



Radio Test Report (Bluetooth EDR)

Report No.: RJ180912C10-2

Test Model: ZenoCCU

Received Date: Sep. 12, 2018

Test Date: Oct. 16 ~ Nov. 16, 2018

Issued Date: Nov. 26, 2018

Applicant: ADVANTECH CO., LTD

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Release Control Record

Issue No.	Description	Date Issued
RJ180912C10-2	Original release	Nov. 26, 2018



1 Certificate of Conformity

Product: IPC

Brand: Zenoway

Test Model: ZenoCCU

Sample Status: Engineering sample

Applicant: ADVANTECH CO., LTD

Test Date: Oct. 16 ~ Nov. 16, 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:

Nov. 26, 2018

Approved by :

Bruce Chen
Bruce Chen / Project Engineer

Date:

Nov. 26, 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)	4.4	Spurious emissions	C
Transmitting Equipment				
F	--	4.5	Antenna power	C
--	--	--	SAR	NA
Transmitting Antenna				
--	--	3.4	Type, configuration, etc. of transmitting antenna	C
--	--	3.5	Direction pattern of transmitting antenna	C
Receiving Equipment				
G	3.3 (1)	4.6	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)	4.5	Antenna power	C
--	3.6 (2)	4.5	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)	4.7	Frequency retention time (FH employed)	C
--	3.4.1(1)	4.8	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	491.896Hz
Spurious emissions	3.508dB
Output power density	2.889dB
Out of band radiated power	3.93dB
Frequency Tolerance	6805.18Hz

2.2 Modification Record

There were no modifications required for compliance.



3 General Information

3.1 General Description of EUT

Product	IPC
Brand	Zenoway
Test Model	ZenoCCU
Status of EUT	Engineering sample
Nominal Voltage	9-60Vdc
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8DPSK
Modulation Technology	FHSS
Transfer Rate	1/2/3Mbps
Operating Frequency	2402.0MHz ~ 2480.0MHz
Number of Channel	79
Rated RF Output Power Density	Refer to Note
Conducted RFOutput Power Density	Refer to Note
Radiated RF Output Power Density	Refer to Note
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Data Cable Supplied	NA

Note:

1. The EUT uses following antenna.

Antenna 1							
Type	Monopole						
Connector	RP-SMA(M)						
Straight position							
Frequency (MHz)	2400	2450	2500	5150	5350	5750	5850
Gain (dBi)	1.04	1.25	0.82	0.85	1.38	0.28	1.04
Bent position 90°							
Frequency (MHz)	2400	2450	2500	5150	5350	5750	5850
Gain (dBi)	1.19	1.57	2.57	0.66	1.03	0.59	1.19

Antenna 2		
Type	Monopole	
Connector	SMA Male Reverse	
Frequency (MHz)	2400~2500	5150~5850
Gain (dBi)	1.64	-2.9

* The antenna 1 is the worst case for final tests.

2. The power table as below:

	Rated power (mW/MHz)	Total Conducted RF output power density (mW/MHz)	Radiated RF output power density (mW/MHz)
Normal mode	0.1	0.055430	0.100172
AFH mode	0.3	0.217431	0.392936

3. 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

79 channels are provided for BT-EDR mode:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

NOTE 1: By means of test software (QRCT v3.0.252.0) provided by manufacture, the power levels during the tests were set according to the following codes:

NOTE 2: Pre-Scan has been conducted to determine the worst-case mode from packet type; we found the DH5 was the worst case, and chosen for final test. Following test items were selected for the final test as listed below.

Test Items
Spurious emissions
Power density (Antenna power)
Occupied / spreading bandwidth

Bluetooth EDR

Modulation type: GFSK		Modulation type: $\pi/4$ -DQPSK		Modulation type: 8DPSK	
Channel	Power setting	Channel	Power setting	Channel	Power setting
0	8	0	8	0	8
39	8	39	8	39	8
78	8	78	8	78	8



3.3 Test Conditions

Test Conditions	Voltage (Vdc)
V_{normal}	24
$V_{\text{max.}}$	26.4 (Note)
$V_{\text{min.}}$	21.6 (Note)

Note: After checking the fluctuation of input voltage to the circuit of the radio part (excluding the power supply) of the equipment to be tested, the fluctuation less than $\pm 1\%$ when input voltage from an external supply into the equipment fluctuates $\pm 10\%$, therefore, the test is carried out only at the normal voltage.

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 1							
Type	Monopole						
Connector	RP-SMA(M)						
Straight position							
Frequency (MHz)	2400	2450	2500	5150	5350	5750	5850
Gain (dBi)	1.04	1.25	0.82	0.85	1.38	0.28	1.04
Bent position 90°							
Frequency (MHz)	2400	2450	2500	5150	5350	5750	5850
Gain (dBi)	1.19	1.57	2.57	0.66	1.03	0.59	1.19

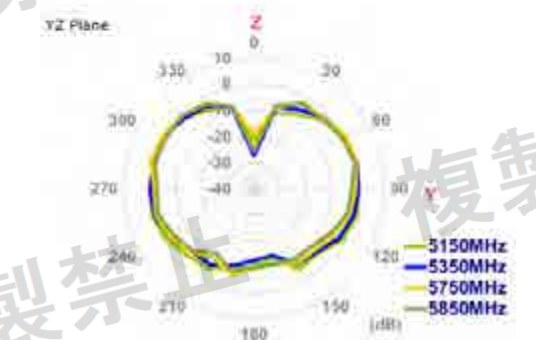
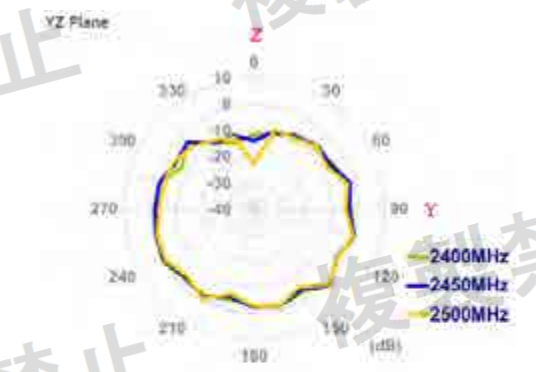
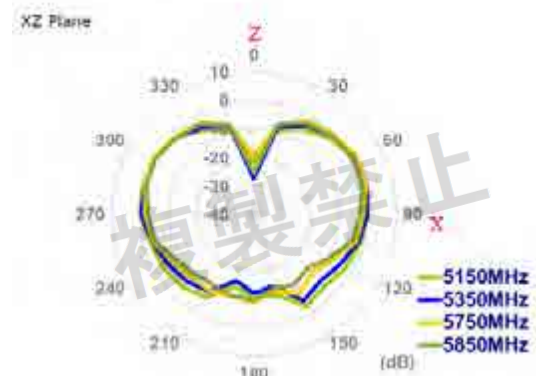
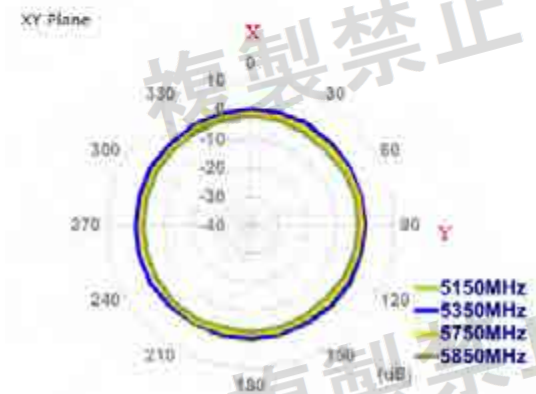
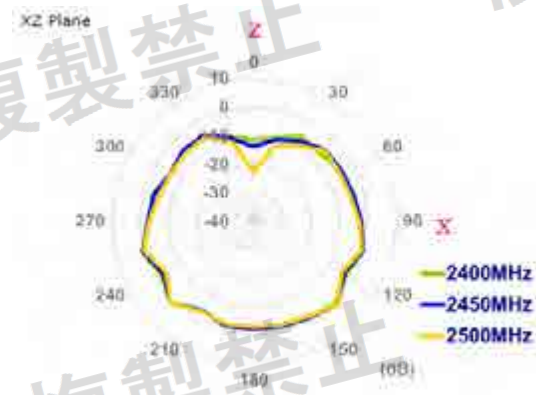
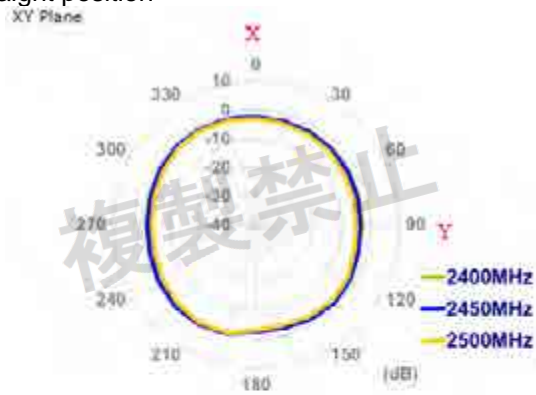
Antenna 2			
Type	Monopole		
Connector	SMA Male Reverse		
Frequency (MHz)	2400~2500		5150~5850
Gain (dBi)	1.64		-2.9



3.5.2 Antenna Pattern

Antenna 1

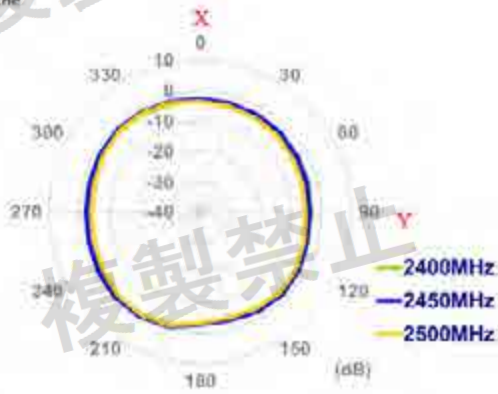
Straight position



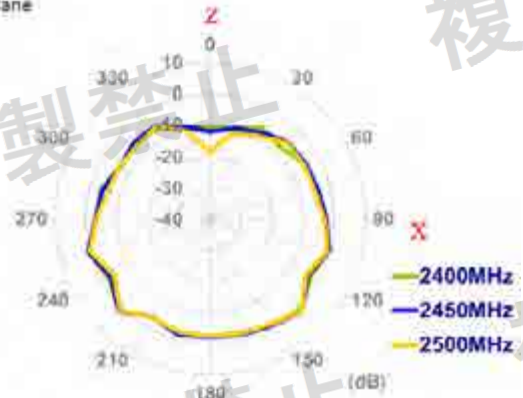


Bent position

XY Plane



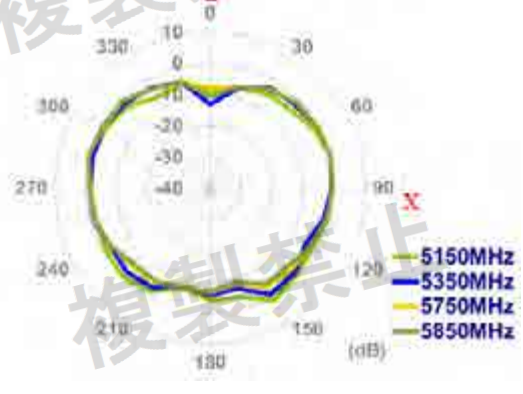
XZ Plane



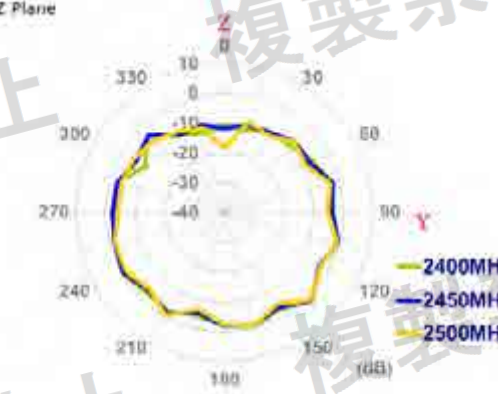
XY Plane



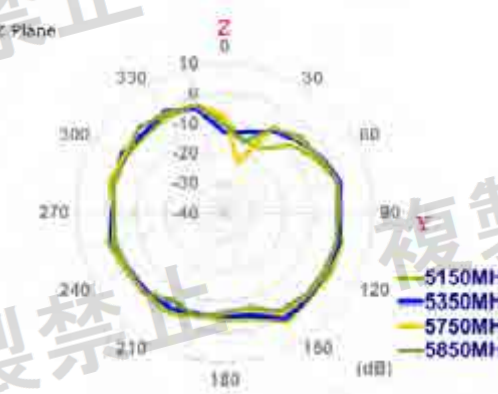
XZ Plane



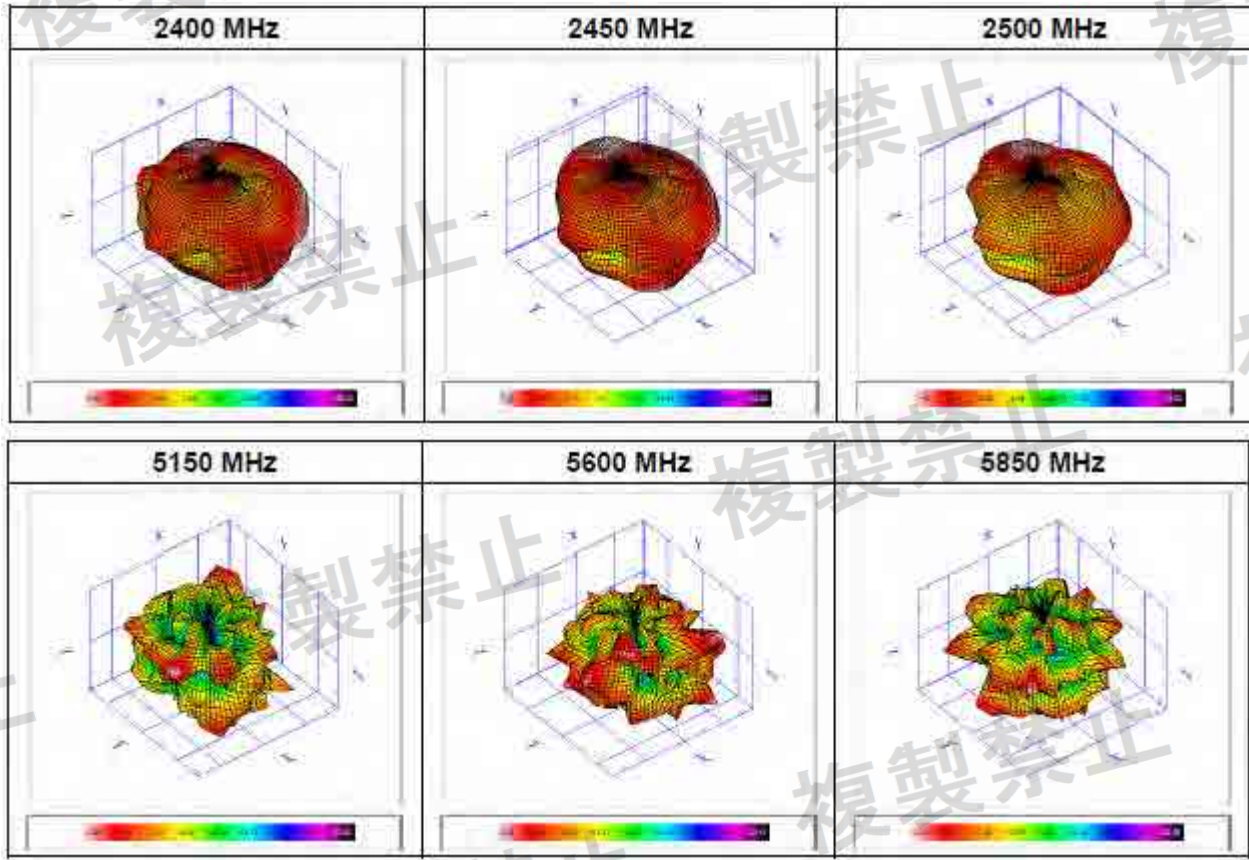
YZ Plane



YZ Plane



Antenna 2





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

Modulation: GFSK

Environmental Conditions		20 deg.C, 70% 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	2401.987290	-5.291	2401.987290	-5.291	2401.987290	-5.291
39	2441	2440.987000	-5.325	2440.987000	-5.325	2440.987000	-5.325
78	2480	2479.986660	-5.379	2479.986660	-5.379	2479.986660	-5.379



4.2 Occupied Bandwidth Measurement (99% power bandwidth)

4.2.1 Limits of Occupied Bandwidth Measurement

Item	Limit
Occupied bandwidth	<83.5 MHz

4.2.2 Test Setup



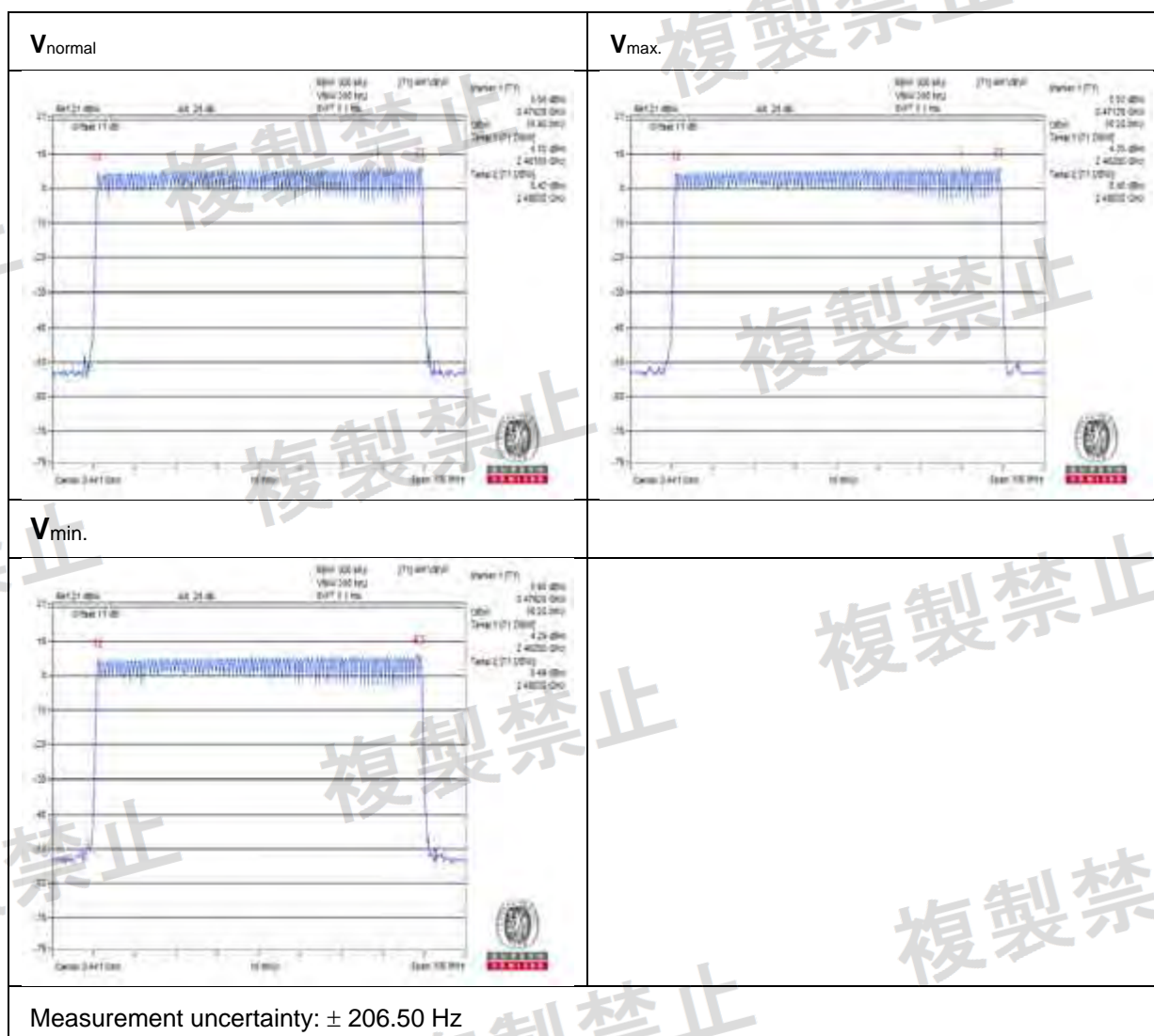


4.2.3 Test Results

Modulation: GFSK
NORMAL MODE

Environmental Conditions	20 deg.C, 70% RH	
Voltage normal	Voltage max.	Voltage min.
Occupied bandwidth (MHz)	Occupied bandwidth (MHz)	Occupied bandwidth (MHz)
78.40	78.20	78.20
Measurement uncertainty	± 206.50 Hz	

NOTE: For the test plots please refer to the below.

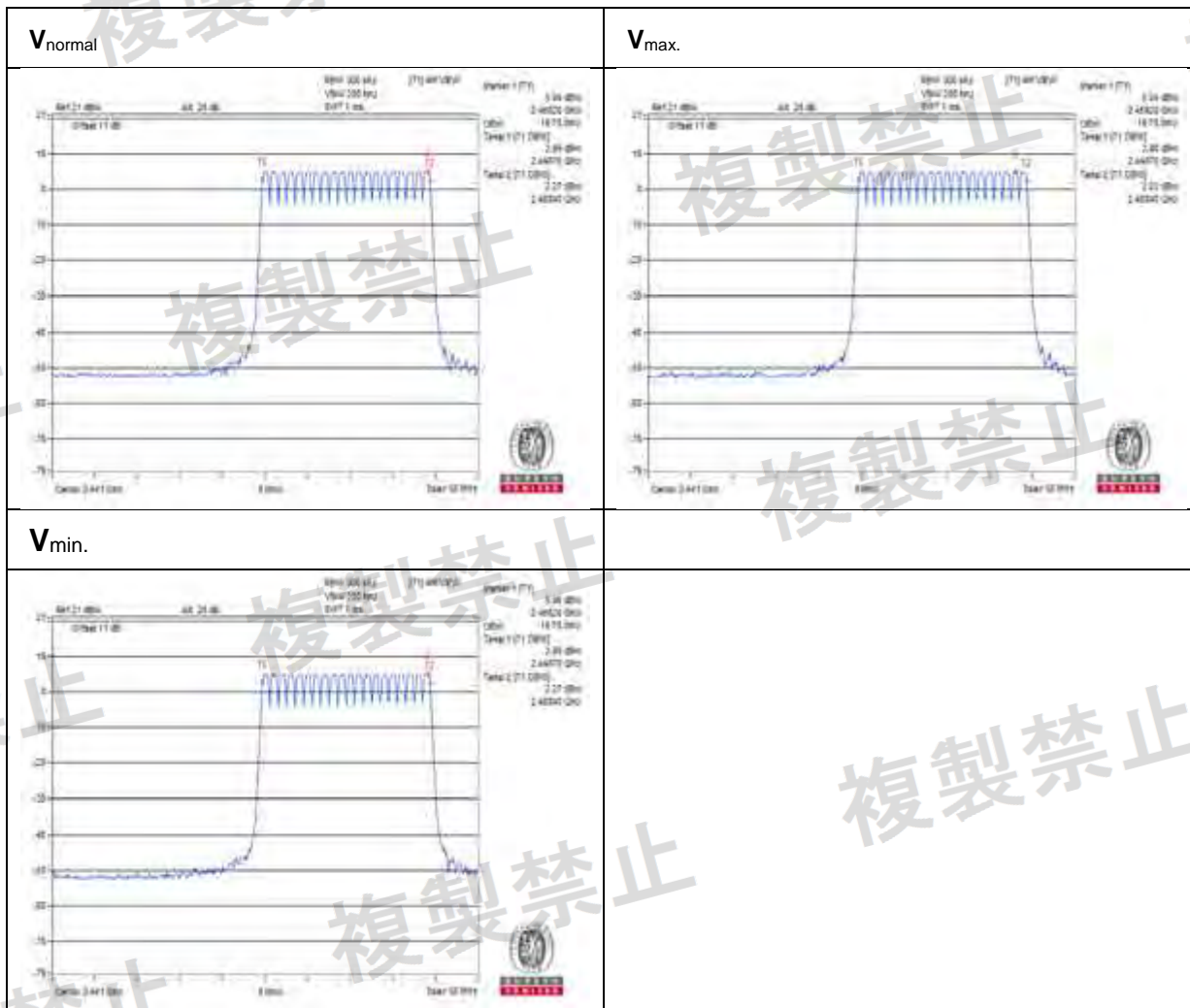




AFH MODE

Environmental Conditions	20 deg.C, 70% RH	
Voltage normal	Voltage max.	Voltage min.
Occupied bandwidth (MHz)	Occupied bandwidth (MHz)	Occupied bandwidth (MHz)
19.70	19.70	19.70
Measurement uncertainty	± 206.50 Hz	

NOTE: For the test plots please refer to the below.



Measurement uncertainty: ± 206.50 Hz

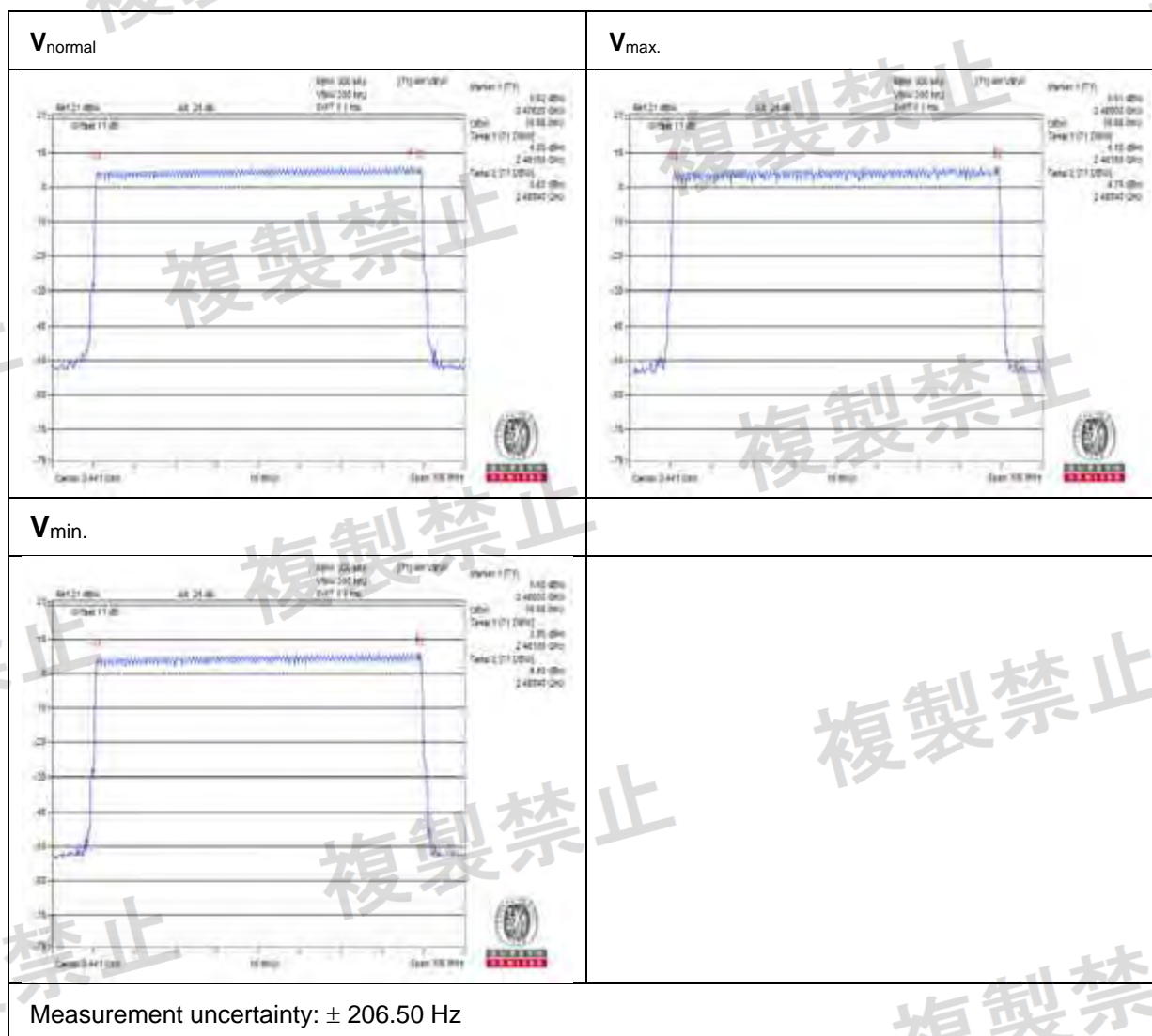


Modulation: $\pi/4$ -DQPSK

NORMAL MODE

Environmental Conditions			20 deg.C, 70% RH		
Voltage _{normal}		Voltage _{max.}		Voltage _{min.}	
Occupied bandwidth (MHz)		Occupied bandwidth (MHz)		Occupied bandwidth (MHz)	
78.60		78.60		78.60	
Measurement uncertainty		± 206.50 Hz			

NOTE: For the test plots please refer to the below.

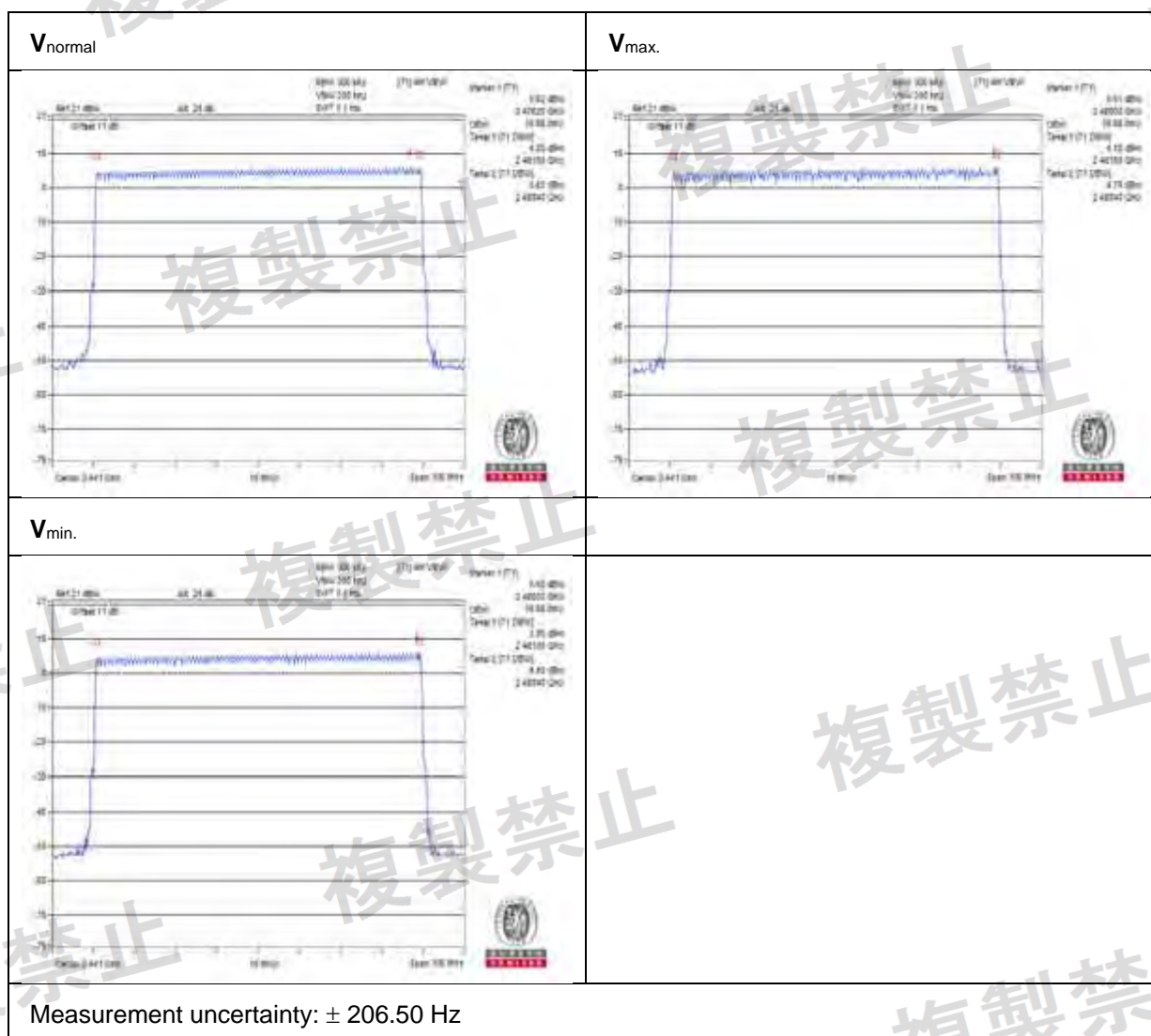




Modulation: 8DPSK
NORMAL MODE

Environmental Conditions	20 deg.C, 70% RH	
Voltage normal	Voltage max.	Voltage min.
Occupied bandwidth (MHz)	Occupied bandwidth (MHz)	Occupied bandwidth (MHz)
78.60	78.60	78.60
Measurement uncertainty	± 206.50 Hz	

NOTE: For the test plots please refer to the below.



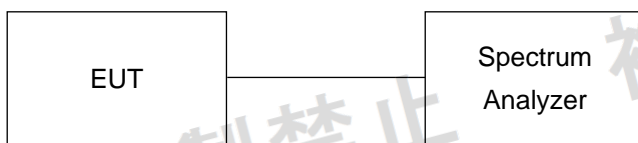


4.3 Spreading Bandwidth Measurement (90% power bandwidth)

4.3.1 Limits of Spreading Bandwidth and Spreading Factor Measurement

Item	Limit	Remark
Spreading Bandwidth	$\geq 500\text{kHz}$	(For DSSS, FHSS)
Spreading Factor	≥ 5	Operating frequency 2400 to 2483.5MHz

4.3.2 Test Setup



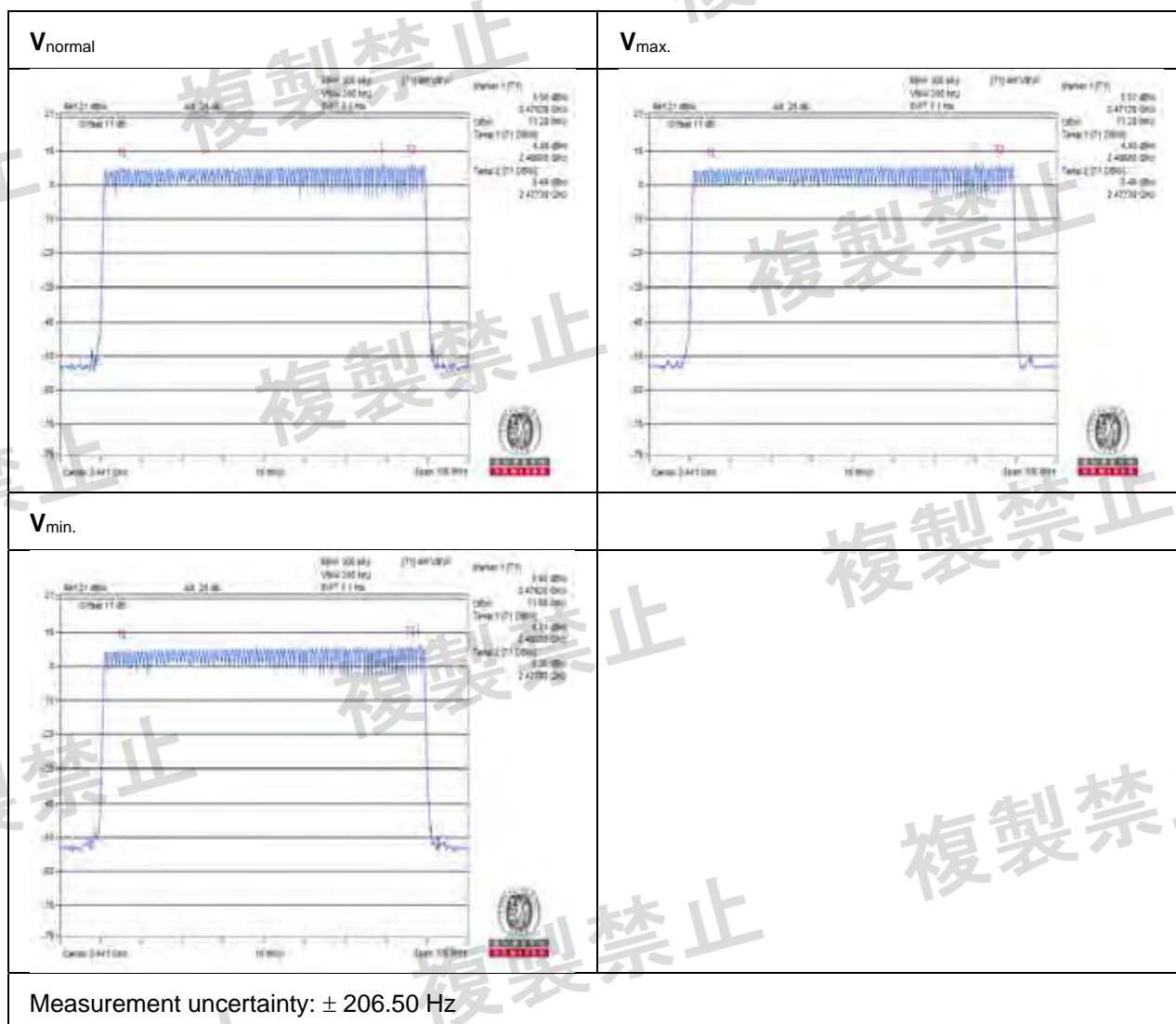


4.3.3 Test Results

Modulation: GFSK
NORMAL MODE

Environmental Conditions		20 deg.C, 70% RH			
Voltage normal		Voltage max.		Voltage min.	
Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
71.20	71.20	71.20	71.20	71.00	71.00
Measurement uncertainty		± 206.50 Hz			

NOTE: 1. Spreading Factor: 90% channel power bandwidth / 1.
2. For the test plots please refer to the below.

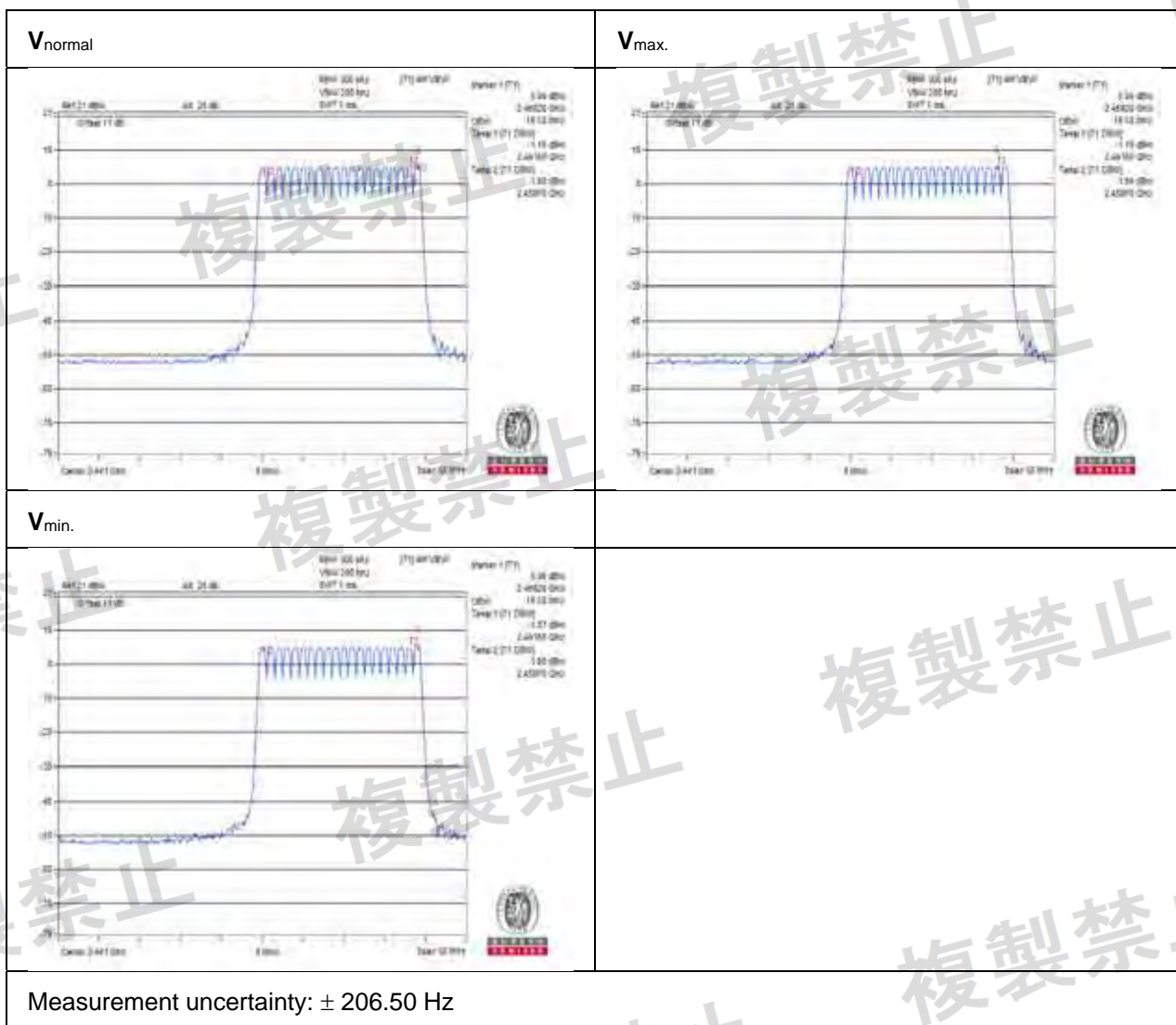




AFH MODE

Environmental Conditions		20 deg.C, 70% RH			
Voltage normal		Voltage max.		Voltage min.	
Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
18.10	18.10	18.10	18.10	18.10	18.10
Measurement uncertainty		± 206.50 Hz			

NOTE: 1. Spreading Factor: 90% channel power bandwidth / 1.
2. For the test plots please refer to the below

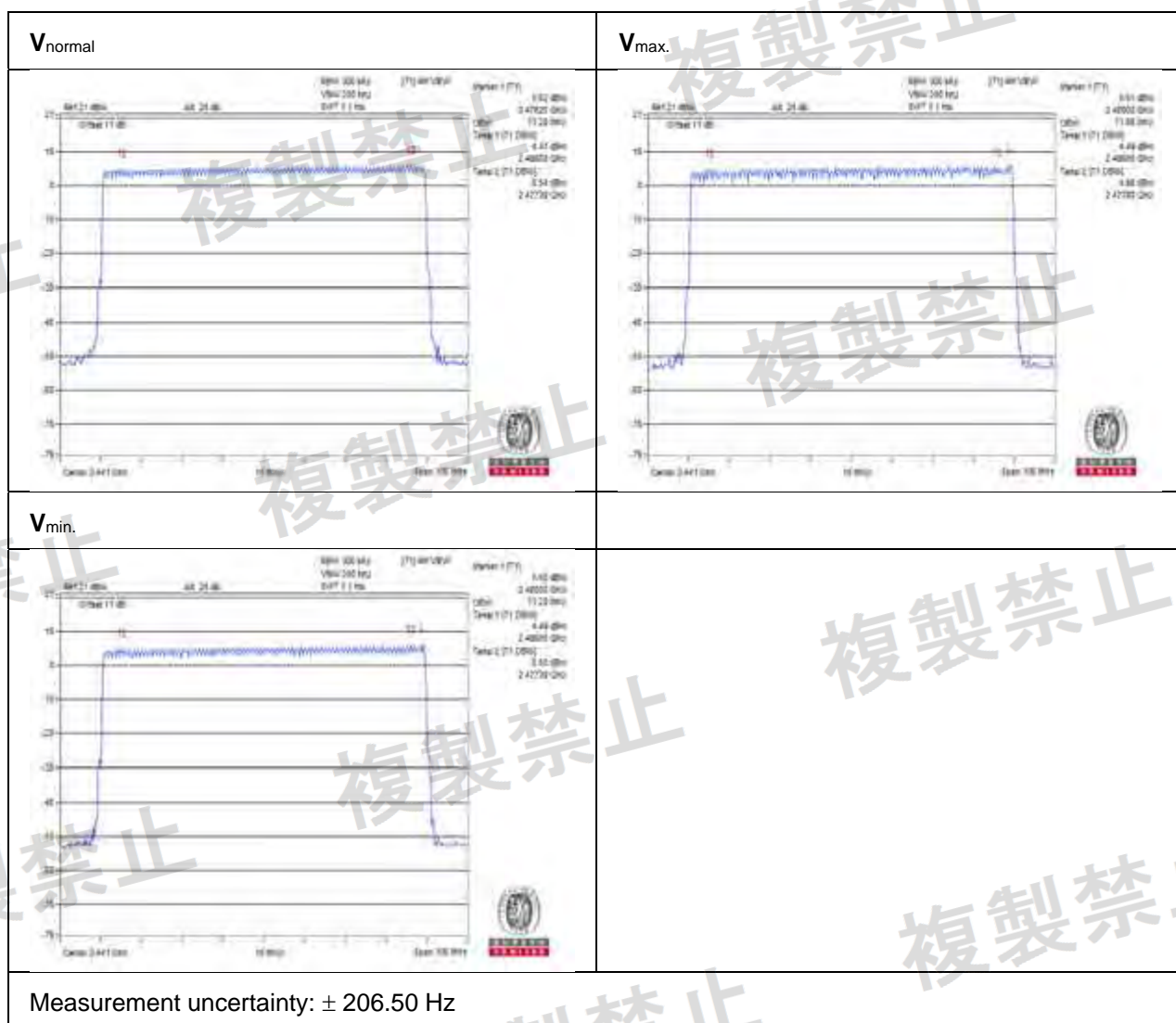




Modulation: $\pi/4$ -DQPSK
NORMAL MODE

Environmental Conditions		20 deg.C, 70% RH			
Voltage normal		Voltage max.		Voltage min.	
Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
71.20	71.20	71.00	71.00	71.20	71.20
Measurement uncertainty		± 206.50 Hz			

NOTE: 1. Spreading Factor: 90% channel power bandwidth / 1.
2. For the test plots please refer to the below.

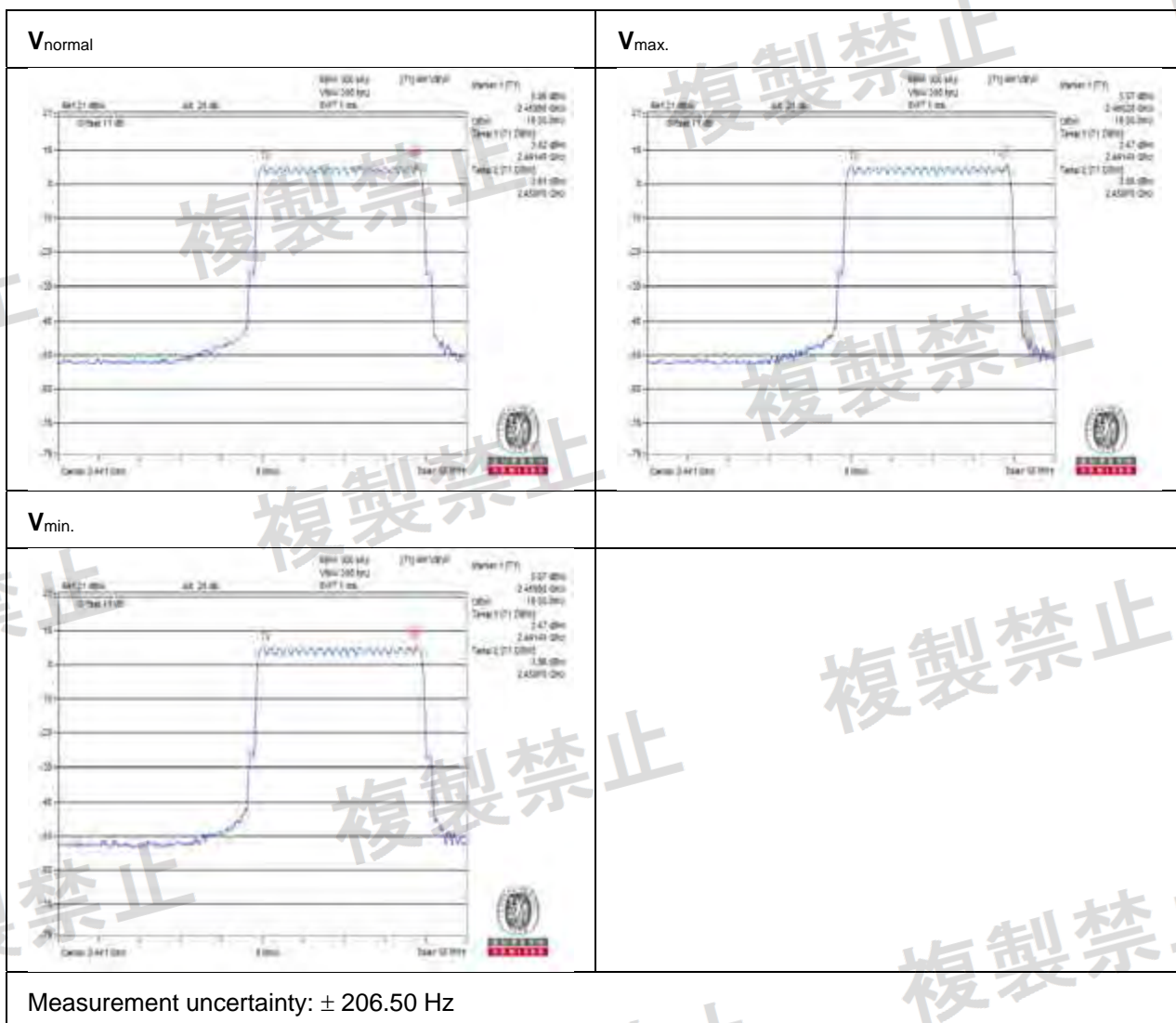




AFH MODE

Environmental Conditions		20 deg.C, 70% RH			
Voltage normal		Voltage max.		Voltage min.	
Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
18.30	18.30	18.30	18.30	18.30	18.30
Measurement uncertainty		± 206.50 Hz			

NOTE: 1. Spreading Factor: 90% channel power bandwidth / 1.
2. For the test plots please refer to the below.



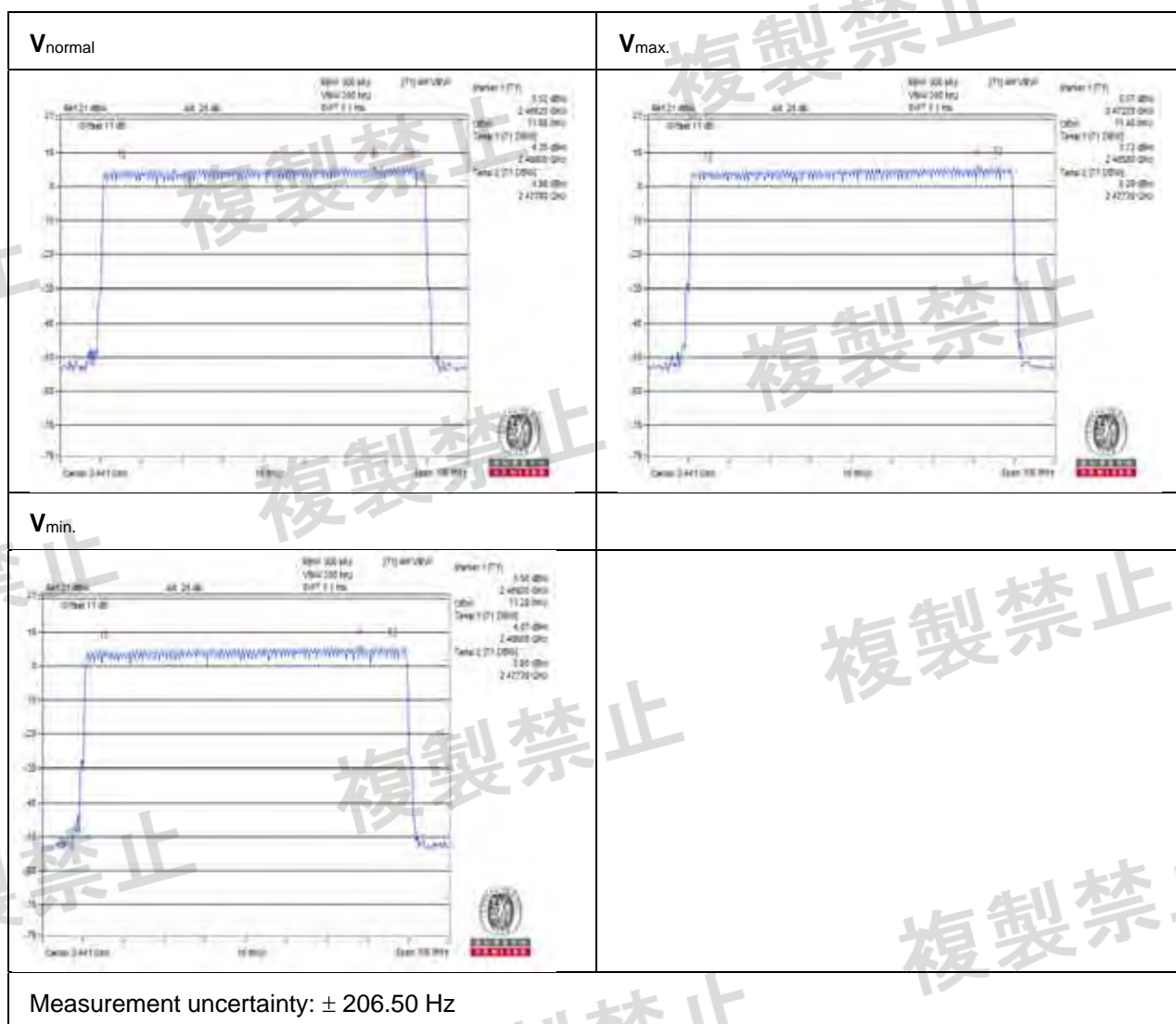


Modulation: 8DPSK

NORMAL MODE

Environmental Conditions		20 deg.C, 70% RH			
Voltage normal		Voltage max.		Voltage min.	
Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
71.00	71.00	71.40	71.40	71.20	71.20
Measurement uncertainty		± 206.50 Hz			

NOTE: 1. Spreading Factor: 90% channel power bandwidth / 1.
2. For the test plots please refer to the below.

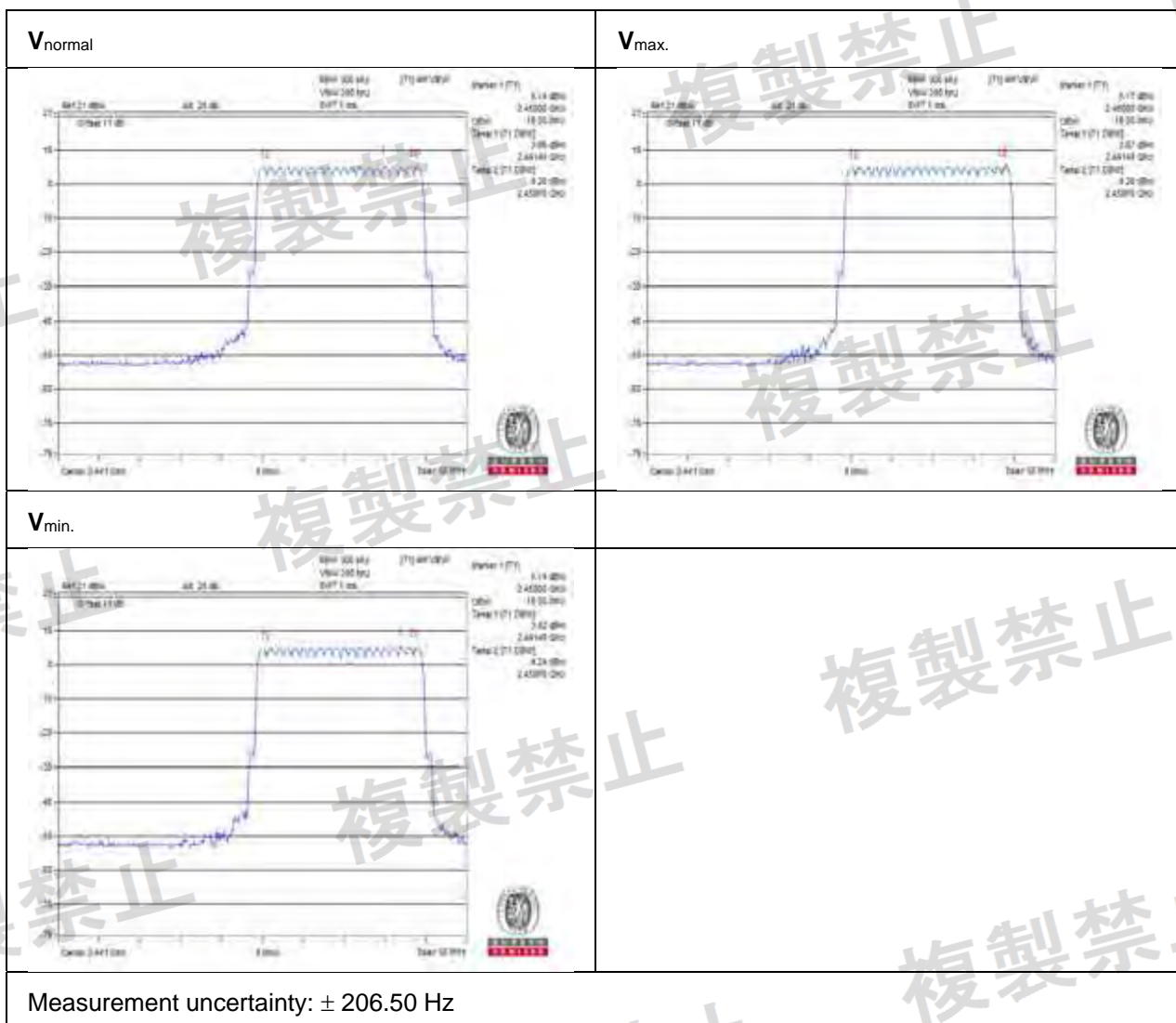




AFH MODE

Environmental Conditions		20 deg.C, 70% RH			
Voltage normal		Voltage max.		Voltage min.	
Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
18.30	18.30	18.30	18.30	18.30	18.30
Measurement uncertainty		± 206.50 Hz			

NOTE: 1. Spreading Factor: 90% channel power bandwidth / 1.
2. For the test plots please refer to the below.





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

Modulation: GFSK

Environmental Conditions		20 deg.C, 70% RH					
Test Channel		CH 0 (2402MHz)		CH 39 (2441MHz)		Limit	Result
Test Condition	Frequency Range	Frequency (MHz)	Measure. Value	Frequency (MHz)	Measure. Value		
V _{normal}	30.0MHz to 1000.0MHz	773.020	0.001841uW	992.240	0.002223uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2112.370	0.016406uW	2345.390	0.022961uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2400.000	0.563638uW	2396.410	0.02138uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2494.340	0.021429uW	2484.200	0.022909uW	25uW	PASS
	2496.5MHz to 12500.0MHz	11219.550	0.095499uW	11239.550	0.072444uW	2.5uW	PASS
V _{max.}	30.0MHz to 1000.0MHz	982.540	0.001897uW	998.060	0.00169uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2156.750	0.018323uW	2312.100	0.022182uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2400.000	0.524807uW	2392.530	0.021184uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2489.370	0.02133uW	2485.680	0.020512uW	25uW	PASS
	2496.5MHz to 12500.0MHz	10879.430	0.074302uW	11519.650	0.068234uW	2.5uW	PASS
V _{min.}	30.0MHz to 1000.0MHz	522.760	0.002317uW	974.780	0.001854uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2226.100	0.021232uW	2312.100	0.027861uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2400.000	0.57544uW	2391.390	0.025527uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2490.000	0.024378uW	2493.170	0.023714uW	25uW	PASS
	2496.5MHz to 12500.0MHz	11239.550	0.062661uW	11259.560	0.060534uW	2.5uW	PASS

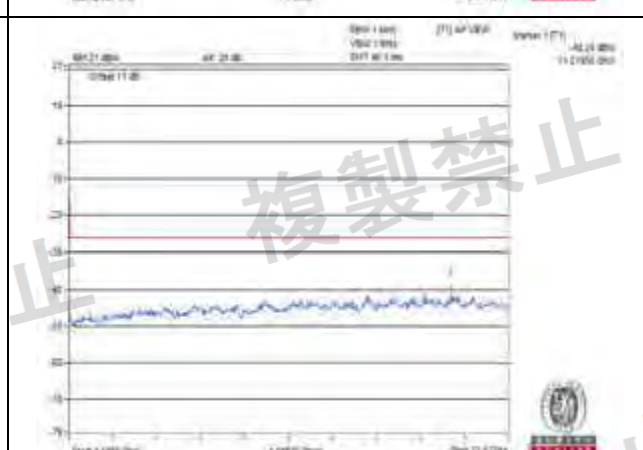
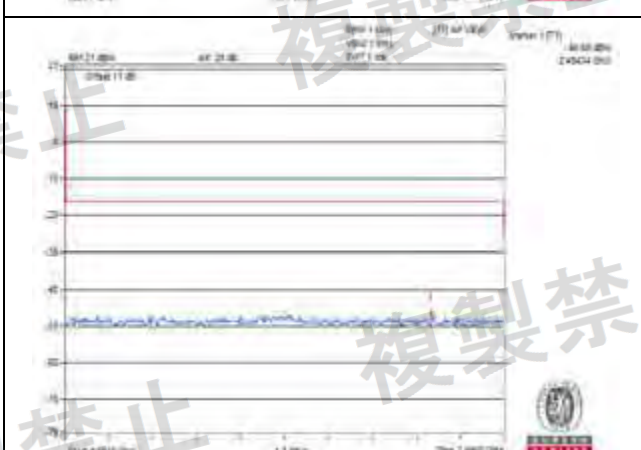
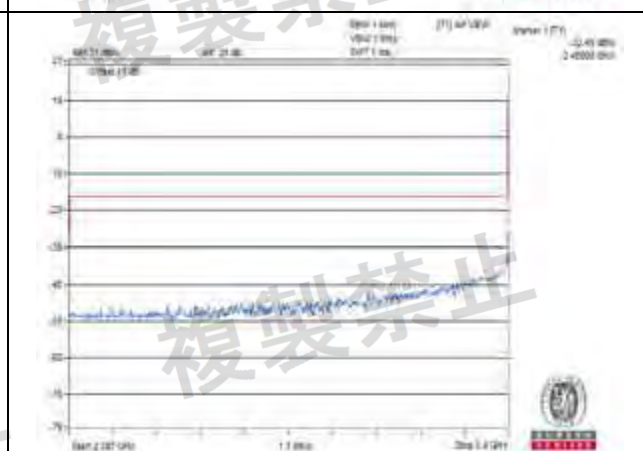
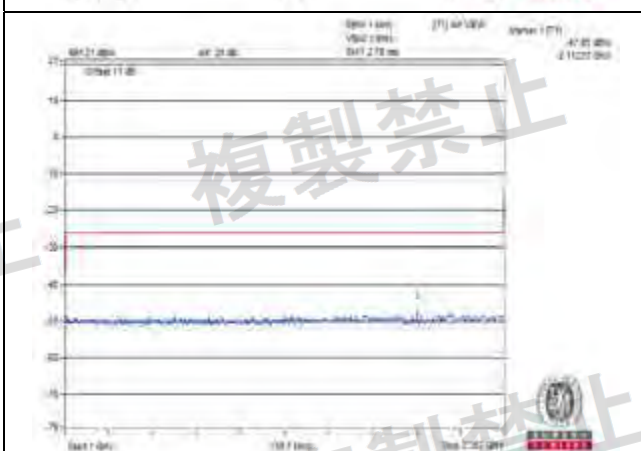
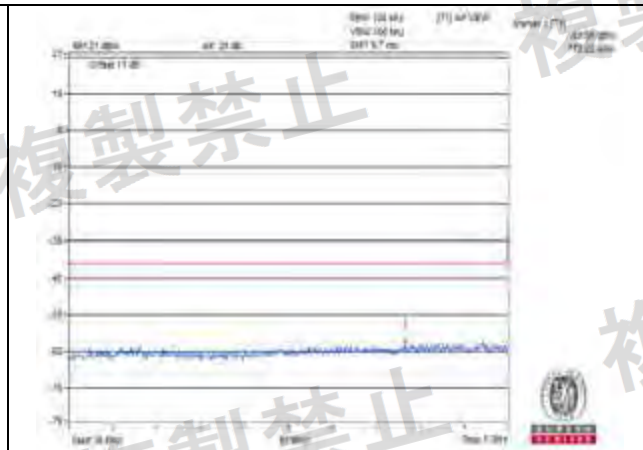
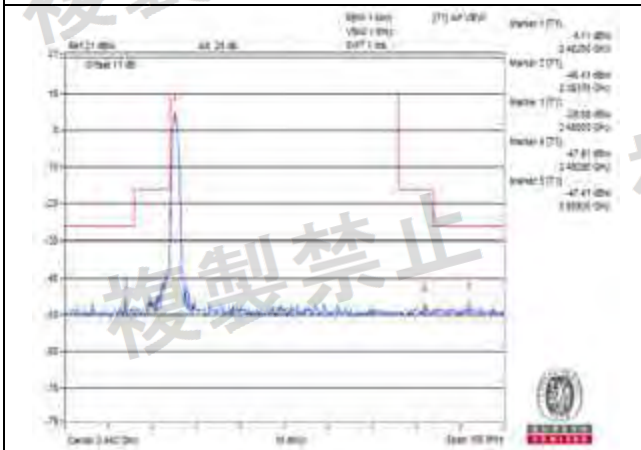


Environmental Conditions		20 deg.C, 70% RH			
Test Channel		CH 78 (2480MHz)		Limit	Result
Test Condition	Frequency Range	Frequency (MHz)	Measure. Value		
V _{normal}	30.0MHz to 1000.0MHz	949.560	0.002183uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2306.550	0.022856uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2392.460	0.019953uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2484.280	0.109144uW	25uW	PASS
	2496.5MHz to 12500.0MHz	9959.110	0.082224uW	2.5uW	PASS
V _{max.}	30.0MHz to 1000.0MHz	759.440	0.00173uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2348.160	0.031842uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2390.870	0.022439uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2483.680	0.11749uW	25uW	PASS
	2496.5MHz to 12500.0MHz	12039.830	0.067453uW	2.5uW	PASS
V _{min.}	30.0MHz to 1000.0MHz	891.360	0.001866uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2192.820	0.019815uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2396.620	0.021777uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2483.700	0.124451uW	25uW	PASS
	2496.5MHz to 12500.0MHz	11359.600	0.067298uW	2.5uW	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.



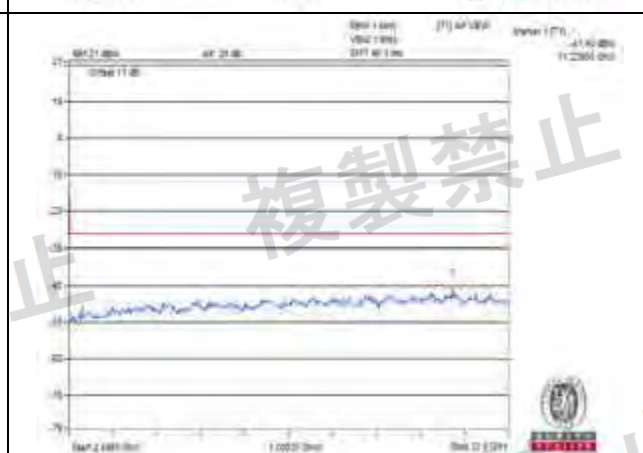
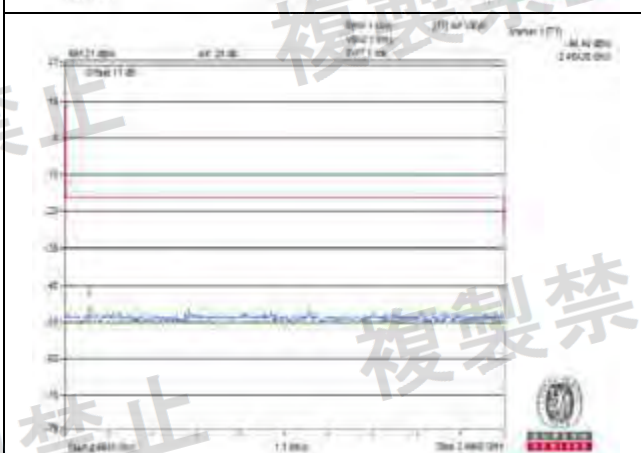
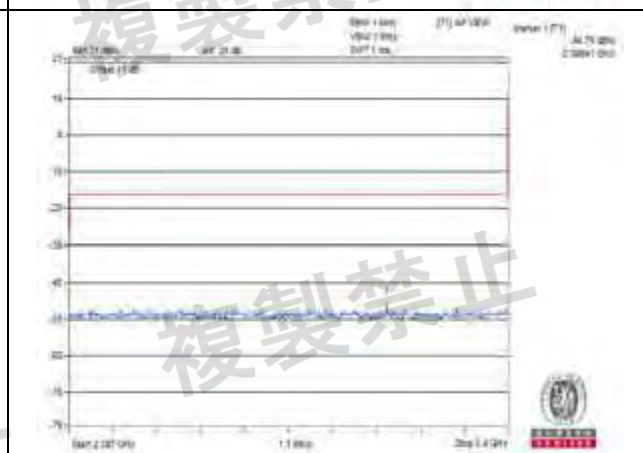
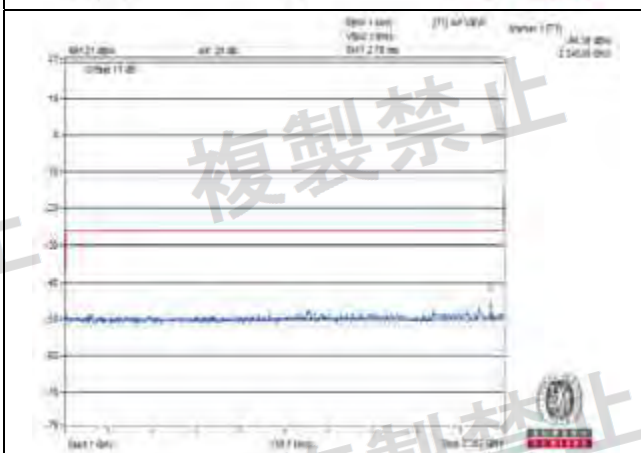
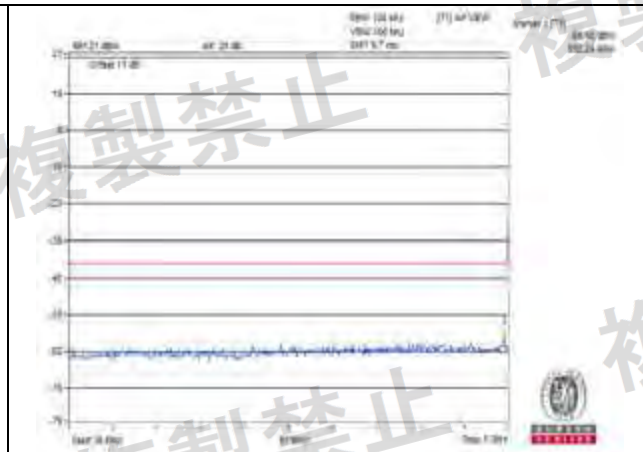
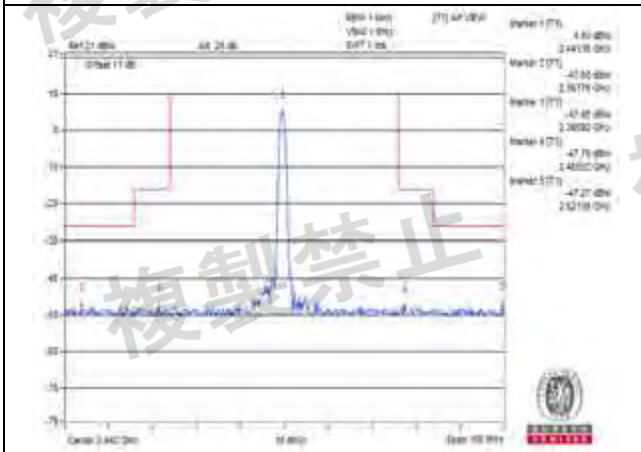
V_{normal}
Channel 0



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



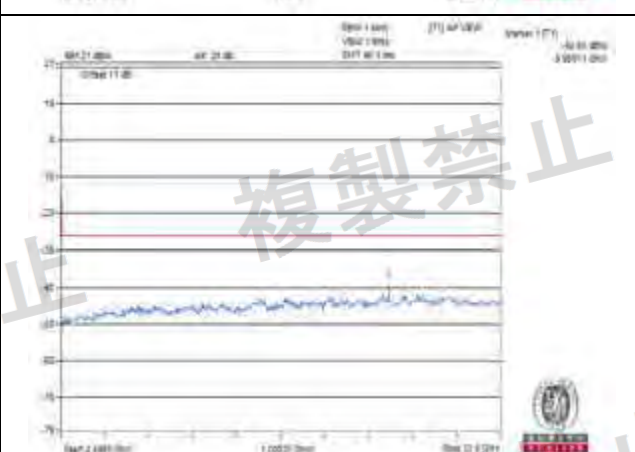
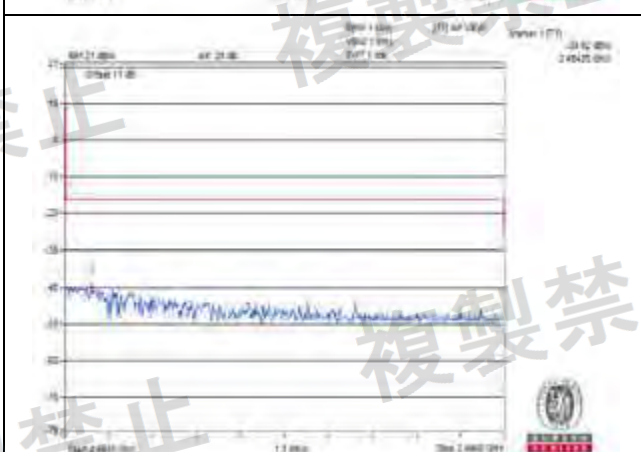
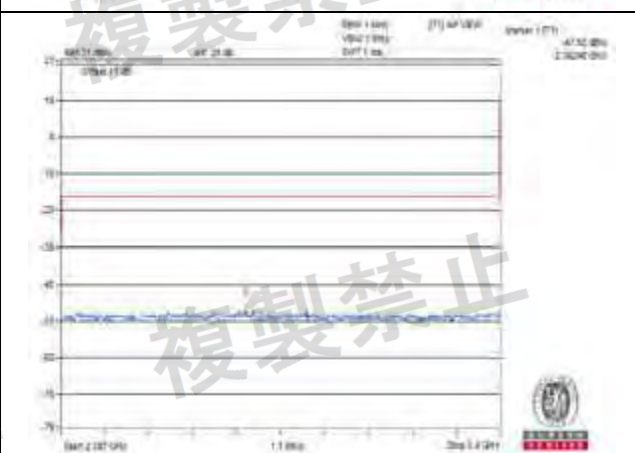
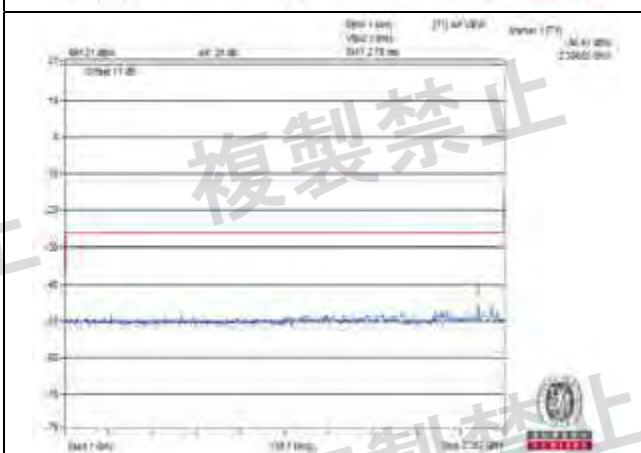
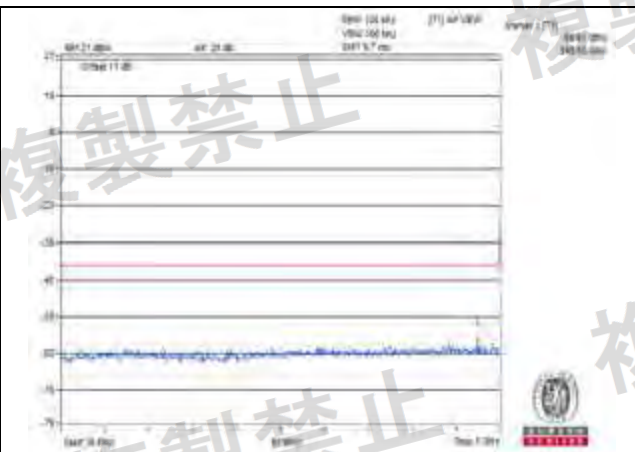
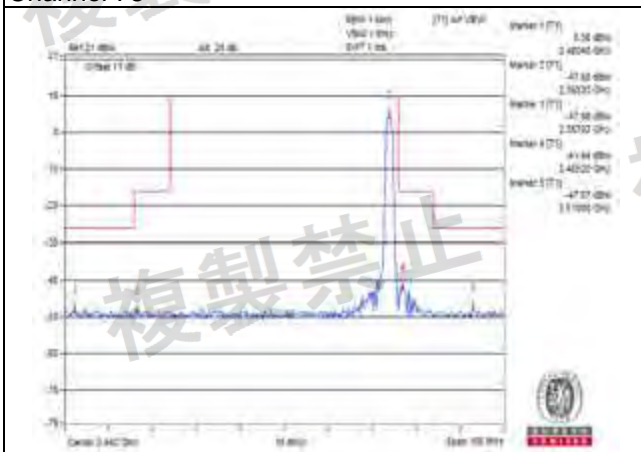
V_{normal}
Channel 39



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



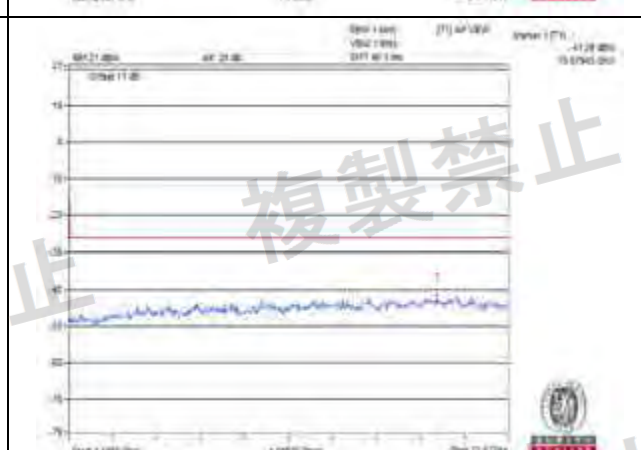
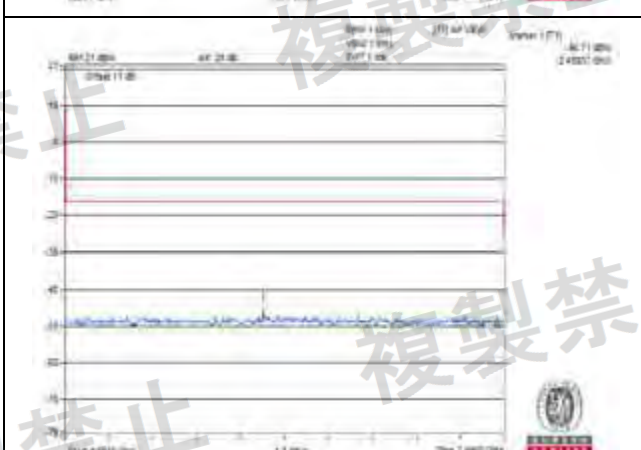
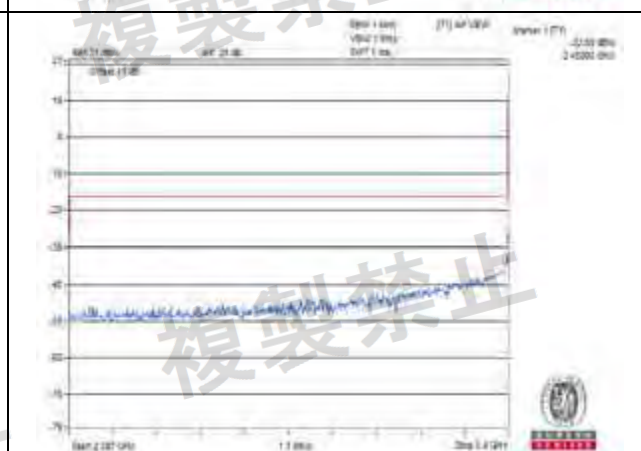
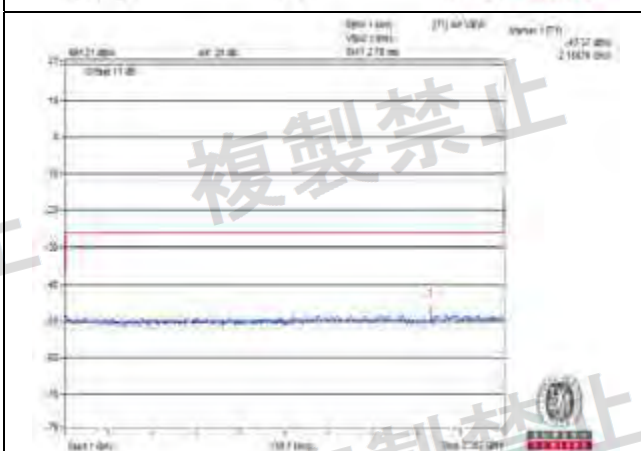
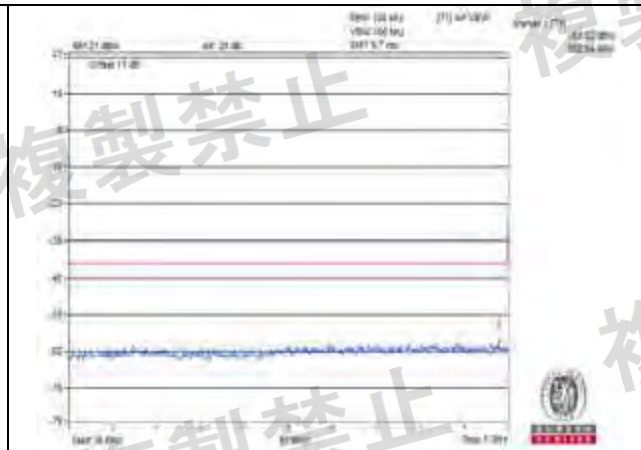
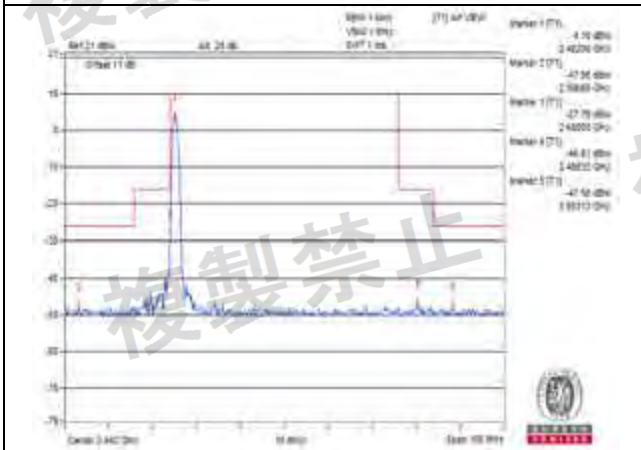
V_{normal}
Channel 78



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



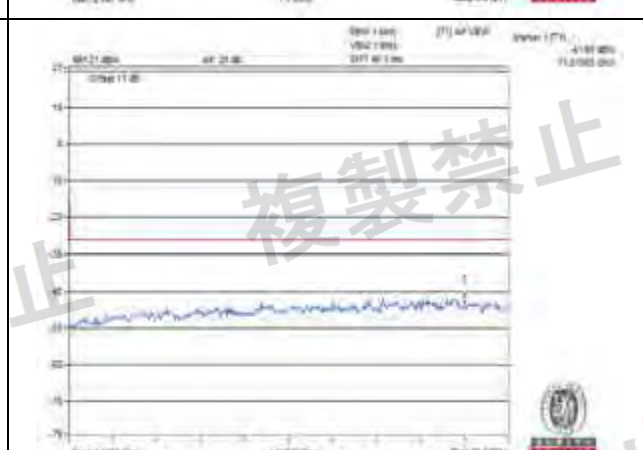
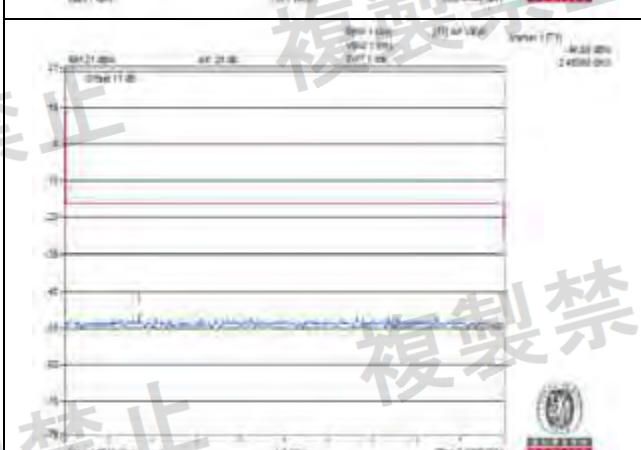
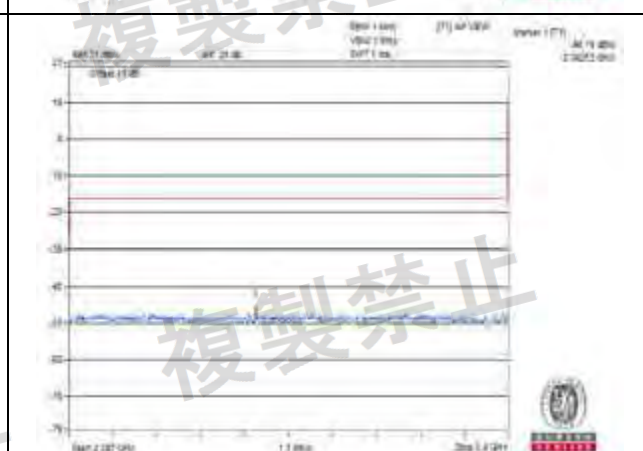
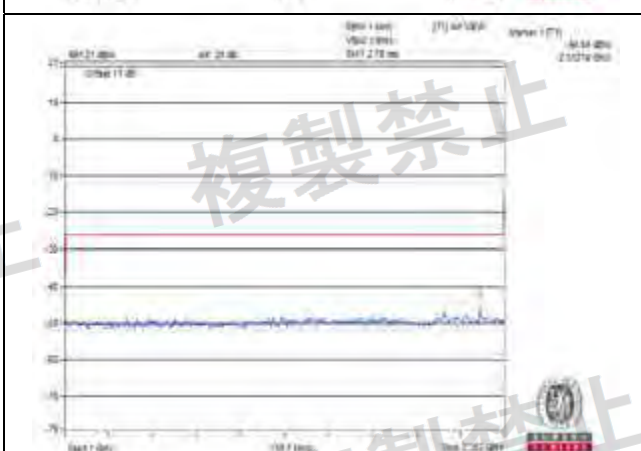
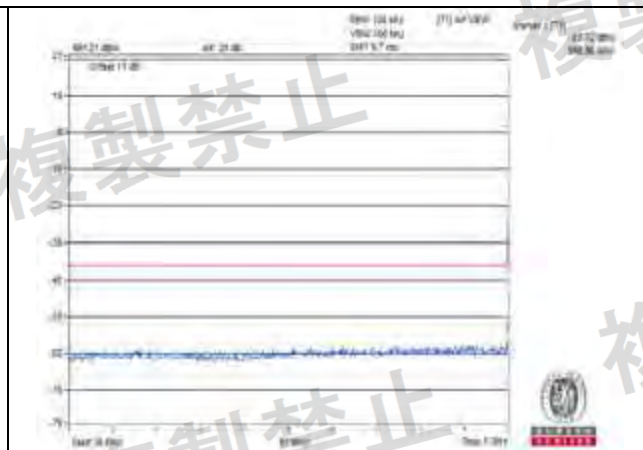
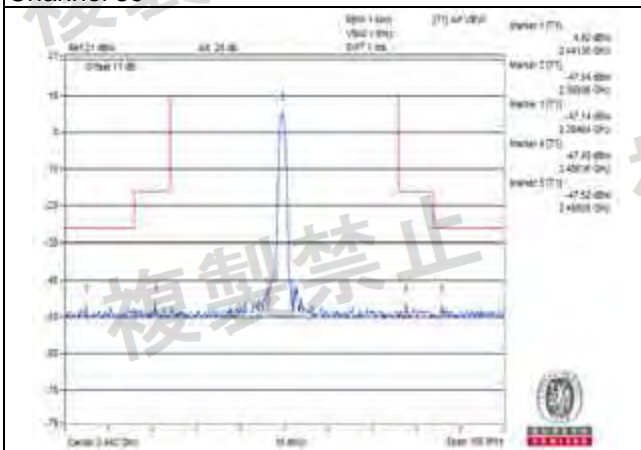
V_{max}
Channel 0



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



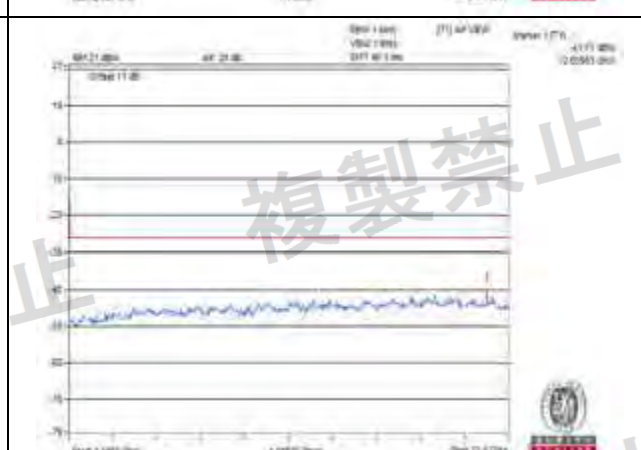
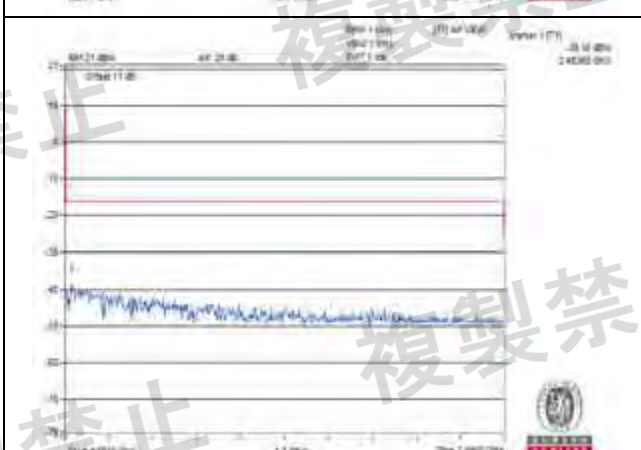
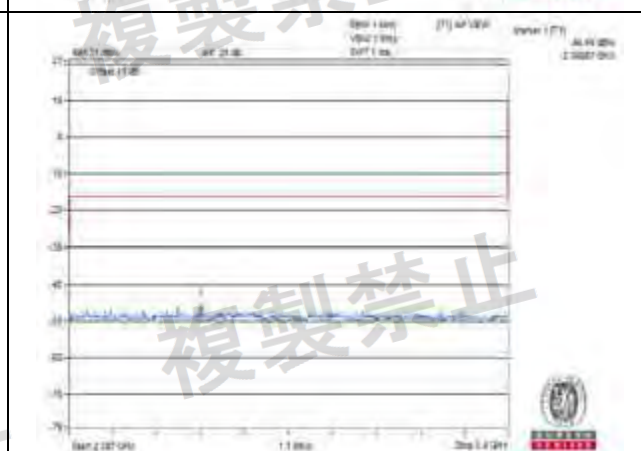
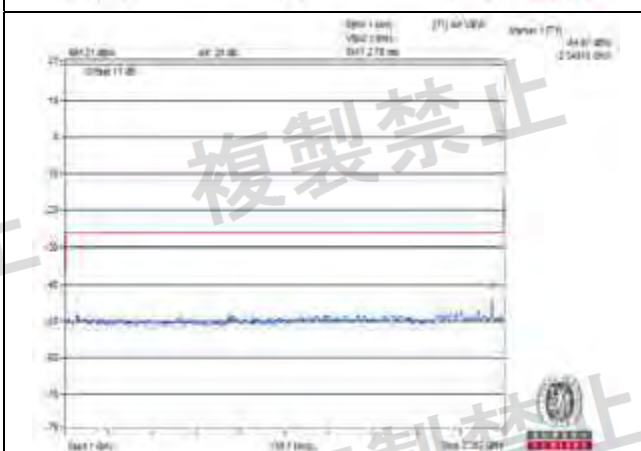
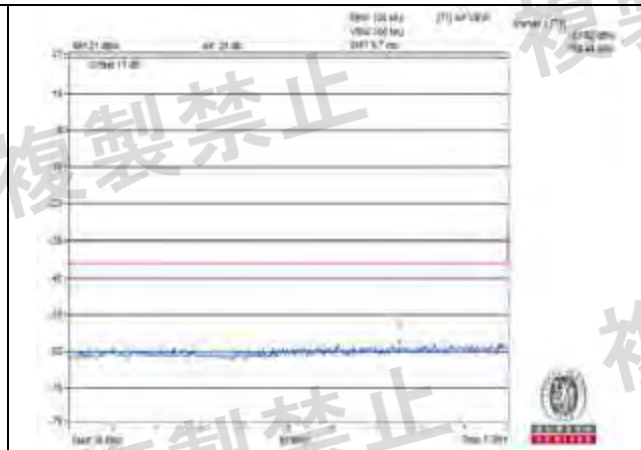
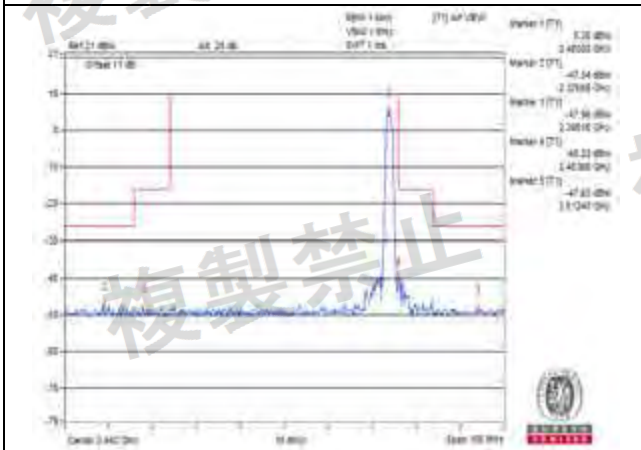
V_{max}
Channel 39



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



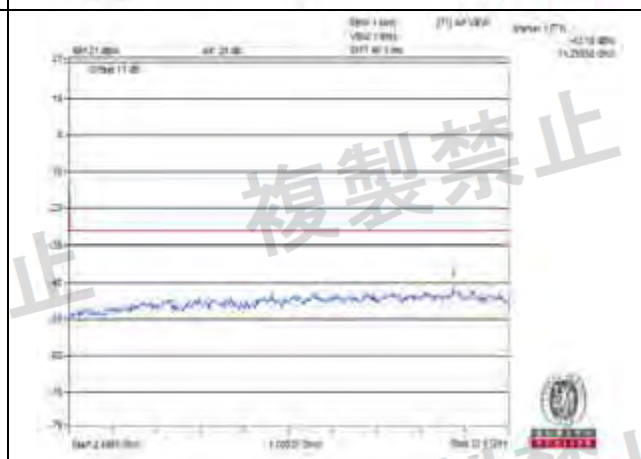
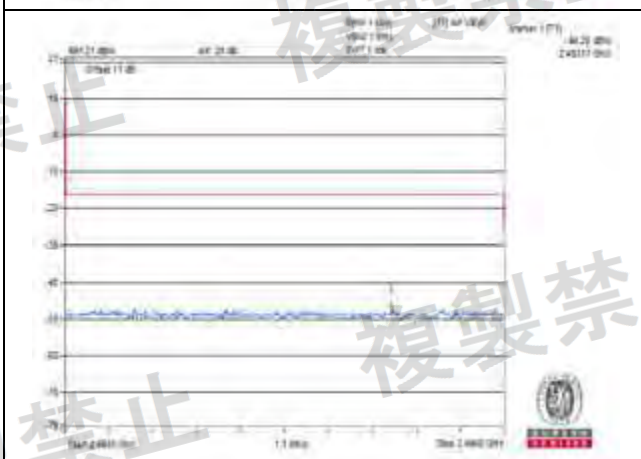
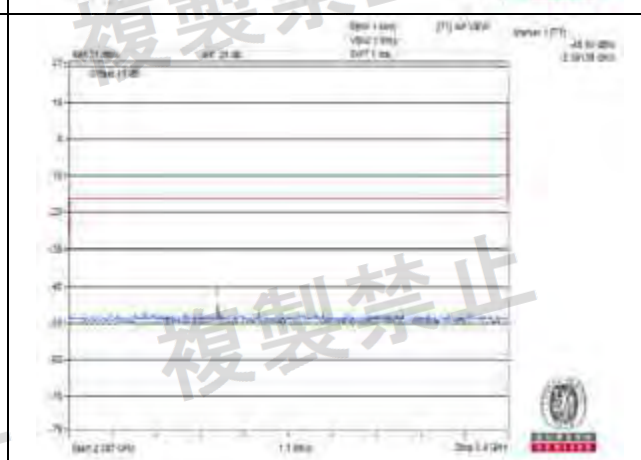
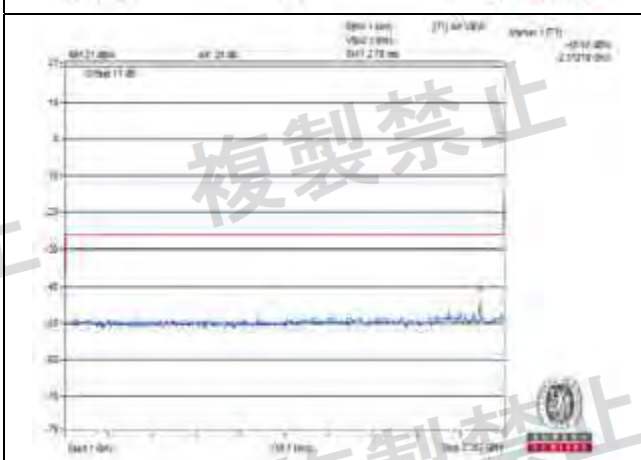
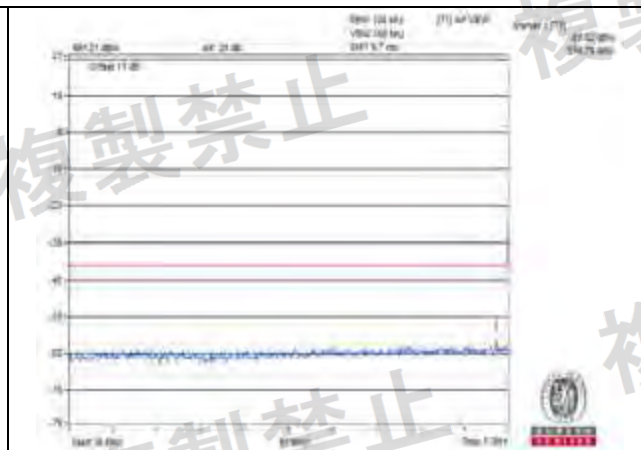
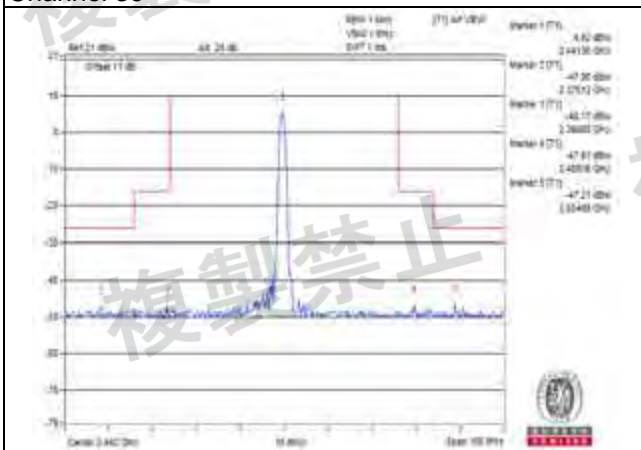
V_{max}
Channel 78



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



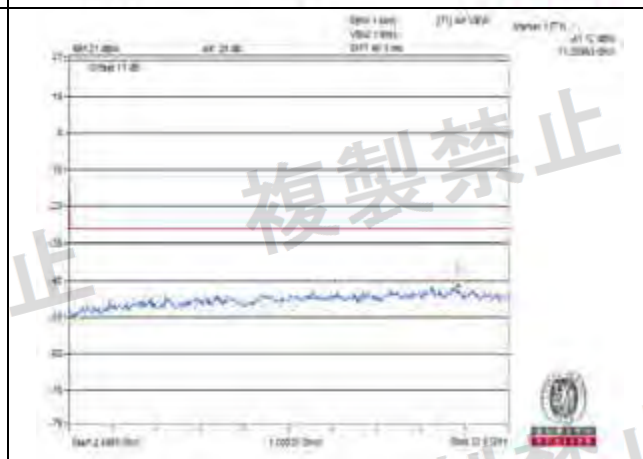
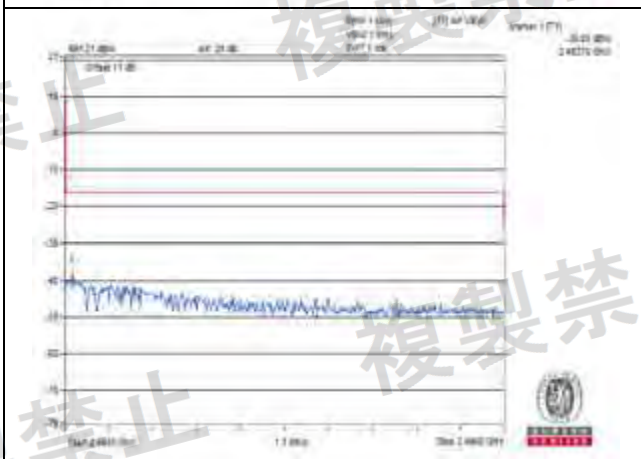
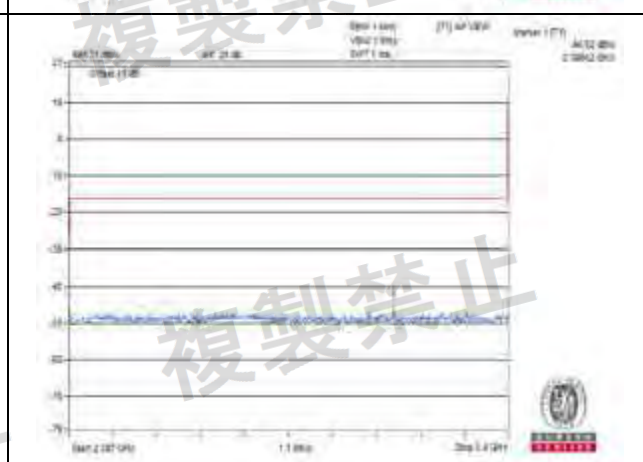
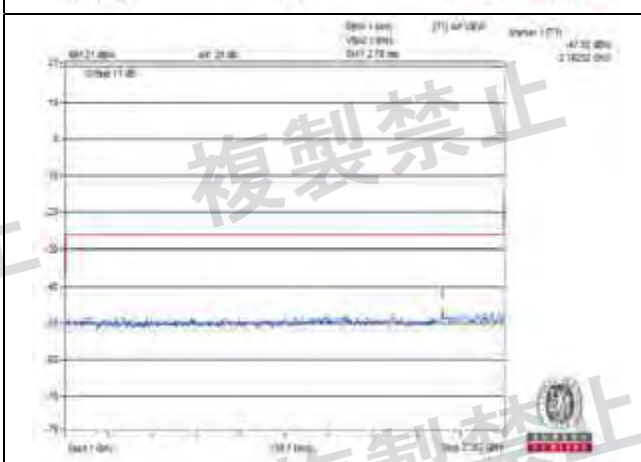
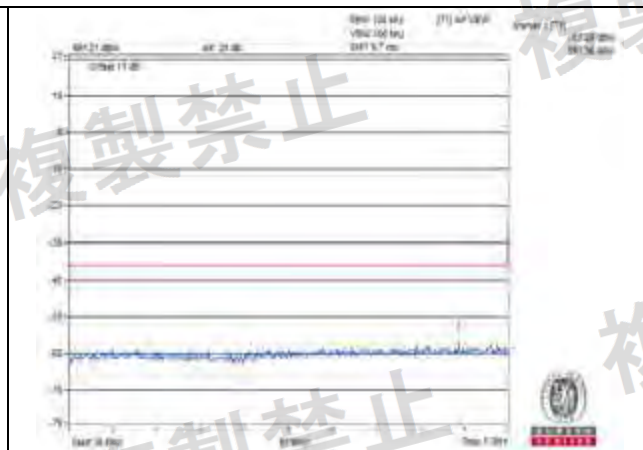
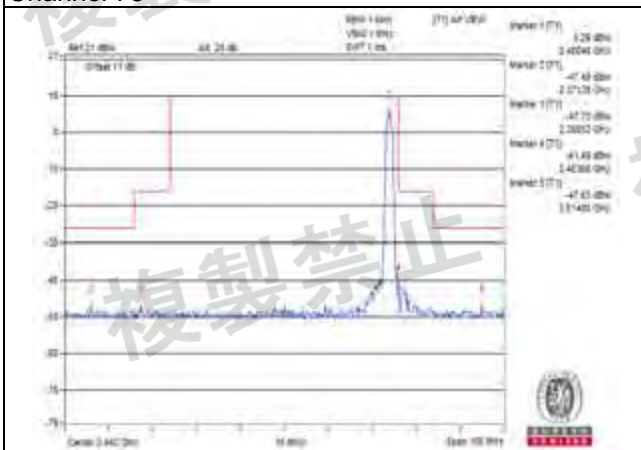
V_{min}
Channel 39



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



V_{min}
Channel 78



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



Modulation: $\pi/4$ -DQPSK

Environmental Conditions		20 deg.C, 70% RH					
Test Channel		CH 0 (2402MHz)		CH 39 (2441MHz)		Limit	Result
Test Condition	Frequency Range	Frequency (MHz)	Measure. Value	Frequency (MHz)	Measure. Value		
V _{normal}	30.0MHz to 1000.0MHz	949.560	0.002173uW	846.740	0.002061uW	0.25uW	PASS
	1000.0MHz to 2387MHz	1196.950	0.017258uW	2364.800	0.021038uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2400.000	6.067363uW	2394.980	0.02037uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2488.200	0.024322uW	2491.790	0.022439uW	25uW	PASS
	2496.5MHz to 12500.0MHz	11739.730	0.068549uW	8038.430	0.065615uW	2.5uW	PASS
V _{max.}	30.0MHz to 1000.0MHz	943.740	0.001963uW	910.760	0.001932uW	0.25uW	PASS
	1000.0MHz to 2387MHz	1968.120	0.018621uW	1901.550	0.019724uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2400.000	5.296634uW	2396.540	0.021528uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2489.420	0.023988uW	2496.310	0.019364uW	25uW	PASS
	2496.5MHz to 12500.0MHz	11299.580	0.073961uW	11319.580	0.070307uW	2.5uW	PASS
V _{min.}	30.0MHz to 1000.0MHz	868.080	0.001905uW	825.400	0.002254uW	0.25uW	PASS
	1000.0MHz to 2387MHz	1801.680	0.019543uW	2309.320	0.021232uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2400.000	5.902011uW	2390.120	0.021777uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2490.000	0.021777uW	2496.470	0.021727uW	25uW	PASS
	2496.5MHz to 12500.0MHz	11239.550	0.07656uW	11279.570	0.068391uW	2.5uW	PASS

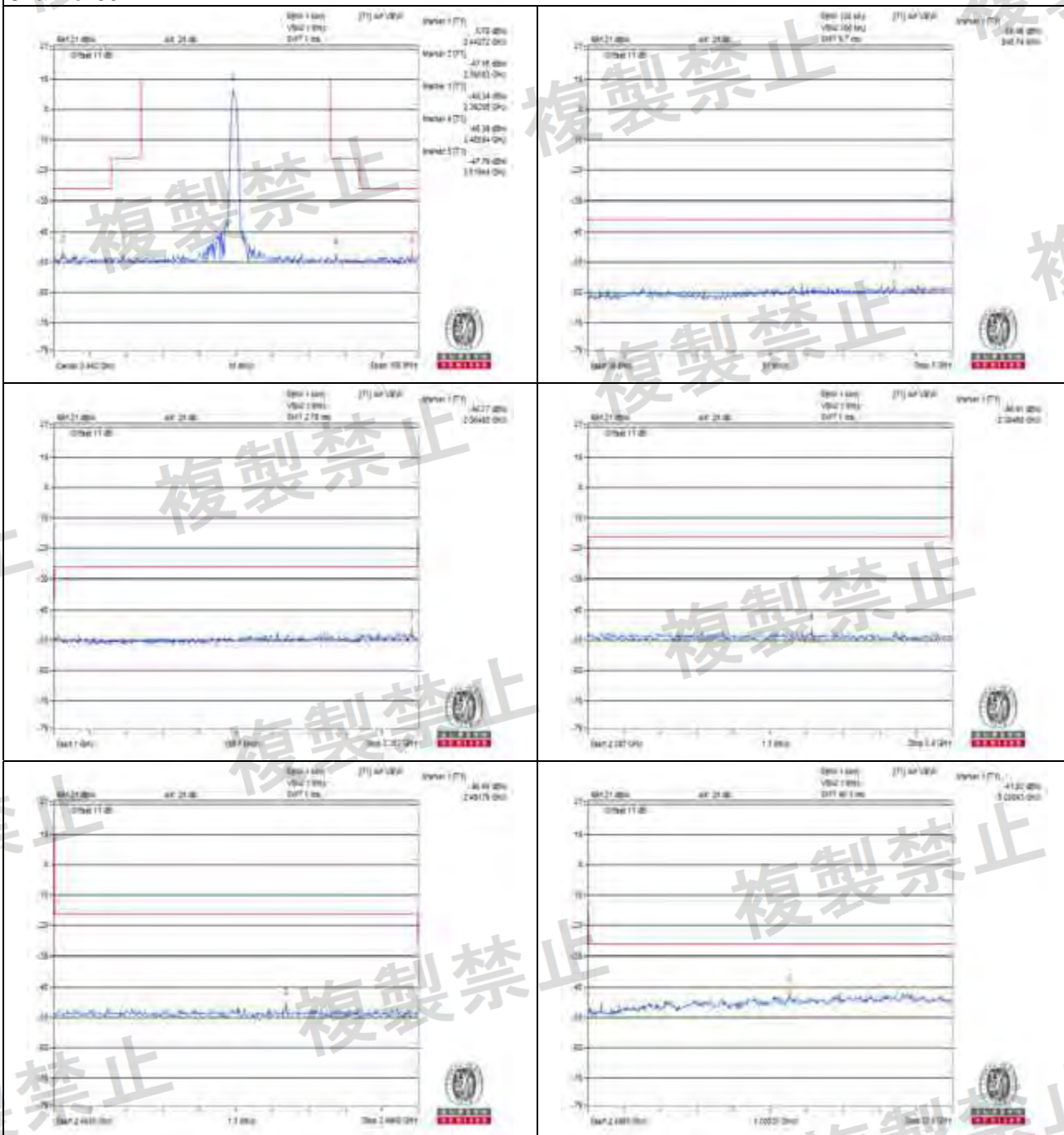


Environmental Conditions		20 deg.C, 70% RH			
Test Channel		CH 78 (2480MHz)		Limit	Result
Test Condition	Frequency Range	Frequency (MHz)	Measure. Value		
V _{normal}	30.0MHz to 1000.0MHz	866.140	0.002004uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2303.780	0.023823uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2391.340	0.024889uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2483.780	0.11885uW	25uW	PASS
	2496.5MHz to 12500.0MHz	11299.580	0.07925uW	2.5uW	PASS
V _{max.}	30.0MHz to 1000.0MHz	914.640	0.00271uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2350.930	0.026546uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2399.710	0.023933uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2483.600	0.110154uW	25uW	PASS
	2496.5MHz to 12500.0MHz	11279.570	0.072778uW	2.5uW	PASS
V _{min.}	30.0MHz to 1000.0MHz	757.500	0.001742uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2348.160	0.026182uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2388.840	0.023227uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2483.550	0.11272uW	25uW	PASS
	2496.5MHz to 12500.0MHz	12199.890	0.058479uW	2.5uW	PASS

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



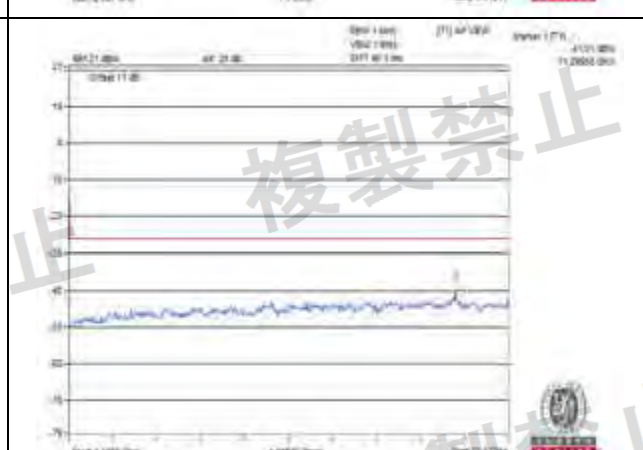
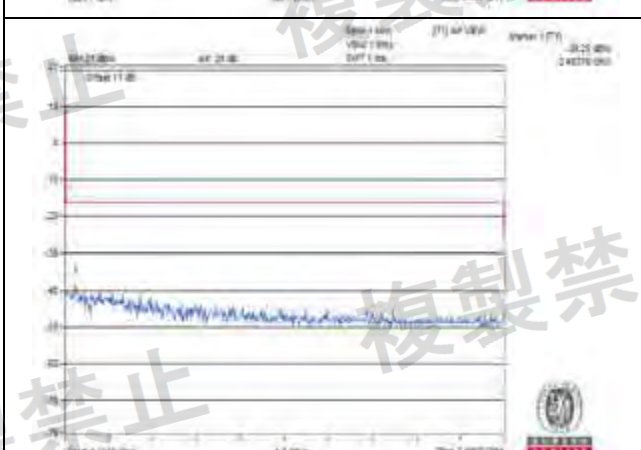
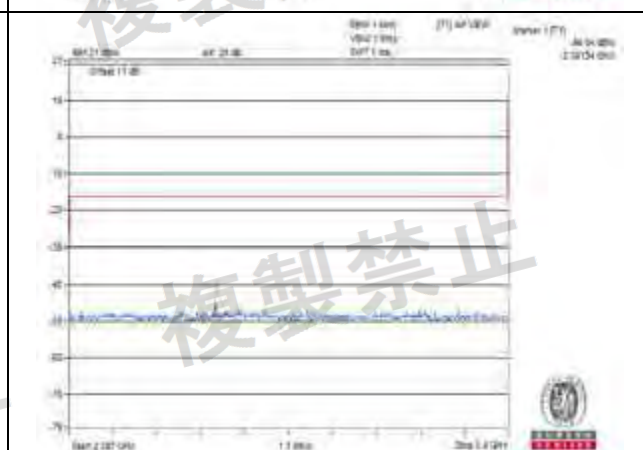
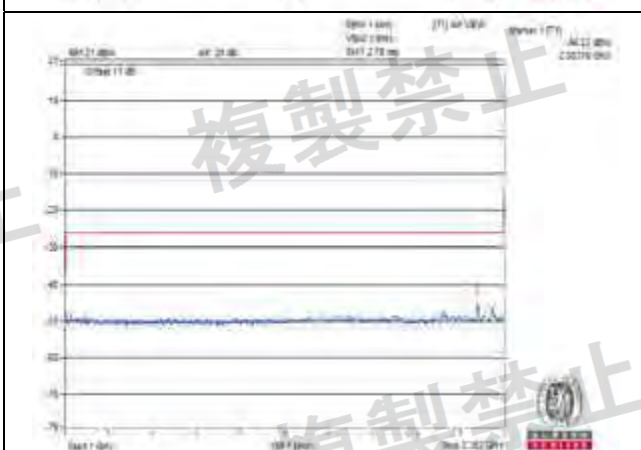
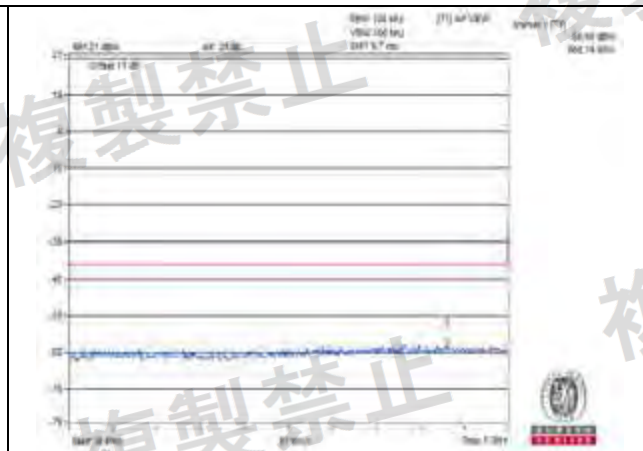
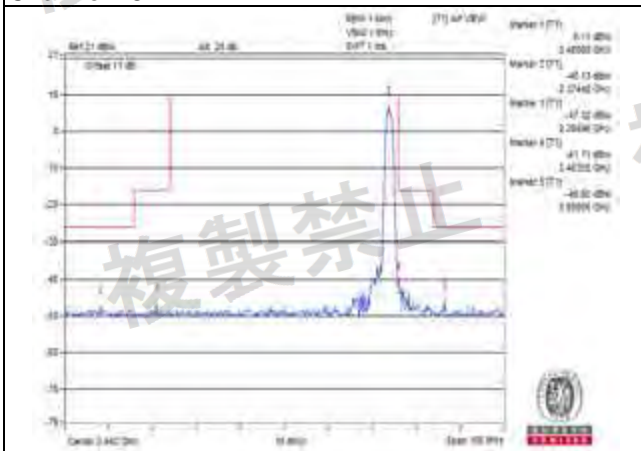
Vnormal
Channel 39



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



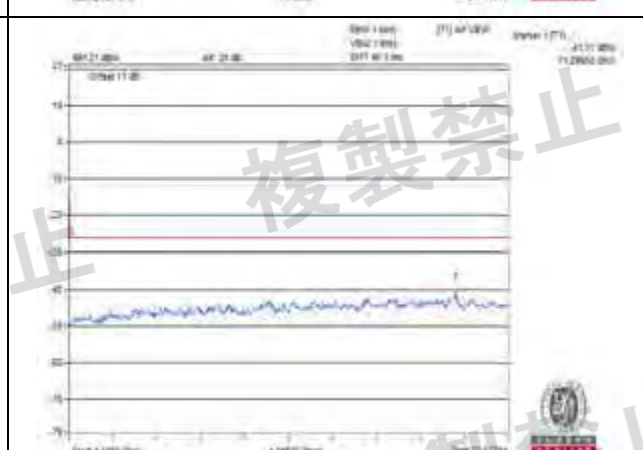
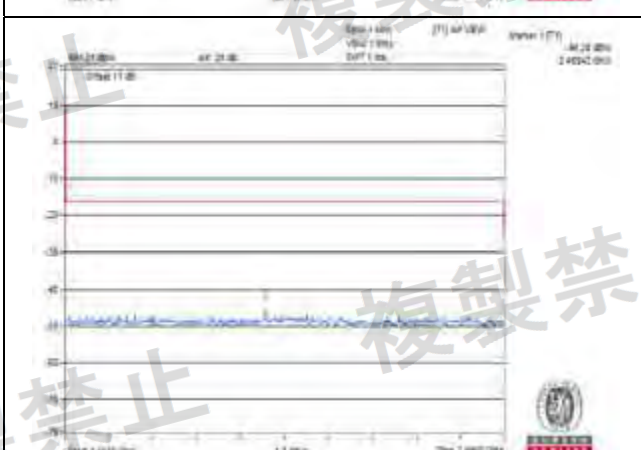
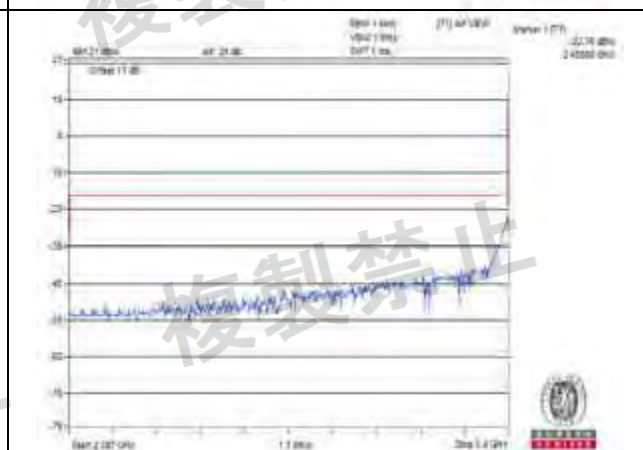
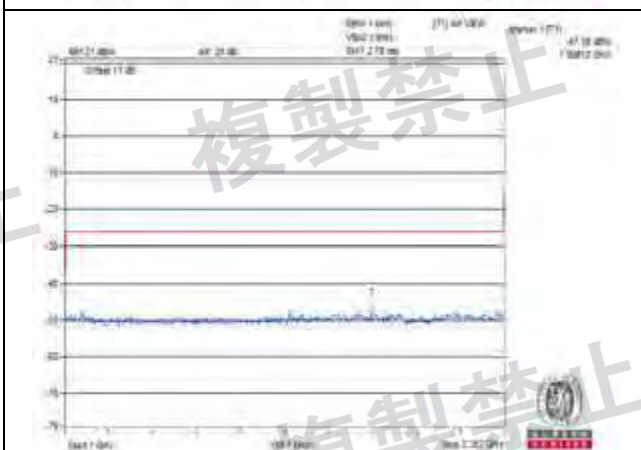
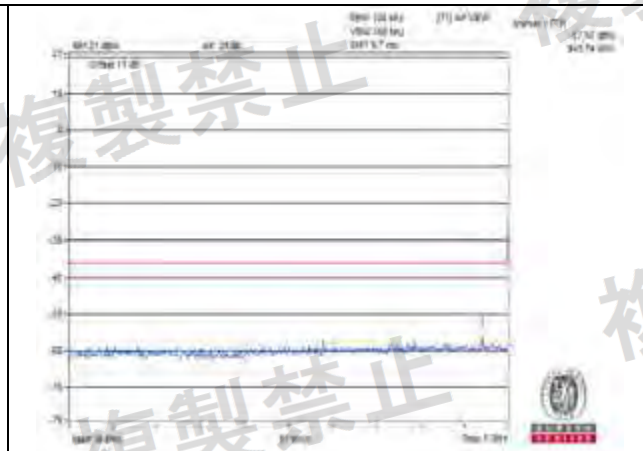
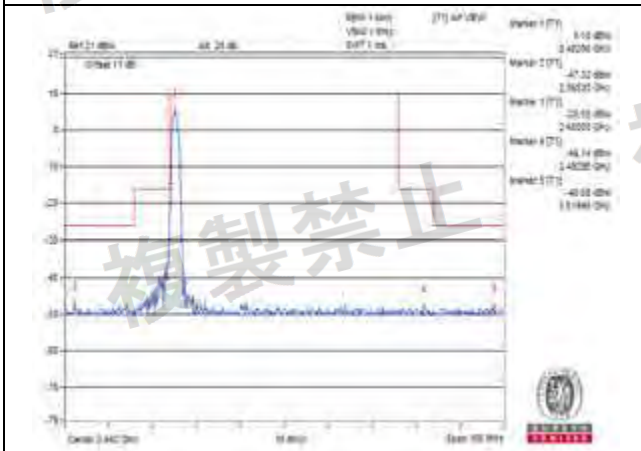
Vnormal
Channel 78



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



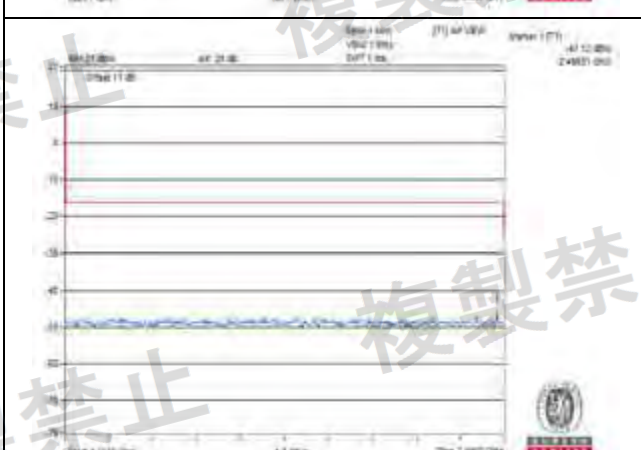
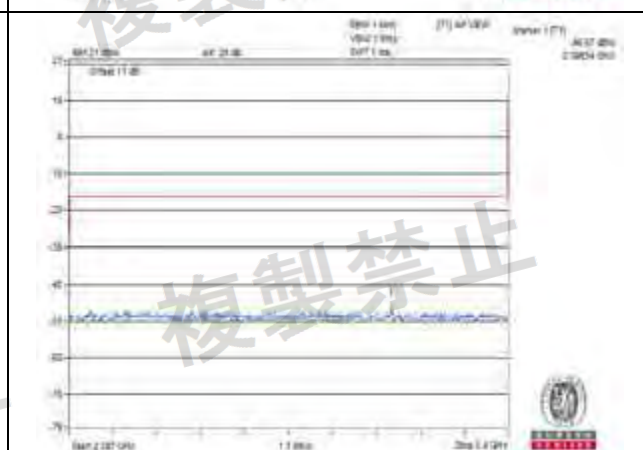
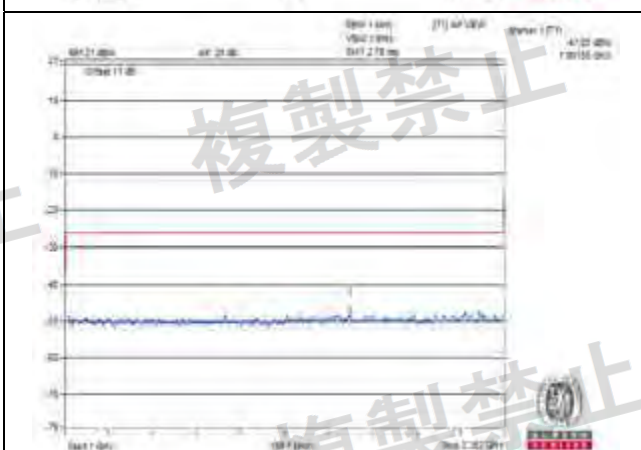
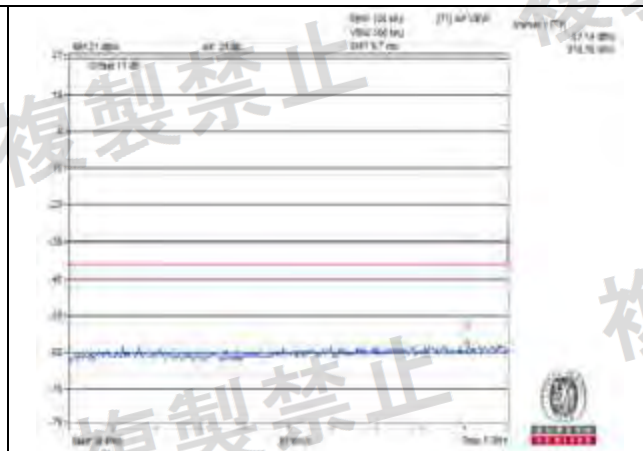
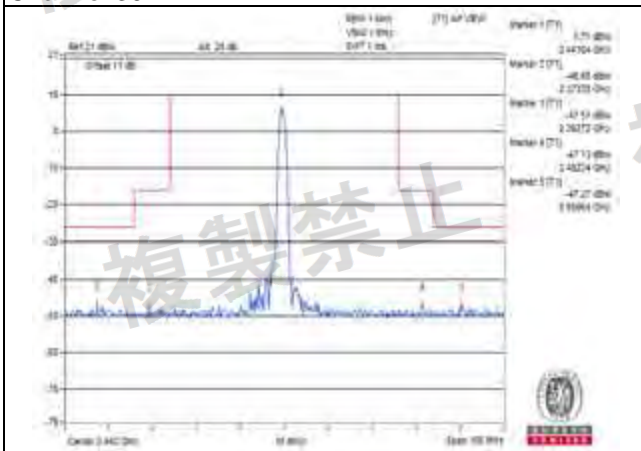
V_{max}
Channel 0



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



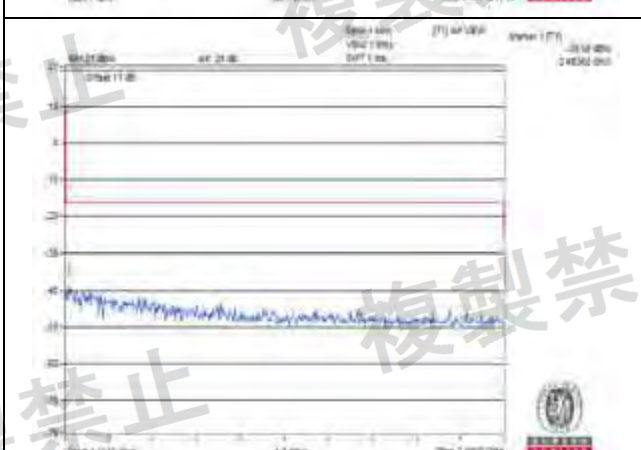
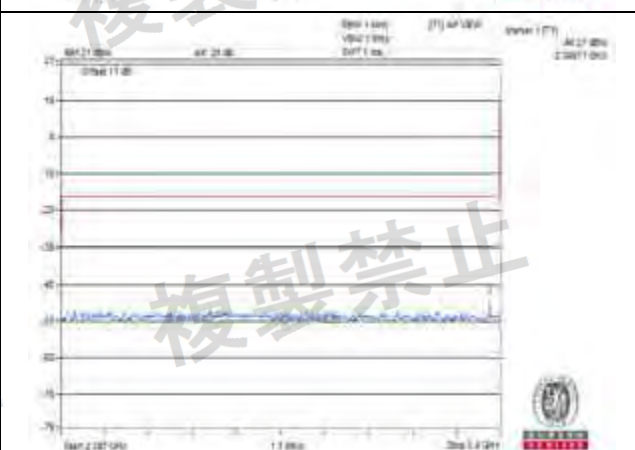
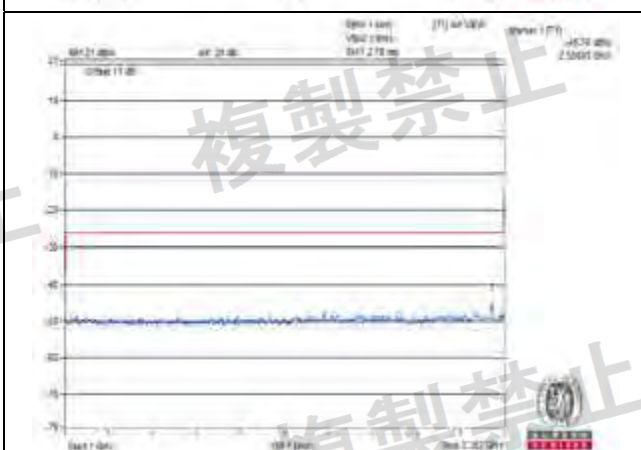
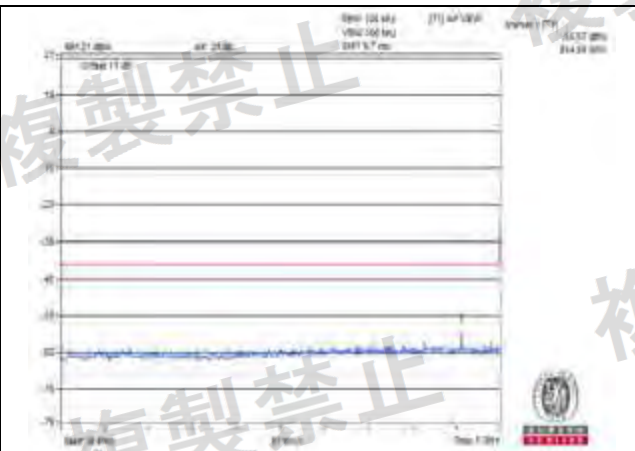
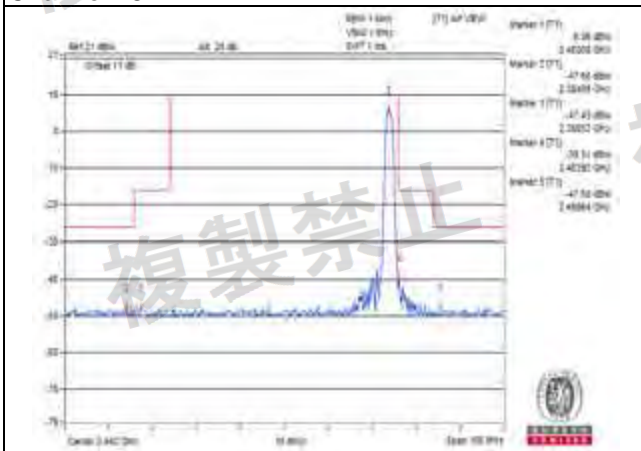
V_{max}
Channel 39



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



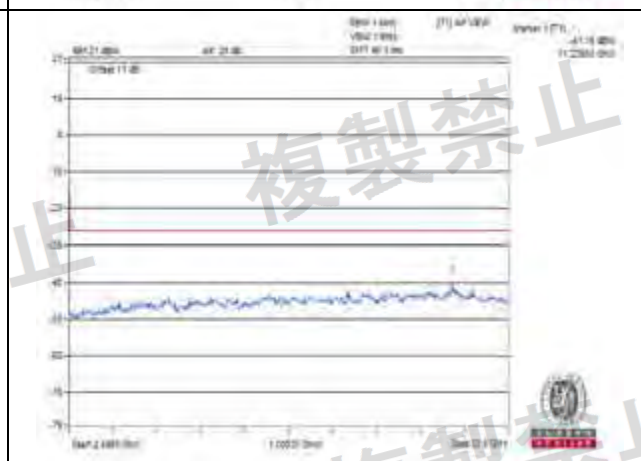
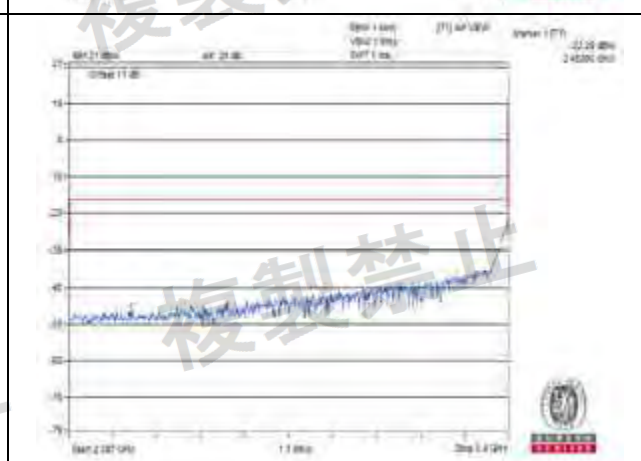
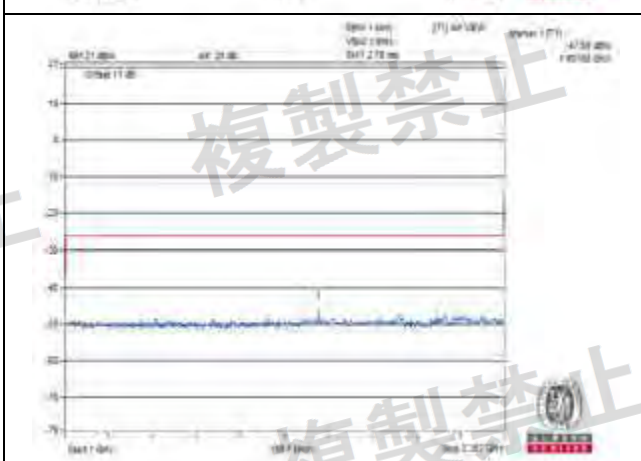
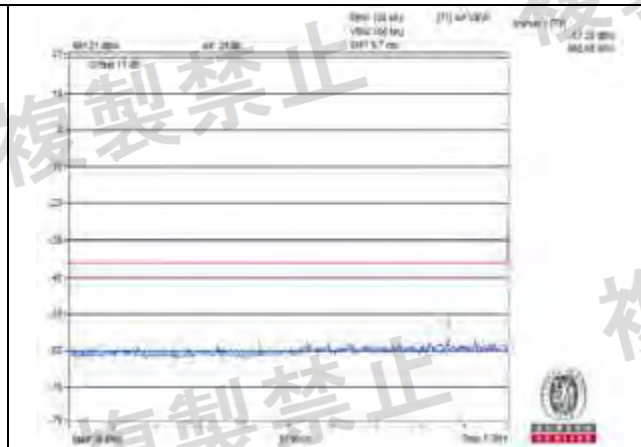
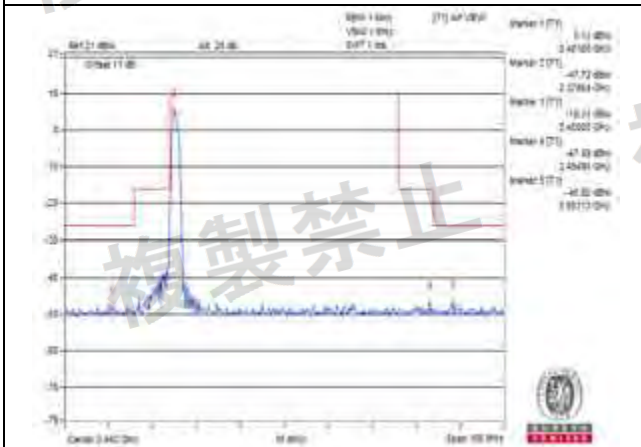
V_{max}
Channel 78



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



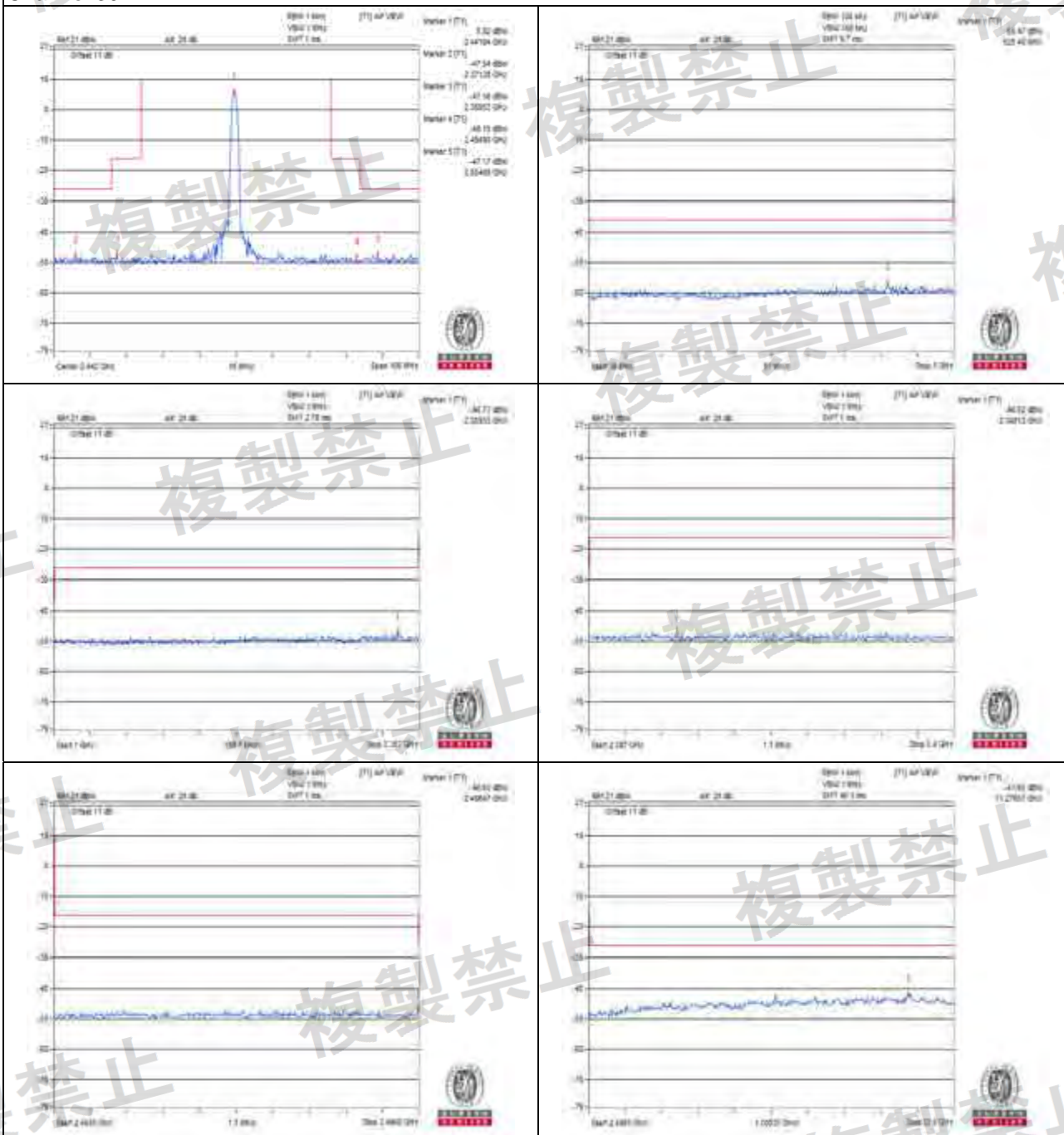
V_{min}
Channel 0



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



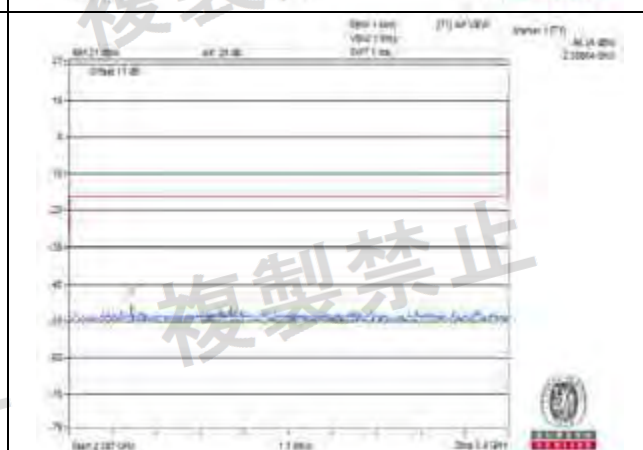
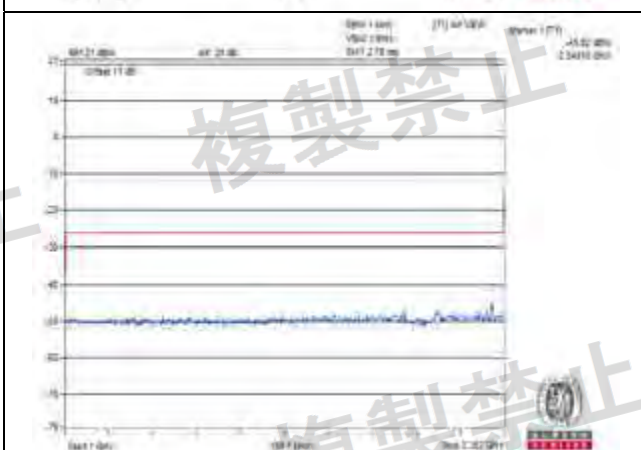
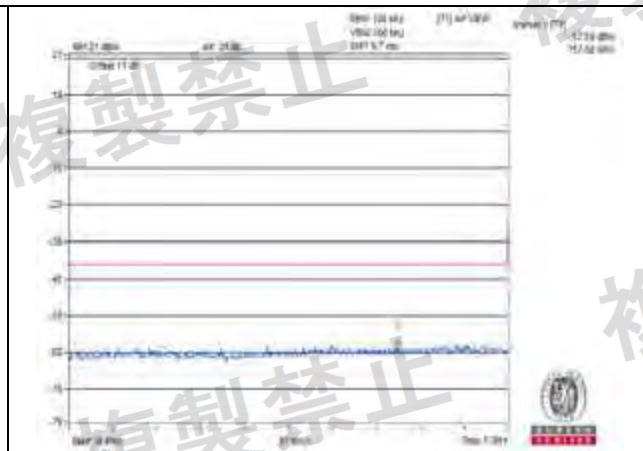
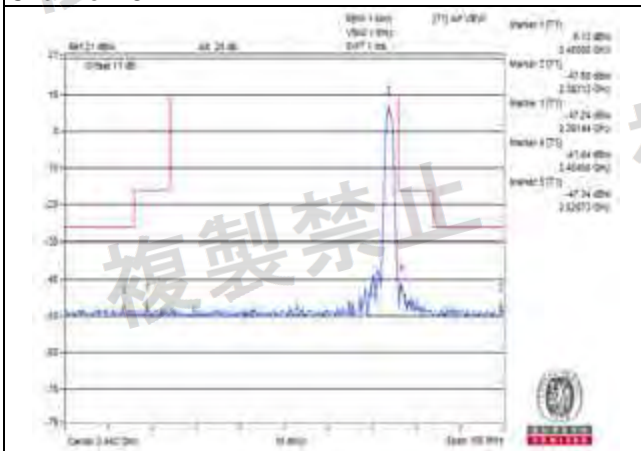
V_{min}
Channel 39



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



V_{min}
Channel 78



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

**Modulation: 8DPSK**

Environmental Conditions		20 deg.C, 70% RH					
Test Channel		CH 0 (2402MHz)		CH 39 (2441MHz)		Limit	Result
Test Condition	Frequency Range	Frequency (MHz)	Measure. Value	Frequency (MHz)	Measure. Value		
V _{normal}	30.0MHz to 1000.0MHz	823.460	0.002uW	179.380	0.001862uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2270.490	0.018578uW	1945.930	0.01803uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2400.000	5.164164uW	2390.480	0.020606uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2489.790	0.022182uW	2492.020	0.022387uW	25uW	PASS
	2496.5MHz to 12500.0MHz	10199.190	0.076913uW	11379.600	0.075683uW	2.5uW	PASS
V _{max.}	30.0MHz to 1000.0MHz	769.140	0.001875uW	563.500	0.001875uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2234.430	0.020989uW	2267.710	0.020091uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2400.000	5.284453uW	2394.120	0.018707uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2489.790	0.025003uW	2490.410	0.023496uW	25uW	PASS
	2496.5MHz to 12500.0MHz	10339.240	0.063973uW	10279.220	0.073114uW	2.5uW	PASS
V _{min.}	30.0MHz to 1000.0MHz	743.920	0.001718uW	813.760	0.001871uW	0.25uW	PASS
	1000.0MHz to 2387MHz	1754.520	0.023605uW	2309.320	0.020797uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2400.000	5.011872uW	2397.450	0.02799uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2495.510	0.023442uW	2488.440	0.020324uW	25uW	PASS
	2496.5MHz to 12500.0MHz	9959.110	0.064863uW	9959.110	0.06792uW	2.5uW	PASS

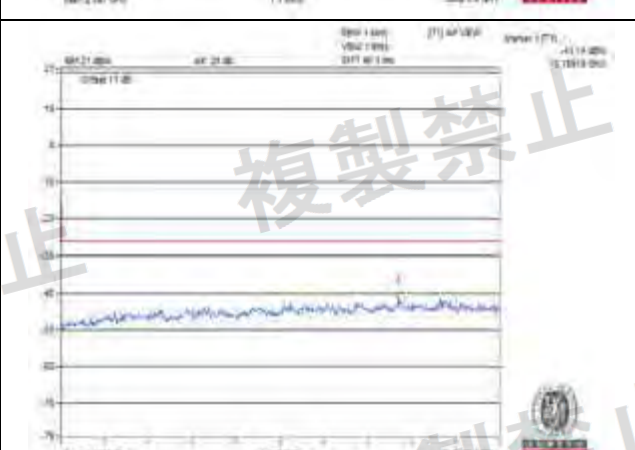
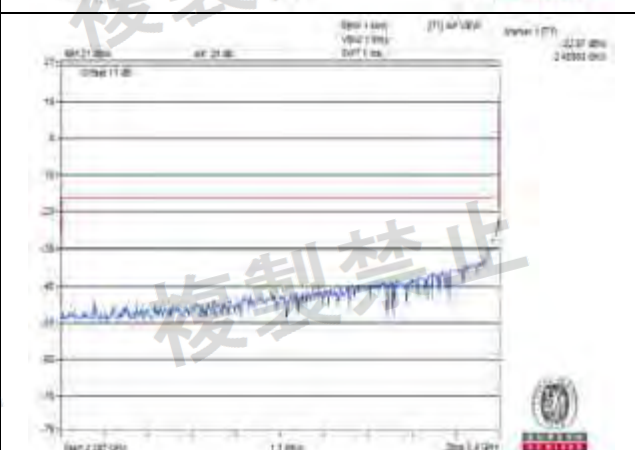
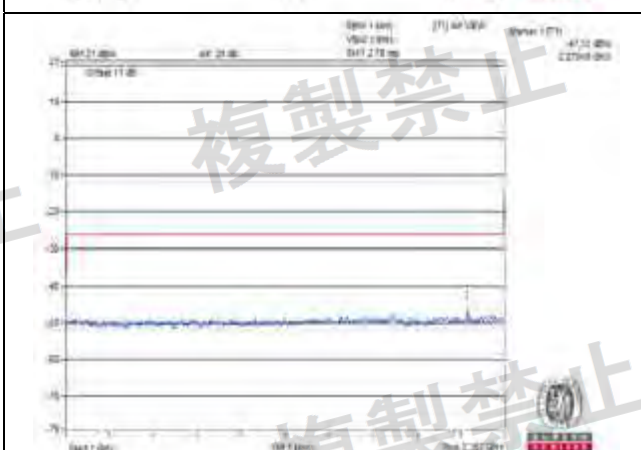
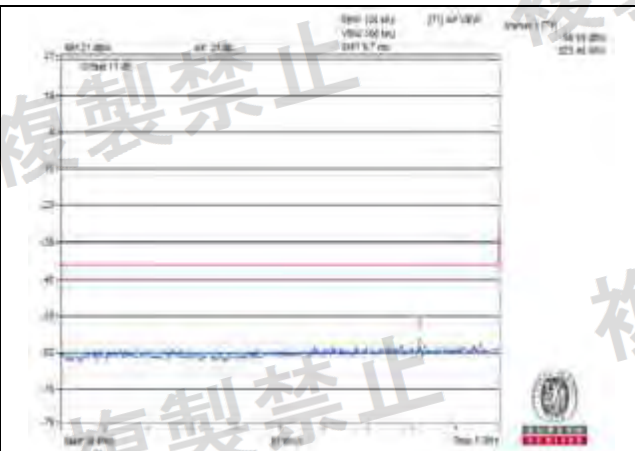
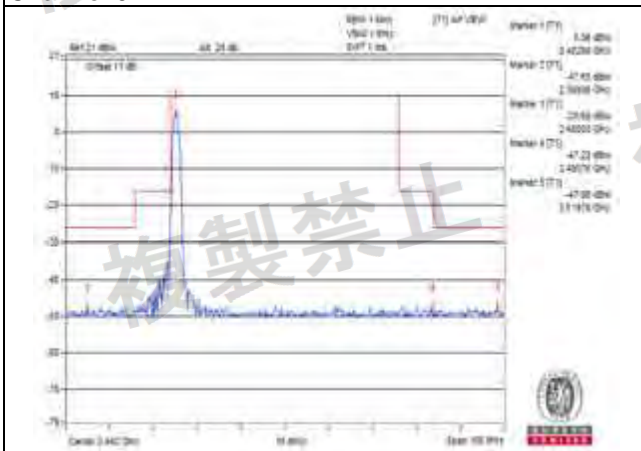


Environmental Conditions		20 deg.C, 70% RH			
Test Channel		CH 78 (2480MHz)		Limit	Result
Test Condition	Frequency Range	Frequency (MHz)	Measure. Value		
V _{normal}	30.0MHz to 1000.0MHz	930.160	0.002075uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2170.620	0.022699uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2393.030	0.01977uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2483.680	0.12218uW	25uW	PASS
	2496.5MHz to 12500.0MHz	8818.710	0.062517uW	2.5uW	PASS
V _{max.}	30.0MHz to 1000.0MHz	753.620	0.001762uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2350.930	0.020941uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2399.630	0.021232uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2483.780	0.123027uW	25uW	PASS
	2496.5MHz to 12500.0MHz	9318.880	0.072444uW	2.5uW	PASS
V _{min.}	30.0MHz to 1000.0MHz	870.020	0.00157uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2350.930	0.020941uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2391.810	0.020701uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2483.500	0.133045uW	25uW	PASS
	2496.5MHz to 12500.0MHz	10739.380	0.072611uW	2.5uW	PASS

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



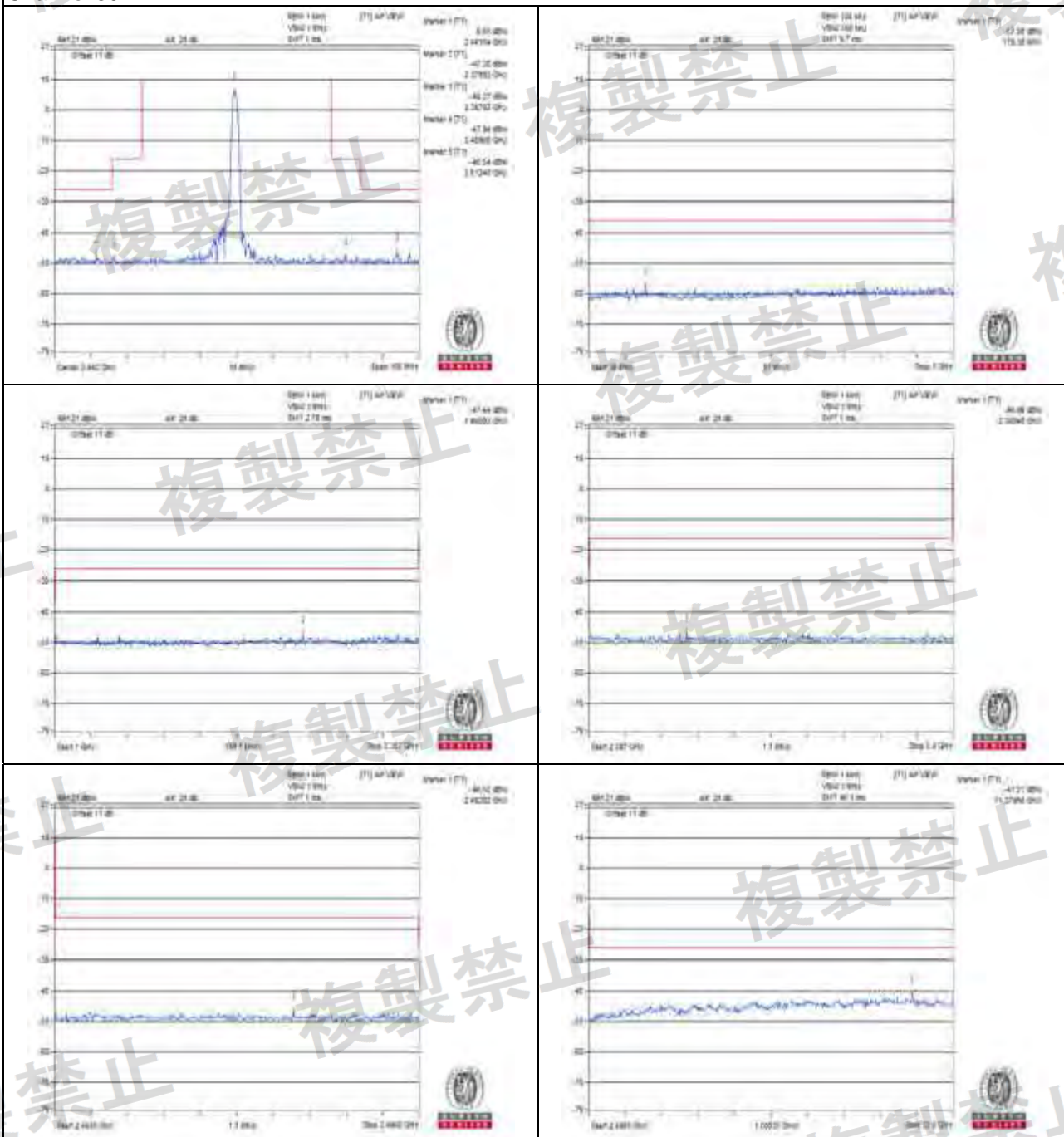
Vnormal
Channel 0



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



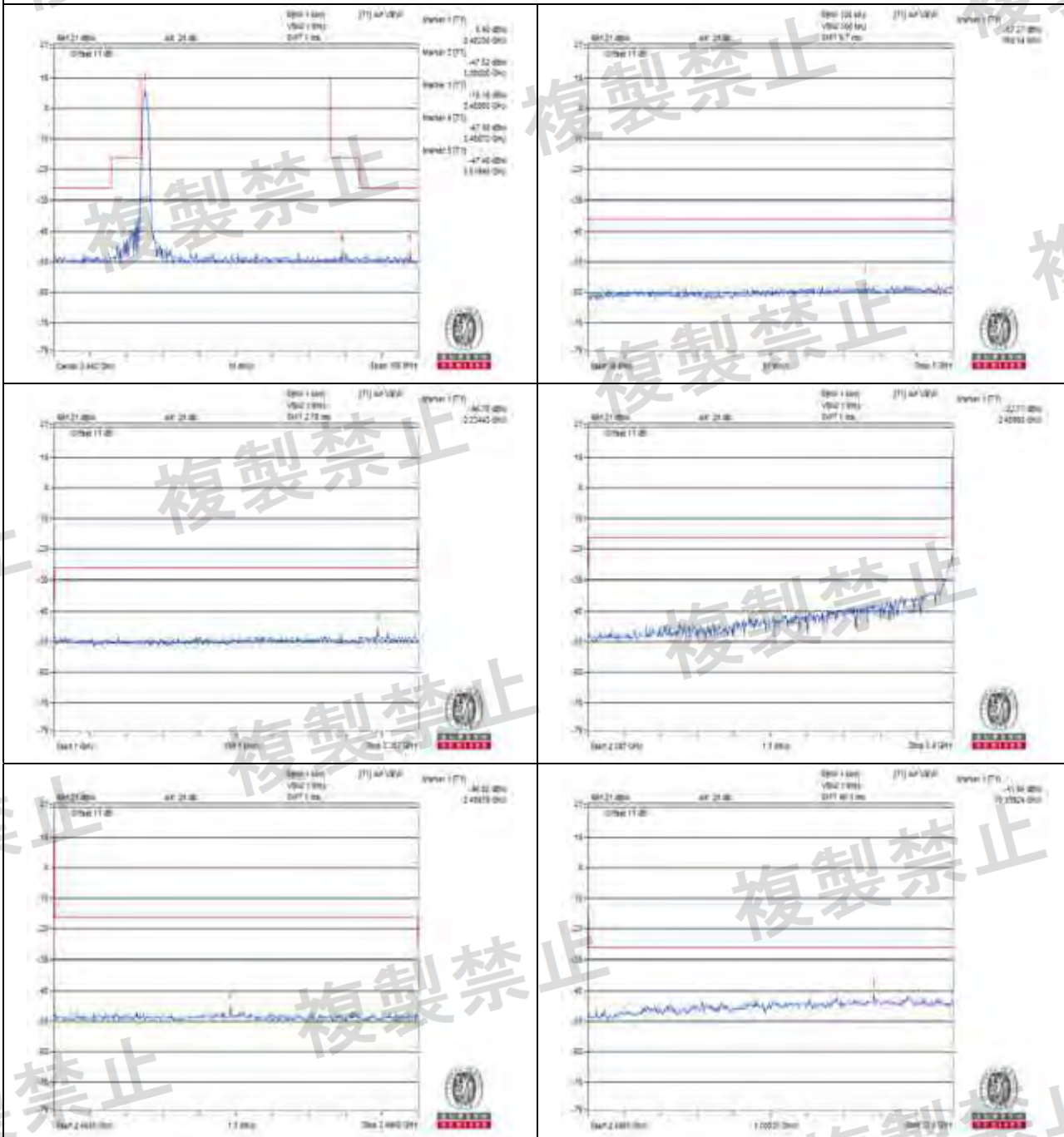
Vnormal
Channel 39



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



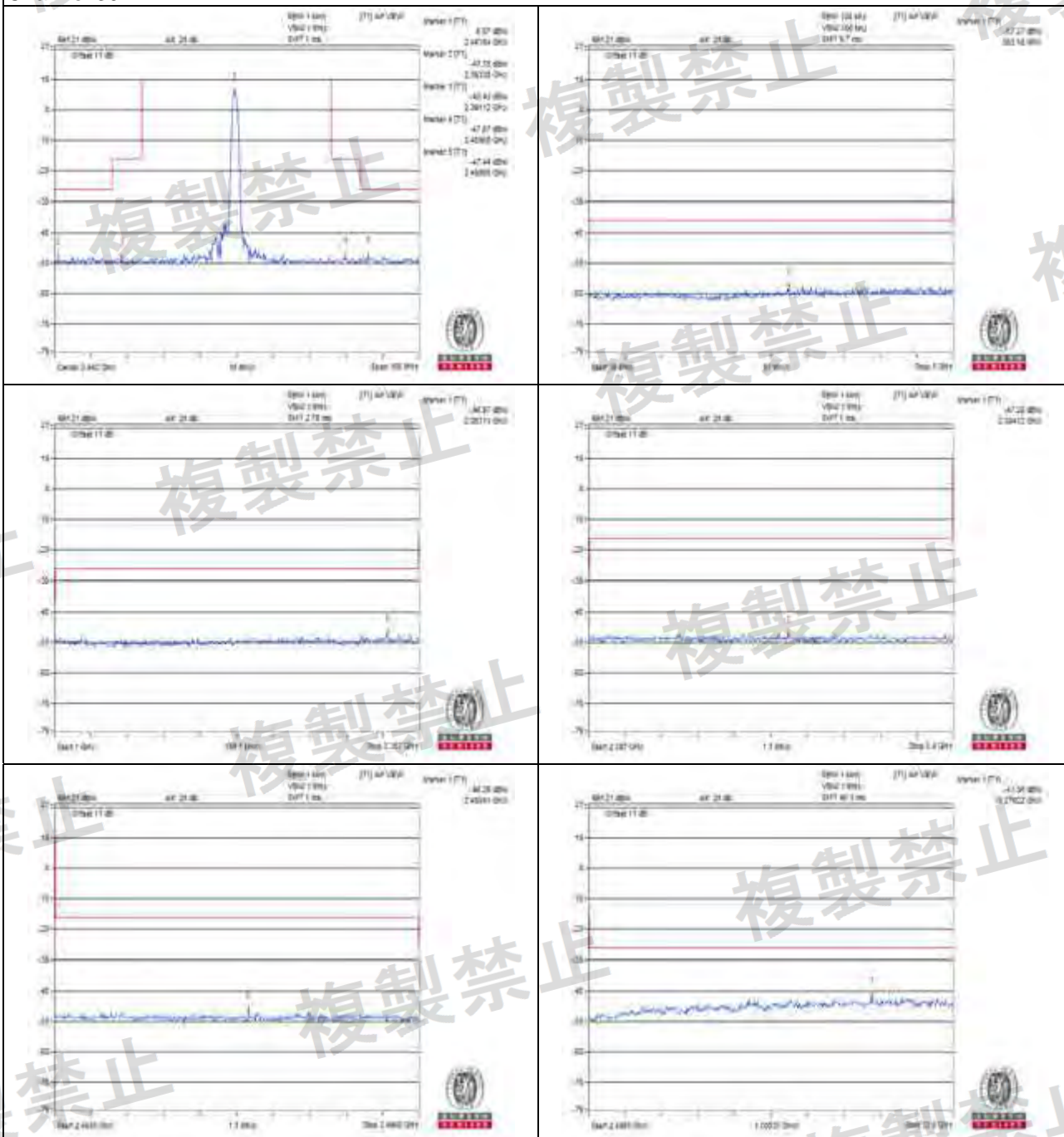
V_{max}
Channel 0



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



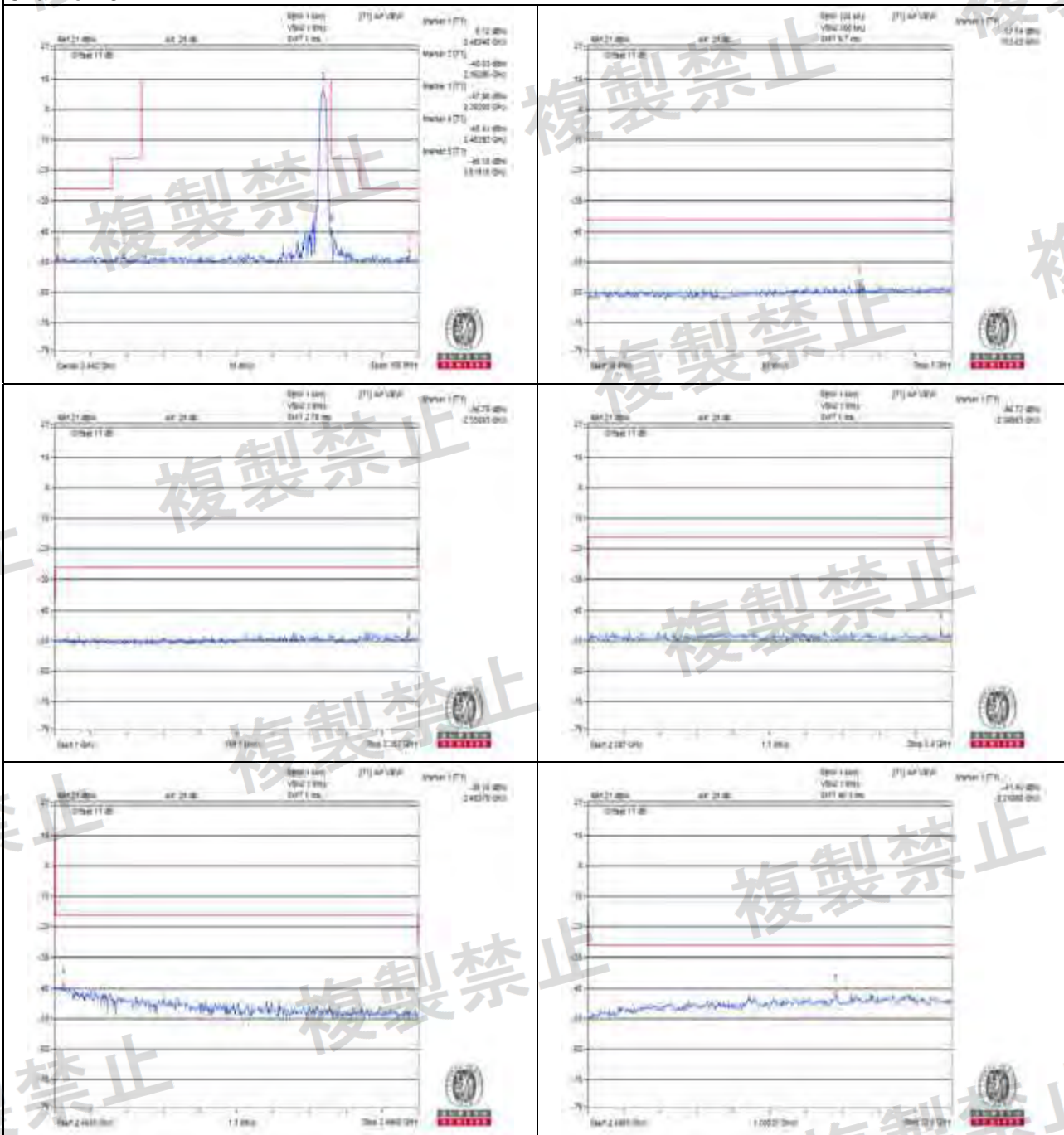
V_{max}
Channel 39



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



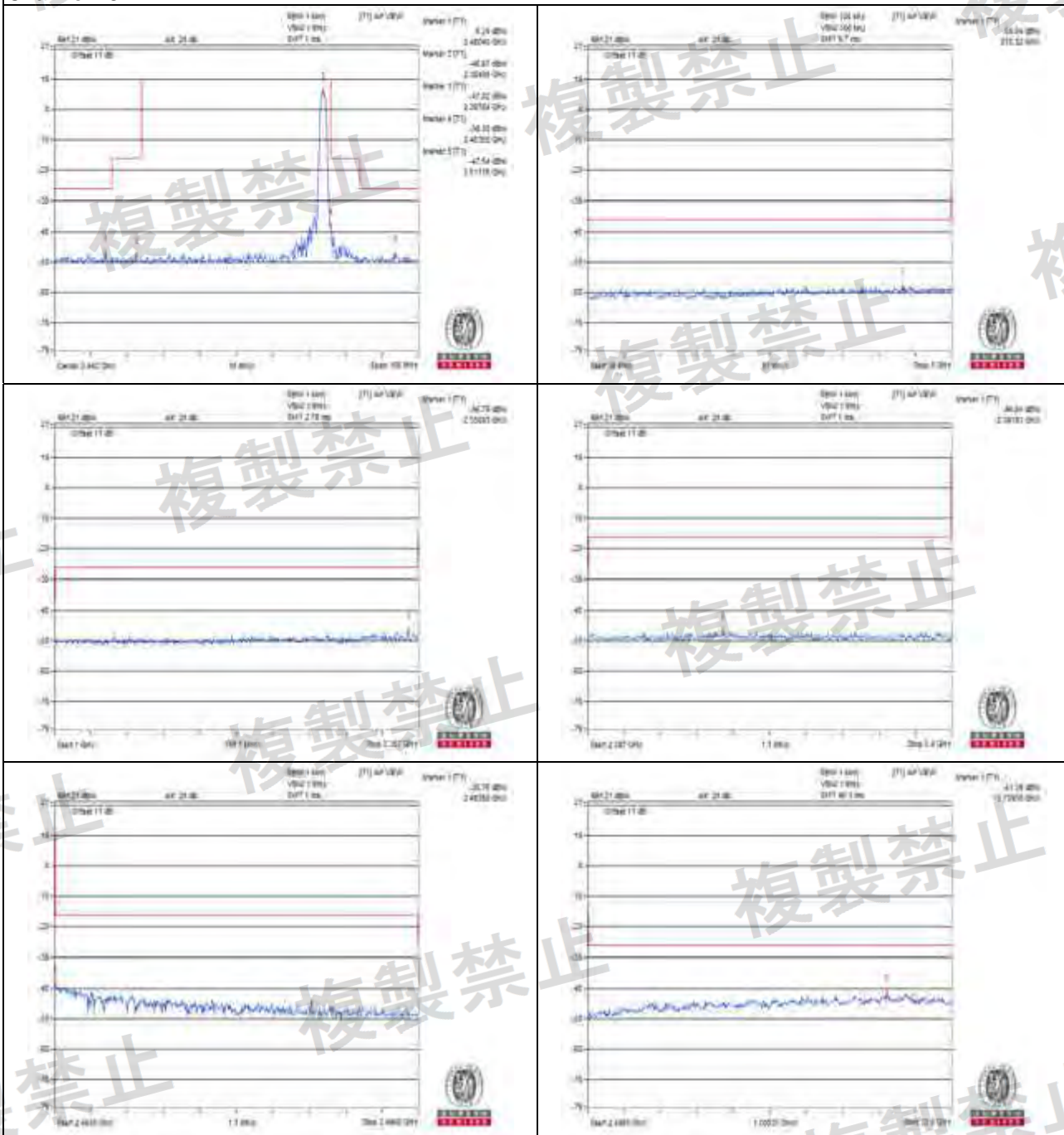
V_{max}
Channel 78



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



V_{min}
Channel 78



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



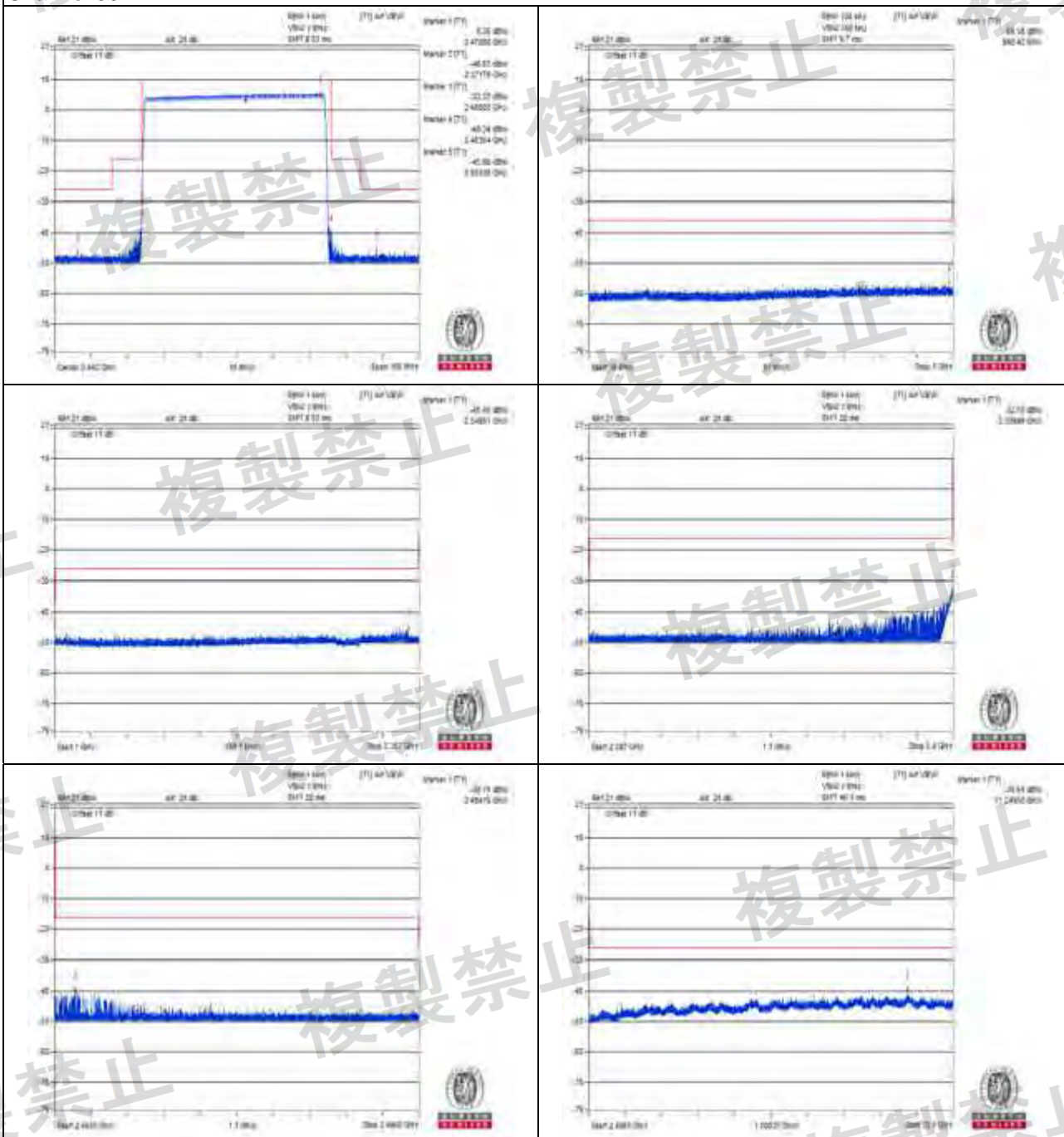
Hopping Mode
Modulation: GFSK

Environmental Conditions		20 deg.C, 70% RH			
Test Channel		CH 39 (2441MHz)		Limit	Result
Test Condition	Frequency Range	Frequency (MHz)	Measure. Value		
V _{normal}	30.0MHz to 1000.0MHz	990.420	0.002uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2348.510	0.028uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2399.990	0.527uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2484.190	0.106uW	25uW	PASS
	2496.5MHz to 12500.0MHz	11249.560	0.111uW	2.5uW	PASS
V _{max.}	30.0MHz to 1000.0MHz	767.920	0.002uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2333.940	0.023uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2400.000	0.492uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2483.870	0.093uW	25uW	PASS
	2496.5MHz to 12500.0MHz	11233.300	0.079uW	2.5uW	PASS
V _{min.}	30.0MHz to 1000.0MHz	903.240	0.002uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2288.340	0.025uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2399.850	0.247uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2483.970	0.104uW	25uW	PASS
	2496.5MHz to 12500.0MHz	11208.290	0.084uW	2.5uW	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.



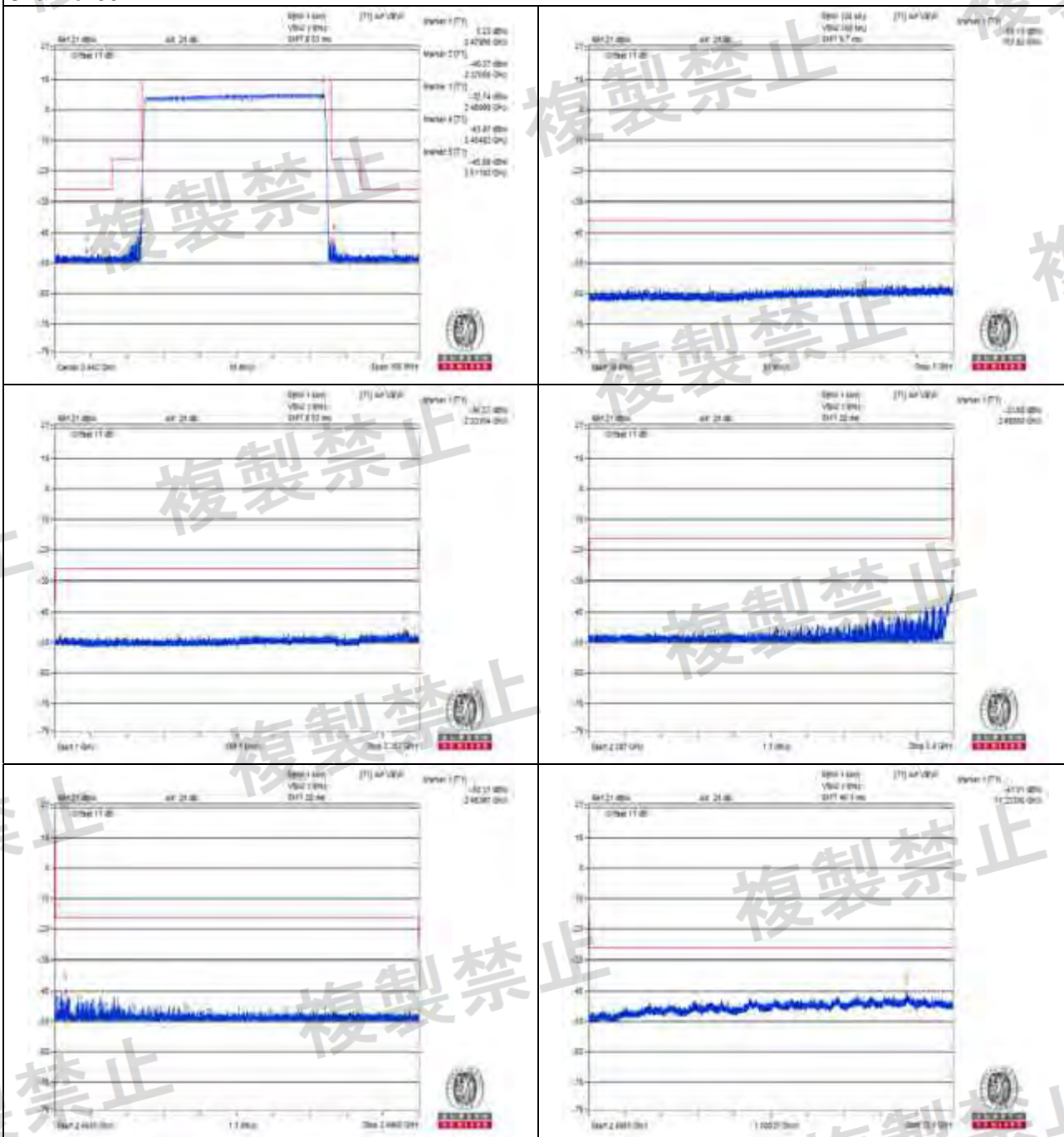
Vnormal
Channel 39



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



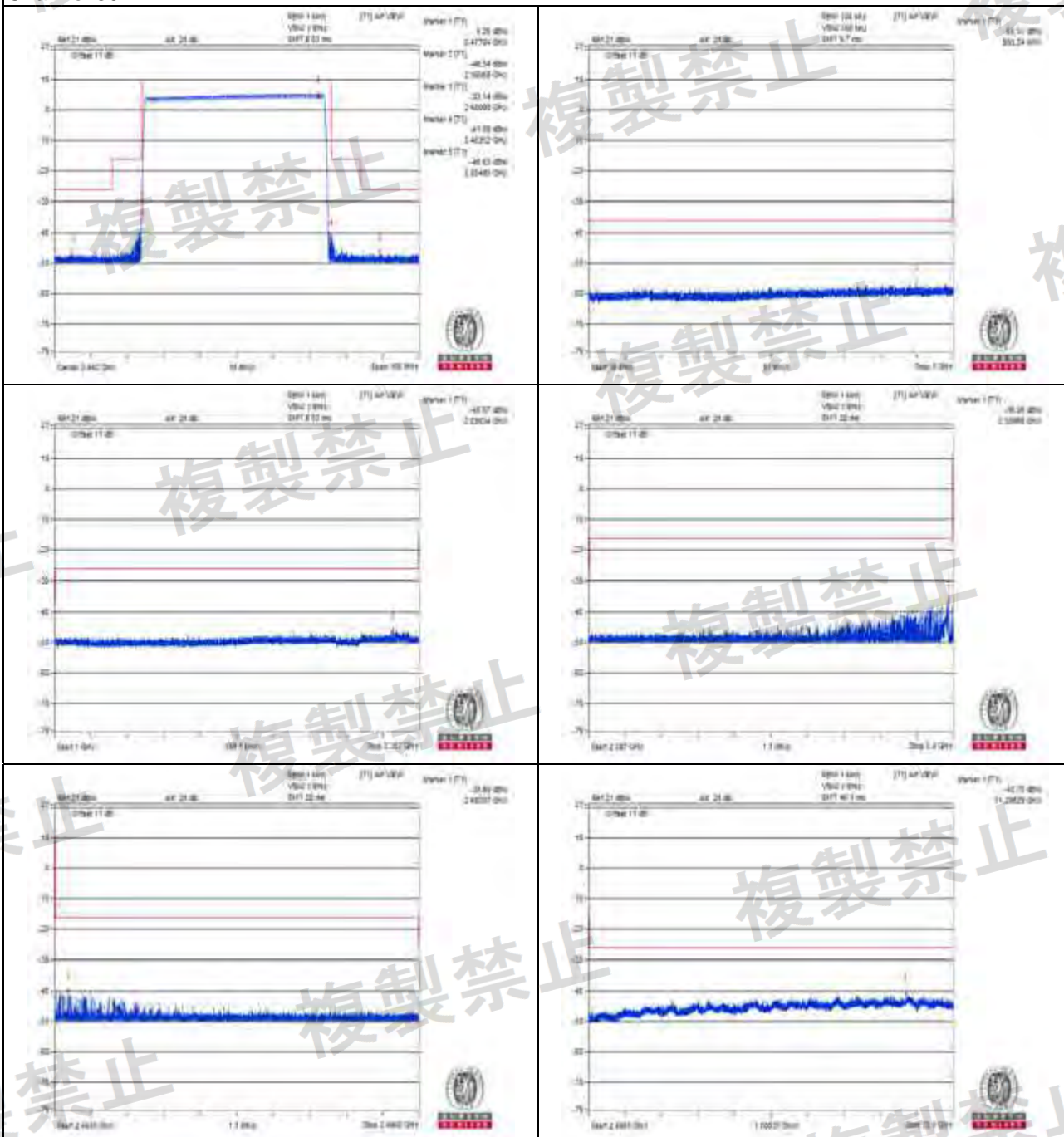
V_{max}
Channel 39



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



V_{min}
Channel 39



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



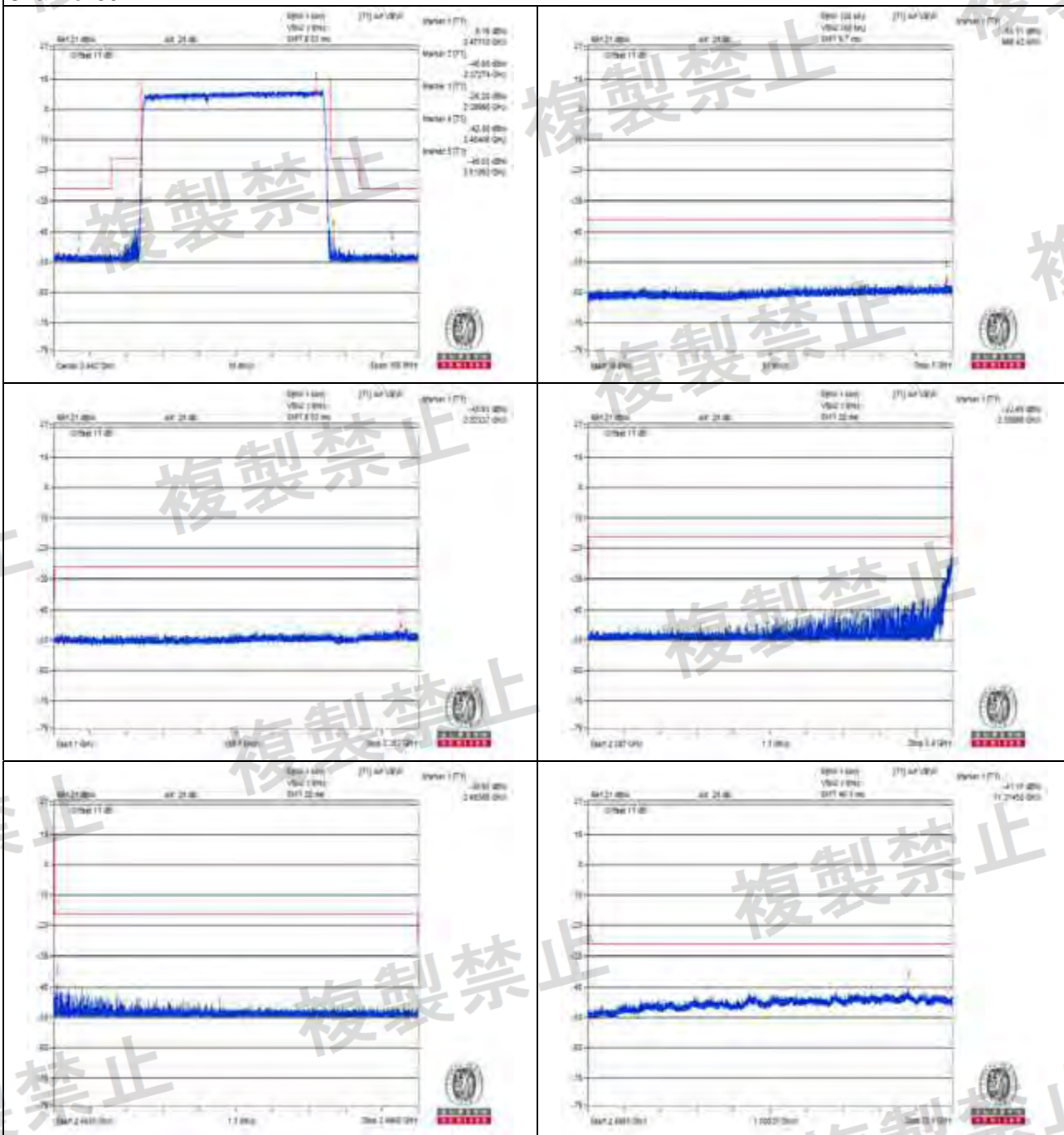
Modulation: $\pi/4$ -DQPSK

Environmental Conditions		20 deg.C, 70% RH			
Test Channel		CH 39 (2441MHz)		Limit	Result
Test Condition	Frequency Range	Frequency (MHz)	Measure. Value		
V _{normal}	30.0MHz to 1000.0MHz	969.560	0.002uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2343.650	0.026uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2400.000	3.793uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2483.630	0.103uW	25uW	PASS
	2496.5MHz to 12500.0MHz	11284.570	0.083uW	2.5uW	PASS
V _{max.}	30.0MHz to 1000.0MHz	986.420	0.002uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2323.370	0.031uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2399.980	5.636uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2483.600	0.108uW	25uW	PASS
	2496.5MHz to 12500.0MHz	11314.580	0.076uW	2.5uW	PASS
V _{min.}	30.0MHz to 1000.0MHz	997.330	0.002uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2321.290	0.025uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2399.960	4.753uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2483.550	0.099uW	25uW	PASS
	2496.5MHz to 12500.0MHz	11287.070	0.08uW	2.5uW	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.



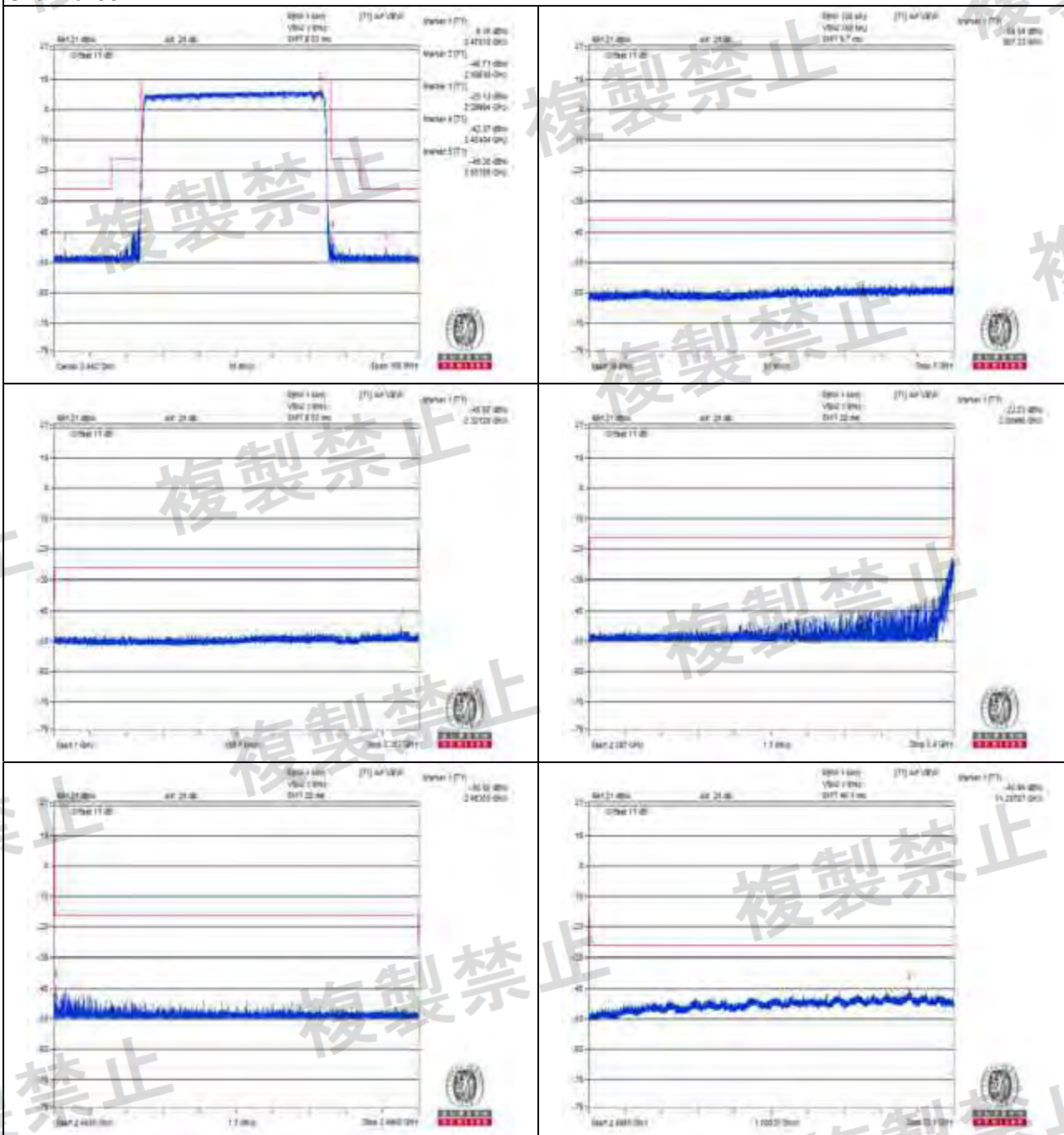
V_{max}
Channel 39



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



V_{min}
Channel 39



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



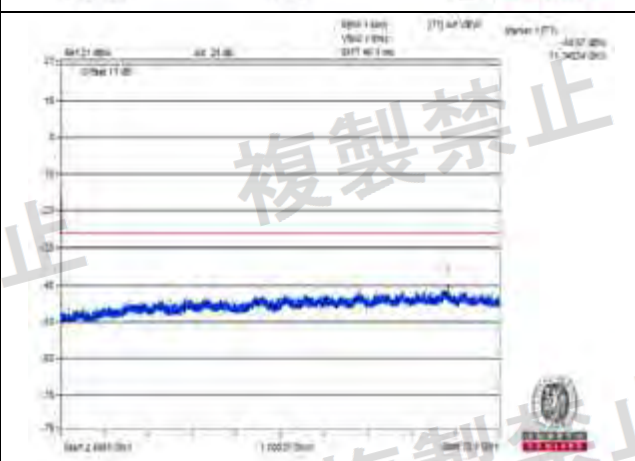
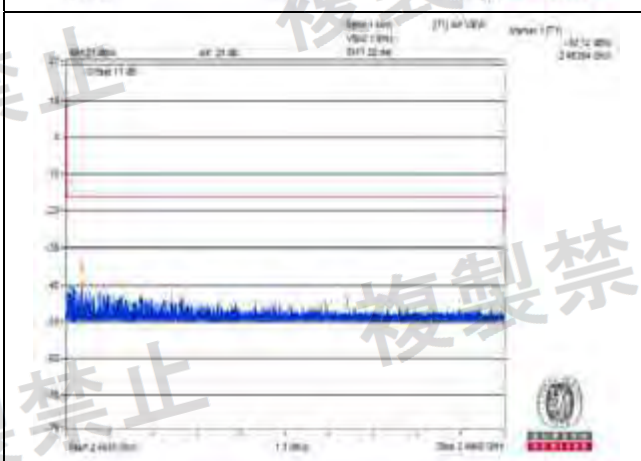
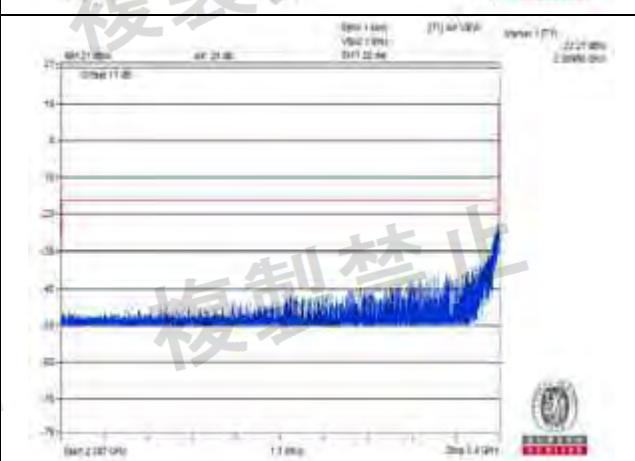
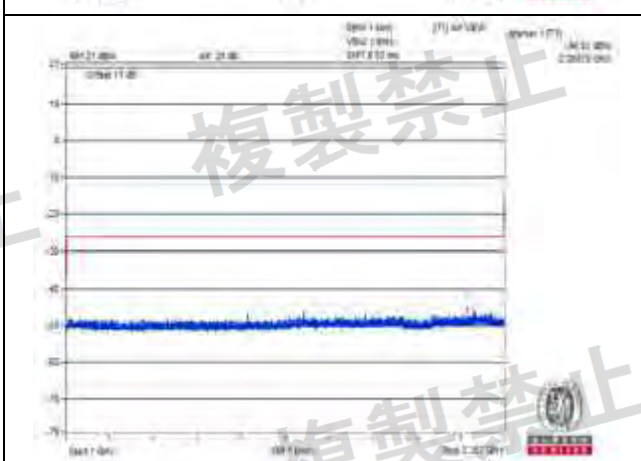
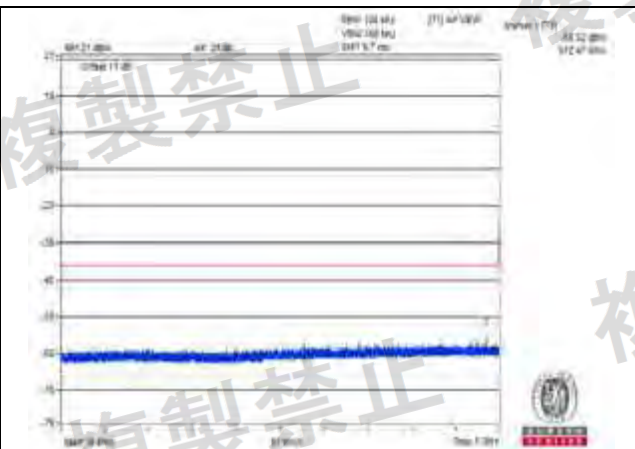
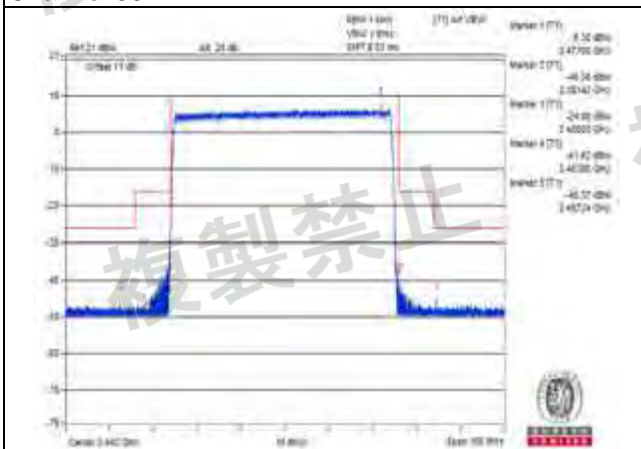
Modulation: 8DPSK

Environmental Conditions		20 deg.C, 70% RH			
Test Channel		CH 39 (2441MHz)		Limit	Result
Test Condition	Frequency Range	Frequency (MHz)	Measure. Value		
V _{normal}	30.0MHz to 1000.0MHz	972.470	0.002uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2269.790	0.024uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2399.980	4.775uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2483.940	0.097uW	25uW	PASS
	2496.5MHz to 12500.0MHz	11348.340	0.085uW	2.5uW	PASS
V _{max.}	30.0MHz to 1000.0MHz	987.510	0.002uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2342.260	0.028uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2399.980	5.035uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2483.640	0.106uW	25uW	PASS
	2496.5MHz to 12500.0MHz	9861.570	0.084uW	2.5uW	PASS
V _{min.}	30.0MHz to 1000.0MHz	670.800	0.002uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2299.960	0.031uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2399.990	5.116uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2483.650	0.09uW	25uW	PASS
	2496.5MHz to 12500.0MHz	11284.570	0.076uW	2.5uW	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.



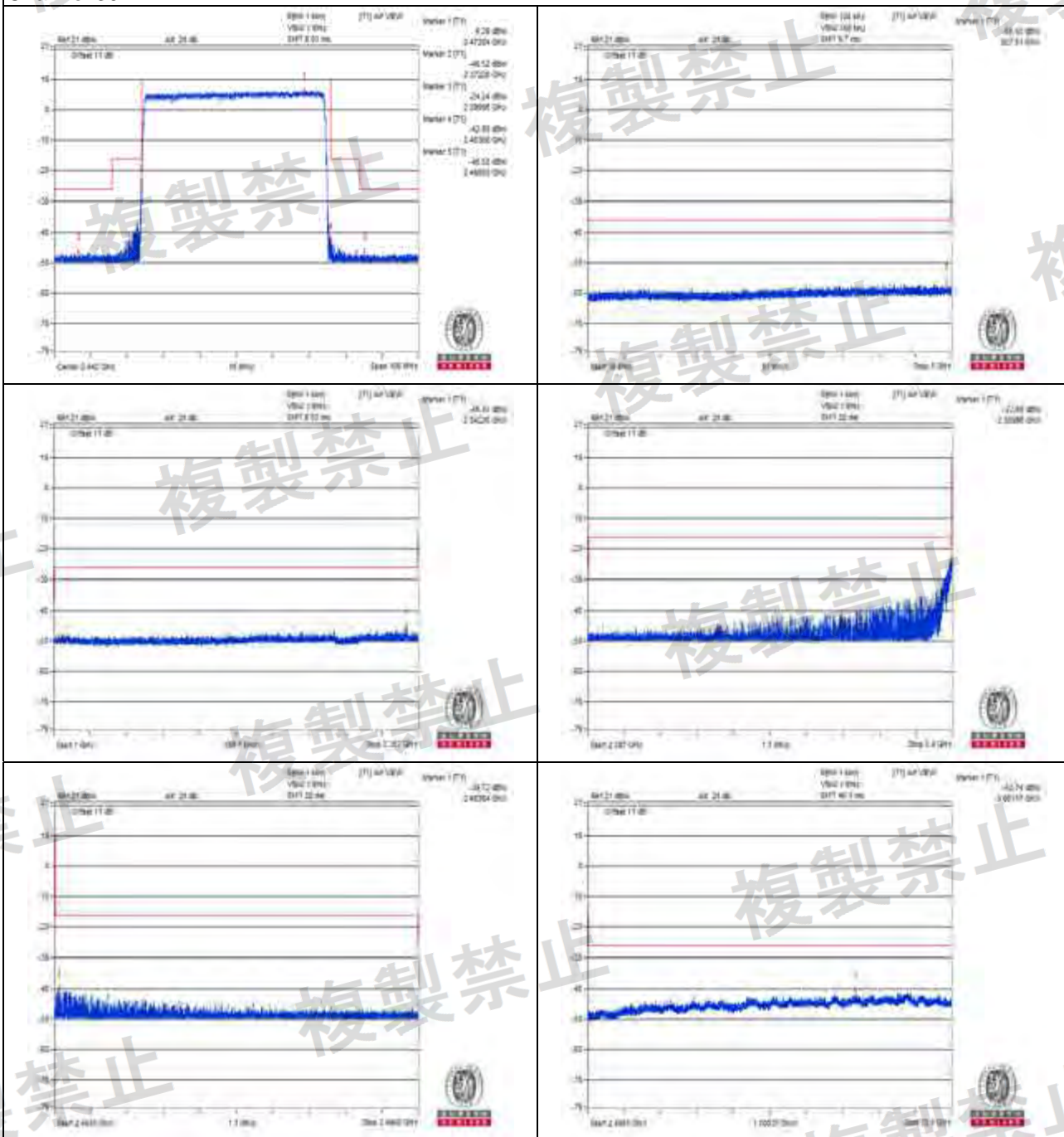
Vnormal
Channel 39



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



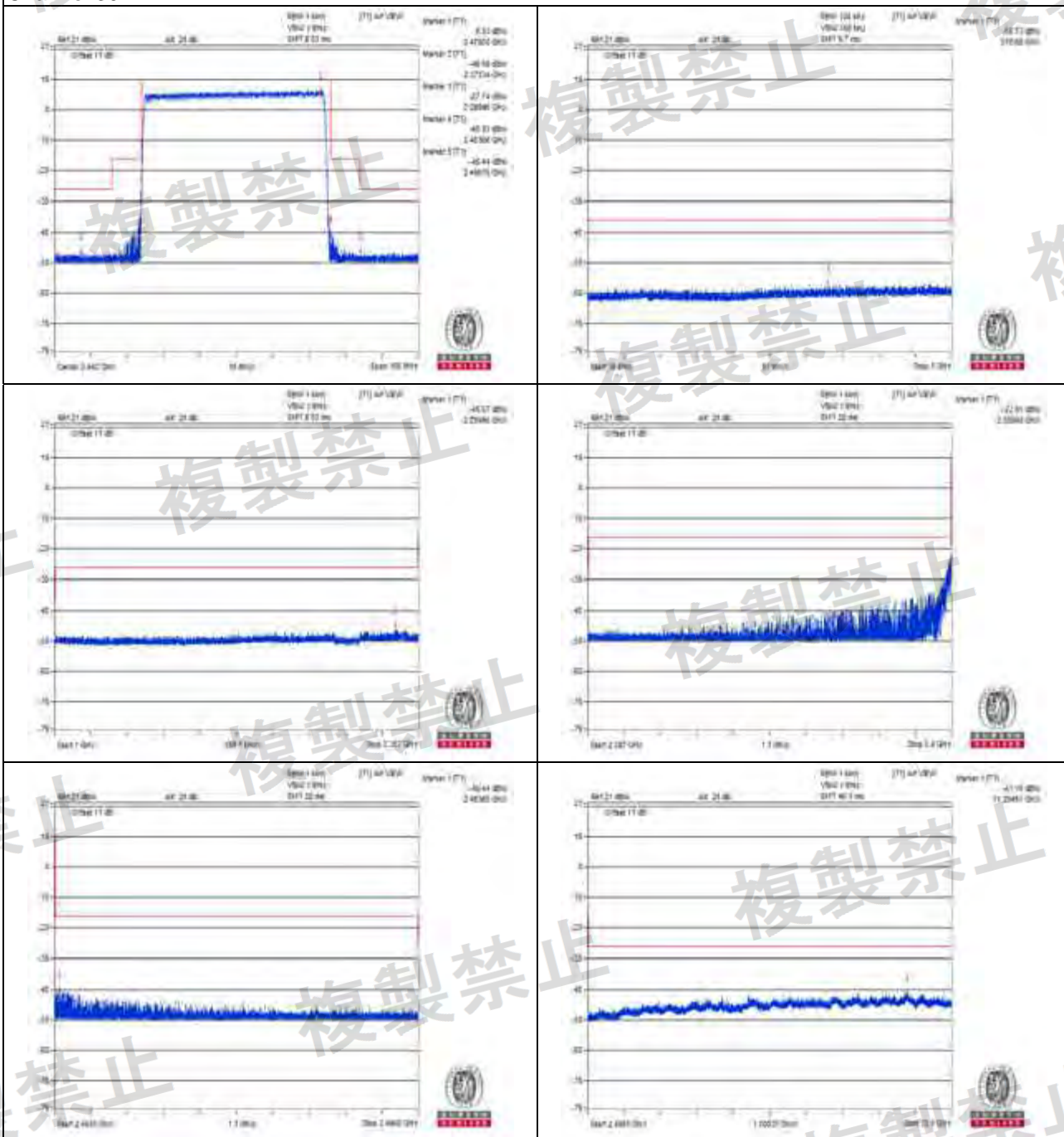
V_{max}
Channel 39



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



V_{min}
Channel 39



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



4.5 Antenna Power Measurement

4.5.1 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 (8.20mW/MHz)	19.14 dBm/MHz (82.03 mW/MHz)
FH	2400 – 2483.5 MHz	3 mW/MHz	6.91 dBm/MHz (4.9 mW/MHz)	16.91 dBm/MHz (49.09 mW/MHz)

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).

4.5.2 Test Setup





4.5.3 Test Results

NORMAL MODE

Environmental Conditions		25 deg.C, 68% RH			
Modulation Type	Data Rate Type	Conducted RF Output Power Density (mW)			
		Normal Voltage	Max. Voltage	Min. Voltage	Max. Limit (mW/MHz)
		24Vdc	26.4Vdc	21.6Vdc	
GFSK	DH5	0.054017	0.052423	0.055430	3
DQPSK	2DH5	0.052907	0.055175	0.051823	3
8DPSK	3DH5	0.047944	0.045952	0.048587	3
Rated power		0.1mW			
Tolerance of antenna power		0.02mW ~ 0.12mW			
Measurement uncertainty		± 1.11dB			

Monopole antenna with 2.57dBi gain

Environmental Conditions		25 deg.C, 68% RH			
Modulation Type	Data Rate Type	Radiated RF Output Power Density (mW)			
		Normal Voltage	Max. Voltage	Min. Voltage	Max. Limit (mW/MHz)
		24Vdc	26.4Vdc	21.6Vdc	
GFSK	DH5	0.097618	0.094737	0.100172	4.909
DQPSK	2DH5	0.095612	0.099711	0.093653	4.909
8DPSK	3DH5	0.086643	0.083043	0.087805	4.909
Measurement uncertainty		± 1.11dB			

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



AFH MODE

Environmental Conditions		25 deg.C, 68% RH			
Modulation Type	Data Rate Type	Conducted RF Output Power Density (mW)			
		Normal Voltage	Max. Voltage	Min. Voltage	Max. Limit (mW/MHz)
		24Vdc	26.4Vdc	21.6Vdc	
GFSK	DH5	0.212486	0.206216	0.217431	3
$\pi/4$ -DQPSK	2DH5	0.205847	0.214067	0.201627	3
8DPSK	3DH5	0.186011	0.179287	0.189038	3
Rated power		0.3mW			
Tolerance of antenna power		0.06mW ~ 0.36mW			
Measurement uncertainty		± 1.11 dB			

Monopole antenna with 2.57dBi gain

Environmental Conditions		25 deg.C, 68% RH			
Modulation Type	Data Rate Type	Radiated RF Output Power Density (mW)			
		Normal Voltage	Max. Voltage	Min. Voltage	Max. Limit (mW/MHz)
		24Vdc	26.4Vdc	21.6Vdc	
GFSK	DH5	0.383999	0.372668	0.392936	4.909
$\pi/4$ -DQPSK	2DH5	0.372001	0.386856	0.364375	4.909
8DPSK	3DH5	0.336154	0.324003	0.341625	4.909
Measurement uncertainty		± 1.11 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

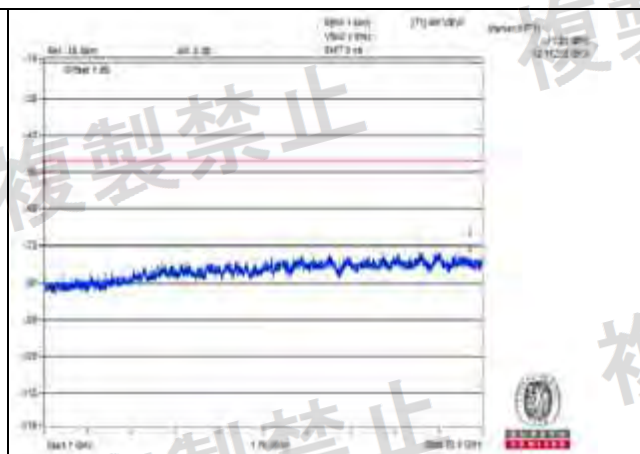
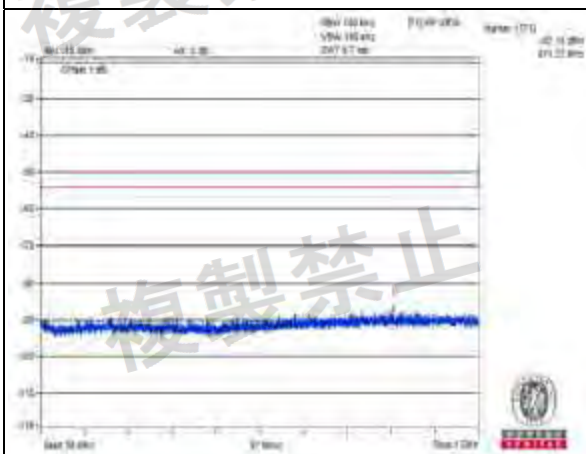
Modulation: GFSK

Test Channel		CH0 (2402MHz)		CH39 (2441MHz)		Limit	Result
Test Condition	Frequency Range	Frequency (MHz)	Measure. Value	Frequency (MHz)	Measure. Value		
V _{normal}	below 1GHz	811.330	0.001928nW	837.520	0.002213nW	4 nW	PASS
	above 1GHz	12172.250	0.075683nW	10861.250	0.090157nW	20 nW	PASS
V _{max.}	below 1GHz	739.550	0.002094nW	746.830	0.019275nW	4 nW	PASS
	above 1GHz	11410.370	0.099312nW	11309.750	0.088308nW	20 nW	PASS
V _{min.}	below 1GHz	847.460	0.001936nW	795.570	0.001824nW	4 nW	PASS
	above 1GHz	11396.000	0.076913nW	11315.500	0.092045nW	20 nW	PASS
Test Channel		CH78 (2480MHz)				Limit	Result
Test Condition	Frequency Range	Frequency (MHz)		Measure. Value			
V _{normal}	below 1GHz	769.620		0.001972nW		4 nW	PASS
	above 1GHz	9006.870		0.073961nW		20 nW	PASS
V _{max.}	below 1GHz	748.770		0.001841nW		4 nW	PASS
	above 1GHz	11358.620		0.083753nW		20 nW	PASS
V _{min.}	below 1GHz	936.950		0.001919nW		4 nW	PASS
	above 1GHz	11301.120		0.087096nW		20 nW	PASS

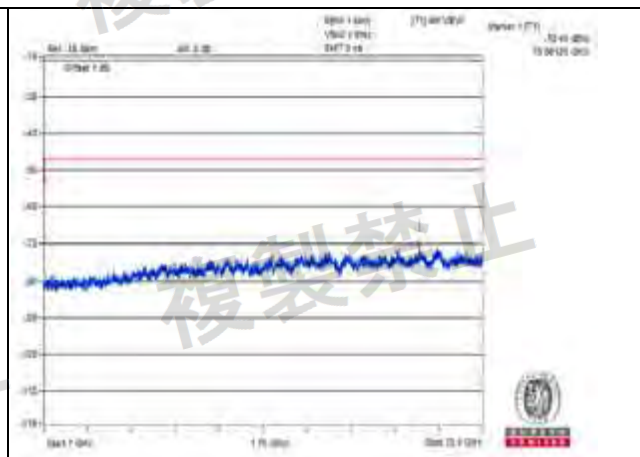
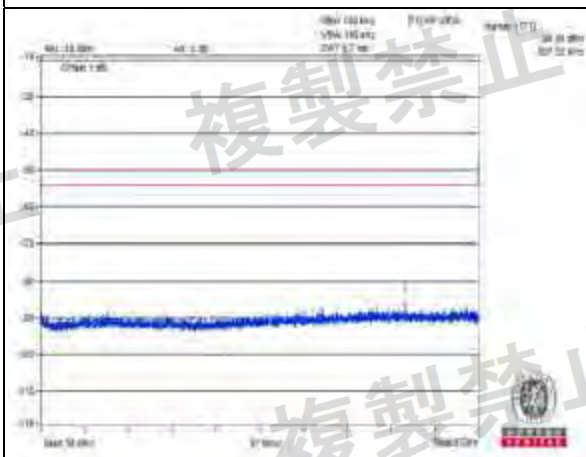
NOTE: 1. The worst value in each frequency range v.s. each channel has been marked by boldface.
2. The spectrum plots are attached on the following pages.



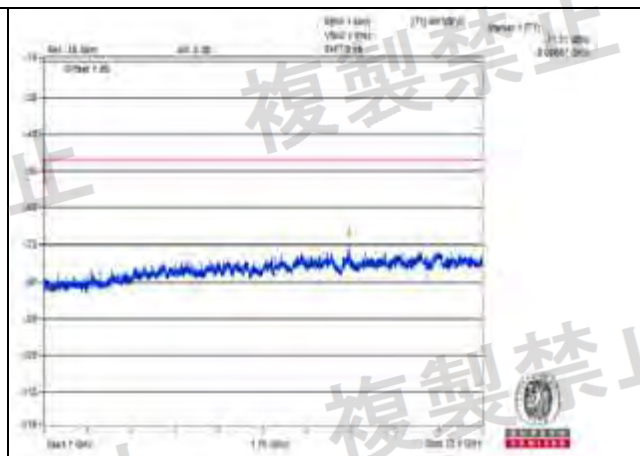
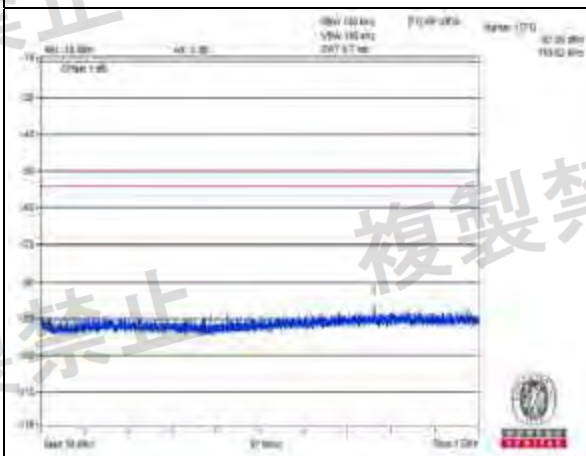
V_{normal}



Channel 0



Channel 39

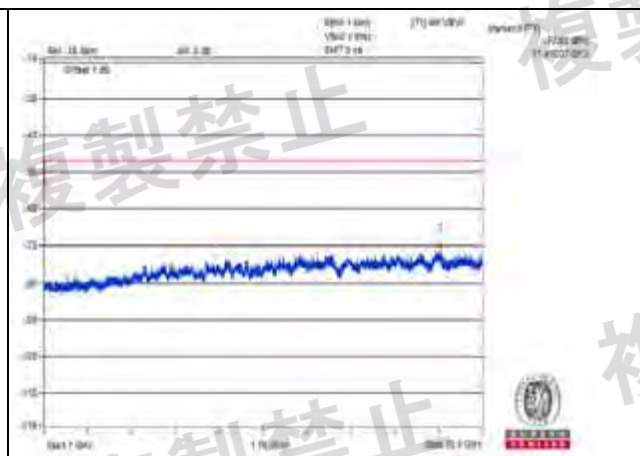
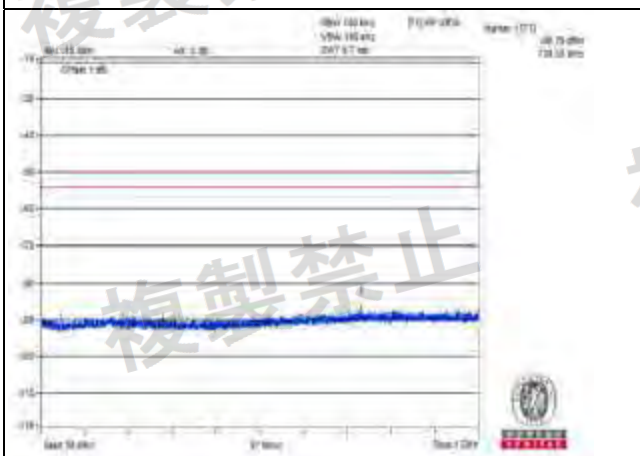


Channel 78

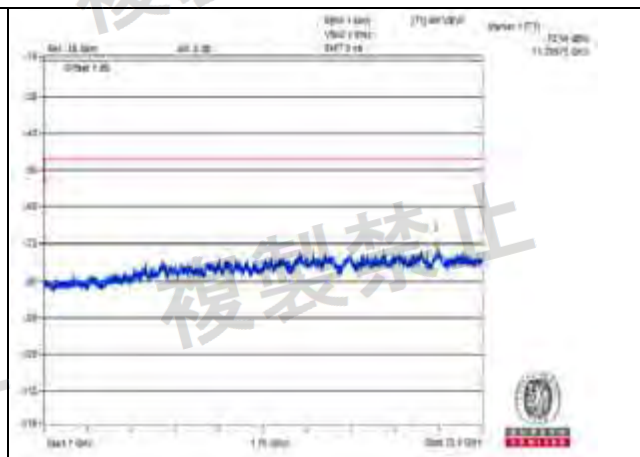
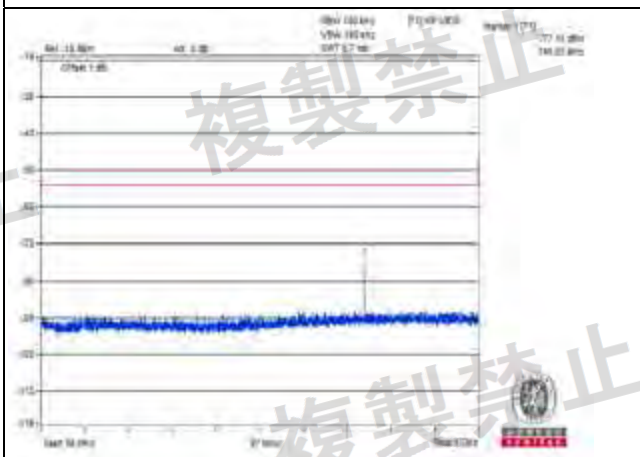
Measurement uncertainty: $\pm 3.93\text{dB}$



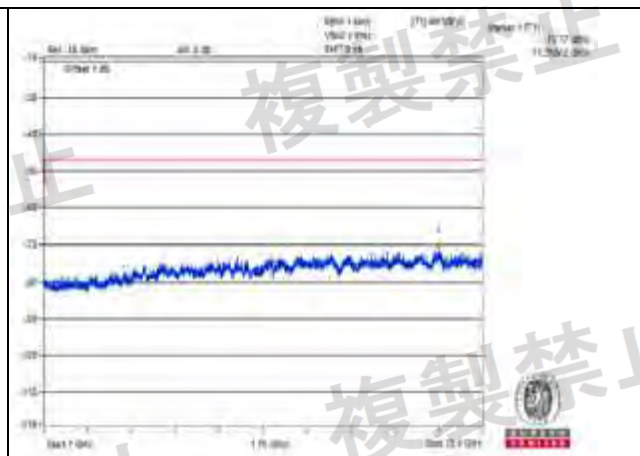
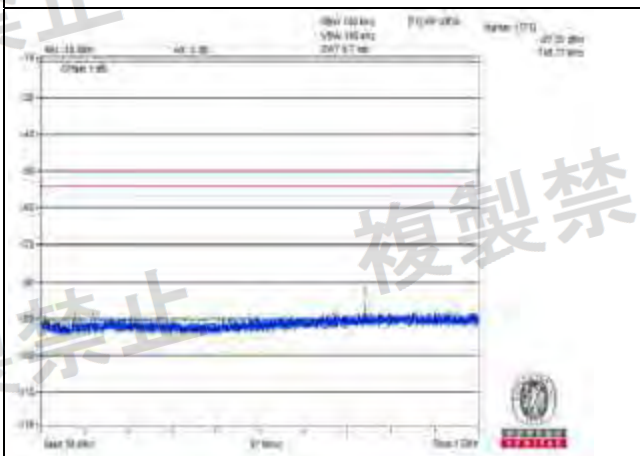
Vmax.



Channel 0



Channel 39

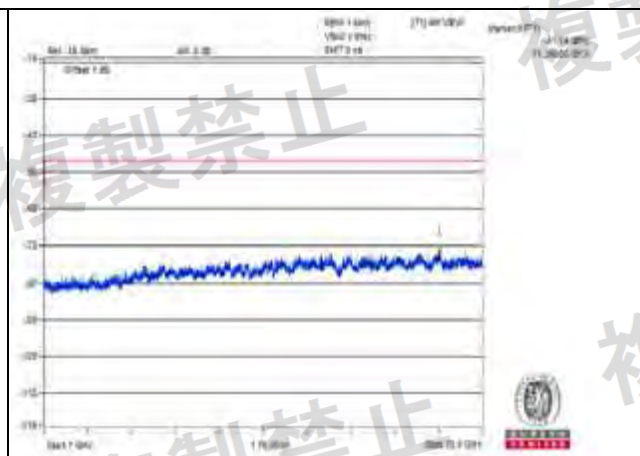
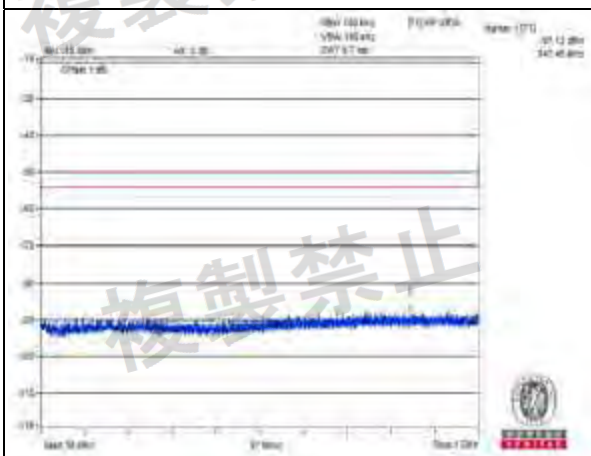


Channel 78

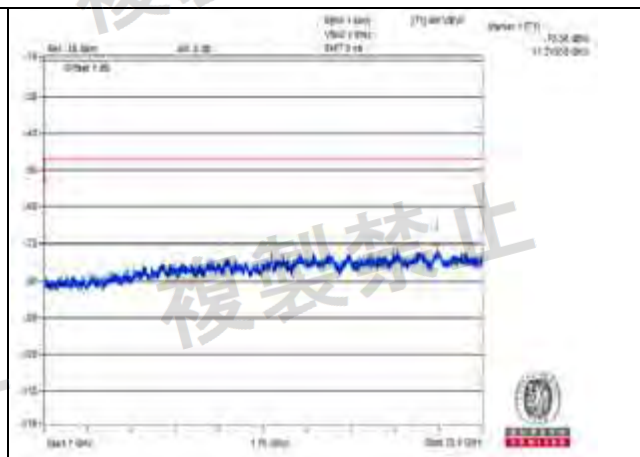
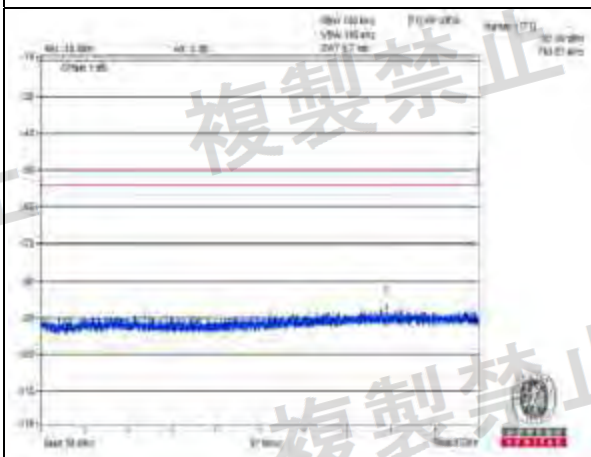
Measurement uncertainty: $\pm 3.93\text{dB}$



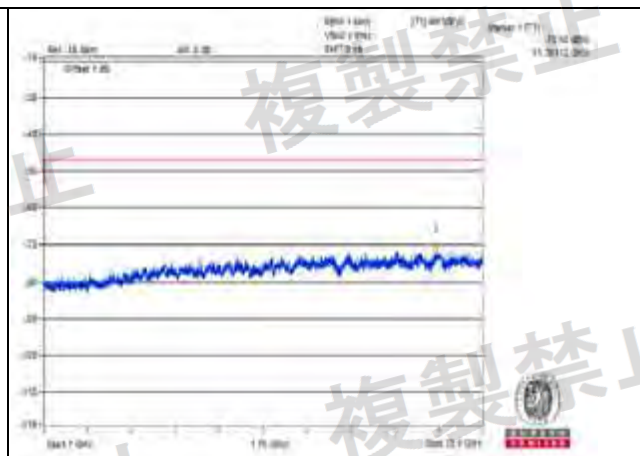
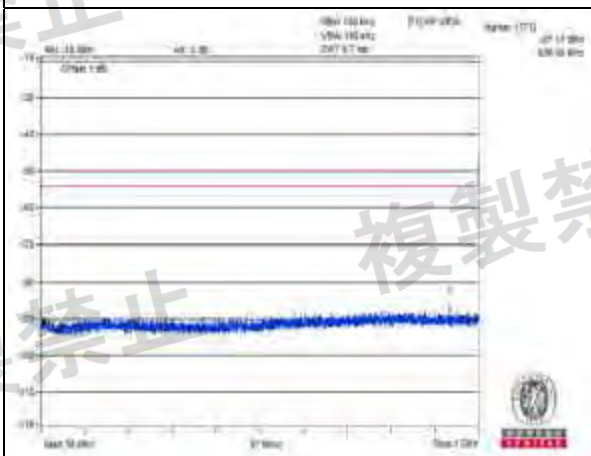
V_{min}.



Channel 0



Channel 39



Channel 78

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



4.7 Dwell Time

4.7.1 Limits of Dwell Time

The frequency retention time in the frequency hopping method shall be 0.4 second or less. The total sum of the frequency retention time in any frequency within the time obtained by multiplying the diffusion rate by 0.4 second shall be 0.4 second or shorter.

Formula:

(Normal mode) dwell time = [diffusion rate/ 79] x duty-cycle x 0.4 seconds

(AFH mode) dwell time = [diffusion rate/20] x duty-cycle x 0.4 sec

4.7.2 Test Setup





4.7.3 Test Result

Modulation: GFSK

NORMAL MODE

Test Condition	Mode	Spreading Rate	[Spreading Rate/79]*0.4	Duty Cycle	Result (msec)	Limit (msec)
Normal Voltage	DH1	71.20	0.360	0.294	105.840	400
	DH3	71.20	0.360	0.647	232.920	400
	DH5	71.20	0.360	0.762	274.320	400
Normal Voltage max.	DH1	71.20	0.360	0.294	105.840	400
	DH3	71.20	0.360	0.647	232.920	400
	DH5	71.20	0.360	0.762	274.320	400
Normal Voltage min.	DH1	71.00	0.359	0.294	105.546	400
	DH3	71.00	0.359	0.647	232.273	400
	DH5	71.00	0.359	0.762	273.558	400

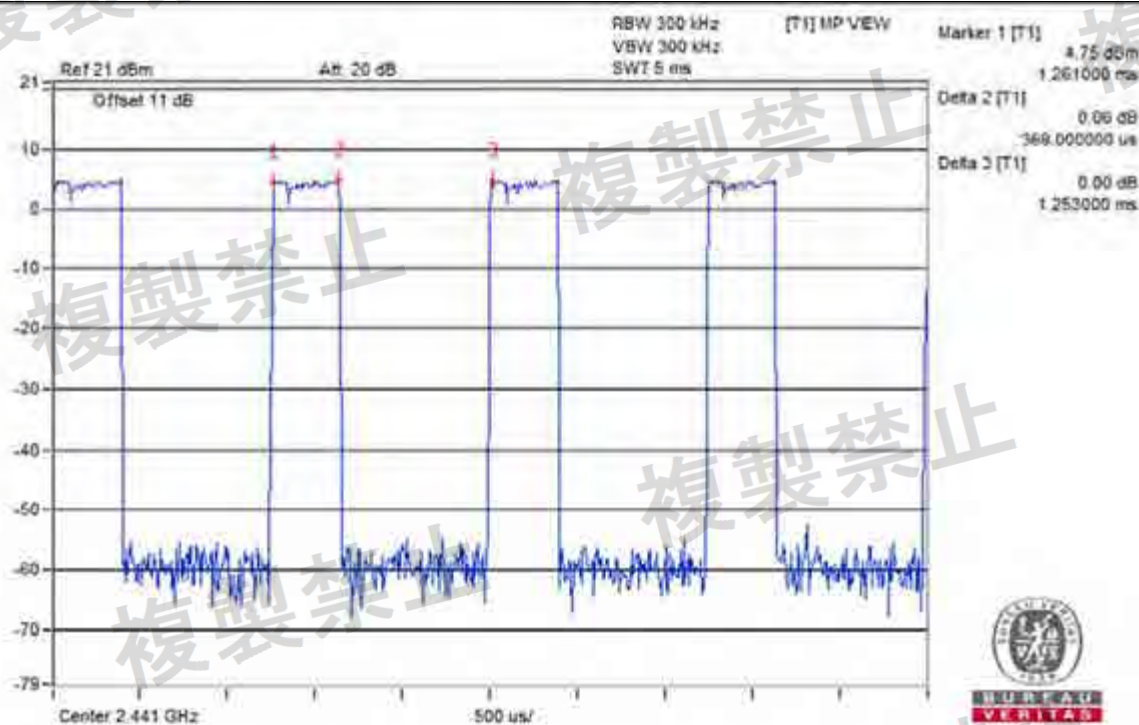
AFH MODE

Test Condition	Mode	Spreading Rate	[Spreading Rate/20]*0.4	Duty Cycle	Result (msec)	Limit (msec)
Normal Voltage	DH1	18.10	0.362	0.294	106.428	400
	DH3	18.10	0.362	0.647	234.214	400
	DH5	18.10	0.362	0.762	275.844	400
Normal Voltage max.	DH1	18.10	0.362	0.294	106.428	400
	DH3	18.10	0.362	0.647	234.214	400
	DH5	18.10	0.362	0.762	275.844	400
Normal Voltage min.	DH1	18.10	0.362	0.294	106.428	400
	DH3	18.10	0.362	0.647	234.214	400
	DH5	18.10	0.362	0.762	275.844	400

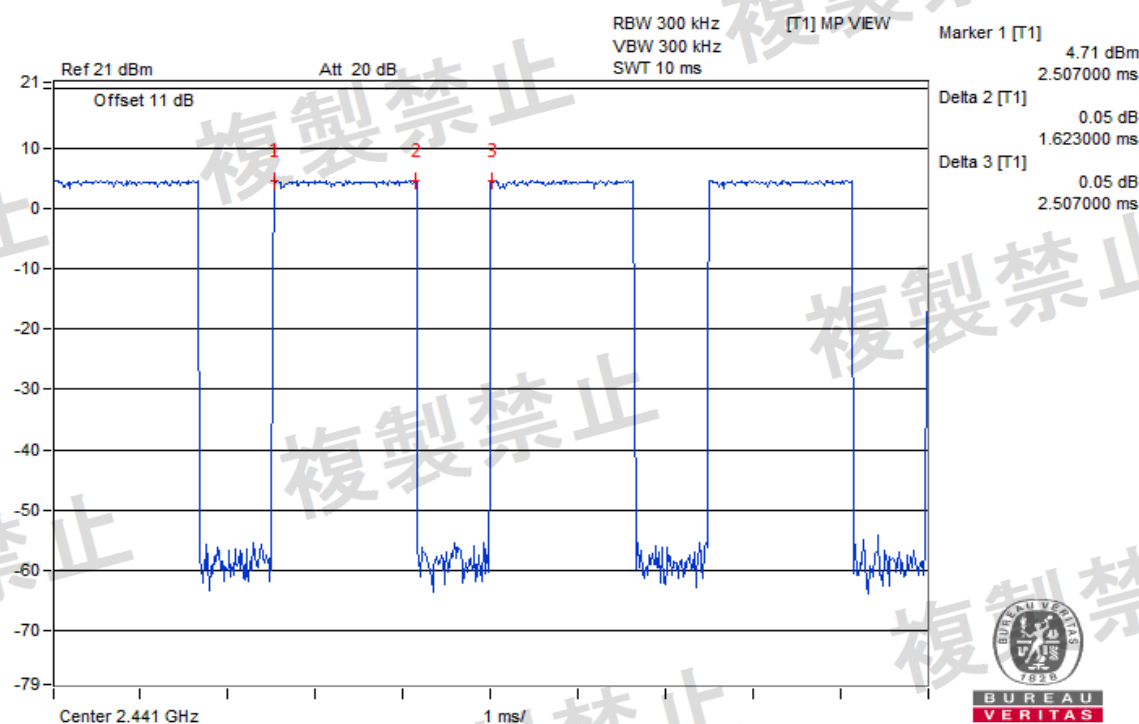
Test plots of the transmitting time slot are shown on next 6 pages.



V_{normal}



DH1

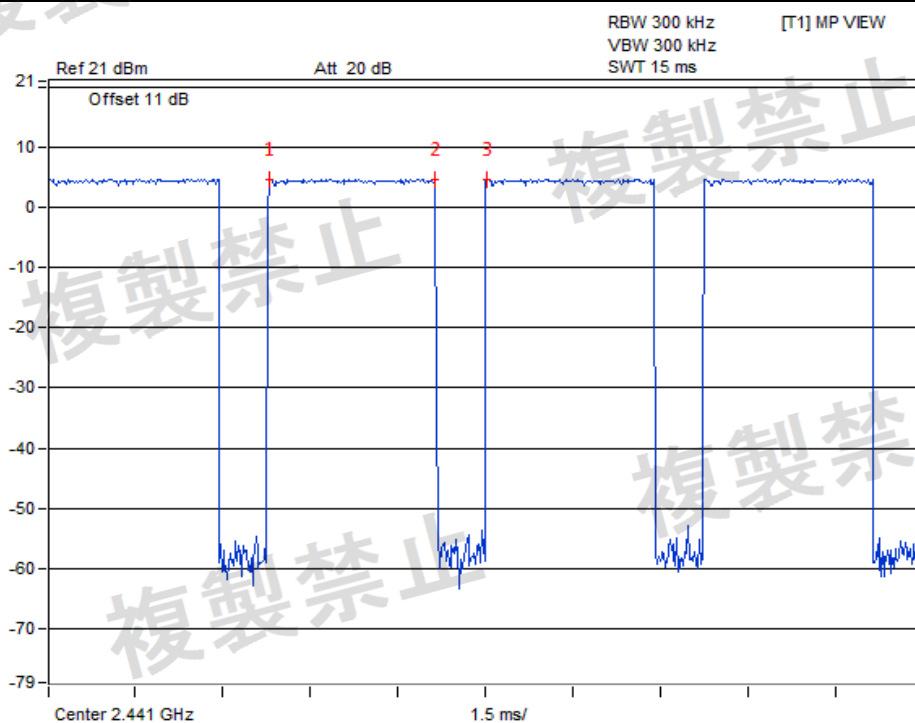


DH3

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



V_{normal}



Marker 1 [T1]
4.70 dBm
3.761000 ms

Delta 2 [T1]
0.16 dB
2.869000 ms

Delta 3 [T1]
0.00 dB
3.761000 ms

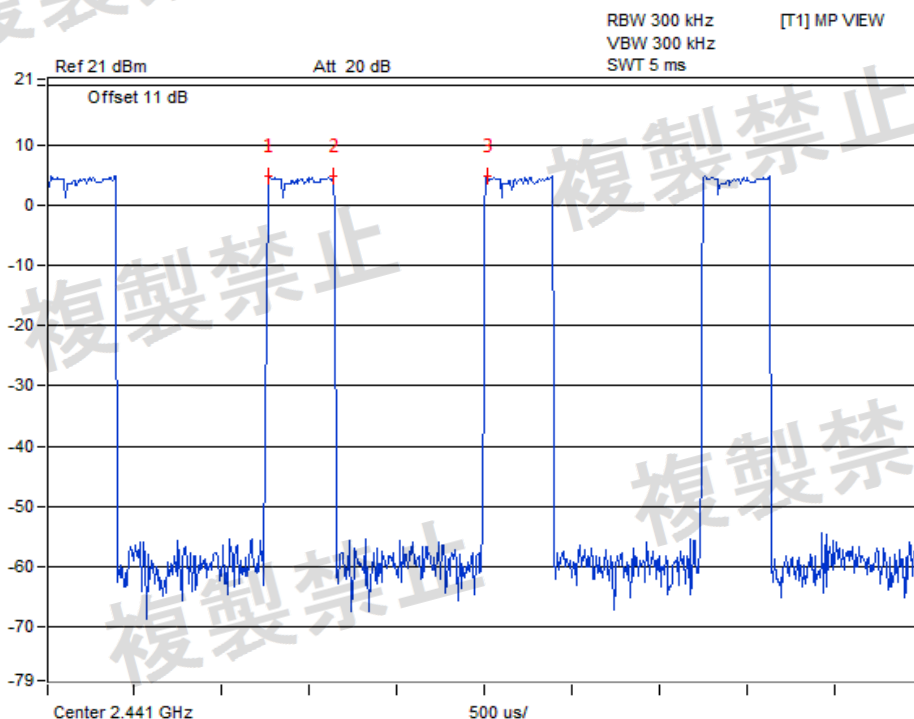


DH5

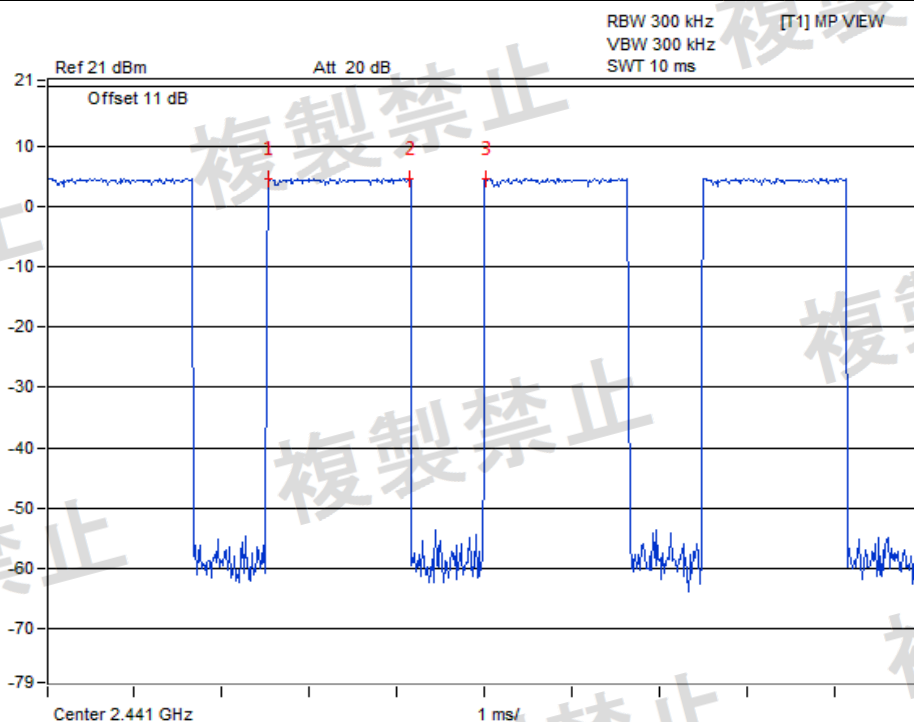
Measurement uncertainty: $\pm 3.93\text{dB}$



V_{max}.



DH1

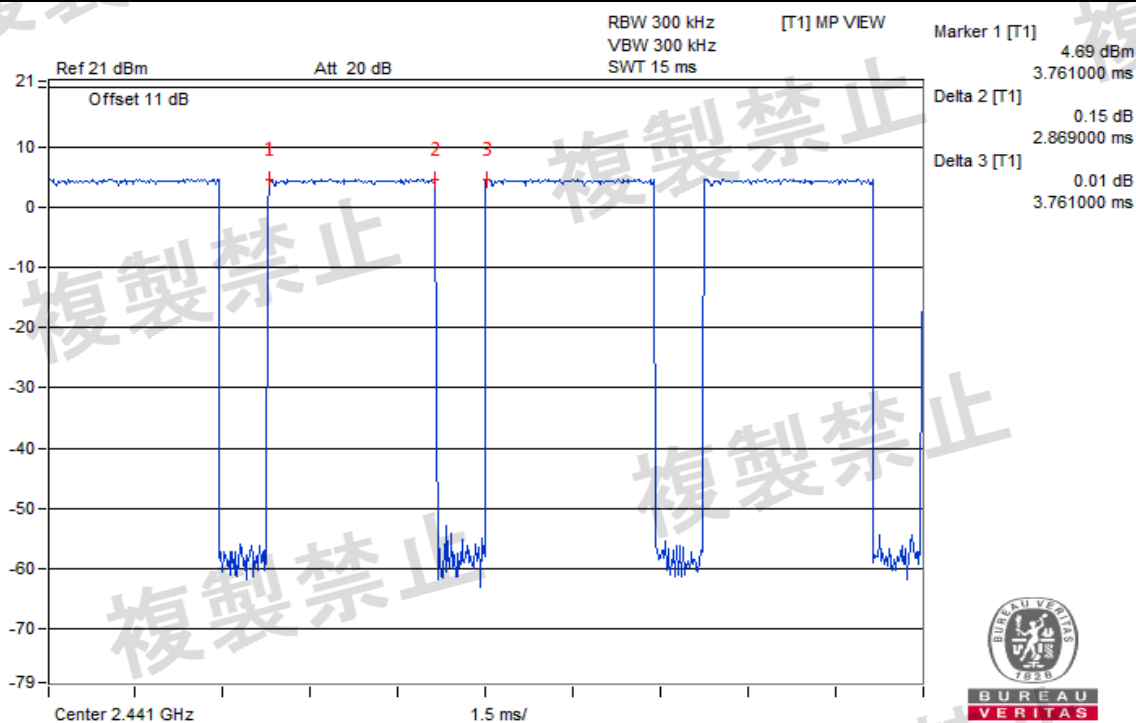


DH3

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



V_{max}.

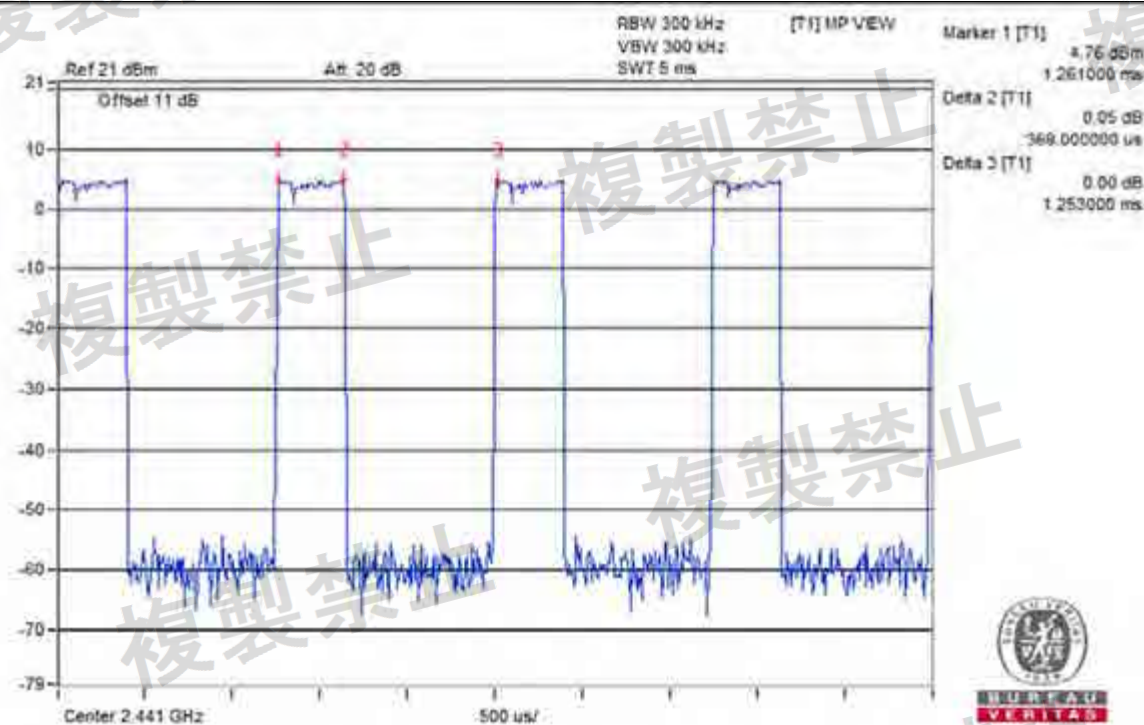


DH5

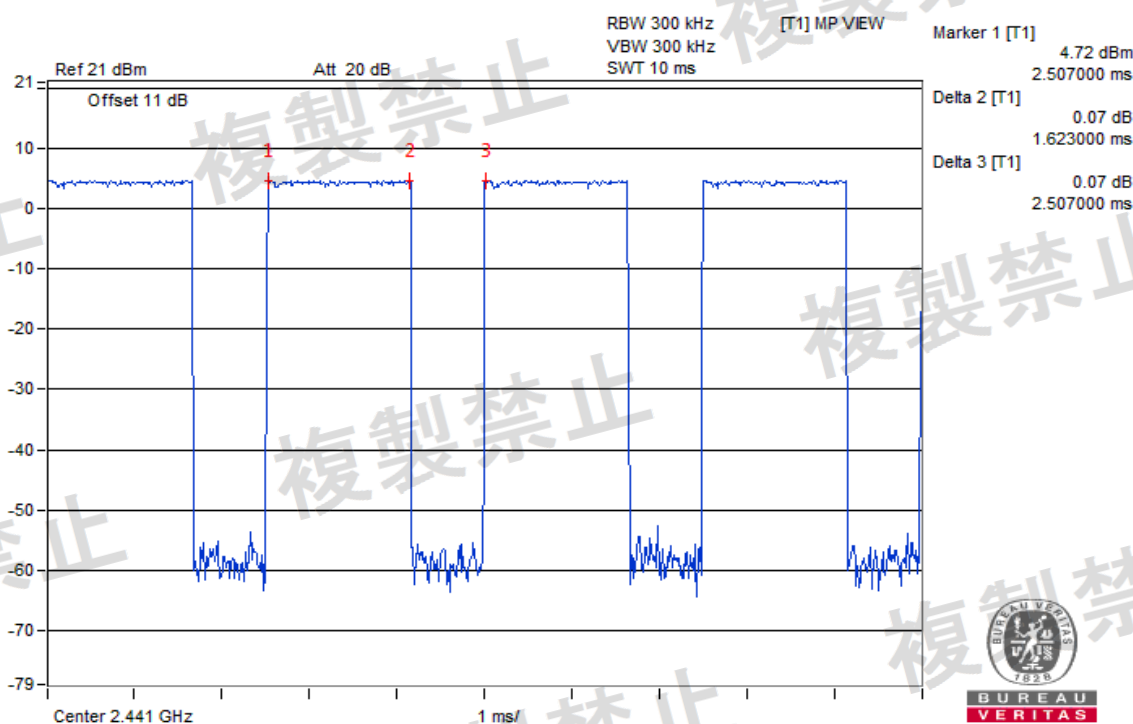
Measurement uncertainty: $\pm 3.93\text{dB}$



V_{min}.



DH1

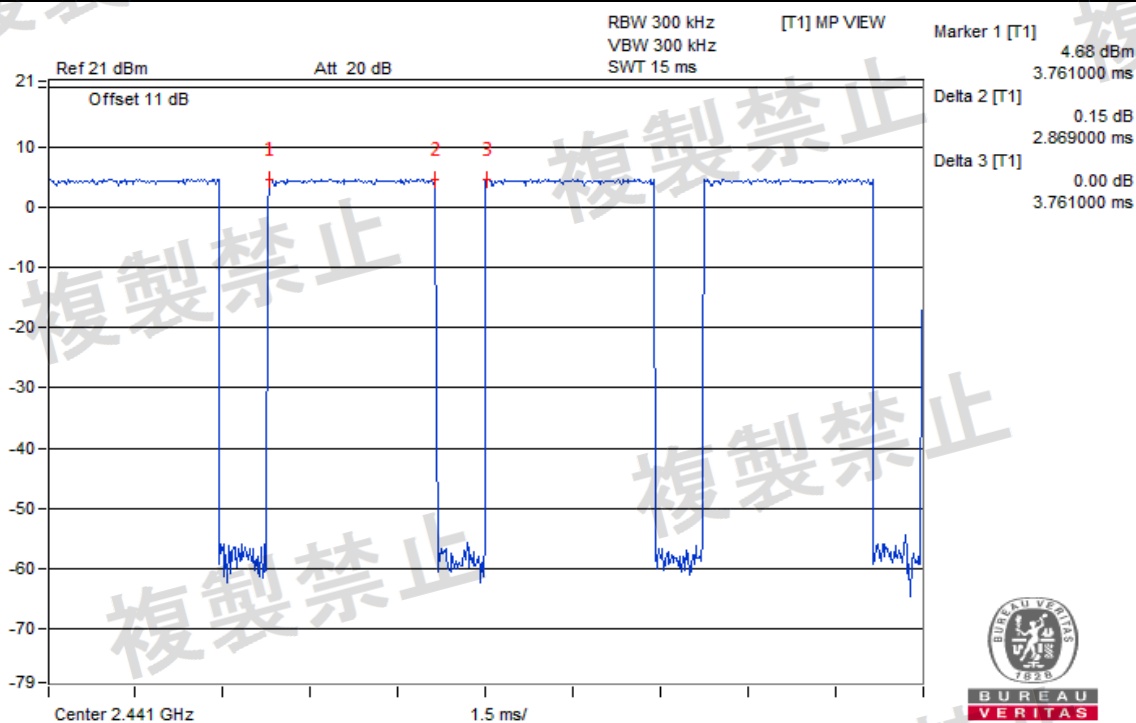


DH3

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



V_{min}



DH5

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



Modulation: $\pi/4$ -DQPSK

NORMAL MODE

Test Condition	Mode	Spreading Rate	[Spreading Rate/79]*0.4	Duty Cycle	Result (msec)	Limit (msec)
Normal Voltage	DH1	71.20	0.360	0.277	99.720	400
	DH3	71.20	0.360	0.650	234.000	400
	DH5	71.20	0.360	0.761	273.960	400
Normal Voltage max.	DH1	71.00	0.359	0.277	99.443	400
	DH3	71.00	0.359	0.650	233.350	400
	DH5	71.00	0.359	0.761	273.199	400
Normal Voltage min.	DH1	71.20	0.360	0.277	99.720	400
	DH3	71.20	0.360	0.650	234.000	400
	DH5	71.20	0.360	0.761	273.960	400

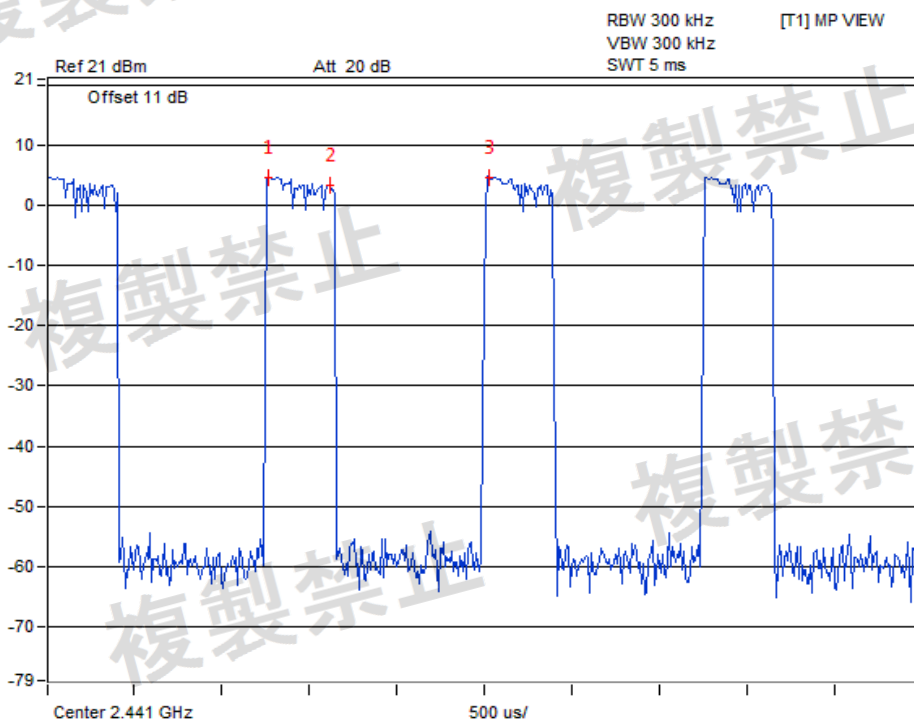
AFH MODE

Test Condition	Mode	Spreading Rate	[Spreading Rate/20]*0.4	Duty Cycle	Result (msec)	Limit (msec)
Normal Voltage	DH1	18.30	0.366	0.277	101.382	400
	DH3	18.30	0.366	0.650	237.900	400
	DH5	18.30	0.366	0.761	278.526	400
Normal Voltage max.	DH1	18.30	0.366	0.277	101.382	400
	DH3	18.30	0.366	0.650	237.900	400
	DH5	18.30	0.366	0.761	278.526	400
Normal Voltage min.	DH1	18.30	0.366	0.277	101.382	400
	DH3	18.30	0.366	0.650	237.900	400
	DH5	18.30	0.366	0.761	278.526	400

Test plots of the transmitting time slot are shown on next 6 pages.



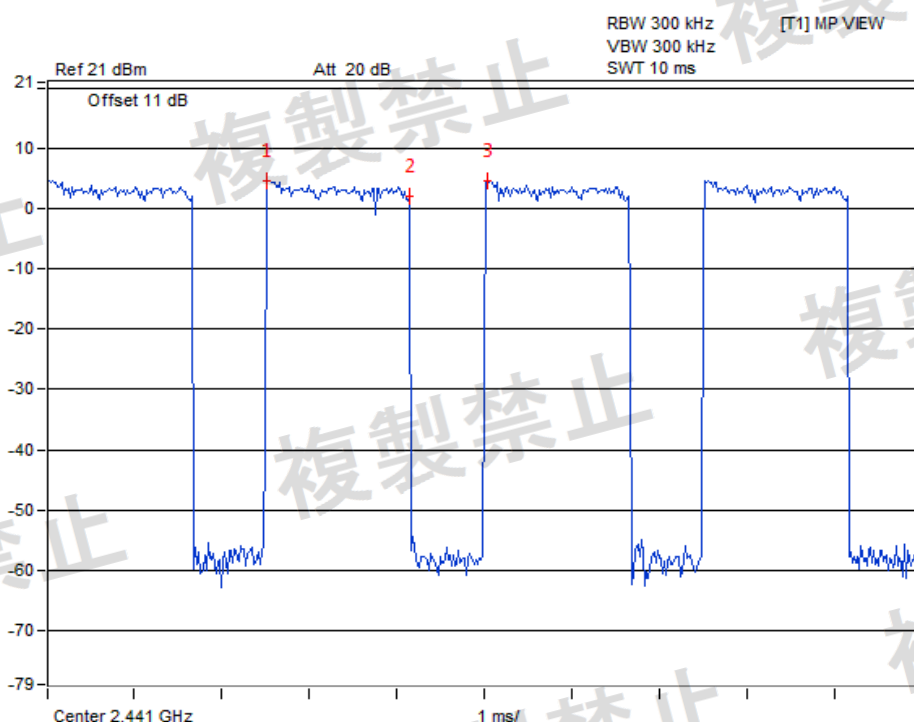
V_{normal}



Marker 1 [T1] 4.75 dBm
1.260000 ms
Delta 2 [T1] 1.43 dB
350.000000 us
Delta 3 [T1] 0.10 dB
1.260000 ms



DH1



Marker 1 [T1] 4.70 dBm
2.500000 ms
Delta 2 [T1] 2.67 dB
1.640000 ms
Delta 3 [T1] 0.00 dB
2.520000 ms

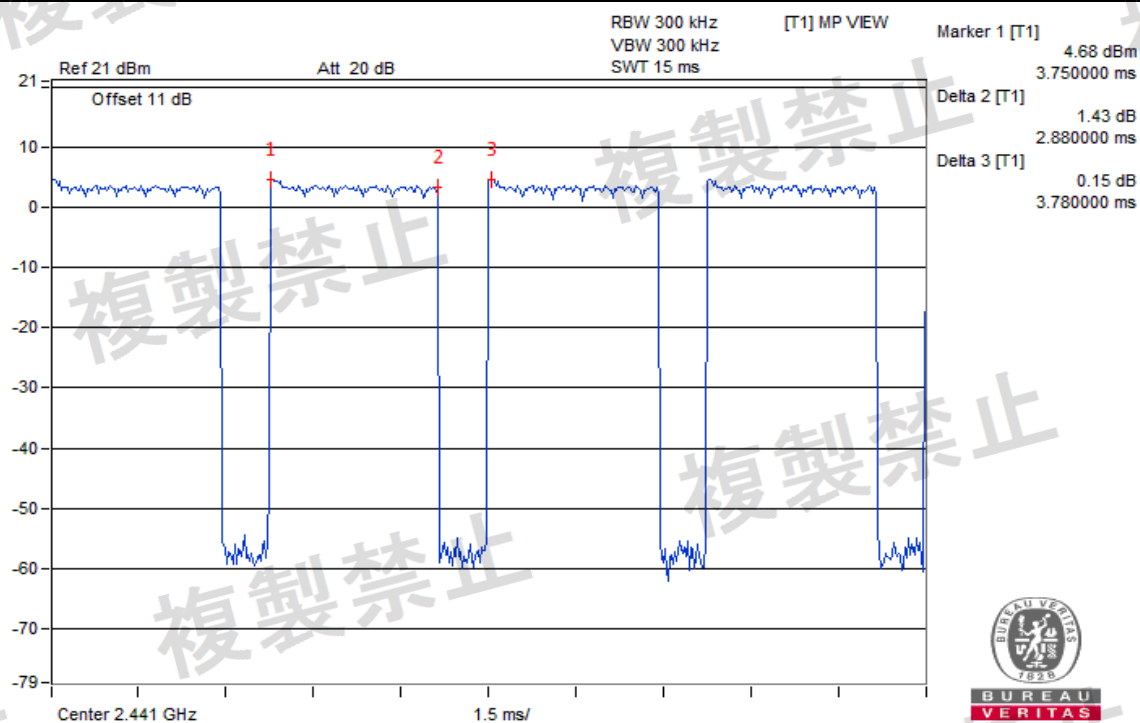


DH3

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

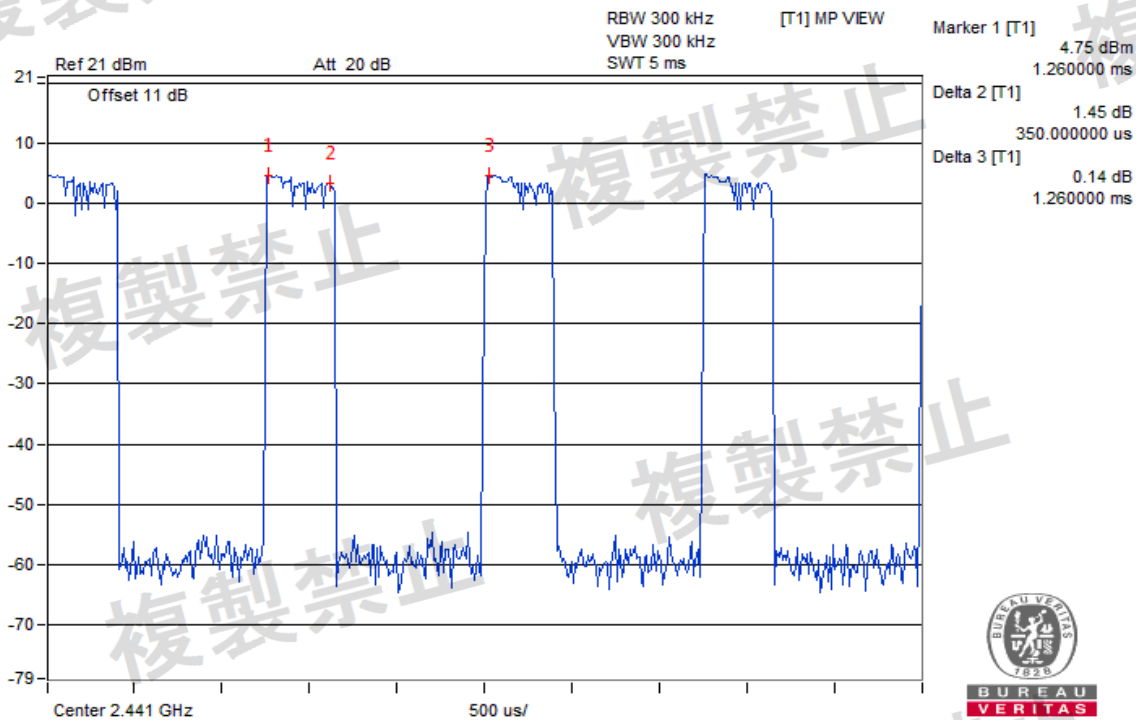


V_{normal}

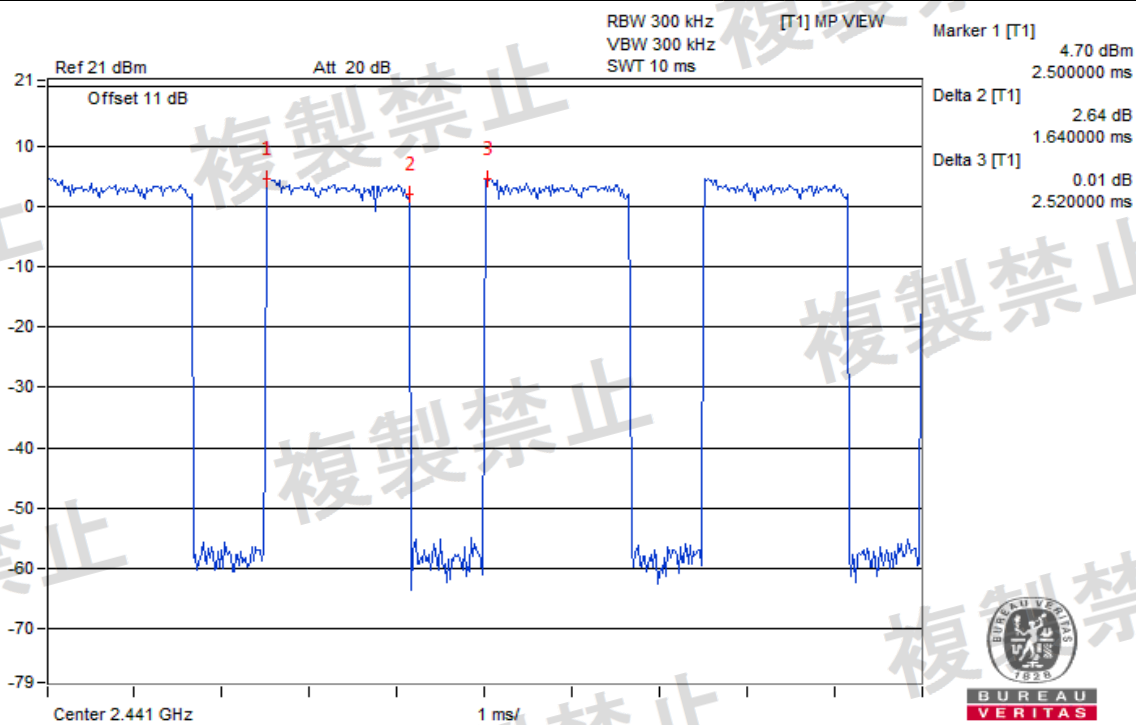


DH5

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

V_{\max} 

DH1

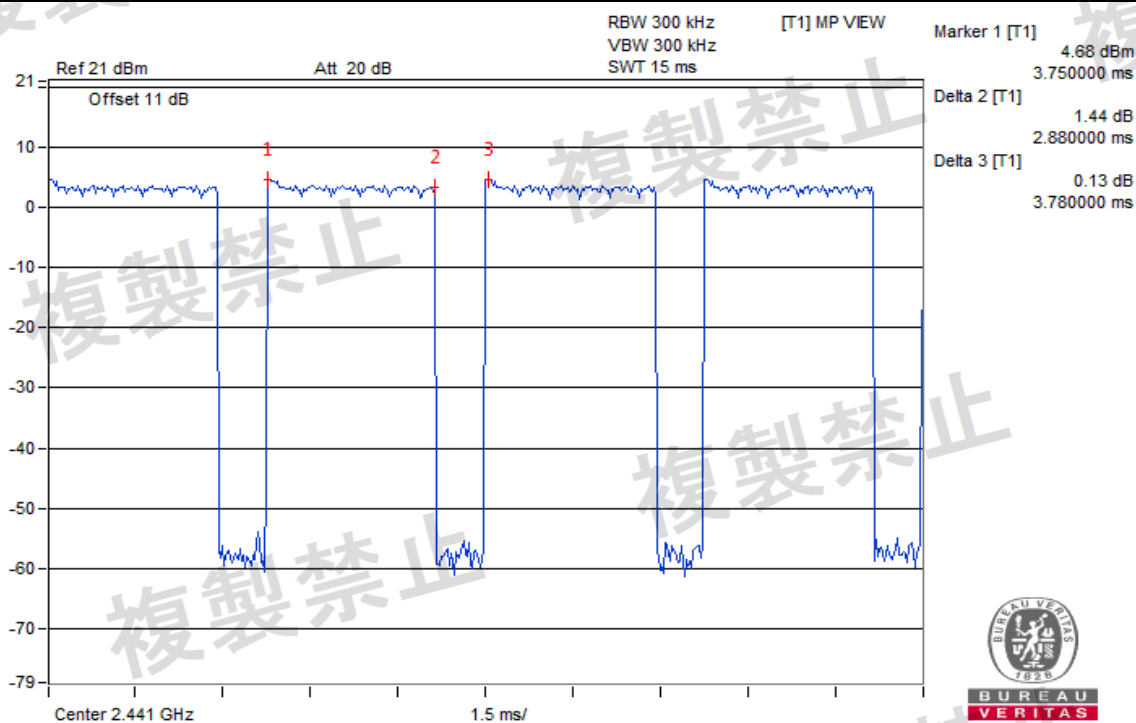


DH3

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

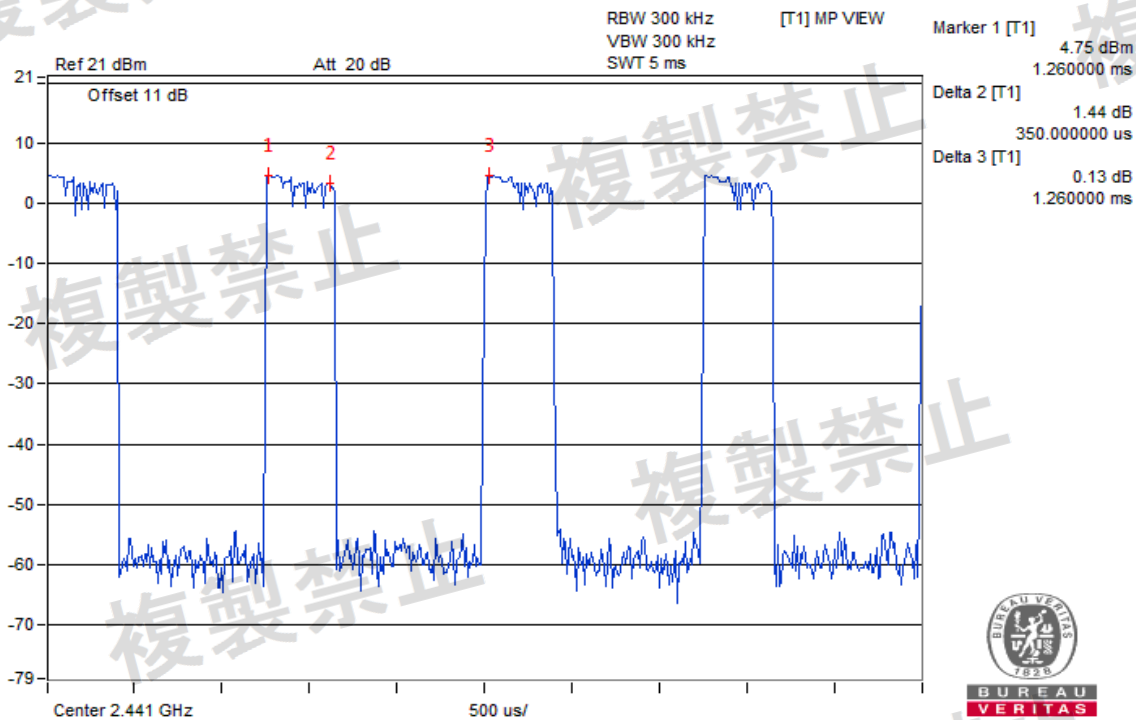


V_{max}.

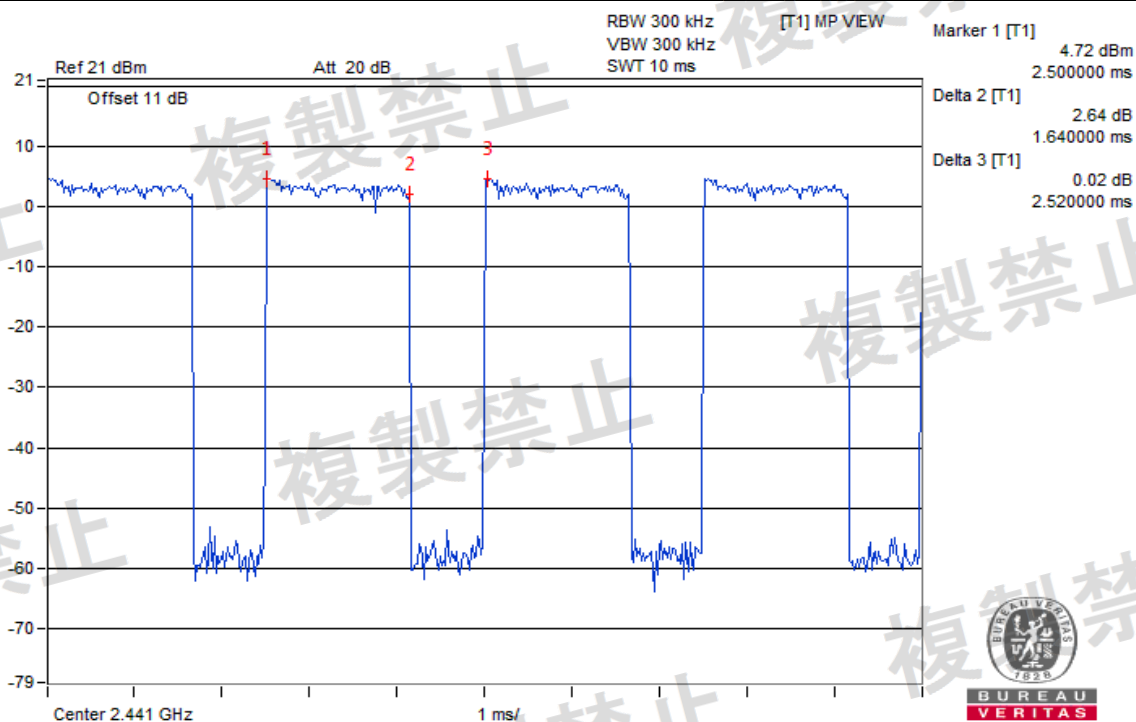


DH5

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

$V_{\min.}$ 

DH1

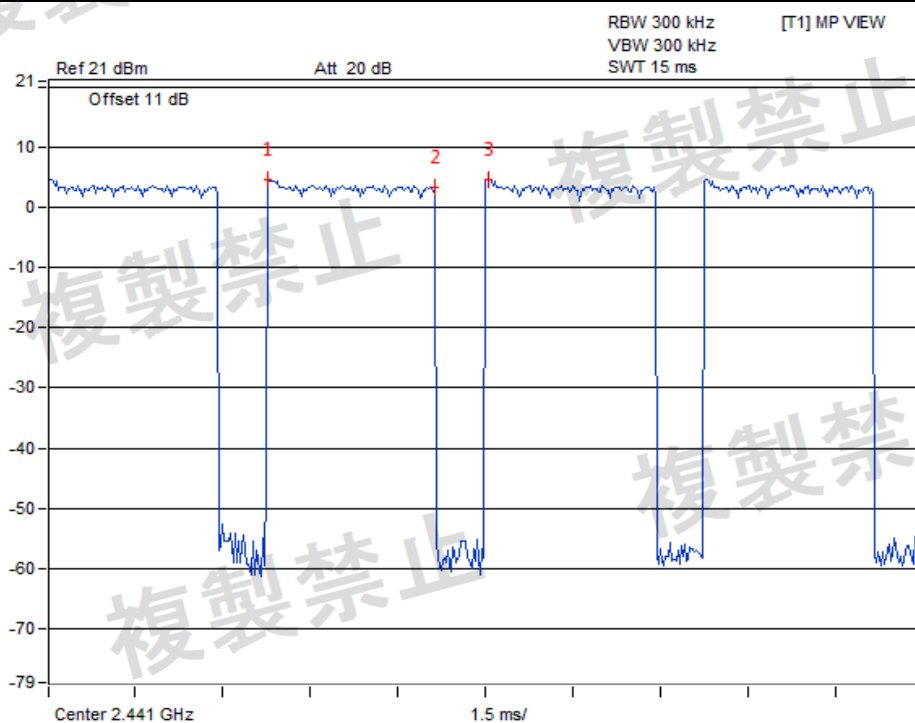


DH3

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



V_{min}



Marker 1 [T1]
4.69 dBm
3.750000 ms

Delta 2 [T1]
1.44 dB
2.880000 ms

Delta 3 [T1]
0.16 dB
3.780000 ms



DH5

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



Modulation: 8DPSK

NORMAL MODE

Test Condition	Mode	Spreading Rate	[Spreading Rate/79]*0.4	Duty Cycle	Result (msec)	Limit (msec)
Normal Voltage	DH1	71.00	0.359	0.293	105.187	400
	DH3	71.00	0.359	0.637	228.683	400
	DH5	71.00	0.359	0.755	271.045	400
Normal Voltage max.	DH1	71.40	0.361	0.293	105.773	400
	DH3	71.40	0.361	0.637	229.957	400
	DH5	71.40	0.361	0.761	274.721	400
Normal Voltage min.	DH1	71.20	0.360	0.293	105.480	400
	DH3	71.20	0.360	0.650	234.000	400
	DH5	71.20	0.360	0.761	273.960	400

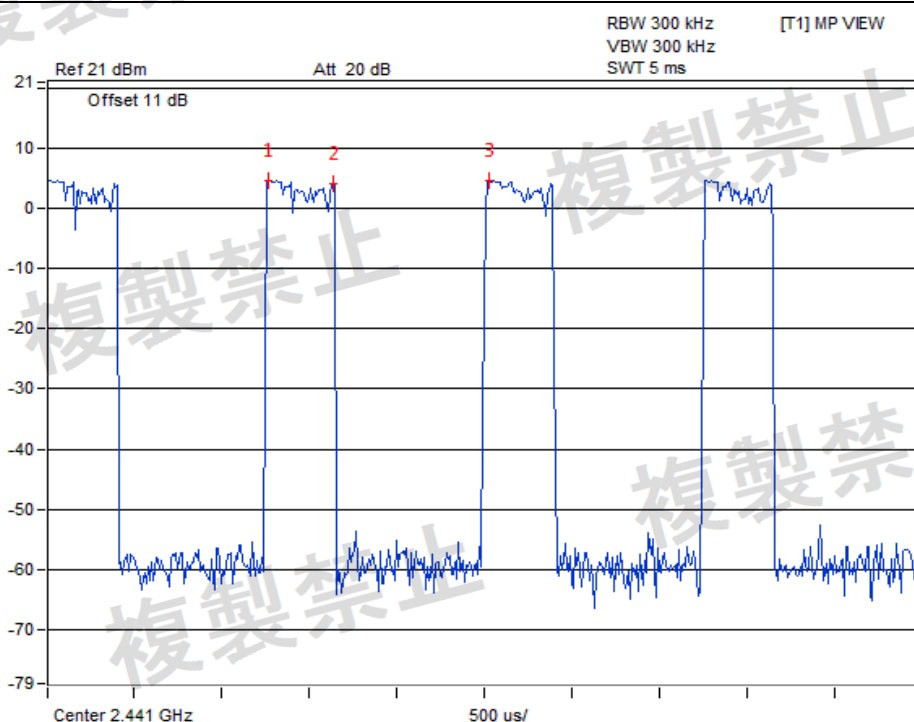
AFH MODE

Test Condition	Mode	Spreading Rate	[Spreading Rate/20]*0.4	Duty Cycle	Result (msec)	Limit (msec)
Normal Voltage	DH1	18.30	0.366	0.293	107.238	400
	DH3	18.30	0.366	0.637	233.142	400
	DH5	18.30	0.366	0.755	276.330	400
Normal Voltage max.	DH1	18.30	0.366	0.293	107.238	400
	DH3	18.30	0.366	0.637	233.142	400
	DH5	18.30	0.366	0.761	278.526	400
Normal Voltage min.	DH1	18.30	0.366	0.293	107.238	400
	DH3	18.30	0.366	0.650	237.900	400
	DH5	18.30	0.366	0.761	278.526	400

Test plots of the transmitting time slot are shown on next 6 pages.



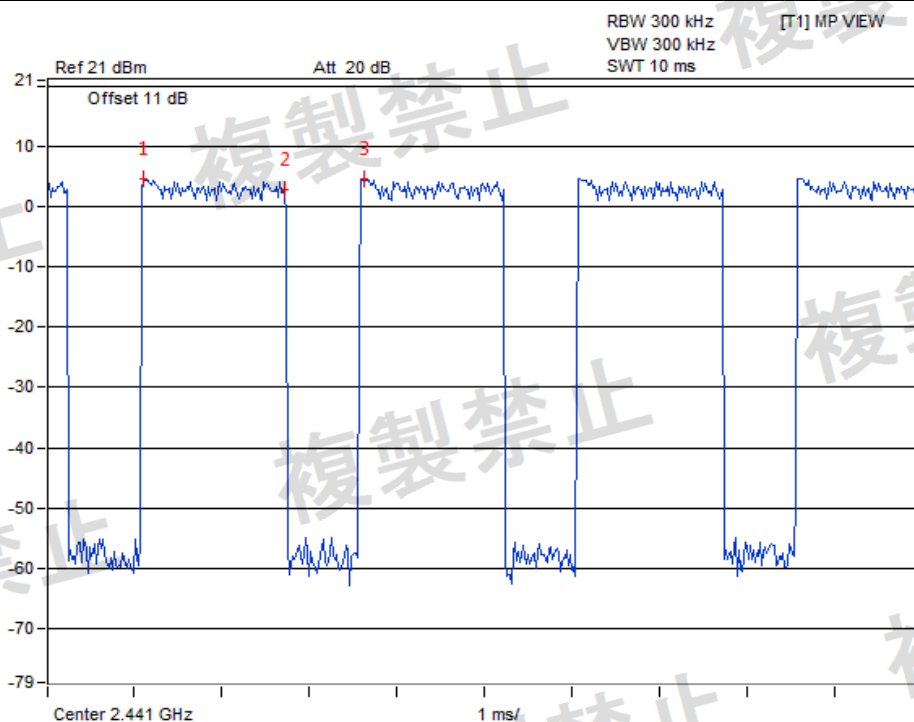
V_{normal}



Marker 1 [T1] 4.73 dBm
1.260000 ms
Delta 2 [T1] 0.65 dB
370.000000 us
Delta 3 [T1] 0.12 dB
1.260000 ms



DH1



Marker 1 [T1] 4.68 dBm
1.080000 ms
Delta 2 [T1] 1.75 dB
1.620000 ms
Delta 3 [T1] 0.17 dB
2.540000 ms

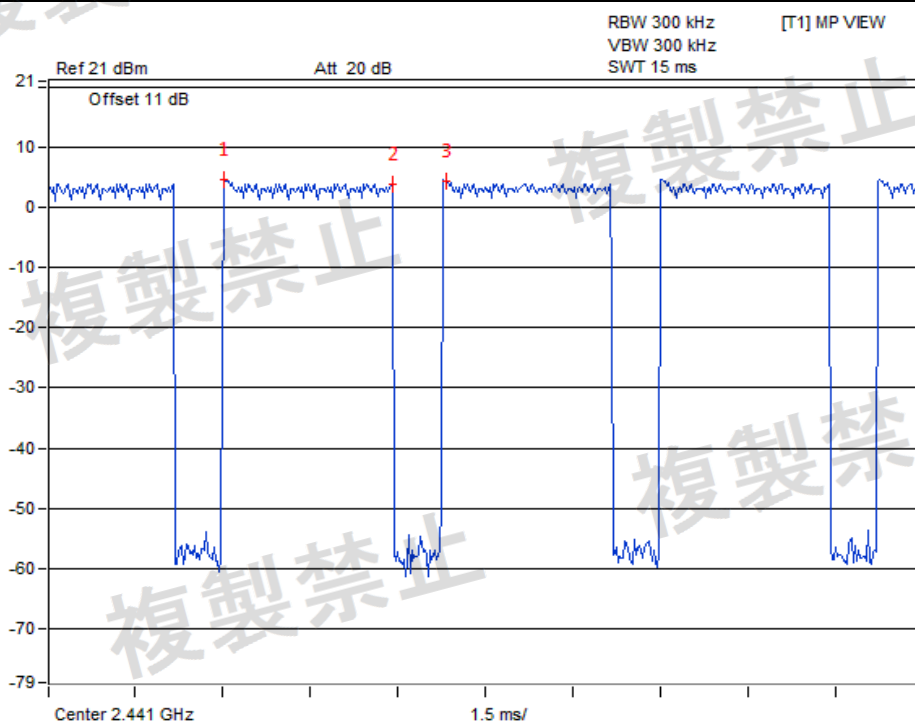


DH3

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



V_{normal}



Marker 1 [T1]
4.67 dBm
3.000000 ms

Delta 2 [T1]
0.77 dB
2.880000 ms

Delta 3 [T1]
0.19 dB
3.810000 ms

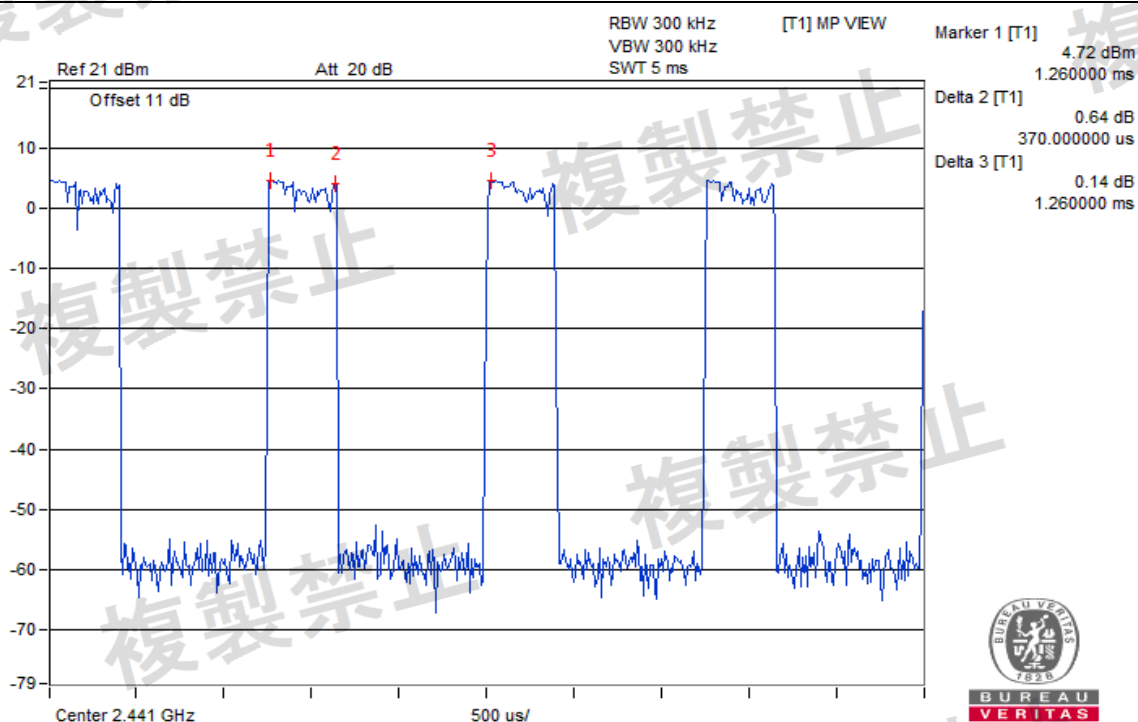


DH5

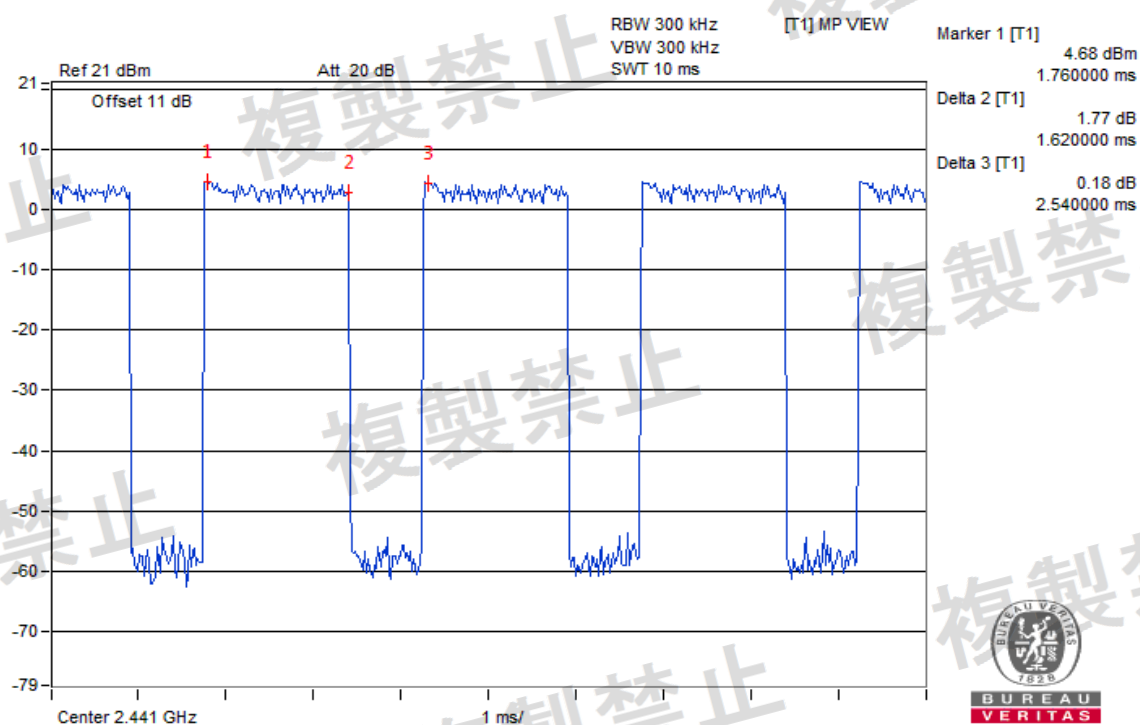
Measurement uncertainty: $\pm 3.93\text{dB}$



V_{max}



DH1

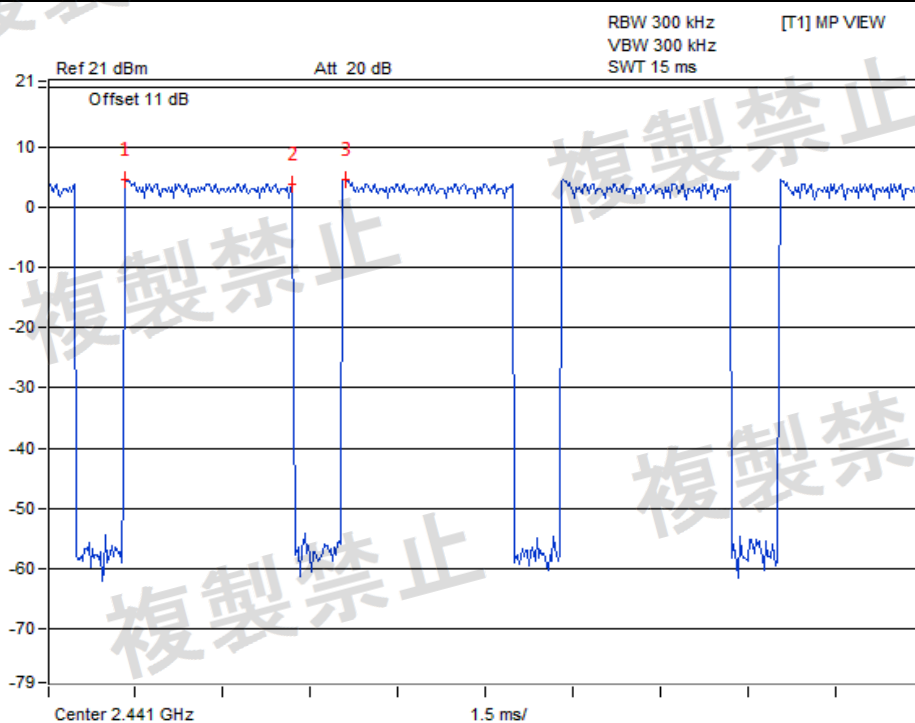


DH3

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



V_{max}.

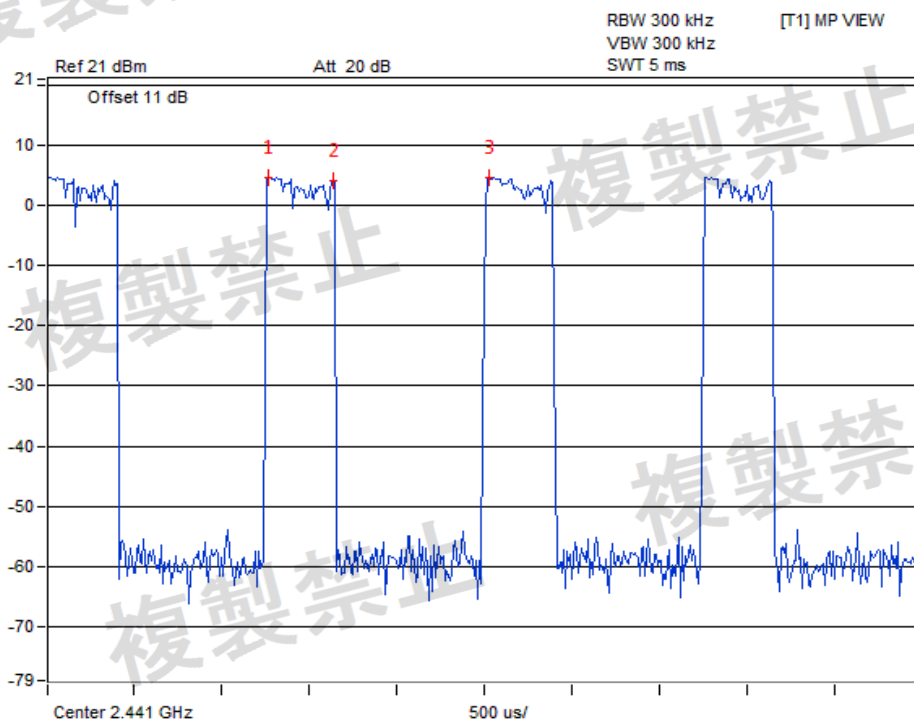


DH5

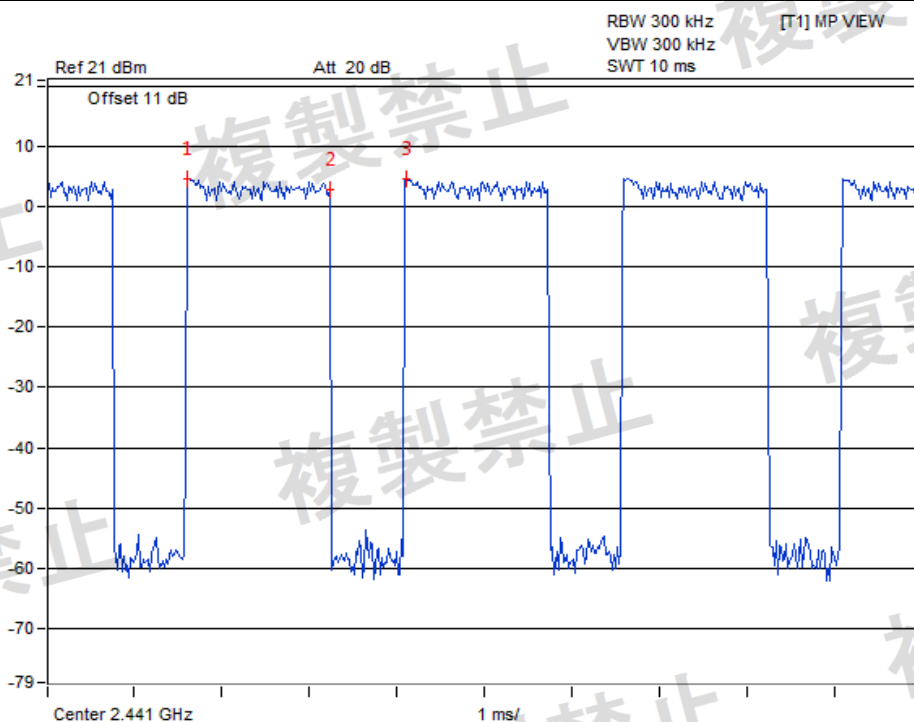
Measurement uncertainty: $\pm 3.93\text{dB}$



V_{min}.



DH1

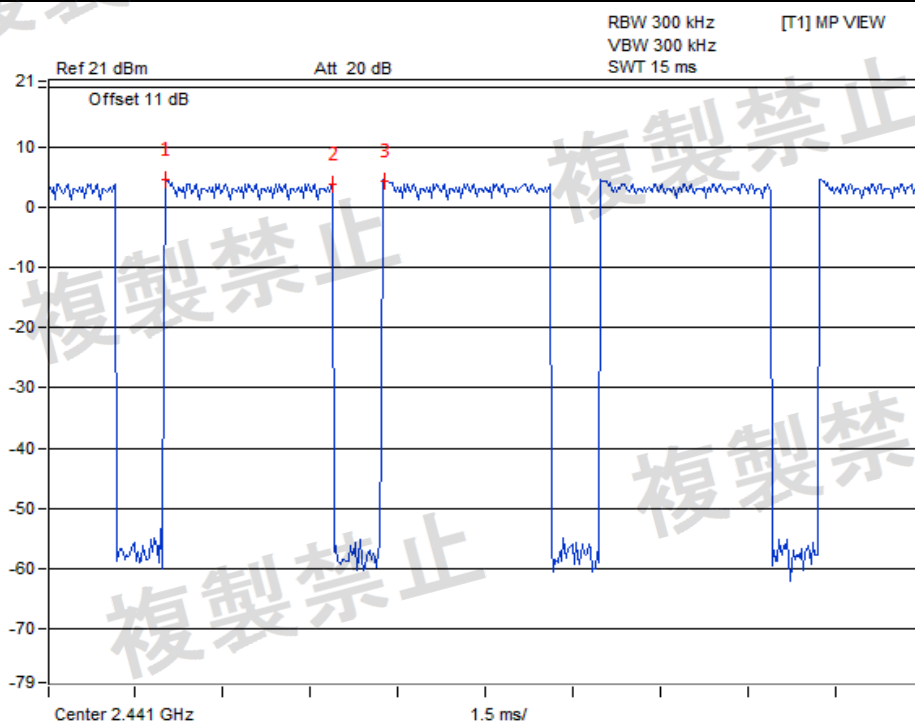


DH3

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



V_{min}



Marker 1 [T1]
4.66 dBm
1.980000 ms

Delta 2 [T1]
0.75 dB
2.880000 ms

Delta 3 [T1]
0.20 dB
3.780000 ms



DH5

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

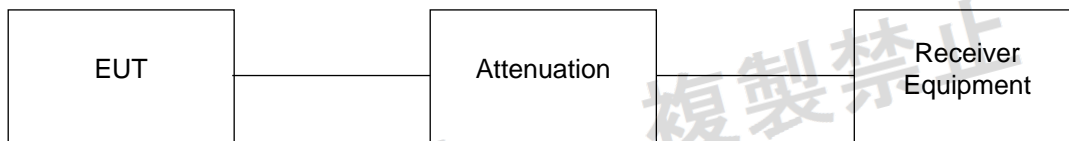


4.8 Interference Prevention Function

4.8.1 Limits of Interference Prevention Function

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

4.8.2 Test Setup



4.8.3 Test Results

Environmental Conditions	25 deg.C, 68% RH
Link Mode	Test Result
Bluetooth	PASS



5 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration	Calibration Authority	Cal. Method
Spectrum Analyzer / Rohde & Schwarz	FSV40	100980	Apr. 17, 2018	Apr. 16, 2019	Electronics Testing Center, Taiwan	c)
Signal Generator / Agilent	E4438C	MY45094468	Nov. 26, 2017	Nov. 25, 2018	Electronics Testing Center, Taiwan	c)
Power Meter / Anritsu	ML2495A	1232003	Dec. 29, 2017	Dec. 28, 2018	Electronics Testing Center, Taiwan	c)
Power Sensor / Anritsu	MA2411B	1207333	Dec. 28, 2017	Dec. 27, 2018	Electronics Testing Center, Taiwan	c)
DC Power Supply / Topward	6306A	727263	NA	NA	NA	d)

NOTE: Calibration Method

- a) : Calibration conducted by the National Institute of Information and Communications Technology~NICT~ or a designated calibration agency under Article 102-18 paragraph (1)~ TELEC EngineeringCenter, Intertek Japan K.K., Keysight Technologies, Inc~.
- b) : Correction conducted pursuant to the provisions of Article 135 or Article 144 of the MeasurementLaw (Law No. 51 of 1992)~Japan Calibration Service System~
- c) : Calibration conducted in foreign countries, which shall be equivalent to the calibration conducted bythe NICT or a designated calibration agency under Article 102-18 paragraph (1)~ TELEC EngineeringCenter, Intertek Japan K.K., Keysight Technologies, Inc~.
- d) : Calibration conducted by using other equipment that listed above from a) to c)



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:

Linko EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

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.

--- END ---