

TEST REPORT

Article 2 Clause 1 Item19

Equipment under test LiveCare LoRa Gateway

Model name LG-XSGJP1001

Applicant uLikeKorea Co., Inc.

Manufacturer uLikeKorea Co., Inc.

Date of test(s) 2021.08.11~2021.08.13

Date of issue 2021.08.17

Issued to
uLikeKorea Co., Inc.

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Test and report completed by :	Report approval by :
	
Bong-Seok, Kim Test engineer	Young-Jin, Lee Technical manager

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KES-RF1-21T0128
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Revision history

Revision	Date of issue	Test report No.	Description
-	2021.08.17	KES-RF1-21T0128	Initial

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1. General information

Applicant: uLikeKorea Co., Inc.
Applicant address: 05836 12F, D ,H-business Park, 26, Beobwon-ro 9-gil, Songpa-gu, Seoul, Korea
Test site: KES Co., Ltd.
Test site address: ☐ 3701, 40, Simin-daero 365beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
☒ 473-21, Gayeo-ro, Yeosu-si, Gyeonggi-do, Korea
Standard Certification Ordinance Article 2 Clause 1 Item 19
Test Methods Ministry of Internal Affairs and Communications Notification Article 88 Appendix 43

1.1. EUT description

Equipment under test LiveCare LoRa Gateway
Frequency range 2 402 MHz ~ 2 480 MHz (LE 1,2 Mbps)
Model: LG-XSGJP1001
Modulation technique GFSK
Antenna specification Antenna type : PCB antenna, Peak gain : -0.84 dBi
Power source DC 5 V
Number of channels 2 402 MHz ~ 2 480 MHz (LE 1,2Mbps) : 40ch
H/W version 2.0
S/W version 2.0

1.2. Information about derivative model

N/A

1.3. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source
-	-	-	-	-

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1.4. Frequency/channel operations

Ch.	Frequency (MHz)	Rate(Mbps)
00	2 402	1,2
.	.	.
20	2 442	1,2
.	.	.
39	2 480	1,2

Note.

This test report is prepared according to the requirements of ISO/IEC 17025.

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2. Summary of tests

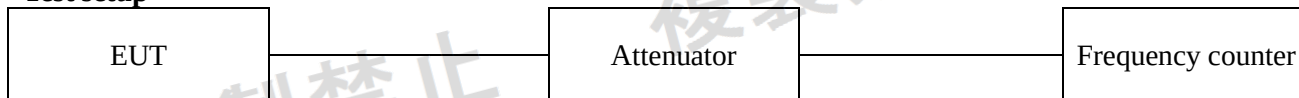
ARIB STD-T66 Clause	Parameter	Verdict
Clause 3.2(2).(4)	Frequency Tolerance	Pass
Clause 3.2(2).(7)	Occupied Bandwidth	Pass
Clause 3.2(2).(8)	Spread Bandwidth	Pass
Clause 3.2(2).(3)	Antenna Power and Tolerances for antenna power	Pass
Clause 3.2(6)	Spurious emission intensity	Pass
Clause 3.3(1)	Secondary radiated emissions	Pass
Clause 3.4(1)	Interference prevention function	Pass

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3. Test results

3.1. Frequency tolerance

Test setup



Limit

Permission deviation $\pm 50 \times 10^{-6}$

Test results

Mode: LE 1Mbps

Test voltage (%)	Test voltage (V)	Frequency (MHz)	Measure frequency (MHz)	Frequency deviation (Hz)	Deviation (ppm)	Verdict
90	DC 4.5	2 402	2 402 006 000	6 000	2.50	PASS
		2 442	2 442 012 000	12 000	4.91	PASS
		2 480	2 480 002 000	2 000	0.81	PASS
100	DC 5.0	2 402	2 402 008 000	2 000	3.33	PASS
		2 442	2 442 005 000	5 000	2.05	PASS
		2 480	2 480 006 000	6 000	2.42	PASS
110	DC 5.5	2 402	2 402 015 000	15 000	6.24	PASS
		2 442	2 442 011 000	11 000	4.50	PASS
		2 480	2 480 010 000	10 000	4.03	PASS

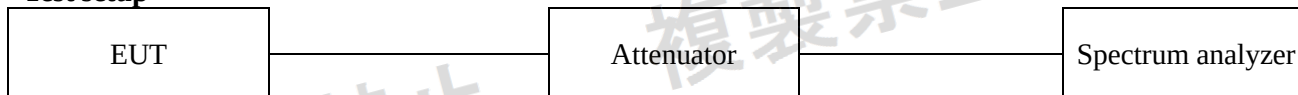
Mode: LE 2Mbps

Test voltage (%)	Test voltage (V)	Frequency (MHz)	Measure frequency (MHz)	Frequency deviation (Hz)	Deviation (ppm)	Verdict
90	DC 4.5	2 402	2 401 992 000	-8 000	-3.33	PASS
		2 442	2 441 990 000	-10 000	-4.10	PASS
		2 480	2 480 002 000	2 000	0.81	PASS
100	DC 5.0	2 402	2 401 980 000	-20 000	-8.33	PASS
		2 442	2 441 980 000	-20 000	-8.19	PASS
		2 480	2 479 978 000	-22 000	-8.87	PASS
110	DC 5.5	2 402	2 402 005 000	5 000	2.08	PASS
		2 442	2 442 012 000	12 000	4.91	PASS
		2 480	2 480 006 000	6 000	2.42	PASS

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3.2. Occupied Bandwidth

Test setup



Limit

Equal or less than 26 MHz(DSSS).

Test results

Mode: LE 1Mbps

Test voltage (%)	Nominal Voltage(V)	Occupied Bandwidth (MHz)			Verdict
		Frequency (2 402 MHz)	Frequency (2 442 MHz)	Frequency (2 480 MHz)	
90	DC 4.5	1.03	1.04	1.03	Pass
100	DC 5.0	1.03	1.04	1.04	Pass
110	DC 5.5	1.04	1.04	1.03	Pass

Mode: LE 2Mbps

Test voltage (%)	Nominal Voltage(V)	Occupied Bandwidth (MHz)			Verdict
		Frequency (2 402 MHz)	Frequency (2 442 MHz)	Frequency (2 480 MHz)	
90	DC 4.5	2.05	2.05	2.04	Pass
100	DC 5.0	2.05	2.05	2.05	Pass
110	DC 5.5	2.05	2.04	2.04	Pass



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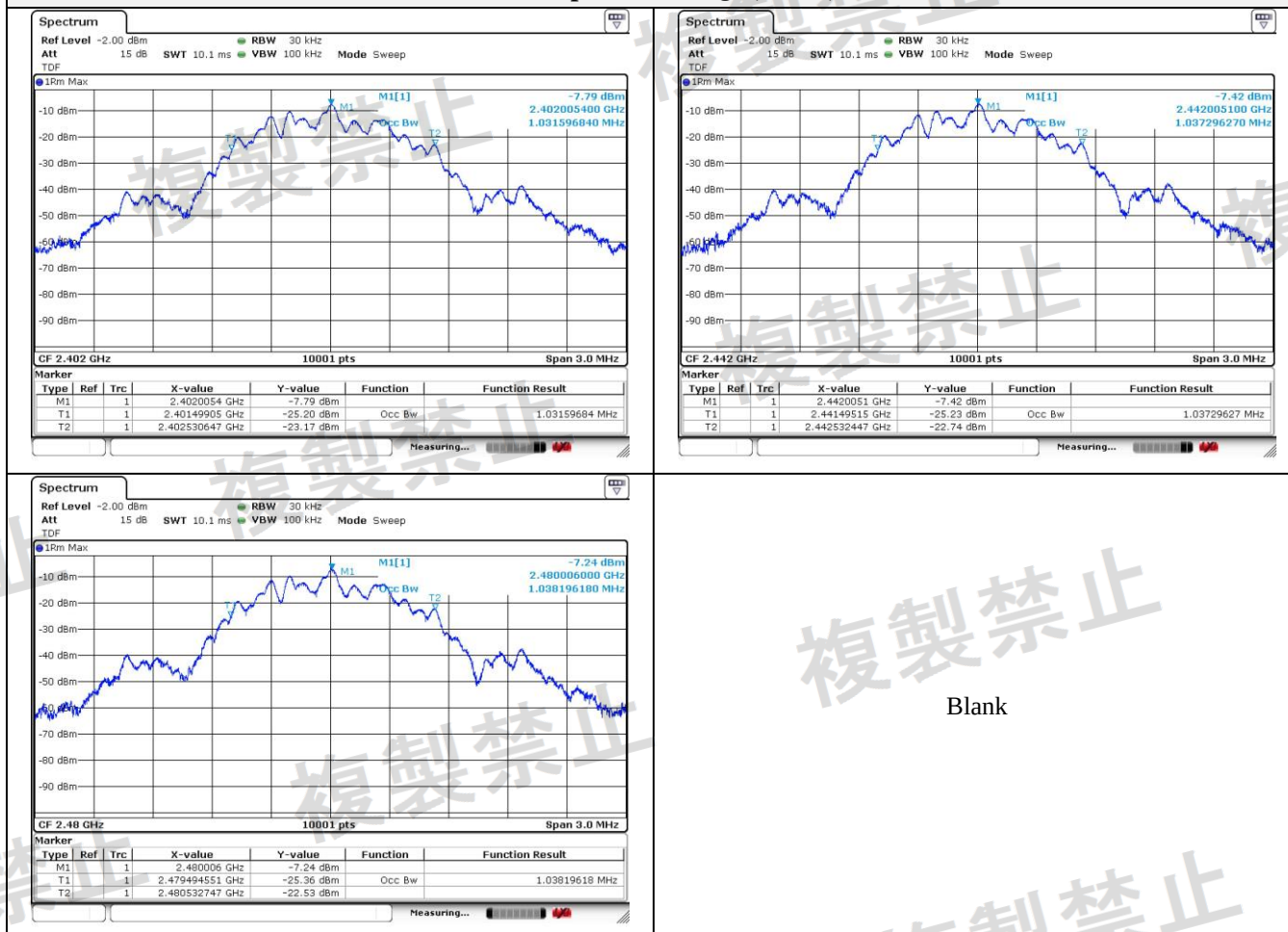
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Test plots

LE 1Mbps- Test voltage (100 %)

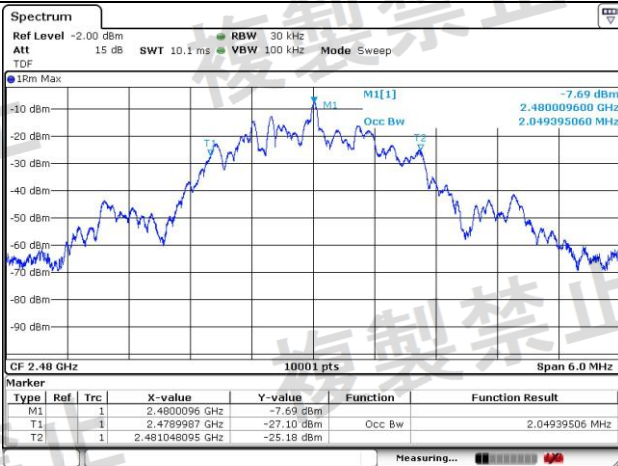
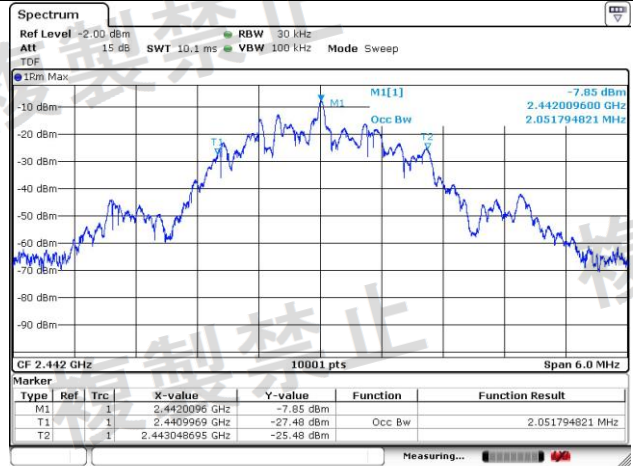
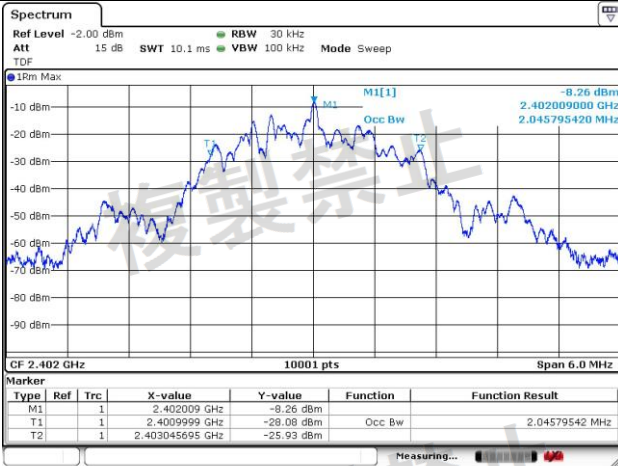


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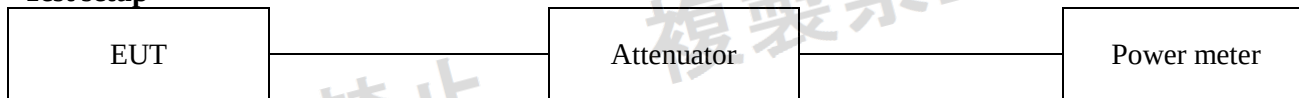
LE 2Mbps - Test voltage (100 %)



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3.3. Spread Bandwidth

Test setup



Limit

Spread Bandwidth shall be 500 kHz or more.

Test results

Mode: LE 1Mbps

Test voltage (%)	Nominal Voltage(V)	Spread Bandwidth (MHz)			Verdict
		Frequency (2 402 MHz)	Frequency (2 442 MHz)	Frequency (2 480 MHz)	
90	DC 4.5	0.650	0.652	0.654	Pass
100	DC 5.0	0.648	0.652	0.654	Pass
110	DC 5.5	0.649	0.653	0.653	Pass

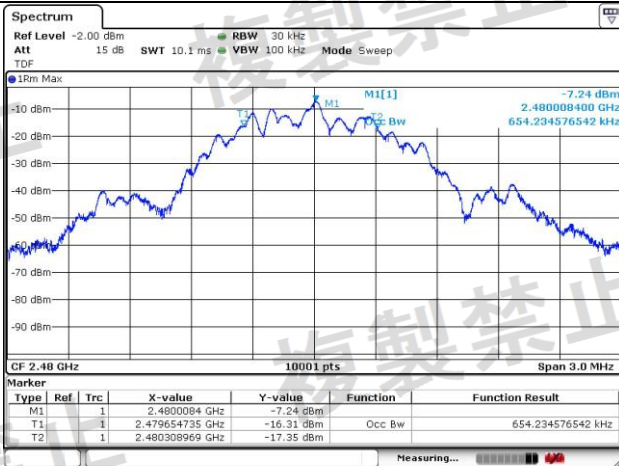
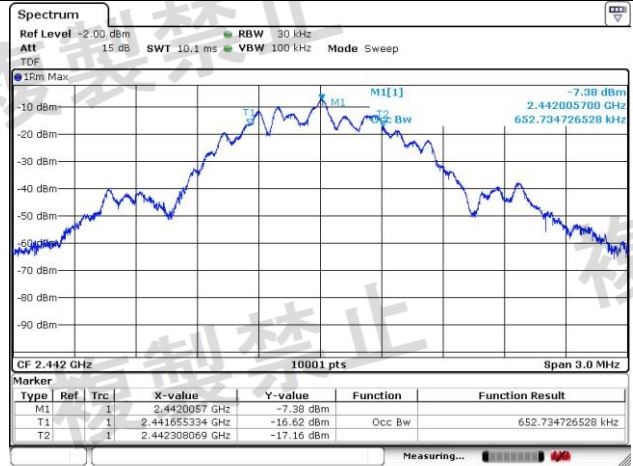
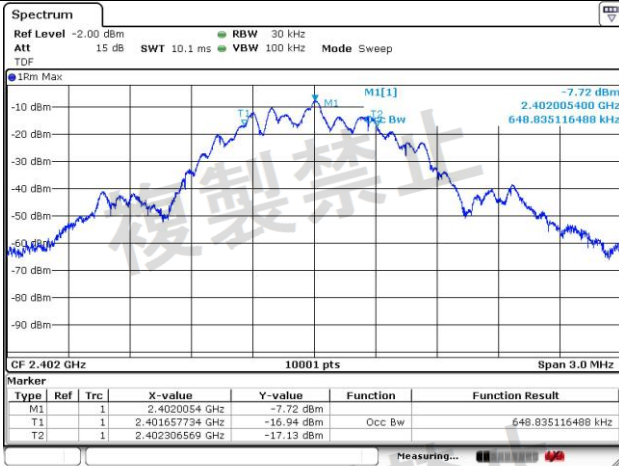
Mode: LE 2Mbps

Test voltage (%)	Nominal Voltage(V)	Spread Bandwidth (MHz)			Verdict
		Frequency (2 402 MHz)	Frequency (2 442 MHz)	Frequency (2 480 MHz)	
90	DC 4.5	1.231	1.238	1.237	Pass
100	DC 5.0	1.227	1.242	1.236	Pass
110	DC 5.5	1.228	1.237	1.240	Pass



Test plots

LE 1Mbps - Test voltage (100 %)



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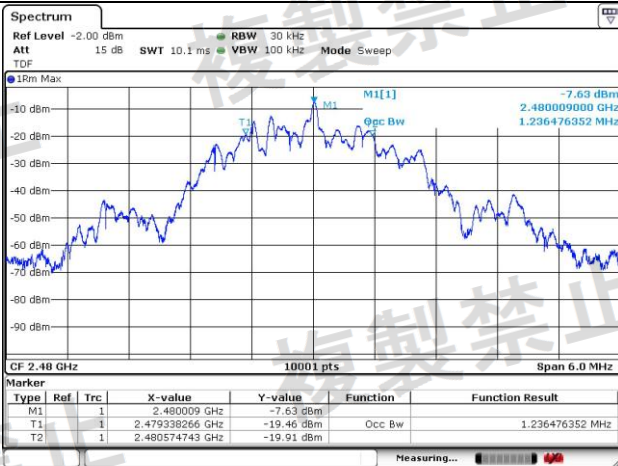
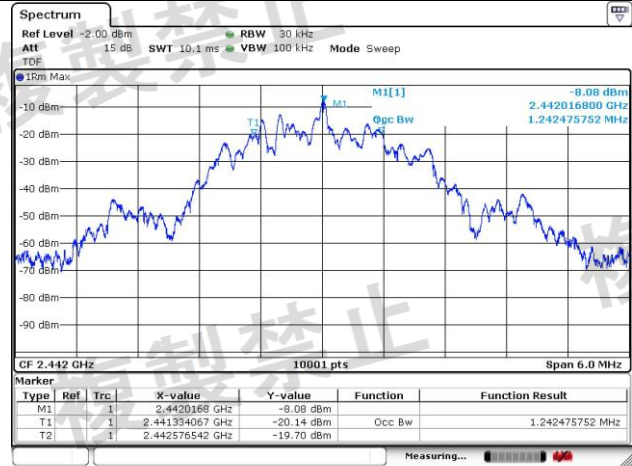
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LE 2Mbps - Test voltage (100 %)

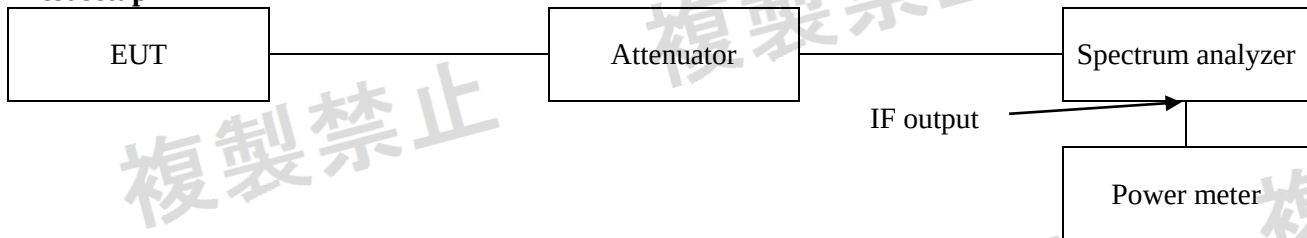


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3.4. Antenna Power and Tolerances for antenna power

Test setup



Limit

Mode: LE 1Mbps

Rate power : 0.6 mW (+20%, -80%)

Upper : 0.72 mW

Lower : 0.12 mW

Mode: LE 2Mbps

Rate power : 0.1 mW (+20%, -80%)

Upper : 0.12 mW

Lower : 0.02 mW

Test results

Mode: LE 1Mbps

Test voltage (%)	Nominal Voltage (V)	Frequency (MHz)	Output power (dBm/MHz)	Output power (mW)	E.I.R.P (dBm/MHz)	Deviation (%)
90	DC 4.5	2 402	-5.19	0.30	-6.03	-50.00
		2 442	-4.80	0.33	-5.64	-45.00
		2 480	-4.63	0.34	-5.47	-43.00
100	DC 5.0	2 402	-5.26	0.30	-6.10	-50.00
		2 442	-4.88	0.33	-5.72	-45.00
		2 480	-4.62	0.35	-5.46	-41.67
110	DC 5.5	2 402	-5.05	0.31	-5.86	-48.33
		2 442	-4.65	0.34	-5.49	-43.33
		2 480	-4.48	0.36	-5.32	-40.00

Mode: LE 2Mbps

Test voltage (%)	Nominal Voltage (V)	Frequency (MHz)	Output power (dBm/MHz)	Output power (mW)	E.I.R.P (dBm/MHz)	Deviation (%)
90	DC 4.5	2 402	-13.25	0.05	-14.09	-50.00
		2 442	-12.50	0.06	-13.34	-40.00
		2 480	-11.66	0.07	-12.50	-30.00
100	DC 5.0	2 402	-13.50	0.04	-14.34	-60.00
		2 442	-12.71	0.05	-13.55	-50.00
		2 480	-11.85	0.07	-12.69	-30.00
110	DC 5.5	2 402	-13.39	0.05	-14.23	-50.00
		2 442	-12.62	0.05	-13.46	-50.00
		2 480	-11.74	0.07	-12.58	-30.00

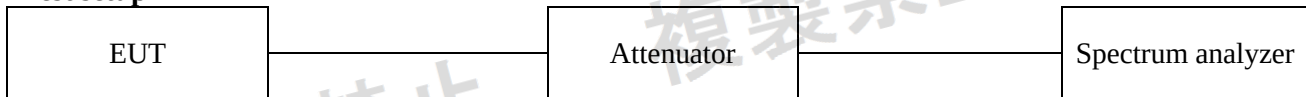
Note.

1. Output power is the result which the Burst Ratio is calculated.
2. E.I.R.P : Output power data + Ant. Max peak gain
3. Antenna gain : -0.84 dBi

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3.5. Spurious emission intensity

Test setup



Limit

1. Less than 2387 MHz : Equal or less than $2.5 \mu\text{W/MHz}$ ($\approx -26 \text{ dBm}$)
2. 2387 MHz ~ 2400 MHz : Equal or less than $25 \mu\text{W/MHz}$ ($\approx -16 \text{ dBm}$)
3. 2483.5 MHz ~ 2496.5 MHz : Equal or less than $25 \mu\text{W/MHz}$ ($\approx -16 \text{ dBm}$)
4. More than 2496.5 MHz : Equal or less than $2.5 \mu\text{W/MHz}$ ($\approx -26 \text{ dBm}$)

Test results

Mode: LE 1Mbps

Test item: Less than 2387 MHz

Test voltage (%)	Nominal Voltage (V)	Frequency (MHz)	Measure frequency (MHz)	Level (dBm)	Verdict
90	DC 4.5	2 402	144.04	-57.41	Pass
		2 442	96.08	-57.96	Pass
		2 480	144.05	-58.34	Pass
100	DC 5.0	2 402	144.05	-58.16	Pass
		2 442	1 737.21	-57.73	Pass
		2 480	1 730.52	-55.49	Pass
110	DC 5.5	2 402	144.05	-57.94	Pass
		2 442	1 748.66	-47.48	Pass
		2 480	144.05	-57.59	Pass

Mode: LE 1Mbps

Test item: 2387 MHz ~ 2400 MHz

Test voltage (%)	Nominal Voltage (V)	Frequency (MHz)	Measure frequency (MHz)	Level (dBm)	Verdict
90	DC 4.5	2 402	2 399.95	-35.27	Pass
		2 442	2 397.23	-56.48	Pass
		2 480	2 396.04	-55.78	Pass
100	DC 5.0	2 402	2 399.98	-35.29	Pass
		2 442	2 388.72	-56.67	Pass
		2 480	2 395.26	-55.30	Pass
110	DC 5.5	2 402	2 399.99	-35.11	Pass
		2 442	2 390.55	-56.54	Pass
		2 480	2 395.60	-55.98	Pass

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Mode: LE 1Mbps**Test item: 2483.5 Mhz ~ 2496.5 Mhz**

Test voltage (%)	Nominal Voltage (V)	Frequency (Mhz)	Measure frequency (Mhz)	Level (dBm)	Verdict
90	DC 4.5	2 402	2 488.79	-56.00	Pass
		2 442	2 487.35	-57.30	Pass
		2 480	2 483.51	-41.40	Pass
100	DC 5.0	2 402	2 485.10	-56.19	Pass
		2 442	2 490.78	-57.18	Pass
		2 480	2 483.52	-41.08	Pass
110	DC 5.5	2 402	2 494.75	-56.51	Pass
		2 442	2 490.14	-57.43	Pass
		2 480	2 483.59	-41.36	Pass

Mode: LE 1Mbps**Test item: More than 2496.5 Mhz**

Test voltage (%)	Nominal Voltage (V)	Frequency (Mhz)	Measure frequency (Mhz)	Level (dBm)	Verdict
90	DC 4.5	2 402	6 985.10	-52.39	Pass
		2 442	6 594.00	-51.73	Pass
		2 480	6 624.00	-52.28	Pass
100	DC 5.0	2 402	6 909.10	-51.31	Pass
		2 442	6 894.10	-51.81	Pass
		2 480	6 619.00	-51.93	Pass
110	DC 5.5	2 402	6 438.00	-52.02	Pass
		2 442	6 905.10	-51.48	Pass
		2 480	6 494.00	-52.15	Pass

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Mode: LE 2Mbps**Test item: Less than 2387 MHz**

Test voltage (%)	Nominal Voltage (V)	Frequency (MHz)	Measure frequency (MHz)	Level (dBm)	Verdict
90	DC 4.5	2 402	144.05	-58.28	Pass
		2 442	2 314.09	-57.95	Pass
		2 480	2 352.04	-57.83	Pass
100	DC 5.0	2 402	144.05	-58.22	Pass
		2 442	144.05	-58.05	Pass
		2 480	2 352.74	-56.17	Pass
110	DC 5.5	2 402	96.08	-58.08	Pass
		2 442	144.29	-58.36	Pass
		2 480	2 323.87	-58.04	Pass

Mode: LE 2Mbps**Test item: 2387 MHz ~ 2400 MHz**

Test voltage (%)	Nominal Voltage (V)	Frequency (MHz)	Measure frequency (MHz)	Level (dBm)	Verdict
90	DC 4.5	2 402	2 399.99	-34.64	Pass
		2 442	2 399.18	-56.47	Pass
		2 480	2 394.85	-56.30	Pass
100	DC 5.0	2 402	2 399.99	-34.47	Pass
		2 442	2 388.35	-56.25	Pass
		2 480	2 396.56	-56.74	Pass
110	DC 5.5	2 402	2 399.99	-34.54	Pass
		2 442	2 396.66	-56.34	Pass
		2 480	2 399.57	-56.37	Pass

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Mode: LE 2Mbps**Test item: 2483.5 MHz ~ 2496.5 MHz**

Test voltage (%)	Nominal Voltage (V)	Frequency (MHz)	Measure frequency (MHz)	Level (dBm)	Verdict
90	DC 4.5	2 402	2 490.56	-56.99	Pass
		2 442	2 488.88	-57.35	Pass
		2 480	2 483.52	-40.54	Pass
100	DC 5.0	2 402	2 490.38	-57.07	Pass
		2 442	2 495.57	-56.93	Pass
		2 480	2 483.59	-40.61	Pass
110	DC 5.5	2 402	2 486.86	-57.80	Pass
		2 442	2 495.28	-57.18	Pass
		2 480	2 483.50	-40.24	Pass

Mode: LE 2Mbps**Test item: More than 2496.5 MHz**

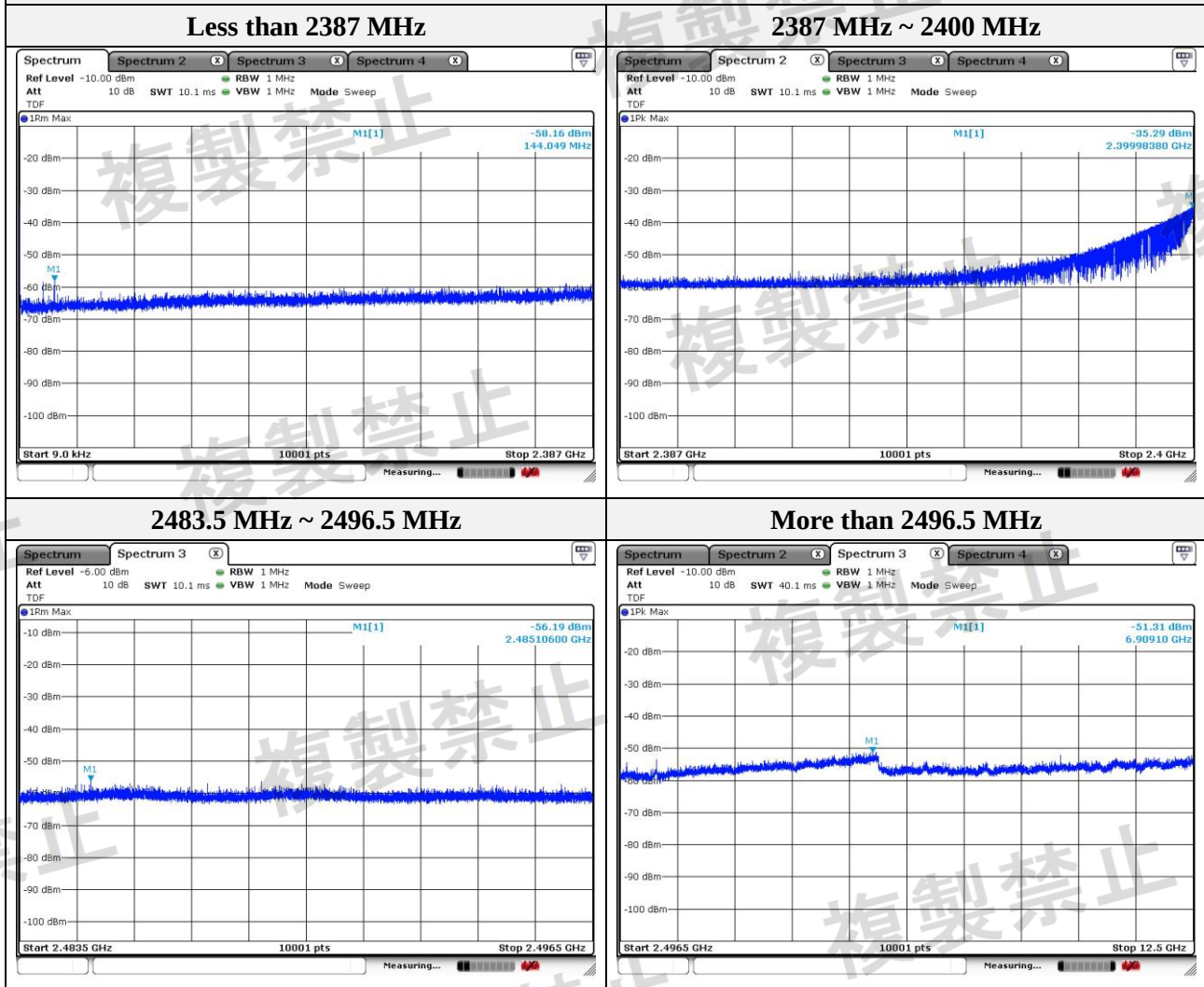
Test voltage (%)	Nominal Voltage (V)	Frequency (MHz)	Measure frequency (MHz)	Level (dBm)	Verdict
90	DC 4.5	2 402	6 519.00	-51.30	Pass
		2 442	6 977.10	-51.48	Pass
		2 480	6 924.10	-51.75	Pass
100	DC 5.0	2 402	6 737.10	-51.61	Pass
		2 442	6 815.10	-51.81	Pass
		2 480	6 896.10	-51.07	Pass
110	DC 5.5	2 402	6 906.10	-51.78	Pass
		2 442	6 812.10	-50.86	Pass
		2 480	6 916.10	-51.29	Pass

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Test plots

Mode: LE 1Mbps

F1 - Test voltage (100 %)



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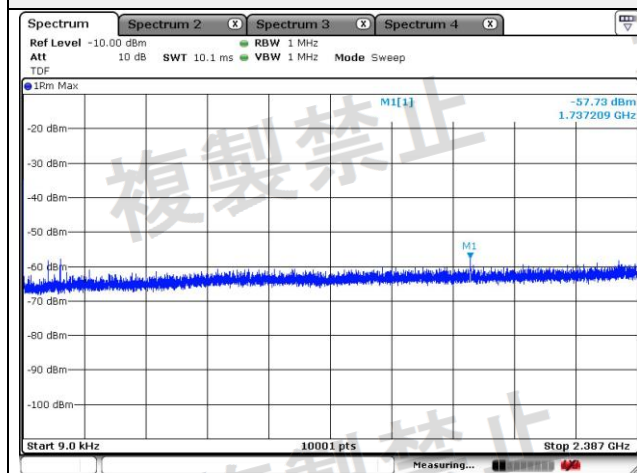
3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
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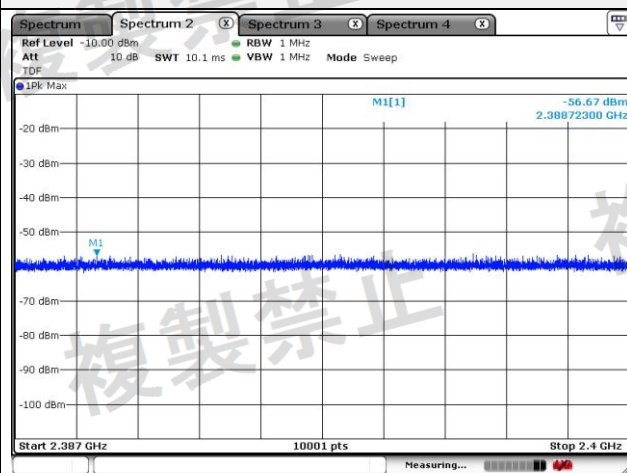
Mode: LE 1Mbps

F2 - Test voltage (100 %)

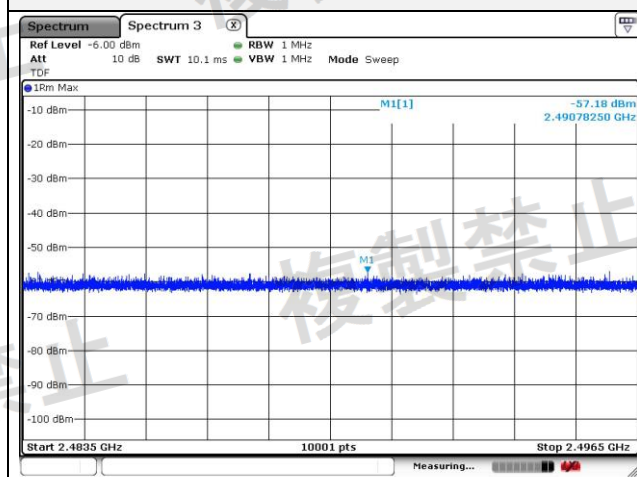
Less than 2387 MHz



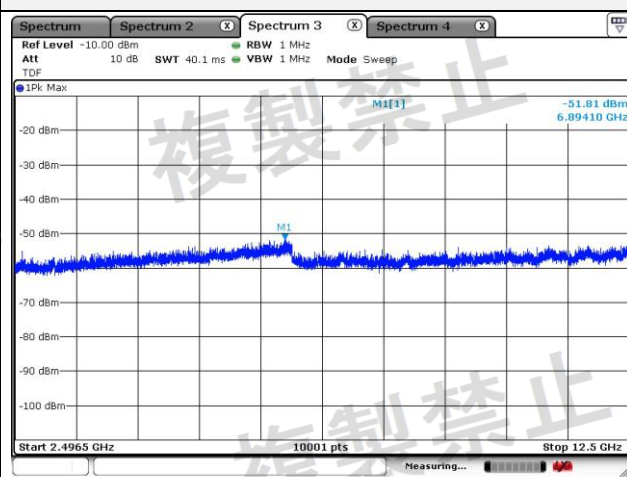
2387 MHz ~ 2400 MHz



2483.5 MHz ~ 2496.5 MHz



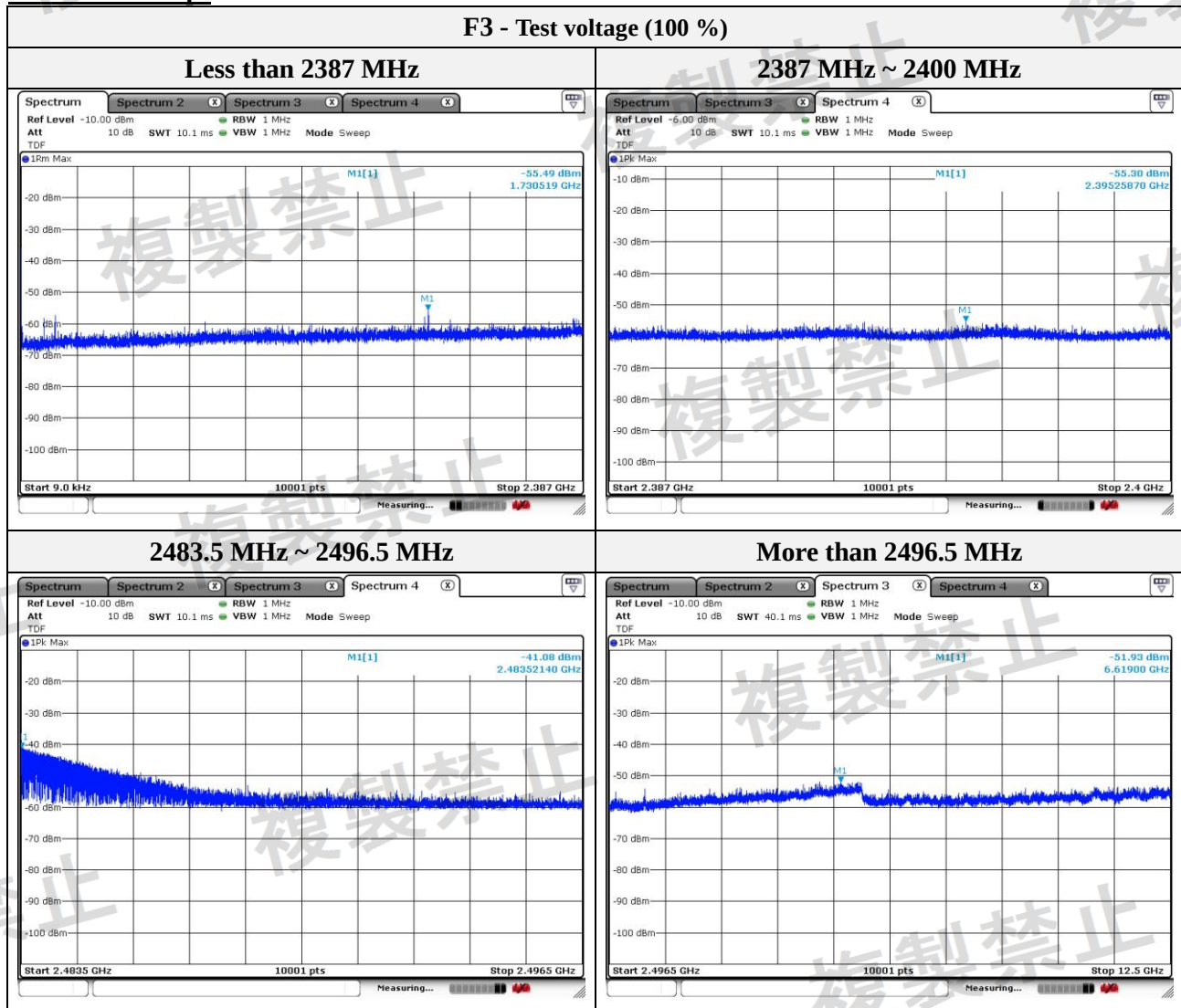
More than 2496.5 MHz



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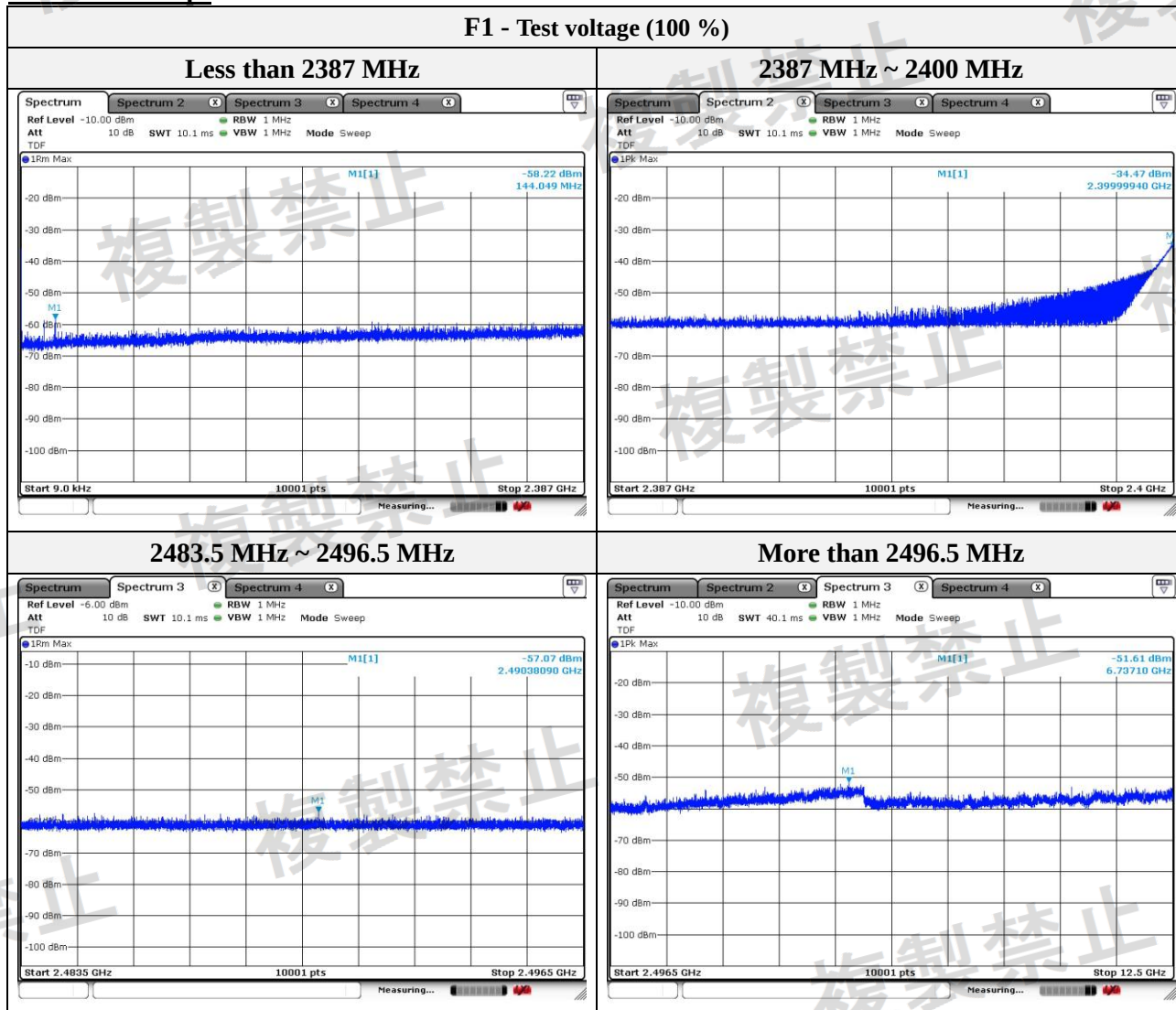


Mode: LE 1Mbps



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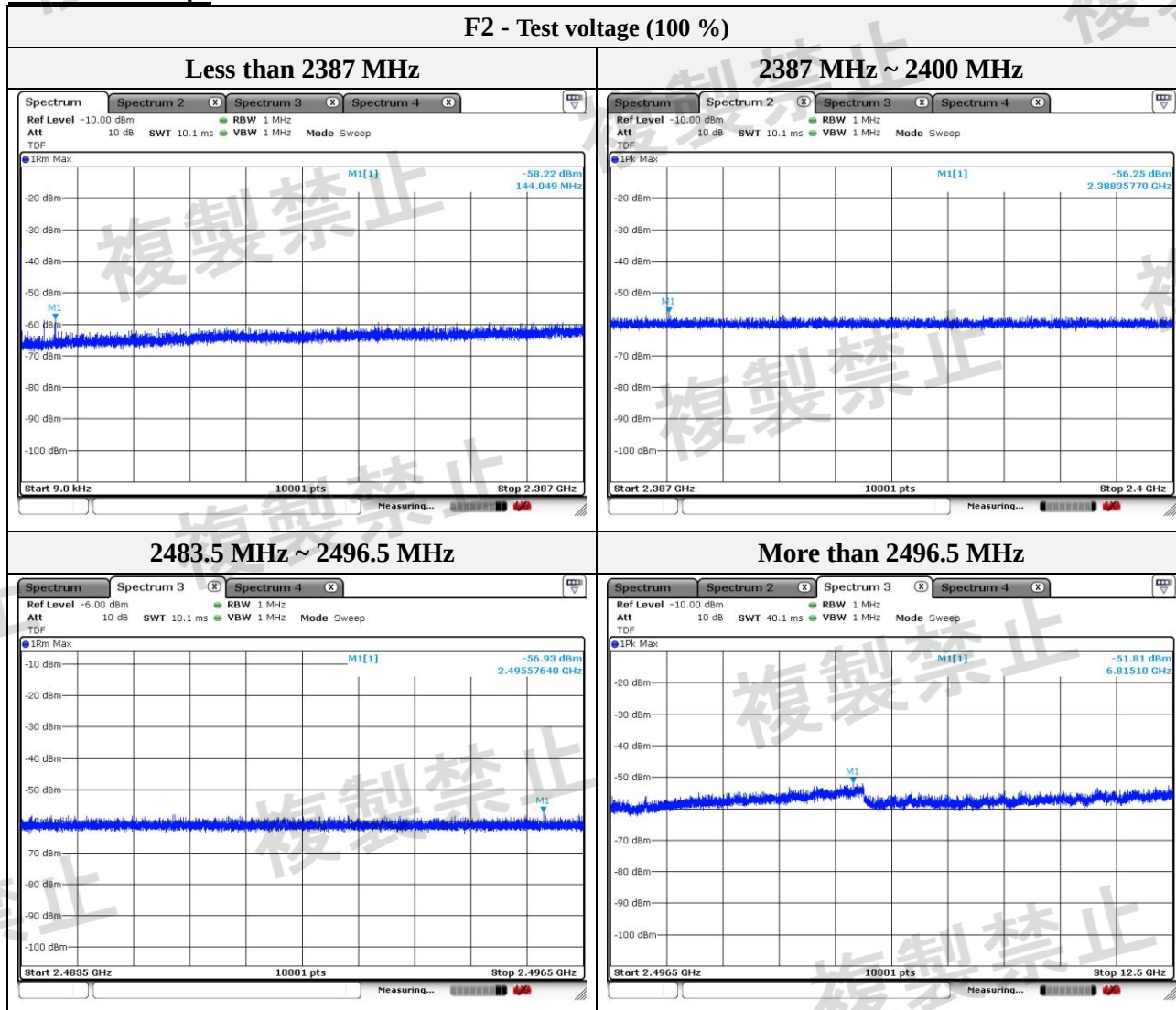
Mode: LE 2Mbps



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Mode: LE 2Mbps



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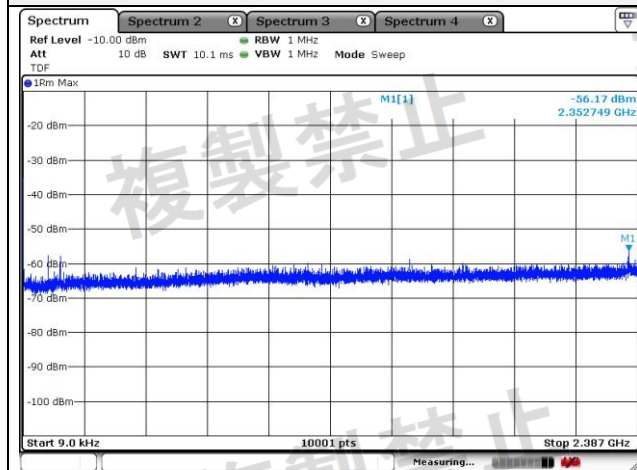
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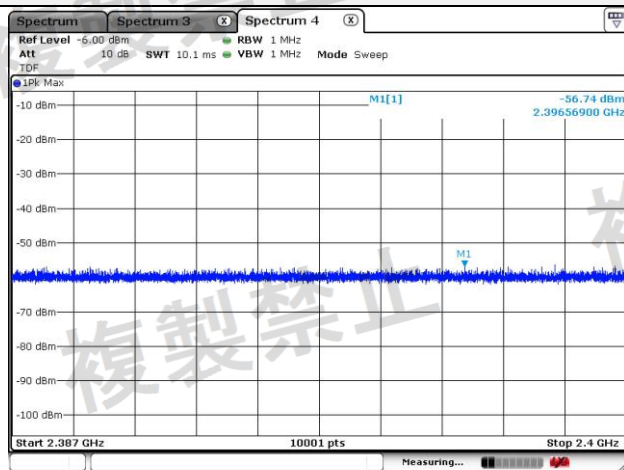
Mode: LE 2Mbps

F3 - Test voltage (100 %)

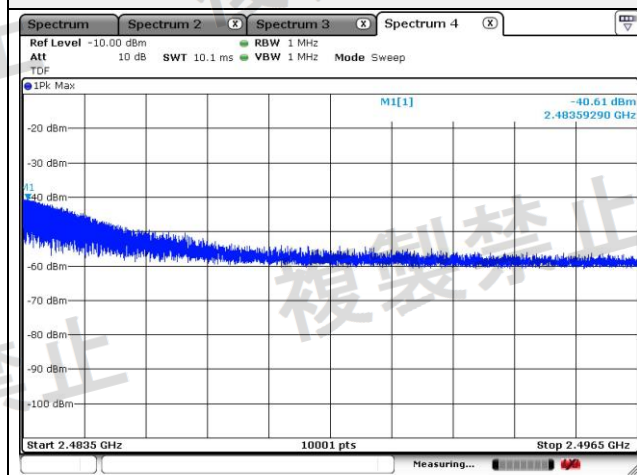
Less than 2387 MHz



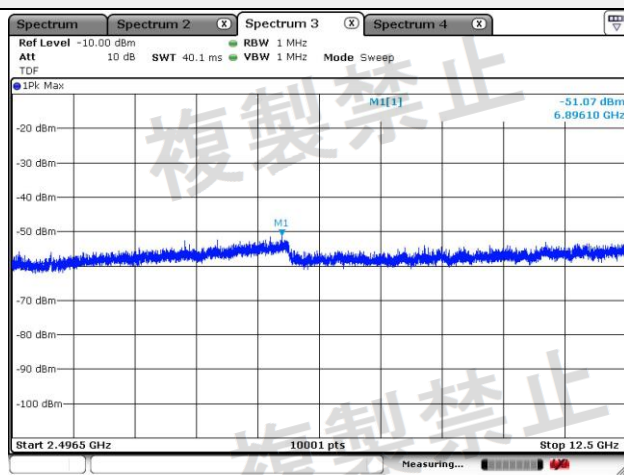
2387 MHz ~ 2400 MHz



2483.5 MHz ~ 2496.5 MHz



More than 2496.5 MHz



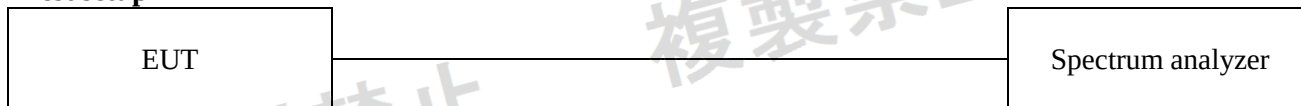
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3.6. Secondary radiated emissions

Test setup



Limit

1. Less than 1GHz : Equal or less than 4 nW(≒ -53.97 dBm)
2. 1GHz ~ less than 12.75 GHz : Equal or less than 20 nW(≒ -46.98 dBm)

Test results

Mode: LE 1Mbps

Test item: Less than ~ 1 GHz

Test voltage (%)	Nominal Voltage (V)	Frequency (MHz)	Measure frequency (MHz)	Level (dBm)	Verdict
90	DC 4.5	2 402	144.04	-72.10	Pass
		2 442	144.04	-72.18	Pass
		2 480	144.04	-71.43	Pass
100	DC 5.0	2 402	144.04	-71.91	Pass
		2 442	96.04	-72.68	Pass
		2 480	144.04	-71.37	Pass
110	DC 5.5	2 402	144.04	-72.14	Pass
		2 442	96.04	-72.57	Pass
		2 480	96.04	-71.70	Pass

Mode: LE 1Mbps

Test item: 1 GHz ~ less than 12.75 GHz

Test voltage (%)	Nominal Voltage (V)	Frequency (MHz)	Measure frequency (MHz)	Level (dBm)	Verdict
90	DC 4.5	2 402	2 425.30	-68.30	Pass
		2 442	2 425.30	-70.29	Pass
		2 480	2 428.70	-70.47	Pass
100	DC 5.0	2 402	2 425.30	-69.20	Pass
		2 442	2 428.70	-70.82	Pass
		2 480	2 425.30	-70.34	Pass
110	DC 5.5	2 402	2 425.30	-67.53	Pass
		2 442	2 425.30	-68.82	Pass
		2 480	2 425.30	-71.22	Pass

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Mode: LE 2Mbps**Test item: Less than ~ 1 GHz**

Test voltage (%)	Nominal Voltage (V)	Frequency (MHz)	Measure frequency (MHz)	Level (dBm)	Verdict
90	DC 4.5	2 402	144.04	-71.35	Pass
		2 442	144.04	-71.42	Pass
		2 480	144.04	-71.57	Pass
100	DC 5.0	2 402	144.04	-71.42	Pass
		2 442	144.04	-71.78	Pass
		2 480	144.04	-71.17	Pass
110	DC 5.5	2 402	144.04	-71.23	Pass
		2 442	144.04	-71.21	Pass
		2 480	144.04	-71.39	Pass

Mode: LE 2Mbps**Test item: 1 GHz ~ less than 12.75 GHz**

Test voltage (%)	Nominal Voltage (V)	Frequency (MHz)	Measure frequency (MHz)	Level (dBm)	Verdict
90	DC 4.5	2 402	2 424.10	-69.74	Pass
		2 442	2 424.10	-69.69	Pass
		2 480	2 429.90	-71.15	Pass
100	DC 5.0	2 402	2 433.30	-70.89	Pass
		2 442	2 425.30	-69.52	Pass
		2 480	2 428.70	-69.78	Pass
110	DC 5.5	2 402	2 428.70	-69.95	Pass
		2 442	2 425.30	-71.95	Pass
		2 480	2 424.10	-70.77	Pass

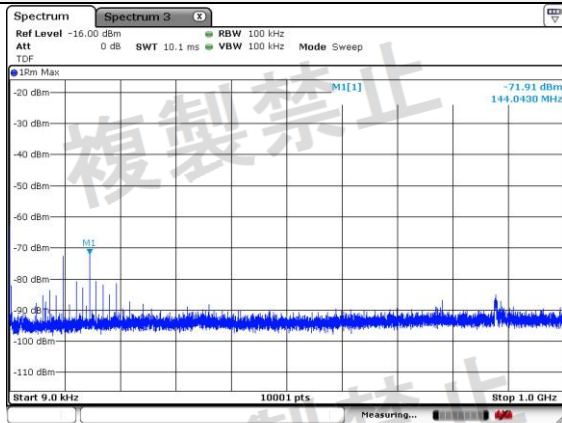
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Test plots

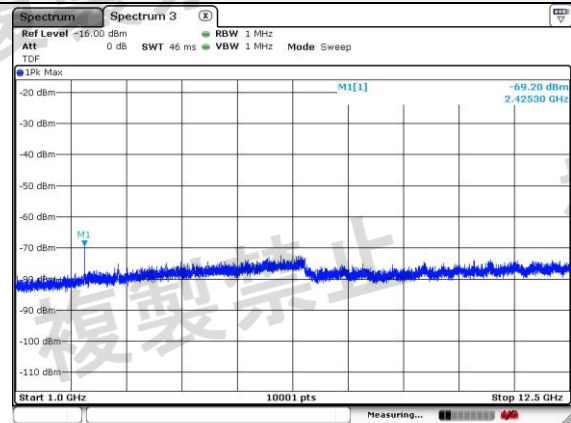
Mode: LE 1Mbps

F1 - Test voltage (100 %)

Less than 1 GHz

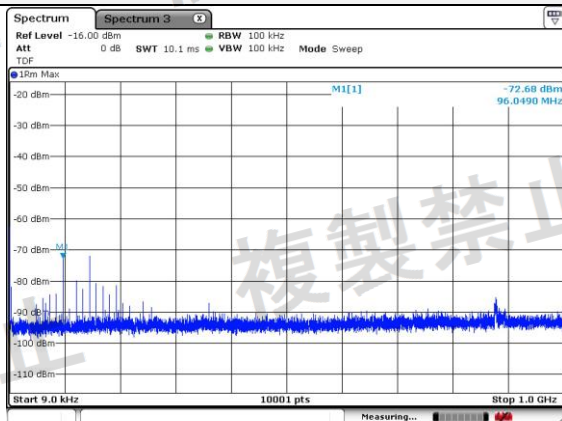


1 GHz ~ 12.5 GHz

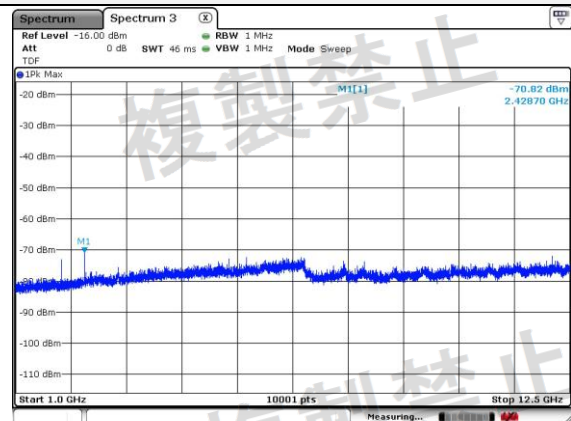


F2 - Test voltage (100 %)

Less than 1 GHz

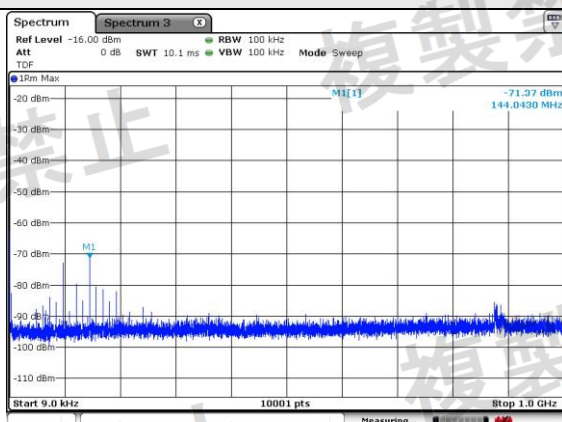


1 GHz ~ 12.5 GHz

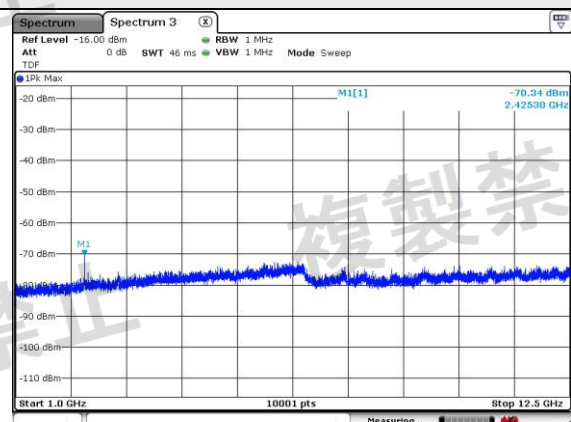


F3 - Test voltage (100 %)

Less than 1 GHz



Less than 1 GHz

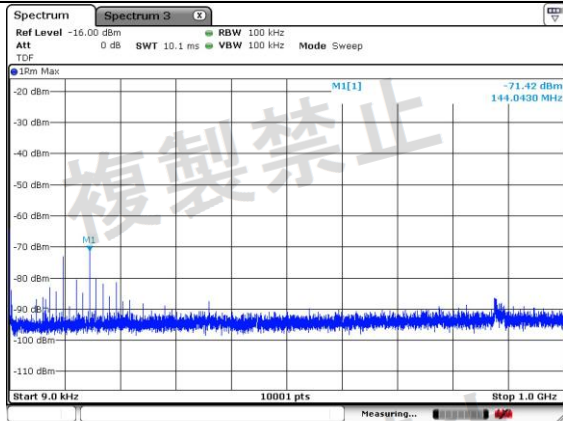


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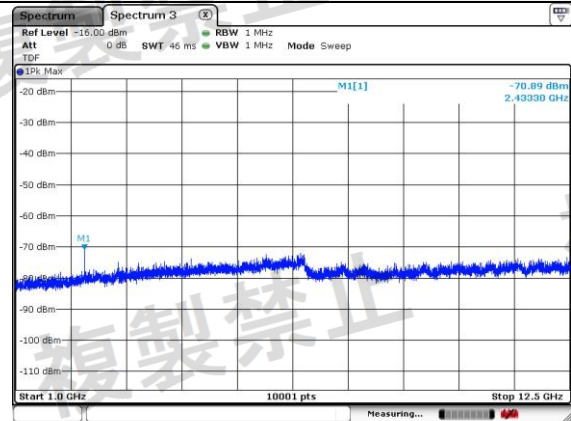
Mode: LE 2Mbps

F1 - Test voltage (100 %)

Less than 1 GHz

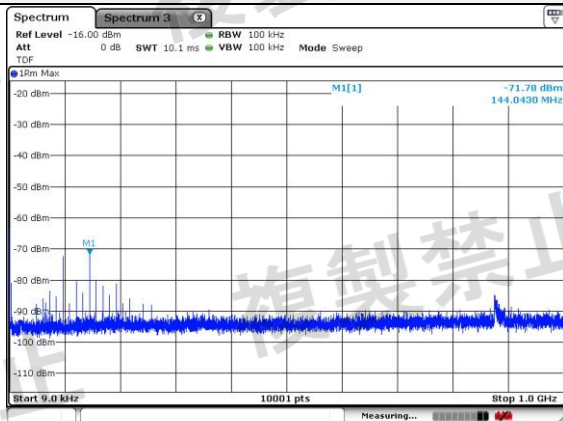


1 GHz ~ 12.5 GHz

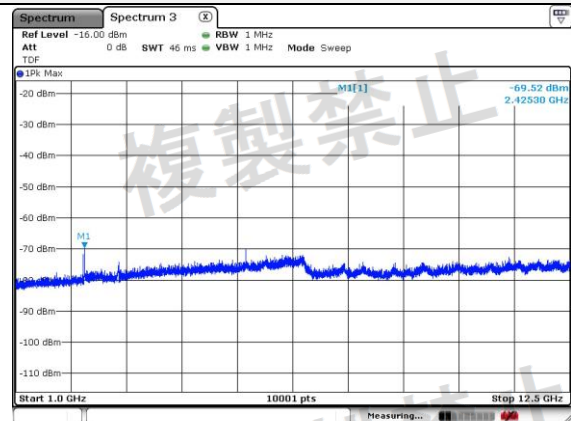


F2 - Test voltage (100 %)

Less than 1 GHz

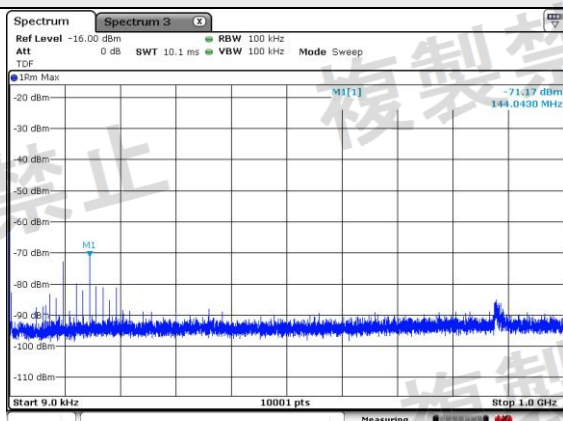


1 GHz ~ 12.5 GHz

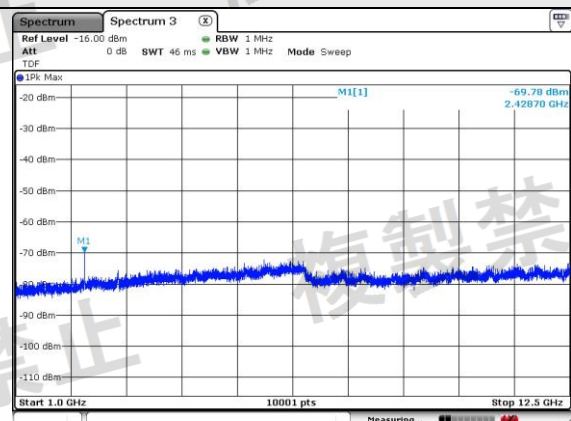


F3 - Test voltage (100 %)

Less than 1 GHz



Less than 1 GHz



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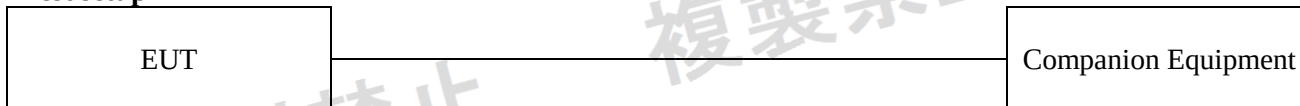
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3.7. Interference prevention function

Test setup



Limit

The identification code shall be 48 bits long.

Test results

Test voltage (%)	Nominal Voltage (V)	Mode	Identification code	Verdict
100	DC 5.0	BLE	2D:31:72:47:55:59	Pass

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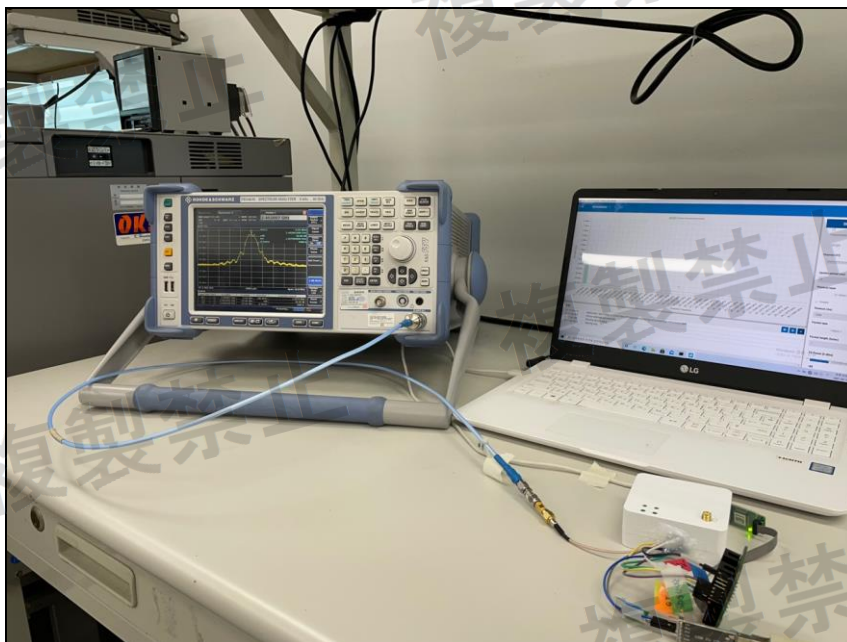
Appendix A. Measurement equipment

Equipment 24-2 paragraph4 「ハ」	Manufacturer	Model	Serial No.	Calibration interval	Calibration Lab.	Calibration due.
Spectrum Analyzer	R&S	FSV40	101725	1 year	HCT	2022.06.18
SIGNAL GENERATOR	KEYSIGHT	N5182B	MY59100115	1 year	HCT	2022.04.29
8360B Series Swept Signal Generator	HP	83630B	3844A00786	1 year	HCT	2022.01.15
Power Meter	Anritsu	ML2495A	2010001	1 year	HCT	2022.04.29
Pulse Power Sensor	Anritsu	MA2411B	1911111	1 year	HCT	2022.04.29
Attenuator	Mini-Circuits	BW-S10- 2W263+	1	1 year	HCT	2022.01.18
DC Power Supply	Agilent	6632B	MY43004090	1 year	HCT	2022.06.21
Frequency Counter	HP	5351B	3049A01295	1 year	HCT	2022.04.29

Peripheral devices

Device	Manufacturer	Model No.	Serial No.
Notebook computer	LG Electronics Inc.,	LGS53	306QCZP560949

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Appendix B. Test Setup Photo

The end of test report.

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