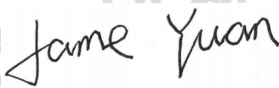




RF MEASUREMENT REPORT

Applicant: Hewlett Packard Enterprise Company
Address: 3333 Scott Blvd, Santa Clara, CA 95054, USA
Product: ACCESS POINT
Model No.: APEX0374, APEX0375, APEX0377
Brand Name:  
Standard: Article 49.20 and the relevant articles of the Ordinance
Regulating Radio Equipment
Test Procedure: MIC Notice No.88 Annex 43
Product Category: Article 2, Paragraph 1, Item 19
Result: Complies
Test Date: 2017-08-01 ~ 2017-10-27

Reviewed By:



(Jame Yuan)

Approved By:



(Robin Wu)

The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standards through the calibration of the equipment and evaluated measurement uncertainty herein.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
2302RSU006-J1	V01	Initial Report	2023-02-17	Valid

Note: This report was based on original report no. 1708RSU01013. Now the applicant added two antennas for APEX0374, any others are same as before. This information was shown on clause 1.7 Antenna No. 9# and 10#, and there was not any other change for test report.

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1.1. Applicant

1.2. Manufacturer

1.3. Testing Facility

☒	Test Site – MRT Suzhou Laboratory
	Laboratory Location (Suzhou - Wuzhong) D8 Building, No.2 Tian’edang Rd., Wuzhong Economic Development Zone, Suzhou, China
	Laboratory Location (Suzhou - SIP) 4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China
	Laboratory Accreditations
	A2LA: 3628.01 FCC: CN1166 VCCI: ☐ R-20025 ☐ G-20034 ☐ C-20020 ☐ T-20020 ☐ R-20141 ☐ G-20134 ☐ C-20103 ☐ T-20104 CNAS: L10551 ISED: CN0001
☐	Test Site – MRT Shenzhen Laboratory
	Laboratory Location (Shenzhen) 1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China
	Laboratory Accreditations A2LA: 3628.02 FCC: CN1284 CNAS: L10551 ISED: CN0105
☐	Test Site – MRT Taiwan Laboratory
	Laboratory Location (Taiwan) No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)
	Laboratory Accreditations TAF: L3261-190725 FCC: 291082, TW3261 ISED: TW3261

1.4. Product Information

Product Name	ACCESS POINT
Model No.	APEX0374, APEX0375, APEX0377
Brand Name:	 
Wi-Fi Specification:	802.11a/b/g/n/ac
Bluetooth Specification:	v4.0 single mode
Software Version:	R660.1.1.0.3.005
Operating Temperature:	-40 ~ 65 °C
Power Type:	POE input or AC adapter input

Note: The difference between three models is that the EUT use different antenna and appearance, other hardware and software are the same.

1.5. Radio Specification under Test

Frequency Range	2402~2480MHz
Bluetooth Version	v4.0
Type of Modulation	GFSK
Data Rate	1Mbps
Declared Output Power	3.0mW/MHz

Note: For other features of this EUT, test report will be issued separately.

1.6. Working Frequencies

Channel	Frequency	Channel	Frequency	Channel	Frequency
00	2402 MHz	01	2404 MHz	02	2406 MHz
03	2408 MHz	04	2410 MHz	05	2412 MHz
06	2414 MHz	07	2416 MHz	08	2418 MHz
09	2420 MHz	10	2422 MHz	11	2424 MHz
12	2426 MHz	13	2428 MHz	14	2430 MHz
15	2432 MHz	16	2434 MHz	17	2436 MHz
18	2438 MHz	19	2440 MHz	20	2442 MHz
21	2444 MHz	22	2446 MHz	23	2448 MHz
24	2450 MHz	25	2452 MHz	26	2454 MHz
27	2456 MHz	28	2458 MHz	29	2460 MHz
30	2462 MHz	31	2464 MHz	32	2466 MHz
33	2468 MHz	34	2470 MHz	35	2472 MHz
36	2474 MHz	37	2476 MHz	38	2478 MHz
39	2480 MHz	--	--	--	--

1.7. Antenna Details

For Model No.: APEX0374

Antenna No.	Polarization	Frequency Band (GHz)	Model No.	Max Peak Gain (dBi)	BF Gain (dBi)
Wi-Fi External Antenna List (2.4GHz 2*2 MIMO, 5GHz 4*4 MIMO)					
1 (Note 3)	Omni	2.4	ANT-2x2-2005	5.0	N/A
2 (Note 3)	Omni	5	ANT-2x2-5005	5.0	3.01
3 (Note 3)	Directional	2.4	ANT-2x2-2314	14.0	N/A
4 (Note 3)	Directional	5	ANT-3x3-5712	11.5	3.01
5 (Note 3)	Directional	5	ANT-4x4-5314	14.0	3.01
6 (Note 3)	Directional	5	MT-484052/NVH	16.0	3.01
7 (Note 3)	Directional	2.4	ANT-3x3-D608	7.5	3.01
		5		7.5	3.01
8 (Note 3)	Directional	2.4	ANT-3x3-D100	5.0	3.01
		5		5.0	3.01
9 (Note 3)	Directional	2.4	ANT-4X4-D707	7.5	3.01
		5		7.5	3.01
10 (Note 3)	Directional	2.4	AP-ANT-28A	7.5	3.01
		5		7.5	3.01
Bluetooth Internal Antenna					
PCB		2.4		3.0	

For Model No.: APEX0375

Polarization	Frequency Band (GHz)	Max Peak Gain (dBi)	BF Gain (dBi)
Wi-Fi Internal Antenna List (2.4GHz 2*2 MIMO, 5GHz 4*4 MIMO)			
Directional (Note 3)	2.4	4.0	N/A
Directional (Note 3)	5	4.6	3.01
Bluetooth Internal Antenna			
PCB	2.4	4.5	

For Model No.: APEX0377

Polarization	Frequency Band (GHz)	Max Peak Gain (dBi)	BF Gain (dBi)
Wi-Fi Internal Antenna List (2.4GHz 2*2 MIMO, 5GHz 4*4 MIMO)			
Directional (Note 3)	2.4	6.4	N/A
Directional (Note 3)	5	6.3	3.0
Bluetooth Internal Antenna			
PCB	2.4	6.7	

Note:

- The EUT supports Cyclic Delay Diversity (CDD) technology for 802.11a/b/g/n/ac mode, and the transmitter output signal is correlated.
- The EUT also supports Beam Forming technology, and the Beam Forming only support 802.11n/ac mode. Directional gain = $G_{ANT} + BF \text{ Gain}$, BF Gain is declared by the applicant.
- These antennas have Cross-Polarized design, the detail see the antenna specification.
- We selected the Wi-Fi max peak gain antenna (Model No.: APEX0374 Directional antenna 3# and 6#) and the Bluetooth max peak gain antenna (Model No.: APEX0377) to perform RF testing.

Antenna RF Port:

Antenna RF Port						
--	2.4GHz RF Port		5GHz RF Port			
Software Control Port	Ant 0	Ant 1	Ant 0	Ant 1	Ant 2	Ant 3
APEX0377						
						

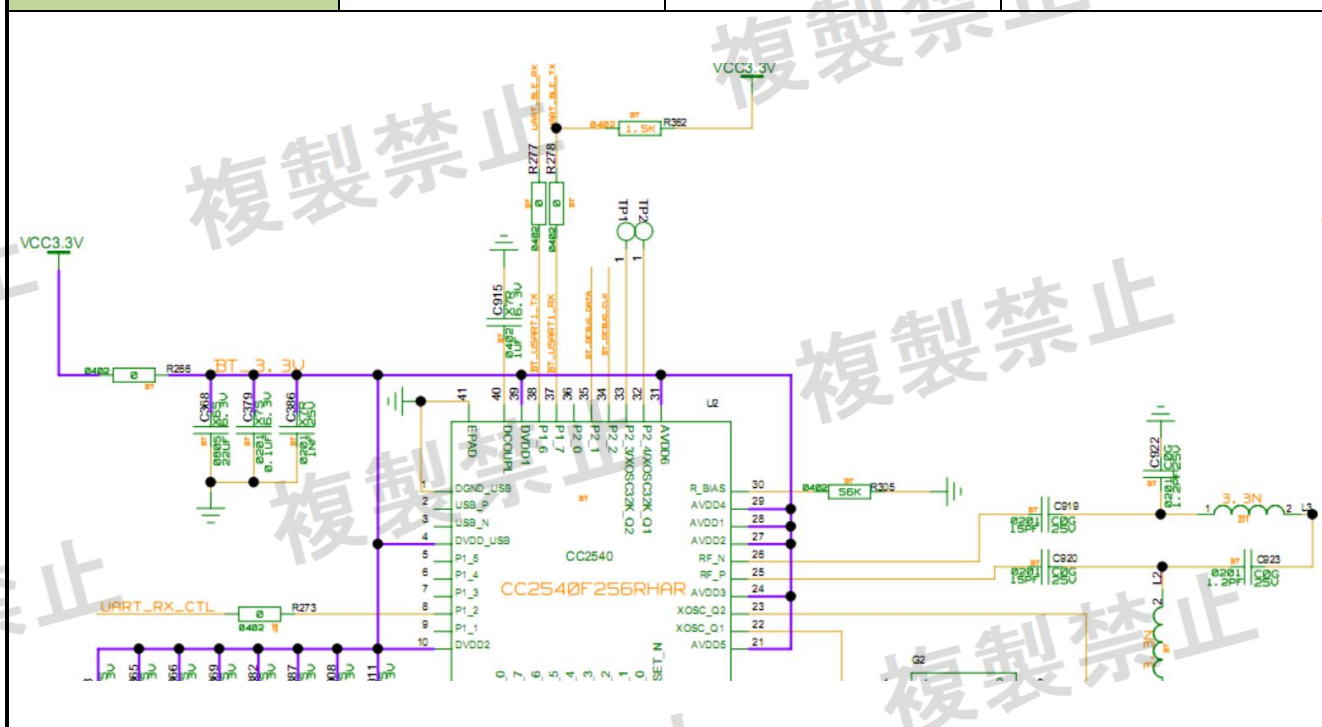
2. Test Configuration

2.1. Test Mode

Test Mode	Mode 1: Transmit by BLE
	Mode 2: Receive by BLE

The **ACCESS POINT Model No.: APEX0374 & APEX0375 & APEX0377** was tested per the guidance of ARIB STD-T66.

Extreme Voltage	100V	90V	110V
Measure Voltage	3.3V	3.28V	3.31V
Tolerance	-	-0.61%	0.30%



The test utility software used during testing was “Smart RF Studio 7”, and the version was “2.4.2”.

3. Measuring Instrument

Conducted Test Equipment (TR3)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date	Cali. Body	Cali. Method
Spectrum Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2018/04/25	Ceprei	C
Vector Signal Generator	Agilent	E4438C	MRTSUE06026	1 year	2017/12/06	Ceprei	C
Programmable Temperature & Humidity Chamber	BAOYT	BYH-1500L	MRTSUE06051	1 year	2017/12/06	Ceprei	C
Temperature/Humidity Meter	Yuhuaze	HTC-2	MRTSUE06180	1 year	2017/12/22	Ceprei	C

Note: All the above test equipment was used and kept valid calibration period during the testing.

Calibration Method:

- Calibration conducted by the National Institute of Information and Communications Technology (NICT) or a designated calibration agency under Article 102-18 paragraph.
- Correction conducted pursuant to the previous of Article 135 or Article 144 of the measurement Law (Law No. 51 of 1992), Japan calibration Service System
- 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.

4. Decision Rules and Measurement Uncertainty

4.1. Decision Rules

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4: 2012 Clause 8.2.

(Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

4.2. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

Conducted Test Item
The maximum measurement uncertainty is defined as: ± 1.127 dB.

5. Test Result

Test Description	Test Limit	Test Condition	Test Result	Reference
Output Power	10mW or less	Conducted	Pass	Section 6.2
Output Power Tolerance	+20% to - 80%		Pass	
E.I.R.P	12.14dBm		Pass	
Spread Bandwidth	$\geq 500\text{KHz}$		N/A	Section 6.3
Spread Factor	≥ 5 for 2400 ~ 2483.5MHz		N/A	
Occupied Bandwidth	$\leq 26\text{MHz}$		Pass	Section 6.4
Frequency Tolerance	-50 ~ +50ppm		Pass	Section 6.5
Transmitter Spurious Emissions	$\leq 2.5\mu\text{W}$ for 30 ~ 2387MHz $\leq 25\mu\text{W}$ for 2387 ~ 2400MHz $\leq 25\mu\text{W}$ for 2483.5 ~ 2496.5MHz $\leq 2.5\mu\text{W}$ for 2496.5 ~ 12500MHz		Pass	Section 6.6
Receiver Spurious Emissions	$\leq 4\text{nW}$ for 10 ~ 1000MHz $\leq 20\text{nW}$ for 1000 ~ 12500MHz		Pass	Section 6.7

Notes:

- The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
- All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.

5.1. Output Power, Output Power Tolerance and E.I.R.P

5.1.1. Test Limit

Output Power $\leq 10\text{mW}$

Output Power Tolerance: +20% to -80%

EIRP $\leq 12.14\text{dBm}$

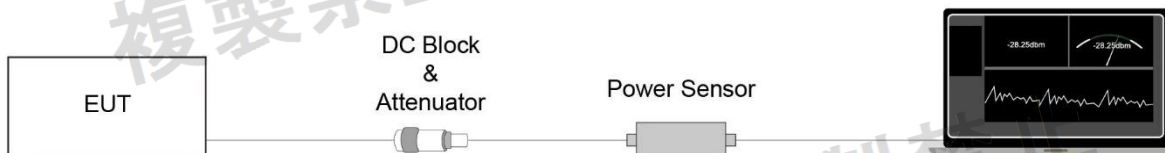
5.1.2. Test Procedure

Measure the total power by Power Meter in a state of hopping mode (with Average Sensor).

If it's the burst wave, please measure the burst ratio. Then calculate the real total power by burst ratio.

Calculate the mean power per 1MHz by dividing the total power by spread bandwidth.

5.1.3. Test Setup



5.1.4. Test Result

EUT	ACCESS POINT	Temperature	22°C
Test Engineer	Dandy Li	Relative Humidity	53%
Test Item	Output Power	Test Date	2017/09/28

Frequency (MHz)	Reading Value (dBm)	Real Value (mW)	Limit (mW)	Result
2402	4.58	2.87	10	Pass
2440	4.44	2.78	10	Pass
2480	4.14	2.59	10	Pass

Note: Real Value (mW) = $10^{\text{[Reading Value (dBm)/10]}}$

Output Power	
2402MHz	2440MHz
	
2480MHz	
	

EUT	ACCESS POINT	Temperature	22°C
Test Engineer	Dandy Li	Relative Humidity	53%
Test Item	Output Power Tolerance	Test Date	2017/09/28

Frequency (MHz)	Output Power (mW)	Declared Output Power (mW)	Tolerance (%)	Limit	Result
2402	2.87	3	-4.33	+20% ~ -80%	Pass
2440	2.78	3	-7.33	+20% ~ -80%	Pass
2480	2.59	3	-13.67	+20% ~ -80%	Pass

Note: Tolerance = (Output Power - Declared Output Power) / Declared Output Power * 100%

EUT	ACCESS POINT	Temperature	22°C
Test Engineer	Dandy Li	Relative Humidity	53%
Test Item	EIRP	Test Date	2017/09/28

Frequency (MHz)	Output Power (dBm)	EIRP (dBm)	Limit (dBm)	Result
2402	4.58	11.28	12.14	Pass
2440	4.44	11.14	12.14	Pass
2480	4.14	10.84	12.14	Pass

Note: EIRP (dBm) = Output Power (dBm) + Antenna Gain (dBi).

5.2. Spread Bandwidth and Spread Factor

5.2.1. Test Limit

Spread Bandwidth ≥ 500 kHz

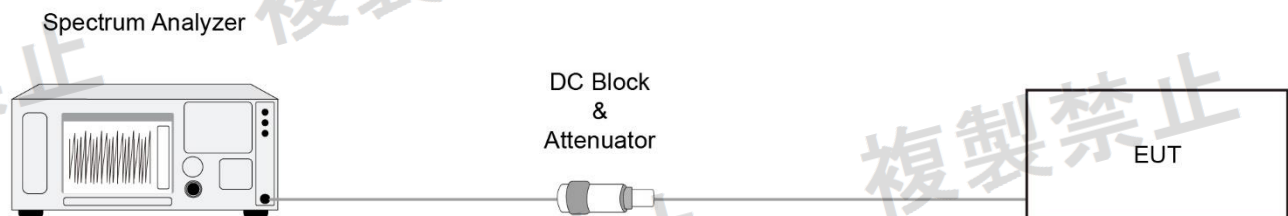
Spread Factor ≥ 5 for 2400 - 2483.5 MHz

5.2.2. Test Procedure

A spectrum analyzer or similar device shall be used to observe a sample of the modulated transmitter's radio frequency power output.

- (a) A positive peak detector function must be used.
- (b) A measurement instrument with an integrated 90% power bandwidth function may be used to automate the test process.
- (c) The measurement instrument bandwidth and span must be set sufficiently with, and, the scan time set sufficiently slowly, to ensure all major modulation products are captured. Note that the measurement bandwidth should also be set sufficiently narrow to avoid adding significant error to the test result.
- (d) 'Maximum Hold' mode may be used to accumulate the measurement result over several scans provided the emission is repetitive in nature.

5.2.3. Test Setup



5.2.4. Test Result

This test item is not applicable for Bluetooth LE device.

5.3. Occupied Bandwidth

5.3.1. Test Limit

≤ 26 MHz

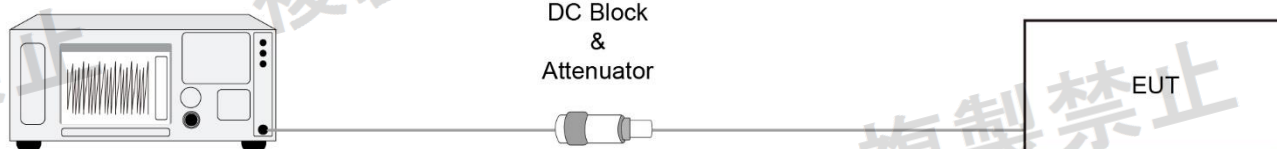
5.3.2. Test Procedure

A spectrum analyzer or similar device shall be used to observe a sample of the modulated transmitter's radio frequency power output.

- (a) A positive peak detector function must be used.
- (b) A measurement instrument with an integrated 99% power bandwidth function may be used to automate the test process.
- (c) The measurement instrument bandwidth and span must be set sufficiently with, and, the scan time set sufficiently slowly, to ensure all major modulation products are captured. Note that the measurement bandwidth should also be set sufficiently narrow to avoid adding significant error to the test result.
- (d) 'Maximum Hold' mode may be used to accumulate the measurement result over several scans provided the emission is repetitive in nature.

5.3.3. Test Setup

Spectrum Analyzer



5.3.4. Test Result

EUT	ACCESS POINT	Temperature	22°C
Test Engineer	Dandy Li	Relative Humidity	53%
Test Site	TR3	Test Date	2017/09/28

Frequency (MHz)	Occupied Bandwidth (MHz)	Limit (MHz)	Result
2402	1.36	≤ 26	Pass
2440	1.35	≤ 26	Pass
2480	1.33	≤ 26	Pass



5.4. Frequency Tolerance

5.4.1. Test Limit

$\leq 50\text{ppm}$

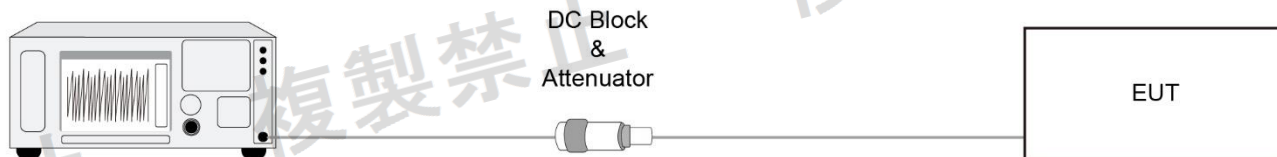
5.4.2. Test Procedure

A spectrum analyzer or similar device shall be used to observe a sample of the modulated transmitter's radio frequency power output.

- (a) A positive peak detector function must be used.
- (b) The measurement instrument bandwidth and span must be set sufficiently with, and, the scan time set sufficiently slowly, to ensure all major modulation products are captured. Note that the measurement bandwidth should also be set sufficiently narrow to avoid adding significant error to the test result.
- (c) 'Maximum Hold' mode may be used to accumulate the measurement result over several scans provided the emission is repetitive in nature.

5.4.3. Test Setup

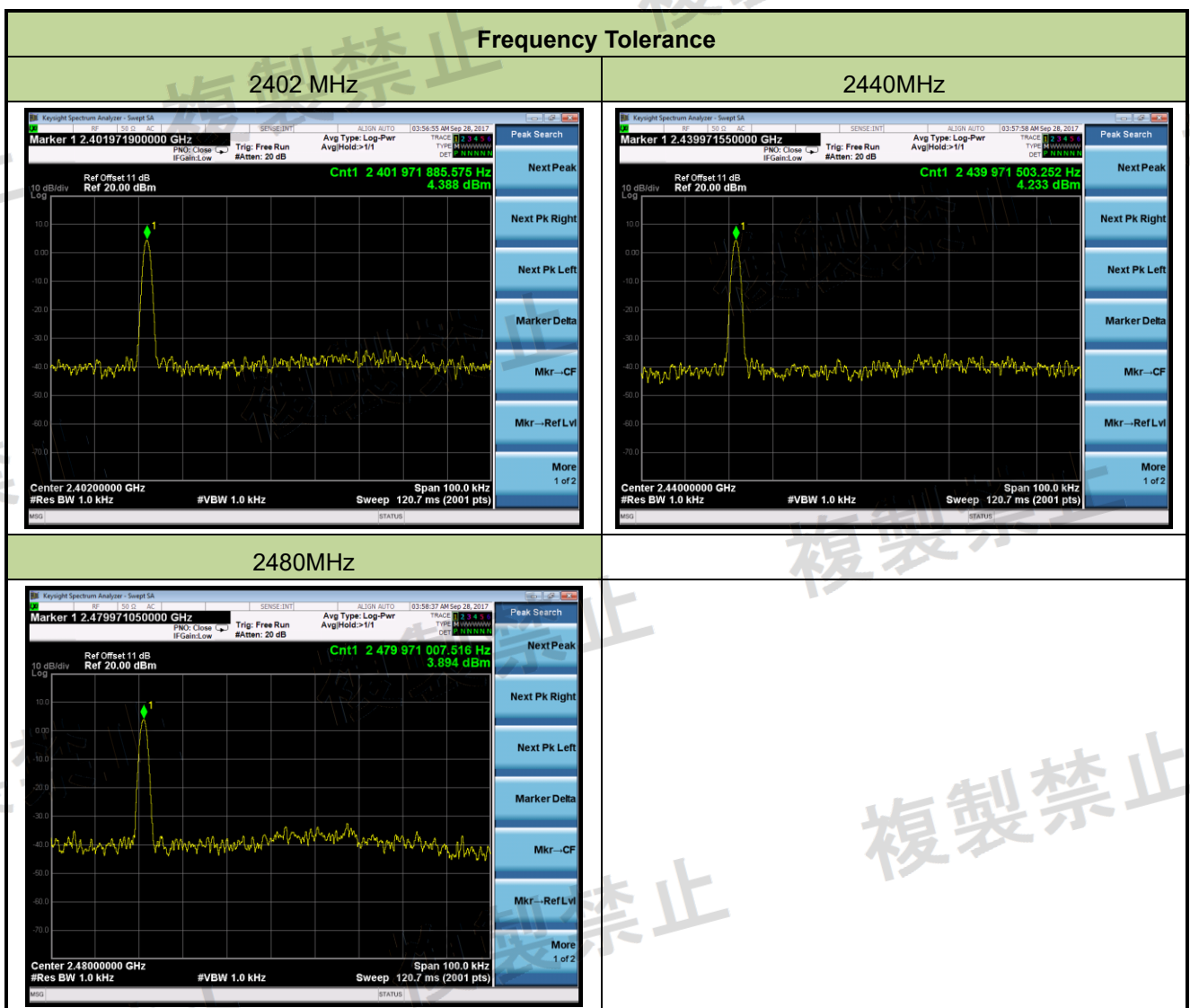
Spectrum Analyzer



5.4.4. Test Result

EUT	ACCESS POINT	Temperature	22°C
Test Engineer	Dandy Li	Relative Humidity	53%
Test Site	TR3	Test Date	2017/09/28

Test Mode	Frequency (MHz)	Measurement Frequency (MHz)	Tolerance (ppm)	Limit (ppm)	Result
Carrier Wave	2402	2401.971886	-11.70	≤ 50	Pass
	2440	2439.971503	-11.68	≤ 50	Pass
	2480	2479.971008	-11.69	≤ 50	Pass



5.5. Transmitter Spurious Emissions

5.5.1. Test Limit

$\leq 2.5\mu\text{W}$ for 30 ~ 2387MHz;

$\leq 25\mu\text{W}$ for 2387 ~ 2400MHz;

$\leq 25\mu\text{W}$ for 2483.5 ~ 2496.5MHz;

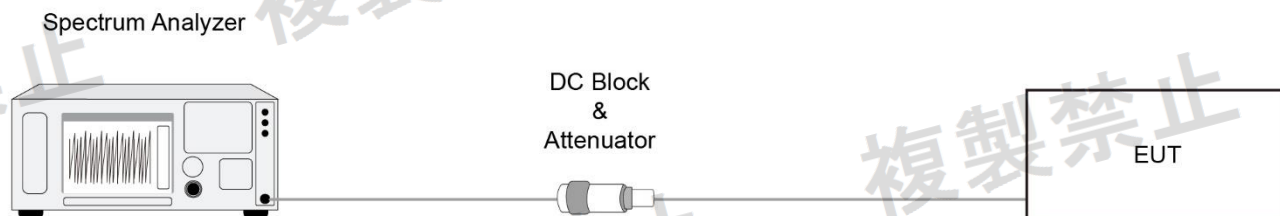
$\leq 2.5\mu\text{W}$ for 2496.5 ~ 12500MHz

5.5.2. Test Procedure

A spectrum analyzer or similar device shall be used to observe a sample of the modulated transmitter's radio frequency power output.

- (a) A positive peak detector function must be used.
- (b) The measurement instrument bandwidth and span must be set sufficiently with, and, the scan time set sufficiently slowly, to ensure all major modulation products are captured. Note that the measurement bandwidth should also be set sufficiently narrow to avoid adding significant error to the test result.
- (c) 'Maximum Hold' mode may be used to accumulate the measurement result over several scans provided the emission is repetitive in nature.

5.5.3. Test Setup



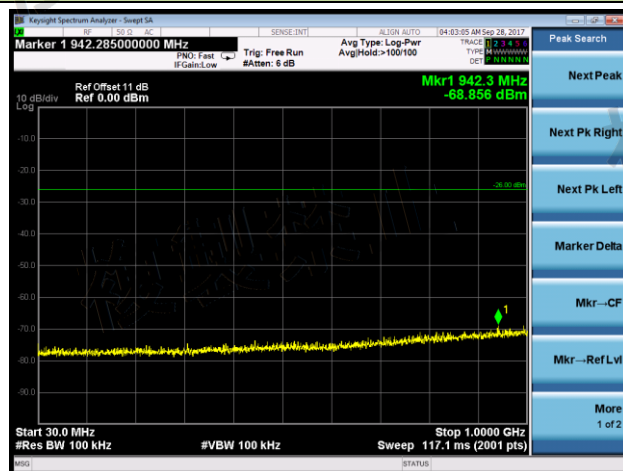
5.5.4. Test Result

EUT	ACCESS POINT	Temperature	22°C
Test Engineer	Dandy Li	Relative Humidity	53%
Test Site	TR3	Test Date	2017/09/28

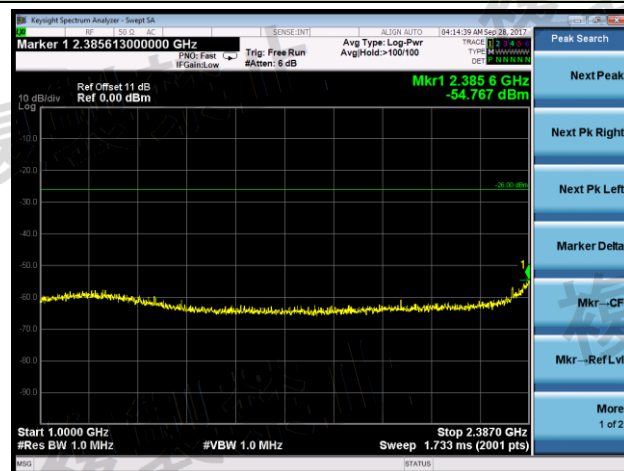
Test Frequency	Frequency Range (MHz)	Max Reading Level (dBm)	Limit (dBm)	Result
2402MHz	30 ~ 1000	-68.86	-26 (2.5uW)	Pass
	1000 ~ 2387	-54.77	-26 (2.5uW)	Pass
	2387 ~ 2400	-24.52	-16 (25uW)	Pass
	2483.5 ~ 2496.5	-58.94	-16 (25uW)	Pass
	2496.5 ~ 8000	-58.07	-26 (2.5uW)	Pass
	8000 ~ 12500	-60.98	-26 (2.5uW)	Pass
2440MHz	30 ~ 1000	-67.75	-26 (2.5uW)	Pass
	1000 ~ 2387	-57.02	-26 (2.5uW)	Pass
	2387 ~ 2400	-56.35	-16 (25uW)	Pass
	2483.5 ~ 2496.5	-56.35	-16 (25uW)	Pass
	2496.5 ~ 8000	-53.40	-26 (2.5uW)	Pass
	8000 ~ 12500	-60.70	-26 (2.5uW)	Pass
2480MHz	30 ~ 1000	-67.50	-26 (2.5uW)	Pass
	1000 ~ 2387	-56.15	-26 (2.5uW)	Pass
	2387 ~ 2400	-58.97	-16 (25uW)	Pass
	2483.5 ~ 2496.5	-37.08	-16 (25uW)	Pass
	2496.5 ~ 8000	-52.81	-26 (2.5uW)	Pass
	8000 ~ 12500	-59.89	-26 (2.5uW)	Pass

Transmitter Spurious Emissions - 2402MHz

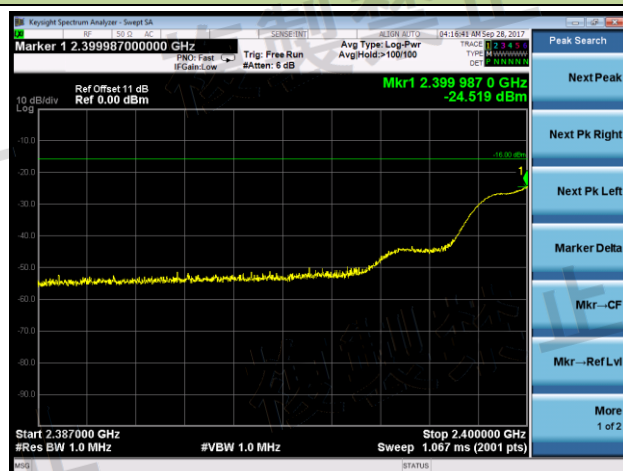
30 ~1000MHz



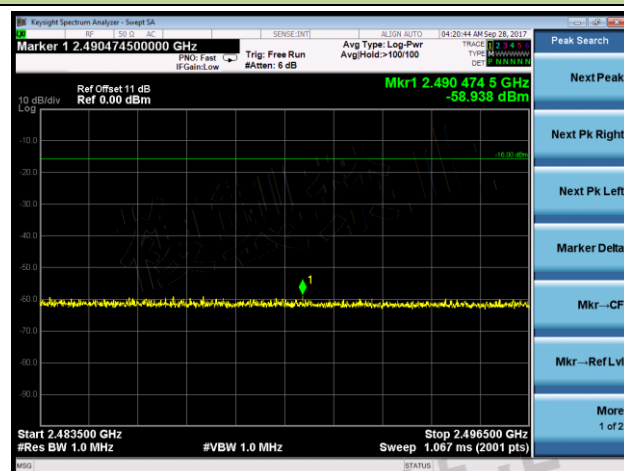
1000 ~ 2387MHz



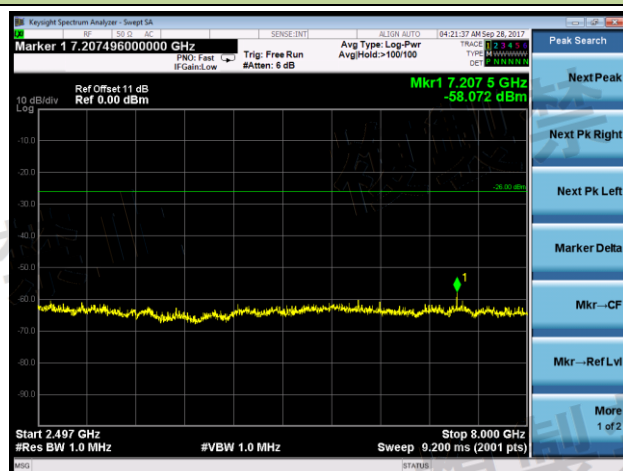
2387 ~ 2400MHz



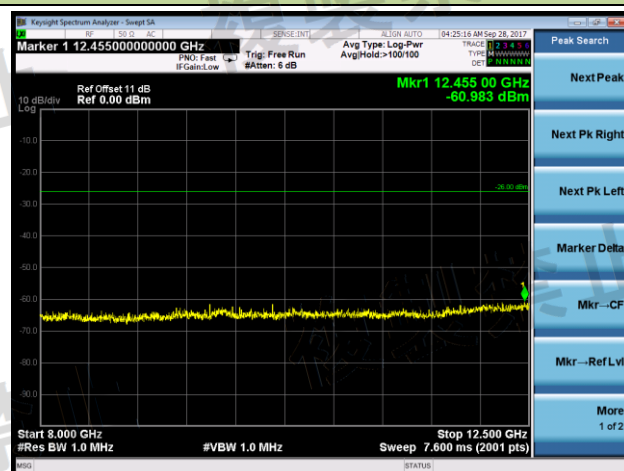
2483.5 ~ 2496.5MHz



2496.5 ~ 8000MHz

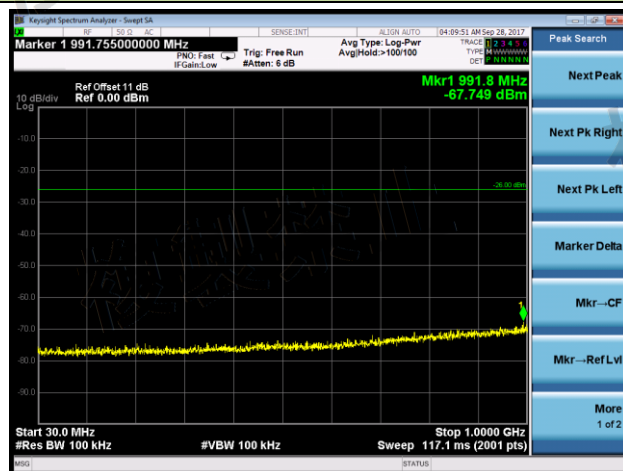


8000 ~ 12500MHz

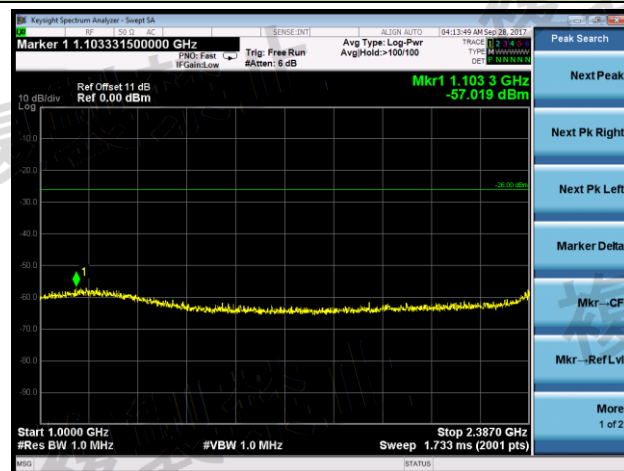


Transmitter Spurious Emissions - 2440MHz

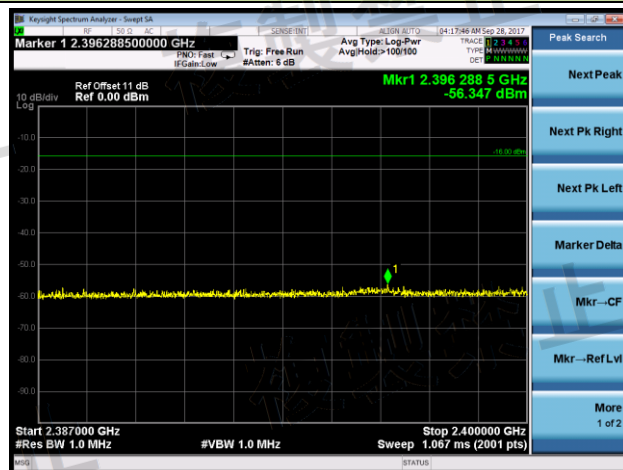
30 ~1000MHz



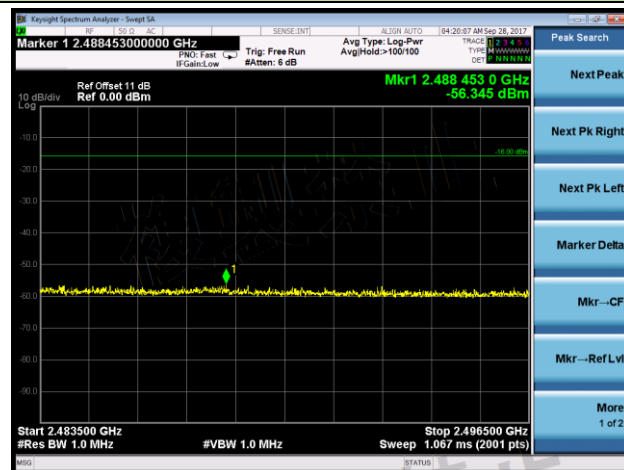
1000 ~ 2387MHz



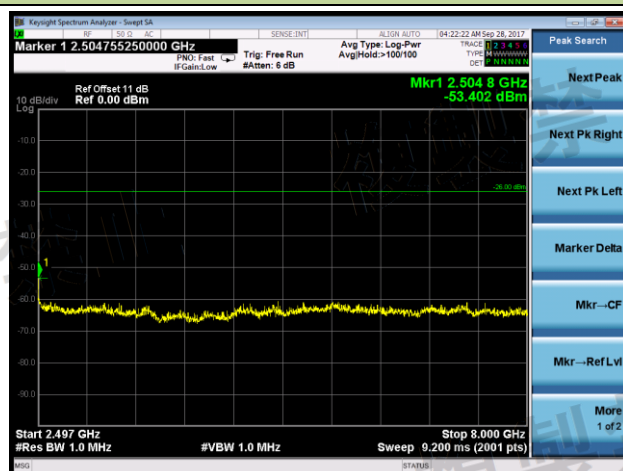
2387 ~ 2400MHz



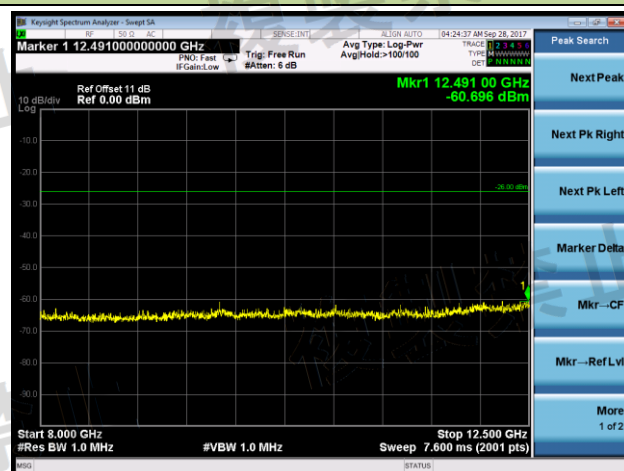
2483.5 ~ 2496.5MHz



2496.5 ~ 8000MHz

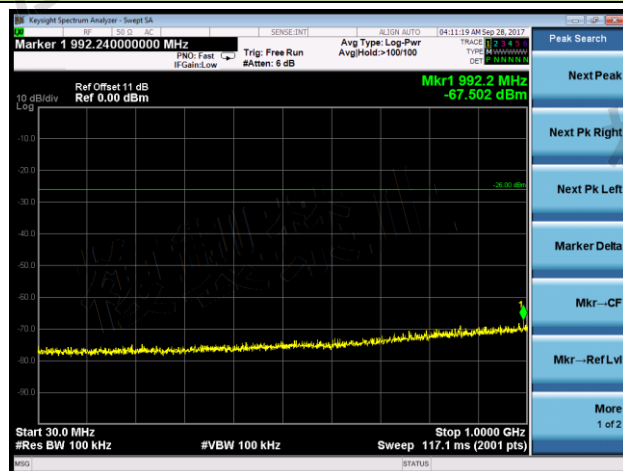


8000 ~ 12500MHz

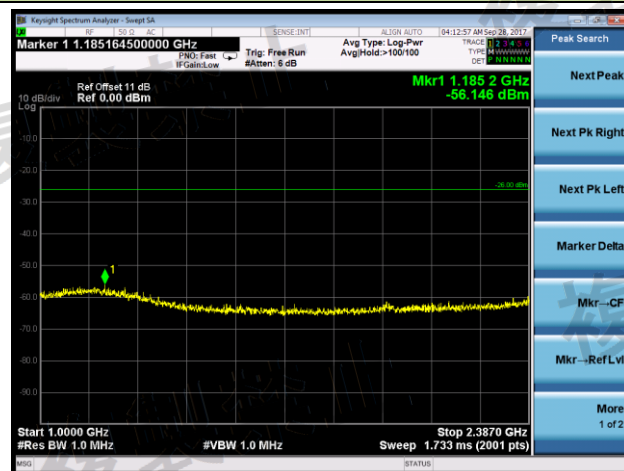


Transmitter Spurious Emissions - 2480MHz

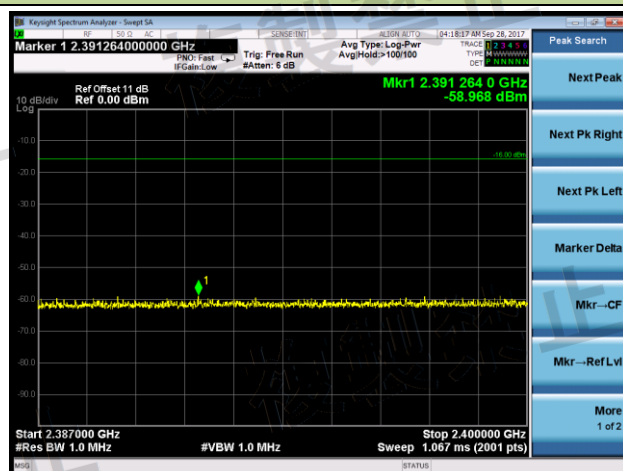
30 ~1000MHz



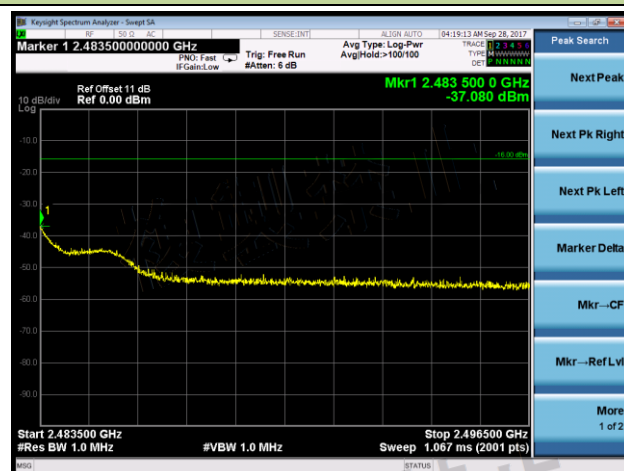
1000 ~ 2387MHz



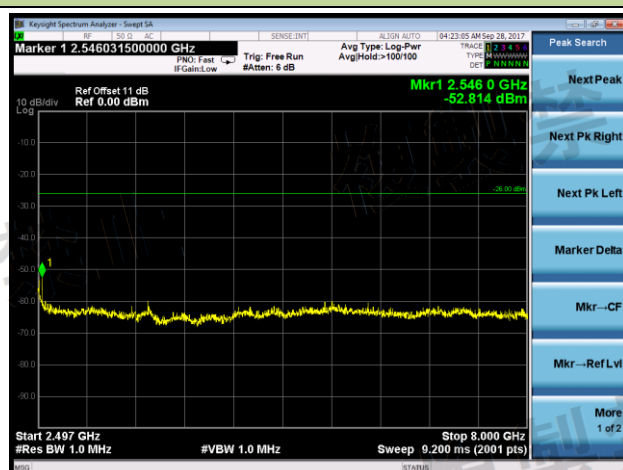
2387 ~ 2400MHz



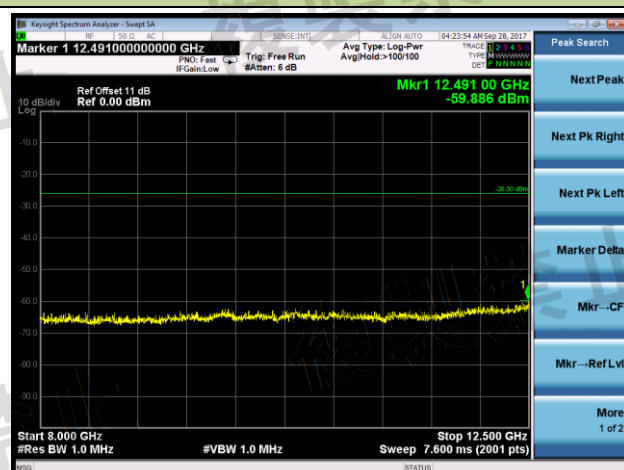
2483.5 ~ 2496.5MHz



2496.5 ~ 8000MHz



8000 ~ 12500MHz



5.6. Receiver Spurious Emissions

5.6.1. Test Limit

$\leq 4\text{nW}$ for 10 - 1000 MHz

$\leq 20\text{nW}$ for 1000 - 12500 MHz

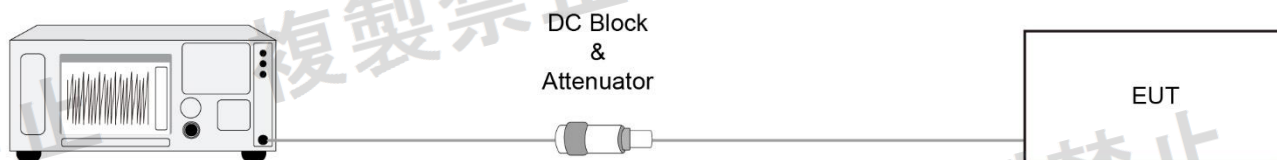
5.6.2. Test Procedure

A spectrum analyzer or similar device shall be used to observe a sample of the modulated transmitter's radio frequency power output.

- (a) A positive peak detector function must be used.
- (b) The measurement instrument bandwidth and span must be set sufficiently with, and, the scan time set sufficiently slowly, to ensure all major modulation products are captured. Note that the measurement bandwidth should also be set sufficiently narrow to avoid adding significant error to the test result.
- (c) 'Maximum Hold' mode may be used to accumulate the measurement result over several scans provided the emission is repetitive in nature.

5.6.3. Test Setup

Spectrum Analyzer



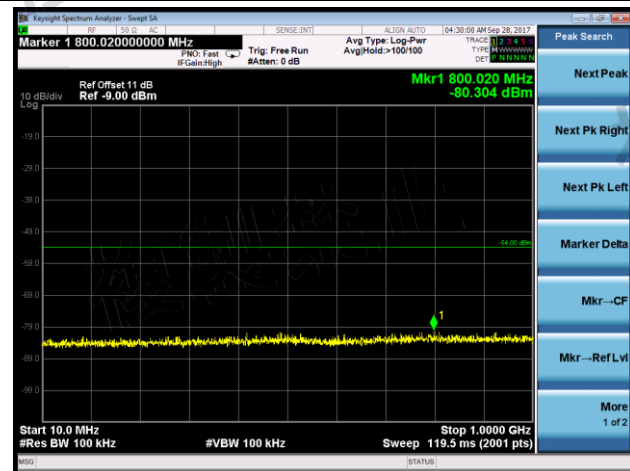
5.6.4. Test Result

EUT	ACCESS POINT	Temperature	22°C
Test Engineer	Dandy Li	Relative Humidity	53%
Test Site	TR3	Test Date	2017/09/28

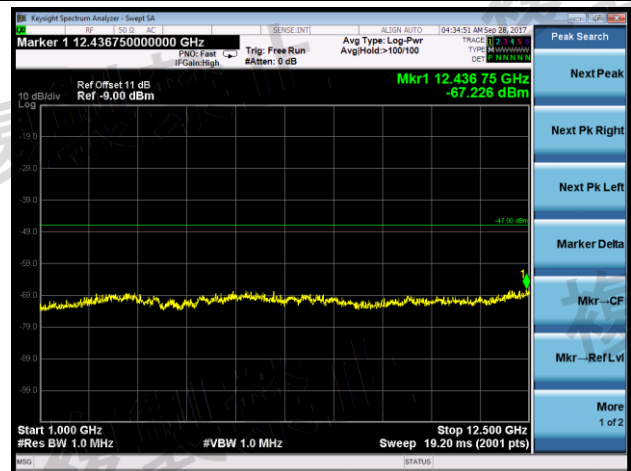
Test Frequency	Frequency Range (MHz)	Max Reading Level (dBm)	Limit (dBm)	Result
2402MHz	10 ~ 1000	-80.30	-54 (4nW)	Pass
	1000 ~ 12500	-67.23	-47 (20nW)	Pass
2440MHz	10 ~ 1000	-80.66	-54 (4nW)	Pass
	1000 ~ 12500	-67.29	-47 (20nW)	Pass
2480MHz	10 ~ 1000	-80.79	-54 (4nW)	Pass
	1000 ~ 12500	-66.78	-47 (20nW)	Pass

Receiver Spurious Emissions - 2402MHz

10 ~1000MHz

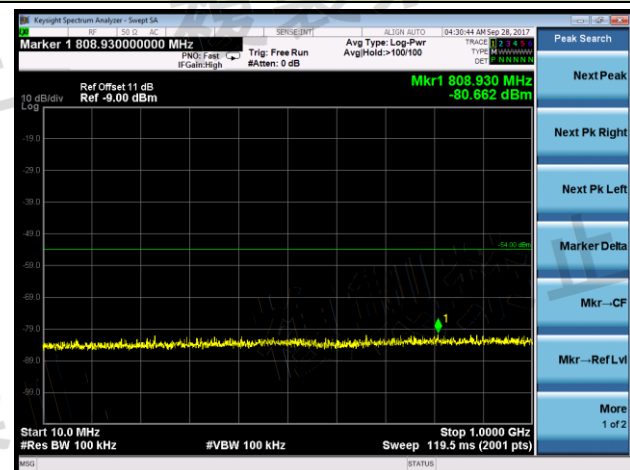


1000 ~ 12500MHz

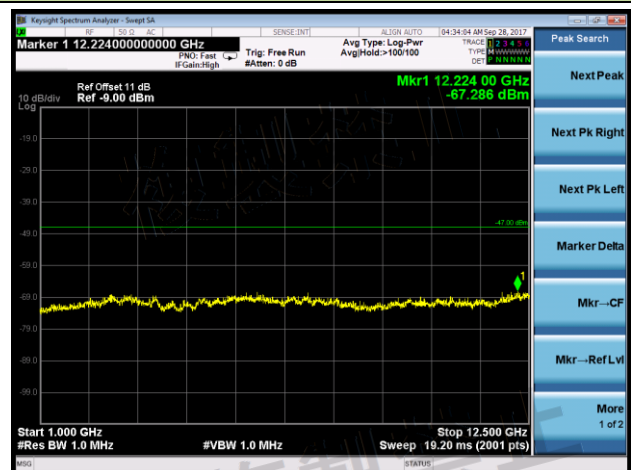


Receiver Spurious Emissions - 2440MHz

10 ~1000MHz

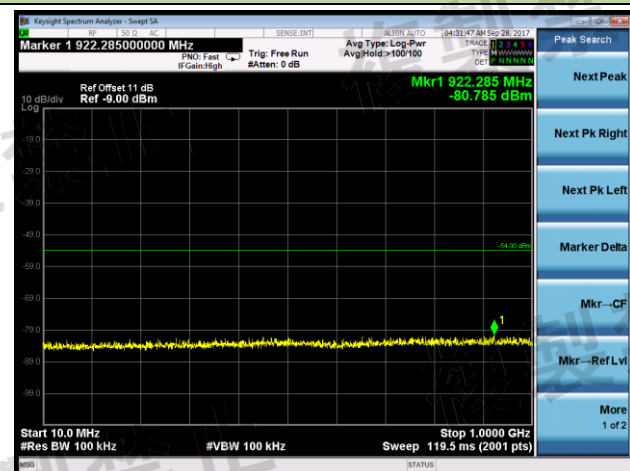


1000 ~ 12500MHz

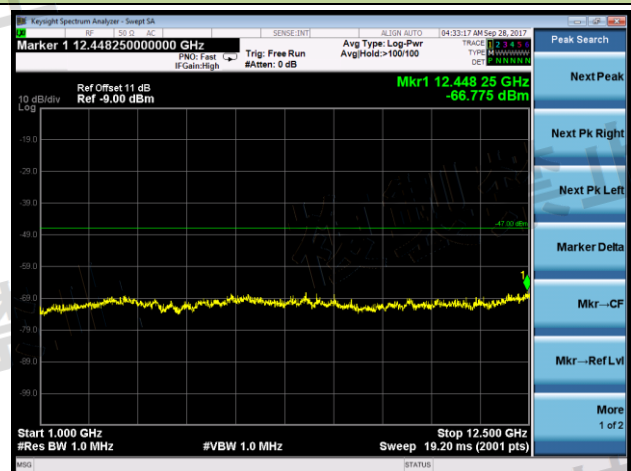


Receiver Spurious Emissions - 2480MHz

10 ~1000MHz



1000 ~ 12500MHz



The End