SPORTON International Inc.
No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, TaoYuan Hsien, Taiwan, R.O.C.
Ph: 886-3-327-3456 / FAX: 886-3-327-0973 / www.sporton.com.tw

FCC RADIO TEST REPORT

Applicant's company	**Cradlepoint, Inc**
Applicant Address	805W. Franklin Street, Boise, ID 83702
FCC ID	**UXX-IBR600E**

Product Name	Industrial Broadband Router
Brand Name	CradlePoint
Model No.	IBR600E / IBR600LE / IBR600LP / IBR600P / IBR600LP- PWD / IBR600LE-PWD / IBR600NM
Test Rule	47 CFR FCC Part 15 Subpart C § 15.247
Test Freq. Range	2400 ~ 2483.5MHz
Received Date	May 16, 2013
Final Test Date	Jun. 16, 2013
Submission Type	Class II Change

Statement

Test result included in this report is for the IEEE 802.11n and IEEE 802.11b/g part of the product.

The test result in this report refers exclusively to the presented test model / sample.

Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.

The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.10-2009**, **47 CFR FCC Part 15 Subpart C**, **KDB 558074 D01 v03** and **KDB 662911 D01 v02**.

The test equipment used to perform the test is calibrated and traceable to NML/ROC.

Testing Laboratory
1190

Table of Contents

History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR17195-07	Rev. 01	Initial issue of report	Jul. 04, 2013

Certificate No.: CB10206176

1. CERTIFICATE OF COMPLIANCE

Product Name	:	**Industrial Broadband Router**
Brand Name	:	**CradlePoint**
Model No.	:	**IBR600E / IBR600LE / IBR600LP / IBR600P / IBR600LP- PWD / IBR600LE-PWD / IBR600NM**
Applicant	:	**Cradlepoint, Inc**
Test Rule Part(s)	:	**47 CFR FCC Part 15 Subpart C § 15.247**

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on May 16, 2013 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.

Sam Chen
SPORTON INTERNATIONAL INC.

2. SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart C				
Part	**Rule Section**	**Description of Test**	**Result**	**Under Limit**
4.1	15.207	AC Power Line Conducted Emissions	Complies	3.20 dB
4.2	15.247(d)	Radiated Emissions	Complies	0.40 dB

3. GENERAL INFORMATION

3.1. Product Details

IEEE 802.11n

Items	Description
Product Type	WLAN (2TX, 2RX)
Radio Type	Intentional Transceiver
Power Type	From Power Adapter
Modulation	see the below table for IEEE 802.11n
Data Modulation	OFDM (BPSK / QPSK / 16QAM / 64QAM)
Data Rate (Mbps)	see the below table for IEEE 802.11n
Frequency Range	2400 ~ 2483.5MHz
Channel Number	11 for 20MHz bandwidth ; 7 for 40MHz bandwidth
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

IEEE 802.11b/g

Items	Description
Product Type	WLAN (1TX, 1RX)
Radio Type	Intentional Transceiver
Power Type	From Power Adapter
Modulation	DSSS for IEEE 802.11b ; OFDM for IEEE 802.11g
Data Modulation	DSSS (BPSK / QPSK / CCK) ; OFDM (BPSK / QPSK / 16QAM / 64QAM)
Data Rate (Mbps)	DSSS (1/ 2/ 5.5/11) ; OFDM (6/9/12/18/24/36/48/54)
Frequency Range	2400 ~ 2483.5MHz
Channel Number	11
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

Antenna & Band width

Antenna	Single (TX)		Two (TX)	
Band width Mode	20 MHz	40 MHz	20 MHz	40 MHz
IEEE 802.11b	V	X	X	X
IEEE 802.11g	V	X	X	X
IEEE 802.11n	X	X	V	V

IEEE 11n Spec.

Protocol	Number of Transmit Chains (NTX)	Data Rate / MCS
802.11n (HT20)	2	MCS 0-15
802.11n (HT40)	2	MCS 0-15
Note 1: IEEE Std. 802.11n modulation consists of HT20 and HT40 (HT: High Throughput). Then EUT support HT20 and HT40. Note 2: Modulation modes consist of below configuration: HT20/HT40: IEEE 802.11n		

3.2. Accessories

Power	Brand	Model	Rating
Adapter 1	HON-KWANG	HK-AB-120A150-US	Input: 100-240V~50/60Hz 0.8A Output: 12V, 1.5A
Adapter 2	TenPao	S024WM1200150	Input: 100-240V~50/60Hz, 600mA Max Output: 12V, 1500mA
Adapter 3	Powertron	PA1024-2HU	Input: 100-240V~50-60Hz 0.6A Output: 12V, 1.5A 18W Max
Others			
Plug*1 (only used Adpater 2)			
Bracket*1			

3.3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Remark
1	Joymax	IWX-1511RSXX-711	Dipole Antenna	Reversed-SMA	5	TX / RX

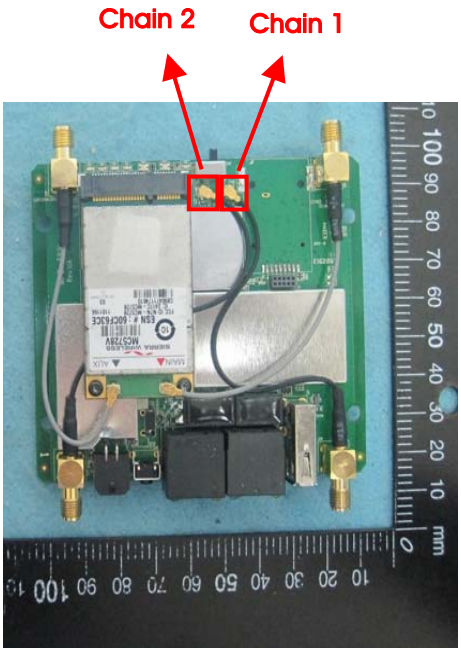
Note: The EUT has a antenna for WLAN function.

For IEEE 802.11b/g mode (1TX/1RX):

Only Chain 1 can be used as transmitting/receiving functions.

For IEEE 802.11n mode (2TX/2RX):

Both Chain 1 and Chain 2 can be used as transmitting/receiving functions.



3.4. Table for Carrier Frequencies

For IEEE 802.11b/g, use Channel 1~Channel 11.

There are two bandwidth systems for IEEE 802.11n.

For both 20MHz bandwidth systems, use Channel 1~Channel 11.

For both 40MHz bandwidth systems, use Channel 3~Channel 9.

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
2400~2483.5MHz	1	2412 MHz	7	2442 MHz
	2	2417 MHz	8	2447 MHz
	3	2422 MHz	9	2452 MHz
	4	2427 MHz	10	2457 MHz
	5	2432 MHz	11	2462 MHz
	6	2437 MHz	-	-

3.5. Table for Test Modes

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate	Channel	Chain
AC Power Line Conducted Emissions	Normal Link	-	-	-
Peak Output Power Power Spectral Density	MCS0/20MHz	6.5 Mbps	1/6/11	1+2
	MCS0/40MHz	13.5 Mbps	3/6/9	1+2
	11b/BPSK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
6dB Spectrum Bandwidth	MCS0/20MHz	6.5 Mbps	1/6/11	1+2
	MCS0/40MHz	13.5 Mbps	3/6/9	1+2
	11b/BPSK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
Radiated Emissions 9kHz~1GHz	Normal Link	-	-	-
Radiated Emissions 1GHz~10th Harmonic	MCS0/20MHz	6.5 Mbps	1/6/11	1+2
	MCS0/40MHz	13.5 Mbps	3/6/9	1+2
	11b/BPSK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
Band Edge Emissions	MCS0/20MHz	6.5 Mbps	1/11	1+2
	MCS0/40MHz	13.5 Mbps	3/9	1+2
	11b/BPSK	1 Mbps	1/11	1
	11g/BPSK	6 Mbps	1/11	1

The following test modes were performed for all tests:

For Conducted Emission test:

Mode 1: EUT 1: IBR600E (2.4G normal)+ Adapter 1

Mode 2: EUT 1: IBR600E (2.4G normal)+ Adapter 2

Mode 3: EUT 1: IBR600E (2.4G normal)+ Adapter 3

Mode 1 has been evaluated to be the worst case among Mode 1~3, thus measurement for Mode 4 ~ 9 will follow this same test mode.

Mode 4: EUT 2: IBR600LE (2.4G normal)+ Adapter 1

Mode 5: EUT 3: IBR600LP (2.4G normal)+ Adapter 1

Mode 6: EUT 4: IBR600P (2.4G normal)+ Adapter 1

Mode 7: EUT 5: IBR600LP-PWD (2.4G normal)+ Adapter 1

Mode 8: EUT 6: IBR600LE-PWD (2.4G normal)+ Adapter 1

Mode 9: EUT 7: IBR600NM (2.4G normal)+ Adapter 1

Mode 4 is the worst case, so it was selected to record in this test report.

For Radiated Emission test:

Mode 1: EUT 1: IBR600E (2.4G normal)+ Adapter 1

Mode 2: EUT 1: IBR600E (2.4G normal)+ Adapter 2

Mode 3: EUT 1: IBR600E (2.4G normal)+ Adapter 3

Mode 3 has been evaluated to be the worst case among Mode 1~3, thus measurement for Mode 4 ~ 9 will follow this same test mode.

Mode 4: EUT 2: IBR600LE (2.4G normal)+ Adapter 3

Mode 5: EUT 3: IBR600LP (2.4G normal)+ Adapter 3

Mode 6: EUT 4: IBR600P (2.4G normal)+ Adapter 3

Mode 7: EUT 5: IBR600LP-PWD (2.4G normal)+ Adapter 3

Mode 8: EUT 6: IBR600LE-PWD (2.4G normal)+ Adapter 3

Mode 9: EUT 7: IBR600NM (2.4G normal)+ Adapter 3

Mode 4 is the worst case, so it was selected to record in this test report.

For Co-location Test:

Mode 1: EUT 1: EVDO link + CDMA link + WIFI link + Adapter 3

Mode 2: EUT 2: LTE link + EVDO link + CDMA link + WIFI LINK+ Adapter 3

Mode 3: EUT 3: LTE link+ HSPA+ link+ WCDMA link + WIFI LINK + Adapter 3

Mode 4: EUT 4: HSPA+ link+ WCDMA link+ WIFI LINK + Adapter 3

Mode 5: EUT 5: LTE link + HSPA + link+ WCDMA link+ WIFI LINK+ Adapter 3

Mode 6: EUT 6: LTE link + EVDO link + CDMA link + WIFI link + Adapter 3

All test results were recorded in the report.

<For MPE and Co-location Test>:

The EUT could be applied with 2.4GHz WLAN function and 3G/LTE function; therefore Maximum Permissible Exposure (Please refer to Appendix B) and Co-location (please refer to Appendix C) tests are added for simultaneously transmit between 2.4GHz WLAN function and 3G/LTE function.

3.6. Table for Testing Locations

Test Site No.	Site Category	Location	FCC Reg. No.	IC File No.
03CH06-HY < Radiation Emissions below 1GHz / Co-location >	SAC	Hwa Ya	722060	4086B-1
CO05-HY	Conduction	Hwa Ya	722060	4086B-1

Open Area Test Site (OATS); Semi Anechoic Chamber (SAC); Please refer section 6 for Test Site Address.

3.7. Table for Class II Change

(1) The difference for each model is shown as below:

Model No.	3G/LTE Module Information			Description			
	Model Number	FCC ID	Supporting Function	WLAN Function	LTE / 3G Function	GPS Function	Antenna
IBR600E	MC5728V	N7N-MC5728	EVDO/CDMA	V	V	X	-
IBR600LE	MC7750	N7NMC7750	LTE/EVDO/CDMA	V	V	X	-
IBR600LP	MC7700	N7NMC7700	LTE/HSPA+/WCDMA	V	V	X	-
IBR600P	MC8705	N7NMC8705	HSPA+/WCDMA	V	V	X	-
IBR600LP-PWD	MC7700	N7NMC7700	LTE/HSPA+/WCDMA	V	V	V	Original device has two WLAN antennas. One of them will change to GPS antenna.
IBR600LE-PWD	MC7750	N7NMC7750	LTE/EVDO/CDMA	V	V	V	Original device has two WLAN antennas. One of them will change to GPS antenna.
IBR600NM	This model number does not contain 3G/LTE module.			V	-		

Note: From the above Model No.: IBR600E was selected as representative model for the test and its data was recorded in this report.

(2) This product is an extension of original one reported under Sporton project number: FR171915, FR171915-04, FR171915-05.

Below is the table for the change of the product with respect to the original one , so revalidate conduction, Radiation 30~1G, co-location.

Model No.	Original Project No.	Modification
IBR600E	Sporton Project No.: FR171915 (Grant Date: 08/10/2011) It contains a certified 3G module (Model No.: MC5728V, FCC ID: N7N-MC5728).	1. Change Bypass filter of antenna port which is used to reduce spurious signal. 2. Changing USB connector to type A from microusb. 3. Adding a new power adapter. 4. Changing old power cable length to 2m (HON-KWANG / HK-AB-120A 150-US) and 1.5m (Powertron Electronics Corp. / PA1024-2HU).
IBR600LE	Sporton Project No.: FR171915-04 (Grant Date: 07/05/2012) It contains a certified LTE module (Model No.: MC7750, FCC ID: N7NMC7750).	1. Changing USB connector to type A from microusb. 2. Adding a new power adapter. 3. Changing old power cable length to 2m (HON-KWANG / HK-AB-120A 150-US) and 1.5m (Powertron Electronics Corp. / PA1024-2HU).
IBR600LP	Sporton Project No.: FR171915-05 (Grant Date: 07/14/2012) It contains a certified LTE module (Model No.: MC7700, FCC ID: N7NMC7700).	1. Changing USB connector to type A from microusb. 2. Adding a new power adapter. 3. Changing the old power cable length to 2m (HON-KWANG / HK-AB-120A 150-US) and 1.5m (Powertron Electronics Corp. / PA1024-2HU).
IBR600P	This project was done by TUV Product Service Ltd.. (Grant Date: 08/17/2012) It contains a 3G module (Model No.: MC8705, FCC ID: N7NMC8705).	1. Changing USB connector to type A from microusb. 2. Adding a new power adapter. 3. Changing old power cable length to 2m (HON-KWANG / HK-AB-120A 150-US) and 1.5m (Powertron Electronics Corp. / PA1024-2HU).
IBR600LP-PWD	Sporton Project No.: 171915-05 (Grant Date: 07/14/2012) It contains a certified LTE module (Model No.: MC7700, FCC ID: N7NMC7700).	1. Changing model number to IBR600LP-PWD from IBR600LP. 2. Changing USB connector to type A from microusb. 3. Adding a new power adapter. 4. Changing the old power cable length to 2m (HON-KWANG / HK-AB-120A 150-US) and 1.5m (Powertron Electronics Corp. / PA1024-2HU). 5. The device has two WLAN antennas. It changes one of them to be GPS antenna.

IBR600LE-PWD	Sporton Project No.: 171915-04 (Grant Date: 07/05/2012) It contains a certified LTE module (Model No.: MC7750, FCC ID: N7NMC7750).	1. Changing model number to IBR600LE-PWD from IBR600LE. 2. Changing USB connector to type A from microusb. 3. Adding a new power adapter. 4. Changing old power cable length to 2m (HON-KWANG / HK-AB-120A 150-US) and 1.5m (Powertron Electronics Corp. / PA1024-2HU). 5. The device has two WLAN antennas. It changes one of them to be GPS antenna.
IBR600NM	Sporton Project No.: 171915-05 (Grant Date: 07/14/2012) This model number does not contain 3G/LTE module.	1. This device with model name IBR600NM does not contain any 3G/LTE module, it supports WLAN function only. 2. Changing USB connector to type A from microusb. 3. Adding a new power adapter. 4. Changing old power cable length to 2m (HON-KWANG / HK-AB-120A 150-US) and 1.5m (Powertron Electronics Corp. / PA1024-2HU).

3.8. Table for Supporting Units

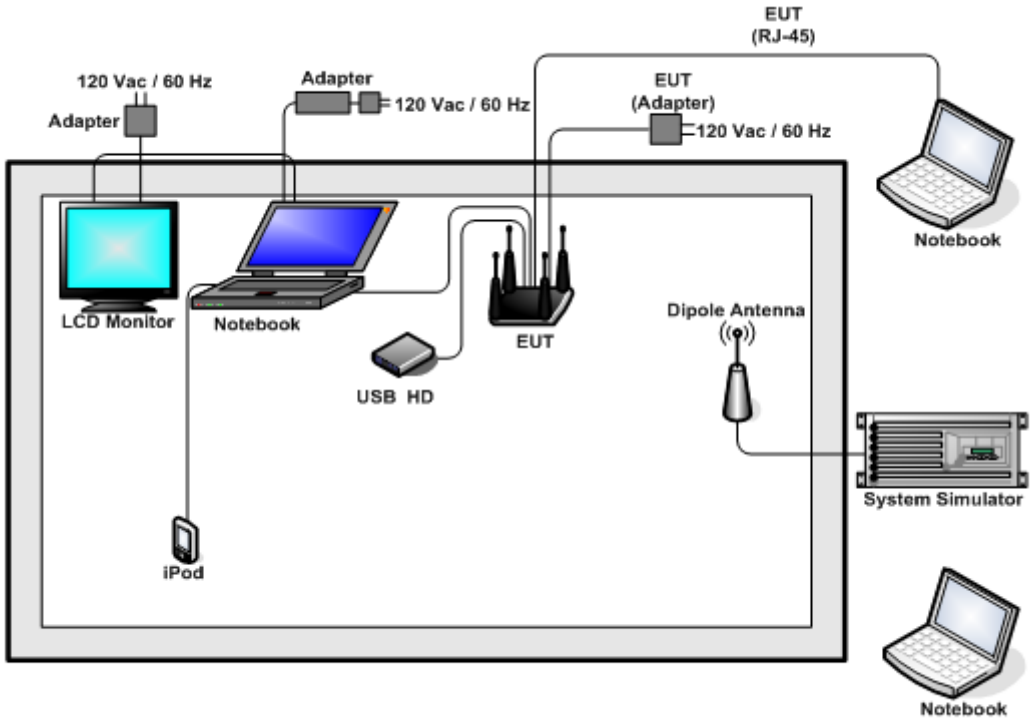
< AC Power Line Conduction Emissions and Radiation Emissions<below 1GHz>/ co-location >

Support Unit	Brand	Model	FCC ID	Data Cable	Power Cord
System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
System Simulator	R&S	CMW 500	N/A	N/A	Unshielded, 1.8 m
GPS Station	Pendulum	GSG-54	N/A	N/A	Unshielded, 1.8 m
iPod	Apple	A1285	DoC	Shielded, 1.0 m	N/A
Notebook	DELL	Latitude E6320	DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
LCD Monitor	DELL	U2410	DoC	Shielded, 1.6 m	Unshielded, 1.8 m
USB2.0 HD	WD	WDBAAR3200ABK-PESN	DoC	Unshielded, 0.5 m	N/A

3.9. Test Configurations

3.9.1. AC Power Line Conduction Emissions and Radiation Emissions<below 1GHz> Test Configuration

Test Mode: Mode 4



4. TEST RESULT

4.1. AC Power Line Conducted Emissions Measurement

4.1.1. Limit

For this product which is designed to be connected to the 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 below limits table.

Frequency (MHz)	QP Limit (dBuV)	AV Limit (dBuV)
0.15~0.5	66~56	56~46
0.5~5	56	46
5~30	60	50

4.1.2. Measuring Instruments and Setting

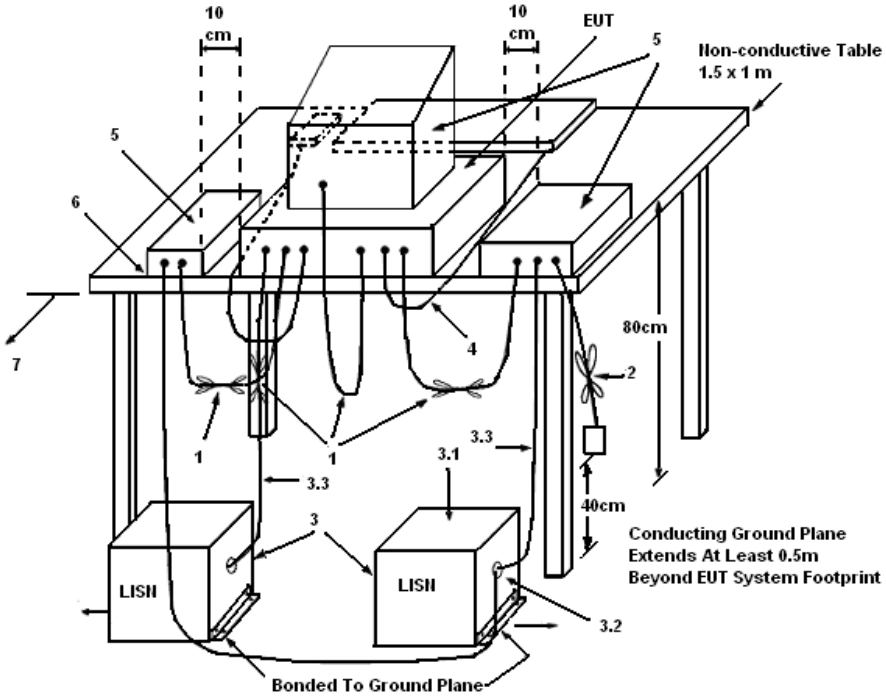
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 KHz

4.1.3. Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 KHz to 30 MHz was searched.
5. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The measurement has to be done between each power line and ground at the power terminal.

4.1.4. Test Setup Layout



LEGEND:

(1) Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

(2) I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

(3) EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω. LISN can be placed on top of, or immediately beneath, reference ground plane.

(3.1) All other equipment powered from additional LISN(s).

(3.2) Multiple outlet strip can be used for multiple power cords of non-EUT equipment.

(3.3) LISN at least 80 cm from nearest part of EUT chassis.

(4) Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.

(5) Non-EUT components of EUT system being tested.

(6) Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.

(7) Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.

4.1.5. Test Deviation

There is no deviation with the original standard.

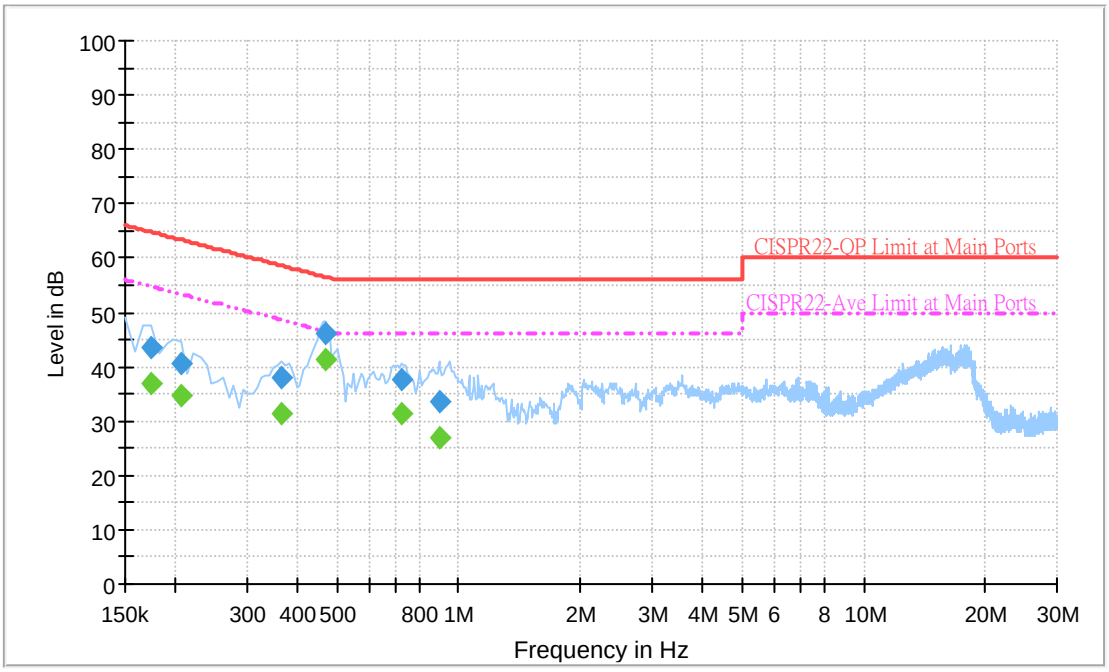
4.1.6. EUT Operation during Test

The EUT was placed on the test table and programmed in normal function.

4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	25~26℃	Humidity	44~46%
Test Engineer	Slash Huang	Phase	Line
Test Mode	Mode 4	Test Date	Jun. 16, 2013

ENV216 Auto Test



Final Result 1

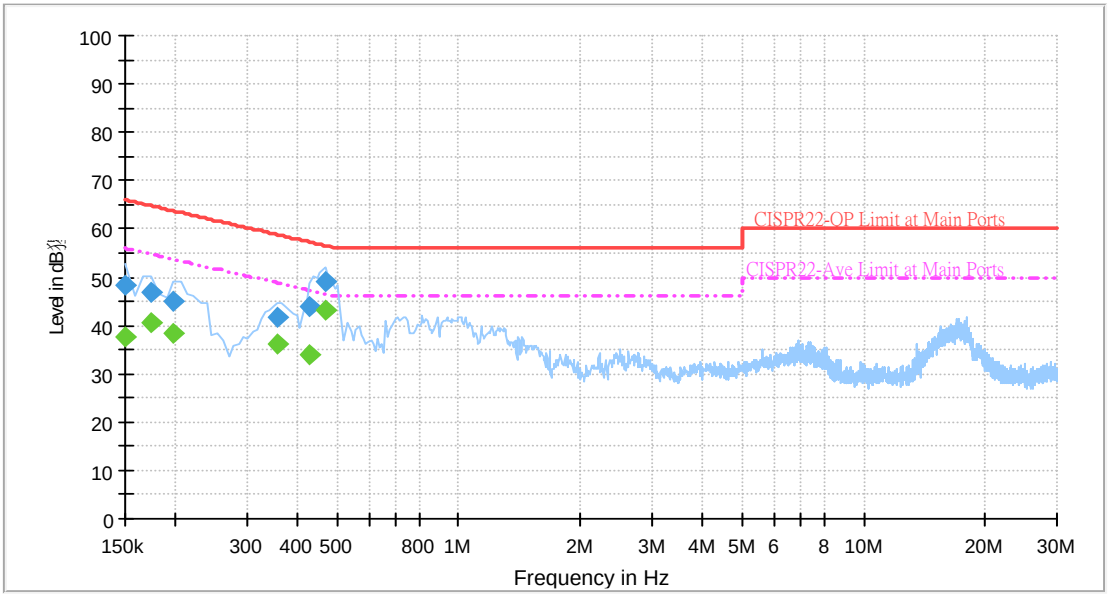
Frequency (MHz)	QuasiPeak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.174000	43.6	Off	L1	19.4	21.2	64.8
0.206000	40.8	Off	L1	19.4	22.6	63.4
0.366000	37.9	Off	L1	19.4	20.7	58.6
0.470000	46.0	Off	L1	19.4	10.5	56.5
0.726000	37.5	Off	L1	19.4	18.5	56.0
0.894000	33.6	Off	L1	19.4	22.4	56.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.174000	37.0	Off	L1	19.4	17.8	54.8
0.206000	34.9	Off	L1	19.4	18.5	53.4
0.366000	31.5	Off	L1	19.4	17.1	48.6
0.470000	41.2	Off	L1	19.4	5.3	46.5
0.726000	31.5	Off	L1	19.4	14.5	46.0
0.894000	26.8	Off	L1	19.4	19.2	46.0

Temperature	25~26℃	Humidity	44~46%
Test Engineer	Slash Huang	Phase	Neutral
Test Mode	Mode 4	Test Date	Jun. 16, 2013

ENV216 Auto Test



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	48.2	Off	N	19.4	17.8	66.0
0.174000	46.7	Off	N	19.4	18.1	64.8
0.198000	45.2	Off	N	19.3	18.5	63.7
0.358000	41.9	Off	N	19.4	16.9	58.8
0.430000	43.9	Off	N	19.4	13.4	57.3
0.470000	49.1	Off	N	19.4	7.4	56.5

Final Result 2

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	37.7	Off	N	19.4	18.3	56.0
0.174000	40.6	Off	N	19.4	14.2	54.8
0.198000	38.4	Off	N	19.3	15.3	53.7
0.358000	36.2	Off	N	19.4	12.6	48.8
0.430000	34.1	Off	N	19.4	13.2	47.3
0.470000	43.3	Off	N	19.4	3.2	46.5

Note:

Level = Read Level + LISN Factor + Cable Loss.

4.2. Radiated Emissions Measurement

4.2.1. Limit

30dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/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

4.2.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1 MHz / 10Hz for Average
RBW / VBW (Emission in non-restricted band)	100kHz / 300kHz for peak

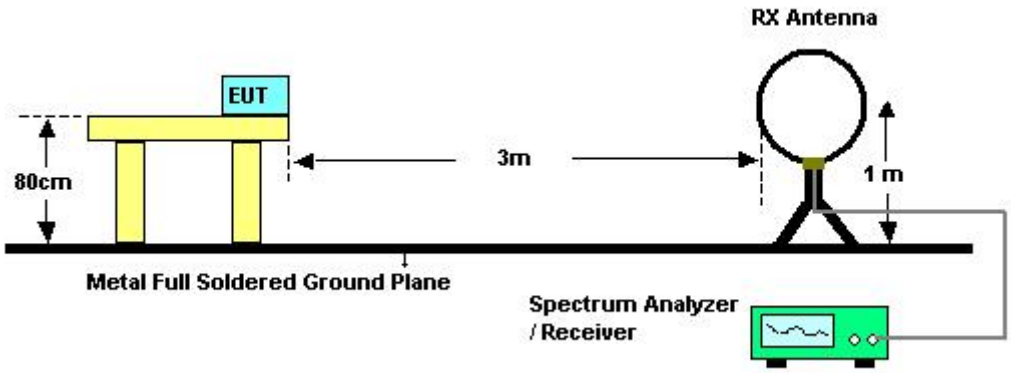
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RBW 120kHz for QP

4.2.3. Test Procedures

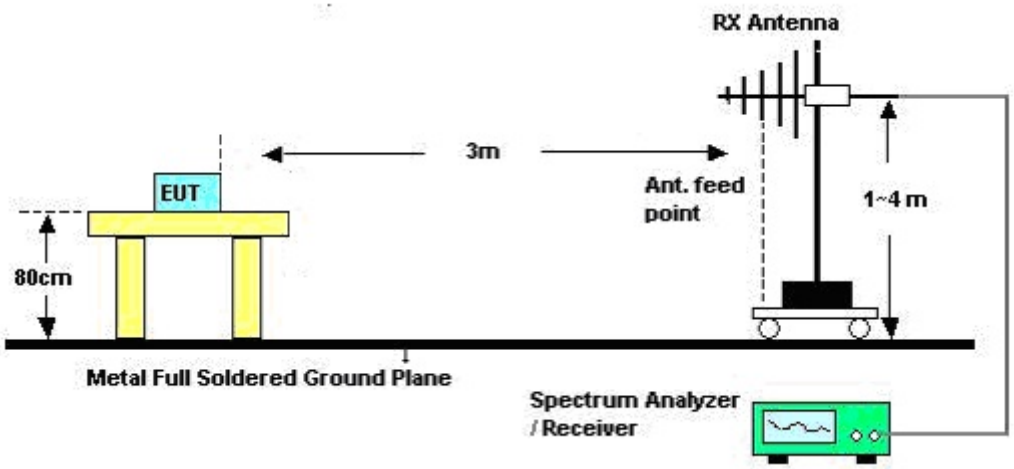
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 m to 4 m) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and 3MHz RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

4.2.4. Test Setup Layout

For Radiated Emissions below 1GHz



For Radiated Emissions above 1GHz



4.2.5. Test Deviation

There is no deviation with the original standard.

4.2.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.2.7. Results of Radiated Emissions (9kHz~30MHz)

Temperature	22~23℃	Humidity	42~44%
Test Engineer	Marlboro Hsu	Configurations	Normal Link
Test Date	Jun. 13, 2013		

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

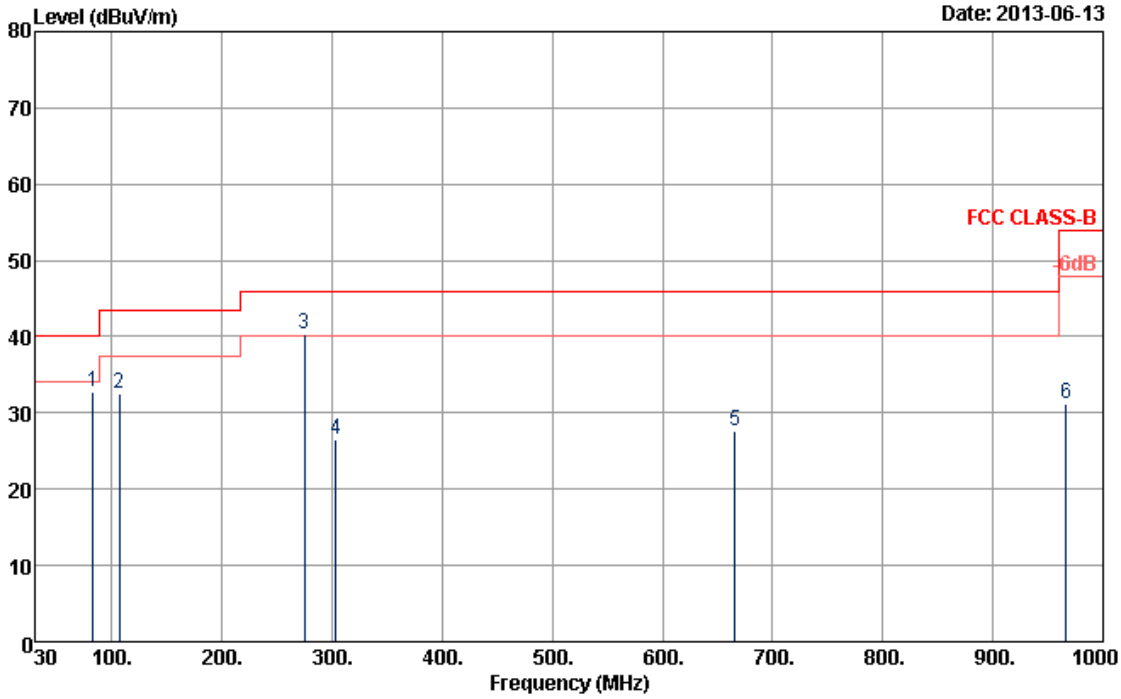
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

4.2.8. Results of Radiated Emissions (30MHz~1GHz)

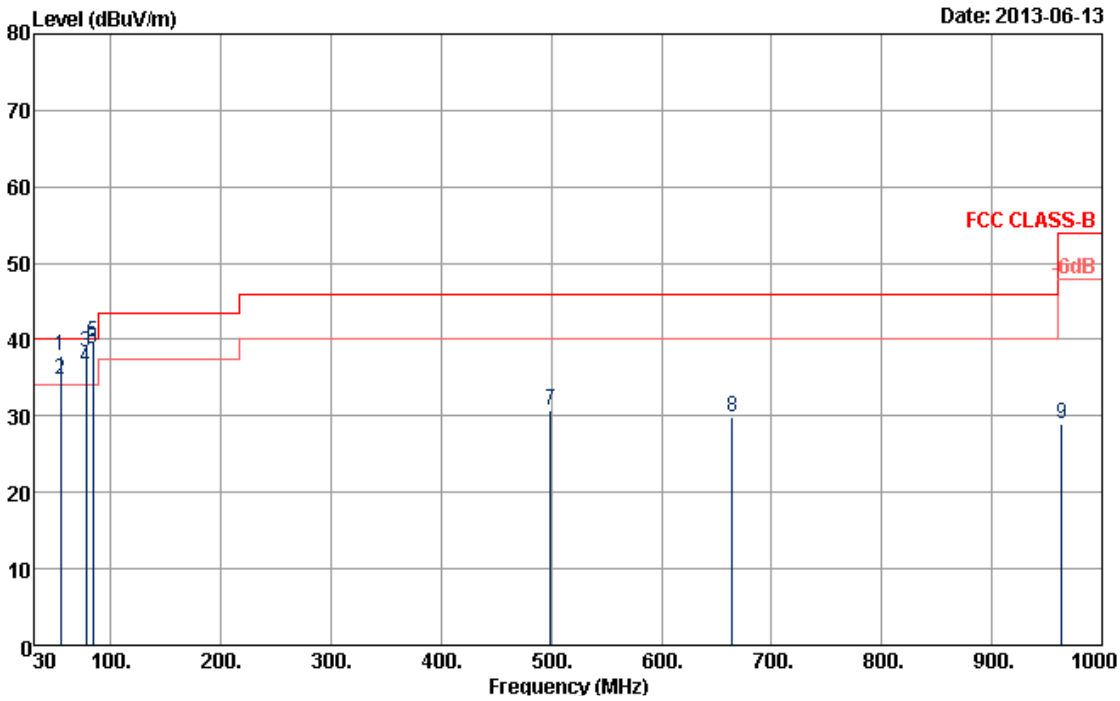
Temperature	22~23℃	Humidity	42~44%
Test Engineer	Marlboro Hsu	Test Mode	Mode 4

Horizontal



		Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
		MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1		82.65	32.71	-7.29	40.00	56.29	7.18	1.00	31.76	---	---	Peak
2		106.95	32.44	-11.06	43.50	51.24	11.82	1.13	31.75	---	---	Peak
3	!	275.16	40.33	-5.67	46.00	57.38	12.85	1.83	31.73	100	317	Peak
4		303.50	26.43	-19.57	46.00	42.96	13.27	1.92	31.72	---	---	Peak
5		665.40	27.64	-18.36	46.00	37.69	19.15	2.83	32.03	---	---	Peak
6		966.40	31.24	-22.76	54.00	37.75	21.06	3.35	30.92	---	---	Peak

Vertical



		Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
		MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	!	54.30	37.78	-2.22	40.00	61.81	6.92	0.83	31.78	100	84	Peak
2	!	54.30	34.70	-5.30	40.00	58.73	6.92	0.83	31.78	100	84	QP
3	!	77.25	38.29	-1.71	40.00	62.32	6.75	0.98	31.76	126	105	Peak
4	!	77.25	36.27	-3.73	40.00	60.30	6.75	0.98	31.76	126	105	QP
5	!	83.46	39.60	-0.40	40.00	63.03	7.32	1.01	31.76	145	360	Peak
6	!	83.46	38.88	-1.12	40.00	62.31	7.32	1.01	31.76	145	360	QP
7		499.50	30.78	-15.22	46.00	42.54	17.69	2.48	31.93	---	---	Peak
8		664.00	29.97	-16.03	46.00	40.02	19.15	2.83	32.03	---	---	Peak
9		963.60	28.92	-25.08	54.00	35.47	21.03	3.35	30.93	---	---	Peak

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

5. LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100356	9kHz – 2.75GHz	Nov. 13, 2012	Conduction (CO05-HY)
Two-LISN (for auxiliary equipment)	Rohde & Schwarz	ENV216	100081	9kHz ~ 30MHz	Dec. 12, 2012	Conduction (CO05-HY)
Two-LISN	Rohde & Schwarz	ENV216	100080	9kHz ~ 30MHz	Dec. 06, 2012	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	Conduction (CO05-HY)
Spectrum Analyzer	R&S	FSP30	101352	9kHz~30GHz	Nov. 07, 2012	Radiation (03CH06-HY)
Spectrum Analyzer	Agilent	E4408B	MY44211030	9kHz ~ 26.5GHz	Nov. 26, 2012	Radiation (03CH06-HY)
EMI Test Receiver	R&S	ESVS10	834468/0003	20MHz ~ 1000MHz	May 06, 2013	Radiation (03CH06-HY)
Bilog Antenna	SCHAFFNER	CBL6112B	2885	30MHz ~ 2GHz	Oct. 06, 2012	Radiation (03CH06-HY)
Double Ridge Horn Antenna	EMCO	3117	00066583	1GHz ~ 18GHz	Aug. 01, 2012	Radiation (03CH06-HY)
Amplifier	Agilent	310N	186713	9kHz ~ 1GHz	Apr. 12, 2013	Radiation (03CH06-HY)
Pre Amplifier	EMCI	EMC051845	SN980048	1GHz ~ 18GHz	Jul. 21, 2012	Radiation (03CH06-HY)
Turn Table	INN-CO	DS2000	420/650/00	0 - 360 degree	N/A	Radiation (03CH06-HY)
Antenna Mast	MF	MF-7802	MF780208212	1 m ~ 4 m	N/A	Radiation (03CH06-HY)

Note: Calibration Interval of instruments listed above is one year.

6. TEST LOCATION

SHIJR	ADD	:	6Fl., No. 106, Sec. 1, Shintai 5th Rd., Shijr City, Taipei, Taiwan 221, R.O.C.
	TEL	:	886-2-2696-2468
	FAX	:	886-2-2696-2255
HWA YA	ADD	:	No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.
	TEL	:	886-3-327-3456
	FAX	:	886-3-318-0055
LINKOU	ADD	:	No. 30-2, Dingfu Tsuen, Linkou Shiang, Taipei, Taiwan 244, R.O.C
	TEL	:	886-2-2601-1640
	FAX	:	886-2-2601-1695
DUNGHU	ADD	:	No. 3, Lane 238, Kangle St., Neihu Chiu, Taipei, Taiwan 114, R.O.C.
	TEL	:	886-2-2631-4739
	FAX	:	886-2-2631-9740
JUNGHE	ADD	:	7Fl., No. 758, Jungjeng Rd., Junghe City, Taipei, Taiwan 235, R.O.C.
	TEL	:	886-2-8227-2020
	FAX	:	886-2-8227-2626
NEIHU	ADD	:	4Fl., No. 339, Hsin Hu 2nd Rd., Taipei 114, Taiwan, R.O.C.
	TEL	:	886-2-2794-8886
	FAX	:	886-2-2794-9777
JHUBEI	ADD	:	No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C.
	TEL	:	886-3-656-9065
	FAX	:	886-3-656-9085

7. MEASUREMENT UNCERTAINTY

Uncertainty of Conducted Emission Measurement (150kHz ~ 30MHz)

Contribution	Uncertainty of x_i			$u(x_i)$
	Value	Unit	Probability Distribution k	
Receiver reading	0.026	dB	normal(k=2)	0.013
Cable loss	0.002	dB	normal(k=2)	0.001
AMN/LISN specification	1.200	dB	normal(k=2)	0.600
Mismatch Receiver VSWR 1= AMN/LISN VSWR 2=	-0.080	dB	U-shaped	0.060
combined standard uncertainty Ue(y)	1.2			
Measuring uncertainty for a level of confidence of 95% U=2Ue(y)	2.4			

Uncertainty of Conducted Emission Measurement

Contribution	Uncertainty of x_i			$u(x_i)$
	Value	Unit	Probability Distribution k	
Cable loss	0.038	dB	normal(k=2)	0.019
Attenuator	0.047	dB	normal(k=2)	0.024
Power Meter specification	0.300	dB	normal(k=2)	0.150
Power Sensor specification	0.300	dB	normal(k=2)	0.150
Mismatch Receiver VSWR 1= Antenna VSWR 2= Pre Amplifier VSWR 3=	-0.080	dB	U-shaped	0.060
combined standard uncertainty Ue(y)	0.403			
Measuring uncertainty for a level of confidence of 95% U=2Ue(y)	0.806			

Uncertainty of Radiated Emission Measurement (30MHz ~ 1,000MHz)

Contribution	Uncertainty of x_i			$u(x_i)$
	Value	Unit	Probability Distribution k	
Receiver reading	0.1727	dB	normal(k=1)	0.1727
Cable loss	0.1736	dB	normal(k=2)	0.0868
Antenna gain	0.1687	dB	normal(k=2)	0.0843
Site imperfection	0.4898	dB	Triangular	0.2
Pre-amplifier gain	0.3661	dB	normal(k=2)	0.183
Transmitter antenna	1.7	dB	rectangular	0.9815
Signal generator	0.5	dB	rectangular	0.2887
Mismatch	0.08	dB	u-shape	0.244
Spectrum analyzer	0.5	dB	rectangular	0.2887
combined standard uncertainty Ue(y)	1.1434			
Measuring uncertainty for a level of confidence of 95% U=2Ue(y)	2.2869			

Uncertainty of Radiated Emission Measurement (1GHz ~ 18GHz)

Contribution	Uncertainty of x_i			$u(x_i)$
	Value	Unit	Probability Distribution k	
Receiver reading	0.1908	dB	normal(k=1)	0.1908
Cable loss	0.1685	dB	normal(k=2)	0.0843
Antenna gain	0.1912	dB	normal(k=2)	0.0956
Site imperfection	1.3091	dB	Triangular	0.5344
Pre-amplifier gain	0.3043	dB	normal(k=2)	0.1521
Transmitter antenna	1.7	dB	rectangular	0.9815
Signal generator	0.5	dB	rectangular	0.2887
Mismatch	0.08	dB	u-shape	0.244
Spectrum analyzer	0.8	dB	rectangular	0.4619
combined standard uncertainty Ue(y)	1.2965			
Measuring uncertainty for a level of confidence of 95% U=2Ue(y)	2.593			

Uncertainty of Radiated Emission Measurement (18GHz ~ 40GHz)

Contribution	Uncertainty of x_i			$u(x_i)$
	Value	Unit	Probability Distribution k	
Receiver reading	0.1864	dB	normal(k=1)	0.1864
Cable loss	0.1666	dB	normal(k=2)	0.0833
Antenna gain	0.1904	dB	normal(k=2)	0.0952
Site imperfection	0.4882	dB	Triangular	0.1993
Pre-amplifier gain	0.2688	dB	normal(k=2)	0.1344
Transmitter antenna	1.7	dB	rectangular	0.9815
Signal generator	0.5	dB	rectangular	0.2887
Mismatch	0.08	dB	u-shape	0.244
Spectrum analyzer	0.8	dB	rectangular	0.4619
combined standard uncertainty Ue(y)	1.1874			
Measuring uncertainty for a level of confidence of 95% U=2Ue(y)	2.3749			