

Certificate of Test

NCT CO., LTD.

211-71, Geumgok-ro, Hwaseong-si, Gyeonggi-do,
Korea 18511
(Tel: +82-31-323-6070 / Fax: +82-31-323-6071)

Report No.:
NW1910-J004

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1. Client

- Name : 株式会社インターソリューションマーケティング
- Address : 150-0013 東京都渋谷区恵比寿1-24-14 EXOS 恵比寿ビル5F
- Date of Receipt : 2019-09-25

2. Use of Report : For quality control

3. Test sample

- Description / Model : 50R / SP76

4. Date of Test : 2019-10-01 ~ 2019-10-18

5. Test method used : Appendix No. 43JN

6. Testing Environment :

- Temperature: (25 ± 5) °C, Humidity: More than 45 % R.H. and less than 75 % R.H.
- * Unless specified otherwise in the individual methods, the tests were conducted on ambient conditions.

7. Test Results : Refer to the test results

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
This Test Report cannot be reproduced, except in full
This test report is prepared according to the requirements of ISO / IEC 17025

Affirmation	Tested by Jong-Myoung, Shin (signature)	Technical Manager Kyung-Taek, Lee (signature)
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October 23, 2019

NCT CO., LTD.



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1. General information's

1-1 Test Performed

Laboratory : NCT CO., LTD.
Address : 211-71, Geumgok-ro, Hwaseong-si, Gyeonggi-do, Korea 18511
Telephone : +82-31-323-6070
Facsimile : +82-31-323-6071

2. Information's about test item

2-1 Applicant information

Company name : 株式会社インターソリューションマーケティング
Address : 150-0013 東京都渋谷区恵比寿1-24-14 EXOS 恵比寿ビル5F
Telephone / Facsimile : -/-

2-2 Equipment Under Test (EUT) description

Test item particulars : 50R
Model and/or type reference : SP76
Additional model name : -
Serial number : Identification
Antenna gain : Chip Antenna with Max gain : 0.93 dBi (M/N:SENA_009)
Date (s) of performance of tests: : 2019-10-01 ~ 2019-10-18
Date of receipt of test item : 2019-09-25
EUT condition : Pre-production, not damaged
Number of channel : 79
EUT Power Source : DC 3.7 V by Battery
Type of Modulation : Basic Mode(GFSK), EDR Mode(Pi/4 DQPSK, 8DPSK)
Firmware version : 1.0
Note : -

2-3 Tested Frequency

	Low frequency	Middle frequency	High frequency
Frequency (MHz) (BDR)	2 402	2 442	2 480
Frequency (MHz) (EDR)	2 402	2 442	2 480

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3. Test Report

3.1 Test Summary

Applied	Test items	Result
<input checked="" type="checkbox"/>	Frequency Tolerance	C
<input checked="" type="checkbox"/>	Occupied Bandwidth (99%) & Spread Bandwidth(90%)	C
<input checked="" type="checkbox"/>	Antenna power	C
<input checked="" type="checkbox"/>	Unwanted emission strength	C
<input checked="" type="checkbox"/>	Dwell time	C
<input checked="" type="checkbox"/>	RX spurious emission	C
<input checked="" type="checkbox"/>	Interference prevention function	C

Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable

TEST STANDARD: The measurement procedure of Certification of Conformity with Technical Regulations for Specified Radio Equipment, Item 19 of Article 2 Paragraph 1

TEST MEASUREMENT METHOD: Appendix No. 43.

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3.2 Test Result

3.2.1 Frequency tolerance

Test procedure

1. The transmitter output is connected to the Spectrum analyzer(or Frequency counter)
2. Setting the spectrum analyzer is as follows.

Center frequency	Operating frequency
Resolution BW	1 kHz
Video BW	Auto
Span	150 kHz
Sweep time	Auto
Detector mode	Positive peak
Trace mode	Max. hold

Measurement data : BDR

Test voltage	Measured item	Frequency tolerance		
		Low frequency	Middle frequency	High frequency
3.70 (V)	Measured value (MHz)	2 401.986 479	2 441.985 278	2 479.986 278
	Tolerance (ppm)	- 5.63	- 6.03	- 5.53

Measurement data : EDR

Test voltage	Measured item	Frequency tolerance		
		Low frequency	Middle frequency	High frequency
3.70 (V)	Measured value (MHz)	2 401.989 664	2 441.988 512	2 479.989 556
	Tolerance (ppm)	- 4.30	- 4.70	- 4.21

Remark

FT (ppm) = [(Measured value(MHz)–Operating frequency(MHz))/Operating frequency(MHz)] × 10⁶

Limit:

±50×10⁻⁶(50 ppm or below)

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3.2.2 Occupied Bandwidth (99%) & Spread Bandwidth(90%)

Test procedure

1. The transmitter output is connected to the Spectrum analyzer
2. Setting the spectrum analyzer is as follows.

Center frequency	2 442 MHz
Resolution BW	300 kHz
Video BW	Auto
Span	100 MHz
Sweep time	Auto
Detector mode	Positive peak
Trace mode	Max. hold

Measurement data : BDR

Test voltage	Measured item	Occupied bandwidth & Spread bandwidth			
		Normal Hopping	AFH		
			Low frequency	Middle frequency	High frequency
3.70 (V)	Occupied bandwidth (MHz)	78.04	19.62	19.62	19.66
	Spread bandwidth (MHz)	70.03	17.79	18.22	18.03

Measurement data : EDR

Test voltage	Measured item	Occupied bandwidth & Spread bandwidth			
		Normal Hopping	AFH		
			Low frequency	Middle frequency	High frequency
3.70 (V)	Occupied bandwidth (MHz)	78.53	20.00	19.95	20.05
	Spread bandwidth (MHz)	70.51	17.98	18.32	18.37

Limit:

Occupied Bandwidth (99%): 83.5 MHz or less

Spread Bandwidth (90%): 500 kHz or more

Spreading Factor 5 or more

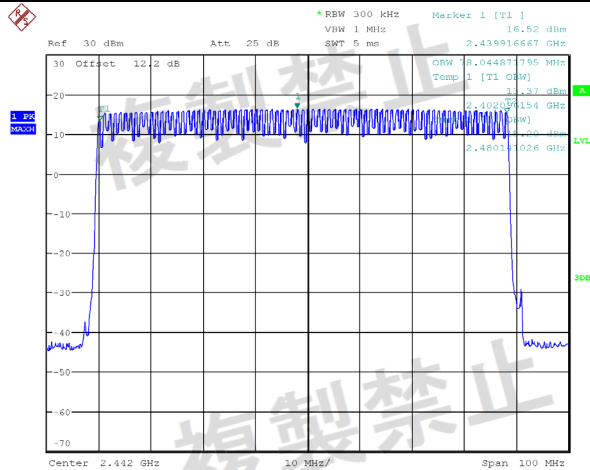
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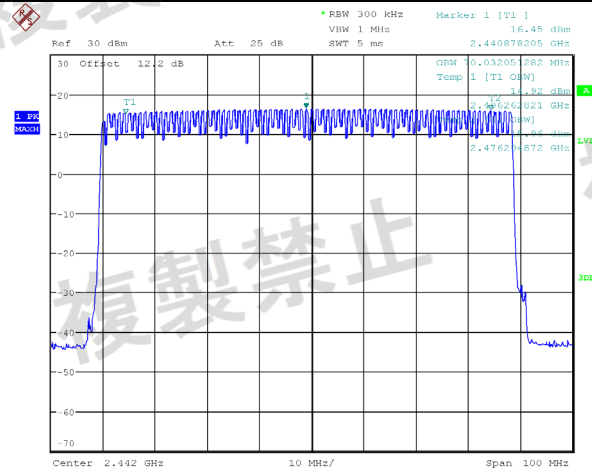
Test Plot : BDR

Normal hopping - 3.70 (V)

Occupied bandwidth (MHz)

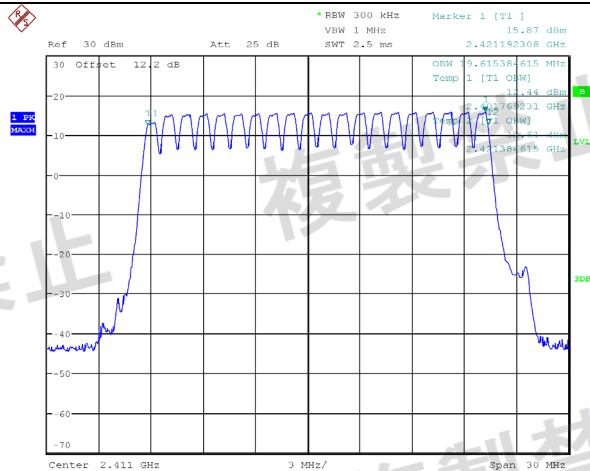


Spread bandwidth (MHz)

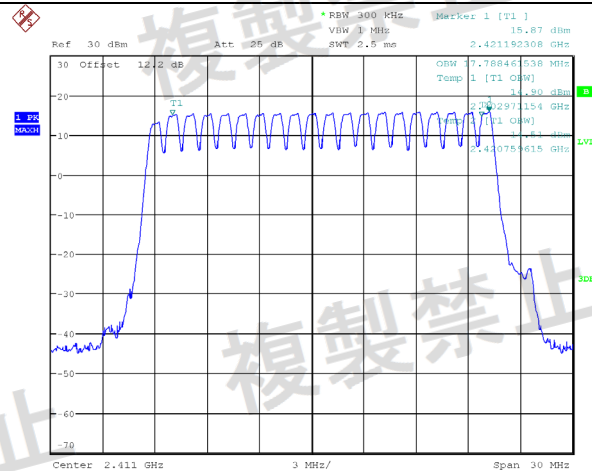


AFH - 3.70 (V)

Occupied bandwidth (MHz) - Low



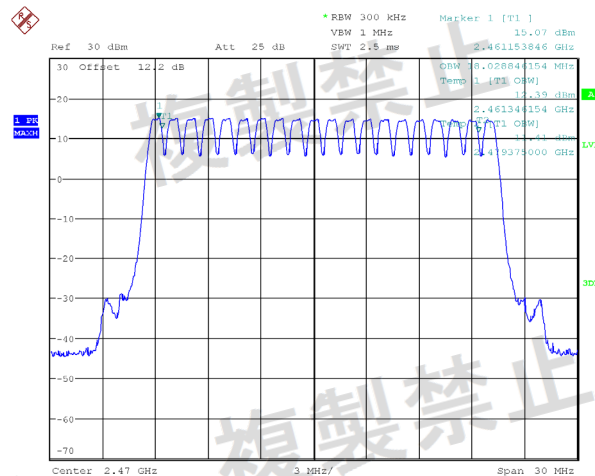
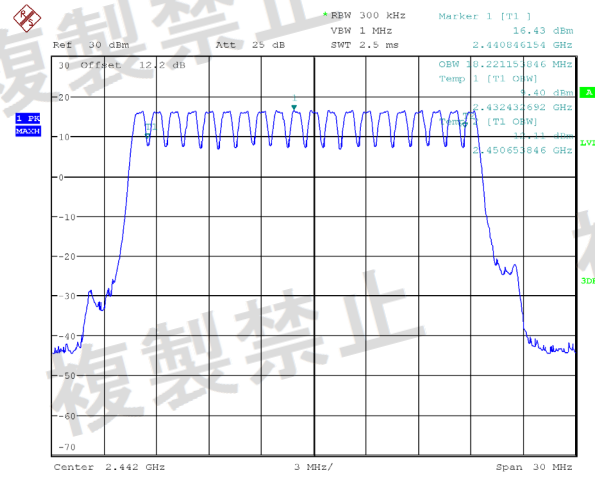
Spread bandwidth (MHz) - Low



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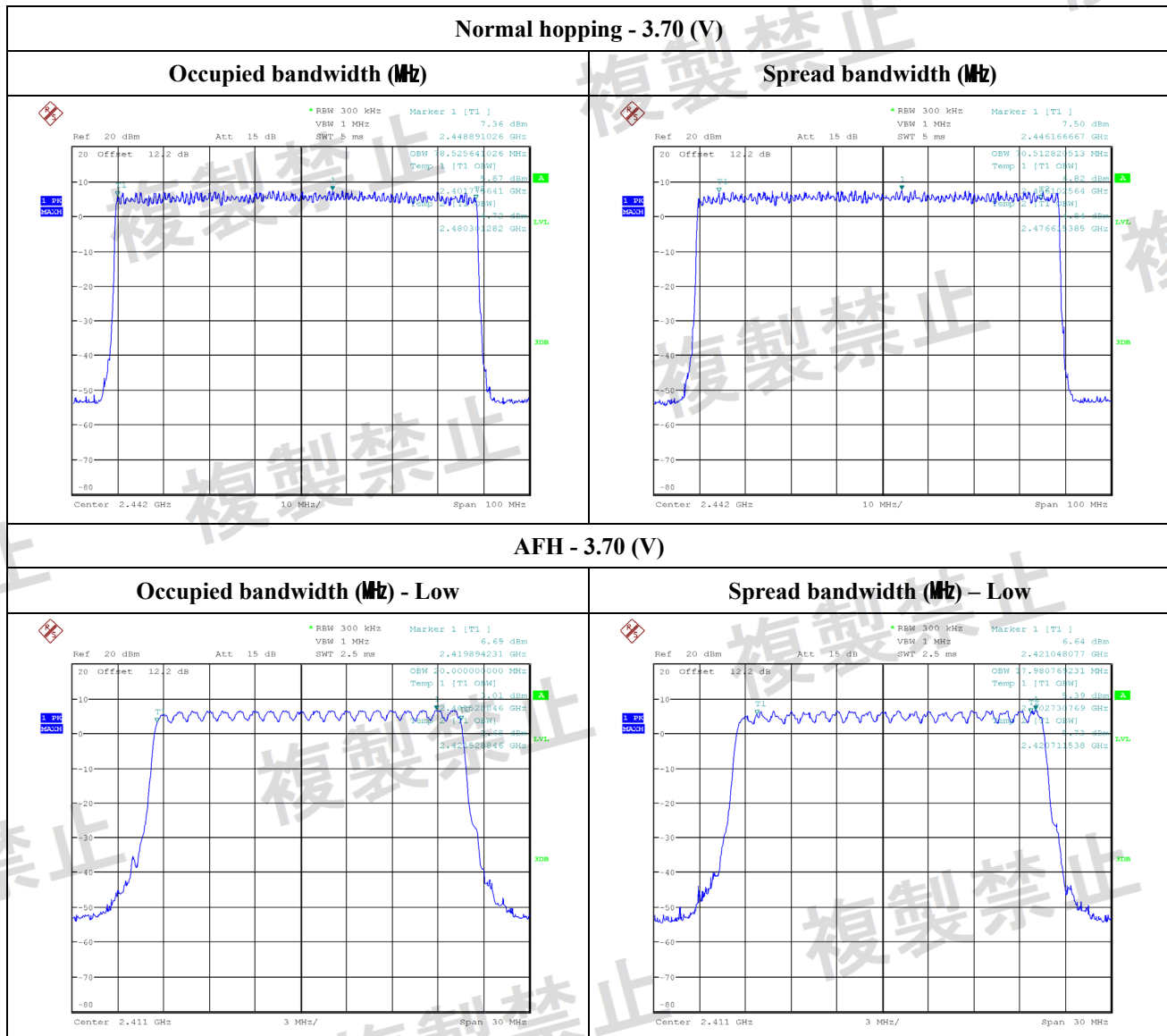
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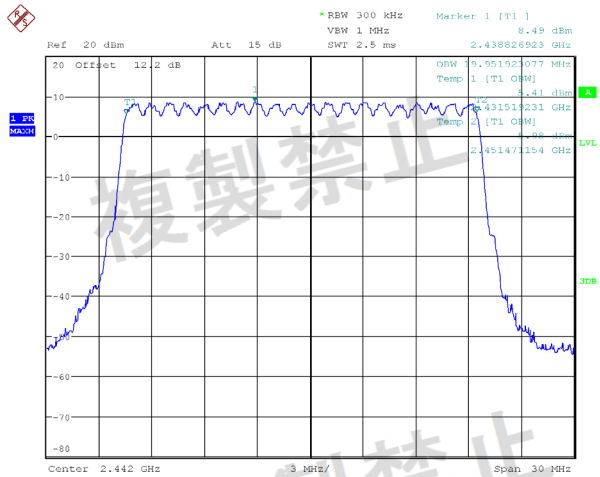
Test Plot : EDR



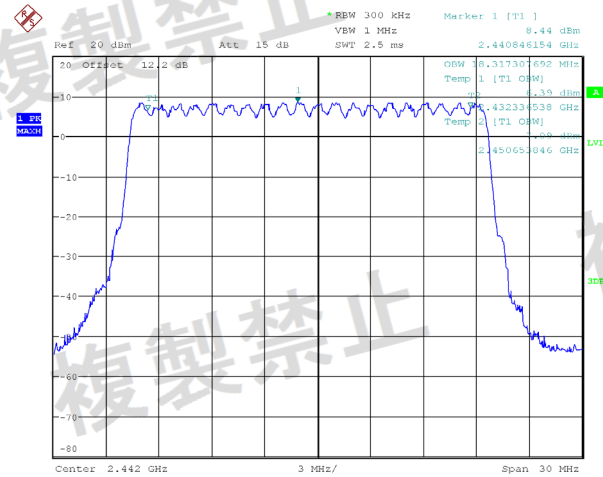
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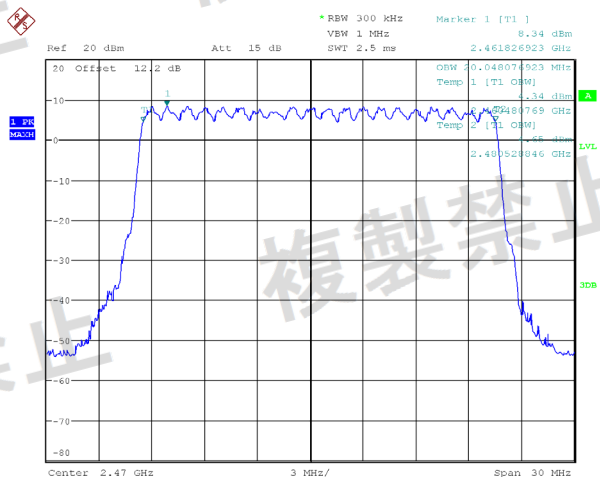
Occupied bandwidth (MHz) – Middle



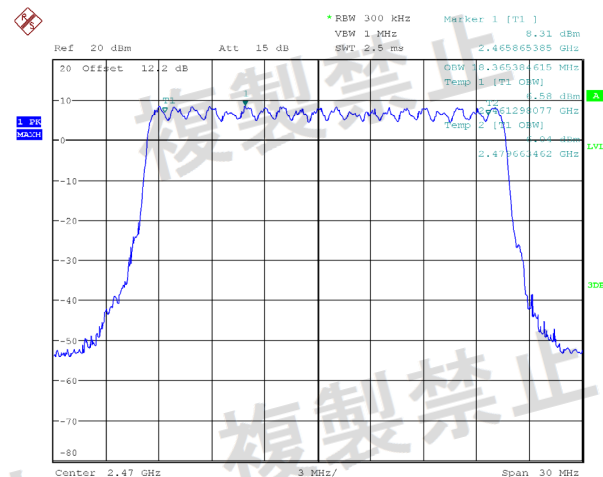
Spread bandwidth (MHz) – Middle



Occupied bandwidth (MHz) - High



Spread bandwidth (MHz) - High



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3.2.3 Antenna power

Test procedure

1. The transmitter output is connected to the Power meter
2. Setting the EUT is operating frequency(hopping mode).

Measurement data : BDR

Test mode	Test voltage	Measured item	Antenna power		
			Low frequency	Middle frequency	High frequency
Normal Hopping	3.70 (V)	Measure value (dBm)	12.19	15.12	14.39
		Antenna power (mW/MHz)	0.24	0.46	0.39
		Power tolerance (%)	-52.71	-7.16	-21.52
Declared power(mW/MHz)			0.50		
Antenna gain(dBi)			0.93		
AFH	3.70 (V)	Measure value (dBm)	13.35	13.60	12.63
		Antenna power (mW/MHz)	1.22	1.26	1.02
		Power tolerance (%)	-39.21	-37.14	-49.18
Declared power(mW/MHz)			2.00		
Antenna gain(dBi)			5.37		

Measurement data : EDR

Test mode	Test voltage	Measured item	Antenna power		
			Low frequency	Middle frequency	High frequency
Normal Hopping	3.70 (V)	Measure value (dBm)	3.90	5.19	4.72
		Antenna power (mW/MHz)	0.03	0.05	0.04
		Power tolerance (%)	-65.19	-53.15	-57.95
Declared power(mW/MHz)			0.10		
Antenna gain(dBi)			0.93		
AFH	3.70 (V)	Measure value (dBm)	4.23	4.67	4.39
		Antenna power (mW/MHz)	0.15	0.16	0.15
		Power tolerance (%)	-41.08	-36.00	-40.15
Declared power(mW/MHz)			0.25		
Antenna gain(dBi)			5.37		

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※ **Remark:**

BDR, EDR : Antenna power(mW/MHz) = Measured value(mW) ÷ Burst ratio ÷ Spread bandwidth(MHz)

Power tolerance (%) = {[Antenna power(mW/MHz) - Declared power(mW/MHz)] ÷ Declared power(mW/MHz)} × 100

Limit:

Output power: 3 mW/MHz or Below

Output power tolerance: Maximum +20 %, Minimum -80 %

3.2.4 Unwanted emission strength

Test procedure

1. Connect transmitter output to the spectrum analyzer input port.
2. The EUT should be transmitting at hopping mode
3. Unwanted emission strength is measured by following setting:
4. Set the spectrum analyzer RBW: 1 MHz, VBW: Auto, Sweep time: auto, Start: 30 MHz, Stop: 2 387 MHz.
5. Set the spectrum analyzer RBW: 1 MHz, VBW: Auto, Sweep time: auto, Start: 2 387 MHz, Stop: 2 400 MHz.
6. Set the spectrum analyzer RBW: 1 MHz, VBW: Auto, Sweep time: auto, Start: 2 483.5 MHz, Stop: 2 496.5 MHz.
7. Set the spectrum analyzer RBW: 1 MHz, VBW: Auto, Sweep time: auto, Start: 2 496.5 MHz, Stop: 12.5 GHz.
8. Detector mode: Peak mode.

Measurement data : BDR

	Test mode			Max. emission value		
				Low frequency	Middle frequency	High frequency
30 MHz ~ 2 387 MHz	Normal Hopping	3.70 (V)	Value(μW)	-	0.701	-
			Frequency(MHz)	-	147.095	-
2 387 MHz ~ 2 400 MHz			Value(μW)	-	3.214	-
RBW 30 kHz			Frequency(MHz)	-	2 399.979	-
2 483.5 MHz ~ 2 496.5 MHz			Value(μW)	-	2.399	-
			Frequency(MHz)	-	2 483.521	-
2 496.5 MHz ~ 12.5 GHz			Value(μW)	-	0.203	-
			Frequency(MHz)	-	2 560.625	-

Limit:

2 387 MHz \leq f \leq 2 400 MHz and 2 483.5 MHz < f \leq 2 496.5 MHz: 25 μ W or less

2 387 MHz > f and 2 496.5 MHz < f: 2.5 μ W or less

	Test mode		Max. emission value			
			Low frequency	Middle frequency	High frequency	
30 MHz ~ 2 387 MHz	AFH	3.70 (V)	Value(μW)	0.406	0.635	0.418
			Frequency(MHz)	105.545	131.986	150.872
2 387 MHz ~ 2 400 MHz			Value(μW)	3.673	0.027	0.031
RBW 30 kHz			Frequency(MHz)	2 399.979	2 398.083	2 399.021
2 483.5 MHz ~ 2 496.5 MHz			Value(μW)	0.039	0.023	2.009
			Frequency(MHz)	2 492.042	2 486.896	2 483.521
2 496.5 MHz ~ 12.5 GHz			Value(μW)	0.199	0.100	0.058
			Frequency(MHz)	2 544.594	2 578.659	2 611.523

Limit:

2 387 MHz \leq f \leq 2 400 MHz and 2 483.5 MHz < f \leq 2 496.5 MHz: 25 μ W or less

2 387 MHz > f and 2 496.5 MHz < f: 2.5 μ W or less

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Measurement data : EDR

	Test mode			Max. emission value		
				Low frequency	Middle frequency	High frequency
30 MHz ~ 2 387 MHz	Normal Hopping	3.70 (V)	Value(μW)	-	0.031	-
2 387 MHz ~ 2 400 MHz RBW 30 kHz			Frequency(MHz)	-	139.540	-
			Value(μW)	-	1.466	-
2 483.5 MHz ~ 2 496.5 MHz			Frequency(MHz)	-	2 399.979	-
			Value(μW)	-	0.332	-
2 496.5 MHz ~ 12.5 GHz			Frequency(MHz)	-	2 483.542	-
			Value(μW)	-	0.039	-
			Frequency(MHz)	-	2 560.625	-

Limit:

2 387 MHz \leq f \leq 2 400 MHz and 2 483.5 MHz < f \leq 2 496.5 MHz: 25 μ W or less

2 387 MHz > f and 2 496.5 MHz < f: 2.5 μ W or less

	Test mode			Max. emission value		
				Low frequency	Middle frequency	High frequency
30 MHz ~ 2 387 MHz	AFH	3.70 (V)	Value(μW)	0.015	0.036	0.033
			Frequency(MHz)	2 266.128	124.431	2 326.564
2 387 MHz ~ 2 400 MHz			Value(μW)	2.291	0.012	0.011
RBW 30 kHz			Frequency(MHz)	2 399.979	2 398.708	2 399.688
2 483.5 MHz ~ 2 496.5 MHz			Value(μW)	0.011	0.012	0.456
			Frequency(MHz)	2 485.958	2 488.313	2 483.521
2 496.5 MHz ~ 12.5 GHz			Value(μW)	0.037	0.021	0.019
			Frequency(MHz)	2 560.625	2 592.688	2 624.750

Limit:

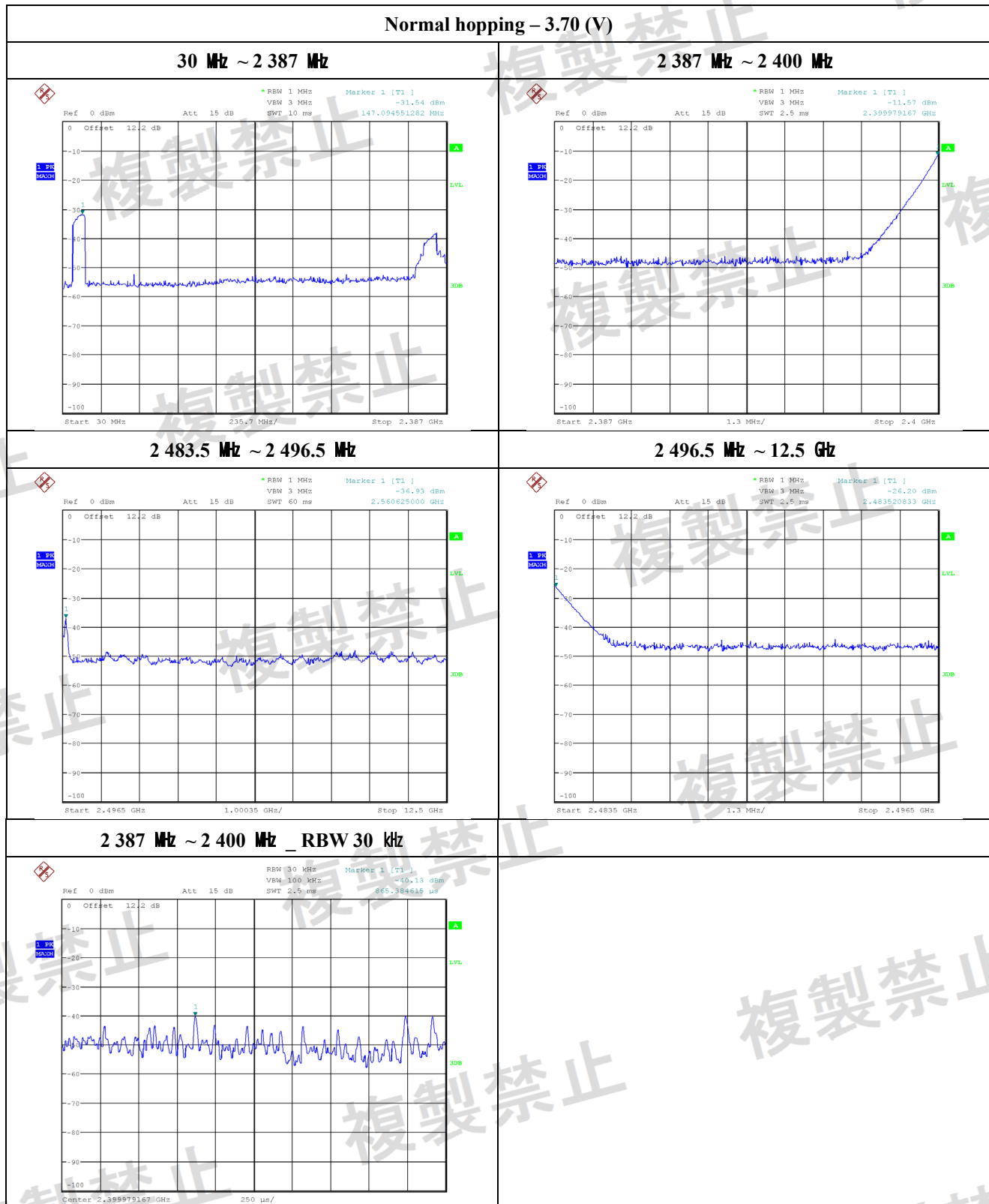
2 387 MHz \leq f \leq 2 400 MHz and 2 483.5 MHz < f \leq 2 496.5 MHz: 25 μ W or less

2 387 MHz > f and 2 496.5 MHz < f: 2.5 μ W or less

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Test Plot : BDR

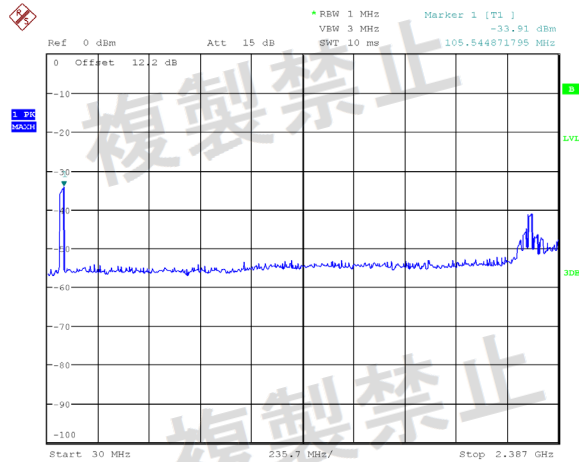


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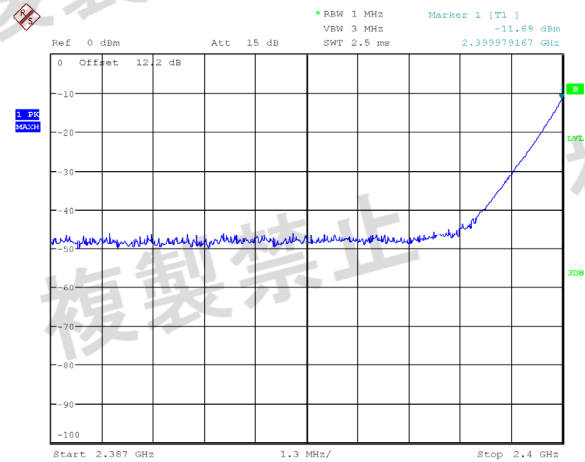
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AFH – Low frequency – 3.70 (V)

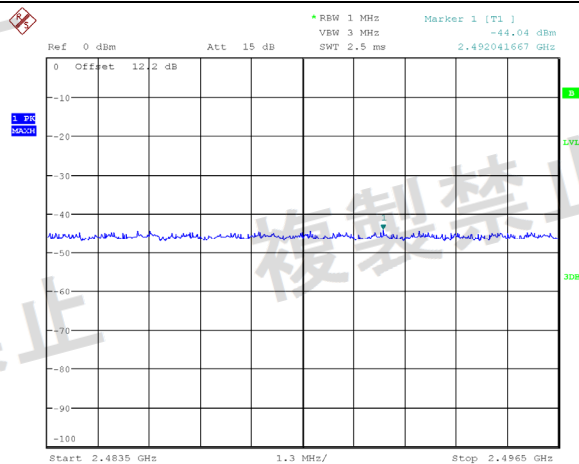
30 MHz ~ 2 387 MHz



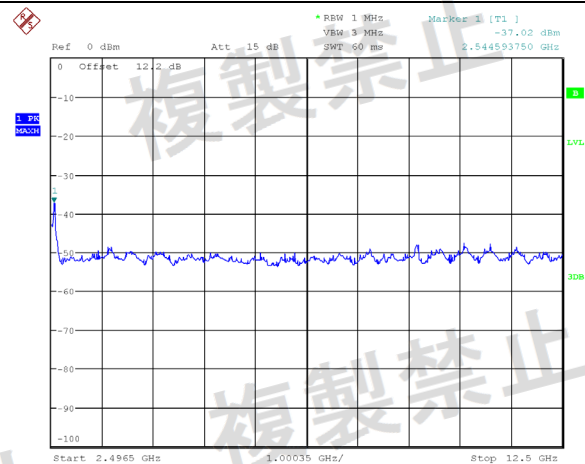
2 387 MHz ~ 2 400 MHz



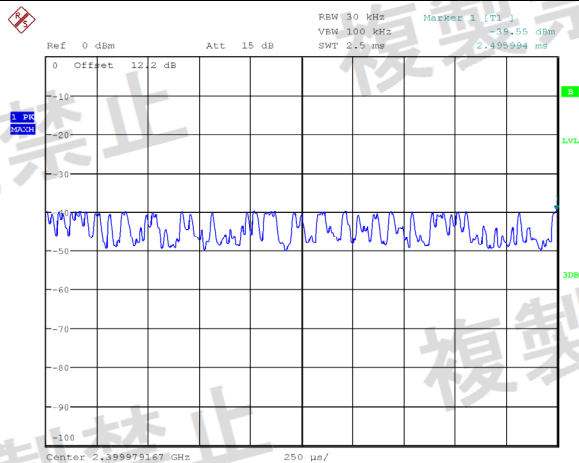
2 483.5 MHz ~ 2 496.5 MHz



2 496.5 MHz ~ 12.5 GHz



2 387 MHz ~ 2 400 MHz _ RBW 30 kHz



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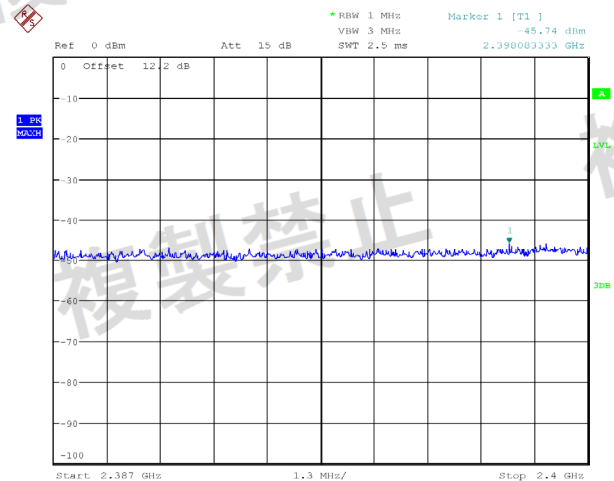
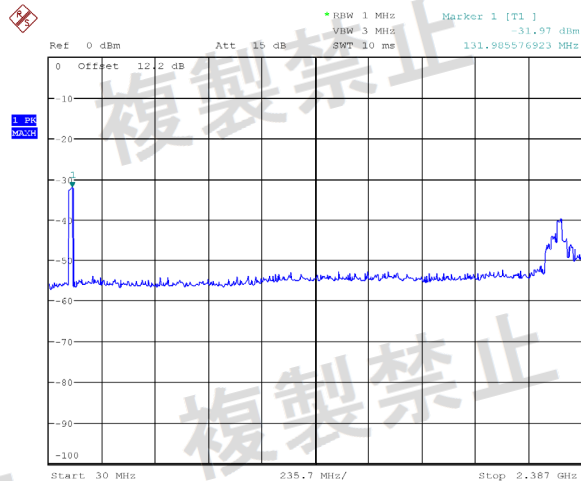
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AFH – Middle frequency – 3.70 (V)

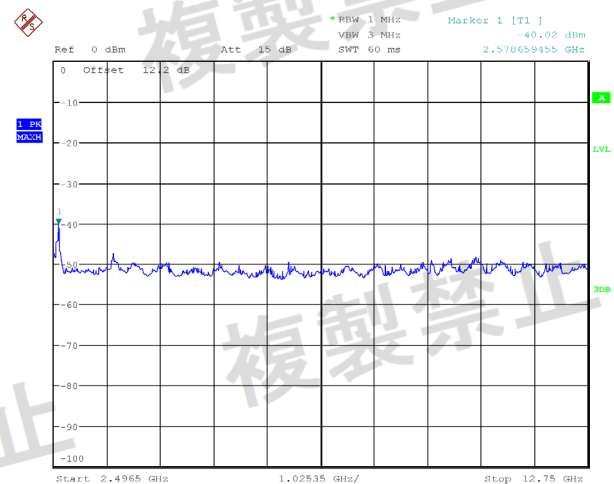
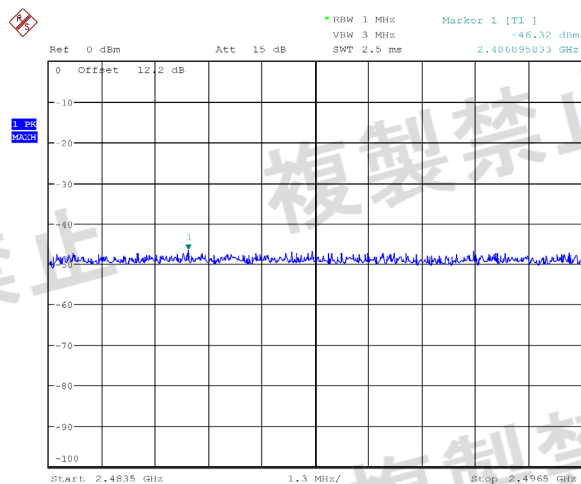
30 MHz ~ 2 387 MHz

2 387 MHz ~ 2 400 MHz



2 483.5 MHz ~ 2 496.5 MHz

2 496.5 MHz ~ 12.5 GHz



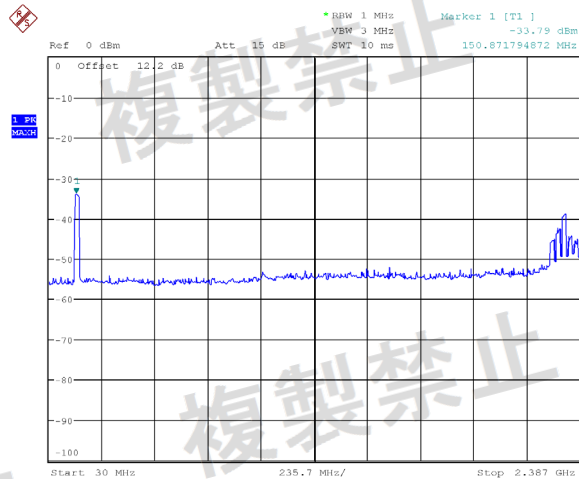
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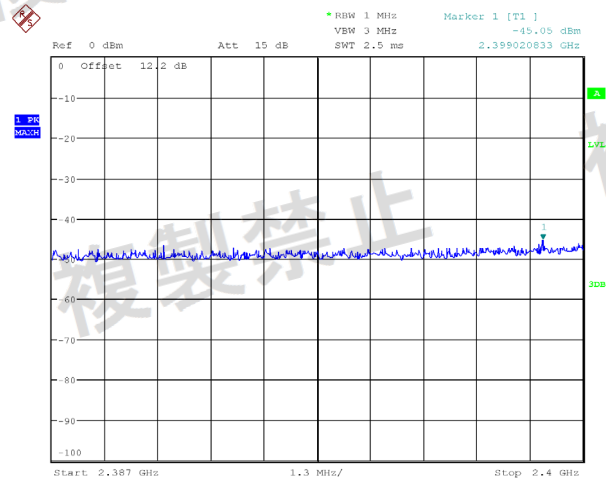
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AFH – High frequency – 3.70 (V)

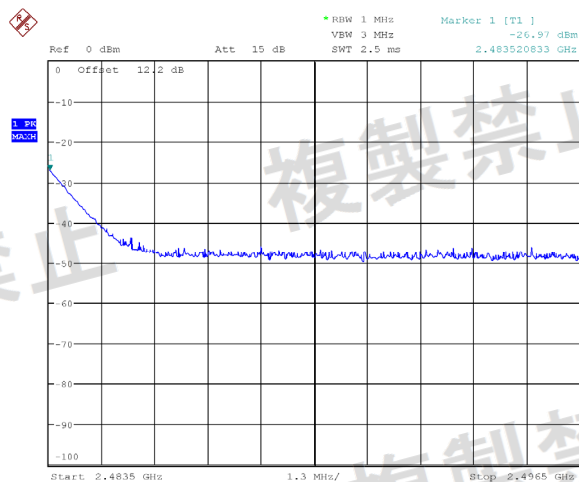
30 MHz ~ 2 387 MHz



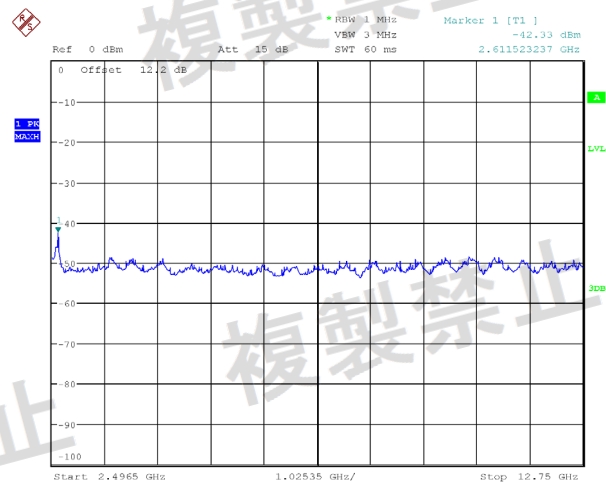
2 387 MHz ~ 2 400 MHz



2 483.5 MHz ~ 2 496.5 MHz



2 496.5 MHz ~ 12.5 GHz

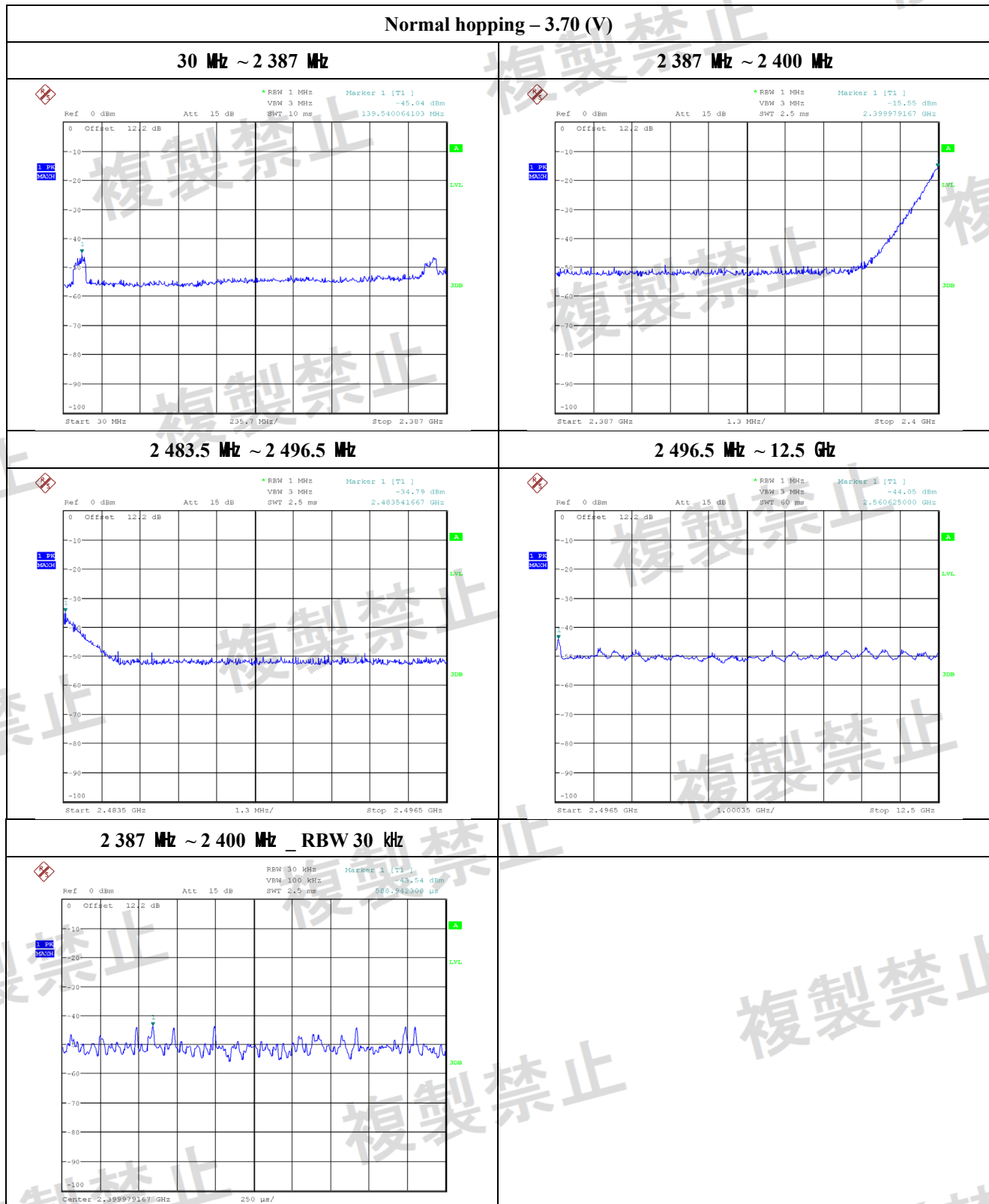


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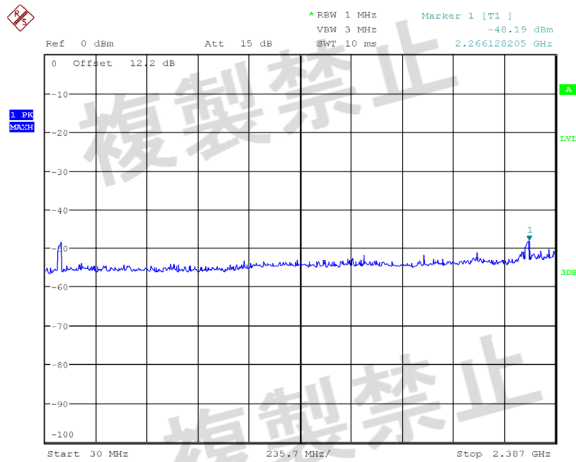
Test Plot : EDR



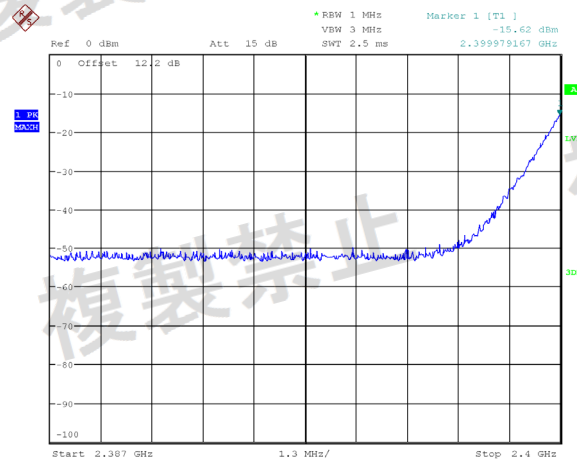
Test Report No.: NW1910-J004

AFH Low frequency – 3.70 (V)

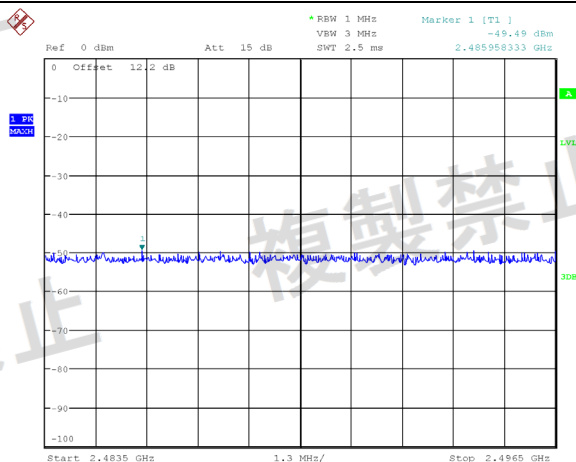
30 MHz ~ 2 387 MHz



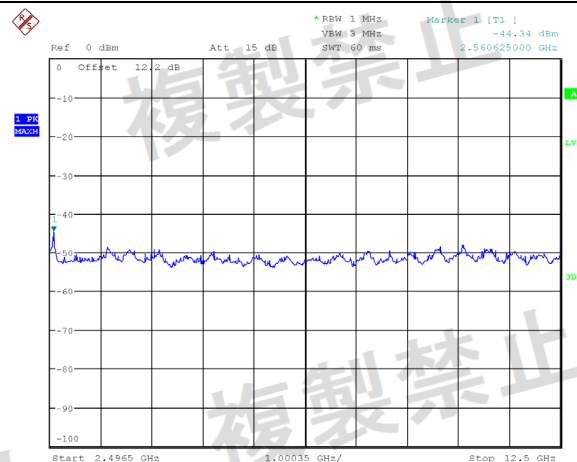
2 387 MHz ~ 2 400 MHz



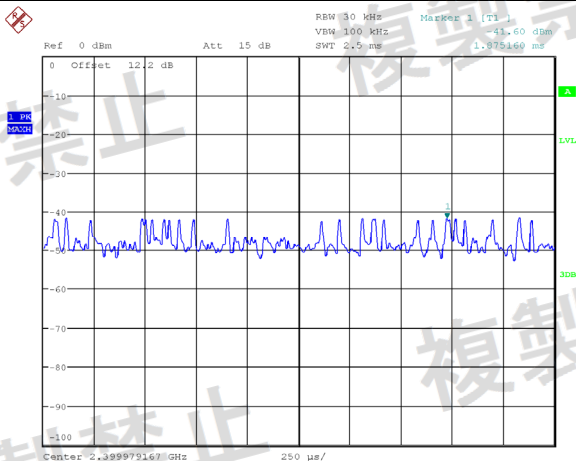
2 483.5 MHz ~ 2 496.5 MHz



2 496.5 MHz ~ 12.5 GHz



2 387 MHz ~ 2 400 MHz _ RBW 30 kHz



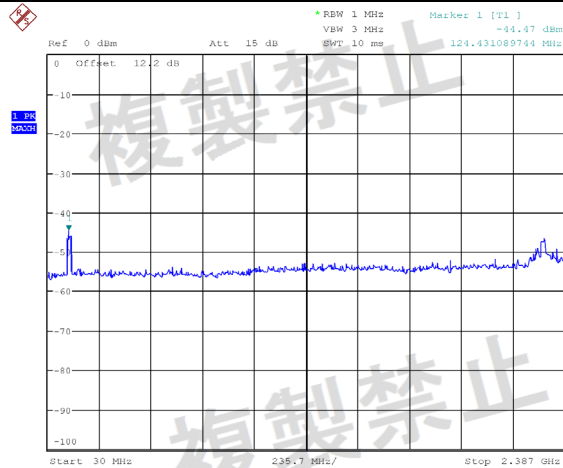
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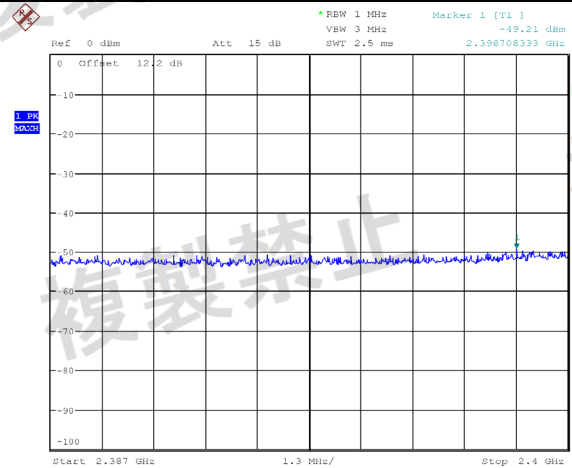
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AFH – Middle frequency – 3.70 (V)

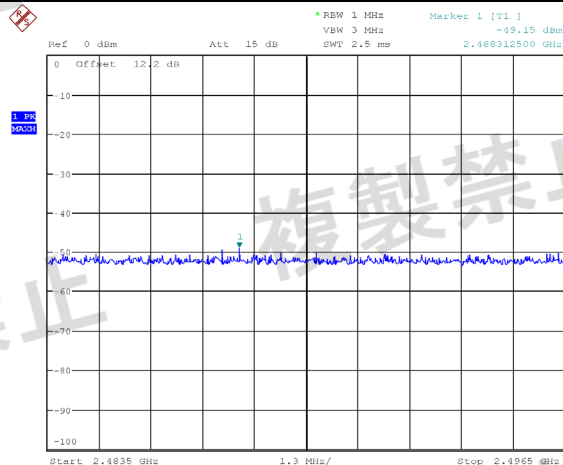
30 MHz ~ 2 387 MHz



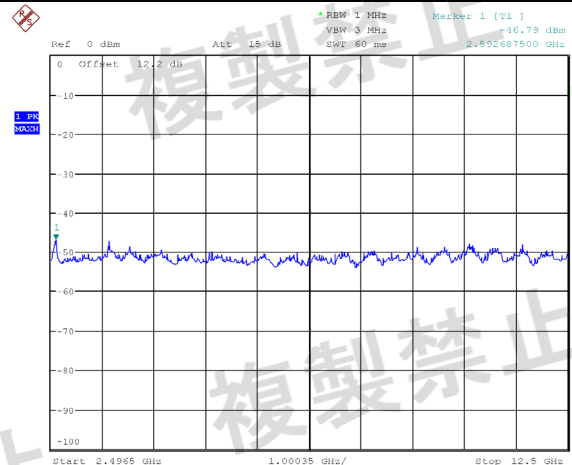
2 387 MHz ~ 2 400 MHz



2 483.5 MHz ~ 2 496.5 MHz



2 496.5 MHz ~ 12.5 GHz



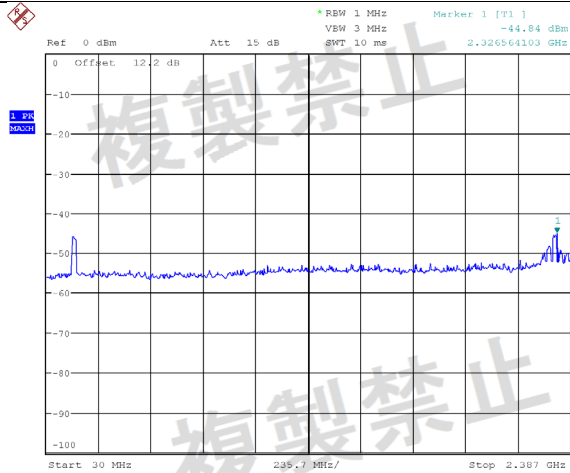
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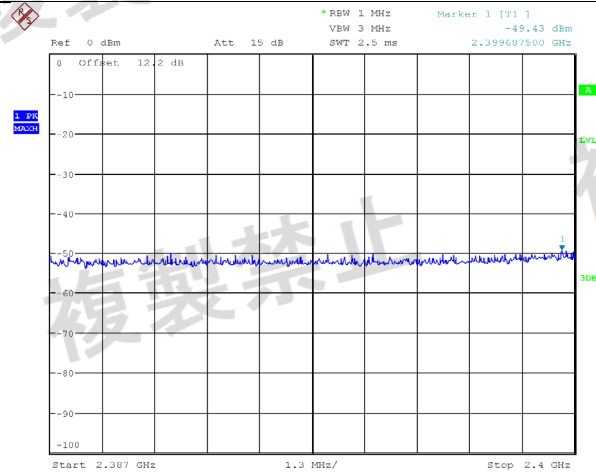
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AFH – High frequency – 3.70 (V)

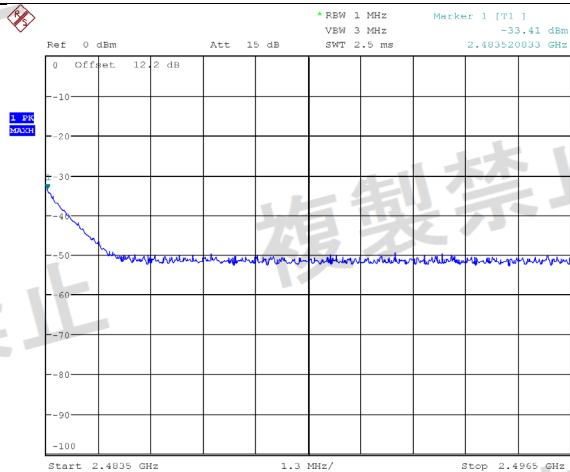
30 MHz ~ 2 387 MHz



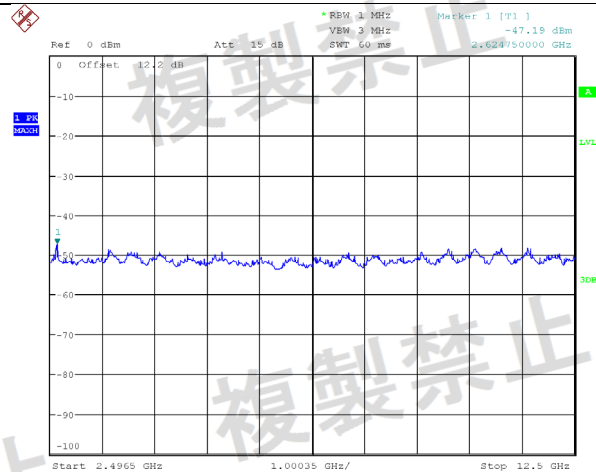
2 387 MHz ~ 2 400 MHz



2 483.5 MHz ~ 2 496.5 MHz



2 496.5 MHz ~ 12.5 GHz



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3.2.5 Dwell time

Test procedure

1. The transmitter output is connected to the Spectrum analyzer
2. Setting the spectrum analyzer is as follows.

Center frequency	Operating frequency
Resolution BW	1 MHz
Video BW	Auto
Span	Zero span
Sweep time	Hopping period
Detector mode	Positive peak
Trace mode	Single
Trigger	Video trigger

3. Selected the longest among the packet type.

Measurement data : BDR

- Normal hopping mode

Test voltage	Frequency hopping dwell time (one wave) (ms)	The number of hopping frequency of when setting up to Sweep a value of "0.4 × spread	Result Time of Occupancy (sec)	Limit for Time of Occupancy (sec)
3.70 (V)	2.904	95	0.276	0.4

- AFH mode

Test voltage	Operating frequency	Frequency hopping dwell time (one wave) (ms)	The number of hopping frequency of when setting up to Sweep a value of "0.4 × spread	Result Time of Occupancy (sec)	Limit for Time of Occupancy (sec)
3.70 (V)	Low	2.904	95	0.276	0.4
	Middle	2.904	98	0.285	0.4
	High	2.904	97	0.282	0.4

Measurement data : EDR

- Normal hopping mode

Test voltage	Frequency hopping dwell time (one wave) (ms)	The number of hopping frequency of when setting up to Sweep a value of "0.4 × spread	Result Time of Occupancy (sec)	Limit for Time of Occupancy (sec)
3.70 (V)	2.923	96	0.281	0.4

- AFH mode

Test voltage	Operating frequency	Frequency hopping dwell time (one wave) (ms)	The number of hopping frequency of when setting up to Sweep a value of "0.4 × spread	Result Time of Occupancy (sec)	Limit for Time of Occupancy (sec)
3.70 (V)	Low	2.923	96	0.281	0.4
	Middle	2.923	98	0.286	0.4
	High	2.923	98	0.286	0.4

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3.2.6 RX spurious emission

Test procedure

1. Connect transmitter output to the spectrum analyzer input port.
2. The EUT should be receiving at hopping mode
3. RX spurious emission is measured by following setting:
4. Set the spectrum analyzer RBW: 100 kHz, VBW: Auto, Sweep: Auto, Start: 30 MHz, Stop: 1 000 MHz.
5. Set the spectrum analyzer RBW: 1 MHz, VBW: Auto, Sweep: Auto, Start: 1 000 MHz, Stop: 10 GHz.
6. Set the spectrum analyzer RBW: 1 MHz, VBW: Auto, Sweep: Auto, Start: 10 GHz, Stop: 12.5 GHz.
7. Detector mode: Peak mode.

Measurement data : BDR

	Test mode		Max. emission value		
			Low frequency	Middle frequency	High frequency
30 MHz ~ 1 000 MHz	3.70 (V)	Value(nW)	-	0.016	-
		Frequency(MHz)	-	861.651	-
1 000 MHz ~ 10 GHz		Value(nW)	-	0.381	-
		Frequency(MHz)	-	3 668.269	-
10 GHz ~ 12.5 GHz		Value(nW)	-	0.612	-
		Frequency(MHz)	-	10 604.968	-

Measurement data : EDR

	Test mode		Max. emission value		
			Low frequency	Middle frequency	High frequency
30 MHz ~ 1 000 MHz	3.70 (V)	Value(nW)	-	0.018	-
		Frequency(MHz)	-	968.910	-
1 000 MHz ~ 12.5 GHz		Value(nW)	-	0.415	-
		Frequency(MHz)	-	3 596.154	-
10 GHz ~ 12.5 GHz		Value(nW)	-	0.490	-
		Frequency(MHz)	-	10 584.936	-

Limit:

Below 1 GHz: 4nW or less

Above 1 GHz: 20nW or less

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3.2.7 Interference prevention function

Measurement data : BDR

Test voltage	Low frequency	Middle frequency	High frequency
3.70 (V)	Pass	Pass	Pass

Measurement data : EDR

Test voltage	Low frequency	Middle frequency	High frequency
3.70 (V)	Pass	Pass	Pass

Limit:

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

APPENDIX

TEST EQUIPMENT USED FOR TESTS

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	Description	Model No.	Manufacturer	Cal. Data	Calibration body.	Calibration method.
1	ATTENUATOR	8493C	Agilent	2019-03-13	HCT	24-2 paragraph4 「 八 」
2	POWER DIVIDER	11636B	Agilent	2019-03-13	HCT	24-2 paragraph4 「 八 」
3	SPECTRUM ANALYZER	FSU26	R&S	2019-09-23	HCT	24-2 paragraph4 「 八 」
4	Power supply	PST-3202	GWInstsk	2019-03-11	HCT	24-2 paragraph4 「 八 」
5	USB Power sensor	U2021XA	Agilent	2019-03-11	HCT	24-2 paragraph4 「 八 」
6	ATTENUATOR	WA/41-30-12	Weinschel	2019-03-11	HCT	24-2 paragraph4 「 八 」
7	ATTENUATOR	WA-9-10-21	Weinschel	2019-04-11	HCT	24-2 paragraph4 「 八 」
8	Vector SG	SMBV100A	R&S	2019-03-11	HCT	24-2 paragraph4 「 八 」
9	SIGNAL GENERATOR	83630L	HP	2019-03-11	HCT	24-2 paragraph4 「 八 」
10	Frequency Counter	53181A	Agilent	2019-03-13	HCT	24-2 paragraph4 「 八 」
11	BLUETOOTH TESTER	TC-3000A	TESCOM	2019-03-11	HCT	24-2 paragraph4 「 八 」

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