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TEST REPORT

Test Result:	Pass*			
Date of Issue:	2019-04-24			
Date of Test:	2019-04-03 to 2019-04-14			
Date of Receipt:	2019-04-01			
Standard(s) :	47 CFR Part 15, Subpart C 15.247			
FCC ID:	Z9G-EDF84			
Trade mark:	EDIFIER			
*	Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.			
Model No.:	W200BT, W200BT SE 🔺			
EUT Name:	Wireless Sports Headphones			
Equipment Under Test (EUT)	:			
Address of Factory:	No.2 Gongyedong Road, Songshan Lake Sci&Tech Industry Park, Dongguan, Guangdong 523808, PR.China			
Factory:	Dongguan Edifier Technology Co., Ltd.			
Address of Manufacturer:	8th floor, ZuoAn Building, NO.68 BeiSiHuanXiLu, Haidian District, Beijing 100080, CHINA			
Manufacturer:	Beijing Edifier Technology Co., Ltd.			
Address of Applicant:	P.O. Box 6264 General Post Office Hong Kong			
Applicant:	Edifier International Limited			
Application No.:	SZEM1904012253CR			

* In the configuration tested, the EUT complied with the standards specified above.

Keny. XN

Keny Xu EMC Laboratory Manager



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	Revision Record					
Version	Chapter	Date	Modifier	Remark		
01		2019-04-24		Original		

Authorized for issue by:		
	1 trong Ulu	
	Harry Wu /Project Engineer	-
	Evic Fu	
	Eric Fu /Reviewer	-



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2 Test Summary

Radio Spectrum Technical Requirement					
Item	Standard	Method	Requirement	Result	
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)	Pass	

Radio Spectrum Matter Part						
Item	Standard	Method	Requirement	Result		
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass		
Minimum 6dB	47 CFR Part 15,	ANSI C63.10 (2013)	47 CFR Part 15, Subpart	Pass		
Bandwidth	Subpart C 15.247	Section 11.8.1	C 15.247a(2)			
Conducted Peak	47 CFR Part 15,	ANSI C63.10 (2013)	47 CFR Part 15, Subpart	Pass		
Output Power	Subpart C 15.247	Section 11.9.1	C 15.247(b)(3)			
Power Spectrum	47 CFR Part 15,	ANSI C63.10 (2013)	47 CFR Part 15, Subpart	Pass		
Density	Subpart C 15.247	Section 11.10.2	C 15.247(e)			
Conducted Band	47 CFR Part 15,	ANSI C63.10 (2013)	47 CFR Part 15, Subpart	Pass		
Edges Measurement	Subpart C 15.247	Section 11.13.3.2	C 15.247(d)			
Conducted Spurious	47 CFR Part 15,	ANSI C63.10 (2013)	47 CFR Part 15, Subpart	Pass		
Emissions	Subpart C 15.247	Section 11.11	C 15.247(d)			
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass		
Radiated Spurious	47 CFR Part 15,	ANSI C63.10 (2013)	47 CFR Part 15, Subpart	Pass		
Emissions	Subpart C 15.247	Section 6.4,6.5,6.6	C 15.205 & 15.209			

Declaration of EUT Family Grouping:

Model No.: W200BT, W200BT SE

Only the model W200BT SE was tested fully, and the model W200BT was performed the Radiated Emissions for discrepancy, since the electrical circuit design, PCB layout, components used and internal wiring and functions were identical for the above models, with only different on product model and appearance.



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General Information 4

4.1 Details of E.U.T.

Power supply:	DC 3.7V by Lithium polymer battery(100mAh),
	Recharge Voltage: DC5V, 500mA
Cable:	USB Cable:30cm, Unshielded
Operation Frequency:	2402MHz to 2480MHz
Bluetooth Version:	V5.0 Dual mode
Modulation Type:	GFSK
Number of Channels:	40
Channel Spacing:	2MHz
Antenna Type:	Chip Antenna
Antenna Gain:	1.5dbi

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Adapter	Apple	A1357 W010A051	REF. No.SEA0500

4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	± 7.25 x 10 ⁻⁸
2	Duty cycle	± 0.37%
3	Occupied Bandwidth	± 3%
4	RF conducted power	± 0.75dB
5	RF power density	± 2.84dB
6	Conducted Spurious emissions	± 0.75dB
_	DE Dedicted newsr	± 4.5dB (below 1GHz)
/	RF Radiated power	± 4.8dB (above 1GHz)
0	Dedicted Courieus emission test	± 4.5dB (Below 1GHz)
Ø	Radiated Spurious emission test	± 4.8dB (Above 1GHz)
9	Temperature test	± 1 ℃
10	Humidity test	± 3%
11	Supply voltages	± 1.5%
12	Time	± 3%



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4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China. 518057. Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

4.5 Test Facility

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

CNAS (No. CNAS L2929)

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

VCCI

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

FCC –Designation Number: CN1178

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

Innovation, Science and Economic Development Canada

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None



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5 Equipment List

Conducted Emissions at AC Power Line (150kHz-30MHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	ZhongYu Electron	GB-88	SEM001-06	2017-05-10	2020-05-09
Measurement Software	AUDIX	e3 V5.4.1221d	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM024-01	2018-07-12	2019-07-11
LISN	Rohde & Schwarz	ENV216	SEM007-01	2018-09-25	2019-09-24
LISN	ETS-LINDGREN	3816/2	SEM007-02	2019-04-01	2020-03-31
EMI Test Receiver	Rohde & Schwarz	ESCI	SEM004-02	2019-04-01	2020-03-31

Minimum 6dB Bandwidth					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2018-09-25	2019-09-24
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2019-04-01	2020-03-31
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-01	2018-07-12	2019-07-11
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2018-09-27	2019-09-26
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2018-09-25	2019-09-24

Conducted Peak Output Power							
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date		
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2018-09-25	2019-09-24		
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2019-04-01	2020-03-31		
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A		
Coaxial Cable	SGS	N/A	SEM031-01	2018-07-12	2019-07-11		
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A		
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2018-09-27	2019-09-26		
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2018-09-25	2019-09-24		

Power Spectrum Density							
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date		
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2018-09-25	2019-09-24		
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2019-04-01	2020-03-31		
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A		
Coaxial Cable	SGS	N/A	SEM031-01	2018-07-12	2019-07-11		



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Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2018-09-27	2019-09-26
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2018-09-25	2019-09-24

Conducted Band Edges Measurement							
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date		
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2018-09-25	2019-09-24		
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2019-04-01	2020-03-31		
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A		
Coaxial Cable	SGS	N/A	SEM031-01	2018-07-12	2019-07-11		
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A		
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2018-09-27	2019-09-26		
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2018-09-25	2019-09-24		

Conducted Spurious Emissions							
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date		
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2018-09-25	2019-09-24		
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2019-04-01	2020-03-31		
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A		
Coaxial Cable	SGS	N/A	SEM031-01	2018-07-12	2019-07-11		
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A		
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2018-09-27	2019-09-26		
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2018-09-25	2019-09-24		

Radiated Emissions which fall in the restricted bands								
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date			
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2018-03-13	2021-03-12			
Measurement Software	AUDIX	e3 V8.2014-6- 27	N/A	N/A	N/A			
Coaxial Cable	SGS	N/A	SEM026-01	2018-07-12	2019-07-11			
EXA Spectrum Analyzer	AgilentTechnologies Inc	N9010A	SEM004-12	2019-04-12	2020-04-11			
BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-01	2017-06-27	2020-06-26			
Horn Antenna (1-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2018-04-13	2021-04-12			
Horn Antenna (15GHz-40GHz)	Schwarzbeck	BBHA 9170	SEM003-15	2017-10-17	2020-10-16			



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Pre-amplifier (0.1-1300MHz)	HP	8447D	SEM005-02	2018-09-25	2019-09-24
Pre-Amplifier (0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	SEM004-11	2018-11-12	2019-11-11
Pre-amplifier (18-26GHz)	Rohde & Schwarz	CH14-H052	SEM005-17	2019-04-01	2020-03-31
Pre-amplifier (26GHz-40GHz)	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2019-04-01	2020-03-31
DC Power Supply	Zhao Xin	RXN-305D	SEM011-02	2018-09-25	2019-09-24
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2017-08-22	2020-08-21

Radiated Spurious Emissions							
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date		
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2018-03-13	2021-03-12		
Measurement Software	AUDIX	e3 V8.2014-6- 27	N/A	N/A	N/A		
Coaxial Cable	SGS	N/A	SEM026-01	2018-07-12	2019-07-11		
EXA Spectrum Analyzer	AgilentTechnologies Inc	N9010A	SEM004-12	2019-04-12	2020-04-11		
BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-01	2017-06-27	2020-06-26		
Horn Antenna (1-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2018-04-13	2021-04-12		
Horn Antenna (15GHz-40GHz)	Schwarzbeck	BBHA 9170	SEM003-15	2017-10-17	2020-10-16		
Pre-amplifier (0.1-1300MHz)	HP	8447D	SEM005-02	2018-09-25	2019-09-24		
Pre-Amplifier (0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	SEM004-11	2018-11-12	2019-11-11		
Pre-amplifier (18-26GHz)	Rohde & Schwarz	CH14-H052	SEM005-17	2019-04-01	2020-03-31		
Pre-amplifier (26GHz-40GHz)	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2019-04-01	2020-03-31		
DC Power Supply	Zhao Xin	RXN-305D	SEM011-02	2018-09-25	2019-09-24		
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2017-08-22	2020-08-21		



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RE in Chamber					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date	Cal. Due date
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2017-08-05	2020-08-04
MXE EMI Receiver (20Hz-8.4GHz)	Agilent Technologies	N9038A	SEM004-05	2018-09-25	2019-09-24
BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEM003-01	2017-06-27	2020-06-26
Pre-amplifier (0.1-1300MHz)	Agilent Technologies	8447D	SEM005-01	2019-04-01	2020-03-31
Measurement Software	AUDIX	e3 V8.2014-6- 27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2018-07-12	2019-07-11

General used equipment							
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date		
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-03	2018-09-27	2019-09-26		
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2018-09-27	2019-09-26		
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2018-09-27	2019-09-26		
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2019-04-04	2020-04-03		



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Radio Spectrum Technical Requirement 6

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)

6.1.2 Conclusion

Standard 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.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 1.5dBi..

Antenna location: Refer to Appendix(Internal photos)



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7 **Radio Spectrum Matter Test Results**

7.1 Conducted Emissions at AC Power Line (150kHz-30MHz)

Test Requirement Test Method: Limit:

47 CFR Part 15, Subpart C 15.207 ANSI C63.10 (2013) Section 6.2

	Conducted limit(dBµV)			
Frequency of emission(MHZ)	Quasi-peak	Average		
0.15-0.5	66 to 56*	56 to 46*		
0.5-5	56	46		
5-30	60	50		
*Decreases with the logarithm of the frequency.				



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7.1.1 E.U.T. Operation

Operating Environment:

Temperature:23 °CHumidity:58 % RHAtmospheric Pressure:1020 mbarPretest these
modes to findd:Charge + TX mode_Keep the EUT in charging and continuously transmitting
mode with GFSK modulation.mode with GFSK modulation.

the worst case: The worst case for final test:

d:Charge + TX mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.

7.1.2 Test Setup Diagram



7.1.3 Measurement Procedure and Data

1) The mains terminal disturbance voltage test was conducted in a shielded room.

2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 500hm/50 μ H + 50hm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,

4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark: LISN=Read Level+ Cable Loss+ LISN Factor



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Mode:d; Line:Live Line



Site :	Shielding	Room
Condition:	Line	
Job No. :	12253CR	
Test mode:	d	

		Cable	LISN	Read		Limit	0ver	
	Freq	Loss	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.17	0.02	9.66	20.15	29.83	54.81	-24.98	Average
2	0.17	0.02	9.66	26.39	36.07	64.81	-28.74	QP
3	0.24	0.03	9.67	16.83	26.53	52.13	-25.60	Average
4	0.24	0.03	9.67	24.47	34.17	62.13	-27.96	QP
5	0.59	0.07	9.67	13.91	23.65	46.00	-22.35	Average
6	0.59	0.07	9.67	21.03	30.77	56.00	-25.23	QP
7	1.09	0.10	9.74	10.12	19.96	46.00	-26.04	Average
8	1.09	0.10	9.74	17.33	27.17	56.00	-28.83	QP
9	2.65	0.16	9.71	9.60	19.47	46.00	-26.53	Average
10	2.65	0.16	9.71	15.60	25.47	56.00	-30.53	QP
11	7.73	0.17	9.80	15.43	25.40	50.00	-24.60	Average
12	7.73	0.17	9.80	20.12	30.09	60.00	-29.91	QP



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Mode:d; Line:Neutral Line



Site :	Shielding	Room
Condition:	Neutral	
Job No. :	12253CR	
Test mode:	d	

		Cable	LISN	Read		Limit	0ver	
	Freq	Loss	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.15	0.01	9.63	19.62	29.26	55.91	-26.65	Average
2	0.15	0.01	9.63	24.66	34.30	65.91	-31.61	QP
3	0.22	0.03	9.64	15.20	24.87	52.66	-27.79	Average
4	0.22	0.03	9.64	24.81	34.48	62.66	-28.18	QP
5	0.60	0.07	9.64	15.88	25.59	46.00	-20.41	Average
6	0.60	0.07	9.64	22.71	32.42	56.00	-23.58	QP
7	1.02	0.09	9.71	10.30	20.10	46.00	-25.90	Average
8	1.02	0.09	9.71	17.19	26.99	56.00	-29.01	QP
9	2.57	0.16	9.68	9.64	19.48	46.00	-26.52	Average
10	2.57	0.16	9.68	15.55	25.39	56.00	-30.61	QP
11	7.81	0.17	9.78	15.46	25.41	50.00	-24.59	Average
12	7.81	0.17	9.78	18.73	28.68	60.00	-31.32	QP



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7.2 Minimum 6dB Bandwidth

Test Requirement	47 CFR Part 15, Subpart C 15.247a(2)
Test Method:	ANSI C63.10 (2013) Section 11.8.1
Limit:	≥500 kHz

7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 21.5 °C Atmospheric Pressure: 1020 mbar Humidity: 57.1 % RH Test mode c:TX mode Keep the EUT in continuously transmitting mode with GFSK modulation

7.2.2 Test Setup Diagram



Ground Reference Plane

7.2.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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7.3 Conducted Peak Output Power

Test Requirement	47 CFR Part 15, Subpart C 15.247(b)(3)
Test Method:	ANSI C63.10 (2013) Section 11.9.1
Limit:	

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥50 hopping channels
	0.25 for 25≤ hopping channels <50
	1 for digital modulation
2400-2483.5	1 for ≥75 non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation



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7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 21.5 °C Humidity: 57.1 % RH Atmospheric Pressure: 1020 mbar Test mode c:TX mode Keep the EUT in continuously transmitting mode with GFSK modulation

7.3.2 Test Setup Diagram



Ground Reference Plane

7.3.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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7.4 Power Spectrum Density

Test Requirement	47 CFR Part 15, Subpart C 15.247(e)
Test Method:	ANSI C63.10 (2013) Section 11.10.2
Limit:	\leq 8dBm in any 3 kHz band during any time interval of continuous
	transmission

7.4.1 E.U.T. Operation

Operating Environment:

Temperature:	21.5 °C	Humidity:	57.1 % RH	Atmospheric Pressure: 1020	mbar
Test mode	c:TX mode_Ke modulation	eep the EUT	in continuously	transmitting mode with GFSK	

7.4.2 Test Setup Diagram



Ground Reference Plane

7.4.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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7.5 Conducted Band Edges Measurement

Test Requirement	47 CFR Part 15, Subpart C 15.247(d)
Test Method:	ANSI C63.10 (2013) Section 11.13.3.2
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, 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)



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7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 21.5 °C Humidity: 57.2 % RH Atmospheric Pressure: 1020 mbar Test mode c:TX mode Keep the EUT in continuously transmitting mode with GFSK modulation

7.5.2 Test Setup Diagram



Ground Reference Plane

7.5.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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7.6 Conducted Spurious Emissions

Test Requirement	47 CFR Part 15, Subpart C 15.247(d)
Test Method:	ANSI C63.10 (2013) Section 11.11
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, 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 §15.209(a) (see §15.205(c)



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7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 21.5 °C Humidity: 57.1 % RH Atmospheric Pressure: 1020 mbar Test mode c:TX mode Keep the EUT in continuously transmitting mode with GFSK modulation

7.6.2 Test Setup Diagram



Ground Reference Plane

7.6.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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7.7 Radiated Emissions which fall in the restricted bands

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209 ANSI C63.10 (2013) Section 6.10.5 Test Method: Measurement Distance: 3m Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.



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7.7.1 E.U.T. Operation

Operating Environment:

	Temperature:	22.4 °C	Humidity:	56.7 % RH	Atmospheric Pressure: 10	20 mbar
	Pretest these modes to find	c:TX mode_Ke modulation	ep the EUT	in continuously	transmitting mode with GFSK	
	the worst case:	d:Charge + TX mode with GFS	mode_Keep SK modulatic	o the EUT in cha	arging and continuously transn	nitting
	The worst case for final test:	c:TX mode_Ke modulation	ep the EUT	in continuously	transmitting mode with GFSK	
7.7.2	Test Setup Diagra	am				

3m or 10m Antenna Towe EUT EUT Turntabl Turntable Ground Reference Pl Ground Reference Plane Test Receiver Test Receiver

30MHz-1GHz

Above 1GHz



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7.7.3 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel, the middle channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.



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Mode:c; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low





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Mode:c; Polarization:Vertical; Modulation:GFSK; ; Channel:Low





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Mode:c; Polarization:Horizontal; Modulation:GFSK; ; Channel:High





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7.8 Radiated Spurious Emissions

Test Requirement	47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method:	ANSI C63.10 (2013) Section 6.4,6.5,6.6
Measurement Distance:	3m
Limit:	

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.



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7.8.1 E.U.T. Operation

Operating Environment:

Temperature: 22.7 °C Humidity: 63.8 % RH Atmospheric Pressure: 1020 mbar c:TX mode Keep the EUT in continuously transmitting mode with GFSK Pretest these modulation modes to find the worst case: d:Charge + TX mode Keep the EUT in charging and continuously transmitting mode with GFSK modulation.

The worst case c:TX mode_Keep the EUT in continuously transmitting mode with GFSK for final test: modulation

7.8.2 Test Setup Diagram











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7.8.3 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel, the middle channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

Remark:

1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.

2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

3) Scan from 9kHz to 25GHz, the disturbance above 18GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

4) For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.



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Model No.:W200BT SE 30MHz~1GHz QP value: Mode: c; Polarization: Horizontal



Condition: 3m HORIZONTAL Job No. : 12253CR									
Mod	le	: с							
			Cable	Ant	Preamp	Read		Limit	0ver
		Freq	Loss	Factor	Factor	Level	Level	Line	Limit
	_								
		MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dE
1	рр	159.78	1.34	15.48	27.05	48.70	38.47	43.50	-5.03
2		240.83	1.63	18.81	26.78	40.21	33.87	46.00	-12.13
3		319.94	1.97	20.23	26.76	44.56	40.00	46.00	-6.00
4		399.03	2.20	22.38	27.18	42.14	39.54	46.00	-6.46
5		416.18	2.27	22.79	27.26	40.60	38.40	46.00	-7.60
6		860,04	3,45	29.30	27.28	34,10	39,57	46,00	-6.43



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Mode: c; Polarization: Vertical



Condition:	3m VERTICAL
Job No. :	12253CR
Mode :	с

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	30.96	0.60	21.95	27.45	28.47	23.57	40.00	-16.43
2	158.11	1.33	15.34	27.05	29.26	18.88	43.50	-24.62
3	231.72	1.58	18.15	26.81	28.63	21.55	46.00	-24.45
4	319.94	1.97	20.23	26.76	28.72	24.16	46.00	-21.84
5	614.21	2.73	26.80	27.92	27.58	29.19	46.00	-16.81
6 pp	851.04	3.41	29.18	27.33	28.60	33.86	46.00	-12.14



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Model No.: W200BT Mode: c; Polarization: Horizontal





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Mode: c; Polarization: Vertical



Condition:	3m VERTICAL
Job No. :	12253CR
Mode :	с

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	30.96	0.60	21.95	27.45	28.47	23.57	40.00	-16.43
2	158.11	1.33	15.34	27.05	29.26	18.88	43.50	-24.62
3	231.72	1.58	18.15	26.81	28.63	21.55	46.00	-24.45
4	319.94	1.97	20.23	26.76	28.72	24.16	46.00	-21.84
5	614.21	2.73	26.80	27.92	27.58	29.19	46.00	-16.81
6 pp	851.04	3.41	29.18	27.33	28.60	33.86	46.00	-12.14



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Above 1GHz

Mode:c; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low





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Mode:c; Polarization:Vertical; Modulation:GFSK; ; Channel:Low





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Mode:c; Polarization:Horizontal; Modulation:GFSK; ; Channel:middle





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Mode:c; Polarization:Vertical; Modulation:GFSK; ; Channel:middle





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Mode:c; Polarization:Horizontal; Modulation:GFSK; ; Channel:High





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Photographs 8

8.1 Test Setup

Refer to Setup Photos

8.2 EUT Constructional Details (EUT Photos)

Refer to EUT external and internal photos



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9 Appendix

9.1 Appendix 15.247

1.6dB Bandwidth

Test Mode	Test Channel	Ant	EBW[MHz]	Limit[MHz]	Verdict
BLE	2402	Ant1	0.705	>=0.5	PASS
BLE	2440	Ant1	0.702	>=0.5	PASS
BLE	2480	Ant1	0.699	>=0.5	PASS



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2.Maximum peak conducted output power

Test Mode	Test Channel	Ant	Power[dBm]	Limit[dBm]	Verdict
BLE	2402	Ant1	6.65	<30	PASS
BLE	2440	Ant1	7.61	<30	PASS
BLE	2480	Ant1	8	<30	PASS



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3.Maximum Peak power spectral density

Test Mode	Test Channel	Ant	PSD[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE	2402	Ant1	-9.57	<8.00	PASS
BLE	2440	Ant1	-8.5	<8.00	PASS
BLE	2480	Ant1	-8.04	<8.00	PASS



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4.Band-edge for RF Conducted Emissions

Test Mode	Test Channel	Ant	Carrier Power[dBm]	Max. Spurious Level [dBm]	Limit [dBm]	Verdict
BLE	2402	Ant1	6.100	-54.064	<-13.9	PASS
BLE	2480	Ant1	7.360	-51.520	<-12.64	PASS



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Test Mode	Test Channel	StartFre [MHz]	StopFre [MHz]	RBW [kHz]	VBW [kHz]	Pref[dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
BLE	2402	30	10000	1000	3000	6.13	-39.010	<- 13.87	PASS
BLE	2402	10000	25000	1000	3000	6.13	-55.080	<- 13.87	PASS
BLE	2440	30	10000	1000	3000	7.15	-37.920	<- 12.85	PASS
BLE	2440	10000	25000	1000	3000	7.15	-52.130	<- 12.85	PASS
BLE	2480	30	10000	1000	3000	7.47	-36.190	<- 12.53	PASS
BLE	2480	10000	25000	1000	3000	7.47	-50.230	<- 12.53	PASS

5.RF Conducted Spurious Emissions



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