

EMC TEST REPORT

REPORT NO.: RM980630H04X

MODEL NO.: WLE200N2

RECEIVED: June 30, 2009

TESTED: July 24 to 31, 2009

ISSUED: Apr. 02, 2013

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RM980630H04X	Original release	Apr. 02, 2013

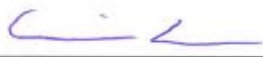


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1 CERTIFICATION

PRODUCT: WIRELESS-BGN 2X2 NETWORK MINI PCIE ADAPTER
BRAND NAME: COMPEX
MODEL NO: WLE200N2
APPLICANT: Compex Systems Pte Ltd.
TESTED: July 24 to 31, 2009
TEST SAMPLE: R&D SAMPLE
STANDARDS: **EN 301 489-1 V1.8.1 (2008-04)**
EN 301 489-17 V2.1.1 (2009-05)
EN 55022: 2006+A1:2007, Class B
EN 61000-3-2:2006+A1:2009+A2:2009 (Not Applicable)
EN 61000-3-3:2008 (Not Applicable)
EN 61000-4-2:2009
EN 61000-4-3:2006+A1:2008+A2:2010
EN 61000-4-4:2004+A1:2010 (Not Applicable)
EN 61000-4-5:2006 (Not Applicable)
EN 61000-4-6:2009 (Not Applicable)
EN 61000-4-11:2004 (Not Applicable)

The above equipment (Model: WLE200N2) 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 :  , **DATE:** Apr. 02, 2013
(Claire Kuan, Specialist)

APPROVED BY :  , **DATE:** Apr. 02, 2013
(Ken Lu, Manager)

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

EMISSION			
Standard	Test Type	Result	Remarks
EN 55022:2006 +A1:2007, Class B	Conducted Test	PASS	Meets Class B Limit Minimum passing margin is -8.93 dB at 0.186 MHz
	Telecommunication Ports Conducted Test	NA	Not Applicable
	Radiated Test	PASS	Meets Class B Limit Minimum passing margin is -1.86 dB at 166.11 MHz
EN 61000-3-2: 2006	Harmonic current emissions	NA	Not Applicable
EN 61000-3-3: 1995 +A1:2001+A2:2005	Voltage fluctuations & flicker	NA	Not Applicable

IMMUNITY			
Standard	Test Type	Result	Remarks
EN 61000-4-2:1995 +A1:1998+A2:2001	Electrostatic discharge immunity test	PASS	Meets the requirements of Performance Criterion A
EN 61000-4-3:2006 +A1:2008	Radiated, radio-frequency, electromagnetic field immunity test	PASS	Meets the requirements of Performance Criterion A
EN 61000-4-4:2004	Electrical fast transient / burst immunity test.	NA	Not Applicable
EN 61000-4-5:2006	Surge immunity test	NA	Not Applicable
EN 61000-4-6:2007	Immunity to conducted disturbances, induced by radio-frequency fields	NA	Not Applicable
EN 61000-4-11:2004	Voltage dips, short interruptions and voltage variations immunity tests	NA	Not Applicable

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	Value
Conducted emissions	2.45 dB
Radiated emissions (30MHz-1GHz)	3.94 dB
Radiated emissions (1GHz ~18GHz)	2.49 dB

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	WIRELESS-BGN 2X2 NETWORK MINI PCIE ADAPTER
MODEL NO.	WLE200N2
POWER SUPPLY	DC 3.3V from host equipment
MODULATION TYPE	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
TRANSFER RATE	802.11b: 11 / 5.5 / 2 / 1Mbps 802.11a / g: 54 / 48 / 36 / 24 / 18 / 12 / 9 / 6Mbps HT20 MCS0~7 (800ns GI): 65 / 58.5 / 52 / 39 / 26 / 19.5 / 13 / 6.5Mbps. HT20 MCS8~15 (800ns GI): 130 / 117 / 104 / 78 / 52 / 39 / 26 / 13Mbps. HT40 MCS0~7 (800ns GI): 135 / 121.5 / 108 / 81 / 54 / 40.5 / 27 / 13.5Mbps. HT40 MCS8~15 (800ns GI): 270 / 243 / 216 / 162 / 108 / 81 / 54 / 27Mbps. HT40 MCS0~7 (400ns GI): 150 / 135 / 120 / 90 / 60 / 45 / 30 / 15Mbps. HT40 MCS8~15 (400ns GI): 300 / 270 / 240 / 180 / 120 / 90 / 60 / 30Mbps.
OPERATING FREQUENCY	802.11b and 802.11g: 2400 ~ 2454.0 MHz for outdoor usage in France 2400 ~ 2483.5 MHz for EU countries (include indoor usage in France)
NUMBER OF CHANNEL	For 802.11b, 802.11g, 802.11n (20MHz) : France: 7 ; Other EU countries: 13 For 802.11n (40MHz) : France: 3 ; Other EU countries: 9
ANTENNA TYPE	Please see note
DATA CABLE	NA
I/O PORT	NA
ASSOCIATED DEVICES	NA

NOTE:

1. There are two sets of antennas provided to this EUT, please refer to the following table:

Set 1					
Transmitter Circuit	Brand	Model	Antenna Type	Antenna Gain (dBi)	Antenna Connector
Chain(0)	Inpaq	DAMA1BM3000402	Dipole	3.2	RPSMA
Chain(1)	Inpaq	DAMA1BM3000402	Dipole	3.2	RPSMA
Set 2					
Transmitter Circuit	Brand	Model	Antenna Type	Antenna Gain (dBi)	Antenna Connector
Chain(0)	Wistron	81.EBJ15.005	PIFA	3.6	IPEX
Chain(1)	Wistron	81.EBJ15.005	PIFA	3.6	IPEX

2. The EUT incorporates CDD function with 802.11b, 802.11g and MIMO function with 802.11n.
3. The EUT is 2 * 2 spatial MIMO (2Tx & 2Rx) without beam forming function. The antenna configurations are two transmitter antennas and two receiver antennas, as there are 2 Dipole antennas or PIFA antennas. Spatial multiplexing modes for simultaneous transmission using 2 antennas, and for simultaneous receiver using 2 antennas.
4. There are two different versions of DUT, the only difference is version -141 has switch regulator installed, and version -041 has the transistors installed instead of switch regulator. The worst-case scenario has been investigated with the same output power, which version -141 shows the worst results on conducted emission, and version -041 shows the worst results on radiated emission. The test data reflects the worst-case scenarios.
5. The EUT was pre-tested under the following modes:

Test Mode	Data rate
Mode A	400ns GI
Mode B	800ns GI

From the above modes, the worst case was found in **Mode B**. Therefore only the test data of the mode was recorded in this report.

6. The above EUT information was declared by the manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.2 DESCRIPTION OF TEST MODES

The EUT was tested under following test modes:

For conducted test	
Test Mode	Description
Mode 1	With PIFA antenna / version -141
For radiated test	
Test Mode	Description
Mode 1	With Dipole antenna / version -041
Mode 2	With PIFA antenna / version -041
For immunity test	
Test Mode	Description
Mode 1	With Dipole antenna / version -041
Mode 2	With Dipole antenna / version -141
Mode 3	With PIFA antenna / version -041
Mode 4	With PIFA antenna / version -141

3.3 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:

EN 301 489-1 V1.8.1 (2008-04), EN 301 489-17 V2.1.1 (2009-05)

Emission tests:

EN 55022: 2006+A1:2007, Class B

EN 61000-3-2:2006+A1:2009+A2:2009 (Not Applicable)

EN 61000-3-3:2008 (Not Applicable)

Immunity tests:

EN 61000-4-2:2009

EN 61000-4-3:2006+A1:2008+A2:2010

EN 61000-4-4:2004+A1:2010 (Not Applicable)

EN 61000-4-5:2006 (Not Applicable)

EN 61000-4-6:2009 (Not Applicable)

EN 61000-4-11:2004 (Not Applicable)

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

3.4 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.

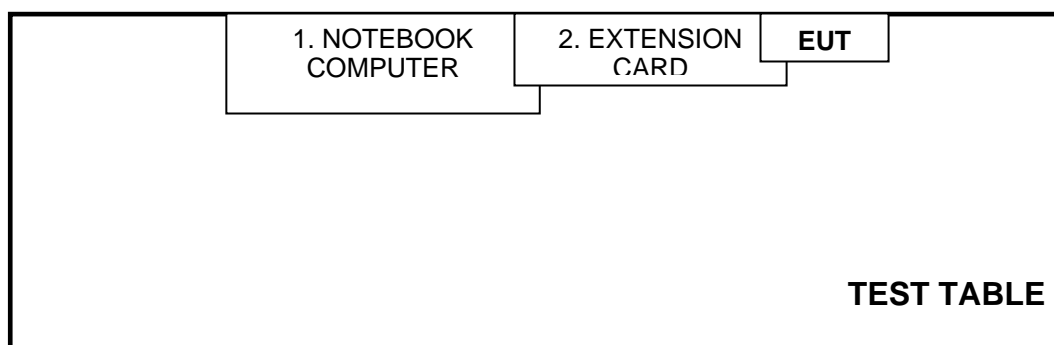
For conducted / radiated test					
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER	Lenovo	0769	0769AUU	FCC DoC
2	EXTENSION CARD	Atheros	NA	NA	NA
For immunity test					
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER	Lenovo	0769	0769AUU	FCC DoC
2	EXTENSION CARD	Atheros	NA	NA	NA
3	WIRELESS ACCESS POINT	Air Station	WLA-G54	NA	NA

For conducted / radiated test	
NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA
2	NA
For immunity test	
NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA
2	NA
3	NA

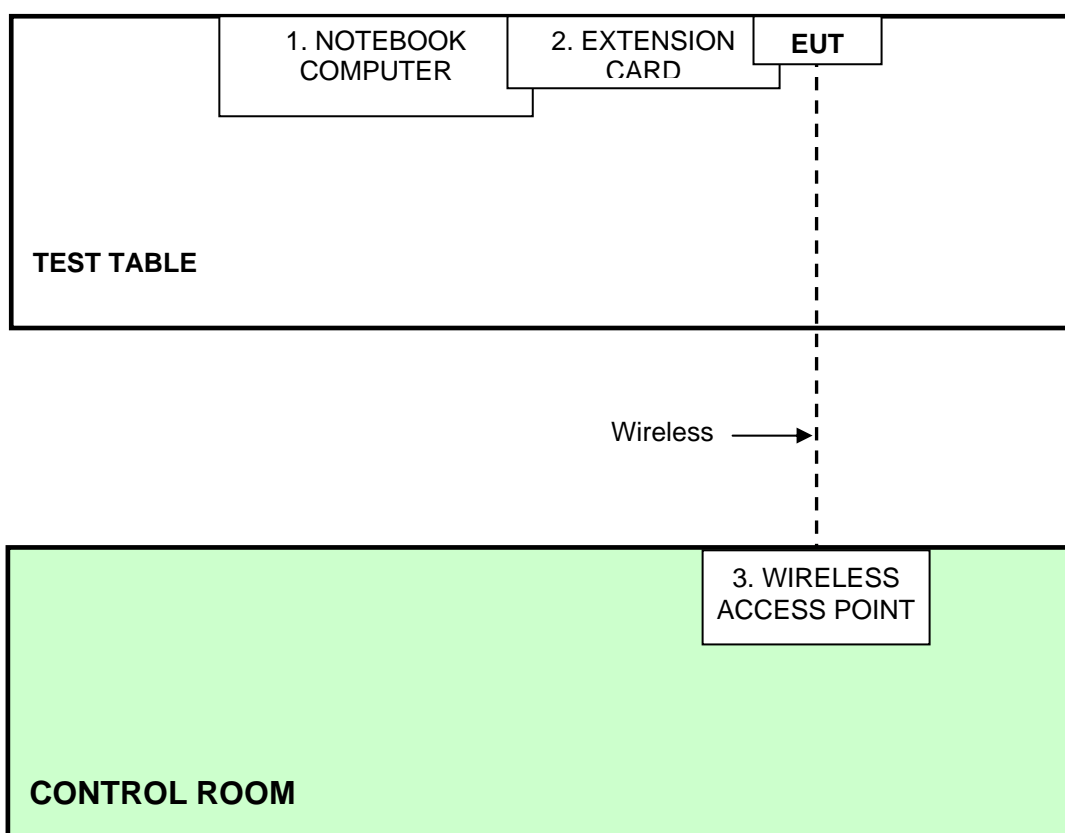
NOTE: All power cords of the above support units are non shielded (1.8m).

3.5 CONFIGURATION OF SYSTEM UNDER TEST

For Conducted / Radiated test



For Immunity test



4 EMISSION TEST

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

TEST STANDARD: EN 55022

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

NOTES: (1) The lower limit shall apply at the transition frequencies.

(2) The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver	ESCS 30	100375	Mar. 23, 2009	Mar. 22, 2010
Line-Impedance Stabilization Network (for Peripheral)	ENV-216	100071	Nov. 26, 2008	Nov. 25, 2009
Line-Impedance Stabilization Network (for EUT)	ESH3-Z5	848773/004	Nov. 05, 2008	Nov. 04, 2009
RF Cable (JYEBAO)	5DFB	COBCAB-001	Aug. 15, 2008	Aug. 14, 2009
50 ohms Terminator	50	3	Nov. 05, 2008	Nov. 04, 2009
Software	BV ADT_Cond_V7.3.7	NA	NA	NA

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 Shielded Room No. B.
3. The VCCI Con B Registration No. is C-2193.

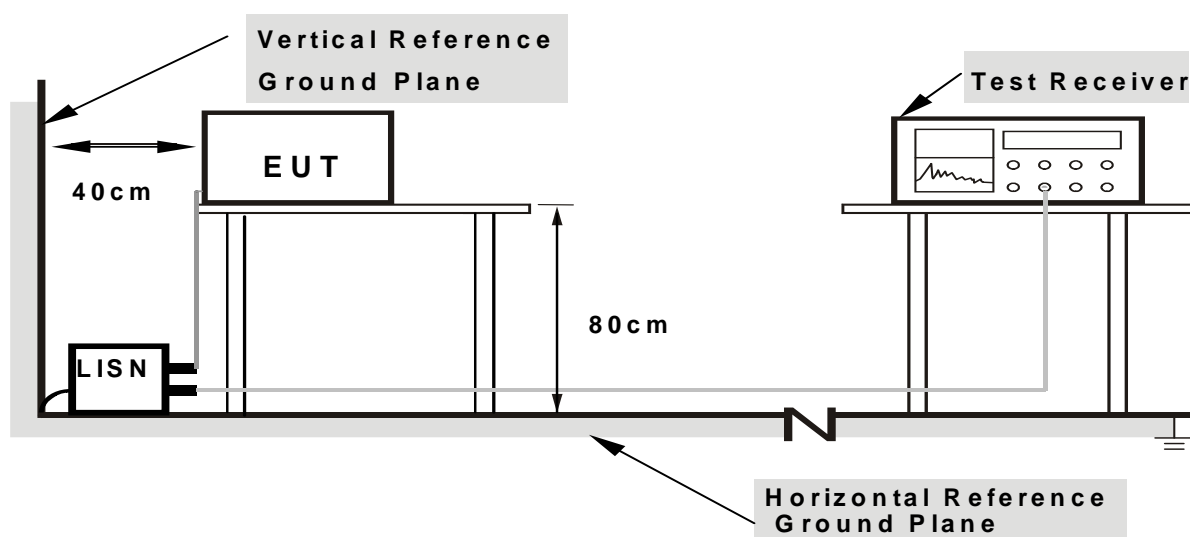
4.1.3 TEST PROCEDURE

- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20dB) were not recorded.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 TEST SETUP



Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.



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4.1.6 EUT OPERATING CONDITIONS

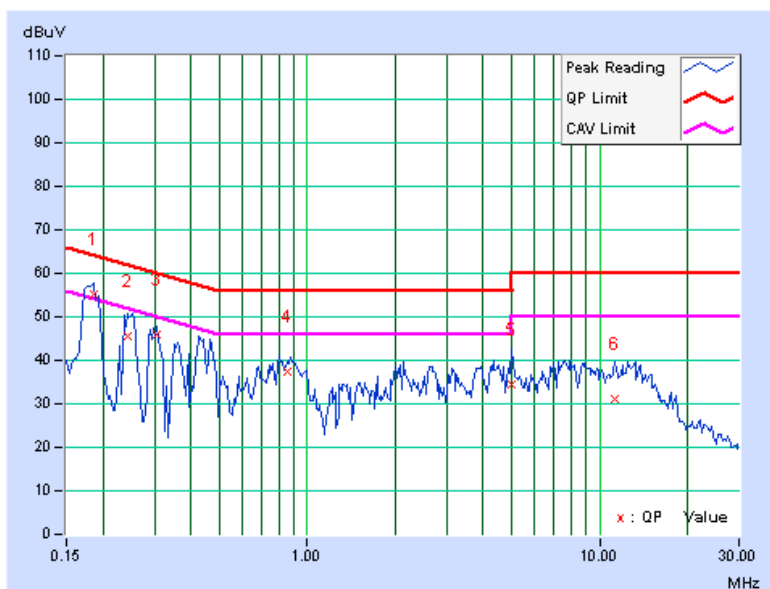
- a. Connect the EUT with support unit 1 (Notebook computer) which placed on a testing table.
- b. Support unit 1 (Notebook computer) run test program “ART v0 9 b4” to allow EUT to transmit continuously at specific channel frequency.

4.1.7 TEST RESULTS

TEST MODE	Mode 1	PHASE	Line (L)
INPUT POWER (SYSTEM)	230Vac, 50 Hz	6dB BANDWIDTH	9 kHz
ENVIRONMENTAL CONDITIONS	20deg. C, 50%RH, 950hPa	TESTED BY	Frank Liu

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.186	0.21	55.09	42.35	55.30	42.56	64.23	54.23	-8.93	-11.67
2	0.244	0.27	45.31	-	45.58	-	61.96	51.96	-16.37	-
3	0.307	0.35	45.48	-	45.83	-	60.06	50.06	-14.23	-
4	0.850	0.33	37.00	-	37.33	-	56.00	46.00	-18.67	-
5	5.017	0.60	33.72	-	34.32	-	60.00	50.00	-25.68	-
6	11.289	0.81	30.24	-	31.05	-	60.00	50.00	-28.95	-

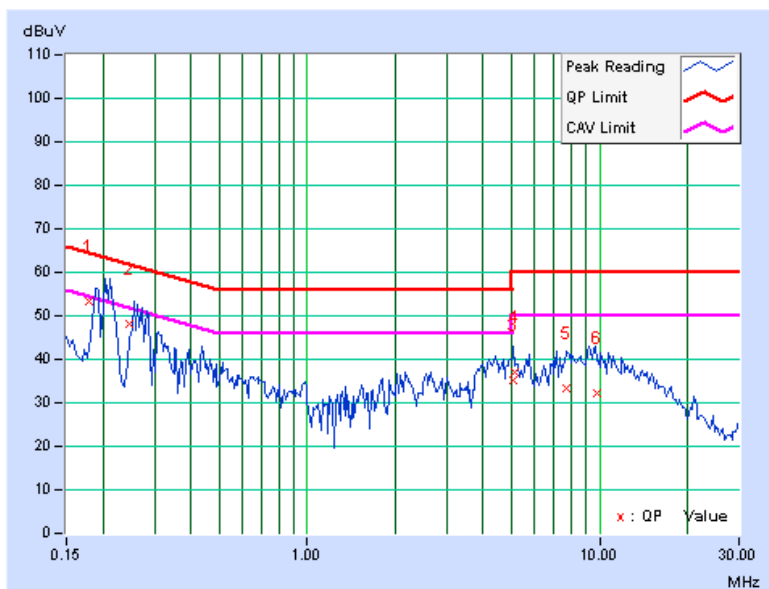
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.



TEST MODE	Mode 1	PHASE	Neutral (N)
INPUT POWER (SYSTEM)	230Vac, 50 Hz	6dB BANDWIDTH	9 kHz
ENVIRONMENTAL CONDITIONS	20deg. C, 50%RH, 950hPa	TESTED BY	Frank Liu

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.180	0.14	53.34	-	53.48	-	64.47	54.47	-11.00	-
2	0.245	0.21	47.79	-	48.00	-	61.91	51.91	-13.91	-
3	5.080	0.52	34.78	-	35.30	-	60.00	50.00	-24.70	-
4	5.100	0.52	36.52	-	37.04	-	60.00	50.00	-22.96	-
5	7.727	0.55	32.66	-	33.21	-	60.00	50.00	-26.79	-
6	9.749	0.57	31.55	-	32.12	-	60.00	50.00	-27.88	-

- REMARKS:** 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Correction factor = Insertion loss + Cable loss
6. Emission Level = Correction Factor + Reading Value.



4.2 RADIATED EMISSION MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

TEST STANDARD: EN 55022

LIMITS BELOW 1GHz

FREQUENCY (MHz)	Class A (at 10m)	Class B (at 10m)
	dBuV/m	dBuV/m
30 - 230	40	30
230 - 1000	47	37

- NOTE:**
- (1) The lower limit shall apply at the transition frequencies.
 - (2) Emission level (dBuV/m) = 20 log Emission level (uV/m).
 - (3) All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

LIMITS ABOVE 1GHz

FREQUENCY (GHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	AVERAGE	PEAK	AVERAGE	PEAK
1 to 3	56	76	50	70
3 to 6	60	80	54	74

- NOTE:**
1. The lower limit shall apply at the transition frequencies.
 2. If the highest frequency of the internal sources of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz.
 3. If the highest frequency of the internal sources of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz.
 4. If the highest frequency of the internal sources of the EUT is between 500 MHz and 1 GHz, the measurement shall only be made up to 5 GHz.
 5. If the highest frequency of the internal sources of the EUT is above 1 GHz, the measurement shall be made up to 5 times the highest frequency or 6 GHz, whichever is less.

4.2.2 TEST INSTRUMENTS

For Below 1GHz:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
ROHDE & SCHWARZ Spectrum Analyzer	FSP40	100036	Dec. 9, 2008	Dec. 8, 2009
Agilent PSA Spectrum Analyzer	E4446A	MY46180622	Apr. 24 , 2009	Apr. 23 , 2010
HP Pre_Amplifier	8449B	3008A01923	Nov. 10, 2008	Nov. 9, 2009
ROHDE & SCHWARZ Test Receiver	ESCS30	847124/029	Sep. 9, 2009	Sep. 8, 2010
SCHWARZBECK TRILOG Broadband Antenna	VULB 9168	138	April 29, 2009	April 28, 2010
Schwarzbeck Horn_Antenna	BBHA9120	D124	Dec. 09, 2008	Dec. 08, 2009
Schwarzbeck Horn_Antenna	BBHA 9170	BBHA9170153	Jan. 22, 2009	Jan. 21, 2010
RF Switches	EMH-011	08009	Oct. 07, 2008	Oct. 06, 2009
RF CABLE (Chaintek)	Sucoflex 106	28077	Aug. 15, 2008	Aug. 14, 2009
RF Cable	8DFB	STCCAB-30M-1GHz	Oct. 07, 2008	Oct. 06, 2009
Software	ADT_Radiated_V7.6.15.9.2	NA	NA	NA
CT Antenna Tower & Turn Table	NA	NA	NA	NA

- 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 horn antenna, HP preamplifier (model: 8449B) and Spectrum Analyzer (model: FSP40) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in Open Site No. C.
4. The FCC Site Registration No. is 656396.
5. The VCCI Site Registration No. is R-1626.
6. The CANADA Site Registration No. is IC 7450G-3.

**A D T****For Above 1GHz:**

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Agilent PSA Series Spectrum Analyzer	E4446A	MY46180622 111 115 UK6	April 24, 2009	April 23, 2010
HP Pre_Amplifier	8449B	3008A01922	Sep. 25, 2008	Sep. 24, 2009
Schwarzbeck Horn_Antenna	BBHA 9120-D	9120D-406	May 04, 2009	May 03, 2010
Software	ADT_Radiated _V7.6.15.9.2	NA	NA	NA
CT Antenna Tower & Turn Table	NA	NA	NA	NA

- NOTE:**
1. The test was performed in RF Chamber No. E.
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. The VCCI Site Registration No. is G-20.

4.2.3 TEST PROCEDURE

Below 1 GHz:

- a. The EUT was placed on the top of a rotating table at a 10 meters open field site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its height 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 quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

NOTE: 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for quasi-peak detection (QP) at frequency 30MHz to 1GHz.

Above 1 GHz:

- a. The EUT was placed on the top of a rotating table 1.2 meters above the ground at 3 meters chamber room. 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 antenna is a broadband antenna, and its height 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 and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

NOTE:

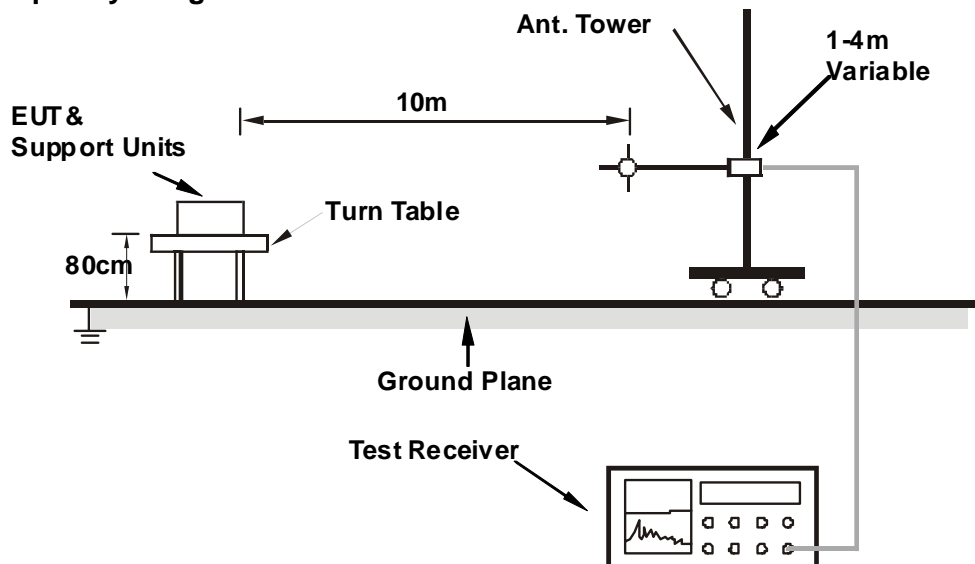
1. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.
2. For measurement of frequency above 1000 MHz, the EUT was set 3 meters away from the interference-receiving antenna.

4.2.4 DEVIATION FROM TEST STANDARD

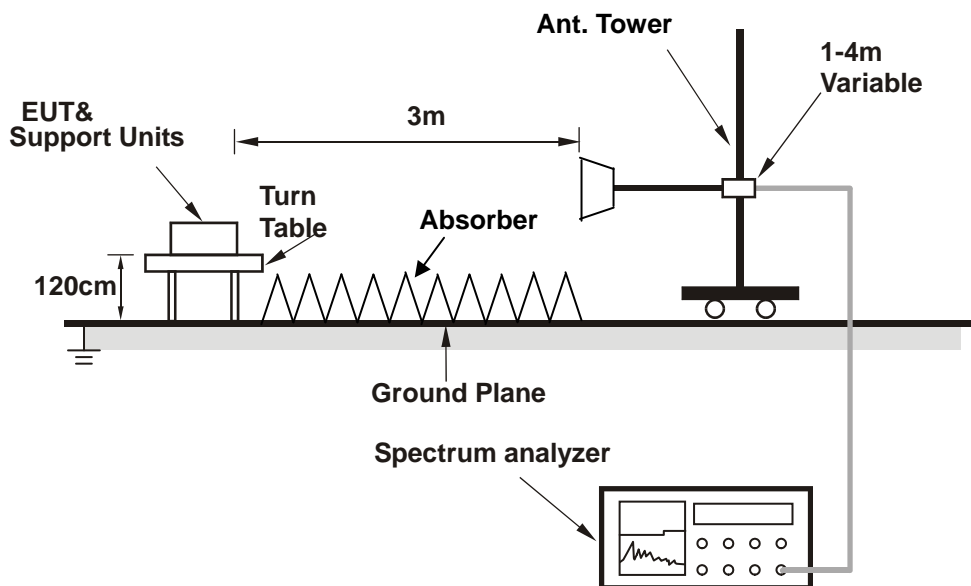
Added - applicable for the radio equipment(s)

4.2.5 TEST SETUP

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.2.6 EUT OPERATING CONDITIONS

Same as 4.1.6

4.2.7 TEST RESULTS(MODE 1)

TEST MODE	Mode 1	INPUT POWER (SYSTEM)	230Vac, 50 Hz
FREQUENCY RANGE	30-1000 MHz	DETECTOR FUNCTION & BANDWIDTH	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	29 deg. C, 55 % RH, 950hPa	TESTED BY	Eric Lee

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 10 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	38.70	22.73 QP	30.00	-7.27	1.70 H	74	8.43	14.30
2	159.80	25.07 QP	30.00	-4.93	1.00 H	4	9.70	15.37
3	166.01	27.08 QP	30.00	-2.92	2.18 H	8	11.84	15.24
4	196.50	20.96 QP	30.00	-9.04	1.94 H	172	8.35	12.61
5	255.50	22.49 QP	37.00	-14.51	1.90 H	218	7.98	14.51
6	497.89	33.03 QP	37.00	-3.97	2.05 H	63	10.60	22.43

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 10 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	45.81	24.95 QP	30.00	-5.05	1.00 V	19	10.34	14.61
2	67.56	26.91 QP	30.00	-3.09	1.41 V	74	13.49	13.42
3	142.86	24.51 QP	30.00	-5.49	1.02 V	226	9.56	14.95
4	162.09	24.77 QP	30.00	-5.23	1.20 V	298	9.45	15.32
5	199.79	23.77 QP	30.00	-6.23	1.45 V	320	11.37	12.40
6	400.45	23.62 QP	37.00	-13.38	2.23 V	290	4.11	19.51

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



A D T

TEST MODE	Mode 1	INPUT POWER (SYSTEM)	230Vac, 50 Hz
FREQUENCY RANGE	1000-6000 MHz	DETECTOR FUNCTION & BANDWIDTH	Peak (PK) / Average (AV), 1MHz
ENVIRONMENTAL CONDITIONS	28 deg. C, 64 % RH, 950 hPa	TESTED BY	Nick Tsai

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL 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	2494.00	46.36 PK	70.00	-23.64	1.40 H	219	14.93	31.43
2	2494.00	29.63 AV	50.00	-20.37	1.40 H	219	-1.80	31.43
3	4985.60	50.98 PK	74.00	-23.02	1.40 H	245	13.87	37.11
4	4985.60	33.10 AV	54.00	-20.90	1.40 H	245	-4.01	37.11

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)	Correction Factor (dB/m)
1	2491.48	45.91 PK	70.00	-24.09	1.40 V	226	14.49	31.42
2	2491.48	29.15 AV	50.00	-20.85	1.40 V	226	-2.27	31.42
3	4993.96	52.19 PK	74.00	-21.81	1.40 V	140	15.06	37.13
4	4993.96	33.85 AV	54.00	-20.15	1.40 V	140	-3.28	37.13

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

4.2.8 TEST RESULTS(MODE 2)

TEST MODE	Mode 2	INPUT POWER (SYSTEM)	230Vac, 50 Hz
FREQUENCY RANGE	30-1000 MHz	DETECTOR FUNCTION & BANDWIDTH	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	29 deg. C, 55 % RH, 950hPa	TESTED BY	Eric Lee

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 10 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	40.21	23.25 QP	30.00	-6.75	1.68 H	295	8.67	14.58
2	159.99	26.21 QP	30.00	-3.79	1.32 H	65	10.85	15.36
3	166.11	28.14 QP	30.00	-1.86	1.32 H	65	12.90	15.24
4	196.55	21.45 QP	30.00	-8.55	1.02 H	326	8.85	12.60
5	255.47	23.51 QP	37.00	-13.49	1.02 H	254	9.00	14.51
6	497.89	33.24 QP	37.00	-3.76	2.22 H	253	10.81	22.43

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 10 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	45.83	24.84 QP	30.00	-5.16	1.02 V	214	10.23	14.61
2	67.58	26.24 QP	30.00	-3.76	1.32 V	62	12.82	13.42
3	142.88	25.12 QP	30.00	-4.88	1.32 V	23	10.16	14.96
4	162.11	25.01 QP	30.00	-4.99	1.32 V	62	9.69	15.32
5	199.81	24.12 QP	30.00	-5.88	1.56 V	324	11.72	12.40
6	400.41	24.21 QP	37.00	-12.79	1.02 V	254	4.70	19.51

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



A D T

TEST MODE	Mode 2	INPUT POWER (SYSTEM)	230Vac, 50 Hz
FREQUENCY RANGE	1000-6000 MHz	DETECTOR FUNCTION & BANDWIDTH	Peak (PK) / Average (AV), 1MHz
ENVIRONMENTAL CONDITIONS	28 deg. C, 64 % RH, 950 hPa	TESTED BY	Nick Tsai

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL 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	2490.12	45.31 PK	70.00	-24.69	1.40 H	126	13.89	31.42
2	2490.12	28.93 AV	50.00	-21.07	1.40 H	126	-2.49	31.42
3	4995.50	51.73 PK	74.00	-22.27	1.40 H	146	14.60	37.13
4	4995.50	33.61 AV	54.00	-20.39	1.40 H	146	-3.52	37.13

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)	Correction Factor (dB/m)
1	2493.00	49.57 PK	70.00	-20.43	1.40 V	240	18.14	31.43
2	2493.00	31.23 AV	50.00	-18.77	1.40 V	240	-0.20	31.43
3	4985.72	51.75 PK	74.00	-22.25	1.40 V	266	14.64	37.11
4	4985.72	33.57 AV	54.00	-20.43	1.40 V	266	-3.54	37.11

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

5 IMMUNITY TEST

5.1 GENERAL DESCRIPTION

Product Standard:	EN 301 489-1 (2008-04), EN 301 489-17 (2009-05)	
Basic Standard, Specification, and Performance Criteria:	EN 61000-4-2	Electrostatic Discharge – ESD: 8kV air discharge, 4kV Contact discharge, Performance Criterion B
	EN 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80-1000 MHz, 1400-2700 MHz, 3V/m, 80% AM (1kHz), Performance Criterion A
	EN 61000-4-4	Electrical Fast Transient/Burst - EFT, Power line: 1kV, Signal line: 0.5kV, Performance Criterion B
	EN 61000-4-5	Surge Immunity Test: 1.2/50 us Open Circuit Voltage, 8 /20 us Short Circuit Current, line to line – 0.5 kV, line to earth - 1kV, Performance Criterion B
	EN 61000-4-6	Conducted Radio Frequency Disturbances Test – CS: 0.15-80 MHz, 3Vrms, 80% AM, 1kHz, Performance Criterion A
	EN 61000-4-11	Voltage Dips: i) 0% residual for 0.5 cycle, Performance Criterion B ii) 0% residual for 1 cycle, Performance Criterion B iii) 70% residual for 25 cycles, Performance Criterion C Voltage Interruptions: i) 0% residual for 250 cycles, Performance Criterion B is required for EUT with battery back-up, Performance Criterion C is required for EUT without battery back-up.

5.2 GENERAL PERFORMANCE CRITERIA DESCRIPTION

The Requirement of Performance Criteria		
1	Performance criteria for continuous phenomena applied to transmitters (CT)	Criterion A of the applicable class shall apply
2	Performance criteria for transient phenomena applied to transmitters (TT)	Criterion B of the applicable class shall apply
3	Performance criteria for continuous phenomena applied to receivers (CR)	Criterion A of the applicable class shall apply
4	Performance criteria for transient phenomena applied to receivers (TR)	Criterion B of the applicable class shall apply

The phenomena allowed during and after test in each criterion are clearly stated in the following table:

Performance criteria		
Criteria	During test	After test
A	Shall operate as intended. May show degradation of performance (see note1). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance (see note 2). Shall be no loss of function. Shall be no loss of stored data or user programmable functions.
B	May show loss of function (one or more). May show degradation of performance (see note 1). No unintentional transmissions.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 2). Shall be no loss of stored data or user programmable functions.
C	May be loss of function (one or more).	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no degradation of performance (see note 2).

NOTE 1: Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance.

If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

NOTE 2: No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed.

If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

5.3 EUT OPERATING CONDITION

- a. Connect the EUT with the support unit 1 (Notebook Computer) which placed on a testing table.
- b. The support unit 1 (Notebook Computer) act as a server system to communicate with support unit 3 (Wireless Access Point) which is placed at outside of testing areas.
- c. The server system runs the test program "Ping.exe" to enable EUT under transmission/receiving condition continuously via wireless.

5.4 ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD)

5.4.1 TEST SPECIFICATION

Basic Standard:	EN 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Discharge Voltage:	Contact Discharge – 2, 4kV (Indirect)
Polarity:	Positive & Negative
Number of Discharge:	Minimum 20 times at each test point
Discharge Mode:	Single Discharge
Discharge Period:	1 second minimum

5.4.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
NoiseKen, ESD Simulator	ESS-100L(A)	0189C01491	July 17, 2009	July 16, 2010
Key Tek, ESD Simulator	MZ-15/EC	9906323	June 09, 2009	June 08, 2010
NoiseKen, ESD Simulator	ESS-2002	ESS062521 2/244	May 11, 2009	May 10, 2010

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 ESD room A.

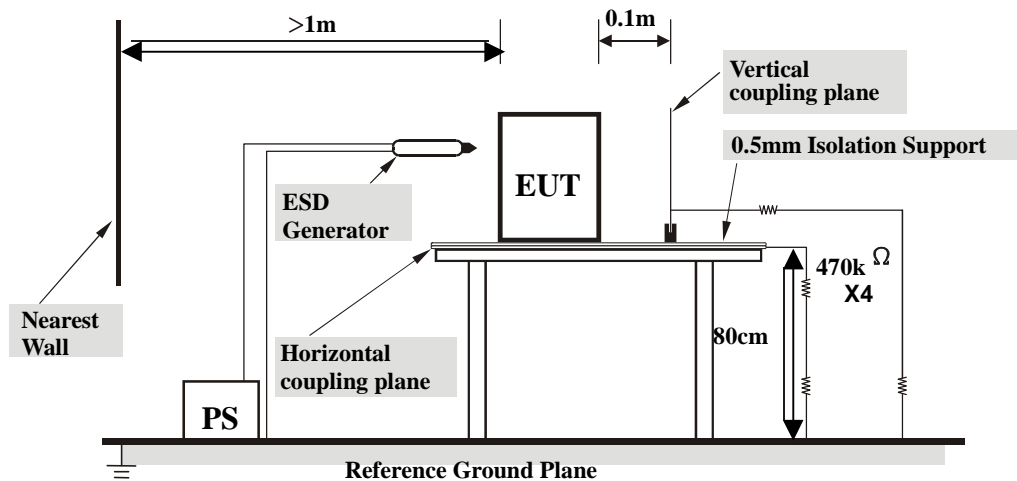
5.4.3 TEST PROCEDURE

- a. Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation.
- b. The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.
- c. The time interval between two successive single discharges was at least 1 second.
- d. The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the EUT.
- e. Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
- f. Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.
- g. At least ten single discharges (in the most sensitive polarity) were applied to the **Horizontal Coupling Plane** at points on each side of the EUT. The ESD generator was positioned at a distance of 0.1 meters from the EUT with the discharge electrode touching the **HCP**.
- h. At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the **Vertical Coupling Plane** in sufficiently different positions that the four faces of the EUT were completely illuminated. The **VCP** (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the EUT.

5.4.4 DEVIATION FROM TEST STANDARD

NA

5.4.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the **Ground Reference Plane**. The **GRP** consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A **Horizontal Coupling Plane** (1.6m x 0.8m) was placed on the table and attached to the **GRP** by means of a cable with $940k\Omega$ total impedance. The equipment under test, was installed in a representative system as described in section 7 of EN 61000-4-2, and its cables were placed on the **HCP** and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

5.4.6 TEST RESULTS (MODE 1~4)

TEST MODE	Mode 1~4	INPUT POWER (SYSTEM)	230Vac, 50 Hz
ENVIRONMENTAL CONDITIONS (Start of Test)	24 deg. C, 54 % RH, 950 hPa	ENVIRONMENTAL CONDITIONS (End of Test)	24 deg. C, 54 % RH, 950 hPa
TESTED BY	Tony Chen		

Note: No direct discharge surfaces found, therefore no direct discharge was executed.

TEST RESULTS OF INDIRECT APPLICATION					
Discharge Level (kV)	Polarity (+/-)	Test Point	Horizontal Coupling Plane	Vertical Coupling Plane	Performance Criterion
2, 4	+/-	1 ~ 4	Note (1)	Note (1)	A

Description of test point:

1. Front side 2. Right side 3. Left side 4. Rear side

NOTE: (1) There was no change compared with initial operation during the test.

5.5 RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST (RS)

5.5.1 TEST SPECIFICATION

Basic Standard:	EN 61000-4-3
Frequency Range:	80 MHz - 1000 MHz 1400 MHz – 2700 MHz
Field Strength:	3 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of momentary frequency
Polarity of Antenna:	Horizontal and Vertical
Antenna Height:	1.5m
Dwell Time:	3 seconds

5.5.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
AR Power Amplifier	150W1000M3	311567	NA	NA
AR Power Amplifier	60S1G3M1	306171	NA	NA
AR LOG ANTENNA	AT5080ANT	309740	NA	NA
BOONTON RF Voltage Meter	4232A	93801	Dec. 26, 2008	Dec. 25, 2009
R&S Signal Generator	SML03	101159	Jan. 09, 2009	Jan. 08, 2010
Electric Field Probe	FP6001	308178	Nov. 14, 2008	Nov. 13, 2009
ADT RS Test Workbench(Software)	ADT_RS_V7.5	NA	NA	NA

- 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 Chamber Room No. B.
 3. The transmit antenna was located at a distance of 2.0m meters from the EUT.

5.5.3 TEST PROCEDURE

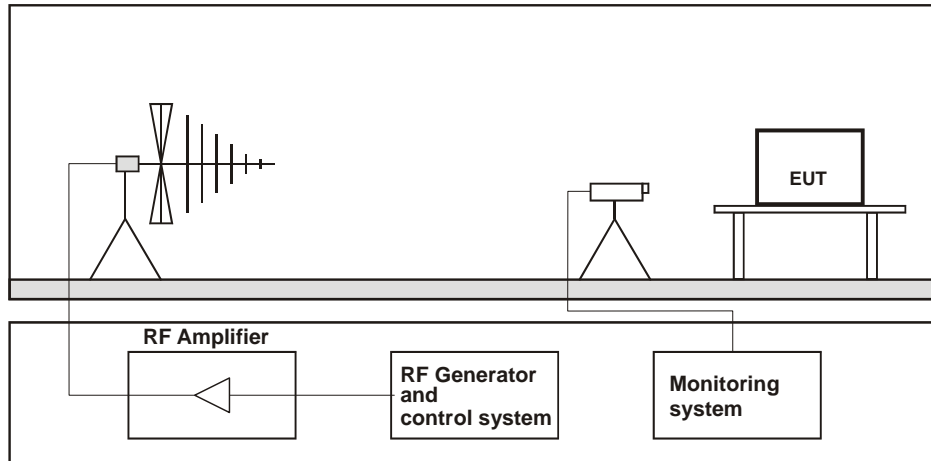
The test procedure was in accordance with EN 61000-4-3

- a. The testing was performed in a fully-anechoic chamber.
- b. The frequency range is swept from 80 MHz to 1000 MHz, 1400 MHz to 2700 MHz with the signal 80% amplitude modulated with a 1kHz sine wave.
- c. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond, but shall in no case be less than 0,5s.
- d. The field strength level was 3V/m.
- e. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

5.5.4 DEVIATION FROM TEST STANDARD

No deviation

5.5.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLETOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of EN 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

5.5.6 TEST RESULTS (MODE 1~4)

TEST MODE	Mode 1~4	INPUT POWER (SYSTEM)	230Vac, 50Hz
ENVIRONMENTAL CONDITIONS (Start of Test)	24 deg. C, 54 % RH, 950 hPa	ENVIRONMENTAL CONDITIONS (End of Test)	24 deg. C, 54 % RH, 950 hPa
TESTED BY	Barry Lee		

Frequency (MHz)	Result	Polarity	Azimuth	Field Strength (V/m)	Obser- vation	Performance Criterion
80 -1000	PASS	V&H	0	3	NOTE	A
80 -1000	PASS	V&H	90	3		
80 -1000	PASS	V&H	180	3		
80 -1000	PASS	V&H	270	3		
1400 -2700	PASS	V&H	0	3	NOTE *	
1400 -2700	PASS	V&H	90	3		
1400 -2700	PASS	V&H	180	3		
1400 -2700	PASS	V&H	270	3		

NOTE: There was no change compared with initial operation during the test.

* The EUT request time out at 2419MHz during the test, but this band is exclusion band in EN 301489-17, the test result (request time out) is acceptable under this condition.

6 PHOTOGRAPHS OF THE TEST CONFIGURATION

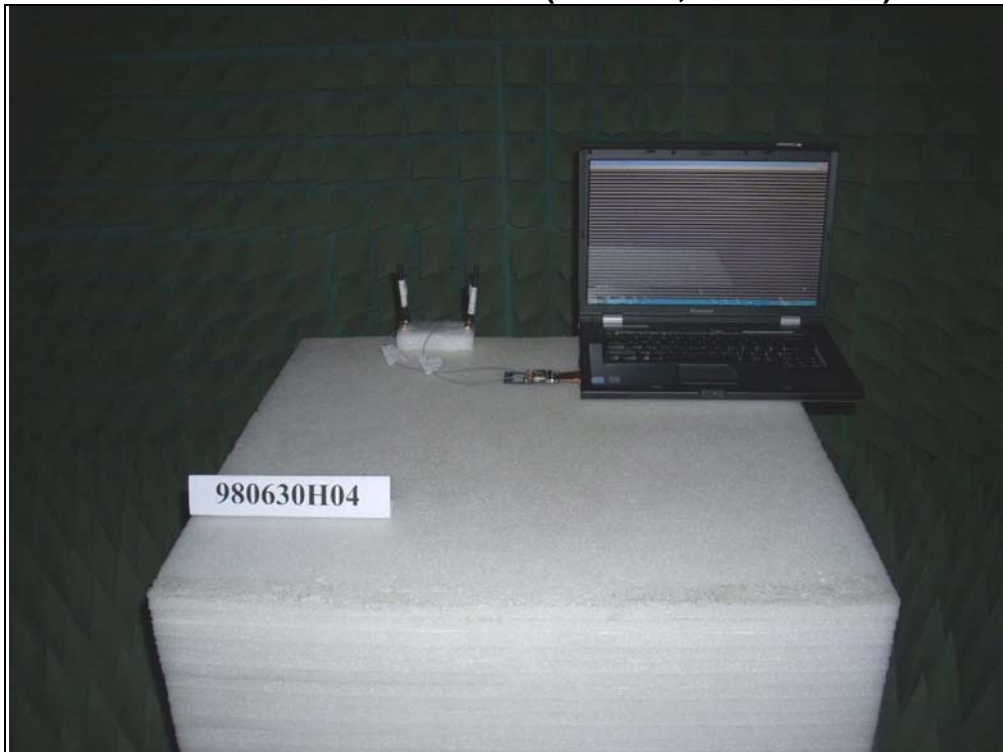
CONDUCTED EMISSION TEST



RADIATED EMISSION TEST(MODE 1, Below 1GHz)



RADIATED EMISSION TEST(MODE 1, Above 1GHz)



RADIATED EMISSION TEST(MODE 2, Below 1GHz)



RADIATED EMISSION TEST(MODE 2, Above 1GHz)



ESD TEST (Mode 1)



ESD TEST (Mode 2)



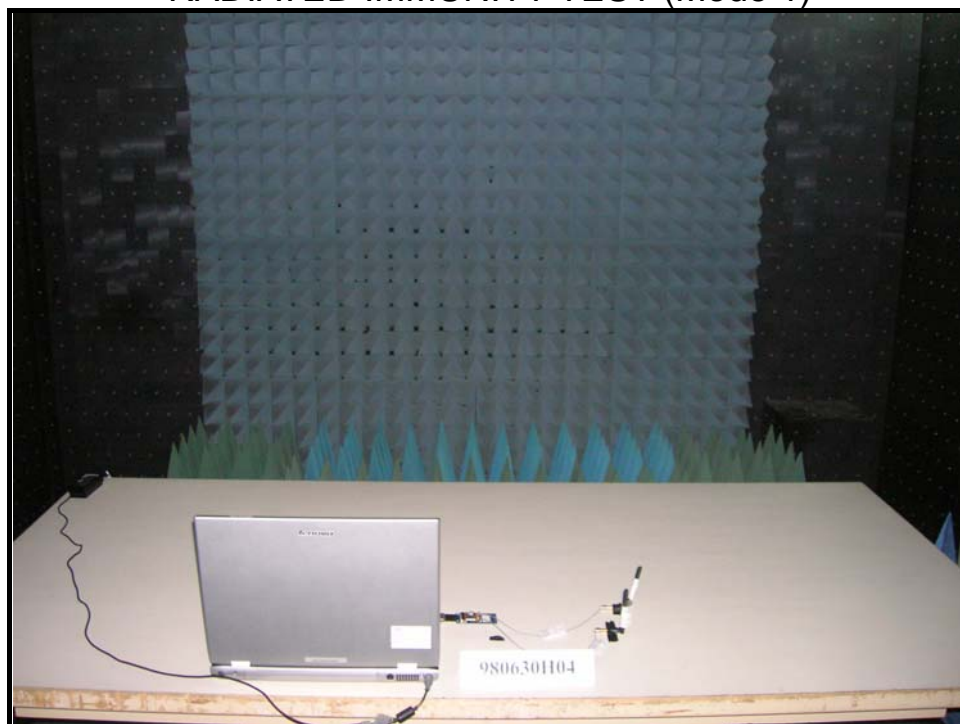
ESD TEST (Mode 3)



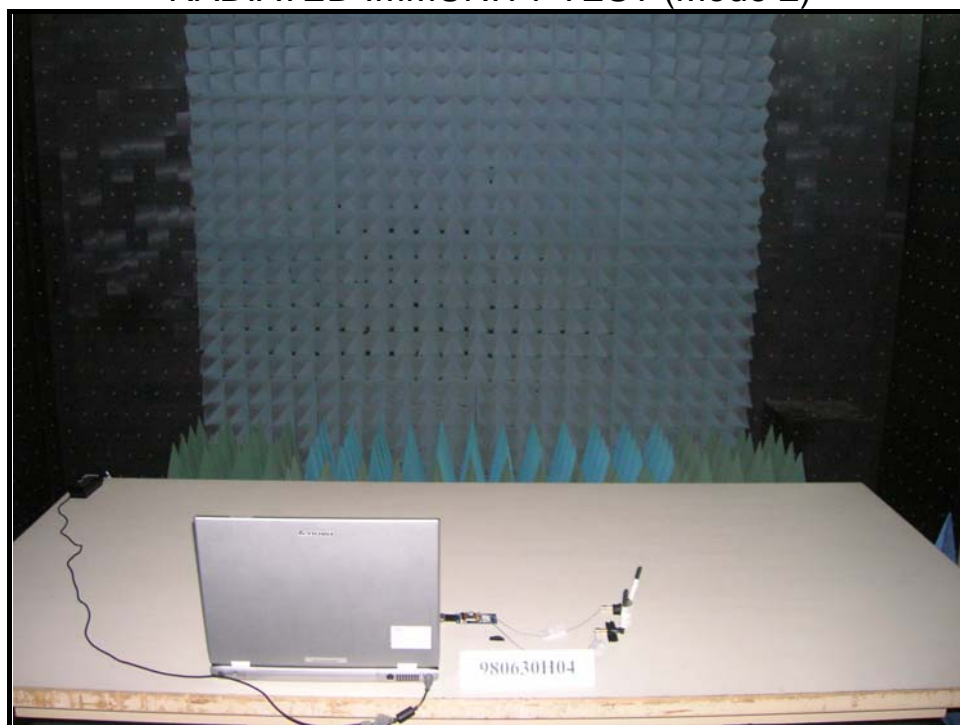
ESD TEST (Mode 4)



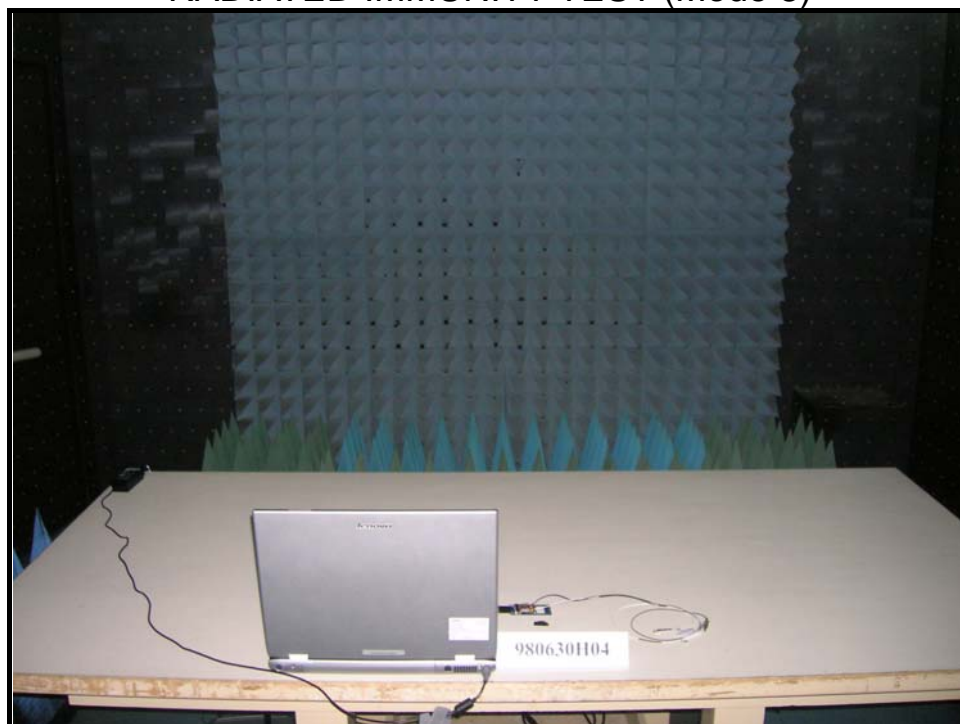
RADIATED IMMUNITY TEST (Mode 1)



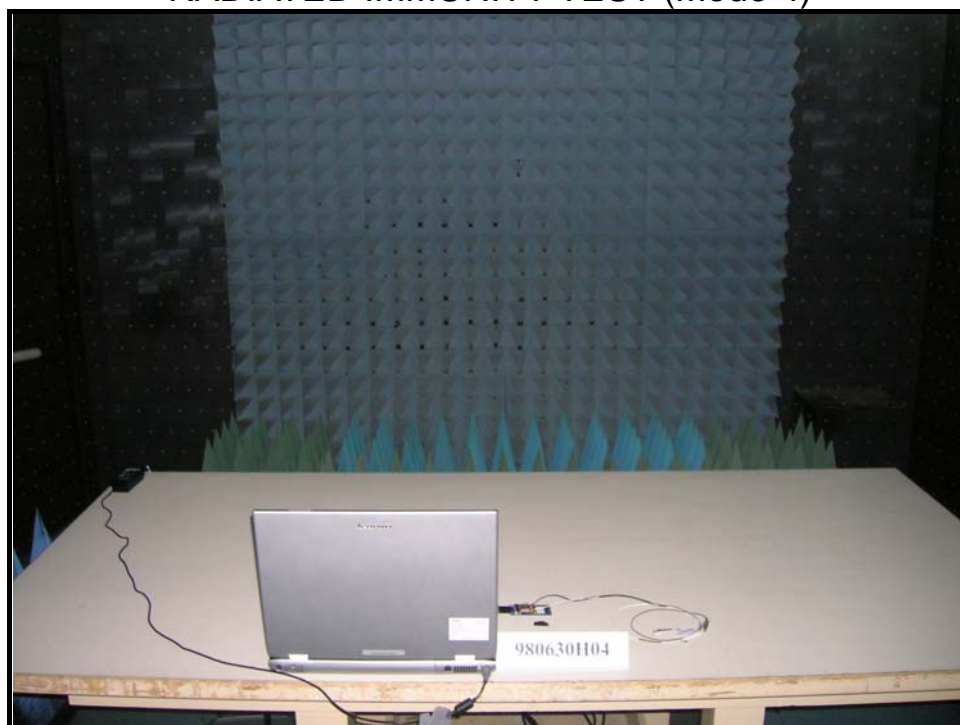
RADIATED IMMUNITY TEST (Mode 2)



RADIATED IMMUNITY TEST (Mode 3)



RADIATED IMMUNITY TEST (Mode 4)



7 APPENDIX - 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.

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

Linko EMC/RF Lab:

Tel: 886-2-26052180

Fax: 886-2-26052943

Hsin Chu EMC/RF Lab:

Tel: 886-3-5935343

Fax: 886-3-5935342

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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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