



# **RF Test Report**

# For

# Beijing InHand Networks Technology Co., Ltd.

	Part 15C Subpart C §15.247		
Test Standards:	RSS 247 Issue 2		
Product Name:	Embedded Computer		
Tested Model:	INBOX710		
Additional Model No.:	INBOX712		
Brand Name:	inhand		
FCC ID:	2AANYINBOX710		
IC:	<u>11594A-INBOX710</u>		
Classification	(DTS) Digital Transmission System		
Report No.:	EC2105025RF01		
Tested Date:	2021-10-12 to 2021-12-03		
Issued Date:	<u>2021-12-03</u>		
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Note: The test results in this report apply exclusively to the tested model / sample. Without written approval of

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# **Report Revise Record**

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	2021.12.03	Valid	Original Report



# TABLE OF CONTENTS

1	TES	T LABORATORY	5
	1.1	Test facility	5
2	GEN	ERAL DESCRIPTION	6
	2.1	Applicant	6
	2.2	Manufacturer	6
	2.3	General Description Of EUT	6
	2.4	Modification of EUT	7
	2.5	Applicable Standards	7
3	TES	T CONFIGURATION OF EQUIPMENT UNDER TEST	8
	3.1	Descriptions of Test Mode	8
	3.2	Test Mode	8
	3.3	Support Equipment	9
	3.4	Test Setup	10
	3.5	Measurement Results Explanation Example	13
4	TES	T RESULT	14
	4.1	DTS and Occupied Channel Bandwidth Measurement	14
	4.2	Maximum Conducted Output Power Measurement	15
	4.3	Maximum Power Spectral Density Measurement	16
	4.4	Band Edges and Spurious Emission Measurement	
	4.5	Radiated Band Edges and Spurious Emission Measurement	
	4.6	AC Conducted Emission Measurement	
	4.7	Antenna Requirements	85
5	LIST	OF MEASURING EQUIPMENT	86
6	UNC	ERTAINTY OF EVALUATION	88
	Арр	endix A: DTS Bandwidth	89
		endix B: Occupied Channel Bandwidth	
		endix C: Maximum conducted output power	
	•••	endix D: Duty Cycle	
	•••	endix E: Maximum power spectral density	
		endix F: Band edge measurements	
		endix G: Conducted Spurious Emission	
	Арр	endix H: Setup Photographs	

# **Summary Of Test Result**

FCC Rule	IC Rule	Description	Limit	Result	Remark
15.247(a)(2)	RSS-247 5.2(a)	6dB Bandwidth	≥ 0.5MHz	Pass	-
-	RSS-Gen 6.7	99% Bandwidth	-	Pass	-
15.247(b)(3)	RSS-247 A5.4(d)	Output Power	≤ 30dBm	Pass	-
15.247(e)	RSS-247 5.2(b)	Power Spectral Density	≤ 8dBm/3kHz	Pass	-
15.247(d)	RSS-247 5.5	Conducted Band Edges and Spurious Emission	≤ 30dBc	Pass	-
15.247(d)	RSS-247 5.5	Radiated Band Edges and Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 3.76 dB at 2390 MHz
15.207	RSS-GEN 8.8	AC Conducted Emission	15.207(a)	Pass	Under limit 6.80 dB at 0.672 MHz
15.203 & 15.247(b)	RSS-GEN 6.8	Antenna Requirement	15.203 & 15.247(b) RSS-GEN 6.8	Pass	-



# 1 Test Laboratory

# 1.1 Test facility

# CNAS (accreditation number: L11138)

Hunan Ecloud Testing Technology Co., Ltd. has obtained the accreditation of China National Accreditation

Service for Conformity Assessment (CNAS).

# FCC (Designation number: CN1244, Test Firm Registration Number: 793308)

Hunan Ecloud Testing Technology Co., Ltd. has been listed on the US Federal Communications Commission

list of test facilities recognized to perform electromagnetic emissions measurements.

# ISED(CAB identifier: CN0012, ISED# :24347)

Hunan Ecloud Testing Technology Co., Ltd. has been listed on the Wireless Device Testing Laboratories list of

innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements.

# A2LA (Certificate Code : 4895.01)

Hunan Ecloud Testing Technology Co., Ltd. has been listed by American Association for Laboratory

Accreditation to perform electromagnetic emission measurement.



# 2 General Description

## 2.1 Applicant

#### Beijing Inhand Networks Technology Co., Ltd.

Room 501, floor 5, building 3, yard 18, ziyue road, chaoyang district, Beijing

## 2.2 Manufacturer

#### Beijing Inhand Networks Technology Co., Ltd.

Room 501, floor 5, building 3, yard 18, ziyue road, chaoyang district, Beijing

# 2.3 General Description Of EUT

Product	Embedded Computer
Model No.	INBOX710
Brand Name	Inhand
Additional No.	INBOX712
	These models are the same in these:appearance,PCB
Difference Description	layout and basic software function;The only difference is
	that the products are used in different markets.
FCC ID	2AANYINBOX710
IC	11594A-INBOX710
Power Supply*	12Vdc
Modulation TechnologyCCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM	
Modulation Type	802.11b : DSSS
	802.11g/n : OFDM
Operating Frequency	2412-2462MHz
Number Of Channel	11
Max. Output Power	802.11b : 13.81 dBm (0.0240 W) 802.11g : 14.22 dBm (0.0264 W) 802.11n HT20 : 14.13 dBm (0.0259 W)
Max. e.i.r.p.	17.22 dBm (0.0527W)
Antenna Type	Suction cup Antenna with 3dBi gain
HW Version	V22
SW Version	V1.4
I/O Ports	Refer to user's manual



- 1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
- 2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.
- 3. Antenna listed as below

Cable No.	Description	Connector	Length	Supplied by
1	WIFI /BT Antenna	RP-SMA-J	2.5m	Applicant
2	3/4G Antenna	SMA-J	2.0m	Applicant
3	3/4G Antenna	SMA-J	2.0m	Applicant

4. The EUT was powered by the following adapters:

MODEL:	KT241120200M2
INPUT:	100-240V~50/60Hz 0.8A
OUTPUT:	12V DC 2A
DC LINE:	2.5 m

# 2.4 Modification of EUT

No modifications are made to the EUT during all test items.

# 2.5 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247
- ANSI C63.10-2013
- IC RSS-247 Issue 2
- IC RSS-Gen Issue 5
- KDB 558074 D01 15.247 Meas Guidance v05r02

#### Remark:

1. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B&ICES-003, recorded in a separate test report.



# **3** Test Configuration of Equipment Under Test

# 3.1 Descriptions of Test Mode

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

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
1	2412 MHz	7	2442 MHz
2	2417 MHz	8	2447 MHz
3	2422 MHz	9	2452 MHz
4	2427 MHz	10	2457 MHz
5	2432 MHz	11	2462 MHz
6	2437 MHz		

The transmitter has a maximum conducted output power as follows:

Frequency Range(MHz)	Mode	Rate	Output Power(dBm)
2412~2462	802.11b	1Mbps	13.81
2412~2462	802.11g	6Mbps	14.22
2412~2462	802.11n HT20	MCS0	14.13

a. Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

## 3.2 Test Mode

#### 3.2.1 Antenna Port Conducted Measurement

Summary table of Test Cases					
Tast Kom	Modulation				
Test item	Test Item 802.11 b 802.11 g 802.11 n HT				
Conducted	Mode 1: CH01	Mode 1: CH01	Mode 1: CH01		
Test Cases	Mode 2: CH06	Mode 2: CH06	Mode 2: CH06		
Test Cases	Mode 3: CH011	Mode 3: CH011	Mode 3: CH011		

## 3.2.2 Radiated Emission Test (Below 1GHz)

Radiated	802.11n HT20
Test Cases	Mode 3: CH011

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Note : 1. Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type. Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

2. Following channel(s) was (were) selected for the final test as listed above

## 3.2.3 Radiated Emission Test (Above 1GHz)

Test Item		Modulation	
rest tiell	802.11 b	802.11 g	802.11n HT20
Dediated	Mode 1: CH01	Mode 1: CH01	Mode 1: CH01
Radiated	Mode 2: CH06	Mode 2: CH06	Mode 2: CH06
Test Cases	Mode 3: CH11	Mode 3: CH11	Mode 3: CH11

Note : 1. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

2. Following channel(s) was (were) selected for the final test as listed above

3. For frequency above 18GHz, the measured value is much lower than the limit, therefore, it is not reflected in the report.

#### 3.2.4 Power Line Conducted Emission Test:

AC	
Conducted	Mode 1 : WLAN Linking + RJ45 ping + HDMI + USB Playing + Adapter
Emission	

## 3.3 Support Equipment

ltem	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	NETGEAR	R7800	PY315100319	N/A	shielded, 1.8 m
2.	Notebook	Lenovo	E470C	FCC sDoC	N/A	shielded cable DC O/P 1.8 m unshielded AC I/P cable1.2 m
3.	Computer Monitior	PHILIPS	243E9Q	SDOC	UK0A1947000361	N/A
4.	Keyboard	Lenovo	EKB-536A	SDOC	801J9679	NA
5.	Mouse	Logitech	U0026	SDOC	810-002149	NA



**Test Setup** 3.4

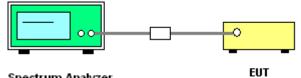
The EUT is continuously communicating to the WIFI tester during the tests.

EUT was set in the Hidden menu mode to enable WIFI communications.

The following picture is a screenshot of the test software

Ampak RFTes	rTool, VER: 6.1				i
	ю			FUNCTIONS	
Fimodule type SDIO		config module, type=SDIO iface=witer/0 o Saccent int, citiva Saccent Saccent	frv, type=<>> module_name=banschil drv_path=:	datarffestlod/bcm3hd ko (w. paths/datarffestlod/fw. bcmdi	á "míg bis ev, pathe viata (rítesttoo) evram tot
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	Advanced				
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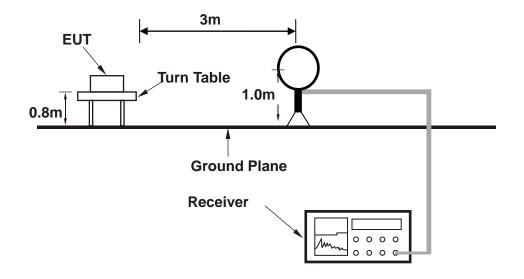
Setup diagram for Conducted Test



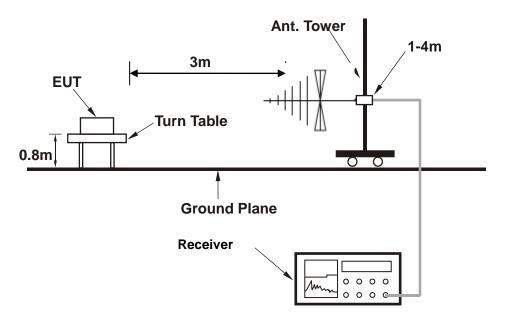
Spectrum Analyzer



#### Setup diagram for Raidation(9KHz~30MHz) Test

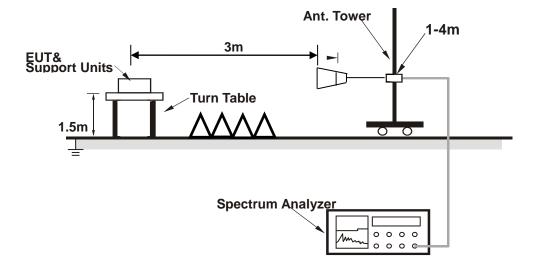


Setup diagram for Raidation(Below 1G) Test

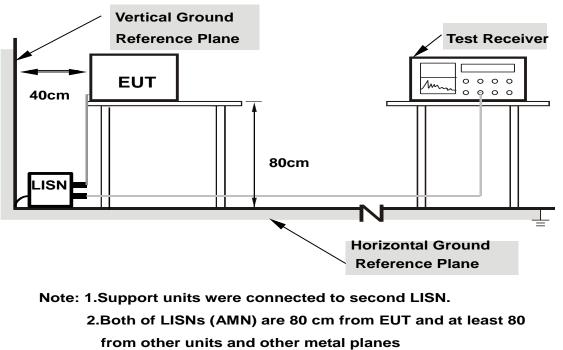




#### Setup diagram for Raidation(Above1G) Test



#### Setup diagram for AC Conducted Emission Test







# 3.5 Measurement Results Explanation Example

#### For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 5 dB and 10dB attenuator.  $Offset(dB) = RF \ cable \ loss(dB) + attenuator \ factor(dB).$ 

= 5 + 10 = 15 (dB)

#### For all radiated test items:

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level Over Limit (dB  $\mu$  V/m) = Level(dB  $\mu$  V/m) - Limit Level (dB  $\mu$  V/m)



# 4 Test Result

# 4.1 DTS and Occupied Channel Bandwidth Measurement

#### 4.1.1 Limit of 6dB Bandwidth

FCC §15.247 (a) (2)

IC RSS-247 5.2(a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

#### 4.1.2 Test Procedures

- 1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v05r02.
- 2. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 3. Turn on the EUT and connect it to measurement instrument.
- 4. Set to the maximum power setting and enable Transmitting the EUT transmit continuously
- Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz.
  Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
- For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) setting should be 1%-5% of OBW, please revise and set the Video bandwidth (VBW) ≥3\* RBW.

#### 4.1.3 Test Result of 6dB Bandwidth

Refer to Appendix A of this test report.

#### 4.1.4 Test Result of 99% Bandwidth

Refer to Appendix B of this test report.



# 4.2 Maximum Conducted Output Power Measurement

#### 4.2.1 Limit of Output Power

#### FCC §15.247 (b)(3)

For systems using digital modulation in the 2400-2483.5 MHz bands: 30dBm. IC RSS-247 A5.4(d) For DTSs employing digital modulation techniques operating in the bands 902-928MHz and 2400-2483.5MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e)

#### 4.2.2 Test Procedures

- 1. The testing follows the Measurement Procedure of ANSI C63.10-2013 section 11.9.2.2.4 Measurement using a spectrum analyzer.
- 2. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 3. Turn on the EUT and connect it to spectrum analyzer.
- 4. Set to the maximum power setting and enaBle Transmitting the EUT transmit continuously
- 5. Measure the duty cycle, x, of the transmitter output signal as described in below:
  - a. Set the center frequency of the instrument to the center frequency of the transmission.
  - b. Set RBW to the largest available Transmitting value.
  - c. Set detector = peak
- Set span to at least 1.5\*OBW.Set RBW=510KHz,VBW=2MHz, Number of points in sweep ≥ 2/3\* span, Sweep time = auto. Detector = RMS
- 7. Allow the sweep to "free run". Trace average 100 traces in RMS mode
- 8. Compute power by integrating the spectrum across the OBW of the signal using the instrument's Channel power measurement function with band limits set equal to the OBW band edges.
- Add 10 log (1/x), where x is the duty cycle. The duty cycle factor has been compensated to the 'offset " of the spectrum analyser.

## 4.2.3 Test Result of Output Power

Refer to Appendix C of this test report.

#### 4.2.4 Test Result of Duty Cycle

Refer to Appendix D of this test report.



# 4.3 Maximum Power Spectral Density Measurement

#### 4.3.1 Limits of Power Spectral Density

FCC§15.247(e)

IC RSS-247 5.2(b)

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

#### 4.3.2 Test Procedure

- The testing follows Measurement Procedure 8.4 DTS maximum power spectral density level in the fundamental emission of ANSI C63.10-2013 section 11.9.2.2.4
- 2. Turn on the EUT and connect it to measurement instrument.
- 3. Measure the duty cycle, x, of the transmitter output signal as described in below:
  - a. Set the center frequency of the instrument to the center frequency of the transmission.
  - b. Set RBW to the largest availaBle Transmitting value.
  - c. Set detector = peak
- Set span to at least 1.5\*OBW.Set RBW= 30 KHz,VBW=100 KHz, Number of points in sweep ≥ 2/3\* span, Sweep time = auto.
- 5. Detector = power averaging (rms), Sweep time = auto couple, Trace mode = averaging (rms) mode over a minimum of 100 traces. Use the peak marker function to determine the maximum power level.
- 6. Add 10 log (1/x), where x is the duty cycle.
- 7. Measure and record the results in the test report.
- 8. The Measured power density (dBm)/ 100kHz is a reference level and used as 30dBc down limit line for Conducted Band Edges and Conducted Spurious Emission.
- 9. Add 10 log(1/x), where x is the duty cycle. The duty cycle factor has been compensated to the 'offset " of the spectrum analyser.

#### 4.3.3 Test Result of Power Spectral Density

Refer to Appendix E of this test report.





# 4.4 Band Edges and Spurious Emission Measurement

#### 4.4.1 Limit of Conducted Band Edges and Spurious Emission

FCC §15.247 (d)

IC RSS-247 5.5

Maximum conducted (average) output power was used to determine compliance, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 30 dBc).

#### 4.4.2 Test Procedures

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Turn on the EUT and connect it to measurement instrument.
- 3. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d).
- 4. Measure and record the results in the test report.
- 5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

#### 4.4.3 Test Result of Conducted Band Edges

Refer to Appendix F of this test report.

#### 4.4.4 Test Result of Conducted Spurious Emission

Refer to Appendix G of this test report.



#### 4.5 Radiated Band Edges and Spurious Emission Measurement

#### 4.5.1 Limit of Radiated Band Edges and Spurious Emission

FCC §15.247 (d)

IC RSS-247 5.5

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 30 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Frequency	Field Strength	Measurement Distance	
(MHz)	(microvolts/meter)	(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	

#### 4.5.2 Test Procedures

- 1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
- 2. The measurement distance is 3 meter.
- 3. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
- 4. Set to the maximum power setting and enable the EUT transmit continuously.
- 5. Use the following spectrum analyzer settings:
  - (1) Span shall wide enough to fully capture the emission being measured;
  - Set RBW=100 kHz for f < 1 GHz, RBW=1MHz for f>1GHz ; VBW RBW; Sweep = auto;
    Detector function = peak; Trace = max hold for peak
  - (3) For average measurement:

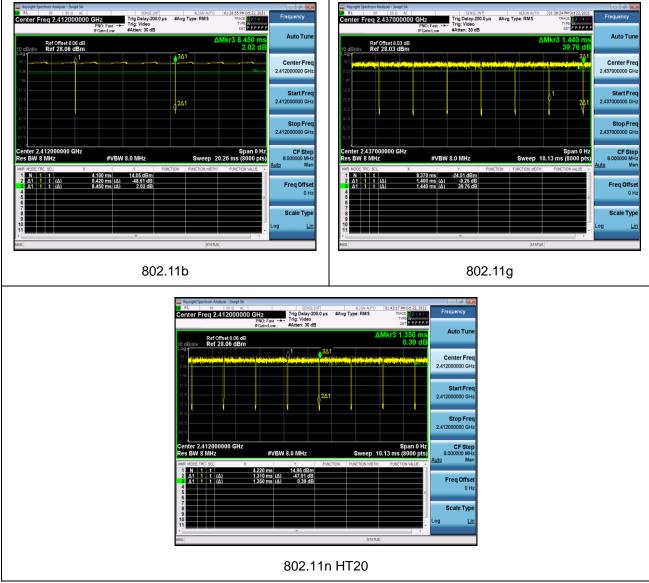
VBW = 10 Hz, when duty cycle is no less than 98 percent.

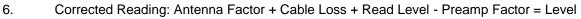
VBW  $\geq$  1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.



Report No.: EC2105025RF01

		Report No.: EC2105025KI 01			
Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting	
802.11b	99.64	-	-	10Hz	
802.11g	97.22	1.40	0.71	1kHz	
802.11n HT20	97.04	1.31	0.76	1kHz	



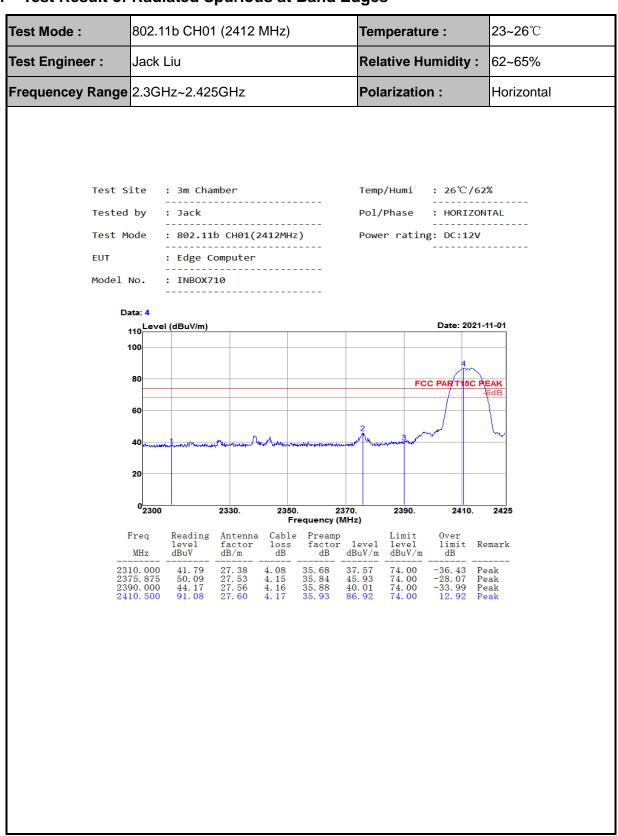


## 4.5.3 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

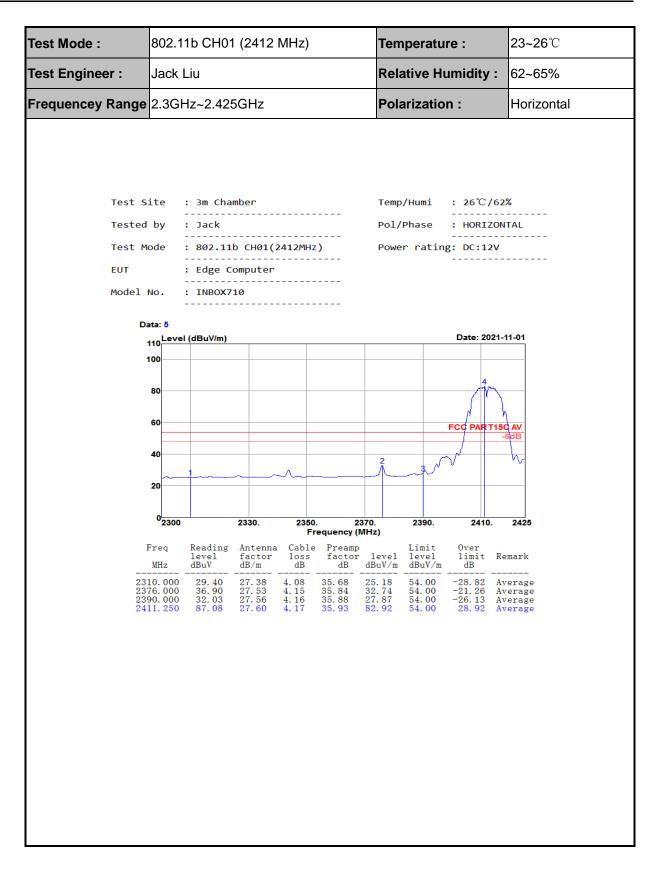
The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.



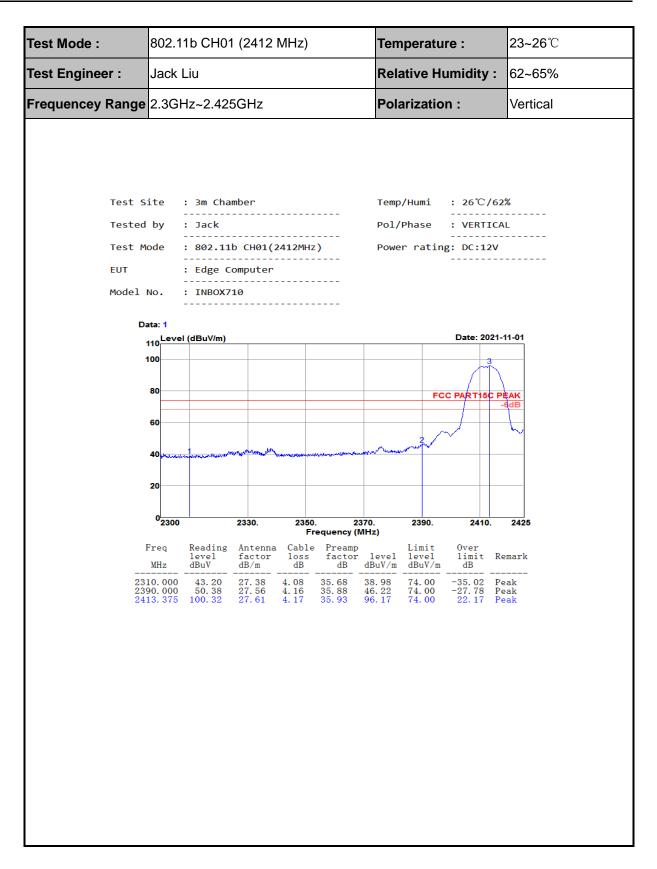
#### 4.5.4 Test Result of Radiated Spurious at Band Edges



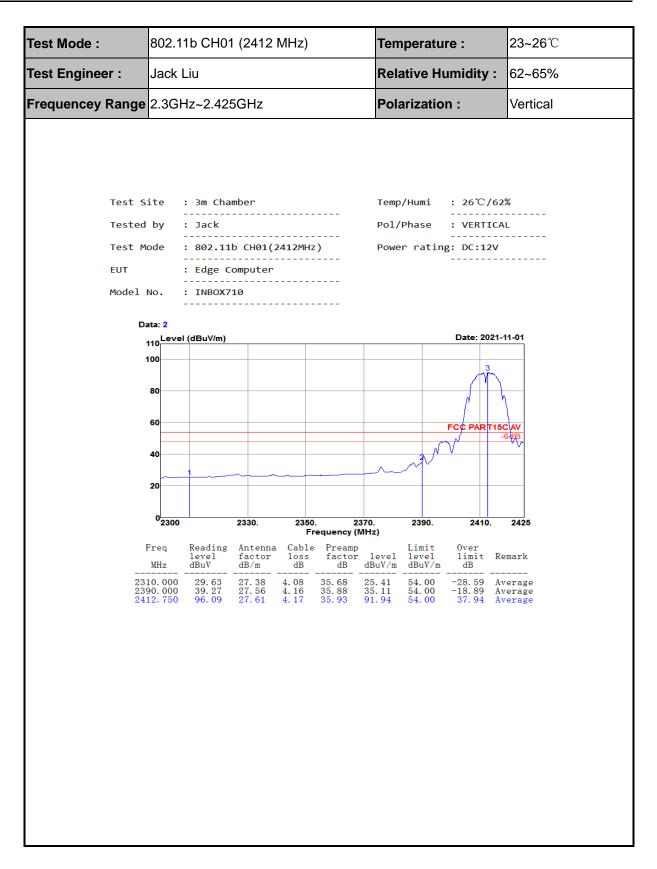




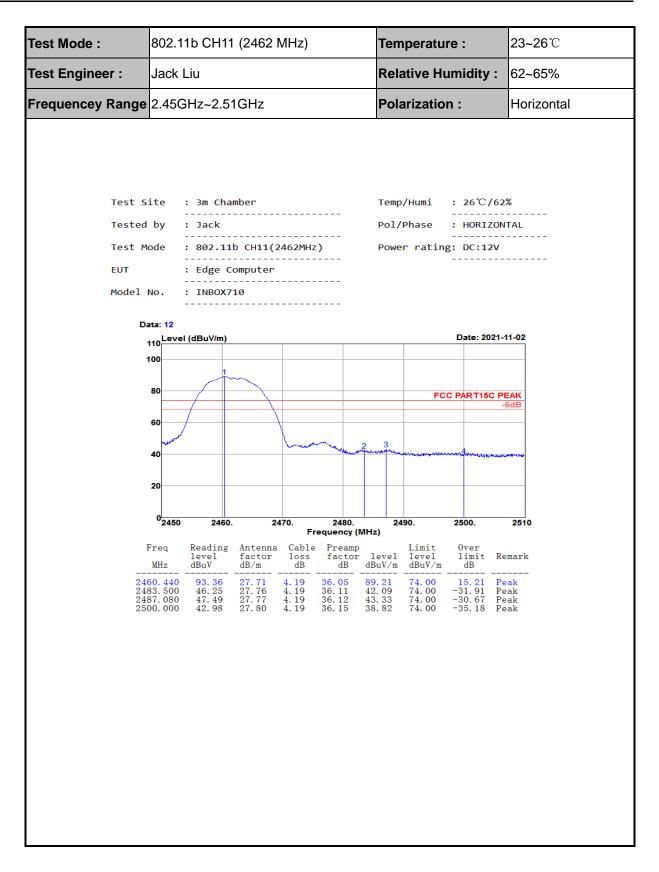




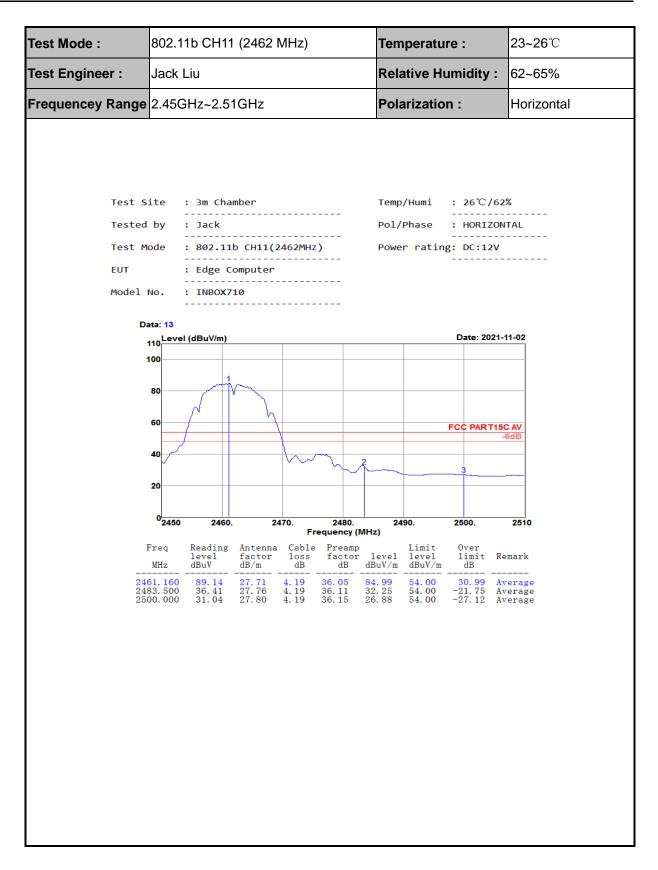




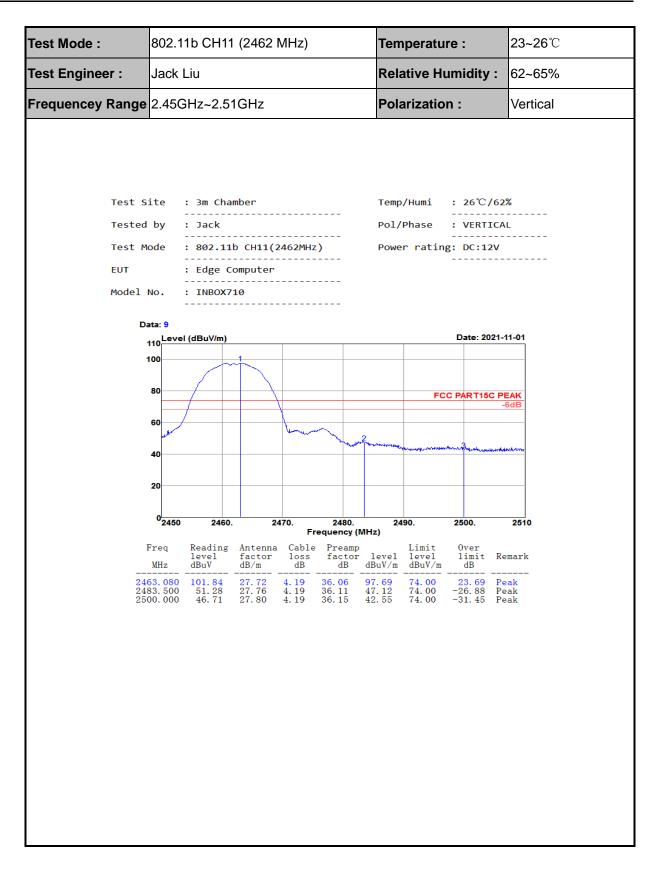




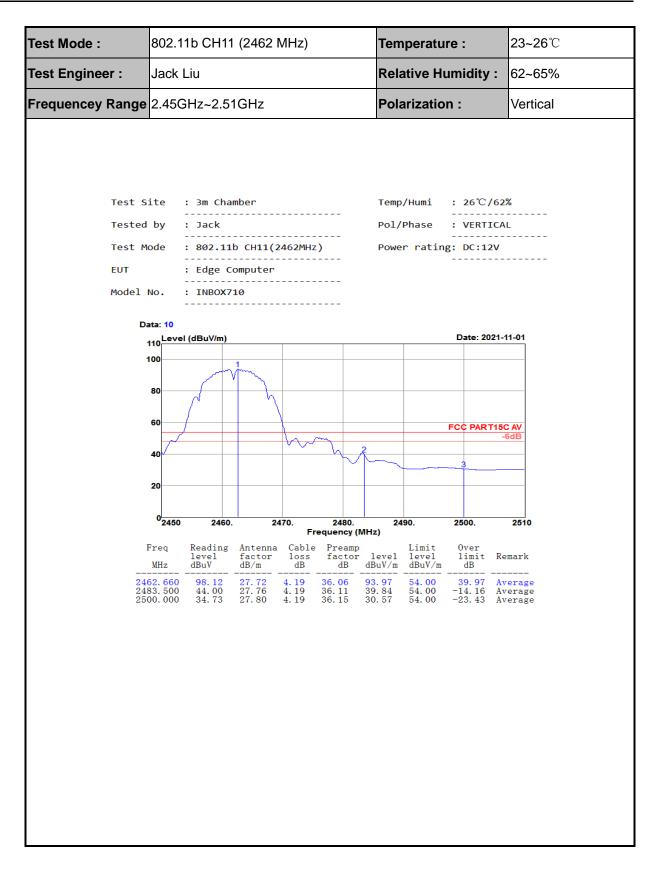




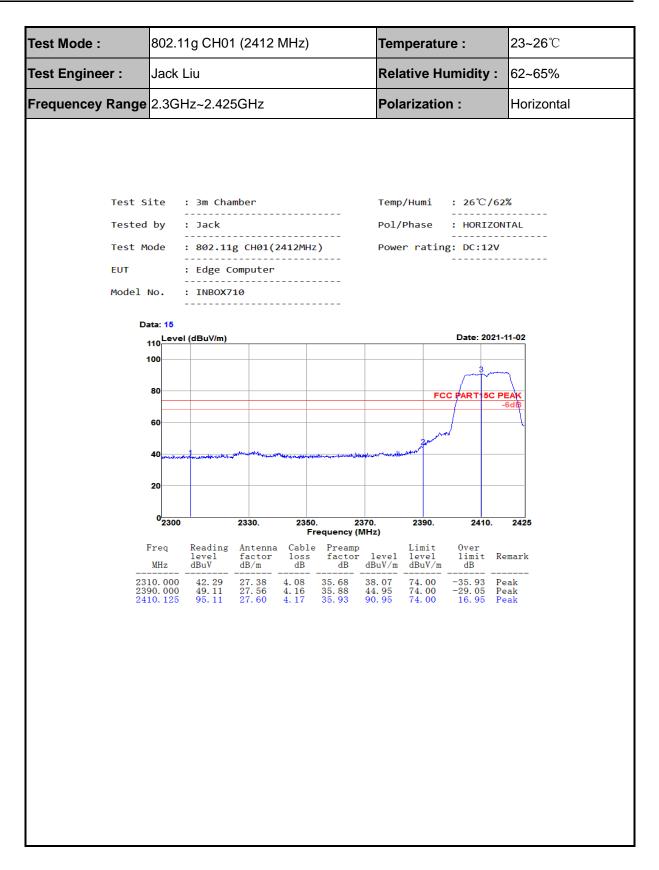




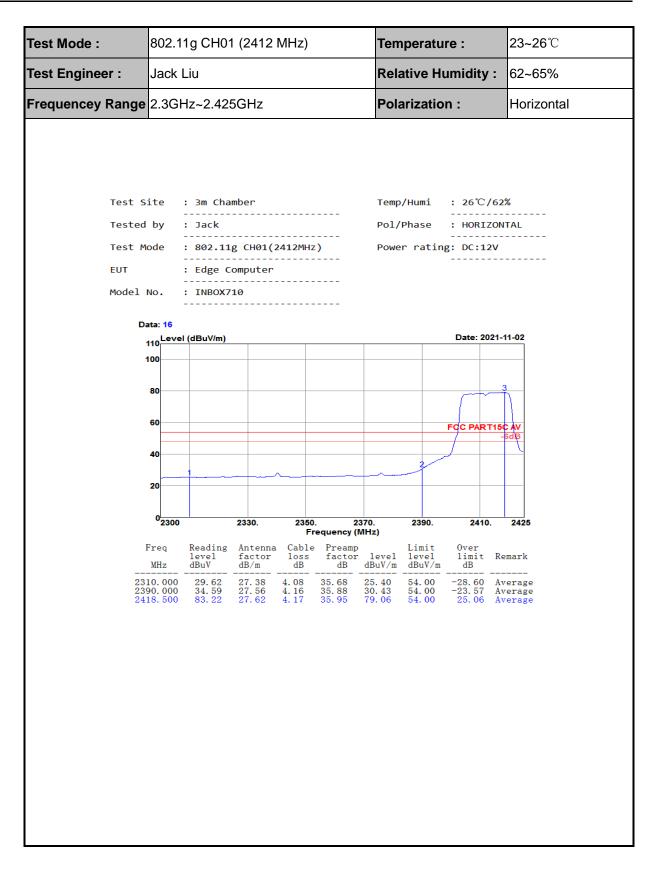




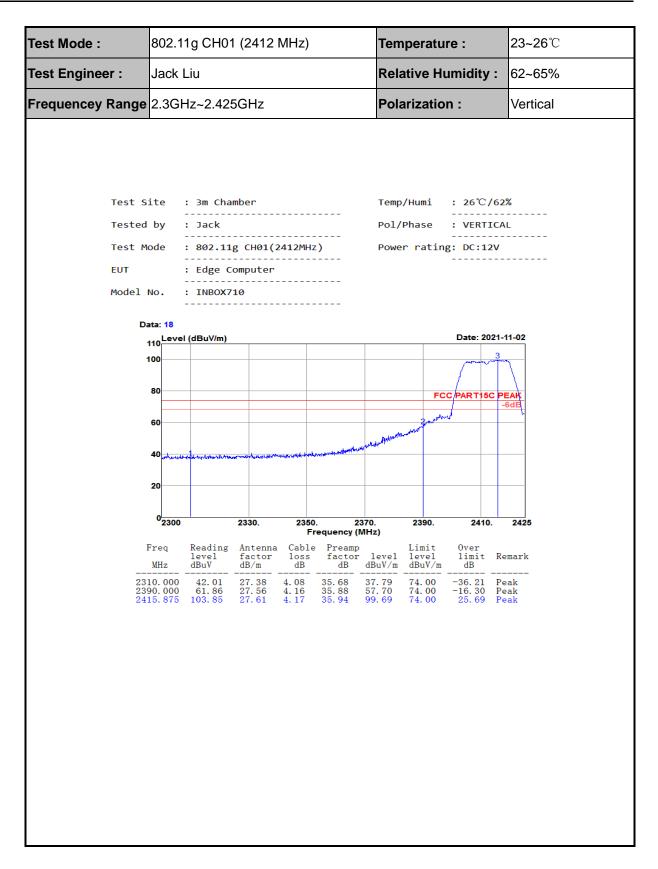




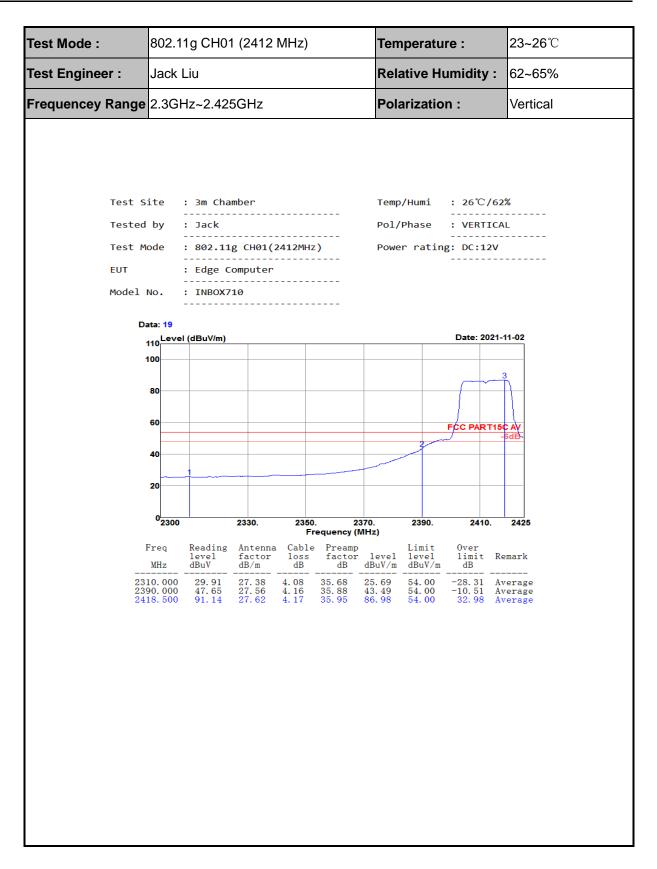




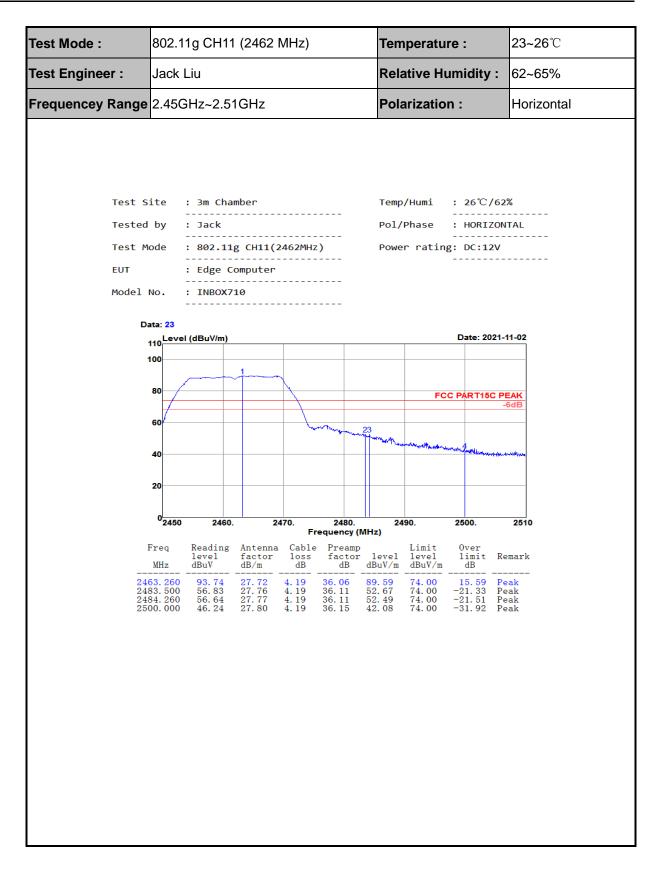




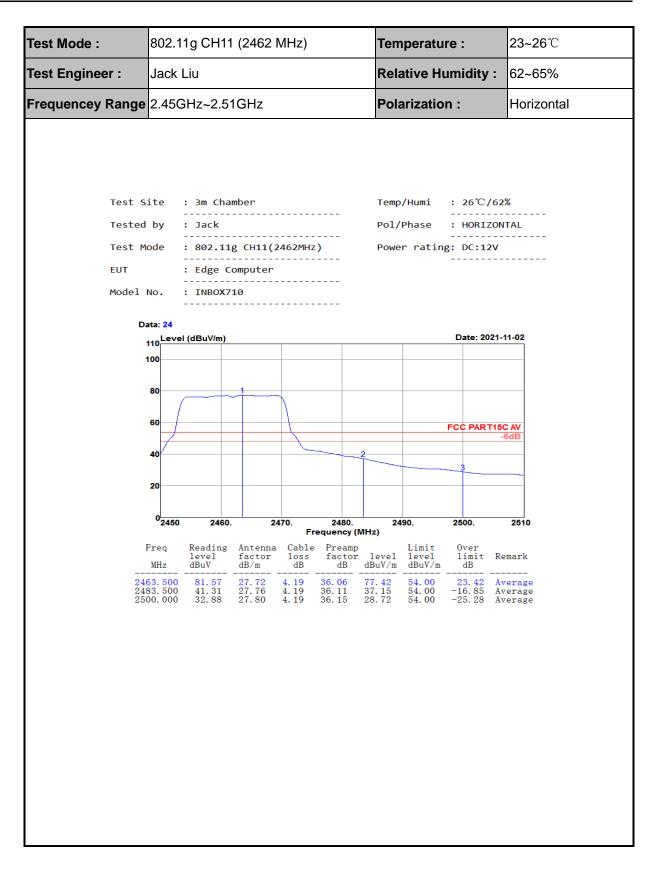




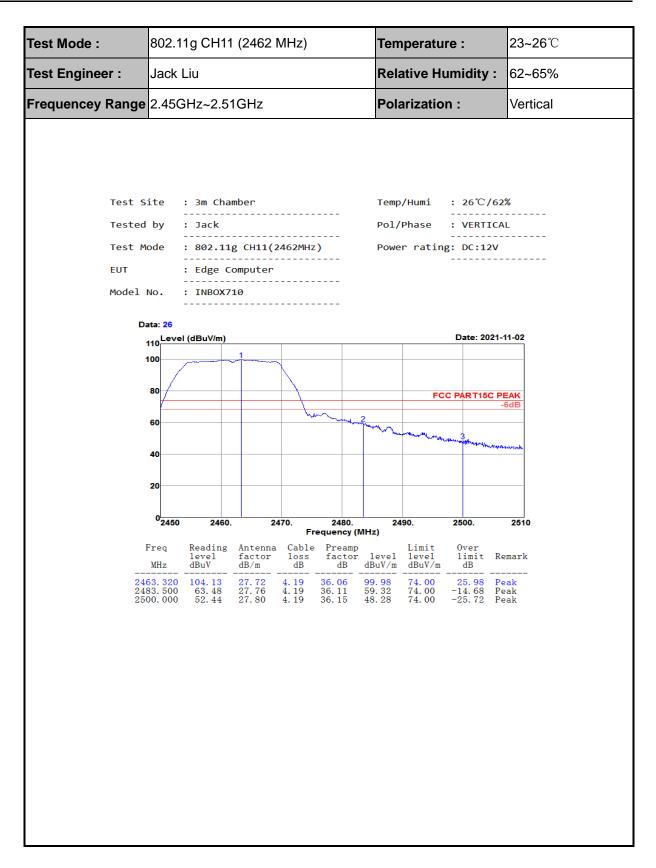




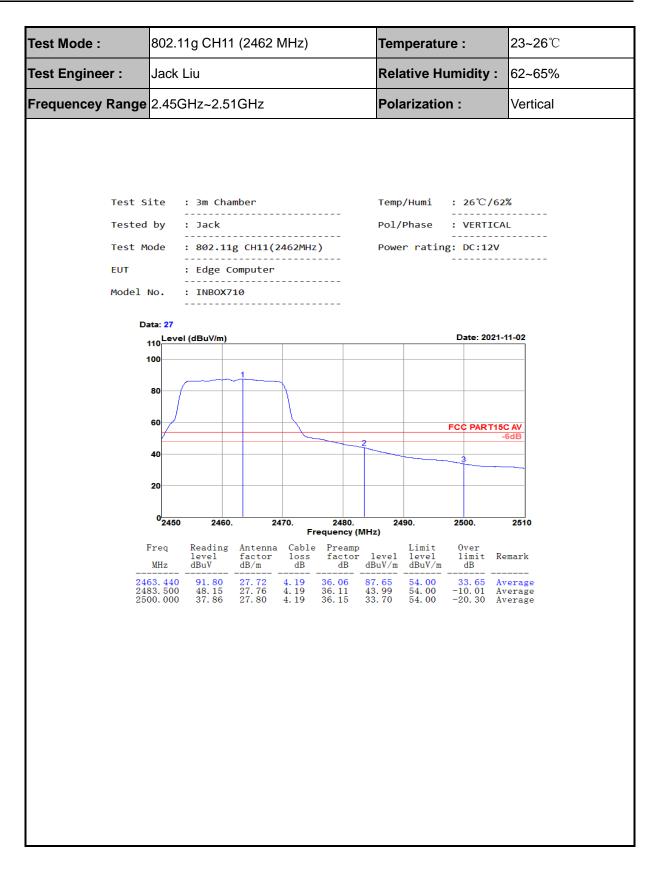




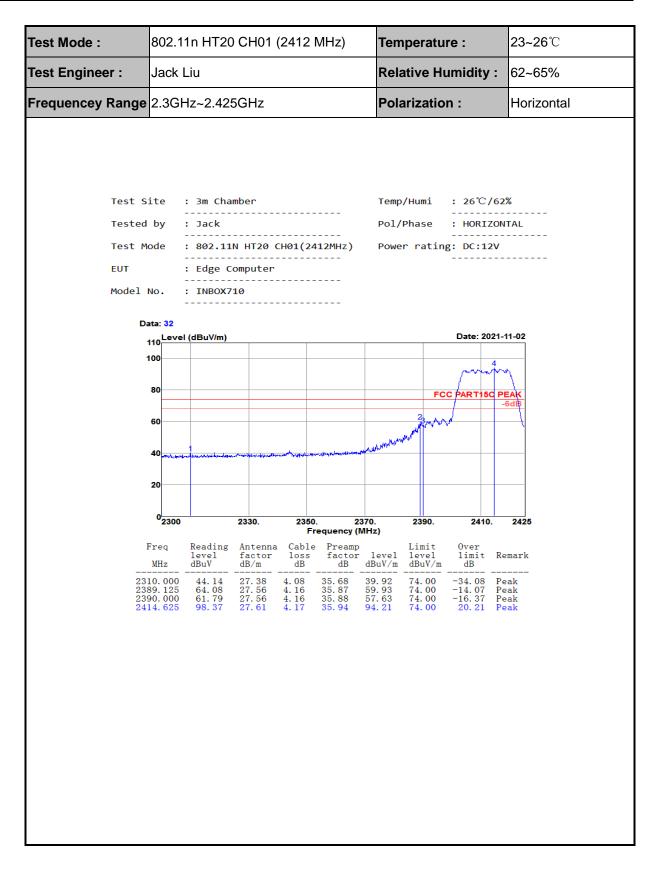




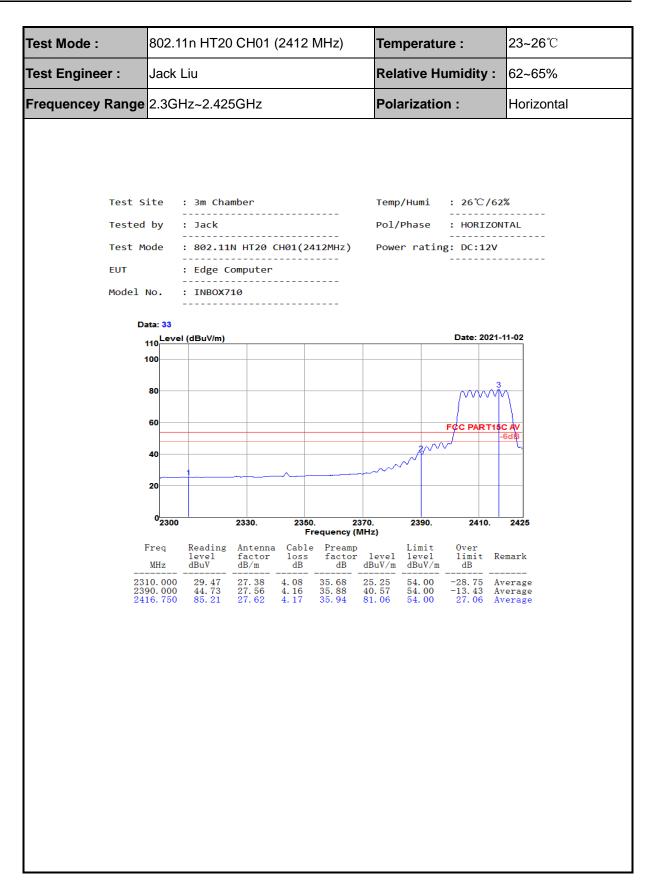




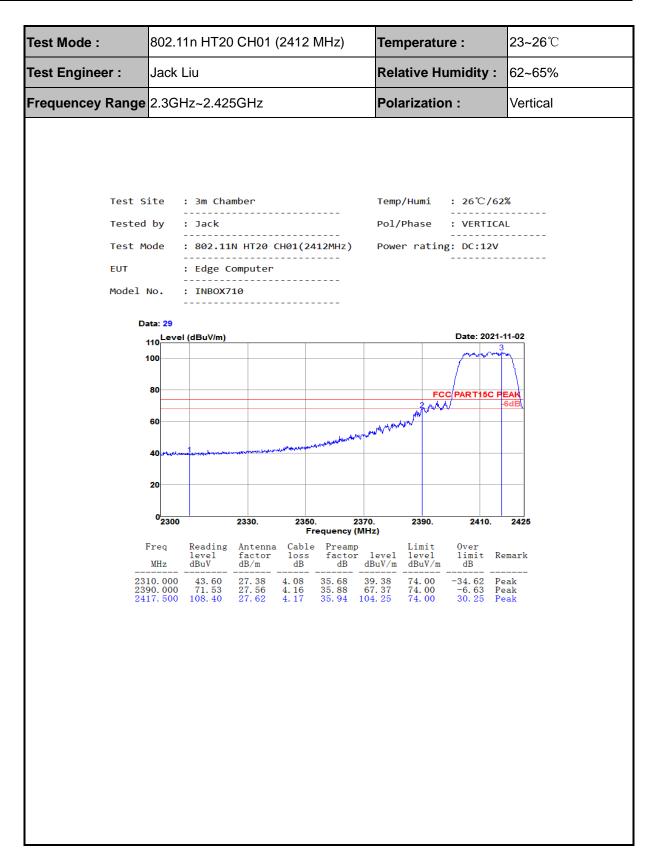




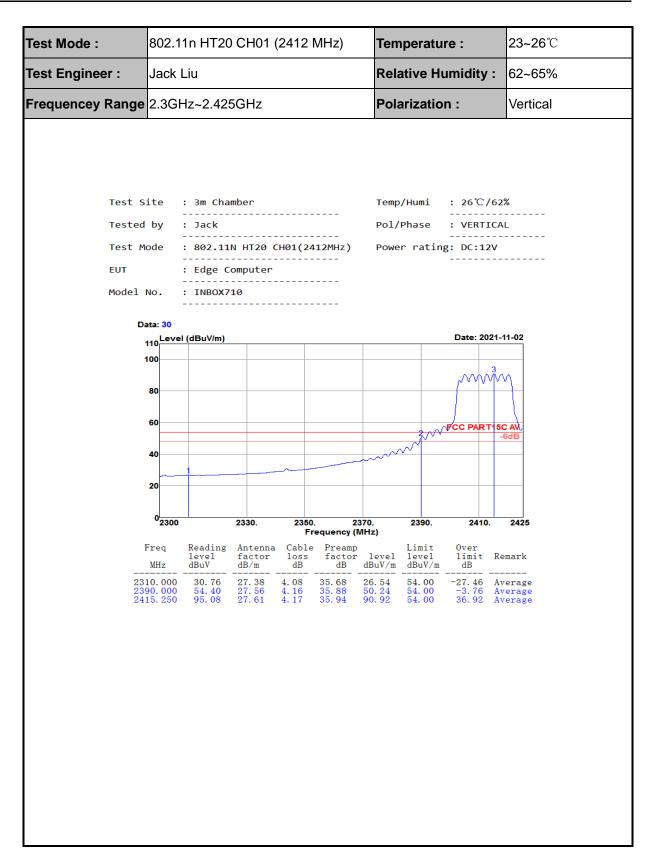




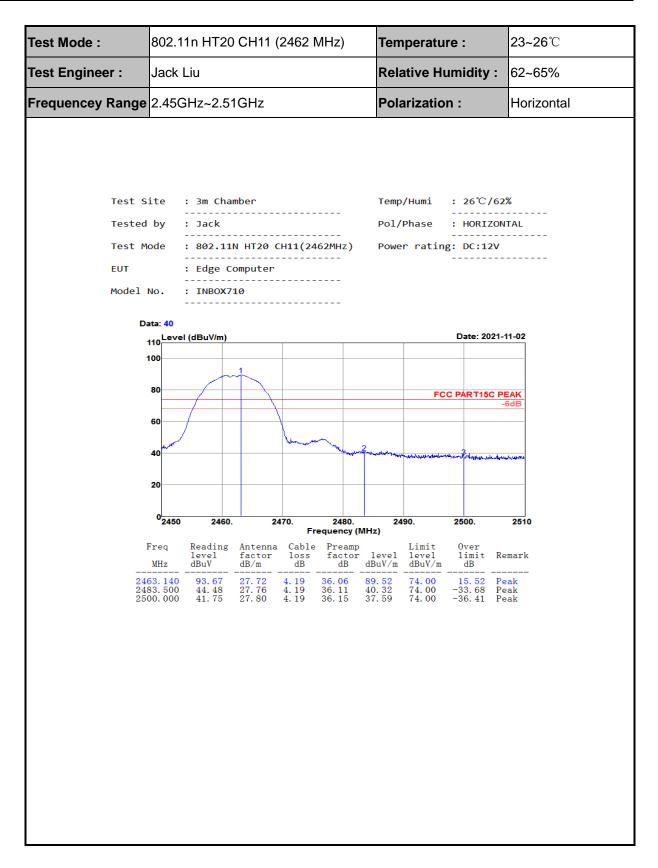




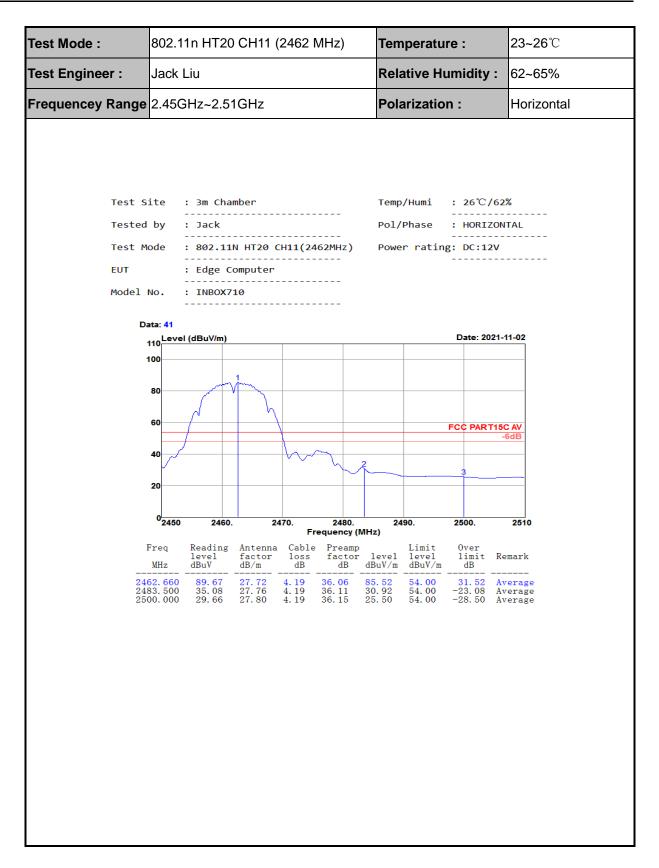




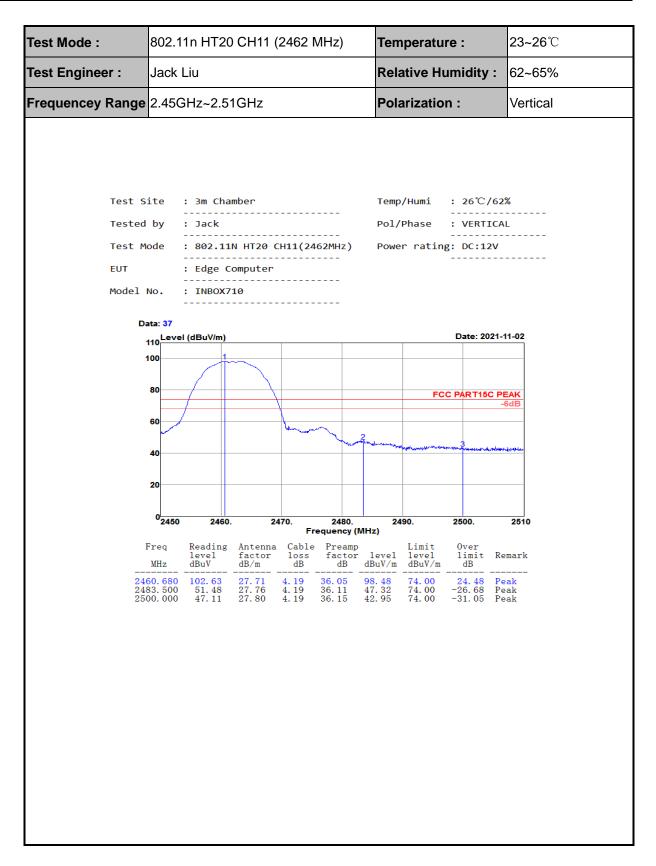




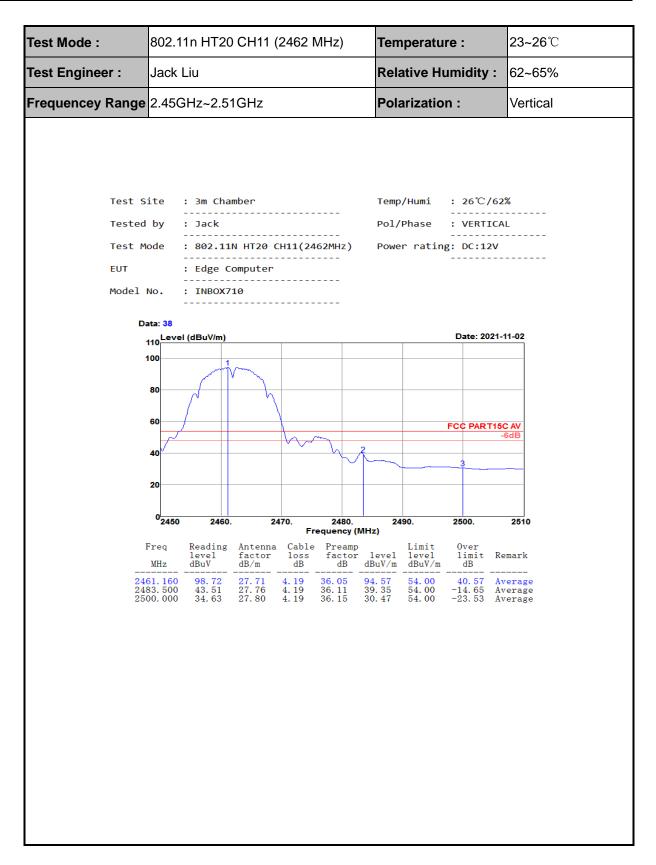






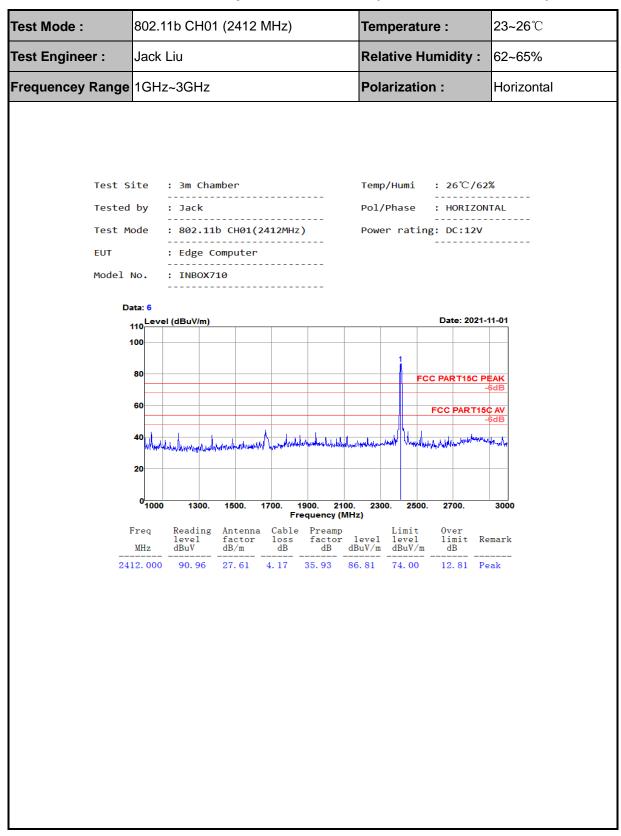




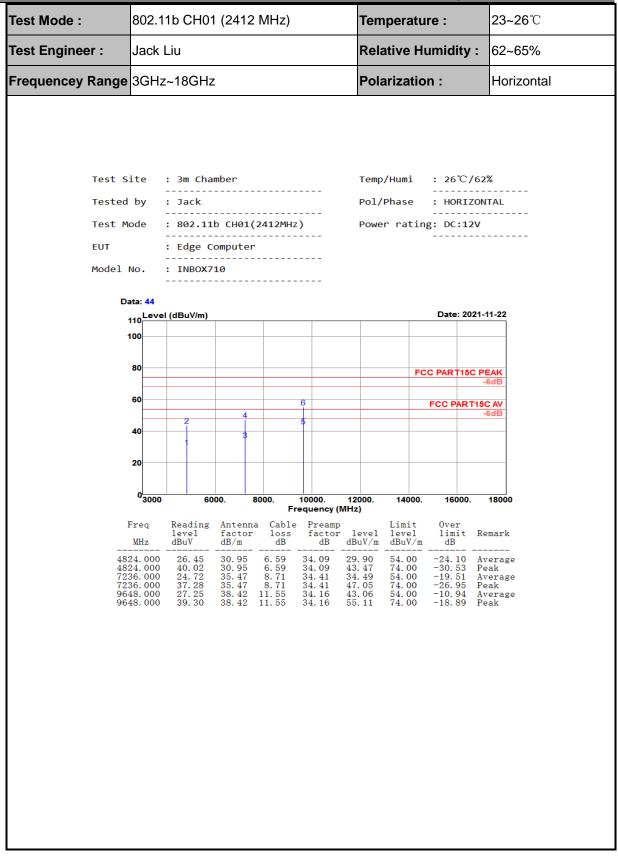




## 4.5.5 Test Result of Radiated Spurious Emission (1GHz ~ 10<sup>th</sup> Harmonic)



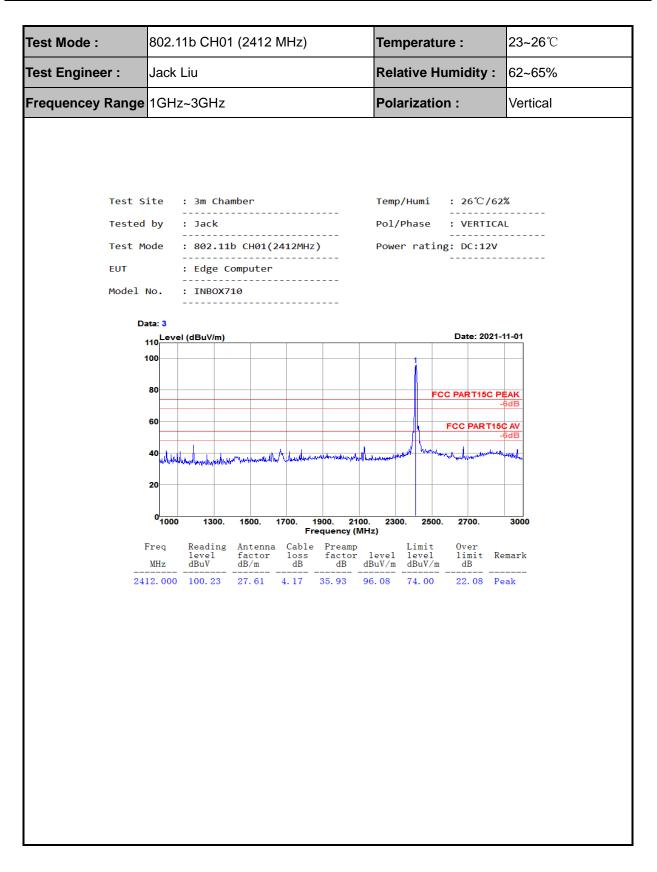




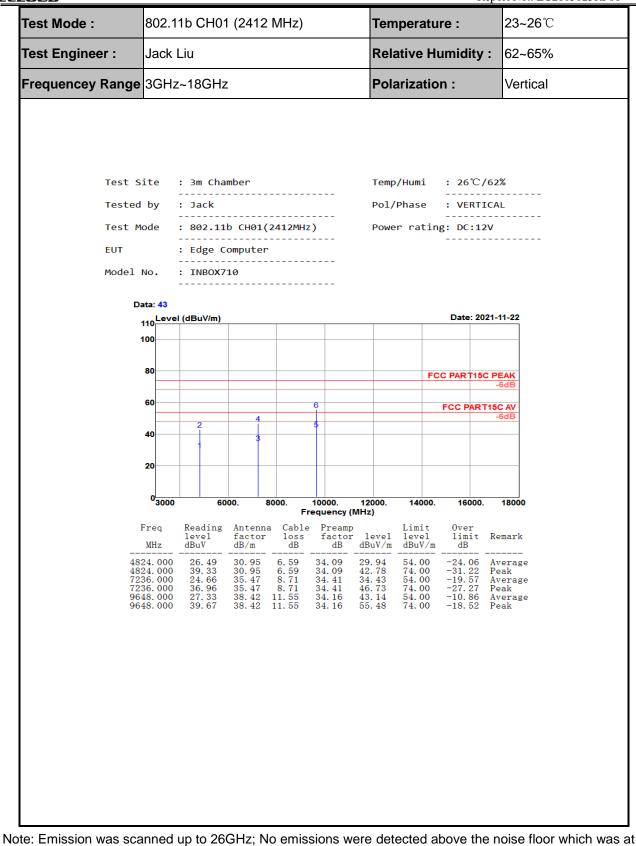
Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at

least 20dB below the specification limit.



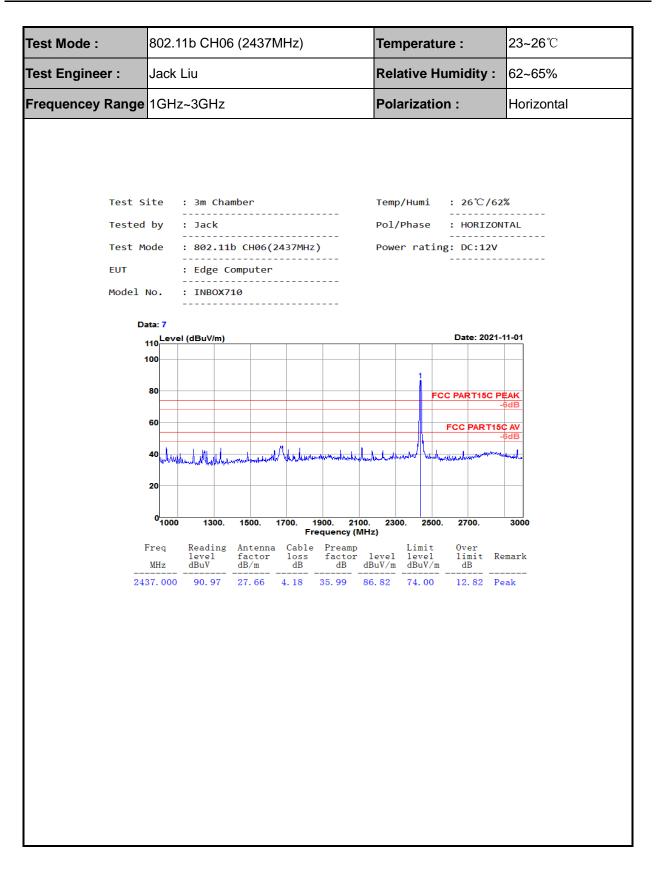




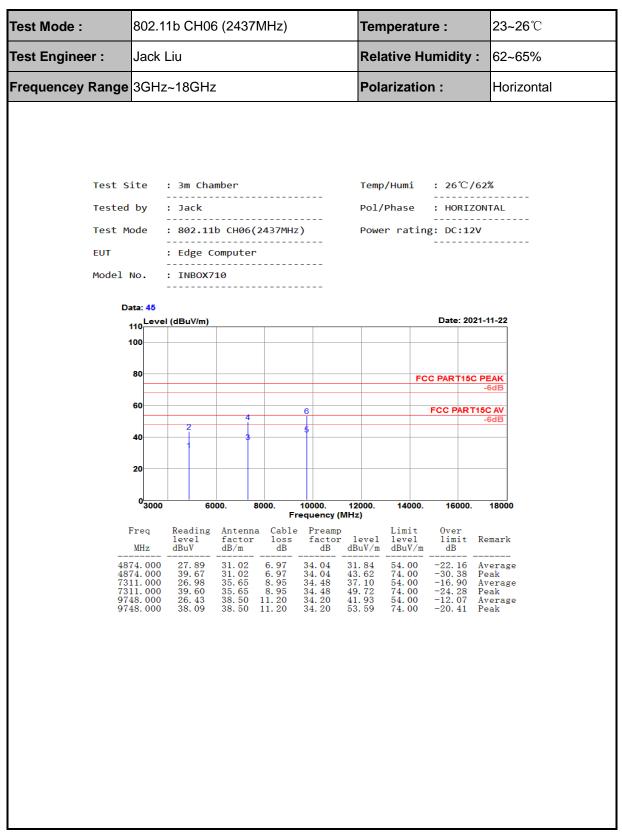


least 20dB below the specification limit.

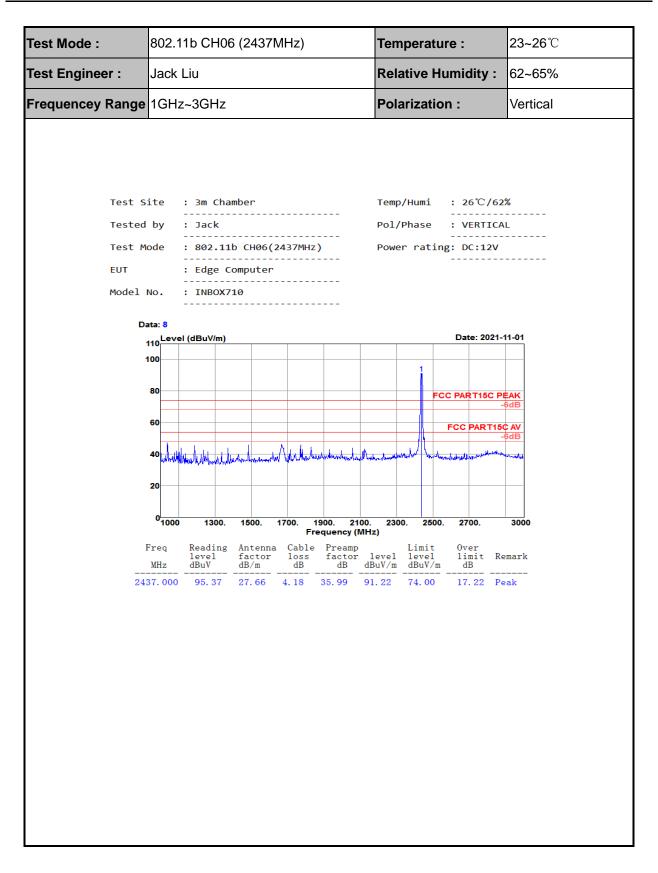




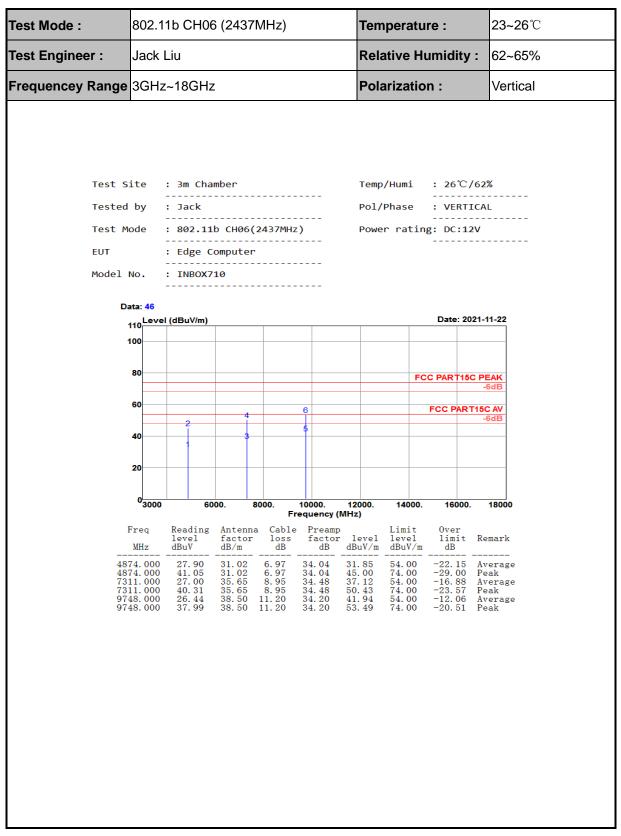




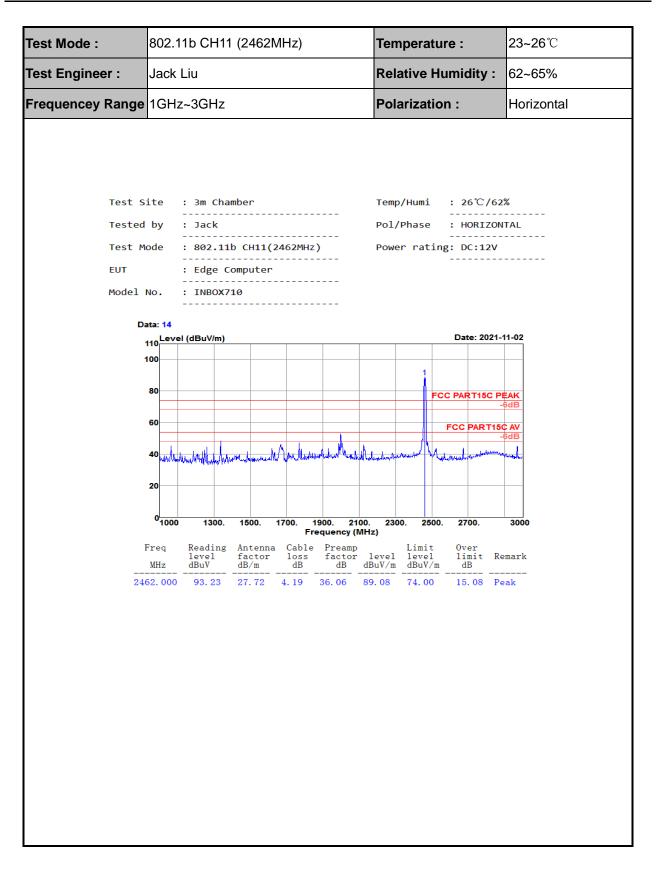




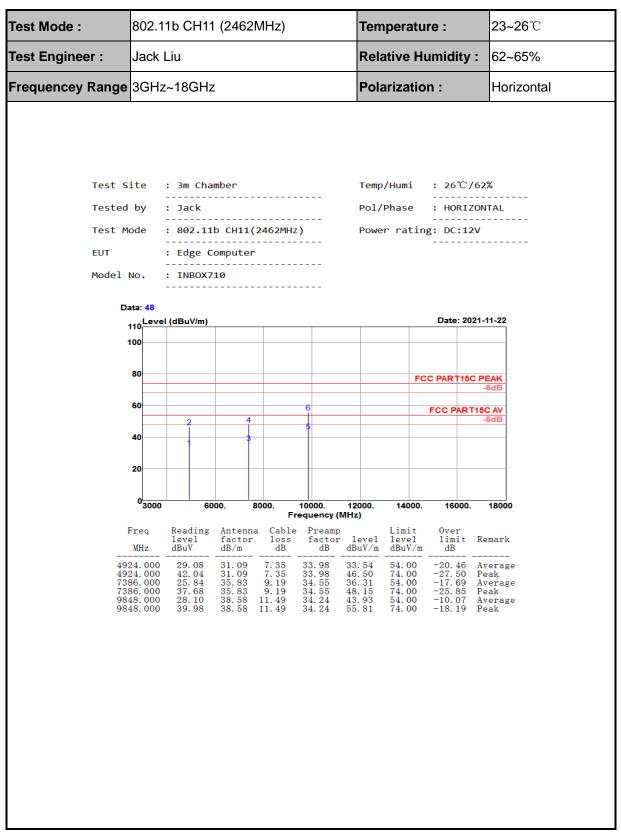




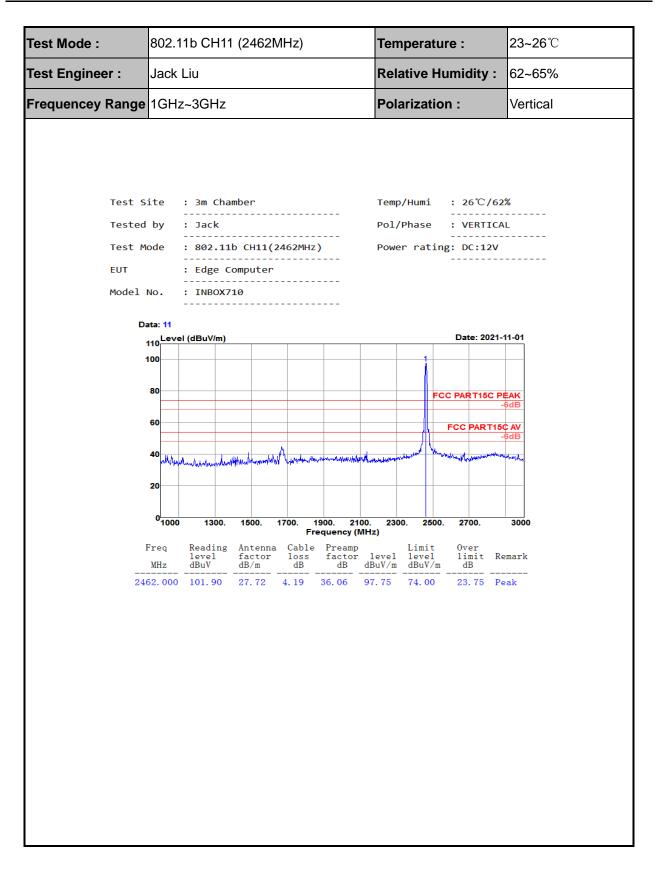




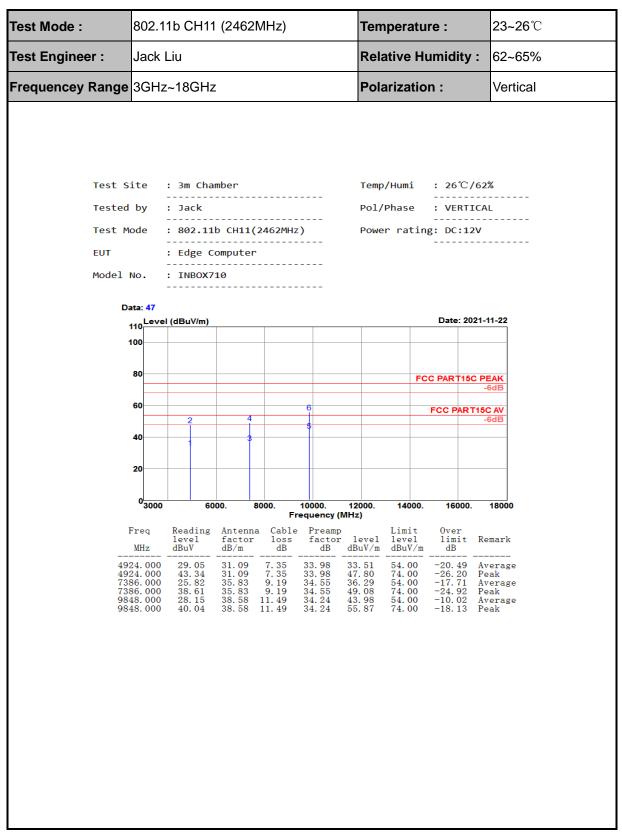




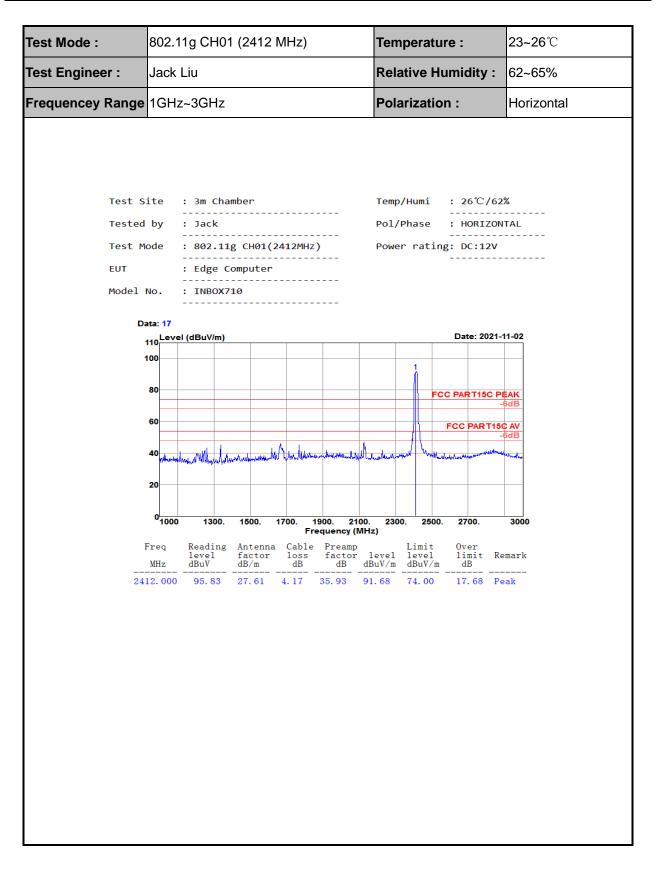




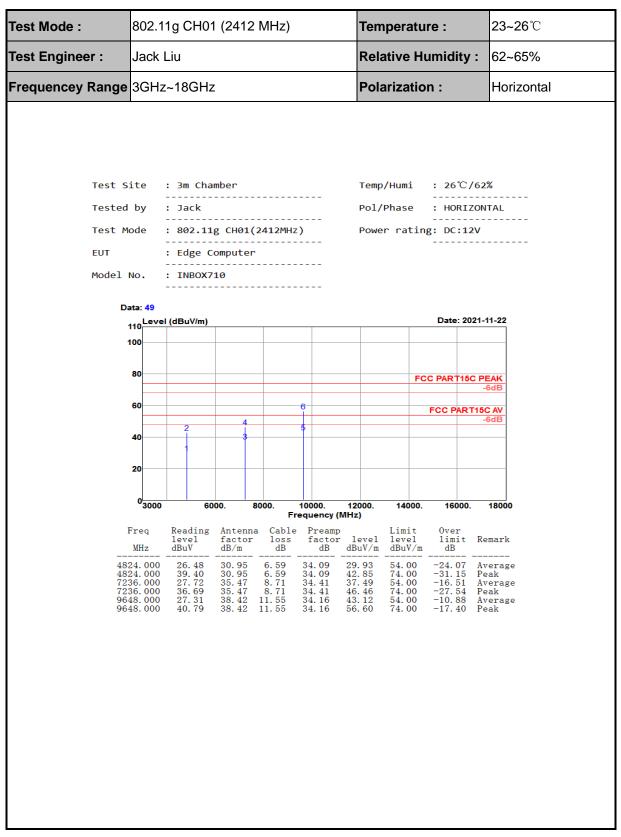




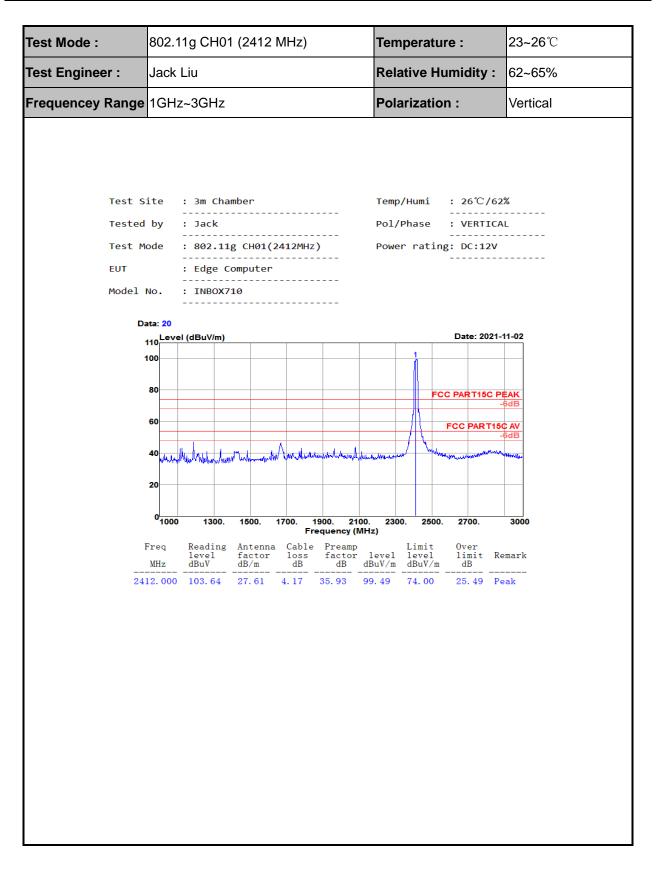




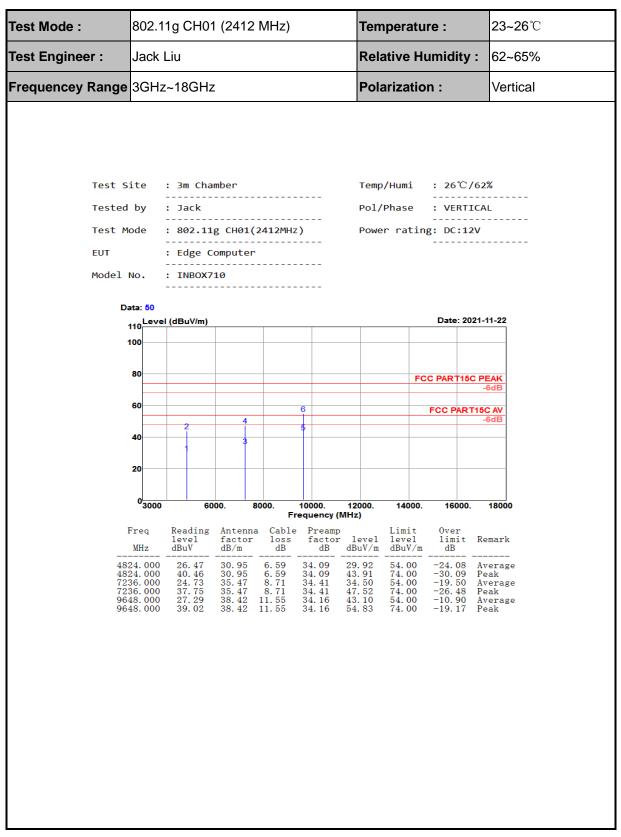




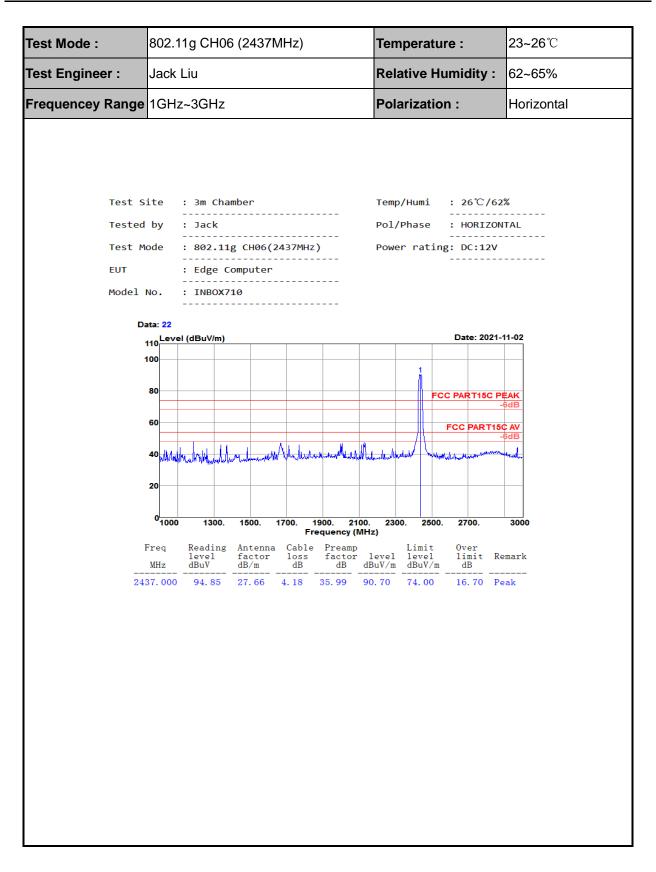




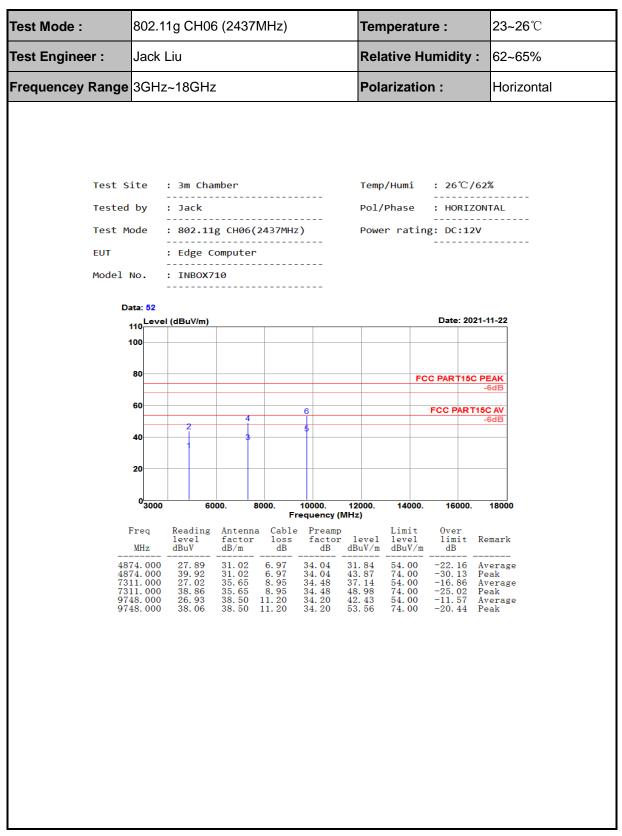




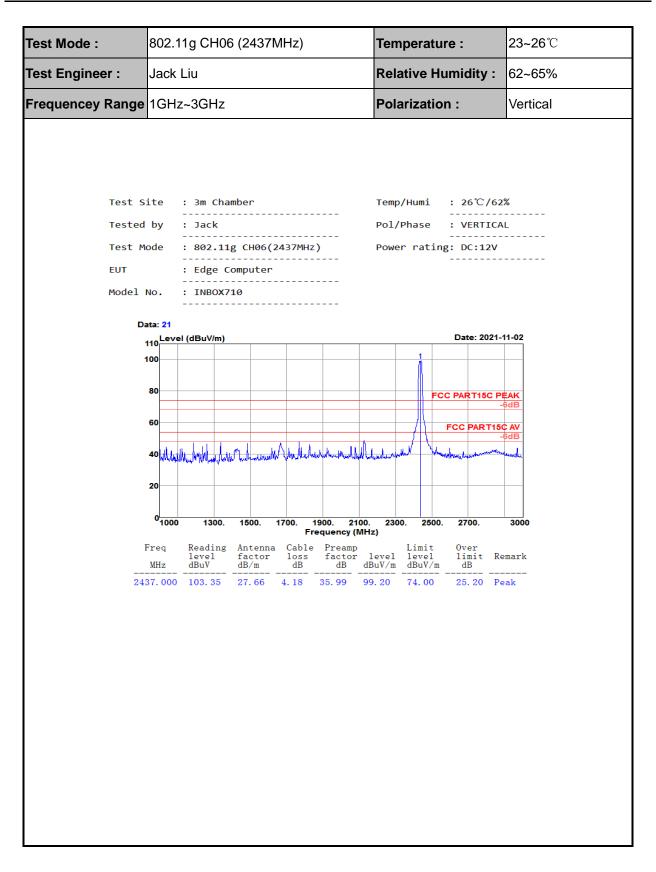




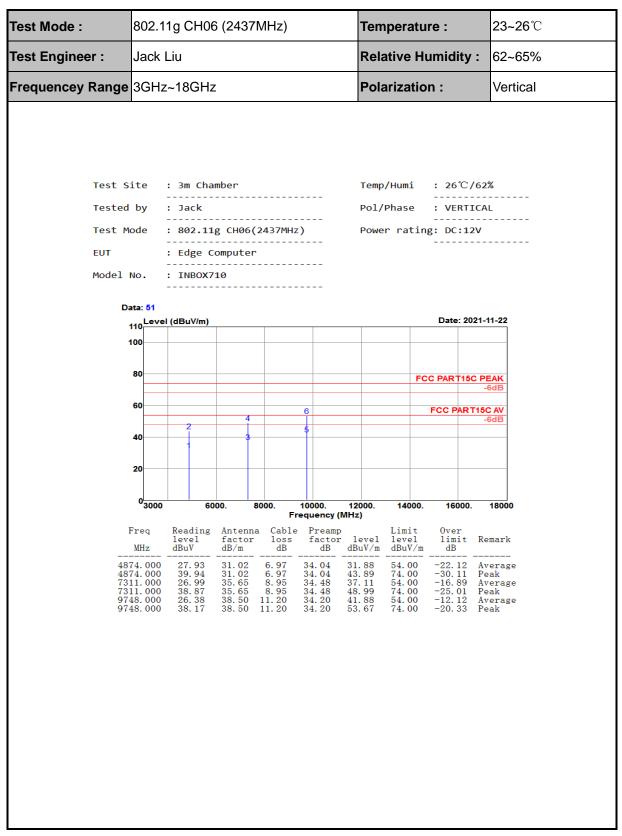




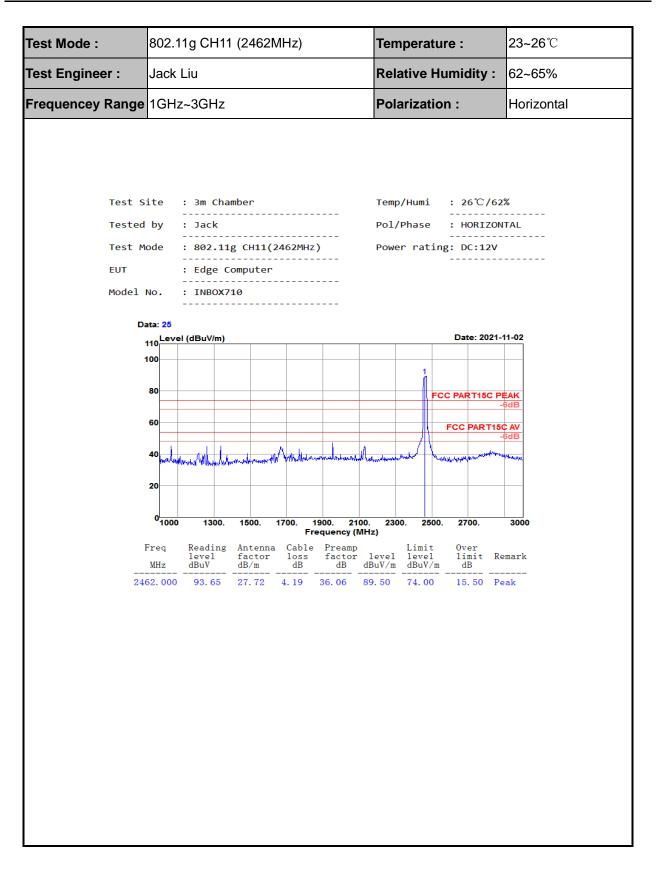




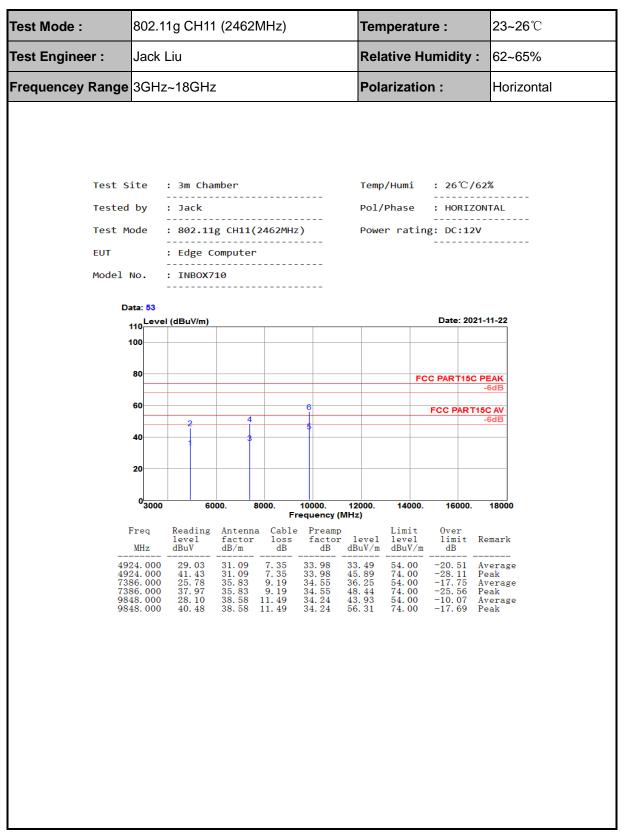




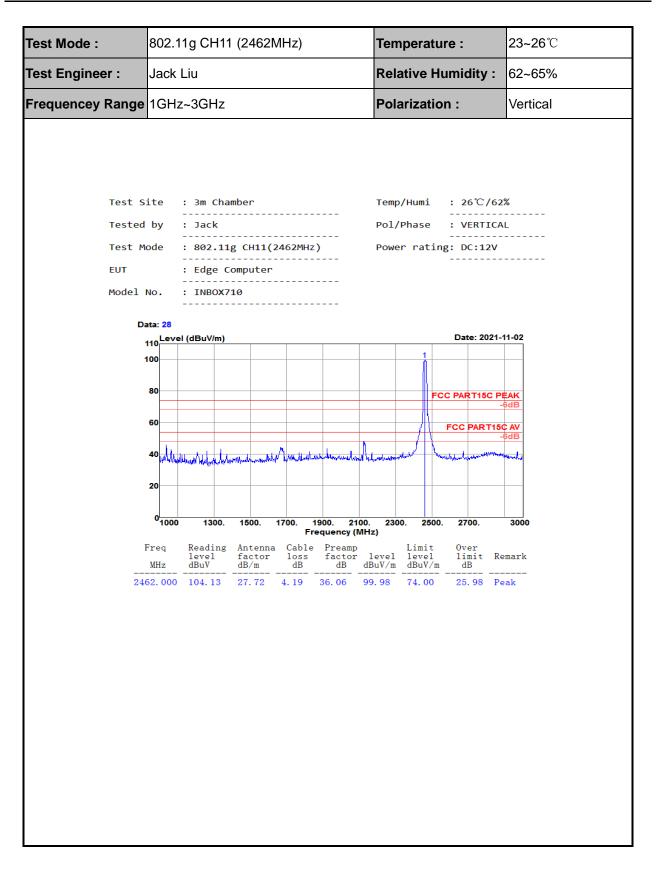




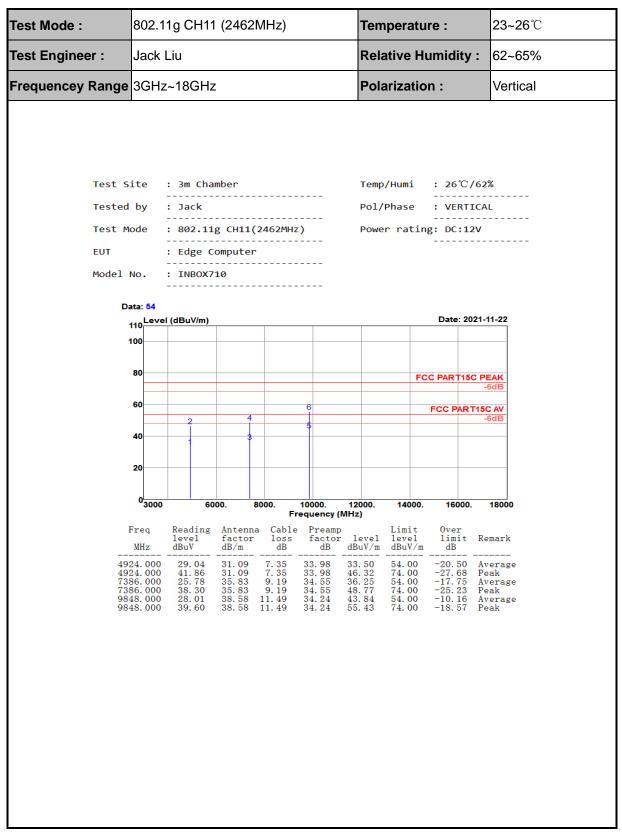




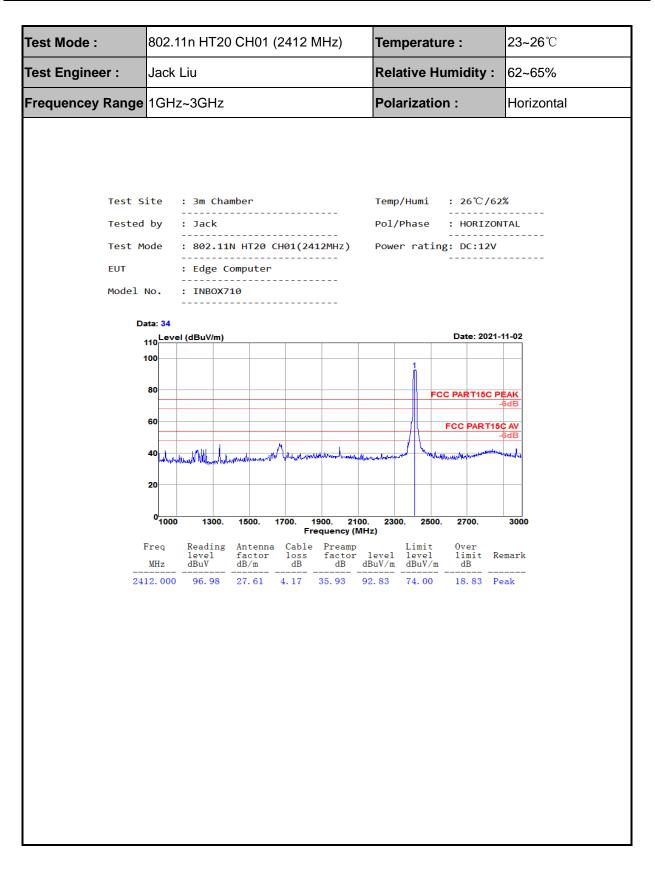




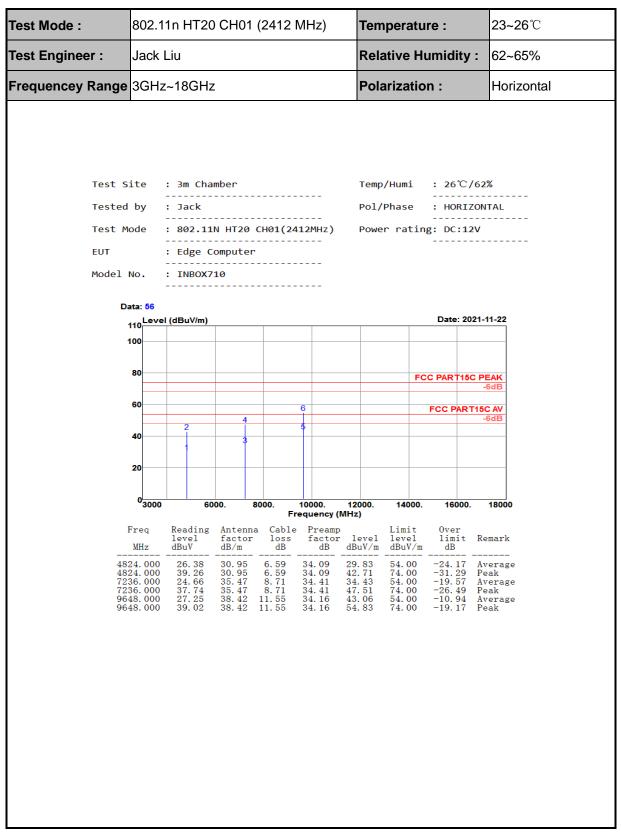




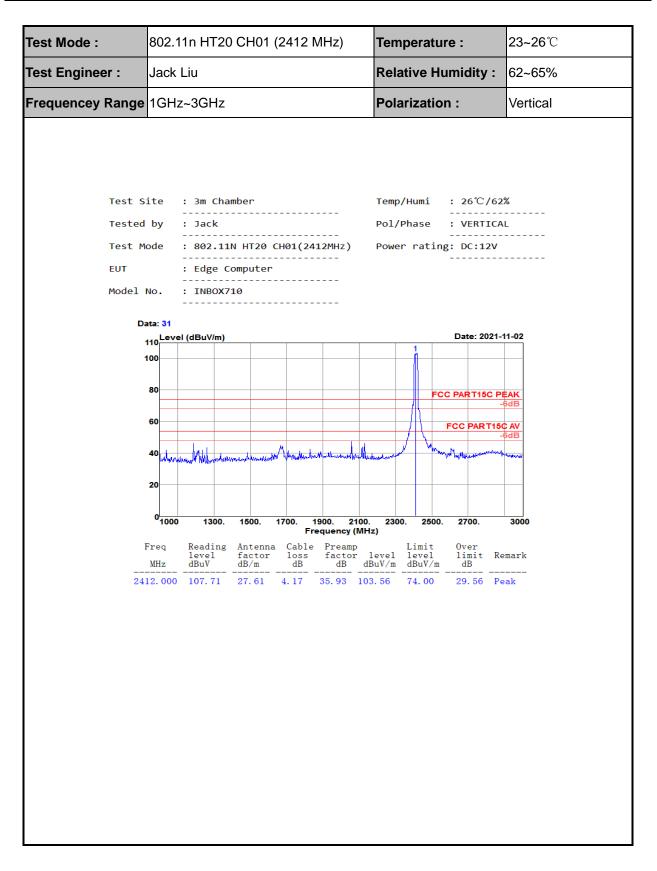




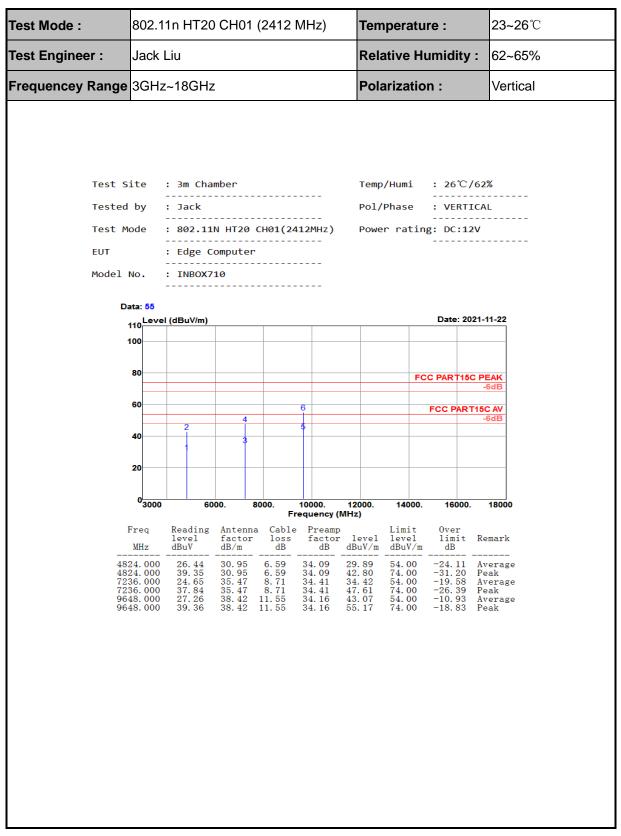




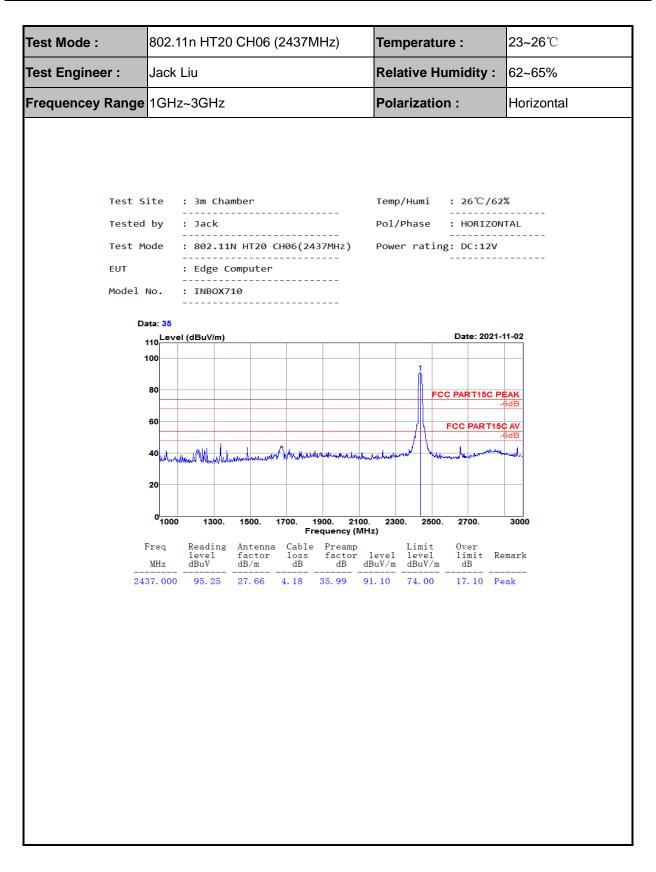




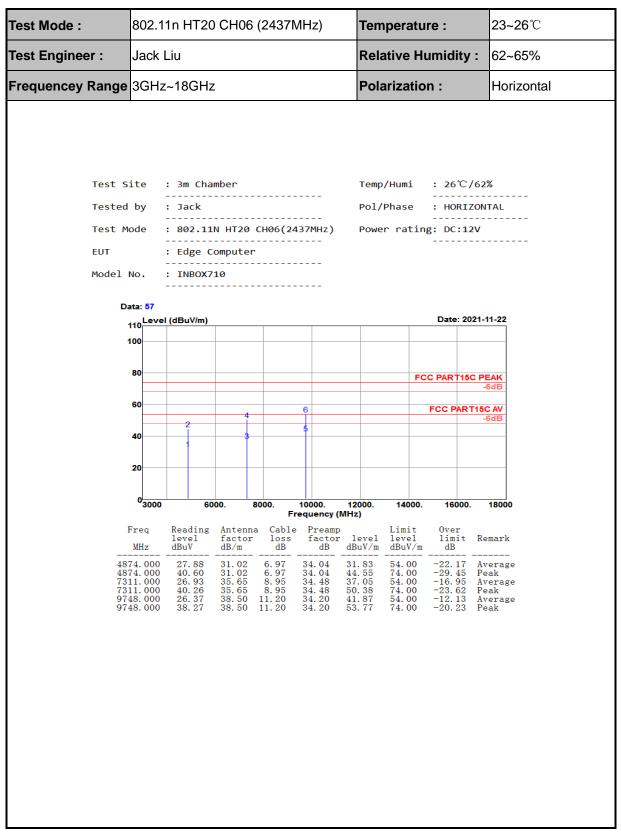




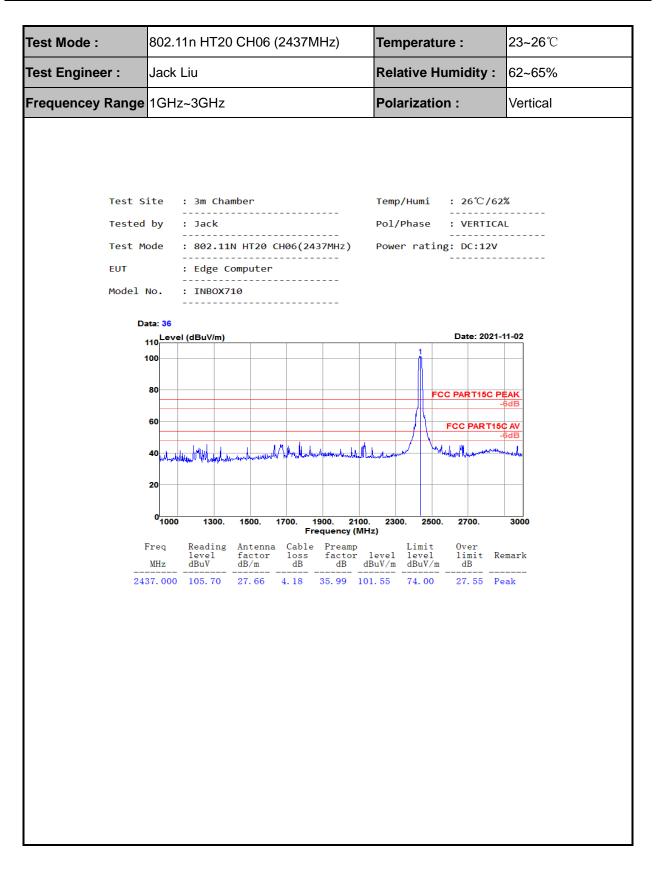




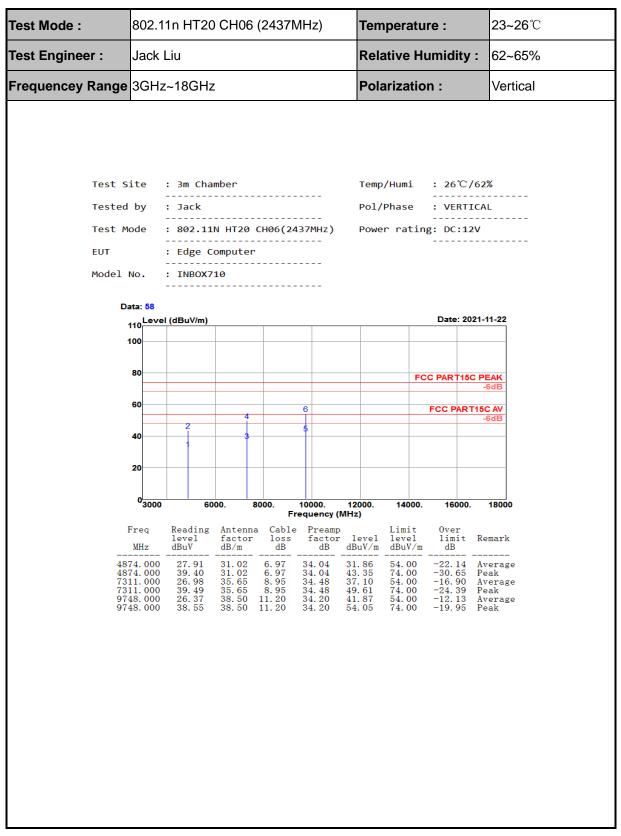




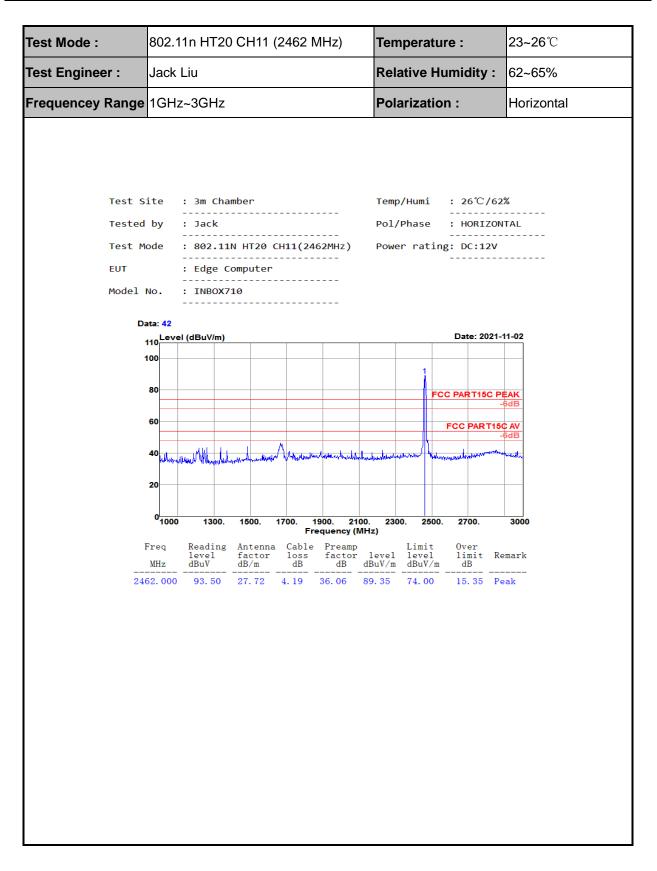




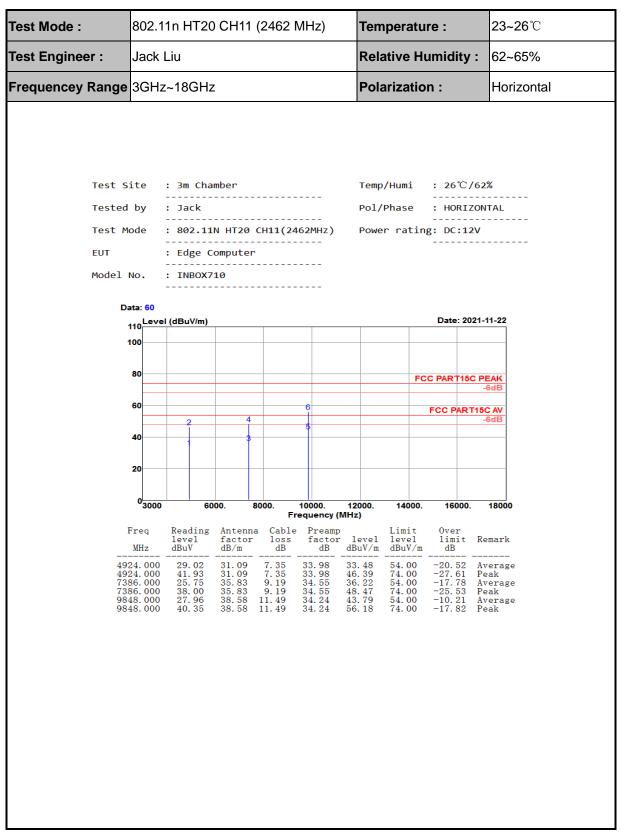




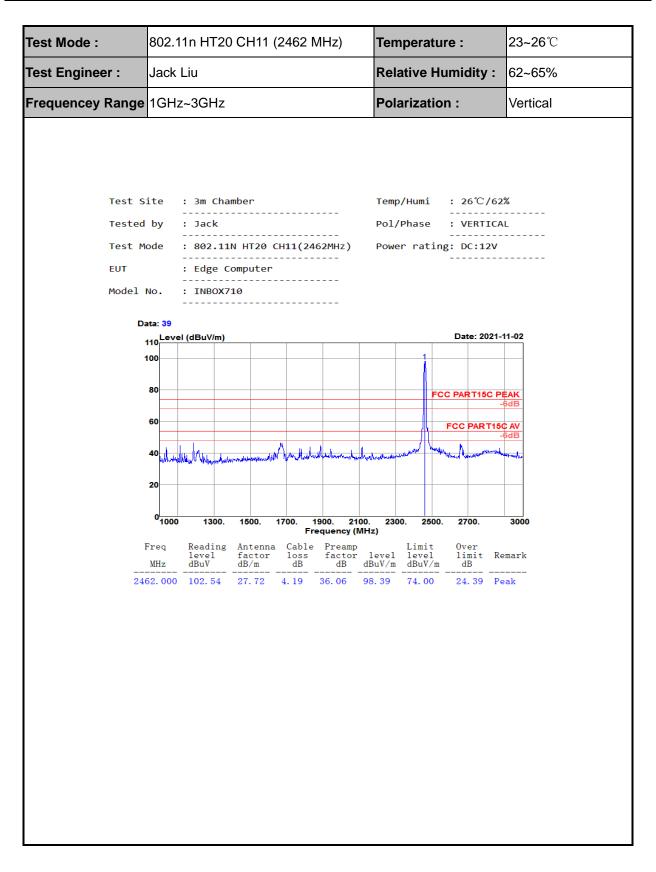




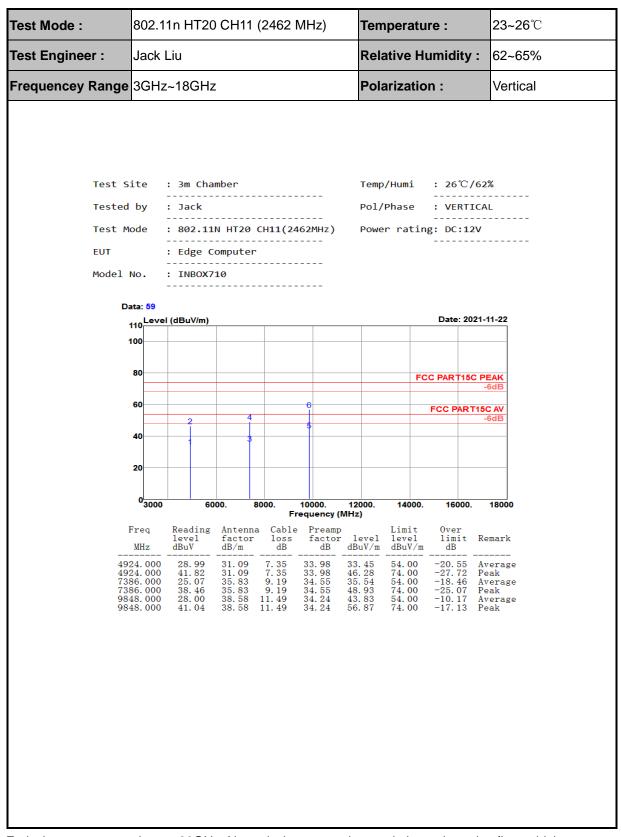






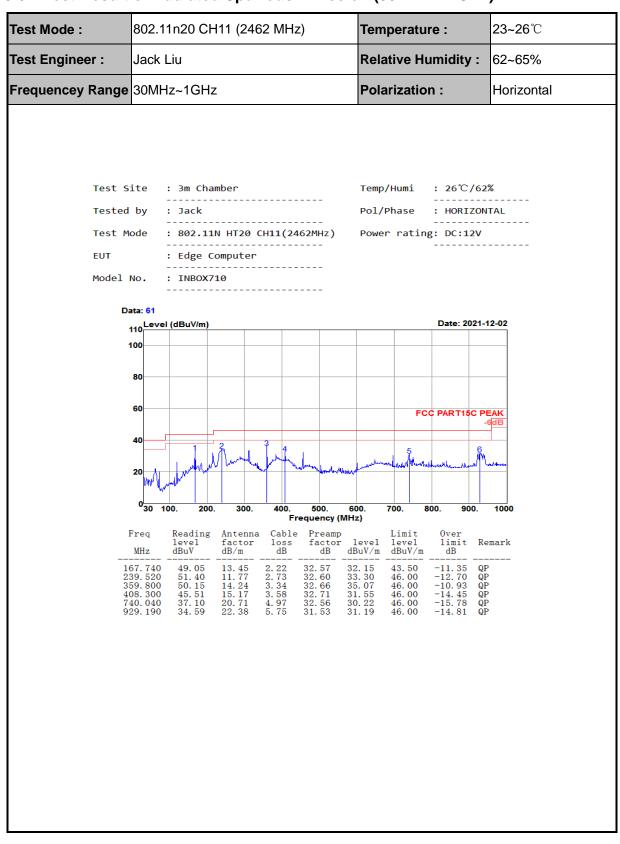




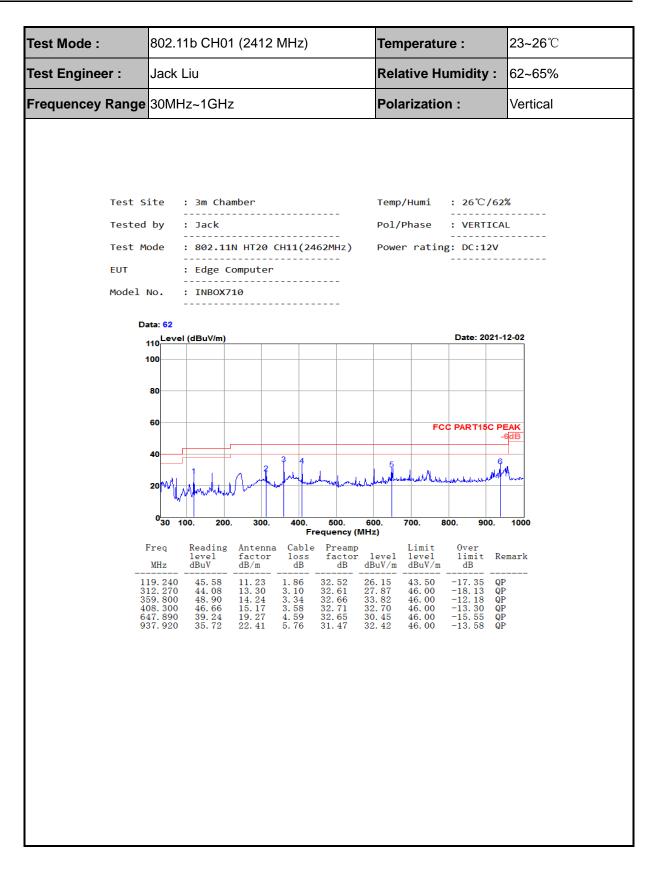




#### 4.5.6 Test Result of Radiated Spurious Emission (30MHz ~ 1GHz)











# 4.6 AC Conducted Emission Measurement

#### 4.6.1 Limit of AC Conducted Emission

FCC §15.207

IC RSS-GEN 8.8

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of omission (MHz)	Conducted	l limit (dBμV)
Frequency of emission (MHz)	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

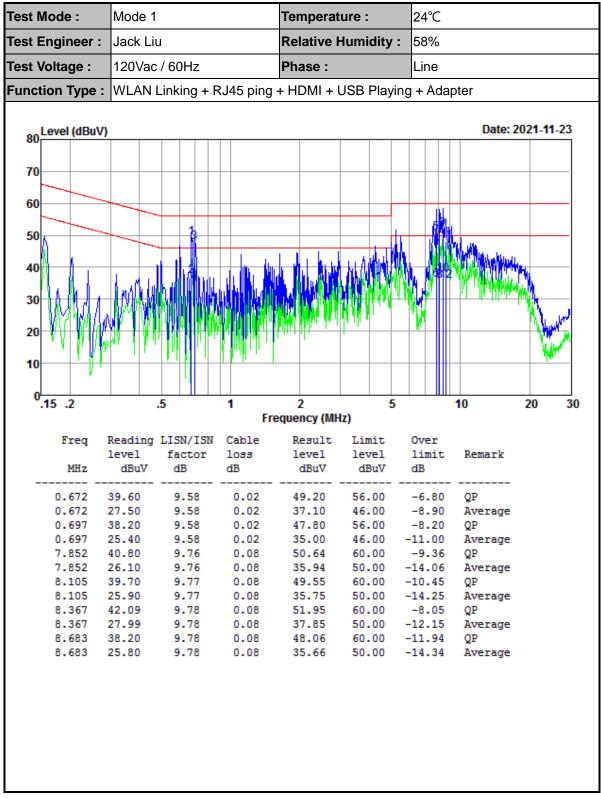
\*Decreases with the logarithm of the frequency.

#### 4.6.2 Test Procedures

- 1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
- 2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
- 3. All the support units are connecting to the other LISN.
- 4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
- 5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
- 6. Both sides of AC line were checked for maximum conducted interference.
- 7. The frequency range from 150 kHz to 30 MHz was searched.
- Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

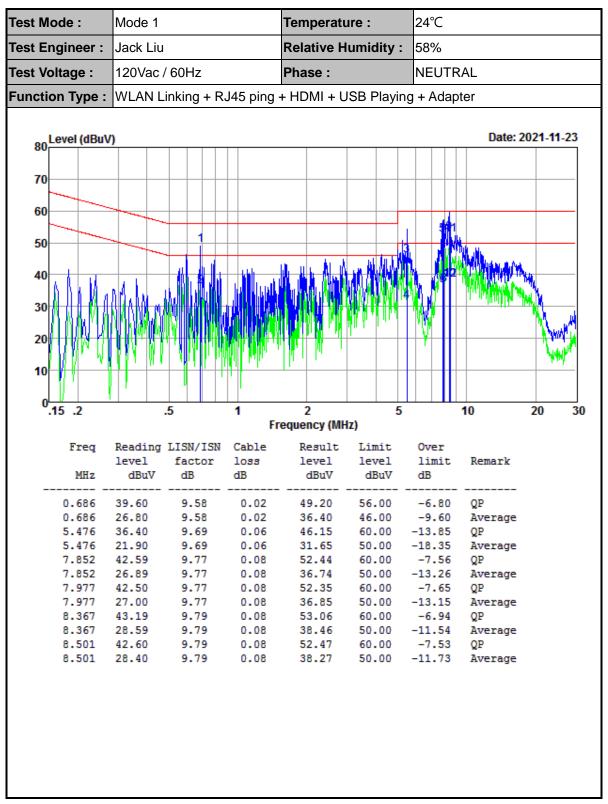


#### 4.6.3 Test Result of AC Conducted Emission



Result Level= Reading Level + LISN Factor + Cable Loss





Result Level= Reading Level + LISN Factor + Cable Loss



## 4.7 Antenna Requirements

#### 4.7.1 Standard Applicable

According to antenna requirement of §15.203.

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be re-placed by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded..

And according to §15.247(4)(1), system operating in the 2400-2483.5MHz bands that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

#### 4.7.2 Antenna Connected Construction

An Suction cup Antenna design is used.

#### 4.7.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



# 5 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Due Date	Remark	
Spectrum Analyzer	Keysight	N9010A	MY56070788	2021-01-05	2022-01-04	Conducted	
Power Sensor	Keysight	U2021XA	MY56510025	2021-01-05	2022-01-04	Conducted	
Power Sensor	Keysight	U2021XA	MY57030005	2021-01-05	2022-01-04	Conducted	
Power Sensor	Keysight	U2021XA	MY56510018	2021-01-05		Conducted	
Power Sensor	Keysight	U2021XA	MY56480002	2021-01-05	2022-01-04	Conducted	
Thermal Chamber	Howkin	UHL-34	19111801	2021-04-21	2022-04-20	Conducted	
Base Station	R&S	CMW 270	101231	2021-01-05	2022-01-04	Conducted	
Signal Generator (Interferer)	Keysight	N5182B	MY56200384	2021-01-05	2022-01-04	Conducted	
Signal Generator (Blocker)	Keysight	N5171B	MY56200661	2021-01-05	2022-01-04	Conducted	

Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV 40	101433	2021-01-05	2022-01-04	Radiation
Amplifier	Sonoma	310	363917	2021-01-06	2022-01-05	Radiation
Amplifier	Schwarzbeck	BBV 9718	327	2021-01-06	2022-01-05	Radiation
Amplifier	Narda	TTA1840-35-HG	2034380	2021-11-27	2024-11-26	Radiation
Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-051	2020-02-14	2023-02-13	Radiation
Broadband Antenna	Schwarzbeck	VULB 9168	9168-757	2020-09-27	2023-09-26	Radiation
Horn Antenna	nna Schwarzbeck BBHA 9120		1677	2020-02-14	2023-02-13	Radiation
Horn Antenna	COM-POWER	AH-1840	101117	2021-06-05	2024-06-04	Radiation
Test Software	Audix	E3	6.111221a	N/A	N/A	Radiation
Filter	Micro-Tronics	BRM 50702	G266	N/A	N/A	Radiation



Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Due Date	Remark
LISN	R&S	ENV216	102125	2021-01-05	2022-01-04	Conducted
LISN	R&S	ENV432	101327	2021-01-06	2022-01-05	Conducted
EMI Test	R&S	ESR3	102143	2021-01-06	2022-01-05	Conducted
Receiver	Rao	LONG	102140	2021 01 00	2022 01 03	Conducted
EMI Test	Audix	Γ2	N/A	N/A	N/A	Conducted
Software	Audix	E3	IN/A	IN/A	IN/A	Conducted

N/A: No Calibration Required



# 6 Uncertainty of Evaluation

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	UNCERTAINTY		
Conducted emissions	9kHz~30MHz	2.42dB		
Radiated emission	30MHz ~ 1GMHz	2.50dB		
	1GHz ~ 18GHz	3.51dB		
	18GHz ~ 40GHz	3.96dB		

MEASUREMENT	UNCERTAINTY
Occupied Channel Bandwidth	±196.4Hz
RF output power, conducted	±2.31dB
Power density, conducted	±2.31dB

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



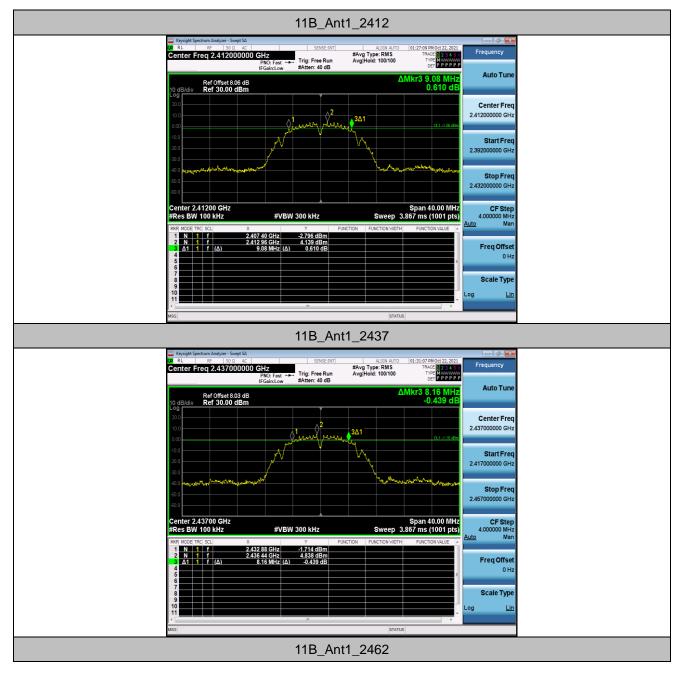
# Appendix A: DTS Bandwidth

#### **Test Result**

TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B .		2412	9.080	2407.400	2416.480	≥0.5	PASS
	Ant1	2437	8.160	2432.880	2441.040	≥0.5	PASS
		2462	8.200	2457.840	2466.040	≥0.5	PASS
11G Ant1		2412	16.440	2403.760	2420.200	≥0.5	PASS
	Ant1	2437	16.400	2428.760	2445.160	≥0.5	PASS
		2462	16.400	2453.760	2470.160	≥0.5	PASS
		2412	17.680	2403.120	2420.800	≥0.5	PASS
11N20SISO	Ant1	2437	17.600	2428.160	2445.760	≥0.5	PASS
		2462	17.640	2453.120	2470.760	≥0.5	PASS



### **Test Graphs**





Report No.: EC2105025RF01





Report No.: EC2105025RF01



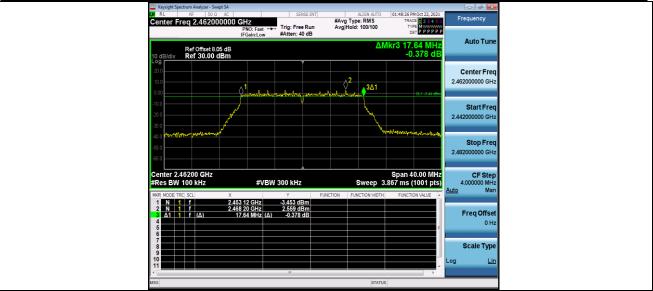


Report No.: EC2105025RF01





#### Report No.: EC2105025RF01





# **Appendix B: Occupied Channel Bandwidth**

#### **Test Result**

TestMode	Antenna	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
		2412	11.778	2406.143	2417.921		PASS
11B Ant1	2437	11.840	2431.080	2442.920		PASS	
		2462	11.786	2456.050	2467.836		PASS
11G Ant1	2412	17.590	2403.223	2420.813		PASS	
	Ant1	2437	17.555	2428.253	2445.808		PASS
		2462	17.634	2453.062	2470.696		PASS
		2412	18.503	2402.786	2421.289		PASS
11N20SISO	Ant1	2437	18.508	2427.745	2446.253		PASS
		2462	18.520	2452.617	2471.137		PASS



### **Test Graphs**



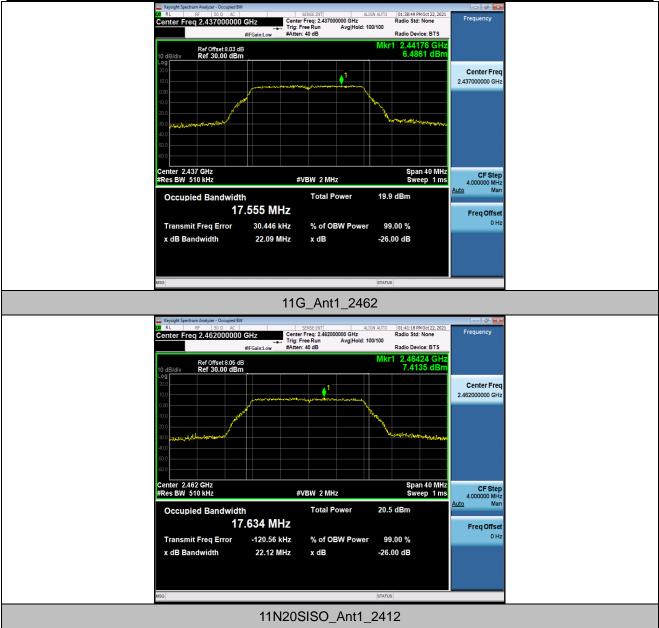


Report No.: EC2105025RF01





Report No.: EC2105025RF01





Report No.: EC2105025RF01





#### Report No.: EC2105025RF01





# Appendix C: Maximum conducted output power

#### **Test Result**

TestMode Antenna	Antenna	Channel	DT (%)	10 log (1/x)	Result	Limit [dBm]	EIRP Result	EIRP Limit	Verdict
				(1/X)	[dBm]	[dbiii]	[dBm]	[dBm]	
		2412	99.64	-	13.06	<=30	16.06	36.02	PASS
11B	Ant1	2437	99.53	-	13.34	<=30	16.34	36.02	PASS
		2462	99.64	-	13.81	<=30	16.81	36.02	PASS
		2412	97.2	0.12	13.44	<=30	16.44	36.02	PASS
11G	Ant1	2437	97.22	0.12	13.8	<=30	16.80	36.02	PASS
		2462	97.22	0.12	14.22	<=30	17.22	36.02	PASS
		2412	97.04	0.13	13.16	<=30	16.16	36.02	PASS
11N20SISO	Ant1	2437	97.04	0.13	13.63	<=30	16.63	36.02	PASS
		2462	97.04	0.13	14.13	<=30	17.13	36.02	PASS



### **Test Graphs**

