



## Radio Test Report (Bluetooth LE)

**Report No.:** RJ180731C10A

**Test Model:** E42W001 (refer to item 3.1 for more details)

**Received Date:** Aug. 08, 2018

**Test Date:** Aug. 20, 2018

**Issued Date:** Aug. 23, 2018

**Applicant:** Dell Inc.

**Address:** One Dell Way, Round Rock, Texas 78682, USA

**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

**Lab Address:** No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C)

**Test Location:** No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)



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### Release Control Record

Issue No.	Description	Date Issued
RJ180731C10A	Original release	Aug. 23, 2018



## 1 Certificate of Conformity

**Product:** Automatic data processing machines

**Brand:** DELL or Dell EMC

**Test Model:** E42W001 (refer to item 3.1 for more details)

**Sample Status:** Engineering sample

**Applicant:** Dell Inc.

**Test Date:** Aug. 20, 2018

**Standards:** ARIB STD-T66 (V3.7), MIC notice 88 Appendix 43  
Article 2 Paragraph 1 of Item 19

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

**Prepared by :**

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Pettie Chen / Senior Specialist

**Date:**

Aug. 23, 2018

**Approved by :**

Bruce Chen  
Bruce Chen / Project Engineer

**Date:**

Aug. 23, 2018



## 2 Summary of Test Results

The EUT has been tested according to the following specifications:

Notice 88 Appendix 43 Reference	ARIB STD-T66 Ref.	Report Reference	Parameter	Test Results (Note)
<b>General Provisions</b>				
C	3.2 (4)	4.1	Frequency tolerance	C
D	3.2 (7)	4.2	Occupied bandwidth	C
E	3.2 (6)	4.4	Spurious emissions	C
<b>Transmitting Equipment</b>				
F	--	4.5	Antenna power	C
--	--	--	SAR	NA
<b>Transmitting Antenna</b>				
--	--	3.5	Type, configuration, etc. of transmitting antenna	C
--	--	3.5	Direction pattern of transmitting antenna	C
<b>Receiving Equipment</b>				
G	3.3 (1)	4.6	Spurious emissions of receiver	C
--	--	3.6	Refer to all articles for transmitting antenna	C
<b>Operating Frequency 2400 to 2483.5MHz</b>				
--	3.7 (1)	3.2	High Frequency	C
--	3.7 (1)	3.4	Modulation section cannot be opened easily	C
--	3.1 (1)	3.1	Communication method	C
--	3.2 (1)a	3.1	Modulation method	C
--	3.2 (1)a	3.1	Spread spectrum method	C
--	3.2 (2)	4.5	Antenna power	C
--	3.6 (2)	3.5.2	Absolute gain of transmitting antenna	C
--	3.6 (2)	--	Angular width of principal radiation (AWPR)	NA
--	3.2 (10)	--	Number of carriers within 1 MHz bandwidth in OFDM	NA
--	3.2 (8)	4.3	Spreading bandwidth	C
--	3.2 (9)	4.3	Spreading factor	C
--	3.2 (11)	--	Frequency retention time (FH employed)	NA
--	3.4.1(1)	4.7	Interference Prevention Function	C
Note: C = Conform NC = Not Conform NT = Not Tested NA = Not Applicable				





## 2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in TR 100 028-1.

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

Parameter	Uncertainty
Occupied Bandwidth	491.896Hz
Spurious emissions	3.508dB
Output power density	2.889dB
Adjacent Channel Leakage Power	1.35dB
Out of band radiated power	3.93dB
Frequency Tolerance	6805.18Hz
Burst length	0.01%

## 2.2 Modification Record

There were no modifications required for compliance.



### 3 General Information

#### 3.1 General Description of EUT

Product	Automatic data processing machines
Brand	DELL or Dell EMC
Test Model	E42W001
Model Difference	Refer to note for more details
Status of EUT	Engineering sample
Nominal Voltage	12Vdc (adapter)
Modulation Type	GFSK
Transfer Rate	1Mbps
Operating Frequency	2402 ~ 2480MHz
Number of Channel	40
Rated RF Output Power Density	4.00mW
Conducted RFOutput Power Density	3.327mW
Radiated RF Output Power Density	5.396mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter, LTE antenna, GPS antenna (3m non-shielded cable)
Data Cable Supplied	NA

Note:

1. The following models are provided to this EUT.

Brand	Model	Difference
DELL or Dell EMC	E42W	RMN
	E42W001	RTN
	VEP1400	MMN

2. The EUT uses following antenna.

Antenna Type	Connector	Gain (dBi)		
		2400MHz	2450MHz	2500MHz
PCB	NA	1.7	2.1	1.2

3. The EUT consumes power from the following Adapter.

Adapter	
Brand	Delta Electronics, Inc.
Model	DPS-65VB
Input Power	100-240Vac, 2.0A, 50Hz-60H
Output Power	12Vdc, 5.417A Max.
Power Line	1.7m non-shielded DC cable with 1 core attached on adapter 2m non-shielded AC cable without core

### 3.2 Description of Test Modes

40 channels are provided to this EUT:

CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

By means of test software (BTOOL) provided by manufacture, the power levels during the tests were set according to the following codes:

Modulation type: GFSK	
Channel	Power Setting
0	Default
19	Default
39	Default

### 3.3 Test Conditions

Test Conditions	Voltage (Vac)
$V_{normal}$	100
$V_{max.}$	110
$V_{min.}$	90

### 3.4 Assembly

The EUT used a kind of particular screw, which could not operated by a tool bought in the market. Only means of brute force will be able to open.

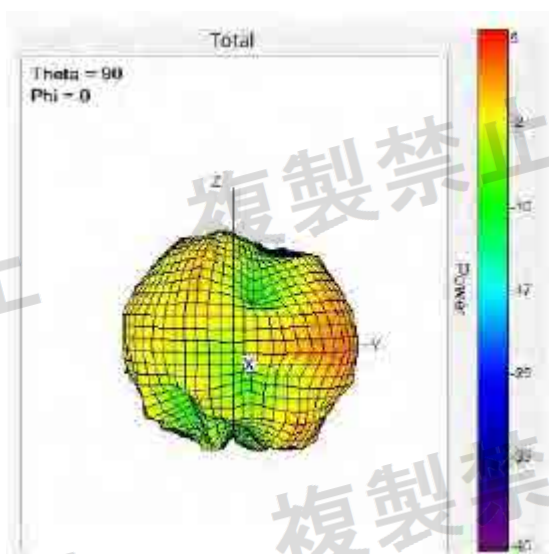


### 3.5 Antenna Specifications

#### 3.5.1 Antenna Gain

Antenna Type	Connector	Gain (dBi)		
		2400MHz	2450MHz	2500MHz
PCB	NA	1.7	2.1	1.2

#### 3.5.2 Antenna Pattern





## 4 Test Results

### 4.1 Frequency Tolerance Measurement

#### 4.1.1 Limits of Frequency Tolerance Measurement

Tolerance of frequency shall be  $\pm 50$ ppm

#### 4.1.2 Test Setup

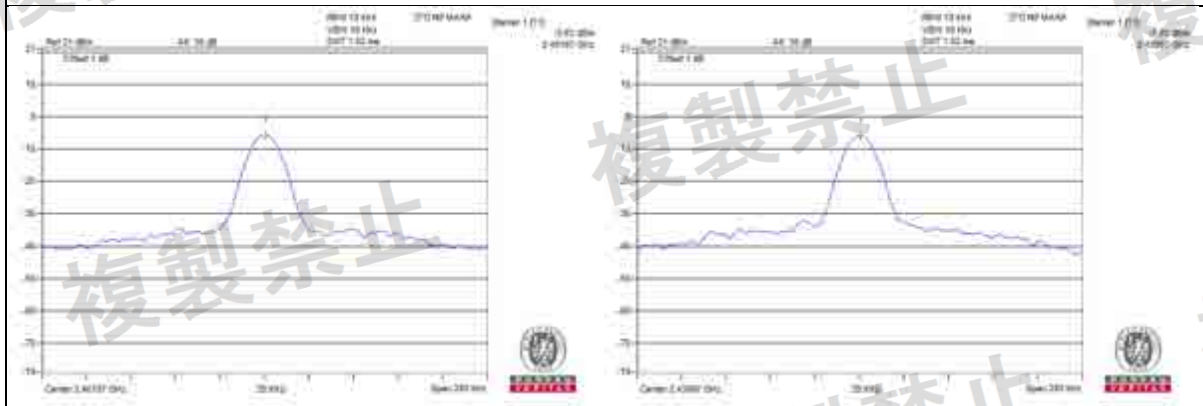


#### 4.1.3 Test Results

Environmental Conditions		25 deg.C, 68% RH					
Channel	Frequency (MHz)	V <sub>normal</sub>		V <sub>max.</sub>		V <sub>min.</sub>	
		Carrier frequency (MHz)	Frequency tolerance (ppm)	Carrier frequency (MHz)	Frequency tolerance (ppm)	Carrier frequency (MHz)	Frequency tolerance (ppm)
0	2402	2401.970330	-12.352	2401.970470	-12.293	2401.970470	-12.293
19	2440	2439.971050	-11.864	2439.971050	-11.864	2439.971050	-11.864
39	2480	2479.969070	-12.471	2479.969070	-12.471	2479.969070	-12.471

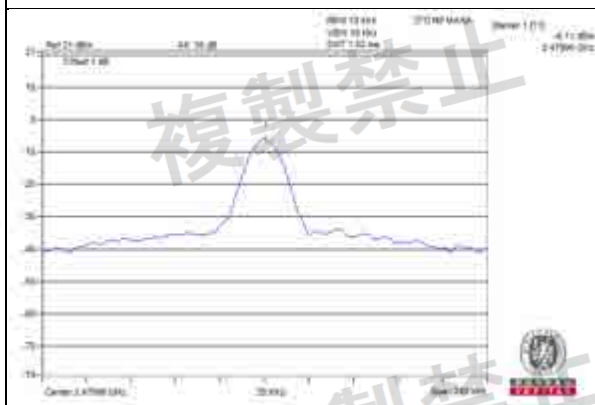


Vnormal



Channel 0

Channel 19

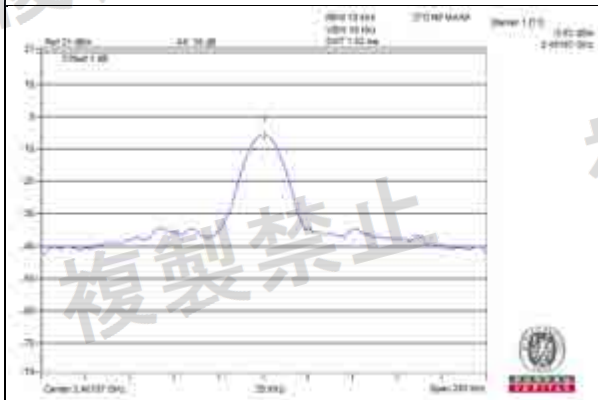


Channel 39

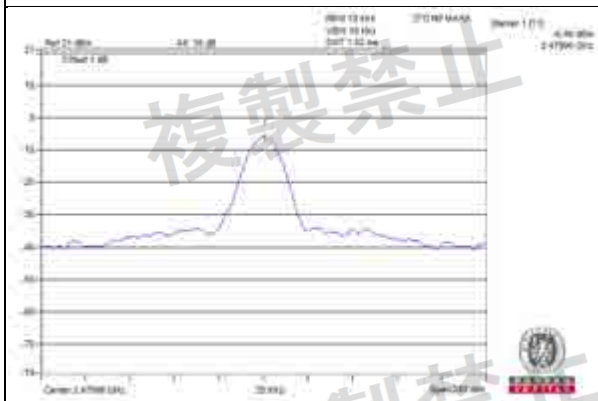
Measurement uncertainty:  $\pm 206.50$  Hz



V<sub>max</sub>.



Channel 0

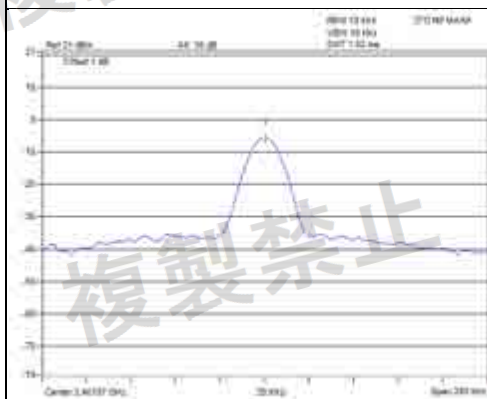


Channel 19

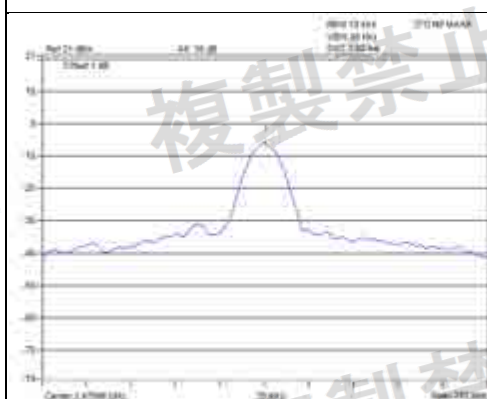
Channel 39

Measurement uncertainty:  $\pm 206.50$  Hz

V<sub>min</sub>.



Channel 0



Channel 39

Measurement uncertainty:  $\pm 206.50$  Hz



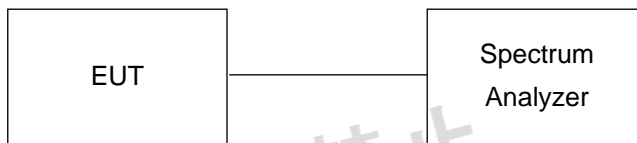


## 4.2 Occupied Bandwidth Measurement (99% power bandwidth)

### 4.2.1 Limits of Occupied Bandwidth Measurement

Item	Limit
Occupied bandwidth	<26MHz

### 4.2.2 Test Setup

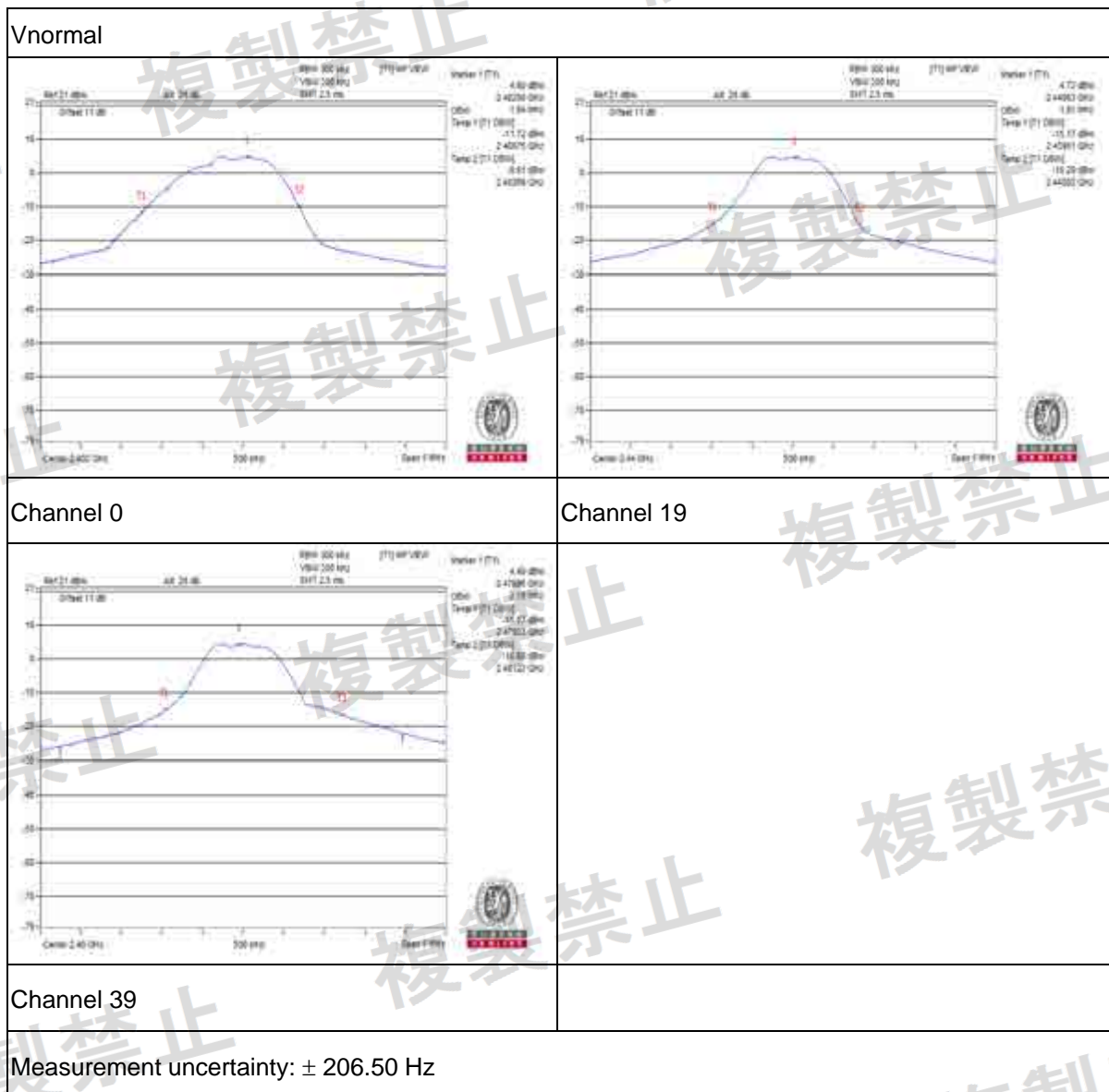




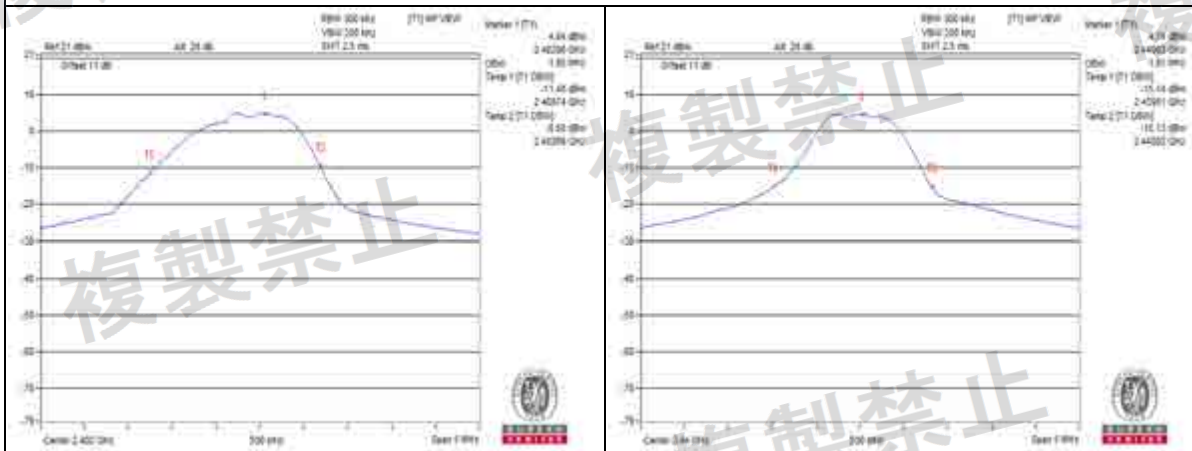
#### 4.2.3 Test Results

Environmental Conditions		25 deg.C, 68% RH		
Channel	Frequency (MHz)	V <sub>normal</sub>	V <sub>max.</sub>	V <sub>min.</sub>
		Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)
0	2402	1.94	1.95	1.96
19	2440	1.81	1.81	1.75
39	2480	2.19	2.21	2.19

Note: 1. For the test plots please refer to the below pages.

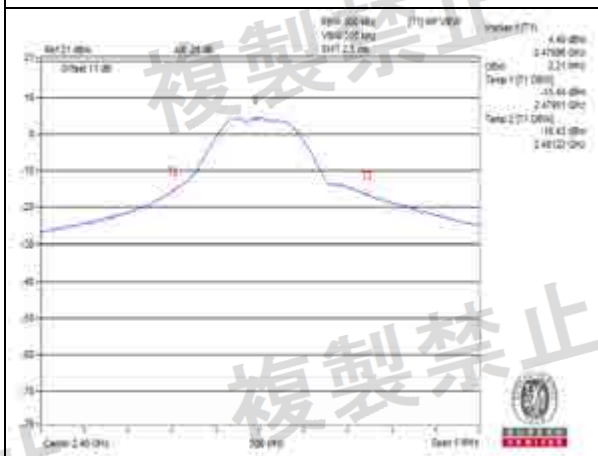


V<sub>max</sub>.



Channel 0

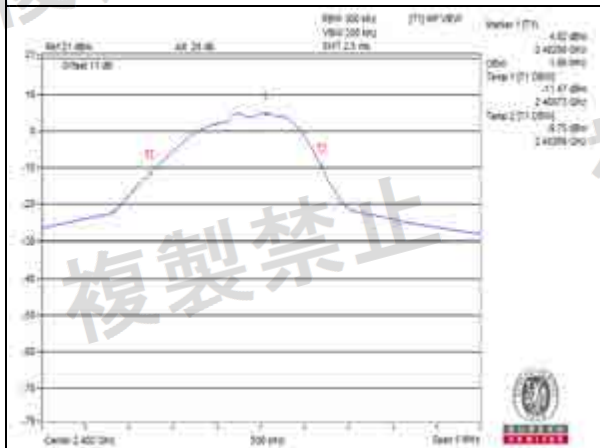
Channel 19



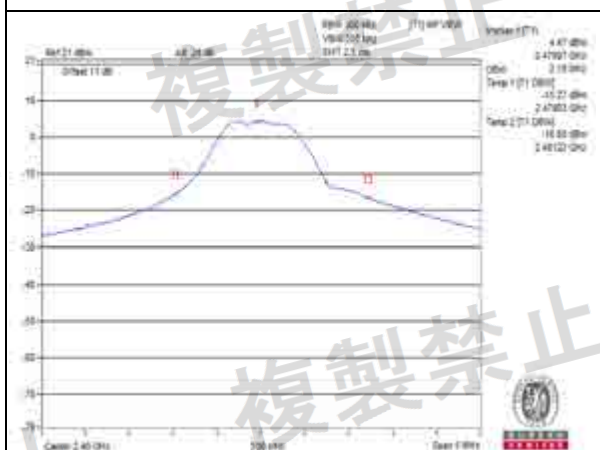
Channel 39

Measurement uncertainty:  $\pm 206.50$  Hz

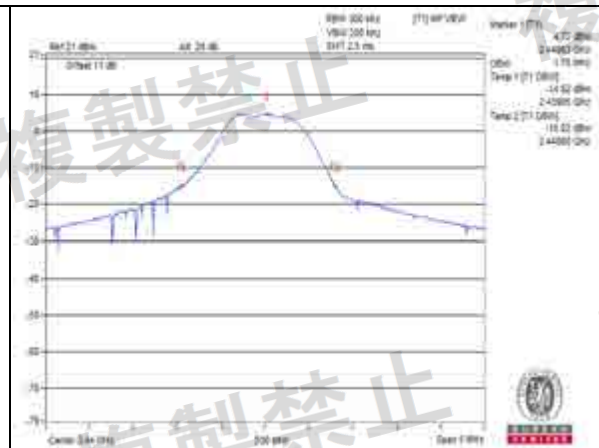
V<sub>min</sub>.



Channel 0



Channel 39



Channel 19

Measurement uncertainty:  $\pm 206.50$  Hz

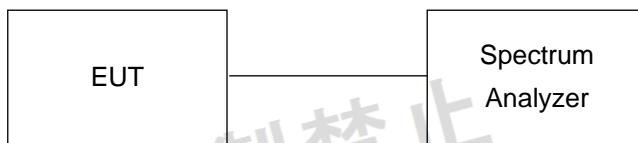


### 4.3 Spreading Bandwidth Measurement (90% power bandwidth)

#### 4.3.1 Limits of Spreading Bandwidth and Spreading Factor Measurement

Item	Limit	Remark
Spreading Bandwidth	$\geq 500\text{kHz}$	
Spreading Factor	$\geq 5$	Operating frequency 2400 to 2483.5MHz

#### 4.3.2 Test Setup



#### 4.3.3 Test Results

Environmental Conditions		25 deg.C, 68% RH					
Channel	Frequency (MHz)	V <sub>normal</sub>		V <sub>max.</sub>		V <sub>min.</sub>	
		Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor
0	2402	1.23	19.68	1.23	19.68	1.25	20.00
19	2440	0.95	15.20	0.94	15.04	0.93	14.88
39	2480	0.96	15.36	0.95	15.20	0.96	15.36

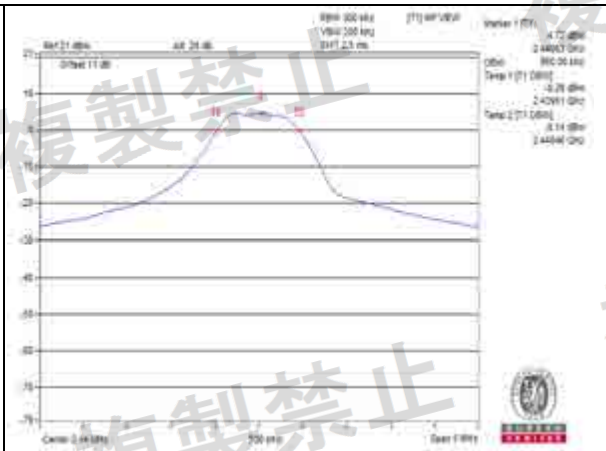
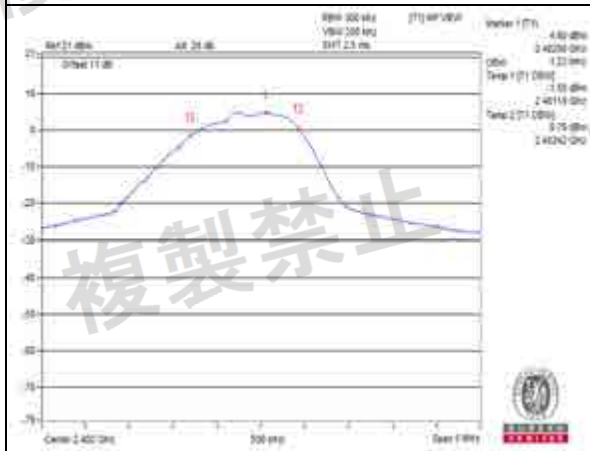
Note: 1. For the test plots please refer to the below pages.

2. Spreading Factor: 90% channel power bandwidth / 0.0625

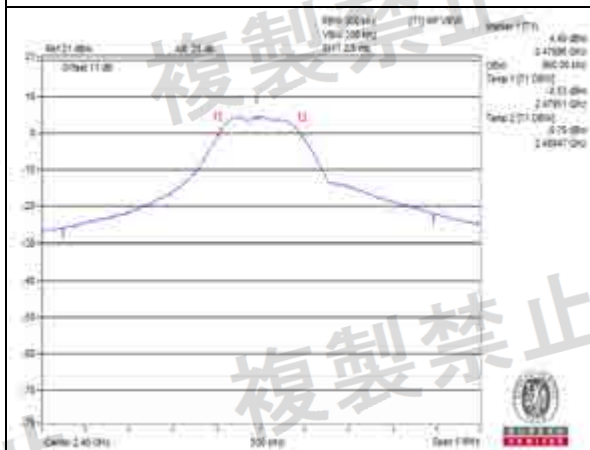




Vnormal



Channel 0



Channel 19

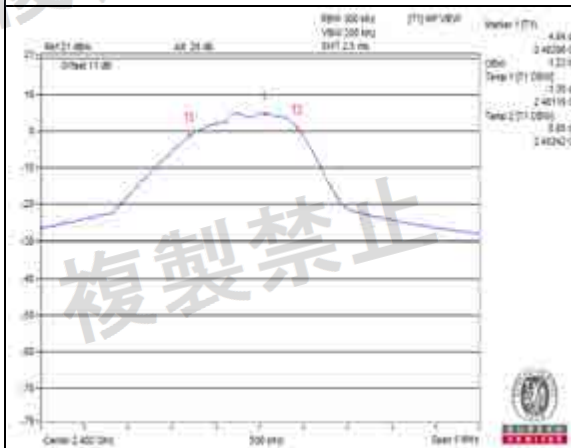


Channel 39

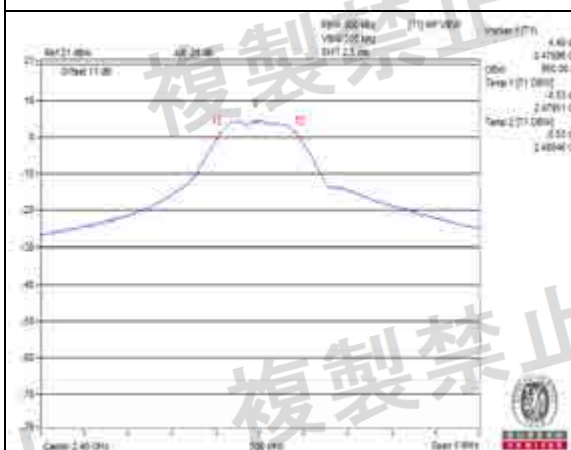
Measurement uncertainty:  $\pm 206.50$  Hz



V<sub>max</sub>.



Channel 0



Channel 19

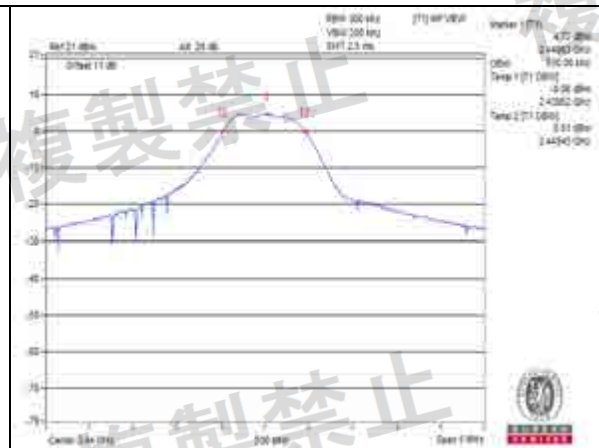
Channel 39

Measurement uncertainty:  $\pm 206.50$  Hz

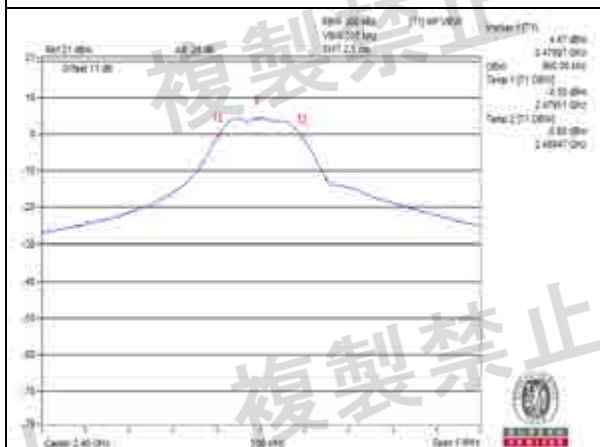
V<sub>min</sub>.



Channel 0



Channel 19



Channel 39

Measurement uncertainty:  $\pm 206.50$  Hz



#### 4.4 Spurious Emissions for Transmitter Measurement

##### 4.4.1 Limits of Spurious Emissions

Frequencies (MHz)	Limit
Operating frequency 2400 to 2483.5MHz	
30.0MHz to 1000.0MHz	$\leq 0.25 \text{ uW/100kHz}$
1000.0MHz to 2387MHz	$\leq 2.5 \text{ uW/MHz}$
2387.0MHz to 2400.0MHz	$\leq 25 \text{ uW/MHz}$
2483.5MHz to 2496.5MHz	$\leq 25 \text{ uW/MHz}$
2496.5MHz to 12500.0MHz	$\leq 2.5 \text{ uW/MHz}$

##### 4.4.2 Test Setup





#### 4.4.3 Test Results

Environmental Conditions		25 deg.C, 68% RH					
Test Channel		CH 0 (2402MHz)		CH 19 (2440MHz)		Limit	Result
Test Condition	Frequency Range	Frequency (MHz)	Measured Value	Frequency (MHz)	Measured Value		
V <sub>normal</sub>	30.0MHz to 1000.0MHz	309.360	0.0171uW	303.540	0.017418uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2387.000	<b>0.547016uW</b>	2387.000	<b>0.069024uW</b>	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2400.000	NOTE 2	2400.000	<b>0.102329uW</b>	25uW	PASS
	2483.5MHz to 2496.5MHz	2485.260	0.033963uW	2490.280	0.048978uW	25uW	PASS
	2496.5MHz to 12500.0MHz	4797.300	NOTE 2	4877.330	2.42661uW	2.5uW	PASS
V <sub>max.</sub>	30.0MHz to 1000.0MHz	530.520	<b>0.01932uW</b>	701.240	<b>0.024889uW</b>	0.25uW	PASS
	1000.0MHz to 2387MHz	2387.000	0.526017uW	2375.900	0.064417uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2400.000	<b>NOTE 2</b>	2395.910	0.095719uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2487.470	<b>0.03581uW</b>	2495.900	0.050582uW	25uW	PASS
	2496.5MHz to 12500.0MHz	4797.300	NOTE 2	4877.330	2.338837uW	2.5uW	PASS
V <sub>min.</sub>	30.0MHz to 1000.0MHz	433.520	0.01845uW	745.860	0.016144uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2387.000	0.484172uW	2387.000	0.059156uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2400.000	NOTE 2	2397.290	0.096605uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2484.200	0.034356uW	2484.430	<b>0.051642uW</b>	25uW	PASS
	2496.5MHz to 12500.0MHz	4797.300	<b>NOTE 2</b>	4877.330	<b>2.483133uW</b>	2.5uW	PASS

Note: The worst value in each frequency range v.s. each channel has been marked by boldface.





Environmental Conditions		25 deg.C, 68% RH			
Test Channel		CH 39 (2480MHz)		Limit	Result
Test Condition	Frequency Range	Frequency (MHz)	Measured Value		
V <sub>normal</sub>	30.0MHz to 1000.0MHz	383.080	0.016711uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2384.220	0.028379uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2394.120	0.059704uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2483.500	14.757065uW	25uW	PASS
	2496.5MHz to 12500.0MHz	4957.360	1.492794uW	2.5uW	PASS
V <sub>max.</sub>	30.0MHz to 1000.0MHz	443.220	0.018793uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2387.000	0.034041uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2398.850	0.05358uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2483.500	14.487719uW	25uW	PASS
	2496.5MHz to 12500.0MHz	4957.360	1.432188uW	2.5uW	PASS
V <sub>min.</sub>	30.0MHz to 1000.0MHz	588.720	0.018365uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2387.000	0.030061uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2396.620	0.054954uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2483.500	14.454398uW	25uW	PASS
	2496.5MHz to 12500.0MHz	4957.360	1.374042uW	2.5uW	PASS



Note: 1. The worst value in each frequency range v.s. each channel has been marked by boldface.

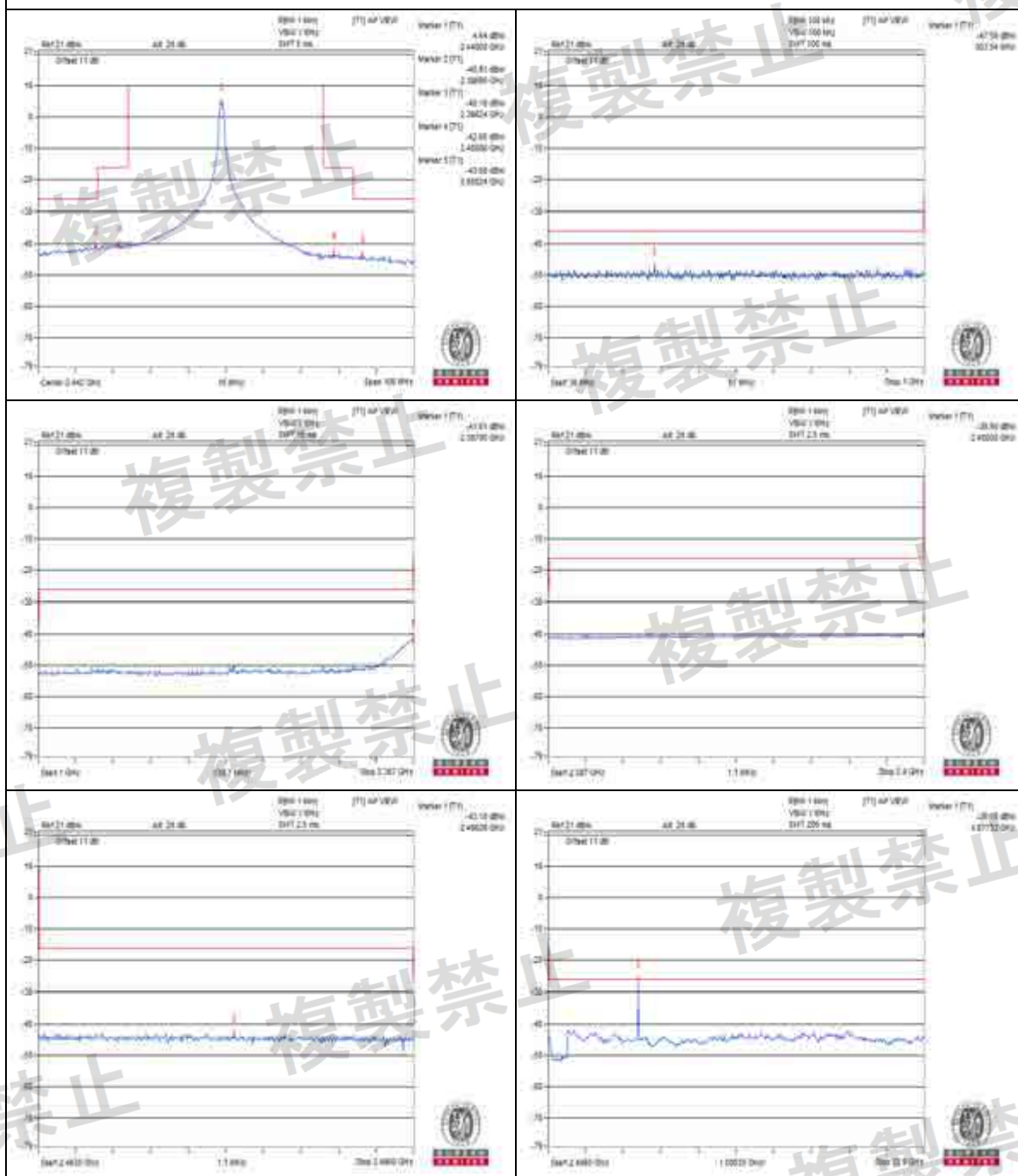
2. Take the value of total data point (501 points) and calculate the total power.  
Divides total power by 501 data point to get the average value.

TEST CONDITION	Average power (dBm)	Average power (uW)
CHANNEL 0		
$V_{normal}$	-19.557101	11.073627
	-26.181058	2.409319
$V_{+10\%}$	-19.548915	11.094519
	-26.222948	2.386191
$V_{-10\%}$	-19.561181	11.063228
	-26.211963	2.392234

Report Format Version: 6.1.1



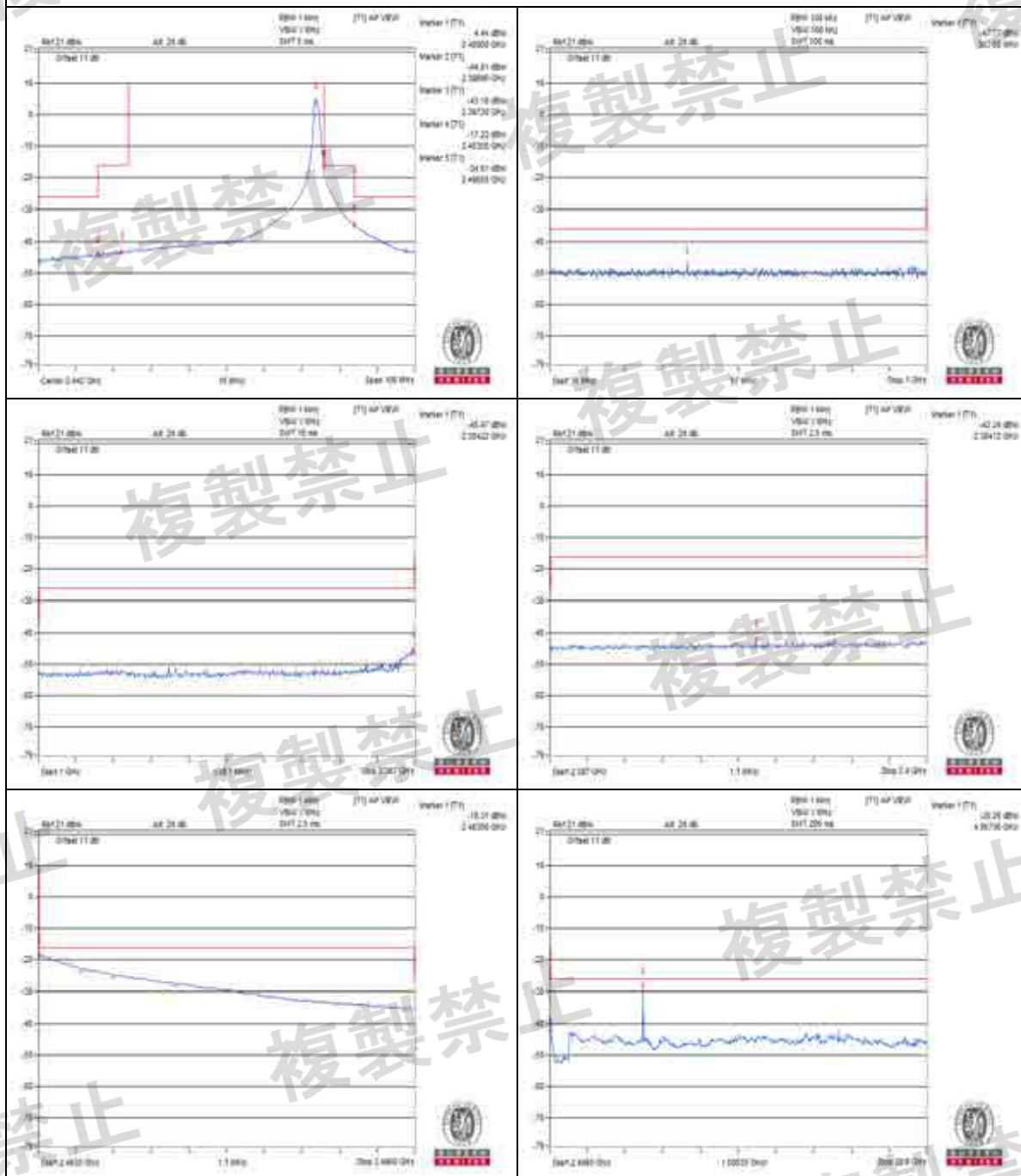
Vnormal  
Channel 19



Measurement uncertainty:  $\pm 3.93\text{dB}$



Vnormal  
Channel 39

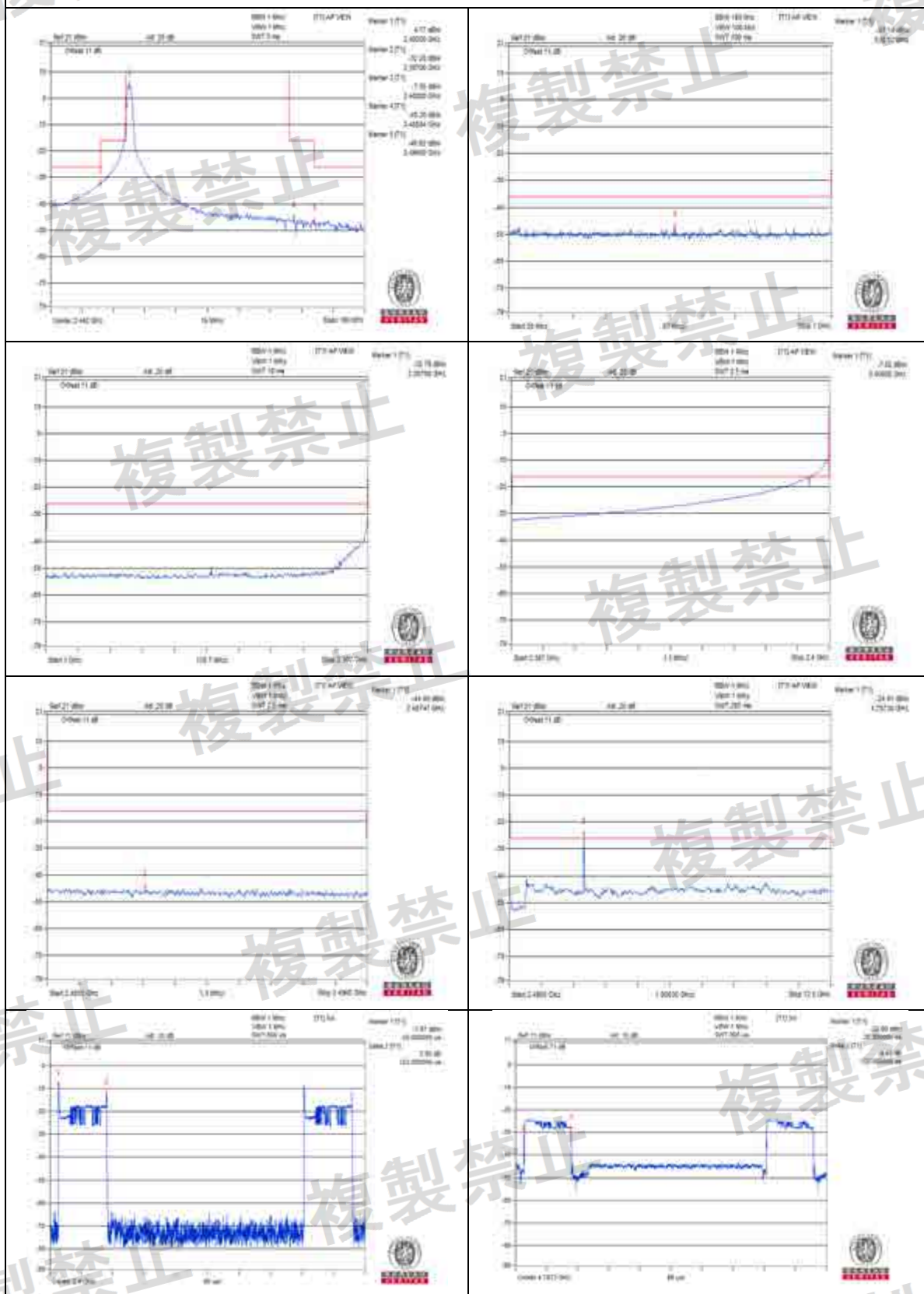


Measurement uncertainty:  $\pm 3.93\text{dB}$



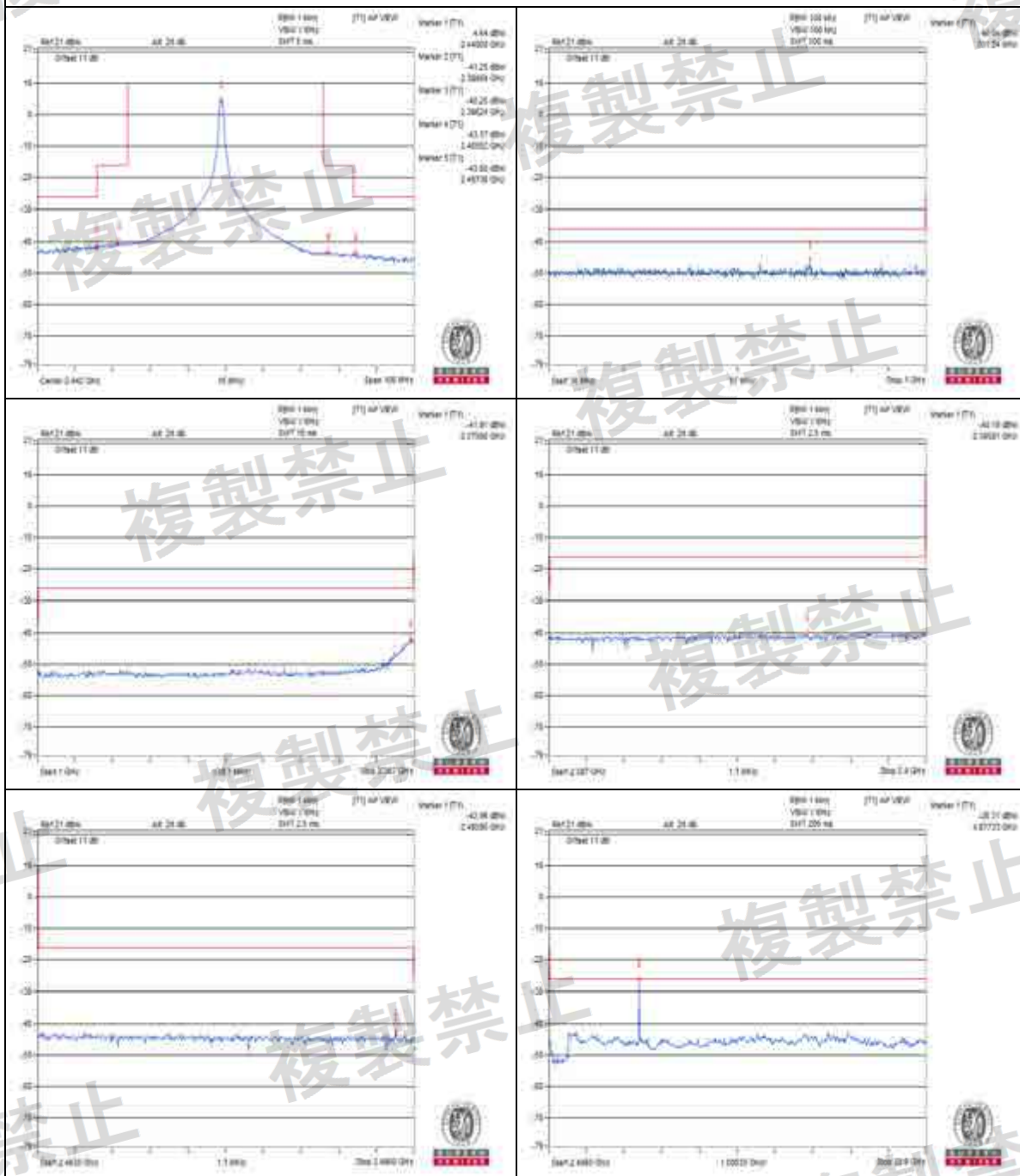


V<sub>max</sub>.  
Channel 0



Measurement uncertainty:  $\pm 3.93\text{dB}$

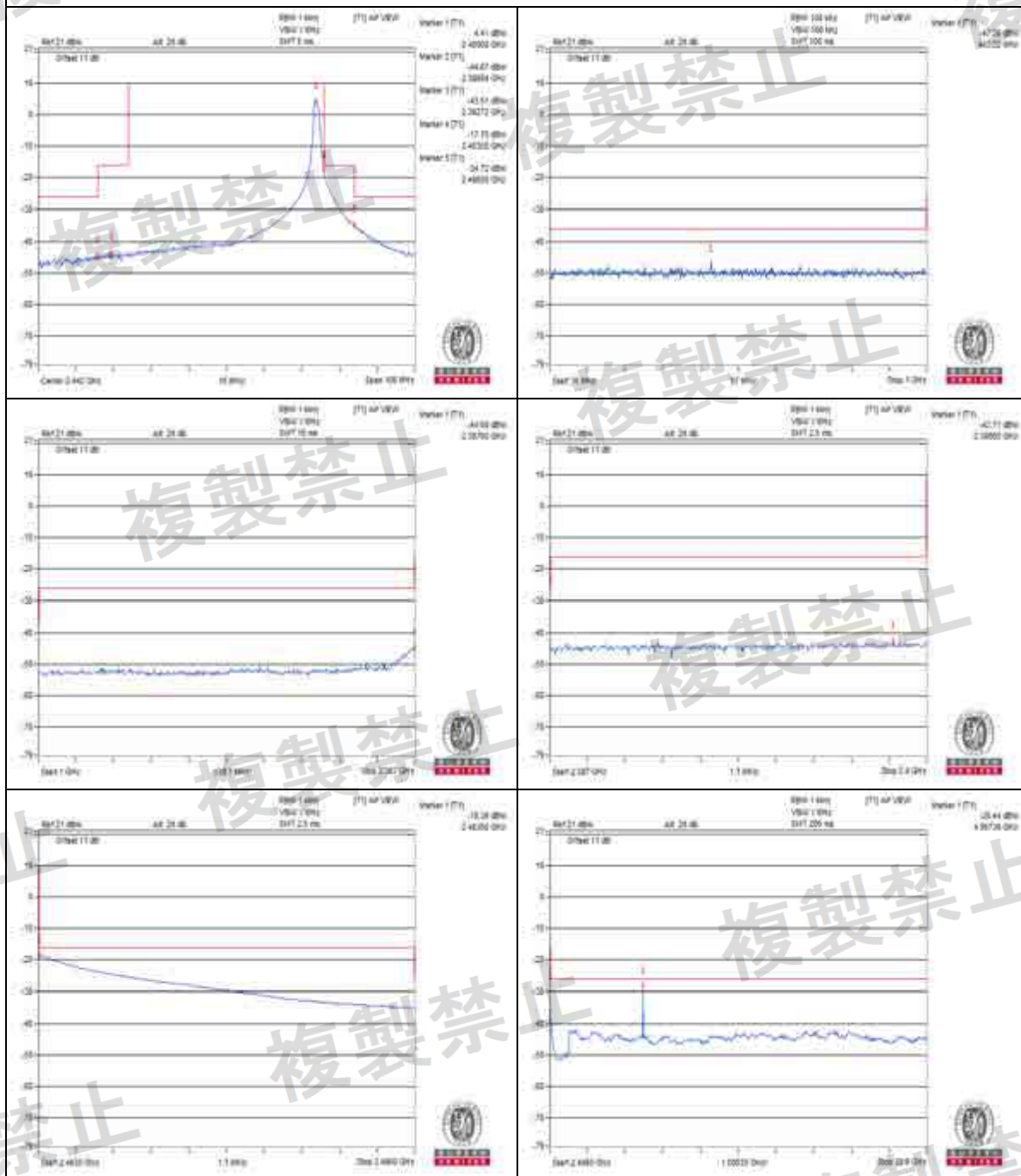
V<sub>max</sub>  
Channel 19



Measurement uncertainty:  $\pm 3.93\text{dB}$

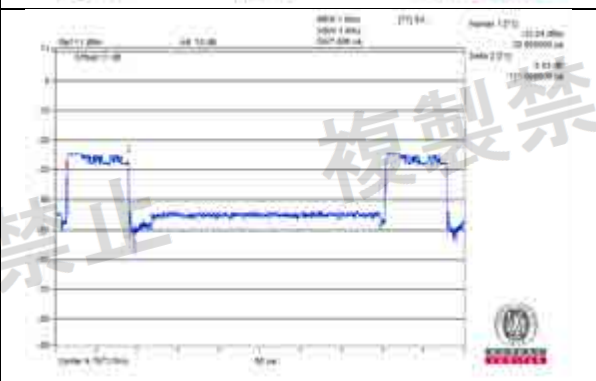
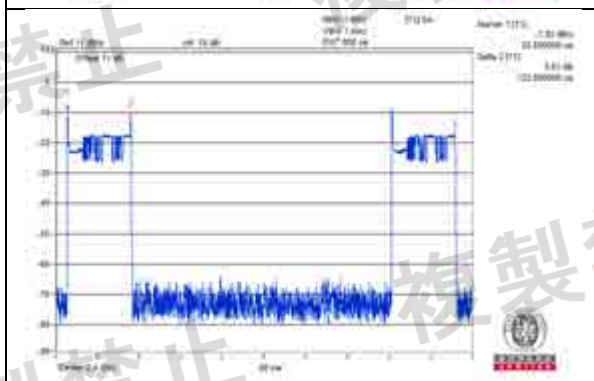
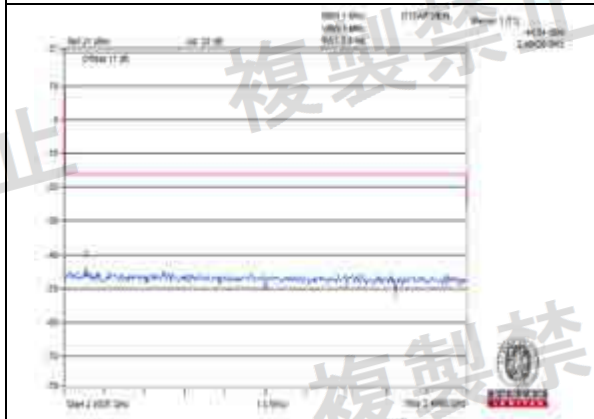
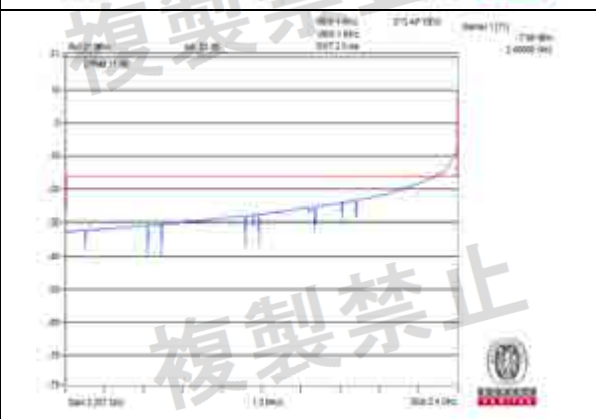
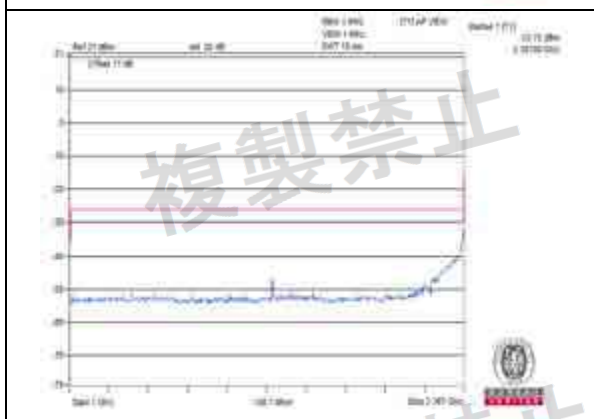
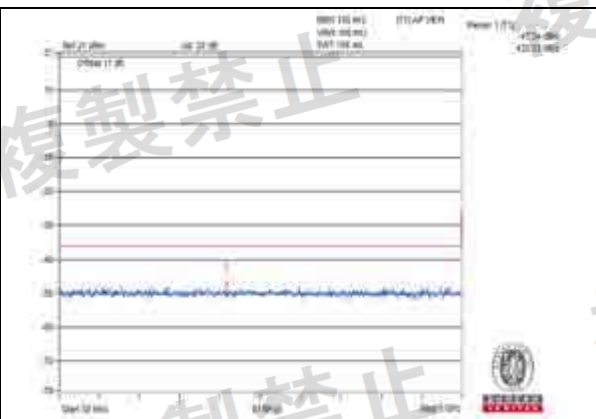
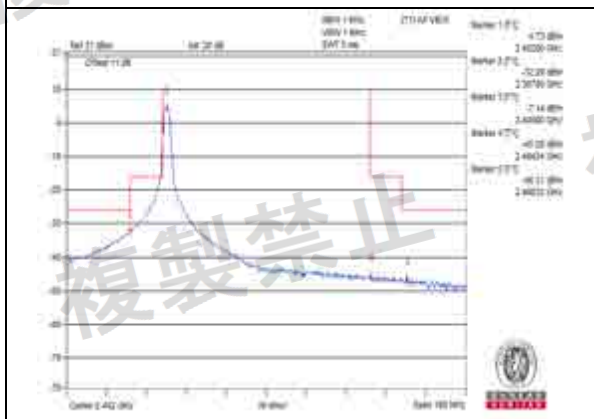


V<sub>max</sub>  
Channel 39



Measurement uncertainty:  $\pm 3.93\text{dB}$

V<sub>min</sub>.  
Channel 0

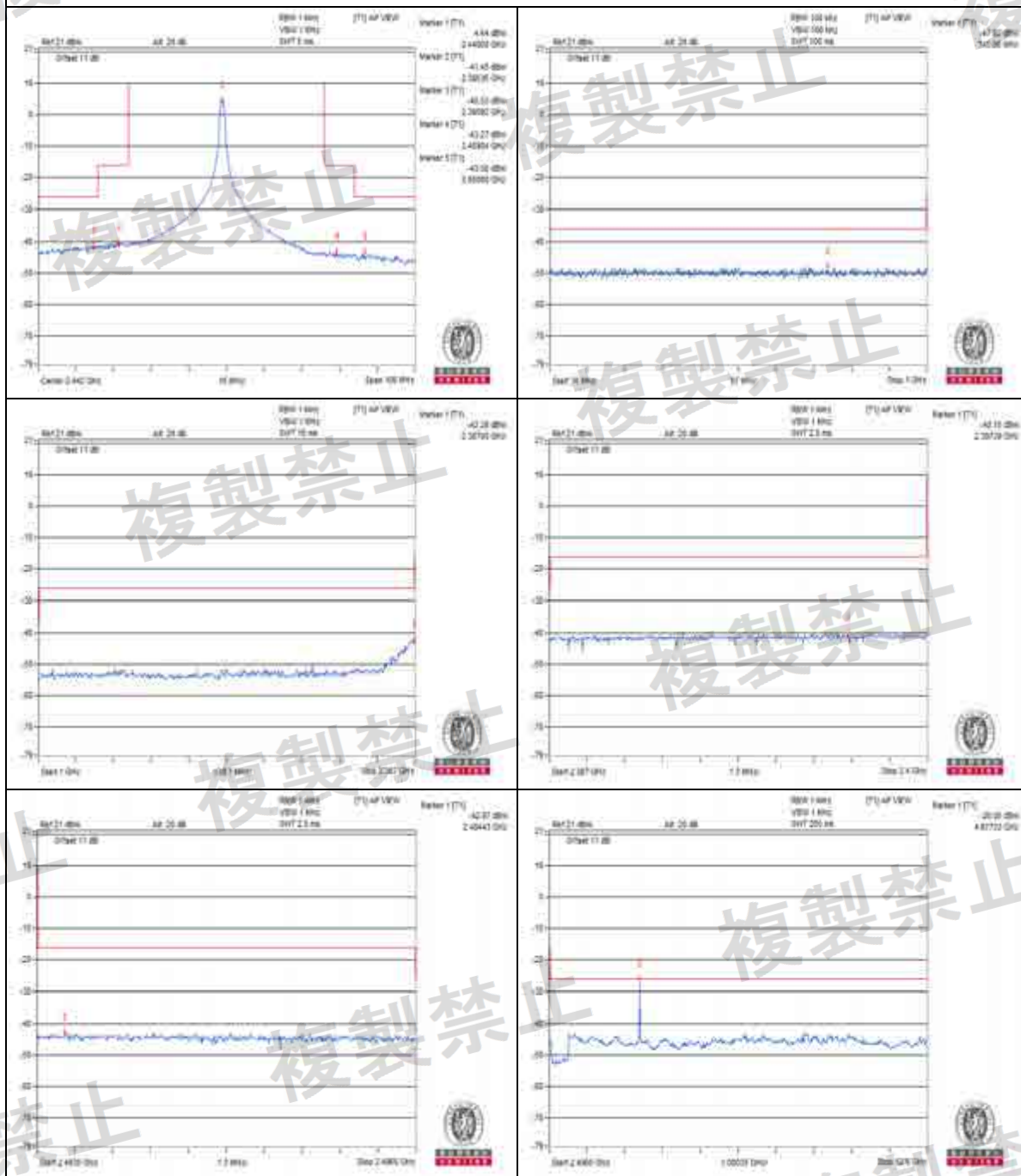


Measurement uncertainty:  $\pm 3.93\text{dB}$





V<sub>min</sub>.  
Channel 19



Measurement uncertainty:  $\pm 3.93\text{dB}$







#### 4.5 Antenna Power Measurement

##### 4.5.1 Limits of Antenna Power

Antenna power shall be 10mW or less.

Tolerance of antenna power shall be +20% (upper value) and -80% (lower value).

##### 4.5.2 Test Setup





#### 4.5.3 Test Results

Environmental Conditions		25 deg.C, 68% RH			
Channel Number	Frequency (MHz)	Conducted RF Output Power Density (mW)			
		Normal Voltage	Max. Voltage	Min. Voltage	Max. Limit (mW/MHz)
		100Vac	110Vac	90Vac	
0	2402	3.327	3.311	3.251	10
19	2440	3.214	3.148	3.097	10
39	2480	3.055	3.162	2.924	10
Rated power		4mW			
Tolerance of antenna power		0.8mW ~ 4.8mW			
Measurement uncertainty		$\pm 1.11\text{dB}$			

#### PCB antenna with 2.1dBi gain

Environmental Conditions		25 deg.C, 68% RH			
Channel Number	Frequency (MHz)	Radiated RF Output Power Density (mW)			
		Normal Voltage	Max. Voltage	Min. Voltage	Max. Limit (mW/MHz)
		100Vac	110Vac	90Vac	
0	2402	5.396	5.370	5.273	16.368
19	2440	5.212	5.105	5.023	16.368
39	2480	4.955	5.128	4.742	16.368
Measurement uncertainty		$\pm 1.11\text{dB}$			

Note: The value of radiated RF output densities are "calculated" values.



#### 4.6 Spurious Emissions for Receiver

##### 4.6.1 Limits of Spurious Emissions for Receiver

Frequencies (MHz)	Limit
Below 1GHz	$\leq 4\text{nW}$ (-54dBm)
Above 1GHz	$\leq 20\text{nW}$ (-47dBm)

##### 4.6.2 Test Setup





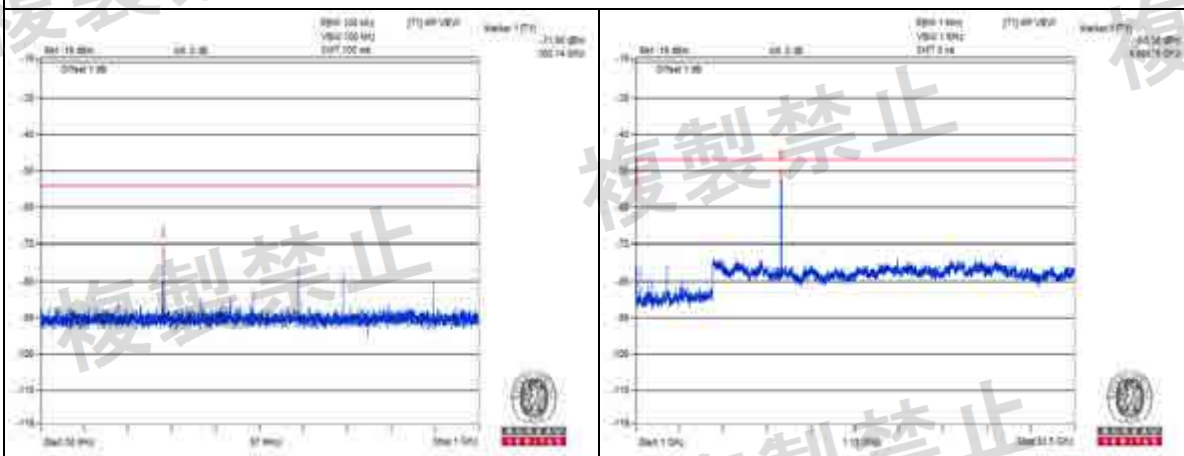
#### 4.6.3 Test Result

Environmental Conditions		25 deg.C, 68% RH					
Test Channel		CH0 (2402MHz)		CH19 (2440MHz)		Limit	Result
Test Condition	Frequency Range	Frequency (MHz)	Measured Value	Frequency (MHz)	Measured Value		
V <sub>normal</sub>	Below 1GHz	300.140	0.063387nW	304.750	0.06166nW	4nW	PASS
	Above 1GHz	4800.750	9.162205nW	4878.370	7.852356nW	20nW	PASS
V <sub>max.</sub>	Below 1GHz	300.140	0.057943nW	304.750	0.058479nW	4nW	PASS
	Above 1GHz	4800.750	9.120108nW	4878.370	7.726806nW	20nW	PASS
V <sub>min.</sub>	Below 1GHz	300.140	0.063387nW	304.750	0.055208nW	4nW	PASS
	Above 1GHz	4800.750	9.37562nW	4878.370	7.673615nW	20nW	PASS
Test Channel		CH39(2480MHz)				Limit	Result
Test Condition	Frequency Range	Frequency (MHz) Measured Value		Measured Value			
V <sub>normal</sub>	Below 1GHz	309.840		0.06223nW		4nW	PASS
	Above 1GHz	4958.870		5.370318nW		20nW	PASS
V <sub>max.</sub>	Below 1GHz	309.840		0.055463nW		4nW	PASS
	Above 1GHz	4958.870		5.508077nW		20nW	PASS
V <sub>min.</sub>	Below 1GHz	309.840		0.058479nW		4nW	PASS
	Above 1GHz	4958.870		5.520774nW		20nW	PASS

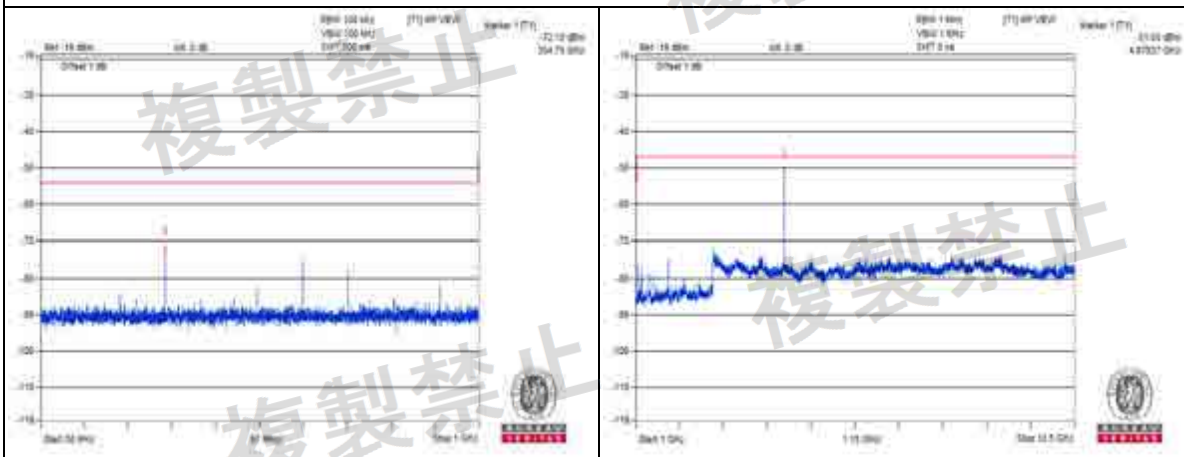
- Note: 1. The worst value in each frequency range v.s. each channel has been marked by boldface.  
2. The spectrum plots are attached on the following pages.



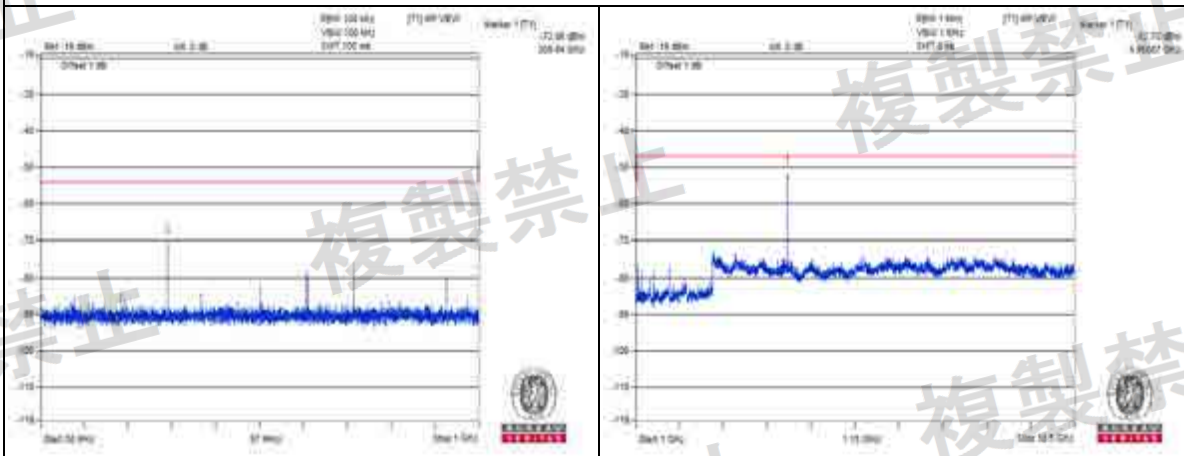
### Vnormal



### Channel 0



### Channel 19

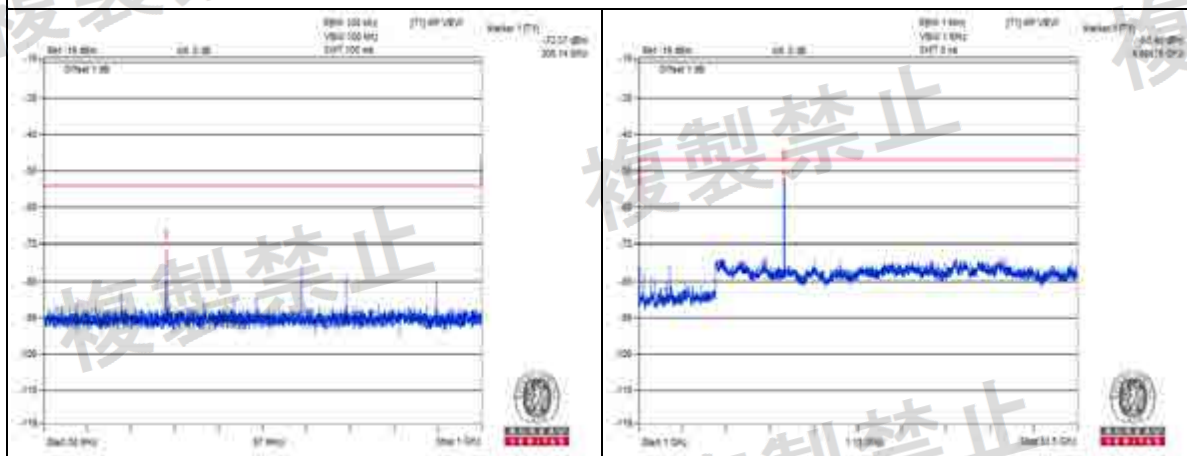


### Channel 39

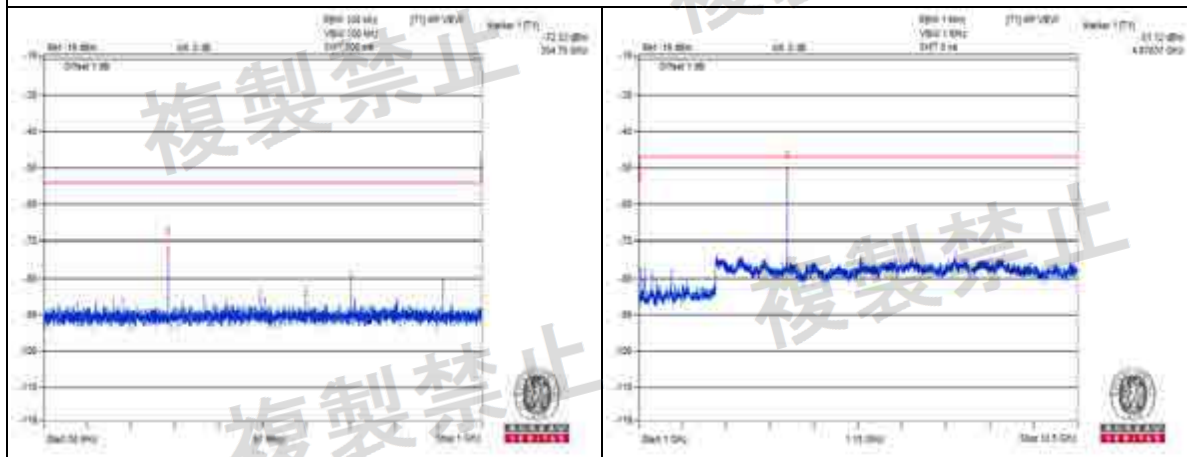
Measurement uncertainty:  $\pm 3.93\text{dB}$



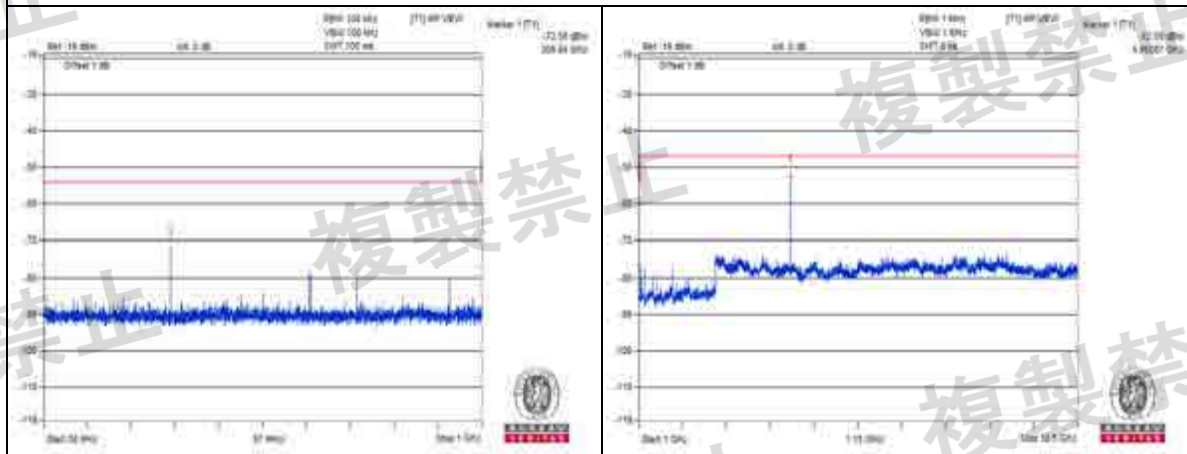
Vmax.



Channel 0



Channel 19

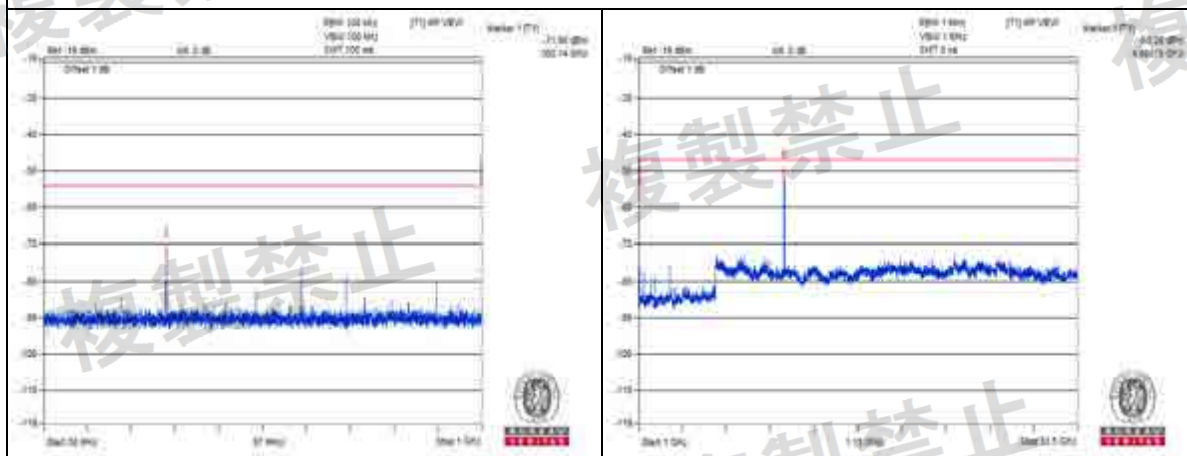


Channel 39

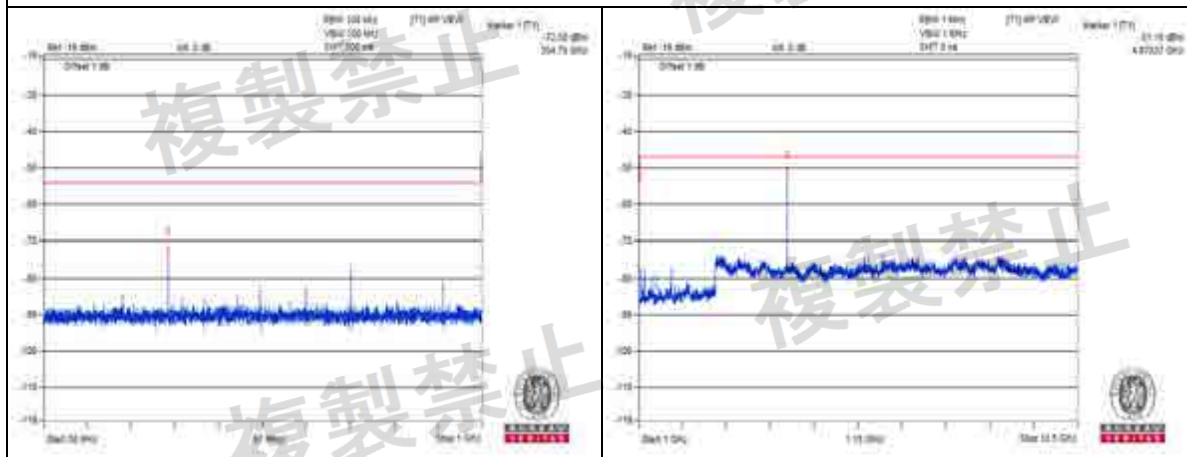
Measurement uncertainty:  $\pm 3.93\text{dB}$



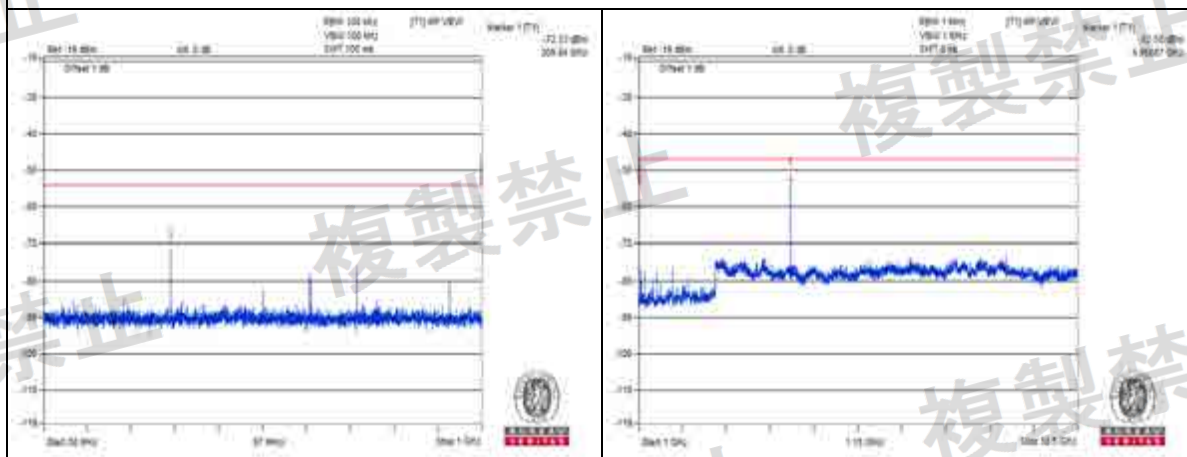
V<sub>min</sub>.



Channel 0



Channel 19



Channel 39

Measurement uncertainty:  $\pm 3.93\text{dB}$

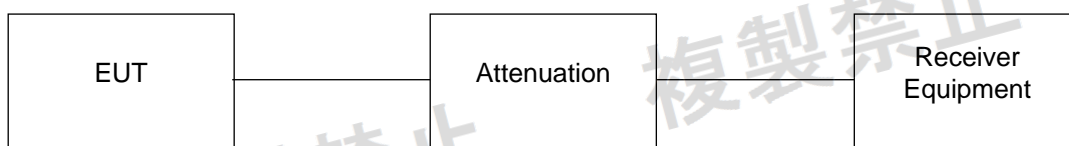


#### 4.7 Interference Prevention Function

##### 4.7.1 Limits of Interference Prevention Function

Radio equipment used mainly on the same premises and automatically transmits or receives identification code.

##### 4.7.2 Test Setup



##### 4.7.3 Test Results

ENVIRONMENTAL CONDITIONS	25 deg.C, 68% RH
Link Mode	Test Result
Bluetooth LE	Pass



## 5 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration	Calibration Authority
Spectrum Analyzer / Rohde & Schwarz	FSV40	100980	Apr. 17, 2018	Apr. 16, 2019	ETC
Signal Generator / Anritsu	E4438C	MY49071692	Sep. 20, 2017	Sep. 19, 2018	ETC
Power Meter / Anritsu	ML2495A	1232003	Dec. 29, 2017	Dec. 28, 2018	ETC
Power Sensor / Anritsu	MA2411B	1207333	Dec. 28, 2017	Dec. 27, 2018	ETC
AC Power Source / Extech	6905S	1991553	NA	NA	NA

**NOTE:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.



## 6 Photographs of the Test Configuration







## Appendix - Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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**Web Site:** [www.bureauveritas-adt.com](http://www.bureauveritas-adt.com)

The address and road map of all our labs can be found in our web site also.

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