



SPORTON LAB.

Certificate No: EH232843-03

CERTIFICATE OF COMPLIANCE

EQUIPMENT : 802.11abgn, USB module
MODEL NO. : WUBR-508N
APPLICANT : SparkLAN Communications, Inc.
8F., No.257, Sec. 2, Tiding Blvd.,
Neihu District, Taipei City 11493,
Taiwan



I HEREBY

CERTIFY THAT:

The following technical requirements and test specifications are relevant to the presumption of conformity under article **3.1(b)** of the **R&TTE Directive 1999/5/EC**

The equipment was **Passed** the test performed according to
ETSI EN 301 489-1 V1.9.2 (2011-09) EN 301 489-17 V2.2.1 (2012-09)

The test was carried out on **Apr. 10, 2012** SPORTON INTERNATIONAL INC. LAB.

Kero Kuo
Engineering Supervisor

CE Test Report

Equipment : 802.11abgn, USB module
Brand Name : SparkLAN
Model No. : WUBR-508N
Standard : EN 301 489-1 V1.9.2 (2011-09)
EN 301 489-17 V2.2.1 (2012-09)
Applicant : SparkLAN Communications, Inc.
Manufacturer : 8F., No.257, Sec. 2, Tiding Blvd.,
Neihu District, Taipei City 11493,
Taiwan

The product sample received on Mar. 29, 2012 and completely tested on Apr. 10, 2012. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in EN 301 489-1 V1.9.2 (2011-09) and shown compliance with the applicable technical standards. The equipment under R&TTE Directive 1999/5/EC of article 3.1b harmonized essential for the EMC requirements.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:



Kero Kuo / Engineering Supervisor



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History of This Test Report

[illegible]

1 SUMMARY OF TEST RESULT

EN 301 489-1 V1.9.2 (2011-09) Emission Tests and Conformance Test Specifications				
Report Clause	Ref. Std. Clause	Test Standard	Description of Test	Result
3.1	8.4	EN 55022:2006/A1:2007	AC Power Conducted Emissions	Complied
3.1	8.7	EN 55022:2006/A1:2007	Telecom Port Conducted Emissions	NA
3.2	8.2	EN 55022:2006/A1:2007	Radiated Emissions	Complied
3.3	8.5	EN 61000-3-2:2006/A1:2009 EN 61000-3-2:2006/A2:2009	Harmonic Current Emissions	NA
3.4	8.6	EN 61000-3-3:2008	Voltage Fluctuations and Flicker	NA

Remark: The "NA" is Not Applicable.

EN 301 489-1 V1.9.2 (2011-09) Immunity Tests and Conformance Test Specifications				
Report Clause	Ref. Std. Clause	Test Standard	Description of Test	Result
4.1	9.3	EN 61000-4-2:2009	ESD (Enclosure)	Complied
4.2	9.2	EN 61000-4-3:2006/A1:2008/A2:2010	RS (Enclosure)	Complied
4.3	9.4	EN 61000-4-4:2004/A1:2010	EFT (AC Power Port)	NA
4.3	9.4	EN 61000-4-4:2004/A1:2010	EFT (Signal and telecommunication ports)	NA
4.4	9.8	EN 61000-4-5:2006	Surge (AC Power Port)	NA
4.4	9.8	EN 61000-4-5:2006	Surge (Signal and telecommunication ports)	NA
4.5	9.5	EN 61000-4-6:2009	CS (AC Power Port)	NA
4.5	9.5	EN 61000-4-6:2009	CS (Signal and telecommunication ports)	NA
4.6	9.7	EN 61000-4-11:2004	DIP (AC Power Port)	NA

Remark: The "NA" is Not Applicable.

Criteria	During test	After test
A	Shall operate as intended. May show degradation of performance (see note 1). 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.	

2 GENERAL INFORMATION

2.1 Product Details

The equipment is 802.11abgn, USB module (Built in Wireless module). For more detailed features description, please refer to the manufacturer's specifications or user's manual.

2.2 Test Manner

- a. During testing, the interface cables and equipment positions were varied according to European Standard EN 55022.
- b. The equipment under test were performed the following test modes:

Test Items	Description of test modes
AC Conducted Emission	Mode 1: System Mode (Wireless link)
Radiated Emissions	Mode 1: System Mode (Wireless link)
EMS	Mode 1: System Mode (Wireless link)

Reminder:

1. The maximum operating frequency is 5.725 GHz.
2. Frequency range investigated: Conduction 150 kHz to 30 MHz, Radiation 30 MHz to 6,000 MHz.
3. Frequency range investigated immunity test: RS 80 MHz to 2,700 MHz.

2.3 Table for Testing Locations

Test Site No.	Site Category	Location	Test Site No.	Site Category	Location
CO01-HY	CON	Hwa Ya	ES01-HY	ESD	Hwa Ya
10CH01-HY (Below 1 GHz)	SAC	Hwa Ya	RS01-HY	RS	Hwa Ya
03CH03-HY (Above 1GHz)	SAC	Hwa Ya	-	-	-

Semi Anechoic Chamber (SAC).

2.4 Table for Supporting Units

< EMI >

Conducted Emission and Radiated emission

No.	Equipment	Brand Name	Model Name
For Local			
1	Notebook	DELL	VOSTRO 3350
2	(USB) Mouse	Microsoft	1113
3	iPod Nano	Apple	A1199
For Remote			
-	Wireless AP	D-Link	DNS-G120

< EMS >

No.	Equipment	Brand Name	Model Name
For Local			
1	Notebook	DELL	PP01L
For Remote			
-	Wireless AP	SIEMENS	SE366

2.5 EUT Operation during Test

Two executive programs, "EMITEST.exe" and "EMCTEST.exe" under Win 7 which generates a complete line of continuously repeating "H" pattern was used as the test software.

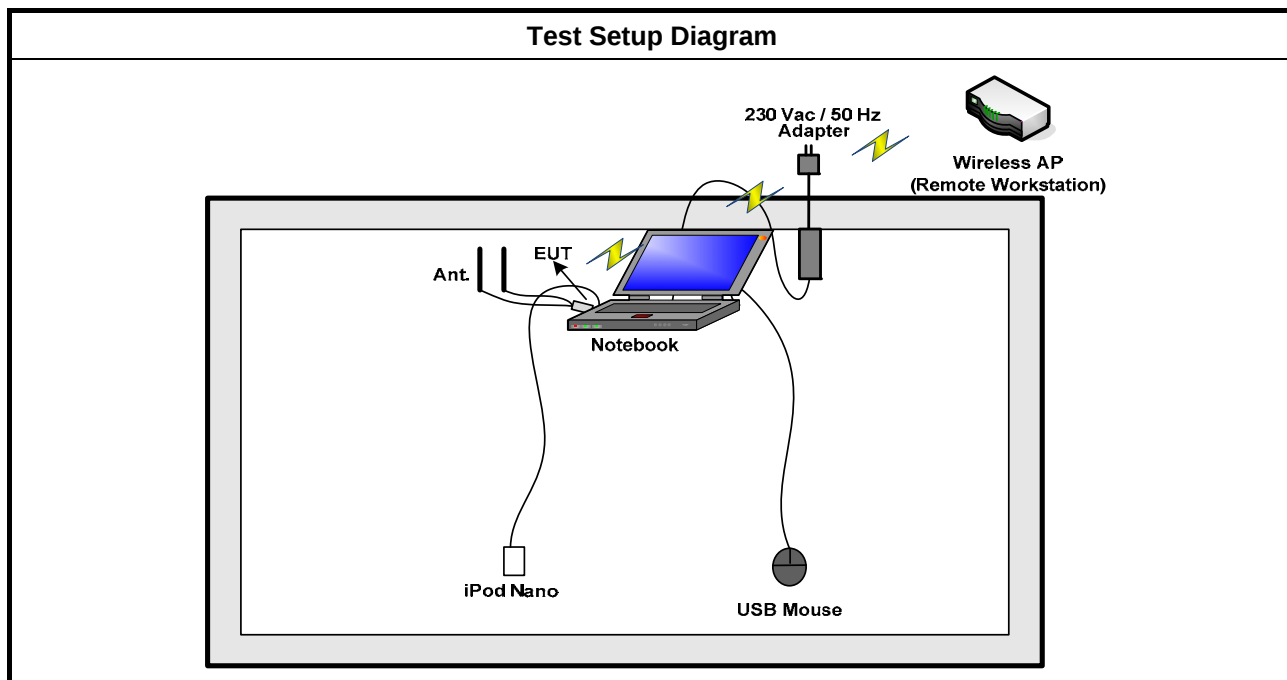
The program was executed as follows:

- a. Turn on the power of all equipment.
- b. The NB reads the test program "EMITEST.exe" from the hard disk drive and runs it.
- c. The NB executed " EMCTEST.exe "sends "H" messages to monitor, and displays "H" patterns on the screen.
- d. Repeat the steps from b to c.

At the same time, the following programs were executed:

- Executed "Winthrax.exe" to read and write data from iPod Nano.
- Executed "Ping.exe" to link with the remote workstation (AP) to maintain the connection via Wireless.

2.6 Test Configuration



3 EMISSION TESTS RESULT

3.1 Test of Conducted Powerline and Telecommunication Line

3.1.1 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

3.1.2 Measuring Instruments and Setting

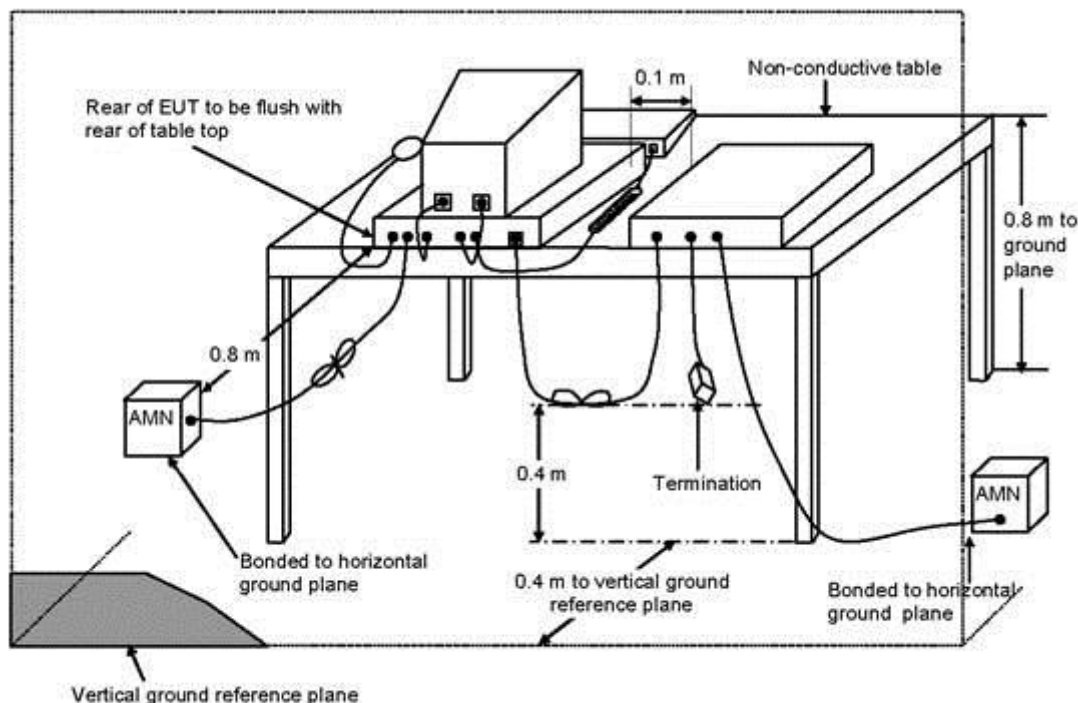
See list of measuring instruments of this test report.

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

3.1.3 Test Procedures

1. The EUT was warmed up for 15 minutes before testing started.
2. The EUT was placed on a desk 0.8 meters height from the metal ground plane and 0.4 meter from the conducting wall of the shielding room and it was kept at least 0.8 meters from any other grounded conducting surface.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN).
4. All the support units are connect to the other LISN.
5. The LISN provides 50 ohm coupling impedance for the measuring instrument.
6. The CISPR states that a 50 ohm, 50 microhenry LISN should be used.
7. Both sides of AC line were checked for maximum conducted interference.
8. The frequency range from 150 kHz to 30 MHz was searched.
9. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

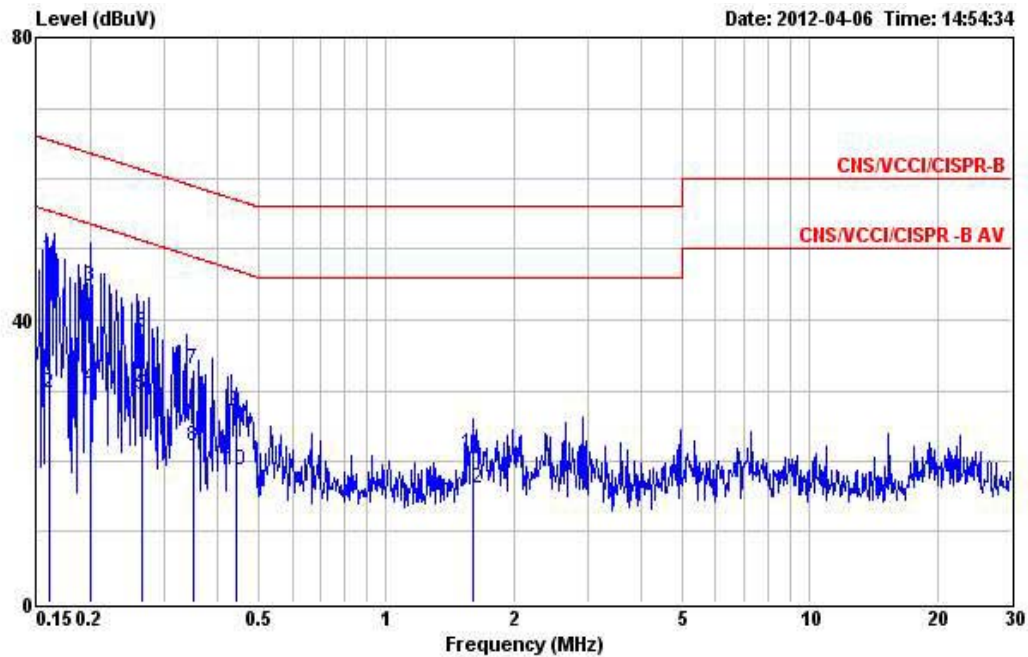
3.1.4 Typical Test Setup Layout of Conducted Powerline



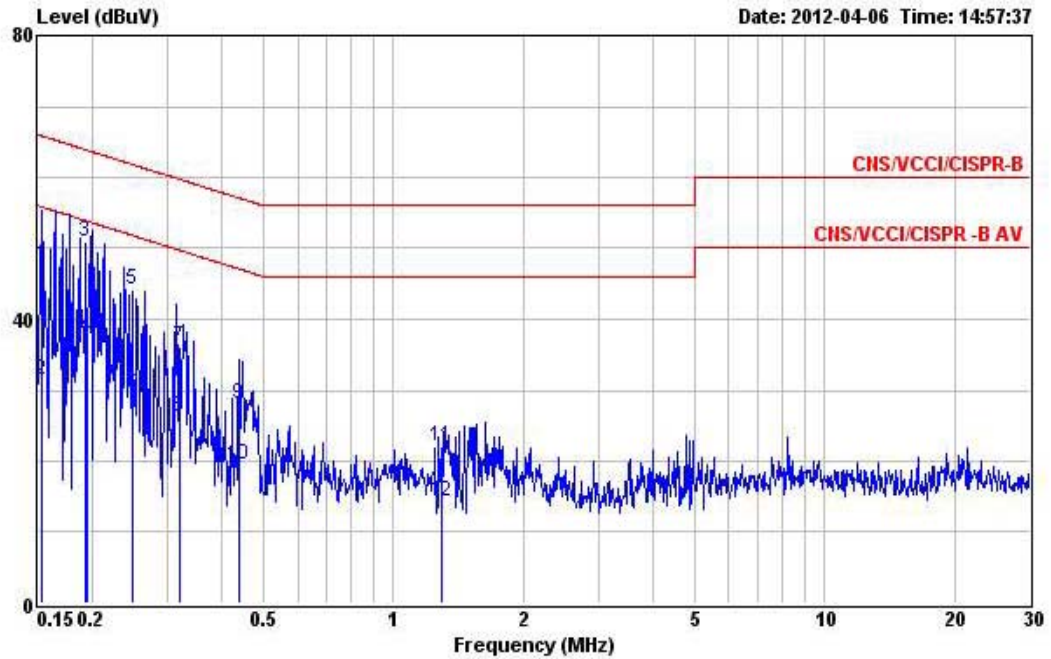
- a. AMN is 80 cm from the EUT and at least 80 cm from other units and other metal planes.
- b. EUT is connected to one artificial mains network (AMN).
- c. All other units of a system are powered from a second AMN. A multiple outlet strip can be used for multiple mains cords.
- d. Rear of EUT to be flushed with rear of table top.
- e. Peripherals shall be placed at a distance of 10 cm from each other and from the controller, except for the monitor which, if this is an acceptable installation practice, shall be placed directly on the top of the controller.
- f. If cables, which hang closer than 40 cm to the horizontal metal ground plane, cannot be shortened to appropriate length, the excess shall be folded back and forth forming a bundle 30 cm to 40 cm long.
- g. Mains cords and signal cables shall be positioned for their entire lengths, as far as possible, at 40 cm from the vertical reference plane.
- h. Cables of hand operated devices, such as keyboards, mice, etc. shall be placed as for normal usage.

3.1.5 Results of AC Power Line Conducted Emissions Measurement

Test Mode	Mode 1	Test Site No.	CO01-HY
Test Frequency	0.15 MHz ~ 30 MHz	Test Engineer	David
Temperature	23.6°C	Relative Humidity	49 %
Note: 1. Corrected Reading (dBμV) = LISN Factor + Cable Loss + Read Level = Level			
■ The test was passed at the minimum margin that marked by the frame in the following data			

Line


	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBμV	dB	dBμV	dBμV	dB	dB	
1	0.160	48.71	-16.73	65.44	48.53	0.08	0.10	QP
2	0.160	29.65	-25.79	55.44	29.47	0.08	0.10	Average
3	0.201	44.74	-18.83	63.57	44.56	0.08	0.10	QP
4	0.201	30.41	-23.16	53.57	30.23	0.08	0.10	Average
5	0.264	29.46	-21.84	51.30	29.28	0.08	0.10	Average
6	0.264	38.05	-23.24	61.29	37.87	0.08	0.10	QP
7	0.350	32.98	-25.98	58.96	32.79	0.09	0.10	QP
8	0.350	22.15	-26.81	48.96	21.96	0.09	0.10	Average
9	0.444	26.89	-30.11	57.00	26.70	0.09	0.10	QP
10	0.444	18.60	-28.40	47.00	18.41	0.09	0.10	Average
11	1.600	21.08	-34.92	56.00	20.86	0.12	0.10	QP
12	1.600	16.10	-29.90	46.00	15.88	0.12	0.10	Average

Neutral


	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.153	47.64	-18.20	65.84	47.47	0.07	0.10	QP
2	0.153	31.52	-24.32	55.84	31.35	0.07	0.10	Average
3	0.194	51.01	-12.86	63.87	50.85	0.06	0.10	QP
4	0.194	37.42	-16.44	53.86	37.26	0.06	0.10	Average
5	0.249	44.25	-17.54	61.79	44.09	0.06	0.10	QP
6	0.249	29.62	-22.17	51.79	29.46	0.06	0.10	Average
7	0.319	36.17	-23.56	59.73	36.00	0.07	0.10	QP
8	0.319	26.16	-23.57	49.73	25.99	0.07	0.10	Average
9	0.437	28.00	-29.12	57.12	27.83	0.07	0.10	QP
10	0.437	19.45	-27.67	47.12	19.28	0.07	0.10	Average
11	1.290	22.02	-33.98	56.00	21.82	0.10	0.10	QP
12	1.290	14.32	-31.68	46.00	14.12	0.10	0.10	Average

3.2 Radiated Emissions Measurement

3.2.1 Limit

Radiated emissions below 1GHz were measured with a bandwidth of 120 kHz for 30 MHz to 1,000 MHz and bandwidth of 1 MHz for above 1 GHz, the measurement shall be made up to 5 times the high test frequency or 6GHz (Based on the high test operating frequency of EUT), whichever is lower. The quasi-peak measuring receiver shall be in accordance with clause 2 of EN55016-1. Receivers with peak detectors shall be in accordance with clause 3 of EN55016-1, and shall have a 6 dB bandwidth in accordance with clause 2 of EN55016-1 and above 1GHz measurement method shall be as specified in 7.3 of EN55016-2-3.

< Limit: Below 1GHz >

Frequency of Emission (MHz)	Field Strength QP Limit (dBuV/m) at 10m
30 ~ 230	30
230 ~ 1000	37

< Limit: Above 1GHz >

Frequency of Emission (GHz)	Field Strength Limit (dBuV/m) at 3m	
	Average	Peak
1 ~ 3	50	70
3 ~ 6	54	74

3.2.2 Measuring Instruments and Setting

See list of measuring instruments of this test report.

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	30MHz~1000MHz / RBW 120kHz for QP
Start ~ Stop Frequency	1GHz~6GHz / RBW 1MHz for Peak, Average

3.2.3 Test Procedures

< Below 1GHz >

- a. The EUT was placed on a rotatable table top 0.8 meter above ground.
- b. The EUT was set 10 meters from the interference-receiving antenna which was mounted on the top of a variable height antenna tower.
- c. The table was rotated 360 degrees to determine the position of the highest radiation.
- d. The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- f. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 3 dB lower than the 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 and reported.

< Above 1GHz >

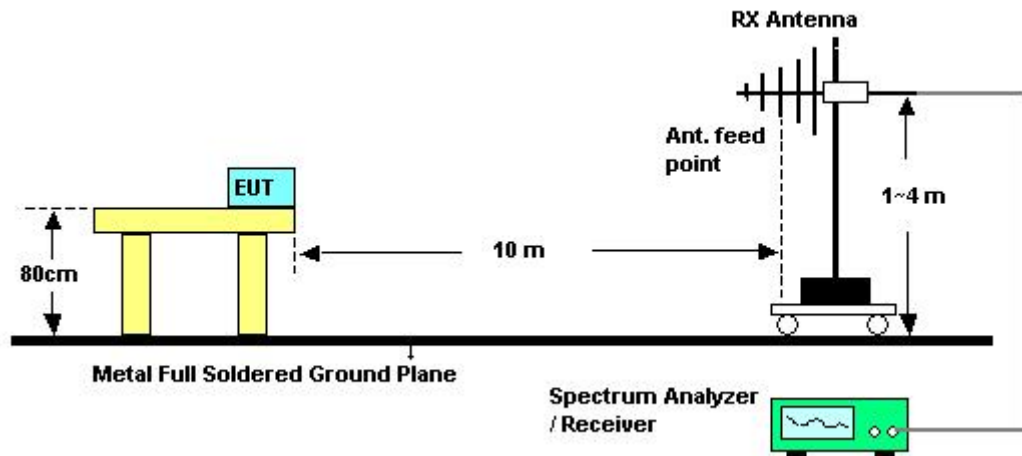
- a. The EUT was placed on a turntable at the height of 0.8 meters from the ground.
- b. The EUT was set at a distance of 3 meters from the interference-receiving antenna which was mounted on the top of a variable height antenna tower.
- c. An absorber was placed between the EUT and Antenna as required per the CISPR16-1-14 standard, specifically, the measurement setup requirements defined for an accredited test site.
- d. The table was rotated 360 degrees to determine the position of the highest radiation.
- e. Set the measuring receiver system to "Peak Detection" function and "Specified Bandwidth" with the "Maximum Hold" mode set on the measuring receiver.
- f. The DRG Horn Antenna was set at a height of 1 meter while turning the turntable to obtain the EUT's most maximized operational radiation noise readings from both the "Horizontal" and "Vertical" polarizations separately.
- g. When an EUT is located on the turntable, and its height is over 172cm (when the antenna's 3dB beam width of 6GHz is at 27°), the DRG Horn Antenna must be raised and descended while turning the turntable to obtain the EUT's most maximized operational radiation noise readings from both the "Horizontal" and "Vertical" polarizations separately.

NOTE: The maximum raise height of the antenna is the same height as that of the top of the EUT while located on top of the turntable.

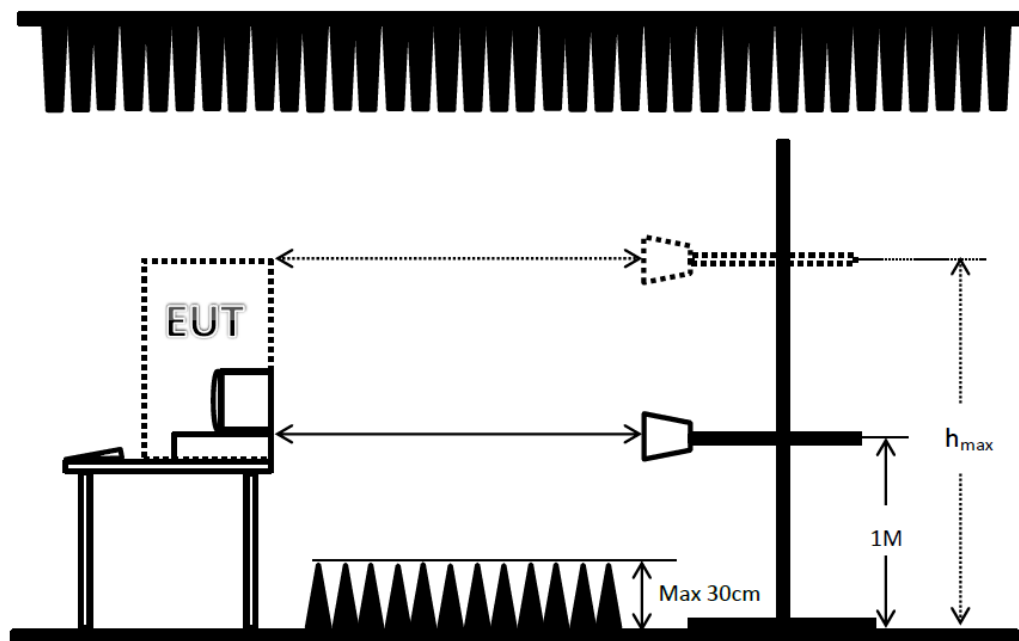
- h. If the emission level of the EUT in "Peak Detection" mode is 20dB lower than the "Average" limit (means that the emission level in "Peak Detection" mode also complies with the limit in "Average Mode"), testing will be stopped and "Peak" values of the EUT will be reported, otherwise, the emissions of the EUT will be measured in "Average Mode" again and then reported.

3.2.4 Test Setup Layout

< Below 1GHz >



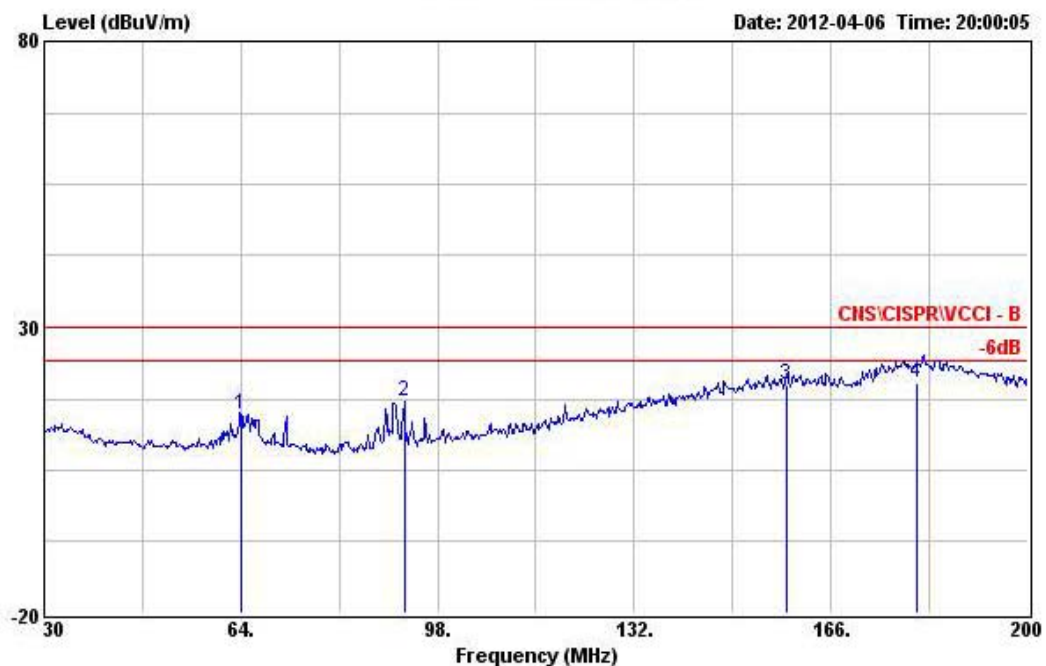
< Above 1GHz >



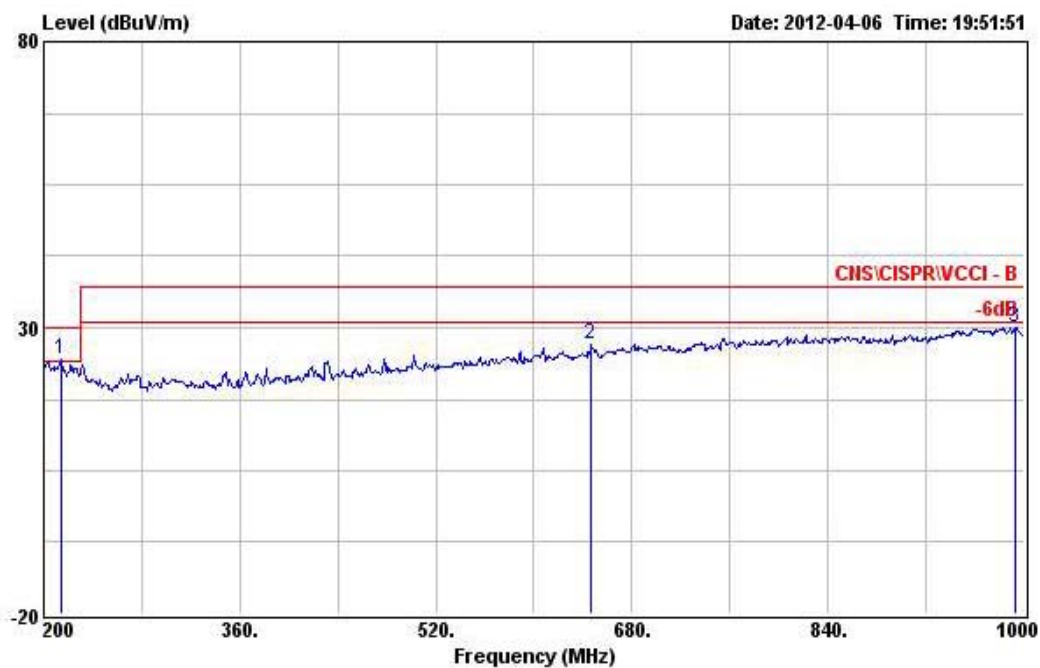
Remark: When EUT's height is over 172cm, h_{max} = top of EUT

3.2.5 Results for Radiated Emissions (30MHz~1GHz)

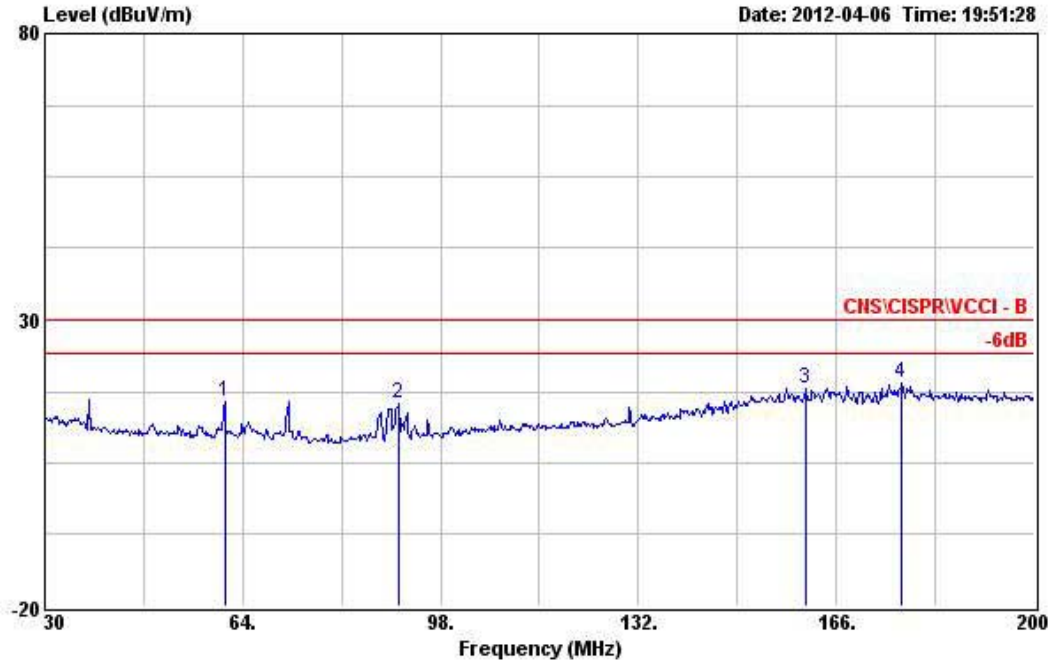
Test mode	Mode 1	Test Site No.	10CH01-HY
Test frequency	30 MHz ~ 1000 MHz	Test Engineer	Stone
Temperature	18.1 °C	Relative Humidity	60 %
Note: 1. Emission level (dBμV/m) = 20 log Emission level (μV/m)			
2. Corrected Reading : Antenna Factor + Cable Loss + Read Level – Preamp Factor = Level			
■ The test was passed at the minimum margin that marked by the frame in the following data			

Horizontal


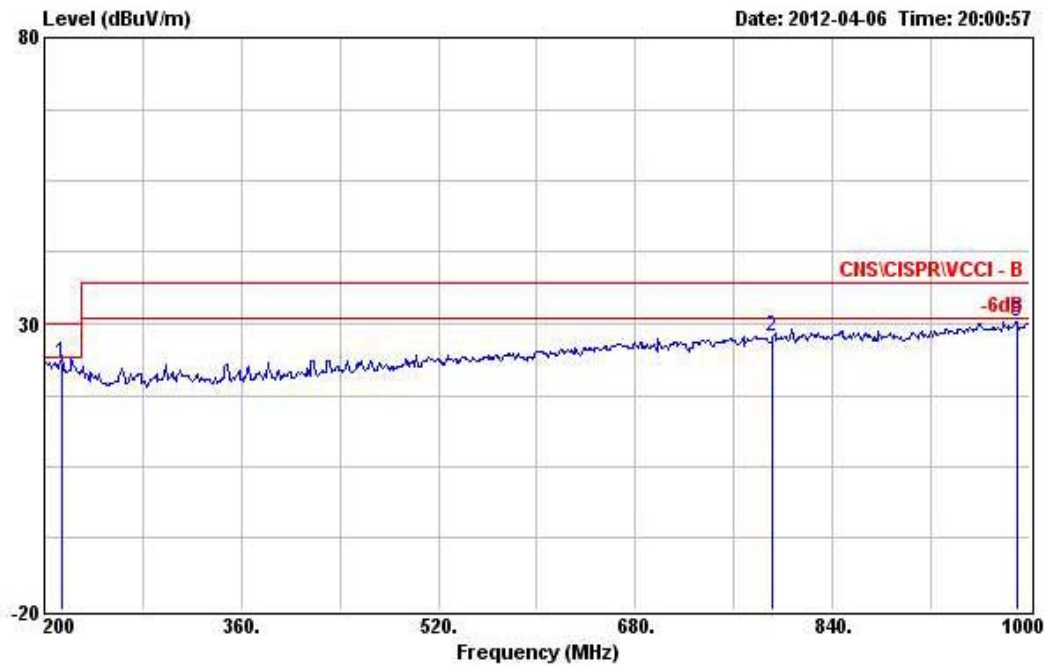
	Freq	Level	Over Limit	Limit Line	Read Level	Cable Loss	Probe Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	64.000	14.87	-15.13	30.00	32.21	1.77	9.58	28.69	Peak	---	---
2	92.220	16.93	-13.07	30.00	34.17	2.16	9.25	28.65	Peak	---	---
3	158.350	19.93	-10.07	30.00	33.00	2.86	12.34	28.27	QP	384	58
4	180.690	20.29	-9.71	30.00	32.15	3.06	13.34	28.26	QP	381	144



	Freq	Level	Over Limit	Limit Line	Read Level	Cable Loss	Probe Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1 !	214.400	24.57	-5.43	30.00	33.55	3.83	13.99	26.80	Peak	---	---
2	647.200	26.94	-10.06	37.00	28.34	7.03	19.46	27.89	Peak	---	---
3	992.800	30.09	-6.91	37.00	27.02	8.12	21.97	27.02	Peak	---	---

Vertical


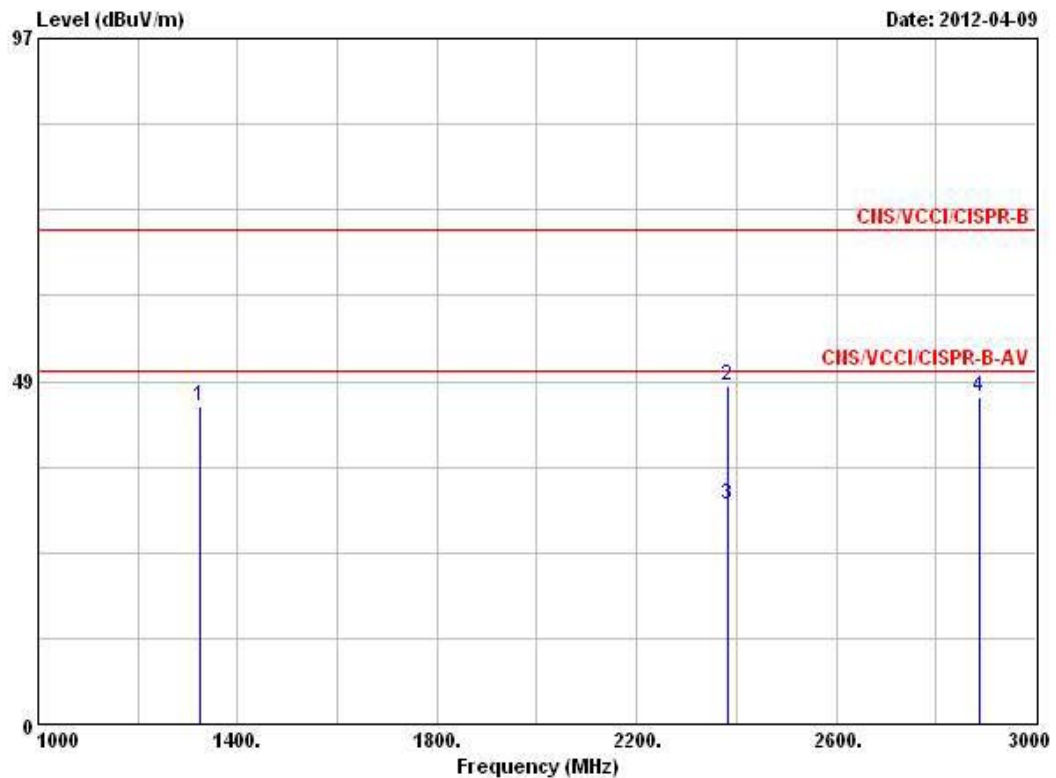
	Freq	Level	Over	Limit	Read	Cable	Probe	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Loss	Factor	Factor	Remark	Pos	Pos
			dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	60.940	15.65	-14.35	30.00	32.88	1.77	9.70	28.70	Peak	---	---
2	90.860	15.40	-14.60	30.00	32.73	2.17	9.15	28.65	Peak	---	---
3	160.900	17.93	-12.07	30.00	30.82	2.89	12.43	28.21	Peak	---	---
4	177.220	18.82	-11.18	30.00	30.82	3.09	13.14	28.23	Peak	---	---



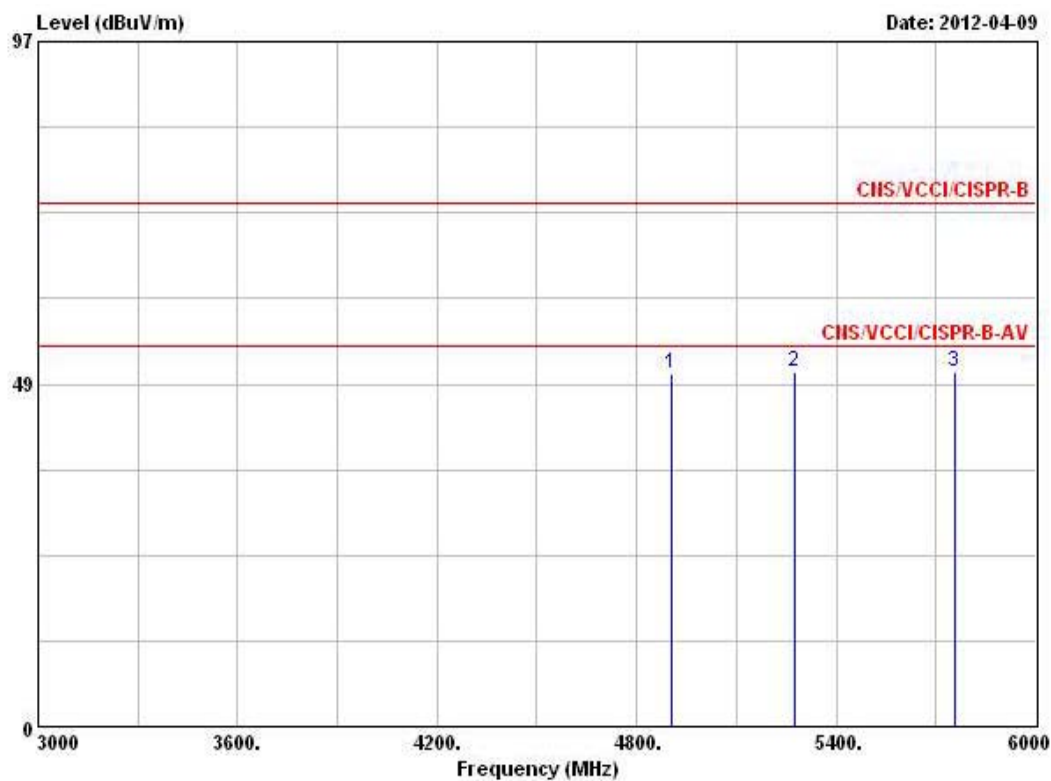
	Freq	Level	Over Limit	Limit Line	Read Level	Cable Loss	Probe Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	214.400	23.02	-6.98	30.00	32.00	3.83	13.99	26.80	QP	100	85
2	791.200	27.75	-9.25	37.00	27.19	7.39	20.82	27.65	Peak	---	---
3	989.600	30.29	-6.71	37.00	27.17	8.22	21.93	27.03	Peak	---	---

3.2.6 Results for Radiated Emissions (1GHz to 6GHz)

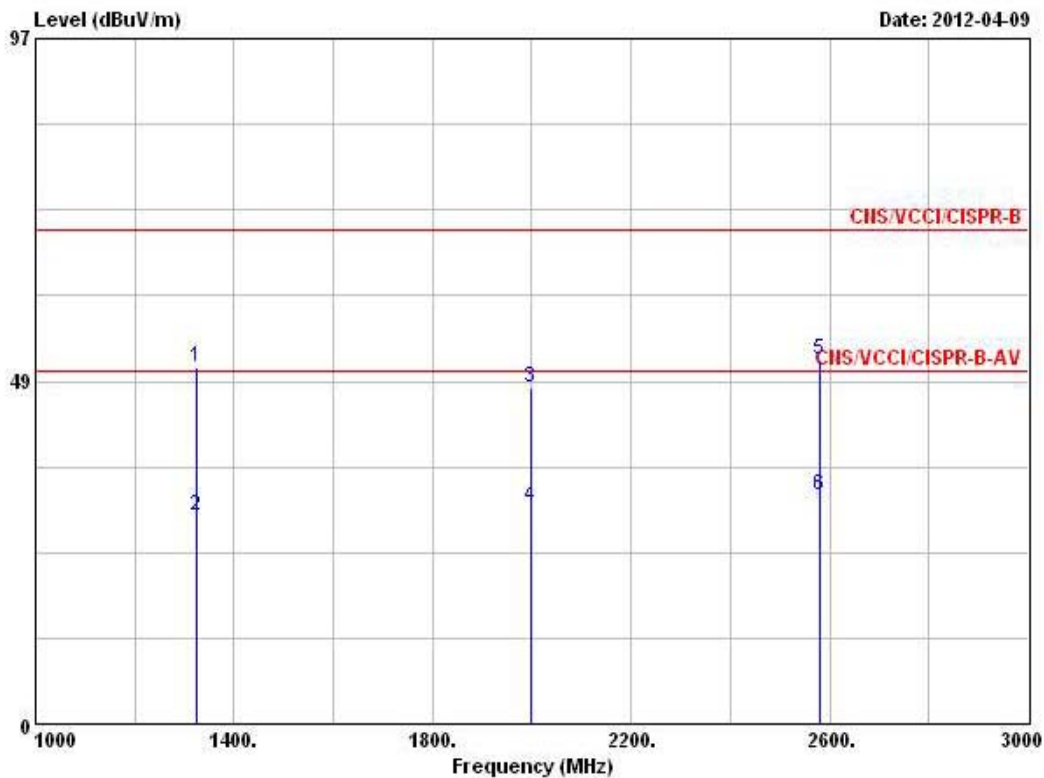
Test mode	Mode 1	Test Site No.	03CH03-HY
Test frequency	30 MHz ~ 1000 MHz	Test Engineer	Chris
Temperature	25 °C	Relative Humidity	55 %
Note: 1. Emission level (dBμV/m) = 20 log Emission level (μV/m)			
2. Corrected Reading : Antenna Factor + Cable Loss + Read Level – Preamp Factor = Level			
■ The test was passed at the minimum margin that marked by the frame in the following data			

Horizontal


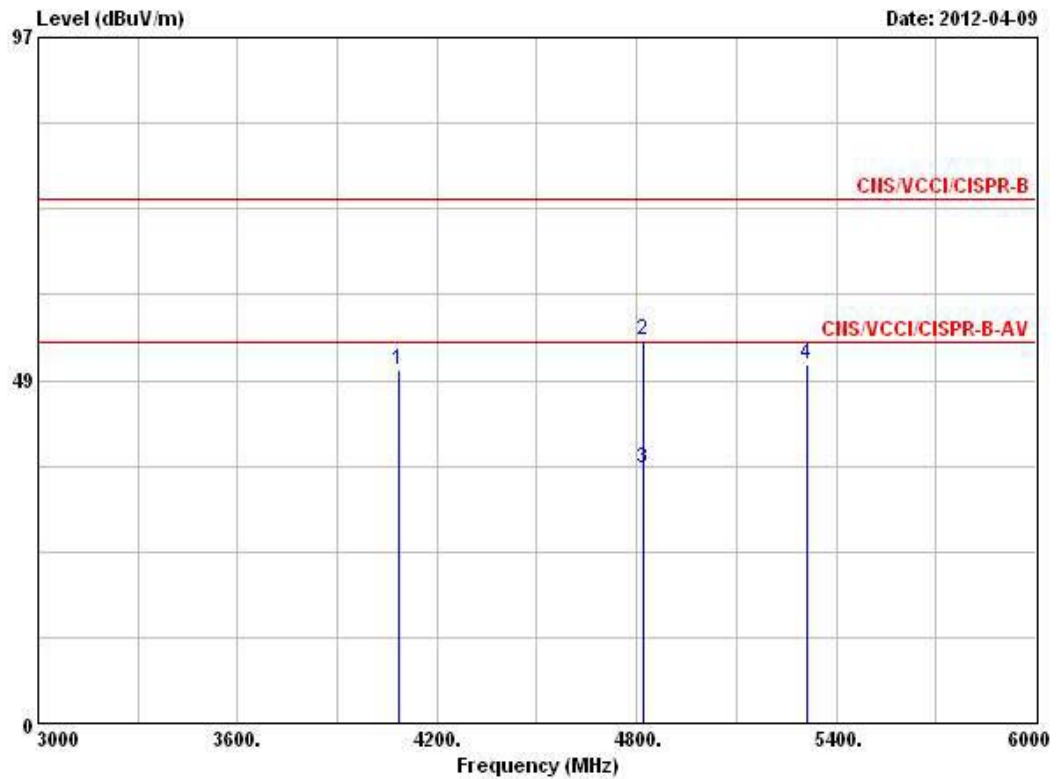
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	1326.000	45.01	-24.99	70.00	50.36	24.86	3.18	33.39	Peak	---	---
2	2382.000	47.91	-22.09	70.00	47.87	28.18	4.59	32.73	Peak	---	---
3	2382.000	31.06	-18.94	50.00	31.02	28.18	4.59	32.73	Average	---	---
4	2886.000	46.26	-23.74	70.00	44.08	29.70	5.29	32.81	Peak	---	---



	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pos	Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	4905.000	49.96	-24.04	74.00	43.92	33.23	5.42	32.61	Peak	---	---
2	5277.000	50.12	-23.88	74.00	43.57	33.74	5.38	32.57	Peak	---	---
3	5754.000	50.12	-23.88	74.00	43.40	34.10	5.21	32.59	Peak	---	---

Vertical


	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp			Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Loss	Factor	Remark		Pos	Pos
			dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	1326.000	50.52	-19.48	70.00	55.87	24.86	3.18	33.39	Peak	---	---
2	1326.000	29.36	-20.64	50.00	34.71	24.86	3.18	33.39	Average	---	---
3	1998.000	47.71	-22.29	70.00	48.80	27.50	4.08	32.67	Peak	---	---
4	1998.000	30.65	-19.35	50.00	31.74	27.50	4.08	32.67	Average	---	---
5	2580.000	51.60	-18.40	70.00	50.76	28.68	4.92	32.76	Peak	---	---
6	2580.000	32.39	-17.61	50.00	31.55	28.68	4.92	32.76	Average	100	230



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamplifier Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	4086.000	50.01	-23.99	74.00	44.67	32.48	5.51	32.65	Peak	---	---
2	4821.000	54.05	-19.95	74.00	48.18	33.06	5.43	32.62	Peak	---	---
3	4821.000	36.06	-17.94	54.00	30.19	33.06	5.43	32.62	Average	---	---
4	5310.000	50.70	-23.30	74.00	44.12	33.78	5.37	32.57	Peak	---	---

3.3 Harmonic Current Emissions Measurement

3.3.1 Limit

Harmonic current emissions evaluate the potential for the EUT to cause distortion on the AC power lines. It is applicable to electrical and electronic equipment having an input current ≤ 16 A par phase, and intended to be connected to public low-voltage distribution systems. EUT has been specified power less than or equal to 600 W and complies with Class D equipment and limits.

Harmonics [n]	Class A [A]	Class B [A]	Class C [% of fund]	Class D [mA/W]
Odd harmonics				
3	2.30	3.45	$30 \times \lambda$	3.4
5	1.14	1.71	10	1.9
7	0.77	1.155	7	1.0
9	0.40	0.60	5	0.5
11	0.33	0.495	3	0.35
13	0.21	0.315	3	3.85/13
$15 \leq n \leq 39$	$0.15 \times 15/n$	$0.225 \times 15/n$	3	$3.85/n$
Even harmonics				
2	1.08	1.62	2	-
4	0.43	0.645	-	-
6	0.30	0.45	-	-
$8 \leq n \leq 40$	$0.23 \times 8/n$	$0.345 \times 8/n$	-	-

3.3.2 Measuring Instruments and Setting

See list of measuring instruments of this test report.

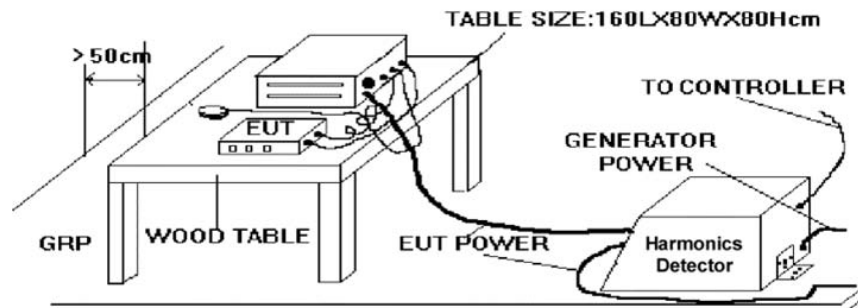
Harmonic and Flicker Tester	Setting
Line Voltage	230 V
Line Frequency	50 Hz
Current Measurement Range	High
Measurement Delay	10.0 seconds
Test Duration	2.00 minutes

3.3.3 Test Procedures

The measurement of harmonic currents shall be performed as follows:

- for each harmonic order, measure the 1.5 s smoothed r.m.s. harmonic current in each DFT time window as defined in IEC 61000-4-7.
- calculate the arithmetic average of the measured values from the DFT time windows, over the entire observation period Short cyclic ($T_{cycle} \leq 2.5$ min). Because of synchronisation to meet the requirements for repeatability in 5%.

3.3.4 Test Setup Layout



3.3.5 Test Deviation

There is no deviation with the original standard.

3.3.6 Results of Harmonic Current Emissions

The EUT power from host so there is no need to do this test.

3.4 Voltage Fluctuation and Flicker Measurement

3.4.1 Limit

The objective of voltage changes, voltage fluctuations and flicker in public low voltage supply systems during equipment with rated current ≤ 16 A per phase, ensures that home appliances and certain other electrical equipment do not adversely affect lighting equipment when connected to the same power system.

Voltage Fluctuation and Flicker Limits

- The value of P_{st} shall not be greater than 1.0.
- The value of P_{it} shall not be greater than 0.65.
- The value of $d(t)$ during a voltage change shall not exceed 3.3 % for more than 500 ms.
- The relative steady-state voltage change, dc , shall not exceed 3.3 %.
- The maximum relative voltage change, d_{max} , shall not exceed 4.0 %.

3.4.2 Measuring Instruments and Setting

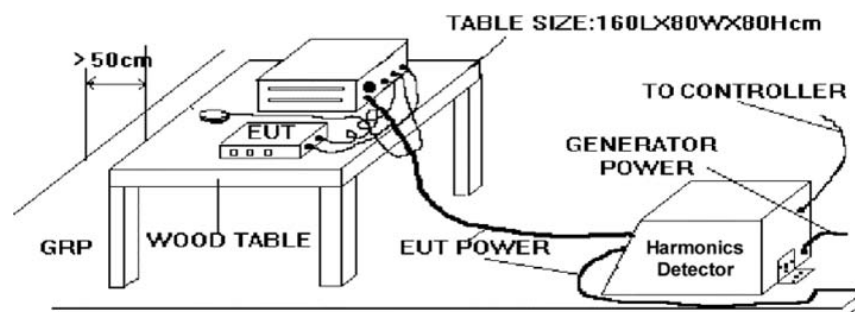
See list of measuring instruments of this test report.

Harmonic and Flicker Tester	Setting
Line Voltage	230 V
Line Frequency	50 Hz
Measurement Delay	10.0 seconds
Pst Integration Time	10 minutes
Pst Integration Periods	1

3.4.3 Test Procedures

The total impedance of the test circuit, excluding the appliance under test, but including the internal impedance of the supply source, shall be equal to the reference impedance. The stability and tolerance of the reference impedance shall be adequate to ensure that the overall accuracy of $\pm 8\%$ is achieved during the whole assessment procedure

3.4.4 Test Setup Layout



3.4.5 Test Deviation

There is no deviation with the original standard.



3.4.6 Test Result of Voltage Fluctuation and Flicker

The EUT power from host so there is no need to do this test.

4 IMMUNITY TESTS RESULT

4.1 Electrostatic Discharge Immunity Measurement (ESD)

4.1.1 Limit

Air discharges and contact charges are estimated to enclosure of EUT on all connectors and conducting surfaces.

Contact Discharges to the conductive surfaces and to coupling planes:

Air Discharge at seam between apertures and insulation surfaces:

On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. This investigation should be restricted to those areas normally handled by the user. A minimum of 10 single air discharges of each polarity and test level shall be applied to the selected test point for each area.

For the time interval between successive single discharges an initial value of 1 s is recommended.

Longer intervals may be necessary to determine whether a system failure has occurred.

The preferential range of test levels for the ESD test is given in following levels:

Contact discharge Test voltage ± 4 kV ; Air discharge Test voltage ± 8 kV.

4.1.2 Measuring Instruments and Setting

See list of measuring instruments of this test report.

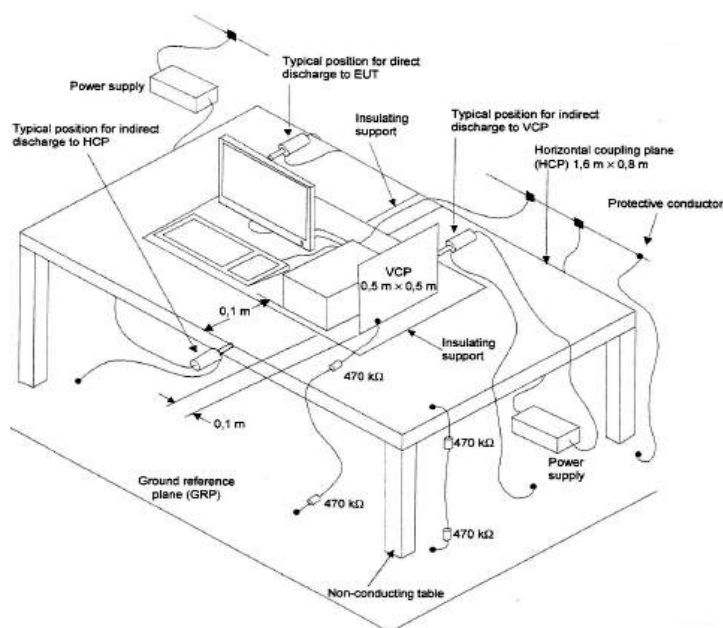
Electrostatic Discharge Simulator	Discharge Setting
Contact Charge Voltage	$\pm 2 / \pm 4$ kV
Air Charge Voltage	$\pm 2 / \pm 4 / \pm 8$ kV
Rise Time	0.8ns + 25%
Half-Value width	30ns + 30%
Polarity	Positive/Negative
Single Discharge Mode	1 discharge per 1s

4.1.3 Test Procedures

1. In the case of air discharge testing the climatic conditions shall be within the following ranges:
 - ambient temperature: 15°C to 35°C;
 - relative humidity : 30% to 60%;
 - atmospheric pressure : 86 kPa (860 mbar) to 106 kPa (1060 mbar).
2. Test programs and software shall be chosen so as to exercise all normal modes of operation of the EUT. The use of special exercising software is encouraged, but permitted only where it can be shown that the EUT is being comprehensively exercised.
3. The test voltage shall be increased from the minimum to the selected test severity level, in order to determine any threshold of failure. The final severity level should not exceed the product specification value in order to avoid damage to the equipment.
4. The test shall be performed with both air discharge and contact discharge. On preselected points at least 10 single discharges (in the most sensitive polarity) shall be applied on air discharge. On preselected points at least 10 single discharges (in the most sensitive polarity) shall be applied on contact discharge.
5. For the time interval between successive single discharges an initial value of one second is recommended. Longer intervals may be necessary to determine whether a system failure has occurred.
6. In the case of contact discharges, the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.
7. In the case of painted surface covering a conducting substrate, the following procedure shall be adopted :
 - If the coating is not declared to be an insulating coating by the equipment manufacturer, then the pointed tip of the generator shall penetrate the coating so as to make contact with the conducting

- substrate.
- Coating declared as insulating by the manufacturer shall only be submitted to the air discharge.
 - The contact discharge test shall not be applied to such surfaces.
8. In the case of air discharges, the round discharge tip of the discharge electrode shall be approached as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator (discharge electrode) shall be removed from the EUT. The generator is then retriggered for a new single discharge. This procedure shall be repeated until the discharges are completed. In the case of an air discharge test, the discharge switch, which is used for contact discharge, shall be closed.

4.1.4 Test Setup



The test setup shall consist of a non-conductive table, (0.8 ± 0.08) m high, standing on the ground reference plane.

A horizontal coupling plane (HCP), (1.6 ± 0.02) m, shall be placed on the table. The EUT and its cables shall be isolated from the coupling plane by an insulating support (0.5 ± 0.05) mm in thickness.

If the EUT is too large to be located 0.1 m minimum from all sides of the HCP, an additional, identical HCP shall be used, placed (0.3 ± 0.02) m from the first HCP. The table has to be enlarged or two tables may be used. The HCPs shall not be bonded together, other than via resistive cables to the GRP.

Setup consists of the test generator, EUT and auxiliary instrumentation necessary to perform DIRECT and INDIRECT application of discharges to the EUT as applicable, in the following manner:

- a. CONTACT DISCHARGE to the conductive surfaces and to coupling plane;
- b. AIR DISCHARGE at insulating surfaces.

The preferred test method is that of type tests performed in laboratories and the only accepted method of demonstrating conformance with this standard. The EUT was arranged as closely as possible to arrangement in final installed conditions.

4.1.5 Test Result of Electrostatic Discharge Immunity

Final Test Date	Apr. 10, 2012	Pressure	101 kPa
Temperature	24°C	Test Engineer	Mars
Humidity	48%	Configuration	Mode 1
Required Performance Criteria	<u>B</u>	Pass Performance Criteria	<u>B</u>

Test Result of Contact Discharge
Indirect discharge to HCP and VCP

Test Point	No. Of Discharges	Contact Discharge / Pointed Tip				Test Record
		+2kV	-2kV	+4kV	-4kV	
HCP (At Front)	10	A	A	B	B	Note ¹
HCP (At Left)	10	A	A	B	B	Note ¹
HCP (At Right)	10	A	A	B	B	Note ¹
HCP (At Rear)	10	A	A	B	B	Note ¹
VCP (At Front)	10	A	A	B	B	Note ¹
VCP (At Left)	10	A	A	B	B	Note ¹
VCP (At Right)	10	A	A	B	B	Note ¹
VCP (At Rear)	10	A	A	B	B	Note ¹
Remark	Note ¹ : the function is self-recoverable.					

Test Result of Air Discharge

In the Air Discharge tested the EUT has no on slots, apertures, or insulating surfaces. So, the air discharge test is not applicable.

4.2 Radio Frequency Electromagnetic Field Immunity Measurement (RS)

4.2.1 Limit

Most electronic equipment is in some manner affected by electromagnetic radiation. RF immunity test entails subjecting the equipment under test to a uniform field of radiated electromagnetic energy of a specified electromagnetic field strength and frequency and monitoring the functionality of the device as the frequency is swept over a specified frequency range.

The preferential range of test field strength levels for the RS test is given in following levels:
80~1GHz 3V/m; 1.4~2.7GHz: 3V/m.

4.2.2 Exclusion Bands

Using the 2,450 MHz band as an example:

- lower limit of exclusion band = $2400 - 120 = 2280$ MHz;
- upper limit of exclusion band = $2483,5 + 124,175 = 2607,675$ MHz;
- thus the exclusion band for 2,45 GHz equipment falling within the scope of the present document extends from 2280 MHz to 2607,675 MHz.

4.2.3 Measuring Instruments and Setting

See list of measuring instruments of this test report.

RS Immunity Test System	Setting
Method Used	Bilog antenna and Horn antenna
Field Strength Exposure	3 V/m (measured un-modulated carrier)
Frequency Range/Modulation	80 MHz to 1000 MHz and 1400 MHz to 2700 MHz, 80% AM modulation
Antenna Polarization	Vertical & Horizontal
Test Distance	3m
Frequency Steps	1% step
Dwell Time	2.9 sec
Exposures	Front, Back, Left and Right of the EUT

4.2.4 Test Procedures

1. The equipment to be tested is placed in the center of the enclosure on a wooden table. The equipment is then connected to power and signal leads according to pertinent installation instructions.
2. The bilog antenna which is enabling the complete frequency range of 80 MHz to 1000 MHz and 1400 MHz to 2700 MHz is placed 3m away from the equipment. The required field strength is determined by placing the field strength meter(s) on top of or directly alongside the equipment under test and monitoring the field strength meter via a remote field strength indicator outside the enclosure while adjusting the continuous-wave to the applicable antennae.
3. The test is normally performed with the generating antenna facing each of four sides of the EUT. The polarization of the field generated by the bi-conical antenna necessitates testing each position twice, once with the antenna positioned vertically and again with the antenna positioned horizontally. The circular polarization of the field from the log-spiral antenna makes a change of position of the antenna unnecessary.
4. At each of the above conditions, the frequency range is swept 80 MHz to 1000 MHz and 1400 MHz to 2700 MHz pausing to adjust the R.F. signal level or to switch oscillators and antenna. The rate of sweep is in the order of 1.5×10^{-3} decades/s. The sensitive frequencies or frequencies of dominant interest may be discretely analyzed.

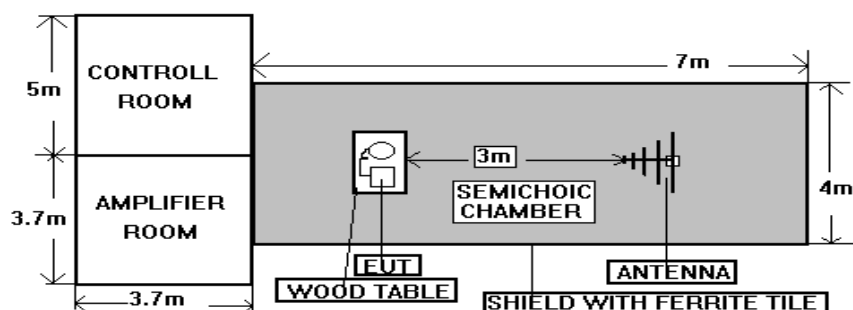
4.2.5 Test Severity Levels

Frequency Band : 80MHz to 2,700 MHz

Level	Test Field Strength (V/m)
1	1
2	3
3	10
X	Specified

Remark : "X" is an open class.

4.2.6 Test Setup Layout



NOTE : The SPORTON 7m x 4m x 4m semi-anechoic chamber is compliance with the sixteen points uniform field requirement as stated in IEC 61000-4-3 Section 6.2.

The procedure defined in this part requires the generation of electromagnetic fields within which the test sample is placed and its operation observed. To generate fields that are useful for simulation of actual (field) conditions may require significant antenna drive power and the resultant high field strength levels. To comply with local regulations and to prevent biological hazards to the testing personnel, it is recommended that these tests be carried out in a shielded enclosure or semi-anechoic chamber.

4.2.7 Test Result of Radio Frequency Electromagnetic Field Immunity

Final Test Date	Apr. 10, 2012		
Temperature	24°C	Test Engineer	Mars
Humidity	48%	Configuration	Mode 1
Required Performance Criteria	<u>A</u>	Pass Performance Criteria	<u>A</u>

Sides of the EUT have been exposed to the field	Antenna positioned	Test field strength Level	Test field strength (V/m)	Observation
Front	Vertical	2	3	No influencing
	Horizontally	2	3	
Left	Vertical	2	3	No influencing
	Horizontally	2	3	
Back	Vertical	2	3	No influencing
	Horizontally	2	3	
Right	Vertical	2	3	No influencing
	Horizontally	2	3	

4.3 Electrical Fast Transient/Burst Immunity Measurement (EFT)

4.3.1 Limit

This test interference signal injects to the AC/DC power supply and signal I/O lines of the EUT.

Test on Power Line:

The EFT/B-generator was located on the GRP. The length from the EFT/B-generator to the EUT as not exceeds 0.5 m.

The EFT/B-generator provides the ability to apply the test voltage in a non-symmetrical condition to the power supply input terminals of the EUT.

The preferential range of test peak voltage levels for the EFT test is given in following levels:

Power Line: $\pm 1\text{kV}$; Telecommunication Lines: $\pm 0.5\text{kV}$.

4.3.2 Measuring Instruments and Setting

See list of measuring instruments of this test report.

EMC Test Station (EFT)	Setting
Test Voltage	Power Line: $\pm 1\text{kV}$; Signal, telecommunication ports: $\pm 0.5\text{kV}$
Polarity	Positive/Negative
Impulse Frequency	5 kHz
Impulse Wave shape (T_r/T_h)	5/50 ns
Burst Duration	15 ms

4.3.3 Test Procedures

1. In order to minimize the effect of environmental parameters on test results, the climatic conditions when test is carrying out shall comply with the following requirements:
ambient temperature: 15°C to 35°C ;
relative humidity : 10% to 75%;
atmospheric pressure : 86 kPa (860 mbar) to 106 kPa (1060 mbar).
2. In order to minimize the effect of environmental parameters on test results, the electromagnetic environment of the laboratory shall not influence the test results.
3. The variety and diversity of equipment and systems to be tested make it difficult to establish general criteria for the evaluation of the effects of fast transients/bursts on equipment and systems.
4. The test results may be classified on the basic of the operating conditions and the functional specification of the equipment under test, according to the following performance criteria:
 - Normal performance within the specification limits.
 - Temporary degradation or loss of function or performance which is self-recoverable.
 - Temporary degradation or loss of function or performance which requires operator intervention or system reset.
 - Degradation or loss of function which is not recoverable due to damage of equipment (components).

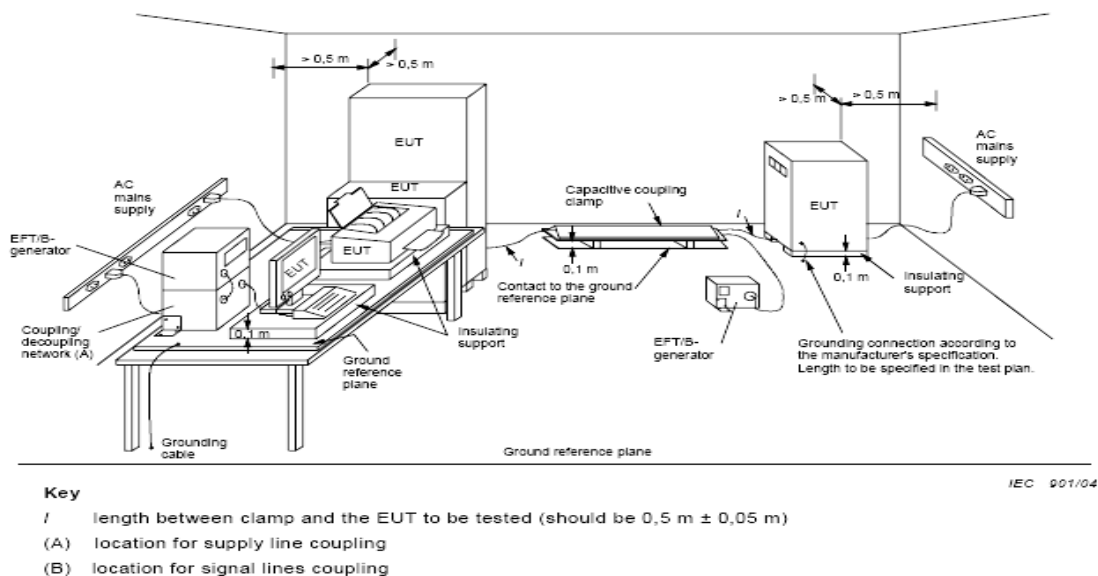
4.3.4 Test Severity Levels

The following test severity levels are recommended for the fast transient/burst test :

Open Circuit Output Test Voltage $\pm 10\%$		
Level	On Power Supply	On I/O Signal, Data and Control Line
1	0.5 kV	0.25 kV
2	1.0 kV	0.50 kV
3	2.0 kV	1.00 kV
4	4.0 kV	2.00 kV
X	Specified	Specified

Remark : " X " is an open level. The level is subject to negotiation between the user and the manufacturer or is specified by the manufacturer.

4.3.5 Test Setup Layout



The EUT was placed on a ground reference plane and was insulated from it by an insulating support about 0.1m thick. If the EUT is table-top equipment, it was located approximately 0.8m above the GRP. The GRP. Was a metallic sheet of 0.25 mm, minimum thickness; other metallic may be used but they shall have at least 0.65 mm thickness. It shall project beyond the EUT by at least 0.1m on all sides and connected to the protective earth. In the SPORTON EMC LAB. We provided 1 mm thickness aluminum ground reference plane or 1 mm thickness stainless steel ground reference plane. The minimum size of the ground reference plane is 1 m x 1 m, the exact size depending on the dimensions of the EUT. It was connected to the protective grounding system. The EUT was arranged and connected according to its functional requirements. The minimum distance between the EUT and other conductive structures, except the GRP. Beneath the EUT, was more than 0.5 m. using the coupling clamp, the minimum distance between the coupling plates and all other conductive structures, except the GRP. Beneath the EUT, was more than 0.5 m. The length of the signal and power lines between the coupling device and the EUT was 0.5m or less.

4.3.6 Test Deviation

There is no deviation with the original standard.



4.3.7 Test Result of Electrical Fast Transient/Burst Immunity

The test is not applicable for this EUT.

4.4 Surge Immunity Measurement (Surge)

4.4.1 Limit

This test simulates a lightning event by inducing transients onto the AC/DC power supply lines in common and differential mode.

Each device was tested in a total of two surge Configuration:

Line to Ground (L-G): Combination Wave, Line to Protective Earth with 9uF and 10Ohm and Neutral to Protective Earth with 9uF and 10Ohm, common mode, generator earthed.

Line-to-Line (L-L): Combination Wave, Line to Neutral with 18uF, differential mode, generator floated.

The preferential range of test peak voltage levels for the Surge test is given in following levels:

AC/DC power Line: Line to line: $\pm 1\text{kV}$; Line to ground: $\pm 2\text{kV}$;

Outdoor Telecommunication Line: Line to ground: $\pm 1\text{kV}$;

Indoor Telecommunication Line: Line to ground: $\pm 0.5\text{kV}$.

4.4.2 Measuring Instruments and Setting

See list of measuring instruments of this test report.

EMC Test Station (Surge)	Setting
Combination Wave Shape	1.2/50us Open Circuit Voltage; 8/20us Short Circuit Current
Power Line Test Voltage	Line to line $\pm 1\text{kV}$; Line to ground $\pm 2\text{kV}$
Telecom Lines Test Voltage	Outdoor Line to ground $\pm 1\text{kV}$; Indoor Line to ground: $\pm 0.5\text{kV}$
Polarity	Positive/Negative
Phase Angle	$0^\circ / 90^\circ / 180^\circ / 270^\circ$
Pulse Repetition Rate	1 time / min. (maximum)
Number of Tests	5 positive and 5 negative at selected points

4.4.3 Test Procedures

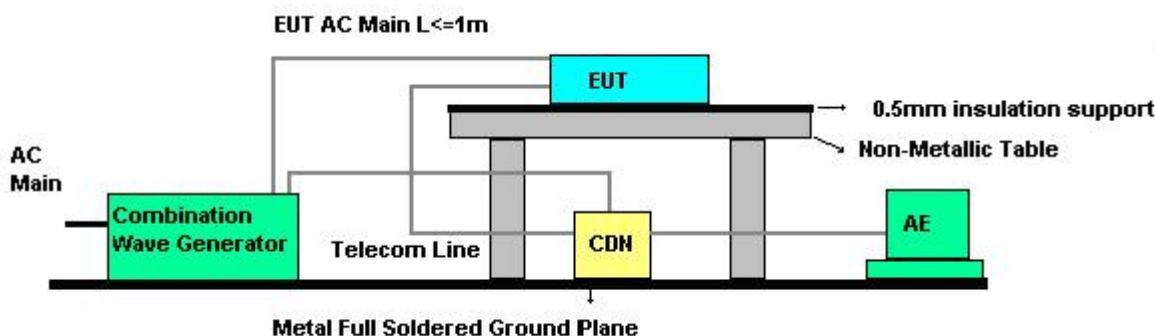
- The climatic conditions shall comply with the following requirements :
 - ambient temperature : 15°C to 35°C
 - relative humidity : 10 % to 75 %
 - atmospheric pressure : 86 kPa to 106 kPa (860 mbar to 1060 mbar)
- Electromagnetic conditions, the electromagnetic environment of the laboratory shall not influence the test results.
- The test shall be performed according the test plan that shall specify the test set-up with
 - generator and other equipment utilized;
 - test level (voltage/current);
 - generator source impedance;
 - internal or external generator trigger;
 - number of tests: at least five positive and five negative at the selected points;
 - repetition rate: maximum 1/min.
 - inputs and outputs to be tested;
 - representative operating conditions of the EUT;
 - sequence of application of the surge to the circuit;
 - phase angle in the case of AC power supply;
 - actual installation conditions, for example :
 - AC : neutral earthed,
 - DC : (+) or (-) earthed to simulated the actual earth conditions.
- If not otherwise specified the surges have to be applied synchronized to the voltage phase at the zero crossing and the peak value of the a.c. voltage wave (positive and negative).
- The surges have to be applied line to line and line(s) and earth. When testing line to earth, the test voltage has to be applied successively between each of the lines and earth, if there is no other specification.

6. The test procedure shall also consider the non-linear current-voltage characteristics of the equipment under test. Therefore the test voltage has to be increased by steps up to the test level specified in the product standard or test plan.
7. All lower levels including the selected test level shall be satisfied. For testing the secondary protection, the output voltage of the generator shall be increased up to the worst-case voltage breakdown level (let-through level) of the primary protection.
8. If the actual operating signal sources are not available, they may be simulated. Under no circumstances may the test level exceed the product specification. The test shall be carried out according to the test plan.
9. To find all critical points of the duty cycle of the equipment, a sufficient number of positive and negative test pulses shall be applied. For acceptance test previously unstressed equipment shall be used and the protection devices shall be replaced.

4.4.4 Test Level

Level	Open-Circuit Test Voltage, $\pm 10\%$, kV
1	0.5
2	1.0
3	2.0
4	4.0
x	Specified
NOTE - x is an open class. This level can be specified in the product specification.	

4.4.5 Test Setup Layout



4.4.6 Test Deviation

There is no deviation with the original standard.



4.4.7 Test Result of Surge Immunity

The test is not applicable for this EUT.

4.5 Conducted Disturbances Induced by RF Field Immunity Measurement (CS)

4.5.1 Limit of Conducted Disturbances Induced by RF Field Immunity (CS)

This test assesses the ability of the EUT to operate as intended in the presence of a radio frequency electromagnetic disturbance on the input/output ports.

The preferential range of test field strength levels for the CS test is given in following levels:
150 kHz ~ 80 MHz: 3 Vrms.

4.5.2 Measuring Instruments

See list of measuring instruments of this test report.

CS Immunity Test System	Setting
Method Used	CDN M016 SWM2 for AC power Port FCC T8:RJ45
Field Strength Exposure	3Vrms
Frequency Range/Modulation	150kHz~80MHz, 80% AM modulation
Frequency Steps	1% step
Dwell Time	2.9 sec

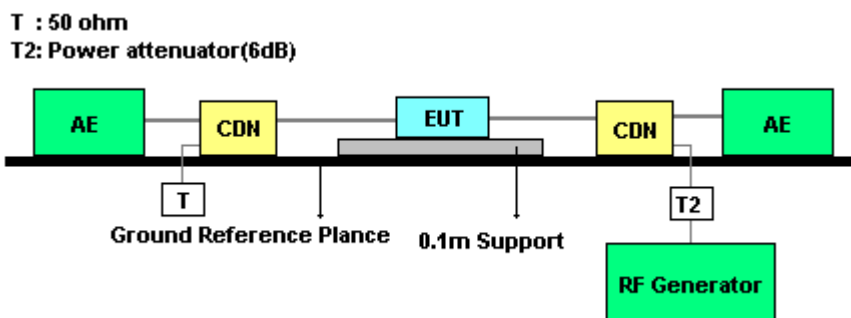
4.5.3 Test Procedures

1. This test method test can be performed without using a self-shielded enclosure. This is because the disturbance levels applied and the geometry of the setups are not likely to radiated a high amount of energy, especially at the lower frequencies. If under certain circumstances the radiated energy is too high, a shielded enclosure has to be used.
2. The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn while the other non-excited RF-input ports of the coupling devices are terminated by a 50-ohm load resistor.
3. The frequency range is swept from 150 kHz to 80 MHz, using the signal levels established during the setting process, and with the disturbance signal 80% amplitude modulated with a 1kHz sine wave, pausing to adjust the RF-signal level or to switch coupling devices as necessary. The rate of sweep shall no exceed 1.5×10^{-3} decades/s. where the frequency is swept incrementally; the step size shall no exceed 1% of the start and thereafter 1% of the preceding frequency value.
4. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies e.g. clock frequencies and harmonics or frequencies of dominant interest shall be analyzed separately.
5. In cases of dispute, the test procedure using a step size not exceeding 1% of the start and thereafter 1% of preceding frequency value shall take precedence.

4.5.4 Test Level

Level	Voltage Level (EMF)
1	1 V rms
2	3 V rms
3	10 V rms
x	Specified
NOTE - x is an open class. This level can be specified in the product specification.	

4.5.5 Test Setup Layout



4.5.6 Test Deviation

There is no deviation with the original standard.



4.5.7 Test Result of Conducted Disturbances Induced by RF Field Immunity

The test is not applicable for this EUT.

4.6 Voltage Dips and Voltage Interruption Immunity Measurement (DIP)

4.6.1 Limit

Voltage failures occur following switching operations, short-circuits, response of fuses and when running up heavy loads. The following table is the limits of the dips and Interruption Immunity Test.

EN 301 489-1 V1.9.2 (2011-09) Voltage Dips and Voltage Interruption Performance Criteria			
Item	Residual Voltage	Residual Voltage Cycle	Performance Criteria
Voltage Dip	0 %	0.5 (10 ms)	TT, TR
Voltage Dip	0 %	1 (20 ms)	TT, TR
Voltage Dip	70 %	25 (500 ms)	TT, TR
Voltage Interruption	0 %	250 (5000 ms)	TT, TR
This test shall be performed on AC power ports. For a voltage interruption the following performance criteria apply: ♦ In the case where the EUT is fitted with a battery back-up, the performance criteria for transient phenomena for transmitters or for receivers shall apply (see clause 6 of the relevant part of EN 301 489 series dealing with the particular type of radio equipment); ♦ In the case where the EUT is powered solely from the AC mains supply (without the use of a parallel battery back-up) volatile user data may have been lost and if applicable the communication link need not to be maintained and lost functions should be recoverable by user or operator; ♦ No unintentional responses shall occur at the end of the test; ♦ In the event of loss of function(s) or in the event of loss of user stored data, this fact shall be recorded in the test report;			

4.6.2 Measuring Instruments and Setting

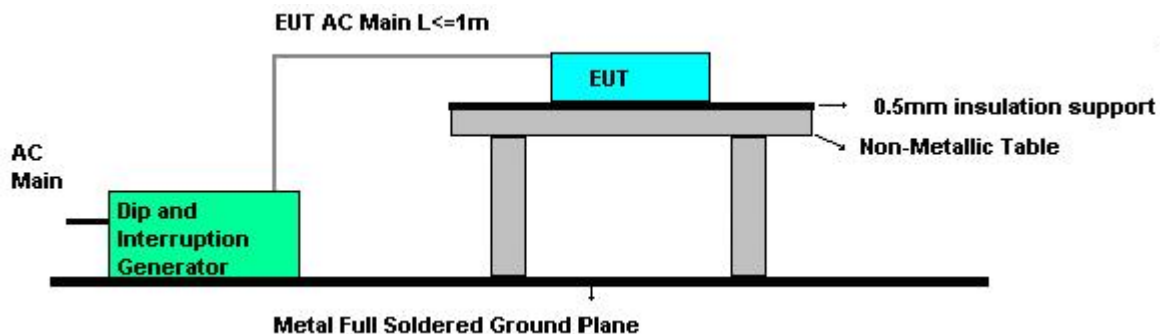
See list of measuring instruments of this test report.

EMC Test Station (Dip Interruption)	Setting
Voltage Reduction (Periods)	0 % (10/20 ms); 70 % (20 ms); 0 % (5000 ms)
Test Interval	10 sec for each event

4.6.3 Test Procedures

- The climatic conditions shall comply with the following requirements :
 - ambient temperature : 15 °C to 35 °C
 - relative humidity : 10 % to 75 %
 - atmospheric pressure : 86 kPa to 106 kPa (860 mbar to 1060 mba)
- The EUT is powered up to a nominal voltage of 240VAC/50Hz and 100VAC/50Hz, and then software-controlled voltage dips and interruptions are introduced.

4.6.4 Test Setup Layout



4.6.5 Test Deviation

There is no deviation with the original standard.



4.6.6 Test Result of Voltage Dips and Voltage Interruption Immunity

The test is not applicable for this EUT.

5 UNCERTAINTY

For EMI

Test Items	Test Site No.	Uncertainty	Remark
Conducted Emissions	CO01-HY	± 2.26dB	Confidence levels of 95%
Radiated Emissions below 1GHz	10CH01-HY	± 2.58dB	Confidence levels of 95%
Radiated Emissions above 1GHz	03CH03-HY	± 5.40dB	Confidence levels of 95%

For EMS

● ESD Immunity (IEC 61000-4-2) Negative Discharge Current

From Standard			
2kV	First Peak Current	Current at 30ns	Current at 60ns
Nominal	7.5	4	2
Min	6.75	2.8	1.4
Max	8.25	5.2	2.6
Tolerance in %	10%	30%	30%

From Calibration Certificate					
Measured First Peak Current	1st Peak Worst Case. +5%	Measured Current at 30ns	30ns Worst Case. +5%	Measured Current at 60ns	60ns Worst Case. -5%
7.48	7.85	4.2	4.41	2.01	2.11
---	6.75	---	2.8	---	1.4
---	8.25	---	5.2	---	2.6

4kV	First Peak Current	Current at 30ns	Current at 60ns
Nominal	15	8	4
Min	13.5	5.6	2.8
Max	16.5	10.4	5.2
Tolerance in %	10%	30%	30%

First Peak Current	1st Peak Worst Case. +5%	Measured Current at 30ns	30ns Worst Case. +5%	Measured Current at 60ns	60ns Worst Case. +5%
15.12	15.88	8.03	8.43	3.68	3.86
---	13.5	---	5.6	---	2.8
---	16.5	---	10.4	---	5.2

6kV	First Peak Current	Current at 30ns	Current at 60ns
Nominal	22.5	12	6
Min	20.25	8.4	4.2
Max	24.75	15.6	7.8
Tolerance in %	10%	30%	30%

First Peak Current	1st Peak Worst Case. -5%	Measured Current at 30ns	30ns Worst Case. +5%	Measured Current at 60ns	60ns Worst Case. +5%
22.78	23.92	12.37	12.99	5.45	5.72
---	20.25	---	8.4	---	4.2
---	24.75	---	15.6	---	7.8

From Standard			
8kV	First Peak Current	Current at 30ns	Current at 60ns
Nominal	30	16	8
Min	27	11.2	5.6
Max	33	20.8	10.4
Tolerance in %	10%	30%	30%

From Calibration Certificate					
First Peak Current	1st Peak Worst Case. +5%	Measured Current at 30ns	30ns Worst Case. +5%	Measured Current at 60ns	60ns Worst Case. +5%
30.26	31.77	16.13	16.94	7.39	7.76
---	27	---	11.2	---	5.6
---	33	---	20.8	---	10.4

Negative Discharge Voltage

Standard Parameters			
Indicated Voltage (kV)	Tolerance (%)	Max. (kV)	Min. (kV)
2	10	2.20	1.80
4	10	4.40	3.60
6	10	6.60	5.40
8	10	8.80	7.20
15	10	16.50	13.50

Measured Values (kV)
2.05
4.027
5.955
7.916
14.839

Negative Rise Time

Standard Parameters	
T max.	1ns
T min	0.7ns

Measured Values			
Indicated Voltage	Measured Rise Time	Worst Case Max. +6%	Worst Case Min. -6%
2kV	0.851	0.902	0.799
4kV	0.780	0.827	0.733
6kV	0.750	0.795	0.705
8kV	0.772	0.818	0.726

It has been demonstrated that the ESD generator meets the specified requirements in the standard with at least a 95% confidence.

● RF Radiated Immunity (IEC 61000-4-3)

Symbol	Source of Uncertainty	Value	Probability Distribution	Divisor	$u_i(y)$
F_{SM}	Felds Strength monitor	1.5	Normal 2	2.000	0.75
FS_{AW}	Field Strength acceptability window	0.50	Rectangular	1.732	0.29
PAH	Power Amplifier Harmonics	0.50	Rectangular	1.732	0.29
R_S	Measurement System Repeatability	0.50	normal 1	1.000	0.50
R_{EUT}	Repeatability of EUT	0.00	normal 1	1.000	0.00
$u_c(F_S)$	Combined Standard Uncertainty		normal		0.83
$U(F_S)$	Expanded Uncertainty		normal k= 2		1.66

Specified Level (V/m)	Test level (V/m)
For 1 Volts	1.25
For 3 Volts	3.33
For 10 Volts	11.22

● EFT/BURST Immunity (IEC 61000-4-4)
Voltage Output

Standard Parameters				Measured Values (kV)
Indicated Voltage (kV)	Tolerance (%)	Max. (kV)	Min. (kV)	
0.5	10	0.55	0.45	0.489
1	10	1.1	0.9	1.006
2	10	2.2	1.8	2.016
4	10	4.4	3.6	3.830
- 0.5	10	- 0.55	- 0.45	- 0.489
- 1	10	- 1.1	- 0.9	- 0.972
- 2	10	- 2.2	- 1.8	- 1.961
- 4	10	- 4.4	- 3.6	- 3.770

Spike Frequency

Standard Parameters					Measured Values (kHz)
Indicated Voltage		Tolerance (%)	Max. (kHz)	Min. (kHz)	
(kV)	(kHz)				
0.5	5	10	5.5	4.5	5.00
1	5	10	5.5	4.5	4.98
2	5	10	5.5	4.5	4.98
4	2.5	10	2.75	2.25	2.49
4	5	10	5.5	4.5	5.01

Burst Width

Standard Parameters				
Indicated Voltage		Tolerance (%)	Max. (ms)	Min. (ms)
(kV)	(ms)			
0.5	15	20	18	12
1	15	20	18	12
2	15	20	18	12
4	15	20	18	12

Measured Values (ms)
14.97
14.94
14.91
14.95

Burst Period

Standard Parameters				
Indicated Voltage		Tolerance (%)	Max. (ms)	Min. (ms)
(kV)	(ms)			
0.5	300	20	360	240
1	300	20	360	240
2	300	20	360	240
4	300	20	360	240

Measured Values (ms)
299.7
300.5
299.2
300.2

It has been demonstrated that the EFT/BURST generator meets the specified requirements in the standard with at least a 95% confidence.

● Surge Immunity (IEC 61000-4-5)
Surge Voltage Output

Standard Parameters			
Indicated Voltage. (kV)	Tolerance (%)	Max.(kV)	Min. (kV)
0.5	10	0.55	0.45
1	10	1.1	0.9
2	10	2.2	1.8
4	10	4.4	3.6
6	10	6.6	5.4
- 0.5	10	- 0.55	- 0.45
- 1	10	- 1.1	- 0.9
- 2	10	- 2.2	- 1.8
- 4	10	- 4.4	- 3.6
- 6	10	- 6.6	- 5.4

Measured Values (kV)
0.488
0.964
1.984
3.94
5.91
- 0.484
- 0.977
- 1.992
- 3.95
- 5.91

Output Wave

Standard Parameters			Measured Values
+ 6 kV			
	Max.	Min.	
Rise Time	1.56 μs	0.84 μs	
Duration Time	60 μs	40 μs	
+ 6 kV			
	Max.	Min.	
Rise Time	1.56 μs	0.84 μs	
Duration Time	60 μs	40 μs	

It has been demonstrated that the Surge generator meets the specified requirements in the standard with at least a 95% confidence.

● RF Conducted Immunity (IEC 61000-4-6)

Symbol	Source of Uncertainty	Value	Probability Distribution	Divisor	$u_i(y)$
S_A	Spectrum Analyzer	1.50	Rectangular	1.732	0.87
C_C	Current coil Calibration	1.00	normal 2	2.000	0.50
M	Mismatch	-0.5	U-shaped	1.414	-0.35
M	Mismatch	-0.3	U-shaped	1.414	-0.35
R_s	Measurement System Repeatability	0.50	normal 1	1.000	0.50
R_{EUT}	Repeatability of EUT	0.00	normal 1	1.000	0.00
$u_c(F_s)$	Combined Standard Uncertainty		normal		1.57
$U(F_s)$	Expanded Uncertainty		Normal k= 2		3.14

Specified Level	Test level (V)
For 1 Volts	1.30
For 3 Volts	3.88
For 10 Volts	12.15

● Voltage Variation Immunity (IEC 61000-4-11)

Short Dip Period

Standard Parameters				
Degree	Duration (ms)	Tolerance (%)	Max. (ms)	Min. (ms)
90	4	5	4.2	3.8
180	8	5	8.4	7.6
270	12	5	12.6	11.4
360	16	5	16.8	15.2

Measured Values (ms)
4.17
8.33
12.50
16.67

Long Dip Period

Standard Parameters				
Degree	Duration (ms)	Tolerance (%)	Max. (ms)	Min. (ms)
90	16	5	16.8	15.2
180	50	5	55	45
270	100	5	110	90
360	150	5	165	135

Measured Values (ms)
16.38
50.04
99.64
149.3

It has been demonstrated that the Dip generator meets the specified requirements in the standard with at least a 95% confidence.

6 LIST OF MEASURING EQUIPMENTS

<EMI>

< Conducted Emission >

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100132	9kHz ~ 2.75GHz	Feb. 08, 2012	Conduction (CO01-HY)
LISN	MessTec	NNB-2/16Z	2001/004	9kHz ~ 30MHz	Jan. 12, 2012	Conduction (CO01-HY)
RF Cable-CON	HUBER+SUHNER	RG213/U	07611832010001	9kHz ~ 30MHz	Mar. 02, 2012	Conduction (CO01-HY)

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

< Radiated Emission below 1GHz >

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
10m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-10M	10CH01-HY	30MHz ~ 1GHz 10m / 3m	Apr. 10, 2012	Radiation (10CH01-HY)
Spectrum Analyzer	R&S	FSP7	838858/013	9kHz ~ 7GHz	Feb. 22, 2012	Radiation (10CH01- HY)
Spectrum Analyzer	R&S	FSP7	10644/007	9kHz ~ 7GHz	Aug. 23, 2011	Radiation (10CH01- HY)
Receiver	R&S	ESC30	100358	9kHz ~ 2.75GHz	Mar. 16, 2012	Radiation (10CH01-HY)
Amplifier	Agilent	8447D	2944A10825	100kHz ~ 1.3GHz	Mar. 30, 2012	Radiation (10CH01-HY)
Amplifier	Agilent	8447D	2944A10826	100kHz ~ 1.3GHz	Apr. 18, 2012	Radiation (10CH01-HY)
Biconical Antenna	Schwarz beck	VHBB 9124	286	30MHz ~ 200MHz	Aug. 04, 2011	Radiation (10CH01-HY)
Log Antenna	Schwarz beck	VUSLP 9111	206	200MHz ~ 1GHz	Aug. 04, 2011	Radiation (10CH01-HY)
Turn Table	HD	DT 60 RPS	1513/004/00	0 ~ 360 degree	N/A	Radiation (10CH01-HY)
Antenna Mast	HD	MA240	240/556/00	1 ~ 4 m	N/A	Radiation (10CH01-HY)
Antenna Mast	HD	MA240	240/559/00	1~ 4 m	N/A	Radiation (10CH01-HY)
RF Cable-R10m	BELDEN	RG8/U	CB023-INSIDE	30MHz ~ 1GHz	Nov. 16, 2011	Radiation (10CH01-HY)
RF Cable-R10m	Suhner Switzerland + Rosenberger	RG223/U + UAA220A-0	CB022-DOOR	30MHz ~ 1GHz	Nov. 16, 2011	Radiation (10CH01-HY)

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

**< Radiated Emission below 1GHz >**

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	1GHz ~ 6 GHz 3m	Dec. 12, 2011	Radiation (03CH03-HY)
Amplifier	Agilent	8449B	3008A02120	1GHz ~ 26.5GHz	Aug. 08, 2011	Radiation (03CH03-HY)
Horn Antenna	EMCO	3115	6741	1GHz ~ 18GHz	May 30, 2011	Radiation (03CH03-HY)
RF Cable-high	SUHNER	SUCOFLEX 106	03CH03-HY	1GHz ~ 40GHz	Jan. 18, 2012	Radiation (03CH03-HY)
Turn Table	HD	DS 420	420/650/00	0 ~ 360 degree	N/A	Radiation (03CH03-HY)
Antenna Mast	MF	MF-7802	MF780208179	1 ~ 4 m	N/A	Radiation (03CH03-HY)
Receiver	R&S	ESI	838496/008	20Hz ~ 7GHz	Apr. 24, 2011	Radiation (03CH03-HY)

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



CE Test Report

Report No. : EH232843-03

< EMS >

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
ESD Simulator	KEYTEK	MZ-15/EC	0302234	Air: 0 ~ 15 kV Contact: 0 ~ 8 kV	Aug. 26, 2011	ESD

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

< RS > -- From 80 MHz to 2,700 MHz test

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Probe	ETS-LINDGREN	HI-6005	00052473	0.1MHz ~ 5GHz	Sep. 02, 2011	RS
Amplifier	AR	250W 1000AM1	320482	80MHz ~ 1GHz	Oct. 12, 2011	RS
Amplifier	AMPLIFIER& RESEARCH	30S1G3	312505	800M ~ 3GHz	Oct. 12, 2011	RS
DUAL DIRECTIONAL COUPLER	AMPLIFIER& RESEARCH	DC6180A	312453	0.8 ~ 4.2GHz	Oct. 12, 2011	RS
DUAL DIRECTIONAL COUPLER	AMPLIFIER& RESEARCH	DC7144A	312782	80 ~ 1GHz	Oct. 12, 2011	RS
INTEGRATED MEASUREMENT SYSTEM	ROHDE& SCHWARZ	IMS	100007	9kHz ~ 3GHz	Mar. 15, 2012	RS
NRP-Z91 POWER SENSOR 6GHZ	ROHDE& SCHWARZ	NRP-Z91 1168.8004.02	100095	9kHz ~ 3GHz	Mar. 15, 2012	RS
Antenna	FRANKONIA	BTA-L	02002L	26MHz ~ 1GHz	May 03, 2011	RS
Antenna	AR	AT4002A	312601	800MHz ~ 5GHz	May 03, 2011	RS

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

7 TEST LOCATION

SHIJR	ADD : 6Fl., No. 106, Sec. 1, Shintai 5th Rd., Shijr City, Taipei 221, Taiwan, R.O.C. TEL : 886-2-2696-2468 FAX : 886-2-2696-2255
HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL : 886-3-327-3456 FAX : 886-3-327-0973
LINKOU	ADD : No. 30-2, Dingfu Vil., Linkou Dist., New Taipei City 244, Taiwan, R.O.C. TEL : 886-2-2601-1640 FAX : 886-2-2601-1695
DUNGHU	ADD : No. 3, Lane 238, Kangle St., Neihu Chiu, Taipei 114, Taiwan, R.O.C. TEL : 886-2-2631-4739 FAX : 886-2-2631-9740
JUNGHE	ADD : 7Fl., No. 758, Jungjeng Rd., Junghe City, Taipei 235, Taiwan, R.O.C. TEL : 886-2-8227-2020 FAX : 886-2-8227-2626
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



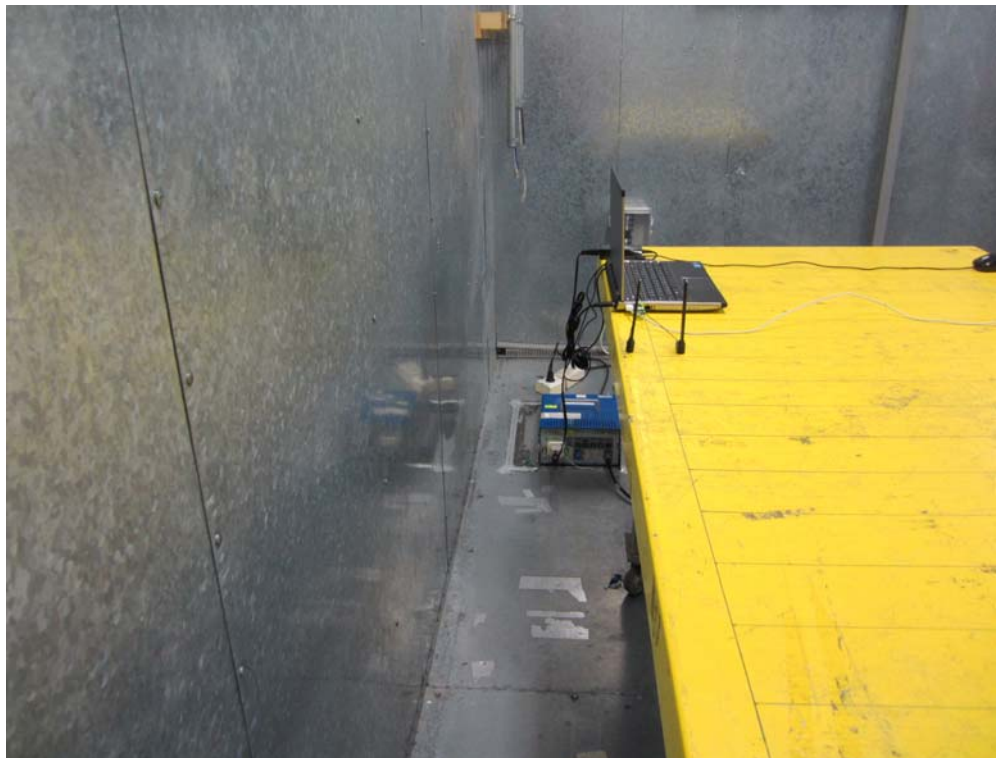
Appendix A. Test Photos

1 Photographs of Conducted Emissions Test Configuration

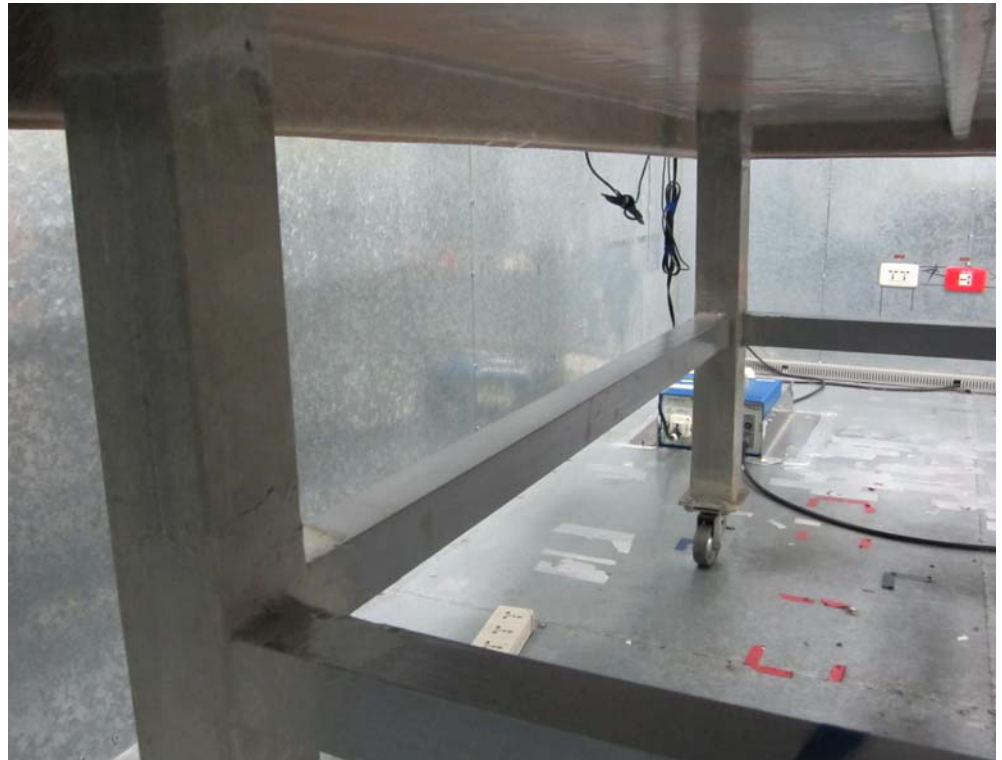
FRONT VIEW



REAR VIEW



SIDE VIEW



2 Photographs of Radiated Emission Test Configuration

Below 1GHz

FRONT VIEW

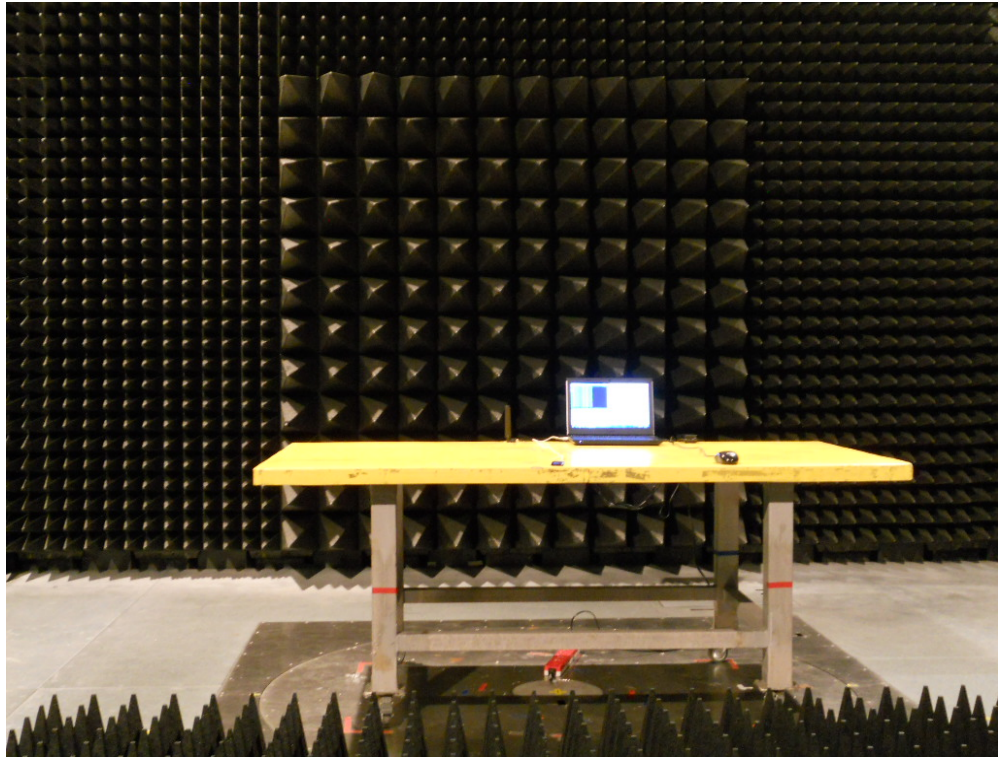


REAR VIEW

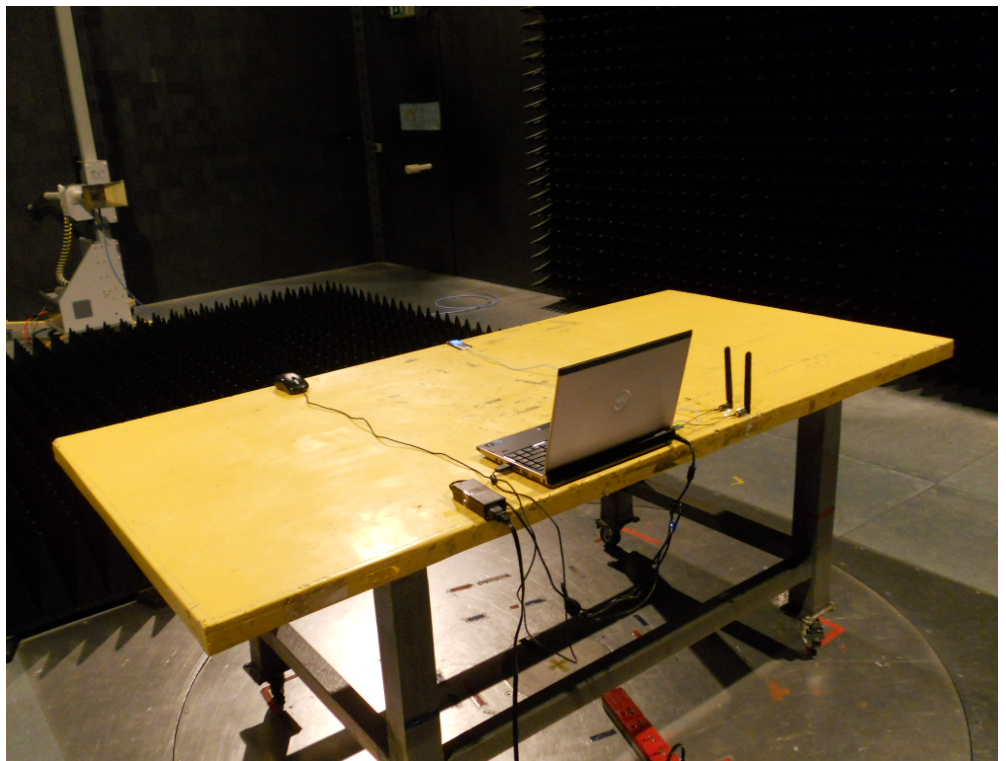


From 1GHz to 6GHz

FRONT VIEW



REAR VIEW



3 Photographs of ESD Immunity Test Configuration

FRONT VIEW



REAR VIEW



4 Photographs of RS Immunity Test Configuration

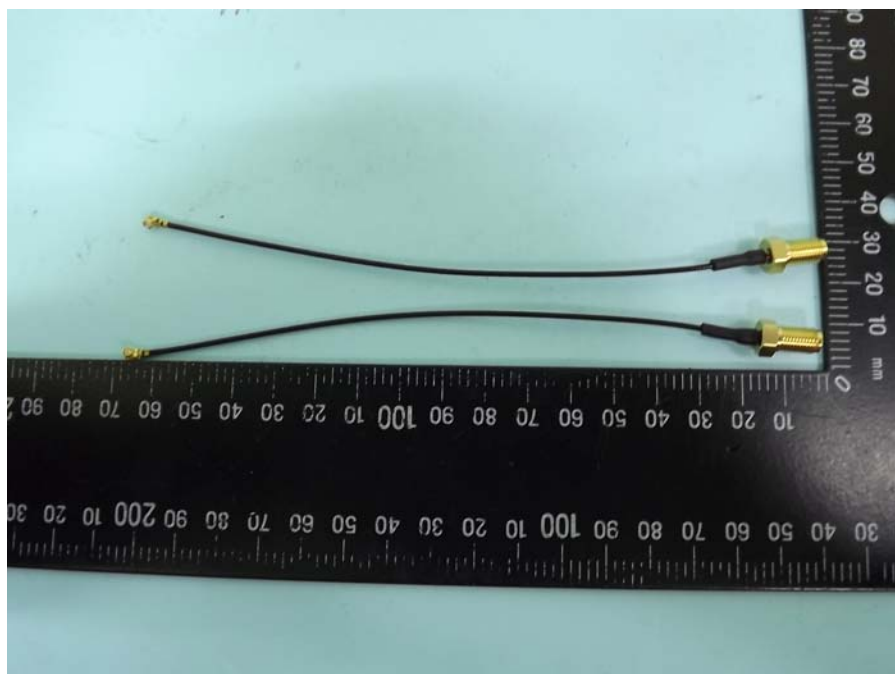
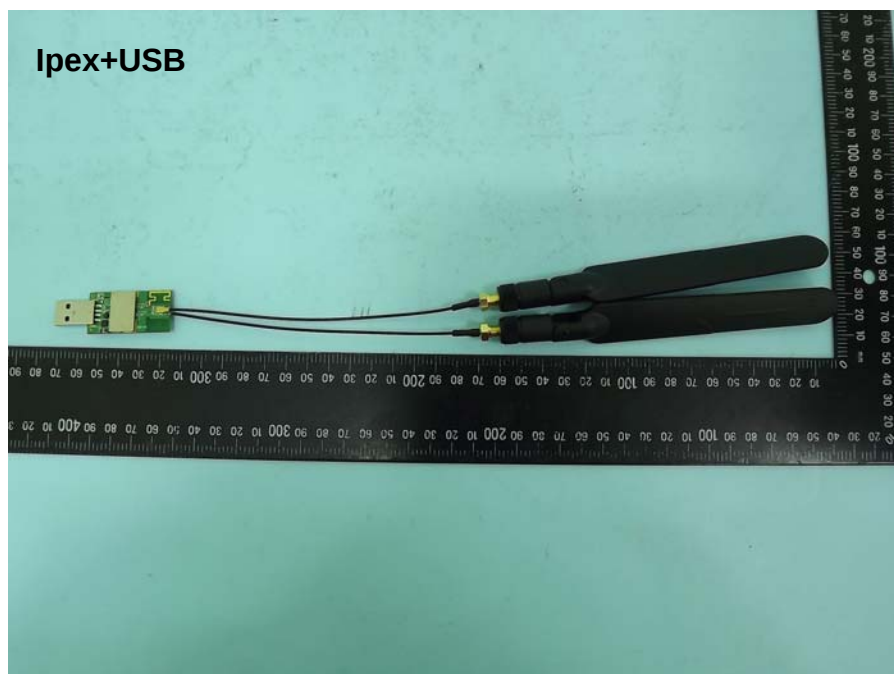
FRONT VIEW

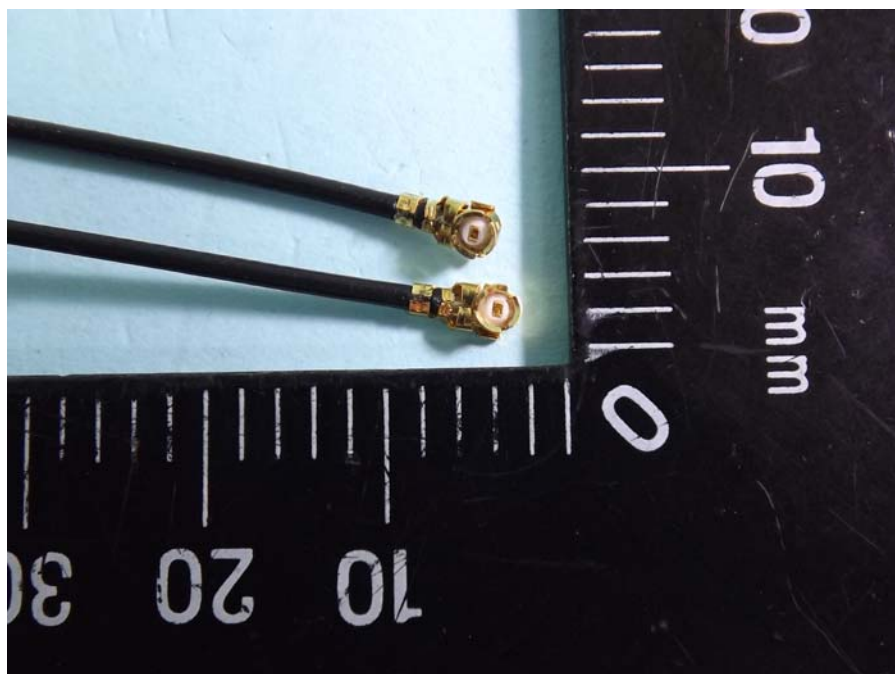


REAR VIEW

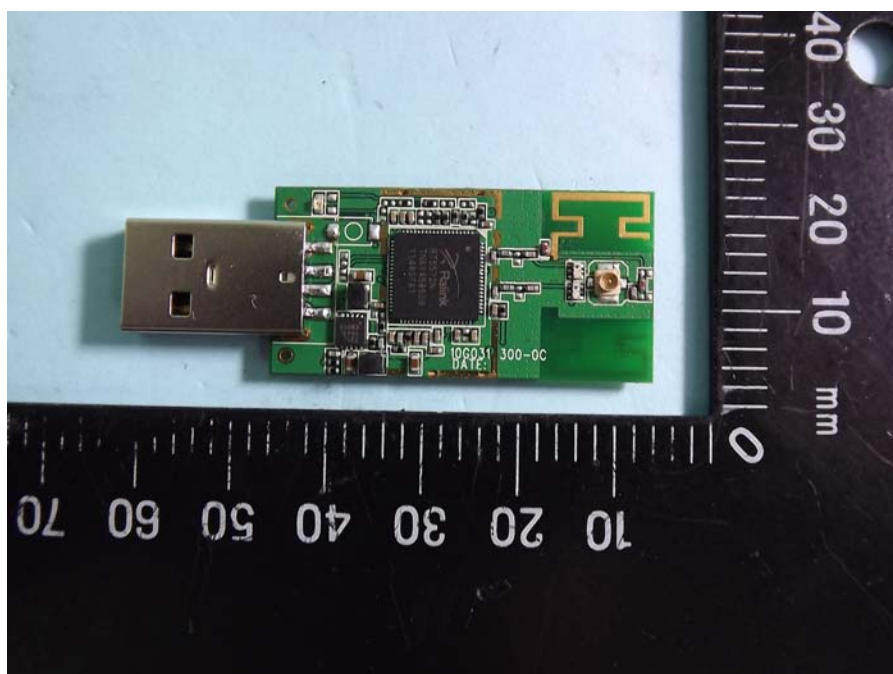
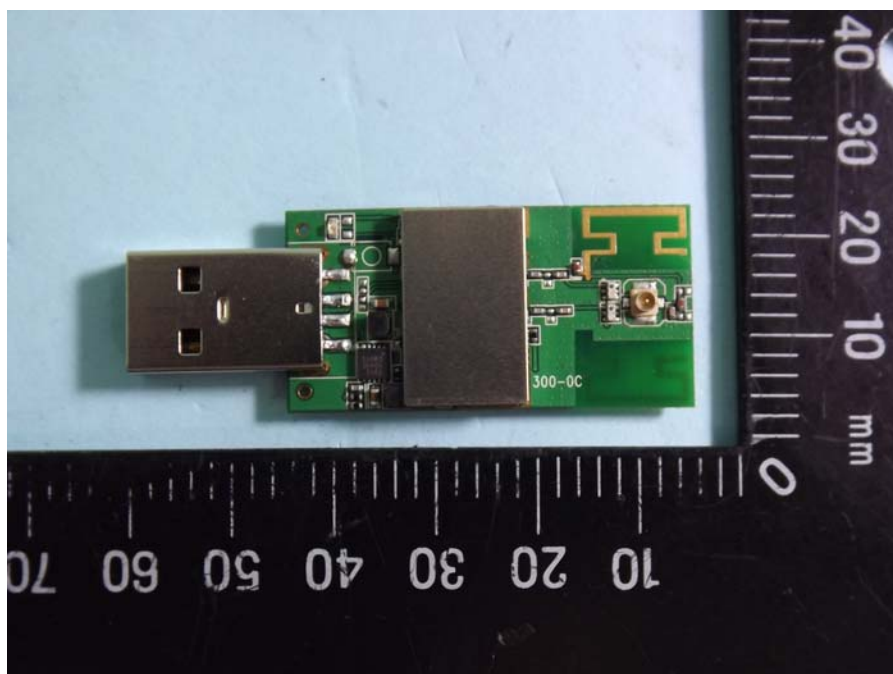


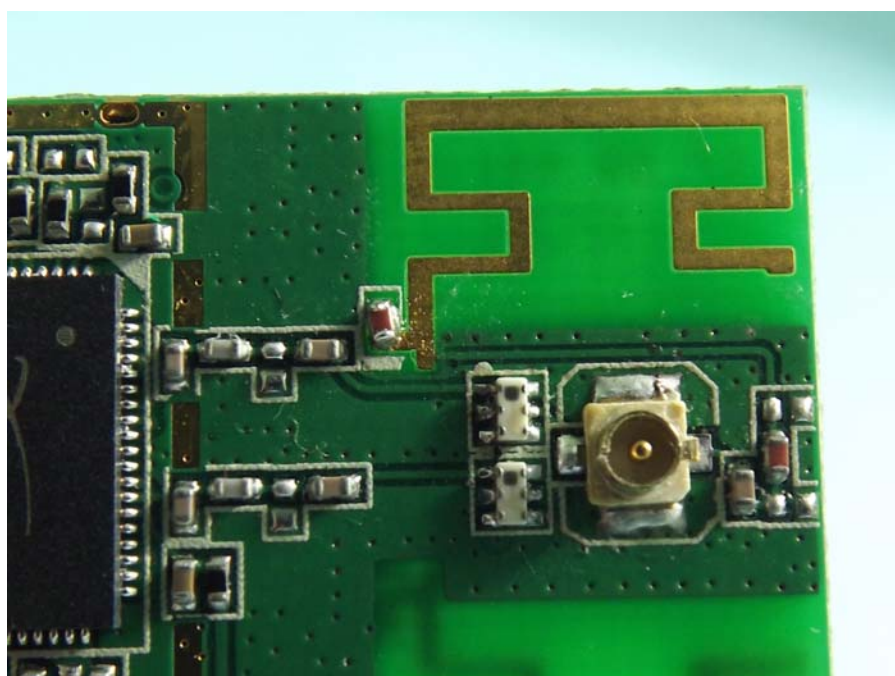
APPENDIX B. Photographs of EUT

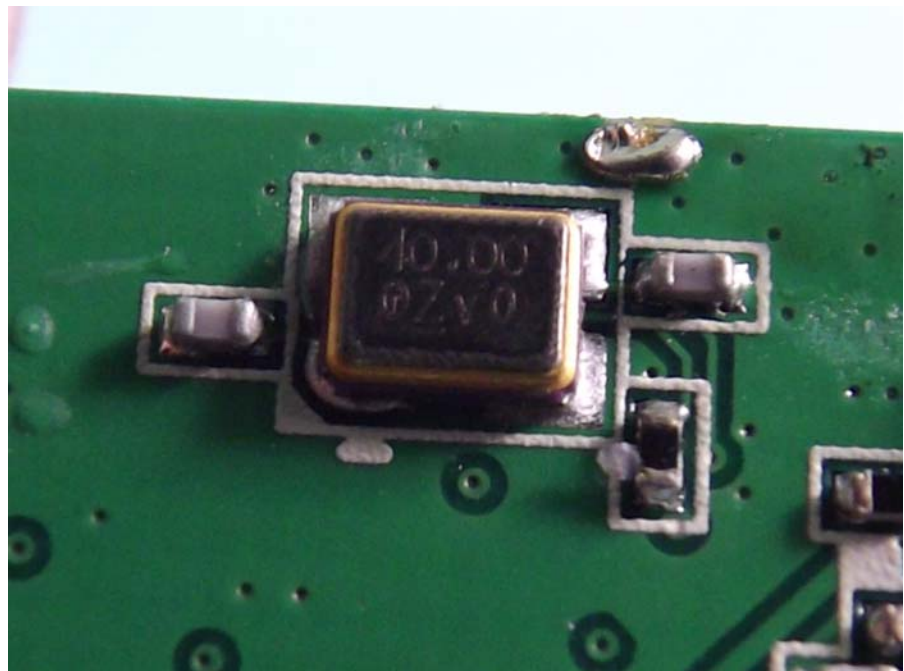
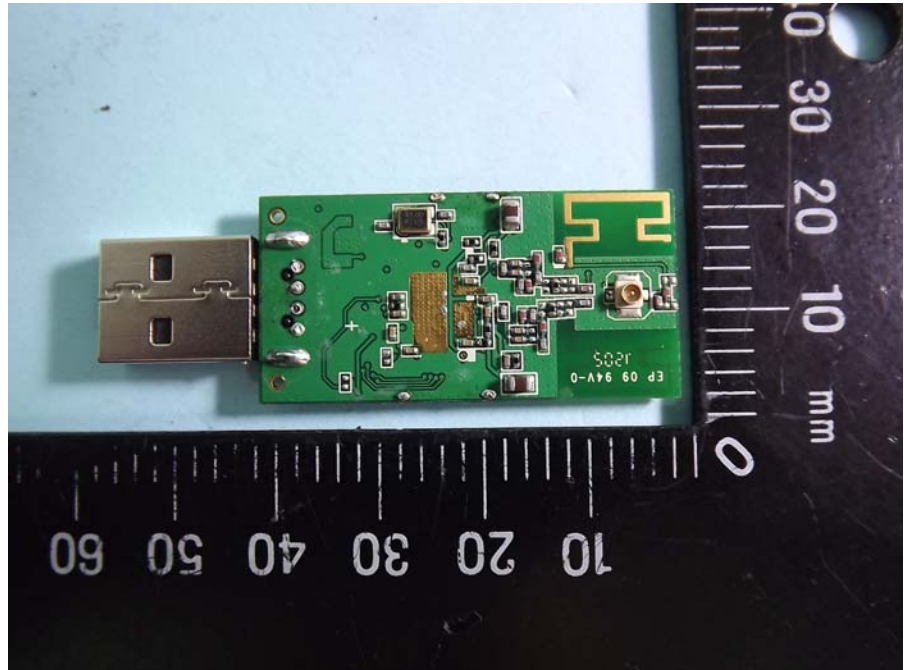


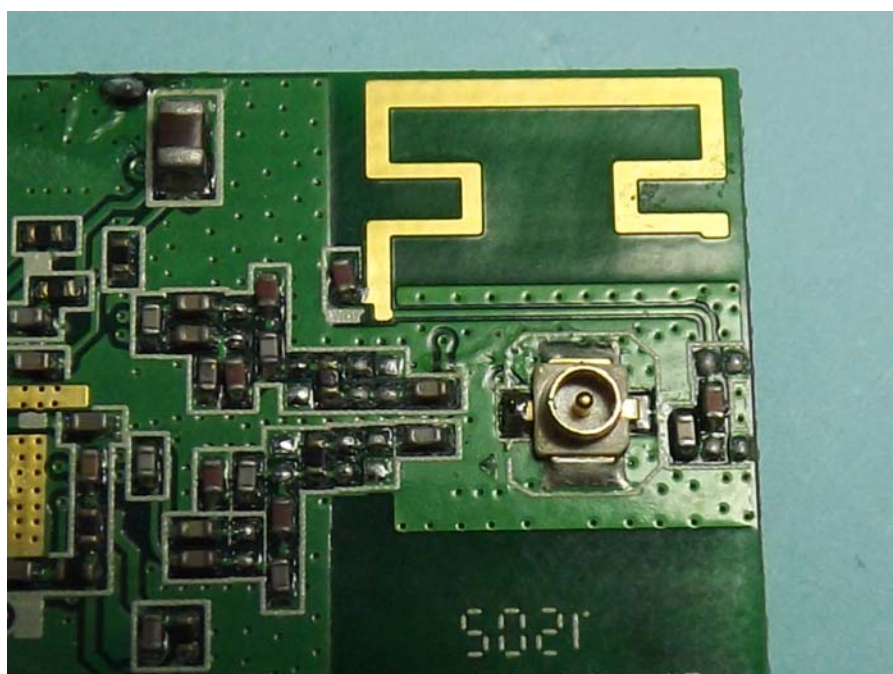
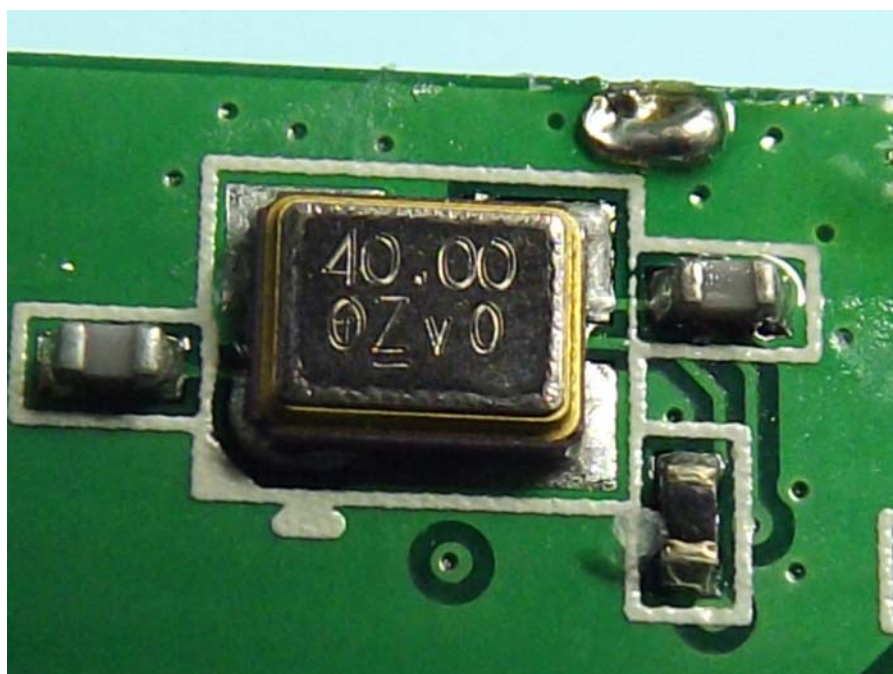












Ipex+4pin pin-header

