

FCC TEST REPORT

REPORT NO.: RF130705D03-1

MODEL NO.: Lenovo N700

FCC ID: EMJMN700

RECEIVED: Jul. 5, 2013

TESTED: Jul. 16, 2013

ISSUED: Jul. 22, 2013

APPLICANT: PRIMAX ELECTRONICS LTD.

ADDRESS: No. 669, Ruey Kuang Road, Neihu, Taipei,

Taiwan, R.O.C.

ISSUED BY: Bureau Veritas Consumer Products Services

(H.K.) Ltd., Taoyuan Branch

LAB LOCATION: No. 47, 14th Ling, Chia Pau Vil., Lin Kou Dist.,

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Report No.: RF130705D03-1 1 of 21 Report Format Version 5.0.0 Reference No.: 130719D04



Table of Contents

RELE	ASE CONTROL RECORD	3
1.	CERTIFICATION	4
2. 2.1	SUMMARY OF TEST RESULTS	
3. 3.1 3.2 3.2.1 3.3 3.3.1 3.4	GENERAL INFORMATION GENERAL DESCRIPTION OF EUT DESCRIPTION OF TEST MODES TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL DESCRIPTION OF SUPPORT UNITS CONFIGURATION OF SYSTEM UNDER TEST. GENERAL DESCRIPTION OF APPLIED STANDARDS	6 7 8 9 9
4.2.4 4.2.5 4.2.6	TEST TYPES AND RESULTS CONDUCTED EMISSION MEASUREMENT RADIATED EMISSION AND BAND EDGE MEASUREMENT LIMITS OF RADIATED EMISSION AND BAND EDGE MEASUREMENT TEST INSTRUMENTS TEST PROCEDURES DEVIATION FROM TEST STANDARD TEST SETUP EUT OPERATING CONDITIONS TEST RESULTS	11 11 11 . 12 . 13 . 13 . 14
5.	PHOTOGRAPHS OF THE TEST CONFIGURATION	. 19
6.	INFORMATION ON THE TESTING LABORATORIES	. 20
7.	APPENDIX A – MODIFICATION RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB	. 21



RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF130705D03-1	Original release	Jul. 22, 2013

teport No.: RF130705D03-1 3 of 21 Report Format Version 5.0.0



1. CERTIFICATION

PRODUCT: Lenovo dual mode Wireless touch mouse N700

BRAND: Lenovo

MODEL NO.: Lenovo N700

APPLICANT: PRIMAX ELECTRONICS LTD.

TESTED: Jul. 16, 2013

TEST SAMPLE: MASS-PRODUCTION

STANDARDS: FCC Part 15, Subpart C (Section 15.249)

ANSI C63.10-2009

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch,** and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY: HIVEL UM, DATE: Jul. 22, 2013

(Albee Chu / Specialist)

APPROVED BY: , **DATE**: Jul. 22, 2013

(Ken Liu / Senior Manager)



2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C (Section 15.249)						
STANDARD PARAGRAPH	TEST TYPE	RESULT	REMARK			
15.207	Conducted Emission Test	N/A	Power supply is 3Vdc from batteries			
15.209 15.249 15.249 (d)	Radiated Emission Test Band Edge Measurement Limit: 50dB less than the peak value of fundamental frequency or meet radiated emission limit in section 15.209		Meet the requirement of limit. Minimum passing margin is -10.9dB at 2390.00MHz.			

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:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Frequency	Uncertainty
Dadiated emissions	30MHz ~ 1GHz	4.30 dB
Radiated emissions	Above 1GHz	3.36 dB



3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

EUT	Lenovo dual mode Wireless touch mouse N700
MODEL NO.	Lenovo N700
POWER SUPPLY	3Vdc from batteries
MODULATION TYPE	GFSK
OPERATING FREQUENCY	2402MHz ~ 2479MHz
NUMBER OF CHANNEL	78
ANTENNA TYPE	Printed antenna with 1.36dBi gain
DATA CABLE	N/A
I/O PORT	N/A
ACCESSORY DEVICES	N/A

NOTE:

- 1. The EUT is a Lenovo dual mode Wireless touch mouse N700.
- 2. The above EUT information is declared by the manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

6 of 21



3.2 DESCRIPTION OF TEST MODES

78 channels are provided to this EUT:

CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460		
19	2421	39	2441	59	2461		

7 of 21

Report No.: RF130705D03-1

Reference No.: 130719D04



3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE		APPLICA	ABLE TO		DESCRIPTION
MODE	PLC	RE≥1G	RE<1G	вм	
-	Note	\checkmark	\checkmark	\checkmark	-

Where **PLC**: P

PLC: Power Line Conducted Emission

RE≥1G: Radiated Emission above 1GHz

RE<1G: Radiated Emission below 1GHz

BM: Bandedge Measurement

NOTE: No need to concern of Conducted Emission due to the EUT is powered by battery

RADIATED EMISSION TEST (ABOVE 1 GHz):

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations axis and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE AVAILABLE CHANNEL		TESTED CHANNEL	MODULATION TYPE
-	0 to 77	0, 39, 77	GFSK

RADIATED EMISSION TEST (BELOW 1 GHz):

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations axis and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	0 to 77	0	GFSK

BANDEDGE MEASUREMENT:

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE AVAILABLE CHANNEL		TESTED CHANNEL	MODULATION TYPE
-	0 to 77	0, 77	GFSK

8 of 21

TEST CONDITION:

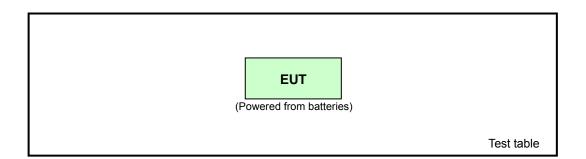
APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE<1G	25deg. C, 83% RH	3Vdc	Dalen Dai
RE≥1G	26deg. C, 79% RH	3Vdc	Dalen Dai
ВМ	26deg. C, 79% RH	3Vdc	Dalen Dai



3.3 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together without any necessary accessory or support unit.

3.3.1 CONFIGURATION OF SYSTEM UNDER TEST





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 Part 15, Subpart C (Section 15.249)

ANSI C63.10-2009

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



4. TEST TYPES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

N/A

4.2 RADIATED EMISSION AND BAND EDGE MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION AND BAND EDGE MEASUREMENT

The field strength of emissions from intentional radiators operate d within these frequency bands shall comply with the following

Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
902 ~ 928 MHz	50	500
2400 ~ 2483.5 MHz	50	500
5725 ~ 5875 MHz	50	500
24 ~ 24.25 GHz	250	2500

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits as below table, whichever is the lesser attenuation

Frequencies (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

NOTE:

- 1. The lower limit shall apply at the transition frequencies.
- 2. Emission level $(dBuV/m) = 20 \log Emission level (uV/m)$.
- 3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.



4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
HP Preamplifier	8447D	2432A03504	Feb. 26, 2013	Feb. 25, 2014
HP Preamplifier	8449B	3008A01201	Feb. 26, 2013	Feb. 25, 2014
Agilent TEST RECEIVER	N9038A	MY51210129	Jan. 03, 2013	Jan. 02, 2014
Schwarzbeck Antenna	VULB 9168	137	Mar. 20, 2013	Mar. 19, 2014
Schwarzbeck Antenna	VHBA 9123	480	May 29, 2013	May 28, 2014
ADT. Turn Table	TT100	0306	NA	NA
ADT. Tower	AT100	0306	NA	NA
Software	ADT_Radiated_V 7.6.15.9.2	NA	NA	NA
SUHNER RF cable	SF102	CABLE-CH6	Aug. 19, 2012	Aug. 18, 2013
Schwarzbeck Horn Antenna	BBHA 9120-D1	D130	May 13, 2013	May 12, 2014
Highpass filter Wainwright Instruments	WHK 3.1/18G-10SS	SN 8	NA	NA
ROHDE & SCHWARZ Spectrum Analyzer	FSP 40	100036	May. 17, 2013	May. 16, 2014

- **NOTE:** 1. The calibration interval of the above test instruments is 12/24 months. And the calibrations are traceable to NML/ROC and NIST/USA.
 - 2. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
 - 3. The test was performed in Chamber No. 6.
 - 4. The Industry Canada Reference No. IC 7450E-6.
 - 5. The FCC Site Registration No. is 447212.



4.2.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. 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.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE:

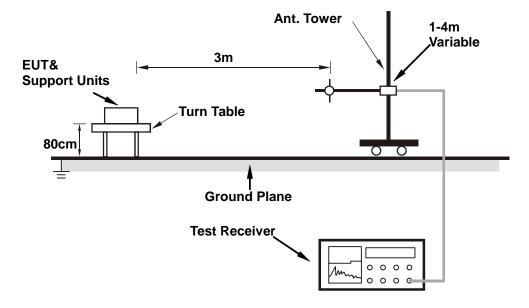
- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
- 2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
- 3. All modes of operation were investigated and the worst-case emissions are reported.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation.



4.2.5 TEST SETUP



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

4.2.6 EUT OPERATING CONDITIONS

Set the EUT under transmission condition continuously at specific channel frequency.



4.2.7 TEST RESULTS

ABOVE 1GHz DATA

CHANNEL	TX Channel 0	DETECTOR	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz	FUNCTION	Average (AV)

		ANTENNA	POLARITY	& TEST DIS	TANCE: HO	RIZONTAL	AT 3 M	
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	63.1 PK	74.0	-10.9	1.00 H	129	66.84	-3.75
2	2390.00	29.6 AV	54.0	-24.4	1.00 H	129	33.35	-3.75
3	2400.00	57.9 PK	74.0	-16.1	1.00 H	129	61.58	-3.70
4	2400.00	26.6 AV	54.0	-27.4	1.00 H	129	30.29	-3.70
5	*2402.00	97.9 PK	114.0	-16.1	1.00 H	129	101.57	-3.69
6	*2402.00	66.6 AV	94.0	-27.4	1.00 H	129	70.28	-3.69
7	4804.00	50.1 PK	74.0	-23.9	1.00 H	88	46.43	3.70
8	4804.00	36.8 AV	54.0	-17.2	1.00 H	88	33.14	3.70
		ANTENNA	POLARIT	Y & TEST DI	STANCE: V	ERTICAL A	T 3 M	
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	51.2 PK	74.0	-22.8	1.10 V	265	54.92	-3.75
2	2390.00	27.5 AV	54.0	-26.5	1.10 V	265	31.28	-3.75
3	2400.00	45.5 PK	74.0	-28.5	1.10 V	265	49.17	-3.70
4	2400.00	18.4 AV	54.0	-35.6	1.10 V	265	22.10	-3.70
5	*2402.00	85.5 PK	114.0	-28.5	1.10 V	265	89.16	-3.69
6	*2402.00	58.4 AV	94.0	-35.6	1.10 V	265	62.09	-3.69
7	4804.00	45.7 PK	74.0	-28.4	1.00 V	179	41.95	3.70

REMARKS:

- 1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
- 2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) Pre-Amplifier Factor(dB)
- 3. The other emission levels were very low against the limit.
- 4. Margin value = Emission Level Limit value
- 5. " * ": Fundamental frequency.



CHANNEL	TX Channel 39	DETECTOR	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz	FUNCTION	Average (AV)

		ΔΝΤΕΝΝΔ	POLARITY	& TEST DIS	TANCE: HO	RIZONTAL	ДТЗМ	
NO.		EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2441.00	95.4 PK	114.0	-18.6	1.21 H	111	98.91	-3.51
2	*2441.00	65.6 AV	94.0	-28.4	1.21 H	111	69.13	-3.51
3	4882.00	51.0 PK	74.0	-23.0	1.06 H	73	47.25	3.76
4	4882.00	38.0 AV	54.0	-16.0	1.06 H	73	34.28	3.76
		ANTENNA	POLARITY	/ & TEST DI	STANCE: V	ERTICAL A	T 3 M	
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
NO .	*2441.00	LEVEL		MARGIN (dB) -27.4		ANGLE		FACTOR
	, ,	LEVEL (dBuV/m)	(dBuV/m)	, ,	HEIGHT (m)	ANGLE (Degree)	(dBuV)	FACTOR (dB/m)
1	*2441.00	LEVEL (dBuV/m) 86.6 PK	(dBuV/m) 114.0	-27.4	HEIGHT (m) 1.10 V	ANGLE (Degree)	(dBuV) 90.12	FACTOR (dB/m) -3.51

REMARKS:

- 1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
- 2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) Pre-Amplifier Factor(dB)
- 3. The other emission levels were very low against the limit.
- 4. Margin value = Emission Level Limit value
- 5. " * ": Fundamental frequency.



CHANNEL	TX Channel 77	DETECTOR	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz	FUNCTION	Average (AV)

		ANTENNA	POLARITY	& TEST DIS	TANCE: HO	RIZONTAL	AT 3 M	
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2479.00	97.8 PK	114.0	-16.2	1.10 H	111	101.15	-3.34
2	*2479.00	66.3 AV	94.0	-27.7	1.10 H	111	69.65	-3.34
3	2483.50	60.8 PK	74.0	-13.2	1.10 H	111	64.13	-3.32
4	2483.50	29.8 AV	54.0	-24.2	1.10 H	111	33.13	-3.32
5	4958.00	49.9 PK	74.0	-24.1	1.02 H	101	46.17	3.70
6	4958.00	36.7 AV	54.0	-17.3	1.02 H	101	33.04	3.70
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	FACTOR (dB/m)
NO .	FREQ. (MHz) *2479.00	LEVEL		MARGIN (dB) -26.8	7	ANGLE		FACTOR
	, ,	LEVEL (dBuV/m)	(dBuV/m)	Ì	HEIGHT (m)	ANGLE (Degree)	(dBuV)	FACTOR (dB/m)
1	*2479.00	LEVEL (dBuV/m) 87.2 PK	(dBuV/m)	-26.8	HEIGHT (m)	ANGLE (Degree)	(dBuV) 90.57	FACTOR (dB/m) -3.34
1 2	*2479.00 *2479.00	LEVEL (dBuV/m) 87.2 PK 59.8 AV	(dBuV/m) 114.0 94.0	-26.8 -34.2	1.03 V 1.03 V	ANGLE (Degree) 150 150	(dBuV) 90.57 63.11	FACTOR (dB/m) -3.34 -3.34
1 2 3	*2479.00 *2479.00 2483.50	LEVEL (dBuV/m) 87.2 PK 59.8 AV 52.1 PK	(dBuV/m) 114.0 94.0 74.0	-26.8 -34.2 -21.9	1.03 V 1.03 V 1.03 V	ANGLE (Degree) 150 150	(dBuV) 90.57 63.11 55.38	FACTOR (dB/m) -3.34 -3.34 -3.32

REMARKS:

- 1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
- 2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) Pre-Amplifier Factor(dB)
- 3. The other emission levels were very low against the limit.
- 4. Margin value = Emission Level Limit value
- 5. " * ": Fundamental frequency.

Report No.: RF130705D03-1 Reference No.: 130719D04 17 of 21

Report Format Version 5.0.0



BELOW 1GHz WORST-CASE DATA

CHANNEL	TX Channel 0	DETECTOR	Ougoi Dook
FREQUENCY RANGE	Below 1000MHz	FUNCTION	Quasi-Peak

		ANTENNA	POLARITY	& TEST DIS	TANCE: HO	RIZONTAL	AT 3 M	
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	117.30	18.9 QP	43.5	-24.6	1.17 H	91	34.72	-15.86
2	331.67	18.3 QP	46.0	-27.7	1.06 H	283	28.96	-10.65
3	613.94	24.3 QP	46.0	-21.7	1.51 H	119	29.29	-5.03
4	702.21	24.6 QP	46.0	-21.5	1.24 H	50	28.35	-3.80
5	777.87	26.1 QP	46.0	-19.9	1.74 H	201	28.26	-2.13
6	905.91	27.8 QP	46.0	-18.2	1.03 H	146	28.20	-0.43
		ANTENNA	POLARITY	/ & TEST DI	STANCE: V	ERTICAL A	T 3 M	
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	98.87	15.2 QP	43.5	-28.3	1.05 V	11	33.40	-18.23
2	138.64	15.8 QP	43.5	-27.7	1.31 V	34	29.94	-14.12
3	191.99	16.0 QP	43.5	-27.5	1.10 V	338	31.82	-15.86
4	551.86	22.8 QP	46.0	-23.2	1.69 V	104	29.38	-6.58
4 5	551.86 814.73	22.8 QP 27.0 QP	46.0 46.0	-23.2 -19.0	1.69 V 1.41 V	104 19	29.38 28.66	-6.58 -1.68

REMARKS:

- 1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
- 2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) Pre-Amplifier Factor(dB)

18 of 21

- 3. The other emission levels were very low against the limit.
- 4. Margin value = Emission Level Limit value



5. PHOTOGRAPHS OF THE TEST CONFIGURATION Please refer to the attached file (Test Setup Photo).



6. INFORMATION ON 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.

Hsin Chu EMC/RF Lab

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

Linko EMC/RF Lab

Tel: 886-2-26052180 Tel: 886-3-5935343 Fax: 886-2-26051924 Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety/Telecom 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.



7. APPENDIX A – MODIFICATION RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB
No modifications were made to the EUT by the lab during the test.
END