

TELEC

RF

TEST REPORT

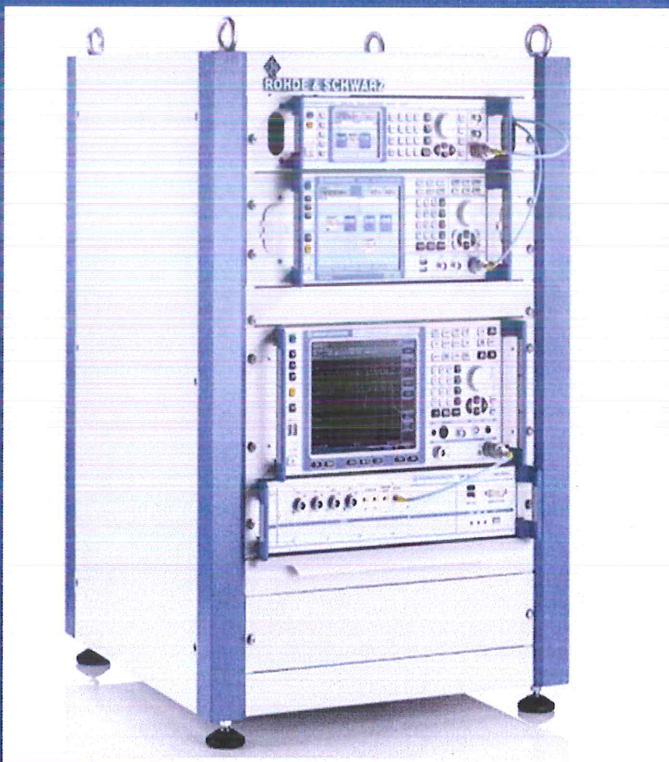
ISSUED BY  
Shenzhen BALUN Technology Co., Ltd.



FOR  
**Tablet**

ISSUED TO  
Samsung Electronics Co., Ltd.

Samsung R5, Maetan dong 129, Samsung ro Youngtong gu, Suwon city  
443 742, Korea



Tested by: Ye Hongji

Ye Hongji

Date Sep. 01, 2020

Approved by: Liao Jianming

Liao Jianming  
(Technical Director)

Date Sep. 01, 2020

Report No.: BL-EC2080218-601

EUT Name: Tablet

Model Name: SM-T290

Brand Name: SAMSUNG

Test Rule: MIC Notice No.88 Appendix No.43

Test Standard: MIC Ordinance Regulating Radio  
Equipment Article 49.20

Test Conclusion: Pass

Test Date: Aug. 14, 2020 ~ Aug. 20, 2020

Date of Issue: Sep. 01, 2020

*NOTE: This test report of test results only related to testing samples, which can be duplicated completely for the legal use with the approval of the applicant; it shall not be reproduced except in full, without the written approval of Shenzhen BALUN Technology Co., Ltd. Any objections should be raised within thirty days from the date of issue. To validate the report, please contact us.*

### Revision History

Version	Issue Date	Revisions
<u>Rev. 01</u>	<u>Sep. 01, 2020</u>	<u>Initial Issue</u>

## TABLE OF CONTENTS

1	ADMINISTRATIVE DATA (GENERAL INFORMATION) .....	4
1.1	Identification of the Testing Laboratory.....	4
1.2	Identification of the Responsible Testing Location .....	4
1.3	Laboratory Condition .....	4
1.4	Announce.....	5
2	PRODUCT INFORMATION.....	6
2.1	Applicant Information .....	6
2.2	Manufacturer Information.....	6
2.3	Factory Information .....	6
2.4	General Description for Equipment under Test (EUT) .....	6
2.5	Ancillary Equipment.....	7
2.6	Technical Information .....	7
2.7	Additional Instructions.....	9
3	SUMMARY OF TEST RESULTS.....	10
3.1	MEASUREMENT UNCERTAINTY .....	11
4	GENERAL TEST CONFIGURATIONS.....	12
4.1	Test Environment Conditions.....	12
4.2	Test Equipment List .....	12
4.3	Description of Test Setup .....	13
5	TEST ITEMS.....	16
5.1	Frequency Error Measurement.....	16
5.2	Occupied Bandwidth and Spread-spectrum Bandwidth / Factor .....	17
5.3	Unwanted Emission Intensity Measurement.....	18
5.4	Antenna Power Error Measurement .....	19
5.5	Limitation of Collateral Emission of Receiver Measurement .....	21
5.6	Carrier sensing function (1) .....	22
5.7	Carrier sensing function (2) .....	23

5.8	Transmission Antenna Gain (EIRP Antenna Power) Measurement .....	24
5.9	Transmission Radiation Angle Width (3dB Beamwidth) Measurement .....	26
5.10	Radio Interference Prevention Capability Measurement .....	27
ANNEX A	TEST RESULT .....	28
A.1	Frequency Error.....	28
A.2	Occupied Bandwidth and Spread-spectrum Bandwidth / Factor .....	29
A.3	Unwanted Emission Intensity Measurement.....	36
A.4	Antenna Power Error Measurement .....	46
A.5	Limitation of Collateral Emission of Receiver Measurement .....	48
A.6	Carrier sensing function (1) .....	51
A.7	Carrier sensing function (2) .....	51
A.8	Transmission Antenna Gain (EIRP Antenna Power) Measurement .....	51
A.9	Transmission Radiation Angle Width (3dB Bandwidth) Measurement .....	51
A.10	Radio Interference Prevention Capability Measurement .....	52
A.11	Construction Protection Confirmation Method .....	52
ANNEX B	TEST SETUP PHOTOS .....	53
ANNEX C	EUT EXTERNAL PHOTOS .....	53
ANNEX D	EUT INTERNAL PHOTOS .....	53



## 1 ADMINISTRATIVE DATA (GENERAL INFORMATION)

### 1.1 Identification of the Testing Laboratory

Company Name:	Shenzhen BALUN Technology Co., Ltd.
Address:	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, ShenZhen, GuangDong Province, P. R. China
Phone Number:	+86 755 6685 0100

### 1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	<p>The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A-1.</p> <p>The laboratory has been listed by US Federal Communications Commission to perform electromagnetic emission measurements. The recognition numbers of test site are 832625.</p> <p>The laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6791.</p>
Description	All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055

### 1.3 Laboratory Condition

Ambient Temperature	20°C to 25°C
Ambient Relative Humidity	45%to 55%
Ambient Pressure	100 kPa to 102 kPa

## 1.4 Announce

- (1) The test report reference to the report template version v3.7.
- (2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
- (3) The test report is invalid if there is any evidence and/or falsification.
- (4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.
- (5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.
- (6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.
- (7) The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.

## 2 PRODUCT INFORMATION

### 2.1 Applicant Information

Applicant	Samsung Electronics Co., Ltd.
Address	Samsung R5, Maetan dong 129, Samsung ro Youngtong gu, Suwon city 443 742, Korea

### 2.2 Manufacturer Information

Manufacturer	Samsung Electronics Co., Ltd.
Address	Samsung R5, Maetan dong 129, Samsung ro Youngtong gu, Suwon city 443 742, Korea

### 2.3 Factory Information

Factory	Jiaxing Yongrui Electron Technology Co., Ltd.
Address	NO.777 Yazhong Road, Daqiao Town, Nanhu District, Jiaxing City, Zhejiang

### 2.4 General Description for Equipment under Test (EUT)

EUT Name	Tablet
Under Test Model Name	SM-T290
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	MP1.0
Software Version	T290.001
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

## 2.5 Ancillary Equipment

Ancillary Equipment 1	Battery 1	
	Brand Name	SWD
	Model No.	SWD-WT-N8
	Serial No.	N/A
	Capacity	5100 mAh
	Rated Voltage	3.82 V
	Limited Voltage	4.4 V
Ancillary Equipment 2	Battery 2	
	Brand Name	SCUD
	Model No.	SCUD-WT-N8
	Serial No.	N/A
	Capacity	5100 mAh
	Rated Voltage	3.82 V
	Limit Charge Voltage	4.4 V
Ancillary Equipment 3	Adapter	
	Brand Name	DongYang
	Model No.	EP-TA200
	Serial No.	N/A
	Rated Input	100-240 V~, 0.5 A, 50/60 Hz
	Rated Output	9 V = 1.67 A or 5 V = 2 A
Ancillary Equipment 4	USB Data Cable	
	Model No.	N/A
	Length (Approx.)	0.8 m
Both batteries were tested, but only the worst test data show in this report, the model SCUD-WT-N8 is the worst.		

## 2.6 Technical Information

Network and Wireless connectivity	Bluetooth 4.2 (BR+EDR+BLE); WIFI 802.11a, 802.11b, 802.11g, 802.11n ;GPS, GLONASS
-----------------------------------	--

The requirement for the following technical information of the EUT was tested in this report:

Frequency Range	802.11b/g/n(20MHz): 2.412GHz - 2.472GHz $f_c = 2412 \text{ MHz} + (N-1)*5 \text{ MHz}$ , where - $f_c$ = "Operating Frequency" in MHz, - N = "Channel Number" with the range from 1 to 13.
Equipment Type (LBT / non- LBT)	Adaptive equipment LBT based Detect and Avoid
Antenna Type	IFA Antenna
Antenna Gain	0.22 dBi
Declare Max Antenna Power Density	7.92 mW/MHz
About the Product	The equipment is Tablet, it contains Bluetooth and WIFI Modules operating at 2.4GHz ISM band. Only the WIFI 802.11b, 802.11g and 802.11n (HT20) was tested in this report.

Modulation technology	Modulation Type	Transfer Rate (Mbps)
DSSS (802.11b)	DBPSK	1
	DQPSK	2
	CCK	5.5/ 11
OFDM (802.11g)	BPSK	6 / 9
	QPSK	12 / 18
	16QAM	24 / 36
	64QAM	48 / 54
OFDM (802.11n-20MHz)	BPSK	6.5
	QPSK	13/19.5
	16QAM	26/39
	64QAM	52/58.5/65



## 2.7 Additional Instructions

### EUT Software Settings:

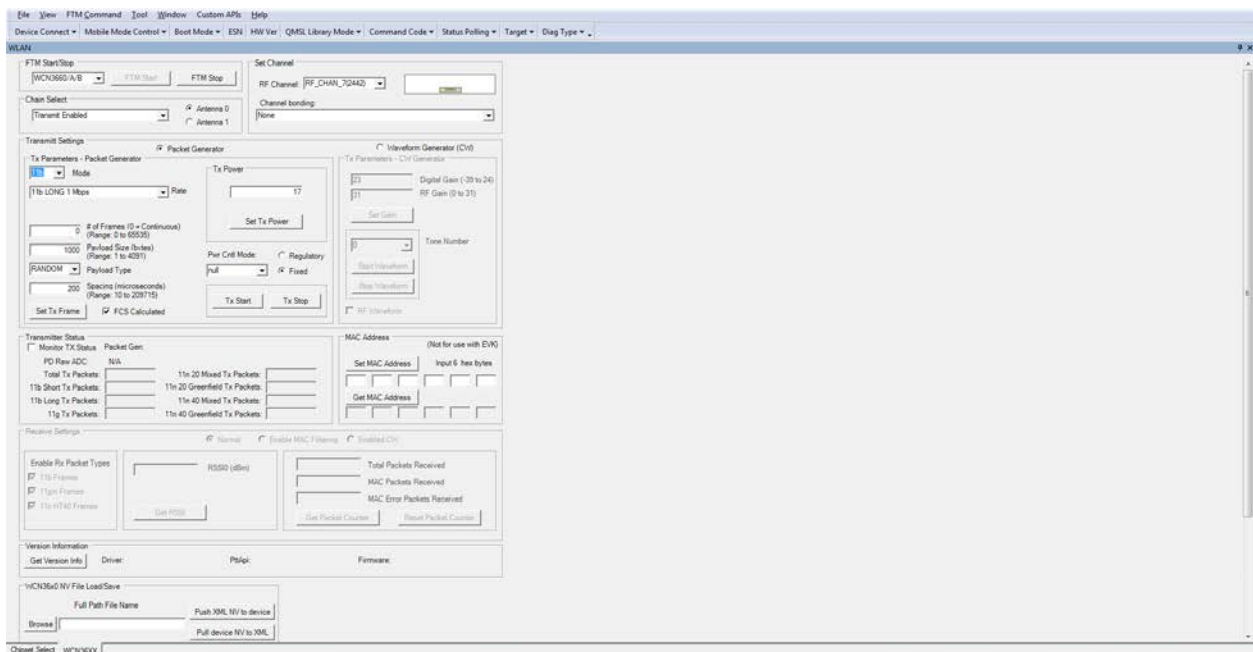
Mode	<input checked="" type="checkbox"/> Special software is used. The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.
------	--

During testing. Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

### EUT Software Settings:

Power level setup in software			
Test Software Version	Test software is set by engineering instruction "QRCT3" in engineering mode		
Support Units (Software installation media)	Description	Manufacturer	Model
	Notebook	N/A	N/A
Mode	Channel	Soft Set	
802.11 b	All	17	
802.11 g	All	16.5	
802.11 n20	All	16	

### Run software:



### 3 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

Part	Description	Channel		Test Mode	Data Rate	Verdict
5.1	Frequency Error	13/7/1	3/7/11	Un-modulation	/	Pass
5.2	Occupied Bandwidth and Spread-spectrum Bandwidth / Factor	13/7/1	3/7/11	11b/11g/11n20	1/6/6.5/13.5 Mbps	Pass
5.3	Unwanted Emission Intensity	13/7/1	3/7/11	11b/11g/11n20	1/6/6.5/13.5 Mbps	Pass
5.4	Antenna Power Error	13/7/1	3/7/11	11b/11g/11n20	1/6/6.5/13.5 Mbps	Pass
5.5	Limitation of Collateral Emission of Receiver	13/7/1	3/7/11	11b/11g/11n20	1/6/6.5/13.5 Mbps	Pass
5.7	Carrier sensing function (2)	13/7/1	3/7/11	11b/11g/11n20	1/6/6.5/13.5 Mbps	N/A
5.8	Transmission Antenna Gain (EIRP Antenna Power)	13/7/1	3/7/11	11b/11g/11n20	1/6/6.5/13.5 Mbps	Pass
5.9	Transmission Radiation Angle Width (3dB Beamwidth)	13/7/1	3/7/11	11b/11g/11n20	1/6/6.5/13.5 Mbps	Pass
5.10	Radio Interference Prevention Capability	13/7/1	3/7/11	11b/11g/11n20	1/6/6.5/13.5 Mbps	Pass
--	Construction Protection Confirmation	--	--	--	--	Pass
Note: The tests were performed according to the method of measurements prescribed in MIC Ordinance Regulating Radio Equipment Section 4.17 of Article 49.20.						

The test channel corresponding to the frequency list

Mode	Channel	Channel Number	Frequency (MHz)
11b	HIGH/MIDDLE/LOW(H/M/L)	13/7/1	2472/2442/2412
11g	HIGH/MIDDLE/LOW(H/M/L)	13/7/1	2472/2442/2412
11n20	HIGH/MIDDLE/LOW(H/M/L)	13/7/1	2472/2442/2412

### 3.1 MEASUREMENT UNCERTAINTY

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
Frequency Error / 99% & 90% Bandwidth	$\pm 0.1 \times 10^{-6}$
Antenna Power	$\pm 0.82\text{dB}$
TX-RX Spurious Emissions	$\pm 0.58\text{dB}$
Transmission Antenna Gain	$\pm 2.32\text{dB}$
Temperature	$\pm 0.6\text{ }^{\circ}\text{C}$
Humidity	$\pm 4.0\%$
DC / AC Power Source	$\pm 0.04\%$

## 4 GENERAL TEST CONFIGURATIONS

### 4.1 Test Environment Conditions

During the measurement, the normal environment conditions were within the listed ranges:

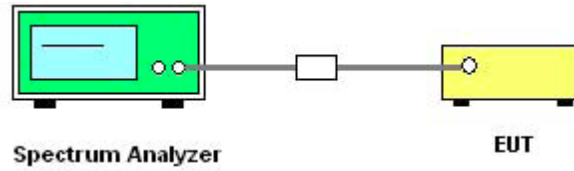
Relative Humidity (%)	45% to 85%	
Atmospheric Pressure (kPa)	100 kPa to 102 kPa	
Temperature	+20°C to +25°C	
Working Voltage of the EUT	NV (Normal Voltage)	3.82V
	LV (Low Voltage)	3.6V
	HV (High Voltage)	4.4V

### 4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Calibration Company	Calibration By	Cal. Date	Cal. Due
Spectrum Analyzer	ROHDE&SC HWARZ	FSV-30	103118	SMQ	Li Zhi	2020.06.08	2021.06.07
Bluetooth Tester	ROHDE&SC HWARZ	CBT	101005	SMQ	Li Zhi	2020.06.08	2021.06.07
Power Splitter	KMW	DCPD-LDC	1305003 215	SMQ	Li Zhi	--	--
Power Sensor	ROHDE&SC HWARZ	NRP-Z 21	103971	--	--	--	--
EMI Receiver	ROHDE&SC HWARZ	ESRP	101036	SMQ	You Shuifu	2020.06.09	2021.06.08
LISN	SCHWARZB ECK	NSLK 8127	8127-687	SMQ	You Shuifu	2020.06.09	2021.06.08
Test Antenna-Bi-Log	SCHWARZB ECK	VULB 9163	9163-624	SCHWARZ BECK	Dieter	2019.07.02	2021.07.01
Test Antenna-Horn	SCHWARZB ECK	BBHA 9120D	9120D-1 917	SCHWARZ BECK	Dieter	2019.07.02	2021.07.01
Test Antenna-Loop	SCHWARZB ECK	FMZB 1519	1519-037	SCHWARZ BECK	Dieter	2019.10.29	2021.10.28
Anechoic Chamber	RAINFORD	9 m*6 m*6 m	N/A	GRGT	Liao Shibo	2017.02.21	2022.02.20
DC Power Supply	ITECH	IT6863 A	6000140 1068721 0020	--	--	2020.06.12	2021.06.11

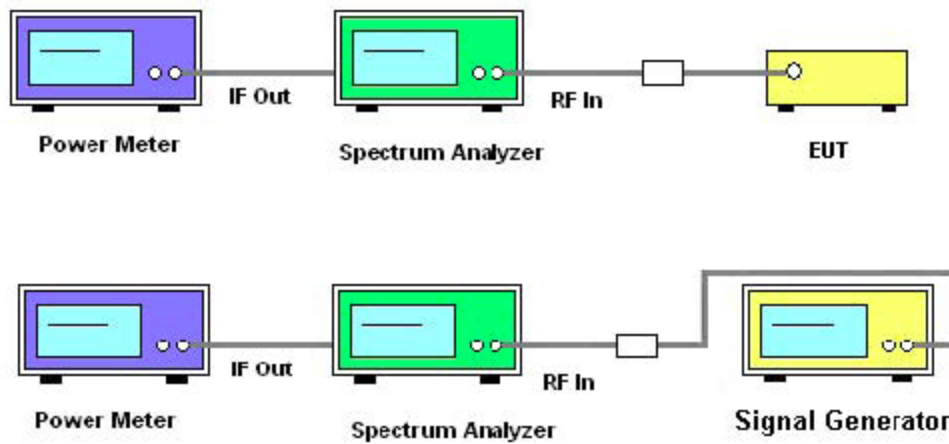
### 4.3 Description of Test Setup

#### 4.3.1 For Antenna Port Test



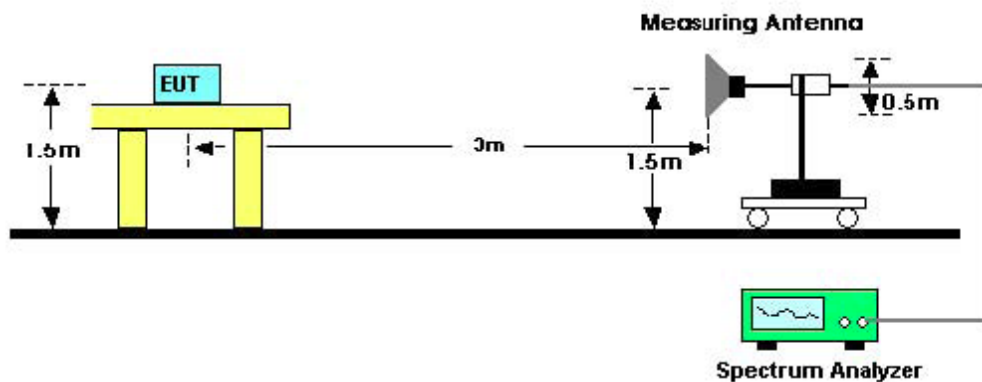
(Diagram 1)

#### 4.3.2 For Antenna Power Error Test

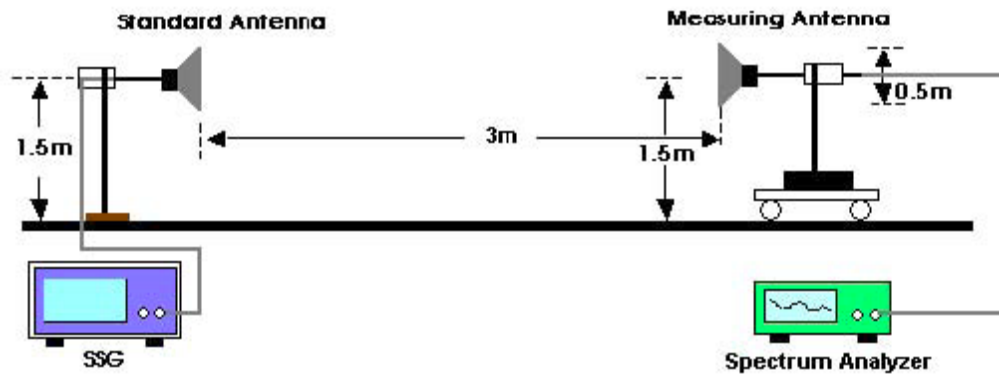


(Diagram 2)

#### 4.3.3 For EIRP Antenna Power Test

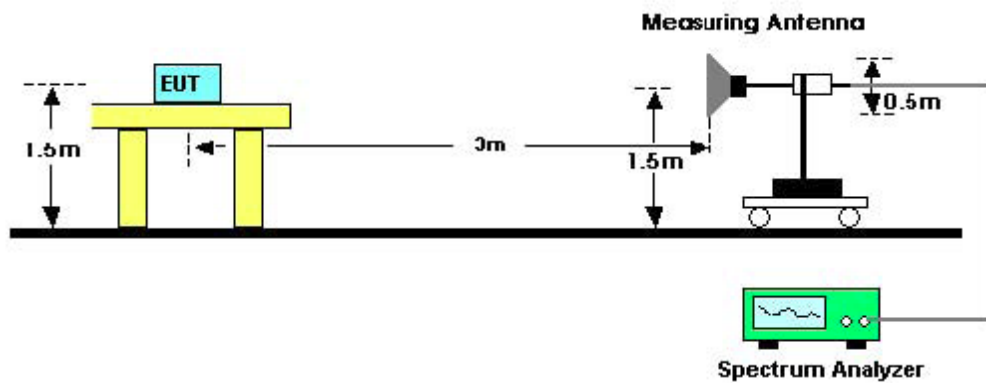


(Diagram 3)



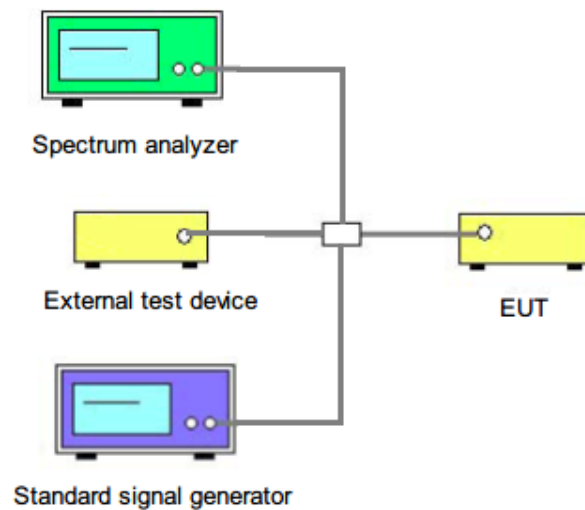
(Diagram 4)

#### 4.3.4 For 3dB Beamwidth Test



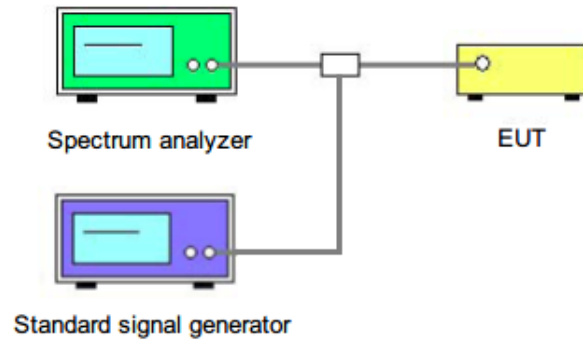
(Diagram 5)

#### 4.3.5 For Carrier sensing function Test



(Diagram 6)





(Diagram 7)

## 5 TEST ITEMS

### 5.1 Frequency Error Measurement

#### 5.1.1 Limit

Item	Limits
Frequency Tolerance	$\leq \pm 50$ ppm

#### 5.1.2 Test Setup

See section 4.3.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

#### 5.1.3 Test Procedure

- 1 Frequency accuracy of SA shall be less than 10% of limits tolerance (5 ppm)
- 2 Setting of SA is following as: RB:10 kHz / VB:30 kHz / SPAN: 50 kHz / AT: 20 dB / Ref: 10 dBm
- 3 Center Frequency: The center frequency of testing for EUT
- 4 Sweep time: Auto
- 5 Sweep mode: Continuous sweep
- 6 Detect mode: Positive peak
- 7 Mark function: Frequency Counter (Resolution 100 Hz)
- 8 EUT have transmitted absence of modulation signal and fixed channelize. f is using the mark cursor to mark the peak frequency value,  $f_c$  is declaring of channel frequency. Then the frequency error formula is  $(f_c - f) / f_c \times 10^6$  ppm and the limit is less than  $\pm 50$  ppm

#### 5.1.4 Test Deviation

There is no deviation with the original standard.

#### 5.1.5 EUT Operation during Test

The EUT was placed on the test table and programmed in un-modulation function.

#### 5.1.6 Test Result

Please refer to ANNEX A.1.

## 5.2 Occupied Bandwidth and Spread-spectrum Bandwidth / Factor

### 5.2.1 Limit

Item	Limits
Occupied Band Width	FHSS $\leq$ 83.5MHz; OFDM,DSSS $\leq$ 26MHz; Others $\leq$ 26MHz
Spread-spectrum Bandwidth	$\geq$ 500 kHz (FHSS, DSSS)
Spreading Spectrum Factor	$\geq$ 5 , Operating Frequency 2400 -2483.5 MHz $\geq$ 10 , Operating Frequency 2471 -2497 MHz

### 5.2.2 Test Setup

See section 4.3.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

### 5.2.3 Test Procedure

1 Set the spectrum analyzer as follows:

Center frequency: Test frequency

Span: Approximately 2 to 3.5 times nominal bandwidth

Resolution bandwidth: Approximately 3% or less nominal bandwidth

Video bandwidth: 3 times resolution bandwidth

Sweep time: auto

Sweep mode: Continuous sweep

Detection: Positive peak

Trace mode: Maximum hold

2 After repeating sweeps until the display shows steady data, store the values at all data points into the computer array variables.

3 Convert the dB values at all data points to antilogarithm on the power dimension.

4 Obtain sum total of the power at all data points, and store it as "total power".

5 Accumulate the power at each data point sequentially upward from the lowest frequency and obtain the limit data point where the accumulated power becomes 0.5% (5% for spreading bandwidth) of the "total power". Then convert the limit data point into frequency and store it as "lower limit frequency"

6 Accumulate the power at each data point sequentially downward from the highest frequency and obtain the limit data point where the accumulated power becomes 0.5% (5% for spreading bandwidth) of the "total power". Then convert the limit data point into frequency and store it as "upper limit frequency".

7 Spread Spectrum Factor = Spread Spectrum Bandwidth / modulation rate of EUT.

### 5.2.4 Test Deviation

There is no deviation with the original standard.

### 5.2.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

### 5.2.6 Test Result

Please refer to ANNEX A.2

### 5.3 Unwanted Emission Intensity Measurement

#### 5.3.1 Limit

Item	Limits
TX Spurious Emission	$\leq 2.5 \mu\text{W/MHz}$ ( $30 \leq f \leq 1000 \text{ MHz}$ ) ,
	$\leq 2.5 \mu\text{W/MHz}$ ( $1000 \text{ MHz} \leq f < 2387 \text{ MHz}$ ; $2496.5 \text{ MHz} < f$ )
	$\leq 25 \mu\text{W/MHz}$ ( $2387 \text{ MHz} \leq f < 2400 \text{ MHz}$ ) and ( $2483.5 \text{ MHz} < f \leq 2496.5 \text{ MHz}$ )

#### 5.3.2 Test Setup

See section 4.3.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

#### 5.3.3 Test Procedure

- 1 EUT have transmitted the maximum modulation signal and fixed channelize.
- 2 Setting of SA is following as: 30 MHz to 1000 MHz with RBW/VBW = 100 kHz , above 1 GHz with RBW/VBW = 1MHz; / AT: 10dB / Ref: 0dBm / Sweep time: Auto / Sweep Mode: Continuous sweep / Detect mode: Positive peak / Trace mode: Max hold.
- 3 Setting of SA is following as 30 MHz and stop frequency 1000 MHz Then to mark peak reading value + cable loss shall be less than 2.5  $\mu\text{W/MHz}$ .
- 4 Setting of SA is following as 1000 MHz and stop frequency 2387 MHz Then to mark peak reading value + cable loss shall be less than 2.5  $\mu\text{W/MHz}$ .
- 5 SA adjusted to start frequency 2387 MHz and stop frequency 2400 MHz. Then to mark peak reading value + cable loss shall be less than 25  $\mu\text{W/MHz}$ .
- 6 SA adjusted to start frequency 2483.5 MHz and stop frequency 2496.5 MHz Then to mark peak reading value + cable loss shall be less than 25  $\mu\text{W/MHz}$ .
- 7 SA adjusted to start frequency 2496.5 MHz and stop frequency 12500 MHz Then to mark peak reading value + cable loss shall be less than 2.5  $\mu\text{W/MHz}$ .
- 8 Measure side band spurious as follows: For 2.4GHz band: 2374 MHz~2400 MHz and 2483.5 MHz~2509.5 MHz RBW = VBW = 30 kHz, Result\_Value = Measured\_Value + 15.2 [dBm].
- 9 If the Result\_Value is over the requirement, take total sum of 1MHz band centered at the spur frequency like ACLP measurement as Result\_Value.

#### 5.3.4 Test Deviation

There is no deviation with the original standard.

#### 5.3.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

#### 5.3.6 Test Result

Please refer to ANNEXA.3.

## 5.4 Antenna Power Error Measurement

### 5.4.1 Limit

Item	Limits
Antenna Power Density	a) FH,FH+DS, or FH+OFDM form 2427 - 2470.75 MHz: $\leq 3$ mW/MHz b) DS but other than a) from 2400~2483.5 MHz: $\leq 10$ mW/MHz c) OFDM, but other than a): For OCB of 26MHz or less: $\leq 10$ mW/MHz For OCB of over 26 MHz to 38MHz: $\leq 5$ mw/MHz d) Other than a), b) and c): $\leq 10$ mW
Antenna Power Error	+20%, -80% (Base on manufacturer declare antenna power density)

### 5.4.2 Test Setup

See section 4.3.2 for test setup description for the antenna power error measurement. The photo of test setup please refer to ANNEX B.

### 5.4.3 Test Procedure

The following table is the setting of the spectrum.

Spectrum Parameter	Setting
Span Frequency	0MHz
RB/VB	1MHz
Detector	Positive Peak
Trace	Max hold
Sweep Time	Auto

Power Meter Parameter	Setting
Filter No.	Auto
Measurement time	0.135 s ~ 26 s

- 1 A power meter is connected on the IF output port of the spectrum analyzer.
- 2 Adjust the spectrum analyzer to have the center frequency the same with the measured carrier.  
RBW=VBW=1MHz,detector mode is positive peak. Turn off the averaging function and use zero span.
- 3 The calibrating signal power shall be reduced to 0 dBm and it shall be verified that the power meter reading also reduces by 10 dB.
- 4 Connect the equipment to be measured. Using the following settings of the spectrum analyzer in combination with "max hold" function, find the frequency of highest power output in the power envelope: center frequency equal to operating frequency; RBW & VBW: 1 MHz; detector mode: positive peak; averaging: off; span: 3 times the spectrum width; amplitude: adjust for middle of the instrument's range. The frequency found shall be recorded.
- 5 Set the center frequency of the spectrum analyzer to the found frequency and switch to zero span. The power meter indicates the measured power density "PD".
- 6 Calculate antenna power density by the formula below  $PD = \text{Power meter value (dBm)} + \text{Cable loss (dB)} + 10 \log_{10}(1/\text{Duty cycle})$  (dB).

7 Antenna Power Error is definition that actual measure antenna power tolerance between + 20% to - 80% power range that base on manufacturer declare the conducted power density.

#### 5.4.4 Test Deviation

There is no deviation with the original standard.

#### 5.4.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

#### 5.4.6 Test Result

Please refer to ANNEXA.4.



## 5.5 Limitation of Collateral Emission of Receiver Measurement

### 5.5.1 Limit

Item	Limits
RX Spurious Emission	$\leq 4\text{nW}$ ( $f < 1\text{GHz}$ )
	$\leq 20\text{nW}$ ( $1\text{GHz} \leq f$ )

### 5.5.2 Test Setup

See section 4.3.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

### 5.5.3 Test Procedure

- 1 EUT has the continuous reception mode and fixed only one channelize.
- 2 Setting of SA is following as RB / VB: 100 kHz (below 1GHz emissions) / 1 MHz (above 1GHz emissions) / AT:10 dB / Ref: 0dBm / Sweep time: Auto / Sweep Mode: Continuous sweep / Detect mode: Positive peak / Trace mode: Max hold
- 3 SA set RB: 100 kHz and VB: 100 kHz. Then adjust to start frequency 30 MHz and stop frequency 1000 MHz. Search to mark peak reading value + cable loss shall be less than 4 nW
- 4 SA set RB: 1 MHz and VB: 1 MHz. Then adjust to start frequency 1000 MHz and stop frequency 12500 MHz. Search to mark peak reading value + cable loss shall be less than 20 nW
- 5 If power level of lower emissions are more than 1/10 of limit (0.4nW for  $f < 1\text{GHz}$ , 2 nW for  $f \geq 1\text{GHz}$ ), all those are to be indicated in the 2nd and 3rd lines. If others are 1/10 or less more of the limit, no necessary to be indicated

### 5.5.4 Test Deviation

There is no deviation with the original standard.

### 5.5.5 EUT Operation during Test

The EUT was programmed to be in continuously receiving mode.

### 5.5.6 Test Result

Please refer to ANNEXA.5.

## 5.6 Carrier sensing function (1)

### 5.6.1 Limit

Radio equipment using OFDM method shall provide a carrier sensing function when the occupied bandwidth of its transmitting device is over 26 MHz and 38 MHz or less.

### 5.6.2 Test Setup

See section 4.3.1 Diagram 6 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

### 5.6.3 Test Procedure

- 1 Set the spectrum analyzer as follows:
  - Center frequency: Center of frequency of test channel
  - Frequency sweep width: 50MHz
  - RBW: Approximately 1MHz
  - VBW: Approximately same as RBW
  - Y-axis scale: 10dB / div
  - Detection mode: Positive peak
- 2 Turn off the output of the standard signal generator. Set the standard signal generator as follows:
  - Carrier frequency: Center of reception frequency band of EUT
  - Modulation: No modulation
  - Output level: Specified level at antenna input of EUT
- 3 Make a line connection between the EUT and the external test device and confirm using the spectrum analyzer that the EUT is transmitting a test frequency signal of OFDM method which occupied bandwidth is over 26 MHz.
- 4 EUT is set to a test frequency and a test spreading code and put to reception state first. when using an external test device, a communication link between the EUT and the external test device is established.
- 5 Turn on the output of the standard signal generator, set the EUT to transmission state and confirm using the spectrum analyzer that the EUT does not transmit radio wave of OFDM method which occupied bandwidth is over 26 MHz.

### 5.6.4 Test Deviation

There is no deviation with the original standard.

### 5.6.5 EUT Operation during Test

EUT is set to a test frequency and a test spreading code and put to reception state first.

### 5.6.6 Test Result

Please refer to ANNEXA.6.

## 5.7 Carrier sensing function (2)

### 5.7.1 Limit

Transmission device used for radio control of outdoor-use model-airplane (except frequency hopping system) shall provide a carrier sensing function that works at the start of the transmission.

### 5.7.2 Test Setup

See section 4.3.1 Diagram 7 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

### 5.7.3 Test Procedure

1 Set the output level of standard signal generator to the specified level at antenna input of EUT, Set the standard signal generator as follows:

Carrier frequency: Center of reception frequency band of EUT

Modulation: No modulation

Output level: Specified level at antenna input of EUT

2 Set the EUT to reception state

3 Turn on the output of the standard signal generator.

4 Set the EUT to transmission state and confirm using the spectrum analyzer that the EUT does not transmit radio wave. Set the spectrum analyzer as follows:

Center frequency: Center of frequency of test channel

Frequency sweep width: 50MHz

RBW: Approximately 1MHz

VBW: Approximately same as RBW

Y-axis scale: 10dB / div

Detection mode: Positive peak

5 Set the EUT to reception state

6 Turn off the output of the standard signal generator.

7 Set the EUT to transmission state and confirm using the spectrum analyzer that the EUT is transmitting radio wave.

### 5.7.4 Test Deviation

There is no deviation with the original standard.

### 5.7.5 EUT Operation during Test

EUT is set to a test frequency.

### 5.7.6 Test Result

Please refer to ANNEX A.7.

## 5.8 Transmission Antenna Gain (EIRP Antenna Power) Measurement

### 5.8.1 Limit

Item	Limits
EIRP Power Density	$\leq 16.91\text{dBm/MHz}$ (FHSS 2427 - 2470.75 MHz) $\leq 22.14\text{dBm/MHz}$ (OFDM, DSSS 2400~2483.5MHz) $\leq 22.14\text{dBm}$ (Other modulation method 2400~2483.5MHz)
Note: This test item will not be applied to the transmission antenna which has a gain of 2.14dBi or less	

### 5.8.2 Test Setup

See section 4.3.4 for test setup description for the antenna port.

### 5.8.3 Test Procedure

- 1 Set EUT and measuring antenna at the same height and roughly facing each other.
- 2 Set spectrum analyzer with RBW=1MHz, VBW=1MHz, Detector=Peak, Trace mode=Max Hold, and tune reference level to observe receiving signal position.
- 3 Move the measuring antenna height up and down within  $\pm 50\text{cm}$  of EUT height and swing it to find the maximum output of the measuring antenna. The output level at the spectrum analyzer is read as "E".
- 4 Remove the EUT from the turn table and put the replacing antenna facing to measuring antenna at same height. Set the standard signal generator (SSG) at same frequency and transmit on then receive the signal
- 5 Swing the replacing antenna give a maximum receiving level.
- 6 Move the measuring antenna height up and down within  $\pm 50\text{cm}$  of replacing antenna height and swing it to find the maximum receiving level.
- 7 Set SSG output power at  $P_t$  to give the equivalent output level of "E" or calculate  $P_t$  with SSG output which gives the nearest of "E" and difference ( $\pm 1\text{dB}$ ). Record the  $P_t$ .
- 8 Calculate EIRP by the formula below  $\text{EIRP} = G_t - L + P_t$ .  
Gt: gain of replacing antenna (dBi)  
L: feeder loss between SSG and replacing antenna  
Pt: Output power of the SSG
- 9 If the antenna for the EUT has circular polarization, sum of V-field and H-field will be result if measuring antenna is linear polarization.

### 5.8.4 Test Deviation

There is no deviation with the original standard.

#### 5.8.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

#### 5.8.6 Test Result

Please refer to ANNEXA.8.

## 5.9 Transmission Radiation Angle Width (3dB Beamwidth) Measurement

### 5.9.1 Limit

Item	Limits
3dB antenna beam width	$360/A$ (If $A < 1$ ; then $A = 1$ ) $A = \{\text{EIRP Power [mW]} / 16.36 \text{ for DS, OFDM}\}$ or $A = \{\text{EIRP Power [mW]} / 4.9 \text{ for FH}\}$
Note: This test item will not be applied to the transmission antenna which has a gain of 2.14dBi or less	

### 5.9.2 Test Setup

See section 4.3.4 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

### 5.9.3 Test Procedure

- 1 Set EUT and measuring antenna at the same height and roughly facing each other.
- 2 Set spectrum analyzer with RBW=1 MHz, VBW=1 KHz, Y scale=5 dB, Detector=Peak, Trace mode=Max Hold, and tune reference level to observe receiving signal position.
- 3 Rotate directions of the EUT horizontally and vertically to find the maximum receiving power.
- 4 Move the measuring antenna height up and down within  $\pm 50\text{cm}$  of EUT height and swing it to find the maximum output of measuring antenna. The output level at the spectrum analyzer is read as "E"
- 5 Calculate permitted radiation angle in horizontal and vertical using EIRP measured in another test method.
- 6 Calculate 3dB antenna beam width by the formula below  $360/A$  (If  $A < 1$ ; then  $A = 1$ ).  $A = \{\text{EIRP Power [mW]} / 16.36 \text{ for DS, OFDM}\}$  or  $A = \{\text{EIRP Power [mW]} / 4.9 \text{ for FH}\}$

### 5.9.4 Test Deviation

There is no deviation with the original standard.

### 5.9.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

### 5.9.6 Test Result

Please refer to ANNEX A.9.



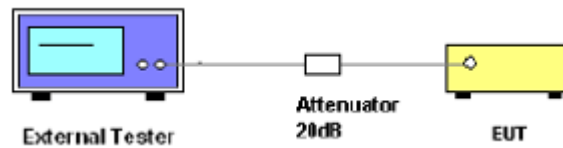
## 5.10 Radio Interference Prevention Capability Measurement

### 5.10.1 Limit

Item	Limits
Identification	$\geq 48$ bits

### 5.10.2 Test Setup

The photo of test setup please refer to ANNEX B.



### 5.10.3 Test Procedure

- 1 In the case that the EUT has the function of automatically transmitting the identification code: a. Transmit the predetermined identification codes from EUT. b. Check the transmitted identification codes with the demodulator.
- 2 In the case of receiving the identification code: a. Transmit the predetermined identification codes from the counterpart. b. Check if communication is normal. c. Transmit the signals other than predetermined ID codes from the counterpart. d. check if the EUT stops the transmission, or if it displays that identification codes are different from the predetermined ones.

### 5.10.4 Test Deviation

There is no deviation with the original standard.

### 5.10.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

### 5.10.6 Test Result

Please refer to ANNEXA.10.

## ANNEX A TEST RESULT

### A.1 Frequency Error

#### Test Data

Mode	Test Voltage	Channel	Frequency f <sub>c</sub> (MHz)	Test Frequency f (MHz)	Frequency Error ppm	Verdict
Un-modulated	LV	Low	2412	2411.988832	-4.63	Pass
		Middle	2442	2441.985761	-5.83	Pass
		High	2472	2471.986504	-5.46	Pass
	NV	Low	2412	2411.989070	-4.53	Pass
		Middle	2442	2441.988075	-4.88	Pass
		High	2472	2471.988069	-4.83	Pass
	HV	Low	2412	2411.988757	-4.66	Pass
		Middle	2442	2441.987688	-5.04	Pass
		High	2472	2471.986629	-5.41	Pass

## A.2 Occupied Bandwidth and Spread-spectrum Bandwidth / Factor

### Test Data

Note1: Spread Spectrum Factor = Spread Bandwidth / transmission rate, (transmission rate = 1.375 for 802.11b; transmission rate = 1.5 for 802.11g / 802.11n (20M)

802.11b

Results of Occupied Bandwidth	Channel	Test Voltage	Measured 99% Occupied Bandwidth (MHz)		Verdict
	Low	LV	13.45		Pass
		NV	13.44		Pass
		HV	13.43		Pass
	Middle	LV	13.39		Pass
		NV	13.33		Pass
		HV	13.34		Pass
	High	LV	13.23		Pass
		NV	13.28		Pass
		HV	13.24		Pass
Results of Spread-spectrum Bandwidth	Channel	Test Voltage	Measured 90% Spread-spectrum Bandwidth (MHz)	Spread Spectrum Factor	Verdict
	Low	LV	8.68	6.31	Pass
		NV	8.64	6.28	Pass
		HV	8.80	6.40	Pass
	Middle	LV	8.64	6.28	Pass
		NV	8.61	6.26	Pass
		HV	8.60	6.25	Pass
	High	LV	8.47	6.16	Pass
		NV	8.48	6.17	Pass
		HV	8.42	6.12	Pass

802.11g

Results of Occupied Bandwidth	Channel	Test Voltage	Measured 99% Occupied Bandwidth (MHz)		Verdict
	Low	LV	16.65		Pass
		NV	16.71		Pass
		HV	16.70		Pass
	Middle	LV	16.58		Pass
		NV	16.59		Pass
		HV	16.64		Pass
	High	LV	16.63		Pass
		NV	16.57		Pass
		HV	17.68		Pass
Results of Spread-spectrum Bandwidth	Channel	Test Voltage	Measured 90% Spread-spectrum Bandwidth (MHz)	Spread Spectrum Factor	Verdict
	Low	LV	15.04	10.02	Pass
		NV	15.04	10.02	Pass
		HV	15.03	10.02	Pass
	Middle	LV	14.96	9.97	Pass
		NV	15.00	10.00	Pass
		HV	15.06	10.04	Pass
	High	LV	14.80	9.87	Pass
		NV	14.76	9.84	Pass
		HV	14.93	9.95	Pass

802.11n- 20 MHz

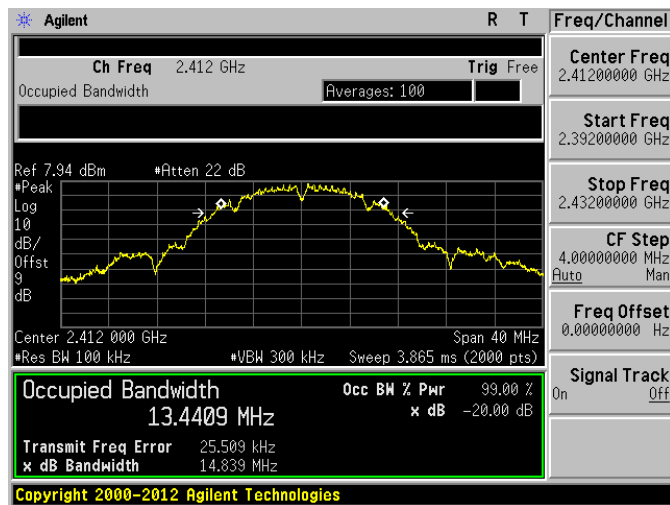
Results of Occupied Bandwidth	Channel	Test Voltage	Measured 99% Occupied Bandwidth (MHz)		Verdict
	Low	LV	17.82		Pass
		NV	17.83		Pass
		HV	17.82		Pass
	Middle	LV	17.74		Pass
		NV	17.74		Pass
		HV	17.74		Pass
	High	LV	17.74		Pass
		NV	17.70		Pass
		HV	17.72		Pass
Results of Spread-spectrum Bandwidth	Channel	Test Voltage	Measured 90% Spread-spectrum Bandwidth (MHz)	Spread Spectrum Factor	Verdict
	Low	LV	16.07	10.71	Pass
		NV	16.02	10.68	Pass
		HV	16.02	10.68	Pass
	Middle	LV	16.00	10.67	Pass
		NV	15.96	10.64	Pass
		HV	15.91	10.61	Pass
	High	LV	15.73	10.49	Pass
		NV	15.75	10.50	Pass
		HV	15.78	10.52	Pass

## Test plots (Occupied Bandwidth)

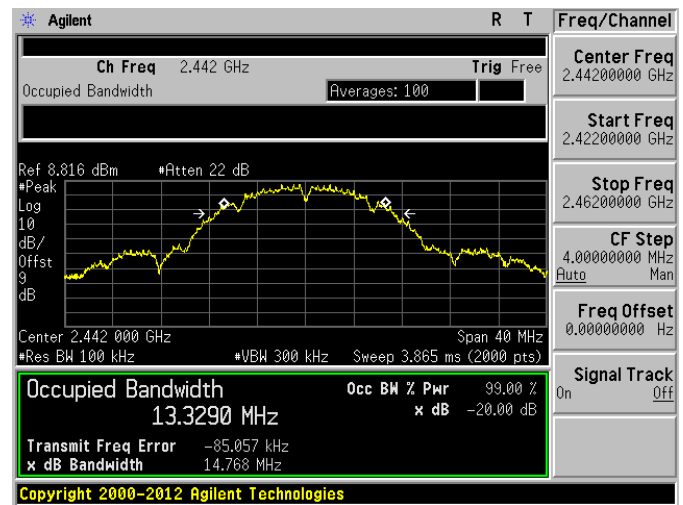
Note: All configurations have been tested, only the Test Voltage NV shown here.

### 802.11b (99% Occupied Bandwidth)

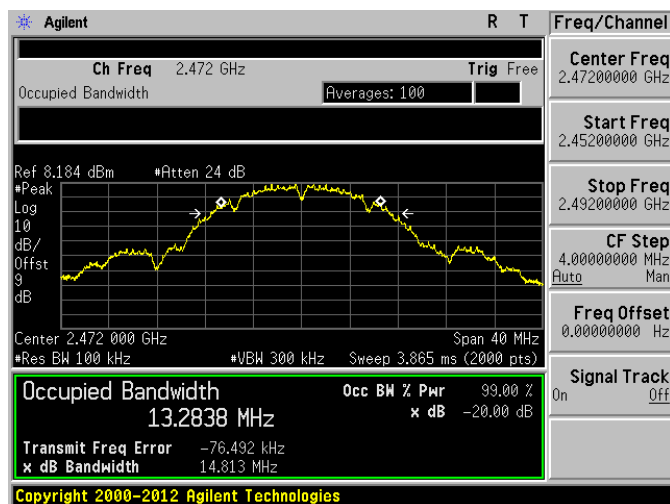
#### A.2.1, 802.11b Low Channel NV:



#### A.2.2, 802.11b Middle Channel NV:

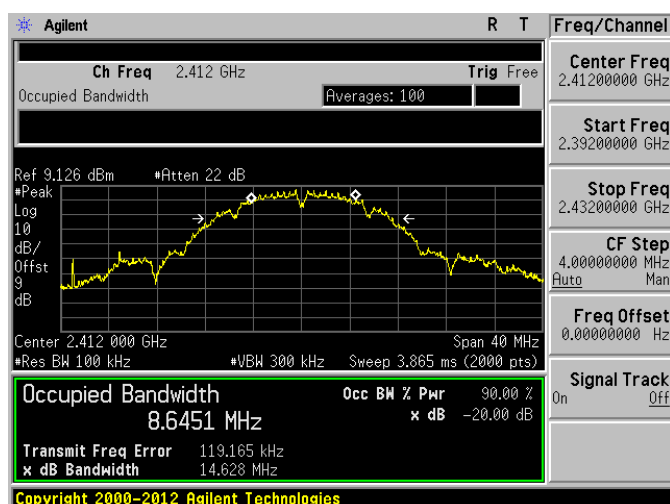


#### A.2.3, 802.11b High Channel NV:

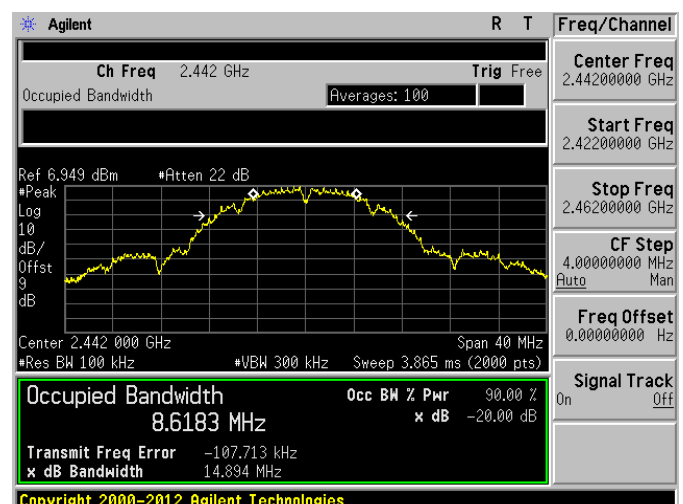


### 802.11b (90% Spread-spectrum Bandwidth)

#### A.2.4, 802.11b Low Channel NV:

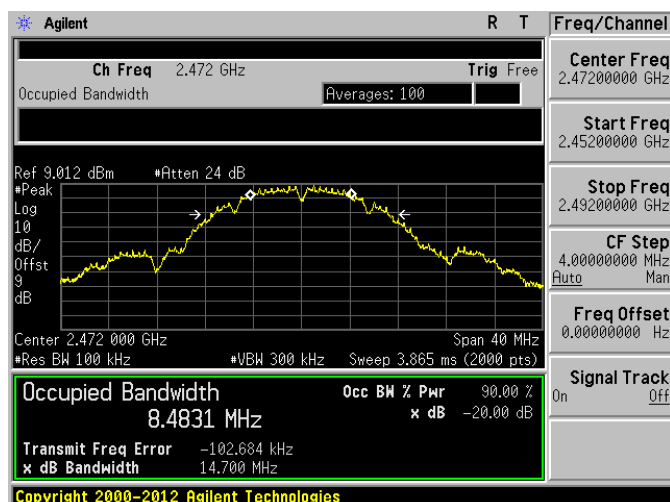


#### A.2.5, 802.11b Middle Channel NV:



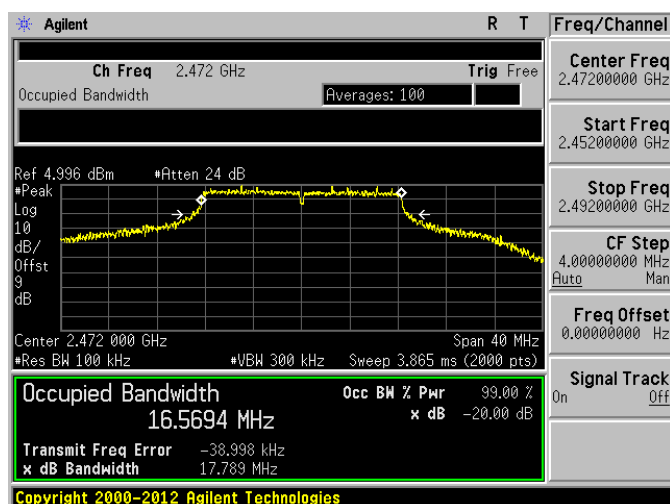


### A.2.6, 802.11b High Channel NV:

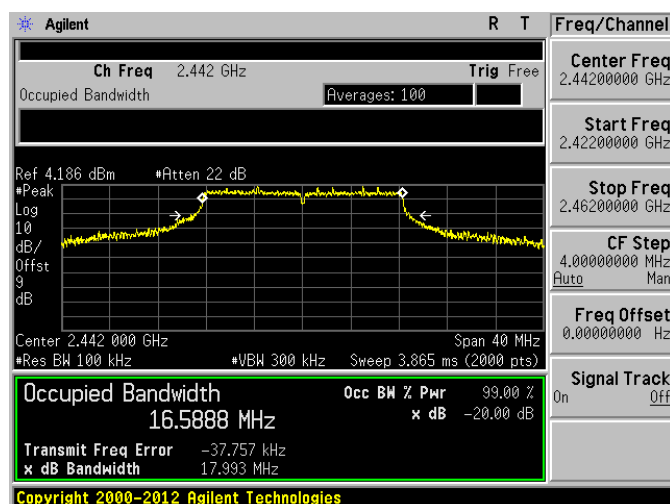


### 802.11g (99% Occupied Bandwidth)

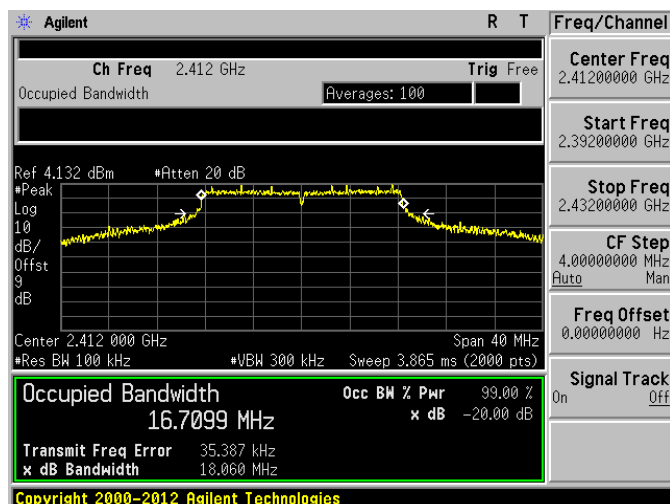
#### A.2.7, 802.11g Low Channel NV:



#### A.2.8, 802.11g Middle Channel NV:

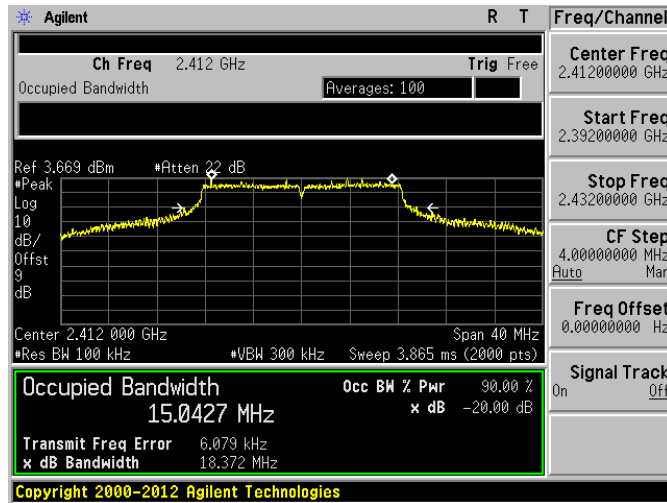


### A.2.9, 802.11g High Channel NV:

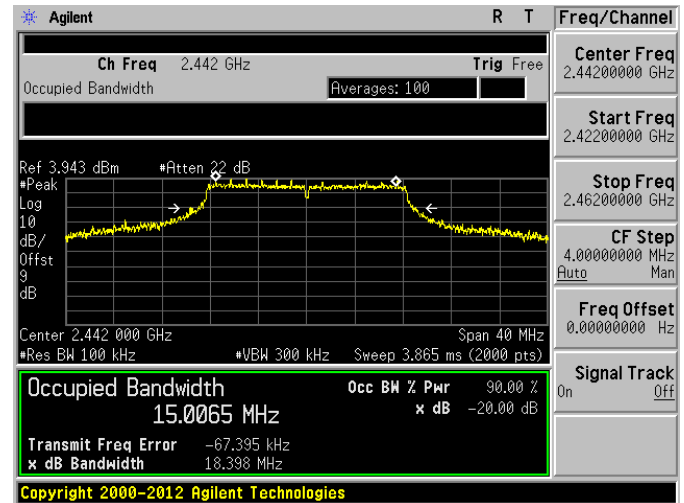


## 802.11g (90% Spread-spectrum Bandwidth)

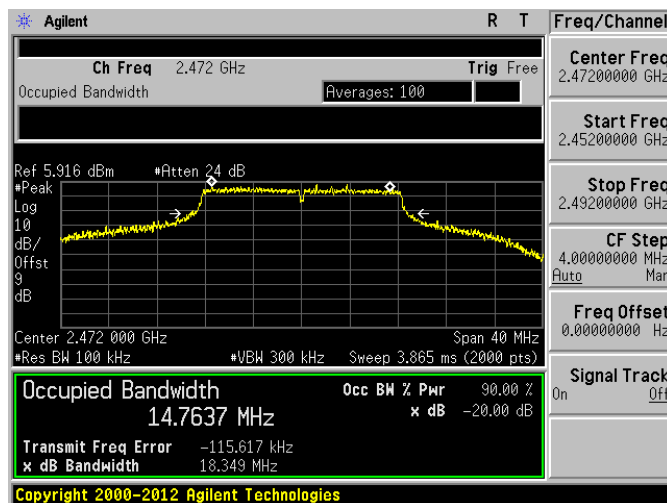
## A.2.10, 802.11g Low Channel NV:



## A.2.11, 802.11g Middle Channel NV:

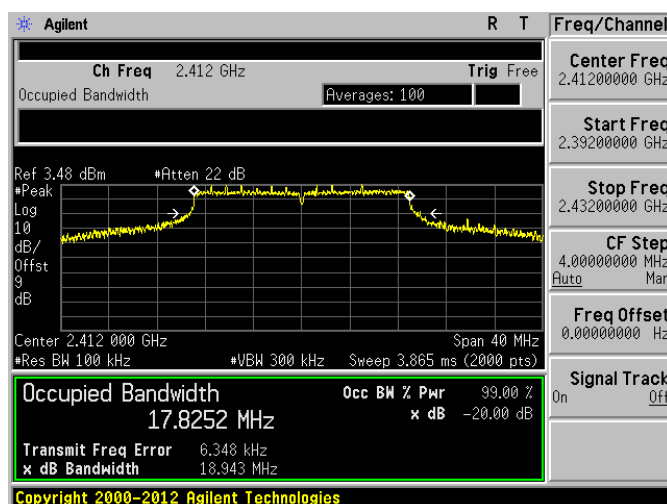


## A.2.12, 802.11g High Channel NV:

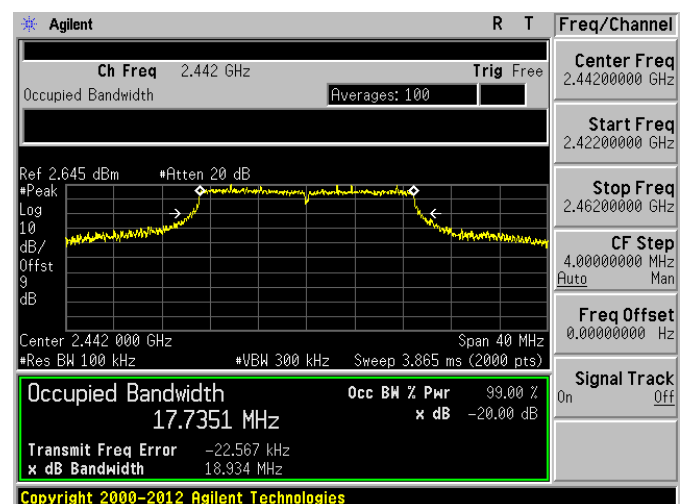


## 802.11n -20MHz (99% Occupied Bandwidth)

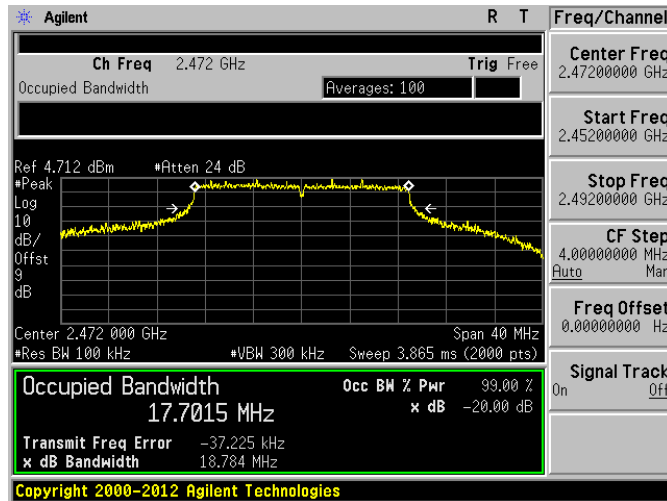
## A.2.13, 802.11n-20 MHz Low Channel NV:



## A.2.14, 802.11n-20 MHz Middle Channel NV:

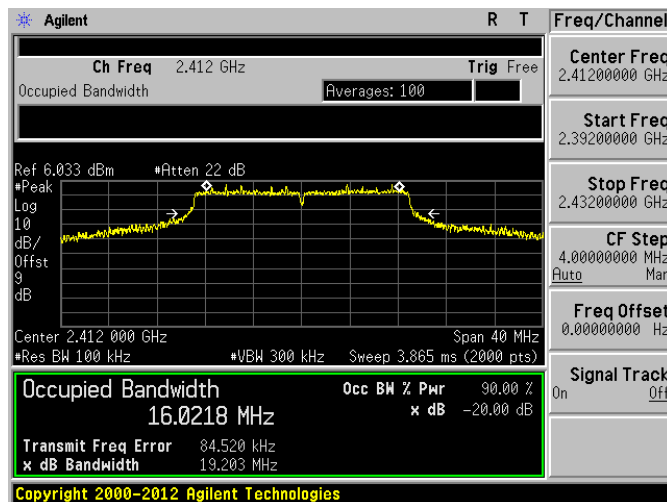


### A.2.15, 802.11 n-20 MHz High Channel NV:

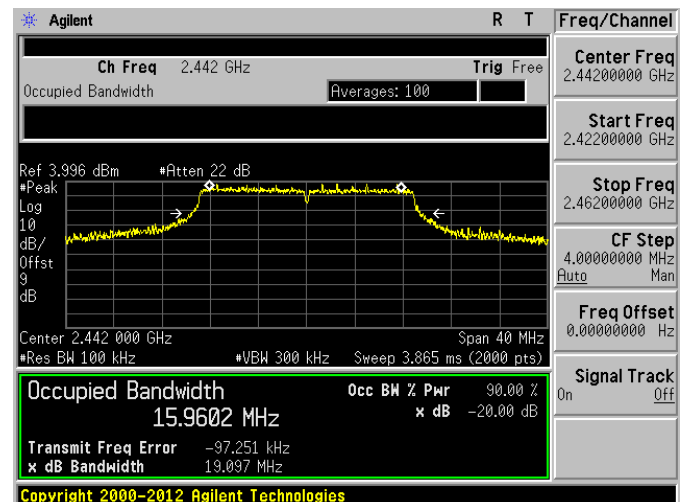


### 802.11n -20MHz (90% Spread-spectrum Bandwidth)

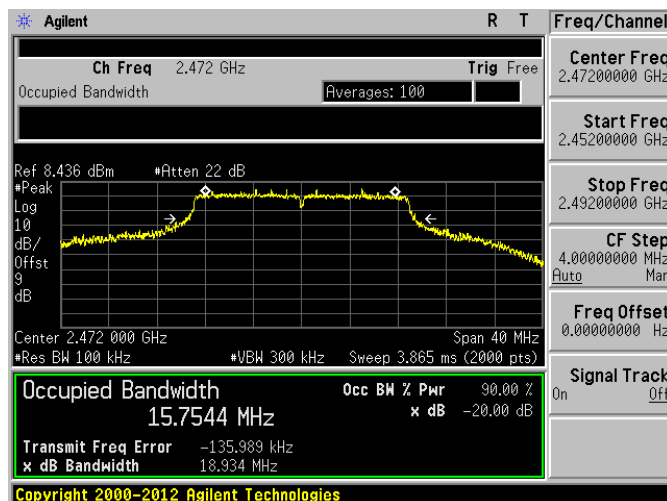
#### A.2.16, 802.11 n-20 MHz Low Channel NV:



#### A.2.17, 802.11 n-20 MHz Middle Channel NV:



### A.2.18, 802.11 n-20 MHz High Channel NV:



### A.3 Unwanted Emission Intensity Measurement

#### Test Data

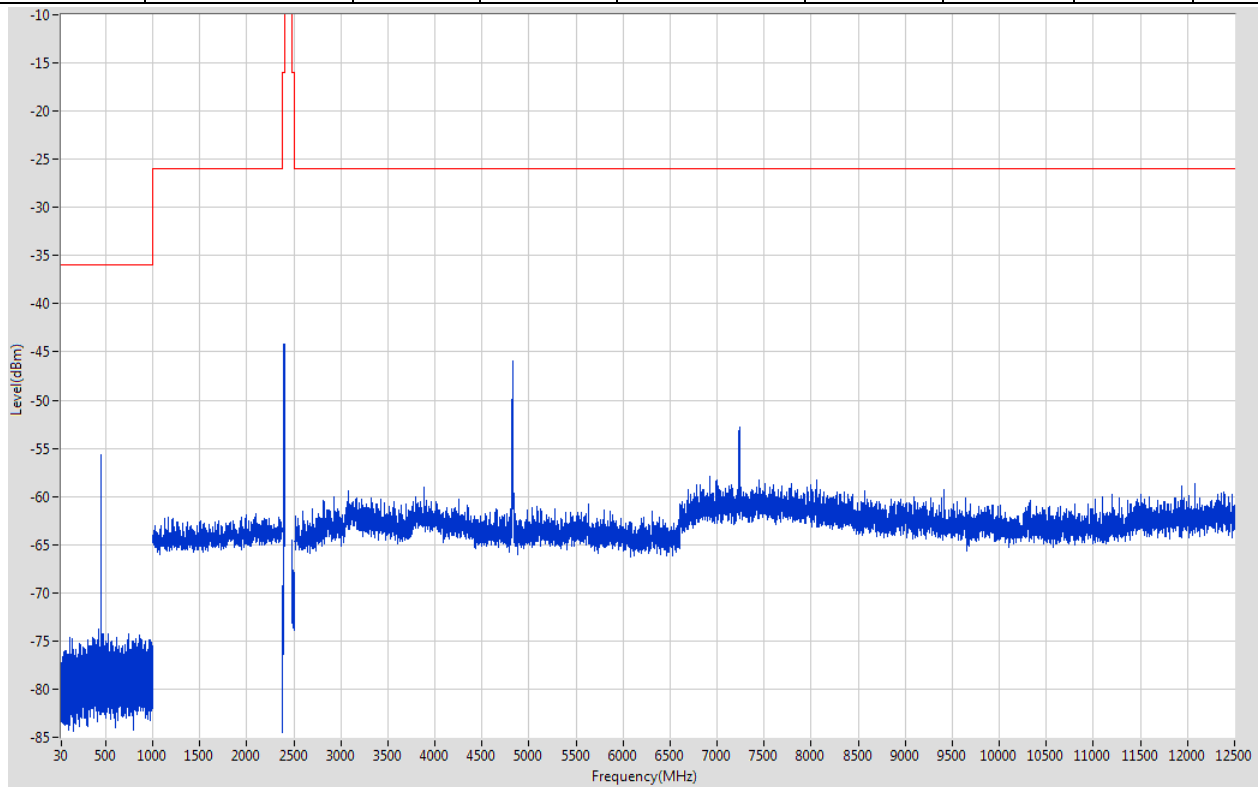
Note: All configurations have been tested, only the worst configuration (Test Voltage NV) shown here.

Mode	Test Voltage	Channel	Refer to Plot	Verdict
802.11b	NV	Low	A.3.1	Pass
		Middle	A.3.2	Pass
		High	A.3.3	Pass
802.11g	NV	Low	A.3.4	Pass
		Middle	A.3.5	Pass
		High	A.3.6	Pass
802.11n-20 MHz	NV	Low	A.3.7	Pass
		Middle	A.3.8	Pass
		High	A.3.9	Pass

### Test plots

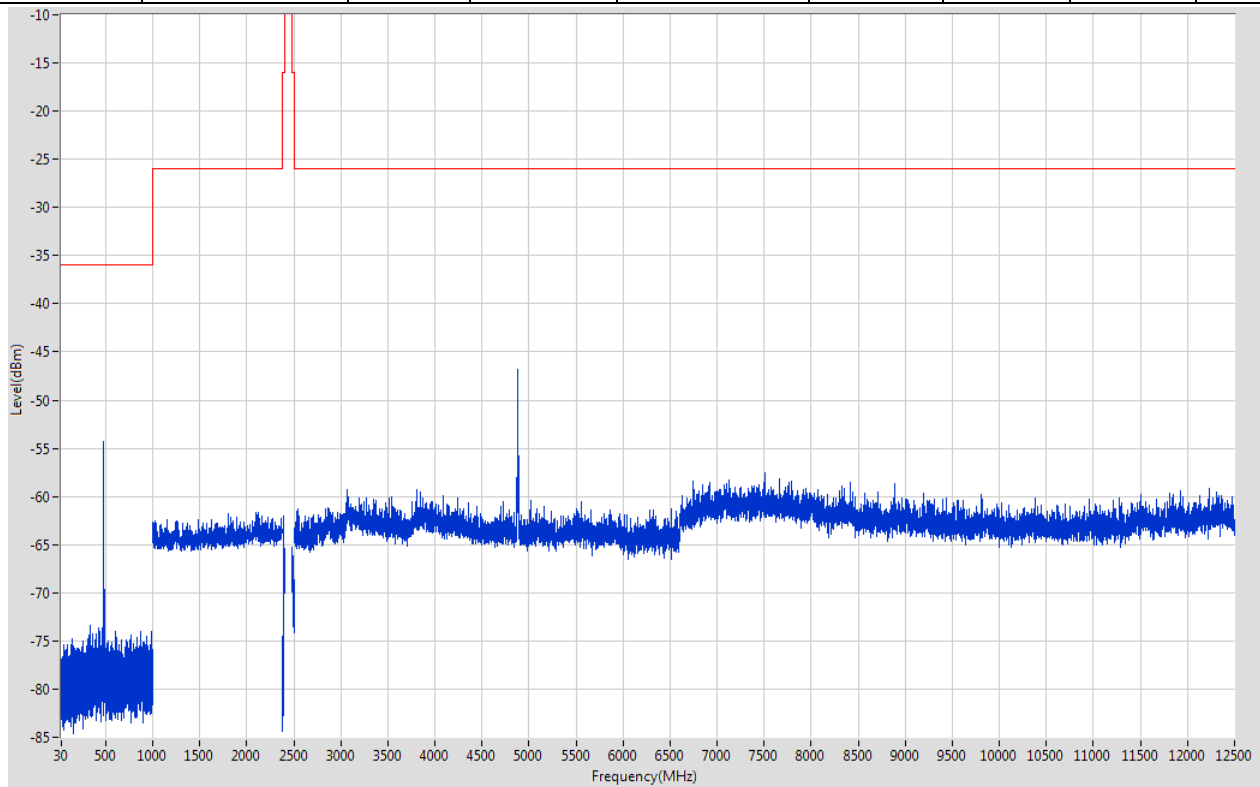
#### A.3.1, 802.11b NV Low Channel:

Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	1000	0.1	Peak	451.251	-55.67	-36	Pass	9699
1000	2374	1	Peak	2102.803	-61.74	-26	Pass	1374
2374	2400	0.03	Peak	2396.994	-44.13	-16	Pass	866
2483.5	2509.5	0.03	Peak	2484.582	-64.55	-16	Pass	866
2509.5	6000	1	Peak	4823.494	-45.88	-26	Pass	3490
6000	12500	1	Peak	7237.190	-52.84	-26	Pass	6500



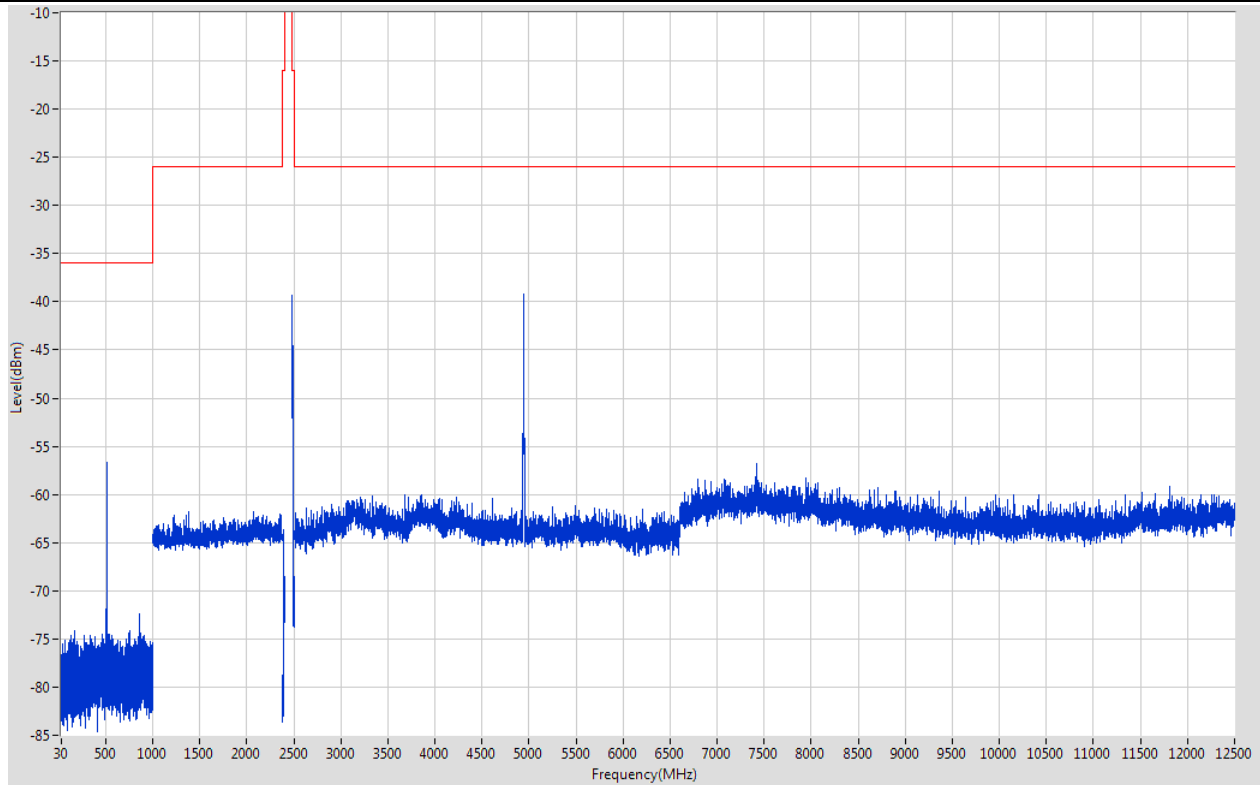
## A.3.2, 802.11b NV Middle Channel:

Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	1000	0.1	Peak	481.255	-54.25	-36	Pass	9699
1000	2374	1	Peak	2118.814	-61.69	-26	Pass	1374
2374	2400	0.03	Peak	2393.207	-62.06	-16	Pass	866
2483.5	2509.5	0.03	Peak	2484.402	-65.34	-16	Pass	866
2509.5	6000	1	Peak	4883.520	-46.83	-26	Pass	3490
6000	12500	1	Peak	7511.232	-57.53	-26	Pass	6500



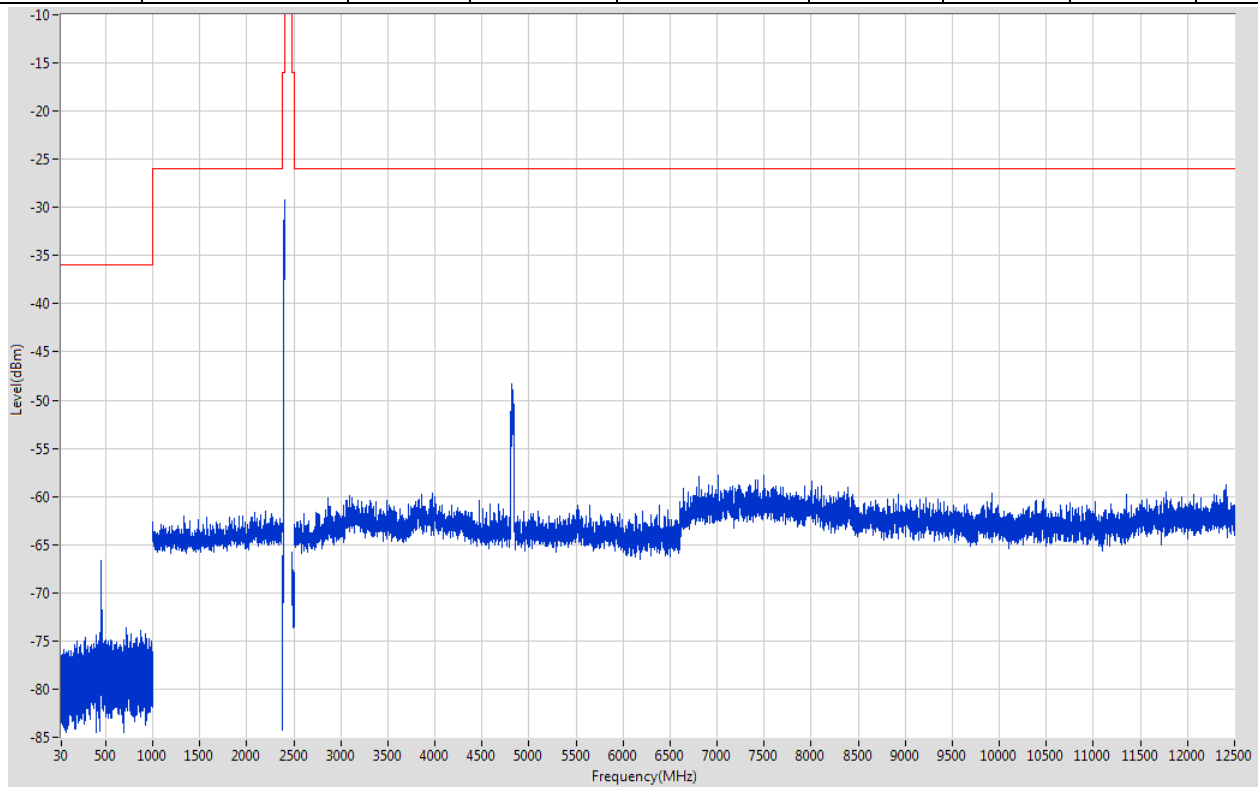
### A.3.3, 802.11b NV High Channel:

Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	1000	0.1	Peak	511.259	-56.70	-36	Pass	9699
1000	2374	1	Peak	1382.278	-61.75	-26	Pass	1374
2374	2400	0.03	Peak	2394.890	-63.61	-16	Pass	866
2483.5	2509.5	0.03	Peak	2486.476	-39.38	-16	Pass	866
2509.5	6000	1	Peak	4944.546	-39.20	-26	Pass	3490
6000	12500	1	Peak	7418.218	-56.83	-26	Pass	6500



## A.3.4, 802.11g NV Low Channel:

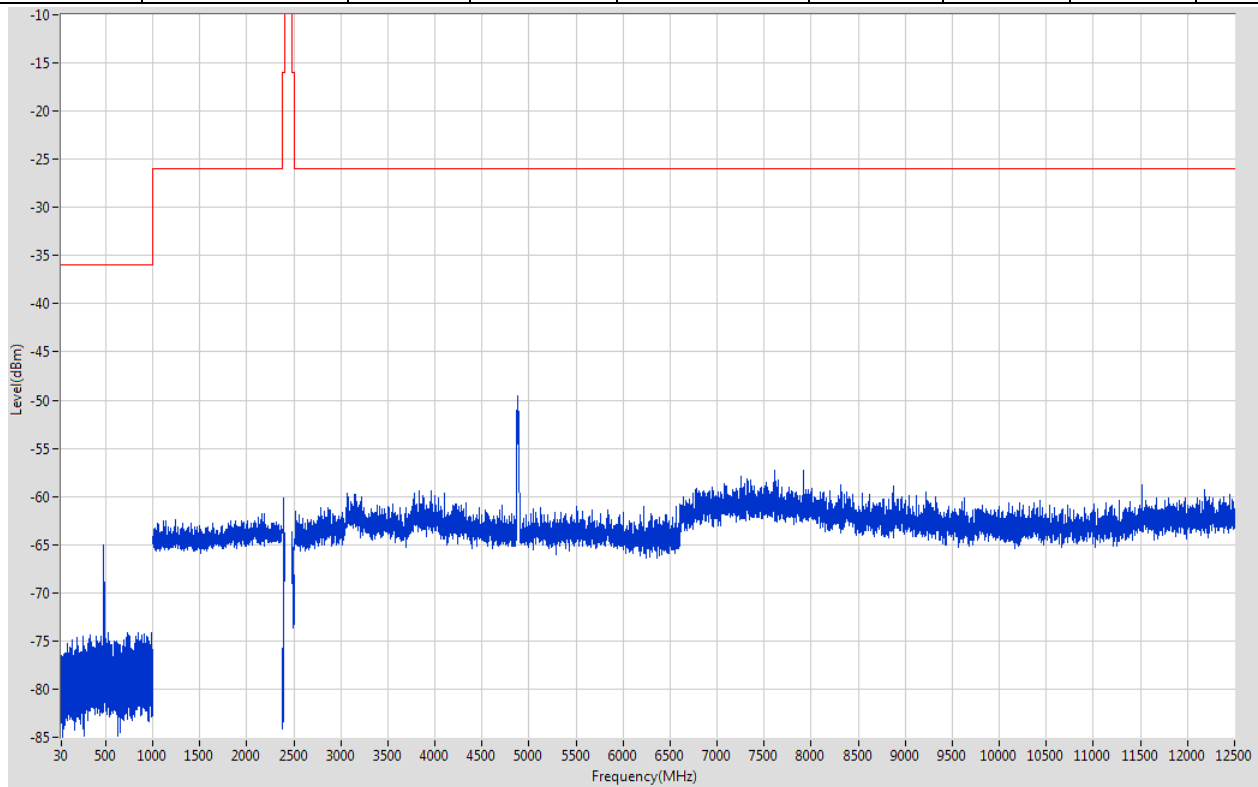
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	1000	0.1	Peak	450.551	-66.60	-36	Pass	9699
1000	2374	1	Peak	2198.873	-61.49	-26	Pass	1374
2374	2400	0.03	Peak	2399.760	-29.21	-16	Pass	866
2483.5	2509.5	0.03	Peak	2485.394	-65.73	-16	Pass	866
2509.5	6000	1	Peak	4819.493	-48.27	-26	Pass	3490
6000	12500	1	Peak	7493.230	-57.76	-26	Pass	6500





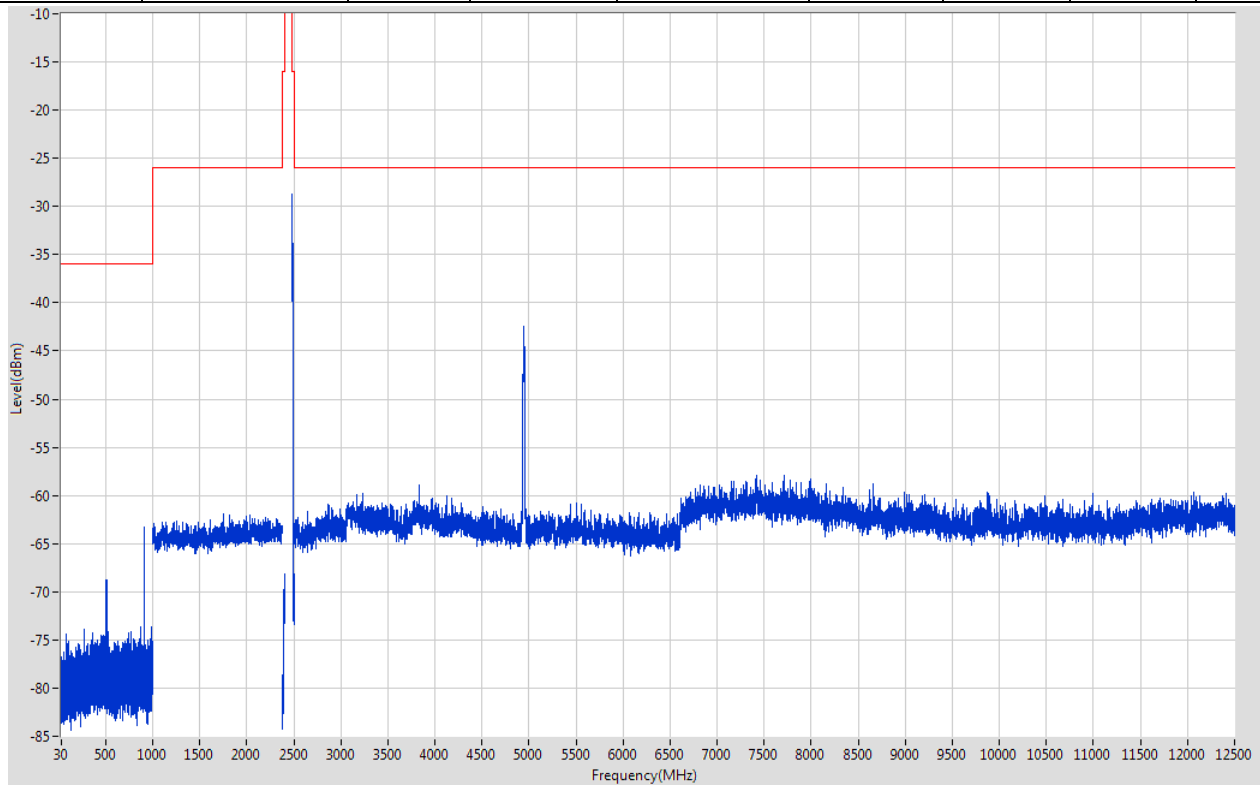
## A.3.5, 802.11g NV Middle Channel:

Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	1000	0.1	Peak	479.955	-65.03	-36	Pass	9699
1000	2374	1	Peak	2164.848	-61.80	-26	Pass	1374
2374	2400	0.03	Peak	2389.510	-60.20	-16	Pass	866
2483.5	2509.5	0.03	Peak	2486.115	-63.69	-16	Pass	866
2509.5	6000	1	Peak	4880.519	-49.53	-26	Pass	3490
6000	12500	1	Peak	7606.247	-57.33	-26	Pass	6500



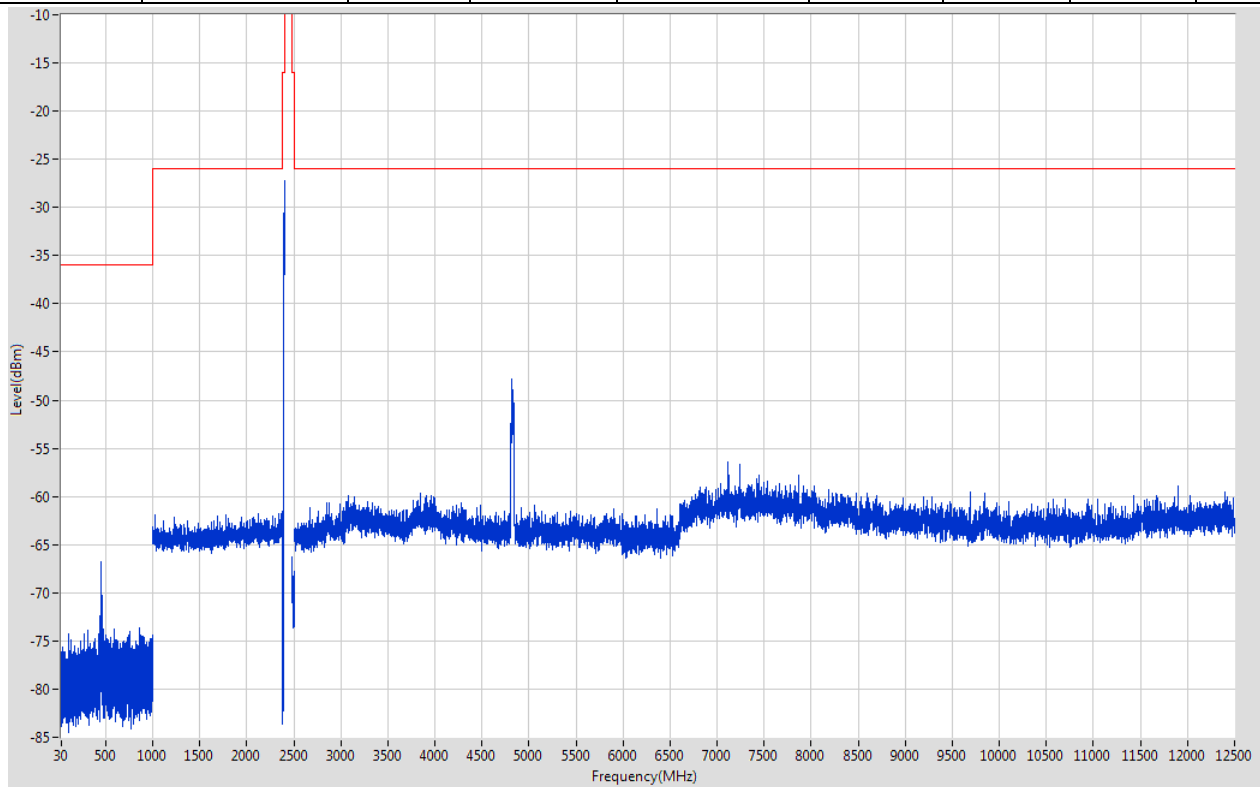
## A.3.6, 802.11g NV High Channel:

Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	1000	0.1	Peak	913.185	-63.25	-36	Pass	9699
1000	2374	1	Peak	1752.548	-61.96	-26	Pass	1374
2374	2400	0.03	Peak	2400.000	-68.16	-16	Pass	866
2483.5	2509.5	0.03	Peak	2483.861	-28.69	-16	Pass	866
2509.5	6000	1	Peak	4945.547	-42.48	-26	Pass	3490
6000	12500	1	Peak	7421.219	-57.93	-26	Pass	6500



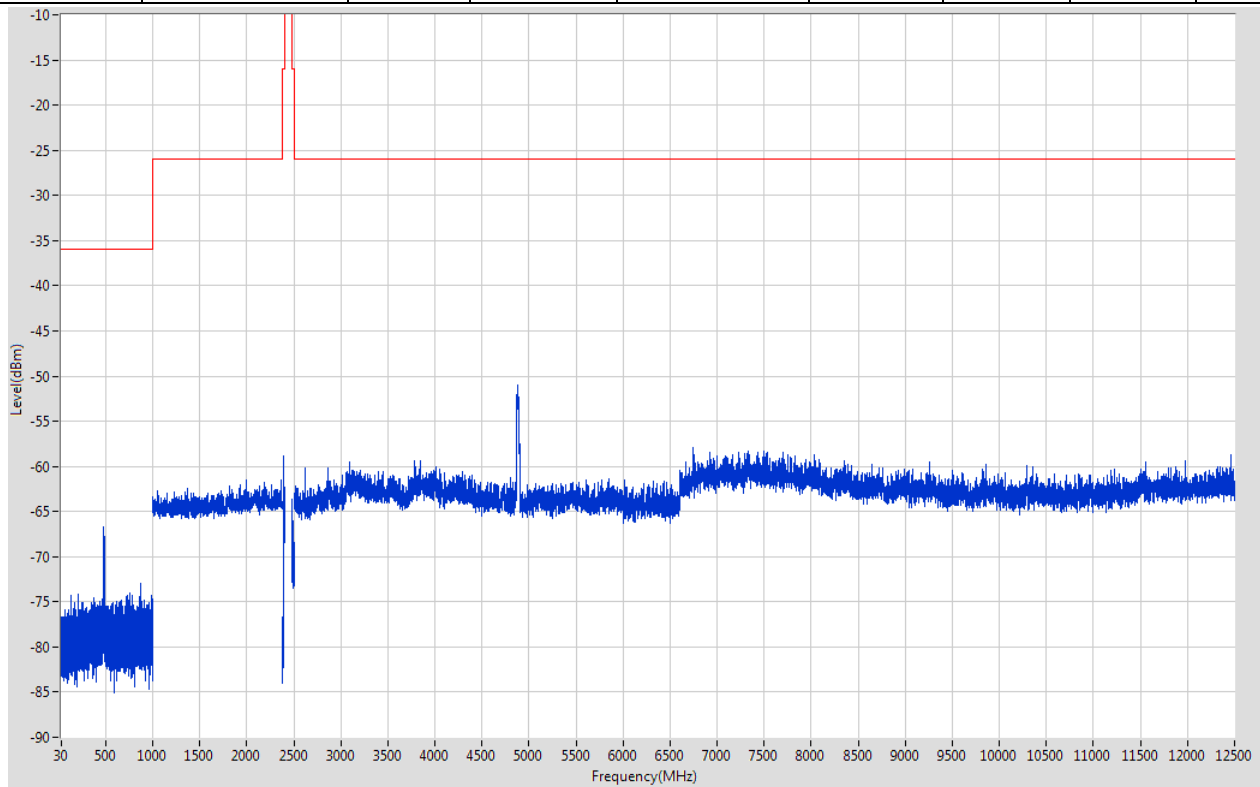
## A.3.7, 802.11n-20MHz NV Low Channel:

Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	1000	0.1	Peak	451.551	-66.80	-36	Pass	9699
1000	2374	1	Peak	2372.999	-61.55	-26	Pass	1374
2374	2400	0.03	Peak	2399.519	-27.25	-16	Pass	866
2483.5	2509.5	0.03	Peak	2483.590	-66.33	-16	Pass	866
2509.5	6000	1	Peak	4821.494	-47.79	-26	Pass	3490
6000	12500	1	Peak	7112.171	-56.43	-26	Pass	6500



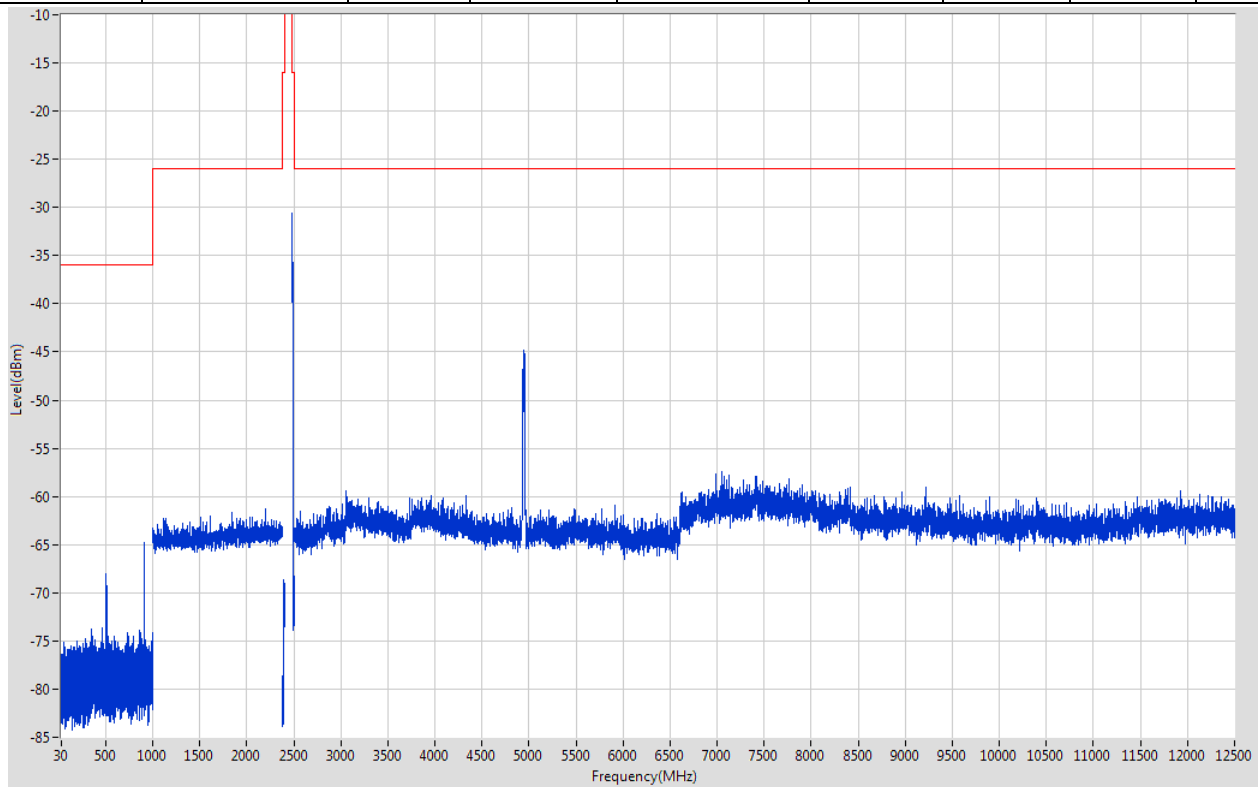
## A.3.8, 802.11n-20MHz NV Middle Channel:

Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	1000	0.1	Peak	481.655	-66.67	-36	Pass	9699
1000	2374	1	Peak	2362.992	-61.46	-26	Pass	1374
2374	2400	0.03	Peak	2390.712	-58.86	-16	Pass	866
2483.5	2509.5	0.03	Peak	2485.784	-63.65	-16	Pass	866
2509.5	6000	1	Peak	4882.520	-51.01	-26	Pass	3490
6000	12500	1	Peak	6749.115	-57.98	-26	Pass	6500



## A.3.9, 802.11n-20MHz NV High Channel:

Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	1000	0.1	Peak	905.775	-64.84	-36	Pass	9699
1000	2374	1	Peak	2199.873	-61.24	-26	Pass	1374
2374	2400	0.03	Peak	2396.754	-68.61	-16	Pass	866
2483.5	2509.5	0.03	Peak	2483.500	-30.62	-16	Pass	866
2509.5	6000	1	Peak	4946.547	-44.76	-26	Pass	3490
6000	12500	1	Peak	7054.162	-57.47	-26	Pass	6500



## A.4 Antenna Power Error Measurement

### 802.11b Test Result

Duty cycle =0.9761

Antenna Power Density PD = power meter value dBm (contains cable loss dB) +10 log<sub>10</sub>(1/ Duty cycle) dB

Manufacturer declares the conducted power density = 7.92mW/MHz

Test Channel	Power meter value (dBm)	Antenna Power Density PD (dBm/ MHz)	Antenna Power Density PD (mW / MHz)	Antenna Power Error	Verdict
Low	7.01	7.12	5.15	-35.02%	Pass
Middle	6.82	6.93	4.93	-37.80%	Pass
High	8.10	8.21	6.61	-16.48%	Pass

### 802.11g Test Result

Duty cycle =0.8701

Antenna Power Density PD = power meter value dBm (contains cable loss dB) +10 log<sub>10</sub>(1/ Duty cycle) dB

Manufacturer declares the conducted power density = 3.14mW/MHz

Test Channel	Power meter value (dBm)	Antenna Power Density PD (dBm/ MHz)	Antenna Power Density PD (mW / MHz)	Antenna Power Error	Verdict
Low	2.27	2.87	1.9383	-38.27%	Pass
Middle	2.73	3.33	2.1549	-31.37%	Pass
High	3.61	4.21	2.6389	-15.96%	Pass

802.11n-20 MHz Test Result

Duty cycle =0.8562

Antenna Power Density PD = power meter value dBm (contains cable loss dB) +10 log<sub>10</sub>(1/ Duty cycle) dB

Manufacturer declares the conducted power density = 2.77mW/MHz

Test Channel	Power meter value (dBm)	Antenna Power Density PD (dBm/ MHz)	Antenna Power Density PD (mW / MHz)	Antenna Power Error	Verdict
Low	2.14	2.81	1.9117	-30.98%	Pass
Middle	1.94	2.61	1.8257	-34.10%	Pass
High	2.71	3.38	2.1798	-21.31%	Pass

## A.5 Limitation of Collateral Emission of Receiver Measurement

### Test Data

Note: All configurations have been tested, only the worst configuration (Test Voltage NV) shown here.

Mode	Test Voltage	Channel	Refer to Plot	Verdict
802.11b	NV	Low	A.5.1	Pass
		Middle	A.5.2	Pass
		High	A.5.3	Pass
802.11g	NV	Low	A.5.4	Pass
		Middle	A.5.5	Pass
		High	A.5.6	Pass
802.11n-20MHz	NV	Low	A.5.7	Pass
		Middle	A.5.8	Pass
		High	A.5.9	Pass



### Test plots

#### A.5.1, 802.11b NV Low Channel:

Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	1000	0.1	Peak	908.078	-73.57	-54	Pass	9699
1000	6000	1	Peak	4296.659	-59.19	-47	Pass	5000
6000	12500	1	Peak	7150.177	-58.00	-47	Pass	6500

#### A.5.2, 802.11b NV Middle Channel:

Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	1000	0.1	Peak	761.889	-73.51	-54	Pass	9699
1000	6000	1	Peak	3797.56	-59.21	-47	Pass	5000
6000	12500	1	Peak	7789.275	-58.09	-47	Pass	6500

#### A.5.3, 802.11b NV High Channel:

Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	1000	0.1	Peak	470.154	-73.2	-54	Pass	9699
1000	6000	1	Peak	3824.565	-60.06	-47	Pass	5000
6000	12500	1	Peak	7513.233	-57.77	-47	Pass	6500

#### A.5.4, 802.11g NV Low Channel:

Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	1000	0.1	Peak	526.461	-73.62	-54	Pass	9699
1000	6000	1	Peak	3164.433	-59.25	-47	Pass	5000
6000	12500	1	Peak	7976.304	-57.88	-47	Pass	6500

#### A.5.5, 802.11g NV Middle Channel:

Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	1000	0.1	Peak	710.183	-73.82	-54	Pass	9699
1000	6000	1	Peak	3071.414	-58.74	-47	Pass	5000
6000	12500	1	Peak	7566.241	-57.88	-47	Pass	6500

## A.5.6, 802.11g NV High Channel:

Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	1000	0.1	Peak	875.835	-73.68	-54	Pass	9699
1000	6000	1	Peak	3796.559	-59.52	-47	Pass	5000
6000	12500	1	Peak	7380.212	-57.56	-47	Pass	6500

## A.5.7, 802.11n-20MHz NV Low Channel:

Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	1000	0.1	Peak	326.336	-73.69	-54	Pass	9699
1000	6000	1	Peak	4032.607	-59.61	-47	Pass	5000
6000	12500	1	Peak	7994.307	-57.45	-47	Pass	6500

## A.5.8, 802.11n-20MHz NV Middle Channel:

Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	1000	0.1	Peak	480.255	-72.28	-54	Pass	9699
1000	6000	1	Peak	3922.585	-59.42	-47	Pass	5000
6000	12500	1	Peak	7406.216	-57.08	-47	Pass	6500

## A.5.9, 802.11n-20MHz NV High Channel:

Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	1000	0.1	Peak	606.67	-73.84	-54	Pass	9699
1000	6000	1	Peak	3097.419	-59.4	-47	Pass	5000
6000	12500	1	Peak	6995.153	-57.36	-47	Pass	6500

## A.6 Carrier sensing function (1)

Note: Not applicable.

## A.7 Carrier sensing function (2)

Because of the EUT is not a radio control of outdoor-use model-airplane, so this test item will not be applied.

## A.8 Transmission Antenna Gain (EIRP Antenna Power) Measurement

Because of the antenna gain is less than 2.14dBi, so this test item will not be applied.

## A.9 Transmission Radiation Angle Width (3dB Bandwidth) Measurement

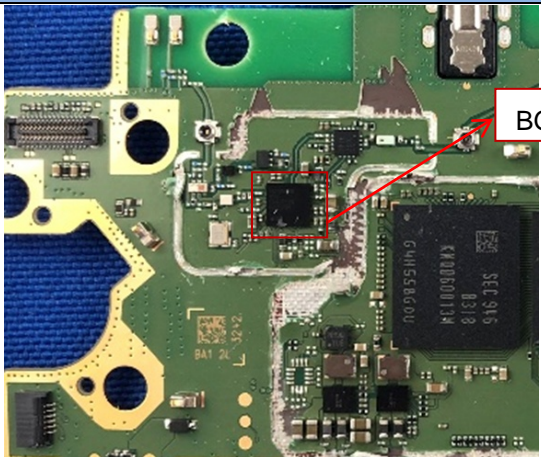
Because of the antenna gain is less than 2.14dBi, so this test item will not be applied.

## A.10 Radio Interference Prevention Capability Measurement

Test Voltage	Channel	Test Result (ID Code)	Verdict
LV	Low	GOOD	Pass
	Middle	GOOD	Pass
	High	GOOD	Pass
NV	Low	GOOD	Pass
	Middle	GOOD	Pass
	High	GOOD	Pass
HV	Low	GOOD	Pass
	Middle	GOOD	Pass
	High	GOOD	Pass

## A.11 Construction Protection Confirmation Method

The RF and modulation portions are protected against illegal modification as following method:

Protected Method	Description
Structure protection	The RF Module is BGA SoC IC, can't be easily modified
Reference Photo	
 <p>The photo shows a green printed circuit board (PCB) with various electronic components. A red box highlights a specific integrated circuit (IC) in the center. A red arrow points from a label 'BGA SoC IC' to this highlighted IC. The IC is a Ball Grid Array (BGA) package, which is a type of surface-mount technology where the pins are soldered directly onto the PCB pads.</p>	

## ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-EC2080218-AR”.

## ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-EC2080218-AW”.

## ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-EC2080218-AI”.

-- END OF REPORT --