KSIGN (Guangdong) Testing Co., Ltd.

KSIGN[®]

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TEST REPORT

Report No:	KS2012S02697E
FCC ID······:	2AO94-H4
Applicant: Address	MOKO TECHNOLOGY LIMITED 2F, Building1,No.37 Xiaxintang Xintang village,Fucheng Street,Longhua District,Shenzhen,Guangdong Province,China
Manufacturer	MOKO TECHNOLOGY Ltd
Address	2F, Building1,No.37 Xiaxintang Xintang village,Fucheng Street,Longhua District,Shenzhen,Guangdong Province,China
Factory	MOKO TECHNOLOHY Ltd
Address	2F, Building1, No. 37 Xiaxintang Xintang village, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, China
Product Name:	Bluetooth Beacon
Trade Mark:	1
Model/Type reference:	H4
Listed Model(s)	H4 pro
Standard:	FCC CFR Title 47 Part 15 Subpart C Section 15.247
Date of Receipt:	Dec. 31, 2020
Date of Test Date:	Dec. 31, 2020~Jan. 14, 2021
Date of issue:	Jan. 15, 2021
Test result:	Pass
Compiled by: (Printed name+signature)	Rory Huang
Supervised by: (Printed name+signature)	Eder Zhan
Approved by:	Carri Lus?
(Printed name+signature)	Cary Luo
Testing Laboratory Name:	KSIGN(Guangdong) Testing Co., Ltd.
Address	West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, People's Republic of China

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1. TEST SUMMARY

1.1. Test Standards

The tests were performed according to following standards:

FCC Rules Part 15.247: Operation within the bands of 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz.

KDB 558074 D01 : The measurement guidance provided herein is applicable only to Digital Transmission System (DTS) devices operating in the 902-928 MHz. 2400-2483.5 MHz and/or 5725-5850 MHz bands under § 15.247 of the FCC rules (Title 47 of the Code of Federal Regulations)

ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.

1.2. Report version

Revised No.	Date of issue	Description
01	Jan. 15, 2021	Original
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1.3. Test Description

FCC Part 15 Subpart C(15.247)					
Test Item	Standard Section	Deset	Tart		
Test Item	FCC	Result	Test Engineer		
Antenna Requirement	15.203	Pass	Rory Huang		
Conducted Emission	15.207	N/A	N/A		
Restricted Bands	15.205	Pass	Rory Huang		
Peak Output Power	15.247(b)	Pass	Rory Huang		
Band Edge Emissions	15.247(d)	Pass	Rory Huang		
Power Spectral Density	15.247(e)	Pass	Rory Huang		
Radiated Emission	15.205&15.209	Pass	Rory Huang		
6dB Bandwidth	15.247(a)(2)	Pass	Rory Huang		
Spurious RF Conducted Emission	15.247(d)	Pass	Rory Huang		

Note:

The measurement uncertainty is not included in the test result.



1.4. Test Facility

Address of the report laboratory

KSIGN(Guangdong) Testing Co., Ltd.

West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, People's Republic of China

Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L13261

KSIGN(Guangdong) Testing Co., Ltd. has been assessed and proved to be in Compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2017 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA-Lab Cert. No.: 5457.01

KSIGN(Guangdong) Testing Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

IC Registration No.: CN0096

The 3m alternate test site of KSIGN(Guangdong) Testing Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: CN0096

FCC-Registration No.: CN1272

KSIGN(Guangdong) Testing Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.



1.5. Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the KSIGN(Guangdong) Testing Co., Ltd. system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device. Below is the best measurement capability for KSIGN(Guangdong) Testing Co., Ltd.

Test Items	Measurement Uncertainty	Notes	
Transmitter power conducted	0.42 dB	(1)	
Transmitter power Radiated	2.14 dB	(1)	
Conducted spurious emissions 9kHz~40GHz	1.60 dB	(1)	
Radiated spurious emissions 9kHz~40GHz	2.20 dB	(1)	
Conducted Emissions 9kHz~30MHz	3.20 dB	(1)	
Radiated Emissions 30~1000MHz	4.70 dB	(1)	
Radiated Emissions 1~18GHz	5.00 dB	(1)	
Radiated Emissions 18~40GHz	5.54 dB	(1)	
Occupied Bandwidth	2.80 dB	(1)	

Note (1): This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

1.6. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15~35°C
Relative Humidity:	30~60 %
Air Pressure:	950~1050mba



2. GENERAL INFORMATION

2.1. General Description of EUT

Test Sample Number 1:	1-1-1(Normal Sample),1-1-2(Engineering Sample) For H4
Product Name:	Bluetooth Beacon
Trade Mark:	
Model/Type reference:	H4
Listed Model(s):	H4 pro
Model Difference:	The difference between product models only depends on the name of the model. H4 is an optional model with built-in temperature and humidity sensor, and H4 PRO is a model with external temperature and humidity sensor. Other power supply methods, safety structure and key components are the same, which do not affect the safety and electromagnetic compatibility performance.
Power supply(Work)	Input:DC 3.0V
Hardware version:	V1.0
Software version:	V1.0.0
Bluetooth V5.2	
Modulation:	GFSK
Operation frequency:	2402MHz~2480MHz
Max Peak Output Power:	0.59dBm
Channel number:	40
Channel separation:	2MHz
Antenna type:	PCB Antenna
Antenna gain:	-0.1dBi



2.2. Operation state

Operation Frequency List: The EUT has been tested under typical operating condition. The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing. BLE, 40 channels are provided to the EUT. Channels 00/19/39 were selected for testing. Operation Frequency List:

Channel	Frequency (MHz)
00	2402
01	2404
19	2440
20	2442
21	2444
38	2478
39	2480

Note: The display in grey were the channel selected for testing.

Test mode

NO.	TEST MODE DESCRIPTION
1	Low channel TX (2402MHz)
2	Middle channel TX (2440MHz)
3	High channel TX (2480MHz)

Note:

- 1. Only the result of the worst case was recorded in the report, if no other cases..
- 2. The test software is the SecureCRTSecure_V7.0.0.326 which can set the EUT into the individual test modes.



2.3. Measurement Instruments List

	Т	onscend JS0806-2	Test system		
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Until
1	Spectrum Analyzer	R&S	FSV40-N	101798	04/07/2021
2	Vector Signal Generator	Agilent	N5182A	MY50142520	04/07/2021
3	Analog Signal Generator	HP	83752A	3344A00337	04/07/2021
4	Power Sensor	Agilent	E9304A	MY50390009	04/07/2021
5	Power Sensor	Agilent	E9300A	MY41498315	04/07/2021
6	Wideband Radio Communication Tester	R&S	CMW500	157282	04/07/2021
7	Climate Chamber	Angul	AGNH80L	1903042120	04/07/2021
8	Dual Output DC Power Supply	Agilent	E3646A	MY40009992	04/07/2021
9	RF Control Unit	Tonscend	JS0806-2	/	04/07/2021

	Transmitter spur	rious emissions & Re	eceiver spurious en	nissions	
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Until
1	EMI Test Receiver	R&S	ESR	102525	04/07/2021
2	High Pass Filter	Chengdu E-Microwave	OHF-3-18-S	0E01901038	03/27/2021
3	High Pass Filter	Chengdu E-Microwave	OHF-6.5-18-S	0E01901039	03/27/2021
4	Spectrum Analyzer	HP	8593E	3831U02087	04/07/2021
5	Ultra-Broadband logarithmic period Antenna	Schwarzbeck	VULB 9163	01230	03/29/2023
6	Loop Antenna	Beijin ZHINAN	ZN30900C	18050	03/25/2021
7	Spectrum Analyzer	R&S	FSV40-N	101798	04/07/2021
8	Horn Antenna	Schwarzbeck	BBHA 9120 D	2023	03/29/2023
9	Pre-Amplifier	Schwarzbeck	BBV 9745	9745#129	04/07/2021
10	Pre-Amplifier	EMCI	EMC051835SE	980662	04/07/2021

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Until
1	LISN	R&S	ENV432	1326.6105.02	03/27/2021
2	EMI Test Receiver	R&S	ESR	102524	04/07/2021
3	Manual RF Switch	JS TOYO	P	MSW-01/002	04/07/2021

Note:

The Cal. Interval was one year.
 The cable loss has calculated in test result which connection between each test instruments.

2.5. Test Software

Software name	Model	Version
Conducted emission Measurement Software	EZ-EMC	EMC-Con 3A1.1
Radiated emission Measurement Software	EZ-EMC	FA-03A.2.RE
Bluetooth and WIFI Test System	JS1120-3	2.5.77.0418



3. TEST ITEM AND RESULTS

3.1. Antenna requirement

Requirement

FCC CFR Title 47 Part 15 Subpart C 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):

(i) Systems operating in the 2400~2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

Test Result

The directional gain of the antenna less than 6dBi, please refer to the EUT internal photographs antenna photo.

Note: The antenna is permanently fixed to the EUT

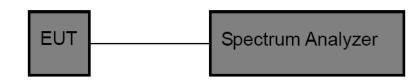


3.2. Peak Output Power

Limit

Test Item	Limit	Frequency Range(MHz)	
Peak Output Power	1 Watt or 30 dBm	2400~2483.5	

Test Configuration



Test Procedure

1. Connect EUT RF Output port to the Spectrum Analyzer through an RF attenuator..

2. Spectrum Setting:

Peak Detector: RBW≥DTS Bandwidth, VBW≥3*RBW.

Sweep time=Auto.

Detector= Peak.

Trace mode= Maxhold.

Allow trace to fully stabilize. Then use the peak marker function to determine the maximum amplitude level.

Test Mode

Please refer to the clause 2.2.

Test Result

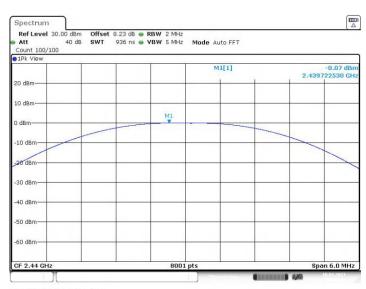
GFSK_1M

Test Mode:	t Mode: BLE Mode			
Channel freque	ncy (MHz)	Test Result (dBm)	Limit (dBm)	
2402		0.57		
2440 2480		-0.07	30	
		-0.76		
		BLE Mode	·	
		2402 MHz		



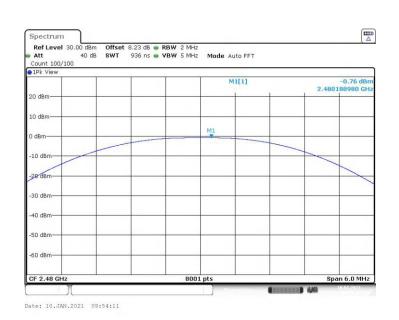


2440 MHz



Date: 10.JAN.2021 09:52:08

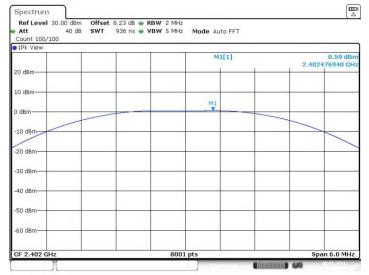
BLE Mode 2480 MHz





GFSK_2M

Test Mode:	est Mode: BLE Mode			
Channel freque	ency (MHz)	Test Result (dBm)	Limit (dBm)	
2402		0.59		
2440)	-0.07	30	
2480		-0.78		
		BLE Mode		
		2402 MHz		

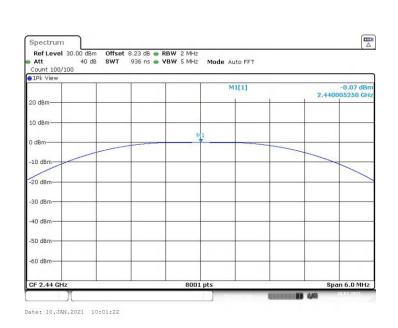


Date: 10.JAN.2021 09:57:21

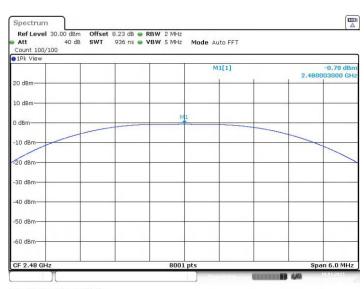


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2440 MHz



2480MHz



Date: 10.JAN.2021 10:02:53



3.3. Power Spectral Density

Limit

FCC Part 15 Subpart C(15.247)				
Test Item	Limit	Frequency Range(MHz)		
Power Spectral Density	8dBm(in any 3 kHz)	2400~2483.5		

Test Configuration

EUT	Spectrum Analyzer

Test Procedure

- 1. Connect EUT RF Output port to the Spectrum Analyzer through an RF attenuator.
- The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above. The measurement according to section 10.b-6.ii of KDB 558074 D01 DTS Meas Guidance v05r02.
- 3. Spectrum Setting:

Set analyser center frequency to DTS channel center frequency. Set the span to 1.5 times the DTS bandwidth. Set the RBW to: 10 kHz Set the VBW to: 30 kHz Detector: peak Sweep time: auto Allow trace to fully stabilize. Then use the peak marker function to determine the maximum amplitude level.

Test Mode

Please refer to the clause 2.2.

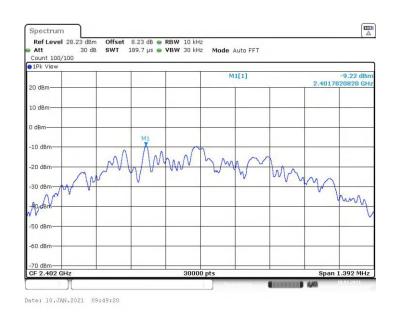
Test Result

Note:

Power Density(dBm/3kHz)=Power Density(dBm/10kHz)-10*Log(10/3)

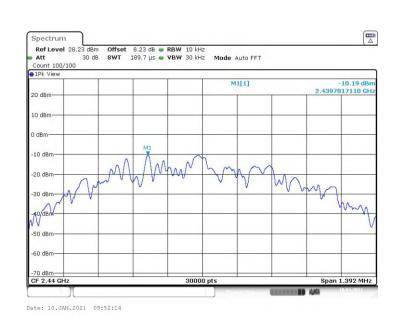
GFSK_1M

Test Mode:	5668°			
Channel Fre (MHz	• •	Power Density (dBm/10kHz)	Power Density (dBm/3kHz)	Limit (dBm)
2402	2	-9.22	-14.45	
2440)	-10.19	-15.42	8dBm/3kHz
2480		-10.76	-15.99	
		BLE Mode		
		2402 MHz		





2440 MHz



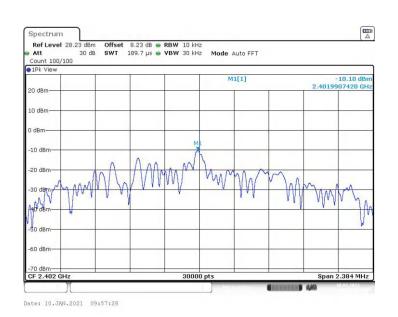
BLE Mode 2480 MHz





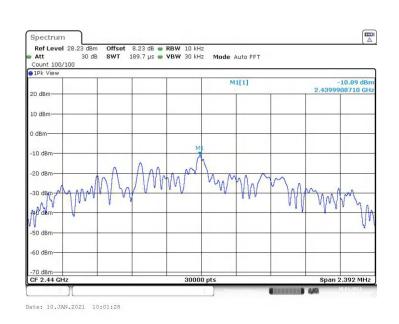
GFSK_2M

Test Mode:	BLE Mode		6/28	
Channel Fre (MHz	• •	Power Density (dBm/10kHz)	Power Density (dBm/3kHz)	Limit (dBm)
2402	2	-10.1	-15.33	
2440		-10.89	-16.12	8dBm/3kHz
2480)	-11.54	-16.77	
		BLE Mode		-
		2402 MHz		

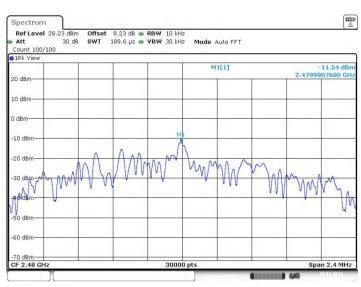




2440 MHz



2480 MHz



Date: 10.JAN.2021 10:03:00



3.4. 6dB Bandwidth

Limit

Test Item	Limit	Frequency Range(MHz)
Bandwidth	>=500 KHz (6dB bandwidth)	2400~2483.5

Test Configuration

EUT Spectrum Analyzer

Test Procedure

- 1. Connect EUT RF Output port to the Spectrum Analyzer through an RF attenuator.
- 2. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.
- 3. The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

4. Spectrum Setting:

6dB bandwidth:

- (1) Set RBW = 100 kHz.
- (2) Set the video bandwidth (VBW) \ge 3 RBW.
- (3) Detector = Peak.
- (4) Trace mode = Max hold.
- (5) Sweep = Auto couple.
- (6) Allow the trace to stabilize.

(7) 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.

NOTE: The EUT was set to continuously transmitting in each mode and low, Middle and high channel for the test.

Test Mode

Please refer to the clause 2.2.

Test Results

GFSK_1M

Test Mode:	BLE Mode		Sel.	
Channel freque	ncy (MHz)	6dB Bandwidth (MHz)	99%Bandwi dth(MHz)	Limit (MHz)
2402		0.696	1.051	
2440		0.696	1.051	≧0.5
2480		0.692	1.055	

BLE Mode

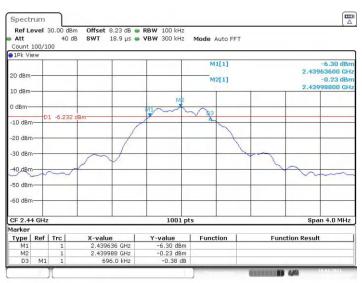
Count 1 1Pk Vie 20 dBm-		JU			M1[1]		-5.64 dBm 2.40163200 GHz
20 aBm-					M2[1]		0.41 dBm 2.40199200 GHz
10 dBm-	+			-			2.40199200 GH2
0 dBm—	-			MP	~		
	DI	-5.586	dBm		V 23		
-10 dBm-			1		5		
-20 dBm-	-				/		
-30 dBm-						-	
-30 aBm-			SV				
40 dBm-		~	~	_			m
-50 dBm-				_			
-60 dBm-	+						
CF 2.40	2 CH	7		1001 pts	-		Span 4.0 MHz
larker	2 01 1			roor pt.	,		opun no miz
Туре	Ref		X-value	Y-value	Function	Functio	on Result
M1 M2	-	1	2.401632 GHz 2.401992 GHz	-5.64 dBm 0.41 dBm			
D3	M1	1	696.0 kHz	0.03 dB			
		-			Me seatting	Second 4	10.01/2021
		-			,		-
03		[090.0 KH2	0.03 08] Mr	Entered 4	10.01N2021

			M1[1]			-0.05 dBm 2.40199600 GHz		
20 dBm-		-	0	CC BW		1.050949051 MH		
10 dBm					-			
0 dBm		M	1					
-10 dBm		m	m					
-20 dBm	J.	1	V	T2				
				5				
-30 dBm	m			V	\sim			
40 dBm					J.	m	m	
-50 dBm								
-60 dBm								
CF 2.402 GHz		1001	pts			Spa	an 4.0 MHz	
T T			10 No.			440	10.01/2021	

Date: 10.JAN.2021 09:49:06



2440 MHz



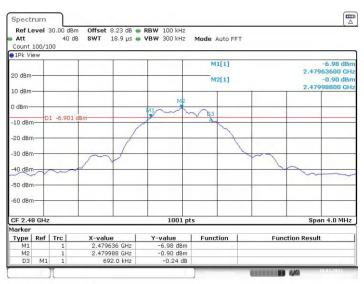
Date: 10.JAN.2021 09:51:50

2440MHz



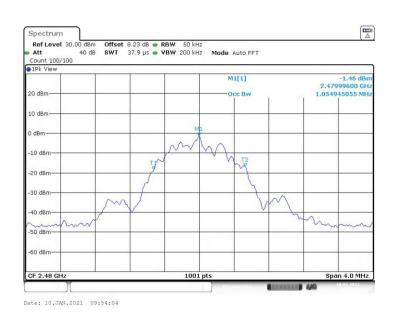


2480 MHz



Date: 10.JAN.2021 09:53:53

2480MHz



GFS	κ	2M
	2 C	1000

<u>0</u>			No. 69	
Test Mode:	BLE Mode		Sale handler	
Channel frequ	iency (MHz)	6dB Bandwidth (MHz)	99%Bandwi dth(MHz)	Limit (MHz)
2402		1.192	2.062	
2440 2480		1.196	2.066	≧0.5
		1.200	2.066	
		BIE Mod		

			2402 I	MHz		
Spectrum						
Ref Level Att Count 100/	40		RBW 100 kHz VBW 300 kHz	Mode Auto FFT		(
1Pk View		A	1			
20 dBm				M1[1] M2[1]		-5.79 dBr 2.40136400 GF 0.40 dBr 2.40199200 GF
10 dBm			ME			
0 dBm	4	mi	ME	_D3	_	
-10 dBm	01 -5.602	2 dBm		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	\sim	
-20 dBm	/	-			1	
-30 dBm-						V
-50 dBm					-	
-60 dBm					-	
CF 2.402 G	Hz		1001 p	ts		Span 4.0 MHz
Marker						
	f Trc	X-value	Y-value	Function	Funct	ion Result
M1	1	2.401364 GHz	-5.79 dBm			
M2 D3 M	1 1	2.401992 GHz 1.192 MHz	0.40 dBm 0.16 dB			
	1			The same from	CONTRACTOR OF	100 100 100 100 100 100 100 100 100 100

Date: 10.JAN.2021 09:57:04 Spectrum Ref Level 30.00 dBm Att 40 dB Count 100/100
 Offset
 8.23 dB
 RBW
 50 kHz

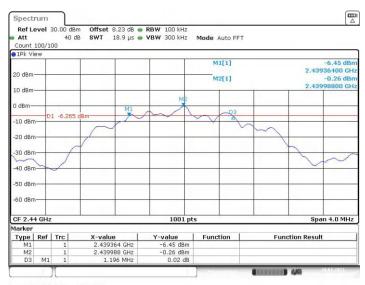
 SWT
 37.9 μs
 VBW
 200 kHz
 Mode
 Auto FFT
 ●1Pk Vie M1[1] 0.16 2.40199 20 dBm Dec Bw 10 dBm 0 dBm -10 dBm TI -20 dBm -30 dBm 40 dBm -50 dBm -60 dBm 4.0 MHz CF 2.402 (1001

Date: 10.JAN.2021 09:57:14

KSIGN

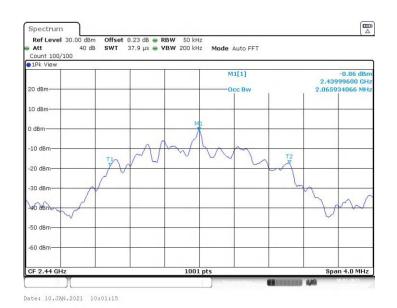
Report No.:KS2012S02697E

2440 MHz



Date: 10.JAN.2021 10:01:04

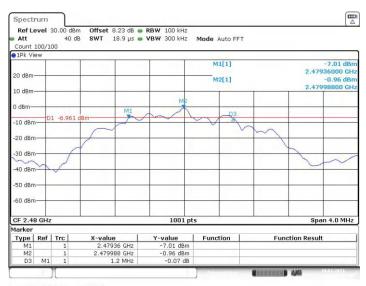
2440 MHz



KSIGN

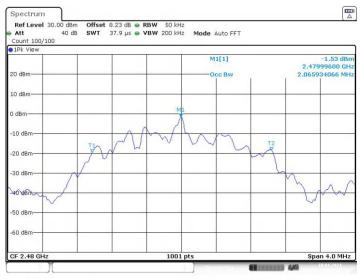
Report No.:KS2012S02697E

2480 MHz



Date: 10.JAN.2021 10:02:36

2480 MHz



Date: 10.JAN.2021 10:02:47



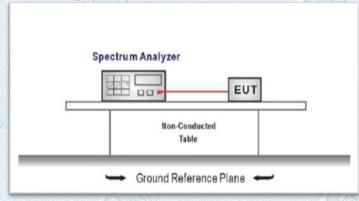
3.5. Band edge and Spurious Emission (conducted)

Limit

FCC CFR Title 47 Part 15 Subpart C Section15.247 (d):

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

Test Configuration



Test Procedure

- 1. Connect EUT RF Output port to the Spectrum Analyzer through an RF attenuator.
- 2. Spectrum Setting: RBW=100KHz VBW=300KHz.

Detector function: Peak. Trace: Max hold. Sweep = Auto couple.

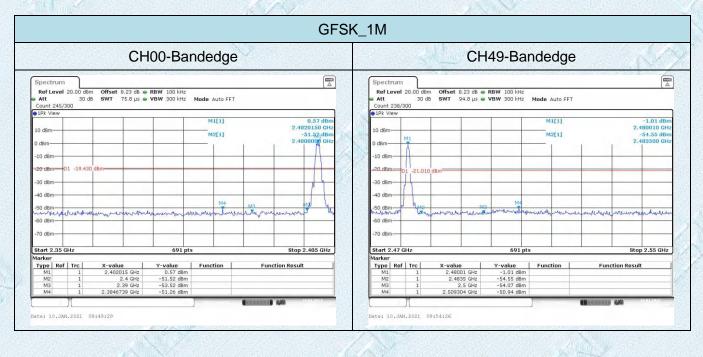
Allow the trace to stabilize.

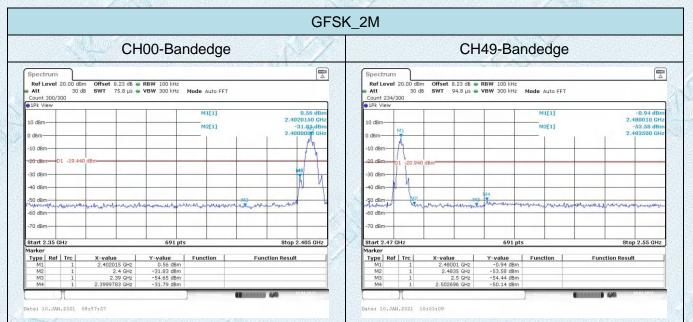
Test Mode

Please refer to the clause 2.2.

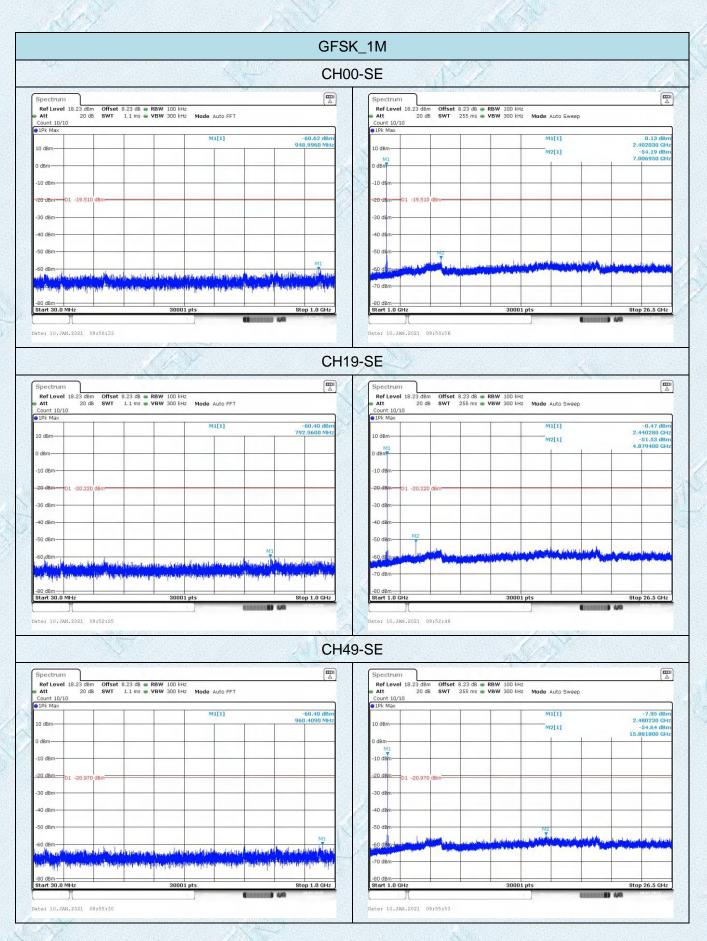


Test Results

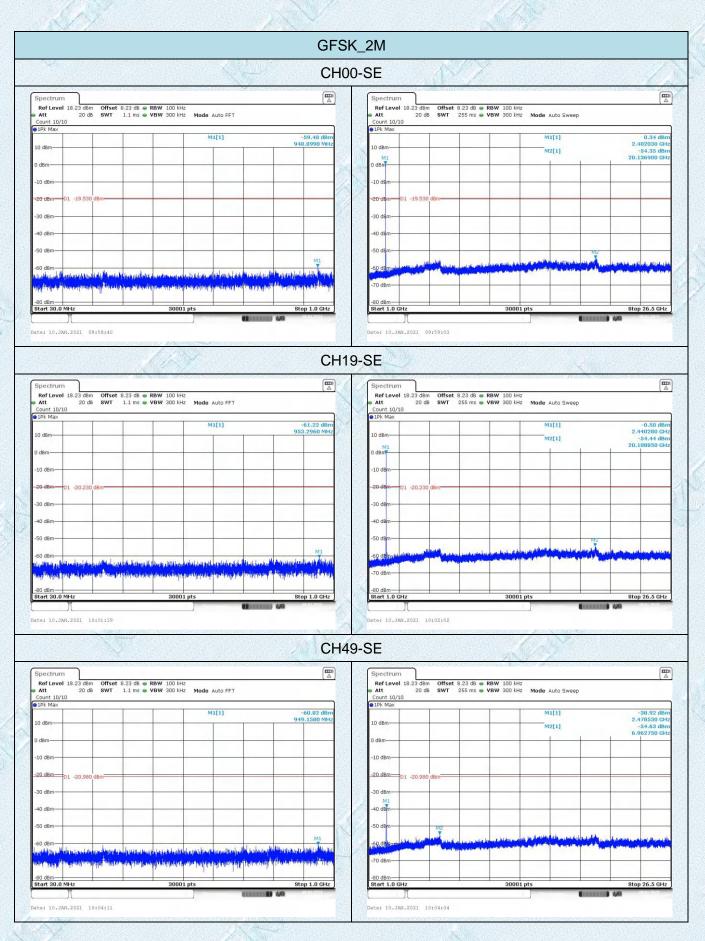














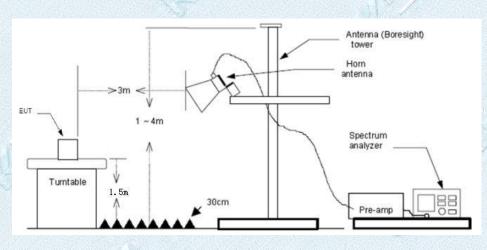
3.6. Band Edge Emissions(Radiated)

Limit

Restricted Frequency Band	(dBuV/m)(at 3m)				
(MHz)	Peak	Average			
2310 ~2390	74	54			
2483.5 ~2500	74	54			

Note: All restriction bands have been tested, only the worst case is reported.

Test Configuration



Test Procedure

- 1. The EUT was setup and tested according to ANSI C63.10:2013 requirements.
- 2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
- 3. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
- 4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
- The receiver set as follow: RBW=1MHz, VBW=3MHz PEAK detector for Peak value. RBW=1MHz, VBW=10Hz with PEAK Detector for Average Value.

Test Mode

Please refer to the clause 2.2.

Test Results

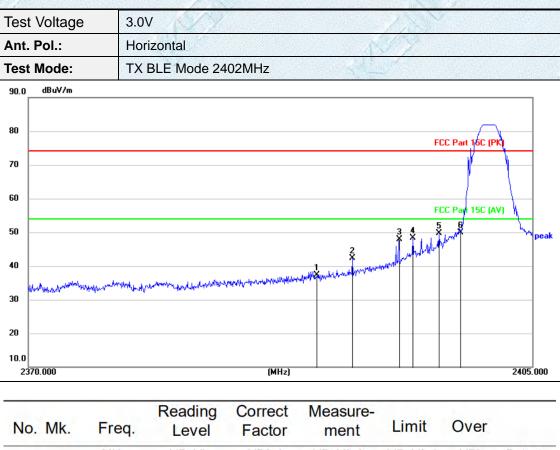
Note:

(1)Measurement = Reading level + Correct Factor

(2)Correct Factor=Antenna Factor + Cable Loss - Preamplifier Factor

(3)All modulation modes were tested, and only the worst data of GFSK_2M was recorded in the report.





	Over	Linin	ment	Factor	Level	Freq.	NO. IVIK
Detector	(dB)	(dBuV/m)	(dBuV/m)	(dB/m)	(dBuV)	MHz	
peak	36.78	74.00	37.22	-10.92	48.14	2390.000	1
peak	31.69	74.00	42.31	-10.92	53.23	2392.463	2
peak	26.17	74.00	47.83	-10.91	58.74	2395.676	3
peak	25.60	74.00	48.40	-10.92	59.32	2396.684	4
peak	24.28	74.00	49.72	-10.92	60.64	2398.518	5
peak	24.09	74.00	49.91	-10.92	60.83	2400.000	6 *

Emission Level= Read Level+ Correct Factor

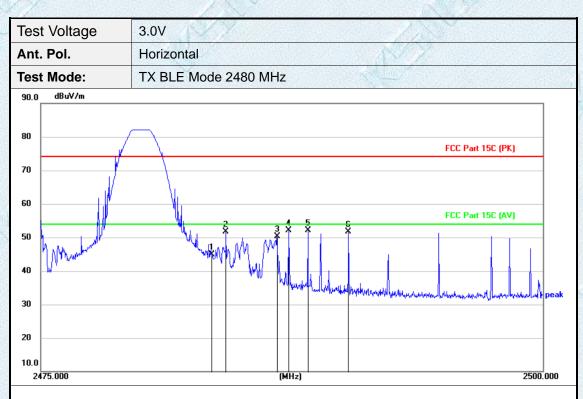
KSIGN

Test Voltage	3.0V
Ant. Pol.	Vertical
Test Mode:	TX BLE Mode 2402MHz
90.0 dBuV/m	
80	FCC Part 15C (PK)
70	
60	FCC Part 15C (AV)
50	1 × * * *
40 minul your transformer	drahl han war war and have a share the second share a
30	
20	
10.0	
2370.000	(MHz) 2405.000

No.	Mk.	Freq.	Level	Factor	ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		2378.092	54.95	-10.92	44.03	74.00	29.97	peak
2		2380.934	57.77	-10.93	46.84	74.00	27.16	peak
3		2390.000	45.94	-10.92	35.02	74.00	38.98	peak
4		2391.445	53.82	-10.92	42.90	74.00	31.10	peak
5		2396.814	61.01	-10.92	50.09	74.00	23.91	peak
6	*	2400.000	62.16	-10.92	51.24	74.00	22.76	peak

Emission Level= Read Level+ Correct Factor





No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		2483.500	55.71	-10.88	44.83	74.00	29.17	peak
2		2484.207	62.67	-10.88	<mark>51.79</mark>	74.00	22.21	peak
3		2486.738	61.25	<mark>-10.88</mark>	50.37	74.00	23.63	peak
4	*	2487.335	62.96	-10.88	52.08	74.00	21.92	peak
5		2488.282	62.92	-10.88	52.04	74.00	21.96	peak
6		2490.310	62.63	-10.89	51.74	74.00	22.26	peak

Emission Level= Read Level+ Correct Factor

KSIGN

and a start of the second s		
Vertical		
TX BLE Mode 2480	MHz	
$\overline{\}$		FCC Part 15C (PK)
		FCC Part 15C (AV)
	* *	5
- AND	Mar Marine Marin	5 S
		Landon and the second
	(MHz)	2500.000
	TX BLE Mode 2480	TX BLE Mode 2480 MHz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		2483.500	54.79	-10.88	43.91	74.00	30.09	peak
2		2484.690	60.42	-10.88	49.54	74.00	24.46	peak
3	*	2486.383	61.51	-10.88	50.63	74.00	23.37	peak
4		2491.480	59.90	-10.89	49.01	74.00	24.99	peak
5		2494.760	56.25	-10.87	45.38	74.00	28.62	peak
6		2497.090	54.06	-10.88	43.18	74.00	30.82	peak

Emission Level= Read Level+ Correct Factor

Over= Limit - Measure-ment

3.7. Spurious Emission (Radiated)

Limit

Radiated Emission Limits (9 kHz~1000 MHz)

Frequency (MHz)	Field Strength (microvolt/meter)	Measurement Distance (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

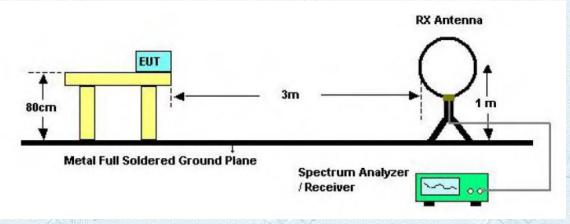
Radiated Emission Limit (Above 1000MHz)

Frequency	Distance Meters(at 3m)					
(MHz)	Peak	Average				
Above 1000	74	54				

Note:

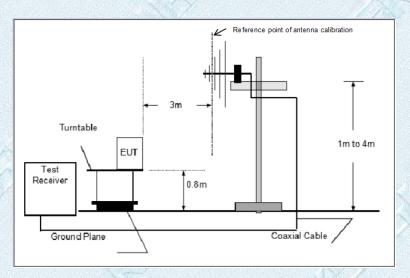
- (1) The tighter limit applies at the band edges.
- (2) Emission Level (dBuV/m)=20log Emission Level (uV/m).

Test Configuration

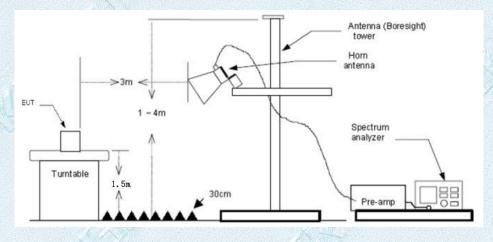


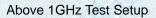
Below 30MHz Test Setup











Test Procedure

- 1. The EUT was setup and tested according to ANSI C63.10:2013
- 2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
- 3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
- 4. 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.
- 5. Set to the maximum power setting and enable the EUT transmit continuously.
- 6. Use the following spectrum analyzer settings
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Below 1 GHz:

RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;

If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

(3) From 1 GHz to 10th harmonic:

RBW=1MHz, VBW=3MHz Peak detector for Peak value.

RBW=1MHz, VBW=10Hz Peak detector for Average value.



Test Mode

Please refer to the clause 2.2.

Test Result

9 KHz~30 MHz and 18GHz~25GHz

From 9 KHz~30 MHz and 18GHz~25GHz: Conclusion: PASS

Note:

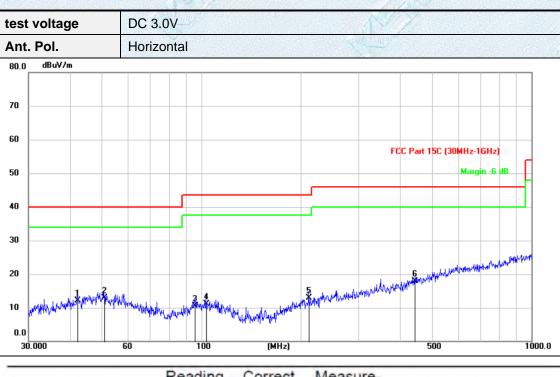
- Measurement = Reading level + Correct Factor
 Correct Factor=Antenna Factor + Cable Loss -Preamplifier Factor
- 2) The peak level is lower than average limit(54 dBuV/m), this data is the too weak instrument of signal is unable to test.
- 3) The emission levels of other frequencies are very lower than the limit and not show in test report.
- 4) The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
- 5) Pre-scan CH00, CH19 and CH49 modulation, and found the GFSK_2M_CH00 which it is worse case for 30MHz-1GHz, so only show the test data for worse case.
- 6) Over= Limit Measure-ment

BELOW 30MHZ

No emission found between lowest internal used/generated frequencies to 30MHz.

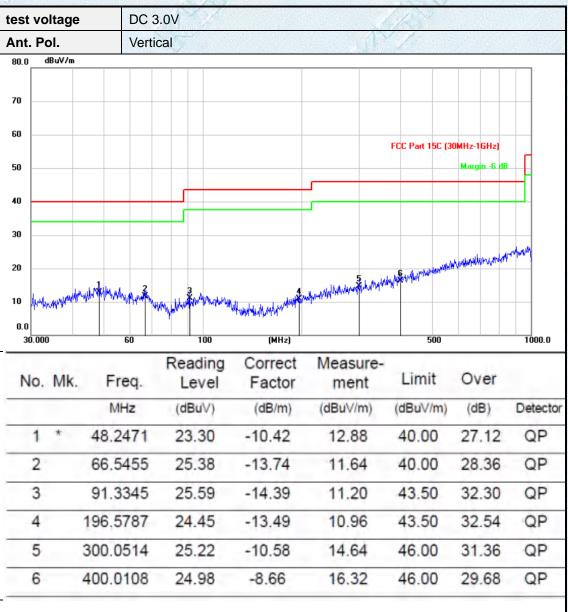


30MHz-1GHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	(dBu∀)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		42.1837	23.29	-11.28	12.01	40.00	27.99	QP
2	*	50.8528	23.44	-10.47	12.97	40.00	27.03	QP
3		95.7286	23.75	-13.24	10.51	43.50	32.99	QP
4		103.5147	24.00	-12.85	11.15	43.50	32.35	QP
5	-	211.8977	25.70	-12.86	12.84	43.50	30.66	QP
6		444.3837	25.42	-7.49	17.93	46.00	28.07	QP
_								

Emission Level= Read Level+ Correct Factor



Adobe 1GHz

Test model: H4

1031 4	voltage	e D	OC 3.0V							
Ant.	Pol.	Н	lorizontal							
Test	Mode	: Т	X BLE Mode	e 2402M	Hz	S. S.				
90.0	dBu¥/m									
80								F	CC Part 15C (PK	k)
70										
~										
60								F	CC Part 15C (AV	
50									A watcher	6 ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
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20										
10.0										
1000.										
	1.000			3000.000	(MHz)	6000.	000	9000.000)	18000.000
1.0	585		Reading	g Cor	rect	Measu	re-		Sec. 12	18000.000
No.	. <mark>Mk.</mark>	Freq.	Reading Level	g Cor			re-	9000.000	Over	18000.000
No.	585	Freq. MHz	Reading	g Cor Fac	rect	Measu	re- t		Over	18000.000 Detector
No.	Mk.		Reading Level (dBuV)	g Cor Fac	rect ctor 3/m)	Measu ment	re- t	Limit	Over	
	. Mk.	MHz	Reading Level (dBuV) 0 44.42	g Cor Fac (dE	rect ctor ^{3/m)}	Measur ment (dBuV/m	re- t	Limit (dBuV/m)	Over (dB)	Detector
1	. Mk.	MHz 3726.800	Reading Level (dBuV) 0 44.42 0 43.18	g Cor Fac (dE -9.1	rect ctor ^{3/m)} 12 55	Measur ment (dBuV/m 35.30	re- t))	Limit (dBuV/m) 74.00	Over (dB) 38.70	Detector peak
1	. Mk.	MHz 3726.800 4573.400	Reading Level (dBuV) 0 44.42 0 43.18 0 42.61	g Cor Fac (dE -9.1	rect ctor 3/m) 12 55 40	Measur ment (dBuV/m 35.30 36.63	re- t))	Limit (dBuV/m) 74.00 74.00	Over (dB) 38.70 37.37	Detector peak peak peak
1 2 3 4	Mk.	MHz 3726.800 4573.400 6412.800 7205.000	Reading Level (dBuV) 0 44.42 0 43.18 0 42.61 0 42.69	g Cor Fac (dE -9. -6. -2.4 -0.0	rect ctor 3/m) 12 55 40 09	Measur ment (dBuV/m 35.30 36.63 40.21 42.60	re- t)))	Limit (dBuV/m) 74.00 74.00 74.00 74.00	Over (dB) 38.70 37.37 33.79 31.40	Detector peak peak peak peak
1 2 3	Mk.	MHz 3726.800 4573.400 6412.800	Reading Level (dBuV) 0 44.42 0 43.18 0 42.61 0 42.69 0 42.02	g Cor Fac (dE -9. -6. -2.4	rect ctor 3/m) 12 55 40 09 38	Measur ment (dBuV/m 35.30 36.63 40.21	re- t)))	Limit (dBuV/m) 74.00 74.00 74.00	Over (dB) 38.70 37.37 33.79	Detector peak peak peak

Emission Level= Read Level+ Correct Factor

est vol	tage	DC 3	.0V	No.				
Ant. Po	d.	Verti	cal			6123		
Test Mo	ode:	TX B	LE Mode	2402MHz	1			
90.0 dB	uV/m							
80						FC	C Part 15C (PK	(<u>)</u>
70								
60						FC	C Part 15C (AV	
50					3		5 mm	6 low peal
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20	• • • •	m., entra	3	000.000 (MHz)	6000.000	9000.000		18000.000
20)				6000.000 Measure- ment	9000.000 Limit	Over	18000.000
20)	eq.	Reading	000.000 (MHz) Correct	Measure-	Long I	Over (dB)	
20	nk. Fre	z.	3 Reading Level	ооо.ооо (мн₂) Correct Factor	Measure- ment	Limit	101020	Detecto
20 10.0 1000.000	n 1k. Fre MH	eq. z)00	з Reading Level (dBuV)	Correct Factor (dB/m)	Measure- ment (dBuV/m)	Limit (dBuV/m)	(dB)	Detecto peak
20 10.0 1000.000 No. N	лк. Fre Мн 3720.0	eq. z)000 300	3 Reading Level (dBuV) 52.00	000.000 (MH2) Correct Factor (dB/m) -9.13	Measure- ment (dBuV/m) 42.87	Limit (dBuV/m) 74.00	(dB) 31.13	Detecto peak peak
20 10.0 1000.000 No. N 1 2	лк. Fre мн 3720.0 4984.8	eq. z 000 300 300	3 Reading Level (dBuV) 52.00 44.73	000.000 (MH2) Correct Factor (dB/m) -9.13 -5.43	Measure- ment (dBuV/m) 42.87 39.30	Limit (dBuV/m) 74.00 74.00	(dB) 31.13 34.70	Detector peak peak peak
20 10.0 1000.000 No. N 1 2 3	лк. Fre Мн 3720.0 4984.8 5994.6	z 2000 300 500 700	3 Reading Level (dBuV) 52.00 44.73 50.95	Correct Factor (dB/m) -9.13 -5.43 -3.81	Measure- ment (dBuV/m) 42.87 39.30 47.14	Limit (dBuV/m) 74.00 74.00 74.00	(dB) 31.13 34.70 26.86	Detecto peak peak peak



test	voltag	е	DC	3.0V				1	SAY -		
Ant	. Pol.		Hor	izontal				and the			
Tes	t Mode):	ТΧ	BLE Mode	2440M	Hz		1			
90.0	dBuV/m	1					1				
80									F	CC Part 15C (PK	
70											
60									F	CC Part 15C (AV	<u></u>
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20											
10.0 10	00.000			3	000.000	(MHz)	6000). 000	9000.00	D	18000.000
	_			Reading	Cor	rect	Measu	ire-			
No	. Mk.	Fre	eq.	Level		ctor	men		Limit	Over	
		MH	z	(dBuV)	(dE	8/m)	(dBuV/r	n)	(dBuV/m)	(dB)	Detector
1		4156.9	900	43.27	-7.9	91	35.3	6	74.00	38.64	peak
2		4879.4	400	46.58	-5.	72	40.8	6	74.00	33.14	peak
3		5981.0	000	43.98	-3.8	_	40.14	4	74.00	33.86	peak
4		8106.0	000	41.41	2.0	14	43.4	5	74.00	30.55	peak
5	1	0115.4	400	40.22	4.2	27	44.4	9	74.00	29.51	peak
6	* 1	7269.0	000	37.50	13.	23	50.73	3	74.00	23.27	peak



test v	voltag	e	DC :	3.0V				SAY.			
Ant.	Pol.		Vert	ical				half			
Test	Mode	:	TX E	BLE Mode	2440MH	łz					
90.0	dBu∀/m	1									
80									FC	C Part 15C (PK	.
70											
60									FCI	C Part 15C (AV	0
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10.0	0.000				000.000	(MHz)	6000.000	900	D.000		18000.000
	0.000			Reading	Corre		Measure-		0.000		10000.000
No.	Mk.	Fre	q.	Level	Fac		ment	Limi	t	Over	
		MHz	Z	(dBuV)	(dB/	m)	(dBuV/m)	(dBuV)	/m)	(dB)	Detector
1		3731.9	00	52.20	-9.0	9	43.11	74.0	0	30.89	peak
2		4879.4	00	47.30	-5.7	2	41.58	74.0	0	32.42	peak
3		5805.9	00	48.49	-4.2	3	44.26	74.0	0	29.74	peak
4		5986.1	00	49.77	-3.8	4	45.93	74.0	0	28.07	peak
5		8107.7	00	41.86	2.04	1	43.90	74.0	0	30.10	peak
6	* 1	6396.9	00	36.66	13.5	6	50.22	74.0	0	23.78	peak

KSIGN

test	volta	ge	DC	3.0V				10/2		
Ant	. Pol.		Hor	izontal				anny see		
Tes	t Moc		TX	BLE Mode 2	2480M	IHz				
90.0	dBuV	/m								
80									FCC Part 15C (Pl	K)
70										
60									FCC Part 15C (A)	v1
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20										
10.0 10	00.000			31	000.000	(MHz)	6000.00	0 9000	.000	18000.000
No	. Mk	. F	req.	Reading Level		rect ctor	Measure ment	e- Limit	Over	
		N	IHz	(dBuV)	(dE	B/m)	(dBuV/m)	(dBuV/	m) (dB)	Detector
1		3255	.900	44.39	-10	.13	34.26	74.00	39.74	peak
2		4961	.000	47.50	-5.	50	42.00	74.00	32.00	peak
3		8092	.400	41.28	2.0	05	43.33	74.00	30.67	peak
4		8826	.800	42.25	1.8	37	44.12	74.00	29.88	peak
5	i	13075	.100	37.61	10.	04	47.65	74.00	26.35	peak
6	*	16531	.200	36.23	13.	76	49.99	74.00	24.01	peak

Emission Level= Read Level+ Correct Factor



40 1 2 3 </th <th></th>	
90.0 dBuV/m 80 80 60 60 60 60 60 60	n
80	n
1 1 <th>n</th>	n
60	
100 100 <th></th>	
50 1 2 30 50 50 50 20 1 2 30 50 50	
40 30 ym/stablightering.gamenetigen	
30 ₁ m/s/s/s/l/h-s/s/s/s/s/s/s/s/s/s/s/s/s/s/s/s/s/s/s	
10.0 100.000 3000.000 (MHz) 6000.000 9000.000	18000.000
Reading Correct Measure-	
No. Mk. Freq. Level Factor ment Limit Over	
MHz (dBuV) (dB/m) (dBuV/m) (dBuV/m) (dB)	Detector
1 3728.500 50.07 -9.12 40.95 74.00 33.05	peak
2 4961.000 47.58 -5.50 42.08 74.00 31.92	peak
3 5778.700 46.63 -4.30 42.33 74.00 31.67	peak
4 5998.000 50.49 -3.81 46.68 74.00 27.32	peak
5 8658.500 41.61 1.90 43.51 74.00 30.49	peak
6 * 13807.800 37.80 10.99 48.79 74.00 25.21	peak

Note: All modulation modes were tested, and only the worst data of GFSK_2M was recorded in the report.



3.8. Conducted Emission

Limit

Conducted Emission Test Limit

Frequency	Maximum RF Line Voltage (dBµV)					
Frequency	Quasi-peak Level	Average Level				
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *				
500kHz~5MHz	56	46				
5MHz~30MHz	60	50				

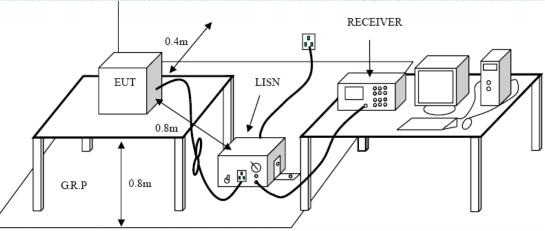
Notes:

(1) *Decreasing linearly with logarithm of the frequency.

(2) The lower limit shall apply at the transition frequencies.

(3) The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

Test Configuration



Test Procedure

- 1. The EUT was setup according to ANSI C63.10:2013 requirements.
- The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
- The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50ohm /50uH coupling impedance for the measuring equipment.
 The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
- 4. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
- 5. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
- 6. Conducted Emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
- 7. During the above scans, the emissions were maximized by cable manipulation.

Test Mode:

Please refer to the clause 2.2.

Test Results

N/A

The product is dry battery power supply.



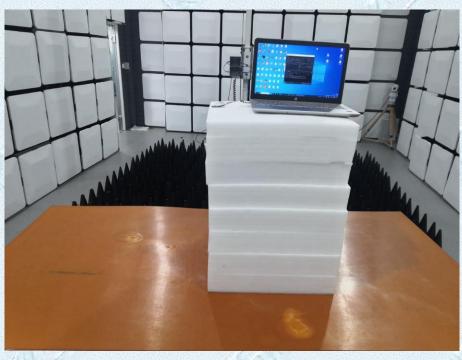
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4.EUT TEST PHOTOS

Radiated Measurement (Below 1GHz)



Radiated Measurement (Above 1GHz)











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5.PHOTOGRAPHS OF EUT CONSTRUCTIONAL

External Photographs Made in China















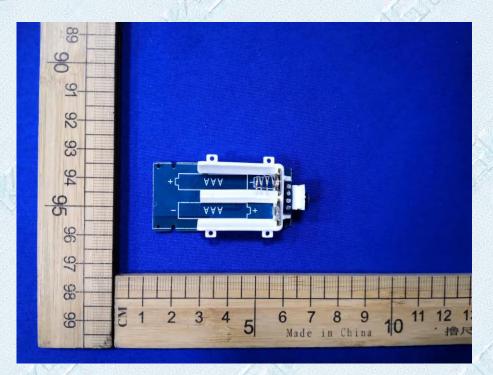


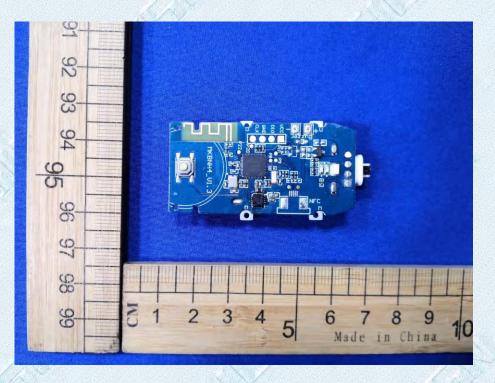


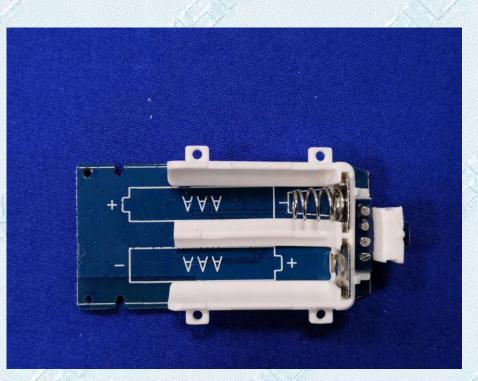


Internal photos













*****THE END*****