FCC Test Report

Report No.: RF160418C29

FCC ID: GZ5NVG4XXQ

Test Model: NVG468MQ

Series Model: NVG448BQ

Received Date: Apr. 18, 2016

Test Date: Apr. 22 ~ May 05, 2016

Issued Date: May 12, 2016

Applicant: ARRIS Group, Inc.

Address: 2500 Walsh Ave. Santa Clara, CA 95051,United State

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

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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Table of Contents

Release Control Record **4**

1 Certificate of Conformity **5**

2 Summary of Test Results **6**

2.1 Measurement Uncertainty 6
2.2 Modification Record 6

3 General Information **7**

3.1 General Description of EUT 7
3.2 Description of Test Modes 9
3.2.1 Test Mode Applicability and Tested Channel Detail 10
3.3 Duty Cycle of Test Signal 12
3.4 Description of Support Units 13
3.4.1 Configuration of System under Test 13
3.5 General Description of Applied Standards 14

4 Test Types and Results **15**

4.1 Radiated Emission and Bandedge Measurement 15
4.1.1 Limits of Radiated Emission and Bandedge Measurement 15
4.1.2 Test Instruments 16
4.1.3 Test Procedures 17
4.1.4 Deviation from Test Standard 17
4.1.5 Test Set Up 18
4.1.6 EUT Operating Conditions 18
4.1.7 Test Results 19
4.2 Conducted Emission Measurement 33
4.2.1 Limits of Conducted Emission Measurement 33
4.2.2 Test Instruments 33
4.2.3 Test Procedures 34
4.2.4 Deviation from Test Standard 34
4.2.5 Test Setup 34
4.2.6 EUT Operating Conditions 34
4.2.7 Test Results 35
4.3 6dB Bandwidth Measurement 39
4.3.1 Limits of 6dB Bandwidth Measurement 39
4.3.2 Test Setup 39
4.3.3 Test Instruments 39
4.3.4 Test Procedure 39
4.3.5 Deviation fromTest Standard 39
4.3.6 EUT Operating Conditions 39
4.3.7 Test Result 40
4.4 Conducted Output Power Measurement 42
4.4.1 Limits of Conducted Output Power Measurement 42
4.4.2 Test Setup 42
4.4.3 Test Instruments 42
4.4.4 Test Procedures 42
4.4.5 Deviation from Test Standard 42
4.4.6 EUT Operating Conditions 42
4.4.7 Test Results 43
4.5 Power Spectral Density Measurement 45
4.5.1 Limits of Power Spectral Density Measurement 45
4.5.2 Test Setup 45
4.5.3 Test Instruments 45
4.5.4 Test Procedure 45
4.5.5 Deviation from Test Standard 45
4.5.6 EUT Operating Condition 45

4.5.7 Test Results 46
4.6 Conducted Out of Band Emission Measurement 48
4.6.1 Limits of Conducted Out of Band Emission Measurement 48
4.6.2 Test Setup 48
4.6.3 Test Instruments 48
4.6.4 Test Procedure 48
4.6.5 Deviation from Test Standard 48
4.6.6 EUT Operating Condition 48
4.6.7 Test Results 48

5 Pictures of Test Arrangements 59

Appendix – Information on the Testing Laboratories 60

Release Control Record

Issue No.	Description	Date Issued
RF160418C29	Original release.	May 12, 2016

1 Certificate of Conformity

Product: Ethernet and FTTH Gateway

Brand: ARRIS

Test Model: NVG468MQ

Series Model: NVG448BQ

Sample Status: Engineering sample

Applicant: ARRIS Group, Inc.

Test Date: Apr. 22 ~ May 05, 2016

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10:2013

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:** May 12, 2016
Polly Chien / Specialist

Approved by : _____ , **Date:** May 12, 2016
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 -6.66dB at 0.64266MHz.
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 2483.50MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	Pass	Meet the requirement of limit.
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is i-pex (MHF) 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	3.59 dB
	200MHz ~ 1000MHz	3.60 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	Ethernet and FTTH Gateway
Brand	ARRIS
Test Model	NVG468MQ
Series Model	NVG448BQ
Model Difference	Refer to Note
Status of EUT	Engineering sample
Power Supply Rating	12Vdc from 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 450.0Mbps
Operating Frequency	2412 ~ 2462MHz
Number of Channel	11 for 802.11b, 802.11g, 802.11n (HT20) 7 for 802.11n (HT40)
Output Power	772.192mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Refer to Note
Data Cable Supplied	NA

Note:

1. All models are listed as below.

Brand	Model	Difference					
		Accessory			I/O port		
		Item	Brand	Model	Item	Number	Function
ARRIS	NVG468MQ	Switch Adapter Power cord: 1.8m non-shielded cable w/o ferrite core	Ktec	KSAS0361200250HU	MOCA 2.0	1	For Local Area Network
					USB 3.0	1	For Mass Storage
					LAN (RJ45)	4	For Local Area Network
		Stand	FOXCONN	447.00105.005	WAN (RJ45)	1	For Wild Area Network
		Ethernet Cable (2m non-shielded cable w/o ferrite core)	NIEN-YI	NYS1097	VOIP (RJ14)	1	For Internet Voice Phone
					DC JACK	1	For Power Supply Input
	NVG448BQ	Switch Adapter Power cord: 1.8m non-shielded cable w/o ferrite core	Ktec	KSAS0361200250HU	VDSL (RJ14)	1	For Wideband/Internet connection
					USB 3.0	1	For Mass Storage
					LAN (RJ45)	4	For Local Area Network
		Stand	FOXCONN	447.00105.005	WAN (RJ45)	1	For Wild Area Network
		Ethernet Cable (2m non-shielded cable w/o ferrite core)	NIEN-YI	NYS1097	VOIP (RJ14)	1	For Internet Voice Phone
		RJ14 Cable (4.5m non-shielded cable w/o ferrite core)	NIEN-YI	NYS1131	DC JACK	1	For Power Supply Input

* After the pretest, the model: NVG468MQ is found to be the worst case model and therefore all tests had been performed to this model. NVG448BQ is not the worst case, therefore tests on conducted and radiated emission below 1GHz test were performed for this model.

2. The EUT incorporates a MIMO function. Physically, the EUT provides 3 completed transmitters and 3 receivers.

Modulation Mode	TX Function	Beamforming mode
802.11b	1TX (Ant. 1)	Not support
802.11g	3TX	Not support
802.11n (HT20)	3TX	Not support
802.11n (HT40)	3TX	Not support

3. The EUT consumes power from the following adapter.

Brand	Ktec
Model	KSAS0361200250HU
Input Power	100-120Vac, 50/60Hz, 1.0A
Output Power	12Vdc, 2.5A
Power cord	1.8m non-shielded cable w/o ferrite core

4. The following antennas were provided to the EUT.

Antenna Type	PIFA	
Antenna Connector	i-pex (MHF)	
Gain (dBi)	Frequency (MHz)	
	2400-2500	5150-5850
Ant. 1	4.00	-
Ant. 2	4.48	-
Ant. 3	2.52	-
Ant. 4	-	3.97
Ant. 5	-	3.18
Ant. 6	-	4.56
Ant. 7	-	4.43

5. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

11 channels are provided for 802.11b, 802.11g and 802.11n (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	
A	√	√	√	√	Model: NVG468MQ
B	-	√	√	-	Model: NVG448BQ

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:

1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Z-plane**.
2. "-"means no effect.

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)
A	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
A	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
A	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	7.2
A	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)
A, B	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)
A, B	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)
A	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
A	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
A	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	7.2
A	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	Chris Lin
RE<1G	16deg. C, 70%RH	120Vac, 60Hz	Nick Hsu
PLC	16deg. C, 70%RH	120Vac, 60Hz	Nick Hsu
APCM	25deg. C, 60%RH	120Vac, 60Hz	Antony Lee

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is ≥ 98%

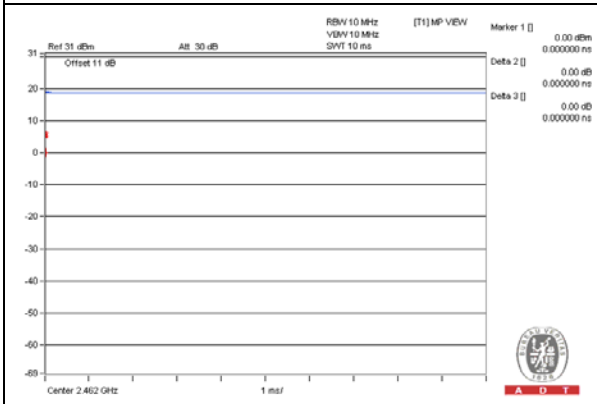
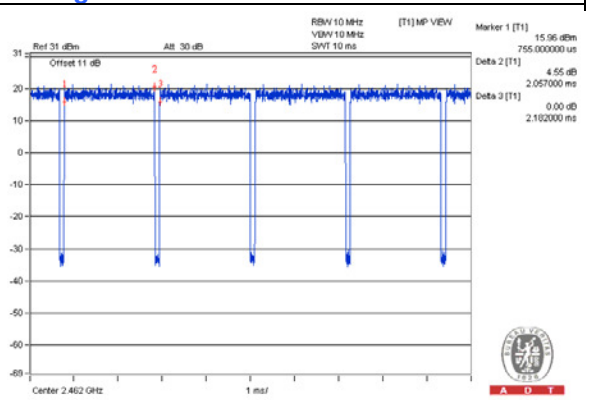
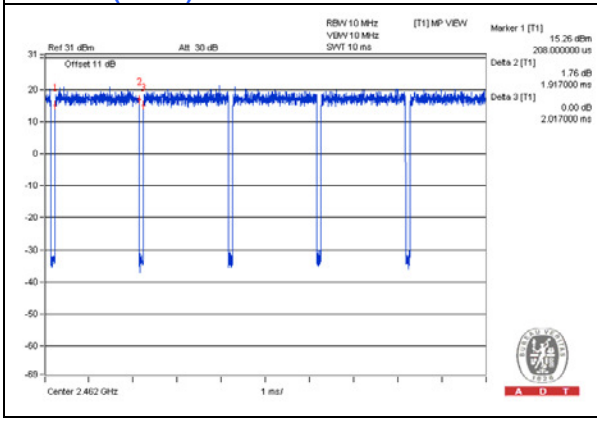
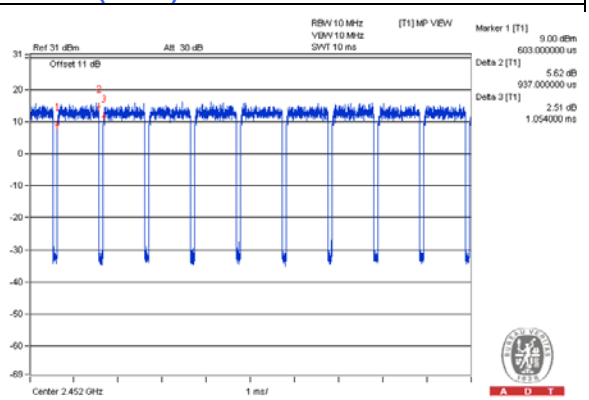
802.11b: Duty cycle of test signal is 100 %

Duty cycle of test signal is < 98%

802.11g: Duty cycle = 2.057/2.182 = 0.943, Duty factor = 10 * log(1/0.943) = 0.25

802.11n (HT20): Duty cycle = 1.917/2.017 = 0.950, Duty factor = 10 * log(1/0.950) = 0.22

802.11n (HT40): Duty cycle = 0.937/1.054 = 0.889, Duty factor = 10 * log(1/0.889) = 0.51

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.	USB HDD	WD	WDBACY5000ABL-01	WXS1CC1D3606	NA	-
B.	Notebook	DELL	E5410	1HC2XM1	FCC DoC Approved	-
C.	LAN Load	NA	NA	NA	NA	-
D.	RJ14 Load	NA	NA	NA	NA	-
E.	RJ11 Load	NA	NA	NA	NA	-
F.	50ohm Load	NA	NA	NA	NA	-

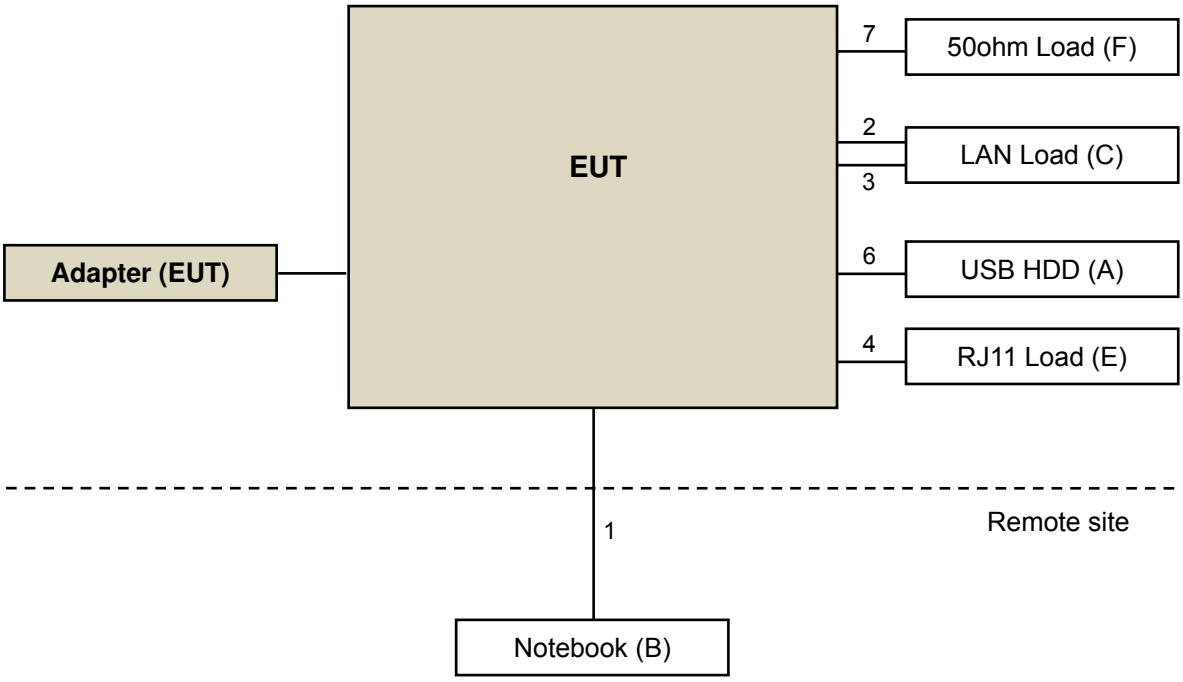
Note:

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

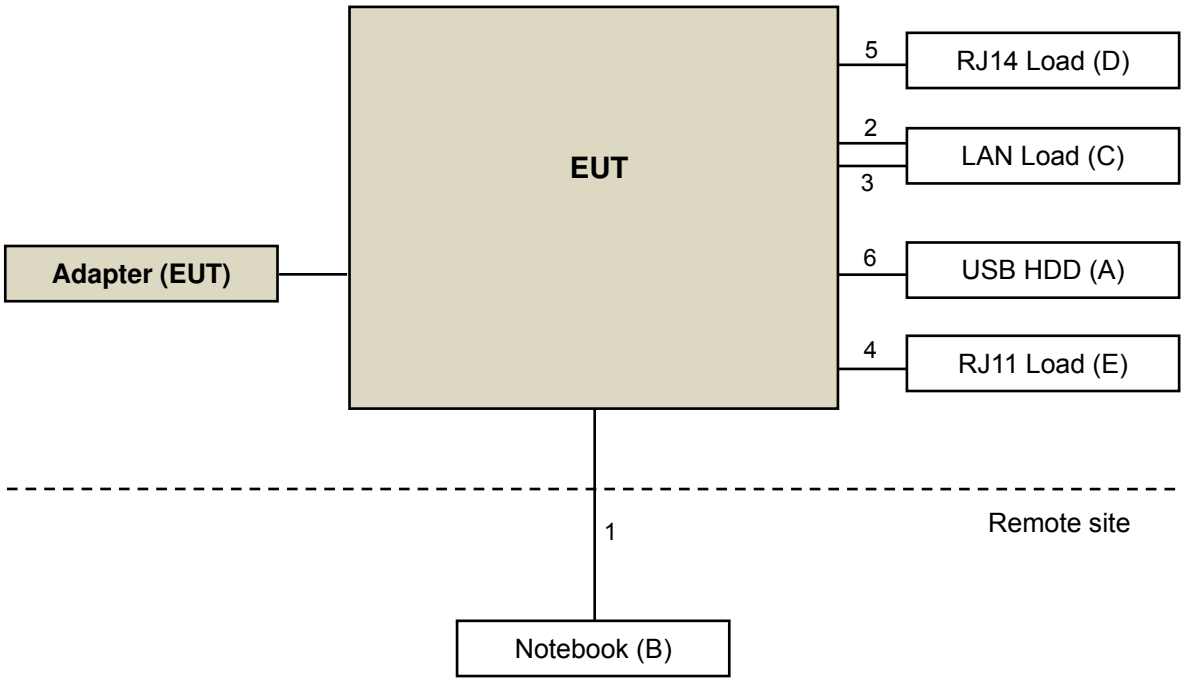
ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ45 cable	1	10	N	0	-
2.	RJ45 cable	3	1	N	0	-
3.	RJ45 cable	1	2	N	0	Accessory of EUT
4.	RJ11 cable	1	1.8	N	0	-
5.	RJ14 cable	1	4.5	N	0	Accessory of EUT
6.	USB cable	1	0.5	N	0	-
7.	Coaxial cable	1	1.8	Y	0	-

3.4.1 Configuration of System under Test

Test Mode A



Test Mode B



3.5 General Description of Applied Standards

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

FCC Part 15, Subpart C (15.247)
KDB 558074 D01 DTS Meas Guidance v03r05
KDB 662911 D01 Multiple Transmitter Output v02r01
ANSI C63.10-2013

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 20dB below the highest level of the desired power:

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

NOTE:

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

4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Oct. 12, 2015	Oct. 11, 2016
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Jul. 08, 2015	Jul. 07, 2016
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Jan. 07, 2016	Jan. 06, 2017
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-1170	Jan. 08, 2016	Jan. 07, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Jan. 18, 2016	Jan. 17, 2017
Preamplifier Agilent	8449B	3008A01960	Aug. 09, 2015	Aug. 08, 2016
Preamplifier Agilent	8447D	2944A10631	Aug. 09, 2015	Aug. 08, 2016
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH4-02(295012+309220)	Aug. 09, 2015	Aug. 08, 2016
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH4-03(250724)	Aug. 09, 2015	Aug. 08, 2016
Software BV ADT	ADT_Radiated_V7.6.15.9.4	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021703	NA	NA
Turn Table BV ADT	TT100	TT93021703	NA	NA
Turn Table Controller BV ADT	SC100.	SC93021703	NA	NA
High Speed Peak Power Meter	ML2495A	0824011	Jul. 09, 2015	Jul. 08, 2016
Power Sensor	MA2411B	0738171	Jul. 09, 2015	Jul. 08, 2016

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 4.
3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site Registration No. is 460141.
5. The IC Site Registration No. is IC7450F-4.

4.1.3 Test Procedures

a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1GHz) / 1.5 meters (for above 1GHz) 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:

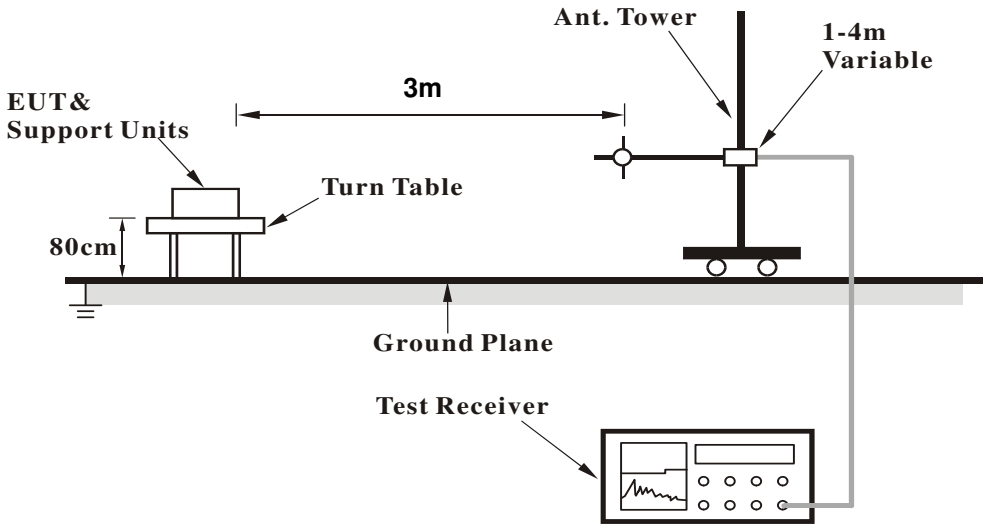
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

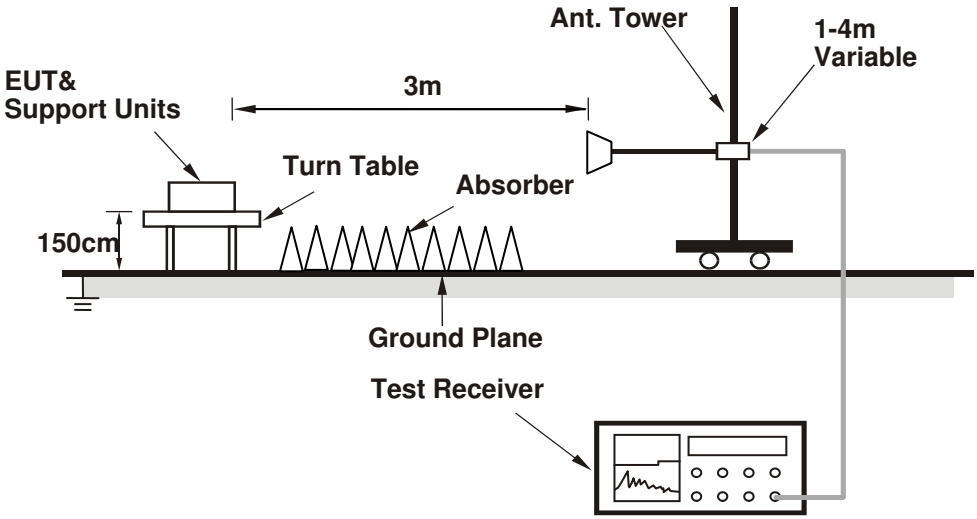
No deviation.

4.1.5 Test 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 notebook to act as communication partner and placed it 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 necessary accessories enable the system in full functions.

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	55.3 PK	74.0	-18.7	2.00 H	290	23.40	31.90
2	2390.00	44.5 AV	54.0	-9.5	2.00 H	290	12.60	31.90
3	*2412.00	105.1 PK			1.98 H	288	73.00	32.10
4	*2412.00	101.2 AV			1.98 H	288	69.10	32.10
5	4824.00	52.9 PK	74.0	-21.1	1.56 H	308	46.50	6.40
6	4824.00	47.5 AV	54.0	-6.5	1.56 H	308	41.10	6.40
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	55.9 PK	74.0	-18.1	1.30 V	360	24.00	31.90
2	2390.00	44.9 AV	54.0	-9.1	1.30 V	360	13.00	31.90
3	*2412.00	94.6 PK			1.27 V	356	62.50	32.10
4	*2412.00	91.1 AV			1.27 V	356	59.00	32.10
5	4824.00	50.6 PK	74.0	-23.4	1.22 V	30	44.20	6.40
6	4824.00	43.4 AV	54.0	-10.6	1.22 V	30	37.00	6.40

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
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	104.1 PK			2.26 H	302	71.90	32.20
2	*2437.00	100.5 AV			2.26 H	302	68.30	32.20
3	4874.00	52.8 PK	74.0	-21.2	1.48 H	312	46.20	6.60
4	4874.00	47.1 AV	54.0	-6.9	1.48 H	312	40.50	6.60
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	93.8 PK			1.00 V	342	61.60	32.20
2	*2437.00	90.8 AV			1.00 V	342	58.60	32.20
3	4874.00	51.2 PK	74.0	-22.8	1.01 V	24	44.60	6.60
4	4874.00	43.2 AV	54.0	-10.8	1.01 V	24	36.60	6.60

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	103.7 PK			2.26 H	300	71.40	32.30
2	*2462.00	99.7 AV			2.26 H	300	67.40	32.30
3	2483.50	56.2 PK	74.0	-17.8	2.60 H	305	23.80	32.40
4	2483.50	45.0 AV	54.0	-9.0	2.60 H	305	12.60	32.40
5	4924.00	50.7 PK	74.0	-23.3	1.47 H	330	44.10	6.60
6	4924.00	42.3 AV	54.0	-11.7	1.47 H	330	35.70	6.60
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	94.2 PK			1.00 V	322	61.90	32.30
2	*2462.00	89.8 AV			1.00 V	322	57.50	32.30
3	2483.50	56.0 PK	74.0	-18.0	1.05 V	325	23.60	32.40
4	2483.50	44.4 AV	54.0	-9.6	1.05 V	325	12.00	32.40
5	4924.00	51.1 PK	74.0	-22.9	1.00 V	231	44.50	6.60
6	4924.00	42.2 AV	54.0	-11.8	1.00 V	231	35.60	6.60

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 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	64.0 PK	74.0	-10.0	1.45 H	254	32.10	31.90
2	2390.00	51.6 AV	54.0	-2.4	1.45 H	254	19.70	31.90
3	*2412.00	108.9 PK			1.43 H	264	76.80	32.10
4	*2412.00	99.4 AV			1.43 H	264	67.30	32.10
5	4824.00	49.0 PK	74.0	-25.0	1.28 H	54	42.60	6.40
6	4824.00	37.0 AV	54.0	-17.0	1.28 H	54	30.60	6.40
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	68.5 PK	74.0	-5.5	1.09 V	351	36.60	31.90
2	2390.00	53.0 AV	54.0	-1.0	1.09 V	351	21.10	31.90
3	*2412.00	112.8 PK			1.73 V	19	80.70	32.10
4	*2412.00	102.6 AV			1.73 V	19	70.50	32.10
5	4824.00	52.0 PK	74.0	-22.0	1.06 V	39	45.60	6.40
6	4824.00	39.7 AV	54.0	-14.3	1.06 V	39	33.30	6.40

Remarks:

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

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	107.6 PK			1.51 H	253	75.40	32.20
2	*2437.00	97.7 AV			1.51 H	253	65.50	32.20
3	4874.00	46.8 PK	74.0	-27.2	1.26 H	98	40.20	6.60
4	4874.00	37.0 AV	54.0	-17.0	1.26 H	98	30.40	6.60
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	111.9 PK			1.19 V	19	79.70	32.20
2	*2437.00	101.2 AV			1.19 V	19	69.00	32.20
3	4874.00	49.9 PK	74.0	-24.1	1.30 V	35	43.30	6.60
4	4874.00	37.9 AV	54.0	-16.1	1.30 V	35	31.30	6.60

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	105.1 PK			1.00 H	250	72.80	32.30
2	*2462.00	95.3 AV			1.00 H	250	63.00	32.30
3	2483.50	63.0 PK	74.0	-11.0	1.08 H	140	30.60	32.40
4	2483.50	49.1 AV	54.0	-4.9	1.08 H	140	16.70	32.40
5	4924.00	48.8 PK	74.0	-25.2	1.53 H	86	42.20	6.60
6	4924.00	36.3 AV	54.0	-17.7	1.53 H	86	29.70	6.60
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	111.0 PK			1.31 V	0	78.70	32.30
2	*2462.00	100.5 AV			1.31 V	0	68.20	32.30
3	2483.50	70.9 PK	74.0	-3.1	1.63 V	12	38.50	32.40
4	2483.50	53.6 AV	54.0	-0.4	1.63 V	12	21.20	32.40
5	4924.00	48.3 PK	74.0	-25.7	1.31 V	13	41.70	6.60
6	4924.00	36.1 AV	54.0	-17.9	1.31 V	13	29.50	6.60

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	65.8 PK	74.0	-8.2	1.71 H	217	33.90	31.90
2	2390.00	51.3 AV	54.0	-2.7	1.71 H	217	19.40	31.90
3	*2412.00	106.7 PK			1.68 H	254	74.60	32.10
4	*2412.00	97.3 AV			1.68 H	254	65.20	32.10
5	4824.00	48.8 PK	74.0	-25.2	1.32 H	322	42.40	6.40
6	4824.00	36.1 AV	54.0	-17.9	1.32 H	322	29.70	6.40
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	65.1 PK	74.0	-8.9	1.94 V	64	33.20	31.90
2	2390.00	52.2 AV	54.0	-1.8	1.94 V	64	20.30	31.90
3	*2412.00	109.9 PK			1.04 V	3	77.80	32.10
4	*2412.00	100.1 AV			1.04 V	3	68.00	32.10
5	4824.00	48.3 PK	74.0	-25.7	1.42 V	44	41.90	6.40
6	4824.00	37.1 AV	54.0	-16.9	1.42 V	44	30.70	6.40

Remarks:

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

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	106.8 PK			1.54 H	251	74.60	32.20
2	*2437.00	97.8 AV			1.54 H	251	65.60	32.20
3	4874.00	49.2 PK	74.0	-24.8	1.05 H	98	42.60	6.60
4	4874.00	37.0 AV	54.0	-17.0	1.05 H	98	30.40	6.60
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	111.3 PK			1.18 V	14	79.10	32.20
2	*2437.00	100.6 AV			1.18 V	14	68.40	32.20
3	4874.00	49.5 PK	74.0	-24.5	1.47 V	87	42.90	6.60
4	4874.00	37.0 AV	54.0	-17.0	1.47 V	87	30.40	6.60

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	106.1 PK			1.36 H	251	73.80	32.30
2	*2462.00	96.3 AV			1.36 H	251	64.00	32.30
3	2483.50	70.0 PK	74.0	-4.0	1.47 H	260	37.60	32.40
4	2483.50	52.0 AV	54.0	-2.0	1.47 H	260	19.60	32.40
5	4924.00	47.8 PK	74.0	-26.2	1.52 H	87	41.20	6.60
6	4924.00	36.7 AV	54.0	-17.3	1.52 H	87	30.10	6.60
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	109.5 PK			1.16 V	357	77.20	32.30
2	*2462.00	99.4 AV			1.16 V	357	67.10	32.30
3	2483.50	71.1 PK	74.0	-2.9	1.02 V	19	38.70	32.40
4	2483.50	53.6 AV	54.0	-0.4	1.02 V	19	21.20	32.40
5	4924.00	48.2 PK	74.0	-25.8	1.47 V	52	41.60	6.60
6	4924.00	36.7 AV	54.0	-17.3	1.47 V	52	30.10	6.60

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	65.5 PK	74.0	-8.5	1.40 H	250	33.60	31.90
2	2390.00	51.2 AV	54.0	-2.8	1.40 H	250	19.30	31.90
3	*2422.00	103.6 PK			1.86 H	265	71.50	32.10
4	*2422.00	93.6 AV			1.86 H	265	61.50	32.10
5	4844.00	48.0 PK	74.0	-26.0	1.47 H	8	41.50	6.50
6	4844.00	36.2 AV	54.0	-17.8	1.47 H	8	29.70	6.50
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	68.4 PK	74.0	-5.6	1.62 V	10	36.50	31.90
2	2390.00	53.1 AV	54.0	-0.9	1.62 V	10	21.20	31.90
3	*2422.00	106.8 PK			1.66 V	0	74.70	32.10
4	*2422.00	96.5 AV			1.66 V	0	64.40	32.10
5	4844.00	49.1 PK	74.0	-24.9	1.47 V	84	42.60	6.50
6	4844.00	36.6 AV	54.0	-17.4	1.47 V	84	30.10	6.50

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 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	103.7 PK			1.71 H	254	71.50	32.20
2	*2437.00	94.7 AV			1.71 H	254	62.50	32.20
3	4874.00	48.3 PK	74.0	-25.7	1.47 H	84	41.70	6.60
4	4874.00	36.4 AV	54.0	-17.6	1.47 H	84	29.80	6.60
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	108.1 PK			1.49 V	6	75.90	32.20
2	*2437.00	98.0 AV			1.49 V	6	65.80	32.20
3	4874.00	49.2 PK	74.0	-24.8	1.59 V	87	42.60	6.60
4	4874.00	36.8 AV	54.0	-17.2	1.59 V	87	30.20	6.60

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	99.3 PK			1.38 H	253	67.00	32.30
2	*2452.00	90.4 AV			1.38 H	253	58.10	32.30
3	2483.50	66.4 PK	74.0	-7.6	1.58 H	269	34.00	32.40
4	2483.50	52.3 AV	54.0	-1.7	1.58 H	269	19.90	32.40
5	4904.00	48.0 PK	74.0	-26.0	1.74 H	85	41.30	6.70
6	4904.00	36.6 AV	54.0	-17.4	1.74 H	85	29.90	6.70
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	105.6 PK			1.29 V	10	73.30	32.30
2	*2452.00	95.4 AV			1.29 V	10	63.10	32.30
3	2483.50	69.9 PK	74.0	-4.1	1.02 V	12	37.50	32.40
4	**2483.50**	**53.9 AV**	**54.0**	**-0.1**	**1.02 V**	**12**	**21.50**	**32.40**
5	4904.00	49.4 PK	74.0	-24.6	1.47 V	85	42.70	6.70
6	4904.00	36.8 AV	54.0	-17.2	1.47 V	85	30.10	6.70

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	TEST MODE	A

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	134.89	33.6 QP	43.5	-9.9	2.00 H	267	48.70	-15.10
2	339.04	37.9 QP	46.0	-8.1	1.00 H	273	49.30	-11.40
3	375.98	37.9 QP	46.0	-8.1	1.00 H	96	48.50	-10.60
4	599.58	41.2 QP	46.0	-4.8	1.49 H	312	47.00	-5.80
5	680.01	40.9 QP	46.0	-5.1	1.11 H	53	45.20	-4.30
6	875.67	39.8 QP	46.0	-6.2	1.49 H	180	40.60	-0.80
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	31.84	35.9 QP	40.0	-4.1	1.00 V	224	52.20	-16.30
2	134.89	32.7 QP	43.5	-10.8	1.00 V	145	47.80	-15.10
3	375.98	38.4 QP	46.0	-7.6	1.50 V	46	49.00	-10.60
4	500.42	38.8 QP	46.0	-7.2	1.00 V	95	47.00	-8.20
5	624.85	42.7 QP	46.0	-3.3	1.50 V	126	47.90	-5.20
6	875.67	41.9 QP	46.0	-4.1	1.50 V	14	42.70	-0.80

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

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz	TEST MODE	B

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	171.83	34.5 QP	43.5	-9.0	1.51 H	244	48.90	-14.40
2	257.38	36.1 QP	46.0	-9.9	1.00 H	229	50.20	-14.10
3	333.21	41.8 QP	46.0	-4.2	1.00 H	263	53.20	-11.40
4	370.15	38.4 QP	46.0	-7.6	1.00 H	127	49.20	-10.80
5	875.67	40.2 QP	46.0	-5.8	1.51 H	188	41.00	-0.80
6	1000.00	42.9 QP	54.0	-11.1	2.00 H	184	41.80	1.10
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	31.84	35.0 QP	40.0	-5.0	1.00 V	225	51.30	-16.30
2	62.95	36.7 QP	40.0	-3.3	1.49 V	237	51.80	-15.10
3	342.93	38.1 QP	46.0	-7.9	1.49 V	293	49.50	-11.40
4	624.85	38.6 QP	46.0	-7.4	1.00 V	73	43.80	-5.20
5	875.67	40.7 QP	46.0	-5.3	1.00 V	143	41.50	-0.80
6	961.21	45.2 QP	54.0	-8.8	1.00 V	274	44.50	0.70

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. 16, 2015	Nov. 15, 2016
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Dec. 26, 2015	Dec. 25, 2016
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Feb. 26, 2016	Feb. 25, 2017
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 24, 2015	Jul. 23, 2016
Software ADT	BV ADT_Cond_ V7.3.7.3	NA	NA	NA

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Shielded Room 1.
3. The VCCI Site Registration No. is C-2040.

4.2.3 Test Procedures

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

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

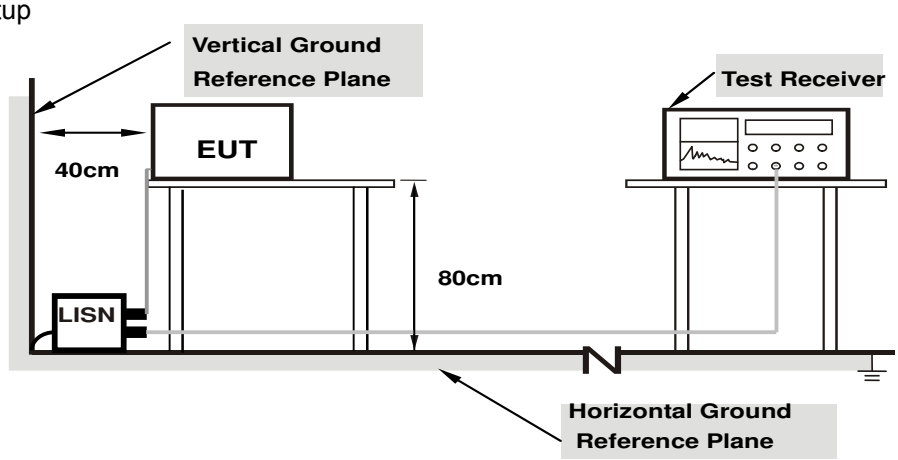
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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.

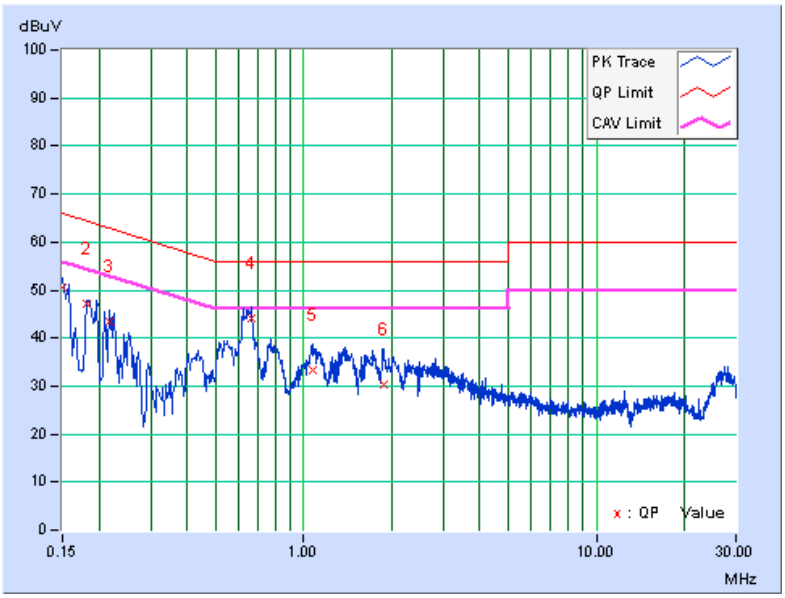
4.2.7 Test Results

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

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	0.15000	10.01	40.41	28.55	50.42	38.56	66.00	56.00	-15.58	-17.44
2	0.18170	10.02	36.97	25.87	46.99	35.89	64.41	54.41	-17.41	-18.51
3	0.21647	10.04	33.33	21.40	43.37	31.44	62.95	52.95	-19.59	-21.52
4	0.66221	10.15	34.04	26.04	44.19	36.19	56.00	46.00	-11.81	-9.81
5	1.06885	10.20	23.30	14.73	33.50	24.93	56.00	46.00	-22.50	-21.07
6	1.87431	10.26	19.95	10.04	30.21	20.30	56.00	46.00	-25.79	-25.70

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.

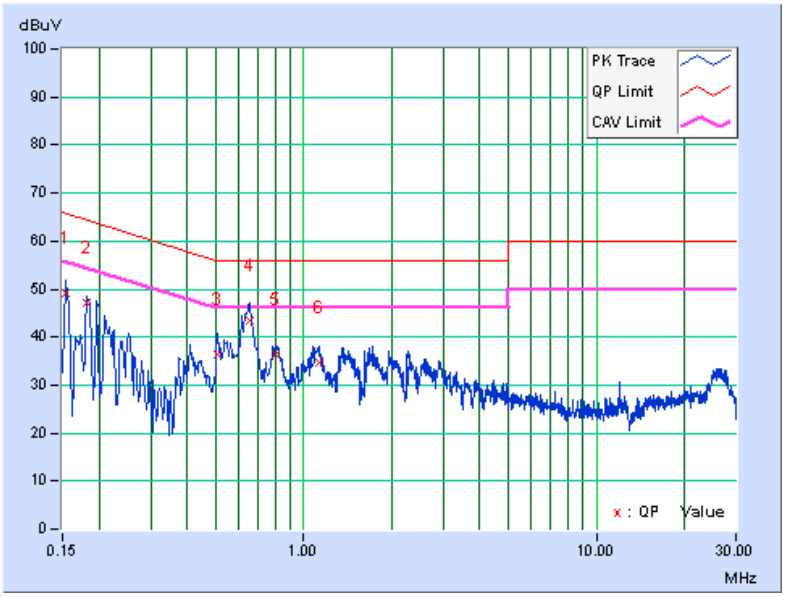


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	10.03	39.27	26.30	49.30	36.33	65.79	55.79	-16.49	-19.46
2	0.18128	10.03	37.24	26.12	47.27	36.15	64.43	54.43	-17.15	-18.27
3	0.50581	10.14	26.22	19.07	36.36	29.21	56.00	46.00	-19.64	-16.79
4	0.65830	10.16	33.40	25.45	43.56	35.61	56.00	46.00	-12.44	-10.39
5	0.79885	10.18	26.10	17.71	36.28	27.89	56.00	46.00	-19.72	-18.11
6	1.13532	10.22	24.45	16.85	34.67	27.07	56.00	46.00	-21.33	-18.93

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.

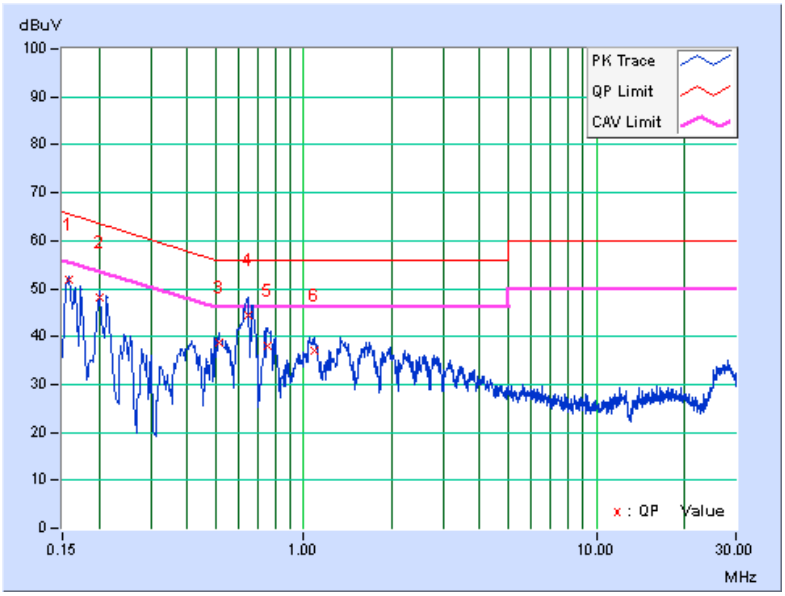


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15782	10.02	41.96	30.74	51.98	40.76	65.58	55.58	-13.60	-14.82
2	0.20084	10.03	38.16	28.74	48.19	38.77	63.58	53.58	-15.39	-14.81
3	0.51312	10.14	28.63	19.53	38.77	29.67	56.00	46.00	-17.23	-16.33
4	0.65044	10.15	34.39	21.85	44.54	32.00	56.00	46.00	-11.46	-14.00
5	0.74990	10.17	27.97	16.15	38.14	26.32	56.00	46.00	-17.86	-19.68
6	1.08840	10.21	26.90	17.27	37.11	27.48	56.00	46.00	-18.89	-18.52

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.

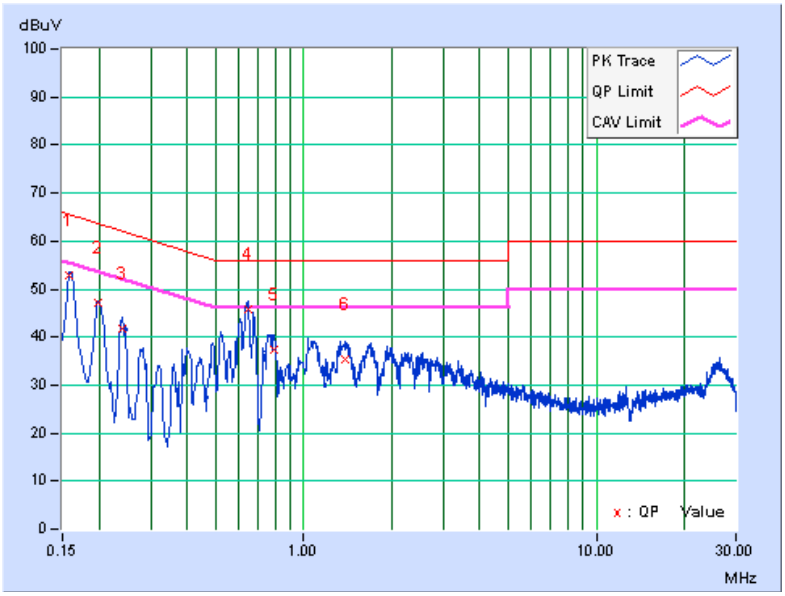


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15802	10.03	42.78	31.47	52.81	41.50	65.57	55.57	-12.76	-14.07
2	0.19717	10.04	37.03	25.92	47.07	35.96	63.73	53.73	-16.66	-17.77
3	0.23993	10.06	31.79	22.19	41.85	32.25	62.10	52.10	-20.25	-19.85
4	**0.64266**	**10.16**	**35.74**	**29.18**	**45.90**	**39.34**	**56.00**	**46.00**	**-10.10**	**-6.66**
5	0.79256	10.18	27.05	18.03	37.23	28.21	56.00	46.00	-18.77	-17.79
6	1.37829	10.24	25.07	16.03	35.31	26.27	56.00	46.00	-20.69	-19.73

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.

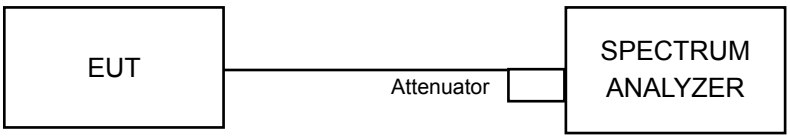


4.3 6dB Bandwidth Measurement

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

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 fromTest 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	9.09	0.5	PASS
6	2437	9.11	0.5	PASS
11	2462	9.07	0.5	PASS

802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
1	2412	16.38	16.36	16.40	0.5	Pass
6	2437	16.38	16.39	16.42	0.5	Pass
11	2462	16.14	16.37	16.39	0.5	Pass

802.11n (HT20)

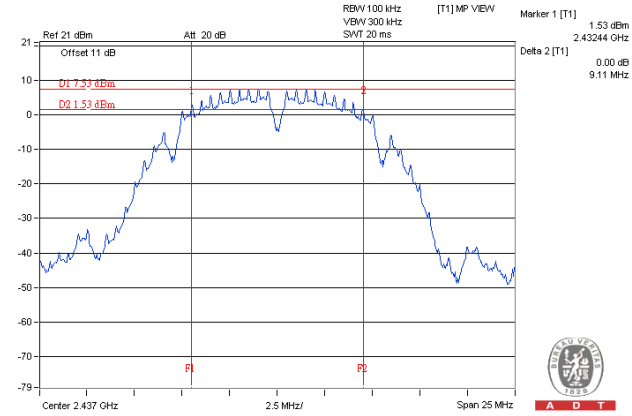
Channel	Frequency (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
1	2412	17.39	17.25	17.63	0.5	Pass
6	2437	17.38	17.65	17.63	0.5	Pass
11	2462	17.36	17.64	16.99	0.5	Pass

802.11n (HT40)

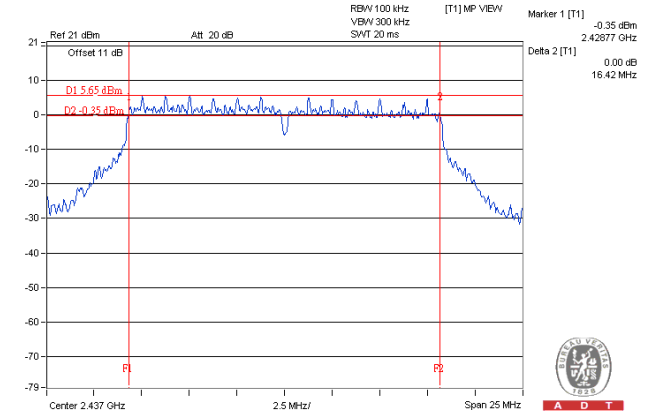
Channel	Frequency (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
3	2422	35.47	35.25	35.26	0.5	Pass
6	2437	36.38	35.88	36.40	0.5	Pass
9	2452	36.45	36.46	36.41	0.5	Pass

Spectrum Plot of Worst Value

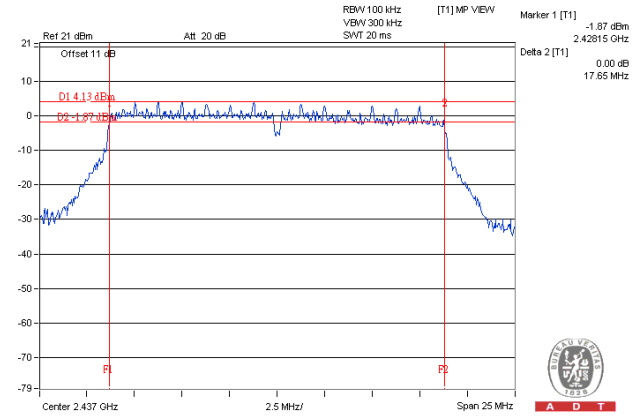
802.11b



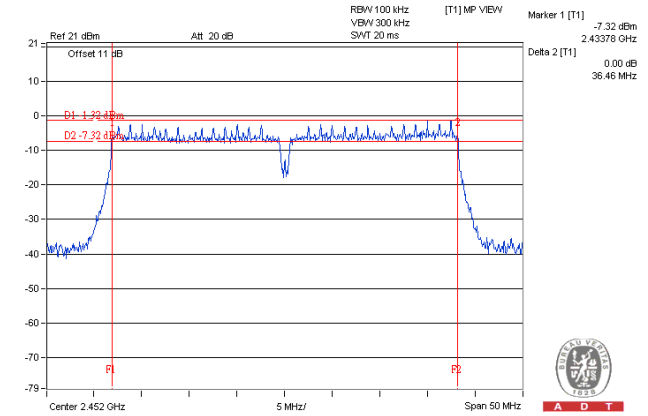
802.11g



802.11n (HT20)



802.11n (HT40)



4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

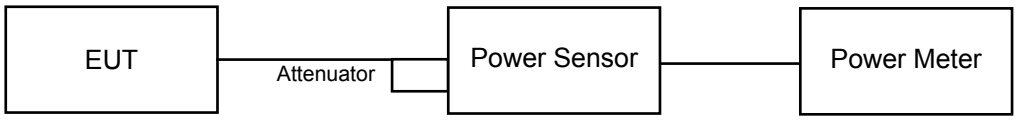
For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

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

Array Gain = 0 dB (i.e., no array gain) for 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

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

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

Same as Item 4.3.6.

4.4.7 Test Results

FOR PEAK POWER

802.11b

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	99.770	19.99	30	Pass
6	2437	98.175	19.92	30	Pass
11	2462	97.275	19.88	30	Pass

802.11g

Chan.	Freq. (MHz)	Peak Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
1	2412	24.11	23.21	23.78	705.824	28.49	30	Pass
6	2437	24.01	23.68	24.58	**772.192**	28.88	30	Pass
11	2462	21.43	21.28	22.32	443.879	26.47	30	Pass

802.11n (HT20)

Chan.	Freq. (MHz)	Peak Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
1	2412	23.23	23.14	23.78	655.222	28.16	30	Pass
6	2437	23.26	22.77	23.54	627.014	27.97	30	Pass
11	2462	21.05	20.43	21.36	374.531	25.73	30	Pass

802.11n (HT40)

Chan.	Freq. (MHz)	Peak Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
3	2422	21.73	21.77	22.16	463.687	26.66	30	Pass
6	2437	22.77	22.02	22.68	533.808	27.27	30	Pass
9	2452	20.31	20.66	20.52	336.532	25.27	30	Pass

FOR AVERAGE POWER

802.11b

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	40.179	16.04
6	2437	43.752	16.41
11	2462	41.783	16.21

802.11g

Chan.	Frequency (MHz)	Avg. Power (dBm)			Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1	Chain 2		
1	2412	16.33	15.77	16.64	126.843	21.03
6	2437	16.17	15.82	16.47	123.955	20.93
11	2462	13.47	13.39	14.21	70.423	18.48

802.11n (HT20)

Chan.	Frequency (MHz)	Avg. Power (dBm)			Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1	Chain 2		
1	2412	15.22	15.01	15.63	101.521	20.07
6	2437	15.15	14.69	15.29	95.984	19.82
11	2462	13.17	12.64	13.49	61.450	17.89

802.11n (HT40)

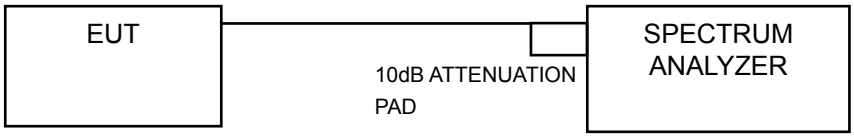
Chan.	Frequency (MHz)	Avg. Power (dBm)			Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1	Chain 2		
3	2422	13.42	13.54	14.03	69.866	18.44
6	2437	14.15	13.65	14.26	75.845	18.80
9	2452	12.09	12.36	12.17	49.882	16.98

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8dBm.

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

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

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

Same as Item 4.3.6

4.5.7 Test Results

802.11b

Channel	Freq. (MHz)	PSD (dBm)	Limit (dBm)	Pass /Fail
1	2412	-5.99	8	Pass
6	2437	-6.75	8	Pass
11	2462	-6.77	8	Pass

802.11g

TX chain	Channel	Freq. (MHz)	PSD (dBm)	10 log (N=3) dB	Total PSD (dBm)	Limit (dBm)	Pass /Fail
0	1	2412	-8.81	4.77	-4.04	5.52	Pass
	6	2437	-9.20	4.77	-4.43	5.52	Pass
	11	2462	-11.15	4.77	-6.38	5.52	Pass
1	1	2412	-9.01	4.77	-4.24	5.52	Pass
	6	2437	-9.32	4.77	-4.55	5.52	Pass
	11	2462	-10.81	4.77	-6.04	5.52	Pass
2	1	2412	-8.87	4.77	-4.10	5.52	Pass
	6	2437	-9.36	4.77	-4.59	5.52	Pass
	11	2462	-10.16	4.77	-5.39	5.52	Pass

NOTE: Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2/2$]= 8.48 dBi > 6dBi , so the power density limit shall be reduced to 8-(8.48-6) = 5.52dBm.

802.11n (HT20)

TX chain	Channel	Freq. (MHz)	PSD (dBm)	10 log (N=3) dB	Total PSD (dBm)	Limit (dBm)	Pass /Fail
0	1	2412	-10.82	4.77	-6.05	5.52	Pass
	6	2437	-10.07	4.77	-5.30	5.52	Pass
	11	2462	-10.71	4.77	-5.94	5.52	Pass
1	1	2412	-10.52	4.77	-5.75	5.52	Pass
	6	2437	-10.81	4.77	-6.04	5.52	Pass
	11	2462	-12.58	4.77	-7.81	5.52	Pass
2	1	2412	-10.19	4.77	-5.42	5.52	Pass
	6	2437	-10.62	4.77	-5.85	5.52	Pass
	11	2462	-12.28	4.77	-7.51	5.52	Pass

NOTE: Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2/2$]= 8.48 dBi > 6dBi , so the power density limit shall be reduced to 8-(8.48-6) = 5.52dBm.

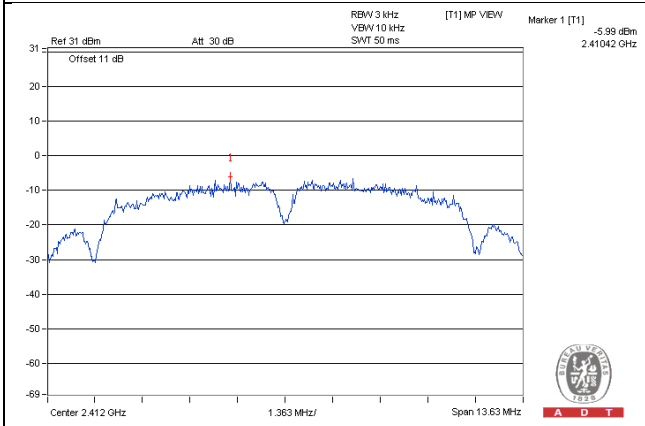
802.11n (HT40)

TX chain	Channel	Freq. (MHz)	PSD (dBm)	10 log (N=3) dB	Total PSD (dBm)	Limit (dBm)	Pass /Fail
0	3	2422	-14.34	4.77	-9.57	5.52	Pass
	6	2437	-13.76	4.77	-8.99	5.52	Pass
	9	2452	-16.17	4.77	-11.40	5.52	Pass
1	3	2422	-14.97	4.77	-10.20	5.52	Pass
	6	2437	-14.93	4.77	-10.16	5.52	Pass
	9	2452	-16.78	4.77	-12.01	5.52	Pass
2	3	2422	-15.12	4.77	-10.35	5.52	Pass
	6	2437	-13.70	4.77	-8.93	5.52	Pass
	9	2452	-16.90	4.77	-12.13	5.52	Pass

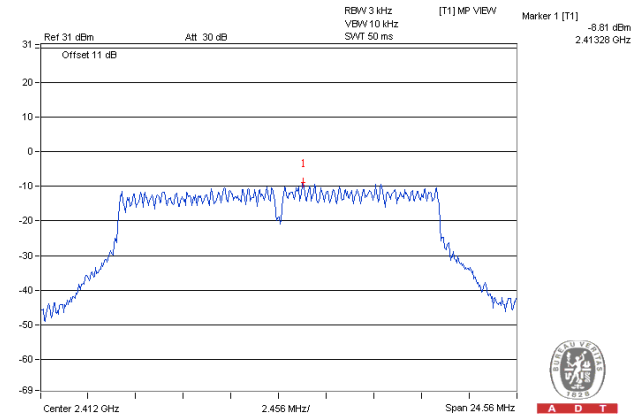
NOTE: Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2/2$]= 8.48 dBi > 6dBi , so the power density limit shall be reduced to 8-(8.48-6) = 5.52dBm.

Spectrum Plot of Worst Value

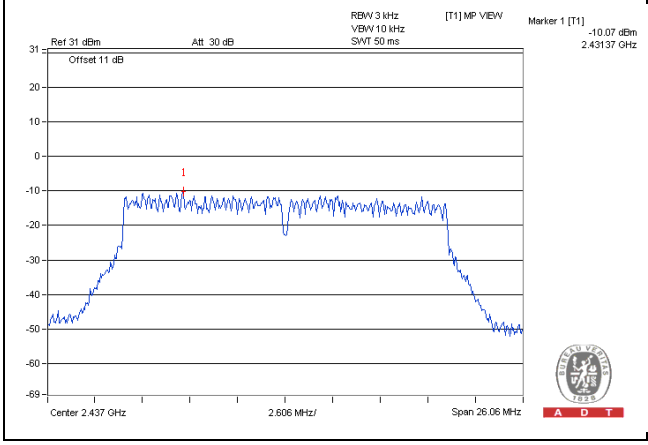
802.11b



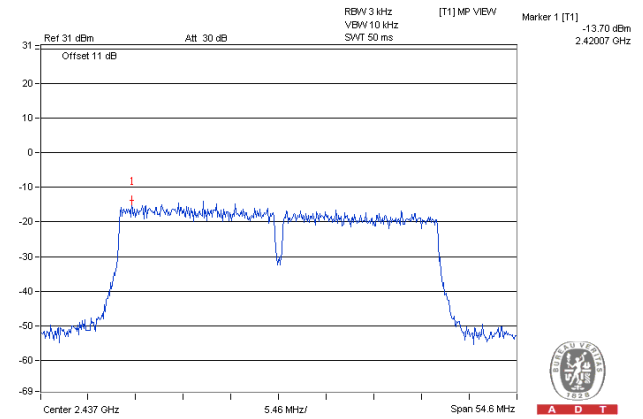
802.11g



802.11n (HT20)



802.11n (HT40)

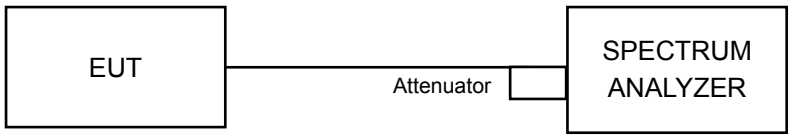


4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

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

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW ≥ 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 OOBE

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

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

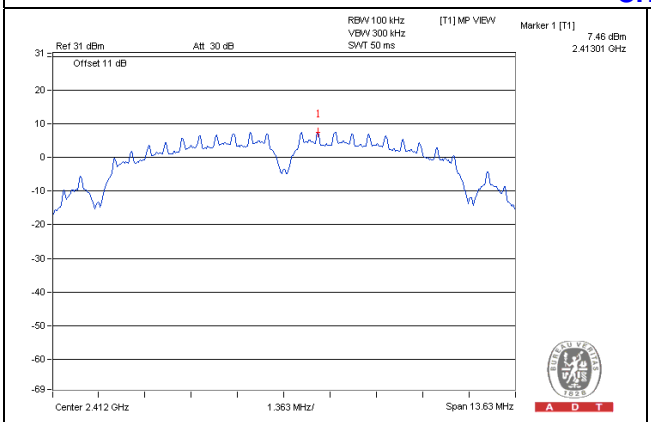
Same as Item 4.3.6

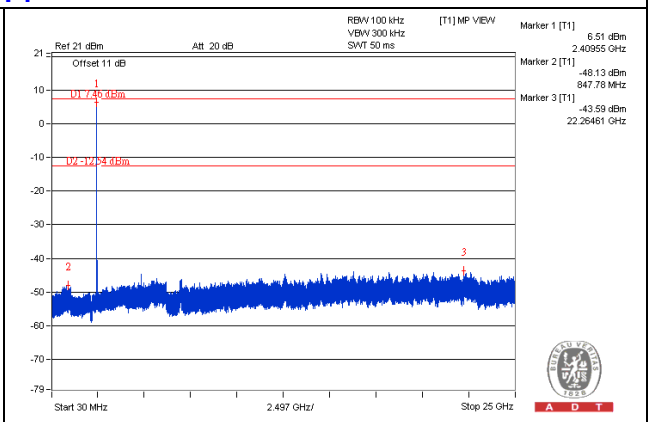
4.6.7 Test Results

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

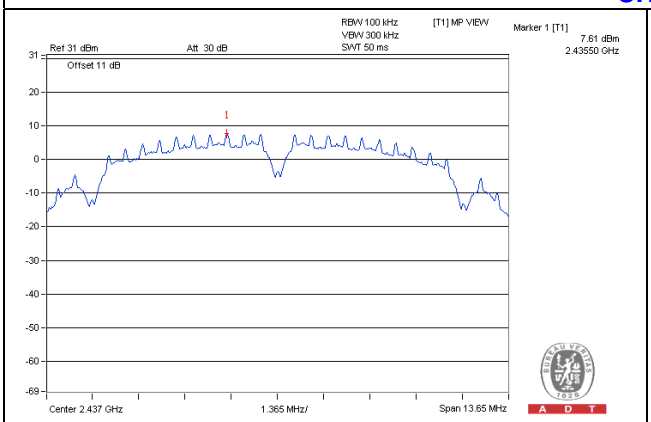
802.11b

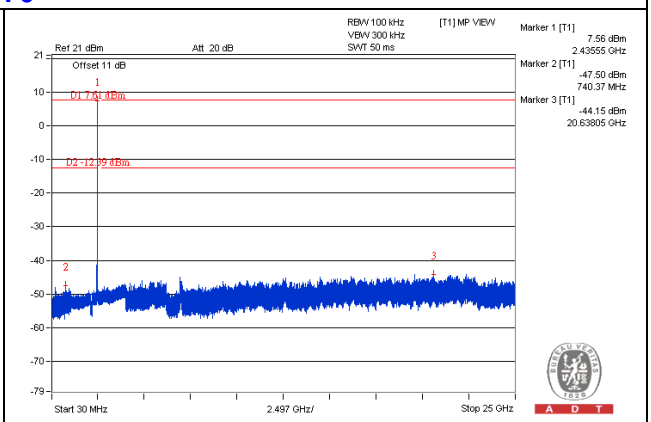
CH 1



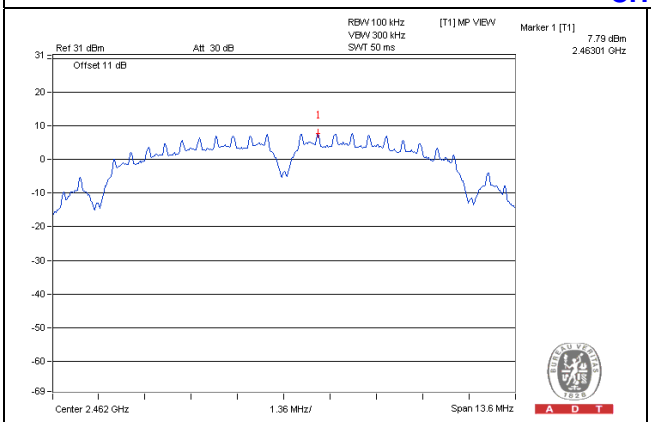


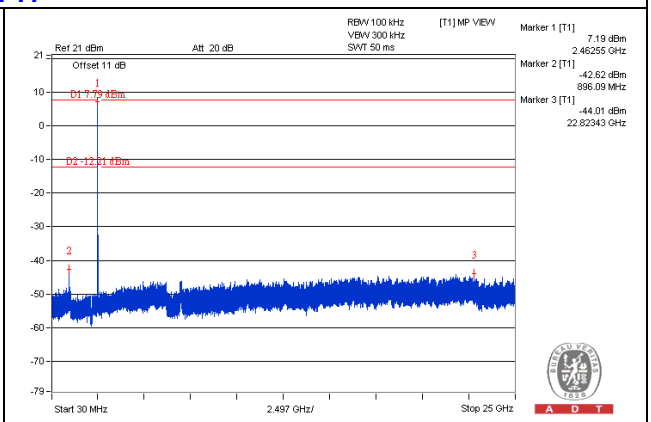
CH 6



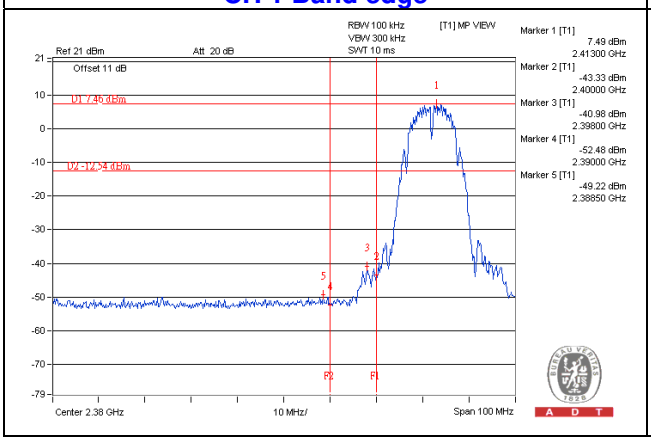


CH 11





CH 1 Band edge



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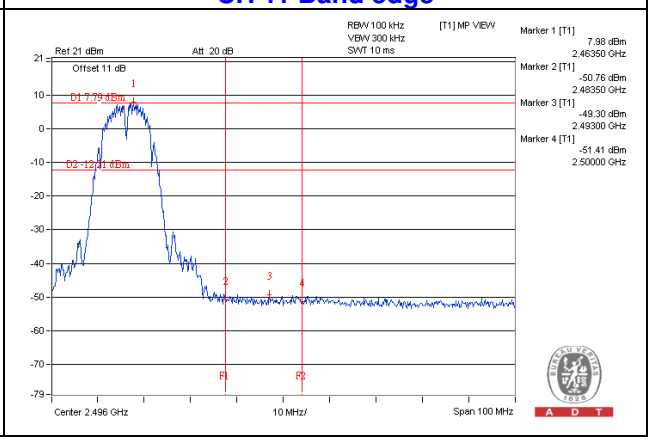
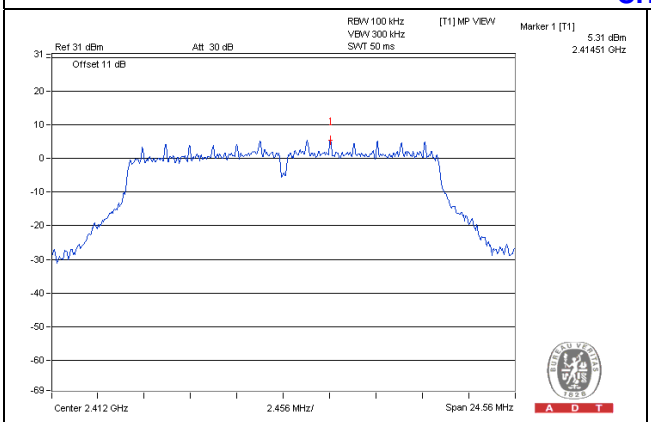
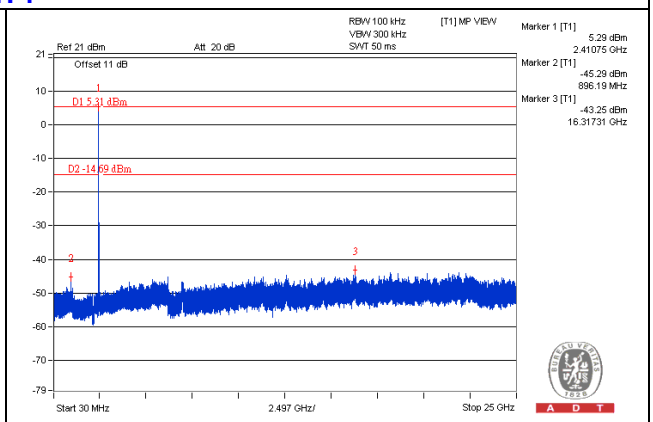


802.11g
CHAIN 0

CH 1





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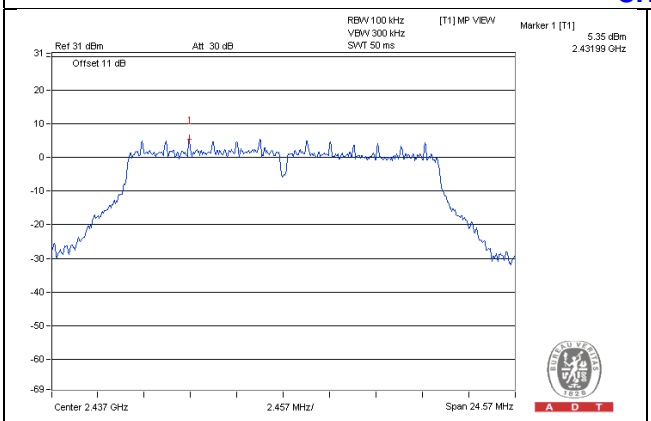

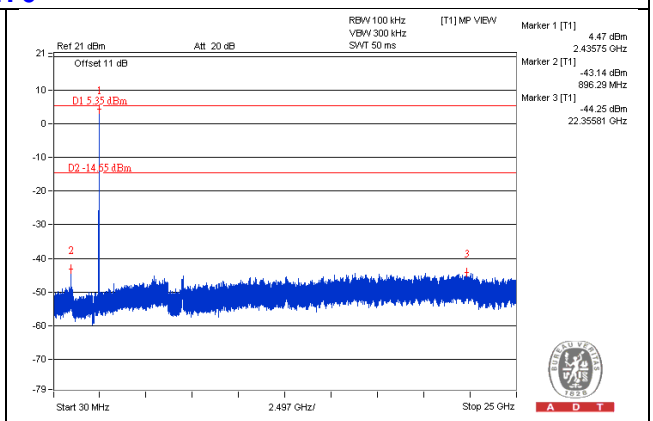

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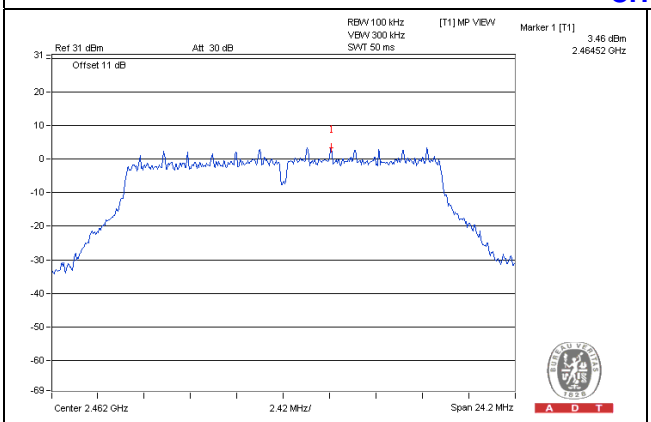
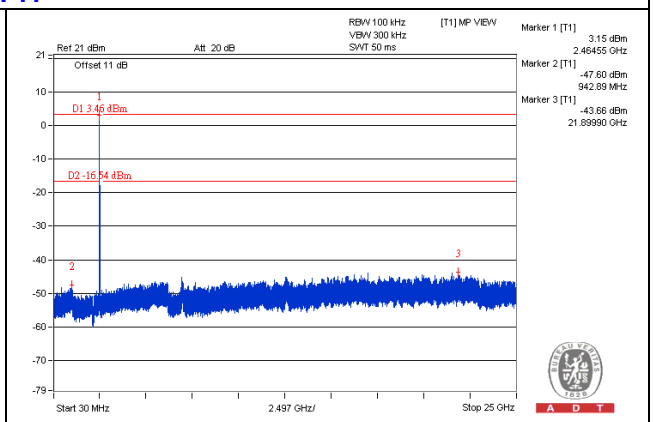
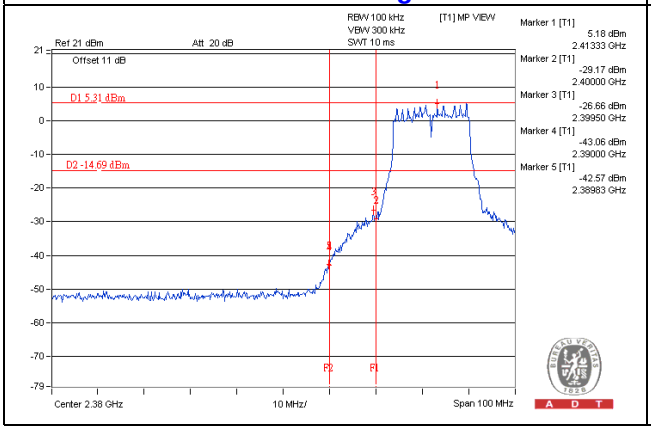
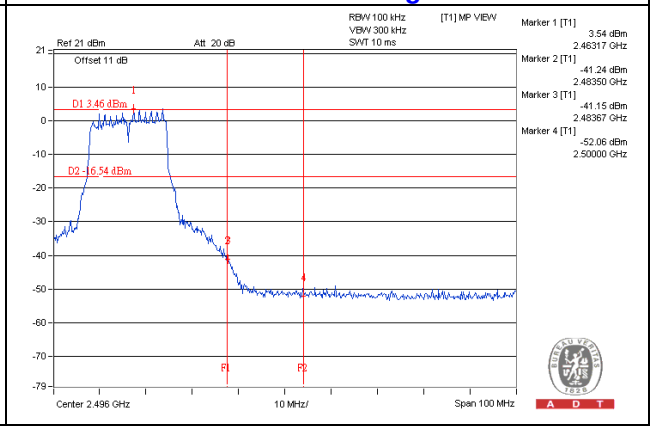




CH 1 Band edge

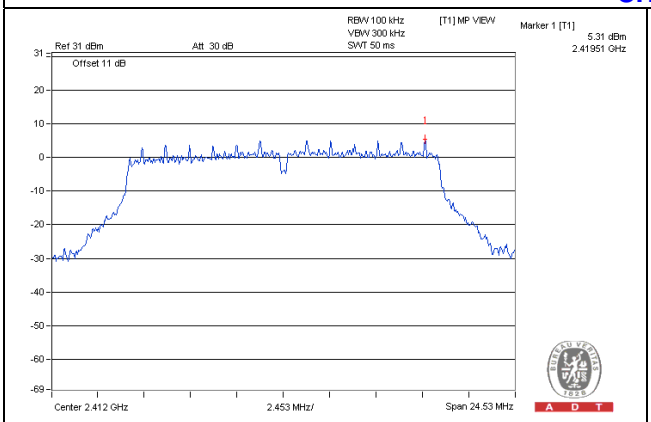


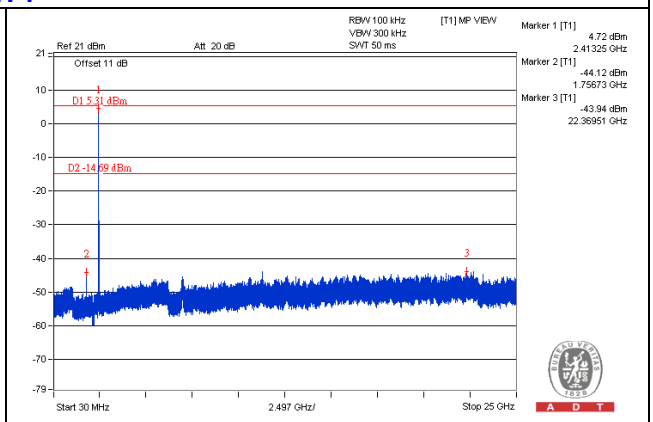
CH 11 Band edge



CHAIN 1

CH 1





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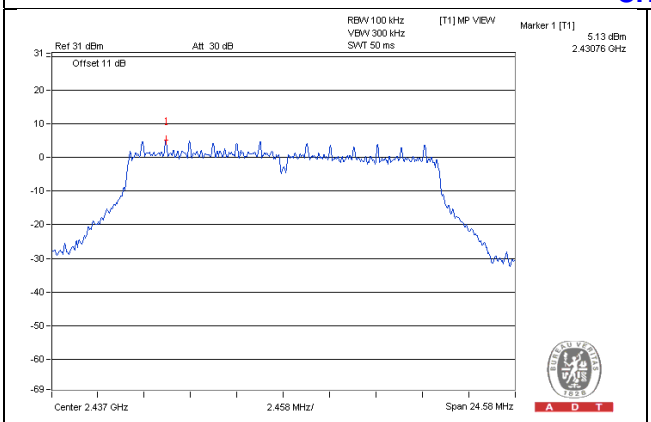
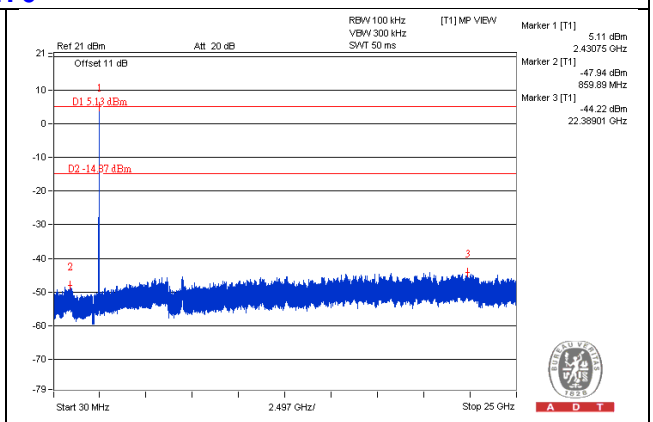
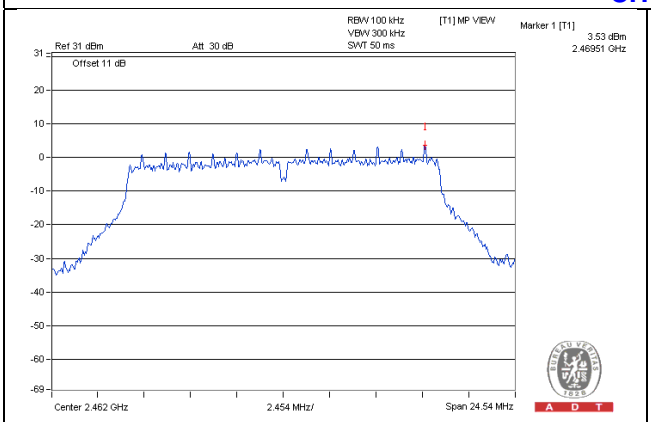
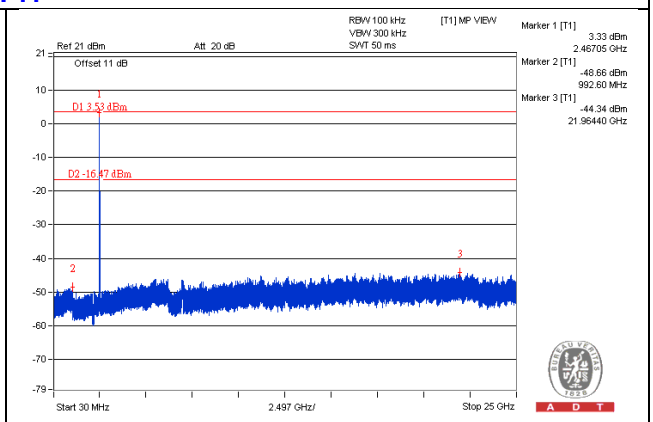


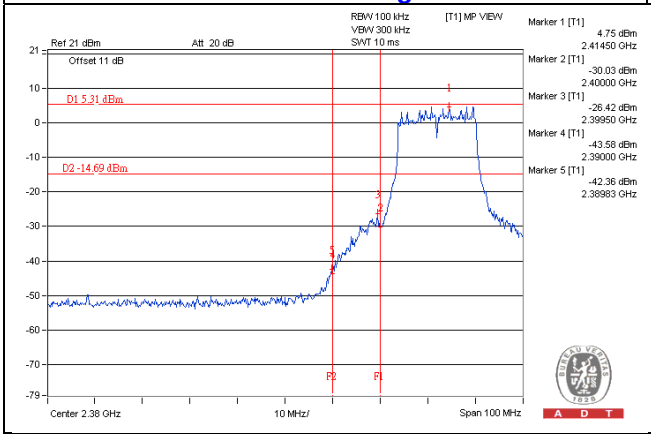


CH 11

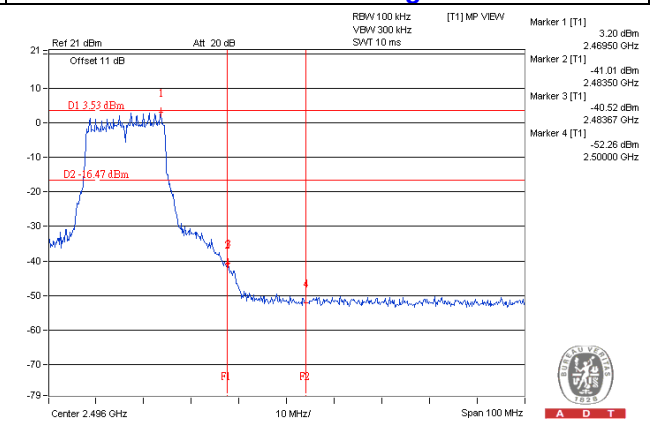




CH 1 Band edge

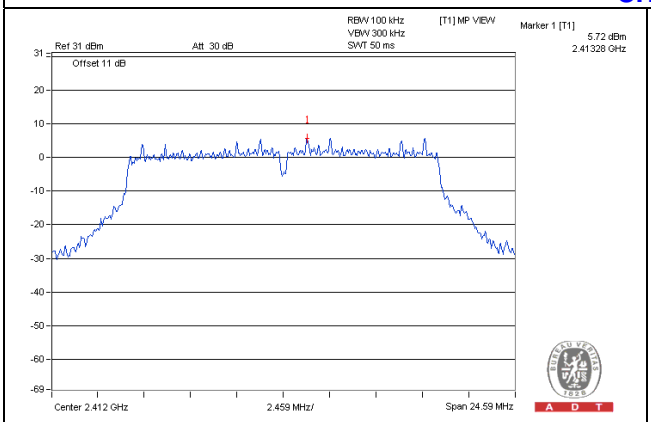


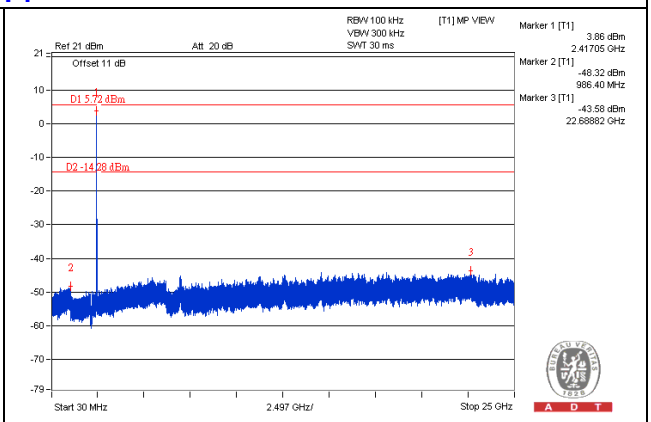
CH 11 Band edge



CHAIN 2

CH 1





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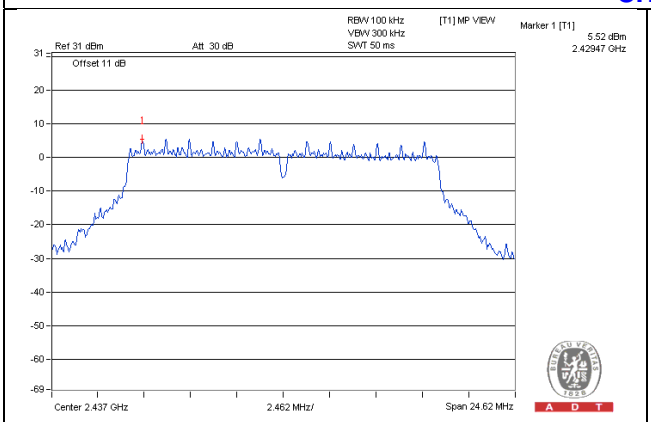
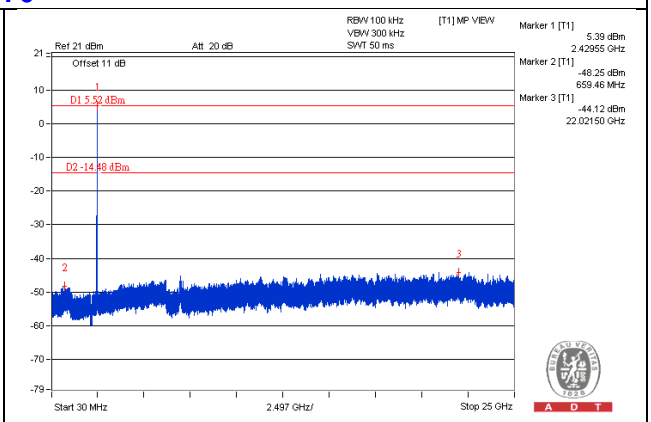
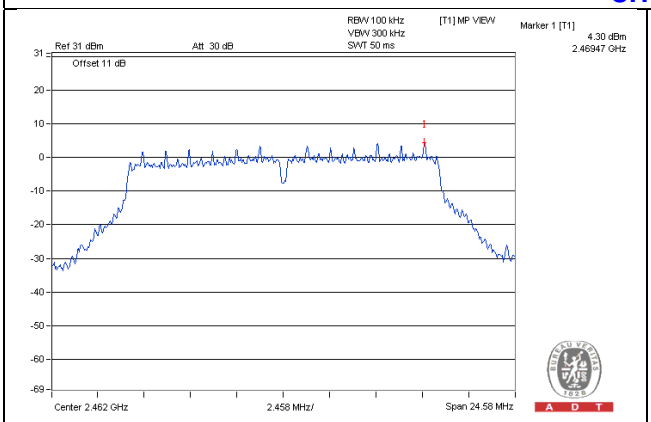
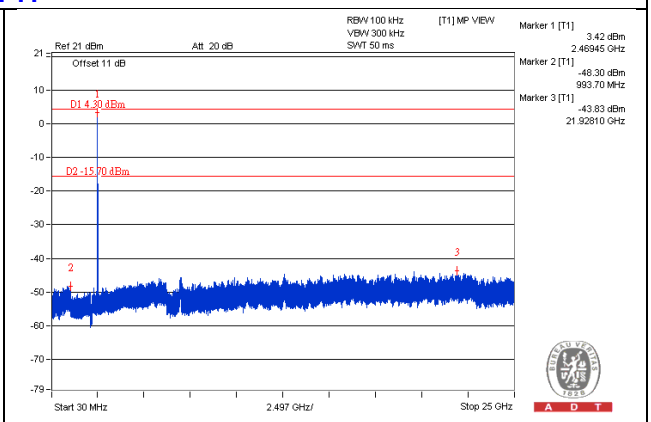


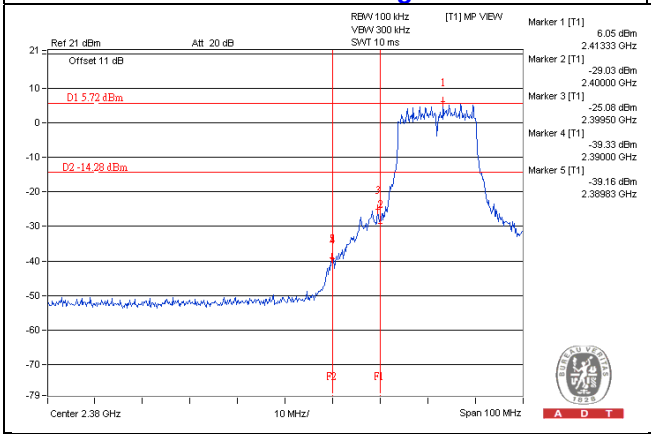


CH 11

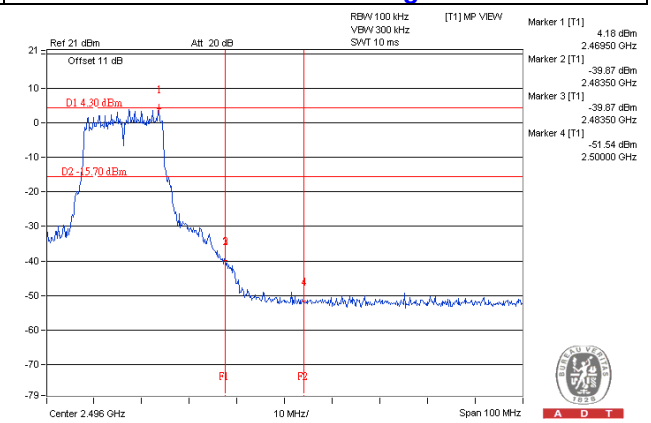




CH 1 Band edge

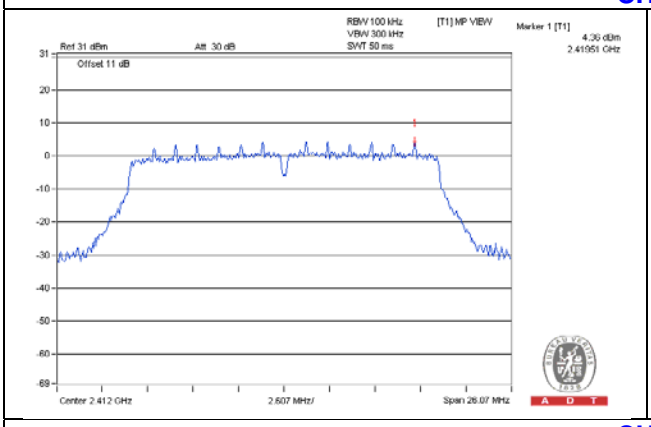


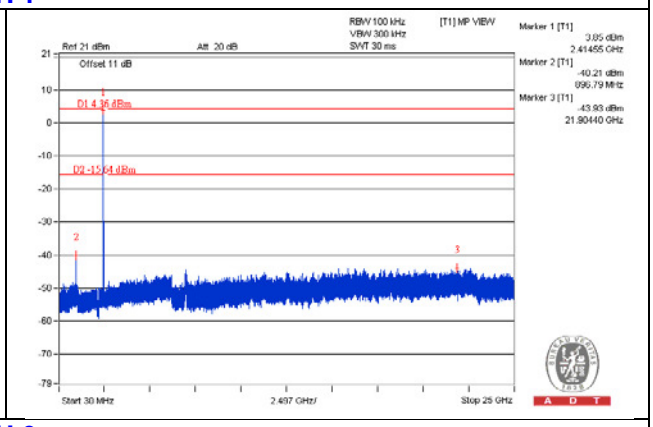
CH 11 Band edge



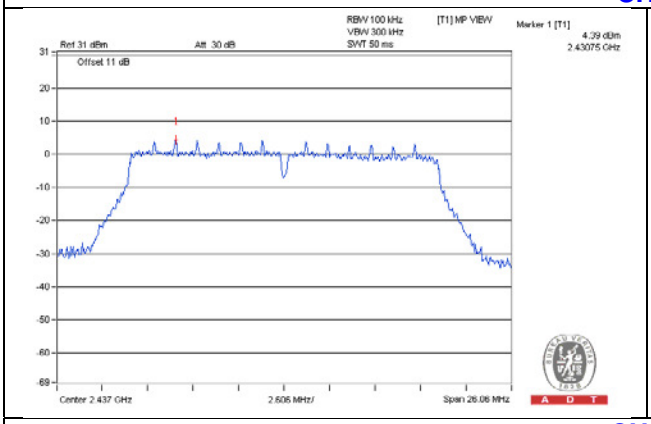
802.11n (HT20)
CHAIN 0

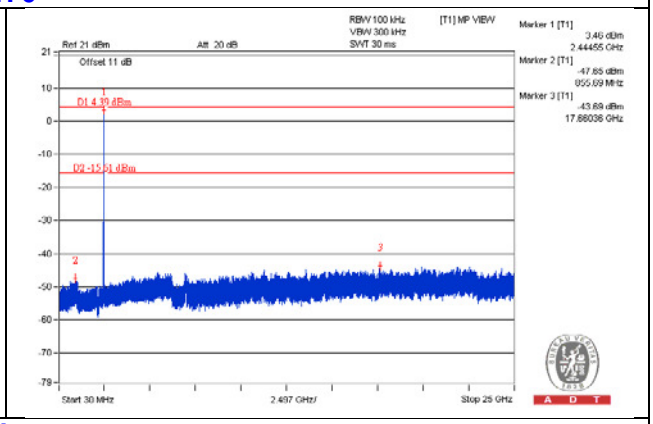
CH 1



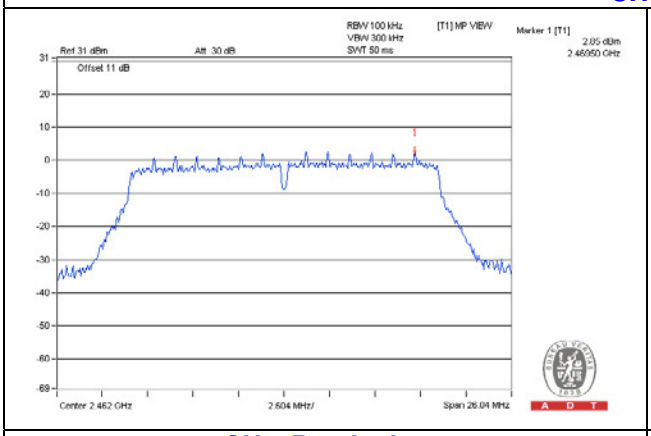


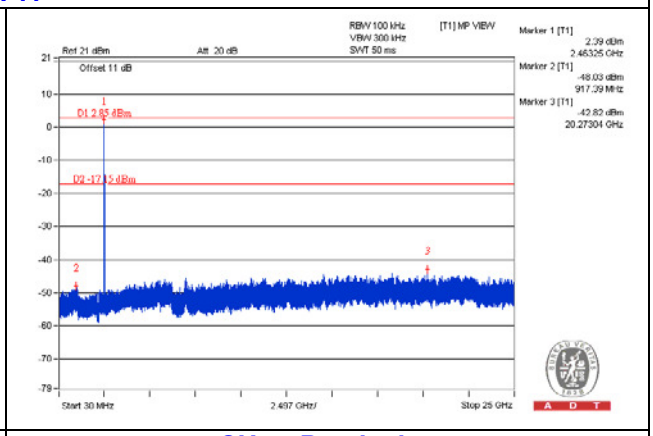
CH 6





CH 11





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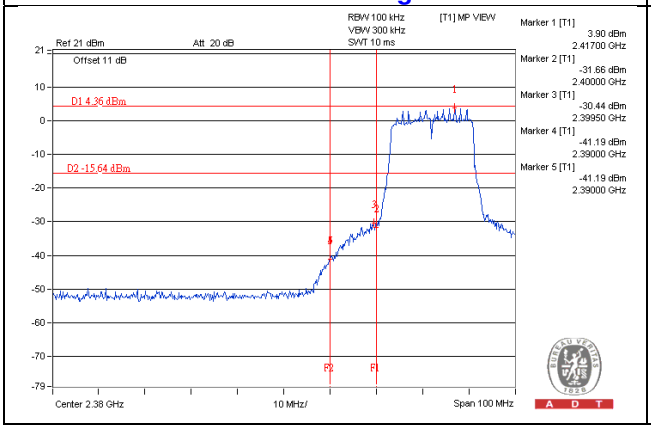

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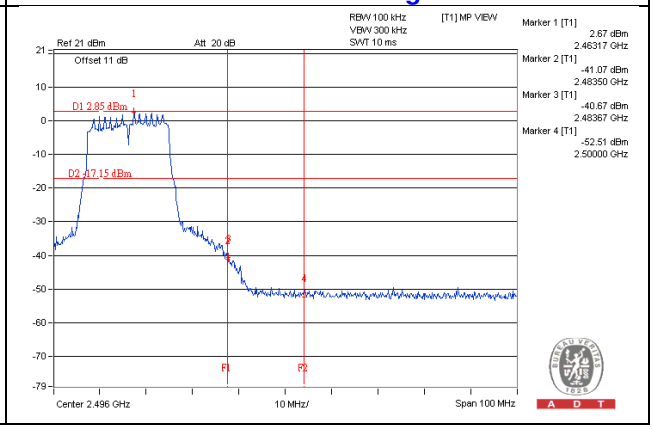
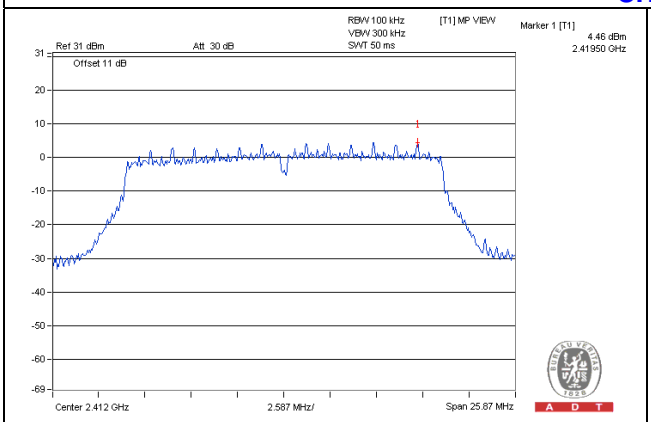
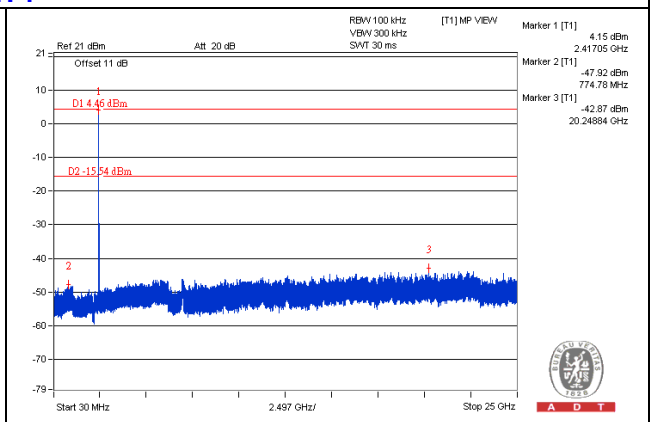


CHAIN 1

CH 1





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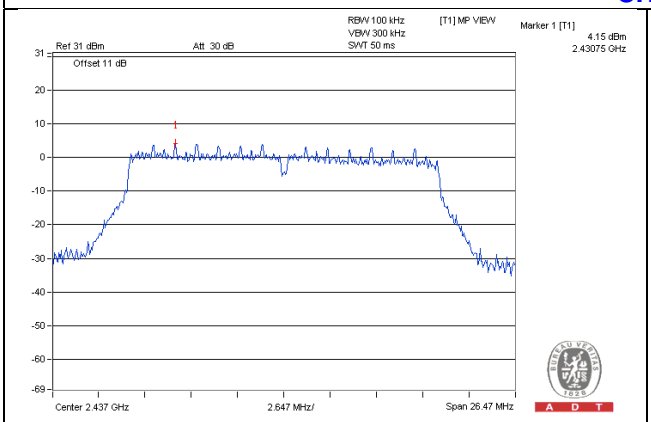

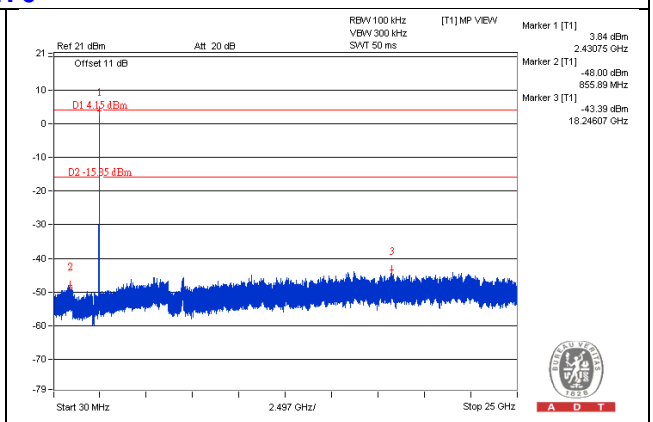

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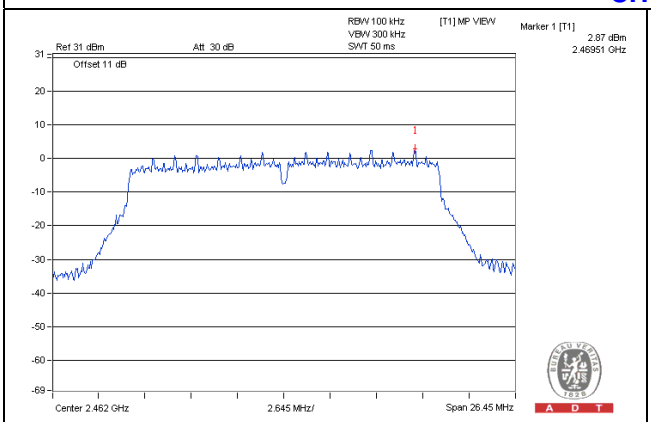

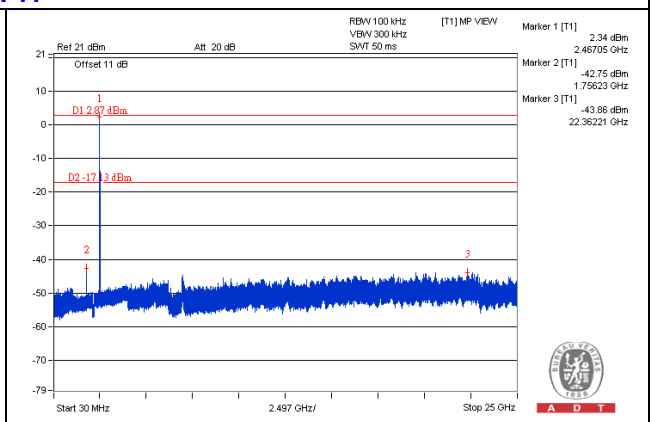

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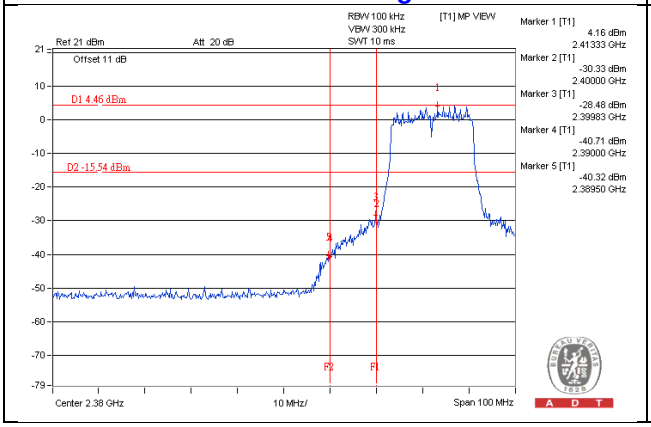

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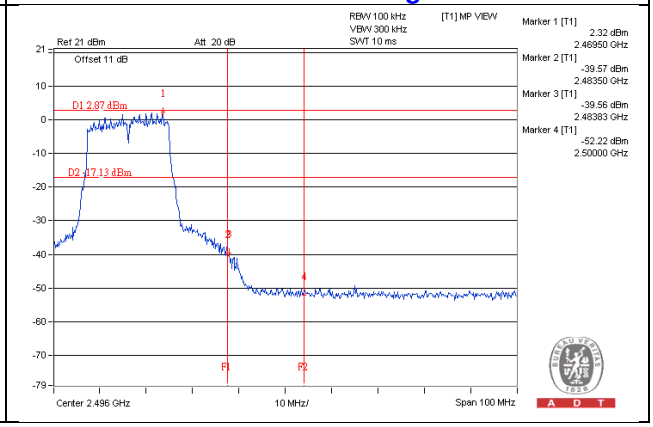
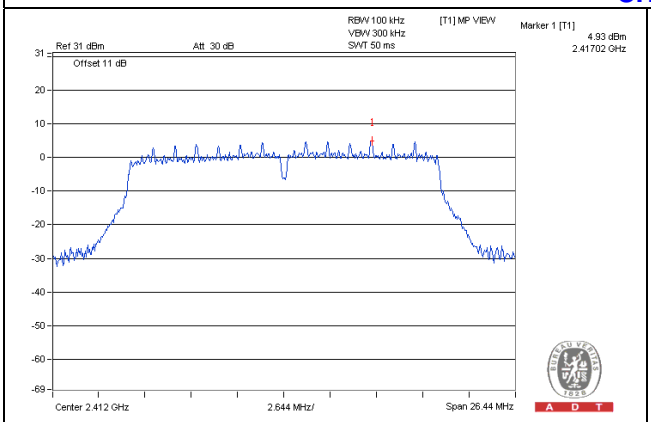
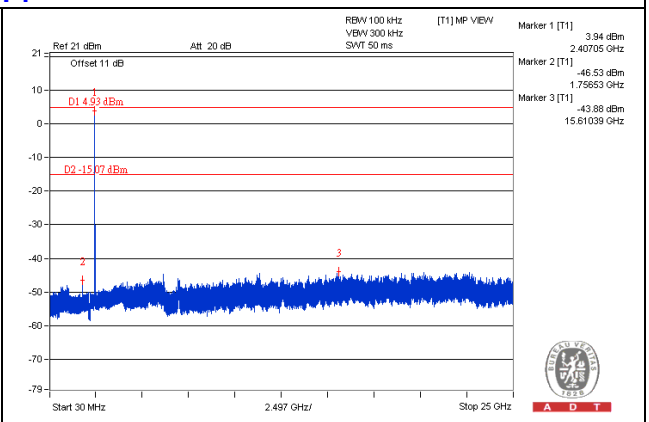


CHAIN 2

CH 1





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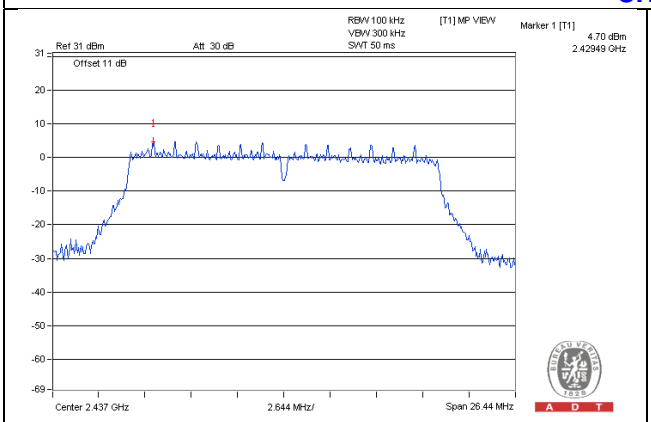

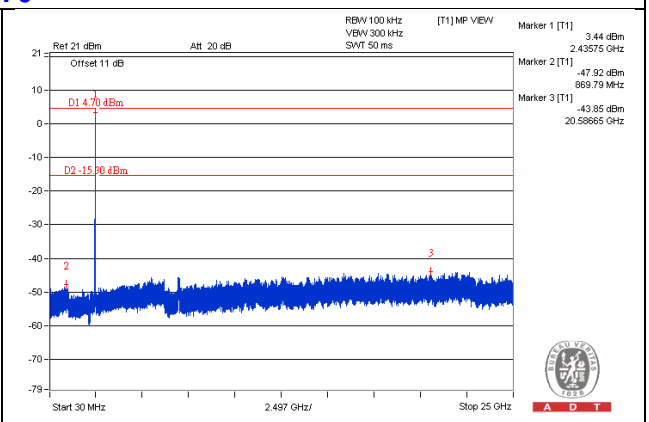

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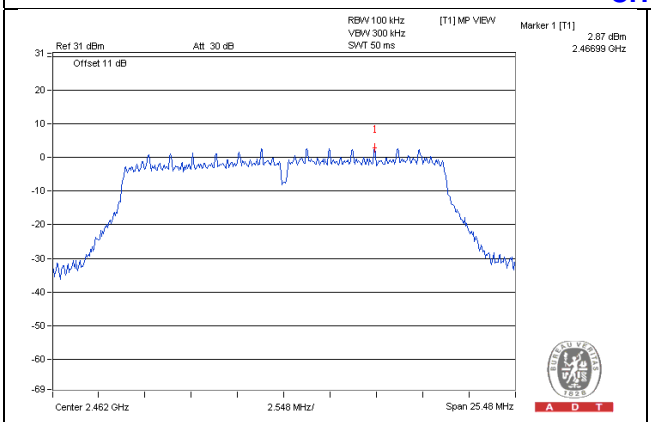

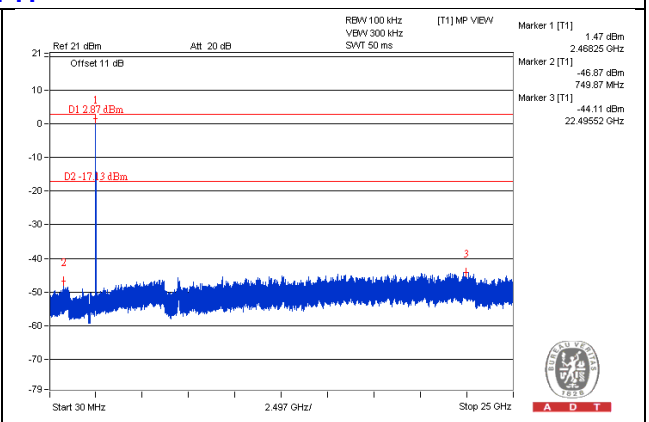

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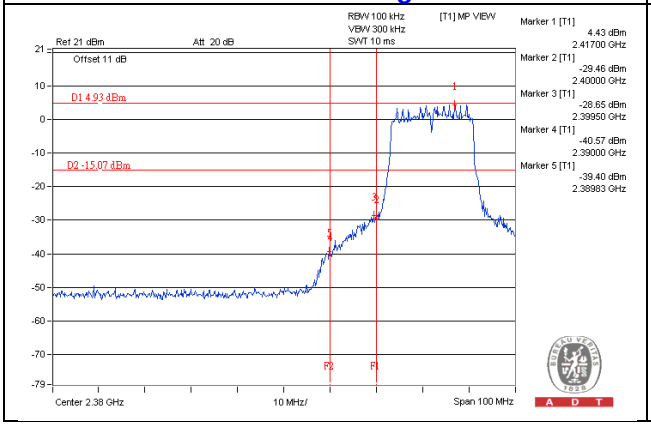

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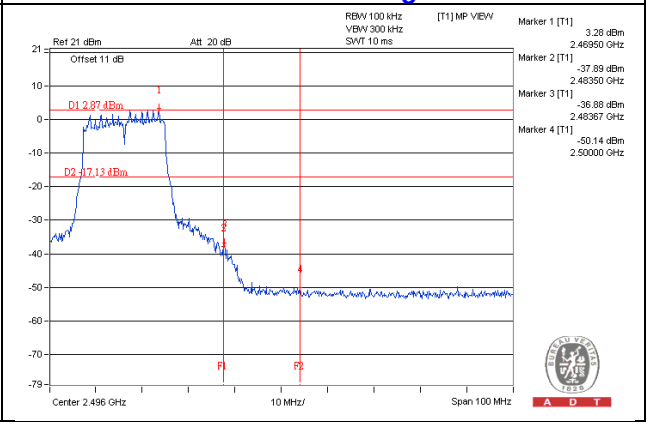

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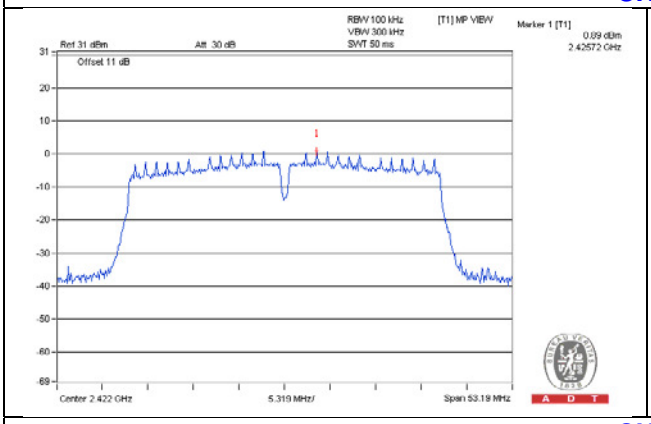
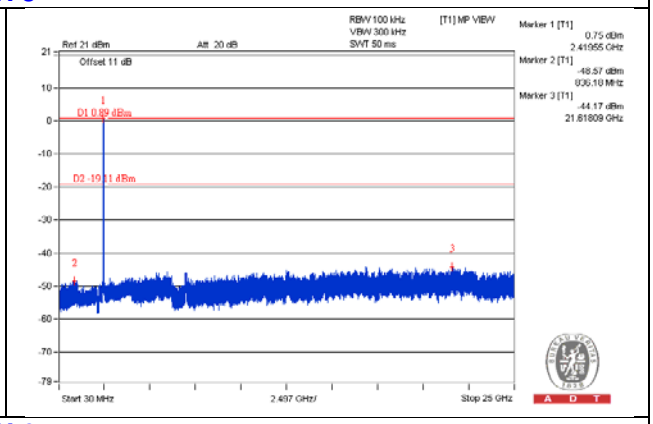
CHAIN 0

CH 3





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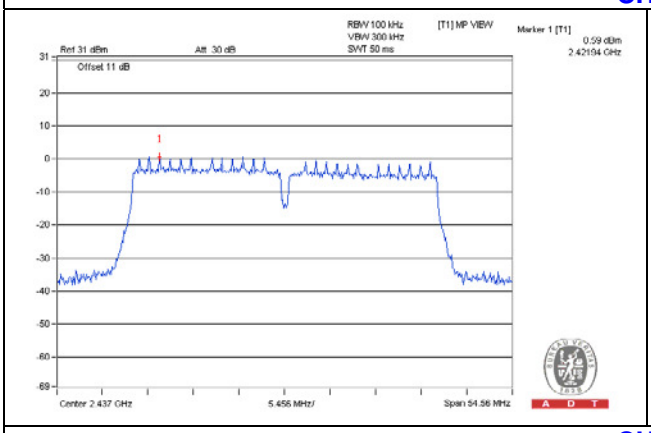

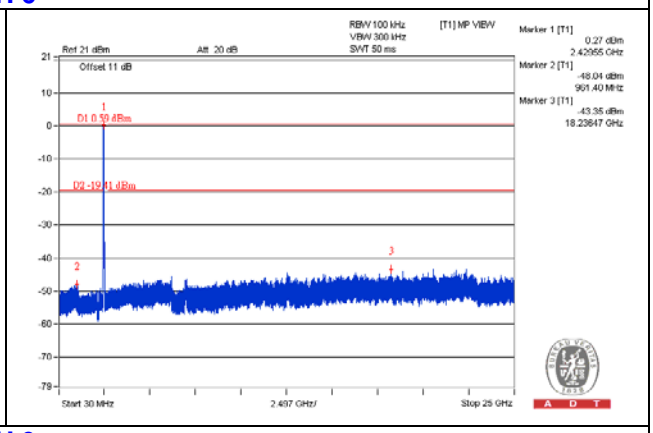

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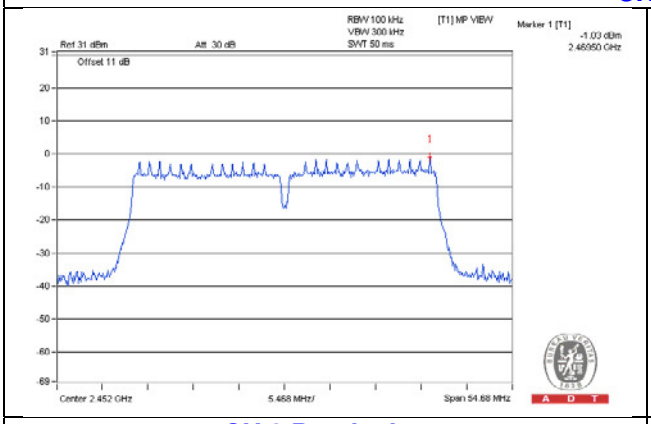

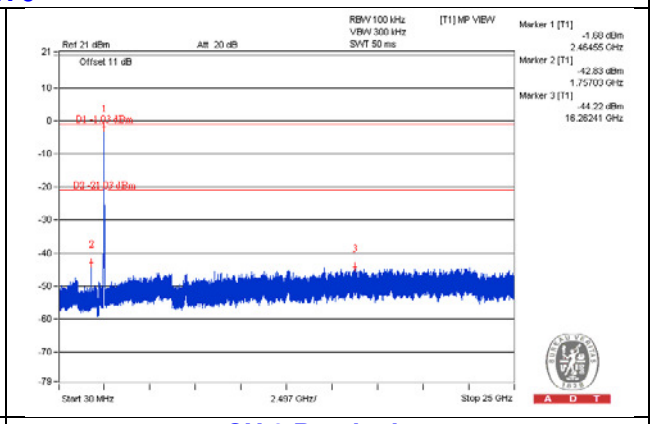

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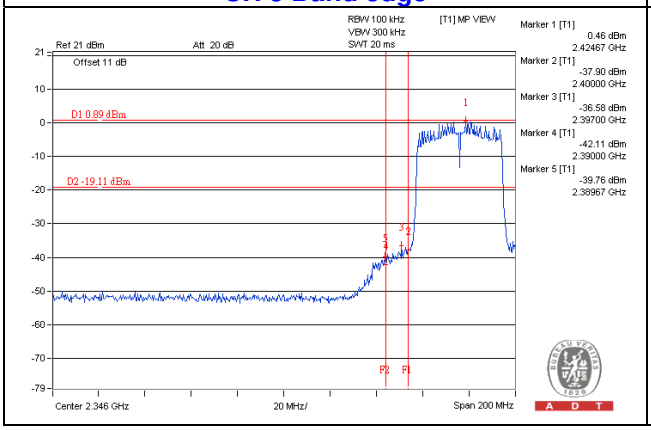

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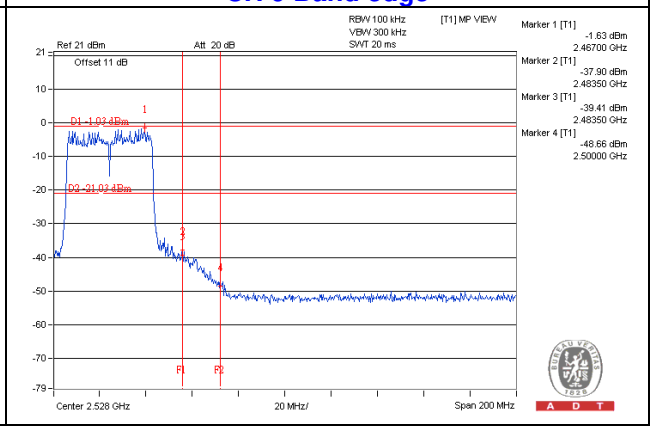
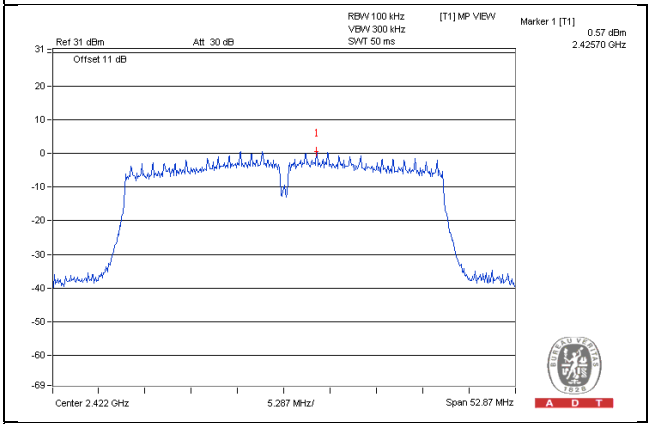
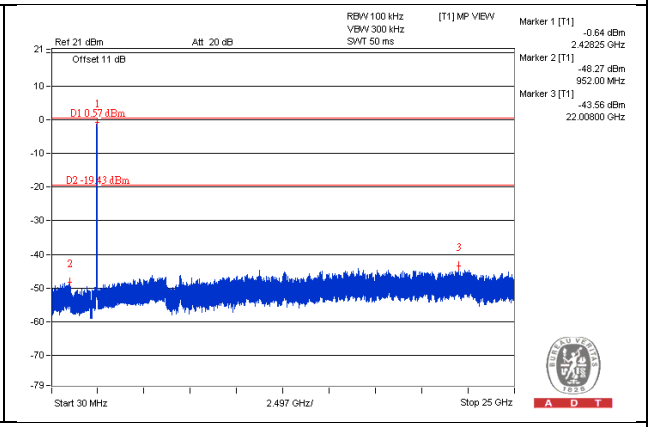


CHAIN 1

CH 3





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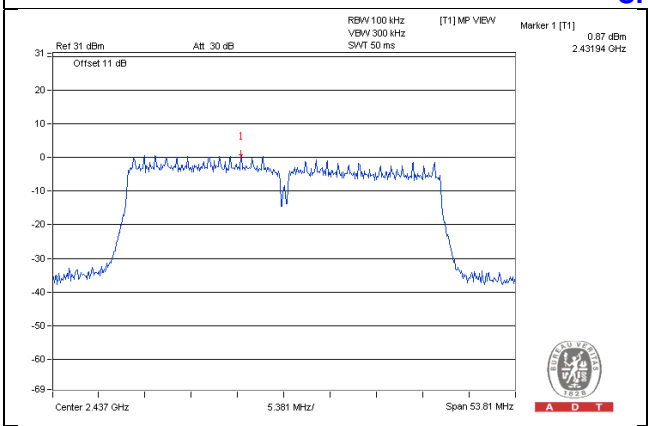

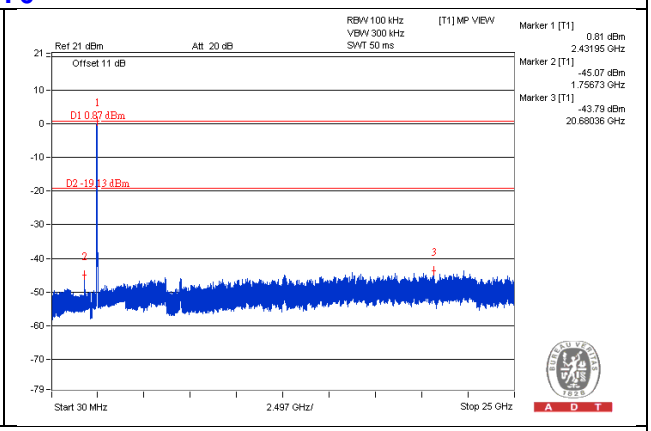

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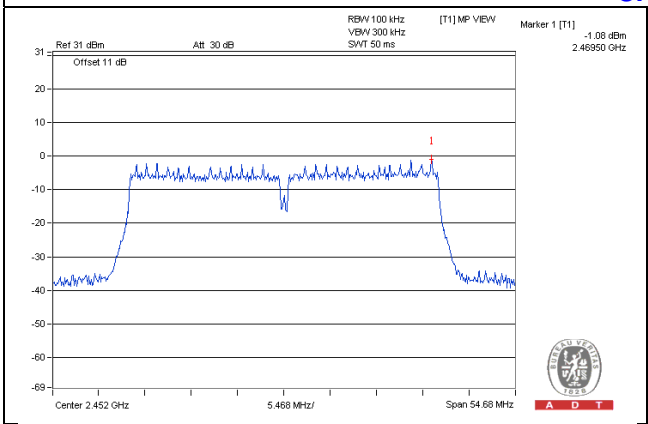

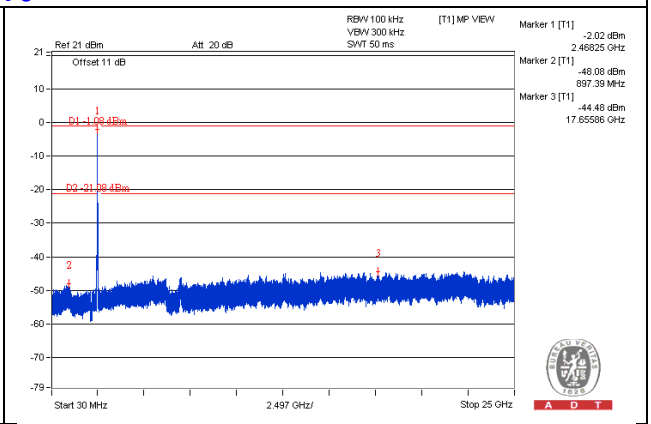

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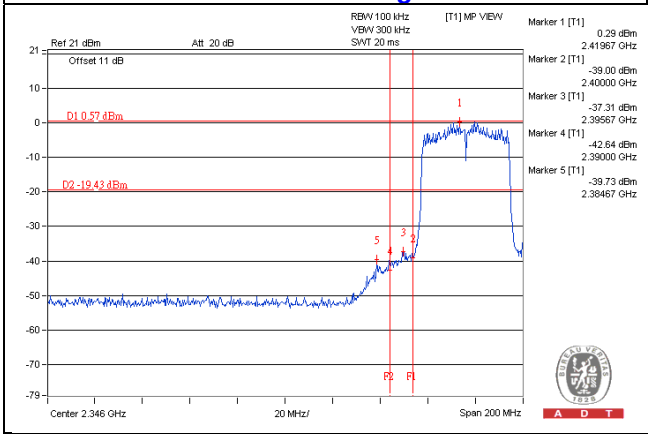

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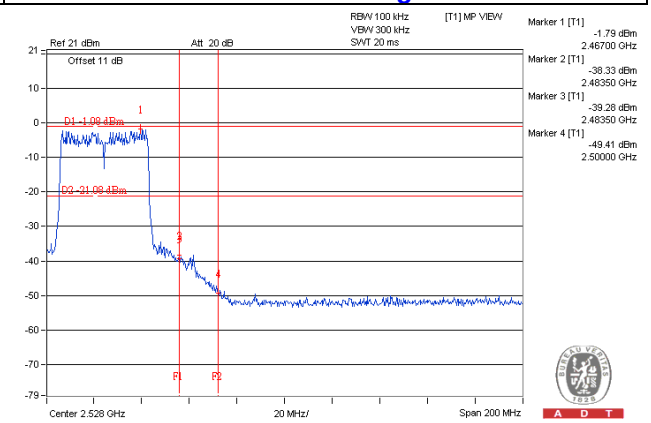
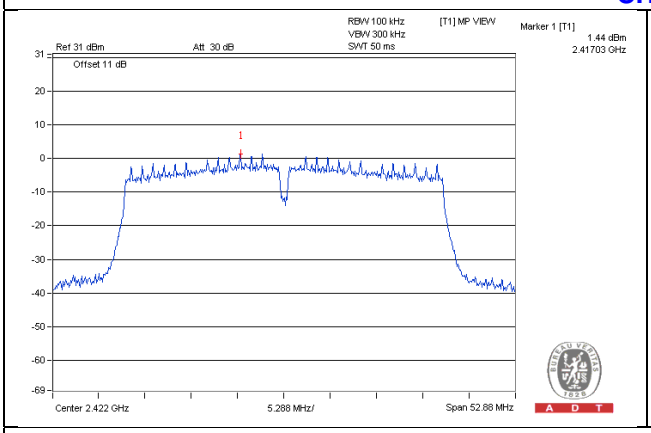
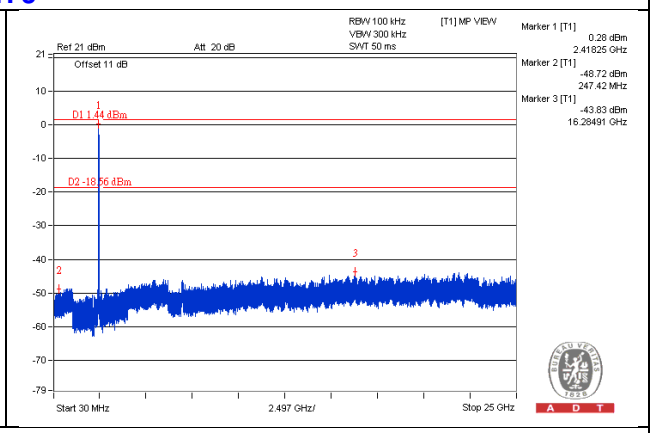


CHAIN 2

CH 3





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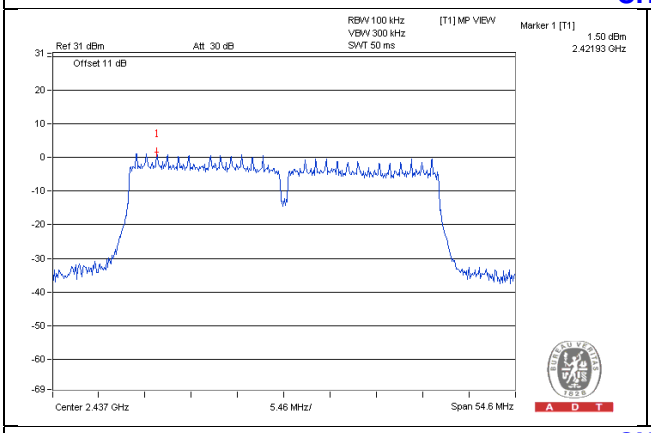

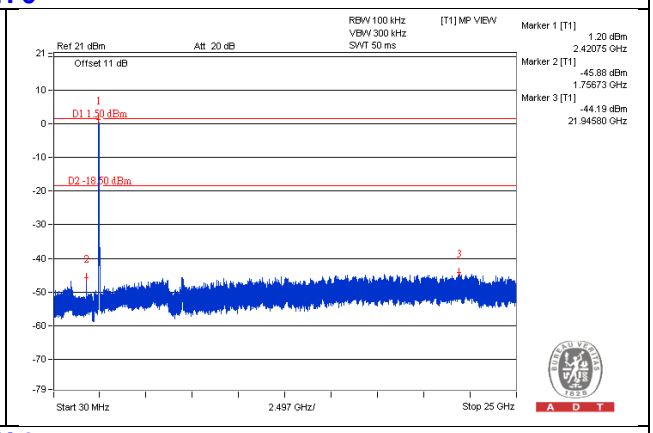

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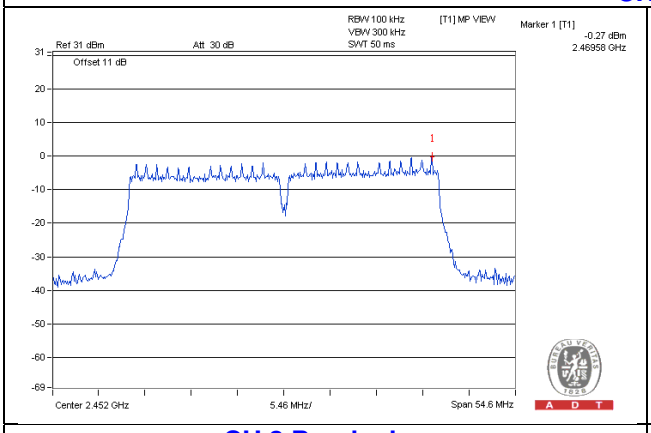
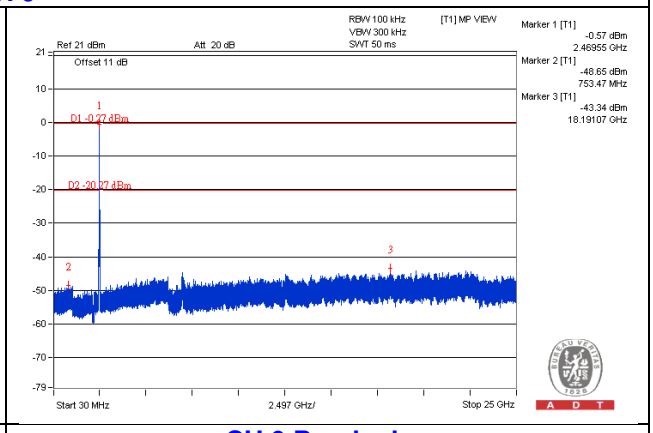
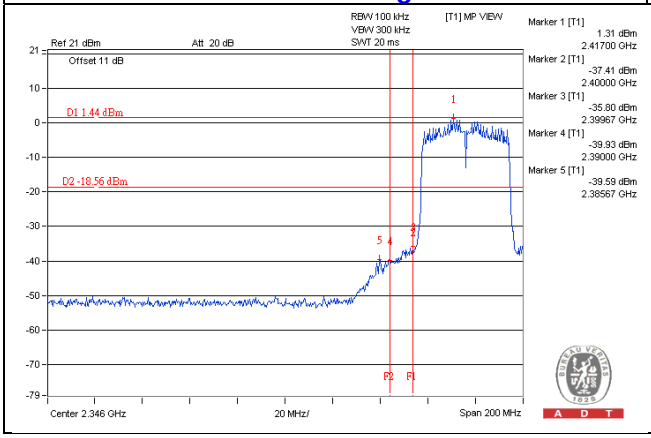
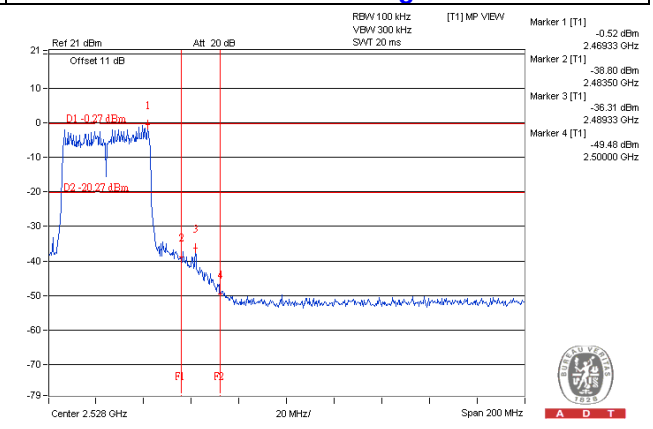




CH 3 Band edge



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:

Linko EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

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

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