



# FCC RF Test Report

# For

# Shenzhen Hangshi Technology Co.,Ltd

Test Standards:	Part 15C Subpart C §15.247		
Product Description:	Bluetooth Keyboard		
Tested Model:	<u>HB242</u>		
Additional Model No.:	<u>N/A</u>		
FCC ID: 2AKHJ-HB242			
Classification	Digital Spread Spectrum (DSS)		
Report No.: EC1908023RF01			
Tested Date:	2019-08-27 to 2019-09-29		
Issued Date:	2019-09-29		
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Note: The test results in this report apply exclusively to the tested model / sample. Without written approval of Hunan Ecloud Testing Technology Co., Ltd., the test report shall not be reproduced except in full.

# **Report Revise Record**

Report Version	Revise Time	Issued Date	Valid Version	Notes	
V1.0	/	2019.09.29	Valid	Original Report	



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**APPENDIX C. EUT INTERNAL PHOTOGRAPHS** 



# **Summary of Test Result**

FCC Rule	Description	Limit	Result	Remark
15.247(a)(1)	20dB Bandwidth	NA	Pass	-
-	99% Bandwidth	-	Pass	-
15.247(a)(1)	Hopping Channel Separation	≥ 2/3 of 20dB BW	Pass	-
15.247(a)(1)	Number of Channels	≥ 15Chs	Pass	-
15.247(a)(1)	Average Time of Occupancy	≤ 0.4sec in 31.6sec period	Pass	-
15.247(b)(1)	Peak Output Power	≤ 1W	Pass	-
15.247(d)	Conducted Band Edges	≤ 20dBc	Pass	-
15.247(d)	Conducted Spurious Emission	≤ 20dBc	Pass	-
15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 5.56 dB at 252.13 MHz
15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 18.84 dB at 0.505 MHz
15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-



# 1 Test Laboratory

# 1.1 Test facility

# CNAS (accreditation number:L11138)

Hunan Ecloud Testing Technology Co., Ltd. has obtained the accreditation of China National Accreditation

Service for Conformity Assessment (CNAS).

# FCC (Designation number:CN1244, Test Firm Registration

# Number:793308 )

Hunan Ecloud Testing Technology Co., Ltd. has been listed on the US Federal Communications Commission

list of test facilities recognized to perform electromagnetic emissions measurements.

# ISED(CAB identifier: CN0012, ISED# :24347)

Hunan Ecloud Testing Technology Co., Ltd. has been listed on the Wireless Device Testing Laboratories list of

innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements.

# A2LA (Certificate Number: 4895.01)

Hunan Ecloud Testing Technology Co., Ltd. has been listed by American Association for Laboratory

Accreditation to perform electromagnetic emission measurement.



# 2 General Description

## 2.1 Applicant

### Shenzhen Hangshi Technology Co.,Ltd

Hangshi Technology Park, Democracy West Industry Area, Shajing Town, Bao'an District, Shenzhen, China.

## 2.2 Manufacturer

### Shenzhen Hangshi Technology Co.,Ltd

Hangshi Technology Park, Democracy West Industry Area, Shajing Town, Bao'an District, Shenzhen, China.

# 2.3 General Description Of EUT

Product	Bluetooth Keyboard
Model No.	HB242
Additional No.	N/A
Difference Description	N/A
FCC ID	2AKHJ-HB242
Power Supply	5Vdc (From adapter or host equipment) 3.7Vdc (Li-ion, polymer)
Modulation Technology	FHSS
Modulation Type	GFSK
Operating Frequency	2402MHz~2480MHz
Number Of Channel	79
Max. Output Power	Bluetooth BR(1Mbps) : -4.46 dBm (0.0004 W)
Antenna Type	PCB Antenna type with 1.87dBi gain
I/O Ports	Refer to user's manual
Cable Supplied	N/A

#### NOTE:

- 1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
- 2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.



# 2.4 Modification of EUT

No modifications are made to the EUT during all test items.

# 2.5 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247
- ANSI C63.10-2013
- KDB 558074 D01 15.247 Meas Guidance v05r02

#### Remark:

1. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.



# **3** Test Configuration of Equipment Under Test

## 3.1 Descriptions of Test Mode

The transmitter has a maximum peak conducted output power as follows:

Channel	Frequency	Mode	Bluetooth RF Output Power
Ch00	2402MHz	GFSK	-5.51
Ch39	2441MHz	GFSK	-4.46
Ch78	2480MHz	GFSK	-5.96

Remark:

- 1. All the test data for each data rate were verified, but only the worst case was reported.
- 2. The data rate was set in 1Mbps for all the test items due to the highest RF output power.
- a. Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.
- b. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

### 3.2 Test Mode

#### 3.2.1 Antenna Port Conducted Measurement

	Summary table of Test Cases					
	Data Rate / Modulation					
Test Item	Bluetooth BR 1Mbps					
	GFSK					
Conducted	Mode 1: CH00_2402 MHz					
Test Cases	Mode 2: CH39_2441 MHz					
lest cases	Mode 3: CH78_2480 MHz					

### 3.2.2 Radiated Emission Test (Below 1GHz)

Radiated	Bluetooth BR 1Mbps GFSK
Test Cases	Mode 3: CH78_2480 MHz

Note : 1. Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type. Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

2. Following channel(s) was (were) selected for the final test as listed above

### 3.2.3 Radiated Emission Test (Above 1GHz)

	Bluetooth BR 1Mbps GFSK			
Radiated	Mode 1: CH00_2402 MHz			
Test Cases	Mode 2: CH39_2441 MHz			
	Mode 3: CH78_2480 MHz			

Note : 1. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that Zorientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

- 2. Following channel(s) was (were) selected for the final test as listed above
- 3. For frequency above 18GHz, the measured value is much lower than the limit, therefore, it is not reflected in the report.

### 3.2.4 Power Line Conducted Emission Test:

AC	
Conducted	Mode 1 : Bluetooth Link + USB Cable (Charging from Adapter)
Emission	



# 3.3 Support Equipment

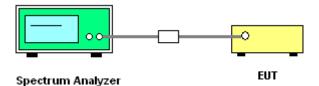
Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	AC Adapter	HUAWEI	HW-059200CHQ	FCC DOC	N/A	N/A
						unshielded 0.8m
2.	MicroUSB Cable	N/A	N/A	N/A	N/A	with magnetic
						ring
						shielded cable
3.	Notebook	Notebook Lenovo	E470C	FCC DoC	N/A	DC O/P 1.8 m
З.	NOLEDOOK	Lenovo	E470C	FUC DUC		unshielded AC
						I/P cable1.2 m

## 3.4 Test Setup

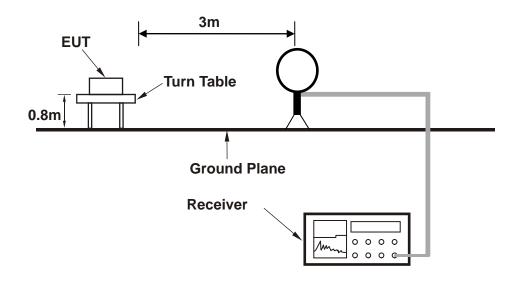
The EUT is continuously communicating to the Bluetooth tester during the tests.

EUT was set in the Hidden menu mode to enable BT communications.

#### Setup diagram for Conducted Test



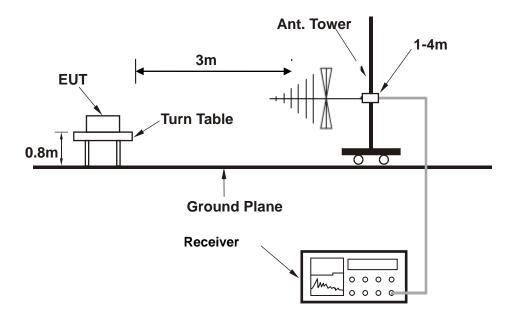
Setup diagram for Radiation(9KHz~30MHz) Test



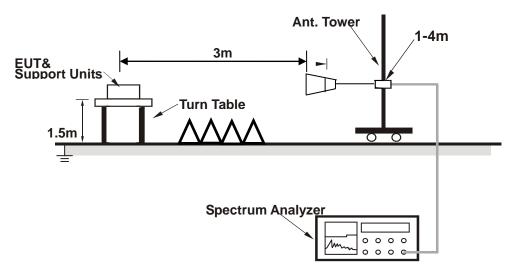
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Setup diagram for Radiation(Below 1G) Test

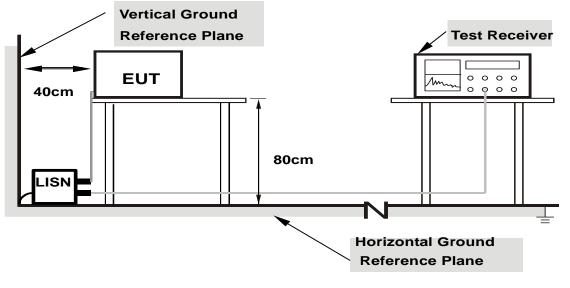


Setup diagram for Radiation(Above1G) Test





Setup diagram for AC Conducted Emission Test



Note: 1.Support units were connected to second LISN. 2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

## **3.5 Measurement Results Explanation Example**

#### For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 5 dB and 10dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 5 + 10 = 15 (dB)

#### For all radiated test items:

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level



# 4 Test Result

# 4.1 20dB and 99% Bandwidth Measurement

### 4.1.1 Limit of 20dB and 99% Bandwidth

None; for reporting purposes only.

### 4.1.2 Test Procedures

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Turn on the EUT and connect it to measurement instrument.
- 3. Use the following spectrum analyzer settings for 20dB Bandwidth measurement.
  - Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel;

 $RBW \ge 1\%$  of the 20 dB bandwidth;  $VBW \ge RBW$ ; Sweep = auto; Detector function = peak; Trace = max hold.

4. Use the following spectrum analyzer settings for 99 % Bandwidth measurement.

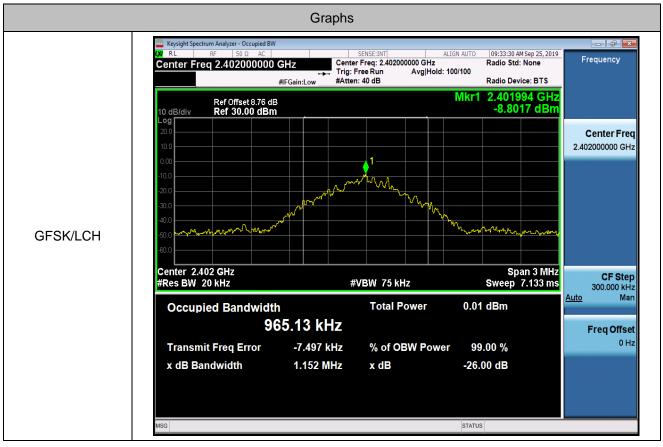
Span = approximately 1.5 to 5 times the 99% bandwidth, centered on a hopping channel; RBW  $\geq$  1% of the 99% bandwidth; VBW  $\geq$  RBW; Sweep = auto; Detector function = sample; Trace = max hold.



### 4.1.3 Test Result of 20dB Bandwidth and 99% Bandwidth

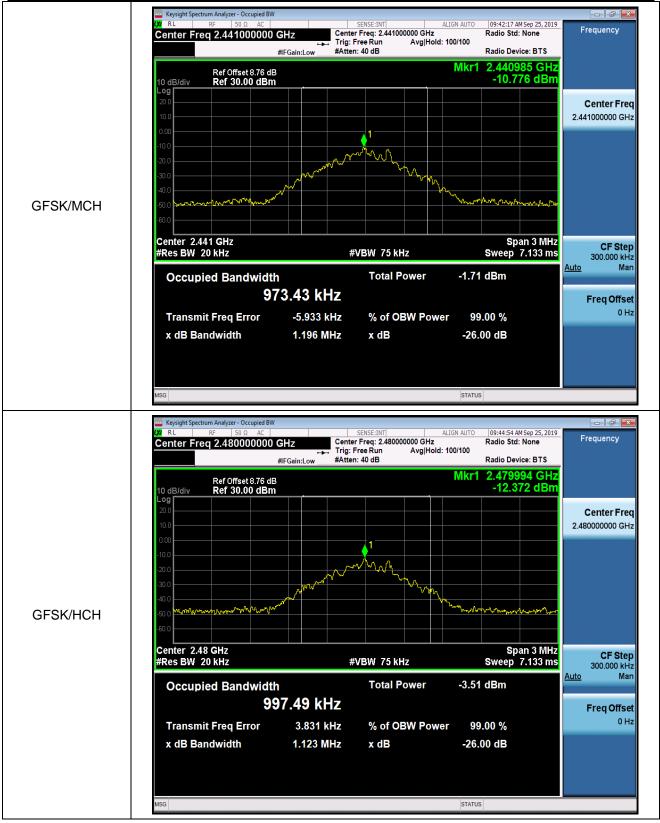
Test Mode :		Transmitting	ansmitting			24~26°⊂		
Test Engine	er:	Victorique.Gao	<b>Relative Humidity :</b>		dity :	50~53%		
Data Rate Modulation C		on Channel	20dB Ban	dwidth [MHz]	99	% OBW [MHz]	Verdict	
1Mbps	GFSK	LCH	1	1.008		0.96513	PASS	
1Mbps	GFSK	MCH	1	1.029		0.97343	PASS	
1Mbps	GFSK	HCH	1	1.005		0.99749	PASS	

#### 99% Plot



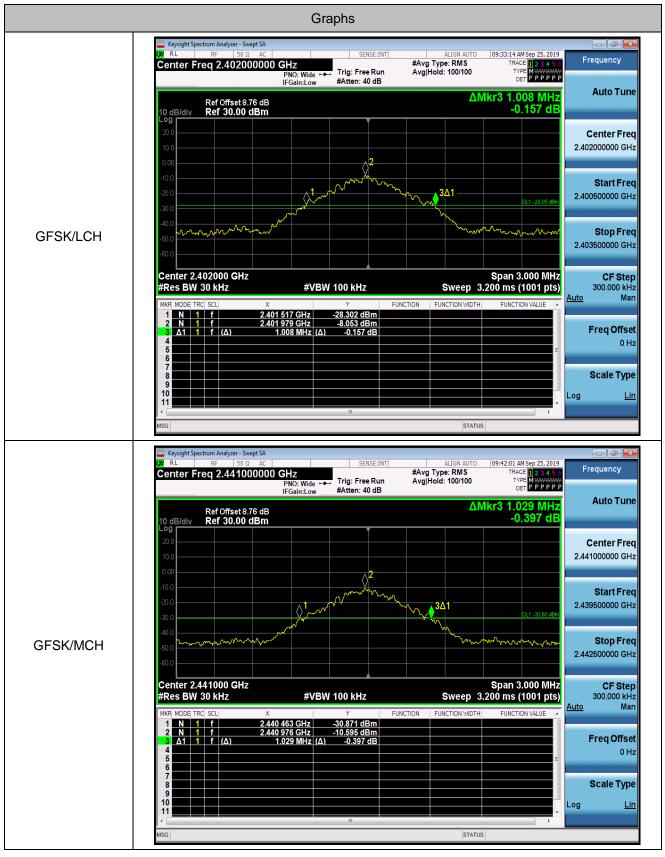


Report No.: EC1908023RF01





#### 20dB Plot





#### Report No.: EC1908023RF01

	Keysight Spectrum Analyzer - Swept SA     Keysight Spectrum Analyzer - Swept SA       XR L     RL     RL     SENSE:INT     ALIGN AUTO     09:44:39 AM Sep 25       Center Freq 2.480000000 GHz     Trace point     #Avg Type: RMS     Trace point       PNO: Wide     Trig: Free Run     Avg Hold: 100/100     TVPE Point       IFGain:Low     #Atten: 40 dB     Det P Point	PPP
	Ref Offset 8.76 dB         ΔMkr3 1.005 N           10 dB/div         Ref 30.00 dBm         -0.125           200         100         100	Auto Tune       dB       Center Freq       2.48000000 GHz
GFSK/HCH	$\begin{array}{c} 100 \\ -100 \\ -200 \\ -300 \\ -40$	
Grawnen	S0 0         Span 3.000           -60 0         -60 0           Center 2.480000 GHz         Span 3.000           #Res BW 30 kHz         #VBW 100 kHz           Sweep 3.200 ms (1001           MKRI MODE TRC SCL         X	MHz pts) Auto MHz Auto MHz Auto Man
	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Freq Offset
		Log <u>Lin</u>



# 4.2 Hopping Channel Separation Measurement

### 4.2.1 Limit of Hopping Channel Separation

### FCC §15.247 (a) (1)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

### 4.2.2 Test Procedures

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Turn on the EUT and connect it to measurement instrument.
- 3. The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

### 4.2.3 Test Result of Hopping Channel Separation

Test Mode :		Transmitting		Temperature :	24~26°⊂		
Test Enginee	r:	Victorique.Gao		Relative Humidity :	50~53%		
Data Rate	Modulatio	n Channel	Carrier	Frequency Separation	on [MHz]	Verdict	
1Mbps	GFSK	Нор		0.984		PASS	



#### **Hopping Frequency Separation Plot**





## 4.3 Number of Channel Measurement

### 4.3.1 Limits of Number of Hopping Frequency

#### FCC § 15.247(a)(1)(iii)

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

### 4.3.2 Test Procedure

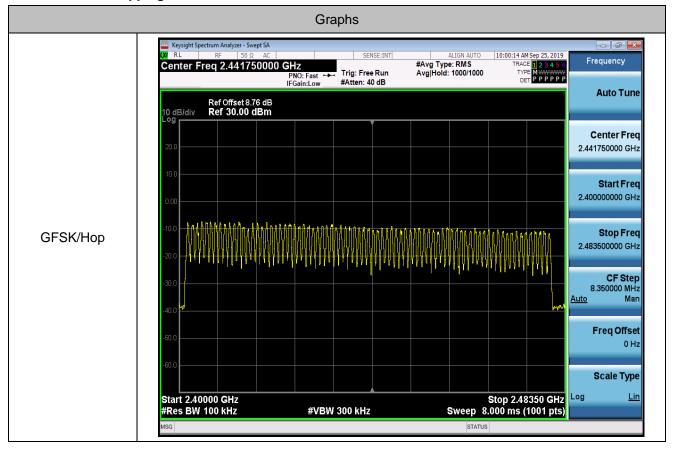
- 1.Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Turn on the EUT and connect it to measurement instrument.
- 3. The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

### 4.3.3 Test Result of Number of Hopping Frequency

Test Mode :		Trans	mitting		Temperature :	24~26℃			
Test Engineer	:	Victo	rique.Gao		Relative Humidity :	50~53%			
Data Rate	Modulati	on	Channel.	Nur	nber of Hopping Cha	nnel	Verdict		
1Mbps	GFSK		Нор	79		79			PASS



#### **Number of Hopping Channels**





## 4.4 Average Time of Occupancy Measurement

### 4.4.1 Limit of Average Time of Occupancy

#### FCC §15.247 (a) (1) (iii)

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.

### 4.4.2 Test Procedures

- 1.Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Turn on the EUT and connect it to measurement instrument.
- 3. The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

4. The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements.

The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s

Test channel: 2441MHz as below:

DH1 time slot= Burst Width (ms)\*(1600/ (2\*79))\*31.6

DH3 time slot= Burst Width (ms)\*(1600/ (4\*79))\*31.6

DH5 time slot= Burst Width (ms)\*(1600/ (6\*79))\*31.6

## 4.4.3 Test Result of Dwell Time

Test Mod	de :	Trans	Transmitting			erature :	<b>24~26°</b> ⊂		
Test Eng	gineer :	Victo	Victorique.Gao			Relative Humidity : 50~53%			
Data	Modulation	Packet	Burst		Width	Total		Dwell	Verdiet
Rate	Modulation	Packet	Channel	[ms/ho	op/ch]	Hops[hop*ch	ן [ו	Time[s]	Verdict
1Mbps	GFSK	DH1	MCH	0.4	13	320		0.138	PASS
1Mbps	GFSK	DH3	MCH	1.6	67	160		0.267	PASS
1Mbps	GFSK	DH5	MCH	2.9	91	106.7		0.310	PASS





#### The Average Time of Occupancy Plot

	Graphs	
	Keysight Spectrum Analyzer - Swept SA           ΟΝ         RL         RF         SO         AC         SENSE:INT         ALIGN AUTO         09:44:42 AM Sep 29, 2019	
	Center Freq 2.441000000 GHz PNO: Fast Trig Delay-1.250 ms Avg Type: Log-Pwr TRACE 1 2 3 4 5 6 TYPE Trig: Video	Frequency
	IFGain:Low #Atten: 30 dB DET PERFER	Auto Tune
	10 dB/div Ref 20.00 dBm 0.49 dB	
		Center Freq 441000000 GHz
	-10.0	44 1000000 GHZ
		Start Freq 441000000 GHz
	-40.0	44 1000000 GHZ
GFSK_DH1/MCH		Stop Freq 441000000 GHz
		44100000 GH2
	Center 2.441000000 GHz Span 0 Hz Res BW 1.0 MHz #VBW 1.0 MHz Sweep 5.000 ms (1001 pts)	CF Step 1.000000 MHz
	MKR         MODE         TRC ISCL         X         Y         FUNCTION         FUNCTION WIDTH         FUNCTION VALUE         Auto           1         N         1         1.240 ms         -18.48 dBm	<u>o</u> Man
	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Freq Offset
		0 Hz
		Scale Type
		<u>Lin</u>
	MSG STATUS	
	🔤 Keysight Spectrum Analyzer - Swept SA	
	X         RL         RF         50 Ω         AC         SENSE:INT         ALIGN AUTO         09:41:39 AM Sep 29, 2019           Center         Freq. 2         2.441000000         GHz         Trig Delay-2.500 ms         Avg Type: Log-Pwr         TRACE         1.2.3.4.5.6	Frequency
	M         RL         RF         50 Ω         AC         SENSE:INT         ALIGN AUTO         09:41:39 AM Sep 29, 2019           Center Freq 2.441000000 GHz         Trig Delay-2.500 ms         Avg Type: Log-Pwr         TRACE I 2 3 4 50           PNO: Fast         Trig: Video         #Atten: 30 dB         Det P P P P P P	
	M         RL         RF         50 Ω         AC         SENSE:INT         ALIGN AUTO         09:41:39 AM Sep 29, 2019           Center Freq 2.441000000 GHz         Trig Delay-2.600 ms         Avg Type: Log-Pwr         TRACE         12 34 5 6           PNO: Fast         Trig Delay-2.600 ms         Avg Type: Log-Pwr         TRACE         12 34 5 6           PNO: Fast         Trig Video         #Atten: 30 dB         Avg Type: Log-Pwr         TRACE         12 34 5 6           Det         PP P P P P         Atten: 30 dB         Avg Type: Log-Our         Trace         12 34 5 6           Det         PP P P P         Atten: 30 dB         Avg Type: Log-Our         Trace         12 34 5 6           Det         PP P P P         Atten: 30 dB         Avg Type: Log-Our         Trace         12 34 5 6           Det         PP P P P         Det         Det         PP P P P         Det           Det         PU P P P         PU P         PU P         PU P         PU P         PU P           Det         O.03 dB         O.03 dB         O.03 dB         O.03 dB         O.03 dB         O.03 dB	Frequency
	M         RF         50 Ω         AC         SENSE:INT         ALIGN AUTO         09:41:39 AM Sep 29, 2019           Center Freq 2.441000000 GHz PNO: Fast IFGain:Low         Trig Delay-2.600 ms #Atten: 30 dB         Avg Type: Log-Pwr         TRACE         12 34 3 G TYPE           DET PP PP P           AUG dB/div           AdMkr2 1.670 ms 0.03 dB           10 dB/div           NO: Fast PP P PP P	Frequency Auto Tune Center Freq
	M         RF         50 Ω         AC         SENSE:INT         ALIGN AUTO         09:41:39 AM Sep 29, 2019           Center Freq 2.441000000 GHz PNO: Fast IFGain:Low         Trig Delay-2.500 ms #Atten: 30 dB         Avg Type: Log-Pwr         TRACE         2.345 G TYPE           0 dB/div         Ref 20.00 dBm         0.03 dB         0.03 dB         2.4	Frequency Auto Tune
	M         RE         50 Ω         AC         SENSE:INT         ALIGN AUTO         09:41:39 AMSep 29, 2019           Center Freq 2.441000000 GHz IFGain:Low         Trig Elsys         Avg Type: Log-Pwr Trig: Video #Atten: 30 dB         Avg Type: Log-Pwr Det P P P P P P Det P P P P P Det P P P P P Det P P P P P           10 dB/div         Ref 20.00 dBm         2ΔMkr2 1.670 ms 0.03 dB         2.100           10 dB/div         Ref 20.00 dBm         2Δ1         700 LVE         2.100	Frequency Auto Tune Center Freq 441000000 GHz Start Freq
	M         RE         50 Ω         AC         SENSE:INT         ALIGN AUTO         09:41:39 AMSep 29, 2019           Center Freq 2.441000000 GHz IFGain:Low         Trig Elsys         Avg Type: Log-Pwr Trig: Video #Atten: 30 dB         Avg Type: Log-Pwr Det P P P P P P Det P P P P P Det P P P P P Det P P P P P           10 dB/div         Ref 20.00 dBm         2ΔMkr2 1.670 ms 0.03 dB         2.100           10 dB/div         Ref 20.00 dBm         2Δ1         700 LVE         2.100	Frequency Auto Tune Center Freq 441000000 GHz
GESK DH3/MCH	M         RE         50 Ω         AC         SENSE:INT         ALIGN AUTO         09:41:39 AMS =p 29, 2019           Center Freq 2.441000000 GHz IFGain:Low         Trig Elsing Automatic Market and Automatic Automatic Market and Auto	Frequency Auto Tune Center Freq 441000000 GHz Start Freq
GFSK_DH3/MCH	M         RE         SE0 Ω         AC         SEREE:NT         ALIGN AUTO         09:41:39 AM Sep 29, 2019           Center Freq 2.441000000 GHz IFGain:Low         Trig: Video #Atten: 30 dB         Avg Type: Log-Pwr Trace II 2 3 4 50 Trig: Video DET P P P P P P DET P P P P P P DET P P P P P DET P P P P P DET P P P P P P P DET P P P P P P P DET P P P P P P DET P P P P P P DET P P P P P P P P DET P P P P P P P DET P P P P P P P P DET P P P P P P P P DET P P P P P P P P P P DET P P P P P P P P P P P DET P P P P P P P P P P P P P P P P P P P	Frequency Auto Tune Center Freq 441000000 GHz Start Freq 441000000 GHz
GFSK_DH3/MCH	M         RE         S0 Ω         AC         SENSE:INT         ALIGN AUTO         09:41:39 AMS =p 29, 2019           Center Freq 2.441000000 GHz         Trig Delay-2.500 ms         Avg Type: Log-Pwr         Trace II 2 34 50           PNO: Fast         Trig: Video         #Atten: 30 dB         Trace II 2 34 50           10 dB/div         Ref 20.00 dBm         0.03 dB         0.03 dB           10 dB/div         Ref 20.00 dBm         0.03 dB         2.4           10 dB/div         Ref 20.00 dBm         2.4         1.4           0.00         1         2.2         2.4         2.4           10 dB/div         1         2.2         2.4         2.4         2.4           10 dB/div         1         2.2         2.4         2.4         2.4         2.4           20 d         1         2.2         1         1         2.4         2.4         2.4         2.4         2.4         2.4         2.4         2.4         2.4         2.4         2.4         2.4<	Frequency Auto Tune Center Freq 441000000 GHz Start Freq 441000000 GHz Stop Freq 441000000 GHz
GFSK_DH3/MCH	M         RL         RF         50 Ω         AC         SENSE:INT         ALIGN AUTO         09:41:39 AMS =p 29, 2019           Center Freq 2.441000000 GHz         Trig:Video         Avg Type: Log-Pwr         TRACE         12 34 36           PNO: Fast         Trig:Video         Avg Type: Log-Pwr         Trace         12 34 36         Trace         12 34 36           IO         dB/div         Ref 20.00 dBm         O.03 dB         24	Frequency Auto Tune Center Freq 441000000 GHz Start Freq 441000000 GHz Stop Freq 441000000 GHz
GFSK_DH3/MCH	M         RE         S0.0. AC         SERIES:NT         ALIGN AUTO         09:41:39 AMSep 29, 2019           Center Freq 2.441000000 GHz IFGain:Low         Trig: Video #Atten: 30 dB         Avg Type: Log-Pwr Trace         Trace         12 34 50 Trop P P P P P Det           Mkr2 1.670 ms 0.03 dB         Avg Type: Log-Pwr Det         Avg Type: Log-Pwr Trace         24 40         24 40           Main         Out         Fast 0.03 dB         Avg Type: Log-Pwr Trig: Video #Atten: 30 dB         Avg Type: Log-Pwr Trace         24 40         24 40           Main         Ref 20.00 dBm         Constraint         Constraint         Avg Type: Log-Pwr Trace         24 40         24 40         24 40         24 40         24 40         24 40         24 40         24 40         24 40         24 40         24 40         24 40         24 40         24 40         24 40         24 40         24 40         24 40         40 40<	Start Frequency           Auto Tune           Center Freq           441000000 GHz           Start Freq           441000000 GHz           Stop Freq           441000000 GHz           CF Step           1.000000 MHz           Man
GFSK_DH3/MCH	M         RL         RE         50.0. AC         SENSE:INT         ALIGN AUTO         09:41:39 AMSep 29, 2019           Center Freq 2.441000000 GHz IFGain:Low         Trig: Video #Atten: 30 dB         Avg Type: Log-Pwr Det         Trace         12 34 36 Det         24 35 0 Det         Trace         12 34 36 0 Det         24 0 0 0 Det         24 0 0 0 Det	Frequency Auto Tune Center Freq 441000000 GHz Start Freq 441000000 GHz Stop Freq 441000000 GHz
GFSK_DH3/MCH	DX         RL         PF         50.0         AC         SERSE:INT         ALIGN AUTO         [09:41:39 AVSep 29, 2019         Trace         123 4 5 5         179:02:00 ms         Avg Type: Log-Pwr         Trace         123 4 5 5         179:02:00 ms         Avg Type: Log-Pwr         Trace         123 4 5 5         179:02:00 ms         Avg Type: Log-Pwr         Trace         123 4 5 5         179:02:00 ms         Avg Type: Log-Pwr         Trace         123 4 5 5         179:02:00 ms         Avg Type: Log-Pwr         Trace         123 4 5 5         124 4 5 5         124 4 5 5         124 4 5 5<	Frequency Auto Tune Center Freq 441000000 GHz Start Freq 441000000 GHz Stop Freq 441000000 GHz CF Step 1.000000 MHz o_Man
GFSK_DH3/MCH	M         RL         RF         50.0. Ac         SERIE:INT         ALIGN AUTO         09:41:39 AMSep 29, 2019           Center Freq 2.441000000 GHz IFGain:Low         Trig Evideo IFGain:Low         Trig Evideo Atten: 30 dB         Avg Type: Log-Pwr Trace II 2 3 4 50 Trig: Video Det P P P P P Det P P P P P P Det P P P P P P Det P P P P P P Det P P P P P Det P P P P P Det P P P P P P P Det P P P P P P P P Det P P P P P P P P P P P P P P P P P P P	Frequency Auto Tune Center Freq 441000000 GHz Start Freq 441000000 GHz Stop Freq 441000000 GHz CF Step 1.000000 MHz Man Freq Offset 0 Hz Scale Type
GFSK_DH3/MCH	MR         RF         50.0. AC         SERVECINT         ALION AUTO         09:41:39 AMSep 29: 2019           Center Freq 2.441000000 GHz IFGain:Low         Trig Delay-2:00 ms rig: Video #Atten: 30 dB         Avg Type: Log-Pwr TRACE         D23 4 ms 23 4 ms Der         PPPPP           AMMkr2 1.670 ms 0.03 dB         AMMkr2 1.670 ms 0.03 dB         2         2         2         2           10 dB/div         Ref 20.00 dBm         0.03 dB         0.03 dB         2         2           10 dB/div         Ref 20.00 dBm         2         2         2         2         2         2         2         2           10 dB/div         Ref 20.00 dBm         1         2         2         1         2         2         2         2         2         2         2         2           10 dB/div         Ref 20.00 dBm         1         2         2         1         2 <td>Frequency Auto Tune Center Freq 441000000 GHz Start Freq 441000000 GHz Stop Freq 441000000 GHz CF Step 1.000000 MHz Man Freq Offset 0 Hz Scale Type</td>	Frequency Auto Tune Center Freq 441000000 GHz Start Freq 441000000 GHz Stop Freq 441000000 GHz CF Step 1.000000 MHz Man Freq Offset 0 Hz Scale Type



#### Report No.: EC1908023RF01

	Keysight Spectrum Analyzer - Swept SA         SENSE:INT         ALIGN AUTO         09:43:20 AM Sep 29, 2019           Center Freq 2.441000000 GHz PNO: Fast ++         Trig Delay-3.750 ms Trig: Video         Avg Type: Log-Pwr         TRACE TYPE	Frequency
	IFGain:Low         #Atten: 30 dB         Det PPPPP           AMkr2 2.910 ms         -0.05 dB	Auto Tune
		Center Freq 2.441000000 GHz
	-20.0	Start Freq 2.441000000 GHz
GFSK_DH5/MCH	-500 <mark>104/104/104/104/104/104/104/104/104/104/</mark>	<b>Stop Freq</b> 2.441000000 GHz
	MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE	<b>CF Step</b> 1.000000 MHz Auto Man
	1       N       1       t       3.720 ms       -17.86 dBm         2       Δ1       1       t       (Δ)       2.910 ms       (Δ)       -0.05 dB         3       4       5 </td <td>Freq Offset 0 Hz</td>	Freq Offset 0 Hz
	6 7 8 8 8 9 9 9 9 9 10 10 10 10 10 10 10 10 10 10 10 10 10	Scale Type



## 4.5 Peak Output Power Measurement

### 4.5.1 Limit of Peak Output Power

Section 15.247 (b) The maximum peak conducted output power of the intentional radiator shall not exceed the following: (1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band 0.125 watts.

### 4.5.2 Test Procedures

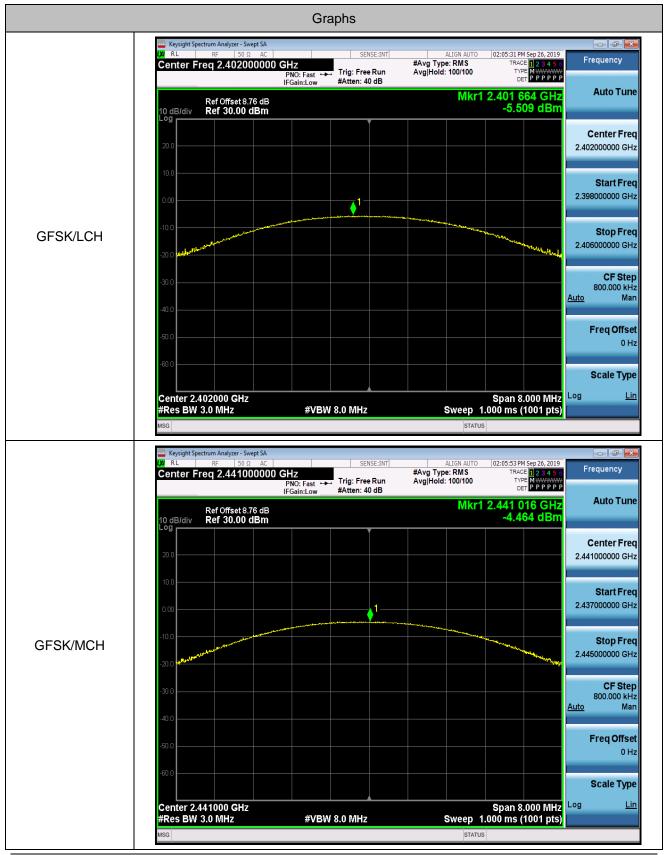
- 1.Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Turn on the EUT and connect it to measurement instrument.
- 3. The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

4.5.3	Test Result of Peak Output Power
-------	----------------------------------

Test Mode	:	Transmitting	,	Temperature :	<b>24~26°</b> C			
Test Engir	neer :	Victorique.Gao		Relative Humidity :	50~53%			
Data	Modulation	Channel	N	Maximum Peak Output		l imit[dDm]	Verdict	
Rate	wodulation	Channel		Power [dBm]		Limit[dBm]	verdict	
1Mbps	GFSK	LCH		-5.51		30	PASS	
1Mbps	GFSK	MCH		-4.46		30	PASS	
1Mbps	GFSK	НСН		-5.96		30	PASS	



#### Peak Output Power Polt



Building A1, Changsha E Center, No. 18 Xiangtai Avenue,

Liuyang Economic and Technological Development Zone, Hunan, P.R.C FCC ID: 2AKHJ-HB242 www.hn-ecloud.com Tel.:+86-731-89634887 Fax.: +86-731-89634887





	Keysight Spectrum Analyzer - Swept SA           ΟΥ         RL         RF         50 Ω         AC           Center Freq 2.480000000 C	SENSE:INT CHZ PNO: Fast → IFGain:Low #Atten: 40 dB	ALIGN AUTO 02:06:14 PM Sep 26, 201 #Avg Type: RMS TRACE 23 4 2 Avg Hold: 100/100 TVPE M	6 Frequency ₩ P
	Ref Offset 8.76 dB		Mkr1 2.479 768 GH -5.956 dBr	z Auto Tune n
	20.0			Center Freq 2.480000000 GHz
	0.00			<b>Start Freq</b> 2.476000000 GHz
GFSK/HCH	-10.0 -20.0 Bundly dy days and a start of the start of th			Stop Freq 2.484000000 GHz
	-30.0			CF Step 800.000 kHz <u>Auto</u> Man
	-60.0			Freq Offset 0 Hz
	Center 2.480000 GHz #Res BW 3.0 MHz	#VBW 8.0 MHz	Span 8.000 MH Sweep 1.000 ms (1001 pt	Scale Type Z Log <u>Lin</u>
	MSG		STATUS	



# 4.6 Conducted Band Edges Measurement

### 4.6.1 Limit of Band Edges

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

### 4.6.2 Test Procedures

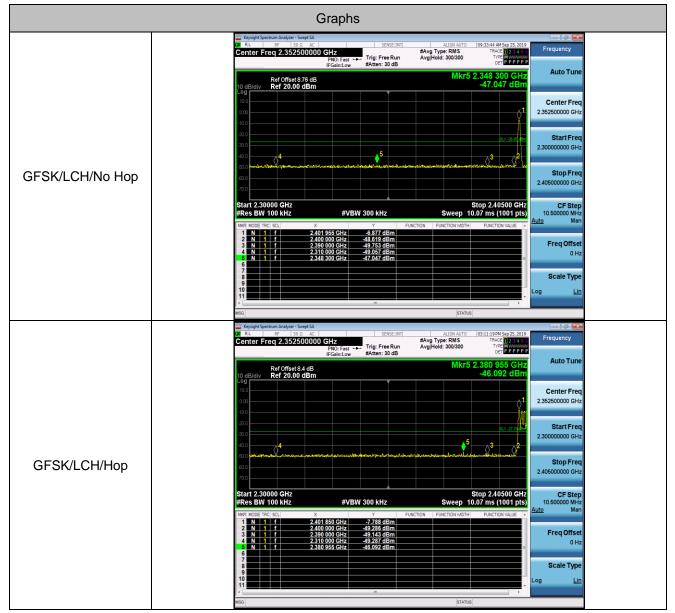
- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Turn on the EUT and connect it to measurement instrument.
- 3.Set RBW = 100kHz, VBW = 300kHz. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100kHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used.
- 4. Enable hopping function of the EUT and then repeat step 1~3.

# 4.6.3 Test Result of Conducted Band Edges

Test Mod	Test Mode : Transmitting				Temperature : 24~26°C					
Test Eng	Test Engineer :			ue.Gao		Relative Humidity : 50~53%				
Data Rate	Modulation	Char	nnel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Ma Spuri Lev [dBi	ous el	Limit [dBm]	Verdict
1Mbps	GFSK	LC	`U	2402	-6.88	Off	-47.	05	-26.88	PASS
TNDPS	GFSK		/ 1	2402	-7.79	On	-46.	09	-27.79	PASS
1Mbps	GFSK	НС	, ц	2480	-10.81	Off	-45.	56	-30.81	PASS
rivibps	GFSK			2400	-10.32	On	-46.	49	-30.32	PASS



#### **Conducted Band Edge Polt**





Report No.: EC1908023RF01

	🔤 Keysight Spectrum Analyzer - Swept SA 👘 🕞 🛋
	DI         R.L         BF         IS0.0         AC         SENSE:INT         ALIGN LUTO         (99-4508 AM Sep 25, 2019)         Frequency           Center Freq 2.510000000 GHz         HAVE Type: RMS         TMACE         12.3 4.57         Frequency           PNO: Fast         +         Trig: Free Run         Avglipidai: 300300         Trig: Free Run         Avglipidai: 300300         Trig: Free Run
	Ref Offset 8.76 dB Mkr4 2.535 20 GHz 10 dB/div Ref 20.00 dBm -45.563 dBm
	100 Center Freq 251000000 GHz
	20 0 Start Freq
GFSK/HCH/No Hop	50.0 https://www.stanting.org/withing.com/
	Start 2.47000 GHz         Stop 2.55000 GHz         CF Step
	#Res BW 100 kHz         #VEW 300 kHz         Sweep         7.667 ms (1001 pts)         8.000000 MHz           MMR MODE THC SCI         X         Y         FUNCTION         FUNCTION WATH         FUNCTION VALUE         Auto         Man           1         N         1         Z480 00 GHz         -10.811 dBm         FUNCTION WATH         FUNCTION VALUE         Auto         Man
	2 N 1 f 2433 50 GHz 550 779 BBm 3 N 1 f 2500 0 GHz 42 175 BBm 5 N 1 f 2535 20 GHz 45 553 BBm 0 0 Hz
	6 7 8 Scale Type
	ASG STATUS
	ML         RF         S0 Ω         AC         SENSE:NT         ALION AUTO         G13:14:09K 96:25,2019         Frequency           Center Freq 2.510000000 GHz         Frequency         #Avg Type: RMS         Trace
	Ref Offset 8.76 dB         Mkr4 2.547 68 GHz         Auto Tune           10 dB/div         Ref 20.00 dBm         -46.491 dBm
	Cog         Center Freq           000         1           000         1
	30.0 Start Freq
	30.0         2         3         4         4         2         4         4         2         4
GFSK/HCH/Hop	So 0     Destrictly west complexity and all description of the optimized at the destrict of th
	Start 2.47000 GHz Stop 2.55000 GHz CF Step #Res BW 100 kHz #VBW 300 kHz Sweep 7.667 ms (1001 pts) 8.00000 MHz
	MRR MODE TRCL SCL X Y FUNCTION FUNCTION WOTH FUNCTION VALUE A Auto Man
	1         N         1         f         2.473 04 GHz         -10.324 dBm           2         N         1         f         2.483 50 GHz         -47.952 dBm         Freq Offset           3         N         1         f         2.6895 dBm         Freq Offset           4         N         1         f         2.847 68 GHz         -46.491 dBm         0 Hz
	6 Scale Type
	MSG STATUS



# 4.7 Conducted Spurious Emission Measurement

### 4.7.1 Limit of Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

### 4.7.2 Test Procedure

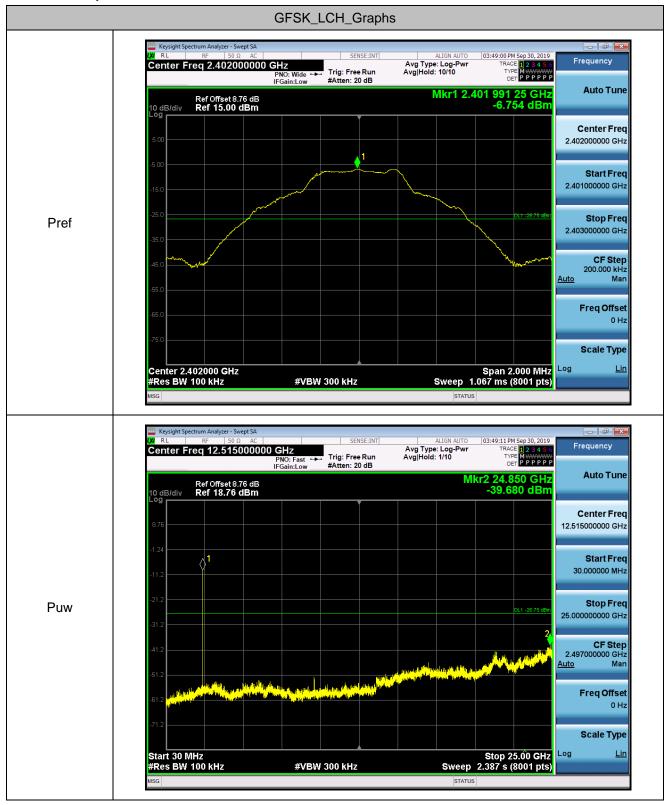
- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Turn on the EUT and connect it to measurement instrument.
- 3.Set to the maximum power setting and enable the EUT transmit continuously.
- 4.Set RBW = 100 kHz, VBW = 300kHz, scan up through 10th harmonic. All harmonics / spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.
- 5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

Test Mode :		Transmitting		Temperature :	<b>24~26°</b> ⊂	
Test Engineer :		Victorique	.Gao	Relative Humidity :	50~53%	
Data Rate	Мо	dulation	Channel	Pref [dBm]	Puw[dBm]	Verdict
1Mbps	(	GFSK	LCH	-6.754	<limit< td=""><td>PASS</td></limit<>	PASS
1Mbps	(	GFSK	MCH	-8.821	<limit< td=""><td>PASS</td></limit<>	PASS
1Mbps	(	GFSK	HCH	-10.643	<limit< td=""><td>PASS</td></limit<>	PASS

### 4.7.3 Test Result of Conducted Spurious Emission

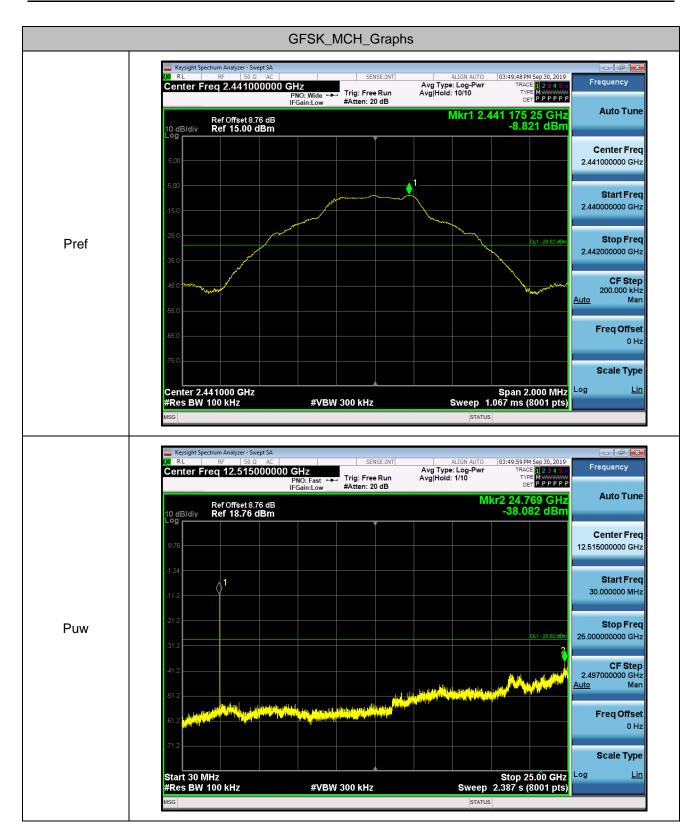


#### **Conducted Spurious Emission Polt**



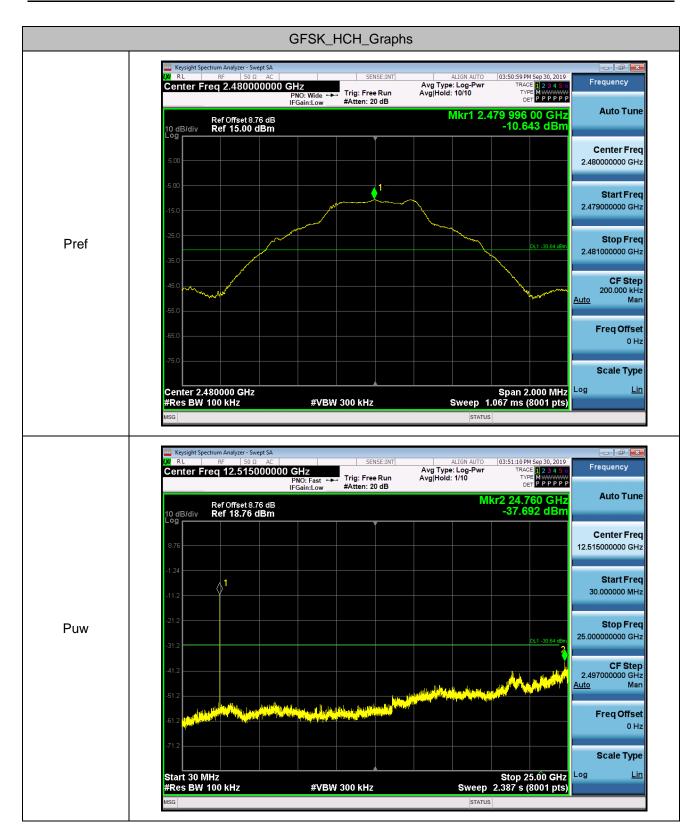














# 4.8 Radiated Band Edges and Spurious Emission Measurement

#### 4.8.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Frequency	Field Strength	Measurement Distance
(MHz)	(microvolts/meter)	(meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

Note: The frequency range from 9KHz to 10th harmonic (25GHz) are checked, and no any emissions were found from 9kHz to 30MHz and 18GHz to 25GHz, So the radiated emissions from 9kHz to 30MHz and 18GHz to 25GHz were not record.

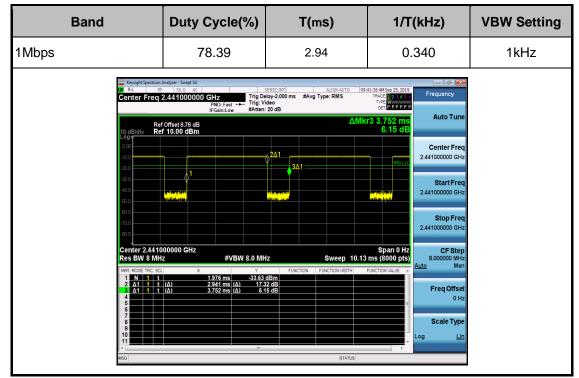


#### 4.8.2 **Test Procedures**

- 1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
- 2. The measurement distance is 3 meter.
- 3. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
- 4. Set to the maximum power setting and enable the EUT transmit continuously.
- 5. Use the following spectrum analyzer settings:
  - Span shall wide enough to fully capture the emission being measured; (1)
  - Set RBW=100 kHz for f<1 GHz, RBW=1MHz for f>1GHz; VBW =3 \* RBW; Sweep = auto; (2) Detector function = peak; Trace = max hold for peak
  - (3) For average measurement:

VBW = 10 Hz, when duty cycle is no less than 98 percent.

VBW  $\ge$  1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control



level for the tested mode of operation.

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level 6.



### 4.8.3 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

#### 4.8.4 Test Result of Radiated Spurious at Band Edges

est Mode :	Bluetoo	oth (1Mbps)	CH00 (2	402MHz)	Tempera	ature :	21~23	S℃
est Engineer	: Jack Liu	u			Relative	Humidity :	63~65	5%
requencey Ra	i <b>nge</b> 2.3GHz	:~2.405GH	z		Polariza	tion :	Horizo	ontal
Data: 9							_	
110	el (dBuV/m)						Date: 20	)19-08-30
100								
80						FCC	PART15	C PEAK
60								
40	manuna	politer and reacherson		human walk Amada	Nonhahmude	2 performanteriological	ANN BRANN	
20								
0	0 2310.	2330.		2350.		70.	2390.	
230			Fre	equency (N	IHZ)			2405
Freq MHz	Reading level dBuV	Antenna factor dB/m		Preamp	-	Limit level dBuV/m	Over limit dB	



est Mode :	Blueto	ooth (1Mbps	s) CH00 (2	2402MHz)	Tempe	rature :		21~2	<b>3</b> ℃
est Engineer :	: Jerry	Wang			Relativ	e Humidit	ty:	63~6	5%
requencey Ra	inge 2.3Gł	Hz~2.405G⊦	łz		Polariz	ation :		Horiz	ontal
Data: 10	el (dBuV/m)	1					Dat	e: 20'	19-08-30
100									
80									4
60							FCC	PART	-15C AV
40		2							
20	~1	_^nm	hur_					3.~~~	
0 <mark>0</mark> 0	2310.	2330.	Fre	2350. equency (N		70.	23	390.	2405
Freq MHz	Reading level dBuV	g Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Ove lir dl	nit	Remark
2310.000 2323.520 2390.000 2402.060	34.93 30.36	26. 91 26. 94 27. 11 27. 15	3. 48 3. 49 3. 53 3. 54	35.45 35.55	23. 24 29. 91 25. 45 82. 46	54.00 54.00 54.00 54.00 54.00	-24. -28.	. 09	Average Average Average Average



st Mode :	Bluetoo	th (1Mbps)	CH00 (2	402MHz)	Tempera	ature :	21~23	°C
st Engineer :	Jack Liu	l			Relative	Humidity	: 63~65	%
equencey Rar	nge 2.3GHz	~2.405GH	Z		Polariza	tion :	Vertica	al
Data: 7							Date: 20	19-08-30
110	l (dBuV/m)						Date. 20	19-00-30
100								
80						FC	C PART15	4 <u>C PEAK</u> -6dB
60							2	Ж
40	houber along the states	man sector de la construction de la construcción de la construcción de la construcción de la construcción de la	Makeholomopak		whent	Maximon	hippend	hand -
20								
	2310.	2330.		2350.	23	70.	2390.	2405
		2330.	Fr	2350. equency (N	23 ЛНz)	70.		
			Fr	2350. equency (N Preamp	23 ЛНz)	70. Limit		



Test Mode :	Bluetoo	th (1Mbps)	CH00 (2	2402MHz)	Temper	ature :	21~23	<b>3</b> °C
Test Engineer :	Jack Liu	l			Relative	e Humidity	v: 63~6	5%
Frequencey Ran	ge 2.3GHz	~2.405GH	Z		Polariza	tion :	Vertic	al
Data: 8 110 <mark>Level</mark>	(dBuV/m)						Date: 20	19-08-30
100								
80								4
60							FCC PAR	T15C AV
40					4	2	Mnmalh	
20			lot	Lun Mu		Mmml	nnungl/h	mm
0 <mark></mark> 2300	2310.	2330.	Fr	2350. equency (N		70.	2390.	2405
Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB		level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
2310.000 2382.110 2390.000	30. 20 35. 76 29. 23 86. 30	26. 91 27. 09 27. 11 27. 15	3. 48 3. 53 3. 53 3. 53 3. 54	35. 43 35. 53 35. 55 35. 56	25.16 30.85 24.32 81.43	54.00 54.00 54.00 54.00 54.00	-23.15 -29.68	Average Average Average Average



est Mode :	Bluetoo	th (1Mbps)	CH78 (2	480MHz)	Tempera	ture :	21~23°	С
est Engineer :	Jack Liu	ı			Relative	Humidity :	63~659	%
equencey Ran	<b>ge</b> 2.477G	Hz~2.510G	θHz		Polariza	tion :	Horizor	ntal
Data: 23 110	(dBuV/m)		1				Date: 20	19-08-30
100								
80						FCC	PART15	
60		2						-6dB
40			alment have a second	3 Hay Lanna Januara		- Annona Mar	on the watcher	Marken
20								
02477 2	480.2482.2	484.2486.24	188.2490.1 Fr	2492.2494.: equency (N	2496.2498. /Hz)	.2500.2502.2	2504.2506	. 2510
Freq MHz		Antenna factor dB/m	Cable	Preamp	level	Limit level dBuV/m	Over limit dB	Remark
	92. 61 51. 84 48. 75 43. 50		3.59	35.68	47.11	74.00 74.00 74.00 74.00 74.00	13. 88 -26. 89 -29. 97 -35. 20	Peak



st Mode :	Bluetooth (1Mbps	s) CH78 (	2480MHz	Tempe	erature :	21~	- <b>23</b> ℃
st Engineer :	Jack Liu			Relativ	ve Humidi	<b>ty</b> : 63~	-65%
equencey Range	2.477GHz~2.510	GHz		Polariz	zation :	Hor	rizontal
Data: <mark>24</mark> 110 <mark>Level (dE</mark>	3uV/m)					Date: 2	019-08-30
100							
80							
60						FCC PAR	-6dB
40							
20	2						
0 <mark>2477 2480</mark>	).2482.2484.2486.24	488.2490.2 Fre	2492.2494.2 equency (N	2496.2498 1H7)	.2500.2502.	2504.250	6. 2510
le	ading Antenna vel factor uV dB/m	Cable	Preamp	level	Limit level dBuV/m	Over limit dB	Remark
	1. 03 27. 35 9. 64 27. 36 9. 12 27. 40		35.67 35.68 35.70		54.00 54.00 54.00	-29.09	Average Average Average



est Mode :	Bluetoo	th (1Mbps)	CH78 (2	480MHz)	Tempera	ature :	21~23	°C
est Engineer :	Jack Liu	ı			Relative	Humidity	: 63~65	%
requencey Range	2.477G	Hz~2.5100	GHz		Polariza	tion :	Vertica	al
Data: 25							Date: 20	19-08-30
110 Level (d	Buv/m)						Date. 20	13-00-00
100								
80								
1	~					FCC	PART15	
	$\rightarrow$							-6dB
60	$\rightarrow$							
		,				3.4		
40	and the	) Kalever vitralisaannav	Million and and	(a-stable - all all all all all all all all all a		Medina services	Non all many a man	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
20								
02477 24	30.2482.2	484.2486.24	488.2490.	2492.2494.	2496.2498	2500.2502.2	2504.2506	. 2510
			Fr	equency (N	/Hz)			
		Antenna		Preamp		Limiț	0ver	<b>D</b> 1
	evel BuV	factor dB/m		factor dB		level dBuV/m	limit dB	Remark
2479.838	78.99	27.35 27.36	3.59	35.67	74.26	74.00 74.00	0.26	Peak
2483 500			3.60	35.70	41.81	74.00	-32.19	
	46.51	21.10	3.60	35.70		74.00	-34.15	D 1



est Mode	:	Blu	etoo	th (1N	/lbps	) CH78	(24	180M	Hz)	Tem	pera	ture :		21	~23	°C
est Engine	eer :	Jac	:k Liu	r						Rela	tive	Humi	dity	: 63	~65	%
requencey	y Ran	<b>ge</b> 2.4	77G	Hz~2.	5100	GHz				Pola	rizat	ion :		Ve	ertica	al
Data:		(dBuV	/m)											Date:	2019	-09-29
													_			
100		_														
80		1														
60		$\square$											FC		DT4	5C AV
													FU		K I I	-6dB
40	$\square$	+								_						
		'	2									3				
20			<u></u>									Ť	~~~~			
0	2477 2	480.24	82.24	84.24	86.24	88.2490	).24	92.24	94.2	2496.24	98.25	500.25	02.25	04.25	06.	2510
								uenc								
Fre ME	-	Readi level dBuV	L –	Ante fact dB/m	or	Cabl loss dB		Prea fact dB	or	leve dBuV/	1 1			Over limi dB		Remark
2479.	970 500	77.9	90 18	27.3 27.3	5 6 0	3.59 3.59 3.60	- 3	5.67 5.68 5.70			5		-		5 <i>I</i>	Average Average Average

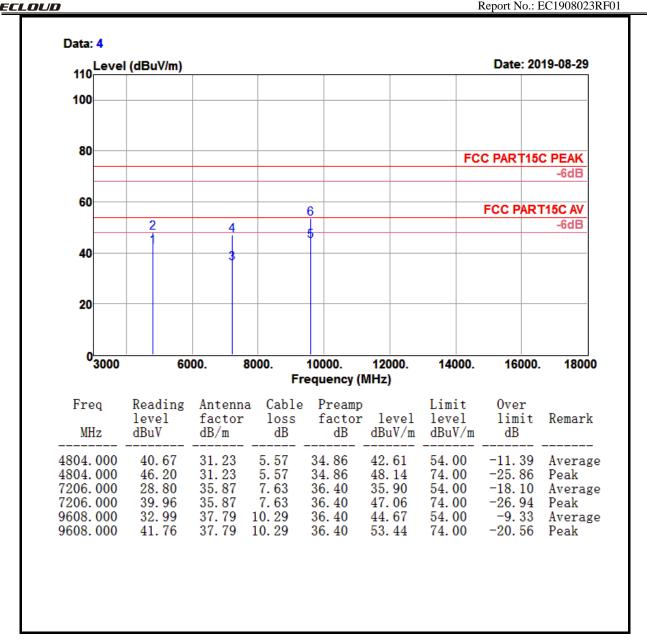


# 4.8.5 Test Result of Radiated Spurious Emission (1GHz ~ 10<sup>th</sup> Harmonic)

	Bluetoc	oth (1Mbps)	CH00 (2	402MHz)	Tempera	ture :	2	21~23°	С
r :	Jack Li	u			Relative	Humic	lity:	63~65%	%
Range	1GHz~	3GHz			Polariza	tion :	ł	Horizor	ntal
							_		
vel (di	3uV/m)							ate: 20	19-08-29
						1	FCC P	ART15	
									-6dB
							FC		T15C AV -6dB
den produktet til	mannan	yhteetheetheetheetheetheetheetheetheethe	wheelpersonalitestar	defensionerality of	whenthe	ustral marked	u	-secondere <sup>t</sup> ration	averant from som the same
00	1300.	1500.				0. 25	500. 2	2700.	3000
16	evel	Antenna factor dB/m		Preamp		leve	1 1		Remark
 00 8	35.93	27.15	3.54	35.56	81.06	74.0	 0	7.06	 Peak
	vel (df	vel (dBuV/m)	Marketter,	vel (dBuV/m)	vel (dBuV/m)           0           0           1           0           1 <t< td=""><td>vel (dBuV/m)</td><td>vel (dBuV/m)           1           <t< td=""><td>vel (dBuV/m)         D          </td><td>vel (dBuV/m)         Date: 20           1         1           1</td></t<></td></t<>	vel (dBuV/m)	vel (dBuV/m)           1 <t< td=""><td>vel (dBuV/m)         D          </td><td>vel (dBuV/m)         Date: 20           1         1           1</td></t<>	vel (dBuV/m)         D	vel (dBuV/m)         Date: 20           1         1           1



equencey Range 3GHz~18GHz Polarization : Horizontal	equencey Range 3GHz~18GHz Polarization : Horizontal Data: 3 100 100 80 60 60 60 60 60 60 60 60 60 60 60 60 60	Polarization :         Horizontal           Data: 3         100         Date: 2019-08-29           100         0         0         0           100         0         0         0         0           100         0         0         0         0         0           100         0         0         0         0         0         0           100         0         0         0         0         0         0         0           100         0	Polarization :         Horizontal           Data: 3         Image: Date: 2019-08-29           100         Image: Date: 2019-08-29           Image: Date: 2019-08-29         Image: Date: 2019-08-29 <t< th=""><th>requencey Range         3GHz~18GHz         Polarization :         Horizontal           Data: 3           Date: 2019-08-25           100        </th><th>est Mode :</th><th>Bluetooth (1Mbps) CH</th><th>00 (2402MHz)</th><th>Temperature :</th><th><b>21~23</b>℃</th></t<>	requencey Range         3GHz~18GHz         Polarization :         Horizontal           Data: 3           Date: 2019-08-25           100	est Mode :	Bluetooth (1Mbps) CH	00 (2402MHz)	Temperature :	<b>21~23</b> ℃
Data: 3 110 Level (dBuV/m) Date: 2019-08-29 100 80 80 90 90 90 90 90 90 90 90 90 9	Data: 3 110 100 80 60 40 40 5000. 8000. 1000. 1200. 1400. 1600. 1800	Data: 3 110 100 80 60 60 60 60 60 60 60 60 60 6	Data: 3 110 100 80 60 60 60 60 60 60 60 60 60 6	Data: 3 110 100 80 60 40 0 0 0 0 0 0 0 0 0 0 0 0 0	est Engineer :	Jack Liu		Relative Humidity :	63~65%
Level (dBuV/m)       Date: 2019-08-29         100	Level (dBuV/m)         Date: 2019-08-29           100         0 <t< td=""><td>Level (dBuV/m) 100 80 80 60 40 40 5000. 8000. 1000. 1200. 14000. 16000. 1800</td><td>Level (dBuV/m) 100 80 80 60 40 40 5000. 8000. 1000. 1200. 14000. 16000. 1800</td><td>Level (dBuV/m)       Date: 2019-08-29         100       0       0       0       0         80       0       0       0       0       0         80       0       0       0       0       0       0         90       0       0       0       0       0       0       0         90       <td< td=""><td>requencey Rar</td><td>nge 3GHz~18GHz</td><td></td><td>Polarization :</td><td>Horizontal</td></td<></td></t<>	Level (dBuV/m) 100 80 80 60 40 40 5000. 8000. 1000. 1200. 14000. 16000. 1800	Level (dBuV/m) 100 80 80 60 40 40 5000. 8000. 1000. 1200. 14000. 16000. 1800	Level (dBuV/m)       Date: 2019-08-29         100       0       0       0       0         80       0       0       0       0       0         80       0       0       0       0       0       0         90       0       0       0       0       0       0       0         90       0 <td< td=""><td>requencey Rar</td><td>nge 3GHz~18GHz</td><td></td><td>Polarization :</td><td>Horizontal</td></td<>	requencey Rar	nge 3GHz~18GHz		Polarization :	Horizontal
100	100 80 60 60 40 60 60 60 60 60 60 60 60 60 6	100 80 60 40 40 500 5000. 8000. 1000. 1200. 14000. 16000. 1800	100 80 60 40 40 500 5000. 8000. 1000. 1200. 14000. 16000. 1800	100 80 60 40 90 90 90 90 90 90 90 90 90 9		al (dBu)//m)			Date: 2019-08-29
80 80 60 40 20 10 10 10 10 10 10 10 10 10 1	80 60 60 40 20 0 3000 6000. 8000. 1000. 1200. 1400. 1600. 1800	80 80 60 60 40 90 90 90 90 90 90 90 90 90 9	80 80 60 60 40 90 90 90 90 90 90 90 90 90 9	80 60 60 40 60 60 60 60 60 60 60 60 60 6					
60         700 PAR 130 PEAR           60         60         60         60           40         60         60         60         60           20         100	Image: Constraint of the	Image: Constraint of the second sec	Image: Contract PEAK         Image: Contract PEAK           60	Image: Constraint of the second sec	100				
60 40 20 	60 40 20 0 3000 6000. 8000. 1000. 1200. 14000. 1600. 1800	60 40 20 0 3000 6000. 8000. 1000. 1200. 14000. 1600. 1800	60 40 20 0 3000 6000. 8000. 1000. 1200. 14000. 1600. 1800	60 40 20 0 3000 6000. 800. 1000. 1200. 1400. 1600. 180	80			FCCI	
40	40 20 0 3000 6000. 8000. 1000. 12000. 14000. 16000. 1800	40 20 0 3000 6000. 8000. 1000. 1200. 14000. 1600. 1800	40 20 0 3000 6000. 8000. 1000. 1200. 14000. 1600. 1800	40 20 0 3000 6000. 800. 1000. 1200. 1400. 1600. 180					
	40 20 0 3000 6000. 8000. 1000. 12000. 14000. 16000. 1800	40 20 0 3000 6000. 8000. 1000. 1200. 14000. 16000. 1800	40 20 0 3000 6000. 8000. 1000. 1200. 14000. 16000. 1800	40 20 0 3000 6000. 8000. 10000. 12000. 14000. 16000. 1800	60		the mark for many	what we are a production of the	And a state of the
	0 3000 6000. 8000. 10000. 12000. 14000. 16000. 1800	0 <mark></mark>	0 <mark></mark>	0 3000 6000. 8000. 10000. 12000. 14000. 16000. 1800	40 martine	manused have an and the second	lengender verste som		
	0 3000 6000. 8000. 10000. 12000. 14000. 16000. 1800	0 3000 6000. 8000. 10000. 12000. 14000. 16000. 1800	0 3000 6000. 8000. 10000. 12000. 14000. 16000. 1800	0 3000 6000. 8000. 10000. 12000. 14000. 16000. 180					
0 3000 6000. 8000. 10000. 12000. 14000. 16000. 1800					20				
0 3000 6000. 8000. 10000. 12000. 14000. 16000. 1800									
	Frequency (MHZ)	Frequency (MHZ)	Frequency (MHZ)	Frequency (MHZ)	<sup>0</sup> 3000	6000. 8000.			16000. 1800

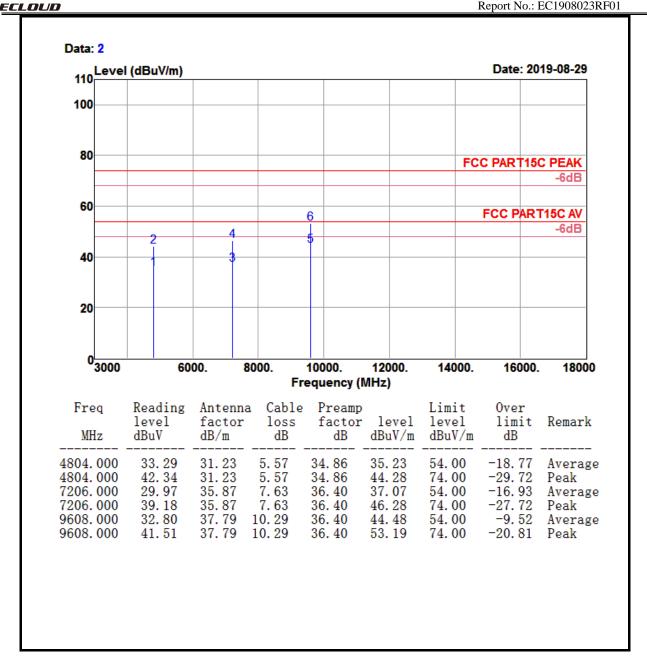




	Bluetoo	oth (1Mbps)	) CH00 (2	2402MHz)	Temper	ature :	21~23	<b>3</b> ℃
est Engineer :	Jack Li	u			Relative	e Humidity	1: 63~6	5%
equencey Ra	n <b>ge</b> 1GHz~	3GHz			Polariza	ation :	Vertic	al
Data: 6 110 Leve	l (dBuV/m)						Date: 20	)19-08-30
100								
80						1 FC	C PART15	C PEAK
60							FCC PAR	-6dB
40								-6dB
20	uhanierenan pinetan handerin	no-laconomically le	normandellare	non an	H humana	nnen Wlash mark	war-soon with a harder	
20								
_		1500.	1700. 1	1900. 21	00. 230	0. 2500.	2700.	3000
0 <mark>1000</mark>	1300.	1000.	Fr	equency (N	/Hz)			
0 <mark></mark> Freq MHz	<b>1300.</b> Reading level dBuV	Antenna factor dB/m			level	Limit level dBuV/m	Over limit dB	Remark



Test Engineer :       Jack Liu       Relative Humidity :       63–65%         Frequencey Range       3GHz~18GHz       Polarization :       Vertical         Data: 1	st Mode :	Bluetooth (1Mbps) CH00 (24	402MHz)	Temperature :		<b>21~23</b> ℃	
Data: 1 110 Level (dBuV/m) Date: 2019-08-2 100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	st Engineer :	Jack Liu		Relative Humidity :		63~65%	
Level (dBuV/m)       Date: 2019-08-2         100	equencey Rang	e 3GHz~18GHz		Polarizat	ion :	Vertical	
100		(dBuV/m)			Da	ate: 2019-08-29	
60         FCC PAR TISC PEAR           40							
60     Image: Solution of the soluti	80				FCC PA		
	60		and have a series	where we also also also also also also also also	unon the part of a	And and a start of the start of	
20	40 marsha	distriction and as the second of the second and the second and the second as a second as a second as a second a					
	20						
0 3000 6000. 8000. 10000. 12000. 14000. 16000. 180 Frequency (MHz)	0 <mark></mark>				14000.	16000. 1800	

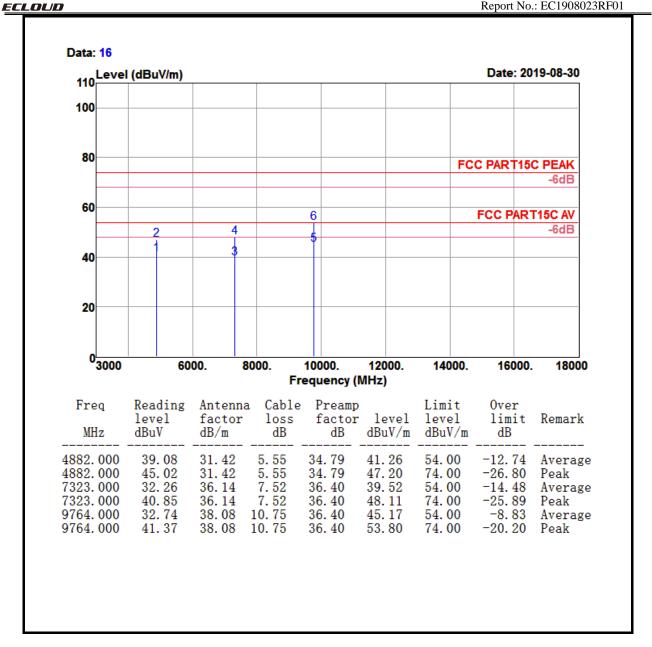




st Mode :	:	Bluetoo	oth (1Mbps	) CH39 (2	2441MHz)	Tempe	rature :	21~2	2 <b>3</b> ℃
st Engine	er:	Jack Li	u			Relativ	e Humidity	1: 63~6	5%
equencey	/ Range	1GHz~	3GHz			Polariz	ation :	Horiz	zontal
Data:		Bulling						Date: 20	019-08-30
110	Level (d	BUV/M)						Date. 20	719-00-30
100									
							1		
80							FCC	PART15	
									-6dB
60								FCC PAR	T15C AV -6dB
40				1		1			
40	nal multiple	himmonia	etern we part when	www.when.	Manuslille	Verbrane	www.www.	un minim	Wales in the second second
20									
20									
0	1000	1300.	1500.	1700. 1	900. 21	00. 230	0. 2500.	2700.	3000
				Fre	equency (N	/Hz)			
Fre MH	1	eading evel BuV	Antenna factor dB/m	Cable loss dB		level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
2441.	000	91.83	27.25	3. 56	35.62	87.02	74.00	13.02	Peak



	Bluetooth (1Mbps)	CH39 (2441MHz)	Temperature :	<b>21~23</b> ℃							
Engineer :	Jack Liu		Relative Humidity :	63~65%							
juencey Rang	ge 3GHz~18GHz Polarization : Horizont										
Data: 15											
	(dBuV/m) Date: 2019-										
100											
80											
			FCCP	ART15C PEAK -6dB							
~			manning	Anentherenter							
60		the second s	My mary and the street	and a second							
	and manual more and and and	allow a super for all the									
40 mar 100	doment										
20											
0 <mark>3000</mark>	6000. 800	00. 10000.	12000. 14000.	16000. 1800							
3000	6000. 800	Frequency (M		16000. 1800							
		i requeitoj (in									

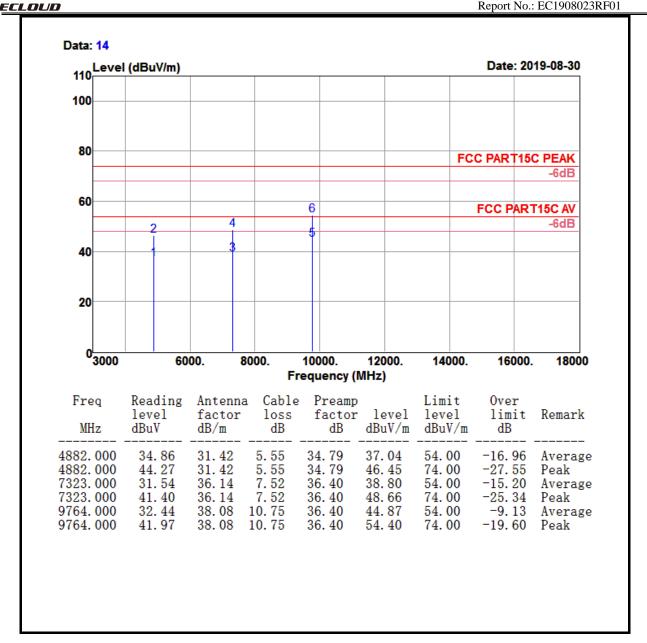




lack Liu IGHz~3GHz				e Humidity	: 63~65	5%	
IGHz~3GHz							
			Polarization : Vertical				
uV/m)					Date: 20	19-09-21	
				1 FCC	C PART15		
						-6dB	
						T15C AV	
			h			-6dB	
ant the construction of th	Varde horosoldabor	unguinettissingettisten al	d universition	and the second	mandal Madam A	wa	
1300. 1500.				0. 2500.	2700.	3000	
	a Cable	Preamp	level		Over limit dB	Remark	
). 90 27. 25	3. 56	35.62	86.09	74.00	12.09	Peak	
-	1300. 1500. ding Antenn el factor V dB/m	1300. 1500. 1700. 1 From ding Antenna Cable rel factor loss V dB/m dB	1300. 1500. 1700. 1900. 210 Frequency (N ding Antenna Cable Preamp rel factor loss factor V dB/m dB dB	1300. 1500. 1700. 1900. 2100. 230 Frequency (MHz) ding Antenna Cable Preamp rel factor loss factor level V dB/m dB dB dBuV/m	1	Image: Sector	



Engineer :         Jack Liu         Relative Humidity :         63-65%           uencey Range         3GHz~18GHz         Polarization :         Vertical           Data: 13         100         Date: 2019-08-30         Date: 2019-08-30           100         0         FCC PART15C PEAK         -6dB           60         -         -         -           0         -         -         -         -           0         -         -         -         -         -           0         -         -         -         -         -         -           0         - </th
Data: 13 110 Level (dBuV/m) Date: 2019-08-30 100 80 80 60 40 40 40 40 40 40 40 40 40 4
Level (dBuV/m)       Date: 2019-08-30         100
100
40
20
0 3000 6000 8000 10000 12000 14000 16000 1800
<sup>0</sup> 3000 6000 8000 10000 12000 14000 16000 180
Frequency (MHz)

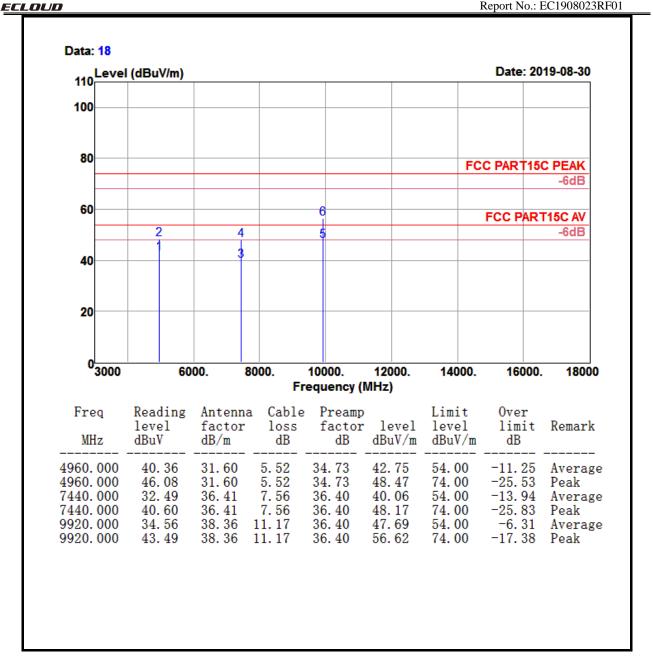




est Mode	:	Bluetoo	th (1Mbps)	CH78 (2	480MHz)	Tempera	ature :	21~23	°C
est Engine	eer : Jack Liu Relative Humidity		Jack Liu				Humidity :	63~65%	
requencey	y Rang	<b>je</b> 1GHz~:	1GHz~3GHz				tion :	Horizontal	
Data									
110	Level	(dBuV/m)						Date: 20	19-08-30
100									
80							FCC	PART15	
									-6dB
60							F		T15C AV
						ń			-6dB
40 20	want transfille	phinamapharta	urrilutedistrythiser	nuterrealboom	A <sup>rd Ha</sup> tternundha	n marine and	and the second	ernputter out	
Q	1000	1300.	1500.		1900. 21 equency (l	00. 230	0. 2500.	2700.	3000
Fre	eq Hz	Reading level dBuV		Cable loss	Preamp factor	level	Limit level dBuV/m	Over limit dB	Remark
2480.	000	91.97	27.35	3.59	35.67	87.24	74.00	13.24	Peak



Mode :	Bluetooth (1Mbps) CH78 (2480M	Hz) Temperature :	21~23℃ 63~65% Horizontal	
Engineer :	Jack Liu	Relative Humidity :		
luencey Rang	ge 3GHz~18GHz	Polarization :		
Data: 17 110	(dBuV/m)	D	ate: 2019-08-30	
110				
80		FCC P	ART15C PEAK	
60	under Am	and the descent on the many	May meet and and	
40	hadrendown when a some and			
20				
03000	6000. 8000. 10000. Frequenc		16000. 1800	

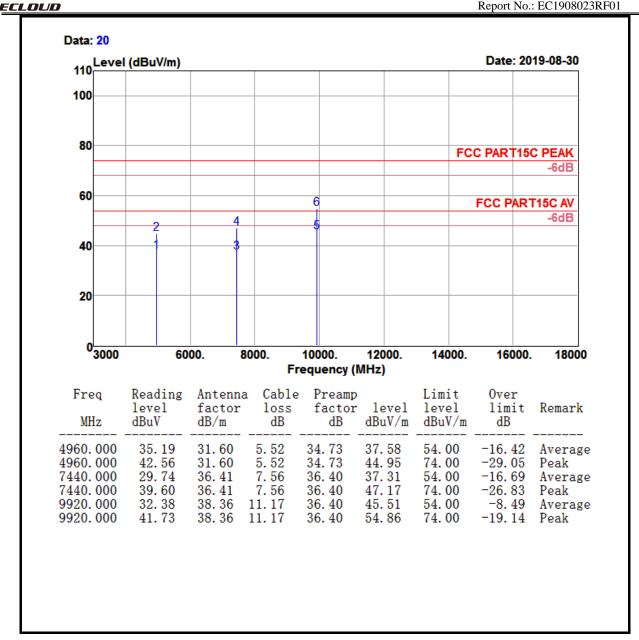




t Mode	•	Bluetoo	oth (1Mbp	s) CH78 (	2480MHz)	Tempe	Temperature :		<b>3℃</b>
t Engin	eer :	Jack Li	u			Relativ	e Humidity	: 63~6	5%
quence	y Ran	<b>ge</b> 1GHz~	3GHz			Polariz	ation :	Verti	cal
Data:	21								
	Level	(dBuV/m)						Date: 20	19-08-30
100									
80							1 FCC	PART15	C PEAK
									-6dB
60									T15C AV
									-6dB
40			w			1			mound
	that while	nursernalistransferde	Munnante	moundanter	walkana katina mata	W Warnin Weeking.	man man Museum	and managements	
20									
0	1000	1300.	1500.			00. 230	0. 2500.	2700.	3000
					equency (I				
Fre	Q	Reading level	Antenna factor	a Cable loss		level	Limit	Over limit	Remark
MH	Iz	dBuV	dB/m	dB	dB	dBuV/m		dB	Remark
2480.	000	80. 51	27.35	3. 59	35.67	75. 78	74.00	1.78	Peak



Test Engineer :		lbps) CH78 (2480MH	z) Temperatu	Temperature :			
	Jack Liu	ck Liu Relative Humidity : 63~65%					
Frequencey Rang	<b>je</b> 3GHz~18GHz	7	Polarizatio	n :	Vertical		
Data: 19	(dPu)//m)			r	Date: 2019	0.08-30	
110 Level	(dbuv/m)			<b>`</b>	Jale. 2018	-00-00	
100							
80				FCC F	PART15C	PEAK	
						-6dB	
60			with have a real stand and the	and the second fille	March March		
40 Jun	Aur many mandane						
20							
0 <mark></mark>	6000.	8000. 10000. Frequenc	12000.	14000.	16000.	18000	





## 4.8.6 Test Result of Radiated Spurious Emission (30MHz ~ 1GHz)

est Mode :	Bluetooth (1Mbps) CH00 (2402MHz)				Temper	ature :	21~23	<b>21~23</b> ℃	
est Engineer :	Jack Liu	I			Relative	e Humidity	: 63~65	5%	
requencey Rang	ge 30MHz-	-1GHz			Polariza	ation :	Horizo	ontal	
Data: 28									
110 Level	(dBuV/m)						Date: 20	19-09-19	
100									
80									
60						FCC	PART15	C PEAK	
40	۲ ۲			6					
20 MMM	n hall little				under some		dadaanka dhadhadhi	nhhh,/ut.i	
	₩₩ 10. 200.	300.	400. Fre	500. equency (N	600. ЛНz)		DO. 900	₩ <u>₩₩</u> ₩ 0. 1000	
Manual	00. 200. Reading level dBuV	300. Antenna factor dB/m						0. 1000 Remark	



est Mode :	Bluetoot	h (1Mbps)	CH00 (2	402MHz)	Temper	ature :	21~23	3℃	
Test Engineer :	Jack Liu				Relative	e Humidity	1: 63~65	5%	
Frequencey Rang	<b>ge</b> 30MHz~	1GHz			Polariza	ation :	Vertic	Vertical	
Data: 27							<b>D</b> ( )		
110	(dBuV/m)						Date: 20	19-09-19	
100									
80									
60						FC	C PART15	C PEAK -6dB	
40	2	. 4	5 6	;					
20	ada Mudal	1. Martin	MM	Aler Maaria	dayal kwaserin in		in transformer	aduren den Meridigens	
Madan	1. 200.	300.	400. Fr	500. equency (N	600.		00. 90	<u>ura, da Marija.</u> 0. 100	
Madan	00. 200. Reading level dBuV	300. Antenna factor dB/m		500. equency (N	600.		00. 90 Over limit dB	0. 100 Remark	



# 4.9 AC Conducted Emission Measurement

#### 4.9.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

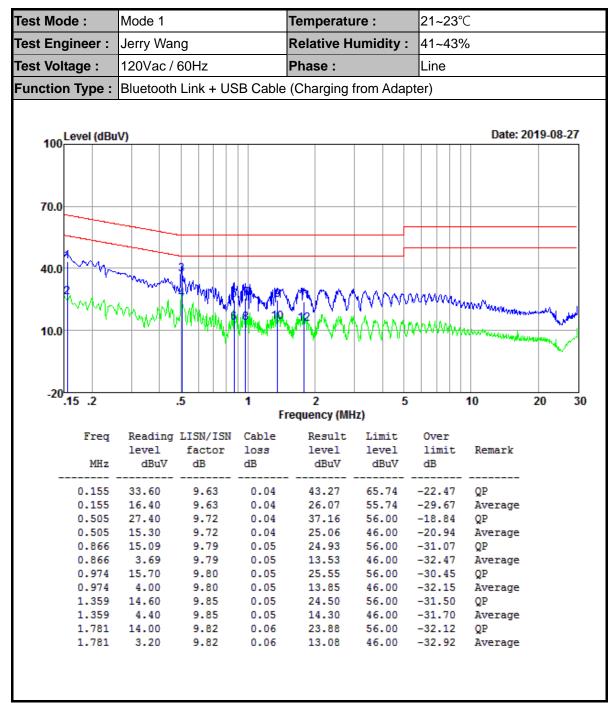
Frequency of omission (MHz)	Conducted limit (dBµV)					
Frequency of emission (MHz)	Quasi-peak	Average				
0.15-0.5	66 to 56*	56 to 46*				
0.5-5	56	46				
5-30	60	50				

\*Decreases with the logarithm of the frequency.

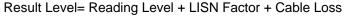
#### 4.9.2 Test Procedures

- 1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
- 2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
- 3. All the support units are connecting to the other LISN.
- 4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
- 5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
- 6.Both sides of AC line were checked for maximum conducted interference.
- 7. The frequency range from 150 kHz to 30 MHz was searched.
- 8.Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

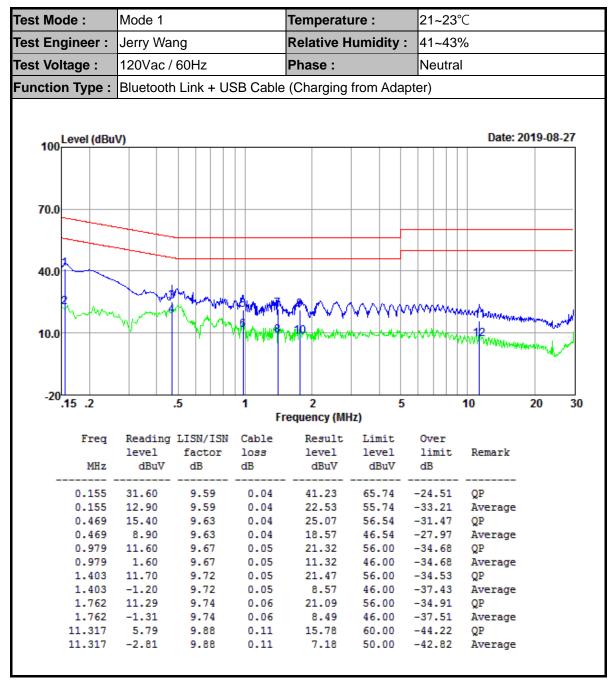




#### 4.9.3 Test Result of AC Conducted Emission







Result Level= Reading Level + LISN Factor + Cable Loss



## 4.10 Antenna Requirements

#### 4.10.1 Standard Applicable

According to antenna requirement of §15.203.

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be re-placed by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded..

And according to §15.247(4)(1), system operating in the 2400-2483.5MHz bands that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

#### 4.10.2 Antenna Connected Construction

An embedded-in antenna design is used.

#### 4.10.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



# 5 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Due Date	Remark
Spectrum Analyzer	Keysight	N9010A	MY56070788	2019/1/23	2020/1/22	Conducted
Power Sensor	Keysight	U2021XA	MY56510025	2019/1/23	2020/1/22	Conducted
Power Sensor	Keysight	U2021XA	MY57030005	2019/1/23	2020/1/22	Conducted
Power Sensor	Keysight	U2021XA	MY56510018	2019/1/23	2020/1/22	Conducted
Power Sensor	Keysight	U2021XA	MY56480002	2019/1/23	2020/1/22	Conducted
Thermal Chamber	Sanmtest	SMC-408-CD	2435	2019/05/09	2020/5/08	Conducted
Base Station	R&S	CMW 270	101231	2019/1/23	2020/1/22	Conducted
Signal Generator (Blocker)	Keysight	N5171B	MY56200661	2019/1/23	2020/1/22	Conducted

Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV 40	101433	2019/2/18	2020/2/17	Radiation
Amplifier	Sonoma	310	363917	2019/1/22	2020/1/21	Radiation
Amplifier	Schwarzbeck	BBV 9718	327	2019/1/22	2020/1/21	Radiation
Amplifier	Narda	TTA1840-35-HG	2034380	2019/05/15	2020/5/14	Radiation
Broadband Antenna	Schwarzbeck	VULB 9168	9168-757	2017-03-03	2020/3/02	Radiation
Horn Antenna	Schwarzbeck	BBHA 9120 D	1677	2017-03-03	2020/3/02	Radiation
Horn Antenna	COM-POWER	AH-1840	101117	2018-06-20	2021/6/19	Radiation
Test Software	Auidx	E3	6.111221a	N/A	N/A	Radiation
Filter	Micro-Tronics	BRM 50702	G266	N/A	N/A	Radiation

Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Due Date	Remark
LISN	R&S	ENV216	102125	2019-01-22	2020-01-21	Conducted
LISN	R&S	ENV432	101327	2019-01-22	2020-01-21	Conducted

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EMI Test Receiver	R&S	ESR3	102143	2019-01-23	2020-01-22	Conducted
EMI Test Software	Audix	E3	N/A	N/A	N/A	Conducted

N/A: No Calibration Required



## 6 Uncertainty of Evaluation

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	9kHz~30MHz	2.60dB
Radiated emission	30MHz ~ 1GMHz	5.05dB
	1GHz ~ 18GHz	5.06 dB
	18GHz ~ 40GHz	3.65dB

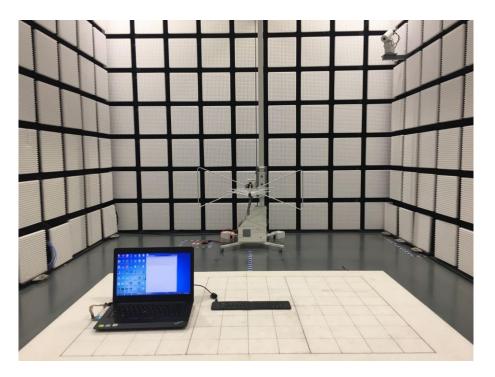
This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.



## **APPENDIX A. SETUP PHOTOGRAPHS**



Fig. 1 Radiated emission setup photo(Below 30MHz)



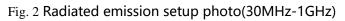






Fig. 3 Radiated emission setup photo(Above 1GHz)



Fig. 4 Power line conducted emission setup photo



## APPENDIX B. EUT EXTERNAL PHOTOGRAPHS

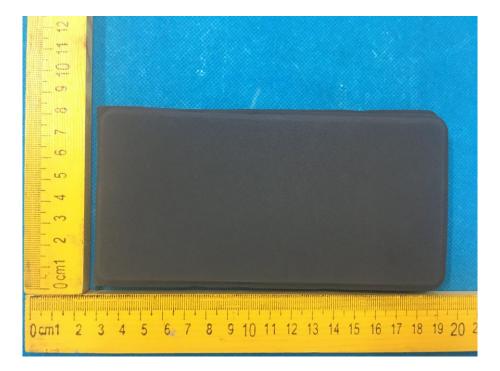


Fig. 1



Fig. 2

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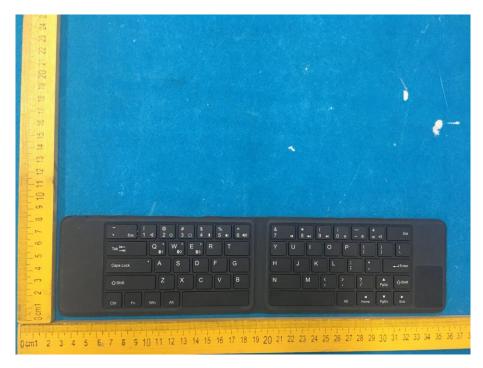


Fig. 3

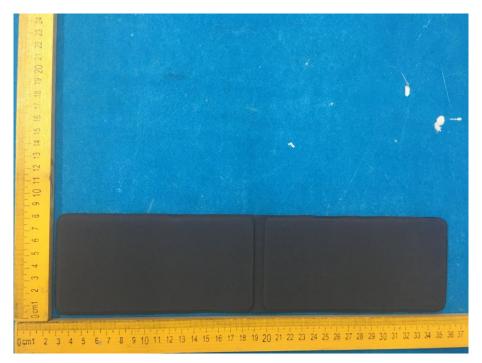


Fig. 4





Fig. 5



Fig. 6





Fig. 7



Fig. 8



## **APPENDIX C. EUT INTERNAL PHOTOGRAPHS**

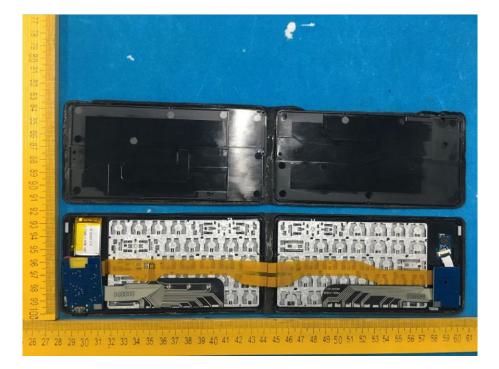


Fig. 1

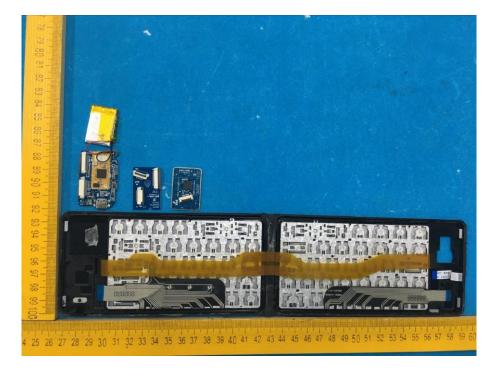


Fig. 2

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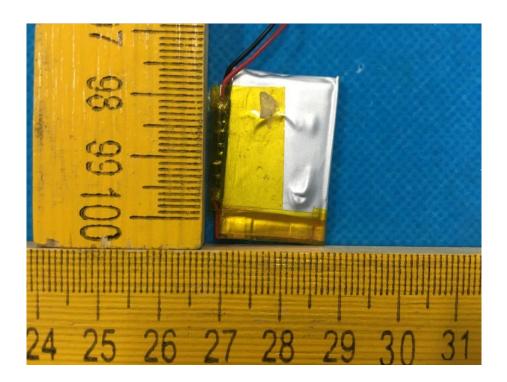


Fig. 3

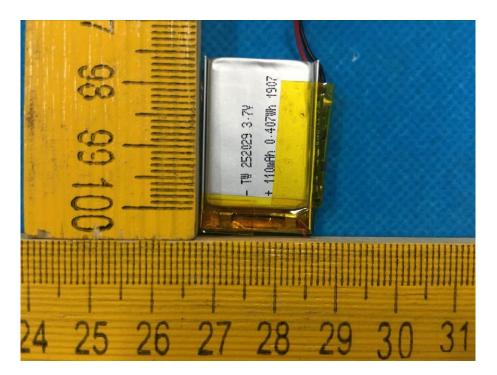


Fig. 4



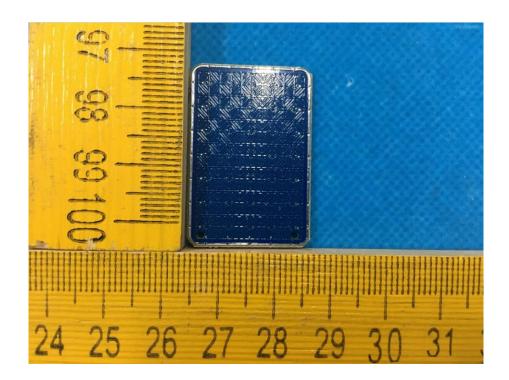


Fig. 5

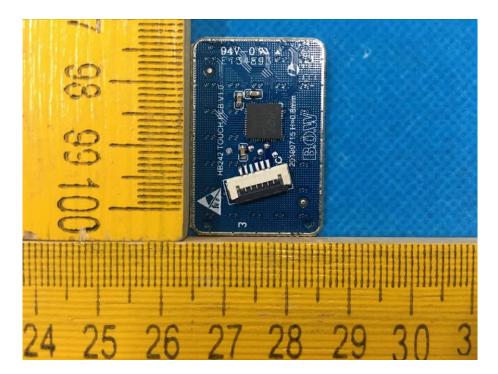


Fig. 6



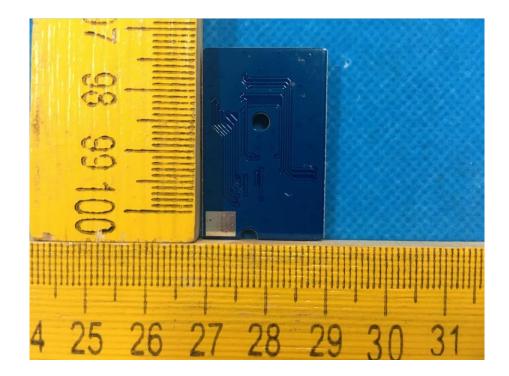


Fig. 7

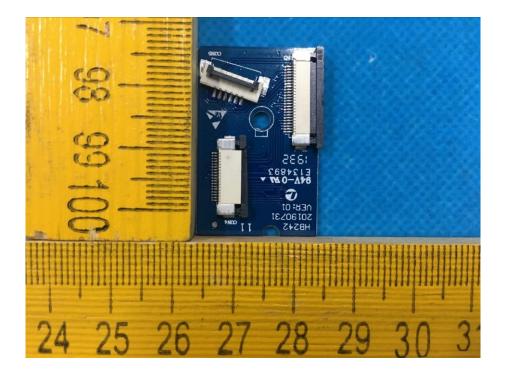


Fig. 8



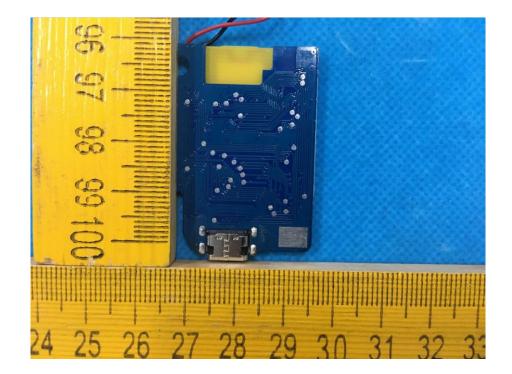


Fig. 9

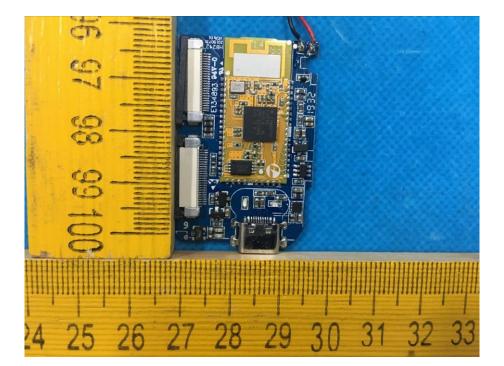


Fig. 10



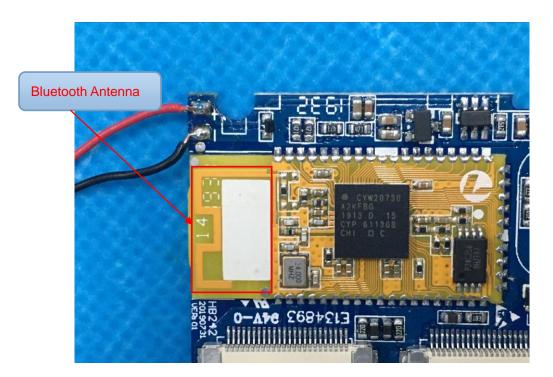


Fig. 11

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