



MEASUREMENT REPORT

FCC PART 27F

Applicant: UnaliWear, Inc.
Address: 3410 Cherry Lane, Austin, TX 78703 USA

Application Type: Class II Permissive Change
Product: Unaliwear BG77
Model No.: BG77
FCC Rule Part(s): FCC CFR 47 Part 27F
Test Date: August 20, 2021

Reviewed By:

Jame Yuan

Jame Yuan

Approved By:

Robin Wu

Robin Wu



The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
2108RSU042-U2	Rev. 01	Initial Report	11-11-2021	Valid

Note: This module was used in portable host and the antenna type change from dipole antenna to FPC antenna, the antenna gain changed from 3.98dBi to -2dBi, so we only evaluated the radiated spurious emissions item.

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1.1. Applicant

3410 Cherry Lane, Austin, TX 78703 USA

UnaliWear, Inc.

3410 Cherry Lane, Austin, TX 78703 USA

☒	Test Site – MRT Suzhou Laboratory
	Laboratory Location (Suzhou - Wuzhong) D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
	Laboratory Location (Suzhou - SIP) 4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China
	Laboratory Accreditations
	A2LA: 3628.01 CNAS: L10551 FCC: CN1166 ISED: CN0001 VCCI: ☐R-20025 ☐G-20034 ☐C-20020 ☐T-20020 ☐R-20141 ☐G-20134 ☐C-20103 ☐T-20104
☐	Test Site – MRT Shenzhen Laboratory
	Laboratory Location (Shenzhen) 1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China
	Laboratory Accreditations
	A2LA: 3628.02 CNAS: L10551 FCC: CN1284 ISED: CN0105
☐	Test Site – MRT Taiwan Laboratory
	Laboratory Location (Taiwan) No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)
	Laboratory Accreditations
	TAF: L3261-190725 FCC: 291082, TW3261 ISED: TW3261

1.4. Product Information

Product Name	Unaliwear BG77
Model No.	BG77
EUT Type	Portable Device
Exposure Category	General Population/Uncontrolled Exposure
Note: The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.	

1.5. Radio Specification under Test

LTE Specification	LTE Band 13 Cat. M1
Frequency Range	777 ~ 787 MHz
Type of Modulation	QPSK, 16QAM
Antenna Type	FPC Antenna
Antenna Gain	-2.0dBi

1.6. Description of Host

Host Name	Kanega Watch
Model No.	KANEGA003
Company Name	UnaliWear, Inc.
Power Type	Battery (DC 3.8V)
Contained Modules	LTE module: Unaliwear BG77 FCC ID: 2AM4C-BG77
	BLE/Wi-Fi module: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module FCC ID: XF6-M4SB
Note: Only BLE and LTE CAT M1 can transmit simultaneously, which was declared by applicant.	

1.7. Test Mode

Mode 1: Transmit by CAT M1 Band 13 Frequency 782.0 MHz
Mode 2: Transmit by Bluetooth-LE (1Mbps) 2446 MHz and CAT M1 Band 13 Frequency 782.0 MHz
Mode 3: Transmit by Bluetooth-LE (2Mbps) 2446 MHz and CAT M1 Band 13 Frequency 782.0 MHz

1.8. Applied Standards

Test Procedure: ANSI C63.26-2015

1.9. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

2. TEST EQUIPMENT CALIBRATION DATE

Radiated Emission (WZ-AC1)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cal. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2022/01/04
PXA Signal Analyzer	Keysight	N9030B	MRTSUE06395	1 year	2022/08/08
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/08
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2022/08/05
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2021/09/27
Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06597	1 year	2021/12/14
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2021/11/14
Thermal Hygrometer	testo	608-H1	MRTSUE06403	1 year	2022/06/28
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	1 year	2022/04/29

Radiated Emission (WZ-AC2)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cal. Due Date
MXE EMI Receiver	Keysight	N9038A	MRTSUE06125	1 year	2022/06/24
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/08
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2022/05/24
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06171	1 year	2021/10/25
Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06597	1 year	2021/12/14
Broadband Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2021/11/14
Thermal Hygrometer	Minggao	ETH529	MRTSUE06170	1 year	2021/12/08
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2022/04/29

Radiated Emission (SIP-AC1)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cal. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06612	1 year	2022/06/24
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06559	1 year	2022/06/24
Loop Antenna	Schwarzbeck	FMZB 1519 B	MRTSUE06937	1 year	2022/03/09
Bilog Period Antenna	Schwarzbeck	VULB9168	MRTSUE06645	1 year	2021/08/30
Double Ridged Horn Antenna	R&S	HF907	MRTSUE06610	1 year	2021/08/30
Preamplifier	EMCI	EMC051845SE	MRTSUE06600	1 year	2021/11/09
Thermal Hygrometer	testo	608-H1	MRTSUE06620	1 year	2021/12/03
Anechoic Chamber	RIKEN	SIP-AC1	MRTSUE06554	1 year	2021/12/24

Radiated Emission (SIP-AC2)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06613	1 year	2022/06/24
MXA Signal Analyzer	Keysight	N9020B	MRTSUE06604	1 year	2021/09/26
Loop Antenna	Schwarzbeck	FMZB 1519 B	MRTSUE06937	1 year	2022/03/09
Bilog Period Antenna	Schwarzbeck	VULB9168	MRTSUE06646	1 year	2021/08/30
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06648	1 year	2021/11/26
Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06599	1 year	2021/11/26
Preamplifier	EMCI	EMC051845SE	MRTSUE06644	1 year	2021/11/09
Preamplifier	EMCI	EMC184045SE	MRTSUE06602	1 year	2021/10/12
Thermal Hygrometer	testo	608-H1	MRTSUE06624	1 year	2021/12/03
Anechoic Chamber	RIKEN	SIP-AC2	MRTSUE06781	1 year	2021/12/24

Radiated Emission (SIP-AC3)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2022/06/09
EMI Test Receiver	R&S	ESR3	MRTSUE06612	1 year	2022/06/24
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06559	1 year	2022/06/24
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/08
Bilog Period Antenna	Schwarzbeck	VULB9168	MRTSUE06646	1 year	2021/08/30
Double Ridged Horn Antenna	R&S	HF907	MRTSUE06611	1 year	2021/09/13
Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06598	1 year	2021/11/26
Preamplifier	EMCI	EMC012645SE	MRTSUE06642	1 year	2022/01/14
Thermal Hygrometer	testo	608-H1	MRTSUE06622	1 year	2021/12/03
Anechoic Chamber	RIKEN	SIP-AC3	MRTSUE06782	1 year	2021/12/24

Software	Version	Function
EMI Software	V3	EMI Test Software

3. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT 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 $k = 2$.

AC Conducted Emission Measurement - SR2	
Measurement Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$):	
9kHz~150kHz: 3.84dB	
150kHz~30MHz: 3.46dB	
Radiated Emission Measurement - AC1	
Measurement Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$):	
Horizontal:	30MHz~300MHz: 4.07dB
	300MHz~1GHz: 3.63dB
	1GHz~25GHz: 4.16dB
Vertical:	30MHz~300MHz: 4.18dB
	300MHz~1GHz: 3.60dB
	1GHz~25GHz: 4.76dB
Radiated Emission Measurement - AC2	
Measurement Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$):	
Horizontal:	30MHz~300MHz: 3.75dB
	300MHz~1GHz: 3.53dB
	1GHz~25GHz: 4.28dB
Vertical:	30MHz~300MHz: 3.86dB
	300MHz~1GHz: 3.53dB
	1GHz~25GHz: 4.33dB

4. TEST RESULT

4.1. Summary

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1053 27.53(c)(f)	Radiated Spurious Emission	Refer to section 5.2.1	Radiated	Pass	Section 5.2

Notes:

- 1) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
- 2) All modes of operation and data rates were investigated. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst case emissions.

4.2. Radiated Spurious Emission Measurement

4.2.1. Test Limit

FCC Part 27.53(c)(2):

(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB.

FCC Part 27.53(f):

For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.

4.2.2. Test Procedure Used

ANSI C63.26-2015 - Section 5.7

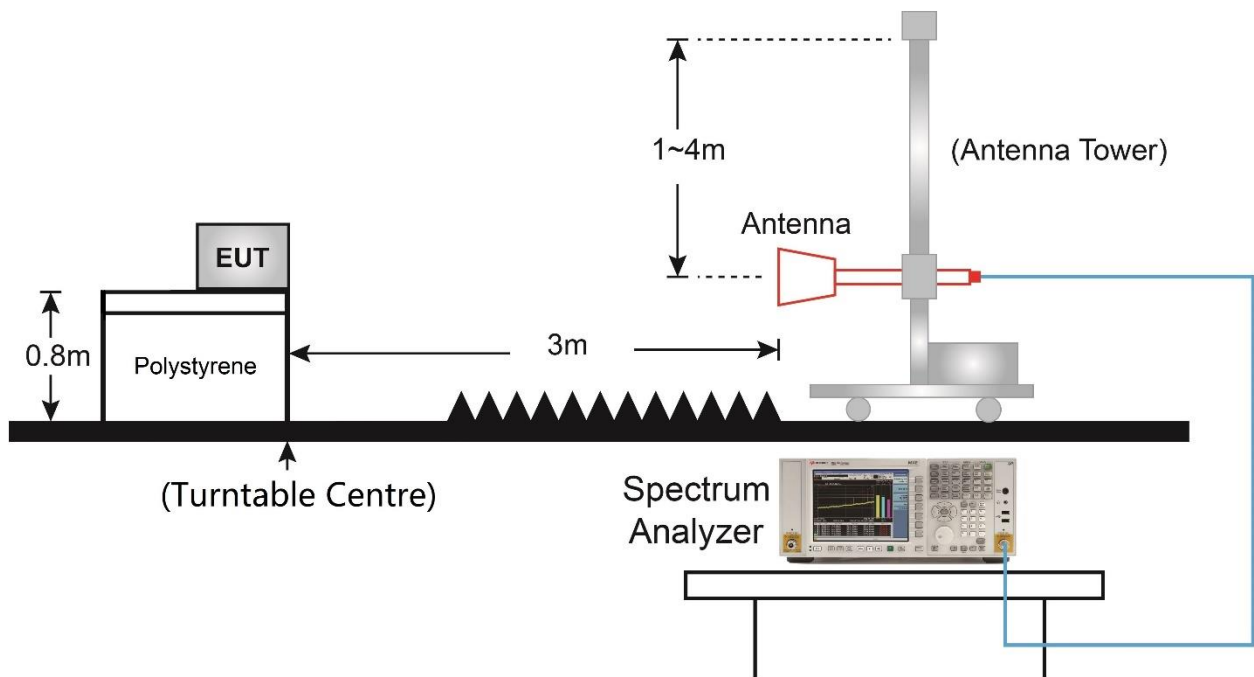
4.2.3. Test Setting

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 100kHz for below 1GHz or 1MHz for above 1GHz
3. VBW = 3 * RBW
4. Detector = power averaging (RMS)
5. Sweep time = Auto couple
6. Sweep point $\geq 2 * (\text{Span} / \text{RBW})$
7. Trace mode = Max hold

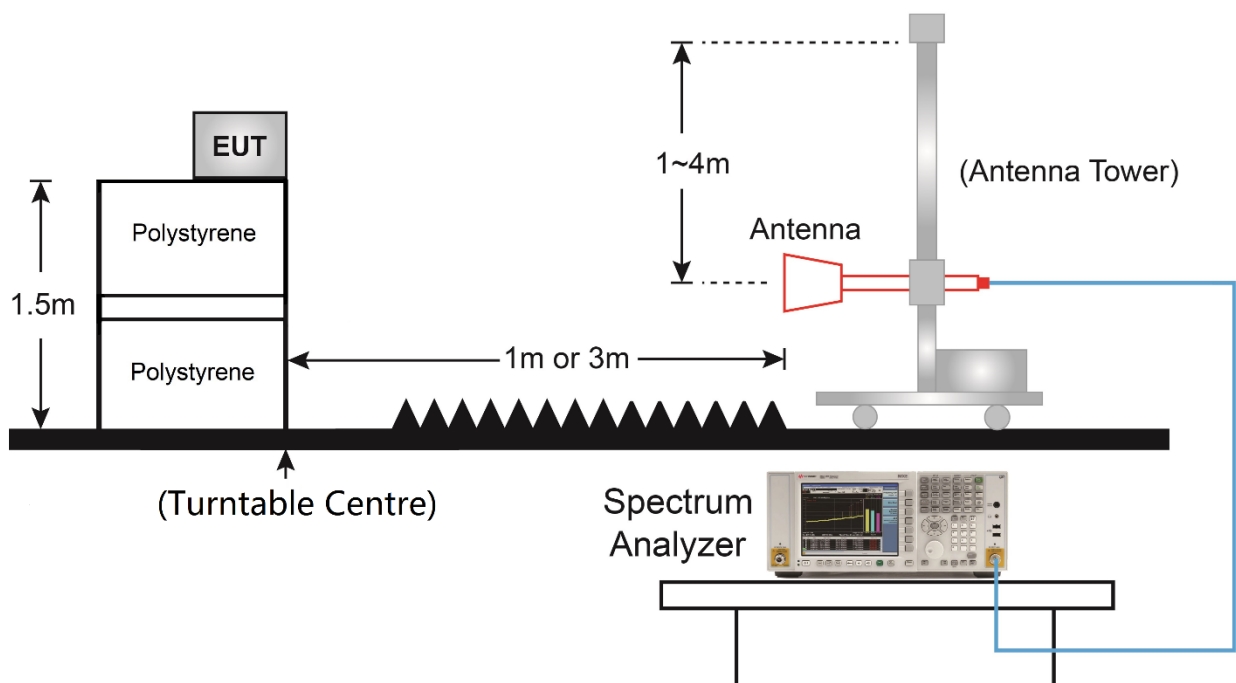
Trace was allowed to stabilize standard test method above 1GHz)

4.2.4. Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



4.2.5. Test Result

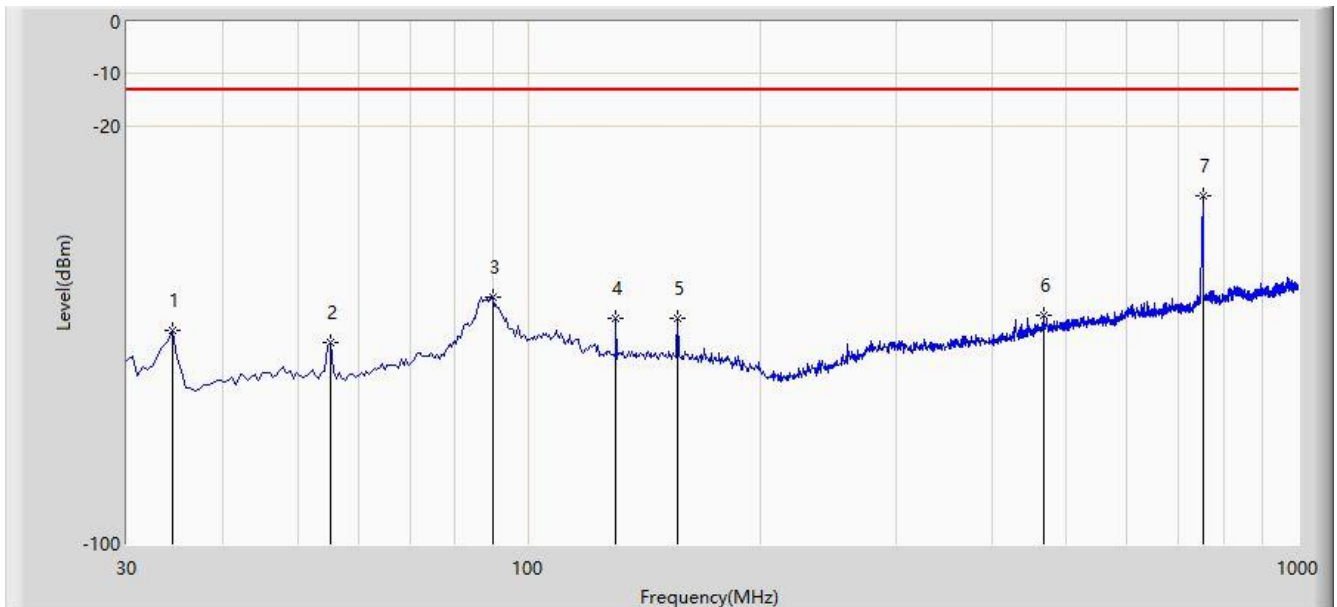
Product	Unaliwear BG77	Temperature	25°C
Test Engineer	Wayen Wang	Relative Humidity	54%
Test Site	SIP-AC2	Test Date	2021/08/20
Test Mode	Mode 1		
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not shown in the report.		

Frequency (MHz)	Reading Level (dBm)	Factor (dB)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Polarization
1559.4	-34.3	-6.5	-40.8	-40.0	-0.8	Average	Horizontal
1560.0	-30.2	-6.6	-36.8	-40.0	3.2	Peak	Horizontal
2340.5	-40.3	-2.7	-43.0	-13.0	-30.0	Peak	Horizontal
3117.5	-54.0	-1.0	-55.0	-13.0	-42.0	Peak	Horizontal
1560.0	-44.1	-6.4	-50.5	-40.0	-10.5	Peak	Vertical
2340.5	-45.7	-2.4	-48.1	-13.0	-35.1	Peak	Vertical
4843.0	-56.9	3.7	-53.2	-13.0	-40.2	Peak	Vertical

Note: Measure Level (dBm) = Reading Level (dBm) + Factor (dB)

The Worst Case of Radiated Emission below 1GHz:

Site: SIP-AC2	Time: 2021/08/20
Limit: FCC_27_LTE Band 13_Spurious_03M_PK	Engineer: Wayen Wang
Probe: SIP-AC2_RF_Substitution_25-1000MHz	Polarity: Vertical
EUT: Unaliwear BG77	Power: By battery
Note: Test mode 1	



No.	Flag	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Margin (dB)	Limit (dBm)	Factor (dB)	Type
1			34.365	-59.151	-81.314	-46.151	-13.000	22.163	PK
2			55.220	-61.343	-86.021	-48.343	-13.000	24.678	PK
3			89.655	-52.879	-91.220	-39.879	-13.000	38.341	PK
4			129.910	-56.924	-85.321	-43.924	-13.000	28.397	PK
5			156.100	-56.846	-85.265	-43.846	-13.000	28.419	PK
6			466.985	-56.236	-89.582	-43.236	-13.000	33.346	PK
7		*	753.135	-33.348	-71.760	-20.348	-13.000	38.412	PK

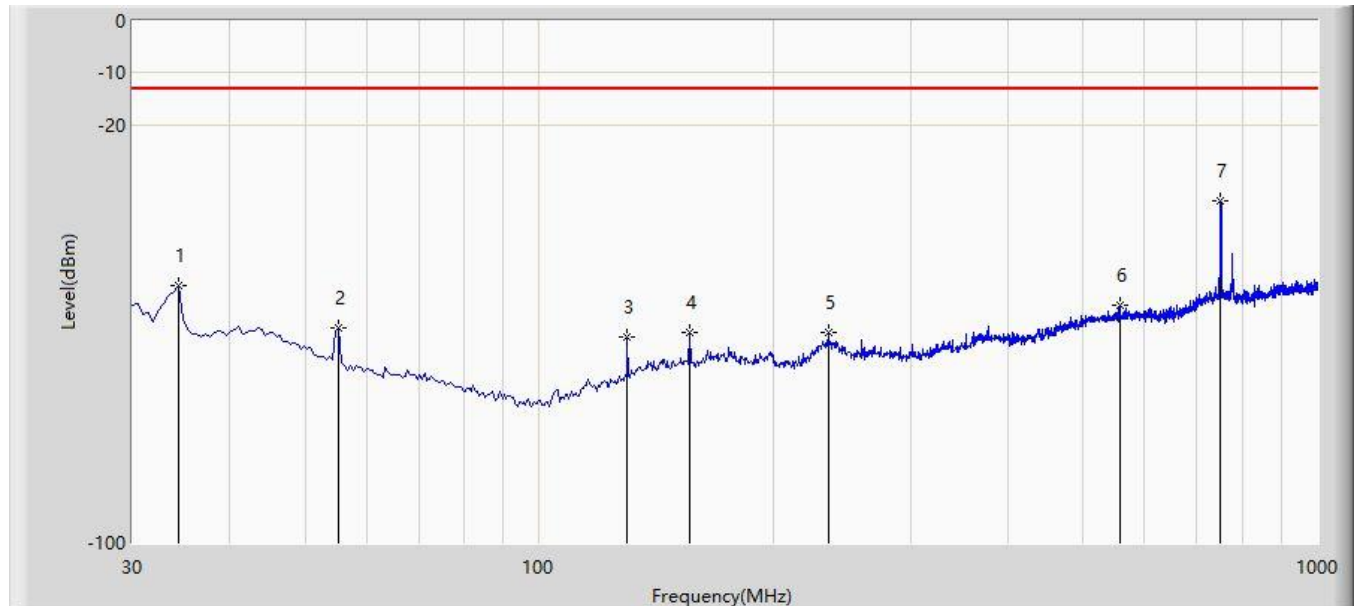
Note 1: Measure Level (dBm) = Reading Level (dBm) + Factor (dB)

Factor (dB) = Air Loss (dB) + Cable Loss (dB) - Antenna Gain (dB) - Amp Gain (dB)

Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz), therefore no data appeared in the report.

Note 3: “*” During the radiated emission testing, there was one fundamental frequency (Point 7) shown on the trace. The radiated emission requirements are not intended to be applicable to the intentional transmissions from a radio transmitter as defined by the ITU, nor to any spurious emissions related to these intentional transmissions.

Site: SIP-AC2	Time: 2021/08/20
Limit: FCC_27_LTE Band 13_Spurious_03M_PK	Engineer: Wayen Wang
Probe: SIP-AC2_RF_Substitution_25-1000MHz	Polarity: Horizontal
EUT: Unaliwear BG77	Power: By battery
Note: Test mode 1	



No.	Flag	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Margin (dB)	Limit (dBm)	Factor (dB)	Type
1			34.365	-50.720	-82.805	-37.720	-13.000	32.085	PK
2			55.220	-58.911	-85.876	-45.911	-13.000	26.965	PK
3			129.910	-60.544	-84.808	-47.544	-13.000	24.264	PK
4			156.100	-59.600	-86.361	-46.600	-13.000	26.761	PK
5			235.155	-59.709	-90.306	-46.709	-13.000	30.597	PK
6			556.710	-54.436	-90.062	-41.436	-13.000	35.626	PK

Note 1: Measure Level (dBm) = Reading Level (dBm) + Factor (dB)

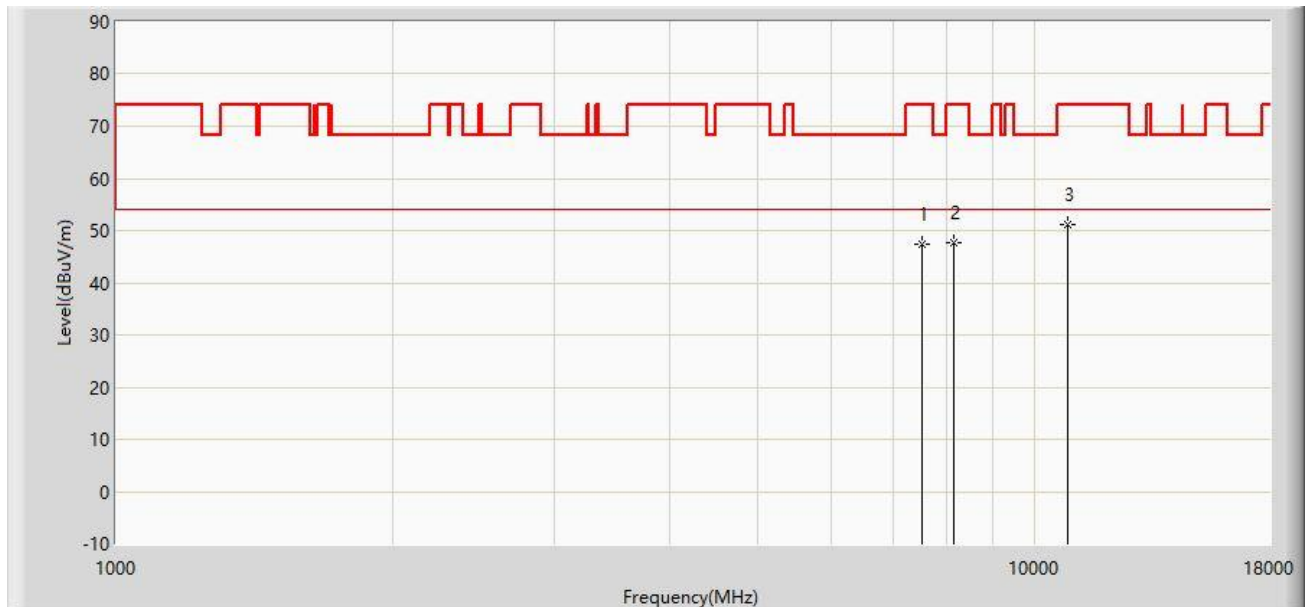
Factor (dB) = Air Loss (dB) + Cable Loss (dB) - Antenna Gain (dB) - Amp Gain (dB)

Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz), therefore no data appeared in the report.

Note 3: “*” During the radiated emission testing, there was one fundamental frequency (Point 7) shown on the trace. The radiated emission requirements are not intended to be applicable to the intentional transmissions from a radio transmitter as defined by the ITU, nor to any spurious emissions related to these intentional transmissions.

Test Result of Radiated Emissions for Co-located

Site: SIP-AC2	Time: 2021/08/20
Limit: FCC_Part15.209_RE(3m)	Engineer: Wayen Wang
Probe: SIP-AC2_BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: UNALIWEAR BG77	Power: By battery
Note: Test mode 2	



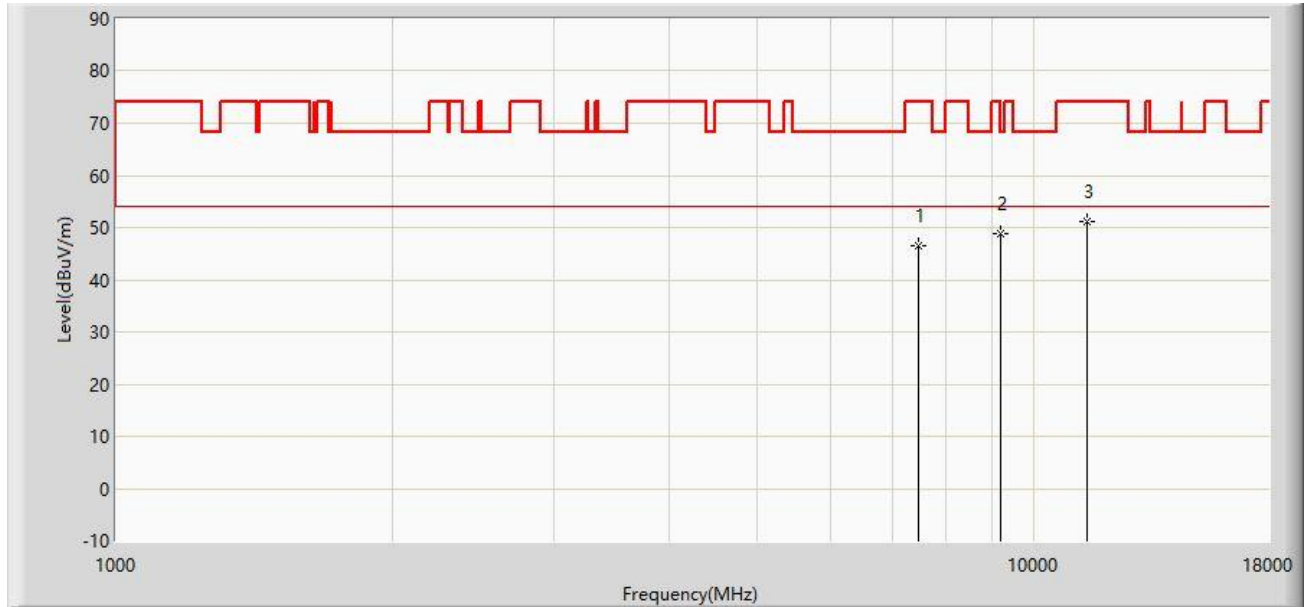
No.	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB/m)	Type
1			7545.000	47.332	48.616	-26.668	74.000	-1.284	PK
2			8148.500	47.666	47.584	-26.334	74.000	0.082	PK
3		*	10868.500	51.043	46.200	-22.957	74.000	4.843	PK

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB/m)

Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB).

Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 18GHz ~ 25GHz), therefore no data appeared in the report.

Site: SIP-AC2	Time: 2021/08/20
Limit: FCC_Part15.209_RE(3m)	Engineer: Wayen Wang
Probe: SIP-AC2_BBHA9120D_1-18GHz	Polarity: Vertical
EUT: UNALIWEAR BG77	Power: By battery
Note: Test mode 2	



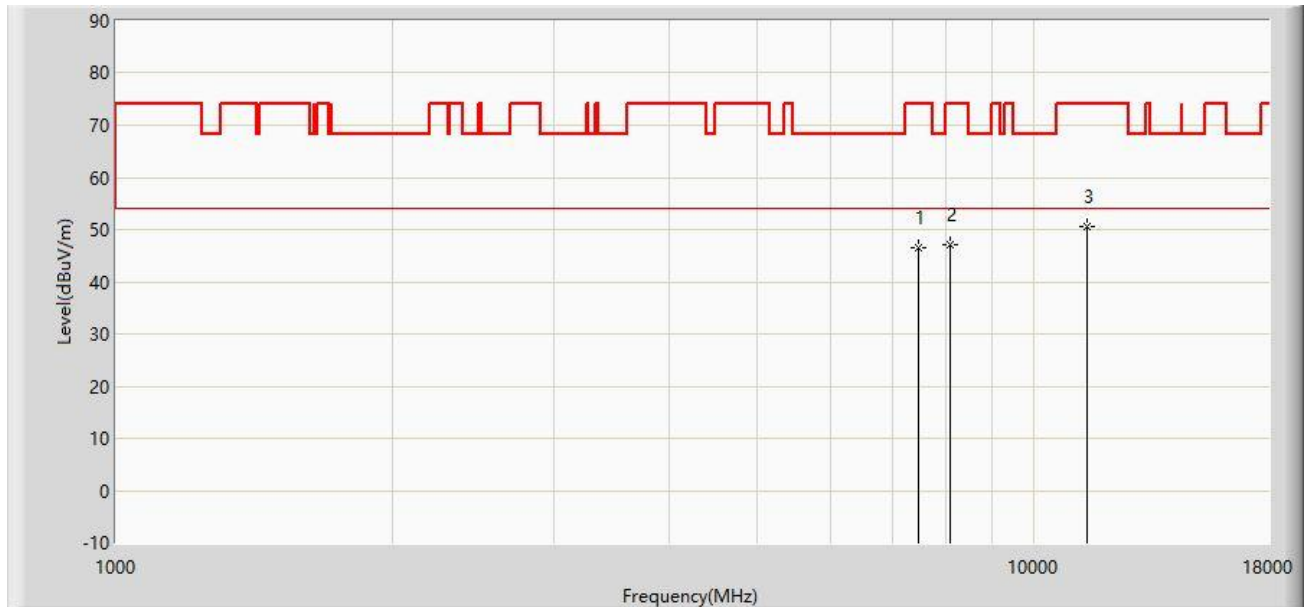
No.	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB/m)	Type
1			7477.000	46.383	47.401	-27.617	74.000	-1.018	PK
2			9177.000	48.919	47.442	-25.081	74.000	1.477	PK
3		*	11421.000	51.277	45.719	-22.723	74.000	5.558	PK

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB/m)

Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB).

Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 18GHz ~ 25GHz), therefore no data appeared in the report.

Site: SIP-AC2	Time: 2021/08/20
Limit: FCC_Part15.209_RE(3m)	Engineer: Wayen Wang
Probe: SIP-AC2_BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: UNALIWEAR BG77	Power: By battery
Note: Test mode 3	



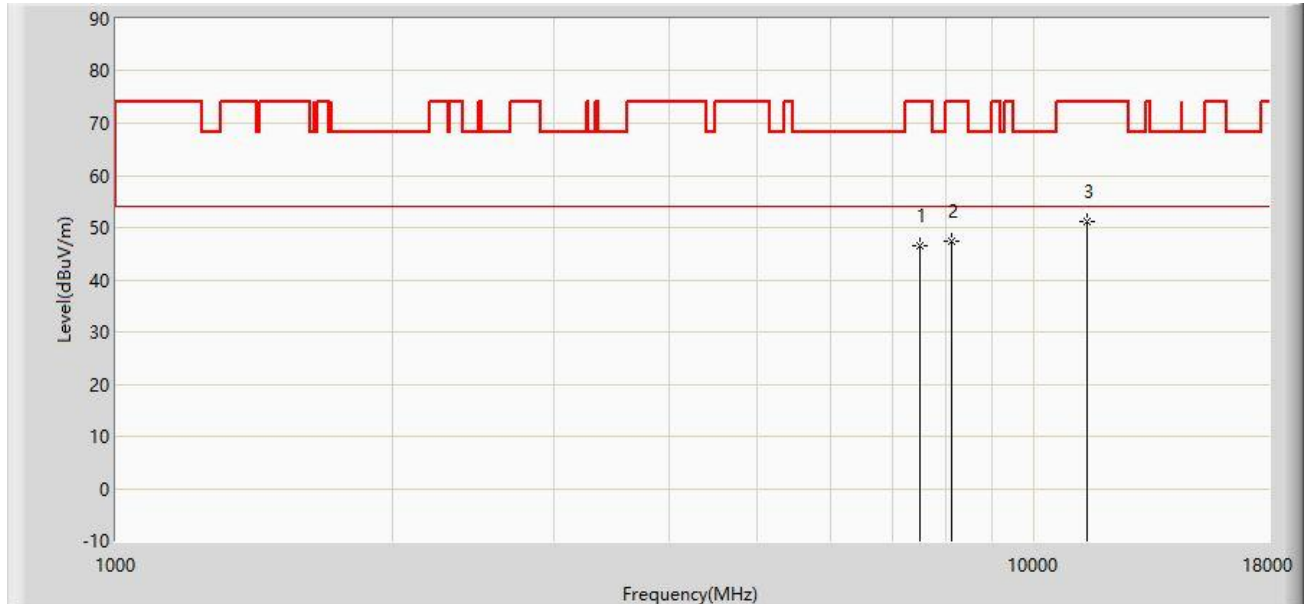
No.	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB/m)	Type
1			7477.000	46.478	47.496	-27.522	74.000	-1.018	PK
2			8097.500	47.072	46.859	-26.928	74.000	0.212	PK
3		*	11438.000	50.439	44.973	-23.561	74.000	5.466	PK

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB/m)

Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB).

Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 18GHz ~ 25GHz), therefore no data appeared in the report.

Site: SIP-AC2	Time: 2021/08/20
Limit: FCC_Part15.209_RE(3m)	Engineer: Wayen Wang
Probe: SIP-AC2_BBHA9120D_1-18GHz	Polarity: Vertical
EUT: UNALIWEAR BG77	Power: By battery
Note: Test mode 3	



No.	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB/m)	Type
1			7519.500	46.401	47.645	-27.599	74.000	-1.245	PK
2			8140.000	47.349	47.302	-26.651	74.000	0.047	PK
3		*	11421.000	51.028	45.470	-22.972	74.000	5.558	PK

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB/m)

Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB).

Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 18GHz ~ 25GHz), therefore no data appeared in the report.

5. CONCLUSION

The data collected relate only the item(s) tested and show that the device is in compliance with Part 15C of the FCC rules.

_____ The End _____

Appendix A - Test Setup Photograph

Refer to “2108RSU042-UT” file.

Appendix B - EUT Photograph

Refer to "2108RSU042-UE" file.