0	-9.9	1.04 V	258	66.13	-2.03
6	2483.50	42.5 AV	54.0	-11.5	1.04 V	258	44.53	-2.03
7	4874.00	45.4 PK	74.0	-28.6	1.00 V	66	39.50	5.90
8	4874.00	33.4 AV	54.0	-20.6	1.00 V	66	27.50	5.90
9	7311.00	55.3 PK	74.0	-18.7	1.22 V	59	42.13	13.17
10	7311.00	41.9 AV	54.0	-12.1	1.22 V	59	28.73	13.17

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.



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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	105.6 PK			1.12 H	0	107.78	-2.18
2	*2452.00	93.6 AV			1.12 H	0	95.78	-2.18
3	2483.50	71.8 PK	74.0	-2.2	1.12 H	0	73.83	-2.03
4	2483.50	52.9 AV	54.0	-1.1	1.12 H	0	54.93	-2.03
5	4904.00	45.5 PK	74.0	-28.5	1.00 H	360	39.48	6.02
6	4904.00	34.7 AV	54.0	-19.3	1.00 H	360	28.68	6.02
7	7356.00	55.0 PK	74.0	-19.0	1.00 H	360	41.82	13.18
8	7356.00	40.9 AV	54.0	-13.1	1.00 H	360	27.72	13.18

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	97.4 PK			1.04 V	263	99.58	-2.18
2	*2452.00	84.8 AV			1.04 V	263	86.98	-2.18
3	2483.50	63.7 PK	74.0	-10.3	1.04 V	263	65.73	-2.03
4	2483.50	42.3 AV	54.0	-11.7	1.04 V	263	44.33	-2.03
5	4904.00	45.5 PK	74.0	-28.5	1.00 V	78	39.48	6.02
6	4904.00	33.2 AV	54.0	-20.8	1.00 V	78	27.18	6.02
7	7356.00	54.9 PK	74.0	-19.1	1.22 V	65	41.72	13.18
8	7356.00	41.6 AV	54.0	-12.4	1.22 V	65	28.42	13.18

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.

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 INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
SPECTRUM ANALYZER R&S	FSP 40	100060	May 08, 2014	May 07, 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. Tested date : Nov. 25, 2014

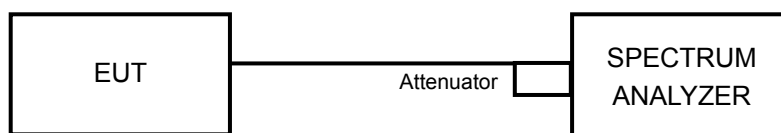
4.3.3 TEST PROCEDURE

1. Set resolution bandwidth (RBW) = 100kHz.
2. Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = Peak.
3. Trace mode = max hold.
4. Sweep = auto couple.
5. 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

4.3.4 DEVIATION FROM TEST STANDARD

No deviation

4.3.5 TEST SETUP



4.3.6 EUT OPERATING CONDITIONS

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



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4.3.7 TEST RESULTS

802.11b

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)		MINIMUM LIMIT (MHz)	PASS / FAIL
		CHAIN 0	CHAIN 1		
1	2412	10.13	10.13	0.5	PASS
6	2437	10.13	10.11	0.5	PASS
11	2462	10.13	10.12	0.5	PASS

802.11g

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)		MINIMUM LIMIT (MHz)	PASS / FAIL
		CHAIN 0	CHAIN 1		
1	2412	16.62	17.83	0.5	PASS
6	2437	16.61	17.83	0.5	PASS
11	2462	16.62	17.86	0.5	PASS

802.11n (HT20)

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)		MINIMUM LIMIT (MHz)	PASS / FAIL
		CHAIN 0	CHAIN 1		
1	2412	17.84	17.82	0.5	PASS
6	2437	17.82	17.85	0.5	PASS
11	2462	17.81	17.83	0.5	PASS

802.11n (HT40)

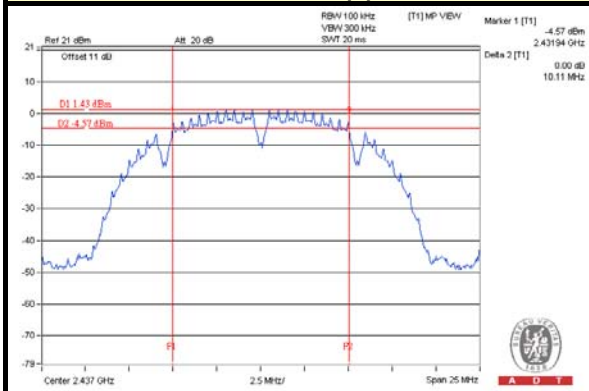
CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)		MINIMUM LIMIT (MHz)	PASS / FAIL
		CHAIN 0	CHAIN 1		
3	2422	36.67	36.64	0.5	PASS
6	2437	36.69	36.69	0.5	PASS
9	2452	36.66	36.67	0.5	PASS



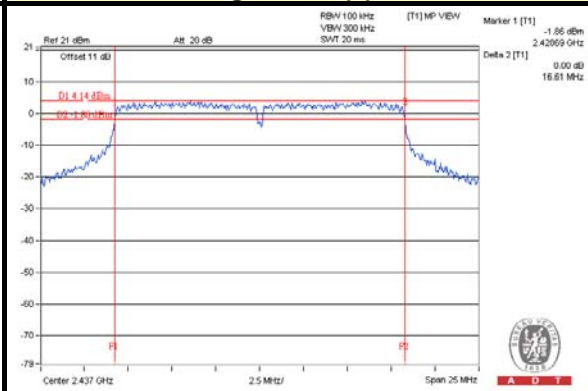
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SPECTRUM PLOT OF WORST VALUE

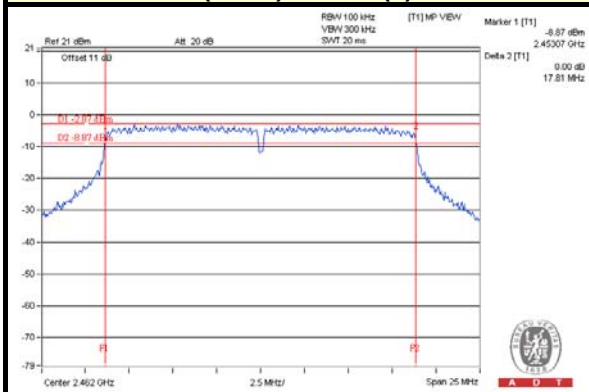
802.11b / Chain(1) : CH6



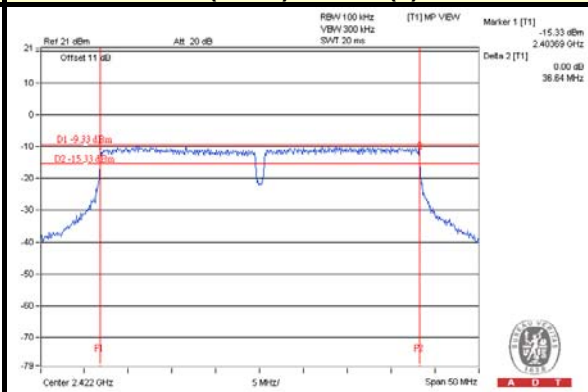
802.11g / Chain(0) : CH6



802.11n (HT20) / Chain(0) : CH11



802.11n (HT40) / Chain(1) : CH3



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 \leq 4;

Array Gain = 0 dB (i.e., no array gain) for channel widths \geq 40 MHz for any NANT;

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

For power measurements on all other devices: Array Gain = $10 \log(\text{NANT}/\text{NSS})$ dB.

4.4.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Power meter Anritsu	ML2495A	1014008	Apr. 30, 2014	Apr. 29, 2015
Power sensor Anritsu	MA2411B	0917122	Apr. 30, 2014	Apr. 29, 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. Tested date : Nov. 25, 2014

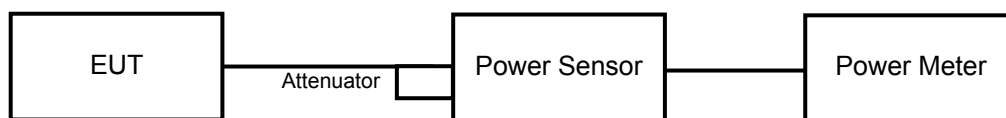
4.4.3 TEST PROCEDURES

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

4.4.4 DEVIATION FROM TEST STANDARD

No deviation.

4.4.5 TEST SETUP



4.4.6 EUT OPERATING CONDITIONS

Same as Item 4.3.6

4.4.7 TEST RESULTS

FOR PEAK POWER

802.11b

CHANNEL	FREQUENCY (MHz)	PEAK POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
1	2412	14.80	14.71	59.78	17.77	30	PASS
6	2437	14.45	14.78	57.922	17.63	30	PASS
11	2462	14.81	14.56	58.845	17.70	30	PASS

802.11g

CHANNEL	FREQUENCY (MHz)	PEAK POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
1	2412	22.43	22.57	355.702	25.51	30	PASS
6	2437	24.51	24.87	589.39	27.70	30	PASS
11	2462	22.02	22.41	333.402	25.23	30	PASS

802.11n (HT20)

CHANNEL	FREQUENCY (MHz)	PEAK POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
1	2412	22.17	22.18	330.012	25.19	30	PASS
6	2437	24.98	25.27	651.287	28.14	30	PASS
11	2462	22.01	22.14	322.537	25.09	30	PASS

802.11n (HT40)

CHANNEL	FREQUENCY (MHz)	PEAK POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
3	2422	19.47	19.54	178.462	22.52	30	PASS
6	2437	22.41	22.85	366.933	25.65	30	PASS
9	2452	18.01	19.76	157.865	21.98	30	PASS



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FOR AVERAGE POWER

802.11b

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)
		CHAIN 0	CHAIN 1		
1	2412	12.42	12.31	34.480	15.38
6	2437	11.99	12.51	33.636	15.27
11	2462	12.41	12.27	34.284	15.35

802.11g

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)
		CHAIN 0	CHAIN 1		
1	2412	13.32	13.42	43.457	16.38
6	2437	19.01	18.89	157.062	21.96
11	2462	12.84	12.96	39.001	15.91

802.11n (HT20)

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)
		CHAIN 0	CHAIN 1		
1	2412	12.87	12.86	38.684	15.88
6	2437	19.46	19.41	175.605	22.45
11	2462	12.57	12.61	36.311	15.60

802.11n (HT40)

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)
		CHAIN 0	CHAIN 1		
3	2422	9.42	9.47	17.601	12.46
6	2437	13.51	14.17	48.561	16.86
9	2452	8.98	9.47	16.758	12.24

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 INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
SPECTRUM ANALYZER R&S	FSP 40	100060	May 08, 2014	May 07, 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. Tested date : Nov. 25, 2014

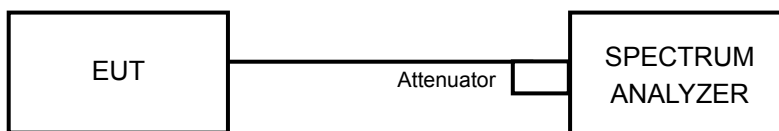
4.5.3 TEST PROCEDURE

1. Set the RBW = 3 kHz, VBW =10 kHz, Detector = peak.
2. Sweep time = auto couple, Trace mode = max hold, allow trace to fully stabilize.
3. Use the peak marker function to determine the maximum amplitude level.

4.5.4 DEVIATION FROM TEST STANDARD

No deviation

4.5.5 TEST SETUP



4.5.6 EUT OPERATING CONDITION

Same as Item 4.3.6



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4.5.7 TEST RESULTS

802.11b

TX CHAIN	CHANNEL	FREQUENCY (MHz)	PSD (dBm)	10 log (N=2) dB	TOTAL PSD (dBm)	LIMIT (dBm)	PASS /FAIL
0	1	2412	-11.42	3.01	-8.41	5.99	PASS
	6	2437	-12.74	3.01	-9.73	5.99	PASS
	11	2462	-12.86	3.01	-9.85	5.99	PASS
1	1	2412	-14.10	3.01	-11.09	5.99	PASS
	6	2437	-13.30	3.01	-10.29	5.99	PASS
	11	2462	-13.94	3.01	-10.93	5.99	PASS

NOTE: Directional gain = $5\text{dBi} + 10\log(2) = 8.01\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $8 - (8.01 - 6) = 5.99\text{dBm}$.

802.11g

TX CHAIN	CHANNEL	FREQUENCY (MHz)	PSD (dBm)	10 log (N=2) dB	TOTAL PSD (dBm)	LIMIT (dBm)	PASS /FAIL
0	1	2412	-12.90	3.01	-9.89	5.99	PASS
	6	2437	-7.14	3.01	-4.13	5.99	PASS
	11	2462	-14.74	3.01	-11.73	5.99	PASS
1	1	2412	-13.82	3.01	-10.81	5.99	PASS
	6	2437	-7.91	3.01	-4.90	5.99	PASS
	11	2462	-15.94	3.01	-12.93	5.99	PASS

NOTE: Directional gain = $5\text{dBi} + 10\log(2) = 8.01\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $8 - (8.01 - 6) = 5.99\text{dBm}$.



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802.11n (HT20)

TX CHAIN	CHANNEL	FREQUENCY (MHz)	PSD (dBm)	10 log (N=2) dB	TOTAL PSD (dBm)	LIMIT (dBm)	PASS /FAIL
0	1	2412	-14.82	3.01	-11.81	5.99	PASS
	6	2437	-8.32	3.01	-5.31	5.99	PASS
	11	2462	-15.18	3.01	-12.17	5.99	PASS
1	1	2412	-14.68	3.01	-11.67	5.99	PASS
	6	2437	-8.13	3.01	-5.12	5.99	PASS
	11	2462	-14.67	3.01	-11.66	5.99	PASS

NOTE: Directional gain = $5\text{dBi} + 10\log(2) = 8.01\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $8-(8.01-6) = 5.99\text{dBm}$.

802.11n (HT40)

TX CHAIN	CHANNEL	FREQUENCY (MHz)	PSD (dBm)	10 log (N=2) dB	TOTAL PSD (dBm)	LIMIT (dBm)	PASS /FAIL
0	3	2422	-21.31	3.01	-18.30	5.99	PASS
	6	2437	-17.07	3.01	-14.06	5.99	PASS
	9	2452	-20.40	3.01	-17.39	5.99	PASS
1	3	2422	-20.43	3.01	-17.42	5.99	PASS
	6	2437	-16.31	3.01	-13.30	5.99	PASS
	9	2452	-22.11	3.01	-19.10	5.99	PASS

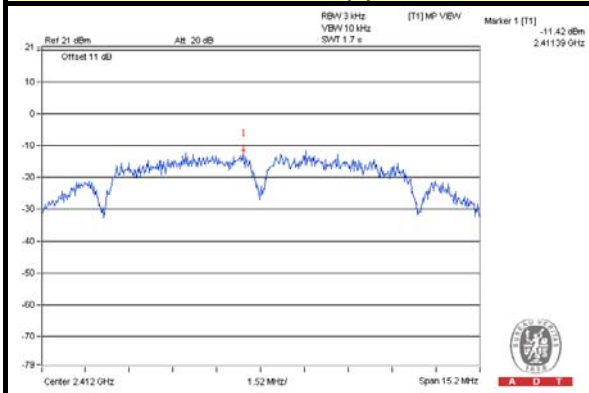
NOTE: Directional gain = $5\text{dBi} + 10\log(2) = 8.01\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $8-(8.01-6) = 5.99\text{dBm}$.



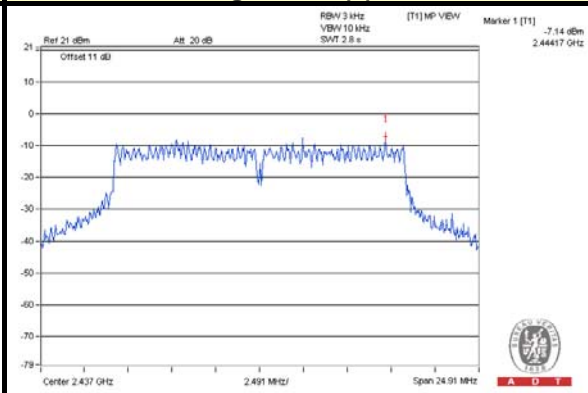
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SPECTRUM PLOT OF WORST VALUE

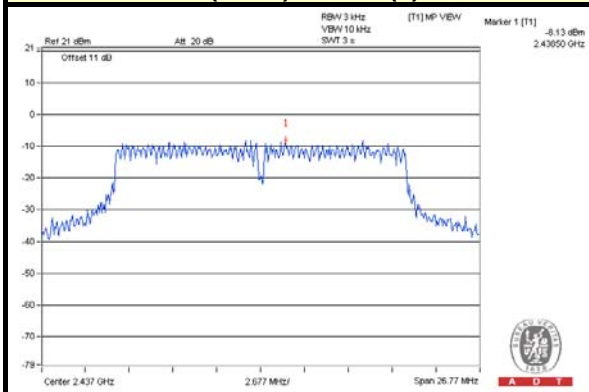
802.11b / Chain(0) : CH1



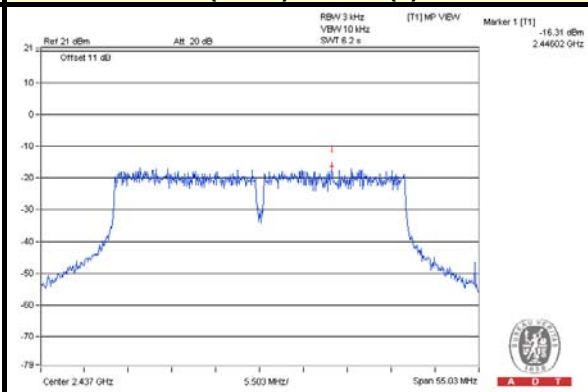
802.11g / Chain(0) : CH6



802.11n (HT20) / Chain(1) : CH6



802.11n (HT40) / Chain(1) : CH6



4.6 CONDUCTED OUT-BAND EMISSION MEASUREMENT

4.6.1 LIMITS OF CONDUCTED OUT-BAND EMISSION MEASUREMENT

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

4.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
SPECTRUM ANALYZER R&S	FSP 40	100060	May 08, 2014	May 07, 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. Tested date : Nov. 25, 2014

4.6.3 TEST PROCEDURE

Measurement Procedure - Reference Level

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

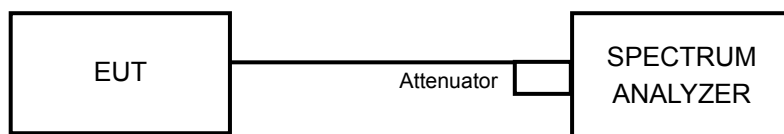
Measurement Procedure –Unwanted Emission Level

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

4.6.4 DEVIATION FROM TEST STANDARD

No deviation

4.6.5 TEST SETUP



4.6.6 EUT OPERATING CONDITION

Same as Item 4.3.6

4.6.7 TEST RESULTS

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

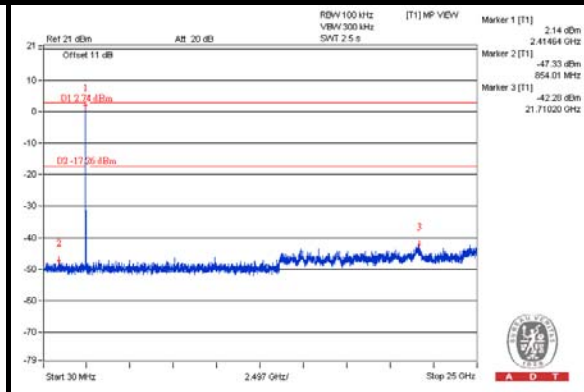
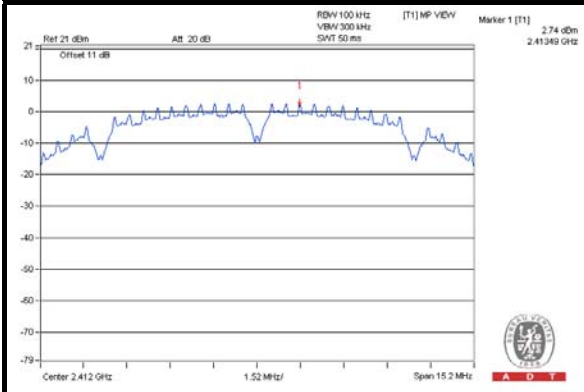


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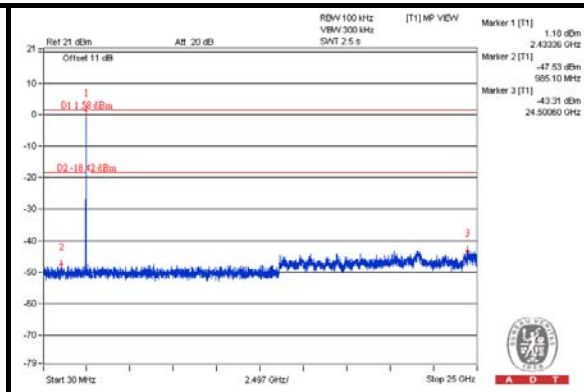
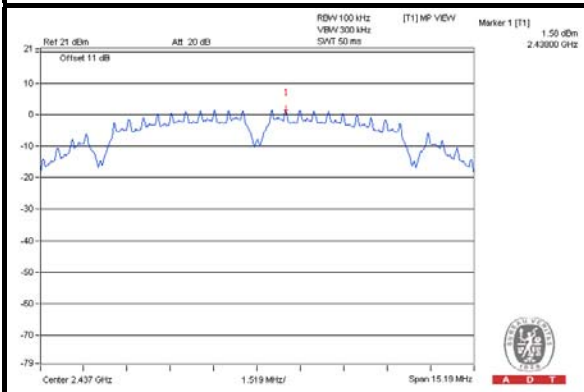
802.11b

Chain (0)

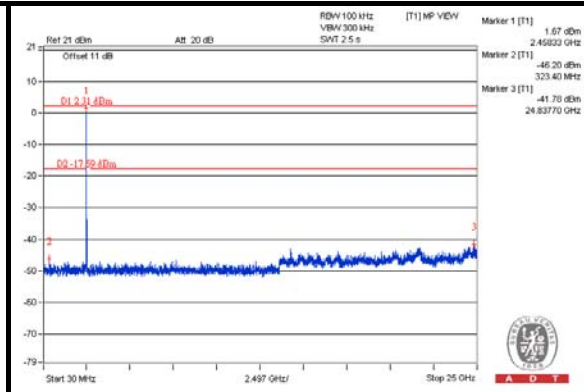
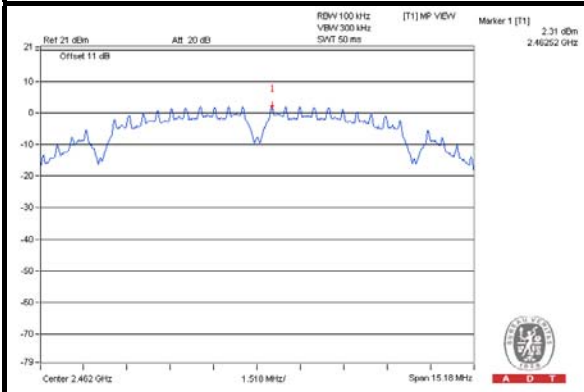
CH 1



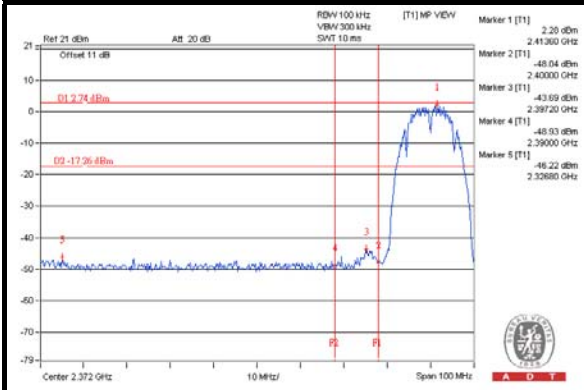
CH 6



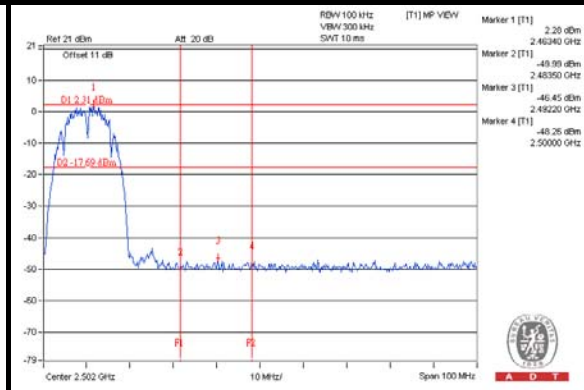
CH 11



CH 1 Band edge



CH 11 Band edge

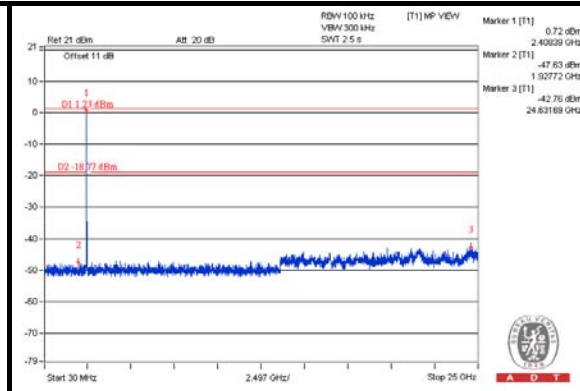
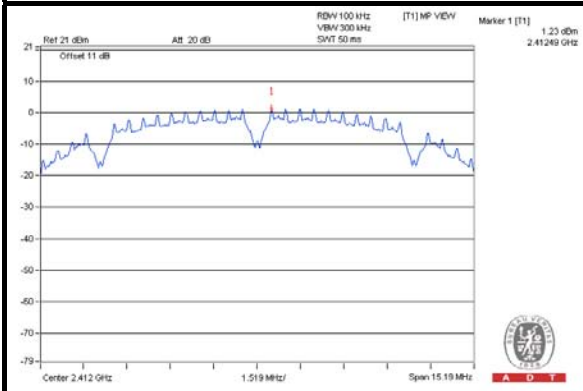




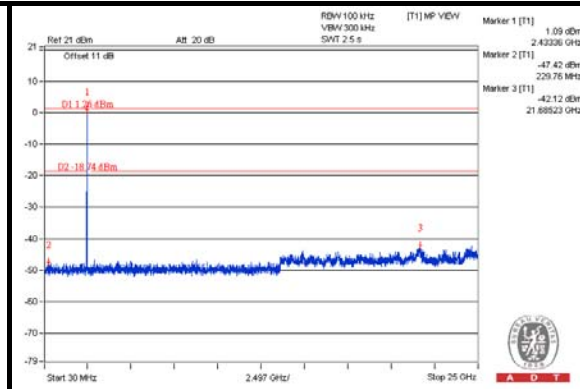
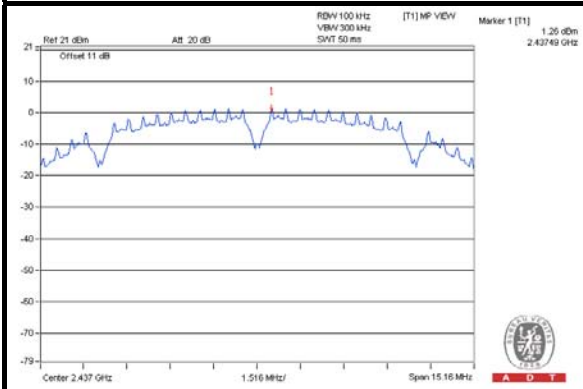
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Chain (1)

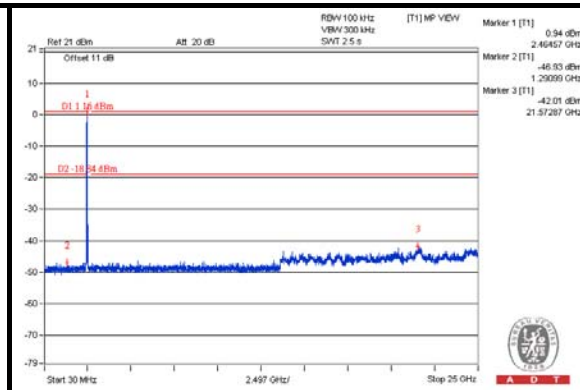
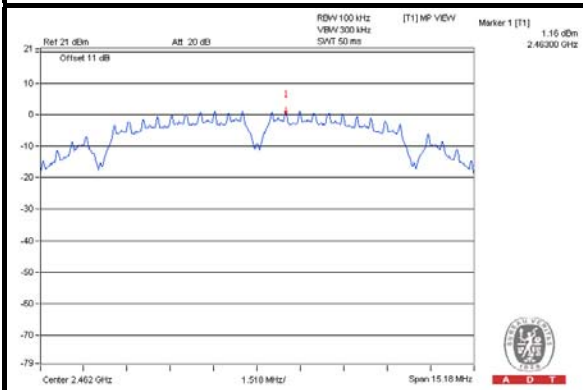
CH 1



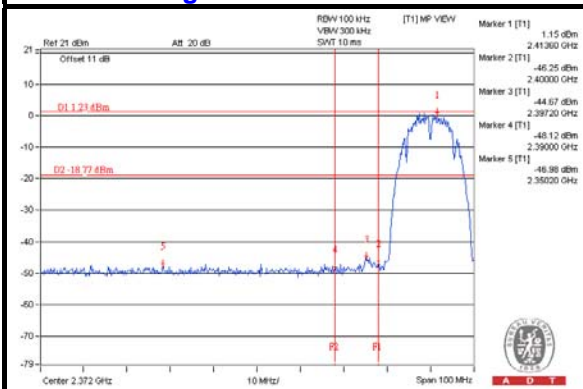
CH 6



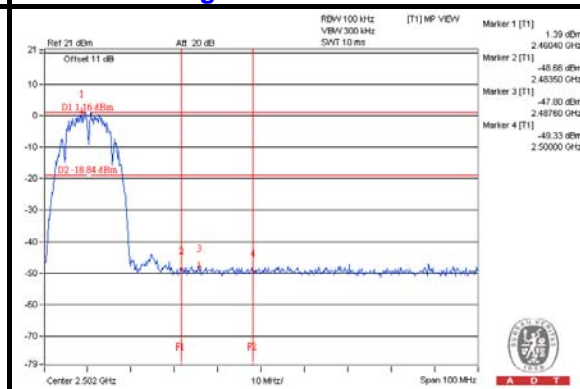
CH 11



CH 1 Band edge



CH 11 Band edge



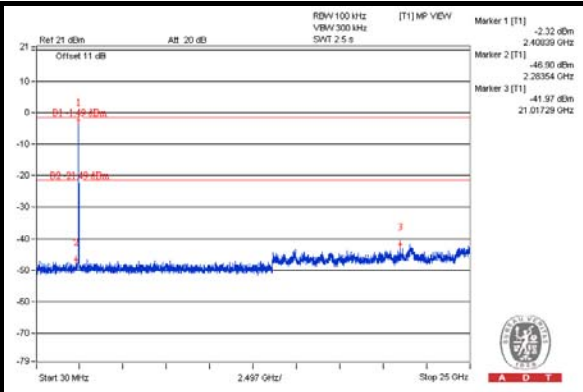
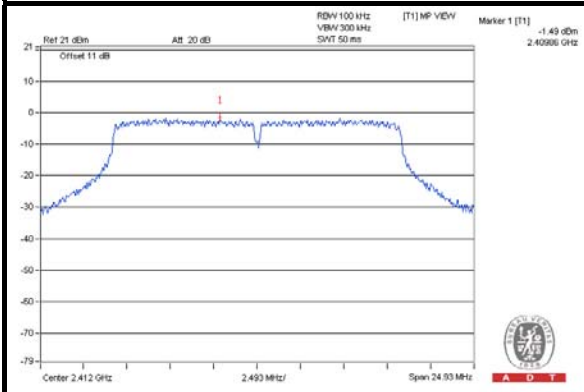


A D T

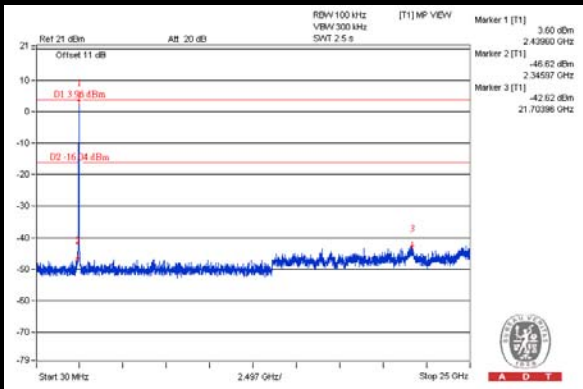
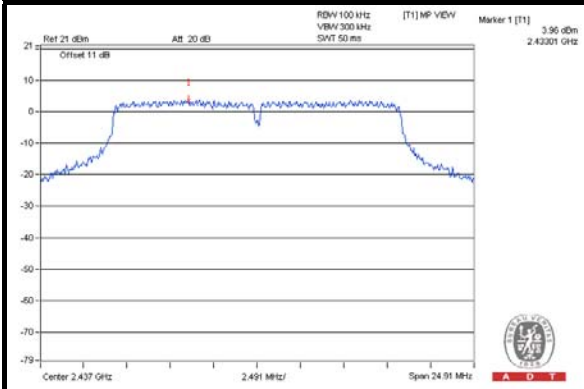
802.11g

Chain (0)

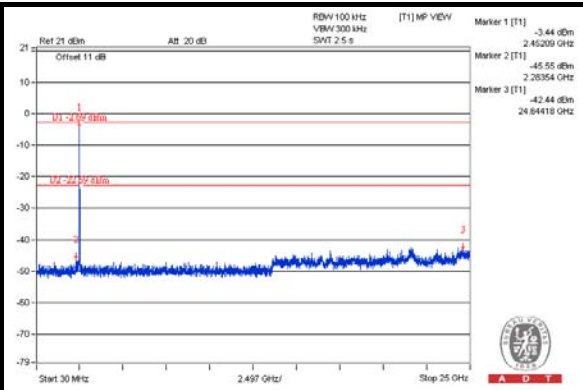
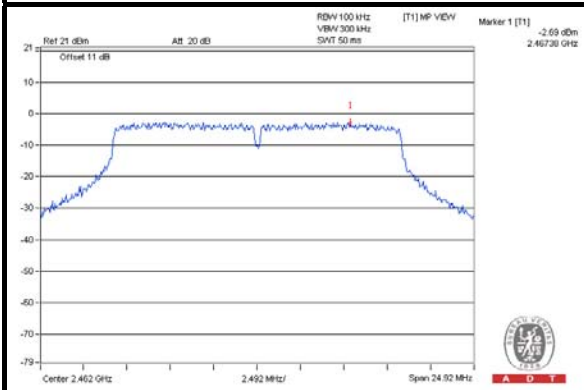
CH 1



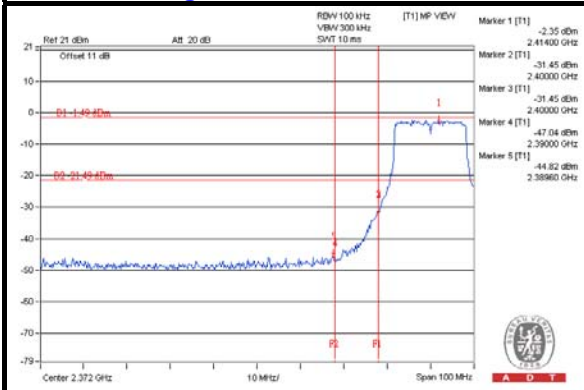
CH 6



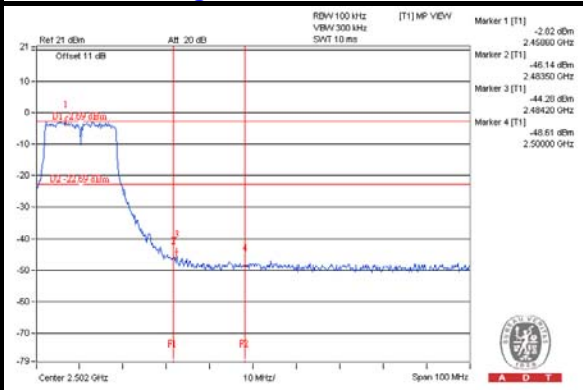
CH 11



CH 1 Band edge



CH 11 Band edge

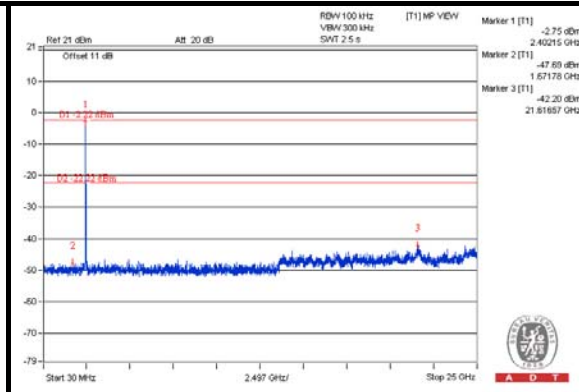
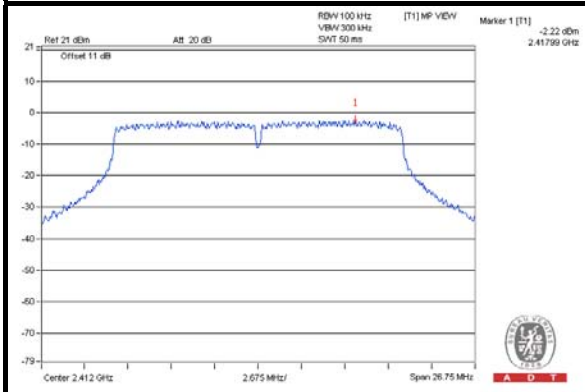




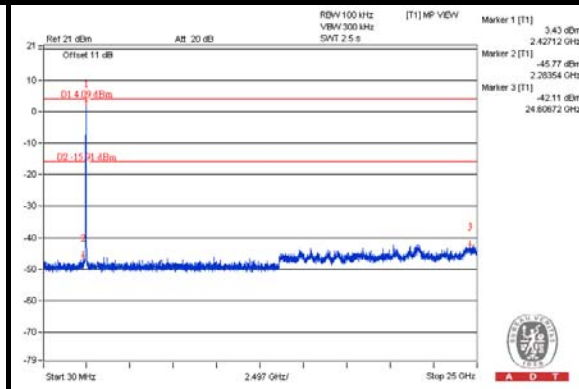
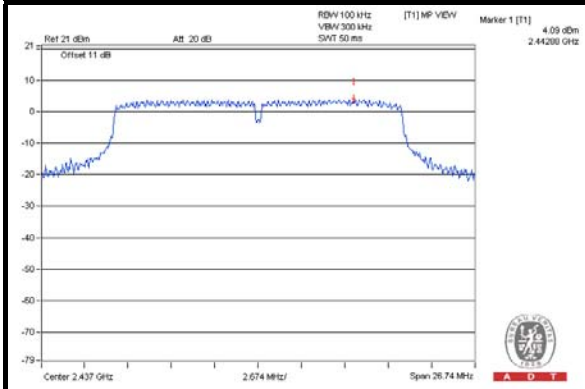
A D T

Chain (1)

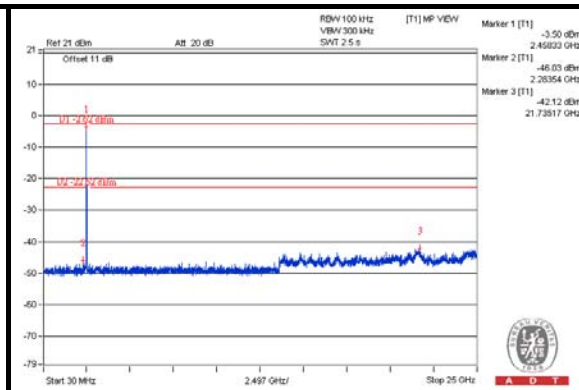
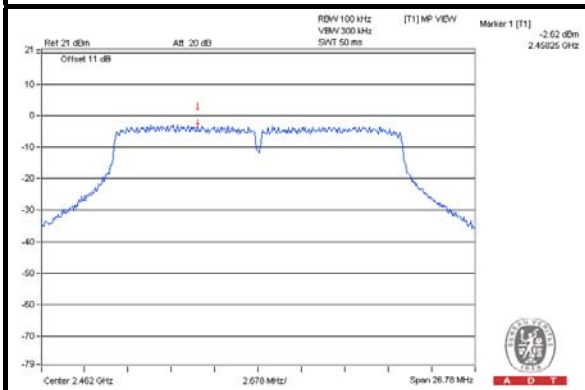
CH 1



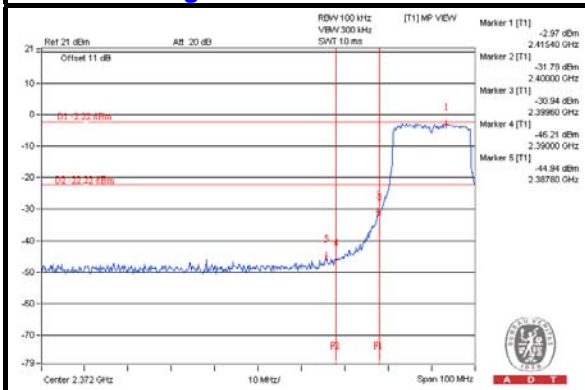
CH 6



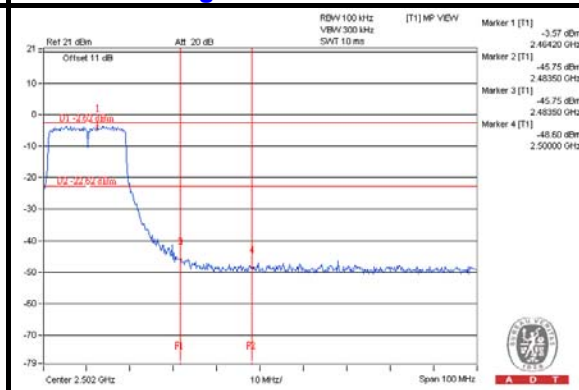
CH 11



CH 1 Band edge



CH 11 Band edge



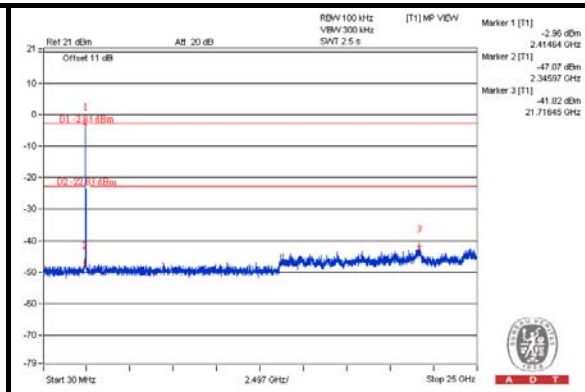
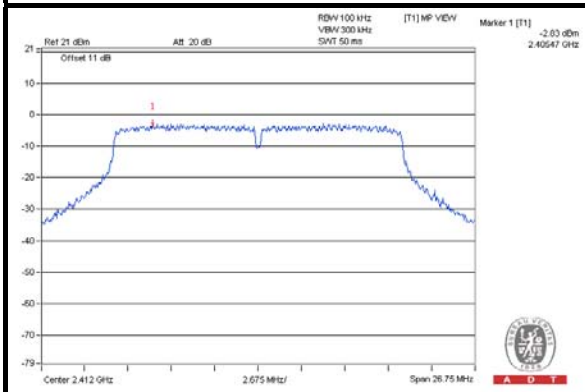


A D T

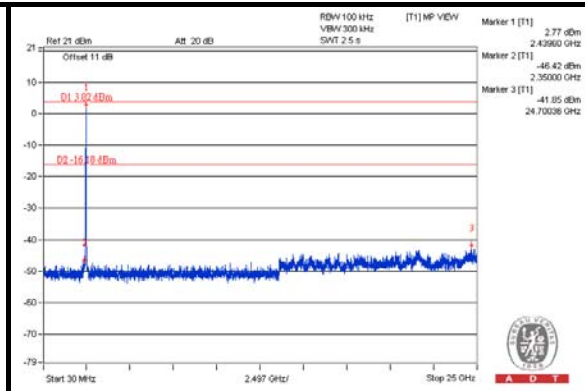
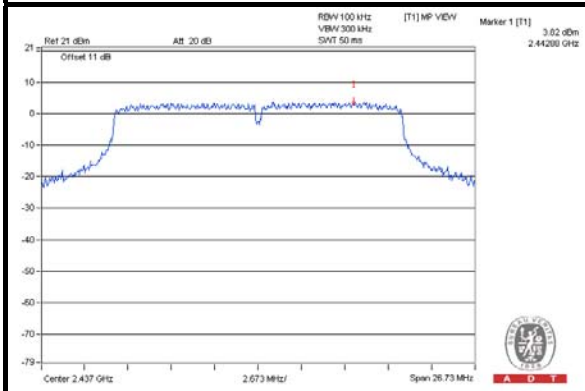
802.11n (HT20)

Chain (0)

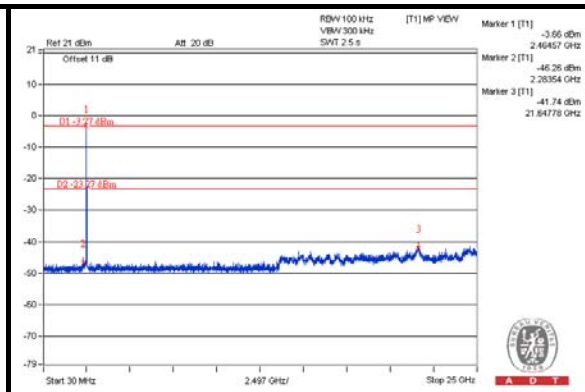
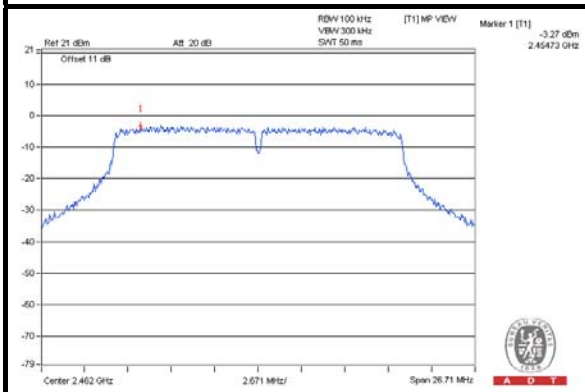
CH 1



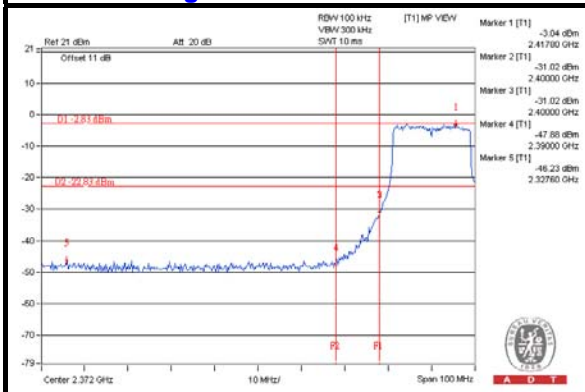
CH 6



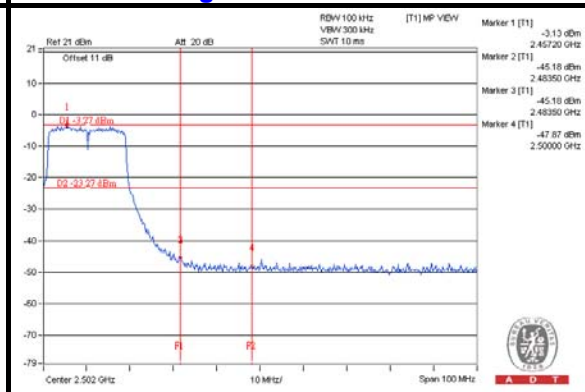
CH 11



CH 1 Band edge



CH 11 Band edge

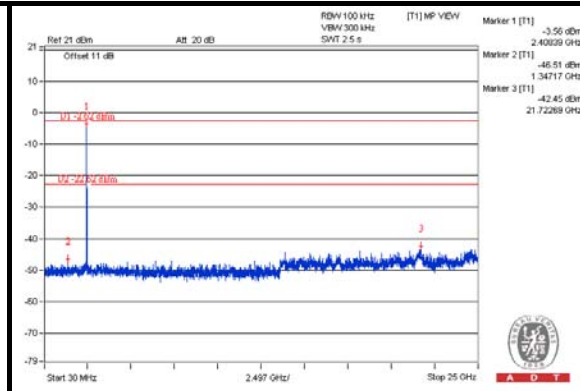
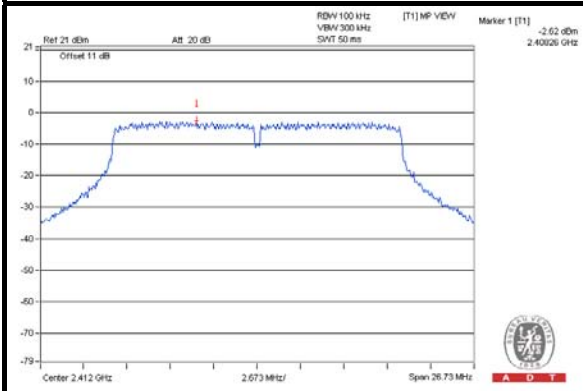




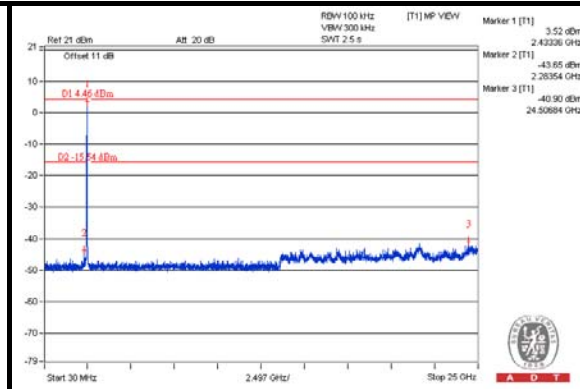
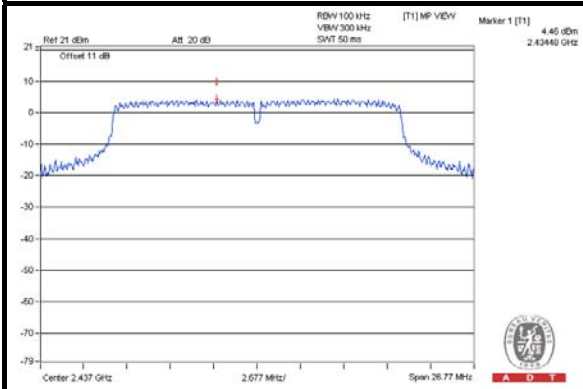
A D T

Chain (1)

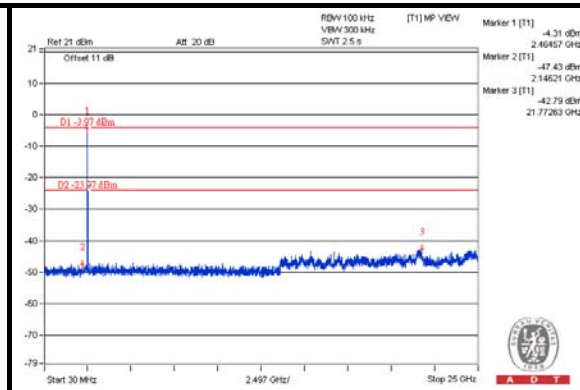
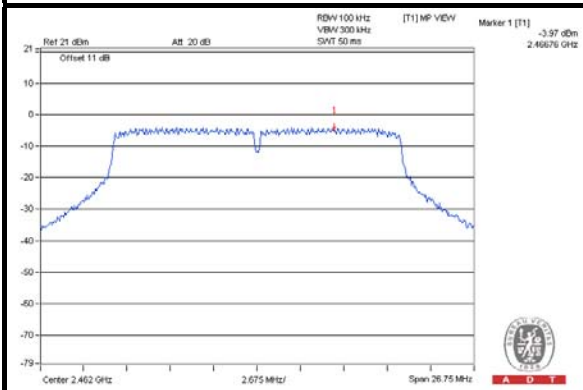
CH 1



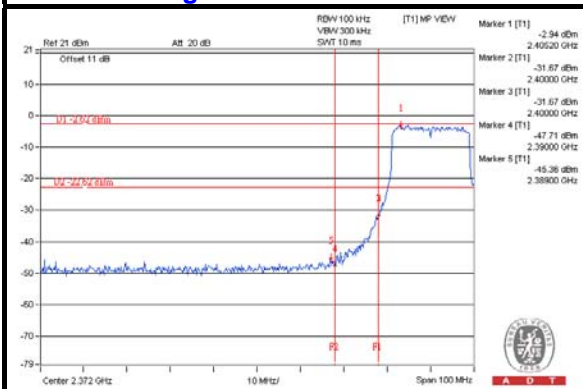
CH 6



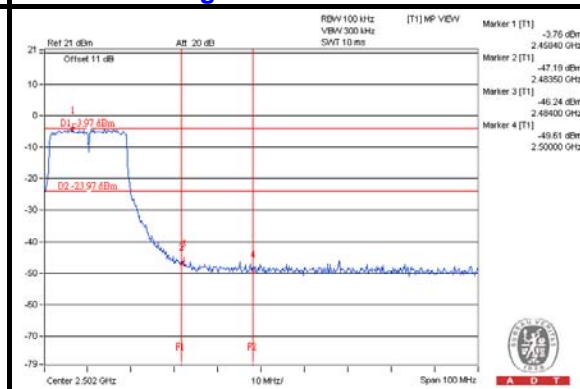
CH 11



CH 1 Band edge



CH 11 Band edge



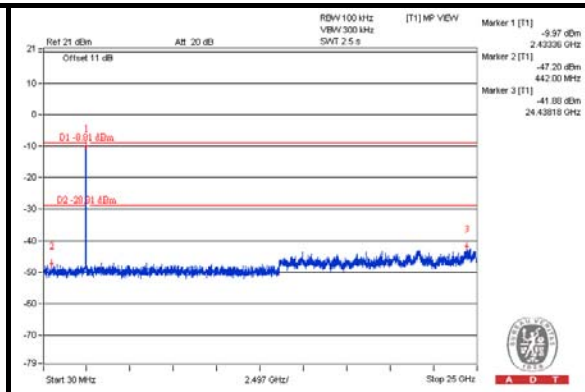
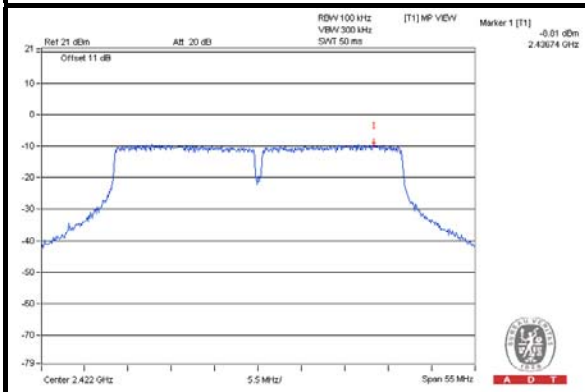


A D T

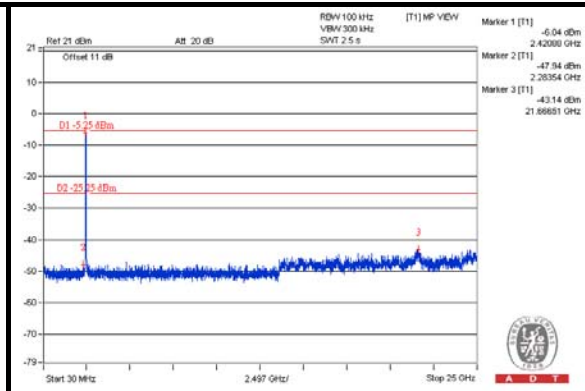
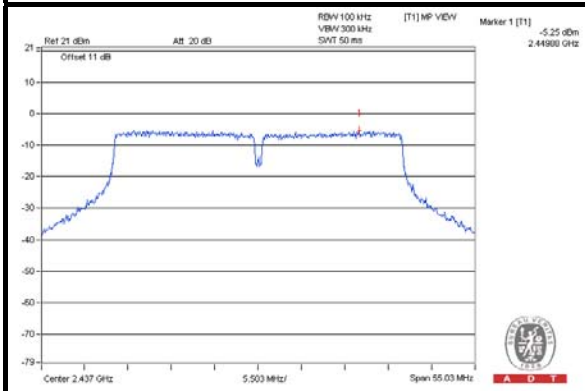
802.11n (HT40)

Chain (0)

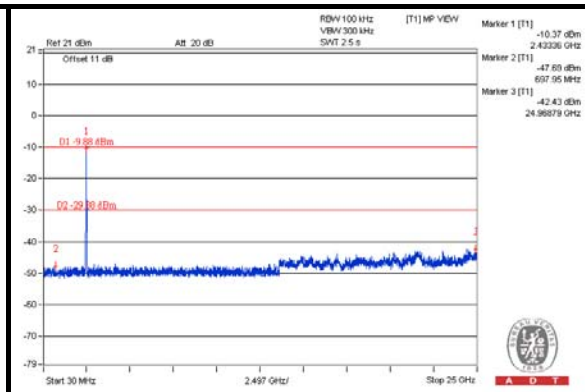
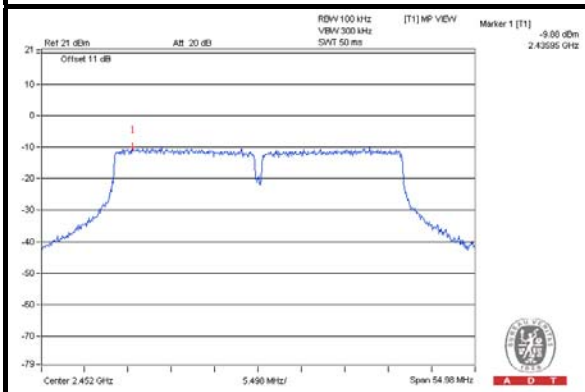
CH 3



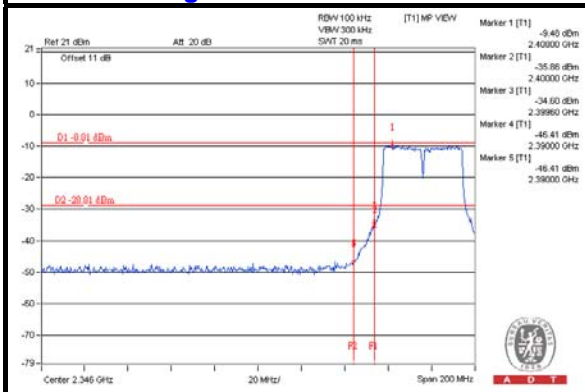
CH 6



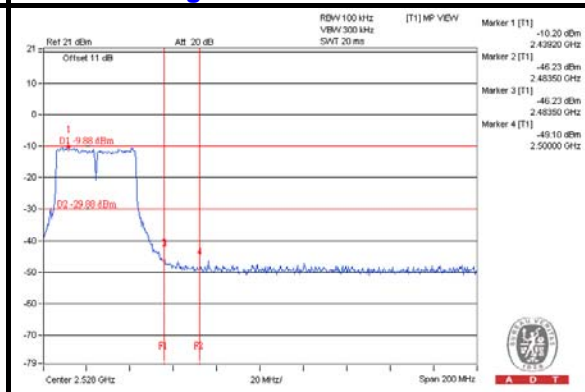
CH 9



CH 3 Band edge



CH 9 Band edge

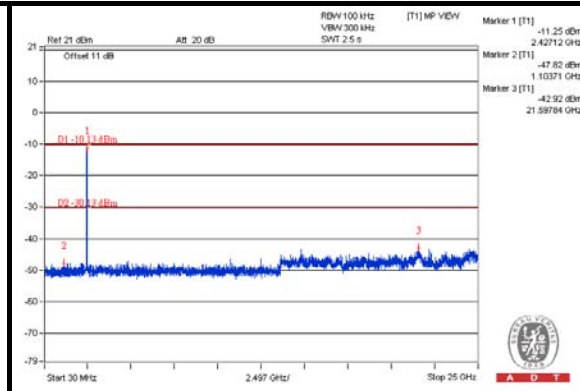
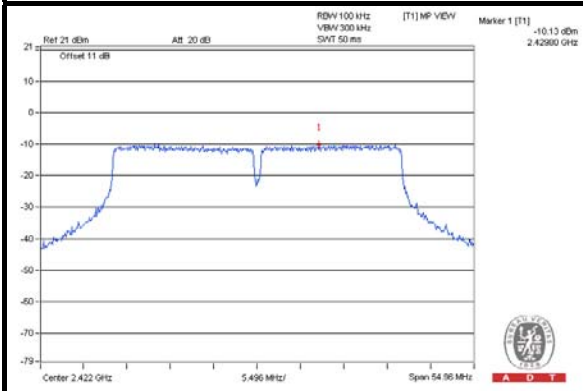




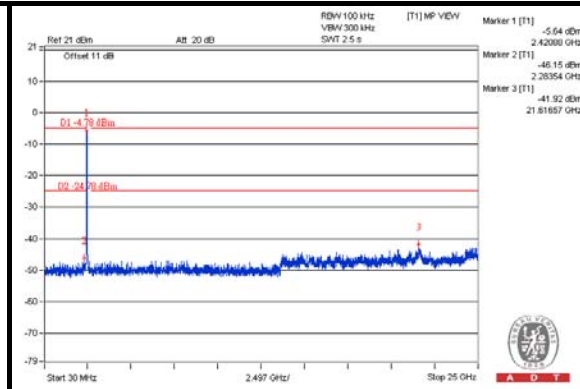
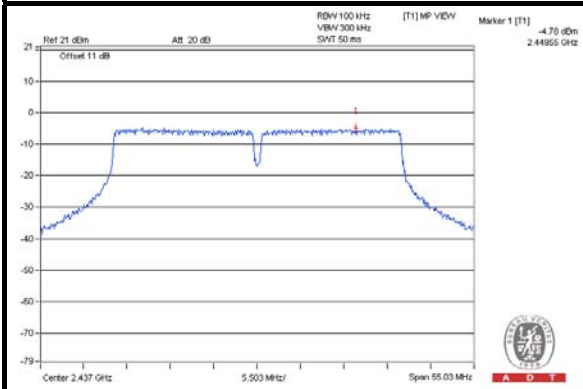
A D T

Chain (1)

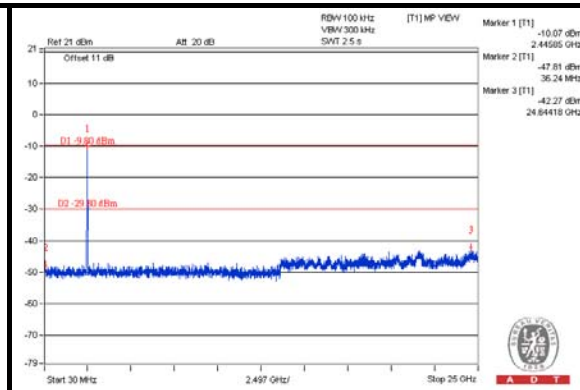
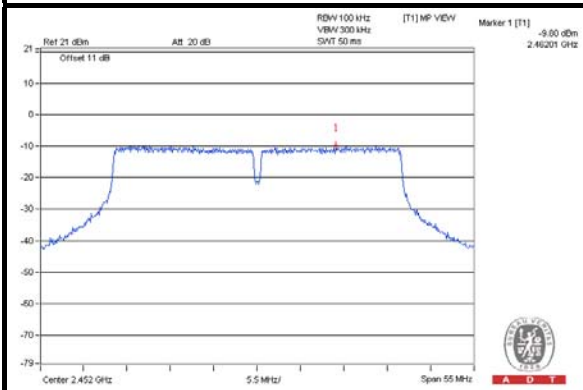
CH 3



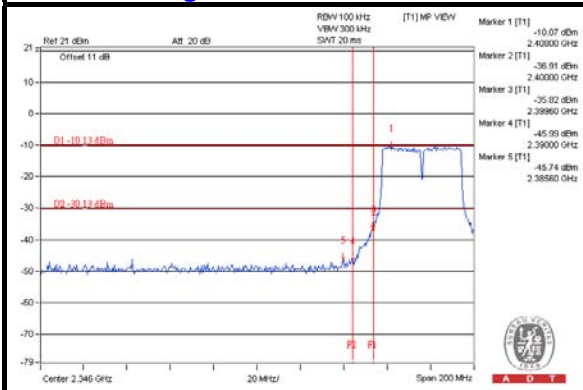
CH 6



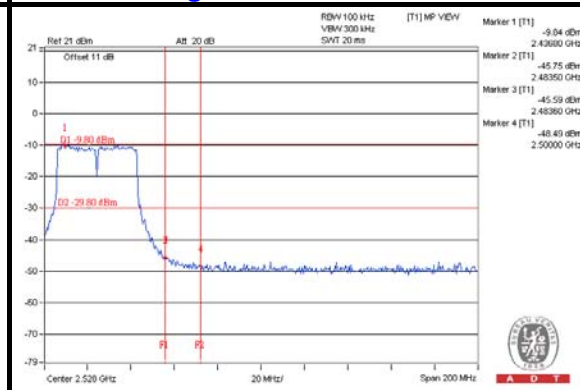
CH 9



CH 3 Band edge



CH 9 Band edge



5. PHOTOGRAPHS OF THE TEST CONFIGURATION

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



6. INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

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

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Fax: 886-2-26052943

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Web Site: www.bureauveritas-adt.com

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



A D T

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

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

--- END ---