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TEST REPORT

Product Name:Truly Wireless Stereo EarbudsTrade Mark:EDIFIERModel No. / HVIN:TWS2Add. Model No. / HVIN:N/AReport Number:181030005RFC-1Test Standards:FCC 47 CFR Part 15 Subpart C
RSS-247 Issue 2
RSS-Gen Issue 5FCC ID:29G-EDF80IC:10004A-EDF80Test Result:PASSDate of Issue:November 21, 2018

Prepared for:

Edifier International Limited P.O. Box 6264 General Post Office Hong Kong China

Prepared by:

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Version

Version No.	Date	Description
V1.0	November 21, 2018	Original



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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Edifier International Limited	
Address of Applicant:	P.O. Box 6264 General Post Office Hong Kong China	
Manufacturer:	Beijing Edifier Technology Co., Ltd.	
Address of Manufacturer:	8th floor, ZuoAn Building,NO.68 BeiSiHuanXiLu, Haidian District, Beijing 100080,CHINA	

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	Truly Wireless Stereo Earbuds			
Troduct Name.	Truly Wireless Stereo I	Laibuus		
Model No. / HVIN:	TWS2			
Add. Model No. / HVIN:	N/A			
Trade Mark:	EDIFIER			
DUT Stage:	Identical Prototype			
EUT Supports Function:	2.4 GHz ISM Band: Bluetooth 5.0 (LE/ 2LE/ LE Code mode is not supported)			
Sample Received Date:	November 15, 2018			
Sample Tested Date:	e Tested Date: November 15, 2018 to November 20, 2018			

1.2.2 Description of Accessories

Battery (Charging case)				
Model No.:	CEL702334			
Battery Type:	Lithium-ion Polymer Rechargeable Battery			
Rated Voltage:	3.7 Vdc			
Limited Charge Voltage:	4.2 Vdc			
Rated Capacity:	500 mAh			

Battery (Headphones)				
Model No.:	CEL601115			
Battery Type:	Lithium-ion Polymer Rechargeable Battery			
Rated Voltage:	3.7 Vdc			
Limited Charge Voltage:	4.2 Vdc			
Rated Capacity:	60 mAh			

Charging cable			
Description:	USB Type-C Plug Cable		
Cable Type:	Unshielded without ferrite		
Length:	0.2 Meter		

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Frequency Band:	2400 MHz to 2483.5 MHz			
Frequency Range:	2402 MHz to 2480 MHz			
Bluetooth Version:	Bluetooth BR + EDR			
Modulation Technique:	Frequency Hopping	Spread Spectrum(FHSS)		
Type of Modulation:	GFSK, π/4DQPSK, 8	DPSK		
Number of Channels:	79			
Channel Separation:	1 MHz			
Hopping Channel Type:	Adaptive Frequency Hopping Systems			
Antenna Type: Chip antenna				
Antenna Gain:	3.45 dBi			
Maximum Peak Power:	Right Ear	9.18 dBm		
	Left Ear	7.72 dBm		
Normal Test Voltage:	ormal Test Voltage: 3.7 V Battery			

1.4 OTHER INFORMATION

Operation Frequency Each of Channel				
	f = 2402 + k MHz, k = 0,,78			
Note:				
f	is the operating frequency (MHz);			
k	is the operating channel.			

Modulation Configure				
Modulation	Packet	Packet Type	Packet Size	
	1-DH1	4	27	
GFSK	1-DH3	11	183	
	1-DH5	15	339	
	2-DH1	20	54	
π/4 DQPSK	2-DH3	26	367	
	2-DH5	30	679	
	3-DH1	24	83	
8DPSK	3-DH3	27	552	
	3-DH5	31	1021	

1.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

1) Support Equipment

Description	Manufacturer	Model No.	Serial Number	Supplied by
Notebook	Lenovo	E450	SL10G10780	UnionTrust

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1.6 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China 518109 Telephone: +86 (0) 755 2823 0888 Fax: +86 (0) 755 2823 0886

1.7 TEST FACILITY

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

CNAS-Lab Code: L9069

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC/EN 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

IC-Registration No.: 21600-1

The 3m Semi-anechoic chamber of Shenzhen UnionTrust Quality and Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 21600-1.

A2LA-Lab Certificate No.: 4312.01

Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

FCC Accredited Lab.

Designation Number: CN1194 Test Firm Registration Number: 259480

1.8 DEVIATION FROM STANDARDS

None.

1.9 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.10OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

1.11 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Measurement Uncertainty
1	Conducted emission 9KHz-150KHz	±3.8 dB
2	Conducted emission 150KHz-30MHz	±3.4 dB
3	Radiated emission 9KHz-30MHz	±4.9 dB
4	Radiated emission 30MHz-1GHz	±4.7 dB
5	Radiated emission 1GHz-18GHz	±5.1 dB
6	Radiated emission 18GHz-26GHz	±5.2 dB
7	Radiated emission 26GHz-40GHz	±5.2 dB
8	Radio frequency	±6.3 x 10 ⁻⁸
9	Occupied Channel Bandwidth	±2.3 %
10	RF output power, conducted	±0.52 dB
11	Spurious emissions, conducted	±1.48 dB

2. TEST SUMMARY

	FCC 47 CFR Part 15 Subpart C Tes	t Cases	
Test Item	Test Requirement	Test Method	Result
Antenna Requirement	FCC 47 CFR Part 15 Subpart C Section 15.203/15.247 (c) RSS-Gen Issue 5, Section 6.8	N/A	PASS
AC Power Line Conducted Emission	FCC 47 CFR Part 15 Subpart C Section 15.207 RSS-Gen Issue 5, Section 8.8	ANSI C63.10-2013 Section 6.2	N/A (See note 1, 2)
Conducted Peak Output Power	FCC 47 CFR Part 15 Subpart C Section 15.247 (b)(1) RSS-247 Issue 2, Section 5.4(b)	ANSI C63.10-2013 Section 7.8.5	PASS
20 dB Bandwidth	FCC 47 CFR Part 15 Subpart C Section 15.247 (a)(1) RSS-247 Issue 2, Section 5.1(a)	ANSI C63.10-2013 Section 6.9.2	PASS
Occupied Bandwidth	RSS-Gen section 6.7	RSS-Gen section 6.7	PASS
Carrier Frequencies Separation	FCC 47 CFR Part 15 Subpart C Section 15.247 (a)(1) RSS-247 Issue 2, Section 5.1(b)	ANSI C63.10-2013 Section 7.8.2	PASS
Number of Hopping Channel	FCC 47 CFR Part 15 Subpart C Section 15.247 (b)(1) RSS-247 Issue 2, Section 5.1(d)	ANSI C63.10-2013 Section 7.8.3	PASS
Dwell Time	FCC 47 CFR Part 15 Subpart C Section 15.247 (a)(1) RSS-247 Issue 2, Section 5.1(d)	ANSI C63.10-2013 Section 7.8.4	PASS
Conducted Out of Band Emission	FCC 47 CFR Part 15 Subpart C Section 15.247(d) RSS-247 Issue 2, Section 5.5	ANSI C63.10-2013 Section 6.10.4 & Section 7.8.8	PASS
Radiated Emissions	FCC 47 CFR Part 15 Subpart C Section 15.205/15.209 RSS-Gen Issue 5, Section 6.13/8.9/8.10	ANSI C63.10-2013 Section 6.3 & 6.5 & 6.6	PASS
Band Edge Measurement	FCC 47 CFR Part 15 Subpart C Section 15.205/15.209 RSS-247 Issue 2, Section 5.5	ANSI C63.10-2013 Section 6.10.5	PASS

Note:

1) N/A: In this whole report not application.

2) Place headphones into the charging case, they will turn off automatically, and the bluetooth does not work.

3. EQUIPMENT LIST

		Radiated Er	nission Test E	Equipment List			
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)	
>	3M Chamber & Accessory Equipment	ETS-LINDGREN	3M	N/A	Dec. 20, 2015	Dec. 19, 2018	
>	Receiver	R&S	ESIB26	100114	Dec. 10, 2017	Dec. 10, 2018	
	Loop Antenna	ETS-LINDGREN	6502	00202525	Dec. 22, 2017	Dec. 22, 2018	
	Broadband Antenna	ETS-LINDGREN	3142E	00201566	Dec. 17, 2017	Dec. 17, 2018	
>	Preamplifier	HP	8447F	2805A02960	Dec. 10, 2017	Dec. 10, 2018	
Z	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201874	May 22, 2018	May 22, 2019	
Y	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	Dec. 17, 2017	Dec. 17, 2018	
>	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A	
	Band Rejection Filter (2400MHz~2500MHz)	Micro-Tronics	BRM50702	G248	June 06, 2018	June 06, 2019	
	Test Software	Audix	e3	Sof	tware Version: 9.16	0323	
•	1	Audix	e3	G248 June 06, 2018 June 06, 20 Software Version: 9.160323			

	Conducted RF test Equipment List											
Used	Equipment	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)							
	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	Dec.10, 2017	Dec. 10, 2018						
	USB Wideband Power Sensor	KEY <mark>SIG</mark> HT	U2021XA	MY55430035	Dec. 10, 2017	Dec. 10, 2018						

4. TEST CONFIGURATION 4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

4.1.1 Normal or Extreme Test Conditions

Environment Parameter	S	Selected Values During Tests							
Test Condition	Ambient								
Test Condition	Temperature (°C)	Voltage	Relative Humidity (%)						
NT/NV	+15 to +35	3.7V Battery	20 to 75						
Remark: 1) NV: Normal Voltage; NT: Normal Temperature									

4.1.2 Record of Normal Environment

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (kPa)	Tested by
Conducted Peak Output Power				
20 dB Bandwidth & Occupied				
Bandwidth				
Carrier Frequencies Separation	25.8	54	99.98	Tony Kang
Number of Hopping Channel				
Dwell Time				
Conducted Out of Band				
Emission				
Radiated Emissions	25.8	46	100.87	Andy Lin
Band Edge Measurement	25.6	40	100.87	

4.2TEST CHANNELS

Mode	Tx/Rx Frequency	Test RF Channel Lists				
Wode	TAILY	Lowest(L)	Middle(M)	Highest(H)		
GFSK	2402 MHz to 2480 MHz	Channel 0	Channel 39	Channel 78		
(DH1, DH3, DH5)		2402 MHz	2441 MHz	2480 MHz		
π/4DQPSK	2402 MHz to 2480 MHz	Channel 0	Channel 39	Channel 78		
(DH1, DH3, DH5)		2402 MHz	2441 MHz	2480 MHz		
8DPSK	2402 MHz to 2480 MHz	Channel 0	Channel 39	Channel 78		
(DH1, DH3, DH5)		2402 MHz	2441 MHz	2480 MHz		

4.3 EUT TEST STATUS

Type of Modulation	Tx Function	Description					
		1. Keep the EUT in continuously transmitting with Modulation					
GFSK/π/4DQPSK/	1Tx	test single					
8DPSK		 Keep the EUT in continuously transmitting with Modulation test Hopping Frequency. 					

Power Setting					
Right Ear	50				
Left Ear	50				

Test Software	
Airoha.AB152xP_LabTestTool_V2.1.4.20365_exe_2.1.4.20365	

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4.4 PRE-SCAN

4.4.1 Pre-scan under all packets at middle channel

Left Ear

Conducted Average Power (dBm) for packets									
Type of Modulation	on GFSK			π/4DQPSK			8DPSK		
Packets	1-DH1	1-DH3	1-DH5	2-DH1	2-DH3	2-DH5	3-DH1	3-DH3	3-DH5
Power (dBm)	0.76	3.73	4.38	-1.14	1.38	1.98	-1.14	1.38	1.99

Right Ear

Conducted Average Power (dBm) for packets									
Type of Modulation		GFSK		π/4DQPSK		8DPSK			
Packets	1-DH1	1-DH3	1-DH5	2-DH1	2-DH3	2-DH5	3-DH1	3-DH3	3-DH5
Power (dBm)	1.98	4.91	5.56	0.24	2.70	3.29	0.20	2.69	3.28

4.4.2 Worst-case data packets

Type of Modulation	Worst-case data rates
GFSK	1-DH5
π/4DQPSK	2-DH5
8DPSK	3-DH5

4.4.3 Tested channel detail

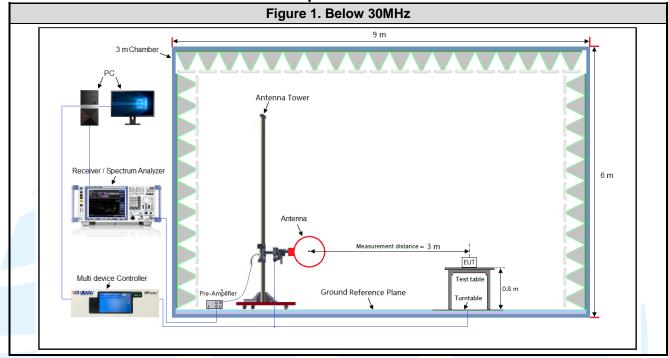
Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data packets and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.

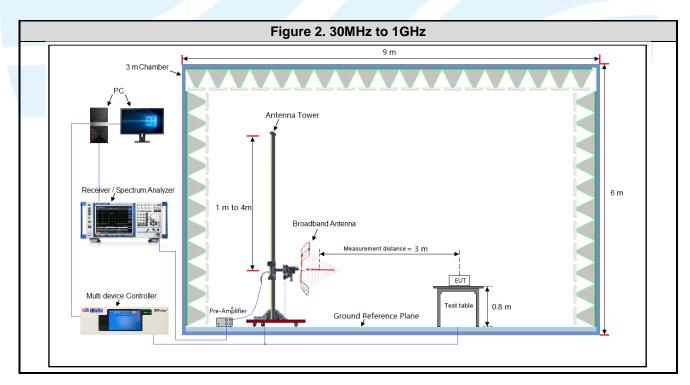
Type of Modulation		GFSK		Π	/4DQPS	K		8DPSK	
Data Packets	1- DH1	1- DH3	1- DH5	2- DH1	2- DH3	2- DH5	3- DH1	3- DH3	3- DH5
Available Channel					0 to 78				
Test Item			Test cha	nnel and	d choose	e of data	packets		
AC Power Line Conducted			Freq	uency Ho	opping Cl	nannel 0	to 78		
Emission					Link				
Conducted Peak Output				Chanr	nel 0 & 39	9 & 78			
Power			N			2			۲
20 dB Bandwidth				Chanr	nel 0 & 39	9 & 78			
20 OB Bandwidth			N			<			K
Carrier Frequencies	Frequency Hopping Channel 0 to 78								
Separation			V						<
Number of Lingsing Changel	Frequency Hopping Channel 0 to 78								
Number of Hopping Channel			V			•			<
Durall Times				С	hannel 3	9			
Dwell Time	2	\checkmark	\checkmark	✓	\checkmark	✓	✓	•	•
Conducted Out of Band				Chanr	nel 0 & 39	9 & 78			
Emission						v			<
				Chanr	nel 0 & 39	9 & 78			
Radiated Emissions			V						
Band Edge Measurements				Channel 0 & 78				1	
(Radiated)			•						

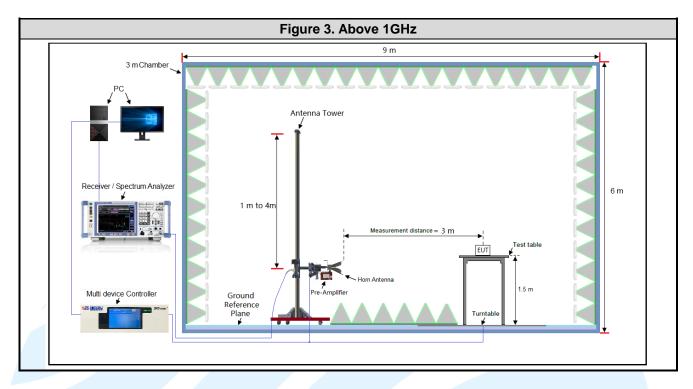
Remark:

- 1. The mark "^W" means is chosen for testing;
- 2. The mark "" means is not chosen for testing.

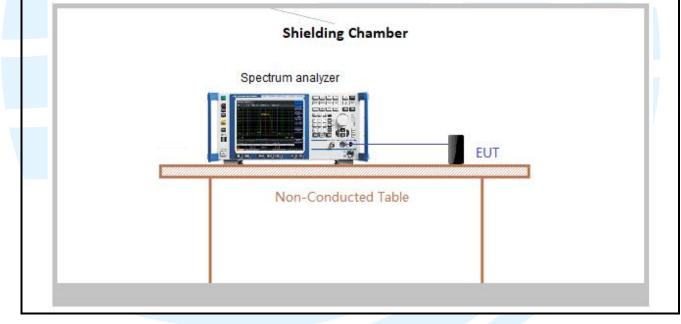
4.5TEST SETUP 4.5.1 For Radiated Emissions test setup







4.5.2 For Conducted RF test setup



4.6 SYSTEM TEST CONFIGURATION

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. It was powered by a 3.7 V Battery. Only the worst case data were recorded in this test report.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Therefore, all final radiated testing was performed with the EUT in (see table below) orientation.

Frequency	Mode	Antenna Port	Worst-case axis positioning
Above 1GHz	1TX	Chain 0	X axis

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

4.7 DUTY CYCLE

Test Procedure: ANSI C63.10-2013 Clause 11.6.

Test Results

Left Ear

Type of Modulation	Packets	On Time (msec)	Period (msec)	Duty Cycle (linear)	Duty Cycle (%)	Duty Cycle Factor (dB)	1/ T Minimum VBW (kHz)	Average Factor (dB)
GFSK	1-DH5	0.828	2.923	0.28	28.33	5.48	1.21	-10.96

Right Ear

Type of Modulation	Packets	On Time (msec)	Period (msec)	Duty Cycle (linear)	Duty Cycle (%)	Duty Cycle Factor (dB)	1/ T Minimum VBW (kHz)	Average Factor (dB)
GFSK 📈	1-DH5	0.828	2.922	0.28	28.34	5.48	1.21	-10.95

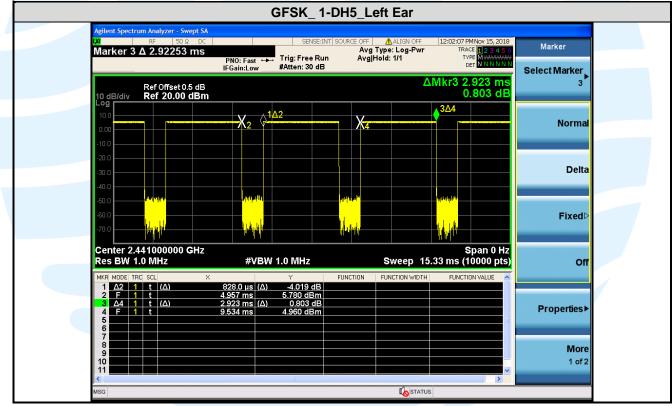
Remark:

1) Duty cycle= On Time/ Period;

2) Duty Cycle factor = 10 * log(1/ Duty cycle);

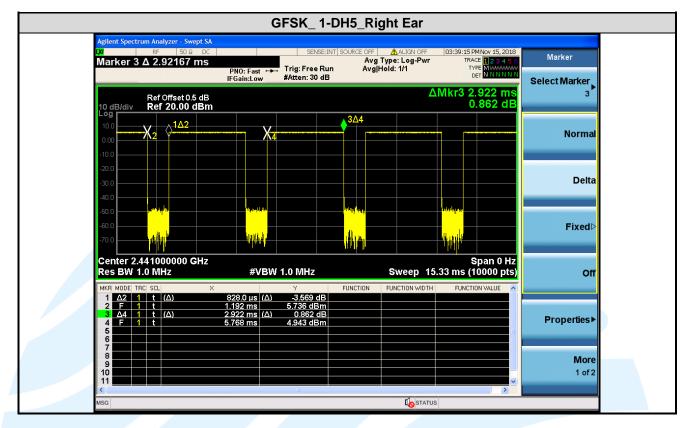
3) Average factor = 20 log₁₀ Duty Cycle.

The test plot as follows



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5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION 5.1 REFERENCE DOCUMENTS FOR TESTING

No.	Identity	Document Title							
1	FCC 47 CFR Part 2 Frequency allocations and radio treaty matters; general rules regulations								
2	FCC 47 CFR Part 15	47 CFR Part 15 Radio Frequency Devices							
3	RSS-247 Issue 2	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE- LAN) Devices							
4	RSS-Gen Issue 5	General Requirements for Compliance of Radio Apparatus							
5	ANSI C63.10-2013	American National Standard for Testing Unlicesed Wireless Devices							

5.2 ANTENNA REQUIREMENT

Standard Requirement

15.203 requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi. **RSS-Gen Issue 5, Section 6.8 requirement:**

According to RSS-Gen Issue 5, section 6.8, a transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns.

EUT Antenna:

Antenna in the interior of the equipment and no consideration of replacement. The gain of the antenna is 3.45 dBi.

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5.3CONDUCTED PEAK OUTPUT POWER

Test Requirement:	FCC 47 CFR Part 15 Subpart C Section1 RSS-247 Issue 2, Section 5.4(b)	5.247 (b)(1)
Test Method:	ANSI C63.10-2013 Section 7.8.5	
Limit:	power shall not exceed 1.0 W if the ho maximum peak conducted output power less than 75 hopping channels. The e.i.r. section 5.4(e). FHSs shall have hopping channel carrie kHz or the 20 dB bandwidth of the hoppin FHSs operating in the band 2400-2483	3.5 MHz, the maximum peak conducted output oset uses 75 or more hopping channels; the shall not exceed 0.125 W if the hopset uses b. shall not exceed 4 W, except as provided in r frequencies separated by a minimum of 25 ng channel, whichever is greater. Alternatively, 8.5 MHz may have hopping channel carrier z or two thirds of the 20 dB bandwidth of the
	hopping channel, whichever is greater, pr	ovided that the systems operate with an output
Test Procedure:	power no greater than 0.125 W. Remove the antenna from the EUT and antenna port to the spectrum analyzer.	I then connect a low loss RF cable from the
	 a) Use the following spectrum analyzer 1) Span: Approximately 5 x 20 dB ba 2) RBW > 20 dB bandwidth of the er 3) VBW ≥ RBW. 4) Sweep: Auto. 5) Detector function: Peak. 6) Trace: Max hold. 	andwidth, centered on a hopping channel.
		et the marker to the peak of the emission. put power, after any corrections for external
	attenuators and cables.	
	e) A plot of the test results and setup d	escription shall be included in the test report.
Test Setup:	Refer to section 4.5.3 for details.	
Instruments Used:	Refer to section 3 for details	
Test Results:	Pass	
Left Ear	Peak Output Power (dBm)	Peak Output Power (mW)

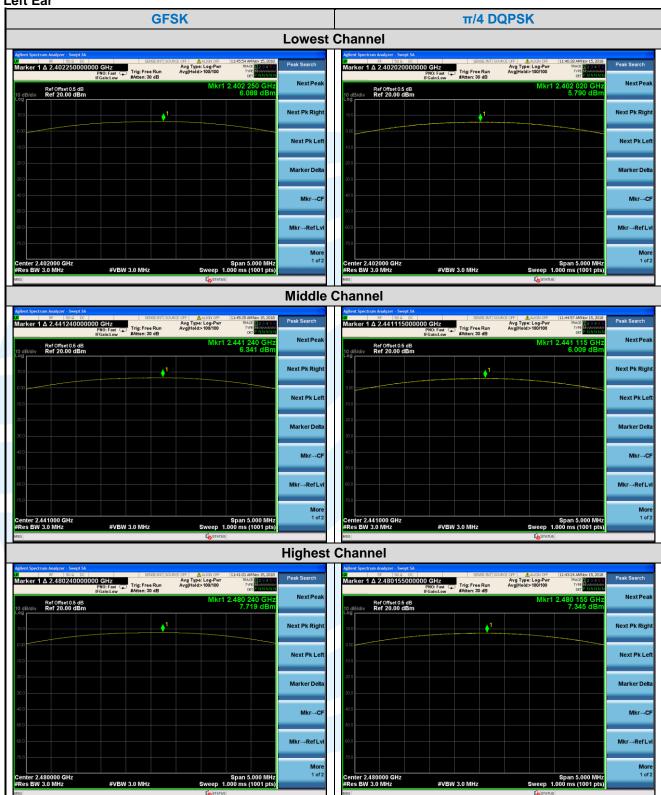
Type of	Peak	Output Power (dBm)	Peak Output Power (mW)			
Modulation	Channel 0	Channel 39	Channel 78	Channel 0	Channel 39	Channel 78	
GFSK	6.09	6.34	7.72	4.06	4.31	5.91	
π/4 DQPSK	5.79	6.01	7.35	3.79	3.99	5.43	
8DPSK	SK 5.99 6.16		7.52	3.97	4.13	5.64	

F	Right Ear						
Type of		Peak	Output Power (dBm)	Peak	output Power (mW)
	Modulation	Channel 0	Channel 39	Channel 78	Channel 0	Channel 39	Channel 78
	GFSK	7.29	7.71	9.18	5.35	5.90	8.27
	π/4 DQPSK	7.10	7.53	8.99	5.13	5.66	7.92
	8DPSK	7.31	7.74	9.15	5.38	5.94	8.23

Note: The antenna gain of 3.45 dBi less than 6dBi maximum permission antenna gain value based on 125 mW peak output power limit.

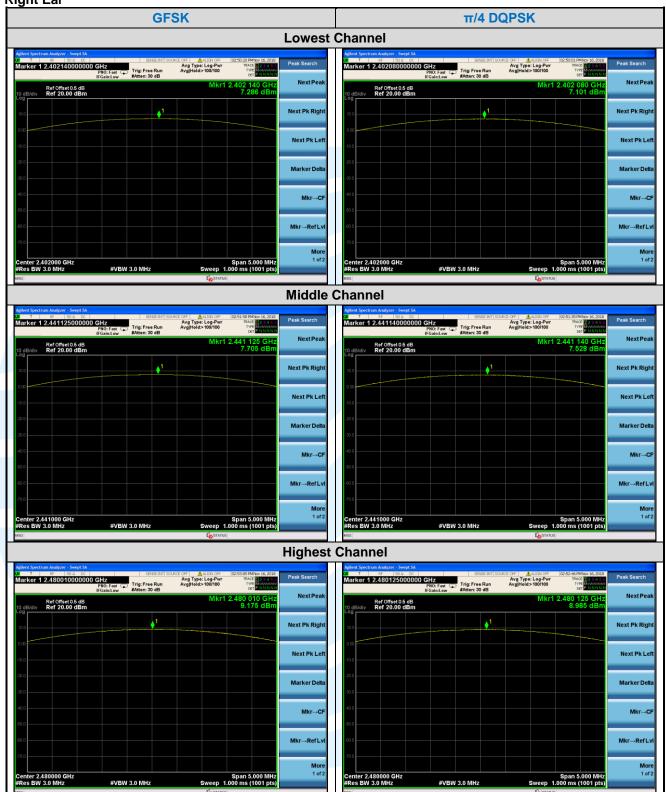
The test plots as follows:

Left Ear









				8DF	PSK					
			Middle	Channel						
Aglient Spectrum Analyzer - Swept SA T RF SO OC Marker 1 2.402005000000	SEMSE:INT SC CH2 PN0: Fast IFGain:Low #Atten: 30 dB	OURCE OFF Avg Type: Log-Pwr Avg Hold:>100/100	02:50:41 PMNov 16, 2018 TRACE 2 3 4 5 6 TYPE 0 DET P NN NN N	Peak Search	Agilent Spectrum Analy: U T RF Marker 1 2.440	50 Q DC	Fast C Trig: Free Run #Atten: 30 dB	SOURCE OFF Avg Type: Log-Pwr Avg Hold>100/100	02:51:06 PMNov 16, 2018 TRACE 2 8 4 5 6 TYPE DET P N N N N	Peak Search
Ref Offset 0.5 dB 10 dB/div Ref 20.00 dBm	II GUILLOW	Mkr1 2	2.402 005 GHz 7.305 dBm	NextPeak	10 dB/div Ref 0	fset 0.5 dB 0.00 dBm		Mkr1	2.440 980 GHz 7.738 dBm	NextPea
10.0	1			Next Pk Right	10.0		1			Next Pk Rig
-10.0				Next Pk Left	-10.0					Next Pk Le
-20.0				Marker Delta	-30.0					Marker Del
-40.0				Mkr→CF	-40.0					Mkr→C
-60.0				Mkr→RefLvl	-60.0					Mkr→RefL
Center 2.402000 GHz #Res BW 3.0 MHz	#VBW 3.0 MHz	Sweep 1.	Span 5.000 MHz 000 ms (1001 pts)	More 1 of 2	Center 2.441000 #Res BW 3.0 MH	I GHz Iz	#VBW 3.0 MHz	Sweep 1	Span 5.000 MHz .000 ms (1001 pts)	Moi 1 of
450		STATUS			MSG			Ko status		
Agilent Spectrum Analyzer - Swept SA	Highest	Channel								
T RF 50 R DC Marker 1 2.480155000000	PNO: East C Irig: Free Run	OURCE OFF ALIGN OFF Avg Type: Log-Pwr Avg Hold>100/100	02:52:23 PMNov 16, 2018 TRACE 2 3 4 5 6 TVPE MONOMIN N DET P N N N N N	Peak Search						
Ref Offset 0.5 dB 10 dB/div Ref 20.00 dBm	IFGain:Low #Atten: 30 dB	Mkr1 :	2.480 155 GHz 9.153 dBm	Next Peak						
10.0	• ¹			Next Pk Right						
.10.0				Next Pk Left						
-30.0				Marker Delta						
-40.0				Mkr→CF						
50.0				Mkr→RefLvi						
-50 0 										
500			Span 5.000 MHz	More 1 of 2						

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5.420 DB BANDWIDTH & OCCUPIED BANDWIDTH

•	Test Require		47 Issue 2, Secti Sen section 6.7	on 5.1(a)					
	Test Method: Limit: Test Procedu	ANSI (RSS-G None; ure: Remov antenr	C63.10-2013 Sec Sen section 6.7 for reporting purp ve the antenna f ha port to the spe e following spect	ooses only. rom the EUT ar ctrum analyzer.		a low loss RF	cable from the		
		b) R c) V(d) S ^r e) D f) Ti g) A	pan = approxima BW = 1% to 5% of BW \geq 3 x RBW weep = auto; etector function = race = max hold If the trace to state eak of the emiss DdB down bandw	of the OBW. = peak bilize, use the n ion, use the ma	narker-to-peak fu arker-delta functi	unction to set the	e marker to the		
		amplitu	The cable loss ude offset.		loss were offse	et into measure	device as an		
	Test Setup:		Refer to section 4.5.3 for details.						
	Instruments		to section 3 for de	etalis					
	Test Results eft Ear	: Pass							
Ī	Type of	20 c	B Bandwidth (N	/Hz)	Occur	bied Bandwidth	(MHz)		
	Modulation	Channel 0	Channel 39	Channel 78	Channel 0	Channel 39	Channel 78		
	0.501/			0.007		0.0001	0.0700		

.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,							
Modulation	Channel 0	Channel 39	Channel 78	Channel 0	Channel 39	Channel 78	
GFSK	0.923	0.923	0.927	0.8757	0.8801	0.8783	
π/4 DQPSK	1.239	1.253	1.246	1.1709	1.1728	1.1725	
8DPSK	1.264	1.265	1.267	1.1644	1.1657	1.1677	

Right Ear

Type of	20 dB Bandwidth (MHz)			Occupied Bandwidth (MHz)		
Modulation	Channel 0	Channel 39	Channel 78	Channel 0	Channel 39	Channel 78
GFSK	0.928	0.926	0.930	0.8763	0.8765	0.8797
π/4 DQPSK	1.247	1.240	1.244	1.1683	1.1696	1.1736
8DPSK	1.262	1.263	1.265	1.1639	1.1649	1.1668

The test plots as follows:

Left Ear











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5.5CARRIER FREQUENCIES SEPARATION

Test Requirement:	FCC 47 CFR Part 15 Subpart C Section 15.247 (a)(1) RSS-247 Issue 2, Section 5.1(b)				
Test Method:	ANSI C63.10-2013 Section 7.8.2				
Limit: Test Procedure:	ANSI C63.10-2013 Section 7.8.2 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. 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. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer. Use the following spectrum analyzer settings:				
	 a) Span: Wide enough to capture the peaks of two adjacent channels. b) RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel. c) Video (or average) bandwidth (VBW) ≥ RBW. d) Sweep: Auto. e) Detector function: Peak. f) Trace: Max hold. g) Allow the trace to stabilize. h) Use the marker-delta function to determine the separation between the peaks of the adjacent channels. 				
	amplitude		offset into measure device as an		
Test Setup:	Refer to section 4.5.3 for details.				
Instruments Used:	Refer to section 3 for details				
Test Results:	Pass				
Left Ear					
Type of Modula	ation	Adjacent Channel Separation (MHz)	Minimum Limit (MHz)		
		Channel 39	Channel 39		

Type of Medulation	Adjacent Channel Separation (WHZ)			
Type of Modulation	Channel 39	Channel 39		
GFSK	1.000	0.615		
π/4 DQPSK	1.000	0.826		
8DPSK	1.000	0.843		
Note: The minimum limit is two-third 20 dB handwidth				

Note: The minimum limit is two-third 20 dB bandwidth.

Right Ear

Type of Medulation	Adjacent Channel Separation (MHz)	Minimum Limit (MHz)		
Type of Modulation	Channel 39	Channel 39		
GFSK	1.000	0.617		
π/4 DQPSK	1.000	0.827		
8DPSK	1.000	0.841		
Note: The minimum limit is two-third 20 dB bandwidth.				

The test plots as follows:

Left Ear

GFSK		π/4 D	QPSK			
Addred Spectrum Audyor - Sept 50 Marker 1 Δ 1.000000000 MH2 IFGainstaw IFGainstaw 19 gBidly Ref 20.00 dBm 10 gBidly Ref 20.00 dBm 10 gBidly Ref 20.00 dBm	PNNNNN Select Marker	Aglent Spectrum Analyzer - Swept SA (M) 8F ISO G DC Marker 1 & 1,000000000 N Ref Offset 0.5 dB 10 dB/dlv Ref 20.00 dBm	Altz PRO: Fast IFGainLow Atten: 30 dB	Avg Type: Log-Pwr Avg Hold:>10/10	02:05:47 PMNov 15, 2018 TRACE 12:33 15 0 TVPE PNNNNN KF1 1.000 MHz -0.161 dB	Marker Select Marke
	Normal		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	142		Norm
	Delta Fixed⊳	-10.0				Del
300	no	-30.0				(
	Properties►	-50 0 -60 0				Propertie
	More 1 of 2	-70.0			Spap 5 000 MHz	Ma 1 o
Center 2.441000 GHz Span 5.00 #Res BW 300 kHz #VBW 910 kHz Sweep 1.000 ms (10 msi	001 pts)	Center 2.441000 GHz #Res BW 300 kHz	#VBW 910 kHz		Span 5.000 MHz 00 ms (1001 pts)	
Center 2.441000 GHz Span 5.00 #Res BW 300 kHz #VBW 910 kHz Sweep 1.000 ms (10 mso Control of the second sec	001 pts)	Center 2.441000 GHz #Res BW 300 kHz M3G	#VBW 910 kHz	Sweep 1.0	00 ms (1001 pts)	
M00	ter 15,2018 Marker Science Marker	Center 2.441000 GH2 #Res BW 300 kH2 MR0	#VBW 910 kHz		00 ms (1001 pts)	
Moil Contract Addref Spectrum Analyzer : Swept SA. BIDE DI SOUCE OF ALL/2010F 015850PMMc SF 1000 CC BIDE DI SOUCE OF ALL/2010F 015850PMMc Marker 1 & 1.00000000000 MHz Arg Type: Log-Per Type: Free Run Arg Type: Log-Per Type: Free Run Arg Type: Log-Per Type:	tev 15, 2019 Marker Select Marker 1 0 MH2	Center 2.441000 GH2 #Res BW 300 kHz	#VBW 910 kHz		00 ms (1001 pts)	
MGG BDPSK Addent Synctrum Audyrer - Server M. Marker 1 & 1.0000000000 MHz PBO: Fast Trig: Free Run IFGaintaw Rate: 20 dB Control Balance	Ver 15,000 Marker Select Marker 1 001 dB Normal Delta	Center 2.441000 GH2 #Res BW 300 kH2 MO	#VBW 910 kHz		00 ms (1001 pts)	
MGG BDPSK Addent Synctrum Audyrer - Server M. Marker 1 & 1.0000000000 MHz PBO: Fast Trig: Free Run IFGaintaw Rate: 20 dB Control Balance	Select Marker Select Marker 1 001 dB Normal Delta Fixedb	Center 2.441000 GH2 #Res BW 300 KH2 MSC	#VBW 910 kHz		00 ms (1001 pts)	
MGG BDPSK Addent Synctrum Audyrer - Server M. Marker 1 & 1.0000000000 MHz PBO: Fast Trig: Free Run IFGaintaw Rate: 20 dB Control Balance	Ver 15,000 Marker Select Marker 1 001 dB Normal Delta	Center 2.441000 GH2 #Res BW 300 kH2 MO	#VBW 910 kHz		00 ms (1001 pts)	
MGG BDPSK Addent Synctrum Audyrer - Server M. Marker 1 & 1.0000000000 MHz PBO: Fast Trig: Free Run IFGaintaw Rate: 20 dB Control Balance	Ver 15, 500 Marker Select Marker, 1 Select Marker, 1 Normal Delta Fixed Orr Properties More	Center 2.441000 GH2 #Res BW 300 kH2 Mo	#VBW 910 kHz		00 ms (1001 pts)	

Right Ear

GFSK	π/4 DQPSK
Andrest Spectrums Analyzer Sweet Str. 30 Control Spectrum Analyzer Sweet Str. 30 Control Spectrum Analyzer BW Viridoo BW 910 kHz PH0: Faat Trig: Free Run Avg Type: Log-Bwr Trig: Str. 30 BW 10 dBlidliv Ref Offset 0.5 x8 Trig: Free Run Avg Type: Log-Bwr Trig: Free Run Str. 30 BW 10 dBlidliv Ref Offset 0.5 x8 Trig: Free Run Avg Type: Log-Bwr Trig: Free Run Str. 30 Mar BW 10 dBlidliv Ref Offset 0.5 x8 Trig: Free Run Avg Type: Log-Bwr Trig: Free Run Str. 30 Mar Str. 30 Str. 30 Mar Str. 30 Mar Str. 30 Str. 30 Str. 30 Str. 30 Str. 30 Mar Str. 30	Control Spectrum Madyore - Swept 55 Control Spectrum Madyore - Swept 55 Control Spectrum Madyore - Swept 55 Marker 1 & 1.000000000 MHZ FIG. Fize Run Break and the second an
600 600 <th>000 Properties> 000 P</th>	000 Properties> 000 P
Address Spectrum Analyzer - Swept SA Scielt III (SORCE OF Landown) Analyzer - Swept SA Marker 1 A 1.0000000 MHz Marker Marker 1 A 1.0000 MHZ Marker Marker Scielt III (SORCE OF Landown) Marker Marker Scielt III (SORCE OF Landown) Marker Scielt III (SORCE OF Landown	

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5.6 NUMBER OF HOPPING CHANNEL

Test Requirement:	FCC 47 CFR Part 15 Subpart C Section 15.247(b)(1) RSS-247 Issue 2, Section 5.1(d)				
Test Method:	ANSI C63.10-2013 Section 7.8.3				
Limit:	Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non- overlapping channels.				
Test Procedure:	Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer. Use the following spectrum analyzer settings:				
	 a) Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen. b) RBW < 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller. c) VBW ≥ RBW. d) Sweep: Auto. e) Detector function: Peak. f) Trace: Max hold. g) Allow the trace to stabilize. 				
	Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.				
Test Setup:	Refer to section 4.5.3 for details.				
Instruments Used:	Refer to section 3 for details				
Test Results:	Pass				
Left Ear					
Туре	of Modulation Number of Hopping Channel				
	GFSK 79				
π					

Type of Modulation	Number of Hopping Channel	
GFSK	79	
π /4 DQPSK	79	
8DPSK	79	

Right Ear

Type of Modulation	Number of Hopping Channel
GFSK	79
π /4 DQPSK	79
8DPSK	79

The test plots as follows:



