FCC TEST REPORT					
	FOR				
S	Shenzhen L&Y Audio Co., LTD				
	Bluetooth Speaker				
	Test Model: RockStar				
List M	Model No.: Please Refer to Page 6				
Prepared for Address	<ul> <li>Shenzhen L&amp;Y Audio Co., LTD</li> <li>No.2 Bldg, No.2 Industrial Zone, Tong Fu YuIndustrial, Tang Xia Yong, Songgang, Bao'an District, Shenzhen, Guangdong, China</li> </ul>				
Prepared by Address	<ul> <li>Shenzhen LCS Compliance Testing Laboratory Ltd.</li> <li>1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China</li> </ul>				
Tel Fax	: (+86)755-82591330 : (+86)755-82591332				
Web Mail	: www.LCS-cert.com : webmaster@LCS-cert.com				
Date of receipt of test sample Number of tested samples Serial number Date of Test Date of Report	<ul> <li>January 09, 2017</li> <li>1</li> <li>Prototype</li> <li>January 09, 2017~July 12, 2017</li> <li>July 12, 2017</li> </ul>				

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# FCC TEST REPORT FCC CFR 47 PART 15 C(15.247): 2016 Report Reference No. ..... : LCS1701090928E Date of Issue ..... : July 12, 2017 Testing Laboratory Name ......:: Shenzhen LCS Compliance Testing Laboratory Ltd. Bao'an District, Shenzhen, Guangdong, China Testing Location/ Procedure...... : Full application of Harmonised standards Partial application of Harmonised standards Other standard testing method Applicant's Name...... : Shenzhen L&Y Audio Co., LTD Address ...... 5 No.2 Bldg, No.2 Industrial Zone, Tong Fu YuIndustrial, Tang Xia Yong, Songgang, Bao'an District, Shenzhen, Guangdong, China Test Specification Standard.....: FCC CFR 47 PART 15 C(15.247): 2016 Test Report Form No. ..... : LCSEMC-1.0 TRF Originator ...... : Shenzhen LCS Compliance Testing Laboratory Ltd. Master TRF ..... : Dated 2011-03 Shenzhen LCS Compliance Testing Laboratory Ltd. All rights reserved. This publication may be reproduced in whole or in part for non-commercial purposes as long as the Shenzhen LCS Compliance Testing Laboratory Ltd. is acknowledged as copyright owner and source of the material. Shenzhen LCS Compliance Testing Laboratory Ltd. takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context. Test Item Description. ..... : Bluetooth Speaker Trade Mark..... : DREAMWAVE Test Model ..... : RockStar Ratings ...... DC 18.5V by battery (5200mAh) Recharge Voltage: 24V----, 4A Input: 24V...... 4A Result .....: Positive Compiled by: Supervised by: Approved by:

Ada Liang/ File administrators

Dick Su/ File administrators

Gavin Liang/ Manager

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# **FCC -- TEST REPORT**

Т

Test Report No. : LCS1701090928E		<u>July 12, 2017</u> Date of issue		
Test Medel				
Test Model	: RockStar			
EUT	: Bluetooth Speaker			
Applicant	: Shenzhen L&Y Audio	Co., LTD		
Address	: No.2 Bldg, No.2 Indust	rial Zone, Tong Fu YuIndustrial,Tang Xia n District, Shenzhen, Guangdong, China		
Telephone	: /			
Fax	:/			
Manufacturer	: Shenzhen L&Y Audio	Co., LTD		
Address		rial Zone, Tong Fu YuIndustrial,Tang Xia n District, Shenzhen, Guangdong, China		
Telephone	:/			
Fax	: /			
Factory	: Shenzhen L&Y Audio	Co., LTD		
Address	0	rial Zone, Tong Fu YuIndustrial,Tang Xia n District, Shenzhen, Guangdong, China		
Telephone	: /			
Fax	: /			

**Test Result** 

Positive

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

# **Revision History**

Revision	Issue Date	Revisions	Revised By
00	July 12, 2017	Initial Issue	Gavin Liang

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# TABLE OF CONTENTS

Description	Page
1. GENERAL INFORMATION	6
1.1 Description of Device (EUT)	6
1.2 Support equipment List	7
1.3 External I/O Cable	
1.4 Description of Test Facility	
1.5 Statement of the Measurement Uncertainty	
1.6 Measurement Uncertainty	
1.7 Description of Test Modes	
2. TEST METHODOLOGY/	
2.1 EUT Configuration	
2.2 EUT Exercise	
2.3 General Test Procedures	
2.4. Test Sample	
3.1 Justification.	
3.2 EUT Exercise Software 3.3 Special Accessories	
3.4 Block Diagram/Schematics	
3.5 Equipment Modifications	
3.6 Test Setup	
4. SUMMARY OF TEST RESULTS	
5. SUMMARY OF TEST EQUIPMENT	
6. MEASUREMENT RESULTS	
6.1 Peak Power	
6.2 Frequency Separation and 20 dB Bandwidth	
6.3 Number of Hopping Frequency	
6.4 Time of Occupancy (Dwell Time)	22
6.5 Conducted Spurious Emissions and Band Edges Test	26
6.6 Restricted Band Emission Limit	
6.7. AC Power line conducted emissions	
6.8. Band-edge measurements for radiated emissions	
6.9. Pseudorandom frequency hopping sequence	
6.10. Antenna requirement	
7. TEST SETUP PHOTOGRAPHS	
8.EXTERNAL AND INTERNAL PHOTOS OF THE EUT	55

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# **1. GENERAL INFORMATION**

1.1 Description of Device (EUT)				
EUT	: Bluetooth Speaker			
Test Model	: RockStar			
List Model No.	: RockStar +, RockStar M, RockStar S, RockStar C			
Model Declaration	: PCB board, structure and internal of these model(s) are the same,So no additional models were tested.			
Power Supply	: DC 18.5V by battery (5200mAh) Recharge Voltage: 24V <sup></sup> , 4A Input: 24V <sup></sup> , 4A			
Hardware version	: V1.0			
Software version	: V1.0			
Bluetooth Operation frequenc	y : 2402MHz-2480MHz			
Bluetooth Version	: V4.0			
Bluetooth Channel Number	<ul><li>: 79 Channels for Bluetooth V3.0(DSS)</li><li>40 Channels for Bluetooth V4.0(DTS)</li></ul>			
Bluetooth Modulation Type	: GFSK, $\pi$ /4-DQPSK , 8-DPSK for Bluetooth V3.0(DSS) GFSK for Bluetooth V4.0(DTS)			
Antenna Description	: Internal Antenna, 1.5dBi(Max.)			

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# 1.2 Support equipment List

Manufacturer	Description	Model	Serial Number	Certificate
Lenovo	PC	B470		DOC
Lenovo	AC/DC ADAPTER	ADP-90DDB		DOC
	AC-DC ADAPTER	KLC-2400400		VOC

# 1.3 External I/O Cable

I/O Port Description	Quantity	Cable
MIC PORT	3	N/A
AG/BASS PORT	1	N/A
KB/BASS PORT	1	N/A
ELECTRIC DRUM PORT	1	N/A
LINE IN PORT	2	N/A
USB PORT	1	N/A
DC PORT	1	N/A

# 1.4 Description of Test Facility

CNAS Registration Number. is L4595. FCC Registration Number. is 899208. Industry Canada Registration Number. is 9642A-1. ESMD Registration Number. is ARCB0108. UL Registration Number. is 100571-492. TUV SUD Registration Number. is SCN1081. TUV RH Registration Number. is UA 50296516-001

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10:2013 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

# 1.5 Statement of the 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 CISPR 16 – 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the LCS quality 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.

# 1.6 Measurement Uncertainty

Test Item		Frequency Range	Uncertainty	Note
		9KHz~30MHz	3.10dB	(1)
		30MHz~200MHz	2.96dB	(1)
Radiation Uncertainty	:	200MHz~1000MHz	3.10dB	(1)
		1GHz~26.5GHz	3.80dB	(1)
		26.5GHz~40GHz	3.90dB	(1)
Conduction Uncertainty	:	150kHz~30MHz	1.63dB	(1)
Power disturbance	:	30MHz~300MHz	1.60dB	(1)

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

# 1.7 Description of Test Modes

Bluetooth operates in the unlicensed ISM Band at 2.4GHz. With basic data rate feature, the data rates can be up to 1 Mb/s by modulating the RF carrier using GFSK techniques. The EUT works in the X-axis, Y-axis, Z-axis. The following operating modes were applied for the related test items. All test modes were tested, only the result of the worst case was recorded in the report.

Mode of Operations	Frequency Range (MHz)	Data Rate (Mbps)		
	2402	1/2/3		
BT V 3.0	2441	1/2/3		
	2480	1/2/3		
For Conducted Emission				
Test Mode		TX Mode		
For Radiated Emission				
Test Mode		TX Mode		

Worst-case mode and channel used for 150 kHz-30 MHz power line conducted emissions was the mode and channel with the highest output power that was determined to be TX (1Mbps).

Worst-case mode and channel used for 9kHz-1000 MHz radiated emissions was the mode and channel with the highest output power, that was determined to be TX(1Mbps-Low Channel).

Pre-test AC conducted emission at charge from PC mode, recorded worst case.

Pre-test AC conducted emission at both voltage AC 120V/60Hz and AC 240V/50Hz, recorded worst case.

# 2. TEST METHODOLOGY/

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR PART 15C 15.207, 15.209, 15.247 and DA 00-705.

# 2.1 EUT Configuration

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

# 2.2 EUT Exercise

The EUT was operated in the normal operating mode for Hopping Numbers and Dwell Time test and a continuous transmits mode for other tests.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209, 15.247 under the FCC Rules Part 15 Subpart C.

# 2.3 General Test Procedures

#### 2.3.1 Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane.. According to the requirements in Section 6.2.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

#### 2.3.2 Radiated Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10-2013

# 2.4. Test Sample

The application provides 2 samples to meet requirement;

Sample Number	Description
Sample 1	Engineer sample – continuous transmit
Sample 2	Normal sample – Intermittent transmit

# **3. SYSTEM TEST CONFIGURATION**

# 3.1 Justification

The system was configured for testing in a continuous transmits condition.

# 3.2 EUT Exercise Software

The system was configured for testing in a continuous transmits condition and change test channels by software (MP\_kit\_RF TOOL) provided by application.

# 3.3 Special Accessories

Manufacturer	Description	Model	Serial Number	Certificate
Lenovo	PC	B470		DOC
Lenovo	AC/DC ADAPTER	ADP-90DDB		DOC

# 3.4 Block Diagram/Schematics

Please refer to the related document.

# 3.5 Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

# 3.6 Test Setup

Please refer to the test setup photo.

# 4. SUMMARY OF TEST RESULTS

Applied Standard: FCC Part 15 Subpart C				
FCC Rules	FCC Rules Description of Test		Result	
§15.247(b)(1)	Maximum Conducted Output Power	Sample 1	Compliant	
§15.247(c)	Frequency Separation And 20 dB Bandwidth	Sample 1	Compliant	
§15.247(a)(1)(ii)	Number Of Hopping Frequency	Sample 2	Compliant	
§15.247(a)(1)(iii)	Time Of Occupancy (Dwell Time)	Sample 2	Compliant	
§15.209, §15.247(d)	Radiated and Conducted Spurious Emissions	Sample 1	Compliant	
§15.205	Emissions at Restricted Band	Sample 1	Compliant	
§15.207(a)	Conducted Emissions	Sample 1	Compliant	
§15.203	Antenna Requirements	Sample 1	Compliant	
§15.247(i)§2.1093	RF Exposure	N/A	Compliant	

# 5. SUMMARY OF TEST EQUIPMENT

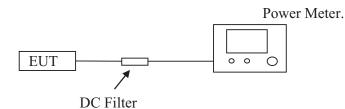
Item	Equipmont	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
	Equipment					
1	Power Sensor	R&S	NRV-Z51	100458	2017-06-18	2018-06-17
2	Power Sensor	R&S	NRV-Z32	10057	2017-06-18	2018-06-17
3	Power Meter	R&S	NRVS	100444	2017-06-18	2018-06-17
4	DC Filter	MPE	23872C	N/A	2017-06-18	2018-06-17
5	RF Cable	Harbour Industries	1452	N/A	2017-06-18	2018-06-17
6	SMA Connector	Harbour Industries	9625	N/A	2017-06-18	2018-06-17
7	Spectrum Analyzer	Agilent	N9020A	MY50510140	2016-10-27	2017-10-26
8	Signal analyzer	Agilent	E4448A(Exter nal mixers to 40GHz)	US44300469	2017-06-16	2018-06-15
9	RF Cable	Hubersuhne	Sucoflex104	FP2RX2	2017-06-18	2018-06-17
10	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2017-06-18	2018-06-17
11	Amplifier	SCHAFFNER	COA9231A	18667	2017-06-18	2018-06-17
12	Amplifier	Agilent	8449B	3008A02120	2017-06-16	2018-06-15
13	Amplifier	MITEQ	AMF-6F-2604 00	9121372	2017-06-16	2018-06-15
14	Loop Antenna	R&S	HFH2-Z2	860004/001	2017-06-18	2018-06-17
15	By-log Antenna	SCHWARZBEC K	VULB9163	9163-470	2017-06-10	2018-06-09
16	Horn Antenna	EMCO	3115	6741	2017-06-10	2018-06-09
17	Horn Antenna	SCHWARZBEC K	BBHA9170	BBHA9170154	2017-06-10	2018-06-09
18	RF Cable-R03m	Jye Bao	RG142	CB021	2017-06-18	2018-06-17
19	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	2017-06-18	2018-06-17
20	EMI Test Receiver	ROHDE & SCHWARZ	ESCI	101142	2017-06-18	2018-06-17
21	Artificial Mains	ROHDE & SCHWARZ	ENV216	101288	2017-06-18	2018-06-17
22	EMI Test Software	AUDIX	E3	N/A	2017-06-18	2018-06-17

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# 6. MEASUREMENT RESULTS

# 6.1 Peak Power

6.1.1 Block Diagram of Test Setup



# 6.1.2 Limit

According to §15.247(b)(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.

# 6.1.3 Test Procedure

The transmitter output is connected to the Power Meter.

#### 6.1.4 Test Results

Temperature	25.6℃	Humidity	54.2%
Test Engineer	Jayden Zhuo	Configurations	BT

Test Mode	Channel	Frequency (MHz)	Measured Maximum Peak Power (dBm)	Limits (dBm)	Verdict
	0	2402	1.098		
GFSK	39	2441	1.667	30	PASS
	78	2480	0.516		
	0	2402	0.101		
π/4-DQPSK	39	2441	0.710	21	PASS
	78	2480	0.569		
	0	2402	0.124		
8-DPSK	39	2441	0.762	21	PASS
	78	2480	0.548		

Remark:

1. Test results including cable loss;

2. please refer to following plots;

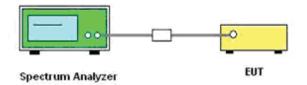
3. Measured output power at difference Packet Type for each mode and recorded worst case for each mode.

# 6.2 Frequency Separation and 20 dB Bandwidth

# 6.2.1 Limit

According to §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 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.

6.2.2 Block Diagram of Test Setup



#### 6.2.3 Test Procedure

Frequency separation test procedure :

1). Place the EUT on the table and set it in transmitting mode.

2). Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.

3). Set center frequency of Spectrum Analyzer = middle of hopping channel.

4). Set the Spectrum Analyzer as RBW = 100 kHz, VBW = 300 kHz, Span = wide enough to capture the peaks of two adjacent channels, Sweep = auto.

5). Max hold, mark 2 peaks of hopping channel and record the 2 peaks frequency.

20dB bandwidth test procedure :

1). Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel.

2). RBW ≥1% of the 20 dB bandwidth, VBW ≥RBW.

- 3). Detector function = peak.
- 4). Trace = max hold.

6.2.4 Test Results

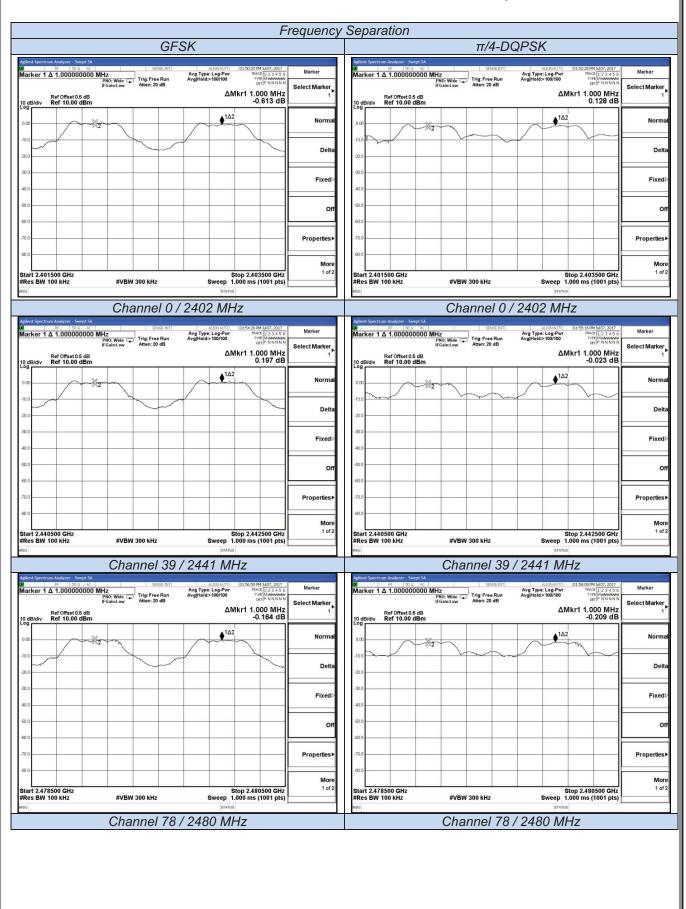
Temperature	25.6°C	Humidity	54.2%
Test Engineer	Jayden Zhuo	Configurations	BT

Т	he Measurement Re	sult With 1Mbps For	GFSK Modulation			
Channel	20dB Bandwidth (KHz)	Channel Separation (MHz)	Limit (KHz)	Result		
Low	823.40		823.40	Pass		
Middle	742.50	1.000	742.50	Pass		
High	733.90		733.90	Pass		
The Measurement Result With 2Mbps For $\pi/4$ -DQPSK Modulation						
Channel	20dB Bandwidth (KHz)	Channel Separation (MHz)	Limit (KHz)	Result		
Low	1115.00		743.33	Pass		
Middle	1118.00	1.000	745.33	Pass		
High	1115.00		743.33	Pass		
Th	e Measurement Res	ult With 3Mbps For 8	-DPSK Modulation	า		
Channel	20dB Bandwidth (KHz)	Channel Separation (MHz)	Limit (KHz)	Result		
Low	1164.00		776.00	Pass		
Middle	1156.00	1.000	770.67	Pass		
High	1164.00		776.00	Pass		

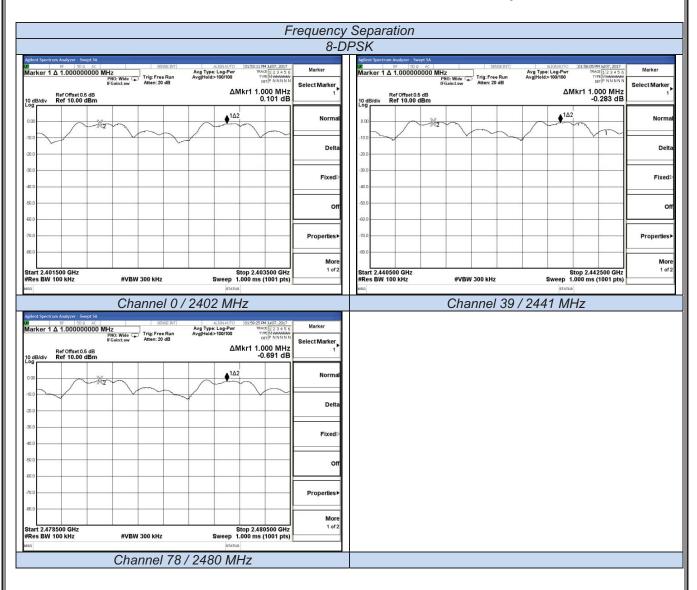
Remark:

1. Test results including cable loss;

please refer to following plots;
 Measured at difference Packet Type for each mode and recorded worst case for each mode.



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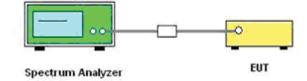
Т	est Plat a	f Test Result
		PSK
Agilent Spectrum Analyzer - Occupied BW	02	Agilent Spectrum Analyzer - Occupied BW
Off         SSC         SSC <td>Trace/Detector</td> <td>Bit         Bit         Bit         ADDAMO         D022321PM M00,2007           Center Freq 2.441001500 GHz         Center Freq 2.441001500 GHz         Center Freq 2.441001500 GHz         Raidie Skit None           #FGaint.tww         Freq Bun         Avgit/side-10/10         Raidie Skit None           #FGaint.tww         Freq Bun         Avgit/side-10/10         Raidie Device: BTS           10 disidiv         Ref 10.00 dBm         Freq Bun         Freq Bun</td>	Trace/Detector	Bit         Bit         Bit         ADDAMO         D022321PM M00,2007           Center Freq 2.441001500 GHz         Center Freq 2.441001500 GHz         Center Freq 2.441001500 GHz         Raidie Skit None           #FGaint.tww         Freq Bun         Avgit/side-10/10         Raidie Skit None           #FGaint.tww         Freq Bun         Avgit/side-10/10         Raidie Device: BTS           10 disidiv         Ref 10.00 dBm         Freq Bun         Freq Bun
	Clear Write	Log Clear Write Clear Write 300
	Average	
.700	Max Hold	TOD         Max Hold           000<
#Res BW 30 kHz #VBW 100 kHz Sweep 3.2 ms	Min Hold	Center 2.441 GHZ Span 3 MHZ #Res BW 30 kHz #VBW 100 kHz Sweep 3.2 ms Min Hold
Occupied Bandwidth Total Power 6.11 dBm 1.1049 MHz	Detector	Occupied Bandwidth Total Power 6.49 dBm
Transmit Freq Error -1.068 kHz OBW Power 99.00 %	Peak≱ Auto <u>Man</u>	Transmit Freq Error -3.730 kHz OBW Power 99.00 %
x dB Bandwidth 1.164 MHz x dB -20.00 dB		x dB Bandwidth 1.156 MHz x dB -20.00 dB
MISG J File <2DH1-00.png> saved STATUS		M6G STATUS
Channel 0 / 2402 MHz		Channel 39 / 2441 MHz
Aglen Syscham Anlyzer, Occupied BW SPSE301 ALSPHATEO 022252 PM M07, 2017 Ref Value 10.00 dBm Tig-free 32.48000000 0Hz Radio Set. None #FGaint.cw #FGaint.cv Radio Set. Set. Set. Set. Set. Set. Set. Set.	Trace/Detector	
10 dB/d/v Ref 10.00 dBm	Clear Write	
	Average	
700 800 Center 2.48 GHz Span 3 MHz	Max Hold	
West Was SW         Stress Was Switz         Spain Smitz         Smitz         Spain Smitz         Smitz <td>Min Hold</td> <td></td>	Min Hold	
1.1048 MHz Transmit Freq Error -2.964 kHz OBW Power 99.00 % x dB Bandwidth 1.164 MHz x dB -20.00 dB	Detector Peak≯ Auto <u>Mar</u>	
MSG STATUS		
Channel 78 / 2480 MHz		

# 6.3 Number of Hopping Frequency

# 6.3.1 Limit

According to §15.247(a)(1)(ii) or A8.1 (d), Frequency hopping systems operating in the band 2400-2483.5 MHz shall use at least 15 hopping channels.

6.3.2 Block Diagram of Test Setup



# 6.3.3 Test Procedure

1). Place the EUT on the table and set it in transmitting mode.

2). Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.

- 3). Set Spectrum Analyzer Start=2400MHz, Stop = 2483.5MHz, Sweep = auto.
- 4). Set the Spectrum Analyzer as RBW, VBW=1MHz.
- 5). Max hold, view and count how many channel in the band.

# 6.3.4 Test Results

Temperature	25.6°C	Humidity	54.2%
Test Engineer	Jayden Zhuo	Configurations	BT

The Measurement Result With The Worst Case of 1Mbps For GFSK Modulation					
Total No. of	Measurement Result (No. of Ch)	Limit (MHz)	Result		
Hopping Channel	79	≥15	Pass		

Note: The test data refer to the following page.

	Number Of Hopp	ing Frequency		
Agilent Spectrum Analyzer - Swept S/	A			
Marker 1 Δ 78.0000000	00 MHz PNO: Fast C Trig: Free Run	ALIGNAUTO Avg Type: Log-Pwr Avg Hold:>100/100	02:24:48 PM Jul 07, 2017 TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P N N N N N	Save
Ref Offset 0.5 dB 10 dB/div Ref 10.00 dBm		۵Mkr	1 78.000 0 MHz -0.640 dB	State▶
0.00 - X 2	www.www.www.www.www.www.	Marra Marra	۲۰۰۰۰۰۰ A2	Trace (+ State)
-10.0				
-30.0				Data (Export) ▶ Trace 1
-50.0				Screen Image
-60.0				intige
-80.0				
Start 2.40000 GHz #Res BW 1.0 MHz	#VBW 1.0 MHz	Sweep 1.	Stop 2.48350 GHz 000 ms (1001 pts)	
MSG	GFS	STATUS		

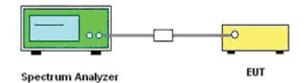
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# 6.4 Time of Occupancy (Dwell Time)

# 6.4.1 Limit

According to §15.247(a)(1)(iii) or A8.1 (d), Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands. The average time of occupancy on any channels shall not greater than 0.4 s within a period 0.4 s multiplied by the number of hopping channels employed.

6.4.2 Block Diagram of Test Setup



# 6.4.3 Test Procedure

1). Place the EUT on the table and set it in transmitting mode.

2). Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.

3). Set center frequency of Spectrum Analyzer = operating frequency.

4). Set the Spectrum Analyzer as RBW, VBW=1MHz, Span = 0Hz, Sweep = auto.

5). Repeat above procedures until all frequency measured was complete.

6.4.4 Test Results

The Dwell Time=Burst Width\*Total Hops. The detailed calculations are showed as follows:

The duration for dwell time calculation: 0.4[s]\*hopping number=0.4[s]\*79[ch]=31.6[s\*ch];

The burst width [ms/hop/ch], which is directly measured, refers to the duration on one channel hop.

The hops per second for all channels: The selected EUT Conf uses a slot type of 5-Tx&1-Rx and a hopping rate of 1600 [ch\*hop/s] for all channels. So the final hopping rate for all channels is 1600/6=266.67 [ch\*hop/s]

The hops per second on one channel: 266.67 [ch\*hops/s]/79 [ch]=3.38 [hop/s];

The total hops for all channels within the dwell time calculation duration: 3.38 [hop/s]\*31.6[s\*ch]=106.67 [hop\*ch];

The dwell time for all channels hopping: 106.67 [hop\*ch]\*Burst Width [ms/hop/ch].

Temperature	25.6°C	Humidity	54.2%
Test Engineer	Jayden Zhuo	Configurations	BT

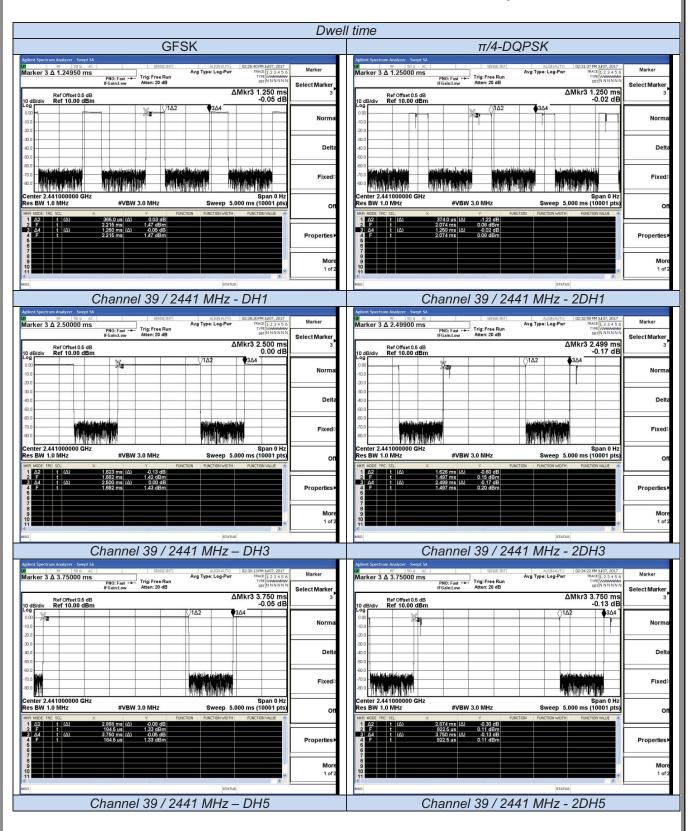
Mode	Frequency (MHz)	Burst Type	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Verdict
		DH1	0.365	0.1178		
GFSK	2441	DH3	1.623	0.2611	0.4	PASS
		DH5	2.868	0.3038		
	2441	2DH1	0.374	0.1203	0.4	PASS
π/4-DQPSK		2DH3	1.626	0.2586		
		2DH5	2.874	0.3055		
		3DH1	0.375	0.1203		
8-DPSK	2441 3DH3	3DH3	1.624	0.2611	0.4	PASS
		3DH5	2.869	0.3072		

Remark:

1. Test results including cable loss;

2. please refer to following plots;

- 3. Measured at difference Packet Type for each mode and recorded woest case for each mode.
- Dwell Time Calculate formula: DH1: Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second DH3: Dwell time=Pulse time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second
  - DH5: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second
- 5. Measured at low, middle and high channel, recorded worst at middle channel;



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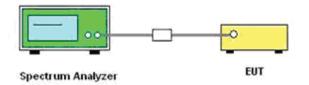
	Dwe	ell time	
	8-E	DPSK	
Agilent Spectrum Analyzer - Swrgt SA         SP/GE B/T         ALSP/AUTO         02:2654 PM J07, 2017           W         RF         S0:0         AC         SP/GE B/T         ALSP/AUTO         02:2654 PM J07, 2017           Marker 3 Δ 1.25050 ms         Trig: Free Run         Avg Type: Log-Per         TMAT[12:24:56         TMAT[12:24:56	Marker	Agletit Spectrum Analyzer - Swept SA         SPIEE.DIT         ALIGNAUTO         02:86:53 PM M/07, 2017           W         FF         SSI         ALIGNAUTO         02:86:53 PM M/07, 2017           Marker 3 Δ 2.500000 ms         FF         Trig: Free Run         Avg Type: Log-Pwr         19:441 [1:2:3:45:6           PR0: Free         Free Run         Arger 30:48         19:441 [1:2:3:45:6         19:441 [1:2:3:45:6	Marker
IF Gains Low         Atten: 20 dB         ΔMkr3 1.251 ms           Ref Offset 0.5 dB         ΔMkr3 1.251 ms         -0.11 dB           10 dB/div         61 1.00 dBm         -0.11 dB	Select Marker 3	IFGaint.tww Atten: 20 dB 40000000000000000000000000000000000	Select Marker 3
	Norma		Normai
	Delta		Delta
	Fixed⊳		Fixed
Center 2.44 1000000 GHz         Span 0 Hz         Span 0 Hz           Res BW 1.0 MHz         #VBW 3.0 MHz         Sweep 5.000 ms (10001 pts)           MRR MORE TRC SQL         X         Y         Ranction worth         Paintine worth           1 M2         1 (2)         \$7245 ms (2)         1 §27 dB         Paintine worth         Paintine worth         Paintine worth	Ofi	Center 2.441000000 GHz         Span 0 Hz         Span 0 Hz           Res BW 1.0 MHz         #VBW 3.0 MHz         Sweep 5.000 ms (10001 pts)           Mex Mode: Frc 50.         X         Y         Function           Mode: Trc 50.         X         Y         Function           Mail         1 M2         1 624 ms (10)         -0.52 dB	Ofi
1 Δ2 t (Δ) 3745 μs (Δ) -132 dB 2 F t (Δ) 2338 ms (Δ) -0.26 dBm 3 Δ4 t (Δ) 1251 ms (Δ) -0.26 dBm 4 F t 2.356 ms 0.26 dBm 6 t 2.356 ms 0.26 dBm 7	Properties►	1 A2 t (10) 1624 mei (10) -0.32 dB 2 F t 1.439 mei 0.16 dBm 3 A4 t (10) 2.500 mei (10) -0.04 dB 4 F t 1.439 me 0.16 dBm 6 t 1.439 me 0.16 dBm 7 I I I I I I I I I I I I I I I I I I I	Properties►
8 9 10 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	More 1 of 2		More 1 of 2
Channel 39 / 2441 MHz - 3DH1		Channel 39 / 2441 MHz - 3DH3	
Agtest Spectrum Analyzer - Swigd SA         Spectrum Analyzer - Swigd SA           Marker 3 Δ 3/14950 ms         File Spectrum Analyzer - Swigd SA           Marker 3 Δ 3/14950 ms         Trig Free Run IFGainLow         Avg Type: Leg Pair Atten: 20 dB         October Spectrum Analyzer - Swigd SA           Ref Offset 0.5 dB         ΔMkr3 3.750 ms         O.06 dB         O.06 dB	Marker Select Marker 3		
	Norma		
	Delta		
	Fixed⊳		
Center 2.44 1000000 GHz         Span 0 Hz         Span 0 Hz           Res BW 1.0 MHz         #VBW 3.0 MHz         Sweep 5.000 ms (10001 pts)           MRR MOBE IRC SD.         x         Y         Rancton worth         Rancton worth           1 Δ22         t (Δ)         2869 ms (Δ)         -027 dB         Rancton worth         Rancton worth	Ofi		
1 Δ2 t (Δ) 2.869 ms (Δ) -0.27 dB 2 F t 4755 us 6-0.20 dBm 3 Δ4 t (Δ) 3.756 ms (Δ) -0.20 dBm 4 F t 491.0 us 6.04 dBm 6 t 491.0 us 6.04 dBm 7 t	Properties►		
	More 1 of 2		
Channel 39 / 2441 MHz – 3DH5			

# 6.5 Conducted Spurious Emissions and Band Edges Test

#### 6.5.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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. Attenuation below the general limits specified in Section 15.209(a) is not required.

6.5.2 Block Diagram of Test Setup



#### 6.5.3 Test Procedure

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 KHz. The video bandwidth is set to 300 KHz.

Measurements are made over the 9 kHz to 26.5GHz range with the transmitter set to the lowest, middle, and highest channels

6.5.4 Test Results of Conducted Spurious Emissions

No non-compliance noted. Only record the worst test result in this report. The test data refer to the following page.

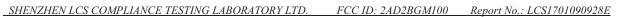
Temperature	25.6°C	Humidity	54.2%
Test Engineer	Jayden Zhuo	Configurations	BT

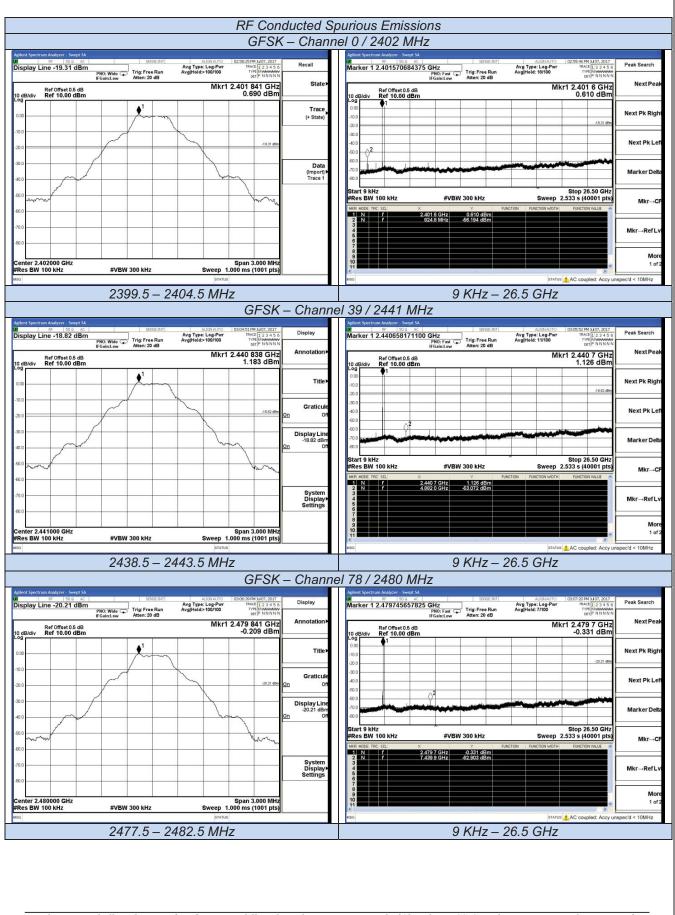
Test Mode	Channel	Frequency (MHz)	Spurious RF Conducted Emission (dBc)	Limits (dBc)	Verdict
	0	2402	<-20		
GFSK	39	2441	<-20	-20	PASS
	78	2480	<-20		
	0	2402	<-20		
π/4-DQPSK	39	2441	<-20	-20	PASS
	78	2480	<-20		
	0	2402	<-20		
8-DPSK	39	2441	<-20	-20	PASS
	78	2480	<-20		

Remark:

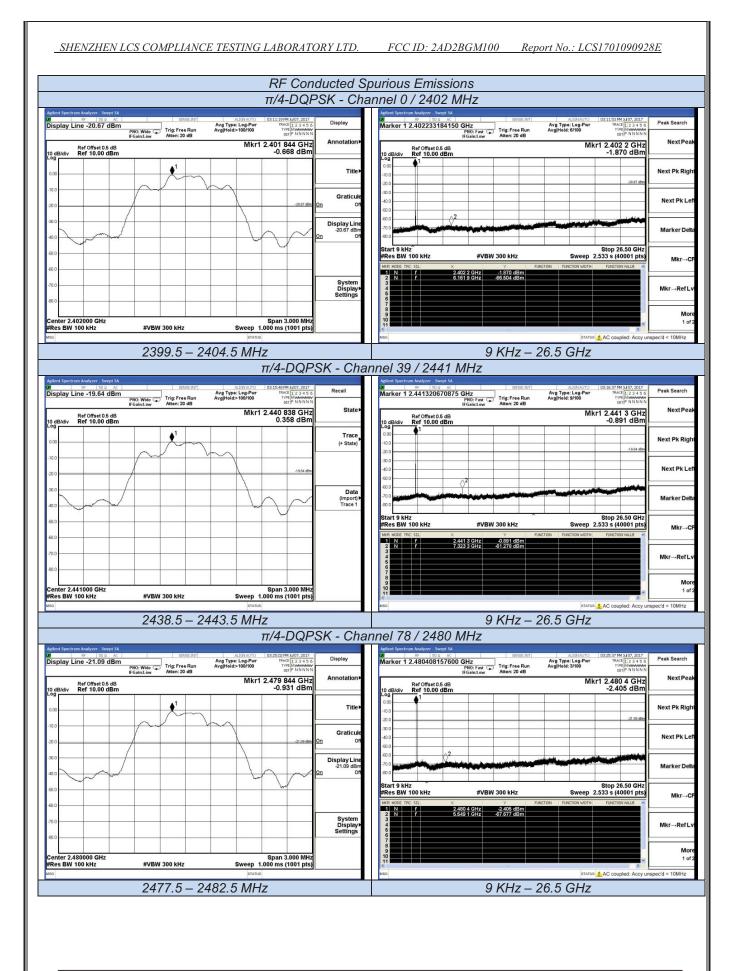
1. Test results including cable loss;

please refer to following plots;
 Measured at difference Packet Type for each mode and recorded worst case for each mode.

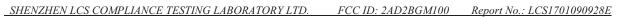


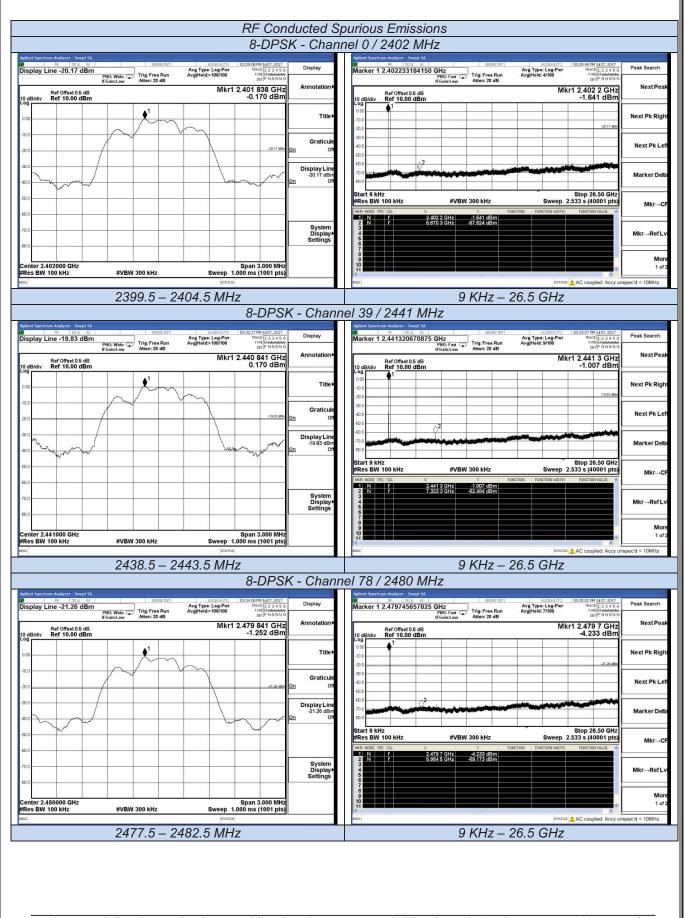


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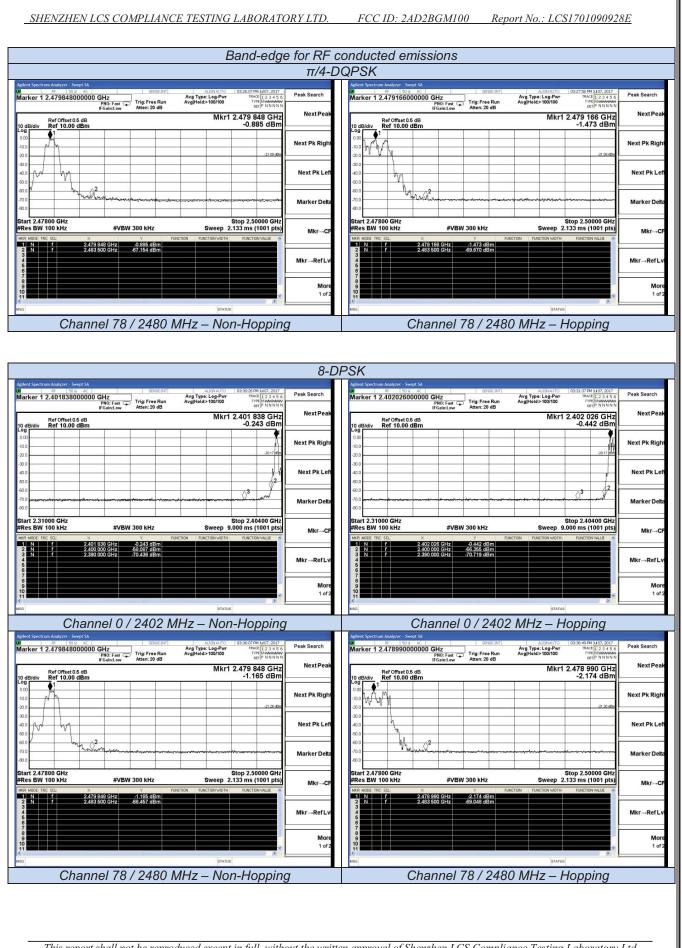
Band-		onducted emissions	
	GF	SK	
Ident Spectrum Analyzer - Swept SA         SPECEDAT         ALIGHAUTO         020124 FM           Ident Spectrum Analyzer - Swept SA         SPECEDAT         ALIGHAUTO         020124 FM           arker 1 2.401838000000 GHz         PRO: Faet Trig: Free Run         Avg Type: Log-Parr         TRACE	12 3 4 5 6 Peak Search	Agilent Spectrum Analyzer - Swigt SA         SEI AC         ALIGNAUTO         0902253 FM J407, 2017           War Her         12,402287 2000000 GHz         AVg Type: Log-Pair         FMore [] (2,34.5.6	Peak Search
IFGain:Low Atten: 20 dB DE	Peak Search	Marker 1 2.402872000000 GHz         Avg Type: Log-Pwr         Titoch Pick (1:2:3:4:5:0)           PR0: Fast C         Trig: Free Run         Avg]Heid>100/100         Titoch Pick (1:2:3:4:5:0)           VertP NNNN         Atten: 20 dB         CertP NNNN	NextPe
	38 GHz 7 dBm	Ref Offset 0.5 dB         Mkr1 2.402 872 GHz           10 dB/div         Ref 10.00 dBm         0.803 dBm	NextPe
99 00 00	Next Pk Right		Next Pk Rig
0.0	-19.31 ( <b>19</b> n	-10.0	
0.0	Next Pk Left	-30.0	Next Pk L
	3		
10	Marker Delta	70.0 And the start of the second	Marker De
art 2.31000 GHz Stop 2.40	400 GHz	Start 2.31000 GHz Stop 2.40400 GHz	
Res BW 100 kHz         #VBW 300 kHz         Sweep         9.000 ms (1           R MODE TRC SQL         X         Y         FUNCTION         FUNCTION		#Res BW 100 kHz         #VBW 300 kHz         Sweep 9.000 ms (1001 pts)           IMER MODE TRC SQL         X         Y         FUNCTION         FUNCTION WIDTH         FUNCTIO	Mkr→
1 N f 2.401838 GHz 0.747 dBm 2 N f 2.390 000 GHz -70.149 dBm 3 N f 2.400 000 GHz 61.687 dBm		1 N f 2.402.872.GHz 0.803.dBm 2 N f 2.390.000.GHz 7-0135.dBm 3 N f 2.400.000.GHz 5.283.dBm	
	Mkr→RefLv		Mkr→Ref
	More		M
	1 of 2		10
Chapped 0 / 2402 Miltz Nep Har	ning	bes provide a second se	
Channel 0 / 2402 MHz – Non-Hop ent Spectrum Analyzer - Swept SA	oping	Channel 0 / 2402 MHz – Hopping	
RF 50 Q AC SENSE:INT ALIGN AUTO 03:08:00 PM arker 1 2.479848000000 GHz Avg Type: Log-Pwr TRACL	123456 Peak Search	Agient Spectrum Analyzer - Swept SA #F 53 € #C 5516E:BIT 41.534.8/170 6310.06 FH 3407,2017 Marker 1 2.4788356000000 GHz Avg Type: Leg+Pwr RMAT[];2 3 4 5 6	Peak Search
IFGain:Low Atten: 20 dB	18 GHZ Next Peak	PRO: Fast Ting: Free Kun Avginted>100/100 007/00 001/00 000/00000000	NextPe
Ref Offset 0.5 dB WIRFT 2.479 64	57 dBm	Ref Offset 0.5 dB Mkr1 2.478 836 GHz 10 dB/div Ref 10.00 dBm -0.064 dBm -0.064 dBm	
	Next Pk Right		Next Pk Rig
	-20.21 dBm	- 100 V V	
	Next Pk Left	40.0	Next Pk L
200 m <sup>2</sup> h <sub>1</sub> 0 <sup>2</sup>		800	
	Marker Delta	170.0 Manufacture	Marker De
art 2.47800 GHz Exes BW 100 kHz #VBW 300 kHz Sweep 2.133 ms (1	0.01 nto	Start 2.47800 GHz         Stop 2.50000 GHz           #Res BW 100 KHz         #VBW 300 kHz         Sweep 2.133 ms (1001 pts)	
R MODE TRC SOL X Y FUNCTION FUNCTION WOTH FUNCTION		MKR MODE TRC SOL X Y FUNCTION WIDTH FUNCTION VALUE	Mkr→
1 N f 2.479 948 GHz 0.167 dBm 2 N f 2.483 500 GHz -68.058 dBm	Mire Deflui	1 N f 2.478 936 GHz -0.064 dBm 2 N f 2.483 500 GHz -59.409 dBm	Mkr→Ref
	Mkr→RefLv		inter i teri
	More	8 9 10	<b>M</b> (
	1 of 2	status	
Channel 78 / 2480 MHz – Non-Ho	nning	Channel 78 / 2480 MHz – Hopping	
	pping		
	π/4-D	QPSK	
ent Spectrum Analyzer - Swept SA 86 \$0.9 AC \$99482:NT ALIGNAUTO 08:12:30 PM	11/07 2017	Agilent Spectrum Analyzer - Swept SA	
arker 1 2.401838000000 GHz PN0: Fast C+ IFGeintice 20 dB	Peak Search	Image: No. 2012         Image: No.	Peak Search
Ref Offset 0.5 dB Mkr1 2.401 83	No. 10	Ref Offset 0.5 dB Mkr1 2.403 154 GHz	NextPe
dB/div Ref 10.00 dBm0.65	•	10 dB/div Ref 10.00 dBm -1.637 dBm	
00	-20.67 kSm	-10.0	Next Pk Rig
10		300	
20	Next Pk Left		Next Pk L
	Marker Delta		Marker De
art 2.31000 GHz Stop 2.40 Res BW 100 kHz #VBW 300 kHz Sweep 9.000 ms (1	400 GHz 1001 pts) Mkr→CF	Start 2.31000 GHz         Stop 2.40400 GHz           #Res BW 100 kHz         #VBW 300 kHz         Sweep 9.000 ms (1001 pts)	Mkr→
VR MODE TRC SOL X Y FUNCTION FUNCTION WIDTH FUNCTION 1 N f 2:401 933 GHz 2:0659 dBm 2:0659 dBm		MKR MODE         TRC         SOL         X         Y         FUNCTION         FUNCTION VIOL	1000000
2 N f 2.390.000 GHz 72.124 dBm N f 2.400.000 GHz 59.972 dBm	Mkr→RefLv	2 N f 2.390 000 GHz 49 064 dBm 3 N f 2.400 000 GHz 45.530 dBm	Mkr→Refl
9	More	9	Mo 1 o

Channel 0 / 2402 MHz – Non-Hopping

10

Channel 0 / 2402 MHz – Hopping

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# 6.6 Restricted Band Emission Limit

# 6.6.1. Standard Applicable

15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz		MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15	
\1\ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46	
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75	
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5	
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2	
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5	
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7	
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4	
6.31175-6.31225	123-138	2200-2300	14.47-14.5	
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2	
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4	
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12	
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0	
12.29-12.293.	167.72-173.2	3332-3339	31.2-31.8	
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5	
12.57675-12.57725	322-335.4	3600-4400	(\2\)	
13.36-13.41				

\1\ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

#### \2\ Above 38.6

According to §15.247 (d): 20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (microvolts/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

# 6.6.2. Measuring Instruments and Setting

Please refer to section 6 of equipment list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10 <sup>th</sup> carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average

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Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB/VB 200Hz/1KHz for QP/AVG
Start ~ Stop Frequency	150kHz~30MHz / RB/VB 9kHz/30KHz for QP/AVG
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz for QP

# 6.6.3. Test Procedures

### 1) Sequence of testing 9 kHz to 30 MHz

# Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

- --- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.
- --- If the EUT is a floor standing device, it is placed on the ground.
- --- Auxiliary equipment and cables were positioned to simulate normal operation conditions.
- --- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- --- The measurement distance is 3 meter.
- --- The EUT was set into operation.

#### Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna height is 0.8 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

#### Final measurement:

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

# 2) Sequence of testing 30 MHz to 1 GHz

# Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

- --- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- --- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- --- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- --- The measurement distance is 3 meter.
- --- The EUT was set into operation.

#### Premeasurement:

- --- The turntable rotates from 0° to 315° using 45° steps.
- --- The antenna is polarized vertical and horizontal.
- --- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

#### Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

# 3) Sequence of testing 1 GHz to 18 GHz

# Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

- --- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- --- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- --- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- --- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- --- The measurement distance is 3 meter.
- --- The EUT was set into operation.

#### Premeasurement:

- --- The turntable rotates from 0° to 315° using 45° steps.
- --- The antenna is polarized vertical and horizontal.
- --- The antenna height scan range is 1 meter to 2.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

#### Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

## 4) Sequence of testing above 18 GHz

## Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

- --- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- --- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- --- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- --- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- --- The measurement distance is 1 meter.
- --- The EUT was set into operation.

## Premeasurement:

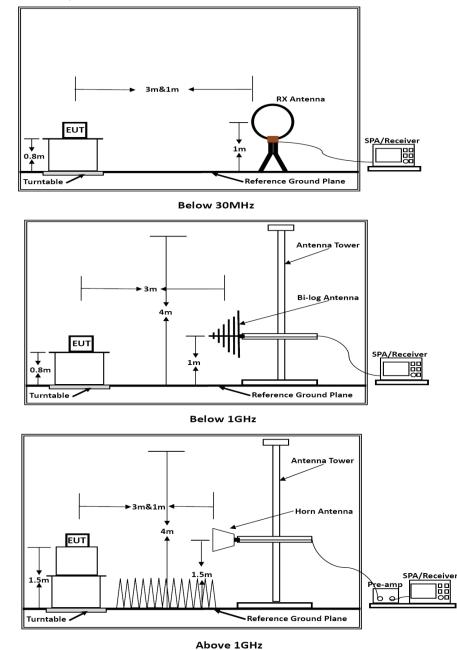
--- The antenna is moved spherical over the EUT in different polarizations of the antenna.

## Final measurement:

--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

## 6.6.4. Test Setup Layout



Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1.5m.

Distance extrapolation factor = 20 log (specific distanc [3m] / test distance [1.5m]) (dB); Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

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## 6.6.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

## 6.6.6. Results of Radiated Emissions (9 kHz~30MHz)

Temperature		<b>24</b> °C		H	umidity	52%		
Test Engineer		Jayden Z	'huo	Configurations			BT	
Freq. (MHz)		Level (dBuV)	Over Limit (dB)		Over Limit (dBuV)		Remark	
-		-	-		-		See Note	

Note:

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

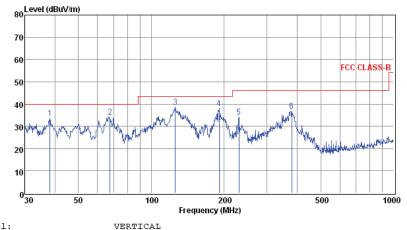
Distance extrapolation factor = 40 log (specific distance / test distance) (dB); Limit line = specific limits (dBuV) + distance extrapolation factor.

## PASS.

Only record the worst test result in this report.

The test data please refer to following page.

#### Below 1GHz (Worst case: GFSK, Low Channel)

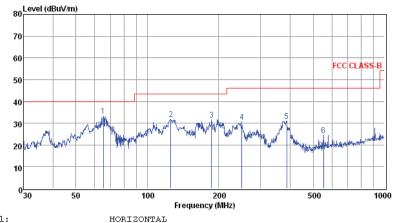




Freq Reading CabLos Antfac Measured Limit Over Remark

	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	38.08	20.13	0.38	13.09	33.60	40.00	-6.40	QP
2	67.44	23.86	0.51	9.71	34.08	40.00	-5.92	QP
3	125.45	28.34	0.71	9.64	38.69	43.50	-4.81	QP
4	190.41	26.56	0.86	10.56	37.98	43.50	-5.52	QP
5	230.10	21.61	0.93	11.65	34.19	46.00	-11.81	QP
6	379.91	21.25	1.18	14.59	37.02	46.00	-8.98	QP

Note: 1. All readings are Quasi-peak values. 2. Measured= Reading + Antenna Factor + Cable Loss 3. The emission that ate 20db blow the offficial limit are not reported



pol:

Freq Reading CabLos Antfac Measured Limit Over Remark

	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	65.11	22.09	0.52	10.66	33.27	40.00	-6.73	QP
2	125.45	21.60	0.71	9.64	31.95	43.50	-11.55	QP
3	186.44	20.37	0.98	10.25	31.60	43.50	-11.90	QP
4	250.30	17.61	1.02	12.07	30.70	46.00	-15.30	QP
5	386.63	14.99	1.32	14.75	31.06	46.00	-14.94	QP
6	552.88	5.36	1.46	17.57	24.39	46.00	-21.61	QP

Note: 1. All readings are Quasi-peak values. 2. Measured= Reading + Antenna Factor + Cable Loss 3. The emission that ate 20db blow the offficial limit are not reported

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## Above 1GHz

Freq. MHz	Reading dBuv	Ant. Fac dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4804.00	55.38	33.06	35.04	3.94	57.34	74.00	-16.66	Peak	Horizontal
4804.00	40.37	33.06	35.04	3.94	42.33	54.00	-11.67	Average	Horizontal
12010.00	52.64	33.16	35.06	3.96	54.70	74.00	-19.30	Peak	Horizontal
12010.00	42.11	33.16	35.06	3.96	44.17	54.00	-9.83	Average	Horizontal
4804.00	58.76	33.06	35.04	3.94	60.72	74.00	-13.28	Peak	Vertical
4804.00	42.16	33.06	35.04	3.94	44.12	54.00	-9.88	Average	Vertical
12010.00	55.22	33.16	35.06	3.96	57.28	74.00	-16.72	Peak	Vertical
12010.00	40.88	33.16	35.06	3.96	42.94	54.00	-11.06	Average	Vertical

The worst test result for GFSK, Channel 0 / 2402 MHz

The worst test result for  $\pi$ /4-DQPSK, Channel 0 / 2402 MHz

Freq. MHz	Reading dBuv	Ant. Fac dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4804.00	54.78	33.06	35.04	3.94	56.74	74.00	-17.26	Peak	Horizontal
4804.00	40.00	33.06	35.04	3.94	41.96	54.00	-12.04	Average	Horizontal
12010.00	52.99	33.16	35.06	3.96	55.05	74.00	-18.95	Peak	Horizontal
12010.00	42.02	33.16	35.06	3.96	44.08	54.00	-9.92	Average	Horizontal
4804.00	59.25	33.06	35.04	3.94	61.21	74.00	-12.79	Peak	Vertical
4804.00	42.27	33.06	35.04	3.94	44.23	54.00	-9.77	Average	Vertical
12010.00	55.28	33.16	35.06	3.96	57.34	74.00	-16.66	Peak	Vertical
12010.00	40.70	33.16	35.06	3.96	42.76	54.00	-11.24	Average	Vertical

The worst test result for 8-DPSK, Channel 0 / 2402 MHz

Freq. MHz	Reading dBuv	Ant. Fac dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4804.00	55.00	33.06	35.04	3.94	56.96	74.00	-17.04	Peak	Horizontal
4804.00	40.16	33.06	35.04	3.94	42.12	54.00	-11.88	Average	Horizontal
12010.00	52.64	33.16	35.06	3.96	54.70	74.00	-19.30	Peak	Horizontal
12010.00	41.97	33.16	35.06	3.96	44.03	54.00	-9.97	Average	Horizontal
4804.00	59.38	33.06	35.04	3.94	61.34	74.00	-12.66	Peak	Vertical
4804.00	42.21	33.06	35.04	3.94	44.17	54.00	-9.83	Average	Vertical
12010.00	54.80	33.16	35.06	3.96	56.86	74.00	-17.14	Peak	Vertical
12010.00	40.77	33.16	35.06	3.96	42.83	54.00	-11.17	Average	Vertical

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The worst test result for GFSK, Channel 39 / 2441 MHz

Freq. MHz	Reading dBuv	Ant. Fac dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4882.00	55.05	33.16	35.15	3.96	57.02	74.00	-16.98	Peak	Horizontal
4882.00	44.15	33.16	35.15	3.96	46.12	54.00	-7.88	Average	Horizontal
12205.00	52.61	33.26	35.17	3.98	54.68	74.00	-19.32	Peak	Horizontal
12205.00	41.09	33.26	35.17	3.98	43.16	54.00	-10.84	Average	Horizontal
4882.00	59.35	33.16	35.15	3.96	61.32	74.00	-12.68	Peak	Vertical
4882.00	42.17	33.16	35.15	3.96	44.14	54.00	-9.86	Average	Vertical
12205.00	55.38	33.26	35.17	3.98	57.45	74.00	-16.55	Peak	Vertical
12205.00	44.08	33.26	35.17	3.98	46.15	54.00	-7.85	Average	Vertical

The worst test result for  $\pi$ /4-DQPSK, Channel 39 / 2441 MHz

Freq. MHz	Reading dBuv	Ant. Fac dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4882.00	55.06	33.16	35.15	3.96	57.03	74.00	-16.97	Peak	Horizontal
4882.00	43.86	33.16	35.15	3.96	45.83	54.00	-8.17	Average	Horizontal
12205.00	52.78	33.26	35.17	3.98	54.85	74.00	-19.15	Peak	Horizontal
12205.00	41.30	33.26	35.17	3.98	43.37	54.00	-10.63	Average	Horizontal
4882.00	59.15	33.16	35.15	3.96	61.12	74.00	-12.88	Peak	Vertical
4882.00	42.30	33.16	35.15	3.96	44.27	54.00	-9.73	Average	Vertical
12205.00	55.32	33.26	35.17	3.98	57.39	74.00	-16.61	Peak	Vertical
12205.00	44.26	33.26	35.17	3.98	46.33	54.00	-7.67	Average	Vertical

The worst test result for 8-DPSK, Channel 39 / 2441 MHz

Freq. MHz	Reading dBuv	Ant. Fac dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4882.00	55.04	33.16	35.15	3.96	57.01	74.00	-16.99	Peak	Horizontal
4882.00	43.91	33.16	35.15	3.96	45.88	54.00	-8.12	Average	Horizontal
12205.00	52.76	33.26	35.17	3.98	54.83	74.00	-19.17	Peak	Horizontal
12205.00	40.91	33.26	35.17	3.98	42.98	54.00	-11.02	Average	Horizontal
4882.00	59.35	33.16	35.15	3.96	61.32	74.00	-12.68	Peak	Vertical
4882.00	41.92	33.16	35.15	3.96	43.89	54.00	-10.11	Average	Vertical
12205.00	54.74	33.26	35.17	3.98	56.81	74.00	-17.19	Peak	Vertical
12205.00	43.79	33.26	35.17	3.98	45.86	54.00	-8.14	Average	Vertical

Pol.

Horizontal Horizontal Horizontal

Vertical

Vertical

Vertical

Vertical

Freq. MHz	Reading dBuv	Ant. Fac dB/m	Pre. Fac dB	Cab. Los dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark
4960.00	54.89	33.26	35.14	3.98	56.99	74.00	-17.01	Peak
4960.00	42.66	33.26	35.14	3.98	44.76	54.00	-9.24	Average
12400.00	50.81	33.36	35.16	4.00	53.01	74.00	-20.99	Peak
12400.00	42.33	33 36	35 16	4 00	44 53	54 00	-9.47	Average

3.98

3.98

4.00

4.00

The worst test result for GFSK, Channel 78 / 2480 MHz

33.26

33.26

33.36

33.36

58.97

42.08

56.92

43.24

The worst test result for  $\pi$ /4-DQPSK, Channel 78 / 2480 MHz

35.14

35.14

35.16

35.16

Freq. MHz	Reading dBuv	Ant. Fac dB/m	Pre. Fac dB	Cab. Los dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4960.00	54.70	33.26	35.14	3.98	56.80	74.00	-17.20	Peak	Horizontal
4960.00	43.37	33.26	35.14	3.98	45.47	54.00	-8.53	Average	Horizontal
12400.00	51.19	33.36	35.16	4.00	53.39	74.00	-20.61	Peak	Horizontal
12400.00	41.69	33.36	35.16	4.00	43.89	54.00	-10.11	Average	Horizontal
4960.00	59.38	33.26	35.14	3.98	61.48	74.00	-12.52	Peak	Vertical
4960.00	41.70	33.26	35.14	3.98	43.80	54.00	-10.20	Average	Vertical
12400.00	57.11	33.36	35.16	4.00	59.31	74.00	-14.69	Peak	Vertical
12400.00	43.18	33.36	35.16	4.00	45.38	54.00	-8.62	Average	Vertical

61.07

44.18

59.12

45.44

74.00

54.00

74.00

54.00

-12.93

-9.82

-14.88

-8.56

Peak

Average

Peak

Average

The worst test result for 8-DPSK,, Channel 78 / 2480 MHz

Freq. MHz	Reading dBuv	Ant. Fac dB/m	Pre. Fac dB	Cab. Los dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4960.00	55.19	33.26	35.14	3.98	57.29	74.00	-16.71	Peak	Horizontal
4960.00	43.02	33.26	35.14	3.98	45.12	54.00	-8.88	Average	Horizontal
12400.00	50.88	33.36	35.16	4.00	53.08	74.00	-20.92	Peak	Horizontal
12400.00	41.73	33.36	35.16	4.00	43.93	54.00	-10.07	Average	Horizontal
4960.00	59.29	33.26	35.14	3.98	61.39	74.00	-12.61	Peak	Vertical
4960.00	41.69	33.26	35.14	3.98	43.79	54.00	-10.21	Average	Vertical
12400.00	57.29	33.36	35.16	4.00	59.49	74.00	-14.51	Peak	Vertical
12400.00	43.22	33.36	35.16	4.00	45.42	54.00	-8.58	Average	Vertical

#### Notes:

4960.00

4960.00

12400.00

12400.00

1). Measuring frequencies from 9k~10th harmonic (ex. 26GHz), No emission found between lowest internal used/generated frequency to 30 MHz.

2). Radiated emissions measured in frequency range from 9k~10th harmonic (ex. 26GHz) were made with an instrument using Peak detector mode.

3). 18~25GHz at least have 20dB margin. No recording in the test report.

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## 6.7. AC Power line conducted emissions

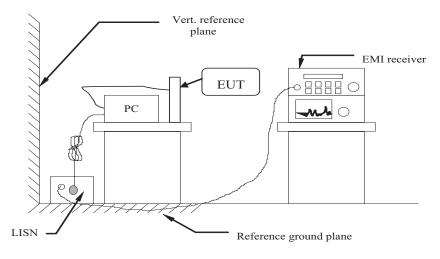
## 6.7.1 Standard Applicable

According to §15.207 (a): For an intentional radiator which 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 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range	Limits (	dBµV)
(MHz)	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

## \* Decreasing linearly with the logarithm of the frequency

## 6.7.2 Block Diagram of Test Setup



## 6.7.3 Test Results

## PASS.

The test data please refer to following page.

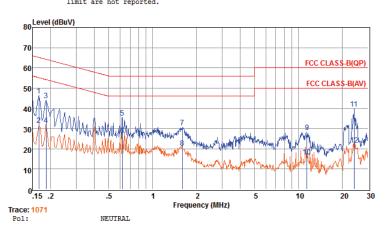
#### Temperature **23.5**℃ Humidity 46.7% **Test Engineer** Jayden Zhuo Configurations BT 80 Level (dBuV) 70 FCC CLASS-B(QP) 60 FCC CLASS-B(AV) 50 4 5 30 2 1 0 .15 .2 .5 2 Frequency (MHz) 10 20 30 1 5 Trace: 1073 Pol: LINE

#### Test Results for AC 120V/60Hz @ GFSK (worst case)

Freq Reading LISNFac CabLos Aux2Fac Measured Limit Over Remark

	MHz	dBuV	dB	dB	dB	dB	dBuV	dBuV	dB
1	0.17	26.86	9.59	0.02	10.00	46.47	65.16	-18.69	QP
2	0.17	12.86	9.59	0.02	10.00	32.47	55.16	-22.69	Average
3	0.19	23.52	9.62	0.02	10.00	43.16	64.20	-21.04	QP
4	0.19	8.27	9.62	0.02	10.00	27.91	54.19	-26.28	Average
5	1.22	12.71	9.63	0.05	10.00	32.39	56.00	-23.61	QP
6	1.22	2.31	9.63	0.05	10.00	21.99	46.00	-24.01	Average
7	1.60	12.61	9.64	0.05	10.00	32.30	56.00	-23.70	QP
8	1.60	1.70	9.64	0.05	10.00	21.39	46.00	-24.61	Average
9	8.28	8.14	9.68	0.07	10.00	27.89	60.00	-32.11	QP
10	8.28	-5.27	9.68	0.07	10.00	14.48	50.00	-35.52	Average
11	10.51	7.87	9.69	0.08	10.00	27.64	60.00	-32.36	QP
12	10.51	-1.91	9.69	0.08	10.00	17.86	50.00	-32.14	Average

Remarks: 1. Measured = Reading +Cable Loss +Aux2 Fac. 2. The emission levels that are 20dB below the official limit are not reported.

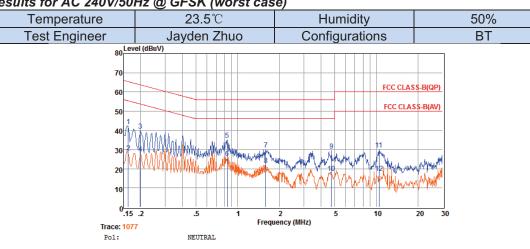


Freq Reading LISNFac CabLos Aux2Fac Measured Limit Over Remark

	MHz	dBuV	dB	dB	dB	dB	dBuV	dBuV	dB
1	0.17	26.65	9.66	0.02	10.00	46.33	65.16	-18.83	QP
2	0.17	12.10	9.66	0.02	10.00	31.78	55.16	-23.38	Average
3	0.19	24.41	9.62	0.02	10.00	44.05	64.20	-20.15	QP
4	0.19	12.19	9.62	0.02	10.00	31.83	54.19	-22.36	Average
5	0.62	15.68	9.63	0.04	10.00	35.35	56.00	-20.65	QP
6	0.62	7.21	9.63	0.04	10.00	26.88	46.00	-19.12	Average
7	1.60	11.03	9.63	0.05	10.00	30.71	56.00	-25.29	QP
8	1.60	0.82	9.63	0.05	10.00	20.50	46.00	-25.50	Average
9	11.44	8.46	9.73	0.09	10.00	28.28	60.00	-31.72	QP
10	11.44	-3.73	9.73	0.09	10.00	16.09	50.00	-33.91	Average
11	24.01	19.80	9.82	0.13	10.00	39.75	60.00	-20.25	QP
12	24.02	2.19	9.82	0.13	10.00	22.14	50.00	-27.86	Average

Remarks: 1. Measured = Reading +Cable Loss +Aux2 Fac. 2. The emission levels that are 20dB below the official limit are not reported.

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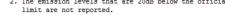


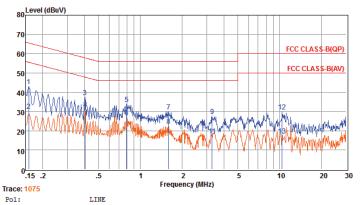
#### Test Results for AC 240V/50Hz @ GFSK (worst case)



	MHz	dBuV	dB	dB	dB	dB	dBuV	dBuV	dB
1	0.16	22.55	9.67	0.02	10.00	42.24	65.34	-23.10	QP
2	0.16	8.84	9.67	0.02	10.00	28.53	55.33	-26.80	Average
3	0.20	20.27	9.59	0.02	10.00	39.88	63.71	-23.83	QP
4	0.20	8.48	9.59	0.02	10.00	28.09	53.71	-25.62	Average
5	0.84	15.31	9.63	0.04	10.00	34.98	56.00	-21.02	QP
6	0.84	6.00	9.63	0.04	10.00	25.67	46.00	-20.33	Average
7	1.59	10.32	9.63	0.05	10.00	30.00	56.00	-26.00	QP
8	1.59	2.22	9.63	0.05	10.00	21.90	46.00	-24.10	Average
9	4.75	9.61	9.66	0.06	10.00	29.33	56.00	-26.67	QP
10	4.75	-1.82	9.66	0.06	10.00	17.90	46.00	-28.10	Average
11	10.45	10.30	9.72	0.08	10.00	30.10	60.00	-29.90	QP
12	10.45	-2.01	9.72	0.08	10.00	17.79	50.00	-32.21	Average

Remarks: 1. Measured = Reading +Cable Loss +Aux2 Fac. 2. The emission levels that are 20dB below the official limit are not reported.





Freq Reading LISNFac CabLos Aux2Fac Measured Limit Over Remark

	MHz	dBuV	dB	dB	dB	dB	dBuV	dBuV	dB
1 2 3	0.16 0.16 0.40	23.43 10.60 17.79	9.58 9.58 9.62	0.02 0.02 0.04	10.00 10.00 10.00	30.20	65.56 55.55 57.81	-22.53 -25.35 -20.36	QP Average QP
4	0.40	11.44	9.62	0.04	10.00	31.10	47.81	-16.71	Average OP
6 7	0.80	7.51	9.64	0.04	10.00	27.19	46.00	-18.81	Average QP
8	1.59	2.81	9.64	0.05	10.00		46.00	-23.50 -28.34	Average QP
10 11	3.28	-2.04	9.65 9.65	0.06	10.0-5		46.00 46.00	-546.00	Average Average
12 13	10.40 10.40	10.38 -2.26	9.69 9.69	0.08	10.00 10.00		60.00 50.00	-29.85 -32.49	QP Average
Ren	arks: 1	. Measure	d = Read	ling +Ca	able Los	s +Aux2	Fac.		

 The emission levels that are 20dB below the official limit are not reported.

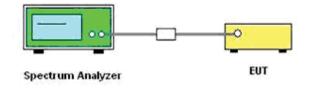
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## 6.8. Band-edge measurements for radiated emissions

## 6.8.1 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

## 6.8.2. Test Setup Layout



## 6.8.3. Measuring Instruments and Setting

Please refer to section 6 of equipment list in this report. The following table is the setting of Spectrum Analyzer.

```
6.8.4. Test Procedures
```

```
According to KDB 412172 section 1.1 Field Strength Approach (linear terms):
```

 $eirp = p_t x g_t = (E x d)^2/30$ 

Where:

pt = transmitter output power in watts,

- $g_t$  = numeric gain of the transmitting antenna (unitless),  $\Box$
- E = electric field strength in V/m,
- d = measurement distance in meters (m).
- $erp = eirp/1.64 = (E \times d)^2/(30 \times 1.64)$

Where all terms are as previously defined.

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
- 3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz for peak detector and RBW=1MHz, VBW=1/B for Peak detector.
- 4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
- 5. Repeat above procedures until all measured frequencies were complete.
- 6. Measure the conducted output power (in dBm) using the detector specified by the appropriate regulatory agency for guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).
- 7. Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level (see 12.2.5 for guidance on determining the applicable antenna gain)

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- 8. Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies ≤ 30 MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies > 1000 MHz).
- 9. For devices with multiple antenna-ports, measure the power of each individual chain and sum the EIRP of all chains in linear terms (e.g., Watts, mW).
- 10. Compare the resultant electric field strength level to the applicable regulatory limit.
- 11. Perform radiated spurious emission test duress until all measured frequencies were complete.

6.8.5. Test Results			
Temperature	25.6℃	Humidity	54.2%
Test Engineer	Jayden Zhuo	Configurations	BT

			GFSK – No	on-Hopping			
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	Ground Reflection Factor (dB)	Covert Radiated E Level At 3m (dBuV/m)	Detector	Limit (dBuV/m)	Verdict
2310.000	-61.022	2.00 <sup>remark6</sup>	0.0	36.238	Peak	74.00	PASS
2310.000	-72.722	2.00 <sup>remark6</sup>	0.0	24.538	AV	54.00	PASS
2390.000	-61.139	2.00 <sup>remark6</sup>	0.0	36.121	Peak	74.00	PASS
2390.000	-72.307	2.00 <sup>remark6</sup>	0.0	24.953	AV	54.00	PASS
2483.500	-58.169	2.00 <sup>remark6</sup>	0.0	39.091	Peak	74.00	PASS
2483.500	-69.998	2.00 <sup>remark6</sup>	0.0	27.262	AV	54.00	PASS
2500.000	-60.060	2.00 <sup>remark6</sup>	0.0	37.200	Peak	74.00	PASS
2500.000	-72.078	2.00 <sup>remark6</sup>	0.0	25.182	AV	54.00	PASS

		Π	/4-DQPSK –	Non-Hopping			
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	Ground Reflection Factor (dB)	Covert Radiated E Level At 3m (dBuV/m)	Detector	Limit (dBuV/m)	Verdict
2310.000	-61.994	2.00 <sup>remark6</sup>	0.0	35.266	Peak	74.00	PASS
2310.000	-72.542	2.00 <sup>remark6</sup>	0.0	24.718	AV	54.00	PASS
2390.000	-61.142	2.00 <sup>remark6</sup>	0.0	36.118	Peak	74.00	PASS
2390.000	-72.213	2.00 <sup>remark6</sup>	0.0	25.047	AV	54.00	PASS
2483.500	-55.478	2.00 <sup>remark6</sup>	0.0	41.782	Peak	74.00	PASS
2483.500	-68.604	2.00 <sup>remark6</sup>	0.0	28.656	AV	54.00	PASS
2500.000	-61.547	2.00 <sup>remark6</sup>	0.0	35.713	Peak	74.00	PASS
2500.000	-71.823	2.00 <sup>remark6</sup>	0.0	25.437	AV	54.00	PASS

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#### COF Test De

			8-DPSK – N	lon-Hopping			
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	Ground Reflection Factor (dB)	Covert Radiated E Level At 3m (dBuV/m)	Detector	Limit (dBuV/m)	Verdict
2310.000	-61.203	2.00 <sup>remark6</sup>	0.0	36.057	Peak	74.00	PASS
2310.000	-72.588	2.00 <sup>remark6</sup>	0.0	24.672	AV	54.00	PASS
2390.000	-60.701	2.00 <sup>remark6</sup>	0.0	36.559	Peak	74.00	PASS
2390.000	-72.206	2.00 <sup>remark6</sup>	0.0	25.054	AV	54.00	PASS
2483.500	-57.074	2.00 <sup>remark6</sup>	0.0	40.186	Peak	74.00	PASS
2483.500	-70.493	2.00 <sup>remark6</sup>	0.0	26.767	AV	54.00	PASS
2500.000	-59.963	2.00 <sup>remark6</sup>	0.0	37.297	Peak	74.00	PASS
2500.000	-71.953	2.00 <sup>remark6</sup>	0.0	25.307	AV	54.00	PASS

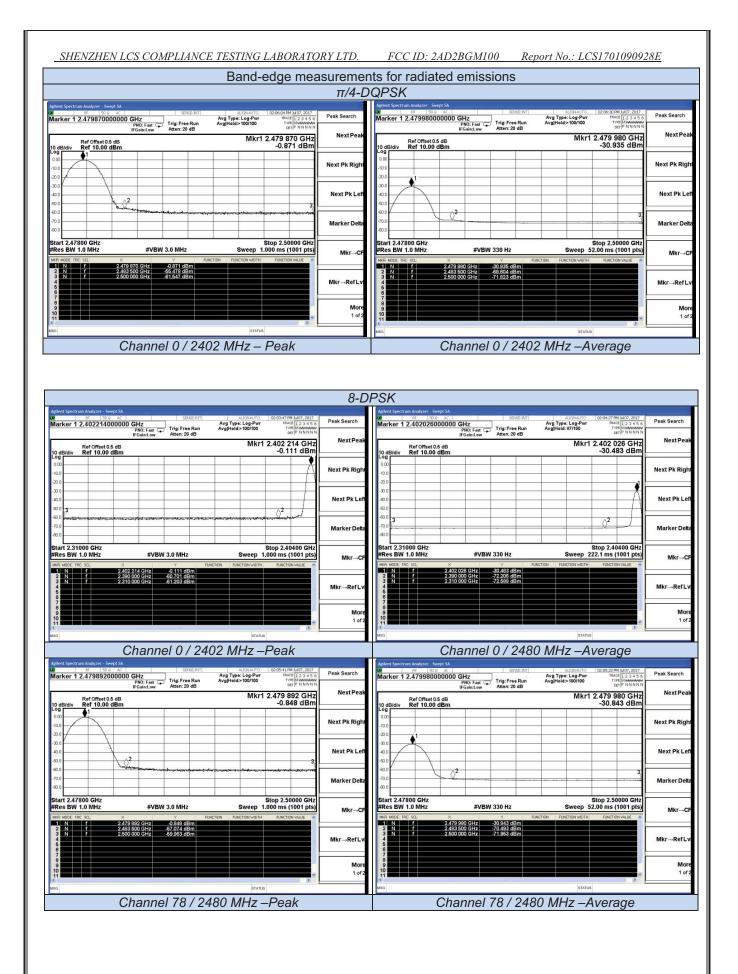
#### Remark:

- 1. Measured at difference Packet Type for each mode and recorded worst case for each mode.
- 2. Measured at Hopping and Non-Hopping mode, recorded worst at Non-Hopping mode.
- 3. The other emission levels were very low against the limit.
- 4. The average measurement was not performed when the peak measured data under the limit of average detection.
- 5. Detector AV is setting spectrum/receiver. RBW=1MHz/VBW=330Hz/Sweep time=Auto/Detector=Peak;
- 6. Since the out-of-band characteristics of the EUT transmit antenna will often be unknown, the use of a conservative antenna gain value is necessary. Thus, when determining the EIRP based on the measured conducted power, the upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands, or 2 dBi, whichever is greater. However, for devices that operate in multiple frequency bands while using the same transmit antenna, the highest gain of the antenna within the operating band nearest in frequency to the restricted band emission being measured may be used in lieu of the overall highest gain when the emission is at a frequency that is within 20 percent of the nearest band edge frequency, but in no case shall a value less than 2 dBi be used.

	Gł	FSK	
Ient Spectrum Analyzer - Swept SA RF 50 0 AC SENSE DIT ALIGNAUTO (02:00:28 PM Mi07, 2017	Peak Search	Agilent Spectrum Analyzer - Swept SA 20 RF 5.0.9 AC SENSERIT ALIGNAUTO (02:01:57 PM 3/107, 2017	k Search
Arker 1 2.401838000000 GHz PR0: Fast IFGaint.ew Trig: Free Run Atten: 20 dB Avg Type: Log-Pur Avg Type: Log-Pur Avg Type: Log-Pur Avg Type: Log-Pur Avg Type: Log-Pur Trig: Free Run Atten: 20 dB	NextPeak	PROFESSOUUUUU GHZ PROFESSOUUUUU GHZ PROFESSOUUUUUU GHZ PROFESSOUUUUU GHZ PROFESSOUUUUUU GHZ PROFESSOUUUUUU PROFESSOUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUU	NextP
Ref Offset 0.5 dB Mkr1 2.401 838 GHz dB/div Ref 10.00 dBm 1.450 dBm		Ref Offset0.5 dB         Mkr1 2.401 838 GHz           10 dB/div         Ref 10.00 dBm	NEALF
	Next Pk Right	-100	xt Pk Ri
	Next Pk Left	50.0	ext Pk
	Marker Delta	80.0	arker D
arit 2.31000 GHz Stop 2.40400 GHz es BW 1.0 MHz #VBW 3.0 MHz Sweep 1.000 ms (1001 pts) Hote: the 3.0 X Y Puncton Puncton worth Puncton worth	Mkr→CF	Start 2,31000 GHz         Stop 2,40400 GHz           #Res BW 1.0 MHz         #VBW 330 Hz         Sweep 222.1 ms (1001 pts)           WR INSE IPS 32.         X         Y         RACTON IN RACTON WORK         A	Mkr-
N f 2401583 GHz 1460 dBm N f 2390 000 Hz 45139 dBm N f 2.310 000 GHz 451.022 dBm	Mkr→RefLvl	1 N f 2.401 988 GHz 2-29 860 dBm 2 N f 2.39000 GHz -72.307 dBm 4 2 3 N f 2.310 000 GHz -72.722 dBm 4 3 N f 2.310 000 GHz -72.722 dBm 5 3 N f 2.310 000 GHz -72.722 dBm 6 3 1 N f 2.310 000 GHz -72.722 dBm	kr→Rei
	More 1 of 2		N 1
Channel 0 / 2402 MHz – Peak			
ent Spectrum Analyzer - Swept SA		Channel 0 / 2402 MHz – Average Aptient Spectrum Analyzer - Swort SA	
RF         50 Q         AC         SENSEINT         ALIGNAUTO         02:07:29 PM 3J/07, 2017           rker 1 2.479892000000 GHz         Avg Type: Log-Pwr         TRACE 1/2 3 4 5 6			
PNO: Fast Trig: Free Run Avg Hold>100/100 TYPE MWWWWW	Peak Search	PND: Fast C Trig: Free Run AvgHold>100/100	k Searc
Trig: Free Run         AvgiHeid>100/100         Vieta Municipal           IFGainLow         Atten: 20 dB         Mkr1 2.479 892 GHz         GB/dV           Ref Offset 0.5 dB         0.524 dBm         0.524 dBm		Marker 1 2.479826000000 GHz PHO: Fast Cp. Trig: Free Run Avg]Hold>1001000 Fredint-tow Ref Offset 0.5 dB Mkr1 2.479 826 GHz	
Ref Offset 0.5 dB Mkr1 2.479 892 GHz 0.524 dBm 0.524 dBm		Marker 1 2.479826000000 GHz PH0:Fast         Trig:Free Run Avg1Heid: 109/00         Avg1Fge: Log-Perr Avg1Heid: 109/00         Trig:Free Run (xg)PH0:Fast         Avg1Fge: Log-Perr Avg1Heid: 109/00         Trig:Free Run (xg)PH0:Fast         Perr Provide         Marker: 20 are provide         Mkr1 2.479 826 GHz -30.105 dBm         Perr Provide         Next           10 dB/dv         Ref 0/fse:10.5 dB         Mkr1 2.479 826 GHz -30.105 dBm         Next         Next<	NextP
Ref Offset 0.5 dB Biddiv Ref 10.00 dBm 0.524 dBm 0 0 0 0 0 0 0 0 0 0 0 0 0	NextPeak	Marker 1 2.479826000000 GHz PH0: Fast         Trig: Free Run Avg Type: Log-Pwr AvgHed: 10900         Match 12.343 & 0 (mp Muthus) memory memor	Next P xt Pk R
Ref Offset 0.5 dB Abditiv Ref 10.00 dBm	Next Peak	Marker 1 2.479826000000 GHz PH0: Fast         Trig: Free Run Avg1Hed: 109/00         Avg1Hed: 103/00         Peak Avg1Hed: 103/00         Peak (xg)           Ref Offset0 5 dB         Mkr1 2.479 826 GHz -30.105 dBm         Mkr1 2.479 826 GHz -30.105 GHz -30	Next P xt Pk R ext Pk
Ref Offset 0.5 dB Bloliv Ref 10.00 dBm 0.524 dBm 0 2 2 3 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Next Peak	Marker 1 2.479826000000 GHz PH0: Fat         Trig Free Run Avg Type: Leg Pwr AvgHed: 109700         Match 12.479 2434 5 (200 Michael State)         Peak Peak Avg Type: Leg Pwr AvgHed: 109700           1         Ref Offset 0.5 dB 10 Gladw         Mkr1 2.479 826 GHz -30.105 dBm         Next Next Next Next           000 000 000 000 000 000 000 000 000 00	Next P xt Pk R ext Pk arker [
Ref Offset 0.5 dB Bloldy Ref 10.00 dBm 0.524 dBm 0 0 0 0.524 dBm 0 0.5	Next Peak	Marker 1 2.479826000000 GHz PH0: Fat         Trig: Free Run Atten: 20 dB         Avg Type: Log Per Avg1Hed: 100100         The Tip: Free Run (cp) PH0: Fat         Per Processor           10 dBidv         Ref 10.00 dBm	Next P xt Pk R ext Pk arker D Mkr-
Ref Offset0.5 dB dB/d/w Ref 10.00 dBm 0.524 dBm 0 0 0 0 0 0 0 0 0 0 0 0 0	Next Peak	Marker 1 2.479826000000 GHz PH0: Fat         Trig: Free Run Atten: 20 dB         Avg Type: Log Per Avg1Hed: 100100         The Tip: Free Run (cp) PH0: Fat         Per Processor           10 dBidv         Ref 10.00 dBm	Next Pi Next Pi xt Pk Ri arker D Mkr

ilent Spectrum Analyzer - Swept SA RF 50 Q AC	SENSE:INT	ALIGNAUTO	02:03:17 PM 3.407, 2017		Agilent Spectrum Analyzer -			202:55 PM 3ul07, 2017	Peak Search
arker 1 2.40221400000	PNO: Fast Trig: Free Run IFGain:Low Atten: 20 dB	Avg Type: Log-Pwr Avg Hold≫100/100	TRACE 1 2 3 4 5 6 TVPE MWWWWW DET P N N N N N	Peak Search	Marker 1 2.401932	2000000 GHz PNO: Fast Trig: Free F IFGain:1 ow Atten: 20 d		TYPE MWWWWW DET P N N N N N	Peak Search
Ref Offset 0.5 dB	I Gaillow	Mkr1	2.402 214 GHz -0.132 dBm	NextPeak	Ref Offset	t 0.5 dB		401 932 GHz -30.586 dBm	NextPe
				Next Pk Right	-10.0 -20.0				Next Pk Rig
			^2	Next Pk Left	-30.0				Next Pk I
0.0 0.0 0.0 0.0	19.99629-20	,		Marker Delta	-60.0 -70.0 -80.0				Marker D
tart 2.31000 GHz Res BW 1.0 MHz		Sweep 1	Stop 2.40400 GHz .000 ms (1001 pts) FUNCTION VALUE	Mkr→CF	Start 2.31000 GHz #Res BW 1.0 MHz	#VBW 330 Hz	Sweep 222.1	p 2.40400 GHz 1 ms (1001 pts) FUNCTION VALUE	Mkr
2 N f 2.39	2 214 GHz -0.132 dBm 0 000 GHz -61.142 dBm 0 000 GHz -61.994 dBm			Mkr→RefLv	1 N F N F 3 4 5 6	2.401 932 GHz -30.596 dBn 2.390 000 GHz -72.213 dBn 2.310 000 GHz -72.542 dBn	n		Mkr→Ref
7 8 9 9 0 1				More 1 of 2	7 8 9 10				<b>M</b> 1
3		STATU	5		MSG		STATUS		

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## 6.9. Pseudorandom frequency hopping sequence

## 6.9.1 Standard Applicable

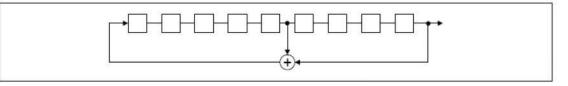
For 47 CFR Part 15C sections 15.247 (a) (1) requirement:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hop-ping 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. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hop-ping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

## 6.9.2 EUT Pseudorandom Frequency Hopping Sequence Requirement

The pseudorandom frequency hopping sequence may be generated in a nice-stage shift register whose 5th first stage. The sequence begins with the first one of 9 consecutive ones, for example: the shift register is initialized with nine ones.

- Number of shift register stages:9
- Length of pseudo-random sequence:29-1=511 bits
- Longest sequence of zeros:8(non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of pseudorandom frequency hopping sequence as follows:

0	2	4	6	62	64	78	1		73 75	77
				 1						Г
				1		1				
						1				
				 1	<u> </u>	1		}		L

Each frequency used equally one the average by each transmitter. The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitter and shift frequencies in synchronization with the transmitted signals.

## 6.10. Antenna requirement

## 6.10.1 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.

## 6.10.2 Antenna Connected Construction

6.10.2.1. Standard Applicable

According to § 15.203 & RSS-Gen, 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.

#### 6.10.2.2. Antenna Connector Construction

The directional gains of antenna used for transmitting is 1.5 dBi, and the antenna is an internal antenna connect to PCB board and no consideration of replacement. Please see EUT photo for details.

6.10.2.3. Results: Compliance.

#### Measurement

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module. For normal BT devices, the GFSK mode is used.

Conducted power refer ANSI C63.10:2013 Section 7.8.5 Output power test procedure for frequency-hopping spread-spectrum (FHSS) devices Radiated power refers to ANSI C63.10:2013 Section 6.6.4 Radiated emissions tests.

#### Measurement parameters

Measurement parameter		
Detector:	Peak	
Sweep Time:	Auto	
Resolution bandwidth:	1MHz	
Video bandwidth:	3MHz	
Trace-Mode:	Max hold	

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Limits

FCC	IC			
Antenna Gain				
6 dBi				

Note: The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module. For BT V3.0 devices, the GFSK mode is used;

T <sub>nom</sub>	V <sub>nom</sub>	Lowest Channel 2402 MHz	Middle Channel 2441 MHz	Highest Channel 2480 MHz
Measu	power [dBm] red with nodulation	1.098	1.667	0.516
Measu	oower [dBm] red with nodulation	2.437	3.090	1.819
Gain [dBi]	Calculated	1.339	1.423	1.303
Measurement uncertainty		± 1.6 dB (cond.) / ± 3.8 dB (rad.)		

# 7. TEST SETUP PHOTOGRAPHS

Please refer to separated files for Test Setup Photos of the EUT.

# 8.EXTERNAL AND INTERNAL PHOTOS OF THE EUT

Please refer to separated files for External Photos & Internal Photos of the EUT.

-----THE END OF REPORT------