



Japan Radio Test Report

of

Equipment Under Test	:	JBOX
Model Number	:	J500
Series Model Number	:	N/A

Issue to

Applicant	:	Yosei Hakobari Corporation
Address	:	2-chōme-13-5 10F Sotokanda, Chiyoda-ku, Tōkyō-to 101-0021 MINTRON Akihabara Building
Trade Name	:	N/A

Test Performed by

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**1. General Information**

Equipment Under Test	JBOX
Model Number	J500
Series Model Number	N/A
Applicant	Yosei Hakobari Corporation
Manufacture	EMBOX TECHNOLOGY CO.

1.1 EUT Description

EUT Name	: JBOX
Model Number	: J500
Serial Number	: 581901495136
Receipt Date	: 09/17/2019
Input Voltage	: Adapter---
	Manufacture : Sunny Computer Technology Co., Ltd.
	Model: SYS1531-1205-W2
	Input: AC 100-240V, 50-60Hz, 1.0A
	Output: DC 5V, 2.4A
Power From	: ☐ Inside ☒ Outside
	☒ Adaptor ☐ Battery ☐ AC Power Source
	☐ DC Power Source ☐ Support Unit PC
Operate Frequency	: Refer to the channel list as described below
Modulation Technique	: GFSK, $\pi/4$ -DQPSK, 8DPSK
Number of Channels	: 78
Channel spacing	: ☐ N/A ☒ <u>1</u> MHz
Antenna Type	: ☒ integral antenna: <u>Dipole Antenna</u>
	☐ a dedicated antenna
Antenna gain	: 1.77 dBi



CERTIFICATE OF COMPLIANCE

According to

TELEC-T401 (2011-05):

- Item 19 of Article 2

Japanese radio regulations 2008:

- Chapter I, II, IV (general provisions)

- Article 9.4(9)

- Article 49.20(1)

Output Power	:	Normal Mode: 0.216 mW/MHz AFH Mode: 0.457 mW/MHz
Carrier Sense	:	☐ Yes ☒ No
ITU Designator	:	78M36F1D

Measurement procedure used:

TELEC-T401 V1.1 (2011-05)

The above equipment was tested by WEISHANG Certification Co., Ltd. for compliance with the requirements set forth in the TELEC-T401 and the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested.

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Approved by:

Reviewed by:

Oct. 07, 2019

Oct. 07, 2019

Date

Engineering Supervisor

Date

Test Engineer



2. Test Configuration of Equipment under Test

2.1 Test Mode and Test Software

- a. An executive program, "RTLBTAPP" under Android was executed to transmit and receive data to the notebook through WLAN.
- b. The following test mode and test software was performed for RF test:
 - GFSK: CH LO: 2402MHz, CH MID: 2441MHz, CH HI: 2480MHz.
 - pi/4-DQPSK: CH LO: 2402MHz, CH MID: 2441MHz, CH HI: 2480MHz.
 - 8DPSK: CH LO: 2402MHz, CH MID: 2441MHz, CH HI: 2480MHz.

2.2 Carrier Frequency of Channels

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	20	2422	40	2442	60	2462
01	2403	21	2423	41	2443	61	2463
02	2404	22	2424	42	2444	62	2464
03	2405	23	2425	43	2445	63	2465
04	2406	24	2426	44	2446	64	2466
05	2407	25	2427	45	2447	65	2467
06	2408	26	2428	46	2448	66	2468
07	2409	27	2429	47	2449	67	2469
08	2410	28	2430	48	2450	68	2470
09	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461	---	---



2.3 General Information of Test

Test Voltage:	Normal Voltage : 100V Extreme Voltage(+10%) : 110V Extreme Voltage(-10%) : 90V
---------------	--

2.4 Measurement Uncertainty

Measurement Item	Uncertainty
Frequency Error	$\pm 0.13\text{ppm}$
Occupied Bandwidth	$\pm 0.03\text{MHz}$
Spread Bandwidth	$\pm 0.03\text{MHz}$
Output Power Tolerance	$\pm 0.015\text{mW}$
TX/RX Spurious Emissions	$\pm 0.017\text{mW}$
Carrier Sensing Function	$\pm 0.05\text{mV}$

**TABLELIST OF TEST AND MEASUREMENT EQUIPMENT**

Item	Instrument	Manufacturer	Model No.	S/N	Next Cal. Date	Calibration Authority
1.	Spectrum Analyzer	HP	8691EM	72412A00110	2020/04/13	ETC
2.	Pre Amplifier	MLT	PREAMP6G-01	20110209	2020/03/17	ETC
3.	Pre Amplifier	MLT	PREAMP6G-02	20110301	2020/03/17	ETC
4.	Biconilog Antenna	EMCO	3142C	00044568	2019/10/06	ETC
5.	Spectrum Analyzer	Agilent	E7403A	US40240137	2020/03/16	ETC
6.	LISN	EMCO	3825/2	2658	2019/11/18	ETC
7.	Spectrum Analyzer	Agilent	E4446A	US44300422	2020/03/19	ETC
8.	Biconilog Antenna	EMCO	3142C	00059739	2020/02/04	ETC
9.	Home Antenna	SCHWARZBECK	BBHA 9120D	304	2019/10/06	ETC
10.	Home Antenna	SCHWARZBECK	BBHA 9170	181	2019/11/12	ETC
11.	TA	Pre Amplifier	0.10~19.1GHz 60dBm	RF01	2019/11/12	ETC
12.	Herotek	Pre Amplifier	A402-417	30690	2019/11/12	ETC
13.	Spectrum Analyzer	Agilent	N9010A	MY50060164	2020/08/26	ETC
14.	Signal Generator	Agilent	8648C	3629U00612	2020/07/31	ETC
15.	Power Meter	Anritsu	ML2495A	1224005	2020/07/31	ETC
16.	Power Sensor	Anritsu	MA2411B	1207295	2020/07/31	ETC

★ The calibrations are traceable to NML/R.O.C.

★ Calibration interval of instruments listed above is one year



3. Transmitter Parameters

3.1 Frequency Error

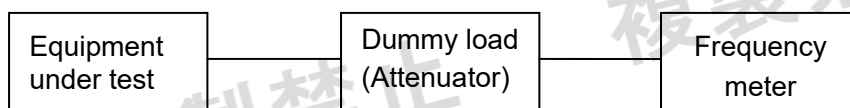
3.1.1 Test Limit

Limits: $\pm 50 \times 10^{-6}$, 50ppm

3.1.2 Test Procedures

According to TELEC-T401, Test item frequency error measuring procedures.

3.1.3 Test Setup



3.1.4 Test Result and Data

Test date: Oct. 04, 2019

Ambient temperature: 26°C

Atmospheric pressure: 1010hPa

Relative humidity: 65%

Test Conditions	Operation Frequency (MHz) / Frequency Error (ppm)					
	2402 MHz		2441 MHz		2480 MHz	
Modulation type: GFSK						
Vnom	2401.9808	-7.99	2440.9824	-7.21	2479.9820	-7.26
Vmax	2401.9812	-7.83	2440.9824	-7.21	2479.9816	-7.42
Vmin	2401.9804	-8.16	2440.9820	-7.37	2479.9816	-7.42
Modulation type: pi/4-DQPSK						
Vnom	2401.9840	-6.66	2440.9826	-7.13	2479.9854	-5.89
Vmax	2401.9836	-6.83	2440.9830	-6.96	2479.9850	-6.05
Vmin	2401.9840	-6.66	2440.9826	-7.13	2479.9850	-6.05
Modulation type: 8DPSK						
Vnom	2401.9818	-7.58	2440.9870	-5.33	2479.9858	-5.73
Vmax	2401.9818	-7.58	2440.9874	-5.16	2479.9854	-5.89
Vmin	2401.9822	-7.41	2440.9874	-5.16	2479.9854	-5.89



3.2 Occupied Bandwidth

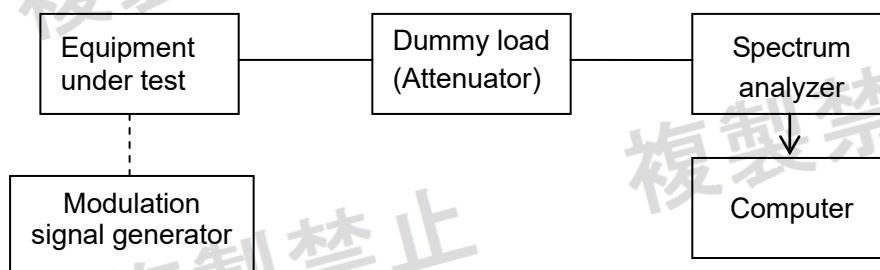
3.2.1 Test Limit

Modulation type	Occupied Band Width
FH、FH+DS、FH+OFDM	< 83.5 MHz
DS	< 26 MHz
Other	< 26 MHz
802.11n HT40	< 38 MHz

3.2.2 Test Procedures

According to TELECOM-T401, test item occupied bandwidth and spreading bandwidth, measuring procedures.

3.2.3 Test Setup



**3.2.4 Test Result and Data**

Test date: Oct. 04, 2019

Ambient temperature: 26℃

Atmospheric pressure: 1010hPa

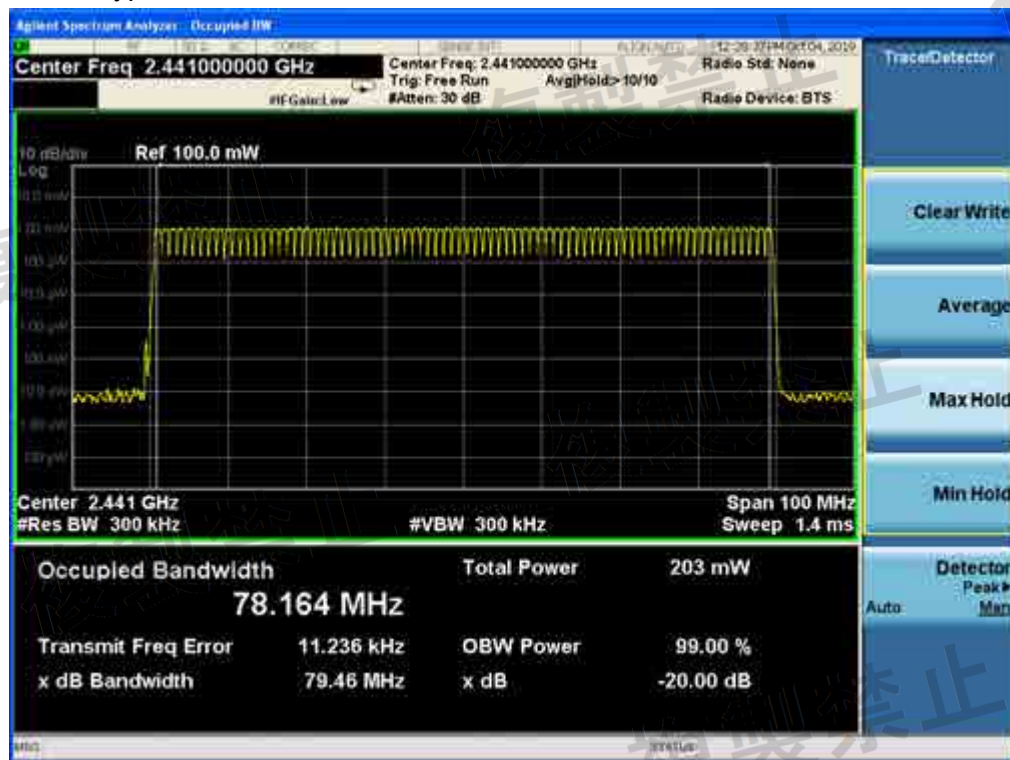
Relative humidity: 65%

Test Conditions	Operation Frequency (MHz) / Occupied Bandwidth (MHz)	
	2400 - 2483.5 MHz	
Modulation type: GFSK		
Vnom	78.16	
Vmax	78.16	
Vmin	78.16	
Modulation type: pi/4-DQPSK		
Vnom	78.36	
Vmax	78.36	
Vmin	78.36	
Modulation type: 8DPSK		
Vnom	78.35	
Vmax	78.35	
Vmin	78.35	

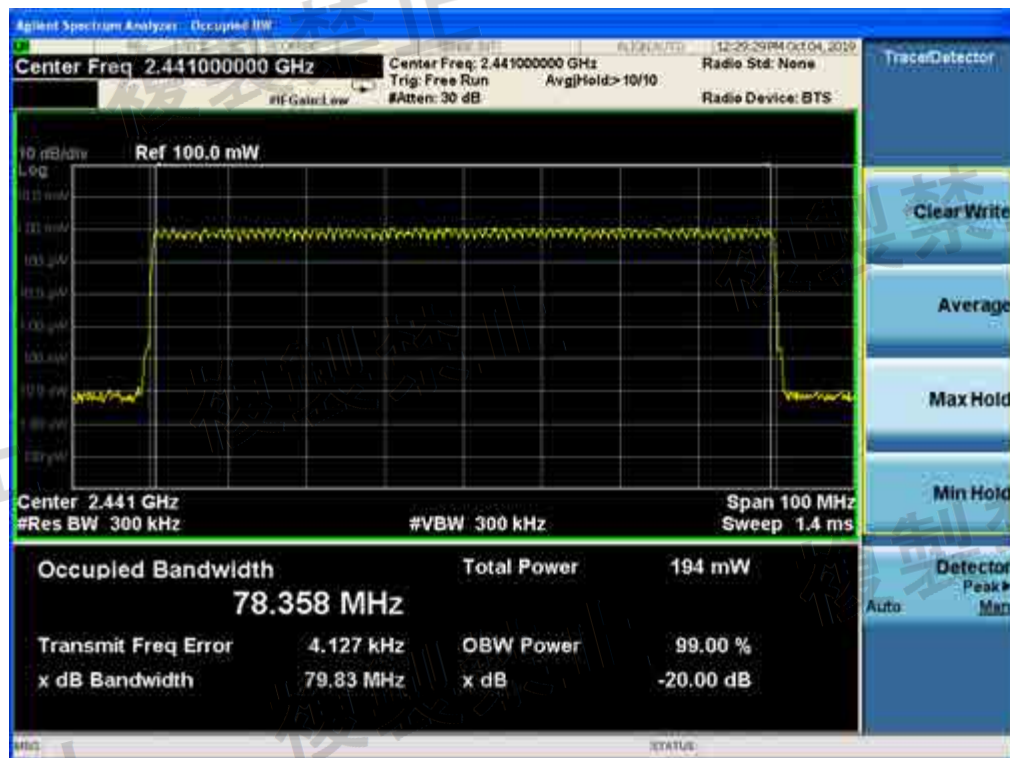
Test Conditions	Operation Frequency (MHz) / Occupied Bandwidth (MHz)	
	2400 - 2483.5 MHz (AFH mode,20 channels)	
Modulation type: GFSK		
Vnom	19.60	
Vmax	19.60	
Vmin	19.60	
Modulation type: pi/4-DQPSK		
Vnom	19.93	
Vmax	19.93	
Vmin	19.93	
Modulation type: 8DPSK		
Vnom	19.91	
Vmax	19.91	
Vmin	19.91	



Modulation type: GFSK

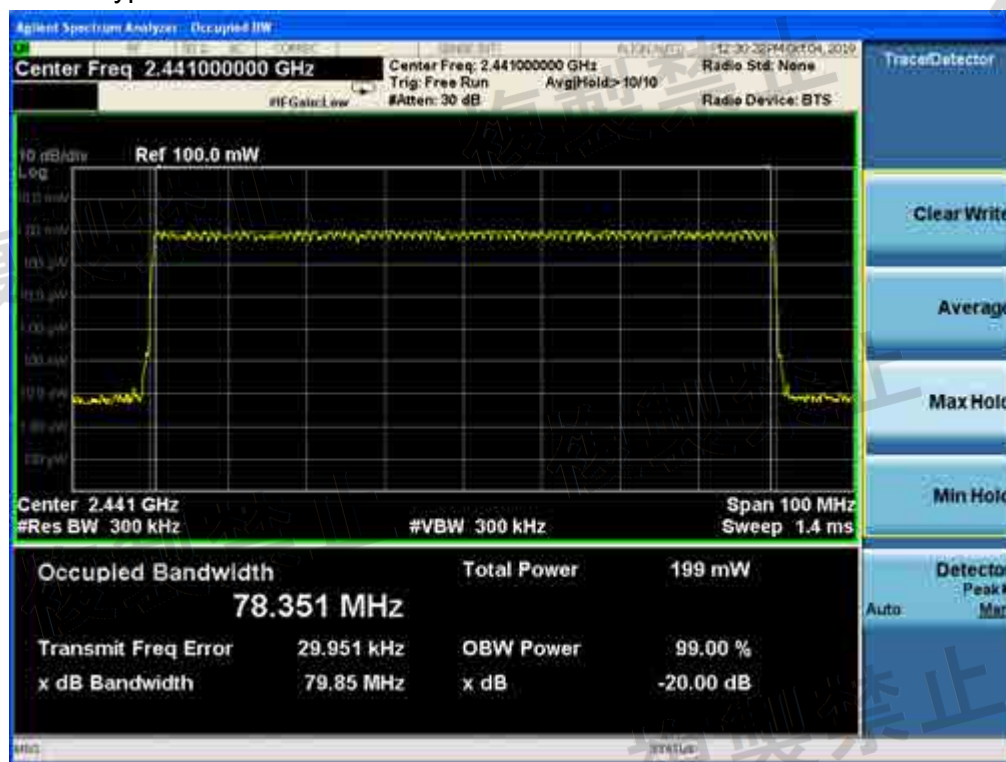


Modulation type: pi/4-DQPSK



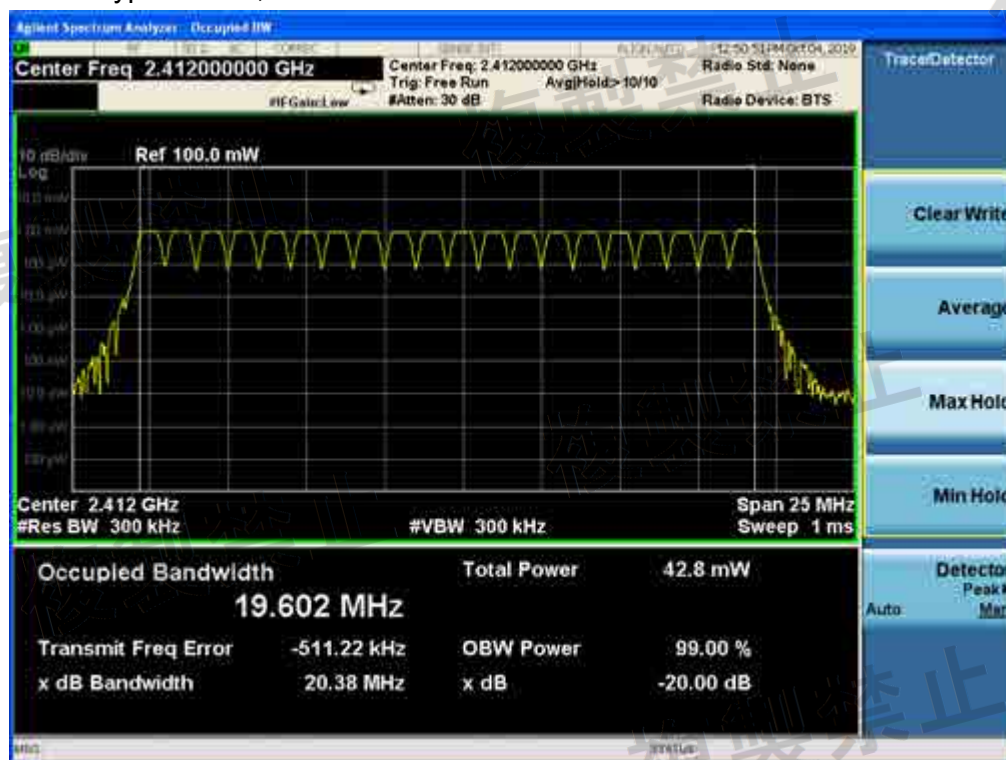


Modulation type: 8DPSK

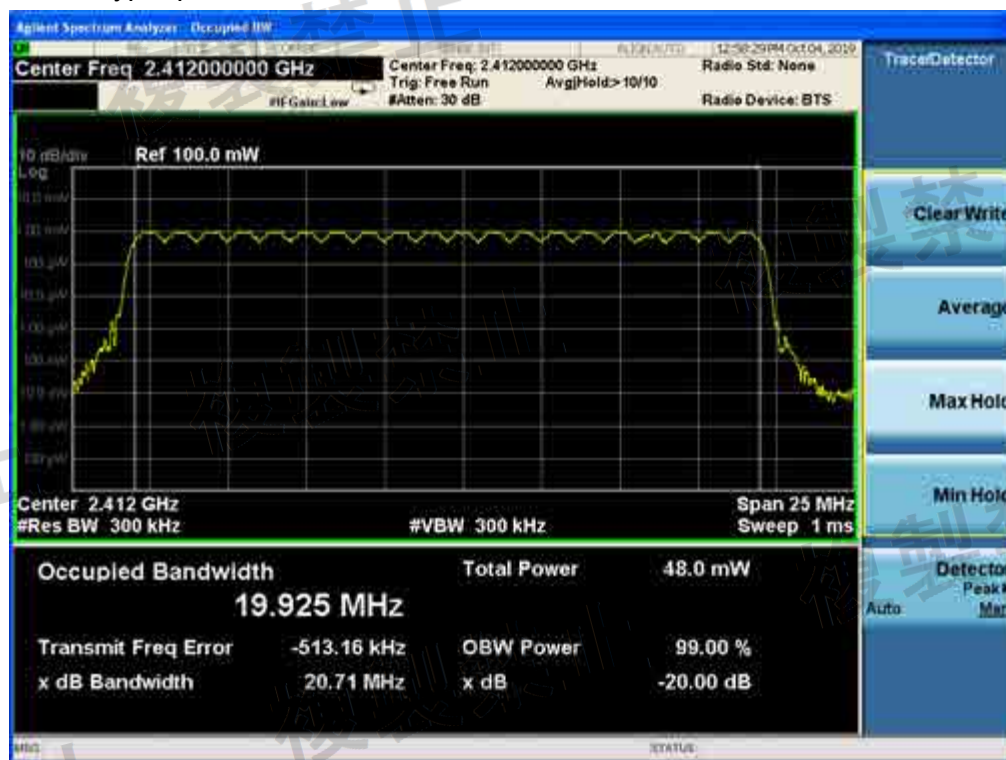




Modulation type: GFSK, AFH Mode

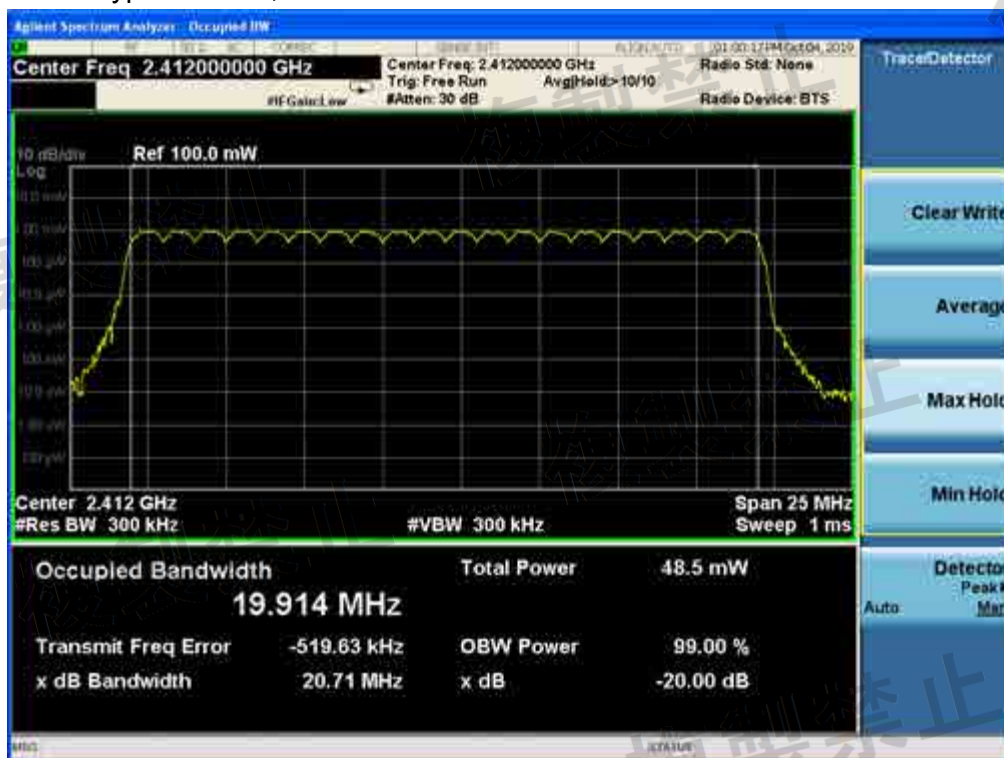


Modulation type: pi/4-DQPSK, AFH Mode





Modulation type: 8DPSK, AFH Mode





3.3 Spread Bandwidth

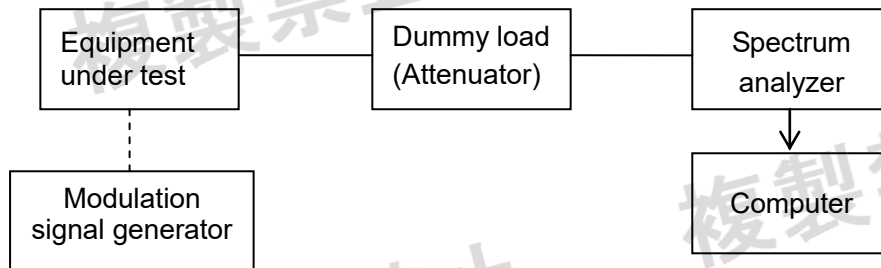
3.3.1 Test Limit

Modulation type	Occupied Bandwidth
FH、FH+DS、FH+OFDM	> 500 kHz
DS	> 500 kHz
Other	---

3.3.2 Test Procedures

According TELEC-T401, test item occupied bandwidth and spreading bandwidth, measuring procedures.

3.3.3 Test Setup



**3.3.4 Test Result and Data**

Test date: Oct. 04, 2019

Ambient temperature: 26℃

Atmospheric pressure: 1010hPa

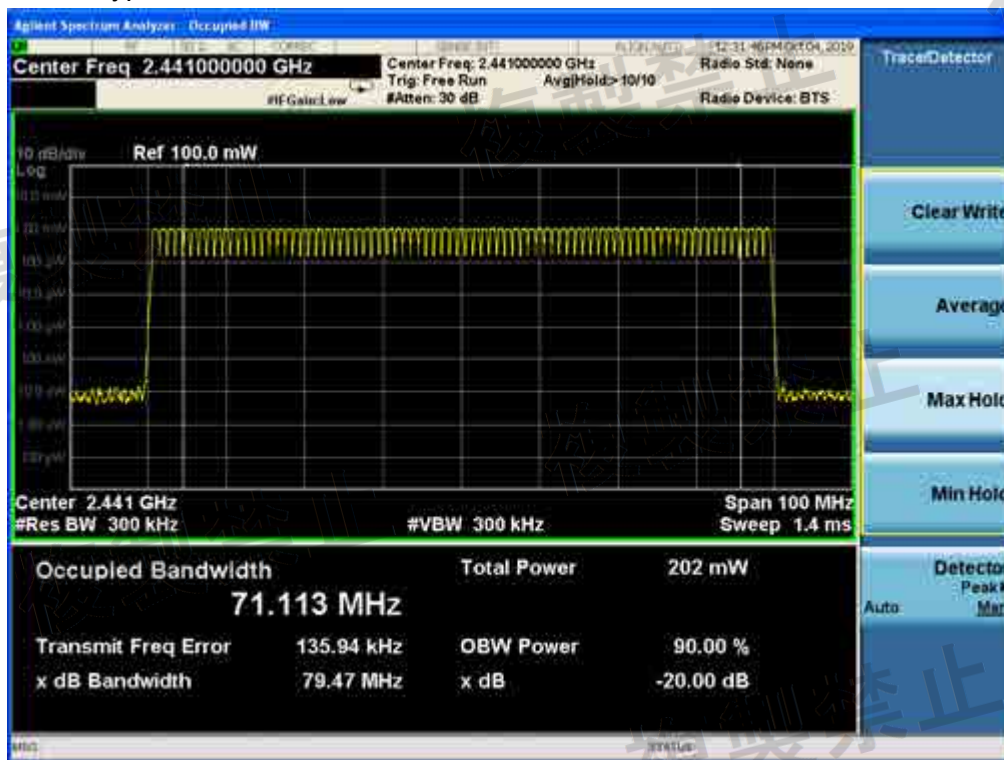
Relative humidity: 65%

Test Conditions	Operation Frequency (MHz) / Spread Bandwidth (MHz)	
	2400 - 2483.5 MHz	
Modulation type: GFSK		
Vnom	71.11	
Vmax	71.11	
Vmin	71.11	
Modulation type: pi/4-DQPSK		
Vnom	71.15	
Vmax	71.15	
Vmin	71.15	
Modulation type: 8DPSK		
Vnom	71.12	
Vmax	71.12	
Vmin	71.12	

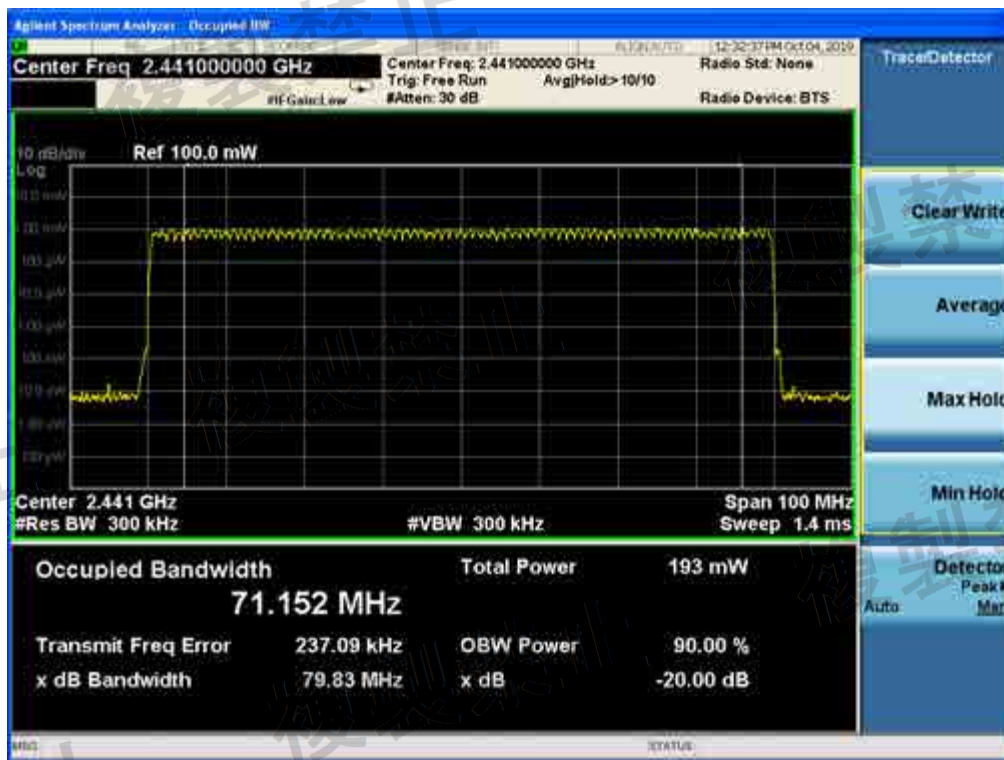
Test Conditions	Operation Frequency (MHz) / Spread Bandwidth (MHz)	
	2400 - 2483.5 MHz (AFH mode,20 channels)	
Modulation type: GFSK		
Vnom	18.25	
Vmax	18.25	
Vmin	18.25	
Modulation type: pi/4-DQPSK		
Vnom	18.31	
Vmax	18.31	
Vmin	18.31	
Modulation type: 8DPSK		
Vnom	18.27	
Vmax	18.27	
Vmin	18.27	



Modulation type: GFSK

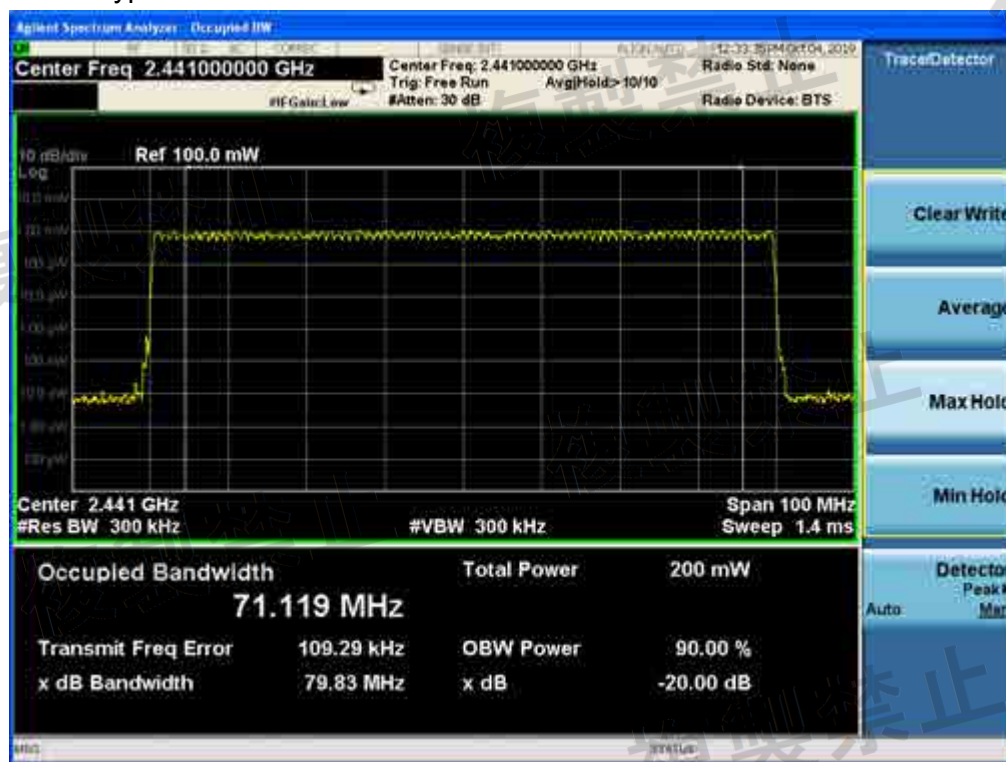


Modulation type: pi/4-DQPSK



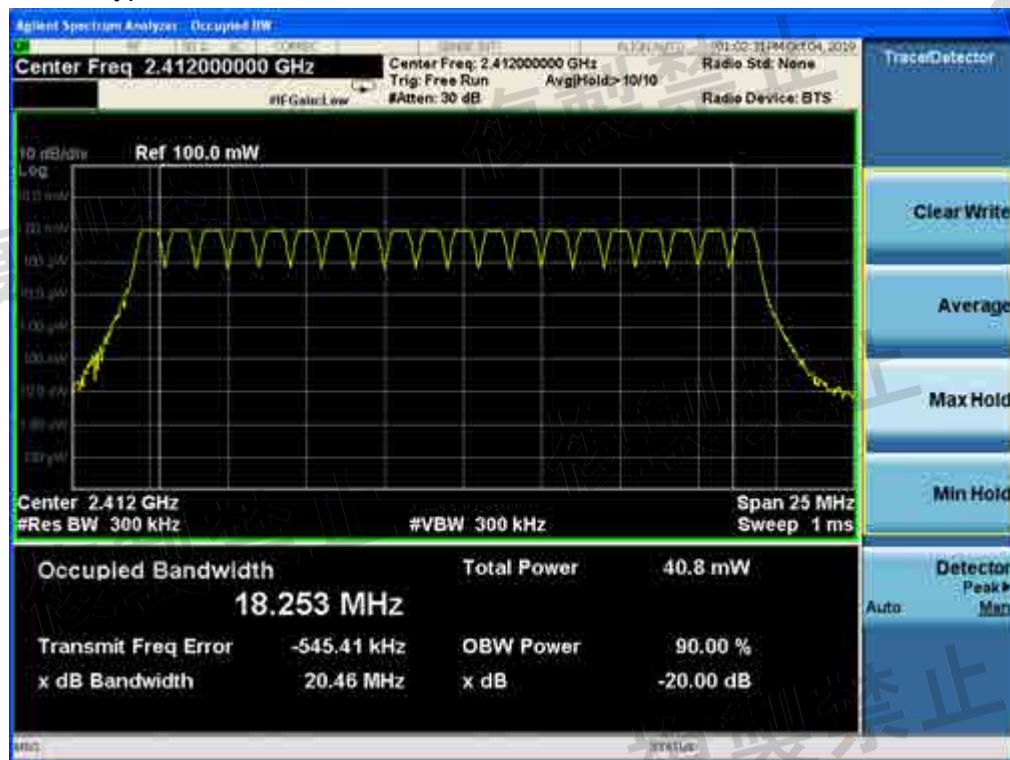


Modulation type: 8DPSK

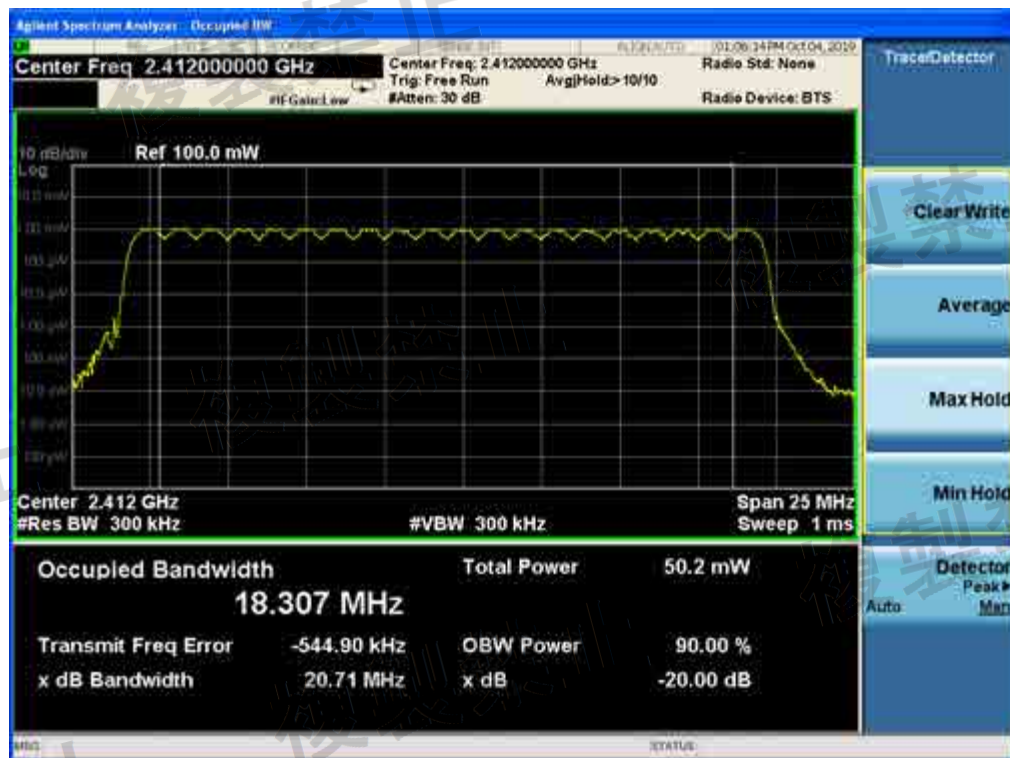




Modulation type: GFSK, AFH Mode

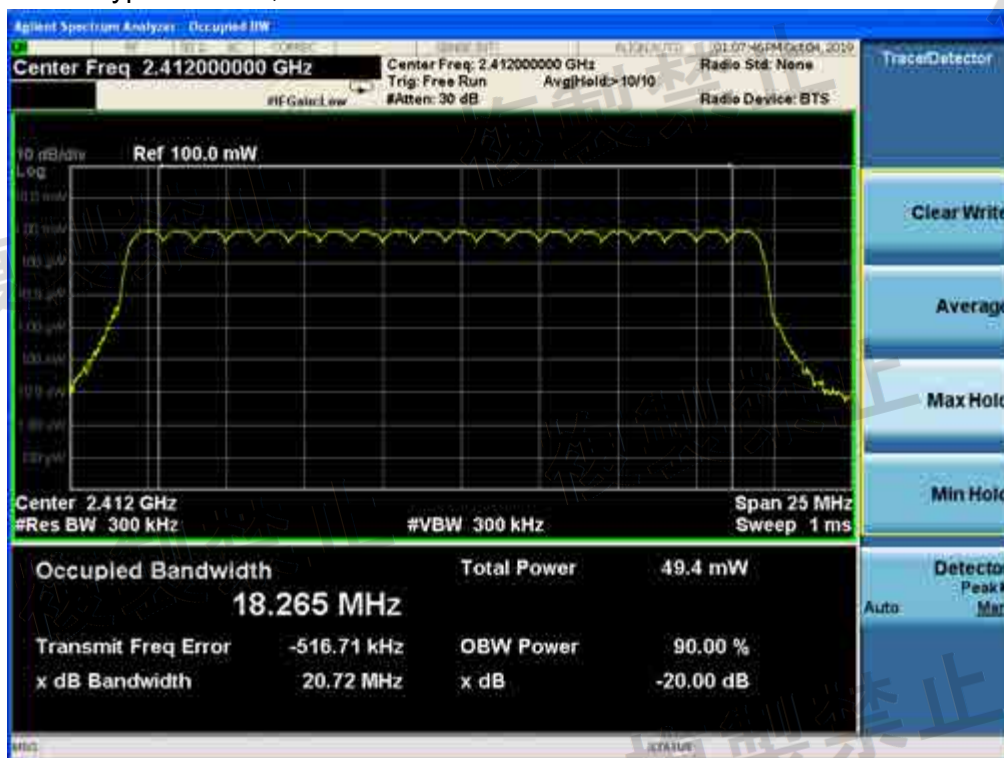


Modulation type: pi/4-DQPSK, AFH Mode





Modulation type: 8DPSK, AFH Mode





3.4 RF Output Power Tolerance

3.4.1 Test Limit

1. tolerance: + 20% ~ - 80%
2. output power:
 - (1) FH、FH+DS、FH+OFDM < 3mW/MHz
 - (2) OFDM、DS < 10mW/MHz
 - (3) Other < 10mW

3.4.2 Test Procedure

According to TELEC-T401, test item antenna power error measuring procedure.

3.4.3 Test Setup



3.4.4 Test Result and Data

Test date: Oct. 04, 2019

Ambient temperature: 26°C

Atmospheric pressure: 1010hPa

Relative humidity: 65%

Test Conditions	Operation Frequency (MHz) / Spread Bandwidth (MHz)	
	2400 - 2483.5 MHz	
	mW/MHz	%
Modulation type: GFSK		
Vnom	0.216	0
Vmax	0.215	-0.46
Vmin	0.215	-0.46
Modulation type: pi/4-DQPSK		
Vnom	0.178	-17.59
Vmax	0.176	-18.52
Vmin	0.177	-18.06
Modulation type: 8DPSK		
Vnom	0.167	-22.69
Vmax	0.166	-23.15
Vmin	0.166	-23.15

(DH1) Power Density = Total Power / (SBW x Duty-Cycle) = 5.540 / (71.11 x 0.360) = **0.216 mW/MHz**

(DH3) Power Density = Total Power / (SBW x Duty-Cycle) = 5.540 / (71.11 x 0.660) = 0.118 mW/MHz

(DH5) Power Density = Total Power / (SBW x Duty-Cycle) = 5.540 / (71.11 x 0.773) = 0.101 mW/MHz

(2DH1) Power Density = Total Power / (SBW x Duty-Cycle) = 4.555 / (71.15 x 0.360) = **0.178 mW/MHz**

(2DH3) Power Density = Total Power / (SBW x Duty-Cycle) = 4.555 / (71.15 x 0.660) = 0.097 mW/MHz

(2DH5) Power Density = Total Power / (SBW x Duty-Cycle) = 4.555 / (71.15 x 0.772) = 0.083 mW/MHz



(3DH1) Power Density = Total Power / (SBW x Duty-Cycle) = 4.287 / (71.12 x 0.360) = **0.167 mW/MHz**

(3DH3) Power Density = Total Power / (SBW x Duty-Cycle) = 4.287 / (71.12 x 0.660) = 0.091 mW/MHz

(3DH5) Power Density = Total Power / (SBW x Duty-Cycle) = 4.287 / (71.12 x 0.775) = 0.078 mW/MHz

Test Conditions	Operation Frequency (MHz) / Output Power	
	2400 - 2483.5 MHz (AFH mode, 20 channels)	
	mW/MHz	%
Modulation type: GFSK		
Vnom	0.475	0
Vmax	0.474	-0.21
Vmin	0.474	-0.21
Modulation type: pi/4-DQPSK		
Vnom	0.457	-3.79
Vmax	0.457	-3.79
Vmin	0.456	-4.00
Modulation type: 8DPSK		
Vnom	0.453	-4.63
Vmax	0.452	-4.84
Vmin	0.452	-4.84

(DH1) Power Density = Total Power / (SBW x Duty-Cycle) = 1.562 / (18.25 x 0.180) = **0.475 mW/MHz**

(DH3) Power Density = Total Power / (SBW x Duty-Cycle) = 1.562 / (18.25 x 0.330) = 0.252 mW/MHz

(DH5) Power Density = Total Power / (SBW x Duty-Cycle) = 1.562 / (18.25 x 0.381) = 0.225 mW/MHz

(2DH1) Power Density = Total Power / (SBW x Duty-Cycle) = 1.505 / (18.31 x 0.180) = **0.457 mW/MHz**

(2DH3) Power Density = Total Power / (SBW x Duty-Cycle) = 1.505 / (18.31 x 0.330) = 0.242 mW/MHz

(2DH5) Power Density = Total Power / (SBW x Duty-Cycle) = 1.505 / (18.31 x 0.386) = 0.213 mW/MHz

(3DH1) Power Density = Total Power / (SBW x Duty-Cycle) = 1.490 / (18.27 x 0.180) = **0.453 mW/MHz**

(3DH3) Power Density = Total Power / (SBW x Duty-Cycle) = 1.490 / (18.27 x 0.330) = 0.240 mW/MHz

(3DH5) Power Density = Total Power / (SBW x Duty-Cycle) = 1.490 / (18.27 x 0.383) = 0.213 mW/MHz



3.5 Spurious Emissions

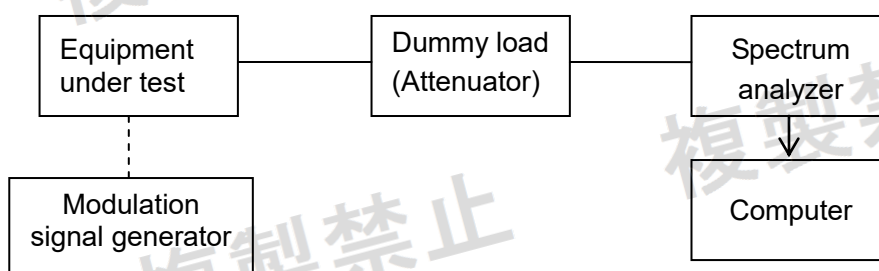
3.5.1 Test Limit

	Frequency Band (For 2400 ~ 2483.5 MHz)	Limit
*1	<2387MHz	2.5 μ W/MHz
*2	2387MHz ~ 2400MHz	25 μ W/MHz
*3	2483.5MHz ~ 2496.5MHz	25 μ W/MHz
*4	>2496.5MHz	2.5 μ W/MHz

3.5.2 Test Procedure

According to TELEC-T401 Spurious and unwanted emission intensity measuring procedure.

3.5.3 Test Setup



**3.5.4 Test Result and Data**

Test date: Oct. 04, 2019

Ambient temperature: 26°C

Atmospheric pressure: 1010hPa

Relative humidity: 65%

Modulation type: GFSK						
Test Conditions	Operation Frequency (MHz) / Spurious Emission					
	CH00 2402MHz		CH39 2441MHz		CH78 2480MHz	
	MHz	μW	MHz	μW	MHz	μW
Frequency Band: < 2387MHz						
Vnom	2323.40	0.002	2361.10	0.002	2361.10	0.001
Vmax	2323.40	0.002	2361.10	0.002	2361.10	0.001
Vmin	2323.40	0.002	2361.10	0.002	2361.10	0.001
Frequency Band: 2387 ~ 2400MHz						
Vnom	2399.43	0.003	2399.94	0.001	2400.00	0.006
Vmax	2399.43	0.002	2399.94	0.001	2400.00	0.006
Vmin	2399.43	0.003	2399.94	0.001	2400.00	0.005
Frequency Band: 2483.5 ~ 2496.5MHz						
Vnom	2486.35	0.001	2487.47	0.001	2483.59	0.001
Vmax	2486.35	0.001	2487.47	0.001	2483.59	0.001
Vmin	2486.35	0.001	2487.47	0.001	2483.59	0.001
Frequency Band: >2496.5MHz						
Vnom	3200.00	0.002	3253.00	0.002	3305.00	0.002
Vmax	3200.00	0.002	3253.00	0.002	3305.00	0.002
Vmin	3200.00	0.002	3253.00	0.002	3305.00	0.002



Modulation type: pi/4-DQPSK						
Test Conditions	Operation Frequency (MHz) / Spurious Emission					
	CH00 2402MHz		CH39 2441MHz		CH78 2480MHz	
	MHz	μW	MHz	μW	MHz	μW
Frequency Band: < 2387MHz						
Vnom	2323.40	0.002	2361.10	0.002	2361.10	0.001
Vmax	2323.40	0.002	2361.10	0.002	2361.10	0.001
Vmin	2323.40	0.002	2361.10	0.002	2361.10	0.001
Frequency Band: 2387 ~ 2400MHz						
Vnom	2399.55	0.002	2391.73	0.001	2399.90	0.004
Vmax	2399.55	0.002	2391.73	0.001	2399.90	0.003
Vmin	2399.55	0.002	2391.73	0.001	2399.90	0.004
Frequency Band: 2483.5 ~ 2496.5MHz						
Vnom	2488.99	0.001	2485.66	0.001	2484.22	0.001
Vmax	2488.99	0.001	2485.66	0.001	2484.22	0.001
Vmin	2488.99	0.001	2485.66	0.001	2484.22	0.001
Frequency Band: >2496.5MHz						
Vnom	3200.00	0.002	3253.00	0.002	3305.00	0.002
Vmax	3200.00	0.002	3253.00	0.002	3305.00	0.002
Vmin	3200.00	0.002	3253.00	0.002	3305.00	0.002



Modulation type: 8DPSK						
Test Conditions	Operation Frequency (MHz) / Spurious Emission					
	CH00 2402MHz		CH39 2441MHz		CH78 2480MHz	
	MHz	μW	MHz	μW	MHz	μW
Frequency Band: < 2387MHz						
Vnom	2323.40	0.001	2361.10	0.002	2321.00	0.001
Vmax	2323.40	0.001	2361.10	0.002	2321.00	0.001
Vmin	2323.40	0.001	2361.10	0.002	2321.00	0.001
Frequency Band: 2387 ~ 2400MHz						
Vnom	2399.97	0.002	2394.74	0.001	2399.99	0.003
Vmax	2399.97	0.002	2394.74	0.001	2399.99	0.003
Vmin	2399.97	0.002	2394.74	0.001	2399.99	0.002
Frequency Band: 2483.5 ~ 2496.5MHz						
Vnom	2484.14	0.001	2486.79	0.001	2483.90	0.001
Vmax	2484.14	0.001	2486.79	0.001	2483.90	0.001
Vmin	2484.14	0.001	2486.79	0.001	2483.90	0.001
Frequency Band: >2496.5MHz						
Vnom	3200.00	0.002	3253.00	0.002	3305.00	0.002
Vmax	3200.00	0.002	3253.00	0.002	3305.00	0.002
Vmin	3200.00	0.002	3253.00	0.002	3305.00	0.002

Note: 1. "---" means that no emissions were detected and there for it is a "PASS"

2. The compensation factor 15.2dB is included in the test result.

3. "*" means the worst emission level for each frequency band

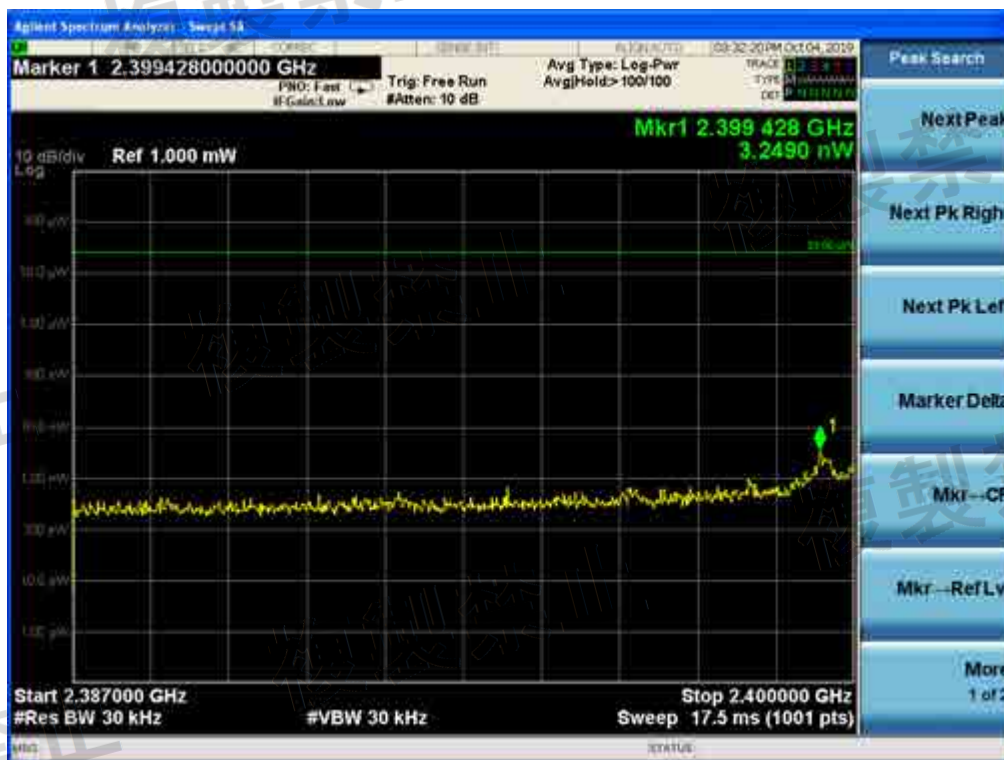


Modulation type: GFSK, CH00

Frequency Band: <2387MHz

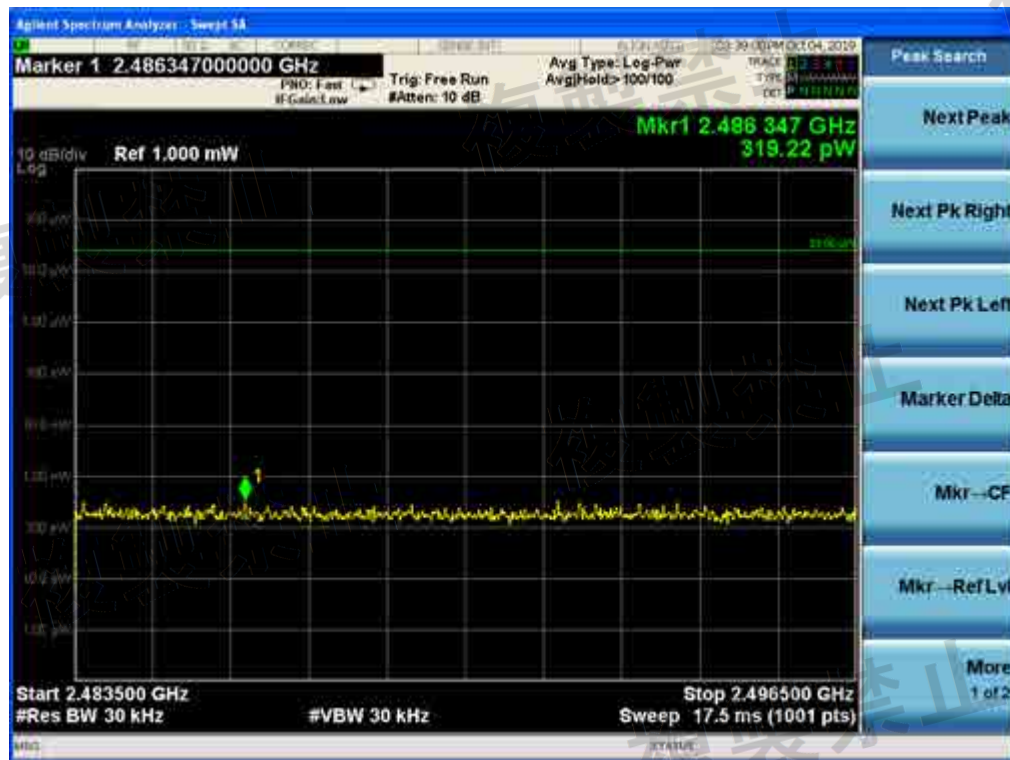


Frequency Band: 2387~2400MHz





Frequency Band: 2483.5~2496.5MHz



Frequency Band: >2496.5MHz



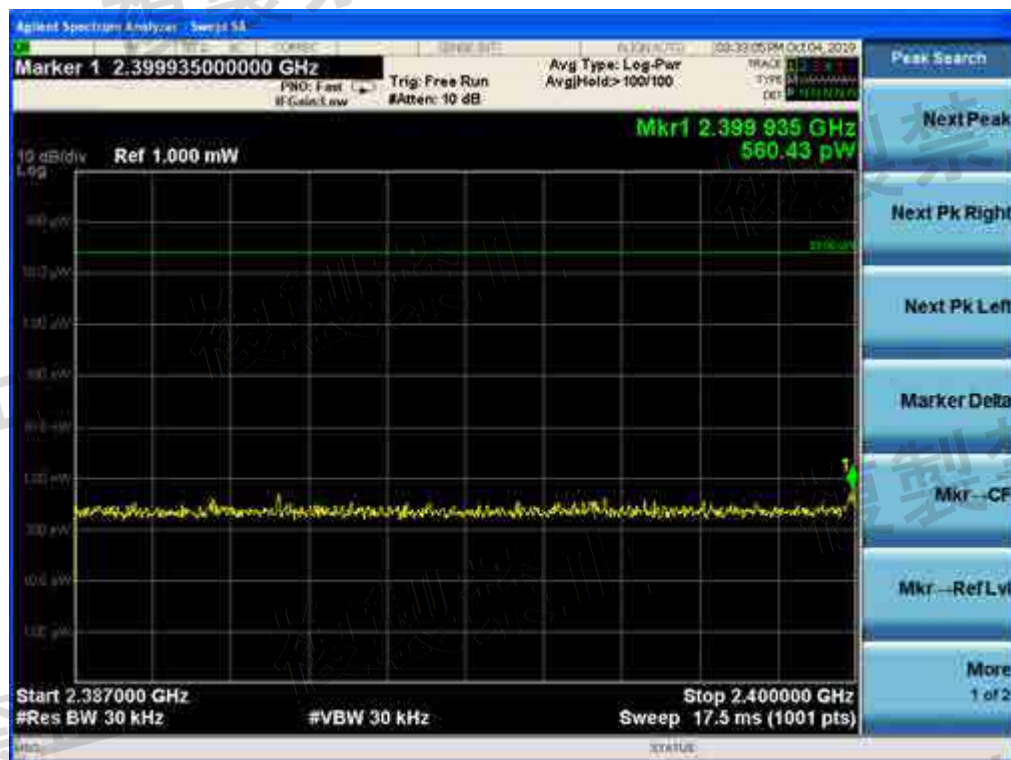


Modulation type: pi/4-DQPSK, CH00

Frequency Band: <2387MHz

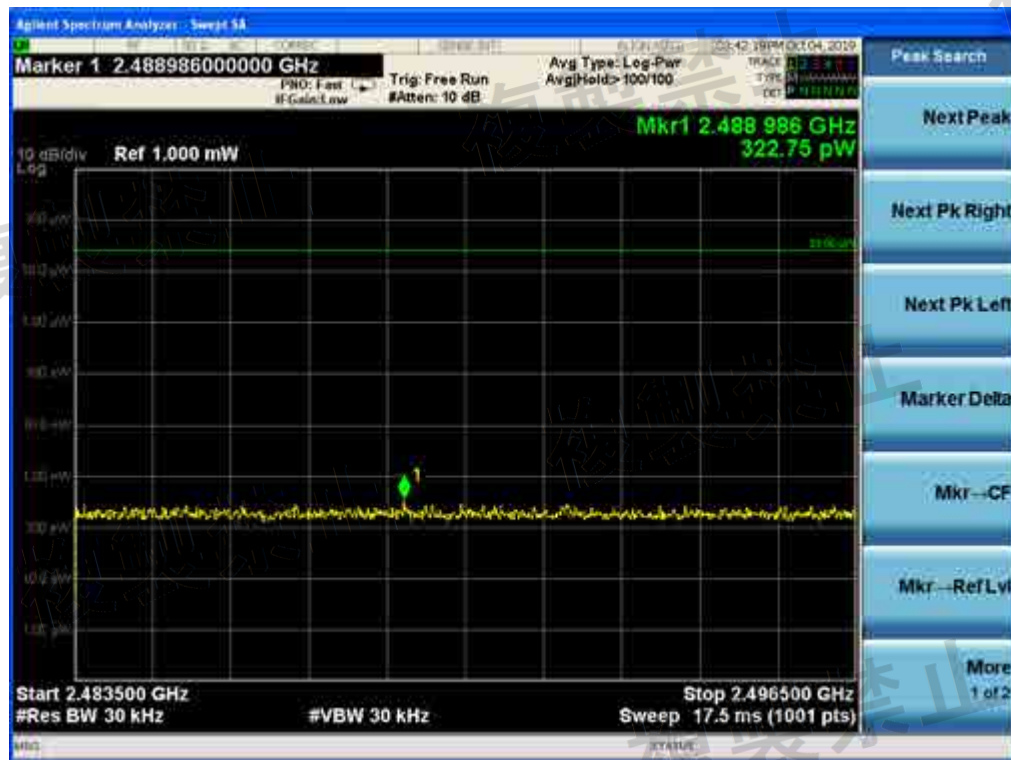


Frequency Band: 2387~2400MHz





Frequency Band: 2483.5~2496.5MHz



Frequency Band: >2496.5MHz



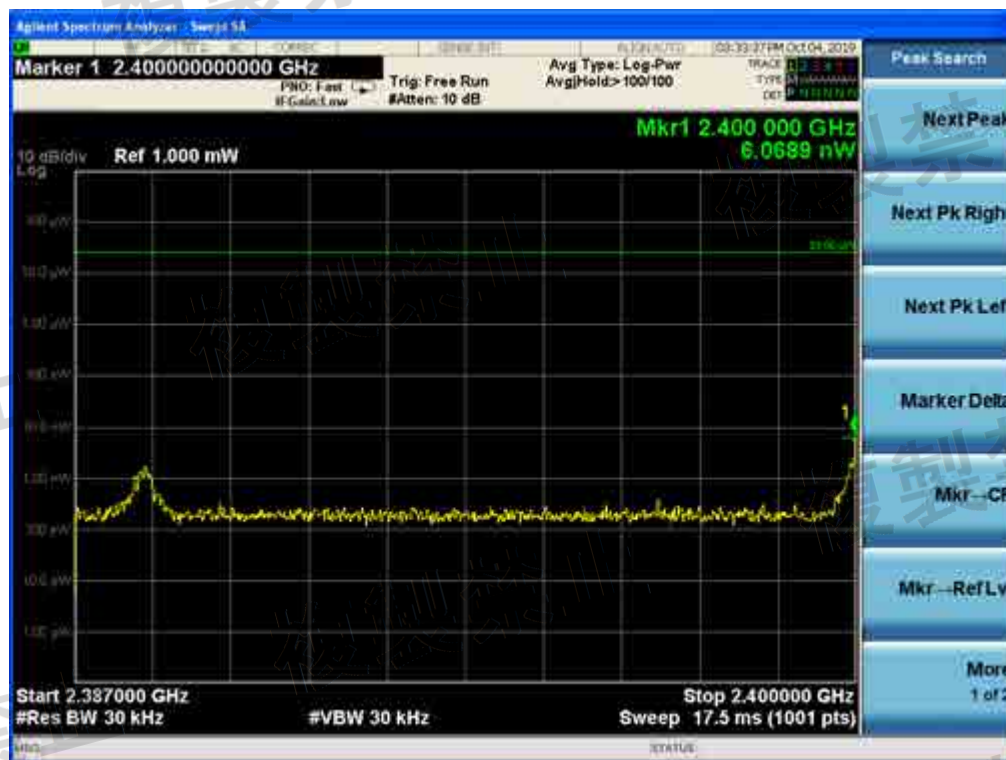


Modulation type: 8DPSK, CH00

Frequency Band: <2387MHz

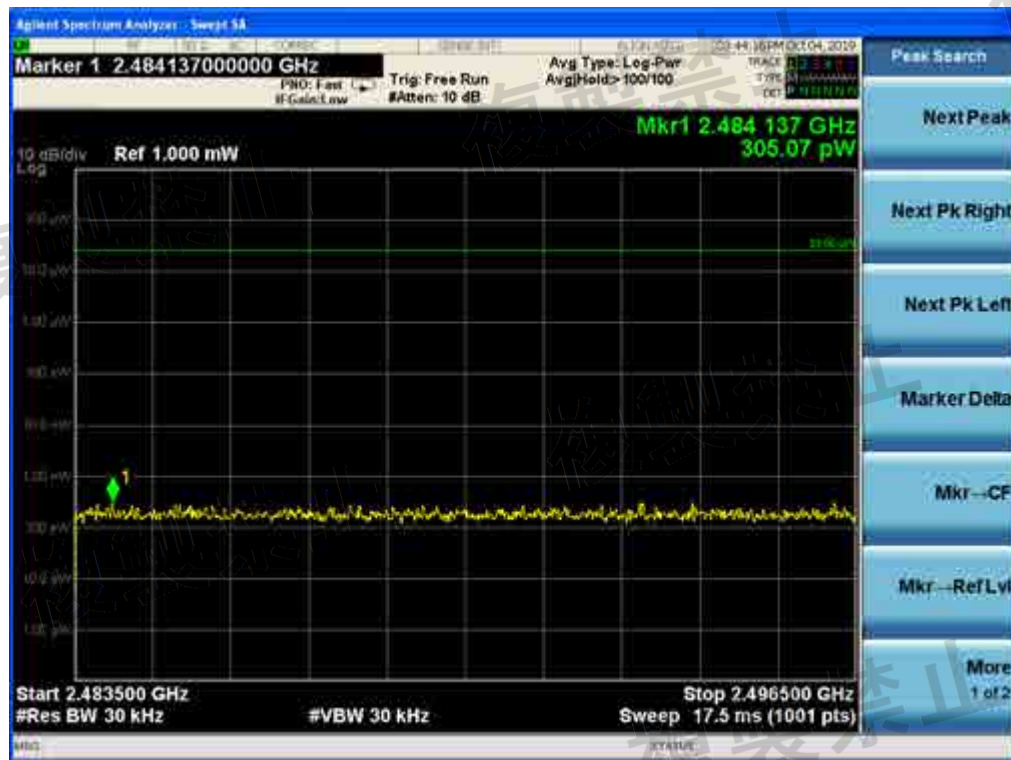


Frequency Band: 2387~2400MHz





Frequency Band: 2483.5~2496.5MHz



Frequency Band: >2496.5MHz



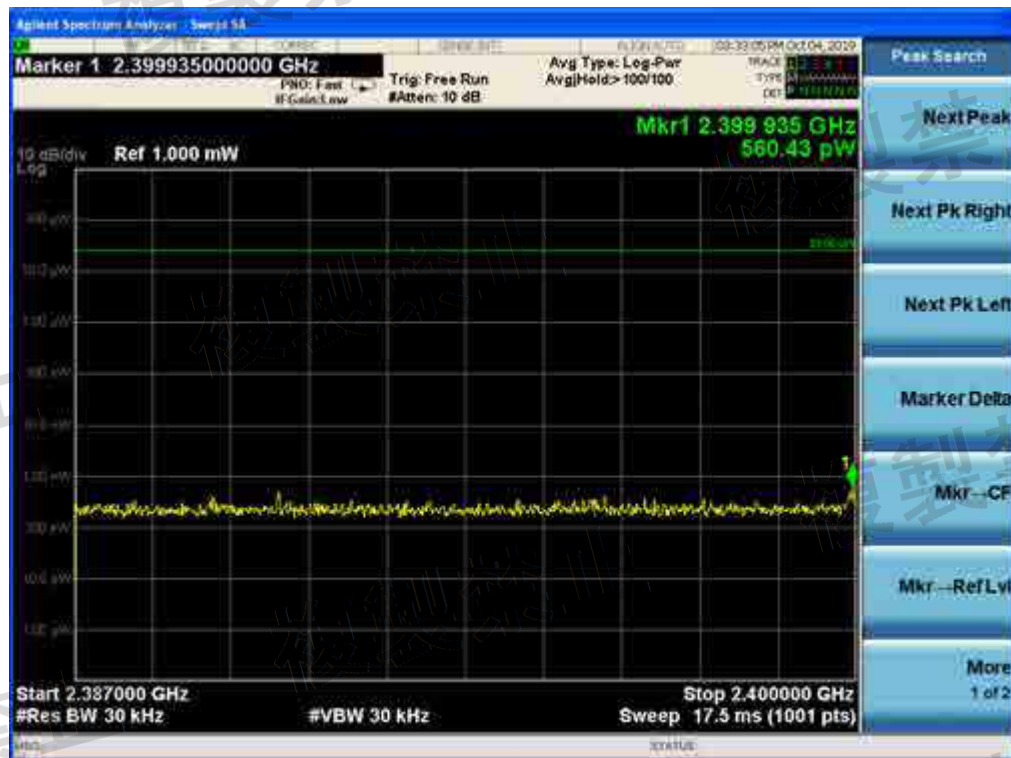


Modulation Type: GFSK, CH39

Frequency Band: < 2387MHz

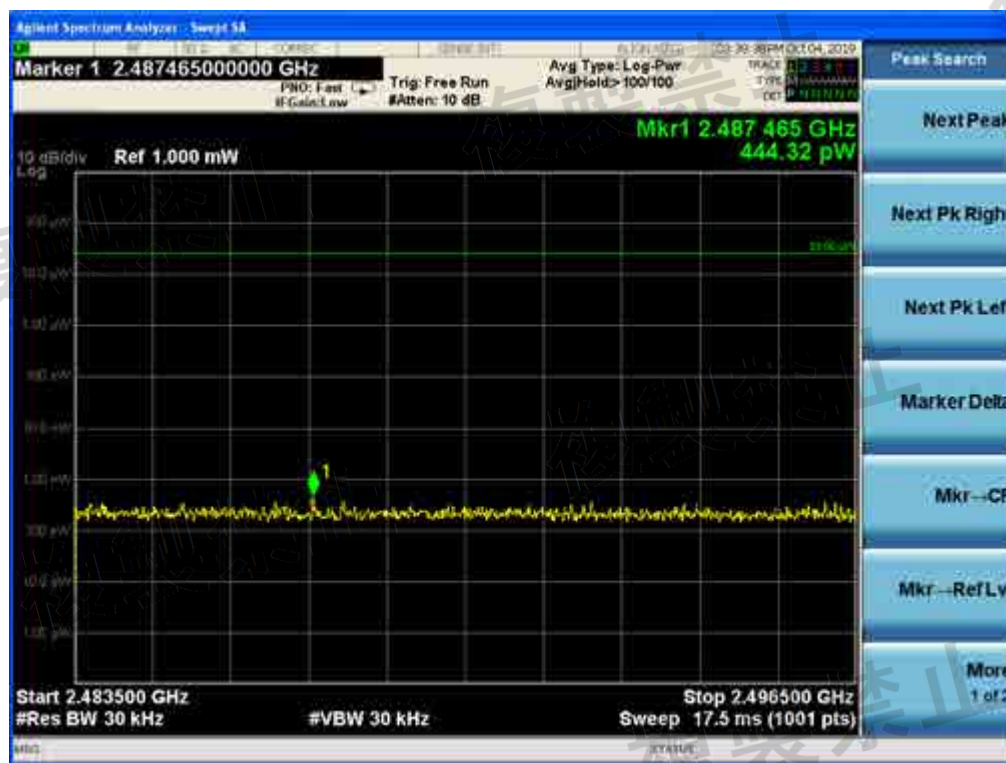


Frequency Band: 2387~2400MHz





Frequency Band: 2483.5~3496.5MHz



Frequency Band: >2496.5MHz



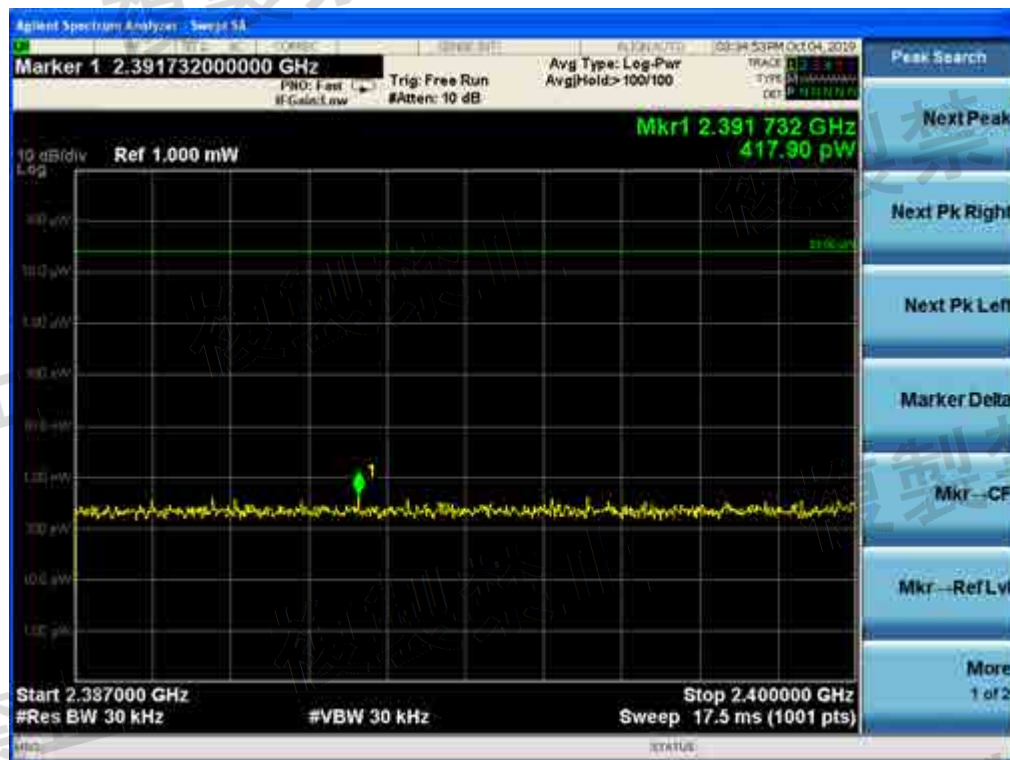


Modulation Type: pi/4-DQPSK, CH39

Frequency Band: <2387MHz

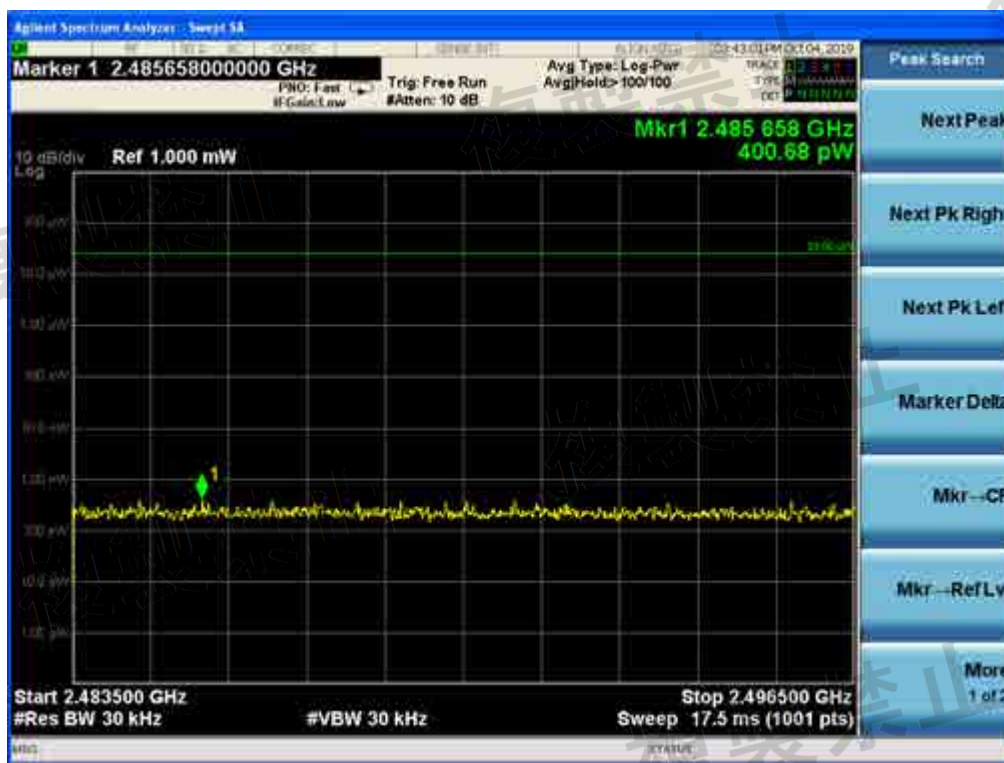


Frequency Band: 2387~2400MHz





Frequency Band: 2483.5~2496.5MHz



Frequency Band: >2496.5MHz



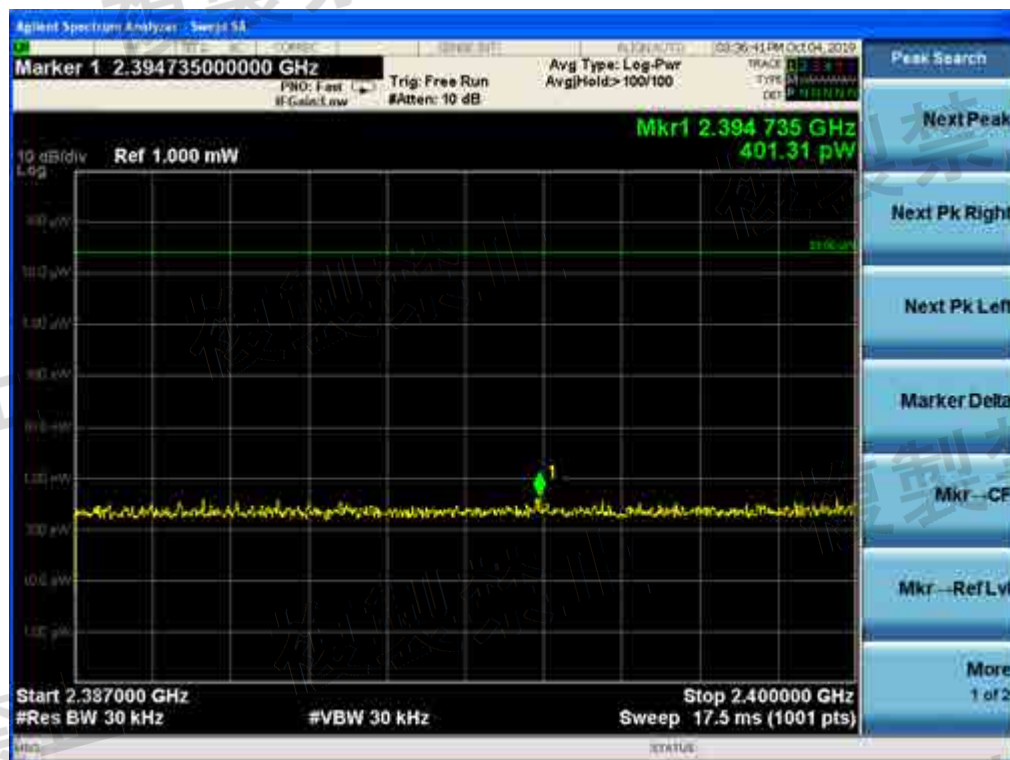


Modulation Type: 8DPSK, CH39

Frequency Band: <2387MHz

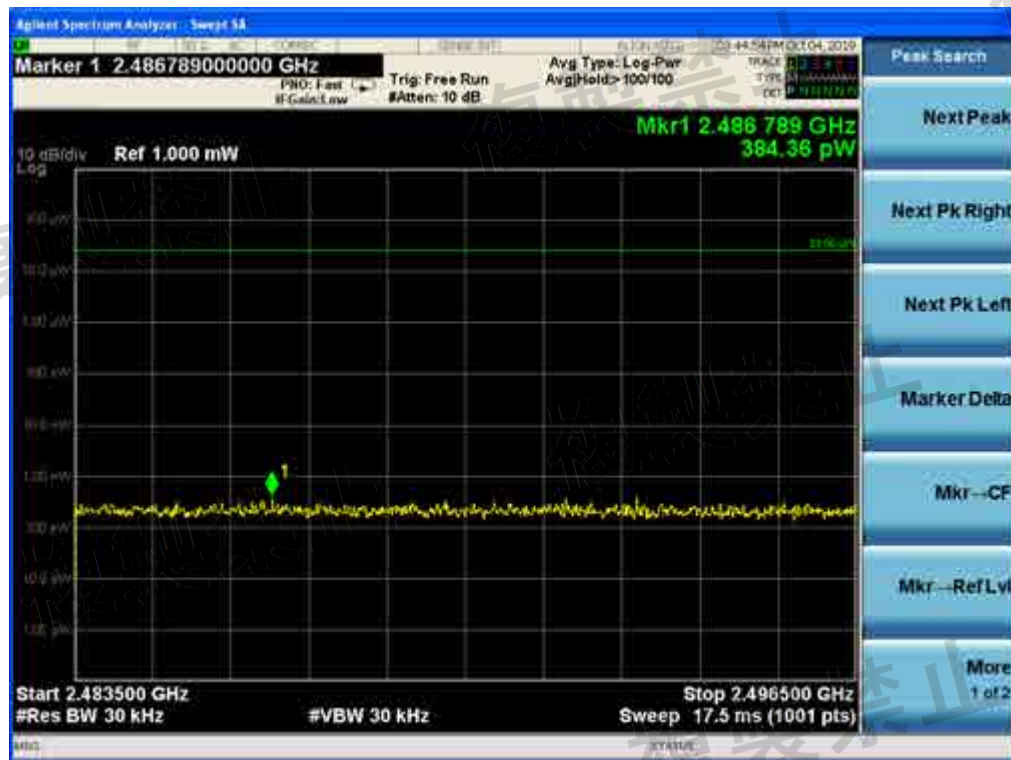


Frequency Band: 2483.5~2400MHz





Frequency Band: 2483.5-2496.5MHz



Frequency Band: >2496.5MHz



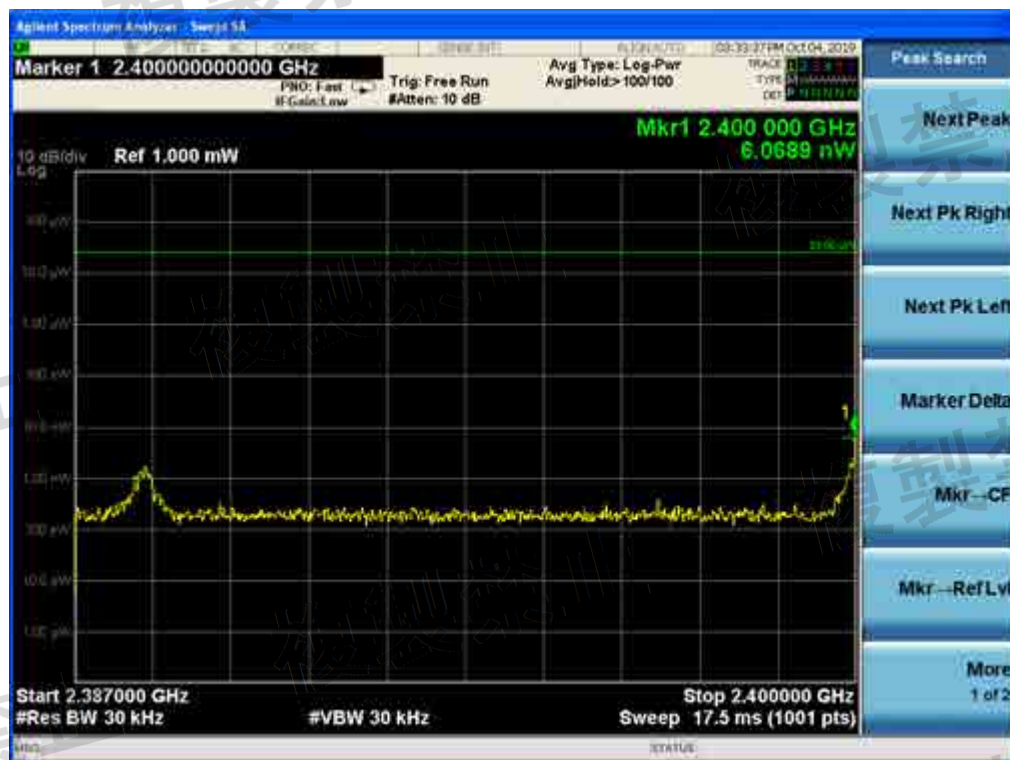


Modulation Type: GFSK, CH78

Frequency Band: <2387MHz



Frequency Band: 2387~2400MHz





Frequency Band: 2483.5~3496.5MHz



Frequency Band: >2496.5MHz



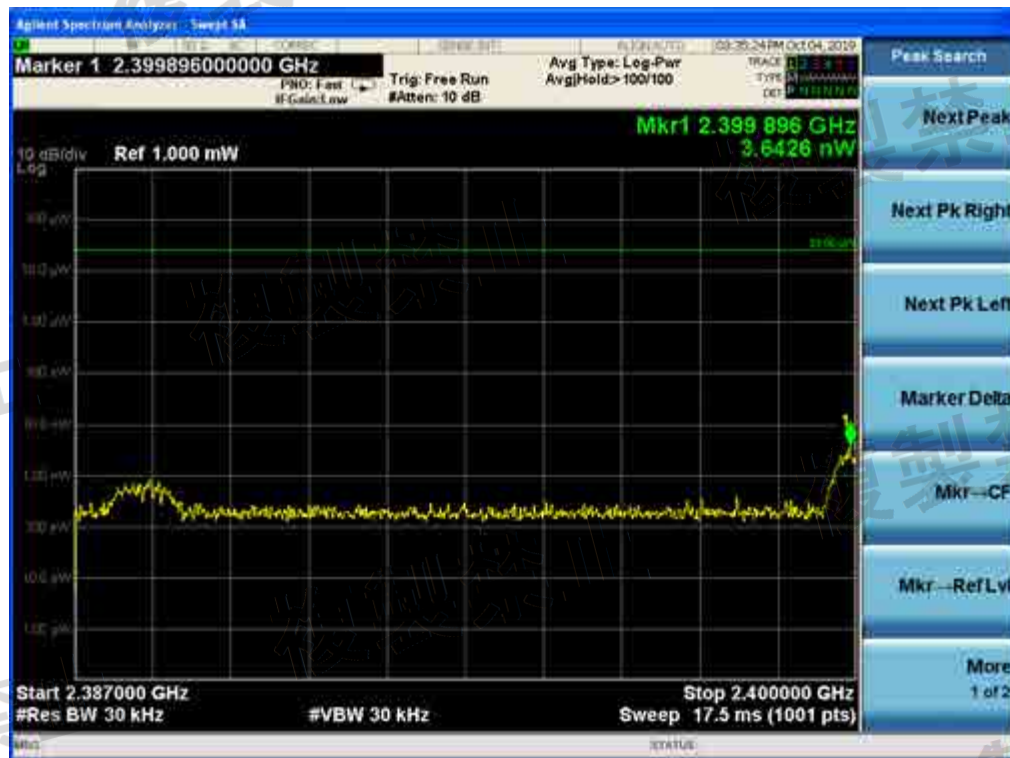


Modulation Type: pi/4-DQPSK, CH78

Frequency Band: <2387MHz

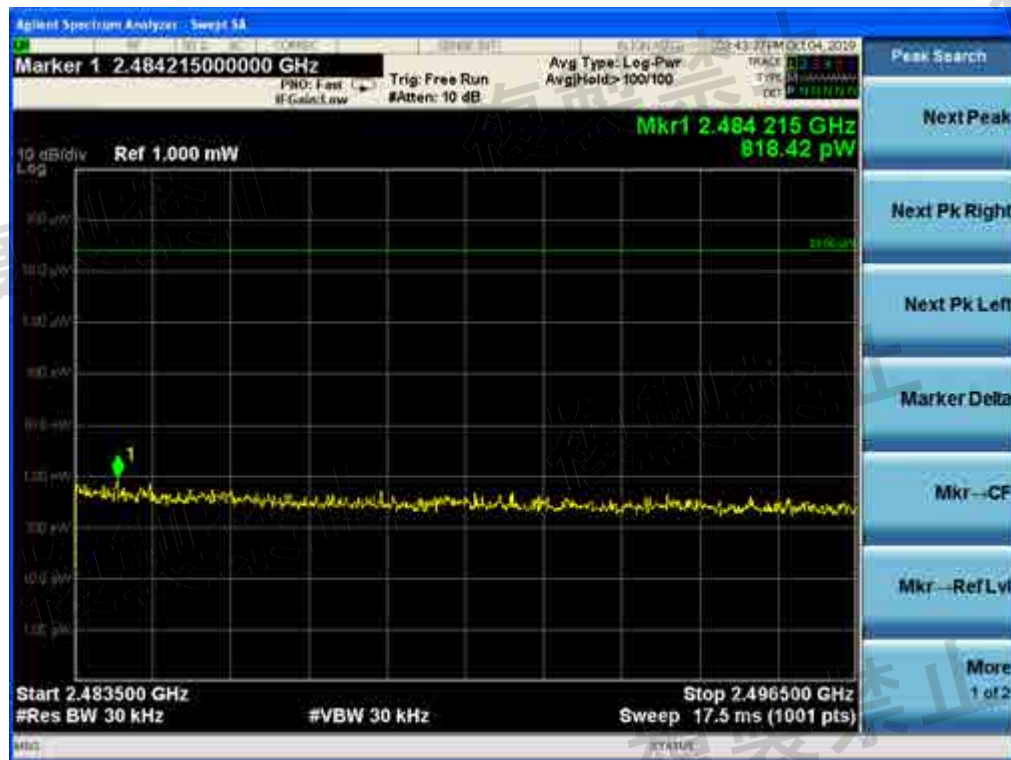


Frequency Band: 2387~2400MHz





Frequency Band: 2483.5~2496.5MHz



Frequency Band: >2496.5MHz





Modulation Type: 8DPSK, CH78

Frequency Band: <2387MHz

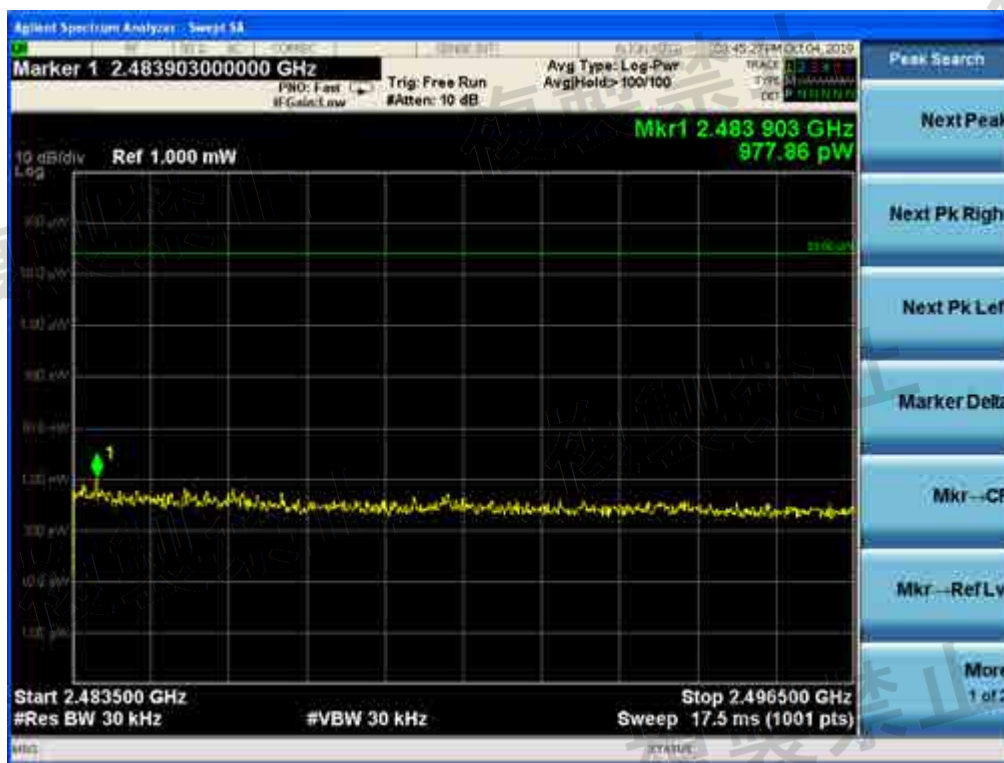


Frequency Band: 2387~2400MHz





Frequency Band: 2483.5~2496.5MHz



Frequency Band: >2496.5MHz





3.6 Dwell Time on each channel

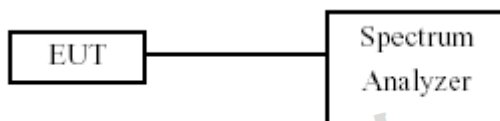
3.6.1 Test Limit

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

3.6.2 Test Procedure

According to TELEC T-401, test item "Holding time of hopping frequency", measuring procedures.

3.6.3 Test Setup



3.6.4 Test Result and Data

Test date: Oct. 04, 2019

Ambient temperature: 26°C

Atmospheric pressure: 1010hPa

Relative humidity: 65%

GFSK (DH5) Mode

Channel	Frequency (MHz)	Dwell Time (ms)
00	2402	278.32
39	2441	278.32
78	2480	278.32

Observation time= $71.11 \times 0.4(s) = 28.44(s)$

Duty-cycle= $2900(us) / 3750(us) = 0.773$

Duty-cycle= $2900(us) / 3750(us) = 0.773$

Duty-cycle= $2900(us) / 3750(us) = 0.773$

a) 2402MHz Dwell time is = 278.32 ms

$28444(ms) \times [0.773 / 79]$

b) 2441MHz Dwell time is = 278.32 ms

$28444(ms) \times [0.773 / 79]$

c) 2480MHz Dwell time is = 278.32 ms

$28444(ms) \times [0.773 / 79]$

**Pi/4-DQPSK (2DH5) Mode**

Channel	Frequency (MHz)	Dwell Time (ms)
00	2402	279.20
39	2441	279.20
78	2480	278.12

Observation time= $71.15 \times 0.4(s) = 28.46(s)$

Duty-cycle= $2905(us) / 3750(us) = 0.775$

Duty-cycle= $2905(us) / 3750(us) = 0.775$

Duty-cycle= $2895(us) / 3750(us) = 0.772$

a) 2402MHz Dwell time is = 279.20 ms

$28460(ms) \times [0.775 / 79]$

b) 2441MHz Dwell time is = 279.20 ms

$28460(ms) \times [0.775 / 79]$

c) 2480MHz Dwell time is = 278.12 ms

$28460(ms) \times [0.772 / 79]$

8DPSK (3DH5) Mode

Channel	Frequency (MHz)	Dwell Time (ms)
00	2402	279.08
39	2441	279.44
78	2480	279.08

Observation time= $71.12 \times 0.4(s) = 28.45(s)$

Duty-cycle= $2905(us) / 3750(us) = 0.775$

Duty-cycle= $2910(us) / 3750(us) = 0.776$

Duty-cycle= $2905(us) / 3750(us) = 0.775$

a) 2402MHz Dwell time is = 279.08 ms

$28448(ms) \times [0.775 / 79]$

b) 2441MHz Dwell time is = 279.44 ms

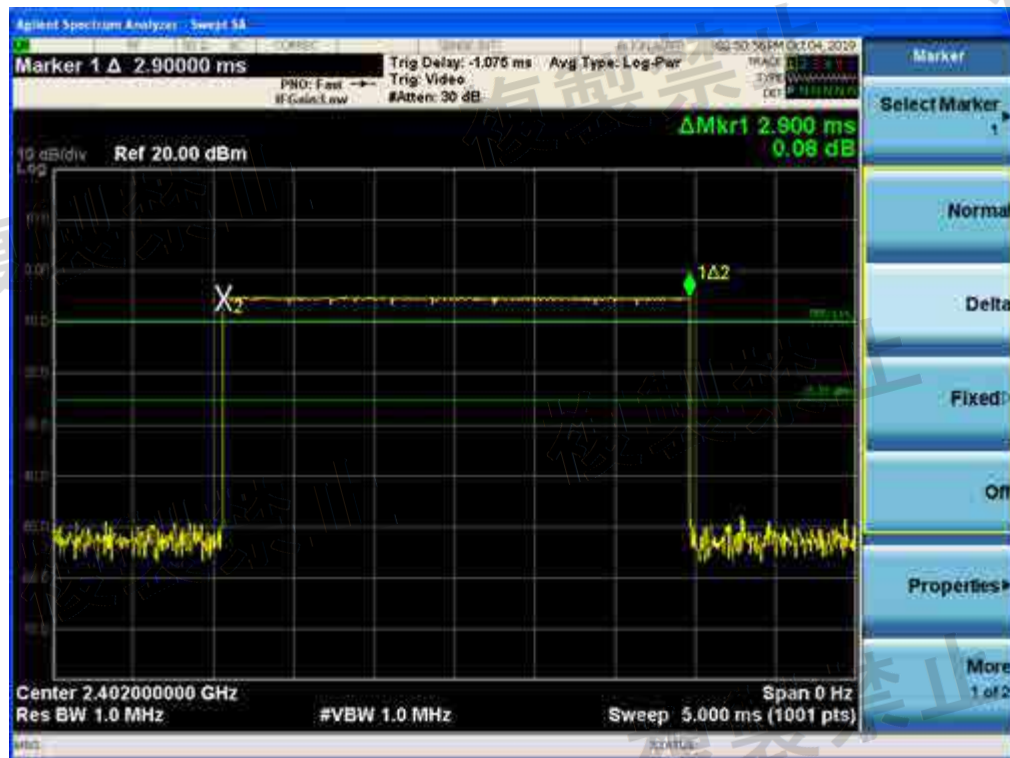
$28448(ms) \times [0.776 / 79]$

c) 2480MHz Dwell time is = 279.08 ms

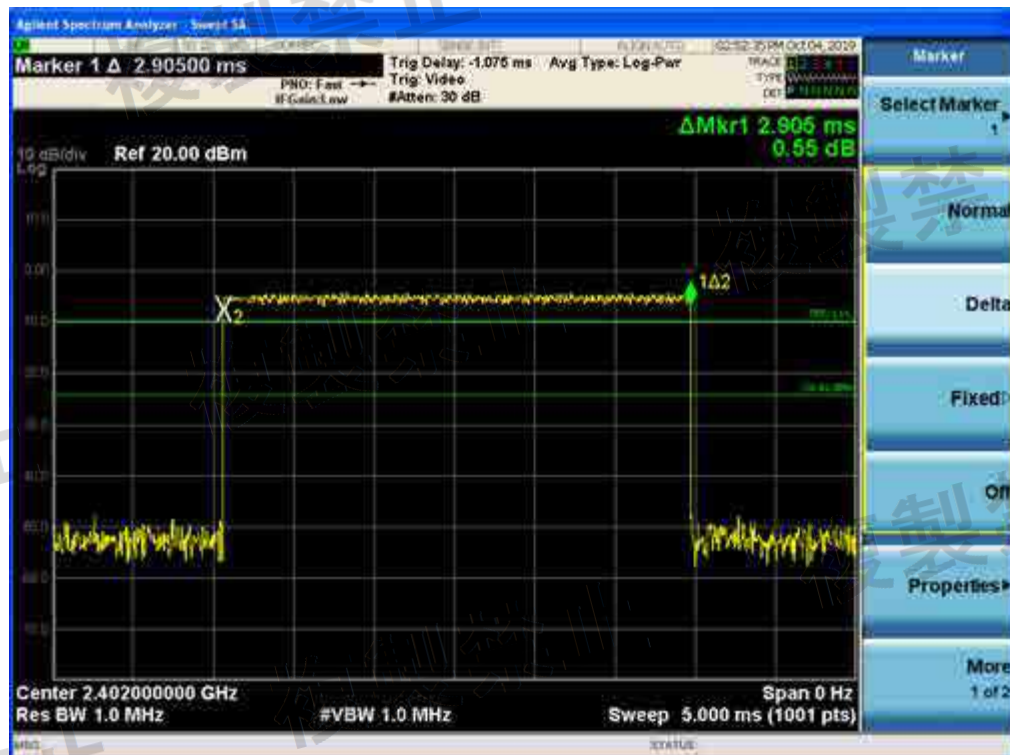
$28448(ms) \times [0.775 / 79]$



Modulation Type: GFSK (DH5), CH00

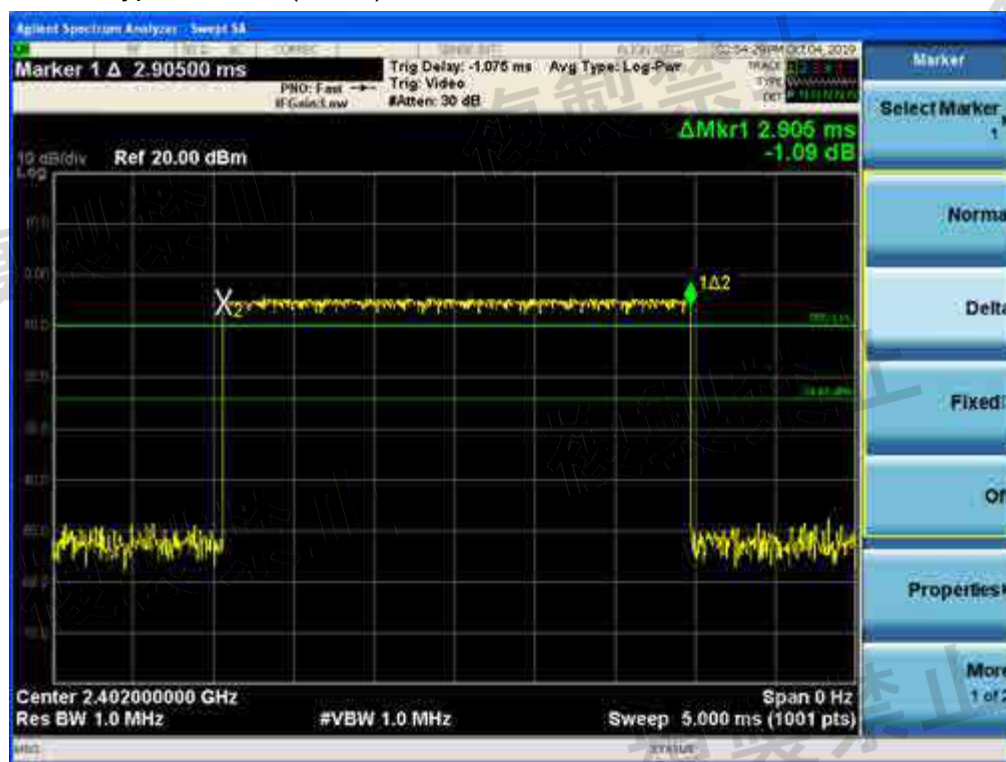


Modulation Type: pi/4-DQPSK (2DH5), CH00

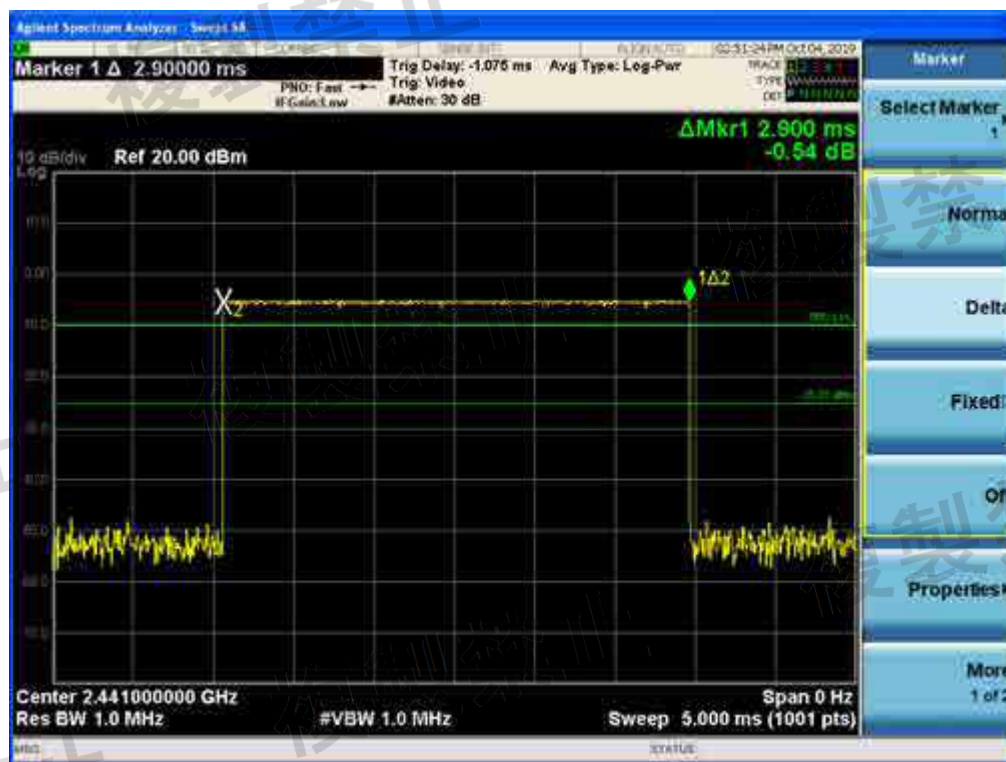




Modulation Type: 8DPSK (3DH5), CH00

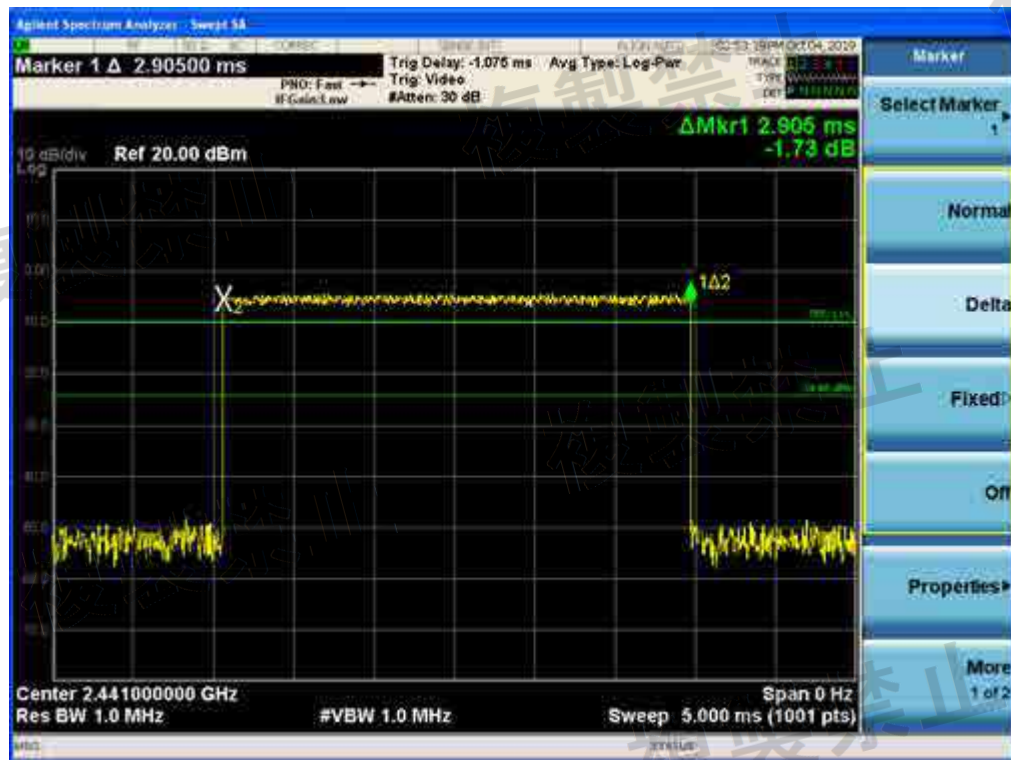


Modulation Type: GFSK (DH5), CH39

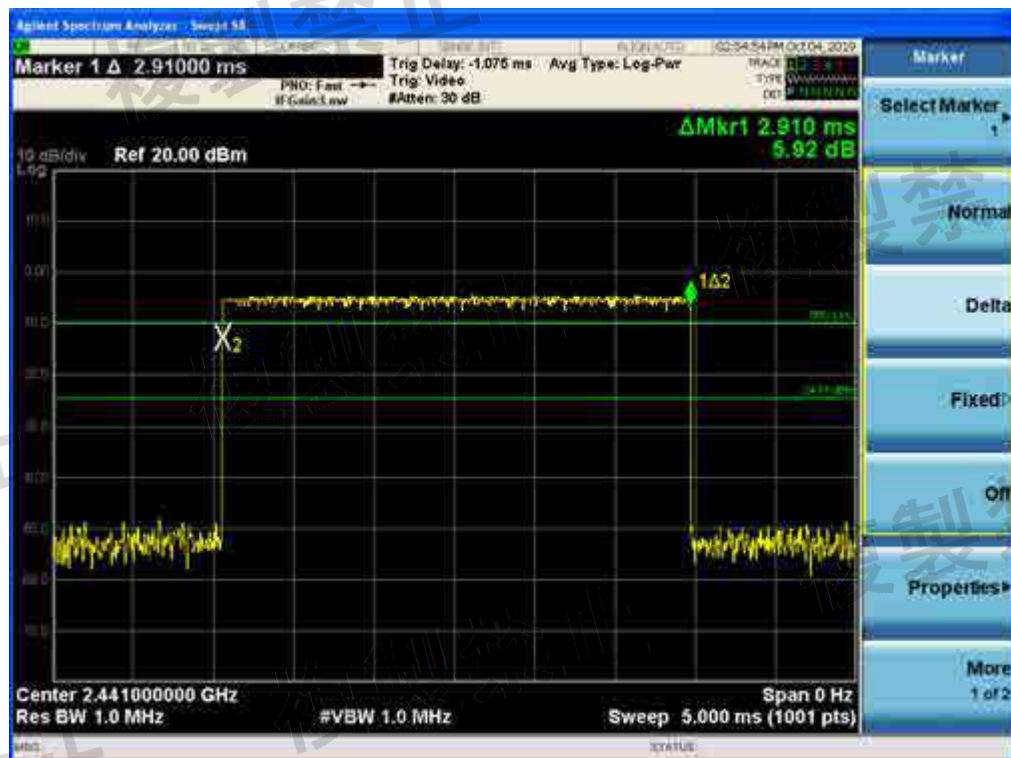




Modulation Type: pi/4-DQPSK (2DH5), CH39

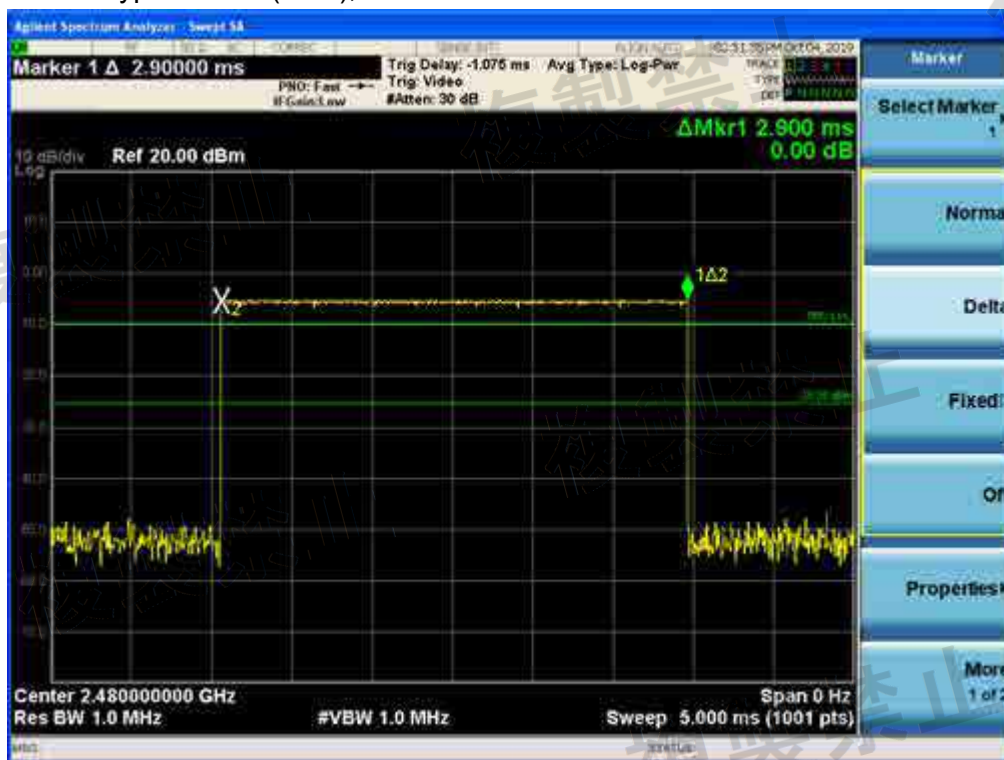


Modulation Type: 8DPSK (3DH5), CH39

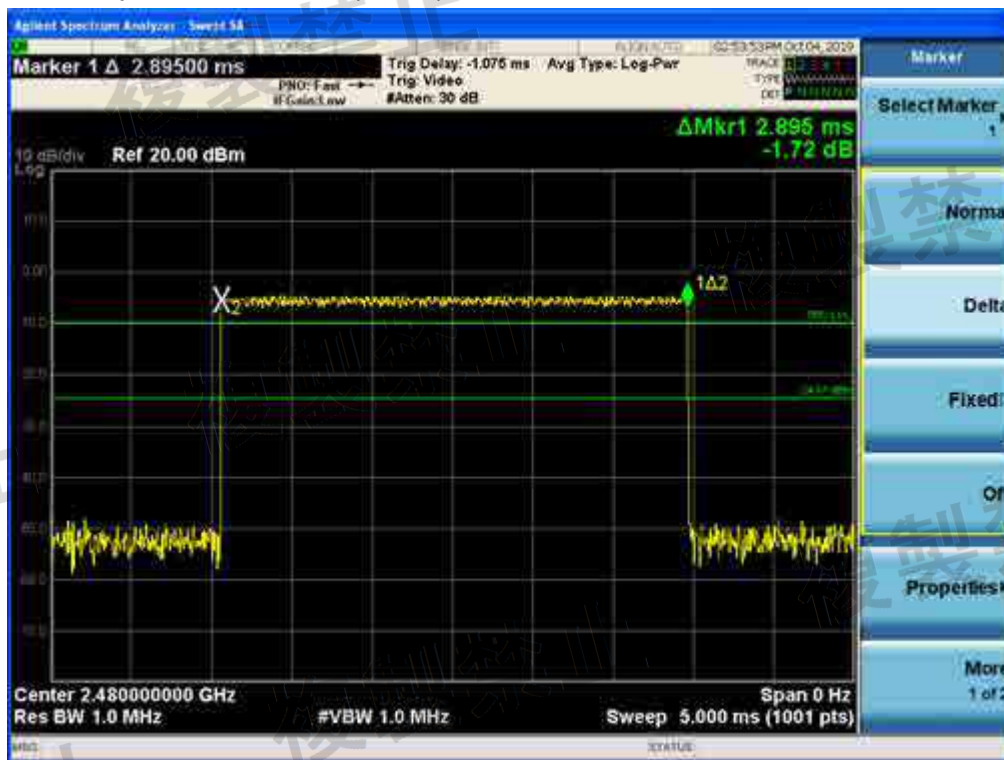




Modulation Type: GFSK (DH5), CH78

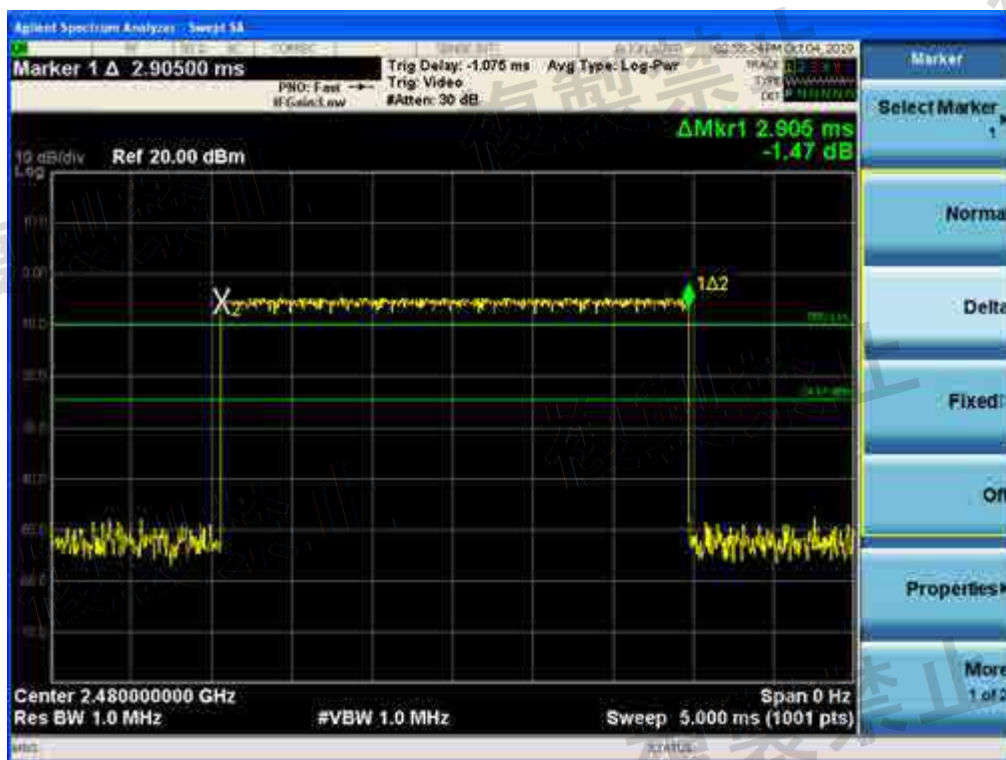


Modulation Type: pi/4-DQPSK (2DH5), CH78





Modulation Type : 8DPSK (3DH5), CH78





3.7 Interference Prevention Function

3.7.1 Test Procedures

According to TELEC-T401, test item Interference prevention function, measuring procedures.

3.7.2 Test Setup



3.7.3 Test Result and Data

Test date: Oct. 04, 2019

Ambient temperature: 26°C

Atmospheric pressure: 1010hPa

Relative humidity: 65%

Radio Interference Prevention Function	
ID Code	Result
MAC Address: 00:27:61:07:A4:A6	Pass



4. Receiver Parameters

4.1 Spurious Emissions

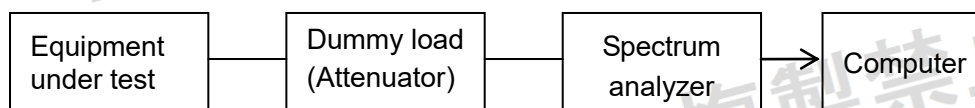
4.1.1 Test Limit

Modulation type	Limit
<1GHz	4nW
1GHz ~ 12.5GHz	20nW

4.1.2 Test Procedures

According to TELEC-T401 Limit of secondary radiated emissions measuring procedure.

4.1.3 Test Setup





4.1.4 Test Result and Data

Test date: Oct. 04, 2019

Ambient temperature: 26°C

Atmospheric pressure: 1010hPa

Relative humidity: 65%

Modulation type: GFSK						
Test Conditions	Operation Frequency (MHz) / Spurious Emission					
	CH00 2402MHz		CH39 2441MHz		CH78 2480MHz	
	MHz	μW	MHz	μW	MHz	μW
Frequency Band: < 1GHz						
Vnom	97.90	0.002	97.90	0.001	97.90	0.001
Vmax	97.90	0.002	97.90	0.001	97.90	0.001
Vmin	97.90	0.002	97.90	0.001	97.90	0.001
Frequency Band: > 1GHz						
Vnom	3196.00	0.002	3256.00	0.002	3304.00	0.002
Vmax	3196.00	0.001	3256.00	0.002	3304.00	0.002
Vmin	3196.00	0.002	3256.00	0.002	3304.00	0.002



Modulation type: pi/4-DQPSK						
Test Conditions	Operation Frequency (MHz) / Spurious Emission					
	CH00 2402MHz		CH39 2441MHz		CH78 2480MHz	
	MHz	μ W	MHz	μ W	MHz	μ W
Frequency Band: < 1GHz						
Vnom	97.90	0.001	97.90	0.001	97.90	0.001
Vmax	97.90	0.001	97.90	0.001	97.90	0.001
Vmin	97.90	0.001	97.90	0.001	97.90	0.001
Frequency Band: > 1GHz						
Vnom	3196.00	0.002	3256.00	0.002	3304.00	0.002
Vmax	3196.00	0.002	3256.00	0.002	3304.00	0.002
Vmin	3196.00	0.001	3256.00	0.002	3304.00	0.002

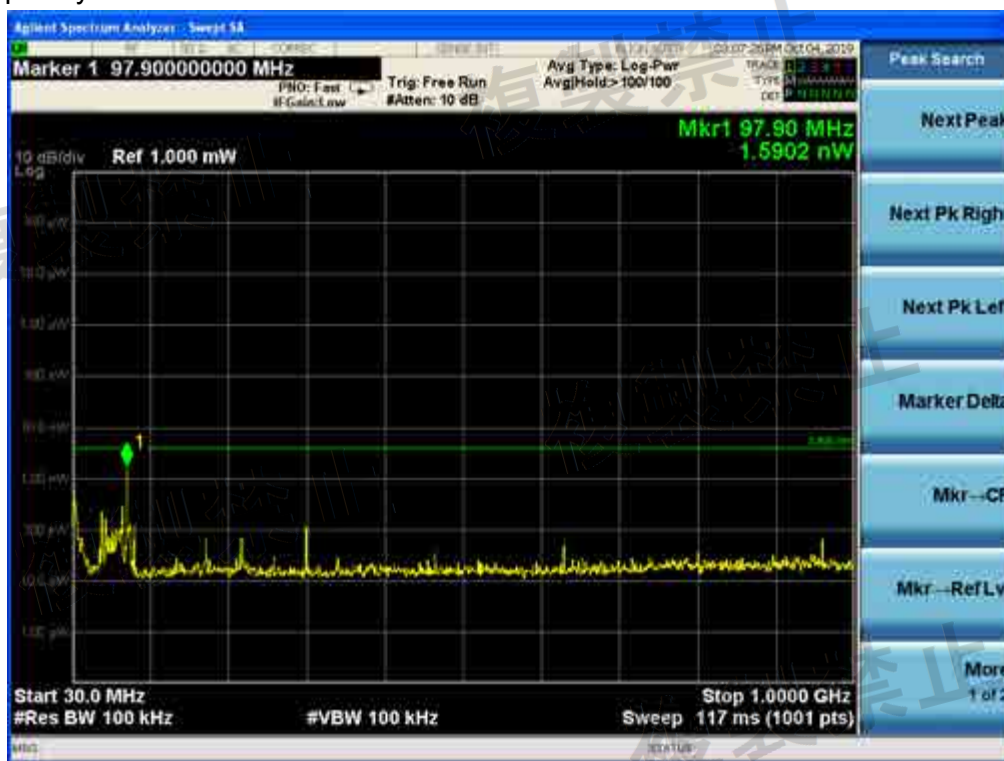
Modulation type: 8DPSK						
Test Conditions	Operation Frequency (MHz) / Spurious Emission					
	CH00 2402MHz		CH39 2441MHz		CH78 2480MHz	
	MHz	μ W	MHz	μ W	MHz	μ W
Frequency Band: < 1GHz						
Vnom	97.90	0.001	97.90	0.001	97.90	0.001
Vmax	97.90	0.001	97.90	0.001	97.90	0.001
Vmin	97.90	0.001	97.90	0.001	97.90	0.001
Frequency Band: > 1GHz						
Vnom	3196.00	0.001	3256.00	0.002	3304.00	0.002
Vmax	3196.00	0.001	3256.00	0.002	3304.00	0.002
Vmin	3196.00	0.001	3256.00	0.002	3304.00	0.002

Note: "---" means that no emissions were detected and there for it is a "PASS"



Modulation type: GFSK, CH00

Frequency Band: < 1GHz



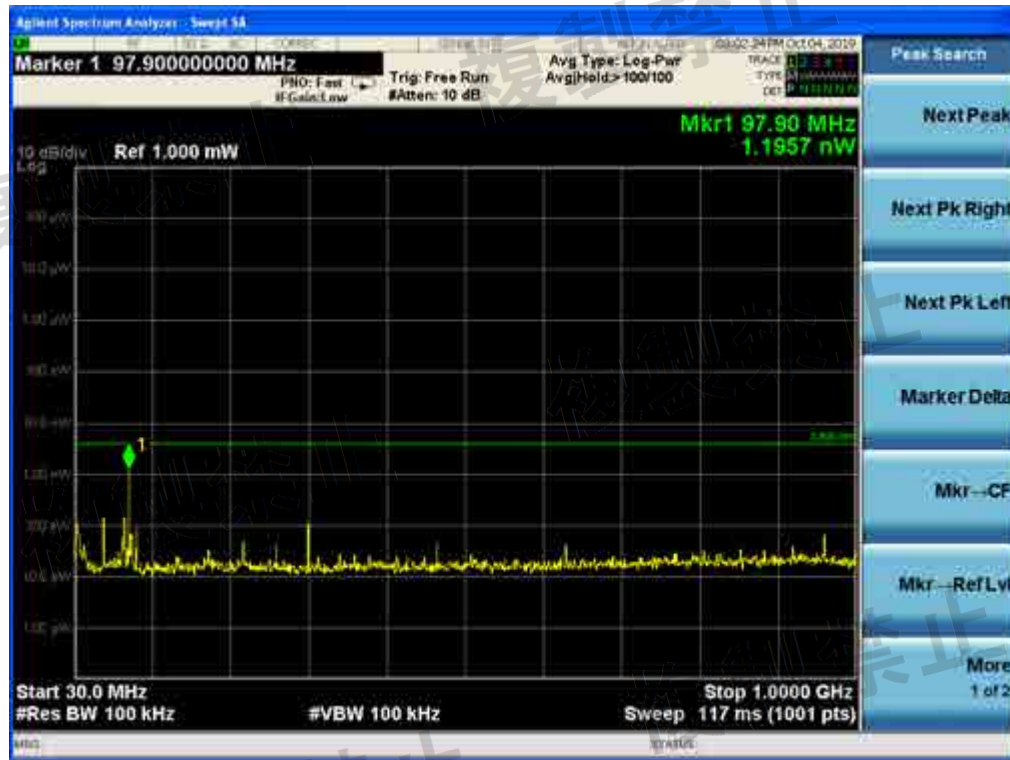
Frequency Band: > 1GHz





Modulation type: pi/4-DQPSK, CH00

Frequency Band: < 1GHz



Frequency Band: > 1GHz





Modulation type: 8DPSK, CH00

Frequency Band: < 1GHz



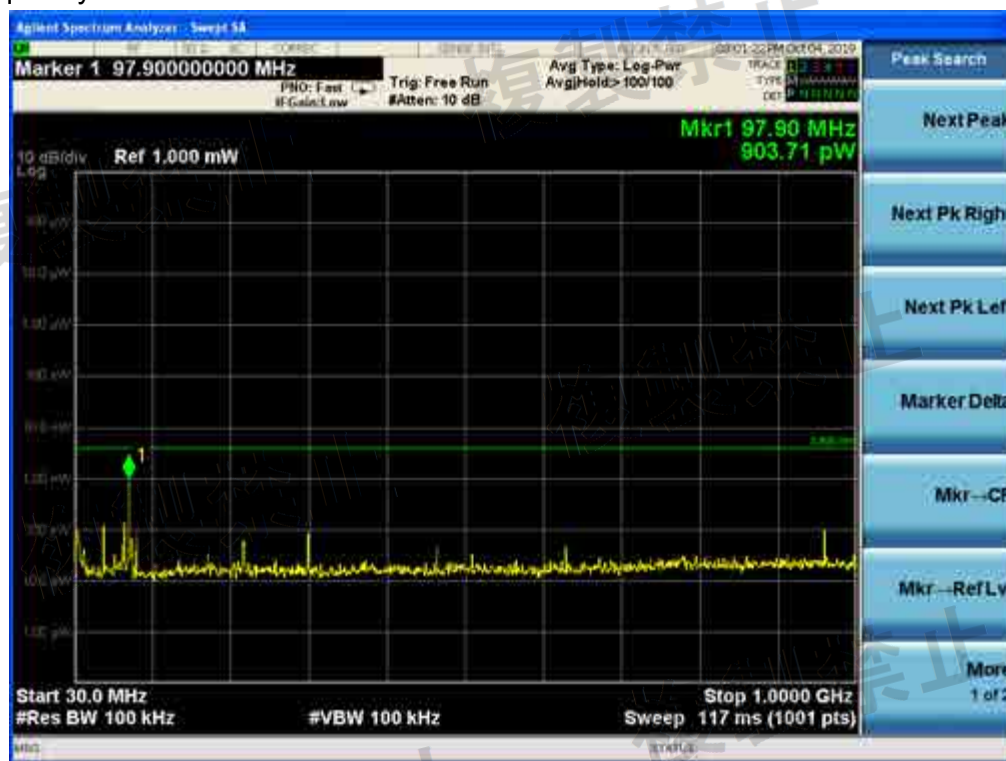
Frequency Band: > 1GHz





Modulation type: GFSK, CH39

Frequency Band: < 1GHz



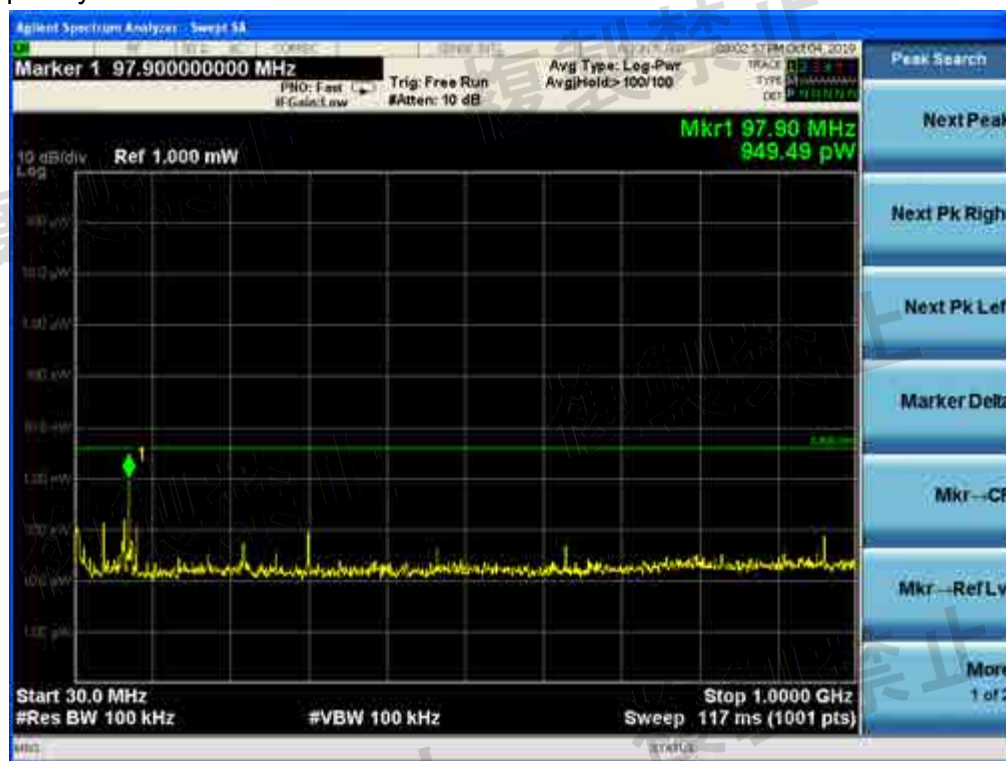
Frequency Band: > 1GHz





Modulation type: pi/4-DQPSK, CH39

Frequency Band: < 1GHz



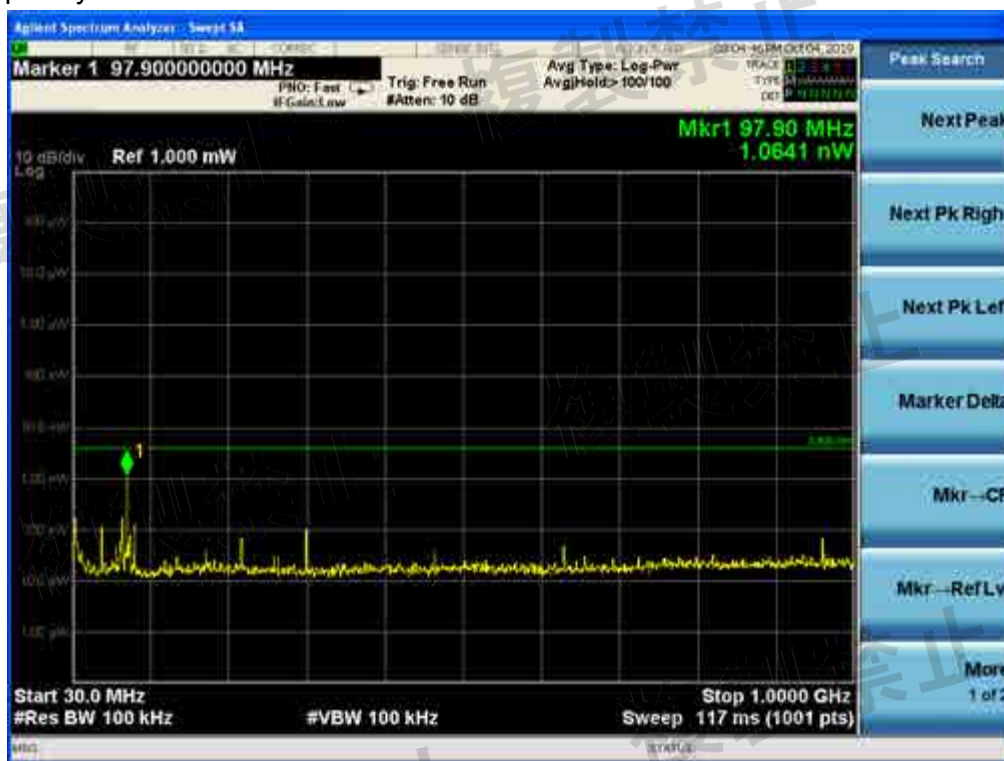
Frequency Band: > 1GHz





Modulation type: 8DPSK, CH39

Frequency Band: < 1GHz



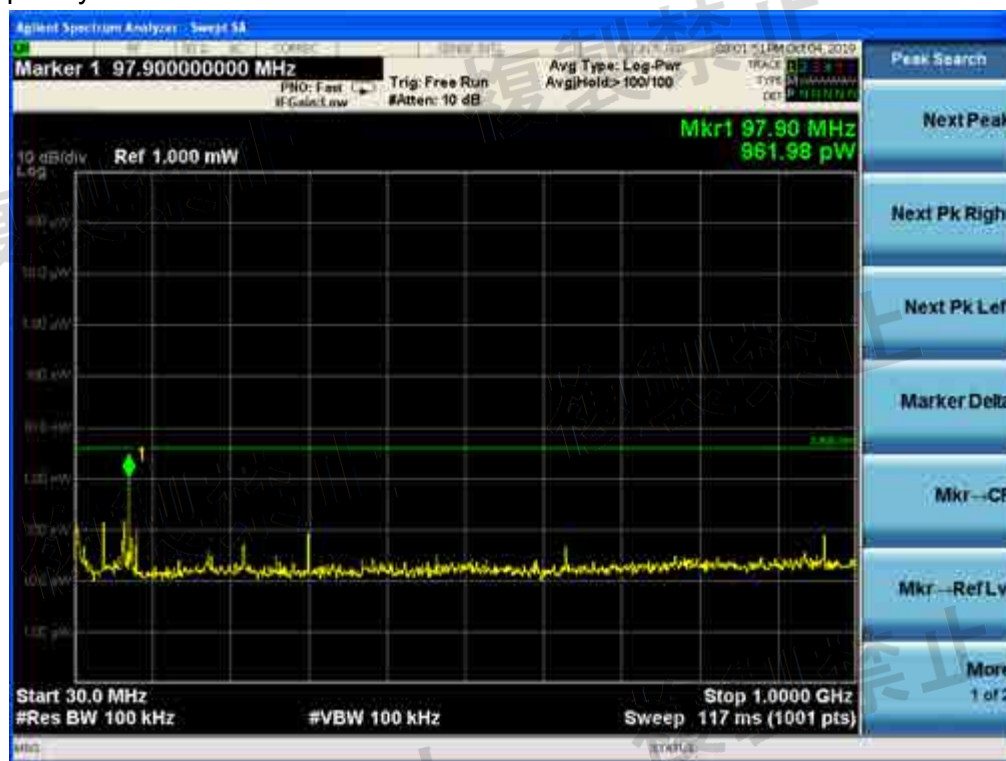
Frequency Band: > 1GHz





Modulation type: GFSK, CH78

Frequency Band: < 1GHz



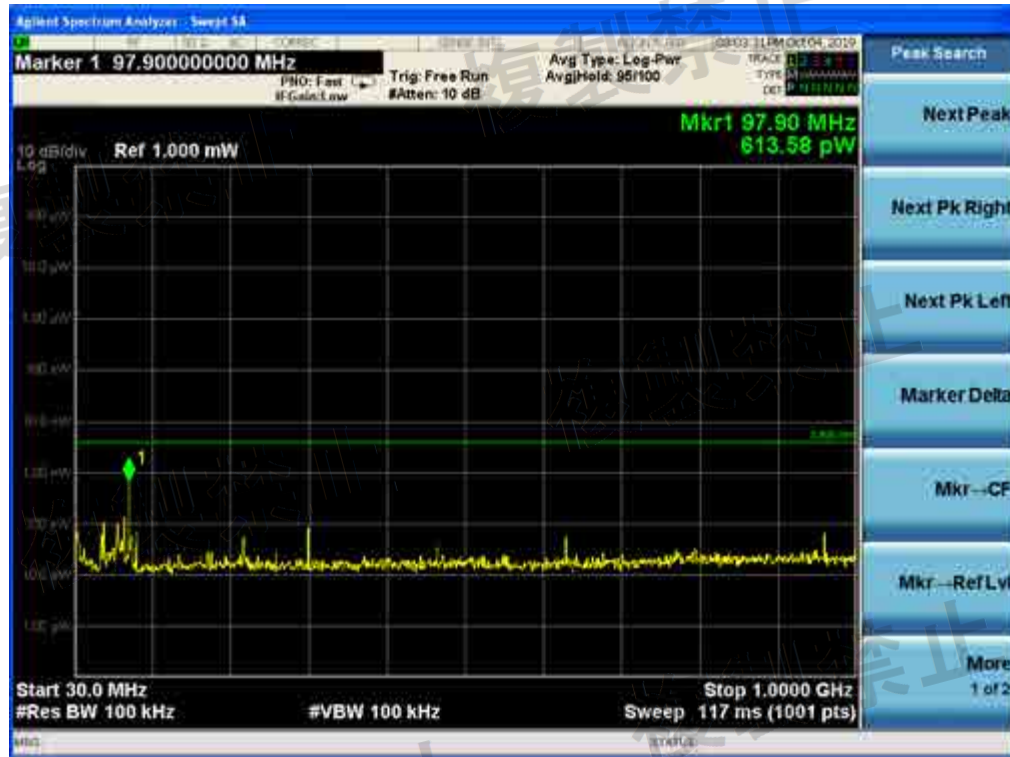
Frequency Band: > 1GHz





Modulation type: pi/4-DQPSK, CH78

Frequency Band: < 1GHz



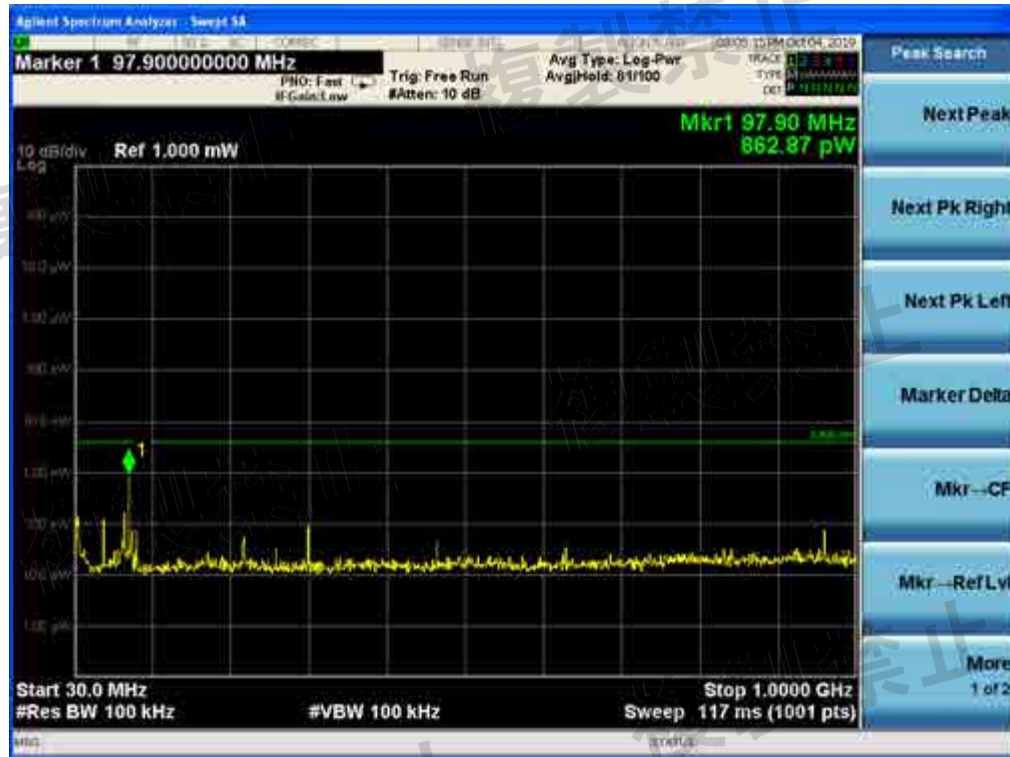
Frequency Band: > 1GHz





Modulation type: 8DPSK, CH78

Frequency Band: < 1GHz



Frequency Band: > 1GHz





5. Angular Width of Principal Radiation

5.1 Test Result

Antenna Model	C02001-A0
Antenna Type & Gain	Dipole Antenna, 1.77dBi
Cable Loss (dB)	0
EIRP (dBm/MHz)	-1.46
Half Power Beam Angles (deg)	360
Limit of E.I.R.P (dBm/MHz)	6.91
Result	Pass



APPENDIX 1

PHOTOS OF TEST CONFIGURATION



< RF Setup Photo >

