

## FCC PART 15B TEST REPORT

For

**Shanghai HowayGIS Co., Ltd**

RM230, Fawkes Building, No. 1985, Road Chunshen, Shanghai, China

**FCC ID: 2AAZD-TGH1-S4**

<b>Report Type:</b> Original Report	<b>Product Type:</b> High Precision Mobile GNSS Receiver
<b>Test Engineer:</b> Iris Tuo	<i>Iris Tuo</i>
<b>Report Number:</b> RKSA180622002-00A	
<b>Report Date:</b> 2018-08-23	
<b>Reviewed By:</b> Ray Wang EMC Leader	<i>Ray. wang</i>
<b>Prepared By:</b> Bay Area Compliance Laboratories Corp. (Kunshan) No.248 Chenghu Road, Kunshan,Jiangsu province, China Tel: +86-0512-86175000 Fax: +86-0512-88934268 <a href="http://www.baclcorp.com.cn">www.baclcorp.com.cn</a>	

**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. 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.

## **TABLE OF CONTENTS**

<b>GENERAL INFORMATION.....</b>	<b>3</b>
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) .....	3
OBJECTIVE .....	3
RELATED SUBMITTAL(S)/GRANT(S).....	3
TEST METHODOLOGY .....	3
TEST FACILITY .....	3
<b>SYSTEM TEST CONFIGURATION.....</b>	<b>4</b>
JUSTIFICATION .....	4
EUT EXERCISE SOFTWARE .....	4
SPECIAL ACCESSORIES.....	4
EQUIPMENT MODIFICATIONS .....	4
SUPPORT EQUIPMENT LIST AND DETAILS .....	4
EXTERNAL I/O CABLE.....	4
BLOCK DIAGRAM OF RADIATED TEST SETUP.....	5
<b>SUMMARY OF TEST RESULTS .....</b>	<b>6</b>
<b>FCC §15.107 –CONDUCTED EMISSIONS .....</b>	<b>7</b>
APPLICABLE STANDARD .....	7
MEASUREMENT UNCERTAINTY.....	7
EUT SETUP.....	7
EMI TEST RECEIVER SETUP.....	8
TEST PROCEDURE .....	8
TEST EQUIPMENT LIST AND DETAILS.....	8
CORRECTED FACTOR & MARGIN CALCULATION .....	8
TEST DATA .....	9
<b>FCC §15.109 - RADIATED EMISSIONS .....</b>	<b>11</b>
APPLICABLE STANDARD .....	11
MEASUREMENT UNCERTAINTY.....	11
EUT SETUP .....	11
EMI TEST RECEIVER SETUP.....	12
TEST PROCEDURE .....	12
TEST EQUIPMENT LIST AND DETAILS.....	13
CORRECTED AMPLITUDE & MARGIN CALCULATION .....	13
TEST DATA .....	14

## GENERAL INFORMATION

### Product Description for Equipment under Test (EUT)

Applicant	Shanghai HowayGIS Co., Ltd
Test Model	TG-H1
Product	High Precision Mobile GNSS Receiver
Rate Voltage	DC12V by adapter and DC7.4V by rechargeable battery
Dimension	210 mm (L)*60 mm (W)*110mm(H)

#### Adapter Information:

Model: A122-1201000ID

Input: AC100-240 V 50/60Hz 0.4A

Output: 12V, 1000mA

Note: The product's series model number: TG-K700, TG-K706, TG-H2, X3, G100, G200. The difference between them was explained in the attached declaration letter.

\* All measurement and test data in this report was gathered from production sample serial number: 20180622002. (Assigned by BACL, Kunshan). The EUT supplied by the applicant was received on 2018-06-22.

### Objective

This report is prepared on behalf of Shanghai HowayGIS Co., Ltd in accordance with Part 2-Subpart J, and Part 15-Subparts A and B of the Federal Communication Commission's rules.

The objective of the manufacturer is to determine the compliance of EUT with FCC Part 15, Class B digital device.

### Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS and Part 15.247 DSS submissions with FCC ID: 2AAZD-TGH1-S4.

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

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

### 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 974614 D01. 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

The system was configured for testing in a typical fashion (as normally used by a typical user).

*Test mode: Data transmission & GPS on*

### EUT Exercise Software

Notebook and EUT data transmission by “U-Center.exe”.

### Special Accessories

No special accessory was used.

### Equipment Modifications

No modification was made to the EUT tested.

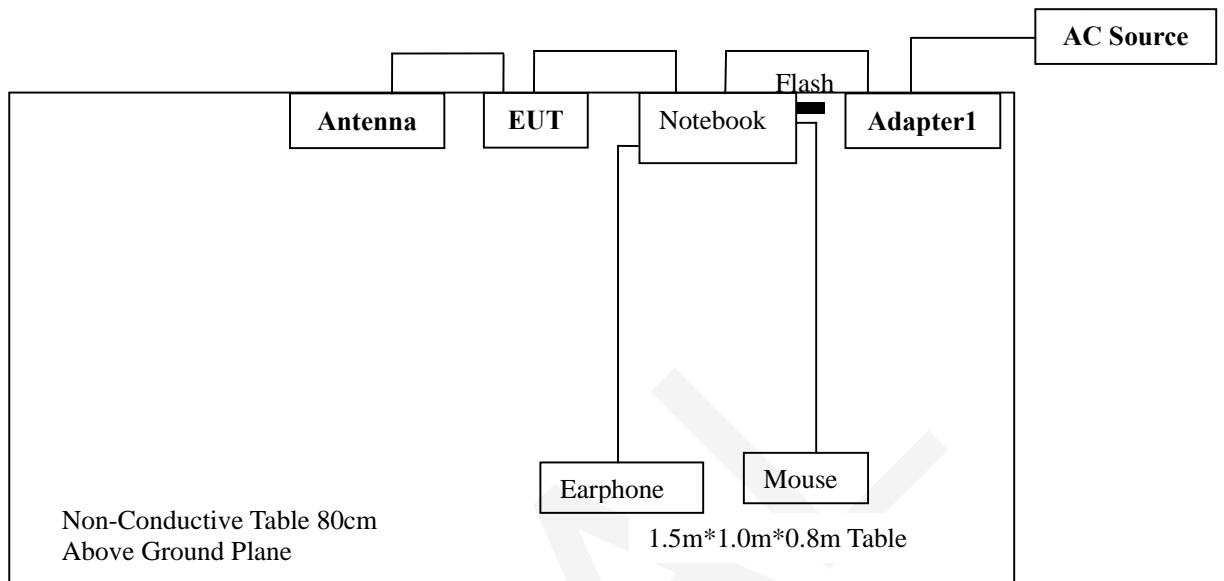
### Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	Notebook	E6410	3094742521
Logitech	Mouse	M-U0026	HS529HB
Lenovo	Flash	T180	0A1266865200521
Shanghai HowayGIS Infotech Co., Ltd	Antenna	/	/
Guang Bao Technology Co.,Ltd	Adapter1	SU10462	/
/	Earphone	/	/

### External I/O Cable

Cable Description	Length (m)	From/Port	To
Antenna Cable	1.0	EUT	Antenna
Mouse USB Cable	1.0	Notebook	Mouse
USB Cable	1.2	Notebook	EUT
Power Cable	1.0	EUT	Adapter
Power Cable	1.0	Adapter/Adapter1	AC Source

## Block Diagram of Radiated Test Setup



**SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Results
§ 15.107	Conducted Emissions	Compliance
§ 15.109	Radiated Emissions	Compliance

## FCC §15.107 –CONDUCTED EMISSIONS

### Applicable Standard

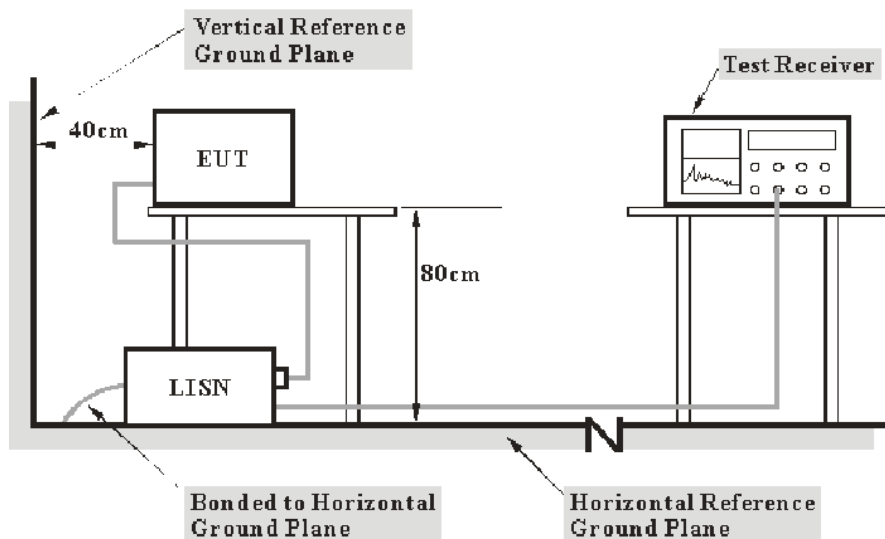
According to FCC§15.107

### Measurement Uncertainty

Input quantities to be considered for conducted disturbance measurements may be receiver reading, attenuation of the connection between LISN and receiver, LISN voltage division factor, LISN VDF frequency interpolation and receiver related input quantities, etc.

Item		Measurement Uncertainty	$U_{\text{cispr}}$
AMN	150kHz~30MHz	3.19 dB	3.4 dB

### 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 C63.4-2014. The related limit was specified in FCC Part 15.107 Class B.

## 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

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

## Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	834115/007	2017-11-12	2018-11-11
ROHDE&SCHWARZ	LISN	ENV216	3560655016	2017-11-12	2018-11-11
BACL	BACL-EMC	V1.0	CE001	--	--
MICRO-COAX	Coaxial Cable	Cable-6	006	2017-09-08	2018-09-07

\* **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).

## Corrected Factor & Margin 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:

$$\text{Correction Amplitude} = \text{Meter Reading} + \text{VDF} + \text{Cable Loss} + \text{Transient Limiter Attenuation}$$

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 7 dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

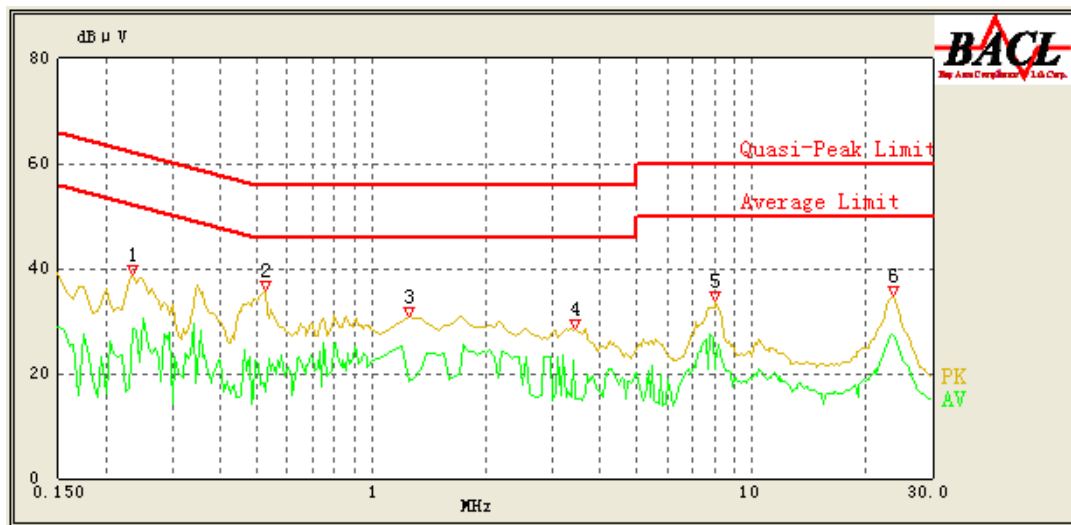


**Test Data****Environmental Conditions**

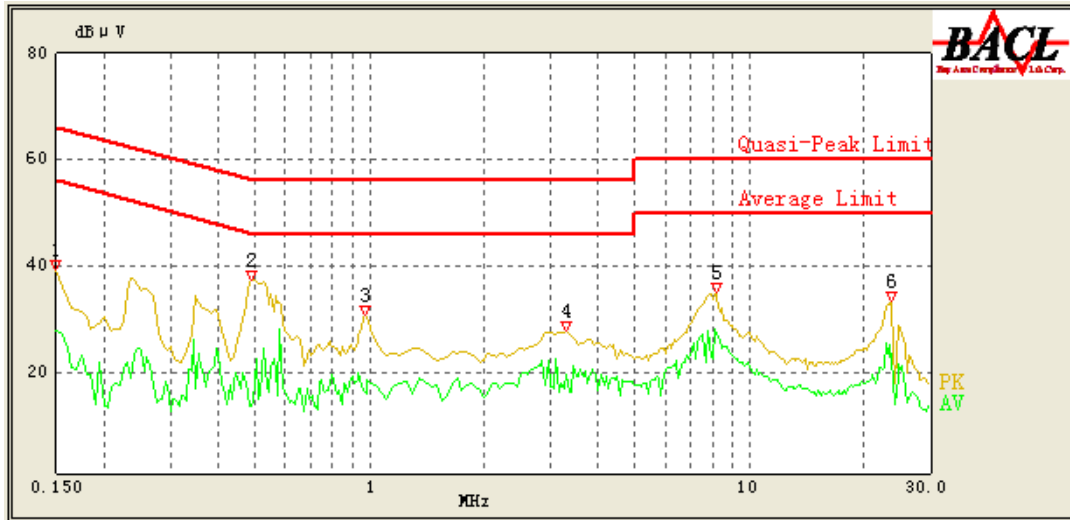
<b>Temperature:</b>	24°C
<b>Relative Humidity:</b>	50 %
<b>ATM Pressure:</b>	101.0 kPa

The testing was performed by Iris Tuo on 2018-08-07

Test mode: Data transmission & GPS on

**Line:**

No.	Frequency (MHz)	Corrected Amplitude (dBμV)	Correction (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/AV/QP)
1	0.235	38.69	16.02	63.57	24.88	QP
	0.235	28.49	16.02	53.57	25.08	AV
2	0.525	35.79	16.06	56.00	20.21	QP
	0.525	16.34	16.06	46.00	29.66	AV
3	1.250	30.98	15.87	56.00	25.02	QP
	1.250	18.60	15.87	46.00	27.40	AV
4	3.450	28.66	15.85	56.00	27.34	QP
	3.450	15.20	15.85	46.00	30.80	AV
5	8.050	33.78	16.01	60.00	26.22	QP
	8.050	22.31	16.01	50.00	27.69	AV
6	23.650	34.76	16.45	60.00	25.24	QP
	23.850	26.69	16.46	50.00	23.31	AV

**Neutral:**

No.	Frequency (MHz)	Corrected Amplitude (dBμV)	Correction (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/AV/QP)
1	0.150	39.43	16.06	66.00	26.57	QP
	0.150	27.80	16.06	56.00	28.20	AV
2	0.490	37.43	16.11	56.29	18.86	QP
	0.490	13.64	16.11	46.29	32.65	AV
3	0.975	30.78	15.94	56.00	25.22	QP
	0.980	15.83	15.94	46.00	30.17	AV
4	3.300	27.84	15.89	56.00	28.16	QP
	3.300	19.66	15.89	46.00	26.34	AV
5	8.150	34.92	15.95	60.00	25.08	QP
	8.100	28.27	15.95	50.00	21.73	AV
6	23.550	33.30	16.22	60.00	26.70	QP
	23.500	25.34	16.22	50.00	24.66	AV

## FCC §15.109 - RADIATED EMISSIONS

### Applicable Standard

FCC §15.109

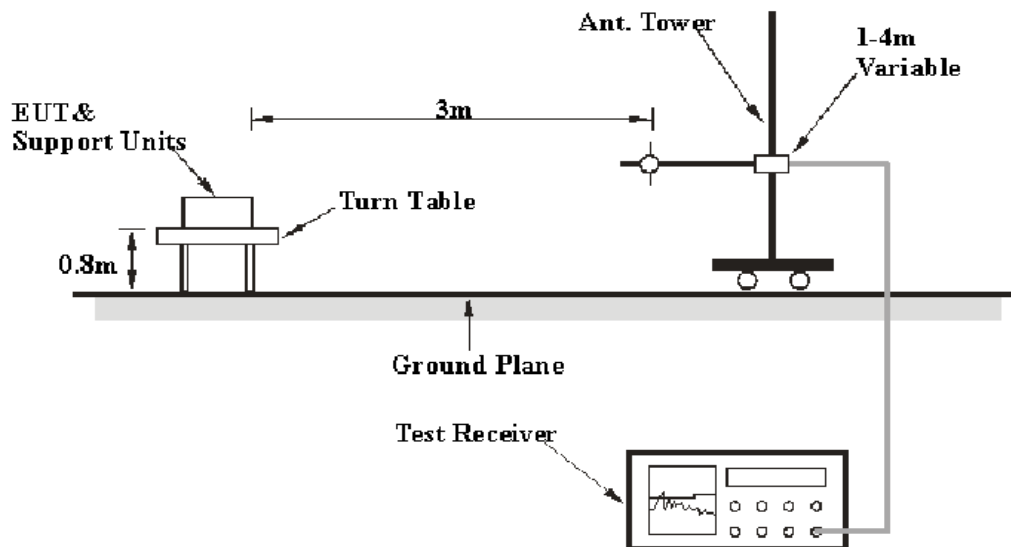
### Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

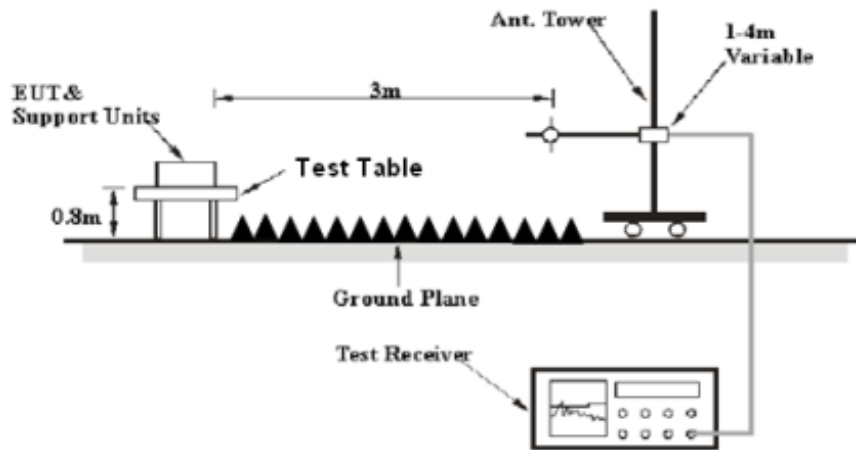
Item		Measurement Uncertainty	$U_{\text{cispr}}$
Radiated Emission	30MHz~1GHz	6.11dB	6.3 dB
	1GHz~6GHz	4.45dB	5.2 dB
	6 GHz ~18 GHz	5.23dB	5.5 dB

### EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.4-2014. The specification used was the FCC Part 15.109 Class B limits.

The spacing between the peripherals was 10 cm.

### EMI Test Receiver Setup

The system was investigated from 30 MHz to 18 GHz.

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

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

All data was recorded in the Quasi-peak detector mode from 30 MHz to 1 GHz, Peak and average detection mode above 1 GHz.

**Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sonoma Instrument	Amplifier	310N	171205	2017-08-14	2018-08-13
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2017-11-12	2018-11-11
Sunol Sciences	Broadband Antenna	JB3	A090314-2	2016-01-09	2019-01-08
ETS	Horn Antenna	3115	9207-3900	2017-07-15	2020-07-14
Rohde & Schwarz	Signal Analyzer	ESU40	100207	2017-08-27	2018-08-26
Champrotek	Chamber	Chamber A	T-KSEMC049	-	-
Champrotek	Chamber	Chamber B	T-KSEMC080	-	-
R&S	Auto test Software	EMC32	100361	-	-
Narda	Pre-amplifier	AFS42-00101800	2001270	2017-12-12	2018-12-11
MICRO-COAX	Coaxial Cable	Cable-8	008	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-4	004	2017-12-12	2018-12-11
MICRO-COAX	Coaxial Cable	Cable-5	005	2017-12-12	2018-12-11

\* **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).

**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:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

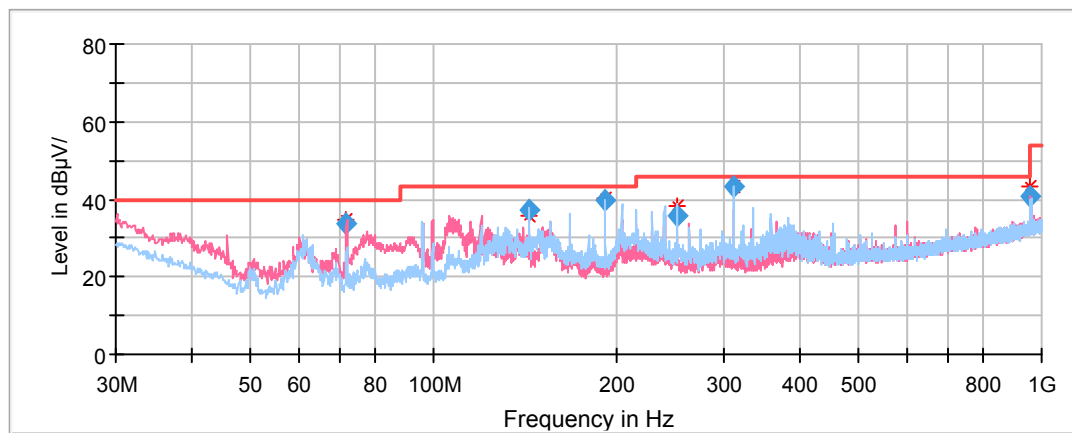
**Test Data****Environmental Conditions**

<b>Temperature:</b>	20.2 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	101.0 kPa

The testing was performed by Iris Tuo on 2018-08-06.

Test mode: Data transmission & GPS on

**30MHz ~ 1GHz**



Frequency (MHz)	Quasi Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
71.915000	33.64	40.00	6.36	101.0	V	152.0	-17.4
143.854650	37.02	43.50	6.48	199.0	H	179.0	-12.1
191.813200	39.98	43.50	3.52	101.0	H	160.0	-12.8
251.795950	35.63	46.00	10.37	101.0	H	227.0	-12.0
311.686250	43.34	46.00	2.66	101.0	H	201.0	-10.2
960.208300	40.66	53.90	13.24	101.0	V	142.0	1.5

**Above 1 GHz:**

Frequency (MHz)	Max Peak (dB $\mu$ V/m)	Average (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1085.000000	---	25.97	54.00	28.03	200.0	V	199.0	-3.8
1085.000000	36.86	---	74.00	37.14	200.0	V	199.0	-3.8
1656.200000	---	29.20	54.00	24.80	100.0	V	148.0	-0.1
1656.200000	38.79	---	74.00	35.21	100.0	V	148.0	-0.1
2638.800000	---	34.05	54.00	19.95	200.0	V	325.0	3.9
2638.800000	43.79	---	74.00	30.21	200.0	V	325.0	3.9
3594.200000	---	37.66	54.00	16.34	100.0	V	225.0	7.6
3594.200000	47.17	---	74.00	26.83	100.0	V	225.0	7.6
7164.200000	---	43.22	54.00	10.78	200.0	V	342.0	15.2
7164.200000	52.89	---	74.00	21.11	200.0	V	342.0	15.2
11339.400000	---	45.57	54.00	8.43	100.0	V	219.0	18.6
11339.400000	55.87	---	74.00	18.13	100.0	V	219.0	18.6

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