	FCC TEST REPORT
	FOR
Dor	gGuan Bingo Electronics Co.,Ltd
	Bluetooth Headset
	Test Model: X1
List Model No.	: BT1 , BT06 , BT08 , S1, S2,S3,K1, K2, X2
Prepared for Address	<ul> <li>DongGuan Bingo Electronics Co.,Ltd</li> <li>Bingo Electronics after the village committee,Shuibei Village,Shipai Town, Dongguan, China</li> </ul>
Prepared by Address Tel Fax Web Mail	<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> <li>(+86)755-82591330</li> <li>(+86)755-82591332</li> <li>www.LCS-cert.com</li> <li>webmaster@LCS-cert.com</li> </ul>
Date of receipt of test sample Number of tested samples Serial number Date of Test	<ul> <li>March 02, 2017</li> <li>1</li> <li>Prototype</li> <li>March 02, 2017~March 23, 2017</li> </ul>

: March 23, 2017

:

Date of Test Date of Report

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March 02, 2017~March 23, 2017

SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. FCC ID: 2ALJZ-X1

	FCC TEST REPORT	
FCC	CFR 47 PART 15 C(15.247): 2015	i
Report Reference No	: LCS1703020348E	
Date of Issue	: March 23, 2017	
<b>U</b>	: Shenzhen LCS Compliance Testing	• •
Address	: 1/F., Xingyuan Industrial Park, Tongo Bao'an District, Shenzhen, Guangdor	la Road, Bao'an Avenue, ng, China
Testing Location/ Procedure	: Full application of Harmonised stands Partial application of Harmonised sta Other standard testing method D	ards ∎ ndards □
Applicant's Name	: DongGuan Bingo Electronics Co.,I	Ltd
Address	: Bingo Electronics after the village con Town, Dongguan, China	mmittee,Shuibei Village,Shipai
Test Specification		
Standard	: FCC CFR 47 PART 15 C(15.247): 20	)15
Test Report Form No	: LCSEMC-1.0	
TRF Originator	: Shenzhen LCS Compliance Testing I	Laboratory Ltd.
Master TRF	: Dated 2011-03	
Shenzhen LCS Compliance Testi	ng Laboratory Ltd. All rights reserved	J.
Shenzhen LCS Compliance Testing the material. Shenzhen LCS Compl	in whole or in part for non-commercial Laboratory Ltd. is acknowledged as co iance Testing Laboratory Ltd. takes no ng from the reader's interpretation of the	pyright owner and source of responsibility for and will not
Test Item Description.	: Bluetooth Headset	
Trade Mark	: N/A	
Test Model		
Ratings	DC 3.7V by battery(300mAh) Charging voltage: 5.0V <sup></sup> , 500mA	
Result		
Compiled by:	Supervised by:	Approved by:
Ada Giang	Josh	Gravino Liang

Ada Liang/ File administrators

Glin Lu/ Technique principal

Gavin Liang/ Manager

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SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. FCC ID: 2ALJZ-X1

Report No.: LCS1703020348E

# **FCC -- TEST REPORT**

Test Report No. : LCS17	03020348E	<u>March 23, 2017</u> Date of issue		
Test Model	: X1			
EUT	: Bluetooth Headset			
Applicant	: DongGuan Bingo Elec	ctronics Co.,Ltd		
Address	: Bingo Electronics after Town, Dongguan, Chin	the village committee,Shuibei Village,Shipai a		
Telephone	: /			
Fax	: /			
Manufacturer	: DongGuan Bingo Elec	•		
Address	: Bingo Electronics after Town, Dongguan, Chin	the village committee,Shuibei Village,Shipai a		
Telephone	: /			
Fax	: /			
Factory	: DongGuan Bingo Elec	ctronics Co.,Ltd		
Address	: Bingo Electronics after Town, Dongguan, Chin	the village committee,Shuibei Village,Shipai a		
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.

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# **Revision History**

Revision	Issue Date	Revisions	Revised By	
00	March 23, 2017	Initial Issue	Gavin Liang	

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SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. FCC ID: 2ALJZ-X1

# **1. GENERAL INFORMATION**

1.1

Description of Device (EUT)	
EUT	: Bluetooth Headset
Test Model	: X1
List Model No.	: X1, BT1 , BT06 , BT08 , S1, S2,S3,K1, K2, X2
Model Declaration	: PCB board, structure and internal of these model(s) are the same, So no additional models were tested.
Power Supply	: DC 3.7V by battery (300mAh) Recharge Voltage: 5.0V, 500mA
Hardware version	: V1.1
Software version	: V1.0
Bluetooth Operation frequency	/: 2402MHz-2480MHz
Bluetooth Version	: V2.1+EDR
Bluetooth Channel Number	: 79 Channels for Bluetooth V2.1+EDR
Bluetooth Modulation Type	: GFSK, $\pi$ /4-DQPSK , 8-DPSK for Bluetooth V2.1+EDR
Antenna Description	: Internal Antenna, 3dBi(Max.)

# 1.2 Support equipment List

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

# 1.3 External I/O Cable

I/O Port Description	Quantity	Cable
Charge Interface	1	N/A
AUX 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 C63.4:2014 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

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# 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
F	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 both power adapter and 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 engineering mode to fix the TX frequency that was for the purpose of the measurements.

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

# **3. SYSTEM TEST CONFIGURATION**

# 3.1 Justification

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

# 3.2 EUT Exercise Software

N/A.

3.3 Special Accessories

N/A.

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	Result				
§15.247(b)(1)	Maximum Conducted Output Power	Compliant			
§15.247(c)	Frequency Separation And 20 dB Bandwidth	Compliant			
§15.247(a)(1)(ii)	Number Of Hopping Frequency	Compliant			
§15.247(a)(1)(iii)	Time Of Occupancy (Dwell Time)	Compliant			
§15.209, §15.205	Conducted Spurious Emissions and Band Edges Test	Compliant			
§15.209, §15.247(d)	Radiated and Conducted Com Spurious Emissions				
§15.205	Emissions at Restricted Band	Compliant			
§15.207(a)	Conducted Emissions	Compliant			
§15.203	Antenna Requirements	Compliant			
§15.247(i)§2.1093	RF Exposure	Compliant			

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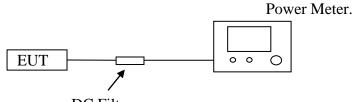
# 5. SUMMARY OF TEST EQUIPMENT

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

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# 6. MEASUREMENT RESULTS

- 6.1 Peak Power
- 6.1.1 Block Diagram of Test Setup



DC Filter

## 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	<b>25</b> ℃	Humidity	50.8%
Test Engineer	Jayden Zhuo	Configurations	BT

Test Mode	Channel	Frequency (MHz)	Measured Maximum Peak Power (dBm)	Limits (dBm)	Verdict
	0	2402	2.674		
GFSK	39	2441	3.318	30	PASS
	78	2480	3.236		
	0	2402	1.752		
π/4-DQPSK	39	2441	2.476	21	PASS
	78	2480	2.336		
	0	2402	1.843		
8-DPSK	39	2441	2.546	21	PASS
	78	2480	2.406		

Remark:

1. Test results including cable loss;

2. please refer to following plots;

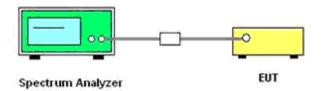
3. Measured output power at difference Packet Type for each mode and recorded worst case for each mode.

# 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

SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD.

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Temperature	<b>25</b> ℃	Humidity	50.8%
Test Engineer	Jayden Zhuo	Configurations	BT

Т	The Measurement Result With 1Mbps For GFSK Modulation						
Channel	20dB Bandwidth (KHz)	Channel Separation (MHz)	Limit (KHz)	Result			
Low	828.30		828.30	Pass			
Middle	821.40	1.000	821.40	Pass			
High	824.40		824.40	Pass			
The Measurement Result With 2Mbps For π/4-DQPSK Modulation							
Channel	20dB Bandwidth (KHz)	Channel Separation (MHz)	Limit (KHz)	Result			
Low	1115.00		743.33	Pass			
Middle	1116.00	1.000	744.00	Pass			
High	1113.00		742.00	Pass			
The Measurement Result With 3Mbps For 8-DPSK Modulation							
Channel	20dB Bandwidth (KHz)	Channel Separation (MHz)	Limit (KHz)	Result			
Low	1161.00		774.00	Pass			
Middle	1159.00	1.000	772.67	Pass			
High	1161.00		774.00	Pass			

Remark:

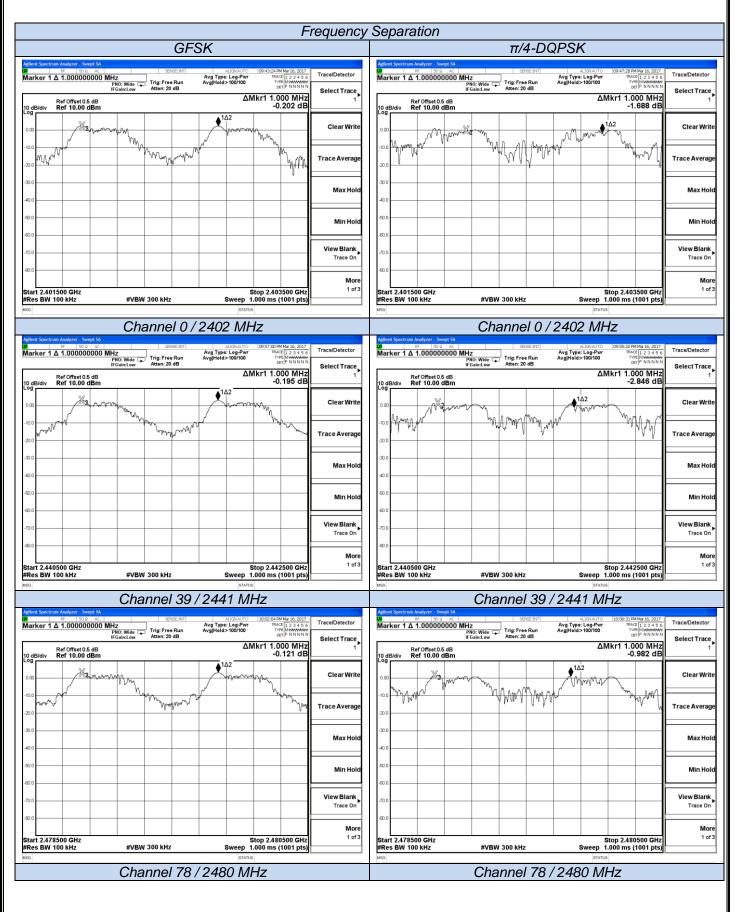
1. Test results including cable loss;

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

#### SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD.

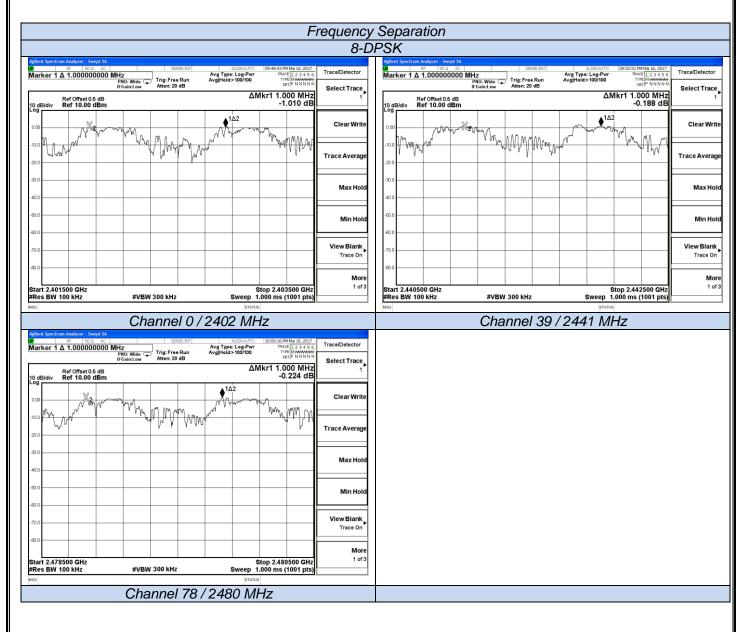
FCC ID: 2ALJZ-X1

Report No.: LCS1703020348E



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 SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD.
 FCC ID: 2ALJZ-X1

Report No.: LCS1703020348E

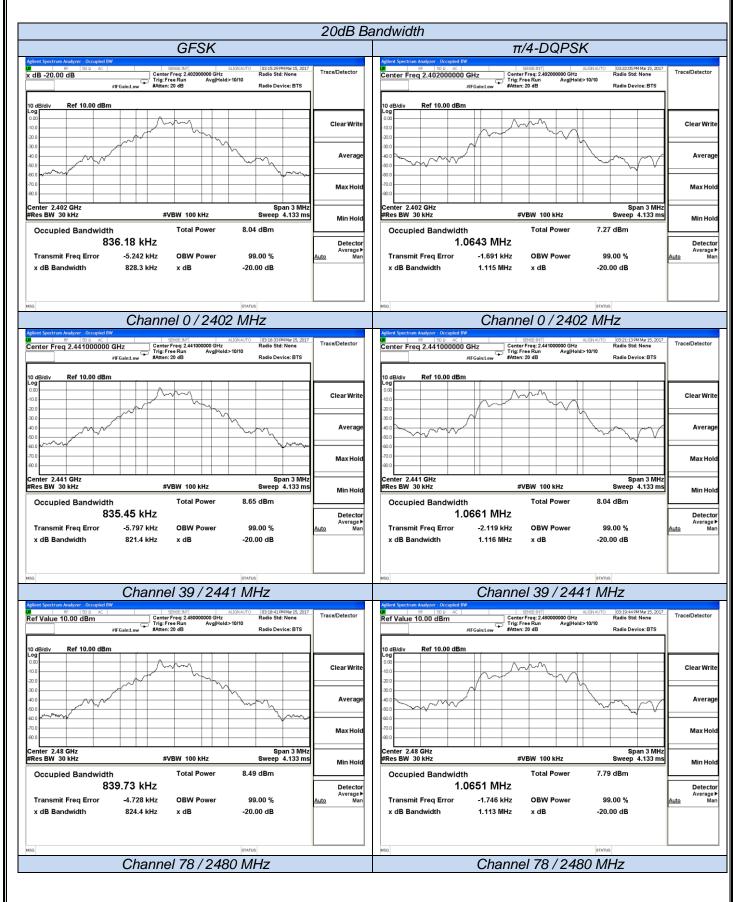


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#### SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD.

FCC ID: 2ALJZ-X1

Report No.: LCS1703020348E



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FCC ID: 2ALJZ-X1

Report No.: LCS1703020348E

Tes		Test Result
	8-DF	PSK
Agint Spectral Analyzer         - Occupied BW         SPREBRT         ALISHANTO         10324:12 FMMar 15, 2017           Center Freq 2.402000000 GHz         Center Freq: 2.40200000 GHz         Radio Std: None         Trig: Free Run         Avg Hold>10/10           IF/GainLow         #Atten: 20 dB         Radio Device: BTS         Radio Device: BTS	- Trace/Detector	Agliont Spectrum Andyzer - Occupied BW RF 50 0 AC STREEPINT ALIONAUTO 0022534PMMar 15, 2017 Center Freq 2.441000000 GHz Radio Std: None ///FGaind.ow ///FGaind.ow ///FGaind.ow
	ClearWrite	10 GBGIV Ref 10.00 dBm
	Average	Average
700	Max Hold	.700
Center 2.402 GHz Span 3 MHz #Res BW 30 kHz #VBW 100 kHz Sweep 4.133 ms	Min Hold	Center 2.441 GHz Span 3 MHz #Res BW 30 kHz #VBW 100 kHz Sweep 4.133 ms Min Hold
Occupied Bandwidth     Total Power     6.91 dBm       1.1058 MHz       Transmit Freq Error     -2.169 kHz     OBW Power     99.00 %       x dB Bandwidth     1.161 MHz     x dB     -20.00 dB	Detector Average► <u>Auto</u> Man	Occupied Bandwidth     Total Power     7.56 dBm       1.1051 MHz     Detector       Transmit Freq Error     -2.644 kHz     OBW Power     99.00 %       x dB Bandwidth     1.159 MHz     x dB     -20.00 dB
HSG STATUS		MSG STATUS
Channel 0 / 2402 MHz		Channel 39 / 2441 MHz
Agtent Spectrum Analyzer - Occupied BW B BF 500 AC SPECENT ALISNAUTO 02326-44 PMMar 15, 2017 Center Freq 2.4800000000 GHz BFGainLow Freq:2.480000000 GHz Radio Std: None BFGainLow FAtten: 20 dB Radio Device: BTS	Trace/Detector	
10 dB/div Ref 10.00 dBm	ClearWrite	
	Average	
60.0 70.0 80.0 80.0	Max Hold	
Center 2.48 GHz Span 3 MHz #Res BW 30 kHz #VBW 100 kHz Sweep 4.133 ms	Min Hold	
Occupied Bandwidth Total Power 7.32 dBm 1.1059 MHz	Detector	
Transmit Freq Error -2.253 kHz OBW Power 99.00 % x dB Bandwidth 1.161 MHz x dB -20.00 dB	Average ► Auto Man	
status Channel 78 / 2480 MHz		

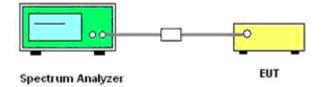
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# 6.3 Number of Hopping Frequency

### 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	<b>25</b> ℃	Humidity	50.8%
Test Engineer	Jayden Zhuo	Configurations	BT

The Measuremen	t Result With The Wors	t 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.

	SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD.	FCC ID: 2ALJZ-X1	Report No.: LCS1703020348E
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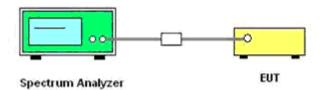
	Number Of Hopp	ing Frequency		
Agilent Spectrum Analyzer - Swept SA				
Marker 1 Δ 78.000000000 MHz PN0: F  FGain:	ast Trig: Free Run Atten: 20 dB	ALIGN AUTO Avg Type: Log-Pwr Avg Hold:>100/100	11:53:14 AM Mar 17, 2017 TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P N N N N N	Trace/Detector
Ref Offset 0.5 dB 10 dB/div Ref 10.00 dBm		∆Mkr1	78.000 0 MHz -0.709 dB	Select Trace
0.00	·····	manus anasa	<u>Δ2</u>	Clear Write
-10.0				Trace Average
-30.0				Max Hold
-40.0				Min Hold
-60.0				View Blank Trace On
-80.0				More
Start 2.40000 GHz #Res BW 1.0 MHz	#VBW 1.0 MHz		top 2.48350 GHz )00 ms (1001 pts)	1 of 3
· · · · · · · · · · · · · · · · · · ·	GFS	K		

# 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].

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Temperature	<b>25</b> ℃	Humidity	50.8%
Test Engineer	Jayden Zhuo	Configurations	ВТ

Mode	Frequency (MHz)	Burst Type	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Verdict
		DH1	0.368	0.1178		
GFSK	2441	DH3	1.616	0.2586	0.4	PASS
	DH5	2.864	0.3055			
		2DH1	0.368	0.1178		
π/4-DQPSK	2441	2DH3	1.616	0.2586	0.4	PASS
		2DH5	2.848	0.3038		
		3DH1	0.368	0.1178		
8-DPSK	2441	3DH3	1.624	0.2598	0.4	PASS
		3DH5	2.880	0.3072		

Remark:

1. Test results including cable loss;

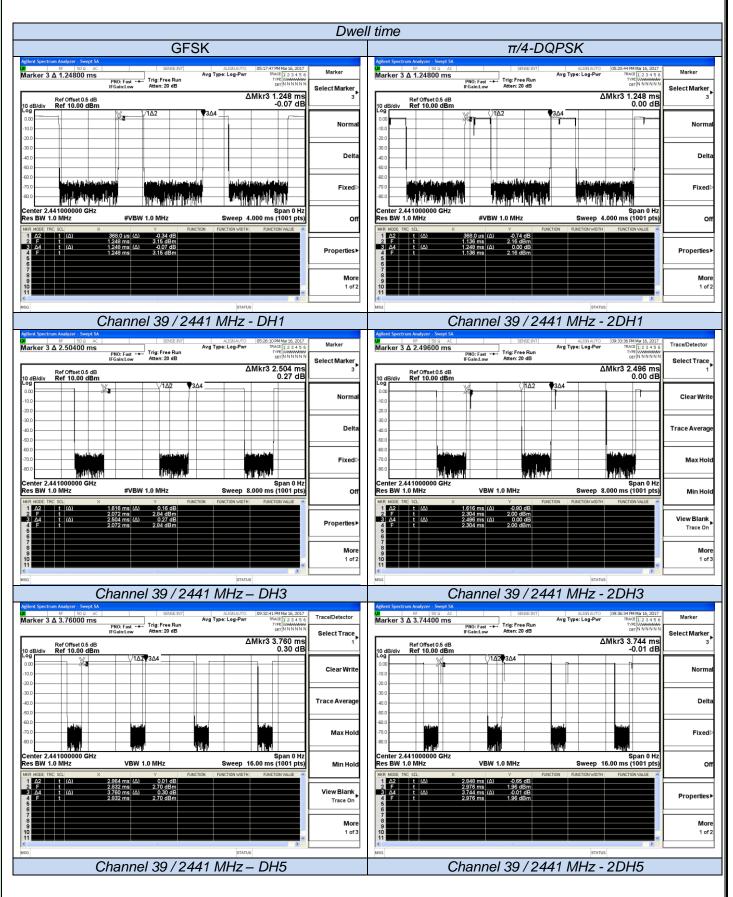
2. please refer to following plots;

- 3. Measured at difference Packet Type for each mode and recorded woest case for each mode.
- 4. 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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	Dwel	ll time	
	8-D	PSK	
PNO: Fast → Trig: Free Run	Marker ect Marker	Aglent Spectrum Analyzer - Swept SA Set 50 0 A C Marker 3 ▲ 2.50400 ms PN0: Fast → Trig: Free Run IF Gaint.ew Atten: 20 dB	Marker Select Marker
Ref Offset 0.5 dB         ΔMkr3 1.260 ms           10 dB/div         Ref 10.00 dBm         -0.02 dB           0.00         -0.02 dB         -0.02 dB	3	Ref Offset 0.5 dB         ΔMkr3 2.504 ms           10 dB/div         Ref 10.00 dBm         1.08 dB           0 g         10 dB/div         1.02 d3Δ4	3*
	Normal		Normal
	Delta		Delta
	Fixed⊳		Fixed⊳
Center 2.441000000 GHz         Span 0 Hz           Res BW 1.0 MHz         #VBW 1.0 MHz         Sweep 4.000 ms (1001 pts)           MR1 MODE THC SCL         X         Y         FUNCTION FUNCTION WOTH         FUNCTION WOTH           1         Δ2         Y         State of the state	off	Center 2.441000000 GHz         Span 0 Hz         Span 0 Hz           Res BW 1.0 MHz         VBW 1.0 MHz         Sweep 8.000 ms (1001 pts)           MRR MODE TRC SCL         X         Y         Function / Function / Worth // Function /	off
2 F t 1.128 ms 2.08 dBm	Properties►	Δ2         L         L         1.00 mm (a)         0.97 dBm           2         F         t         2.264 ms         0.91 dBm           3         Δ.4         t         (Δ)         2.804 ms         0.91 dBm           4         F         t         2.264 ms         0.91 dBm           5         f         t         2.264 ms         0.91 dBm	Properties►
	More 1 of 2		More 1 of 2
MSG STATUS		MSG STATUS	
Channel 39 / 2441 MHz - 3DH1 Addres Spectrum Analyzer - Swept SA		2 Channel 39 / 2441 MHz - 3DH3	
Marker 3 ∆ 3.74400 ms         ENCENT         ALSHAUTO         0xx40114046,2027         N           Marker 3 ∆ 3.74400 ms         PN0: Fast         Trig: Free Run         Avg Type: Log-Pwr         Trive(2) [12:3:45:6         N           Floaring         Trig: Grad Box         Trig: Grad Box         Selection         Selection         Selection         N	Marker ect Marker		
Ref Offset0.5 dB         ΔMkr3 3.744 ms           10 dB/div         Ref 10.00 dBm         0.00 dB           Log         ₩         €/10/2804	3		
	Normai		
	Delta		
	Fixed⊳		
Center 2.441000000 GHz         Span 0 Hz           Res BW 1.0 MHz         VBW 1.0 MHz         Sweep 16.00 ms (1001 pts)           MRR MODE TRC SCL         X         Y         PUNCTION         PUNCTION WIDTH         PUNCTION WIDTH	Off		
1         Δ2         t         (Δ)         2.890 ms         (Δ)         0.38 dB         1	Properties►		
	More 1 of 2		
K STATUS			
Channel 39 / 2441 MHz – 3DH5			

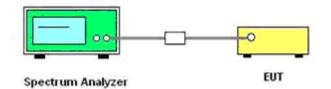
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# 6.5 Conducted Spurious Emissions and Band Edges Test

#### 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.

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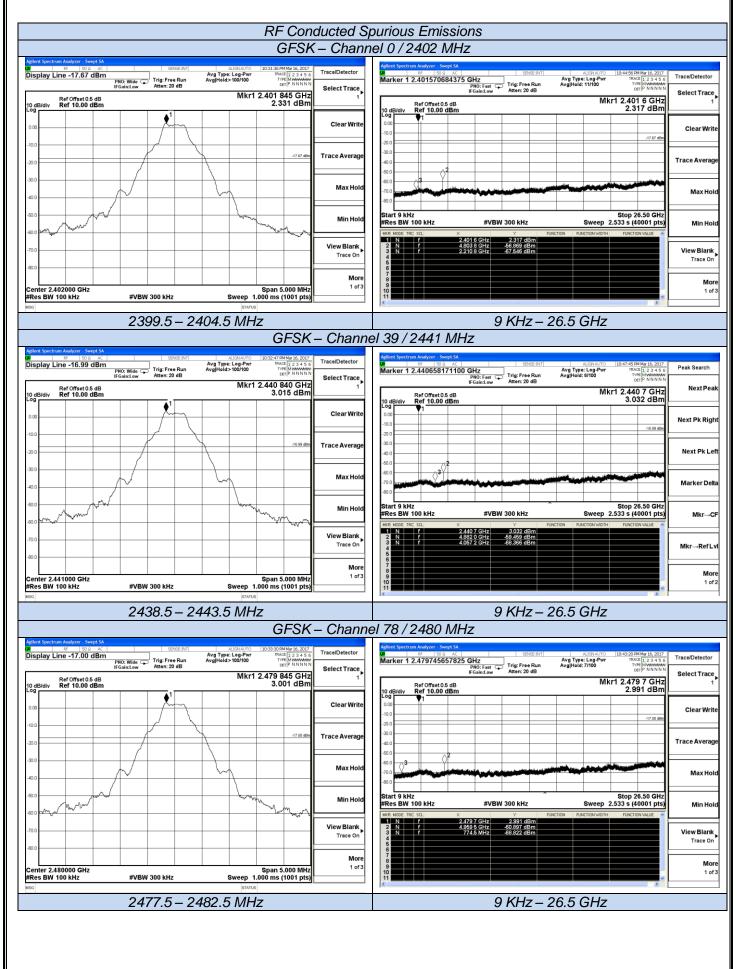
Temperature	<b>25</b> ℃	Humidity	50.8%
Test Engineer	Jayden Zhuo	Configurations	BT

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		

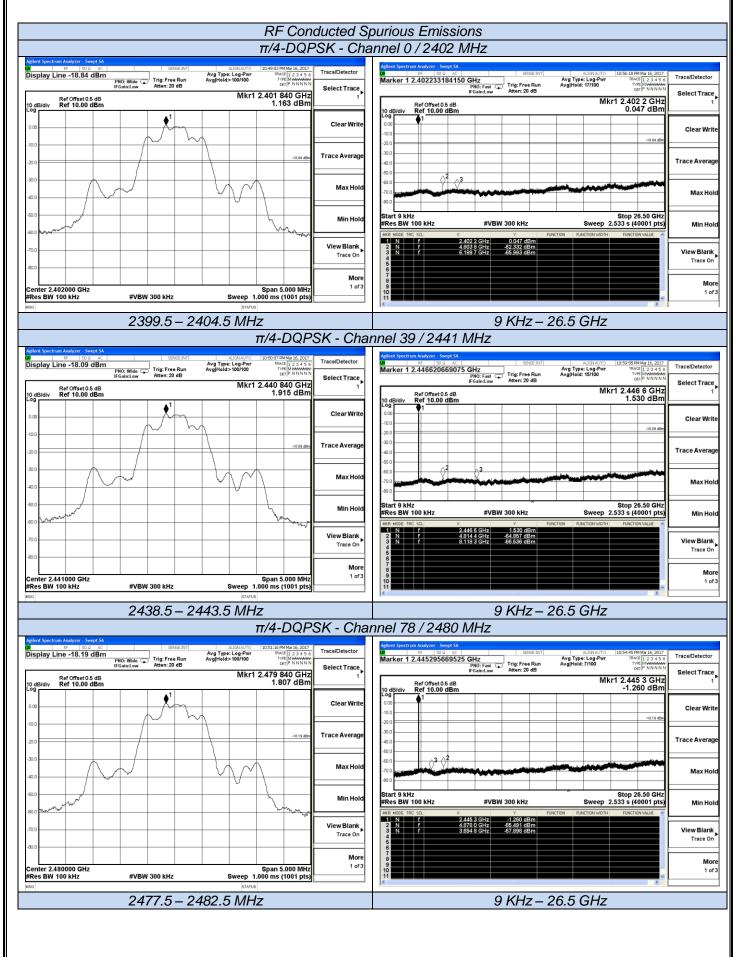
Remark:

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.

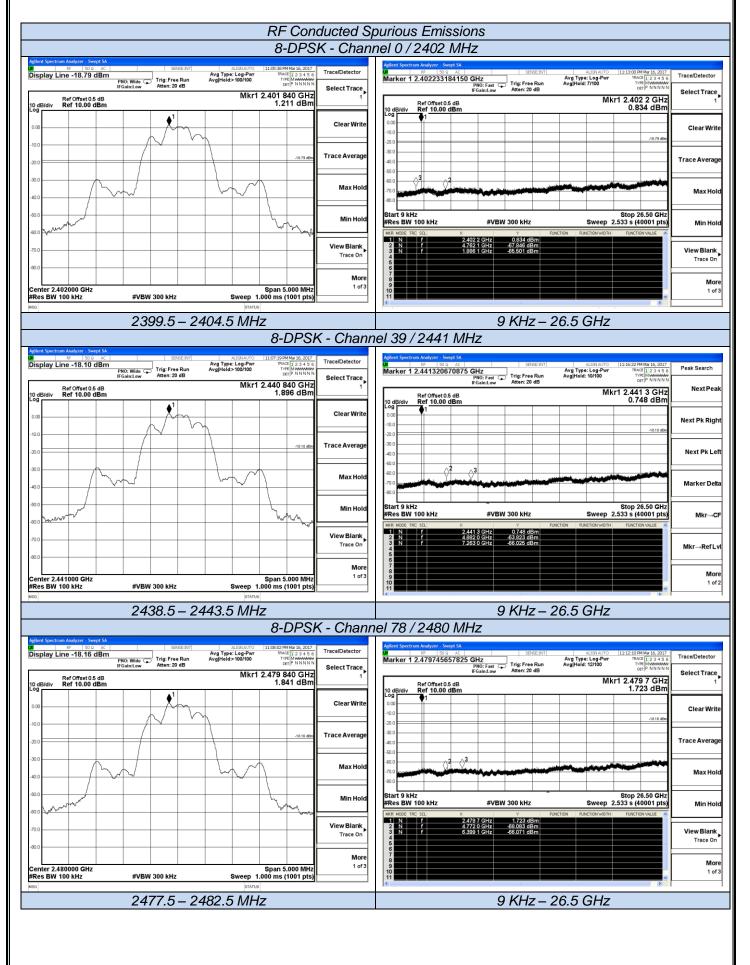
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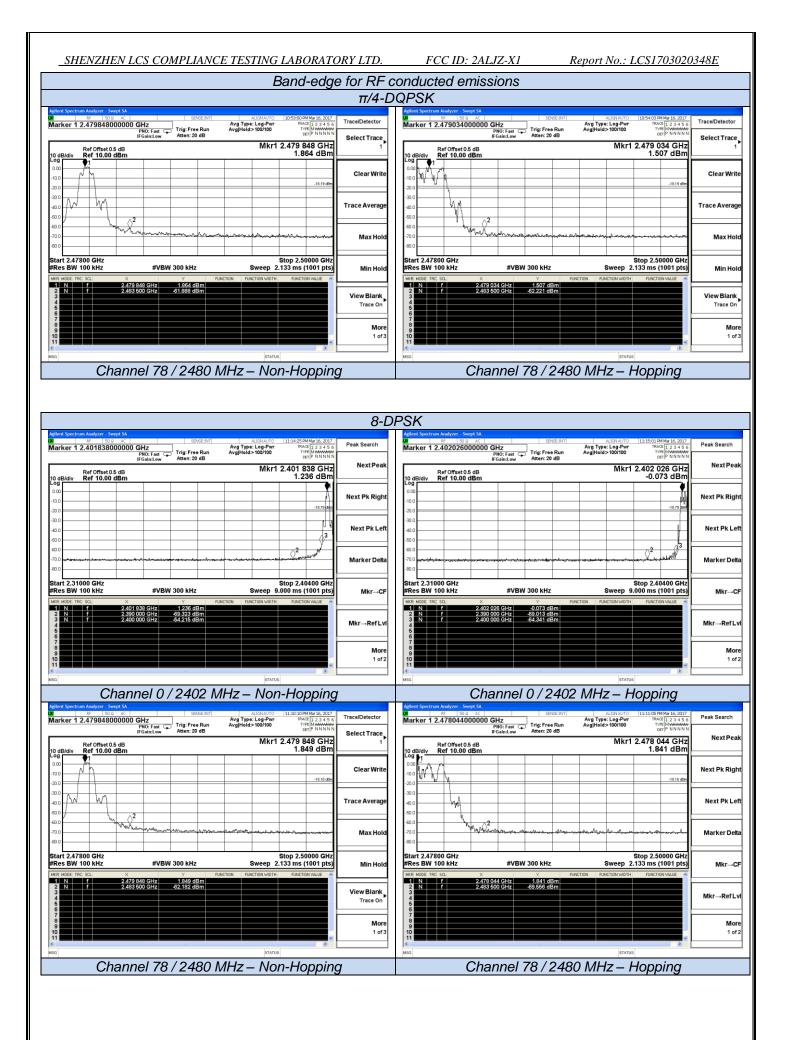
#### SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. FCC ID: 2ALJZ-X1

Report No.: LCS1703020348E

Band-edge for RF conducted emissions			
GFSK			
Adlent Spectrum Analyzer - Swopt SA	Trace/Detector	Aglent Spectrum Analyzer - Swept SA 10 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	arch
PNO: Fast IFGain:Low Atten: 20 dB	Select Trace	PN0: Fast Trig: Free Run Avg Hold>100/100 PFE PNNNN IFGain:Low Atten: 20 dB	
Ref Offset 0.5 dB Mkr1 2.401 838 GHz 10 dB/div Ref 10.00 dBm 2.365 dBm	1	Ref Offset 0.5 dB Mkr1 2.401 838 GHz Nex 10 dB/div Ref 10.00 dBm 2.272 dBm	t Peak
Log	Clear Write		k Right
300 -400 -500	Trace Average	600	Pk Left
	Max Hold	40.0 700	er Delta
Start 2.31000 GHz         Stop 2.40400 GHz           #Res BW 100 kHz         #VBW 300 kHz         Sweep 9.000 ms (1001 pts)           MMR MODELTIC SQL         X         Y         Punction         Punction         Punction vulue         *	Min Hold	MKR MODE TRC SCL X Y FUNCTION WIDTH FUNCTION VALUE	kr→CF
2 N f 2.300 000 GHz 2-56 654 dBm 3 N f 2.400 000 GHz -54.129 dBm 4 S f 2.400 000 GHz -54.129 dBm	View Blank Trace On	1 N f 2.401 838 GHz 2.272 dBm 2 N f 2.380 000 GHz - 70.088 dBm 3 N f 2.400 000 GHz - 55.757 dBm 4 S M f 2.400 000 GHz - 55.757 dBm 6 S	RefLvl
7 8 9 10 11	More 1 of 3		More 1 of 2
MSG STATUS		MSG	
Channel 0 / 2402 MHz – Non-Hopping		Channel 0 / 2402 MHz – Hopping	
Aglinni Spectrum Analyzer - Swept SA. 87 87 850 3° Ac Marker 2 2.483500000000 GHz PRO: Fast FGainture Trig: Free Run Atten: 20 dB	Trace/Detector Select Trace	Agtent Spectrum Analyzer - Swept SA         SPECEDIT         ALIXNA/TO         10x4208 PM Mar 36, 2012           W         85         500         AC         SPECEDIT         ALIXNA/TO         10x4208 PM Mar 36, 2012           Marker 1 2.476836000000 GHz PHO: Fast Current Processor         Trig: Free Run Atten: 20 dB         Avg Type: Log-Pwr Atten: 20 dB         Trig! Prev Run Action Processor         Peak Se	
Adjust Spectrum Ambyers         Sweet A.         State	Trace/Detector	Aglenit Spectrum Analyzer - Swept SA         SPICE.DIT         ALIONA/TO         10x4208 PM Mar 15, 2012           Warker 1 2.4788366000000 GHz IFGeint.ew         Trig: Free Run Atten: 20 dB         Arg Type: Log-Pwr Avg]Hold>100160         Trice JM Mar 15, 2012           Ref Offset 0.5 dB         Mkr1 2.4788 836 GHz         Nex	arch tt Peak
Aglient Spectrum Analyzer         Swept SA           R3         50 2         Ac         SENSE.INT         AUSHAUTO         ID-41.07 PM Mer 16, 2017           Marker 2 2.4835000000000 GHz         Trig: Free Run IFGG: nature         Trig: Free Run Atten: 20 dB         Avg Type: Log-Pvr AvgIHold>100/100         ID-41.07 PM Mer 16, 2017           Ref Offset 0.5 dB         Mkr2 2.483 5000 GHz         Mkr2 2.483 5000 GHz	Trace/Detector	Agtent Spectrum Analyzer - Swrgt 5A         SPICE.DIT         ALIZNA/TO         [10:4208 PM Mar 35, 2017]           Warker 1 2.476836000000 GHz Marker 1 2.476836000000 GHz IFGeint.ew         Trig: Free Run Atten: 20 dB         Avg Type: Log-Pwr Avg/Hold>100100         Twc/Microsoft Trig: Free Run Avg/Hold>2005         Peak Se           Provide         B         Mkr1 2.478 836 GHz         Nex	t Peak
Adjust Spectrum Andyzer         Sweet SA           1         50         50         Active Andyzer           Marker 2 2.483500000000 GHz         Trig: Free Run IF Gain:Low         Avg Type: Leg-Pur Atten: 20 dB         Trig: Free Run ArgHolds-100/100         Trig: Free Run Trig: Free Run Atten: 20 dB         Mkr2 2.483 500 GHz -55.658 dBm           10 dB/div         -65.658 dBm         -65.658 dBm         -700.98           000         -1700.98         -1700.98         -1700.98	Trace/Detector Select Trace	Applient Spectrum Analyzer - Sweet SA           Control - Contr	t Peak
Adjust Spectrum Andyzer         Swell SA           Marker 2 2.483500000000 GHz         Bit 50 0 AC GHz           PI0: Feat         Frig: Free Run IFGaint.tew         Avg Type: Leg-Pur Atten: 20 dB         Marker 2 2.483 50000000 GHz           10 dB/div         Ref Offset 0.5 dB         Mkr2 2.483 500 GHz         Bit 50 0 Ac GHz           0 dB/div         Ref Offset 0.5 dB         Mkr2 2.483 500 GHz         Bit 50 Ac GHz           0 dB/div         Ref 00.00 dBm         -65.658 dBm         -65.658 dBm           0 d0         -77 0.066         -77 0.066         -77 0.066	Trace/Detector Select Trace 1 Clear Write	Adjent         Spectrum Analyzer - Swrigt SA.         Peak Se.	k Right
Adjust Stysektrain Andyzer         Sweet BA           Image: Stysektrain Andyzer         Stop 2.6 AC           Marker 2 2.483500000000 GHz         Trigs: Free Run IFGainst.ew         Avg Type: Leg-Pwr Avg Hide/s 100/100         The Stop 2.6 C           Marker 2 2.483500000000 GHz         Trigs: Free Run IFGainst.ew         Avg Type: Leg-Pwr Atten: 20 dB         The Stop 2.6 C           0 dB/dur         Ref 00.5 dB         Mkr2 2.483 500 GHz         The Stop 2.6 C           0 dB/dur         - 65.658 dBm         - 65.658 dBm           0 dB/dur         - 65.658 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm </th <th>Trace/Detector Select Trace 1 Clear Write Trace Average</th> <th>Address Spectrum Analyzer: Sweet SA         Bit So &amp; Ac         Bit So &amp; Ac         Bit So &amp; Ac         Peak Se           Marker 12.478835000000 GHz Price Fast 10 dBioldy         Trig: Free Run Marker 20 dB         Arg Type: Leg Pwr Arg Type: Leg Pwr</th> <th>k Right Pk Left</th>	Trace/Detector Select Trace 1 Clear Write Trace Average	Address Spectrum Analyzer: Sweet SA         Bit So & Ac         Bit So & Ac         Bit So & Ac         Peak Se           Marker 12.478835000000 GHz Price Fast 10 dBioldy         Trig: Free Run Marker 20 dB         Arg Type: Leg Pwr Arg Type: Leg Pwr	k Right Pk Left
Algebra         State         <	Trace/Detector Select Trace, 1 Clear Write Trace Average Max Hold	Addint Spectrum Analyzer Sweet SA         Store Entities         ALXIVATIO         ID-C200 PM Mar 36, 2007         Peak Sa           Marker 1 Z.47883600000 GHz PHC Fast 0 dB/db/ 10 dB/db/ 0 0         Trig: Free Run Atten: 20 dB         Arg Tyre: Leg-Pwr Arg Tyre: Leg-P	tt Peak k Right Pk Left tr Delta kr→CF
Adjust Stysektrain Andyzer         Sweet BA           Image: Stysektrain Andyzer         Stop 2.6 AC           Marker 2 2.483500000000 GHz         Trigs: Free Run IFGainst.ew         Avg Type: Leg-Pwr Avg Hide/s 100/100         The Stop 2.6 C           Marker 2 2.483500000000 GHz         Trigs: Free Run IFGainst.ew         Avg Type: Leg-Pwr Atten: 20 dB         The Stop 2.6 C           0 dB/dur         Ref 00.5 dB         Mkr2 2.483 500 GHz         The Stop 2.6 C           0 dB/dur         - 65.658 dBm         - 65.658 dBm           0 dB/dur         - 65.658 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm </th <th>Trace/Detector Select Trace 1 Clear Write Trace Average Max Hold Min Hold View Blank</th> <th>Address Spectrum Analyzer: Sweets SA.         Sector Spectrum Analyzer: Sweets SA.         Sector Spectrum Analyzer: Sweets SA.         Peak Sector SA.         <t< th=""><th>tt Peak k Right Pk Left tr Delta kr→CF</th></t<></th>	Trace/Detector Select Trace 1 Clear Write Trace Average Max Hold Min Hold View Blank	Address Spectrum Analyzer: Sweets SA.         Sector Spectrum Analyzer: Sweets SA.         Sector Spectrum Analyzer: Sweets SA.         Peak Sector SA. <t< th=""><th>tt Peak k Right Pk Left tr Delta kr→CF</th></t<>	tt Peak k Right Pk Left tr Delta kr→CF
Adjust Stysektrain Andyzer         Sweet BA           Image: Stysektrain Andyzer         Stop 2.6 AC           Marker 2 2.483500000000 GHz         Trigs: Free Run IFGainst.ew         Avg Type: Leg-Pwr Avg Hide/s 100/100         The Stop 2.6 C           Marker 2 2.483500000000 GHz         Trigs: Free Run IFGainst.ew         Avg Type: Leg-Pwr Atten: 20 dB         The Stop 2.6 C           0 dB/dur         Ref 00.5 dB         Mkr2 2.483 500 GHz         The Stop 2.6 C           0 dB/dur         - 65.658 dBm         - 65.658 dBm           0 dB/dur         - 65.658 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm           0 dB/dur         - 770 dBm         - 770 dBm         - 770 dBm </th <th>Trace/Detector Select Trace 1 Clear Write Trace Average Max Hold Min Hold View Blank Trace On More 1 of 3</th> <th>Address Spectrum Analyzer: Sweet SA.         Bit I So Co.         Co.         I So Co.         Peak Se           Marker 12.4788350000000 GHz PHC Fast I Co.         Trig: Free Run Atten: 20 dB         Arg Type: Log Pwr Arg Type: Log P</th> <th>k Right k Right Pk Left r Delta kr→CF Ref Lvl</th>	Trace/Detector Select Trace 1 Clear Write Trace Average Max Hold Min Hold View Blank Trace On More 1 of 3	Address Spectrum Analyzer: Sweet SA.         Bit I So Co.         Co.         I So Co.         Peak Se           Marker 12.4788350000000 GHz PHC Fast I Co.         Trig: Free Run Atten: 20 dB         Arg Type: Log Pwr Arg Type: Log P	k Right k Right Pk Left r Delta kr→CF Ref Lvl

π/4-DQPSK			
Agilent Spectrum Analyzer         Swept SA         Spectrum Analyzer         Swept SA           2         IP         50.9         AC         Spectrum Analyzer         IDS727 PM Mer 16, 2017           3         IP         50.9         AC         Spectrum Analyzer         IDS727 PM Mer 16, 2017           Marker 1 2.401838000000 GHz         Trigs: Free Run         Avg1Hold>100100         Trigs: Free Run Avg1Hold>100100         Trigs: Free Run Avg1Hold>100100           IF GainLow         Atten: 20 dB         CB         EP ININAN         EP ININAN	Peak Search	Aglent Spectrum Analyzer - Swept SA         SPIEEINT         ALIGULUTO         IDSE:31 PM Mr 15, 2017           W         FF         50.9         AC         SPIEEINT         ALIGULUTO         IDSE:31 PM Mr 15, 2017           Marker 1 2.402026000000 GHz         Trig: Free Run FR010-Fast         Avg Type: Log-Pwr Atten: 20 4B         Trig: Free Run Atten: 20 4B         Avg Hold>100100         Trig: Free Run Cer[P NNNNN	:h
Ref Offset 0.5 dB         Mkr1 2.401 838 GHz           10 dB/div         Ref 10.00 dBm         1.227 dBm           Log         Max         1.227 dBm	NextPeak	Ref Offset 0.5 dB Mkr1 2.402 026 GHz 10 dB/div Ref 10.00 dBm 1.007 dBm	Peak
100	Next Pk Right	Log 0.00 	tight
300 400 500	Next Pk Left	300 Next Pk	Left
	Marker Delta	800 700	Delta
Start 2.31000 GHz         Stop 2.40400 GHz           #Res BW 100 kHz         #VBW 300 kHz         Sweep 9.000 ms (1001 pts)           Mar Moder Ro Sci.         x         y         Punction         Punction value *	Mkr→CF	Start 2.31000 GHz         Stop 2.40400 GHz           #Res BW 100 kHz         #VBW 300 kHz         Sweep 9.000 ms (100 Hz)           Mkr/ MCB FR SLL         X         Y         Function Victor Vic	→CF
11 N f 2401838 GHz 1227 GBm 2 N f 239000 GHz 469393 dBm 4 f 2400 000 GHz 469393 dBm 4 g	Mkr⊸RefLvl	1         N         f         24/2202 GHz         1007 dBm           2         N         r         258000 GHz         69846 dBm           3         N         f         2400 000 GHz         69846 dBm           4         5         5         5         5           6         5         5         5         5	fLvI
	More 1 of 2		<b>Nore</b> 1 of 2
MSG STATUS	KE STATUS KATUS		
Channel 0 / 2402 MHz – Non-Hopping 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 )	Measuremen t 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 ( $\pm$  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  $(\pm 45^\circ)$  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:**

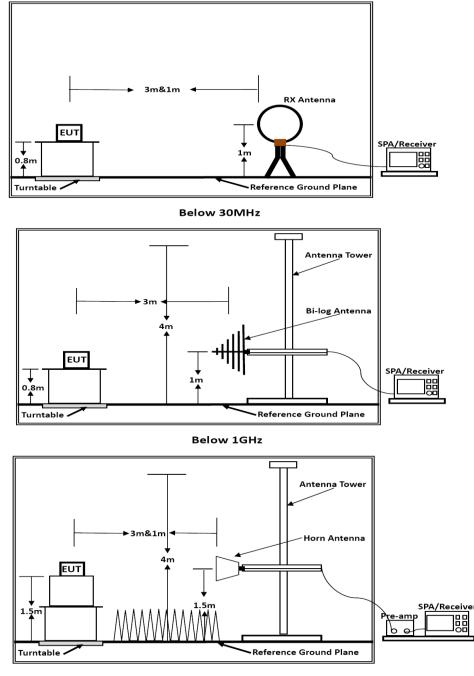
--- The antenna is moved spherical over the EUT in different polarizations of the antenna.

## **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 1GHz

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 =  $20 \log (\text{specific distanc [3m] / test distance [1.5m]}) (dB);$ 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	23.8	<b>23.8</b> ℃		umidity	54%
Test Engineer	Jayden	Zhuo	Conf	igurations	BT
Freq. (MHz)	Level (dBuV)	Over (d	Limit B)	Over Limit (dBuV)	it 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.

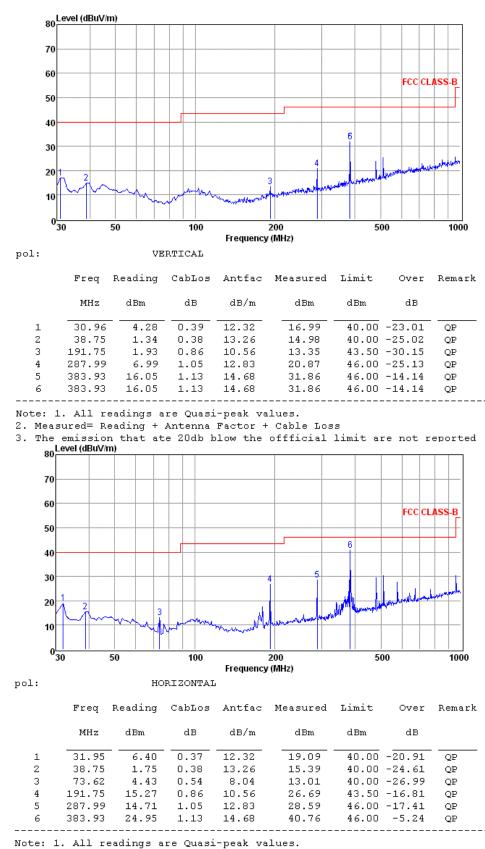
Distance extrapolation factor = 40 log (specific distance / test distance) (dB); Limit line = specific limits (dBuV) + distance extrapolation factor.

### PASS.

Only record the worst test result in this report.

The test data please refer to following page.

### Below 1GHz (Low Channel)



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	55.18	33.30	36.44	7.68	59.72	74.00	-14.28	Peak	Horizontal
4804.00	39.98	33.30	36.44	7.68	44.52	54.00	-9.48	Average	Horizontal
12010.00	52.97	36.52	35.37	10.22	64.34	74.00	-9.66	Peak	Horizontal
12010.00	34.91	36.52	35.37	10.22	46.28	54.00	-7.72	Average	Horizontal
4804.00	58.62	33.48	36.44	7.68	63.34	74.00	-10.66	Peak	Vertical
4804.00	42.18	33.48	36.44	7.68	46.90	54.00	-7.10	Average	Vertical
12010.00	54.81	36.36	35.37	10.22	66.02	74.00	-7.98	Peak	Vertical
12010.00	50.21	36.36	35.37	10.22	61.42	54.00	7.42	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	55.10	33.30	36.44	7.68	59.64	74.00	-14.36	Peak	Horizontal
4804.00	39.83	33.30	36.44	7.68	44.37	54.00	-9.63	Average	Horizontal
12010.00	53.38	36.52	35.37	10.22	64.75	74.00	-9.25	Peak	Horizontal
12010.00	35.27	36.52	35.37	10.22	46.64	54.00	-7.36	Average	Horizontal
4804.00	59.34	33.48	36.44	7.68	64.06	74.00	-9.94	Peak	Vertical
4804.00	41.75	33.48	36.44	7.68	46.47	54.00	-7.53	Average	Vertical
12010.00	54.98	36.36	35.37	10.22	66.19	74.00	-7.81	Peak	Vertical
12010.00	50.32	36.36	35.37	10.22	61.53	54.00	7.53	Average	Vertical

The worst test result for 8DPSK, 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	54.75	33.30	36.44	7.68	59.29	74.00	-14.71	Peak	Horizontal
4804.00	39.82	33.30	36.44	7.68	44.36	54.00	-9.64	Average	Horizontal
12010.00	52.82	36.52	35.37	10.22	64.19	74.00	-9.81	Peak	Horizontal
12010.00	34.63	36.52	35.37	10.22	46.00	54.00	-8.00	Average	Horizontal
4804.00	59.23	33.48	36.44	7.68	63.95	74.00	-10.05	Peak	Vertical
4804.00	41.83	33.48	36.44	7.68	46.55	54.00	-7.45	Average	Vertical
12010.00	55.12	36.36	35.37	10.22	66.33	74.00	-7.67	Peak	Vertical
12010.00	50.15	36.36	35.37	10.22	61.36	54.00	7.36	Average	Vertical

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	55.36	33.30	36.44	7.68	59.90	74.00	-14.10	Peak	Horizontal
4882.00	44.33	33.30	36.44	7.68	48.87	54.00	-5.13	Average	Horizontal
12205.00	53.34	36.52	35.37	10.22	64.71	74.00	-9.29	Peak	Horizontal
12205.00	34.99	36.52	35.37	10.22	46.36	54.00	-7.64	Average	Horizontal
4882.00	58.85	33.31	36.44	7.68	63.40	74.00	-10.60	Peak	Vertical
4882.00	41.94	33.31	36.44	7.68	46.49	54.00	-7.51	Average	Vertical
12205.00	54.68	36.63	35.37	10.22	66.16	74.00	-7.84	Peak	Vertical
12205.00	50.11	36.63	35.37	10.22	61.59	54.00	7.59	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	Measure d dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4882.00	54.71	33.30	36.44	7.68	59.25	74.00	-14.75	Peak	Horizontal
4882.00	43.87	33.30	36.44	7.68	48.41	54.00	-5.59	Average	Horizontal
12205.00	52.85	36.52	35.37	10.22	64.22	74.00	-9.78	Peak	Horizontal
12205.00	34.60	36.52	35.37	10.22	45.97	54.00	-8.03	Average	Horizontal
4882.00	59.02	33.31	36.44	7.68	63.57	74.00	-10.43	Peak	Vertical
4882.00	42.04	33.31	36.44	7.68	46.59	54.00	-7.41	Average	Vertical
12205.00	54.71	36.63	35.37	10.22	66.19	74.00	-7.81	Peak	Vertical
12205.00	49.75	36.63	35.37	10.22	61.23	54.00	7.23	Average	Vertical

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

Freq. MHz	Reading dBuv	Ant. Fac dB/m	Pre. Fac. dB	Cab. Loss dB	Measure d dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4882.00	55.09	33.30	36.44	7.68	59.63	74.00	-14.37	Peak	Horizontal
4882.00	44.14	33.30	36.44	7.68	48.68	54.00	-5.32	Average	Horizontal
12205.00	52.96	36.52	35.37	10.22	64.33	74.00	-9.67	Peak	Horizontal
12205.00	35.14	36.52	35.37	10.22	46.51	54.00	-7.49	Average	Horizontal
4882.00	59.05	33.31	36.44	7.68	63.60	74.00	-10.40	Peak	Vertical
4882.00	42.35	33.31	36.44	7.68	46.90	54.00	-7.10	Average	Vertical
12205.00	55.01	36.63	35.37	10.22	66.49	74.00	-7.51	Peak	Vertical
12205.00	50.18	36.63	35.37	10.22	61.66	54.00	7.66	Average	Vertical

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The worst test result for GFSK, Channel 78 / 2480 MHz
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Freq. MHz	Reading dBuv	Ant. Fac dB/m	Pre. Fac dB	Cab.L os dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4960.00	55.23	33.55	36.41	7.74	60.11	74.00	-13.89	Peak	Horizontal
4960.00	43.20	33.55	36.41	7.74	48.08	54.00	-5.92	Average	Horizontal
12400.00	51.18	36.52	35.37	10.22	62.55	74.00	-11.45	Peak	Horizontal
12400.00	34.80	36.52	35.37	10.22	46.17	54.00	-7.83	Average	Horizontal
4960.00	59.20	33.73	36.41	7.74	64.26	74.00	-9.74	Peak	Vertical
4960.00	42.27	33.73	36.41	7.74	47.33	54.00	-6.67	Average	Vertical
12400.00	56.62	36.27	35.37	10.22	67.74	74.00	-6.26	Peak	Vertical
12400.00	35.29	36.27	35.37	10.22	46.41	54.00	-7.59	Average	Vertical

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

Freq. MHz	Reading dBuv	Ant. Fac dB/m	Pre. Fac dB	Cab.L os dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4960.00	54.84	33.55	36.41	7.74	59.72	74.00	-14.28	Peak	Horizontal
4960.00	43.00	33.55	36.41	7.74	47.88	54.00	-6.12	Average	Horizontal
12400.00	50.70	36.52	35.37	10.22	62.07	74.00	-11.93	Peak	Horizontal
12400.00	34.72	36.52	35.37	10.22	46.09	54.00	-7.91	Average	Horizontal
4960.00	59.33	33.73	36.41	7.74	64.39	74.00	-9.61	Peak	Vertical
4960.00	41.79	33.73	36.41	7.74	46.85	54.00	-7.15	Average	Vertical
12400.00	57.11	36.27	35.37	10.22	68.23	74.00	-5.77	Peak	Vertical
12400.00	34.64	36.27	35.37	10.22	45.76	54.00	-8.24	Average	Vertical

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

Freq. MHz	Reading dBuv	Ant. Fac dB/m	Pre. Fac dB	Cab.L os dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4960.00	54.76	33.55	36.41	7.74	59.64	74.00	-14.36	Peak	Horizontal
4960.00	43.21	33.55	36.41	7.74	48.09	54.00	-5.91	Average	Horizontal
12400.00	51.36	36.52	35.37	10.22	62.73	74.00	-11.27	Peak	Horizontal
12400.00	35.22	36.52	35.37	10.22	46.59	54.00	-7.41	Average	Horizontal
4960.00	58.61	33.73	36.41	7.74	63.67	74.00	-10.33	Peak	Vertical
4960.00	41.71	33.73	36.41	7.74	46.77	54.00	-7.23	Average	Vertical
12400.00	57.00	36.27	35.37	10.22	68.12	74.00	-5.88	Peak	Vertical
12400.00	34.87	36.27	35.37	10.22	45.99	54.00	-8.01	Average	Vertical

### Notes:

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

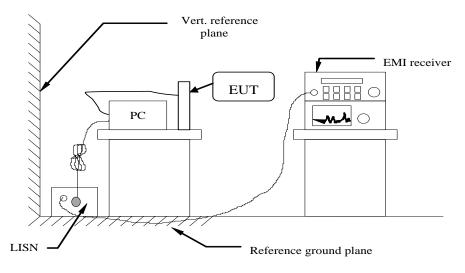
### 6.7.1 Standard Applicable

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

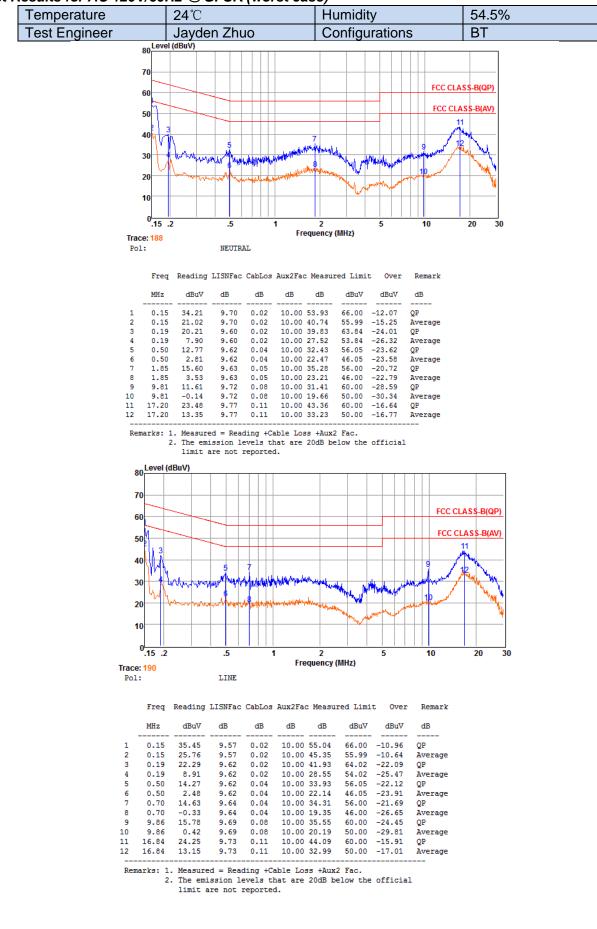
### 6.7.2 Block Diagram of Test Setup



#### 6.7.3 Test Results

### PASS.

The test data please refer to following page.

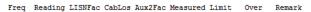


#### Test Results for AC 120V/60Hz @ GFSK (worst case)

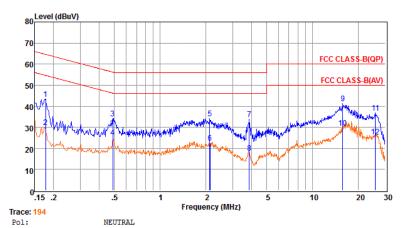
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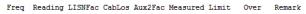
#### Temperature **24**℃ Humidity 54.5% **Test Engineer** Jayden Zhuo Configurations BT 80 Level (dBuV) 70 FCC CLASS-B(QP) 60 FCC CLASS-B(AV) 50 11 40 30 20 10 0\_\_\_\_\_. .15 .2 .5 1 2 5 10 20 30 Frequency (MHz) Trace: 192 Pol: LINE

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



	MHz	dBuV	dB	dB	dB	dB	dBuV	dBuV	dB
1	0.15	31.17	9.57	0.02	10.00	50.76	66.00	-15.24	QP
2	0.15	18.58	9.57	0.02	10.00	38.17	55.99	-17.82	Average
3	0.17	26.86	9.59	0.02	10.00	46.47	65.16	-18.69	QP
4	0.17	16.40	9.59	0.02	10.00	36.01	55.16	-19.15	Average
5	0.49	15.60	9.62	0.04	10.00	35.26	56.10	-20.84	QP
6	0.49	3.53	9.62	0.04	10.00	23.19	46.10	-22.91	Average
7	1.02	12.92	9.63	0.05	10.00	32.60	56.00	-23.40	QP
8	1.02	0.59	9.63	0.05	10.00	20.27	46.00	-25.73	Average
9	3.84	12.67	9.65	0.06	10.00	32.38	56.00	-23.62	QP
10	3.84	-1.67	9.65	0.06	10.00	18.04	46.00	-27.96	Average
11	16.57	21.28	9.73	0.11	10.00	41.12	60.00	-18.88	QP
12	16.57	10.71	9.73	0.11	10.00	30.55	50.00	-19.45	Average





	MHz	dBuV	dB	dB	dB	dB	dBuV	dBuV	dB
1	0.18	23.75	9.64	0.02	10.00	43.41	64.59	-21.18	QP
2	0.18	10.45	9.63	0.02	10.00	30.10	54.59	-24.49	Average
3	0.49	14.46	9.62	0.04	10.00	34.12	56.19	-22.07	QP
4	0.49	5.52	9.62	0.04	10.00	25.18	46.18	-21.00	Average
5	2.12	14.57	9.63	0.05	10.00	34.25	56.00	-21.75	QP
6	2.12	2.94	9.63	0.05	10.00	22.62	46.00	-23.38	Average
7	3.84	14.24	9.65	0.06	10.00	33.95	56.00	-22.05	QP
8	3.84	-1.74	9.65	0.06	10.00	17.97	46.00	-28.03	Average
9	15.80	21.40	9.75	0.10	10.00	41.25	60.00	-18.75	QP
10	15.80	9.95	9.75	0.10	10.00	29.80	50.00	-20.20	Average
11	25.86	16.86	9.83	0.13	10.00	36.82	60.00	-23.18	QP
12	25.86	5.73	9.83	0.13	10.00	25.69	50.00	-24.31	Average

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

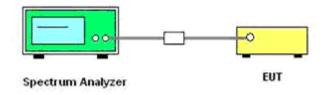
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### 6.8. Band-edge measurements for radiated emissions

### 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:  $p_t$  = transmitter output power in watts,

 $g_t$  = numeric gain of the transmitting antenna (unitless),

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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- 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.

Temperature	<b>23.8</b> ℃	Humidity	54%
Test Engineer	Jayden Zhuo	Configurations	BT

		(	GFSK – Non-l	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	-59.040	3.0	0.0	39.220	Peak	74.00	PASS
2310.000	-62.746	3.0	0.0	35.514	AV	54.00	PASS
2390.000	-59.768	3.0	0.0	38.492	Peak	74.00	PASS
2390.000	-62.045	3.0	0.0	36.215	AV	54.00	PASS
2483.500	-53.327	3.0	0.0	44.933	Peak	74.00	PASS
2483.500	-60.689	3.0	0.0	37.571	AV	54.00	PASS
2500.000	-60.582	3.0	0.0	37.678	Peak	74.00	PASS
2500.000	-61.857	3.0	0.0	36.403	AV	54.00	PASS

		π/4	-DQPSK – 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	-61.165	3.0	0.0	37.095	Peak	74.00	PASS
2310.000	-62.628	3.0	0.0	35.632	AV	54.00	PASS
2390.000	-59.029	3.0	0.0	39.231	Peak	74.00	PASS
2390.000	-61.928	3.0	0.0	36.332	AV	54.00	PASS
2483.500	-50.957	3.0	0.0	47.303	Peak	74.00	PASS
2483.500	-60.557	3.0	0.0	37.703	AV	54.00	PASS
2500.000	-59.266	3.0	0.0	38.994	Peak	74.00	PASS
2500.000	-61.821	3.0	0.0	36.439	AV	54.00	PASS

		8.	DPSK – 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	-60.102	3.0	0.0	38.158	Peak	74.00	PASS
2310.000	-62.630	3.0	0.0	35.630	AV	54.00	PASS
2390.000	-60.312	3.0	0.0	37.948	Peak	74.00	PASS
2390.000	-62.214	3.0	0.0	36.046	AV	54.00	PASS
2483.500	-54.044	3.0	0.0	44.216	Peak	74.00	PASS
2483.500	-61.211	3.0	0.0	37.049	AV	54.00	PASS
2500.000	-60.793	3.0	0.0	37.467	Peak	74.00	PASS
2500.000	-61.878	3.0	0.0	36.382	AV	54.00	PASS

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### 6.8.5. Test Results

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;

FCC ID: 2ALJZ-X1

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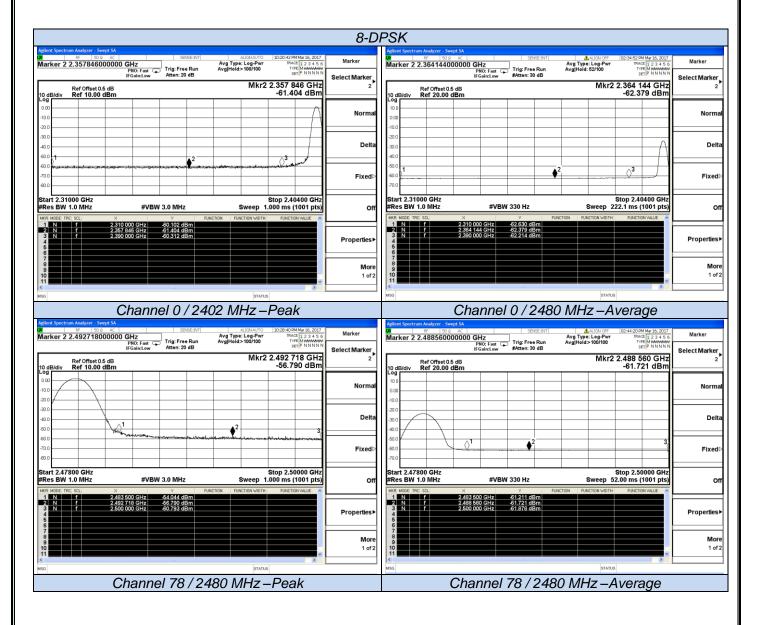
Band-edge mea	asuremer	its for radiated emissions	
	GF	FSK	
Agilent Spectrum Analyzer         Swept SA           μ         RF         S0 Ω         AC         SENSE:INT         ALIGN AUTO         10:15:20 PM Mar 16, 2017		Agilent Spectrum Analyzer - Swept SA           Δ         RF         50 Ω         AC         SENSE:INT         Δ         ALIGN OFF         02:29:56 PM Mar 16, 2017	
Marker 2 2.348728000000 GHz FIG: Free Run Avg[Hold>100/100 FIG: FIG: FIG: FIG: FIG: FIG: FIG: FIG:	Trace/Detector	Marker 2 2.350232000000 GHz Avg Type: Log-Pwr TRACE 1 2 3 4 5 6	Trace/Detector
in dument in the second s	Select Trace	in contactory	Select Trace
Ref Offset 0.5 dB Mkr2 2.348 728 GHz 10 dB/div Ref 10.00 dBm -58.441 dBm	1	Ref Offset 0.5 dB Mkr2 2.350 232 GHz 10 dB/div Ref 20.00 dBm -62.573 dBm -	1
-10.0	Clear Write	0.00	Clear Write
-20.0		-10.0	
-30.0	Trace Average	-20.0	Trace Average
-400	Trace Average	-30.0	Trace Average
-50.0 1 60.0 Economic and a state of the sta		50.0	
-70.0	Max Hold		Max Hold
-80.0		-70.0	
Start 2.31000 GHz         Stop 2.40400 GHz           #Res BW 1.0 MHz         #VBW 3.0 MHz         Sweep 1.000 ms (1001 pts)		Start 2.31000 GHz Stop 2.40400 GHz	
#Res BW 1.0 MHz #VBW 3.0 MHz Sweep 1.000 ms (1001 pts) WKR MODE TRC SCL X Y RUNCTION VALUE	Min Hold	#Res BW 1.0 MHz #VBW 330 Hz Sweep 222.1 ms (1001 pts)	Min Hold
1 N f 2.310 000 GHz -59.040 dBm 2 N f 2.348 728 GHz -59.041 dBm		In         f         2.310 000 GHz         -52.746 dBm	
3 N f 2.390 000 GHz 59.768 dBm	View Blank Trace On	3 N f 2.390 000 GHz -62.045 dBm	View Blank
5 6 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	Trace On		Trace On
7 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	More		More
9	1 of 3	9 10	1 of 3
11 · · · · · · · · · · · · · · · · · ·			
MSG STATUS		MSG STATUS	
Channel 0 / 2402 MHz – Peak		Channel 0 / 2402 MHz – Average	
		Channel 07 2402 Minz – Average	
Agilent Spectrum Analyzer - Swept SA		Agilent Spectrum Analyzer - Swept SA	_
Aglent Spectrum Analyzer - Swept SA         SENSE BIT         ALIBITATIO         10:27:01 PM MM 16; 2017           B         BF         S0:0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0	Marker	Agilint Spectrum Analyzer - Swept SA         Bit Stressen         Accist OFF         D02:97:11 PM Mir 16, 2017           BF         ISO 0         AC         SENSE:911         Accist OFF         D02:97:11 PM Mir 16, 2017           Marker 2 2: A489020000000 GHz         Avg Type: Log-Pwr         TRAId [1:2:3:45:6         Finds [1:2:3:45:6	Marker
Agilenit Spectrum Analyzer         Swept SA         SISNEENT         ALISHAUTO         1022701 PMMar 16, 2017           Image: Spectrum Analyzer         Swept SA         SISNEENT         ALISHAUTO         1022701 PMMar 16, 2017           Image: Spectrum Analyzer         Signed Same         Trig: Free Run PMO: East         Arg Type: Log-Pwr Atem: 20 dB         Trig: Free Run Atem: 20 dB         Arg Type: Log-Pwr Rung Type: Log-Pwr	Marker Select Marker	MgRinnt Spectrum Analyzer.         Swept SA.         SEVEE.RT         ▲ #LSH OFF         (02:37:11 PM Mar 15, 2017)           Marker 2 2.4890/220000000 GHz         Trig: Free Run BifGaint.0w         Arg Type: Leg-Per AvgIrtedz-100/100         Trig: Free Run BifGaint.0w         AvgIrtedz-100/100         Trig: Free Run BifGaint.0w	Marker Select Marker
Aglenit Spectrum Analyzer         Sweet Stat         SBREENTI         ALISHAUTO         1027101 PM Mar 16, 2017           Marker 2 2.49087000000 GHz IFGaind.sw         Frig: Free Run IFGaind.sw         Trig: Free Run Atten: 20 dB         Arg Type: Log-Pwr Avg[Heid>100/100         Trig: Free Run Ref Offset 0.6 dB           Ref Offset 0.6 dB         Mkr2 2.490 870 GHz		Molimit Spectrum Analyzer         Swedt 3A         Sevectrum Analyzer         Swedt 3A           Marker 2 2.4890/22000000 GHz Marker 2 0.4890/22000000 GHz IFGaintow         Trig: Free Run #Atten: 30 dB         Arg Type: Leg-Per Avg]Held>100/100         Trig: Free Run Avg]Held>100/100         Arg Type: Leg-Per Avg]Held>100/100         Trig: Free Run Avg]Held>100/100           Ref Offset 0.5 dB         Mkr2 2.489 022 GHz         Trig: Free Run Avg]Held>100/100         Mkr2 2.489 022 GHz	
Agelonit Spectrum Analyzer         Swept SA.         SERE.EXT         ALISHADTO         102701 PM Mar 16, 2017           Marker 2 2.49087000000 GHZ PHO: Feet Fraint.ev         Trig: Free Run PHO: Feet Fraint.ev         Trig: Free Run Atten: 20 dB         Avg Type: Log-Pwr Avg[Hold>100700         Trice [Humwine Trice [Humwine Avg[Hold>100700           Ref Offset 0.5 dB 10 dB/div         Ref 10.00 dBm         -56.782 dBm         -56.782 dBm	Select Marker	Arghint Spectrum Analyzer         Swept SA           PP         030 a. Z.           Marker 2 2.489022000000 GHz         Trig: Free Run           PRG: Fast C.         Trig: Free Run           Ref Offset 0.5 dB         Mkren 2.0489 022 GHz           10 dB/div         Ref 20.00 dBm	
Addient         Spectrum         Ausnahrto         1027101 PMMar 16, 2017           Marker 2 2.49087000000 GHz Marker 2 2.49087000000 GHz PHO: East IFGainLow         Trig: Free Run Atten: 20 dB         Avg Type: Log-Pwr Avg Heid>100/t00         Trig: Fire Run Atten: 20 dB           Ref Offset 0.5 dB 10 dB/div         Mkr2 2.490 870 GHz -56.782 dBm         -56.782 dBm	Select Marker	Marker 2 2.489022000000 GHz IFGGinclow         Operation         Marker 2 2.489022000000 GHz Avg Type: Log-Pur Avg Type: Log Pur Avg	
Agelonit Spectrum Analyzer         Swept SA.         SERE.EXT         ALISHADTO         102701 PM Mar 16, 2017           Marker 2 2.49087000000 GHZ PHO: Feet Fraint.ev         Trig: Free Run PHO: Feet Fraint.ev         Trig: Free Run Atten: 20 dB         Avg Type: Log-Pwr Avg[Hold>100700         Trice [Humwine Trice [Humwine Ref Offset 0.5 dB           No dB/div         Ref Offset 0.5 dB         Mkr2 2.490 870 GHz -56.782 dBm         -56.782 dBm	Select Marker	Arghint Spectrum Analyzer         Swept SA           PP         030 a. Z.           Marker 2 2.489022000000 GHz         Trig: Free Run           PRG: Fast C.         Trig: Free Run           Ref Offset 0.5 dB         Mkren 2.0489 022 GHz           10 dB/div         Ref 20.00 dBm	Select Marker
Addimit Spectrum Analyzer         Swigd SA         1920E3P01         ALSPIANTO         10270120140416.2017           Marker 2 2.49087000000 GHz         PR0.5 Past         PR0.5 Past         Avg Type: Log Pwr         Avg Type: Log Pwr           PR0.5 Past         PR0.5 Past         PR0.5 Past         Avg Type: Log Pwr         Ref Offset 05 dB           I 0 dB/dir         Ref Offset 05 dB         Mkr2 2.490 870 GHZ         Set 05 GB           Log 0         -56.782 dBm         -56.782 dBm	Select Marker	Adjuint Spectrum Analyzer         Sweet SM           187	Select Marker 2 Normal
Addimit Spectrum Analyzer         Swight	Select Marker	Marker 2 2.489022000000 GHz         Avg Type Log-Purr         Marker 2 2.489022000000 GHz           Marker 2 2.48902200000 GHz         Avg Type Log-Purr         Avg Type Log-Purr         Marker 12 2.45 sp           Marker 2 2.48902200000 GHz         Trig: Free Run         Avg Type Log-Purr         Avg Type Log-Purr         Marker 2 2.489 022 GHz           Io         Io         Bit Spin Low         Marker 2 Chr Bit Spin Low         Avg Type Log-Purr         Avg Type Log Chr Bit Spin Low           Io         Global Spin Low         Marker 2 Chr Bit Spin Low         Avg Type Log Chr Bit Spin Low         Colspin Low           Io         OddStdiv         Colspin Low         Colspin Low         Avg Type Log Chr Bit Spin Low         Colspin Low           Io         OddStdiv         Colspin Log Chr Bit Spin Low         Marker 2 Log Chr Bit Spin Low         Colspin Low           Io         OddStdiv         Odd Spin Low         Odd Spin Low         Colspin Log Chr Bit Spin Low         Colspin Low           Io         Odd Spin Low           Io         Odd Spin Low           Io         Odd Spin Low	Select Marker
Adjent         Spectrum         Adjent         Adjent         Spectrum <th< th=""><th>Select Marker</th><th>Arg Type: Log Pure         OUT 100 CONT         OUT 100 CONT           Marker 2 2.489022000000 CHz         Avg Type: Log Pure         Avg Type: Log Pure         Marker 10:2017           Marker 2 2.489022000000 CHz         Trig: Free Run IFGainLow         Avg Type: Log Pure         Marker 2020         Marker 2017           Marker 2 2.48902200000 CHz         Trig: Free Run IFGainLow         Avg Type: Log Pure         Marker 2017         Marker 2017           Marker 2 2.48902200000 CHZ         Marker 2 Ch2         Marker 2 Ch2         Ch2         Marker 2 Ch2         Marker 2 Ch2           Image Chark         Free Run         Avg Type: Log Pure         Avg Type: Log Pure         Marker 2 Ch2         Marker 2 Ch2           Image Chark         Marker 2 Ch3         Marker 2 Ch3</th><th>Select Marker 2 Normal</th></th<>	Select Marker	Arg Type: Log Pure         OUT 100 CONT         OUT 100 CONT           Marker 2 2.489022000000 CHz         Avg Type: Log Pure         Avg Type: Log Pure         Marker 10:2017           Marker 2 2.489022000000 CHz         Trig: Free Run IFGainLow         Avg Type: Log Pure         Marker 2020         Marker 2017           Marker 2 2.48902200000 CHz         Trig: Free Run IFGainLow         Avg Type: Log Pure         Marker 2017         Marker 2017           Marker 2 2.48902200000 CHZ         Marker 2 Ch2         Marker 2 Ch2         Ch2         Marker 2 Ch2         Marker 2 Ch2           Image Chark         Free Run         Avg Type: Log Pure         Avg Type: Log Pure         Marker 2 Ch2         Marker 2 Ch2           Image Chark         Marker 2 Ch3	Select Marker 2 Normal
Addient Spectrum Analyzer         Swept SM           100         100         1002         1	Select Marker	Marker 2 2.489022000000 GHz         Avg Type Log-Purr         Marker 2 2.489022000000 GHz           Marker 2 2.48902200000 GHz         Avg Type Log-Purr         Avg Type Log-Purr         Marker 12 2.45 sp           Marker 2 2.48902200000 GHz         Trig: Free Run         Avg Type Log-Purr         Avg Type Log-Purr         Marker 2 2.489 022 GHz           Io         Io         Bit Spin Low         Marker 2 Chr Bit Spin Low         Avg Type Log-Purr         Avg Type Log Chr Bit Spin Low           Io         Global Spin Low         Marker 2 Chr Bit Spin Low         Avg Type Log Chr Bit Spin Low         Colspin Low           Io         OddStdiv         Colspin Log Chr Bit Spin Low         Marker 2 Chr Bit Spin Low         Colspin Low           Io         OddStdiv         Colspin Low         Marker 2 Chr Bit Spin Low         Colspin Low         Colspin Low           Io         OddStdiv         OddStdiv         Odd Spin Low         Colspin Low         Colspin Low         Colspin Low         Colspin Low           Io         Odd         Odd Spin Low           Io         Odd Spin Low	Select Marker 2 Normal
Addient Spectrum Analyzer         Swept SM           100         100         1002         1	Select Marker 2 Normal Delta	Ref         Offset 0.5 dB (100)         Column (100)         Column (100)         Column (100) <th>Select Marker 2 Normal Delta</th>	Select Marker 2 Normal Delta
Addent Spectrum Analyzer         SweetStill         Addition         State         Addition         State         Addition         State         Addition         State         Addition         State         Addition         State         State         Addition         State         State <tht< th=""><th>Select Marker 2 Normal Delta Fixed&gt;</th><th>Ref Offset 0.5 dB         Marker 2 2.489022000000 GHz         Marker 2 2.489022 GHz         Marker 2 3.489022 GHz         Marker 3.4800 GHz</th><th>Select Marker 2 Normal Delta Fixed</th></tht<>	Select Marker 2 Normal Delta Fixed>	Ref Offset 0.5 dB         Marker 2 2.489022000000 GHz         Marker 2 2.489022 GHz         Marker 2 3.489022 GHz         Marker 3.4800 GHz	Select Marker 2 Normal Delta Fixed
Addent Spectrum Analyzer         Swept SM           109         109         100         1027         102	Select Marker 2 Normal Delta	Ref Offset 0.5 dB         Marker 2 2.489022000000 GHz         Marker 2 2.48902200000 GHz         Marker 2 2.489022000000 GHz         Marker 2 2.48902200000 GHz         Marker 2 2.48902200000 GHz         Marker 2 2.489022 GHz         Marker 2 .489022 GHz         Marker 2 .4800GHz         Marker 2 .4800GHz	Select Marker 2 Normal Delta
Addent Spectrum Analyzer         Swept SM           199         199         1027         10	Select Marker 2 Normal Delta Fixed>	Addivid Spectrum Analyzer         Sweet SA           9         90	Select Marker 2 Normal Delta Fixed
Ref Offset 0.6 dB         Mirzer 2.49087000000 GHz         Aug Trais Log Processing         Marker 2.4.500 GHz         Aug Trais Log Processing         Marker 2.4.500 GHz         State 1.0 Cm Marker 2.4.5.500 GHz         State 1.0 Cm Marker 2.4.5.5.500 GHz         State 1.0 Cm M	Select Marker, 2 Normal Delta Fixed> Off	Ref Offset 0.5 dB         Marker 2 2.489022000000 GHz         Avg Type: Log-Pur         Marker 2 2.489022000000 GHz           Warker 2 2.489022000000 GHz         Trig: Free Run         Avg Type: Log-Pur         Marker 10.234.56           Warker 2 2.489022000000 GHz         Trig: Free Run         Avg Type: Log-Pur         Marker 10.234.56           Warker 2 2.48902200000 GHz         Trig: Free Run         Avg Type: Log-Pur         Marker 10.234.56           Uo dBidiu         Free Run         Avg Type: Log-Pur         Avg Type: Log-Pur         Marker 10.234.56           0 dBidiu         Free Run         Avg Type: Log-Pur         Avg Type: Log-Pur         Marker 10.234.56           10 dBidiu         Free Run         Avg Type: Log-Pur         Avg Type: Log-Pur         Avg Type: Log-Pur           10 dBidiu         Free Run         State: 30 dB         Mkr2 2.489 022 GHz         -61.650 dBm           10 dBidiu	Select Marker 2 Normal Delta Fixed> Off
Addent Spectrum Analyzer         Swept SM           199         199         1027         10	Select Marker 2 Normal Delta Fixed>	Addivid Spectrum Analyzer         Sweet SA           9         90	Select Marker 2 Normal Delta Fixed
Addent Spectrum Analyzer         Swept SM           199         199         1027         10	Select Marker, 2 Normal Delta Fixed> Off Properties>	Addivid Spectrum Analyzer         Sweet SA           9         90	Select Marker 2 Normal Delta Fixed> Off Properties>
Addent Spectrum Analyzer         Swept SM           199         199         1027         10	Select Marker 2 Normal Delta Fixed Fixed Off Properties More	Avginter         Source Construction         Source Construction         Avginter         Construction         Constru	Select Marker 2 Normal Delta FixedD Off Properties> More
Addent Spectrum Analyzer         Swept SM           199         199         1027         10	Select Marker, 2 Normal Delta Fixed> Off Properties>	Addivid Spectrum Analyzer         Sweet SA           9         90	Select Marker 2 Normal Delta Fixed> Off Properties>
Addent Spectrum Analyzer         Swept SM           199         199         1027         10	Select Marker 2 Normal Delta Fixed Fixed Off Properties More	Andread Severtion         Angree Log         Occup With Severtion         Angree Log         Occup With Severtion         Marker 12:0:00           Marker 2 2.489022000000 GHz         PR0: Fax         Trig: Free Run         Avg Type: Log-Pur         Marker 10:00/10         Marker 10:00/10 </th <th>Select Marker 2 Normal Delta FixedD Off Properties&gt; More</th>	Select Marker 2 Normal Delta FixedD Off Properties> More
Adjent         Spectrum         Adjent Spectrum         Adjent Spectrum         Adjent Spectrum         Adjent Spectrum         Adjent Spectrum         Increased Spectrum         Increase	Select Marker 2 Normal Delta Fixed Fixed Off Properties More	Andread Seventian Analyzer         Surget SA         Analysis         Constraints         Arg Type: Log-Purr Avg Type: Log Purr Avg Type: Log Pu	Select Marker 2 Normal Delta FixedD Off Properties> More

	π/4-L	DQPSK		
Ageinnt Spectrum Analyzer         Sword SA         Stress Intl         All SPARTO           ##         ##         100 p.m.         All SPARTO         All SPARTO         All SPARTO           Marker 2 2.345626000000 GHz PNO: Fast IF GainLiow         Trig: Free Run Atten: 20 dB         Avg Type: Log-Pwr Avg Hold>100/100	10:19:31 PMMar 16, 2017 TRACE [1 2 3 4 5 6 TYPE MWWWWW DET P NNNNN Select Marker	Aglent Spectrum Analyzer - Swyd SA Marker 2 2.348634000000 GHz IFORICast IFGRICAST I	Auton OFF         02:33:26 PM Mar 16, 2017           Avg Type: Log-Pwr         TRACE [1] 2 3 4 5 6           Avg[Hoid>100/100         TVPE (NNNN)	Marker Select Marker
10 dB/div Ref 10.00 dBm	2.345 626 GHz 2 -61.736 dBm	Ref Offset 0.5 dB 10 dB/div Ref 20.00 dBm	Mkr2 2.348 634 GHz -62.336 dBm	2
	Norma			Normal
	Delta			Delta
500 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Fixed	500 1 2 2 700 2	3	Fixed⊳
	Stop 2.40400 GHz 000 ms (1001 pts) Off	Start 2.31000 GHz           #Res BW 1.0 MHz         #VBW 330 Hz           Iwrn moder THD SQL         X         Y         Punc	Stop 2.40400 GHz Sweep 222.1 ms (1001 pts)	Off
1 N f 2.310.000 CHz 451.456 dBm 2 N f 2.346.556 CHz 451.256 dBm 3 N f 2.380.000 GHz 59.029 dBm 4 5	Properties►	1 N f 2.310 000 GHz 65 628 dBm 2 N f 2.349 633 GHz 62 338 dBm 3 N f 2.390 000 GHz 61 528 dBm 4 5		Properties►
7 8 9 10 11	More 1 of 2	7 8 9 10 11		More 1 of 2
C STATUS	<b>&gt;</b>	MSG	STATUS	
Channel 0 / 2402 MHz –	Peak	Channel 0 / 2402	MHz – Average	

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Band-edg	e measureme	nts for radiated emissions	
	π/4-E	DQPSK	
Marker 2 2 49065000000 GHz Avg Type: Log-Pwr	ACE 11 2 3 4 5 6 TYPE MWWWW DET P NNNN DET P NNNNN Select Marker	Agilint Spectrum Analyzer         Swrgt SM           2         RF         500 a. AC         SENSE INT         Automation SM         Control Contrecontere Control Control Control Control Contrective C	Marker Select Marker
		Ref Offset 0.5 dB Mkr2 2.491 640 GHz 10 dB/div Ref 20.00 dBm -61.565 dBm	2
	Normal		Normal
	Delta		Delta
600	Fixed⊳		Fixed⊳
#Res BW 1.0 MHz         #VBW 3.0 MHz         Sweep 1.000 ms           MXR MODE TRC SCL         X         Y         PUNCTION         PUNCTION	50000 GHz (1001 pts) Off	Start 2.47800 GHz         Stop 2.50000 GHz           #Res BW 1.0 MHz         #VBW 330 Hz         Sweep 52.00 ms (1001 pts)           MRR MODE TRC SCL         X         Y         Punction         Punction width         Punction width	Off
1 N f 2.483 500 GHz 569 57 dBm 2 N f 2.490 560 GHz 567 748 dBm 3 N f 2.500 000 GHz 58 266 dBm 4 5	Properties►	1 N f 2.493 500 GHz 260 557 dBm 2 N f 2.491 540 GHz 61.565 dBm 3 N f 2.500 000 GHz 61.565 dBm 4 G	Properties►
7 9 9 10 11	More 1 of 2	7 8 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	More 1 of 2
K STATUS	>	K STATUS	
Channel 0 / 2402 MHz – Pea	ak	Channel 0 / 2402 MHz – Average	



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### 6.9. Pseudorandom frequency hopping sequence

### 6.9.1 Standard Applicable

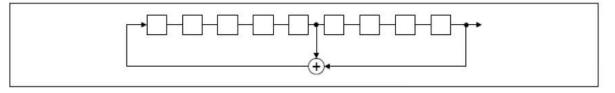
For 47 CFR Part 15C sections 15.247 (a) (1) requirement:

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

0	2	4	6		62 64	78	1	73 75 77
						1		
				1		1		
		I 1	L	1	1 1 1			

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 3 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.

# 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------

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