

TEST REPORT

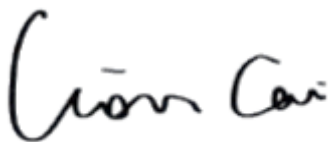
Application No.: BTEK240401007AE
Version Number: V0
Applicant: Guangdong Fenergy Technology Co., Ltd
Address of Applicant: Building 35, Zone 5, Huaide Cuigang Industrial Park, Fuyong Street, Bao 'an District, Shenzhen
Manufacturer: Guangdong Fenergy Technology Co., Ltd
Address of Manufacturer: Building 35, Zone 5, Huaide Cuigang Industrial Park, Fuyong Street, Bao 'an District, Shenzhen
Factory: Guangdong Fenergy Technology Co., Ltd
Address of Factory: Building 35, Zone 5, Huaide Cuigang Industrial Park, Fuyong Street, Bao 'an District, Shenzhen

Equipment Under Test (EUT):

EUT Name: 3-in-1 Magnetic Charger
Model No.: AT2473
Trade Mark: atomi
Standard(s) : 47 CFR Part 15 Subpart C
Date of Receipt: 2024-04-09
Date of Test: 2024-04-09 to 2024-04-28
Date of Issue: 2024-04-29

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.



Lion Cai

EMC Laboratory Manager

ShenZhen BANTEK Testing Co.,Ltd.

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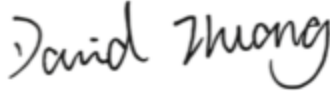

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Revision Record				
Version	Chapter	Date	Modifier	Remark
V0		2024-04-29		Original

Authorized for issue by			
			
	<hr/>		
	Daivid.Zhuang/Project Engineer		
			
	<hr/>		
	Elam.Yang/Reviewer		



2 Test Summary

Item	Document Title
47 CFR Part 15, Subpart C	Intentional Radiators
ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

Item	Standard	Result
Antenna Requirements	15.203	Pass
20dB Occupied Bandwidth	2.1049	Pass
AC Power Line Conducted Emissions	15.207	Pass
Spurious Emissions	15.209	Pass

Note:

E.U.T./EUT means Equipment Under Test.

Pass means the test result passed the test standard requirement, please find the detailed decision rule in the report relative section.



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3 General Information

3.1 Details of E.U.T.

Power Supply	USB-C Input: 12V=1.67A UBS Output: 5V=1A, 5W max. Wireless Charge Stand Output: 15W Earbud Output: 3W
Modulation Type	FSK
Operating frequency	112kHz-205kHz
Antenna Type	Coil antenna
Hardware Version	M2138P-IP6806 REV1.2,M2316-TL15A905-IP6808 20231012-V1.0
Software Version	M2316-IP6808 ,QFN32_0.5
Sample number	BTEK240401007AE-01
Remark: The information in this section is provided by the applicant or manufacturer, BANTEK is not liable to the accuracy, suitability, reliability or/and integrity of the information.	

3.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
WPC charging load	EESON	2S	/
Earbud	Apple	AirPods	/

3.3 Measurement Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2 and TR100 028-1/-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

d TR100 028-1/-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Value
Occupied Channel Bandwidth	69 KHz
RF output power, conducted	0.87 dB
Power Spectral Density, conducted	0.69 dB
Unwanted Emissions, conducted	0.94 dB
All emissions, radiated(<1GHz)	4.12 dB
All emissions, radiated(>1GHz)	4.16 dB
Temperature	0.82 °C
Humidity	4.1 %



3.4 Test Location

All tests were performed at:

Shenzhen BANTEK Testing Co., Ltd.

A5&A6, Building B1&B2, No.45 Gangtou Road, Bogang Community, Shajing Street, Bao'an District, Shenzhen, Guangdong, China 518104

Tel: +86 0755-2334 4200 Fax: +86 0755-2334 4200

FCC Registration Number: 264293

Designation Number: CN1356

No tests were sub-contracted.

3.5 Deviation from Standards

None

3.6 Abnormalities from Standard Conditions

None



4 Equipment List

Conducted Method Test					
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Shielding Room	YIHENG ENECTRONIC	5.5*3.1*3	YH-BT- 220304-03	2022-03-03	2025-03-02
EXA Signal Analyzer	KEYSIGHT	N9020A	MY54230486	2023-06-12	2024-06-11
DC Power Supply	E3632A	E3642A	KR75304416	2023-06-12	2024-06-11
Attenuator	RswTech	SMA-JK-6dB	N/A	2023-06-12	2024-06-11
Attenuator	RswTech	SMA-JK-3dB	N/A	2023-06-12	2024-06-11
RF Control Unit	Techy	TR1029-1	N/A	2023-06-12	2024-06-11
RF Sensor Unit	Techy	TR1029-2	N/A	2023-06-12	2024-06-11
MXG Vector Signal Generator	Agilent	N5182A	US46240522	2023-06-12	2024-06-11
Programmable Temperature&Humidity Chamber	GRT	GR-HWX1000	GR22051001	2023-06-12	2024-06-11
Measurement Software	TACHOY	RF TestSoft V2.0.0.0	N/A	2023-06-12	2024-06-11

Radiated Method Test					
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
3m Semi-Anechoic Chamber	YIHENG ENECTRONIC	966	YH-BT- 220304-01	2022-05-06	2025-05-05
EMI Test Receiver	Rohde&Schwarz	ESCI	100694	2023-06-12	2024-06-11
TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	01324	2022-06-15	2025-06-14
Pre-Amplifier	Schwarzbeck	BBV 9745	#180	2023-06-12	2024-06-11
Loop antenna	Schwarzbeck	FMZB1519B	00056	2023-06-12	2024-06-11
Measurement Software	Fara	EZ_EMV Ver. FA- 03A2	N/A	N/A	N/A

Conducted disturbance Test					
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Shielding Room	YIHENG ENECTRONIC	9*5*3.3	YH-BT- 220304-04	2022-03-03	2025-03-02
EMI Test Receiver	Rohde&Schwarz	ESCI	101021	2023-06-12	2024-06-11
Measurement Software	Fara	EZ_EMV Ver. FA- 03A2	N/A	N/A	N/A
LISN	Rohde&Schwarz	ENV216	101472	2023-06-12	2024-06-11
LISN	Schwarzbeck	NSLK 8128	05127	2023-06-12	2024-06-11
Pulse Limiter	Schwarzbeck	VTSD 9561 F-N	00890	2023-06-12	2024-06-11



General used equipment					
Equipment	Manufacturer	Model No	Serial No	Cal Date	Cal Due Date
Humidity/Temperature/B arometric Pressure Indicator	KUMAR	F132	N/A	2023-06-12	2024-06-11
Humidity/Temperature/B arometric Pressure Indicator	KUMAR	F132	N/A	2023-06-12	2024-06-11



5 Radio Spectrum Technical Requirement

5.1 Antenna Requirement

5.1.1 Test Requirement:

Test Requirement FCC §15.203;

5.1.2 Conclusion

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 replaced 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 § 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 § 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.

If directional gain of transmitting antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. 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 FCC rule.

The EUT uses an Integral Antenna which in accordance to Section 15.203 is considered sufficient to comply with the provisions of this section.



6 Radio Spectrum Matter Test Results

6.1 20dB Occupied Bandwidth

Test Requirement FCC Part 2.1049

6.1.1 E.U.T. Operation

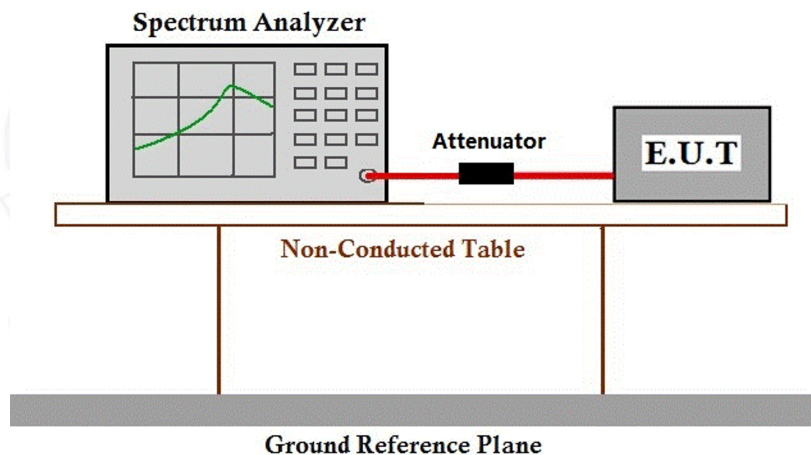
Operating Environment:

Temperature: 25.7 °C Humidity: 53.2 % RH Atmospheric Pressure: 1010 mbar

6.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	Operation(Wireless): Keep the EUT pairing with other devices(Iphone:15W).
Final test	02	Operation(Wireless): Keep the EUT pairing with other devices(Earbud:3W).

6.1.3 Test Setup Diagram



6.1.4 Measurement Procedure and Data

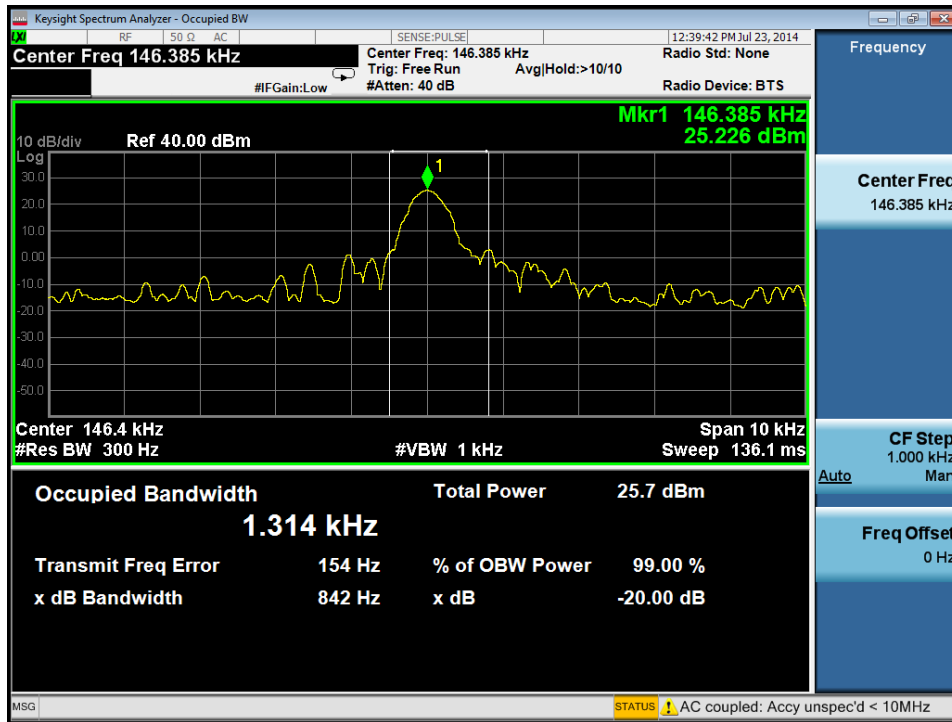
cable loss=0.9

- The transmitter output was connected to the spectrum analyzer through an attenuator, the pathloss was compensated to the results for each measurement.
- Set to the maximum power setting and enable the EUT transmit continuously
- Use the following spectrum analyzer settings:
 - Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
 - RBW \geq 1% of the 20 dB bandwidth, VBW \geq RBW
 - Sweep = auto, Detector function = peak, Trace = max hold
- Measure and record the results in the test report.



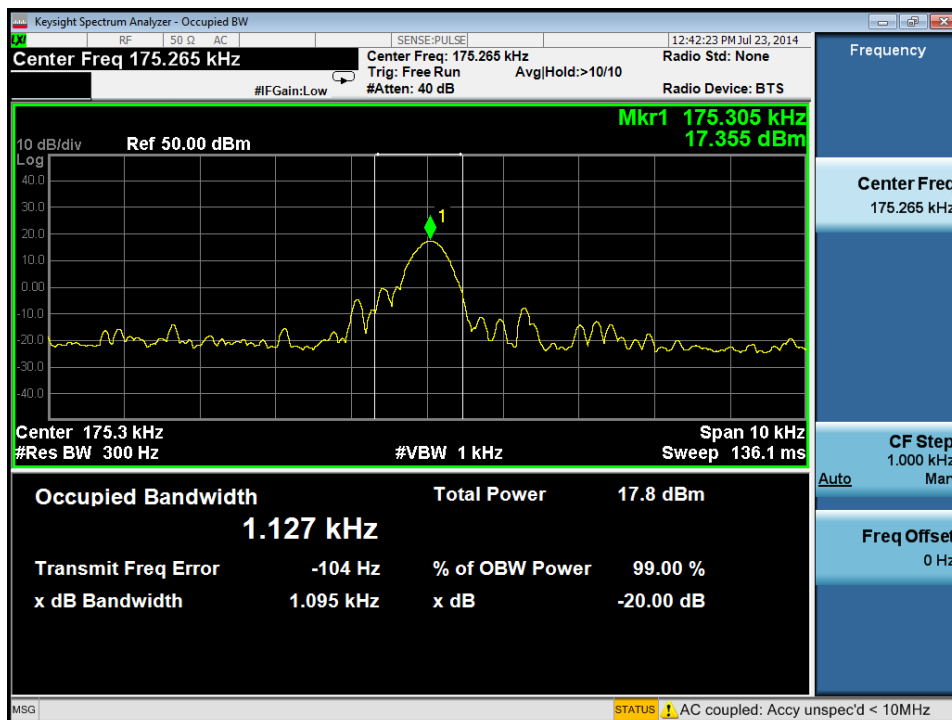
For ANT1 (ipone wireless output)

Freq. (kHz)	20 dB bandwidth Result (kHz)	Conclusion
146.385	0.842	PASS



For ANT2 (Earbud wireless output)

Freq. (kHz)	20 dB bandwidth Result (kHz)	Conclusion
175.265	1.095	PASS



6.2 AC Power Line Conducted Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.207

Test Method:

Limit:

Frequency of emission(MHz)	Conducted limit(dB μ V)	
	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.

Detector: Peak for pre-scan (9kHz resolution bandwidth) 0.15M to 30MHz

6.2.1 E.U.T. Operation

Operating Environment:

Temperature: 25.7 °C

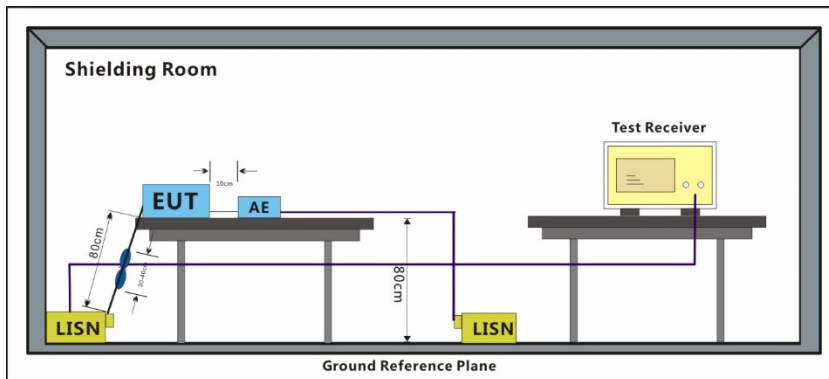
Humidity: 57.2 % RH

Atmospheric Pressure: 1010 mbar

6.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Pre_scan	00	Idle mode: Keep the EUT standby
Pre_scan	01	Operation(Wireless): Keep the EUT pairing with other devices(Iphone:15W).
Pre_scan	02	Operation(Wireless): Keep the EUT pairing with other devices(Earbud:3W).
Final test	03	Operation(Wireless): Keep the EUT Full load

6.2.3 Test Setup Diagram



6.2.4 Measurement Procedure and Data

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

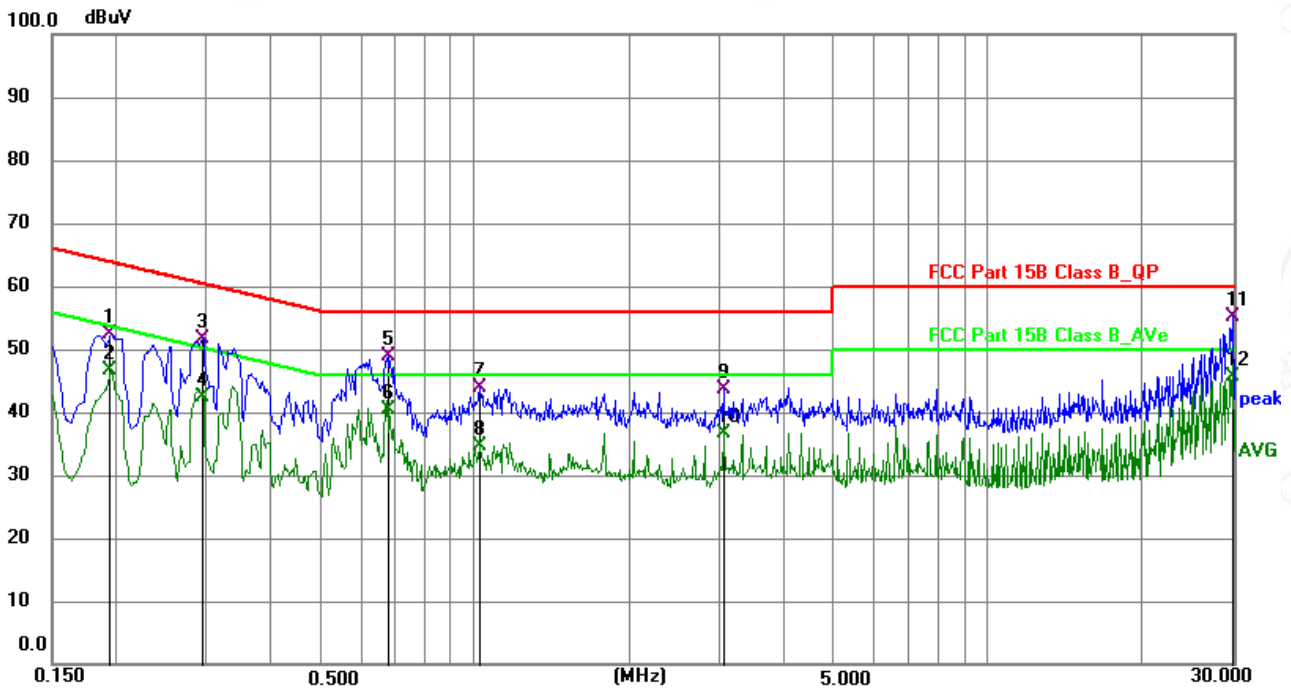
Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

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

Note:Level (dBuV) = Reading (dBuV) + Factor (dB)



Test Mode: 03; Line: Live line; Modulation:FSK



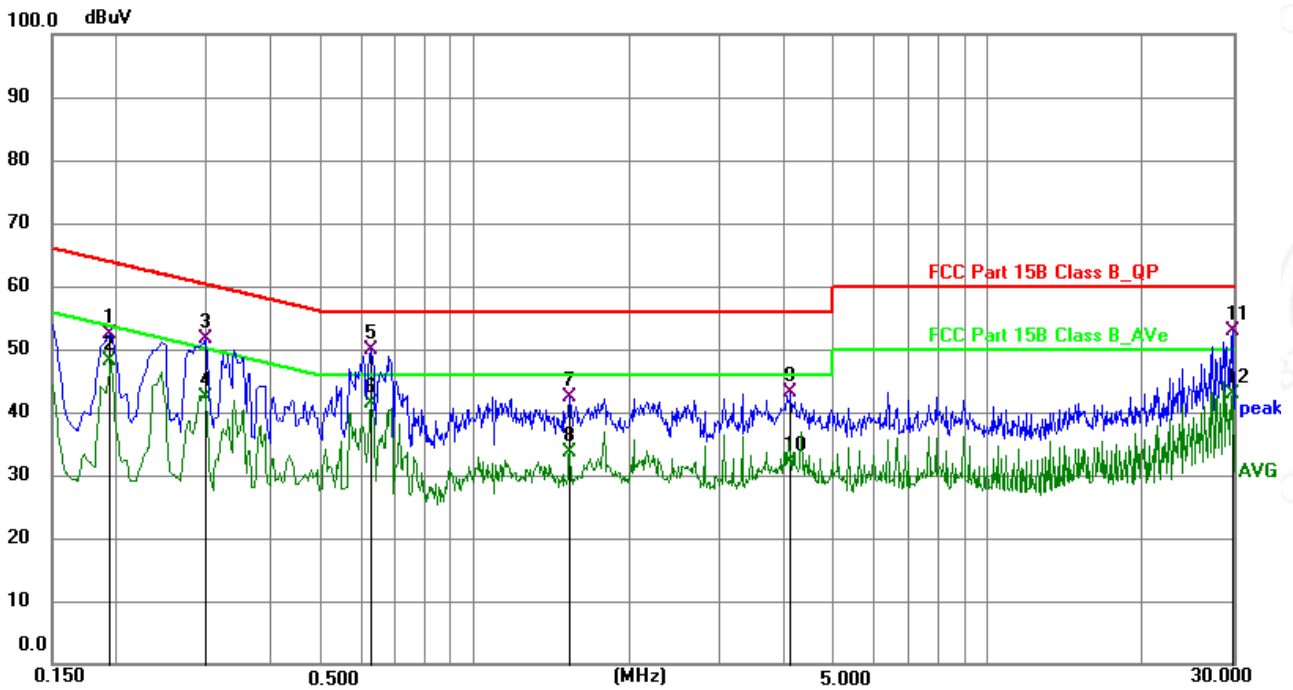
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1949	32.47	19.80	52.27	63.83	-11.56	QP	P	
2	0.1949	26.79	19.80	46.59	53.83	-7.24	AVG	P	
3	0.2940	31.81	19.81	51.62	60.41	-8.79	QP	P	
4	0.2940	22.53	19.81	42.34	50.41	-8.07	AVG	P	
5	0.6809	28.96	19.91	48.87	56.00	-7.13	QP	P	
6	0.6809	20.50	19.91	40.41	46.00	-5.59	AVG	P	
7	1.0230	23.75	20.02	43.77	56.00	-12.23	QP	P	
8	1.0230	14.55	20.02	34.57	46.00	-11.43	AVG	P	
9	3.0570	23.52	20.19	43.71	56.00	-12.29	QP	P	
10	3.0570	16.53	20.19	36.72	46.00	-9.28	AVG	P	
11	29.9400	31.90	23.14	55.04	60.00	-4.96	QP	P	
12 *	29.9400	22.45	23.14	45.59	50.00	-4.41	AVG	P	

NOTE:

- 1.Level (dBuV) = Reading (dBuV) + Factor (dB)
- 2.Factor = Insertion Loss + Cable Loss.
- 3.Margin = Level – Limit.



Test Mode: 03; Line: Neutral Line; Modulation:FSK



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1949	32.61	19.81	52.42	63.83	-11.41	QP	P	
2	0.1949	28.27	19.81	48.08	53.83	-5.75	AVG	P	
3	0.2983	31.92	19.82	51.74	60.29	-8.55	QP	P	
4	0.2983	22.63	19.82	42.45	50.29	-7.84	AVG	P	
5	0.6270	29.88	19.90	49.78	56.00	-6.22	QP	P	
6 *	0.6270	21.59	19.90	41.49	46.00	-4.51	AVG	P	
7	1.5315	22.26	20.04	42.30	56.00	-13.70	QP	P	
8	1.5315	13.49	20.04	33.53	46.00	-12.47	AVG	P	
9	4.1280	22.95	20.18	43.13	56.00	-12.87	QP	P	
10	4.1280	11.98	20.18	32.16	46.00	-13.84	AVG	P	
11	29.9532	29.70	23.21	52.91	60.00	-7.09	QP	P	
12	29.9532	19.76	23.21	42.97	50.00	-7.03	AVG	P	

NOTE:

- 1.Level (dBuV) = Reading (dBuV) + Factor (dB)
- 2.Factor = Insertion Loss + Cable Loss.
- 3.Margin = Level – Limit.



6.3 Radiated Spurious Emissions

Test Requirement FCC §15.209

Test Method:

Limit:

Radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a). According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

FCC Part 15.209				
Frequency (MHz)	Field Strength Limitation		Field Strength Limitation Frequency tion at 3m Measurement Dist	
	(uV/m)	Dist	(uV/m)	(dBuV/m)
0.009 – 0.490	2400 / F(KHz)	300m	10000 * 2400/F(KHz)	20log 2400/F(KHz) + 80
0.490 – 1.705	24000 / F(KHz)	30m	100 * 24000/F(KHz)	20log 24000/F(KHz) + 40
1.705 – 30.00	30	30m	100* 30	20log 30 + 40
30.0 – 88.0	100	3m	100	20log 100
88.0 – 216.0	150	3m	150	20log 150
216.0 – 960.0	200	3m	200	20log 200
Above 960.0	500	3m	500	20log 500

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.

6.3.1 E.U.T. Operation

Operating Environment:

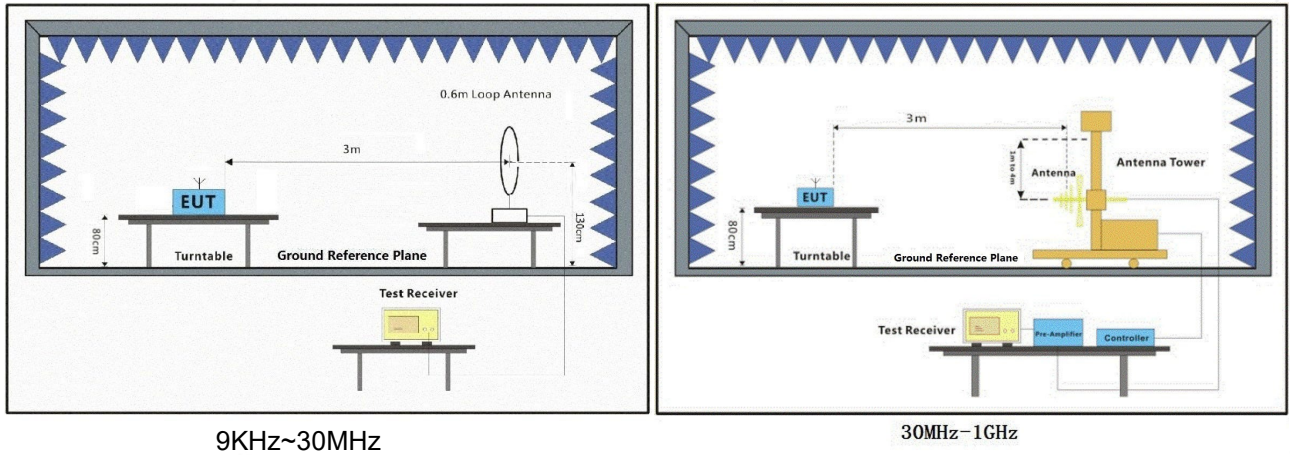
Temperature: 25.3 °C Humidity: 57.4 % RH Atmospheric Pressure: 1010 mbar

6.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Pre_scan	00	Idle mode: Keep the EUT standby
Pre_scan	01	Operation(Wireless): Keep the EUT pairing with other devices(Iphone:15W).
Pre_scan	02	Operation(Wireless): Keep the EUT pairing with other devices(Earbud:3W).
Final test	03	Operation(Wireless): Keep the EUT Full load



6.3.3 Test Setup Diagram



6.3.4 Measurement Procedure and Data

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can move up and down between 1 to 4 meters to find out the maximum emission level. Broadband antenna (calibrated by dipole antenna) are used as a receiving antenna. Both horizontal and vertical polarization of the antenna are set on measurement.



9 kHz ~ 30 MHz

Polarization: coaxial

Freq (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Gain (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detect or
0.0272	2.24	17.8	31.53	75.63	64.14	118.90	-54.77	QP
0.0323	2.32	17.8	32.43	78.10	65.79	117.42	-51.63	QP
0.1480	2.24	17.8	31.53	85.00	73.51	104.20	-30.69	QP
0.7081	2.46	17.8	31.67	45.95	34.54	70.60	-36.06	QP
1.2014	3.06	27.53	33.76	28.46	25.29	69.54	-44.26	QP
2.6059	3.11	29.26	33.52	27.72	26.57	69.54	-42.97	QP
7.6010	3.25	28.72	33.94	26.79	24.82	69.54	-44.72	QP

Polarization: coplaner

Freq (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Gain (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detect or
0.0277	2.24	17.8	31.53	76.16	64.67	118.76	-54.08	QP
0.0332	2.32	17.8	32.43	79.31	67.00	117.17	-50.18	QP
0.1490	2.24	17.8	31.53	83.00	71.51	104.14	-32.63	QP
0.7083	2.46	17.8	31.67	44.98	33.57	70.60	-37.03	QP
1.2025	3.06	27.53	33.76	28.27	25.10	69.54	-44.44	QP
2.6084	3.11	29.26	33.52	28.57	27.42	69.54	-42.12	QP
7.6072	3.25	28.72	33.94	25.08	23.11	69.54	-46.43	QP

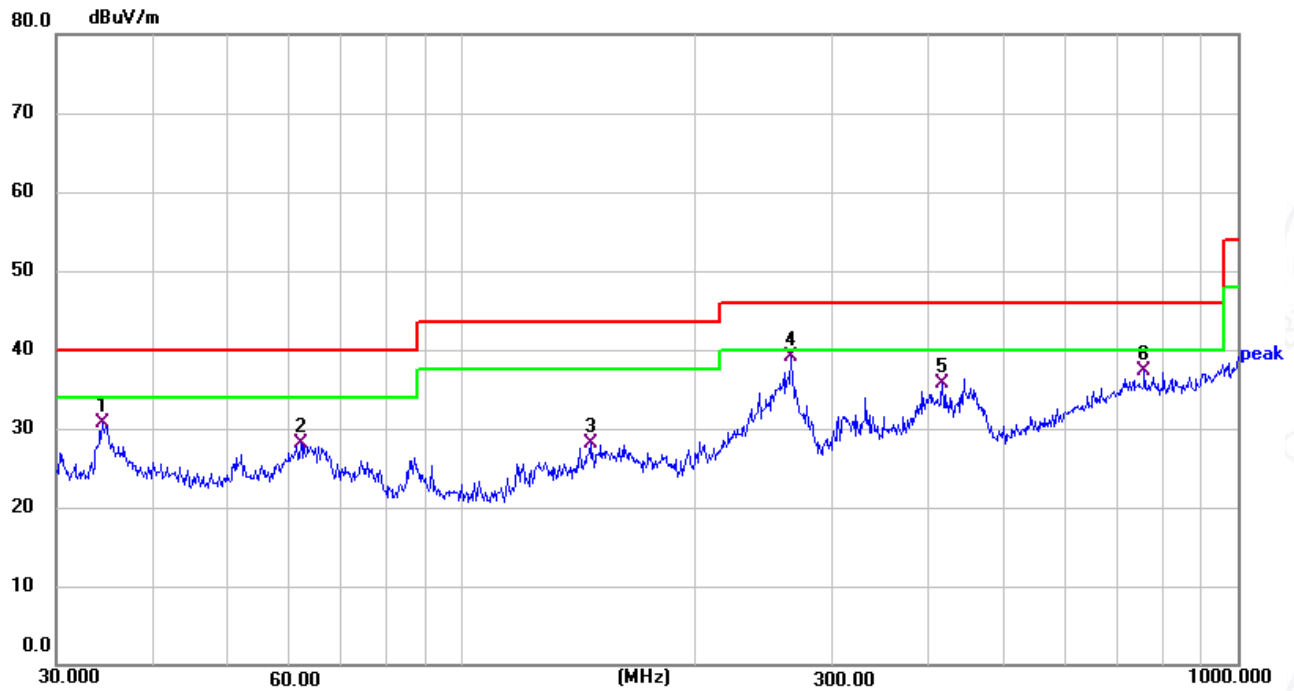
Note:

- 1). $Level(dBuV/m) = Reading(dBuV) + Factor(dB/m)$
- 2). $Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ loss(dB) - Pre\ Amplifier\ gain(dB)$
- 3). $Margin(dB) = Limit(dBuV/m) - Level(dBuV/m)$



30 MHz ~ 1GHz

Test Mode: 03; Polarity: Horizontal; Modulation:FSK



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	34.3964	48.41	-17.62	30.79	40.00	-9.21	QP	200	11	P	
2	61.9950	46.54	-18.36	28.18	40.00	-11.82	QP	100	99	P	
3	146.3734	45.19	-17.02	28.17	43.50	-15.33	QP	200	242	P	
4 *	265.6757	57.67	-18.66	39.01	46.00	-6.99	QP	100	173	P	
5	416.1791	50.55	-14.94	35.61	46.00	-10.39	QP	100	160	P	
6	758.0407	46.03	-8.75	37.28	46.00	-8.72	QP	200	11	P	

NOTE:

1.Level (dBuV/m) = Reading (dBuV) + Factor (dB/m)

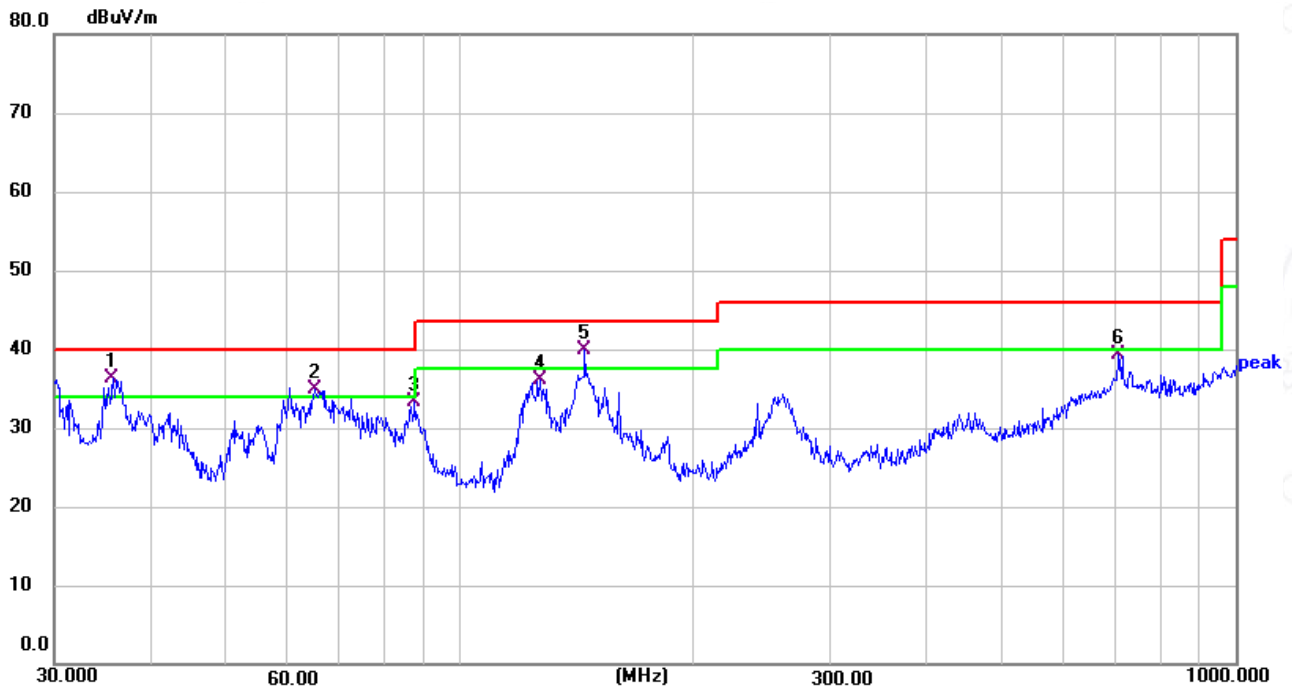
The reading level is calculated by software which is not shown in the sheet

2.Factor = Antenna Factor+ Cable Loss-Preamp Factor

3.Margin = Level – Limit.



Test Mode: 03; Polarity: Vertical; Modulation:FSK



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1 !	35.7490	53.78	-17.47	36.31	40.00	-3.69	QP	100	206	P	
2 !	65.1145	53.95	-19.07	34.88	40.00	-5.12	QP	100	201	P	
3	87.4177	55.42	-22.04	33.38	40.00	-6.62	QP	100	290	P	
4	126.7723	54.45	-18.35	36.10	43.50	-7.40	QP	100	11	P	
5 *	144.8418	56.99	-17.17	39.82	43.50	-3.68	QP	100	112	P	
6	706.6999	48.96	-9.60	39.36	46.00	-6.64	QP	100	306	P	

NOTE:

1.Level (dBuV/m) = Reading (dBuV) + Factor (dB/m)

The reading level is calculated by software which is not shown in the sheet

2.Factor = Antenna Factor+ Cable Loss-Preamp Factor

3.Margin = Level – Limit.



7 Test Setup Photo

Please refer to the Appendix test setup Photos.

8 EUT Constructional Details (EUT Photos)

Please refer to the Appendix EUT Photos.

- End of the Report -

