





FCC Test Report

FCC ID : 2AAS9-WSMK-161

Equipment : VENUE Tag
Model No. : WSMK-161

Brand Name : BROWAN

Applicant : BROWAN COMMUNICATIONS

INCORPORATION

Address : No.15-1, Zhonghua Rd., Hsinchu Industrial

Park, Hukou Hsinchu Hsien Taiwan 303

Standard : 47 CFR FCC Part 15.225

Received Date : Aug. 18, 2022

Tested Date : Oct. 18 ~ Oct. 26, 2022

We, International Certification Corporation, 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 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

Report No.: FR281802NF Page: 1 of 16



Table of Contents

1	GENERAL DESCRIPTION	5
1.1	Information	5
1.2	Local Support Equipment List	6
1.3	Test Setup Chart	6
1.4	The Equipment List	7
1.5	Test Standards	8
1.6	Deviation from Test Standard and Measurement Procedure	8
1.7	Measurement Uncertainty	8
2	TEST CONFIGURATION	9
2.1	Testing Facility	9
2.2	The Worst Test Modes and Channel Details	9
3	TRANSMITTER TEST RESULTS	10
3.1	20dB and Occupied Bandwidth	10
3.2	Field Strength of Fundamental Emissions	11
3.3	Unwanted Emissions into Restricted Frequency Bands	12
3.4	Frequency Stability	14
3.5	AC Power Line Conducted Emissions	15
1	TEST I AROBATORY INFORMATION	16

- Appendix A. 20dB and Occupied Bandwidth
- **Appendix B. Field Strength of Fundamental Emissions**
- **Appendix C. Unwanted Emissions into Restricted Frequency Bands**
- Appendix D. Field Strength of Fundamental Emissions
- **Appendix E. AC Power Line Conducted Emissions**



Release Record

Report No.	Version	Description	Issued Date
FR281802NF	Rev. 01	Initial issue	Dec. 06, 2022

Report No.: FR281802NF Page: 3 of 16



Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	AC Power Line Conducted Emissions	[dBuV]: 13.560MHz 46.80 (Margin -3.20dB) - AV	Pass
15.225(a)~(c)	Field strength of fundamental emissions and spectrum mask	Meet the requirement of limit	Pass
15.225(d)	Field strength of any emissions appearing outside of the 13.110-14.010 MHz band	Meet the requirement of limit	Pass
15.225(e)	Frequency tolerance	Meet the requirement of limit	Pass
15.215 (c)	20dB bandwidth	Meet the requirement of limit	Pass
15.203	Antenna Requirement	Meet the requirement of limit	Pass

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Report No.: FR281802NF Page: 4 of 16



1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information						
Frequency Range (MHz) Modulation Ch. Frequency (MHz) Channel Number						
13.553 – 13.567	ASK	13.56	1			

1.1.2 Antenna Details

Ant. No.	Туре	Connector	Antenna Gain (dBi)
1	PCB loop antenna	FPC connector	5

1.1.3 EUT Operational Condition

Power Type	5V / 0.5A				
Operational Voltage					
Operational Climatic	⊠ Tnom (20°C)		☑ Tmin (-20°C)		

1.1.4 Accessories

No.	Equipment	Description
1	USB type C charging cable	1.2m non-shielded without core
2	Cradle	

1.1.5 Test Tool and Power Index

Test Tool	adb, V1.0.40
Power Index	Default

Report No.: FR281802NF Page: 5 of 16

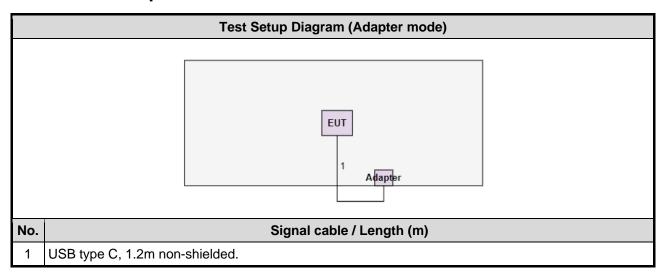


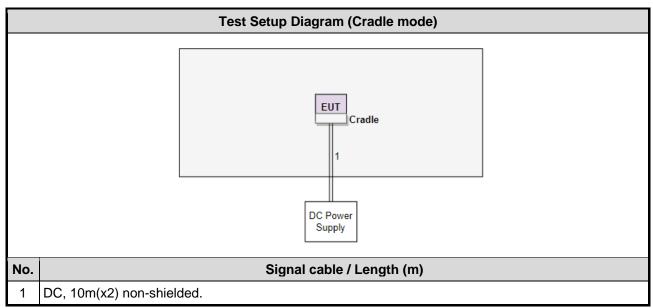
1.2 Local Support Equipment List

	Support Equipment List								
No.	No. Equipment Brand Model FCC ID Remarks								
1	Notebook	DELL	Latitude 5400	DoC					
2	Adapter	Samsung	ETA-U90JWs						
3	DC Power Supply	GWINSTEK	GPC-60300						
4	Cradle								

Note: The support notebook was disconnected from EUT and was removed from test table after sending command to control EUT to transmit continuously

1.3 Test Setup Chart





Report No.: FR281802NF Page: 6 of 16



1.4 The Equipment List

Test Item	Conducted Emission								
Test Site	Conduction room 1 / (0	Conduction room 1 / (CO01-WS)							
Tested Date	Oct. 20 ~ Oct. 26, 202	Oct. 20 ~ Oct. 26, 2022							
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until				
Receiver	R&S	ESR3	101658	Feb. 16, 2022	Feb. 15, 2023				
LISN	R&S	ENV216	101579	Apr. 21, 2022	Apr. 20, 2023				
LISN (Support Unit)	SCHWARZBECK	NSLK 8127	8127667	Jan .07, 2022	Jan .06, 2023				
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Oct. 17, 2022	Oct. 16, 2023				
50 ohm terminal (Support Unit)	NA	50	04	May 10, 2022	May 09, 2023				
Measurement Software	AUDIX	e3	6.120210k	NA	NA				

Test Item	Radiated Emission below 1GHz							
Test Site	966 chamber1 / (03CH01-WS)							
Tested Date	Oct. 18 ~ Oct. 24, 202	Oct. 18 ~ Oct. 24, 2022						
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until			
Receiver	R&S	ESR3	101657	Mar. 15, 2022	Mar. 14, 2023			
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 08, 2021	Nov. 07, 2022			
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Aug. 03, 2022	Aug. 02, 2023			
Preamplifier	EMC	EMC02325	980225	Jun. 28, 2022	Jun. 27, 2023			
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 04, 2022	Oct. 03, 2023			
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Oct. 04, 2022	Oct. 03, 2023			
LF cable 11M	EMC	EMCCFD400-NW-N W-11000	200801	Oct. 04, 2022	Oct. 03, 2023			
LF cable 1M	EMC	EMCCFD400-NM-N M-1000	160502	Oct. 04, 2022	Oct. 03, 2023			
Measurement Software	AUDIX	e3	6.120210g	NA	NA			
Note: Calibration Inter	rval of instruments liste	d above is one year.		•				

Report No.: FR281802NF Page: 7 of 16



Test Item	RF Conducted	RF Conducted							
Test Site	(TH01-WS)	TH01-WS)							
Tested Date	Oct. 25, 2022	Oct. 25, 2022							
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until				
Spectrum Analyzer	R&S	FSV40	101910	Apr. 18, 2022	Apr. 17, 2023				
Power Meter	Anritsu	ML2495A	1241002	Nov. 07, 2021	Nov. 06, 2022				
Power Sensor	Anritsu	MA2411B	1207366	Nov. 07, 2021	Nov. 06, 2022				
DC POWER SOURCE	GW INSTEK	GPC-6030D	GES855395	Nov. 08, 2021	Nov. 07, 2022				
TEMP&HUMIDITY CHAMBER	GIANT FORCE	GCT-225-40-SP-SD	MAF1212-002	Jun. 22, 2022	Jun. 21, 2023				
Note: Calibration Inte	rval of instruments liste	d above is one year.							

1.5 Test Standards

47 CFR FCC Part 15.225 ANSI C63.10-2013

1.6 Deviation from Test Standard and Measurement Procedure

None

1.7 Measurement Uncertainty

The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)).

Measurement Uncertainty					
Parameters	Uncertainty				
Bandwidth	±34.130 Hz				
Radiated emission ≤ 30MHz	±2.3 dB				
Radiated emission ≤ 1GHz	±3.41 dB				
Temperature	±0.4 °C				
AC conducted emission	±2.92 dB				

Report No.: FR281802NF Page: 8 of 16



2 Test Configuration

2.1 Testing Facility

Test Laboratory	International Certification Corporation
Test Site	CO01-WS, 03CH01-WS, TH01-WS
Address of Test Site	No.3-1, Lane 6, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 33381, Taiwan (R.O.C.)

FCC Designation No.: TW2732FCC site registration No.: 181692

➤ ISED#: 10807A

➤ CAB identifier: TW2732

2.2 The Worst Test Modes and Channel Details

Test item	Mode	Test Frequency (MHz)	Test Configuration
AC Power Line Conducted Emissions	NFC	13.56	1, 2
Field strength of fundamental emissions	NFC	13.56	1, 2
Unwanted Emissions into Restricted Frequency Bands < 30MHz	NFC	13.56	1, 2
Unwanted Emissions into Restricted Frequency Bands > 30MHz	NFC	13.56	1, 2
Frequency tolerance	NFC	13.56	2
20dB bandwidth	NFC	13.56	2

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** results were found as the worst case and were shown in this report.
- 2. Test configurations are listed as follows:
 - 1) Test configuration 1: Cradle mode
 - 2) Test configuration 2: Adapter mode

Report No.: FR281802NF Page: 9 of 16



3 Transmitter Test Results

3.1 20dB and Occupied Bandwidth

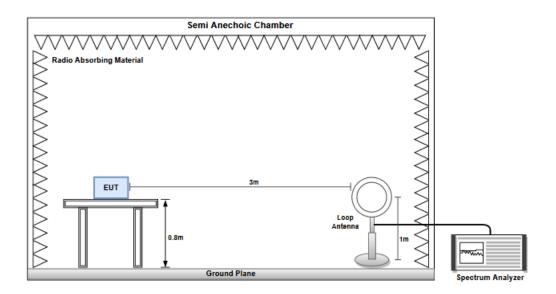
3.1.1 Limit of 20dB Bandwidth

The upper and lower frequency of the 20dB bandwidth shall within 13.553~13.567 MHz

3.1.2 Test Procedures

- 1. Set resolution bandwidth (RBW) = 1 kHz, Video bandwidth = 3 kHz.
- 2. Detector = Peak, Trace mode = max hold.
- 3. Sweep = auto couple, Allow the trace to stabilize.
- 4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 20dB relative to the maximum level measured in the fundamental emission.

3.1.3 Test Setup



3.1.4 Test Result

Ambient Condition	23°C / 64%	Tested By	Brad Wu
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Refer to Appendix A.

Report No.: FR281802NF Page: 10 of 16



3.2 Field Strength of Fundamental Emissions

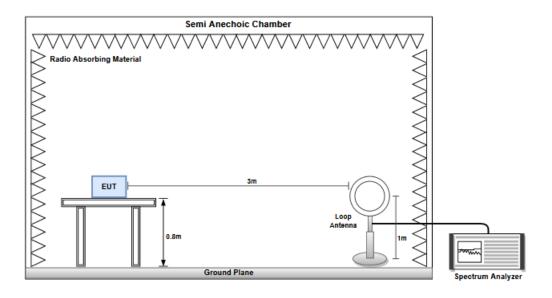
3.2.1 Field Strength of Fundamental Emissions

The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

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 open and close planes of polarization. . Distance between EUT and antenna is 3 m.
- 3. This investigation is performed with the EUT rotated 360°, and the antenna rotated to repeat the measurements for both the open and close antenna polarizations.

3.2.3 Test Setup



3.2.4 Test Result

Amalaiant Canalitian	2490 / 620/	Tootool Dec	Drod M.
Ambient Condition	24 0 / 63%	Tested By	Brad Wu

Refer to Appendix B.

Report No.: FR281802NF Page: 11 of 16



3.3 Unwanted Emissions into Restricted Frequency Bands

3.3.1 Limit of Unwanted Emissions into Restricted Frequency Bands

- 1) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- 2) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
- 3) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in below table

Restricted Band Emissions Limit								
Frequency Range (MHz) Field Strength (uV/m) Field Strength (dBuV/m) Measure								
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	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.

3.3.2 Test Procedures

- 4. 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.
- 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.
- 6. 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.

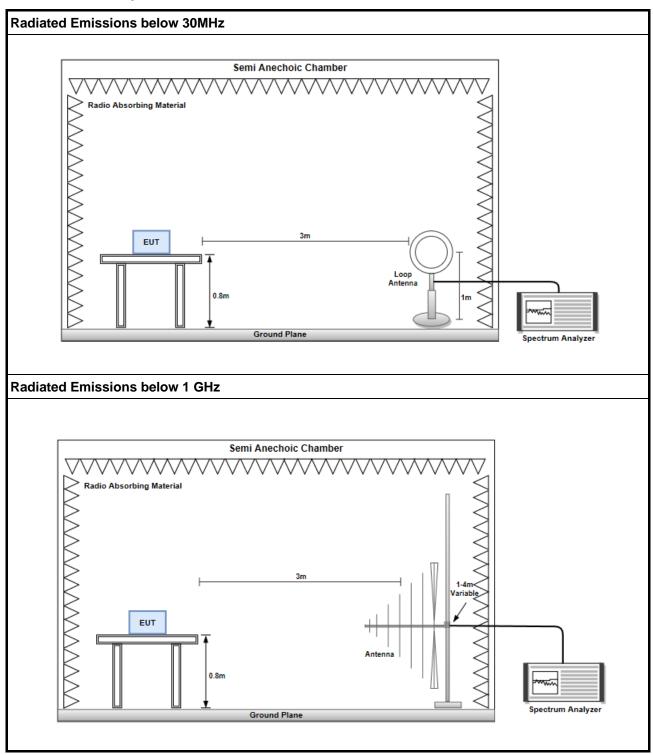
Note:

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

Report No.: FR281802NF Page: 12 of 16



3.3.3 Test Setup



3.3.4 Test Results

Refer to Appendix C.

Report No.: FR281802NF Page: 13 of 16



3.4 Frequency Stability

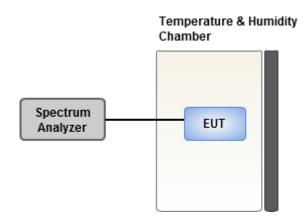
3.4.1 Frequency Stability Limit

Carrier frequency stability shall be maintained to ±0.01% (±100 ppm).

3.4.2 Test Procedures

	Test Method					
\boxtimes	Refer as ANSI C63.10, clause 6.8 for frequency stability tests					
	□ Frequency stability with respect to ambient temperature					
	□ Frequency stability when varying supply voltage					
	For conducted measurement.					
	For radiated measurement. The equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted power level.					

3.4.3 Test Setup



3.4.4 Test Result

Ambient Condition 23°C / 64% Teste	ed By Brad Wu	
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Refer to Appendix D.

Report No.: FR281802NF Page: 14 of 16



3.5 AC Power Line Conducted Emissions

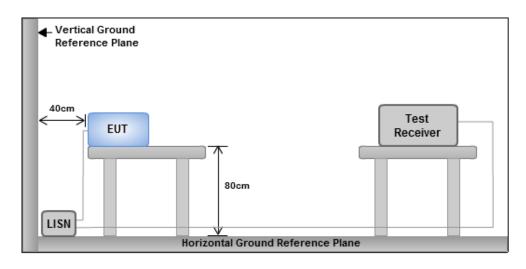
3.5.1 Limit of AC Power Line Conducted Emissions

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.								

3.5.2 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.

3.5.3 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

3.5.4 Test Result

Refer to Appendix E.

Report No.: FR281802NF Page: 15 of 16



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 Corporation (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 Dist., Tao Yuan
City 33381, Taiwan (R.O.C.)
No.2-1, Lane 6, Wen San 3rd
St., Kwei Shan Dist., Tao Yuan
City 33381, Taiwan (R.O.C.)

Kwei Shan Site II

Tel: 886-3-271-8640 No.14-1, Lane 19, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 333, Taiwan (R.O.C.)

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

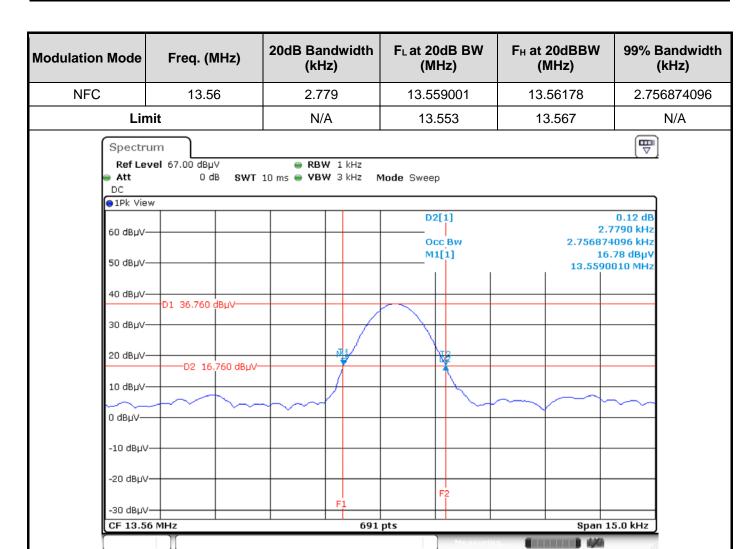
Tel: 886-3-271-8666 Fax: 886-3-318-0345

Email: ICC Service@icertifi.com.tw

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Report No.: FR281802NF Page: 16 of 16







Test configuration 1: Cradle mode

Field Strength of Fundamental Emissions Result							
Polarization	Emission Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	SA Reading (dBuV)	Factor (dB)	Remark
Open	13.56	60.15	105.39	-45.24	35.74	24.41	QP

Field Strength of Fundamental Emissions Result								
Polarization Emission Limit (dBuV/m) SA Reading (dBuV) Factor (dB) Remark						Remark		
Close	13.56	56.95	105.39	-48.44	32.54	24.41	QP	

Note: Emission level = SA reading + Factor.

Test configuration 2: Adapter mode

Field Strength of Fundamental Emissions Result							
Polarization	Emission Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	SA Reading (dBuV)	Factor (dB)	Remark
Open	13.56	60.77	105.39	-44.62	36.36	24.41	QP

Field Strength of Fundamental Emissions Result								
Polarization	Emission Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	SA Reading (dBuV)	Factor (dB)	Remark	
Close	13.56	57.73	105.39	-47.66	33.32	24.41	QP	

Note: Emission level = SA reading + Factor.



Test configuration 1: Cradle mode

Unwanted Emissions (Below 30MHz)

Field Strength of Fundamental Emissions Result								
Polarization	Emission Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	SA Reading (dBuV)	Factor(dB)	Remark	
Open	13.41	46.23	62	-15.77	21.87	24.36	QP	
Open	13.553	48.14	71.87	-23.73	23.74	24.4	QP	
Open	13.567	48.82	71.86	-23.04	24.41	24.41	QP	
Open	13.71	46.23	61.81	-15.58	21.78	24.45	QP	
Open	27.12	32.85	49.54	-16.69	12.98	19.87	QP	

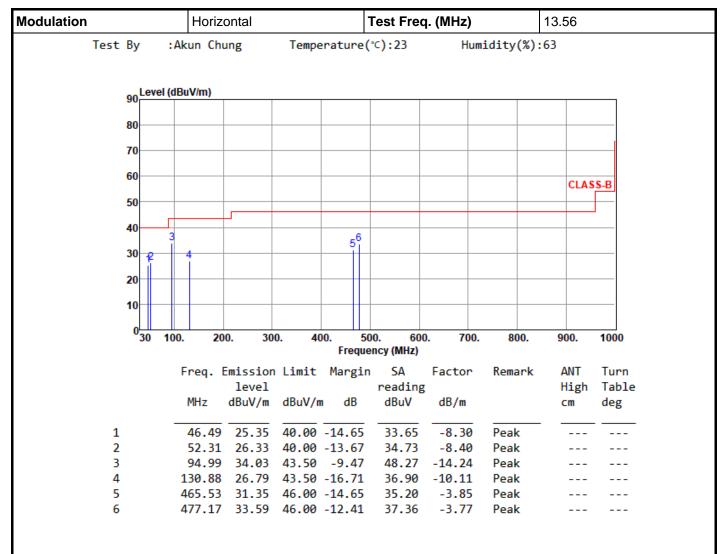
Field Strength of Fundamental Emissions Result								
Polarization	Emission Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	SA Reading (dBuV)	Factor(dB)	Remark	
Close	13.41	42.75	62	-19.25	18.39	24.36	QP	
Close	13.553	45.02	71.87	-26.85	20.62	24.4	QP	
Close	13.567	45.15	71.86	-26.71	20.74	24.41	QP	
Close	13.71	43.82	61.81	-17.99	19.37	24.45	QP	
Close	27.12	31.15	49.54	-18.39	11.28	19.87	QP	

Note: Emission level = SA reading + Factor.

Page No. : 1 of 6



Unwanted Emissions (Below 1GHz)

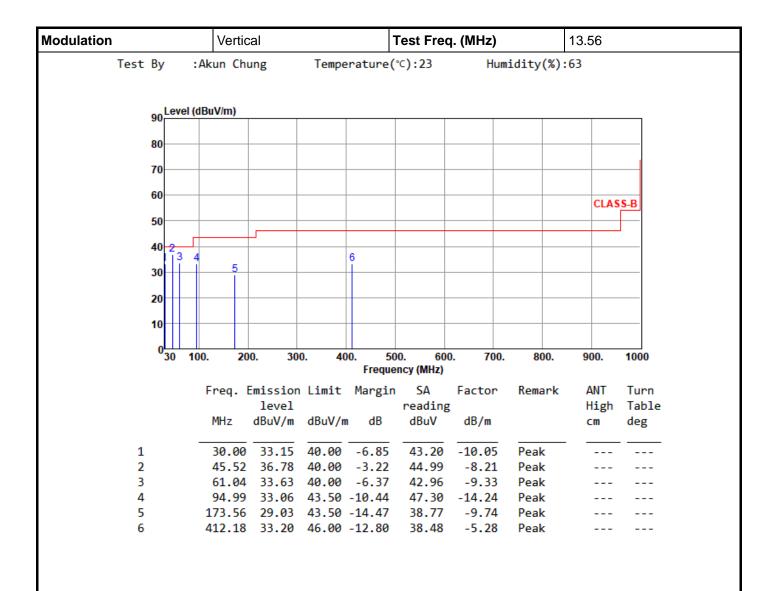


Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*Factor includes antenna factor, cable loss and amplifier gain

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





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

*Factor includes antenna factor , cable loss and amplifier gain

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



Test configuration 2: Adapter mode

Unwanted Emissions (Below 30MHz)

Field Strength of Fundamental Emissions Result								
Polarization	Emission Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	SA Reading (dBuV)	Factor(dB)	Remark	
Open	13.41	46.43	62	-15.57	22.07	24.36	QP	
Open	13.553	48.66	71.87	-23.21	24.26	24.4	QP	
Open	13.567	49.44	71.86	-22.42	25.03	24.41	QP	
Open	13.71	47.01	61.81	-14.8	22.56	24.45	QP	
Open	27.12	33.08	49.54	-16.46	13.21	19.87	QP	

Field Strength of Fundamental Emissions Result								
Polarization	Emission Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	SA Reading (dBuV)	Factor(dB)	Remark	
Close	13.41	43.42	62	-18.58	19.06	24.36	QP	
Close	13.553	46.26	71.87	-25.61	21.86	24.4	QP	
Close	13.567	46.09	71.86	-25.77	21.68	24.41	QP	
Close	13.71	44.64	61.81	-17.17	20.19	24.45	QP	
Close	27.12	31.94	49.54	-17.6	12.07	19.87	QP	

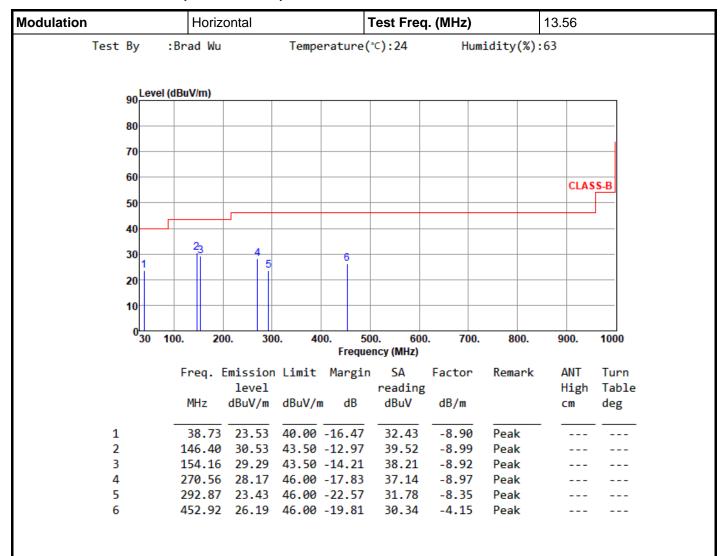
Note: Emission level = SA reading + Factor.

Page No. : 4 of 6





Unwanted Emissions (Below 1GHz)

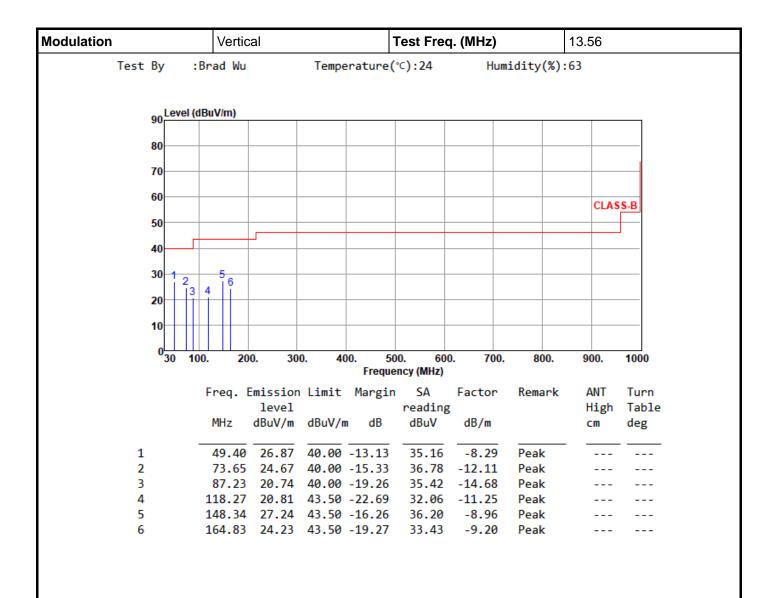


Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

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

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





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

*Factor includes antenna factor , cable loss and amplifier gain

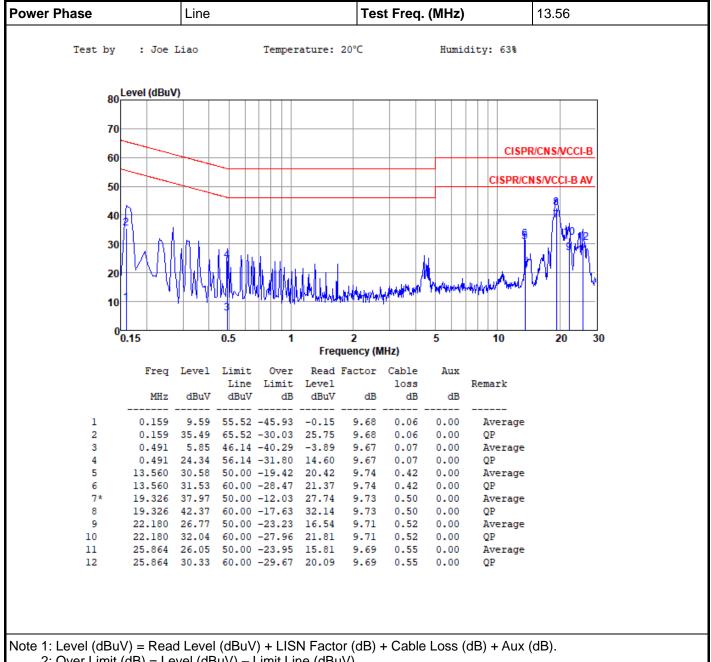
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).



Frequency: 13.56 MHz	Frequency Drift (ppm)						
Temperature (°C)	0 minute	2 minutes	5 minutes	10 minutes			
T20°C Vmax	26.55	25.81	24.34	25.81			
T20°C Vmin	26.55	25.07	25.07	26.55			
T60°C Vnom	25.07	25.81	25.81	25.81			
T50°C Vnom	25.81	26.55	25.07	25.07			
T40°C Vnom	24.34	22.86	25.07	26.55			
T30°C Vnom	26.55	25.07	25.81	25.81			
T20°C Vnom	25.81	25.07	24.34	25.07			
T10°C Vnom	24.34	23.60	25.81	25.07			
T0°C Vnom	28.02	27.29	26.55	26.55			
T-10°C Vnom	30.24	30.97	31.71	29.50			
T-20°C Vnom	33.92	34.66	33.19	35.40			
Vnom [V]: 3.7		Vmax [V]: 4.1	Vmin [V]: 3.45				
Tnom [°C]: 20		Tmax [°C]: 60	Tmin [°C]: -20				

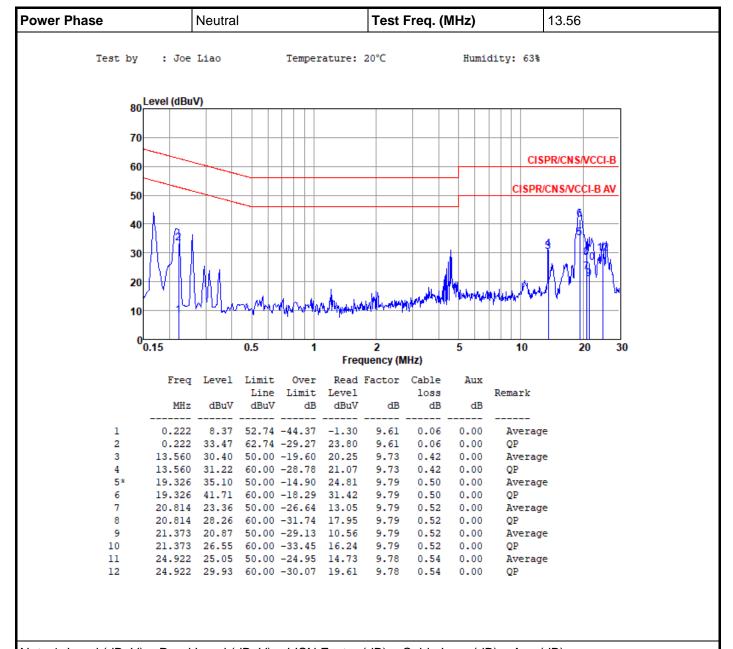


Test configuration 1: Cradle mode



2: Over Limit (dB) = Level (dBuV) - Limit Line (dBuV).



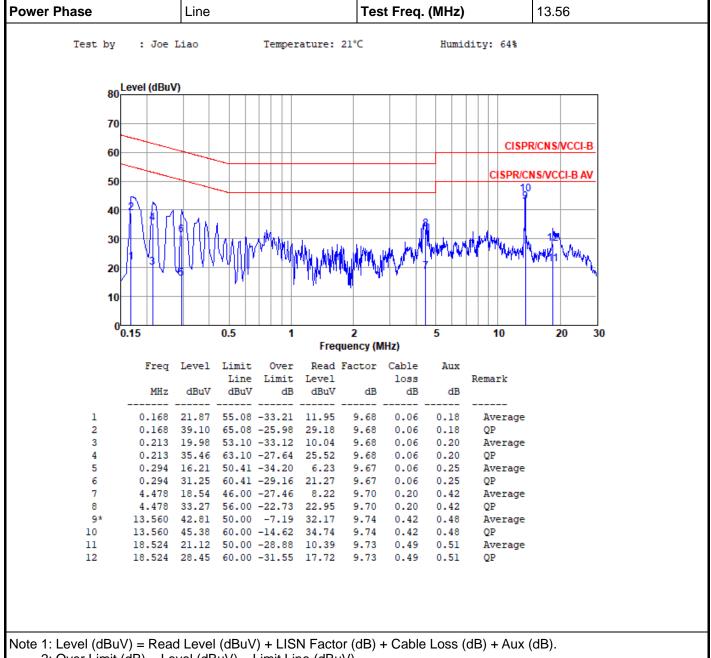


Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB) + Aux (dB).

2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

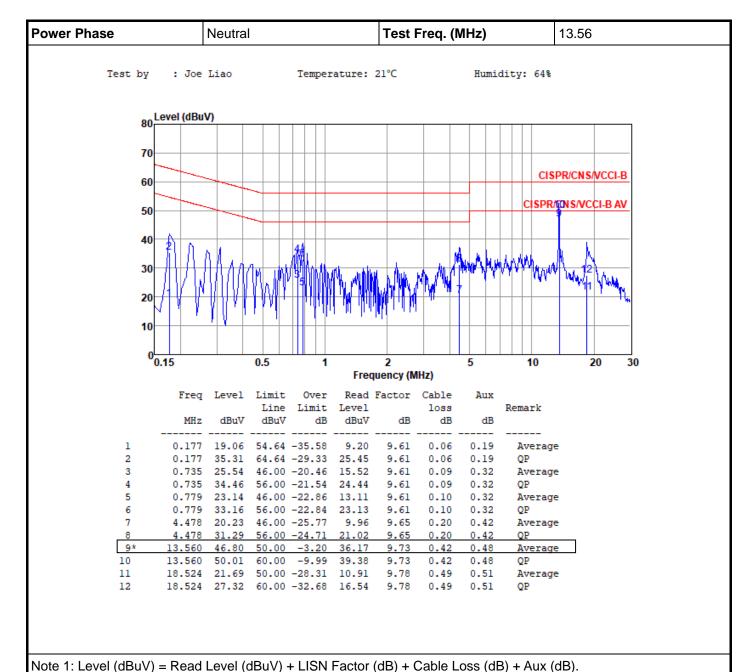


Test configuration 2: Adapter mode



2: Over Limit (dB) = Level (dBuV) - Limit Line (dBuV).





Ole 1. Level (ubuv) = Reau Level (ubuv) + Lishin Factor (ub) + Cable Loss (ub) + Aux (ub)

2: Over Limit (dB) = Level (dBuV) - Limit Line (dBuV).