



Report No.: FC2N2510-01

FCC EMI TEST REPORT

FCC ID : GKRRMLN1T Equipment : 5G LGA Module

Brand Name : COMPAL Model Name : RML-N1t

Marketing Name : 5G LGA Module

Applicant : Compal Electronics, Inc.

No.581 & 581-1, Ruiguang Rd., Neihu District, Taipei,

(114) **Taiwan**

Manufacturer : Compal Electronics, Inc.

No.581 & 581-1, Ruiguang Rd., Neihu District, Taipei,

(114) Taiwan

Standard : FCC 47 CFR FCC Part 15 Subpart B Class B

The product was received on Jan. 05, 2023 and testing was performed from Jan. 10, 2023 to Jan. 17, 2023. We, Sporton International Inc. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI C63.4-2014 and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval from Sporton International Inc. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: Louis Wu

Louis Win

Sporton International Inc. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)

TEL: 886-3-327-3456 Page Number : 1 of 13
FAX: 886-3-328-4978 Issue Date : Mar. 15, 2023

Report Template No.: BU5-FD15B Version 2.5

Report Version : 01

Table of Contents

Report No. : FC2N2510-01

story o	of this test report	3
mmar	ry of Test Result	4
Gene	eral Description	5
1.1. 1.2. 1.3. 1.4.	Modification of EUT Test Location	5 5
Test	t Configuration of Equipment Under Test	6
2.1. 2.2. 2.3. 2.4.	Connection Diagram of Test System Support Unit used in test configuration and system	6 7
Test	t Result	8
3.1. 3.2.		
List	of Measuring Equipment	12
Unce	ertainty of Evaluation	13
pendi	ix B. Radiated Emission Test Result	
	mma Gen 1.1. 1.2. 1.3. 1.4. Tes: 2.1. 2.2. 2.3. 2.4. Tes: 3.1. 3.2. List Unc pend	mmary of Test Result

TEL: 886-3-327-3456 : 2 of 13 Page Number FAX: 886-3-328-4978 Issue Date : Mar. 15, 2023 Report Version : 01

Report Template No.: BU5-FD15B Version 2.5

History of this test report

Report No. : FC2N2510-01

Report No.	Version	Description	Issue Date
FC2N2510-01	01	Initial issue of report	Mar. 15, 2023

TEL: 886-3-327-3456 Page Number : 3 of 13 FAX: 886-3-328-4978 Issue Date : Mar. 15, 2023

Summary of Test Result

Report No. : FC2N2510-01

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.107	AC Conducted Emission	Pass	3.78 dB under the limit at 0.436 MHz
3.2	15.109	Radiated Emission	Pass	12.43 dB under the limit at 953.100 MHz

Declaration of Conformity:

- The test results (PASS/FAIL) with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
 - It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results.
- 2. The measurement uncertainty please refer to this report "Uncertainty of Evaluation".

Comments and Explanations:

The product specifications of the EUT presented in the report are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Keven Cheng Report Producer: Doris Chen

TEL: 886-3-327-3456 Page Number : 4 of 13 FAX: 886-3-328-4978 Issue Date : Mar. 15, 2023

1. General Description

1.1. Product Feature of Equipment Under Test

LTE/5G NR and GNSS.

Product Feature				
Antenna Type	WWAN: Monopole Antenna GPS: Monopole Antenna			

Report No.: FC2N2510-01

Remark: The EUT's information above is declared by manufacturer. Please refer to Comments and Explanations in report summary.

1.2. Modification of EUT

No modifications made to the EUT during the testing.

1.3. Test Location

Test Site	Sporton International Inc. EMC & Wireless Communications Laboratory
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	Sporton Site No. CO05-HY, 03CH06-HY

FCC designation No.: TW1093

1.4. Applicable Standards

According to the specifications declared by the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC 47 CFR FCC Part 15 Subpart B Class B
- + ANSI C63.4-2014

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.

TEL: 886-3-327-3456 Page Number : 5 of 13 FAX: 886-3-328-4978 Issue Date : Mar. 15, 2023

2. Test Configuration of Equipment Under Test

2.1. Test Mode

The EUT is tested along with the peripherals, operating under possible configurations in compliant with normal operation. The maximum emissions can be identified by a pre-scan carried out in different orientations of placement pursuant to ANSI C63.4-2014. Frequency range covered: Conduction Emission (150 kHz to 30 MHz), Radiation Emission (30 MHz to the 5th harmonics of the highest fundamental frequency or to 40 GHz, whichever is lower).

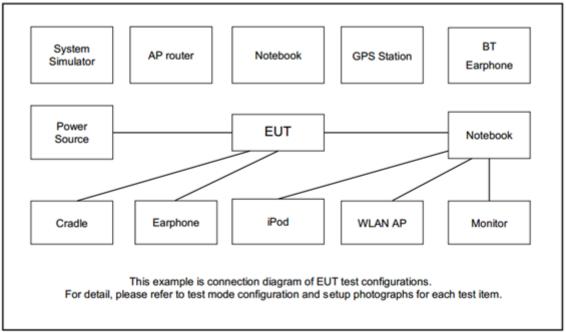
Report No. : FC2N2510-01

Test Items	Functions Enabled
AC Conducted	Mode 1: LTE Band 5 (Middle Channel) Link + GPS Rx + Adapter
AC Conducted Emission	Mode 2: LTE Band 12 (Middle Channel) Link + GPS Rx + Adapter
Lillission	Mode 3: 5G NR n71 (Middle Channel) Link + GPS Rx + Adapter
Dodistod	Mode 1: LTE Band 5 (Middle Channel) Link + GPS Rx + Adapter
Radiated Emissions	Mode 2: LTE Band 12 (Middle Channel) Link + GPS Rx + Adapter
Lilliasions	Mode 3: 5G NR n71 (Middle Channel) Link + GPS Rx + Adapter

Remark:

- 1. The worst case of AC is mode 1; only the test data of this mode was reported.
- 2. The worst case of RE is mode 3; only the test data of this mode was reported.
- For Radiation Emission after pre-scanned the cellular band between 30MHz ~ 960MHz (LTE Band 5/12,5G NR n71); only the worst case for cellular band test data of this mode was reported.

2.2. Connection Diagram of Test System



TEL: 886-3-327-3456 Page Number : 6 of 13 FAX: 886-3-328-4978 Issue Date : Mar. 15, 2023

2.3. Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	5G Wireless Test Platform	Anritsu	MT8000A	N/A	N/A	Unshielded, 1.8 m
2.	System Simulator	Anritsu	MT8821C	N/A	N/A	Unshielded, 1.8 m
3.	GPS Station	Pendulum	GSG-54	N/A	N/A	Unshielded, 1.8 m
4.	WLAN AP	SMC	SMC-100	HEDWG4005ACC	N/A	Unshielded, 1.8 m
5.	Adapter	LUCENT TRANS	1A78	N/A	N/A	Unshielded, 2.0m
6.	Fixture	Compal	ZM30	N/A	N/A	N/A

Report No. : FC2N2510-01

2.4. EUT Operation Test Setup

- 1. The EUT link with system simulator via WWAN function.
- 2. Execute "GPS Test" to make the EUT receive continuous signals from GPS station.

TEL: 886-3-327-3456 Page Number : 7 of 13 FAX: 886-3-328-4978 Issue Date : Mar. 15, 2023

3. Test Result

3.1. Test of AC Conducted Emission Measurement

3.1.1. Limits of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Report No.: FC2N2510-01

<Class B>

Frequency of emission	Conducted limit (dBuV)			
(MHz)	Quasi-peak	Average		
0.15-0.5	66 to 56*	56 to 46*		
0.5-5	56	46		
5-30	60	50		

^{*}Decreases with the logarithm of the frequency.

3.1.2. Measuring Instruments

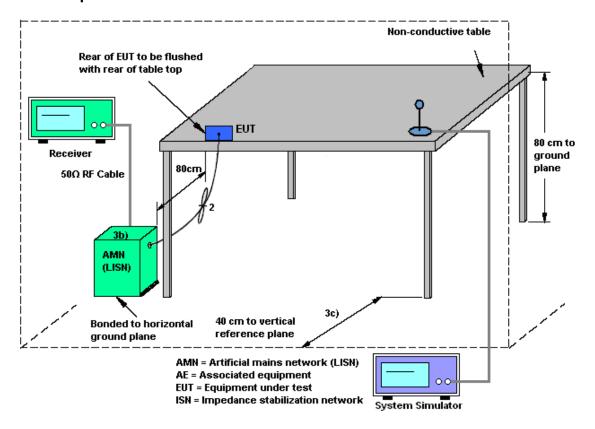
Please refer to the measuring equipment list in this test report.

3.1.3. Test Procedure

- 1. The EUT is placed 0.4 meter away from the conducting wall of the shielding room, and is kept at least 80 centimeters from any other grounded conducting surface.
- 2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
- 3. All the support units are connecting to the other LISN.
- 4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
- 5. The FCC states that a 50 ohm, 50 microhenry LISN shall be used.
- 6. Both Line and Neutral shall be tested in order to find out the maximum conducted emission.
- 7. The frequency range from 150 kHz to 30 MHz is scanned.
- Set the test-receiver system to Peak Detect Function and specified bandwidth (If Bandwidth = 9 kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

TEL: 886-3-327-3456 Page Number : 8 of 13 FAX: 886-3-328-4978 Issue Date : Mar. 15, 2023

3.1.4. Test Setup



Report No. : FC2N2510-01

3.1.5. Test Result of AC Conducted Emission

Please refer to Appendix A.

TEL: 886-3-327-3456 Page Number : 9 of 13 FAX: 886-3-328-4978 Issue Date : Mar. 15, 2023

3.2. Test of Radiated Emission Measurement

3.2.1. Limit of Radiated Emission

The emissions from an unintentional radiator shall not exceed the field strength levels specified in the following table:

Report No. : FC2N2510-01

<Class B>

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)	
30 – 88	100	3	
88 – 216	150	3	
216 - 960	200	3	
Above 960	500	3	

3.2.2. Measuring Instruments

Please refer to the measuring equipment list in this test report.

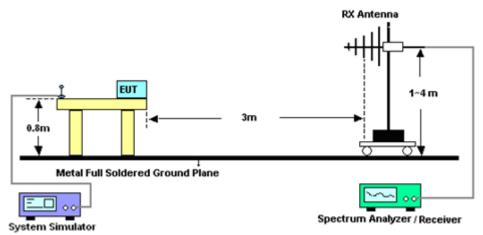
3.2.3. Test Procedures

- 1. The EUT is placed on a turntable with 0.8 meter above ground.
- 2. The EUT is set 3 meters from the interference receiving antenna, which is mounted on the top of a variable height antenna tower.
- 3. The table is rotated 360 degrees to determine the position of the highest radiation.
- 4. The antenna is a Bi-Log antenna and its height is adjusted between one to four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
- 5. For each suspected emission, the EUT is arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
- Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode (RBW=120 kHz/VBW=300 kHz for frequency below 1 GHz; RBW=1 MHz VBW=3 MHz (Peak), RBW=1 MHz/VBW=10 Hz (Average) for frequency above 1 GHz).
- 7. If the emission level of the EUT in peak mode is 3 dB lower than the limit specified, peak values of EUT will be reported. Otherwise, the emission will be repeated by using the quasi-peak method and reported.

TEL: 886-3-327-3456 Page Number : 10 of 13 FAX: 886-3-328-4978 Issue Date : Mar. 15, 2023

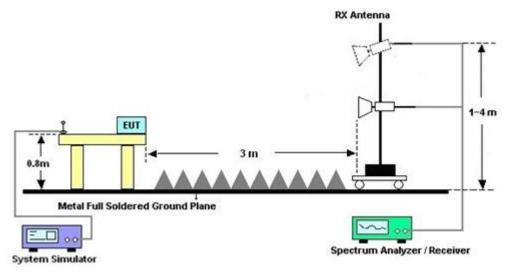
3.2.4. Test Setup of Radiated Emission

For Radiated Emissions from 30 MHz to 1 GHz



Report No. : FC2N2510-01

For Radiated Emissions from 1GHz to 18GHz



3.2.5. Test Result of Radiated Emission

Please refer to Appendix B.

TEL: 886-3-327-3456 Page Number : 11 of 13
FAX: 886-3-328-4978 Issue Date : Mar. 15, 2023

4. List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Amplifier	SONOMA	310N	186713	9kHz~1GHz	Apr. 28, 2022	Jan. 17, 2023	Apr. 27, 2023	Radiation (03CH06-HY)
Bilog Antenna	Schaffner	CBL 6111C & N-6-06	2725 & AT-N0601	30MHz~1GHz	Nov. 06, 2022	Jan. 17, 2023	Nov. 05, 2023	Radiation (03CH06-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100472	20Hz~26.5GHz	Feb. 09, 2022	Jan. 17, 2023	Feb. 08, 2023	Radiation (03CH06-HY)
Horn Antenna	SCHWARZBE CK	BBHA 9120 D	9120D-02037	1GHz~18GHz	Dec. 30, 2022	Jan. 17, 2023	Dec. 29, 2023	Radiation (03CH06-HY)
Preamplifier	Jet-Power	JPA00101800- 30-10P	1601180001	1GHz~18GHz	Jul. 18, 2022	Jan. 17, 2023	Jul. 17, 2023	Radiation (03CH06-HY)
RF Cable	HUBER + SUHNER	SF102_7000m m	532299/2	30MHz to 40GHz	Jul. 04, 2022	Jan. 17, 2023	Jul. 03, 2023	Radiation (03CH06-HY)
RF Cable	HUBER + SUHNER	SF102_3000m m	532422/2	30MHz to 40GHz	Jul. 04, 2022	Jan. 17, 2023	Jul. 03, 2023	Radiation (03CH06-HY)
RF Cable	HUBER + SUHNER	SF102_2000m m	532421/2	30MHz to 40GHz	Jul. 04, 2022	Jan. 17, 2023	Jul. 03, 2023	Radiation (03CH06-HY)
RF Cable	HUBER + SUHNER	SF104	802433/4	30Mhz to 18Ghz	Aug. 18, 2022	Jan. 17, 2023	Aug. 17, 2023	Radiation (03CH06-HY)
Hygrometer	TECPEL	DTM-303B	TP210018	N/A	Oct. 27, 2022	Jan. 17, 2023	Oct. 26, 2023	Radiation (03CH06-HY)
Controller	INN-CO	EM1000	060782	Control Turn table & Ant Mast	N/A	Jan. 17, 2023	N/A	Radiation (03CH06-HY)
Antenna Mast	MF	MF-7802	MF780208212	1m~4m	N/A	Jan. 17, 2023	N/A	Radiation (03CH06-HY)
Turn Table	INN-CO	DS2000	420/650/00	0-360 degree	N/A	Jan. 17, 2023	N/A	Radiation (03CH06-HY)
Software	Audix	E3 6.2009-8-24 (k5)	N/A	N/A	N/A	Jan. 17, 2023	N/A	Radiation (03CH06-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Jan. 10, 2023	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Dec. 01, 2022	Jan. 10, 2023	Nov. 30, 2023	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Nov. 17, 2022	Jan. 10, 2023	Nov. 16, 2023	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Nov. 17, 2022	Jan. 10, 2023	Nov. 16, 2023	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32	N/A	N/A	N/A	Jan. 10, 2023	N/A	Conduction (CO05-HY)
Pulse Limiter	SCHWARZBE CK	VTSD 9561-F N	00691	N/A	Aug. 01, 2022	Jan. 10, 2023	Jul. 31, 2023	Conduction (CO05-HY)
LISN Cable	MVE	RG-400	260260	N/A	Dec. 29, 2022	Jan. 10, 2023	Dec. 28, 2023	Conduction (CO05-HY)

Report No. : FC2N2510-01

TEL: 886-3-327-3456 Page Number : 12 of 13 FAX: 886-3-328-4978 Issue Date : Mar. 15, 2023

5. Uncertainty of Evaluation

<u>Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)</u>

Measuring Uncertainty for a Level of Confidence	3.5 dB
of 95% (U = 2Uc(y))	3.5 UB

Report No. : FC2N2510-01

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence	6.3 4B
of 95% (U = 2Uc(y))	6.3 dB

Uncertainty of Radiated Emission Measurement (1000 MHz ~6000 MHz)

Measuring Uncertainty for a Level of Confidence	4.6 dB	
of 95% (U = 2Uc(y))	4.0 UB	

Uncertainty of Radiated Emission Measurement (6000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence	4.5 dB
of 95% (U = 2Uc(y))	4.5 UB

TEL: 886-3-327-3456 Page Number : 13 of 13 FAX: 886-3-328-4978 Issue Date : Mar. 15, 2023

Appendix A. AC Conducted Emission Test Results

Test Engineer :	Calvin Mana	Temperature :	23~26 ℃
	Calvin wang	Relative Humidity :	45~55%

Report No. : FC2N2510-01

TEL: 886-3-327-3456 Page Number : A1 of A1

FAX: 886-3-328-4978

EUT Information

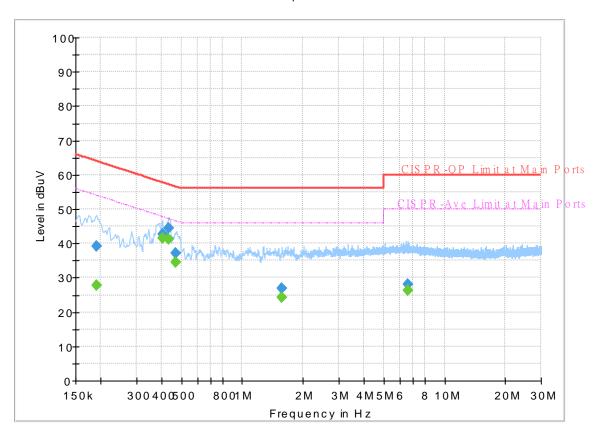
 Report NO :
 2N2510-01

 Test Mode :
 Mode 1

 Test Voltage :
 120Vac/60Hz

Phase: Line

FullSpectrum



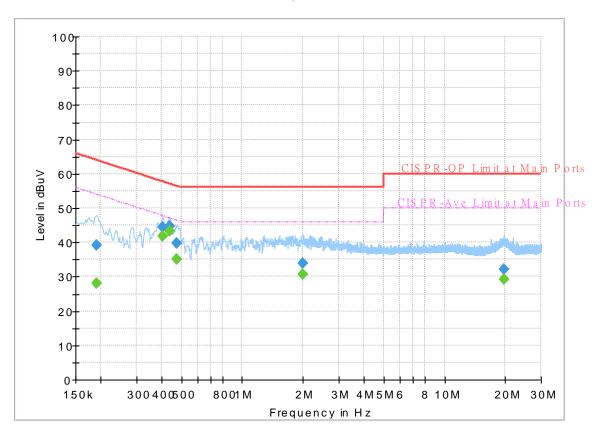
Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.190500		27.78	54.02	26.24	L1	OFF	19.9
0.190500	39.31		64.02	24.71	L1	OFF	19.9
0.402000		41.56	47.81	6.25	L1	OFF	19.9
0.402000	42.73	-	57.81	15.08	L1	OFF	19.9
0.433500		41.24	47.19	5.95	L1	OFF	19.9
0.433500	44.44		57.19	12.75	L1	OFF	19.9
0.469500		34.58	46.52	11.94	L1	OFF	19.9
0.469500	37.13	-	56.52	19.39	L1	OFF	19.9
1.574250		24.37	46.00	21.63	L1	OFF	19.9
1.574250	26.92	-	56.00	29.08	L1	OFF	19.9
6.614250		26.40	50.00	23.60	L1	OFF	20.1
6.614250	28.15		60.00	31.85	L1	OFF	20.1

EUT Information

Report NO: 2N2510-01
Test Mode: Mode 1
Test Voltage: 120Vac/60Hz
Phase: Neutral

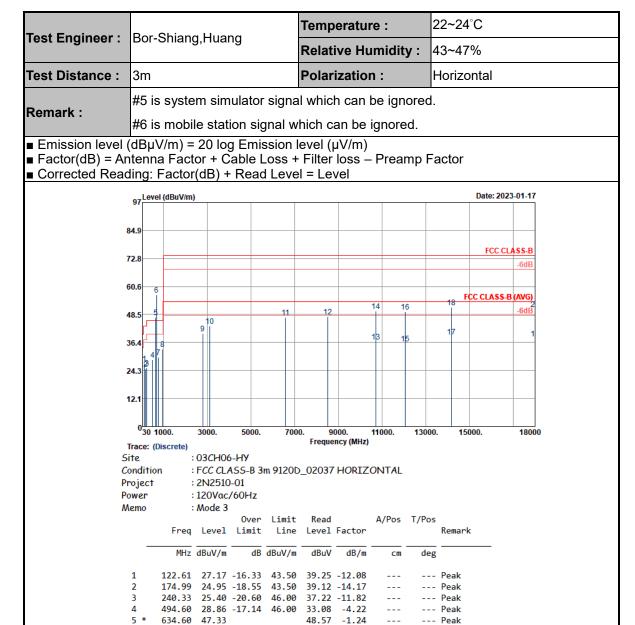
FullSpectrum



Final Result

Frequency	QuasiPeak	CAverage	Limit	Margin	Line	Filter	Corr.
(MHz)	(dBuV)	(dBuV)	(dBuV)	(dB)			(dB)
0.190500		27.96	54.02	26.06	N	OFF	19.9
0.190500	39.20	-	64.02	24.82	N	OFF	19.9
0.404250		41.93	47.77	5.84	N	OFF	19.9
0.404250	44.53		57.77	13.24	N	OFF	19.9
0.435750		43.36	47.14	3.78	N	OFF	19.9
0.435750	44.71		57.14	12.43	N	OFF	19.9
0.474000		35.13	46.44	11.31	N	OFF	19.9
0.474000	39.88		56.44	16.56	N	OFF	19.9
2.001750		30.61	46.00	15.39	N	OFF	19.9
2.001750	33.81	-	56.00	22.19	N	OFF	19.9
19.684500		29.10	50.00	20.90	N	OFF	20.6
19.684500	32.13		60.00	27.87	N	OFF	20.6

Appendix B. Radiated Emission Test Result



58.14

57.33

42.20

56.21

53.97

33.49

65.35 -25.00

66.96 -23.55

59.27 -11.74

-1.00

0.81

5.17

-7.29

-6.37

-6.37

-2.36

-2.36

4.50

--- Peak

--- Average

--- Average

--- Average

--- Average

Report No.: FC2N2510-01

TEL: 886-3-327-3456 Page Number : B1 of B2

680.80 57.14

10

11

13

14

15

16

17

18

19

764.10 29.94 -16.06 46.00 29.13

953.10 33.57 -12.43 46.00 28.40

6584.00 47.25 -26.75 74.00 61.16 -13.91

10716.00 36.81 -17.19 54.00 44.10 -7.29

74.00

54.00

54.00

2788.00 40.35 -33.65 74.00

3124.00 43.41 -30.59 74.00

10716.00 50.04 -23.96 74.00

12052.00 49.84 -24.16 74.00

14170.00 51.61 -22.39 74.00

17995.00 50.73 -23.27 74.00

14170.00 38.94 -15.06 54.00 41.30

8526.00 47.53 -26.47

12052.00 35.83 -18.17

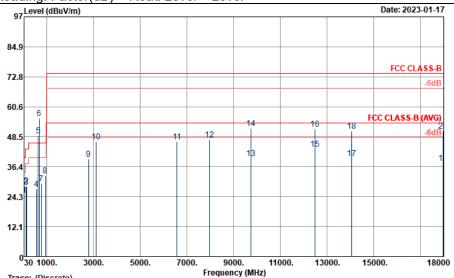
17995.00 37.99 -16.01

FAX: 886-3-328-4978

CC EMI TEST REPORT Report No. : FC2N2510-01

Toot Engineer	Por Chiana Huana	Temperature :	22~24°C				
rest Engineer:	Bor-Shiang,Huang	Relative Humidity :	43~47%				
Test Distance :	3m	Polarization :	Vertical				
Remark :	#5 is system simulator signal which can be ignored.						

- #6 is mobile station signal which can be ignored.
- Emission level (dBμV/m) = 20 log Emission level (μV/m) ■ Factor(dB) = Antenna Factor + Cable Loss + Filter loss – Preamp Factor
- Corrected Reading: Factor(dB) + Read Level = Level



A/Pos T/Pos

Trace: (Discrete)

Site : 03CH06-HY

Condition : FCC CLASS-B 3m 9120D_02037 VERTICAL

	Freq	Level	Limit	Line	Level	Factor			Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	cm	deg	
1	34.86	24.99	-15.01	40.00	33.78	-8.79			Peak
2	119.91	28.65	-14.85	43.50	40.77	-12.12			Peak
3	142.32	28.16	-15.34	43.50	40.33	-12.17			Peak
4	560.40	27.16	-18.84	46.00	28.88	-1.72			Peak
5	* 634.60	49.01			50.25	-1.24			Peak
6	* 680.80	56.05			57.05	-1.00			Peak
7	760.60	29.56	-16.44	46.00	28.76	0.80			Peak
8	939.10	32.61	-13.39	46.00	27.77	4.84			Peak
9	2790.00	39.38	-34.62	74.00	64.37	-24.99			Peak
10	3124.00	46.34	-27.66	74.00	69.89	-23.55			Peak
11	6584.00	46.61	-27.39	74.00	60.52	-13.91			Peak
12	7976.00	47.18	-26.82	74.00	59.49	-12.31			Peak
13	9748.00	39.64	-14.36	54.00	49.40	-9.76			Average
14	9748.00	51.96	-22.04	74.00	61.72	-9.76			Peak
15	12500.00	43.58	-10.42	54.00	49.30	-5.72			Average
16	12500.00	51.59	-22.41	74.00	57.31	-5.72			Peak
17	14050.00	39.81	-14.19	54.00	42.50	-2.69			Average
18	14050.00	50.75	-23.25	74.00	53.44	-2.69			Peak
19	17980.00	37.85	-16.15	54.00	33.50	4.35			Average
20	17980.00	50.76	-23.24	74.00	46.41	4.35			Peak

TEL: 886-3-327-3456 Page Number : B2 of B2

FAX: 886-3-328-4978