

TEST REPORT

Report number : KR20-SRT0015

Issue date : 2020-07-06

Applicant : DREAMUS COMPANY
5, Bangbae-ro 18gil, Seocho-gu, Seoul,
Republic of Korea
TEL : 02-3019-7542
FAX : 02-3019-7576

Equipment under test (EUT) : IRIVER MINIONS WIRELESS KEYBOARD

Model name : IMK101J

Date of test : 2020.06.26 ~ 2020.07.01

Test place : KCTL Inc.
65 Sinwon-ro, Yeongtong-gu, Suwon-si,
Gyeonggi-do, Korea

Test results : PASS

The results in this report are applicable only to the equipment tested.

This report shall not be re-produced except in full without the written approval of **KCTL Inc.**

Tested by;



Hosung Lee

Approved by;



Heesu Ahn

1. Summary of Test

1. Purpose of test

Ordinance on Technical Standards Conformity Certification of Specified Radio Equipment
2.4GHz Band wide band low power data communication System

2. Standards

Certification Ordinance Article 2 Clause 1 Item19

1) Test Methods

Ministry of Internal Affairs and Communications Notification Article 88 Appendix 43

2) Deviation from standards

None

3. List of applied test to the EUT

Article 88 Appendix 43	Classification of EUT	Condition	Result
3	Frequency Tolerance	Conducted	PASS
4	Occupied Bandwidth	Conducted	PASS
4	Spread Bandwidth	Conducted	PASS
5	Unwanted (Spurious) Emission Strength	Conducted	PASS
6	RF Output Power Tolerance	Conducted	PASS
7	Secondary Emitted Radio Wave Strength	Conducted	PASS
13	Time of occupancy hopping frequency	Conducted	PASS
13	Spreading Factor	Conducted	PASS
12	Interference Prevention Function	Conducted	PASS

1) Test set up

Table-Top

2) Modification to the EUT by laboratory

None

1. Test Information

1. Applicant

DREAMUS COMPANY
5, Bangbae-ro 18gil, Seocho-gu, Seoul, Republic of Korea

2. Equipment under test IRIVER MINIONS WIRELESS KEYBOARD

3. Model number IMK101J

4. Serial number N/A

5. Size (W) 287.1 x (D) 35.2 x (H) 148.3 with Figure (W) 287.1 x (D) 17.8 x (H) 131.8 without Figure

6. Terminal limitation -10°C to 50°C

7. RF Specification Frequency range 2402-2480MHz

8. Number of RF Channels 79 Channels

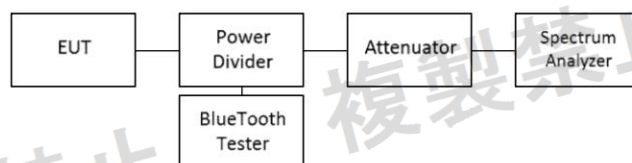
9. Modulation method FHSS(GFSK)

10. Data rate 1 Mbps

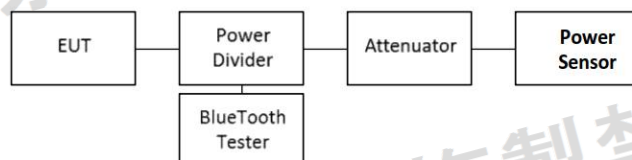
10. Variation of the family model(s) IMK201J, IMK301J

2. Configuration of equipment

1. Occupied Bandwidth, Spread bandwidth, Frequency tolerance
Unwanted(Spurious) emission strength, Secondary emitted radio wave strength,
Time of occupancy hopping frequency



2. RF output power tolerance



4. Measurement equipment list

USE	Equipment	Company	Model No.	Serial No.	Calibrated by	Cal. Method	Cal. Due	Cal. Date
X	Spectrum Analyzer	R&S	FSV30	100808	HCT	(c)	2020-07-30	2019-07-30
X	DC Power Supply	AGILENT	E3632A	KR73001026	HCT	(c)	2021-04-09	2020-04-09
X	Signal Generator	R&S	SMR40	100007	HCT	(c)	2021-04-08	2020-04-08
X	Attenuator	HP	8491A	29738	HCT	(c)	2021-01-03	2020-01-03
X	Coaxial Attenuator	Weinschel ENGINEERING	56-10	53206	HCT	(c)	2021-01-22	2020-01-22
X	Bluetooth Tester	TESCOM	TC-3000B	3000B640056	HCT	(c)	2021-01-21	2020-01-21
X	Power Divider	AeroFlex/ Weinschel, Inc	1580-1	PE430	HCT	(c)	2020-08-01	2019-08-01
X	Power Sensor	R&S	NRP-Z81	1137.9009.02-106223-bB	HCT	(c)	2021-05-25	2020-05-25

Note1: "X" used equipment.

Note2: The validity of measurement equipment is one year from the first day of the following month of the calibration date.

Note3:

Cal.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)~ TELECOM Engineering Center, Intertek Japan K.K., Keysight Technologies, Inc~.

b) : Correction conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Law (Law No. 51 of 1992)~Japan Calibration Service System~

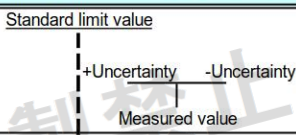
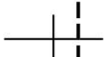
c) : Calibration conducted in foreign countries, which shall be equivalent to the calibration conducted by the NICT or a designated calibration agency under Article 102-18 paragraph (1)~ TELECOM Engineering Center, Intertek Japan K.K., Keysight Technologies, Inc~.

d) : Calibration conducted by using other equipment that listed above from a) to c)

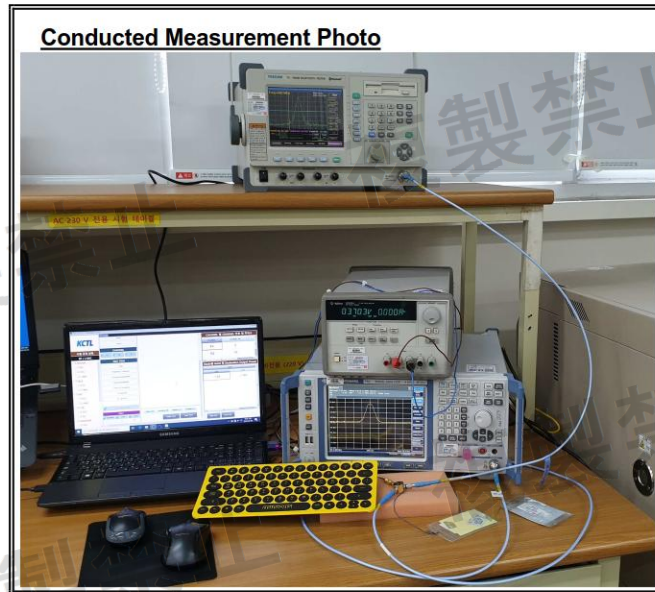
5. Uncertainty

About uncertainty of measured value

Parameter	Uncertainty
Total RF power conducted	$\pm 1.42\text{dB}$
Spurious emissions conducted	$\pm 1.05\text{dB}$
Temperature	$\pm 1.12^\circ\text{C}$
Humidity	$\pm 4.92\%$

Judge	Measured value and standard limit value
PASS	Case1  Standard limit value +Uncertainty -Uncertainty Measured value Even if it takes uncertainty into consideration, a standard limit value is fulfilled.
	Case2  Although measured value is in a standard limit value, a limit value won't be fulfilled if uncertainty is taken into consideration.
FAIL	Case3  Although measured value exceeds a standard limit value, a limit value will be fulfilled if uncertainty is taken into consideration.
	Case4  Even if it takes uncertainty into consideration, a standard limit value isn't fulfilled.

6. Photographs



3. Test results (Rated voltage)

S/N : N/A

Environment of test room	Date of test	2020-06-26	2020-06-29	2020-06-30
	Temperature	21 °C	20 °C	21 °C
	Humidity	49 %	50 %	50 %

Peak Antenna Gain	1.87	dBi
Declaration Output Power	0.006	mW/MHz
Declaration Output Power	-22.22	dBm/MHz
E.I.R.P.	-20.35	dBm/MHz
Input Power Voltage	3.00	VDC

Tested Circuit Insertion Loss		0	dB
Frequency equal to the Transmission rate		1	MHz
Transmission Time	ON TIME	2.897	ms
	OFF TIME	0.827	ms
	Ratio	0.778	
Packet Type (Mode)		DH5	mode
Transmit Speed		1	MHz

Using TDF and offset function in Spectrum Analyzer.

Measurement of plots are included Loss value.

(Att : 10dB + Power Divider : 6dB + Cable loss + EUT cable: 0.5dB offset)

Test category : 2.4GHz Band Low-Power Data Communication System (BluetoothV3.0+BDR [GFSK])	

Measurement Frequency	MHz	2402	2441	2480	Result	Limit	Note
Channel Number	Ch.	0	39	78	---	---	
Frequency Measurements	MHz	2402.0050	2441.0050	2480.0150	---	---	
Frequency Tolerance	ppm	2.0816	2.0483	6.0484	PASS	±50×10 ⁻⁶ (50ppm)	
Occupied Bandwidth	MHz	---	78.02	---	PASS	83.5MHz or below	
Spread Bandwidth	MHz	---	70.63	---	PASS	500kHz or more	
RF Output Power	mW/MHz	0.005395	0.003945	0.002958	PASS	3mW/MHz or below	
RF Output Power Tolerance	%	-10.0770	-34.2538	-50.6973	PASS	+20 to -80%	
Unwanted (Spurious) Emission Strength	30 to 2387MHz	uW/MHz	---	0.030761	---	PASS	2.5uW/MHz or below
		MHz	---	1837.200	---	----	
	2387 to 2400MHz	uW/MHz	---	0.635331	---	PASS	25uW/MHz or below
		MHz	---	2399.994	---	----	
	2483.5 to 2496.5MHz	uW/MHz	---	0.036141	---	PASS	25uW/MHz or below
		MHz	---	2494.714	---	----	
Secondary Emitted Radio Wave Strength	2496.5 to 12500MHz	uW/MHz	---	0.110662	---	PASS	2.5uW/MHz or below
		MHz	---	6967.500	---	----	
	30 to 1000MHz	nW	---	0.029854	---	PASS	4nW or below
		MHz	---	892.920	---	----	
	1000 to 10000MHz	nW	---	1.409289	---	PASS	20nW or below
		MHz	---	6956.500	---	----	
Time of occupancy hopping frequency	10000 to 12500MHz	nW	---	0.412098	---	PASS	20nW or below
		MHz	---	11831.000	---	----	
Spreading Factor	sec	---	0.002930	---	PASS	0.4sec or below	
	sec	---	0.249050	---	PASS	0.4sec or below	0.4sec×Spread rate
Interference Prevention Function		---	70.630000	---	PASS	5 or more	
		Good			PASS		

3. Test results (-10% voltage)

S/N : N/A

Environment of test room	Date of test	2020-06-26	2020-06-29	2020-06-30
	Temperature	21 °C	20 °C	21 °C
	Humidity	49 %	50 %	50 %

Peak Antenna Gain	1.87	dBi
Declaration Output Power	0.006	mW/MHz
Declaration Output Power	-22.22	dBm/MHz
E.I.R.P.	-20.35	dBm/MHz
Input Power Voltage	2.70	VDC

Tested Circuit Insertion Loss		0	dB
Frequency equal to the Transmission rate		1	MHz
Transmission Time	ON TIME	2.920	ms
	OFF TIME	0.825	ms
	Ratio	0.780	
Packet Type (Mode)		DH5	mode
Transmit Speed		1	MHz

Using TDF and offset function in Spectrum Analyzer.

Measurement of plots are included Loss value.

(Att : 10dB + Power Divider : 6dB + Cable loss + EUT cable: 0.5dB offset)

Test category : 2.4GHz Band Low-Power Data Communication System (BluetoothV3.0+BDR [GFSK])	

Measurement Frequency	MHz	2402	2441	2480	Result	Limit	Note
Channel Number	Ch.	0	39	78	---	---	
Frequency Measurements	MHz	2402.0000	2441.0050	2480.0200	---	---	
Frequency Tolerance	ppm	0.0000	2.0483	8.0645	PASS	±50×10 ⁻⁶ (50ppm)	
Occupied Bandwidth	MHz	---	78.12	---	PASS	83.5MHz or below	
Spread Bandwidth	MHz	---	70.23	---	PASS	500kHz or more	
RF Output Power	mW/MHz	0.005427	0.003878	0.002868	PASS	3mW/MHz or below	
RF Output Power Tolerance	%	-9.5494	-35.3734	-52.2018	PASS	+20 to -80%	
Unwanted (Spurious) Emission Strength	30 to 2387MHz	uW/MHz	---	0.031842	---	PASS	2.5uW/MHz or below
		MHz	---	1801.900	---	----	
	2387 to 2400MHz	uW/MHz	---	0.644169	---	PASS	25uW/MHz or below
		MHz	---	2399.994	---	----	
	2483.5 to 2496.5MHz	uW/MHz	---	0.032137	---	PASS	25uW/MHz or below
		MHz	---	2493.156	---	----	
	2496.5 to 12500MHz	uW/MHz	---	0.106170	---	PASS	2.5uW/MHz or below
		MHz	---	6998.500	---	----	
Secondary Emitted Radio Wave Strength	30 to 1000MHz	nW	---	0.018750	---	PASS	4nW or below
		MHz	---	890.010	---	----	
	1000 to 10000MHz	nW	---	1.380384	---	PASS	20nW or below
		MHz	---	6938.600	---	----	
	10000 to 12500MHz	nW	---	0.430527	---	PASS	20nW or below
		MHz	---	12331.000	---	----	
Time of occupancy hopping frequency	sec	---	0.002930	---	PASS	0.4sec or below	
	sec	---	0.263700	---	PASS	0.4sec or below	0.4sec×Spread rate
Spreading Factor		---	70.230000	---	PASS	5 or more	
Interference Prevention Function		Good			PASS		

3. Test results (+10% voltage)

S/N : N/A

Environment of test room	Date of test	2020-06-26	2020-06-29	2020-06-30
	Temperature	21 °C	20 °C	21 °C
	Humidity	49 %	50 %	50 %

Peak Antenna Gain	1.87	dBi
Declaration Output Power	0.006	mW/MHz
Declaration Output Power	-22.22	dBm/MHz
E.I.R.P.	-20.35	dBm/MHz
Input Power Voltage	3.30	VDC

Tested Circuit Insertion Loss		0	dB
Frequency equal to the Transmission rate		1	MHz
Transmission Time	ON TIME	2.926	ms
	OFF TIME	0.567	ms
	Ratio	0.838	
Packet Type (Mode)		DH5	mode
Transmit Speed		1	MHz

Using TDF and offset function in Spectrum Analyzer.
Measurement of plots are included Loss value.

(Att : 10dB + Power Divider : 6dB + Cable loss + EUT cable: 0.5dB offset)

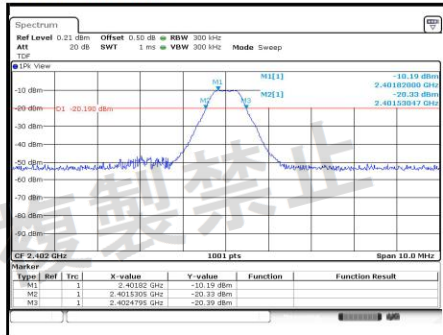
Test category : 2.4GHz Band Low-Power Data Communication System (BluetoothV3.0+BDR [GFSK])	

Measurement Frequency	MHz	2402	2441	2480	Result	Limit	Note
Channel Number	Ch.	0	39	78	---	---	
Frequency Measurements	MHz	2402.0100	2441.0050	2480.0100	---	---	
Frequency Tolerance	ppm	4.1632	2.0483	4.0323	PASS	±50×10 ⁻⁶ (50ppm)	
Occupied Bandwidth	MHz	---	78.02	---	PASS	83.5MHz or below	
Spread Bandwidth	MHz	---	70.43	---	PASS	500kHz or more	
RF Output Power	mW/MHz	0.005095	0.003708	0.002826	PASS	3mW/MHz or below	
RF Output Power Tolerance	%	-15.0761	-38.1941	-52.8990	PASS	+20 to -80%	
Unwanted (Spurious) Emission Strength	30 to 2387MHz	uW/MHz	---	0.033497	---	PASS	2.5uW/MHz or below
		MHz	---	1825.400	---	----	
	2387 to 2400MHz	uW/MHz	---	0.619441	---	PASS	25uW/MHz or below
		MHz	---	2399.994	---	----	
	2483.5 to 2496.5MHz	uW/MHz	---	0.032211	---	PASS	25uW/MHz or below
		MHz	---	2494.286	---	----	
Secondary Emitted Radio Wave Strength	2496.5 to 12500MHz	uW/MHz	---	0.106660	---	PASS	2.5uW/MHz or below
		MHz	---	6977.500	---	----	
	30 to 1000MHz	nW	---	0.039537	---	PASS	4nW or below
		MHz	---	889.050	---	----	
	1000 to 10000MHz	nW	---	1.145513	---	PASS	20nW or below
		MHz	---	6956.500	---	----	
Time of occupancy hopping frequency	10000 to 12500MHz	nW	---	0.429536	---	PASS	20nW or below
		MHz	---	12287.100	---	----	
Spreading Factor	sec	---	0.002930	---	PASS	0.4sec or below	0.4sec×Spread rate
	sec	---	0.251980	---	PASS	0.4sec or below	
Interference Prevention Function		---	70.430000	---	PASS	5 or more	
		Good			PASS		

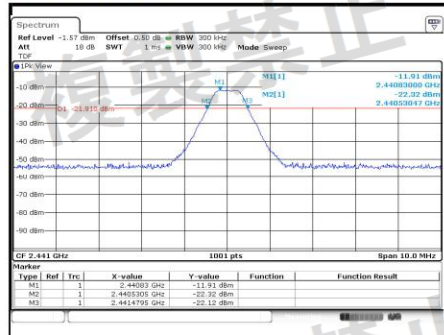
7. Test chart

7.1 Frequency tolerance (Rated voltage)

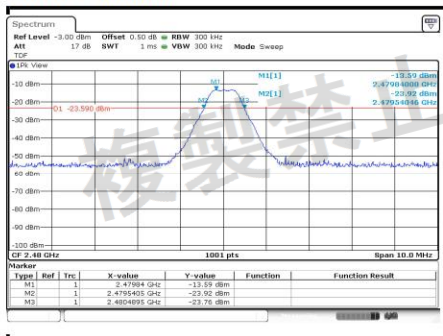
Ch.0: 2402MHz



Ch.39: 2441MHz



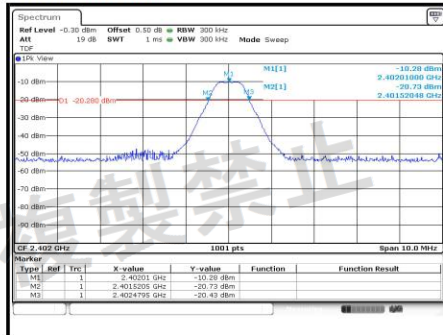
Ch.78: 2480MHz



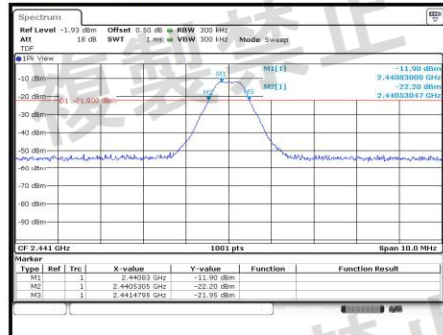
7. Test chart

7.1 Frequency tolerance (-10% voltage)

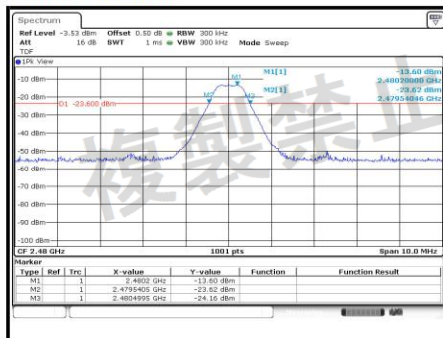
Ch.0: 2402MHz



Ch.39: 2441MHz



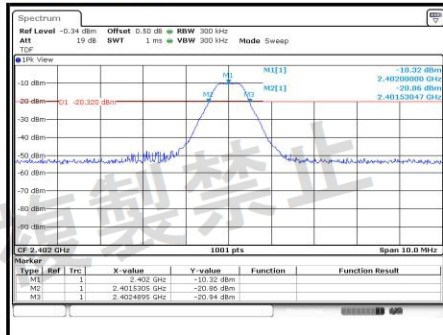
Ch.78: 2480MHz



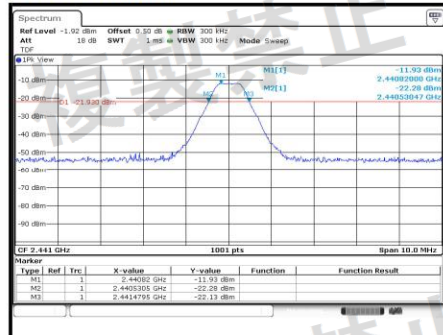
7. Test chart

7.1 Frequency tolerance (+10% voltage)

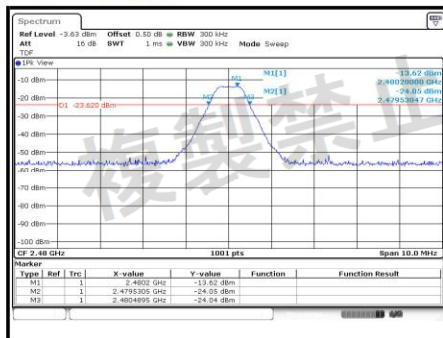
Ch.0: 2402MHz



Ch.39: 2441MHz



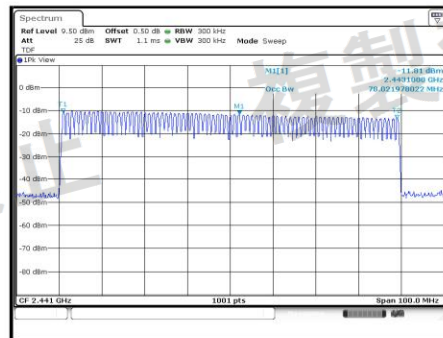
Ch.78: 2480MHz



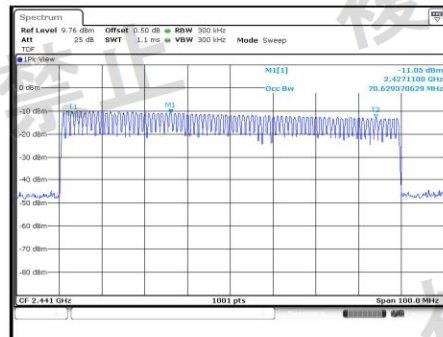
7. Test chart

7.2 Occupied bandwidth / Spread bandwidth (Rated voltage)

Occupied bandwidth



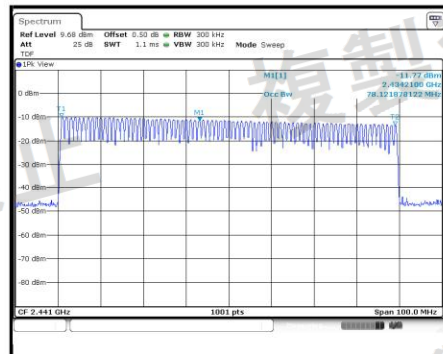
Spread bandwidth



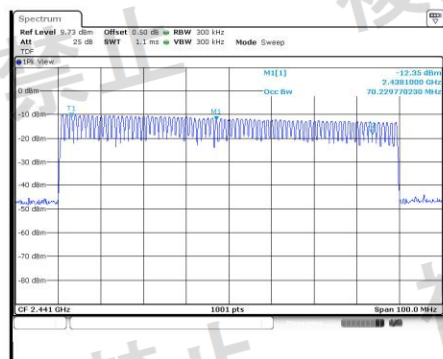
7. Test chart

7.2 Occupied bandwidth / Spread bandwidth (Rated voltage)

Occupied bandwidth



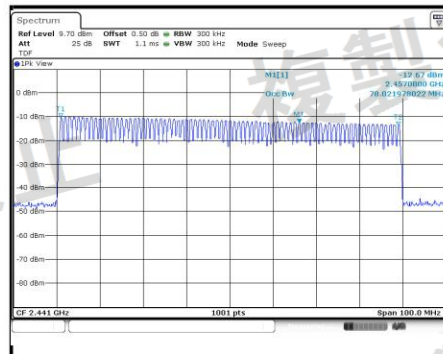
Spread bandwidth



7. Test chart

7.2 Occupied bandwidth / Spread bandwidth (Rated voltage)

Occupied bandwidth



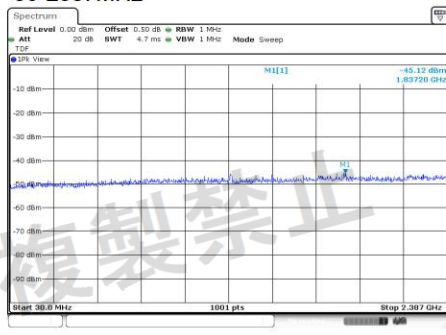
Spread bandwidth



7. Test chart

7.3 Unwanted(Spurious) emission strength (Rated voltage)

30-2387MHz



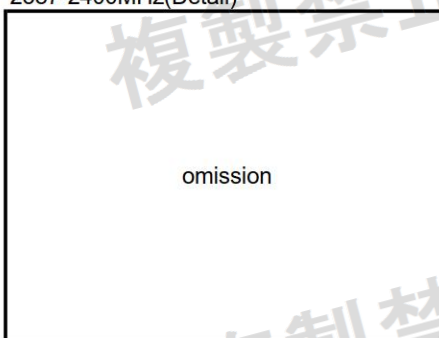
30MHz-5135MHz(Detail)



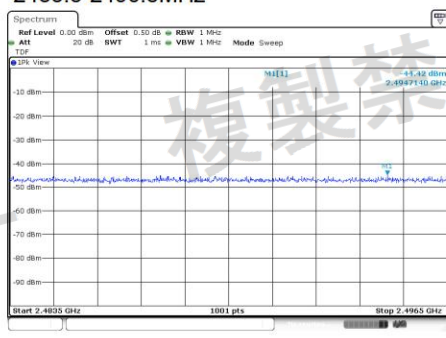
2387-2400MHz



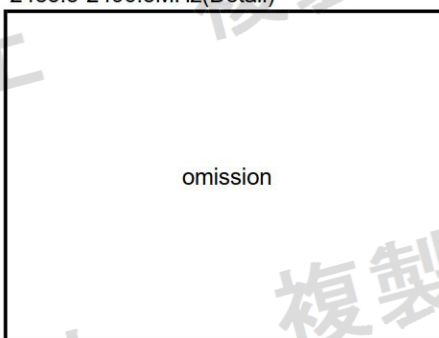
2387-2400MHz(Detail)



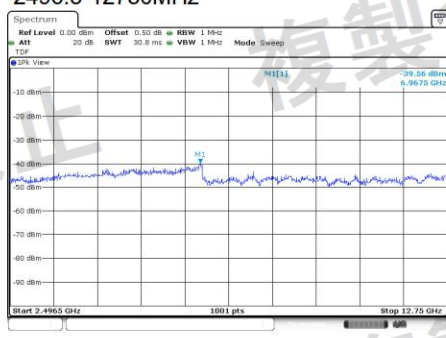
2483.5-2496.5MHz



2483.5-2496.5MHz(Detail)



2496.5-12750MHz



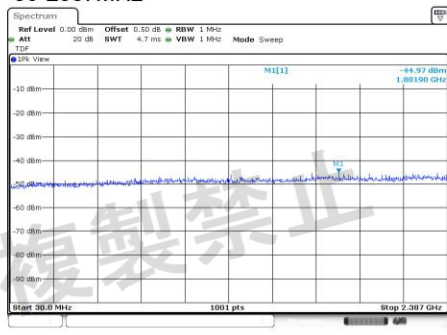
2496.5-12750MHz(Detail)



7. Test chart

7.3 Unwanted(Spurious) emission strength (-10% voltage)

30-2387MHz



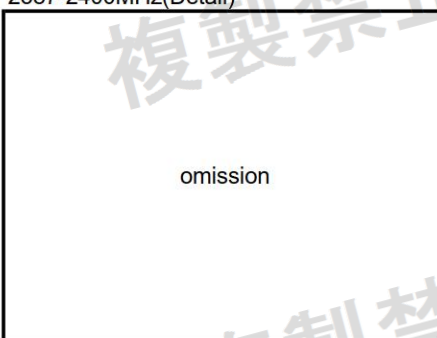
30MHz-5135MHz(Detail)



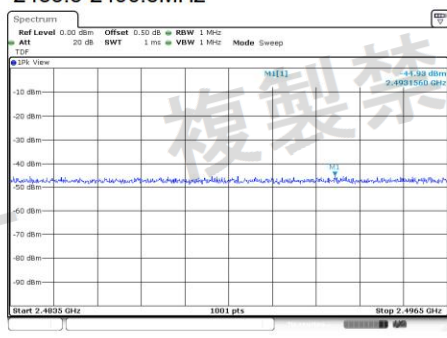
2387-2400MHz



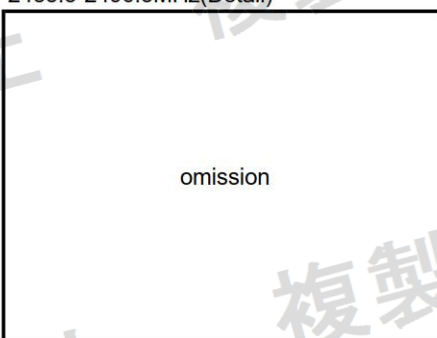
2387-2400MHz(Detail)



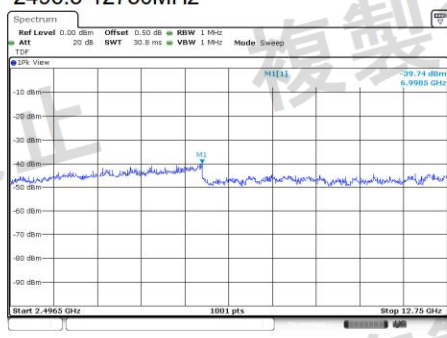
2483.5-2496.5MHz



2483.5-2496.5MHz(Detail)



2496.5-12750MHz



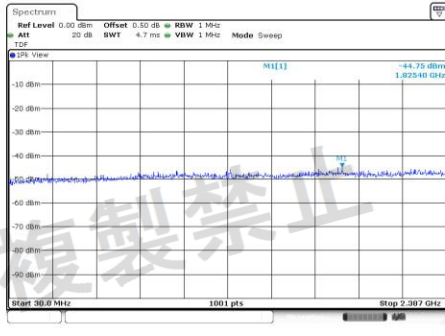
2496.5-12750MHz(Detail)



7. Test chart

7.3 Unwanted(Spurious) emission strength (+10% voltage)

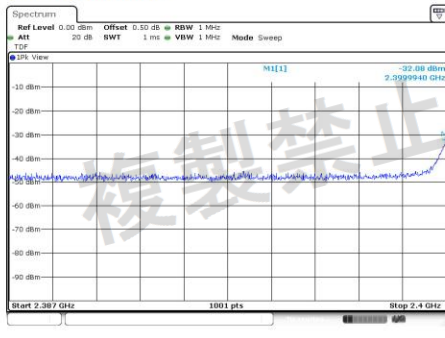
30-2387MHz



30MHz-5135MHz(Detail)



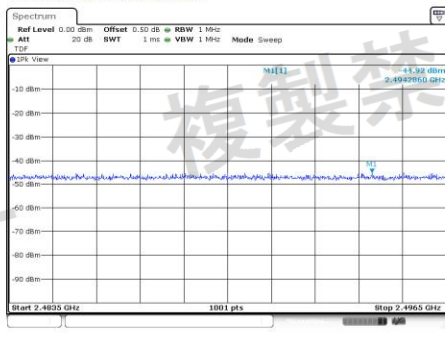
2387-2400MHz



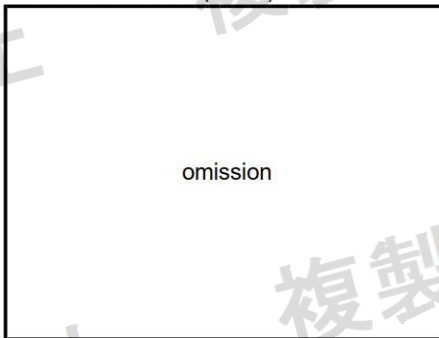
2387-2400MHz(Detail)



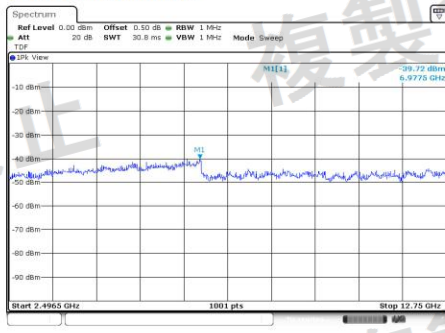
2483.5-2496.5MHz



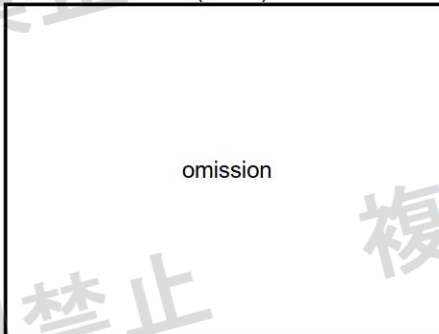
2483.5-2496.5MHz(Detail)



2496.5-12750MHz



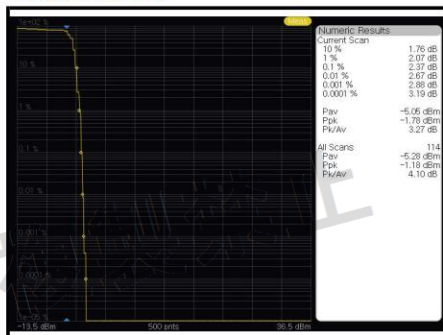
2496.5-12750MHz(Detail)



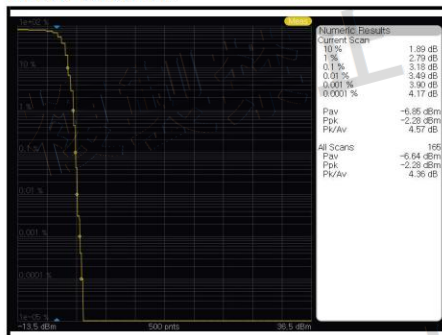
7. Test chart

7.4 RF output power tolerance (Rated voltage)

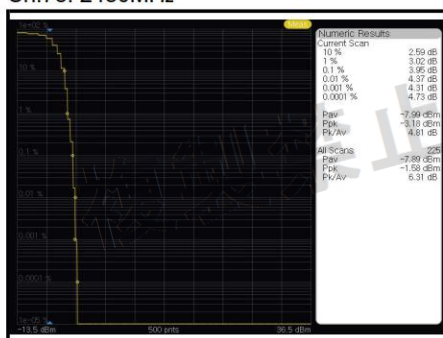
Ch.0: 2402MHz



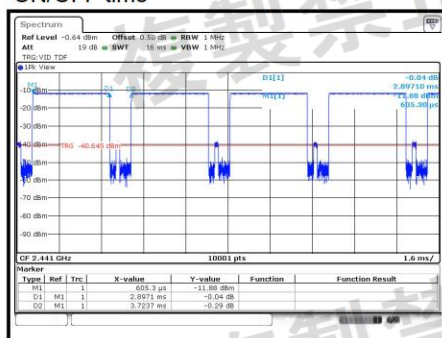
Ch.39: 2441MHz



Ch.78: 2480MHz



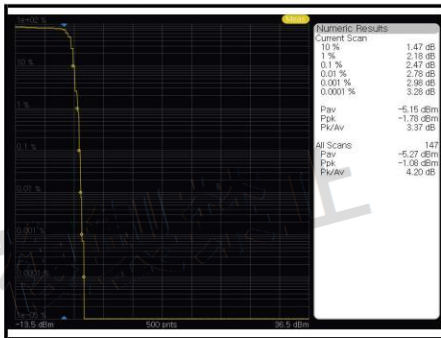
ON/OFF time



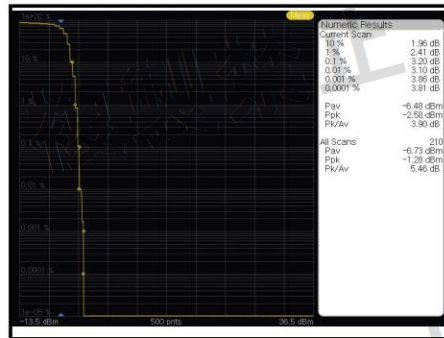
7. Test chart

7.4 RF output power tolerance (-10% voltage)

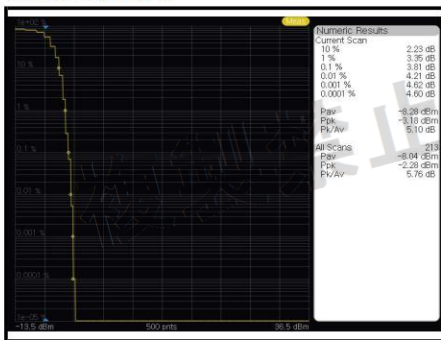
Ch.0: 2402MHz



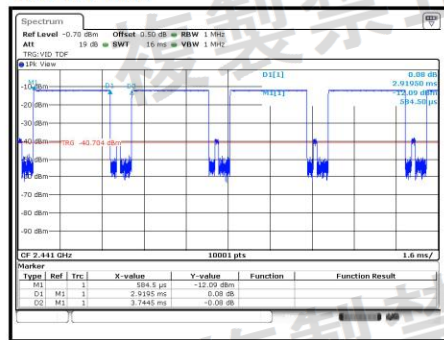
Ch.39: 2441MHz



Ch.78: 2480MHz



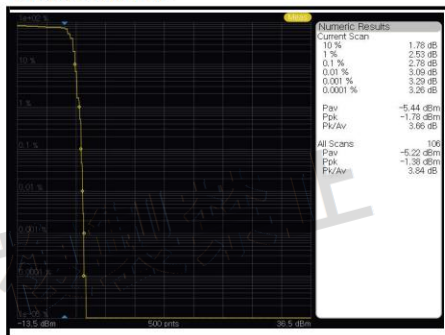
ON/OFF time



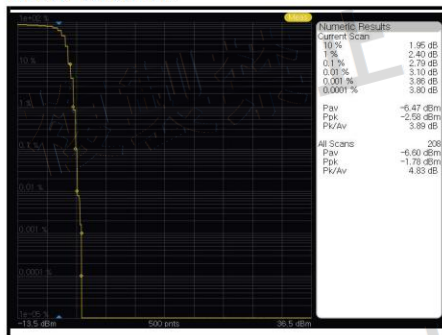
7. Test chart

7.4 RF output power tolerance (+10% voltage)

Ch.0: 2402MHz



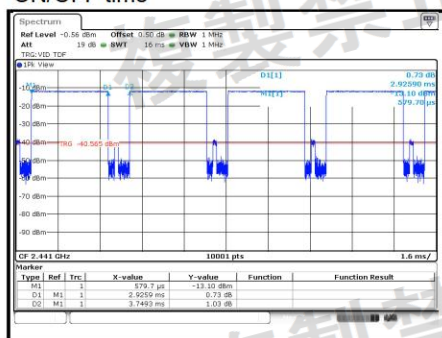
Ch.39: 2441MHz



Ch.78: 2480MHz



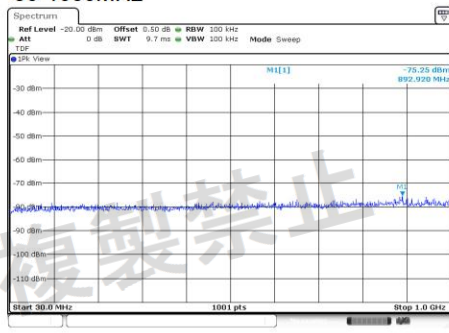
ON/OFF time



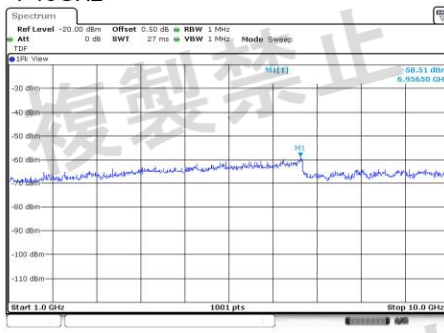
7. Test chart

7.5 Secondary emitted radio wave strength (Rated voltage)

30-1000MHz



1-10GHz



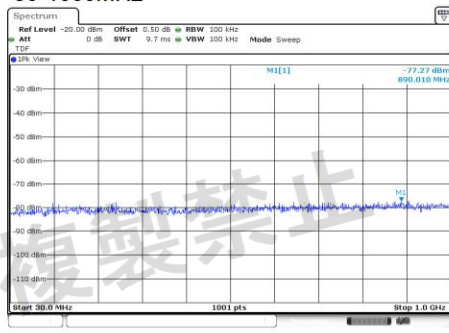
10-12.75GHz



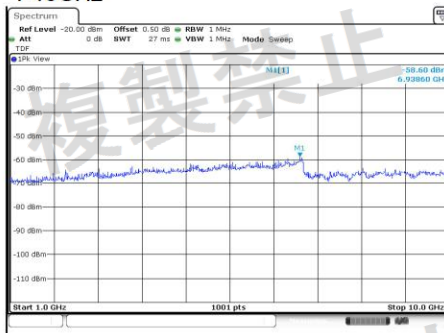
7. Test chart

7.5 Secondary emitted radio wave strength (-10% voltage)

30-1000MHz



1-10GHz



10-12.75GHz



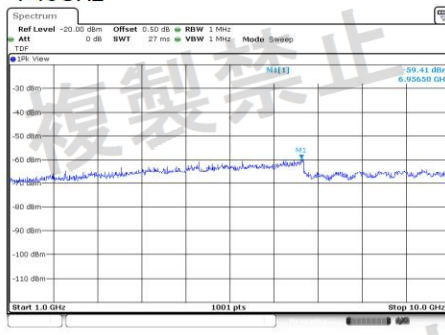
7. Test chart

7.5 Secondary emitted radio wave strength (+10% voltage)

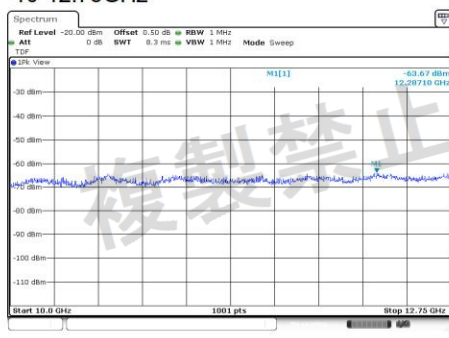
30-1000MHz



1-10GHz

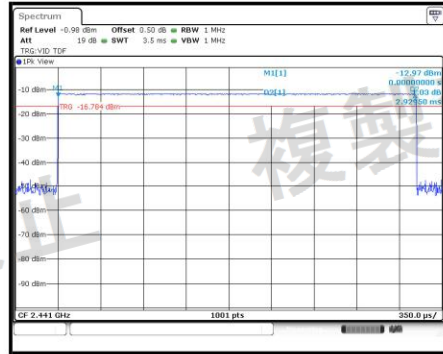


10-12.75GHz

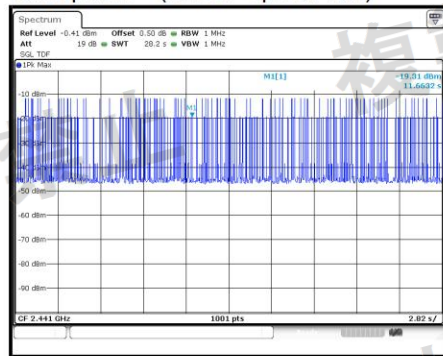


7. Test chart

7.6 Time of occupancy hopping frequency (Rated voltage)

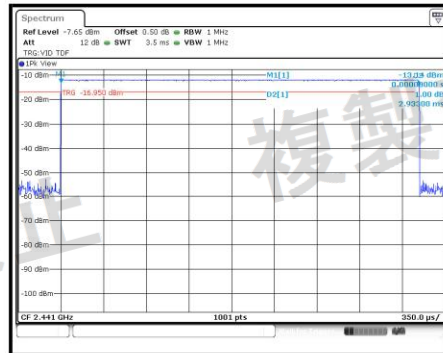


Sweep time = (0.4sec×Spread rate)



7. Test chart

7.6 Time of occupancy hopping frequency (-10% voltage)

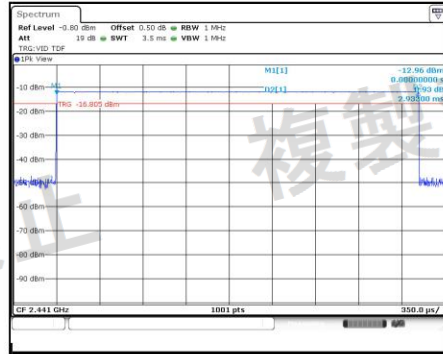


Sweep time = (0.4sec×Spread rate)



7. Test chart

7.6 Time of occupancy hopping frequency (+10% voltage)



Sweep time = (0.4sec×Spread rate)



3. Test results (rated voltage)

S/N : N/A

Environment of test room	Date of test	2020-06-26	2020-06-29	2020-06-30
	Temperature	21 °C	20 °C	21 °C
	Humidity	49 %	50 %	50 %

Peak Antenna Gain	-1.44	dBi
Declaration Output Power	0.020	mW/MHz
Declaration Output Power	-16.99	dBm/MHz
E.I.R.P.	-18.43	dBm/MHz
Input Power Voltage	3.00	VDC

Tested Circuit Insertion Loss		0	dB
Frequency equal to the Transmission rate		1	MHz
Transmission Time	ON TIME	2.904	ms
	OFF TIME	0.859	ms
	Ratio	0.772	
Packet Type (Mode)		DH5	mode
Transmit Speed		1	MHz

Using TDF and offset function in Spectrum Analyzer.
Measurement of plots are included Loss value.

(Att : 10dB + Power Divider : 6dB + Cable loss + EUT cable: 0.5dB offset)

Test category :	2.4GHz Band Low-Power Data Communication System (BluetoothV3.0+BDR [GFSK])

Measurement Frequency	MHz	2402	2441	2480	Result	Limit	Note
Channel Number	Ch.	0	39	78	---	---	
Frequency Measurements	MHz	---	---	---	---	---	
Frequency Tolerance	ppm	---	---	---	---	±50×10 ⁻⁶ (50ppm)	
Occupied Bandwidth	MHz	19.6	19.6	19.6	PASS	83.5MHz or below	
Spread Bandwidth	MHz	18.01	18.04	18.04	PASS	500kHz or more	
RF Output Power	mW/MHz	0.021981	0.015500	0.011570	PASS	3mW/MHz or below	
RF Output Power Tolerance	%	9.9034	-22.5024	-42.1520	PASS	+20 to -80%	
Unwanted (Spurious) Emission Strength	30 to 2387MHz	uW/MHz	0.046881	0.027797	0.029376	PASS	2.5uW/MHz or below
		MHz	1801.900	2263.400	2218.600	----	
	2387 to 2400MHz	uW/MHz	0.663743	0.029512	0.031696	PASS	25uW/MHz or below
		MHz	2399.994	2387.279	2390.162	----	
	2483.5 to 2496.5MHz	uW/MHz	0.030903	0.033806	0.035645	PASS	25uW/MHz or below
		MHz	2486.286	2484.143	2494.416	----	
	2496.5 to 12500MHz	uW/MHz	0.109648	0.144544	0.102329	PASS	2.5uW/MHz or below
		MHz	6906.500	6977.500	6998.500	----	
Time of occupancy hopping frequency	sec	0.002930	0.002930	0.002930	PASS	0.4sec or below	
	sec	0.205100	0.249050	0.254910	PASS	0.4sec or below	0.4sec×Spread rate
Spreading Factor	---	18.010000	18.040000	18.040000	PASS	5 or more	
Interference Prevention Function		Good			PASS		

3. Test results (-10% voltage)

S/N : N/A

Environment of test room	Date of test	2020-06-26	2020-06-29	2020-06-30
	Temperature	21 °C	20 °C	21 °C
	Humidity	49 %	50 %	50 %

Peak Antenna Gain	1.87	dBi
Declaration Output Power	0.020	mW/MHz
Declaration Output Power	-16.99	dBm/MHz
E.I.R.P.	-15.12	dBm/MHz
Input Power Voltage	2.70	VDC

Tested Circuit Insertion Loss		0	dB
Frequency equal to the Transmission rate		1	MHz
Transmission Time	ON TIME	2.929	ms
	OFF TIME	0.822	ms
	Ratio	0.781	
Packet Type (Mode)		DH5	mode
Transmit Speed		1	MHz

Using TDF and offset function in Spectrum Analyzer.
Measurement of plots are included Loss value.

(Att : 10dB + Power Divider : 6dB + Cable loss + EUT cable: 0.5dB offset)

Test category :	2.4GHz Band Low-Power Data Communication System (BluetoothV3.0+BDR [GFSK])

Measurement Frequency	MHz	2402	2441	2480	Result	Limit	Note
Channel Number	Ch.	0	39	78	---	---	
Frequency Measurements	MHz	---	---	---	---	---	
Frequency Tolerance	ppm	---	---	---	---	±50×10 ⁻⁶ (50ppm)	
Occupied Bandwidth	MHz	19.6	19.6	19.6	PASS	83.5MHz or below	
Spread Bandwidth	MHz	18.04	18.01	18.01	PASS	500kHz or more	
RF Output Power	mW/MHz	0.021288	0.015519	0.011936	PASS	3mW/MHz or below	
RF Output Power Tolerance	%	6.4396	-22.4064	-40.3204	PASS	+20 to -80%	
Unwanted (Spurious) Emission Strength	30 to 2387MHz	uW/MHz	0.039719	0.027479	0.032885	PASS	2.5uW/MHz or below
		MHz	1801.900	2258.700	1797.200	----	
	2387 to 2400MHz	uW/MHz	0.626614	0.030479	0.031477	PASS	25uW/MHz or below
		MHz	2399.994	2397.292	2389.838	----	
	2483.5 to 2496.5MHz	uW/MHz	0.032434	0.039084	0.034198	PASS	25uW/MHz or below
		MHz	2496.468	2492.857	2489.961	----	
	2496.5 to 12500MHz	uW/MHz	0.116413	0.124738	0.127938	PASS	2.5uW/MHz or below
		MHz	6957.500	6998.500	6998.500	----	
Time of occupancy hopping frequency	sec	0.002930	0.002930	0.002930	PASS	0.4sec or below	
	sec	0.254910	0.246120	0.251980	PASS	0.4sec or below	0.4sec×Spread rate
Spreading Factor	---	18.040000	18.010000	18.010000	PASS	5 or more	
Interference Prevention Function	Good				PASS		

3. Test results (+10% voltage)

S/N : N/A

Environment of test room	Date of test	2020-06-26	2020-06-29	2020-06-30
	Temperature	21 °C	20 °C	21 °C
	Humidity	49 %	50 %	50 %

Peak Antenna Gain	1.87	dBi
Declaration Output Power	0.020	mW/MHz
Declaration Output Power	-16.99	dBm/MHz
E.I.R.P.	-15.12	dBm/MHz
Input Power Voltage	3.30	VDC

Tested Circuit Insertion Loss		0	dB
Frequency equal to the Transmission rate		1	MHz
Transmission Time	ON TIME	2.923	ms
	OFF TIME	0.825	ms
	Ratio	0.780	
Packet Type (Mode)		DH5	mode
Transmit Speed		1	MHz

Using TDF and offset function in Spectrum Analyzer.
Measurement of plots are included Loss value.

(Att : 10dB + Power Divider : 6dB + Cable loss + EUT cable: 0.5dB offset)

Test category :	2.4GHz Band Low-Power Data Communication System (BluetoothV3.0+BDR [GFSK])

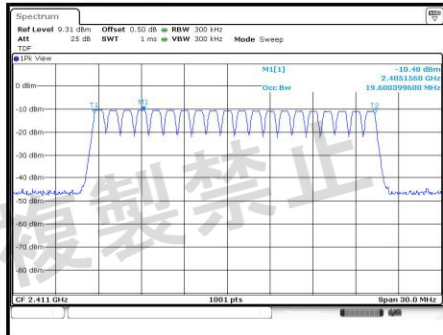
Measurement Frequency	MHz	2402	2441	2480	Result	Limit	Note
Channel Number	Ch.	0	39	78	---	---	
Frequency Measurements	MHz	---	---	---	---	---	
Frequency Tolerance	ppm	---	---	---	---	±50×10 ⁻⁶ (50ppm)	
Occupied Bandwidth	MHz	19.6	19.6	19.6	PASS	83.5MHz or below	
Spread Bandwidth	MHz	17.98	17.95	18.07	PASS	500kHz or more	
RF Output Power	mW/MHz	0.021537	0.015414	0.011067	PASS	3mW/MHz or below	
RF Output Power Tolerance	%	7.6864	-22.9299	-44.6660	PASS	+20 to -80%	
Unwanted (Spurious) Emission Strength	30 to 2387MHz	uW/MHz	0.034674	0.026977	0.026363	PASS	2.5uW/MHz or below
		MHz	1801.900	2051.500	1849.000	----	
	2387 to 2400MHz	uW/MHz	0.620869	0.032063	0.032285	PASS	25uW/MHz or below
		MHz	2399.994	2395.422	2397.487	----	
	2483.5 to 2496.5MHz	uW/MHz	0.033806	0.035075	0.035237	PASS	25uW/MHz or below
		MHz	2491.247	2491.974	2485.299	----	
	2496.5 to 12500MHz	uW/MHz	0.110408	0.131220	0.120781	PASS	2.5uW/MHz or below
		MHz	6998.500	6998.500	6895.500	----	
Time of occupancy hopping frequency	sec	0.002930	0.002930	0.002930	PASS	0.4sec or below	
	sec	0.228540	0.249050	0.251980	PASS	0.4sec or below	0.4sec×Spread rate
Spreading Factor	---	17.980000	17.950000	18.070000	PASS	5 or more	
Interference Prevention Function		Good			PASS		

5. Test chart

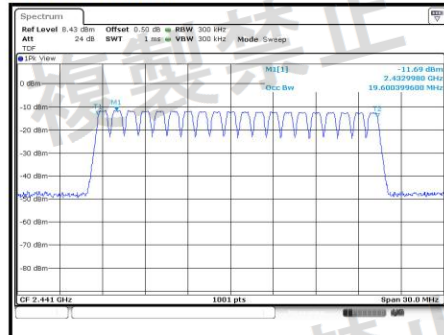
5.1 Occupied bandwidth / Spread bandwidth (Rated voltage)

Occupied bandwidth

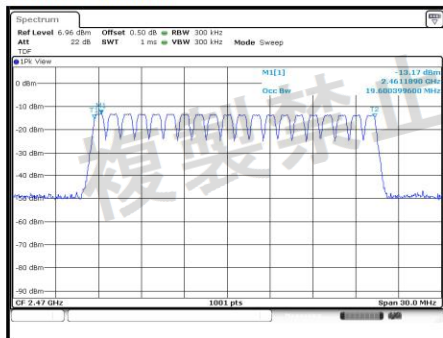
Ch.0: 2402MHz



Ch.39: 2441MHz

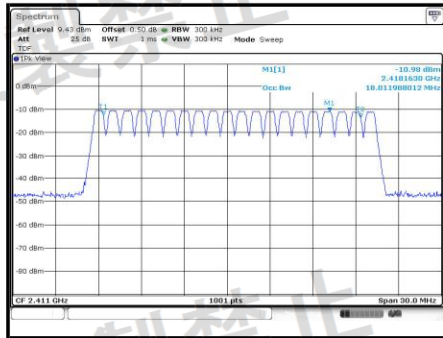


Ch.78: 2480MHz

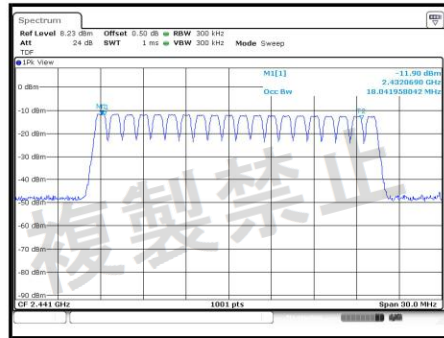


Spread bandwidth

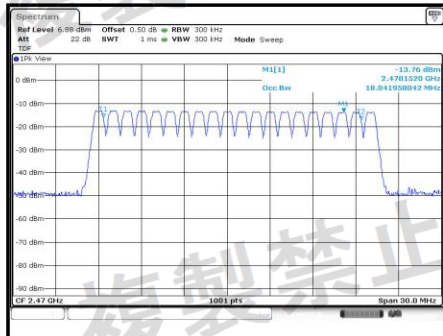
Ch.0: 2402MHz



Ch.39: 2441MHz



Ch.78: 2480MHz

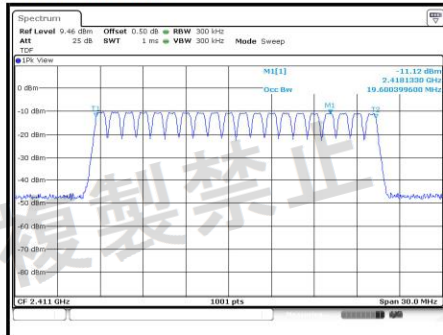


5. Test chart

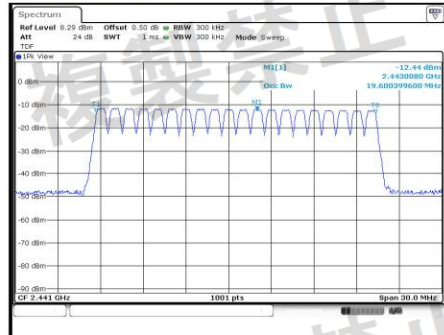
5.1 Occupied bandwidth / Spread bandwidth (-10% voltage)

Occupied bandwidth

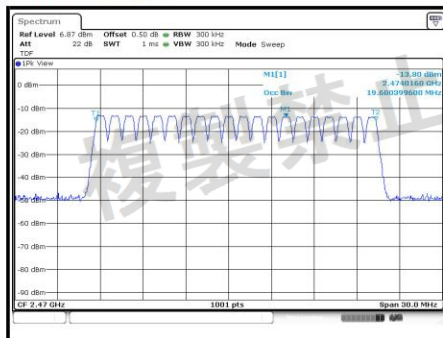
Ch.0: 2402MHz



Ch.39: 2441MHz

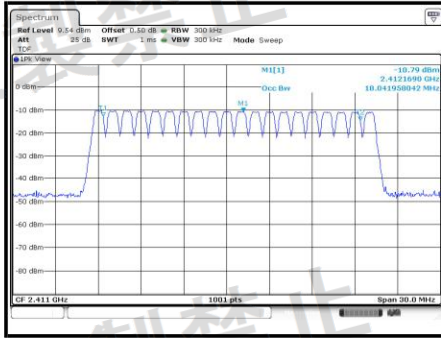


Ch.78: 2480MHz

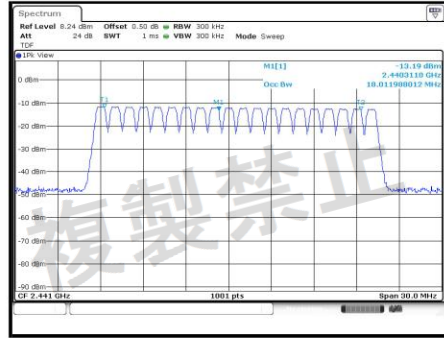


Spread bandwidth

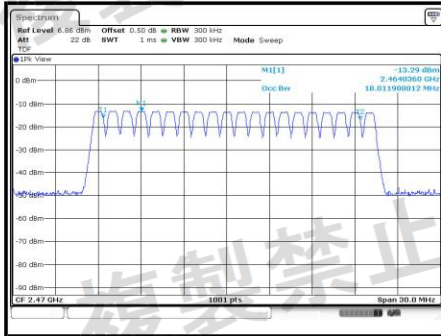
Ch.0: 2402MHz



Ch.39: 2441MHz



Ch.78: 2480MHz

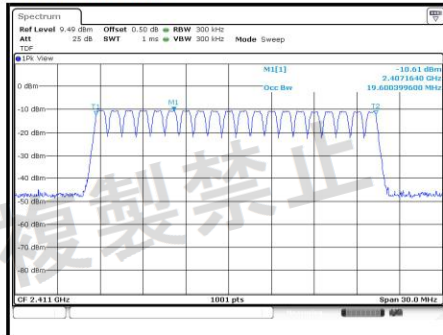


5. Test chart

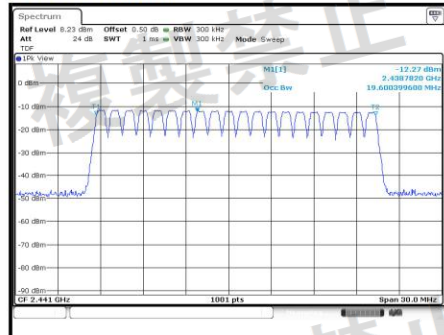
5.1 Occupied bandwidth / Spread bandwidth (+10% voltage)

Occupied bandwidth

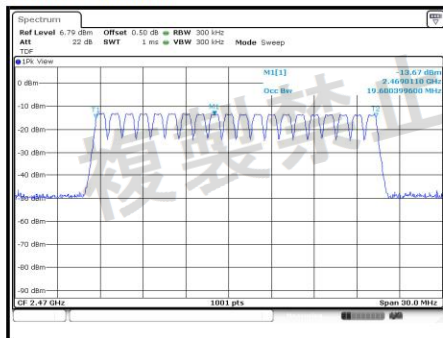
Ch.0: 2402MHz



Ch.39: 2441MHz

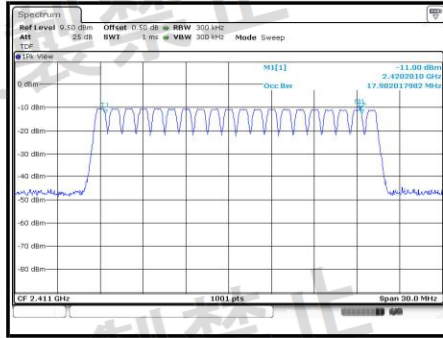


Ch.78: 2480MHz

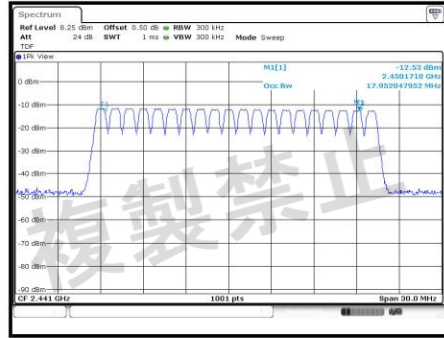


Spread bandwidth

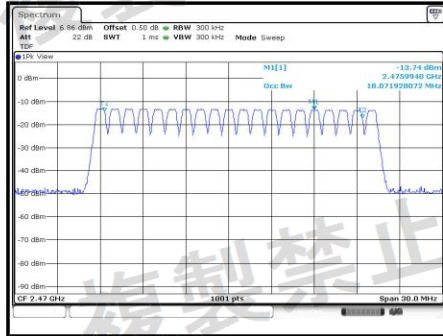
Ch.0: 2402MHz



Ch.39: 2441MHz



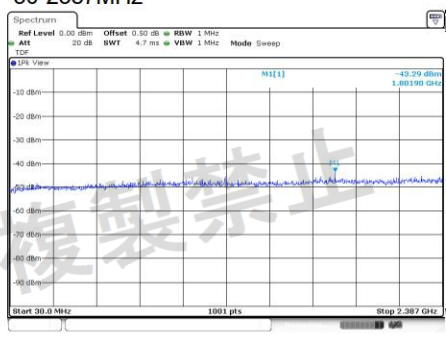
Ch.78: 2480MHz



5. Test chart

5.2 Unwanted(Spurious) emission strength (Rated voltage)

Ch.0: 2402MHz
30-2387MHz



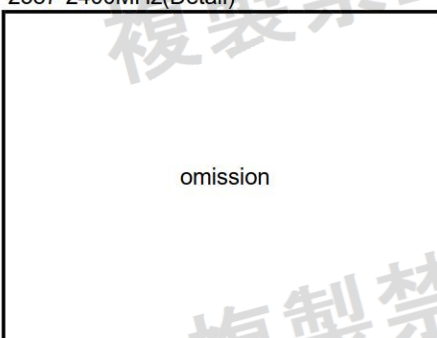
30MHz-5135MHz(Detail)



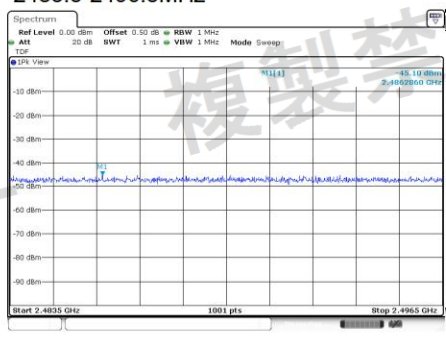
2387-2400MHz



2387-2400MHz(Detail)



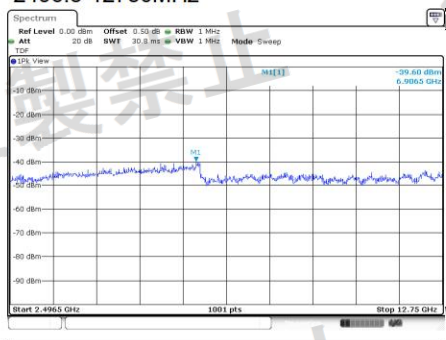
2483.5-2496.5MHz



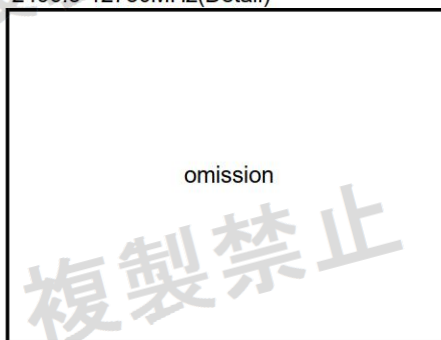
2483.5-2496.5MHz(Detail)



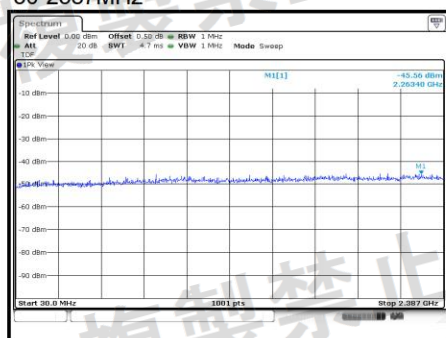
2496.5-12750MHz



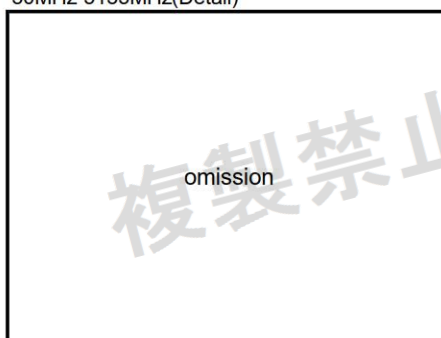
2496.5-12750MHz(Detail)



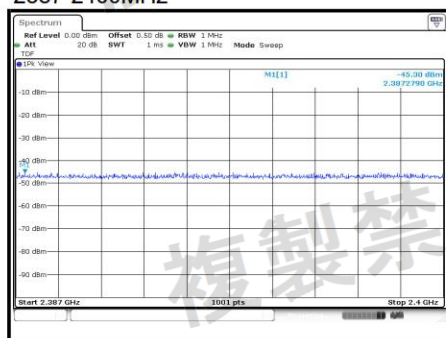
Ch.39: 2441MHz
30-2387MHz



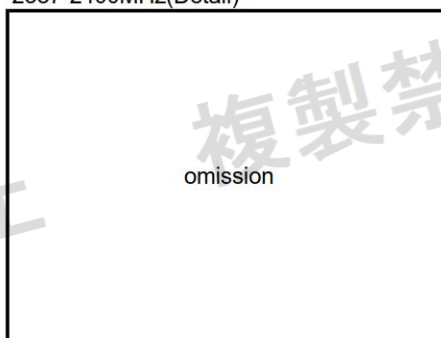
30MHz-5135MHz(Detail)



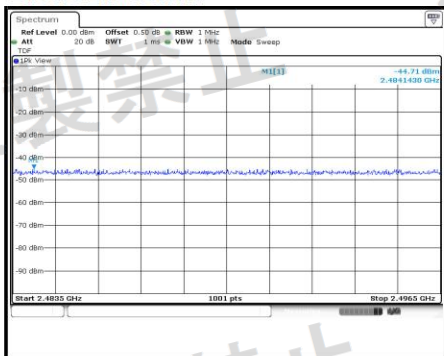
2387-2400MHz



2387-2400MHz(Detail)



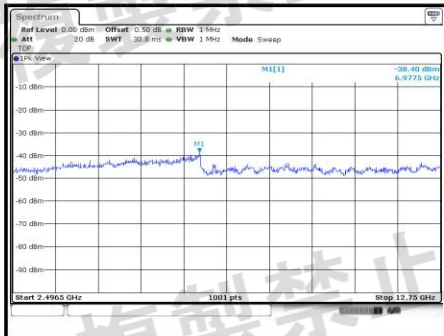
2483.5-2496.5MHz



2483.5-2496.5MHz(Detail)



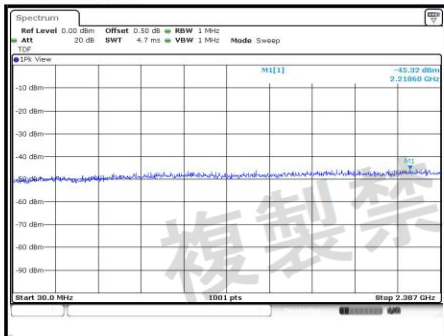
2496.5-12750MHz



2496.5-12750MHz(Detail)



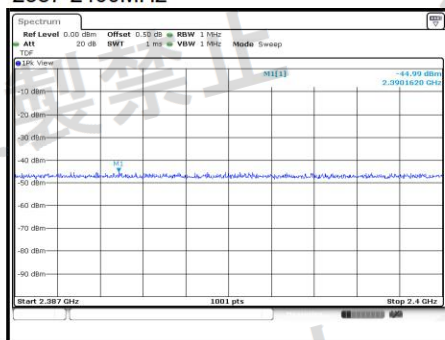
Ch.78: 2480MHz
30-2387MHz



30MHz-5135MHz(Detail)



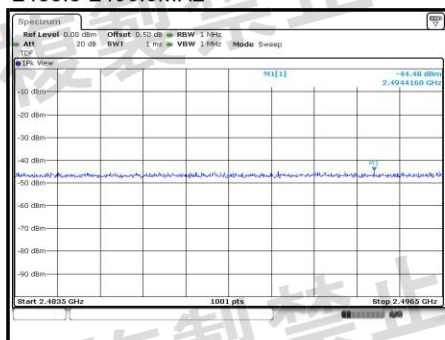
2387-2400MHz



2387-2400MHz(Detail)



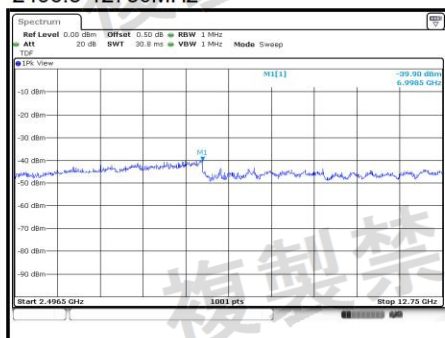
2483.5-2496.5MHz



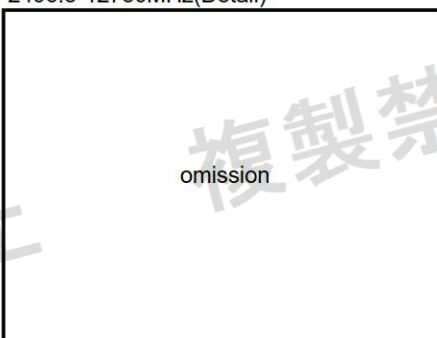
2483.5-2496.5MHz(Detail)



2496.5-12750MHz



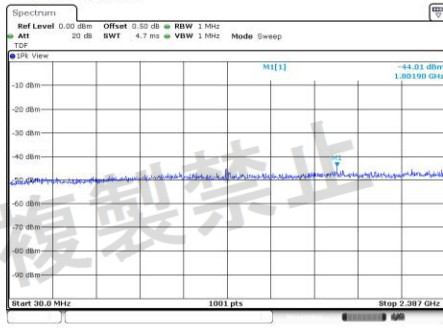
2496.5-12750MHz(Detail)



5. Test chart

5.2 Unwanted(Spurious) emission strength (-10% voltage)

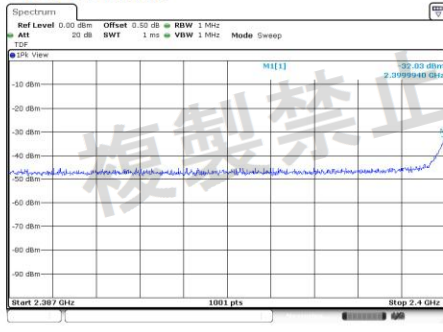
Ch.0: 2402MHz
30-2387MHz



30MHz-5135MHz(Detail)



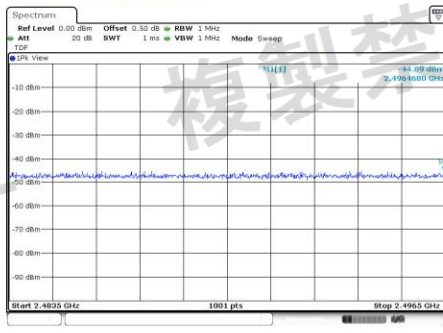
2387-2400MHz



2387-2400MHz(Detail)



2483.5-2496.5MHz



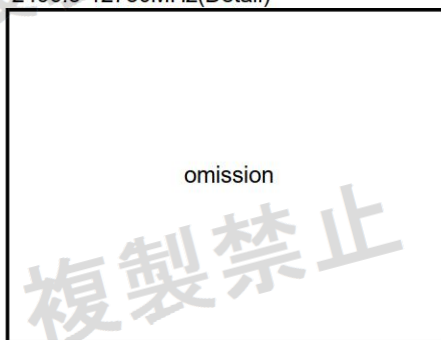
2483.5-2496.5MHz(Detail)



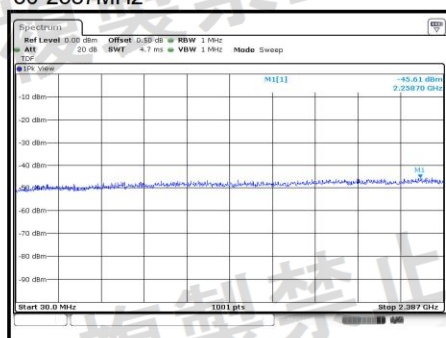
2496.5-12750MHz



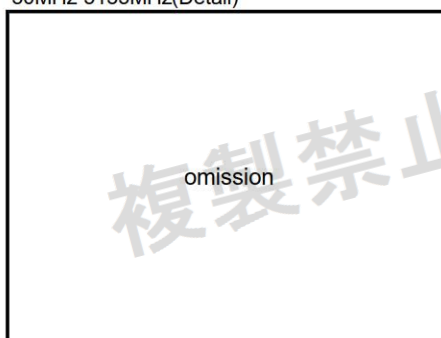
2496.5-12750MHz(Detail)



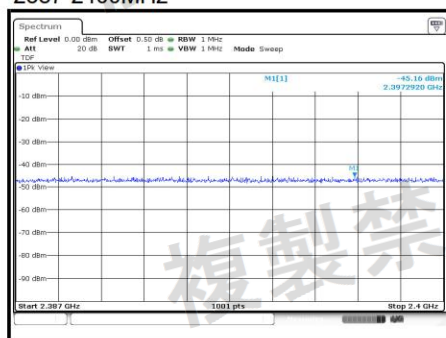
Ch.39: 2441MHz
30-2387MHz



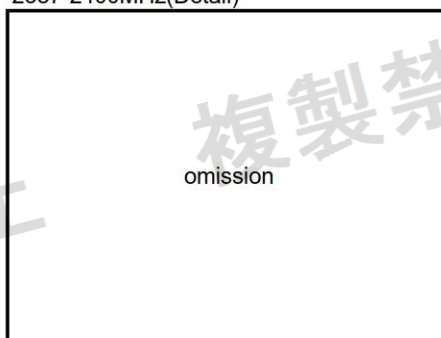
30MHz-5135MHz(Detail)



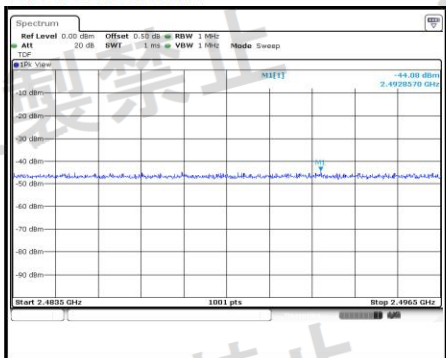
2387-2400MHz



2387-2400MHz(Detail)



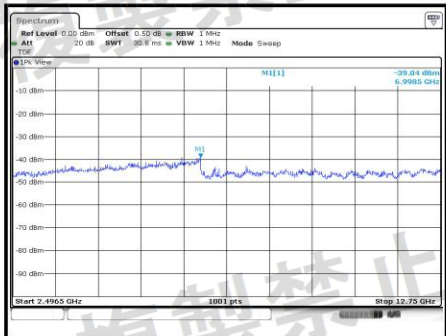
2483.5-2496.5MHz



2483.5-2496.5MHz(Detail)



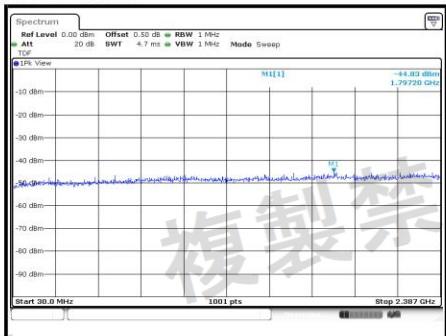
2496.5-12750MHz



2496.5-12750MHz(Detail)



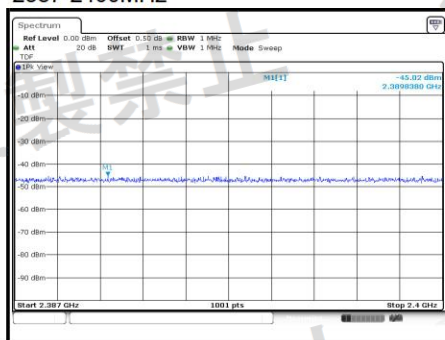
Ch.78: 2480MHz
30-2387MHz



30MHz-5135MHz(Detail)



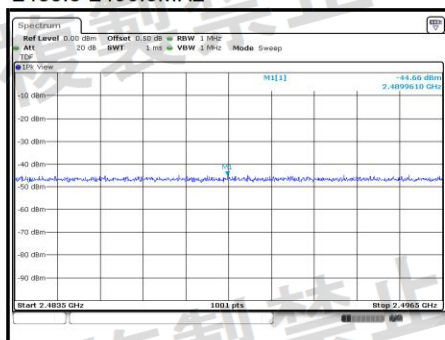
2387-2400MHz



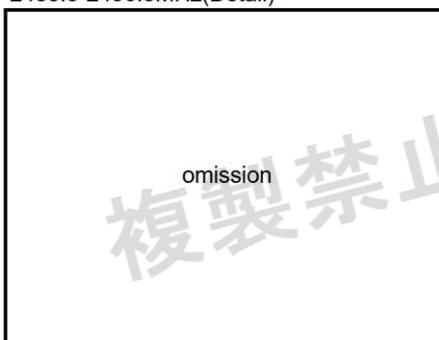
2387-2400MHz(Detail)



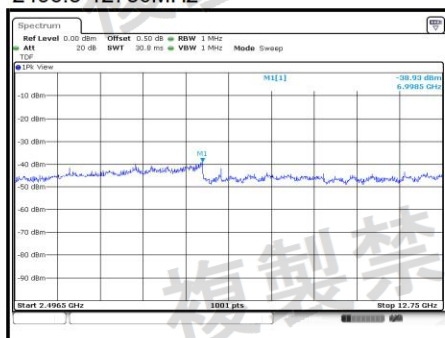
2483.5-2496.5MHz



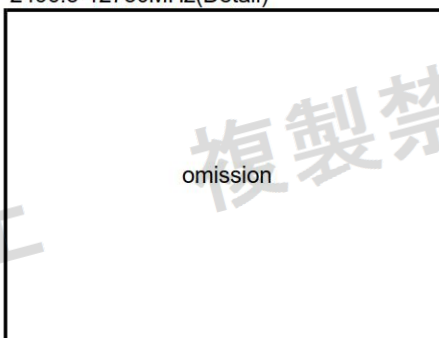
2483.5-2496.5MHz(Detail)



2496.5-12750MHz



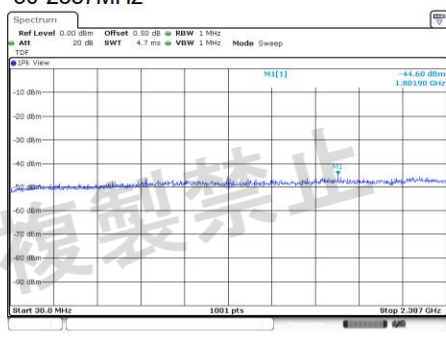
2496.5-12750MHz(Detail)



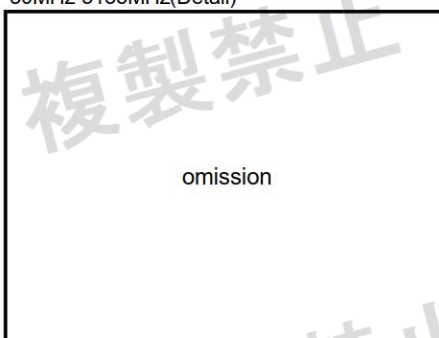
5. Test chart

5.2 Unwanted(Spurious) emission strength (+10% voltage)

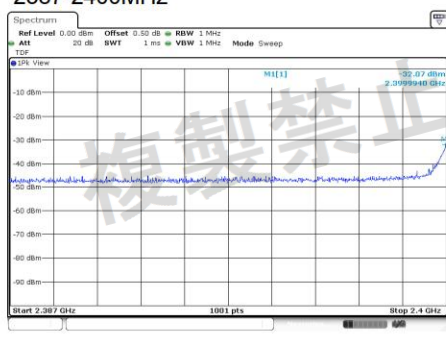
Ch.0: 2402MHz
30-2387MHz



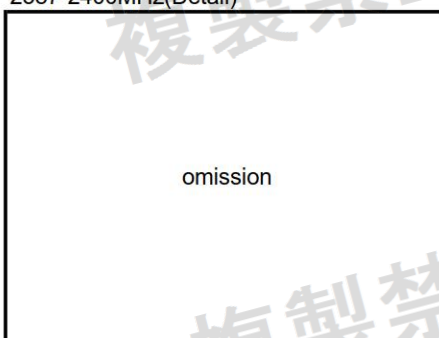
30MHz-5135MHz(Detail)



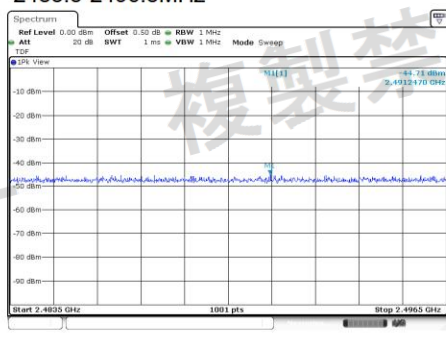
2387-2400MHz



2387-2400MHz(Detail)



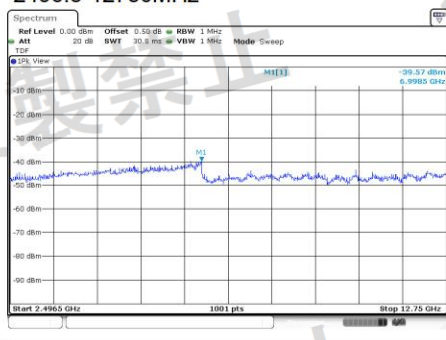
2483.5-2496.5MHz



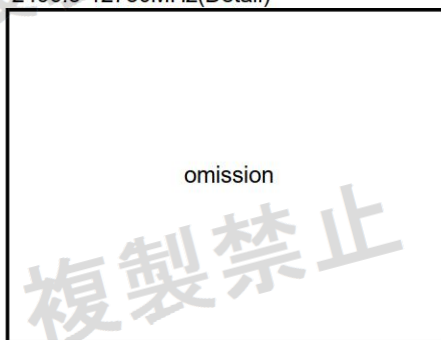
2483.5-2496.5MHz(Detail)



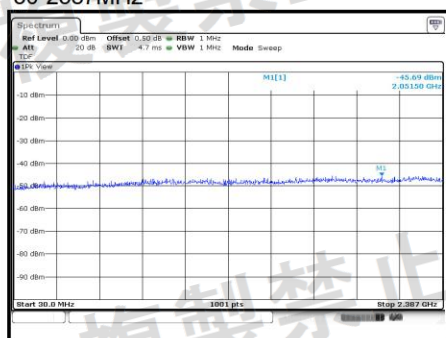
2496.5-12750MHz



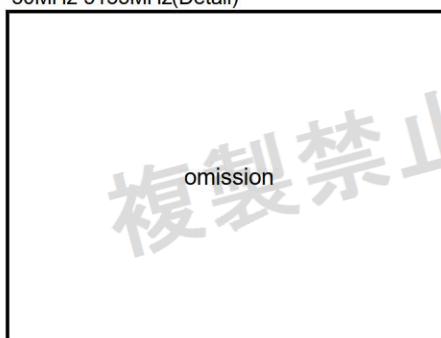
2496.5-12750MHz(Detail)



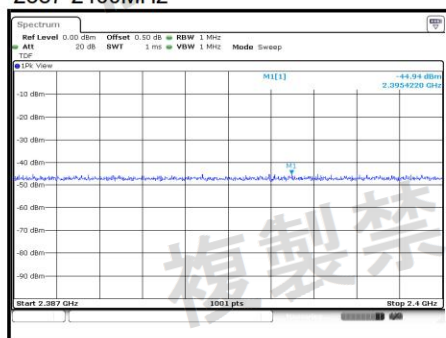
Ch.39: 2441MHz
30-2387MHz



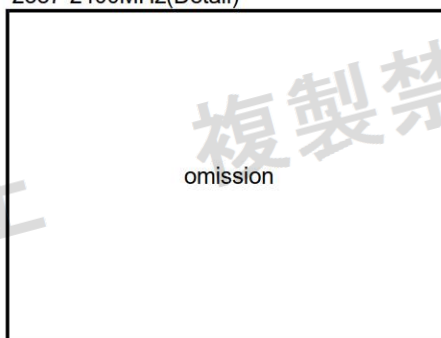
30MHz-5135MHz(Detail)



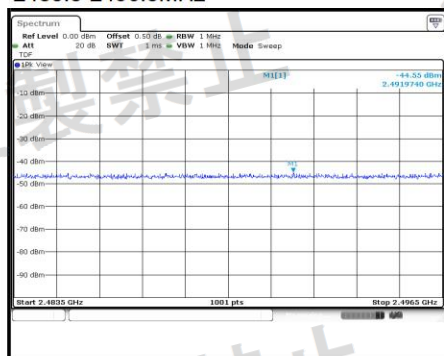
2387-2400MHz



2387-2400MHz(Detail)



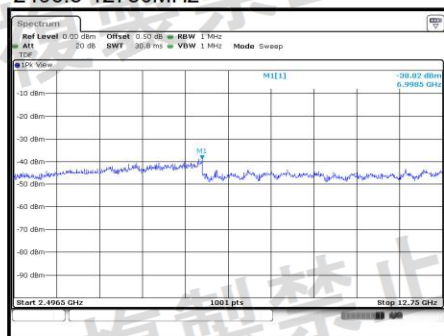
2483.5-2496.5MHz



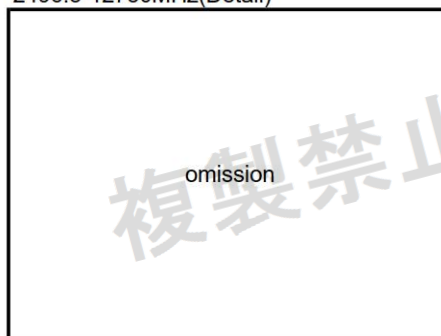
2483.5-2496.5MHz(Detail)



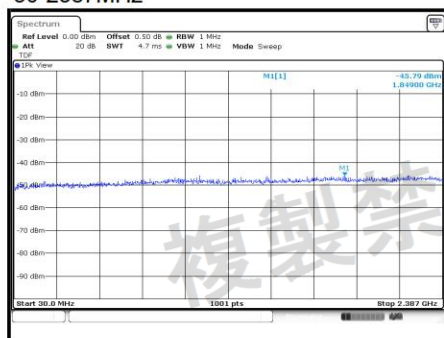
2496.5-12750MHz



2496.5-12750MHz(Detail)



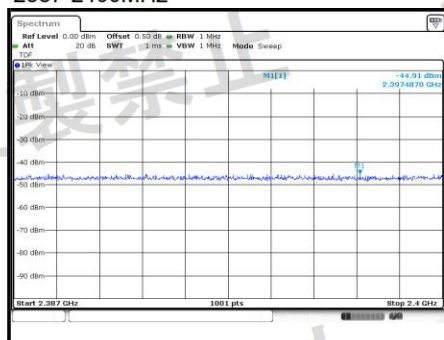
Ch.78: 2480MHz
30-2387MHz



30MHz-5135MHz(Detail)



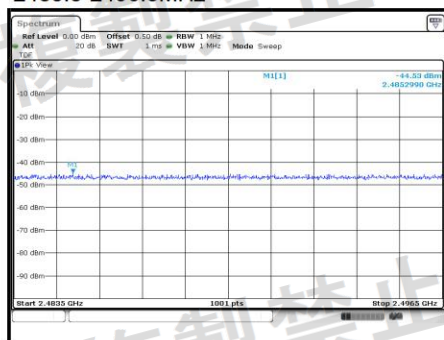
2387-2400MHz



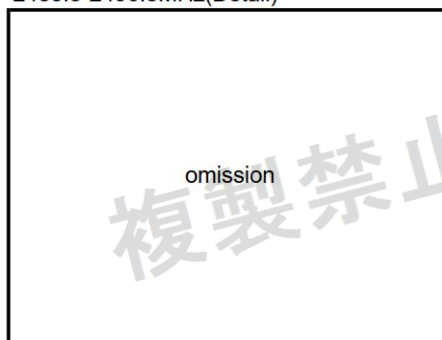
2387-2400MHz(Detail)



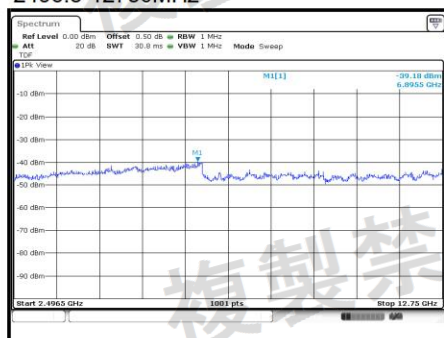
2483.5-2496.5MHz



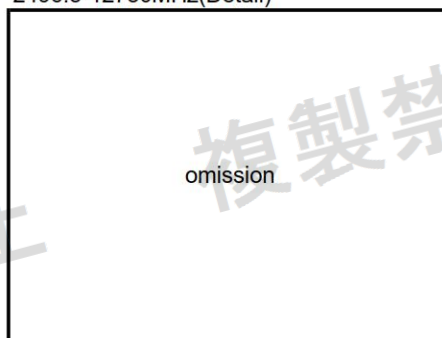
2483.5-2496.5MHz(Detail)



2496.5-12750MHz



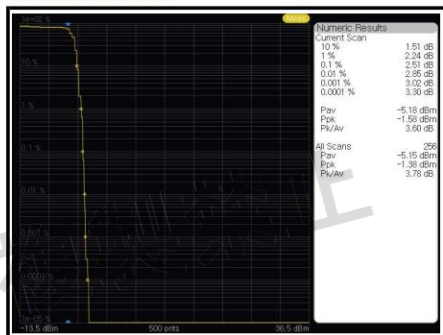
2496.5-12750MHz(Detail)



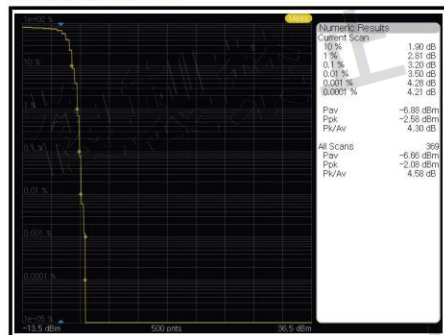
5. Test chart

5.3 RF output power tolerance (Rated voltage)

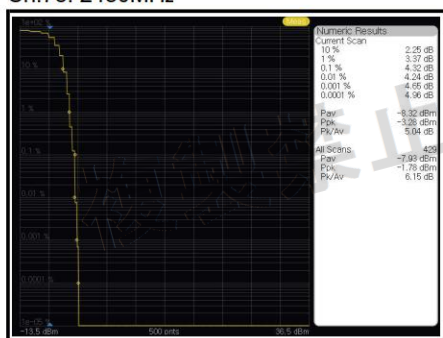
Ch.0: 2402MHz



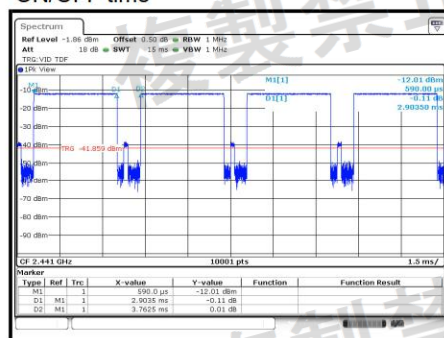
Ch.39: 2441MHz



Ch.78: 2480MHz



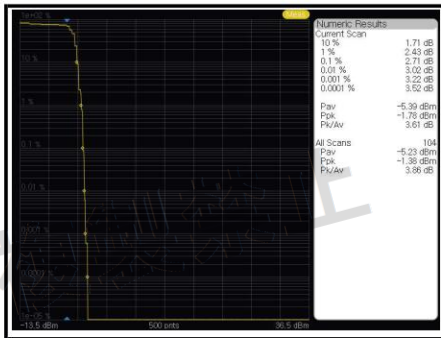
ON/OFF time



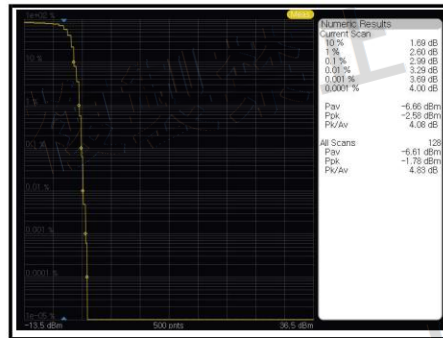
5. Test chart

5.3 RF output power tolerance (-10% voltage)

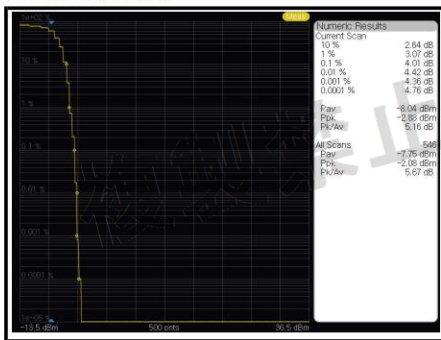
Ch.0: 2402MHz



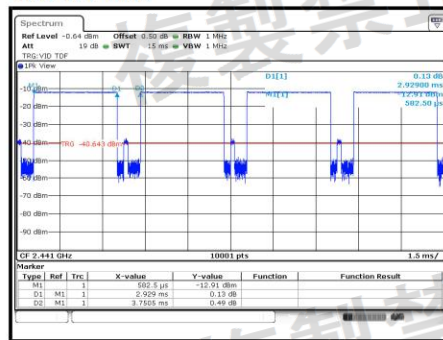
Ch.39: 2441MHz



Ch.78: 2480MHz



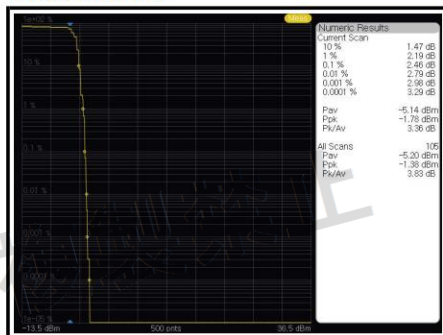
ON/OFF time



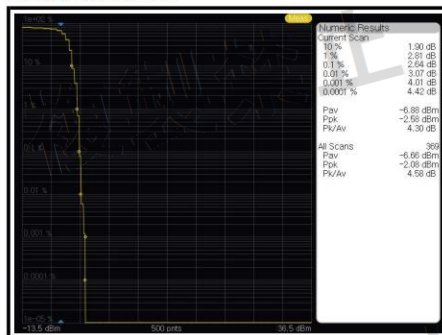
5. Test chart

5.3 RF output power tolerance (+10% voltage)

Ch.0: 2402MHz



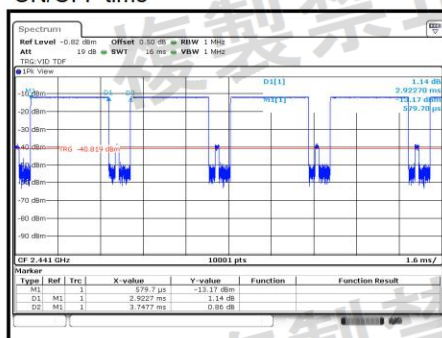
Ch.39: 2441MHz



Ch.78: 2480MHz



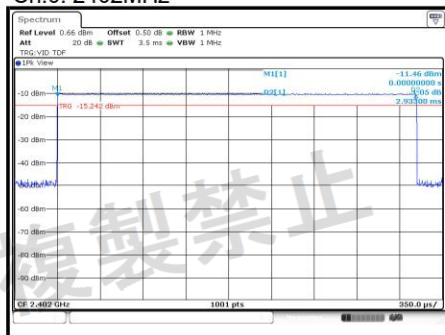
ON/OFF time



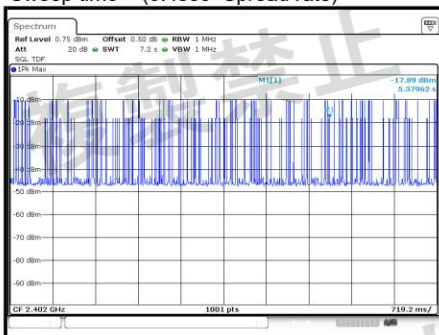
5. Test chart

5.4 Time of occupancy hopping frequency (Rated voltage)

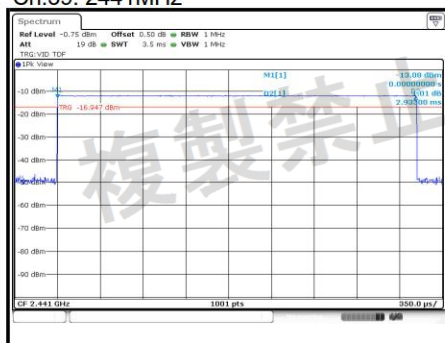
Ch.0: 2402MHz



Sweep time = (0.4sec×Spread rate)



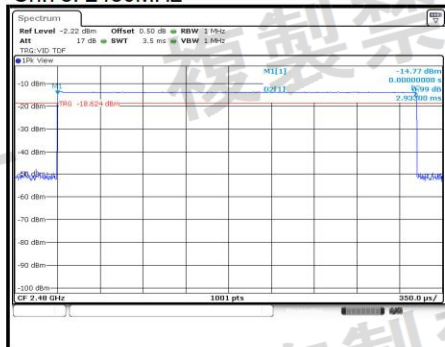
Ch.39: 2441MHz



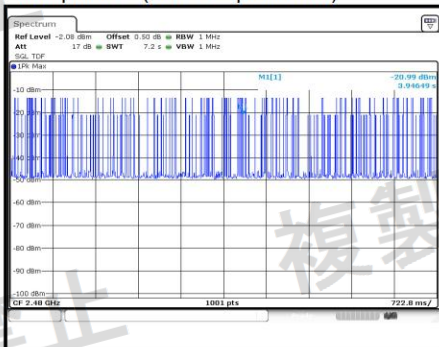
Sweep time = (0.4sec×Spread rate)



Ch.78: 2480MHz



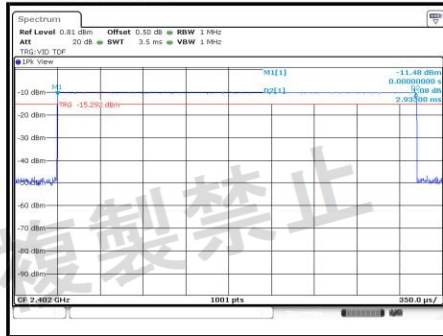
Sweep time = (0.4sec×Spread rate)



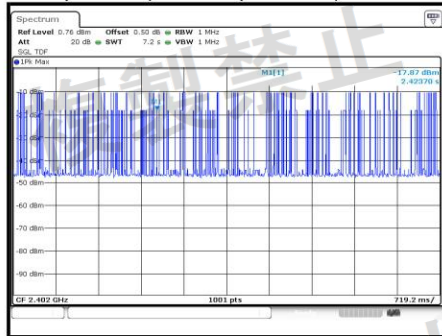
5. Test chart

5.4 Time of occupancy hopping frequency (-10% voltage)

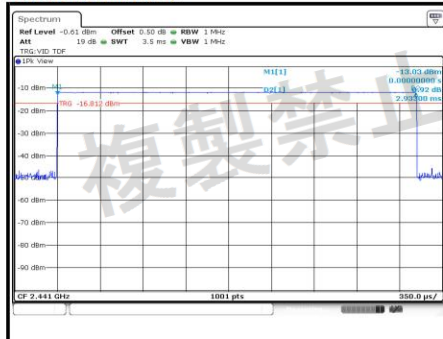
Ch.0: 2402MHz



Sweep time = (0.4sec×Spread rate)



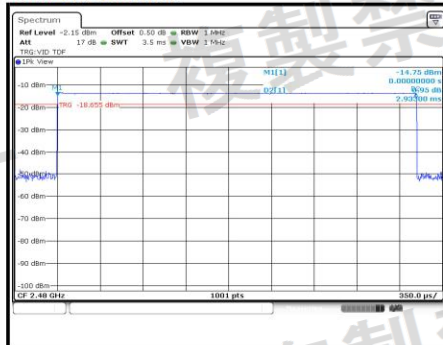
Ch.39: 2441MHz



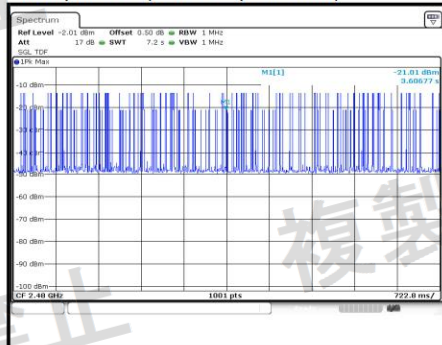
Sweep time = (0.4sec×Spread rate)



Ch.78: 2480MHz



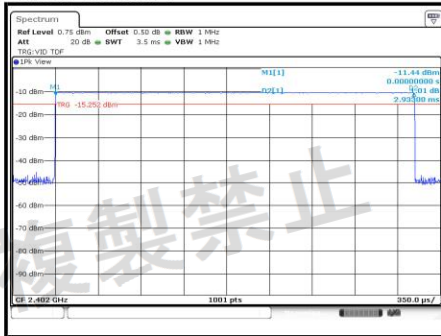
Sweep time = (0.4sec×Spread rate)



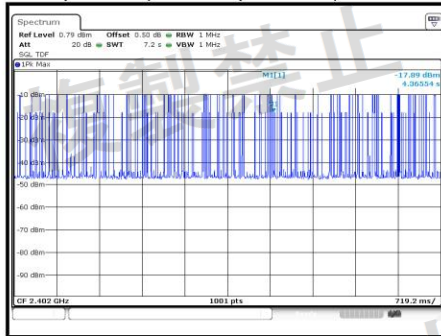
5. Test chart

5.4 Time of occupancy hopping frequency (-10% voltage)

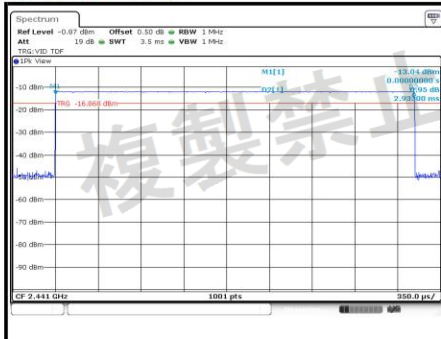
Ch.0: 2402MHz



Sweep time = (0.4sec×Spread rate)



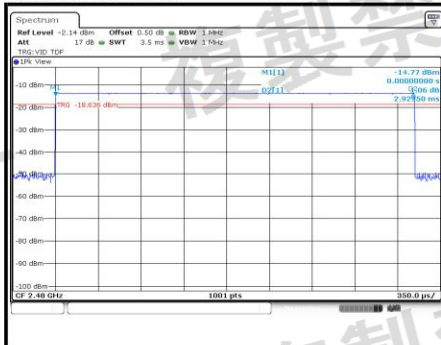
Ch.39: 2441MHz



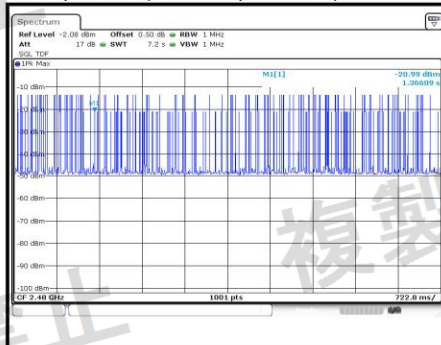
Sweep time = (0.4sec×Spread rate)



Ch.78: 2480MHz



Sweep time = (0.4sec×Spread rate)



6. Laboratory description

1. Location

Name: KCTL Inc.
65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
Telephone Number: +82 31 285 0894
Facsimile Number: +82 505 299 8311

2. Accreditation and Registration

1) FCC

Site Designation No.: KR0040
Site Registration No.: 687132

2) VCCI

Registration No.: R-20080, G-20078, C-20059, T-20056

3) Industry Canada

Registration No.: 8035A

Test Site	OATS 3m	OATS 10m	OATS 30m	Chamber 3m	Chamber 10m	Expiry Date
8035A-2	No	No	No	Yes	Yes	2021-02-21

4) KOLAS

Registration number	Expiration date
KT231	2020-09-13