

# **FCC Test Report**

## Report No: FCS202205041W01

## Issued for

Applicant:	ANKANG COMATE TECH CO.,LTD		
Address:	North end of Gaoxin No.7 Road,The High-Tech Industrial Zone, AnkangShaanxi,China		
Product Name:	3-PIECE CD SHELF SYSTEM with Digital PLL FM Stereo Radio and Bluetooth Wireless Technology		
Brand Name:	MAGNAVOX		
Model Name:	MM444BT		
Series Model:	N/A		
FCC ID:	2ASKIMM444BTX		
Issued By: Flux Compliance Service Laboratory Add: Room 105 Floor Bao hao Technology Building 1 NO.15 Gong ye West Road Hi-Tech Industrial, Song shan lake Dongguan Tel: 769-27280901 Fax:769-27280901 http://www.FCS-lab.com			

## **TEST RESULT CERTIFICATION**

Applicant's Name:	ANKANG COMATE TECH CO.,LTD
Address:	North end of Gaoxin No.7 Road,The High-Tech Industrial Zone, AnkangShaanxi,China
Manufacture's Name:	ANKANG COMATE TECH CO.,LTD
Address:	North end of Gaoxin No.7 Road,The High-Tech Industrial Zone, AnkangShaanxi,China
Product Description	
Product Name:	3-PIECE CD SHELF SYSTEM with Digital PLL FM Stereo Radio and Bluetooth Wireless Technology
Brand Name	MAGNAVOX
Model Name:	MM444BT
Series Model	N/A
Test Standards	FCC Rules and Regulations Part 15 Subpart C, Section 247
Test Procedure:	ANSI C63.10:2013

This device described above has been tested by Flux Compliance Service Laboratory, the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

This report shall not be reproduced except in full, without the written approval of Flux Compliance Service Laboratory, this document may be altered or revised by Flux Compliance Service Laboratory, personal only, and shall be noted in the revision of the document.

Date of Test.....

Date (s) of performance of tests.: May. 11 2022~May. 21 2022

Date of Issue..... May. 21 2022

Test Result	:	Pass
-------------	---	------

Tested by	:	Scott shen
		(Scott Shen)
Reviewed by	:	DukeQuer
		(Duke Qian)
Approved by	:	Inferon?
		(1 1 ) (1 )

(Jack Wang)



**Table of Contents** 

Page

1. SUMMARY OF TEST RESULTS6
1.1 TEST FACTORY7
1.2 MEASUREMENT UNCERTAINTY7
2. GENERAL INFORMATION8
2.1 GENERAL DESCRIPTION OF THE EUT8
2.2 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED 10
2.3 DESCRIPTION OF NECESSARY ACCESSORIES AND SUPPORT UNITS11
2.4 EQUIPMENTS LIST
3. 20DB BANDWIDTH
3.1 Limit
3.2 Test Procedure
3.3 Test setup
3.4 Test results
3.5 Original Test Data14
4 CONDUCTED OUTPUT POWER16
4.1 LIMIT
4.2 TEST PROCEDURE
4.3 TEST SETUP
4.4 TEST RESULTS
5 NUMBER OF HOPPING CHANNEL
5.1 LIMIT
5.2 TEST PROCEDURE
5.3 TEST SETUP
5.4 EUT OPERATION CONDITIONS
5.5 TEST RESULTS
6 BAND EDGE AND SPURIOUS(CONDUCTED) 21
6.1 LIMIT
6.2 TEST PROCEDURE
6.3 TEST SETUP
6.4 TEST RESULTS
6.5 Original test data22



## **Table of Contents**

Page

7 F	RADIATED EMISSION MEASUREMENT	. 29
	7.1 RADIATED EMISSION LIMITS	.29
	7.2 TEST PROCEDURE	. 30
	7.3 TESTSETUP	. 31
	7.4. TEST RESULTS	.33
8 A	VERAGE TIME OF OCCUPANCY	40
	8.1 LIMIT	40
	8.2 TEST PROCEDURE	. 40
	8.3 TEST SETUP	40
	8.4 TEST RESULTS	.41
	8.5 ORIGINAL TEST DATA	.41
9 H	OPPING CHANNEL SEPARATION MEASUREMEN	43
	9.1 LIMIT	43
	9.2 TEST PROCEDURE	
	9.3 TEST SETUP	43
	9.4 EUT OPERATION CONDITIONS	. 43
	9.5 TEST RESULTS	.44
10	CONDUCTED EMISSION TEST	46
	10.1 POWER LINE CONDUCTED EMISSION LIMITS	46
	10.2 TEST PROCEDURE	.47
	10.3 TEST SETUP	. 47
	10.4 TEST RESULT	. 48
11	ANTENNA REQUIREMENT	.50
	11.1 STANDARD REQUIREMENT	.50
	11.2 RESULT	50



## **Revision History**

Rev.	Issue Date	Effect Page	Contents
00	May. 21 2022	N/A	N/A

Flux Compliance Service Laboratory Room 105 Floor Bao hao Technology Building 1 NO.15 Gong ye West Road Hi-Tech Industrial, Song shan lake Dongguan Tel: 769-27280901 Fax:769-27280901 http://www.FCS-lab.com

## 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards: KDB 558074 D01 15.247 Meas Guidance v05r02

	FCC Part 15.247,Subpart C		
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	
15.247(a)(1)	Hopping Channel Separation	PASS	
15.247 (b)(2)	Output Power	PASS	
15.209	Radiated Spurious Emission	PASS	
15.247(d)	Conducted Spurious & Band Edge Emission	PASS	
15.247(a)(1 )(i)	Number of Hopping Frequency	PASS	
15.247(a)(1)(i)	Dwell Time	PASS	
15.247(a)(1)	20dB Bandwidth 99% Bandwidth	PASS	
15.205	Restricted bands of operation	PASS	
Part 15.247(d)/part 15.209(a)	Band Edge Emission	PASS	
15.203	Antenna Requirement	PASS	

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

(2) All tests are according to ANSI C63.10-2013

## **1.1 TEST FACTORY**

Company Name:	Flux Compliance Service Laboratory	
Address:	Room 105 Floor Bao hao Technology Building 1 NO.15 Gong ye West Road Hi-Tech Industrial, Song shan lake Dongguan	
Telephone:	+86-769-27280901	
Fax:	+86-769-27280901	
FCC Test Firm Registration Number: 514908 Designation number: CN0127 A2LA accreditation number: 5545.01		

## 1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement  $\mathbf{y} \pm \mathbf{U}$ , where expended uncertainty  $\mathbf{U}$  is based on a standard uncertainty multiplied by a coverage factor of **k=2**, providing a level of confidence of approximately **95** %.

No.	Item	Uncertainty
1	RF output power, conducted	±0.71dB
2	Unwanted Emissions, conducted	±2.988 dB
3	Conducted Emission (9KHz-150KHz)	±4.13 dB
4	Conducted Emission (150KHz-30MHz)	±4.74 dB
5	All emissions,radiated(<1G) 9KHz-30MHz	±5.1 dB
6	All emissions,radiated(<1G) 30MHz-1000MHz	±5.2 dB
7	All emissions, radiated 1GHz -18GHz	±4.66 dB
8	All emissions,radiated 18GHz -40GHz	±4.31 dB



## 2. GENERAL INFORMATION

## 2.1 GENERAL DESCRIPTION OF THE EUT

Product Name	3-PIECE CD SHELF SYSTEM with Digital PLL FM Stereo Radio and Bluetooth Wireless Technology
Trade Name	MAGNAVOX
Model Name	MM444BT
Series Model	N/A
Model Difference	N/A
Channel List	Please refer to the Note 2.
Operation frequency	2402MHz-2480MHz
Modulation:	GFSK
Transmitter rate:	1MHz
Power supply	AC 100-240V~50/60Hz 0.4A
Battery	2 x 1.5AA
Hardware version number	V1.0
Software version number	V1.0
Connecting I/O Port(s)	Please refer to the User's Manual

#### Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.



## 2.

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402MHz	21	2422MHz	41	2442MHz	61	2462MHz
2	2403MHz	22	2423MHz	42	2443MHz	62	2463MHz
		:		*****			į
19	2420MHz	39	2440MHz	59	2460MHz	79	2480MHz
20	2421MHz	40	2441MHz	60	2461MHz		

## 3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	NA	BGHM	PCB Antenna	N/A	1.0	Antenna



## 2.2 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

#### Block diagram of EUT configuration for test



### Test software: the FCC tool

The test softeware was used to control EUT work in continuous TX mode, and select test channel, Wireless mode as below table

No.	Test model descrption
1	Low channel GFSK
2	Middle channel GFSK
3	High channel GFSK
4	Hopping GFSK

Note:

- 1. All the test modes can be supply by battery, only the result of the worst case recorded in the report. GFSK mode is worst mode.
- 2. For radiated emission, 3 axis were chosen for testing for each applicable mode.
- 3. The EUT used fully charge battery when tested.
- 4. During the test, the dutycycle>98%, the test voltage was tuned from 85% to 115% of the

Nominal rate supply votage, and found that the worst case was the nominal rated supply condition, So the report just shows that condition's data



## 2.3 DESCRIPTION OF NECESSARY ACCESSORIES AND SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

#### Necessary accessories

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
1	DC power	N/A	FRG695	N/A	This DC power is for testing only in report.
2	Phone	N/A	H5634	N/A	This phone is for testing only in report.

Support units

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
C-1	unshielded	NO	100cm	N/A	C-1

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in <sup>r</sup>Length <sup>a</sup> column.
- (3) "YES" is means "shielded" "with core"; "NO" is means "unshielded" "without core".



## 2.4 EQUIPMENTS LIST

## Radiation Test equipment

Kind of Equipment	Manufacturer	Type No.	Company No.	Last calibration	Calibrated until	
EMI Test Receiver	R&S	ESRP 3	FCS-E001	2022.02.10	2023.02.09	
Signal Analyzer	R&S	FSV40-N	FCS-E012	2022.02.10	2023.02.09	
Active loop Antenna	ZHINAN	ZN30900C	FCS-E013	2022.02.10	2023.02.09	
Bilog Antenna	SCHWARZBECK	VULB 9168	FCS-E002	2022.02.10	2023.02.09	
Horn Antenna	SCHWARZBECK	BBHA 9120D	FCS-E003	2022.02.10	2023.02.09	
SHF-EHF Horn Antenna (18G-40GHz)	A-INFO	LB-180400-KF	FCS-E018	2022.02.10	2023.02.09	
Pre-Amplifier(0.1M-3G Hz)	EMCI	EM330N	FCS-E004	2022.02.10	2023.02.09	
Pre-Amplifier (1G-18GHz)	N/A	TSAMP-0518SE	FCS-E014	2022.02.10	2023.02.09	
Pre-Amplifier (18G-40GHz)	TERA-MW	TRLA-0400	FCS-E019	2022.02.10	2023.02.09	
Temperature & Humidity	HTC-1	victor	FCS-E005	2022.02.10	2023.02.09	
DC power	N/A	FRG695	FCS-E047	2022.02.10	2023.02.09	
Testing Software		EZ-EMC(Ver.STSLAB 03A1 RE)				

## **Conduction Test equipment**

Kind of Equipment	Manufacturer	Type No.	Company No.	Last calibration	Calibrated until
EMI Test Receiver	R&S	ESPI	FCS-E020	2022.02.10	2023.02.09
LISN	R&S	ENV216	FCS-E007	2022.02.10	2023.02.09
LISN	ETS	3810/2NM	FCS-E009	2022.02.10	2023.02.09
Temperature & Humidity	HTC-1	victor	FCS-E008	2022.02.10	2023.02.09
Testing Software	tware EZ-EMC(Ver.EMC-CON 3A1.1)				

## **RF** Connected Test

Kind of Equipment	Manufacturer	Type No.	Company No.	Last calibration	Calibrated until
MXA SIGNAL Analyzer	Keysight	N9020A	FCS-E015	2022.02.10	2023.02.09
Spectrum Analyzer	Agilent	E4447A	MY50180039	2022.02.10	2023.02.09
Spectrum Analyzer	R&S	FSV-40	101499	2022.02.10	2023.02.09
Power Sensor	Agilent	UX2021XA	FCS-E021	2022.02.10	2023.02.09
Testing Software	sting Software EZ-EMC(Ver.STSLAB 03A1 RE)				



## 3. 20DB BANDWIDTH

## 3.1 Limit

	FCC Part15	(15.247), Subpart (	C
Section	Test Item	Limit	Frequency Range (MHz)
15.247a(1)	20dB bandwidth	500KHz	2400-2483.5

#### 3.2 Test Procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Set the spectrum analyzer as follows

RBW:	30kHz
VBW:	100kHz
Detector Mode:	AVG
Sweep time:	auto
Trace mode	Max hold

(3) Allow the trace to stabilize, measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

#### 3.3 Test setup



#### 3.4 Test results

TestMode	Channel (MHz)	20dB Bandwidth (MHz)	Result
Lowest	2402MHz	0.9412	Pass
Middle	2441MHz	0.9421	Pass
Highest	2480MHz	0.9359	Pass



#### 3.5 Original Test Data



#### Middle





Rt   Ref   State   State   Ref Offset 9.17 dB   Radio Device: BTS     Ref Offset 9.17 dB   Mkr1 2.480156 GHz   -3.8257 dBn   -3.8257 dBn     0 dB/div   Ref 20.00 dBm   -3.8257 dBn   -3.8257 dBn     0 dB/div   Ref 20.00 dBm   -3.8257 dBn   -3.8257 dBn     0 dB/div   Ref 20.00 dBm   -3.8257 dBn   -3.8257 dBn     0 dB/div   Ref 20.00 dBm   -3.8257 dBn   -3.8257 dBn     0 dB/div   Ref 20.00 dBm   -3.8257 dBn   -3.8257 dBn     0 dB/div   Ref 20.00 dBm   -3.8257 dBn   -3.8257 dBn     0 dB/div   Ref 20.00 dBm   -4.00 dBn   -3.8257 dBn     0 dB/div   Ref 20.00 dBm   -4.00 dBn   -3.8257 dBn     0 dB/div   Ref 20.00 dBm   -4.00 dBn   -3.8257 dBn     0 dB/div   Ref 20.00 dBm   -4.00 dBn   -3.8257 dBn     0 dB/div   Ref 20.00 dBm   -4.00 dBn   -4.00 dBn     0 dB/div   Ref 20.00 dBn   -5.52 dBm   -4.00 dBn     0 dB/div   Transmit Freq Error   2.241 kHz   OBW Power   99.00 %     x dB Bandwidth   935.9 kHz   x dB <th></th> <th></th> <th>riigii</th> <th></th> <th></th>			riigii		
Center Freq 2.480000000 GHz Tig: Frea Run Avg Hold: 300/300 Radio Device: BTS Ref Offset 9.17 dB Ref 20.00 dBm Center Freq: 2.4800156 GHz -3.8257 dBm Center Freq: 2.48000000 GHz -3.8257 dBm Center Freq 2.480000000 GH Center Freq 2.48000000 GH Center Freq 3.00.000 H Center	gilent Spectrum Analyzer - Occupied BW				
0 dB/div   Ref 20.00 dBm   -3.8257 dBm     -00   -00   -00   -00   -00     <	Center Freq 2.480000000	Trig: F	r Freq: 2.480000000 GHz ree Run Avg Hold	Radio Std: None 1: 300/300	
Center Fre 2.48000000 GH Center Fre 2.48000000 GH CENTER CF Ste 300.000 KHz Sweep 3.2 ms CF Ste 300.000 KHz Sweep 3.2 ms Freq Offse 0 H X dB Bandwidth 935.9 KHz X dB CHZ CF Ste 300.000 KHZ Sweep 3.2 ms CF Ste 300.000 KHZ Sweep 3.2 ms Span 3 MHZ Sweep 3.2 ms Span 3 MHZ Sweep 3.2 ms Sweep 3.2 ms Sweep 3.2 ms Span 3 MHZ Sweep 3.2 ms Sweep 3.2 ms Span 3 MHZ Sweep 3.2 ms Sweep 3.	10 dB/div Ref 20.00 dBm			Mkr1 2.480156 G -3.8257 dE	Hz Sm
200 200 200 200 200 200 200 200	0.00		1		Center Freq 2.480000000 GHz
500   1	-10.0				
Zond   Span 3 MHz     Center 2.48 GHz   #VBW 100 kHz   Span 3 MHz     Atter 8 BW 30 kHz   #VBW 100 kHz   Sweep 3.2 ms     Occupied Bandwidth   Total Power   5.52 dBm     826.82 kHz   Freq Offset     Transmit Freq Error   2.241 kHz   OBW Power   99.00 %     x dB Bandwidth   935.9 kHz   x dB   -20.00 dB	-40.0			hormon	
#Res BW 30 kHz #VBW 100 kHz Sweep 3.2 ms   Occupied Bandwidth Total Power 5.52 dBm   826.82 kHz Freq Offse   Transmit Freq Error 2.241 kHz OBW Power 99.00 %   x dB Bandwidth 935.9 kHz x dB -20.00 dB	-60.0				
Occupied Bandwidth Total Power 5.52 dBm   826.82 kHz Freq Offse   Transmit Freq Error 2.241 kHz OBW Power 99.00 %   x dB Bandwidth 935.9 kHz x dB -20.00 dB	Center 2.48 GHz #Res BW 30 kHz	#	VBW 100 kHz		ms 300.000 kHz
826.82 kHz Transmit Freq Error 2.241 kHz OBW Power 99.00 % x dB Bandwidth 935.9 kHz x dB -20.00 dB	Occupied Bandwidth		Total Power	5.52 dBm	Auto
Transmit Freq Error 2.241 kHz OBW Power 99.00 %   x dB Bandwidth 935.9 kHz x dB -20.00 dB					Freq Offset
	Transmit Freq Error	2.241 kHz	<b>OBW Power</b>	99.00 %	0 Hz
SG STATUS	x dB Bandwidth	935.9 kHz	x dB	-20.00 dB	
	ISG			STATUS	

High



## **4 CONDUCTED OUTPUT POWER**

#### 4.1 LIMIT

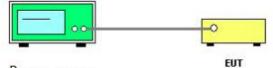
	FCC Part1	5 Subpart C	
Section	Test Item	Limit	Frequency Range (MHz)
15.247(b)(1)	Peak output power	Power<1W(30dBm)	2400-2483.5

#### **4.2 TEST PROCEDURE**

(1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.

- (2) Spectrum Setting: RBW=1MHz, VBW=3MHz, Detector=Peak (If 20dB BW ≤1 MHz) RBW=3MHz, VBW=8MHz, Detector=Peak (If 20dB BW > 1 MHz)
- (3) The EUT was set to continuously transmitting in the max power during the test.

#### 4.3 TEST SETUP



Power sensor

## 4.4 TEST RESULTS

TestMode	Channel (MHz)	Result (dBm)	Limit (dBm)	Verdict
Lowest	2402MHz	3.482	30	Pass
Middle	2441MHz	-1.178	30	Pass
Highest	2480MHz	-1.789	30	Pass

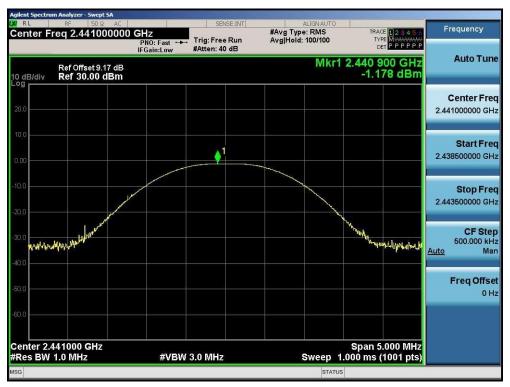
Page 17 of 50





#### Low

Middle



Page 18 of 50



RL	m Analyzer - Swept SA RF 50 Ω A	č I	SENSE:INT		ALIGNAUTO		State of the second second second
enter F	req 2.4800000			#Avg Typ Avg Hold		TRACE 123456 TYPE MWWWWW DET PPPPP	Frequency
0 dB/div	Ref Offset 9.17 d Ref 30.00 dBr	в	whiten to vib		Mkr1 2	480 135 GHz -1.789 dBm	Auto Tun
							Center Fre 2.480000000 GH
.00			<b>↓</b> <sup>1</sup>				Start Fre 2.477500000 GF
		~			- And		<b>Stop Fre</b> 2.482500000 GH
0.0 <b>JYPIOHA</b>	Autophyal for the second of the				*	wan mantana ana ana ana ana ana ana ana ana a	CF Ste 500.000 kH Auto Ma
							Freq Offs 0 H
	180000 GHz					Span 5.000 MHz	
tes BW	1.0 MHz	#VI	3W 3.0 MHz		Sweep 1.00	10 ms (1001 pts)	

## High

Flux Compliance Service Laboratory Room 105 Floor Bao hao Technology Building 1 NO.15 Gong ye West Road Hi-Tech Industrial, Song shan lake Dongguan Tel: 769-27280901 Fax:769-27280901 http://www.FCS-lab.com



## **5 NUMBER OF HOPPING CHANNEL**

5.1 LIMIT

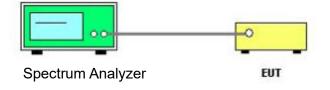
	FCC Part 15.247,Subpart C RSS-247 Issue 2						
Section Test Item Limit				FrequencyRange (MHz)	Result		
	15.247 (a)(1)(iii) RSS-247	Number of Hopping Channel	>15	2400-2483.5	PASS		

#### 5.2 TEST PROCEDURE

a The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.

b Spectrum Setting: RBW= 300KHz, VBW=300KHz, Sweep time = Auto

5.3 TEST SETUP



## 5.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



## 5.5 TEST RESULTS

Temperature:	25 °C	Relative Humidity:	60%
Test Mode:	Hopping Mode -GFSK Mode	Test Voltage:	AC 110V

RF 50 Ω AC	SENSE:PULSE	ALIGN AUTO		Peak Search
arker 2 2.480076500000	PNO: Fast IFGain:Low Atten: 30 dB	Avg Type: Log-Pwr Avg Hold:>100/100	TRACE 1 2 3 4 5 6 TYPE MWWWW DET PNNNNN	
dB/div Ref 20.00 dBm		Mkr2 2.48	0 076 5 GHz -4.484 dBm	NextPea
			2	Next Pk Rig
	And Adama and Adama and A	<u>tthlitthttattattat</u>		Next Pk Lo
0				Marker De
art 2.40000 GHz les BW 300 kHz	#VBW 300 kHz	Sto Sweep 1.133	p 2.48350 GHz 8 ms (1001 pts)	Mkr→(
R     MODE     TRC     SCL     X       I     N     1     f     2.401 7/       Z     N     1     f     2.400 0/       3     I     I     I     I	53 5 GHz 3.526 dBm 76 5 GHz -4.484 dBm	FUNCTION FUNCTION WIDTH	FUNCTION VALUE	Mkr→RefL
			E	MIRI - ACCI I
				<b>Мо</b> 1 о



## 6 BAND EDGE AND SPURIOUS(CONDUCTED)

#### 6.1 LIMIT

In any 100kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 30dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

## 6.2 TEST PROCEDURE

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Establish a reference level by using the following procedure:

Center frequency	DTS Channel center		
	frequency		
RBW:	100kHz		
VBW:	300kHz		
Span	1.5times the DTS bandwidth		
Detector Mode:	Pake		
Sweep time:	auto		
Trace mode	Max hold		

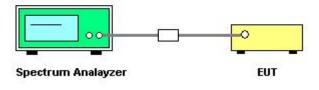
(3) Establish Allow the trace to stabilize, use the peak marker function to determine the maximum peak power level to establish the reference level.

(4) Set the spectrum analyzer as follows:

RBW:	100kHz
VBW:	300kHz
Span	Encompass frequency range to be
	measured
Number of measurement points	≥span/RBW
Detector Mode:	Pake
Sweep time:	auto
Trace mode	Max hold

(5) Allow the trace to stabilize, use the peak marker function to determine the maximum amplitude of all unwanted emissions outside of the authorized frequency band

#### 6.3 TEST SETUP





## 6.4 TEST RESULTS

Eut set mode CH or Frequency		Result
GFSK	CH1	Pass
	CH79	Pass

6.5 Original test data

CH1 2402MHZ

enter Freq 2.360000	C IOO GHz PNO: Fast ↔ IEGain:Low	Trig: Free Run #Atten: 30 dB	ALIGNAUTO #Avg Type: RMS Avg Hold: 300/300	TRACE 1 2 3 4 5 0 TYPE M WWWWW DET P P P P P P	Frequency
Ref Offset 9.16 c 0 dB/div Ref 20.00 dB	IB		Mk	r5 2.381 2 GHz -50.166 dBm	Auto Tun
og 10.0 0.00				1	Center Fre 2.360000000 GH
			5	A 3 A 2 6	Start Fre 2.310000000 G⊦
000 <b>197</b>	ค. <sup></sup> รูปเกิมไปอยู่การใหญ่ที่สามมัด	alash mangana na mangahas	and the second	() () (AA / MYC	Stop Fre 2.410000000 G⊦
tart 2.31000 GHz Res BW 100 kHz	#VB\	V 300 kHz	Sweep 9	Stop 2.41000 GHz .600 ms (1001 pts)	<b>CF Ste</b> 10.000000 MH Auto Ma
KR     MODE     TRC     SCL       1     N     1     F       2     N     1     F       3     N     1     F       4     N     1     F       5     N     1     F       6     -     -     -       7     -     -     -	× 2.402 2 GHz 2.400 0 GHz 2.390 0 GHz 2.310 0 GHz 2.381 2 GHz	Y -0.851 dBm -51.742 dBm -52.143 dBm -51.396 dBm -50.166 dBm	FUNCTION FUNCTION WIDTH	FUNCTION VALUE	Freq Offse 0 ⊦

## CH79 2480MHZ

et 9.17 dB 00 dBm	IFGain:Low					
				Mkr4	2.538 64 GH -48.830 dBr	
						Center Free 2.510000000 GH
		2				2.470000000 GH
$\langle \rangle$			unders <sup>1</sup> de neuro	<sup>መቀ</sup> ንቀም የርሳት ማሽም ትመሳት ላይ	senter the second	2.550000000 GH
	#VB	W 300 kHz				
2.48 2.50	3 50 GHz 0 00 GHz	-2.065 dBm -52.677 dBm -51.558 dBm -48.830 dBm	FUNCTION		FUNCTION VALUE	Freq Offse
	× 2.47 2.48 2.50	#vB	#VBW 300 kHz 2.479 84 GHz -2.065 dBm 2.483 80 GHz -52.677 dBm 2.500 00 GHz -51.558 dBm	#VBW 300 kHz 2.479 84 GHz -2.065 dBm 2.433 80 GHz -52.677 dBm 2.500 0 GHz -51.558 dBm	#VBW 300 kHz     Sweep 7.       2.479 84 GHz     -2.065 dBm       2.433 80 GHz     -52.677 dBm       2.438 80 GHz     -51.558 dBm	X     Y     Function     Function<



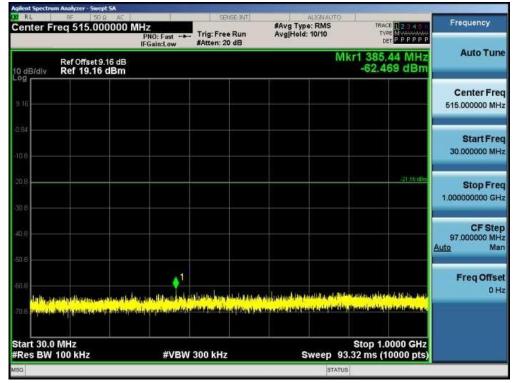
Page 23 of 50

#### Spurious emissions

#### Low 2402MHz



#### 30MHz-1000MHz



Page 24 of 50



## 1GHz-26.5GHz



## Middle 2441MHz



Page 25 of 50



#### 30MHz-1000MHz

RL	RF 50 Ω A		SENSE:INT	ALIGNAUTO #Avg Type: RMS	TRACK DESIGNATION	Frequency
enter F	req 515.0000	PNO: Fast IFGain:Low	Trig: Free Run #Atten: 20 dB	AvgiHold: 10/10	TRACE 12345 TYPE DET PPPPP	
0 dB/div	Ref Offset 9.17 d Ref 19.17 dBr			Mkr	1 756.99 MHz -62.052 dBm	Auto Tun
9.17						Center Fre 515.000000 MH
183						Start Fre 30.000000 MH
20.8					22.15 uB=	Stop Fre 1.000000000 GH
40 6						CF Ste 97.000000 MH Auto Ma
50.8				• • • • •		Freq Offse
n a altra	ja politica di segunda da di dala da segunda di segunda di segunda di segunda di segunda di segunda di segunda	in a data di sa di s Na sa di s	a dala da		alla pinetralia bidea da da ali Ventre processo primo perana	
tart 30.0 Res BW	0 MHz 100 kHz	#VBW	300 kHz		Stop 1.0000 GHz 2 ms (10000 pts)	
50				STATUS		

## 1GHz-26.5GHz



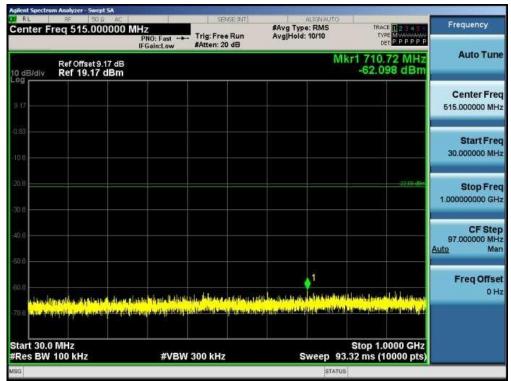




#### High 2480MHz



#### 30MHz-1000MHz



Page 27 of 50



#### m Analyzer - Swept SA Frequency #Avg Type: RMS Avg|Hold: 10/10 TYPE MONTHUN Center Freq 13.750000000 GHz Trig: Free Run #Atten: 20 dB PNO: Fast ----IFGain:Low Auto Tune Mkr1 1.747 2 GHz -43.496 dBm Ref Offset 9.17 dB Ref 19.17 dBm 10 dB/div **Center Freq** 13.75000000 GHz Start Freq 1.00000000 GHz Stop Freq 26.50000000 GHz CF Step 2.550000000 GHz <u>auto</u> Man Auto A ALLIN 41 dia di 11 **Freq Offset** N.A 0 Hz Start 1.00 GHz #Res BW 100 kHz Stop 26.50 GHz Sweep 2.437 s (10000 pts) #VBW 300 kHz

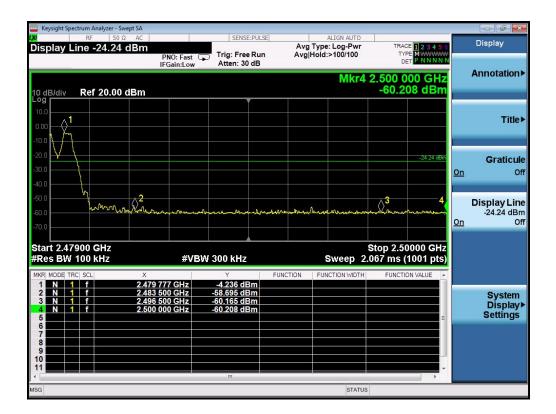
#### 1GHz-26.5GHz



## Page 28 of 50

## For Hopping Band edge

Keysight Spectrum Analyzer - Swept SA					
Display Line -16.76 dBm	PNO: Fast 🕞 Tri	sense:pulse	ALIGN AUTO Avg Type: Log-Pwr Avg Hold:>100/100	TRACE 1 2 3 4 5 6	Display
10 dB/div Ref 20.00 dBm		ten: 30 dB		r3 2.400 0 GHz -29.161 dBm	Annotation ►
10.0 0.00 -10.0				↓   ↓   ↓	Title►
-20.0					Graticule On Off
-50.0 -60.0 <mark>Herealty Harton Heisterson Technology</mark> -70.0	esta and a standard and a f	k-yingatur Markayan Artanagik wayna	on all and the second		Display Line -16.76 dBm <u>On</u> Off
Start 2.31000 GHz #Res BW 100 kHz	#VBW 300		Sweep 9	Stop 2.41000 GHz .600 ms (1001 pts)	
2     N     1     f     2.       3     N     1     f     2.       4     5     5     5     5       6     7     7     8     6	402 0 GHz 3. 390 0 GHz -60.	Y FUNC 241 dBm 201 dBm 161 dBm	TION FUNCTION WIDTH	FUNCTION VALUE	System Display≯ Settings
9 10 11 × MSG		m	STATUS		





## 7 RADIATED EMISSION MEASUREMENT

## 7.1 RADIATED EMISSION LIMITS

In any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the Restricted band specified on Part15.205(a)&209(a) limit in the table and according to ANSI C63.10-2013 below has to be followed

## LIMITS OF RADIATED EMISSION MEASUREMENT (0.009MHz - 1000MHz)

Frequencies	Field Strength Measurement Dis	
(MHz)	(micorvolts/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

## LIMITS OF RADIATED EMISSION MEASUREMENT (1GHz-25 GHz)

FREQUENCY (MHz)	(dBuV/m) (at 3M)			
	PEAK	AVERAGE		
Above 1000	74	54		

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

#### For Radiated Emission

Spectrum Parameter	Setting		
Attenuation	Auto		
Detector	Peak/AV		
Start Frequency	1000 MHz(Peak/AV)		
Stop Frequency	10th carrier hamonic(Peak/AV)		
RB / VB (emission in restricted			
band)	PK=1MHz / 1MHz, AV=1 MHz /10 Hz		



For Band edge

Dana dago					
Setting					
Peak/AV					
Lower Band Edge: 2300 to 2403 MHz					
Upper Band Edge: 2479 to 2500 MHz					
PK=1MHz / 1MHz, AV=1 MHz / 10 Hz					

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~90kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	90kHz~110kHz / RB 200Hz for QP
Start ~ Stop Frequency	110kHz~490kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	490kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

## 7.2 TEST PROCEDURE

- a. The measuring distance of at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz,and above 1GHz.
- b. The EUT was placed on the top of a rotating table 0.8 meters (above 1GHz is 1.5 m) above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The height of the equipment shall be 0.8 m(above 1GHz is 1.5 m); the height of the test antenna shall vary between 1 m to 4 m. horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then QuasiPeak detector mode re-measured.
- e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos. Note:

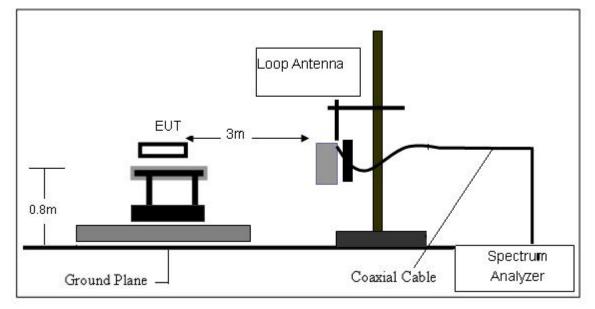
Both horizontal and vertical antenna polarities were tested

and performed pretest to three orthogonal axis. The worst case emissions were reported

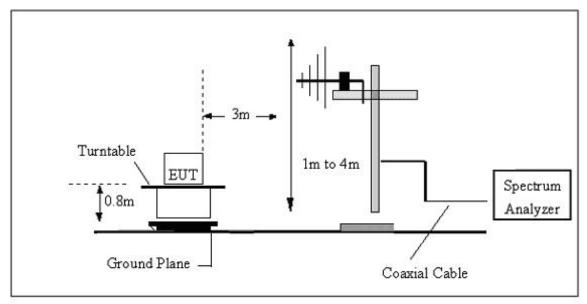


## 7.3 TESTSETUP

## (A) Radiated Emission Test-Up Frequency Below 30MHz

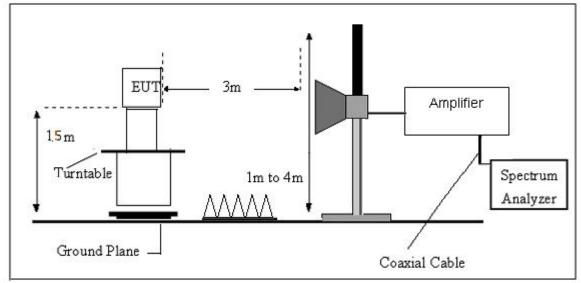


## (B) Radiated Emission Test-Up Frequency 30MHz~1GHz











## 7.4. TEST RESULTS

(9KHz-30MHz)

Temperature:	<b>22.7℃</b>	Relative Humidity:	61%
Test Voltage:	AC 110V	Test Mode:	GFSK

Freq.	Reading	Limit	Margin	State	
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F	Test Result
					PASS
					PASS

Note:

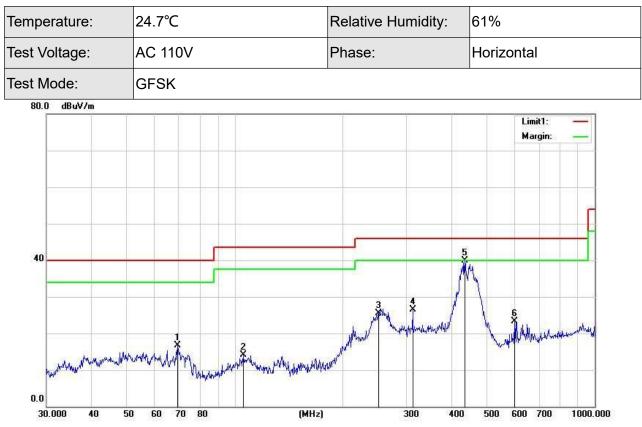
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =40 log (specific distance/test distance)(dB);

Limit line = specific limits (dBuv) + distance extrapolation factor.



(30MHz-1000MHz)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/	(dBuV/m)	(dBuV/m)	(dB)	
			m)				
1	69.3568	36.91	-20.21	16.70	40.00	-23.30	QP
2	105.6414	31.99	-17.98	14.01	43.50	-29.49	QP
3	251.1802	43.20	-17.70	25.50	46.00	-20.50	QP
4	312.1792	42.33	-15.77	26.56	46.00	-19.44	QP
5	435.5898	54.31	-14.44	39.87	46.00	-6.13	QP
6	599.3211	34.68	-11.36	23.32	46.00	-22.68	QP

Note: 1. Margin = Result (Result =Reading + Factor )–Limit

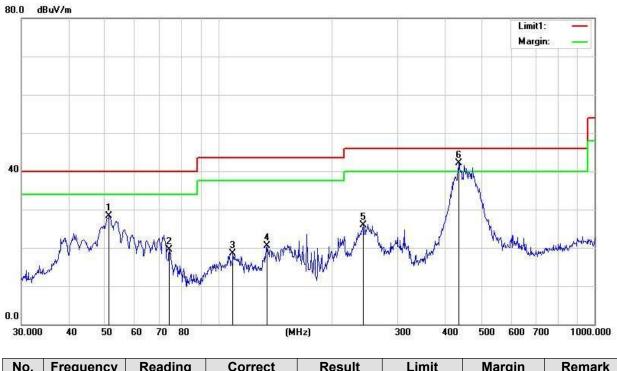
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.





Temperature:	22.7°C	Relative Humidity:	61%
Test Voltage:	AC 110V	Phase:	Vertical
Test Mode:	GFSK		



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/	(dBuV/m) (dBuV/m)		(dB)	
			m)				
1	51.3005	68.52	-40.24	28.28	40.00	-11.72	QP
2	74.1351	59.79	-40.24	19.55	40.00	-20.45	QP
3	109.4116	58.68	-40.24	18.44	43.50	-25.06	QP
4	134.5592	60.70	-40.24	20.46	43.50	-23.04	QP
5	242.5252	66.08	-40.24	25.84	46.00	-20.16	QP
6	435.5898	82.33	-40.24	42.09	46.00	-3.91	QP

Note: 1. Margin = Result (Result = Reading + Factor )-Limit

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.



## ■ Above 1GHz

## Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4804.00	36.21	31.78	8.6	32.09	44.5	74.00	-29.5	Vertical
7206.00	31.24	36.15	11.65	32	47.04	74.00	-26.96	Vertical
9608.00	31.22	37.95	14.14	31.62	51.69	74.00	-22.31	Vertical
12010.00	*	¥.	-					Vertical
14412.00								Vertical
4804.00	39.67	31.78	8.6	32.09	47.96	74.00	-26.04	Horizontal
7206.00	33.01	36.15	11.65	32	48.81	74.00	-25.19	Horizontal
9608.00	29.54	37.95	14.14	31.62	50.01	74.00	-23.99	Horizontal
12010.00	*					74.00		Horizontal
14412.00	*					74.00		Horizontal

#### Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4804.00	25.12	31.78	8.6	32.09	33.41	54.00	-20.59	Vertical
7206.00	20.06	36.15	11.65	32	35.86	54.00	-18.14	Vertical
9608.00	19.23	37.95	14.14	31.62	39.7	54.00	-14.30	Vertical
12010.00	*					54.00		Vertical
14412.00	*					54.00		Vertical
4804.00	29.01	31.78	8.6	32.09	37.3	54.00	-16.70	Horizontal
7206.00	22.23	36.15	11.65	32	38.03	54.00	-15.97	Horizontal
9608.00	18.15	37.95	14.14	31.62	38.62	54.00	-15.38	Horizontal
12010.00	*					54.00		Horizontal
14412.00	*					54.00		Horizontal





# Peak value:

Frequency (MHz)	Read Leve <b>l</b> (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Leve <b>l</b> (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	po <b>l</b> arization
4882.00	39.06	31.85	8.67	32.12	47.46	74.00	-26.54	Vertica
7323.00	32.99	36.37	11.72	31.89	49.19	74.00	-24.81	Vertical
9764.00	32.50	38.35	14.25	31.62	53.48	74.00	-20.52	Vertical
12205.00	*					74.00		Vertical
14646.00	*					74.00		Vertical
4882.00	43.70	31.85	8.67	32.12	52.10	74.00	-21.90	Horizontal
7323.00	34.90	36.37	11.72	31.89	51.10	74.00	-22.90	Horizontal
9764.00	32.09	38.35	14.25	31.62	53.07	74.00	-20.93	Horizonta
12205.00	*					74.00		Horizonta
14646.00	*					74.00		Horizonta

# Average value:

Frequency (MHz)	Read Leve <b>l</b> (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Leve <b>l</b> (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	po <b>l</b> arization
4882.00	27.56	31.85	8.67	32.12	35.96	54.00	-18.04	Vertical
7323.00	21.49	36.37	11.72	31.89	37.69	54.00	-16.31	Vertical
9764.00	20.46	38.35	14.25	31.62	41.44	54.00	-12.56	Vertica
12205.00	*	2				54.00		Vertica
14646.00	*	5				54.00		Vertica
4882.00	31.98	31.85	8.67	32.12	40.38	54.00	-13.62	Horizontal
7323.00	23.78	36.37	11.72	31.89	39.98	54.00	-14.02	Horizontal
9764.00	20.34	38.35	14.25	31.62	41.32	54.00	-12.68	Horizonta
12205.00	*					54.00		Horizonta
14646.00	*	8				54.00		Horizonta



### Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4960.00	35.86	31.93	8.73	32.16	44.36	74.00	-29.64	Vertical
7440.00	31.05	36.59	11.79	31.78	47.65	74.00	-26.35	Vertical
9920.00	31.26	38.81	14.38	31.88	52.57	74.00	-21.43	Vertical
12400.00	*					74.00		Vertical
14880.00	*	2 8	2 3 8 8			74.00		Vertical
4960.00	39.54	31.93	8.73	32.16	48.04	74.00	-25.96	Horizontal
7440.00	32.99	36.59	11.79	31.78	49.59	74.00	-24.41	Horizontal
9920.00	29.62	38.81	14.38	31.88	50.93	74.00	-23.07	Horizontal
12400.00	*	2				74.00		Horizontal
14880.00	*					74.00		Horizontal

Page 38 of 50

# Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4960.00	25.16	31.93	8.73	32.16	33.66	54.00	-20.34	Vertical
7440.00	20.03	36.59	11.79	31.78	36.63	54.00	-17.37	Vertical
9920.00	19.65	38.81	14.38	31.88	40.96	54.00	-13.04	Vertical
12400.00	-			2		54.00		Vertical
14880.00	1	9 0	2 8 0 3			54.00		Vertical
4960.00	29.02	31.93	8.73	32.16	37.52	54.00	-16.48	Horizontal
7440.00	22.45	36.59	11.79	31.78	39.05	54.00	-14.95	Horizontal
9920.00	18.35	38.81	14.38	31.88	39.66	54.00	-14.34	Horizontal
12400.00	*	9 0				54.00		Horizontal
14880.00	*					54.00		Horizontal

Remarks:

1. Final Level =Receiver Read level + Antenna Factor + Cable Loss - Preamplifier Factor

2. "\*", means this data is the too weak instrument of signal is unable to test.

3. The emission levels of other frequencies are very lower than the limit and not show in test report.





#### Radiated Band Edge data

Remark: All restriction band have been tested, and only the worst case is shown in report

#### Low CH (GFSK)

#### Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	39.19	27.59	5.38	30.18	41.98	74.00	-32.02	Horizontal
2400.00	55.45	27.58	5.39	30.18	58.24	74.00	-15.76	Horizontal
2390.00	39.38	27.59	5.38	30.18	42.17	74.00	-31.83	Vertical
2400.00	57.09	27.58	5.39	30.18	59.88	74.00	-14.12	Vertical

#### Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	30.57	27.59	5.38	30.18	33.36	54.00	-20.64	Horizontal
2400.00	41.59	27.58	5.39	30.18	44.38	54.00	-9.62	Horizontal
2390.00	30.25	27.59	5.38	30.18	33.04	54.00	-20.96	Vertical
2400.00	42.89	27.58	5.39	30.18	45.68	54.00	-8.32	Vertical

#### High CH(GFSK)

#### Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	46.43	27.53	5.47	24.80	54.63	74.00	-19.37	Horizontal
2500.00	45.73	27.55	5.49	24.86	53,91	74.00	-20.09	Horizontal
2483.50	47.43	27.53	5.47	24.80	55.63	74.00	-18.37	Vertical
2500.00	46.89	27.55	5.49	24.86	55.07	74.00	-18.93	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	35.58	27.53	5.47	24.80	43.78	54.00	-10.22	Horizontal
2500.00	35.59	27.55	5.49	24.86	43.77	54.00	-10.23	Horizontal
2483.50	36.31	27.53	5.47	24.80	44.51	54.00	-9.49	Vertical
2500.00	35.41	27.55	5.49	24.86	43.59	54.00	-10.41	Vertical

#### Remarks:

1. Final Level =Receiver Read level + Antenna Factor + Cable Loss - Preamplifier Factor



#### 8 AVERAGE TIME OF OCCUPANCY

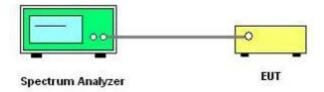
#### 8.1 LIMIT

	FCC F	Parti 5 (15.247), Su	bpart C
Section	Test Item	Limit	Frequency Range (MHz)
15.247(a)(1)	Average Time of Occupancy	0.4 sec	2400-2483.5

#### **8.2 TEST PROCEDURE**

- a. The transmitter output (antenna port) was connected to the spectrum analyzer.
- b. Set RBW =1MHz/VBW =3MHz.
- c. Use a video trigger with the trigger level set to enable triggering only on full pulses.
- d. Sweep Time is more than once pulse time.
- e. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
- f. Measure the maximum time duration of one single pulse.
- g. Set the EUT for DH5, DH3 and DH1 packet transmitting.
- h. Measure the maximum time duration of one single pulse.
- i. DH5 Packet permit maximum 1600/ 79 / 6 = 3.37 hops per second in each channel (5 time slots RX, 1 time slot TX). So the number of pulses in the observation period of 31.6 seconds is 3.37x31.6 = 106.6.
- j. DH3 Packet permit maximum 1600 / 79 / 4 = 5.06 hops per second in each channel (3 time slots RX, 1 time slot TX). So the number of pulses in the observation period of 31.6 seconds is 5.06x31.6 = 160.
- k. DH1 Packet permit maximum 1600 / 79 / 2 = 10.12 hops per second in each channel (1 time slot RX, 1 time slot TX). So the number of pulses in the observation period of 31.6 seconds is 10.12x31.6 = 320.

#### 8.3 TEST SETUP





#### 8.4 TEST RESULTS

Mode	Data Packet	Frequency (MHz)	Pulse Duration (ms)	Dwell Time (ms)	Limit(s)	Conclusion
	DH1	2441	0.3825	122.40	<0.4	Pass
GFSK	DH3	2441	1.654	264.64	<0.4	Pass
	DH5	2441	2.898	309.12	<0.4	Pass
Note2: DH1 time slo DH3 time slo DH5 time slo	ot = Pulse Dura ot = Pulse Dura	s) * 79 = 31.6 ation * (1600/(2*) ation * (1600/(4*) ition * (1600/(6*7 period: T= 0.4 S	79))́ * Aperiod tir ′9)) * Aperiod tin	ne 1e	=31.6 s	

# 8.5 ORIGINAL TEST DATA

Agilent Spectri	um Analyzer - Swept SA RF 50 Ω AC		SENSE:INT	ALIG	NAUTO		
Center F	Freq 2.441000000	PNO: Fast +++	Trig Delay-200.0 Trig: Video #Atten: 40 dB		MS TRAG	EL23456 PEWAWAAAAA ETPPPPPP	Frequency
0 dB/div	Ref 30.00 dBm				ΔMkr2 3	82.5 µs 1.01 dB	Auto Tune
20.0							Center Fred 2.441000000 GH:
0.00	241						Start Free 2.441000000 GH
10.0 <b>1</b>	2Δ1						<b>Stop Free</b> 2.441000000 GH
30.0							<b>CF Ste</b> 1.000000 MH <u>Auto</u> Ma
50.0	aladina potala alterativa alterativa Prefettiva data prema alterativa	watala darawa ya ja la wasa kata karika kata ya	haddlan yn yr ddin yr far Ynglagor yr og ffyrfyr	l hereisin all al al daha da ba <mark>Tali an </mark>	tin ang talah ta padis. Talam tang tang tang ta	hlanini a muk Tudun malan	Freq Offse 0 H
.60.0		- A Har Bardes			n		
	.441000000 GHz 1.0 MHz	#VBW 3	3.0 MHz	Sw	eep 10.13 ms (	pan 0 Hz 8000 pts)	
SG					STATUS		

Flux Compliance Service Laboratory Room 105 Floor Bao hao Technology Building 1 NO.15 Gong ye West Road Hi-Tech Industrial, Song shan lake Dongguan Tel: 769-27280901 Fax:769-27280901 http://www.FCS-lab.com



RL	RF 50 Ω AC		SEN Trig Delay		#Avg Type		TRAC	123456	Frequency
enter F	req 2.441000000	PNO: Fast +++ IFGain:Low		o .	*Avg i yp	5. NWIO	TYP	E P P P P P P	
) dB/div	Ref 30.00 dBm					۵	Mkr2 1.	654 ms 3.41 dB	Auto Tur
20.0									Center Fre 2.441000000 GF
.00									Start Fro 2.441000000 GI
0.0								TRIG LVL	<b>Stop Fr</b> 2.441000000 G
0.0	2∆1								CF Ste 1.000000 MI Auto Mi
0.0	d it hit has		and and the ball	len il de l	ula li vilandom	philming a string t		la l	Freq Offs
0.0 <mark></mark>	a the second	<mark>na wana bab</mark>	abhdabh	<mark>di Mangha</mark>	, weeks and a second of the	<mark>Multippl</mark> ta	u ali for all for	hild high high h	0
enter 2. es BW 1	441000000 GHz L0 MHz	#\/B\/	3.0 MHz			Sween 1	S 0.13 ms (3	pan 0 Hz	

LXI RL	m Analyzer - Swep RF 50 S	AC AC			ISE:INT		ALIGN AUTO			Frequency
Center F	req 2.4410		PNO: Fast 🔸			#Avg Type	e: RMS	TYP	E 1 2 3 4 5 6 E WWWWWWW T P P P P P P	Frequency
10 dB/div	Ref 30.00		FGain:Low	#Atten: 40			Δ	Mkr2 2.		Auto Tur
20.0						2				Center Fre 2.441000000 GF
10.0 0.00										<b>Start Fre</b> 2.441000000 GH
-10.0	24								TRIG LVL	<b>Stop Fre</b> 2.441000000 GF
-30.0										CF Ste 1.000000 MH Auto Ma
-40.0 1 -50.0 1	itelasi Ny syri	hinterniti Interniti	en appelant fille en angener fille	S add as <sup>20</sup>	an an di a	y kilo hodarit Independence	02 0.200 00	<mark>halan papa ana</mark>	e baldidigi i NG Galdidigi i	Freq Offs 0 H
	441000000 (	GHz					11 84		pan 0 Hz	
Res BW 1	.0 MHz		#VBN	/ 3.0 MHz			Sweep 2 STATUS	0.26 ms (	8000 pts)	



# 9 HOPPING CHANNEL SEPARATION MEASUREMEN

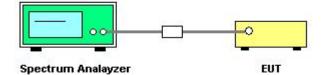
9.1 LIMIT

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

Spectrum Parameter	Setting			
Attenuation	Auto			
Span Frequency	> 20 dB Bandwidth or Channel Separation			
RB	30 kHz (20dB Bandwidth) / 30 kHz (Channel Separation)			
VB	100 kHz (20dB Bandwidth) /100 kHz (Channel Separation)			
Detector	Peak			
Trace	Max Hold			
Sweep Time	Auto			

#### 9.2 TEST PROCEDURE

- a. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
- b. The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised for 20 dB bandwidth measurement.
- c. The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised for channel separation measurement
- 9.3 TEST SETUP



#### 9.4 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.



# 9.5 TEST RESULTS

Temperature:	25 °C	Relative Humidity:	60%
Test Mode:	GFSK Mode	Test Voltage:	AC 110V

Modulation	Frequency (MHz)	Markl Frequency (MHz)	Mark2 Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
	2402	2401.930	2402.773	0.843	0.953	Pass
GFSK	2441	2440.924	2441.914	0.990	0.953	Pass
	2480	2478.948	2479.914	0.966	0.951	Pass











# **10 CONDUCTED EMISSION TEST**

#### **10.1 POWER LINE CONDUCTED EMISSION LIMITS**

Operating frequency band. In case the emission fall within the restricted band specified on Part 207(a) limit in the table below has to be followed.

	Conducted Emissionlimit (dBuV)			
FREQUENCY (MHz)	Quasi-peak	Average		
0.15 -0.5	66 - 56 *	56 - 46 *		
0.50 -5.0	56.00	46.00		
5.0 -30.0	60.00	50.00		

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " \* " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

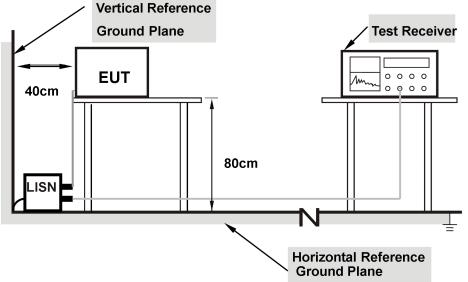
Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz



#### **10.2 TEST PROCEDURE**

- a. The EUT was 0.8 meters from the horizontal ground plane and 0.4 meters from the vertical ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

# 10.3 TEST SETUP



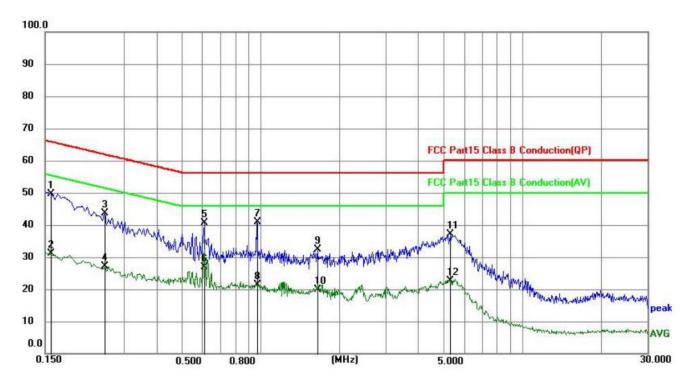
Note: 1.Support units were connected to second LISN.

2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes



# **10.4 TEST RESULT**

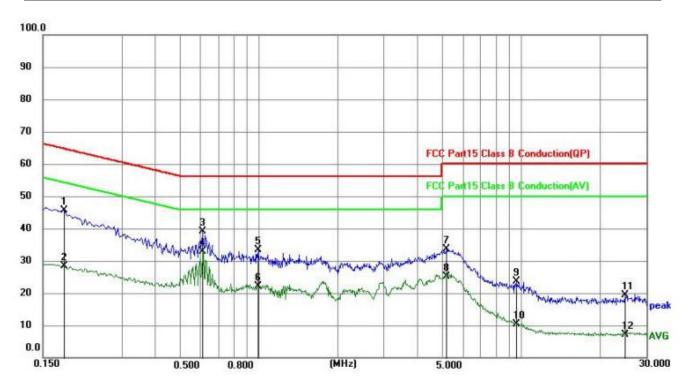
Temperature:	<b>22.1</b> ℃	Relative Humidity:	56%
Test Voltage:	120V/60HZ	Phase:	L
Test Mode:	GFSK		



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	0.1590	39.95	9.78	49.73	65.52	15.79	QP
2	0.1590	21.46	9.78	31.24	55.52	24.28	AVG
3	0.2535	33.79	9.81	43.60	61.64	18.04	QP
4	0.2535	17.25	9.81	27.06	51.64	24.58	AVG
5	0.6090	30.73	9.88	40.61	56.00	15.39	QP
6	0.6090	17.10	9.88	26.98	46.00	19.02	AVG
7	0.9645	30.94	9.92	40.86	56.00	15.14	QP
8	0.9645	11.36	9.92	21.28	46.00	24.72	AVG
9	1.6530	22.42	9.93	32.35	56.00	23.65	QP
10	1.6530	9.84	9.93	19.77	46.00	26.23	AVG
11	5.3070	27.23	9.96	37.19	60.00	22.81	QP
12	5.3070	12.70	9.96	22.66	50.00	27.34	AVG



Temperature:	22.1 °C	Relative Humidity:	56%
Test Voltage:	120V/60HZ	Phase:	N
Test Mode:	GFSK		



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	0.1815	35.79	9.78	45.57	64.42	18.85	QP
2	0.1815	18.71	9.78	28.49	54.42	25.93	AVG
3	0.6090	29.35	9.88	39.23	56.00	16.77	QP
4	0.6090	23.11	9.88	32.99	46.00	13.01	AVG
5	0.9915	23.39	9.92	33.31	56.00	22.69	QP
6	0.9915	12.09	9.92	22.01	46.00	23.99	AVG
7	5.1900	23.54	10.03	33.57	60.00	26.43	QP
8	5.1900	15.09	10.03	25.12	50.00	24.88	AVG
9	9.6315	13.39	10.18	23.57	60.00	36.43	QP
10	9.6315	0.25	10.18	10.43	50.00	39.57	AVG
11	24.8325	9.06	10.27	19.33	60.00	40.67	QP
12	24.8325	-3.02	10.27	7.25	50.00	42.75	AVG



#### **11 ANTENNA REQUIREMENT**

#### **11.1 STANDARD REQUIREMENT**

For intentional device, according to FCC 47 CFR Section 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. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

### 11.2 RESULT

The antennas used for this product are PCB antenna and no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is 1.0dBi.

\*\*\*\*\*\*END OF THE REPORT\*\*\*\*\*