

**ARIB STD- T66 JANPAN MIC
CERTIFICATION TEST REPORT**

OF

Grow Care Pot

MODEL No: HHCCPOT002

BRAND NAME: N/A

REPORT NO: ES180716008W

ISSUE DATE: July 20, 2018

Prepared for

Takasho Co., Ltd.

20-1 Minami Akasaka, Kainan, Wakayama, Japan 642-0017

Prepared by

EMTEK (SHENZHEN) CO., LTD.

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

TEL: 86-755-26954280

FAX: 86-755-26954282

TEST RESULT CERTIFICATION

Applicant:	Takasho Co., Ltd. 20-1 Minami Akasaka, Kainan, Wakayama, Japan 642-0017
Manufacturer:	Takasho Co., Ltd. 20-1 Minami Akasaka, Kainan, Wakayama, Japan 642-0017
Product Description:	Grow Care Pot
Brand Name:	N/A
Model Number:	HHCCPOT002
Serial Number:	N/A
File Number:	ES180716008W
Date of Test:	July 16, 2018 to July 20, 2018

Measurement Procedure Used:

APPLICABLE STANDARDS		
STANDARD	Test Procedure	TEST RESULT
ARIB STD T-66 V3.7 RE-740 49.20 MIC Requirements for Certification	MIC public notice 88:2004, annex 43 MIC public notice 88:2004, annex 1	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 : July 16, 2018 to July 20, 2018

Prepared by :

Abel Wu

Abel Wu /Editor

Reviewer :

Yaping Shen

Yaping Shen /Supervisor

Approve & Authorized Signer :

Lisa Wang

Lisa Wang/Manager

Modified Information

Rev.	Summary	Date of Rev.	Report No.
Ver.1.0	Original Report	/	ES180716008W

Table of Contents

1	EUT TECHNICAL DESCRIPTION	5
2	SUMMARY OF TEST RESULT	6
3	TEST METHODOLOGY	7
3.1	GENERAL DESCRIPTION OF APPLIED STANDARDS.....	7
3.2	MEASUREMENT EQUIPMENT USED	7
3.3	DESCRIPTION OF TEST MODES.....	8
4	FACILITIES AND ACCREDITATIONS	9
4.1	FACILITIES.....	9
4.2	LABORATORY ACCREDITATIONS AND LISTINGS	9
5	TEST SYSTEM UNCERTAINTY	10
6	SETUP OF EQUIPMENT UNDER TEST.....	11
6.1	RADIO FREQUENCY TEST SETUP 1	11
6.2	RADIO FREQUENCY TEST SETUP 2	11
6.3	CONDUCTED EMISSION TEST SETUP.....	12
6.4	SUPPORT EQUIPMENT	12
7	WIRELESS MODULE VOLTAGE TEST IN EXTREME CONDITIONS.....	13
7.1	Applicable Standard.....	13
7.2	Test Configuration.....	13
7.3	Test Results	14
8	TEST REQUIREMENTS	15
8.1	FREQUENCY ERROR	15
8.2	OCCUPIED BANDWIDTH.....	17
8.3	SPREADING BANDWIDTH	21
8.4	POWER TO ANTENNA (CONDUCTED).....	25
8.5	SPURIOUS EMISSIONS INTENSITY.....	28
8.6	COLLATERAL EMISSIONS OF RECEIVER.....	33
8.7	INTERFACE PREVENTION FUNCTION	37
9	APPENDIX PHOTOGRAPHS OF TEST SETUP	38

1 EUT TECHNICAL DESCRIPTION

Characteristics	Description
BT Version	BT4.1 with BLE Mode
Data Rate	1Mbps
Modulation:	GFSK
Operating Frequency Range(s):	2402-2480MHz;
Number of Channels:	40 channels;
Rated Antenna power:	0.5mW
Antenna Type :	PCB Antenna
Antenna Gain:	0 dBi
Power supply:	DC 5V from external power DC 3.7V from Li-on battery
Temperature Range	-10°C ~ +55°C
Hardware version:	HHCCPOT002
Software version:	V1.0

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

2 SUMMARY OF TEST RESULT

ARIB STD-T66 Clause	Test Parameter	Verdict	Remark
Clause 3.2(2).(4)	Frequency Error	PASS	
Clause 3.2(2).(7)	Occupied Bandwidth	PASS	
Clause 3.2(2).(8)	Spreading Bandwidth	PASS	
Clause 3.2 (2)	Power to Antenna (conducted)	PASS	
Clause 3.2 (2)	Power Density to Antenna (conducted)	PASS	
Clause 3.2 (6)	Spurious emission Intensity	PASS	
Clause 3.3 (1)	Collateral Emissions of Receiver	PASS	
Clause 3.4 (1)	Interference prevention function	PASS	
NOTE1: N/A (Not Applicable)			

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:
 ARIB STD T-66 Second Generation Low Power Data Communication System/Wireless LAN System
 RE-740 49.20 MIC Requirements for Certification

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 20, 2018	CEPREI
L.I.S.N.	Schwarzbeck	NNLK8129	8129203	May 19, 2018	CEPREI
50Ω Coaxial Switch	Anritsu	MP59B	M20531	May 20, 2018	CEPREI
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100006	May 19, 2018	CEPREI
Voltage Probe	Rohde & Schwarz	TK9416	N/A	May 19, 2018	CEPREI
I.S.N	Rohde & Schwarz	ENY22	1109.9508.02	May 20, 2018	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 20, 2018	CEPREI
Pre-Amplifier	HP	8447D	2944A07999	May 19, 2018	CEPREI
Bilog Antenna	Schwarzbeck	VULB9163	142	May 19, 2018	CEPREI
Loop Antenna	ARA	PLA-1030/B	1029	May 19, 2018	CEPREI
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170399	May 19, 2018	CEPREI
Horn Antenna	Schwarzbeck	BBHA 9120	D143	May 19, 2018	CEPREI
Cable	Schwarzbeck	AK9513	ACRX1	May 20, 2018	CEPREI
Cable	Rosenberger	N/A	FP2RX2	May 20, 2018	CEPREI
Cable	Schwarzbeck	AK9513	CRPX1	May 20, 2018	CEPREI
Cable	Schwarzbeck	AK9513	CRRX2	May 20, 2018	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 20, 2018	CEPREI
Spectrum Analyzer	Agilent	N9010A	My53470879	May 20, 2018	CEPREI
Spectrum Analyzer	R & S	FSV40	132.1-3008K3 9-100967-AP	May 20, 2018	CEPREI
Power meter	Anritsu	ML2495A	0824006	May 20, 2018	CEPREI
Power sensor	Anritsu	MA2411B	0738172	May 20, 2018	CEPREI
Oscilloscope	Tektronix	TDS3012B	071-0964-03	May 20, 2018	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, then record on this report.

Those data rates (Bluetooth v4.0:1Mbps) were used for all test.

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 v4.0:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	19	2440	...	...
2	2404	20	2442	37	2476
4	2406	21	2444	38	2478
...	...	...	...	39	2480
Note: $f_c = 2402\text{MHz} + k \times 2\text{MHz}$ $k=0$ to 39					

Test Frequency and channel for Bluetooth v4.0:

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	19	2440	39	2480

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, 2016.10.24

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 03, 2017

Designation Number: CN1204

Test Firm Registration Number: 882943

Accredited by Industry Canada, November 24, 2015

The Certificate Registration Number is 4480A.

Certificated by VCCI, Japan

Registration No.: R-2777

Valid until 2019/10/27

Certificated by VCCI, Japan

Registration No.: G-627

Valid until 2018/11/20

Certificated by VCCI, Japan

Registration No.: C-3065

Valid until 2019/10/27

Registration No.: T-1318

Valid until 2018/03/28

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:

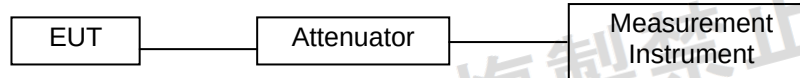
Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-5}$
Uncertainty for Output power test	$\pm 0.83\text{dB}$
Conducted Emissions Test	$\pm 2.0\text{dB}$
Radiated Emission Test	$\pm 2.0\text{dB}$
Occupied Bandwidth Test	$\pm 1.0\text{dB}$
Power density test	$\pm 1.85\text{dB}$
All emission, radiated	$\pm 3\text{dB}$
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 SETUP OF EQUIPMENT UNDER TEST

6.1 RADIO FREQUENCY TEST SETUP 1

The Bluetooth V4.0 component's antenna ports(s) of the EUT are connected to the measurement instrument per an appropriate attenuator. The EUT is controlled by PC/software to emit the specified signals for the purpose of measurements.

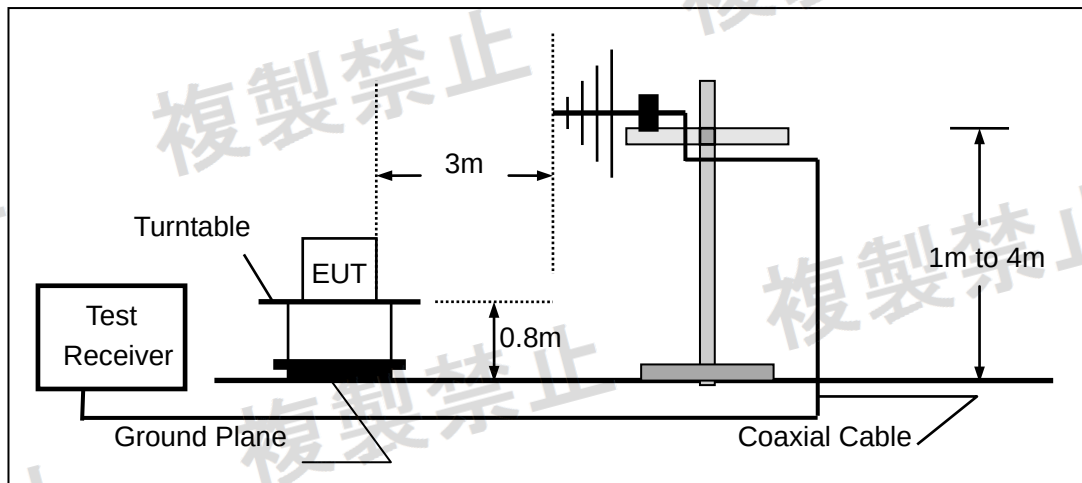


6.2 RADIO FREQUENCY TEST SETUP 2

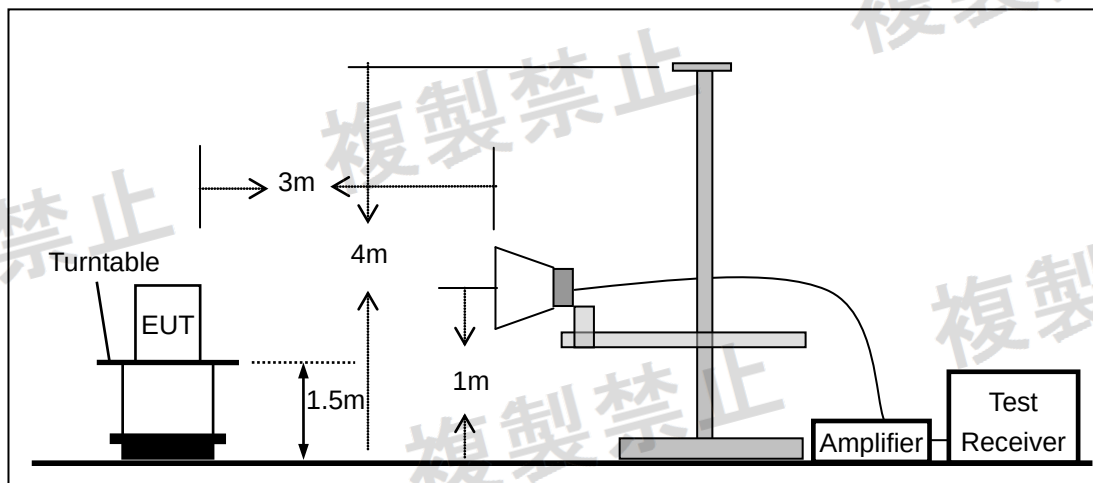
The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.4. The test distance is 3m. The setup is according to the requirements in Section 13.1.4.1 of ANSI C63.4-2009 and CAN/CSA-CEI/IEC CISPR 22.

The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

(a) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(b) Radiated Emission Test Set-Up, Frequency above 1000MHz

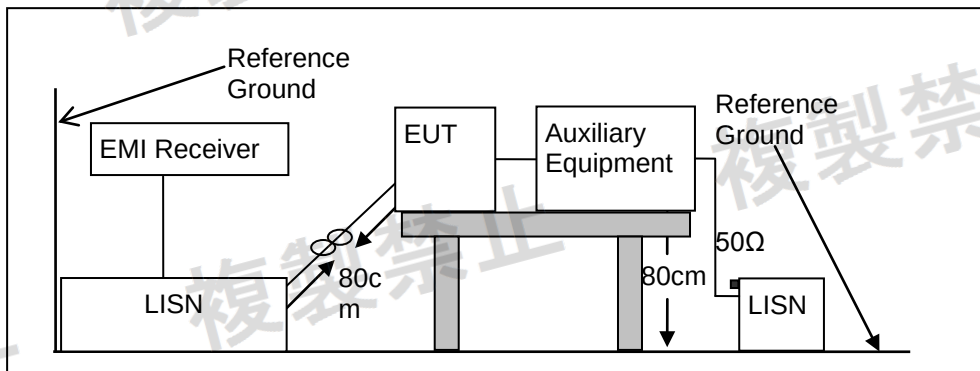


6.3 CONDUCTED EMISSION TEST SETUP

The mains cable of the EUT (maybe per AC/DC Adapter) must be connected to LISN. The LISN shall be placed 0.8 m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8m from the LISN.

Ground connections, where required for safety purposes, shall be connected to the reference ground point of the LISN and, where not otherwise provided or specified by the manufacturer, shall be of same length as the mains cable and run parallel to the mains connection at a separation distance of not more than 0.1 m.

According to the requirements in Section 13.1.4.1 of ANSI C63.4-2009 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode.



6.4 SUPPORT EQUIPMENT

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note

Notes:

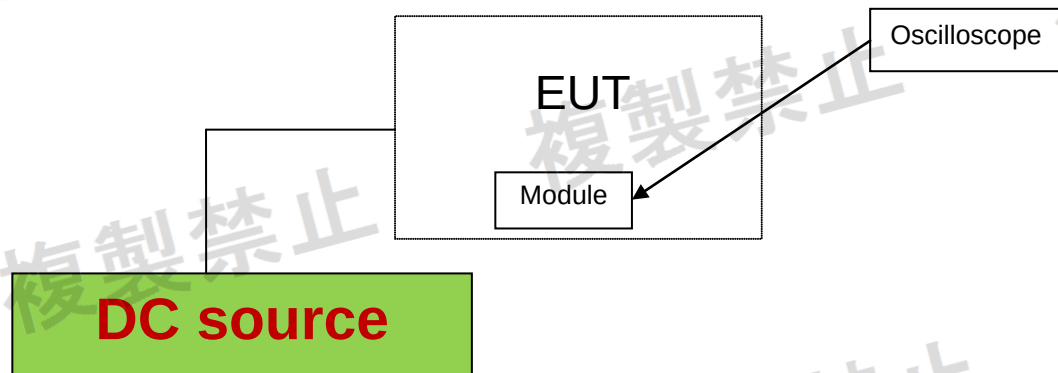
1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
3. Unless otherwise denoted as EUT in [Remark] column , device(s) used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

7 WIRELESS MODULE VOLTAGE TEST IN EXTREME CONDITIONS

7.1 Applicable Standard

When there is a fluctuation of +/-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 +/-1%, Measurement shall be tested with the rated voltage.

7.2 Test Configuration



7.3 Test Results

Temperature :	25℃	Test Date :	July 18, 2018
Humidity :	55 %	Test By:	King Kong

Test Voltage	DC 3.7V
Module Test voltage	3.3
Module Ratedvoltage	3.3
The Range of Module Voltage(%)	0

Note: In extreme conditions, EUT module power is confirmed below +/-1%.

8 TEST REQUIREMENTS

8.1 FREQUENCY ERROR

8.1.1 Applicable Standard

According to ARIB STD-T66, Clause 3.2(2).(4)

8.1.2 Conformance Limit

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

8.1.3 Test Configuration

Test according to clause 6.1 radio frequency test setup 1.

8.1.4 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.

8.1.5 Test Results

Temperature :	25°C	Test Date :	July 18, 2018
Humidity :	55 %	Test By:	King Kong
		Test voltage	Normal voltage

Modulation Mode	Channel Number	Channel Frequency (MHz)	Reading (MHz)	Deviation (kHz)	Tolerance (ppm)	Limit (ppm)	Verdict
Non-Modulation	0	2402	2401.9937	-6.3	-2.62	50	PASS
	19	2440	2440.9946	-5.4	-2.21	50	PASS
	39	2480	2479.9952	-4.8	-1.94	50	PASS
Note: N/A (Not Applicable)							

8.2 OCCUPIED BANDWIDTH

8.2.1 Applicable Standard

According to ARIB STD-T66 Clause 3.2(2).(7)

8.2.2 Conformance Limit

Permissible value for occupied bandwidth for DSSS & OFDM equipment (Carrier frequencies from 2,400MHz to 2,483.5MHz or from 2,471MHz to 2,497MHz, for all equipment except for 40 MHz channel separation) shall be 26MHz or less.

8.2.3 Test Configuration

Test according to clause 6.1 radio frequency test setup 1

8.2.4 Test Procedure

Spectrum analyzer is set as below

Central Frequency	Test frequency
Sweeping Bandwidth	2 to 3.5 times the allowable value (SPAN=4MHz)
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".

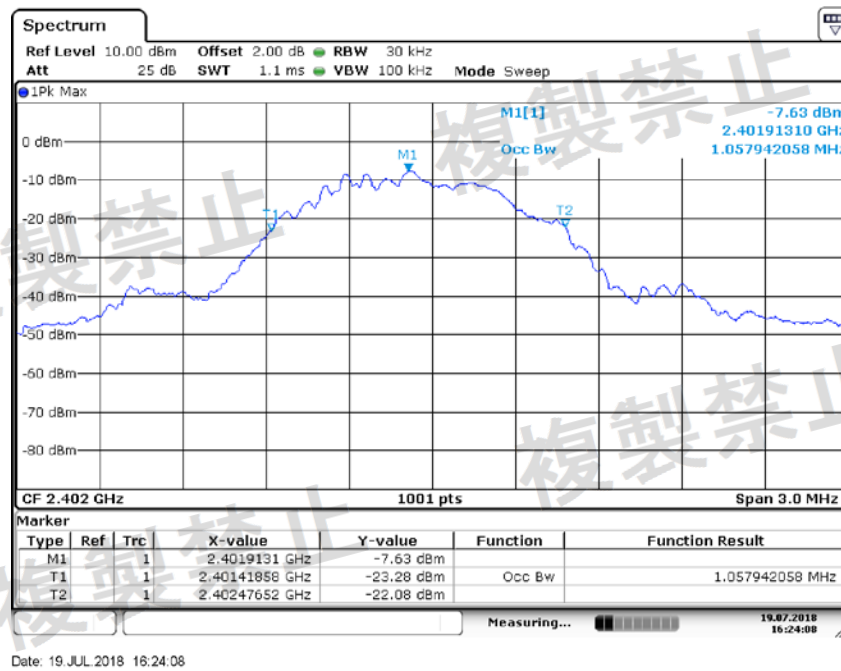
Starting with the data of the maximum frequency, the power is summed sequentially, and the limiting data point where the value achieves 0.5% of the total power is sensed. The limiting point is converted to frequency, stored as "upper limit"

8.2.5 Test Results

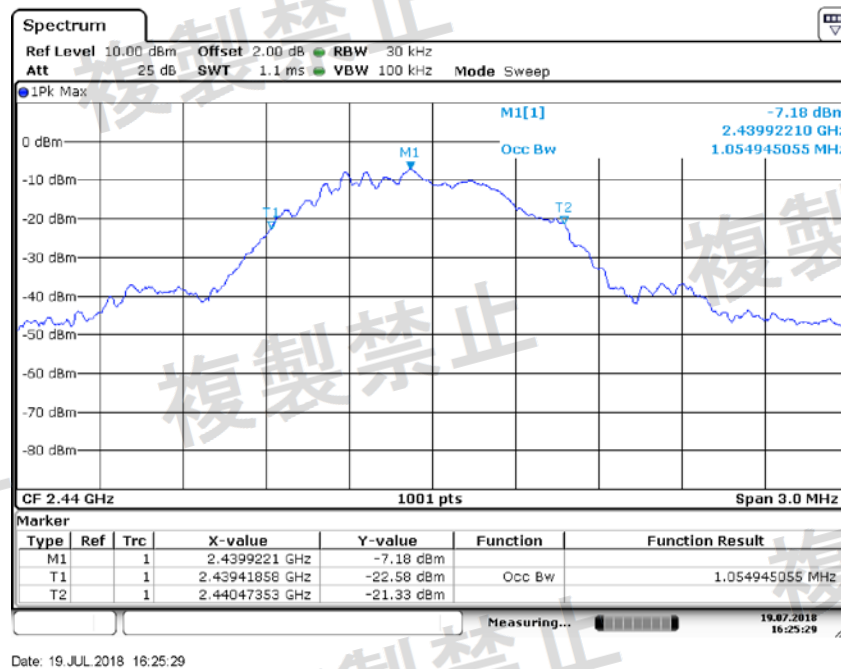
Temperature :	25°C	Test Date :	July 18, 2018
Humidity :	55 %	Test By:	King Kong
		Test voltage	Normal voltage

Modulation Mode	Channel Number	Channel Frequency (MHz)	Occupied Bandwidth (KHz)	Limit (MHz)	Verdict
GFSK	0	2402	1057.94	<=26	PASS
	19	2440	1054.94	<=26	PASS
	39	2480	1075.92	<=26	PASS
Note: N/A (Not Applicable)					

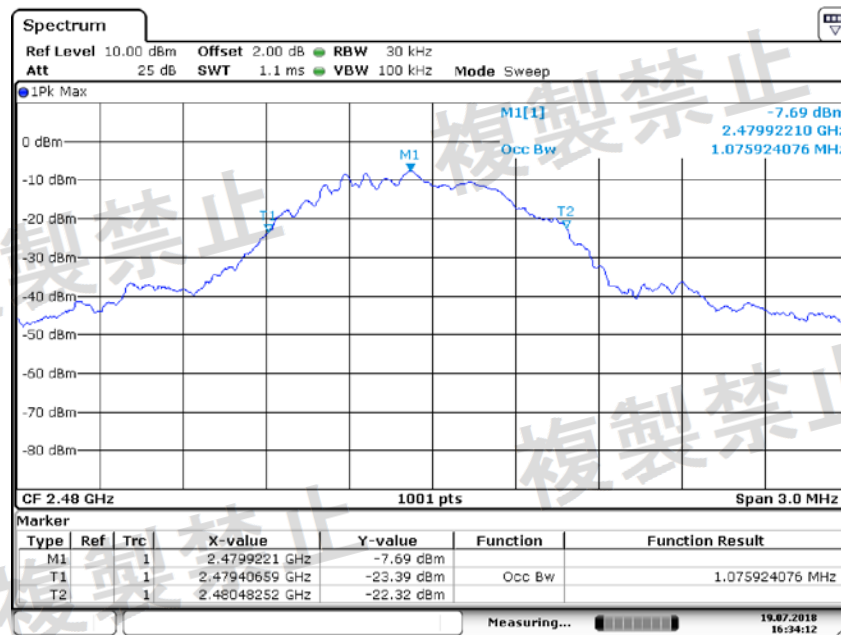
Test Model	Occupied Bandwidth Bluetooth V4.0		
Test voltage	Normal voltage	Channel Frequency	2402MHz



Test Model	Occupied Bandwidth Bluetooth V4.0		
Test voltage	Normal voltage	Channel Frequency	2440MHz



Test Model	Occupied Bandwidth Bluetooth V4.0		
Test voltage	Normal voltage	Channel Frequency	2480MHz



Date: 19.JUL.2018 16:34:11

8.3 SPREADING BANDWIDTH

8.3.1 Applicable Standard

According to ARIB STD-T66 Clause 3.2(2).(8)

8.3.2 Conformance Limit

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.

8.3.3 Test Configuration

Test according to clause 6.1 radio frequency test setup 1

8.3.4 Test Procedure

Spectrum analyzer is set as below

Central Frequency	Test frequency
Sweeping Bandwidth	2 to 3.5 times the allowable value (SPAN=4MHz)
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 5% of the total power is sensed. The limiting point is converted to frequency, stored as "lower limit".

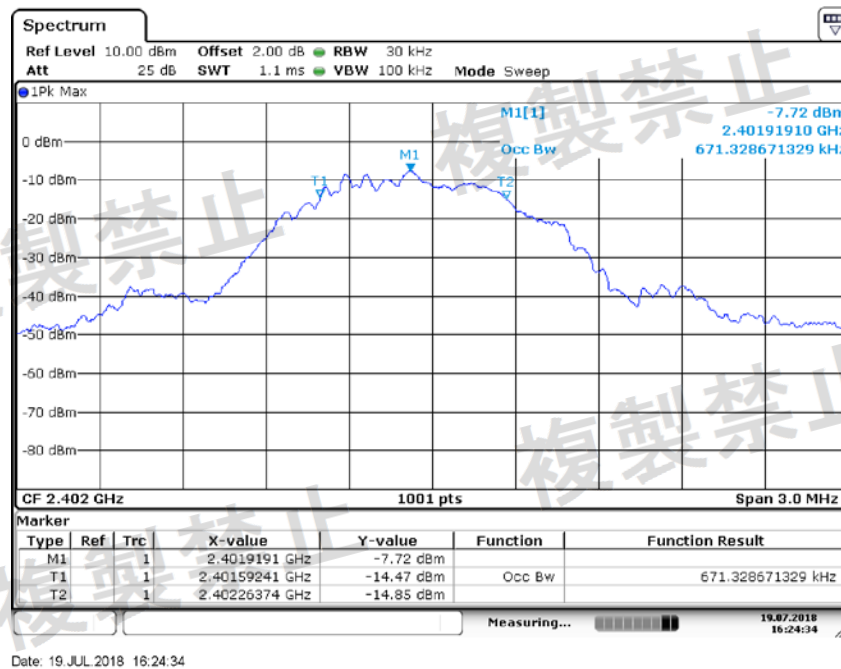
Starting with the data of the maximum frequency, the power is summed sequentially, and the limiting data point where the value achieves 5% of the total power is sensed. The limiting point is converted to frequency, stored as "upper limit"

8.3.5 Test Results

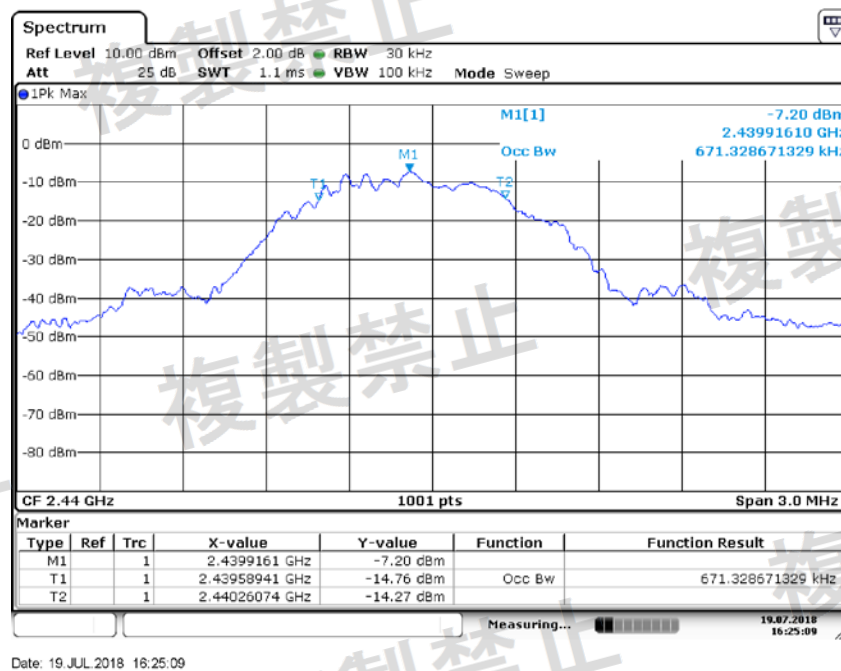
Temperature :	25°C	Test Date :	July 18, 2018
Humidity :	55 %	Test By:	King Kong
		Test voltage	Normal voltage

Modulation Mode	Channel Number	Channel Frequency (MHz)	Spreading Bandwidth (KHz)	Limit (kHz)	Verdict
GFSK	0	2402	671.33	>=500	PASS
	19	2440	671.33	>=500	PASS
	39	2480	683.32	>=500	PASS
Note: N/A (Not Applicable)					

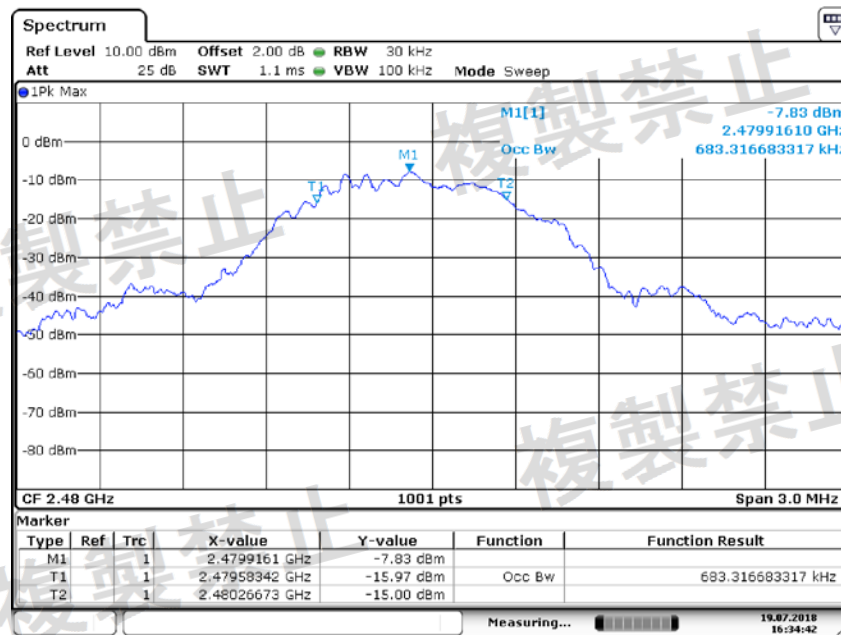
Test Model	Spreading Bandwidth Bluetooth V4.0		
Test voltage	Normal voltage	Channel Frequency	2402MHz



Test Model	Spreading Bandwidth Bluetooth V4.0		
Test voltage	Normal voltage	Channel Frequency	2440MHz



Test Model	Spreading Bandwidth Bluetooth V4.0		
Test voltage	Normal voltage	Channel Frequency	2480MHz



Date: 19.JUL.2018 16:34:42

8.4 POWER TO ANTENNA (CONDUCTED)

8.4.1 Applicable Standard

According to ARIB STD-T66 Clause 3.2

8.4.2 Conformance Limit

- a) The antenna power of a transmitting equipment (with a frequency band of 2427.00 – 2470.75 MHz, for spread spectrum systems using FH systems, hybrid systems of DS and FH, or hybrid systems of FH and OFDM) shall be such that the mean power within a bandwidth of 1MHz is 3 mW or less in the case of modulation using a standard coding test signal with the same transmission rate as that of the modulation signal.
- b) The antenna power of a transmitting equipment using a spread spectrum system other than any of those in “a” and the OFDM system shall be such that the mean power within a bandwidth of 1MHz is 10mW or less in the case of modulation using a standard coding test signal with the same transmission rate as that of the modulation signal.
- c) The antenna power of a transmitting equipment using systems other than any of those in “a” or “b” shall be 10mW or less.

8.4.3 Test Configuration

Test according to clause 6.1 radio frequency test setup 1

8.4.4 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	Consecutive sweep
Phase-Detection Mode	Sample

Measurement Procedure

(1) No frequency hopping systems:

- a. Configure the settings of the spectrum analyzer to 2(3).
- b. After repeating sweeps (until no display changes are found), measure the maximum power frequency per MHz.
- c. Connect the high frequency power meter to the IF output of the spectrum analysers.
- d. Configure the settings of the spectrum analyzer to 2(4).
- e. Set the antenna power as follows:
 - Continuous waves: value indicated on the high frequency power meter, corrected according to 2(1).
 - Burst waves: value similarly corrected in the case of continuous waves 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)

8.4.5 Test Results

Temperature :	25℃	Test Date :	July 18, 2018
Humidity :	55 %	Test By:	King Kong
		Test voltage	Normal voltage

Modulation Mode	Channel number	Channel Frequency (MHz)	Power density (mW)	Rated Antenna power (mW)	Antenna Power Error (+20%,-80%)	Limit (mW)
GFSK	0	2402	0.42	0.5	-16.0%	10
	19	2440	0.48	0.5	-4.0%	10
	39	2480	0.42	0.5	-16.0%	10
Note:						

8.5 SPURIOUS EMISSIONS INTENSITY

8.5.1 Applicable Standard

According to ARIB STD-T66 Clause 3.2(6)

8.5.2 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 |

8.5.3 Test Configuration

Test according to clause 6.1 radio frequency test setup 1

8.5.4 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

Respectively mark the maximum results in the above sweep bandwidth.

8.5.5 Test Results

■ Spurious Emission below 1GHz (30MHz to 1GHz)

Temperature :		25°C	Test Date :		July 18, 2018	
Humidity :		55 %	Test By:		King Kong	
Test band:		30MHz to 1000MHz	Test mode:		GFSK	
Test condition	Channel Frequency (MHz)	RBW (kHz)	Reading frequency (MHz)	Reading (dBm)	Limit (dBm)	Verdict
Normal voltage	2402	100	748.78	-69.96	-36	PASS
	2440	100	746.88	-69.31	-36	PASS
	2480	100	725.68	-69.35	-36	PASS

■ Spurious Emission between 1GHz and 2387MHz

Temperature :		25°C	Test Date :		July 18, 2018	
Humidity :		55 %	Test By:		King Kong	
Test band:		1GHz and 2387MHz	Test mode:		GFSK	
Test condition	Channel Frequency (MHz)	RBW (kHz)	Reading frequency (MHz)	Reading (dBm)	Limit (dBm)	Verdict
Normal voltage	2402	1000	2385.24	-42.49	-26	PASS
	2440	1000	2386.98	-53.35	-26	PASS
	2480	1000	2275.11	-59.83	-26	PASS

■ Spurious Emission in Restricted Band 2387-2400MHz

Temperature :		25°C	Test Date :		July 18, 2018	
Humidity :		55 %	Test By:		King Kong	
Test band:		2387-2400MHz	Test mode:		GFSK	
Test condition	Channel Frequency (MHz)	RBW (kHz)	Reading frequency (MHz)	Reading (dBm)	Limit (dBm)	Verdict
Normal voltage	2402	1000	2399.94	-21.70	-16	PASS
	2440	1000	2399.20	-47.89	-16	PASS
	2480	1000	2399.32	-58.13	-16	PASS

■ Spurious Emission in Restricted Band 2483.5-2496.5MHz

Temperature :		25°C	Test Date :		July 18, 2018	
Humidity :		55 %	Test By:		King Kong	
Test band:		2483.5-2496.5MHz	Test mode:		GFSK	
Test condition	Channel Frequency (MHz)	RBW (kHz)	Reading frequency (MHz)	Reading (dBm)	Limit (dBm)	Verdict
Normal voltage	2402	1000	2485.75	-57.83	-16	PASS
	2440	1000	2484.34	-53.50	-16	PASS
	2480	1000	2483.56	-28.00	-16	PASS

■ Spurious Emission in Restricted Band 2496.5MHz and 12.5GHz

Temperature :	25°C	Test Date :	July 18, 2018
Humidity :	55 %	Test By:	King Kong
Test band:	2496.5MHz and 12.5GHz	Test mode:	GFSK

Test condition	Channel Frequency (MHz)	RBW (kHz)	Reading frequency (MHz)	Reading (dBm)	Limit (dBm)	Verdict
Normal voltage	2402	1000	4924.78	-54.12	-26	PASS
	2440	1000	5000.74	-61.59	-26	PASS
	2480	1000	5081.08	-62.14	-26	PASS

Test Model

Spurious Emission Intensity (30MHz to 12.5GHz)

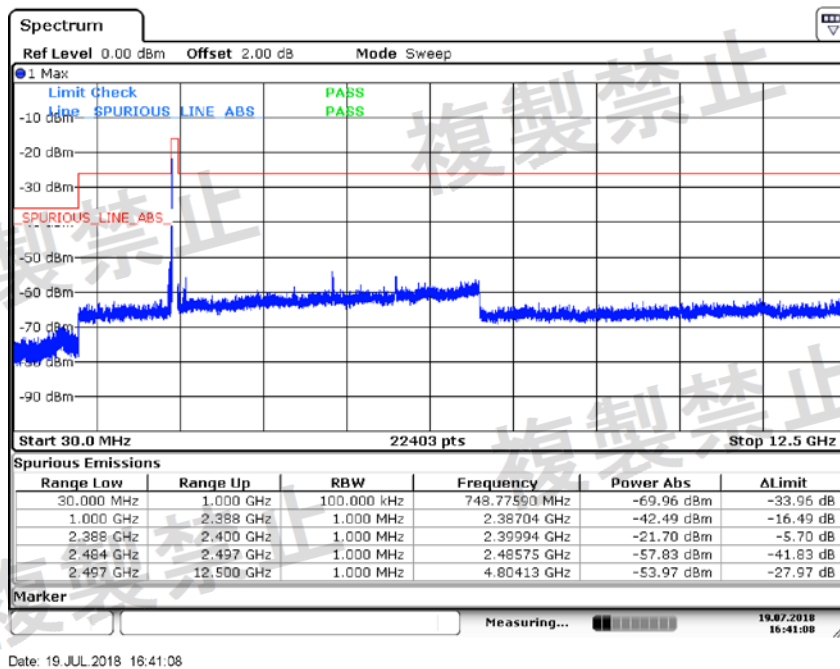
GFSK

Test condition

Normal voltage

Channel Frequency

2402MHz



Test Model

Spurious Emission Intensity (30MHz to 12.5GHz)

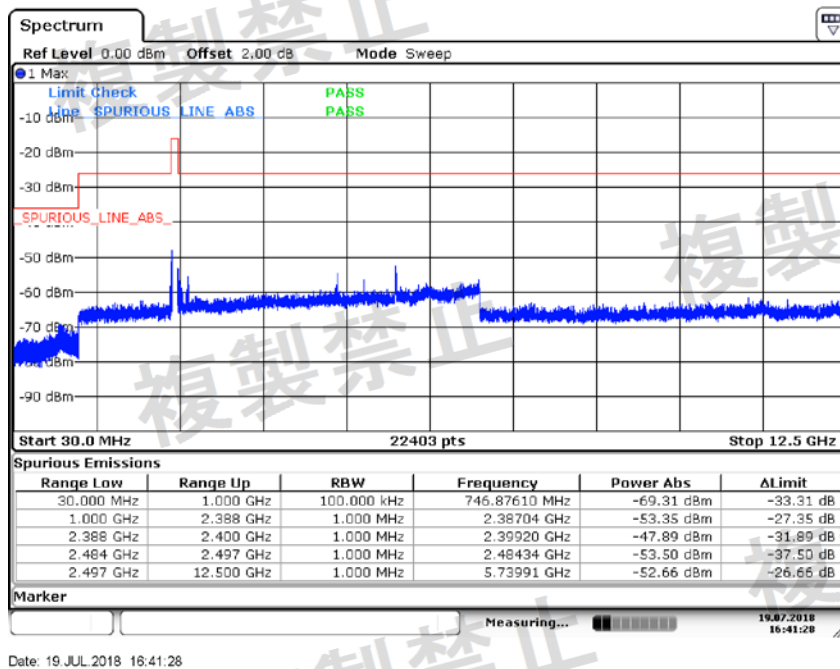
GFSK

Test condition

Normal voltage

Channel Frequency

2440MHz



Test Model

Spurious Emission Intensity (30MHz to 12.5GHz)

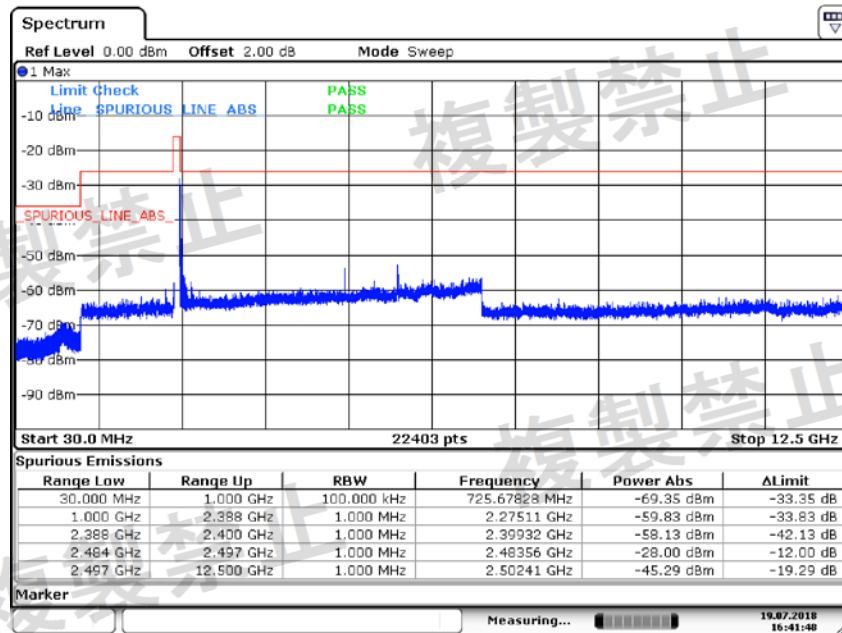
GFSK

Test condition

Normal voltage

Channel Frequency

2480MHz



Date: 19 JUL 2018 16:41:48

8.6 COLLATERAL EMISSIONS OF RECEIVER

8.6.1 Applicable Standard

According to ARIB STD-T66 Clause 3.3(1)

8.6.2 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 |

8.6.3 Test Configuration

Test according to clause 6.1 radio frequency test setup 1

8.6.4 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).

8.6.5 Test Results

■ Collateral Emissions of Receiver below 1GHz (30MHz to 1GHz)

Temperature :	25℃	Test Date :	July 18, 2018
Humidity :	55 %	Test By:	King Kong
Test band:	30MHz to 1GHz	Test mode:	GFSK

Test condition	Channel Frequency (MHz)	RBW (kHz)	Reading frequency (MHz)	Reading (dBm)	Limit (dBm)	Verdict
Normal voltage	2402	100	949.66	-87.51	-54	PASS
	2440	100	757.08	-86.78	-54	PASS
	2480	100	875.16	-87.59	-54	PASS

■ Collateral Emissions of Receiver above 1GHz (1GHz to 12.5GHz)

Temperature :	25℃	Test Date :	July 18, 2018
Humidity :	55 %	Test By:	King Kong
Test band:	1GHz to 12.5GHz	Test mode:	GFSK

Test condition	Channel Frequency (MHz)	RBW (kHz)	Reading frequency (MHz)	Reading (dBm)	Limit (dBm)	Verdict
Normal voltage	2402	1000	6114.06	-73.00	-47	PASS
	2440	1000	2408.38	-72.58	-47	PASS
	2480	1000	6908.99	-73.84	-47	PASS

Test Model

Collateral Emissions of Receiver (30MHz to 12.5GHz)

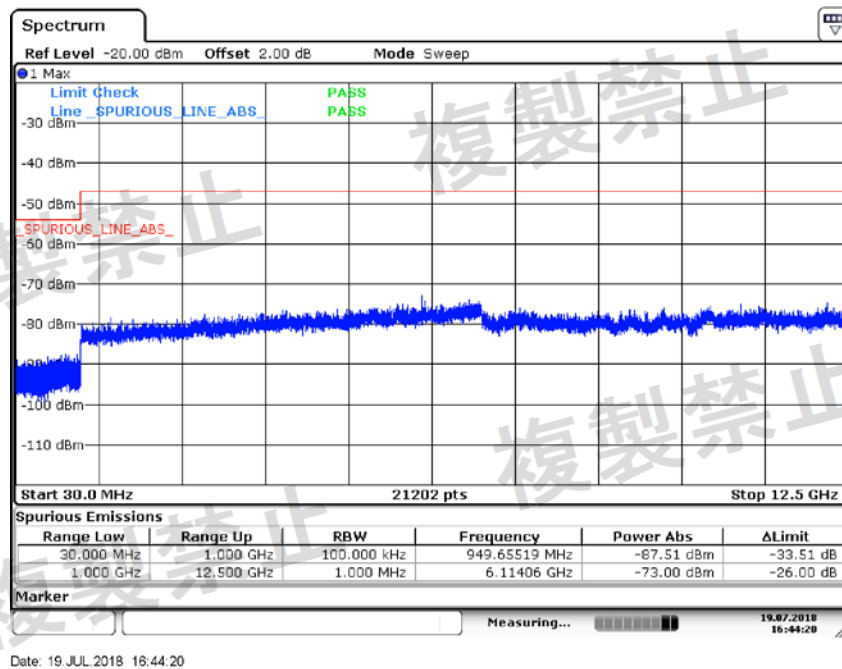
GFSK

Test condition

Normal voltage

Channel Frequency

2402MHz



Test Model

Collateral Emissions of Receiver (30MHz to 12.5GHz)

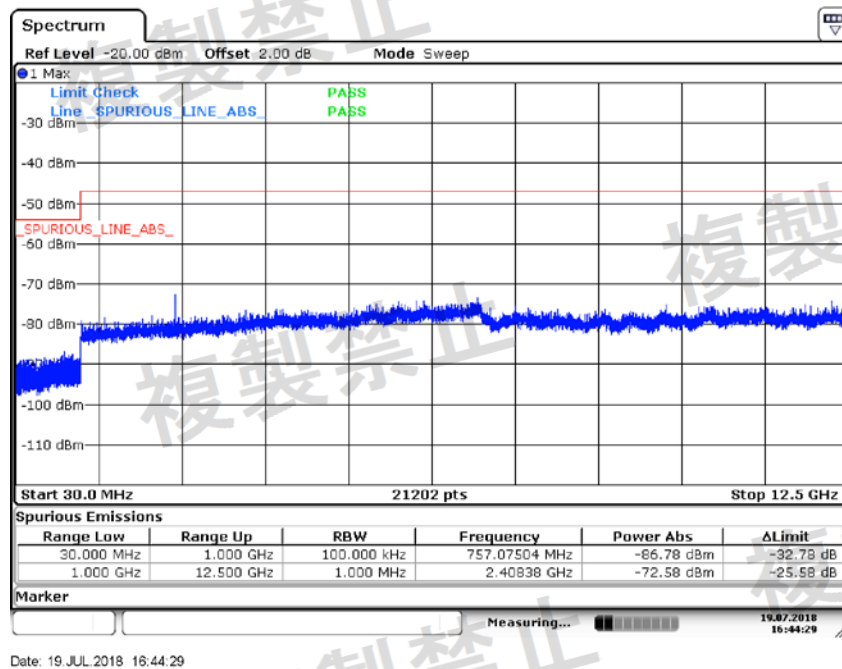
GFSK

Test condition

Normal voltage

Channel Frequency

2440MHz



Test Model

Collateral Emissions of Receiver (30MHz to 12.5GHz)

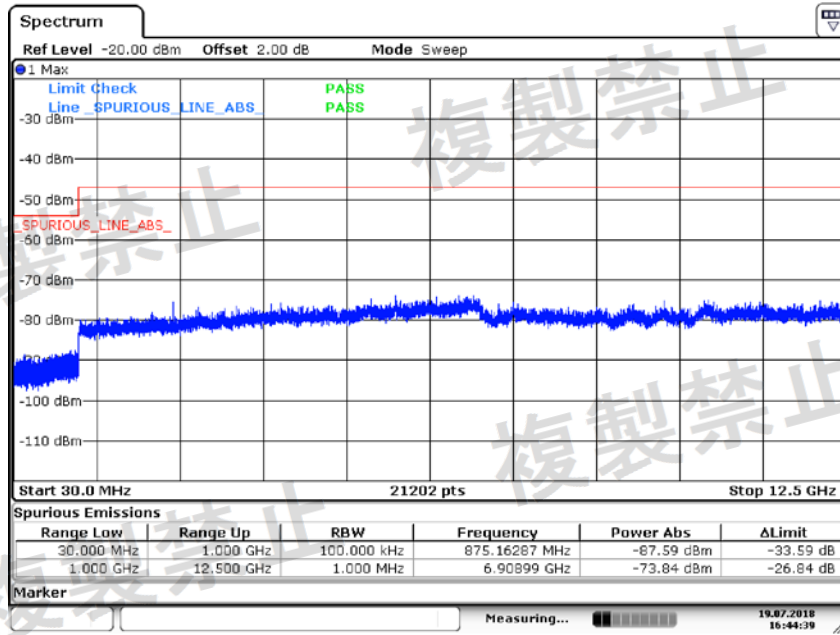
GFSK

Test condition

Normal voltage

Channel Frequency

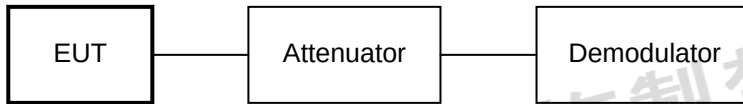
2480MHz



Date: 19 JUL 2018 16:44:39

8.7 INTERFACE PREVENTION FUNCTION

(1) In case identification code is transmitted



(2) In case identification code is received



(3) Measuring Equipment Conditions

- a. The Demodulator shall demodulate the TX-signal transmitted by the EUT and be able to display the contents of the identification code.
- b. The opposite sample shall be able to transmit TX-signal equivalent to the TX-signal transmitted by the EUT.

(4) Conditions of EUT

The EUT is set on the usual operating mode.

(5) Measurement Procedure

- (1) In case the EUT possesses function to transmit identification code automatically
 - a. Predetermined identification code is transmitted by the EUT.
 - b. Verify the transmitted identification code.
- (2) In case the EUT possesses function to receive identification code automatically
 - a. Predetermined identification code is transmitted by the opposite sample.
 - b. Verify the working of the normal communication.
 - c. Other code than the predetermined identification code is transmitted by the opposite sample.
 - d. Verify the EUT to stop transmitting or to display that the ID code is different.

Carrier Sense

	Normal Voltage	High Voltage	Low Voltage
Result	Pass	Pass	Pass

9 APPENDIX PHOTOGRAPHS OF TEST SETUP

