

2.4GHz Wideband Low Power Data Communication System Test Report

Product Name	Wireless speaker
Model No.	Codi

Applicant	Dynaudio A/S
Address	Sverigesvej 15, 8660 Skanderborg, Denmark

Date of Receipt	Nov. 20, 2020
Issued Date	May 03, 2021
Report No.	20B0726R-E3032140409
Report Version	V1.0



The test results relate only to the samples tested.

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

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Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

Test Report

Issued Date: May 03, 2021

Report No.: 20B0726R-E3032140409



Product Name	Wireless speaker
Applicant	Dynaudio A/S
Address	Sverigesvej 15, 8660 Skanderborg, Denmark
Manufacturer	Dynaudio A/S
Model No.	Codi
EUT Rated Voltage	AC 100-240V, 50-60Hz
EUT Test Voltage	AC 100V / 60Hz
Trade Name	DYNAUDIO
Measurement Standard	Public notice of MIC No.88 test method of specified radio equipment (January 26, 2004) Annex43. Article 2 paragraph 1 item 19
Test Result	Complied

Documented By :

Ida Tung

(Project Specialist / Ida Tung)

Tested By :

Bill Lin

(Senior Engineer / Bill Lin)

Approved By :

Jack Hsu

(Senior Engineer / Jack Hsu)

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Revision History

Report No.	Version	Description	Issued Date
20B0726R-E3032140409	V1.0	Initial issue of report.	May 03, 2021

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Wireless speaker
Trade Name	DYNAUDIO
Model No.	Codi
SERIAL NUMBER	50:1E:2D:3E:2F:7D
Frequency Range	802.11b/g/n20: 2412-2472MHz
Number of Channels	802.11b/g/n20: 13CH
Data Rate	802.11b: 1-11Mbps, 802.11g: 6-54Mbps, 802.11n: up to 72.2Mbps
Type of Modulation	802.11b: DSSS (DBPSK, DQPSK, CCK) 802.11g/n: OFDM (BPSK, QPSK, 16QAM, 64QAM)
Antenna Type	PIFA Antenna
Antenna Gain	Refer to the table "Antenna List"
Channel Control	Auto
Declared Output Power	802.11b: 1.934 mW/MHz 802.11g: 0.640 mW/MHz 802.11n20: 0.547 mW/MHz
Contain Module	Stream / Stream1832 (M/N: Codi Primary) Summit / SWM908SD (M/N: Codi Primary) Summit / SWS997SD (M/N: Codi Client)

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	WoodStone	WIA2416ILMS200317	PIFA Antenna	3.1dBi for 2.4 GHz

802.11b/g/n-20 Center Frequency of Each Channel (WLAN):

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 01:	2412 MHz	Channel 02:	2417 MHz	Channel 03:	2422 MHz	Channel 04:	2427 MHz
Channel 05:	2432 MHz	Channel 06:	2437 MHz	Channel 07:	2442 MHz	Channel 08:	2447 MHz
Channel 09:	2452 MHz	Channel 10:	2457 MHz	Channel 11:	2462 MHz	Channel 12:	2467 MHz
Channel 13:	2472 MHz						

Note:

1. The EUT is a Wireless speaker with a built-in 2.4 GHz and 5 GHz WLAN and Bluetooth V5.0, V3.0, V2.1+EDR and WISA transceiver, this report for 2.4 GHz WLAN.
2. The test data in this report is Stream / Stream1832 (M/N: Codi Primary).
3. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
4. Lowest and highest data rates are tested in each mode. Only worst case is shown in the report. (802.11b is 1Mbps、802.11g is 6Mbps and 802.11n(20M-BW) is 7.2Mbps).

Test Mode	Mode 1: Transmit (802.11b 1Mbps)
	Mode 2: Transmit (802.11g 6Mbps)
	Mode 3: Transmit (802.11n20 7.2Mbps)
	Mode 4: Receive (802.11b 1Mbps)
	Mode 5: Receive (802.11g 6Mbps)
	Mode 6: Receive (802.11n20 7.2Mbps)

1.2. EUT Exercise Software

- (1) Execute software “Dut labtool V1.0.0.146” on the EUT.
- (2) Configure the test mode, the test channel, and the data rate.
- (3) Press “OK” to start the continuous Transmit.
- (4) Verify that the EUT works properly.

1.3. Parament of test software setting

The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Test Software	Dut labtool V1.0.0.146		
Frequency	2412MHz	2442MHz	2472MHz
IEEE 802.11b	13	14	14
IEEE 802.11g	9	10	10
IEEE 802.11n-20	9	9	10

1.4. Test Conditions

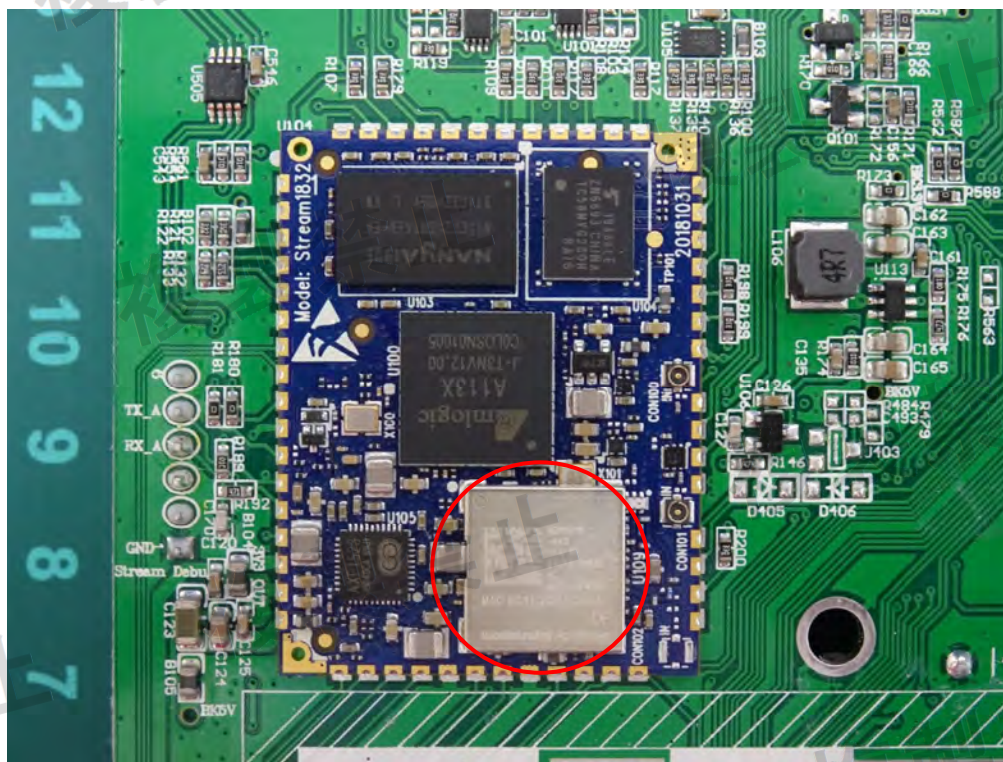
Voltage Test Item	Test Voltage	Voltage meter reading value (RF Chip pin17)
Nominal Voltage	AC 110V	5.04V DC
Highest Voltage	AC 121V	5.03V DC
Lowest Voltage	AC 99V	5.01V DC

Note: 1. The Voltage supply for RF Chip pin17 is 5.03 VDC.

2. The internal supply gives a fluctuation value less than 1 % (**Around 0.60% from max. to min.**)

1.5. RF and IF section must be tamper requirement

Requirement	Comments	Result
RF, IF and Modulation section must be tamper	☐ Use Special Screw ☐ Metal Shielding is Soldered (Please see Attachment: EUT Detailed Photographs) ☐ Use Ball Grid Array (BGA)	--
	☐ RF module/Chip pin >10 ☒ RF module/Chip pins distance <1.5mm (Please see mechanism photograph)	Complete



1.6. Test Facility

Ambient conditions in the laboratory:

Performed Item	Items	Required	Actual
Conductive	Temperature (°C)	15~35 °C	25.0 °C
	Humidity (%RH)	20~75 %	55.0 %

Site Description : Accredited by TAF
Accredited Number: 3023

Test Laboratory : DEKRA Testing and Certification Co., Ltd
Address : No. 26, Huaya 1st Rd., Guishan Dist.,
Taoyuan City 333411, Taiwan, R.O.C.

Phone number : +886-3-275-7255
Fax number : +866-3-327-5505
Email address : info.tw@dekra.com
Website : <http://www.dekra.com.tw>

1.7. List of Test Equipment

For Conducted measurements /SH2

	Equipment	Manufacturer	Model No.	Serial No.	Calibrated	Cal. Method	Cal. Date	Due. Date
X	Spectrum Analyzer	R&S	FSV40	101149	ETC	*(c)	2021.02.04	2022.02.03
X	Peak Power Analyzer	Keysight	8990B	MY51000539	ETC	*(c)	2021.06.07	2022.06.06
X	Wideband Power Sensor	Keysight	N1923A	MY59240002	ETC	*(c)	2021.05.17	2022.05.16
X	Wideband Power Sensor	Keysight	N1923A	MY59240003	ETC	*(c)	2021.05.17	2022.05.16
X	Signal Generator	R&S	SMB100A	110724	ETC	*(c)	2021.04.07	2022.04.06
X	Signal Generator	R&S	SMBV100A	261757	ETC	*(c)	2020.12.23	2021.12.22
X	4-WAY Power Divider	Woken	0120A04056002D	DSU893W3S3	ETC	*(c)	2020.11.23	2021.11.22

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : DEKRA Conduction Test System V9.0.5
4.
 - a) Calibration conducted by the National Institute of Information and Communications Technology(NICT) (hereinafter referred to as "NICT") or a designated calibration agency under Article 102-18 paragraph (1)
 - b) Correction conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Law (Law No. 51 of 1992)
 - c) Calibration conducted in foreign countries, which shall be equivalent to the calibration conducted by the NICT or a designated agency under Article 102-18 paragraph (1).
 - d) Calibration conducted by using measuring instruments and other equipment listed in the right column of Table No. 3 attached hereto, which shall have been given any of calibration, etc. listed above from a) to c).

1.8. Uncertainty

Uncertainties have been calculated according to the DEKRA internal document, and is described in each test chapter of this report.

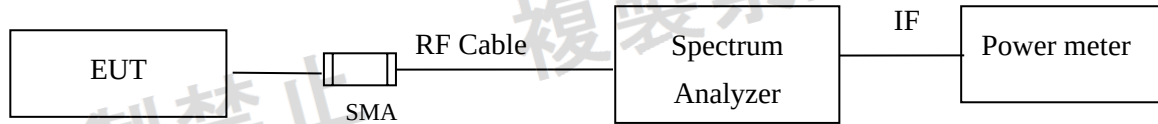
The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%.

Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

Test item	Uncertainty	
Output Power and Output Power Tolerance	Power Meter ± 0.91 dB	Spectrum Analyzer ± 2.53 dB
Spread Bandwidth and Spread Factor	± 682.83 Hz	
Occupied Bandwidth	± 682.83 Hz	
Frequency Tolerance	± 682.83 Hz	
Transmitter Spurious Emissions	± 2.53 dB	
Receiver Spurious Emissions	± 2.53 dB	
Carrier Sensing	± 2.31 ms	

2. Output Power and Output Power Tolerance

2.1. Test Setup



2.2. Limits

Channel Power of 802.11b/g $\leq 10\text{dBm/MHz}$

Channel Power of 802.11n 20MBW $\leq 10\text{dBm/MHz}$

Channel power of 802.11n 40MBW $\leq 6.98\text{dBm/MHz}$

Output Power Tolerance: +20% to -80%

2.3. Test Procedure

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

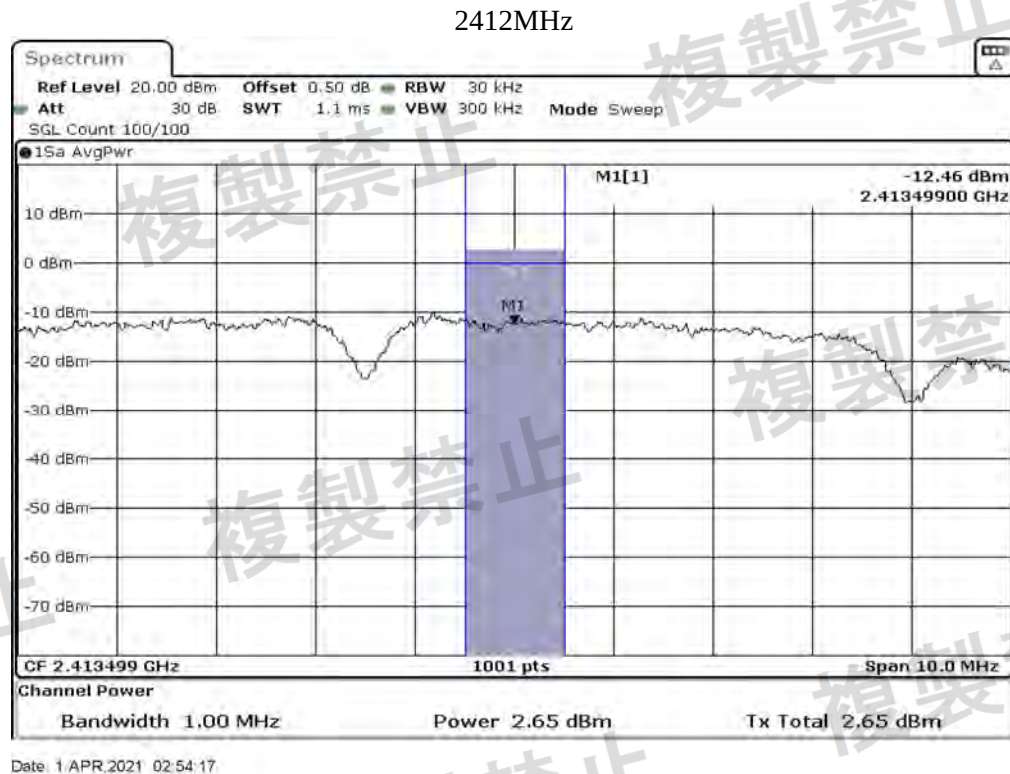
- A sample detector function must be used.
- A measurement instrument with an integrated 1MHz power bandwidth function may be used to automate the test process.
- Connect the power meter to the IF output of the spectrum analyzer.
- Set zero span of spectrum analyzer and 'Maximum Hold' than test result will show in power meter.

2.4. Test Result of Output Power and Output Power Tolerance

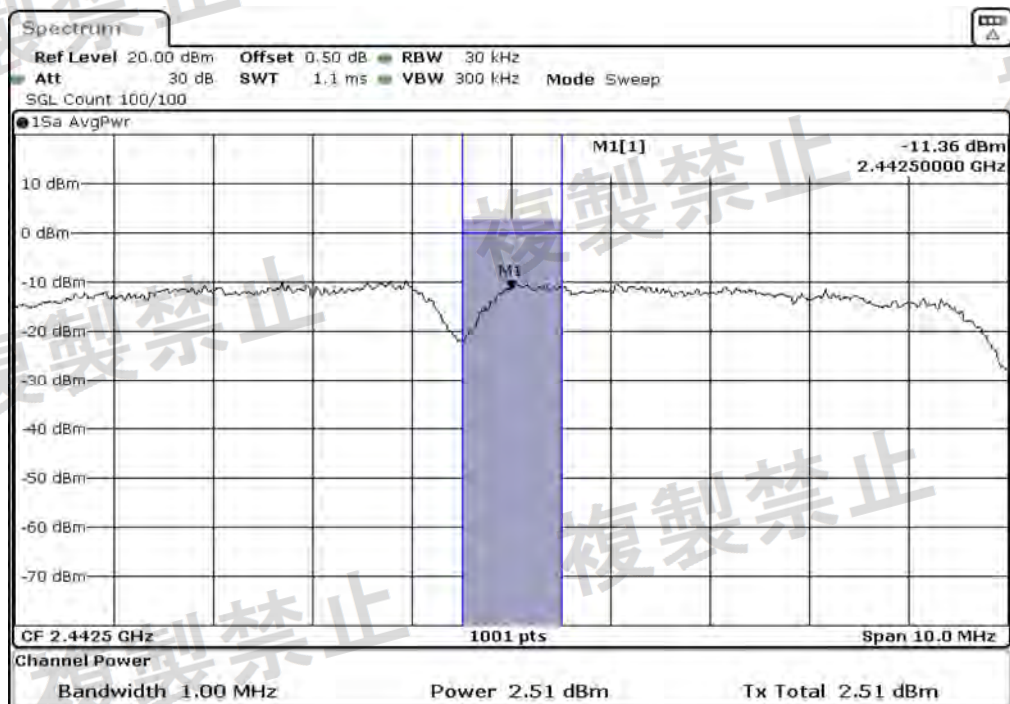
Product : Wireless speaker
 Test Item : Output Power
 Test Date : 2021/04/08
 Test Mode : Mode 1: Transmit (802.11b 1Mbps)

Maximum Antenna Gain= 3.1dBi				
Frequency (MHz)	Real Value (dBm/MHz)	Limit (dBm/MHz)	Real Value (EIRP) (dBm/MHz)	Limit (EIRP) (dBm/MHz)
2412	2.65	10	5.75	12.14
2442	2.51	10	5.61	12.14
2472	2.55	10	5.65	12.14

Real Value (EIRP) = Real Value + Antenna Gain

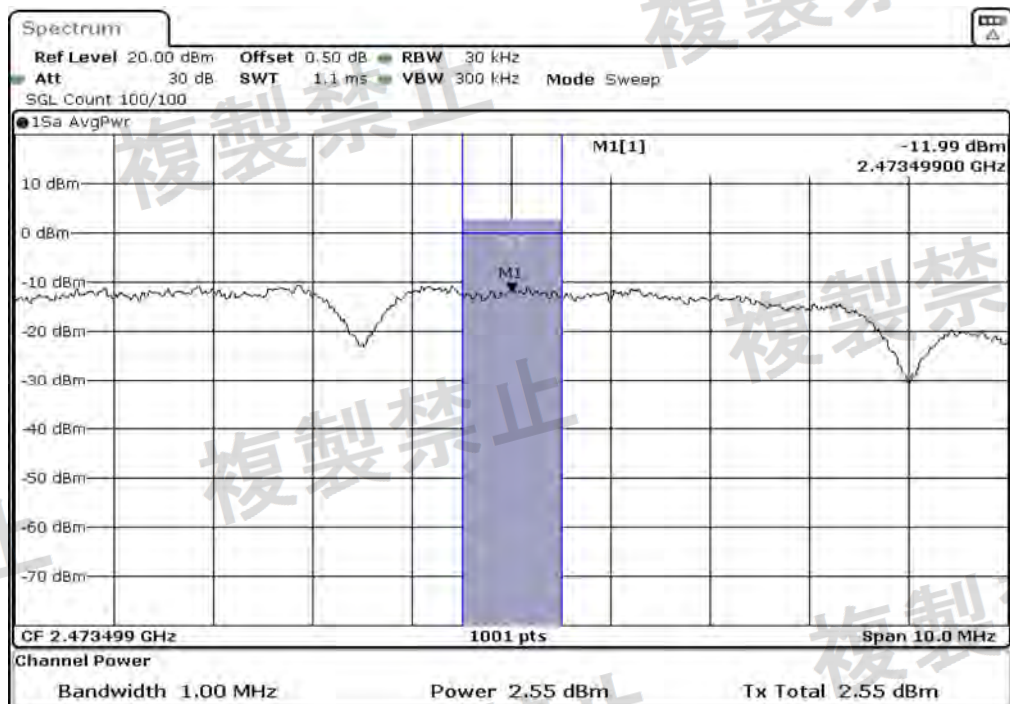


2442MHz



Date: 1 APR.2021 03:07:39

2472MHz

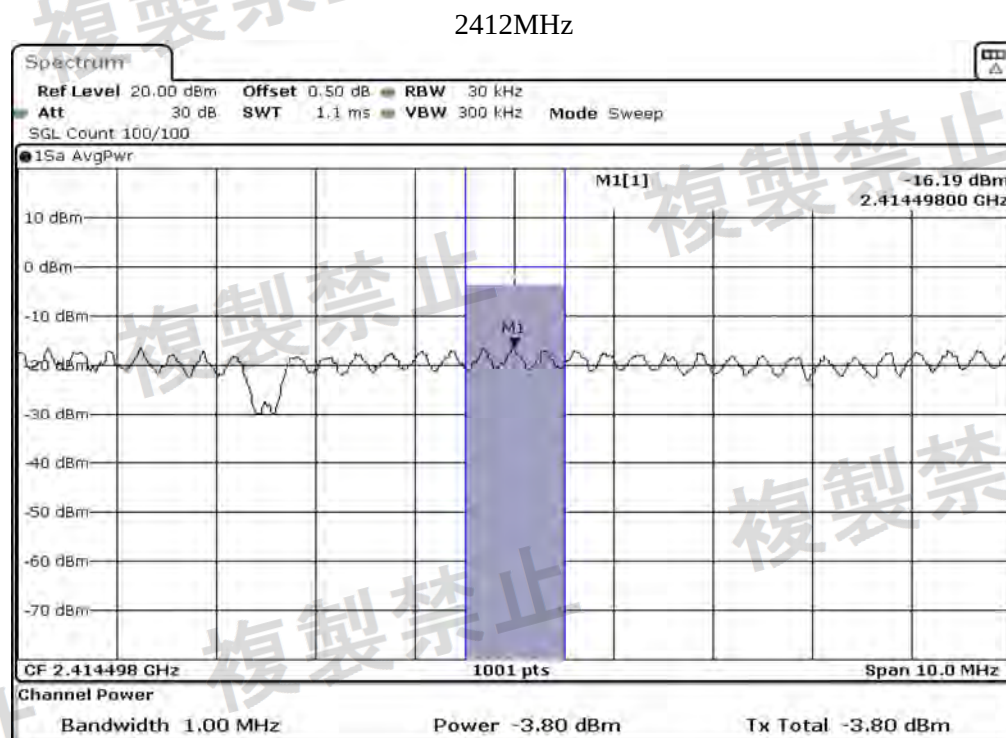


Date: 1 APR.2021 03:16:45

Product : Wireless speaker
 Test Item : Output Power
 Test Date : 2021/04/08
 Test Mode : Mode 2: Transmit (802.11g 6Mbps)

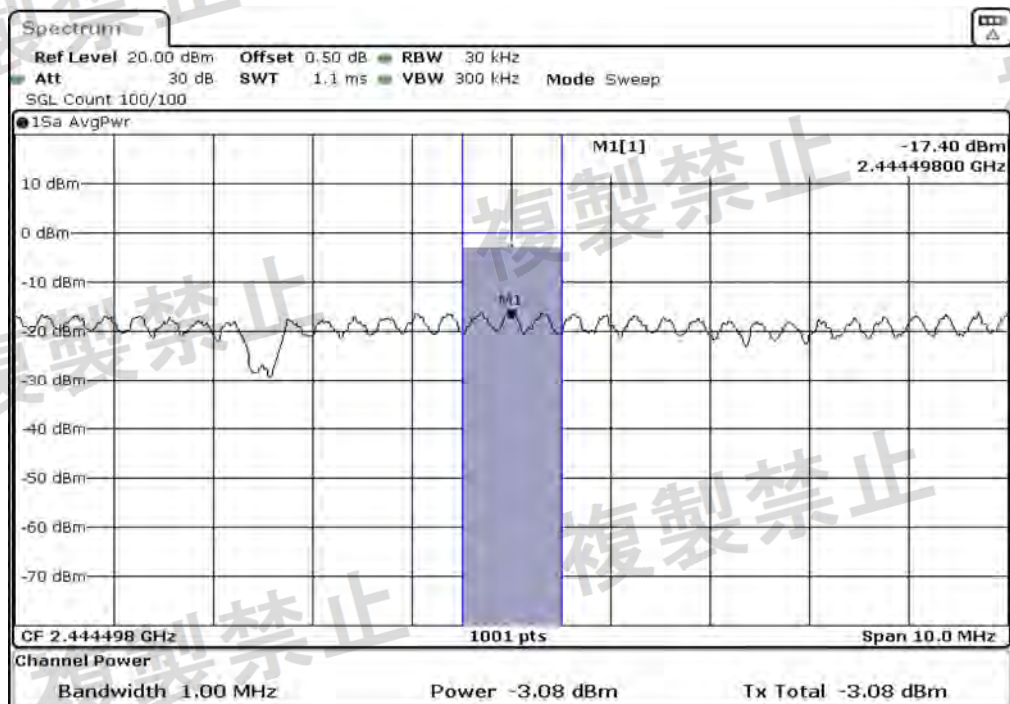
Maximum Antenna Gain= 3.1dBi				
Frequency (MHz)	Real Value (dBm/MHz)	Limit (dBm/MHz)	Real Value(EIRP) (dBm/MHz)	Limit (EIRP) (dBm/MHz)
2412	-3.80	10	-0.70	12.14
2442	-3.08	10	0.02	12.14
2472	-3.94	10	-0.84	12.14

Real Value (EIRP) = Real Value + Antenna Gain



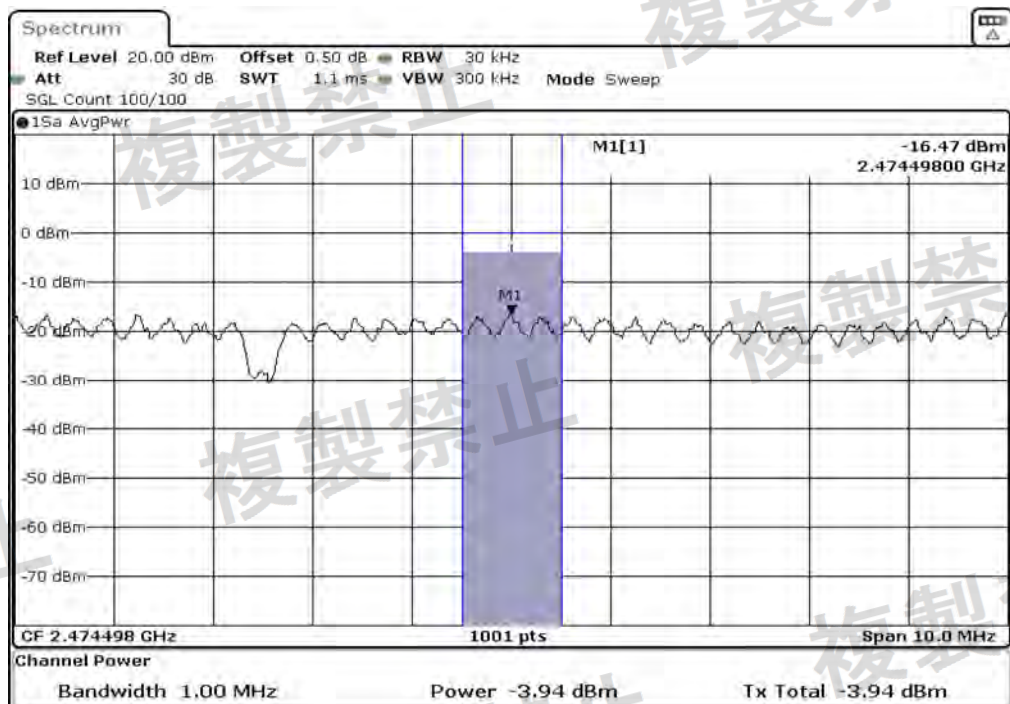
Date: 1 APR 2021 03:22:30

2442MHz



Date: 1 APR 2021 03:36:44

2472MHz

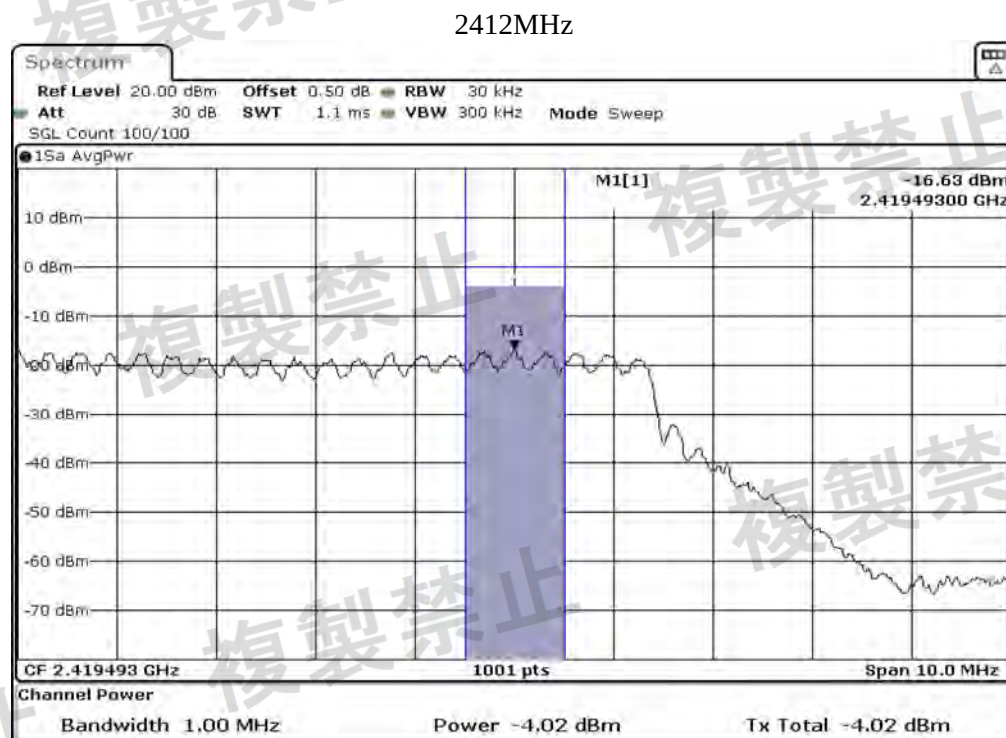


Date: 1 APR 2021 05:13:10

Product : Wireless speaker
 Test Item : Output Power
 Test Date : 2021/04/08
 Test Mode : Mode 3: Transmit (802.11n20 7.2Mbps)

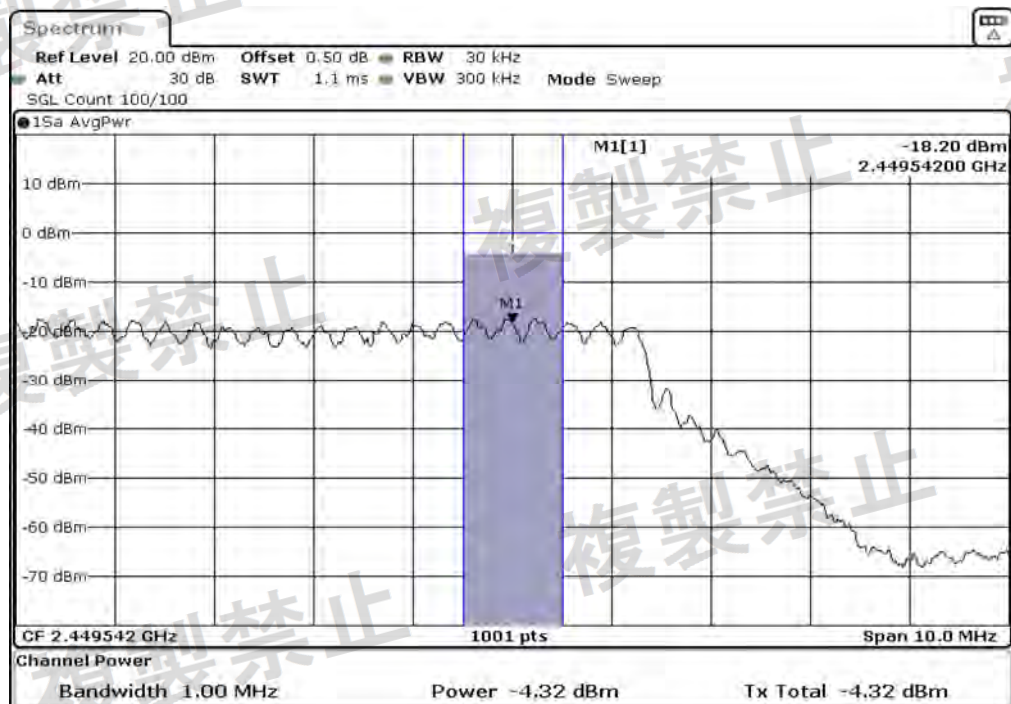
Maximum Antenna Gain= 3.1dBi				
Frequency (MHz)	Real Value (dBm/MHz)	Limit (dBm/MHz)	Real Value(EIRP) (dBm/MHz)	Limit (EIRP) (dBm/MHz)
2412	-4.02	10	-0.92	12.14
2442	-4.32	10	-1.22	12.14
2472	-4.02	10	-0.92	12.14

Real Value (EIRP) = Real Value + Antenna Gain



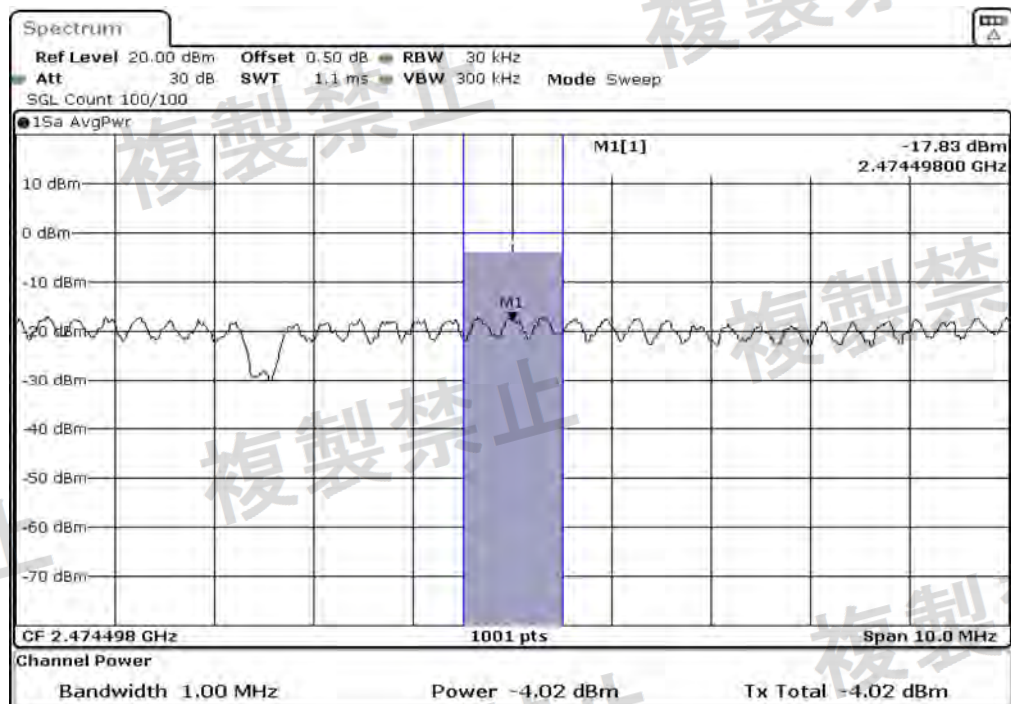
Date: 1 APR 2021 05:37:47

2442MHz



Date: 1 APR.2021 05:45:57

2472MHz



Date: 1 APR.2021 05:51:45

Product : Wireless speaker
Test Item : Output Power Tolerance
Test Date : 2021/04/08
Test Mode : Mode 1: Transmit (802.11b 1Mbps)

Frequency (MHz)	Declared Output Power (mW/MHz)	Output Power (mW/MHz)	Tolerance (%)	Limit (dBm/MHz)
2412	1.934	1.841	-4.83	+20% to -80%
2442	1.934	1.782	-7.84	+20% to -80%
2472	1.934	1.799	-6.99	+20% to -80%

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

Product : Wireless speaker
Test Item : Output Power Tolerance
Test Date : 2021/04/08
Test Mode : Mode 2: Transmit (802.11g 6Mbps)

Frequency (MHz)	Declared Output Power (mW/MHz)	Output Power (mW/MHz)	Tolerance (%)	Limit (dBm/MHz)
2412	0.640	0.417	-34.84	+20% to -80%
2442	0.640	0.492	-23.09	+20% to -80%
2472	0.640	0.404	-36.91	+20% to -80%

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

Product : Wireless speaker
Test Item : Output Power Tolerance
Test Date : 2021/04/08
Test Mode : Mode 3: Transmit (802.11n20 7.2Mbps)

Frequency (MHz)	Declared Output Power (mW/MHz)	Output Power (mW/MHz)	Tolerance (%)	Limit (dBm/MHz)
2412	0.547	0.396	-27.58	+20% to -80%
2442	0.547	0.370	-32.42	+20% to -80%
2472	0.547	0.396	-27.58	+20% to -80%

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

Test Result	PASS
--------------------	------

3. Spread Bandwidth and Spread Factor

3.1. Test Setup



3.2. Test Procedure

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

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

3.3. Limits

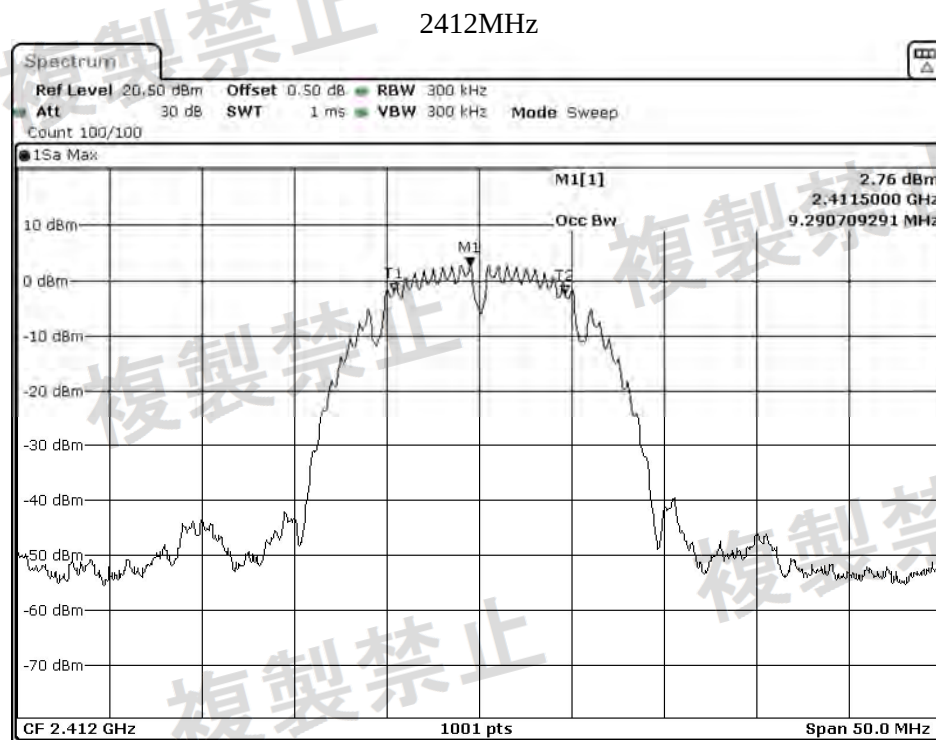
Spread Bandwidth ≥ 500 kHz

Spread Factor ≥ 5 for 2400 – 2483.5 MHz, ≥ 10 for 2471 – 2497 MHz

3.4. Test Result of Spread Bandwidth and Spread Factor

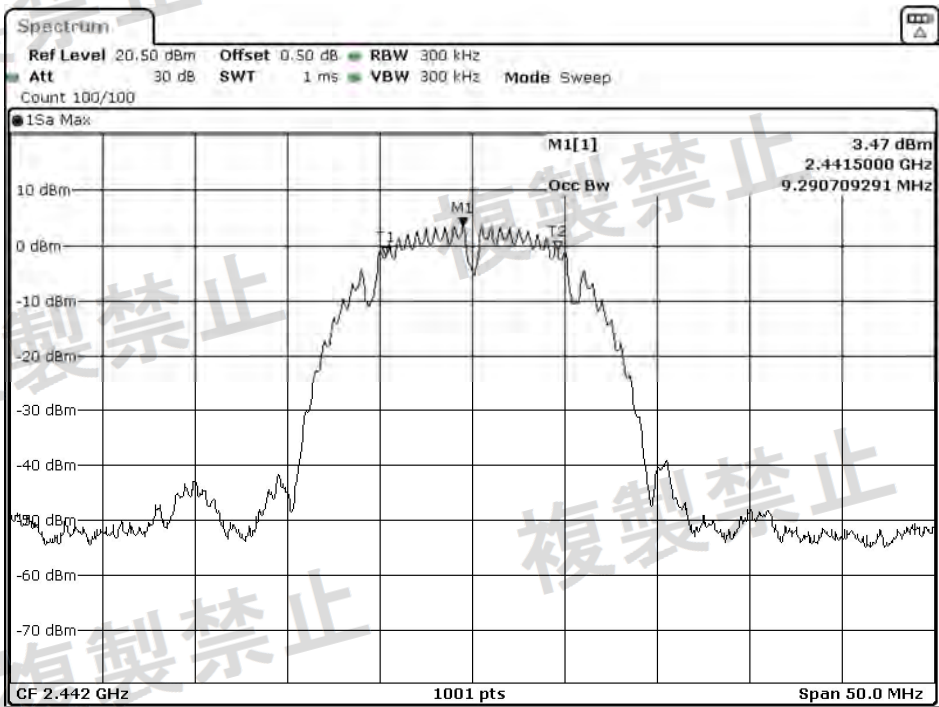
Product : Wireless speaker
 Test Item : Spread Bandwidth
 Test Mode : Mode 1: Transmit (802.11b 1Mbps)

Frequency (MHz)	Reading Value (MHz)	Limit (kHz)
2412	9.29	≥ 500
2442	9.29	≥ 500
2472	9.29	≥ 500



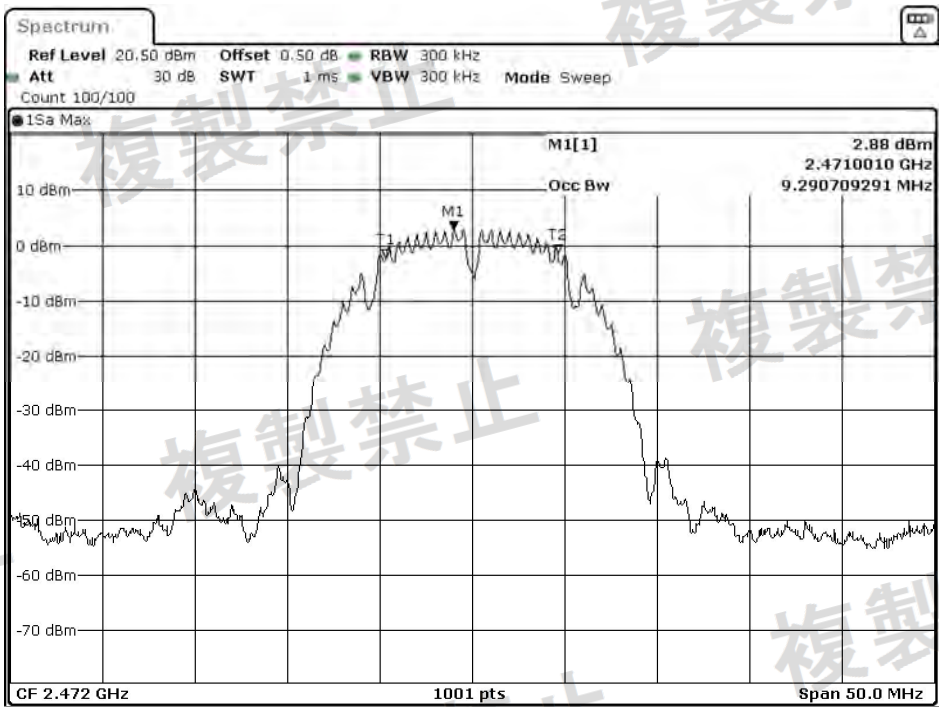
Date: 1.APR.2021 02:50:39

2442MHz



Date: 1.APR.2021 03:06:49

2472MHz



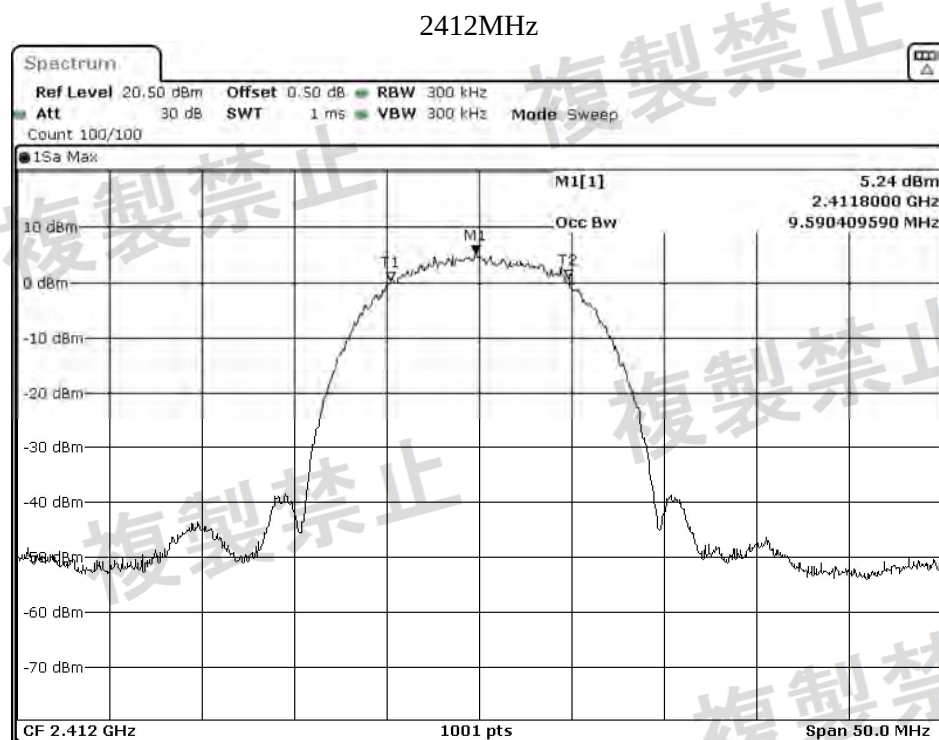
Date: 1.APR.2021 03:15:54

Product : Wireless speaker
Test Item : Spread Factor
Test Mode : Mode 1: Transmit (802.11b 1Mbps)

Frequency (MHz)	Spread Bandwidth / 1.375	Limit
2412	6.7564	≥ 5
2442	6.7564	≥ 5
2472	6.7564	≥ 5

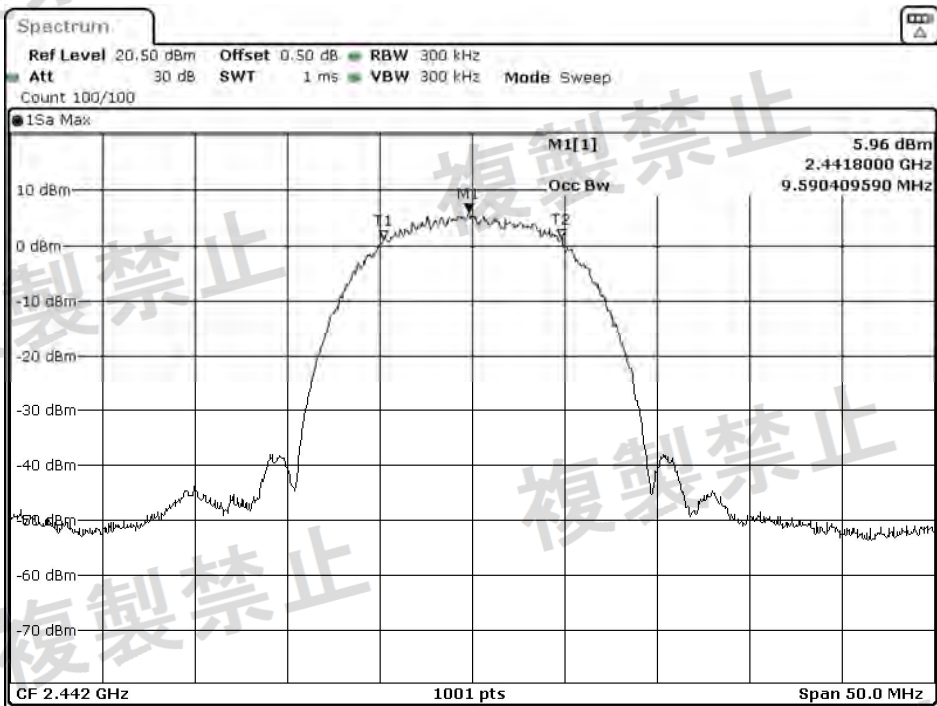
Product : Wireless speaker
 Test Item : Spread Bandwidth
 Test Mode : Mode 1: Transmit (802.11b 11Mbps)

Frequency (MHz)	Reading Value (MHz)	Limit (kHz)
2412	9.59	≥ 500
2442	9.59	≥ 500
2472	9.64	≥ 500



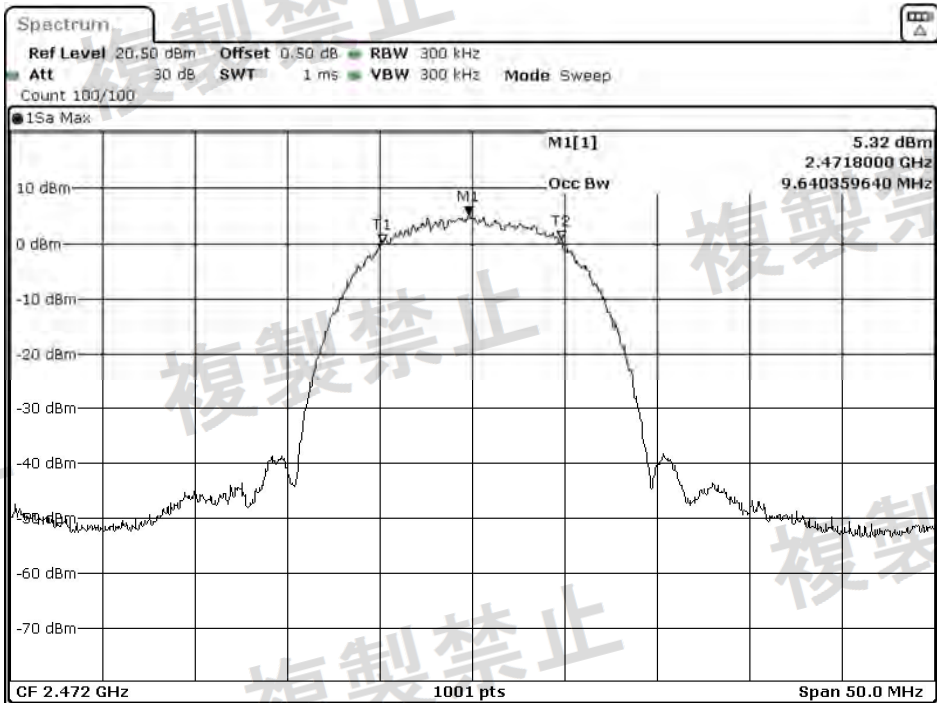
Date: 1.APR.2021 06:37:37

2442MHz



Date: 1.APR.2021 06:43:06

2472MHz



Date: 1.APR.2021 06:44:15

Product : Wireless speaker
Test Item : Spread Factor
Test Mode : Mode 1: Transmit (802.11b 11Mbps)

Frequency (MHz)	Spread Bandwidth / 1.375	Limit
2412	6.9745	≥ 5
2442	6.9745	≥ 5
2472	7.0109	≥ 5

Test Result	PASS
--------------------	------

4. Occupied Bandwidth

4.1. Test Setup



4.2. Test Procedure

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

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

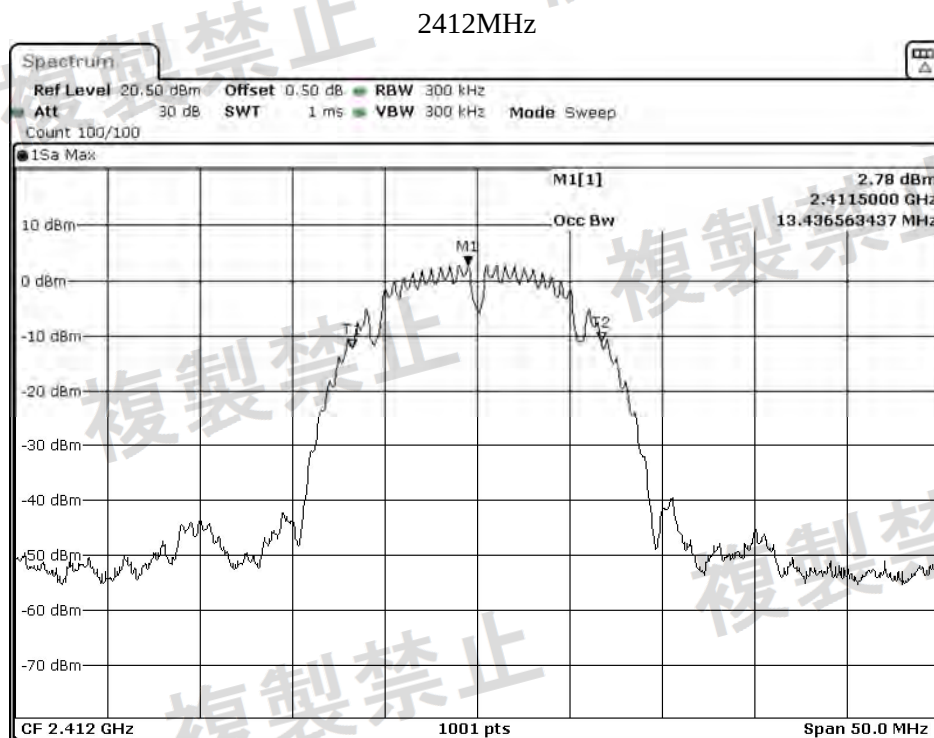
4.3. Limits

≤ 26 MHz for DSSS&OFDM, ≤ 83.5 MHz for FHSS,
 ≤ 38 MHz for OFDM(Wide-band)

4.4. Test Result of Occupied Bandwidth

Product : Wireless speaker
 Test Item : Occupied Bandwidth
 Test Mode : Mode 1: Transmit (802.11b 1Mbps)

Frequency (MHz)	Reading Value (MHz)	Limit (MHz)
2412	13.436	≤ 26
2442	13.486	≤ 26
2472	13.436	≤ 26



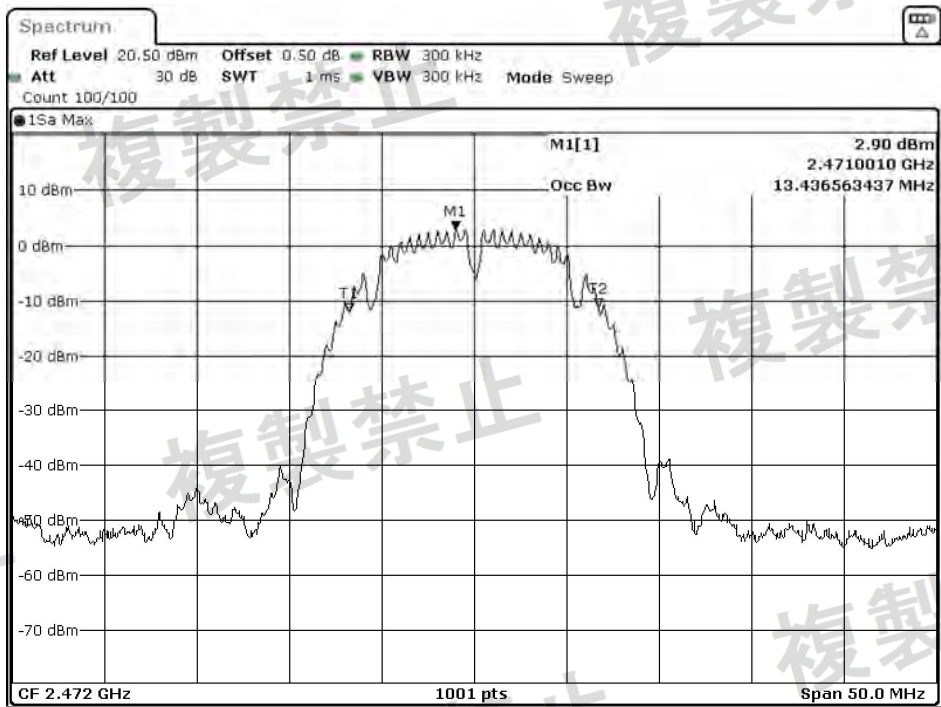
Date: 1.APR.2021 02:50:18

2442MHz



Date: 1.APR.2021 03:06:28

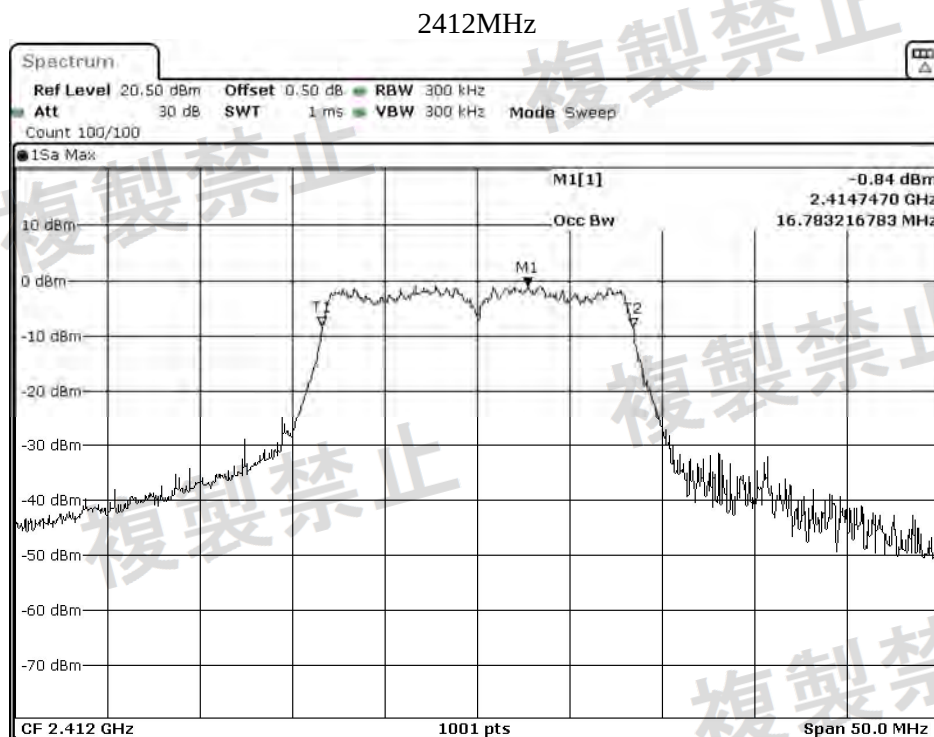
2472MHz



Date: 1.APR.2021 03:15:33

Product : Wireless speaker
 Test Item : Occupied Bandwidth
 Test Mode : Mode 2: Transmit (802.11g 6Mbps)

Frequency (MHz)	Reading Value (MHz)	Limit (MHz)
2412	16.783	≤ 26
2442	16.783	≤ 26
2472	16.783	≤ 26



Date: 1.APR.2021 03:21:17

Spectrum

Ref Level 20.50 dBm Offset 0.50 dB RBW 300 kHz
Att 30 dB SWT 1 ms VBW 300 kHz Mode Sweep
Count 100/100

1Sa Max

10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm

M1[1]
Occ BW
M1
T1
T2

-0.31 dBm
2.4447470 GHz
16.783216783 MHz

CF 2.442 GHz 1001 pts Span 50.0 MHz

Spectrum

Ref Level 20.50 dBm Offset 0.50 dB RBW 300 kHz
Att 30 dB SWT 1 ms VBW 300 kHz Mode Sweep
Count 100/100

1Sa Max

M1[1] -1.16 dBm
2.4697520 GHz
16.783216783 MHz

Occ BW

M1

M2

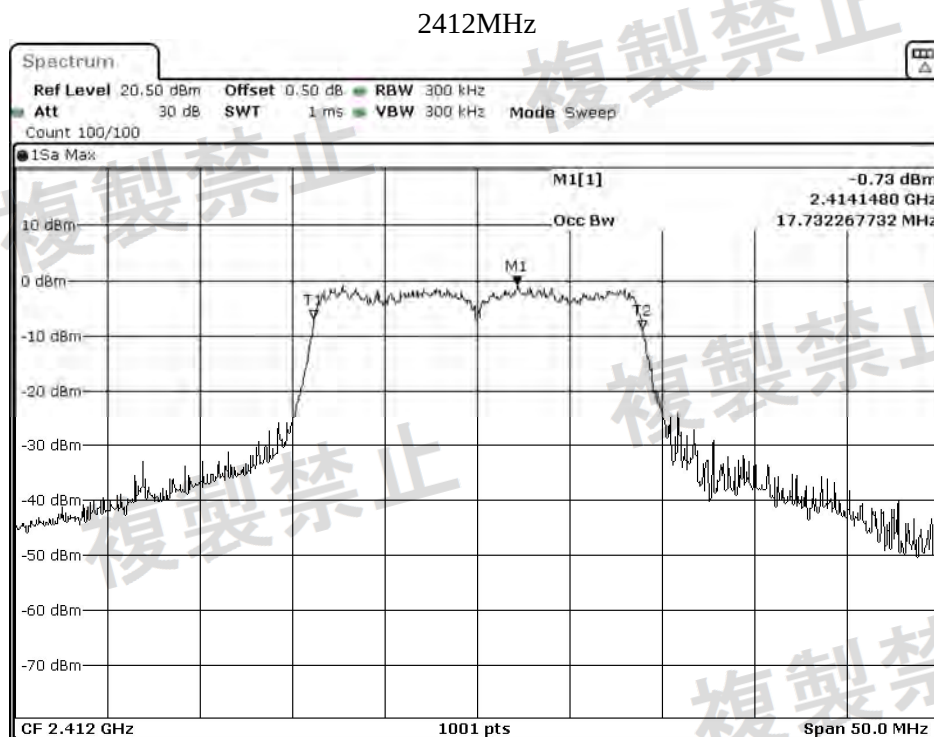
CF 2.472 GHz 1001 pts Span 50.0 MHz

The image shows a spectrum plot with a grid. The vertical axis represents power in dBm, ranging from -70 to 10. The horizontal axis represents frequency in GHz, ranging from 2.46 to 2.48. A signal trace is visible, showing a peak at 2.472 GHz. The peak is labeled M1 and has a level of -1.16 dBm. The trace is labeled M1[1]. The plot also shows a noise floor around -40 dBm. The plot includes a grid and various measurement parameters.

Page: 34 of 111

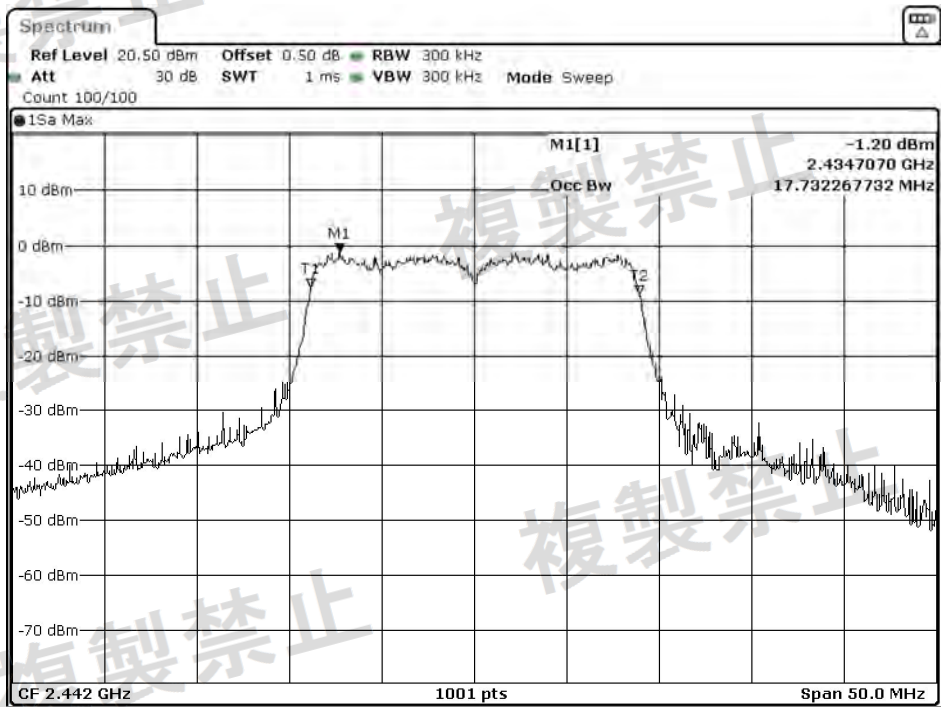
Product : Wireless speaker
 Test Item : Occupied Bandwidth
 Test Mode : Mode 3: Transmit (802.11n20 7.2Mbps)

Frequency (MHz)	Reading Value (MHz)	Limit (MHz)
2412	17.732	≤ 26
2442	17.732	≤ 26
2472	17.682	≤ 26



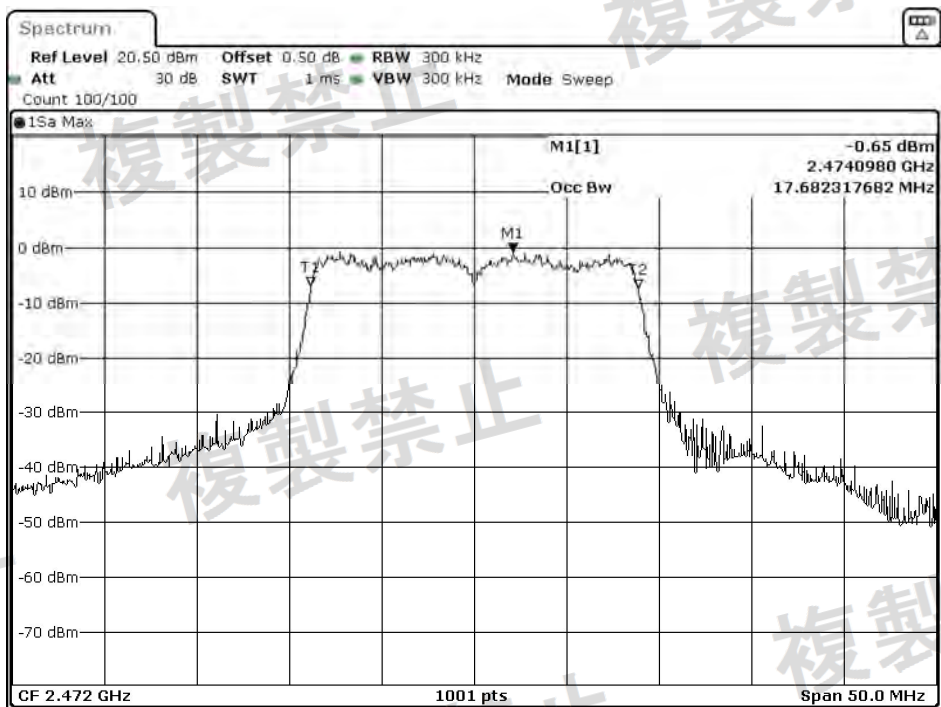
Date: 1.APR.2021 05:36:35

2442MHz



Date: 1.APR.2021 05:44:44

2472MHz



Date: 1.APR.2021 05:50:31

Test Result

PASS

5. Frequency Tolerance

5.1. Test Setup



5.2. Test Procedure

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

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

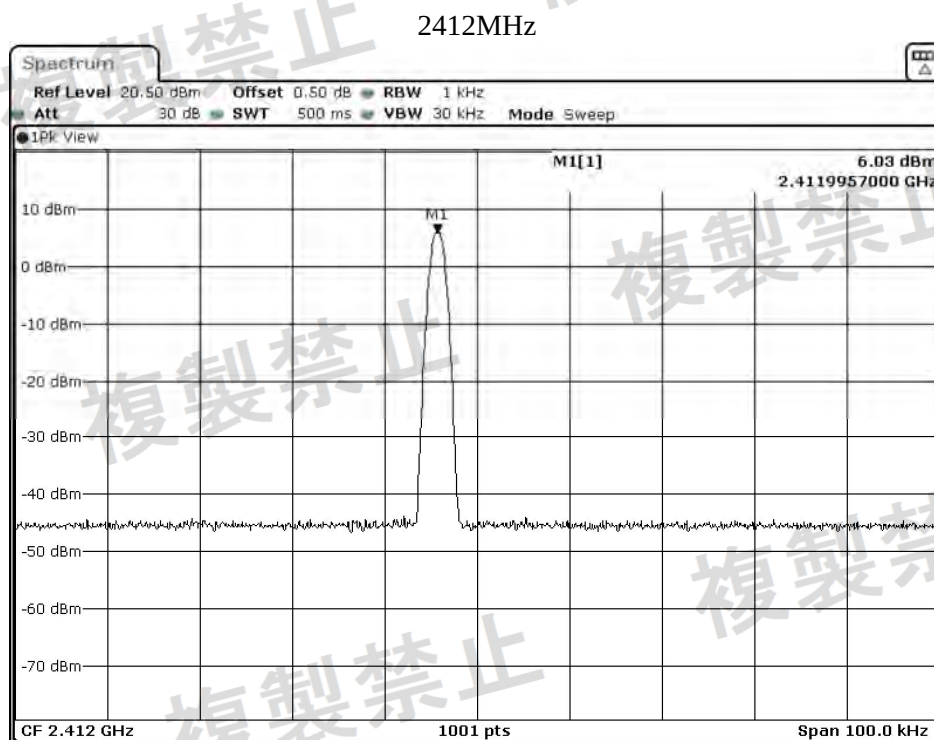
5.3. Limits

≤ 50 ppm

5.4. Test Result of Frequency Tolerance

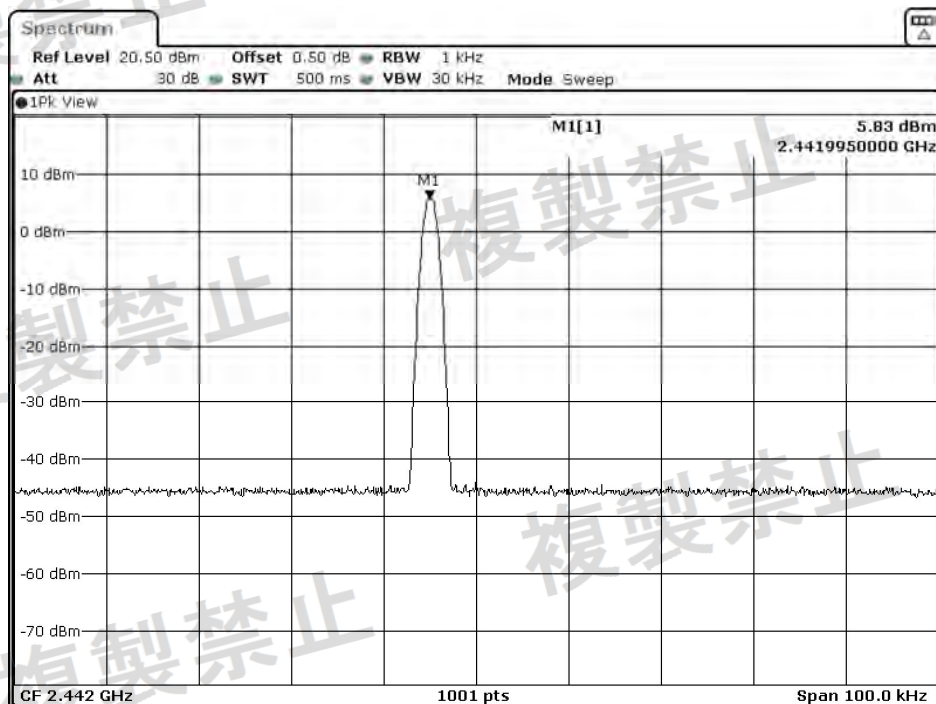
Product : Wireless speaker
 Test Item : Frequency Tolerance
 Test Mode : Mode 1: Transmit (802.11b 1Mbps)

Frequency (MHz)	Reading Value (MHz)	Tolerance (ppm)	Limit (ppm)
2412	2411.9957	-1.78275	≤ 50
2442	2441.9950	-2.04750	≤ 50
2472	2471.9935	-2.62945	≤ 50



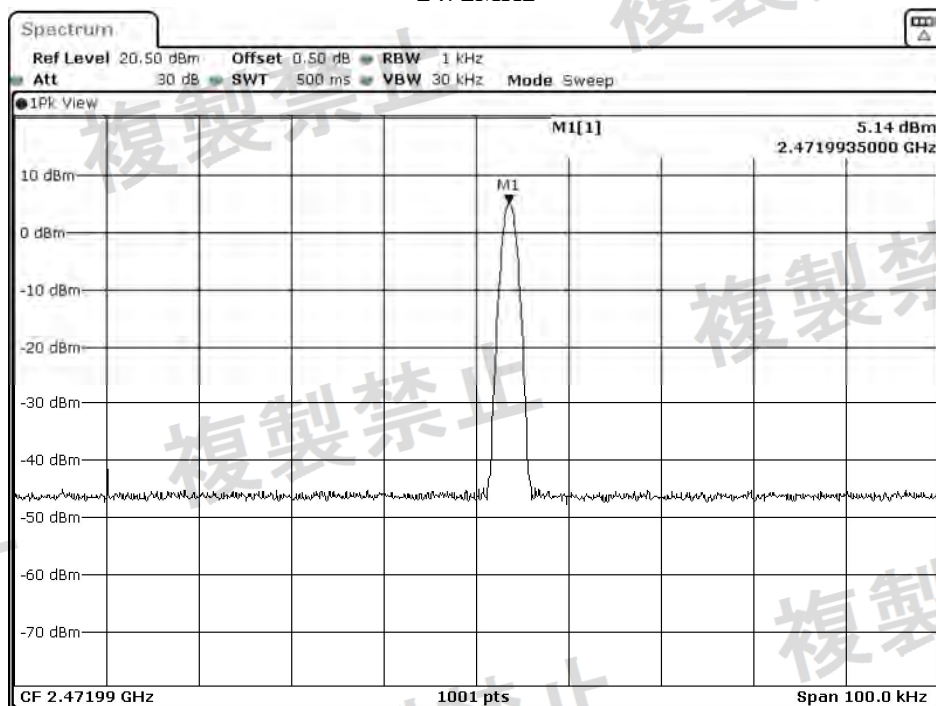
Date: 1.APR.2021 02:47:16

2442MHz



Date: 1.APR.2021 03:04:53

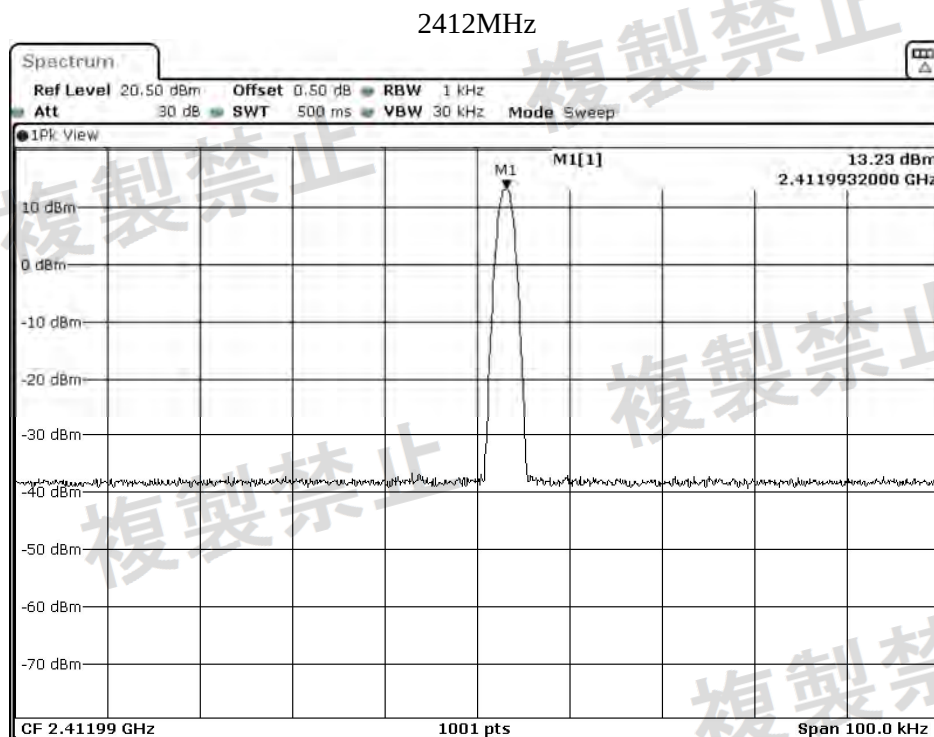
2472MHz



Date: 1.APR.2021 03:12:22

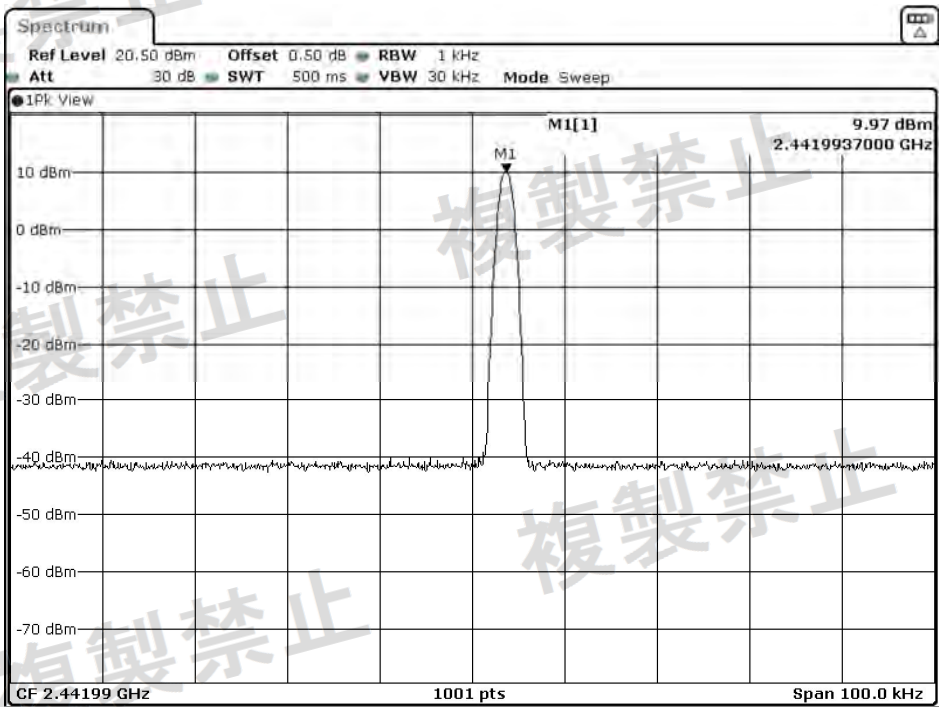
Product : Wireless speaker
 Test Item : Frequency Tolerance
 Test Mode : Mode 2: Transmit (802.11g 6Mbps)

Frequency (MHz)	Reading Value (MHz)	Tolerance (ppm)	Limit (ppm)
2412	2411.9932	-2.81924	≤ 50
2442	2441.9937	-2.57985	≤ 50
2472	2471.9938	-2.50809	≤ 50



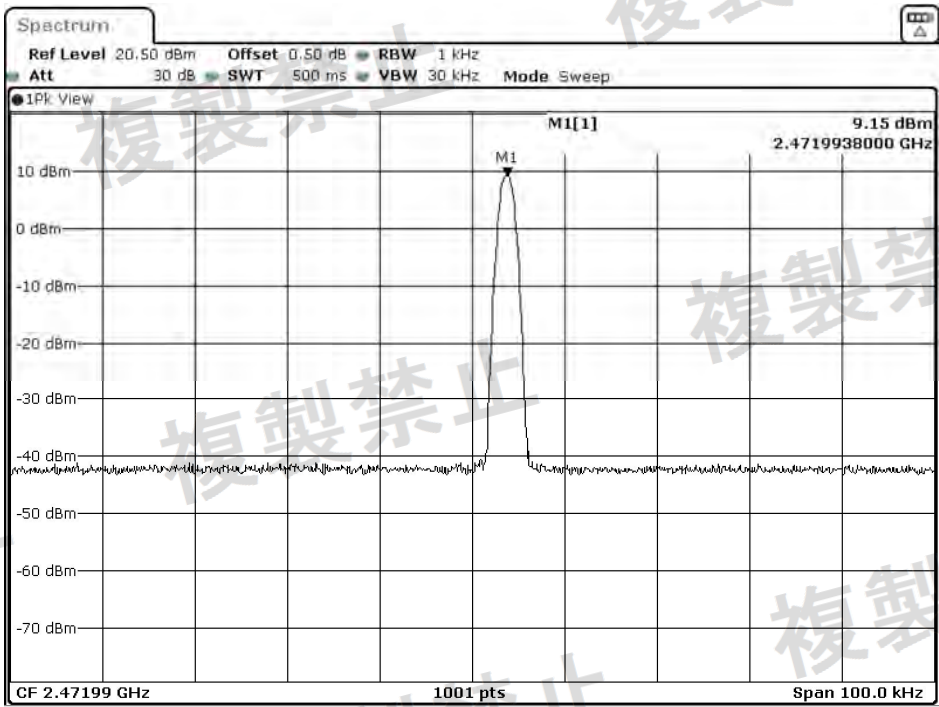
Date: 1.APR.2021 03:20:31

2442MHz



Date: 1.APR.2021 03:30:24

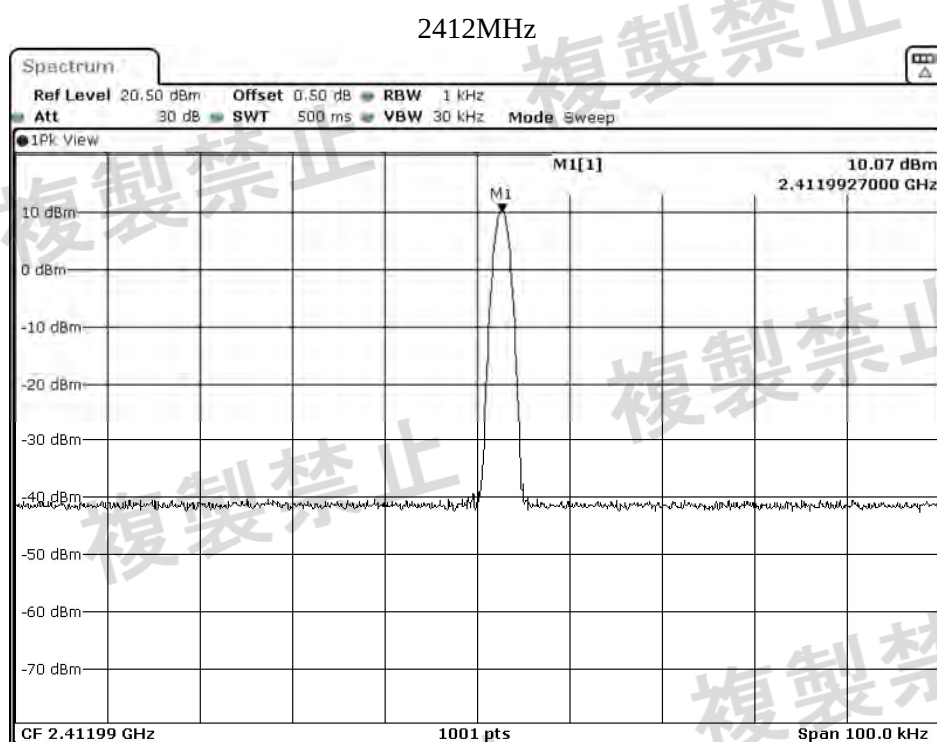
2472MHz



Date: 1.APR.2021 05:07:42

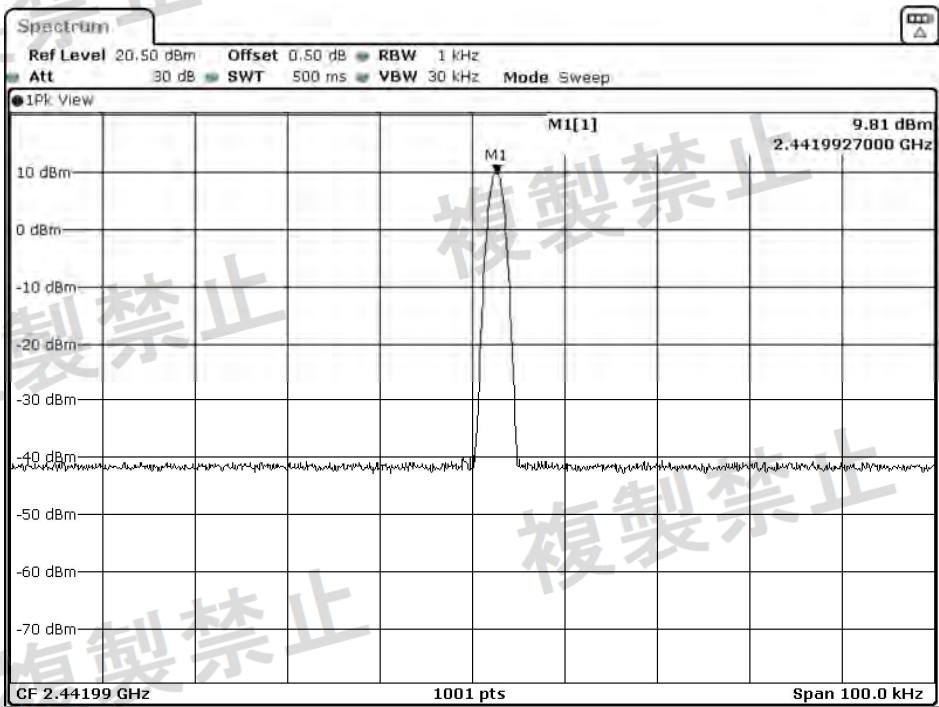
Product : Wireless speaker
Test Item : Frequency Tolerance
Test Mode : Mode 3: Transmit (802.11n20 7.2Mbps)

Frequency (MHz)	Reading Value (MHz)	Tolerance (ppm)	Limit (ppm)
2412	2411.9927	-3.02653	≤ 50
2442	2441.9927	-2.98935	≤ 50
2472	2471.9927	-2.95307	≤ 50



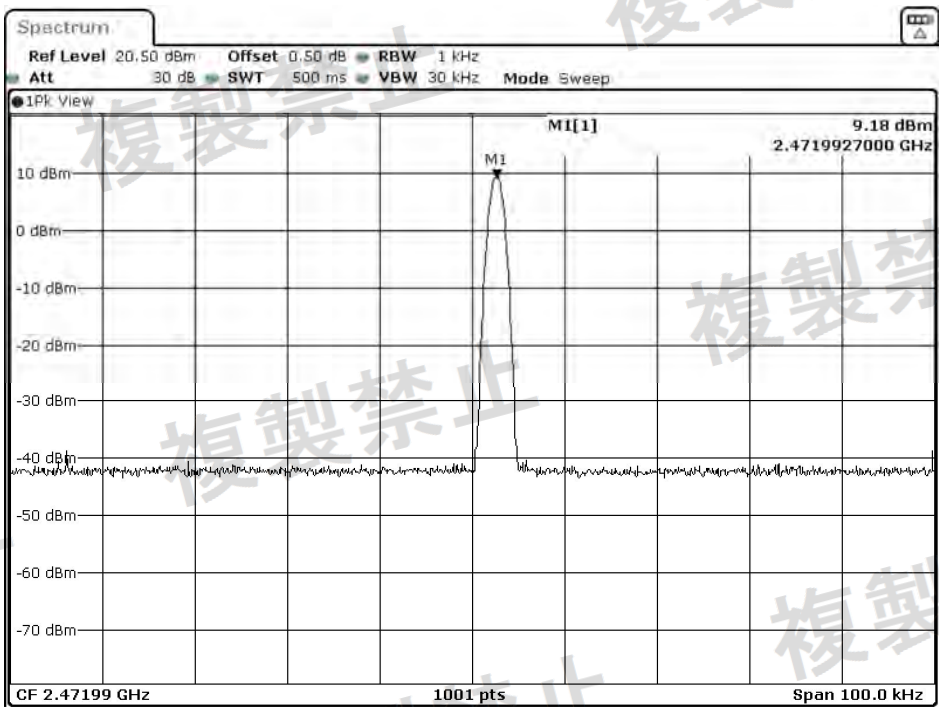
Date: 1.APR.2021 05:28:59

2442MHz



Date: 1.APR.2021 05:43:25

2472MHz



Date: 1.APR.2021 05:49:47

Test Result	PASS
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6. Transmitter Spurious Emissions

6.1. Test Setup



6.2. Test Procedure

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

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

6.3. Limits

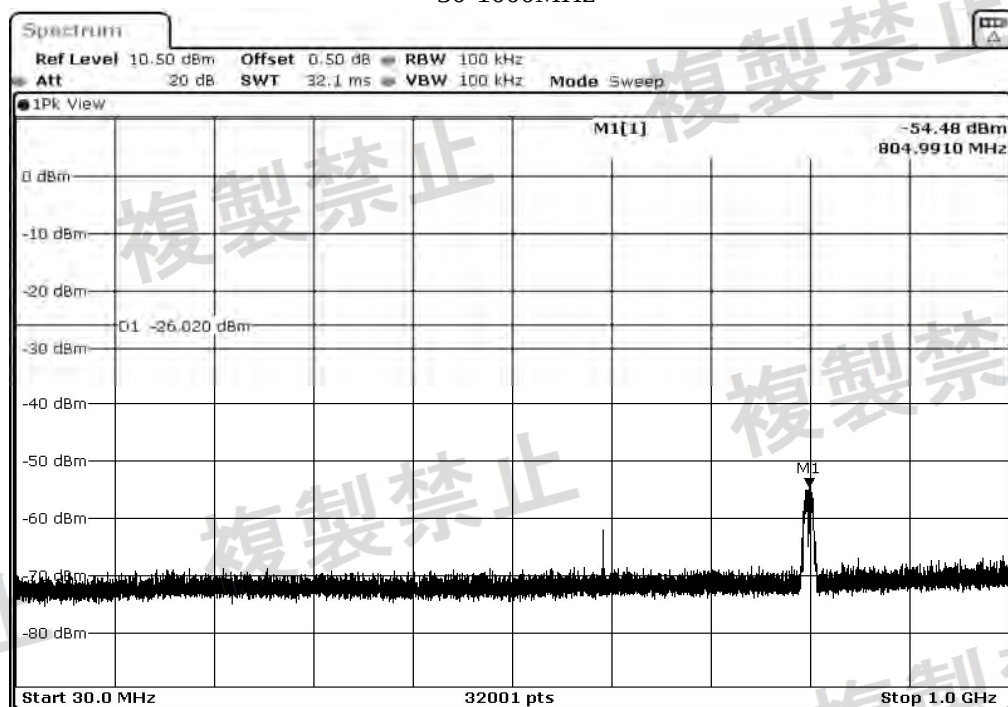
- $\leq 2.5\mu\text{W}$ for 30 – 2387 MHz
- $\leq 25\mu\text{W}$ for 2387 – 2400 MHz
- $\leq 25\mu\text{W}$ for 2483.5 – 2496.5 MHz
- $\leq 2.5\mu\text{W}$ for 2496.5 – 12500 MHz

6.4. Test Result of Transmitter Spurious Emissions

Product : Wireless speaker
 Test Item : Transmitter Spurious Emissions
 Test Mode : Mode 1: Transmit (802.11b 1Mbps) 2412MHz

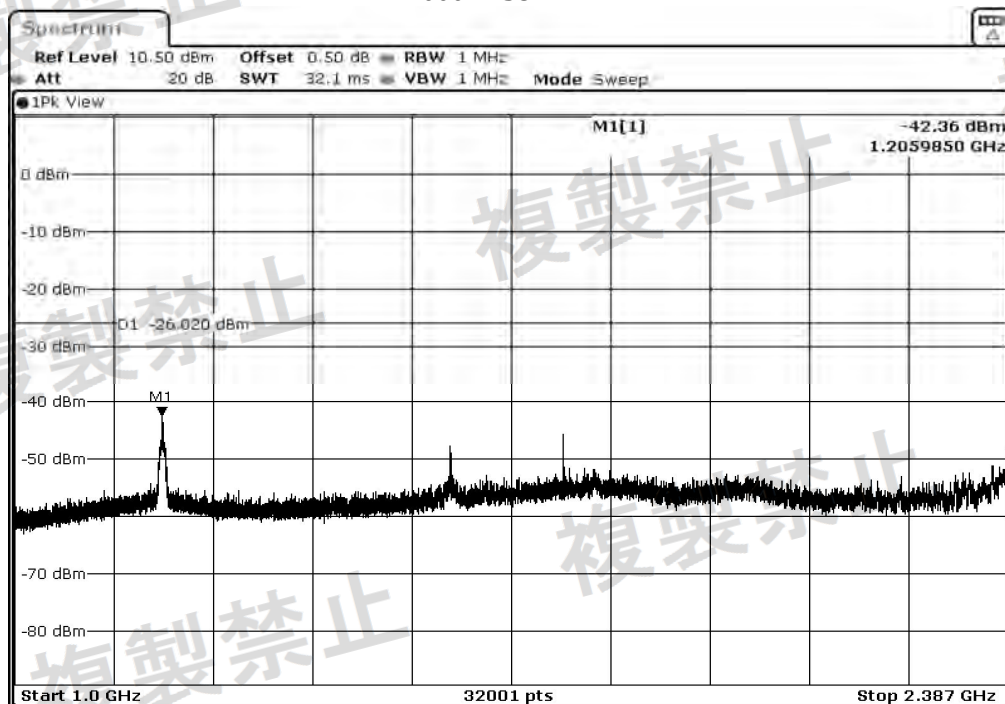
Frequency Range (MHz)	Reading Value (dBm)	Limit (dBm)
30-1000	-54.48	-26 (2.5uW)
1000 – 2387	-42.36	-26 (2.5uW)
2387 – 2400	-41.12	-16 (25uW)
2483.5 – 2496.5	-50.89	-16 (25uW)
2496.5 – 8000	-42.65	-26 (2.5uW)
8000 – 12750	-56.56	-26 (2.5uW)

30-1000MHz



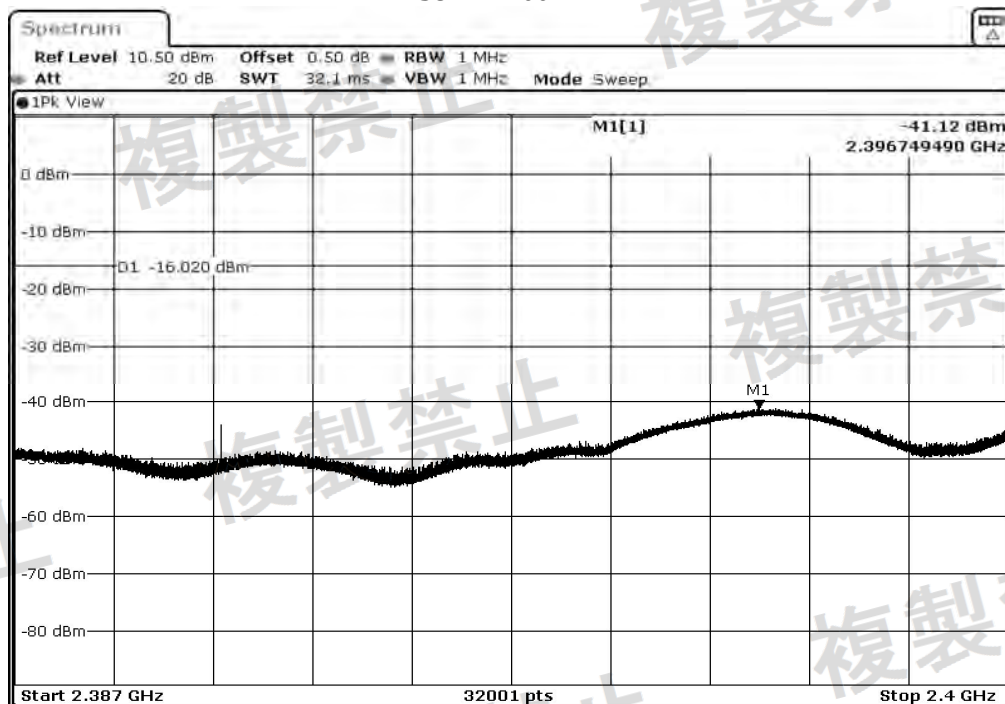
Date: 1.APR.2021 02:59:45

1000– 2387MHz



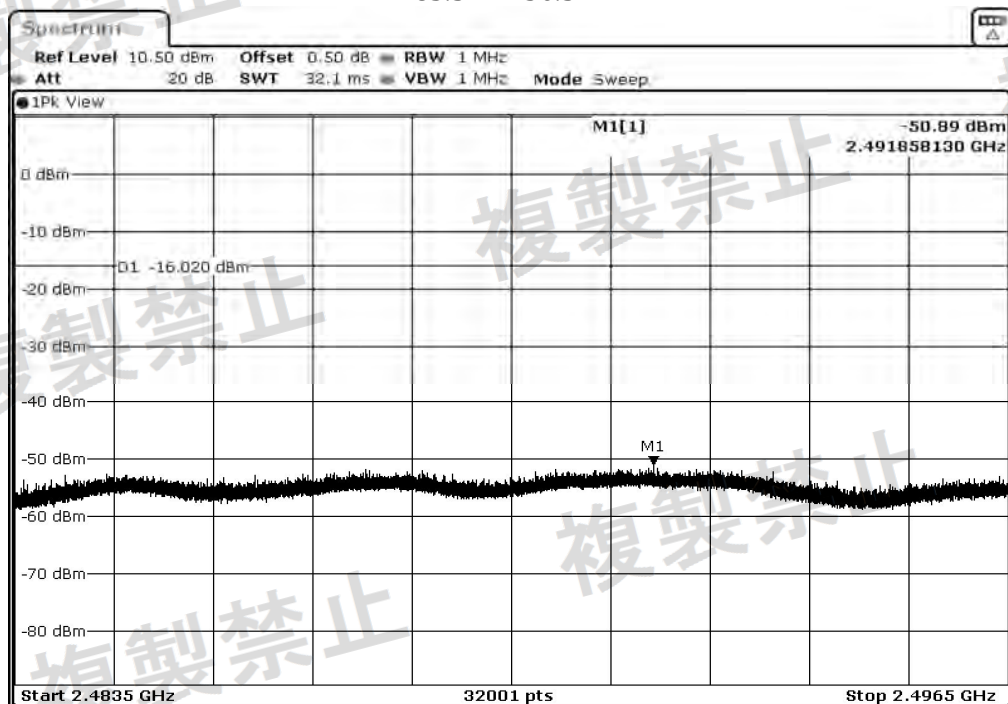
Date: 1.APR.2021 03:00:06

2387 – 2400 MHz



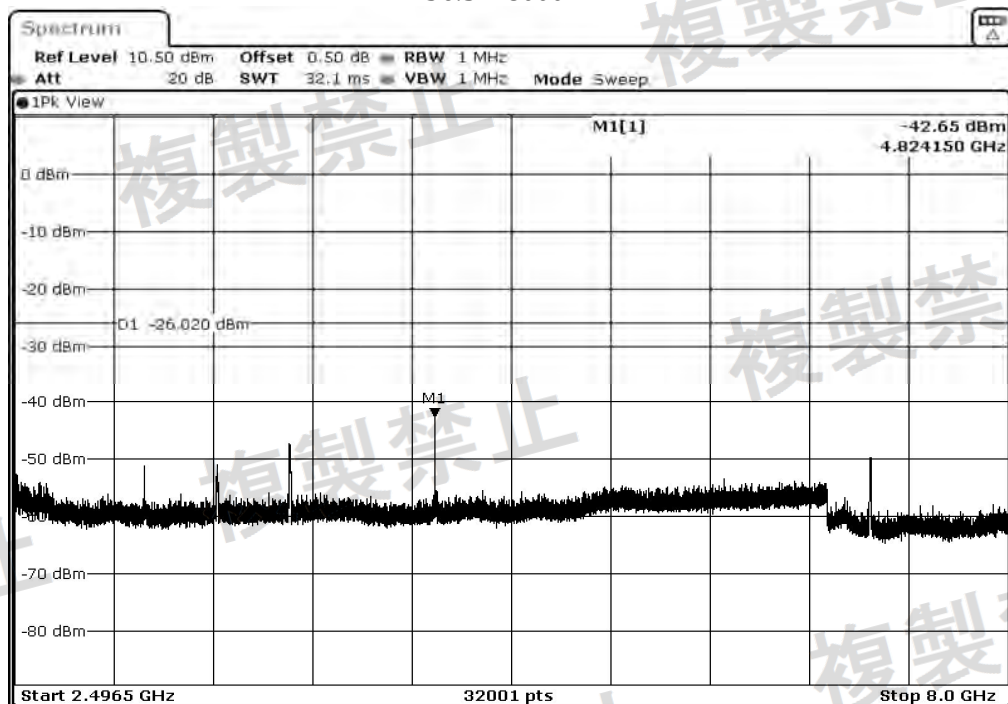
Date: 1.APR.2021 03:00:28

2483.5 – 2496.5MHz



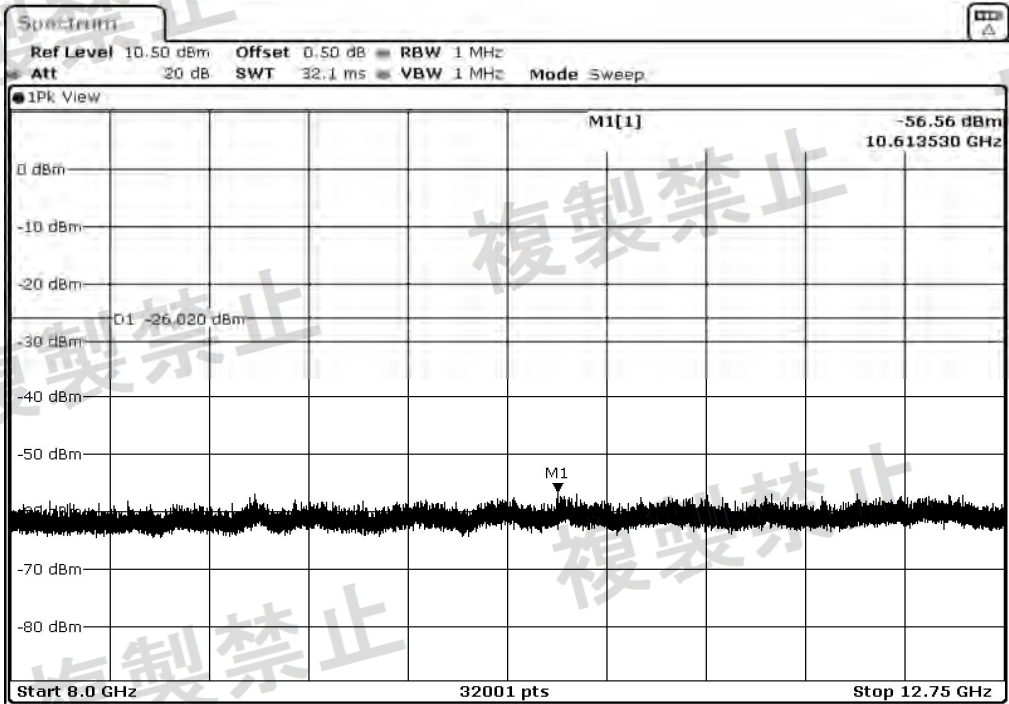
Date: 1.APR.2021 03:00:50

2496.5 – 8000MHz



Date: 1.APR.2021 03:01:12

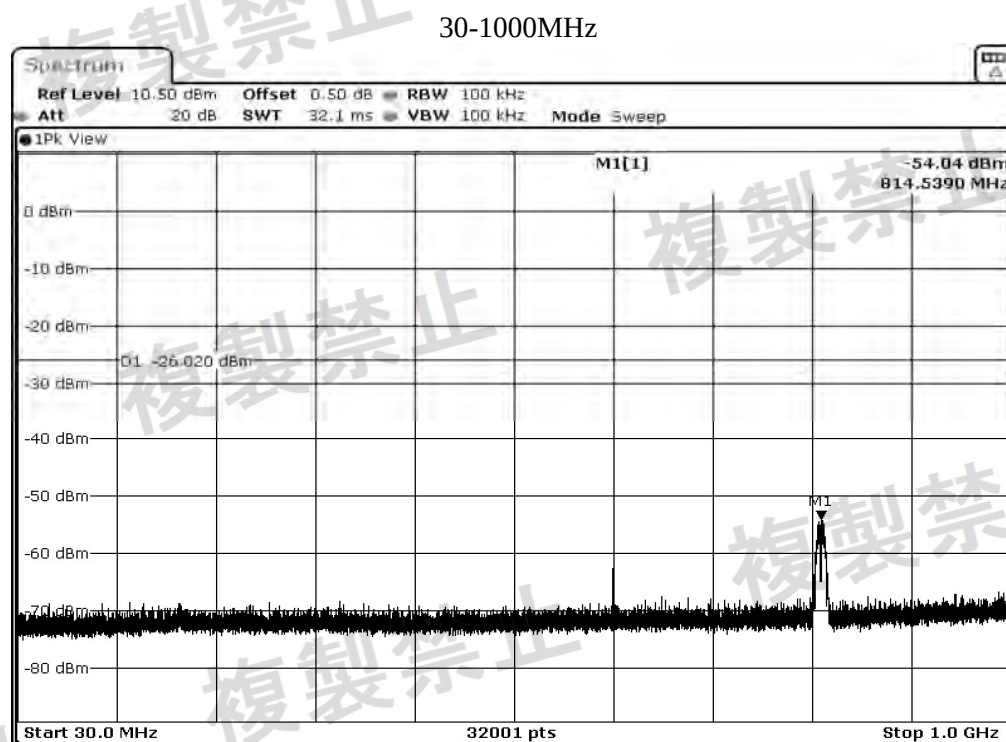
8000 – 12750MHz



Date: 1.APR.2021 03:01:35

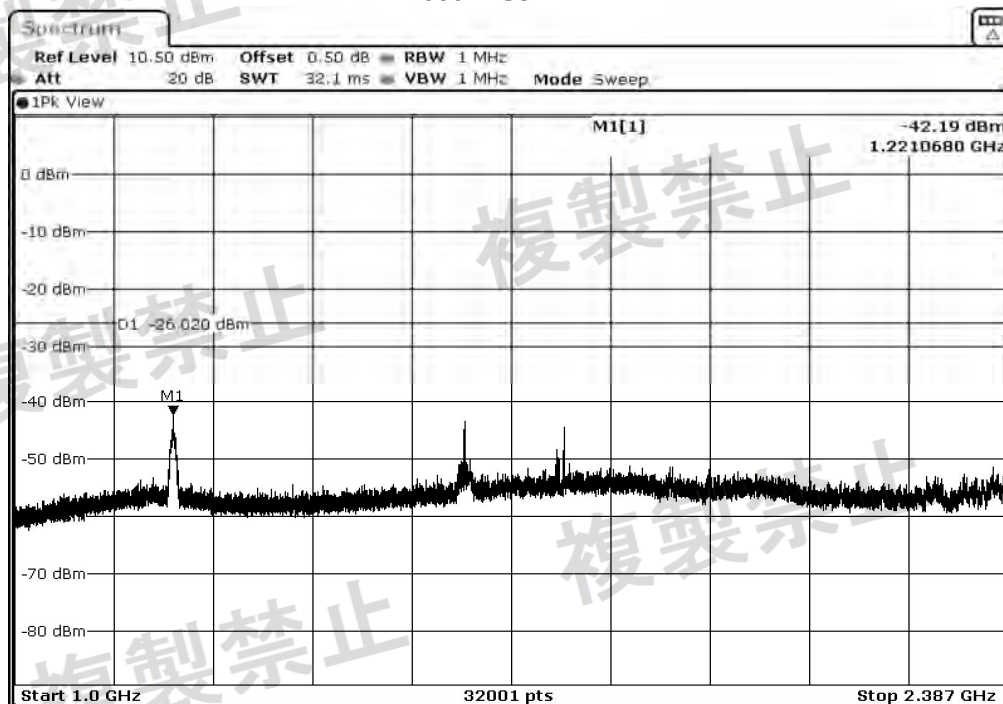
Product : Wireless speaker
 Test Item : Transmitter Spurious Emissions
 Test Mode : Mode 1: Transmit (802.11b 1Mbps) 2442MHz

Frequency Range (MHz)	Reading Value (dBm)	Limit (dBm)
30-1000	-54.04	-26 (2.5uW)
1000 – 2387	-42.19	-26 (2.5uW)
2387 – 2400	-51.16	-16 (25uW)
2483.5 – 2496.5	-50.09	-16 (25uW)
2496.5 – 8000	-45.31	-26 (2.5uW)
8000 – 12750	-56.26	-26 (2.5uW)



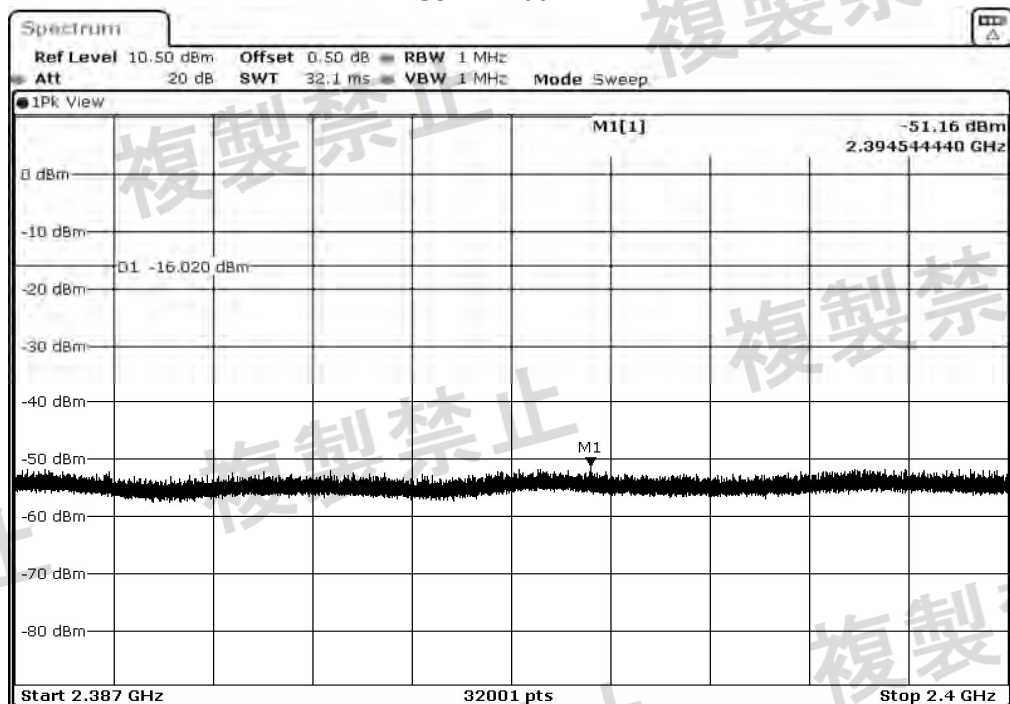
Date: 1.APR.2021 03:08:02

1000– 2387MHz



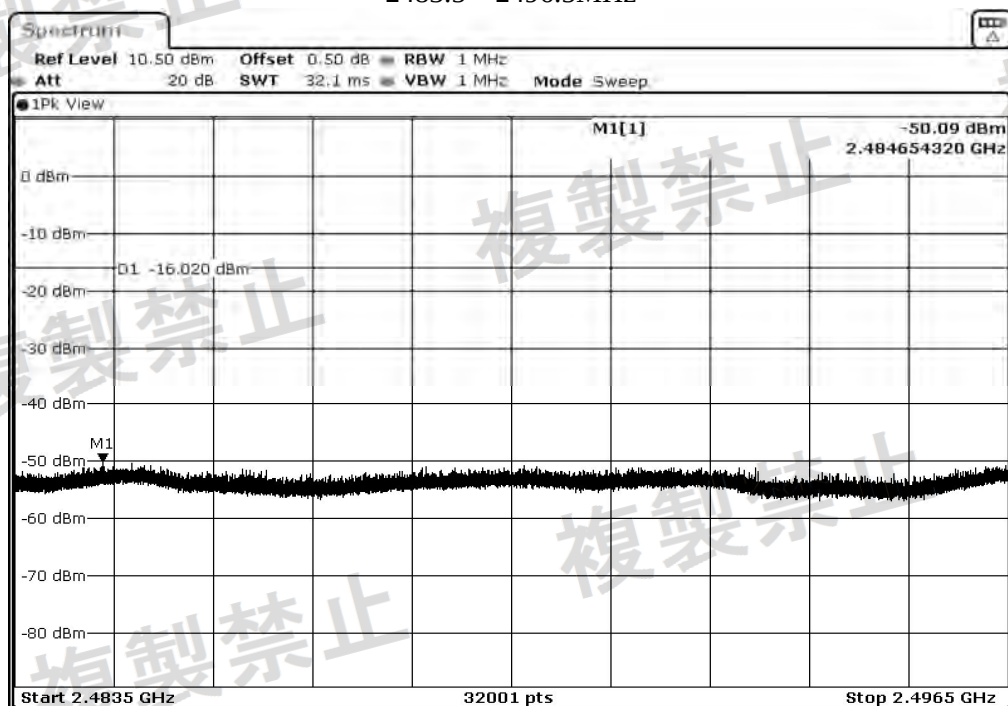
Date: 1.APR.2021 03:08:25

2387 – 2400 MHz



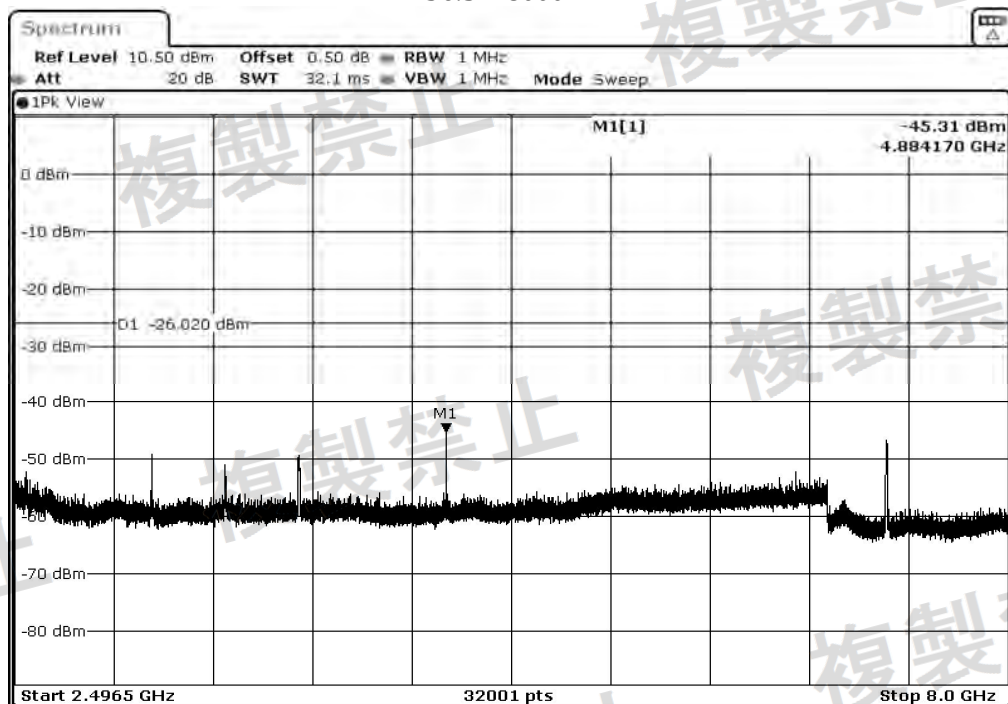
Date: 1.APR.2021 03:08:48

2483.5 – 2496.5MHz



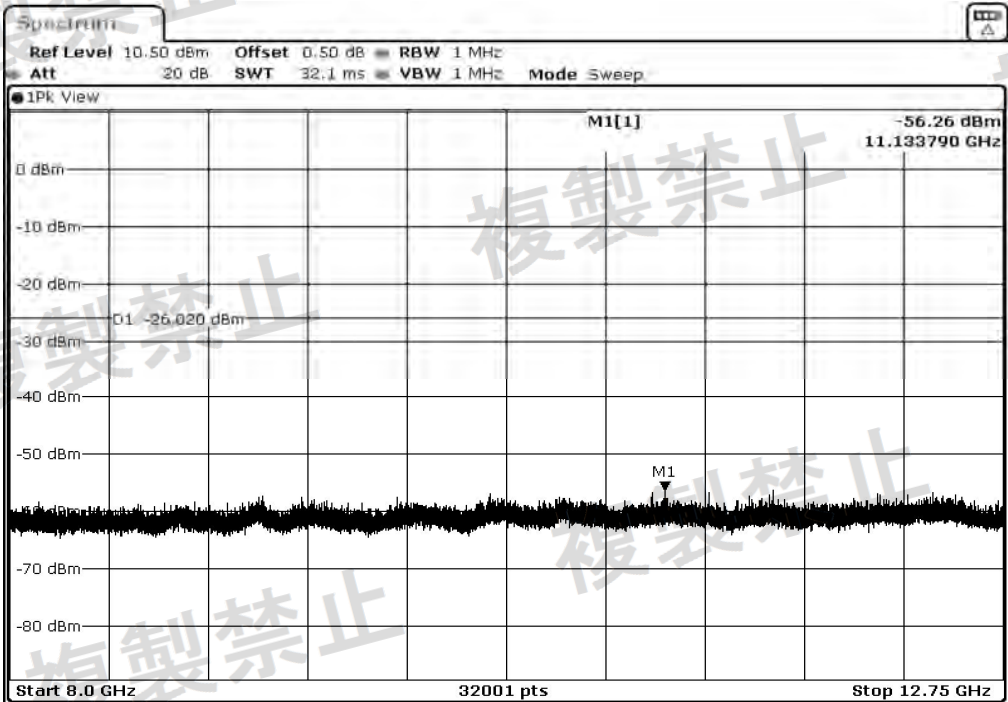
Date: 1.APR.2021 03:09:10

2496.5 – 8000MHz



Date: 1.APR.2021 03:09:33

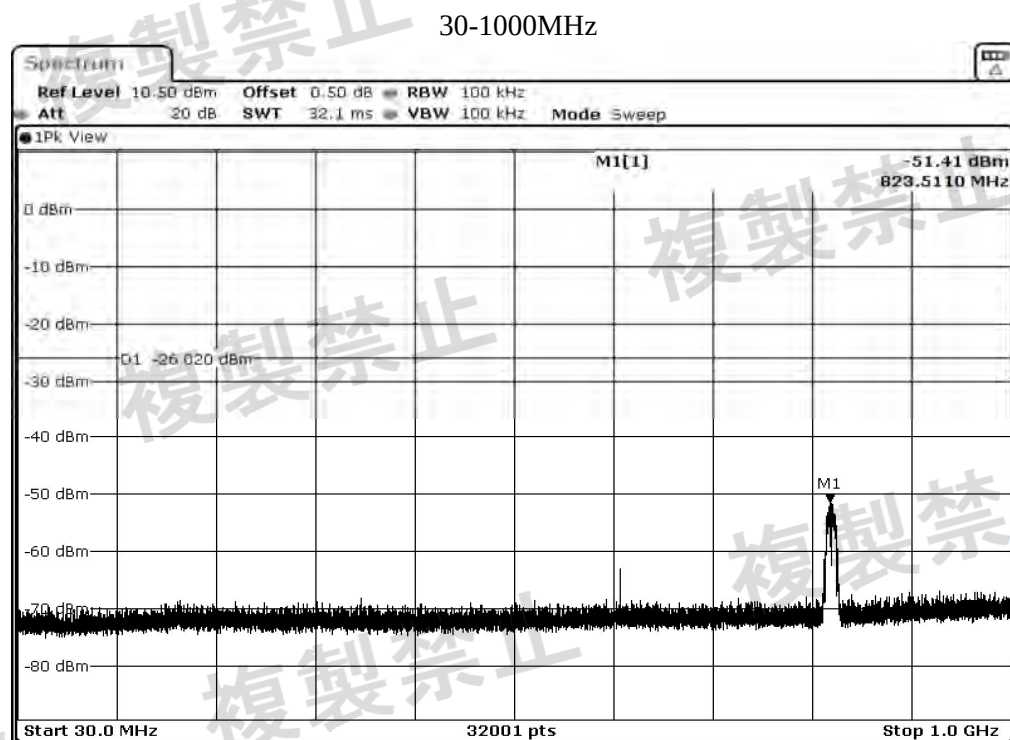
8000 – 12750MHz



Date: 1.APR.2021 03:09:56

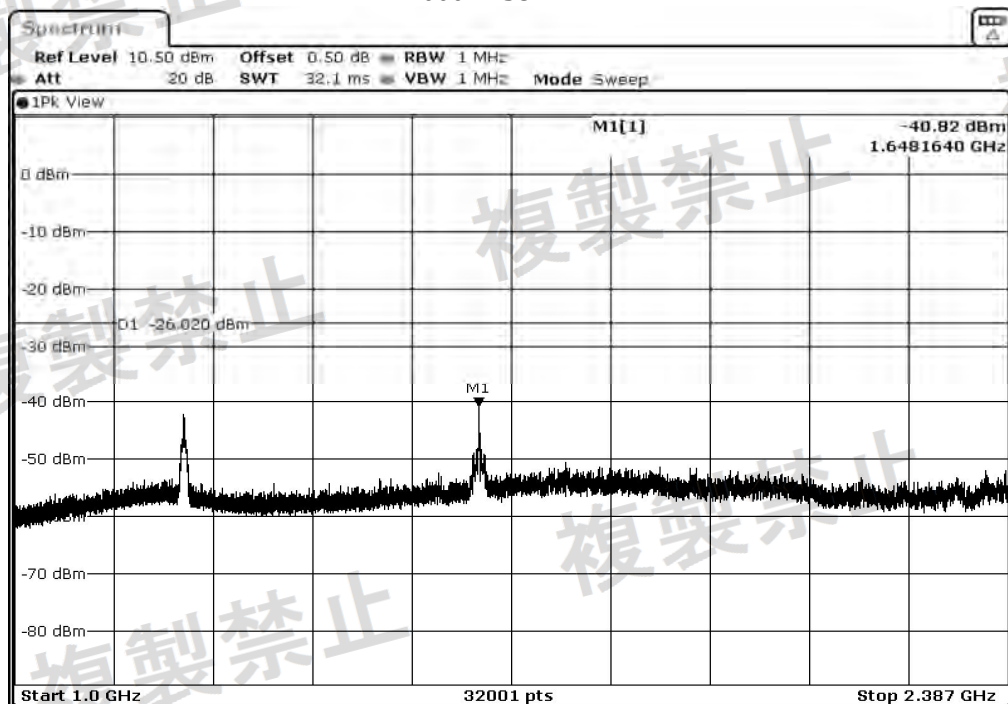
Product : Wireless speaker
 Test Item : Transmitter Spurious Emissions
 Test Mode : Mode 1: Transmit (802.11b 1Mbps) 2472MHz

Frequency Range (MHz)	Reading Value (dBm)	Limit (dBm)
30-1000	-51.41	-26 (2.5uW)
1000 – 2387	-40.82	-26 (2.5uW)
2387 – 2400	-50.32	-16 (25uW)
2483.5 – 2496.5	-41.92	-16 (25uW)
2496.5 – 8000	-48.14	-26 (2.5uW)
8000 – 12750	-56.63	-26 (2.5uW)



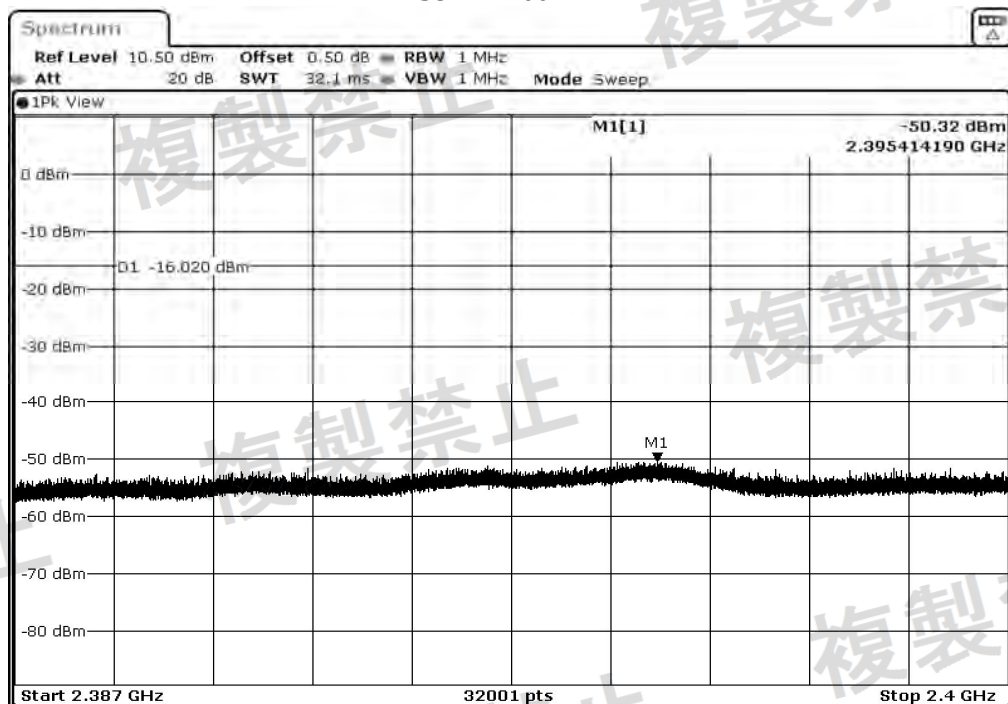
Date: 1.APR.2021 03:17:08

1000– 2387MHz



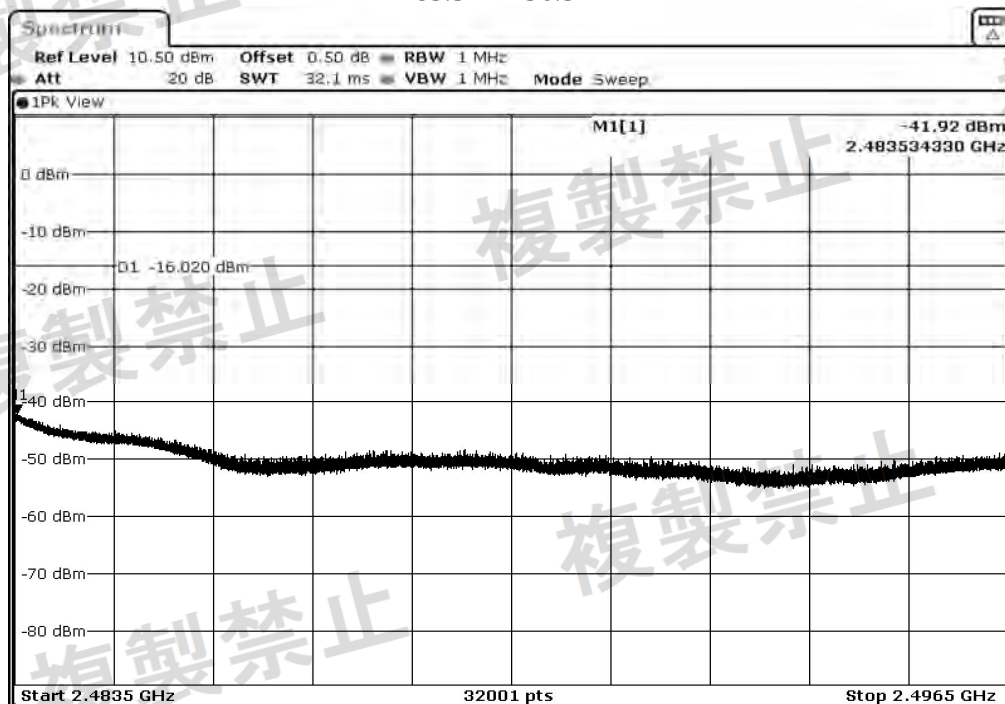
Date: 1.APR.2021 03:17:31

2387 – 2400 MHz



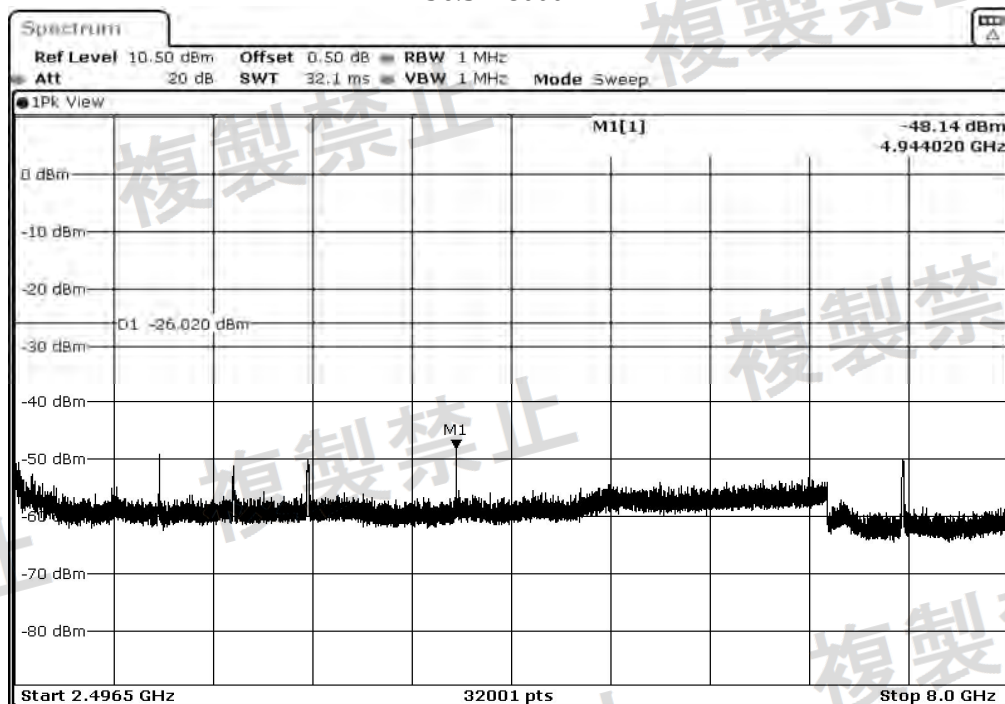
Date: 1.APR.2021 03:17:53

2483.5 – 2496.5MHz



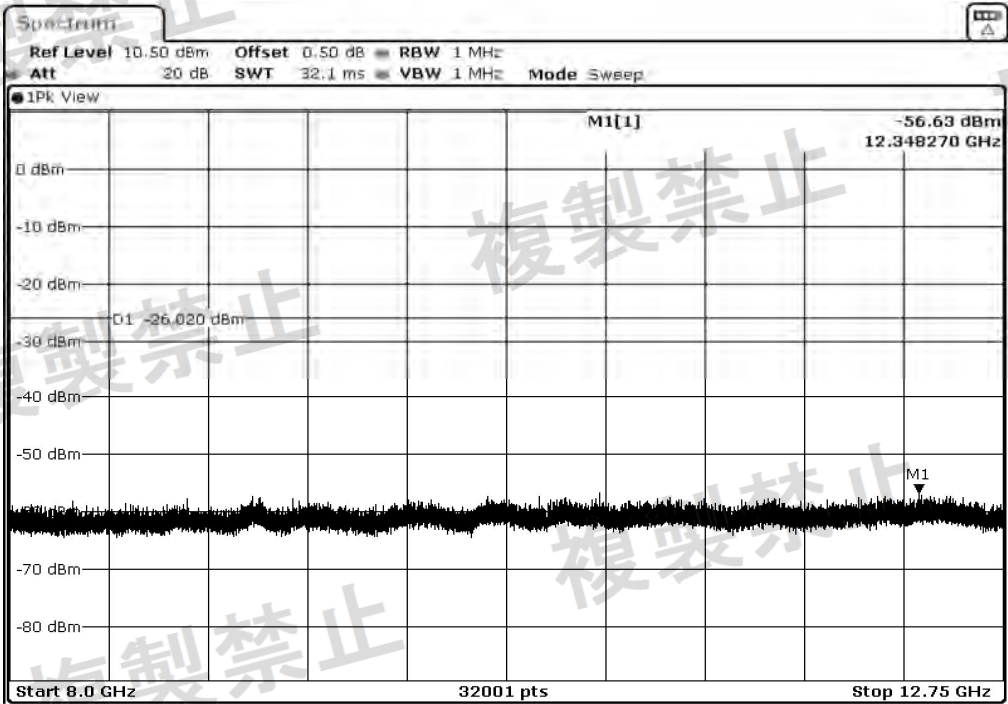
Date: 1.APR.2021 03:18:16

2496.5 – 8000MHz



Date: 1.APR.2021 03:18:39

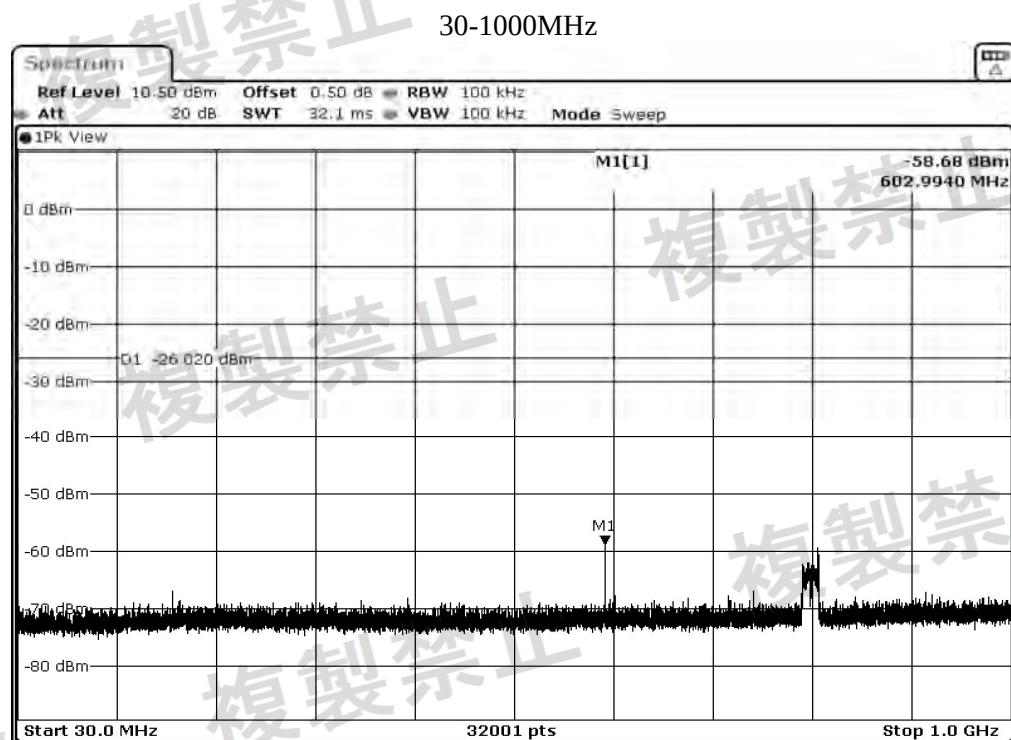
8000 – 12750MHz



Date: 1.APR.2021 03:19:01

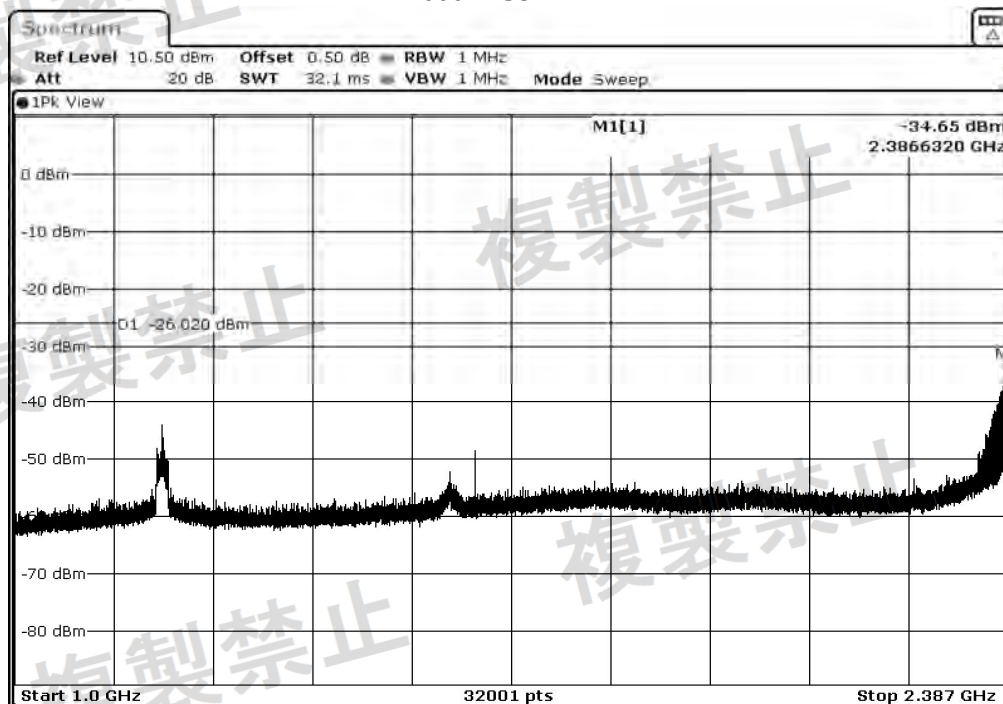
Product : Wireless speaker
 Test Item : Transmitter Spurious Emissions
 Test Mode : Mode 2: Transmit (802.11g 6Mbps) 2412MHz

Frequency Range (MHz)	Reading Value (dBm)	Limit (dBm)
30-1000	-58.68	-26 (2.5uW)
1000 – 2387	-34.65	-26 (2.5uW)
2387 – 2400	-19.79	-16 (25uW)
2483.5 – 2496.5	-34.48	-16 (25uW)
2496.5 – 8000	-48.23	-26 (2.5uW)
8000 – 12750	-56.29	-26 (2.5uW)



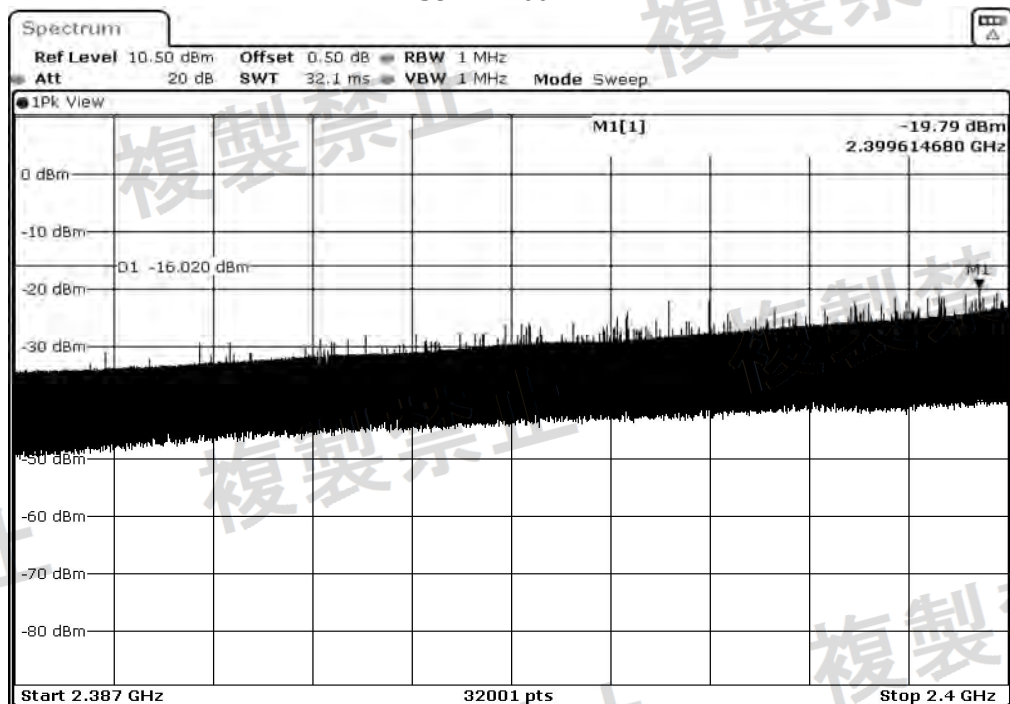
Date: 1.APR.2021 03:22:53

1000– 2387MHz



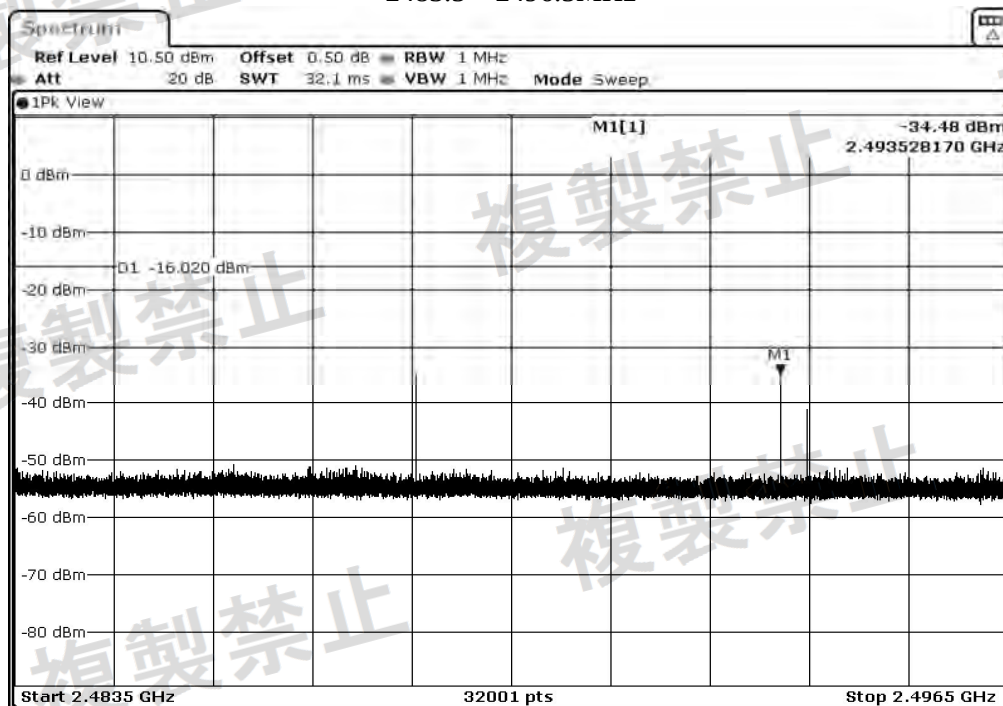
Date: 1.APR.2021 03:23:15

2387 – 2400 MHz



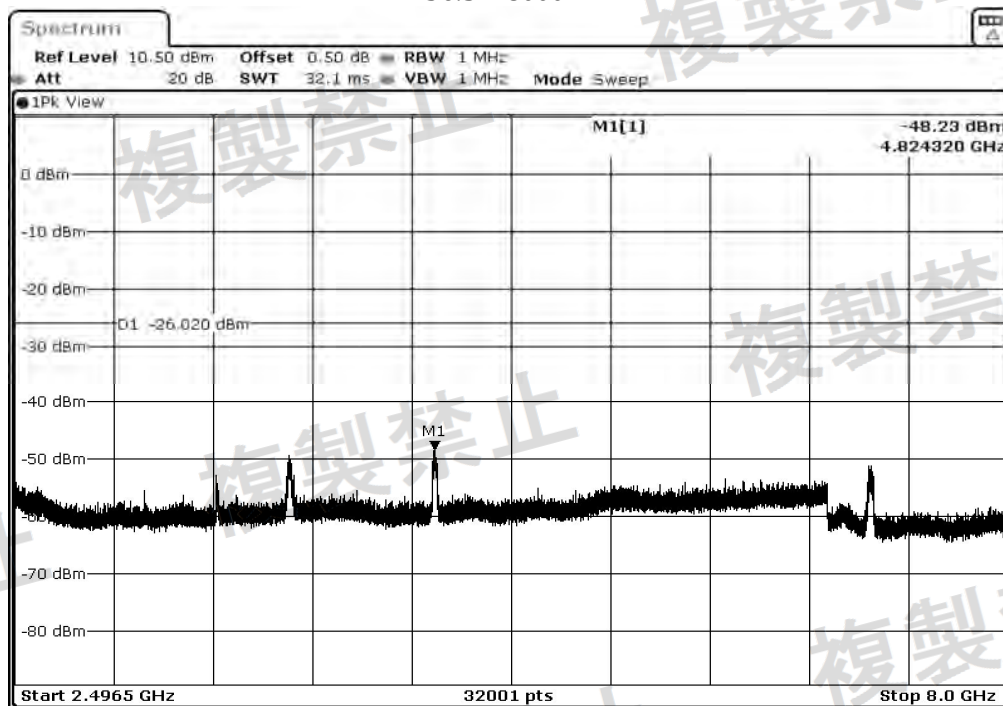
Date: 1.APR.2021 03:23:38

2483.5 – 2496.5MHz



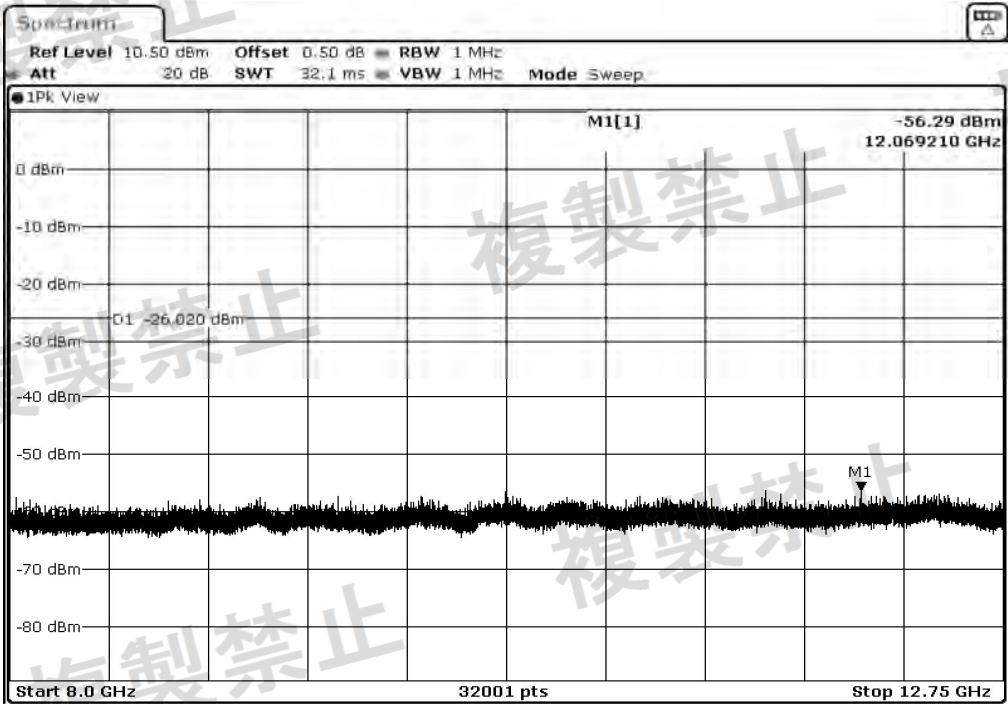
Date: 1.APR.2021 03:24:00

2496.5 – 8000MHz



Date: 1.APR.2021 03:24:23

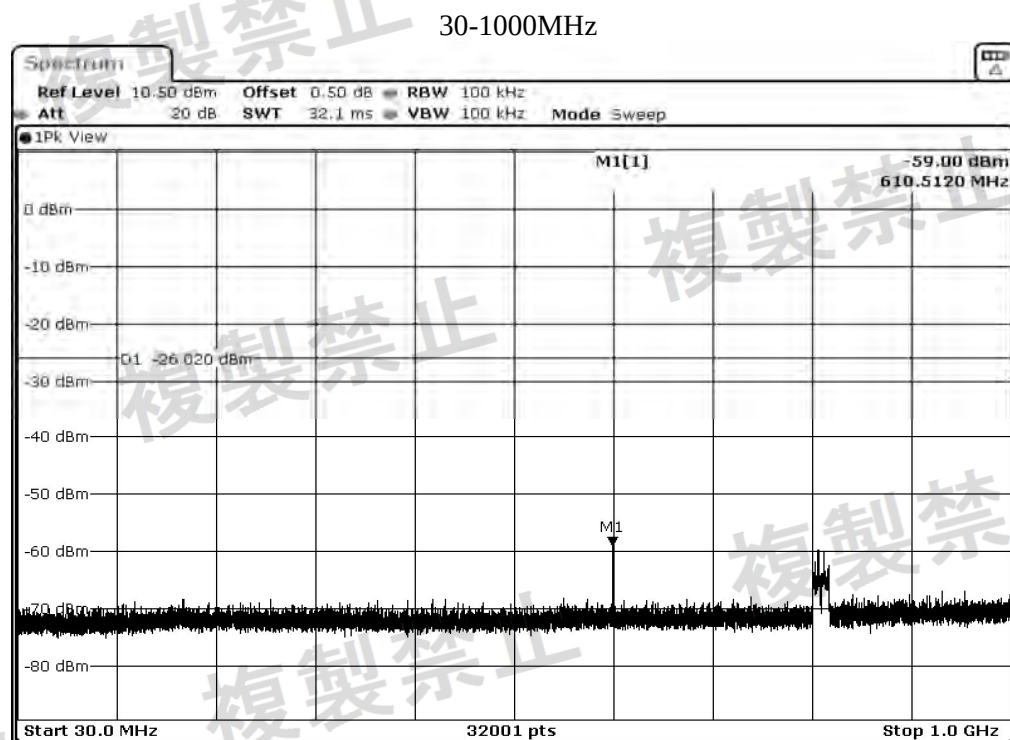
8000 – 12750MHz



Date: 1.APR.2021 03:24:45

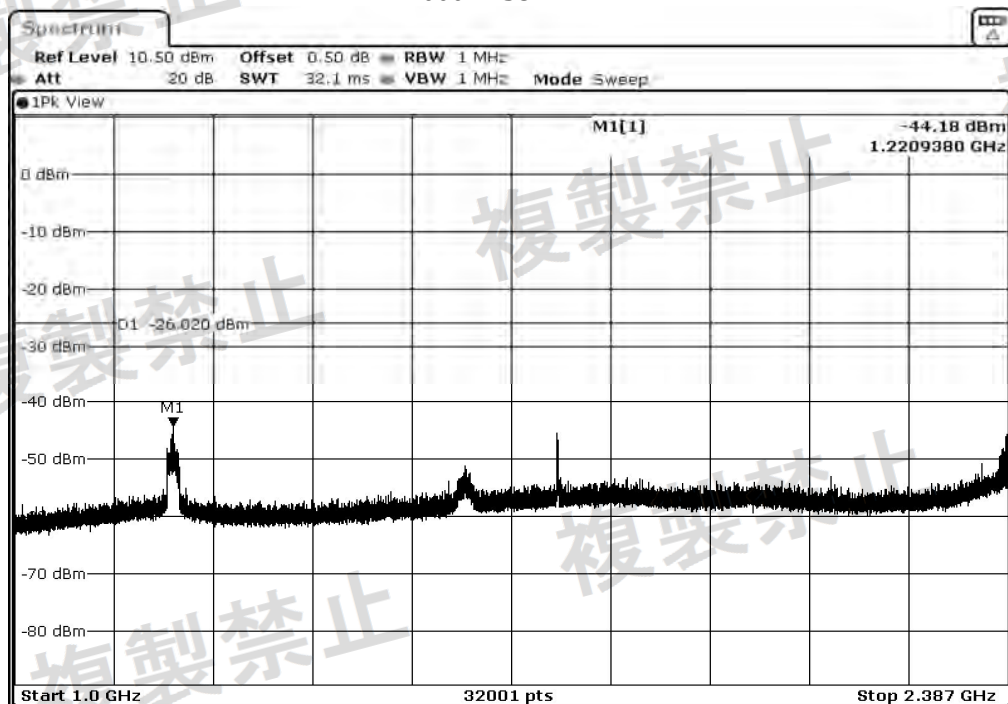
Product : Wireless speaker
 Test Item : Transmitter Spurious Emissions
 Test Mode : Mode 2: Transmit (802.11g 6Mbps) 2442MHz

Frequency Range (MHz)	Reading Value (dBm)	Limit (dBm)
30-1000	-59.00	-26 (2.5uW)
1000 – 2387	-44.18	-26 (2.5uW)
2387 – 2400	-39.86	-16 (25uW)
2483.5 – 2496.5	-41.28	-16 (25uW)
2496.5 – 8000	-47.96	-26 (2.5uW)
8000 – 12750	-55.98	-26 (2.5uW)



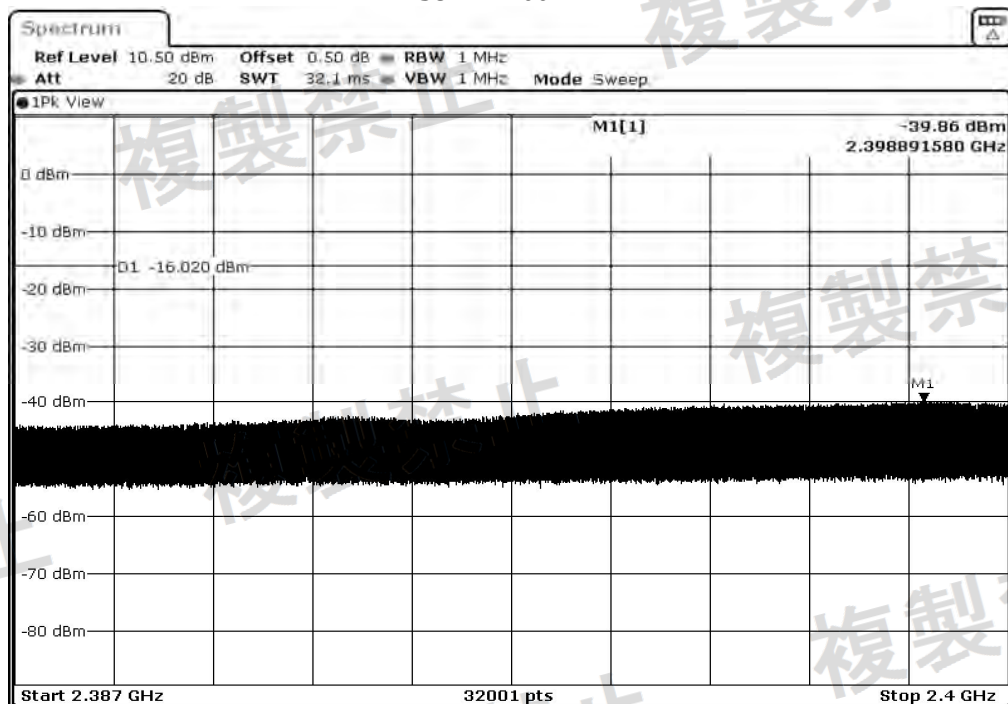
Date: 1.APR.2021 03:37:07

1000– 2387MHz



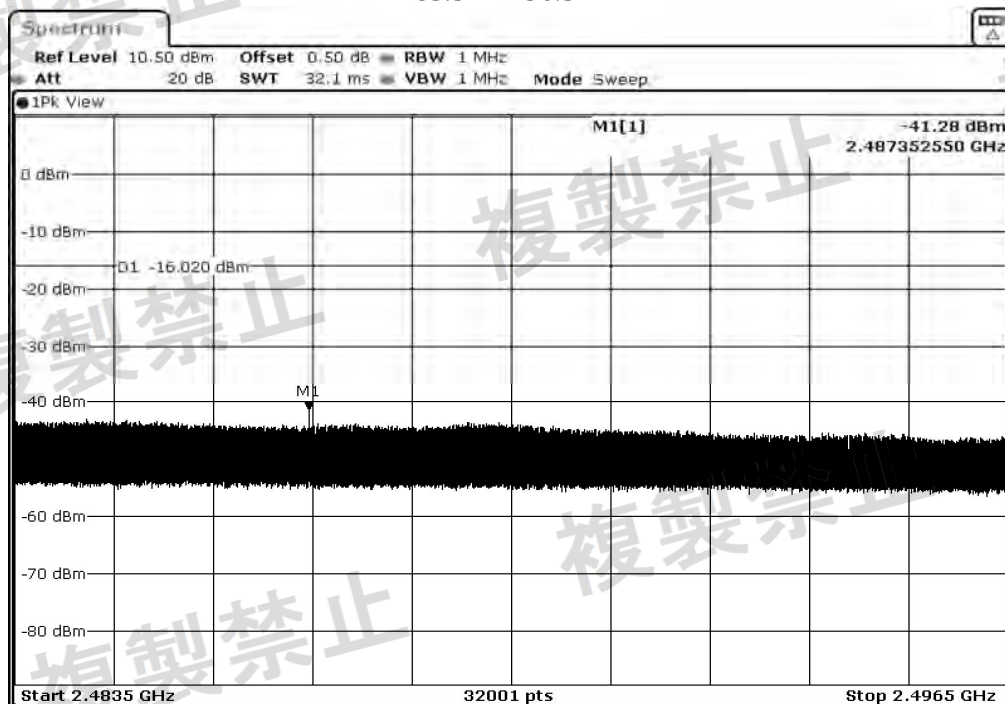
Date: 1.APR.2021 03:37:29

2387 – 2400 MHz



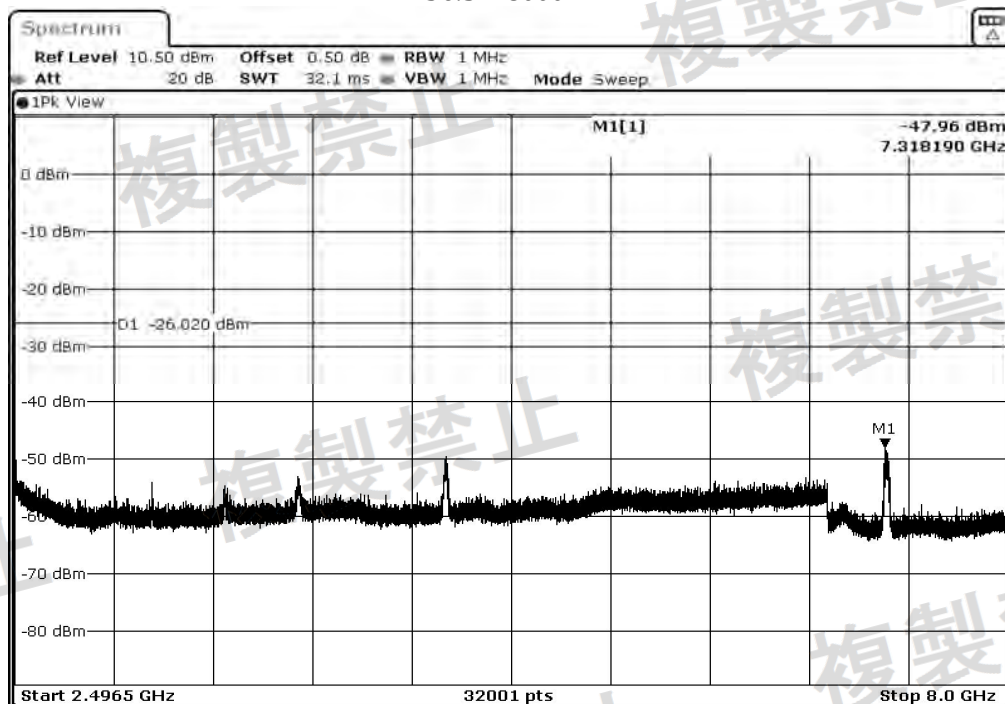
Date: 1.APR.2021 03:37:52

2483.5 – 2496.5MHz



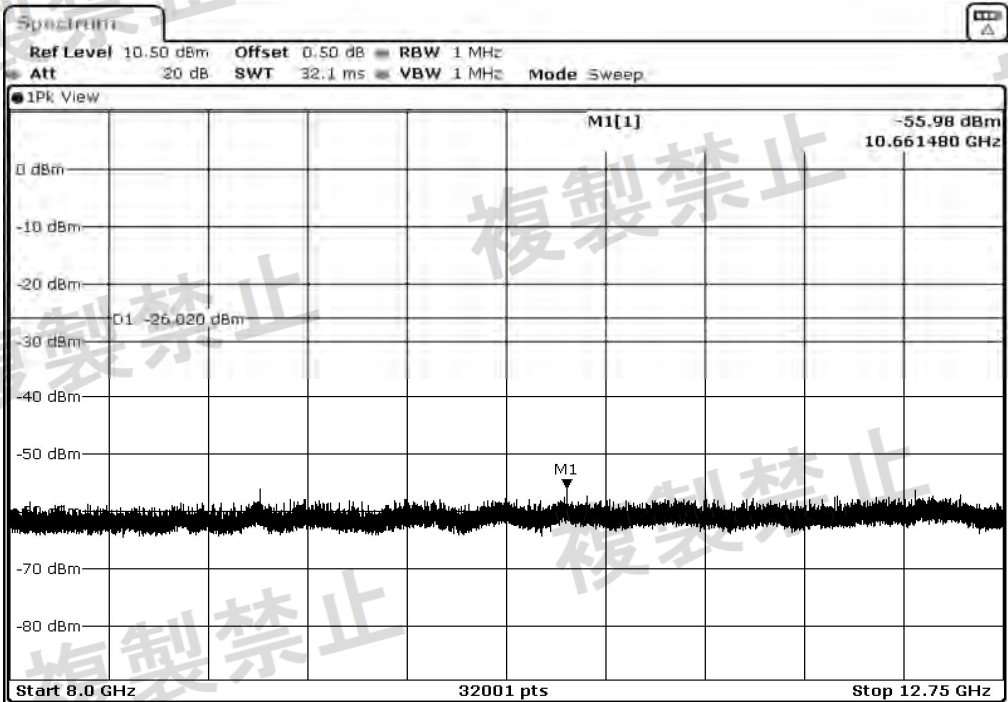
Date: 1.APR.2021 03:38:14

2496.5 – 8000MHz



Date: 1.APR.2021 03:38:37

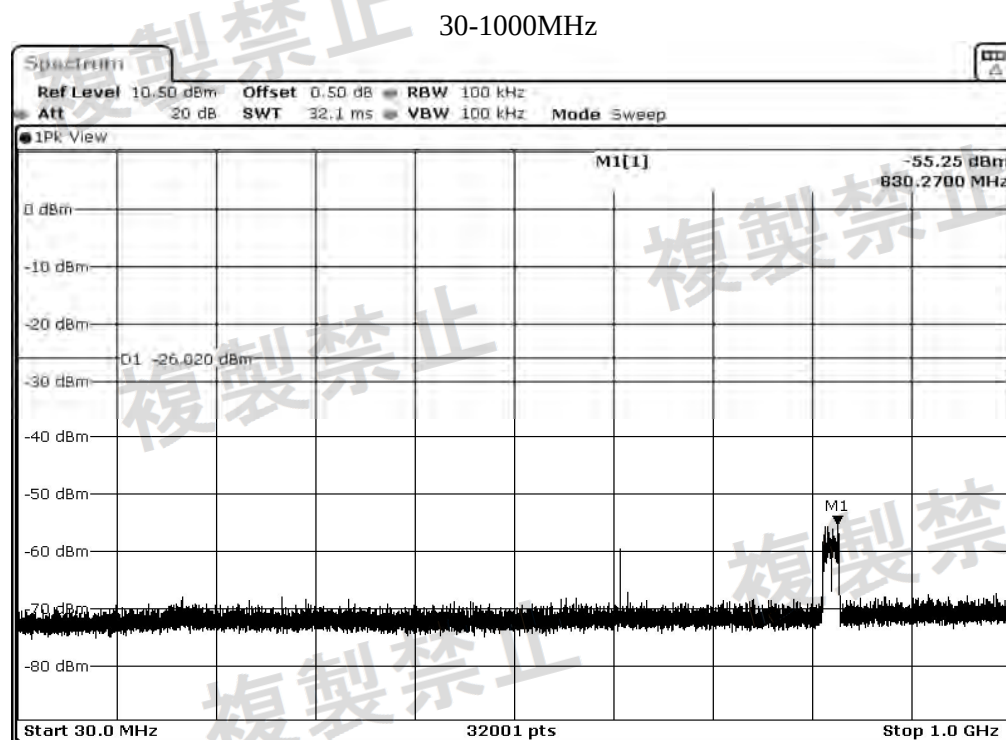
8000 – 12750MHz



Date: 1.APR.2021 03:38:59

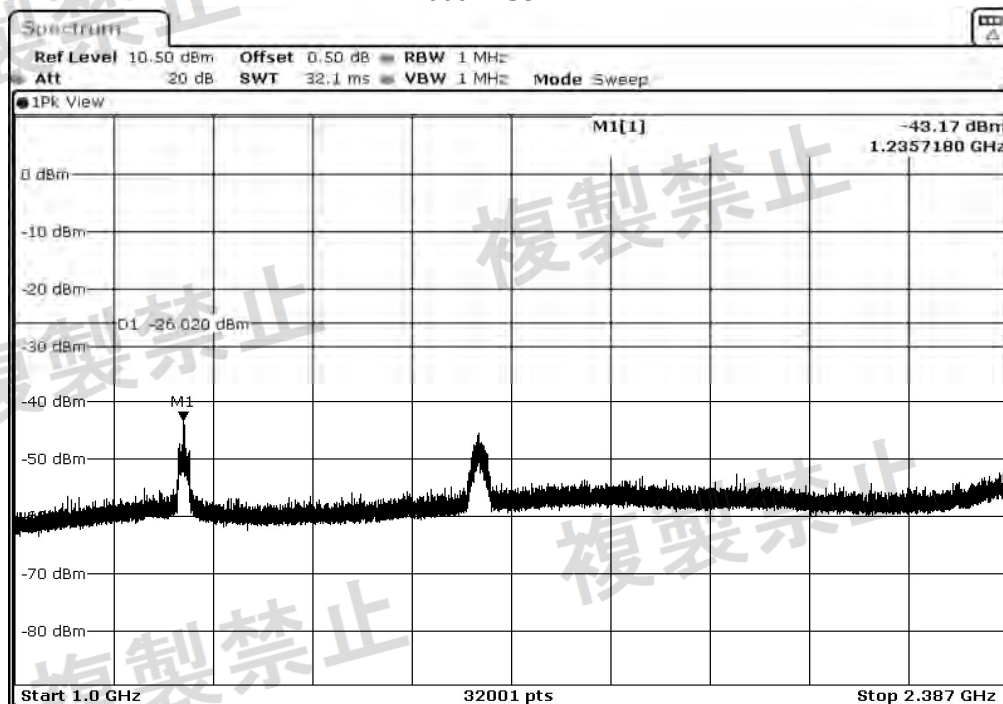
Product : Wireless speaker
 Test Item : Transmitter Spurious Emissions
 Test Mode : Mode 2: Transmit (802.11g 6Mbps) 2472MHz

Frequency Range (MHz)	Reading Value (dBm)	Limit (dBm)
30-1000	-55.25	-26 (2.5uW)
1000 – 2387	-43.17	-26 (2.5uW)
2387 – 2400	-50.39	-16 (25uW)
2483.5 – 2496.5	-20.64	-16 (25uW)
2496.5 – 8000	-36.23	-26 (2.5uW)
8000 – 12750	-56.32	-26 (2.5uW)



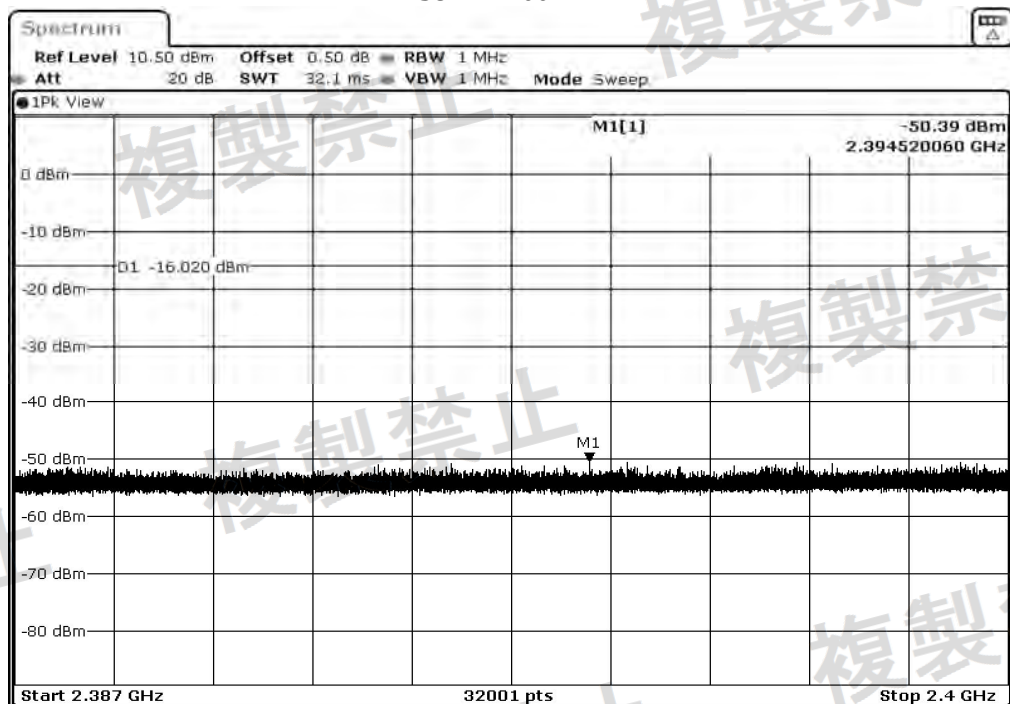
Date: 1.APR.2021 05:13:32

1000– 2387MHz



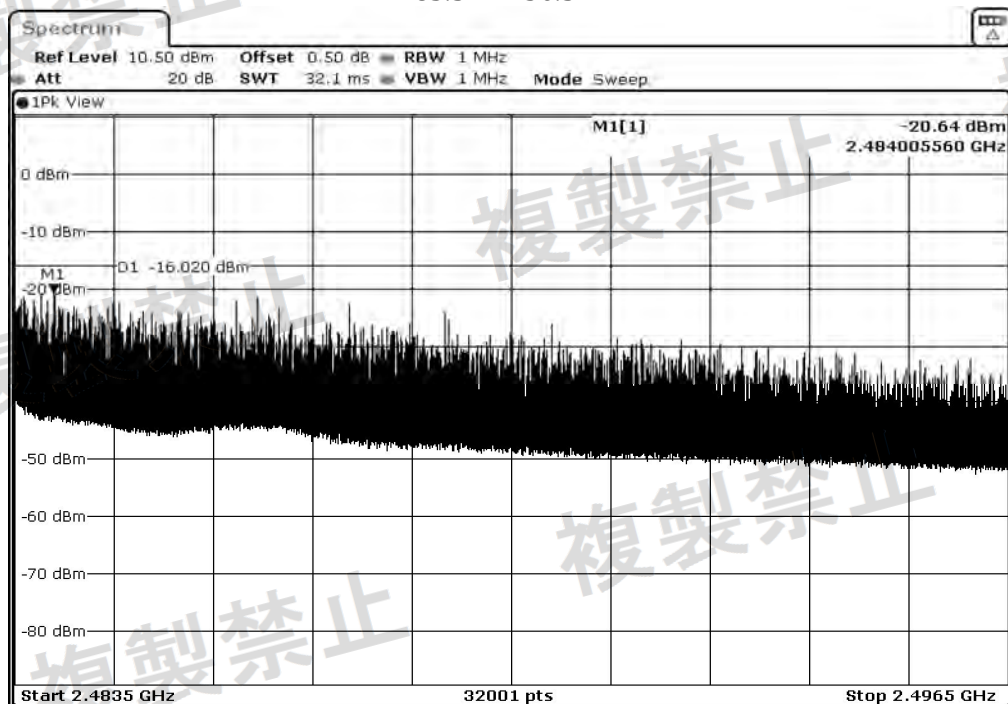
Date: 1.APR.2021 05:13:54

2387 – 2400 MHz



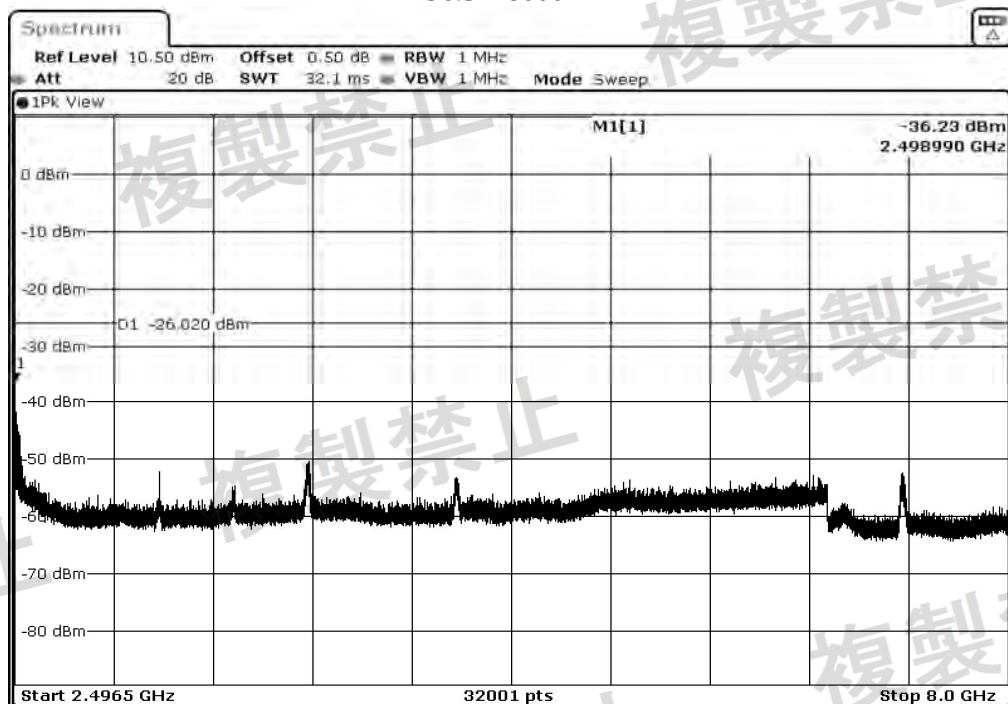
Date: 1.APR.2021 05:14:17

2483.5 – 2496.5MHz



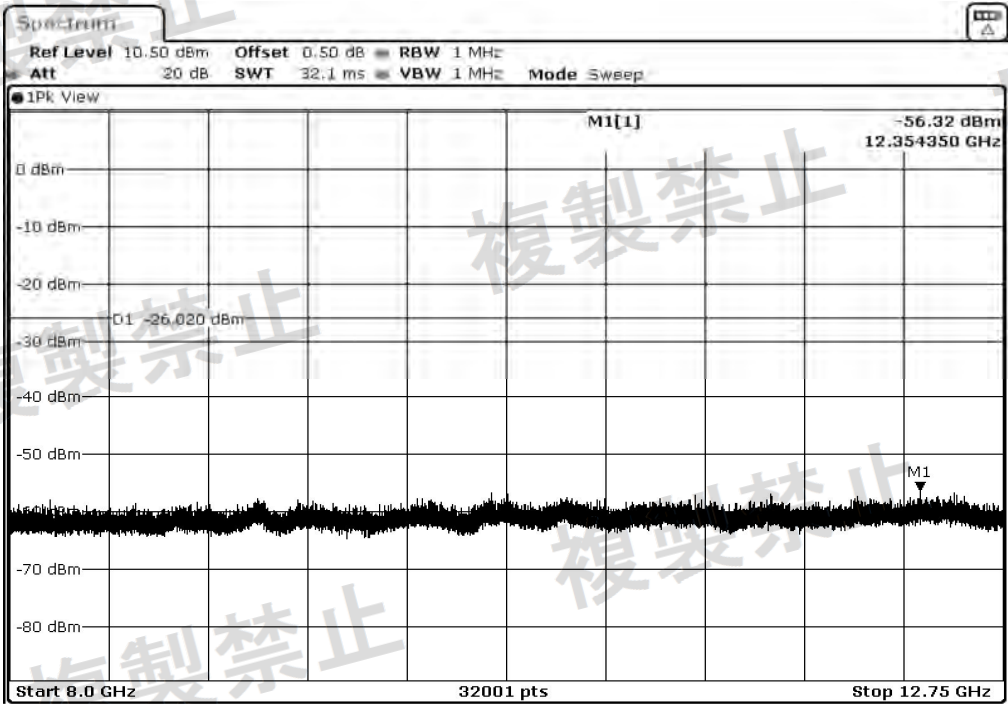
Date: 1.APR.2021 05:14:39

2496.5 – 8000MHz



Date: 1.APR.2021 05:15:02

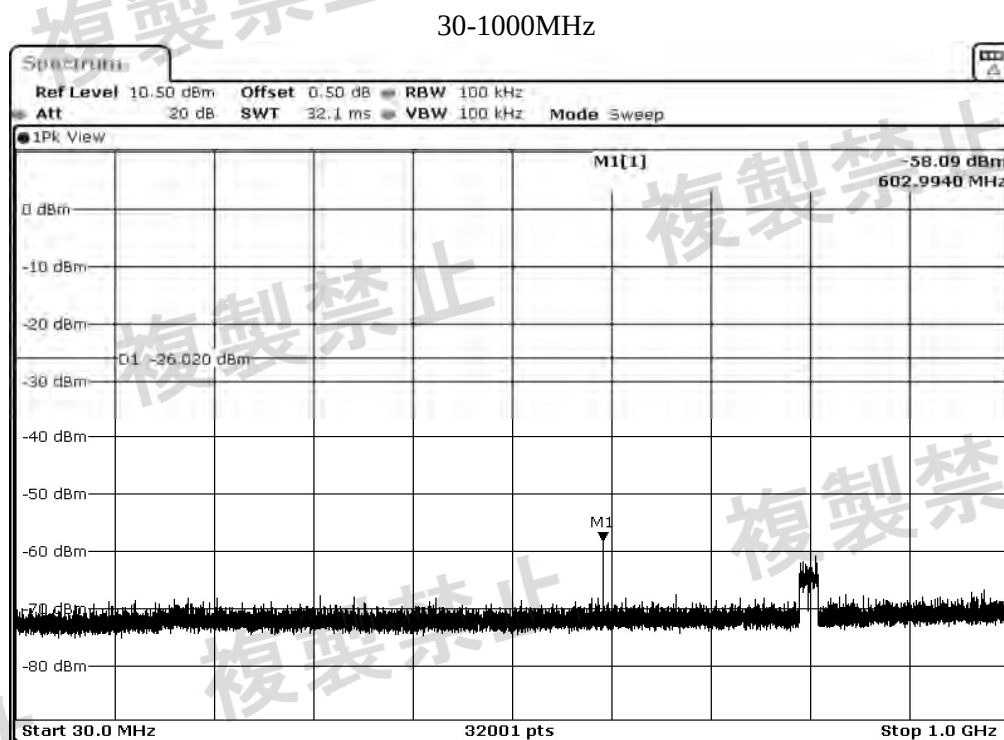
8000 – 12750MHz



Date: 1.APR.2021 05:15:24

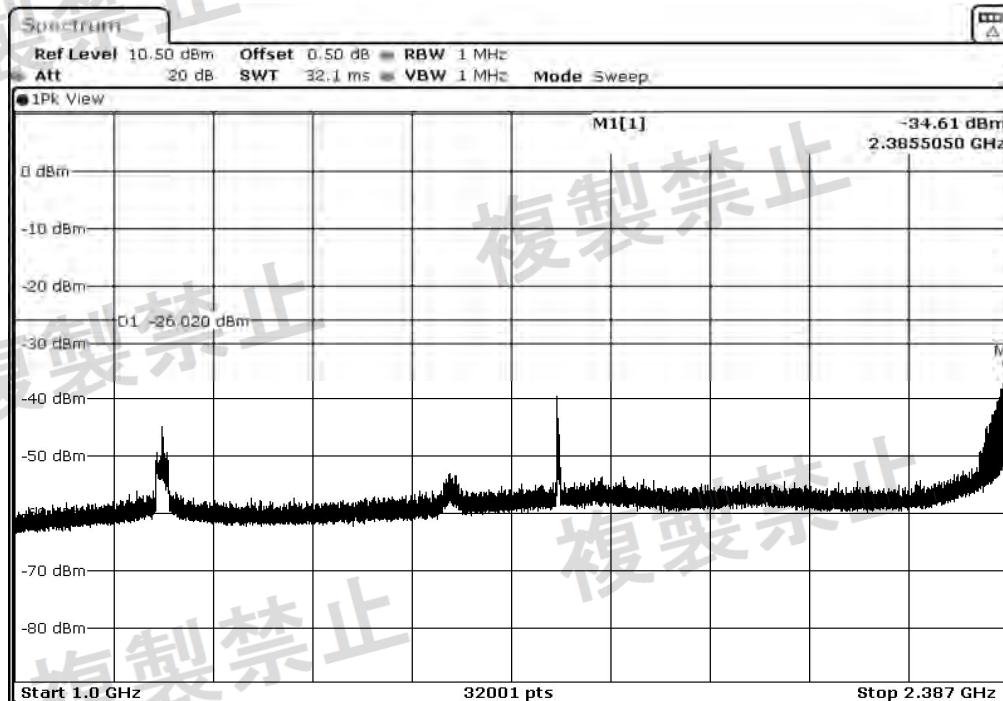
Product : Wireless speaker
Test Item : Transmitter Spurious Emissions
Test Mode : Mode 3: Transmit (802.11n20 7.2Mbps) 2412MHz

Frequency Range (MHz)	Reading Value (dBm)	Limit (dBm)
30-1000	-58.09	-26 (2.5uW)
1000 – 2387	-34.61	-26 (2.5uW)
2387 – 2400	-31.95	-16 (25uW)
2483.5 – 2496.5	-50.59	-16 (25uW)
2496.5 – 8000	-47.70	-26 (2.5uW)
8000 – 12750	-56.61	-26 (2.5uW)



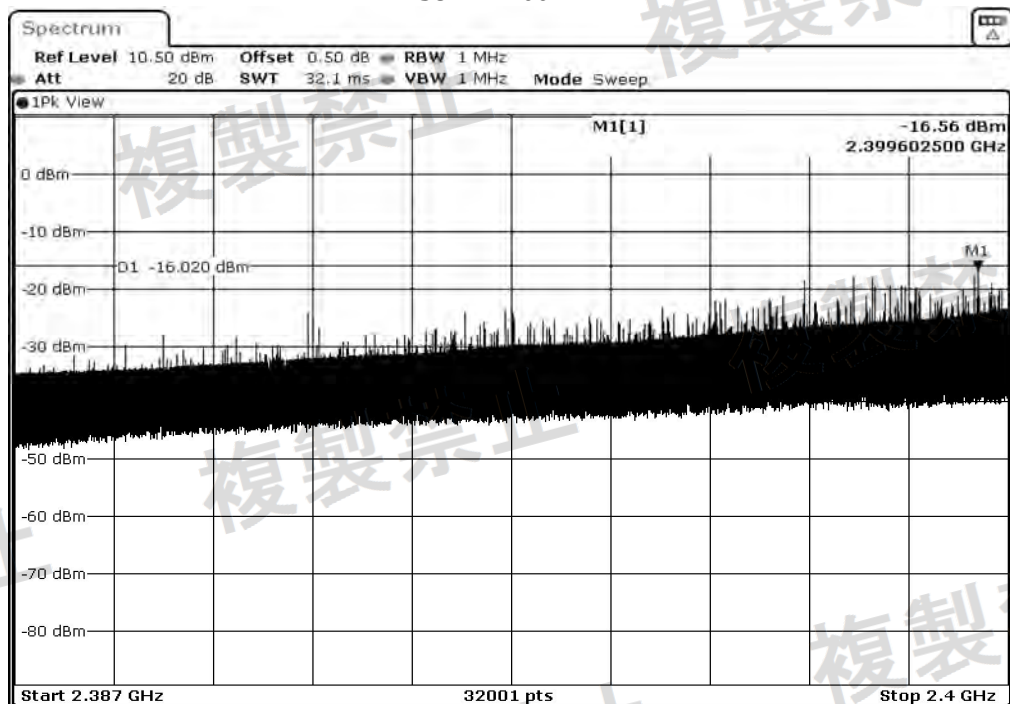
Date: 1.APR.2021 05:38:10

1000– 2387MHz



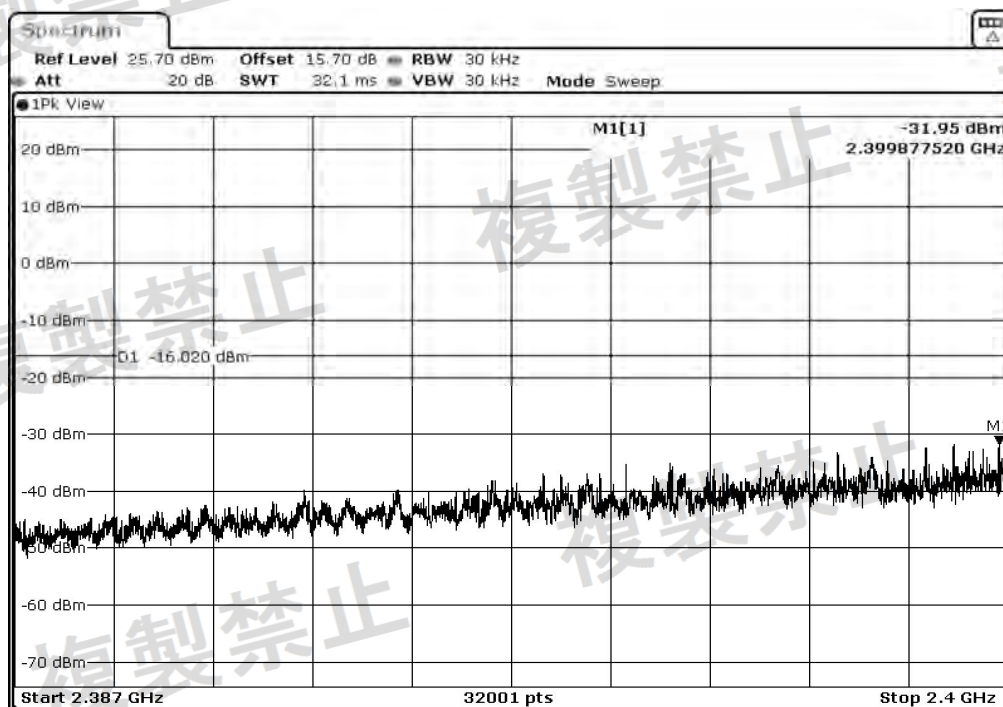
Date: 1.APR.2021 05:38:32

2387 – 2400 MHz



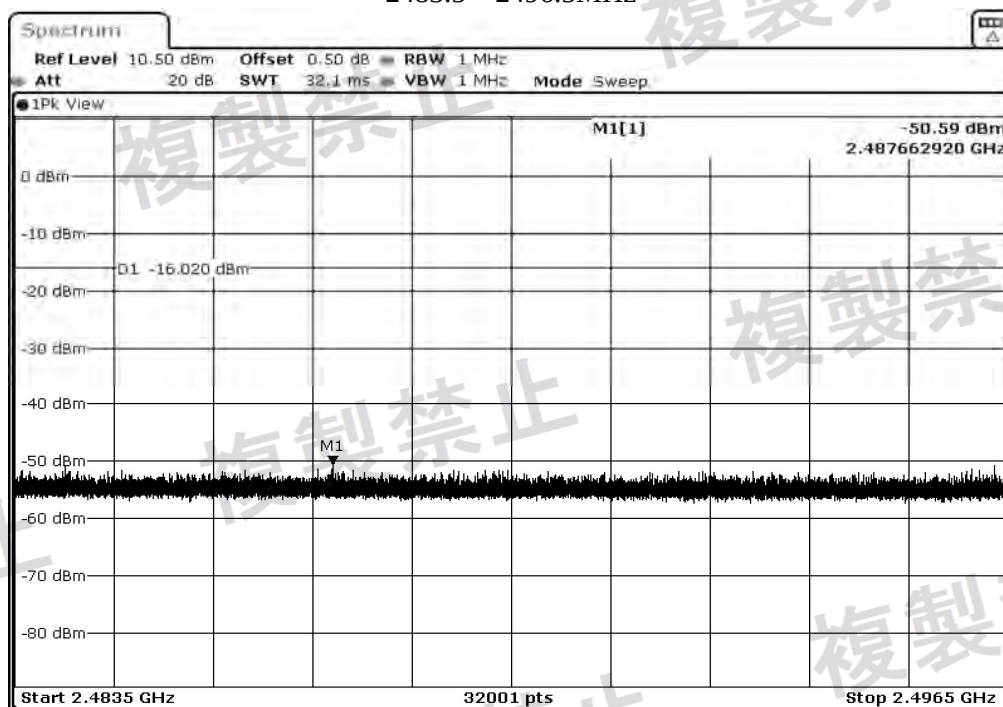
Date: 1.APR.2021 05:38:54

2387 – 2400 MHz - 1



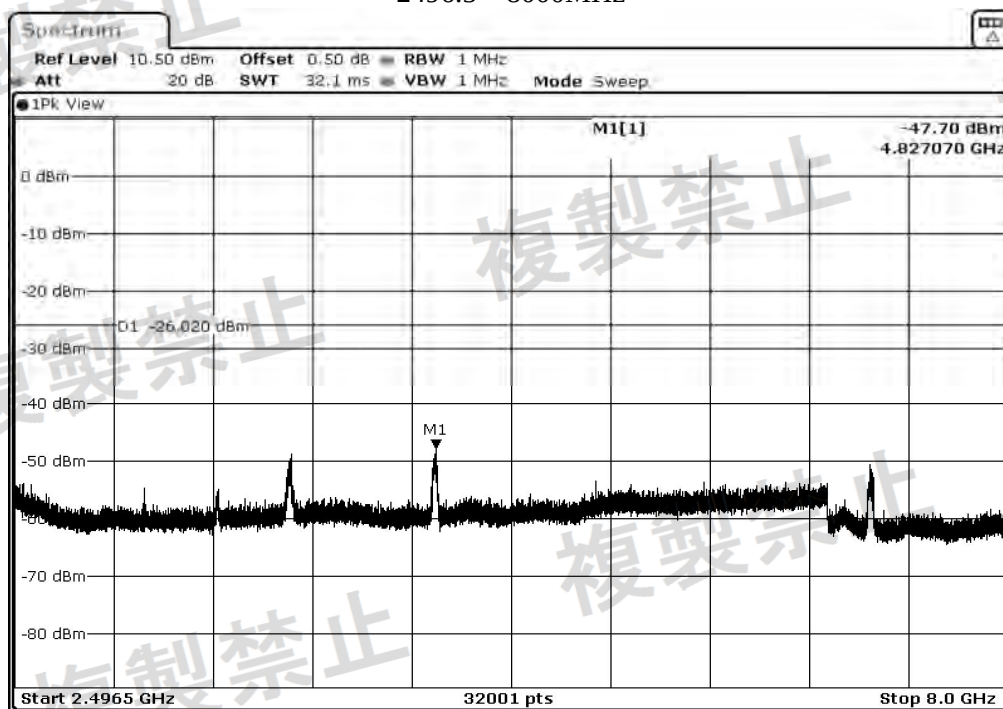
Date: 1.APR.2021 05:39:21

2483.5 – 2496.5MHz



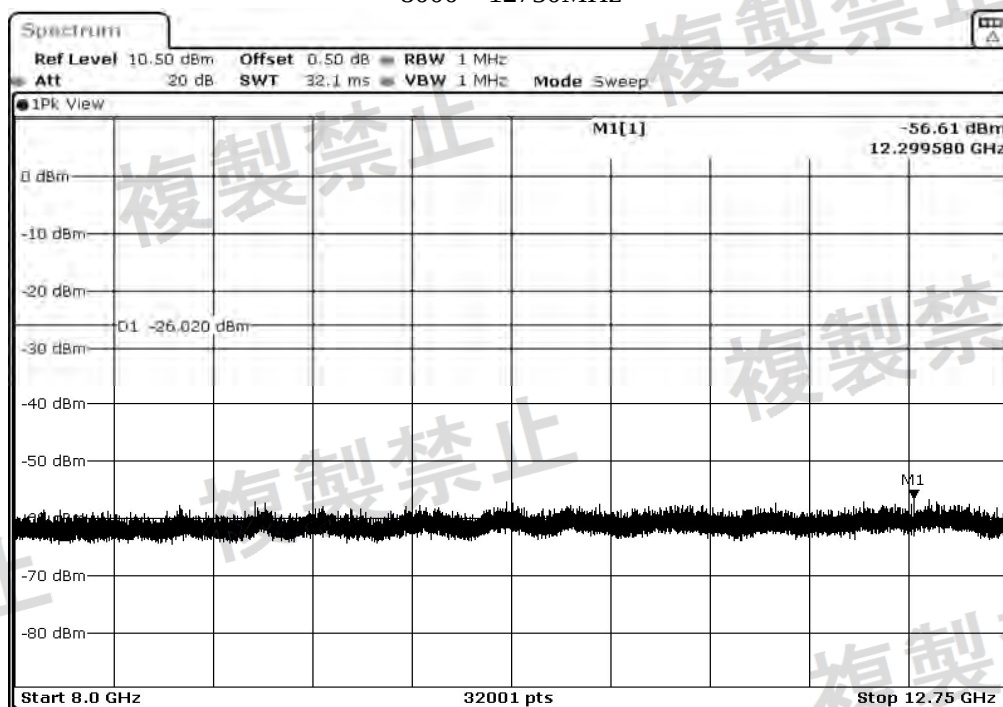
Date: 1.APR.2021 05:39:44

2496.5 – 8000MHz



Date: 1.APR.2021 05:40:06

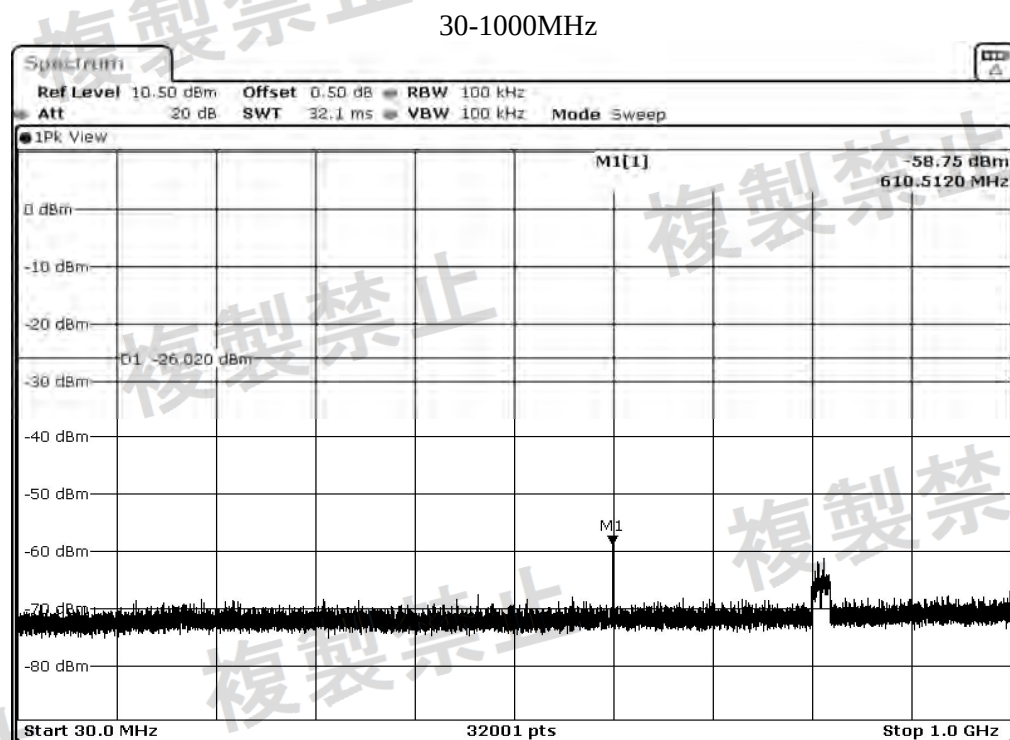
8000 – 12750MHz



Date: 1.APR.2021 05:40:29

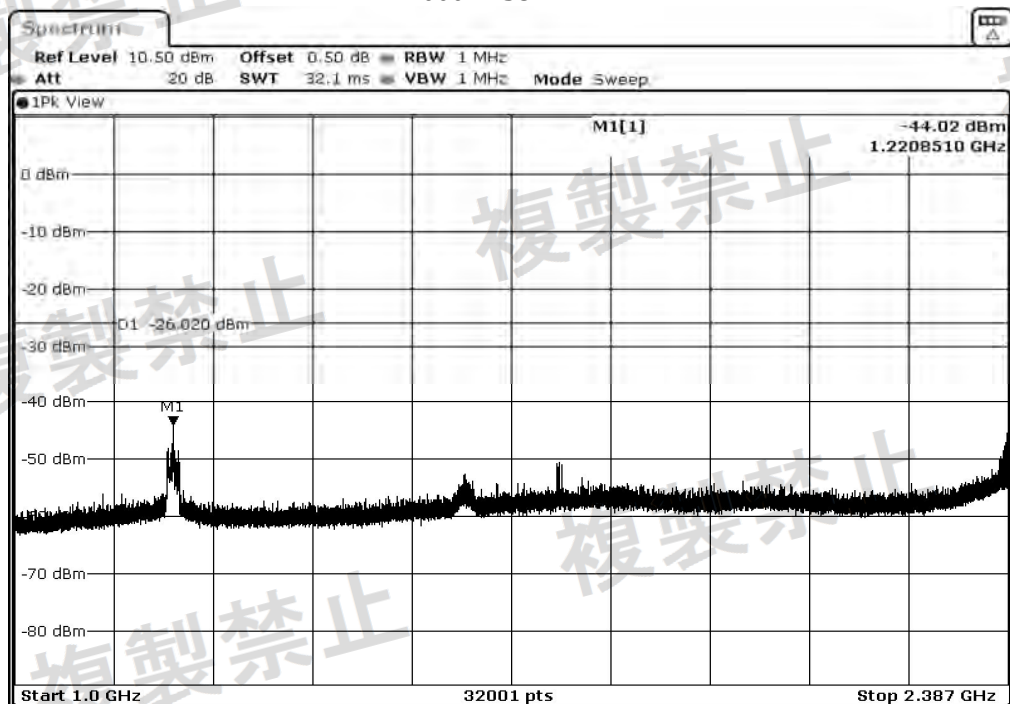
Product : Wireless speaker
 Test Item : Transmitter Spurious Emissions
 Test Mode : Mode 3: Transmit (802.11n20 7.2Mbps) 2442MHz

Frequency Range (MHz)	Reading Value (dBm)	Limit (dBm)
30-1000	-58.75	-26 (2.5uW)
1000 – 2387	-44.02	-26 (2.5uW)
2387 – 2400	-40.81	-16 (25uW)
2483.5 – 2496.5	-43.24	-16 (25uW)
2496.5 – 8000	-48.54	-26 (2.5uW)
8000 – 12750	-56.86	-26 (2.5uW)



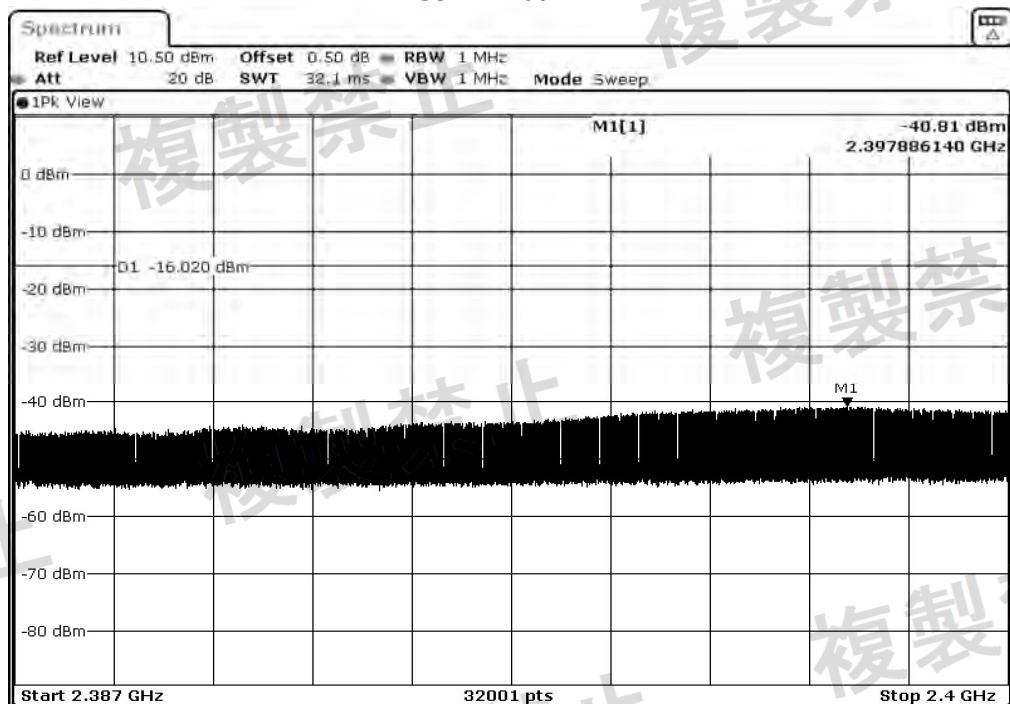
Date: 1.APR.2021 05:46:20

1000– 2387MHz



Date: 1.APR.2021 05:46:42

2387 – 2400 MHz



Date: 1.APR.2021 05:47:05

Spectrum

Ref Level 10.50 dBm Offset 0.50 dB RBW 1 MHz
Att 20 dB SWT 32.1 ms VBW 1 MHz Mode Sweep

1Pk View

M1[1] -43.24 dBm
2.485231180 GHz

D1 -16.020 dBm

M1

Start 2.4835 GHz 32001 pts Stop 2.4965 GHz

Spectrum

Ref Level 10.50 dBm Offset 0.50 dB RBW 1 MHz
Att 20 dB SWT 32.1 ms VBW 1 MHz Mode Sweep

● 1Pk View

M1[1] -48.54 dBm
2.497960 GHz

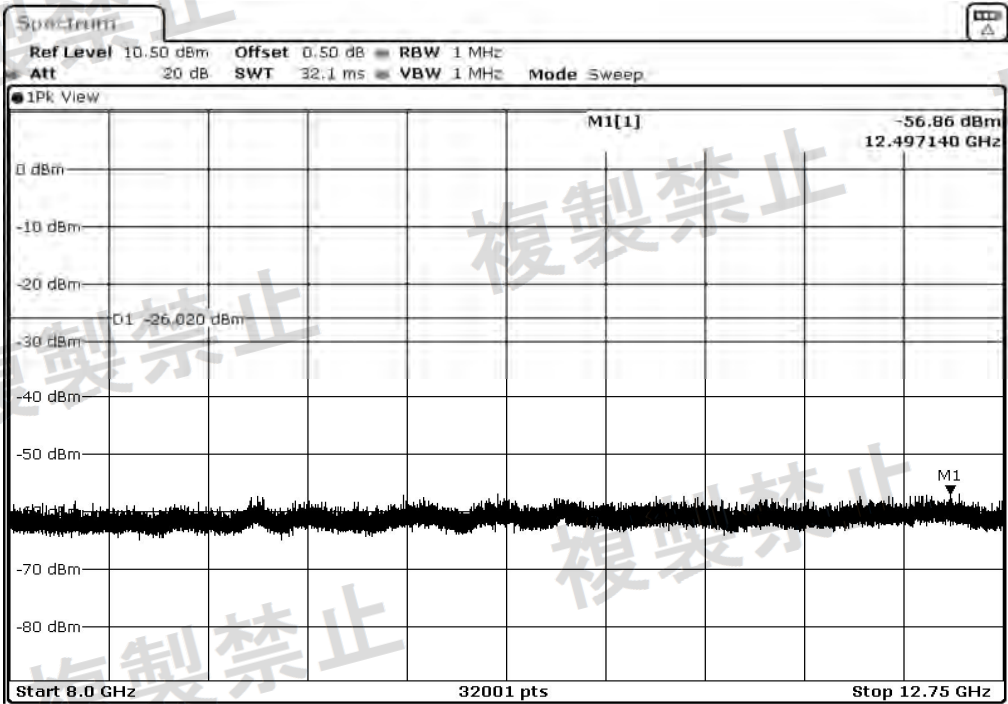
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm

D1 -26.020 dBm

Start 2.4965 GHz 32001 pts Stop 8.0 GHz

Page: 75 of 111

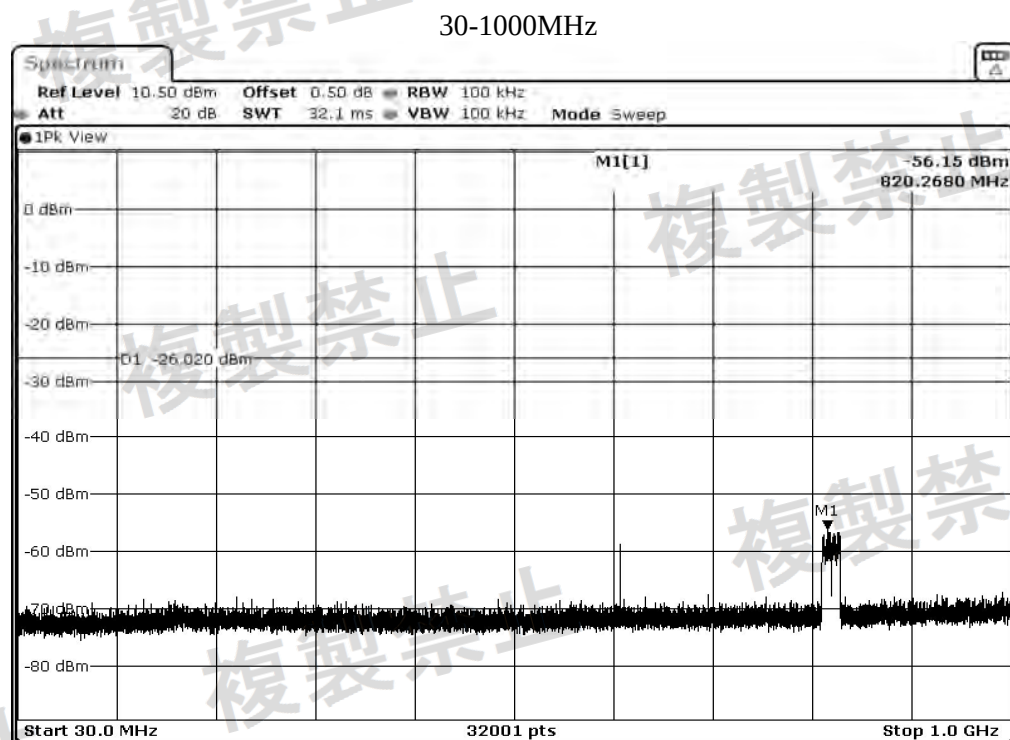
8000 – 12750MHz



Date: 1.APR.2021 05:48:12

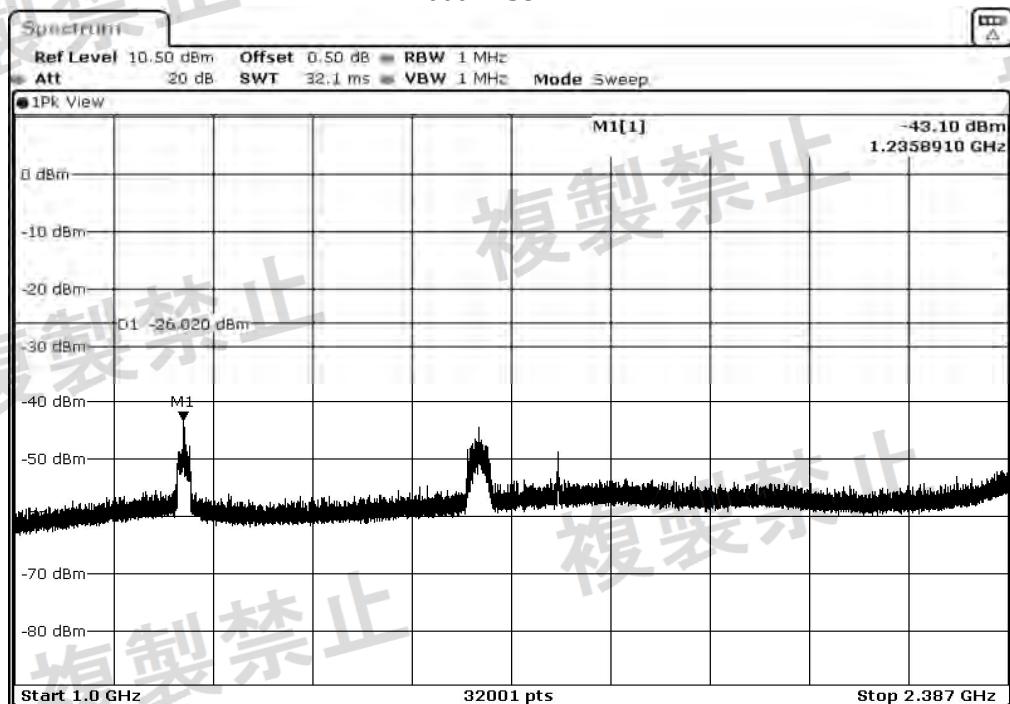
Product : Wireless speaker
 Test Item : Transmitter Spurious Emissions
 Test Mode : Mode 3: Transmit (802.11n20 7.2Mbps) 2472MHz

Frequency Range (MHz)	Reading Value (dBm)	Limit (dBm)
30-1000	-56.15	-26 (2.5uW)
1000 – 2387	-43.10	-26 (2.5uW)
2387 – 2400	-49.59	-16 (25uW)
2483.5 – 2496.5	-48.44	-16 (25uW)
2496.5 – 8000	-37.53	-26 (2.5uW)
8000 – 12750	-56.65	-26 (2.5uW)



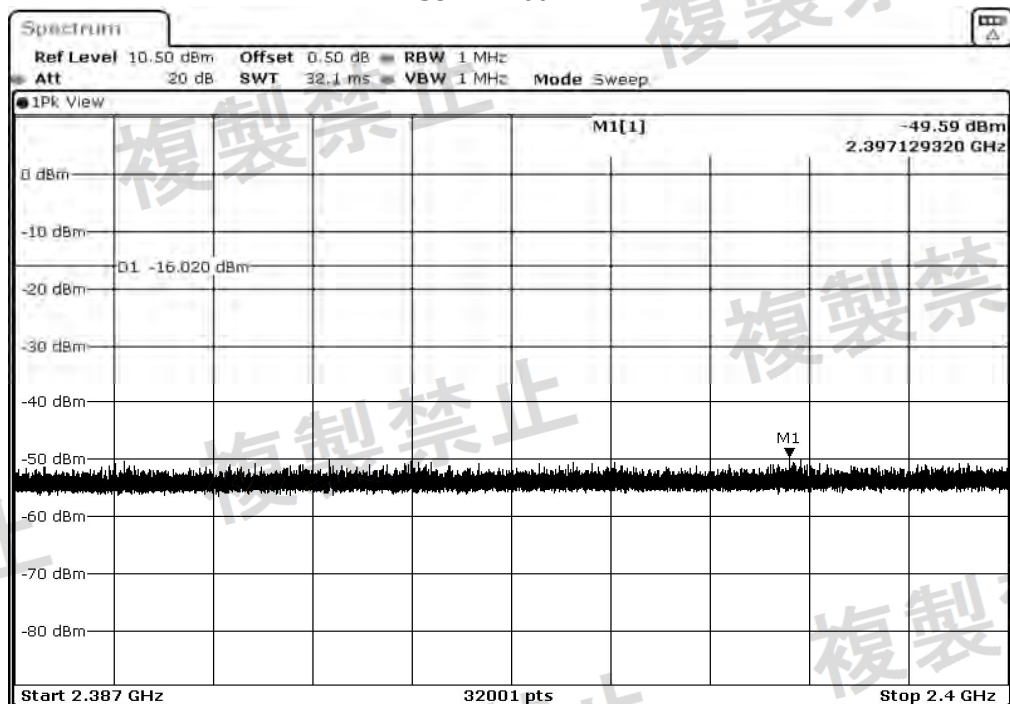
Date: 1.APR.2021 05:52:08

1000– 2387MHz



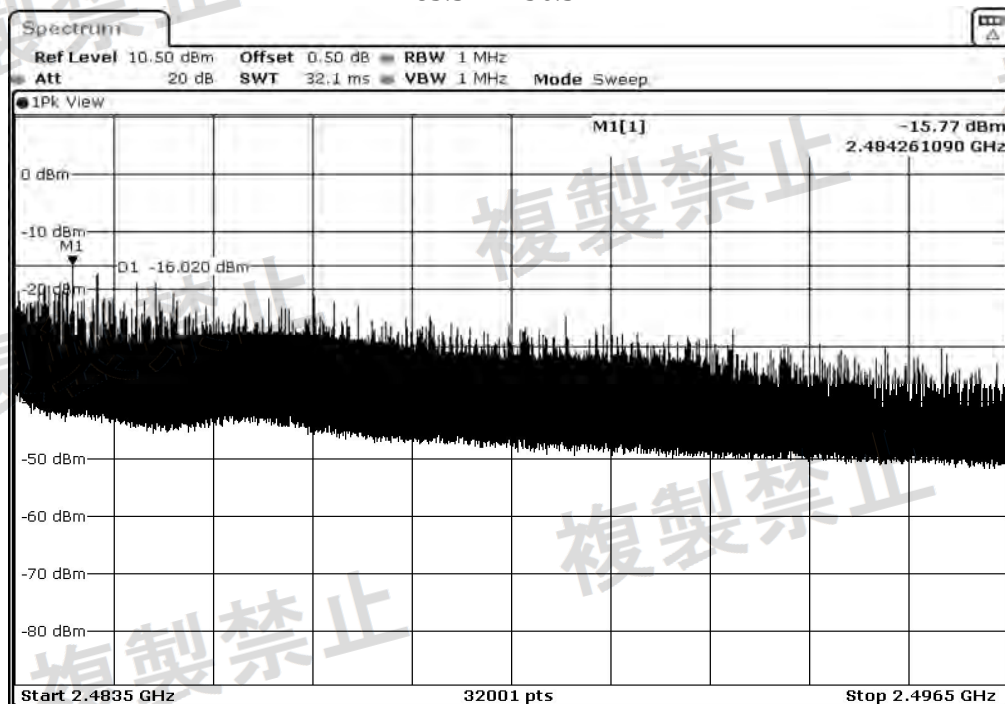
Date: 1.APR.2021 05:52:30

2387 – 2400 MHz



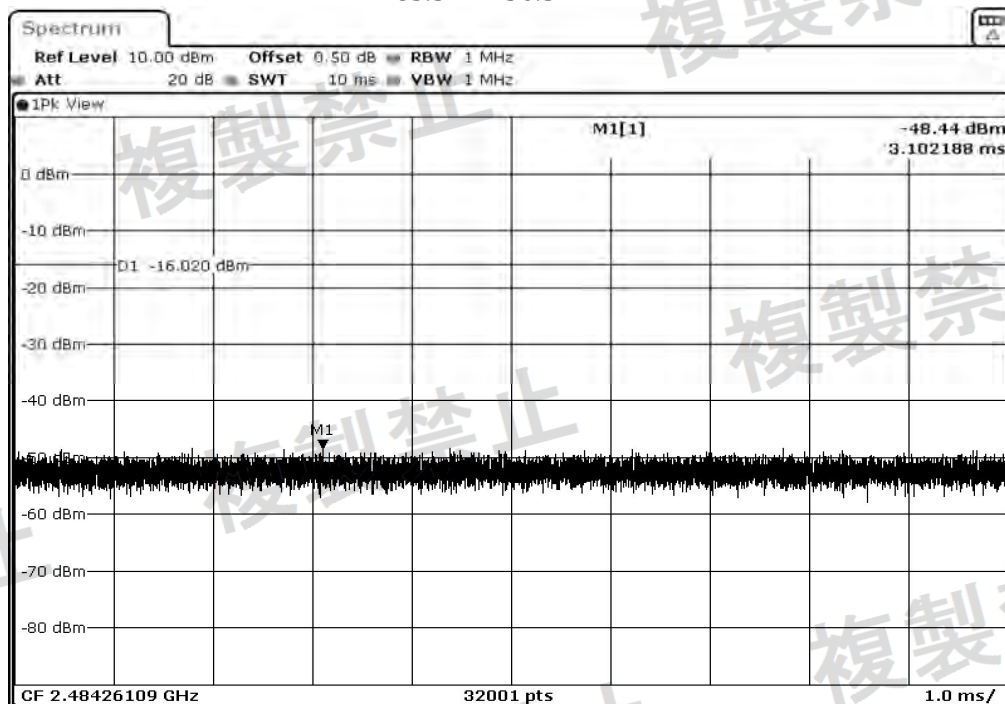
Date: 1.APR.2021 05:52:53

2483.5 – 2496.5MHz



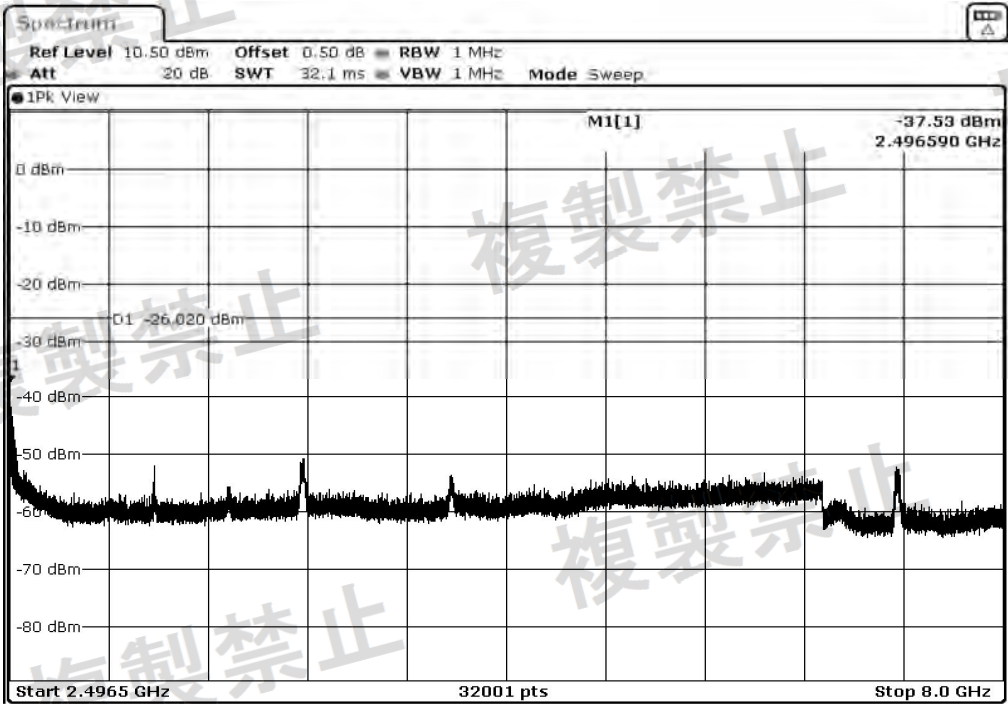
Date: 1.APR.2021 05:53:15

2483.5 – 2496.5MHz - 1



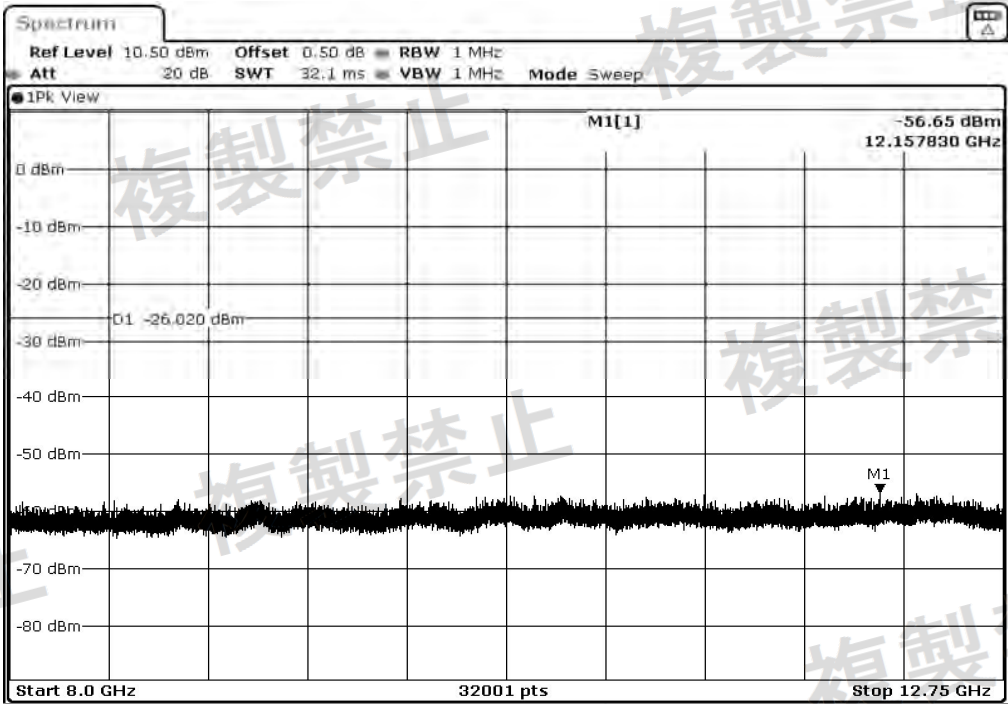
Date: 1.APR.2021 05:53:38

2496.5 – 8000MHz



Date: 1.APR.2021 05:54:00

8000 – 12750MHz



Date: 1.APR.2021 05:54:22

Test Result	PASS
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7. Receiver Suprious Emissions

7.1. Test Setup



7.2. Test Procedure

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

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

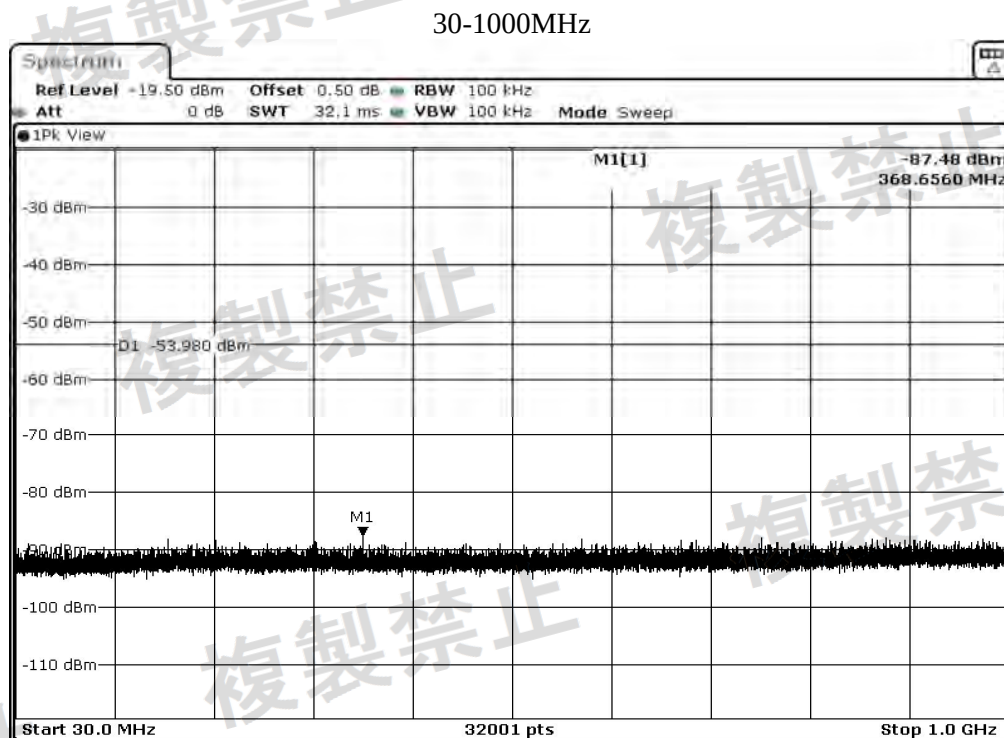
7.3. Limits

- $\leq 4\text{nW}$ for 30-1000 MHz
- $\leq 20\text{nW}$ for 1000 – 3000 MHz
- $\leq 20\text{nW}$ for 3000 – 8000 MHz
- $\leq 20\text{nW}$ for 8000 – 12500 MHz

7.4. Test Result of Receiver Spurious Emissions

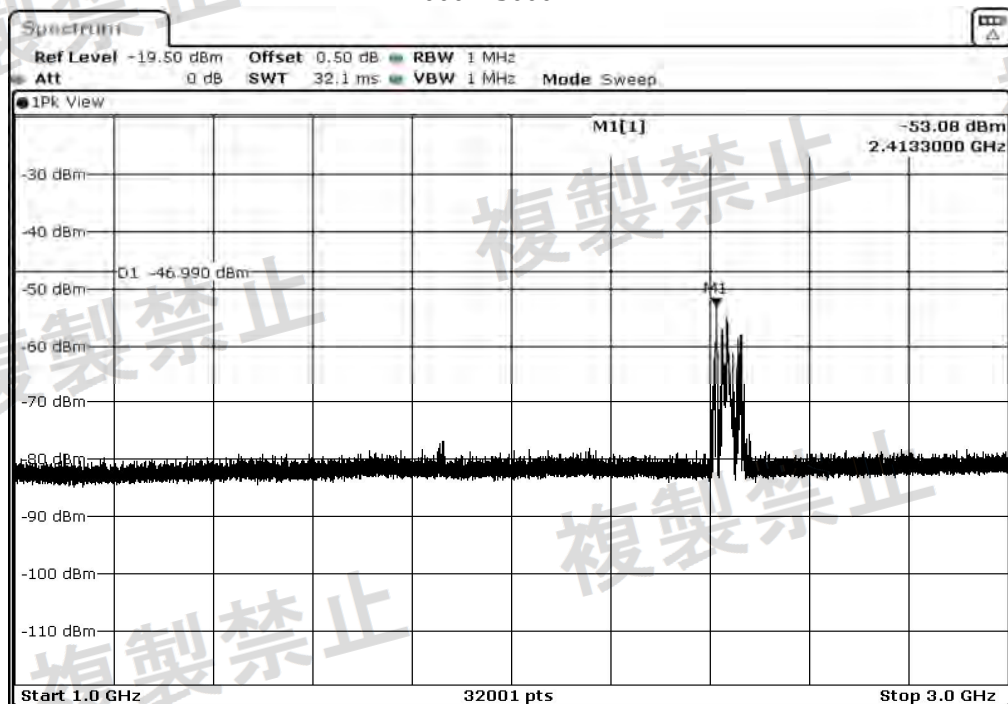
Product : Wireless speaker
 Test Item : Receiver Spurious Emissions
 Test Mode : Mode 4: Receive (802.11b 1Mbps) 2412MHz

Frequency Range (MHz)	Reading Value (dBm)	Limit (dBm)
30-1000	-87.48	-54 (4nW)
1000 – 3000	-53.08	-47 (20nW)
3000 – 8000	-72.83	-47 (20nW)
8000 – 12750	-76.28	-47 (20nW)



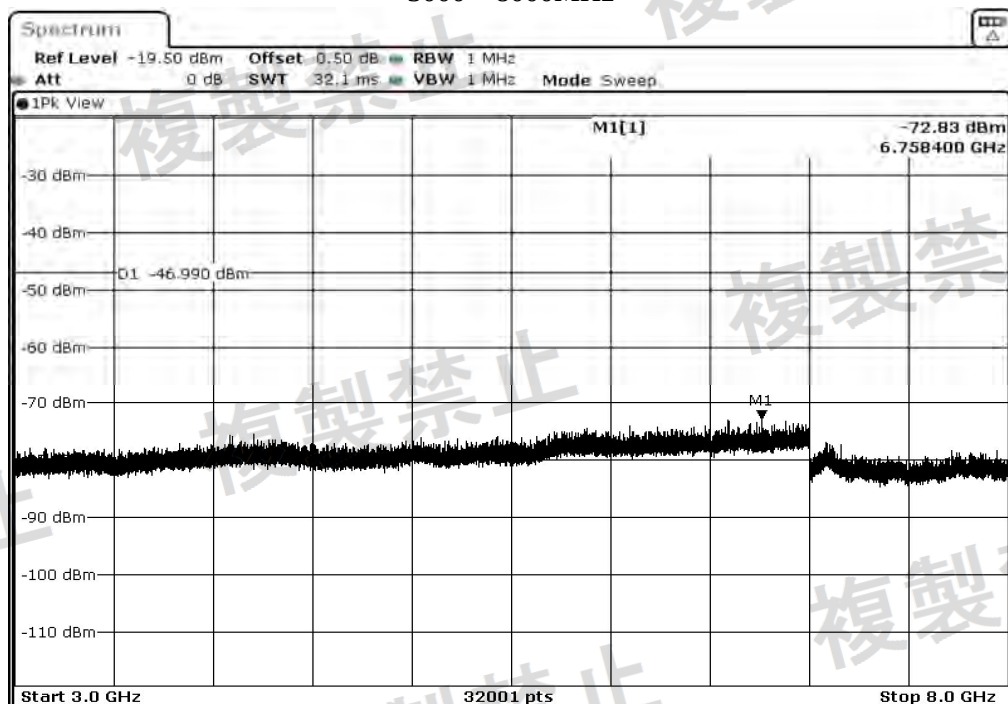
Date: 1.APR.2021 07:09:45

1000 – 3000MHz



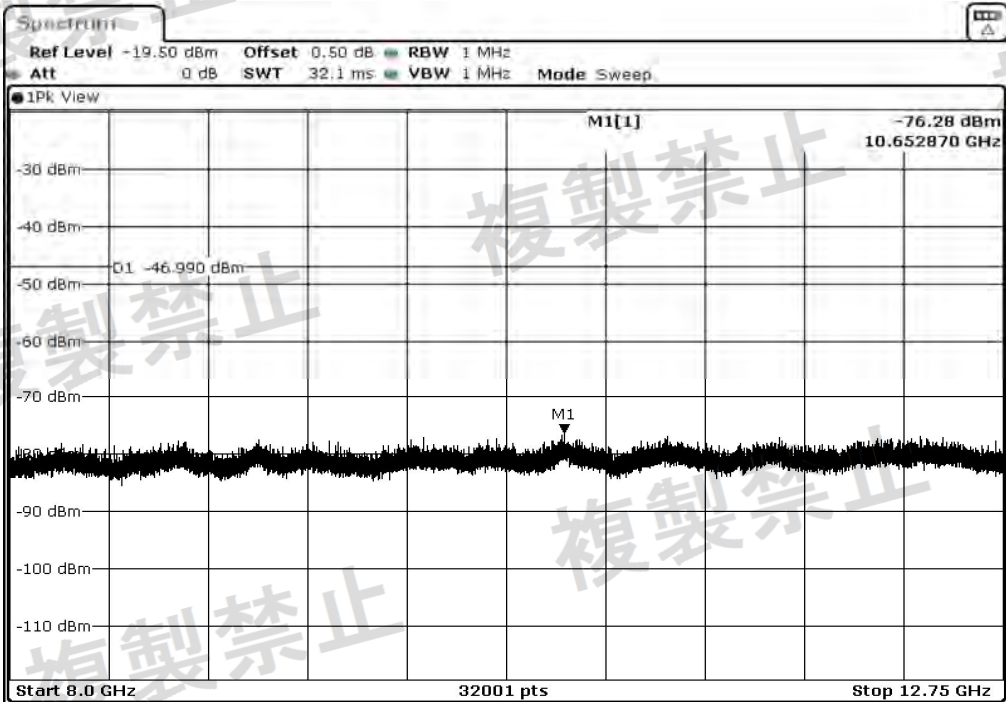
Date: 1.APR.2021 07:10:08

3000 – 8000MHz



Date: 1.APR.2021 07:10:30

8000 – 12750MHz

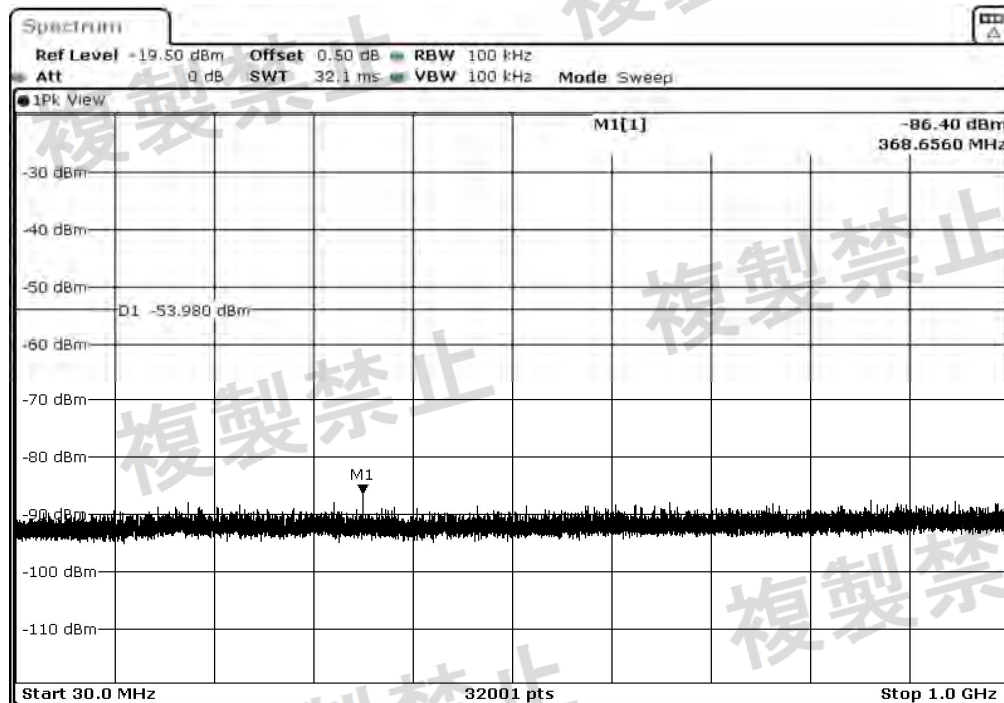


Date: 1.APR.2021 07:10:53

Product : Wireless speaker
Test Item : Receiver Spurious Emissions
Test Mode : Mode 4: Receive (802.11b 1Mbps) 2442MHz

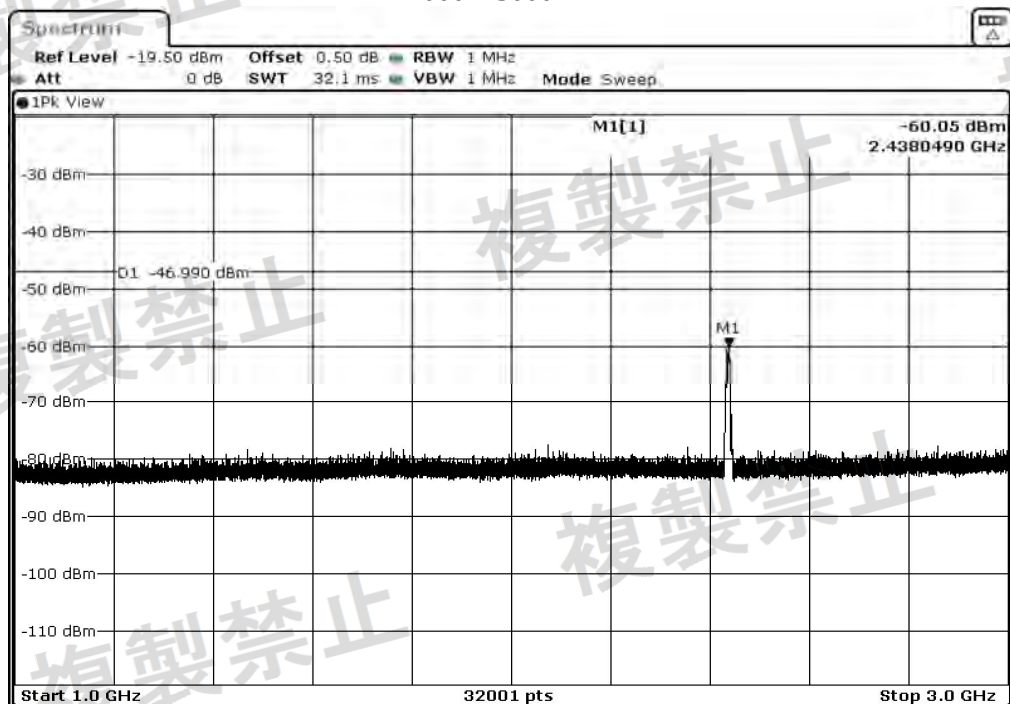
Frequency Range (MHz)	Reading Value (dBm)	Limit (dBm)
30-1000	-86.40	-54 (4nW)
1000 – 3000	-60.05	-47 (20nW)
3000 – 8000	-73.07	-47 (20nW)
8000 – 12750	-76.10	-47 (20nW)

30-1000MHz



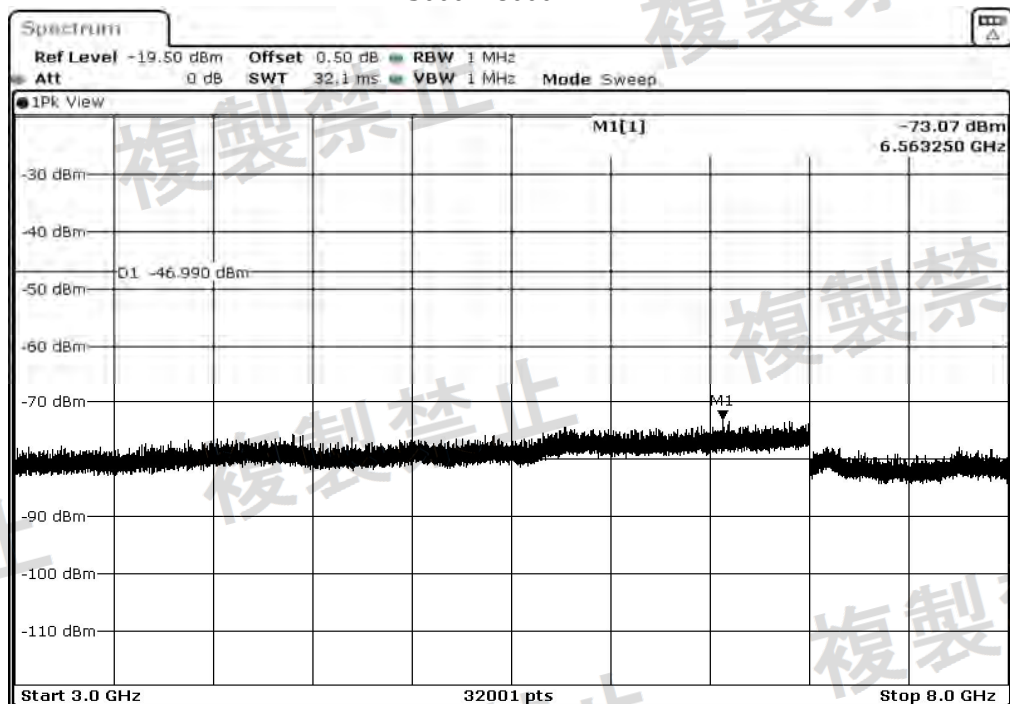
Date: 1.APR.2021 07:26:00

1000 – 3000MHz



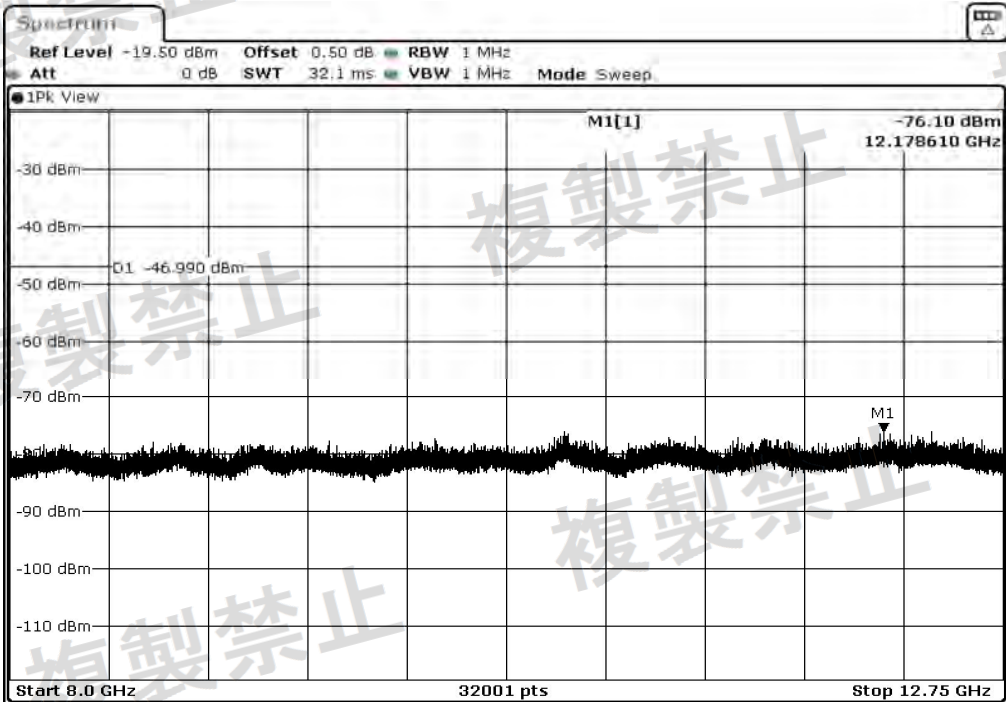
Date: 1.APR.2021 07:26:21

3000 – 8000MHz



Date: 1.APR.2021 07:26:44

8000 – 12750MHz

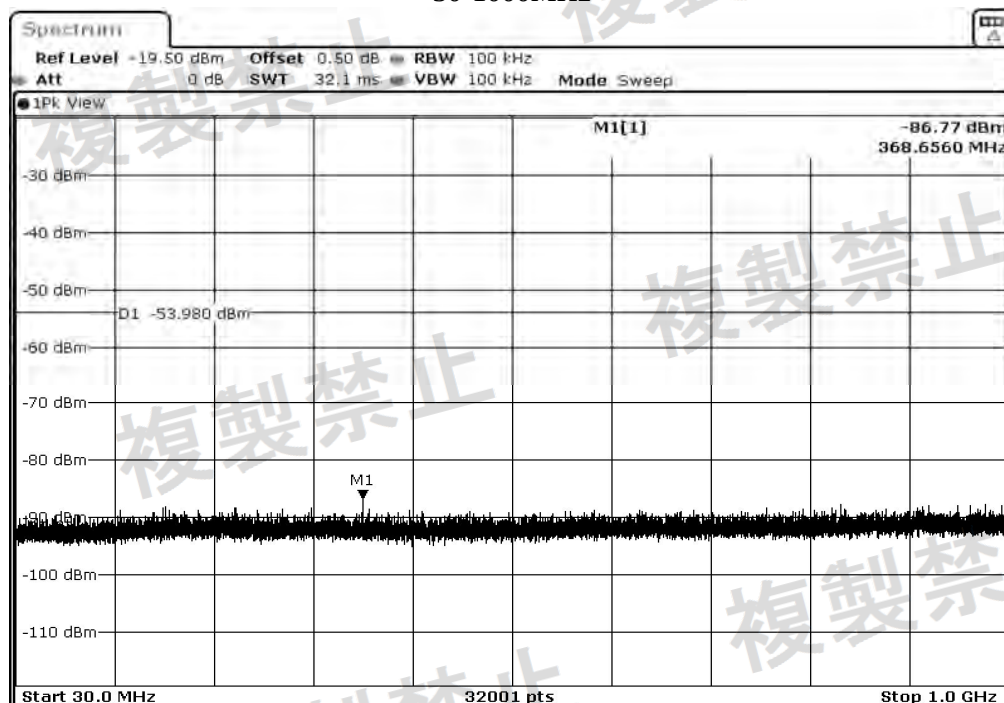


Date: 1.APR.2021 07:27:07

Product : Wireless speaker
Test Item : Receiver Spurious Emissions
Test Mode : Mode 4: Receive (802.11b 1Mbps) 2472MHz

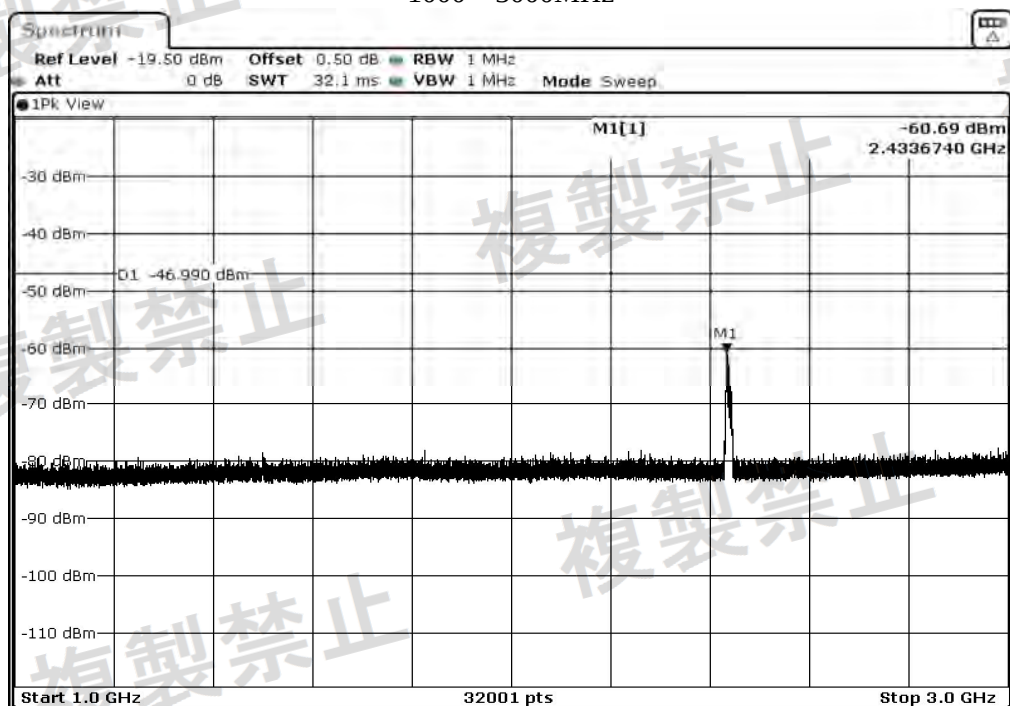
Frequency Range (MHz)	Reading Value (dBm)	Limit (dBm)
30-1000	-86.77	-54 (4nW)
1000 – 3000	-60.69	-47 (20nW)
3000 – 8000	-73.66	-47 (20nW)
8000 – 12750	-76.46	-47 (20nW)

30-1000MHz



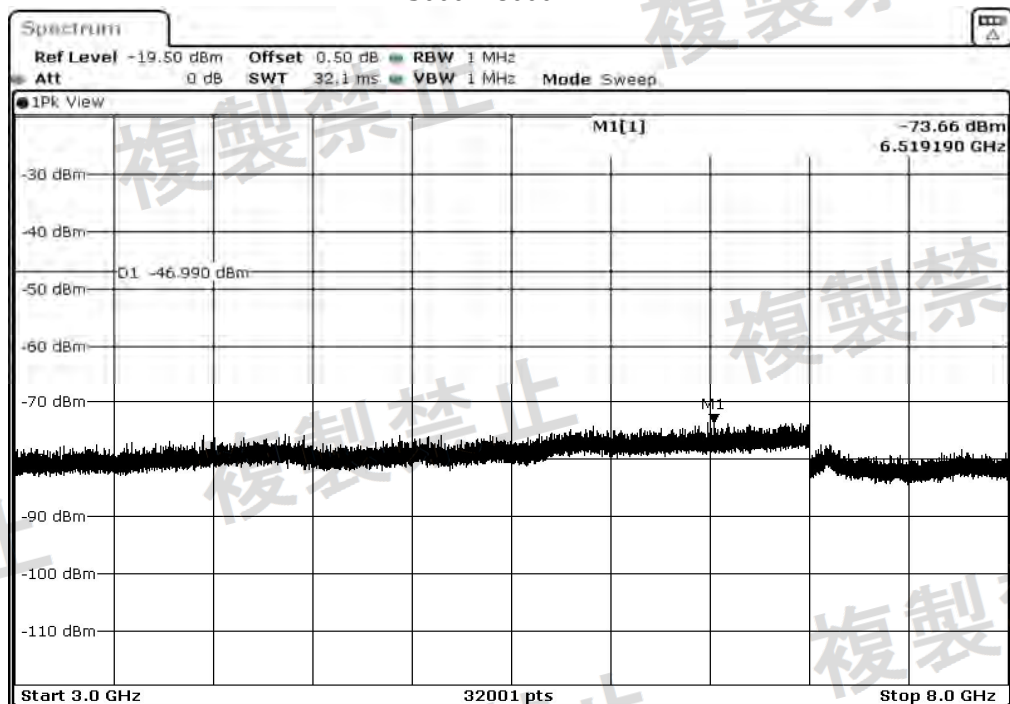
Date: 1.APR.2021 07:27:41

1000 – 3000MHz



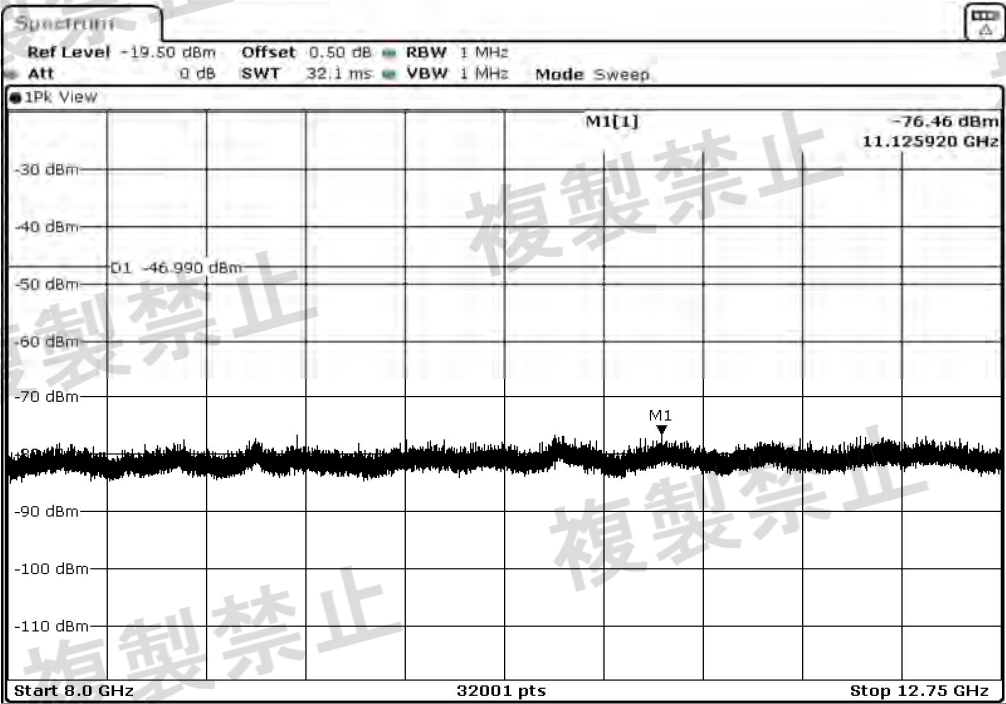
Date: 1.APR.2021 07:28:04

3000 – 8000MHz



Date: 1.APR.2021 07:28:26

8000 – 12750MHz

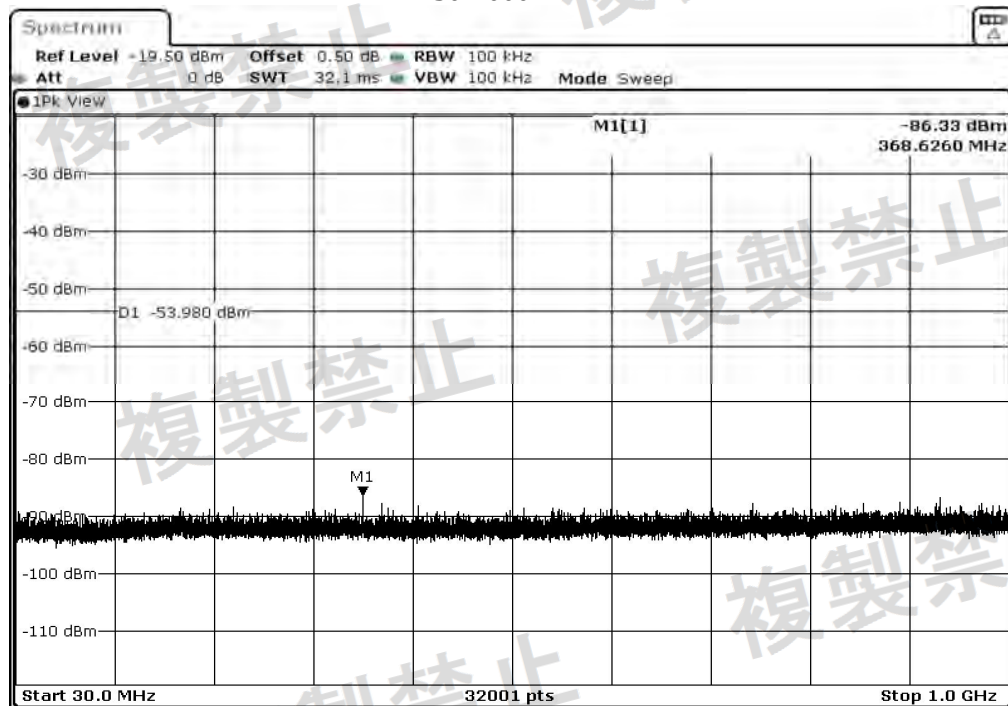


Date: 1.APR.2021 07:28:49

Product : Wireless speaker
 Test Item : Receiver Spurious Emissions
 Test Mode : Mode 5: Receive (802.11g 6Mbps) 2412MHz

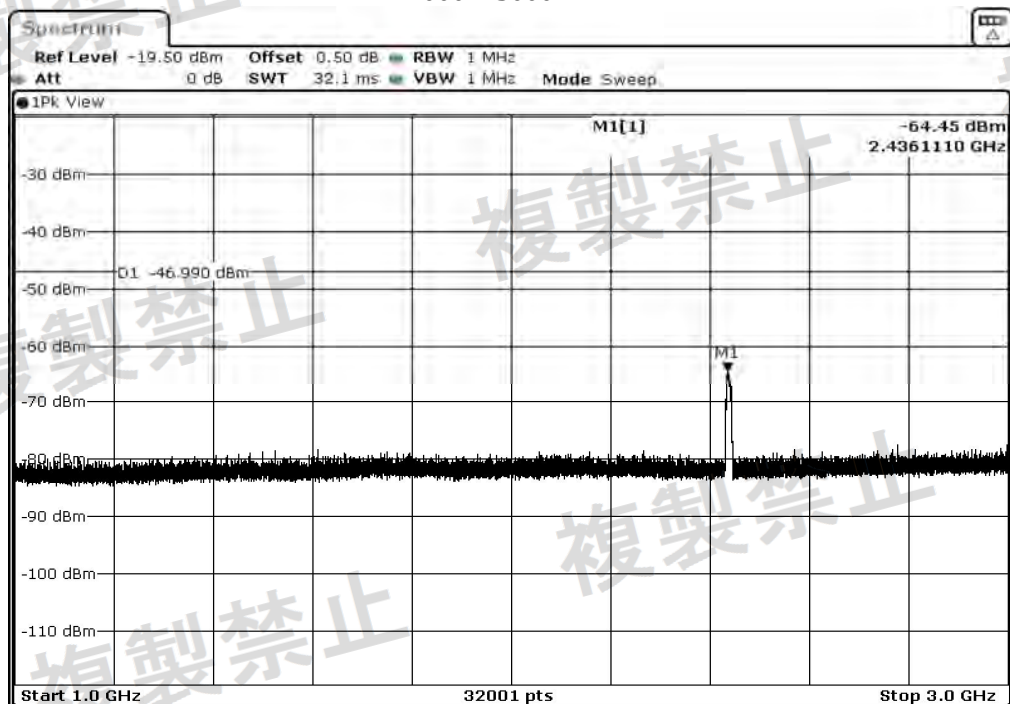
Frequency Range (MHz)	Reading Value (dBm)	Limit (dBm)
30-1000	-86.33	-54 (4nW)
1000 – 3000	-64.45	-47 (20nW)
3000 – 8000	-72.70	-47 (20nW)
8000 – 12750	-76.57	-47 (20nW)

30-1000MHz



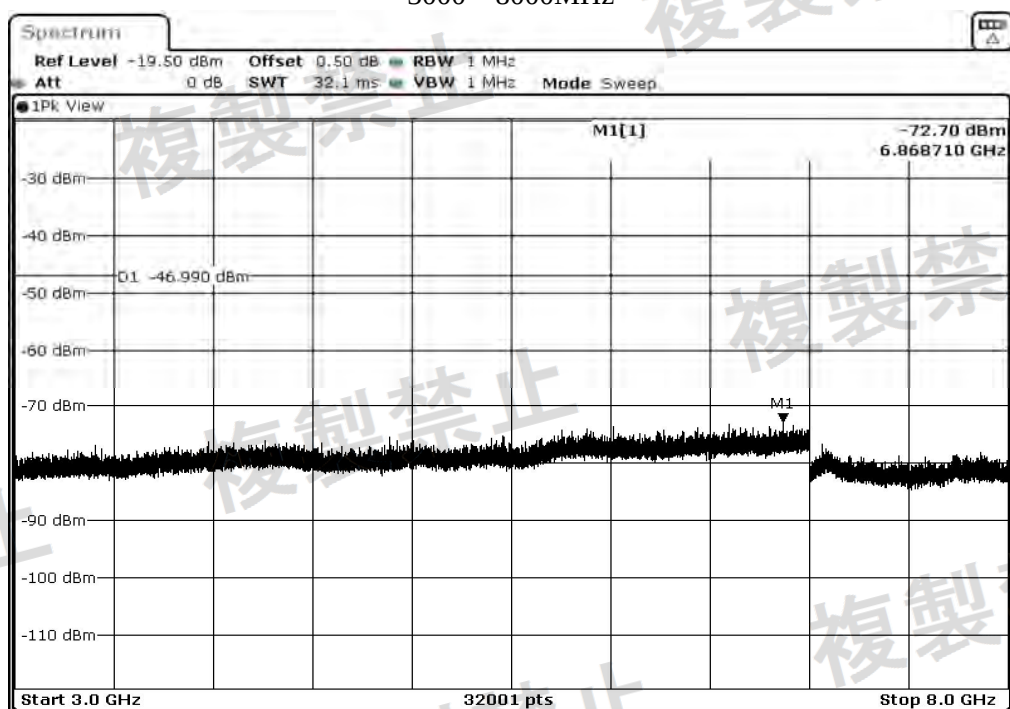
Date: 1.APR.2021 07:29:25

1000 – 3000MHz



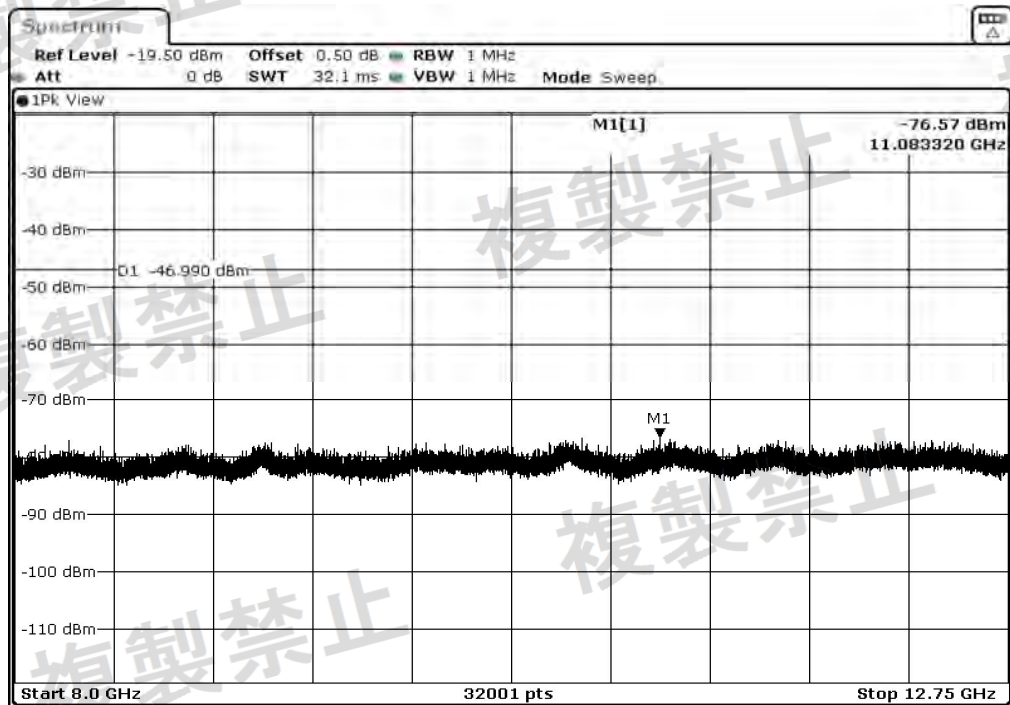
Date: 1.APR.2021 07:29:48

3000 – 8000MHz



Date: 1.APR.2021 07:30:11

8000 – 12750MHz

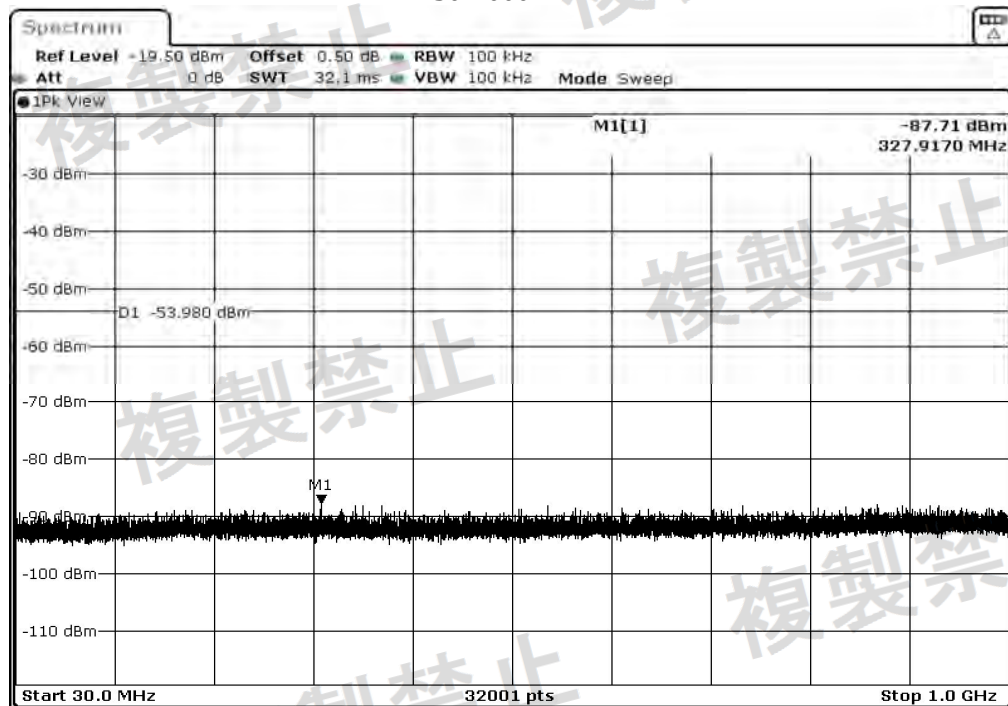


Date: 1.APR.2021 07:30:33

Product : Wireless speaker
 Test Item : Receiver Spurious Emissions
 Test Mode : Mode 5: Receive (802.11g 6Mbps) 2442MHz

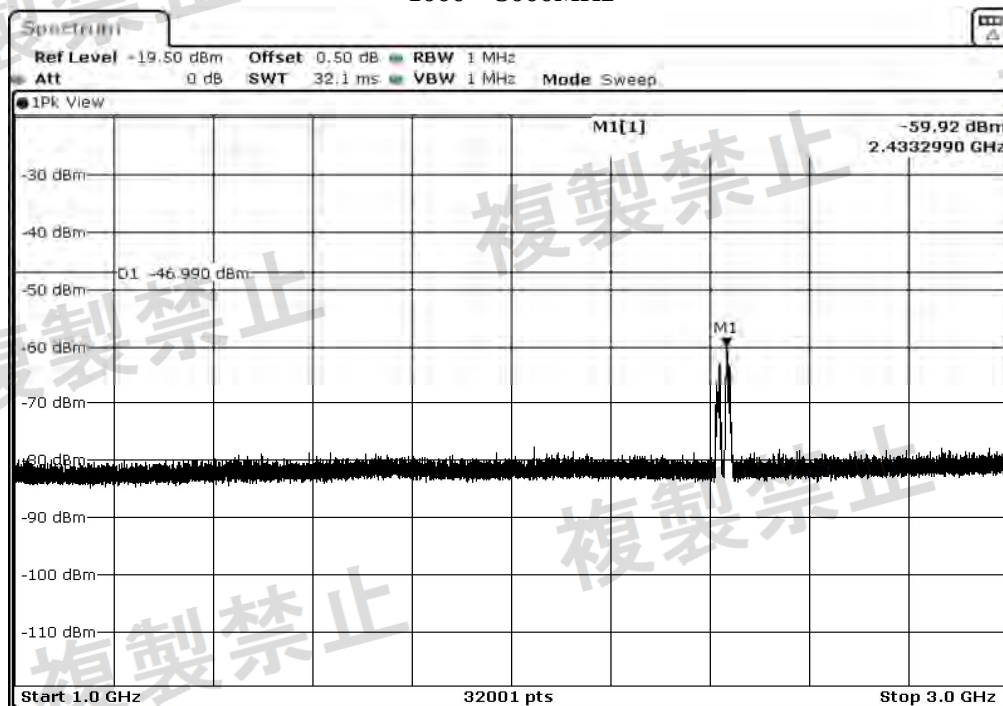
Frequency Range (MHz)	Reading Value (dBm)	Limit (dBm)
30-1000	-87.71	-54 (4nW)
1000 – 3000	-59.92	-47 (20nW)
3000 – 8000	-72.73	-47 (20nW)
8000 – 12750	-76.04	-47 (20nW)

30-1000MHz



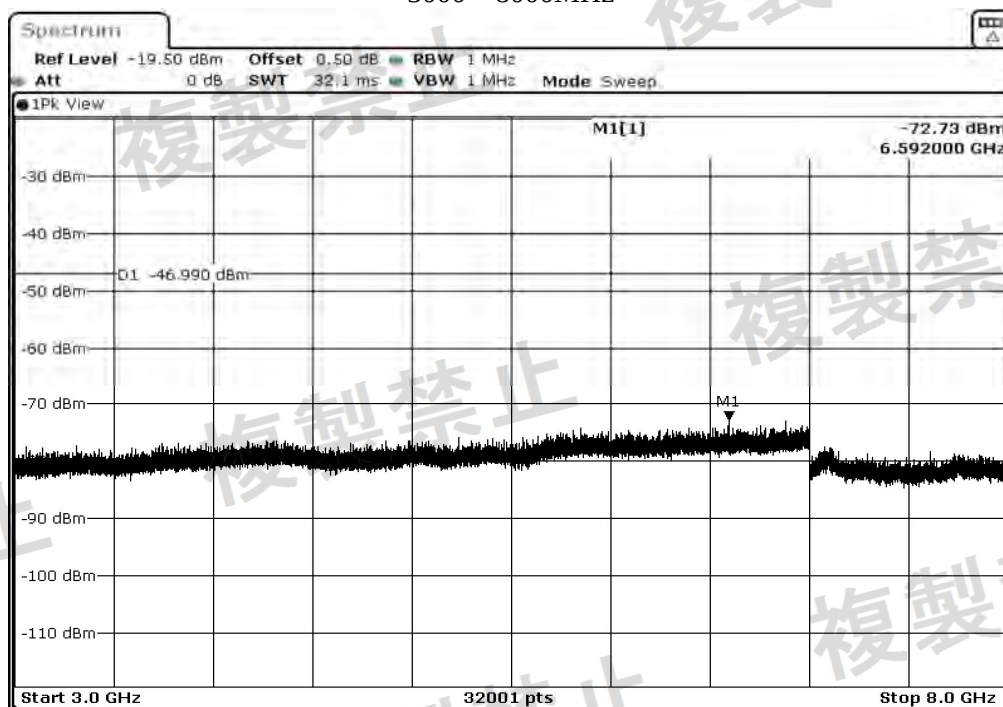
Date: 1.APR.2021 07:31:01

1000 – 3000MHz



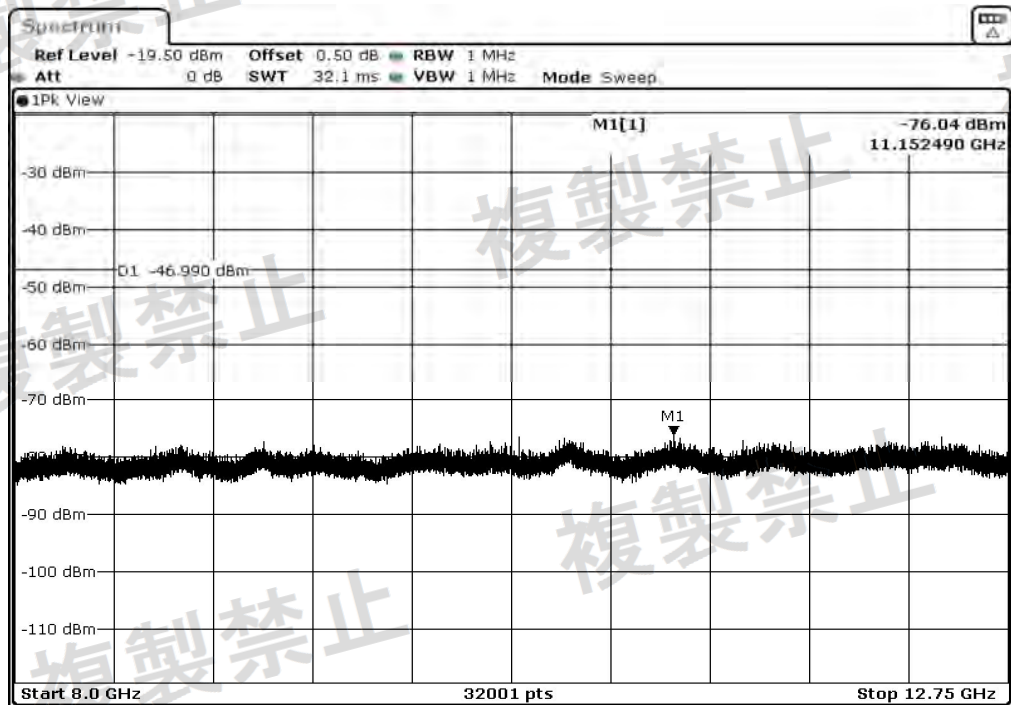
Date: 1.APR.2021 07:31:23

3000 – 8000MHz



Date: 1.APR.2021 07:31:46

8000 – 12750MHz

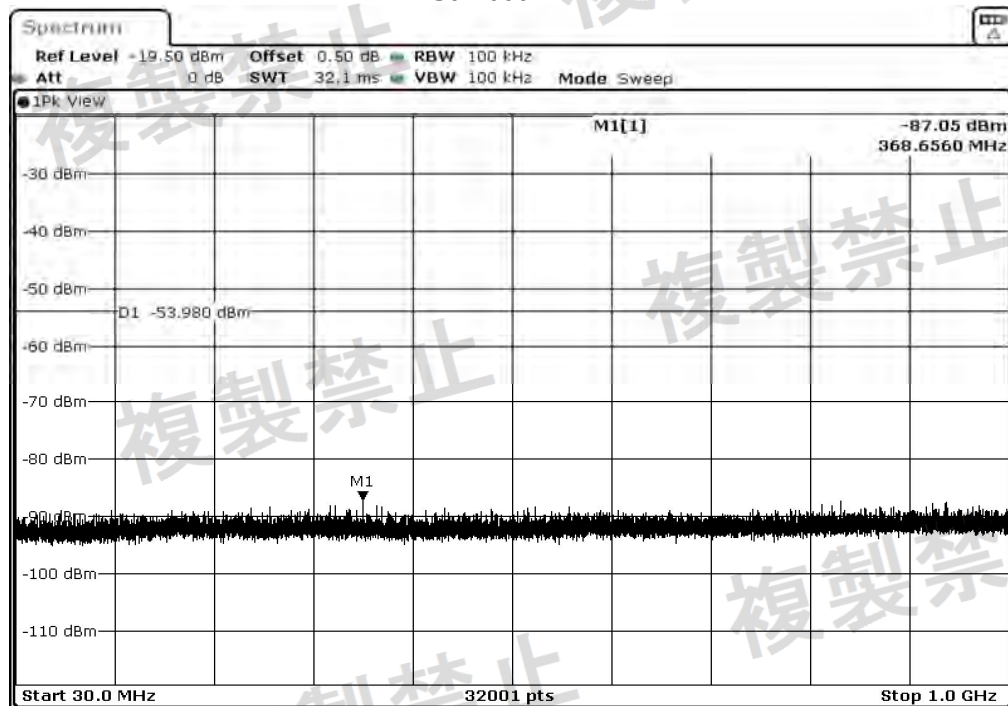


Date: 1.APR.2021 07:32:09

Product : Wireless speaker
 Test Item : Receiver Spurious Emissions
 Test Mode : Mode 5: Receive (802.11g 6Mbps) 2472MHz

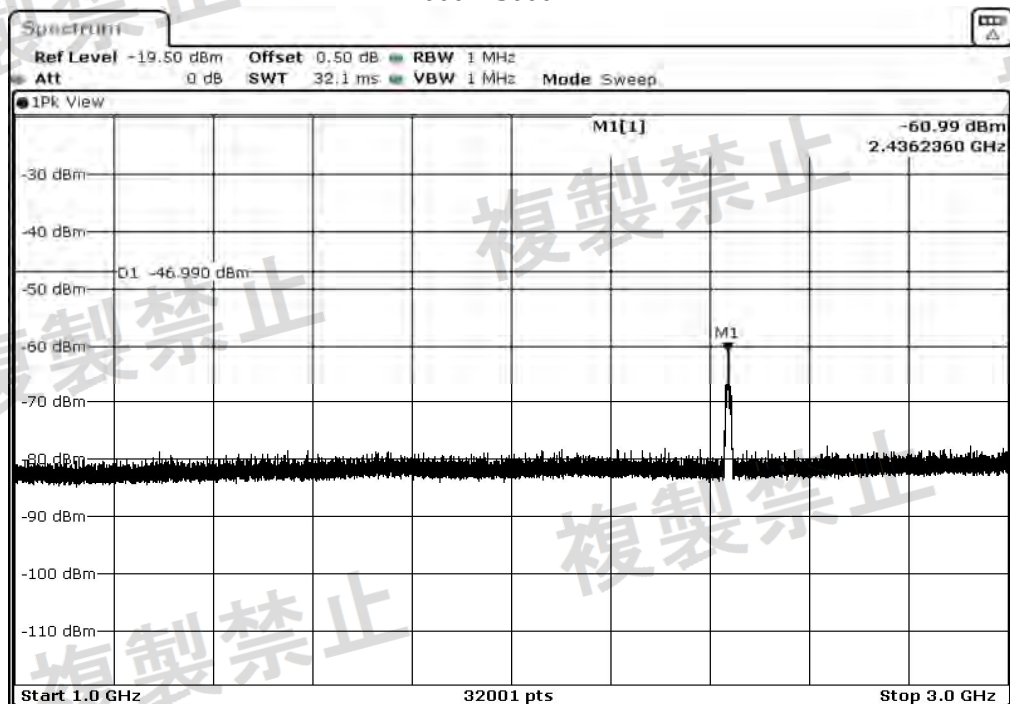
Frequency Range (MHz)	Reading Value (dBm)	Limit (dBm)
30-1000	-87.05	-54 (4nW)
1000 – 3000	-60.99	-47 (20nW)
3000 – 8000	-73.29	-47 (20nW)
8000 – 12750	-75.27	-47 (20nW)

30-1000MHz



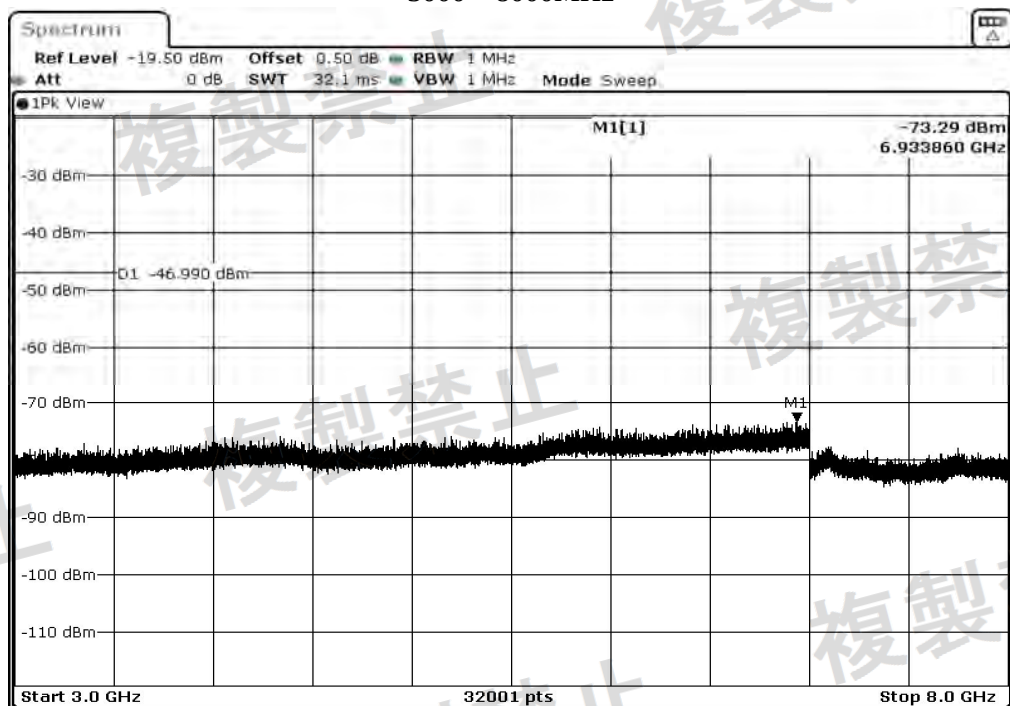
Date: 1.APR.2021 07:32:33

1000 – 3000MHz



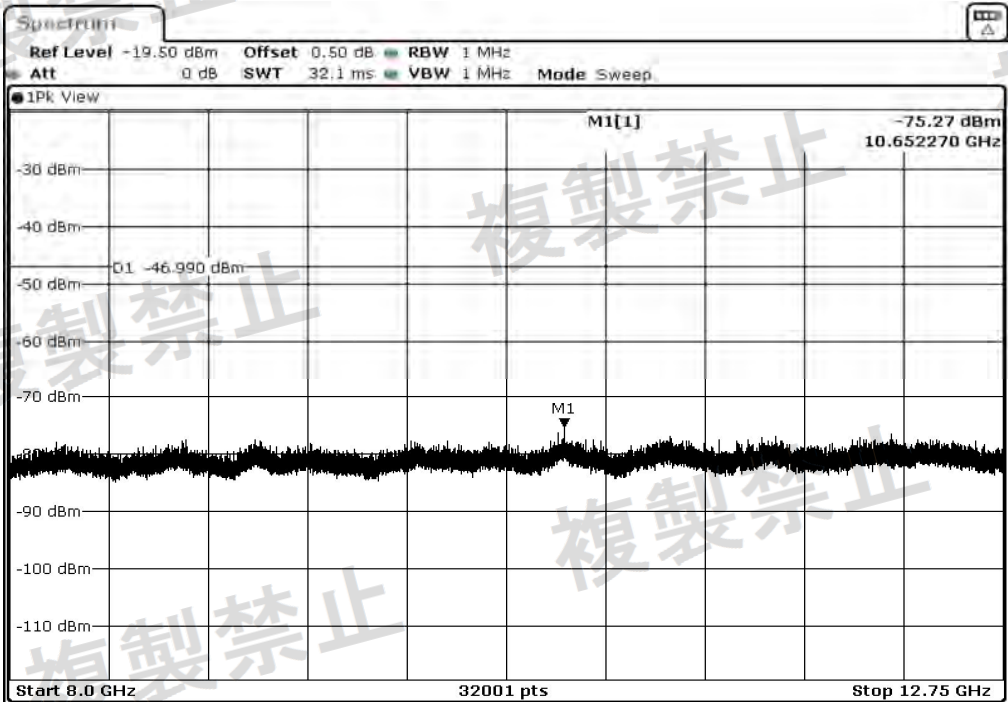
Date: 1.APR.2021 07:32:56

3000 – 8000MHz



Date: 1.APR.2021 07:33:18

8000 – 12750MHz

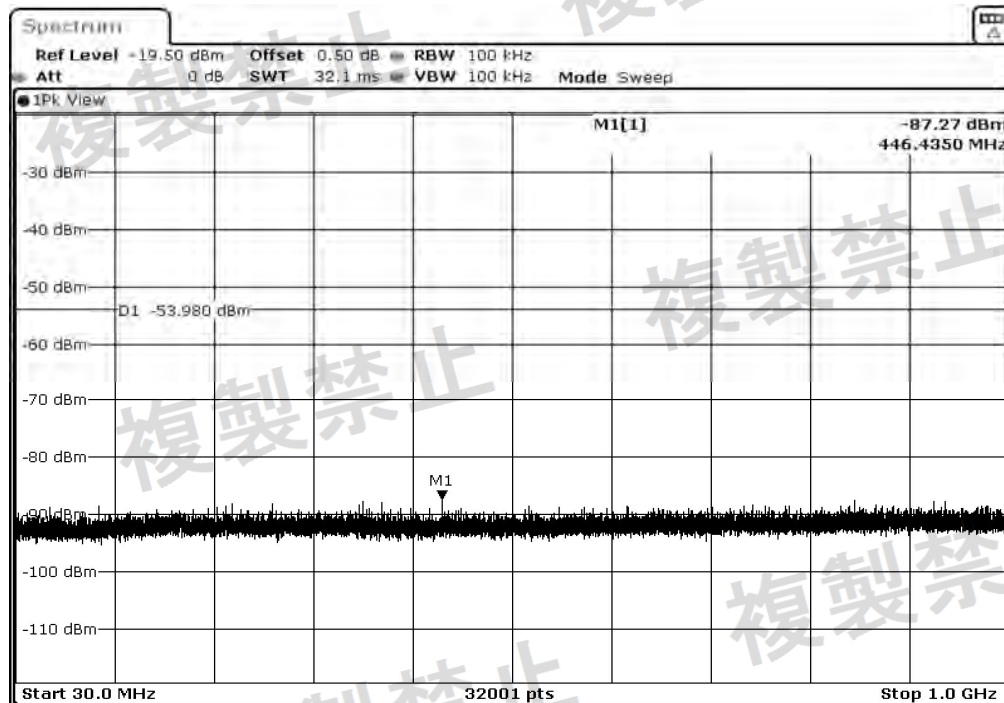


Date: 1.APR.2021 07:33:41

Product : Wireless speaker
Test Item : Receiver Spurious Emissions
Test Mode : Mode 6: Receive (802.11n20 7.2Mbps) 2412MHz

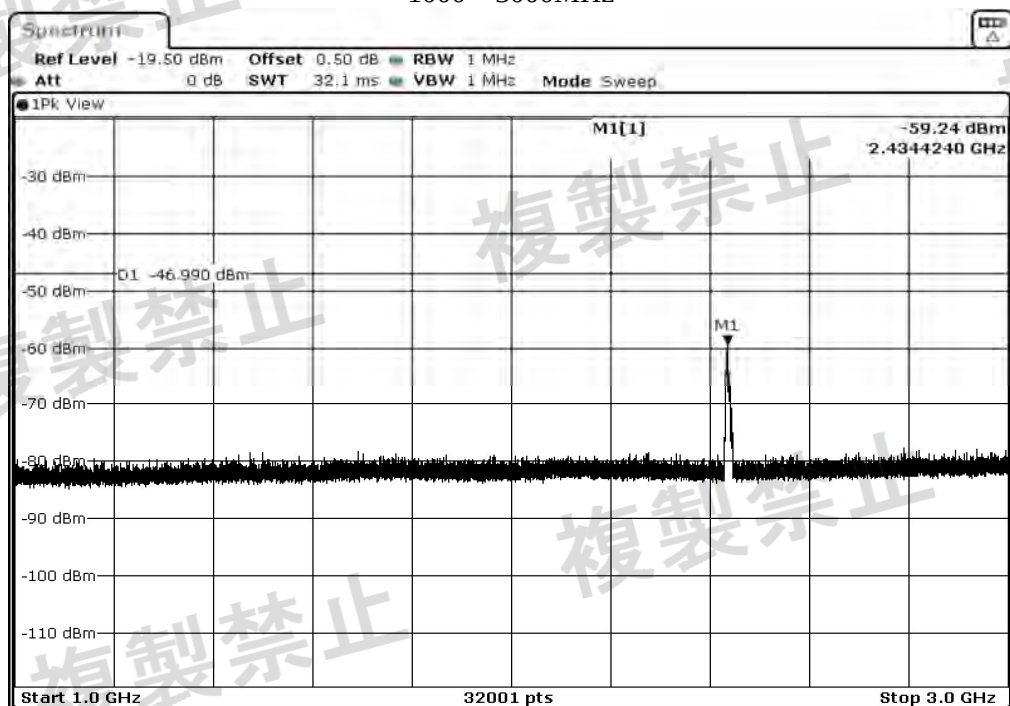
Frequency Range (MHz)	Reading Value (dBm)	Limit (dBm)
30-1000	-87.27	-54 (4nW)
1000 – 3000	-59.24	-47 (20nW)
3000 – 8000	-73.14	-47 (20nW)
8000 – 12750	-76.17	-47 (20nW)

30-1000MHz



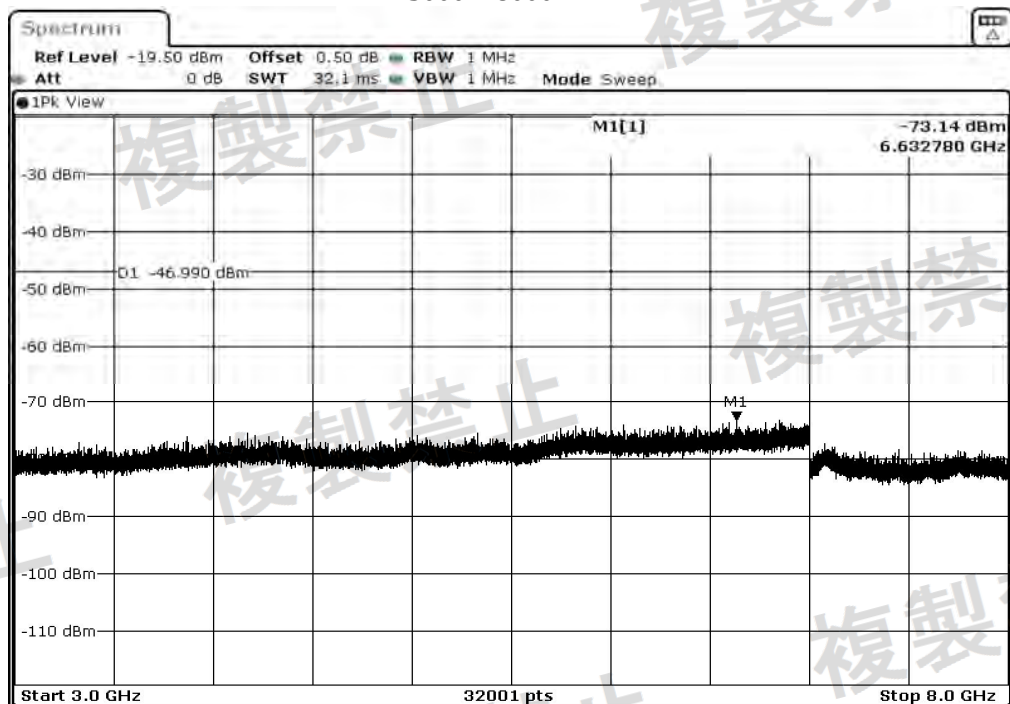
Date: 1.APR.2021 07:34:11

1000 – 3000MHz



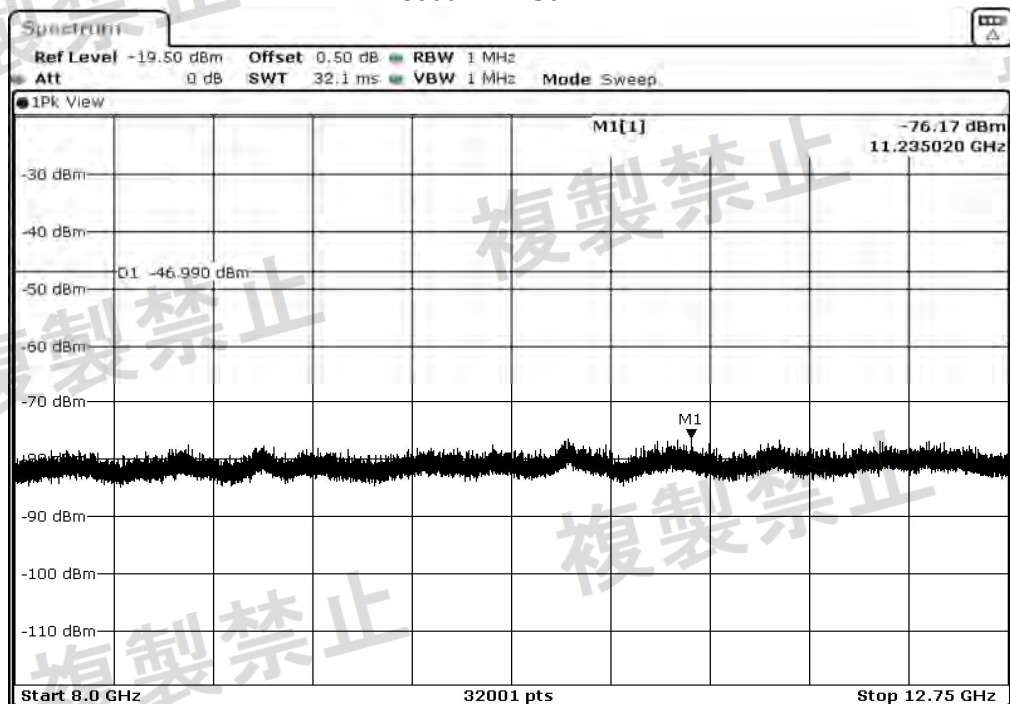
Date: 1.APR.2021 07:34:34

3000 – 8000MHz



Date: 1.APR.2021 07:34:56

8000 – 12750MHz

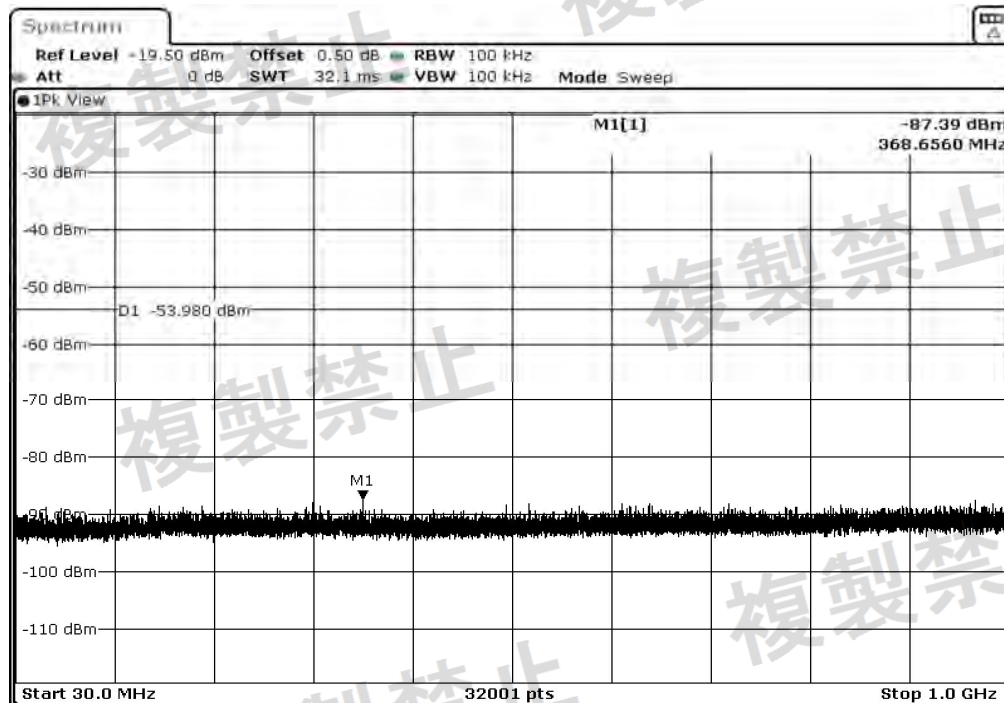


Date: 1.APR.2021 07:35:19

Product : Wireless speaker
 Test Item : Receiver Spurious Emissions
 Test Mode : Mode 6: Receive (802.11n20 7.2Mbps) 2442MHz

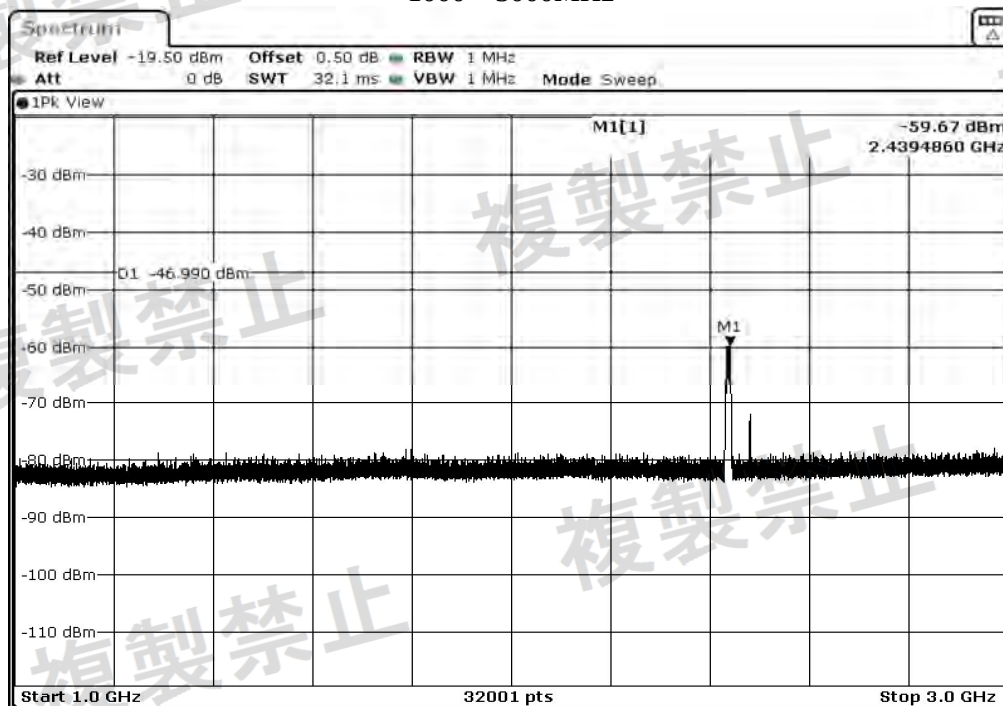
Frequency Range (MHz)	Reading Value (dBm)	Limit (dBm)
30-1000	-87.39	-54 (4nW)
1000 – 3000	-59.67	-47 (20nW)
3000 – 8000	-72.91	-47 (20nW)
8000 – 12750	-76.25	-47 (20nW)

30-1000MHz



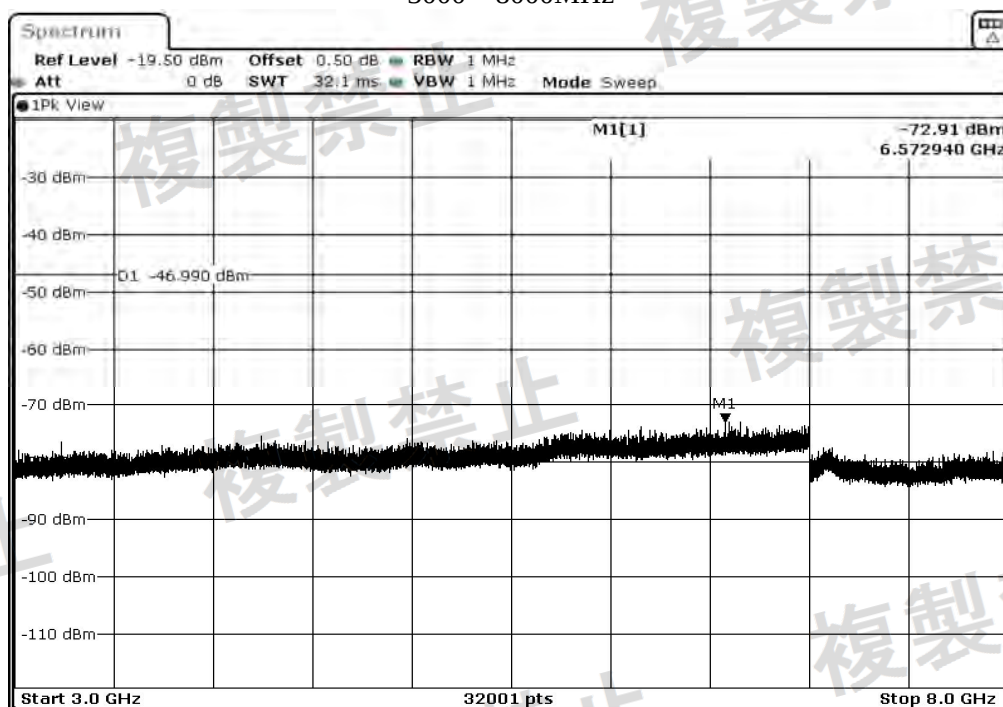
Date: 1.APR.2021 07:35:49

1000 – 3000MHz



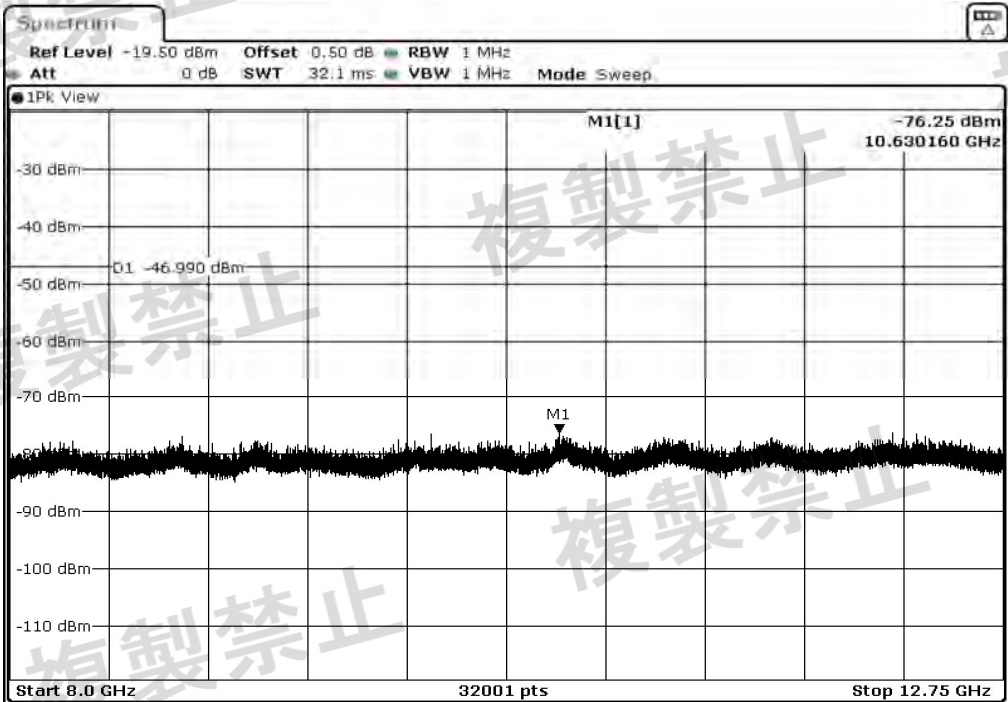
Date: 1.APR.2021 07:36:12

3000 – 8000MHz



Date: 1.APR.2021 07:36:34

8000 – 12750MHz

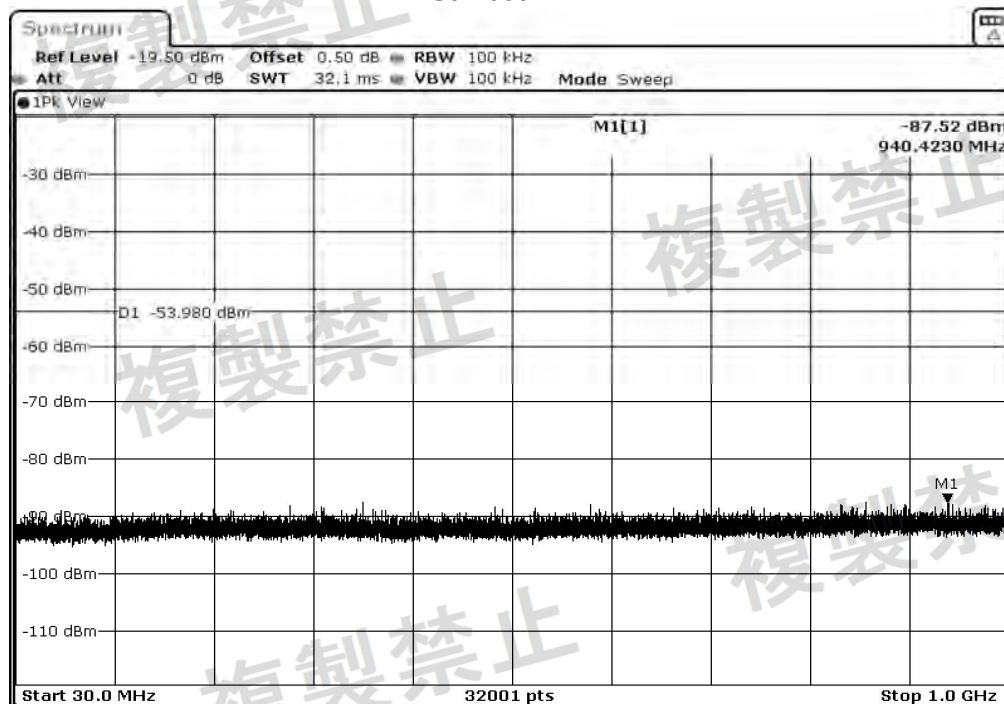


Date: 1.APR.2021 07:36:57

Product : Wireless speaker
Test Item : Receiver Spurious Emissions
Test Mode : Mode 6: Receive (802.11n20 7.2Mbps) 2472MHz

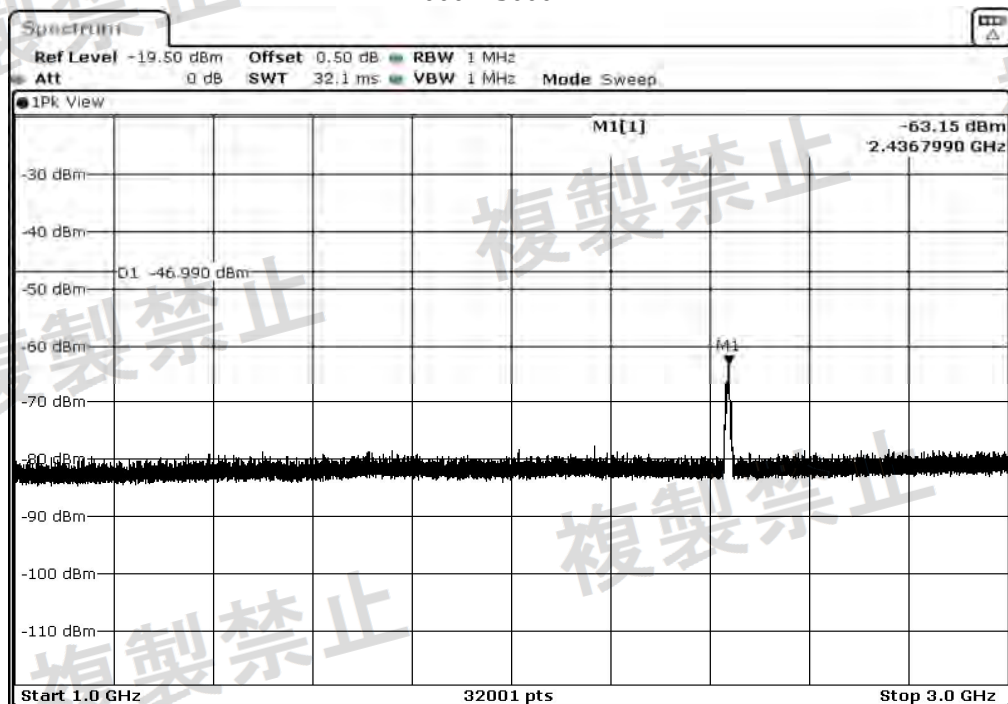
Frequency Range (MHz)	Reading Value (dBm)	Limit (dBm)
30-1000	-87.52	-54 (4nW)
1000 – 3000	-63.15	-47 (20nW)
3000 – 8000	-73.20	-47 (20nW)
8000 – 12750	-76.27	-47 (20nW)

30-1000MHz



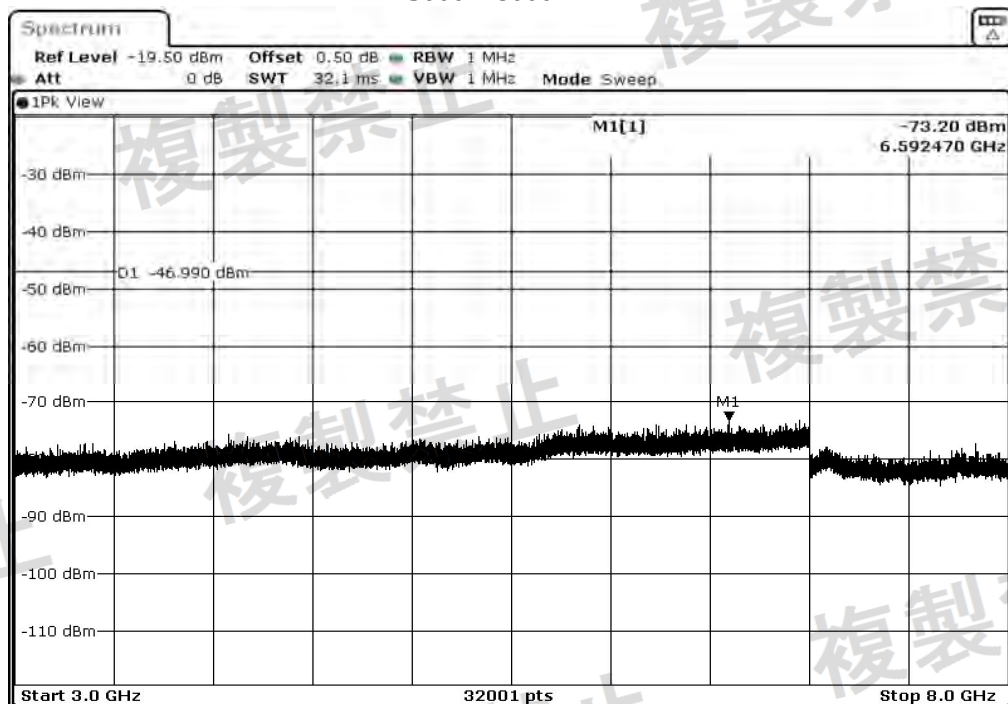
Date: 1.APR.2021 07:38:55

1000 – 3000MHz



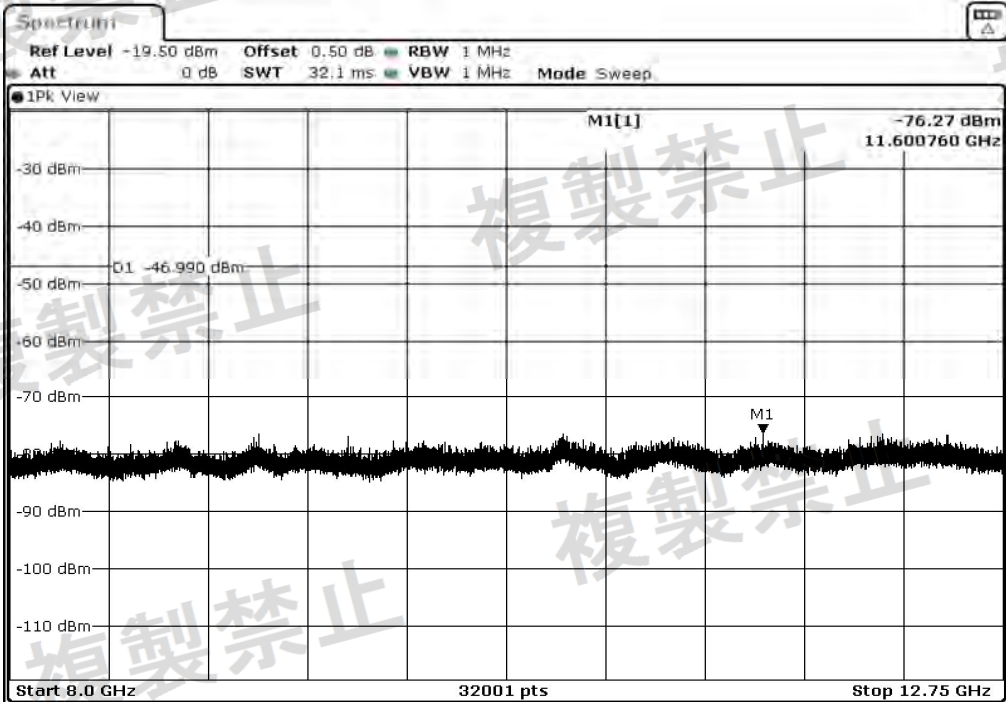
Date: 1.APR.2021 07:39:17

3000 – 8000MHz



Date: 1.APR.2021 07:39:39

8000 – 12750MHz



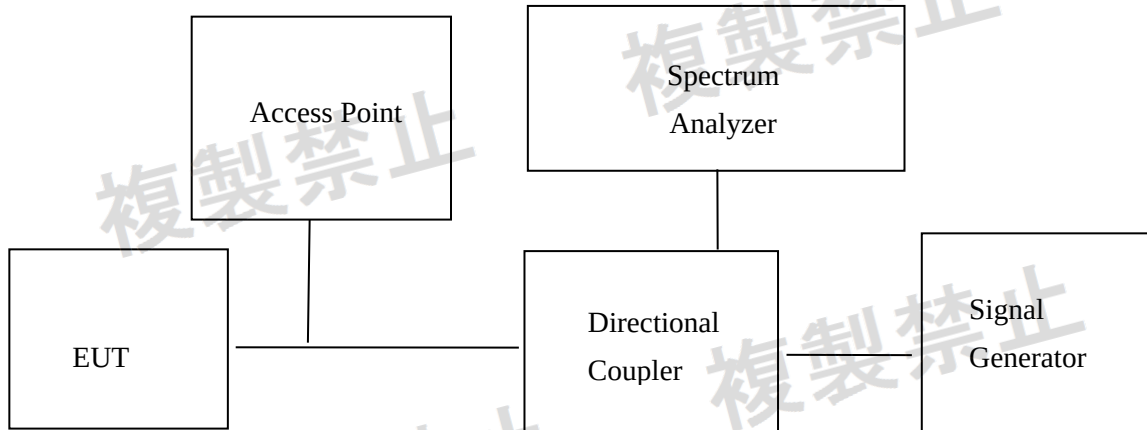
Date: 1.APR.2021 07:40:02

Test Result

PASS

8. Carrier Sensing

8.1. Test Setup



8.2. Test Procedure

- Link EUT and Access Point to Directional Coupler input port.
- Link Signal Generator and Spectrum Analyzer to test port and output port in the Directional Coupler separately.
- A positive Peak Detector function in Spectrum Analyzer must be used.
- Set the Span to Zero.
- Press the Signal Generator on and it will output the Carrier Signal. When the Link breaks off, wait a minute and press the Signal Generator off. After a while, reset the Link and done the test.

8.3. Limits

Stop transmission while Carrier detecting.

8.4. Test Result of Carrier Sensing

This device does not support 802.11n(40M-BW) technology, this test item is not performed.

9. EMI Reduction Method During Compliance Testing

No modification was made during testing.