FCC Test Report

FCC ID	:	**2ABSJ-VT46**
Equipment	:	**Tire-pressure monitoring system (TPMS)**
Model No.	:	**VT46**
Multiple Listing	:	**H46**
Brand Name	:	**ATEQ**
Applicant	:	**CONTROL TECHNOLOGY CO. TAIWAN BRANCH**
Address	:	**NO 221, San Jia Dong street, 40642 Taichung, Taiwan**
Standard	:	**47 CFR FCC Part 15.209**
Received Date	:	**Jun. 17, 2016**
Tested Date	:	**Sep. 22, 2016**

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:

Along Chen / Assistant Manager

Approved by:

Gary Chang / Manager

Testing Laboratory 2732

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Release Record

Report No.	Version	Description	Issued Date
FR661704	Rev. 01	Initial issue	Oct. 05, 2016

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV/m at 3m]: 4.549MHz 46.01 (Margin -9.99dB) - QP	Pass
15.209	Radiated Emissions	[dBuV/m at 3m]: 39.70 MHz 38.98 (Margin -1.02dB) - QP	Pass

1 General Description

1.1 Information

1.1.1 Product Details

The following models are provided to this EUT.

Brand Name	Model Name	Product Name	Description
ATEQ	VT46	Tire-pressure monitoring system (TPMS)	Panel different
	H46		

- All models are electrically identical, different model names are for marketing purpose.
- The above models, model VT46 was selected as a representative one for the final test and only its data was recorded in this report.

1.1.2 Specification of the Equipment under Test (EUT)

RF General Information				
Frequency Range (kHz)	Modulation	Ch. Frequency (kHz)	Channel Number	Data Rate
123 ~ 127	CW	125	1	10 kbps

1.1.3 Antenna Details

Ant. No.	Type	Gain (dBi)	Connector	Remark
1	Wirebound	---	---	---

1.1.4 EUT Operational Condition

Supply Voltage	5Vdc from adapter 3.7Vdc from battery

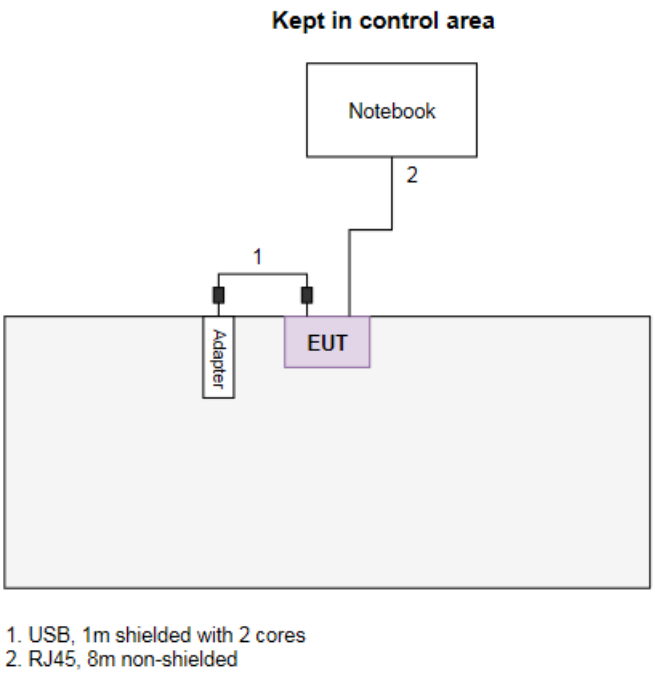
1.1.5 Accessories

Accessories		
No.	**Equipment**	**Description**
1	AC adapter	Brand Name: JS Model Name: FJ-SW1260502000UN I/P: 100-240Vac, 50/60Hz, 0.4A O/P: 5Vdc, 2000mA
2	USB cable	1m shielded with two cores (for charging use)
3	Rechargeable Li-ion Battery	Brand Name: General Electronics Battery Co., Ltd. Model Name: GEB904860 Rating: 3.7Vdc, 3000mAh

Support Equipment List						
No.	**Equipment**	**Brand**	**Model**	**S/N**	**FCC ID**	**Signal cable / Length (m)**
1	Notebook	DELL	Latitude E6430	G3GB4X1	DoC	RJ45, 8m non-shielded.

1.2 Test Setup Chart

Test Setup Diagram



1.3 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
EMC Receiver	R&S	ESCS 30	100169	Oct. 21, 2015	Oct. 20, 2016
LISN	SCHWARZBECK	Schwarzbeck 8127	8127-667	Nov. 13, 2015	Nov. 12, 2016
RF Cable-CON	EMC	EMCCFD300-BM-BM-6000	50821	Dec. 21, 2015	Dec. 20, 2016
Measurement Software	AUDIX	e3	6.120210k	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission				
Test Site	966 chamber 2 / (03CH02-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101499	Dec. 17, 2015	Dec. 16, 2016
Receiver	R&S	ESR3	101657	Jan. 12, 2016	Jan. 11, 2017
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-523	Nov. 09, 2015	Nov. 08, 2016
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1095	Oct. 07, 2015	Oct. 06, 2016
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 04, 2015	Nov. 03, 2016
Preamplifier	Burgeon	BPA-530	100218	Nov. 03, 2015	Nov. 02, 2016
Preamplifier	EMC	EMC12630SE	980322	Aug. 05, 2016	Aug. 04, 2017
Preamplifier	EMC	EMC184045B	980192	Aug. 24, 2016	Aug. 23, 2017
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16140/4	Dec. 10, 2015	Dec. 09, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16018/4	Dec. 10, 2015	Dec. 09, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16015/4	Dec. 10, 2015	Dec. 09, 2016
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-003	Dec. 10, 2015	Dec. 09, 2016
LF cable 10M	EMCC	CFD400-E	CFD400-001	Dec. 10, 2015	Dec. 09, 2016
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.4 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

1.5 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**
AC conducted emission	±2.90 dB
Radiated emission	±3.87 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	25°C / 55%	Howard Huang
Radiated Emissions	03CH02-WS	21°C / 60%	Felix Sung

- 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)
Conducted Emissions	CW	125
Radiated Emissions	CW	125

NOTE:

1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **Z-plane** result was found as the worst case and was shown in this report.

3 Transmitter Test Results

3.1 Conducted Emissions

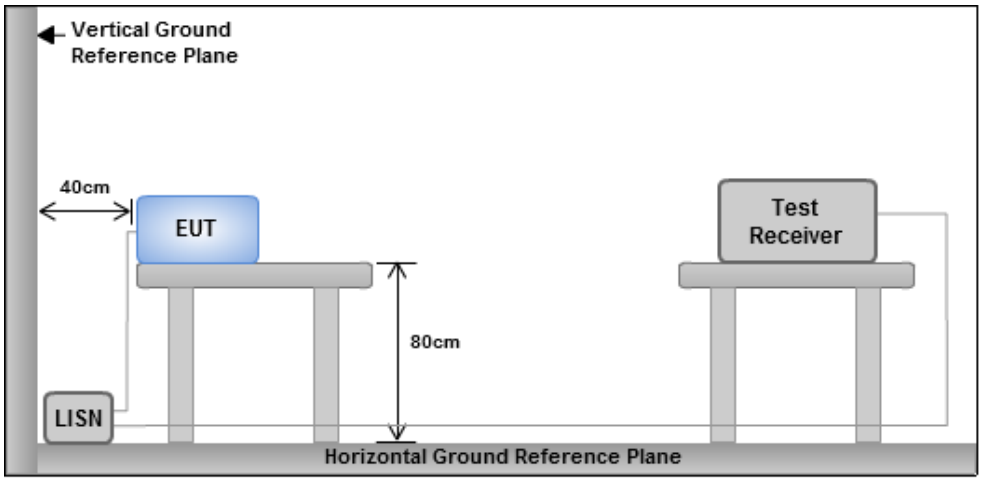
3.1.1 Limit of Conducted Emissions

Conducted Emissions Limit		
Frequency Emission (MHz)	**Quasi-Peak**	**Average**
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50
Note 1: * Decreases with the logarithm of the frequency.		

3.1.2 Test Procedures

1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels of AC power line conducted emission are across the 50 Ω LISN port.
3. AC conducted emission measurements is made over frequency range from 150 kHz to 30 MHz.
4. This measurement was performed with AC 120V / 60Hz.

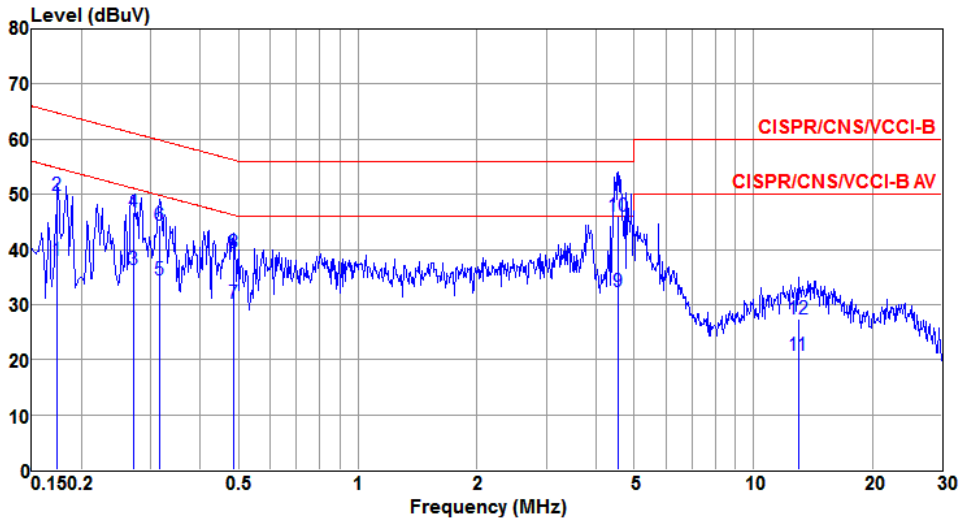
3.1.3 Test Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.1.4 Test Result of Conducted Emissions

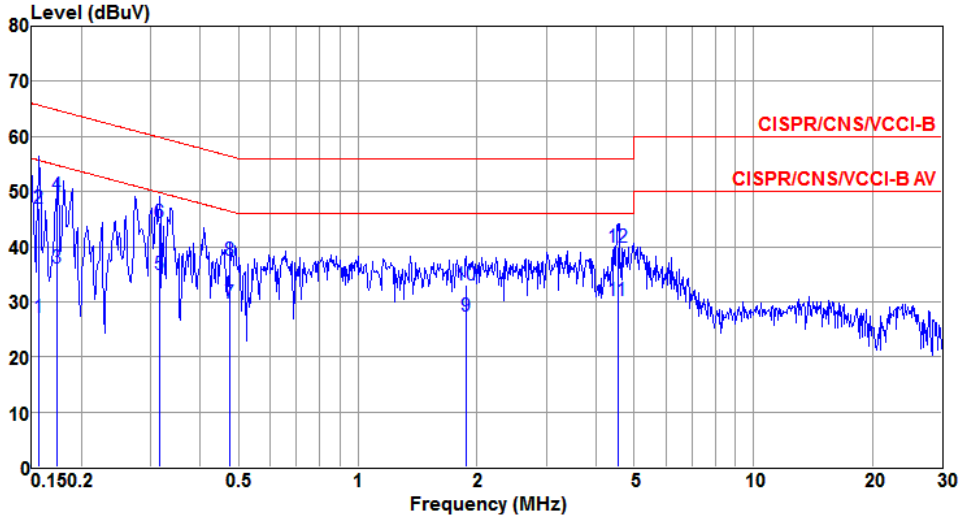
Power Phase	Line	Test Freq. (kHz)	125



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.174	38.02	54.77	-16.75	37.42	0.58	0.02	Average
2	0.174	49.70	64.77	-15.07	49.10	0.58	0.02	QP
3	0.270	36.36	51.12	-14.76	36.12	0.22	0.02	Average
4	0.270	46.62	61.12	-14.50	46.38	0.22	0.02	QP
5	0.315	34.41	49.84	-15.43	34.18	0.20	0.03	Average
6	0.315	44.46	59.84	-15.38	44.23	0.20	0.03	QP
7	0.486	30.32	46.23	-15.91	30.12	0.16	0.04	Average
8	0.486	39.31	56.23	-16.92	39.11	0.16	0.04	QP
9	4.549	32.28	46.00	-13.72	31.84	0.31	0.13	Average
10@	4.549	46.01	56.00	-9.99	45.57	0.31	0.13	QP
11	12.988	20.81	50.00	-29.19	19.91	0.71	0.19	Average
12	12.988	27.28	60.00	-32.72	26.38	0.71	0.19	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

Power Phase	Neutral	Test Freq. (kHz)	125



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.156	27.15	55.65	-28.50	26.37	0.76	0.02	Average
2	0.156	46.91	65.65	-18.74	46.13	0.76	0.02	QP
3	0.174	36.19	54.77	-18.58	35.63	0.54	0.02	Average
4	0.174	49.41	64.77	-15.36	48.85	0.54	0.02	QP
5@	0.315	34.92	49.84	-14.92	34.72	0.17	0.03	Average
6	0.315	44.26	59.84	-15.58	44.06	0.17	0.03	QP
7	0.476	29.81	46.41	-16.60	29.61	0.16	0.04	Average
8	0.476	37.52	56.41	-18.89	37.32	0.16	0.04	QP
9	1.878	27.35	46.00	-18.65	27.05	0.22	0.08	Average
10	1.878	33.11	56.00	-22.89	32.81	0.22	0.08	QP
11	4.549	30.25	46.00	-15.75	29.41	0.71	0.13	Average
12	4.549	39.78	56.00	-16.22	38.94	0.71	0.13	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

3.2 Radiated Emissions

3.2.1 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.

3.2.2 Test Procedures

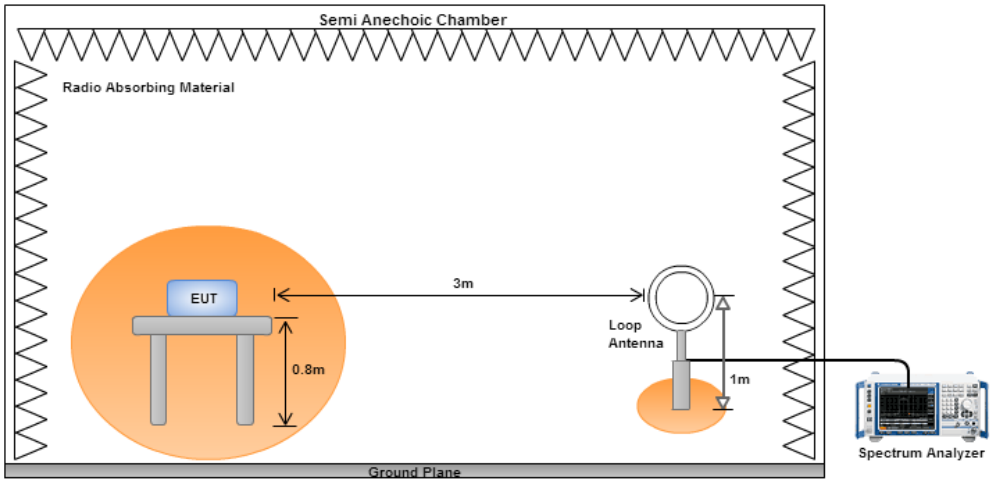
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission 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:

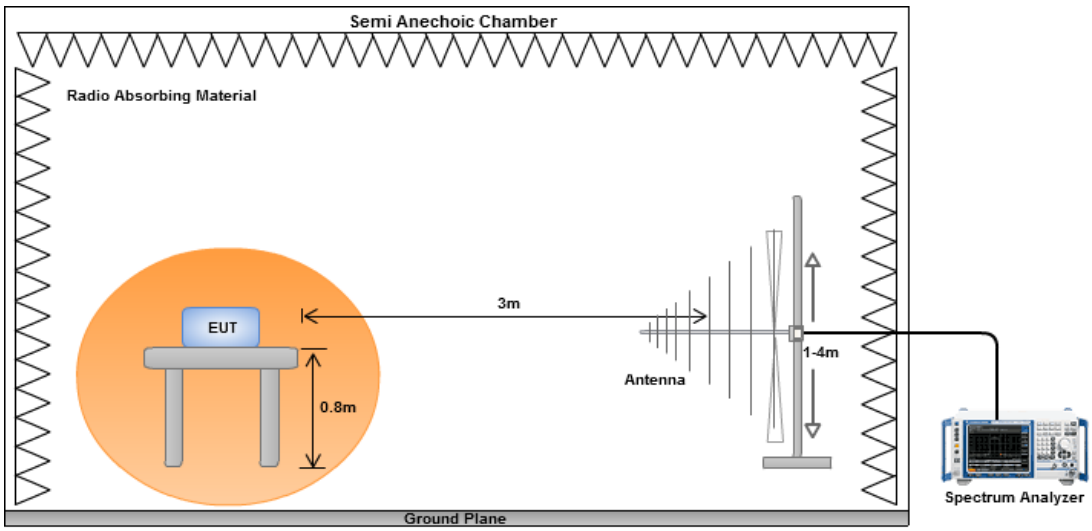
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.

3.2.3 Test Setup

Radiated Emissions below 30MHz



Radiated Emissions below 1GHz



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

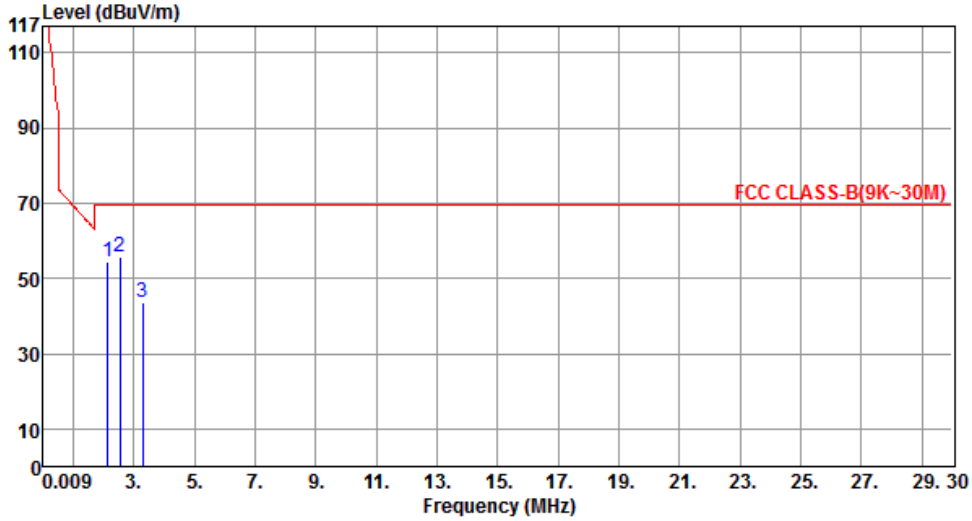
Polarization		Loop Open					
Frequency (MHz)		Emission Level dBuV/m	Limit (dBuV/m)	Margin (dB)	SA Reading (dBuV/m)	Factor	Remark
1	0.125	100.76	105.67	-4.91	81.2	19.56	Average
2	0.125	101.54	125.67	-24.13	81.98	19.56	Peak
3	0.25	60.83	99.65	-38.82	41.4	19.43	Average
4	0.25	62.03	119.65	-57.62	42.6	19.43	Peak
5	0.375	44.1	96.12	-52.02	24.7	19.4	Average
6	0.375	49.8	116.12	-66.32	30.4	19.4	Peak

Polarization		Loop Close					
Frequency (MHz)		Emission Level dBuV/m	Limit (dBuV/m)	Margin (dB)	SA Reading (dBuV/m)	Factor	Remark
1	0.125	95.66	105.67	-10.01	76.1	19.56	Average
2	0.125	96.46	125.67	-29.21	76.9	19.56	Peak
3	0.25	55.73	99.65	-43.92	36.3	19.43	Average
4	0.25	57.33	119.65	-62.32	37.9	19.43	Peak
5	0.375	39.6	96.12	-56.52	20.2	19.4	Average
6	0.375	44.5	116.12	-71.62	25.1	19.4	Peak

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).

3.2.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

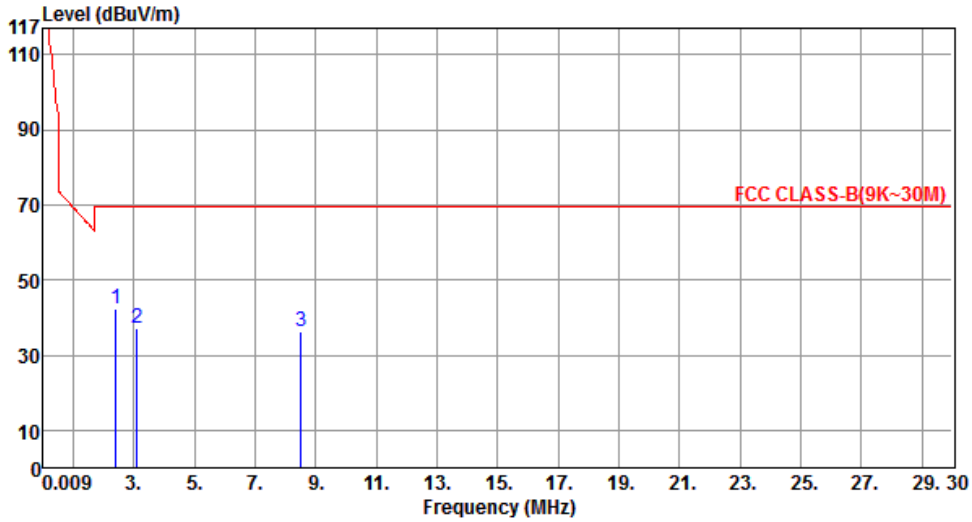
Polarization	Loop Open	Test Freq. (kHz)	125



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2.14	54.22	69.54	-15.32	34.97	19.25	Peak	---	---
2	2.53	55.59	69.54	-13.95	36.41	19.18	Peak	---	---
3	3.28	43.60	69.54	-25.94	24.40	19.20	Peak	---	---

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

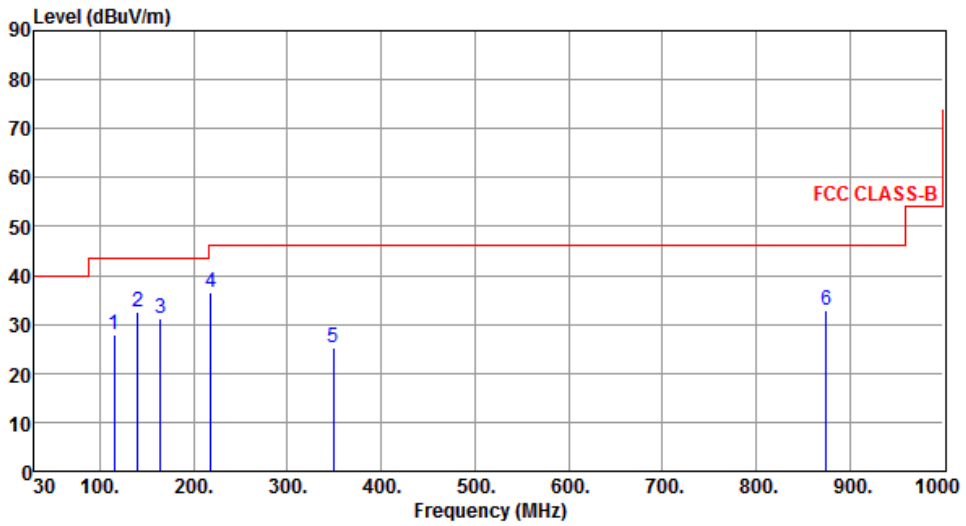


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2.41	42.34	69.54	-27.20	23.14	19.20	Peak	---	---
2	3.10	37.05	69.54	-32.49	17.91	19.14	Peak	---	---
3	8.50	36.20	69.54	-33.34	16.04	20.16	Peak	---	---

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

3.2.6 Transmitter Radiated Unwanted Emissions (Above 30MHz)

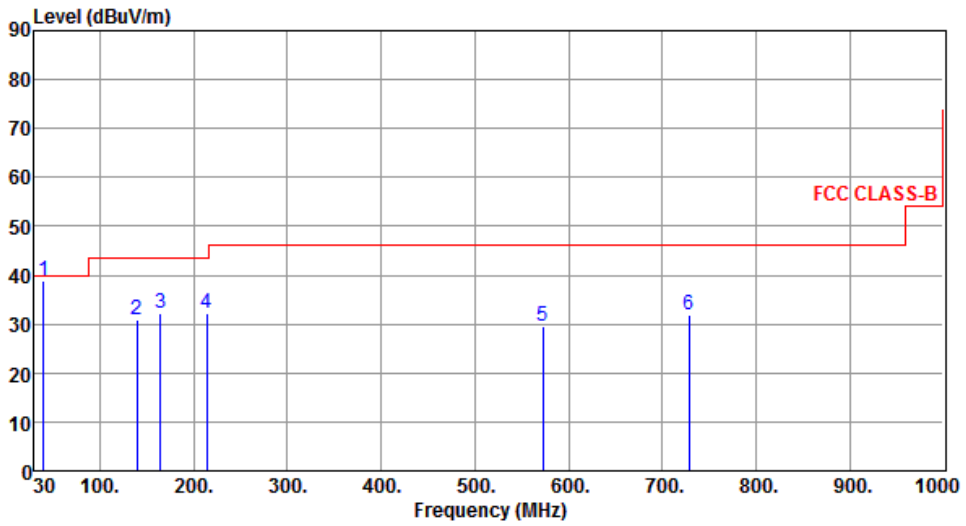
Polarization	Horizontal	Test Freq. (kHz)	125



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	115.36	27.79	43.50	-15.71	38.76	-10.97	Peak	---	---
2	140.58	32.40	43.50	-11.10	41.15	-8.75	Peak	---	---
3	164.83	31.27	43.50	-12.23	39.66	-8.39	Peak	---	---
4	218.18	36.51	46.00	-9.49	47.49	-10.98	Peak	---	---
5	349.13	25.36	46.00	-20.64	32.06	-6.70	Peak	---	---
6	874.87	32.71	46.00	-13.29	29.53	3.18	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	38.98	40.00	-1.02	46.99	-8.01	QP	100	233
2	139.61	30.94	43.50	-12.56	39.74	-8.80	Peak	---	---
3	164.83	32.16	43.50	-11.34	40.55	-8.39	Peak	---	---
4	214.30	32.29	43.50	-11.21	43.33	-11.04	Peak	---	---
5	572.23	29.46	46.00	-16.54	31.13	-1.67	Peak	---	---
6	728.40	31.96	46.00	-14.04	30.94	1.02	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 Hsiang. Location map can be found on our website http://www.icertifi.com.tw.

Linkou	**Kwei Shan**	**Kwei Shan Site II**
Tel: 886-2-2601-1640	Tel: 886-3-271-8666	Tel: 886-3-271-8640
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.

Tel: 886-3-271-8666
Fax: 886-3-318-0155
Email: ICC_Service@icertifi.com.tw

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