



FCC LISTED, REGISTRATION
NUMBER: 2764.01

ISED LISTED REGISTRATION
NUMBER: 23595-1

Test report No:

4041ERM.001

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	Battery Radiofrequency Module
(*) Trademark	Visteon Corporation
(*) Model and /or type reference tested	BRFM
Other identification of the product	--
(*) Features	Wireless Battery Management
Manufacturer	Visteon Corporation One Village Center Drive, Van Buren Township, MI 48111, USA.
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)	Domingo Galvez EMC & RF Lab Manager  Digitally signed by Domingo Galvez DN: cn=Domingo Galvez, o=DEKRA Certification Inc., ou=Regulatory Lab, email=dgalvez@dekra.com, c=US
Date of issue	04-18-2023
Report template No	FDT08_23 (*) "Data provided by the client"

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Competences and guarantees

DEKRA Certification Inc. is a testing laboratory accredited by A2LA (The American Association for Laboratory Accreditation), to perform the tests indicated in the Certificate 2764.01

DEKRA Certification Inc. 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 Certification Inc. has a calibration and maintenance program for its measurement equipment.

DEKRA Certification Inc. 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 Certification at the time of performance of the test.

DEKRA Certification Inc. 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 Certification Inc.

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 Certification Inc.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Certification Inc. and the Accreditation Bodies.

Testing Site

Test Site	DEKRA Certification Inc.
Test Site Location	405 Glenn Dr. Suite 12, Sterling, VA 20164 United States of America

Uncertainty

Uncertainty (factor $k=2$) was calculated according to the DEKRA Certification internal document PODT000.

Test case	Frequency (MHz)	U (k=2)	Units
Antenna power and tolerances for antenna power	2402-2483	0.78	dB
Frequency tolerance		10.03	kHz
Spurious emission intensity	0.01 - 1000	0.48	dB
Receiving equipment. Limit on secondary radiated emissions	1000 - 25000	0.94	dB
Permissible value for occupied bandwidth, Spread Bandwidth	2402-2483	5.0	kHz
Antenna gain		2.6	dB

Data provided by the client

The following data has been provided by the client:

The DUT is a Module intended to aggregate individual cell voltages and module temperatures from the HV battery in addition to pack voltage and current and communicate them to the VICM3.

DEKRA declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples used for test have been selected by: The client.

- Sample S/01 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
4041B/05	RF Conducted Sample	BRFM	1123053000018016	03/30/2023

- Sample S/01 is composed of the following accessories:

Control N°	Description	Model	Serial N°	Date of reception
3910/08	Cheeta Test board	--	--	11/15/2022
3910/09	Test Board	--	--	11/15/2022
3910/12	Cable Ethernet	--	--	11/15/2022
3910/13	Cable USB	--	--	11/15/2022

1. Sample S/01 was used for the following test(s): All tests indicated in appendix A.

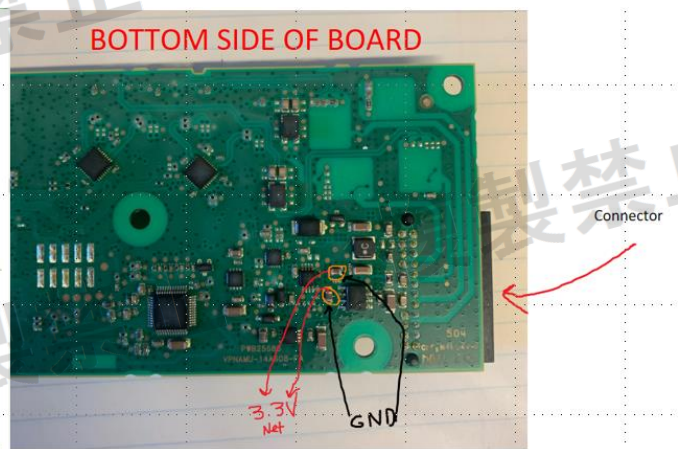
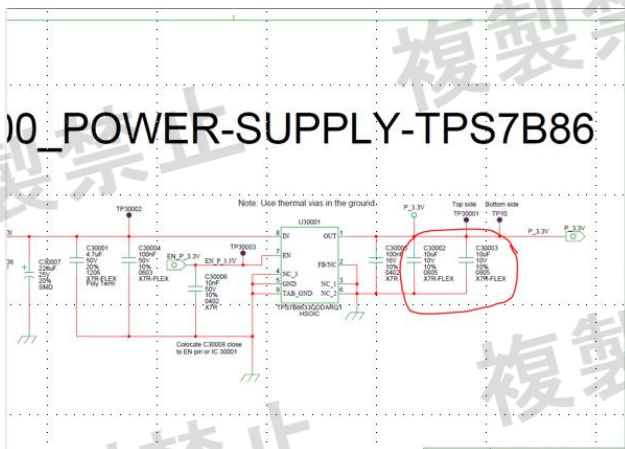
Test sample description

Ports..... :	Port name and description		Cable					
			Specified length [m]	Attached during test	Shielded	Coupled to patient		
	Main connector/harness		60 cm	☐	☐	N/A		
				☐	☐	N/A		
				☐	☐	N/A		
Supplementary information to the ports..... :		No Data Provided						
Rated power supply	Voltage and Frequency		Reference poles					
			L1	L2	L3	N	PE	
	☐	AC:	☐	☐	☐	☐	☐	
	☐	AC:	☐	☐	☐	☐	☐	
	☒	DC: 5.4 V						
	☐	DC:						
Rated Power	Current in normal mode: 0.5 mA							
Clock frequencies..... :	40 MHz							
Other parameters	No Data Provided							
Software version	SWE101-28371-000R01 / SWE101-28371-000R04							
Hardware version	VPNAMU-14B115-HJ / VPPAMU-14B115-FA							
Dimensions in cm (W x H x D)	207.42 mm X 70.05 mm							
Mounting position	☐	Table top equipment						
	☐	Wall/Ceiling mounted equipment						
	☐	Floor standing equipment						
	☐	Hand-held equipment						
	☒	Other: Integrated in-side electric vehicle battery pack.						

Modules/parts.....:	Module/parts of test item	Type	Manufacturer
	No Data Provided		
Accessories (not part of the test item)	Description	Type	Manufacturer
	Harness		
	Main connector		
	Cheetah		
	CMUr		
Documents as provided by the applicant.....:	Description	File name	Issue date
	Declaration Equipment Data	FDT30_18 Declaration Equipment Data_BRFM_July 12, 2022.pdf	06/12/2022
Copy of marking plate:			
No Marking plate found.			

Voltage fluctuation test was performed at the test points shown in the following diagrams and photo, and the deviations of the input voltages to the RF module were within + or – 1% as shown in the table below.

External Power Supply (V)	IC Power Supply (V)	Deviation from Nominal voltage (mV)	Deviation (%)
5.40	3.3	---	---
4.86	3.3	33	1%
5.94	3.3	33	1%



Identification of the client

VISTEON CORPORATION
One Village Center Drive. Van Buren Township
MI 48111

Testing period and place

Test Location	DEKRA Certification Inc.
Date (start)	03-29-2023
Date (finish)	03-30-2023

Document history

Report number	Date	Description
4041ERM.001	04-18-2023	First release

Environmental conditions

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

Temperature	Min. = 15 °C
	Max. = 35 °C
Relative humidity	Min. = 45 %
	Max. = 75 %
Air pressure	Min. = 860 mbar
	Max. = 1060 mbar

Remarks and comments

The tests have been performed by the technical personnel: Juliana Cherry.

List of equipment used during the test

Conducted Measurements

Manufacture	Device	Type	Serial No.	Calibration Authority	Date of last calibration	Date of next calibration	Calibration method
Rohde & Schwarz	Spectrum analyzer	FSV40	101627	Rohde & Schwarz	2022-11-01	2023-11-01	c)
Rohde & Schwarz	NRP6AN Average power sensor	NRP6AN	101029	HCT	2022-06-09	2023-06-09	c)

Note: Calibration Method

- a) Calibration conducted by the National Institute of Information and Communications Technology (NICT) or a designated calibration agency under Article 102-18 paragraph (1) 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 listed above from a) to c).

Testing verdicts

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

Summary

1. Bluetooth

Requirement – Test case	Verdict	Remark
Antenna power and tolerances for antenna power	P	N/A
Frequency tolerance	P	N/A
Spurious emission intensity	P	N/A
Permissible value for occupied bandwidth	P	N/A
Receiving equipment. Limit on secondary radiated emissions	P	N/A
Interference prevention function	P	N/A
Antenna gain	P	N/A

Appendix A: Test results. Proprietary Protocol

PRODUCT INFORMATION

Modulation:	GFSK
Spread spectrum system:	No (Other digital modulation methods).
Nominal necessary Bandwidth:	2 MHz
Maximum declared antenna gain:	+2.6 dBi.
Declared Antenna Power:	10.0 mW
Type of antenna:	Integrated chip antenna
Operating nominal frequency range:	2405 – 2480 MHz
Type of power supply:	DC voltage

DESCRIPTION OF TEST CONDITIONS

TEST CONDITIONS	DESCRIPTION
TC#01 (Port 1)	Power supply (V): Vnominal = 5.4 Vdc GFSK Bandwidth: 2 MHz <u>Test Frequencies for Conducted tests:</u> Lowest channel: 2405 MHz Middle channel: 2445 MHz Highest channel: 2480 MHz
TC#02 (Port 2)	Power supply (V): Vnominal = 5.4 Vdc GFSK Bandwidth: 2 MHz <u>Test Frequencies for Conducted tests:</u> Lowest channel: 2405 MHz Middle channel: 2445 MHz Highest channel: 2480 MHz

CONDUCTED MEASUREMENTS

The equipment under test (EUT) was set up in a shielded room and its antenna port (SMA type) is directly connected to the spectrum analyzer.

The EUT is set in continuous transmission with and without modulation using an implemented test mode

Test Results

TC#1

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（5.4V） Nominal Voltage			
				2405 MHz	2445 MHz	2480 MHz	
常温 Nominal Temperature （16℃） （47％）	空中線電力 Antenna power and tolerances for antenna power		dBm	---	7.34	8.34	8.30
		Duty Cycle Correction	dB	---	0.00	0.00	0.00
		Corrected power	dBm	---	7.34	8.34	8.30
		Corrected power	mW	10	5.42	6.82	6.76
			%	-80% to +20%	-45.84	-31.84	-32.41
	周波数の偏差 Frequency Tolerance		ppm	50	11.14	12.11	8.87
			MHz	---	2404.973	2444.970	2479.978
	スプリアス発射の不要発射 Spurious Emissions	30 to 2387 MHz	dBm/MHz	-26	-46.51	-46.53	-46.77
			MHz	---	890.19	1103.50	1113.87
		2387 to 2400 MHz	dBm/MHz	-16	-45.67	-46.21	-46.70
			MHz	---	2396.03	2395.07	2391.79
		2483.5 to 2496.5 MHz	dBm/MHz	-16	-45.77	-45.79	-41.91
			MHz	---	2486.32	2484.99	2483.51
		2496.5 to 12500 MHz	dBm/MHz	-26	-40.97	-41.27	-41.35
			MHz	---	7544.80	6820.50	7550.80
	占有周波数帯幅 Permissible value for occupied bandwidth		MHz	26	2.05	2.04	2.04
	副次的に発する電波等の強度 Collateral Emissions	30 MHz to 1 GHz	dBm/100kHz	-54	-78.21	-79.12	-79.23
			MHz	---	944.37	843.20	891.41
		1 to 12.5 GHz	dBm/MHz	-47	-64.10	-64.08	-63.74
			MHz	---	6985.17	6974.83	6997.82
	混信防止機能 Interference prevention function		良・否 Pass/Fail	---	Pass	Pass	Pass
空中線利得 Antenna gain (A = EIRP (mW/MHz) /16.37, A < 1)		--	A < 1	A < 1	A < 1	A < 1	

TC#2

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（5.4V） Nominal Voltage			
				2405 MHz	2445 MHz	2480 MHz	
常温 Nominal Temperature (16°C) (47%)	空中線電力 Antenna power and tolerances for antenna power		dBm	---	7.35	7.74	8.76
		Duty Cycle Correction	dB	---	0.00	0.00	0.00
		Corrected power	dBm	---	7.35	7.74	8.76
		Corrected power	mW	10	5.44	5.95	7.51
			%	-80% to +20%	-45.62	-40.54	-24.86
	周波数の偏差 Frequency Tolerance		ppm	50	10.81	13.91	11.29
			MHz	---	2404.974	2444.966	2479.972
	スプリアス発射の不要発射 Spurious Emissions	30 to 2387 MHz	dBm/MHz	-26	-46.67	-46.58	-46.37
			MHz	---	1016.29	2138.69	1802.11
		2387 to 2400 MHz	dBm/MHz	-16	-46.11	-46.66	-46.62
			MHz	---	2394.90	2395.63	2388.43
		2483.5 to 2496.5 MHz	dBm/MHz	-16	-46.72	-46.56	-41.85
			MHz	---	2488.20	2493.37	2483.51
		2496.5 to 12500 MHz	dBm/MHz	-26	-40.30	-41.00	-41.14
			MHz	---	6975.60	9161.30	6879.50
		占有周波数帯幅 Permissible value for occupied bandwidth	MHz	26	2.04	2.04	2.03
	副次的に発する電波等の強度 Collateral Emissions	30 MHz to 1 GHz	dBm/100kHz	-54	-78.96	-79.33	-78.73
			MHz	---	984.14	859.20	855.03
		1 to 12.5 GHz	dBm/MHz	-47	-63.95	-64.18	-63.83
			MHz	---	6995.53	6980.57	6989.78
	混信防止機能 Interference prevention function		良・否 Pass/Fail	---	Pass	Pass	Pass
空中線利得 Antenna gain (A = EIRP (mW/MHz) /16.37, A < 1)		--	A < 1	A < 1	A < 1	A < 1	

Appendix B: Photographs

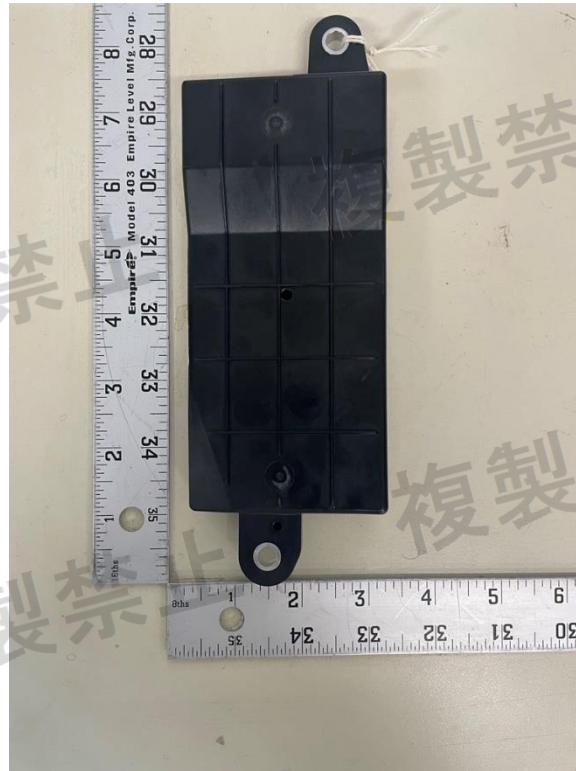


Figure B1: DUT Front View



Figure B2: DUT Rear View

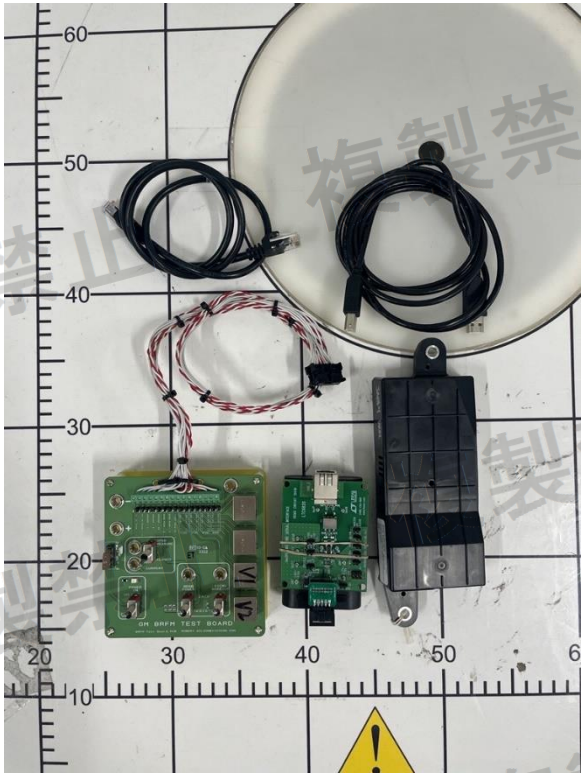


Figure B3. Front View of DUT with Accessories

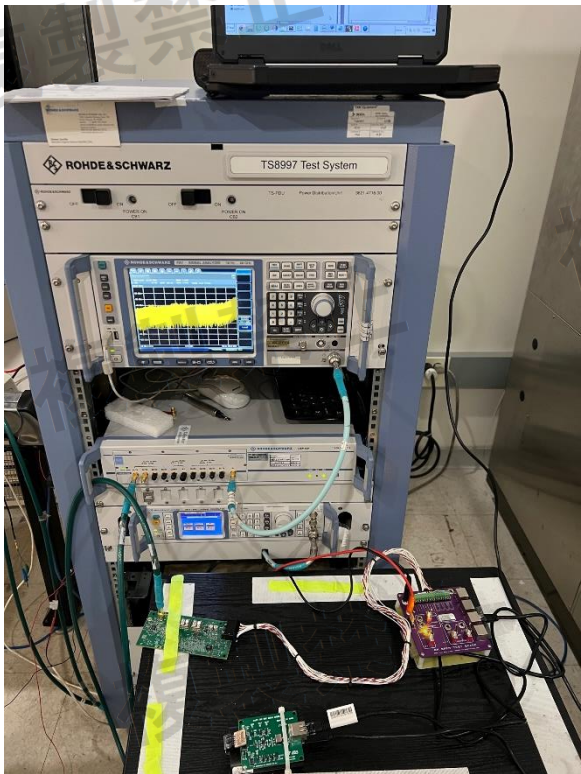
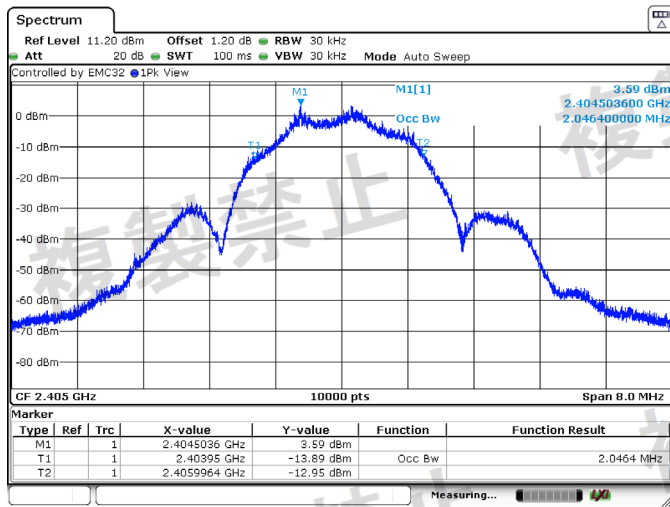
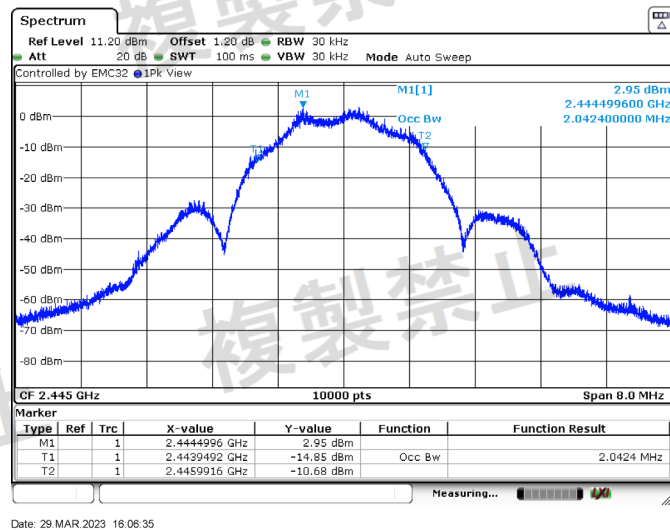


Figure B4. Conducted Test Setup

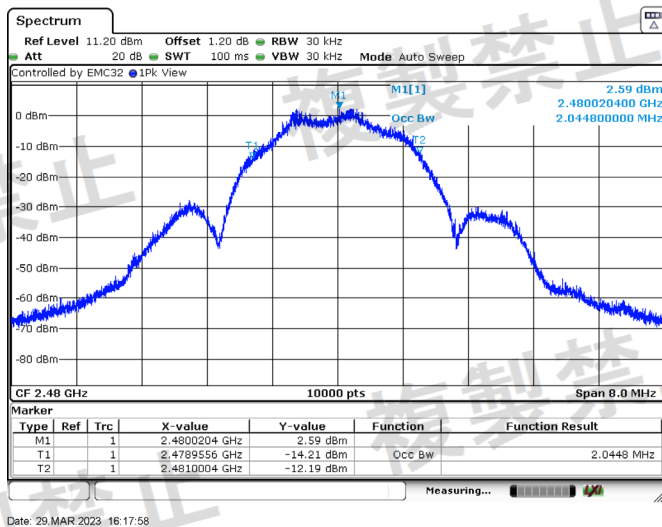
Permissible value for occupied bandwidth (BRFM TC#1)



2405MHz

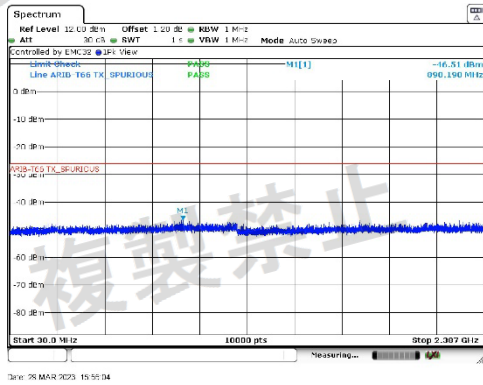


2445MHz

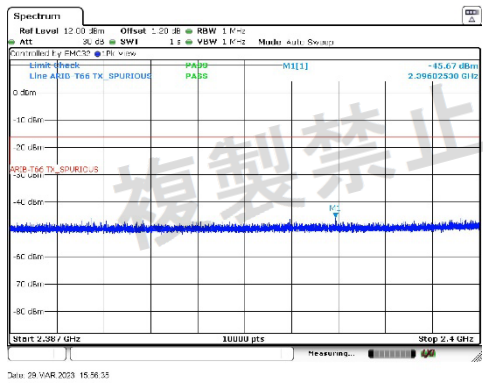


2480MHz

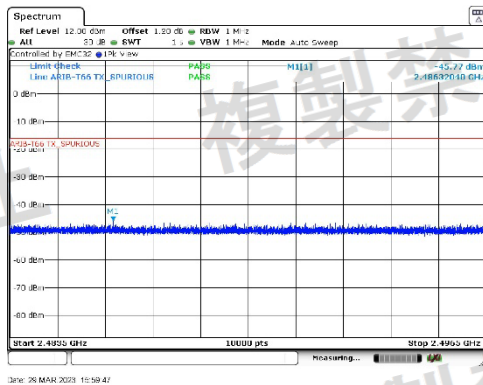
Spurious emission intensity (2405MHz)



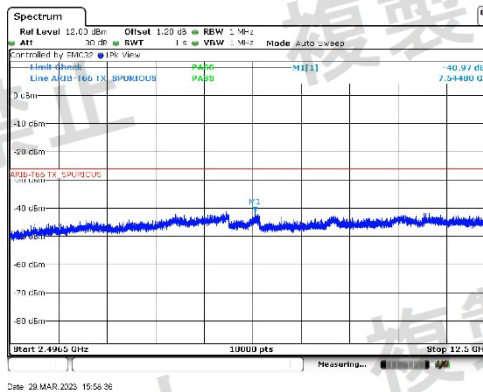
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$2387\text{MHz} \leq f < 2400\text{MHz}$

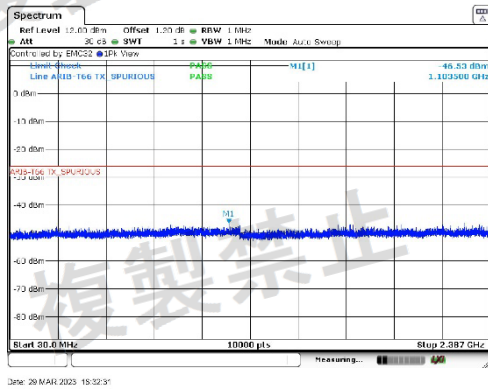


$2483.5\text{MHz} < f \leq 2496.5\text{MHz}$

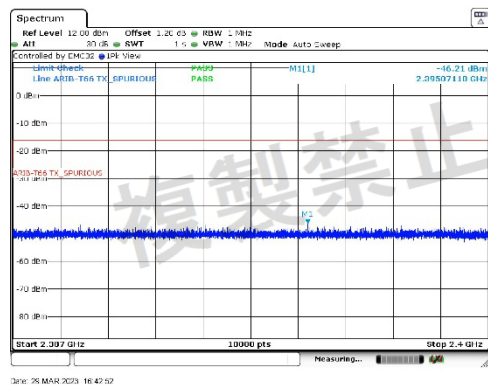


$2496.5\text{MHz} < f$

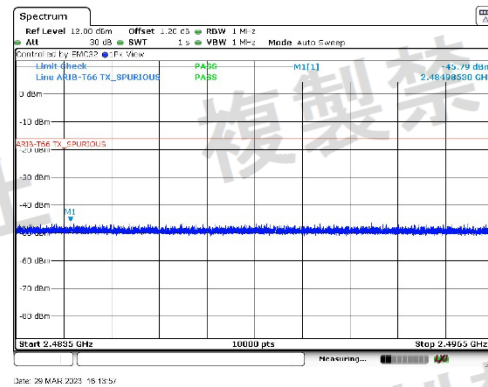
Spurious emission intensity (2445MHz)



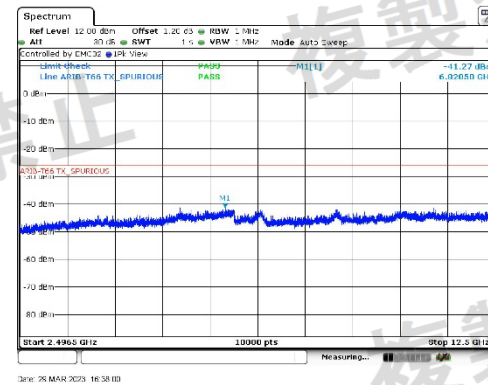
$f < 2387\text{MHz}$



$2387\text{MHz} \leq f < 2400\text{MHz}$

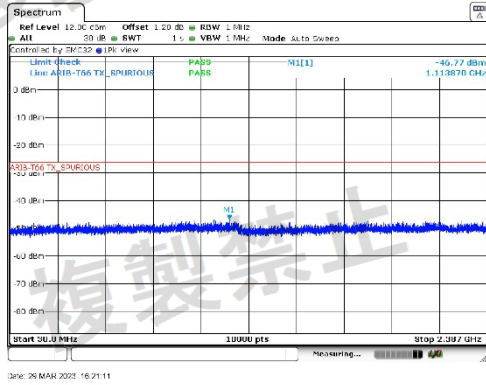


$2483.5\text{MHz} < f \leq 2496.5\text{MHz}$

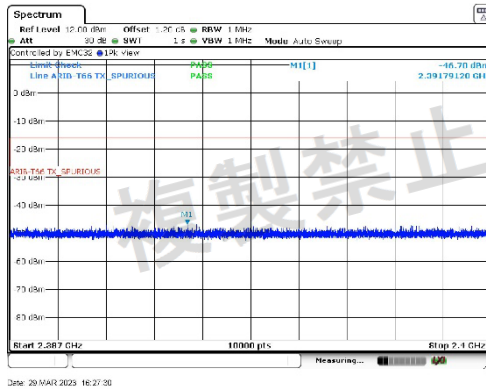


$2496.5\text{MHz} < f$

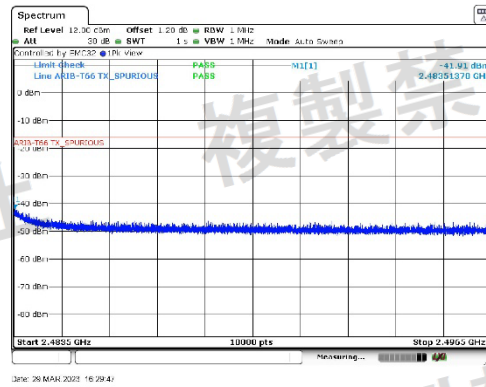
Spurious emission intensity (2480MHz)



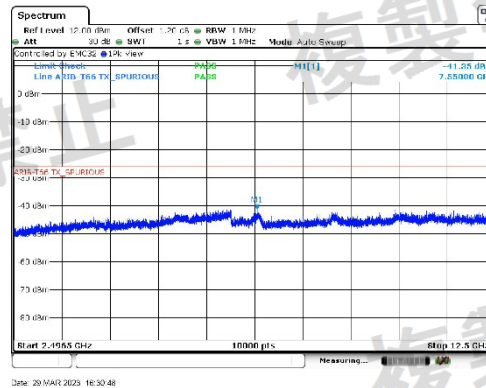
$f < 2387\text{MHz}$



$2387\text{MHz} \leq f < 2400\text{MHz}$

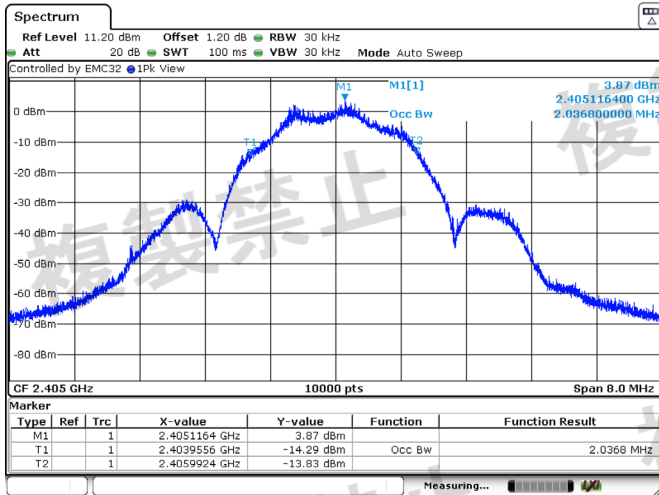


$2483.5\text{MHz} < f \leq 2496.5\text{MHz}$

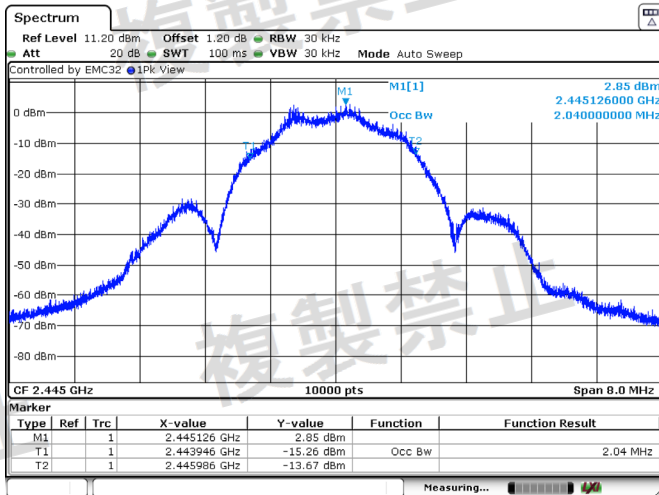


$2496.5\text{MHz} < f$

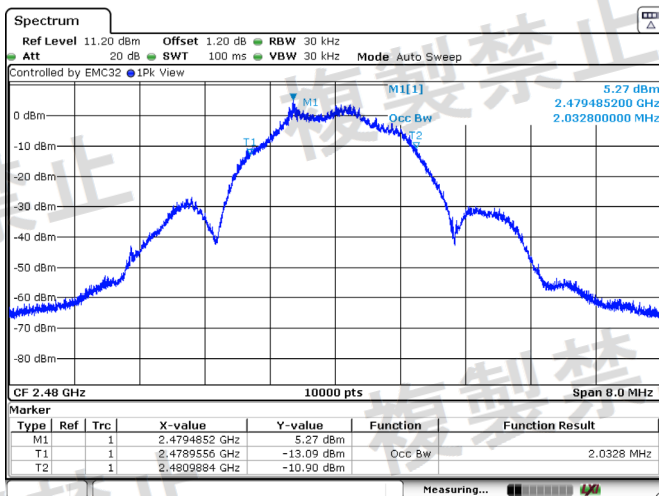
Permissible value for occupied bandwidth (BRFM TC#2)



2405MHz

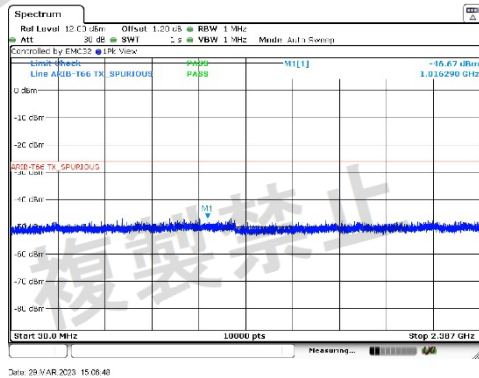


2445MHz

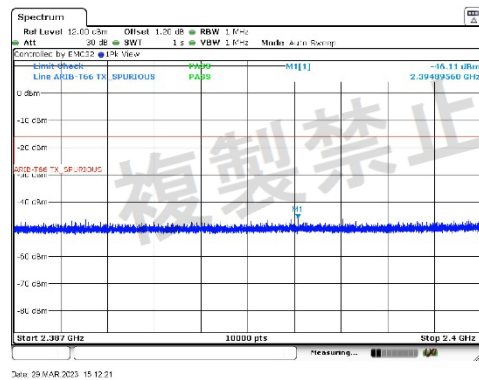


2480MHz

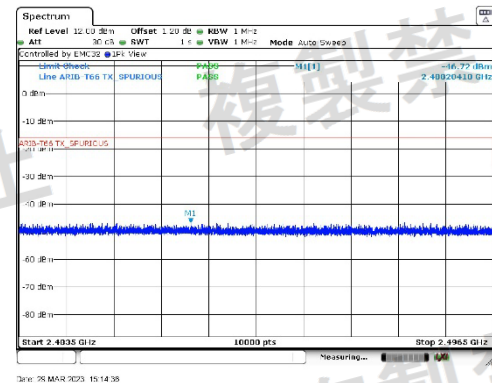
Spurious emission intensity (2405MHz)



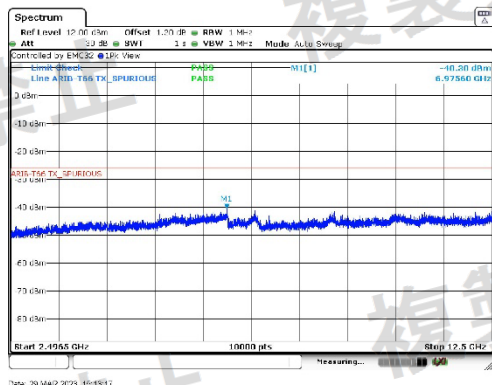
$f < 2387\text{MHz}$



$2387\text{MHz} \leq f < 2400\text{MHz}$

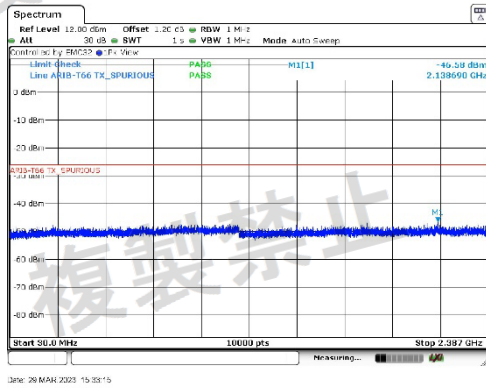


$2483.5\text{MHz} < f \leq 2496.5\text{MHz}$

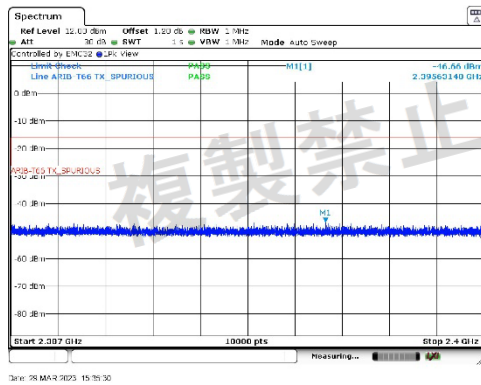


$2496.5\text{MHz} < f$

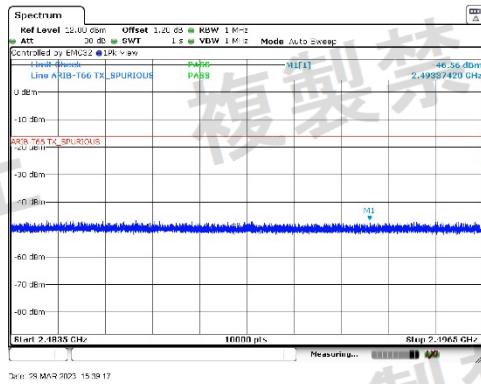
Spurious emission intensity (2445MHz)



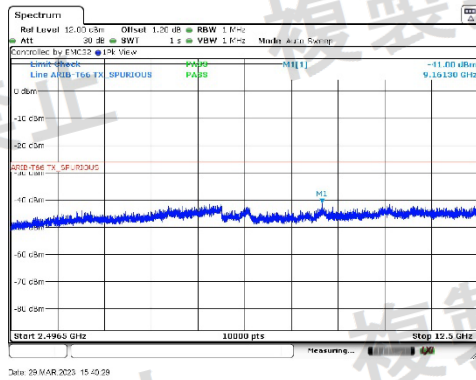
$f < 2387\text{MHz}$



$2387\text{MHz} \leq f < 2400\text{MHz}$

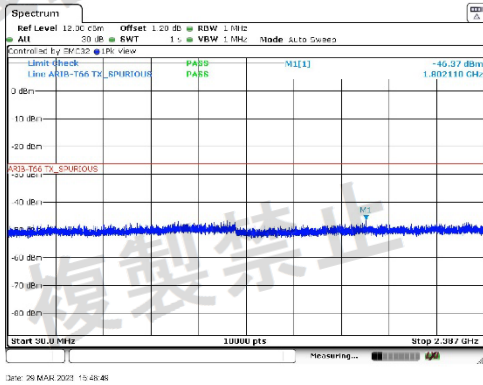


$2483.5\text{MHz} < f \leq 2496.5\text{MHz}$

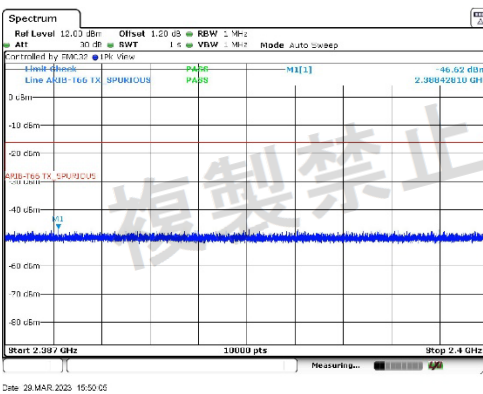


$2496.5\text{MHz} < f$

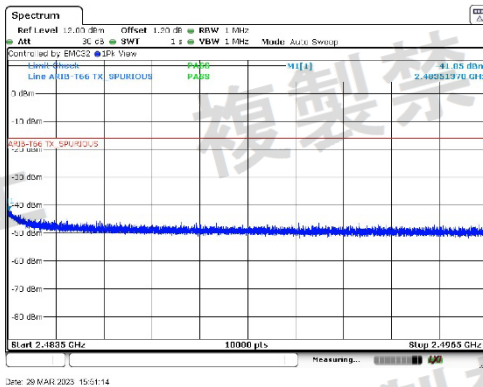
Spurious emission intensity (2480MHz)



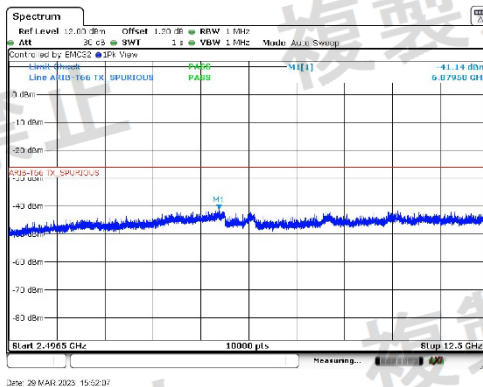
$f < 2387\text{MHz}$



$2387\text{MHz} \leq f < 2400\text{MHz}$



$2483.5\text{MHz} < f \leq 2496.5\text{MHz}$



$2496.5\text{MHz} < f$