



EMC TEST REPORT

Applicant Positioning Universal Inc
FCC ID 2AHRH-FJ1000LMV
Product LTE Cat M1 Vehicle Telematics and
Radio Telecommunications Device
Model FJ1000LMV
Report No. R1808A0404-E1
Issue Date September 13, 2018

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC Code CFR47 Part15B (2018)/ ANSI C63.4 (2014)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Wei Liu

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Summary of measurement results

Number	Test Case	Clause in FCC Rules	Conclusion
1	Radiated Emission	15.109, ANSI C63.4-2014	PASS
2	Conducted Emission	15.107, ANSI C63.4-2014	PASS
Test Date: August 28, 2018~ September 7, 2018			

1 Test Laboratory

1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2 Test facility

CNAS (accreditation number: L2264)

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

IC (recognition number is 8510A)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

1.3 Testing Location

Company: TA Technology (Shanghai) Co., Ltd.
Address: No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China
City: Shanghai
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2 General Description of Equipment under Test

2.1 Client Information

Applicant	Positioning Universal Inc
Applicant address	4660 La Jolla Village Drive Suite 1100, San Diego, California, United States
Manufacturer	Positioning Universal Inc
Manufacturer address	4660 La Jolla Village Drive Suite 1100, San Diego, California, United States

2.2 General information

EUT Description			
Device Type:	Movable Device		
Model Number:	FJ1000LMV		
IMEI:	886326030002705		
HW Version:	TM120MV_P1		
SW Version:	LR5.1.1.0-37753		
Antenna Type:	Internal Antenna		
Frequency:	Band	Tx (MHz)	Rx (MHz)
	LTE Band 4	1710 ~ 1755	2110 ~ 2155
	LTE Band 13	777 ~ 787	746 ~ 756
Modulation:	LTE: QPSK / 16QAM		
Test Mode:	External power supply + EUT + Idle Mode		
Note: The information of the EUT is declared by the manufacturer.			



2.3 Applied Standards

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

Test standards

FCC Code CFR47 Part15B (2018)

ANSI C63.4 (2014)



2.4 Test Mode

Test Mode	
Mode 1	External power supply + EUT + Idle Mode

3 Test Case Results

3.1 Radiated Emission

Ambient condition

Temperature	Relative humidity	Pressure
24°C~26°C	45%~50%	102.5kPa

Methods of Measurement

The EUT is placed on a non-metallic table 0.8m above the horizontal metal reference ground plane. The distance between EUT and receive antenna should be 3 meters. During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.4-2014. Sweep the whole frequency band through the range from 30MHz to the 5th harmonic of the carrier. During the test, the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turn table shall be rotated from 0 to 360 degrees for detecting the maximum of radiated signal level.

The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing. During the test, the EUT is worked at maximum output power.

Set the spectrum analyzer in the following:

Below 1GHz:

RBW=100 kHz / VBW=300 kHz / Sweep=AUTO

Above 1GHz:

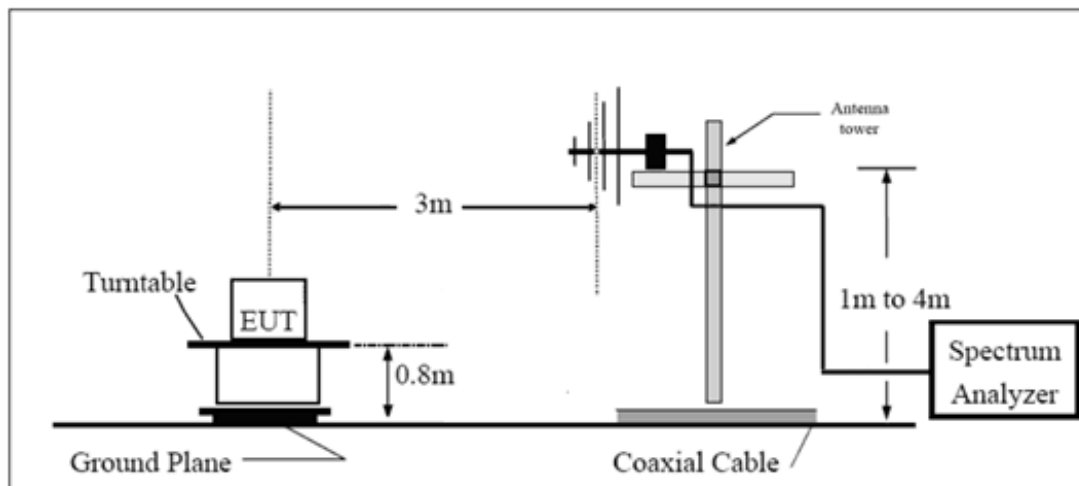
(a) PEAK: RBW=1MHz / VBW=3MHz/ Sweep=AUTO

(b) AVERAGE: RBW=1MHz / VBW=1Hz / Sweep=AUTO

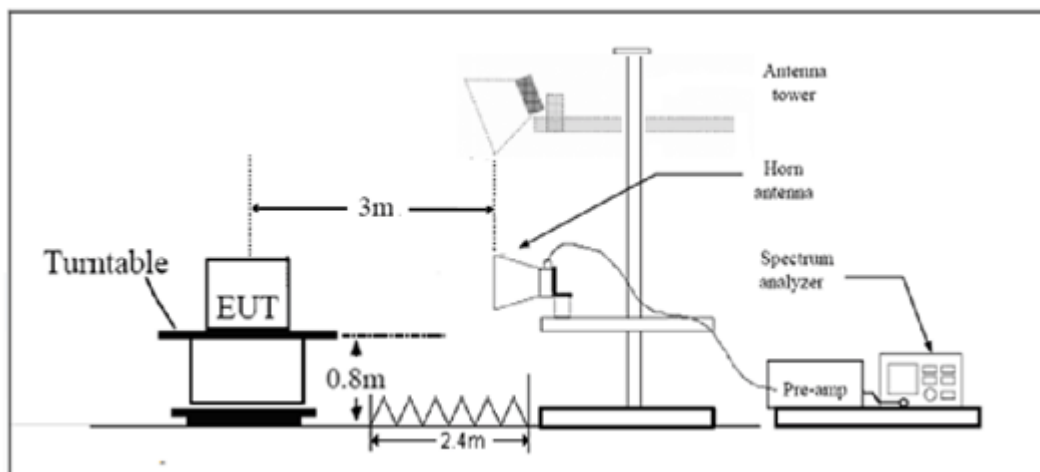
The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.

Test Setup

Below 1GHz



Above 1GHz



Note: Area side:2.4mX3.6m

Antenna Tower meets ANSI C63.4 requirements for measurements above 1 GHz by keeping the antenna aimed at the EUT during the antenna's ascent/ descent along the antenna mast.

Limits

Frequency (MHz)	Field Strength (dB μ V/m)	Detector
30 -88	40.0	Quasi-peak
88-216	43.5	Quasi-peak
216 – 960	46.0	Quasi-peak
960-1000	54.0	Quasi-peak
1000-5 th harmonic of the highest frequency or 40GHz, which is lower	54 74	Average Peak

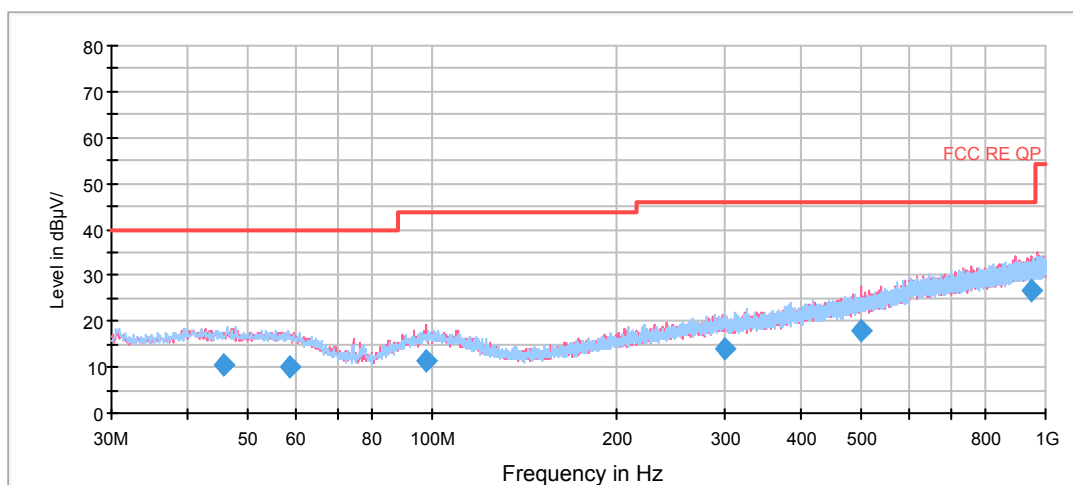
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$. $U = 3.704$ dB.

Test Results

The following graphs display the maximum values of horizontal and vertical by software.
For above 1GHz, Blue trace uses the peak detection, Green trace uses the average detection.

RE 0.03-1GHz QP Class B

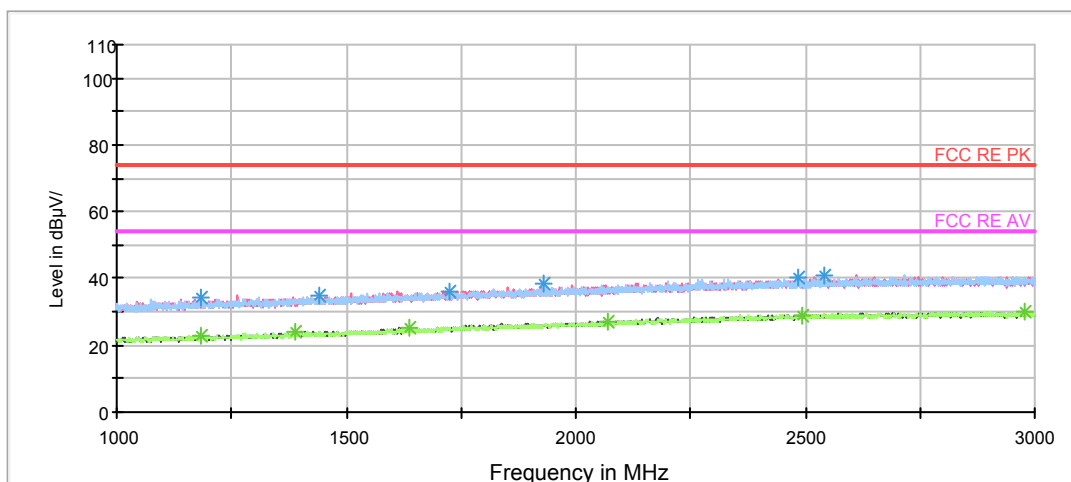


Radiated Emission from 30MHz to 1GHz

Frequency (MHz)	Quasi-Peak (dBuV/m)	Reading value (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
45.647500	10.3	-2.9	200.0	H	34.0	13.2	29.7	40.0
58.652500	10.0	-2.7	100.0	V	353.0	12.7	30.0	40.0
97.538750	11.2	-1.7	200.0	V	171.0	12.9	32.3	43.5
299.653750	13.9	-1.9	100.0	H	108.0	15.8	32.1	46.0
501.656250	18.1	-2.5	100.0	V	108.0	20.6	27.9	46.0
949.720000	26.6	-0.5	100.0	V	325.0	27.1	19.4	46.0

Remark: 1. Quasi-Peak = Reading value + Correction factor
2. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)
3. Margin = Limit – Quasi-Peak

RE 1G-6GHz PK+AV Class B

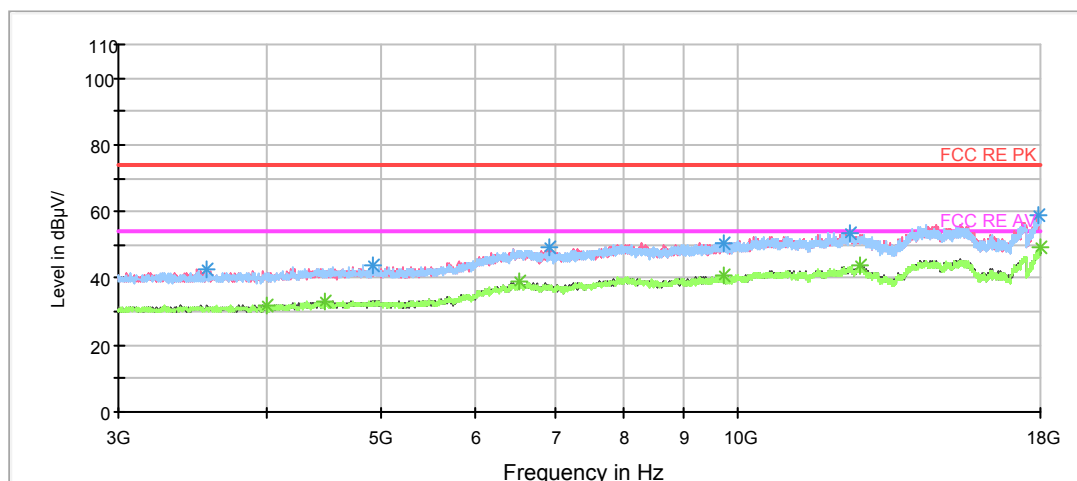


Radiated Emission from 1GHz to 3GHz

Frequency (MHz)	Peak (dBuV/m)	Reading value (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1185.500000	34.3	38.6	200.0	H	0.0	-4.3	39.7	74
1442.000000	34.7	37.9	100.0	H	26.0	-3.2	39.3	74
1725.500000	36.3	37.9	100.0	H	206.0	-1.6	37.7	74
1929.500000	38.2	38.7	200.0	H	0.0	-0.5	35.8	74
2483.500000	40.1	38.1	100.0	V	243.0	2.0	33.9	74
2541.000000	40.9	38.4	100.0	H	264.0	2.5	33.1	74

Frequency (MHz)	Average (dBuV/m)	Reading value (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1184.500000	22.7	27.0	200.0	V	0.0	-4.3	31.3	54
1387.000000	23.9	27.3	200.0	H	0.0	-3.4	30.1	54
1639.500000	25.4	27.6	100.0	V	164.0	-2.2	28.6	54
2068.000000	27.0	26.8	100.0	V	83.0	0.2	27.0	54
2494.000000	29.1	27.0	200.0	V	115.0	2.1	24.9	54
2976.500000	30.0	27.2	100.0	V	106.0	2.8	24.0	54

FCC RE 1G-18GHz PK+AV Class B



Radiated Emission from 3GHz to 18GHz

Frequency (MHz)	Peak (dBuV/m)	Reading value (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
3555.000000	42.7	46.8	200.0	H	359.0	-4.1	31.3	74
4927.500000	43.8	45.8	100.0	H	0.0	-2.0	30.2	74
6931.875000	49.1	45.5	200.0	V	7.0	3.6	24.9	74
9718.125000	50.6	43.4	200.0	H	280.0	7.2	23.4	74
12450.000000	53.5	41.2	200.0	V	149.0	12.3	20.5	74
17964.375000	58.9	40.3	100.0	H	153.0	18.6	15.1	74

Frequency (MHz)	Average (dBuV/m)	Reading value (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
3995.625000	31.9	35.1	200.0	V	7.0	-3.2	22.1	54
4477.500000	33.2	35.7	200.0	V	208.0	-2.5	20.8	54
6543.750000	38.8	34.6	200.0	H	178.0	4.2	15.2	54
9746.250000	41.0	34.0	200.0	V	0.0	7.0	13.0	54
12697.500000	43.6	31.3	200.0	V	224.0	12.3	10.4	54
17998.125000	49.1	30.1	200.0	V	7.0	19.0	4.9	54

3.2 Conducted Emission

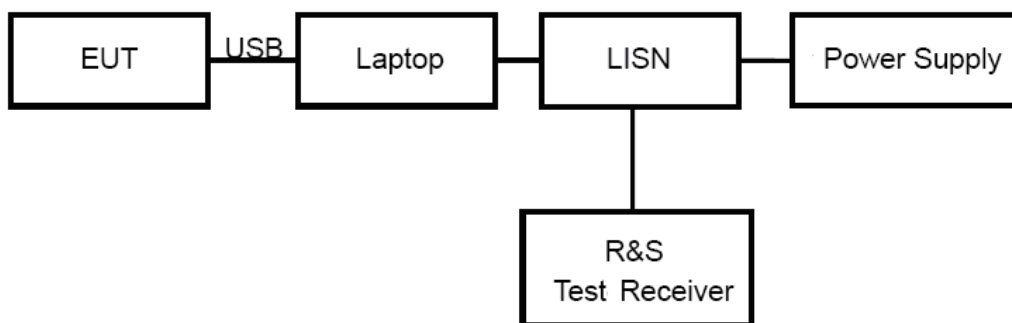
Ambient condition

Temperature	Relative humidity	Pressure
24°C ~26°C	50%~55%	102.5kPa

Methods of Measurement

The EUT is placed on a non-metallic table of 80cm height above the horizontal metal reference ground plane. During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.4-2014. Connect the AC power line of the EUT to the L.I.S.N. Use EMI receiver to detect the average and Quasi-peak value. RBW is set to 9 kHz, VBW is set to 30kHz. The measurement result should include both L line and N line.

Test Setup



Note: Power Supply is AC Power source and it is used to change the voltage 120V/60Hz.

Limits

Frequency (MHz)	Conducted Limits(dB μ V)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46 *
0.5 - 5	56	46
5 - 30	60	50
*: Decreases with the logarithm of the frequency.		

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$. $U = 2.57$ dB.



Test Results

The equipment doesn't connect to public network, therefore this requirement does not apply.

4 Main Test Instrument

Name	Manufacturer	Type	Serial Number	Last Cal.	Cal. Due Date
Signal Analyzer	R&S	FSV30	100815	2017-12-17	2018-12-16
EMI Test Receiver	R&S	ESCI	100948	2018-05-20	2019-05-19
Trilog Antenna	SCHWARZBECK	VULB 9163	9163-201	2017-11-18	2019-11-17
Horn Antenna	R&S	HF907	100126	2018-07-07	2020-07-06
EMI Test Receiver	R&S	ESR	101667	2018-05-20	2019-05-19
LISN	R&S	ENV216	101171	2016-12-16	2019-12-15
Bore Sight Antenna mast	ETS	2171B	00058752	/	/
Test software	EMC32	R&S	9.26.0	/	/

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

ANNEX A: The EUT Appearance and Test Configuration

A.1 EUT Appearance



Picture 1 EUT

A.2 Test Setup



a: Below 1GHz



b: Above 1GHz

Picture 2 Radiated Emission Test Setup