TESTING LABORATORY
CERTIFICATE#4323.01

FCC PART 15.249

TEST REPORT

For

Qingdao Magene Intelligence Technology Co., Ltd.

HaoQiGongChang No. 512, Xuzhou Road No. 79, Shinan District, Qingdao, Shandong, China

FCC ID: 2ALZG-C406

Report Type:	**Product Type:**
Original Report	Smart GPS Bike Computer

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Report Number:	RKSA201028001-00C
Report Date:	2020-11-25
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	Qingdao Magene Intelligence Technology Co., Ltd.
Tested Model	C406
Product Type	Smart GPS Bike Computer
Power Supply	DC 3.7V from battery, DC 5V from USB port
RF Function	ANT+
Operating Band/Frequency	2457 MHz
Channel Number	1
Modulation Type	GFSK
Antenna Type	PCB antenna
*Antenna Gain	-2 dBi

Note: The Maximum Antenna Gain was provided by manufacturer.*

All measurement and test data in this report was gathered from production sample serial number: 20201028001. (Assigned by the BACL. The EUT supplied by the applicant was received on 2020-10-28)

Objective

This type approval report is prepared on behalf of *Qingdao Magene Intelligence Technology Co., Ltd.* in accordance with Part 2-Subpart J, and Part 15-Subparts A and C of the Federal Communications Commission rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

FCC Part15.247 DTS submissions with FCC ID: 2ALZG-C406

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Lab Corp. (Kunshan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Item		Uncertainty
AC Power Lines Conducted Emissions		3.19 dB
RF conducted test with spectrum		0.9dB
RF Output Power with Power meter		0.5dB
Radiated emission	30MHz~1GHz	6.11dB
	1GHz~6GHz	4.45dB
	6GHz~18GHz	5.23dB
	18GHz~40GHz	5.65dB
Occupied Bandwidth		0.5kHz
Temperature		1.0℃
Humidity		6%

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and the FCC designation No. CN1185 under the FCC KDB 558074 D01 and CAB identifier CN0004 under the ISED requirement. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

SYSTEM TEST CONFIGURATION

Justification

Channel list:

Channel	Frequency (MHz)
1	2457

EUT Exercise Software

RF Test Tool: QRCT3

Support Equipment List and Details

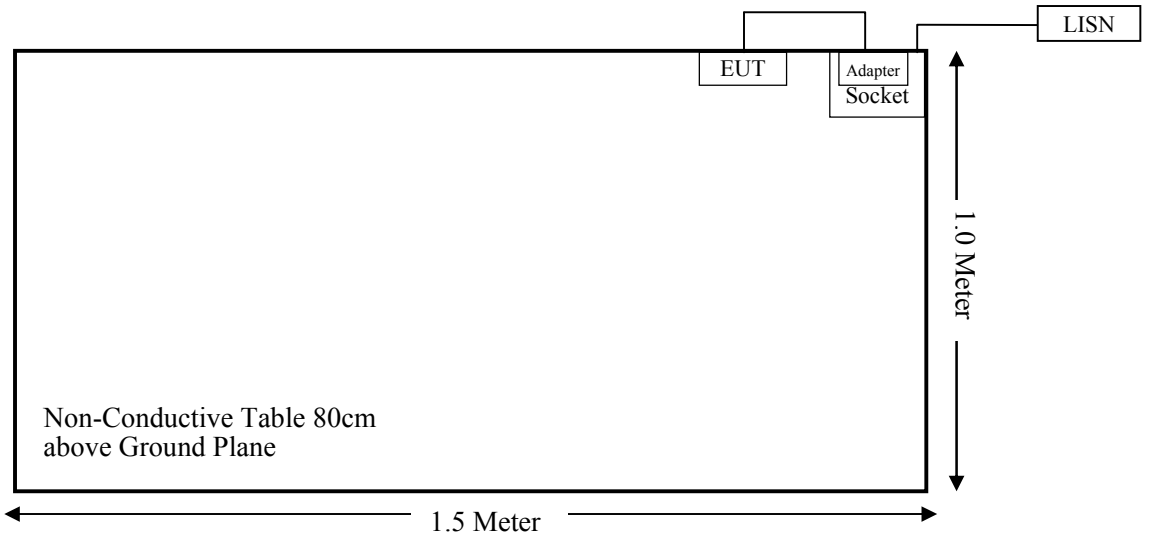
Manufacturer	Description	Model	Serial Number
Delippo	Adapter	B06120050	/

External I/O Cable

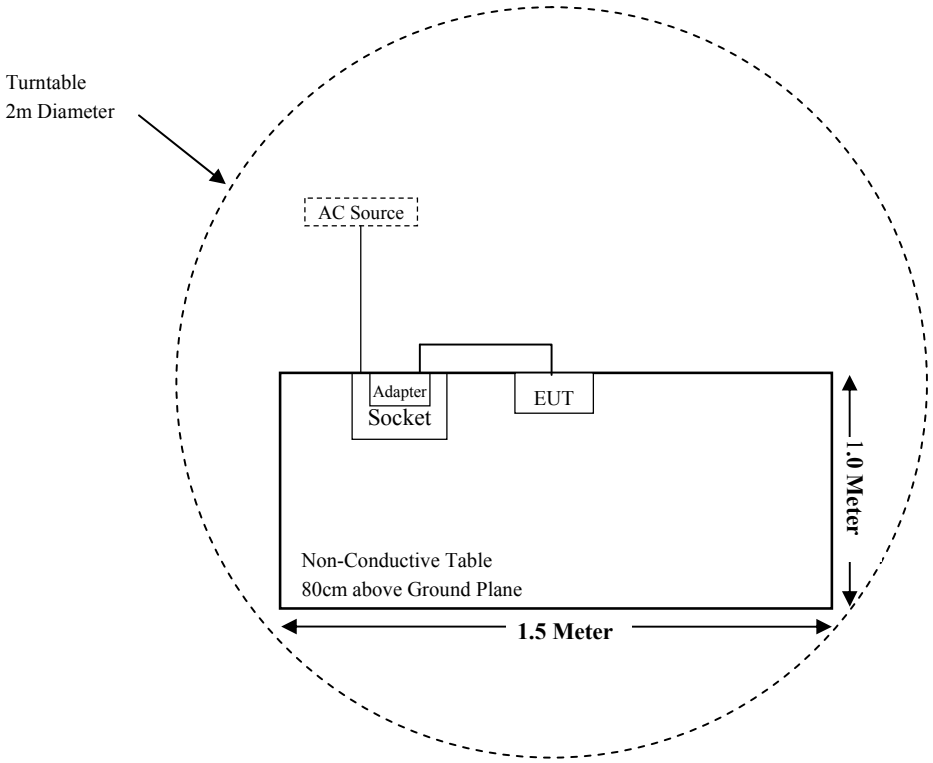
Cable Description	Length (m)	From Port	To
Power Cable	1.2	EUT	Adapter

Block Diagram of Test Setup

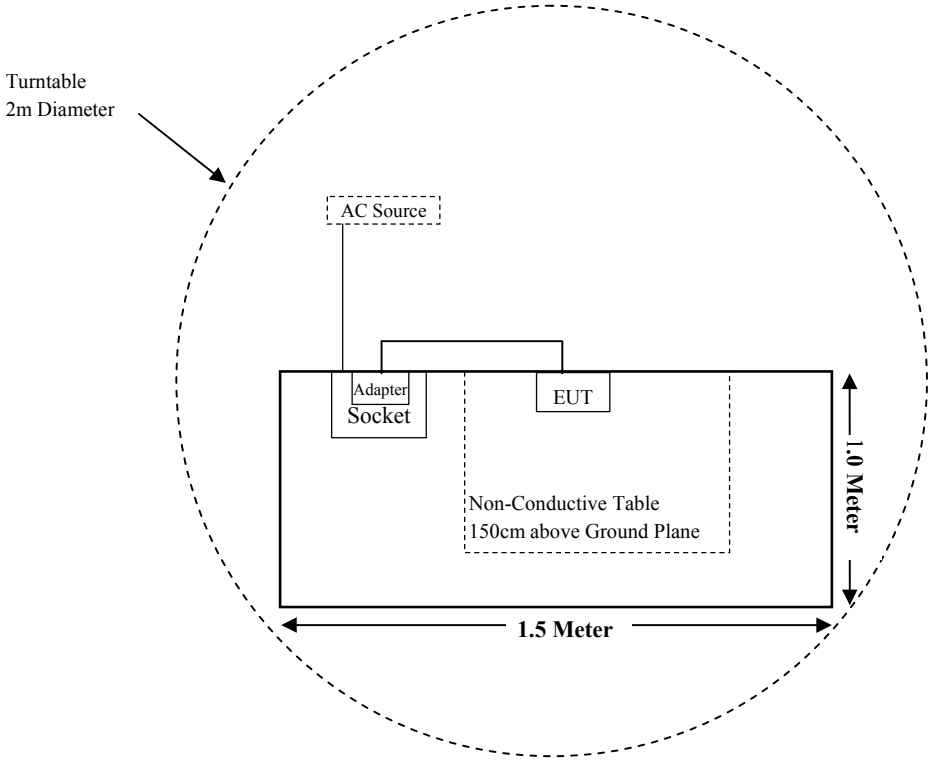
For Conducted Emissions:



For Radiated Emissions(Below 1GHz):



For Radiated Emissions(Above 1GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliant
§15.207(a)	Conduction Emissions	Compliant
15.205, §15.209, §15.249	Radiated Emissions& Out of Band Emission	Compliant
§15.215 (c)	20 dB Bandwidth	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test（Chamber 1#）					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2019-11-30	2020-11-29
Sunol Sciences	Broadband Antenna	JB3	A090413-1	2020-01-09	2021-01-08
Sonoma Instrunent	Pre-amplifier	310N	171205	2020-08-14	2021-08-13
Rohde & Schwarz	Auto Test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-8	008	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2020-08-15	2021-08-14
Radiated Emission Test（Chamber 2#）					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2020-08-27	2021-08-26
ETS-LINDGREN	Horn Antenna	3115	6229	2019-01-11	2022-01-10
ETS-LINDGREN	Horn Antenna	3116	00084159	2019-10-18	2022-10-17
A.H.Systems,inc	Amplifier	PAM-0118P	512	2020-02-20	2021-02-19
EM Electronics Corporation	Amplifier	EM18G40G	060726	2020-03-22	2021-03-21
MICRO-TRONICS	Notch filter	BRM50702	G024	2020-08-05	2021-08-04
Narda	Attenuator/10dB	10dB	010	2020-08-15	2021-08-14
Rohde & Schwarz	Auto Test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-11	011	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2020-08-15	2021-08-14
RF Conducted Test					
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/009	2020-09-21	2021-09-20
Narda	Attenuator	10dB	010	2020-08-15	2021-08-14
Qingdao Magene	RF Cable	Qingdao Magene C01	C01	Each Time	/
Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03-101746-zn	2020-08-05	2021-08-04
Rohde & Schwarz	LISN	ENV216	3560655016	2019-11-30	2020-11-29
Audix	Test Software	e3	V9	N/A	N/A
Rohde & Schwarz	Pulse limiter	ESH3-Z2	0357.8810.54	2020-08-10	2021-08-09
MICRO-COAX	Coaxial Cable	Cable-15	015	2020-08-15	2021-08-14

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC§15.203 - ANTENNA REQUIREMENT

Applicable Standard

For intentional device, 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.

Antenna Connector Construction

The EUT has a PCB antenna for ANT+ which was permanently attached and the antenna gain is -2.00dBi, fulfill the requirement of this section. Please refer to the EUT photos.

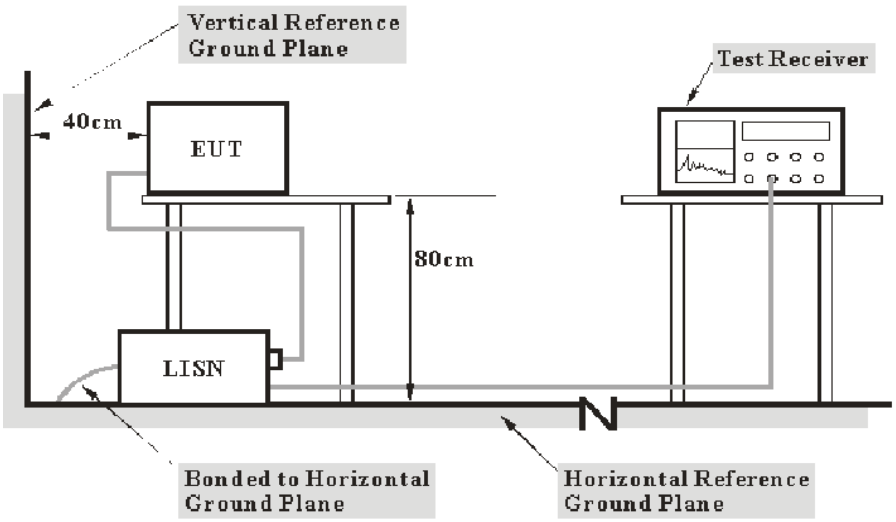
Result: Compliant.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a)

EUT Setup



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 measurement procedure of EUT setup is according with ANSI C63.10-2013. The related limit was specified in FCC Part 15.207.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

ANSI C63.10-2013 clause 6.2

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.

Factor & Over Limit Calculation

The Corrected Factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)

The "**Over Limit**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, an over limit of 7 dB means the emission is 7 dB above the limit. The equation for over limit calculation is as follows:

Over Limit (dB) = Read level (dBμV) + Factor (dB) - Limit (dBμV)

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

Test Data

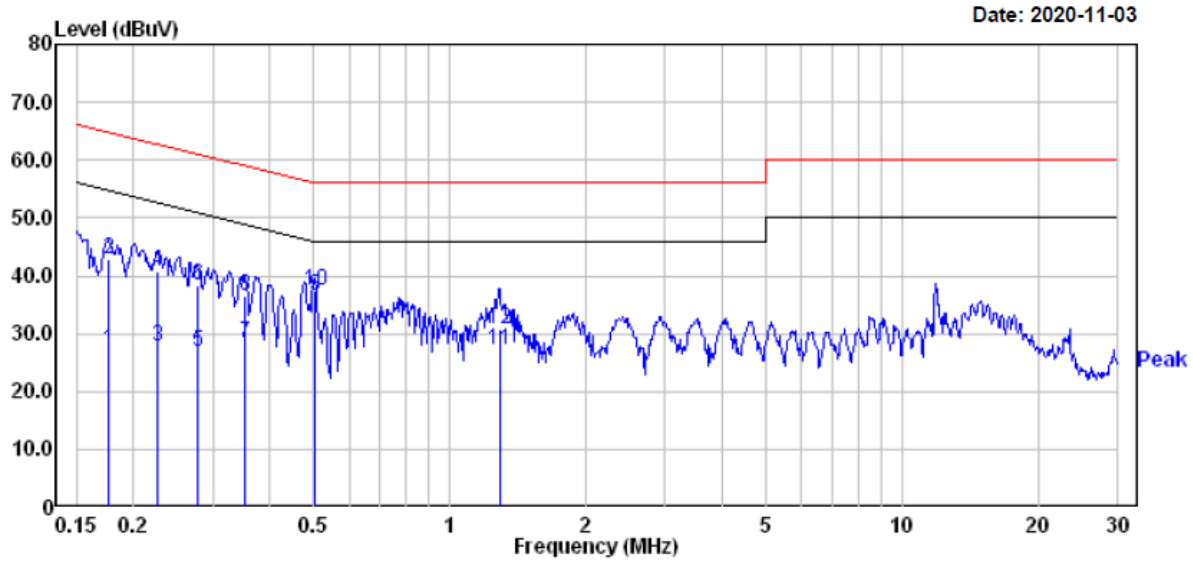
Environmental Conditions

Temperature:	23.5 ℃
Relative Humidity:	53 %
ATM Pressure:	101.4 kPa

The testing was performed by CK Huang on 2020-11-03.

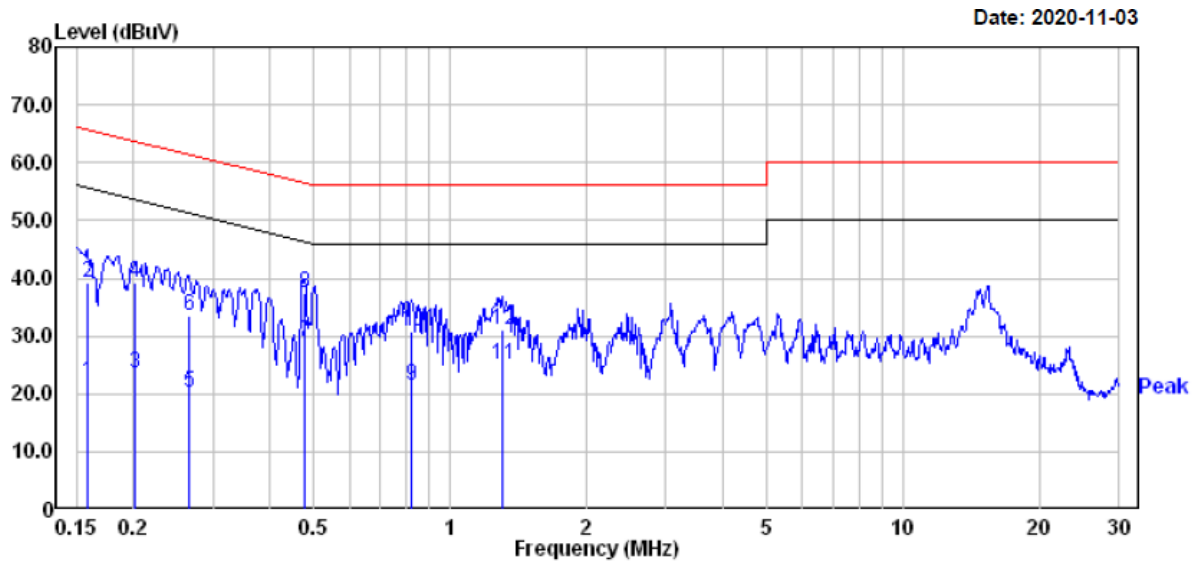
EUT operation mode: Transmitting

AC 120V/60 Hz, Line



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.176	7.30	19.83	27.13	54.68	-27.55	Average
2	0.176	22.90	19.83	42.73	64.68	-21.95	QP
3	0.226	8.00	19.82	27.82	52.61	-24.79	Average
4	0.226	20.90	19.82	40.72	62.61	-21.89	QP
5	0.277	7.10	19.82	26.92	50.90	-23.98	Average
6	0.277	18.60	19.82	38.42	60.90	-22.48	QP
7	0.352	8.69	19.81	28.50	48.91	-20.41	Average
8	0.352	16.79	19.81	36.60	58.91	-22.31	QP
9	0.502	16.70	19.76	36.46	46.00	-9.54	Average
10	0.502	17.60	19.76	37.36	56.00	-18.64	QP
11	1.289	7.50	19.82	27.32	46.00	-18.68	Average
12	1.289	11.00	19.82	30.82	56.00	-25.18	QP

AC 120V/60 Hz, Neutral



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.158	2.10	19.82	21.92	55.56	-33.64	Average
2	0.158	19.30	19.82	39.12	65.56	-26.44	QP
3	0.201	3.80	19.82	23.62	53.58	-29.96	Average
4	0.201	19.40	19.82	39.22	63.58	-24.36	QP
5	0.264	0.50	19.82	20.32	51.29	-30.97	Average
6	0.264	13.70	19.82	33.52	61.29	-27.77	QP
7	0.476	9.30	19.76	29.06	46.41	-17.35	Average
8	0.476	17.70	19.76	37.46	56.41	-18.95	QP
9	0.822	1.81	19.70	21.51	46.00	-24.49	Average
10	0.822	11.01	19.70	30.71	56.00	-25.29	QP
11	1.303	5.10	19.82	24.92	46.00	-21.08	Average
12	1.303	11.30	19.82	31.12	56.00	-24.88	QP

Note:

1) Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)
2) Over Limit (dB) = Read level (dBμV) + Factor (dB) - Limit (dBμV)

FCC§15.205, §15.209&§15.249- RADIATED EMISSIONS& OUT OF BAND EMISSION

Applicable Standard

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:

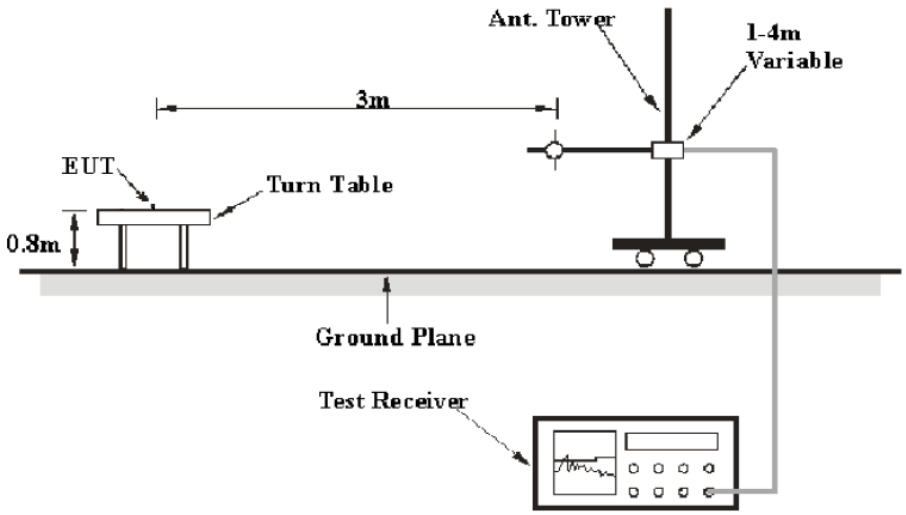
Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

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

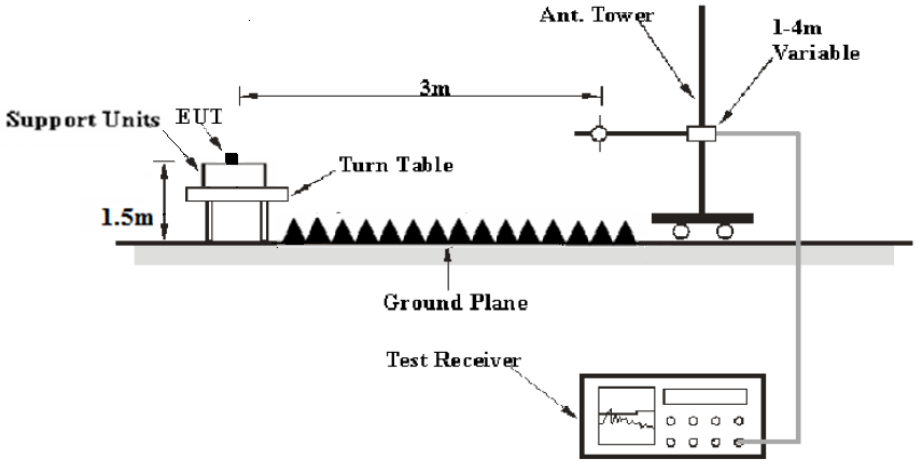
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

EUT Setup

Below 1 GHz:



Above 1 GHz:



The radiated emission and out of band 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 15.209/15.205 and FCC 15.249 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

Test Equipment Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver Setup was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1GHz	1MHz	3 MHz	/	Peak
	1MHz	3 MHz	1MHz	AVG

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude (dBμV/m) = Meter Reading (dBμV) + Antenna Factor (dB/m) + Cable Loss (dB) - Amplifier Gain (dB)

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin (dB) = Limit (dBμV/m) – Corrected Amplitude (dBμV /m)

Test Results Summary

According to the data in the following table, the EUT complied with the FCC Part 15.209 &15.205 & 15.249.

Test Data

Environmental Conditions

Temperature:	23.5°C
Relative Humidity:	50 %
ATM Pressure:	101.2 kPa

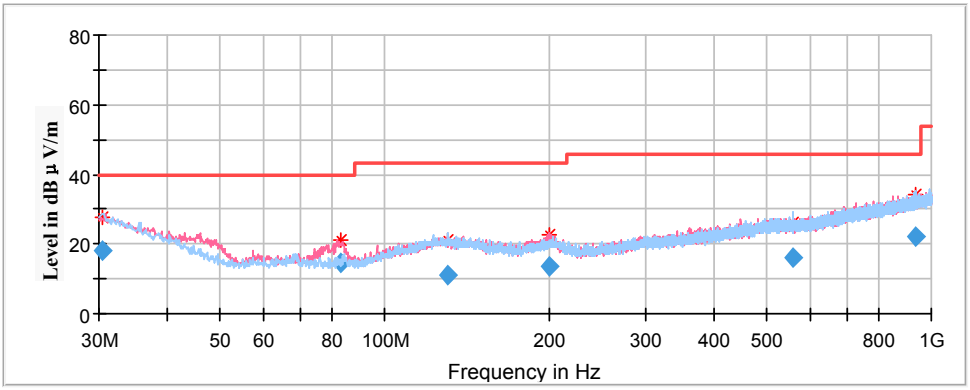
The testing was performed by CK Huang on 2020-11-09.

Test Mode: Transmitting

Spurious Emission Test:

30MHz-1GHz

*(Pre-scan in the X,Y and Z axes of orientation, the worst case **Z-axis of orientation** was recorded)*



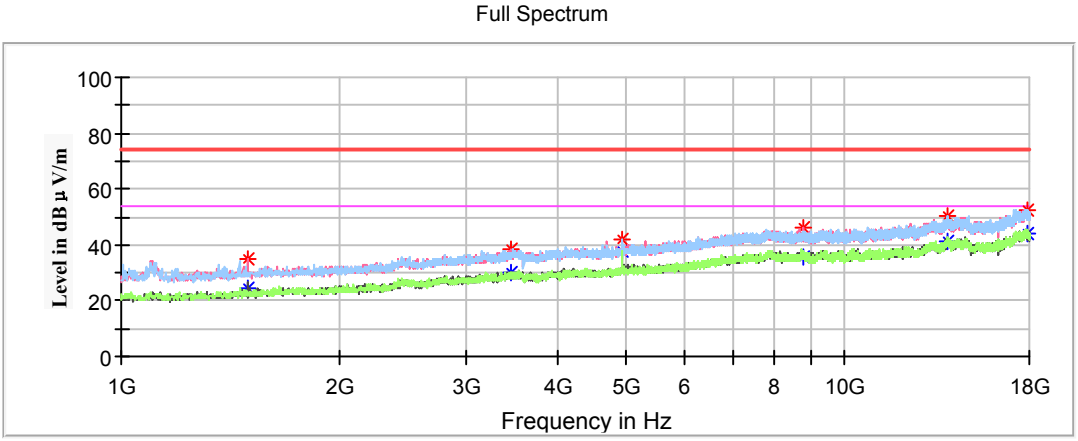
Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	Quasi-peak (dBµV/m)	Height (cm)	Polar (H/V)				
30.533434	18.29	100.0	H	181.0	-4.9	40.00	21.71
83.000550	14.38	100.0	V	245.0	-17.9	40.00	25.62
130.539550	11.24	200.0	H	162.0	-11.4	43.50	32.26
200.179350	13.74	100.0	V	100.0	-11.5	43.50	29.76
557.884350	16.19	200.0	H	23.0	-5.7	46.00	29.81
938.115650	22.37	200.0	H	194.0	0.9	46.00	23.63

1GHz-18GHz

*(Pre-scan in the X,Y and Z axes of orientation, the worst case **Z-axis of orientation** was recorded.)*

Note:
1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)
   Corrected Amplitude (dBμV/m) = Corrected Factor (dB/m) + Reading (dBμV)
   Margin (dB) = Limit (dBμV/m) – Corrected Amplitude (dBμV/m)

Channel Frequency: 2457MHz

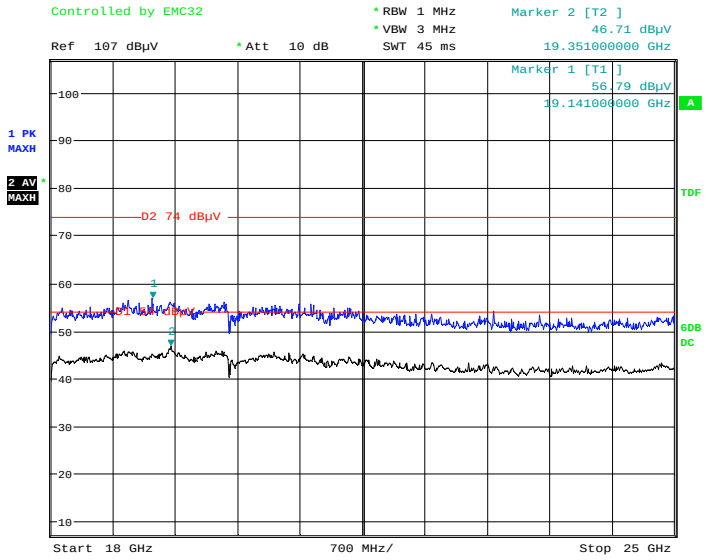


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
1494.700000	---	24.75	100.0	V	271.0	-16.4	54.00	29.25
1494.700000	34.73	---	100.0	V	271.0	-16.4	74.00	39.27
3448.000000	---	29.74	200.0	V	297.0	-9.0	54.00	24.26
3448.000000	38.59	---	200.0	V	297.0	-9.0	74.00	35.41
4914.000000	41.98	---	200.0	H	72.0	-5.4	74.00	32.02
4914.000000	---	37.47	200.0	H	72.0	-5.4	54.00	16.53
8789.400000	---	35.94	200.0	V	283.0	1.6	54.00	18.06
8789.400000	45.83	---	200.0	V	283.0	1.6	74.00	28.17
13894.500000	---	41.57	100.0	H	270.0	6.0	54.00	12.43
13894.500000	50.06	---	100.0	H	270.0	6.0	74.00	23.94
17845.300000	---	43.90	200.0	H	217.0	8.8	54.00	10.10
17845.300000	52.73	---	200.0	H	217.0	8.8	74.00	21.27

18GHz-25GHz

*(Pre-scan in the X,Y and Z axes of orientation, the worst case **Z-axis of orientation** was recorded)*

Horizontal



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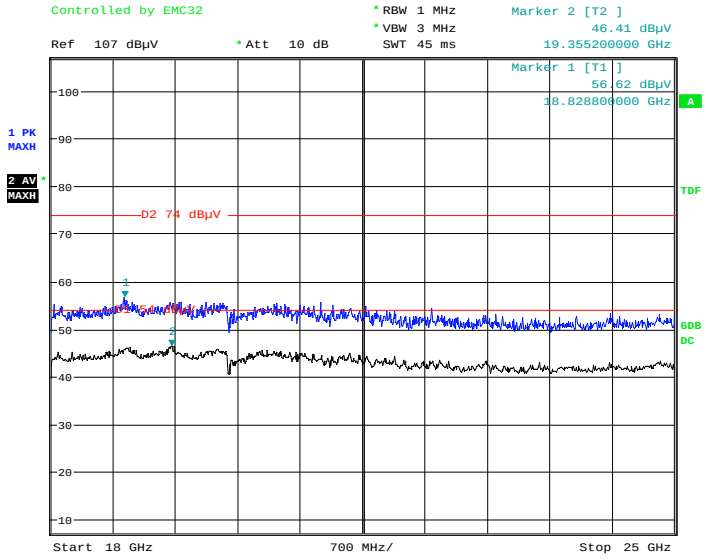
Vertical



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Fundamental Test & Restricted Bands Emissions Test:

*(Pre-scan in the X, Y and Z axes of orientation, the worst case **Z-axis of orientation** was recorded.)*

Note:
1. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)
   Corrected Amplitude (dBμV/m) = Corrected Factor (dB/m) + Reading (dBμV)
   Margin (dB) = Limit (dBμV/m) – Corrected Amplitude (dBμV/m)

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
Channel Frequency: 2457MHz								
2400.000000	---	42.15	200.0	H	219.0	6.0	54.00	11.85
2400.000000	46.52	---	200.0	H	219.0	6.0	74.00	27.48
2457.000000	79.63	---	100.0	H	189.0	6.2	114.00	34.37
2457.000000	---	77.64	100.0	H	189.0	6.2	94.00	16.36
2457.000000	77.61	---	150.0	V	348.0	6.2	114.00	36.39
2457.000000	---	75.23	150.0	V	348.0	6.2	94.00	18.77
2483.500000	---	42.91	100.0	H	187.0	6.3	54.00	11.09
2483.500000	46.74	---	100.0	H	187.0	6.3	74.00	27.26

FCC §15.215(c) – 20 dB BANDWIDTH TESTING

Applicable Standard

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.

Test Procedure

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 on the test table without connection to measurement instrument. Turn on the EUT. 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.

Test Data

Environmental Conditions

Temperature:	23.9 °C
Relative Humidity:	52 %
ATM Pressure:	101.3 kPa

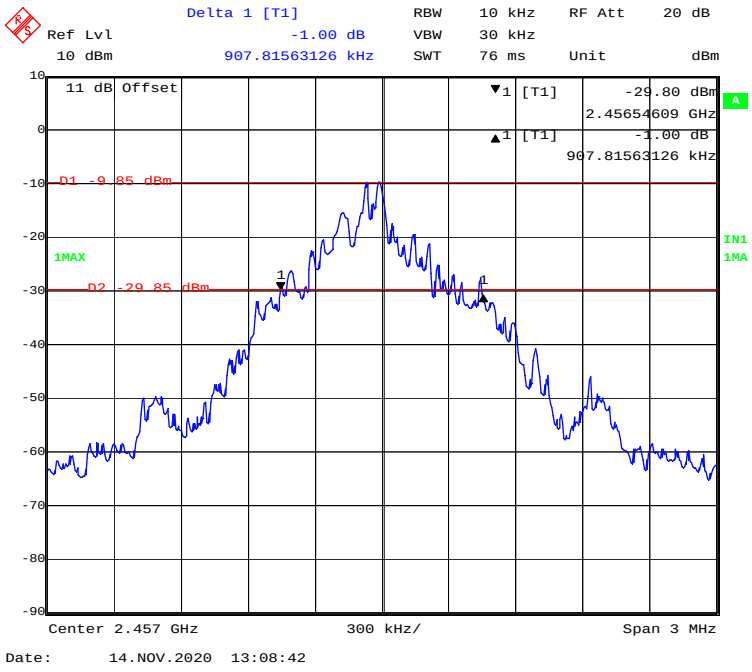
The testing was performed by CK Huang on 2020-11-14.

Test Result: Compliant

Test Mode: Transmitting

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
1	2457	0.908

Channel Frequency: 2457MHz



Declarations

1: BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with an asterisk '*'. Customer model name, addresses, names, trademarks etc. are not considered data.

2: Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

3: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

4: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

5: This report cannot be reproduced except in full, without prior written approval of the Company.

6: This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

******* END OF REPORT *******