

FCC Test Report

FCC ID : 2ANR7-TPMS4

Equipment : Tire-pressure monitoring system (TPMS)

Model No. : TPMS4 : SUN TPMX

(Two models are for marketing purpose)

Brand Name : Snap-on

Applicant : ATEQ INSTRUMENTS (ASIA) PTE LTD.TAIWAN

BRANCH (SINGAPORE)

Address : 3 LANE223, SAN JIA DONG STREET, 40642,

TAICHUNG

Standard : 47 CFR FCC Part 15.209

Received Date : Oct. 30, 2017

Tested Date : Apr. 10 ~ Apr. 16, 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.

Testing Laboratory

Reviewed by: Approved by:

Along Chen / Assistant Manager Gary Chang / Manager

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Release Record

Report No.	Version	Description	Issued Date
FR7O3001	Rev. 01	Initial issue	May 11, 2018

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Summary of Test Results

FCC Rules Test Items		Measured	Result
15.207	Conducted Emissions	[dBuV/m at 3m]: 0.168MHz 54.56 (Margin -10.52dB) - QP	Pass
15.209		[dBuV/m at 3m]: 117.30MHz 42.45 (Margin -1.05dB) - QP	Pass

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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	
123 ~ 127	CW	125	1	10 kbps	

1.1.2 Antenna Details

Ant. No.	Туре	Gain (dBi)	Connector	Remark
1	Wirebound			

1.1.3 EUT Operational Condition

Supply Voltage 5Vdc from AC adapter 3.8Vdc from Lithium battery	
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1.1.4 Accessories

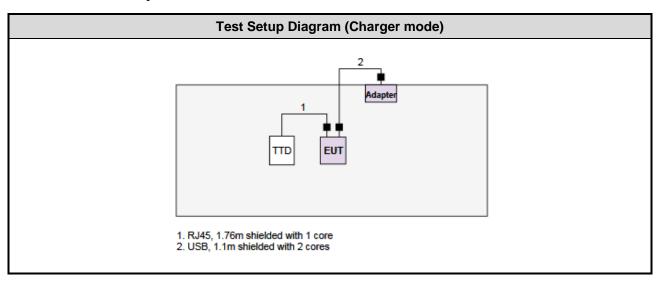
No.	Equipment	Description	
1	Brand: NEXcell Battery Co., Ltd. Battery Model Name: NLI-N7100. Power Rating: 3.8Vdc, 3050mAh		
		Model: FJ-SW1260502000UN I/P: 100-240Vac, 50/60Hz, 0.4A	
3	USB cable 1.1m shielded with 2 cores		
4 Tire Tread Depth 1.76m shielded with 1 core		1.76m shielded with 1 core	

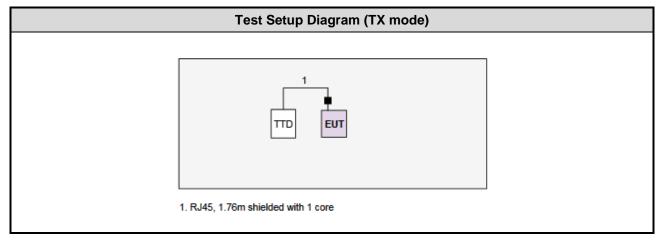
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	Support Equipment List						
No.	Equipment	Brand	Model	S/N	FCC ID	Signal cable / Length (m)	
1	Tire Tread Depth (TTD)					RJ45, 1.76m shielded with 1 core.	

1.2 Test Setup Chart





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1.3 The Equipment List

Test Item	Radiated Emission					
Test Site	966 chamber1 / (03CH01-WS)					
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until	
Spectrum Analyzer	R&S	FSV40	101498	Dec. 04, 2017	Dec. 03, 2018	
Receiver	R&S	ESR3	101658	Nov. 20, 2017	Nov. 19, 2018	
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jul. 25, 2017	Jul. 24, 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	980225	Jul. 28, 2017	Jul. 27, 2018	
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Dec. 07, 2017	Dec. 06, 2018	
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 07, 2017	Dec. 06, 2018	
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 07, 2017	Dec. 06, 2018	
LF cable 1M	EMC	EMCCFD400-NM-N M-1000	16052	Dec. 07, 2017	Dec. 06, 2018	
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Dec. 07, 2017	Dec. 06, 2018	
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Dec. 07, 2017	Dec. 06, 2018	
Measurement Software	AUDIX	e3	6.120210g	NA	NA	

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 FCC KDB 414788 D01 Radiated Test Site v01

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	±3.66 dB			

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2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	22°C / 59%	Alex Tsai
Radiated Emissions	03CH01-WS	24°C / 61%	Akun Chung

FCC Designation No.: TW2732
 FCC site registration No.: 181692
 IC site registration No.: 10807A-1

2.2 The Worst Test Modes and Channel Details

Test item	Modulation Mode	Test Frequency (kHz)	Test Configuration
AC Conducted Emissions			Charger mode
Radiated Emissions			Charger mode
Radiated Emissions	CW	125	TX mode

NOTE:

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

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3 Transmitter Test Results

3.1 Conducted Emissions

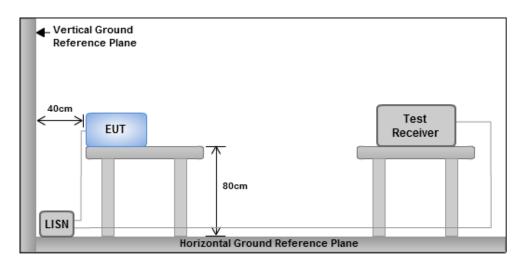
3.1.1 Limit of Conducted Emissions

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.

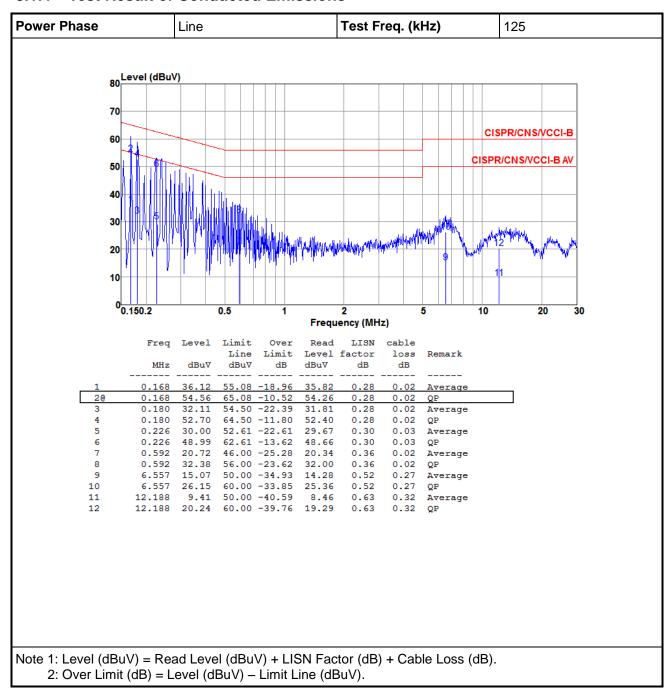
Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

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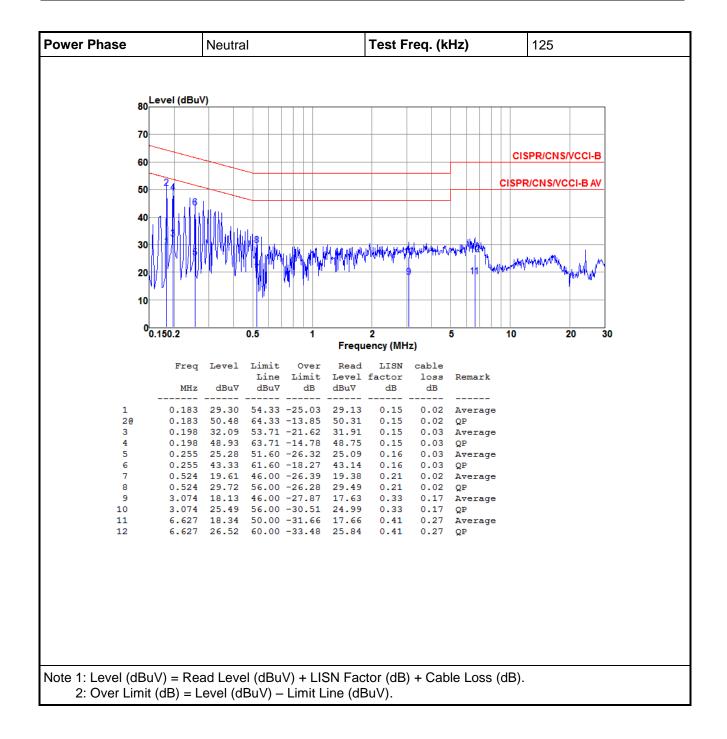
Charger mode

3.1.4 Test Result of Conducted Emissions



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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

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

- 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.

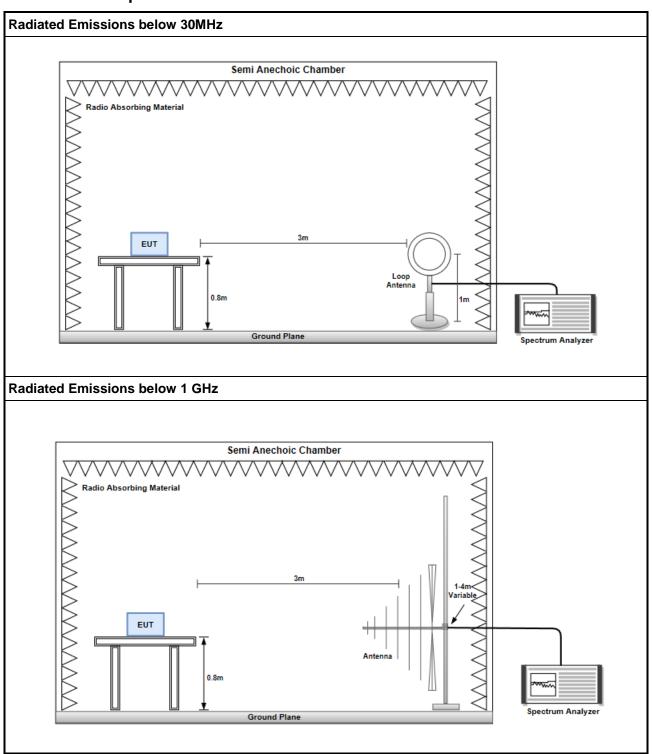
Note:

- 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.

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3.2.3 Test Setup



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TX mode

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

Polaria	zation	Loop Open					
Frequ	ıency (MHz)	Emission Level dBuV/m	Limit (dBuV/m)	Margin (dB)	SA Reading (dBuV/m)	Factor	Remark
1	0.125	77.17	105.67	-28.50	54.20	22.97	Average
2	0.125	77.25	125.67	-48.42	54.20	22.97	Peak
3	0.250	60.90	99.65	-38.75	37.50	22.59	Average
4	0.250	61.49	119.65	-58.16	38.90	22.59	Peak
5	0.375	57.70	96.12	-38.42	35.40	22.30	Average
6	0.375	58.40	116.12	-57.72	36.10	22.30	Peak

Polari	zation	Loop Close					
Frequ	uency (MHz)	Emission Level dBuV/m	Limit (dBuV/m)	Margin (dB)	SA Reading (dBuV/m)	Factor	Remark
1	0.125	72.27	105.67	-33.40	49.30	22.97	Average
2	0.125	72.35	125.67	-53.32	49.30	22.97	Peak
3	0.250	55.19	99.65	-44.46	32.60	22.59	Average
4	0.250	56.29	119.65	-63.36	33.70	22.59	Peak
5	0.375	55.10	96.12	-41.02	32.80	22.30	Average
6	0.375	56.40	116.12	-59.72	34.10	22.30	Peak

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB).

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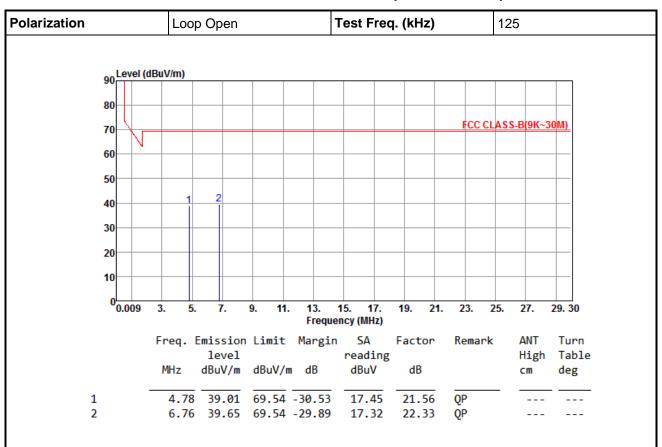
^{*}Factor includes antenna factor and cable loss.

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).



TX mode

3.2.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

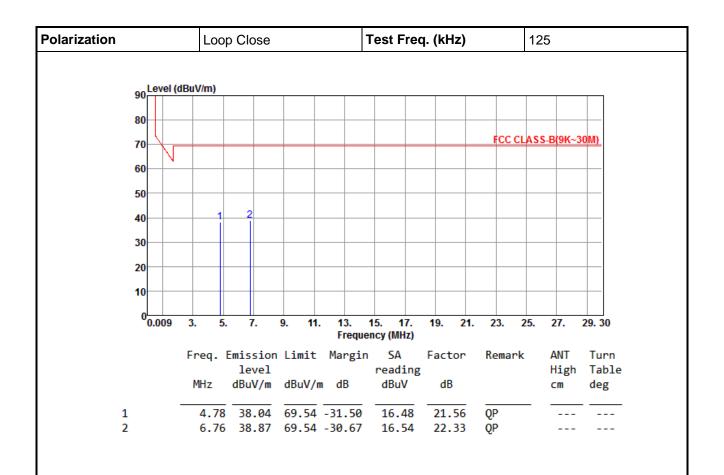


Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor (dB)

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m)

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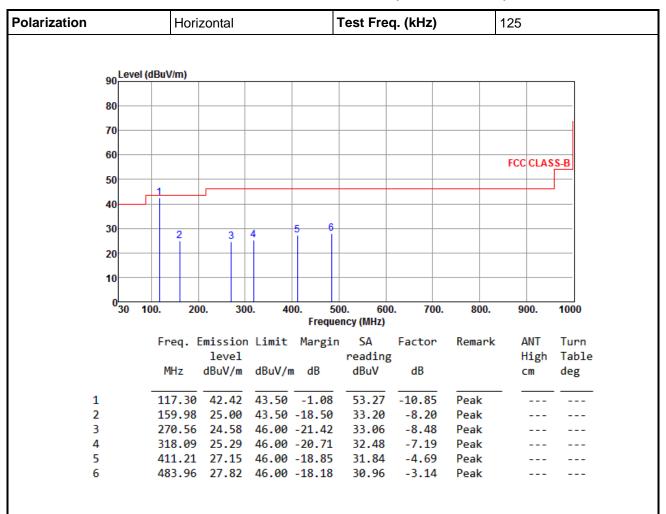
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor (dB)Note 2: Margin (dB) = Emission level (dBuV/m) - Limit (dBuV/m)

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TX mode

3.2.6 Transmitter Radiated Unwanted Emissions (Above 30MHz)



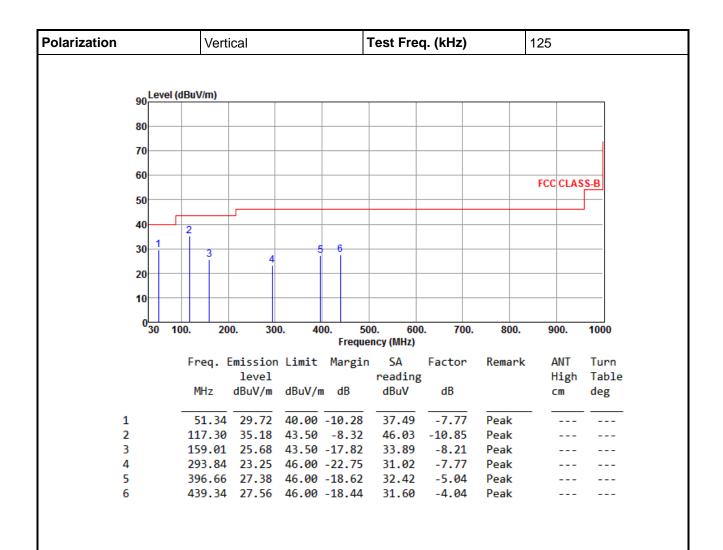
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m)

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^{*}Factor includes antenna factor, cable loss and amplifier gain





Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor, cable loss and amplifier gain

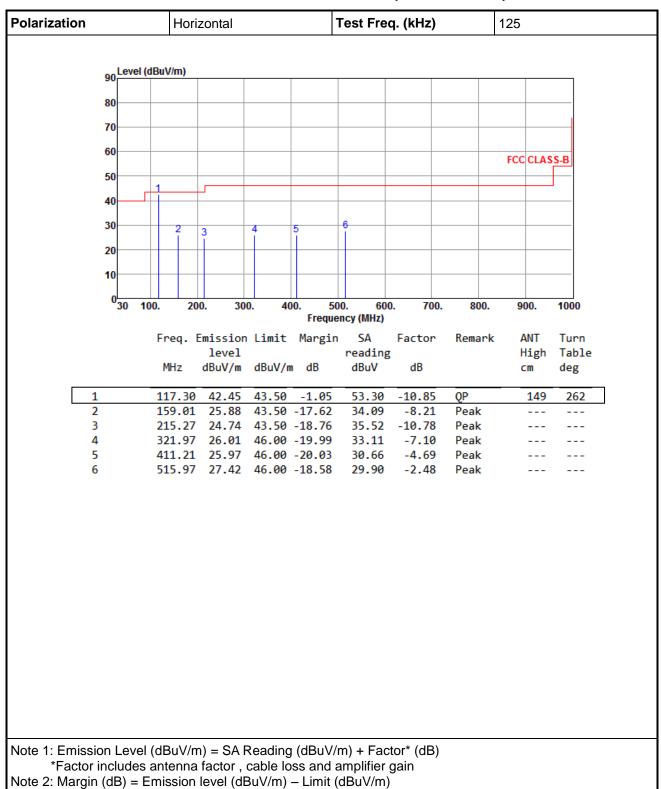
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m)

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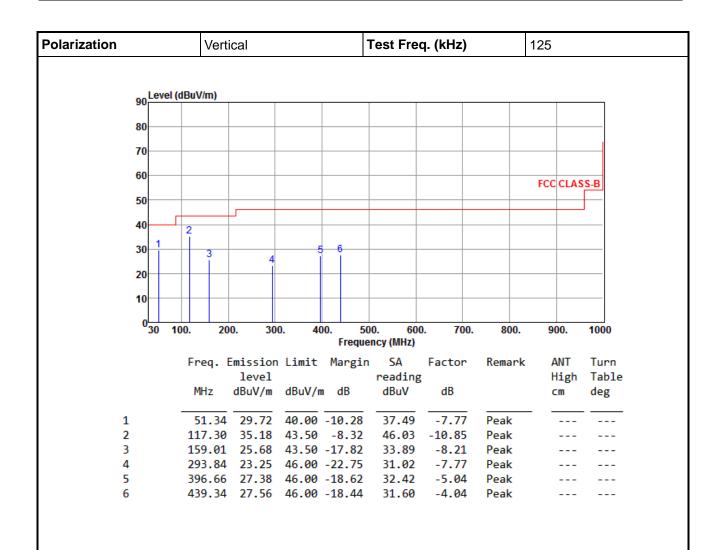
Charger mode

3.2.7 Transmitter Radiated Unwanted Emissions (Above 30MHz)



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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)

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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

Tel: 886-2-2601-1640 No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City,

Taiwan, R.O.C.

Kwei Shan

Tel: 886-3-271-8666 No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.

Kwei Shan Site II

Tel: 886-3-271-8640

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

==END==

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