



TESTING LABORATORY
CERTIFICATE # 4821.01




JAPAN MIC TEST REPORT

For

Shenzhen Xin Yuan Electronic Technology Co., Ltd.

401 4F Bldg. building B. No.5, 1st Rd Bantianshangxue Technology Park, Bantian St,
Longgang Dist., Shenzhen Guangdong China

Model: T-WATCH V1.7

Report Type: Original Report	Product Type: T-WATCH
Report Number: RSZ191118002-07C	
Report Date: 2019-12-09	
Nancy Wang 	
Reviewed By: RF Engineer	
Prepared By: Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn	

Note: This report must not be used by the customer to claim product certification, approval, or endorsement by A2LA* or any agency of the Federal Government. This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk “★”.

BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with an asterisk “*”. Customer model name, addresses, names, trademarks etc. are not considered data.

This report cannot be reproduced except in full, without prior written approval of the Company. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested. This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

TABLE OF CONTENTS

GENERAL INFORMATION.....	3
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
OBJECTIVE	3
RELATED SUBMITTAL(S)/GRANT(S).....	3
TEST METHODOLOGY	3
EUT TEST CONFIGURATION.....	4
DESCRIPTION OF TEST CONFIGURATION	4
EUT EXERCISE SOFTWARE	4
EQUIPMENT MODIFICATIONS	4
DUTY CYCLE	5
SUPPORT EQUIPMENT LIST AND DETAILS	5
CONFIGURATION OF TEST SETUP	6
SUMMARY OF TEST RESULTS	7
TEST EQUIPMENT LIST	8
FREQUENCY ERROR	9
LIMIT	9
TEST PROCEDURE	9
TEST DATA	9
OCCUPIED BANDWIDTH AND SPREADING BANDWIDTH	11
LIMIT	11
TEST PROCEDURE	11
TEST DATA	11
TRANSMITTER SPURIOUS EMISSION STRENGTH AND UNWANTED EMISSION INTENSITY.....	14
LIMIT	14
TEST PROCEDURE	14
TEST DATA	15
ANTENNA OUTPUT POWER, ANTENNA POWER TOLERANCE AND TRANSMISSION ANTENNA GAIN.....	20
LIMIT	20
TEST PROCEDURE	20
TEST DATA	21
RECEIVER SPURIOUS EMISSION AND UNWANTED EMISSION INTENSITY	24
LIMIT	24
TEST PROCEDURE	24
MEASUREMENT RESULT	25
INTERFERENCE PREVENTION FUNCTION.....	27
REQUIREMENT	27
TEST PROCEDURE	27
MEASUREMENT RESULT	27
CONSTRUCTION PROTECTION CONFIRMATION	28
LIMIT	28
CONFIRMATION METHOD.....	28

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Equipment Name		T-WATCH
Tested Model		T-WATCH V1.7
Radio Type		WLAN
WIFI Technical Parameters	Support Technical	802.11b
	Modulation Type	DSSS
	Frequency Range	802.11b:2484MHz
	Output Power	802.11b (2484MHz): 4 mW/MHz
	Antenna Gain	1.02 dBi
Nominal Power Supply:		3.7 V _{DC}
Voltage Range		3.33 V _{DC} to 4.07 V _{DC}
Sample serial number		RSZ191118002-RF-S5 (Assigned by BACL, Shenzhen)
Received date		2019/11/18
Sample/EUT Status		Good condition

Objective

The objective of the manufacturer is to demonstrate compliance with Radio Law of Japan item 19-2 of Article 2 Paragraph 1, rules and limits for this device including:

- Frequency Error
- Occupied Bandwidth and Spreading Bandwidth
- Transmitter Spurious Emission and Unwanted Emission Intensity
- Antenna Output Power And Output Power Tolerance
- Receiver Spurious Emission Strength
- Interference Prevention Function
- Construction Protection Confirmation

Related Submittal(s)/Grant(s)

Item 19 of Article 2 Paragraph 1 for BT
Item 19 of Article 2 Paragraph 1 for BLE
Item 19 of Article 2 Paragraph 1 for Wi-Fi 2412-2472MHz

Test Methodology

All measurements contained in this report were conducted with technical regulations of the Radio Law of Japan.

EUT TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in a testing mode which was selected by manufacturer.

For frequency 2484MHz, channel 14 was tested.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
14	2484	/	/

Test voltage:

Normal voltage: 3.7 V_{DC}
Low voltage: 3.33 V_{DC}
High voltage: 4.07 V_{DC}

EUT Exercise Software

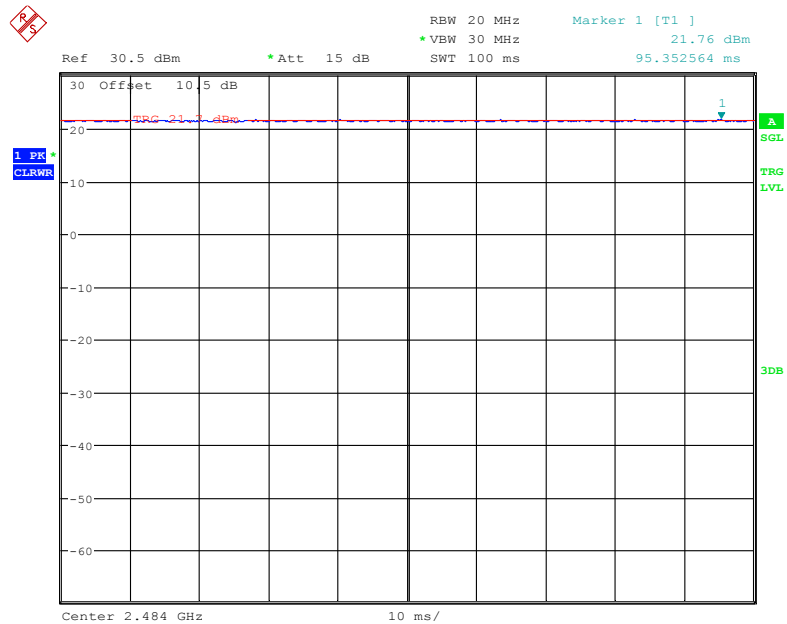
“espRFTool_2.0.exe” software was used.

The test was performed under:

802.11b 2484MHz: Data rate: 1 Mbps, power level: 8

Equipment Modifications

No modification was made to the EUT tested.

Duty cycle

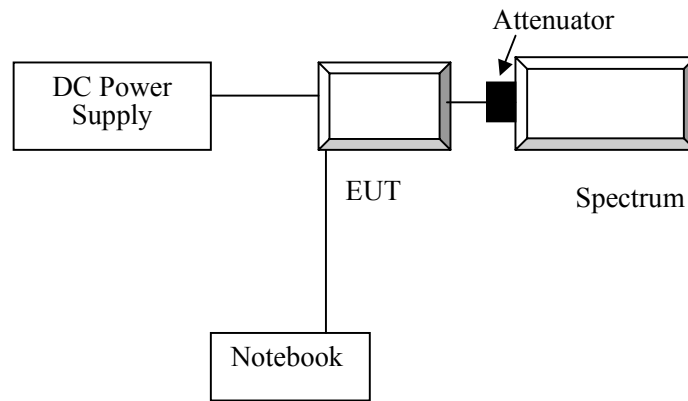
Date: 2.DEC.2019 11:58:46

Mode	Duty Cycle (%)	10log(1/ Duty Cycle)
2484	100	0

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Dell	Notebook	Latitude E5430	11429208685
instek	DC Power Supply	GPS-3030DD	EM832096

Configuration of Test Setup



SUMMARY OF TEST RESULTS

MIC Notice No.88 Appendix No.44 Article 2, Paragraph 1, Item 19-2 Rules Section	Description of Test	Result
3	Frequency Error	Compliance
4	Occupied Bandwidth and Spreading Bandwidth	Compliance
5	Transmitter Spurious Emission and Unwanted Emission Intensity	Compliance
6	Antenna Output Power and Output Power Tolerance	Compliance
7	Receiver Spurious Emission and Unwanted Emission Intensity	Compliance
9	Frequency Hopping Dwell Time	Not Applicable*
10	Interference Prevention Function	Compliance
Note 1	Construction Protection Confirmation	Compliance

Not Applicable*: Testing is only required for FHSS system devices.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
KEYSIGHT	Vector signal source	N5182B	MY53051503	2019-07-22	2020-07-21
Rohde & Schwarz	Spectrum Analyzer	FSU26	200120	2019-03-02	2020-03-01
Agilent	USB wideband power meter	U2021XA	MY54250003	2019-07-10	2020-07-09
Fluke	Digital Multimeter	287	19000011	2019-07-26	2020-07-25
instek	DC Power Supply	GPS-3030DD	EM832096	NCR	NCR
WEINSCHL	10dB Attenuator	5324	AU 3842	Each Time	

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

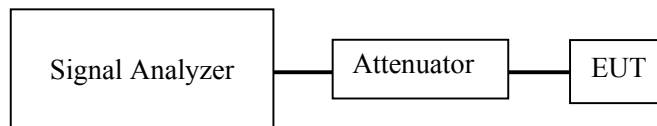
FREQUENCY ERROR

Limit

50 ppm or below

Test Procedure

Measurement System Diagram



Conditions of Application Equipment (EUT)

- Set the application equipment (EUT) to the measurement frequency.
- The modulation state shall be “continuous carrier wave without modulation” mode.

Spectrum Analyzer Conditions

- Center Frequency: Frequency to measure (2484 MHz)
- RBW: 10 kHz, VBW: 30 kHz
- Sweep time: Auto
- Log scale: 10dB/Div, Data points: 501points (400 points or more)
- Reference level: 20dBm, Attenuator: 30dB
- Detection: Positive Peak, Sweep mode: Continuous
- Marker: Spot

Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Cary Guan on 2019-12-02.

Test Mode: Transmitting (Test without modulation)

Test Result: Compliant

Normal Voltage

Frequency (MHz)	Measure frequency (MHz)	Frequency tolerance (ppm)	Limit (ppm)
2484	2483.980769	-7.742	< 50

High Voltage

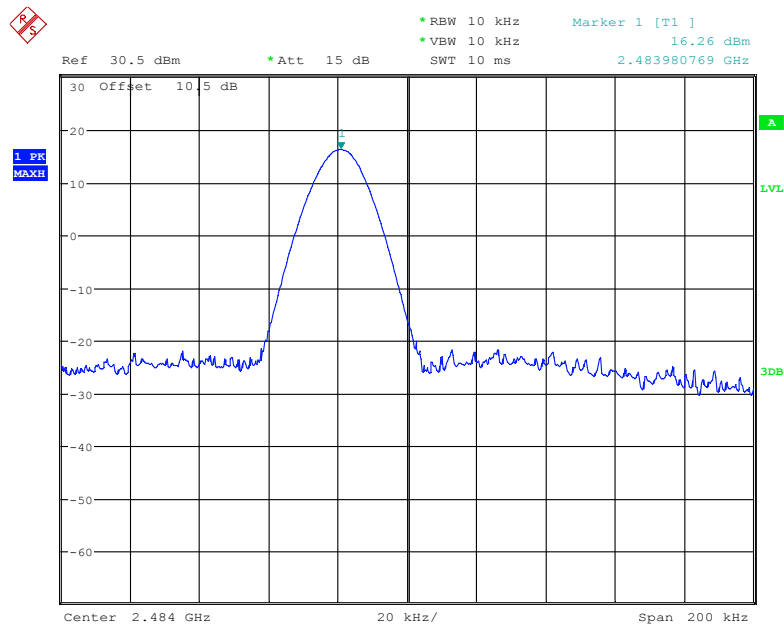
Frequency (MHz)	Measure frequency (MHz)	Frequency tolerance (ppm)	Limit (ppm)
2484	2483.980534	-7.837	< 50

Low Voltage

Frequency (MHz)	Measure frequency (MHz)	Frequency tolerance (ppm)	Limit (ppm)
2484	2483.980692	-7.773	< 50

Please refer to the following plots for normal voltage:

Test Frequency: 2484MHz



Date: 2.DEC.2019 11:24:23

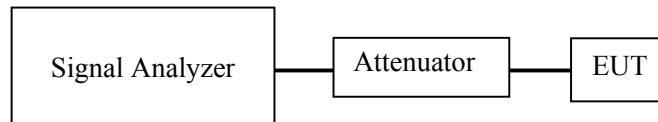
OCCUPIED BANDWIDTH AND SPREADING BANDWIDTH

Limit

- Occupied bandwidth: FH \leq 83.5 MHz; OFDM \leq 38MHz; DS \leq 26 MHz; Others \leq 26 MHz
- Spread Bandwidth: \geq 500 kHz (FH, DS), Spread factor $>$ 10.

Test Procedure

1. Setting of SA is following as: RB: 300 kHz / VB: 300 kHz / Sweep time: Auto / Sweep Mode: Continuous sweep / Detect mode: Positive peak / Trace mode: Max hold
2. EUT have transmitted the maximum modulation signal and fixed channelize. SA set to 99% of occupied bandwidth to measure occupied bandwidth.
3. EUT have transmitted the maximum modulation signal and fixed channelize. SA set to 90% of occupied bandwidth to measure spread bandwidth.
4. Spread Factor=Spread Bandwidth/modulation rate. The modulation rate: MR=1.375 for 802.11b.



Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Cary Guan on 2019-12-02.

Test Mode: Transmitting

Test Result: Compliant

Normal Voltage

Frequency	2484 MHz	Limit
Occupied bandwidth (MHz)	18.72	≤ 26
Spread bandwidth (MHz)	14.23	≥ 0.5
Spread factor	10.35	> 10

High Voltage

Frequency	2484 MHz	Limit
Occupied bandwidth (MHz)	18.39	≤ 26
Spread bandwidth (MHz)	14.21	≥ 0.5
Spread factor	10.33	> 10

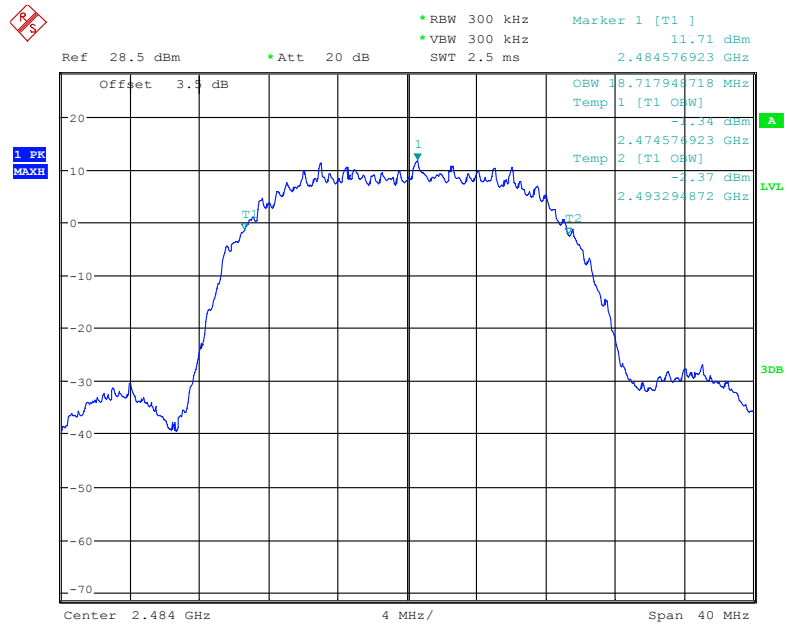
Low Voltage

Frequency	2484 MHz	Limit
Occupied bandwidth (MHz)	18.36	≤ 26
Spread bandwidth (MHz)	14.16	≥ 0.5
Spread factor	10.30	> 10

Note: Spread factor = Spread bandwidth/Modulation rate
Modulation rate: 802.11b=1.375

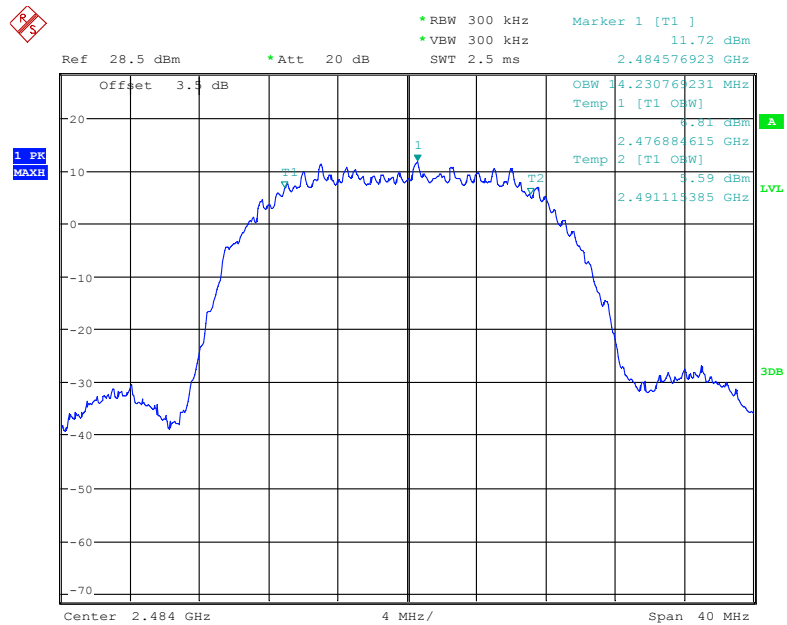
Please refer to the following plots for normal voltage:

Occupied Bandwidth:



Date: 2.DEC.2019 09:32:40

Spread Bandwidth:



Date: 2.DEC.2019 09:34:08

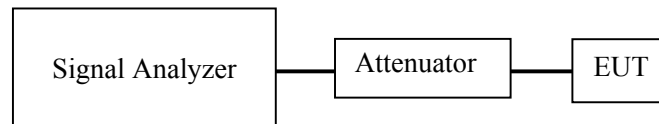
TRANSMITTER SPURIOUS EMISSION STRENGTH AND UNWANTED EMISSION INTENSITY

Limit

- 30 MHz $\leq f \leq$ 2458 MHz: $\leq 2.5 \mu\text{W}/\text{MHz}$
- 2458 MHz $< f \leq$ 2471 MHz: $\leq 25 \mu\text{W}/\text{MHz}$
- 2497 MHz $< f \leq$ 2510 MHz: $\leq 25 \mu\text{W}/\text{MHz}$
- 2510 MHz $< f \leq$ 12500 MHz: $\leq 2.5 \mu\text{W}/\text{MHz}$

Test Procedure

Measurement System Diagram



Conditions of Application Equipment (EUT)

- The modulation state shall be in continuously transmitting mode.

Spectrum Analyzer Conditions

- Setting of SA start 30MHz and stop frequency 1000MHz, RB: 100kHz/VB: 100k Hz, Sweep time: Auto. Sweep mode: continuous sweep .Detect mode: Positive peak/Trace mode: max hold. Then to mark peak. Reading value+cable loss shall be less than 0.25 μW .
- Setting of SA start 1000MHz and stop frequency 2458MHz, RB: 1MHz/VB: 1MHz, Sweep time: Auto. Sweep mode: continuous sweep .Detect mode: Positive peak/Trace mode: max hold. Then to mark peak. Reading value+cable loss shall be less than 2.5 μW .
- Setting of SA start 2458MHz and stop frequency 2471MHz, RB: 1MHz/VB: 1MHz, Sweep time: Auto. Sweep mode: continuous sweep .Detect mode: Positive peak/Trace mode: max hold. Then to mark peak. Reading value+cable loss shall be less than 25 μW .
- Setting of SA start 2497MHz and stop frequency 2510MHz, RB: 1MHz/VB: 1MHz, Sweep time: Auto. Sweep mode: continuous sweep .Detect mode: Positive peak/Trace mode: max hold. Then to mark peak. Reading value+cable loss shall be less than 25 μW .
- Setting of SA start 2510MHz and stop frequency 12500MHz, RB: 1MHz/VB: 1MHz, Sweep time: Auto. Sweep mode: continuous sweep .Detect mode: Positive peak/Trace mode: max hold. Then to mark peak. Reading value+cable loss shall be less than 2.5 μW .

Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Cary Guan on 2019-12-02.

Test Mode: Transmitting

Test Result: Compliant

Normal

Item	Frequency Band	2484MHz	Limit
Raw data	Band I (dBm/100kHz)	-45.90	-36 dBm/100kHz
	Band II (dBm/MHz)	-35.77	-26 dBm/MHz
	Band III (dBm/MHz)	-24.92	-16 dBm/MHz
	Band IV (dBm/MHz)	-22.48	-16 dBm/MHz
	Band V (dBm/MHz)	-28.32	-26 dBm/MHz

High Voltage

Item	Frequency Band	2484MHz	Limit
Raw data	Band I (dBm/100kHz)	-45.88	-36 dBm/100kHz
	Band II (dBm/MHz)	-35.76	-26 dBm/MHz
	Band III (dBm/MHz)	-24.89	-16 dBm/MHz
	Band IV (dBm/MHz)	-22.46	-16 dBm/MHz
	Band V (dBm/MHz)	-28.30	-26 dBm/MHz

Low Voltage

Item	Frequency Band	2484MHz	Limit
Raw data	Band I (dBm/100kHz)	-45.90	-36 dBm/100kHz
	Band II (dBm/MHz)	-35.73	-26 dBm/MHz
	Band III (dBm/MHz)	-24.90	-16 dBm/MHz
	Band IV (dBm/MHz)	-22.45	-16 dBm/MHz
	Band V (dBm/MHz)	-28.29	-26 dBm/MHz

Note:

Band I: 30 MHz~1000 MHz

Band II: 1000 MHz~2458 MHz

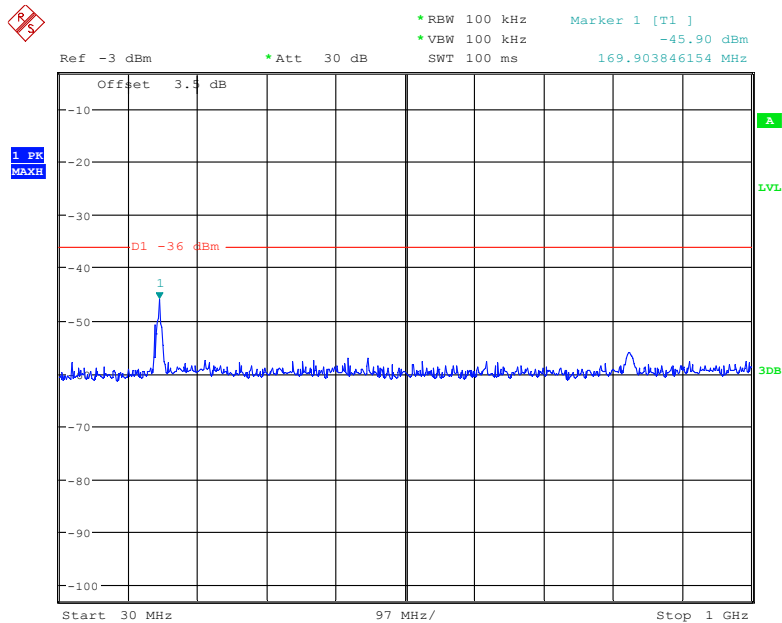
Band III: 2458 MHz~2471 MHz

Band IV: 2497 MHz-2510 MHz

Band V: 2510 MHz-12500 MHz

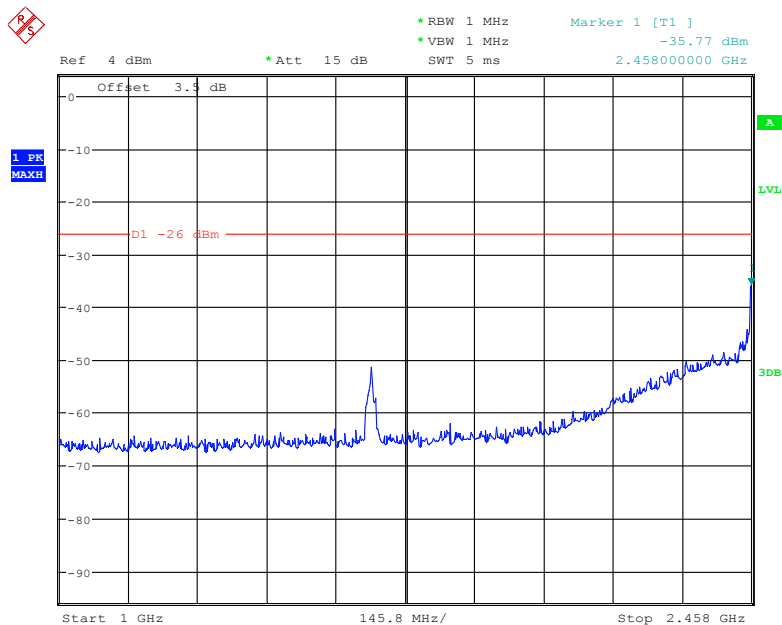
Please refer to the following plots for normal voltage:

30 MHz~1000 MHz



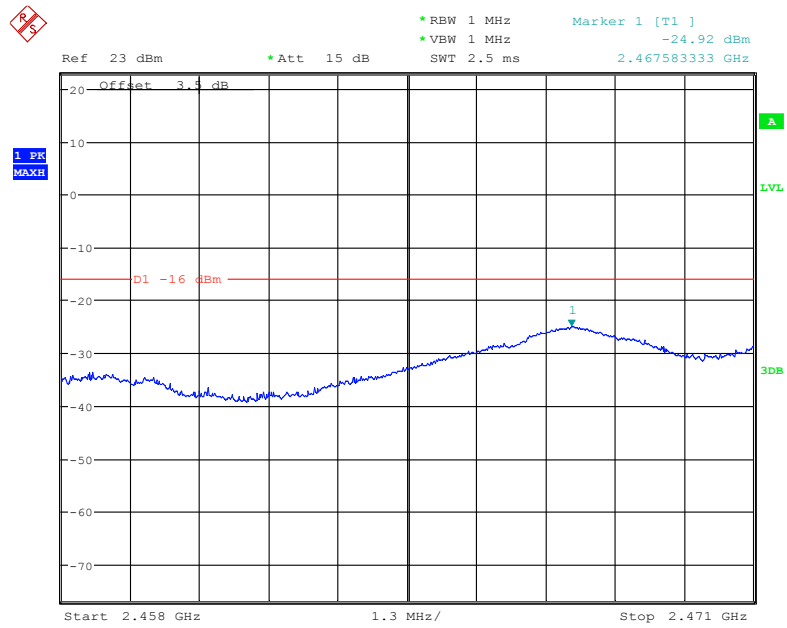
Date: 2.DEC.2019 09:39:33

1000 MHz~2458 MHz



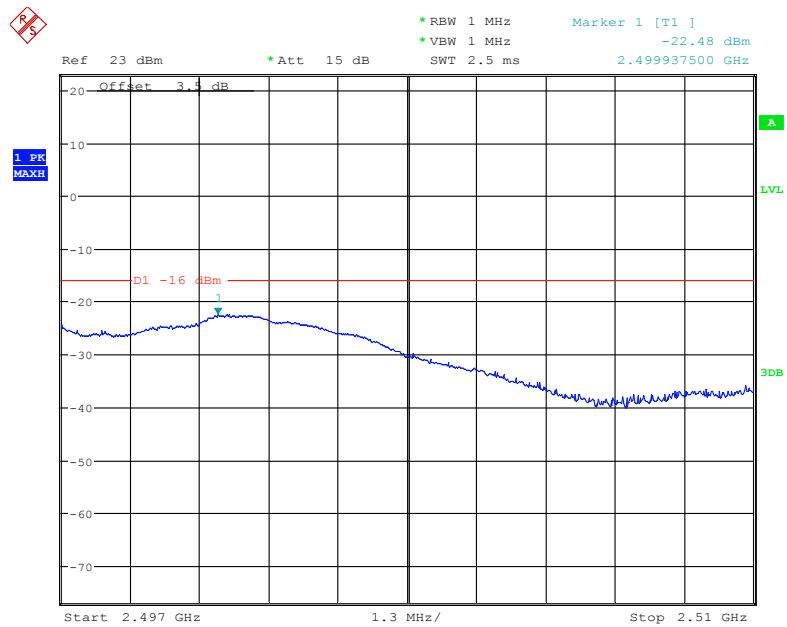
Date: 2.DEC.2019 09:41:11

2458 MHz – 2471 MHz



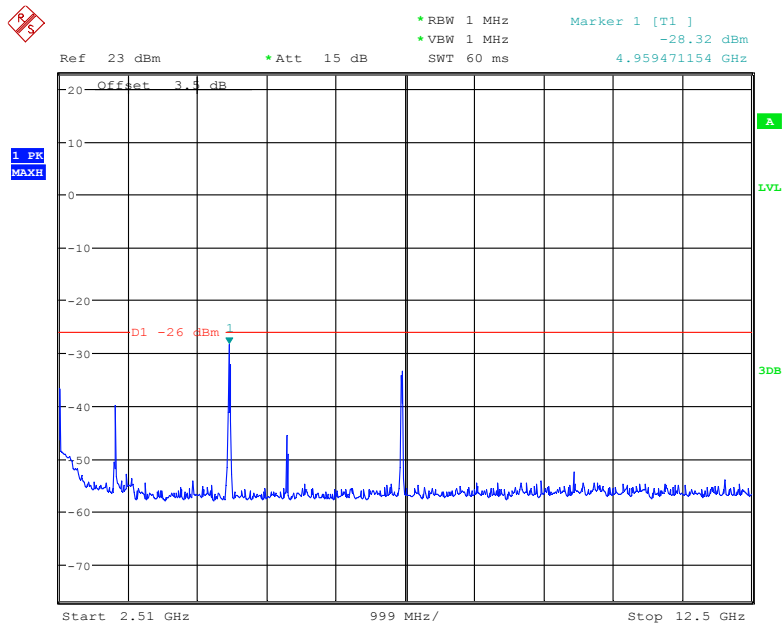
Date: 2.DEC.2019 09:42:14

2497 MHz – 2510 MHz



Date: 2.DEC.2019 09:43:09

2510 MHz – 12500 MHz



Date: 2.DEC.2019 09:45:31

ANTENNA OUTPUT POWER, ANTENNA POWER TOLERANCE AND TRANSMISSION ANTENNA GAIN

Limit

- $\leq 10 \text{ mW/MHz}$

The Output Power Tolerance must be within +20%, -80%.

E.i.r.p:

- $\leq 12.14 \text{ dBm/MHz}$

Note: E.I.R.P will not be applied to the transmission antenna which has a gain of 2.14 dBi or less.

Test Procedure

Step 1:

Connect the UUT to the spectrum analyzer and use the following settings:

- Centre Frequency: The centre frequency of the channel under test.
- Resolution BW: 1 MHz.
- Video BW: 1 MHz.
- Span: Wide enough to cover the complete power envelope of the signal of the UUT.
- Detector: Peak.
- Trace Mode: Max Hold.

Step 2:

When the trace is complete, find the peak value of the power envelope and record the frequency.

Step 3:

Make the following changes to the settings of the spectrum analyzer:

- Centre Frequency: Equal to the frequency recorded in step 2.
- Span: 3 MHz.
- Resolution BW: 1 MHz.
- Video BW: 1 MHz.
- Sweep time: 1 minute.
- Detector: Average (see note).
- Trace Mode: Max Hold.

NOTE: The detector mode "Average" is often referred to as "RMS Average" or "Sample" but do not use Video Average.

Step 4:

When the trace is complete, capture the trace, for example using the "View" option on the spectrum analyzer.

Find the peak value of the trace and place the analyzer marker on this peak. This level is recorded as the highest mean power (spectral power density) D in a 1 MHz band.

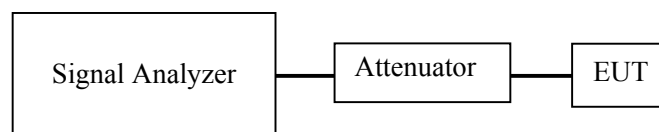
Alternatively, where a spectrum analyzer is equipped with a facility to measure spectral power density, this facility may be used to display the spectral power density D in dBm/MHz.

D shall be recorded in the test report.

The maximum e.i.r.p. spectral density is calculated from the above measured power density (D), and the applicable antenna assembly gain "G" in dBi, according to the formula below. If more than one antenna assembly is intended for this power setting, the gain of the antenna assembly with the highest gain shall be used.

• $PD = D + G$;

Test Setup Block diagram



Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Cary Guan on 2019-12-02.

Test Mode: Transmitting

Test Result: Compliant

Normal

Nominal Output power is 4mW / MHz for 802.11b:

Frequency	2484MHz	Limit
Antenna power (dBm/MHz)	6.44	10
Duty cycle (%)	100	/
Antenna power (mW/MHz)	4.41	10
Antenna power error (%)	10.25	-80 - +20
EIRP(dBm/MHz)	7.46	12.14

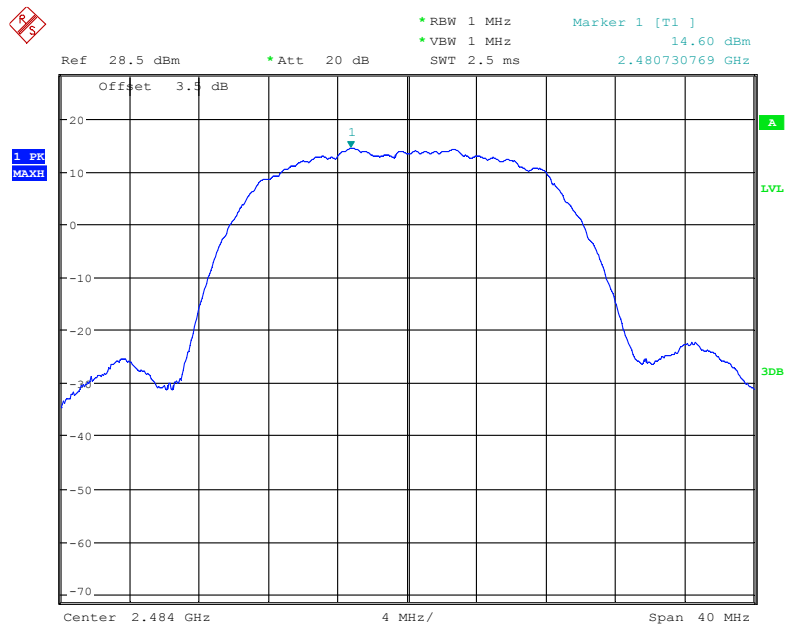
High Voltage

Frequency	2484MHz	Limit
Antenna power (dBm/MHz)	6.48	10
Duty cycle (%)	100	/
Antenna power (mW/MHz)	4.45	10
Antenna power error (%)	11.25	-80 - +20
EIRP(dBm/MHz)	7.50	12.14

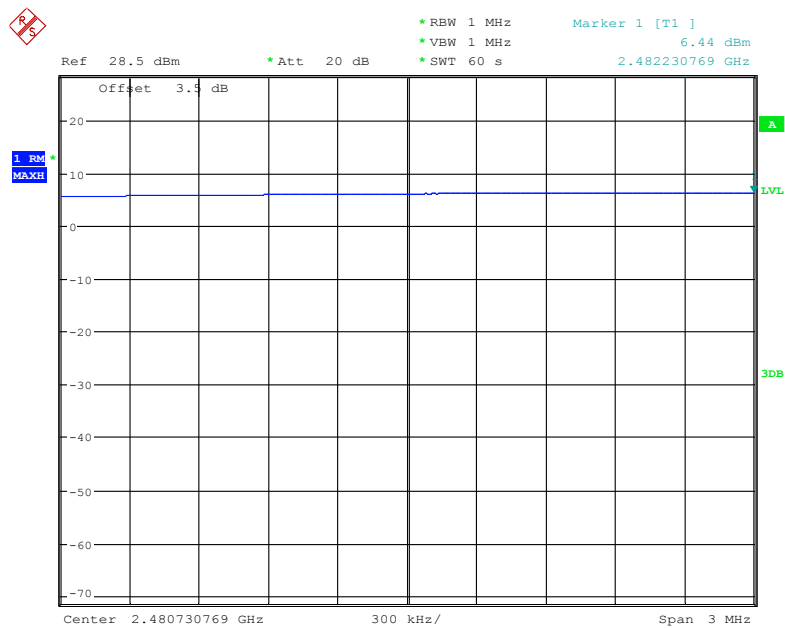
Low Voltage

Frequency	2484MHz	Limit
Antenna power (dBm/MHz)	6.5	10
Duty cycle (%)	100	/
Antenna power (mW/MHz)	4.47	10
Antenna power error (%)	11.75	-80 - +20
EIRP(dBm/MHz)	7.52	12.14

Note: The antenna gain is 1.02 dBi.



Date: 2.DEC.2019 09:27:18



Date: 2.DEC.2019 09:30:25

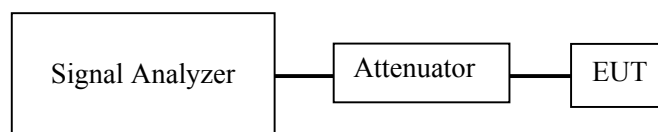
RECEIVER SPURIOUS EMISSION AND UNWANTED EMISSION INTENSITY

Limit

- $\leq 4 \text{ nW}$ ($30 \text{ MHz} \leq f \leq 1000 \text{ MHz}$)
- $\leq 20 \text{ nW}$ ($1 \text{ GHz} \leq f \leq 12.5 \text{ GHz}$)

Test Procedure

Measurement System Diagram



Conditions of Application Equipment (EUT)

- The modulation state shall be “continuous receiving mode”.

Spectrum Analyzer Conditions

- Start Frequency: Start Frequency of frequency range to measure (30MHz or 1GHz)
- Stop Frequency: Stop Frequency of frequency range to measure (1GHz or 12.5GHz)
- Span: AUTO (Measurement Range)
- RBW: 100 kHz, VBW: 100 kHz for Frequency < 1 GHz
- RBW: 1MHz, VBW: 1MHz for Frequency > 1 GHz
- Sweep time: AUTO or more
- Sweep mode: Auto Sweep
- Detection: Positive Peak
- Reference Level: Enough level for maximum dynamic range

Measurement Result**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Cary Guan on 2019-12-02.

Test Mode: Receiving

Test Result: Compliant, please see the below table and plots.

Normal

Item	Frequency Band	2484MHz	Limit
Raw data	Band VI (dBm)	-72.96	-54
	Band VII (dBm)	-64.68	-47

High Voltage

Item	Frequency Band	2484MHz	Limit
Raw data	Band VI (dBm)	-72.43	-54
	Band VII (dBm)	-63.96	-47

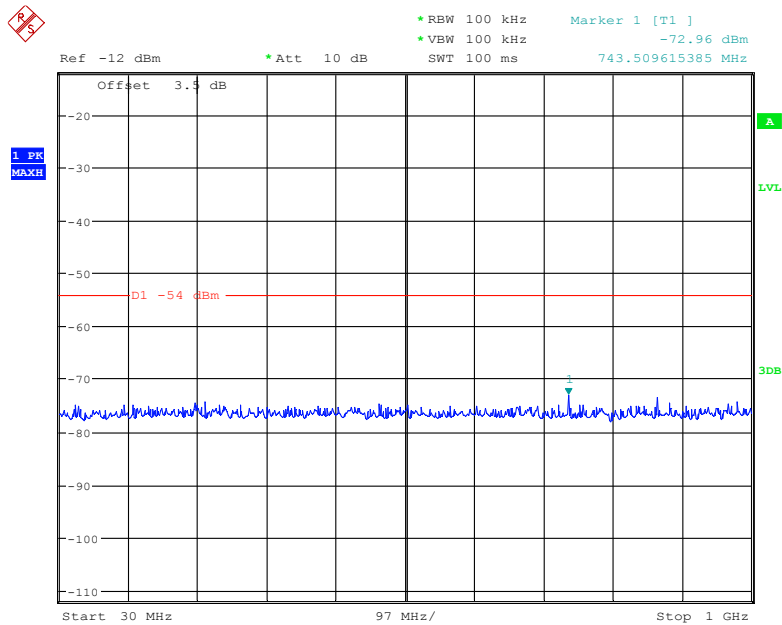
Low Voltage

Item	Frequency Band	2484MHz	Limit
Raw data	Band VI (dBm)	-71.86	-54
	Band VII (dBm)	-64.52	-47

Note: Band VI: 30 MHz~1000 MHz
Band VII: 1000 MHz~12500 MHz

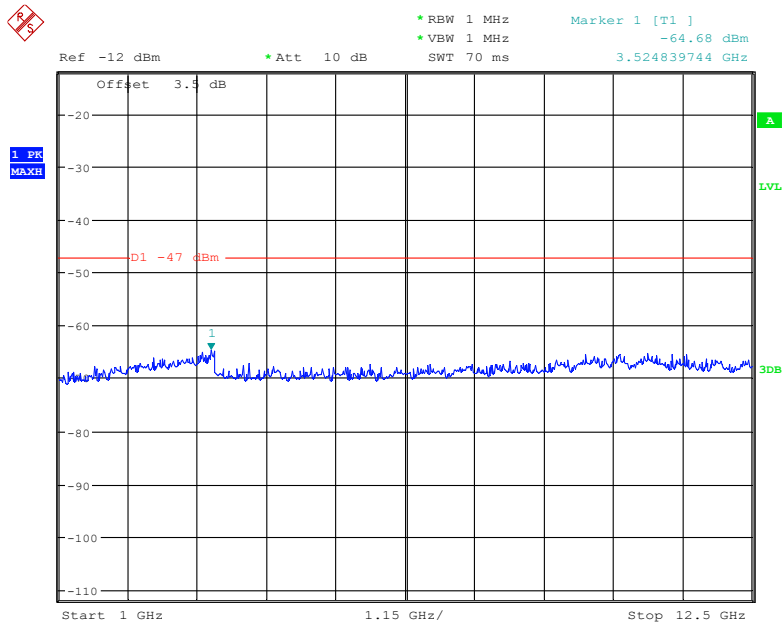
Normal Condition Test Data as below:

30 MHz – 1 GHz



Date: 2.DEC.2019 09:48:08

1 GHz – 12.5 GHz



Date: 2.DEC.2019 09:49:41

INTERFERENCE PREVENTION FUNCTION

Requirement

The EUT shall have the interference prevention capability to transmit or to receive the identification automatically, so that sender and receiver shall exclude other equipment.

Test Procedure

In the case that the EUT has the function of automatically transmitting the identification code:

1. Transmit the predetermined identification codes from EUT
2. Check the transmitted identification codes with the demodulator.

In the case of receiving the identification codes:

1. Transmit the predetermined identification codes from the counterpart.
2. Check if communication is normal
3. Transmit the signal other than predetermined ID codes from the counterpart.
4. Check if the EUT stops the transmission, or if it displays that identification codes are different from the predetermined ones.

Measurement Result

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Cary Guan on 2019-12-02.

Test Result: Compliance

CONSTRUCTION PROTECTION CONFIRMATION

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.

Confirmation Method

The device has the screws which make sure the device can't be opened easily. Please refer to the EUT photos.

****END OF REPORT****