MEASUREMENT REPORT
FCC Part 15B

FCC ID:	2AMR2DL
APPLICANT:	United Automotive Electronic Systems Co., Ltd.
Application Type:	Certification
Product:	GEM BCM
Model No.:	LV2 low
FCC Rule Part(s):	FCC Part 15 Subpart B: 2018 Class B
Test Procedure(s):	ANSI C63.4: 2014
Test Date:	May 09, 2019

Reviewed By: (Kevin Guo)

Approved By: (Robin Wu)

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

The test results relate only to the samples tested.
This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2014. Test results reported herein relate only to the item(s) tested.
The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
1811WSU026-U2	Rev. 01	Initial report	05-09-2019	Valid

CONTENTS

§2.1033 General Information

Applicant:	United Automotive Electronic Systems Co., Ltd.
Applicant Address:	No. 555 Rong Qiao Road, Pudong New Area, Shanghai, China
Manufacturer:	United Automotive Electronic Systems Co., Ltd.
Manufacturer Address:	No. 555 Rong Qiao Road, Pudong New Area, Shanghai, China
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- **MRT facility is a FCC registered (MRT Reg. No. 893164) test facility with the site description report on file and has met all the requirements specified in ANSI C63.4-2014.**
- **MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.**
- **MRT facility is a VCCI registered (R-20025, G-20034, C-20020, T-20020) test laboratory with the site description on file at VCCI Council.**
- **MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications, Radio and SAR testing.**


Accredited Laboratory

A2LA has accredited

MRT TECHNOLOGY (SUZHOU) CO., LTD.

Suzhou, Jiangsu, People's Republic of China

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

Presented this 24th day of July 2018.

President and CEO
For the Accreditation Council
Certificate Number 3628.01
Valid to August 31, 2020

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

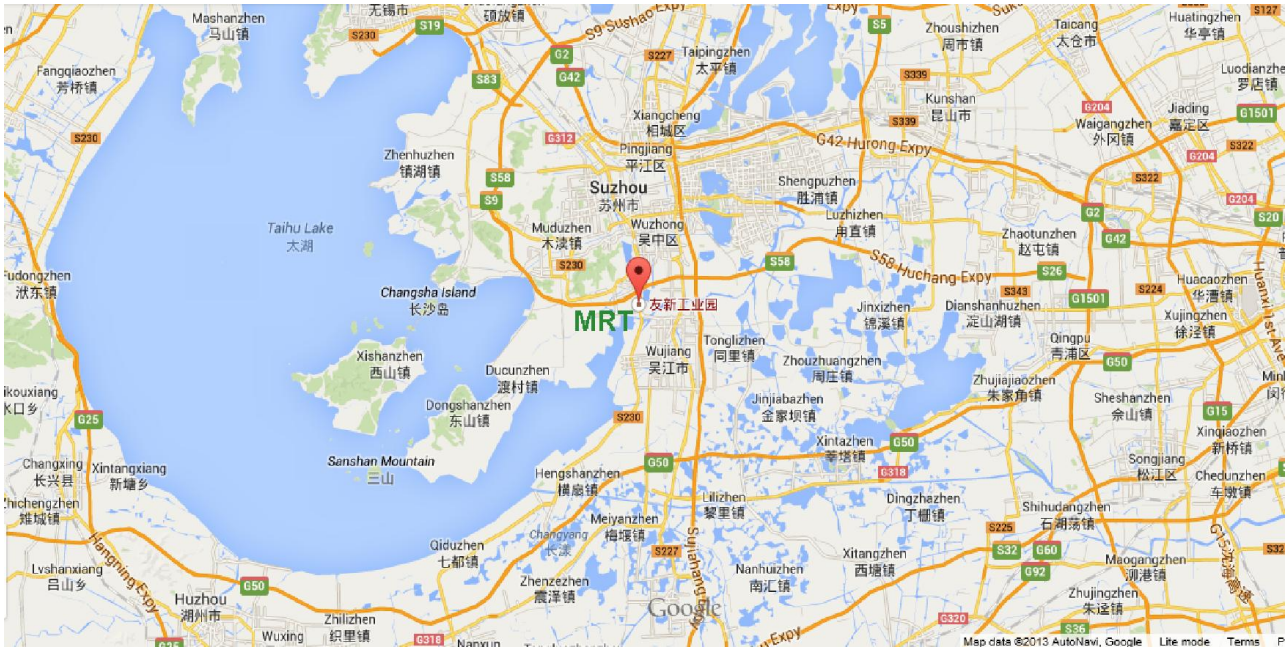
1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The measurement facility compliant with the test site requirements specified in ANSI C63.4-2014.



2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name:	GEM BCM
Model No.:	LV2 low
Transmitting Frequency:	125KHz
Reception Frequency:	433.92MHz
Operation Voltage:	DC 12V (battery power)

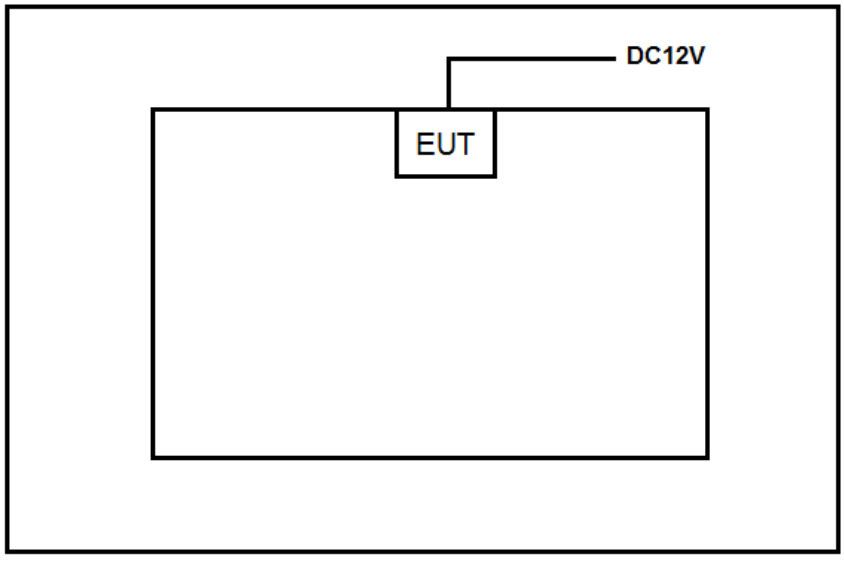
2.2. Test Mode

Test Mode	
EMI Mode	Mode 1: 125KHz and 433.92MHz worked in the same time.

2.3. Test Configuration

The EUT was tested per the guidance FCC Part 15 Subpart B: 2018 and ANSI C63.4: 2014 was used to reference the appropriate EUT setup for radiated emissions testing and AC line conducted testing.

Connection Diagram (Mode 1)



Product		Manufacturer	Model No.	Serial No.	Power Cord
1	DC Power Supply	Guwei	DPS-3303C	N/A	Non-Shielded, 1.5m

2.4. Test Software

Not Applicable.

3. DESCRIPTION OF TEST

3.1. Evaluation Procedure

The measurement procedures described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical Equipment in the Range of 9kHz to 40GHz (ANSI C63.4-2014) was used in the measurement of the Equipment under test.

Deviation from measurement procedure…….....None

3.2. AC Line Conducted Emissions

The line-conducted facility is located inside an 8'x4'x4' shielded enclosure. A 1m x 2m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50uH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply line(s) will be connected to the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference ground-plane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the receiver and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The receiver was scanned from 150 kHz to 30 MHz. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 9 kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or resolution, clock or data exchange speed, scrolling H pattern to the EUT and/or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions are used for final measurements on the same test site.

Line conducted emissions test results are shown in Section 6.1.

3.3. Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. An MF Model 210SS turntable is used for radiated measurement. It is a continuously rotatable, remote controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm high PVC support structure is placed on top of the turntable.
For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30 MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30 MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 0.8 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, mode of operation, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.
Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions. According to 3dB beam-width of horn antenna, the horn antenna should be always directed to the EUT when rising height.

4. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions - SR2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06185	1 year	2020/04/15
Two-Line V-Network	R&S	ENV 216	MRTSUE06002	1 year	2019/06/14
Two-Line V-Network	R&S	ENV 216	MRTSUE06003	1 year	2019/06/14
Thermohygrometer	Testo	608-H1	MRTSUE06404	1 year	2019/08/14
Shielding Anechoic Chamber	MIX-BEP	Chamber-SR2	MRTSUE06214	N/A	N/A

Radiated Emissions - AC1

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2019/08/13
PXA Signal Analyzer	Keysight	9030B	MRTSUE06395	1 year	2019/09/25
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2020/03/31
Broad Band Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2019/10/19
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2019/11/16
Thermohygrometer	Testo	608-H1	MRTSUE06403	1 year	2019/08/14
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	1 year	2020/05/01

Radiated Emission - AC2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Keysight	N9038A	MRTSUE06125	1 year	2019/08/13
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2019/10/19
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06171	1 year	2019/11/09
Broadband Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2019/11/16
Temperature/Humidity Meter	Minggao	ETH529	MRTSUE06170	1 year	2019/12/13
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2020/05/01

Software	**Version**	**Function**
EMI Software	V3	EMI Test Software

5. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

AC Conducted Emission Measurement - SR2
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 150kHz~30MHz: 3.46dB
Radiated Emission Measurement - AC1
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz ~ 1GHz: 4.18dB 1GHz ~ 25GHz: 4.76dB
Radiated Emission Measurement - AC2
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz ~ 1GHz: 3.86dB 1GHz ~ 25GHz: 4.33dB

6. TEST RESULT

6.1. Summary

FCC Part Section(s)	Test Description	Test Result
15.107	Conducted Emissions	N/A
15.109	Radiated Emissions	Pass

Note: “N/A” means that this item is not applicable, and the detail information refers to relevant section.

6.2. Conducted Emission Measurement

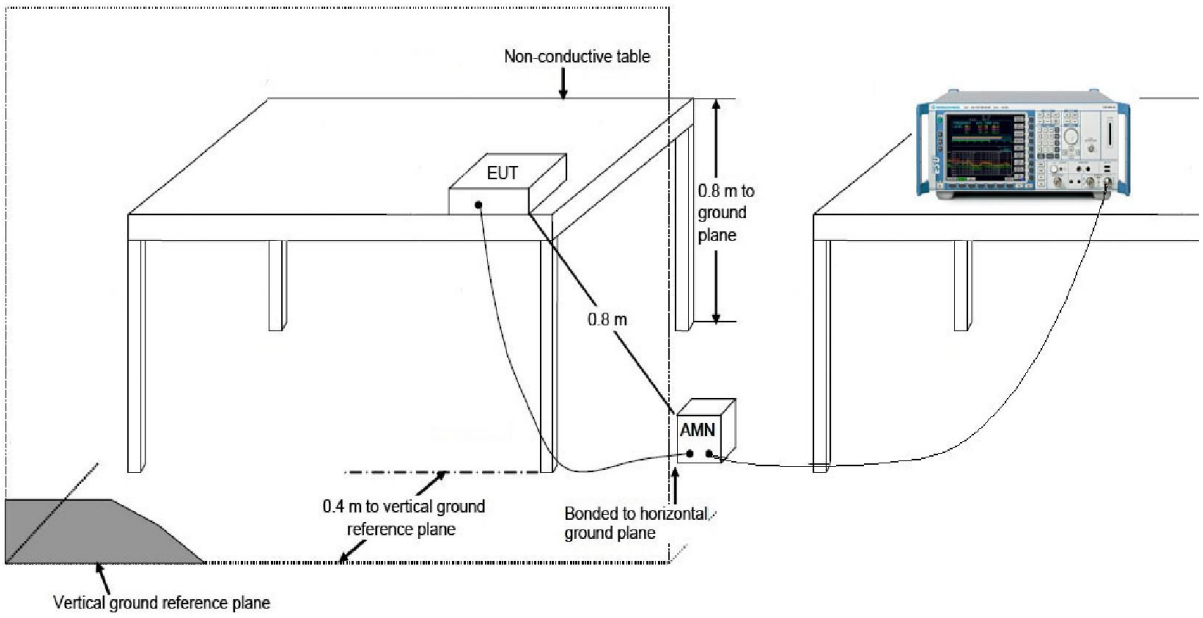
6.2.1.Test Limit

FCC Part 15.107 Limits		
Frequency (MHz)	QP (dBμV)	AV (dBμV)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

6.2.2.Test Setup



6.2.3.Test Result

Power supply of EUT is by DC source, so this item is not applicable.

6.3. Radiated Emission Measurement

6.3.1.Test Limit

FCC Part 15.109 Limits		
Frequency (MHz)	Distance (m)	Level (dBμV/m)
30 - 88	3	40
88 - 216	3	43.5
216 - 960	3	46
Above 960	3	54

Note 1: The lower limit shall apply at the transition frequency.

Note 2: Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

Note 3: E field strength (dBμV/m) = 20 log E field strength (uV/m)

6.3.2.Test Frequency selected

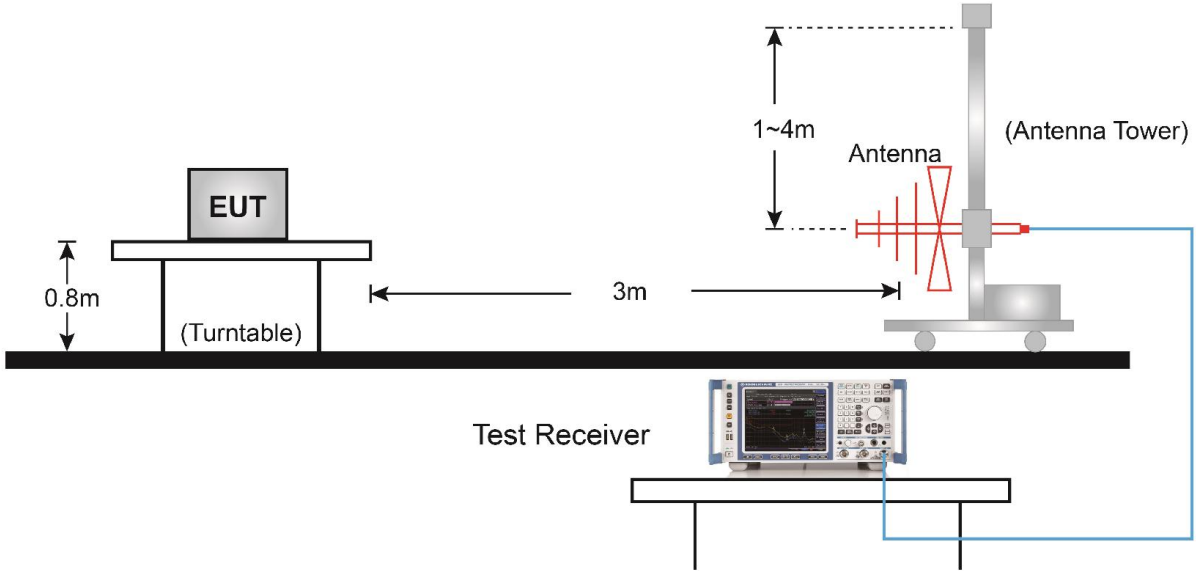
For an unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a radiated emission limit is specified, up to the frequency shown in the following table:

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705 - 108	1000
108 - 500	2000
500 - 1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

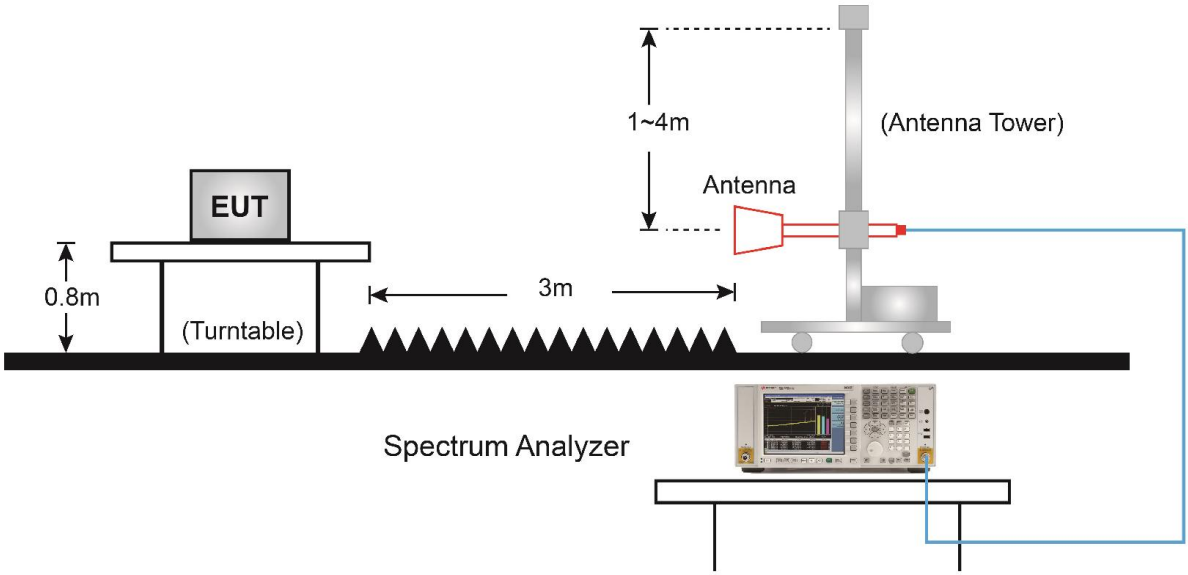
Note: Highest frequency generated or used in this device is 433.92MHz.

6.3.3.Test Setup

30MHz ~ 1GHz Test Setup:

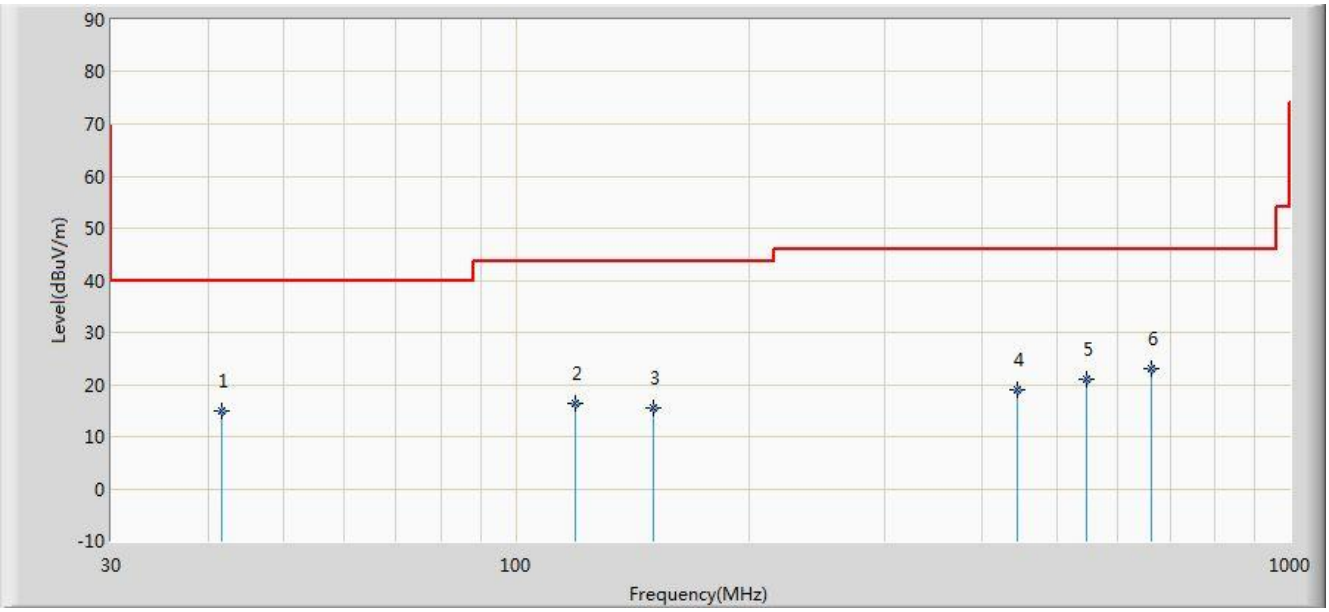


1GMHz ~ 18GHz Test Setup:



6.3.4.Test Result

Site: AC1	Time: 2019/05/09 - 15:20
Limit: FCC_Part15.109_RSE(3m)	Engineer: Bacon Dong
Probe: VULB 9168 _20-2000MHz	Polarity: Horizontal
EUT: GEM BCM	Power: DC 12V
Note: Mode 1	

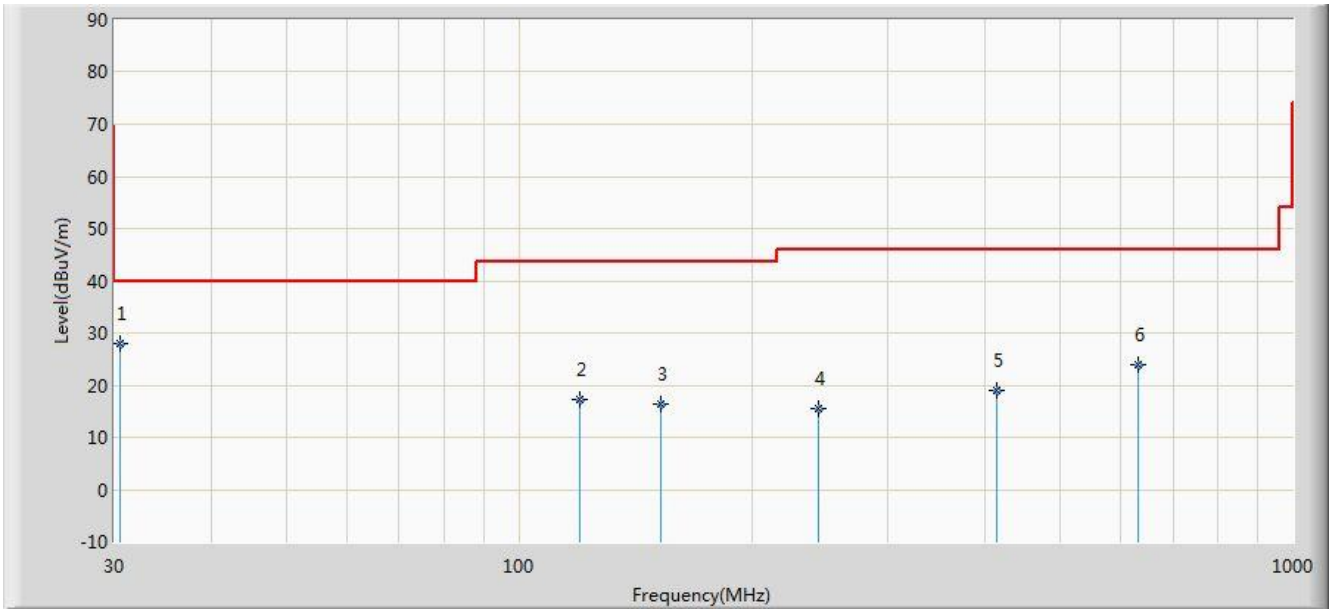


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			41.648	14.945	0.374	-25.055	40.000	14.570	QP
2			119.340	16.271	3.017	-27.229	43.500	13.254	QP
3			150.546	15.566	0.178	-27.934	43.500	15.388	QP
4			444.156	18.963	1.024	-27.037	46.000	17.938	QP
5			546.017	21.047	1.243	-24.953	46.000	19.804	QP
6		*	661.165	22.966	1.022	-23.034	46.000	21.944	QP

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2019/05/09 - 15:21
Limit: FCC_Part15.109_RSE(3m)	Engineer: Bacon Dong
Probe: VULB 9168 _20-2000MHz	Polarity: Vertical
EUT: GEM BCM	Power: DC 12V
Note: Mode 1	

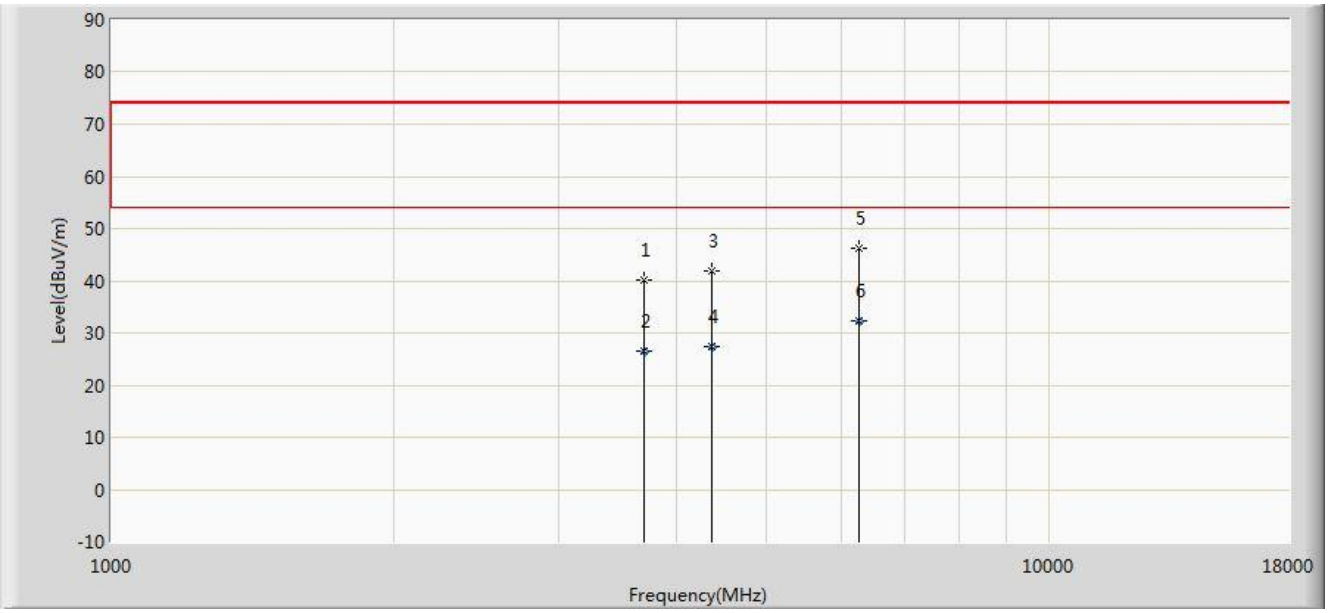


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	30.561	27.841	14.050	-12.159	40.000	13.791	QP
2			119.725	17.356	4.070	-26.144	43.500	13.286	QP
3			152.220	16.319	0.918	-27.181	43.500	15.401	QP
4			243.400	15.606	2.544	-30.394	46.000	13.062	QP
5			414.120	18.927	1.810	-27.073	46.000	17.118	QP
6			630.915	23.901	2.376	-22.099	46.000	21.525	QP

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2019/05/09 - 11:47
Limit: FCC_Part15.109_RE(3m)_ClassB	Engineer: Bacon Dong
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: GEM BCM	Power: DC 12V
Note: Mode 1	

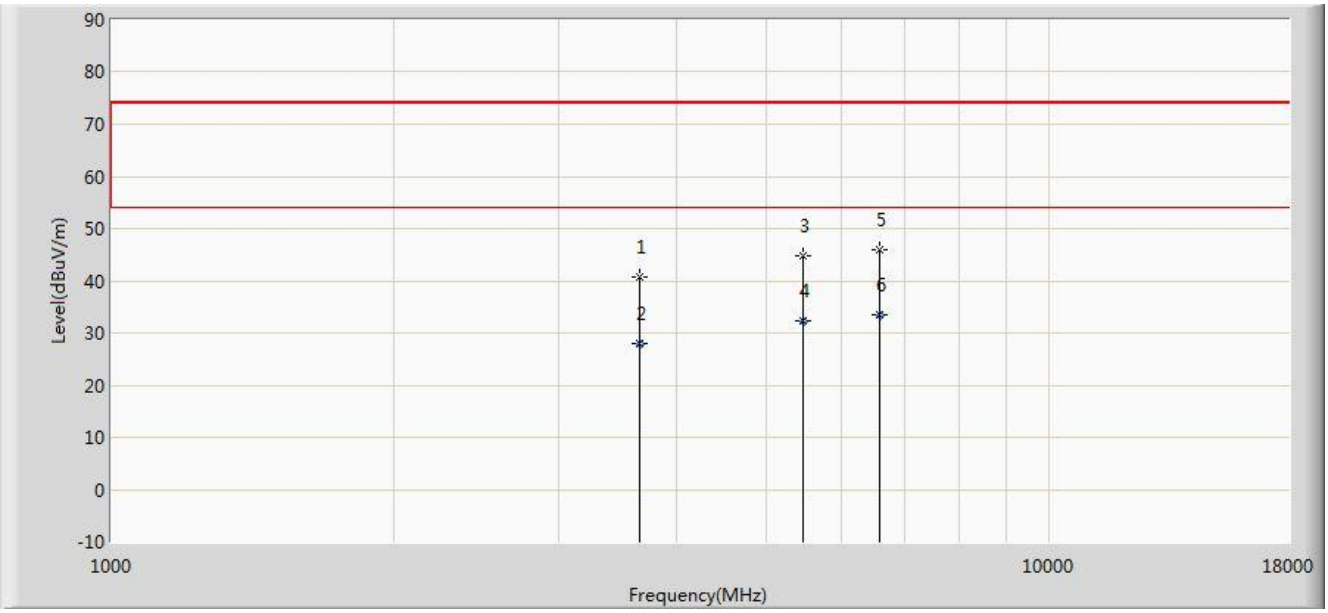


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			3703.000	40.262	38.786	-33.738	74.000	1.476	PK
2			3703.000	26.553	25.077	-27.447	54.000	1.476	AV
3			4366.000	41.785	37.896	-32.215	74.000	3.889	PK
4			4366.000	27.359	23.470	-26.641	54.000	3.889	AV
5			6278.500	46.248	37.868	-27.752	74.000	8.380	PK
6		*	6278.500	32.420	24.040	-21.580	54.000	8.380	AV

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Site: AC1	Time: 2019/05/09 - 11:47
Limit: FCC_Part15.109_RE(3m)_ClassB	Engineer: Bacon Dong
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: GEM BCM	Power: DC 12V
Note: Mode 1	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			3660.500	40.663	39.239	-33.337	74.000	1.424	PK
2			3660.500	27.854	26.430	-26.146	54.000	1.424	AV
3			5462.500	44.826	38.225	-29.174	74.000	6.602	PK
4			5462.500	32.268	25.667	-21.732	54.000	6.602	AV
5			6601.500	46.085	36.368	-27.915	74.000	9.717	PK
6		*	6601.500	33.457	23.740	-20.543	54.000	9.717	AV

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

7. CONCLUSION

The data collected relate only the item(s) tested and show that the **GEM** has been tested to comply with the requirements specified in §15.107 / §15.109 of the FCC Rules.

The End

Appendix A - Test Setup Photograph

Refer to “1811WSU026-UT” file.

Appendix B - EUT Photograph

Refer to “1811WSU026-UE” file.