

## FCC PART 15B, CLASS B TEST REPORT

For

### **Ruio Communication Technology Co.,Ltd**

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**FCC ID: 2ALCI-FRESHFUNB937**

<b>Report Type:</b> Original Report	<b>Product Type:</b> 4G CPE
<b>Report Number:</b> RSZ181017001-00A	
<b>Report Date:</b> 2018-11-07 Rocky Kang	
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## GENERAL INFORMATION

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

The *Ruio Communication Technology Co.,Ltd*'s product, model number: *B937* (*FCC ID: 2ALCI-FRESHFUNB937*) or the "EUT" in this report was a *4G CPE*, which was measured approximately: 16.5 cm (L) \* 15.0 cm (W) \* 2.8 cm (H), rated with input voltage: DC 12V from adapter. The highest operating frequency is 2690MHz.

Adapter information:

Model: ZL-A012W1201000

Input: AC 100-240V, 50/60Hz, 0.5A

Output: DC 12V, 1A

*\*All measurement and test data in this report was gathered from production sample serial number: 181017001 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2018-10-17.*

### Objective

This test report is prepared on behalf of *Ruio Communication Technology Co.,Ltd* in accordance with Part 2-Subpart J, Part 15-Subparts A, B of the Federal Communication Commissions rules.

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

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

FCC Part 15.247 DTS and FCC Part 22H&24E&27 PCB submissions with FCC ID: 2ALCI-FRESHFUNB937.

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

### Measurement Uncertainty

Parameter		uncertainty
Conducted Emissions		±1.95dB
Emissions, radiated	Below 1GHz	±4.75dB
	Above 1GHz	±4.88dB

### **Test Facility**

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

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, FCC Registration No.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

The system was configured for testing in a manufacturer testing fashion.

### EUT Exercise Software

No exercise software was used.

### Special Accessories

No special accessory.

### Equipment Modifications

No modification was made to the EUT tested.

### Support Equipment List and Details

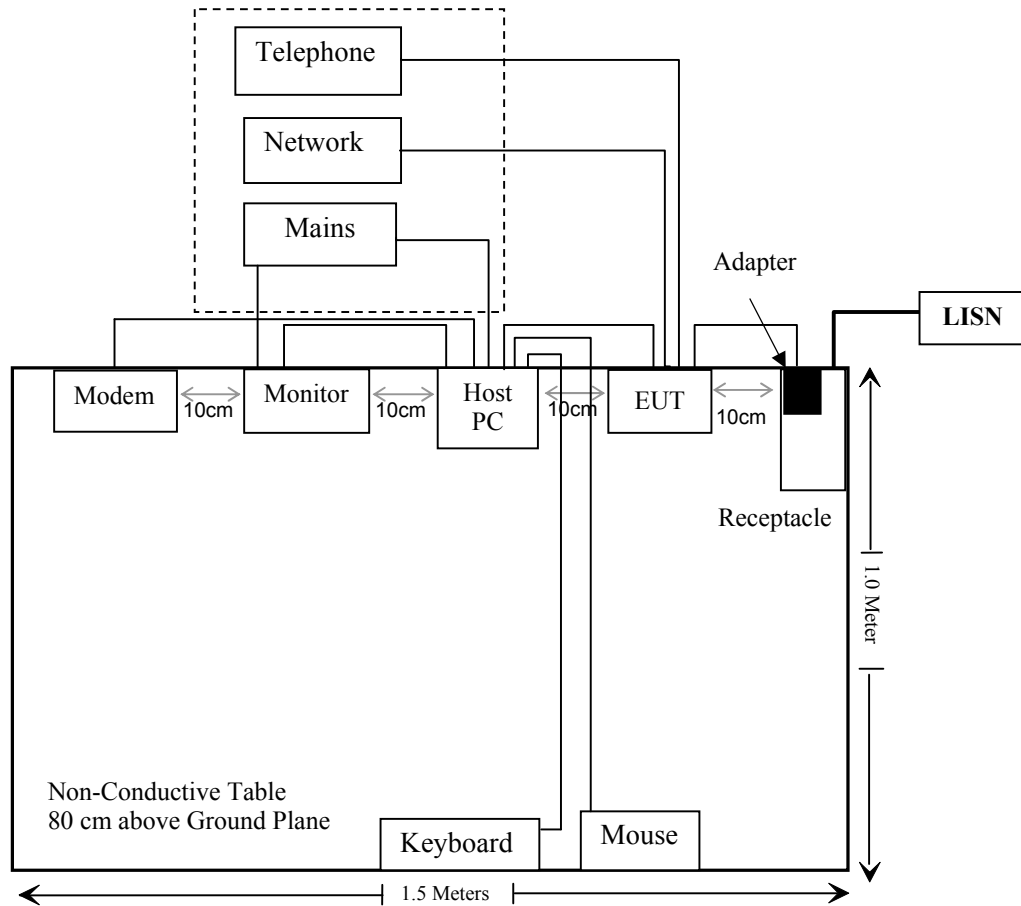
Manufacturer	Description	Model	Serial Number
TIANNIAO	Telephone	TL2201	7848262666L
DELL	Host PC	DCSCSF	127BP2X
TCL	Monitor	TFT1560PS	ALA560806C160409
Microsoft	Keyboard	1406	0200706128743
DELL	Mouse	MOC5UO	G1900NKD
SAST	Modem	AEM-2100	0293

### External I/O Cable

Cable Description	Length (m)	From Port	To
Un-shielding Detachable DC Cable	1.0	EUT	Adapter
Un-shielded Detachable RJ11 Line	3.0	Telephone	EUT
Un-shielded Detachable RJ45 Line	3.0	Host PC	EUT
Un-shielded Detachable RJ45 Line	3.0	Network	EUT
Un-shielded Detachable RS232Cable	1.8	Host PC	Modem
Un-shielded Detachable VGA Cable	1.5	Host PC	Monitor

## Block Diagram of Test Setup

For conducted emission



**SUMMARY OF TEST RESULTS**

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

**TEST EQUIPMENT LIST**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
<b>AC Line Conducted Emission Test</b>					
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2018-07-11	2019-07-11
Rohde & Schwarz	LISN	ENV216	3560.6650.12-101613-Yb	2017-12-21	2018-12-21
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2018-05-12	2018-11-21
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
Unknown	Conducted Emission Cable	78652	UF A210B-1-0720-504504	2018-05-12	2018-11-12
<b>Radiated Emission Test</b>					
A.H.System	Horn Antenna	SAS-200/571	135	2018-08-18	2021-08-17
Rohde & Schwarz	Signal Analyzer	FSEM	845987/005	2018-06-23	2019-06-23
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017-12-22	2020-12-21
COM-POWER	Pre-amplifier	PA-122	181919	2018-05-22	2018-11-22
Sonoma instrument	Amplifier	310N	186238	2018-05-12	2018-11-12
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2018-01-11	2019-01-11
Ducommun technologies	RF Cable	UFA147A-2362-100100	MFR64639 231029-003	2018-08-01	2019-02-01
Ducommun technologies	RF Cable	104PEA	218124002	2018-05-21	2018-11-21
Ducommun technologies	RF Cable	RG-214	1	2018-05-21	2018-11-19
Ducommun technologies	RF Cable	RG-214	2	2018-05-22	2018-11-22
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR

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



## FCC §15.107 – AC LINE CONDUCTED EMISSIONS

### Applicable Standard

According to FCC §15.107

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

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

During the conducted emission test, the host PC was connected to the first LISN and the other relevant equipments were connected to the second 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.

## Corrected Factor & Margin Calculation

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

$$\text{Correction Factor} = \text{LISN VDF} + \text{Cable Loss} + \text{Transient Limiter Attenuation}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 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 Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.107,

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level is in compliance with the limit if

$$L_m + U_{(Lm)} \leq L_{\text{lim}} + U_{\text{cisp}}r$$

In BACL.,  $U_{(Lm)}$  is less than  $U_{\text{cisp}r}$ , if  $L_m$  is less than  $L_{\text{lim}}$ , it implies that the EUT complies with the limit.

## Test Data

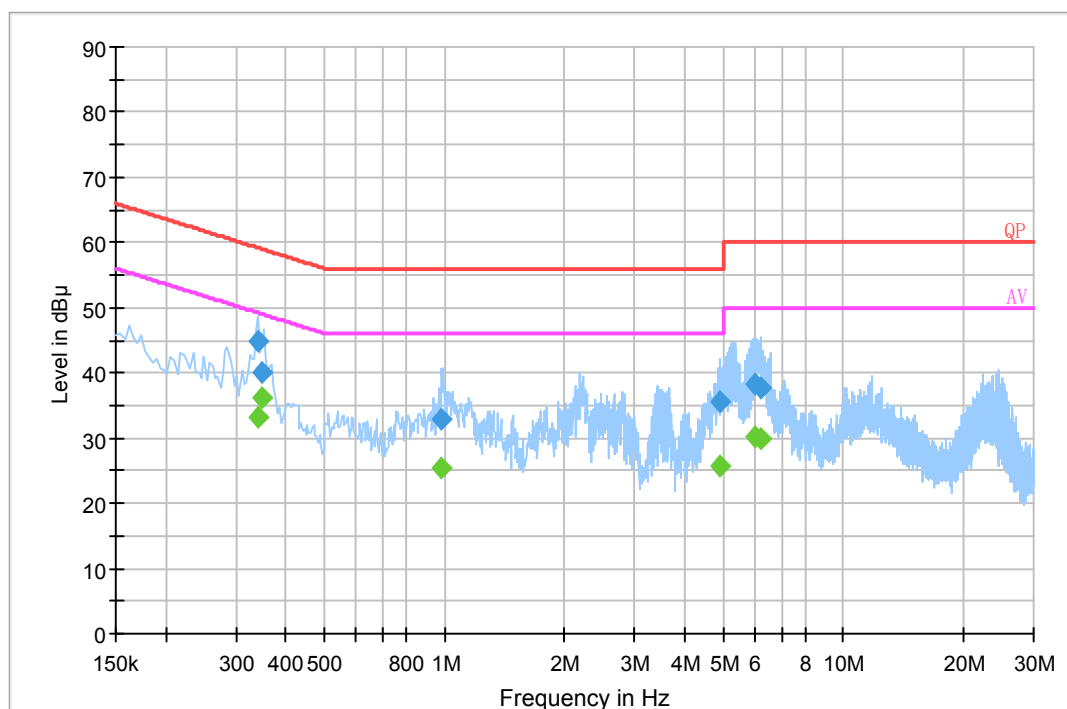
### Environmental Conditions

Temperature:	24 °C
Relative Humidity:	60 %
ATM Pressure:	101.0 kPa

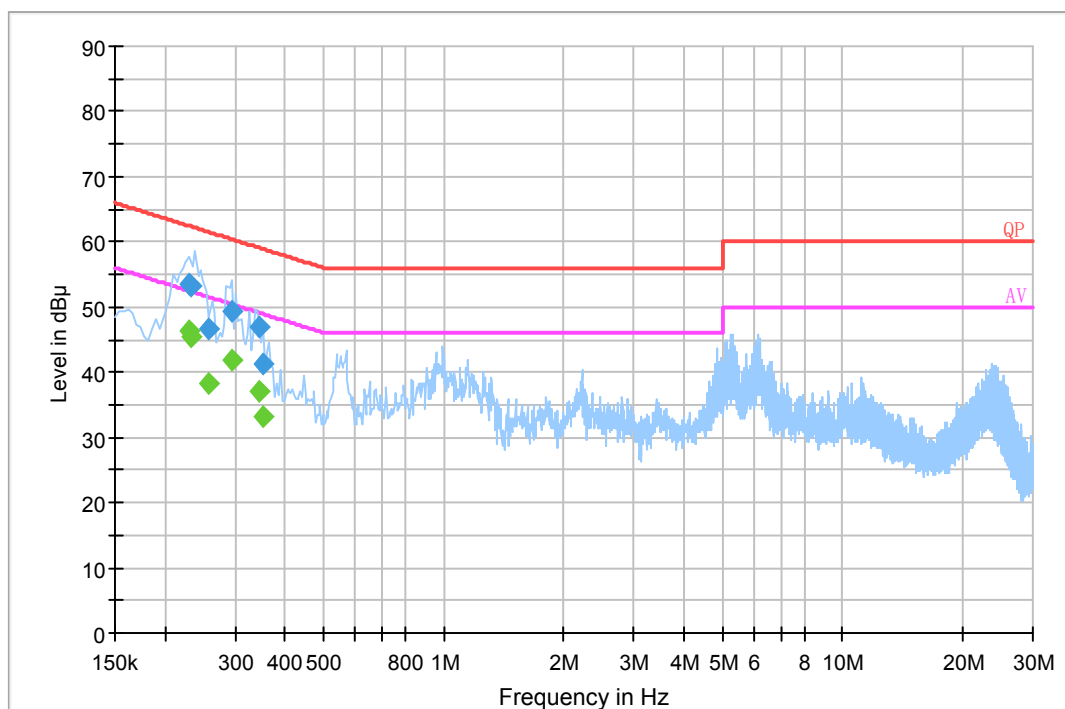
*The testing was performed by Kiki Kong on 2018-10-29.*

EUT Operation Mode: Ping IP & Talking

AC 120V/60 Hz, Line



Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.340870	44.8	19.7	59.2	14.4	QP
0.348690	40.2	19.7	59.0	18.8	QP
0.979210	32.9	19.8	56.0	23.1	QP
4.928590	35.4	20.1	56.0	20.6	QP
6.020990	38.2	20.1	60.0	21.8	QP
6.185210	37.7	20.1	60.0	22.3	QP
0.340870	33.3	19.7	49.2	15.9	Ave.
0.348690	36.0	19.7	49.0	13.0	Ave.
0.979210	25.5	19.8	46.0	20.5	Ave.
4.928590	25.8	20.1	46.0	20.2	Ave.
6.020990	30.3	20.1	50.0	19.7	Ave.
6.185210	29.9	20.1	50.0	20.1	Ave.

**AC 120V/60 Hz, Neutral**

Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.230500	53.4	19.7	62.4	9.0	QP
0.233500	53.1	19.7	62.3	9.2	QP
0.257500	46.6	19.7	61.5	14.9	QP
0.293500	49.3	19.8	60.4	11.1	QP
0.343070	46.9	19.7	59.1	12.2	QP
0.352690	41.4	19.7	58.9	17.5	QP
0.230500	46.4	19.7	52.4	6.0	Ave.
0.233500	45.5	19.7	52.3	6.8	Ave.
0.257500	38.4	19.7	51.5	13.1	Ave.
0.293500	41.9	19.8	50.4	8.5	Ave.
0.343070	37.1	19.7	49.1	12.0	Ave.
0.352690	33.3	19.7	48.9	15.6	Ave.

**Note:**

- 1) Correction Factor = LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation
- 2) Corrected Amplitude = Reading + Correction Factor
- 3) Margin = Limit – Corrected Amplitude

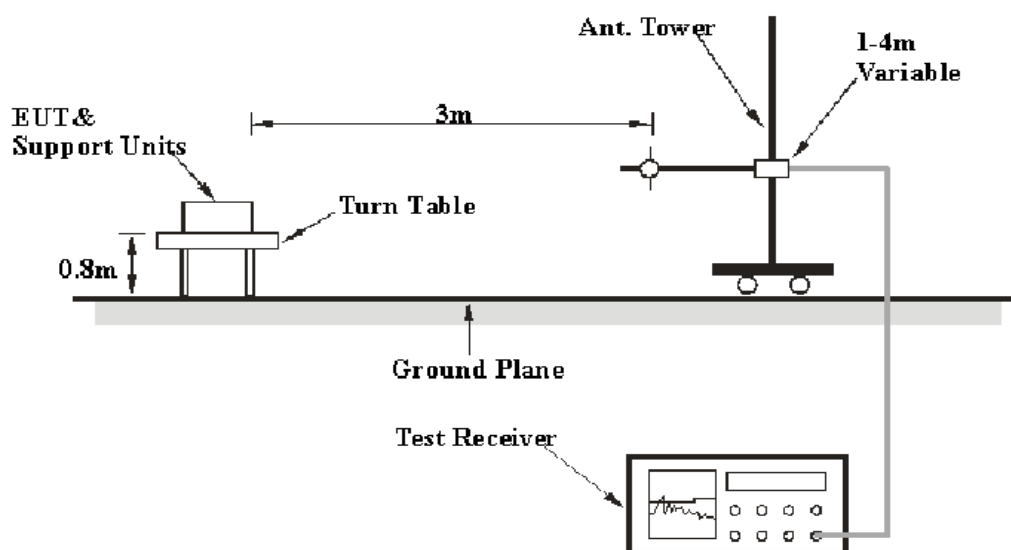
## FCC §15.109 - RADIATED SPURIOUS EMISSIONS

### Applicable Standard

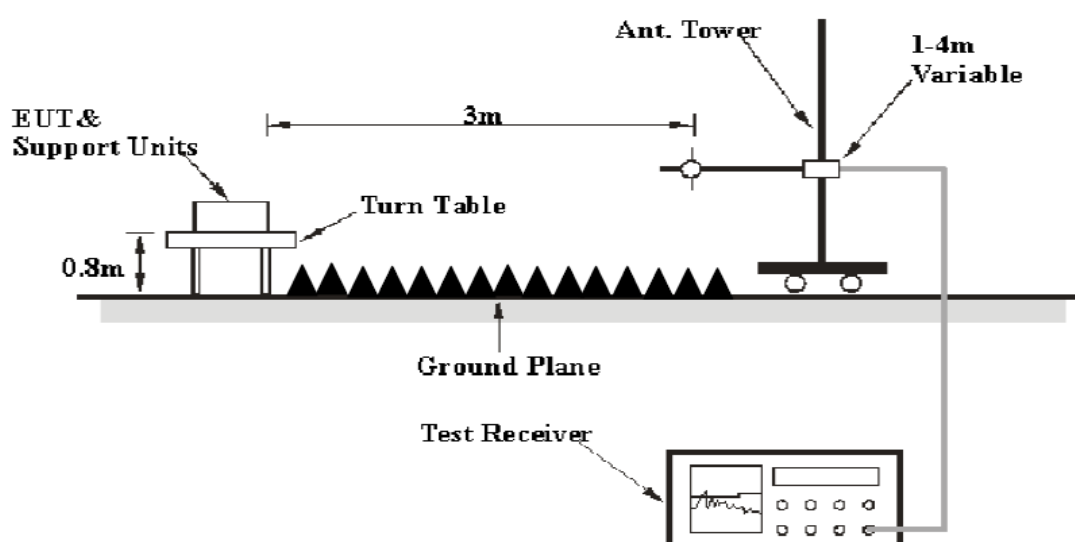
FCC §15.109

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

The spacing between the peripherals was 10 cm.

### EMI Test Receiver Setup

The system was investigated from 30 MHz to 13.5 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	Measurment
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Ave.

### 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 and PK and average detector 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:

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

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 Results Summary

According to the data in the following table, the EUT complied with the FCC §15.109 Class B,

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level is in compliance with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

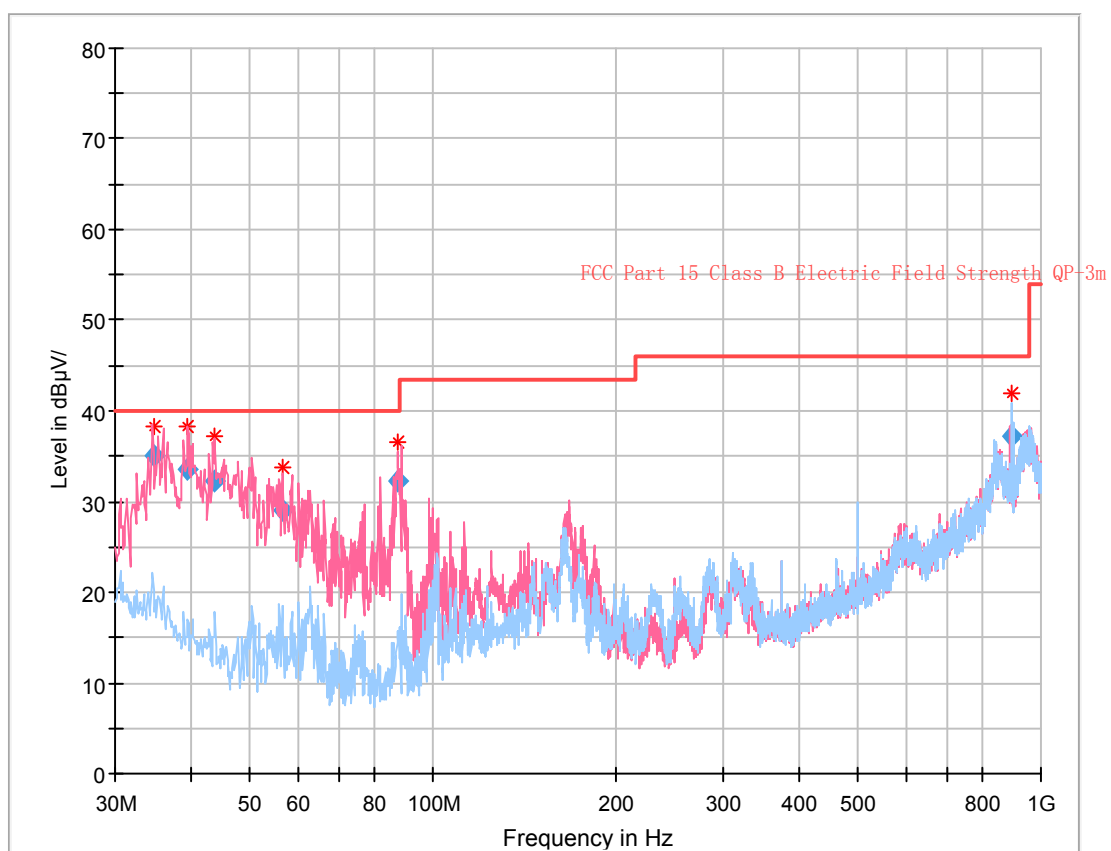
In BACL,  $U_{(Lm)}$  is less than  $U_{cispr}$ , if  $L_m$  is less than  $L_{lim}$ , it implies that the EUT complies with the limit.

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

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Kiki Kong on 2018-11-07.*

*EUT Operation Mode: Ping IP & Talking*

**30 MHz~1 GHz:**

Frequency (MHz)	Corrected Amplitude (dBμV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
34.646875	35.02	116.0	V	45.0	-10.3	40.00	4.98
39.498500	33.48	106.0	V	162.0	-13.4	40.00	6.52
43.798625	32.36	100.0	V	180.0	-16.4	40.00	7.64
56.520625	29.07	107.0	V	305.0	-20.0	40.00	10.93
87.465875	32.21	119.0	V	50.0	-19.3	40.00	7.79
893.011250	37.11	150.0	H	205.0	4.5	46.00	8.89



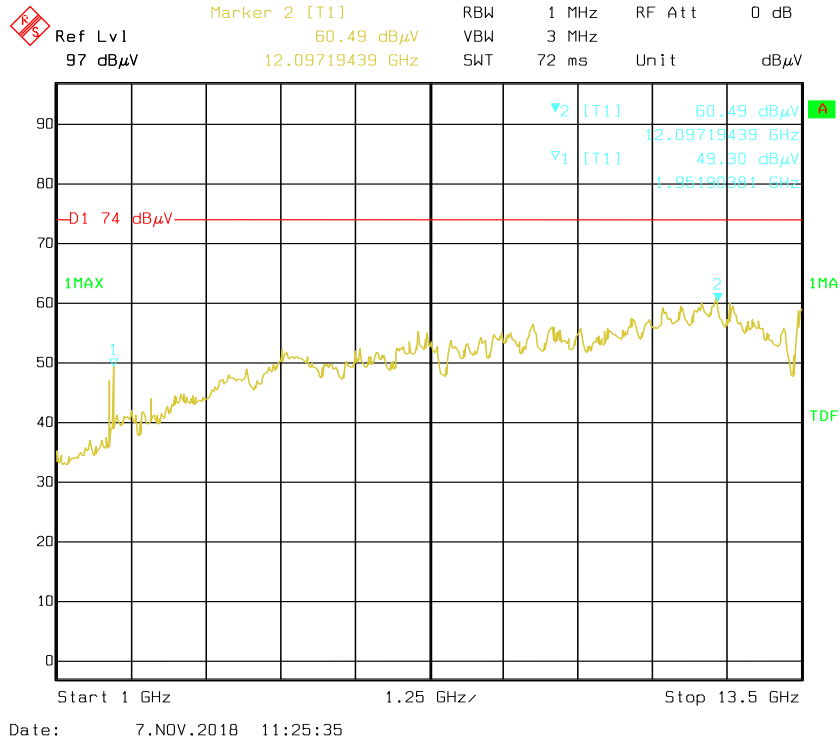
**1 GHz – 13.5 GHz:**

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBuV/m)	FCC Part 15B	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H / V)			Limit (dBuV/m)	Margin (dB)
1951.90	50.9	PK	238	2.2	H	-1.60	49.30	74	24.7
1951.90	37.29	Ave.	238	2.2	H	-1.60	35.69	54	18.31
1876.75	58.53	PK	191	1.9	V	-1.68	56.85	74	17.15
1876.75	54.26	Ave.	191	1.9	V	-1.68	52.58	54	1.42
2580.58	53.81	PK	314	1.6	H	-0.50	53.31	74	20.69
2580.58	51.19	Ave.	314	1.6	H	-0.50	50.69	54	3.31
2580.58	56.6	PK	335	1.2	V	-0.50	56.10	74	17.9
2580.58	49.79	Ave.	335	1.2	V	-0.50	49.29	54	4.71

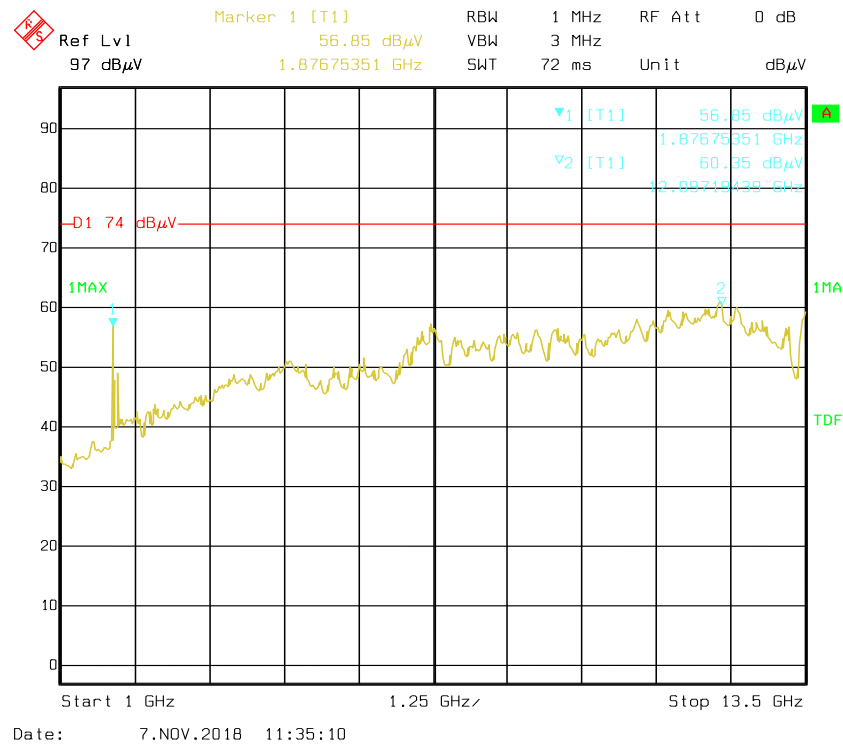
**Note:**

- 1) Correction Factor=Antenna factor (RX) + cable loss – amplifier factor
- 2) Corrected Amplitude = Correction Factor + Reading
- 3) Margin = Limit - Corrected Amplitude

**Pre-scan for peak**  
**Horizontal – Peak (1-13.5 GHz)**



**Vertical - Peak (1-13.5 GHz)**



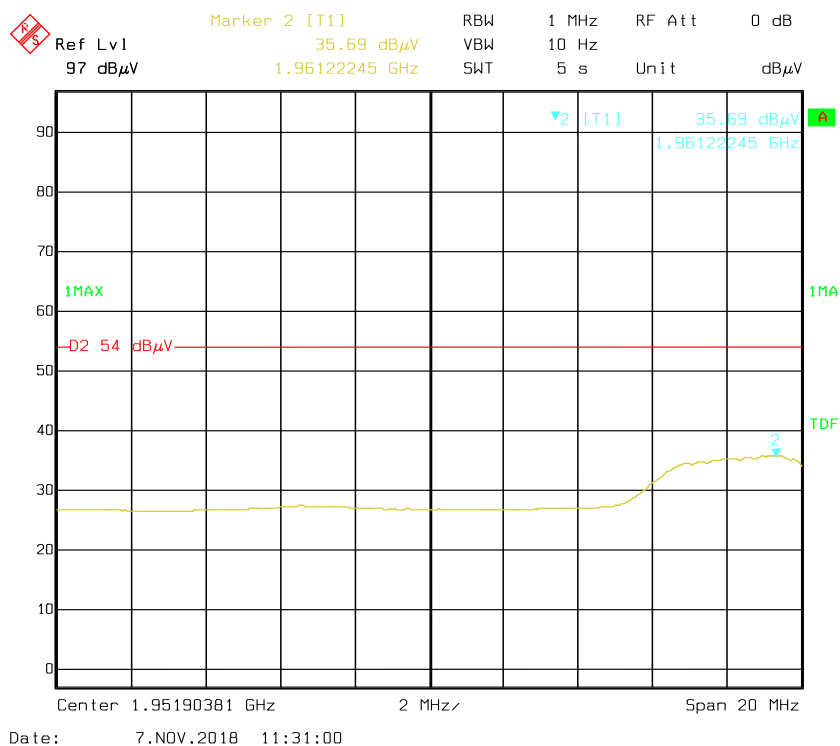
Ref Lvl 97 dBμV  
 Marker 2 [T1] 47.52 dBμV  
 12.08719439 GHz  
 RBW 1 MHz  
 VBW 10 Hz  
 SWT 5 s  
 RF Att 0 dB  
 Unit dBμV

90  
 80  
 70  
 60  
 50  
 40  
 30  
 20  
 10  
 0

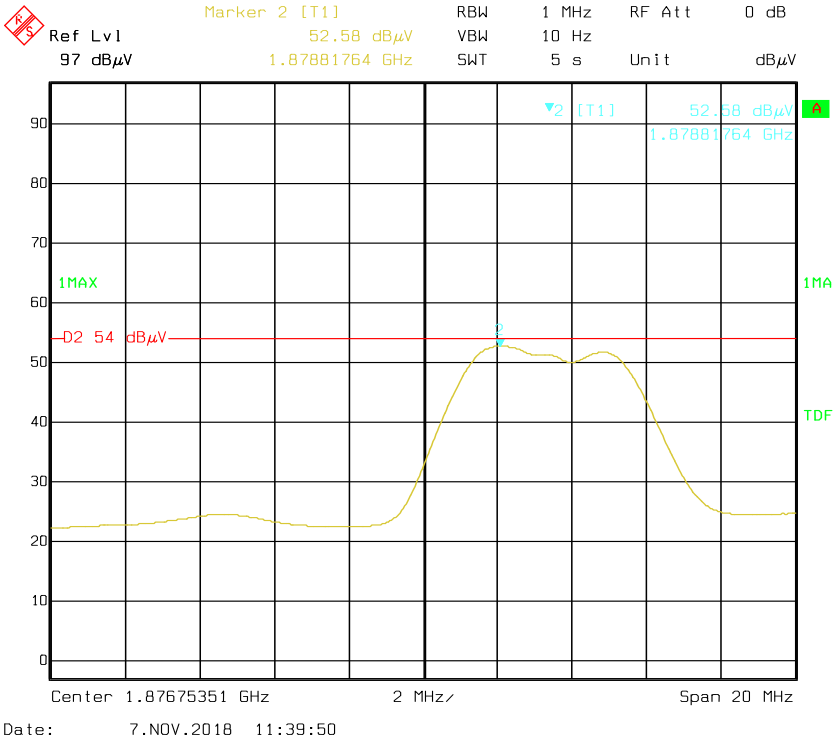
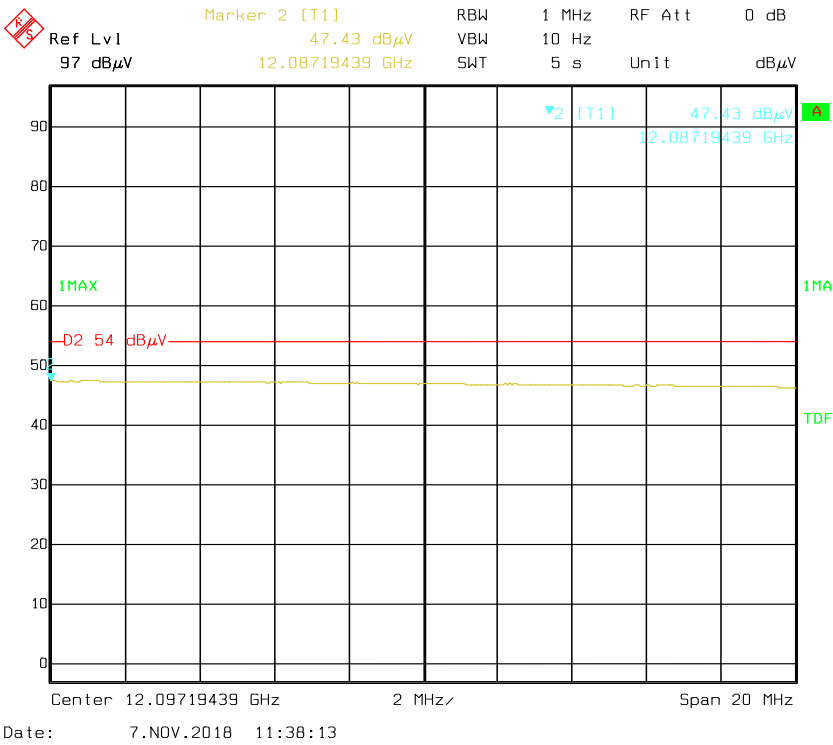
1MAX  
 D2 54 dBμV  
 2 [T1] 47.52 dBμV  
 12.08719439 GHz

Center 12.09719439 GHz  
 2 MHz  
 Span 20 MHz

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Vertical - Average



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