



Radio Test Report

Report No.: RJ180420C01 R1

Test Model: WISE-4210-S231

Series Model: WISE-4210-S251, WISE-4210-AP (Refer to item 3.1 for more details)

Received Date: Apr. 20, 2018

Test Date: May 04 ~ Jul. 18, 2018

Issued Date: Oct. 03, 2018

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Table of Contents

Release Control Record	3
1 Certificate of Conformity	4
2 Summary of Test Results	5
2.1 Test Instruments	6
2.2 Measurement Uncertainty	6
2.3 Modification Record	6
3 General Information	7
3.1 General Description of EUT	7
3.2 Description of Test Modes	8
3.3 Test Conditions	8
3.4 Assembly	8
3.5 Antenna Specifications	9
3.5.1 Antenna Gain	9
3.5.2 Antenna Pattern	9
4 Test Results	10
4.1 Frequency Tolerance Measurement	10
4.1.1 Limits of Frequency Tolerance Measurement	10
4.1.2 Test Setup	10
4.1.3 Test Results	10
4.2 Occupied Bandwidth Measurement (99% power bandwidth)	11
4.2.1 Limits of Occupied Bandwidth Measurement	11
4.2.2 Test Setup	11
4.2.3 Test Results	12
4.3 Spurious Emissions for Transmitter Measurement	18
4.3.1 Limits of Spurious Emissions	18
4.3.2 Test Setup	18
4.3.3 Test Results	19
4.4 Adjacent Channel Leakage Power	61
4.4.1 Limits of Adjacent Channel Leakage Power	61
4.4.2 Test Results	62
4.5 Antenna Power Measurement	63
4.5.1 Limits of Antenna Power	63
4.5.2 Test Setup	63
4.5.3 Test Results	64
4.6 Spurious Emissions for Receiver	66
4.6.1 Limits of Spurious Emissions for Receiver	66
4.6.2 Test Setup	66
4.6.3 Test Result	67
4.7 Transmission Time Control	89
4.7.1 Limits of Transmission Time Control	89
4.7.2 Test Setup	89
4.7.3 Test Results	90
4.8 Carrier Sense	94
4.8.1 Limits of Carrier Sense	94
4.8.2 Test Setup	94
4.8.3 Test Results	95
4.9 Interference Prevention Function	99
4.9.1 Limits of Interference Prevention Function	99
4.9.2 Test Setup	99
4.9.3 Test Results	99
5 Photographs of the Test Configuration	100
Appendix - Information on the Testing Laboratories	101



Release Control Record

Issue No.	Description	Date Issued
RJ180420C01	Original release	Jul. 24, 2018
RJ180420C01 R1	Revised model difference description and modulation type	Oct. 03, 2018



1 Certificate of Conformity

Product: IoT Wireless Sensor Node

Brand: Advantech

Test Model: WISE-4210-S231

Series Model: WISE-4210-S251, WISE-4210-AP (Refer to item 3.1 for more details)

Applicant: ADVANTECH CO., LTD

Test Date: May 04 ~ Jul. 18, 2018

Standards: ARIB STD-T108

Measurement was conducted by the temporary test method which submitted to the Minister for Internal Affairs and Communications based on the Ordinance Concerning Technical Regulations Conformity Certification etc. of Specified Radio Equipment in Annex 1, the Ministry of Internal Affairs and Communication notification in Article 88, Paragraph 2.

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 : Polly Chien , **Date:** Oct. 03, 2018
Polly Chien / Specialist

Approved by : Bruce Chen , **Date:** Oct. 03, 2018
Bruce Chen / Project Engineer

2 Summary of Test Results

The EUT has been tested according to the following specifications:

Notice 88 Reference	ARIB STD-T108 REF. (Part 2)	REPORT REFERENCE	PARAMETER	TEST RESULTS (NOTE)
GENERAL PROVISIONS				
Appendix 22 3rd	3.2.4	4.1	Frequency tolerance	C
Appendix 22 3rd	3.2.6	4.2	Occupied bandwidth	C
Appendix 1	3.2.8	4.3	Spurious emissions	C
TRANSMITTING EQUIPMENT				
Appendix 22 3rd	3.2.1	4.5	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				
Appendix 22 3rd	3.3	4.6	Spurious emissions of receiver	C
-	-	3.5	Refer to all articles for transmitting antenna	C
OPERATING FREQUENCY 920MHz-BAND				
-	3.5	3.4	High frequency/modulation section cannot be opened easily	C
-	3.1.1	3.1	Communication method	C
-	3.2.5	3.1	Modulation method	C
-	3.7	4.5	Absolute gain of transmitting antenna	C
Appendix 22 3rd	3.4.1	4.7	Transmission time control equipment	C
Appendix 22 3rd	3.2.7	4.4	Adjacent channel leakage power	C
Appendix 22 3rd	3.4.2	4.8	Carrier Sense Capability	C
Appendix 22 3rd	3.4.3	-	Skipping carrier sense in a response	NA
-	3.4.4	4.9	Interference Prevention Function	C
NOTE: C = Conform NC = Not Conform NT = Not Tested NA = Not Applicable				

2.1 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until	Calibration Authority
Spectrum Analyzer / Rohde & Schwarz	FSP 40	100040	Aug. 18, 2017	Aug. 17, 2018	ETC
Signal Generator / Agilent	E4438C	MY49071692	Sep. 20, 2017	Sep. 19, 2018	ETC
Power Meter / Anritsu	ML2495A	0824012	Aug. 18, 2017	Aug. 17, 2018	ETC
Power Sensor / Anritsu	MA2411B	0738171	Aug. 18, 2017	Aug. 17, 2018	ETC
Power Splitter/ Agilent	11667B	11628	NA	NA	BV CPS E&E
Power Splitter/ Agilent	11667B	52805	NA	NA	BV CPS E&E

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2.2 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	1620.33Hz
Spurious emissions	2.52dB
Output power density	1.37dB
Adjacent Channel Leakage Power	0.71 dB
Out of band radiated power	2.52 dB
Frequency Tolerance	1620.33Hz
Transmission Time	2.23ms

2.3 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	IoT Wireless Sensor Node
Brand	Advantech
Test Model	WISE-4210-S231
Series Model	WISE-4210-S251, WISE-4210-AP
Model Difference	Refer to note for more details
Nominal Voltage	24Vdc
Modulation Type	GFSK for 2.5kbps / 5kbps / 50kbps FSK for 625bps
Operating Frequency	920.8 ~ 923.2MHz
Transfer Rate	2.5kbps / 5kbps / 50kbps / 625bps
Number of Channel	7
Rated RF Output Power	Refer to Note
Conducted RF Output Power	Refer to Note
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Data Cable Supplied	NA

Note:

1. The following models are provided to this EUT.

Brand	Model	Description
Advantech	WISE-4210-S231	RF module is the same, only the I/O port is different
	WISE-4210-S251	
	WISE-4210-AP	
		Normal condition is TX + RX I/O : T/H sensor (Temperature and humidity sensor)
		Normal condition is TX + RX I/O : 6 x DI, RS485 x1
		Normal condition is TX + RX I/O : Ethernet x1, RS485X1

* The model of the WISE-4210-S231 was chosen for final test.

2. The following antenna was provided to the EUT.

Antenna Type	Antenna Connector	Brand	Model	Gain
Dipole	Rev SMA	Advantech	1750008837-01	2dBi

3. The power table as below:

	Rated power (mW)	Conducted RF Output Power (mW)
625bps	18	17.947
50kbps	18	18.197
5kbps	18	17.783
2.5kbps	18	17.579

4. 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

7 channels are provided to this EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
1	920.8	4	922.0	7	923.2
2	921.2	5	922.4		
3	921.6	6	922.8		

Note: By means of test software (SmartRF Studio 7) provided by manufacture, the power levels during the tests were set according to the following codes:

Channel	Power setting	
	625bps	50kbps
1	10	10
4	10	10
7	10	10

3.3 Test Conditions

Test Conditions	Voltage (Vdc)
V_{normal}	24
$V_{max.}$	50
$V_{min.}$	10

3.4 Assembly

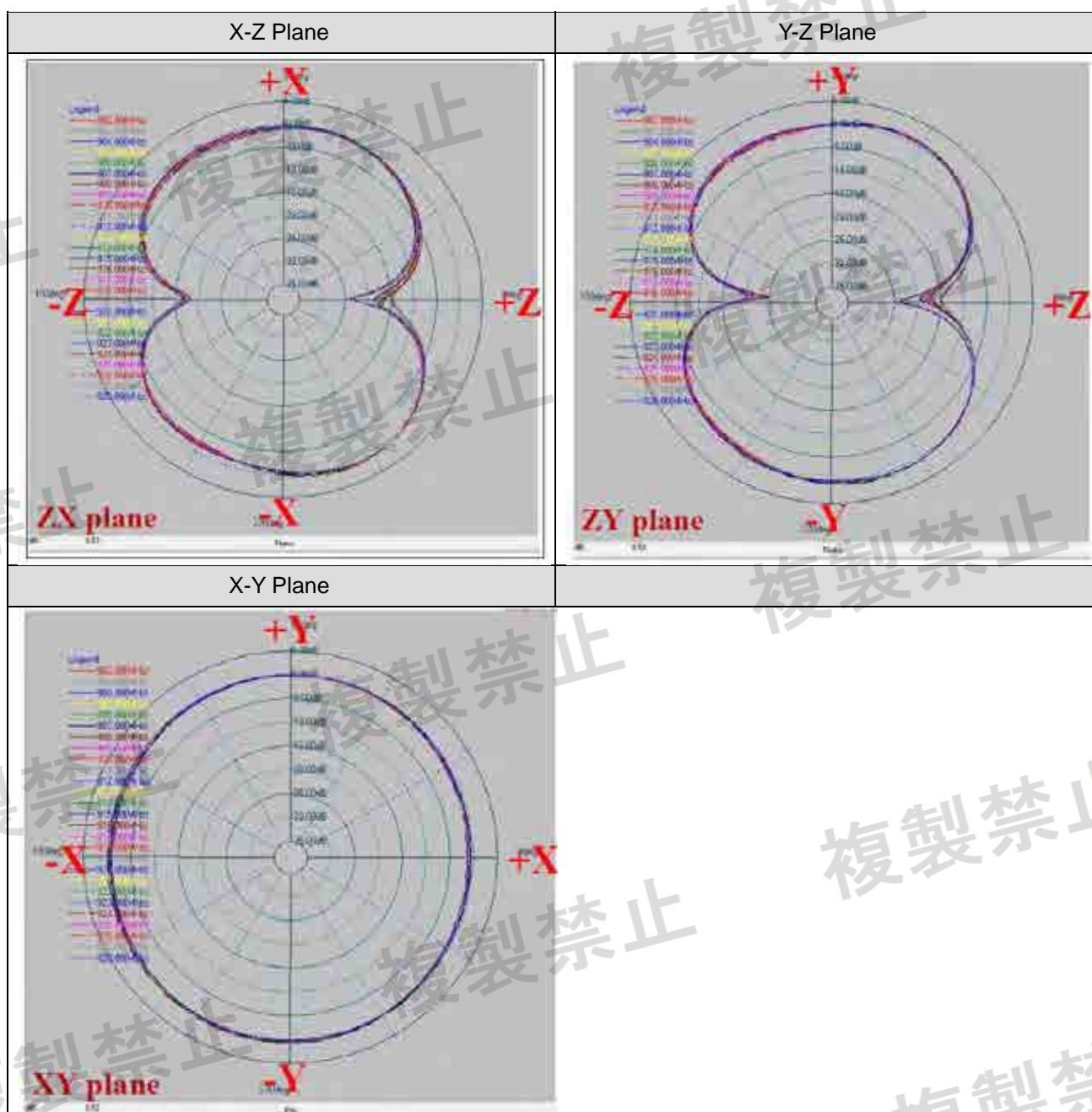
The modulation section, preamplifier, RF component etc, are shielded on the metal housing, and is not capable of being open easily.

3.5 Antenna Specifications

3.5.1 Antenna Gain

Antenna Type	Antenna Connector	Brand	Model	Gain
Dipole	Rev SMA	Advantech	1750008837-01	2dBi

3.5.2 Antenna Pattern



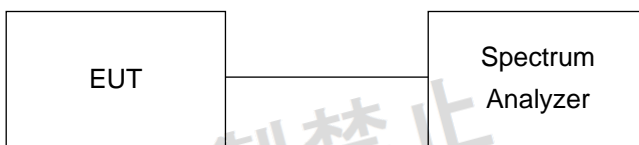
4 Test Results

4.1 Frequency Tolerance Measurement

4.1.1 Limits of Frequency Tolerance Measurement

It shall be within 20×10^{-6}

4.1.2 Test Setup



4.1.3 Test Results

625bps

Environmental Conditions		24 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)
1	920.8	920.788400	-12.597	920.788400	-12.597	920.788400	-12.597
4	922.0	921.987580	-13.470	921.987290	-13.785	921.987290	-13.785
7	923.2	923.187580	-13.453	923.187580	-13.453	923.187580	-13.453

50 kbps

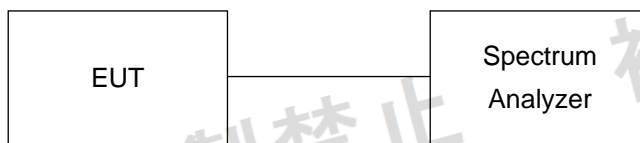
Environmental Conditions		24 deg.C, 70% RH					
Channel	Frequency (MHz)	Voltage normal		Voltage max.		Voltage min.	
		Carrier frequency (MHz)	Frequency tolerance (ppm)	Carrier frequency (MHz)	Frequency tolerance (ppm)	Carrier frequency (MHz)	Frequency tolerance (ppm)
1	920.8	920.788400	-12.597	920.788400	-12.597	920.788400	-12.597
4	922.0	921.986130	-15.043	921.986130	-15.043	921.986130	-15.043
7	923.2	923.186080	-15.077	923.186370	-14.763	923.186080	-15.077

4.2 Occupied Bandwidth Measurement (99% power bandwidth)

4.2.1 Limits of Occupied Bandwidth Measurement

Item	Limit
Occupied bandwidth	(200 x n) kHz
Notes: 1. For center frequency is from 928.15 MHz to 929.65 MHz, it shall be (100 x n) kHz or less 2. $n = 1$ (n is a number of unit radio channels constituting the radio channel and is an integer from 1 to 5.)	

4.2.2 Test Setup



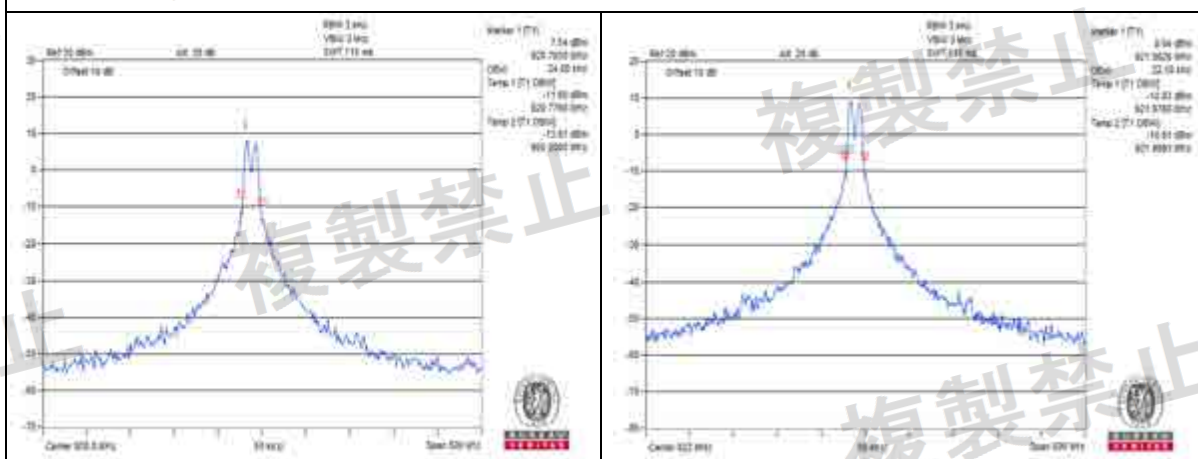
4.2.3 Test Results

625bps

Environmental Conditions		24 deg.C, 70% RH		
Channel	Frequency (MHz)	V _{normal}	V _{max.}	V _{min.}
		Occupied Bandwidth (kHz)	Occupied Bandwidth (kHz)	Occupied Bandwidth (kHz)
1	920.8	24.00	23.00	24.00
4	922.0	22.50	22.50	22.50
7	923.2	23.90	23.20	23.90

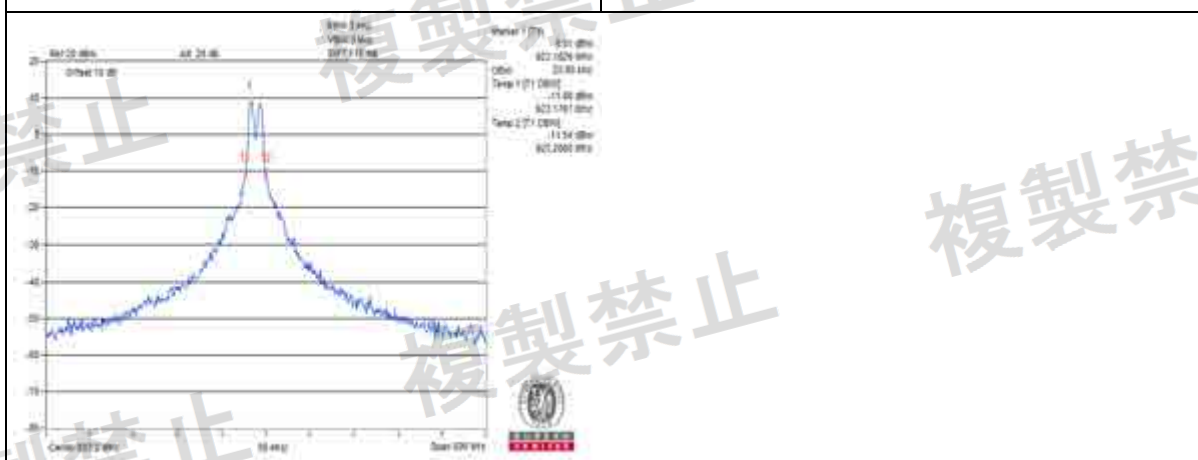
Note: 1. For the test plots please refer to the below pages.

V_{normal}



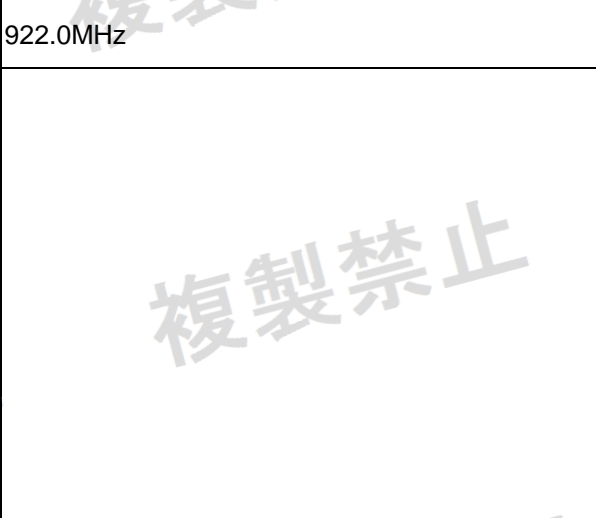
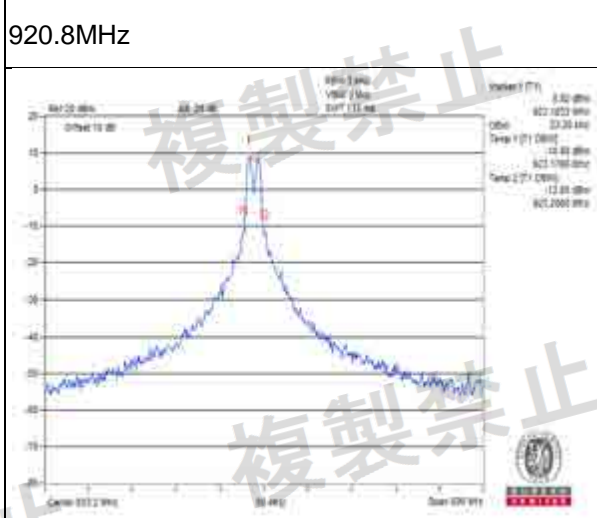
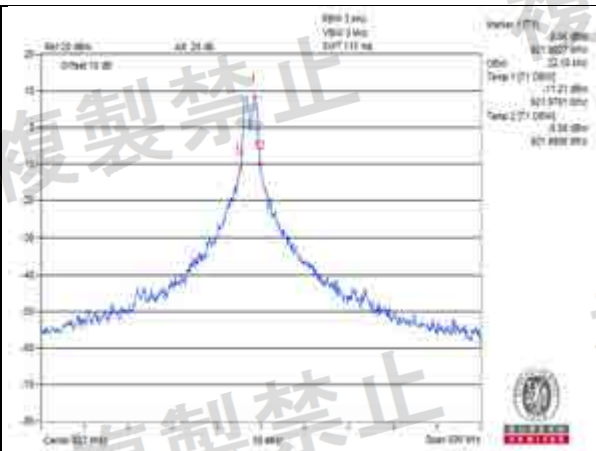
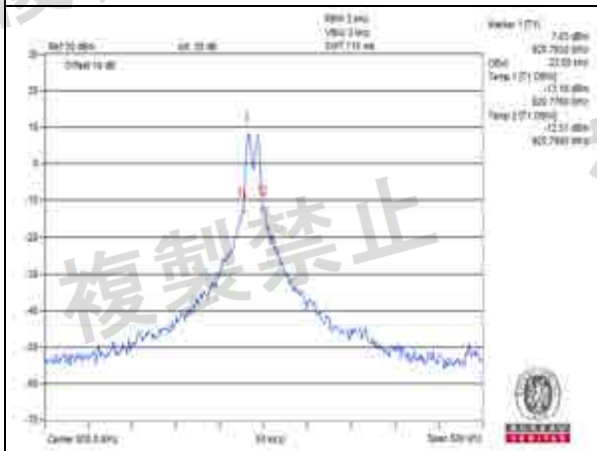
920.8MHz

922.0MHz

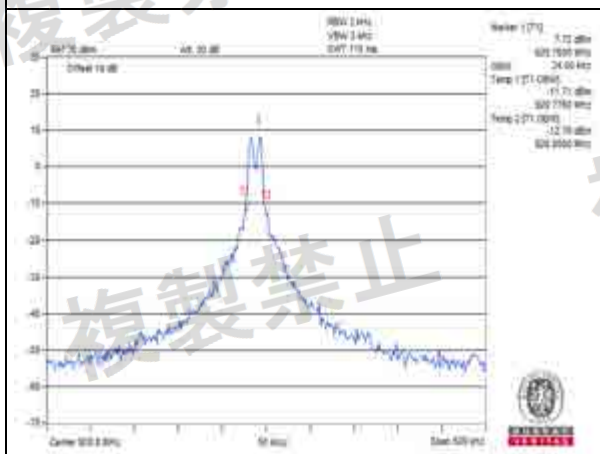


923.2MHz

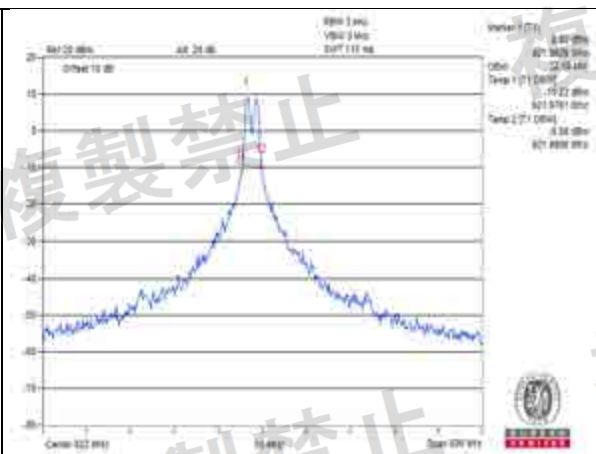
V_{max}.



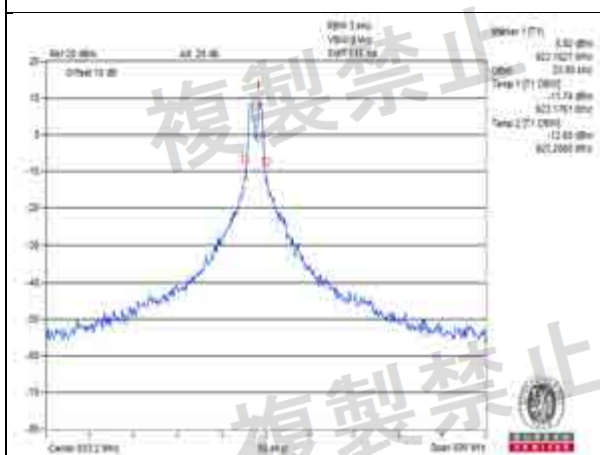
V_{min}.



920.8MHz



922.0MHz



923.2MHz

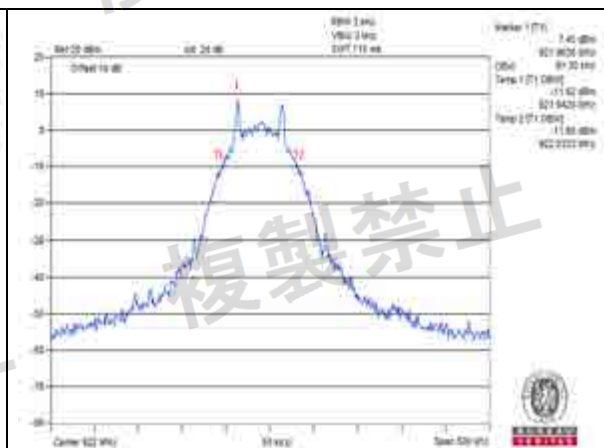
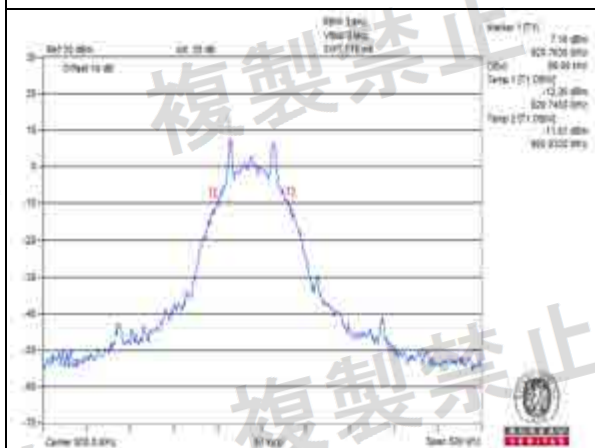


50 kbps

Environmental Conditions		24 deg.C, 70% RH		
Channel	Frequency (MHz)	V _{normal}	V _{max.}	V _{min.}
		Occupied Bandwidth (kHz)	Occupied Bandwidth (kHz)	Occupied Bandwidth (kHz)
1	920.8	88.00	91.00	89.00
4	922.0	91.30	92.70	90.60
7	923.2	91.30	92.10	91.30

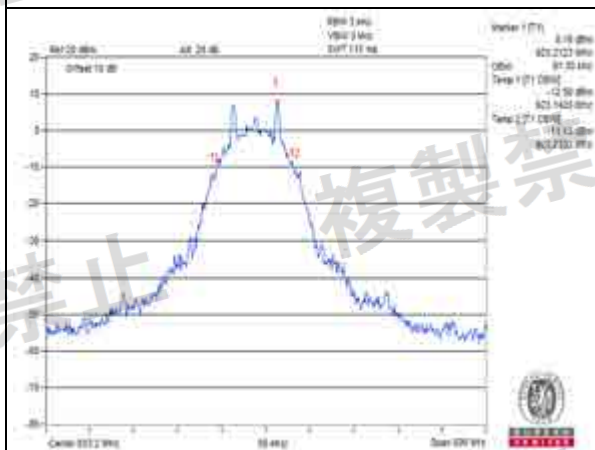
Note: 1. For the test plots please refer to the below pages.

V_{normal}



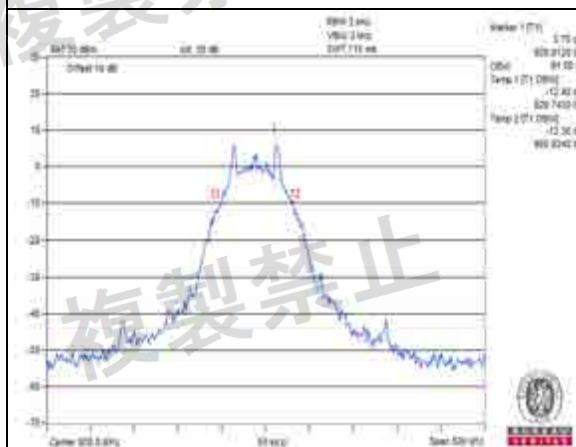
920.8MHz

922.0MHz

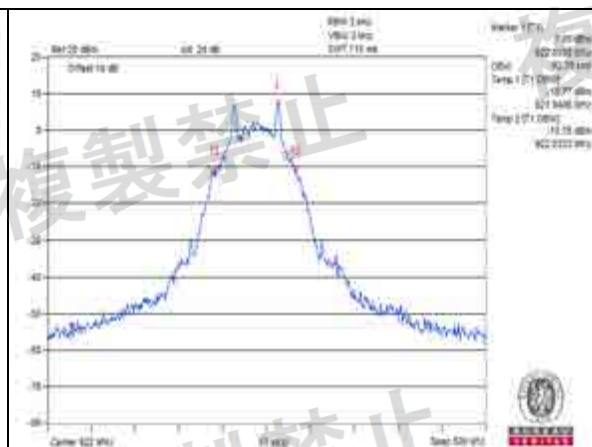


923.2MHz

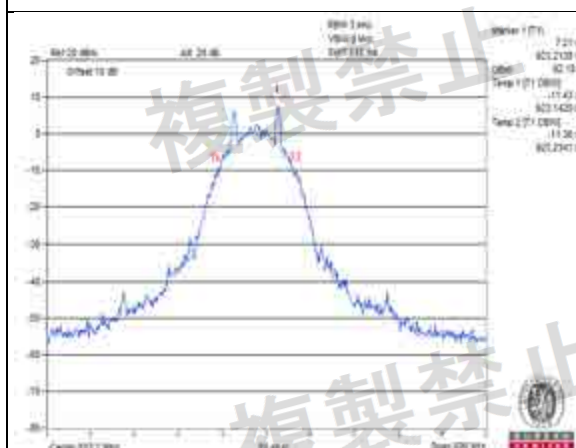
V_{max}.



920.8MHz

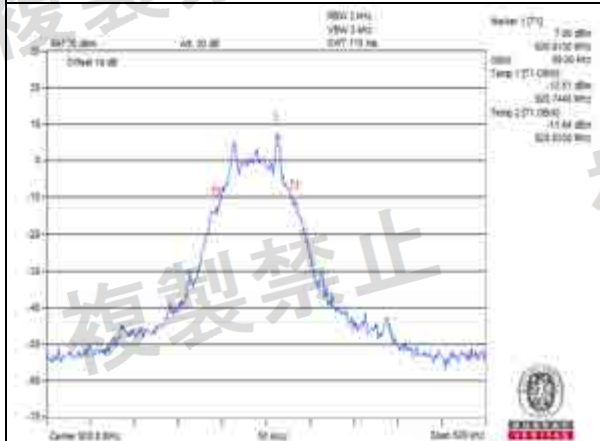


922.0MHz

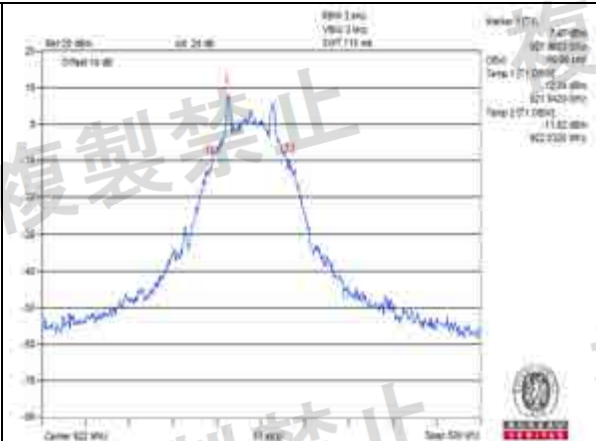


923.2MHz

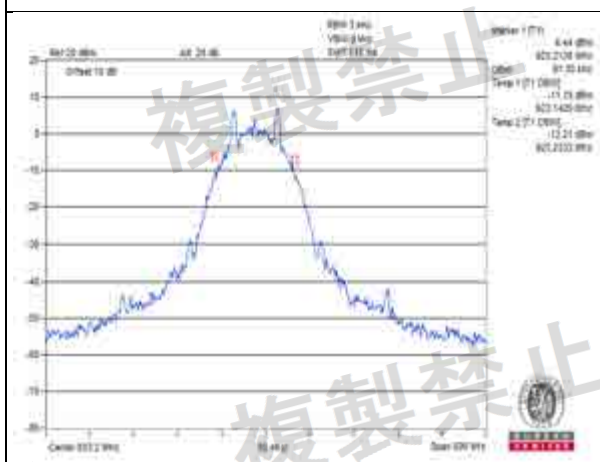
V_{min}.



920.8MHz



922.0MHz



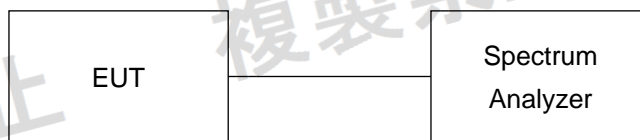
923.2MHz

4.3 Spurious Emissions for Transmitter Measurement

4.3.1 Limits of Spurious Emissions

Frequency band	Limit (dBm)	RBW
$f \leq 710 \text{ MHz}$	-36	100kHz
$710 \text{ MHz} < f \leq 900 \text{ MHz}$	-55	1MHz
$900 \text{ MHz} < f \leq 915 \text{ MHz}$	-55	100kHz
$915 \text{ MHz} < f \leq 930 \text{ MHz}^*$ (Except for $ f-f_c \leq (200+100 \times n) \text{ kHz}$ if bandwidth of unit radio channel is 200 kHz, except for $ f-f_c \leq (100+50 \times n) \text{ kHz}$ if bandwidth of unit radio channel is 100 kHz. Except for $ f-f_c \leq (100+100 \times n) \text{ kHz}$ If frequency band is $915.9 \text{ MHz} \leq f \leq 916.9 \text{ MHz}$ and $920.5 \text{ MHz} \leq$ 922.3 MHz . Where n is a number of unit radio channels constituting the radio channel and is an integer from 1 to 5)	-36	100kHz
$930 \text{ MHz} < f \leq 1000 \text{ MHz}$	-55	100kHz
$1000 \text{ MHz} < f \leq 1,215 \text{ MHz}$	-45	1MHz
$1,215 \text{ MHz} < f$	-30	1MHz

4.3.2 Test Setup



4.3.3 Test Results

625bps

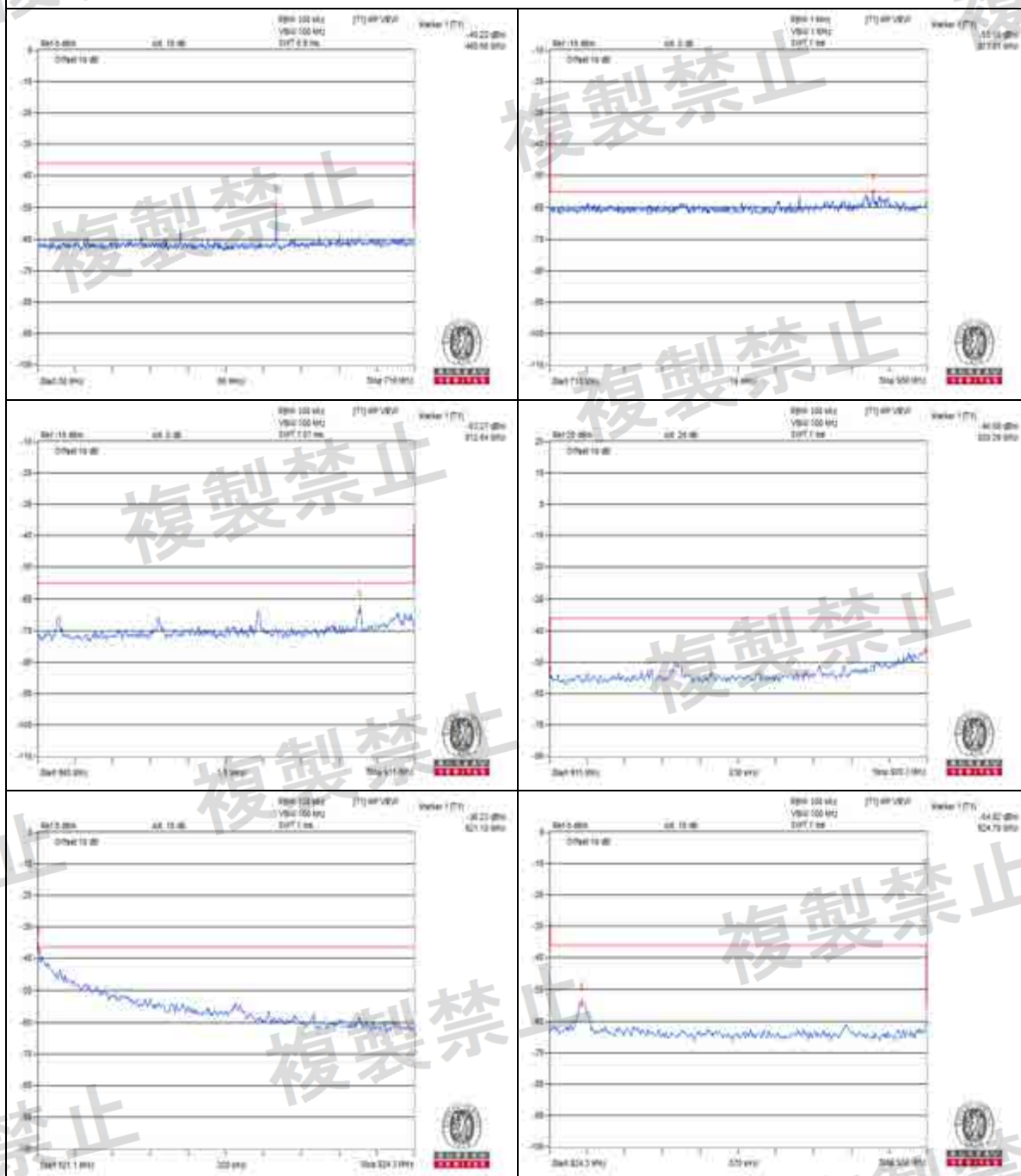
TEST CHANNEL		920.8MHz		LIMIT	RESULT
TEST CONDITION	FREQUENCY RANGE	FREQUENCY (MHz)	MEASURE. VALUE		
Vnormal	30MHz to 710MHz	460.660	-49.22	-36	PASS
	710MHz to 900MHz	873.010	-55.15	-55	PASS
	900MHz to 915MHz	912.840	-63.27	-55	PASS
	915MHz to 920.3MHz	920.290	-46.09	-36	PASS
	CF+300KHz to 924.3MHz	921.100	-36.23	-36	PASS
	924.3MHz to 930MHz	924.780	-54.02	-36	PASS
	930MHz to 1000MHz	939.840	-55.71	-55	PASS
	1000MHz to 1215MHz	1075.090	-51.66	-45	PASS
	1215MHz to 5000MHz	1840.340	-46.77	-30	PASS
Vmax.	30MHz to 710MHz	460.660	-56.48	-36	PASS
	710MHz to 900MHz	869.150	-55.44	-55	PASS
	900MHz to 915MHz	912.800	-63.01	-55	PASS
	915MHz to 920.3MHz	920.280	-45.09	-36	PASS
	CF+300KHz to 924.3MHz	921.100	-38.25	-36	PASS
	924.3MHz to 930MHz	924.780	-53.42	-36	PASS
	930MHz to 1000MHz	939.840	-55.66	-55	PASS
	1000MHz to 1215MHz	1060.440	-51.54	-45	PASS
	1215MHz to 5000MHz	1840.340	-47.56	-30	PASS
Vmin.	30MHz to 710MHz	460.660	-56.49	-36	PASS
	710MHz to 900MHz	869.430	-55.63	-55	PASS
	900MHz to 915MHz	912.800	-63.98	-55	PASS
	915MHz to 920.3MHz	920.300	-45.24	-36	PASS
	CF+300KHz to 924.3MHz	921.100	-38.75	-36	PASS
	924.3MHz to 930MHz	924.770	-53.58	-36	PASS
	930MHz to 1000MHz	939.840	-56.05	-55	PASS
	1000MHz to 1215MHz	1064.810	-51.87	-45	PASS
	1215MHz to 5000MHz	1840.34	-46.95	-30	PASS

TEST CHANNEL		922.0MHz		LIMIT	RESULT
TEST CONDITION	FREQUENCY RANGE	FREQUENCY (MHz)	MEASURE. VALUE		
Vnormal	30MHz to 710MHz	460.660	-49.16	-36	PASS
	710MHz to 900MHz	894.490	-58.58	-55	PASS
	900MHz to 915MHz	910.000	-63.66	-55	PASS
	915MHz to 920.3MHz	920.000	-51.36	-36	PASS
	920.3MHz to CF-300KHz	921.700	-38.32	-36	PASS
	CF+300KHz to 930MHz	922.300	-39.25	-36	PASS
	930MHz to 1000MHz	945.920	-59.78	-55	PASS
	1000MHz to 1215MHz	1017.760	-55.37	-45	PASS
	1215MHz to 5000MHz	1840.340	-50.92	-30	PASS
Vmax.	30MHz to 710MHz	461.120	-55.85	-36	PASS
	710MHz to 900MHz	900.000	-58.10	-55	PASS
	900MHz to 915MHz	909.990	-64.12	-55	PASS
	915MHz to 920.3MHz	920.000	-51.37	-36	PASS
	920.3MHz to CF-300KHz	921.690	-37.86	-36	PASS
	CF+300KHz to 930MHz	922.300	-40.17	-36	PASS
	930MHz to 1000MHz	945.960	-59.84	-55	PASS
	1000MHz to 1215MHz	1066.220	-55.00	-45	PASS
	1215MHz to 5000MHz	1722.190	-44.53	-30	PASS
Vmin.	30MHz to 710MHz	461.120	-55.00	-36	PASS
	710MHz to 900MHz	898.100	-57.78	-55	PASS
	900MHz to 915MHz	909.990	-63.86	-55	PASS
	915MHz to 920.3MHz	920.020	-51.20	-36	PASS
	920.3MHz to CF-300KHz	921.680	-37.17	-36	PASS
	CF+300KHz to 930MHz	922.300	-41.56	-36	PASS
	930MHz to 1000MHz	945.960	-59.99	-55	PASS
	1000MHz to 1215MHz	1066.220	-55.85	-45	PASS
	1215MHz to 5000MHz	1714.62	-40.21	-30	PASS

TEST CHANNEL		923.2MHz		LIMIT	RESULT
TEST CONDITION	FREQUENCY RANGE	FREQUENCY (MHz)	MEASURE. VALUE		
Vnormal	30MHz to 710MHz	461.120	-54.94	-36	PASS
	710MHz to 900MHz	893.920	-56.95	-55	PASS
	900MHz to 915MHz	911.160	-64.43	-55	PASS
	915MHz to 920.3MHz	919.200	-56.92	-36	PASS
	920.3MHz to CF-300KHz	922.880	-36.36	-36	PASS
	CF+300KHz to 930MHz	923.530	-40.94	-36	PASS
	930MHz to 1000MHz	931.120	-59.11	-55	PASS
	1000MHz to 1215MHz	1067.510	-54.33	-45	PASS
	1215MHz to 5000MHz	1722.190	-41.62	-30	PASS
Vmax.	30MHz to 710MHz	462.480	-56.24	-36	PASS
	710MHz to 900MHz	894.300	-56.59	-55	PASS
	900MHz to 915MHz	907.200	-64.99	-55	PASS
	915MHz to 920.3MHz	919.170	-55.81	-36	PASS
	920.3MHz to CF-300KHz	922.880	-36.06	-36	PASS
	CF+300KHz to 930MHz	923.500	-39.85	-36	PASS
	930MHz to 1000MHz	931.120	-58.23	-55	PASS
	1000MHz to 1215MHz	1067.510	-54.81	-45	PASS
	1215MHz to 5000MHz	1707.05	-47.99	-30	PASS
Vmin.	30MHz to 710MHz	462.480	-55.33	-36	PASS
	710MHz to 900MHz	894.300	-57.20	-55	PASS
	900MHz to 915MHz	907.200	-65.69	-55	PASS
	915MHz to 920.3MHz	919.190	-55.40	-36	PASS
	920.3MHz to CF-300KHz	922.880	-38.23	-36	PASS
	CF+300KHz to 930MHz	923.500	-37.46	-36	PASS
	930MHz to 1000MHz	931.120	-59.05	-55	PASS
	1000MHz to 1215MHz	1067.510	-55.92	-45	PASS
	1215MHz to 5000MHz	1722.19	-39.09	-30	PASS

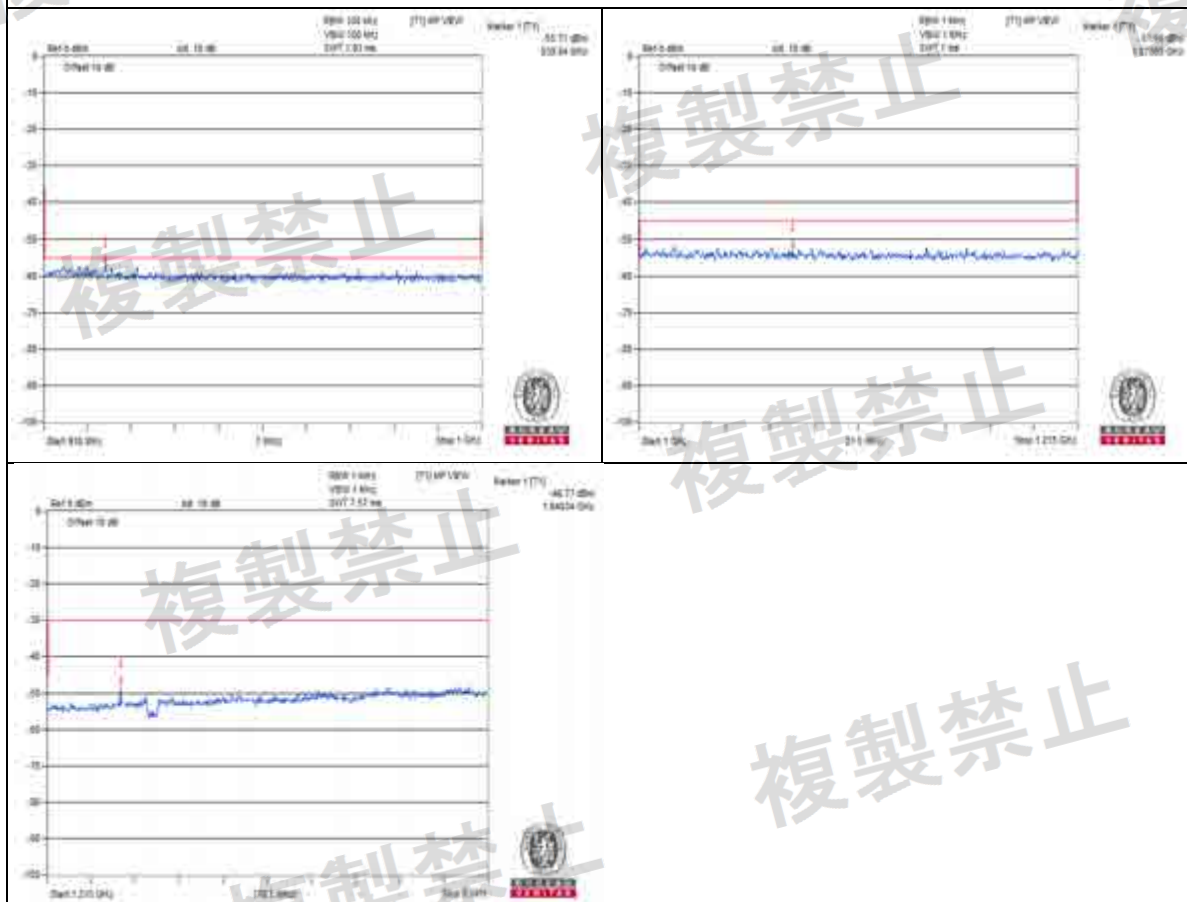
Note: 1. The worst value in each frequency range v.s. each channel has been marked by boldface.
2. The spectrum plots are attached on the following pages.

Vnormal



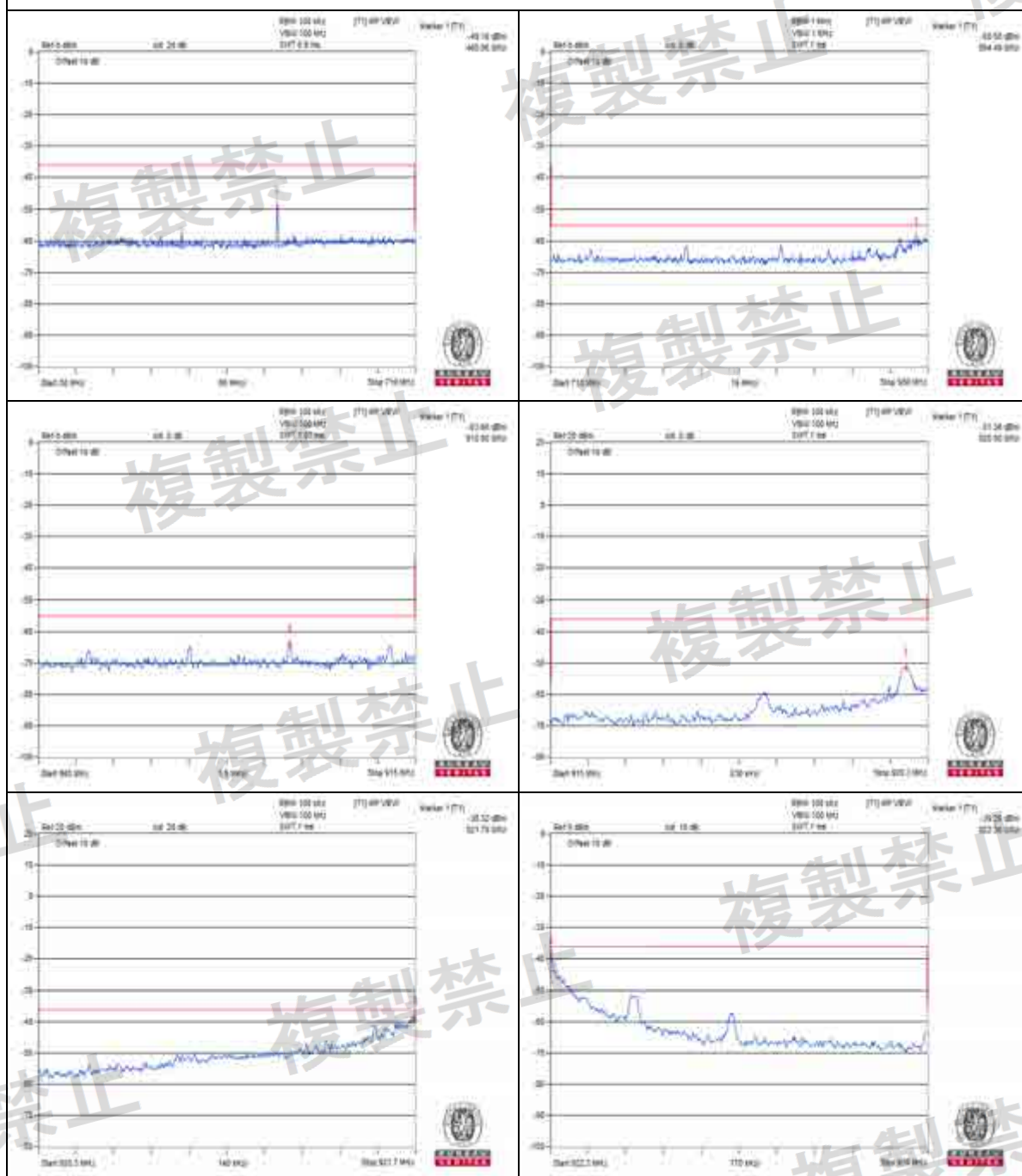
920.8MHz

Vnormal



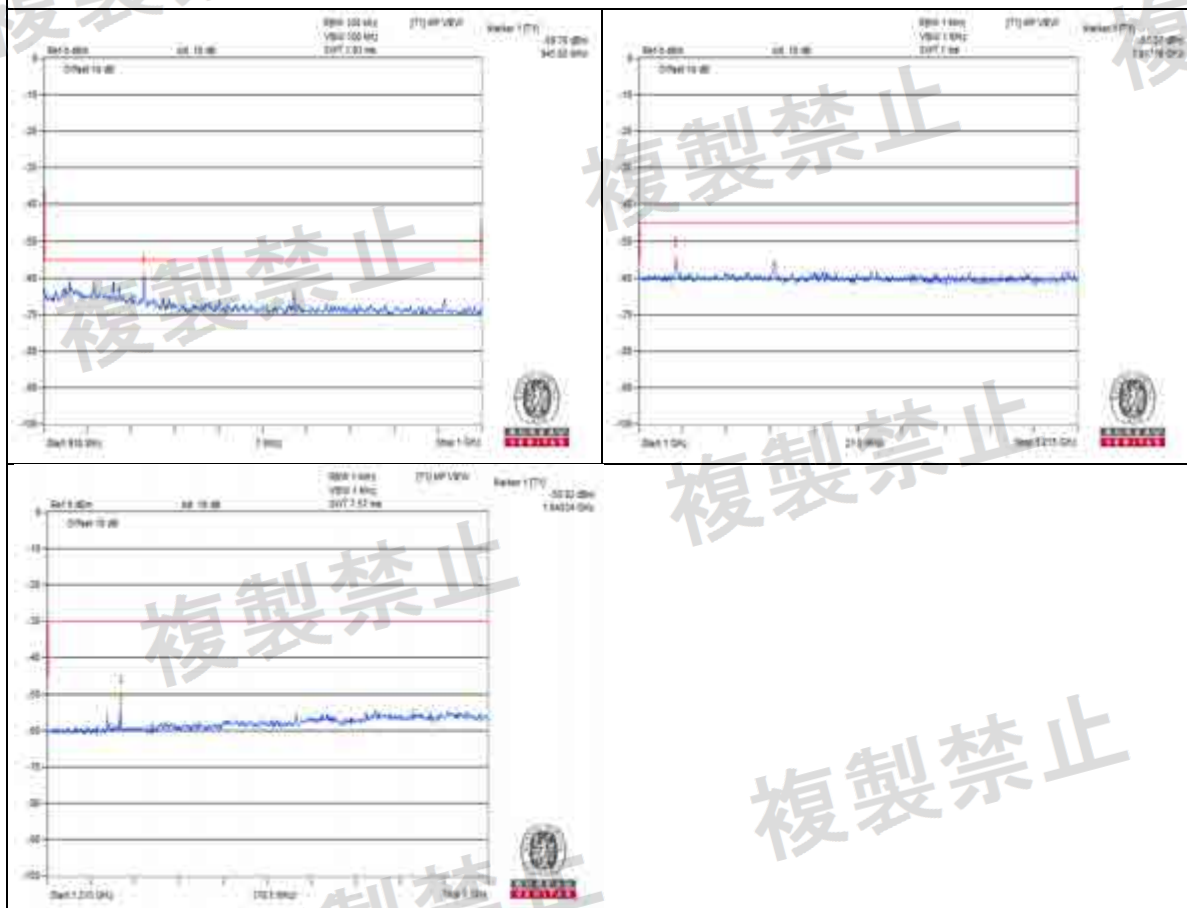
920.8MHz

Vnormal



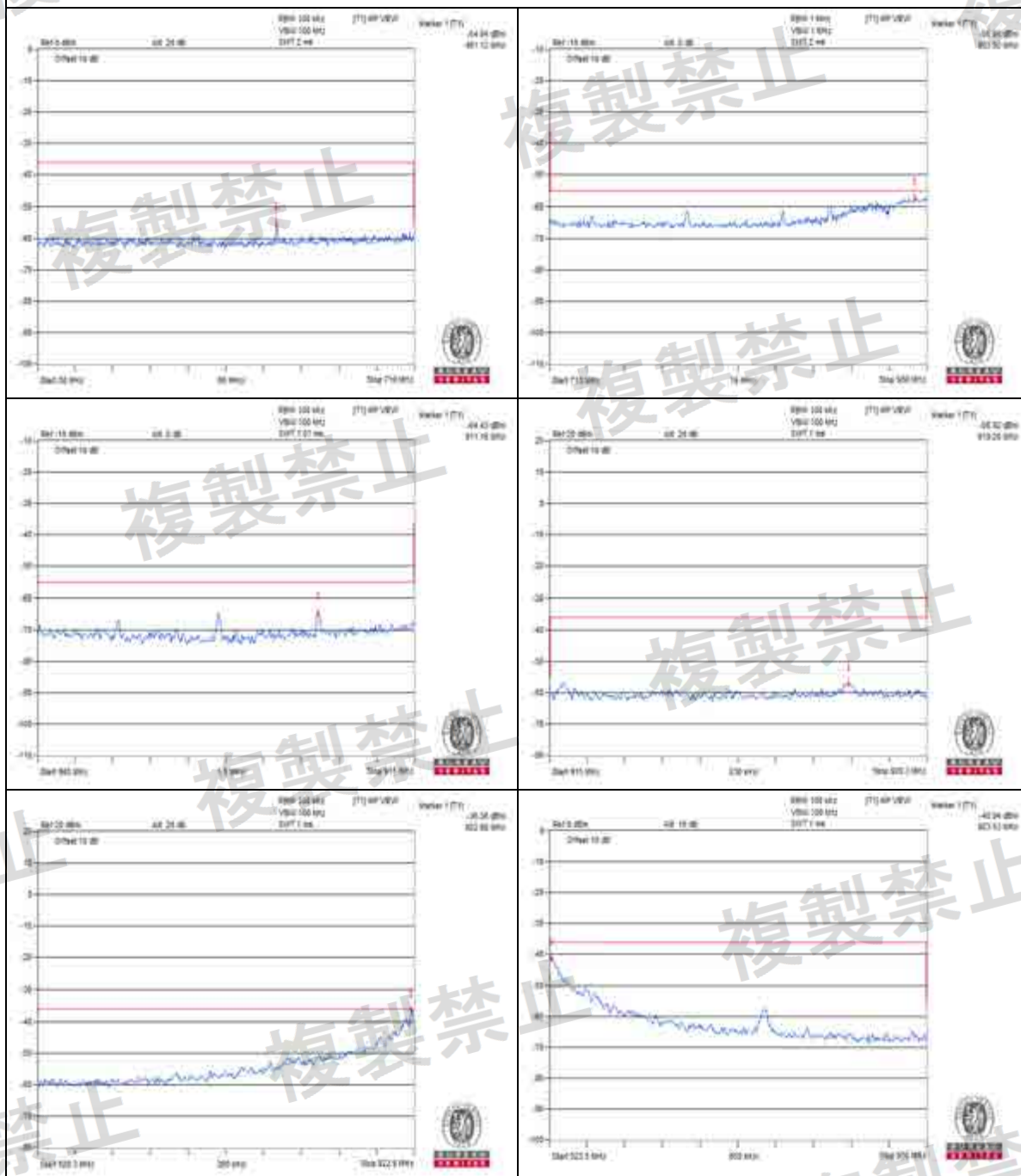
922.0MHz

Vnormal



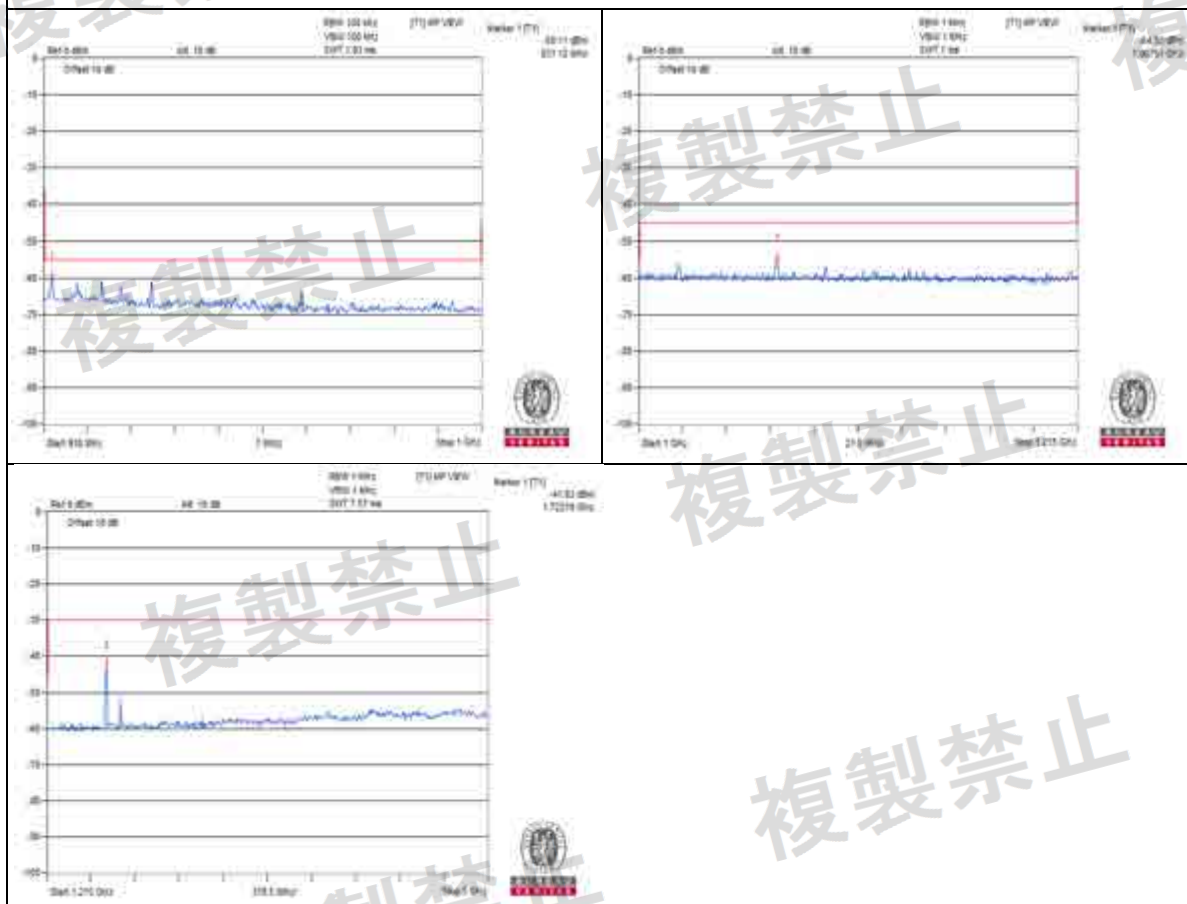
922.0MHz

Vnormal



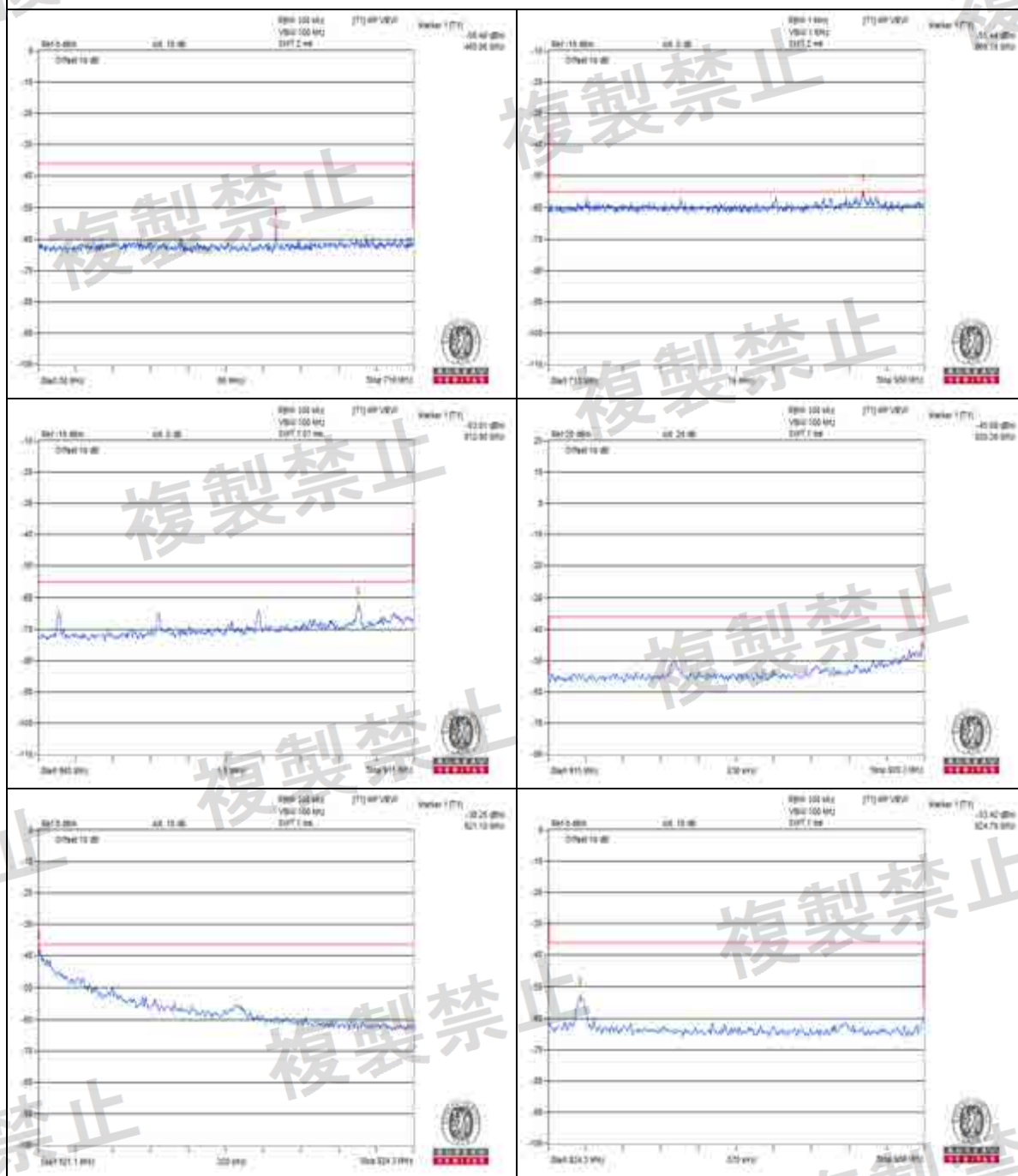
923.2MHz

Vnormal



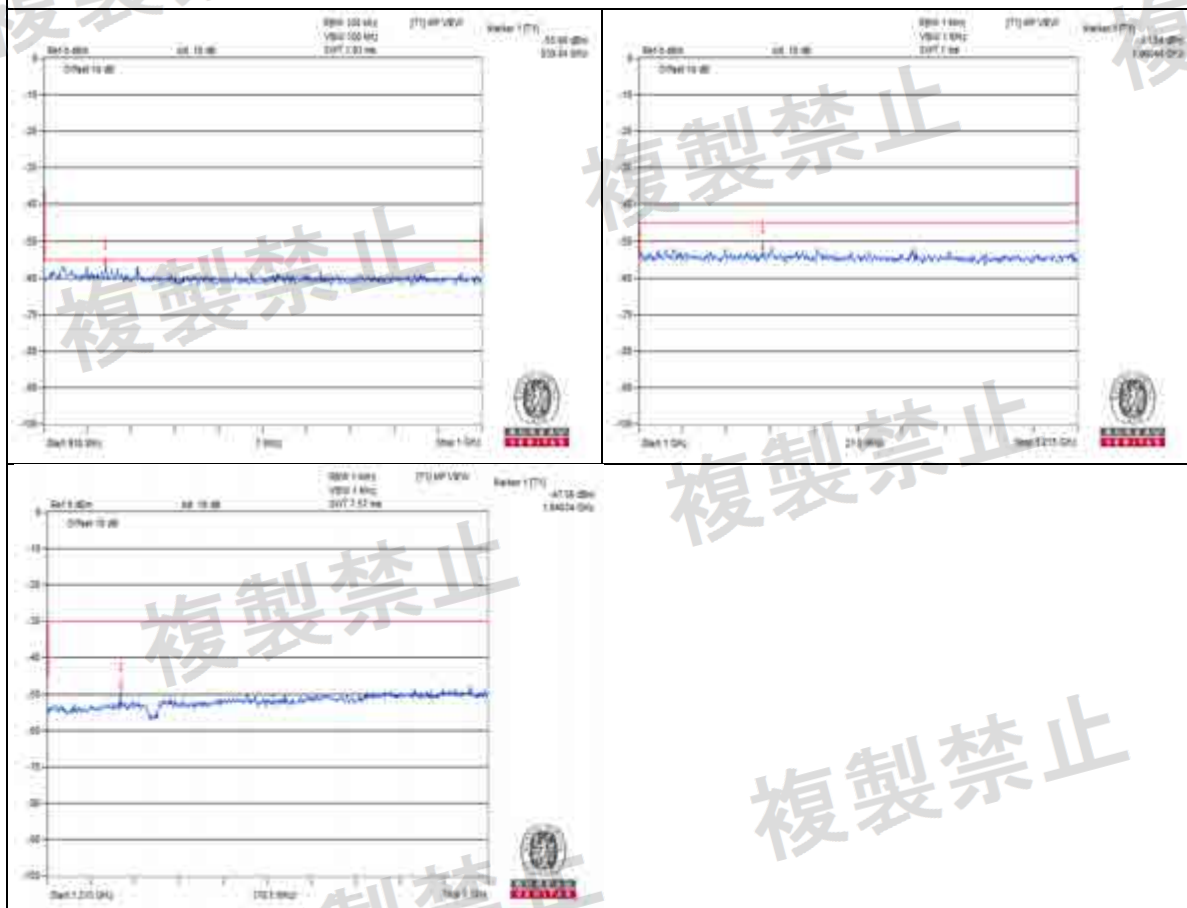
923.2MHz

Vmax.



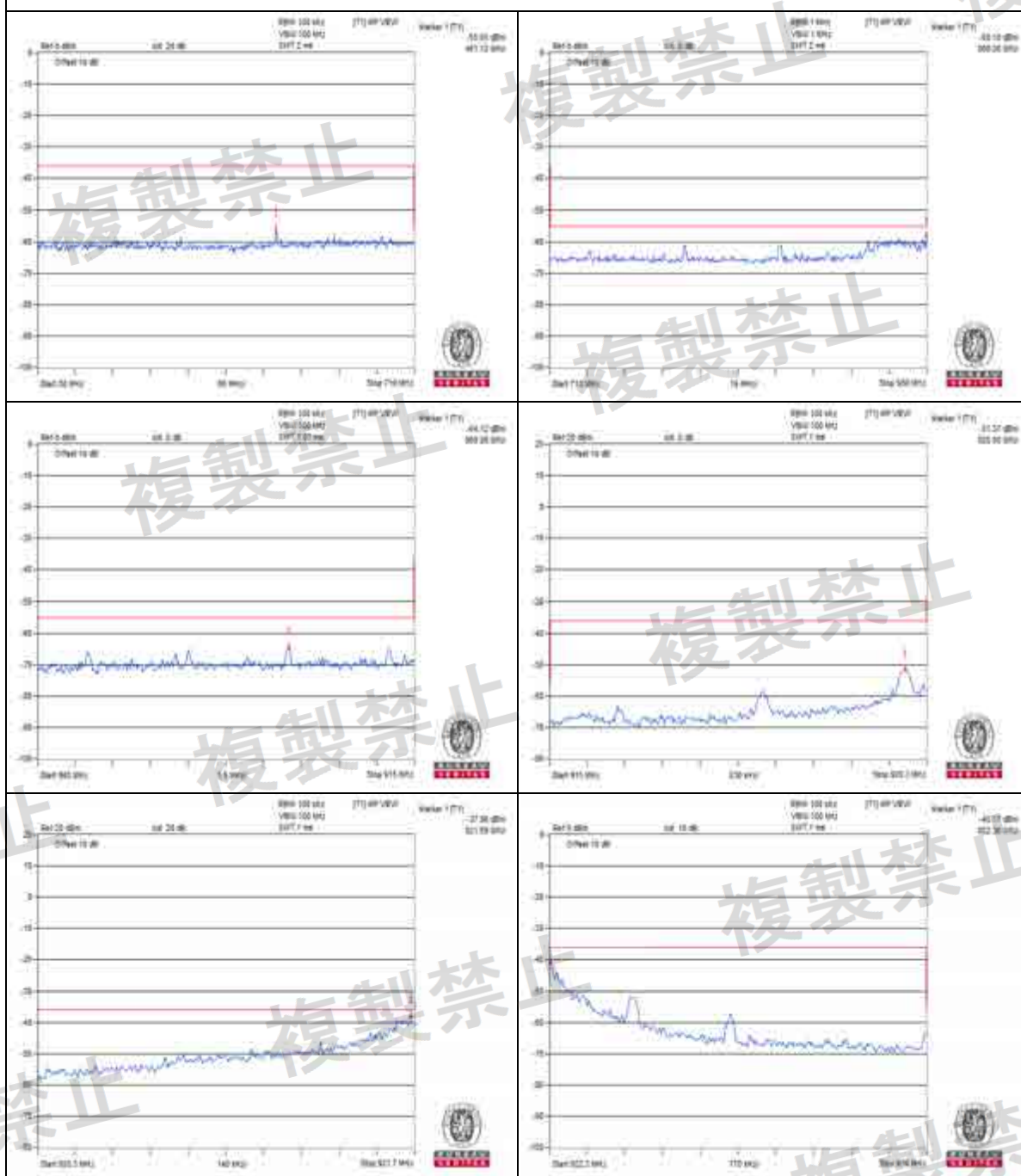
920.8MHz

Vmax.



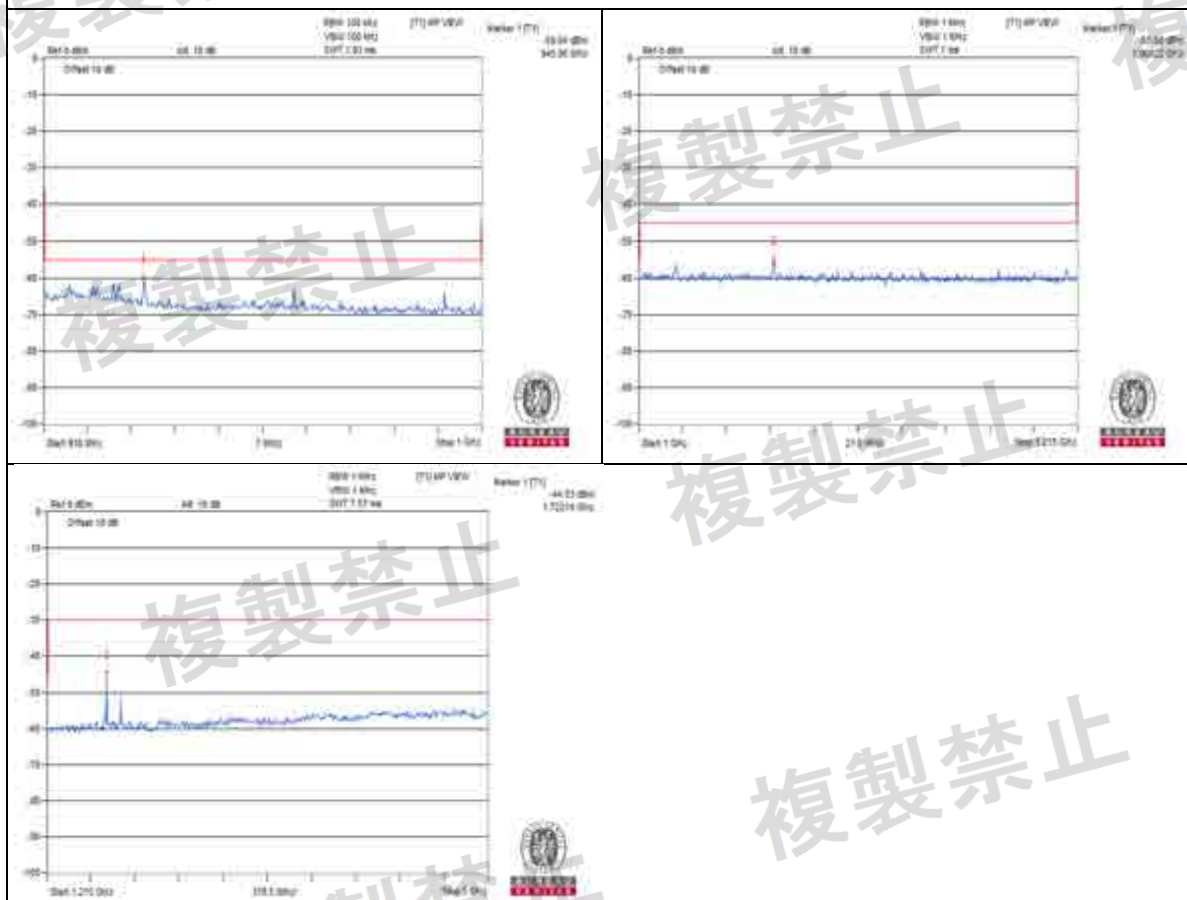
920.8MHz

Vmax.



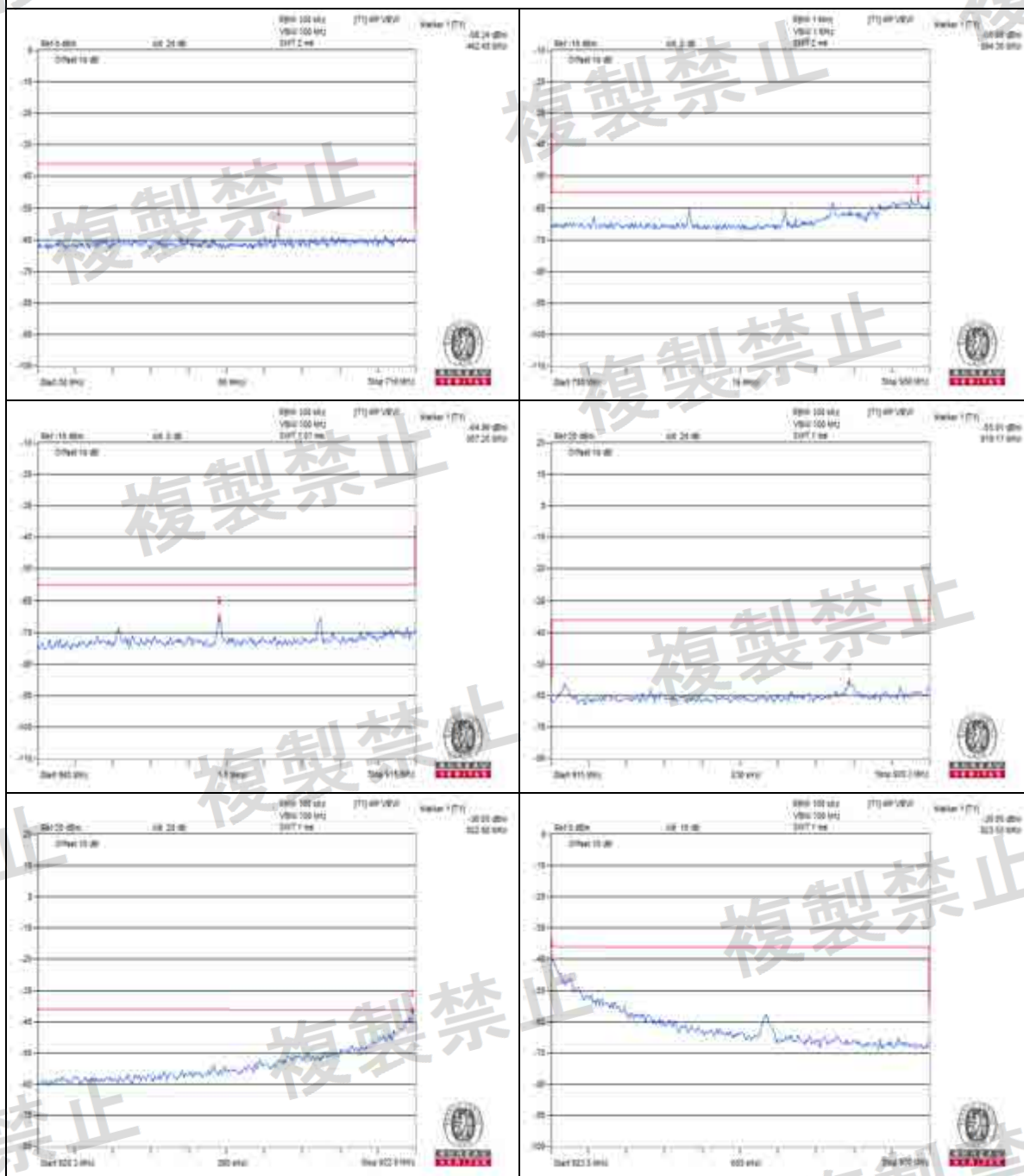
922.0MHz

Vmax.



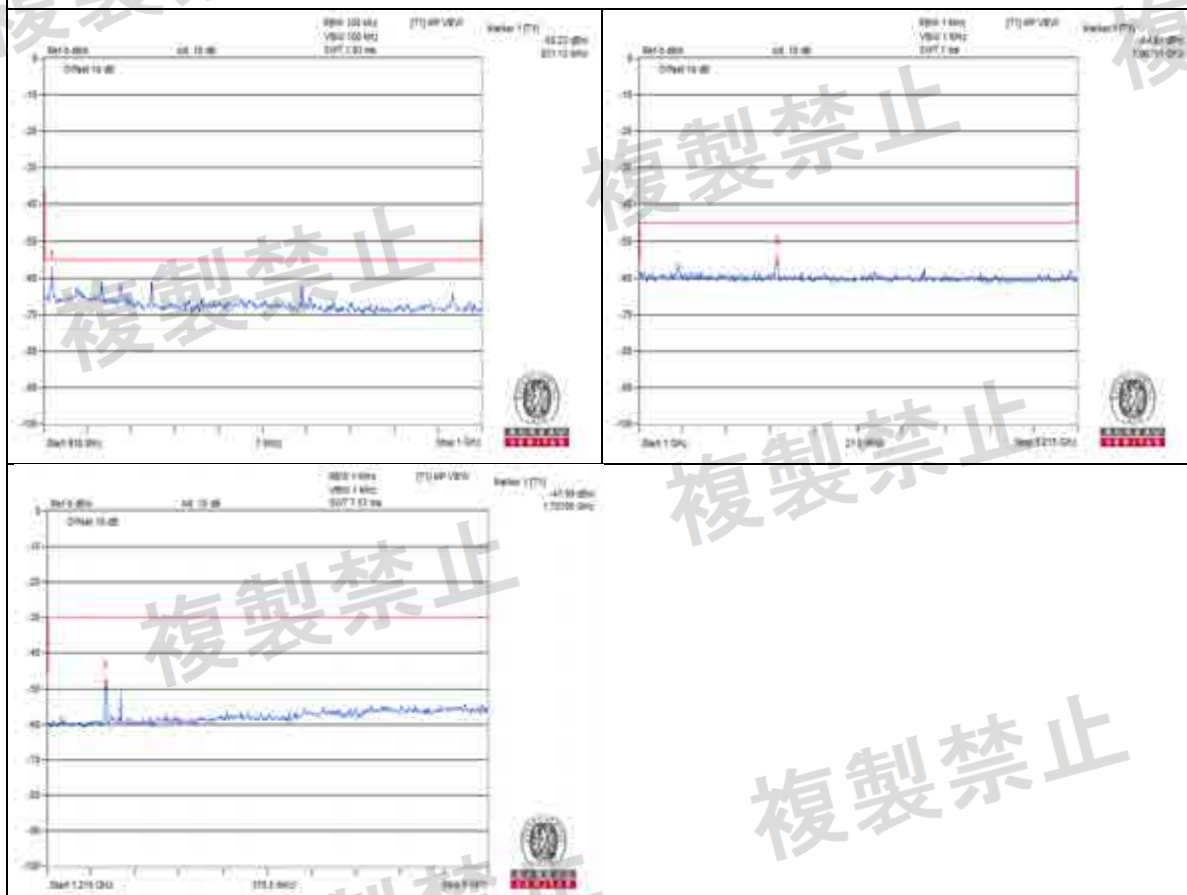
922.0MHz

V_{max}.



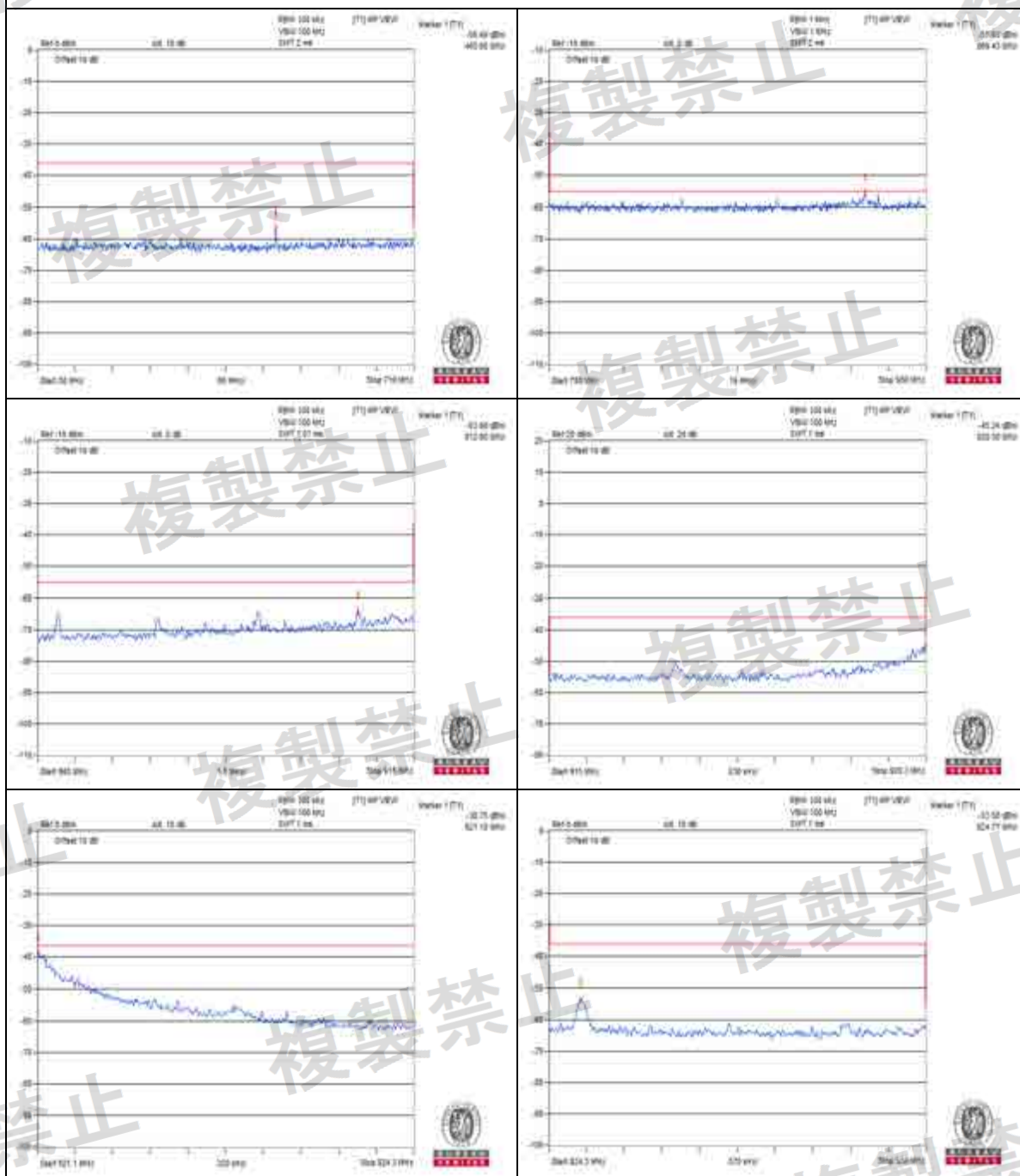
923.2MHz

Vmax.



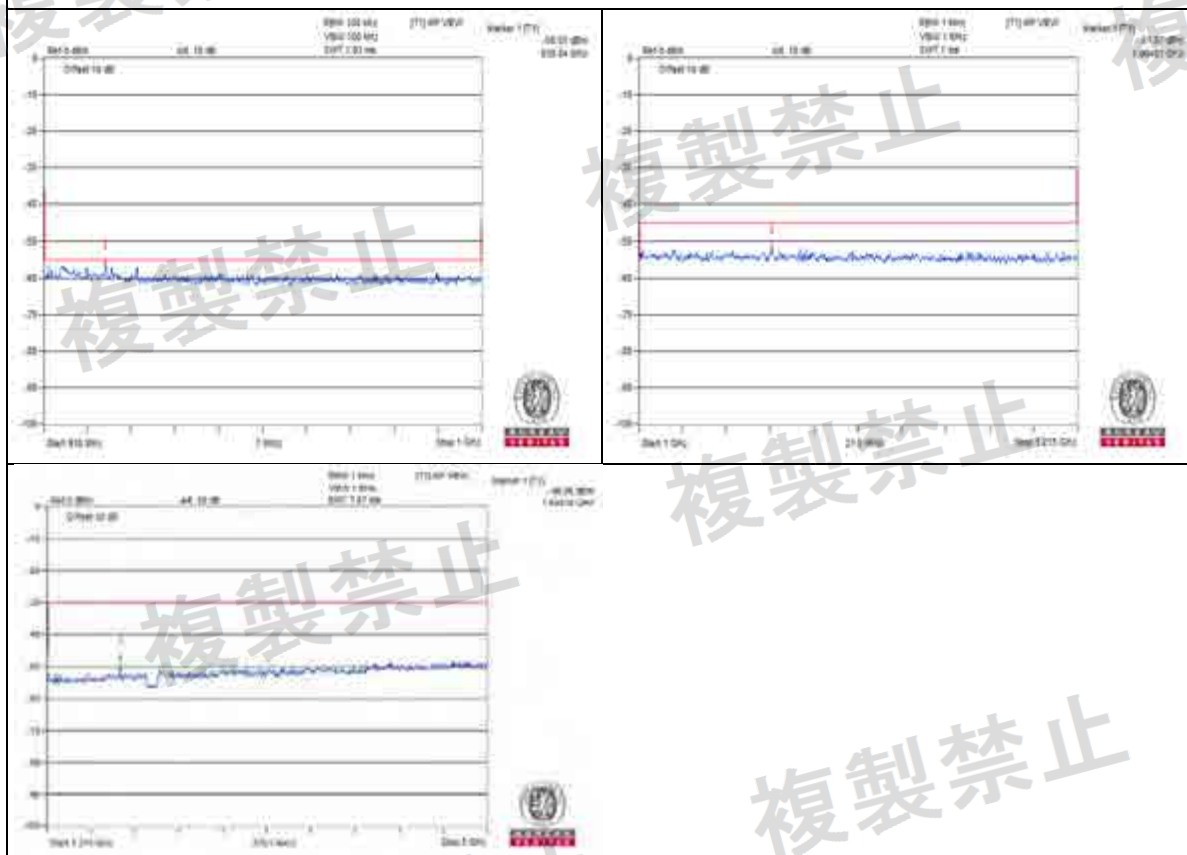
923.2MHz

V_{min}.



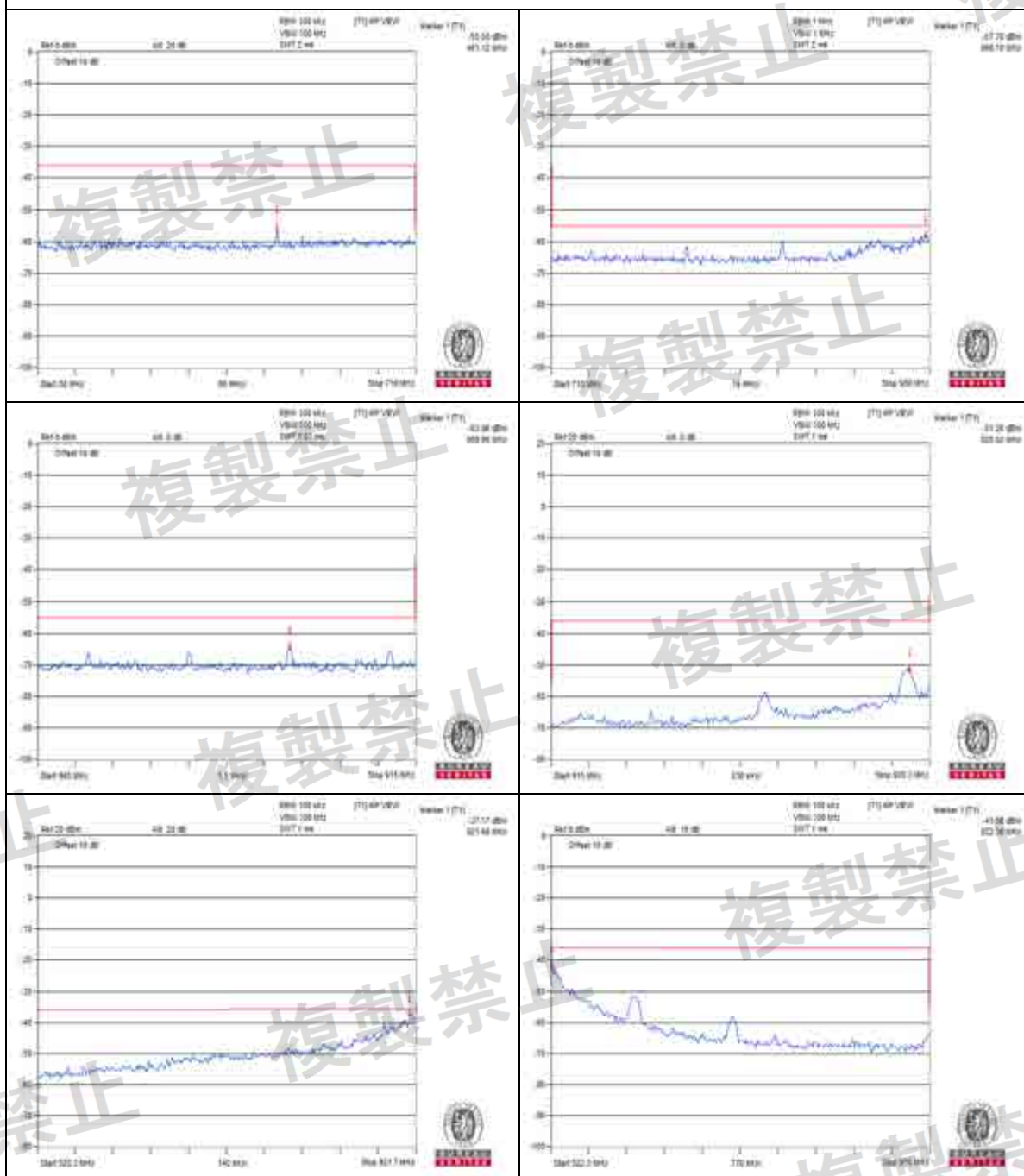
920.8MHz

Vmin.



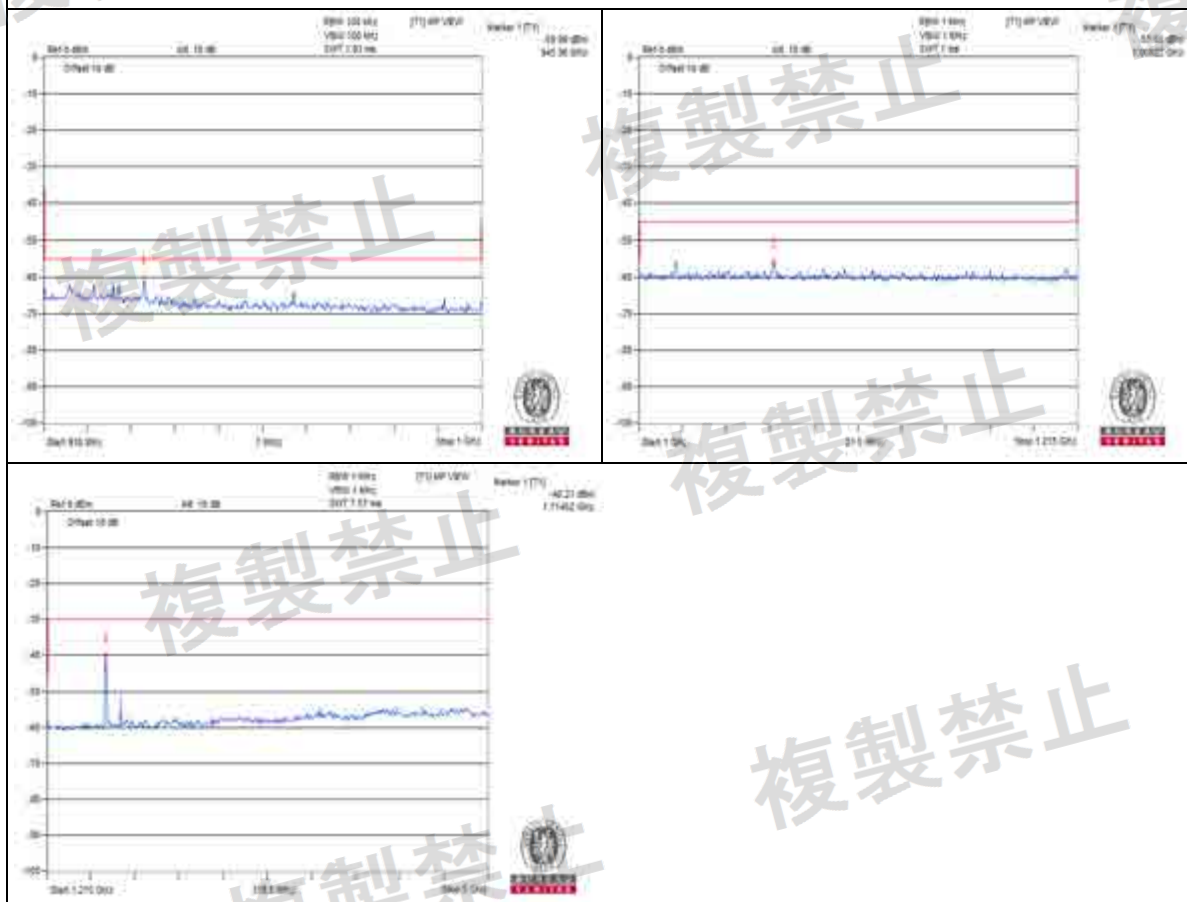
920.8MHz

Vmin.



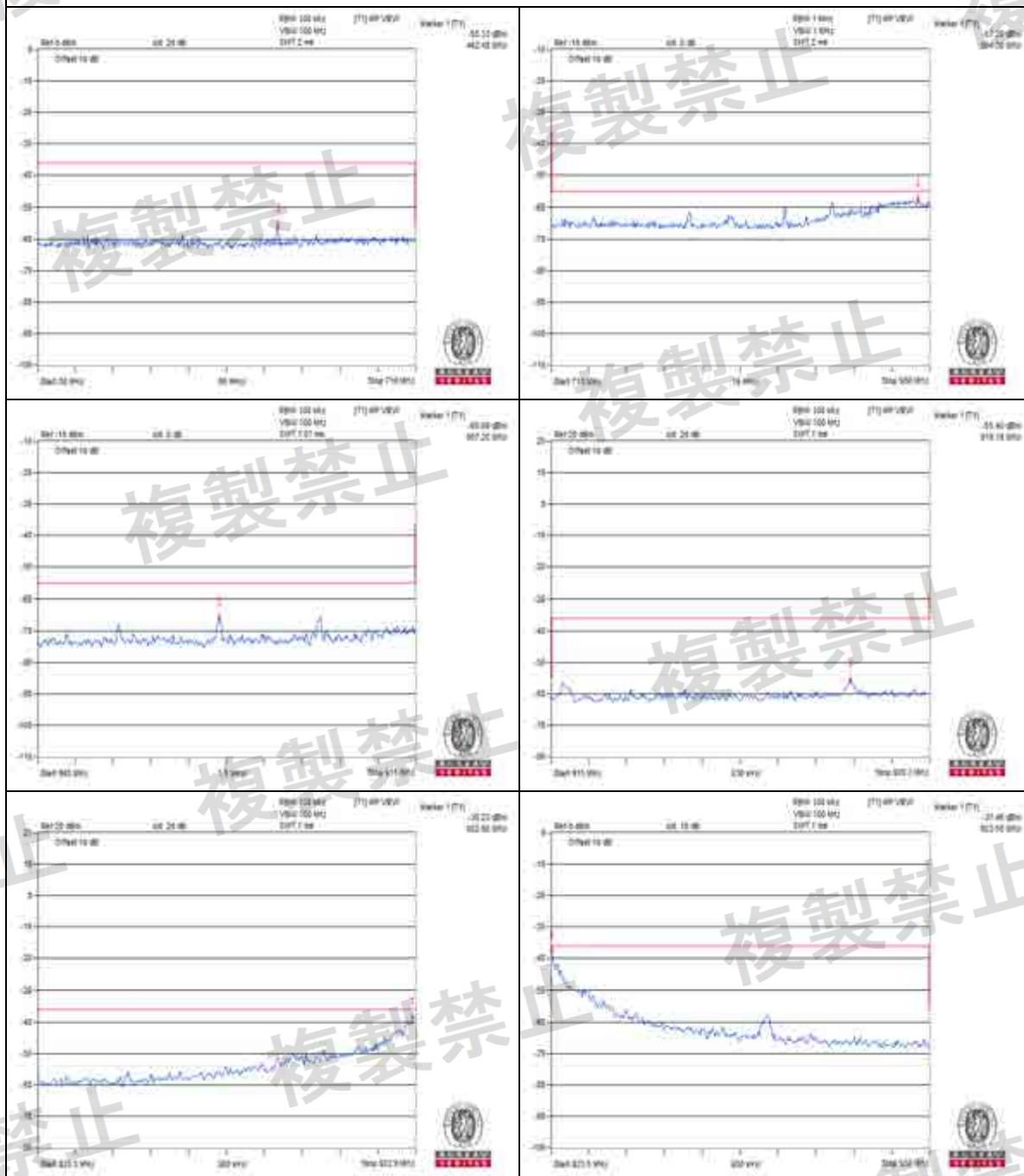
922.0MHz

V_{min}.



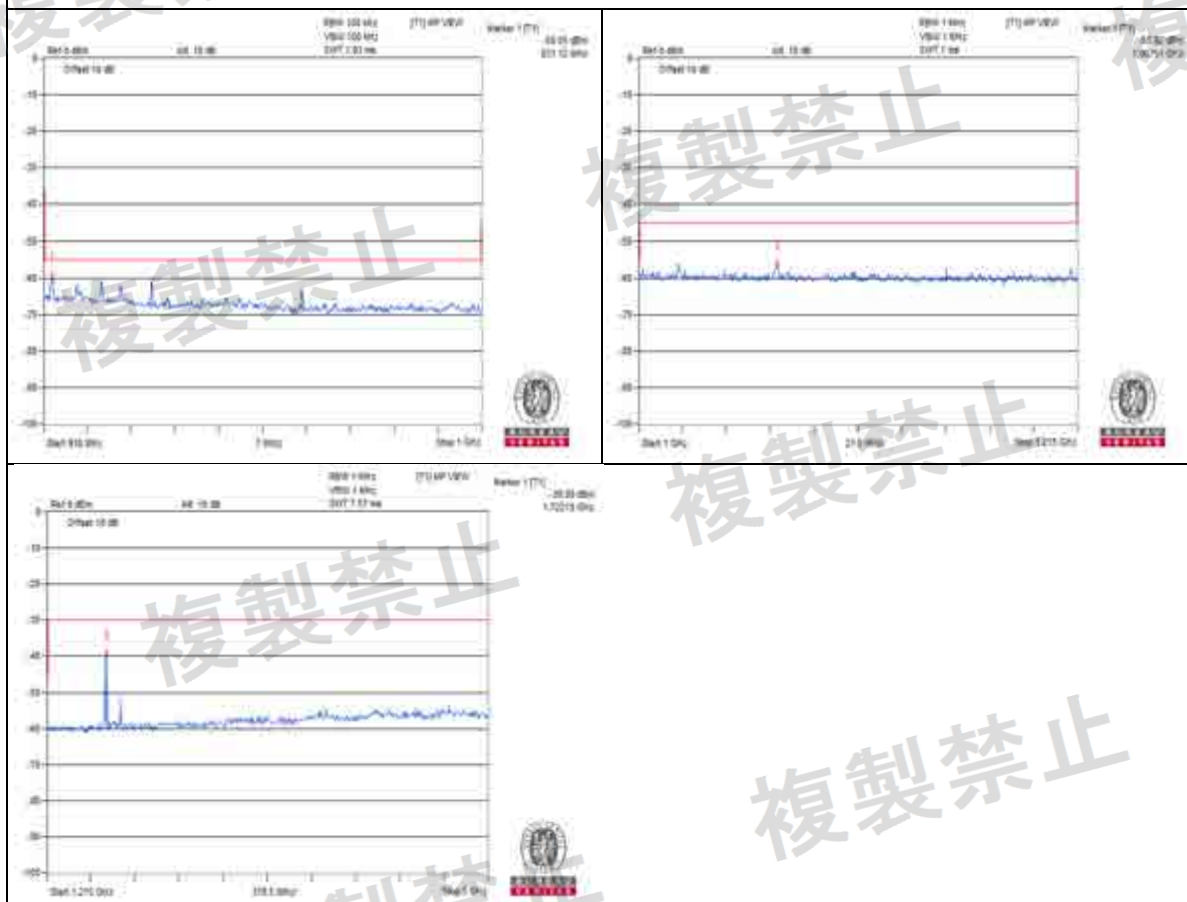
922.0MHz

Vmin.



923.2MHz

Vmin.



923.2MHz

50 kbps

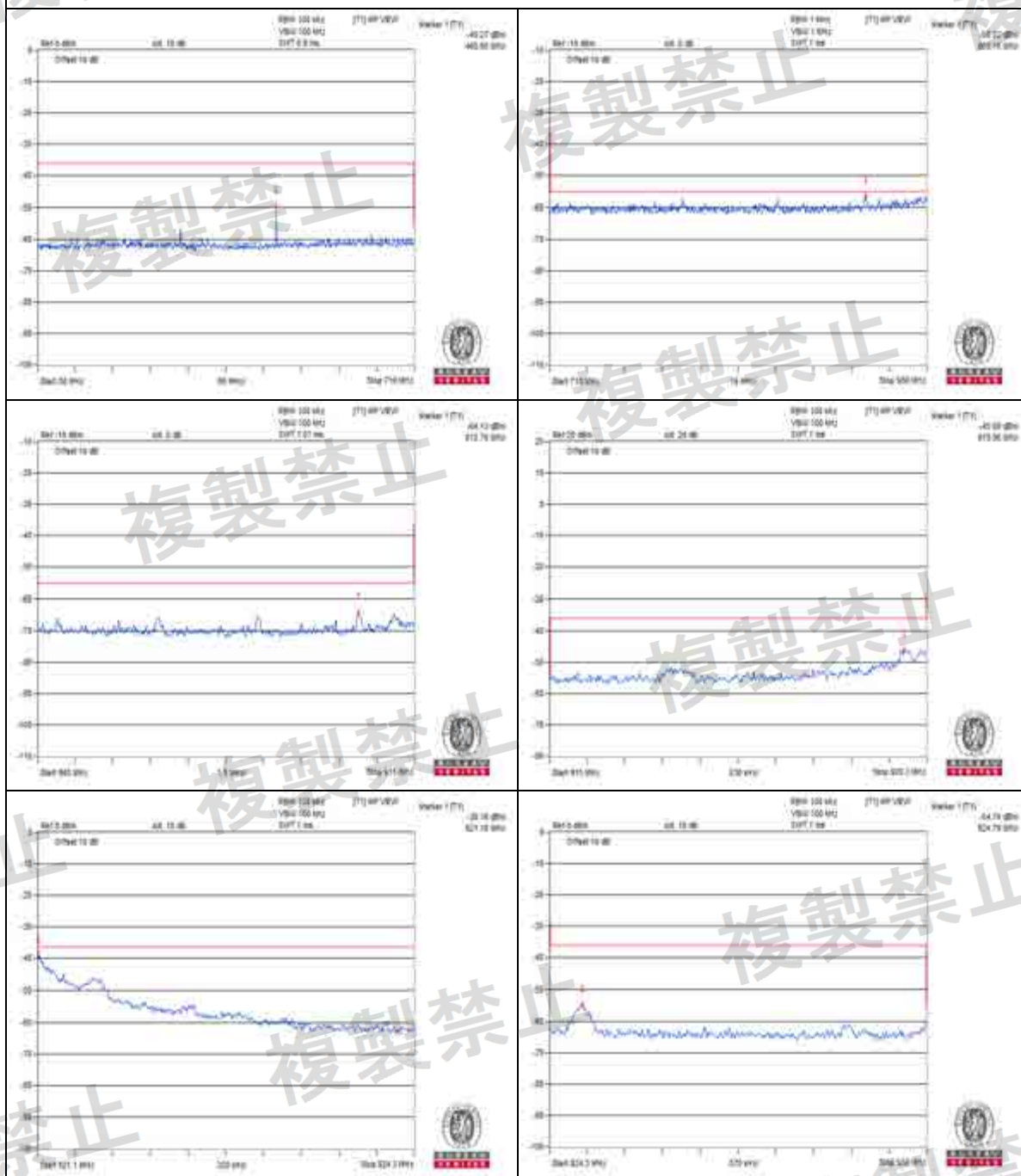
TEST CHANNEL		920.8MHz		LIMIT	RESULT
TEST CONDITION	FREQUENCY RANGE	FREQUENCY (MHz)	MEASURE. VALUE		
Vnormal	30MHz to 710MHz	460.660	-49.27	-36	PASS
	710MHz to 900MHz	869.150	-56.32	-55	PASS
	900MHz to 915MHz	912.780	-64.13	-55	PASS
	915MHz to 920.3MHz	919.980	-45.89	-36	PASS
	CF+300KHz to 924.3MHz	921.100	-39.18	-36	PASS
	924.3MHz to 930MHz	924.790	-54.74	-36	PASS
	930MHz to 1000MHz	939.840	-55.62	-55	PASS
	1000MHz to 1215MHz	1016.820	-51.55	-45	PASS
	1215MHz to 5000MHz	1840.340	-47.64	-30	PASS
Vmax.	30MHz to 710MHz	460.660	-56.70	-36	PASS
	710MHz to 900MHz	868.880	-55.15	-55	PASS
	900MHz to 915MHz	912.800	-63.70	-55	PASS
	915MHz to 920.3MHz	920.270	-45.97	-36	PASS
	CF+300KHz to 924.3MHz	921.100	-39.24	-36	PASS
	924.3MHz to 930MHz	924.790	-53.71	-36	PASS
	930MHz to 1000MHz	939.840	-55.06	-55	PASS
	1000MHz to 1215MHz	1016.510	-51.14	-45	PASS
	1215MHz to 5000MHz	1840.340	-46.89	-30	PASS
Vmin.	30MHz to 710MHz	460.660	-56.13	-36	PASS
	710MHz to 900MHz	869.150	-55.78	-55	PASS
	900MHz to 915MHz	914.260	-63.46	-55	PASS
	915MHz to 920.3MHz	920.280	-45.32	-36	PASS
	CF+300KHz to 924.3MHz	921.100	-40.63	-36	PASS
	924.3MHz to 930MHz	924.790	-53.78	-36	PASS
	930MHz to 1000MHz	939.940	-56.34	-55	PASS
	1000MHz to 1215MHz	1025.860	-51.39	-45	PASS
	1215MHz to 5000MHz	1840.340	-46.58	-30	PASS

TEST CHANNEL		922.0MHz		LIMIT	RESULT
TEST CONDITION	FREQUENCY RANGE	FREQUENCY (MHz)	MEASURE. VALUE		
Vnormal	30MHz to 710MHz	460.660	-48.93	-36	PASS
	710MHz to 900MHz	900.000	-59.11	-55	PASS
	900MHz to 915MHz	913.950	-64.66	-55	PASS
	915MHz to 920.3MHz	920.070	-52.31	-36	PASS
	920.3MHz to CF-300KHz	921.680	-39.63	-36	PASS
	CF+300KHz to 930MHz	922.300	-40.69	-36	PASS
	930MHz to 1000MHz	945.920	-60.35	-55	PASS
	1000MHz to 1215MHz	1065.740	-55.18	-45	PASS
	1215MHz to 5000MHz	1840.340	-51.28	-30	PASS
Vmax.	30MHz to 710MHz	461.120	-56.05	-36	PASS
	710MHz to 900MHz	893.160	-58.36	-55	PASS
	900MHz to 915MHz	914.010	-64.59	-55	PASS
	915MHz to 920.3MHz	920.110	-51.70	-36	PASS
	920.3MHz to CF-300KHz	921.690	-38.35	-36	PASS
	CF+300KHz to 930MHz	922.300	-41.09	-36	PASS
	930MHz to 1000MHz	945.960	-59.63	-55	PASS
	1000MHz to 1215MHz	1066.220	-55.52	-45	PASS
	1215MHz to 5000MHz	1843.310	-51.00	-30	PASS
Vmin.	30MHz to 710MHz	461.120	-55.68	-36	PASS
	710MHz to 900MHz	897.720	-57.97	-55	PASS
	900MHz to 915MHz	909.990	-64.17	-55	PASS
	915MHz to 920.3MHz	919.880	-51.80	-36	PASS
	920.3MHz to CF-300KHz	921.680	-38.70	-36	PASS
	CF+300KHz to 930MHz	922.300	-41.50	-36	PASS
	930MHz to 1000MHz	945.960	-59.79	-55	PASS
	1000MHz to 1215MHz	1018.060	-56.05	-45	PASS
	1215MHz to 5000MHz	1843.310	-51.10	-30	PASS

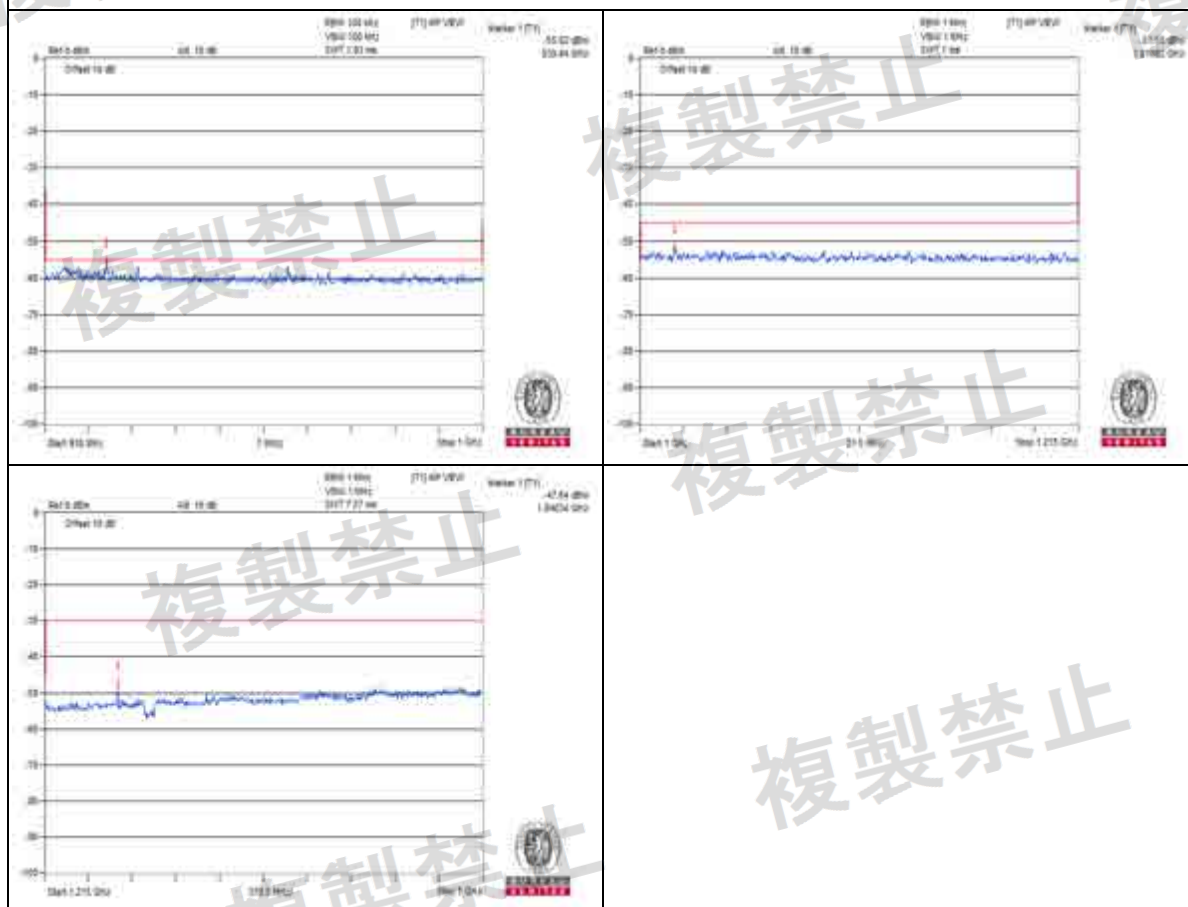
TEST CHANNEL		923.2MHz		LIMIT	RESULT
TEST CONDITION	FREQUENCY RANGE	FREQUENCY (MHz)	MEASURE. VALUE		
Vnormal	30MHz to 710MHz	461.650	-49.35	-36	PASS
	710MHz to 900MHz	886.780	-58.23	-55	PASS
	900MHz to 915MHz	907.190	-64.83	-55	PASS
	915MHz to 920.3MHz	919.180	-56.61	-36	PASS
	920.3MHz to CF-300KHz	922.890	-38.45	-36	PASS
	CF+300KHz to 930MHz	923.500	-41.50	-36	PASS
	930MHz to 1000MHz	931.110	-59.45	-55	PASS
	1000MHz to 1215MHz	1019.310	-55.26	-45	PASS
	1215MHz to 5000MHz	1845.830	-51.16	-30	PASS
Vmax.	30MHz to 710MHz	461.650	-55.46	-36	PASS
	710MHz to 900MHz	899.720	-58.69	-55	PASS
	900MHz to 915MHz	911.210	-63.53	-55	PASS
	915MHz to 920.3MHz	919.270	-56.44	-36	PASS
	920.3MHz to CF-300KHz	922.900	-40.48	-36	PASS
	CF+300KHz to 930MHz	923.500	-40.46	-36	PASS
	930MHz to 1000MHz	931.110	-58.39	-55	PASS
	1000MHz to 1215MHz	1019.310	-55.56	-45	PASS
	1215MHz to 5000MHz	1845.830	-51.74	-30	PASS
Vmin.	30MHz to 710MHz	461.650	-55.58	-36	PASS
	710MHz to 900MHz	887.050	-56.55	-55	PASS
	900MHz to 915MHz	907.210	-64.66	-55	PASS
	915MHz to 920.3MHz	919.160	-56.05	-36	PASS
	920.3MHz to CF-300KHz	922.900	-38.98	-36	PASS
	CF+300KHz to 930MHz	923.500	-40.84	-36	PASS
	930MHz to 1000MHz	931.110	-59.46	-55	PASS
	1000MHz to 1215MHz	1019.310	-54.36	-45	PASS
	1215MHz to 5000MHz	1845.830	-51.39	-30	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

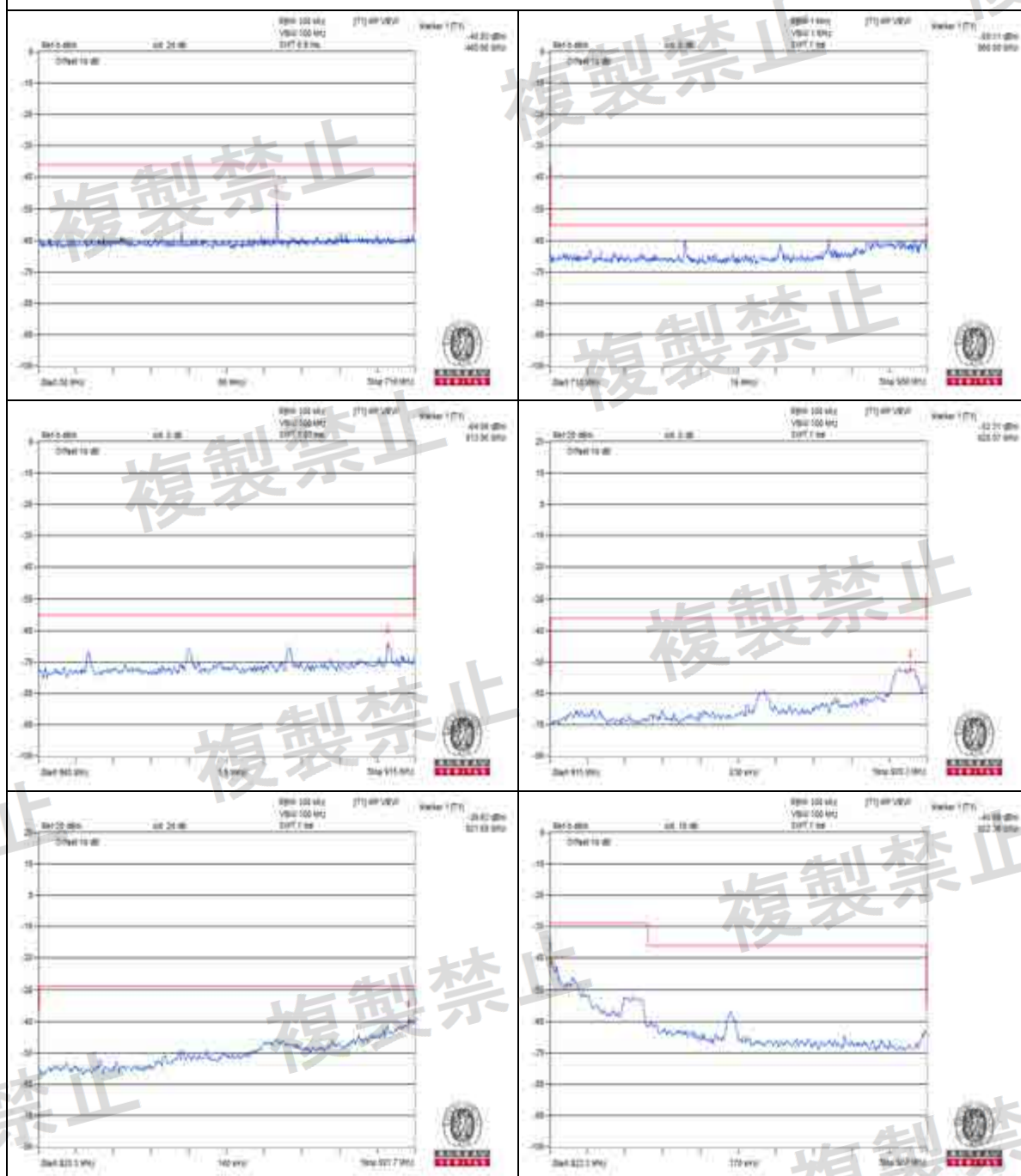


920.8MHz



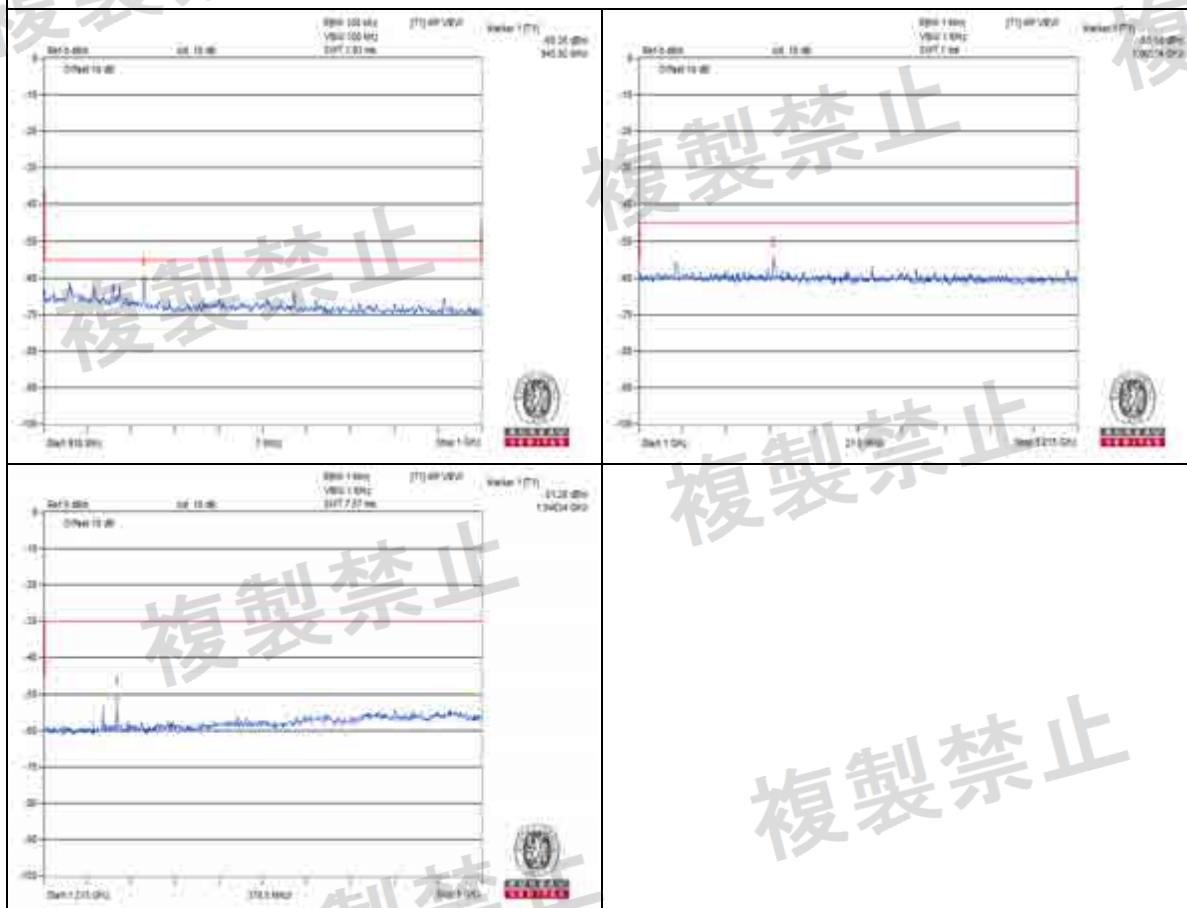
920.8MHz

Vnormal



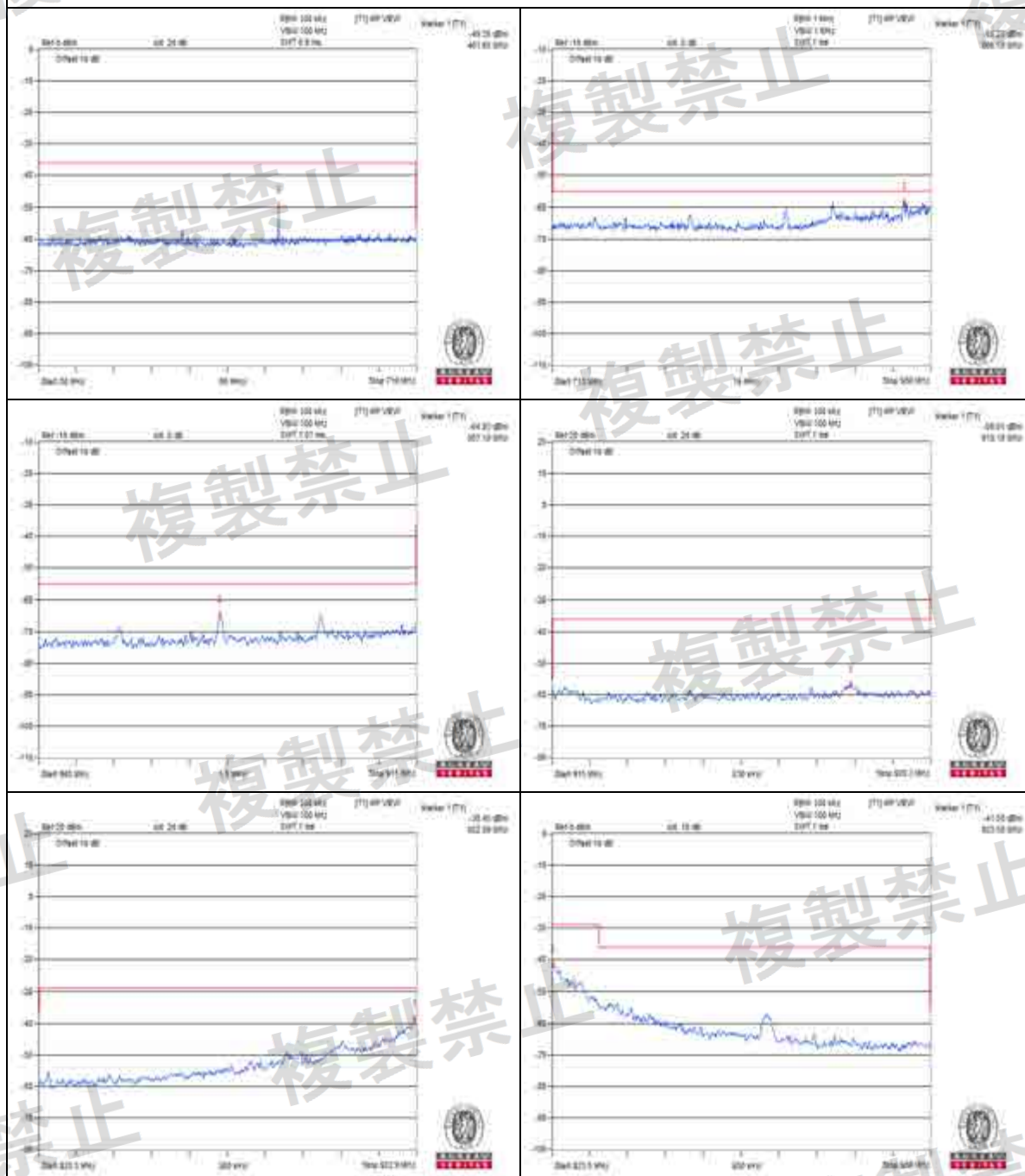
922.0MHz

Vnormal



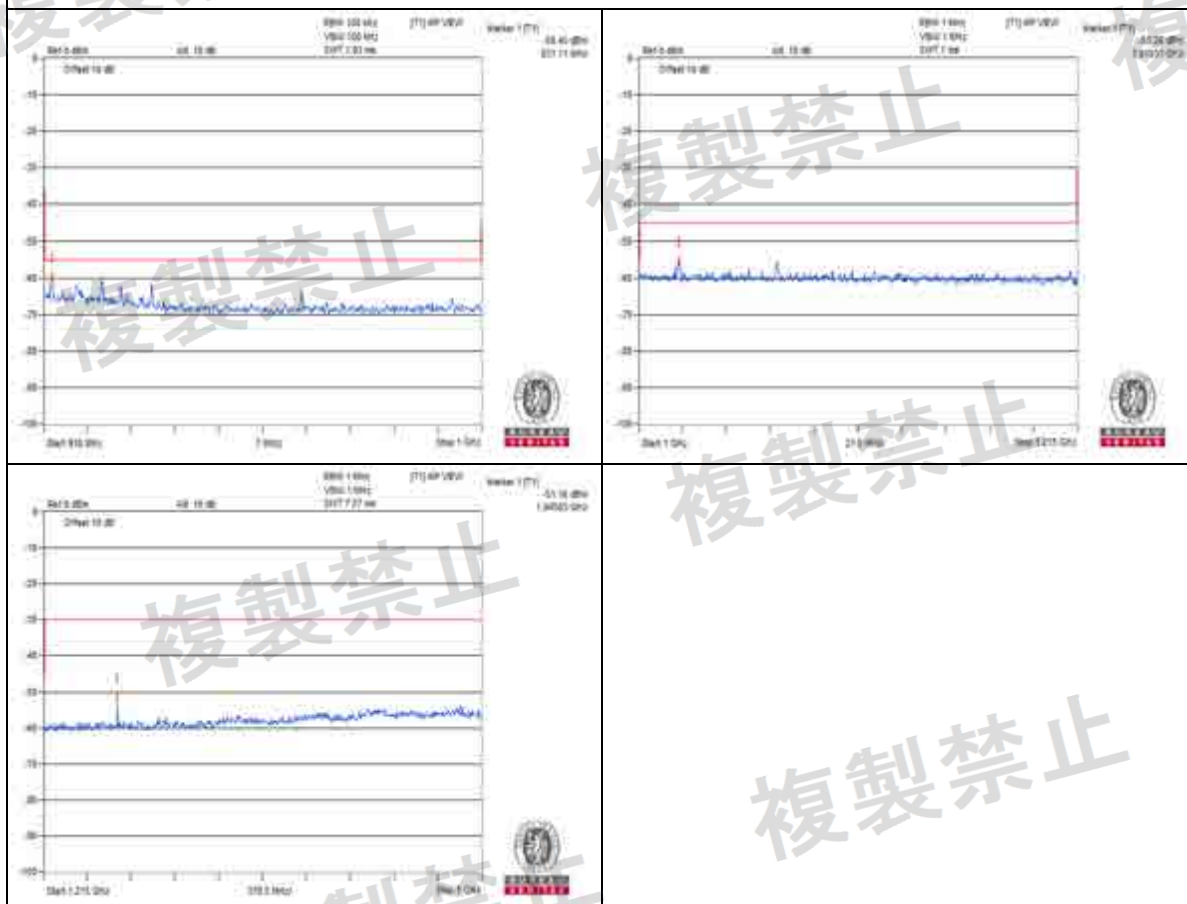
922.0MHz

Vnormal



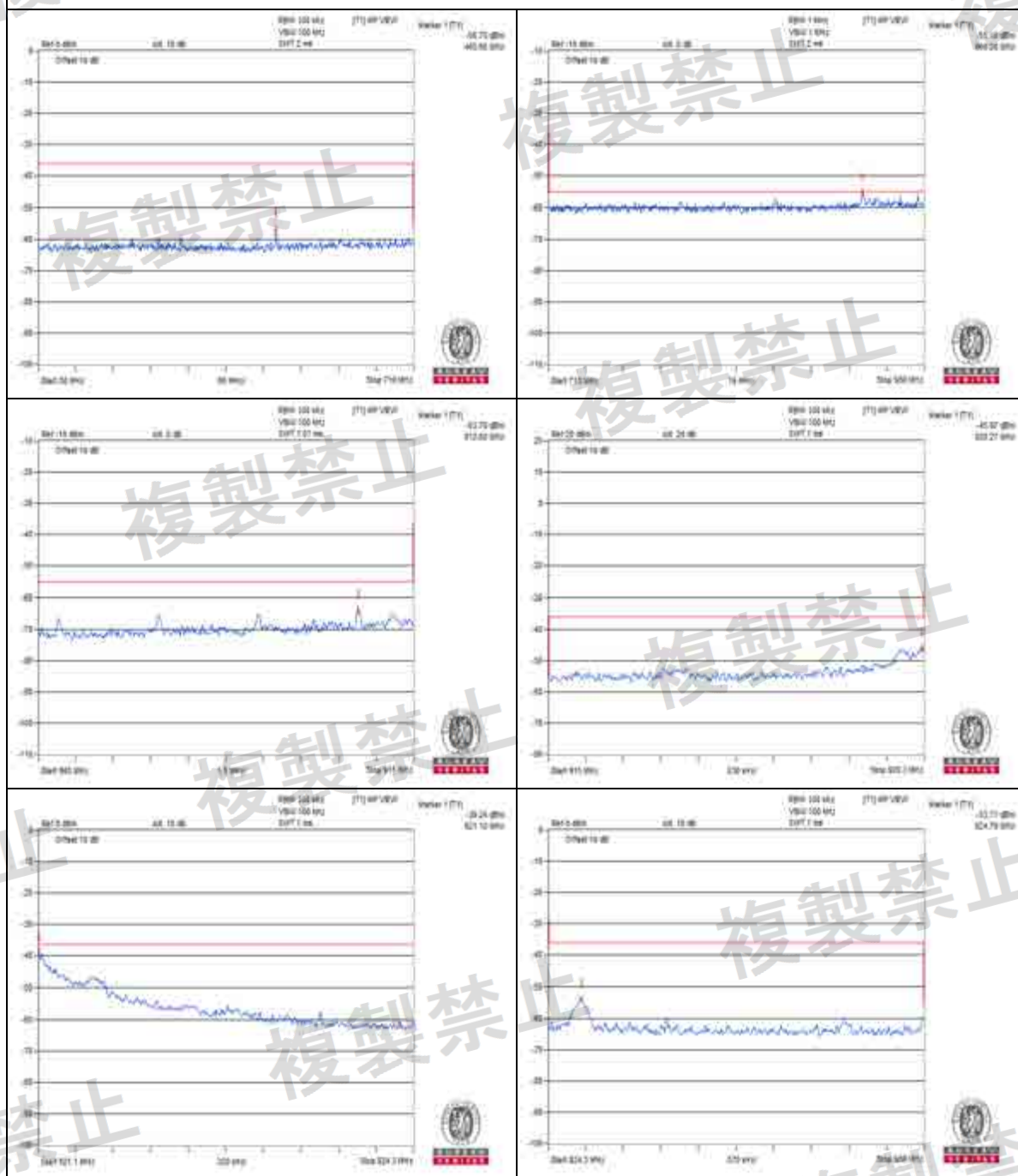
923.2MHz

Vnormal



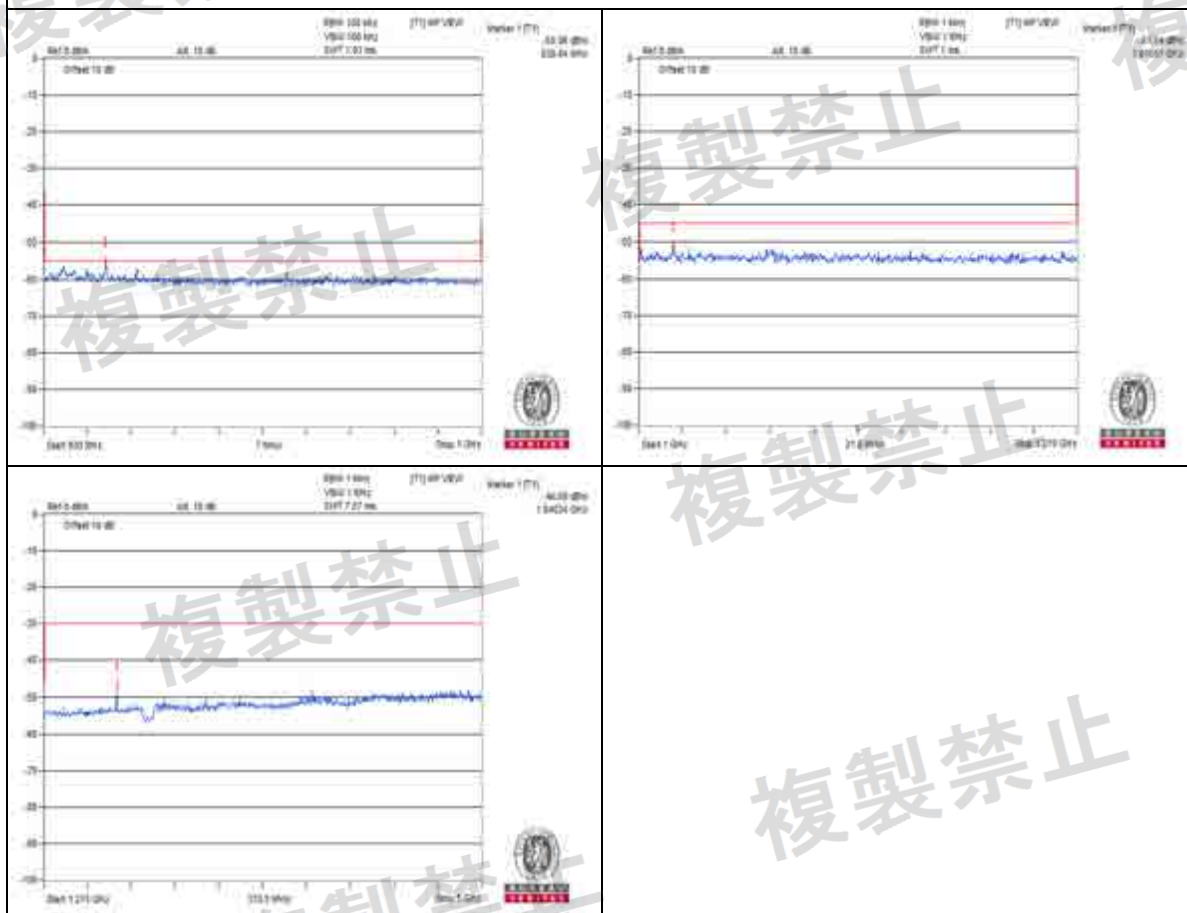
923.2MHz

Vmax.



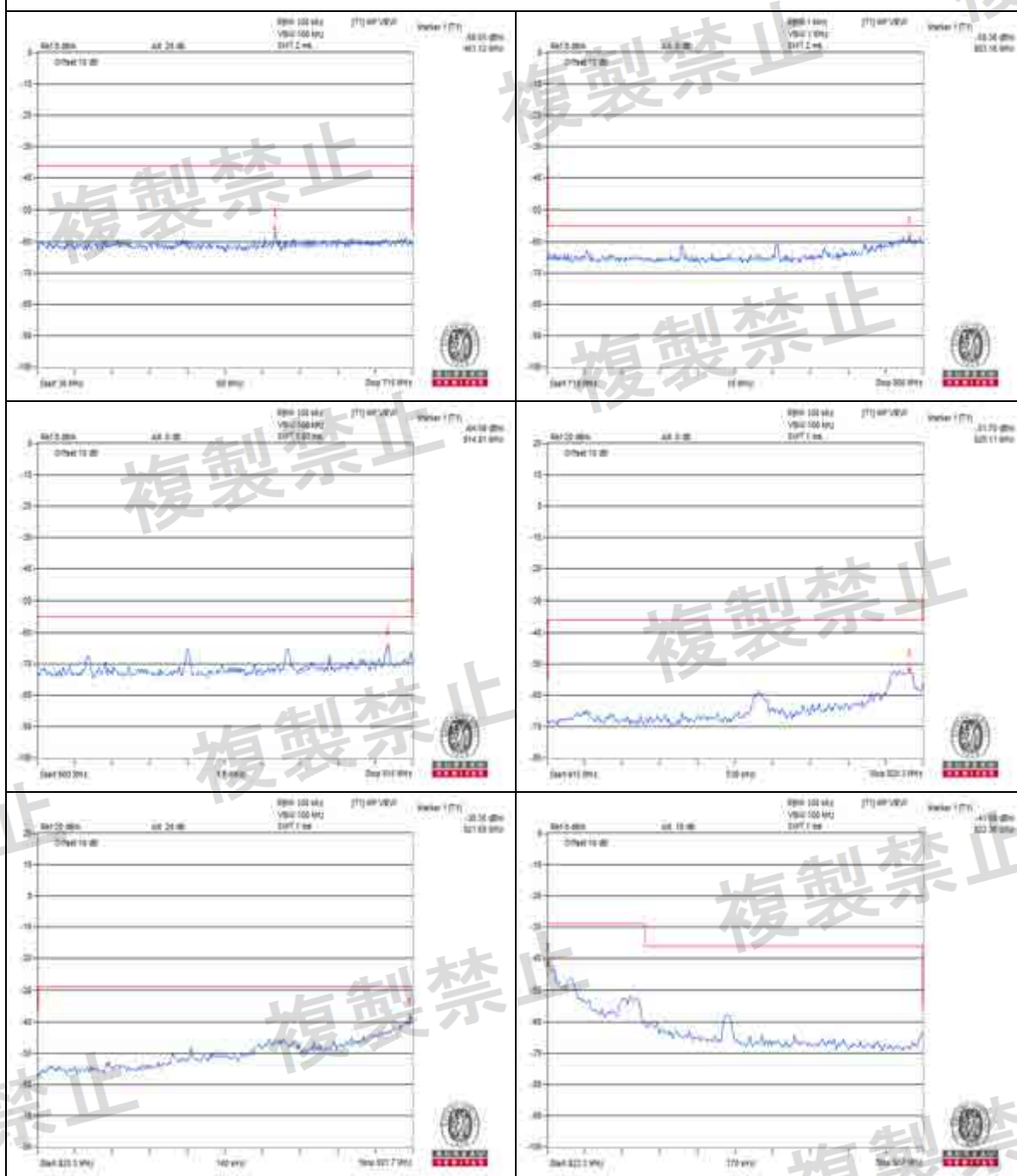
920.8MHz

Vmax.



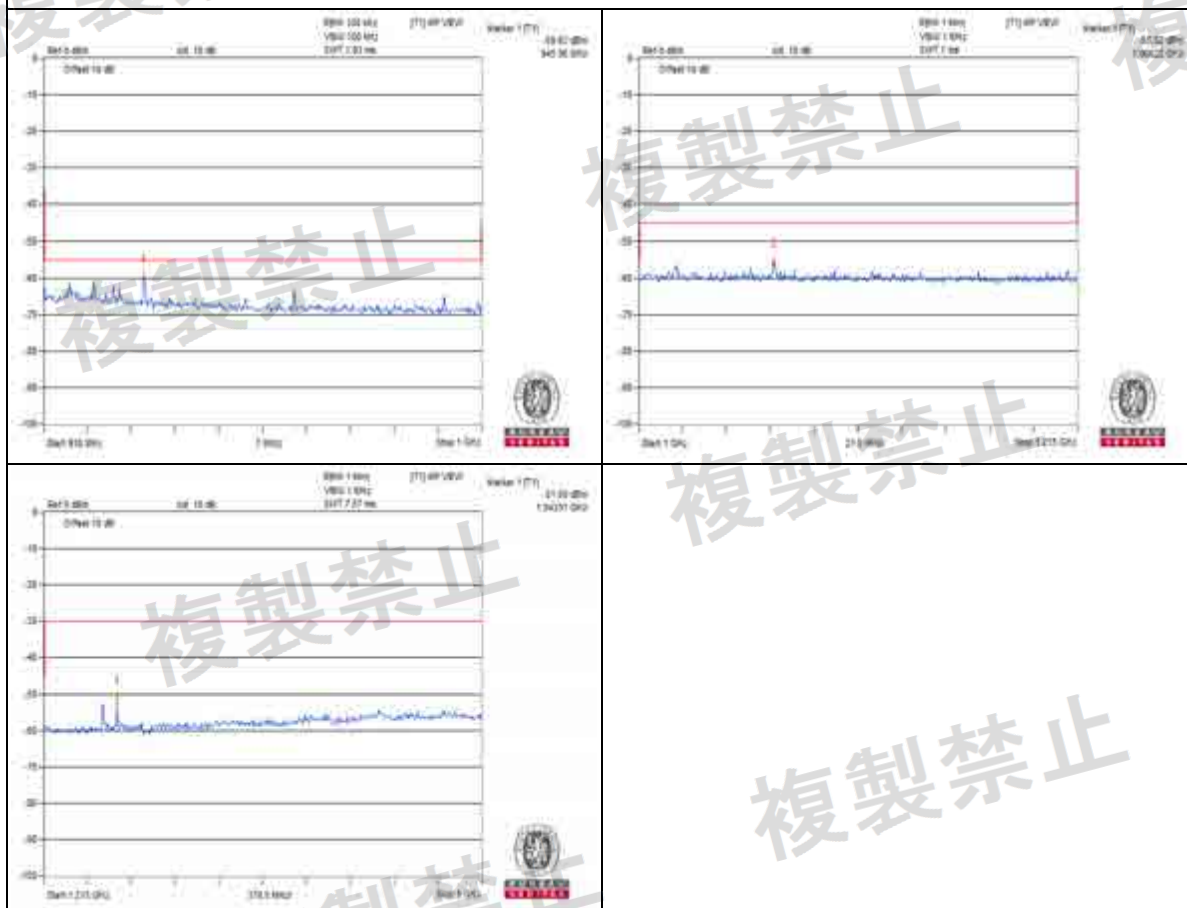
920.8MHz

Vmax.



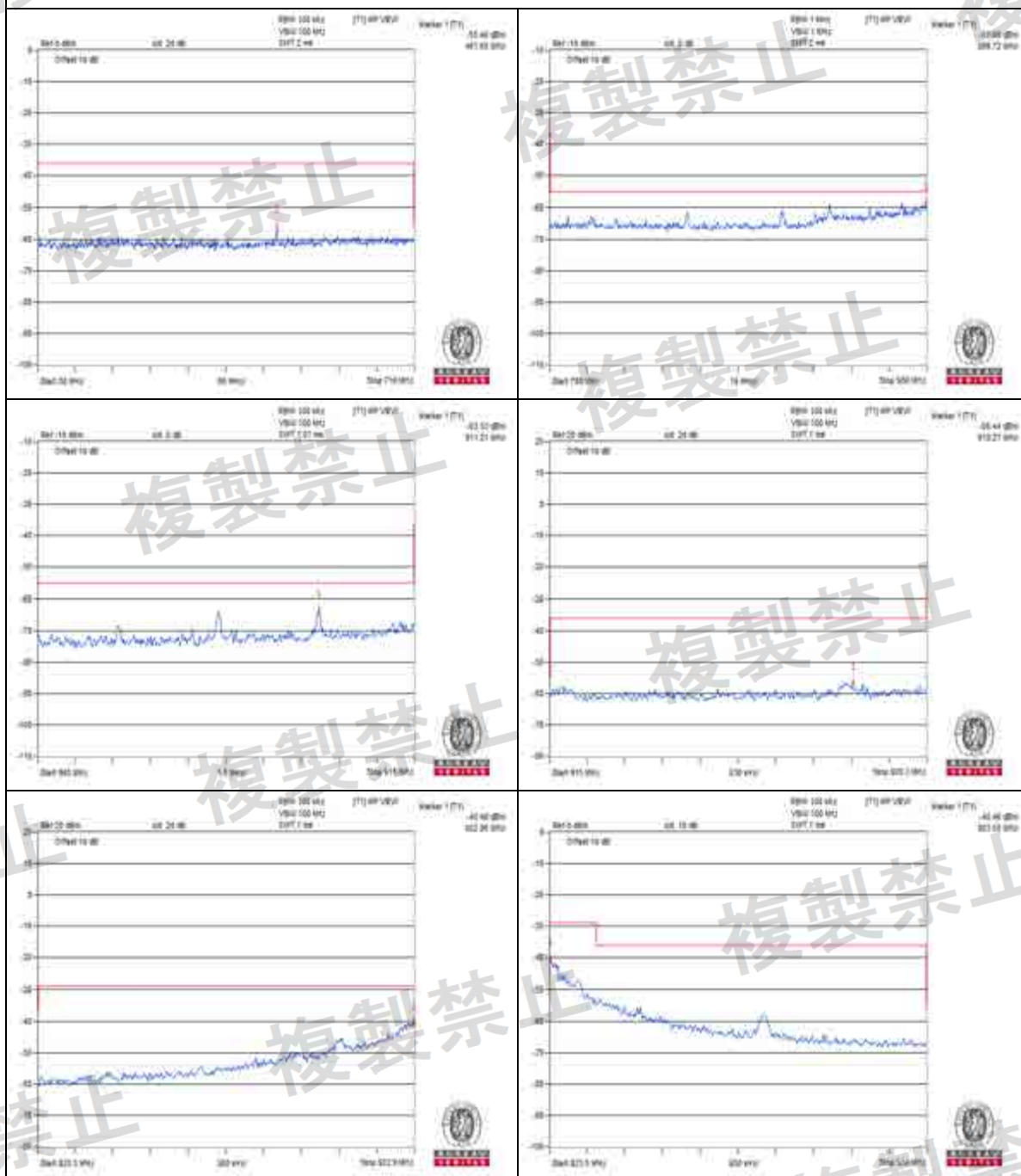
922.0MHz

Vmax.



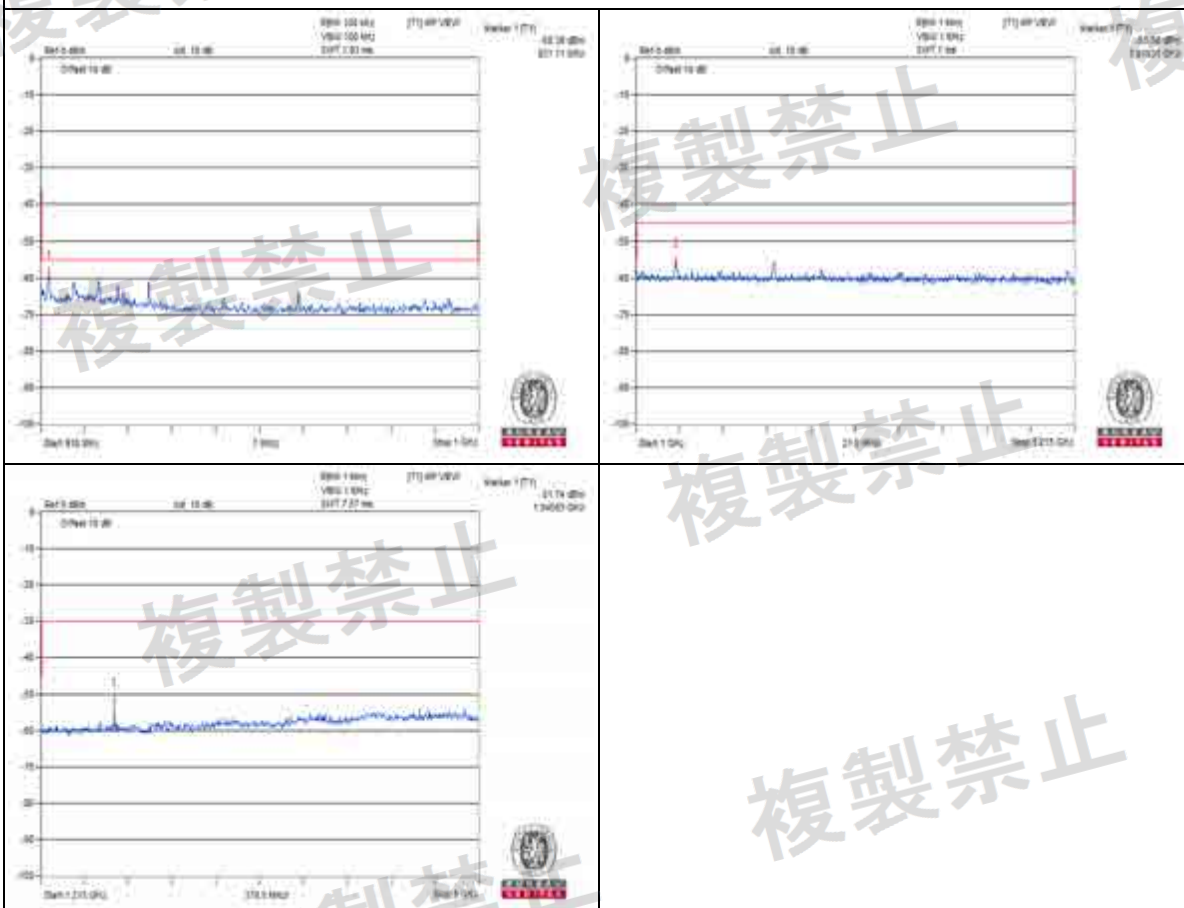
922.0MHz

V_{max}.

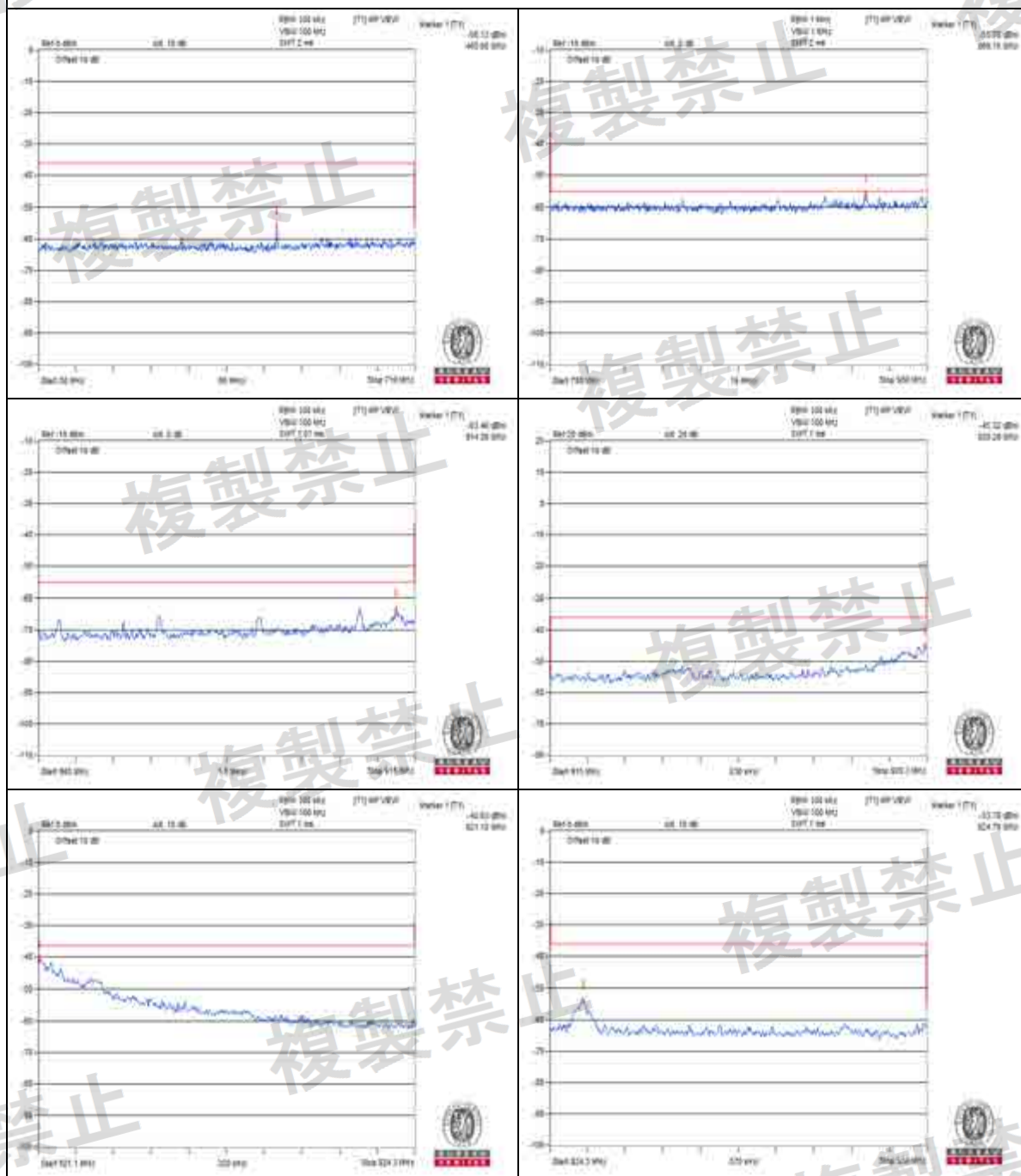


923.2MHz

Vmax.

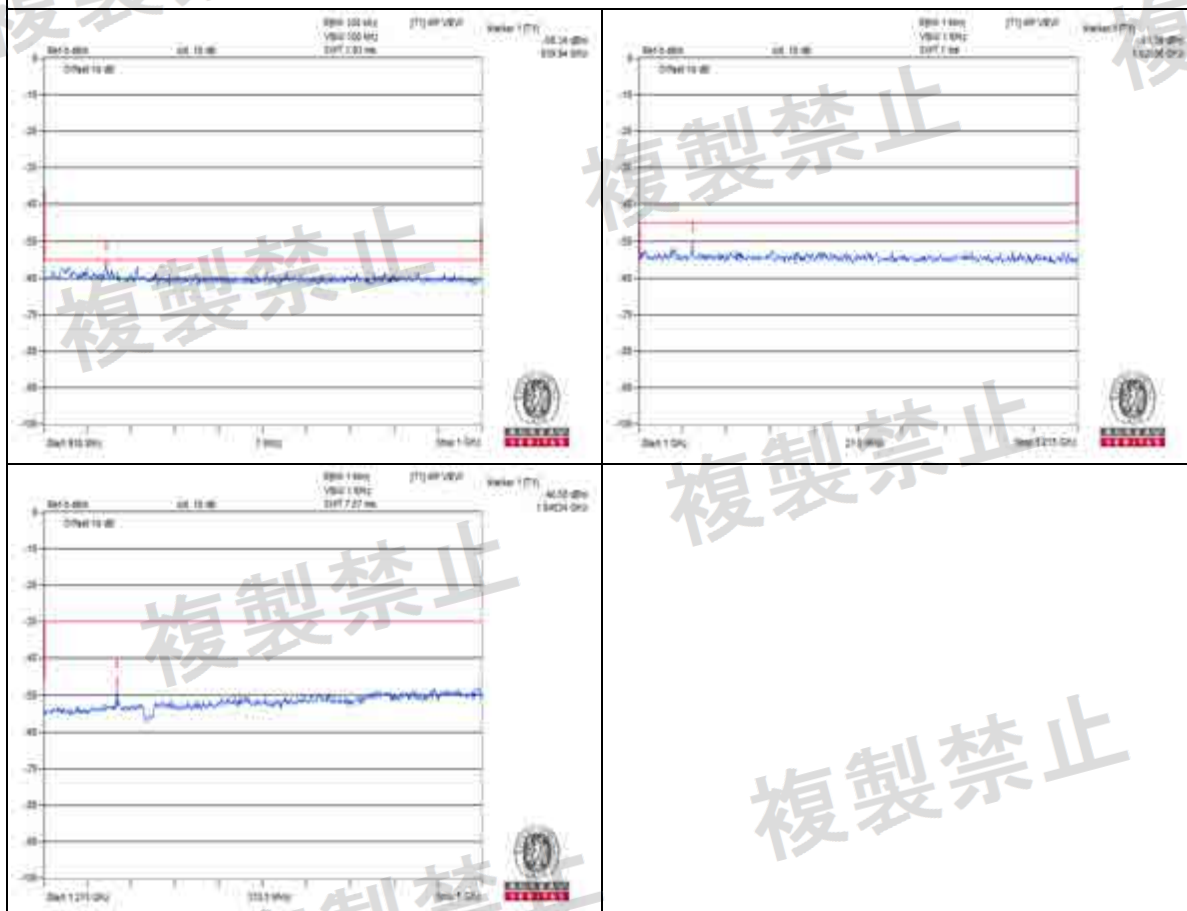


923.2MHz



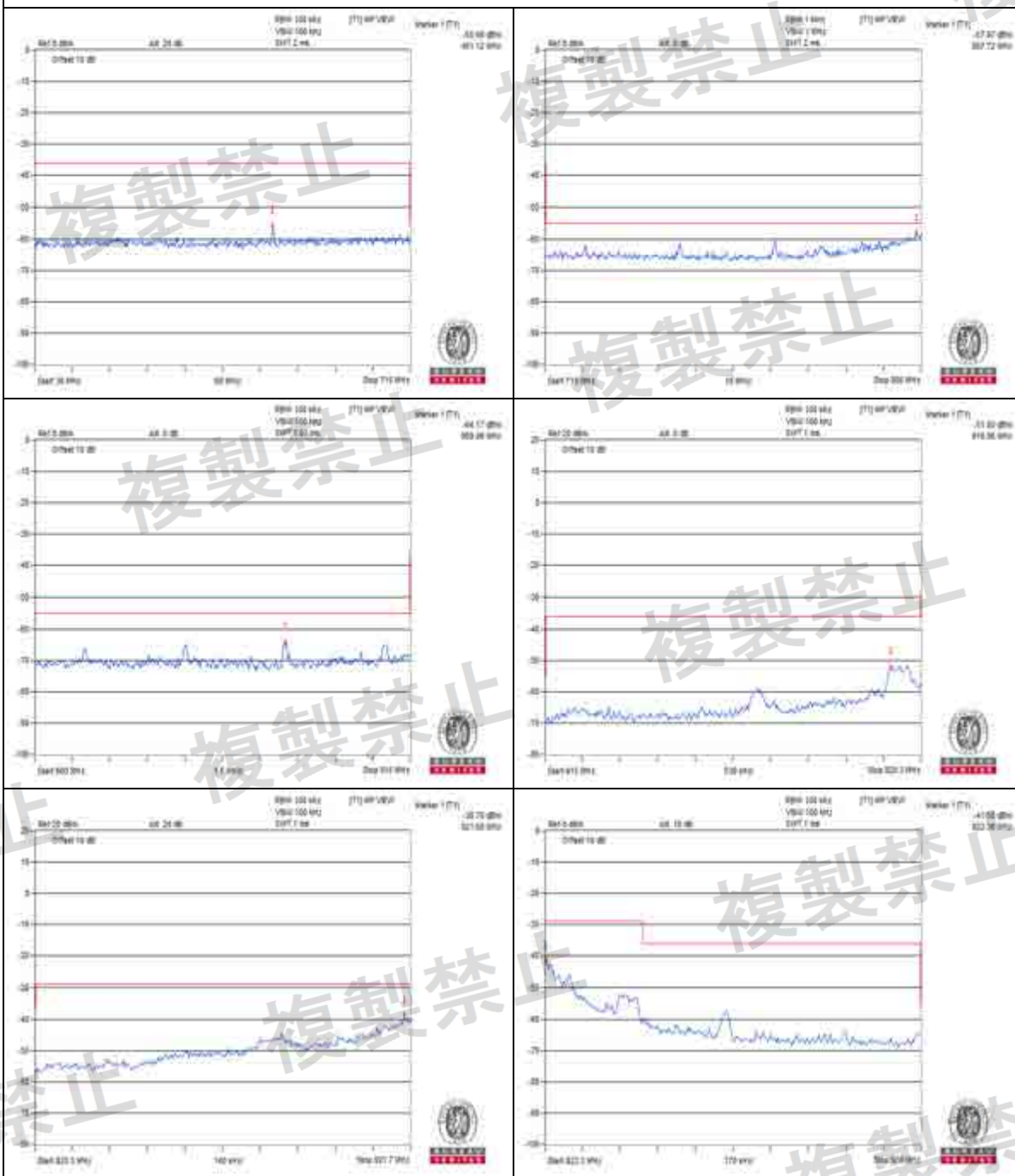
920.8MHz

Vmin.



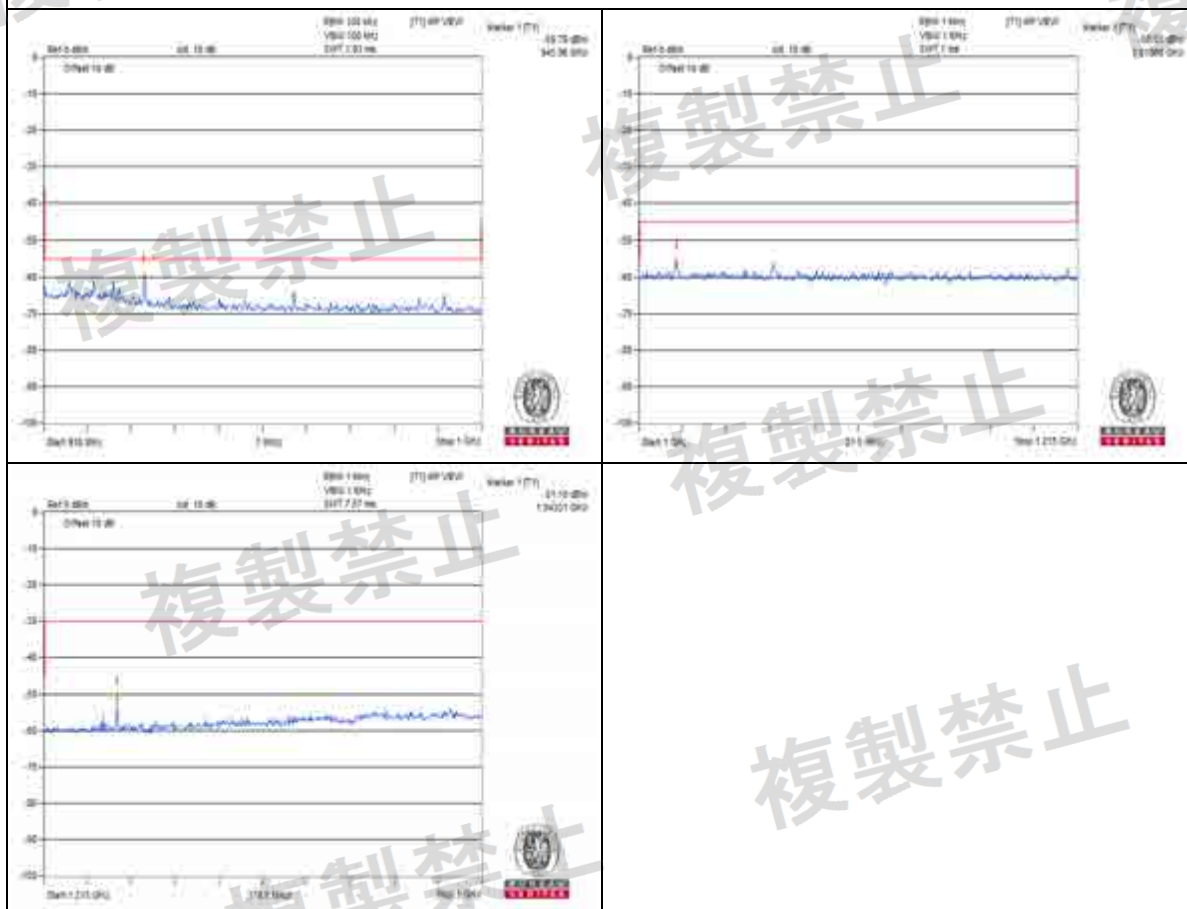
920.8MHz

V_{min}.



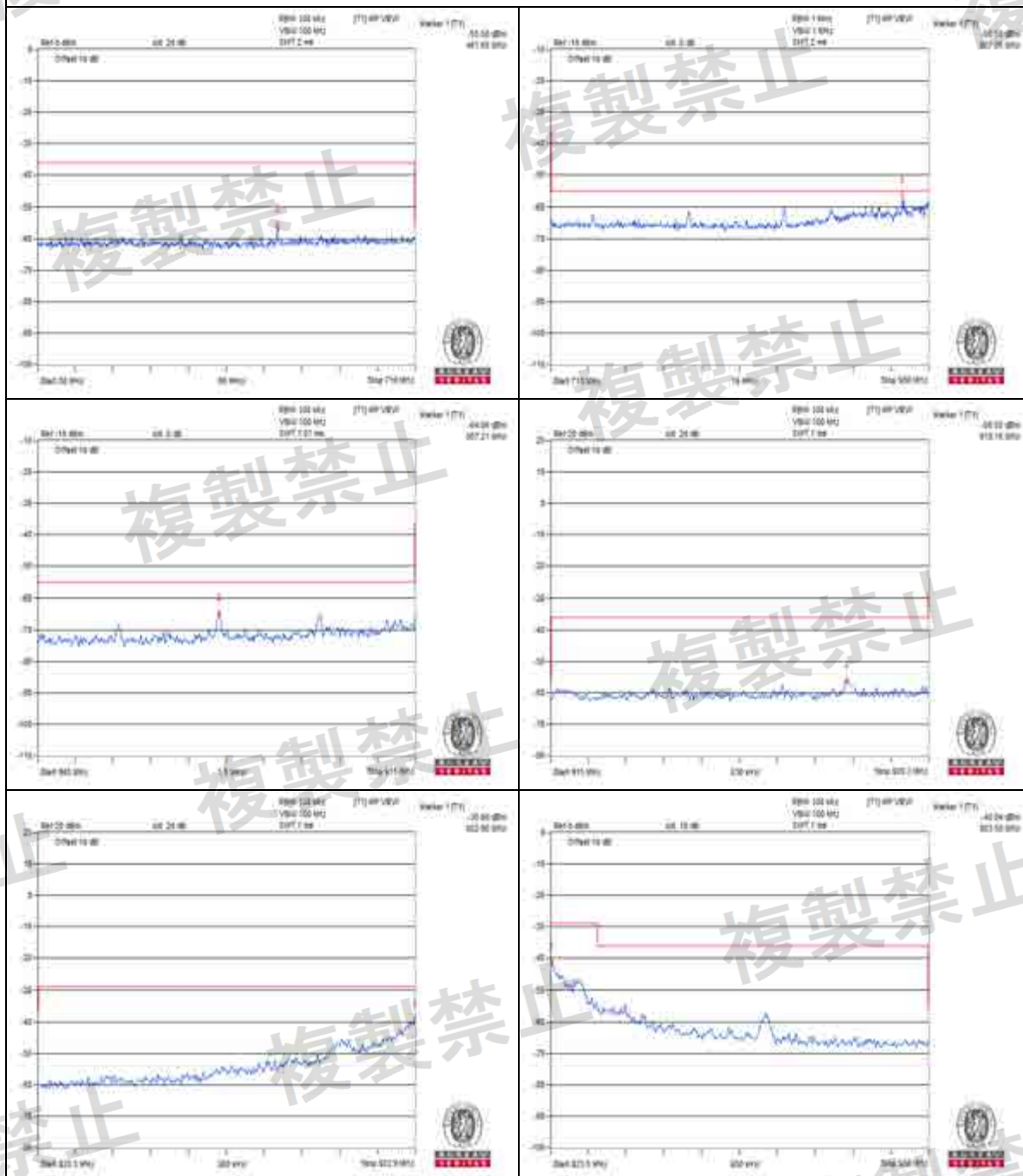
922.0MHz

V_{min}.



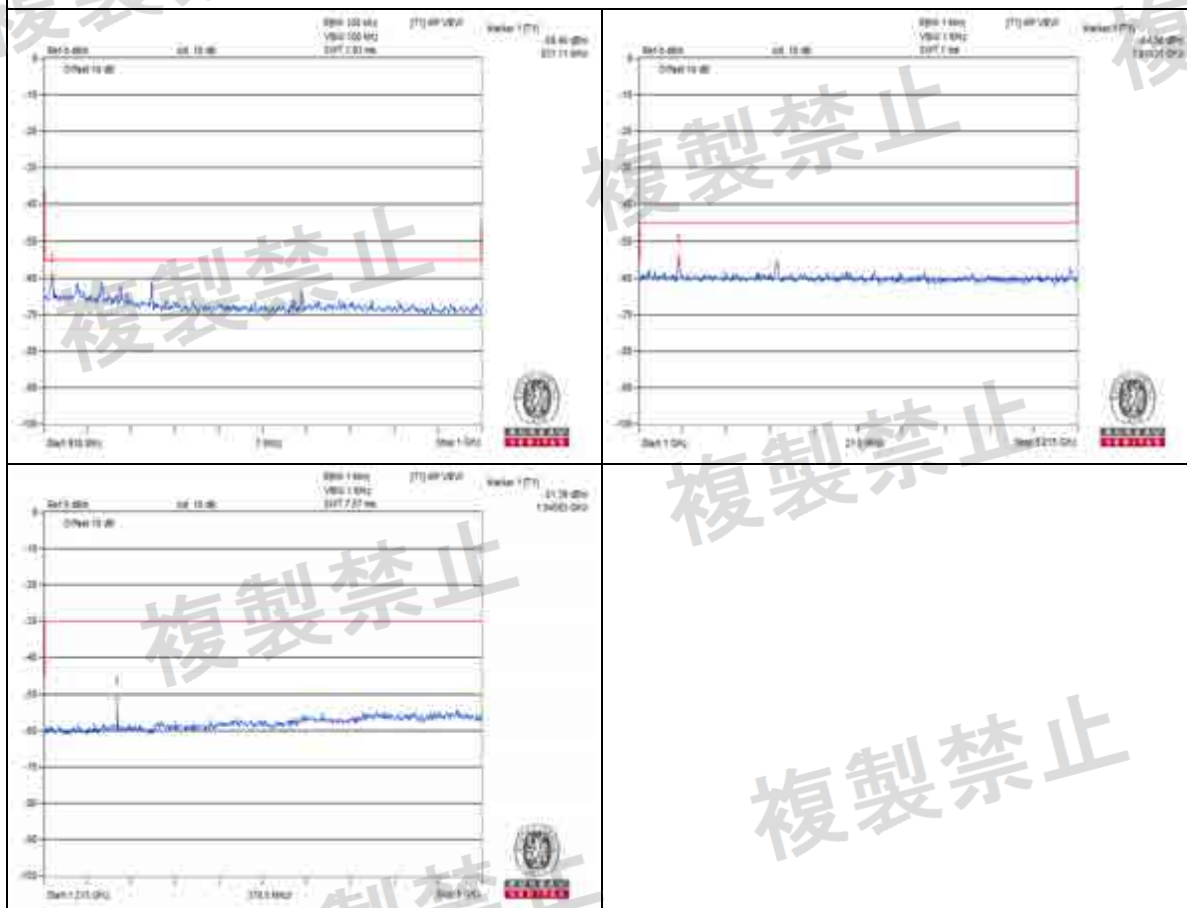
922.0MHz

V_{min}.



923.2MHz

Vmin.



923.2MHz

4.4 Adjacent Channel Leakage Power

4.4.1 Limits of Adjacent Channel Leakage Power

Frequency Band (MHz) 915.9MHz TO 916.9MHz	Limit
At the edge of a Radio channel	-20dBm
In unit radio channel Adjacent to a radio channel	-26dBm

Frequency Band (MHz) 920.5MHz TO 922.3MHz	Limit
At the edge of a Radio channel	-7dBm
In unit radio channel Adjacent to a radio channel	-15dBm or less (*)

* If antenna power is reduced by 1mW or less, each adjacent channel leakage power is 26dBm or less.

Frequency Band (MHz) 922.3MHz TO 928.1MHz (Antenna power is 1mW or less)	Limit
In unit radio channel Adjacent to a radio channel	-26dBm or less

Frequency Band (MHz) 922.3MHz TO 928.1MHz (Antenna power is more than 1mW and 20mW or less.)	Limit
In unit radio channel Adjacent to a radio channel	-15dBm or less

Frequency Band (MHz) 928.1MHz TO 929.7MHz	Limit
In unit radio channel Adjacent to a radio channel	-26dBm or less

4.4.2 Test Results

625bps

ENVIRONMENTAL CONDITIONS		24 deg.C, 70% RH			
VOLTAGE	FREQUENCY (MHz)	920.8MHz	922.0MHz	923.2MHz	MAX. LIMIT (dBm)
V _{nom}	Mean Power of carrier (dBm)	11.88	13.24	13.28	-
	Mean Power +0.2 MHz distance of carrier (dBm)	-32.80	-32.05	-31.38	-15
	Mean Power -0.2 MHz distance of carrier (dBm)	-30.17	-29.29	-28.30	-15
V _{max.}	Mean Power of carrier (dBm)	12.03	13.28	13.25	-
	Mean Power +0.2 MHz distance of carrier (dBm)	-32.59	-32.34	-31.42	-15
	Mean Power -0.2 MHz distance of carrier (dBm)	-30.24	-29.48	-28.65	-15
V _{min.}	Mean Power of carrier (dBm)	12.14	13.29	13.29	-
	Mean Power +0.2 MHz distance of carrier (dBm)	-32.65	-32.28	-31.59	-15
	Mean Power -0.2 MHz distance of carrier (dBm)	-30.24	-29.52	-28.53	-15

50 kbps

ENVIRONMENTAL CONDITIONS		24 deg.C, 70% RH			
VOLTAGE	FREQUENCY (MHz)	920.8MHz	922.0MHz	923.2MHz	MAX. LIMIT (dBm)
V _{nom}	Mean Power of carrier (dBm)	14.39	15.88	15.86	-
	Mean Power +0.2 MHz distance of carrier (dBm)	-31.50	-32.26	-31.46	-15
	Mean Power -0.2 MHz distance of carrier (dBm)	-27.71	-28.08	-26.61	-15
V _{max.}	Mean Power of carrier (dBm)	14.73	15.89	15.76	-
	Mean Power +0.2 MHz distance of carrier (dBm)	-31.26	-32.53	-31.55	-15
	Mean Power -0.2 MHz distance of carrier (dBm)	-28.44	-27.57	-26.93	-15
V _{min.}	Mean Power of carrier (dBm)	14.65	15.99	15.87	-
	Mean Power +0.2 MHz distance of carrier (dBm)	-31.23	-32.64	-31.17	-15
	Mean Power -0.2 MHz distance of carrier (dBm)	-27.95	-27.45	-27.33	-15

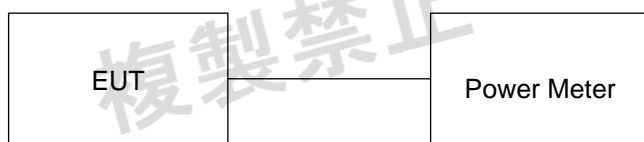
4.5 Antenna Power Measurement

4.5.1 Limits of Antenna Power

Application	Antenna Power	Applied CH number	Unit CH bandwidth	CH used in a bundle
	1mW or less	1-5	200kHz	1~5 ch
		62-77	100kHz	1~5 ch
V	20mW or less	24-61	200kHz	None

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

4.5.2 Test Setup



4.5.3 Test Results

625bps

ENVIRONMENTAL CONDITIONS	24 deg.C, 70% RH			
TEST CONDITION	CONDUCTED RF OUTPUT POWER (mW)			
	CHANNEL 1 920.8MHz	CHANNEL 4 922.0Hz	CHANNEL 7 923.2MHz	MAX. LIMIT (mW)
V _{normal}	17.906	17.742	17.338	20
V _{max.}	17.947	17.783	17.378	20
V _{min.}	17.906	17.701	17.298	20
RATED POWER	18			
TOLERANCE OF ANTENNA POWER	3.6 ~ 21.6			

50 kbps

ENVIRONMENTAL CONDITIONS	24 deg.C, 70% RH			
TEST CONDITION	CONDUCTED RF OUTPUT POWER (mW)			
	CHANNEL 1 920.8MHz	CHANNEL 4 922.0Hz	CHANNEL 7 923.2MHz	MAX. LIMIT (mW)
V _{normal}	18.155	18.155	17.742	20
V _{max.}	18.197	18.197	17.783	20
V _{min.}	18.113	18.113	17.701	20
RATED POWER	18			
TOLERANCE OF ANTENNA POWER	3.6 ~ 21.6			

5kbps

ENVIRONMENTAL CONDITIONS	24 deg.C, 70% RH			
TEST CONDITION	CONDUCTED RF OUTPUT POWER (mW)			
	CHANNEL 1 920.8MHz	CHANNEL 4 922.0Hz	CHANNEL 7 923.2MHz	MAX. LIMIT (mW)
V _{normal}	17.742	17.498	17.100	20
V _{max.}	17.783	17.579	17.179	20
V _{min.}	17.660	17.418	17.061	20
RATED POWER	18			
TOLERANCE OF ANTENNA POWER	3.6 ~ 21.6			

2.5kbps

ENVIRONMENTAL CONDITIONS	24 deg.C, 70% RH			
TEST CONDITION	CONDUCTED RF OUTPUT POWER (mW)			
	CHANNEL 1 920.8MHz	CHANNEL 4 922.0Hz	CHANNEL 7 923.2MHz	MAX. LIMIT (mW)
V _{normal}	17.539	17.418	16.943	20
V _{max.}	17.579	17.458	17.022	20
V _{min.}	17.458	17.338	16.866	20
RATED POWER	18			
TOLERANCE OF ANTENNA POWER	3.6 ~ 21.6			

4.6 Spurious Emissions for Receiver

4.6.1 Limits of Spurious Emissions for Receiver

FREQUENCY BAND	LIMIT (dBm)	RBW
$f \leq 710 \text{ MHz}$	-54	100kHz
$710 \text{ MHz} < f \leq 900 \text{ MHz}$	-55	1MHz
$900 \text{ MHz} < f \leq 915 \text{ MHz}$	-55	100kHz
$915 \text{ MHz} < f \leq 930 \text{ MHz}$	-54	100kHz
$930 \text{ MHz} < f \leq 1000 \text{ MHz}$	-55	100kHz
$1000 \text{ MHz} < f$	-47	1MHz

4.6.2 Test Setup



4.6.3 Test Result

625bps

TEST CHANNEL		920.8MHz		922.0MHz		LIMIT	RESULT
TEST CONDITION	FREQUENCY RANGE	FREQ. (MHz)	MEASURE. VALUE	FREQ. (MHz)	MEASURE. VALUE		
Vnormal	30MHz to 710MHz	336.000	-76.76	645.940	-77.54	-54/100kHz	PASS
	710MHz to 900MHz	848.320	-72.10	867.780	-66.11	-55/MHz	PASS
	900MHz to 915MHz	900.000	-76.69	911.650	-78.54	-55/100kHz	PASS
	915MHz to 930MHz	930.000	-77.49	916.170	-78.89	-54/100kHz	PASS
	930MHz to 1000MHz	979.280	-76.35	977.680	-75.52	-55/100kHz	PASS
	1000MHz to 1215MHz	1209.840	-71.57	1040.190	-66.78	-47/MHz	PASS
Vmax.	30MHz to 710MHz	225.840	-76.83	696.200	-76.62	-54/100kHz	PASS
	710MHz to 900MHz	846.800	-72.05	886.500	-67.28	-55/MHz	PASS
	900MHz to 915MHz	910.170	-76.23	912.910	-78.94	-55/100kHz	PASS
	915MHz to 930MHz	918.120	-76.76	929.260	-79.03	-54/100kHz	PASS
	930MHz to 1000MHz	956.460	-76.48	935.070	-76.43	-55/100kHz	PASS
	1000MHz to 1215MHz	1030.960	-71.83	1160.780	-67.28	-47/MHz	PASS
Vmin.	30MHz to 710MHz	397.200	-76.39	661.710	-77.11	-54/100kHz	PASS
	710MHz to 900MHz	812.220	-71.80	820.140	-66.90	-55/MHz	PASS
	900MHz to 915MHz	907.080	-77.02	907.130	-77.32	-55/100kHz	PASS
	915MHz to 930MHz	926.460	-75.87	917.800	-78.68	-54/100kHz	PASS
	930MHz to 1000MHz	950.580	-76.97	966.820	-75.29	-55/100kHz	PASS
	1000MHz to 1215MHz	1204.250	-71.84	1212.500	-67.16	-47/MHz	PASS

TEST CHANNEL		923.2MHz		LIMIT	RESULT
TEST CONDITION	FREQUENCY RANGE	FREQUENCY (MHz)	MEASURE. VALUE		
Vnormal	30MHz to 710MHz	709.010	-76.94	-54/100kHz	PASS
	710MHz to 900MHz	859.520	-66.63	-55/MHz	PASS
	900MHz to 915MHz	910.860	-77.47	-55/100kHz	PASS
	915MHz to 930MHz	921.020	-77.90	-54/100kHz	PASS
	930MHz to 1000MHz	933.040	-75.62	-55/100kHz	PASS
	1000MHz to 1215MHz	1021.500	-66.81	-47/MHz	PASS
Vmax.	30MHz to 710MHz	649.880	-77.26	-54/100kHz	PASS
	710MHz to 900MHz	871.630	-66.59	-55/MHz	PASS
	900MHz to 915MHz	906.820	-78.68	-55/100kHz	PASS
	915MHz to 930MHz	922.000	-78.95	-54/100kHz	PASS
	930MHz to 1000MHz	969.150	-74.98	-55/100kHz	PASS
	1000MHz to 1215MHz	1033.960	-67.10	-47/MHz	PASS
Vmin.	30MHz to 710MHz	642.000	-77.45	-54/100kHz	PASS
	710MHz to 900MHz	885.950	-66.38	-55/MHz	PASS
	900MHz to 915MHz	902.760	-77.96	-55/100kHz	PASS
	915MHz to 930MHz	915.150	-78.28	-54/100kHz	PASS
	930MHz to 1000MHz	932.630	-76.05	-55/100kHz	PASS
	1000MHz to 1215MHz	1120.580	-67.13	-47/MHz	PASS

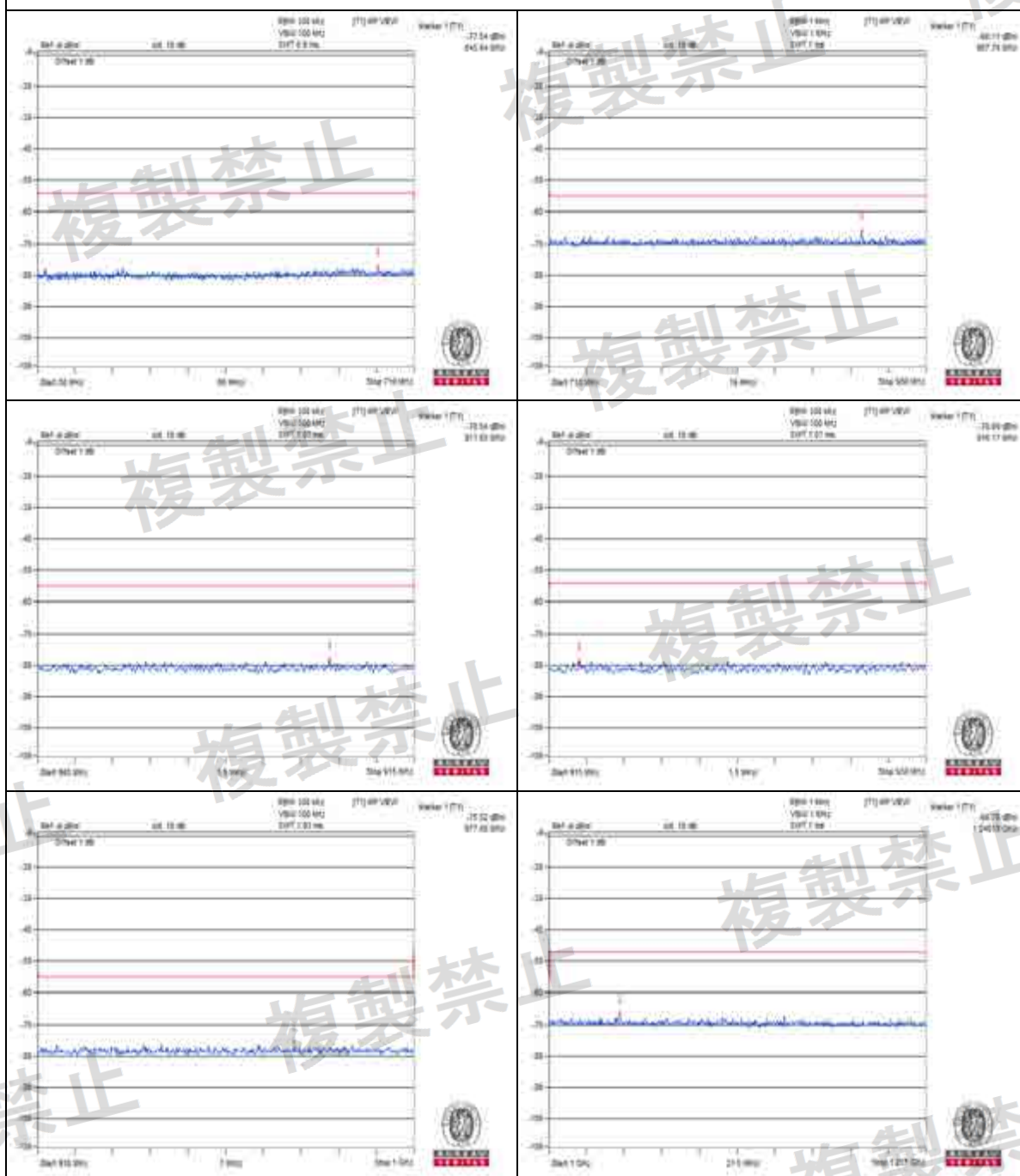
NOTE: 1. The worst value in each frequency range v.s. each channel has been marked by boldface.
2. The spectrum plots are attached on the following pages.

Vnormal



920.8MHz

Vnormal



922.0MHz

Vnormal



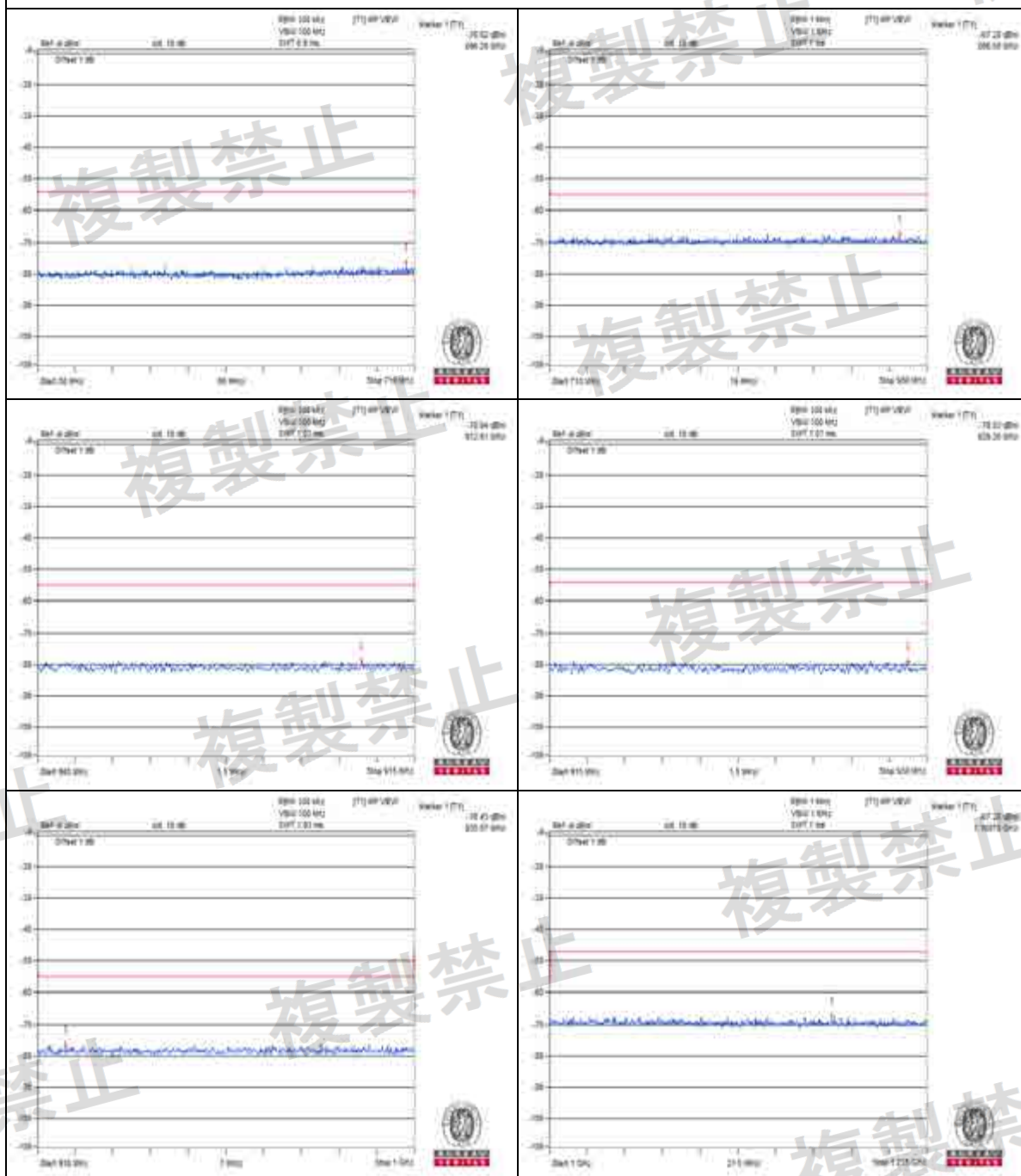
923.2MHz

Vmax.



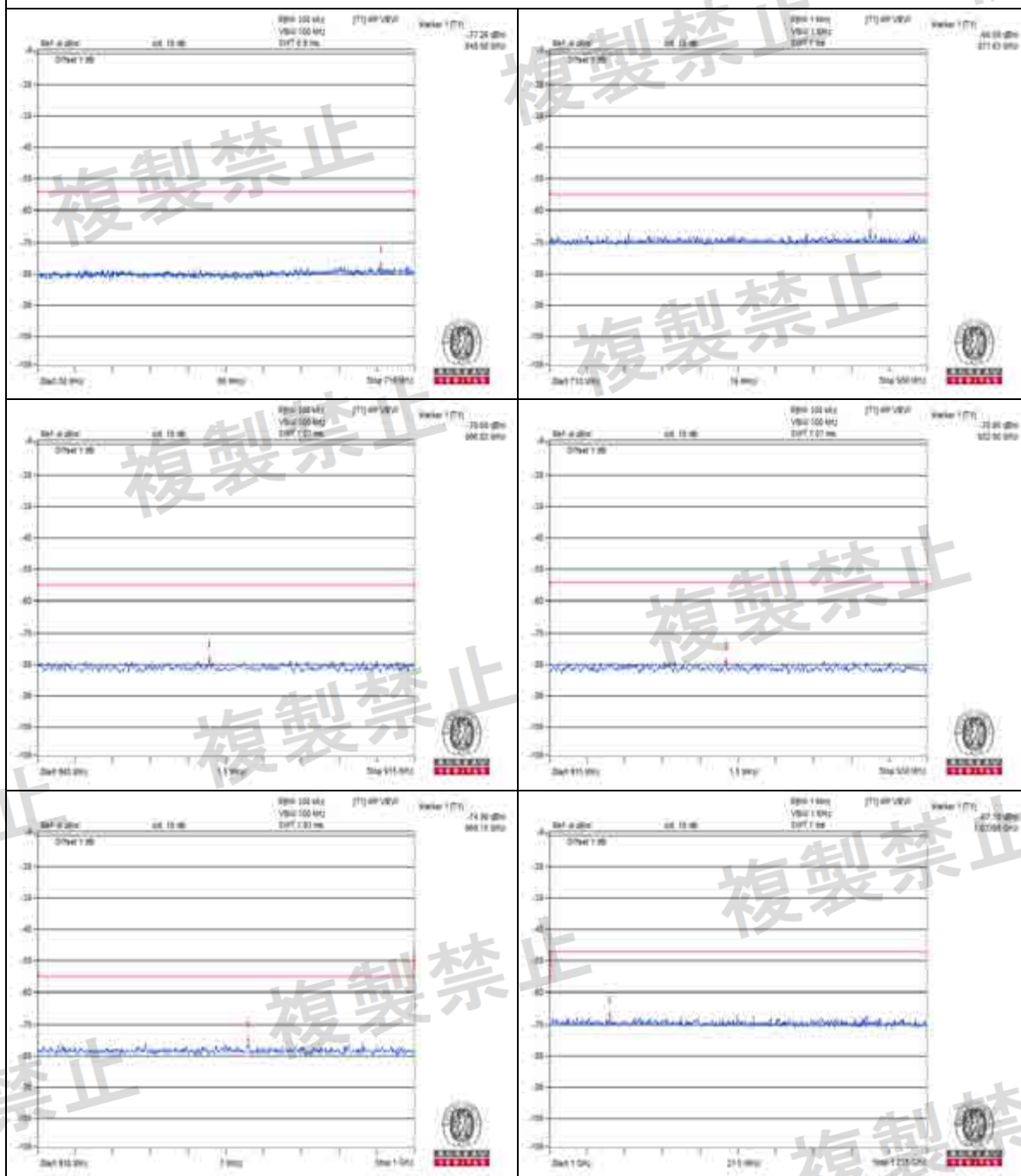
920.8MHz

Vmax.



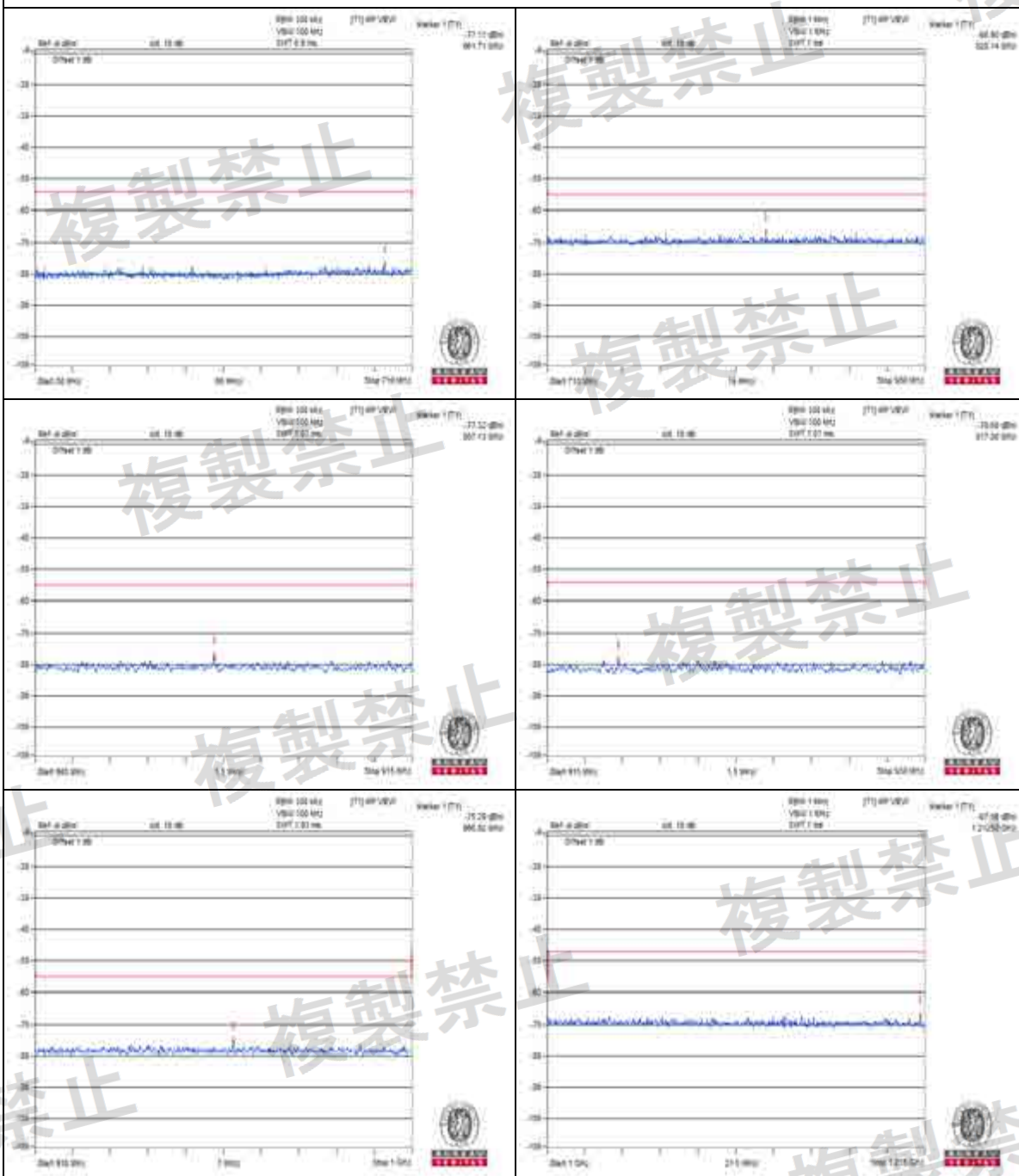
922.0MHz

Vmax.



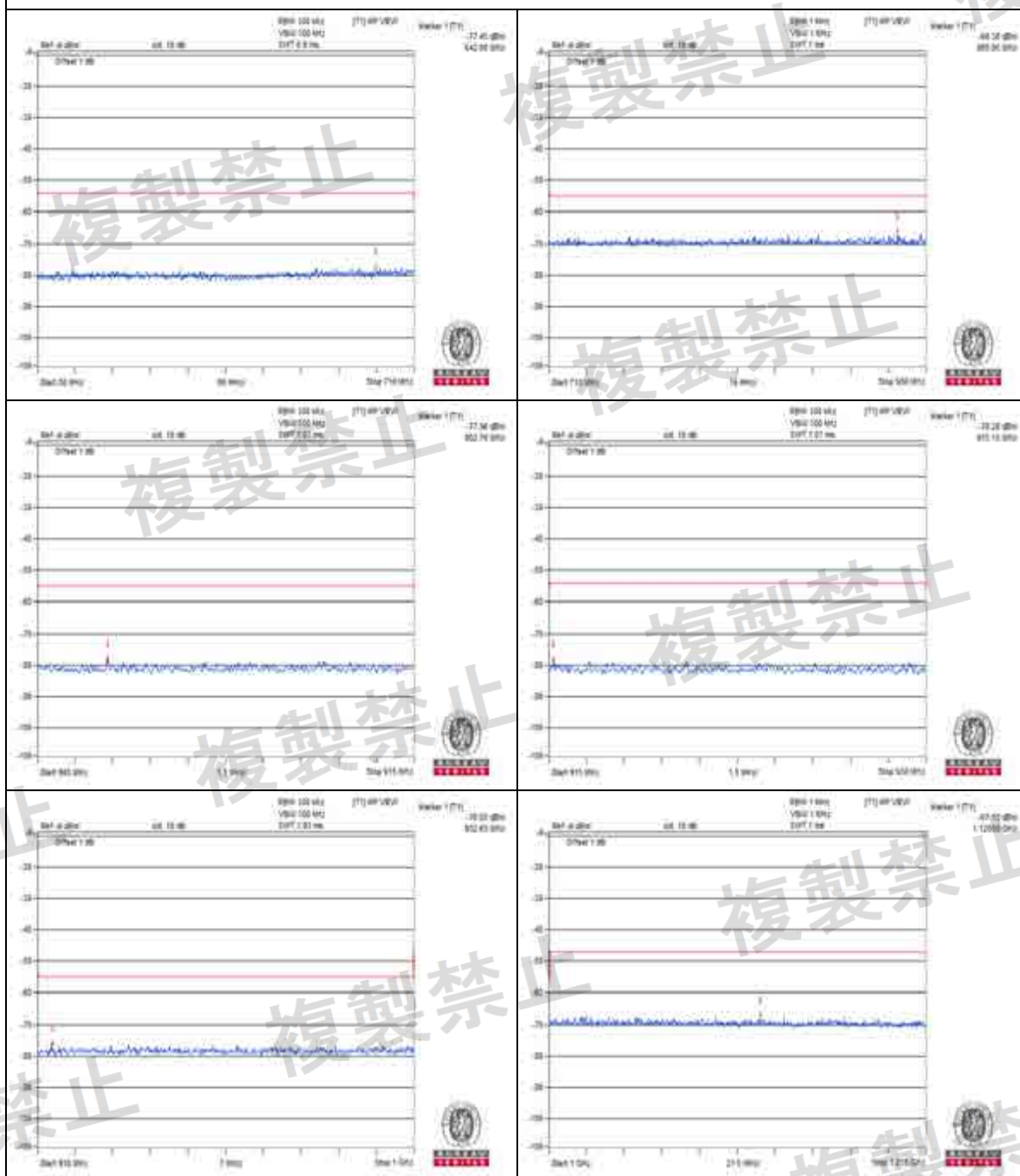
923.2MHz

Vmin.



922.0MHz

V_{min}.



923.2MHz

50 kbps

TEST CHANNEL		920.8MHz		922.0MHz		LIMIT	RESULT
TEST CONDITION	FREQUENCY RANGE	FREQ. (MHz)	MEASURE. VALUE	FREQ. (MHz)	MEASURE. VALUE		
Vnormal	30MHz to 710MHz	288.400	-76.64	161.070	-76.87	-54/100kHz	PASS
	710MHz to 900MHz	811.840	-71.70	824.000	-67.10	-55/MHz	PASS
	900MHz to 915MHz	910.740	-76.80	909.320	-78.28	-55/100kHz	PASS
	915MHz to 930MHz	918.000	-76.78	925.390	-78.69	-54/100kHz	PASS
	930MHz to 1000MHz	958.000	-77.11	972.400	-76.48	-55/100kHz	PASS
	1000MHz to 1215MHz	1046.440	-71.67	1005.920	-66.50	-47/MHz	PASS
Vmax.	30MHz to 710MHz	518.240	-76.43	594.690	-76.69	-54/100kHz	PASS
	710MHz to 900MHz	747.240	-72.02	828.400	-67.27	-55/MHz	PASS
	900MHz to 915MHz	909.990	-76.94	912.320	-78.55	-55/100kHz	PASS
	915MHz to 930MHz	921.360	-77.44	927.300	-78.59	-54/100kHz	PASS
	930MHz to 1000MHz	997.340	-76.10	989.750	-76.25	-55/100kHz	PASS
	1000MHz to 1215MHz	1098.040	-71.07	1204.400	-67.36	-47/MHz	PASS
Vmin.	30MHz to 710MHz	586.240	-75.56	690.280	-76.51	-54/100kHz	PASS
	710MHz to 900MHz	829.700	-71.14	732.850	-67.60	-55/MHz	PASS
	900MHz to 915MHz	907.200	-75.67	907.860	-77.64	-55/100kHz	PASS
	915MHz to 930MHz	921.180	-75.75	919.080	-78.66	-54/100kHz	PASS
	930MHz to 1000MHz	932.240	-76.69	984.880	-75.85	-55/100kHz	PASS
	1000MHz to 1215MHz	1039.990	-71.38	1200.350	-66.90	-47/MHz	PASS

TEST CHANNEL		923.2MHz		LIMIT	RESULT
TEST CONDITION	FREQUENCY RANGE	FREQUENCY (MHz)	MEASURE. VALUE		
Vnormal	30MHz to 710MHz	705.070	-77.20	-54/100kHz	PASS
	710MHz to 900MHz	854.280	-66.44	-55/MHz	PASS
	900MHz to 915MHz	905.430	-78.68	-55/100kHz	PASS
	915MHz to 930MHz	929.560	-78.54	-54/100kHz	PASS
	930MHz to 1000MHz	961.040	-76.13	-55/100kHz	PASS
	1000MHz to 1215MHz	1081.940	-67.27	-47/MHz	PASS
Vmax.	30MHz to 710MHz	687.330	-77.43	-54/100kHz	PASS
	710MHz to 900MHz	764.520	-66.45	-55/MHz	PASS
	900MHz to 915MHz	909.930	-78.49	-55/100kHz	PASS
	915MHz to 930MHz	920.390	-77.16	-54/100kHz	PASS
	930MHz to 1000MHz	965.100	-75.30	-55/100kHz	PASS
	1000MHz to 1215MHz	1105.630	-66.97	-47/MHz	PASS
Vmin.	30MHz to 710MHz	562.170	-77.62	-54/100kHz	PASS
	710MHz to 900MHz	861.720	-67.07	-55/MHz	PASS
	900MHz to 915MHz	913.190	-78.50	-55/100kHz	PASS
	915MHz to 930MHz	924.470	-79.37	-54/100kHz	PASS
	930MHz to 1000MHz	969.560	-76.20	-55/100kHz	PASS
	1000MHz to 1215MHz	1107.500	-67.37	-47/MHz	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



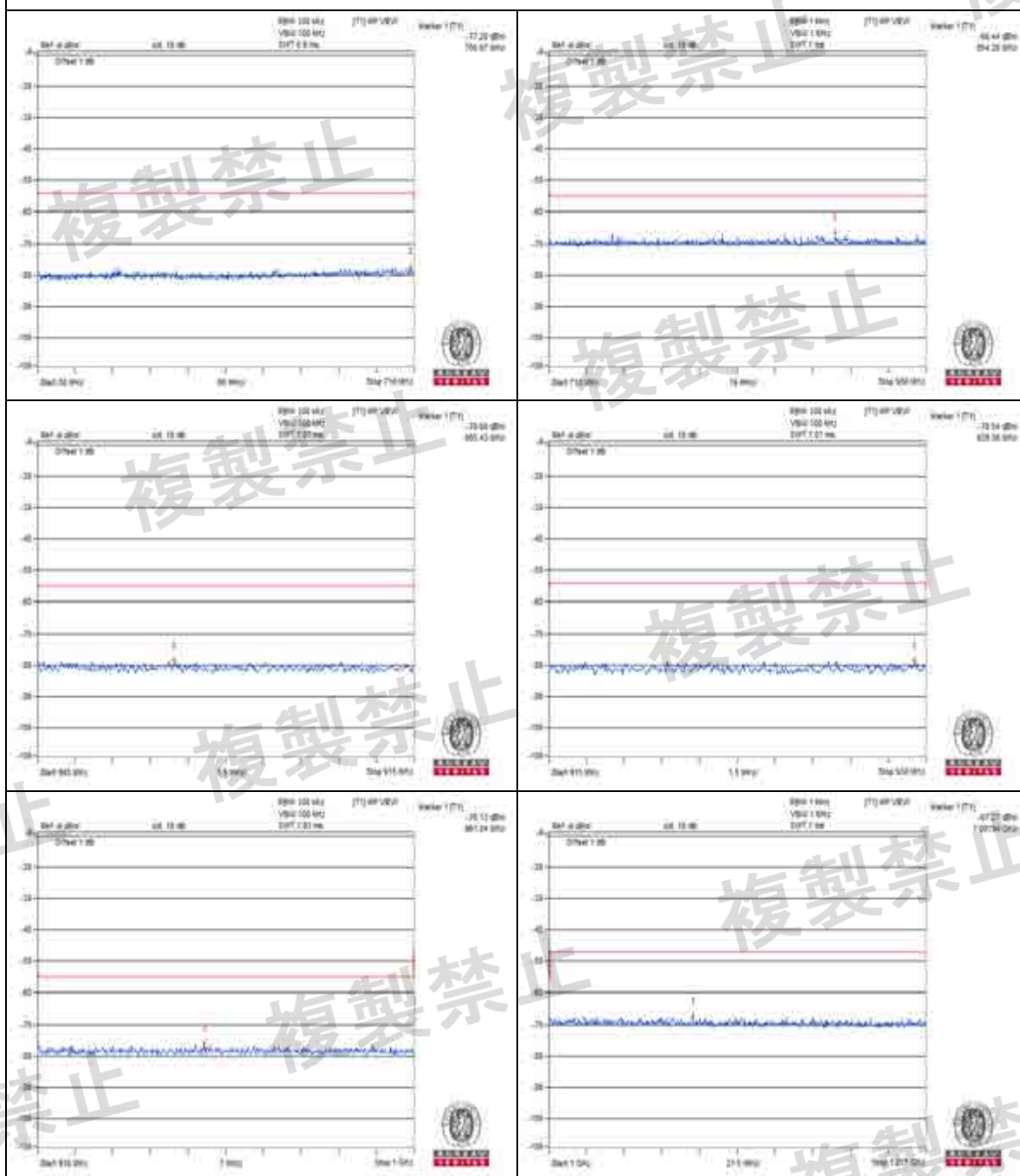
920.8MHz

Vnormal



922.0MHz

Vnormal



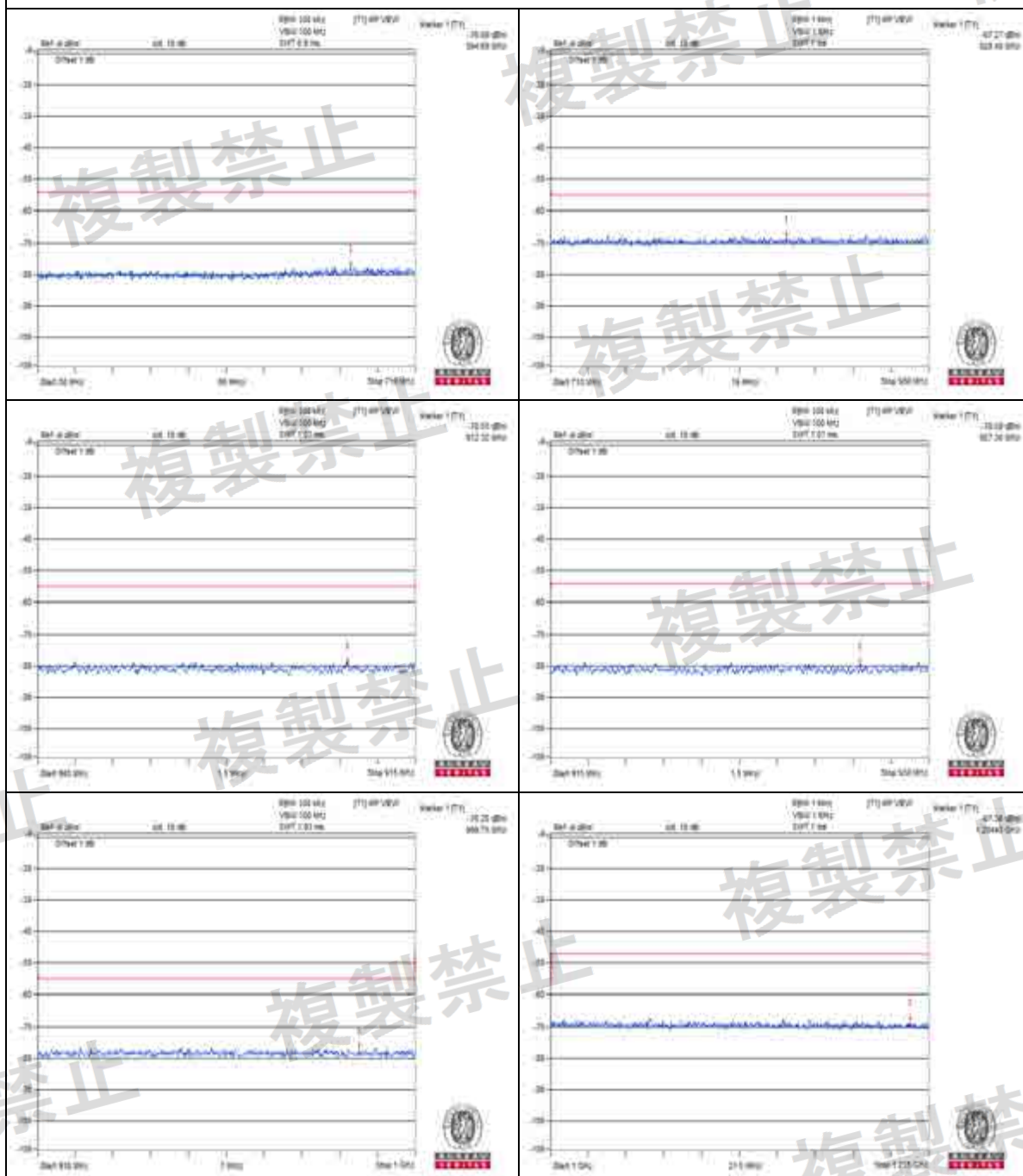
923.2MHz

Vmax.



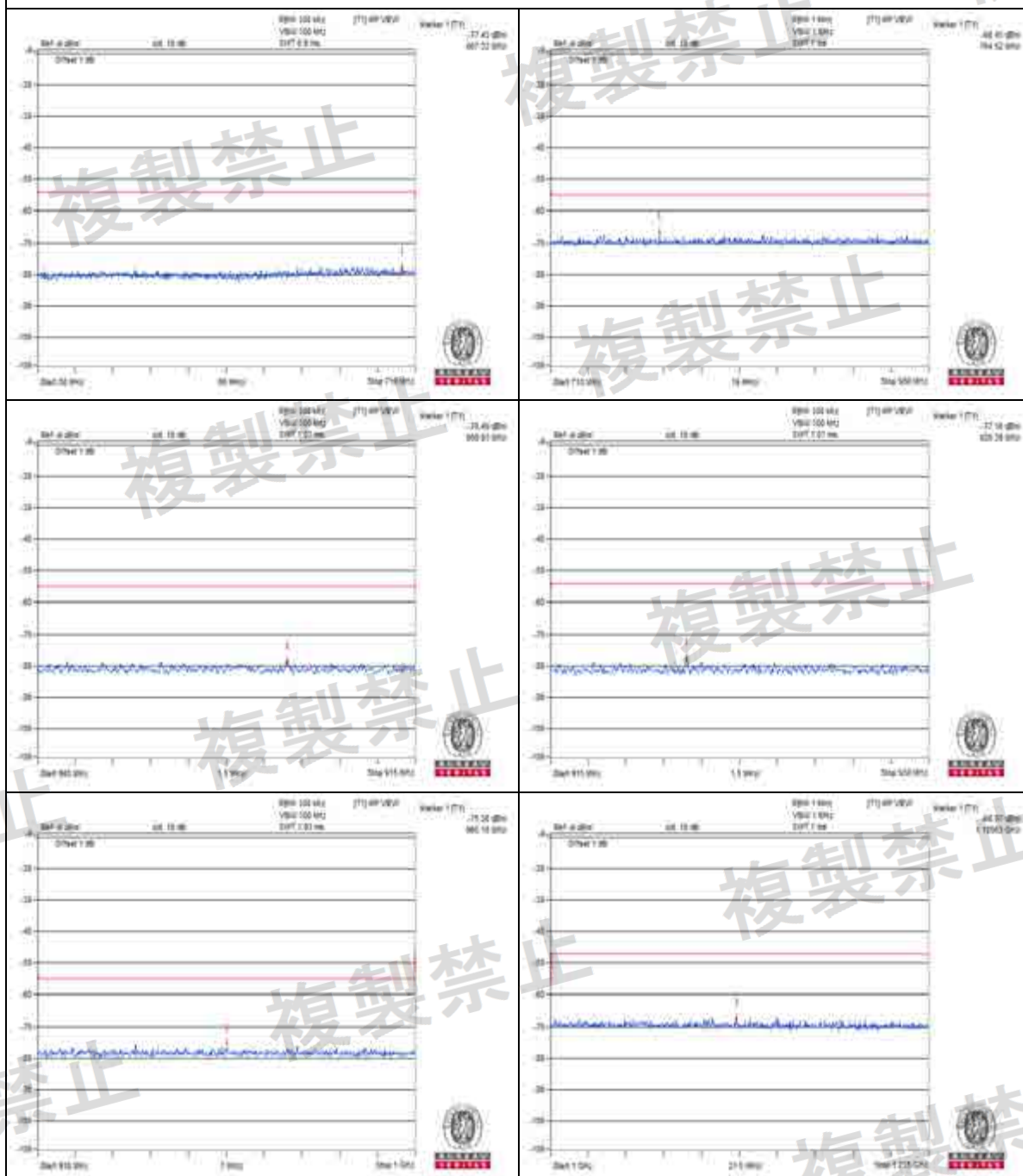
920.8MHz

V_{max}.



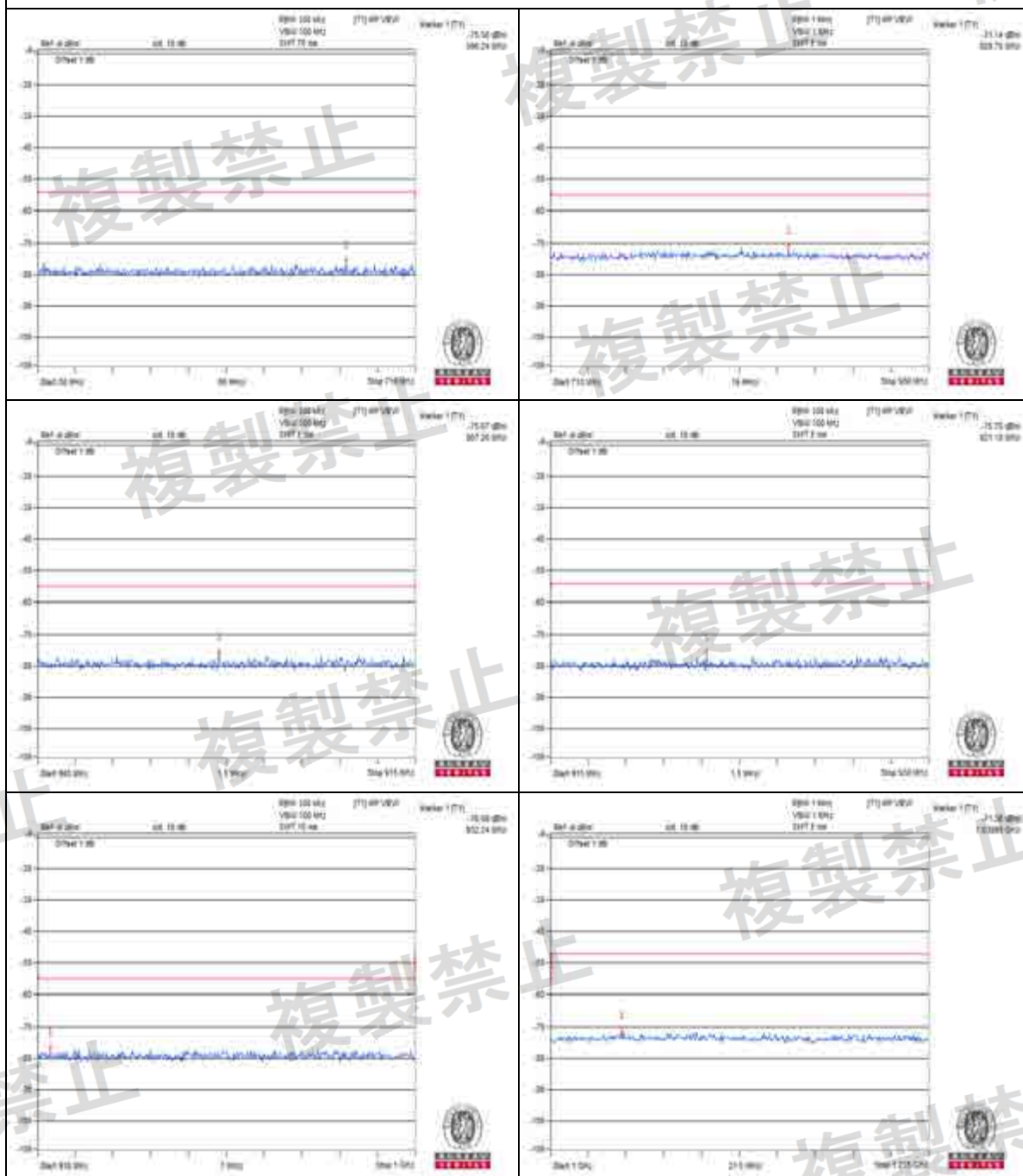
922.0MHz

V_{max}.



923.2MHz

Vmin.



920.8MHz

V_{min}.



922.0MHz

Vmin.



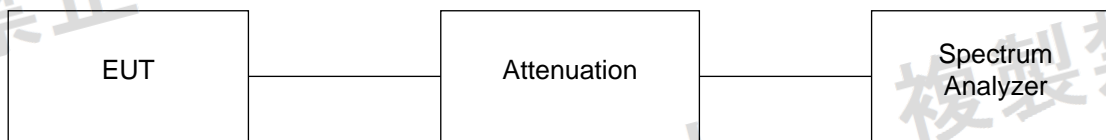
923.2MHz

4.7 Transmission Time Control

4.7.1 Limits of Transmission Time Control

Application	Antenna Power	Applied CH number	Unit CH bandwidth	CH used in a bundle	Sending duration	Pause duration	The sum of emission time per arbitrary one hour
	1mW or less	1-5	200kHz	1~5 ch	100ms or less	100ms	3.6sec or less
		62-77	100kHz	1~5 ch	50ms or less	50ms	None
V	20mW or less	24-38	200kHz	1~5 ch	4s	50ms	None
		33-61	200kHz	1ch	More than 200ms, and 400ms or less	Ten times or more of the former sending time	360sec or less
					More than 6ms, and 200ms or less	2ms	
					6ms or less	None	
				2ch	More than 3ms, and 200ms or less	2ms	
					3ms or less	None	
				3~5ch	More than 2ms, and 100ms or less	2ms	
					2ms or less	None	

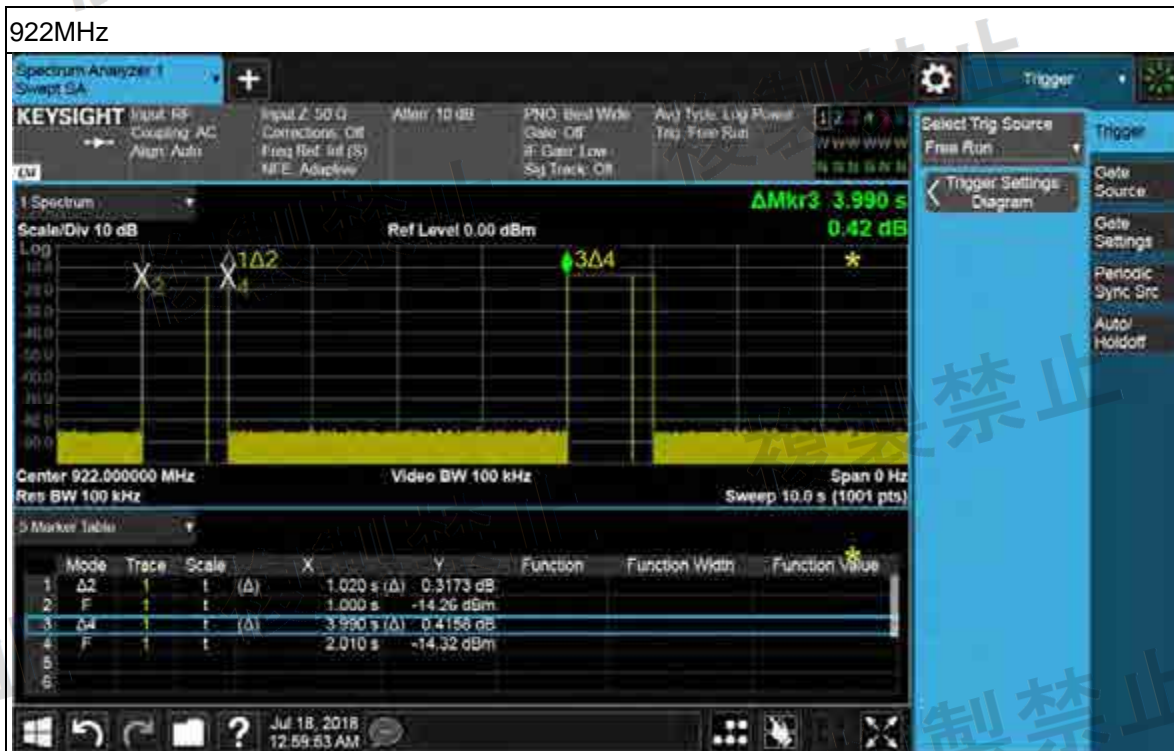
4.7.2 Test Setup



4.7.3 Test Results

625bps

Test Condition	Frequency (MHz)	922 MHz(ms)	Limit (s)		Pass/Fail
Transmission times	On-time (S)	1.02	\leq	4.000	PASS
	Off-time (ms)	3990	\geq	0.050	PASS



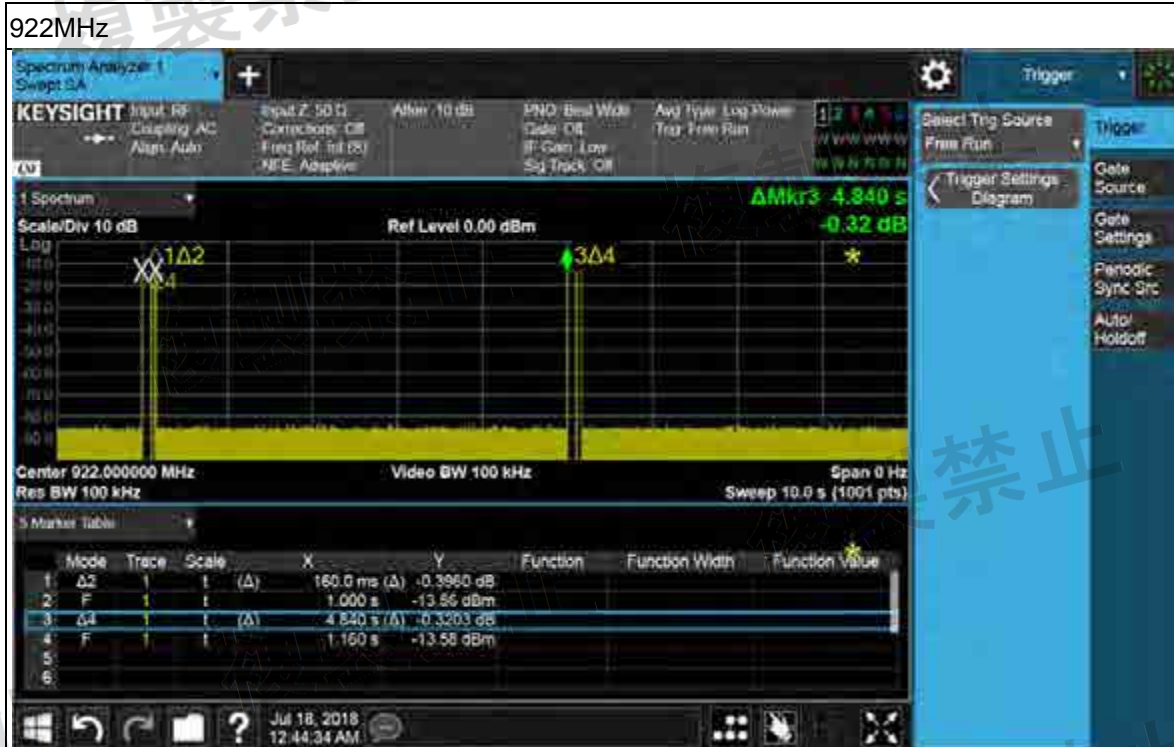
50kbps

Test Condition	Frequency (MHz)	922 MHz(ms)	Limit (s)		Pass/Fail
Transmission times	On-time (S)	0.028	\geq	4.000	PASS
	Off-time (ms)	4984	\geq	0.050	PASS



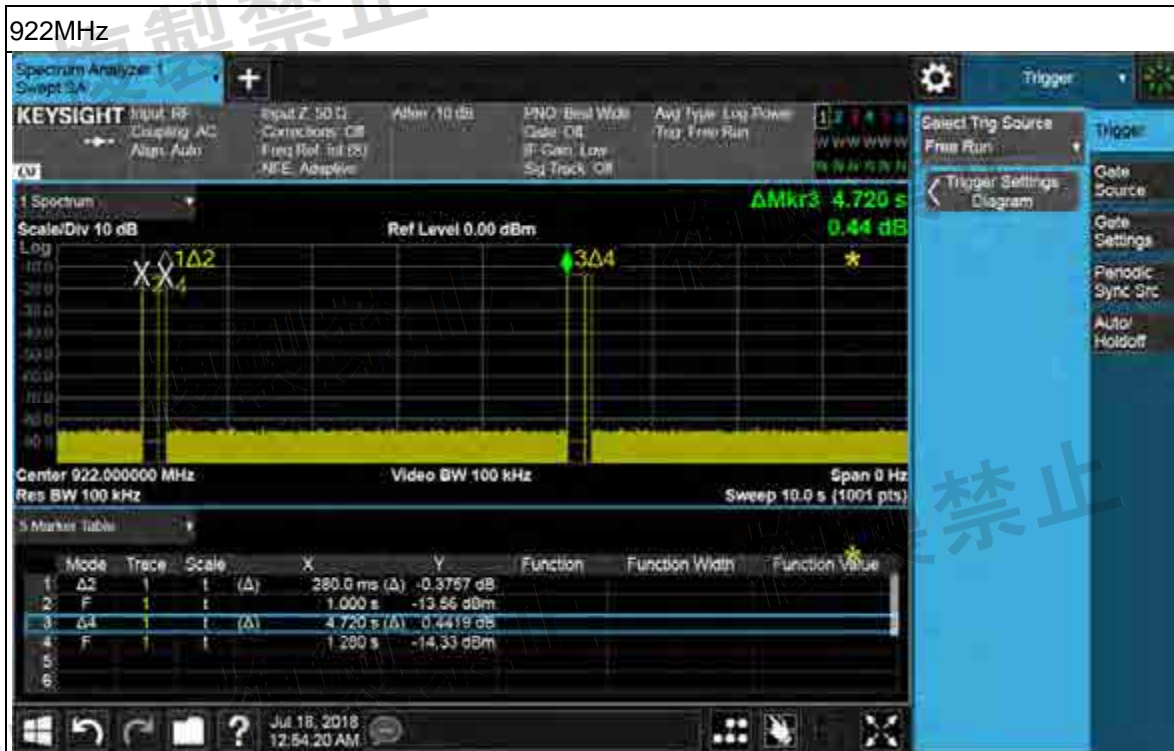
5kbps

Test Condition	Frequency (MHz)	922 MHz(ms)	Limit (s)		Pass/Fail
Transmission times	On-time (S)	0.16	\geq	4.000	PASS
	Off-time (ms)	4840	\geq	0.050	PASS



2.5kbps

Test Condition	Frequency (MHz)	922 MHz(ms)	Limit (s)		Pass/Fail
Transmission times	On-time (S)	0.28	\geq	4.000	PASS
	Off-time (ms)	4720	\geq	0.050	PASS

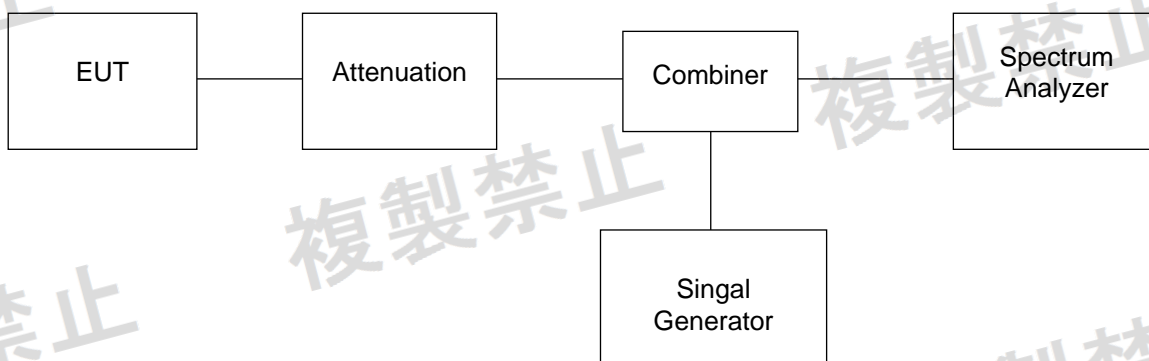


4.8 Carrier Sense

4.8.1 Limits of Carrier Sense

Application	Antenna Power	Applied CH number	Unit CH bandwidth	CH used in a bundle	Carrier sense time
	1mW or less	1-5	200kHz	1~5 ch	None
		62-77	100kHz	1~5 ch	
V	20mW or less	24-38	200kHz	1~5 ch	5ms or more
		33-61	200kHz	1ch	128us or more
				2ch	
				3~5ch	

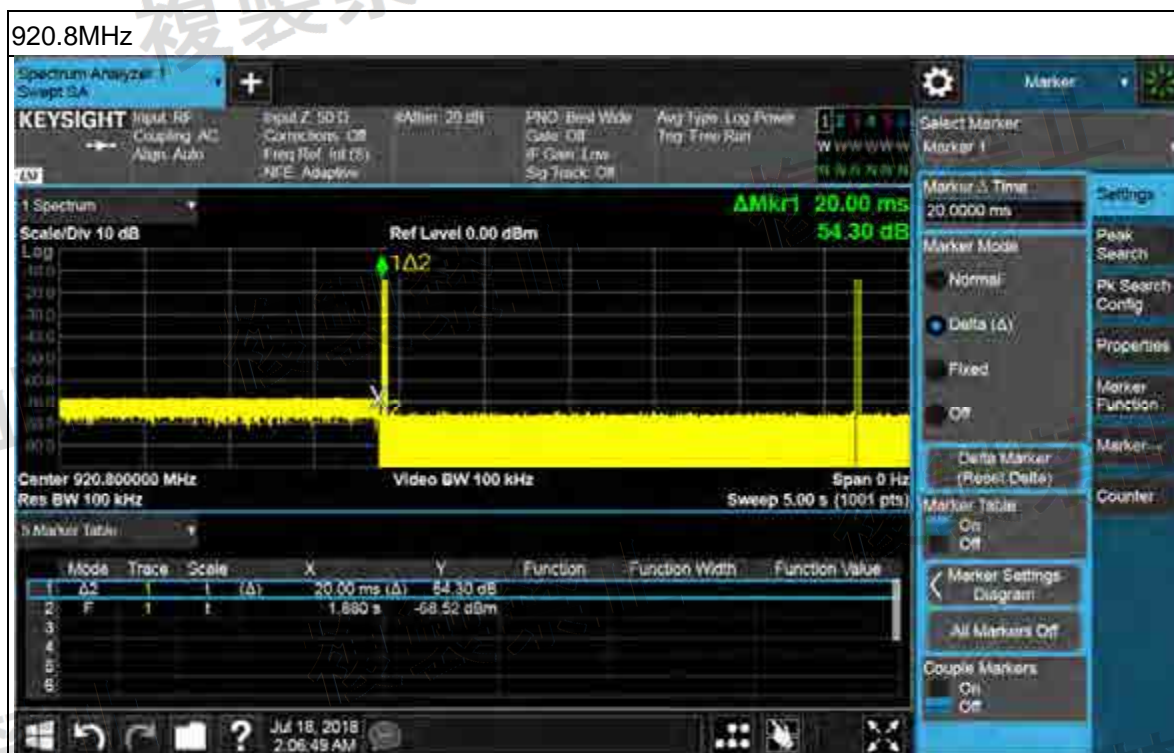
4.8.2 Test Setup



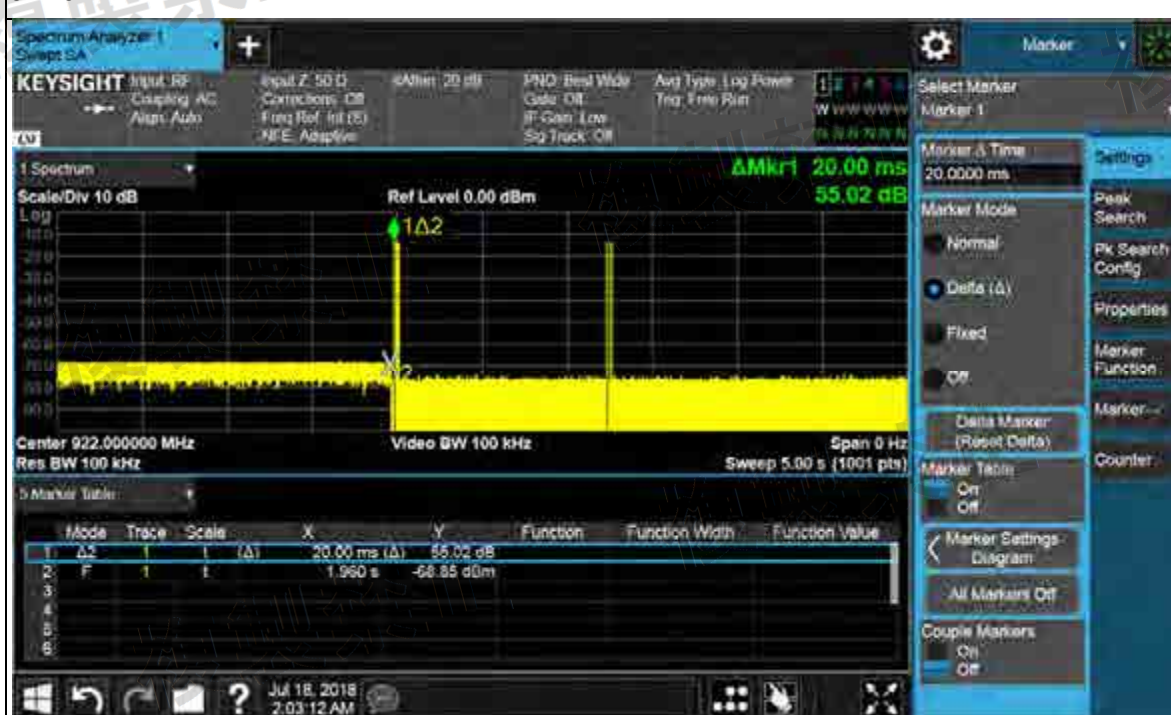
4.8.3 Test Results

50kbps

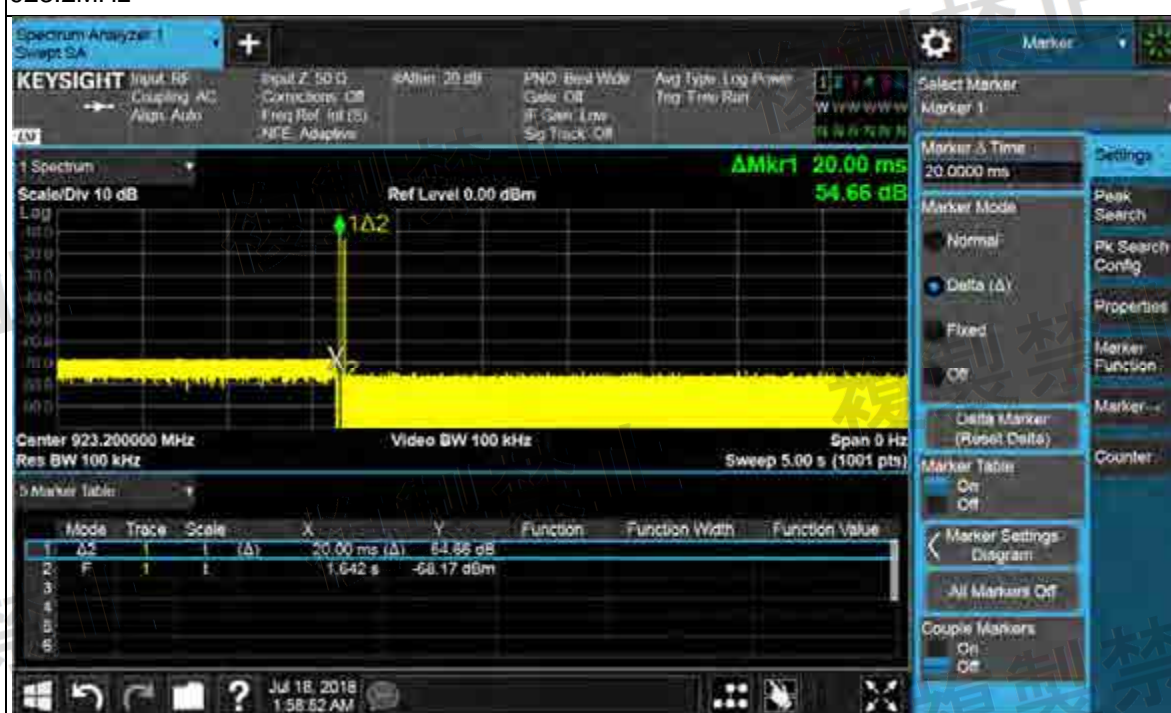
Test Condition	Frequency (MHz)	Test	Limit	Pass/Fail
Transmission Level	920.8	-80	\leq -80dBm	Pass
Judgment time		40	\geq 5ms	Pass
Transmission Level	922.0	-80	\leq -80dBm	Pass
Judgment time		40	\geq 5ms	Pass
Transmission Level	923.2	-80	\leq -80dBm	Pass
Judgment time		40	\geq 5ms	Pass



922.0MHz

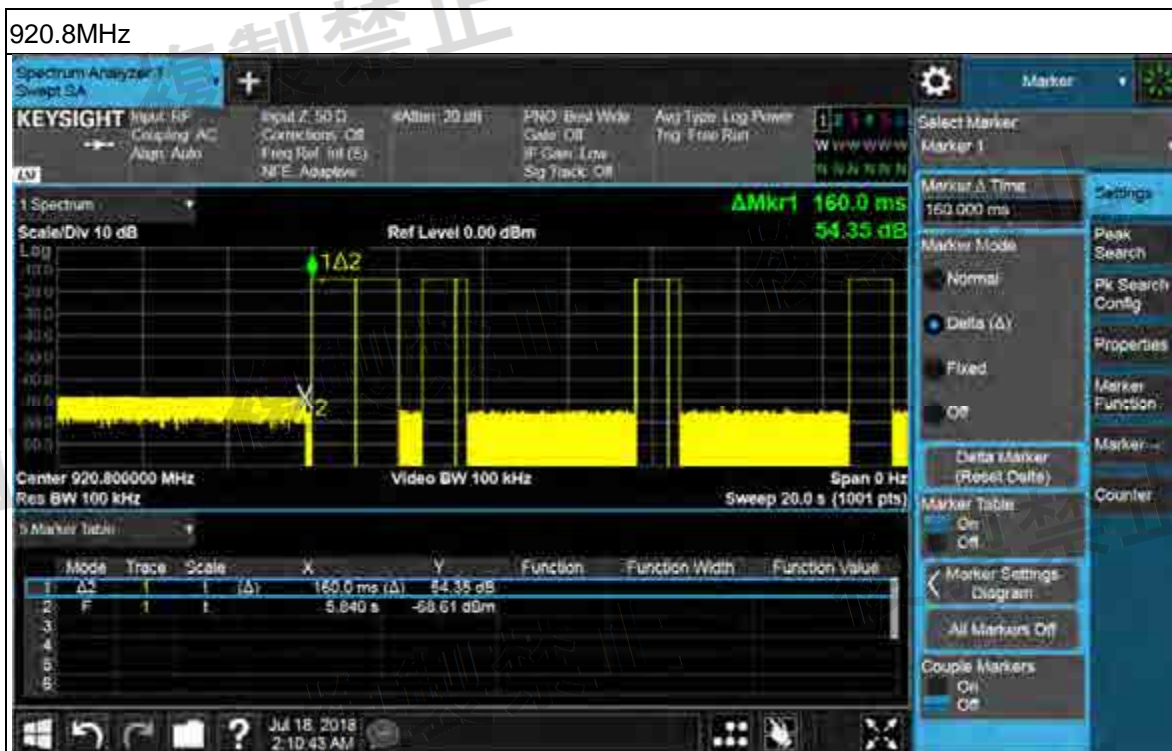


923.2MHz



625bps

Test Condition	Frequency (MHz)	Test	Limit		Pass/Fail
Transmission Level	920.8	-80	\leq	-80dBm	Pass
Judgment time		160	\geq	5ms	Pass
Transmission Level	922.0	-80	\leq	-80dBm	Pass
Judgment time		2220	\geq	5ms	Pass
Transmission Level	923.2	-80	\leq	-80dBm	Pass
Judgment time		1840	\geq	5ms	Pass



922.0MHz



923.2MHz

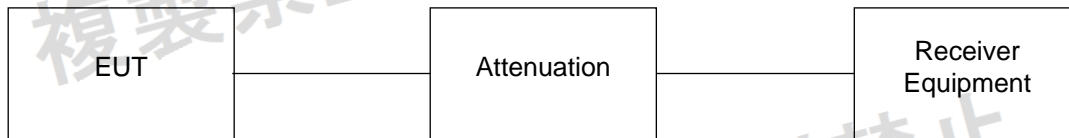


4.9 Interference Prevention Function

4.9.1 Limits of Interference Prevention Function

The radio equipment shall automatically transmit/receive identification codes.

4.9.2 Test Setup



4.9.3 Test Results

Environmental Conditions	24 deg.C, 70% RH
Link Mode	Test Result
Normal	Pass

5 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 FCC recognized accredited test firms and 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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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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