

Test Report No:
81369RRF.003A1

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	DA14533 Pro Development Kit Daughterboard
(*) Trademark	SmartBond
(*) Model and /or type reference	DA14533-00RNDB-P
Other identification of the product	FCC ID: Y82 IC: 9576A
(*) Features	Bluetooth LE 5.3 HW version: 610-05-A SW version: SDK_6.0.22.1401
Applicant	Renesas Design Netherlands B.V. Het Zuiderkruis 53, 5215 MV 's-Hertogenbosch, The Netherlands
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	2025-03-05
Report template No	FDT08_25 (*) "Data provided by the client"

Firmado
digitalmente
por 53680346W
JOSE MANUEL
GOMEZ
(C:A29507456)

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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.

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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 $\leq \pm 1.438$ 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 of DA14533 is an ultra-low-power SoC integrating a 2.4 GHz transceiver and an Arm® Cortex®-M0+ microcontroller with a RAM of 64 kB and a One-Time Programmable (OTP) memory of 12 kB. It can be used as a standalone application processor or as a data pump in hosted systems. Ultra-low power can be achieved using the integrated Low IQ Buck DCDC which is on during sleep.

The radio transceiver, the baseband processor, and the qualified Bluetooth® low energy stack is fully compliant with the Bluetooth® Low Energy 5.3 standard.

3. Declaration of the Applicant: Voltage variation:

Date:06-Feb-2025

We, Renesas Design Netherlands B.V. located at Het Zuiderkruis 53, 5215 MV 's-Hertogenbosch / THE NETHERLANDS, responsible of manufacturing the following product:

Model: DA14533-00RNDB-P

Brand: Renesas

Hereby declare that the product mentioned above has an external power supply of 3V.
According to Public notice of MIC No. 88 test method of specified radio equipment Annex 43, our product must perform voltage fluctuation test ($\pm 10\%$) at the following test points in order to check extreme conditions as recorded in the notice:

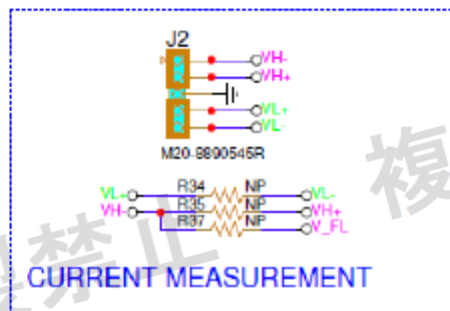


Figure 1: Jumper J2 allows connecting external power supply directly to the DA14533 SoC

The DA14533 has an integrated power management unit (PMU) which comprises a VDD_Clamp, a POR circuitry, a DCDC converter, and various LDOs. The system diagram of the integrated PMU is shown in Figure 2.

Features

- Buck and DCDC bypass configurations
- Single inductance DCDC converter configured for Buck configuration
- Programmable DCDC converter outputs
- Active and Sleep mode LDOs
- Low BOM and use of small external components

The DA14533 SoC Internal voltages are regulated voltages. They are within the margin of $\pm 1\%$.

Renesas Design Netherlands B.V.

Het Zuiderkruis 53, 5215 MV 's-Hertogenbosch, the Netherlands tel. +31(0)736408822 fax. +31(0)736408823 Chamber of Commerce #17177191
URL: <http://www.renesas.com>

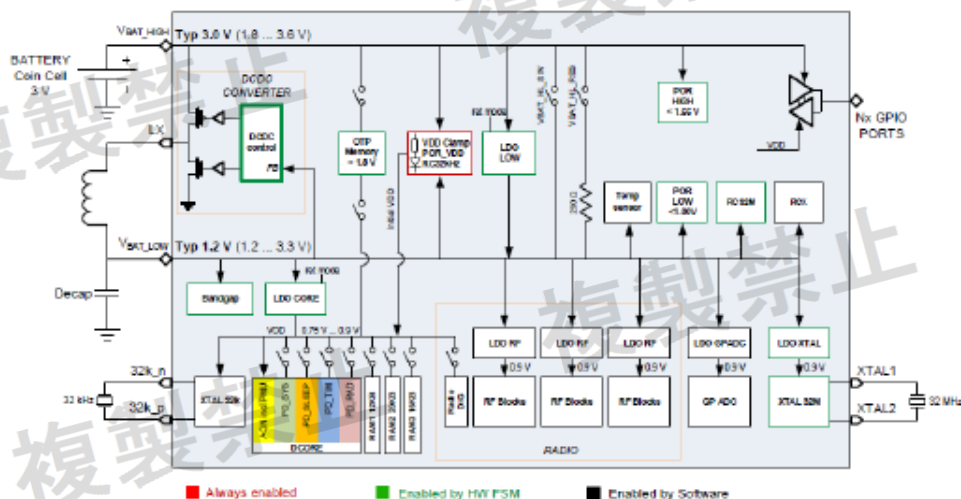


Figure 2: Power Management Unit. Internal LDO RF for power supply of radio.

Based on these results and considering orange square in Figure 2 named 'RADIO', only nominal voltage will be used to perform all the test for this product according to the aforementioned notice.

Sincerely,

(Signature)

DocuSigned by:
Steven Lewsink
c9e0c6e08e40d

Name: Steven Leussink

Designation: Director

Email: steven.leussink.wx@renesas.com

Phone: +31(0)736408822

Renesas Design Netherlands B.V.

Het Zuiderkruis 53, 5215 MV 's-Hertogenbosch / THE NETHERLANDS

Renesas Design Netherlands B.V.

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URL: <http://www.renegas.com>

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 N°	Date of Reception	Application
S/01	81369B/012	DA14533 Pro Development Kit Daughterboard	DA14533	-	2024-11-27	Element Under Test
S/01	81369B/005	DA14533 Pro Development Kit Motherboard	DA1453X	-	2024-11-27	Auxiliary Element
S/01	81369B/001	USB cable	-	-	2024-11-27	Auxiliary Element

Notes referenced to samples during the project:

Id	Type
S/01	Sample used for all tests.

Test sample description

Ports.....:	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded			
	RF Port for conducted measurements	-	☒	☐			
Supplementary information to the ports.....:	-						
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☐ AC:		☐	☐	☐	☐	☐
	☒ DC: 3 V						
Rated Power.....:	+4.1 dBm						
Clock frequencies.....:	32 MHz, 32.768 KHz						
Other parameters	-						
Software version.....:	SDK_6.0.22.1401						
Hardware version	610-05-A						
Dimensions in cm (W x H x D) ...:	3.4x4.2						
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			
	high speed usb cable		cable	Multicomp			
	da1453x devkit pro motherboard		PCB	Renesas			
Documents as provided by the applicant	Description		File name	Issue date			
	-		-	-			

Identification of the client

Renesas Design Netherlands B.V.
Het Zuiderkruis 53, 5215 MV 's-Hertogenbosch, The Netherlands

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2025-02-03
Date (finish)	2025-02-03

Document history

Report number	Date	Description
81369RRF.003	2025-03-04	First release.
81369RRF.003A1	2025-03-05	Second release. It is modified due to a typos. This modification test report cancels and replaces the test report 81369RRF.003.

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: Álvaro Gutiérrez.

Used instrumentation:

Control No.	Equipment	Model	Manufacturer	Next Calibration
06792	SHIELDED ROOM	S101	ETS LINDGREN	N/A
06609	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2025-04-22
06615	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2025-04-04
09555	TWO CHANNEL POWER SUPPLY, 32V, 10/5A, 188W	HMP2020	ROHDE AND SCHWARZ	N/A
07794	SIGNAL AND SPECTRUM ANALYZER 10 Hz - 40 GHz	FSV40	ROHDE AND SCHWARZ	2025-04-21
04848	EMC/RF MEASUREMENT SOFTWARE	EMC32	ROHDE AND SCHWARZ	N/A

Testing verdicts

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

Summary

Bluetooth Low Energy (1M):

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	--
<u>Supplementary information and remarks:</u>			
None.			

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TEST CONDITIONS

(*): Data provided by the client.

POWER SUPPLY (*):

Vnominal: 3 Vdc

Type of Power Supply: External DC.

TEST FREQUENCIES (*):

Modulation	Data rates	Low Channel:	Middle Channel	High Channel
BLE GFSK	1 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:

Temperature: 23 °C

Humidity: 55 %

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

PRODUCT INFORMATION

Information	Description
Modulation:	GFSK.
Spread spectrum system:	No (Other digital modulation methods).
Nominal necessary Bandwidth:	1 MHz
Maximum declared antenna gain:	+2.2 dBi.
Rated Antenna Power:	6.3 dBm (4.265795188 mW).
Type of Antenna:	Integrated Printed Inverted F
Operating nominal frequency range:	2400 MHz to 2483.5 MHz.
Nominal power supply:	3.3 Vdc.
Type of power supply:	External DC.

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

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	

Results:

Mode: Other digital modulation methods than a & b.

Maximum Rated Antenna Power: 6.3 dBm (4.265795188 mW)

Vnom:

Channel	Measured antenna power (dBm)	Antenna power (mW)	Deviation from maximum rated antenna power (%)
Low (2402 MHz)	3.190000	2.084491	-51.13476407
Middle (2440 MHz)	3.060000	2.023019	-52.57580147
High (2480 MHz)	2.850000	1.927525	-54.81440556

Verdict:

PASS

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

Limits:

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

Results:

Vnom:

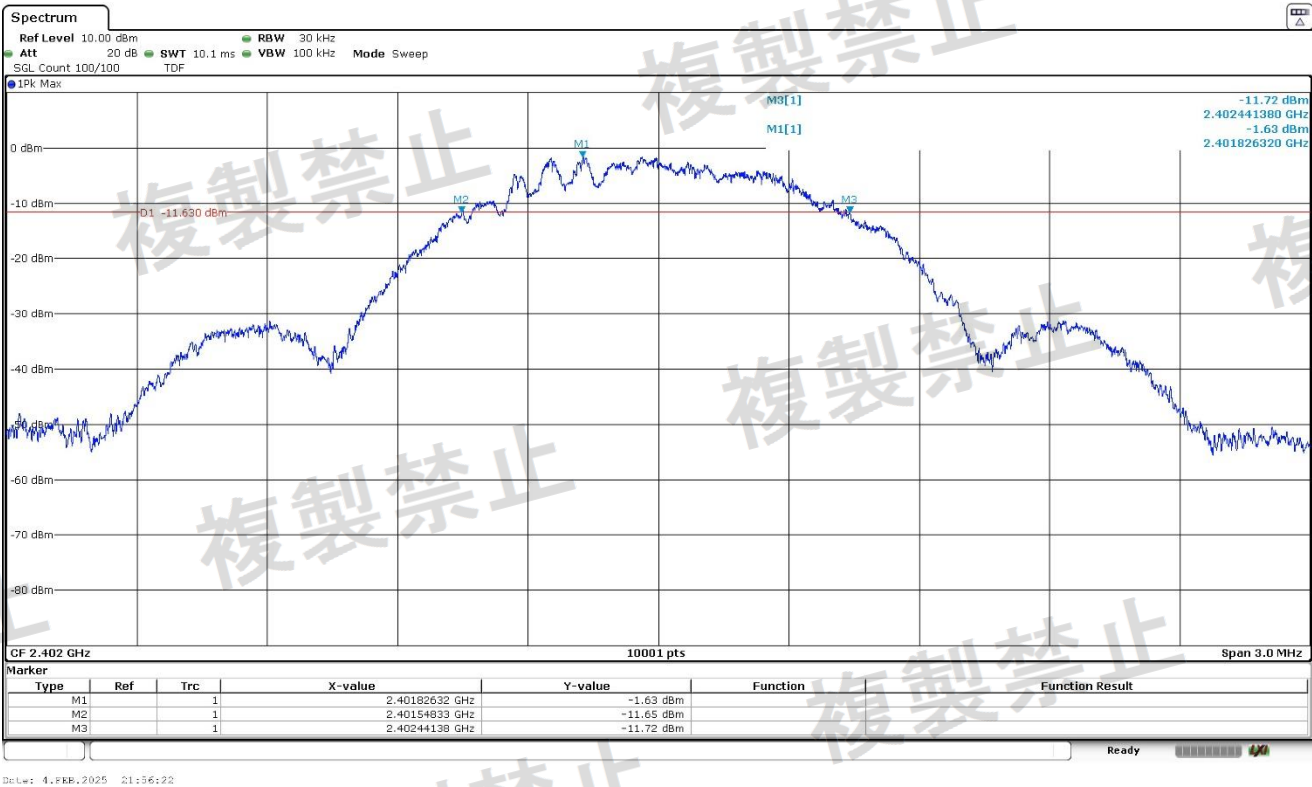
Channel	Frequency error (Hz)	Frequency error (ppm)
Low (2402 MHz)	-5145	-2.141965029
Middle (2440 MHz)	2315	0.948770492
High (2480 MHz)	7770	3.133064516

Verdict:

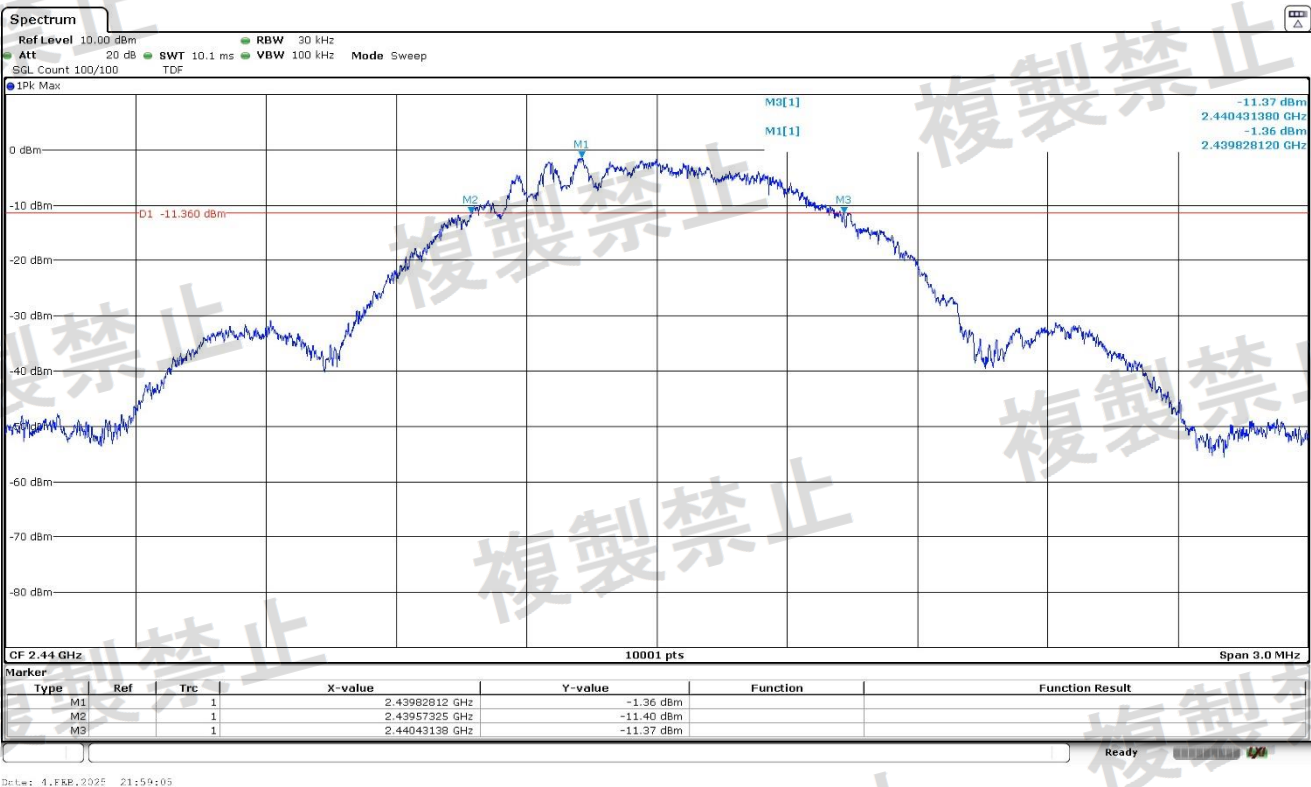
PASS

Vnom:

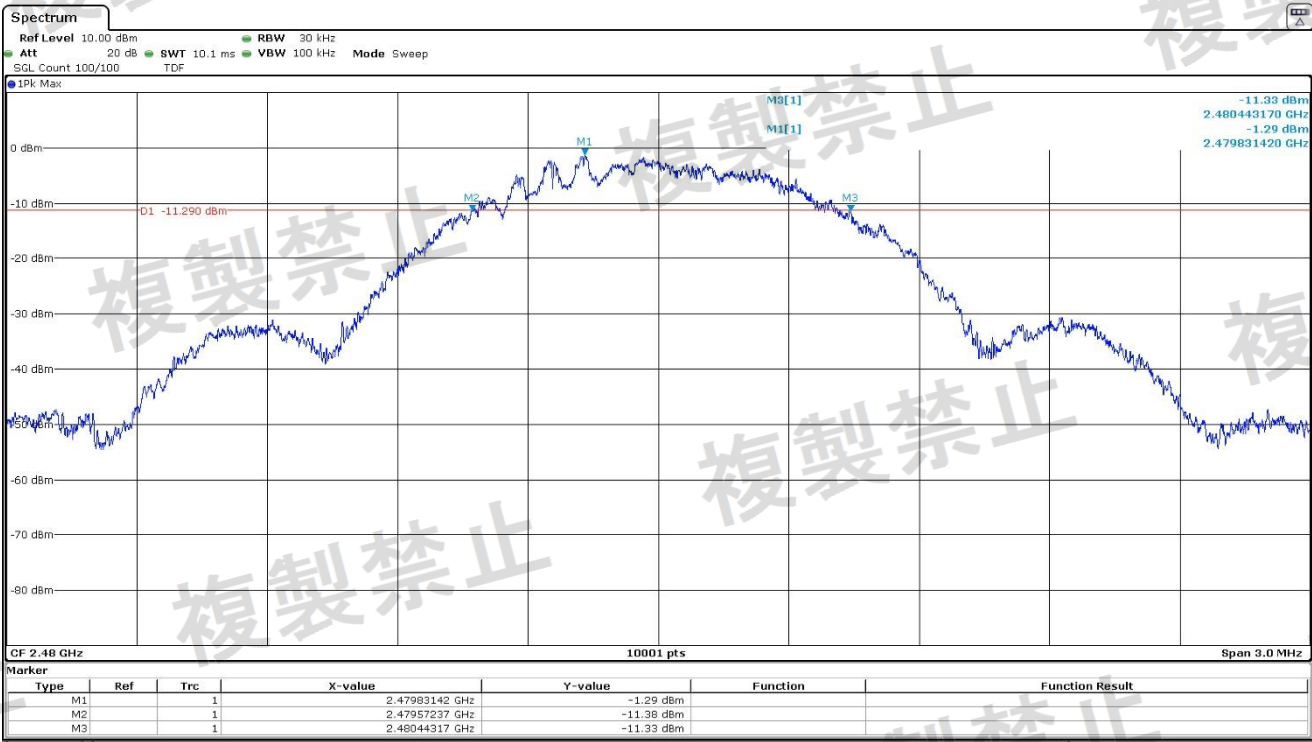
- LOW CHANNEL:



- MID CHANNEL:



HIGH CHANNEL:



Date: 4.FEB.2025 22:01:25

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

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. |

Results:

Vnom:

- 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.

Verdict:

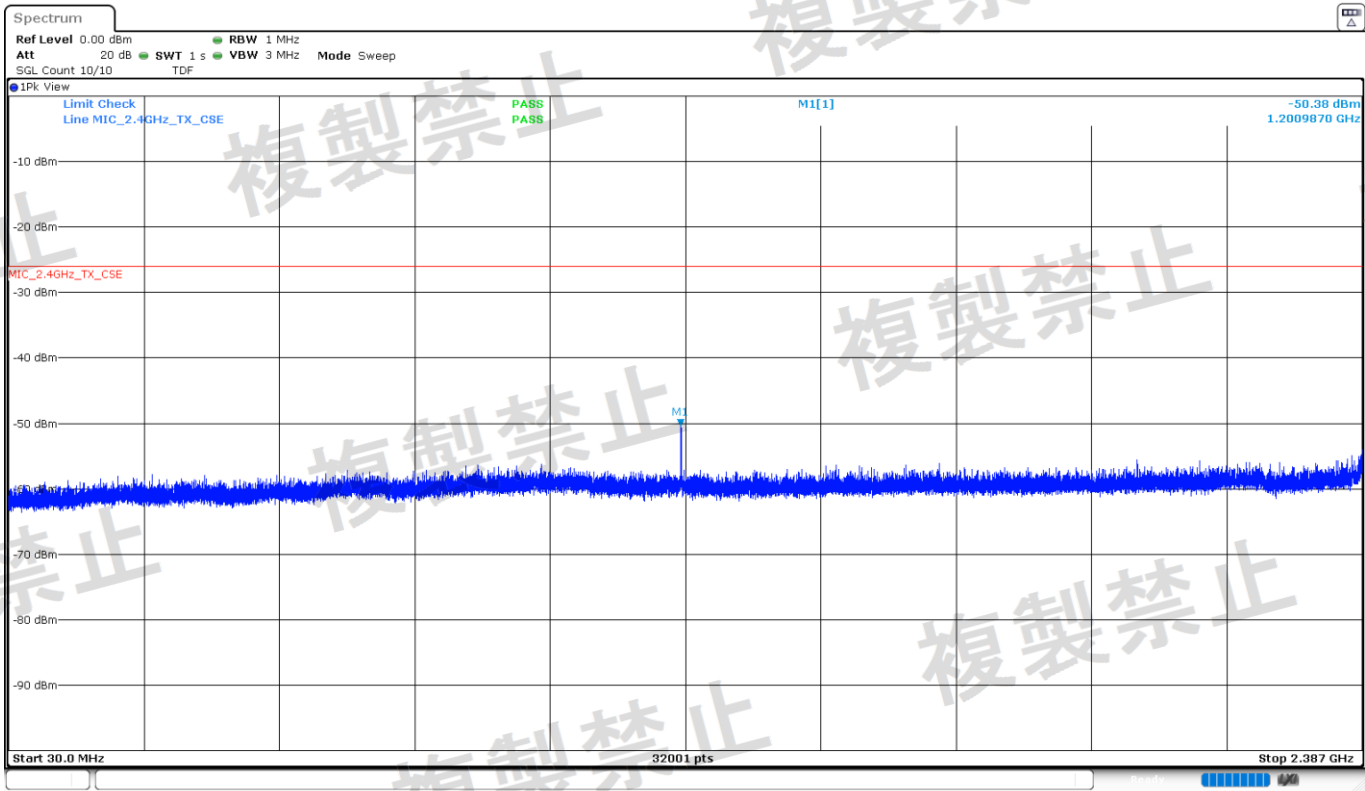
PASS

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

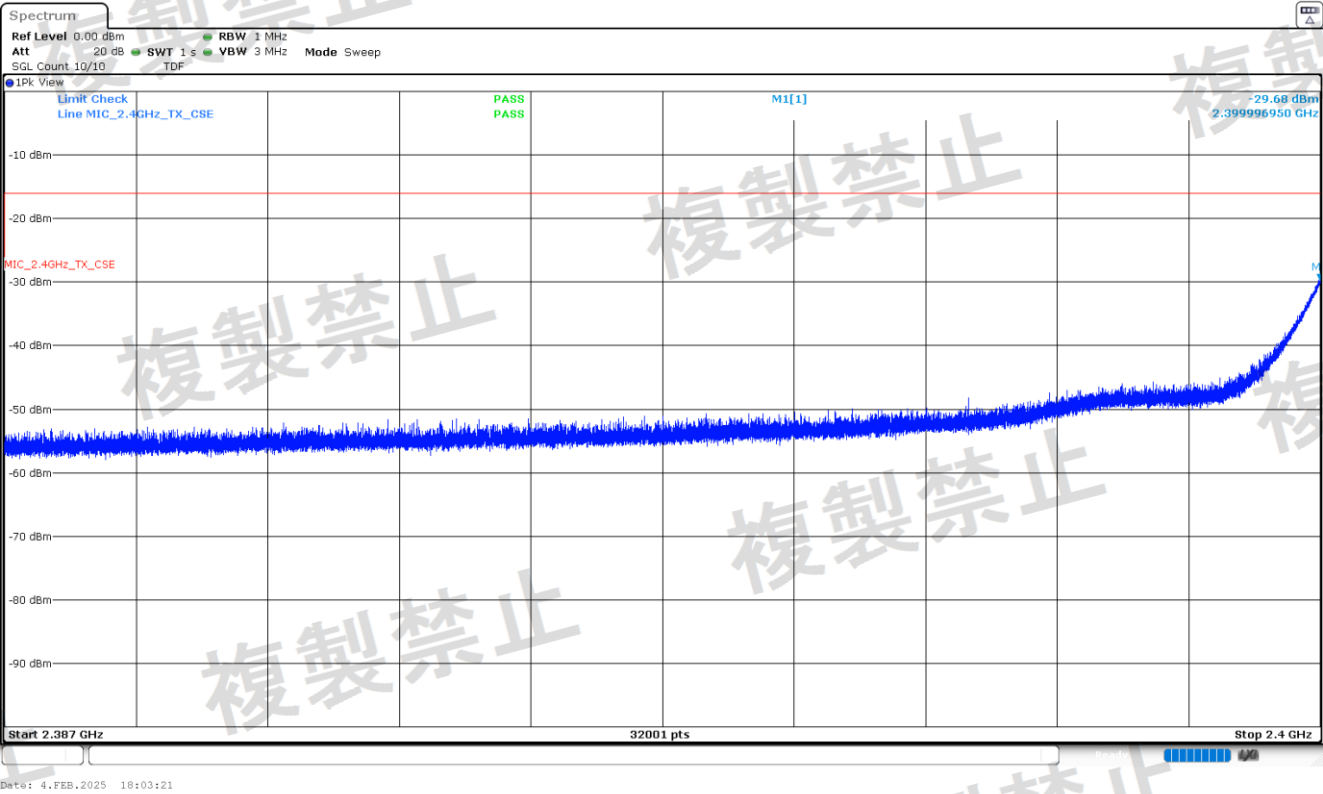
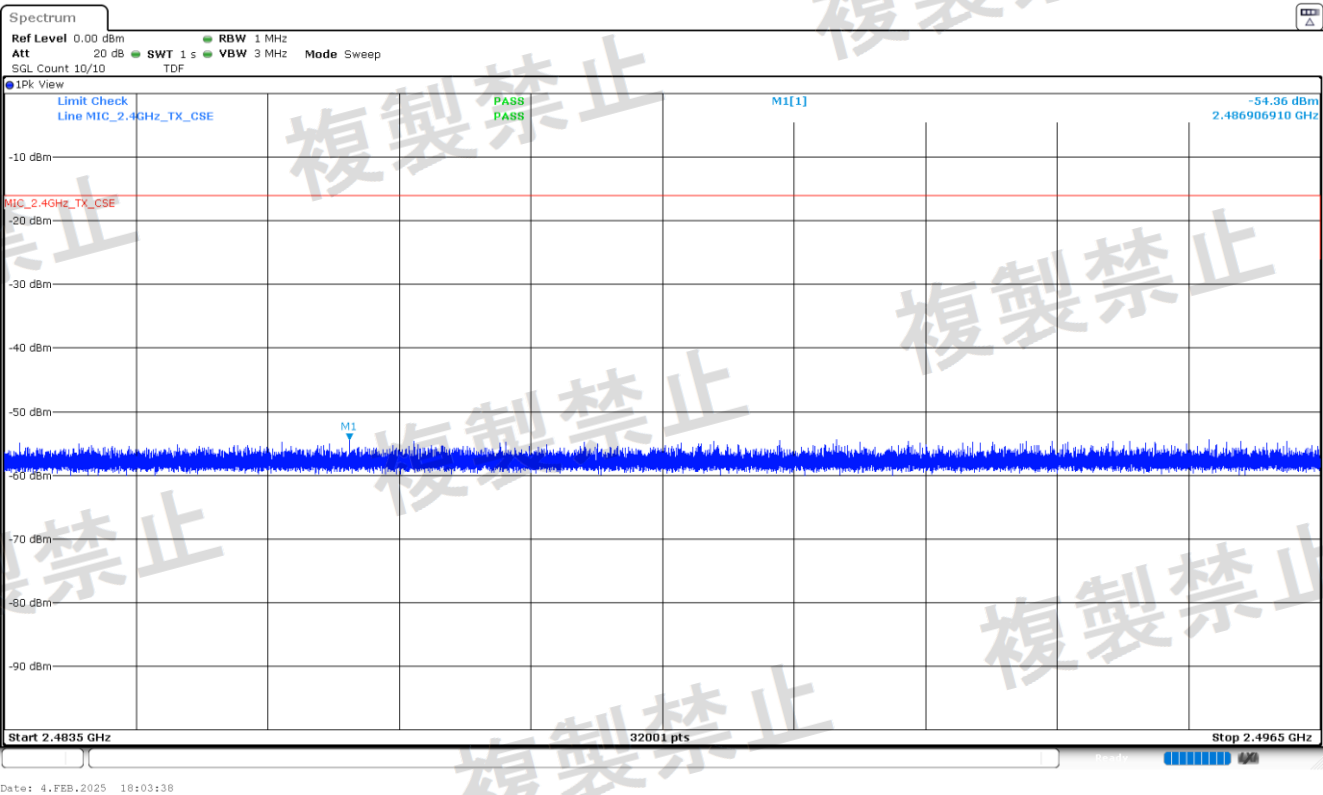
Vnom:

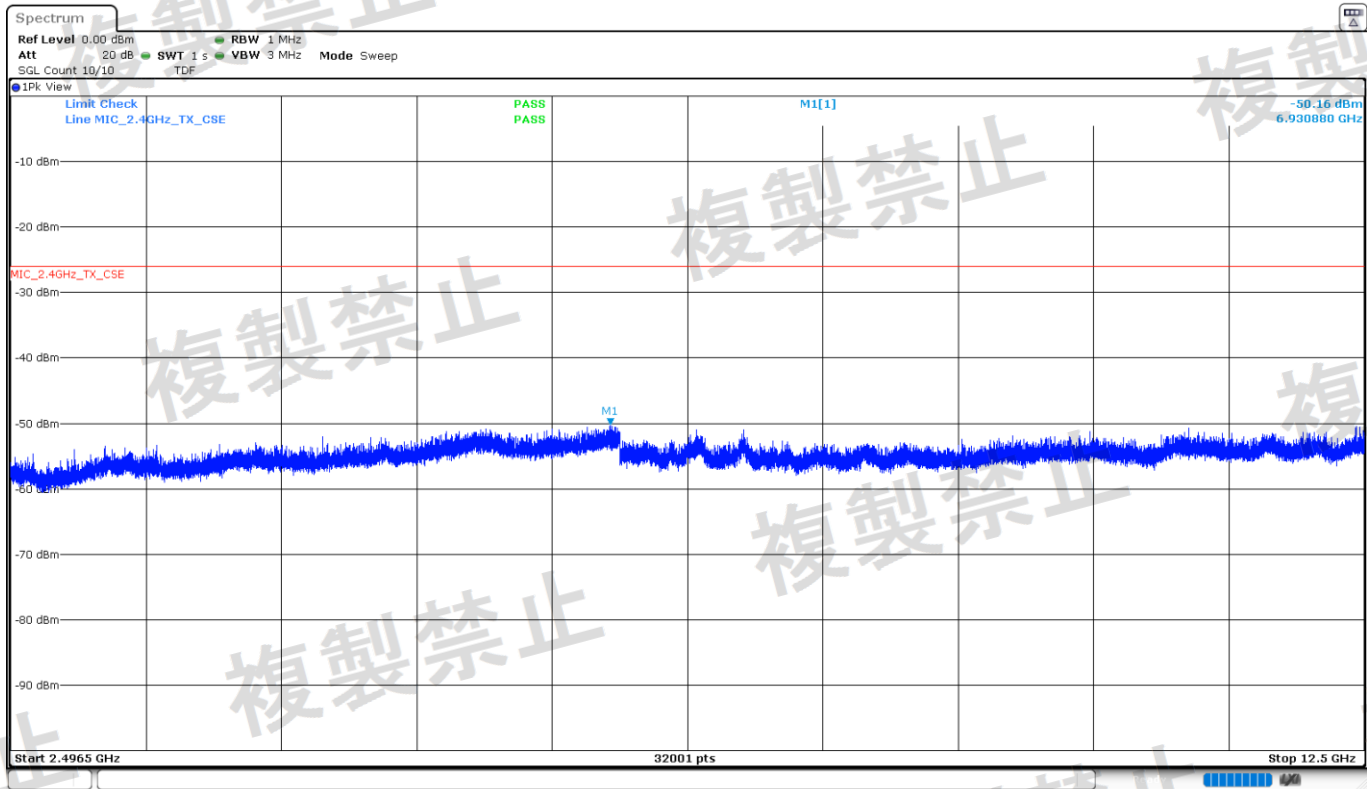
- LOW CHANNEL:

Frequency range 30 MHz – 12.5 GHz:



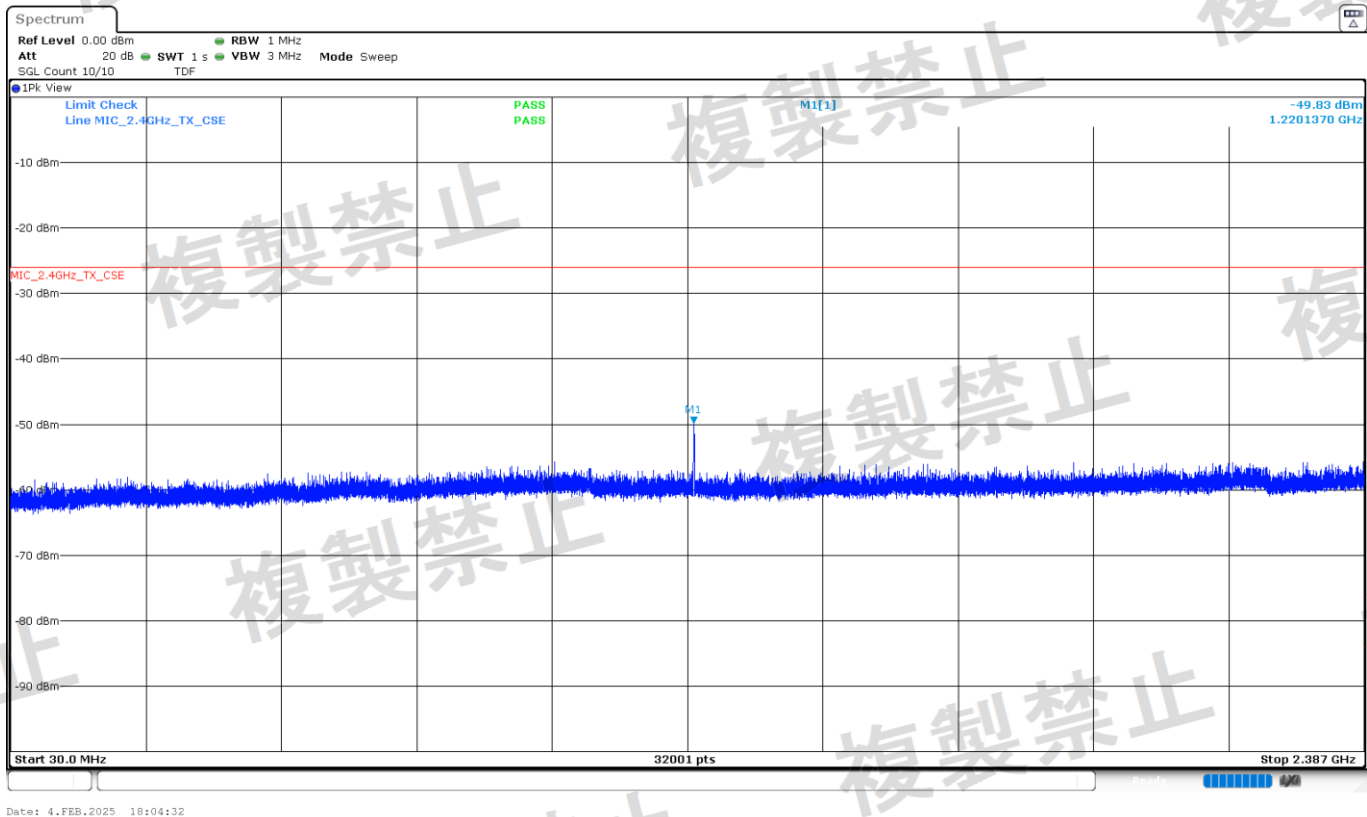
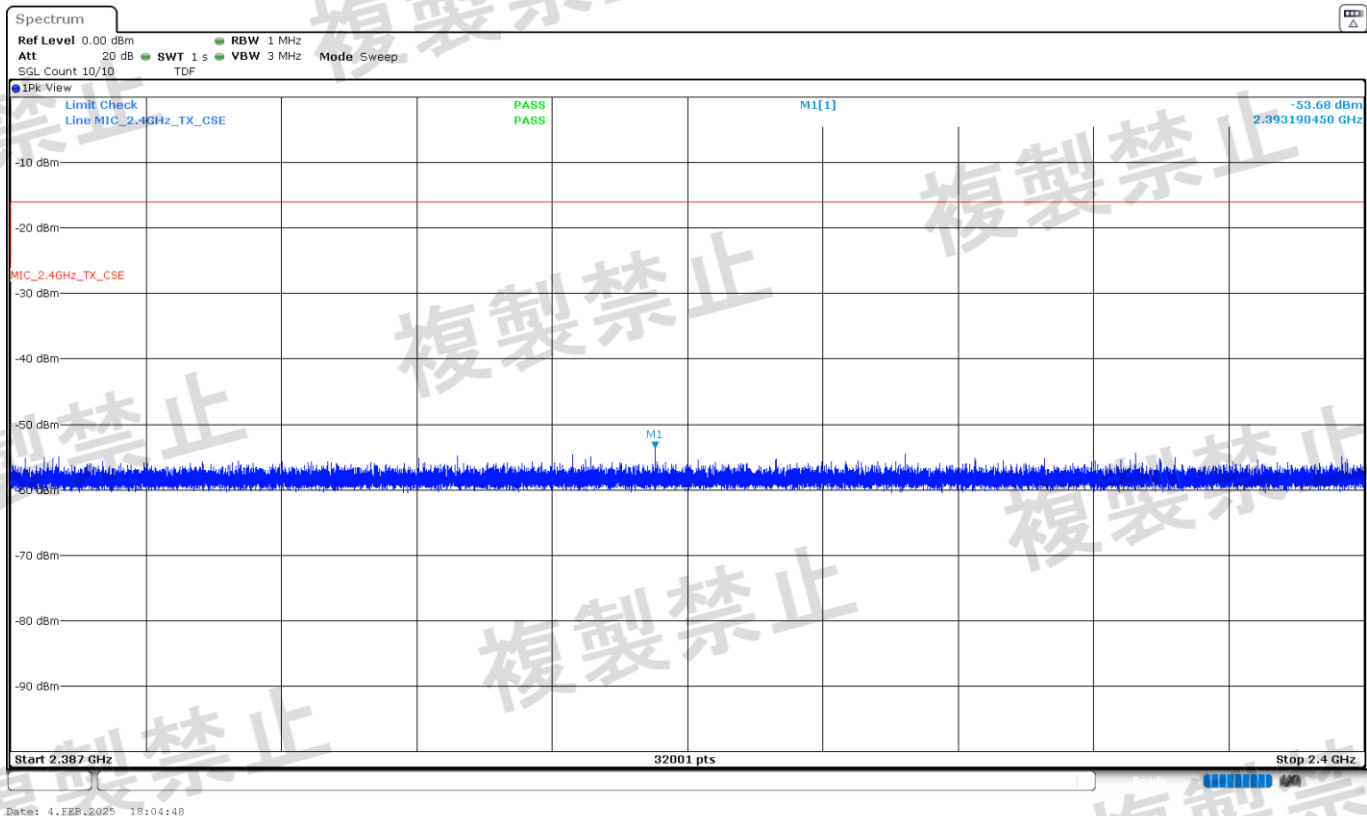
Date: 4.FEB.2025 18:03:04

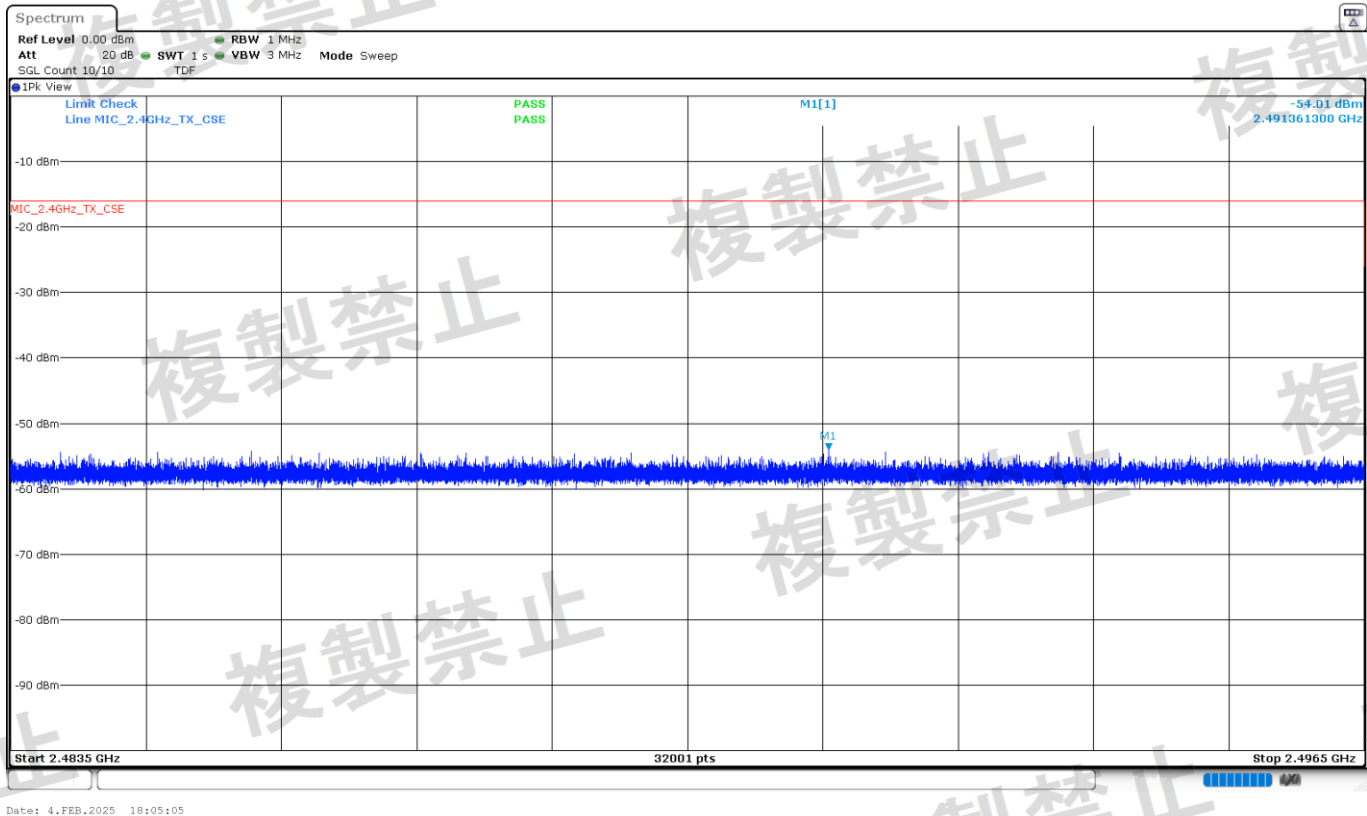
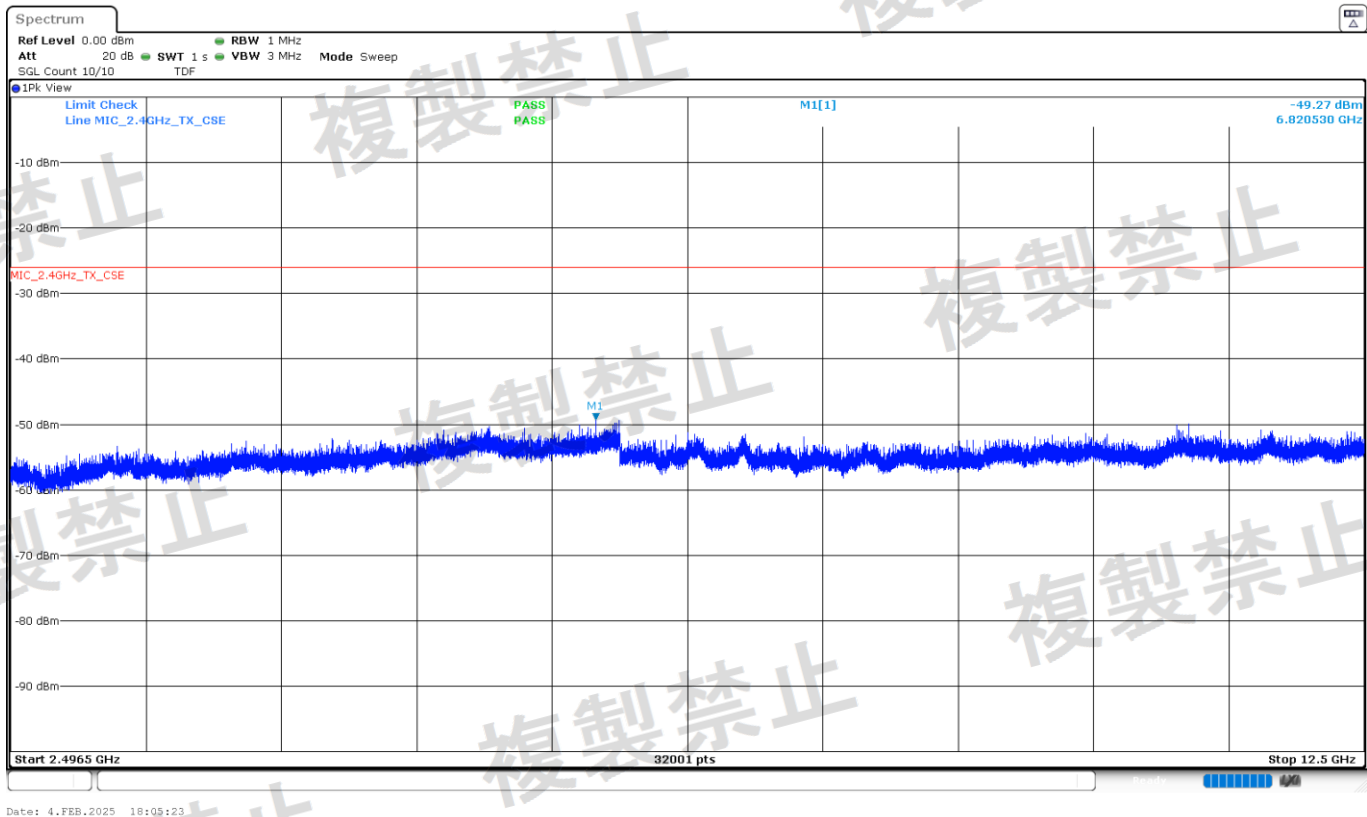




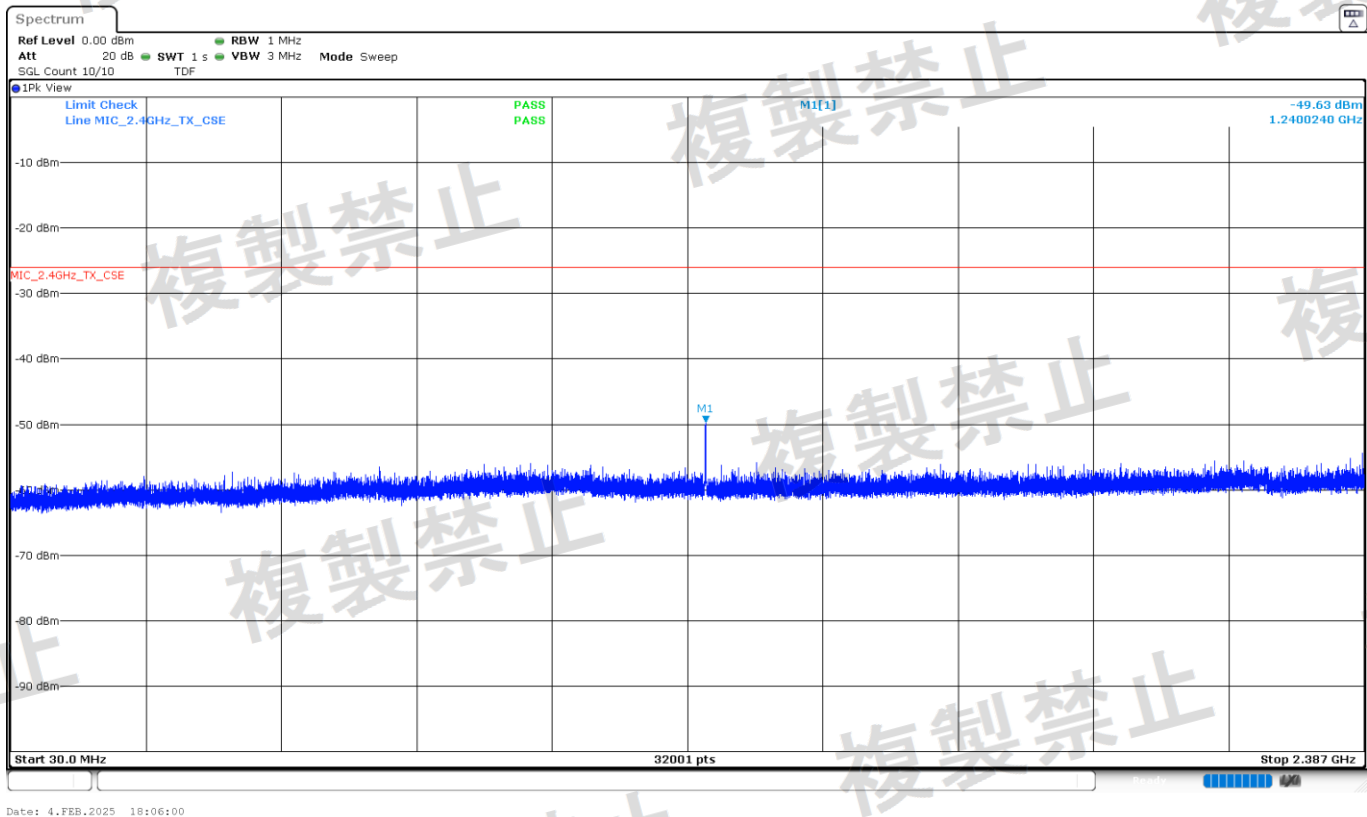
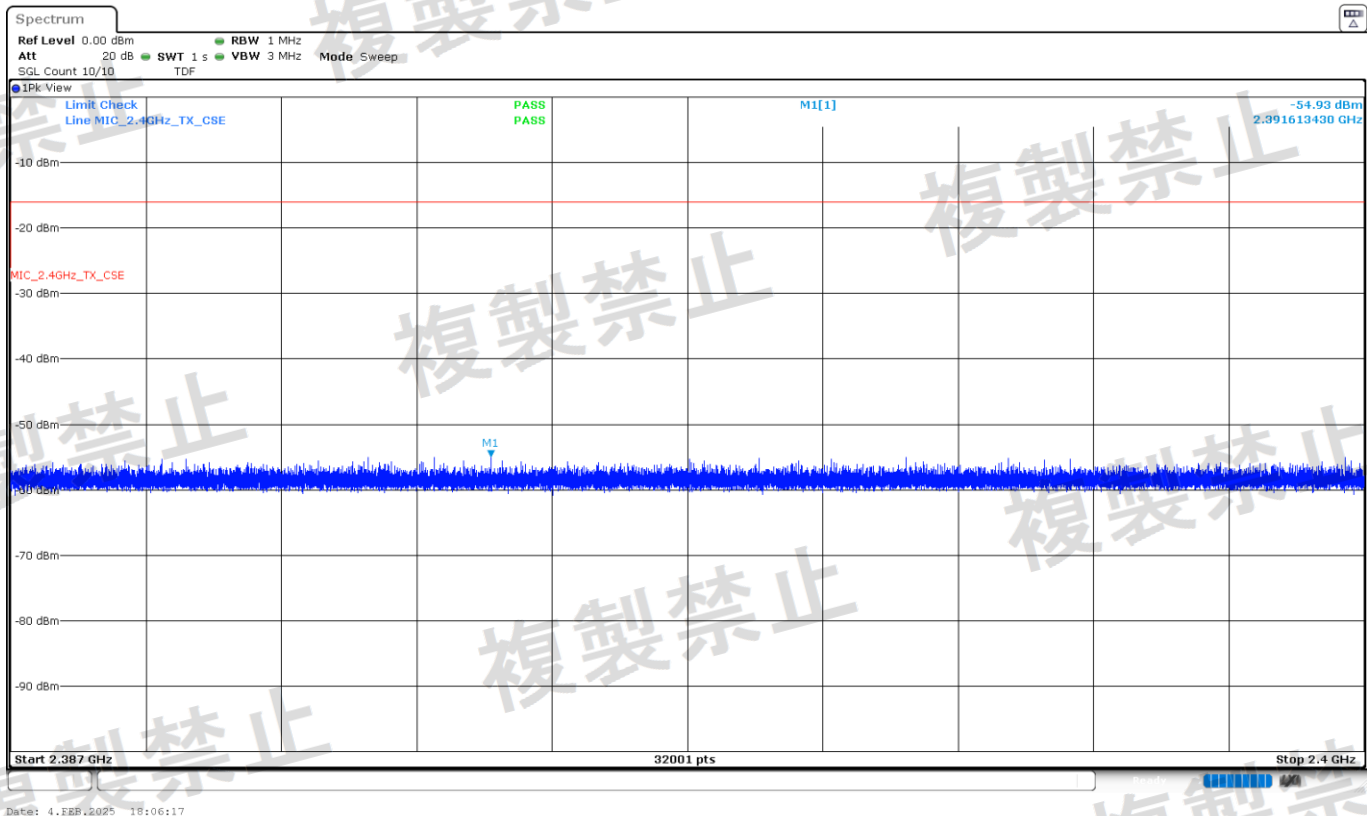
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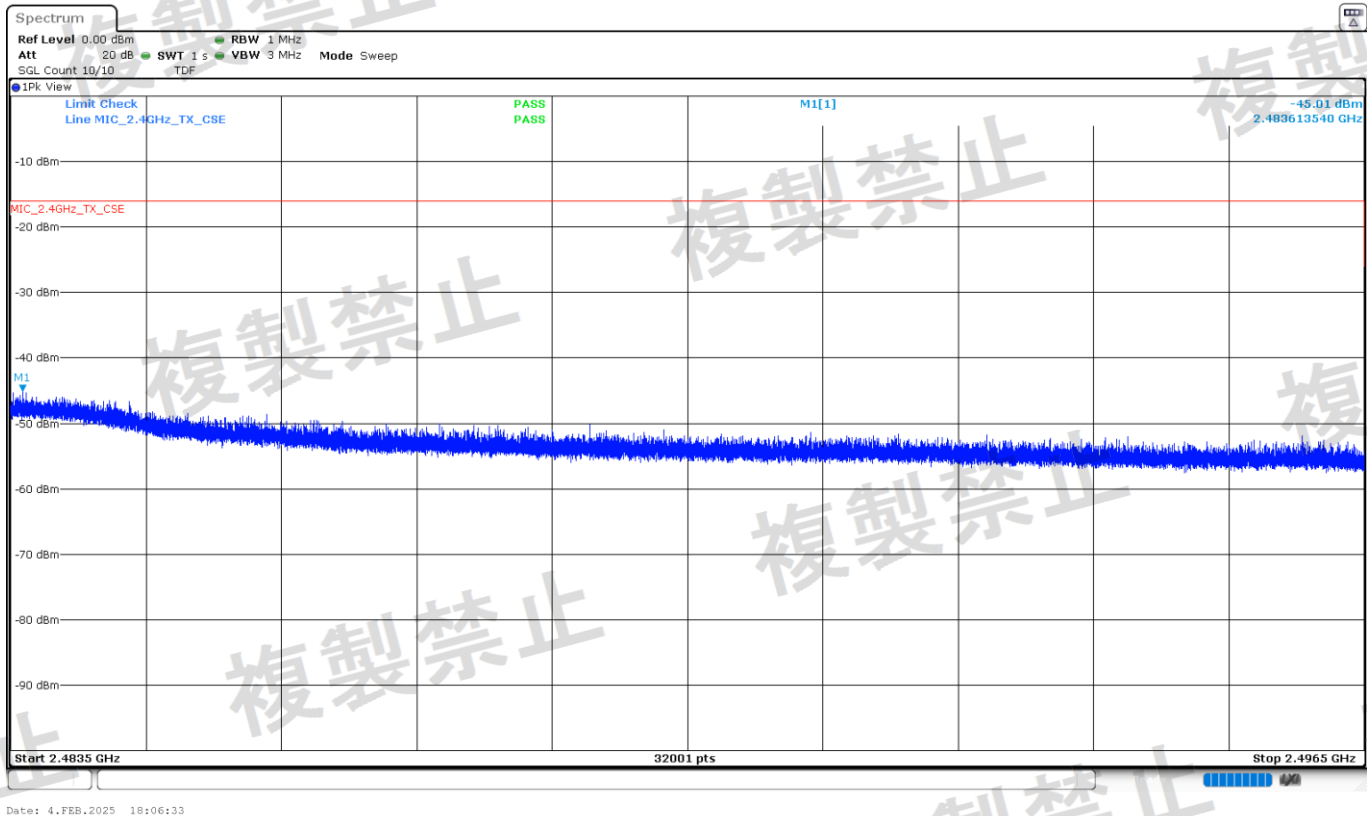
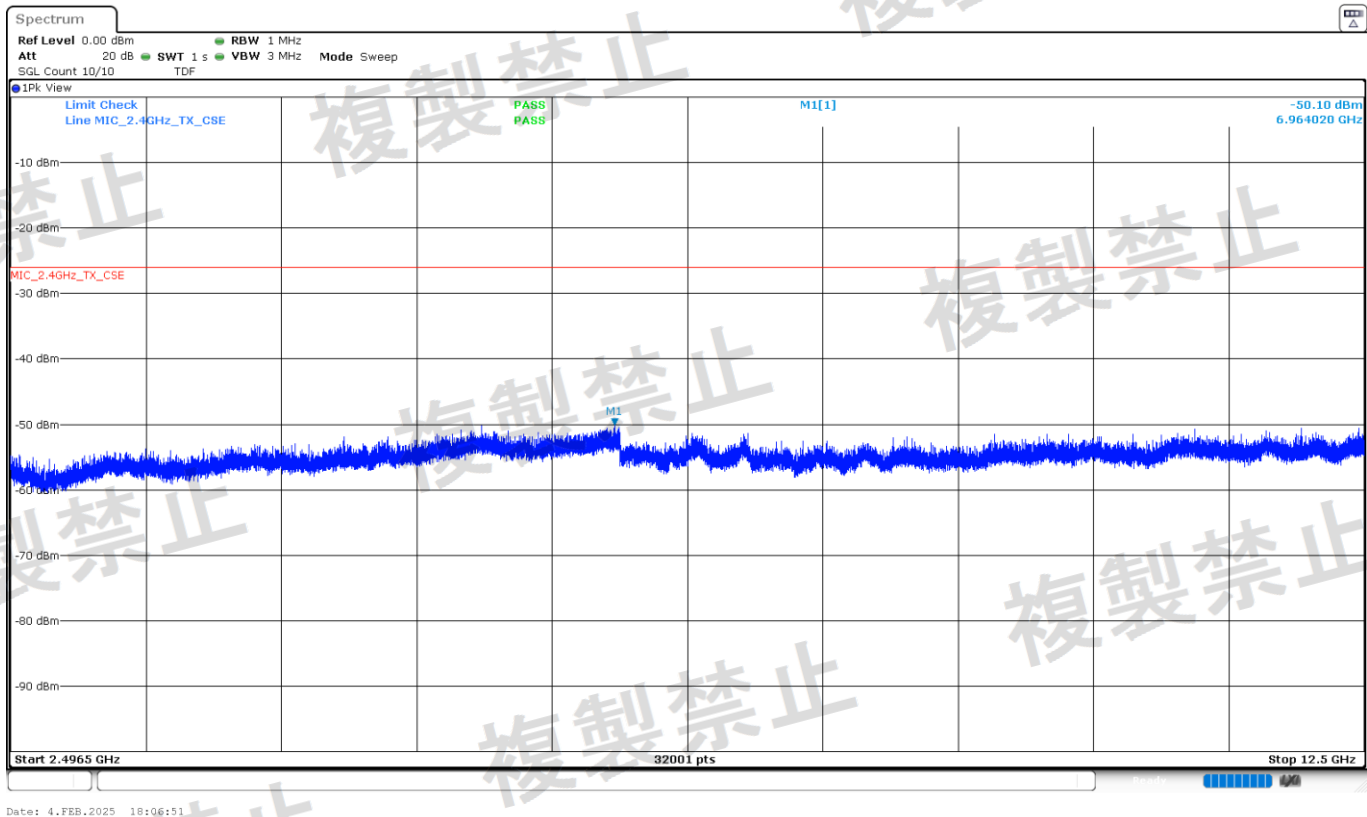
- MIDDLE CHANNEL:
Frequency range 30 MHz – 12.5 GHz:





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





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

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

Results:

Mode: Other digital modulation methods.

Vnom:

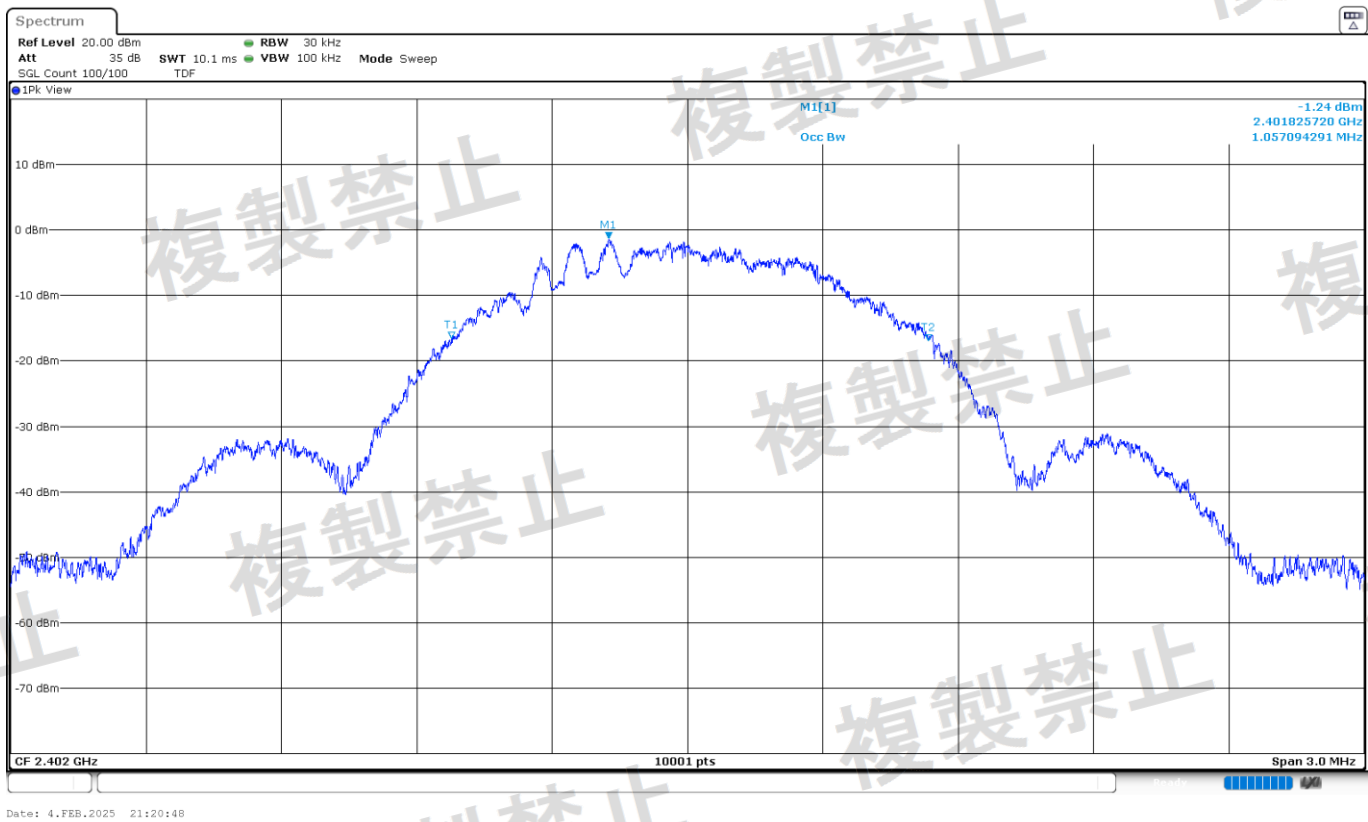
	Low Channel 2402 MHz	Middle Channel 2440 MHz	High Channel 2480 MHz
99% occupied bandwidth (MHz)	1.057094291	1.055594441	1.063693631

Verdict:

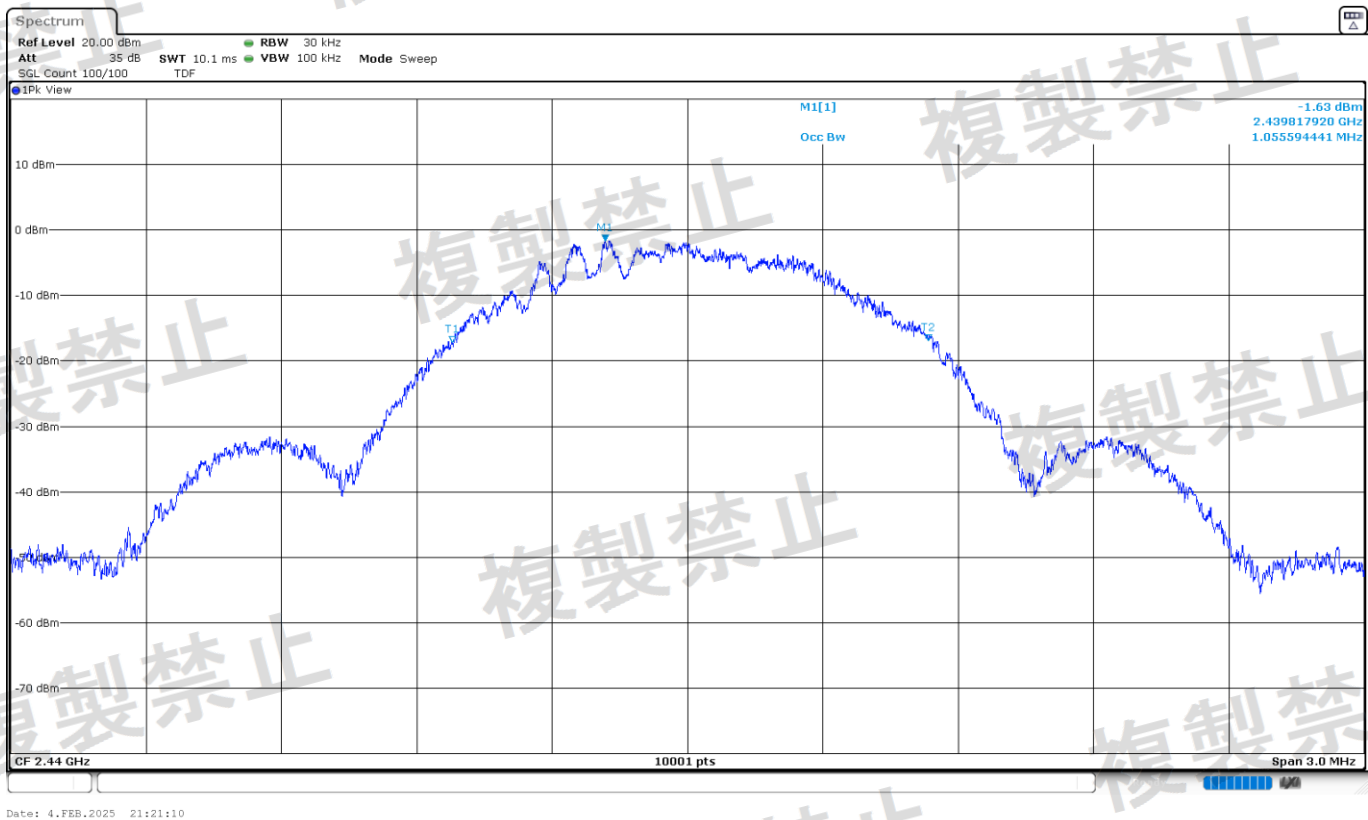
PASS

Vnom:

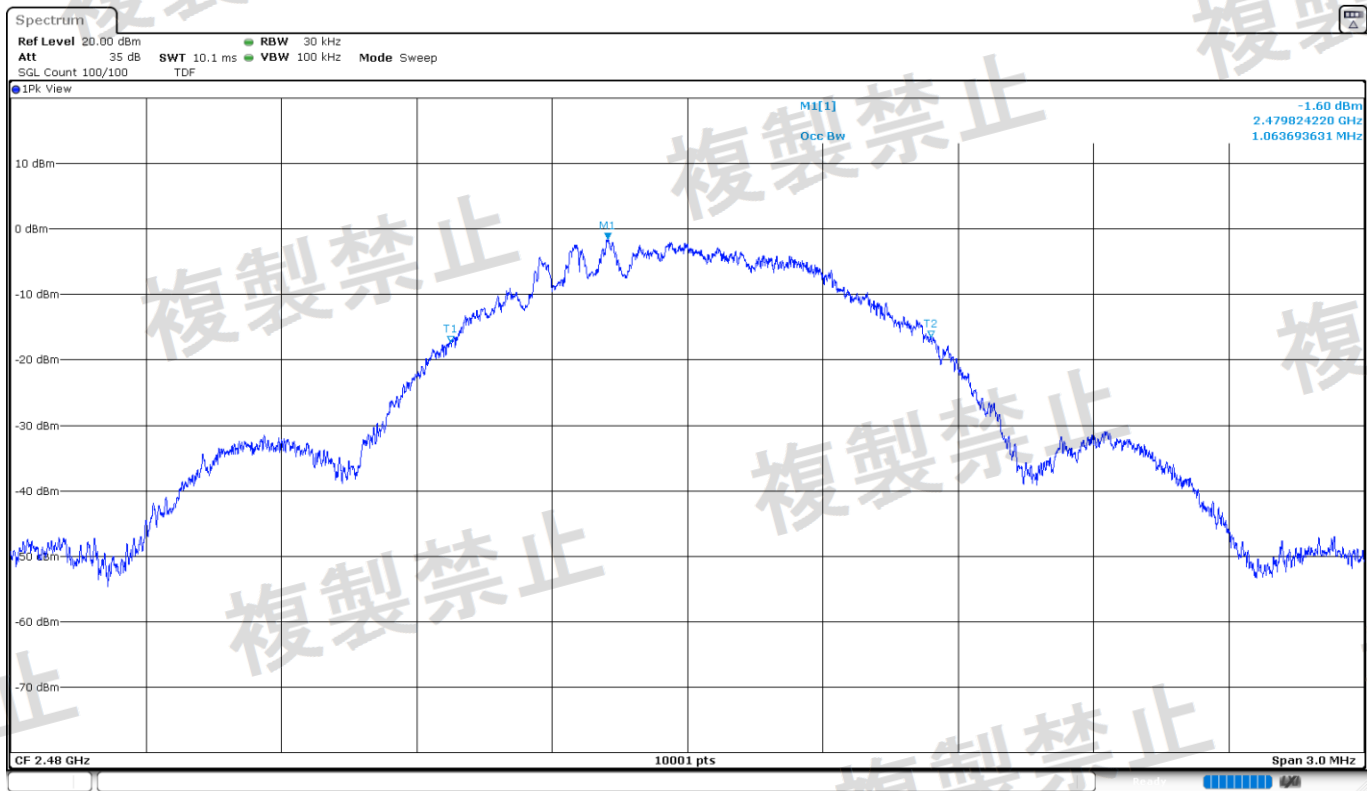
- LOW CHANNEL:



- MIDDLE CHANNEL:



HIGH CHANNEL:



Date: 4.FEB.2025 21:21:25

Article 24.2. Receiving equipment. Limit on secondary radiated emissions

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.

Results:

Vnom:

- LOW CHANNEL:

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)
4805.840	-53.52	-47

- MIDDLE CHANNEL:

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)
4882.030	-53.00	-47

- HIGH CHANNEL:

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)
4961.810	-53.28	-47

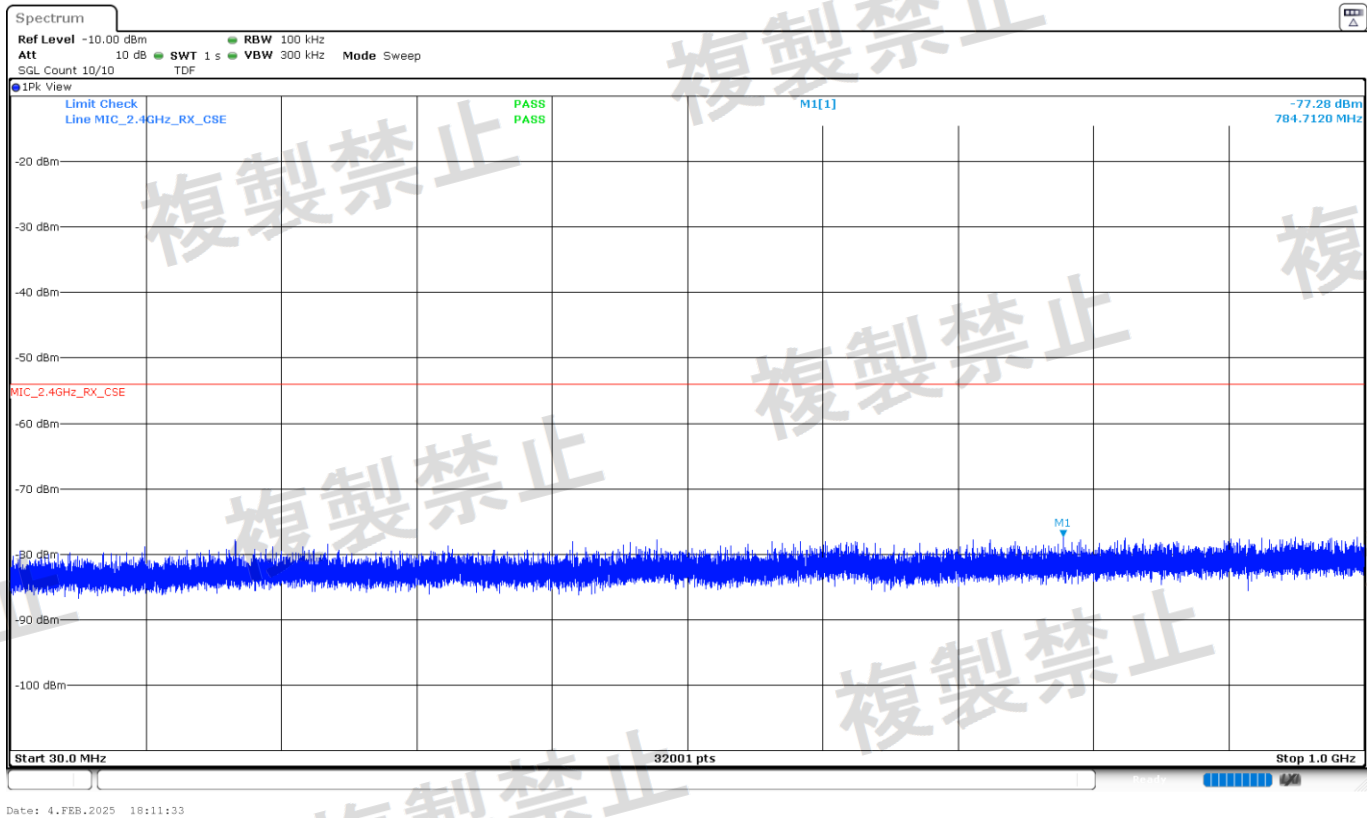
Verdict:

PASS

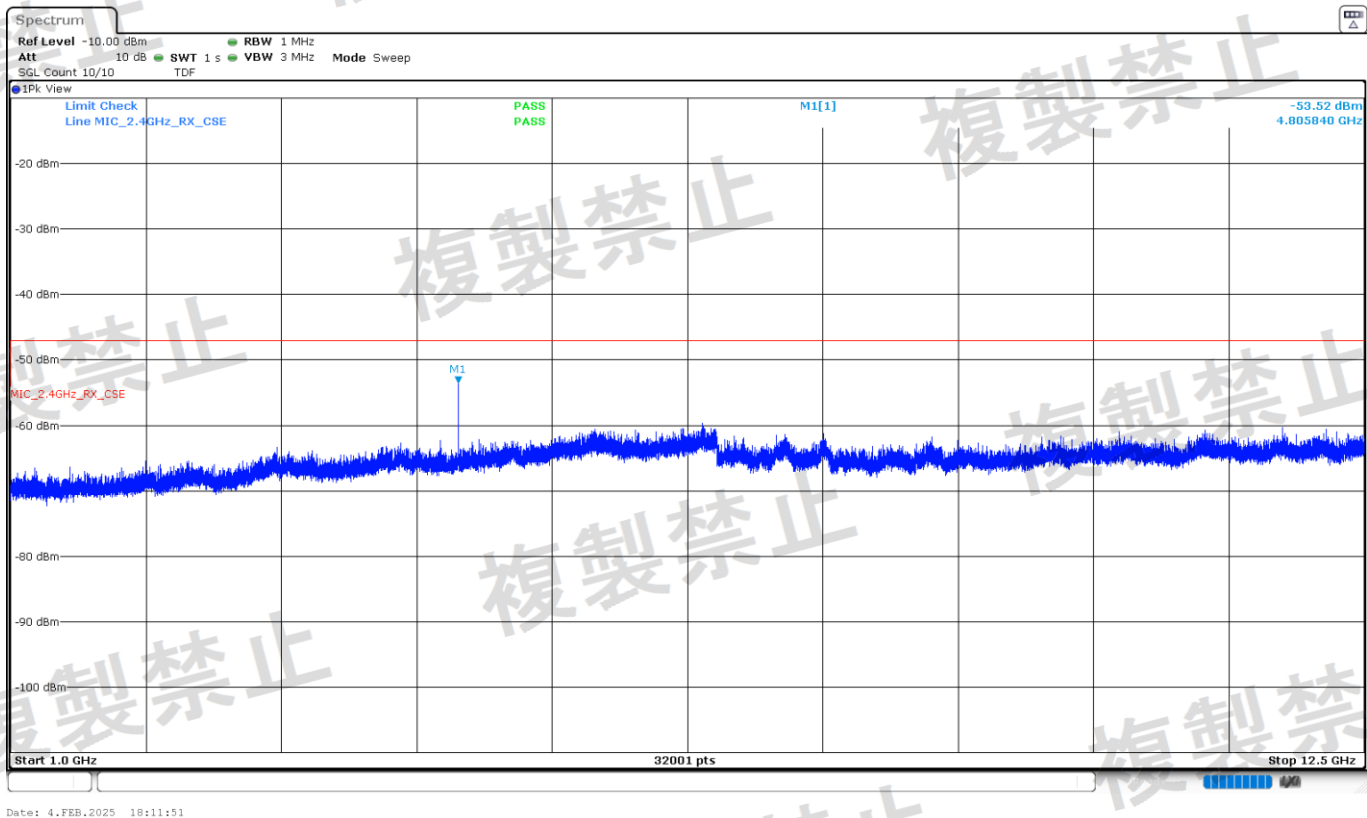
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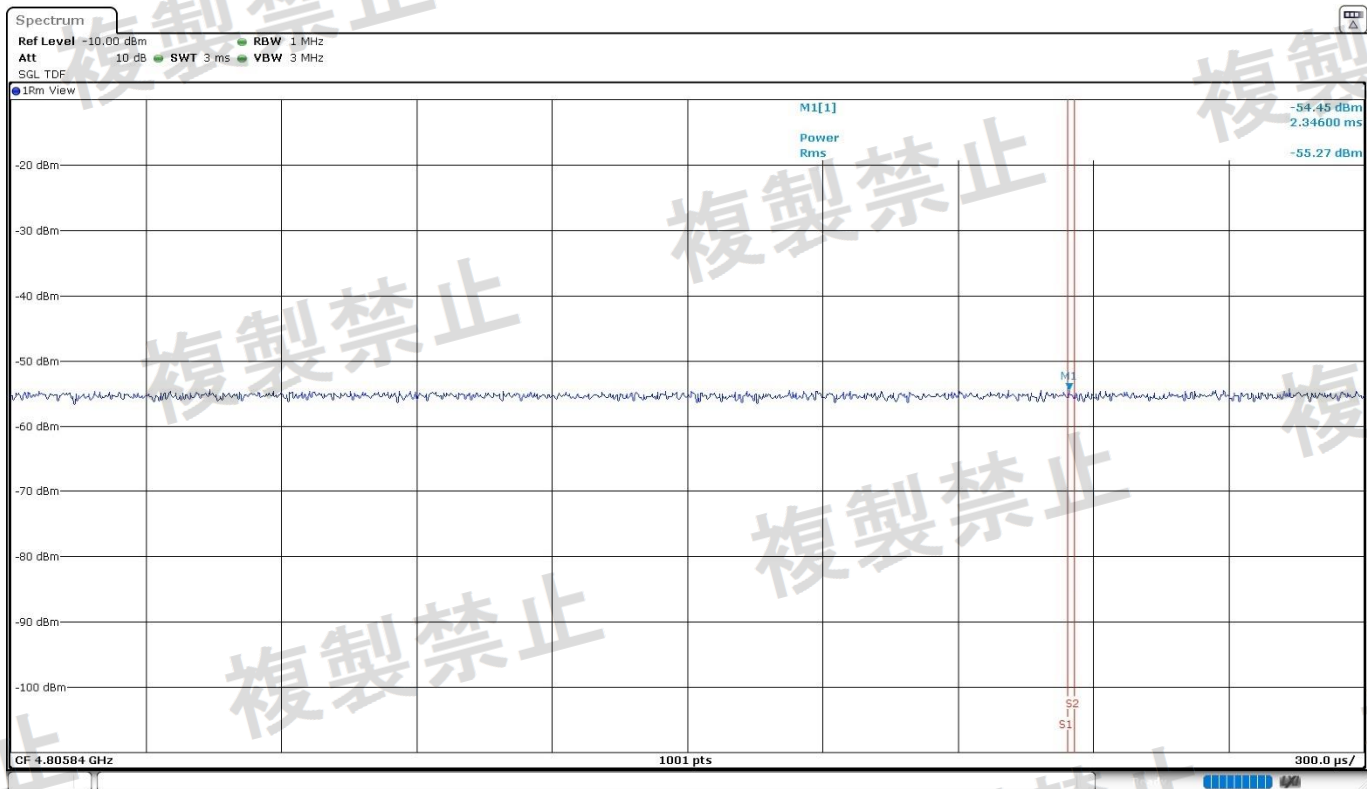
- LOW CHANNEL:

Frequency range 30 MHz - 1 GHz:



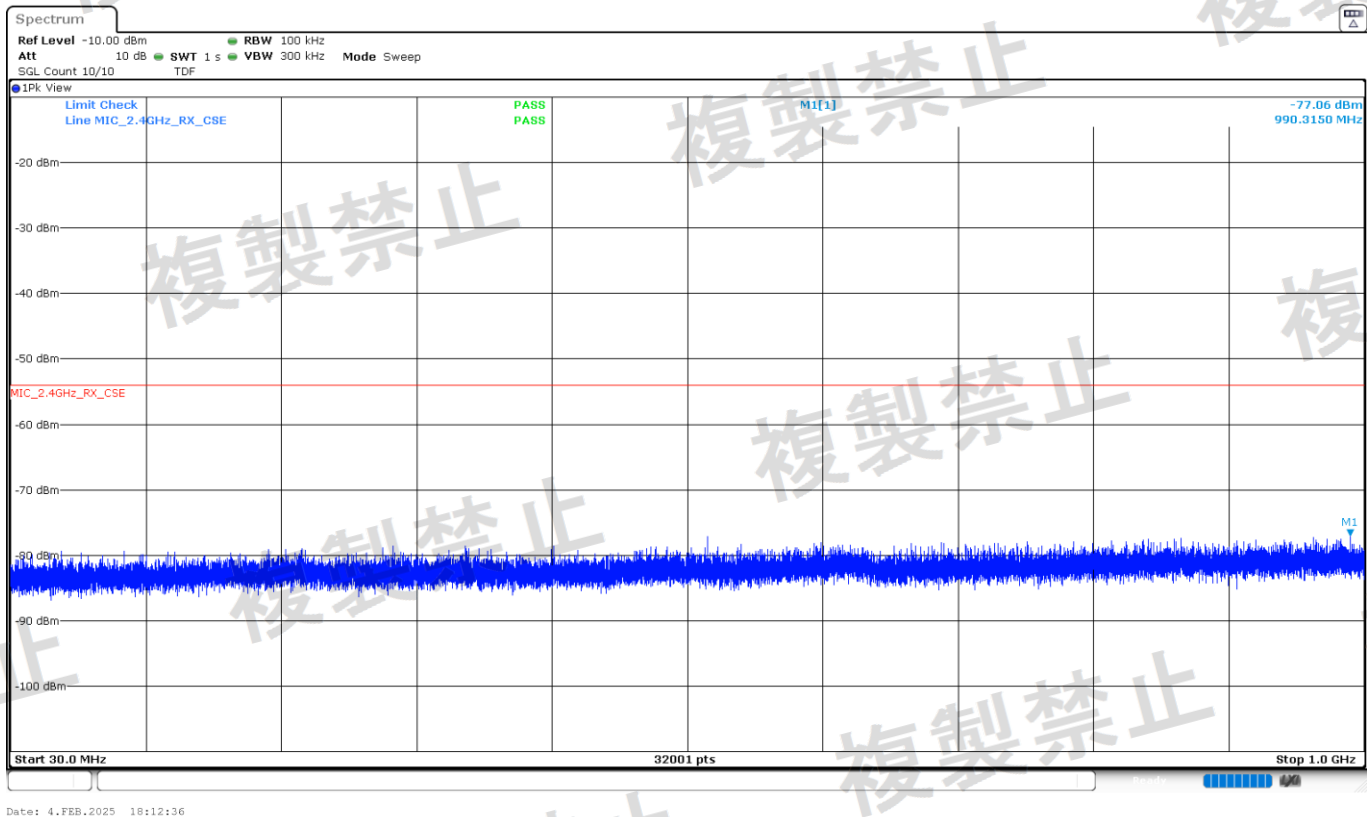
Frequency range 1 – 12.5 GHz:



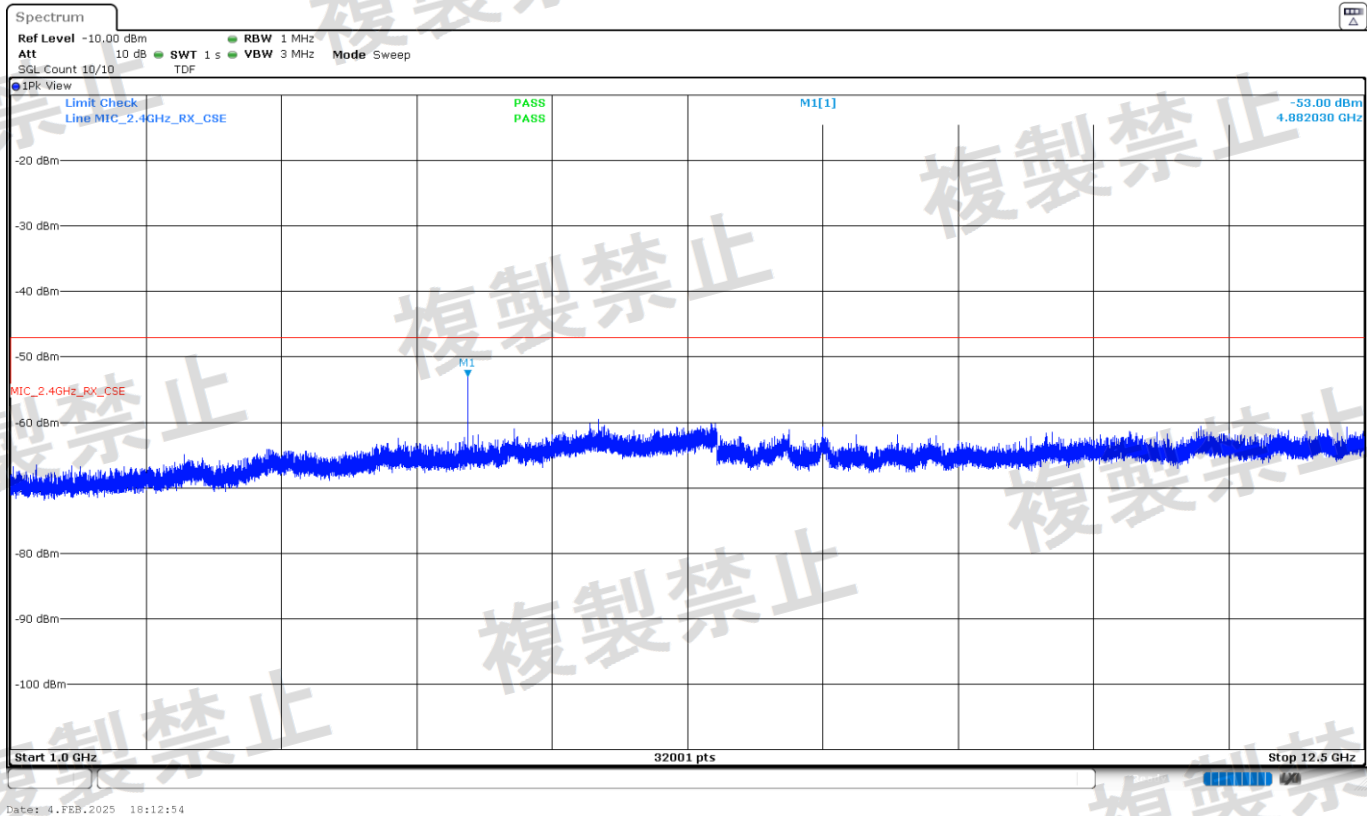


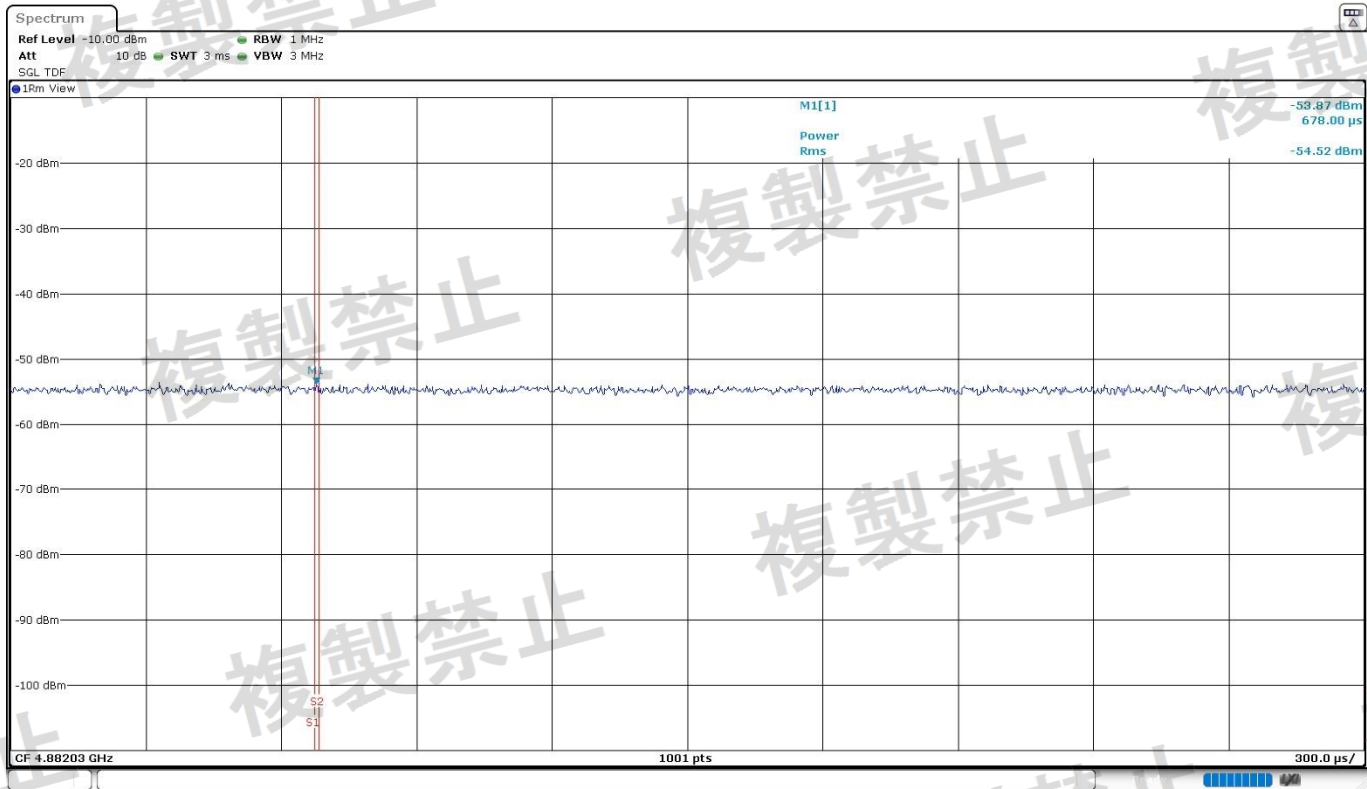
Dated: 4.Feb.2025 18:12:01

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



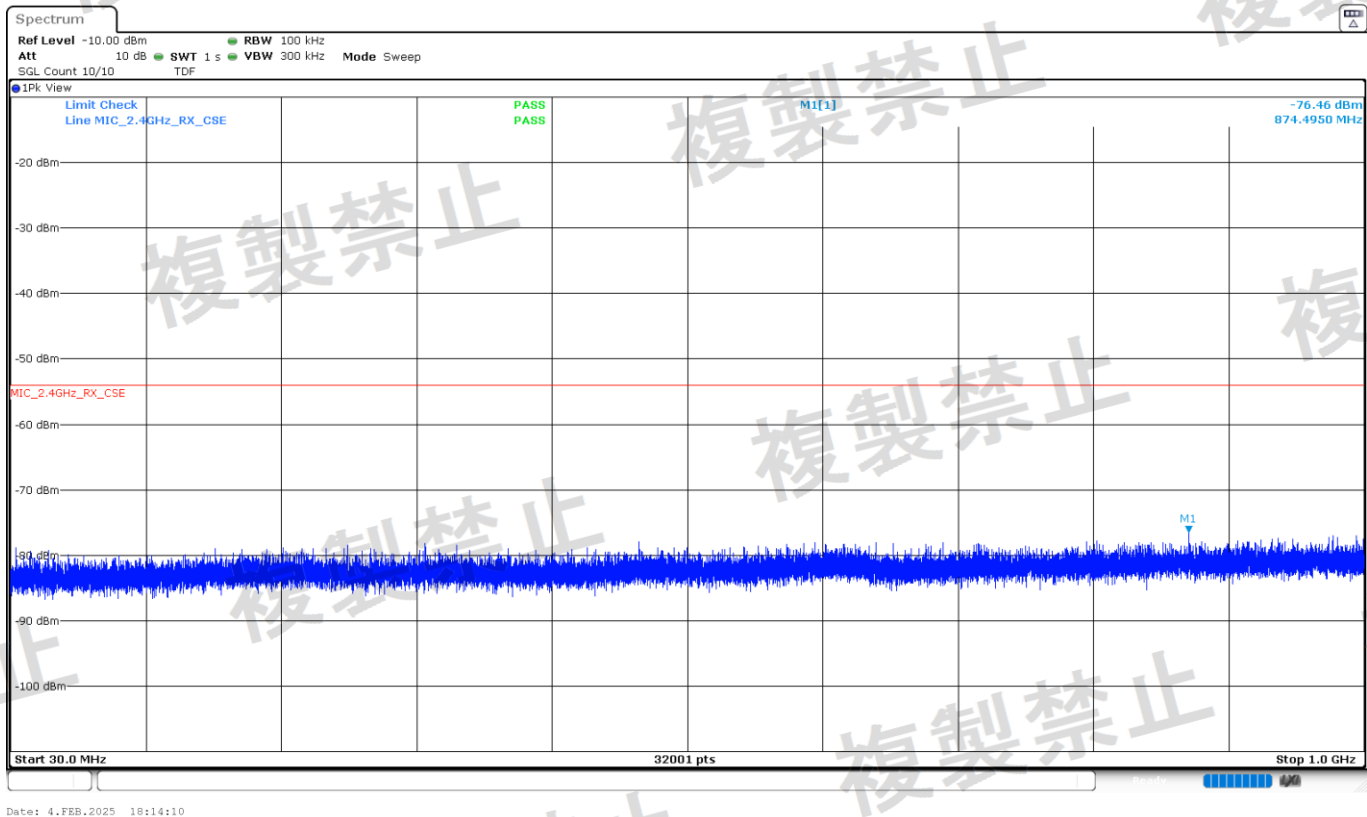
- Frequency range 1 – 12.5 GHz:



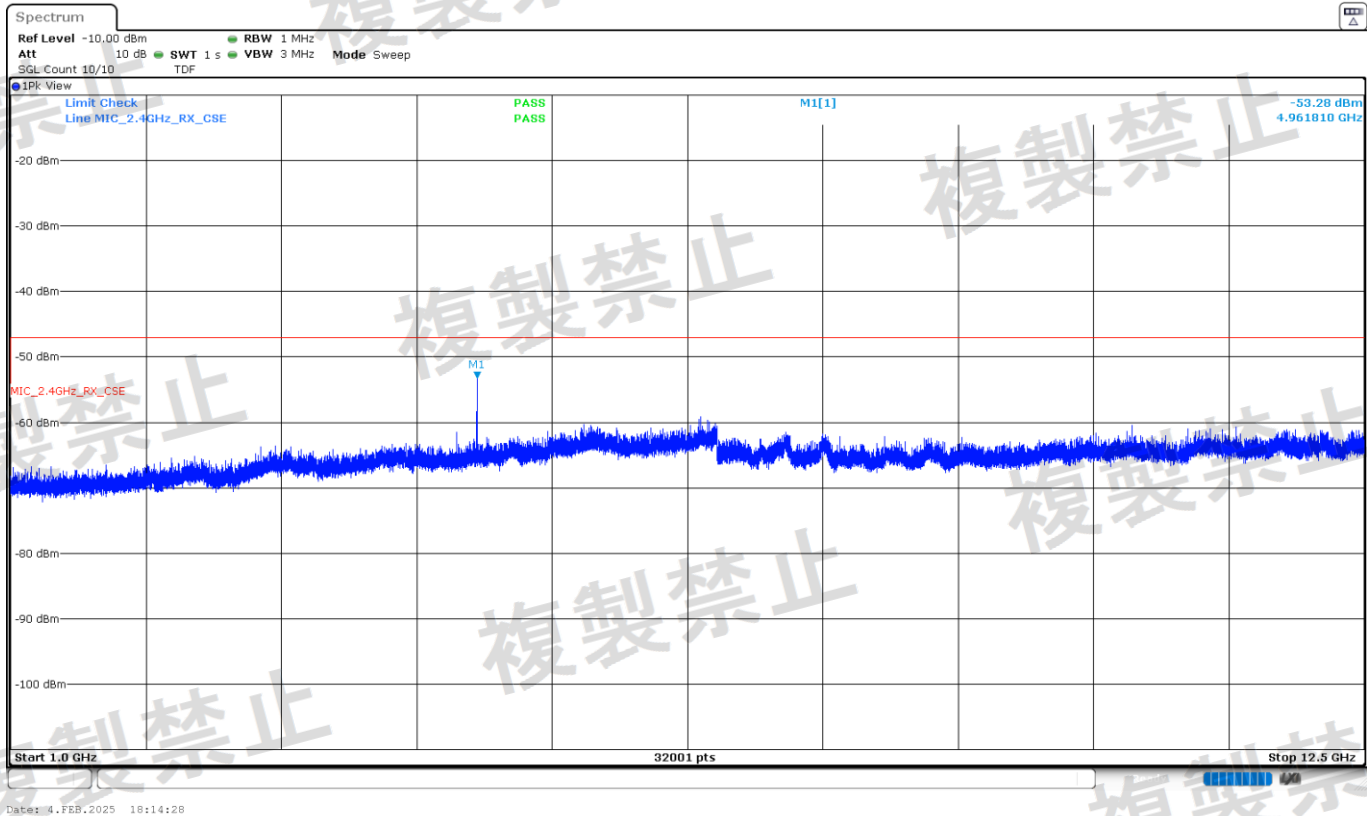


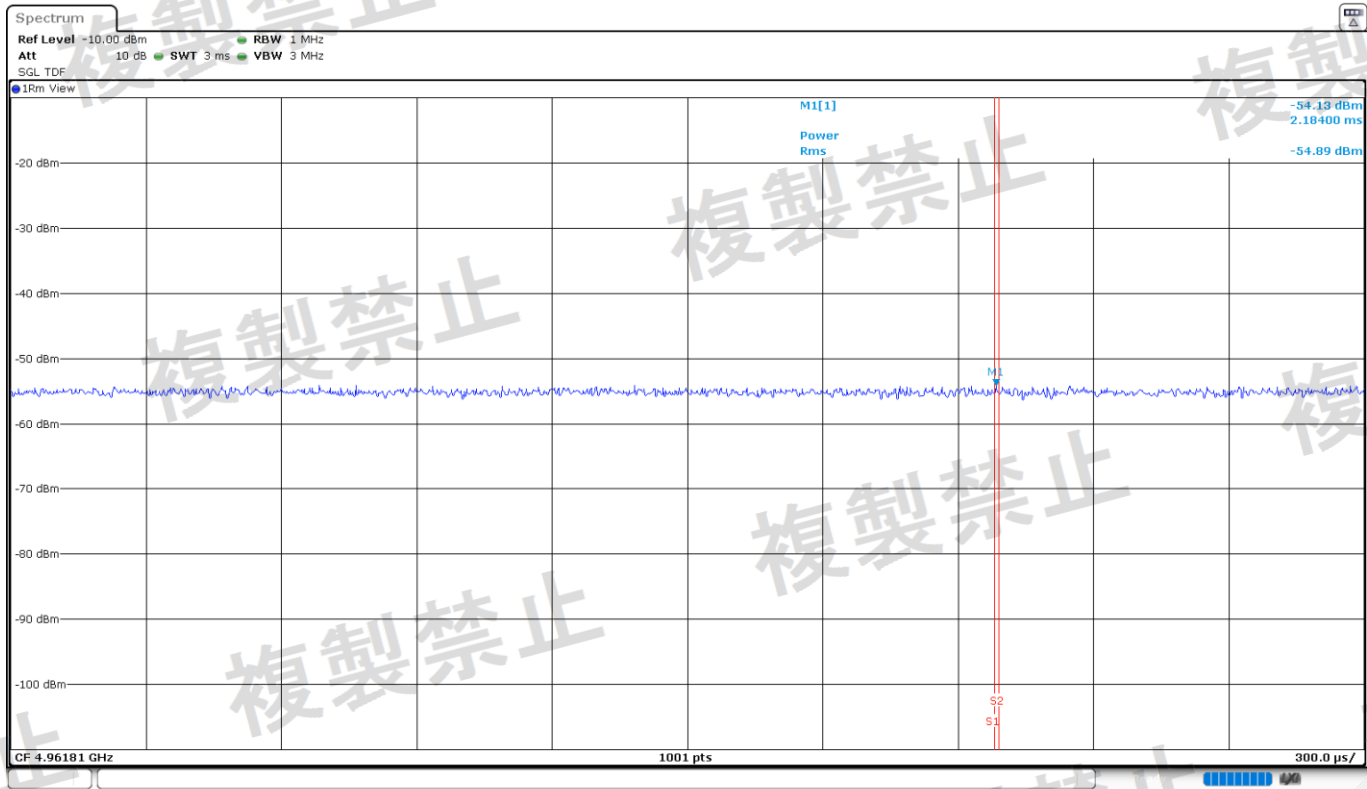
Dated: 4. Feb. 2025 10:13:32

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



Frequency range 1 – 12.5 GHz:





Date: 4.FEB.2025 18:14:53

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

Limits:

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

Results:

BLE MAC
48:23:35:F4:00:09

LIST OF DEVICES

N	Name	Address	RSSI	Ad
1	RENESAS-DA14533-BRBN	482335F40009	-57	1x1 struct

Verdict:

PASS

Article 49-20. Antenna. Antenna gain

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

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

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

Results:

Maximum Declared Antenna Gain: +2.2 dBi

Vnom:

Channel	Measured antenna power (dBm)	Radiated power EIRP (dBm)	Radiated power EIRP (mW)	A = EIRP (mW) / 16.37
Low (2402 MHz)	3.190000	5.39	3.46	< 1
Middle (2440 MHz)	3.060000	5.26	3.36	< 1
High (2480 MHz)	2.850000	5.05	3.20	< 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 THE TESTS

