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FCC RADIO TEST REPORT

Applicant's company	**Sunsky International Ltd.**
Applicant Address	3F., No. 3, Aly. 6, Ln. 45, Baoxing Rd., Xindian Dist., New Taipei City 23145, Taiwan (Tongshuai Science Park)
FCC ID	2AA7E-2400-01
Manufacturer's company	**Sunsky International Ltd.**
Manufacturer Address	3F., No. 3, Aly. 6, Ln. 45, Baoxing Rd., Xindian Dist., New Taipei City 23145, Taiwan (Tongshuai Science Park)

Product Name	TRAFFIC MICROWAVE SENSOR
Brand Name	Sunsky
Model Name	SunRay HD
Test Rule Part(s)	47 CFR FCC Part 15 Subpart C § 15.249
Test Freq. Range	24000 ~ 24250MHz
Received Date	Aug. 24, 2013
Final Test Date	Oct. 21, 2013
Submission Type	Original Equipment

Statement

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** and **47 CFR FCC Part 15 Subpart C**.

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

TAF
Testing Laboratory
1190

Table of Contents

History of This Test Report

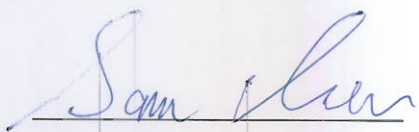
REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR382428-01	Rev. 01	Initial issue of report	Oct. 30, 2013

Certificate No.: CB10210128

1 CERTIFICATE OF COMPLIANCE

Product Name	:	**TRAFFIC MICROWAVE SENSOR**
Brand Name	:	**Sunsky**
Model Name	:	**SunRay HD**
Applicant	:	**Sunsky International Ltd.**
Test Rule Part(s)	:	**47 CFR FCC Part 15 Subpart C § 15.249**

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Aug. 24, 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.



Reviewed By:
Sam Chen

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	2.3	AC Power Line Conducted Emissions	Complies	20.71 dB
4.2	15.249(a)	Field Strength of Fundamental Emissions	Complies	6.40 dB
4.3	15.215(c)	20dB Spectrum Bandwidth	Complies	-
4.4	15.249(a)/(d)	Radiated Emissions	Complies	1.75 dB
4.5	15.249(d)	Band Edge Emissions	Complies	3.28 dB
4.6	15.203	Antenna Requirements	Complies	-

3 GENERAL INFORMATION

3.1 Product Details

Items	Description
Power Type	From DC 12-36V
Modulation	FMCW
Frequency Range	24000 ~ 24250MHz
Operation Frequency Range	24005~24245MHz
Channel Band Width (99%)	240.10 MHz
Max. Field Strength	80.29 dBuV/m at 3m (average)
Carrier Frequencies	Please refer to section 3.3
Antenna	Antenna Type: Patch Antenna (Without any antenna connector) Antenna Gain: 16.7dBi

3.2 Accessories

N/A

3.3 Table for Test Modes

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
AC Power Line Conducted Emissions	CTX
Field Strength of Fundamental Emissions 20dB Spectrum Bandwidth	CTX
Radiated Emissions 30MHz~1GHz	CTX
Radiated Emissions 1GHz~40GHz	CTX
Radiated Emissions 40GHz~100GHz	CTX
Band Edge Emissions	CTX

Note: CTX=continuously transmitting

3.4 Table for Testing Locations

Test Site No.	Site Category	Location	FCC Reg. No.	IC File No.	VCCI Reg. No
03CH01-CB	SAC	Hsin Chu	187376	IC 4086D	-
CO01-CB	Conduction	Hsin Chu	262045	IC 4086D	-
TH01-CB	OVEN Room	Hsin Chu	-	-	-

Open Area Test Site (OATS); Semi Anechoic Chamber (SAC).

Please refer section 6 for Test Site Address.

3.5 Table for Supporting Units

Support Unit	Brand	Model	FCC ID
Power Supply	MW	NES-25-15	N/A

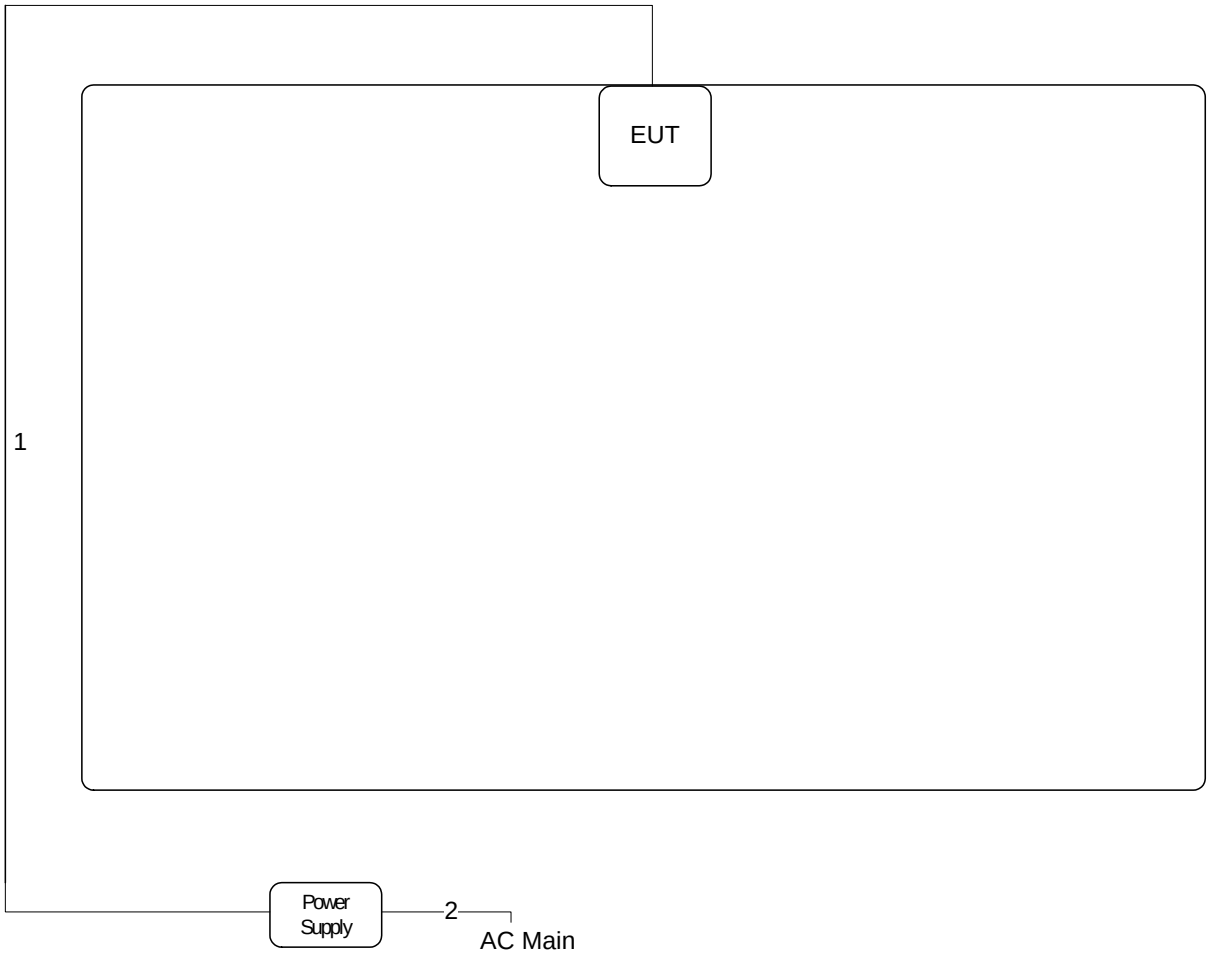
3.6 Test Configurations

3.6.1 AC Power Line Conduction Emissions Test Configuration

Item	Connection	Shielded	Length
1	AC Power cable	No	1.7m
2	AC Power cable	No	10m

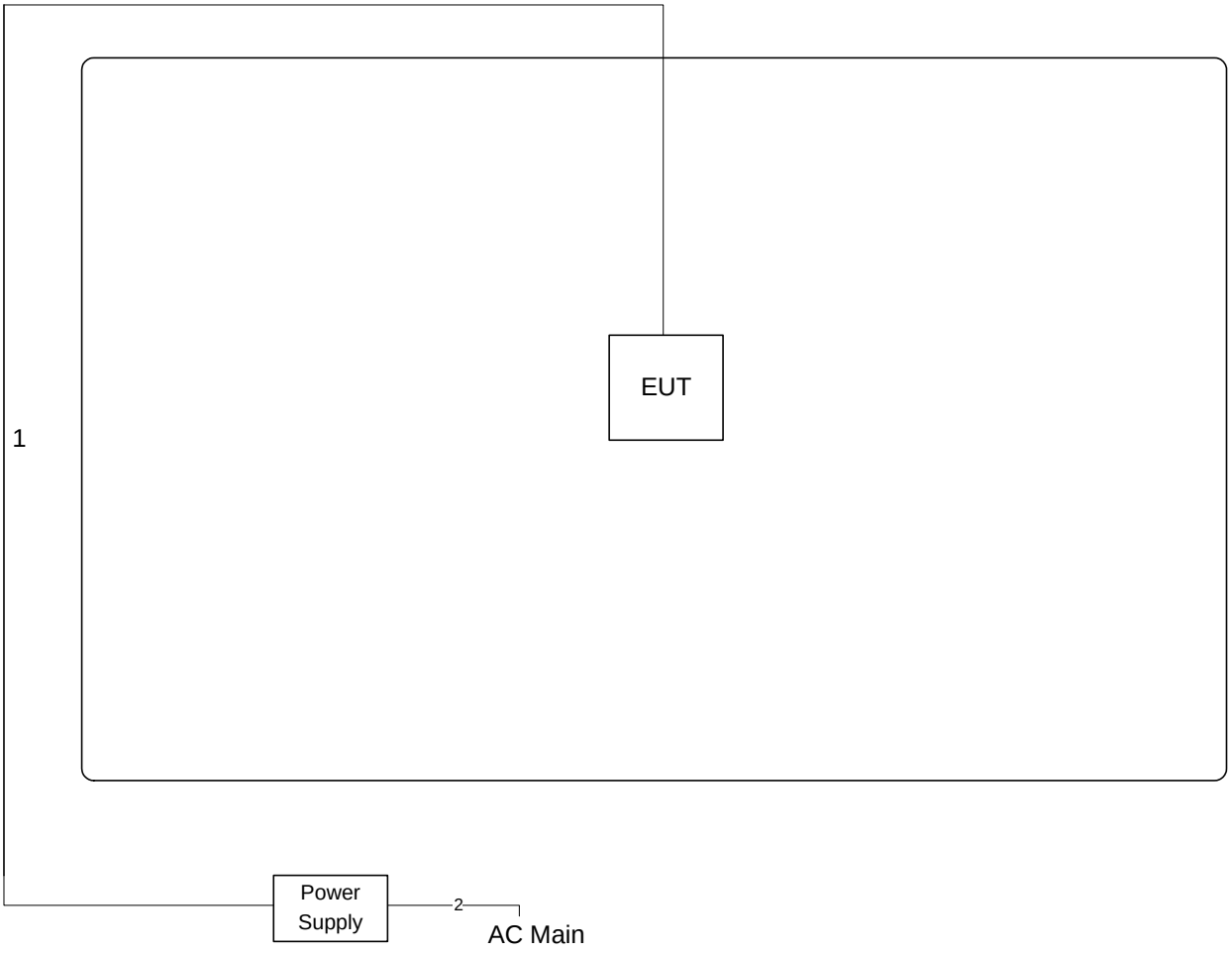
3.6.2 Radiation Emissions Test Configuration

Test Configuration: 30MHz~1GHz



Item	Connection	Shielded	Length
1	AC Power cable	No	10m
2	AC Power cable	No	1.7m

Test Configuration: above 1GHz



Item	Connection	Shielded	Length
1	AC Power cable	No	10m
2	AC Power cable	No	1.7m

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

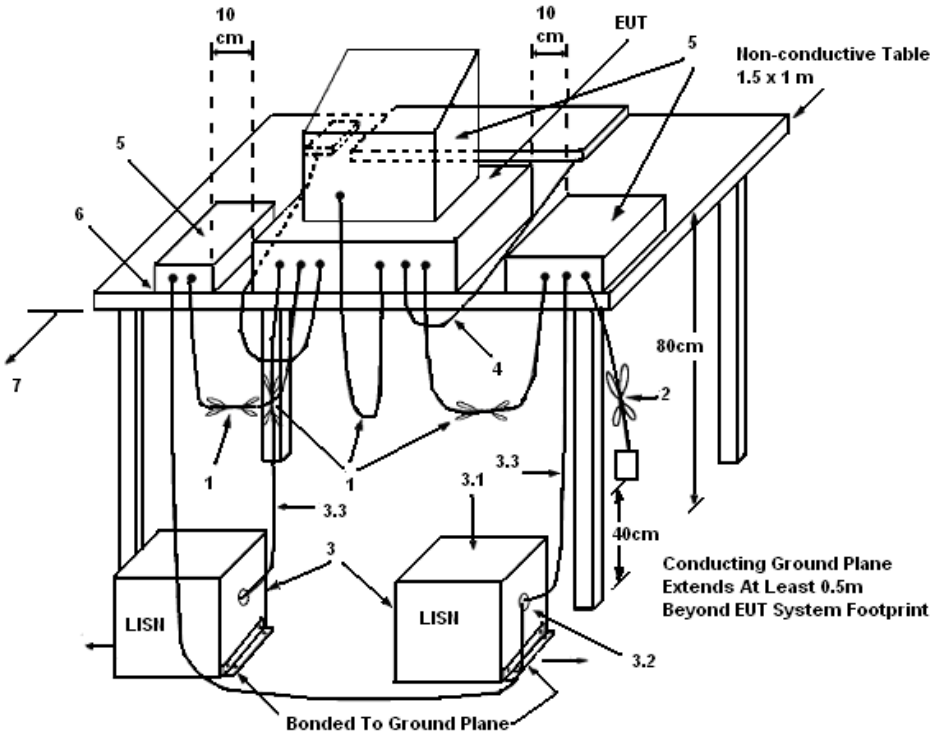
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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

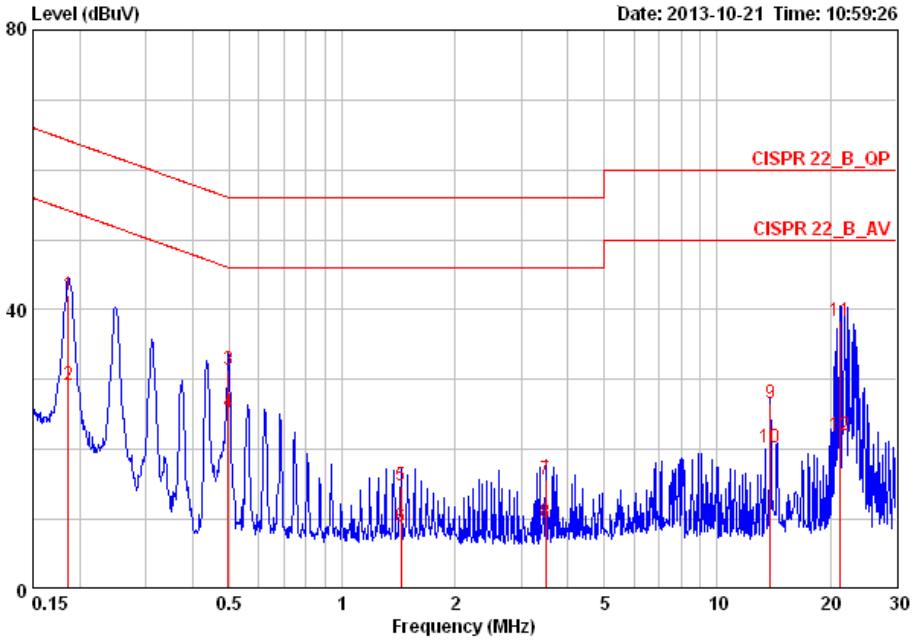
There is no deviation with the original standard.

4.1.6 EUT Operation during Test

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

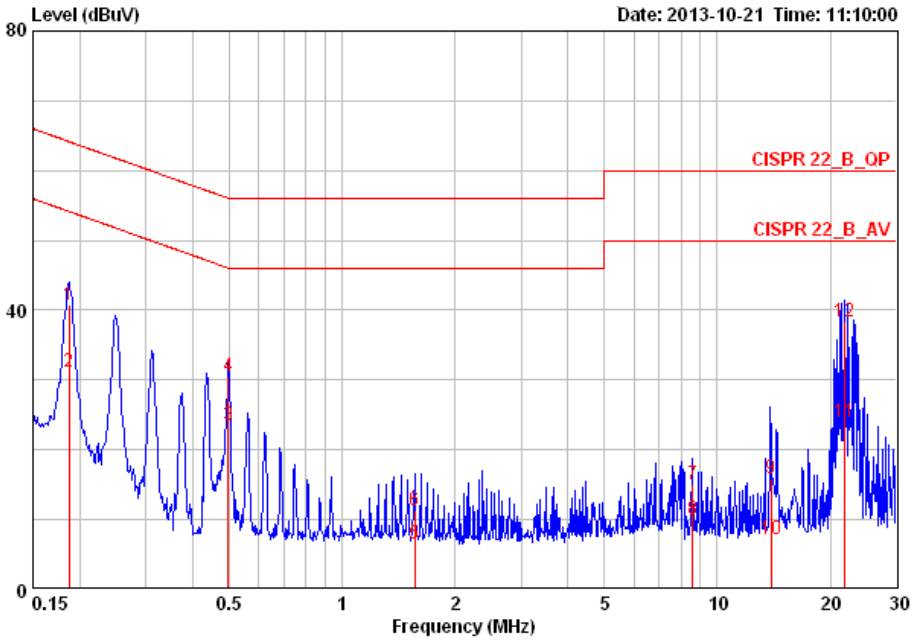
4.1.7 Results of AC Power Line Conducted Emissions Measurement

Temperature	24℃	Humidity	52%
Test Engineer	Sollo Luo	Phase	Line
Configuration	CTX		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.18640	41.97	-22.22	64.20	41.63	0.15	0.19	LINE	QP
2	0.18640	29.18	-25.01	54.20	28.84	0.15	0.19	LINE	AVERAGE
3	0.49673	31.44	-24.61	56.05	31.09	0.15	0.20	LINE	QP
4 @	0.49673	25.34	-20.71	46.05	24.99	0.15	0.20	LINE	AVERAGE
5	1.433	14.74	-41.26	56.00	14.35	0.18	0.22	LINE	QP
6	1.433	8.85	-37.15	46.00	8.46	0.18	0.22	LINE	AVERAGE
7	3.486	15.70	-40.30	56.00	15.21	0.21	0.28	LINE	QP
8	3.486	9.56	-36.44	46.00	9.07	0.21	0.28	LINE	AVERAGE
9	13.877	26.50	-33.50	60.00	25.71	0.39	0.40	LINE	QP
10	13.877	20.31	-29.69	50.00	19.52	0.39	0.40	LINE	AVERAGE
11	21.159	38.28	-21.72	60.00	37.28	0.50	0.50	LINE	QP
12	21.159	22.11	-27.89	50.00	21.11	0.50	0.50	LINE	AVERAGE

Temperature	24℃	Humidity	52%
Test Engineer	Sollo Luo	Phase	Neutral
Configuration	CTX		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.18739	40.86	-23.30	64.15	40.58	0.08	0.20	NEUTRAL	QP
2	0.18739	31.20	-22.96	54.15	30.92	0.08	0.20	NEUTRAL	AVERAGE
3	0.49673	23.60	-22.45	46.05	23.32	0.08	0.20	NEUTRAL	AVERAGE
4	0.49673	30.43	-25.62	56.05	30.15	0.08	0.20	NEUTRAL	QP
5	1.560	6.53	-39.47	46.00	6.21	0.10	0.22	NEUTRAL	AVERAGE
6	1.560	11.37	-44.63	56.00	11.05	0.10	0.22	NEUTRAL	QP
7	8.589	15.10	-44.90	60.00	14.59	0.21	0.30	NEUTRAL	QP
8	8.589	10.04	-39.96	50.00	9.53	0.21	0.30	NEUTRAL	AVERAGE
9	13.880	15.92	-44.08	60.00	15.22	0.30	0.40	NEUTRAL	QP
10	13.880	7.21	-42.79	50.00	6.51	0.30	0.40	NEUTRAL	AVERAGE
11	21.844	23.98	-26.02	50.00	23.05	0.43	0.50	NEUTRAL	AVERAGE
12 @	21.844	38.39	-21.61	60.00	37.46	0.43	0.50	NEUTRAL	QP

Note:

Level = Read Level + LISN Factor + Cable Loss

4.2 Field Strength of Fundamental Emissions Measurement

4.2.1 Limit

The field strength of fundamental emissions within these bands specified at a distance of 3 meters (measurement instrumentation employing an average detector) shall comply with the following table.

Frequency Band (MHz)	Fundamental Emissions Limit Average/Peak (dBuV/m) at 3m
24000-24250	108/128

4.2.2 Measuring Instruments and Setting

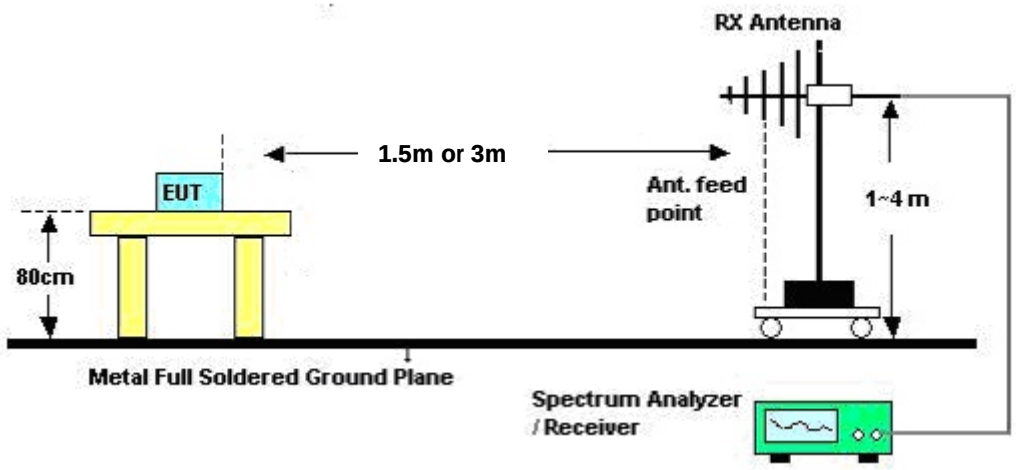
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Power Meter Parameter	Setting
RBW	1 MHz Peak / 1MHz Average
VBW	1 MHz Peak / 10Hz Average
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

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. For Fundamental emissions, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
6. 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.

4.2.4 Test Setup Layout



Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1.5m.

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1.5m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [6.02 dB].

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 Test Result of Field Strength of Fundamental Emissions

Temperature	25℃	Humidity	40%
Test Engineer	Satoshi Yang	Test Date	Sep. 11, 2013

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		
1	24008.50	80.29	108.00	-27.71	61.28	14.53	38.60	34.12	Average	HORIZONTAL
2	24008.50	121.60	128.00	-6.40	102.59	14.53	38.60	34.12	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		
1	24057.80	64.05	108.00	-43.95	44.97	14.55	38.66	34.13	Average	VERTICAL
2	24057.80	105.36	128.00	-22.64	86.28	14.55	38.66	34.13	Peak	VERTICAL

Note:

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

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

4.3 20dB Spectrum Bandwidth Measurement

4.3.1 Limit

Intentional radiators must be designed to ensure that the 20 dB bandwidth of the emissions in the specific band (24000 ~ 24250MHz).

4.3.2 Measuring Instruments and Setting

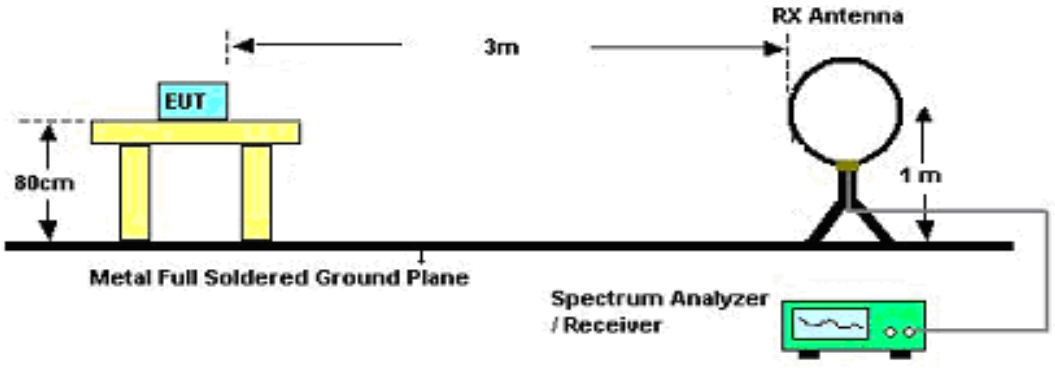
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 20dB Bandwidth
RBW	1000 kHz
VBW	3000 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

4.3.3 Test Procedures

1. The test procedure is the same as section 4.4.3.
2. The resolution bandwidth of 1000 kHz and the video bandwidth of 3000 kHz were used.
3. Measured the spectrum width with power higher than 20dB below carrier.

4.3.4 Test Setup Layout



4.3.5 Test Deviation

There is no deviation with the original standard.

4.3.6 EUT Operation during Test

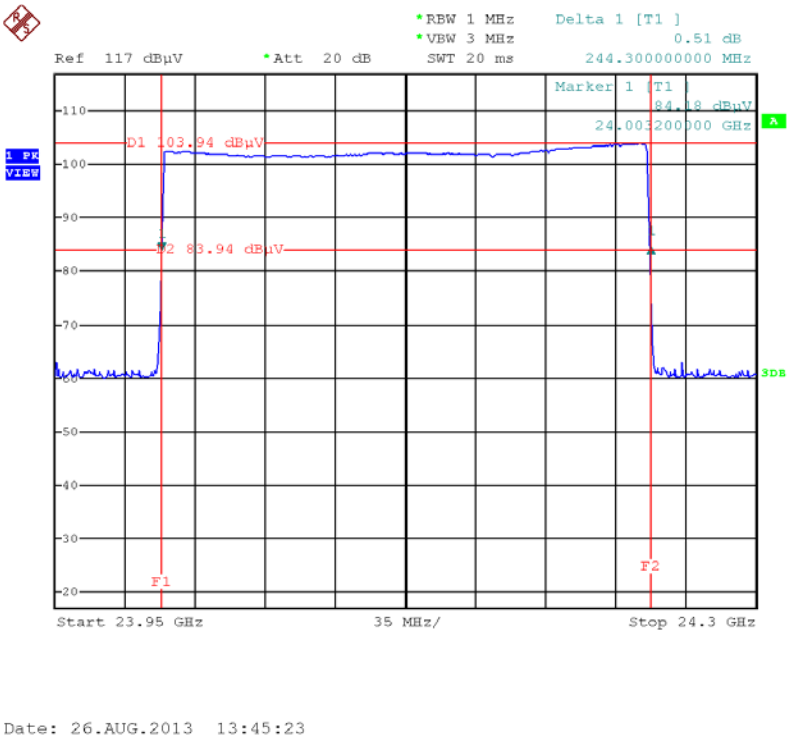
The EUT was programmed to be in continuously transmitting mode.

4.3.7 Test Result of 20dB Spectrum Bandwidth

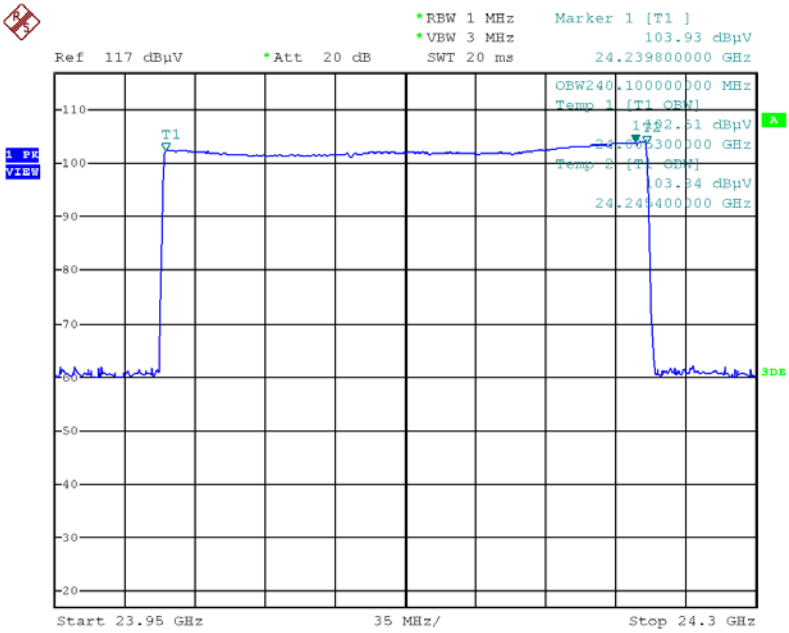
Temperature	25℃	Humidity	40%
Test Engineer	Magic Lai		

20dB BW (MHz)	99% OBW (MHz)	Frequency range (MHz) f_L > 24000MHz	Frequency range (MHz) f_H < 24250MHz	Test Result
244.300	240.100	24003.2000	24247.5000	**Complies**

20 dB Bandwidth Plot



99% Bandwidth Plot



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4.4 Radiated Emissions Measurement

4.4.1 Limit

Harmonic emissions limits comply with below 54 dBuV/m at 3m. Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 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

4.4.2 Measuring Instruments and Setting

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

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average

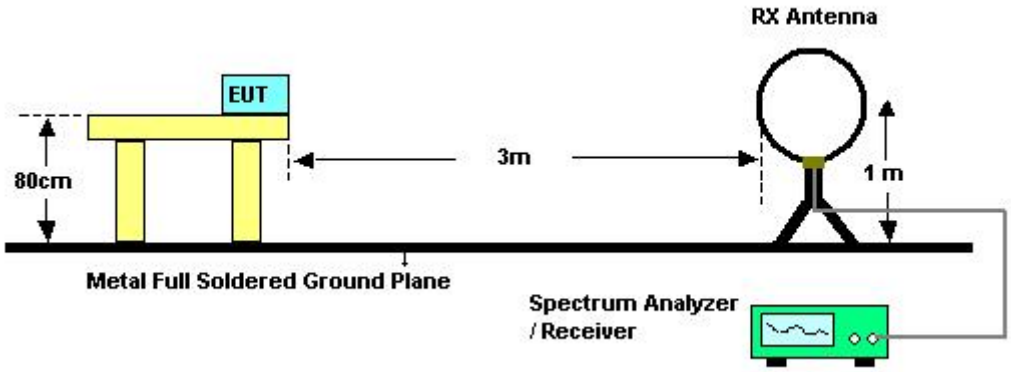
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RBW 120kHz for QP

4.4.3 Test Procedures

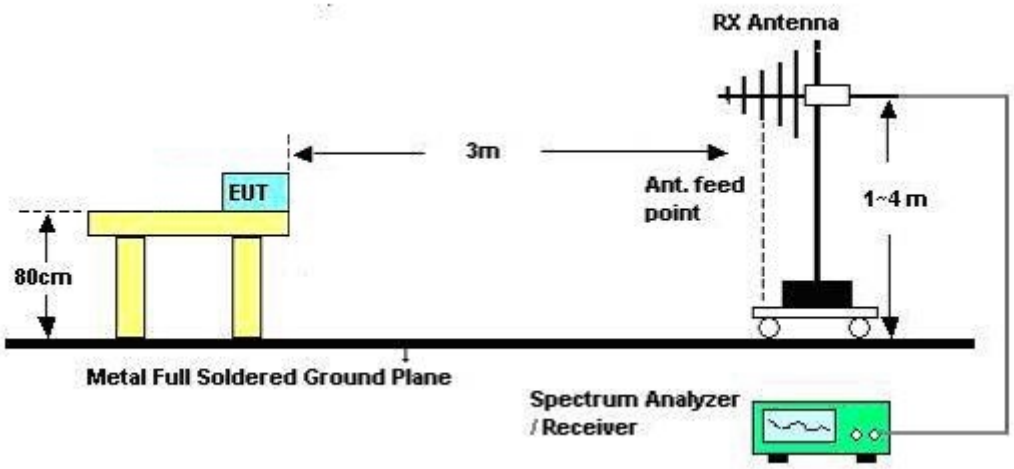
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting 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 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.

4.4.4 Test Setup Layout

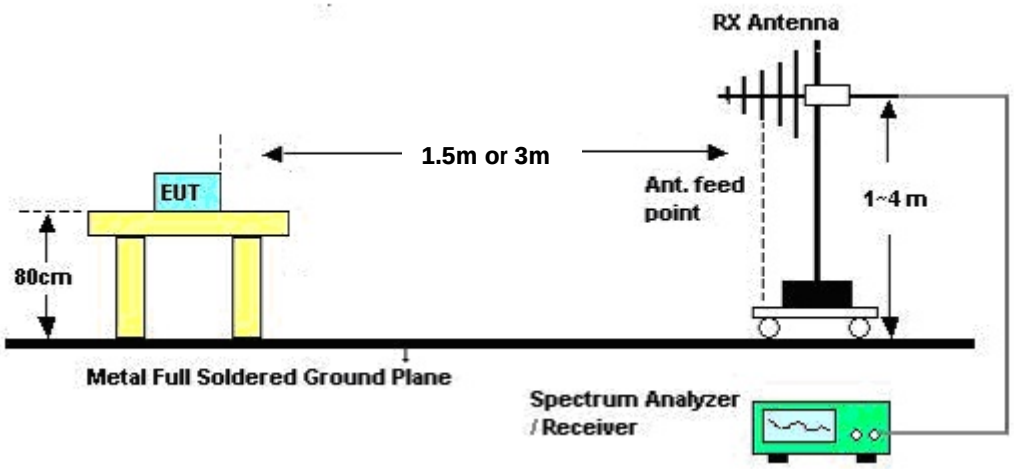
For Radiated Emissions: 9kHz ~30MHz



For Radiated Emissions: 30MHz~1GHz



For radiated emissions: Above 1GHz



Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1.5m or 3m to 0.5m.

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1.5m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [6.02 dB].

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [0.5m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [15.56 dB].

4.4.5 Test Deviation

There is no deviation with the original standard.

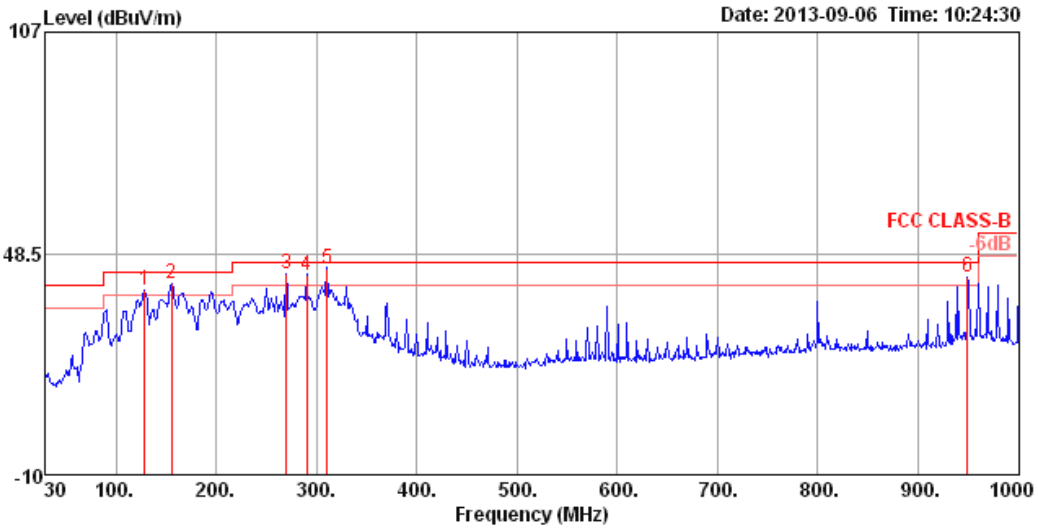
4.4.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.4.7 Results of Radiated Emissions (30MHz~1GHz)

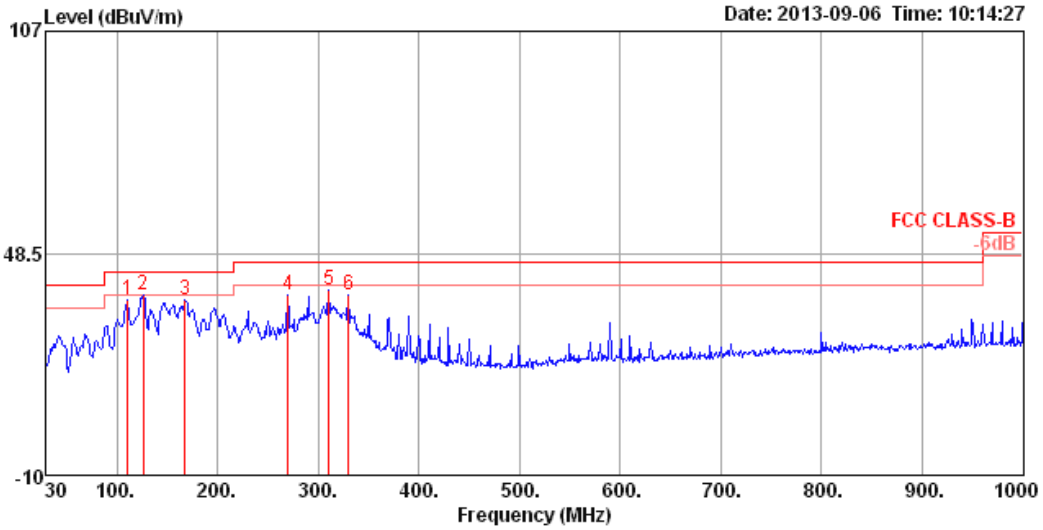
Temperature	25℃	Humidity	40%
Test Engineer	David Tseng	Configurations	CTX

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	128.94	38.63	43.50	-4.87	57.17	1.35	11.68	31.57	200	186	HORIZONTAL	Peak
2	155.13	40.48	43.50	-3.02	60.80	1.50	9.75	31.57	212	205	HORIZONTAL	QP
3	270.01	42.94	46.00	-3.06	60.15	1.99	12.35	31.55	100	164	HORIZONTAL	QP
4	289.96	42.46	46.00	-3.54	59.22	2.08	12.69	31.53	100	169	HORIZONTAL	QP
5	310.33	44.25	46.00	-1.75	60.08	2.15	13.40	31.38	100	168	HORIZONTAL	QP
6	949.56	42.05	46.00	-3.95	48.15	4.08	20.93	31.11	125	354	HORIZONTAL	Peak

Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	110.51	36.39	43.50	-7.11	55.29	1.25	11.39	31.54	100	148	VERTICAL	Peak
2	126.03	37.43	43.50	-6.07	55.95	1.33	11.72	31.57	100	161	VERTICAL	Peak
3	167.74	36.17	43.50	-7.33	56.88	1.57	9.25	31.53	125	134	VERTICAL	Peak
4	269.59	37.39	46.00	-8.61	54.60	1.99	12.35	31.55	200	222	VERTICAL	Peak
5	310.33	38.73	46.00	-7.27	54.56	2.15	13.40	31.38	150	287	VERTICAL	Peak
6	329.73	37.69	46.00	-8.31	53.10	2.25	13.76	31.42	150	349	VERTICAL	Peak

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB 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.

4.4.8 Results for Radiated Emissions (1GHz~40GHz)

Temperature	25℃	Humidity	40%
Test Engineer	David Tseng	Configurations	1~18G
Test Date	Sep. 06, 2013		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	2999.80	71.91	74.00	-2.09	74.45	4.13	29.20	35.87	143	348	HORIZONTAL	Peak
2	3000.16	43.92	54.00	-10.08	46.46	4.13	29.20	35.87	143	348	HORIZONTAL	Average
3	9000.32	45.93	54.00	-8.07	36.03	7.62	37.70	35.42	105	288	HORIZONTAL	Average
4	9000.38	62.09	74.00	-11.91	52.19	7.62	37.70	35.42	105	288	HORIZONTAL	Peak
5	12000.41	51.76	54.00	-2.24	38.66	9.14	38.80	34.84	103	302	HORIZONTAL	Average
6	12000.41	71.23	74.00	-2.77	58.13	9.14	38.80	34.84	103	302	HORIZONTAL	Peak

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	3000.11	71.04	74.00	-2.96	73.58	4.13	29.20	35.87	156	28	VERTICAL	Peak
2	3000.16	43.50	54.00	-10.50	46.04	4.13	29.20	35.87	156	28	VERTICAL	Average
3	9000.23	58.84	74.00	-15.16	48.94	7.62	37.70	35.42	105	358	VERTICAL	Peak
4	9000.30	44.27	54.00	-9.73	34.37	7.62	37.70	35.42	105	358	VERTICAL	Average
5	12000.33	71.04	74.00	-2.96	57.94	9.14	38.80	34.84	121	353	VERTICAL	Peak
6	12000.41	51.56	54.00	-2.44	38.46	9.14	38.80	34.84	121	353	VERTICAL	Average

Temperature	25℃	Humidity	40%
Test Engineer	Serway Li	Configurations	18~26.5G
Test Date	Sep. 06, 2013		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	21000.58	45.39	60.00	-14.61	34.16	9.33	37.50	35.60	Average	103	356	HORIZONTAL
2	21000.83	58.03	80.00	-21.97	46.80	9.33	37.50	35.60	Peak	103	356	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	21000.54	57.97	80.00	-22.03	46.74	9.33	37.50	35.60	Peak	100	155	VERTICAL
2	21000.97	43.74	60.00	-16.26	32.51	9.33	37.50	35.60	Average	100	155	VERTICAL

Temperature	25℃	Humidity	40%
Test Engineer	Serway Li	Configurations	26.5~40G
Test Date	Sep. 06, 2013		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	30001.03	48.37	60.00	-11.63	39.11	11.61	39.70	42.05	Average	100	40	HORIZONTAL
2	30001.05	59.12	80.00	-20.88	49.86	11.61	39.70	42.05	Peak	100	40	HORIZONTAL
3	36001.16	62.34	80.00	-17.66	53.44	6.93	42.10	40.13	Peak	100	353	HORIZONTAL
4	36001.21	49.52	60.00	-10.48	40.62	6.93	42.10	40.13	Average	100	353	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	30000.97	45.71	60.00	-14.29	36.45	11.61	39.70	42.05	Average	102	358	VERTICAL
2	30001.48	56.69	80.00	-23.31	47.43	11.61	39.70	42.05	Peak	102	358	VERTICAL
3	36001.07	60.78	80.00	-19.22	51.88	6.93	42.10	40.13	Peak	117	10	VERTICAL
4	36001.09	48.42	60.00	-11.58	39.52	6.93	42.10	40.13	Average	117	10	VERTICAL

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB 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.

4.4.9 Results for Radiated Emissions (40GHz~100GHz)

4.4.10 Limit

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in 47 CFR Part 15.249, whichever is the lesser attenuation.

Operating Frequencies (MHz)	Harmonics Strength (micorvolts/meter)	Harmonics Strength (dBuV/m) at 3m
24.0~24.25 GHz	2500 at 3m	68 (Average)
24.0~24.25 GHz	2500 at 3m	88 (Peak)

4.4.11 Test Result

Temperature	25°C	Humidity	40%
Test Engineer	Serway Li	Test Date	Sep. 06, 2013

Frequency (GHz)	Measurement Distance (m)	Measurement Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
48.400	0.5	83.608	103.56	-19.952
Frequency (GHz)	**Measurement Distance (m)**	**Measurement Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**
48.488	0.5	72.934	83.56	-10.626
Frequency (GHz)	**Measurement Distance (m)**	**Measurement Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**
72.507	0.5	91.139	103.56	-12.421
Frequency (GHz)	**Measurement Distance (m)**	**Measurement Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**
72.499	0.5	75.608	83.56	-7.952

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [0.5m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [15.56 dB].

4.5 Band Edge Emissions Measurement

4.5.1 Limit

Band edge emissions radiated outside of the specified frequency bands shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 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

4.5.2 Measuring Instruments and Setting

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

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	100 MHz
RBW / VBW	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average

4.5.3 Test Procedures

The test procedure is the same as section 4.4.3, only the frequency range investigated is limited to 2MHz around bandedges.

4.5.4 Test Setup Layout

This test setup layout is the same as that shown in section 4.4.4

4.5.5 Test Deviation

There is no deviation with the original standard.

4.5.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.5.7 Test Result of Band Edge and Fundamental Emissions

Temperature	25℃	Humidity	40%
Test Engineer	Satoshi Yang	Test Date	Sep. 11, 2013

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		
1	24000.00	37.52	63.50	-25.98	18.51	14.53	38.60	34.12	Average	HORIZONTAL
2	24000.00	78.83	83.50	-4.67	59.82	14.53	38.60	34.12	Peak	HORIZONTAL
3	24143.60	86.13			66.91	14.58	38.79	34.15	Average	HORIZONTAL
4	24143.60	127.44			108.22	14.58	38.79	34.15	Peak	HORIZONTAL
5	24250.00	38.91	63.50	-24.59	19.52	14.61	38.95	34.17	Average	HORIZONTAL
6	24250.00	80.22	83.50	-3.28	60.83	14.61	38.95	34.17	Peak	HORIZONTAL

Item 3, 4 are the fundamental frequency at 24005~24245MHz.

Note:

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

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

4.6 Antenna Requirements

4.6.1 Limit

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited.

4.6.2 Antenna Connector Construction

Please refer to section 3.1 in this test report, antenna connector complied with the requirements.

5 LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMI Test Receiver	R&S	ESCS 30	100377	9kHz ~ 2.75GHz	Oct. 23, 2012	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Nov. 26, 2012	Conduction (CO01-CB)
V- LISN	Schwarzbeck	NSLK 8127	8127478	9kHz ~ 30MHz	Jul. 17, 2013	Conduction (CO01-CB)
Impulsbegrenzer Pulse Limiter	Rohde&Schwarz	ESH3-Z2	100430	9kHz~30MHz	Feb. 21, 2013	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	0.15MHz~30MHz	Dec. 04, 2012	Conduction (CO01-CB)
Software	Audix	E3	5.410e	-	-	Conduction (CO01-CB)
BILOG ANTENNA	Schaffner	CBL6112D	22021	20MHz ~ 2GHz	Apr. 16, 2013	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9 kHz - 30 MHz	Nov. 05, 2012*	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Nov. 27, 2012	Radiation (03CH01-CB)
Horn Antenna	SCHWARZBEAK	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Nov. 23, 2012	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Nov. 27, 2012	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Nov. 23, 2012	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26.5GHz ~ 40GHz	Jul. 30, 2013	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP40	100056	9kHz~40GHz	Nov. 16, 2012	Radiation (03CH01-CB)
EMI Test Receiver	R&S	ESCS 30	100355	9kHz ~ 2.75GHz	Apr. 12, 2013	Radiation (03CH01-CB)
Turn Table	INN CO	CO 2000	N/A	0 ~ 360 degree	N.C.R	Radiation (03CH01-CB)
Antenna Mast	INN CO	CO2000	N/A	1 m - 4 m	N.C.R	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-1	N/A	30 MHz - 1 GHz	Nov. 18, 2012	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-1	N/A	1 GHz – 26.5 GHz	Nov. 18, 2012	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-2	N/A	1 GHz – 26.5 GHz	Nov. 18, 2012	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-3	N/A	1 GHz - 40 GHz	Nov. 18, 2012	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-4	N/A	1 GHz - 40 GHz	Nov. 18, 2012	Radiation (03CH01-CB)
Signal analyzer	R&S	FSV40	100979	9kHz~40GHz	Oct. 08, 2012	Conducted (TH01-CB)
RF Power Divider	Woken	2 Way	0120A02056002D	2GHz ~ 18GHz	Nov. 18, 2012	Conducted (TH01-CB)
RF Power Divider	Woken	3 Way	MDC2366	2GHz ~ 18GHz	Nov. 18, 2012	Conducted (TH01-CB)
RF Power Divider	Woken	4 Way	0120A04056002D	2GHz ~ 18GHz	Nov. 18, 2012	Conducted (TH01-CB)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
RF Cable-high	Woken	High Cable-7	-	1 GHz – 26.5 GHz	Nov. 19, 2012	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-8	-	1 GHz – 26.5 GHz	Nov. 19, 2012	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-9	-	1 GHz – 26.5 GHz	Nov. 19, 2012	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-10	-	1 GHz – 26.5 GHz	Nov. 19, 2012	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-11	-	1 GHz – 26.5 GHz	Nov. 19, 2012	Conducted (TH01-CB)

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

* Calibration Interval of instruments listed above is two years.

N.C.R. means Non-Calibration required.

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 Uc(y)				1.2
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)				2.4

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

Contribution	Uncertainty of x_i			$u(x_i)$
	Value	Unit	Probability Distribution k	
Receiver reading	±0.173	dB	K=1	0.086
Cable loss	±0.174	dB	K=2	0.087
Antenna gain	±0.169	dB	K=2	0.084
Site imperfection	±0.433	dB	Triangular	0.214
Pre-amplifier gain	±0.366	dB	K=2	0.183
Transmitter antenna	±1.200	dB	Rectangular	0.600
Signal generator	±0.461	dB	Rectangular	0.231
Mismatch	±0.080	dB	U-shape	0.040
Spectrum analyzer	±0.500	dB	Rectangular	0.250
Combined standard uncertainty Uc(y)				1.778
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)				3.555

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

Contribution	Uncertainty of x_i			$u(x_i)$
	Value	Unit	Probability Distribution k	
Receiver reading	±0.191	dB	K=1	0.095
Cable loss	±0.169	dB	K=2	0.084
Antenna gain	±0.191	dB	K=2	0.096
Site imperfection	±0.582	dB	Triangular	0.291
Pre-amplifier gain	±0.304	dB	K=2	0.152
Transmitter antenna	±1.200	dB	Rectangular	0.600
Signal generator	±0.461	dB	Rectangular	0.231
Mismatch	±0.080	dB	U-shape	0.040
Spectrum analyzer	±0.500	dB	Rectangular	0.250
Combined standard uncertainty Uc(y)				1.839
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)				3.678

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

Contribution	Uncertainty of x_i			$u(x_i)$
	Value	Unit	Probability Distribution k	
Receiver reading	±0.186	dB	K=1	0.093
Cable loss	±0.167	dB	K=2	0.083
Antenna gain	±0.190	dB	K=2	0.095
Site imperfection	±0.488	dB	Triangular	0.244
Pre-amplifier gain	±0.269	dB	K=2	0.134
Transmitter antenna	±1.200	dB	Rectangular	0.600
Signal generator	±0.461	dB	Rectangular	0.231
Mismatch	±0.080	dB	U-shape	0.040
Spectrum analyzer	±0.500	dB	Rectangular	0.250
Combined standard uncertainty Uc(y)				1.771
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)				3.541

Uncertainty of Conducted Emission Measurement

Contribution	Uncertainty of x_i			$u(x_i)$
	Value	Unit	Probability Distribution k	
Cable loss	±0.038	dB	K=2	0.019
Attenuator	±0.047	dB	K=2	0.024
Power Meter specification	±0.300	dB	Triangular	0.150
Power Sensor specification	±0.300	dB	Rectangular	0.150
Signal generator	±0.461	dB	Rectangular	0.231
Mismatch	±0.080	dB	U-shape	0.040
Spectrum analyzer	±0.500	dB	Rectangular	0.250
Combined standard uncertainty Uc(y)				0.863
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)				1.726