

Partial FCC Test Report (Part 96)

Report No.: RFBFLF-WTW-P21070538F-6

FCC ID: MSQFM350GL

Test Model: FM350-GL

Received Date: Dec. 28, 2022

Test Date: Jan. 03, 2023

Issued Date: Mar. 08, 2023

Applicant: ASUSTeK COMPUTER INC.

Address: 1F., No. 15, Lide Rd., Beitou Dist., Taipei City 112, Taiwan

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lin Kou Laboratories

Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

Test Location: No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City
33383, Taiwan

**FCC Registration /
Designation Number:** 788550 / TW0003



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Release Control Record

Issue No.	Description	Date Issued
RFBFLF-WTW-P21070538F-6	Original Release	Mar. 08, 2023

2 Summary of Test Results

47 CFR FCC Part 96			
FCC Clause	Test Item	Result	Remarks
2.1046 96.41(b)	Maximum Peak Output Power	N/A	Refer to Note
2.1047 96.41(a)	Modulation Characteristics	N/A	Refer to Note
2.1046 96.41(b)	Maximum Power Spectral Density	N/A	Refer to Note
96.41(g)	Peak to Average Ration	N/A	Refer to Note
2.1049	Emission Bandwidth	N/A	Refer to Note
2.1055	Frequency Stability	N/A	Refer to Note
2.1051 96.41(e)	Conducted Spurious Emissions	N/A	Refer to Note
2.1053 96.41(e)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -4.19 dB at 7250.00 MHz.

Note:

1. This report is a partial report, only test items of Radiated Spurious Emissions tests was performed. Other testing data please refer to Sporton report no.: FG051802F_R01 for module (Brand: Fibocom, Model: FM350-GL).
2. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	2.44 dB
	30 MHz ~ 200 MHz	2.95 dB
	200 MHz ~ 1000 MHz	2.95 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	5G Module		
Brand	Fibocom Wireless Inc		
Test Model	FM350-GL		
Status of EUT	Engineering sample		
Power Supply Rating	11.61 Vdc (Battery) 5 Vdc / 9Vdc / 15Vdc / 20Vdc (Adapter)		
Modulation Type	QPSK, 16QAM, 64QAM, 256QAM		
Operating Frequency	LTE Band 48	Channel Bandwidth 5MHz	TX: 3552.5 ~ 3697.5 MHz RX: 3552.5 ~ 3697.5 MHz
		Channel Bandwidth 10MHz	TX: 3555 ~ 3695 MHz RX: 3555 ~ 3695 MHz
		Channel Bandwidth 15MHz	TX: 3557.5 ~ 3692.5 MHz RX: 3557.5 ~ 3692.5 MHz
		Channel Bandwidth 20MHz	TX: 3560 ~ 3690 MHz RX: 3560 ~ 3690 MHz
		Channel Bandwidth 20MHz	TX: 3560 ~ 3690 MHz RX: 3560 ~ 3690 MHz
Antenna Type	Refer to Note as below		
Tx / Rx Function	2Tx / 4Rx		

Note:

- The EUT is authorized for use in specific End-product. Please refer to below for more details.

Product Name	Brand	Model	Difference
Notebook PC/Expertbook	ASUS	B7402FB	For marketing purpose
		B7402F	
		B7402FV	
		B7402FVA	
		B7402FVAT	

2. The antenna information is listed as below.

WWAN Antenna								
Ant. Type	Couple							
Band	NB				Tablet			
	Antenna Peak Gain (dBi)				Antenna Peak Gain (dBi)			
	Ant 0 (TX/RX)	Ant 1 (RX)	Ant 2 (TX/RX)	Ant 3 (RX)	Ant 0 (TX/RX)	Ant 1 (RX)	Ant 2 (TX/RX)	Ant 3 (RX)
WCDMA II / LTE 2 / 5G NR n2	1.96	1.51	1.82	1.96	-1.18	1.92	0.93	-1.73
WCDMA IV / LTE 4	1.89	1.57	1.84	1.87	1.22	1.95	0.48	-0.24
WCDMA V / LTE 5 / 5G NR n5	-0.42	-	-	-0.36	-3.96	-	-	-2.49
LTE 7 / 5G NR n7	1.97	1.61	1.79	1.83	0.29	1.94	1.99	0.79
LTE 12	0.88	-	-	-0.86	-1.05	-	-	-4.13
LTE 13	1.95	-	-	1.99	0.23	-	-	-1.81
LTE 14	1.90	-	-	1.81	-0.78	-	-	-1.95
LTE 17	0.88	-	-	-0.86	-1.05	-	-	-4.13
LTE 25 / 5G NR n25	1.93	1.77	1.82	1.97	-1.04	1.92	0.93	-1.69
LTE 26	-0.03	-	-	-0.22	-3.72	-	-	-2.49
LTE 30 / 5G NR n30	1.80	1.27	1.83	1.96	0.49	1.33	0.71	1.63
LTE 38 / 5G NR n38	1.31	1.55	1.88	1.81	0.8	1.96	1.94	-0.46
LTE 41 / 5G NR n41	1.97	1.98	1.50	1.84	1.82	1.84	1.86	1.96
LTE 48	1.90	1.89	1.73	1.91	1.84	1.77	1.82	1.83
LTE 66 / 5G NR n66	1.94	1.75	1.85	1.85	1.22	1.99	0.51	-0.44
5G NR n77	1.98	1.91	1.87	1.97	1.80	1.89	1.92	1.90
5G NR n78	1.98	1.75	1.87	1.91	1.98	1.89	1.82	1.93

*The max antenna gain was chosen for final test.

3. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

3.2 Test Mode Applicability and Tested Channel Detail

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis of Tablet Mode and NB Mode, and antenna ports.

The worst case was found when positioned on NB mode. Following channel(s) was (were) selected for the final test as listed below:

Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation
Radiated Emission	55340 to 56640	55990	20MHz	QPSK

Note:

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
Radiated Emission	24 deg. C, 66 % RH	120 Vac, 60 Hz	Thomas Cheng

3.3 Description of Support Units

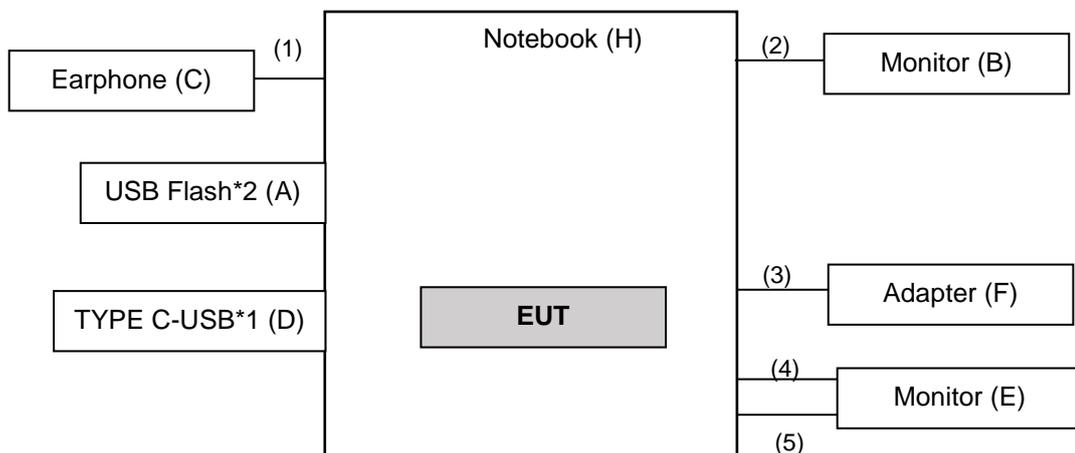
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	USB*2	TRANSCEND	USB3.0 32GB	N/A	N/A	Provided by Lab
B	Monitor	Dell	A14S2421HSXmTW	CN-01KQFW-WSL00-24C-711B	N/A	Provided by Lab
C	Earphone	HTC	HTC_MAX320	N/A	N/A	Provided by Lab
D	TYPE C-USB*1	SanDisk	SDDDC3-032G	N/A	N/A	Provided by Lab
E	Monitor	Dell	A14S2421HSXmTW	CN-01KQFW-WSL00-24C-714B	N/A	Provided by Lab
F	Adapter	CHICONY	A19-065N3A	N/A	N/A	Accessory of the EUT
G	Radio Communication Analyzer	Anritsu	MT8821C	6201462755	NA	Provided by Lab
H	Notebook	ASUS	B7402FV	NA	NA	Provided by client

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Audio for Earphone Cable	1	1.2	N	0	Provided by Lab
2.	HDMI Cable	1	1.8	Y	0	Provided by Lab
3.	Adapter Cable	1	1.6	Y	0	Accessory of the EUT
4.	Mini DP TO DP Cable	1	1.5	Y	0	Provided by Lab
5.	Micro HDMI TO HDMI Cable	1	1.5	Y	0	Provided by Lab

3.3.1 Configuration of System under Test

<Radiated Emission Test>



Under Table

Remote Site

3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC 47 CFR Part 2

FCC 47 CFR Part 96

KDB 971168 D01 Power Meas License Digital Systems v02r02

KDB 940660 D01 Part 96 CBRS Eqpt v02

ANSI/TIA/EIA-603-D-2010

All test items have been performed and recorded as per the above standards.

4 Test Types and Results

4.1 Radiated Emission Measurement

4.1.1 Limits of Radiated Emission Measurement

The power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40dBm/MHz .

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower & Turn Max-Full	MFA-440H	AT93021705	NA	NA
Turn Table Max-Full	MFT-201SS	NA	NA	NA
Turn Table Controller Max-Full	MG-7802	NA	NA	NA
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 27, 2022	Apr. 26, 2023
Signal Analyzer Agilent	N9010A	MY52220207	Jan. 06, 2022	Jan. 05, 2023
Loop Antenna TESEQ	HLA 6121	45745	Jul. 27, 2022	Jul. 26, 2023
Loop Antenna EMCI	EM-6879	269	Sep. 19, 2022	Sep. 18, 2023
Pre-amplifier EMCI	EMC001340	980201	Sep. 23, 2022	Sep. 22, 2023
RF Coaxial Cable EMCI	5D-NM-BM	140903+140902	Jan. 15, 2022	Jan. 14, 2023
Pre-Amplifier EMCI	EMC 330H	980112	Oct. 01, 2022	Sep. 30, 2023
Bi_Log Antenna Schwarzbeck	VULB9168	9168-472	Oct. 21, 2022	Oct. 20, 2023
RF Coaxial Cable WORKEN	8D-FB	Cable-Ch10-01	Oct. 01, 2022	Sep. 30, 2023
Horn Antenna Schwarzbeck	BBHA 9120D	9120D-969	Nov. 13, 2022	Nov. 12, 2023
Pre-Amplifier EMCI	EMC 012645	980115	Oct. 01, 2022	Sep. 30, 2023
RF Coaxial Cable EMCI	EMC104-SM-SM-8000+30 00	171005	Oct. 01, 2022	Sep. 30, 2023
RF Coaxial Cable HUBER SUHNER	SUCOFLEX 104	EMC104-SM-SM-1000 (140807)	Oct. 01, 2022	Sep. 30, 2023
RF FLITER MICRO-TRONICS	BRM50716	060	Jan. 10, 2022	Jan. 09, 2023
RF FLITER MICRO-TRONICS	BRM17690	004	Jan. 10, 2022	Jan. 09, 2023
Boresight antenna tower fixture BV	BAF-02	7	NA	NA
Radio Communication Analyzer Anritsu	MT8821C	6201462755	Mar. 03, 2022	Mar. 02, 2023
Pre-Amplifier EMCI	EMC 184045	980116	Oct. 01, 2022	Sep. 30, 2023
Horn Antenna Schwarzbeck	BBHA 9170	148	Nov. 13, 2022	Nov. 12, 2023
RF Coaxial Cable EMCI	EMC102-KM-KM-600	150928	Jul. 09, 2022	Jul. 08, 2023
RF Coaxial Cable EMCI	EMC102-KM-KM-3000	150929	Jul. 09, 2022	Jul. 08, 2023

- Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HY - 966 chamber 5.

4.1.3 Test Procedures

- a. In the semi-anechoic chamber, EUT placed on the 0.8m(below or equal 1GHz) and/or 1.5m(above 1GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- b. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- c. Perform a field strength measurement and record the worse read value, is the field strength value via a spectrum reading obtained corrected for antenna factor, cable loss and pre-amplifier factor and then mathematically convert the measured field strength level to EIRP/ERP level.
- d. Following C63.26 section 5.5 and 5.2.7
 $EIRP (dBm) = E (dB\mu V/m) + 20\log(D) - 104.8$; where D is the measurement distance (in the far field region) in m.
 $ERP (dBm) = E (dB\mu V/m) + 20\log(D) - 104.8 - 2.15$; where D is the measurement distance (in the far field region) in m.

Note:

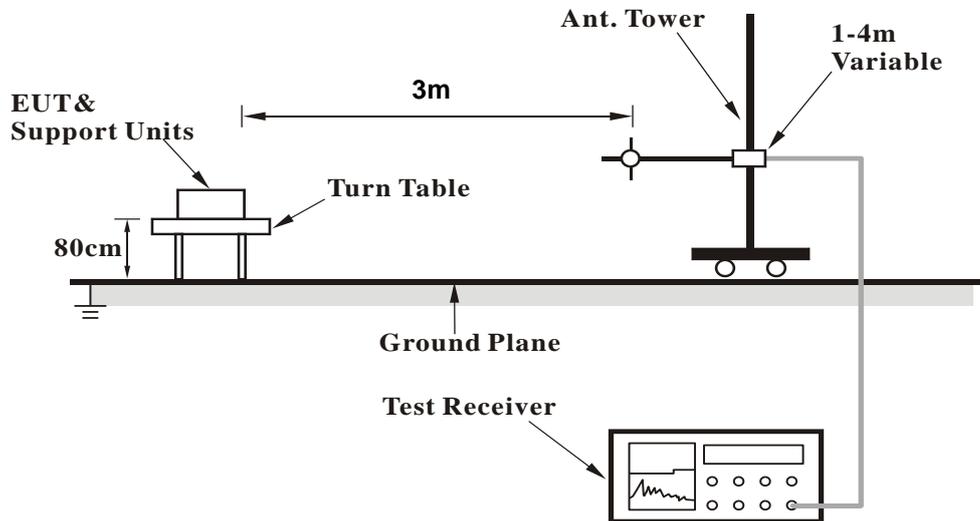
1. The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.
2. The emission levels were against the limit of frequency range 9 kHz ~ 30 MHz:
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

4.1.4 Deviation from Test Standard

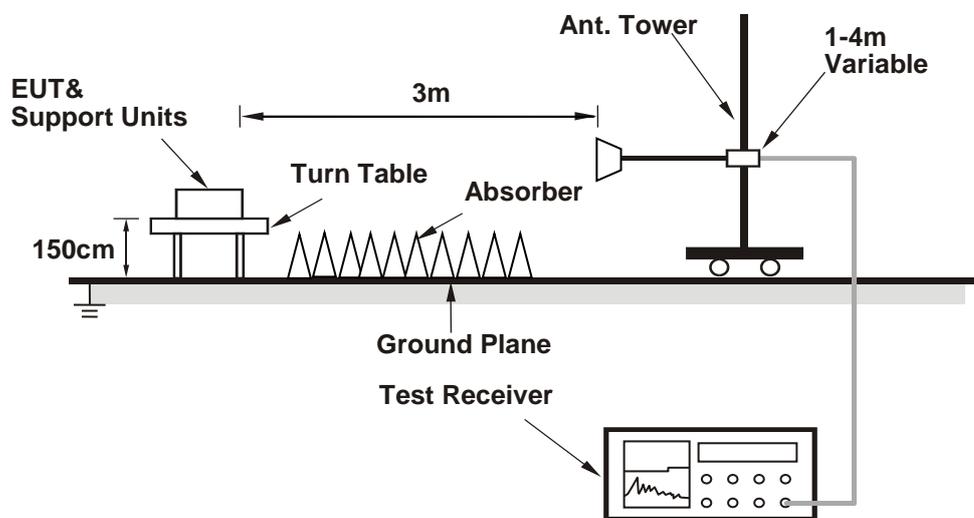
No deviation.

4.1.5 Test Set Up

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 Test Results

Below 1GHz

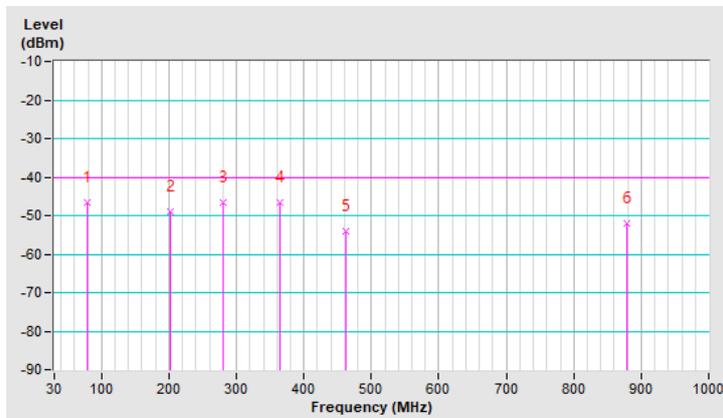
LTE Band 48, Channel Bandwidth: 20MHz

RF Mode	TX LTE Band XLVIII-20MHz	Channel	CH 55990 : 3625.0 MHz
Frequency Range	30MHz ~ 1GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	78.50	-46.70	-40.00	-6.70	2.98 H	28	64.98	-111.68
2	201.69	-49.15	-40.00	-9.15	2.68 H	166	61.76	-110.91
3	280.26	-46.54	-40.00	-6.54	1.79 H	145	60.95	-107.49
4	363.68	-46.69	-40.00	-6.69	2.54 H	358	58.95	-105.64
5	461.65	-53.93	-40.00	-13.93	1.57 H	125	49.13	-103.06
6	879.72	-51.96	-40.00	-11.96	3.18 H	67	44.57	-96.53

Remarks:

1. $EIRP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8$
3. $Margin\ value = EIRP - Limit\ value$
4. The other EIRP levels were very low against the limit.

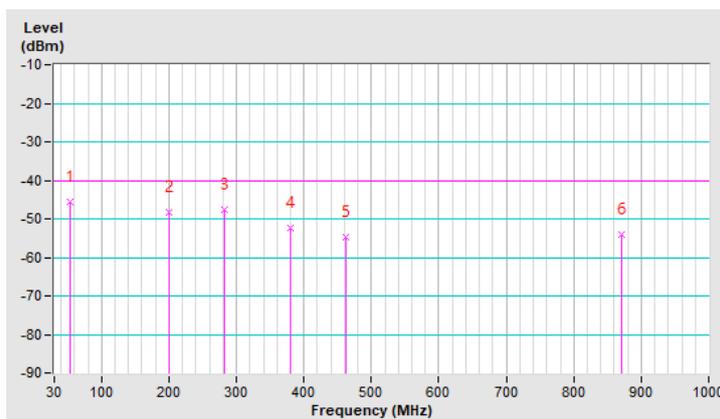


RF Mode	TX LTE Band XLVIII-20MHz	Channel	CH 55990 : 3625.0 MHz
Frequency Range	30MHz ~ 1GHz		

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	53.28	-45.70	-40.00	-5.70	1.36 V	109	61.95	-107.65
2	199.75	-48.24	-40.00	-8.24	2.15 V	211	62.65	-110.89
3	282.20	-47.74	-40.00	-7.74	2.32 V	182	59.69	-107.43
4	380.17	-52.54	-40.00	-12.54	3.83 V	92	52.53	-105.07
5	462.62	-54.76	-40.00	-14.76	1.26 V	85	48.28	-103.04
6	870.02	-54.16	-40.00	-14.16	3.34 V	91	42.54	-96.70

Remarks:

1. $EIRP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8$
3. $Margin\ value = EIRP - Limit\ value$
4. The other EIRP levels were very low against the limit.



Above 1GHz
 LTE Band 48

RF Mode	TX LTE Band XLVIII-20MHz	Channel	CH 55990 : 3625.0 MHz
Frequency Range	1GHz ~ 40GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m

No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	7250.00	-45.35	-40.00	-5.35	2.39 H	176	54.32	-99.67

Antenna Polarity & Test Distance : Vertical at 3 m

No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	7250.00	-44.19	-40.00	-4.19	2.80 V	252	55.48	-99.67

Remarks:

1. $EIRP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8$
3. Margin value = EIRP – Limit value
4. The other EIRP levels were very low against the limit.

5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Lin Kou EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF Lab/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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