



FCC Part 15.249

TEST REPORT

For

ALATECH Technology Limited

39F., No. 758, Jungming S. RD. Taichung, Taiwan

FCC ID: YQOWB002

Report Type	Original Report
Product Type:	Star2 GPS Watch
Report Number :	RLK190624002-00C
Report Date :	2019/08/08
Reviewed By:	Flight Hsieh <i>Flight Hsieh</i>
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Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Taiwan)

Revision History


Revision	Report Number	Issue Date	Description
1.0	RLK190624002-00C	2019/08/08	Original Report

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1 General Information

1.1 Product Description for Equipment under Test (EUT)

Applicant	ALATECH Technology Limited 39F., No. 758, Jungming S. RD. Taichung, Taiwan
Manufacturer	Zhejiang ALA Fitness Technology LTD. No.405 Tongxin Road, Tongxiang Economic Development Zone, Zhejiang, China
Brand(Trade) Name	
Product (Equipment)	Star2 GPS Watch
Model Name	WB002
EUT Function	ANT+
Frequency Range	2457 MHz
Number of Channels	1 Channel
Filed Strength	84.36 dBuV/m
Received Date	Jun. 24, 2019
Date of Test	Jul. 08, 2019 ~ Jul. 16, 2019
Modulation Type	GFSK

*All measurement and test data in this report was gathered from production sample serial number: 190624002 (Assigned by BACL, Taiwan).

1.2 Operation Condition of EUT

Power Operation (Voltage Range)	<input checked="" type="checkbox"/> AC 120 V/60 Hz <input checked="" type="checkbox"/> Adapter (Not for Sale) via USB with Dock. <input type="checkbox"/> By Power Cord.
	<input type="checkbox"/> DC Type <input type="checkbox"/> DC Power Supply <input checked="" type="checkbox"/> Battery: lithium battery PL502023 3.7Vdc 230 mAH <input checked="" type="checkbox"/> External from USB Cable 5Vdc <input type="checkbox"/> External DC Adapter
	<input type="checkbox"/> Host System

1.3 Objective and Test Methodology

The Objective of this Test Report was to document the compliance of the ALATECH Technology Limited Appliance (Model: WB002) to the requirements of the following Standards:

- Part 2, Subpart J, Part 15, Subparts A and C, section 15.249 of the Federal Communication Commission's rules.
- ANSI C63.10-2013 of the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

1.4 Measurement Uncertainty

Parameter	Expanded Measurement uncertainty
RF output power with Power Meter	± 0.55 dB
Occupied Channel Bandwidth	± 4.45 %
RF Conducted test with Spectrum	± 1.45 dB
AC Power Line Conducted Emission	± 2.66 dB
Radiated Below 1G	± 3.57 dB
Radiated Above 1G-18G	± 4.29 dB
Radiated Above 18G-40G	± 4.67 dB

1.5 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Linkou) to collect test data is located on

☒ No.6, Wende 2Rd., Guishan Dist., Taoyuan City 33382, Taiwan (R.O.C.).

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database. The FCC Registration No.: 0027578244. Designation No.: TW3546. The Test Firm Registration No.: 181430.

2 System Test Configuration

2.1 Test Channels and Description of Worst Test Configuration

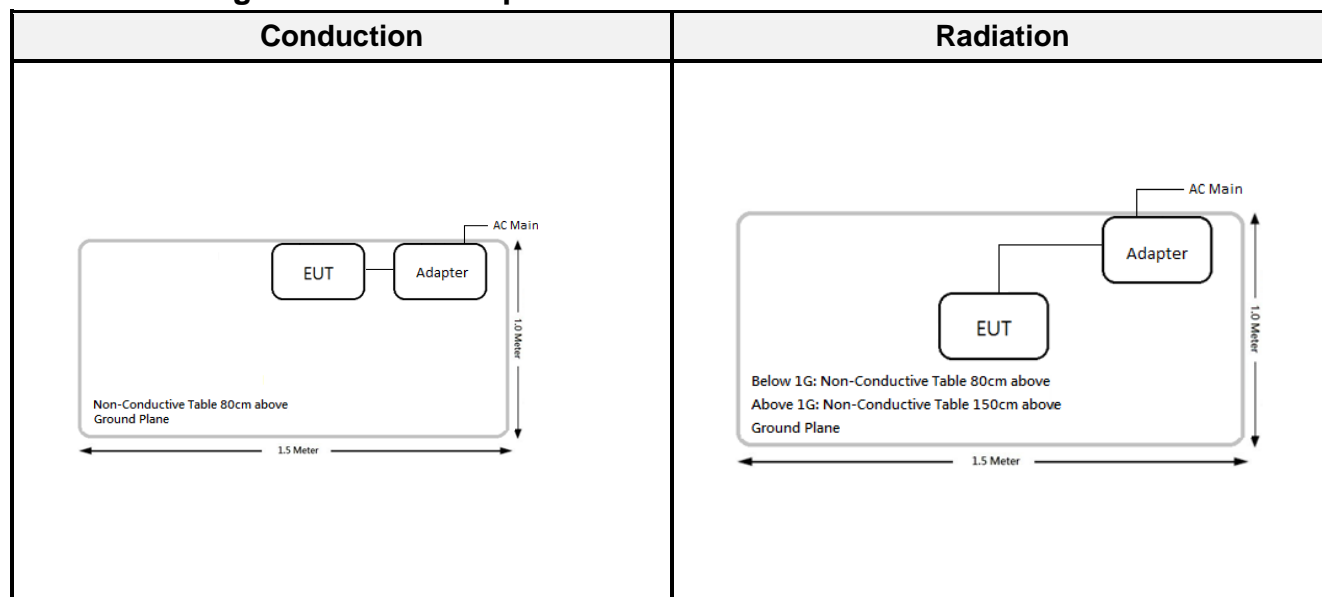
The system was configured for testing in testing mode which was provided by manufacturer.

No special accessory, No modification was made to the EUT and No special equipment used during test.

2.2 Support Equipment List and External Cable List

No.	Description	Manufacturer	Model Number	BSMI	FCC ID / DoC
A	Adapter	DVE	DSA-5PFU1-05	NA	DoC
B	Adapter	Apple	A1385	N/A	DoC

2.3 Block Diagram of Test Setup



3 Summary of Test Results

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.249	Spurious Emissions	Compliance
§15.215(c)	20 dB Emission Bandwidth	Compliance

4 FCC §15.203 - Antenna Requirements

4.1 Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna does not exceed 6dBi

4.2 Antenna List and Details

Manufacturer	Model	Antenna Type	Antenna Gain	Result
ALATECH	BT-ANT	FPCB Antenna	-2.19	Compliance

The EUT has an internal antenna arrangement, which was permanently attached, fulfill the requirement of this section.

5 FCC §15.207 - AC Line Conducted Emissions

5.1 Applicable Standard

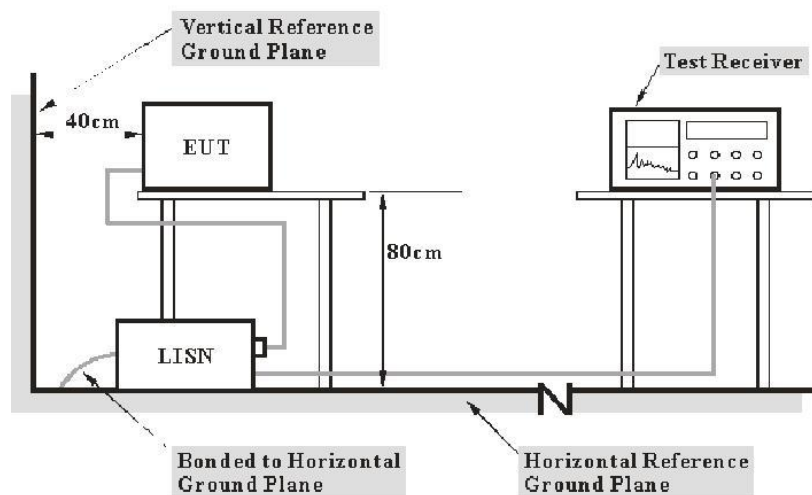
According to FCC §15.207

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Channel	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56 ^{Note 1}	56 to 46 ^{Note 2}
0.5-5	56	46
5-30	60	50

Note 1: Decreases with the logarithm of the frequency. Note 2: A linear average detector is required

5.2 EUT Setup and Test Procedure



- Note: 1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30MHz. During the conducted emission test, the EMI test receiver was set with the following configurations

Frequency Range	Receiver RBW
150 kHz - 30 MHz	9 kHz

During the conducted emission test, the adapter was connected to the outlet of the LISN. Maximizing procedure was performed on the six (6) highest emissions of the EUT. All data was recorded in the Quasi-peak and average detection mode.

5.3 Test Equipment List and Details

Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
Conduction Room					
LISN	Rohde & Schwarz	ENV216	101612	2019/02/21	2020/02/20
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2018/10/23	2019/10/22
Pulse Limiter	Rohde & Schwarz	ESH3Z2	TXZEM104	2018/08/03	2019/08/02
RF Cable	EMEC	EM-CB5D	001	2019/07/01	2020/06/30
Software	AUDIX	e3	V9.150826k	N.C.R	N.C.R

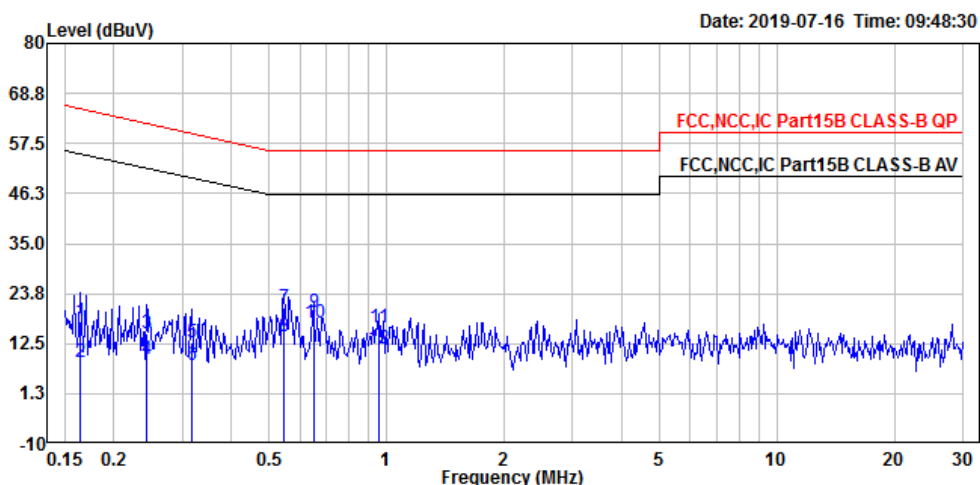
***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).

5.4 Test Environmental Conditions

Temperature:	20 °C	Relative Humidity:	50 %
ATM Pressure:	1010hPa	Test Engineer:	Ray Huang
Test Date:	2019-07-16		

5.5 AC Line Conducted Emission Test Plot and Data

Mode: AC 120 V/60 Hz, ANT+ mode, Line



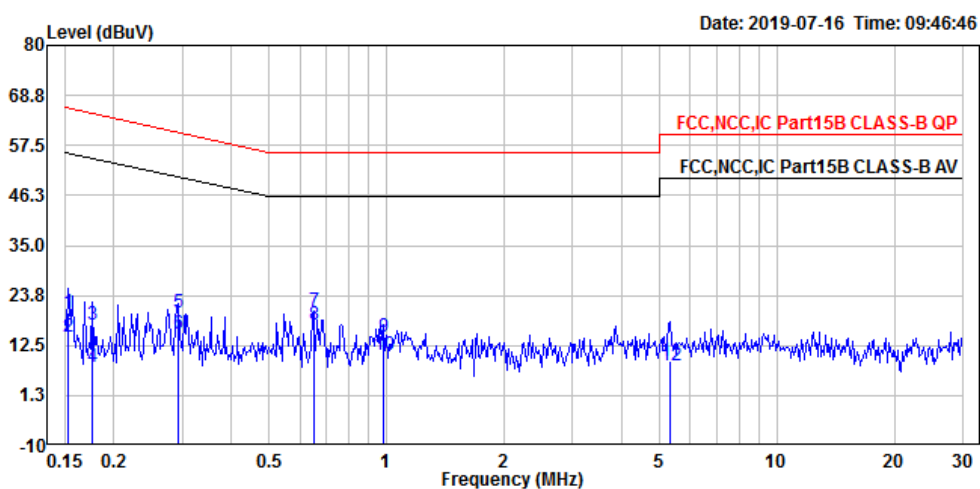
	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	
1	0.164	-2.53	17.34	19.87	65.27	-47.93	QP
2	0.164	-11.65	8.22	19.87	55.27	-47.05	Average
3	0.242	-5.03	14.83	19.86	62.03	-47.20	QP
4	0.242	-10.96	8.90	19.86	52.03	-43.13	Average
5	0.317	-7.26	12.61	19.87	59.78	-47.17	QP
6	0.317	-12.29	7.58	19.87	49.78	-42.20	Average
7	0.545	0.74	20.62	19.88	56.00	-35.38	QP
8	0.545	-5.81	14.07	19.88	46.00	-31.93	Average
9	0.650	-0.24	19.65	19.89	56.00	-36.35	QP
10	0.650	-2.88	17.01	19.89	46.00	-28.99	Average
11	0.952	-3.90	16.00	19.90	56.00	-40.00	QP
12	0.952	-8.38	11.52	19.90	46.00	-34.48	Average

Note:

$Level = Read\ Level + Factor$

$Over\ Limit\ (Margin) = Level - Limit\ Line$

$Factor = (LISN, ISN, PLC\ or\ current\ probe)\ Factor + Cable\ Loss + Attenuator$

Mode: AC 120 V/60 Hz, ANT+ mode, Neutral

	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	
1	0.152	0.15	20.02	19.87	65.87	-45.85	QP
2	0.152	-5.26	14.61	19.87	55.87	-41.26	Average
3	0.176	-2.53	17.33	19.86	64.68	-47.35	QP
4	0.176	-12.06	7.80	19.86	54.68	-46.88	Average
5	0.293	0.14	20.00	19.86	60.44	-40.44	QP
6	0.293	-4.78	15.08	19.86	50.44	-35.36	Average
7	0.650	0.19	20.08	19.89	56.00	-35.92	QP
8	0.650	-2.81	17.08	19.89	46.00	-28.92	Average
9	0.983	-5.32	14.58	19.90	56.00	-41.42	QP
10	0.983	-9.52	10.38	19.90	46.00	-35.62	Average
11	5.324	-10.84	9.19	20.03	60.00	-50.81	QP
12	5.324	-12.15	7.88	20.03	50.00	-42.12	Average

Note:

$Level = Read\ Level + Factor$

$Over\ Limit\ (Margin) = Level - Limit\ Line$

$Factor = (LISN, ISN, PLC\ or\ current\ probe)\ Factor + Cable\ Loss + Attenuator$

6 FCC §15.209, §15.205, §15.249 – Spurious Emissions

6.1 Applicable Standard

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1MHz.

As Per FCC §15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	13.36-13.41	399.9-410	4.5-5.15
0.495-0.505	16.42-16.423	608-614	5.35-5.46
2.1735-2.1905	16.69475-16.69525	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6

As per FCC §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:

Frequency (MHz)	Field Strength (micro volts/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

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

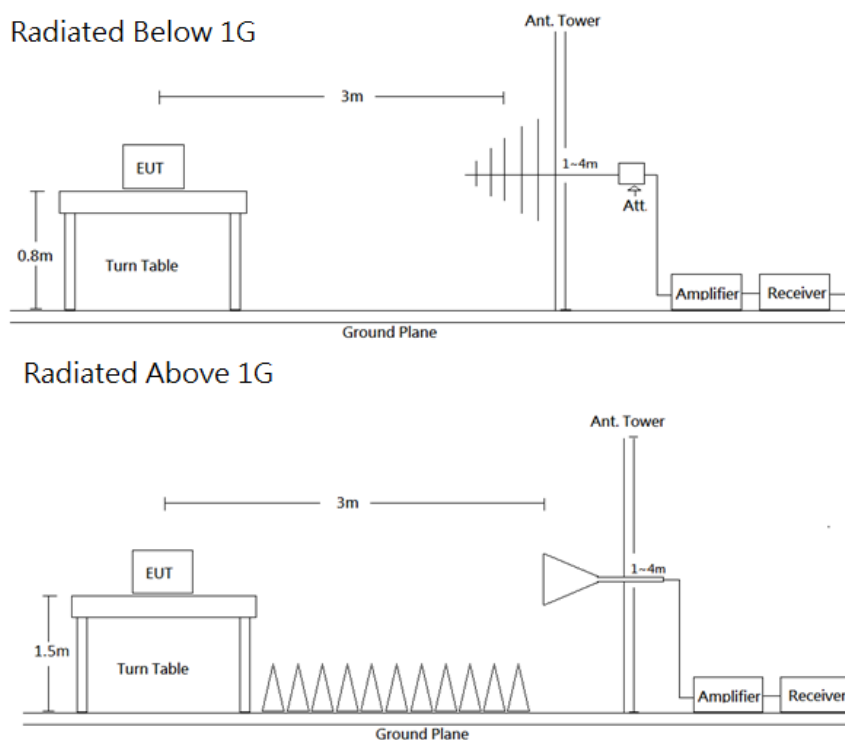
As per FCC§15.249 (a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (millivolts/meter)
920-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

As per FCC§15.249 (c), Field strength limits are specified at a distance of 3 meters.

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

6.2 EUT Setup and Test Procedure



Radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC Part 15.209 and FCC 15.249 Limits.

The system was investigated from 30 MHz to 26.5 GHz. During the radiated emission test, the EMI test receiver was set with the following configurations measurement method 6.3 in ANSI C63.10.

Frequency Range	RBW	VBW	Detector	Duty cycle	Measurement method
30-1000 MHz	120 kHz	/	QP	-	QP
Above 1 GHz	1 MHz	3 MHz	PK	-	PK
	1 MHz	3 MHz	RMS	>98 %	Ave
	1 MHz	1/T	PK	<98 %	Ave

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations. All data was recorded in the Quasi-peak detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

6.3 Test Equipment List and Details

Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
966A Room					
Bilog Antenna with 6 dB Attenuator	SUNOL SCIENCES & MINI-CIRCUITS	JB6/UNAT-6+	A050115/15542_01	2018/12/11	2019/12/10
Horn Antenna	ETS-Lindgren	3115	00040736	2019/03/22	2020/03/21
Horn Antenna	ETS-Lindgren	3116	62638	2018/08/29	2019/08/28
Preamplifier	Sonoma	310N	130601	2018/09/20	2019/09/19
Preamplifier	EM Electronics Corp.	EM01G18G	060657	2018/12/07	2019/12/06
Microwave Preamplifier	EM Electronics Corporation	EM18G40G	060656	2019/01/11	2020/01/10
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2018/10/23	2019/10/22
Signal Analyzer	Rohde & Schwarz	FSV40	101435	2019/02/14	2020/02/13
Micro flex Cable	UTIFLEX	FSCM 64639 / (2M)	93D0127	2018/07/31	2019/07/30
Micro flex Cable	UTIFLEX	UFA210A-1-3149-300300	MFR64639 226389-001	2018/11/16	2019/11/15
Micro flex Cable	ROSNOL	K1K50-UP0264-K1K50-450CM	160309-1	2019/03/04	2020/03/03
Micro flex Cable	ROSNOL	K1K50-UP0264-K1K50-80CM	160309-2	2019/01/16	2020/01/15
Turn Table	Champro	TT-2000	060772-T	N.C.R	N.C.R
Antenna Tower	Champro	AM-BS-4500-B	060772-A	N.C.R	N.C.R
Controller	Champro	EM1000	60772	N.C.R	N.C.R
Software	AUDIX	e3	E3LK-01	N.C.R	N.C.R

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).

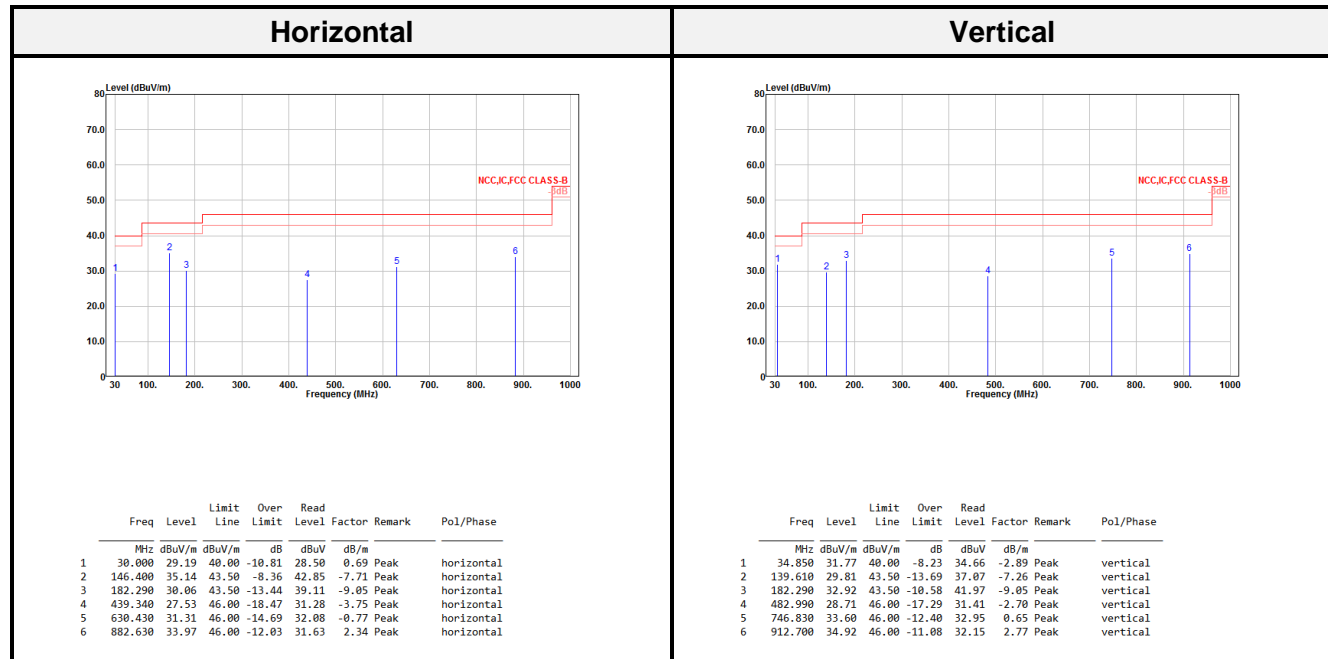
6.4 Test Environmental Conditions

Temperature:	20 °C	Relative Humidity:	50 %
ATM Pressure:	1014 hPa	Test Engineer:	Leo Chang
Test Date:	2019-07-12	-	-

6.5 Radiated Emission Test Plot and Data

Transmitting mode (Pre-scan with three orthogonal axis, and worse case as Z axis)

Below 1G (30 MHz-1 GHz)



Band Edge:

Horizontal							Vertical						
Freq	Level	Limit	Over	Read			Freq	Level	Limit	Over	Read		
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2355.360	32.92	54.00	-21.08	45.61	-12.69	Average	2340.960	32.51	54.00	-21.49	45.24	-12.73	Average
2355.360	45.78	74.00	-28.22	58.47	-12.69	Peak	2340.960	45.80	74.00	-28.20	58.53	-12.73	Peak
2456.880	75.06	94.00	-18.94	87.30	-12.24	Average	2457.360	79.99	94.00	-14.01	92.23	-12.24	Average
2456.880	79.19	114.00	-34.81	91.43	-12.24	Peak	2457.360	84.36	114.00	-29.64	96.60	-12.24	Peak
2496.720	32.66	54.00	-21.34	44.95	-12.29	Average	2489.280	33.07	54.00	-20.93	45.35	-12.28	Average
2496.720	45.65	74.00	-28.35	57.94	-12.29	Peak	2489.280	45.68	74.00	-28.32	57.96	-12.28	Peak

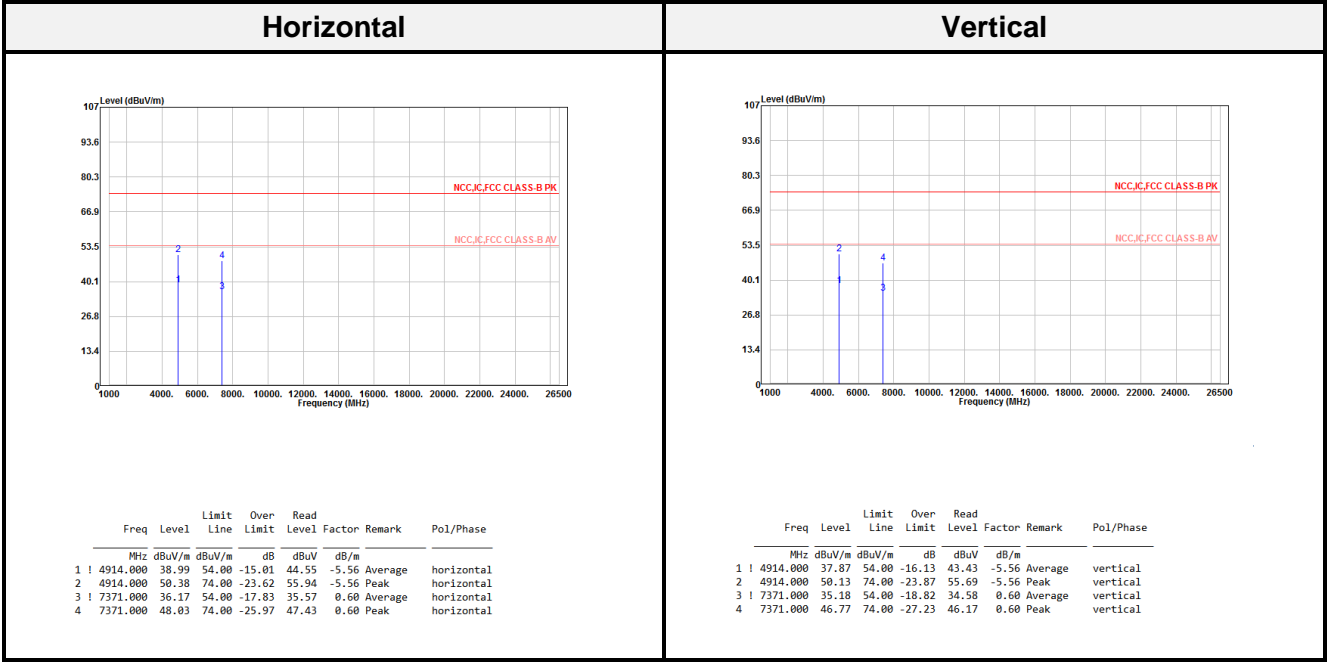
Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Spurious emissions more than 20 dB below the limit were not reported

Above 1G (1 GHz-26.5 GHz)



Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Spurious emissions more than 20 dB below the limit were not reported

7 FCC §15.215(c) – 20 dB Emission Bandwidth

7.1 Applicable Standard

According to FCC §15.215(c),

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

7.2 Test Procedure

According to ANSI C63.10-2013, the steps for the first option are as follows:

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete..

7.3 Test Equipment List and Details

Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
Conducted Room					
Signal Analyzer	Rohde & Schwarz	FSV40	101435	2019/02/14	2020/02/13
Cable	WOKEN	SFL402	S02-160323-07	2019/02/11	2020/02/10

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).

7.4 Test Environmental Conditions

Temperature:	29~30 °C	Relative Humidity:	54~55 %
ATM Pressure:	1015 hPa	Test Engineer:	Ian Tu
Conducted Test Date:	2019-07-08	-	-

7.5 Test Results

Frequency (MHz)	Result
2457	1.2200

20 dB Bandwidth	-
<div><p>Spectrum</p><p>Ref Level 20.00 dBm Offset 11.00 dB RBW 100 kHz Att 30 dB SWF 500 ms VBW 300 kHz Mode Auto Sweep</p><p>IPk View</p><p>D1[1] -0.33 dB 1.22000 MHz Occ Bw 1.089725036 MHz M1[1] -21.89 dBm 2.45634880 GHz</p><p>D1 -1.830 dBm D2 -21.830 dBm</p><p>F1 F2</p><p>CF 2.457 GHz 691 pts Span 3.0 MHz</p><p>Measuring... 08/07/2019 17:47:39</p><p>Date: 8.JUL.2019 17:47:39</p></div>	-

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