

**MIC Public Notic 88:2004 Annex 43
CERTIFICATION TEST REPORT**

FOR

Speaker Earphone

Model No.: L1,L2 ,L3, L4 ,L6 ,L7 ,MH1 ,MH3 ,MH5 ,VOGUE.2 ,Z16 ,Z17

Trademark: N/A

Report No.: ES190924010W

Issue Date: October 14, 2019

Prepared for

Fukuyama Trade CO.,LTD

MITSUZAWA MINAMICHO16-1, KANAGAWAKU, YOKOHAMASHI,
KANAGAWAKEN, JAPAN

Prepared by

EMTEK (SHENZHEN) CO., LTD.

Bldg 69, Majialong Industry Zone, Nanshan District,
Shenzhen, Guangdong, China

TEL: 86-755-26954280

FAX: 86-755-26954282

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TEST RESULT CERTIFICATION

Applicant : Fukuyama Trade CO.,LTD
Address : MITSUZAWA MINAMICHO16-1,KANAGAWAKU,YOKOHAMASHI,
KANAGAWAKEN,JAPAN
Manufacturer : Fukuyama Trade CO.,LTD
Address : MITSUZAWA MINAMICHO16-1,KANAGAWAKU,YOKOHAMASHI,
KANAGAWAKEN,JAPAN
EUT : Speaker Earphone
Model Name : L1,L2 ,L3 ,L4 ,L6 ,L7 ,MH1 ,MH3 ,MH5 ,VOGUE.2 ,Z16 ,Z17
Trademark : N/A

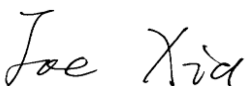
Measurement Procedure Used:

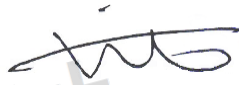
APPLICABLE STANDARDS		
STANDARD	Test Procedure	TEST RESULT
Item 19 of Article 2 Paragraph 1	MIC public notice 88:2004, annex 43	PASS

The device described above is tested by EMTEK (SHENZHEN) CO., LTD. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and EMTEK (SHENZHEN) CO., LTD. is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) was measured according to the test methods of Ordinance Concerning Technical Regulations Conformity Certification etc. of Specified Radio Equipment in Annex 1, the Ministry of Internal Affairs and Communication notification in Annex "43" of Article 88, Paragraph 1 or the test method more than equivalent and the result is technically compliant with the ARIB STD T-66 requirements.
The test results of this report relate only to the tested sample identified in this report

Date of Test : September 29, 2019 to October 11, 2019

Prepared by : 
Sewen Guo /Editor

Reviewer : 
Joe Xia/Supervisor

Approve & Authorized Signer : 
Lisa Wang/Manager



Modified Information

Rev.	Summary	Date of Rev.	Report No.
Ver.1.0	Original Report	October 14, 2019	ES190924010W

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1 EUT TECHNICAL DESCRIPTION

Characteristics	Description
BT Version	Bluetooth 4.2
Data Rate	1Mbps for BT BR GFSK modulation 2Mbps for BT EDR pi/4-DQPSK modulation
Modulation:	GFSK modulation for BT BR(1Mbps) pi/4-DQPSK modulation for BT EDR(2Mbps)
Operating Frequency Range(s):	2402-2480MHz for BT
Number of Channels:	79 channels for BT
Rated Antenna power:	0.5 mW/MHz for Bluetooth
Antenna Type :	Integral Antenna
Antenna Gain:	2.0 dBi;
Power supply:	☒ DC supply: DC 5.0V
Battery:	2000mAH,3.7V
Hardware version:	1.0
Software version:	1.0
Temperature Range	0°C ~ +45°C

Note: for more details, please refer to the User's manual of the EUT.

2 SUMMARY OF TEST RESULT

MIC RULES	DESCRIPTION OF TEST	RESULT
Item 19	RF Output Power	Compliant
Item 19	Frequency Tolerance	Compliant
Item 19	Occupied Bandwidth /Spreading Bandwidth/Spread Factor	Compliant
Item 19	Holding time of hopping frequency	Compliant
Item 19	Transmitter Spurious Emissions	Compliant
Item 19	Receiver Spurious Emissions	Compliant
Item 19	Interference Prevention Function	Compliant
Item 19	Carrier Sending Function	N/A

3 TEST METHODOLOGY

3.1 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to its specifications, the EUT must comply with the requirements of the following standards:
Item 19 of Article 2 Paragraph 1 of the TELEC rules for 2.4GHz band wide-band low-power data communication system. All measurements contained in this report were conducted with test method for radio equipment specified in MIC public notice 88:2004, annex 43 for certification. And measuring method for electric field intensity of radio station with remarkably weak radiowave transmitted.

3.2 MEASUREMENT EQUIPMENT USED

3.2.1 Conducted Emission Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	Calibration Lab.
Test Receiver	Rohde & Schwarz	ESCS30	828985/018	May 21, 2019	CEPREI
L.I.S.N.	Schwarzbeck	NNLK8129	8129203	May 20, 2019	CEPREI
50Ω Coaxial Switch	Anritsu	MP59B	M20531	May 21, 2019	CEPREI
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100006	May 20, 2019	CEPREI
Voltage Probe	Rohde & Schwarz	TK9416	N/A	May 20, 2019	CEPREI
I.S.N	Rohde & Schwarz	ENY22	1109.9508.02	May 21, 2019	CEPREI

3.2.2 Radiated Emission Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	Calibration Lab.
EMI Test Receiver	Rohde & Schwarz	ESU	1302.6005.26	May 21, 2019	CEPREI
Pre-Amplifier	HP	8447D	2944A07999	May 20, 2019	CEPREI
Bilog Antenna	Schwarzbeck	VULB9163	142	May 20, 2019	CEPREI
Loop Antenna	ARA	PLA-1030/B	1029	May 20, 2019	CEPREI
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170399	May 20, 2019	CEPREI
Horn Antenna	Schwarzbeck	BBHA 9120	D143	May 20, 2019	CEPREI
Cable	Schwarzbeck	AK9513	ACRX1	May 21, 2019	CEPREI
Cable	Rosenberger	N/A	FP2RX2	May 21, 2019	CEPREI
Cable	Schwarzbeck	AK9513	CRPX1	May 21, 2019	CEPREI
Cable	Schwarzbeck	AK9513	CRRX2	May 21, 2019	CEPREI

3.2.3 Radio Frequency Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	Calibration Lab.
Spectrum Analyzer	Agilent	E4407B	88156318	May 21, 2019	CEPREI
Spectrum Analyzer	Agilent	N9010A	My53470879	May 21, 2019	CEPREI
Spectrum Analyzer	R & S	FSV40	132.1-3008K3 9-100967-AP	May 21, 2019	CEPREI
Power meter	Anritsu	ML2495A	0824006	May 21, 2019	CEPREI
Power sensor	Anritsu	MA2411B	0738172	May 21, 2019	CEPREI
Oscilloscope	Tektronix	TDS3012B	071-0964-03	May 21, 2019	CEPREI

Remark: Each piece of equipment is scheduled for calibration once a year.

3.3 DESCRIPTION OF TEST MODES

The EUT has been tested under its typical operating condition.

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

Test of channel included the lowest and middle and highest frequency to perform the test, and then record on this report.

Those data rates (1Mbps for Bluetooth BR GFSK modulation; 2Mbps for Bluetooth EDR pi/4-DQPSK modulation) were used for all tests.

Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Frequency and Channel list for Bluetooth v4.2:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	39	2441	...	...
1	2403	40	2442	76	2478
2	2404	41	2443	77	2479
...	...	...	...	78	2480
Note: $f_c = 2402\text{MHz} + k \times 1\text{MHz}$ $k=0$ to 78					

Test Frequency and channel for Bluetooth v4.2:

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	39	2441	78	2480

3.4 SUPPORT EQUIPMENT

EUT Cable List and Details

Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Cable List and Details

Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Equipment List and Details

Description	Manufacturer	Model	Serial Number
/	/	/	/

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
3. Unless otherwise denoted as EUT in [Remark] column, device(s) used in tested system is a support equipment

4 FACILITIES AND ACCREDITATIONS

4.1 FACILITIES

All measurement facilities used to collect the measurement data are located at Bldg 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, China. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22."

4.2 LABORATORY ACCREDITATIONS AND LISTINGS

Site Description

EMC Lab. : Accredited by CNAS, 2018.11.30
The certificate is valid until 2022.10.28
The Laboratory has been assessed and proved to be in compliance with CNAS/CL01:2006
The Certificate Registration Number is L2291

Accredited by FCC, August 09, 2018
Designation Number: CN1204
Test Firm Registration Number: 882943
Accredited by A2LA, August 08, 2018
The Certificate Registration Number is 4321.01

Accredited by Industry Canada, November 09, 2018
The Conformity Assessment Body Identifier is CN0008.

Certificated by VCCI, Japan
Registration No.: R-2777
Valid until 2019/10/27

Certificated by VCCI, Japan
Registration No.: G-10627
Valid until 2021/11/20

Certificated by VCCI, Japan
Registration No.: C-3065
Valid until 2019/10/27

Registration No.: T-11318
Valid until 2021/03/28

Name of Firm : EMTEK (SHENZHEN) CO., LTD.
Site Location : Bldg 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, China

5 TEST SYSTEM UNCERTAINTY

The following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-5}$
Uncertainty for Output power test	$\pm 0.83\text{dB}$
Conducted Emissions Test	$\pm 2.0\text{dB}$
Radiated Emission Test	$\pm 2.0\text{dB}$
Occupied Bandwidth Test	$\pm 1.0\text{dB}$
Power density test	$\pm 1.85\text{dB}$
All emission, radiated	$\pm 3\text{dB}$
Antenna Port Emission	$\pm 3\text{dB}$
Temperature	$\pm 0.5^{\circ}\text{C}$
Humidity	$\pm 3\%$

Measurement Uncertainty for a level of Confidence of 95%

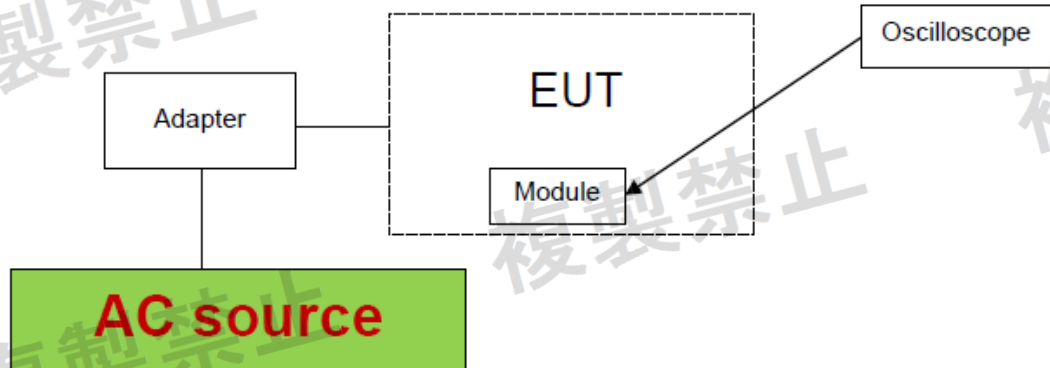
6 WIRELESS MODULE VOLTAGE TEST IN EXTREME CONDITIONS

6.1 Applicable Standard

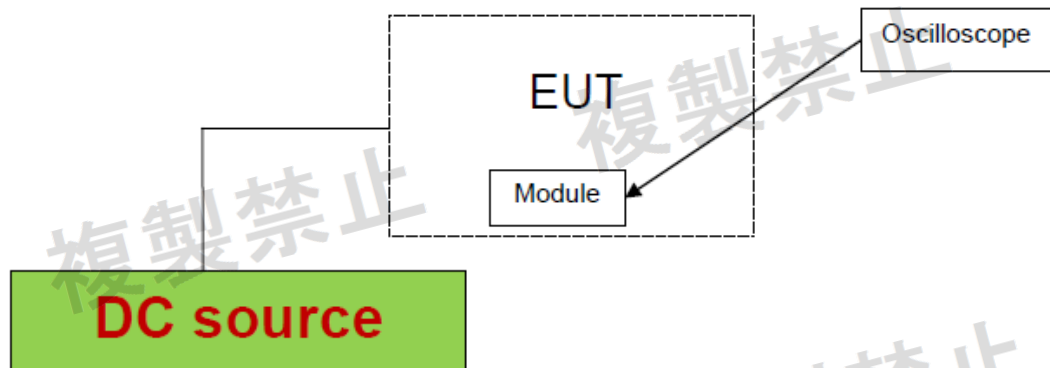
When there is a fluctuation of $\pm 10\%$ input voltage from external power to the test equipment. If the fluctuation of input voltage to the circuit of the radio part (excl. power) in the test equipment is confirmed below $\pm 1\%$, Measurement shall be tested with the rated voltage.

6.2 Test Configuration

Config A



Config B



6.3 Test Results

Test Voltage	AC 90V	AC 100V	AC 110V
Module Test voltage	3.30	3.30	3.31
Module Ratedvoltage	3.30	3.30	3.30
The Range of Module Voltage(%)	0	0	0.3

Test Voltage	DC 4.5V	DC 5.0V	DC 5.5V
Module Test voltage	3.31	3.32	3.31
Module Ratedvoltage	3.30	3.30	3.30
The Range of Module Voltage(%)	0.3	0.6	0.3

Note: In extreme conditions, EUT module power is confirmed below $\pm 1\%$.

7 TEST REQUIREMENTS

7.1 FREQUENCY TOLERANCE

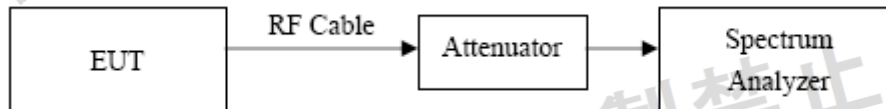
7.1.1 Applicable Standard

According to Item 19 of Article 2 Paragraph 1.

7.1.2 Conformance Limit

For the 2.4 GHz bands it shall be better than 50 ppm under the operational conditions

7.1.3 Test Setup Block Diagram



7.1.4 Test Procedure

If the fluctuation of input voltage to the circuit of the radio part (excl. power) in the test equipment is confirmed below $\pm 1\%$, Measurement shall be tested with the rated voltage.

When there is a fluctuation of $\pm 10\%$ input voltage from external power to the test equipment. In case the test equipment is designed to function only within the specified fluctuation range of $\pm 10\%$ for the voltage source tests shall be conducted applying the rated voltage and a respective specified maximum/minimum value of fluctuation range.

Set the EUT on the test frequency and transmit.

Stop the modulation (stop the spreading), set on "continuous transmission of no-modulated radiation" in principle. If impossible, on "continuous burst transmission of no-modulated radiation", or a modulation mode to generate a specific frequency spectrum so that the frequency can be measured using a spectrum analyzer (example: a wave of the sub-carrier).

In case of no-modulation (consecutive or continuous burst), direct measurement is conducted with the frequency meter.

In case of burst wave, the measurement is conducted for a time period to achieve a sufficient accuracy. The mean value is employed as the measurement value.

In case of a test mode generating specific frequency spectrum, the spectrum frequency is measured with the spectrum analyzer.

7.1.5 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

7.1.6 Test Results

Modulation Mode	Channel Number	Channel Frequency (MHz)	Reading (MHz)	Deviation (kHz)	Tolerance (ppm)	Limit (ppm)	Verdict
Non-Modulation	0	2402	2401.9815	-18.5	-7.70	50	PASS
	39	2441	2440.9758	-24.2	-9.91	50	PASS
	78	2480	2479.9869	-13.1	-5.28	50	PASS
Note: N/A (Not Applicable)							

7.2 OCCUPIED BANDWIDTH / SPREADING BANDWIDTH

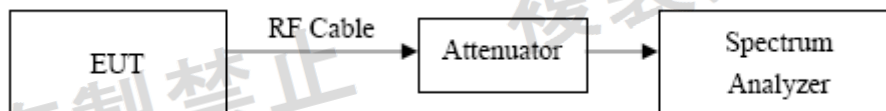
7.2.1 Applicable Standard

According to Item 19 of Article 2 Paragraph 1.

7.2.2 Conformance Limit

Permissible value for occupied bandwidth using the FH system, a hybrid systems combining DS and FH systems or hybrid system combining FH and OFDM systems shall be 83.5MHz or less,
In spread spectrum systems, spread bandwidth (which refers to a frequency bandwidth with an upper limit and lower limit such that each of the mean powers radiated above the upper frequency limit and below the lower frequency limit is equal to 5% of the total mean power radiated ,this also applies hereafter) shall be 500kHz or more.

7.2.3 Test Setup Block Diagram



7.2.4 Test Procedure

Spectrum analyzer is set as below

Central Frequency	Test frequency
Sweeping Bandwidth	2 to 3.5 times the allowable value (SPAN=160MHz)
Resolution Bandwidth	Lower than 3 % of allowable value (RBW=10kHz)
Video Bandwidth	Same level as Resolution Bandwidth
Y-Axis Scale	10 dB/Div
Input Level	Carrier level is sufficiently higher than spectrum analyzer noise
Sweep Time	Minimum time to assure the measurement accuracy (In case of burst wave, 1 burst per 1 sample)
Sampling points	More than 400 points
Sweep Mode	Consecutive sweep
Phase-Detection Mode	Positive peak
Trigger Condition	Max-hold

The measured value of the spectrum analyzer is processed by the computer internally or externally
Conditions of EUT

Set the test frequency and the modulation is performed with the standard coded test signal. In case of OFDM with burst wave, the modulation is conducted to minimize the rate of the time that the number of sub-carrier is less (short preamble).

After a repetition of sweep so that no variation is found, values of all the data points are loaded into the array variable on the computer.

For all the data, the dB values are converted to antilogarithm of power dimension.

Power summation of all the data is estimated and stored as "total power value".

Starting with the data of the minimum frequency, the power is summed sequentially, and the limiting data point where the value achieves 0.5% of the total power is sensed. The limiting point is converted to frequency, stored as "lower limit".

Starting with the data of the maximum frequency, the power is summed sequentially, and the limiting data point where the value achieves 0.5% of the total power is sensed. The limiting point is converted to frequency, stored as "upper limit"

7.2.5 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

7.2.6 Test Results

Occupied Bandwidth (99% Emission bandwidth)

Modulation Mode	Occupied Bandwidth (MHz)	Limit (MHz)	Verdict
GFSK	78.825	≤ 83.5	PASS
$\pi/4$ -DQPSK	78.685	≤ 83.5	PASS
Note: N/A (Not Applicable)			

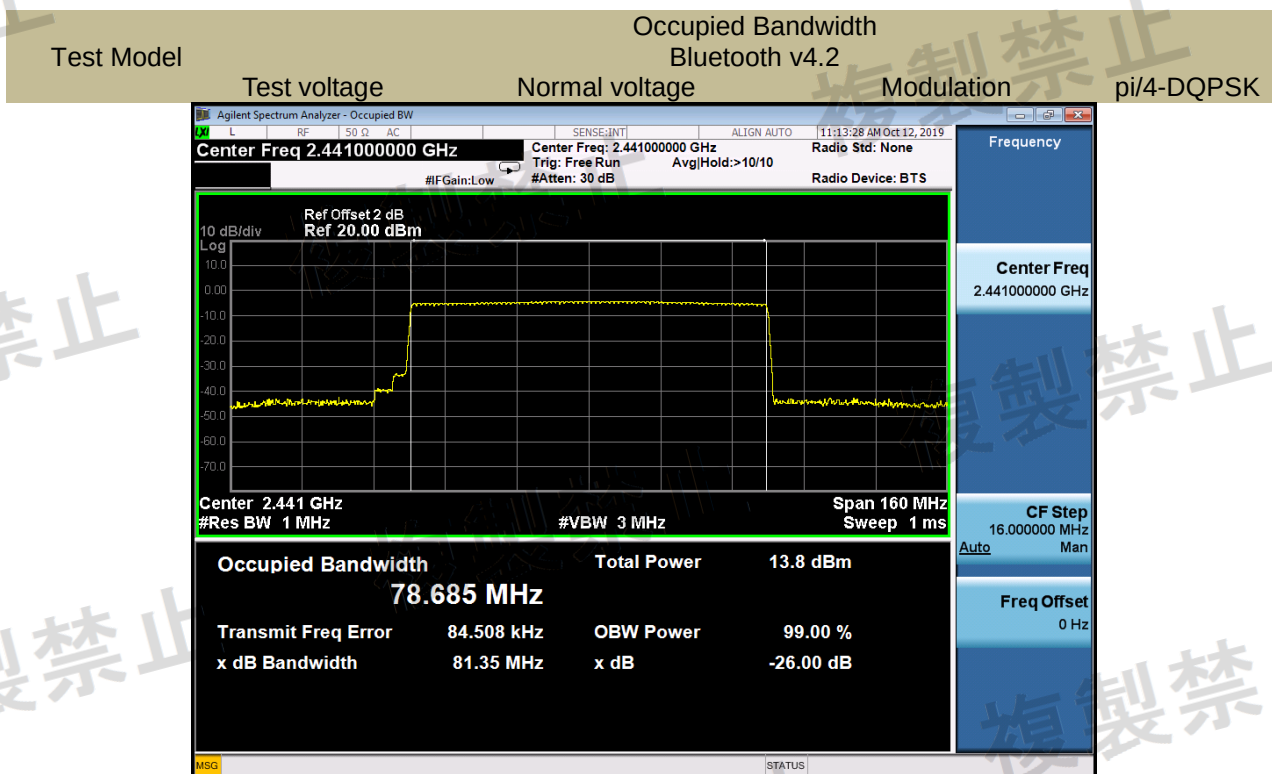
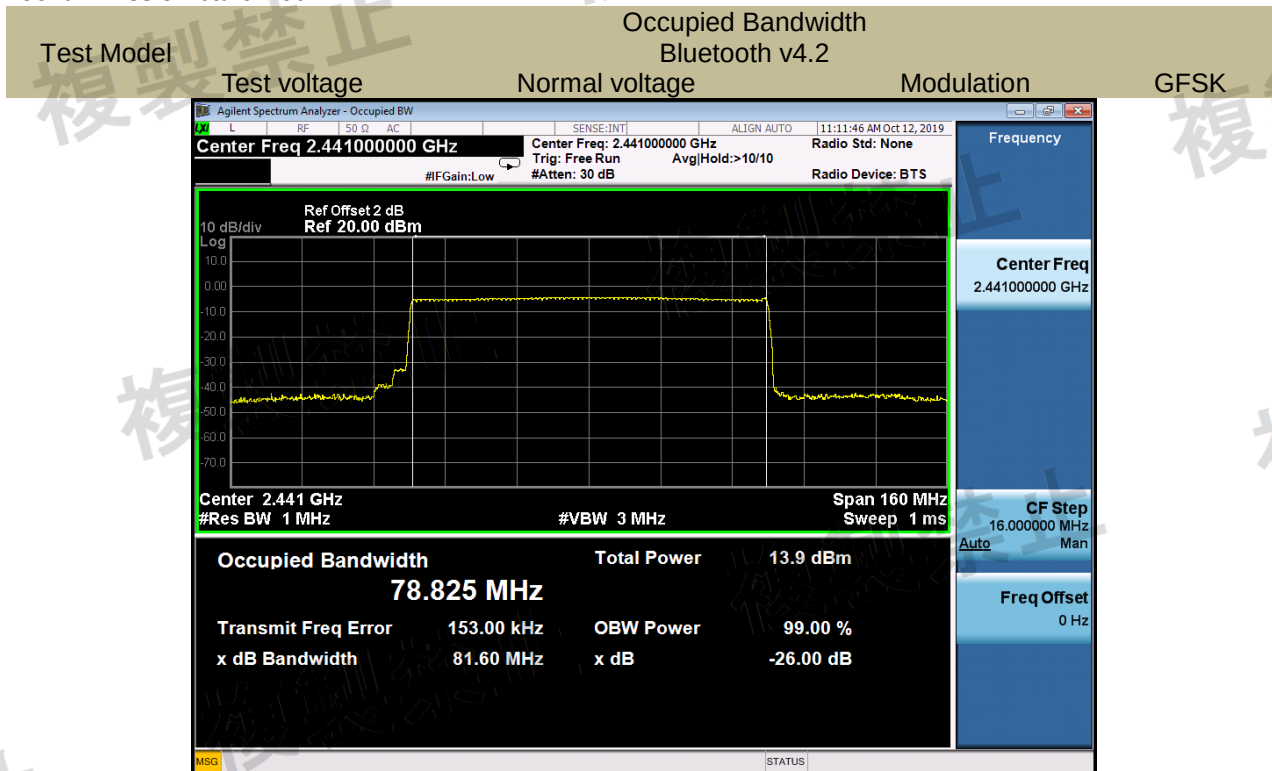
Diffusion Bandwidth (90% Emission bandwidth)

Modulation Mode	Occupied Bandwidth (MHz)	Limit (MHz)	Verdict
GFSK	70.945	≥ 500	PASS
$\pi/4$ -DQPSK	70.662	≥ 500	PASS
Note: N/A (Not Applicable)			

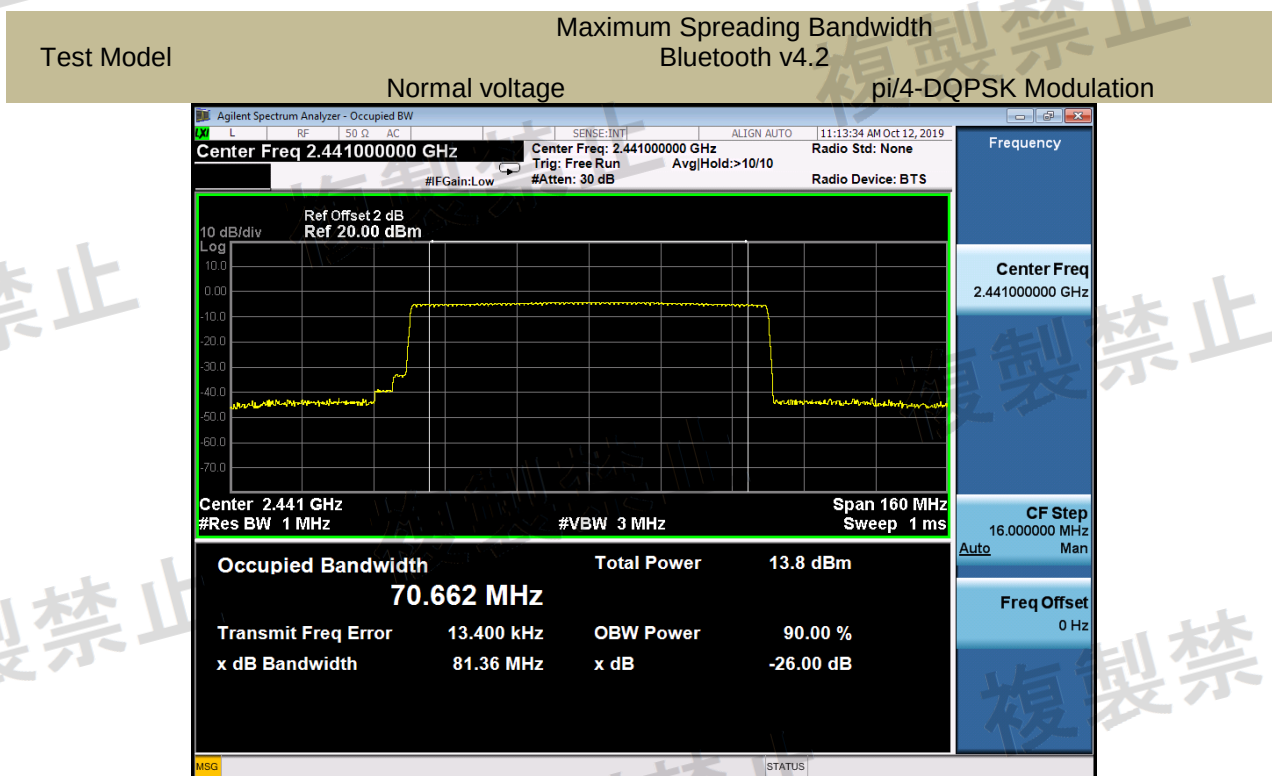
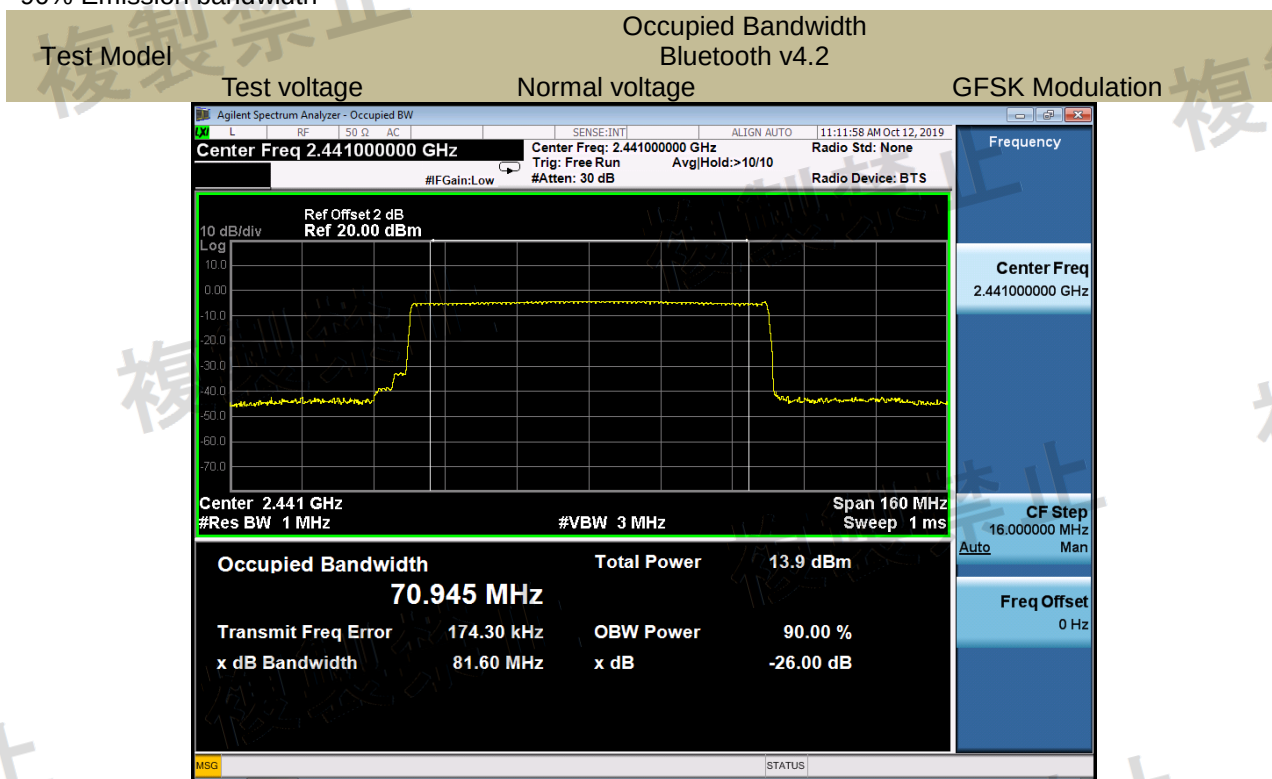
Spread Factor

Test mode	Diffusion Bandwidth	Modulation Data Rate (M)	Spread Factor	Limit
GFSK	70.945	1	70.945	≥ 5
$\pi/4$ -DQPSK	70.662	1	70.662	≥ 5

99% Emission bandwidth



90% Emission bandwidth



7.3 HOPPING FREQUENCY STAYING TIME (DWELL TIME)

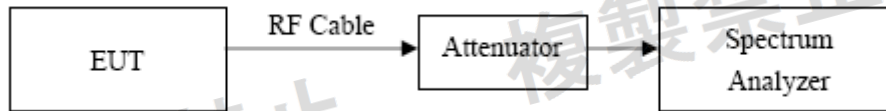
7.3.1 Applicable Standard

According to Item 19 of Article 2 Paragraph 1.

7.3.2 Conformance Limit

Frequency dwell time (time during which radio waves continue to be emitted at a specified frequency) of a transmitting equipment using the FH system shall be 0.4 seconds or less. When a simple system (except hybrid system) is used, total frequency dwell time at an arbitrary frequency within the time period obtained by multiplying 0.4 seconds by the process gain shall be 0.4 seconds or less.

7.3.3 Test Setup Block Diagram



7.3.4 Test Procedure

Set the EUT at the test frequency with test spreading code(Frequency Hopping), then modulation is performed with standard PN test signal

Spectrum analyzer is set as below

Central Frequency	Measurement hopping frequency
Sweep Frequency Bandwidth	0 MHz
Resolution Bandwidth	Approx. 1 MHz
Video Bandwidth	Same level as resolution bandwidth
Y-Axis Scale	10 dB/Div
Sweep Time	Hopping period
Sweep Mode	Single sweep
Trigger Condition	Video trigger
Phase-Detection Mode	Positive peak

Set the spectrum analyzer as in 2 above, wait for the hopping signal at the frequency to hop to.

Read the staying time from the trajectory on the screen at the frequency to hop in the hopping period by using marker, confirm the summation of the staying time to be less than 0.4 seconds.

In the same manner as (2), read the integral of the staying time at the frequency to hop in the hopping period.

Calculate the total of the frequency staying time at the frequency to hop to as described in the equation below.

Repeat the measurement for each frequency to hop.

7.3.5 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

7.3.6 Test Results

All the modulation modes were tested the data of the worst mode (GFSK) are recorded in the following pages and all modulation methods do not exceed the above mentioned limits.

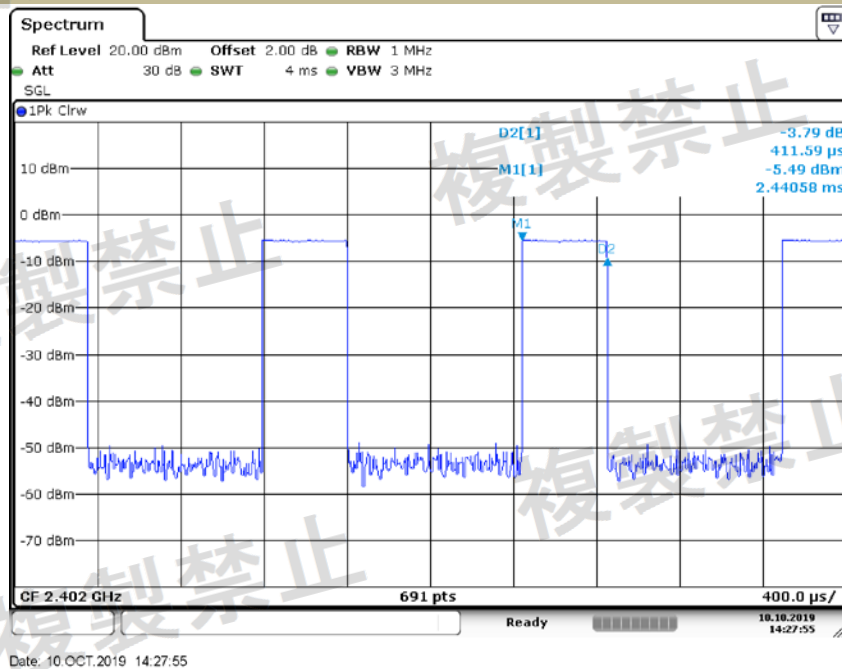
Modulation Mode	Channel Frequency (MHz)	packet type	observation time(s)	amount of bursts per second	Pluse width (ms)	dwell time(ms)	Limit (ms)	Verdict
GFSK	2441	DH1	0.4*79=31.6	1600/(2*79) =10.13	0.411	131.520	<400	PASS
		DH3		1600/(4*79) =5.06	1.673	267.680	<400	PASS
		DH5		1600/(6*79) =3.38	2.913	310.720	<400	PASS
Note: N/A (Not Applicable)								

Test Model

Average Time Of Occupancy (Dwell Time)

CH 0: 2441MHz

GFSK DH1

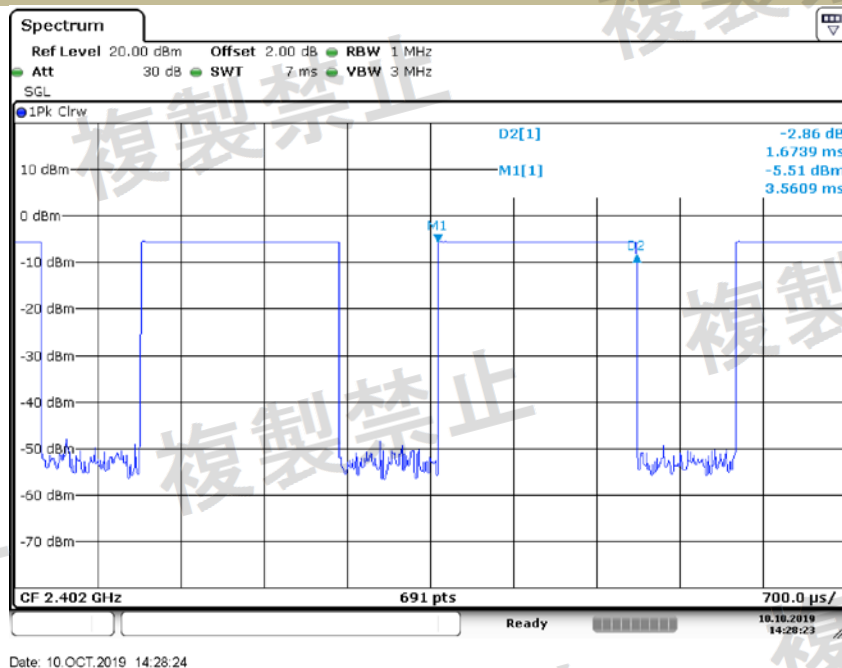


Test Model

Average Time Of Occupancy (Dwell Time)

CH 0: 2441MHz

GFSK DH3



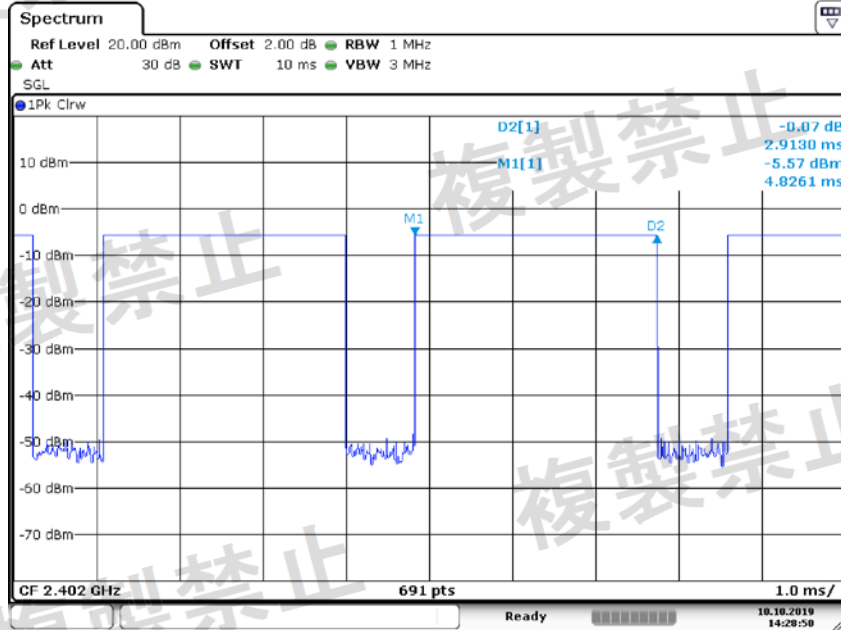
Average Time Of Occupancy (Dwell Time)

Test Model

Bluetooth v4.2

CH 0: 2441MHz

GFSK DH5



Date: 10.OCT.2019 14:28:50

7.4 POWER TO ANTENNA (CONDUCTED)

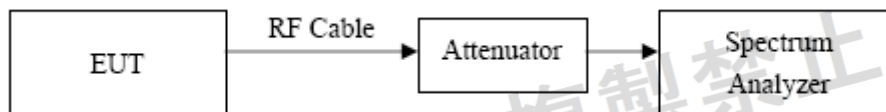
7.4.1 Applicable Standard

According to Item 19 of Article 2 Paragraph 1.

7.4.2 Conformance Limit

The maximum permit antenna power is 3mW/MHz for DSSS the maximum permit antenna power is 10mW, and the maximum permit tolerance is +20% or -80%

7.4.3 Test Setup Block Diagram



7.4.4 Test Procedure

Set the EUT on the test frequency and the consecutive TX mode or continuous (constant period, constant burst length) burst TX mode.

In case of spreading code used, set on the test spreading code, then the modulation is performed with standard coding test signal.

(1) Measure the equivalent noise bandwidth at the spectrum analyzer for resolution bandwidth of 1 MHz, then read the value correcting the resolution bandwidth on the 1 MHz equivalent bandwidth. In case of a spreading bandwidth lower than 1 MHz, however, perform the correction only for a higher value than "Spreading bandwidth (MHz) / Equivalent noise bandwidth (MHz)".

(2) The attenuation value of the attenuator shall be set to achieve the optimal operating input level at the spectrum analyzer.

(3) Spectrum analyzer for seeking the maximum antenna power is set as below.

Central Frequency	Test frequency
Sweeping Bandwidth	Approx. twice the Occupied Bandwidth
Resolution Bandwidth	1 MHz
Video Bandwidth	Approx. twice the resolution bandwidth (VBW=2MHz)
Y-Axis Scale	10 dB/Div
Sweep Time	Minimum time to assure the measurement accuracy (In case of burst wave, 1 burst per 1 sample)
Trigger Condition	Free run
Data points	More than 400 points
Sweep Mode	Consecutive sweep
Phase-Detection Mode	Positive peak
Display mode	Max-hold

(4) Spectrum analyzer for measuring the antenna power is set as below. In this case, calibrate the indication of the RF Power Meter on the output of the EUT with the RF Power Meter connected to the IF output of the spectrum analyzer.

Central Frequency	Frequency to achieve the maximum power (sought frequency)
Sweeping Bandwidth	0 Hz
Resolution Bandwidth	1 MHz
Video Bandwidth	Same level as the resolution bandwidth

Sweep Mode
Phase-Detection Mode

Consecutive sweep
Sample

Measurement Procedure

Frequency hopping system or combined systems of direct spread and frequency hopping:

- Connect the high frequency power meter to the output of the attenuator and measure the total power (without bandwidth limitation)
- Divide the total power by the spread bandwidth to find the "average" power per MHz.
- Confirm that frequency distribution of the hopping frequencies is homogeneous according to the supporting data. If frequency distribution of the frequencies is not homogeneous, consider other measurement or correction methods based on the supporting data.
- Set the antenna power as follows:
 - Continuous waves: value in b.
 - Burst waves: value in b. and value calculated from the average power within bursts from rates of transmission times (i.e. correction on the duty-cycle, to find the average within the transmit burst)

7.4.5 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

7.4.6 Test Results

Frequency MHz	Measure Value (dBm/MHz)	Limit (dBm/MHz)	Antenna Gain (dBi)	EIRP (dBm/MHz)	EIRP Limit (dBm/MHz)
GFSK (1Mbps)					
2402	-5.02	4.771	2.0	-3.02	6.911
2441	-5.90	4.771	2.0	-3.90	6.911
2480	-4.84	4.771	2.0	-2.84	6.911
$\pi/4$ -DQPSK(2Mbps)					
2402	-4.18	4.771	2.0	-2.18	6.911
2441	-5.02	4.771	2.0	-3.02	6.911
2480	-4.13	4.771	2.0	-2.13	6.911

RF Output Power Tolerance

Frequency (MHz)	Output Power (mW/MHz)	Rated Output Power (mW/MHz)	Tolerance (%)	Limit (%)
GFSK (1Mbps)				
2402	0.31	0.5	-38.00	+20% to -80%
2441	0.26	0.5	-48.00	+20% to -80%
2480	0.33	0.5	-34.00	+20% to -80%
$\pi/4$ -DQPSK(2Mbps)				
2402	0.38	0.5	-24.00	+20% to -80%
2441	0.31	0.5	-38.00	+20% to -80%
2480	0.39	0.5	-22.00	+20% to -80%

Note: Tolerance = (Output Power – Rated Output Power) / Rated Output Power * 100%

7.5 SPURIOUS EMISSIONS INTENSITY

7.5.1 Applicable Standard

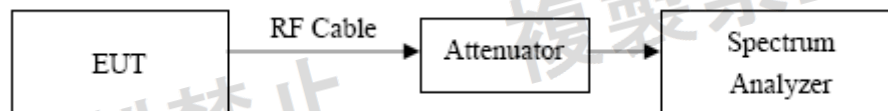
According to Item 19 of Article 2 Paragraph 1.

7.5.2 Conformance Limit

Permissible mean power of spurious emission of each frequency supplied to a feeder, that is, mean power of spurious emission in the 1 MHz bandwidth at frequency f other than frequency band used shall be as follows:

- | | |
|---|-----------------------------------|
| a. $2,387\text{MHz} \leq f \leq 2,400\text{MHz}$ and $2,483.5\text{MHz} < f \leq 2,496.5\text{MHz}$ | 25 μW (-16dB) or less |
| b. $2,387\text{MHz} > f$ and $2,496.5\text{MHz} < f$ | 2.5 μW (-26dB) or less |

7.5.3 Test Setup Block Diagram



7.5.4 Test Procedure

(1) Spectrum analyzer for seeking the spurious emission is set as below

Sweeping Bandwidth	For seeking the spurious emission, from frequency lowest possible to the 5 times the carrier frequency
Resolution Bandwidth	1 MHz
Video Bandwidth	Approx. As same as Resolution bandwidth
Y-Axis Scale	10 dB/Div
Input Level	Value of maximum dynamic range
Sweep Time	Minimum time to assure the measurement accuracy (Note 1)
Sweep Mode	Single sweep
Phase-Detection Mode	Positive peak

(2) The settings of the spectrum analyzer while conducting spurious amplitude measurements are as follows:

- Central Frequency: Acquired spurious frequencies in (1)
- Sweep Frequency 0 Hz
- Resolution Bandwidth 1 MHz
- Video Bandwidth same as Resolution Bandwidth
- Note: take into account that the requirement limits the power in a bandwidth of 1 MHz.
- If the measurement is carried out with a bandwidth of 100 kHz (for frequencies below 1 GHz), the limit shall be reduced with 10 dB.
- For example 2.5 μW in 1 MHz = -26 dBm limit, becomes -36 dBm for 100 kHz bandwidth.
- Y-Axis Scale 10 dB/Div
- Input Level: choose input level within the linear range of the SA mixer (so that no additional spurious are generated by the mixer)
- Sweep Time: Minimum amount of time to ensure measurement accuracy. However, in the case of burst waves, time exceeds duration of 1 burst.
- Data Points Over 400 points
- Sweep Mode: Single sweep
- Detection Mode Sample (BIN-Width $\ll$ RBW, so that all spurious emissions are captured) [BIN-width is the frequency difference between 2 adjacent sample points on the display]

(3) Set EUT as occupied bandwidth is measure. That is, Set the EUT on the test frequency and the continuous TX mode or continuous (constant period, constant burst length) burst TX mode. In case of spreading

code used, set on the test spreading code, then the modulation is performed with standard coding test signal.

The spectrum analyzer is set as 2 (1). Seek the spurious emission If the amplitude of the sought spurious emission satisfies the specified value (in case of 2 (2) Note 1, the specified value is -3dB), the measurement of 2 (2) is not performed, then the estimated value is employed as the measured value.

In case the sought spurious emission amplitude exceeds the specified value, seek the spurious frequency by narrowing the sweeping band sequentially as 100 MHz, 10 MHz, 1 MHz for the purpose of higher accuracy of the spectrum analyzer. Set the spectrum analyzer as 2 (2). Estimate the mean value of the spurious amplitude, then employ it as the measured value (In case DSSS as well as OFDM with burst wave, the mean inside of the burst).

Sweep Bandwidth: 30MHz~2387MHz, 2483.5MHz~2496.5MHz, 2496.5MHz~12500MHz

1. Respectively mark the maximum results in the above sweep bandwidth.

7.5.5 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

7.5.6 Test Results

Test Model

Spurious Emission Intensity (30MHz to 12.5GHz)

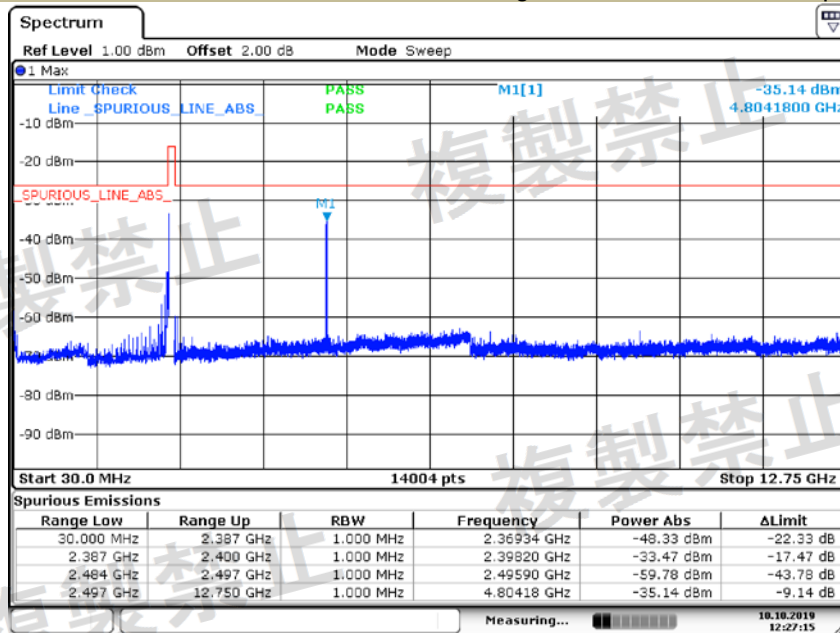
GFSK

Test condition

Normal voltage

Channel Frequency

2402MHz



Date: 10.OCT.2019 12:27:15

Test Model

Spurious Emission Intensity (30MHz to 12.5GHz)

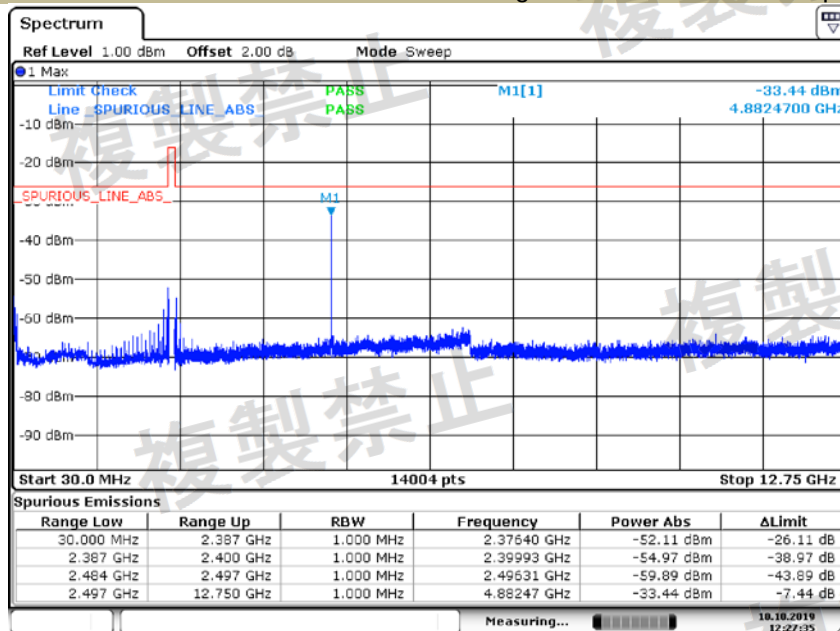
GFSK

Test condition

Normal voltage

Channel Frequency

2441MHz



Date: 10.OCT.2019 12:27:35

Test Model

Spurious Emission Intensity (30MHz to 12.5GHz)

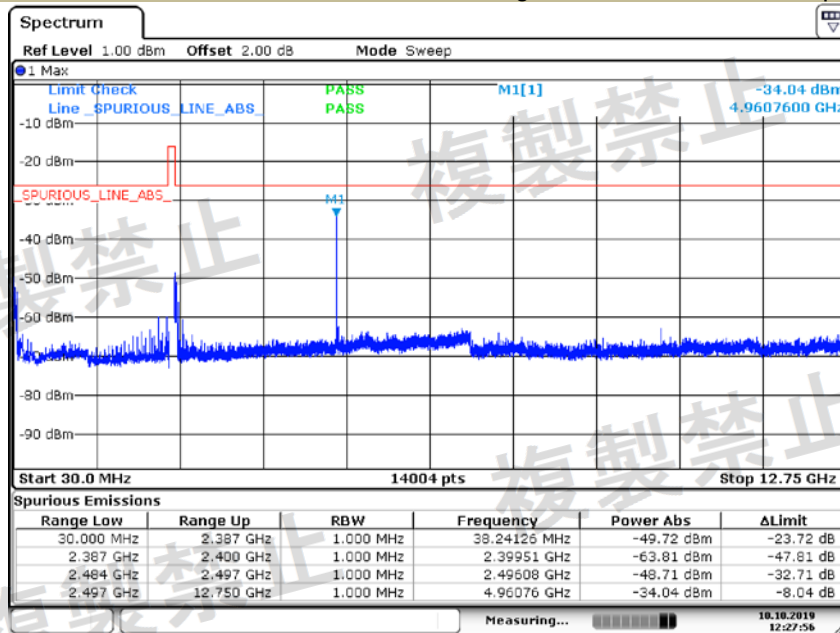
GFSK

Test condition

Normal voltage

Channel Frequency

2480MHz



Date: 10.OCT.2019 12:27:56

Test Model

Spurious Emission Intensity (30MHz to 12.5GHz)

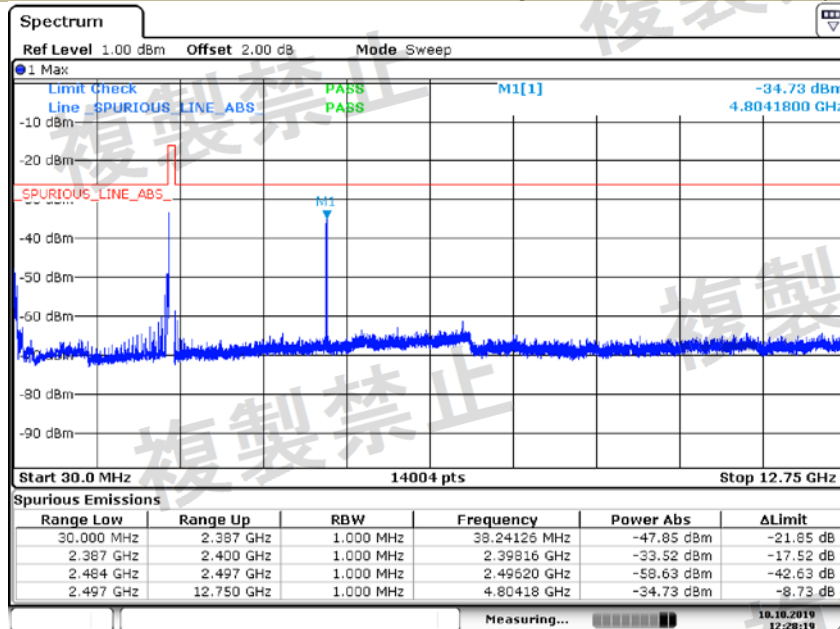
pi/4-DQPSK

Test condition

Normal voltage

Channel Frequency

2402MHz



Date: 10.OCT.2019 12:28:19

Test Model

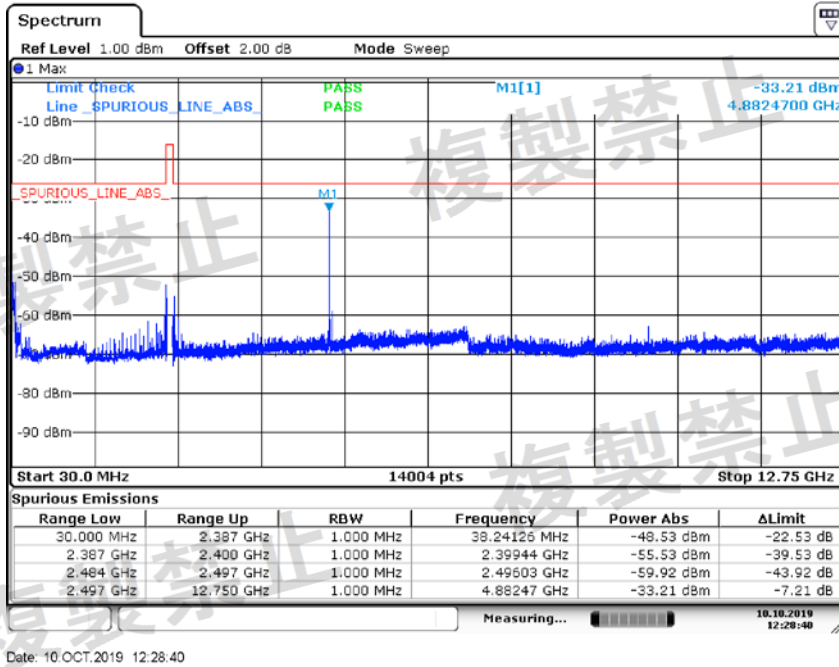
Spurious Emission Intensity (30MHz to 12.5GHz)
pi/4-DQPSK

Test condition

Normal voltage

Channel Frequency

2441MHz



Test Model

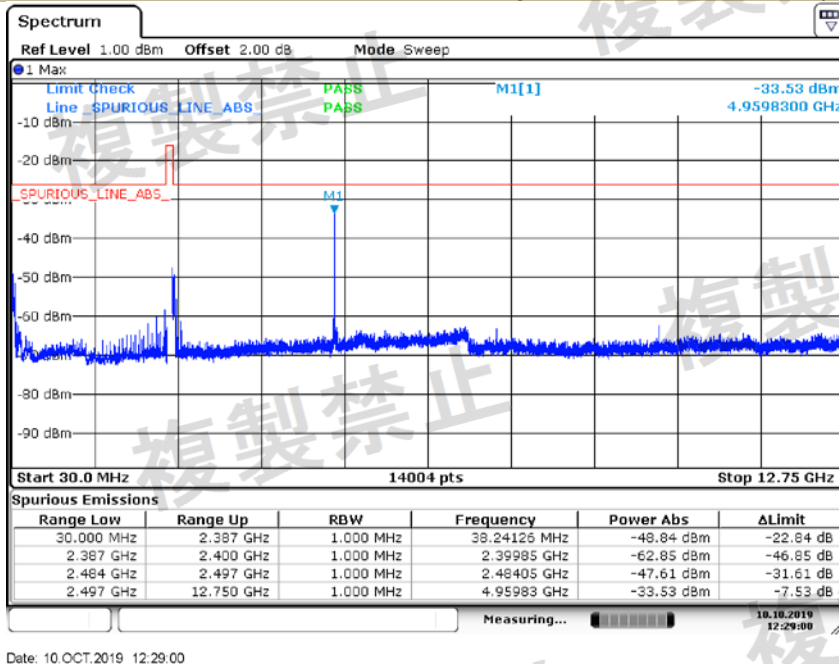
Spurious Emission Intensity (30MHz to 12.5GHz)
pi/4-DQPSK

Test condition

Normal voltage

Channel Frequency

2480MHz



7.6 COLLATERAL EMISSIONS OF RECEIVER

7.6.1 Applicable Standard

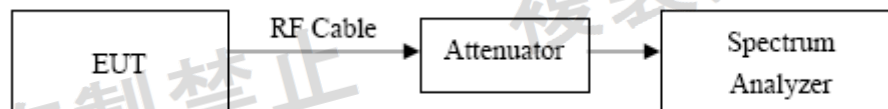
According to Item 19 of Article 2 Paragraph 1.

7.6.2 Conformance Limit

The limit on secondary emissions radiated from the receiving equipment within which the function of other radio equipment will not be impaired shall be, in terms of the power of a dummy antenna circuit that has the same electrical constant as the receiving antenna, 4 nW (-54dBm) or less at a frequency below 1 GHz and 20 nW(-47dBm) or less at a frequency of 1 GHz or higher as measured using the circuit.

- | | |
|----------------------|-----------------------|
| a. 30 MHz - 1000 MHz | 4 nW (-54dBm) or less |
| b. 1GHz – 12.5 GHz | 20 nW(-47dBm) or less |

7.6.3 Test Setup Block Diagram



7.6.4 Test Procedure

Set the EUT so that the test frequency is can be measured receipt consecutively all the time.

(1) Set the attenuation value of the dummy load lowest as possible, due to low level of the measured object.

(2) Set Spectrum analyzer for seeking the collateral emission is set as below.

Sweeping Bandwidth	30MHz to 5 times of carrier frequency
Resolution Bandwidth	In case of frequency lower than 1 GHz, 100 kHz In case of frequency higher than 1 MHz
Video Bandwidth	Same level as the resolution bandwidth
Sweep Time	Minimum time to assure the measurement accuracy
Y-Axis Scale	10 dB/Div
Sweep Mode	Single sweep
Phase-Detection Mode	Positive peak

(3) Spectrum analyzer for measuring the collateral emission is set as below.

Central Frequency	Collateral emission frequency
Sweeping Bandwidth	0 Hz
Resolution Bandwidth	In case of frequency lower than 1 GHz, 100 kHz In case of frequency higher than 1 MHz
Video Bandwidth	Same level as the resolution bandwidth
Sweep Mode	Single sweep
Detection Mode	Sample

Set the spectrum analyzer as (2), seek the maximum amplitude of the collateral emission.

In case of sought result lower than 1/10 limit value, employ the sought value as the measured value.

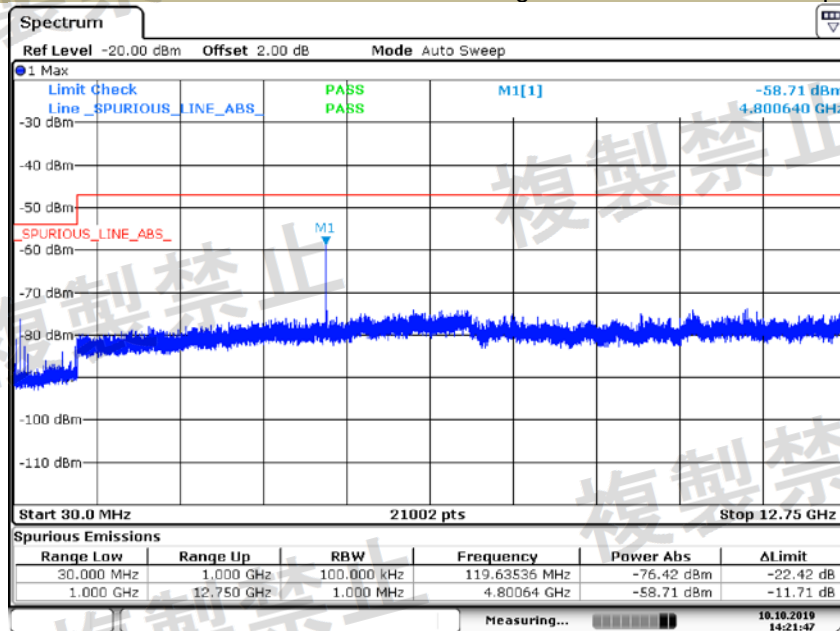
In case the sought value exceeds 1/10 limit value, seek the collateral emission frequency by narrowing the sweeping band sequentially to 1/10 for the purpose of higher accuracy of the spectrum analyzer. Set the spectrum analyzer as (3).

7.6.5 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

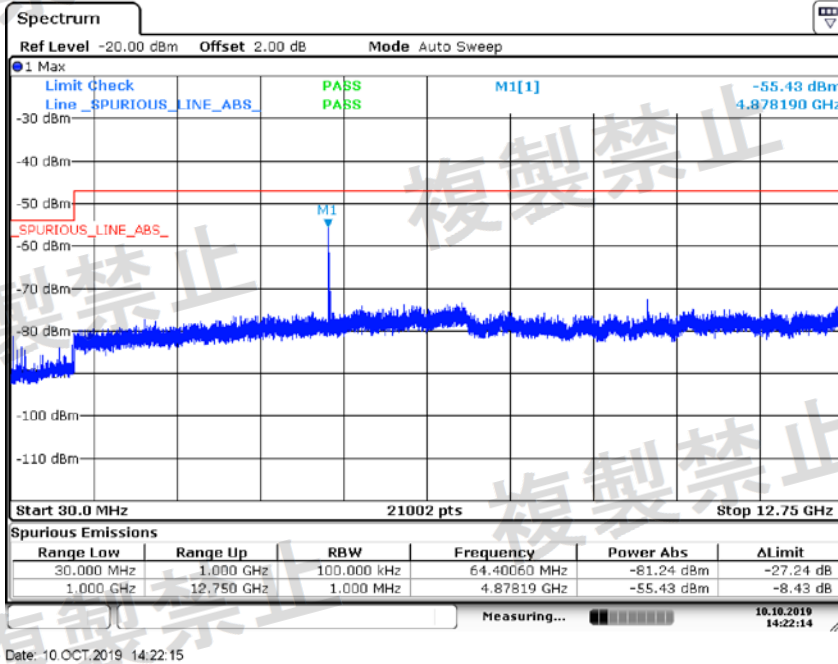
7.6.6 Test Results

Test Model	Collateral Emissions of Receiver (30MHz to 12.5GHz)			
	GFSK			
Test condition	Normal voltage	Channel Frequency	2402MHz	

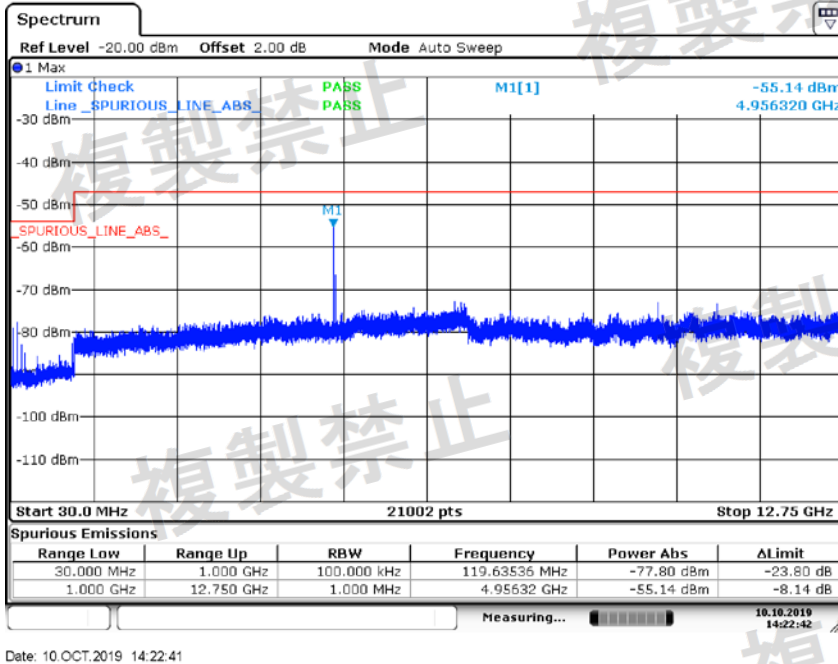


Date: 10.OCT.2019 14:21:47

Collateral Emissions of Receiver (30MHz to 12.5GHz)			
Test Model	GFSK		
Test condition	Normal voltage	Channel Frequency	2441MHz



Collateral Emissions of Receiver (30MHz to 12.5GHz)			
Test Model	GFSK		
Test condition	Normal voltage	Channel Frequency	2480MHz



Test Model

Collateral Emissions of Receiver (30MHz to 12.5GHz)

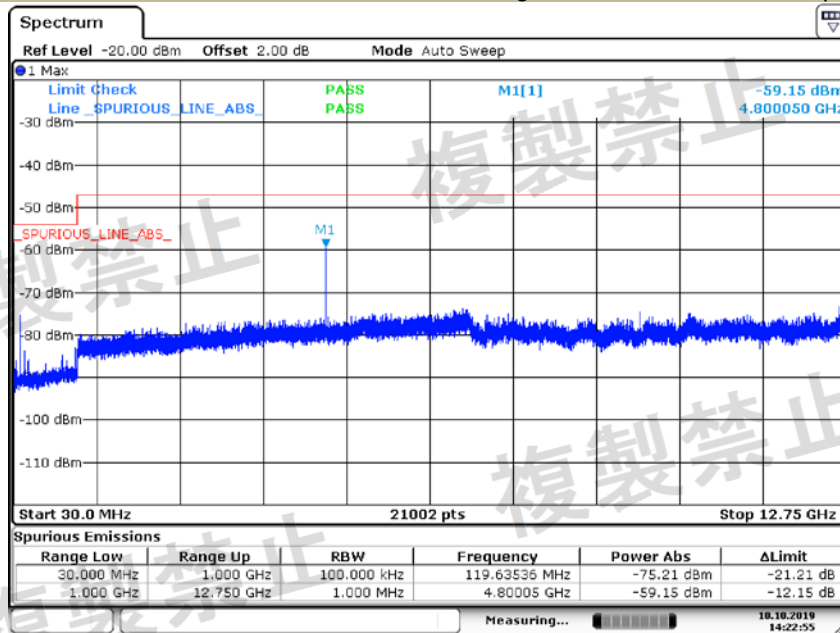
pi/4-DQPSK

Test condition

Normal voltage

Channel Frequency

2402MHz



Date: 10.OCT.2019 14:22:55

Test Model

Collateral Emissions of Receiver (30MHz to 12.5GHz)

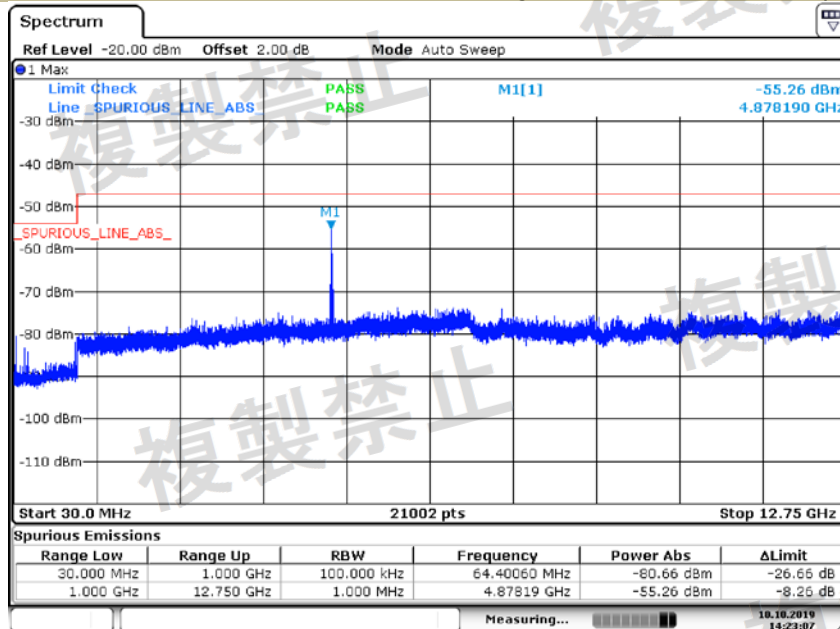
pi/4-DQPSK

Test condition

Normal voltage

Channel Frequency

2441MHz



Date: 10.OCT.2019 14:23:07

Test Model

Collateral Emissions of Receiver (30MHz to 12.5GHz)

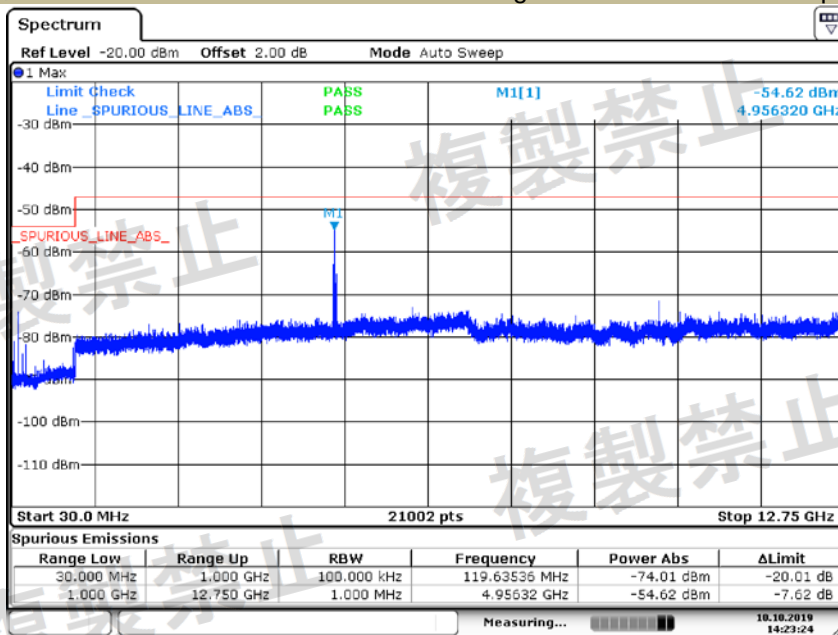
pi/4-DQPSK

Test condition

Normal voltage

Channel Frequency

2480MHz



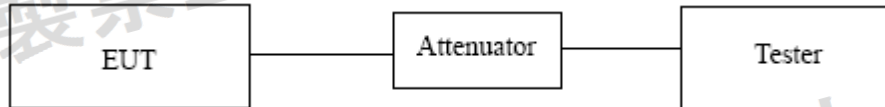
Date: 10.OCT.2019 14:23:24

7.7 INTERFACE PREVENTION FUNCTION

7.7.1 Standard Applicable

According to Item 19 of Article 2 Paragraph 1. The device shall have the function of automatic transmission or reception of identification code.

7.7.2 Test Setup Block Diagram



7.7.3 Test Procedure

1. Set the EUT in the usual operation condition
2. The radio equipment with automatic transmitting function of identification code
 - A. Transmit the assigned identification code from the radio equipment.
 - B. Confirm the identification code received by the demodulator.
3. The radio equipment with automatic receiving function of identification code
 - A. Transmit the assigned identification code from the opposite equipment.
 - B. Confirm that the usual communication is available.
 - C. Transmit the identification code distinct from the assigned one from the opposite equipment.
 - D. Confirm that the radio equipment is stopped or an indication is displayed as the identification code is different.

The identification function shall be recorded.

7.7.4 Summary of Test Results/Plots

Test Item	Test Result
Transmitting Function of Identification Code	>48 bits
Receiving Function of Identification Code	>48 bits

8 APPENDIX PHOTOGRAPHS OF TEST SETUP

