

Radio Test Report

Report No.: RJ180131E02

Test Model: HSN-W001P

Received Date: Jan. 16, 2018

Test Date: Feb. 07, 2018

Issued Date: Feb. 27, 2018

Applicant: Wacom Co., Ltd.

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

Issue No.	Description	Date Issued
RJ180131E02	Original release.	Feb. 27, 2018

1 Certificate of Conformity

Product: HP Active Pen G2

Brand: hp

Test Model: HSN-W001P

Sample Status: ENGINEERING SAMPLE

Applicant: Wacom Co., Ltd.

Test Date: Feb. 07, 2018

Standards: ARIB STD-T66 (V3.7), MIC notice 88 Appendix 43

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 EMC characteristics under the conditions specified in this report.

Prepared by :

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Feb. 27, 2018

Approved by :

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Feb. 27, 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)
General Provisions				
C	3.2 (4)	4.1	Frequency tolerance	C
D	3.2 (7)	4.2	Occupied bandwidth	C
E	3.2 (6)	4.3	Spurious emissions	C
Transmitting Equipment				
F	--	4.4	Antenna power	C
--	--	--	SAR	NA
Transmitting Antenna				
--	--	3.5	Type, configuration, etc. of transmitting antenna	C
--	--	3.5	Direction pattern of transmitting antenna	C
Receiving Equipment				
G	3.3 (1)	4.5	Spurious emissions of receiver	C
--	--	3.5	Refer to all articles for transmitting antenna	C
Operating Frequency 2400 to 2483.5MHz				
--	3.7 (1)	3.4	High frequency / 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)	4.4	Antenna power	C
--	3.6 (2)	4.4	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)	--	Spreading bandwidth	NA
--	3.2 (9)	--	Spreading factor	NA
--	3.2 (11)	--	Frequency retention time (FH employed)	NA
--	3.4.1(1)	4.6	Interference Prevention Function	C
--	3.4.1(3)	--	Carrier Sense Capability	NA
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	703.56 Hz
Spurious emissions	2.52 dB
Output power density	1.37 dB
Out of band radiated power	2.52 dB
Frequency Tolerance	703.56 Hz

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	HP Active Pen G2
Brand	hp
Test Model	HSN-W001P
Status of EUT	ENGINEERING SAMPLE
Nominal Voltage	5Vdc from USB interface or 3.7Vdc from battery
Modulation Type	GFSK
Modulation Technology	DTS
Transfer Rate	up to 1Mbps
Operating Frequency	2402MHz ~ 2480MHz
Number of Channel	40
Rated RF Output Power	3 mW
Conducted RF Output Power	2.41 mW
Radiated RF Output Power	4.732 mW
Antenna Type	Refer to section 3.5
Antenna Connector	Refer to section 3.5
Accessory Device	Batteryx1
Cable Supplied	NA

Note:

- The EUT has two colors, which are identical to each other in all aspects except for the following:

Brand	Model	Product name	Color
hp	HSN-W001P	HP Active Pen G2	Black
			Silver

From the above colors, color is **Silver** was selected as representative sample for the test and its data was recorded in this report.

- The EUT could be supplied with 3.7V battery as the following table:

Source	Brand Name	Model No.	Spec.
Main source	EML	FT68200R	3.7V 50mAh
2nd source	EVE	L0678-LF	3.7V 50mAh

From the above models, source: **Main Source** was selected as representative model for the test and its data was recorded in this report.

- The USB port of the EUT is only for charging the rechargeable battery. And the EUT has Bluetooth function under charging mode.
- The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

40 channels are provided for BT-LE mode:

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

Note:

1. The channels which were indicated in bold type of the above channel list were selected as representative test channel. Therefore only the data of the test channels were recorded in this report.

By means of test software (nRFgo Studio.exe V1.21.0.2) provided by manufacturer, the power levels during the tests were set according to the following codes:

Channel	Power Setting
0	Default
19	Default
39	Default

3.3 Test Conditions

Test Conditions	Voltage (Vdc)
V_{normal}	3.7
V_{max}	4.07
V_{min}	3.33

3.4 Assembly

The EUT is constructed as a HP Active Pen G2. The housing consists of two parts, and the plastic enclosure is sealed firmly, separating the two parts was only possible by means of brute force.

3.5 Antenna Specifications

3.5.1 Antenna Gain

Antenna Net Gain (dBi)	Frequency range (GHz)	Antenna Type	Connector Type
2.93	2.4~2.4835	Chip	none

3.5.2 Antenna Pattern

Please refer to the attached file (Antenna pattern).

4 Test Results

4.1 Frequency Tolerance Measurement

4.1.1 Limits of Frequency Tolerance Measurement

Tolerance of frequency shall be +/- 50ppm

4.1.2 Test Setup



4.1.3 Test Results

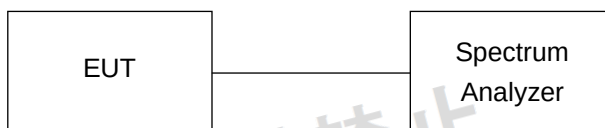
Environmental Conditions		25 deg.C, 60% RH					
Channel	Frequency (MHz)	Voltage _{normal}		Voltage _{max}		Voltage _{min}	
		Carrier frequency (MHz)	Frequency tolerance (ppm)	Carrier frequency (MHz)	Frequency tolerance (ppm)	Carrier frequency (MHz)	Frequency tolerance (ppm)
0	2402	2402.020920	8.709	2402.020640	8.592	2402.019920	8.293
19	2440	2440.020360	8.344	2440.020880	8.557	2440.020640	8.459
39	2480	2480.021320	8.596	2480.020520	8.274	2480.021240	8.564

4.2 Occupied Bandwidth Measurement (99% power bandwidth)

4.2.1 Limits of Occupied Bandwidth Measurement

Item	Limit
Occupied bandwidth	<26MHz

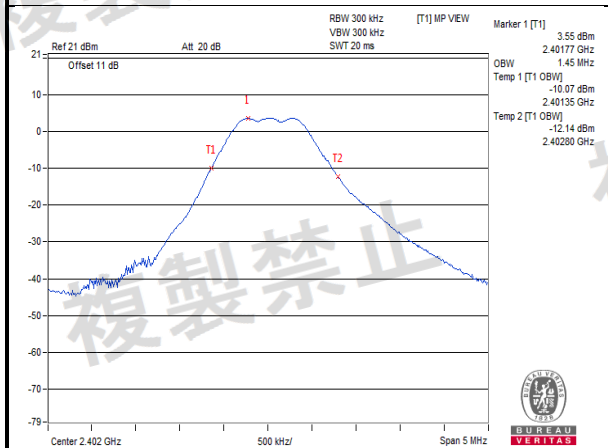
4.2.2 Test Setup



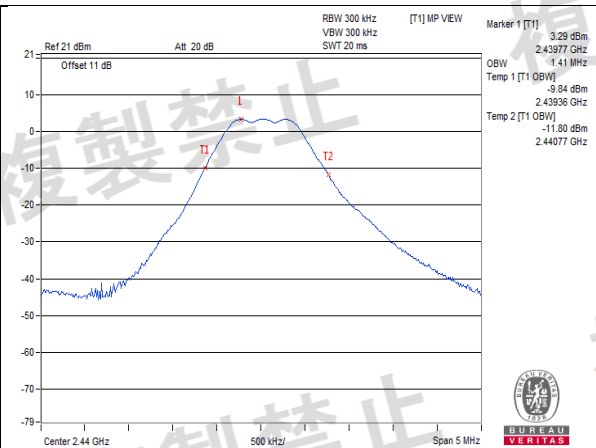
4.2.3 Test Results

Environmental Conditions		25 deg.C, 60% RH		
Channel	Frequency (MHz)	V_{normal}	V_{max}	V_{min}
		Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)
0	2402	1.45	1.45	1.45
19	2440	1.41	1.42	1.42
39	2480	1.38	1.39	1.38

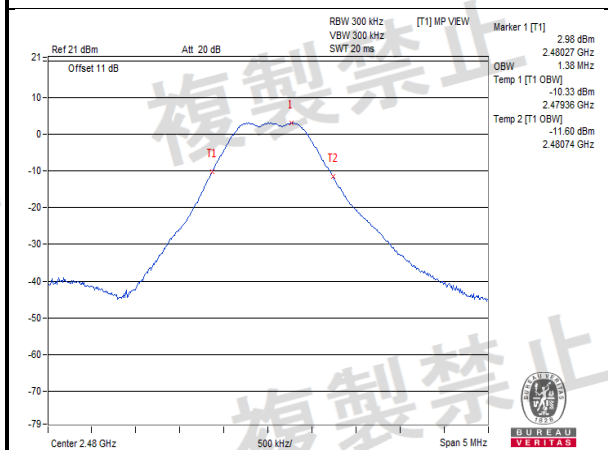
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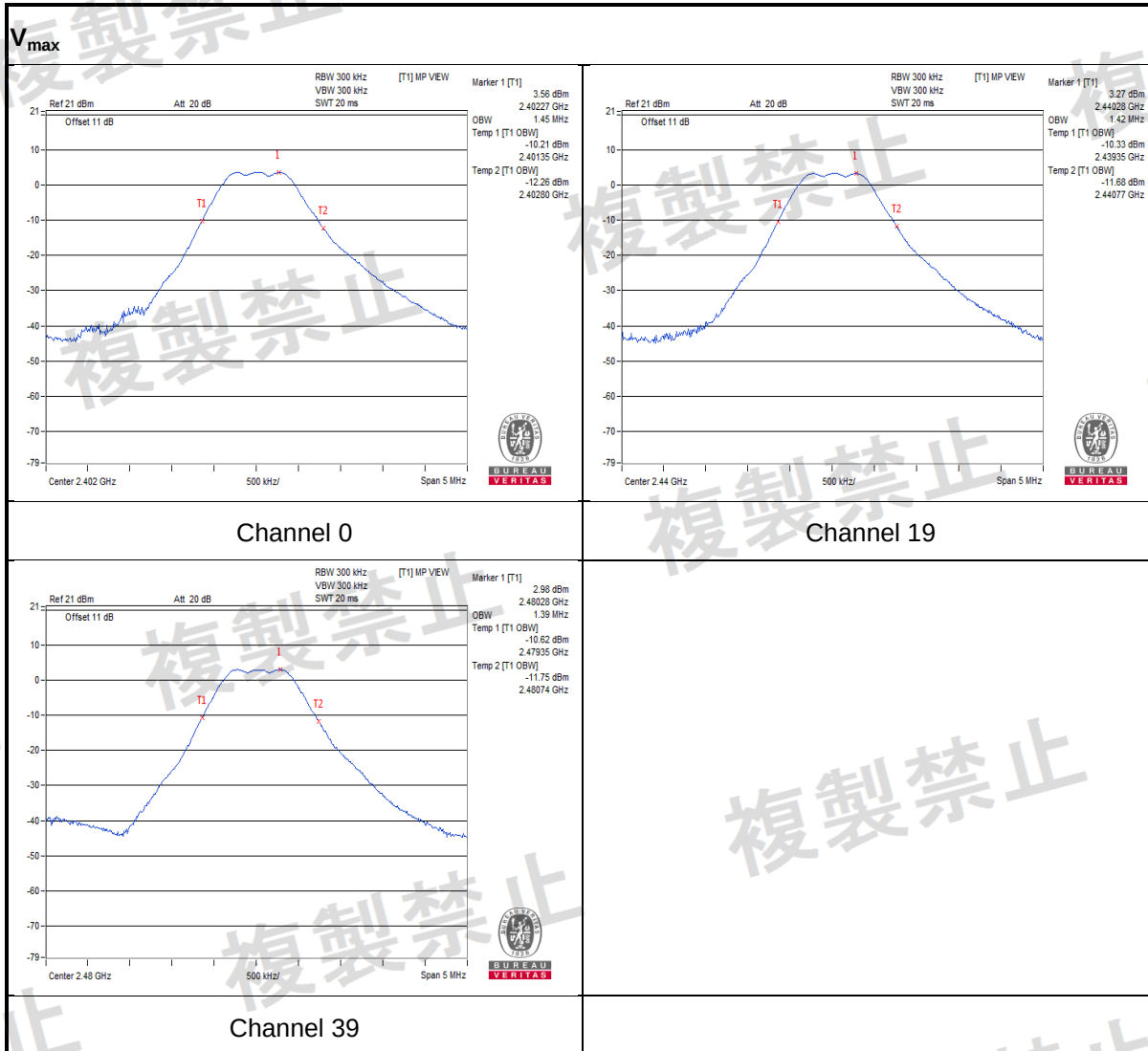
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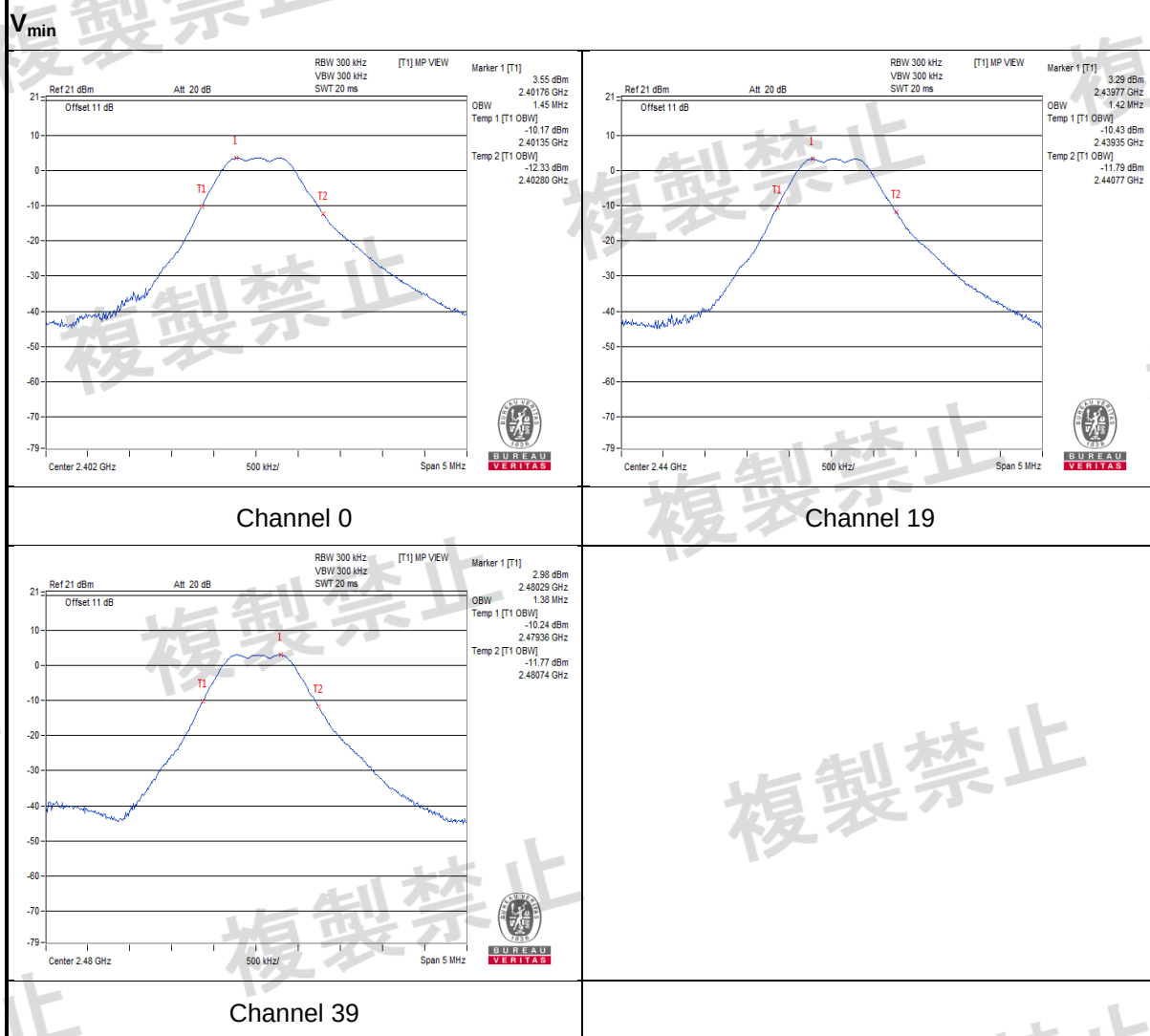


Channel 19



Channel 39



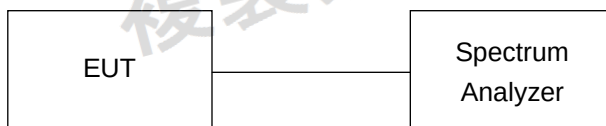


4.3 Spurious Emissions for Transmitter Measurement

4.3.1 Limits of Spurious Emissions

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

4.3.2 Test Setup



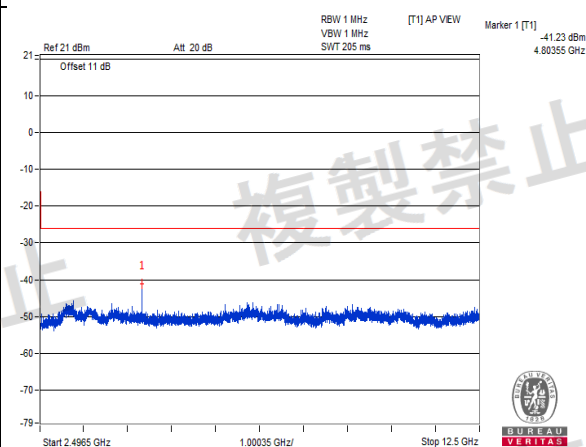
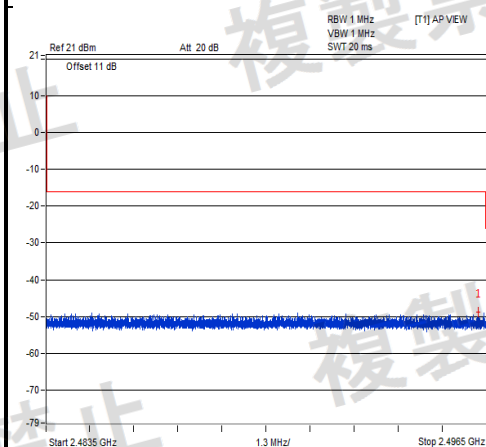
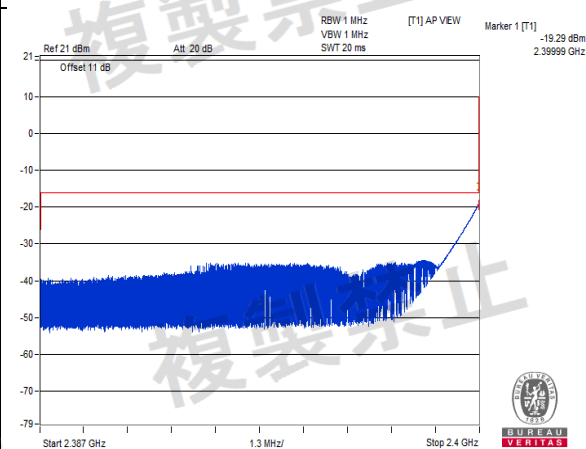
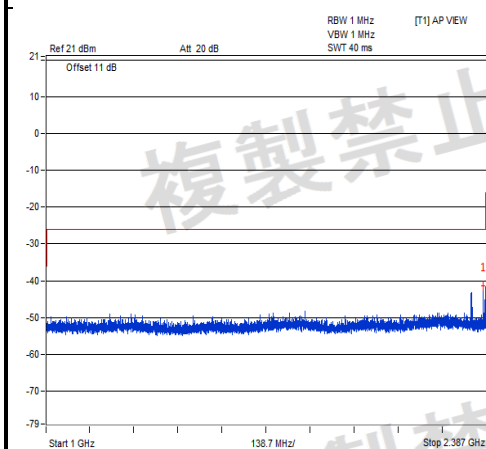
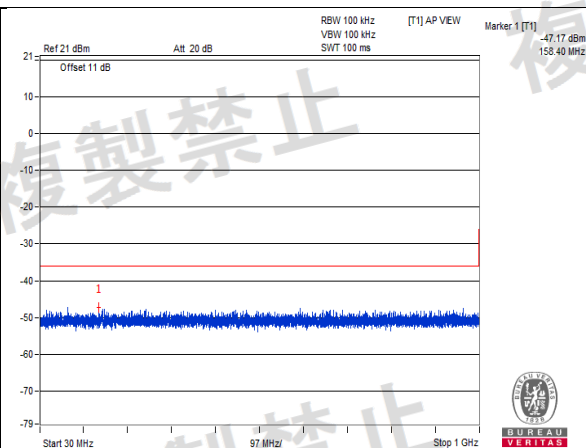
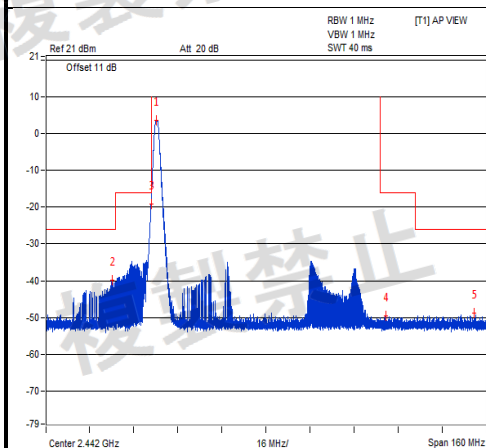
4.3.3 Test Results

Environmental Conditions		25 deg.C, 60% RH					
Test Channel		CH 0 (2402MHz)		CH 19 (2440MHz)		Limit	Result
Test Condition	Frequency Range	Frequency (MHz)	Measured Value	Frequency (MHz)	Measured Value		
V _{normal}	30.0MHz to 1000.0MHz	158.4	0.019uW	746.58	0.063uW	0.25 uW/100kHz	PASS
	1000.0MHz to 2387MHz	2378.15	0.074uW	2342.78	0.305uW	2.5uW/MHz	PASS
	2387.0MHz to 2400.0MHz	2399.99	11.776uW	2398.43	0.363uW	25uW/MHz	PASS
	2483.5MHz to 2496.5MHz	2496.28	0.013uW	2488.86	0.015uW	25uW/MHz	PASS
	2496.5MHz to 12500.0MHz	4803.55	0.075uW	4879.83	0.036uW	2.5uW/MHz	PASS
V _{max}	30.0MHz to 1000.0MHz	554.52	0.017uW	75.71	0.02uW	0.25 uW/100kHz	PASS
	1000.0MHz to 2387MHz	2342.44	0.255uW	2342.61	0.301uW	2.5uW/MHz	PASS
	2387.0MHz to 2400.0MHz	2400	11.694uW	2398.4	0.355uW	25uW/MHz	PASS
	2483.5MHz to 2496.5MHz	2493.85	0.015uW	2493.74	0.013uW	25uW/MHz	PASS
	2496.5MHz to 12500.0MHz	4804.8	0.068uW	7414.47	0.035uW	2.5uW/MHz	PASS
V _{min}	30.0MHz to 1000.0MHz	280.74	0.019uW	405.99	0.019uW	0.25 uW/100kHz	PASS
	1000.0MHz to 2387MHz	2342.26	0.198uW	2342.26	0.215uW	2.5uW/MHz	PASS
	2387.0MHz to 2400.0MHz	2400	12.274uW	2398.39	0.365uW	25uW/MHz	PASS
	2483.5MHz to 2496.5MHz	2490	0.013uW	2487.5	0.013uW	25uW/MHz	PASS
	2496.5MHz to 12500.0MHz	4803.55	0.079uW	4879.83	0.038uW	2.5uW/MHz	PASS

Test Channel		CH 39 (2480MHz)		Limit	Result
Test Condition	Frequency Range	Frequency (MHz)	Measured Value		
V _{normal}	30.0MHz to 1000.0MHz	626.06	0.023uW	0.25 uW/100kHz	PASS
	1000.0MHz to 2387MHz	1776.19	0.015uW	2.5uW/MHz	PASS
	2387.0MHz to 2400.0MHz	2394.24	0.013uW	25uW/MHz	PASS
	2483.5MHz to 2496.5MHz	2483.5	0.387uW	25uW/MHz	PASS
	2496.5MHz to 12500.0MHz	2587.78	0.081uW	2.5uW/MHz	PASS
V _{max}	30.0MHz to 1000.0MHz	640	0.019uW	0.25 uW/100kHz	PASS
	1000.0MHz to 2387MHz	2208.42	0.014uW	2.5uW/MHz	PASS
	2387.0MHz to 2400.0MHz	2389.28	0.013uW	25uW/MHz	PASS
	2483.5MHz to 2496.5MHz	2483.5	0.389uW	25uW/MHz	PASS
	2496.5MHz to 12500.0MHz	2517.75	0.26uW	2.5uW/MHz	PASS
V _{min}	30.0MHz to 1000.0MHz	214.05	0.019uW	0.25 uW/100kHz	PASS
	1000.0MHz to 2387MHz	2249.34	0.014uW	2.5uW/MHz	PASS
	2387.0MHz to 2400.0MHz	2389.97	0.013uW	25uW/MHz	PASS
	2483.5MHz to 2496.5MHz	2483.5	0.383uW	25uW/MHz	PASS
	2496.5MHz to 12500.0MHz	2519	0.272uW	2.5uW/MHz	PASS

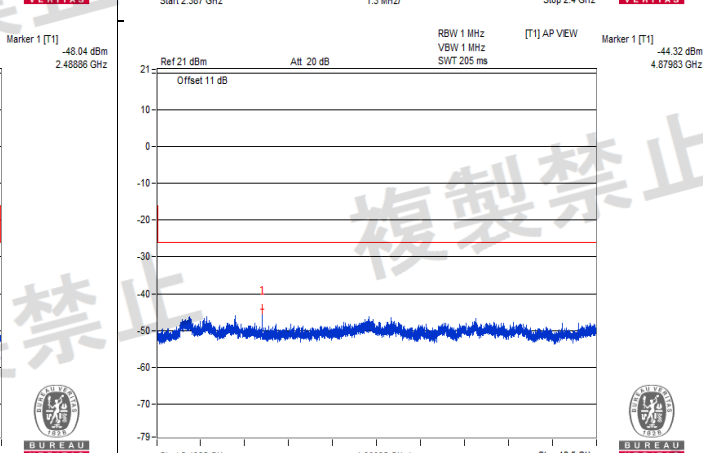
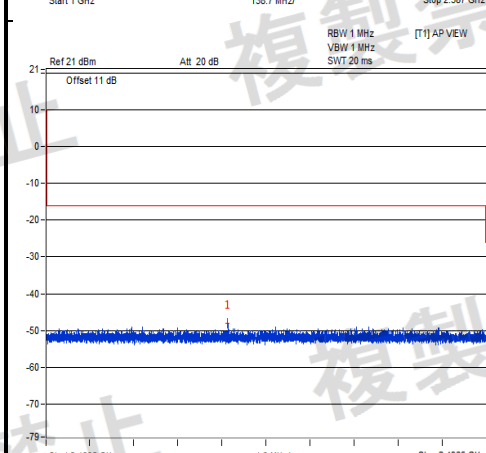
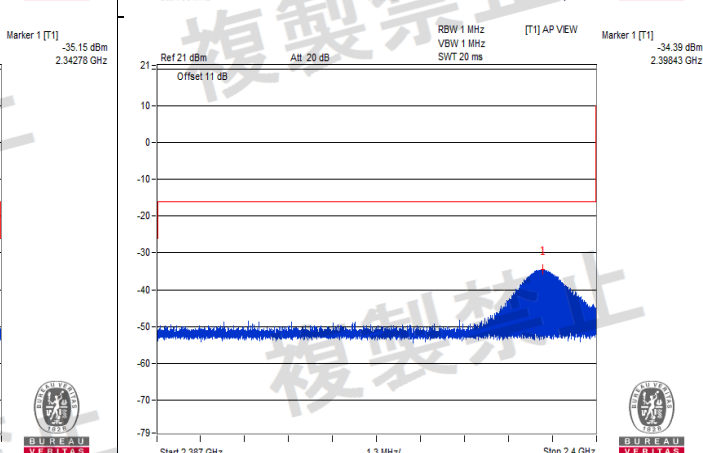
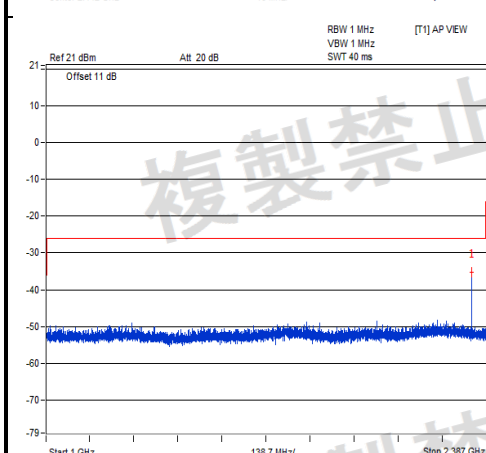
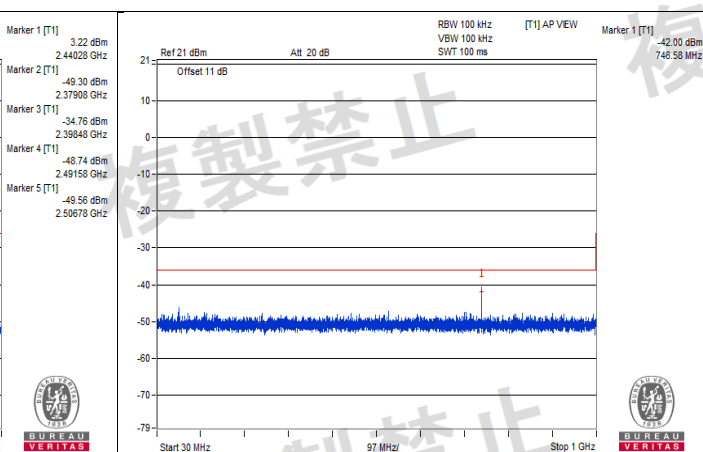
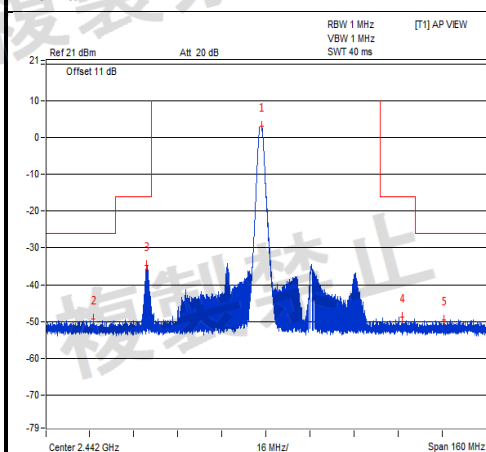
Note: 1. The worst value in each frequency range v.s. each channel has been marked by boldface.

Vnormal



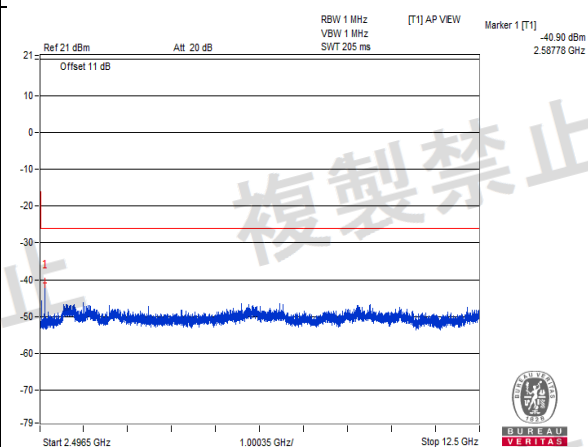
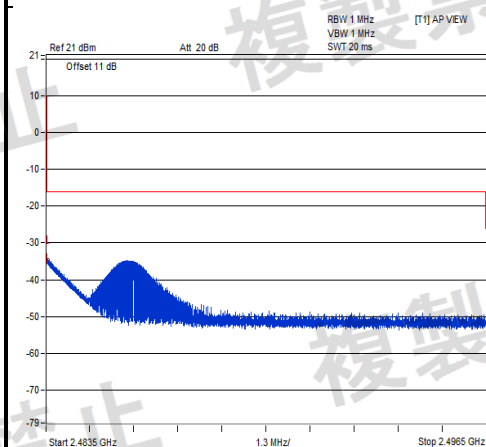
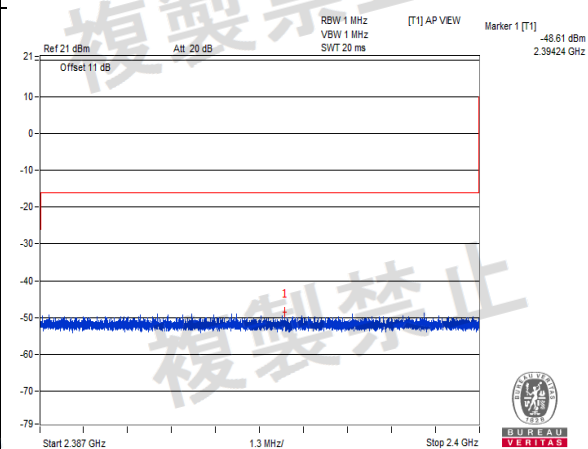
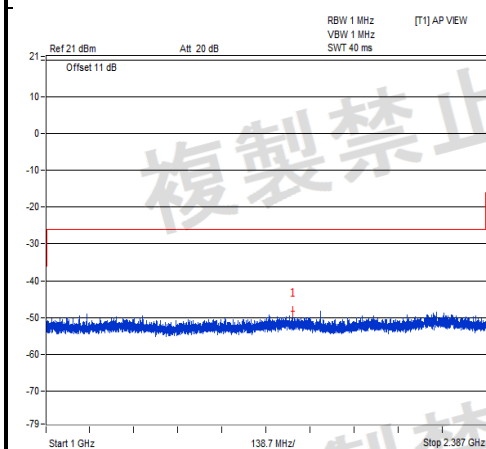
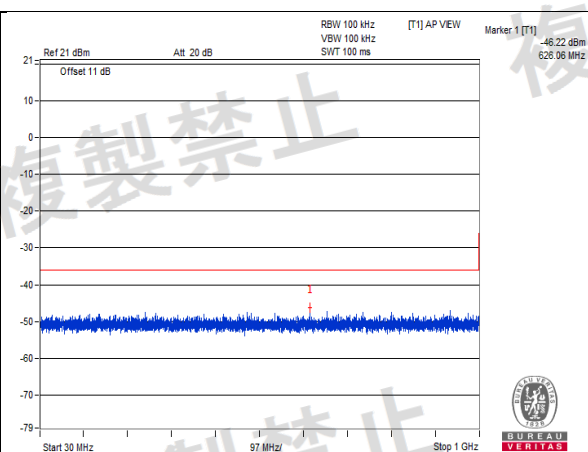
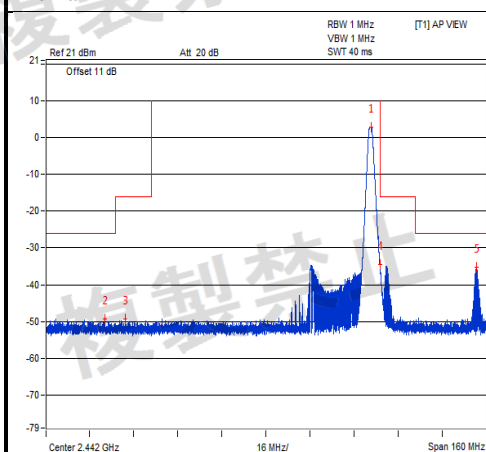
Channel 0

Vnormal

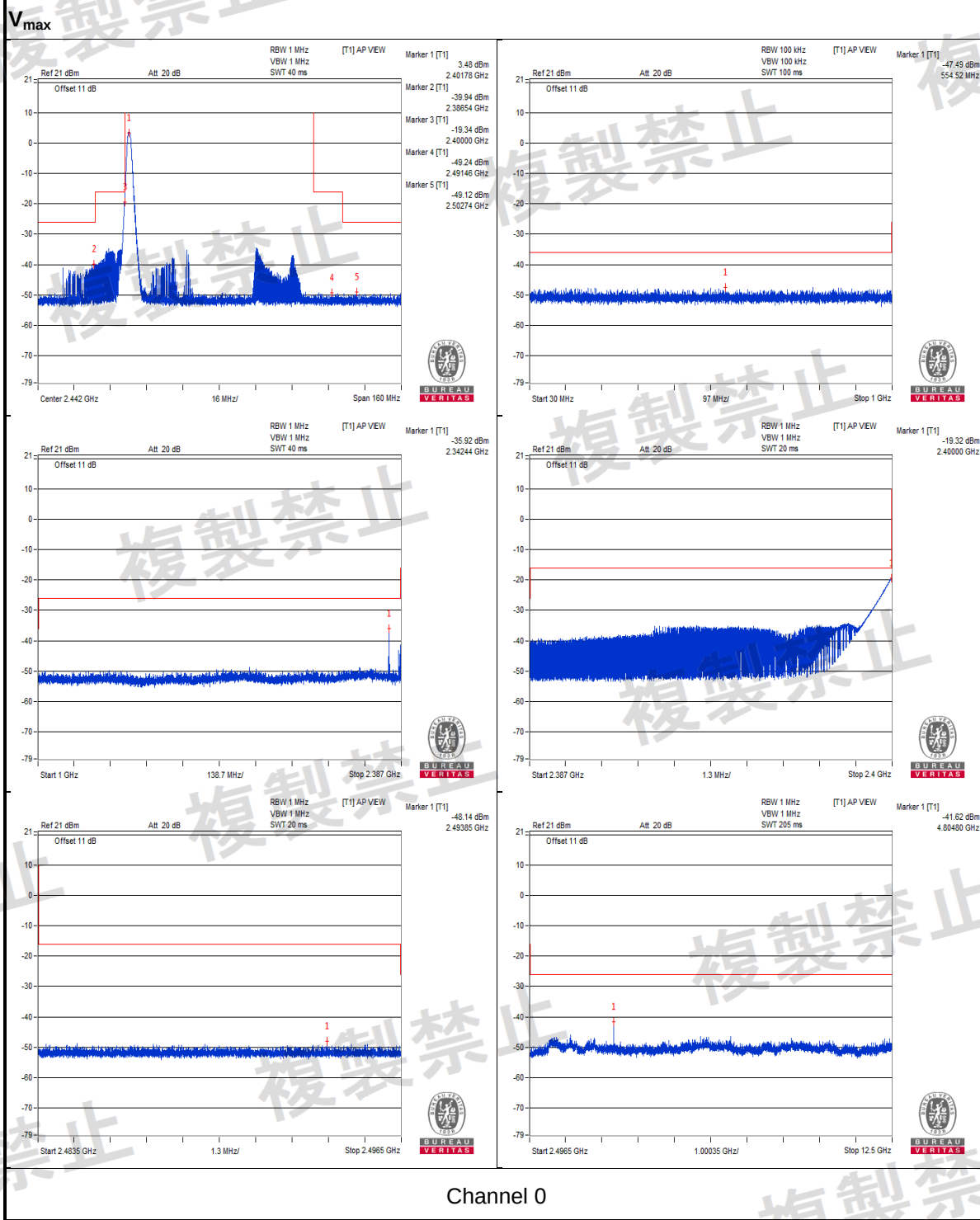


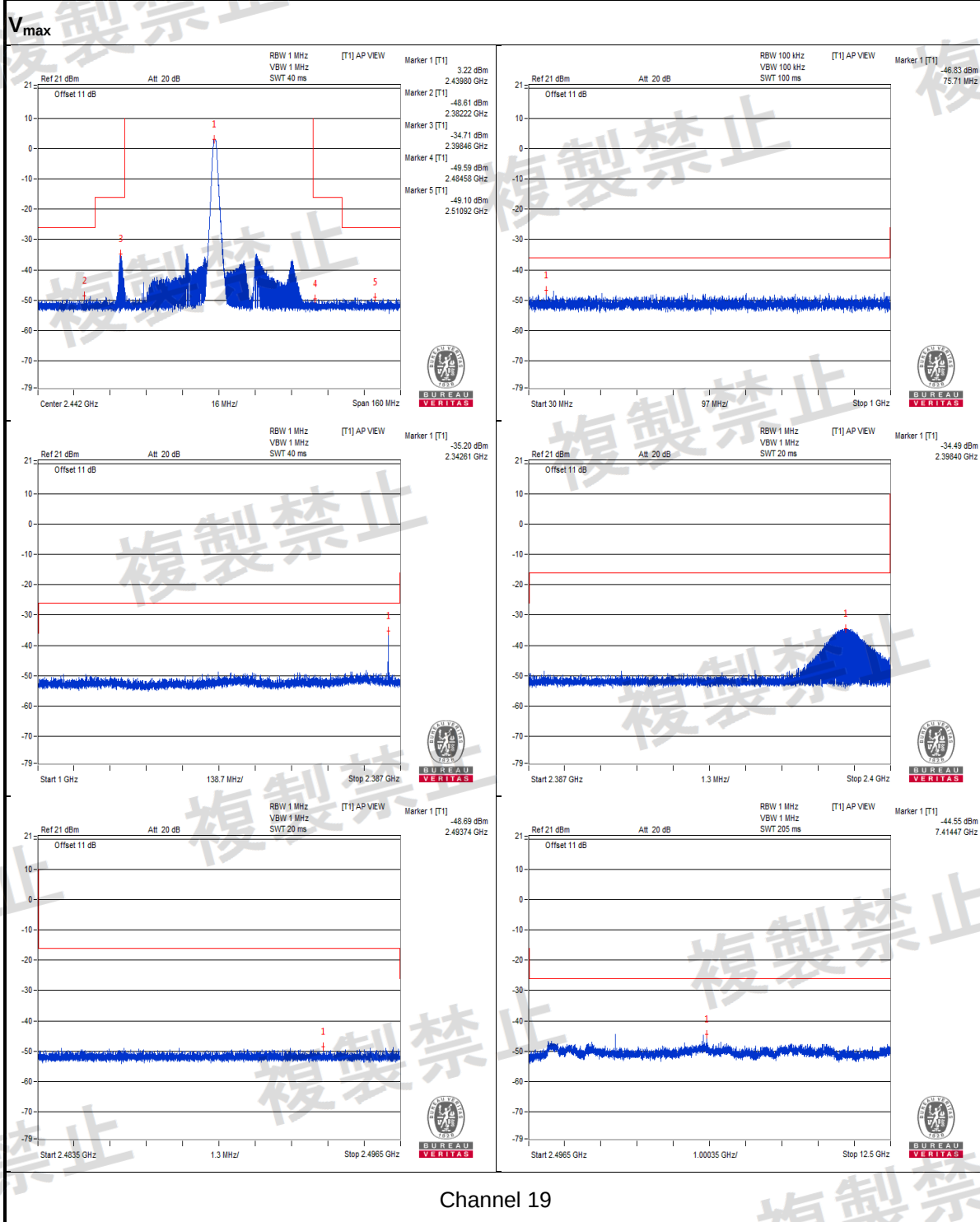
Channel 19

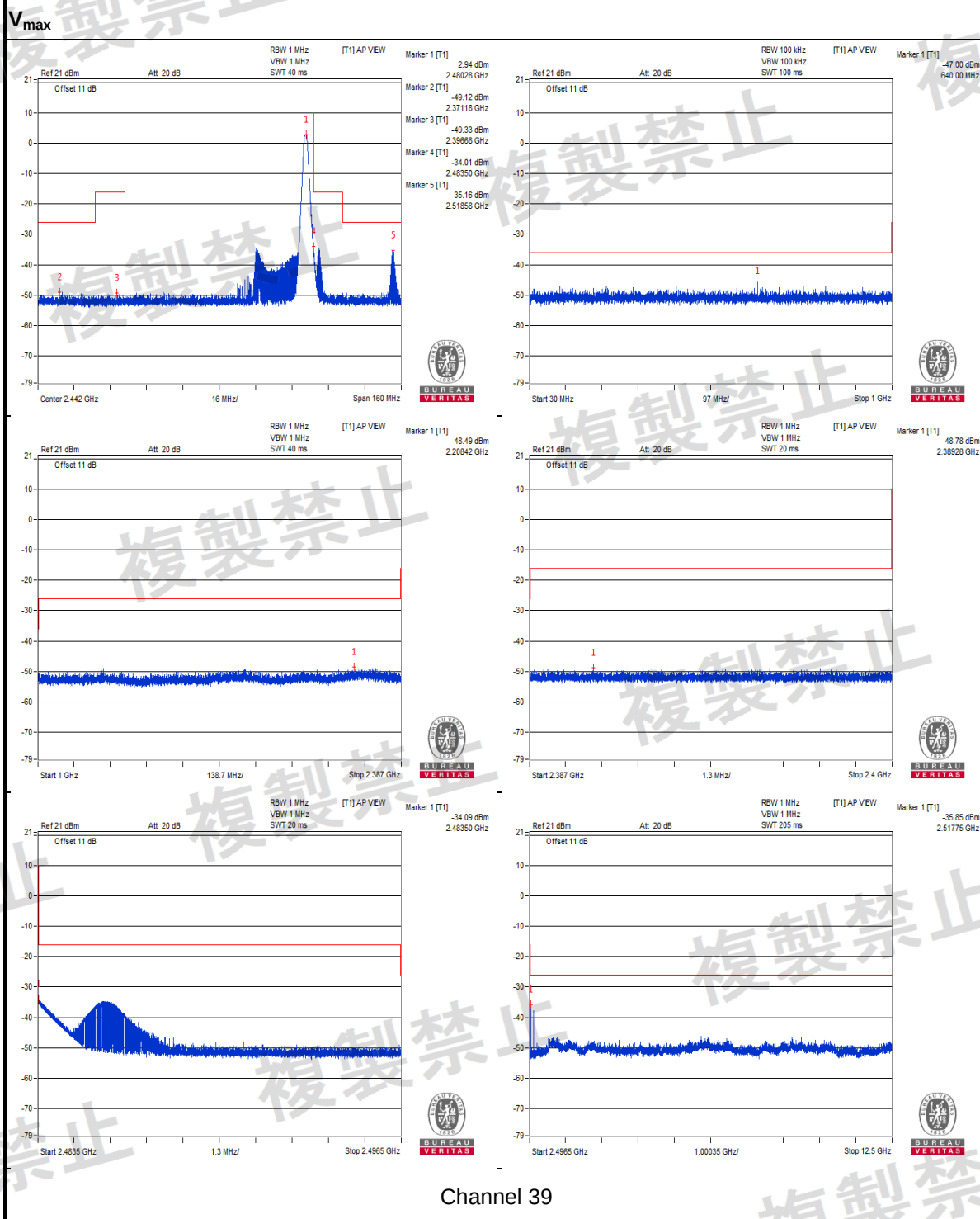
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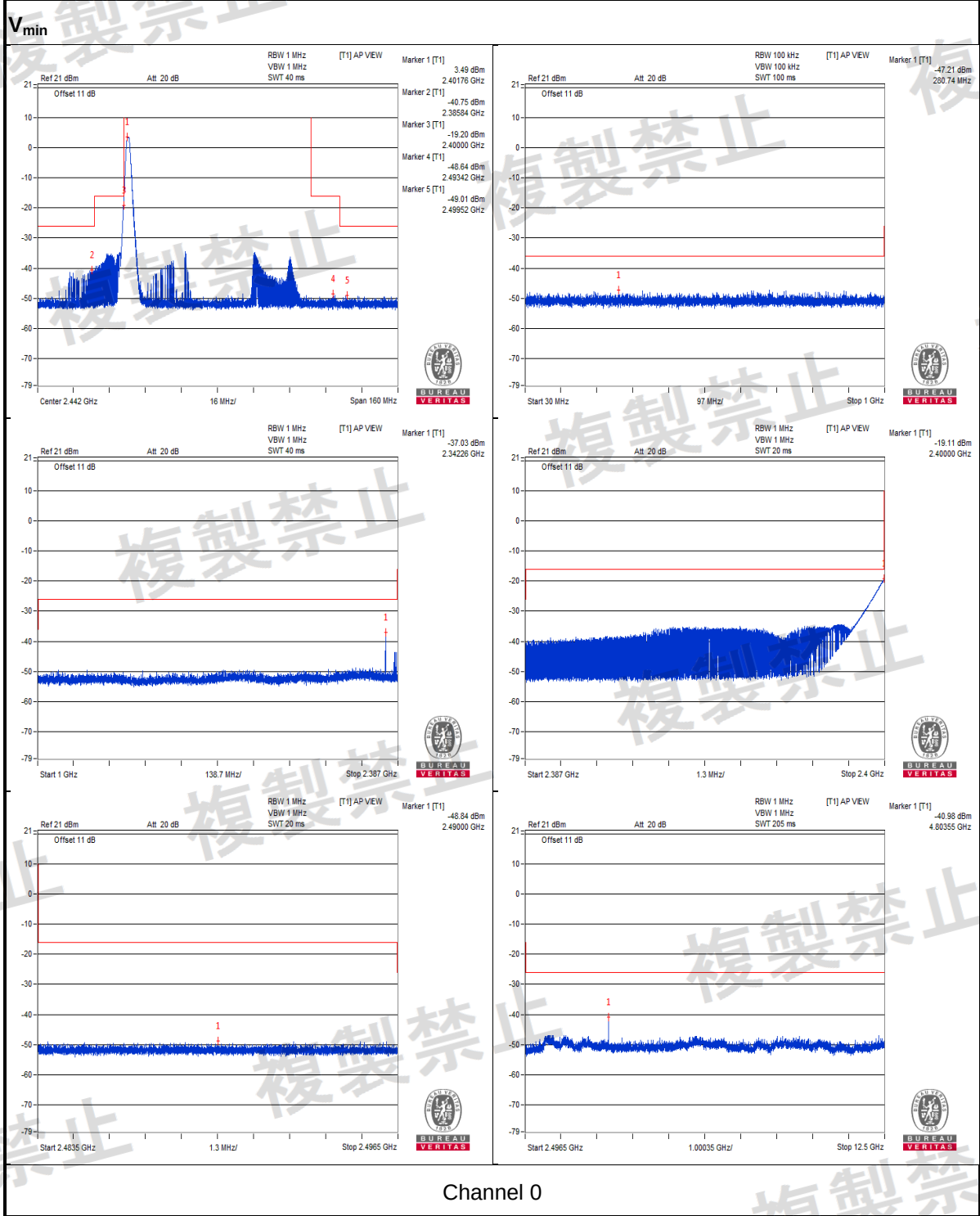


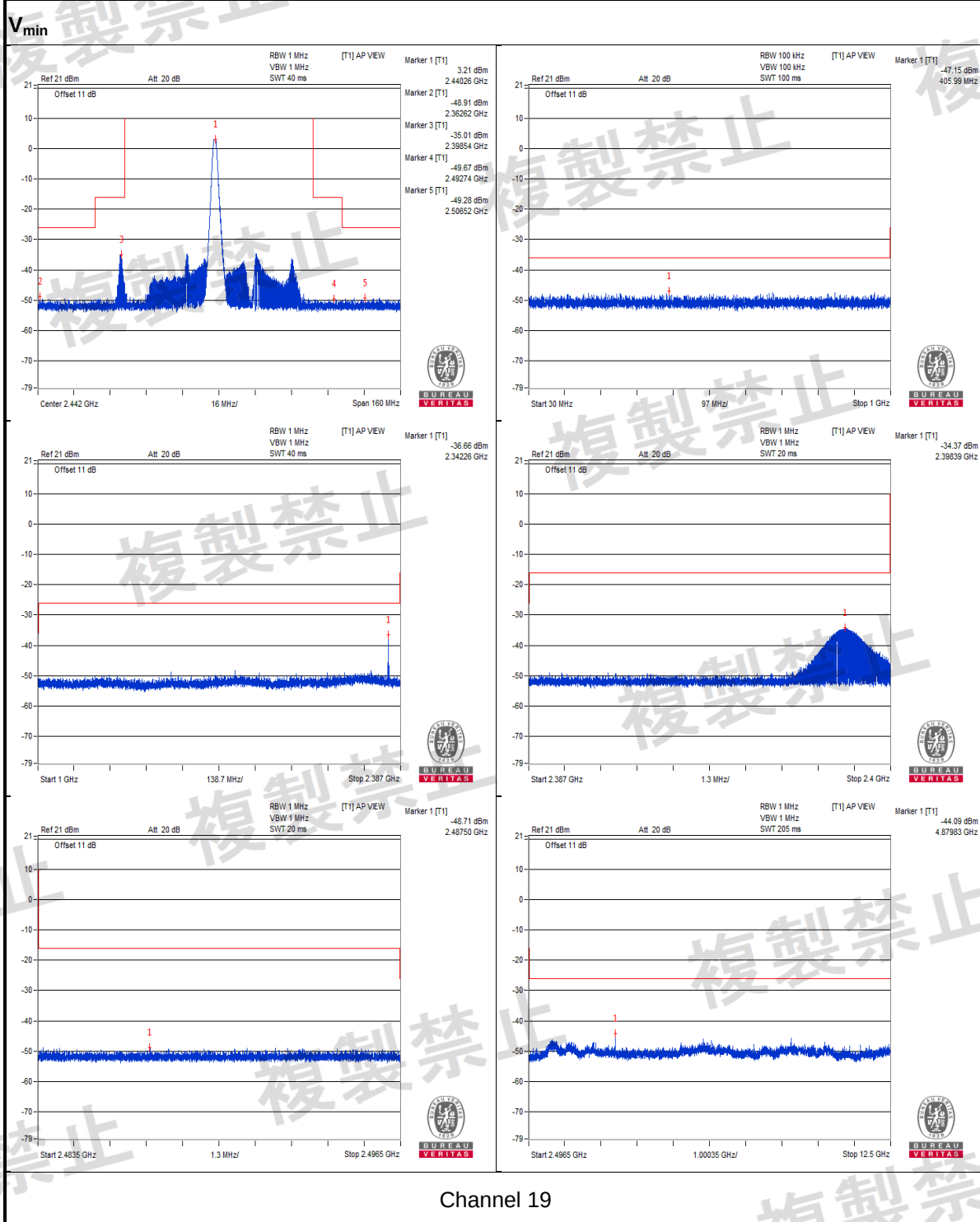
Channel 39

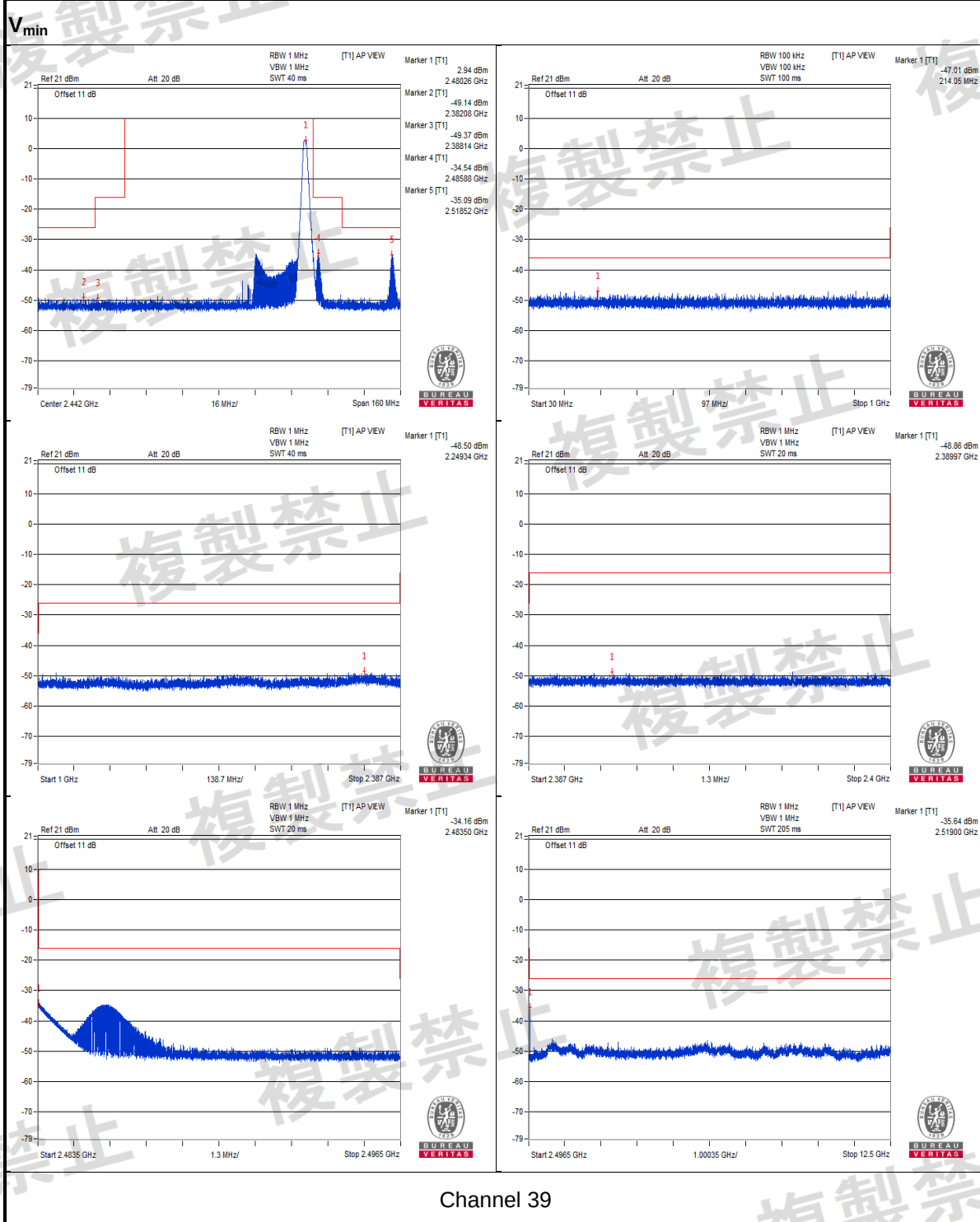












4.4 Antenna Power Measurement

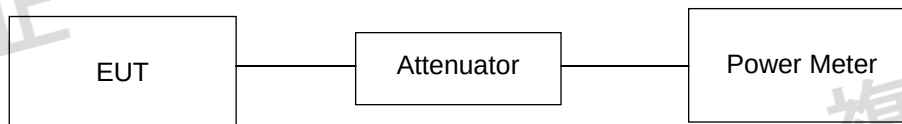
4.4.1 Limits of Antenna Power

Modulation System	Frequency Band Used	Antenna Power (Max.)	EIRP (Max.)	
			Omni-Directional Case	Directional Case
DS	2400 – 2483.5 MHz	10 mW/MHz	12.14 dBm/MHz (16.368 mW/MHz)	22.14 dBm/MHz (163.68 mW/MHz)
OFDM (Note 1)	2400 – 2483.5 MHz	10 mW/MHz	12.14 dBm/MHz (16.368 mW/MHz)	22.14 dBm/MHz (163.68 mW/MHz)
OFDM (Note 2)	2400 – 2483.5 MHz	5 mW/MHz	9.14 dBm/MHz (8.203 mW/MHz)	19.14 dBm/MHz (82.03 mW/MHz)
Other than the above	2400 – 2483.5 MHz	10 mW	12.14 dBm (16.368 mW)	22.14 dBm (163.68 mW)

Note:

1. Occupied bandwidth is less than 26MHz
2. Occupied bandwidth is more than 26MHz and less than 38MHz
3. The half-power beam width for directional antenna shall be $360/A$ degrees or less, where A is a ratio which causes the EIRP concerned to exceed the omnidirectional EIRP upper limit.
4. Tolerance of antenna power shall be +20% (upper value) and -80% (lower value).

4.4.2 Test Setup



4.4.3 Test Results

Environmental Conditions		25 deg.C, 60% RH		
Channel Number	Frequency (MHz)	Conducted RF Output Power (mW)		
		V _{normal}	V _{max}	V _{min}
0	2402	2.41	2.399	2.355
19	2440	2.296	2.249	2.213
39	2480	2.133	2.208	2.042
Max. Limit (mW)		10		
Rated Power		3		
Tolerance of Antenna Power		0.6 ~ 3.6		

Chip antenna with antenna gain: 2.93 dBi

Environmental Conditions		25 deg.C, 60% RH		
Channel Number	Frequency (MHz)	Radiated RF Output Power (mW)		
		V _{normal}	V _{max}	V _{min}
0	2402	4.732	4.71	4.624
19	2440	4.508	4.416	4.345
39	2480	4.188	4.335	4.009
EIRP Max. Limit (mW)		16.368		

Note: 1. The radiated RF output power is a “calculated” value derived from the conducted value.

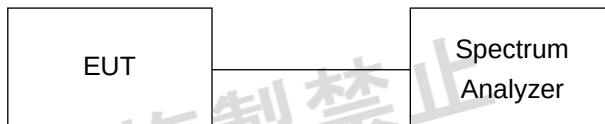
2. Formula: Radiated RF output power = Conducted RF output power + Maximum Antenna Gain

4.5 Spurious Emissions for Receiver

4.5.1 Limits of Spurious Emissions for Receiver

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

4.5.2 Test Setup

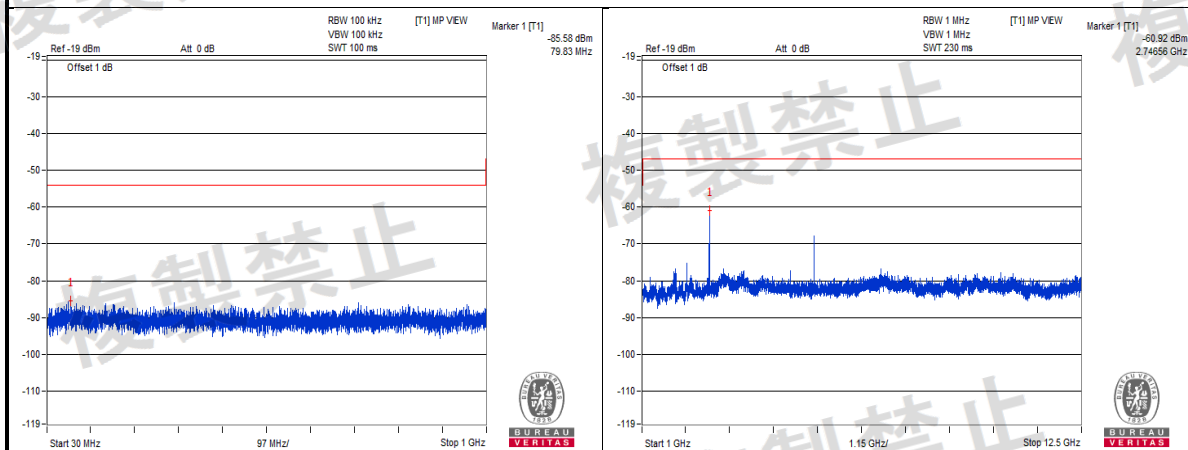


4.5.3 Test Result

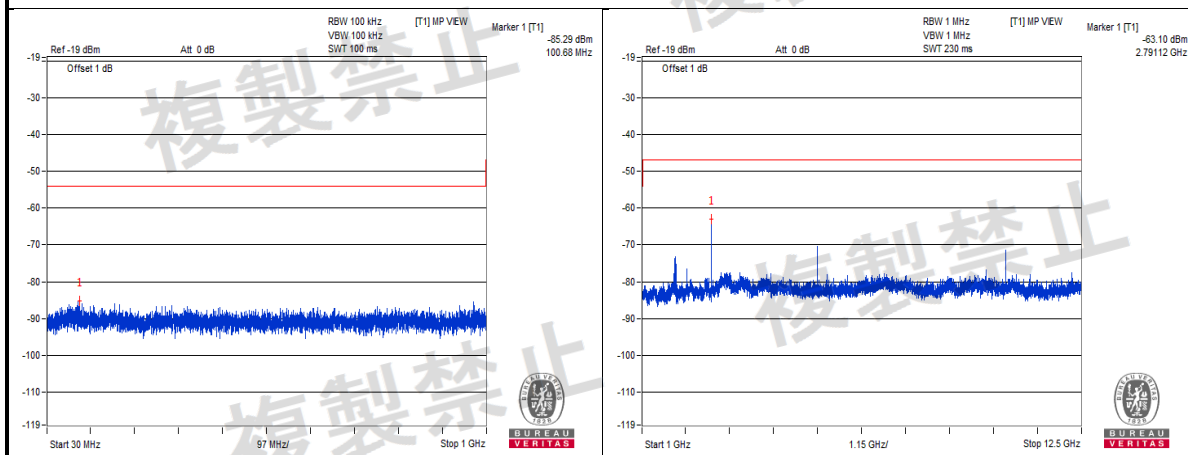
Environmental Conditions		25 deg.C, 60% RH					
Test Channel		CH 0 (2402MHz)		CH 19 (2440MHz)		Limit	Result
Test Condition	Frequency Range	Frequency (MHz)	Measured Value	Frequency (MHz)	Measured Value		
V _{normal}	Below 1GHz	79.83	0.002767nW	100.68	0.002958nW	4nW/100kHz	PASS
	Above 1GHz	2746.56	0.809096nW	2791.12	0.489779nW	20nW/MHz	PASS
V _{max}	Below 1GHz	849.89	0.002944nW	74.13	0.002649nW	4nW/100kHz	PASS
	Above 1GHz	2746.56	0.776247nW	2791.12	0.506991nW	20nW/MHz	PASS
V _{min}	Below 1GHz	185.8	0.003266nW	479.59	0.002547nW	4nW/100kHz	PASS
	Above 1GHz	2746.56	0.76913nW	2791.12	0.534564nW	20nW/MHz	PASS
Test Channel		CH 39 (2480MHz)				Limit	Result
Test Condition	Frequency Range	Frequency (MHz) Measured Value		Measured Value			
V _{normal}	Below 1GHz	372.16		0.002884nW		4nW/100kHz	PASS
	Above 1GHz	2835.68		0.496592nW		20nW/MHz	PASS
V _{max}	Below 1GHz	943.61		0.002692nW		4nW/100kHz	PASS
	Above 1GHz	2835.68		0.49545nW		20nW/MHz	PASS
V _{min}	Below 1GHz	171.49		0.002825nW		4nW/100kHz	PASS
	Above 1GHz	2835.68		0.451856nW		20nW/MHz	PASS

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

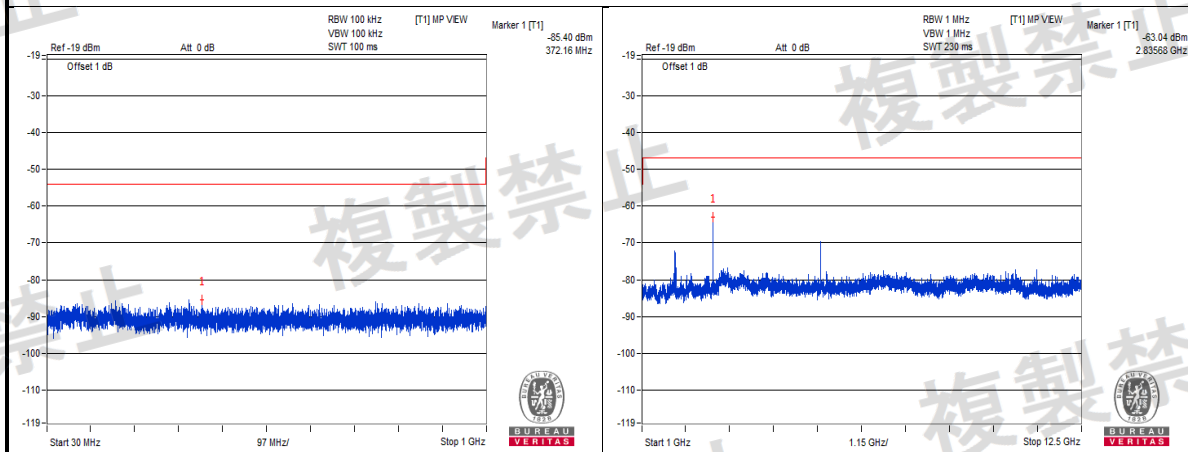
V normal



Channel 0

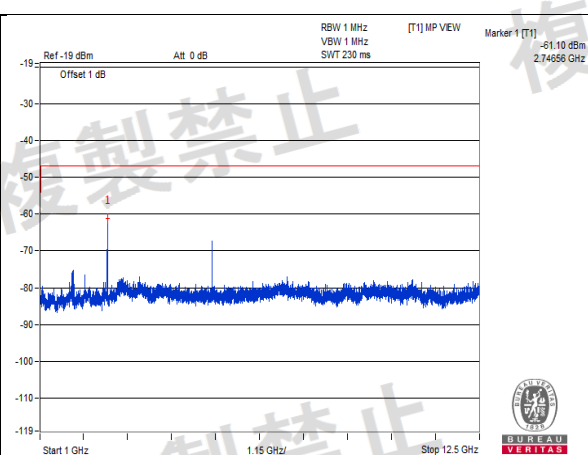
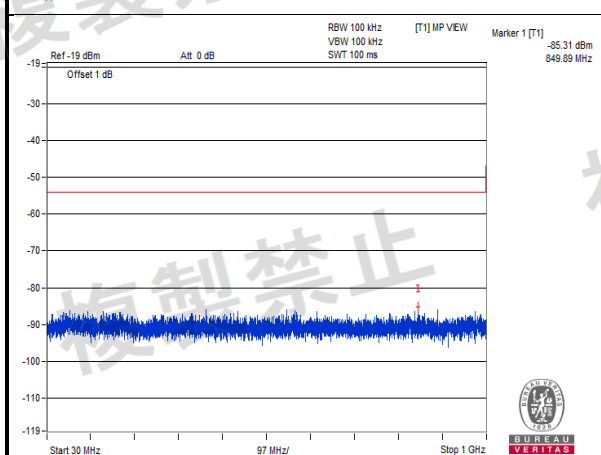


Channel 19

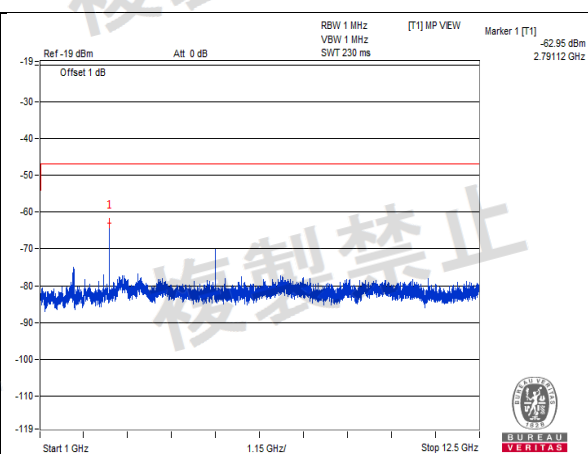
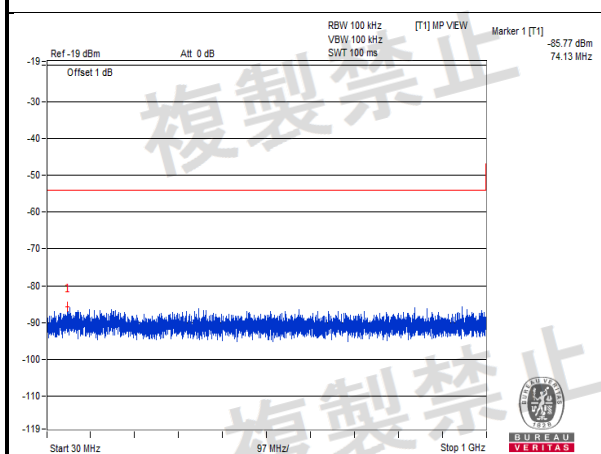


Channel 39

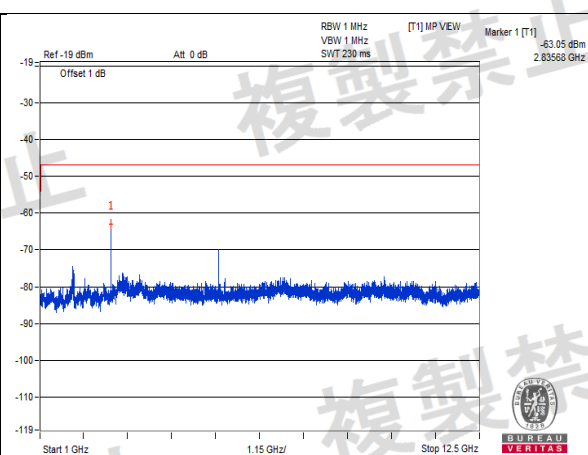
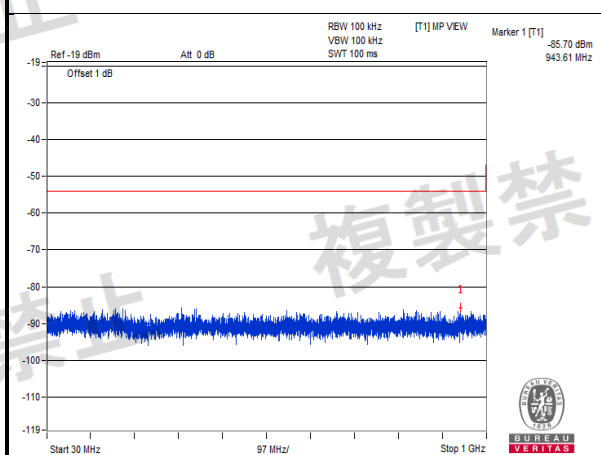
V_{max}



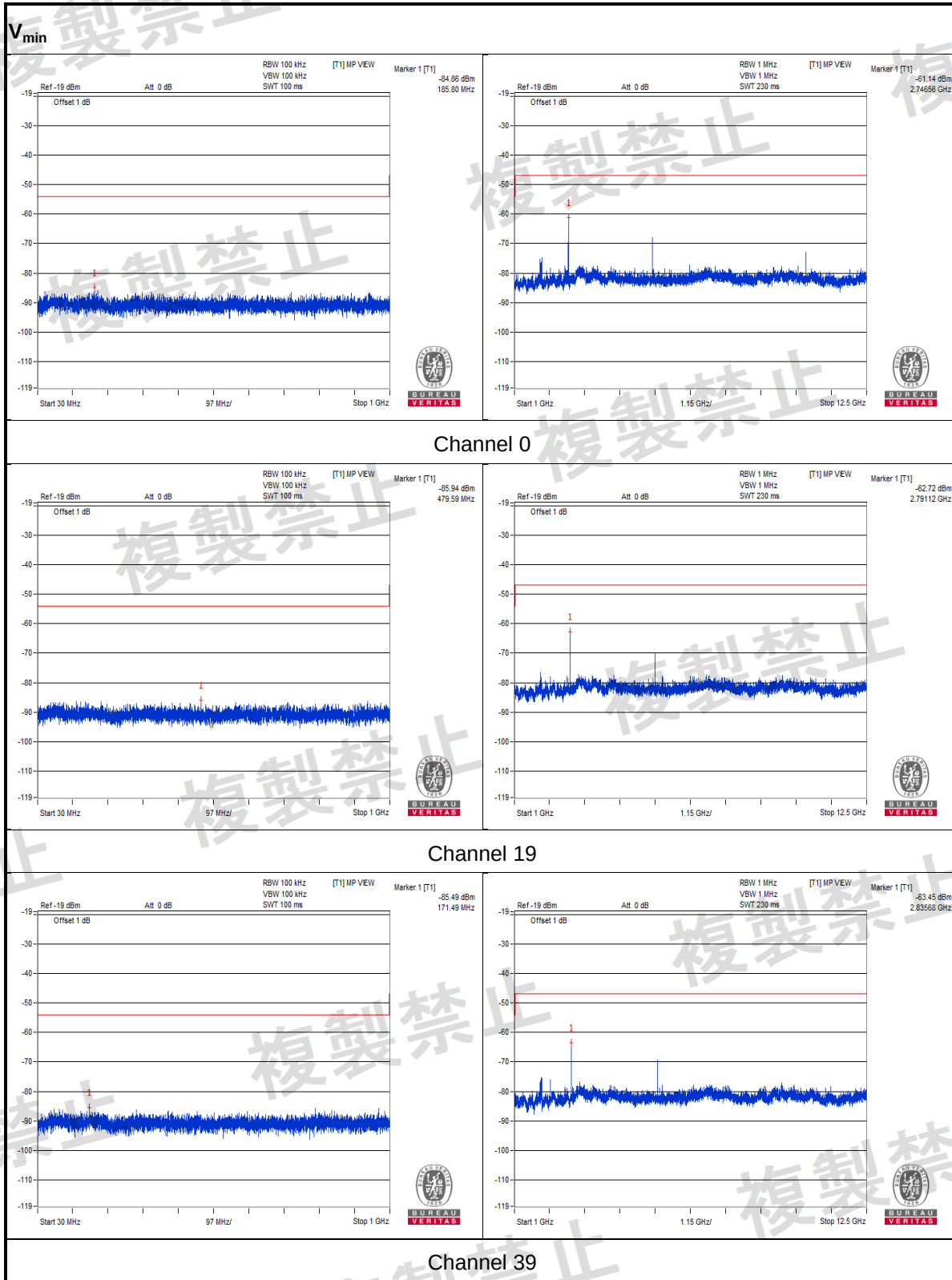
Channel 0



Channel 19



Channel 39

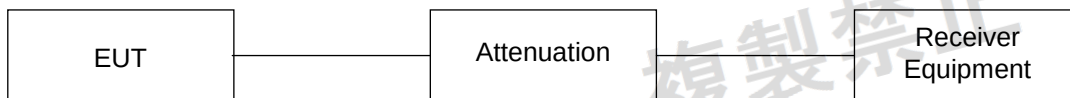


4.6 Interference Prevention Function

4.6.1 Limits of Interference Prevention Function

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

4.6.2 Test Setup



4.6.3 Test Results

Environmental Conditions	25 deg.C, 60% RH
Link Mode	Test Result
BT-LE	PASS

5 Test Instruments

Description & Manufacturer	Model no.	Serial No.	Calibrated Date	Calibrated Until	Calibration Authority
Spectrum Analyzer R&S	FSV40	100964	July 1, 2017	June 30, 2018	ETC
ESG Vector signal generator Agilent	E4438C	MY47271330 506 602 UNJ	Oct, 11, 2017	Oct. 10, 2018	ETC
Detector Narda	4503A	0306	NA	NA	NA
Power Meter Anritsu	ML2495A	1014008	MAY 11, 2017	MAY 10, 2018	ETC
Power Sensor Anritsu	MA2411B	0917122	MAY 11, 2017	MAY 10, 2018	ETC
Digital Oscilloscope R&S	RTO1012	300053	June 28, 2017	June 27, 2018	ETC
DC Power Supply Topward	6603D	795558	NA	NA	NA
AC Power Source Extech Electronics	6205	1440452	NA	NA	NA
True RMS Clamp Meter FLUKE	325	31130711WS	May 29, 2017	May 28, 2018	ETC

NOTE:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. Tested Date: Feb. 07, 2018

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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Fax: 886-2-26051924

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Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: 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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