

Test Report No:
82408RRF.002

Test Report

**Ordinance Regulating Radio Equipment, Radio Regulatory Commission Regulations No 18 - November 30, 1950 (as amended).
Second generation low power data communication system / Wireless LAN system.**

(*) Identification of item tested	An instrument cluster with Bluetooth® for operation in a vehicle
(*) Trademark	BOSCH
(*) Model and /or type reference	5inColorD
Other identification of the product	FCC ID: 2AUXS-5INCOLORD IC: 25847-5INCOLORD
(*) Features	Bluetooth LE HW version: C3.2 SW version: BRP5-0.0.SWP25.1.28
Applicant	Robert Bosch GmbH Robert-Bosch-Strasse 200, 31139 Hildesheim, Germany
Test method requested, standard	平成十六年総務省告示第八十八号(特定無線設備の技術基準適合証明等に関する規則別表第一号一(3)の規定に基づく特性試験の試験方法)別表第四十三 Public notice of MIC No. 88 test method of specified radio equipment Annex 43, Article 2 Paragraph 1 Item 19
Summary	IN COMPLIANCE
Approved by (name / position & signature)	José Manuel Gómez Galván EMC Consumer & RF Lab. Manager 
Date of issue	2025-06-04
Report template No	FDT08_25 (*) "Data provided by the client"

Index

Competences and guarantees 3

General conditions 3

Uncertainty 3

Data provided by the client 4

Usage of samples 4

Test sample description 5

Identification of the client 5

Testing period and place 5

Document history 5

Environmental conditions 6

Remarks and comments 6

Testing verdicts 7

Summary 7

Appendix A: Test results. Bluetooth Low Energy (1M, 2M) 8

Appendix B: Photographs 54

Competences and guarantees

DEKRA Testing and Certification S.A.U. is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA Testing and Certification S.A.U. has a calibration and maintenance program for its measurement equipment.

DEKRA Testing and Certification S.A.U. guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Testing and Certification S.A.U. at the time of performance of the test.

DEKRA Testing and Certification S.A.U. is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA Testing and Certification S.A.U.

General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Testing and Certification S.A.U.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Testing and Certification S.A.U. and the Accreditation Bodies.

Uncertainty

Uncertainty (factor $k=2$) was calculated according to the DEKRA Testing and Certification S.A.U. internal document PODT000.

- Transmitting equipment. Antenna power and tolerances for antenna power Measurement uncertainty $\leq \pm 2.01$ dB
- Transmitting equipment. Frequency tolerance Measurement uncertainty $\leq \pm 4.75$ kHz
- Transmitting equipment. Spurious emission intensity Measurement uncertainty $\leq \pm 2.85$ dB
- Transmitting equipment. Permissible value for occupied bandwidth Measurement uncertainty $\leq \pm 6.35$ kHz
- Transmitting equipment. Spread bandwidth Measurement uncertainty $\leq \pm 710.28$ kHz
- Receiving equipment. Limit on secondary radiated emissions Measurement uncertainty $\leq \pm 2.95$ dB

Data provided by the client

The following data has been provided by the client:

- 1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").
- 2. The sample consists of an instrument cluster with Bluetooth® for operation in a vehicle.

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results. The laboratory is not responsible for such information and it is not covered by accreditation.

Usage of samples

Samples undergoing test have been selected by: The client.

Id	Control Number	Description	Model	Serial Nº	Date of Reception	Application
S/01	82408/026	instrument cluster with Bluetooth® for operation in a vehicle	5inColorD	0000573	2025-04-14	Element Under Test
S/01	82408/039	Module	-	-	2025-04-14	Auxiliary Element
S/01	82408/042	Harness	-	-	2025-04-14	Auxiliary Element
S/01	82408/037	Ethernet Cable	-	-	2025-04-14	Auxiliary Element
S/01	82408/040	VGA to VGA Flat Cable	-	-	2025-04-14	Auxiliary Element
S/02	82408/013	instrument cluster with Bluetooth® for operation in a vehicle	5inColorD	0263781000-27	2025-03-31	Element Under Test

Notes referenced to samples during the project:

Id	Type
S/01	Sample used for all tests but the test 'Identification code transmission/reception'.
S/02	Sample used for the test 'Identification code transmission/reception'.

Test sample description

Ports.....:	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded			
	-	-	☒	☐			
Supplementary information to the ports.....:	-						
Rated power supply.....:	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☐ AC:		☐	☐	☐	☐	☐
	☐ DC:						
Rated Power							
Clock frequencies.....:							
Other parameters.....:							
Software version	BRP5-0.0.SWP25.1.28						
Hardware version	C3.2						
Dimensions in cm (W x H x D)....:	15,054 x 10,047 x 4,697						
Mounting position.....:	☐	Table top equipment					
	☐	Wall/Ceiling mounted equipment					
	☐	Floor standing equipment					
	☐	Hand-held equipment					
	☐	Other:					
Modules/parts	Module/parts of test item		Type	Manufacturer			
	-		-	-			
Accessories (not part of the test item).....:	Description		Type	Manufacturer			
	-		-	-			
Documents as provided by the applicant	Description		File name	Issue date			
	-		-	-			

Identification of the client

Robert Bosch GmbH
Robert-Bosch-Platz 1, 70839 Gerlingen, Germany

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2025-05-08
Date (finish)	2025-05-08

Document history

Report number	Date	Description
82408RRF.002	2025-06-04	First release.

Environmental conditions

In the chamber for conducted measurements, the following limits were not exceeded during the test:

Temperature	Min. = 5 °C Max. = 35 °C
Relative humidity	Min. = 45 % Max. = 85 %

Remarks and comments

The tests have been performed by the technical personnel: Carmen Vázquez.

Used instrumentation:

Control No.	Equipment	Model	Serial number	Manufacturer	Calibration date	Calibration Authority	Calibration Method
04826	SHIELDED ROOM	S101	N/A	ETS LINDGREN	N/A	N/A	c)
07547	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	60038034575	HW GROUP	2025-04-22	DEKRA TC	c)
05880	DC POWER SUPPLY 30V/5A	U8002A	MY56340002	KEYSIGHT TECHNOLOGIES	N/A	N/A	c)
07760	DIGITAL MULTIMETER	175	46970084	FLUKE	2024-11-07	DEKRA TC	c)
06157	SIGNAL AND SPECTRUM ANALYZER 10 Hz - 40 GHz	FSV40	101714	ROHDE AND SCHWARZ	2025-03-17	ROHDE AND SCHWARZ	c)
04848	EMC/RF MEASUREMENT SOFTWARE	EMC32	N/A	ROHDE AND SCHWARZ	N/A	N/A	c)

Note: Calibration Method

- a) Calibration conducted by the National Institute of Information and Communications Technology (NICT) or a designed calibration agency under Article 102-18 paragraph (1) of the Radio Law.
- b) Calibration conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Law (Law No. 51 of 1992) Japan Calibration Service System.
- c) Calibration conducted in foreign countries, which shall be equivalent to the calibration conducted by the NICT or a designated calibration agency under Article 102-18 paragraph (1).
- d) Calibration conducted by using other equipment that is listed above from a) to c).

Testing verdicts

Not applicable:	N/A
Pass:	P
Fail:	F
Not measured:	N/M

Summary

Bluetooth Low Energy (1M, 2M):

MIC No. 88 Annex 43			
Requirement – Test case		Verdict	Remark
Article 49-20 and Article 14.7 Table 8	Transmitting equipment. Antenna power. Tolerances for antenna power.	P	--
Article 5 and Annex 1 table 7-8	Transmitting equipment. Frequency tolerance.	P	--
Article 7 and Annex 3. 26	Transmitting equipment. Spurious emission intensity.	P	--
Article 6 and Annex 2. 30	Transmitting equipment. Permissible value for occupied bandwidth.	P	--
Article 24.2	Receiving equipment. Limit on secondary radiated emissions.	P	--
Article 9.4-5	Controlling equipment. Interference prevention function. Identification code transmission/reception.	P	--
Article 49-20	Antenna. Antenna gain	P	--
Supplementary information and remarks:			
None.			

Appendix A: Test results. Bluetooth Low Energy (1M, 2M)

INDEX

TEST CONDITIONS 10

PRODUCT INFORMATION 12

Article 49-20 and Article 14.7 Table 8. Transmitting equipment. Antenna power. Tolerances for antenna power 14

Article 5 and Annex 1 table 7-8. Transmitting equipment. Frequency tolerance 17

Article 7 and Annex 3. 26. Transmitting equipment. Spurious emission intensity.....20

Article 6 and Annex 2. 30. Transmitting equipment. Permissible value for occupied bandwidth 28

Article 24.2. Receiving equipment. Limit on secondary radiated emissions.....39

Article 9.4-5. Controlling equipment. Interference prevention function. Identification code transmission/reception 47

Article 49-20. Antenna. Antenna gain.....52

TEST CONDITIONS

(*): Data provided by the client.

POWER SUPPLY (*):

Vnominal: 12 Vdc

Type of Power Supply: Vehicle battery.

TEST FREQUENCIES (*):

Modulation	Data rates	Low Channel:	Middle Channel	High Channel
BLE GFSK	1 Mbit/s	2402 MHz	2440 MHz	2480 MHz
BLE GFSK	2 Mbit/s	2402 MHz	2440 MHz	2480 MHz

During transmitter test the EUT was controlled by a SW tool provided by the client to operate in a continuous transmit mode on the modulation schemes and test channels as required.

ENVIRONMENTAL CONDITIONS DURING TESTING:

Date	Temperature	Humidity
2025-05-08	20.03 °C – 29.27 °C	49.91 % - 59.57 %

CONDUCTED MEASUREMENTS:

The equipment under test was set up in a shielded room and its antenna port (SMA type) is connected to the spectrum analyser through a low loss RF cable. The reading of the spectrum analyser is corrected with the cable loss.

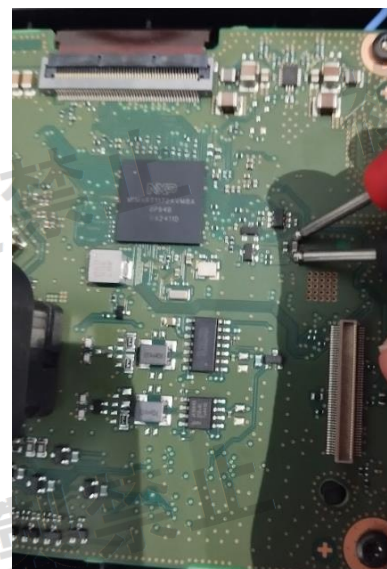
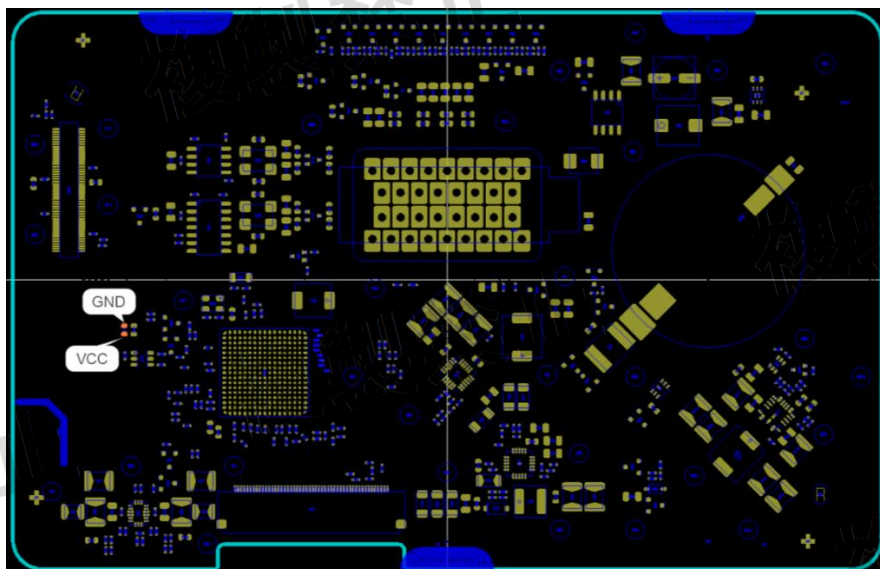
The DC supply voltage is applied using a power supply.

The Equipment Under Test (E.U.T.) is set in continuous transmission with modulation using an implemented test mode. The test mode also permits to set the E.U.T. in receiving mode with the transmission disabled

VOLTAGE FLUCTUATION TEST:

The product has a power supply of 12 Vdc. According to Public notice of MIC No. 88 test method of specified radio equipment Annex 43, it must perform voltage fluctuation test ($\pm 10\%$) in order to check extreme conditions as recorded in the notice. The deviations of the input voltages to the RF chipset/module, that can be measured at test points indicated below, were within the margin of $\pm 1\%$:

Customer has declared the input voltage of the RF chipset/module in the next schematic:



Measurements:

	Vnom	Vnom + 10%	Vnom - 10%
DUT Input voltage (V)	12	13.2	10.8
RF chipset/module Input voltage (V)	3'314	3'314	3'314
Variation (%)	N/A	0	0



PRODUCT INFORMATION

Modulation:	GFSK.
Spread spectrum system:	No (Other digital modulation methods).
Nominal necessary Bandwidth:	1 MHz. 2 MHz.
Maximum declared antenna gain:	+3.04 dBi.
Rated Antenna Power:	5 dBm (3.16227766 mW).
Type of Antenna:	Internal
Operating nominal frequency range:	2400 MHz to 2483.5 MHz.
Nominal power supply:	12 Vdc.
Type of power supply:	Vehicle battery.

SUMMARY TABLE

BLE 1M

試験機器の状態 Test Condition	試験項目 (注3) Test Case	単位 Unit	制限 Limit	常圧 (3.7V) Nominal Voltage			備考 Notes	
				2402 MHz	2440 MHz	2480 MHz		
常温 Nominal Temperature (20.03 °C ~ 29.27 °C) (49.91 % - 59.57 %)	空中線電力 Antenna power and tolerances for antenna power	(TX1)	dBm	---	2.49	2.30	2.08	Measured antenna power (dBm)
		Duty Cycle Correction	dB	---	0.00	0.00	0.00	Duty Factor Correction (dB)
		Corrected power	dBm	---	2.49	2.30	2.08	
		Corrected power	mW	10	1.77	1.70	1.61	
	周波数の偏差 Frequency Tolerance	Deviation from maximum rated antenna power	%	---	-43.8952024	-46.29682036	-48.949500	
		(TX1)	ppm	50	-21.39800167	-21.68032787	-21.97580645	
		Frequency error	Hz	---	-53800	-52900	-54500	
		Frequency Absolute value	MHz	---	2.401,9462	2439.9471	2479.9455	
	スプリアス放射の不要放射 Unwanted Emission Strength	30.0 to 2387.0 MHz	dBm/MHz	-26	0.00	0.00	0.00	
		(TX1)	MHz	---	0.00	0	0.00	
		2387.0 to 2400.0 MHz	dBm/MHz	-16	-33.15	0.00	0.00	
		MHz	---	2.399,9998	0	0.00	0.00	
		2483.5 to 2496.5 MHz	dBm/MHz	-16	0.00	0.00	0.00	
		MHz	---	0.00	0	0.00	0.00	
		2496.5 to 12500.0 MHz	dBm/MHz	-26	0.00	-41.62	0.00	
		MHz	---	0.00	4880.23	0.00	0.00	
	占有周波数帯幅 Occupied Bandwidth	(TX1)	MHz	26	1,09700	1,08500	1,08900	
		30.0 to 1000.0 MHz	dBm/100kHz	-54	0.00	0.00	0.00	
		(RX1)	MHz	---	0.00	0	0.00	
	副次的に発生する電波等の強度 Secondary Radiated Emissions Strength	1000.0 to 12500.0 MHz	dBm/MHz	-47	0.00	0.00	0.00	
		MHz	---	0.00	0.00	0.00	0.00	
	干渉防止機能 Interference Prevention Function			良・否 Pass/Fail	Pass	Pass	Pass	BLE MAC : 67CE9780DF17
	空中線利得 Antenna absolute gain (12.14 dBi or less)			良・否 Pass/Fail	Pass	Pass	Pass	

Antenna gain:	3,04	dBi					
Rated Power (dBm):	5,0			2402 MHz	2440 MHz	2480 MHz	
Rated Power (mW):	3,162277660		Duty Cycle	1,00000000	1,00000000	1,00000000	

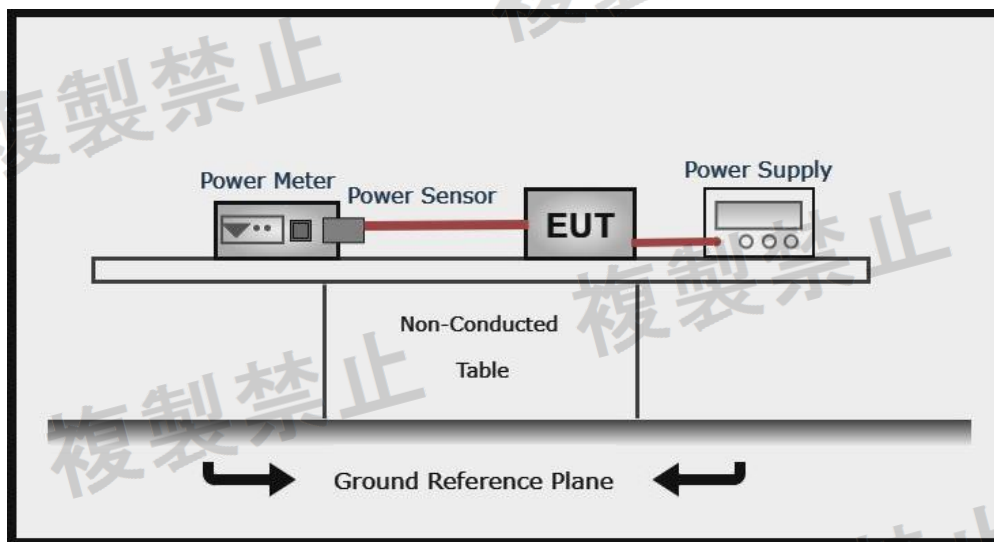
BLE 2M

試験機器の状態 Test Condition	試験項目 (注3) Test Case	単位 Unit	制限 Limit	電圧 (3.7V) Nominal Voltage			備考 Notes	
常温 Nominal Temperature (20.03 °C – 29.27 °C) (49.91 % - 59.57 %)				2402 MHz	2440 MHz	2480 MHz		
	(TX1)	dBm	---	2.50	2.31	2.08	Measured antenna power (dBm)	
	空中線電力	Duty Cycle Correction	dB	---	0.00	0.00	0.00	Duty Factor Correction (dB)
	Antenna power and tolerances for antenna power	Corrected power	dBm	---	2.50	2.31	2.08	
		Corrected power	mW	10	1.78	1.70	1.61	
		Deviation from maximum rated antenna power	%	---	-43.76586748	-46.17302175	-48.949500	
	周波数の偏差	(TX1)	ppm	50	-20.932556	-20.327869	-21.161290	
		Frequency error	Hz	---	-50280	-49600	-52480	
		Frequency Absolute value	MHz	---	2401.94972	2439.9504	2479.94752	
	スプリアス放射の不要放射	30.0 to 2387.0 MHz	dBm/MHz	-26	0.00	0.00	0.00	
		(TX1)	MHz	---	0.00	0	0.00	
		2387.0 to 2400.0 MHz	dBm/MHz	-16	---	-22.62	0.00	
		MHz	---	---	2.399,99086	0	0.00	
		2483.5 to 2496.5 MHz	dBm/MHz	-16	---	0.00	0.00	
		MHz	---	---	0.00	0	0.00	
		2496.5 to 12500.0 MHz	dBm/MHz	-26	0.00	-41.64	0.00	
		MHz	---	---	0.00	4.880,85	0.00	
	占有周波数帯幅	(TX1)	MHz	26	2,0728	2,086791	2,061294	
		30.0 to 1000.0 MHz	dBm/100kHz	-54	0.00	0.00	0.00	
		(RX1)	MHz	---	0.00	0	0.00	
	副次的に発生する電波等の強度	1000.0 to 12500.0 MHz	dBm/MHz	-47	0.00	0.00	0.00	
		MHz	---	---	0.00	0.00	0.00	
	干渉防止機能	Interference Prevention Function	良・否 Pass/Fail	Pass	Pass	Pass	Pass	BLE MAC : 67CE9780DF17
空中線利得	Antenna absolute gain (12.14 dBi or less)	良・否 Pass/Fail	Pass	Pass	Pass	Pass		

Antenna gain:	3,04	dBi					
Rated Power (dBm):	5,0			2402 MHz	2440 MHz	2480 MHz	
Rated Power (mW):	3,162277660		Duty Cycle	1,00000000	1,00000000	1,00000000	

Article 49-20 and Article 14.7 Table 8. Transmitting equipment. Antenna power. Tolerances for antenna power

Test Setup:



Limits:

Mode	Limit	Tolerance
a) FH, FH+DS, FH+OFDM	3 mW/MHz	+20%
b) OFDM (Narrow bandwidth), DS	10 mW/MHz	
c) Other than a & b	10 mW	
d) OFDM (Wide band)	5 mW/MHz	

Test method:

According to MIC Notice No. 88 Annex 43

Test procedure:

The conducted RF output power measurements were made at the RF output terminals of the DUT, using an average power meter, selecting maximum transmission power of the DUT in the different test channels. The measurement is corrected with the duty cycle.

Results:

Mode: Other digital modulation methods than a & b.

Vnom:

Modulation: BTLE 5.0 (GFSK 1 Mbit/s)

Channel	Duty Cycle (%)	Duty Factor Correction (dB)	Measured antenna power with Duty Cycle correction (dBm)	Antenna power with Duty Cycle Correction (mW)	Deviation from maximum rated antenna power (%)
Low (2402 MHz)	100	0	2.490	3.57	-43.895202
Middle (2440 MHz)	100	0	2.300	3.42	-46.296820
High (2480 MHz)	100	0	2.080	3.25	-48.949500

Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

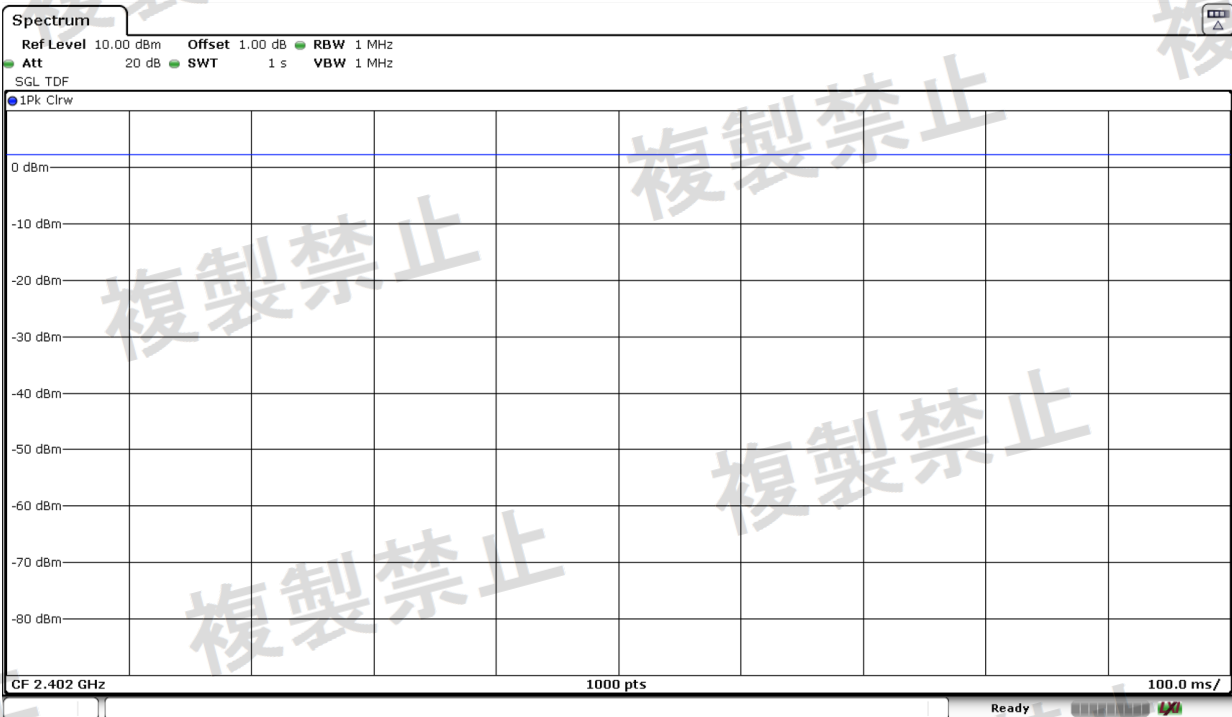
Channel	Duty Cycle (%)	Duty Factor Correction (dB)	Measured antenna power with Duty Cycle correction (dBm)	Antenna power with Duty Cycle Correction (mW)	Deviation from maximum rated antenna power (%)
Low (2402 MHz)	100	0	2.500	3.58	-43.765867
Middle (2440 MHz)	100	0	2.310	3.43	-46.173021
High (2480 MHz)	100	0	2.080	3.25	-48.949500

Measurement uncertainty: < ± 2.01 dB

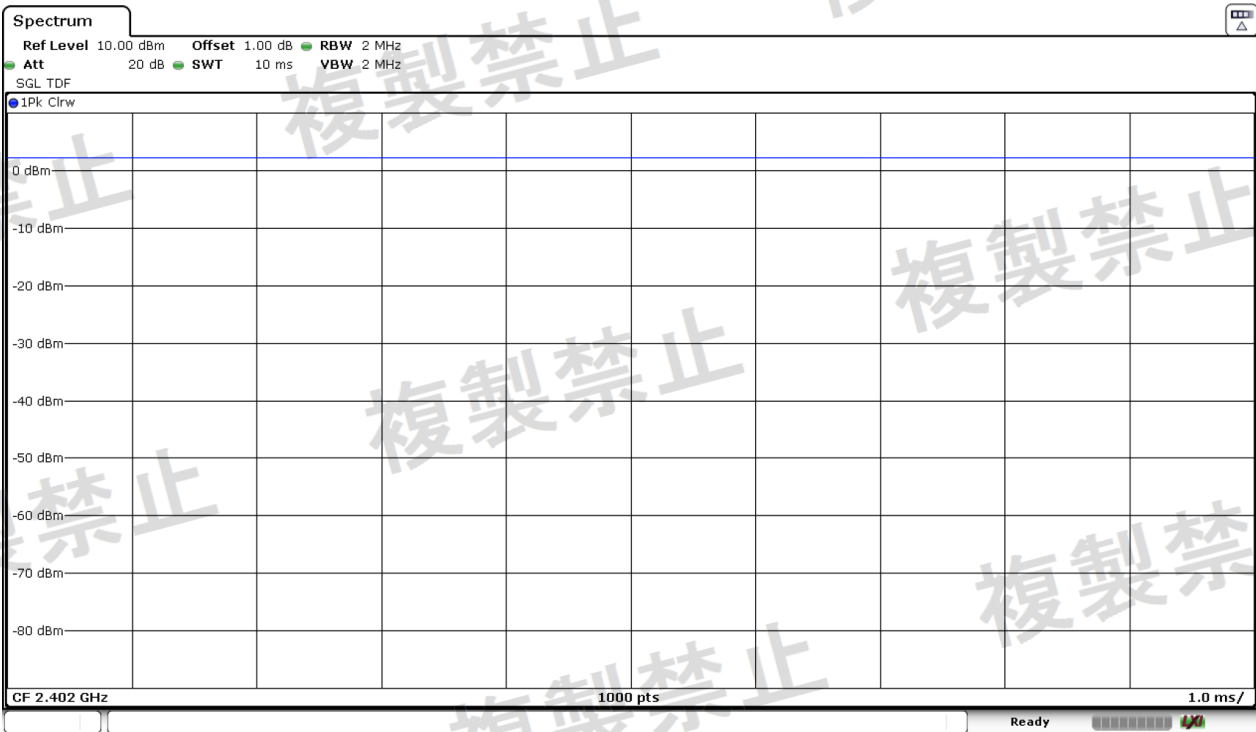
Verdict:

PASS

Duty Cycle 1M:

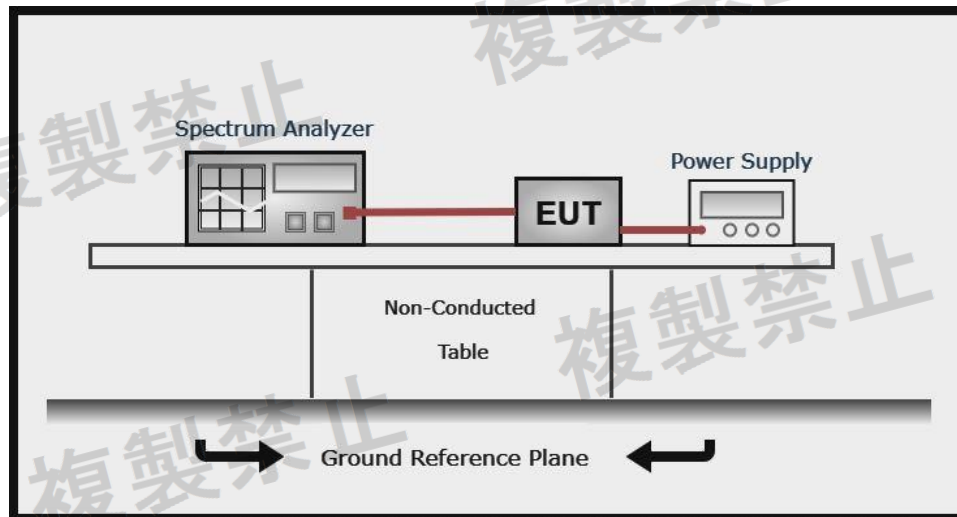


Duty Cycle 2M:



Article 5 and Annex 1 table 7-8. Transmitting equipment. Frequency tolerance

Test Setup:



Limits:

Frequency tolerance shall be $\pm 50 \times 10^{-6}$ (50 ppm).

Test method:

According to MIC Notice No. 88 Annex 43

Test procedure:

The DUT is connected to the spectrum analyzer and it is configured at maximum output power in the different test channels, no modulation active. The frequency error is calculated as the difference between the maximum peak detected and the nominal value.

Results:

Vnom:

Modulation: BTLE 5.0 (GFSK 1 Mbit/s)

Channel	Frequency error (Hz)	Frequency error (ppm)
Low (2402 MHz)	-53800	-22.39800167
Middle (2440 MHz)	-52900	-21.68032787
High (2480 MHz)	-54500	-21.97580645
Measurement uncertainty	<± 7.10 kHz	

Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

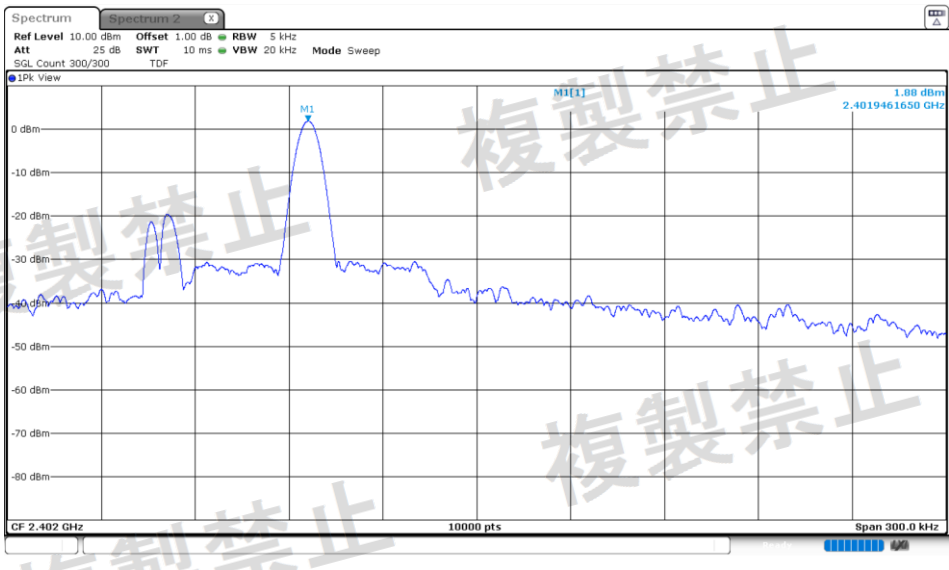
Channel	Frequency error (Hz)	Frequency error (ppm)
Low (2402 MHz)	-50280	-20.9325562
Middle (2440 MHz)	-49600	-20.32786885
High (2480 MHz)	-52480	-21.16129032
Measurement uncertainty	<± 7.10 kHz	

Verdict:

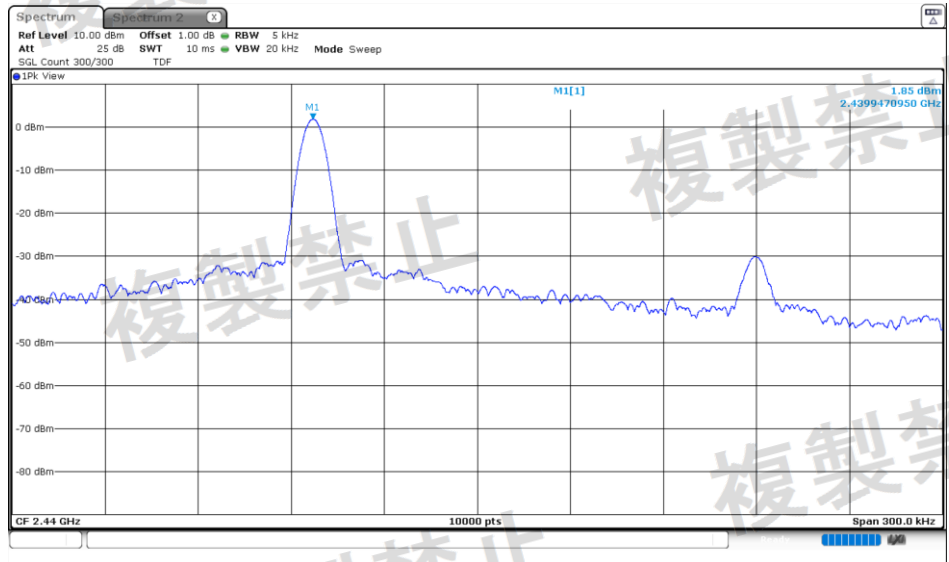
PASS

Measurements:

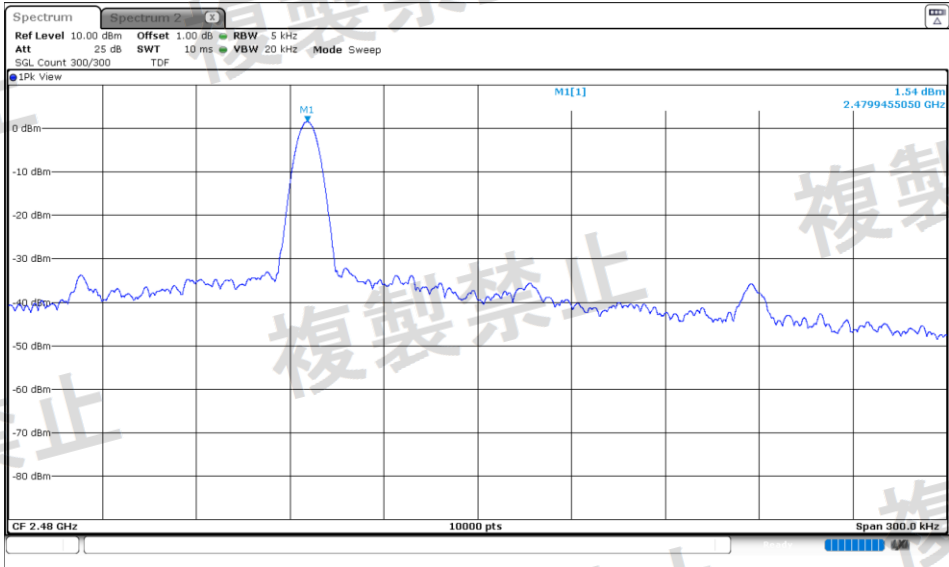
LOW CHANNEL:



MIDDLE CHANNEL:

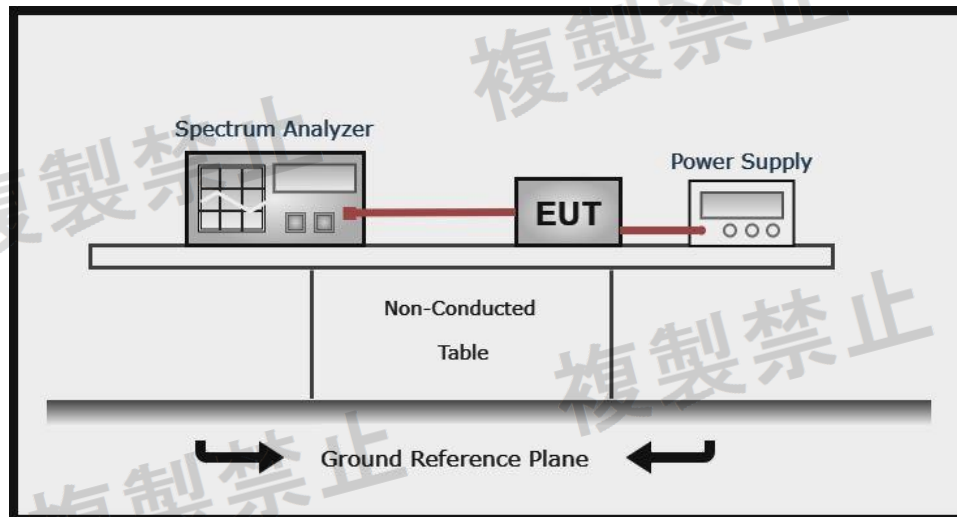


HIGH CHANNEL:



Article 7 and Annex 3. 26. Transmitting equipment. Spurious emission intensity

Test Setup:



Limits:

Permissible mean power of spurious emission of each frequency supplied to a feeder, that is, mean power of spurious emission in the 1 MHz bandwidth at frequency f other than frequency band used shall be as follows:

a. $2,387 \text{ MHz} \leq f \leq 2,400 \text{ MHz}$ and $2,483.5 \text{ MHz} < f \leq 2,496.5 \text{ MHz}$ 25 μW (-16 dBm) or less.

b. $2,387 \text{ MHz} > f$ and $2,496.5 \text{ MHz} < f$ 2.5 μW (-26 dBm) or less.

Test method:

According to MIC Notice No. 88 Annex 43

Test procedure:

The DUT is connected to the spectrum analyzer and it is configured at maximum output power in the different test channels. The spectrum analyzer is configured with the parameters (RWB, VBW, frequency span) indicated in the test method. It is ensure to have at least 10 dB of margin between background noise and limit line.

Results:

Vnom:

Modulation: BTLE 5.0 (GFSK 1 Mbit/s)

- LOW CHANNEL:

F(MHz)	P(dBm)
2399.999800	-25.61

- MIDDLE CHANNEL:

Spurious frequencies detected at less than 10 dB below the limit:

- HIGH CHANNEL:

No spurious frequencies detected at less than 10 dB below the limit.

Measurement uncertainty <± 2.77 dB

Verdict:

PASS

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
Receiver: [FSV 40]					
9 kHz - 150 kHz	141 Hz	PK+	300 Hz	1 s	0 dB
150 kHz - 30 MHz	3.317 kHz	PK+	10 kHz	1 s	0 dB
30 MHz - 1 GHz	97 kHz	PK+	1 MHz	1 s	0 dB
1 GHz - 2.3 GHz	130 kHz	PK+	1 MHz	1 s	0 dB
2.3 GHz - 2.6 GHz	30 kHz	PK+	1 MHz	1 s	0 dB
2.6 GHz - 12.5 GHz	330 kHz	PK+	1 MHz	1 s	0 dB
12.5 GHz - 25 GHz	416.667 kHz	PK+	1 MHz	1 s	0 dB

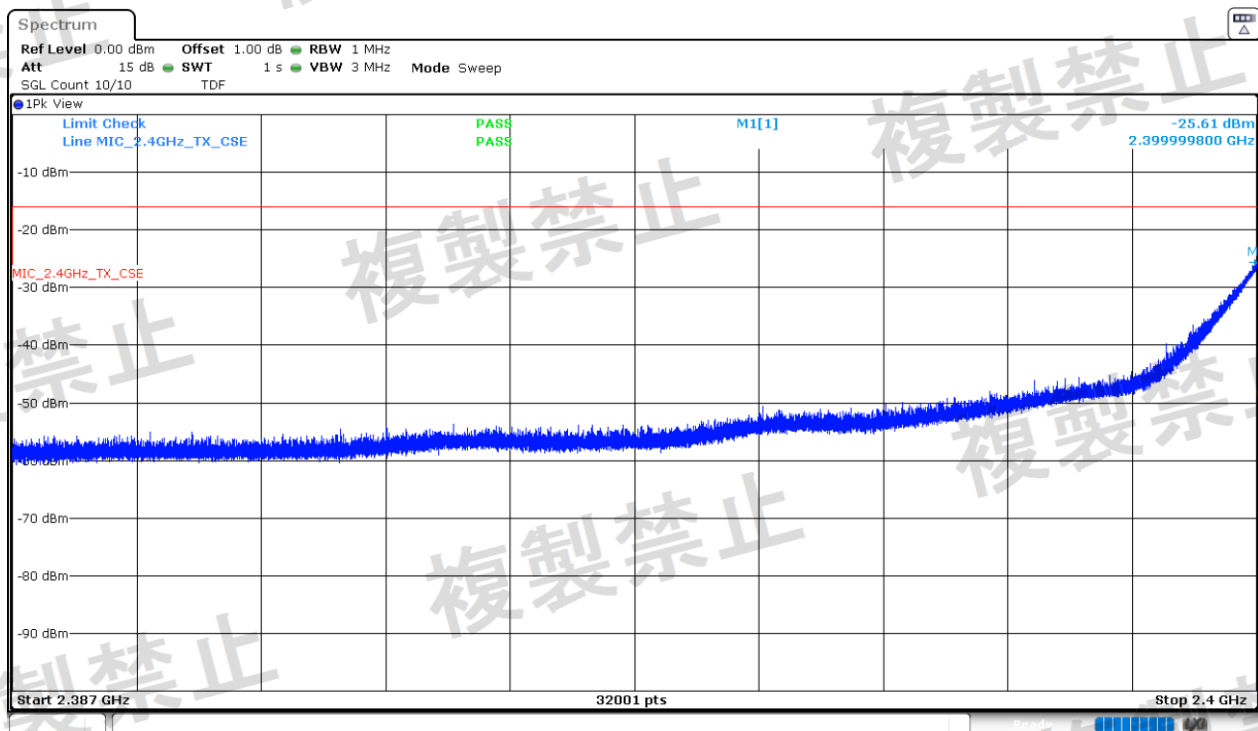
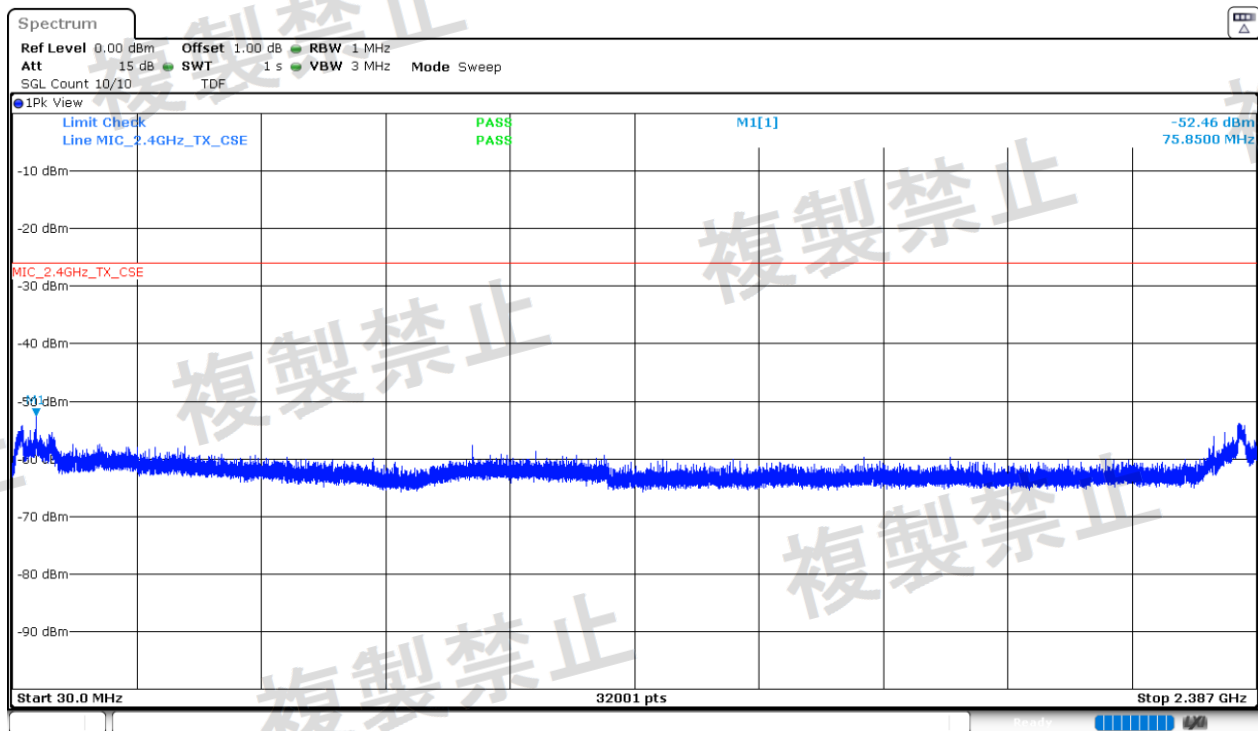
Measurements

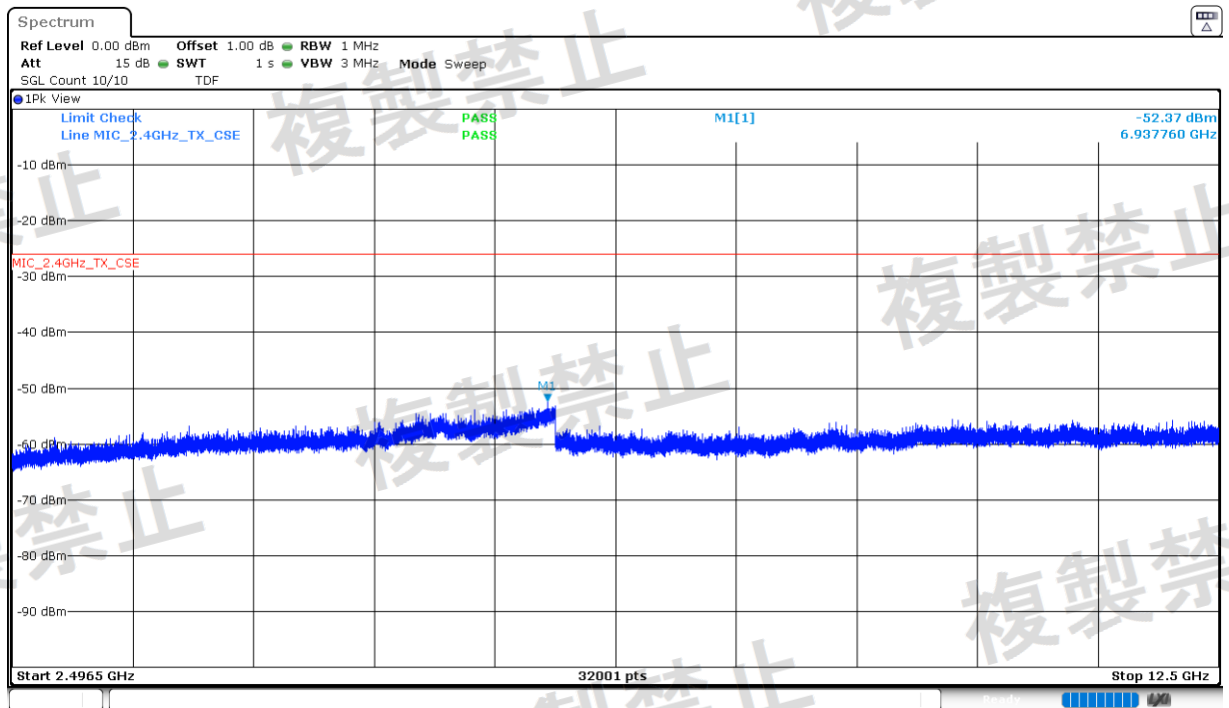
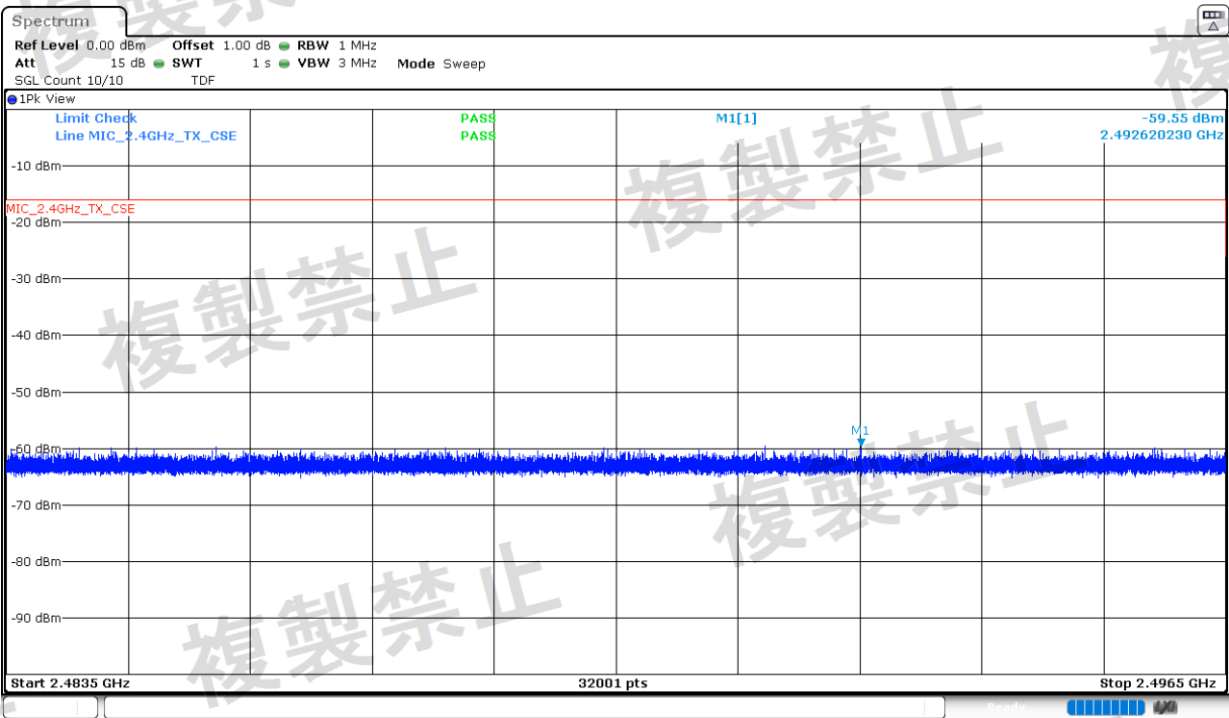
Vnom:

Modulation: BTLE 5.0 (GFSK 1 Mbit/s)

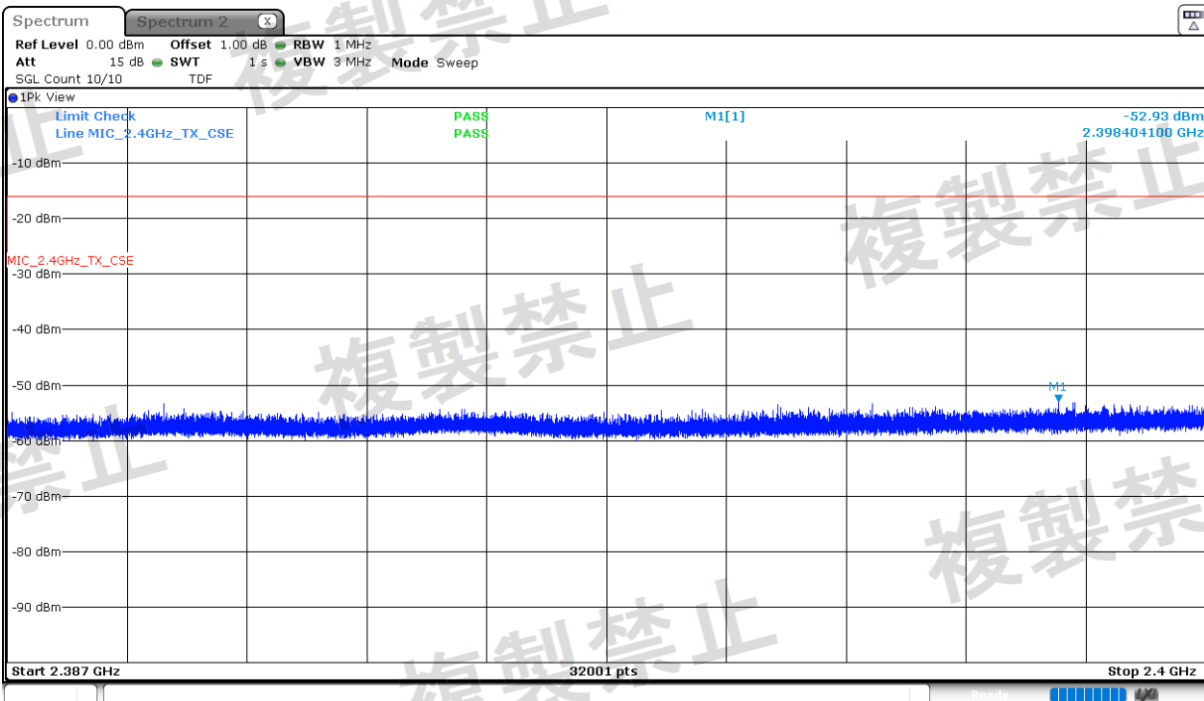
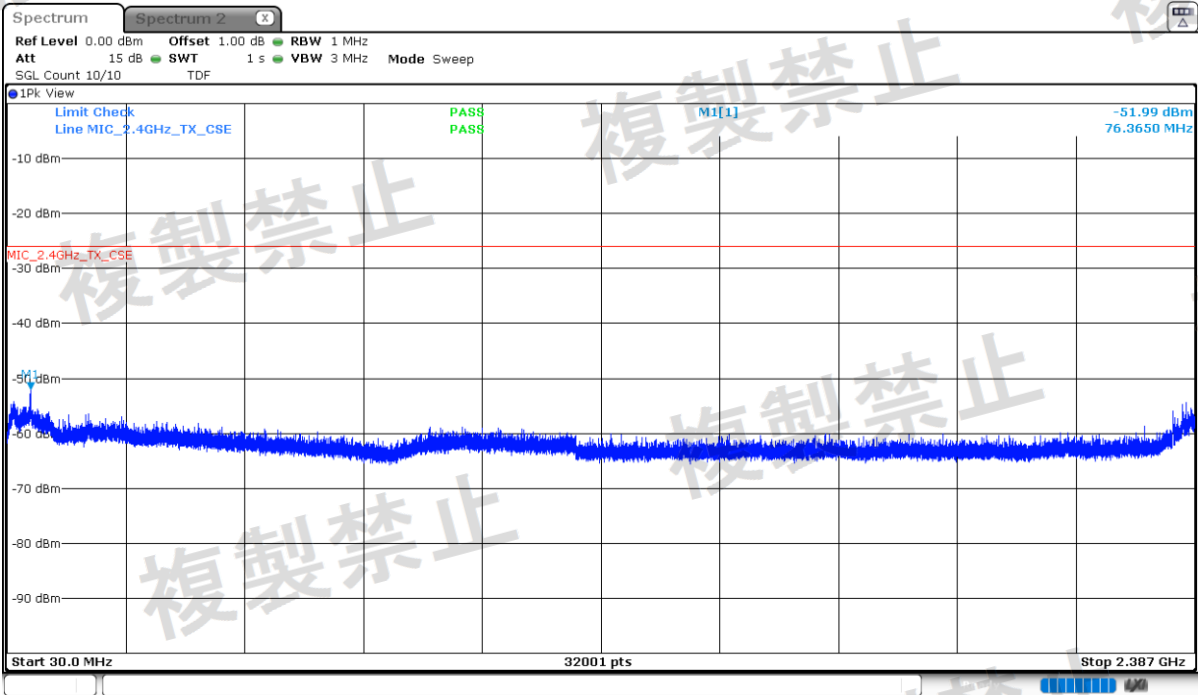
- LOW CHANNEL:

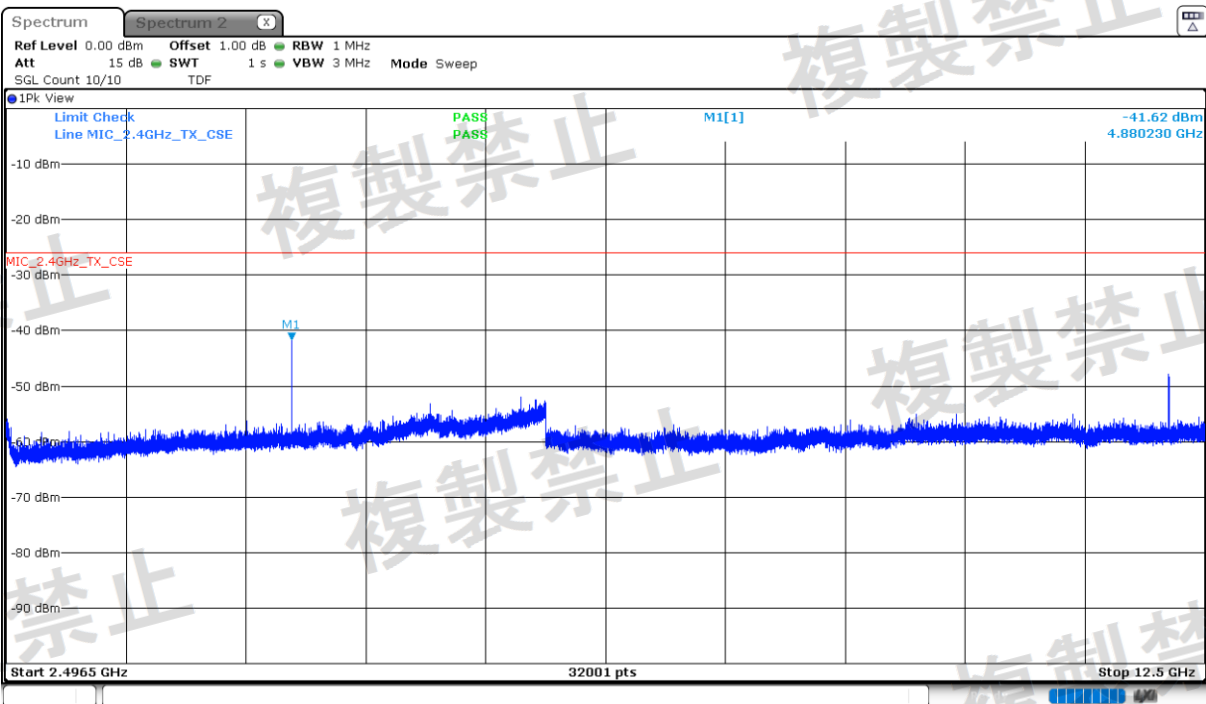
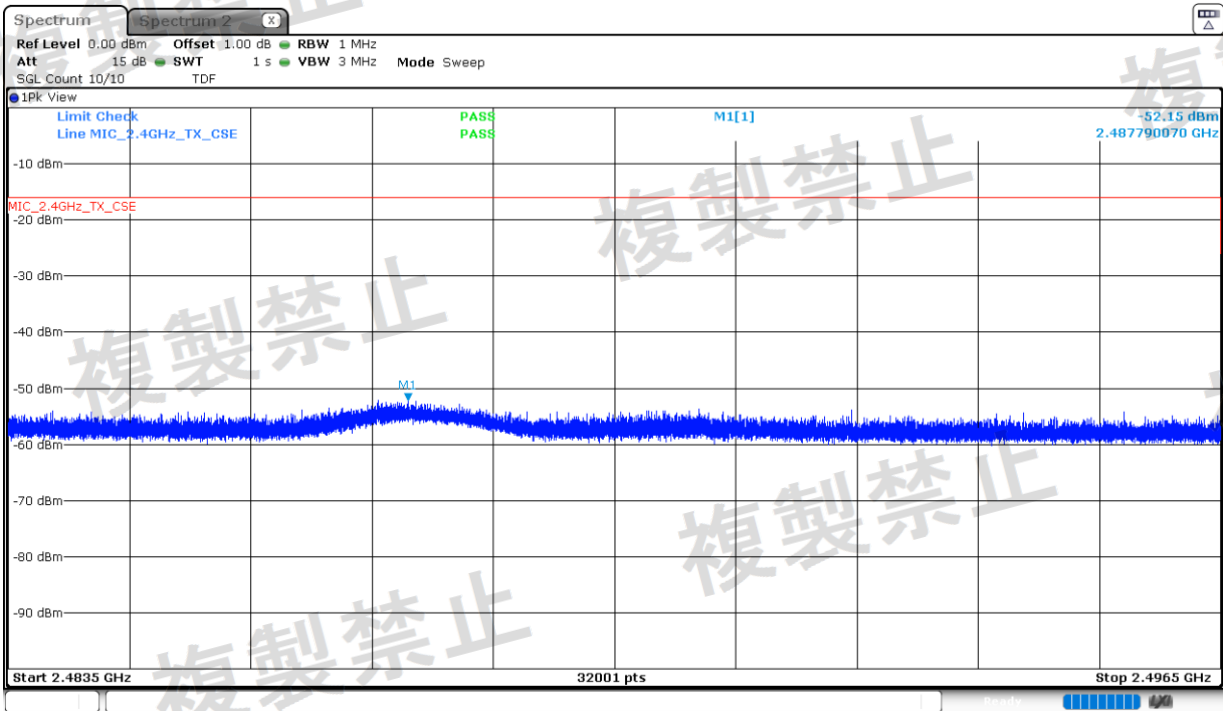
Frequency range 30 MHz - 12.5 GHz:



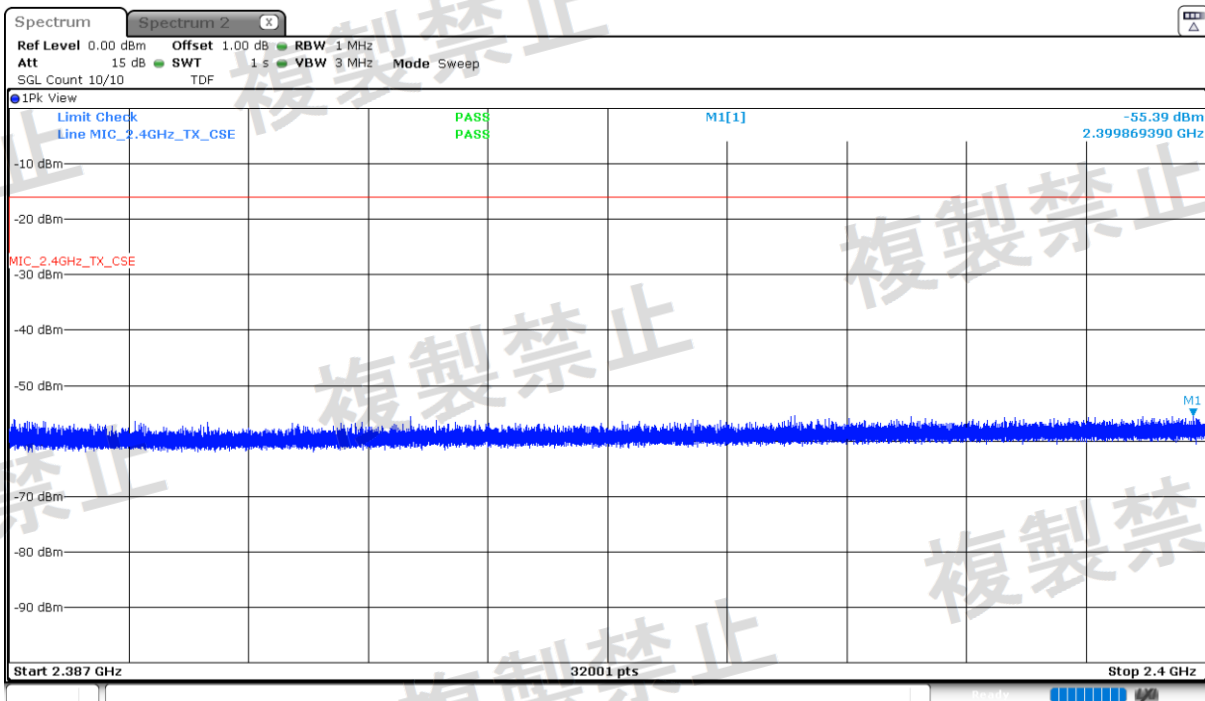
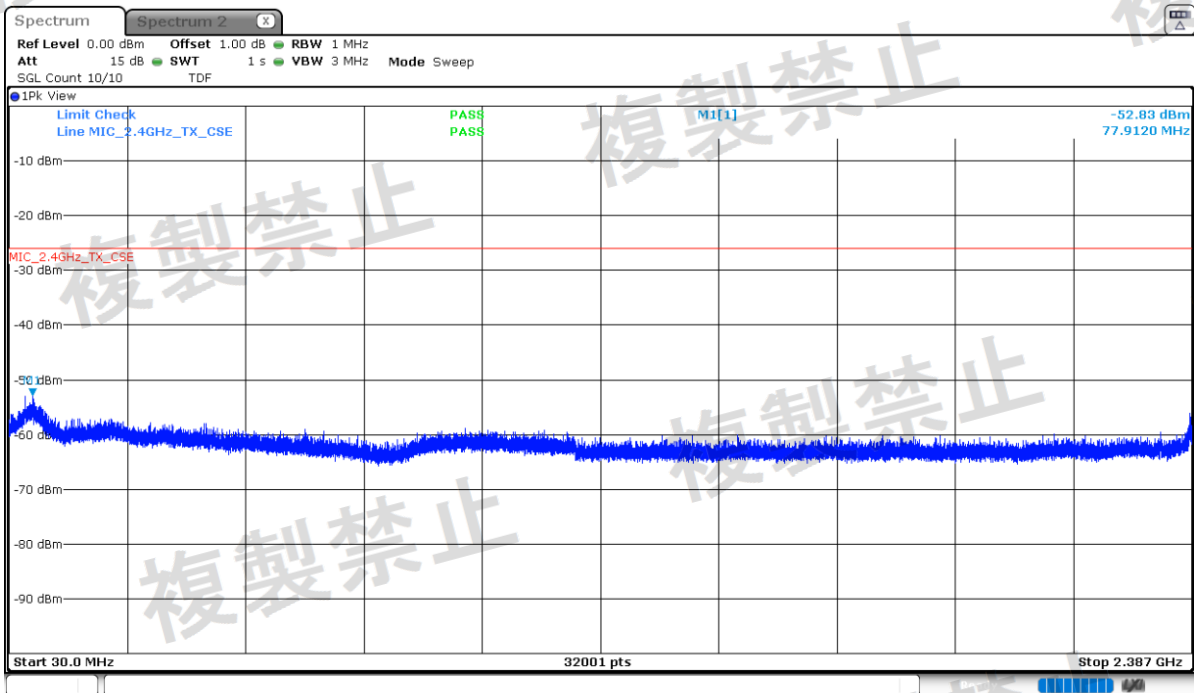


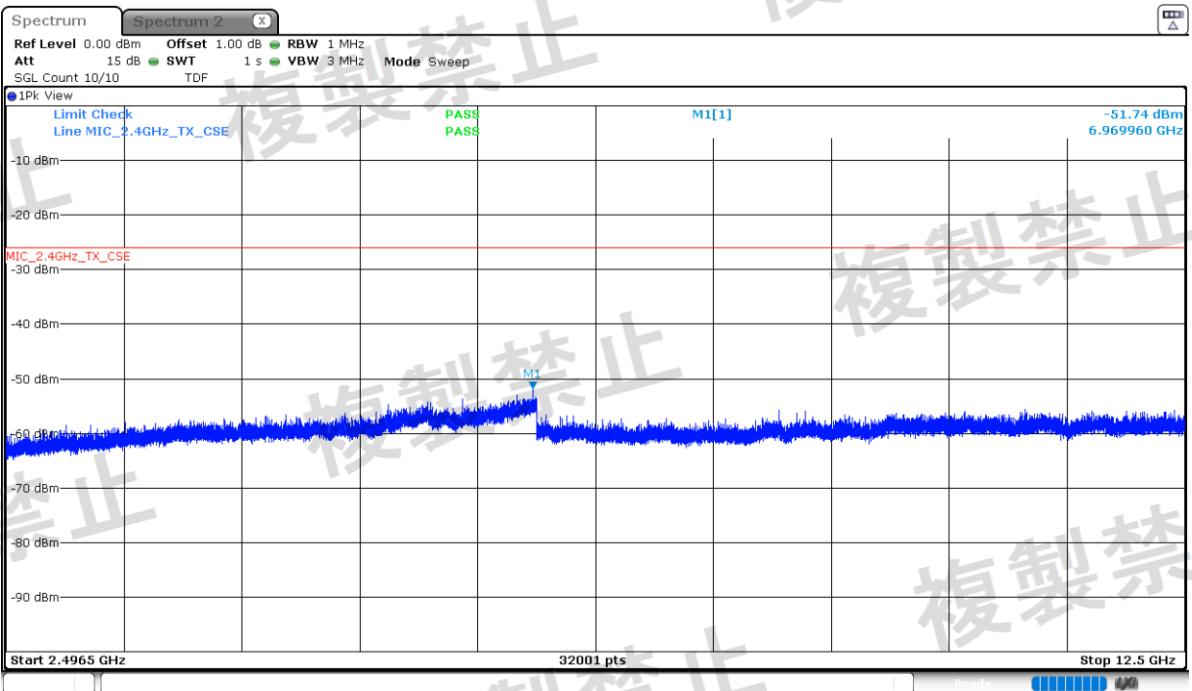
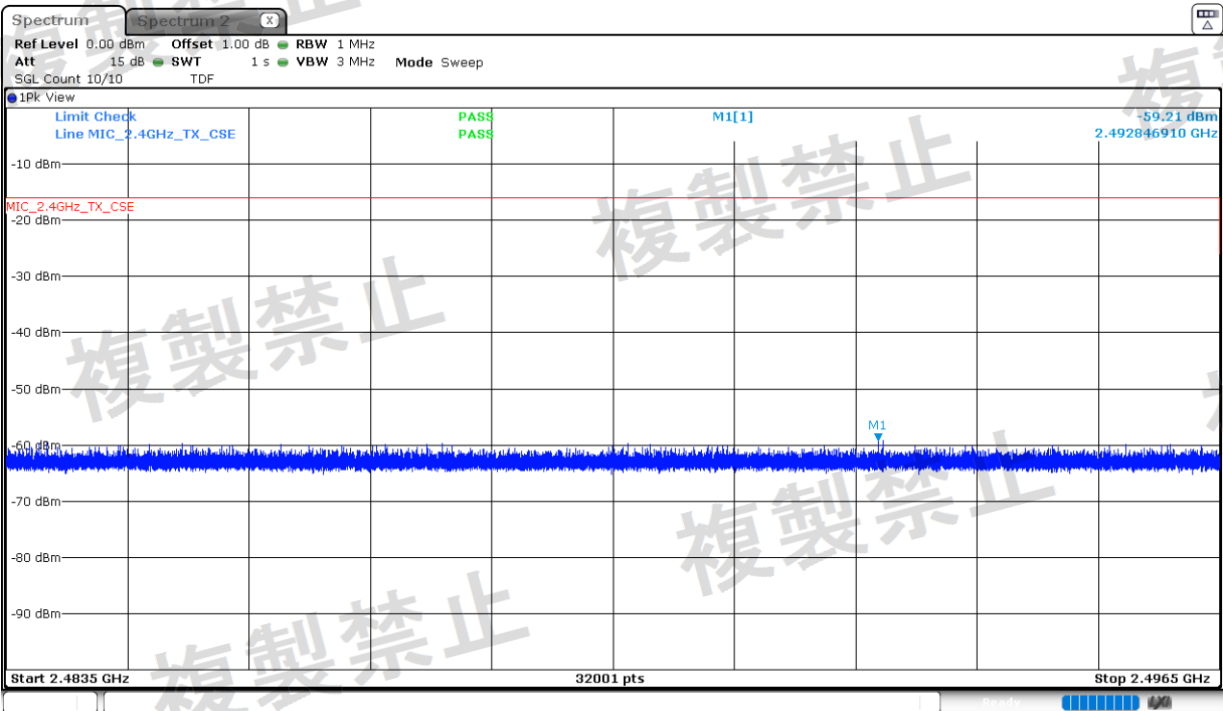
- MIDDLE CHANNEL:
Frequency range 30 MHz – 12.5 GHz:





- HIGH CHANNEL:
Frequency range 30 MHz - 12.5 GHz:





Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

• LOW CHANNEL:

F(MHz)	P(dBm)
2399.99086	-22.62

• MIDDLE CHANNEL:

Spurious frequencies detected at less than 10 dB below the limit:

• HIGH CHANNEL:

No spurious frequencies detected at less than 10 dB below the limit.

Measurement uncertainty <± 2.77 dB

Verdict:

PASS

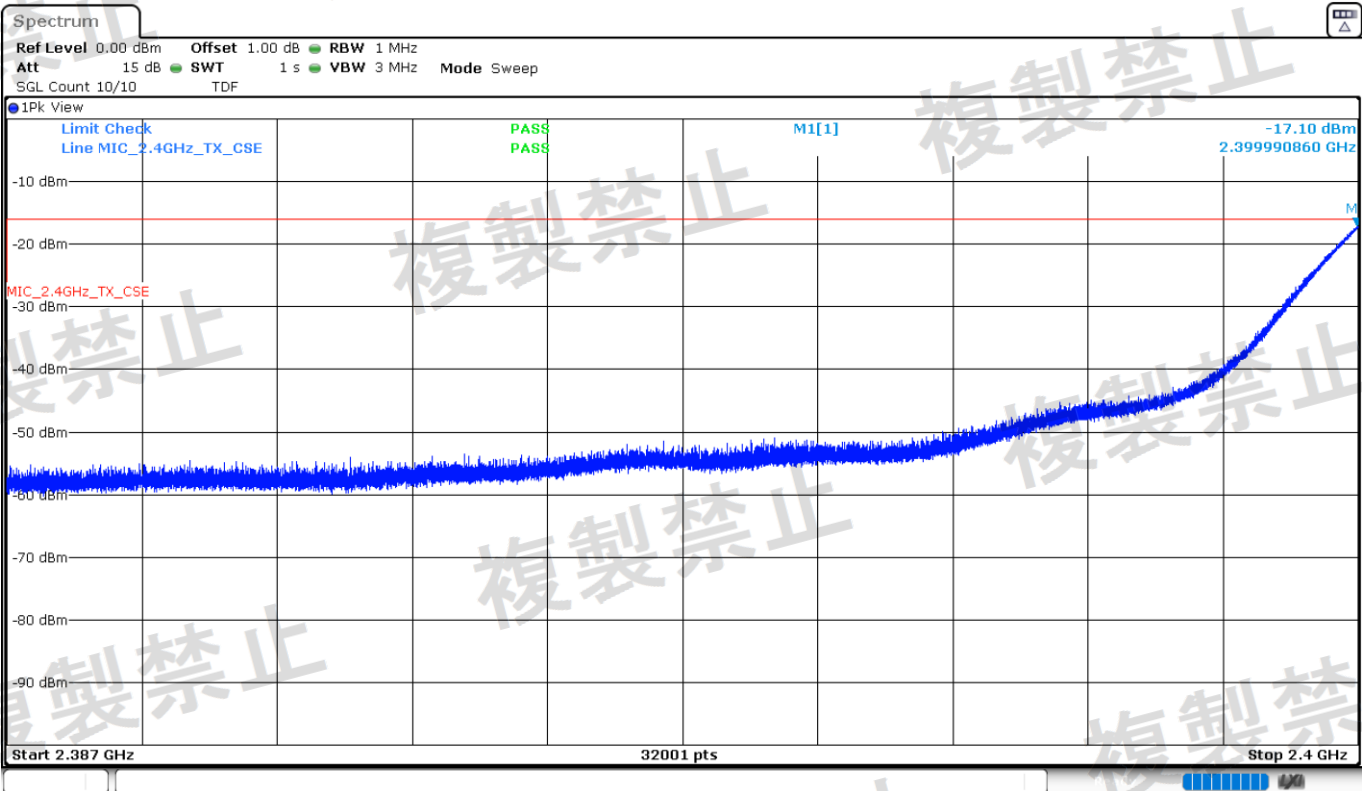
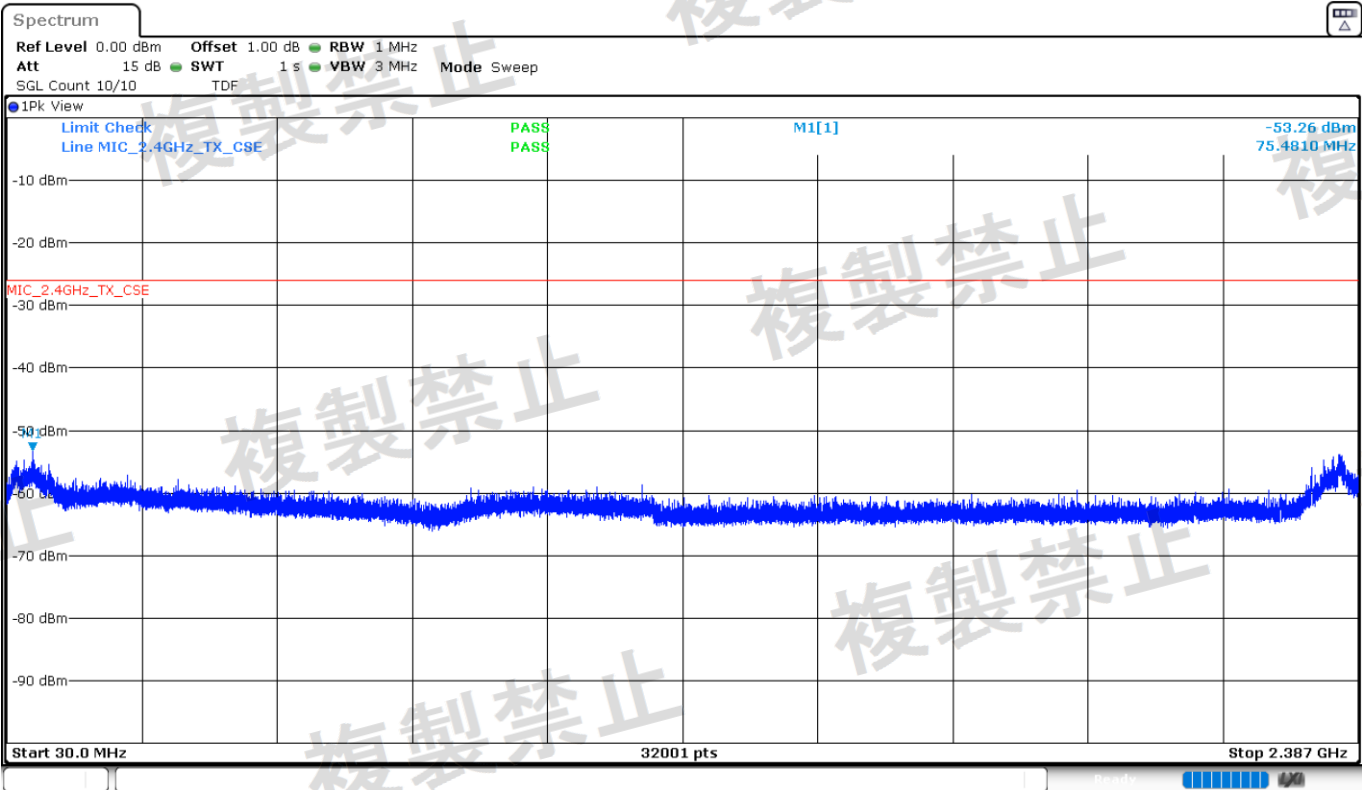
Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
Receiver: [FSV 40]					
9 kHz - 150 kHz	141 Hz	PK+	300 Hz	1 s	0 dB
150 kHz - 30 MHz	3.317 kHz	PK+	10 kHz	1 s	0 dB
30 MHz - 1 GHz	97 kHz	PK+	1 MHz	1 s	0 dB
1 GHz - 2.3 GHz	130 kHz	PK+	1 MHz	1 s	0 dB
2.3 GHz - 2.6 GHz	30 kHz	PK+	1 MHz	1 s	0 dB
2.6 GHz - 12.5 GHz	330 kHz	PK+	1 MHz	1 s	0 dB
12.5 GHz - 25 GHz	416.667 kHz	PK+	1 MHz	1 s	0 dB

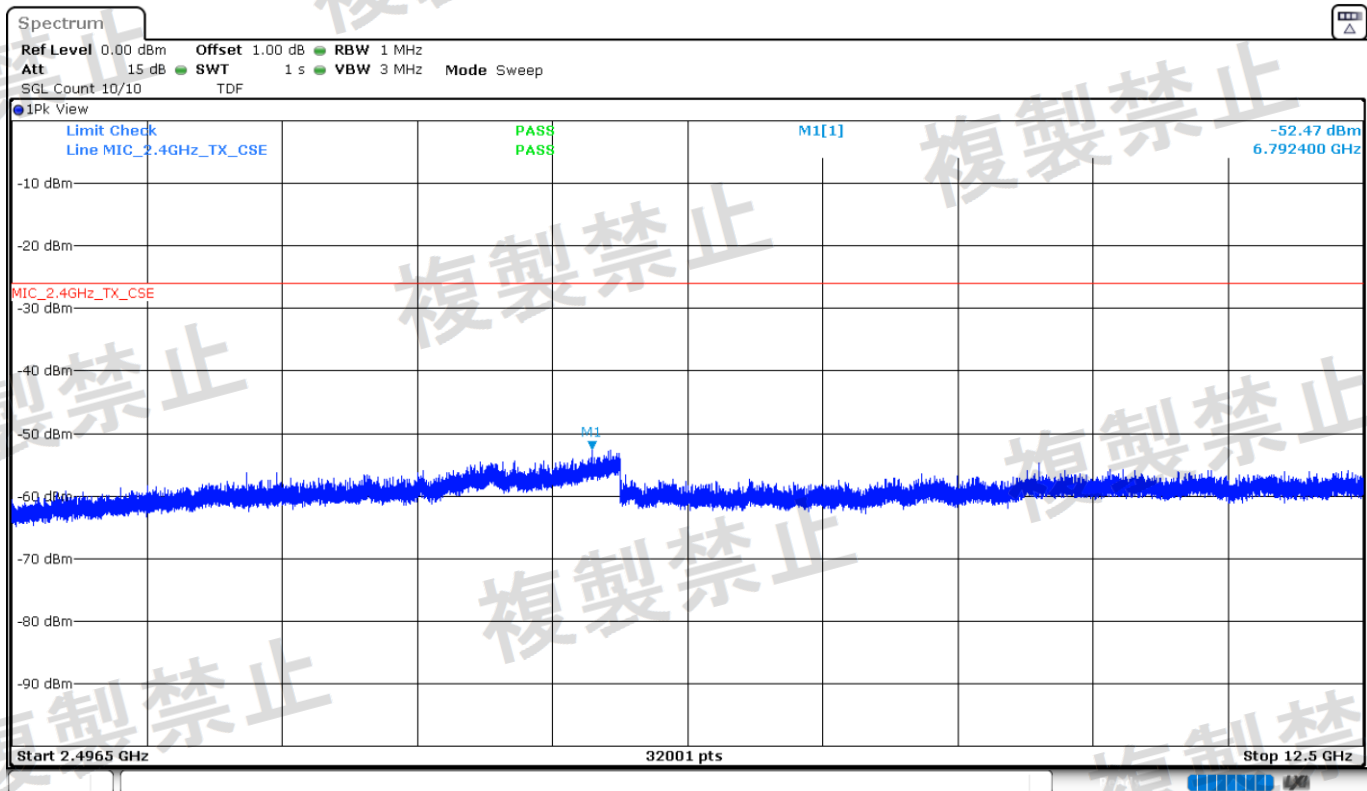
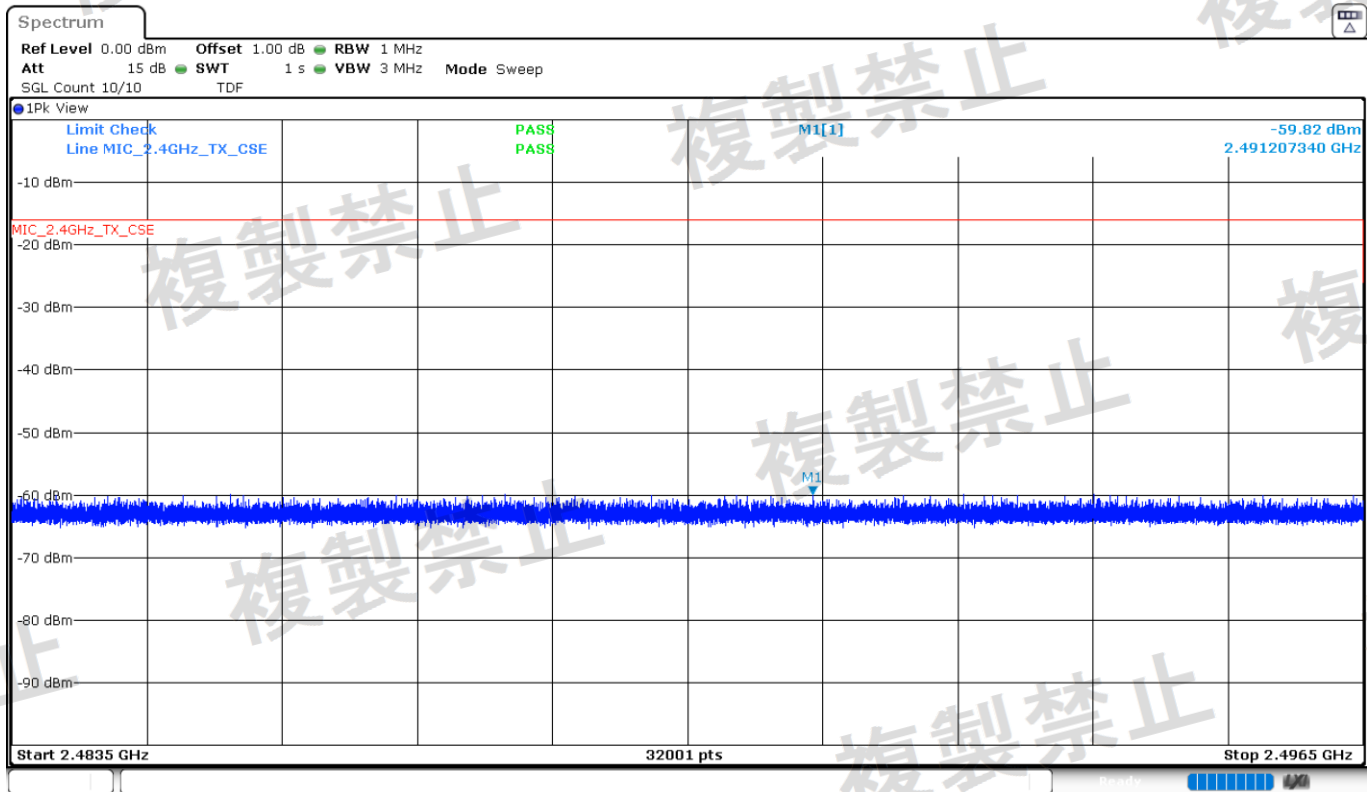
Vnom:

Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

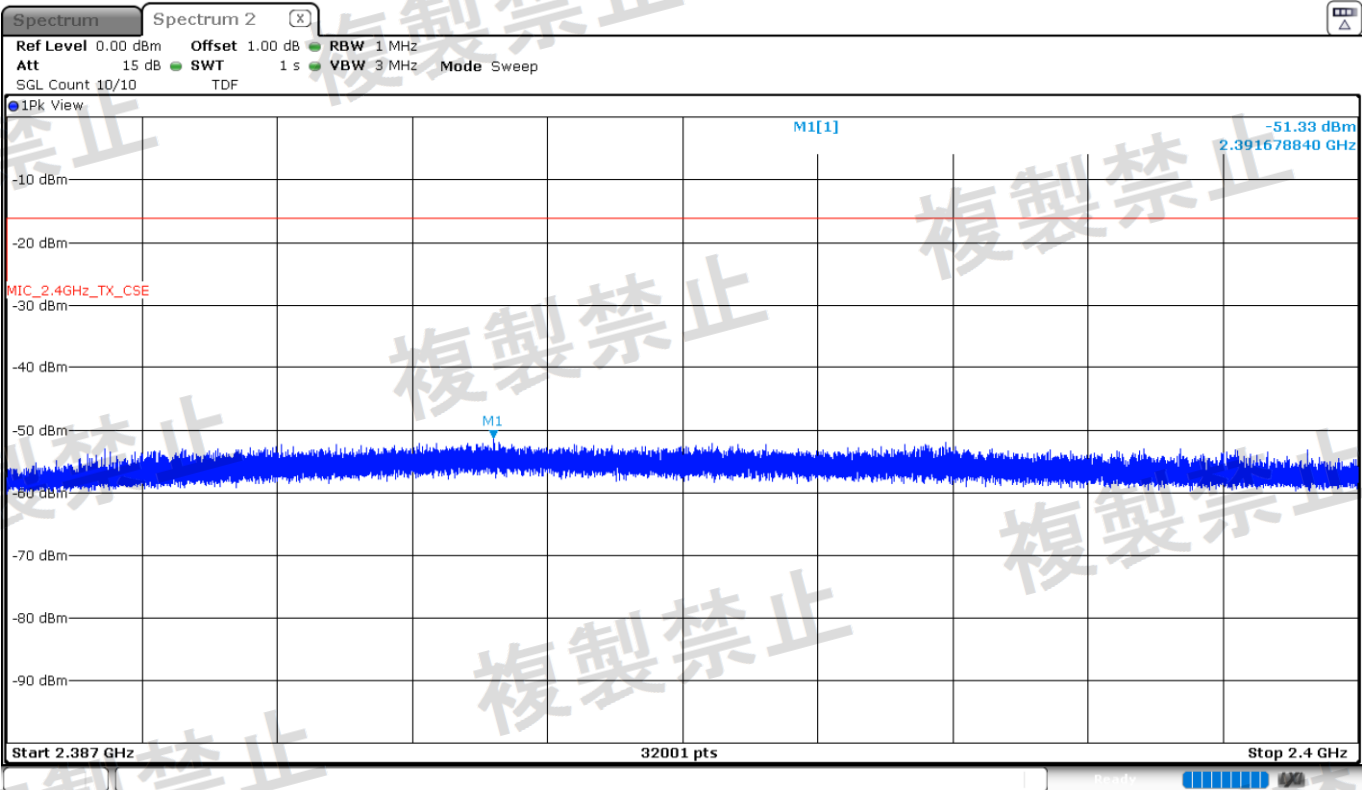
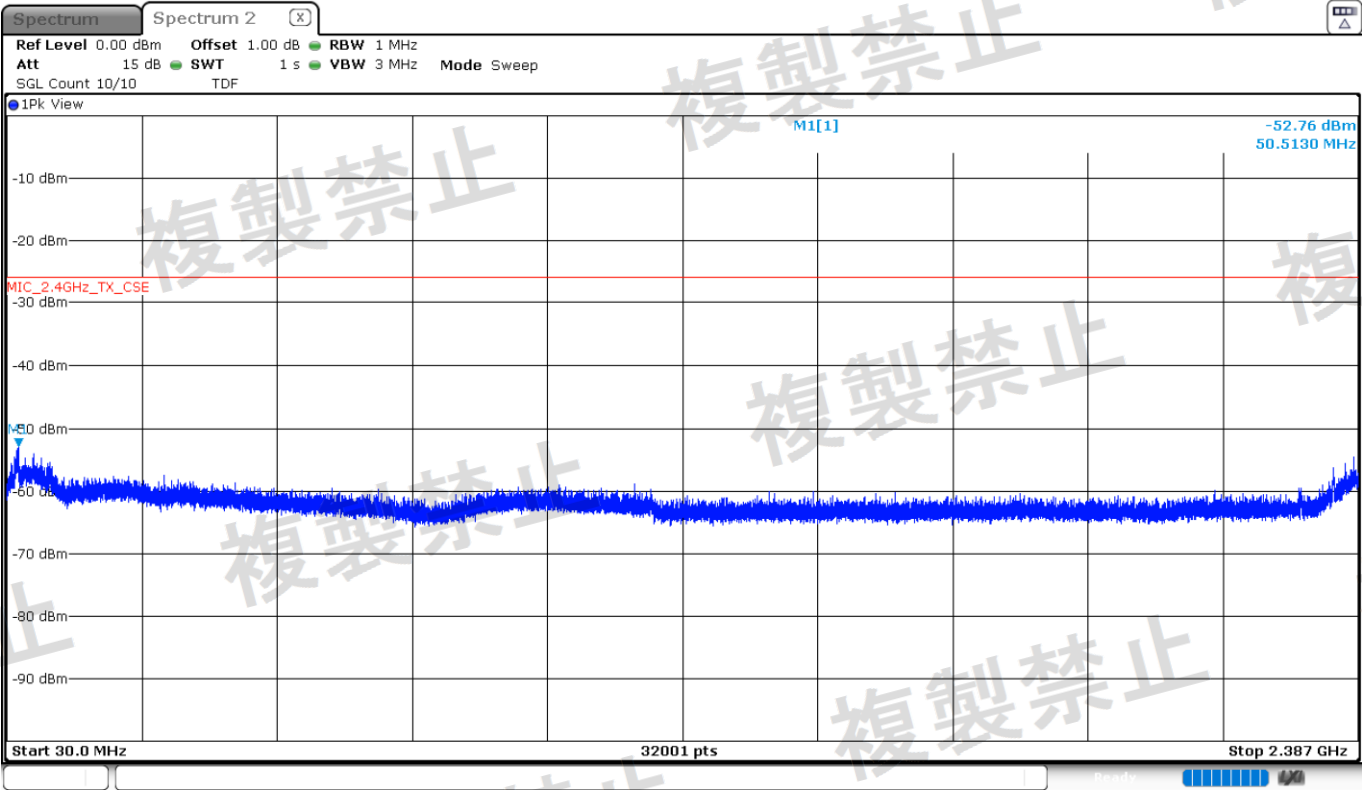
- LOW CHANNEL:

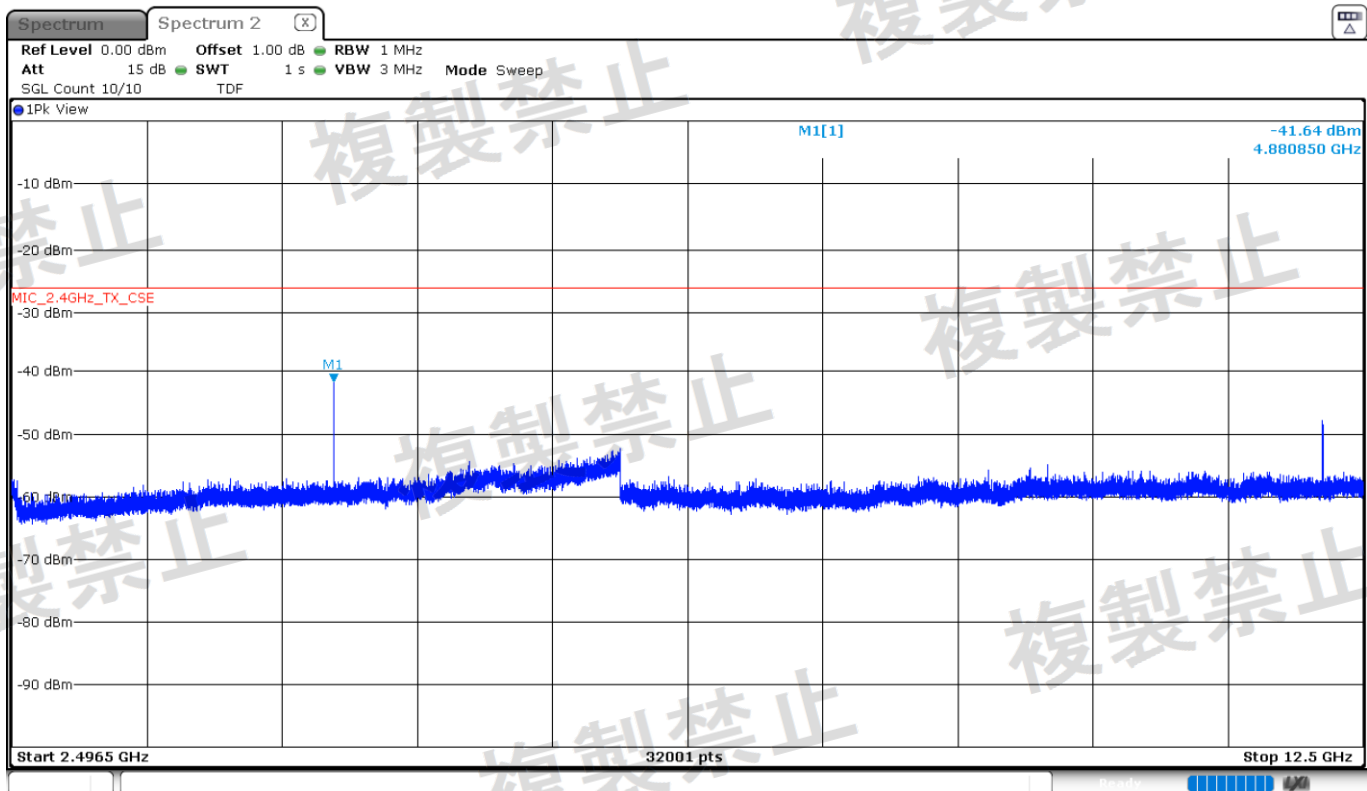
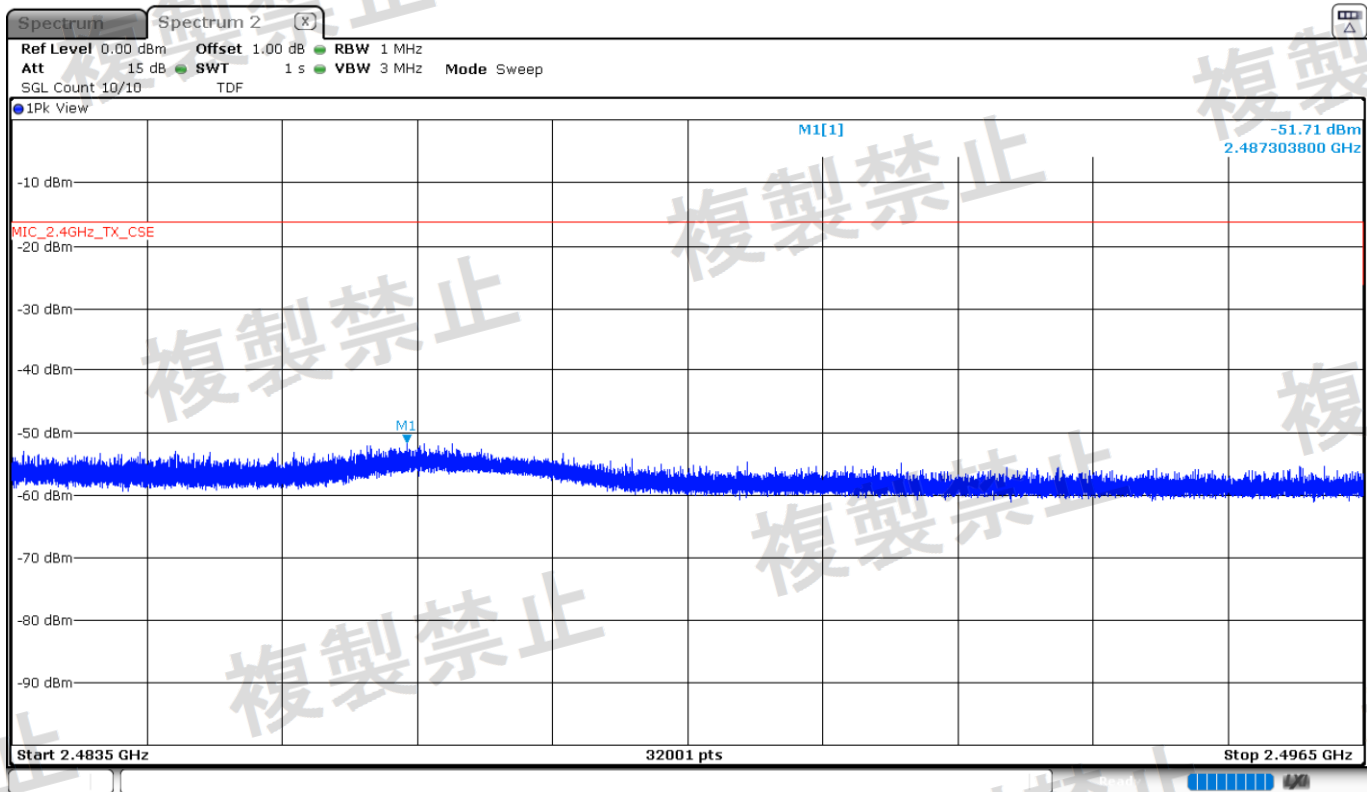
Frequency range 30 MHz - 12.5 GHz:



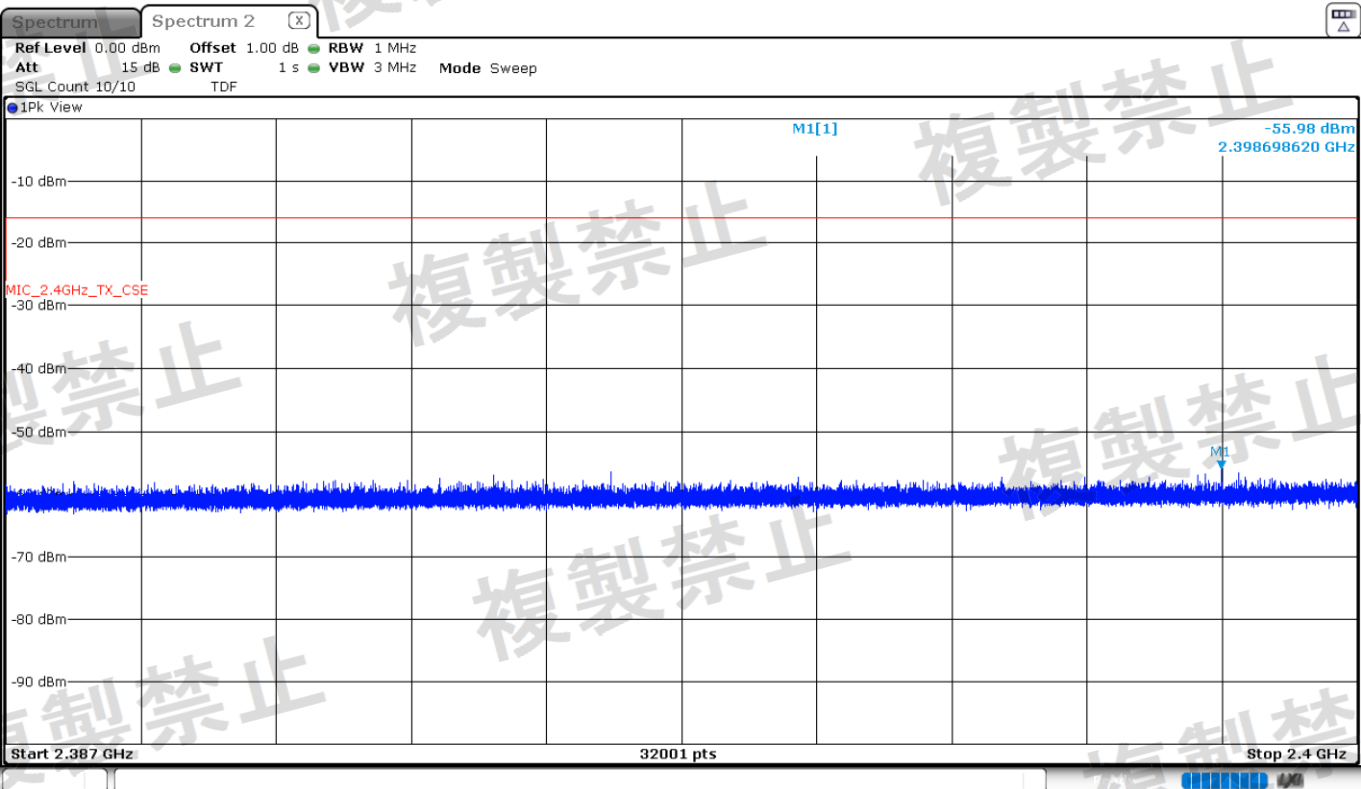
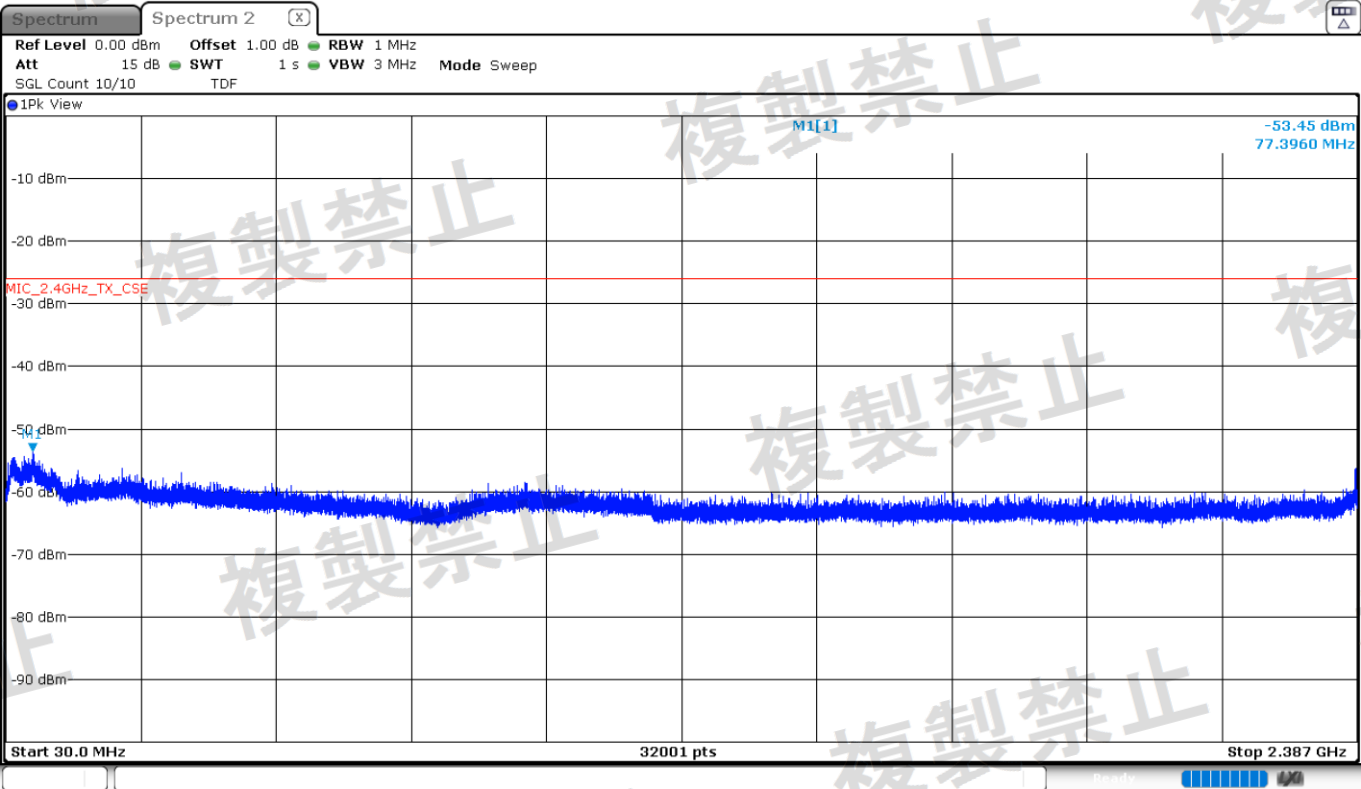


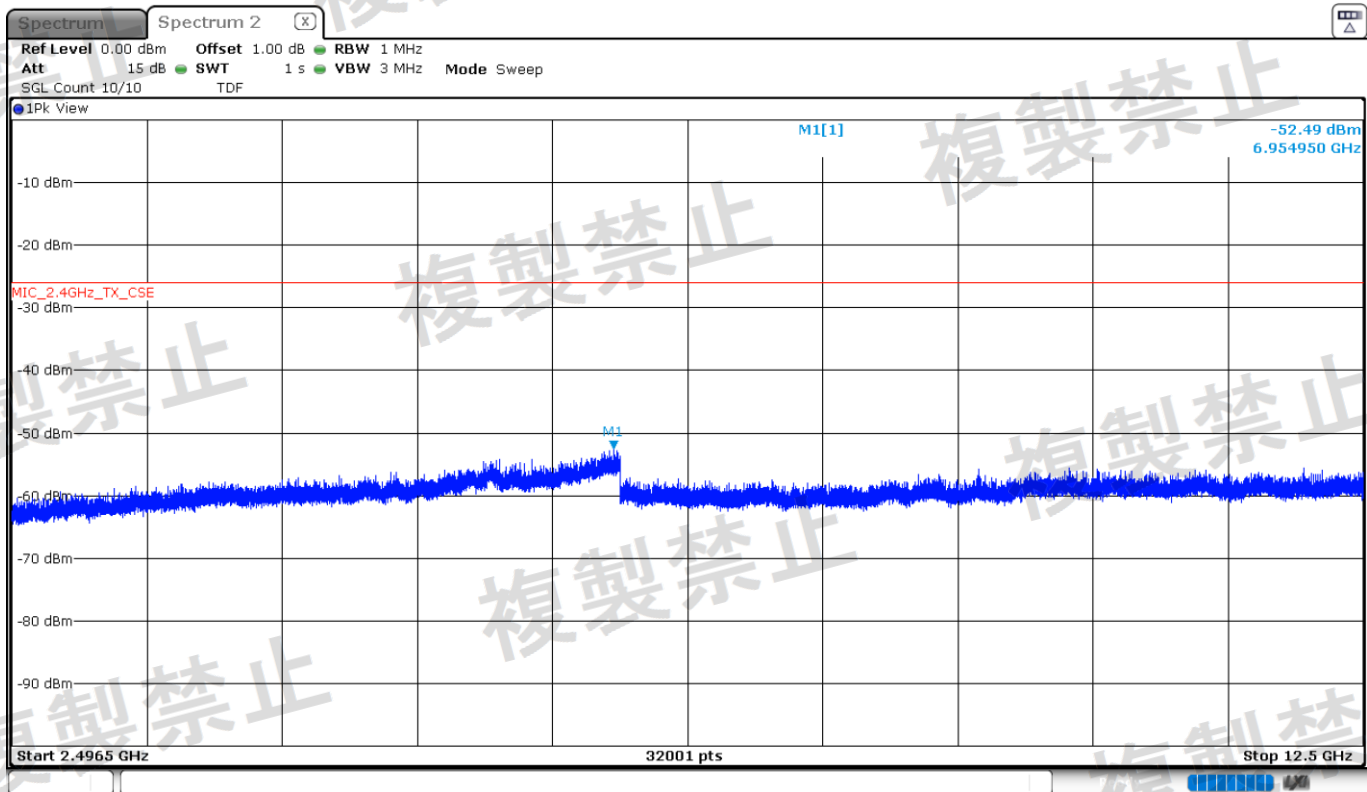
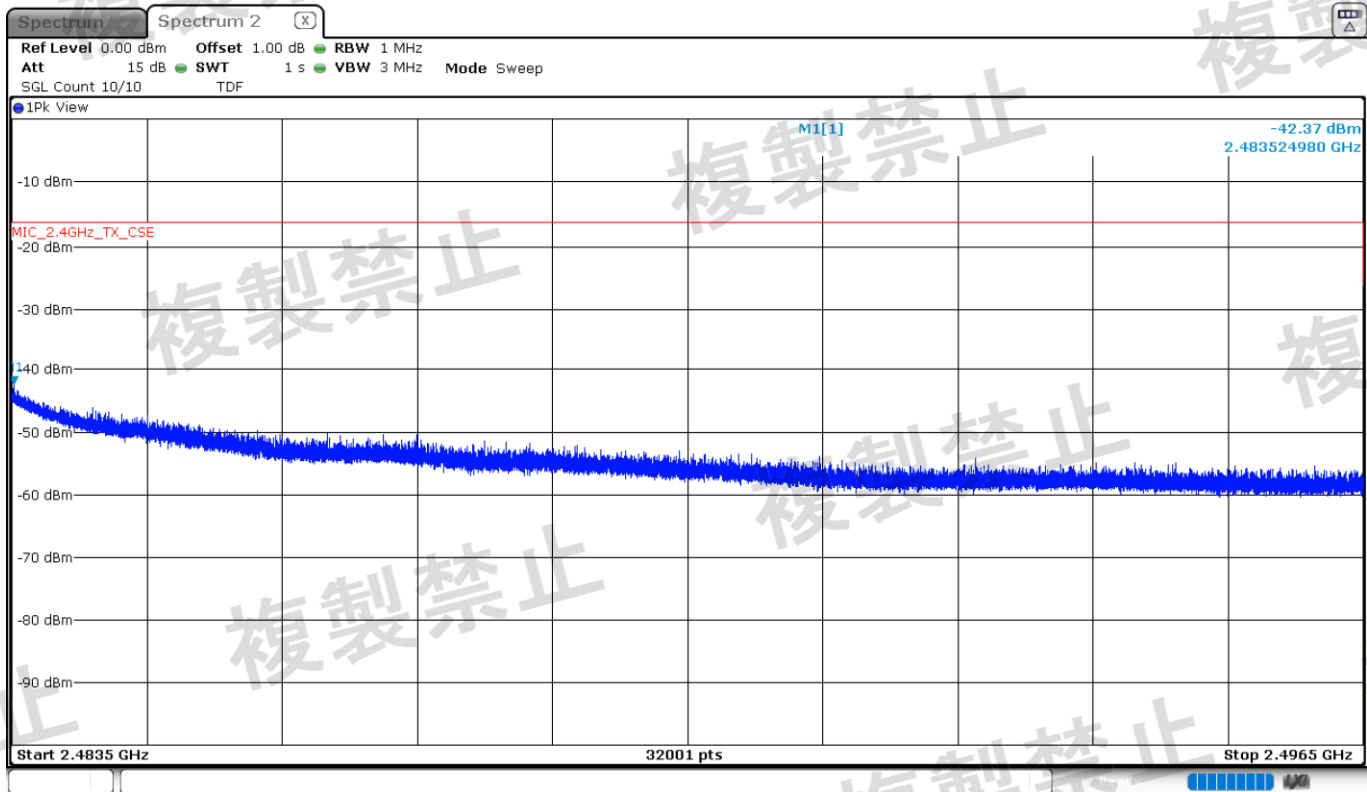
- MIDDLE CHANNEL:
Frequency range 30 MHz - 12.5 GHz:





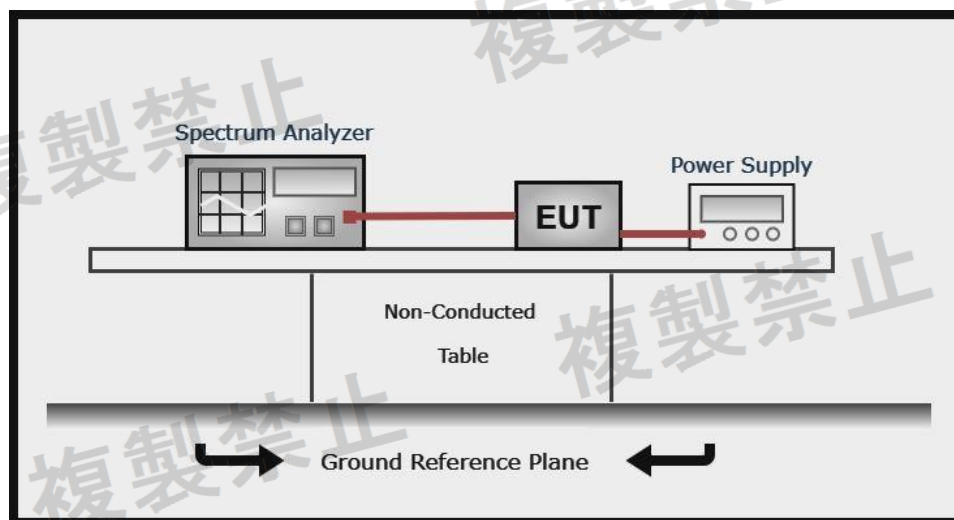
HIGH CHANNEL:
Frequency range 30 MHz – 12.5 GHz:





Article 6 and Annex 2. 30. Transmitting equipment. Permissible value for occupied bandwidth

Test Setup:



Limits:

Mode	Limit
FH	83.5 MHz
FH+DS	83.5 MHz
FH+OFDM	83.5 MHz
OFDM (Narrow bandwidth), DS	26 MHz
OFDM (Wide band)	38 MHz
Others	26 MHz

Test method:

According to MIC Notice No. 88 Annex 43

Test procedure:

The DUT is connected to the spectrum analyzer and it is configured at maximum output power in the different test channels. The spectrum analyzer is with the function 99% occupied bandwidth.

Results:

Mode: Other digital modulation methods.

Vnom:

Modulation: BTLE 5.0 (GFSK 1 Mbit/s)

	Low Channel 2402 MHz	Middle Channel 2440 MHz	High Channel 2480 MHz
99% occupied bandwidth (MHz)	1.09700	1.08500	1.08900
Limit	<26 MHz		
Measurement uncertainty (kHz)	<± 6.06		

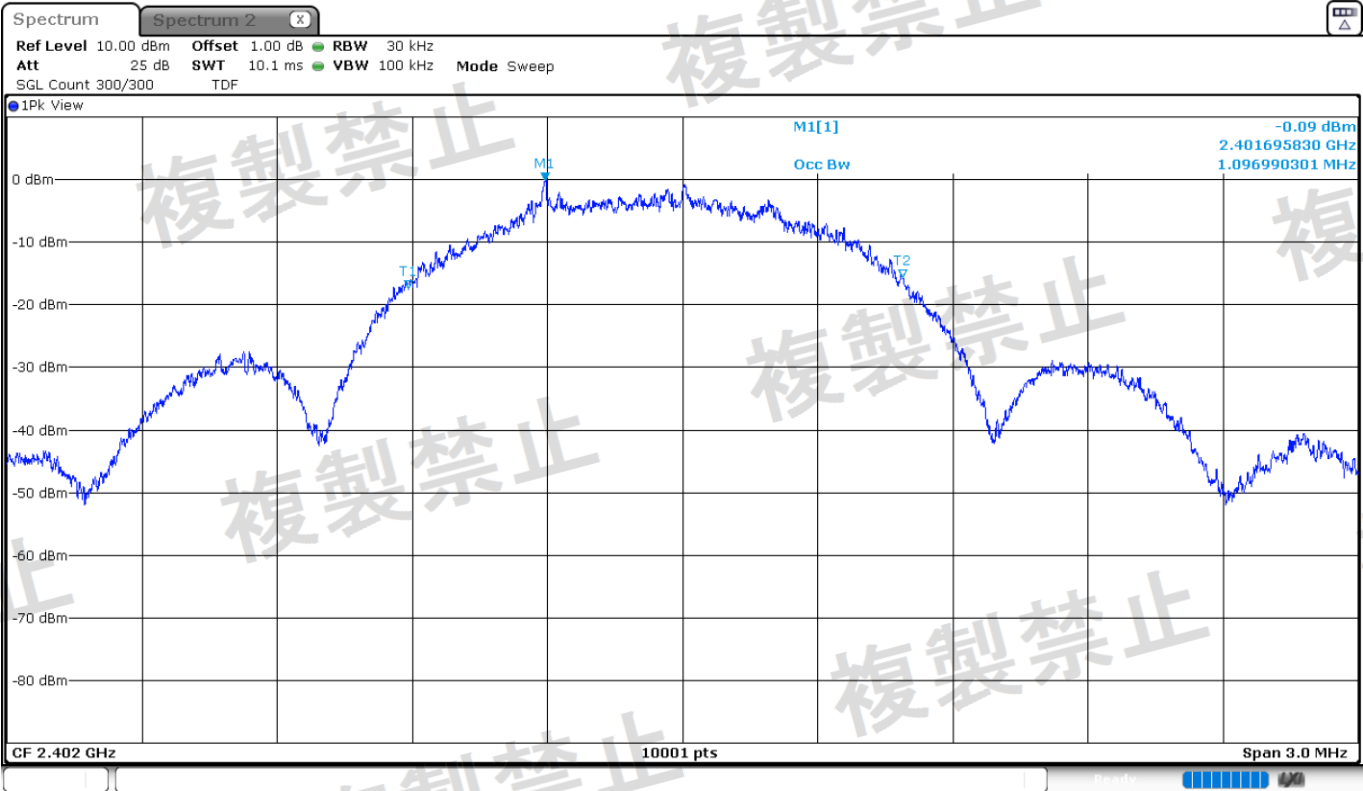
Verdict:

PASS

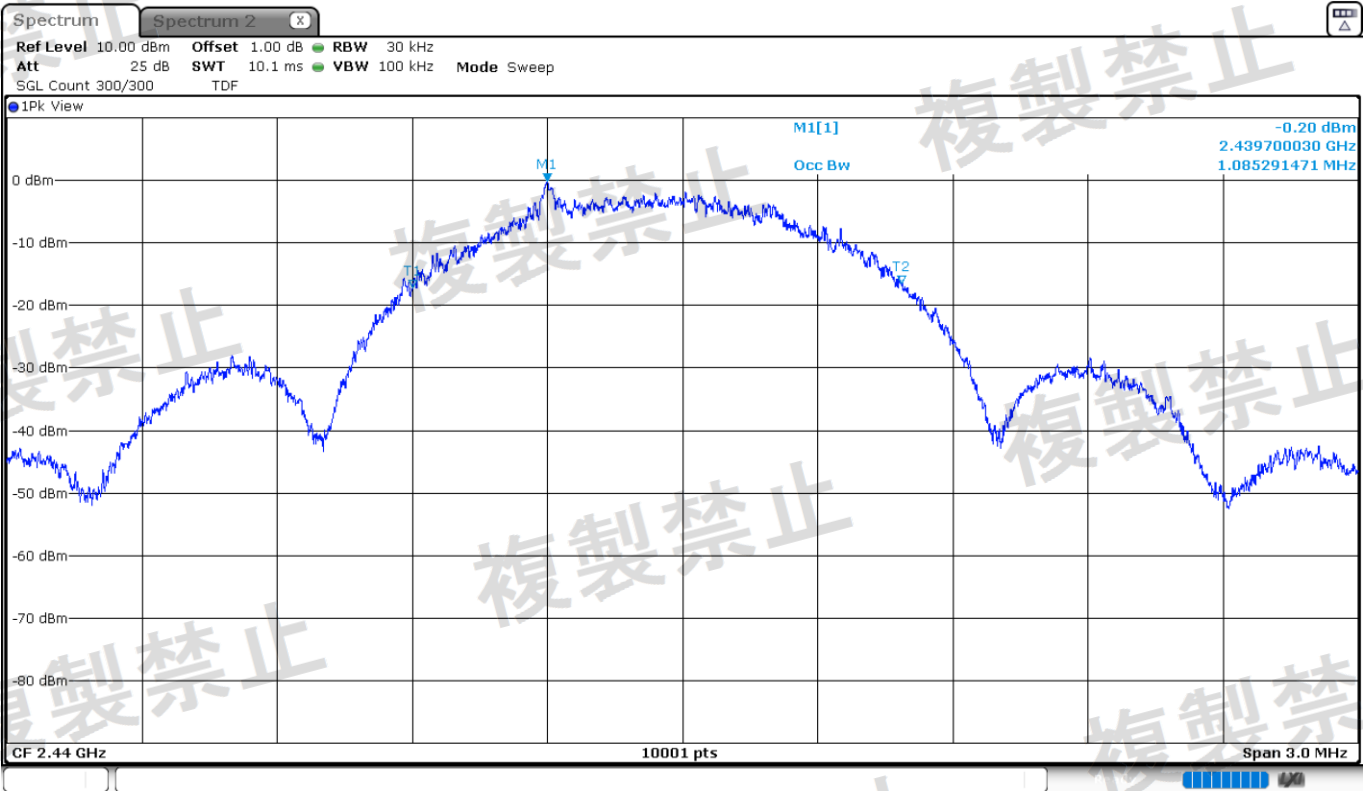
Vnom:

Modulation: BTLE 5.0 (GFSK 1 Mbit/s)

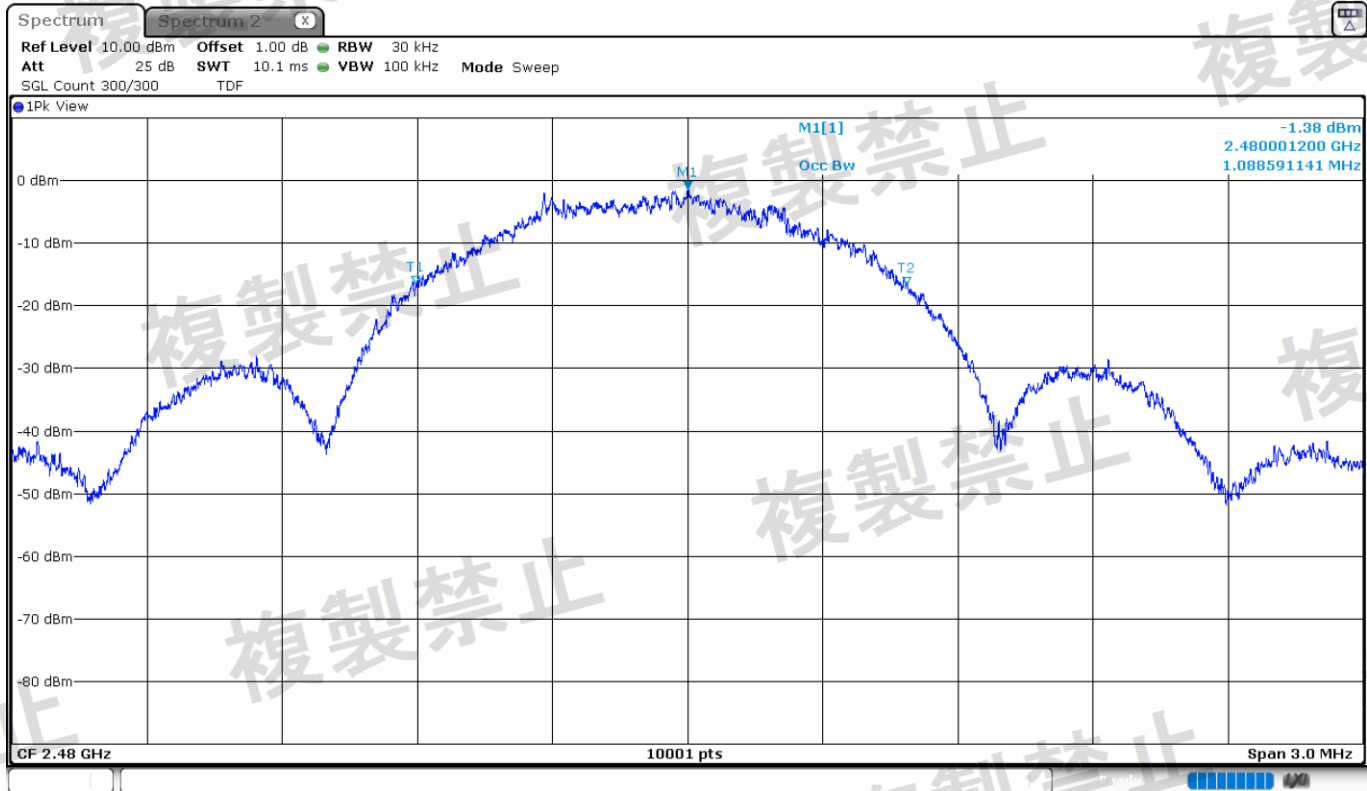
• LOW CHANNEL:



• MIDDLE CHANNEL:



HIGH CHANNEL:



Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

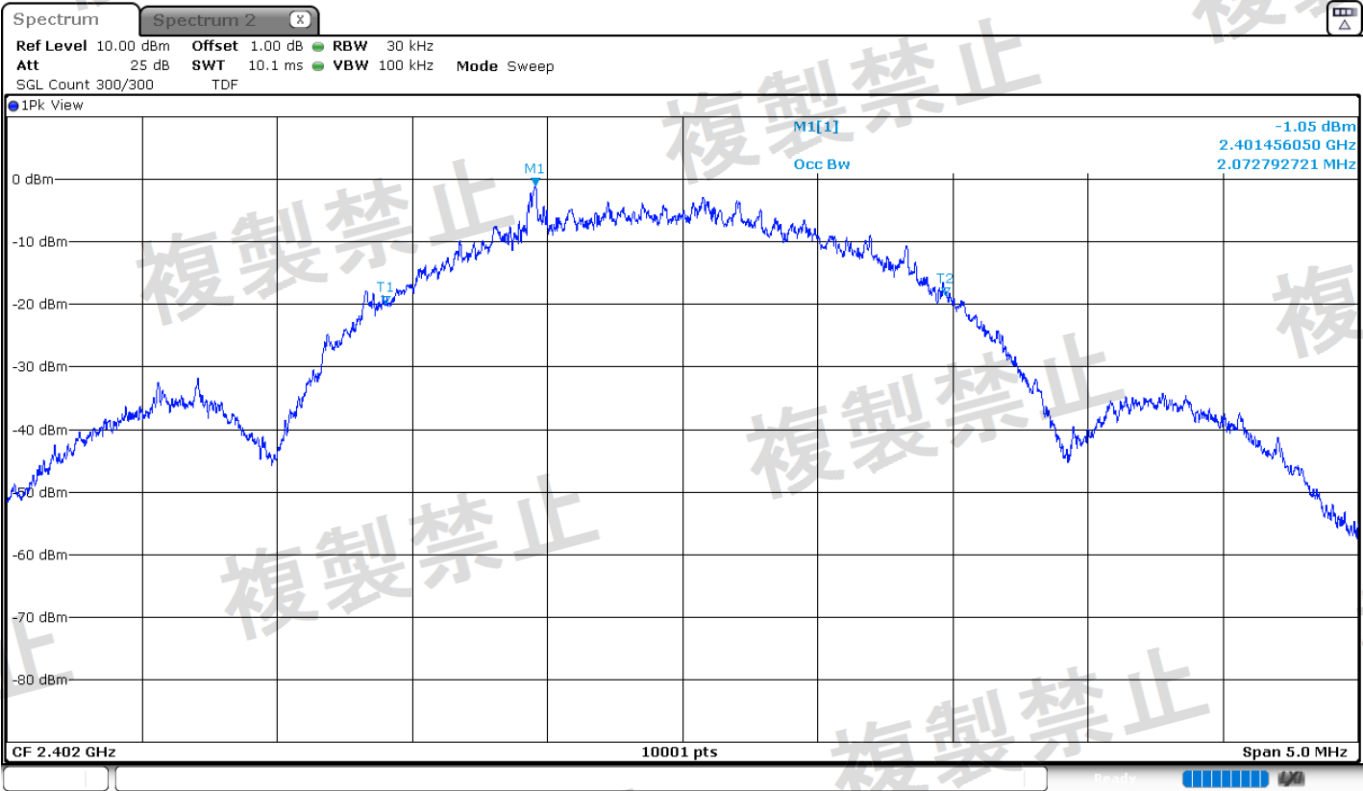
	Low Channel 2402 MHz	Middle Channel 2440 MHz	High Channel 2480 MHz
99% occupied bandwidth (MHz)	2.072792721	2.086791321	2.061293871
Limit	<26 MHz		
Measurement uncertainty (kHz)	<± 6.06		

Verdict:

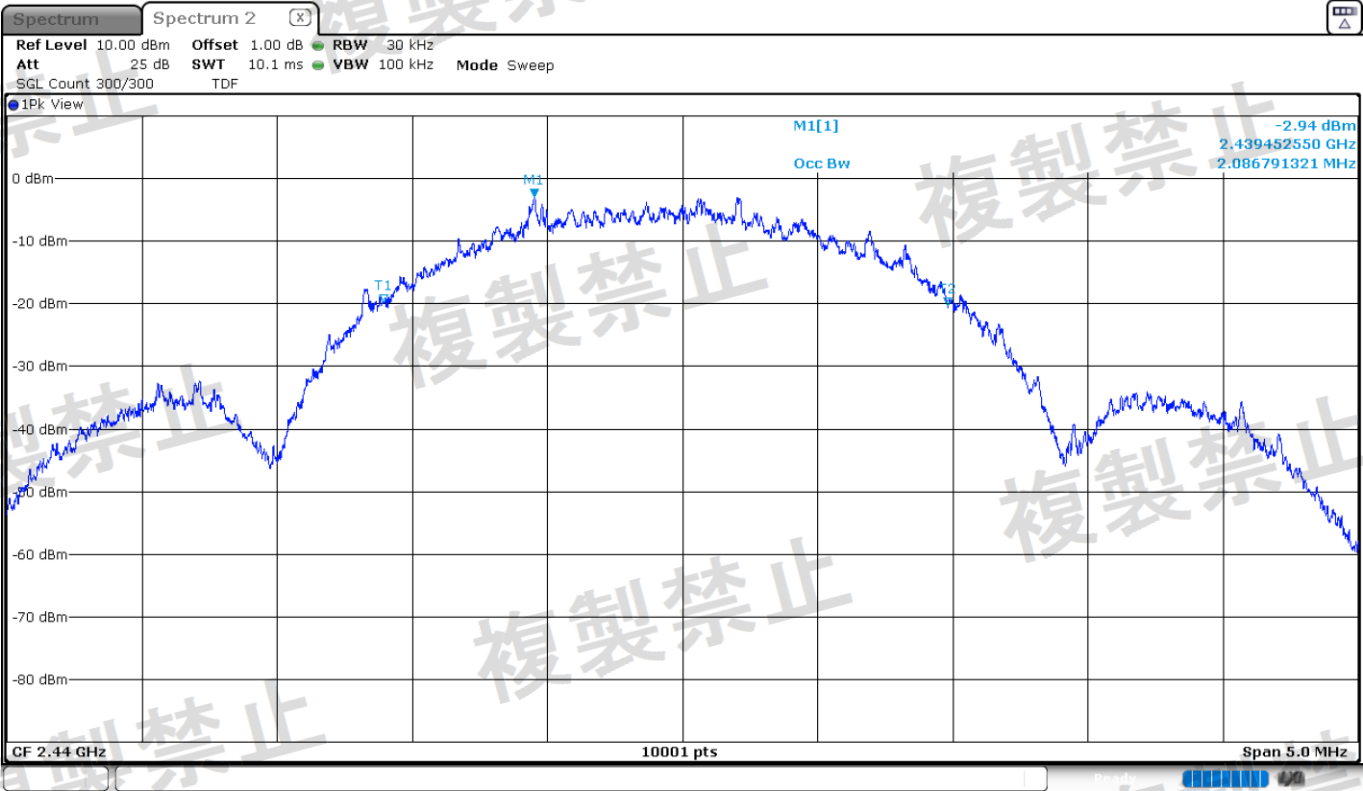
PASS

Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

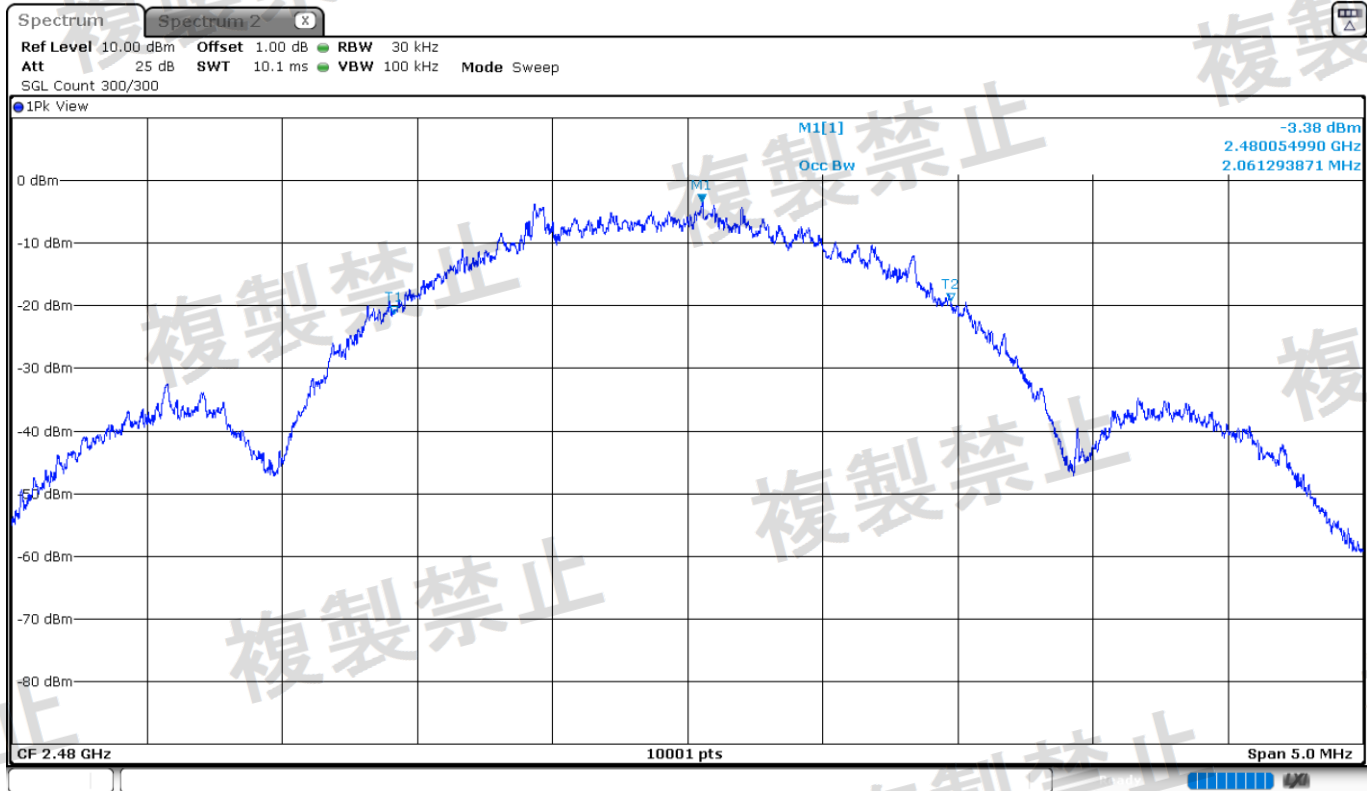
• LOW CHANNEL:



• MIDDLE CHANNEL:

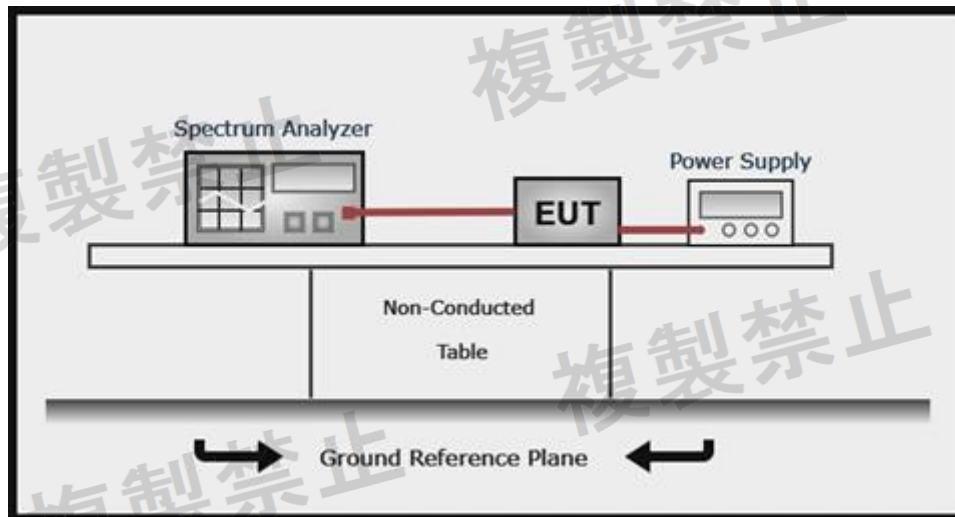


HIGH CHANNEL:



Article 24.2. Receiving equipment. Limit on secondary radiated emissions

Test Setup:



Limits:

The limit on secondary emissions radiated from the receiving equipment within which the function of other radio equipment will not be impaired shall be, in terms of the power of a dummy antenna circuit that has the same electrical constant as the receiving antenna, 4 nW (-54 dBm) or less at a frequency below 1 GHz and 20 nW (-47 dBm) or less at a frequency of 1 GHz or higher as measured using the circuit.

Test method:

According to MIC Notice No. 88 Annex 43

Test procedure:

The DUT is connected to the spectrum analyzer and it is configured in reception mode in the different test channels. The spectrum analyzer is configured with the parameters (RWB, VBW, frequency span) indicated in the test standard. It is ensure to have at least 10 dB of margin between background noise and limit line.

Results:

Vnom:

Modulation: BTLE 5.0 (GFSK 1 Mbit/s)

- **LOW CHANNEL:**

No spurious frequencies detected at less than 10 dB below the limit.

- **MIDDLE CHANNEL:**

No spurious frequencies detected at less than 10 dB below the limit.

- **HIGH CHANNEL:**

No spurious frequencies detected at less than 10 dB below the limit.

Measurement uncertainty $< \pm 2.94 \text{ dB}$

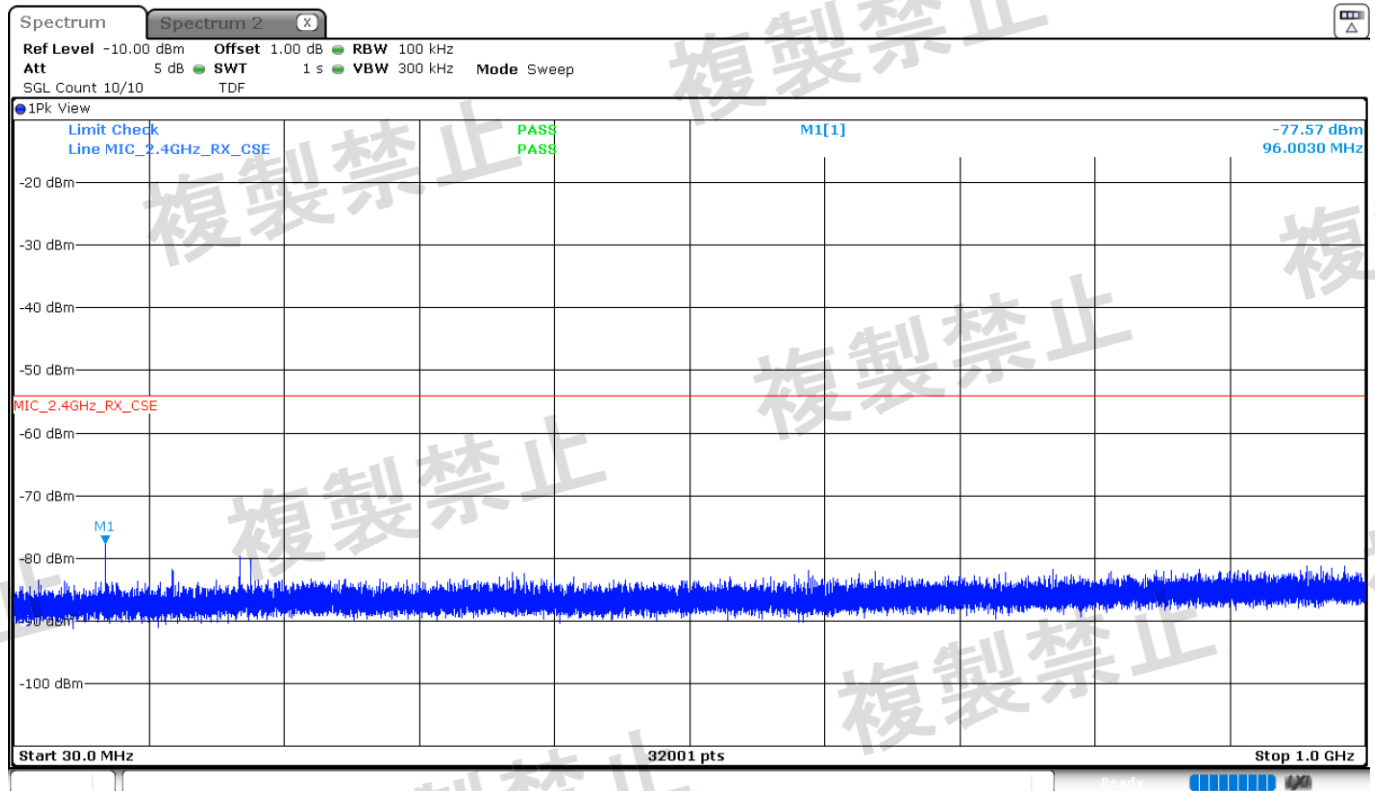
Verdict:

PASS

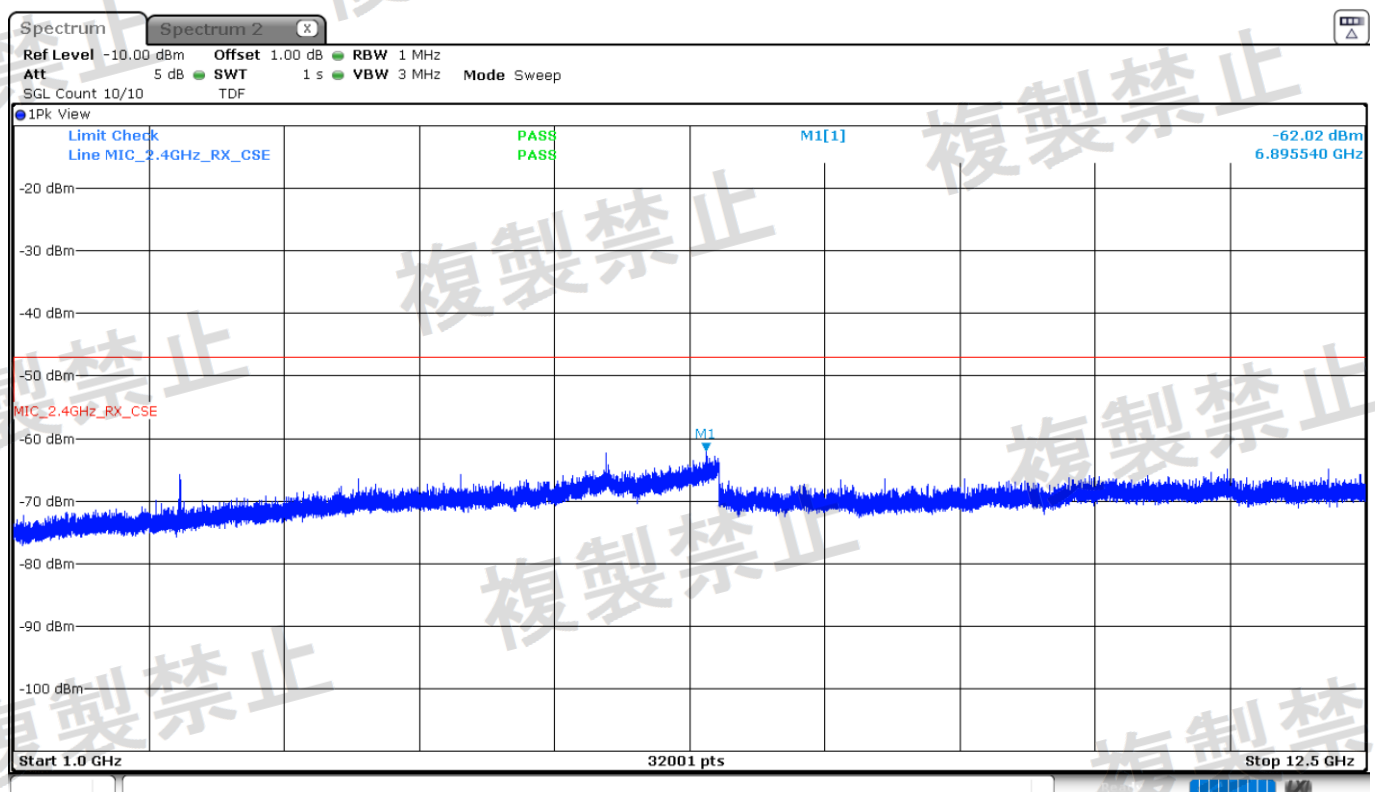
Modulation: BTLE 5.0 (GFSK 1 Mbit/s)

- **LOW CHANNEL:**

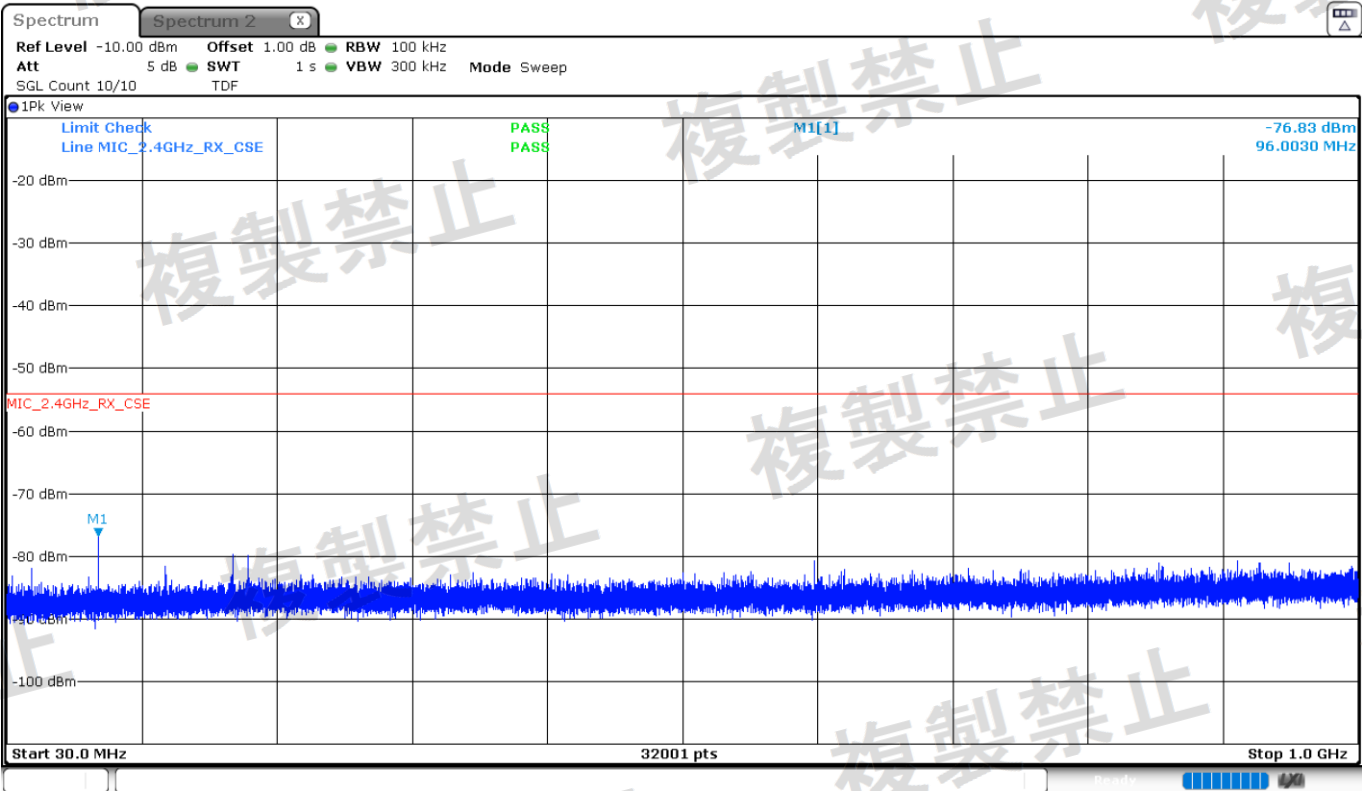
Frequency range 30 MHz - 1 GHz:



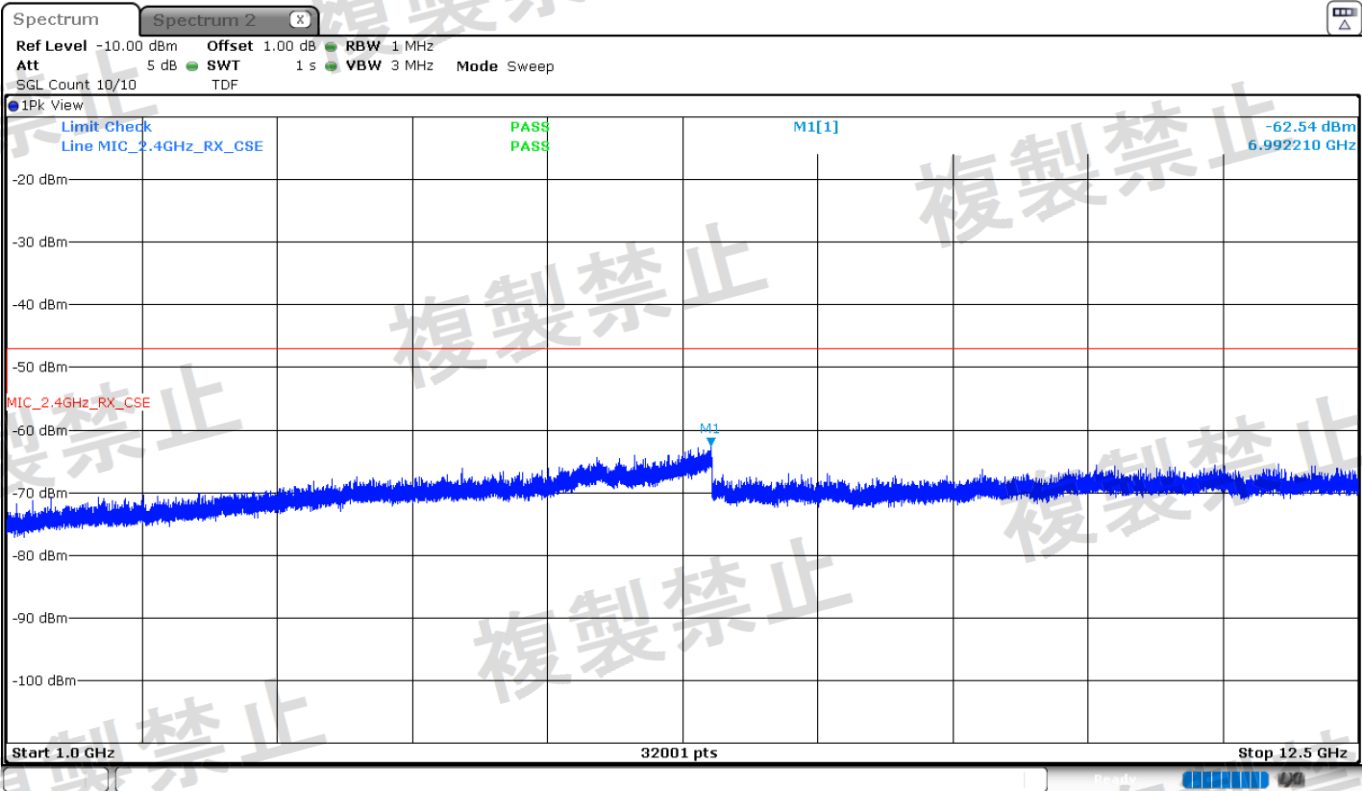
Frequency range 1 - 12.5 GHz:



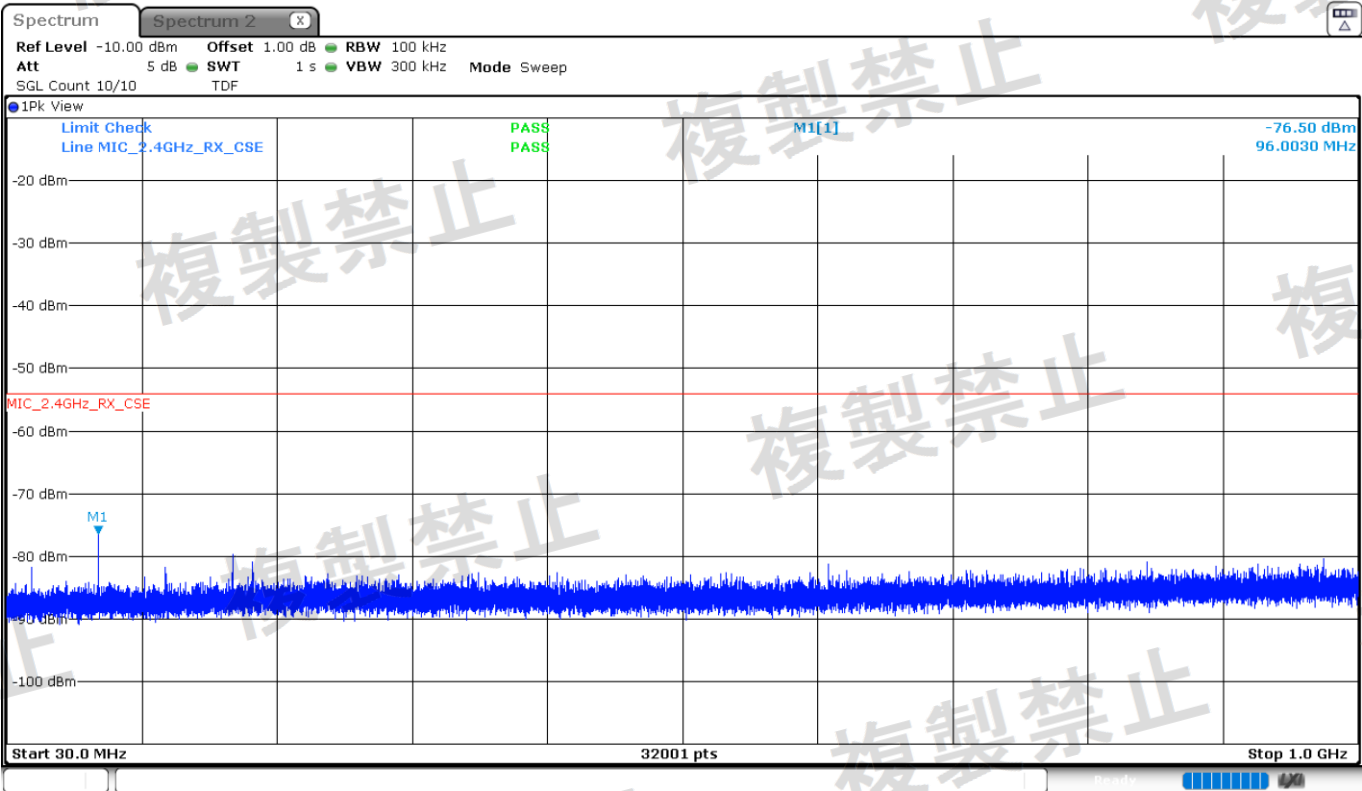
- MIDDLE CHANNEL:
Frequency range 30 MHz - 1 GHz:



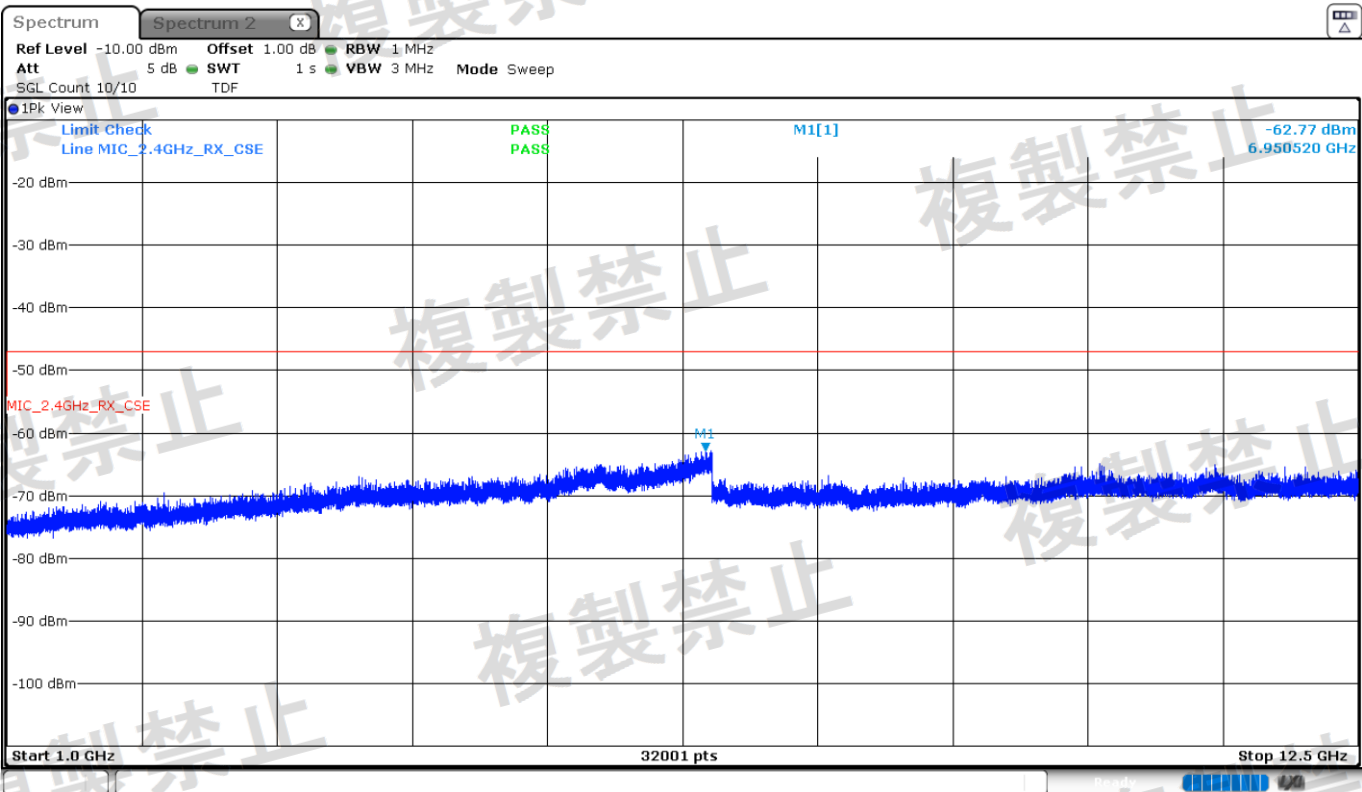
- Frequency range 1 - 12.5 GHz:



- HIGH CHANNEL:
Frequency range 30 MHz - 1 GHz:



- Frequency range 1 - 12.5 GHz:



Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

- **LOW CHANNEL:**

No spurious frequencies detected at less than 10 dB below the limit.

- **MIDDLE CHANNEL:**

No spurious frequencies detected at less than 10 dB below the limit.

- **HIGH CHANNEL:**

No spurious frequencies detected at less than 10 dB below the limit.

Measurement uncertainty $< \pm 2.94$ dB

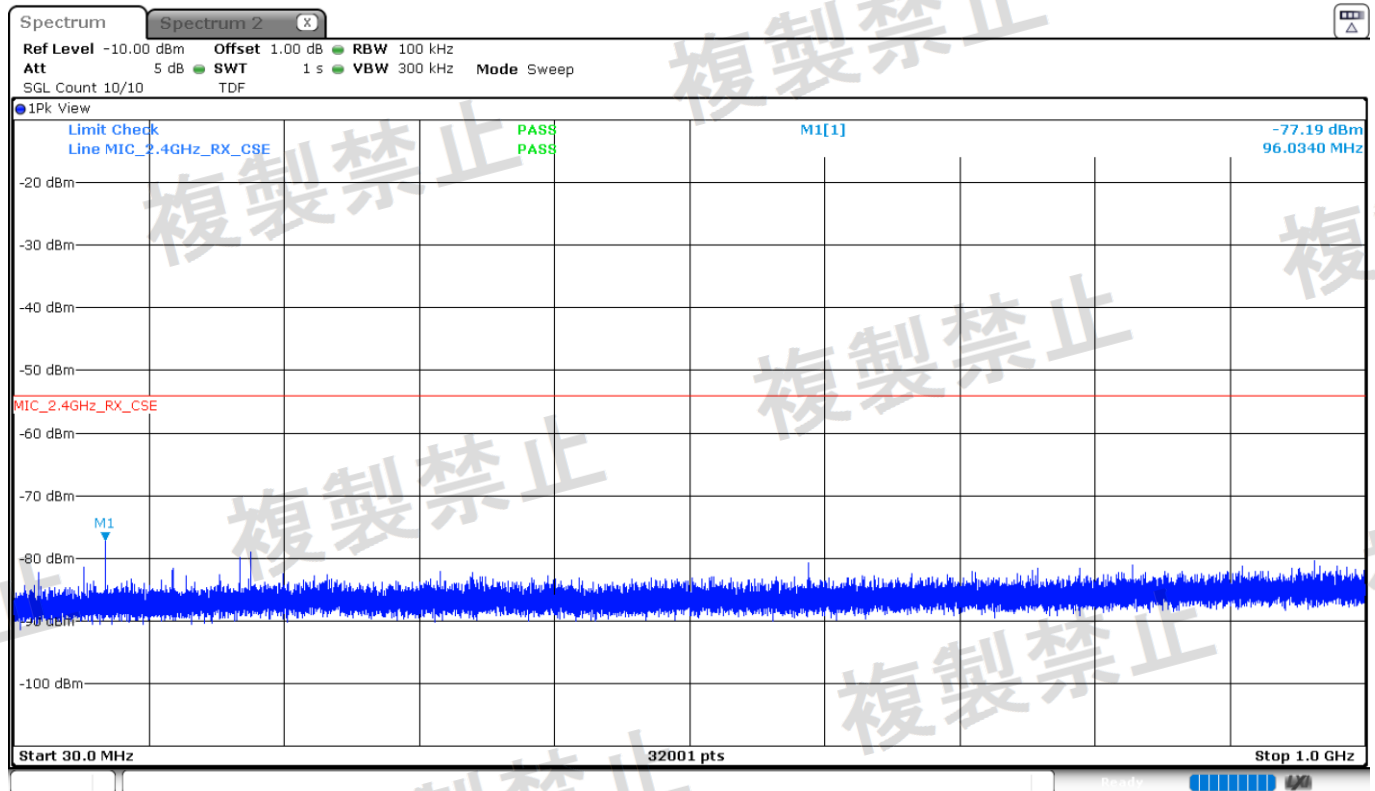
Verdict:

PASS

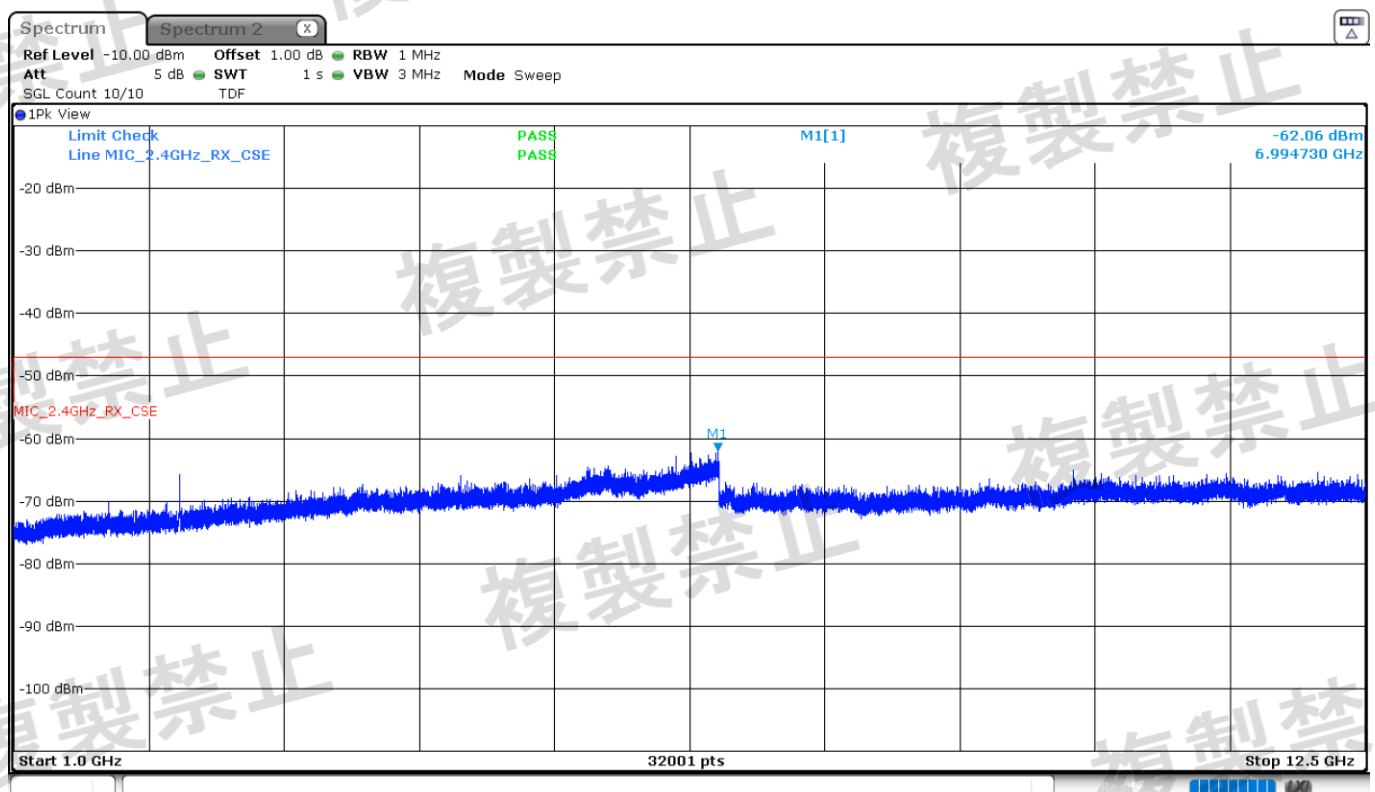
Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

- **LOW CHANNEL:**

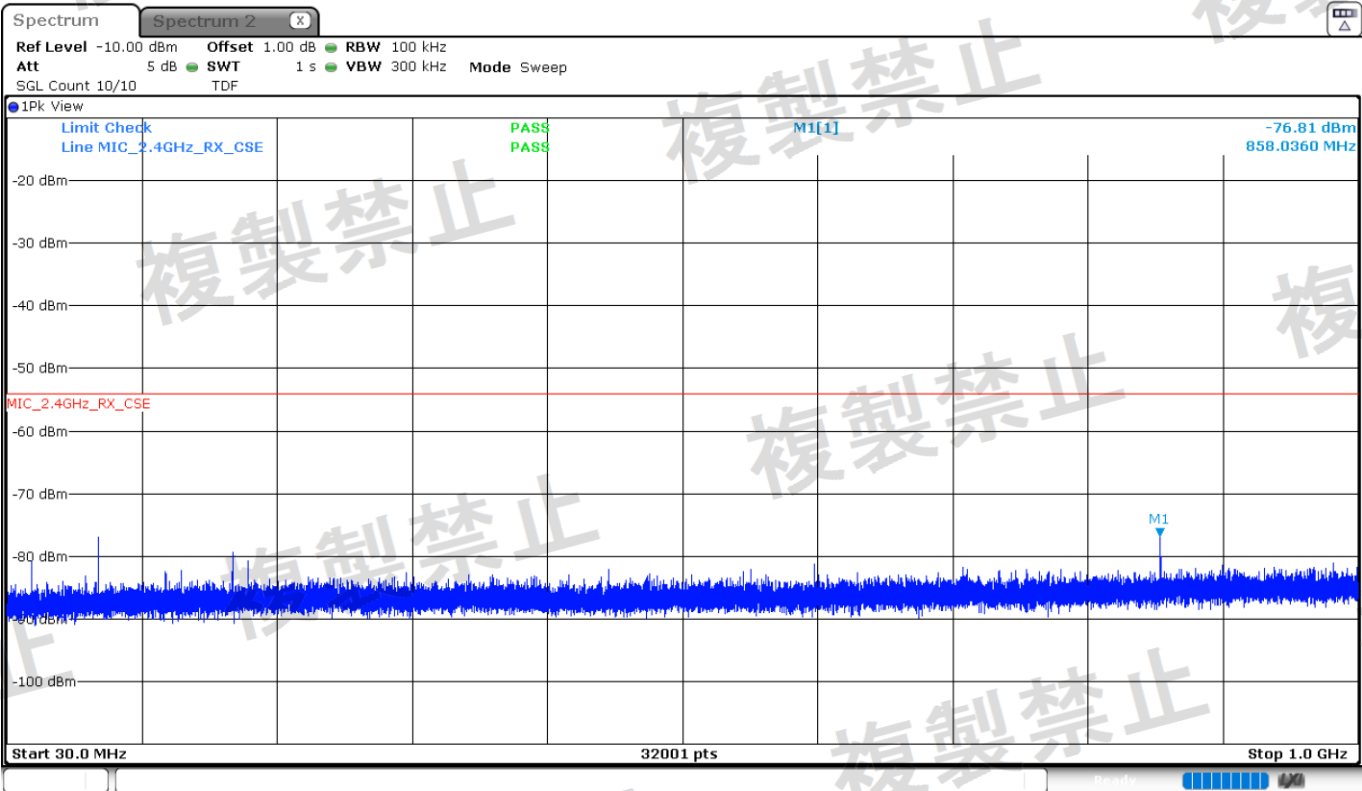
Frequency range 30 MHz - 1 GHz:



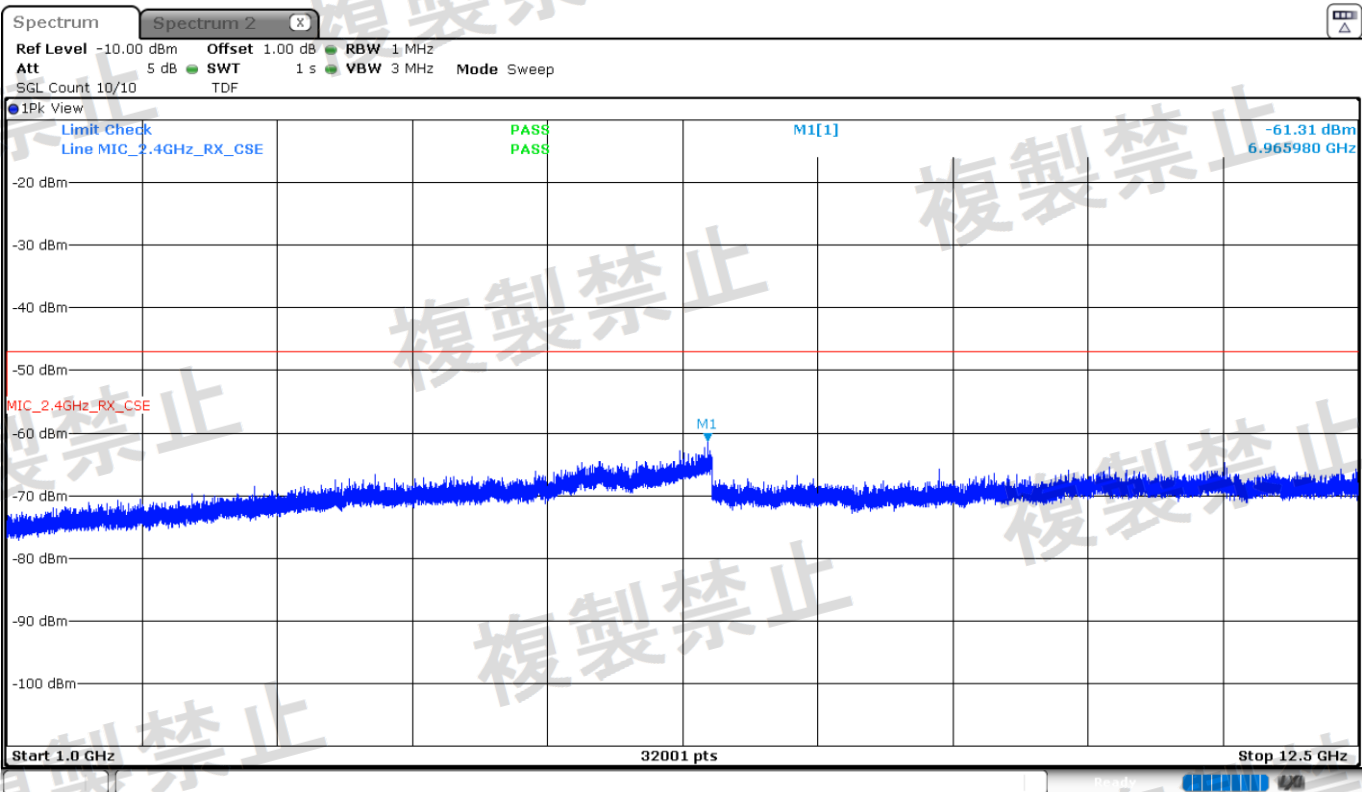
Frequency range 1 - 12.5 GHz:



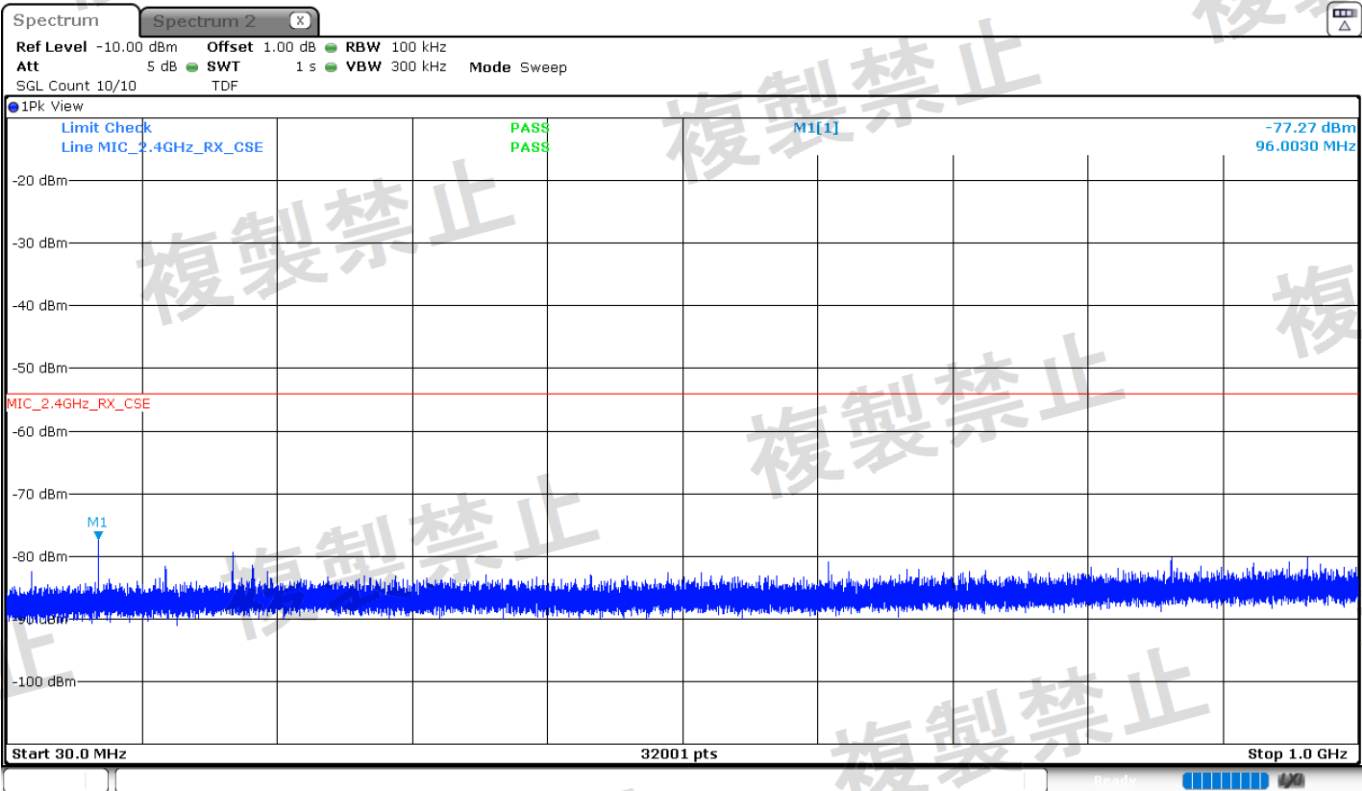
- MIDDLE CHANNEL:
Frequency range 30 MHz - 1 GHz:



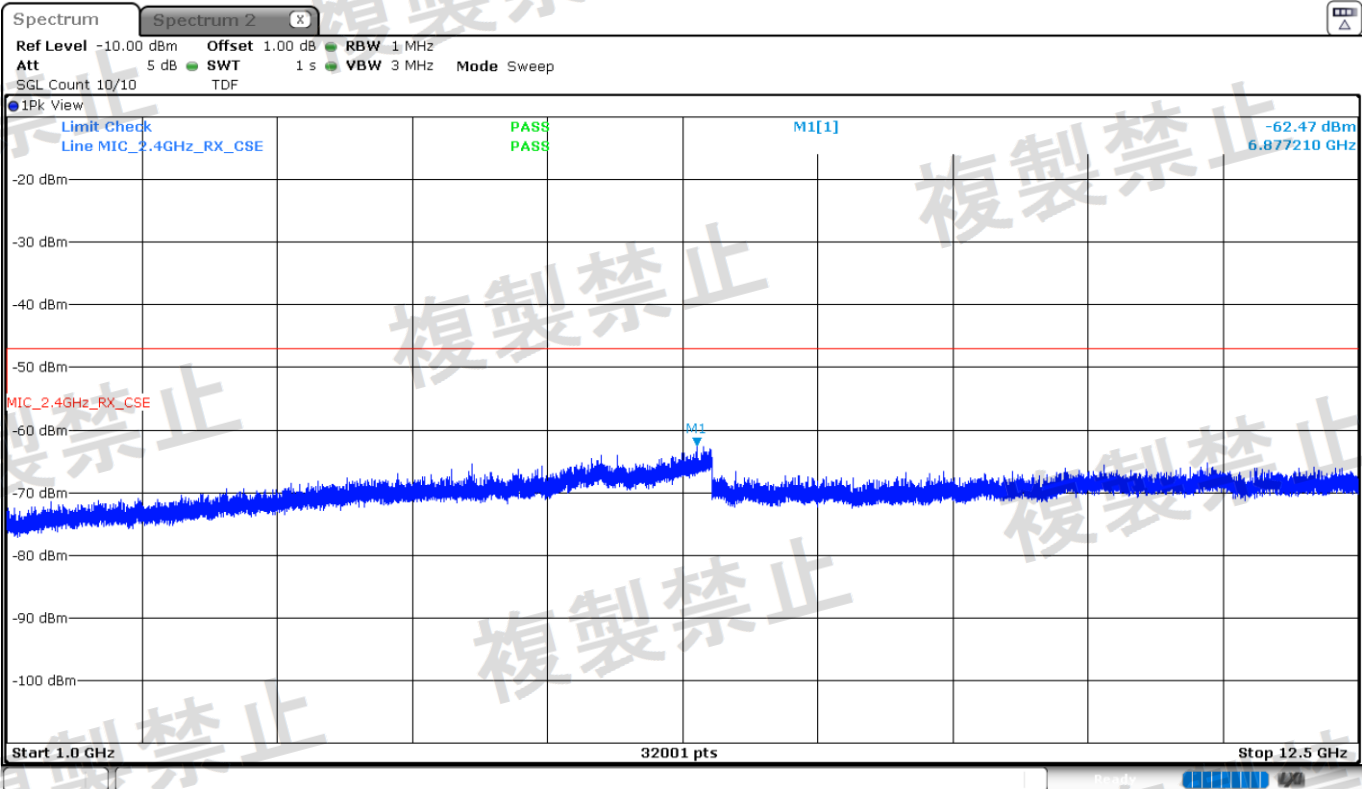
- Frequency range 1 - 12.5 GHz:



- HIGH CHANNEL:
Frequency range 30 MHz - 1 GHz:

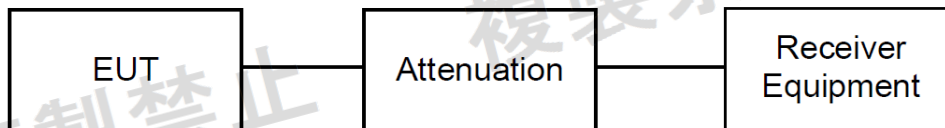


- Frequency range 1 - 12.5 GHz:



Article 9.4-5. Controlling equipment. Interference prevention function. Identification code transmission/reception

Test Setup:



Limits:

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

Test method:

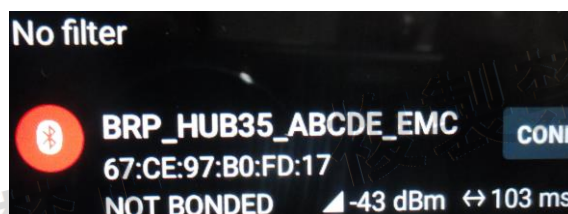
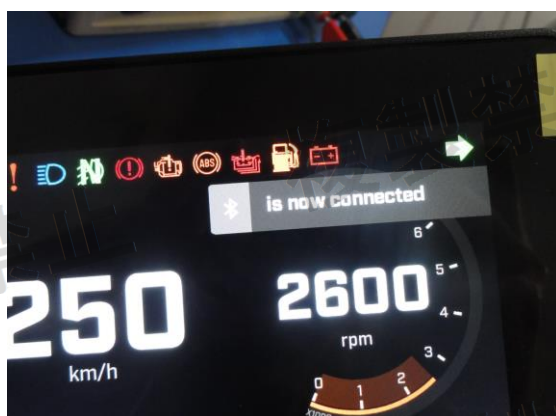
According to MIC Notice No. 88 Annex 43

Test procedure:

The DUT is placed on a shielded room to isolate it. With the DUT turned off and using a spectrum analyzer and an antenna, it is checked that no signal from other devices are present inside the shielded room in the frequency range of interest. Then, the DUT is turned ON. Using an ancillary device, the MAC address is checked and registered.

Results:

BLE MAC
67:CE:97:B0:DF:17

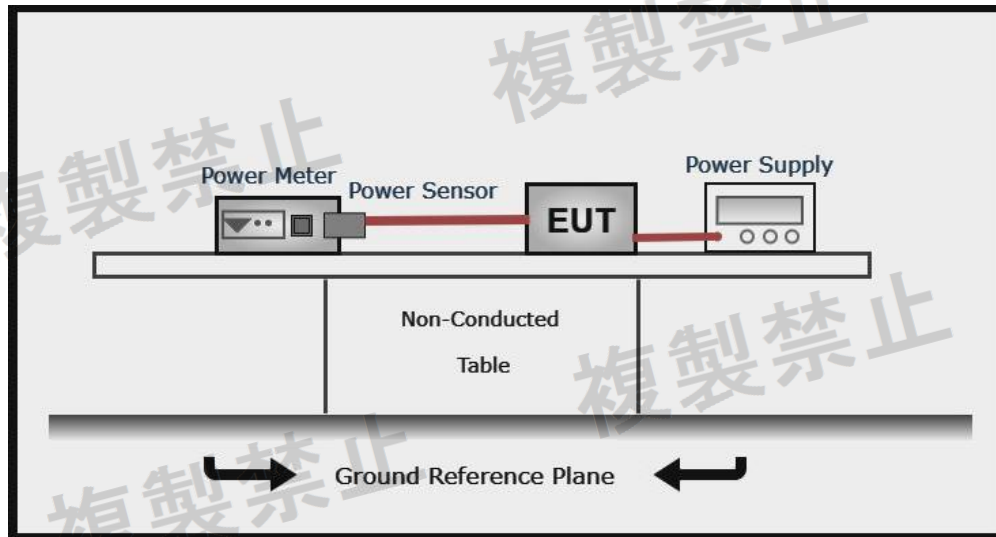


Verdict:

PASS

Article 49-20. Antenna. Antenna gain

Test Setup:



Limits:

a: The absolute gain of the transmitting antenna shall be 12.14 dB or less. However, when the equivalent isotropic radiated power EIRP (equivalent isotropic radiated power in the 1 MHz bandwidth in the case of spread spectrum and OFDM systems) is equal to or less than the value obtained by applying an antenna power with the mean power of 10 mW with its absolute gain being 12.14 dB, the shortage shall be compensated for by the gain of the transmitting antenna (Note that mean power is 10 mW in the 1 MHz bandwidth in the case of spread spectrum and OFDM systems; however, mean power of 3 mW in the 1 MHz bandwidth is applied if the FH system, a hybrid system combining DS and FH systems, or a hybrid system combining FH and OFDM systems is employed and the frequency band of 2,427 - 2,470.75 MHz is used).

b: The Half-Power Beam width Angle HPBA (angle between two points at which radiated power becomes 1/2) of the transmitting antenna's horizontal and vertical planes shall not exceed the value as determined by the following formula:

$$HPBA \leq 360 / A \text{ [degrees]}$$

where constant A is equal to the value obtained by dividing the equivalent isotropic radiated power EIRP (equivalent isotropic radiated power in the 1 MHz bandwidth in the case of spread spectrum and OFDM systems) by the value obtained by applying an antenna power with the mean power of 10 mW with its absolute gain being 2.14 dB, and shall be assumed to be 1 if it is less than 1 (Note that mean power is 10 mW in the 1 MHz bandwidth in the case of spread spectrum and OFDM systems; however, mean power of 3 mW in the 1 MHz bandwidth is applied if the FH system, a hybrid system combining DS and FH systems, or a hybrid system combining the FH and OFDM systems is employed and the frequency band of 2,427 - 2,470.75 MHz is used).

Therefore

$$A = EIRP \text{ (mW)} / (10 \text{ mW} \times \text{absolute gain}) = EIRP \text{ (mW)} / 16.37$$

Where absolute gain is the linear value corresponding to 2.14 dB = 1.637.

Test method:

According to MIC Notice No. 88 Annex 43

Test procedure:

The conducted RF output power measurements were made at the RF output terminals of the DUT, using an average power meter, selecting maximum transmission power of the DUT in the different test channels. The measurement is corrected with the duty cycle. Antenna gain is added to these results in order to calculate the E.I.R.P.

Results:

Maximum Declared Antenna Gain: +3.04 dBi

Vnom:

Modulation: BTLE 5.0 (GFSK 1 Mbit/s)

Channel	Measured antenna power (dBm)	Radiated power EIRP (dBm)	Radiated power EIRP (mW)	A = EIRP (mW) /16.37
Low (2402 MHz)	2.49	5.53	3.57	< 1
Middle (2440 MHz)	2.30	5.34	3.42	< 1
High (2480 MHz)	2.08	5.12	3.25	< 1

Since A is < 1, it is assumed to be 1, and therefore the half-power beam width must be 360° or less.

Verdict:

PASS

Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

Channel	Measured antenna power (dBm)	Radiated power EIRP (dBm)	Radiated power EIRP (mW)	A = EIRP (mW) /16.37
Low (2402 MHz)	2.50	5.54	3.58	< 1
Middle (2440 MHz)	2.31	5.35	3.43	< 1
High (2480 MHz)	2.08	5.12	3.25	< 1

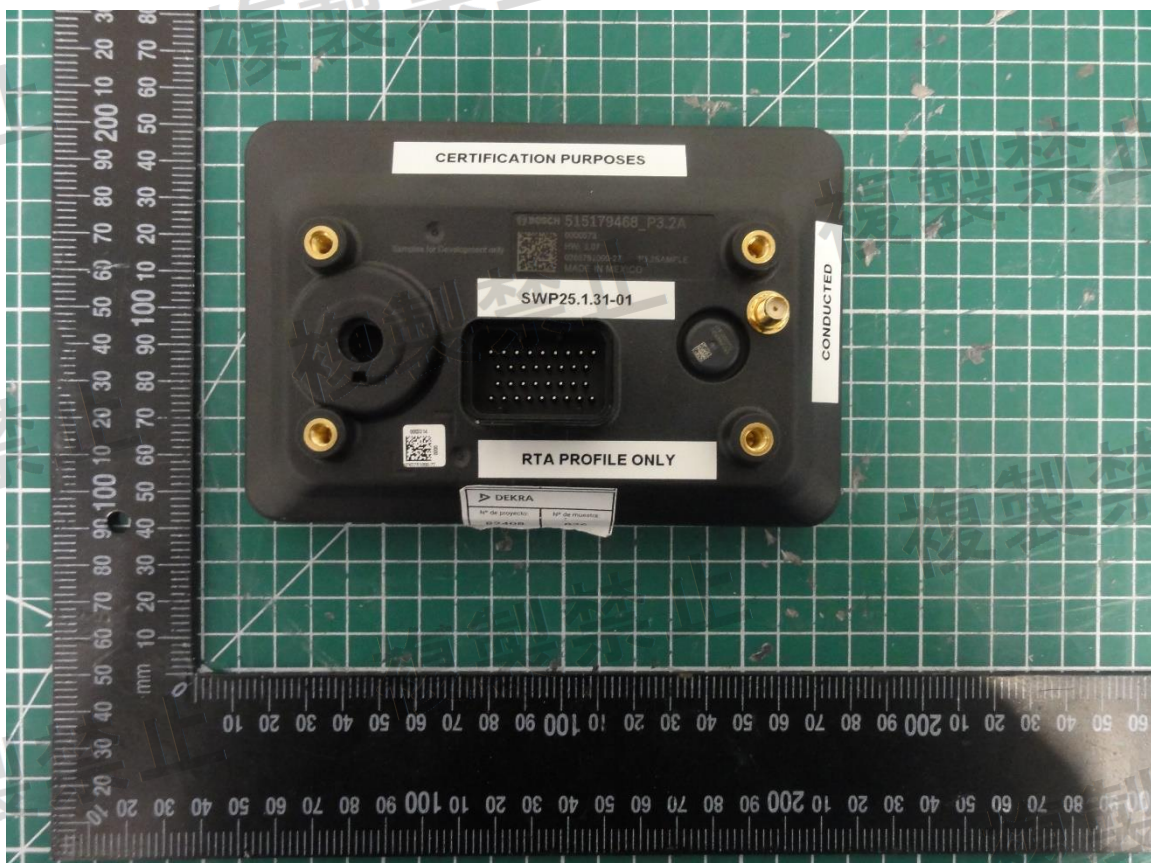
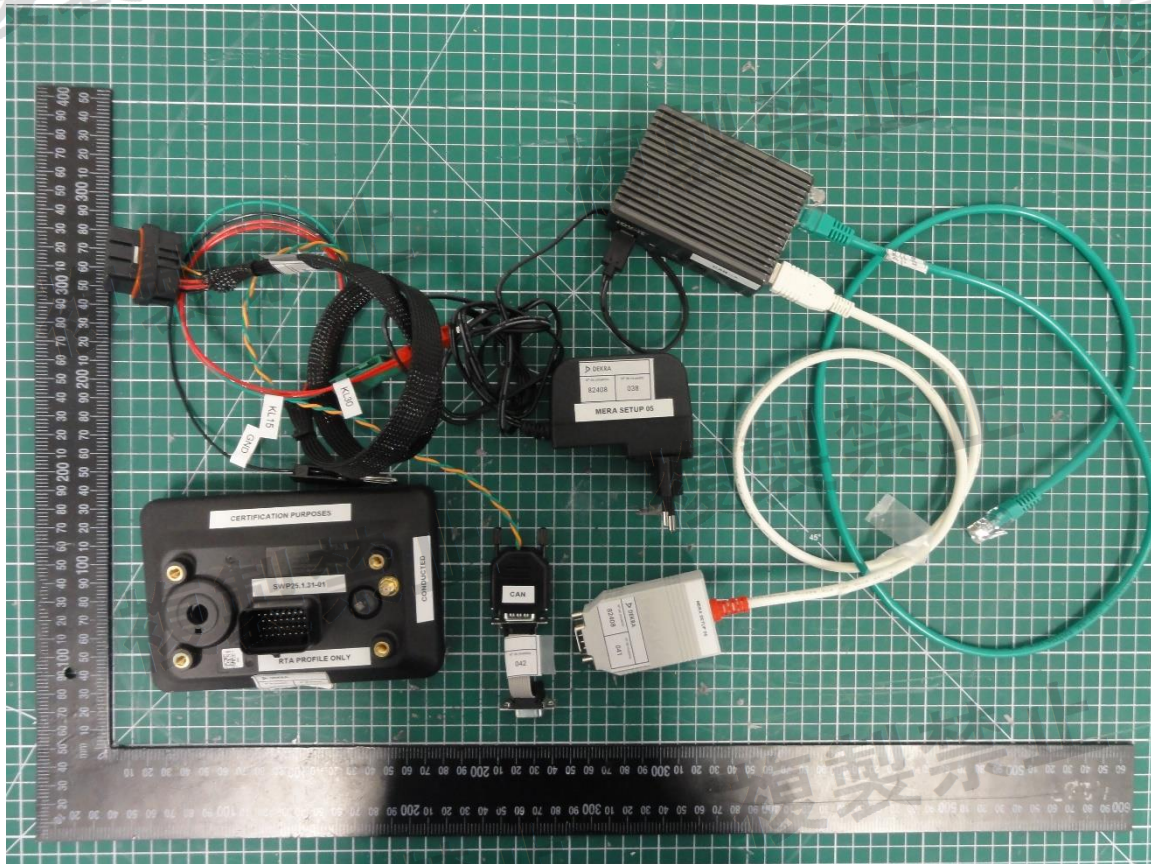
Since A is < 1, it is assumed to be 1, and therefore the half-power beam width must be 360° or less.

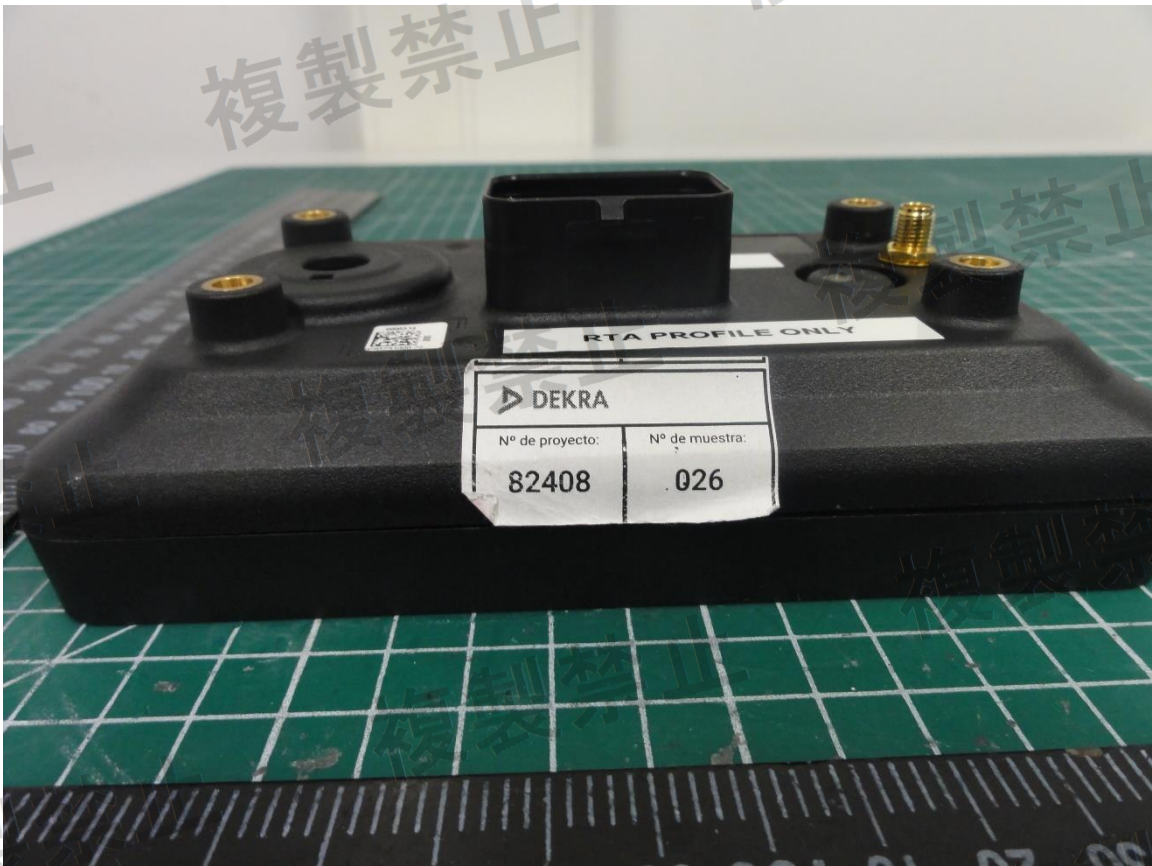
Verdict:

PASS

Appendix C: Photographs

EQUIPMENT VIEW FOR ALL THE TESTS BUT THE TEST 'Identification code transmission/reception'





複製禁止

複製禁止

複製禁止

複製禁止

止

複製禁止

禁止

複製

複製禁止

複製禁止

製禁止

複製禁止

複製禁止

止

複製

複製禁止

複製禁止

EQUIPMENT VIEW FOR THE TEST ‘Identification code transmission/reception’

