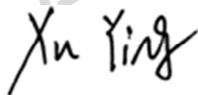


Test Report

Applicant	Espressif Systems (Shanghai) Co.,Ltd.
Product	2.4G Wi-Fi & Bluetooth IoT Module
Model	ESP8684-WROOM-02UC
Report No.	EFTA26030298-IE-01-R3V3
Issue Date	June 16, 2026

Eurofins TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **Article 49-20, MIC notification. No.88 of 2004, Annex 44**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.



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Approved by: Xu Kai

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Version	Revision Description	Issue Date
Rev.0	Initial issue of report.	May 28, 2026
Rev.1	Update description.	June 10, 2026
Rev.2	Update description.	June 15, 2026
Rev.3	Update description.	June 16, 2026
Note: This revised report (Report No.: EFTA26030298-IE-01-R3V3) supersedes and replaces the previously issued report (Report No.: EFTA26030298-IE-01-R3V2). Please discard or destroy the previously issued report and dispose of it accordingly.		

Summary of Measurement Results

Number	Summary of Measurements of Results	Verdict
1	Frequency Error Measurement	PASS
2	Occupied Bandwidth Measurement	PASS
3	Spread Bandwidth and Spread Factor Measurement	PASS
4	Antenna Power (Conducted) Measurement	PASS
5	Transmission Radiation Angle Width (3dB Beamwidth)	NA
6	Unwanted Emission Strength Measurement	PASS
7	Secondarily Emitted Radio Wave Strength Measurement	PASS
8	Carrier Sense Measurement	NA
9	Radio Interference Prevention Capability Measurement	PASS
10	Construction Protection Confirmation Method	PASS
Date of Testing: March 26, 2026 ~ April 15, 2026		
Date of Sample Received: March 23, 2026		
Note: NA = Not applicable.		
All indications of Pass/Fail in this report are opinions expressed by Eurofins TA Technology (Shanghai) Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.		

1. Test Laboratory

1.1. Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **Eurofins TA Technology (Shanghai) Co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2. Testing Location

Company: Eurofins TA Technology (Shanghai) Co., Ltd.
Address: Building 3, No.145, Jintang Rd, Pudong Shanghai, P.R.China
City: Shanghai
Post code: 201201
Country: P. R. China
Contact: Xu Kai
Telephone: +86-021-50791141/2/3
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Website: <https://www.eurofins.com/electrical-and-electronics>
E-mail: Kain.Xu@cpt.eurofinscn.com

2. General Description of Equipment Under Test

2.1. Applicant and Manufacturer Information

Applicant	Espressif Systems (Shanghai) Co., Ltd.
Applicant address	1-7th Floor, Building 3, 235 Yubei Road, Pudong New Area, Shanghai, China
Manufacturer	Espressif Systems (Shanghai) Co., Ltd.
Manufacturer address	1-7th Floor, Building 3, 235 Yubei Road, Pudong New Area, Shanghai, China

2.2. General Information

EUT Description	
Model	ESP8684-WROOM-02UC
Lab internal SN	260323-04-007
Hardware Version	V1.0
Software Version	V1.1.3.4
Antenna Type	External Antenna
Antenna Gain	2.33 dBi
Device operating configurations	
Test Mode:	802.11 b CH14
Operating Frequency Range(s)	2471 MHz-2497 MHz
Test Modulation:	(802.11b) DSSS;
Operating voltage range:	3.0 V to 3.6 V
State DC voltage:	3.3V
Auxiliary Test Equipment	
PC	Manufacturer: Dell Model: Latitude 3420 (SN: 9JSCR93)
Serial port board	Model: FTDI FT232RNL
Note: The EUT is sent from the applicant to Eurofins TA and the information of the EUT is declared by the applicant.	

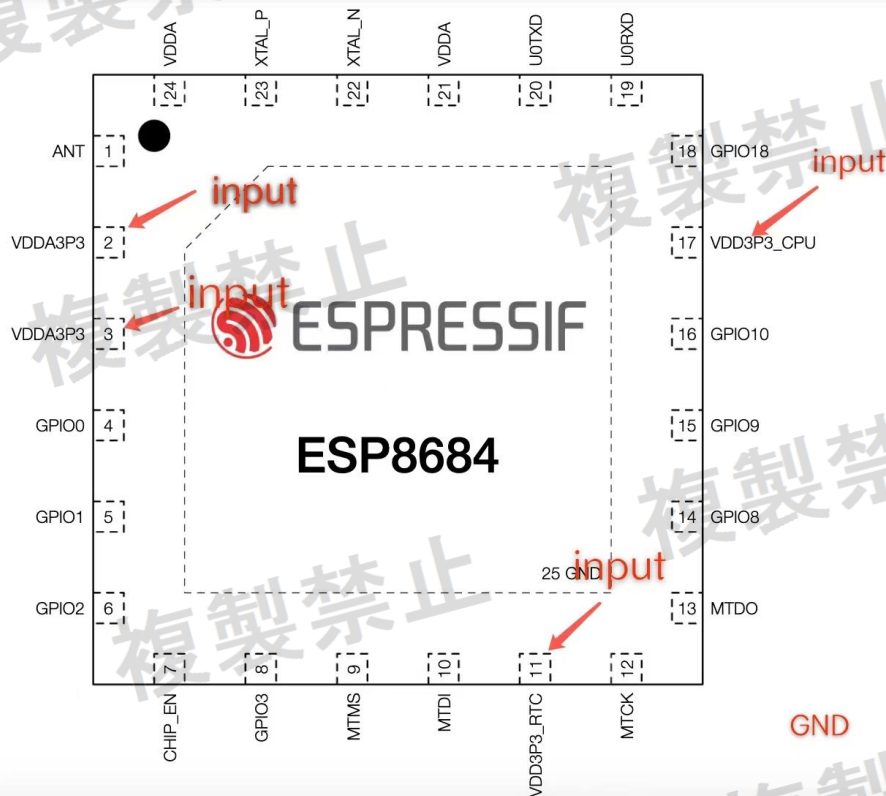
Environment of Test Site

Temperature:	25°C
Huidity:	59%
Atmospheric Pressure:	100.77 kpa
Test Voltage:	Normal Voltage: 3.3V Extreme Voltage: 3.0V~3.6V

Note: For extreme voltage test, we have tested the relationship between the external power supply and RF IC power supply. Base on the test results. only the normal voltage was selected to perform all items. The details information as below:

External Power Supply(V)	IC power supply(V)	Deviation from normal(V)	Deviation (%)
NV: 3.3V	3.3V	--	--
LV: 3V	3.3V	0.00V	0.00%
HV: 3.6V	3.3V	0.00V	0.00%

Measurement point position



3. Applied Standards

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

Article 49-20

MIC notification. No.88 of 2004, Annex 44

Article 2, Paragraph 1, Item (19-2)

4. Test Configuration

For all the test items, an engineering test program installed in notebook was used to make the EUT continuously transmit/receive.

5. Test Case Results

5.1. Frequency Error Measurement

Ambient Condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

Spectrum Analyzer Setting

RBW: 10 kHz

VBW: 10 kHz

Sweep Time: AUTO (Minimum time to ensure measurement accuracy.)

Data Points: 401 points or more

Sweep Mode: Single Sweep

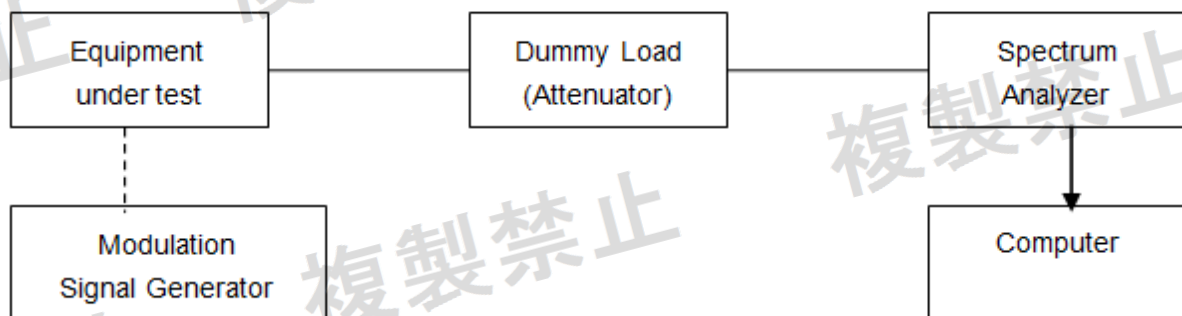
Detection Mode: Positive Peak

Storage Mode: Normal

Y-axis Scale: 10 dB/Div.

Reference Level: Enough level for maximum dynamic range

Test Setup



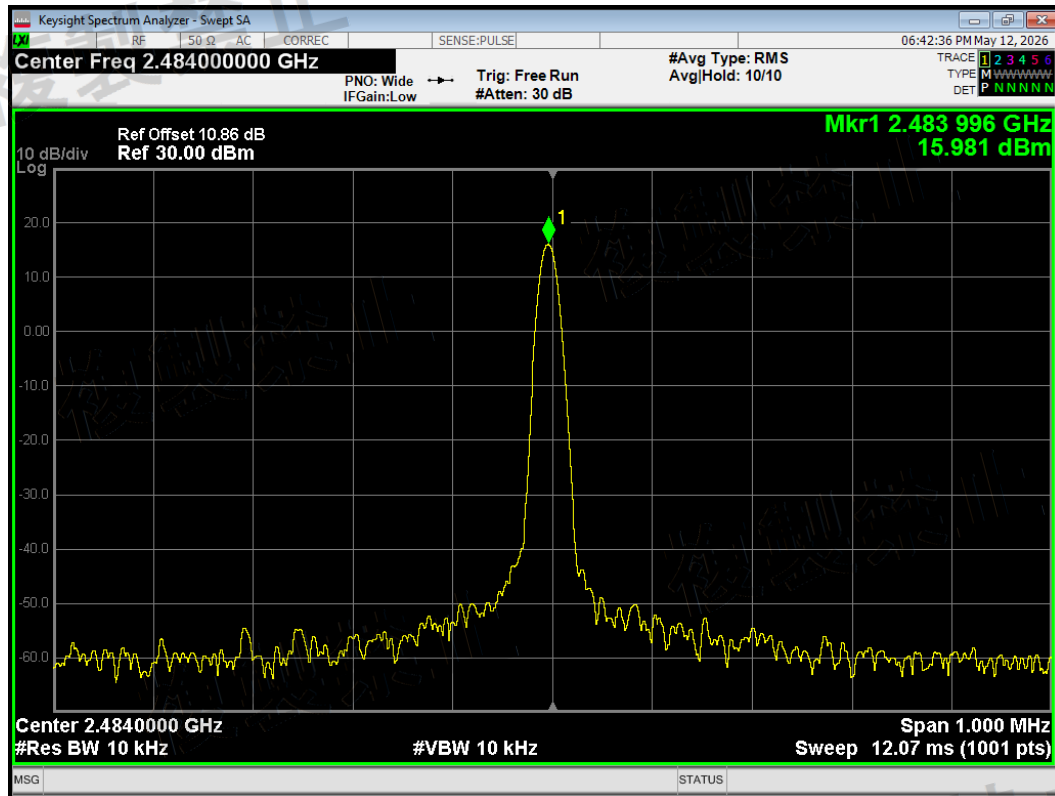
Limits

Frequency Tolerance +/-50 ppm.

Test Results

Test Mode	Test Frequency (MHz)	Measured Frequency (MHz)	Tolerance (MHz)	Frequency Tolerance (ppm)	Limit (ppm)	Result
CW	2484	2483.996	0.004	-1.61	+/-50	Pass

Freq. Error 2484MHz



5.2. Occupied Bandwidth Measurement

Method of Measurement

Spectrum Analyzer Setting

SPAN: 40 MHz(BW=20)

RBW: 300 kHz

VBW: 300 kHz

Sweep Time: AUTO (Minimum time to ensure measurement accuracy.)

Data Points: 401 points or more

Indication mode: Max hold

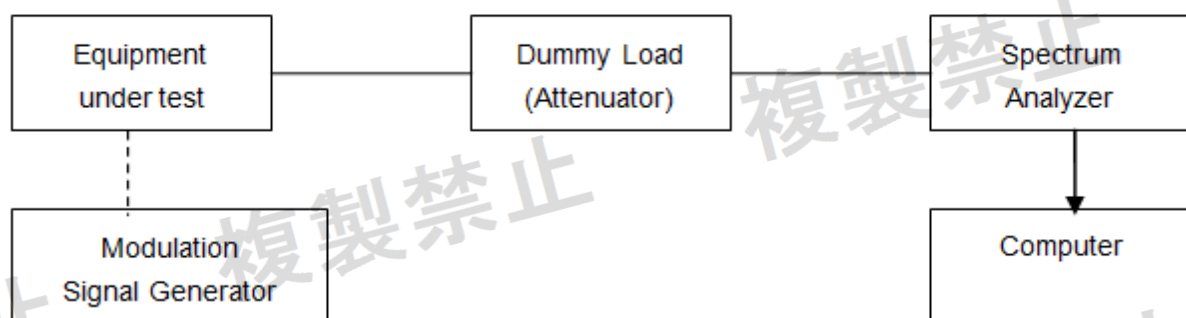
Detection Mode: Positive Peak

Storage Mode: Normal

Y-axis Scale: 10 dB/Div.

Reference Level: Enough level for maximum dynamic range

Test Setup



Limits

Others: Occupied Bandwidth ≤ 26 MHz.

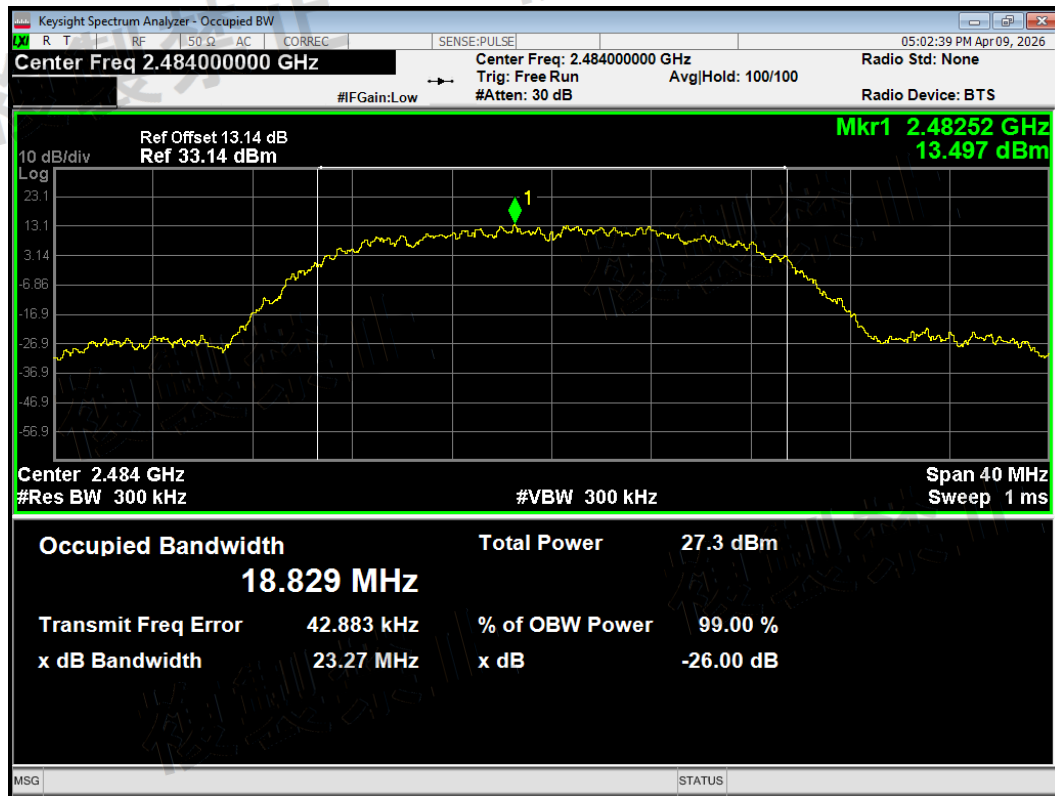
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 936$ Hz.

Test Results

Test Mode	Carrier frequency (MHz)	99% bandwidth (MHz)	Limit (MHz)	Result
802.11b	2484	18.829	≤26	Pass

OBW 802.11b 2484MHz



5.3. Spread Bandwidth and Spread Factor Measurement

Ambient Condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

Spectrum Analyzer Setting

SPAN: 40 MHz(BW=20)

RBW: 300 kHz

VBW: 300 kHz

Sweep Time: AUTO (Minimum time to ensure measurement accuracy.)

Data Points: 401 points or more

Indication mode: Max hold

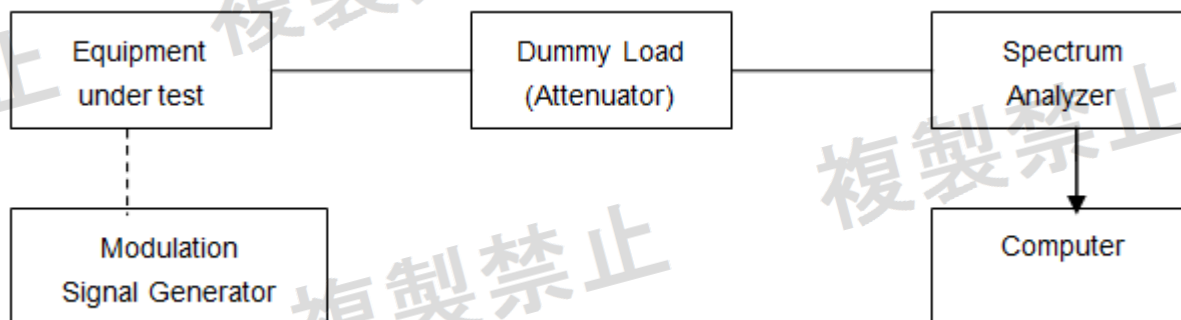
Detection Mode: Positive Peak

Storage Mode: Normal

Y-axis Scale: 10 dB/Div.

Reference Level: Enough level for maximum dynamic range

Test Setup



Limits

Spread Bandwidth ≥ 0.5 MHz.

Spread Factor ≥ 10

Measurement Uncertainty

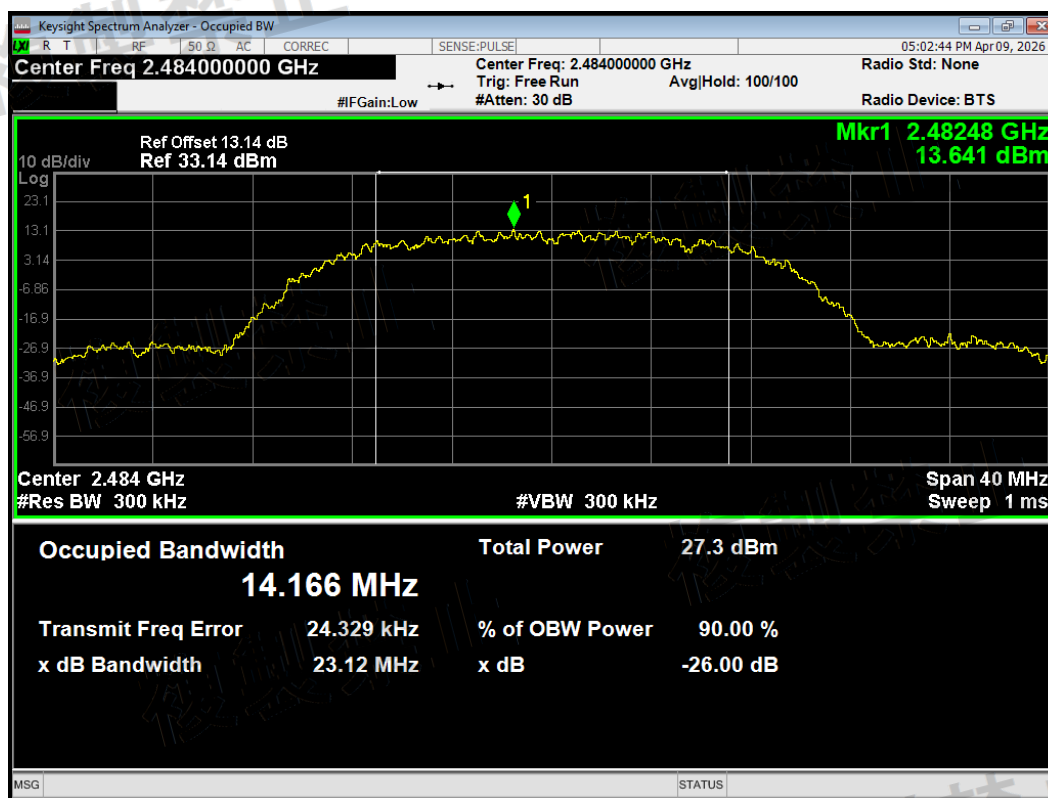
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 936$ Hz.

Test Results

Mode	Frequency (MHz)	90% SBW (MHz)	Limit (MHz)	SF	SF Limit	Result
802.11b	2484	14.166	0.5	10.3	10	Pass

Note: Spreading Factor: 90% channel power bandwidth / 1.375 (modulation rate of EUT)

Spreading Bandwidth 802.11b 2484MHz



5.4. Antenna Power (Conducted) Measurement

Ambient Condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

Spectrum Analyzer Setting

SPAN: OBW×2

RBW: 1 MHz

VBW: 1 MHz

Detector: Positive peak

Display mode: Max hold

Sweep Time: AUTO (Minimum time to ensure measurement accuracy.)

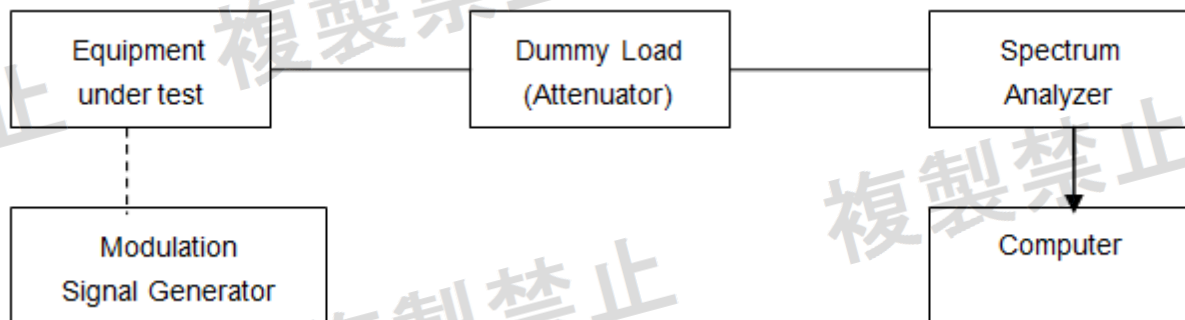
Center Frequency: Searched frequency

Span: 0

RBW: 1MHz

VBW: 1MHz

Test Setup



Limits

RF Output Power ≤ 10 mW/MHz;

Output Power Tolerance: +20%, -80%

EIRP Limit ≤ 12.14 dBm/MHz

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 0.44$ dB.

Test Results:

Network Standards	Carrier Frequency (MHz)	Power Index
802.11b	2484	0

Test Mode	Test Frequency (MHz)	Antenna Power (dBm/MHz)	Antenna Power (mW/MHz)	Limit (mW/MHz)	Declaration Antenna Power (mW/MHz)	Tolerance	Tolerance Limit	Result
802.11b	2484	7.22	5.27	10	5	5.45%	[+20%, -80%]	Pass

Test Mode	Test Frequency (MHz)	EIRP (dBm/MHz)	Limit (dBm/MHz)
802.11b	2484	9.55	12.14
Note: EIRP = Antenna Power + Antenna Gain (Antenna Gain = 2.33 dBi)			

5.5. Transmission Radiation Angle Width (3dB Beamwidth)

Ambient Condition

Temperature	Relative humidity	Pressure
25°C	50%	101.5kPa

Methods of Measurement

Set EUT and measuring antenna at the same height and roughly facing each other.

Set spectrum analyzer RBW=1MHz, VBW=1MHz, SPAN=0Hz, Dector=Positive Peak and tune reference level to observer receiving signal position.

Rotate directions of the EUT horizontally and vertically to find the maximum receiving power.

Move the measuring antenna height up and down with $\pm 50\text{cm}$ of EUT height and swing it to find the maximum output of measuring antenna. The output level at the spectrum analyzer is read as "E".

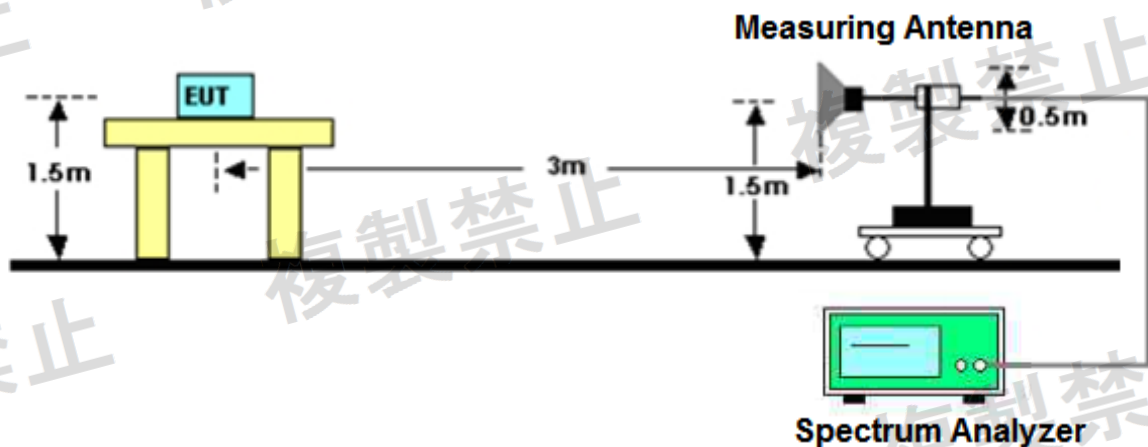
Calculate permitted radiation angle in horizontal and vertical using EIRP measured in another test method.

Calculate 3dB antenna beam width by the formula below $360/A$ (if $A < 1$; then $A = 1$).

$A = \{\text{EIRP Power [mW]} / 16.36 \text{ for DS, OFDM}\}$ or

$A = \{\text{EIRP Power [mW]} / 4.9 \text{ for FH}\}$

Test Setup



Limit

Item	Limits
3dB Antenna beamwidth	$360/A$ (if $A < 1$; then $A = 1$) $A = \{ \text{EIRP Power [mW]} / 16.36 \text{ for DS, OFDM} \}$ or $A = \{ \text{EIRP Power [mW]} / 4.9 \text{ for FH} \}$
Remark: This test item will not be applied to Antenna Gain of EUT is lower than 2.14dBi.	

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$, $U = 3.55 \text{ dB}$.

Test Results

This test item will not be applied to EIRP of EUT is Lower than 12.14 dBm/MHz.

5.6. Unwanted Emission Strength Measurement

Ambient Condition

Temperature	Relative humidity	Pressure
25°C	50%	101.5kPa

Method of Measurement

Step-1

Spectrum Analyzer Setting

RBW: 1MHz

VBW: Same as RBW

Sweep Time: AUTO (Minimum time to ensure measurement accuracy)

Sweep Mode: Single Sweep

Detection Mode: Positive Peak

Step-2

Spectrum Analyzer Setting

Center Frequency: Searched Frequency

SPAN: 0 Hz

RBW: 100kHz for frequencies below 1GHz, 1MHz for frequencies above 1GHz

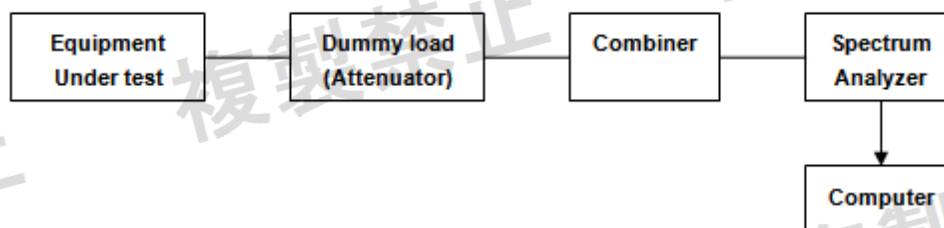
VBW: Same as RBW

Sweep Time: AUTO (Minimum time to ensure measurement accuracy)

Sweep Mode: Single Sweep

Detection Mode: Sample

Test Setup



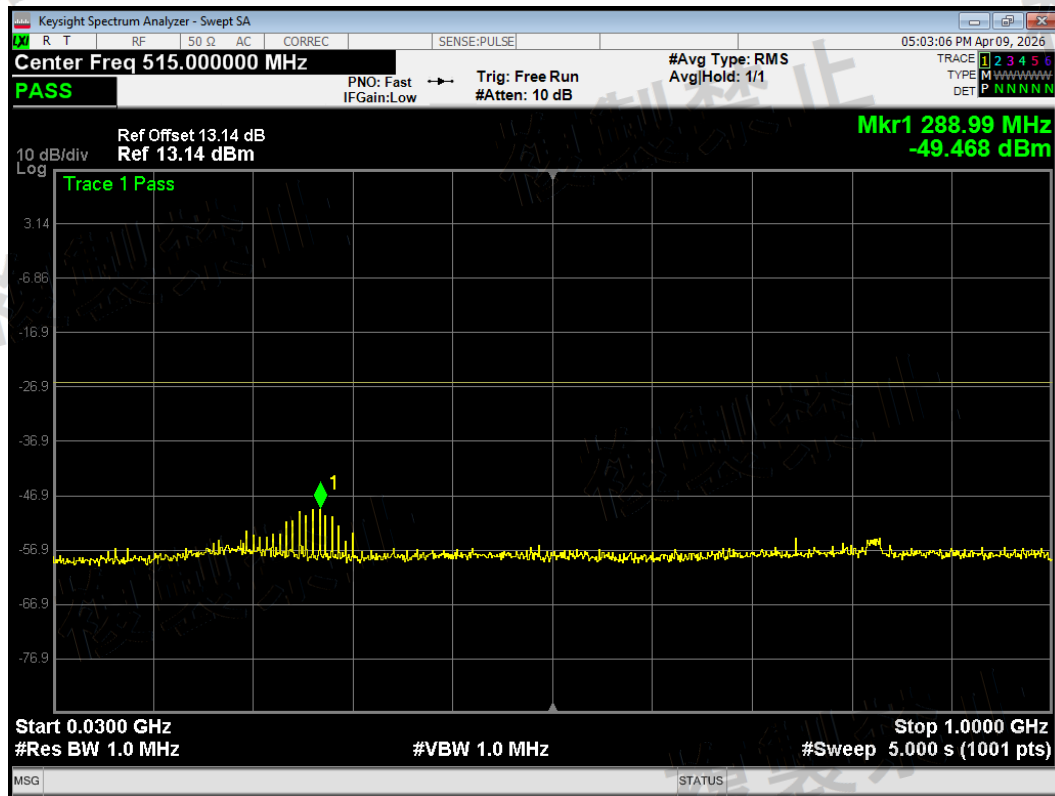
Limit

Frequency Range	Limits(μ W/MHz)
30MHz - 2458MHz	2.5 μ W/MHz
2458MHz - 2471MHz	25 μ W/MHz
2497MHz - 2510MHz	25 μ W/MHz
2510MHz - 12.5GHz	2.5 μ W/MHz

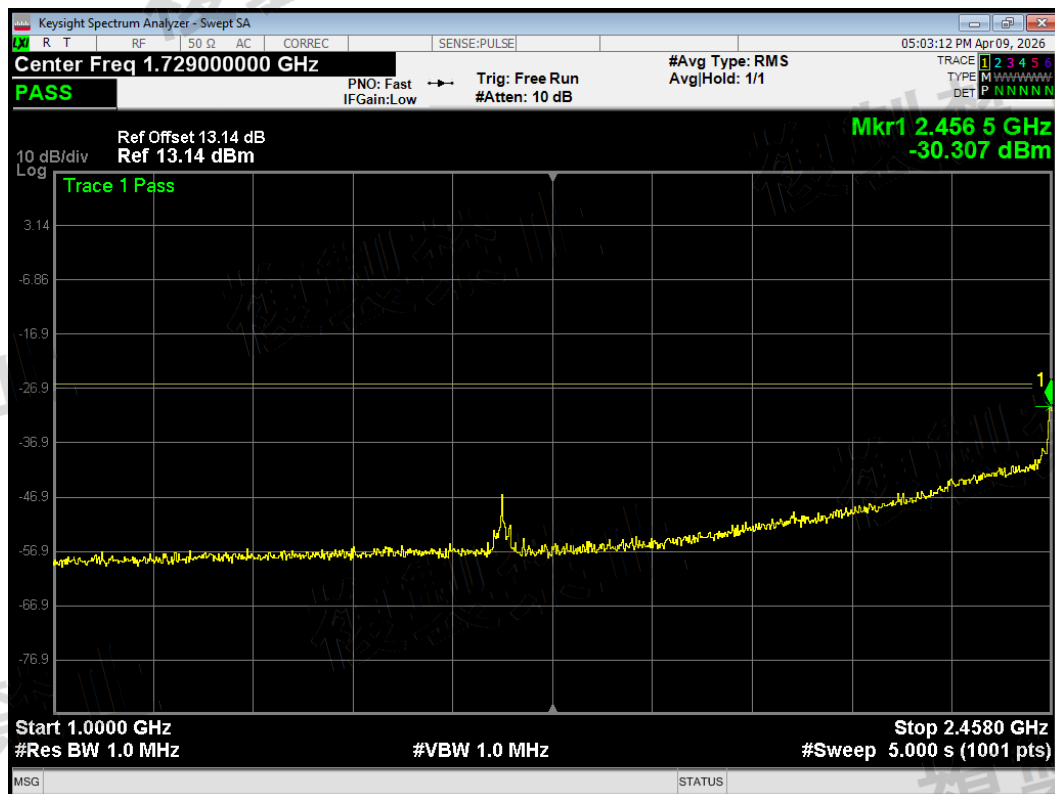
Test Results

Mode	Frequency (MHz)	Range (MHz)	Emission Frequency (MHz)	Max Peak Value (dBm/MHz)	Max Peak Value (μW/MHz)	Limit (μW/MHz)	Verdict
802.11b	2484	30-1000	288.99	-49.46	0.011	2.5	Pass
802.11b	2484	1000-2458	2456.54	-30.30	0.933	2.5	Pass
802.11b	2484	2458-2471	2467.46	-17.78	16.672	25	Pass
802.11b	2484	2497-2510	2500.38	-16.58	21.979	25	Pass
802.11b	2484	2510-13000	2510.00	-29.28	1.180	2.5	Pass

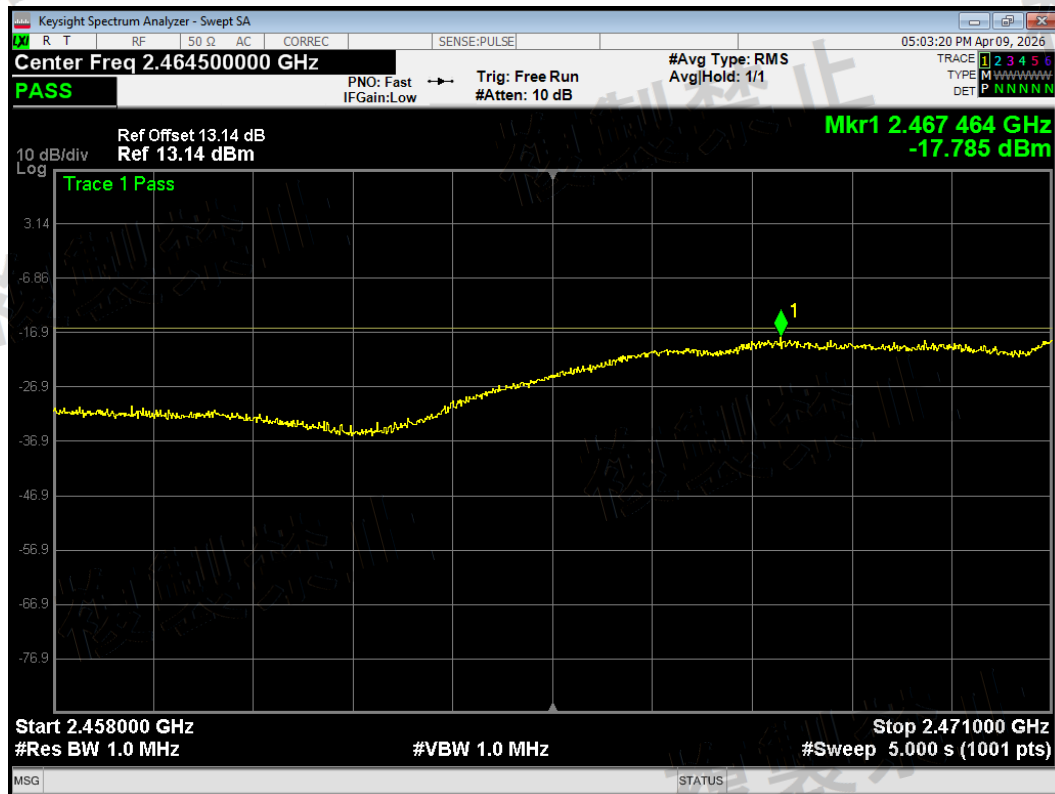
Tx. Spurious 802.11b 2484MHz @ 30MHz-1000MHz



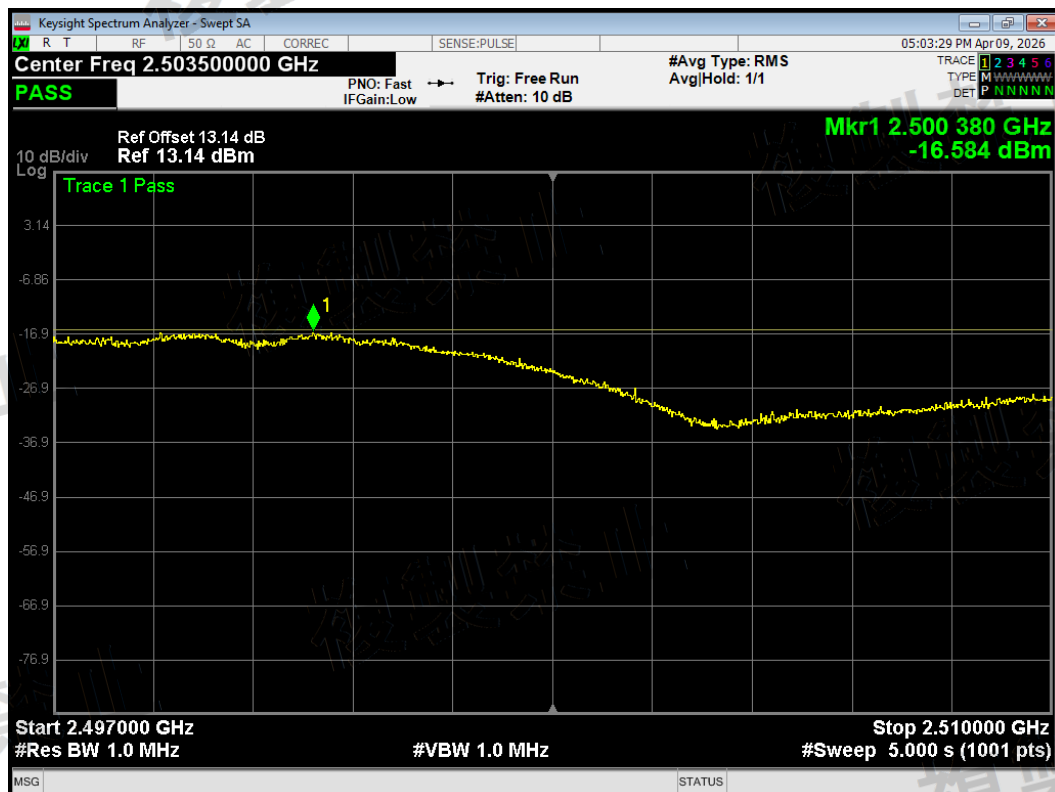
Tx. Spurious 802.11b 2484MHz @ 1000MHz-2458MHz



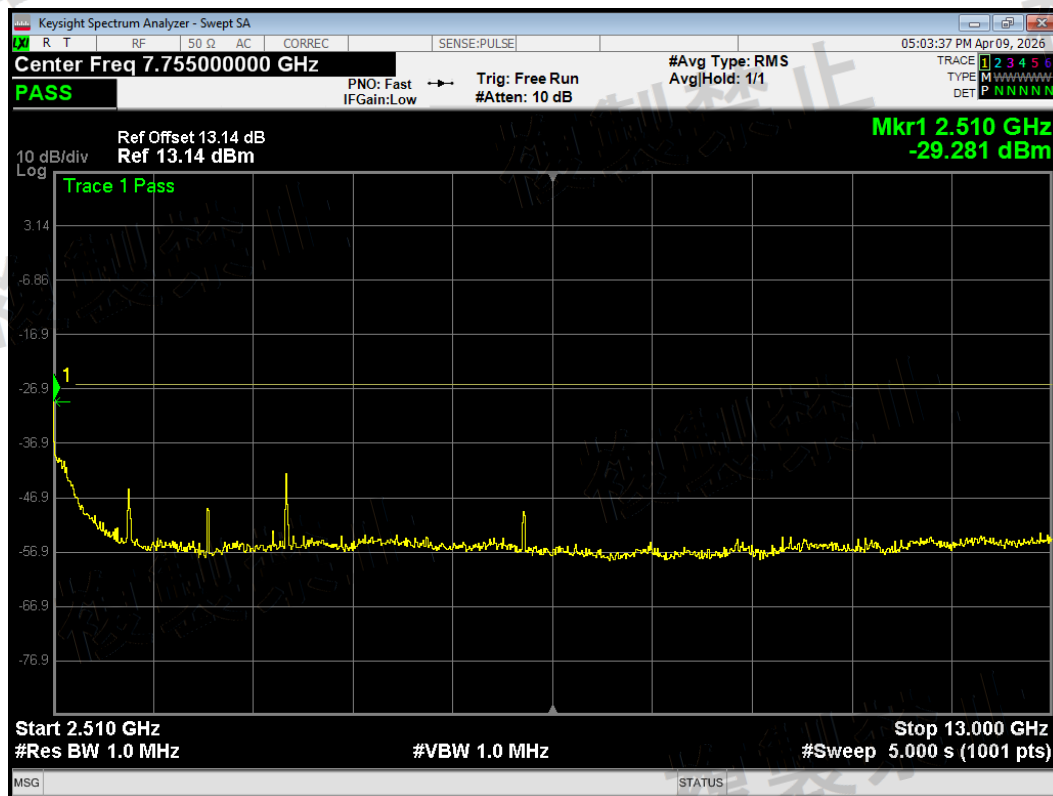
Tx. Spurious 802.11b 2484MHz @ 2458MHz-2471MHz



Tx. Spurious 802.11b 2484MHz @ 2497MHz-2510MHz



Tx. Spurious 802.11b 2484MHz @ 2510MHz-13000MHz



5.7. Secondarily Emitted Radio Wave Strength Measurement

Ambient Condition

Temperature	Relative humidity	Pressure
25°C	50%	101.5kPa

Method of Measurement

Step-1

Spectrum Analyzer Setting

RBW: 1 MHz (frequency range; 1 GHz over), 100 kHz (frequency range; 30 MHz to 1 GHz)

VBW: Same as RBW

Sweep Time: AUTO (Minimum time to ensure measurement accuracy)

Sweep Mode: Single Sweep

Detection Mode: Positive Peak

Step-2

Spectrum Analyzer Setting

Center Frequency: Searched Frequency

RBW: 1 MHz (frequency range; 1 GHz over), 100 kHz (frequency range; 30 MHz to 1 GHz)

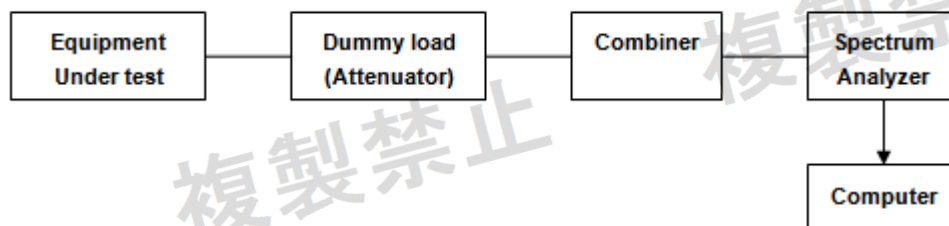
VBW: Same as RBW

Sweep Time: AUTO (Minimum time to ensure measurement accuracy)

Sweep Mode: Single Sweep

Detection Mode: Sample

Test Setup



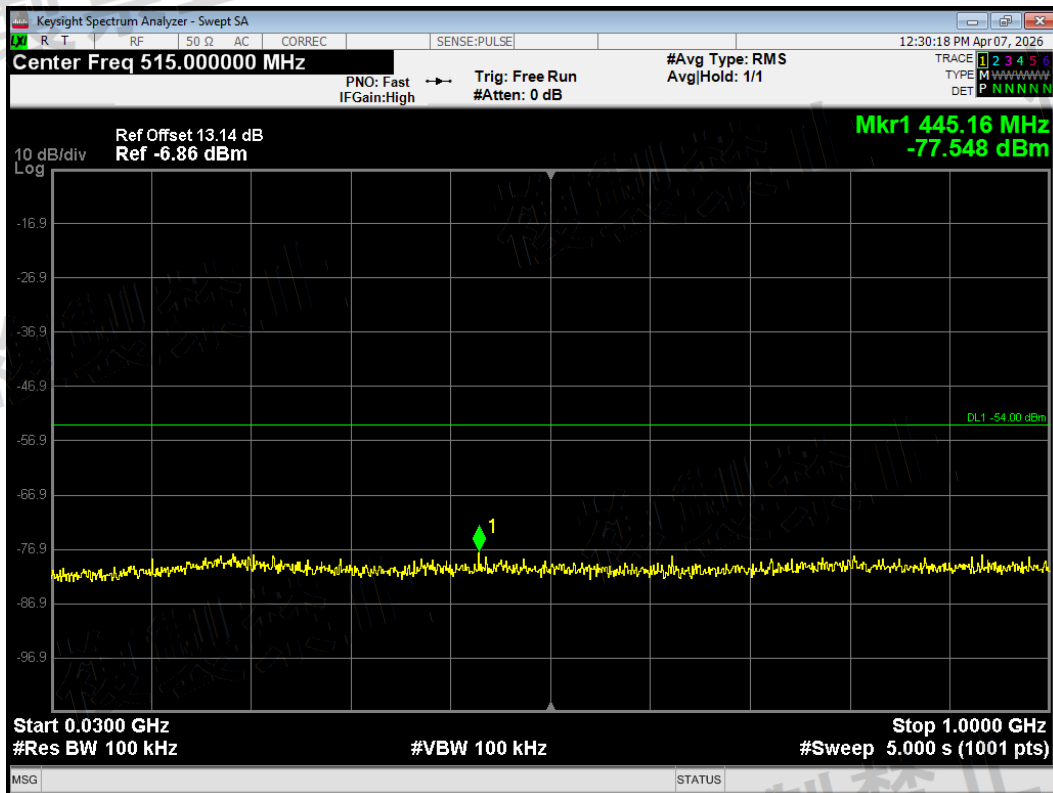
Limit

Frequency Range	Limits(nW)
Under 1 GHz	≤ 4
1GHz-12.5GHz	≤ 20

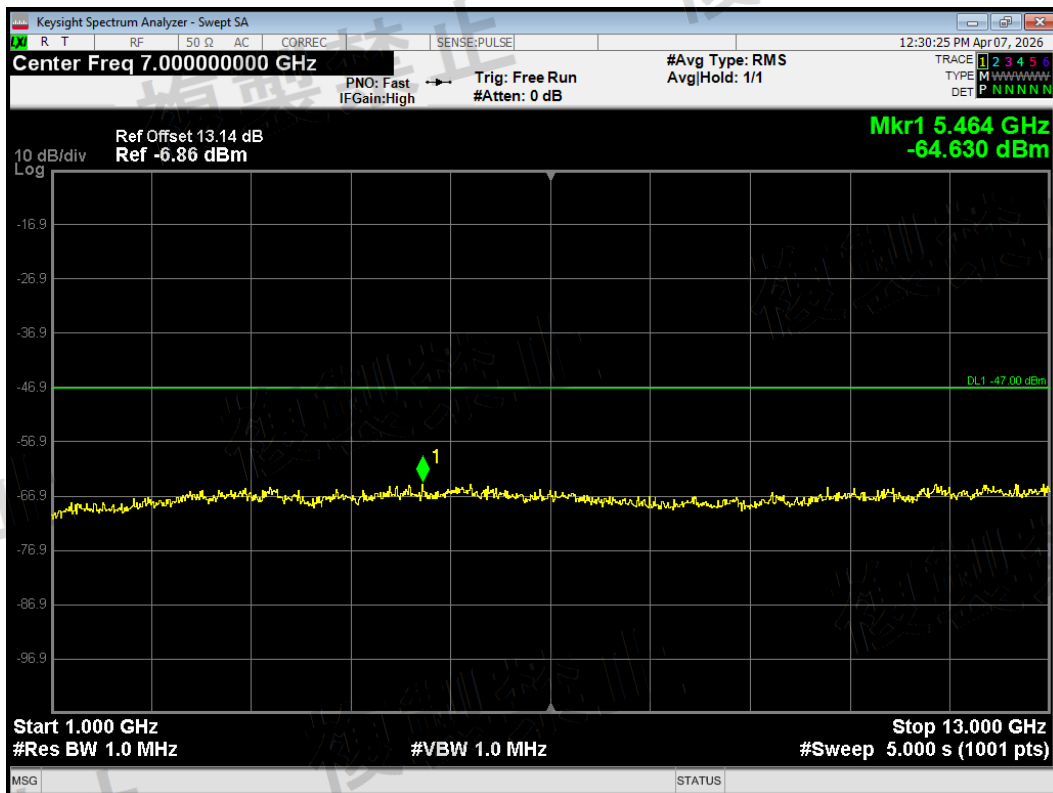
Test Results

Mode	Frequency (MHz)	Range (MHz)	Emission Frequency (MHz)	Max Peak Value (dBm)	Max Peak Value (nW)	Limit (nW)	Verdict
802.11b	2484	30-1000	445.16	-77.55	0.02	4	Pass
802.11b	2484	1000-13000	5464	-64.63	0.34	20	Pass

Rx. Spurious 802.11b 2484MHz @ 30MHz-1000MHz



Rx. Spurious 802.11b 2484MHz @ 1000MHz-13000MHz



5.8. Radio Interference Prevention Capability Measurement

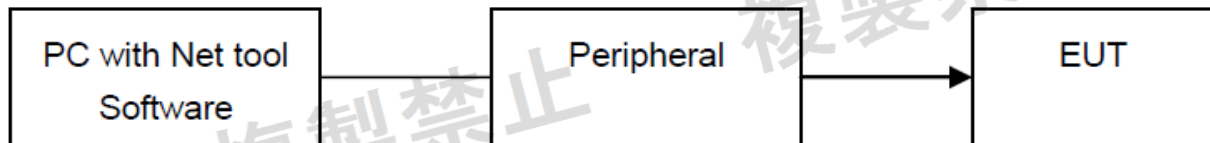
Ambient Condition

Temperature	Relative humidity	Pressure
25°C	50%	101.5kPa

Method of Measurement

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.

Test Setup



Limit

Identification code $\geq$ 48 bits

Test Results

Test Mode	Test Frequency (MHz)	Identification code	Result
802.11b	2484	48	Pass

MAC address	083A8D410258 ↵
-------------	----------------

5.9. Construction Protection Confirmation Method

Ambient Condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

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.

Test Results:

Protected Method	BB and RF chips are protected by metal shielding shells
Description	BB and RF chips are protected by metal shielding shells, and the heat is conducted using thermal silicone grease inside. The interface is an M.2 interface. When used, it requires a matching heat dissipation design, so the module is generally located inside the entire device when used, and users cannot touch it.

Photo



6. Uncertainty Measurement

Parameter	Uncertainty
RF Output Power	$\pm 1.25\text{dB}$
Frequency Error Measurement	$\pm 2.5 \times 10^{-7}$
Occupied Bandwidth and Spread-spectrum Bandwidth / Factor	$\pm 4.54\%$
Unwanted Emission Strength Measurement	$\pm 1.23\text{dB}$
Secondarily Emitted Radio Wave Strength	$\pm 1.12\text{ dB}$

7. Main Test Instruments

Name	Manufacturer	Type	Serial Number	Calibration Unite	Date of Calibration	Expiry Date	Calibration Method
Power sensor	R&S	NRP18S	101954	CEPREI	2025-05-06	2026-05-05	c
Spectrum Analyzer	KEYSIGHT	N9020A	MY51330870	CEPREI	2025-05-06	2026-05-05	c
Multimeter	FLUKE	15B+	34210714WS	CEPREI	2025-05-06	2026-05-05	c
Vector Signal Generator	KEYSIGHT	N5182B	MY51350303	CTTL	2025-11-24	2026-11-23	c
DC Power Supply	UNI-T	UTP1306S+	2205D0517426	CEPREI	2025-11-24	2026-11-23	c
Test software	MW	MTS8310	/	/	/	/	c
TEMP/HUMIDITY	DELIXI	HTC-1	/	CTTL	2025-05-06	2026-05-05	c

Calibration Method:

- a) Calibration conducted by the National Institute of Information and Communications Technology (NICT) (hereinafter referred to as "NICT") or a designated calibration agency under Article 102-18 paragraph (1)
- b) Correction conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Law (Law No. 51 of 1992)
- 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)
- d) Calibration conducted by using measuring instruments and other equipment listed in the right column of Table No. 3 attached hereto, which shall have been given any of calibration, etc. listed above from a) to c)

8. The EUT Appearance

Refer to *EUT Appearance*.

9. Test Setup Photos

Refer to *RF Test Setup*.

*****END OF REPORT *****