JAPAN Radio Test Report

WLAN 2.4GHz Band

APPLICANT	:	Lenovo (Shanghai) Electronics Technology Co., Ltd.
PRODUCT NAME	:	Lenovo smart Display
BRAND NAME	:	Lenovo
MODEL NAME	:	Lenovo CD-17302F
TYPE EMISSIONS	:	13M8G1D (DSSS_802.11b) ; 16M6G1D/D1D (OFDM_802.11g) ; 17M7G1D/D1D (OFDM_802.11n_HT20)
DECLARATION OUTPUT POWER	:	9.00 mW/MHz (DSSS_802.11b) ; 3.95 mW/MHz (OFDM_802.11g) ; 3.35 mW/MHz (OFDM_802.11n_HT20)
STANDARD	:	Article 49-20 and the relevant articles of the Ordinance Regulating Radio Equipment
TEST PROCEDURE	:	MIC Notice No.88 Appendix No.43

JAPAN Radio Test Report – WLAN 2.4G Band Report No. : JR962620B

The product sample received on Jun. 26, 2019 and completely tested on Aug. 12, 2019. We, Sporton International Inc. (KunShan), would like to declare that the tested sample has been evaluated in accordance with the procedures given in MIC Notice No.88 Appendix No.43 and shown to be compliant with the applicable technical standards. Article 2 Paragraph 1 Item 19 of the Certificate Ordinance of the Radio Law indicates the classification of the specified radio equipment.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (KunShan), the test report shall not be reproduced except in full.

Prepared by: James Huang / Manager

Approved by: Jones Tsai / Manager

Sporton International Inc. (KunShan)

No.3-2, Pingxiang Road, Kunshan Development Zone, Jiangsu, China

TABLE OF CONTENTS

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
JR962620B	Rev. 01	Initial issue of report	Sep. 06, 2019

SUMMARY OF TEST RESULT

Report Section	Description	Result
3.1	Frequency Tolerance	Pass
3.2	Occupied Bandwidth and Spread-spectrum Bandwidth / Spread Factor	Pass
3.3	Unwanted Emission Intensity	Pass
3.4	RF Output Power / Tolerance	Pass
3.5	Limitation of Collateral Emission of Receiver	Pass
3.6	Transmission Antenna Gain (EIRP Antenna Power)	N/A
3.7	Transmission Radiation Angle Width (3dB Beam width)	N/A
3.8	Radio Interference Prevention Capability	Pass
3.9	Carrier Sense Function	N/A
3.10	Construction Protection Confirmation	Pass

1 General Description

1.1 Applicant

Lenovo (Shanghai) Electronics Technology Co., Ltd.
Section 304-305, Building No. 4, # 222, Meiyue Road, China (Shanghai) Pilot Free Trade Zone

1.2 Manufacturer

Lenovo PC HK Limited
23/F, Lincoln House, Taikoo Place979 King's Road, Quarry Bay, Hong Kong P.R.China

1.3 Feature of Equipment Under Test

Product Feature & Specification		
Product Name	Lenovo smart Display	
Brand Name	Lenovo	
Model Name	Lenovo CD-17302F	
Support Category / Frequency Range	Article 2-1-19 / 2400MHz ~ 2483.5MHz	
WLAN Type of Modulation	■ Direct Spreading (DS) ■ Orthogonal frequency-division multiplexing (OFDM) □ Frequency Hopping (FH)	
RF Technology	■ 802.11b ■ 802.11g ■ 802.11n-HT20 □ 802.11n-HT40	
Number of Channels	20MHz System	13
Channel Spacing	5 MHz	
Declaration RF Output Power	9.00 mW/MHz (DSSS 802.11b mode) 3.95 mW/MHz (OFDM 802.11g mode) 3.35 mW/MHz (OFDM 802.11n_HT20 mode)	
Antenna Power (E.I.R.P)	8.042 dBm/MHz (DSSS 802.11b mode) 4.466 dBm/MHz (OFDM 802.11g mode) 3.750 dBm/MHz (OFDM 802.11n_HT20 mode)	
Type of Modulation	■ BPSK ■ QPSK ■ 16QAM ■ 64QAM □ 256QAM	
Power Source[NOTE]	■ Commercial power	AC 100 ~ 240V
	■ External Power Source	DC 20V, 1.5A
	□ Lithium battery	DC 3.7V, mAh
	□ UM battery	DC 1.2V

NOTE: When EUT be operated at ±10% from the normal supply voltage, the supply voltage of RF part was varied within ±1%. All test cases were done under the normal supply voltage.

Power Supply voltage 100 Vac (Nominal)	Power Supply voltage 110 Vac (+10%)	Power Supply voltage 90 Vac (-10%)
1.8	1.8	1.8

Measurement point

Antenna Information			
Brand Name :	N/A	**Model Name :**	N/A
Antenna Type :	PIFA	**Antenna Gain :**	-1.50 dBi

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Modification of EUT

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

1.5 Testing Site

Test Site	Sporton International Inc. (KunShan) Mobile Communications Laboratory
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone, Jiangsu province, China TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958
Test Site No.	**Sporton Site No.:** TH01-KS

Test Items	Uncertainty	Remark
Occupied Channel Bandwidth	±101.5 kHz	Confidence 95%
RF output power, conducted	±0.68 dB	Confidence 95%
Frequency Tolerance	±101.5 kHz	Confidence 95%
Power density, conducted	±0.46 dB	Confidence 95%
Temperature	±0.8 °C	Confidence 95%
Humidity	±3 %	Confidence 95%
Time	±0.33 %	Confidence 95%

1.6 Applied Standards

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

- Article 49-20 and the relevant articles of the Ordinance Regulating Radio Equipment

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. The measurement was implemented in accordance with MIC Notice No. 88 Appendix No. 43.

1.7 Ancillary Equipment List

None.

2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

Channel	Frequency (MHz)
1	2412
2	2417
3	2422
4	2427
5	2432
6	2437
7	2442
8	2447
9	2452
10	2457
11	2462
12	2467
13	2472

2.2 EUT Operation Test Setup

During testing, RF test program provided by the customer was used to control the operating channel as well as the output power level.

3 Test Result

3.1 Frequency Tolerance Measurement

3.1.1 Limit

Item	Limits
Frequency Tolerance	≤50ppm

3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedure

1. Frequency accuracy of instrument shall be less than 10% of limits tolerance (5ppm).
2. Two methods for the item
   a. CW Tone method
      i. Setting of SA is following as: RBW:1kHz / VBW:30kHz.
      ii. Maker Max. level to get measuring frequency f.
   b. 10dB down method
      i. Setting of SA is following as: RBW:100kHz / VBW: 100kHz / Trace: MaxHold
      ii. Display line Level = Max. level – 10dB to place two markers, highest(fH) and lowest(fL) frequency
      iii. Determine measuring frequency f = (fH-fL)/2
3. The frequency tolerance test case is directly measured using spectrum analyzer. Then the frequency error formula is $(f-fc)/fc \times 10^6$ ppm and the limit is less than ±50ppm.

3.1.4 Test Setup

3.1.5 Test Deviation

There is no deviation with the original standard.

3.1.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.1.7 Test Result of Frequency Tolerance

Please refer to Appendix B.

3.2 Occupied Bandwidth and Spread-spectrum Bandwidth / Spread Factor Measurement

3.2.1 Limit

Item	Limits
Occupied Band Width	DS ≤ 26MHz; Others ≤ 26MHz OFDM (For BW=20MHz) ≤ 26MHz
Spreading Bandwidth	DS ≥ 500 kHz

3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

3.2.3 Test Procedures

1. Setting of SA is following as: RBW: 300KHz / VBW:300KHz / Sweep Mode: Continuous sweep / Detect mode: Positive peak / Trace mode: Max hold.
2. EUT have transmitted each modulation signal and fixed channelize (For DSSS or OFDM Device). SA set to 99% of occupied bandwidth to measure occupied bandwidth. The limit is less than 26MHz (For DSSS or OFDM Device).
3. SA set to 90% of occupied bandwidth to measure Spread Spectrum Bandwidth and must greater than 500kHz.
4. Spread Spectrum Factor = Spread Spectrum Bandwidth / modulation rate of EUT.
5. Spread Spectrum Factor limit is greater than 5.

3.2.4 Test Setup

3.2.5 Test Deviation

There is no deviation with the original standard.

3.2.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.2.7 Test Result of Occupied Bandwidth and Spread-spectrum Bandwidth / Spread Factor Measurement

Please refer to Appendix B.

3.3 Unwanted Emission Intensity Measurement

3.3.1 Limit

Item	Limits
Tx Spurious Emission	≤ 2.5 μW (2387MHz > f ; 2496.5MHz < f)
	≤ 25 μW (2387MHz ≤ f <2400MHz) and (2483.5MHz < f ≤ 2496.5MHz)

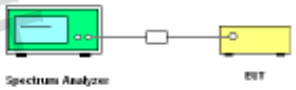
3.3.2 Measuring Instruments

See list of measuring instruments of this test report.

3.3.3 Test Procedures

1. EUT have transmitted the maximum power and fixed channelize.
2. Setting of SA is following as: RBW:1MHz / VBW:1MHz above 1GHz, Sweep time: Auto / Sweep Mode: Continuous sweep / Detect mode: Positive peak / Trace mode: Max hold.
3. Setting of SA is following as: RBW:100KHz / VBW:100KHz under 1GHz, Sweep time: Auto / Sweep Mode: Continuous sweep / Detect mode: Positive peak / Trace mode: Max hold.
4. Setting of SA is following as 30MHz and stop frequency 2387MHz Then to mark peak reading value + cable loss shall be less than 2.5μW.
5. SA adjusted to start frequency 2387MHz and stop frequency 2400MHz. Then to mark peak reading value + cable loss shall be less than 25μW.
6. SA adjusted to start frequency 2483.5MHz and stop frequency 2496.5MHz Then to mark peak reading value + cable loss shall be less than 25μW.
7. SA adjusted to start frequency 2496.5MHz and stop frequency 12500MHz Then to mark peak reading value + cable loss shall be less than 2.5μW.
8. 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.

3.3.4 Test Setup



3.3.5 Test Deviation

There is no deviation with the original standard.

3.3.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.3.7 Test Result of Unwanted Emission Intensity

Please refer to Appendix B.

3.4 RF Output Power / Tolerance

3.4.1 Limit

Item	Limits
Antenna Power Density	≤ 10mW/MHz (OFDM,DS from 2400~2483.5MHz) ≤ 10mW (Other from 2400~2483.5MHz)
Antenna Power Error	+20%, -80% (Base on manufacturer declare antenna power density)

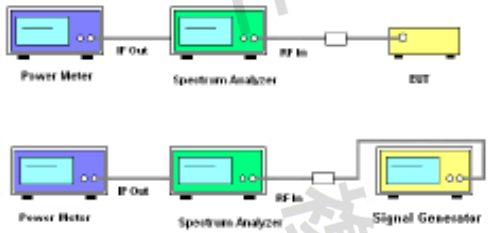
3.4.2 Measuring Instruments

See list of measuring instruments of this test report.

3.4.3 Test Procedures

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 “E”.
6. Remove the EUT and put the replacing standard signal generator (SSG). Set the standard signal generator (SSG) at same frequency and transmit on, then set SSG output power at Pt to give the equivalent output level of “E”.
7. Calculate antenna power density by the formula below PD = Pt + 10*log(1/x).
   x: The duty cycle of the EUT in continuously transmitting mode
   Pt: Output power of the SSG
8. 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.

3.4.4 Test Setup



3.4.5 Test Deviation

There is no deviation with the original standard.

3.4.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.4.7 Test Result of RF Output Power / Tolerance

Please refer to Appendix B.

3.5 Limitation of Collateral Emission of Receiver Measurement

3.5.1 Limit

Item	Limits
Rx Spurious Emission	≤ 4nW (f < 1GHz)
	≤ 20nW (1GHz ≤ f)

3.5.2 Measuring Instruments

See list of measuring instruments of this test report.

3.5.3 Test Procedures

1. EUT have the continuous reception mode and fixed only one channelize.
2. SA set RBW: 100KHz and VBW: 100KHz. Then adjust to start frequency 30MHz and stop frequency 1000MHz. Search to mark peak reading value + cable loss shall be less than 4nW.
3. SA set RBW: 1MHz and VBW: 1MHz. Then adjust to start frequency 1000MHz and stop frequency 12500MHz. Search to mark peak reading value + cable loss shall be less than 20nW.
4. If power level of lower emissions are more than 1/10 of limit (.0.4nW for f < 1GHz, 2nW for f >= 1GHz), 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.

3.5.4 Test Setup

3.5.5 Test Deviation

There is no deviation with the original standard.

3.5.6 EUT Operation during Test

The EUT was programmed to be in continuously reception mode.

3.5.7 Test Result of Limitation of Collateral Emission of Receiver

Please refer to Appendix B.

3.6 Transmission Antenna Gain (EIRP Antenna Power) Measurement

3.6.1 Limit

Item	Limits
EIRP Power Density	≤ 12.14dBm/MHz (OFDM,DS from 2400~2483.5MHz) ≤ 12.14dBm (Other from 2400~2483.5MHz)
Remark: This test item will not be applied to EIRP power of EUT is lower than 12.14dBm/MHz.	

3.6.2 Measuring Instruments

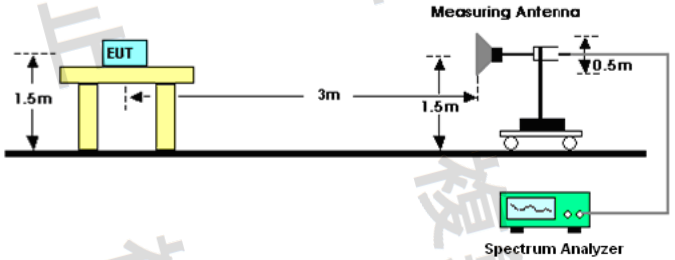
See list of measuring instruments of this test report.

3.6.3 Test Procedures

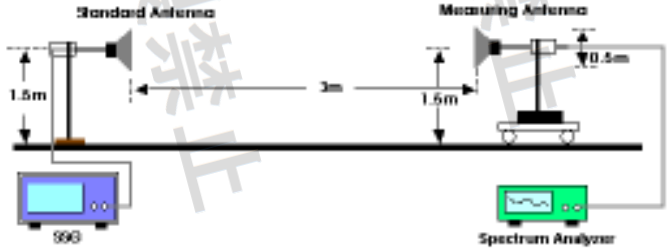
1. Set EUT ad measuring antenna at the same height and roughly facing each other.
2. Move the measuring antenna height up and down within ± 50cm of EUT height and swing it to find the maximum output of the measuring antenna. The output level at the spectrum analyzer is read sa “E“.
3. Remove the EUT 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.
4. Swing the replacing antenna give a maximum receiving level.
5. Move the measuring antenna height up and down within ± 50cm of replacing antenna height and swing it to find the maximum receiving level.
6. Set SSG output power at Pt to give the equivalent output level of “E” or caluate Pt with SSG output which gives the nearest of “E” and difference (± 1dB). Record the Pt.
7. Calculate EIRP by the formula below EIRP = Gt – L + Pt.
   Gt: gain of replacing antenna (dBi)
   L: feeder loss between SSG and replacing antenna
   Pt: Output power of the SSG
8. 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.

3.6.4 Test Setup

<For EUT radiation measurement>



<For standard antenna measurement>



3.6.5 Test Deviation

There is no deviation with the original standard.

3.6.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.6.7 Test Result of Transmission Antenna Gain (EIRP Antenna Power)

Please refer to Appendix B. For the antenna gain, please refer to antenna test report.

Remark: This test item will not be applied to EIRP power of EUT is lower than 12.14dBm/MHz.

3.7 Transmission Radiation Angle Width (3dB Beamwidth) Measurement

3.7.1 Limit

Item	Limits
3dB antenna beamwidth	360/A (If A < 1; then A = 1) A = {EIRP Power [dBm/MHz] – 12.14 [dBm/MHz] for DS, OFDM} or {E.I.R.P Power [dBm/MHz] – 6.91 [dBm/MHz] for FH
Remark: This test item will not be applied to EIRP power of EUT is lower than 12.14dBm/MHz.	

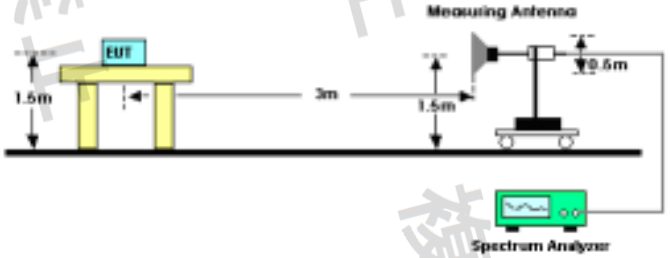
3.7.2 Measuring Instruments

See list of measuring instruments of this test report.

3.7.3 Test Procedures

1. Set EUT and measuring antenna at the same height and roughly facing each other.
2. Set spectrum analyzer with condition in section 3.7.2 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 ± 50cm 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 = {EIRP Power [dBm/MHz] – 12.14 [dBm/MHz] for DS, OFDM} or
   A = {E.I.R.P Power [dBm/MHz] – 6.91 [dBm/MHz] for FH}

3.7.4 Test Setup



3.7.5 Test Deviation

There is no deviation with the original standard.

3.7.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.7.7 Test Result of Transmission Radiation Angle Width (3dB Beamwidth)

Please refer to Appendix B.

For the antenna gain, please refer to antenna test report.

Remark: This test item will not be applied to EIRP power of EUT is lower than 12.14dBm/MHz.

3.8 Radio Interference Prevention Capability Measurement

3.8.1 Limit

Item	Limits
Identification code	≥ 48 bits

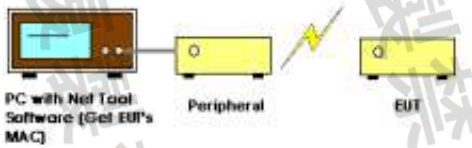
3.8.2 Measuring Instruments

See list of measuring instruments of this test report.

3.8.3 Test Procedures

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

3.8.4 Test Setup



3.8.5 Test Deviation

There is no deviation with the original standard.

3.8.6 EUT Operation during Test

The EUT was programmed to be in normal transmitting mode.

3.8.7 Test Result of Radio Interference Prevention Capability

Please refer to Appendix B.

3.9 Carrier Sense

3.9.1 Limit

The radio equipment connected to telecommunication circuit equipment shall be equipped with a device which detects emissions radiated from another radio station and prevents interference, or a device which prevents interference by operation on a receive signal and a signal for diffusion for signal level detection.

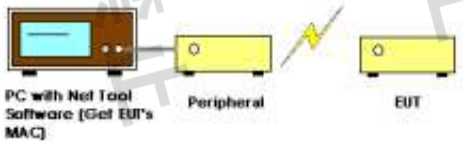
3.9.2 Measuring Instruments

See list of measuring instruments of this test report.

3.9.3 Test Procedures

1. Set the EUT link with a peripheral, access point 802.11n-HT40
2. Set a signal generator (simulate a radio device which co-exists with EUT) at same frequency channel with a proper signal level (exceeding 100mV/m) output to act as interference signal.
3. Monitor the signal transmission between the EUT and peripheral, while the interference signal presents. The EUT would stop transmitting once it detects interference signal over the air, then record it pass, otherwise, the result is fail.

3.9.4 Test Setup



3.9.5 Test Deviation

There is no deviation with the original standard.

3.9.6 EUT Operation during Test

The EUT was programmed to be in normal transmitting mode.

3.9.7 Test Result of Carrier Sense

Not Applicable.

3.10 Construction Protection Confirmation Method

3.10.1 Limit

The high-frequency section and modulation section of the radio equipment except for the antenna system shall not be capable of being opened easily.

3.10.2 Confirmation Method

☐	Sealed with special screws.
☐	Plastic chassis is being welded using ultrasonic waves.
☐	Chassis is glued using a special adhesive.
☐	Metal covers are spot-fused.
☐	Cover is specially interlocked.
■	RF and Modulation components are covered with shielding case and this shielding case is soldered.
☐	Shield case is welded at RF and modulation parts, and ID-ROM is welded using the BGA Method.
☐	Shield case is welded at RF and modulation parts, and ID-ROM is glued at its lead with a special adhesive.
☐	Shield case is welded at RF and modulation parts, and ID-ROM is glued with a non-transparent laminating agent.
☐	Other :

3.10.3 The Photos of Construction Protection

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Periods of Test	Due Date	Calibration Body	Calibration Method
Spectrum Analyzer	R&S	FSV30	101338	10Hz~30GHz	Apr. 16, 2019	Aug. 07, 2019~ Aug. 12, 2019	Apr. 15, 2020	CEPREI Calibration and Testing Center	C
Pulse Power Senor	Anritsu	ML2495A	1339163	300MHz~40GHz	Nov. 19, 2018	Aug. 07, 2019~ Aug. 12, 2019	Nov. 18, 2019	CEPREI Calibration and Testing Center	C
Power Meter	Anritsu	ML2495A	1435004	50MHz Bandwidth	Nov. 19, 2018	Aug. 07, 2019~ Aug. 12, 2019	Nov. 18, 2019	CEPREI Calibration and Testing Center	C
AC Power Source	Chroma	61602	ABP00000081 1	AC 0V~300V, 45Hz~1000Hz	Oct. 12, 2018	Aug. 07, 2019~ Aug. 12, 2019	Oct. 11, 2019	CEPREI Calibration and Testing Center	C
Multi-meter	YFE	YF-303	YF-303-01	-	Apr. 17, 2019	Aug. 07, 2019~ Aug. 12, 2019	Apr. 16, 2020	CEPREI Calibration and Testing Center	C

Note: Above test equipment was used and kept valid calibration period during test.

Calibration Method :

a) : Calibration conducted by the National Institute of Information and Communications Technology～ NICT～ or a designated calibration agency under Article 102-18 paragraph

(1) TELEC Engeneering Center, Intertek Japan K.K., Keysight Technologies, Inc～.

b) : Correction conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Law (Law No. 51 of 1992)～Japan Calibration Service Syste～

c) : Calibration conducted in foreign countries, which shall be equivalent to the calibration conducted by the NICT or a designated calibration agency under Article 102-18 paragraph

(1)～ TELEC Engeneering Center, Intertek Japan K.K., Keysight Technologies, Inc～.

Appendix A. Setup Photographs

Front View

Near View

Appendix B. Test Results

Please refer to the following pages for test results.

1. TEST RESULTS DATA
WLAN 2.4G Band - 802.11b

Environment of Test Room	Temperature	21~24 °C
	Humidity	49~51 %
Test Engineer	Lion Ran	

Modulatoin Type :	DS
Type Emissions :	13M8G1D

Peak Antenna Gain	-1.50	dBi
Declaration Output Power	9.00	mW/MHz
Declaration Output Power	9.542	dBm/MHz
E.I.R.P	**8.042**	**dBm/MHz**
Input Power Voltage	100-240	VAC

Antenna System	**SISO**

Antenna	No.	Type	Gain
	1	PIFA	-1.50
	2	---	---
	3	---	---

Tested Circuit Insertion Loss		5.5	dB
Burst	ON TIME	8.406	msec
	OFF TIME	0.087	msec
	Ratio	98.976	%
Packet Type (Mode)		1Mbps	mode

Frequency equal to the transmission rate of the modulation signal (5.5Mbps mode)
1.375

Test Category : 2.4GHz Band Wideband Low-Power Data Communication System

Comprehensive operation test

Use the DC Power Supply to adjust voltage.

1.1. TEST Results (Normal Voltage)

Measurement Frequency	MHz	2412	2442	2472	Regulation	Result
Channel Number	Ch.	1	7	13	-----	-----
Reading Frequency (TX1)	MHz	2412.071	2442.072	2472.073	-----	-----
Frequency Tolerance (TX1)	ppm	29.5191	29.3202	29.3285	50	**PASS**
Reading Frequency (TX2)	MHz	-----	-----	-----	-----	-----
Frequency Tolerance (TX2)	ppm	-----	-----	-----	-----	-----
Reading Frequency (TX3)	MHz	-----	-----	-----	-----	-----
Frequency Tolerance (TX3)	ppm	-----	-----	-----	-----	-----
Occupied Bandwidth (TX1)	MHz	13.75	13.75	13.82	26	**PASS**
Spread Bandwidth (TX1)	MHz	8.76	8.76	8.76	0.5	**PASS**
Occupied Bandwidth (TX2)	MHz	-----	-----	-----	-----	-----
Spread Bandwidth (TX2)	MHz	-----	-----	-----	-----	-----
Occupied Bandwidth (TX3)	MHz	-----	-----	-----	-----	-----
Spread Bandwidth (TX3)	MHz	-----	-----	-----	-----	-----
RF Output Power (TX1)	mW/MHz	8.800	8.269	8.580	-----	-----
RF Output Power (TX2)	mW/MHz	-----	-----	-----	-----	-----
RF Output Power (TX3)	mW/MHz	-----	-----	-----	-----	-----
RF Output Power (Max)	mW/MHz	8.800	8.269	8.580	10.00	**PASS**
RF Output Power Tolerance Max(TX1,TX2,TX3)	%	-2.22	-8.12	-4.67	20%~80%	**PASS**
Real Total Output Power (TX1)	dBm	17.84	17.47	17.79	-----	-----
Real Total Output Power (TX2)	dBm	-----	-----	-----	-----	-----
Real Total Output Power (TX3)	dBm	-----	-----	-----	-----	-----
Real Total Output Power (Max)	dBm	17.84	17.47	17.79	-----	-----

1.1. TEST Results (Normal Voltage)

Measurement Frequency		MHz	2412	2442	2472	Regulation	Result
Channel Number		Ch.	1	7	13	-----	-----
Unwanted Emission Strength (TX1) for Ch1 ~13	Under 2387MHz	µW/MHz	0.019454	0.018621	0.020654	2.5	**PASS**
		MHz	2386.650	701.803	895.590	-----	-----
	2387-2400MHz	µW/MHz	1.028016	0.024099	0.017140	25	**PASS**
		MHz	2397.260	2399.354	2389.790	-----	-----
	2483.5-2496.5MHz	µW/MHz	0.015631	0.020137	1.244515	25	**PASS**
		MHz	2486.150	2489.337	2486.921	-----	-----
	2496.5MHz-12.5GHz	µW/MHz	0.087297	0.106660	0.169434	2.5	**PASS**
		MHz	7238.190	7327.207	7415.229	-----	-----
Unwanted Emission Strength (TX2) for Ch1 ~13	Under 2387MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2387-2400MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2483.5-2496.5MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2496.5MHz-12.5GHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
Unwanted Emission Strength (TX3) for Ch1 ~13	Under 2387MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2387-2400MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2483.5-2496.5MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2496.5MHz-12.5GHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
Unwanted Emission Strength (TX1+2) or (TX1+2+3) for Ch1 ~13	Under 2387MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2387-2400MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2483.5-2496.5MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2496.5MHz-12.5GHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	It should be added up all spurious measurement values within "Reference Bandwidth(=1MHz)" of the same frequency.						
Secondarily Emitted Radio Wave Strength (RX Spurious) (RX1)	Under 1GHz	nW	0.044771	0.045186	0.041783	4	**PASS**
		MHz	948.256	976.286	904.998	-----	-----
	1 - 12.5GHz	nW	0.554626	0.524807	0.548277	20	**PASS**
		MHz	6996.271	6947.400	6751.917	-----	-----
Secondarily Emitted Radio Wave Strength (RX Spurious) (RX2)	Under 1GHz	nW	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	1 - 12.5GHz	nW	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
Secondarily Emitted Radio Wave Strength (RX Spurious) (RX3)	Under 1GHz	nW	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	1 - 12.5GHz	nW	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
Secondarily Emitted Radio Wave Strength (RX Spurious) (RX1+2) or (RX1+2+3)	Under 1GHz	nW	-----	-----	-----	-----	-----
						-----	-----
	1 - 12.5GHz	nW	-----	-----	-----	-----	-----
						-----	-----
	It should be added up all spurious measurement values within "Reference Bandwidth(=1MHz)" of the same frequency.						
Spread Factor		-----	6.37	6.37	6.37	5	**PASS**
Interference Prevention Function		-----		good		-----	**PASS**

Report Number : JR962620B

2. TEST RESULTS DATA
WLAN 2.4G Band - 802.11g

Environment of Test Room	Temperature	21~24 °C
	Humidity	49~51 %
Test Engineer	Lion Ran	

Modulatoin Type :	OFDM
Type Emissions :	16M6G1D/D1D

Peak Antenna Gain	-1.50	dBi
Declaration Output Power	3.95	mW/MHz
Declaration Output Power	5.966	dBm/MHz
E.I.R.P	**4.466**	**dBm/MHz**
Input Power Voltage	100-240	VAC

Antenna System	**SISO**

Antenna	No.	Type	Gain
	1	PIFA	-1.50
	2	---	---
	3	---	---

Tested Circuit Insertion Loss		5.5	dB
Burst	ON TIME	1.391	msec
	OFF TIME	0.101	msec
	Ratio	93.204	%
Packet Type (Mode)		6Mbps	mode

Test Category :	2.4GHz Band Wideband Low-Power Data Communication System

Comprehensive operation test
Use the DC Power Supply to adjust voltage.

2.1. TEST Results (Normal Voltage)

Measurement Frequency	MHz	2412	2442	2472	Regulation	Result
Channel Number	Ch.	1	7	13	-----	-----
Reading Frequency (TX1)	MHz	2412.071	2442.072	2472.073	-----	-----
Frequency Tolerance (TX1)	ppm	29.3408	29.5127	29.6804	50	**PASS**
Reading Frequency (TX2)	MHz	-----	-----	-----	-----	-----
Frequency Tolerance (TX2)	ppm	-----	-----	-----	-----	-----
Reading Frequency (TX3)	MHz	-----	-----	-----	-----	-----
Frequency Tolerance (TX3)	ppm	-----	-----	-----	-----	-----
Occupied Bandwidth (TX1)	MHz	16.50	16.64	16.57	26	**PASS**
Occupied Bandwidth (TX2)	MHz	-----	-----	-----	-----	-----
Occupied Bandwidth (TX3)	MHz	-----	-----	-----	-----	-----
RF Output Power (TX1)	mW/MHz	3.618	4.007	3.397	-----	-----
RF Output Power (TX2)	mW/MHz	-----	-----	-----	-----	-----
RF Output Power (TX3)	mW/MHz	-----	-----	-----	-----	-----
RF Output Power (Max)	mW/MHz	3.618	4.007	3.397	10.00	**PASS**
RF Output Power Tolerance Max(TX1,TX2,TX3)	%	-8.41	1.45	-14.01	20%~-80%	**PASS**
Real Total Output Power (TX1)	dBm	16.50	16.55	16.61	-----	-----
Real Total Output Power (TX2)	dBm	-----	-----	-----	-----	-----
Real Total Output Power (TX3)	dBm	-----	-----	-----	-----	-----
Real Total Output Power (Max)	dBm	16.50	16.55	16.61	-----	-----

This report shall not be reproduced except in full without the written approval of Sporton International Inc.

2.1. TEST Results (Normal Voltage)

Measurement Frequency		MHz	2412	2442	2472	Regulation	Result
Channel Number		Ch.	1	7	13	-----	-----
Unwanted Emission Strength (TX1) for Ch1 ~13	Under 2387MHz	µW/MHz	0.041400	0.018450	0.014791	2.5	**PASS**
		MHz	2383.881	836.232	913.824	-----	-----
	2387-2400MHz	µW/MHz	4.168694	0.005702	0.017219	25	**PASS**
		MHz	2399.763	2399.704	2389.803	-----	-----
	2483.5-2496.5MHz	µW/MHz	0.023281	0.035892	5.248075	25	**PASS**
		MHz	2486.654	2493.261	2483.536	-----	-----
	2496.5MHz-12.5GHz	µW/MHz	0.077983	0.065313	0.076208	2.5	**PASS**
		MHz	7245.187	7335.209	7419.230	-----	-----
Unwanted Emission Strength (TX2) for Ch1 ~ 13	Under 2387MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2387-2400MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2483.5-2496.5MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2496.5MHz-12.5GHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
Unwanted Emission Strength (TX3) for Ch1 ~ 13	Under 2387MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2387-2400MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2483.5-2496.5MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2496.5MHz-12.5GHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
Unwanted Emission Strength (TX1+2) or (TX1+2+3) for Ch1 ~13	Under 2387MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2387-2400MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2483.5-2496.5MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2496.5MHz-12.5GHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	It should be added up all spurious measurement values within "Reference Bandwidth(=1MHz)" of the same frequency.						
Secondarily Emitted Radio Wave Strength (RX Spurious) (RX1)	Under 1GHz	nW	0.050003	0.046345	0.045920	4	**PASS**
		MHz	908.587	967.945	867.657	-----	-----
	1 - 12.5GHz	nW	0.562341	0.529663	0.524807	20	**PASS**
		MHz	6547.809	6447.192	6875.531	-----	-----
Secondarily Emitted Radio Wave Strength (RX Spurious) (RX2)	Under 1GHz	nW	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	1 - 12.5GHz	nW	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
Secondarily Emitted Radio Wave Strength (RX Spurious) (RX3)	Under 1GHz	nW	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	1 - 12.5GHz	nW	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
Secondarily Emitted Radio Wave Strength (RX Spurious) (RX1+2) or (RX1+2+3)	Under 1GHz	nW	-----	-----	-----	-----	-----
						-----	-----
	1 - 12.5GHz	nW	-----	-----	-----	-----	-----
						-----	-----
	It should be added up all spurious measurement values within "Reference Bandwidth(=1MHz)" of the same frequency.						
Interference Prevention Function		-----	good			-----	**PASS**

3. TEST RESULTS DATA
WLAN 2.4G Band - 802.11n-HT20

Environment of Test Room	Temperature	21~24 °C
	Humidity	49~51 %
Test Engineer	Lion Ran	

Modulatoin Type :	OFDM
Type Emissions :	17M7G1D/D1D

Peak Antenna Gain	-1.50	dBi
Declaration Output Power	3.35	mW/MHz
Declaration Output Power	5.250	dBm/MHz
E.I.R.P	**3.750**	**dBm/MHz**
Input Power Voltage	100-240	VAC

Antenna System	**SISO**

Antenna	No.	Type	Gain
	1	PIFA	-1.50
	2	---	---
	3	---	---

Tested Circuit Insertion Loss		5.5	dB
Burst	ON TIME	1.304	msec
	OFF TIME	0.094	msec
	Ratio	93.264	%
Packet Type (Mode)		MCS0	mode

Test Category :	2.4GHz Band Wideband Low-Power Data Communication System

Comprehensive operation test
Use the DC Power Supply to adjust voltage.

3.1. TEST Results (Normal Voltage)

Measurement Frequency	MHz	2412	2442	2472	Regulation	Result
Channel Number	Ch.	1	7	13	-----	-----
Reading Frequency (TX1)	MHz	2412.071	2442.072	2472.073	-----	-----
Frequency Tolerance (TX1)	ppm	29.5191	29.4840	29.6804	50	**PASS**
Reading Frequency (TX2)	MHz	-----	-----	-----	-----	-----
Frequency Tolerance (TX2)	ppm	-----	-----	-----	-----	-----
Reading Frequency (TX3)	MHz	-----	-----	-----	-----	-----
Frequency Tolerance (TX3)	ppm	-----	-----	-----	-----	-----
Occupied Bandwidth (TX1)	MHz	17.66	17.66	17.73	26	**PASS**
Occupied Bandwidth (TX2)	MHz	-----	-----	-----	-----	-----
Occupied Bandwidth (TX3)	MHz	-----	-----	-----	-----	-----
RF Output Power (TX1)	mW/MHz	3.252	2.895	2.949	-----	-----
RF Output Power (TX2)	mW/MHz	-----	-----	-----	-----	-----
RF Output Power (TX3)	mW/MHz	-----	-----	-----	-----	-----
RF Output Power (Max)	mW/MHz	3.252	2.895	2.949	10.00	**PASS**
RF Output Power Tolerance Max(TX1,TX2,TX3)	%	-2.92	-13.58	-11.97	20%~-80%	**PASS**
Real Total Output Power (TX1)	dBm	15.30	15.32	15.37	-----	-----
Real Total Output Power (TX2)	dBm	-----	-----	-----	-----	-----
Real Total Output Power (TX3)	dBm	-----	-----	-----	-----	-----
Real Total Output Power (Max)	dBm	15.30	15.32	15.37	-----	-----

3.1. TEST Results (Normal Voltage)

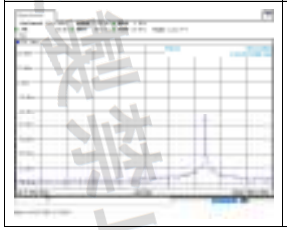
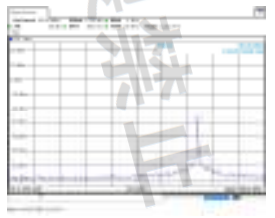
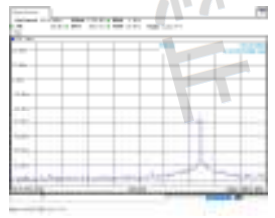
Measurement Frequency		MHz	2412	2442	2472	Regulation	Result
Channel Number		Ch.	1	7	13	-----	-----
Unwanted Emission Strength (TX1) for Ch1 ~13	Under 2387MHz	µW/MHz	0.041591	0.014928	0.015812	2.5	**PASS**
		MHz	2382.494	720.425	979.002	-----	-----
	2387-2400MHz	µW/MHz	2.249055	0.032659	0.021627	25	**PASS**
		MHz	2399.704	2398.821	2395.469	-----	-----
	2483.5-2496.5MHz	µW/MHz	0.020277	0.026853	2.735269	25	**PASS**
		MHz	2484.302	2492.722	2483.718	-----	-----
	2496.5MHz-12.5GHz	µW/MHz	0.046026	0.057677	0.101391	2.5	**PASS**
		MHz	7244.187	7331.208	2498.000	-----	-----
Unwanted Emission Strength (TX2) for Ch1 ~ 13	Under 2387MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2387-2400MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2483.5-2496.5MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2496.5MHz-12.5GHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
Unwanted Emission Strength (TX3) for Ch1 ~ 13	Under 2387MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2387-2400MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2483.5-2496.5MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2496.5MHz-12.5GHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
Unwanted Emission Strength (TX1+2) or (TX1+2+3) for Ch1 ~13	Under 2387MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2387-2400MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2483.5-2496.5MHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	2496.5MHz-12.5GHz	µW/MHz	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	It should be added up all spurious measurement values within "Reference Bandwidth(=1MHz)" of the same frequency.						
Secondarily Emitted Radio Wave Strength (RX Spurious) (RX1)	Under 1GHz	nW	0.047643	0.051286	0.042267	4	**PASS**
		MHz	988.604	928.082	473.876	-----	-----
	1 - 12.5GHz	nW	0.508159	0.574116	0.530884	20	**PASS**
		MHz	5762.041	6803.662	6444.317	-----	-----
Secondarily Emitted Radio Wave Strength (RX Spurious) (RX2)	Under 1GHz	nW	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	1 - 12.5GHz	nW	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
Secondarily Emitted Radio Wave Strength (RX Spurious) (RX3)	Under 1GHz	nW	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
	1 - 12.5GHz	nW	-----	-----	-----	-----	-----
		MHz	-----	-----	-----	-----	-----
Secondarily Emitted Radio Wave Strength (RX Spurious) (RX1+2) or (RX1+2+3)	Under 1GHz	nW	-----	-----	-----	-----	-----
						-----	-----
	1 - 12.5GHz	nW	-----	-----	-----	-----	-----
						-----	-----
	It should be added up all spurious measurement values within "Reference Bandwidth(=1MHz)" of the same frequency.						
Interference Prevention Function		-----	good			-----	**PASS**

Appendix C. Test Plots

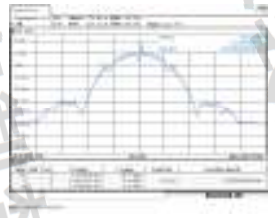
C.1. 2.4GHz Band_NV

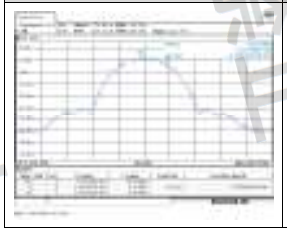
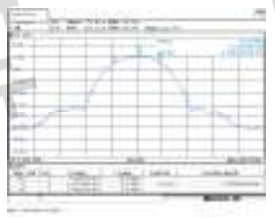
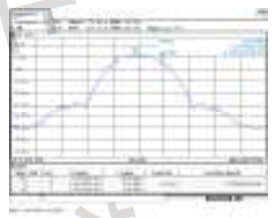
C.1.1. 802.11b

i. Frequency Tolerance

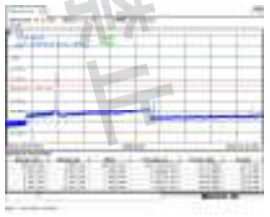
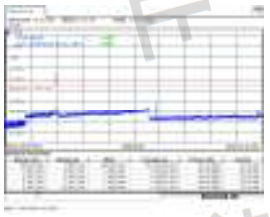
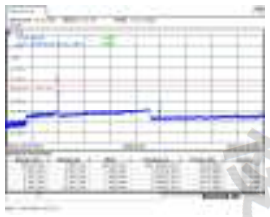
Low Channel	Middle Channel	High Channel
		

ii. Occupied Bandwidth and Spread-spectrum Bandwidth

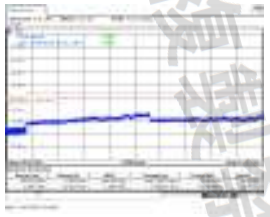
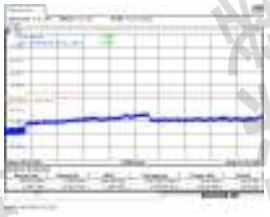
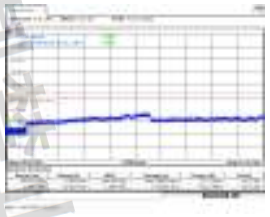
Occupied Bandwidth		
Low Channel	Middle Channel	High Channel
		

Spread-spectrum Bandwidth		
Low Channel	Middle Channel	High Channel
		

iii. Unwanted Emission Intensity

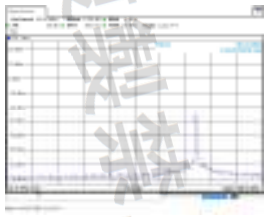
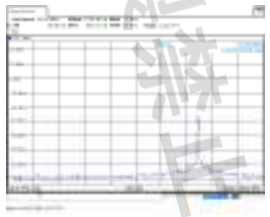
Low Channel	Middle Channel	High Channel
		

iv. Limitation of Collateral Emission of Receiver

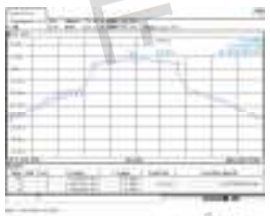
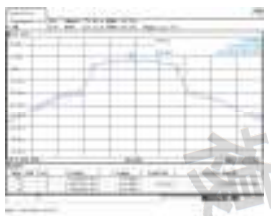
Low Channel	Middle Channel	High Channel
		

C.1.2. 802.11g

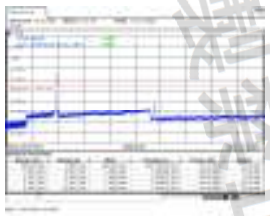
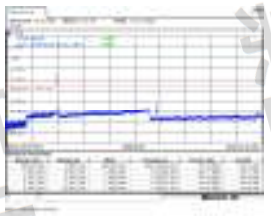
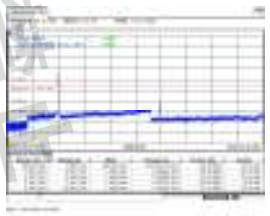
i. Frequency Tolerance

Low Channel	Middle Channel	High Channel
		

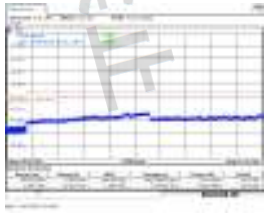
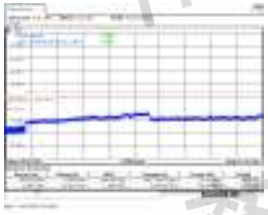
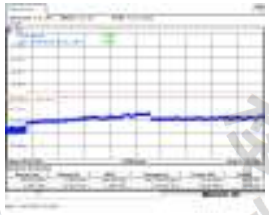
ii. Occupied Bandwidth

Low Channel	Middle Channel	High Channel
		

iii. Unwanted Emission Intensity

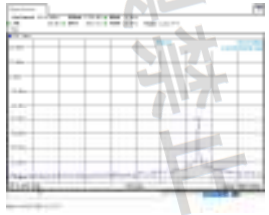
Low Channel	Middle Channel	High Channel
		

iv. Limitation of Collateral Emission of Receiver

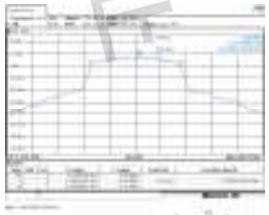
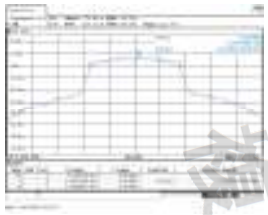
Low Channel	Middle Channel	High Channel
		

C.1.3. 802.11n-HT20

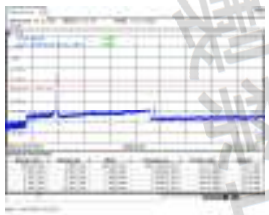
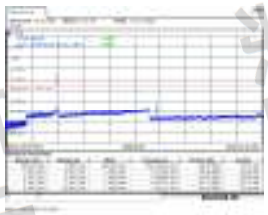
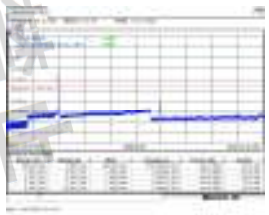
i. Frequency Tolerance

Low Channel	Middle Channel	High Channel
		

ii. Occupied Bandwidth

Low Channel	Middle Channel	High Channel
		

iii. Unwanted Emission Intensity

Low Channel	Middle Channel	High Channel
		

iv. Limitation of Collateral Emission of Receiver

Low Channel	Middle Channel	High Channel