FCC Test Report

FCC ID	:	**2APOM-MQBA0**
Equipment	:	**MQBA0**
Model No.	:	**MQBA0**
Brand Name	:	**Magneti Marelli**
Applicant	:	**Magneti Marelli Electronic Systems**
Address	:	**Avenida Emancipacao, Parque Pinheiros, SP 801,Hortolandia,Brazil,13184654**
Standard	:	**47 CFR FCC Part 15.209**
Received Date	:	**Apr. 11, 2018**
Tested Date	:	**Apr. 19, 2018**

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by: **Approved by:**

Along Chen / Assistant Manager **Gary Chang / Manager**

Testing Laboratory 2732

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Release Record

Report No.	Version	Description	Issued Date
FR841102	Rev. 01	Initial issue	Jun. 28, 2018

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	Note	N/A
15.209	Radiated Emissions	[dBuV/m at 3m]: 39.70MHz 26.79 (Margin -13.21dB) - PK	Pass
Note: The EUT consumes DC power from battery, therefore this test is not required.			

1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information				
Frequency Range (kHz)	**Modulation**	**Ch. Frequency (kHz)**	**Channel Number**	**Data Rate**
125	ASK	125	1	5.2kbit/s

1.1.2 Antenna Details

Ant. No.	Type	Gain (dBi)	Connector	Remark
1	Inductive Loop	8	Molex 94242-2618	---

1.1.3 EUT Operational Condition

Supply Voltage	12Vdc from battery

1.1.4 Accessories

N/A

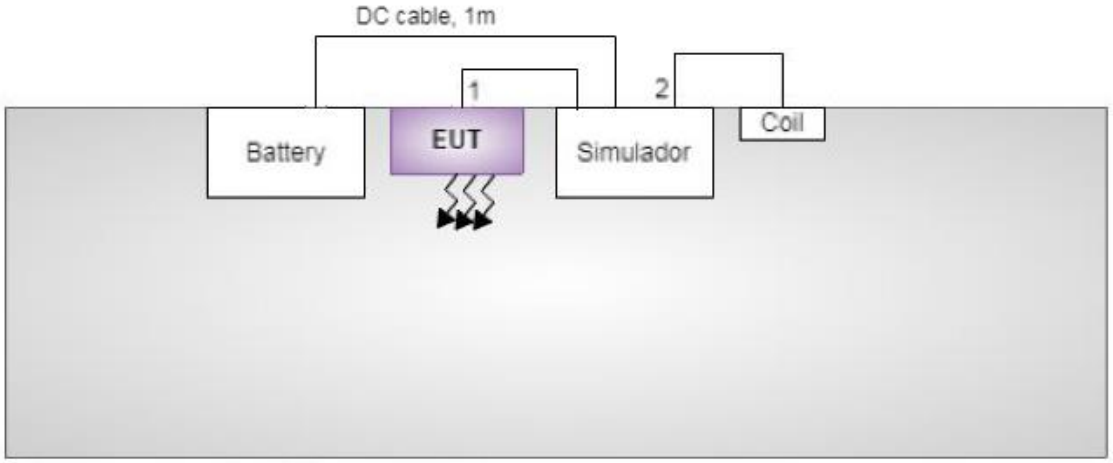
1.2 Local Support Equipment List

Support Equipment List					
No.	**Equipment**	**Brand**	**Model**	**S/N**	**Signal cable / Length (m)**
1	Simulador	Labtrix	---	---	Test harness cable, 1.76m non-shielded.
2	Test harness	---	---	---	Ignition switch with immobilizer antenna coil cable, 0.69m non-shielded.
3	Battery	YUASA	36B20R(S)	---	---

Note: No.1-2 were provided by applicant.

1.3 Test Setup Chart

Test Setup Diagram



1. Test harness cable, 1.76m non-shielded.
2. Ignition switch with immobilizer antenna coil cable, 0.69m non-shielded.

1.4 The Equipment List

Test Item	Radiated Emission				
Test Site	966 chamber 2 / (03CH02-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	Agilent	N9010A	MY53400091	Nov. 15, 2017	Nov. 14, 2018
Receiver	Agilent	N9038A	MY53290044	Sep. 26, 2017	Sep. 25, 2018
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-523	Nov. 10, 2017	Nov. 09, 2018
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 13, 2017	Nov. 12, 2018
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Dec. 07, 2017	Dec. 06, 2018
Preamplifier	EMC	EMC02325	980194	Sep. 25, 2017	Sep. 24, 2018
Preamplifier	Agilent	83017A	MY39501309	Sep. 25, 2017	Sep. 24, 2018
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16140/4	Dec. 06, 2017	Dec. 05, 2018
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16018/4	Dec. 06, 2017	Dec. 05, 2018
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16015/4	Dec. 06, 2017	Dec. 05, 2018
LF cable 1M	EMC	EMCCFD400-NM-NM-1000	16051	Dec. 06, 2017	Dec. 05, 2018
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-003	Dec. 06, 2017	Dec. 05, 2018
LF cable 10M	EMCC	CFD400-E	CFD400-001	Dec. 06, 2017	Dec. 05, 2018
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

According to the specification of EUT, the EUT must comply with following standards and KDB documents.

47 CFR FCC Part 15.209
ANSI C63.10-2013

1.6 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Measurement Uncertainty	
Parameters	**Uncertainty**
Radiated emission	±3.62 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
Radiated Emissions	03CH02-WS	22°C / 62%	Akun Cung

- FCC site registration No.: 181692
- IC site registration No.: 10807A-2

2.2 The Worst Test Modes and Channel Details

Test item	Modulation Mode	Test Frequency (kHz)
Radiated Emissions	ASK	125

NOTE:

1. The EUT was pretested with 2 orientations placed on the table for the radiated emission measurement –Horizontal and Vertical. The Horizontal result was found as the worst case and was shown in this report.

3 Transmitter Test Results

3.1 Radiated Emissions

3.1.1 Limit of Radiated Emissions

Restricted Band Emissions Limit			
Frequency Range (MHz)	**Field Strength (uV/m)**	**Field Strength (dBuV/m)**	**Measure Distance (m)**
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29.54	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1:
Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit
Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.1.2 Test Procedures

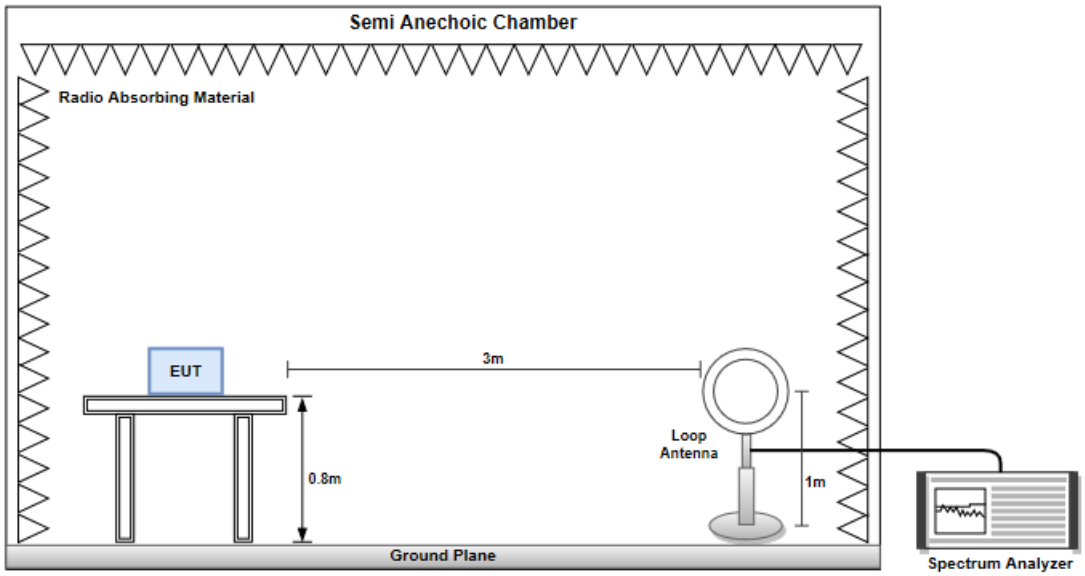
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at a height of 0.8 m test table above the ground plane.
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

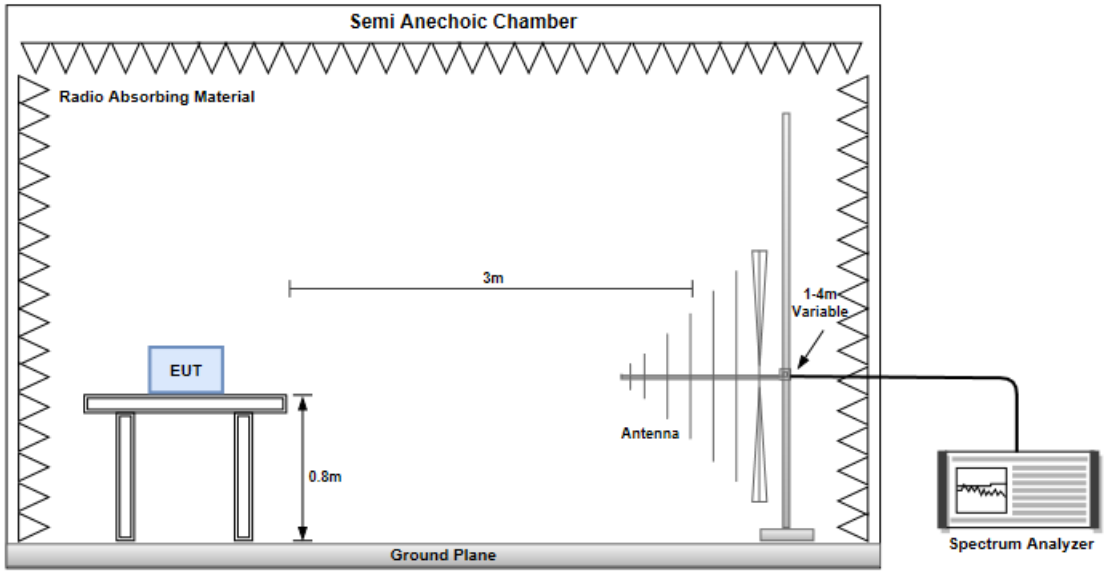
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. Correction values between measurement form the semi-anechoic chamber and open-field test site have been confirmed and added to the factor.

3.1.3 Test Setup

Radiated Emissions below 30MHz



Radiated Emissions below 1 GHz



3.1.4 Transmitter Radiated Unwanted Emissions (9kHz ~ 1.705MHz)

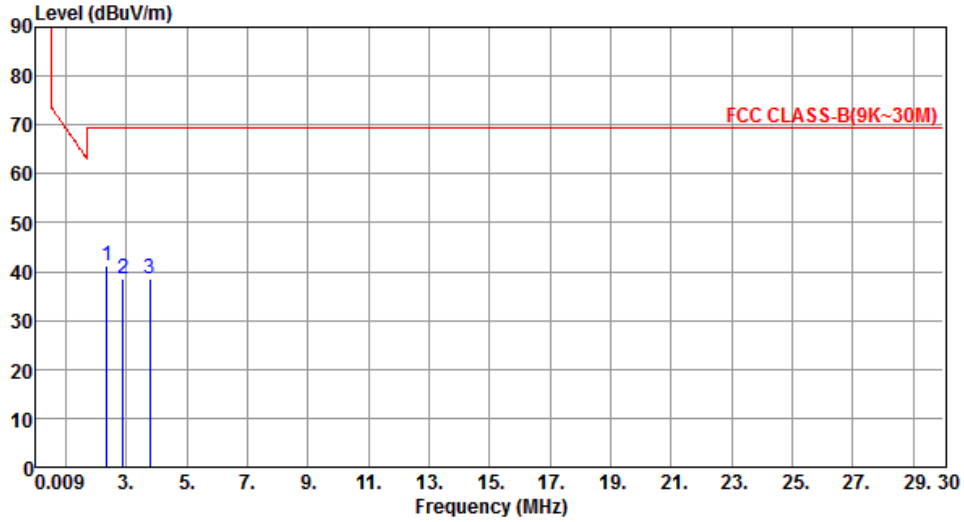
Polarization		Loop Open					
Frequency (MHz)		Emission Level dBuV/m	Limit (dBuV/m)	Margin (dB)	SA Reading (dBuV/m)	Factor	Remark
1	**0.125**	**80.97**	**105.67**	**-24.7**	**58**	**22.97**	**Average**
2	0.125	81.07	125.67	-44.6	58.1	22.97	Peak
3	0.375	47.3	96.12	-48.82	25	22.3	Average
4	0.375	49.7	116.12	-66.42	27.4	22.3	Peak
5	0.625	41.91	71.69	-29.78	19.7	22.21	QP

Polarization		Loop Close					
Frequency (MHz)		Emission Level dBuV/m	Limit (dBuV/m)	Margin (dB)	SA Reading (dBuV/m)	Factor	Remark
1	**0.125**	**76.57**	**105.67**	**-29.1**	**53.6**	**22.97**	**Average**
2	0.125	76.68	125.67	-48.99	53.6	22.97	Peak
3	0.375	43	96.12	-53.12	20.7	22.3	Average
4	0.375	46.4	116.12	-69.72	24.1	22.3	Peak
5	0.625	39.61	71.69	-32.08	17.4	22.21	QP

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB).
*Factor includes antenna factor and cable loss.
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

3.1.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

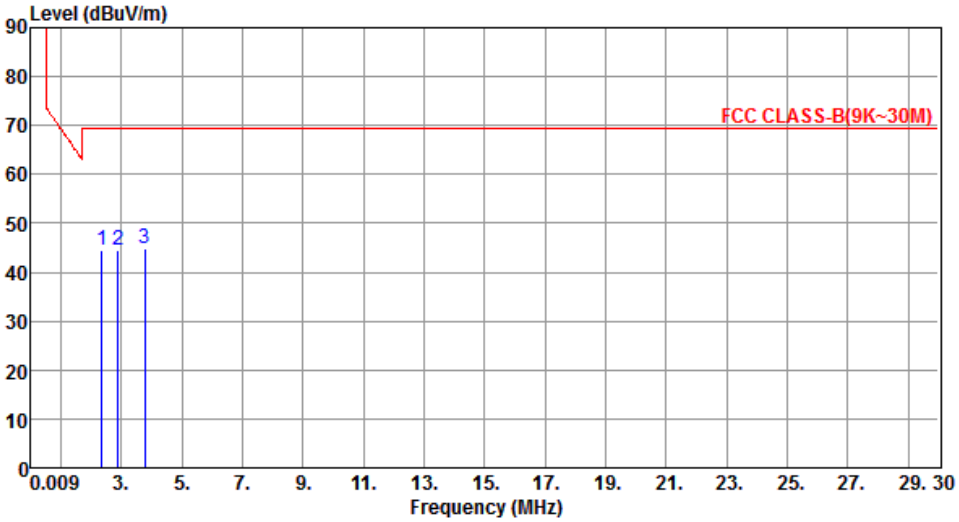
Polarization	Loop Open	Test Freq. (kHz)	125



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2.35	41.25	69.54	-28.29	19.93	21.32	QP	---	---
2	2.89	38.60	69.54	-30.94	17.57	21.03	QP	---	---
3	3.76	38.57	69.54	-30.97	17.32	21.25	QP	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor (dB)
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m)

Polarization	Loop Close	Test Freq. (kHz)	125

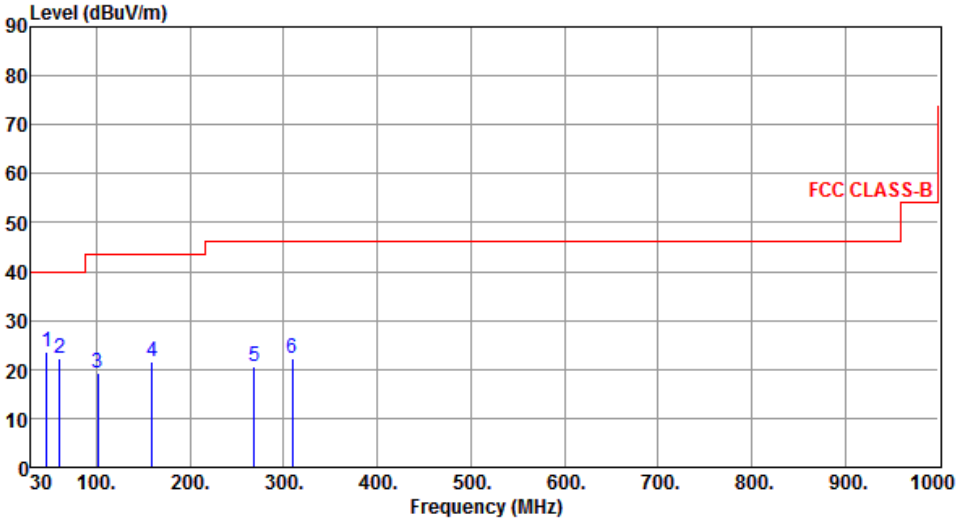


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2.35	44.58	69.54	-24.96	23.26	21.32	QP	---	---
2	2.89	44.62	69.54	-24.92	23.59	21.03	QP	---	---
3	3.76	44.91	69.54	-24.63	23.66	21.25	QP	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor (dB)
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m)

3.1.6 Transmitter Radiated Unwanted Emissions (Above 30MHz)

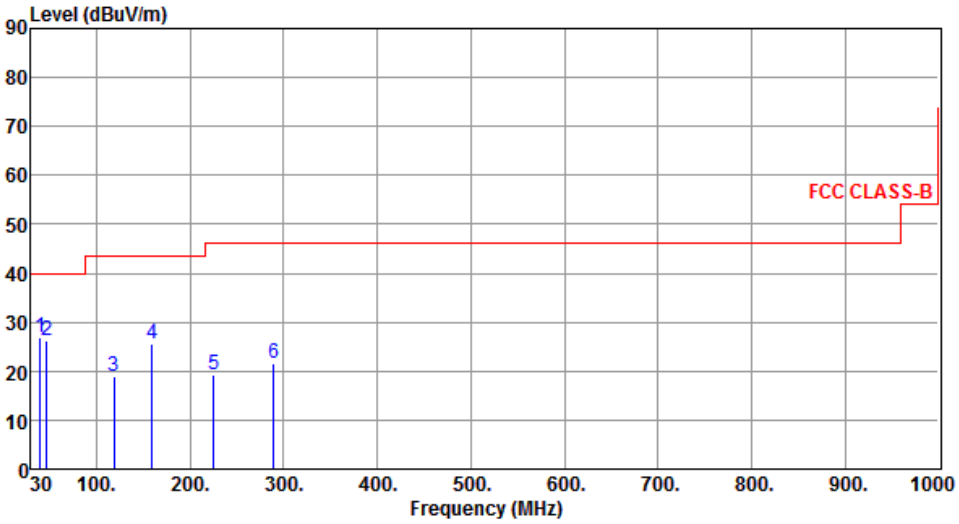
Polarization	Horizontal	Test Freq. (kHz)	125



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	46.49	23.63	40.00	-16.37	31.36	-7.73	Peak	---	---
2	61.04	22.28	40.00	-17.72	30.96	-8.68	Peak	---	---
3	101.78	19.25	43.50	-24.25	31.96	-12.71	Peak	---	---
4	159.01	21.74	43.50	-21.76	29.95	-8.21	Peak	---	---
5	268.62	20.56	46.00	-25.44	29.13	-8.57	Peak	---	---
6	309.36	22.16	46.00	-23.84	29.57	-7.41	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m)

Polarization	Vertical	Test Freq. (kHz)	125



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	39.70	26.79	40.00	-13.21	34.91	-8.12	Peak	---	---
2	46.49	26.35	40.00	-13.65	34.08	-7.73	Peak	---	---
3	118.27	18.91	43.50	-24.59	29.68	-10.77	Peak	---	---
4	159.01	25.58	43.50	-17.92	33.79	-8.21	Peak	---	---
5	224.97	19.24	46.00	-26.76	29.76	-10.52	Peak	---	---
6	288.99	21.49	46.00	-24.51	29.37	-7.88	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m)

4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website http://www.icertifi.com.tw.

Linkou	**Kwei Shan**	**Kwei Shan Site II**
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No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan, R.O.C.	No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.	No. 14-1, Lane 19, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.

If you have any suggestion, please feel free to contact us as below information.

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