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FCC RADIO TEST REPORT

Applicant's company	Ittron Technology Inc.
Applicant Address	9F, #75, Sec. 1, Hsin Tai Wu Rd., Hsichih, Taipei Hsien, Taiwan, R.O.C.
FCC ID	F2QRFSCORPIUSP20U
Manufacturer's company	Qumax Elec. (Dongguan) CO., LTD.
Manufacturer Address	Sec. B, Hopewell Industrial City, Sima, Changping Town, Dongguan City, Guangdong Province, Post Code:523570, P.R.C.

Product Name	2.4GHz Wireless Joystick Keyboard
Brand Name	IONE
Model Name	Scorpius-P20
Test Rule Part(s)	47 CFR FCC Part 15 Subpart C § 15.249
Test Freq. Range	2400 ~ 2483.5MHz
Receive Date	Aug. 01, 2005
Test Date	Jan. 10, 2006
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 C63.4-2003** and **47 CFR FCC Part 15 Subpart C**.

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

NVLAQ[®]

Lab Code: 200079-0

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History of This Test Report

Original Issue Date: Jan. 11, 2006

Report No.: FR580102

■ No additional attachment.

□ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

1. CERTIFICATE OF COMPLIANCE

Product Name : 2.4GHz Wireless Joystick Keyboard
Brand Name : IONE
Model Name : Scorpius-P20
Applicant : Itron Technology Inc.
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. 01, 2005 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.


Wayne Hsu / Supervisor
Sporton International Inc.

2. SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart C				
Part	Rule Section	Description of Test	Result	Under Limit
4.1	15.207	AC Power Line Conducted Emissions	Complies	16.18 dB
4.2	15.249(a)	Field Strength of Fundamental Emissions	Complies	17.05 dB
4.3	15.215(c)	20dB Spectrum Bandwidth	Complies	-
4.4	15.249(a)/(d)	Radiated Emissions	Complies	3.73 dB
4.5	15.249(d)	Band Edge Emissions	Complies	5.94 dB
4.6	15.203	Antenna Requirements	Complies	-

Test Items	Uncertainty	Remark
AC Power Line Conducted Emissions	±2.26dB	Confidence levels of 95%
Field Strength of Fundamental Emissions	±3.72dB	Confidence levels of 95%
20dB Spectrum Bandwidth	±6.25×10 ⁻⁷	Confidence levels of 95%
Radiated Emissions/ Band Edge Emissions	±3.72dB	Confidence levels of 95%

3. GENERAL INFORMATION

3.1. Product Details

Items	Description
Product Type	Low Power Communication Device
Radio Type	Intentional Transmitter
Power Type	Battery for TX; Host System for RX
Interface Type	USB for RX
Modulation	GFSK
Frequency Range	2400 ~ 2483.5MHz
Channel Number	8
Max. Field Strength	76.95 dBuV/m at 3m (Average)
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

3.2. Accessories

USB Cable.

3.3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	-	-	Printed Antenna	NA	-

3.4. Table for Carrier Frequencies

Frequency Band	Channel No.	Frequency
2400 ~ 2483.5MHz	1	2405 MHz
	:	:
	:	:
	:	:
	4	2432 MHz
	:	:
	:	:
	:	:
	8	2468 MHz

3.5. 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	Channel	Antenna
AC Power Line Conducted Emissions	Normal Use	4	1
Radiated Emissions 9kHz~1GHz	CTX	4	1
Field Strength of Fundamental Emissions Radiated Emissions 1GHz~10 th Harmonic	CTX	1/4/8	1
Band Edge Emissions	CTX	1/8	1
20dB Spectrum Bandwidth	CTX	1/4/8	NA

Note: CTX= continuously transmitting

3.6. Table for Testing Locations

Test Site No.	Site Category	Location	FCC Reg. No.	IC File No.	VCCI Reg. No
03CH03-HY	SAC	Hwa Ya	101377	IC 4088	-
CO04-HY	Conduction	Hwa Ya	101377	IC 4088	-
TH01-HY	OVEN Room	Hwa Ya	-	-	-

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

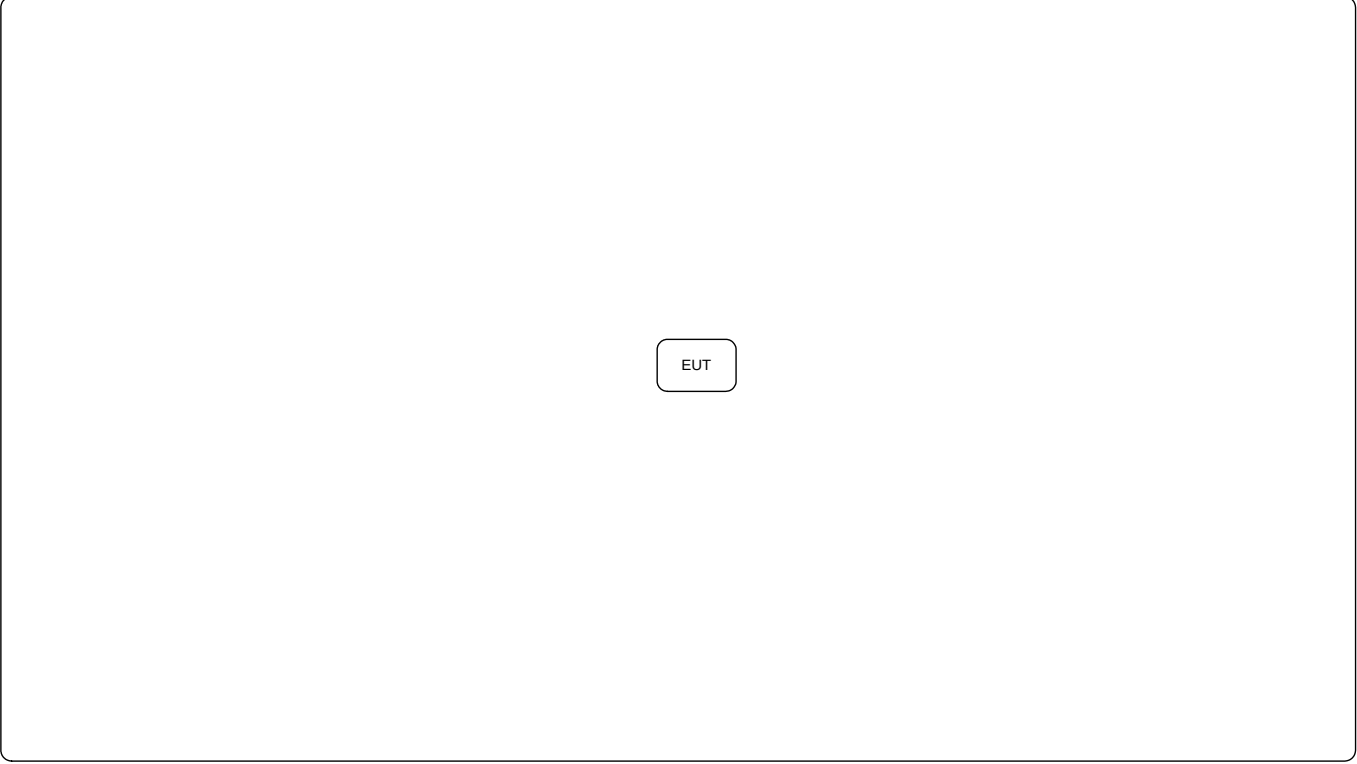
Please refer section 6 for Test Site Address.

3.7. Table for Supporting Units

Support Unit	Brand	Model	FCC ID
Modem	ACEEX	DM-1414	FCC ID IFAXDM1414
Notebook	DELL(D400)	PPT	DoC
Flash	-	-	DoC

3.8. Test Configurations

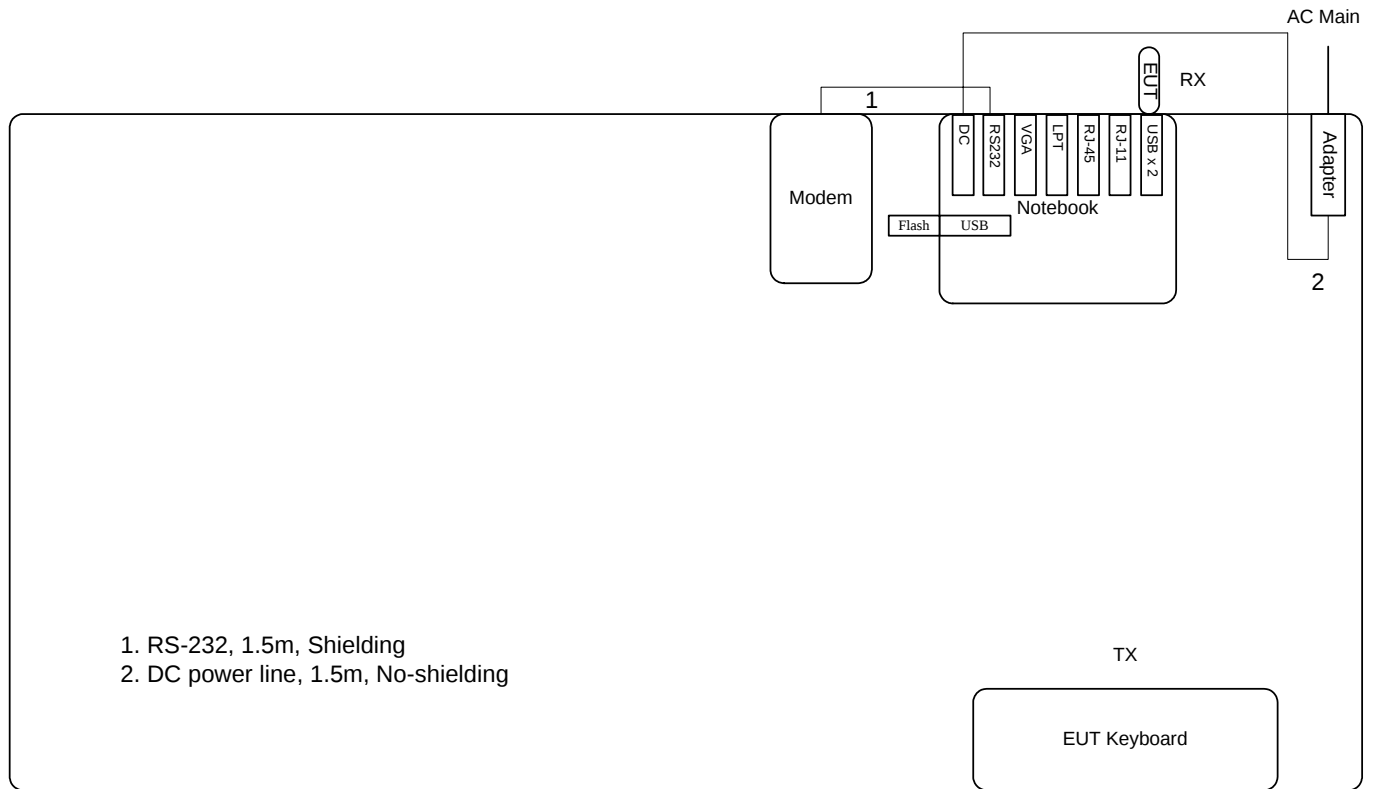
3.8.1. Radiation Emissions Test Configuration



EUT

3.8.2. AC Power Line Conduction Emissions Test Configuration

TX Normal Mode



4. TEST RESULT

4.1. AC Power Line Conducted Emissions Measurement

4.1.1. Limit

For a Low-power Radio-frequency Device 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

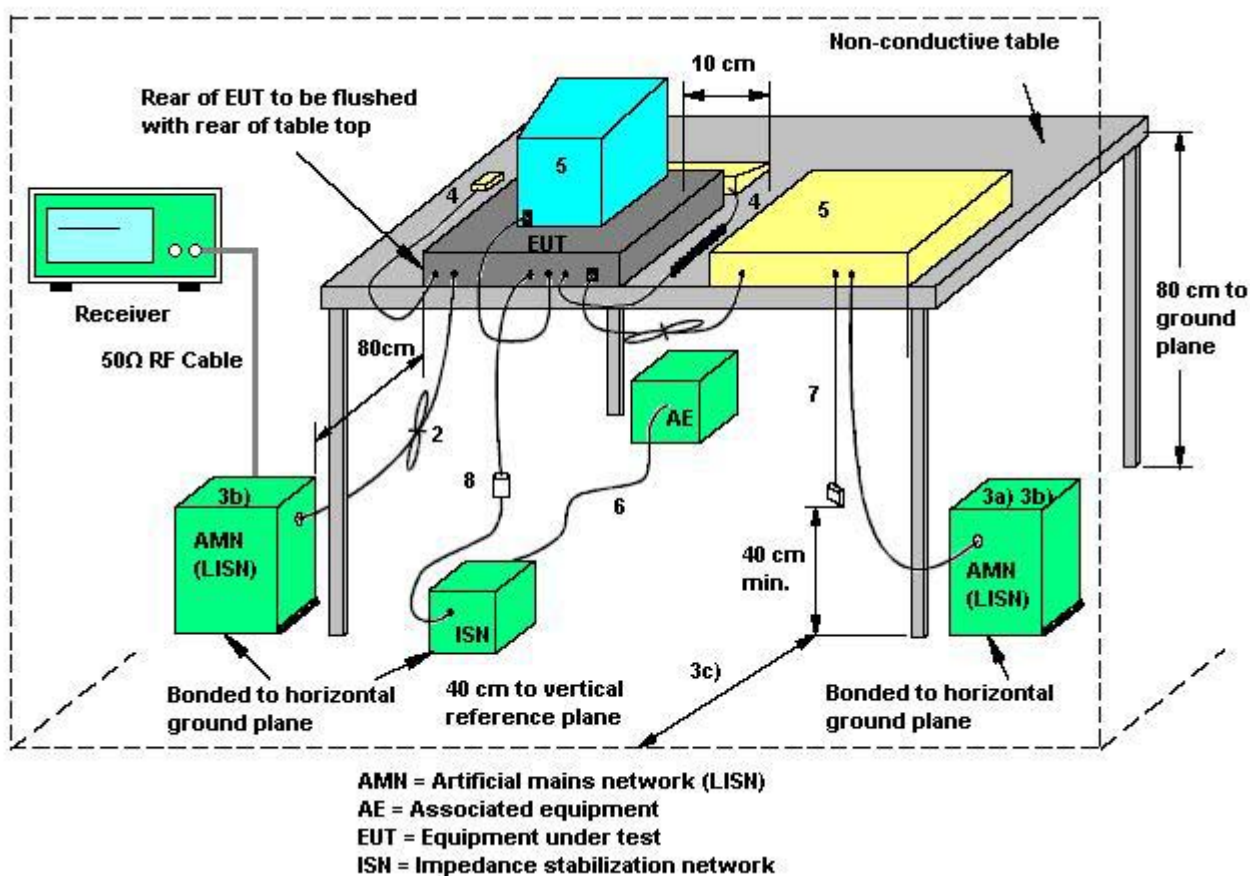
Please refer to section 5 in this report. The following table is the setting of the receiver.

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 C63.4. 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



1. If cables, which hang closer than 40 cm to the horizontal metal groundplane, cannot be shortened to appropriate length, the excess shall be folded back and forth forming a bundle 30 cm to 40 cm long.
2. Excess mains cord shall be bundled in the centre or shortened to appropriate length.
3. EUT is connected to one artificial mains network (AMN). All AMNs and ISNs may alternatively be connected to a vertical reference plane or metal wall.
4. All other units of a system are powered from a second AMN. A multiple outlet strip can be used for multiple mains cords.
5. AMN and ISN are 80 cm from the EUT and at least 80 cm from other units and other metal planes.
6. Mains cords and signal cables shall be positioned for their entire lengths, as far as possible, at 40 cm from the vertical reference plane.
7. Cables of hand operated devices, such as keyboards, mice, etc. shall be placed as for normal usage.
8. 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.
9. I/O signal cable intended for external connection.
10. The end of the I/O signal cables which are not connected to an AE may be terminated, if required, using correct terminating impedance.
11. If used, the current probe shall be placed at 0,1 m from the ISN.

4.1.5. Test Deviation

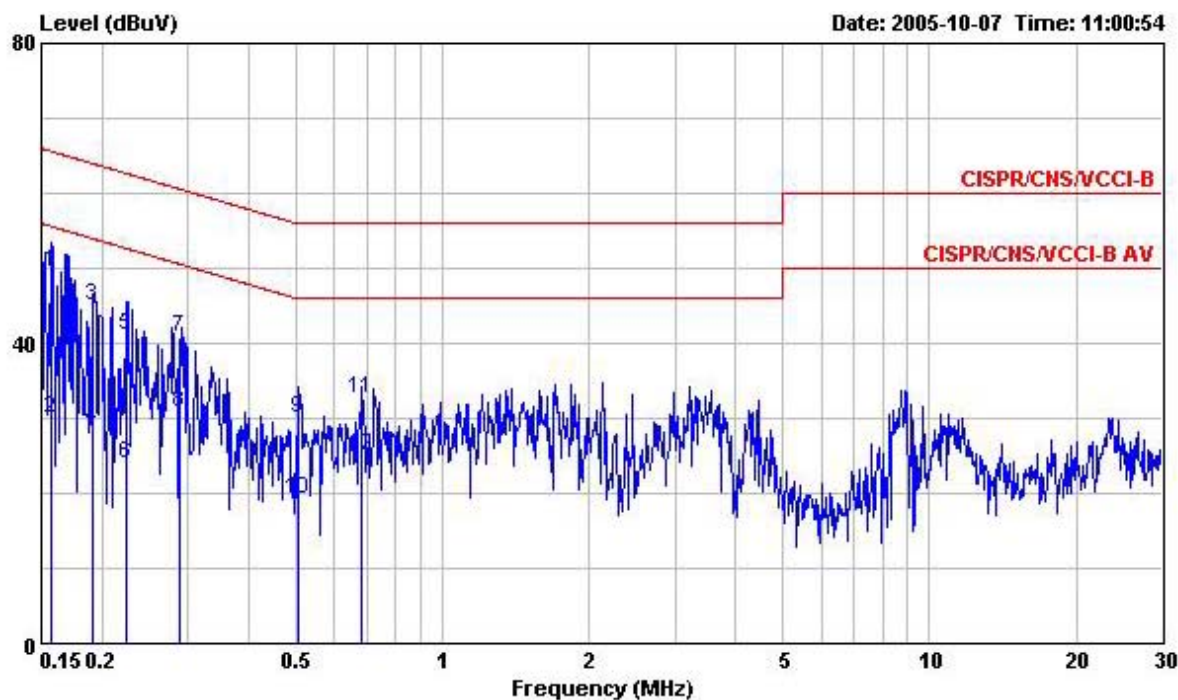
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

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

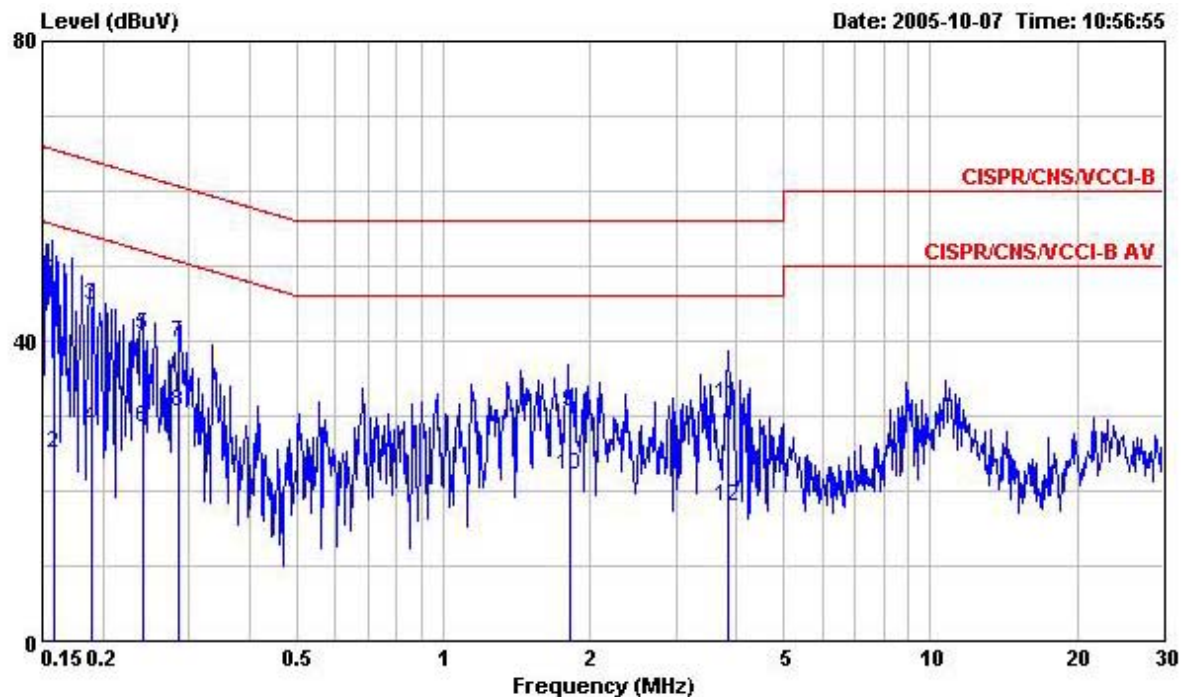
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	25°C	Humidity	52%
Test Engineer	Ted Chiu	Phase	Line
Configuration	Normal Mode		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1564950	49.47	-16.18	65.65	48.92	0.06	0.49	QP
2	0.1564950	29.88	-25.77	55.65	29.33	0.06	0.49	Average
3	0.1903870	44.96	-19.06	64.02	44.64	0.06	0.26	QP
4	0.1903870	28.81	-25.21	54.02	28.49	0.06	0.26	Average
5	0.2231870	40.93	-21.77	62.70	40.64	0.06	0.23	QP
6	0.2231870	23.87	-28.83	52.70	23.58	0.06	0.23	Average
7	0.2885090	40.81	-19.76	60.57	40.44	0.06	0.31	QP
8	0.2885090	30.89	-19.68	50.57	30.52	0.06	0.31	Average
9	0.5073740	29.88	-26.12	56.00	29.52	0.14	0.22	QP
10	0.5073740	19.09	-26.91	46.00	18.73	0.14	0.22	Average
11	0.6826310	32.63	-23.37	56.00	31.83	0.11	0.69	QP
12	0.6826310	24.96	-21.04	46.00	24.16	0.11	0.69	Average

Temperature	25°C	Humidity	52%
Test Engineer	Ted Chiu	Phase	Neutral
Configuration	Normal Mode		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1589450	48.20	-17.32	65.52	47.62	0.11	0.47	QP
2	0.1589450	24.90	-30.62	55.52	24.32	0.11	0.47	Average
3	0.1893810	44.80	-19.26	64.06	44.43	0.11	0.26	QP
4	0.1893810	28.53	-25.53	54.06	28.16	0.11	0.26	Average
5	0.2416480	40.70	-21.34	62.04	40.33	0.11	0.26	QP
6	0.2416480	28.47	-23.57	52.04	28.10	0.11	0.26	Average
7	0.2862970	39.68	-20.95	60.63	39.26	0.11	0.31	QP
8	0.2862970	30.61	-20.02	50.63	30.19	0.11	0.31	Average
9	1.810	30.65	-25.35	56.00	30.14	0.23	0.28	QP
10	1.810	22.10	-23.90	46.00	21.59	0.23	0.28	Average
11	3.840	31.49	-24.51	56.00	30.96	0.23	0.30	QP
12	3.840	17.83	-28.17	46.00	17.30	0.23	0.30	Average

Note:

Level = Read Level + LISN Factor + Cable Loss

4.2. Field Strength of Fundamental Emissions Measurement

4.2.1. Limit

The field strength of 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 (dBuV/m) at 3m
2400-2483.5	94
5725-5875	94

4.2.2. Measuring Instruments and Setting

Please refer to section 5 in this report. The following table is the setting of the Spectrum Analyzer.

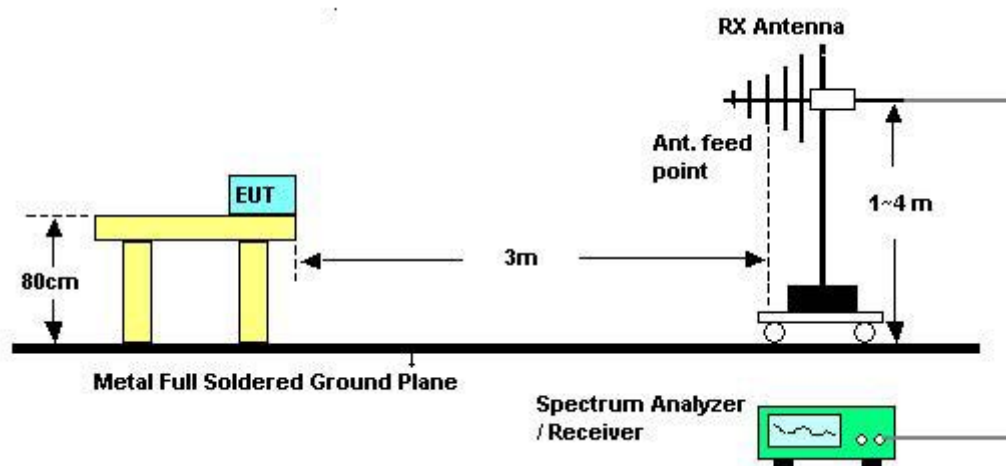
Power Meter Parameter	Setting
Attenuation	Auto
RB	1 MHz Peak / 1MHz Average
VB	1 MHz Peak / 10Hz Average
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

4.2.3. Test Procedures

1. Configure the EUT according to ANSI C63.4. 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. 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



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	28°C	Humidity	59%
Test Engineer	Vic Xiao	Configurations	Channel 1

Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamplifier Factor	Remark	Table Pos	Ant Pos
MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		deg	cm
2404.810	90.74	-23.26	60.22	114.00	2.28	28.24	0.00	Peak	200	200
2405.380	75.64	-18.36	45.10	94.00	2.30	28.24	0.00	Average	---	---

Temperature	28°C	Humidity	59%
Test Engineer	Vic Xiao	Configurations	Channel 4

Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamplifier Factor	Remark	Table Pos	Ant Pos
MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		deg	cm
2432.170	75.38	-18.62	44.81	94.00	2.30	28.28	0.00	Average	---	---
2432.170	90.48	-23.52	59.91	114.00	2.30	28.28	0.00	Peak	---	---

Temperature	28°C	Humidity	59%
Test Engineer	Vic Xiao	Configurations	Channel 8

Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamplifier Factor	Remark	Table Pos	Ant Pos
MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		deg	cm
2468.460	92.05	-21.95	61.39	114.00	2.32	28.34	0.00	Peak	---	---
2468.460	76.95	-17.05	46.29	94.00	2.32	28.34	0.00	Average	---	---

Note:

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

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

Receiving maximum fundamental emissions are Vertical Polarization.

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 (2400 ~ 2483.5MHz).

4.3.2. Measuring Instruments and Setting

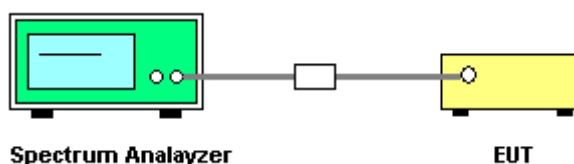
Please refer to section 5 in this report. The following table is the setting of the Spectrum Analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 6dB Bandwidth
RB	100 kHz
VB	100 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

4.3.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
2. The resolution bandwidth of 100 kHz and the video bandwidth of 100 kHz were used.
3. Measured the spectrum width with power higher than 6dB 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

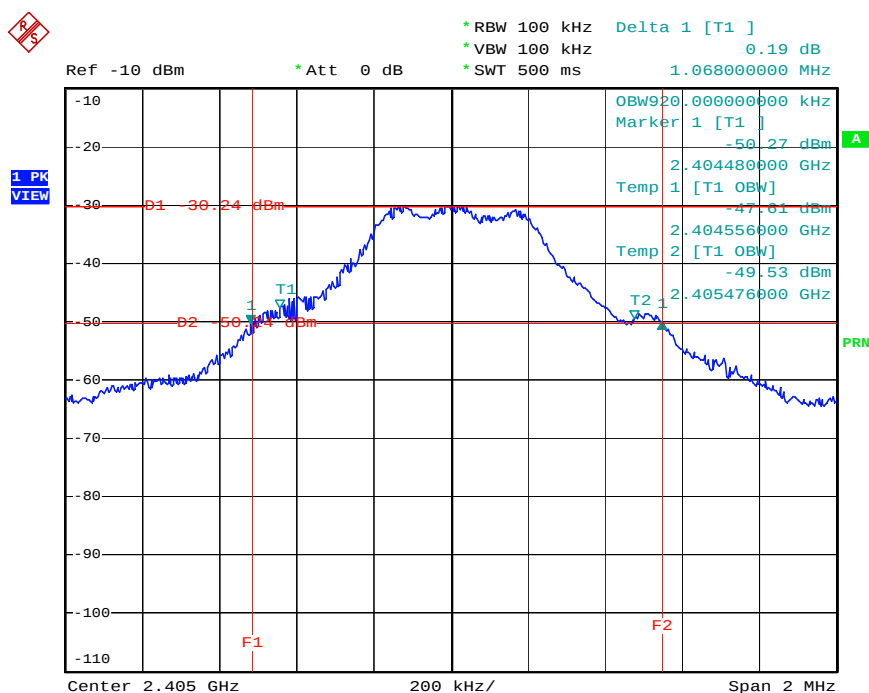
The EUT was programmed to be in continuously transmitting mode.

4.3.7. Test Result of 20dB Spectrum Bandwidth

Temperature	28°C	Humidity	59%
Test Engineer	Vic Xiao	Configurations	Channel 1/4/8

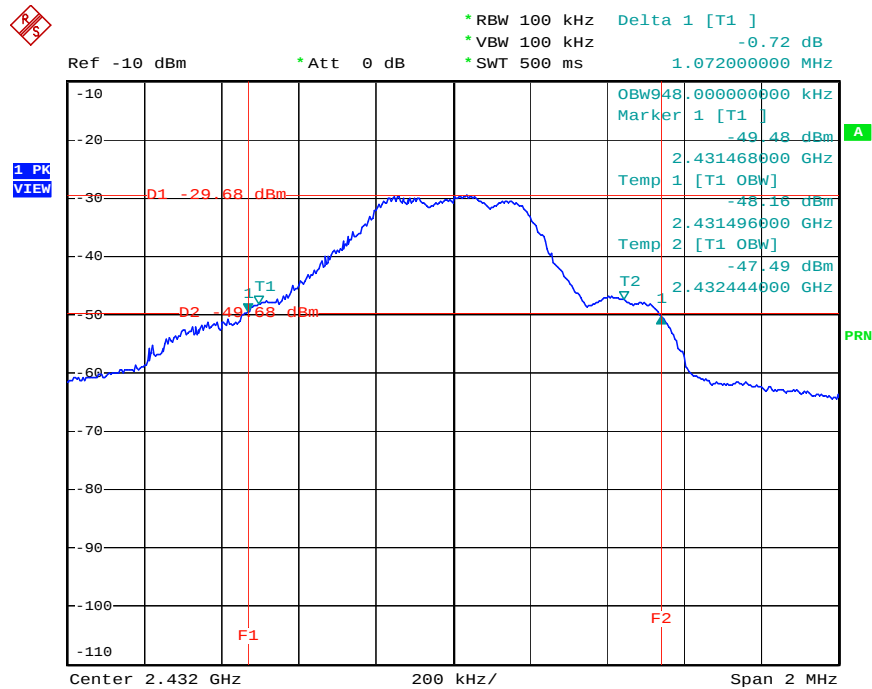
Frequency	20dB BW (MHz)	99% OBW (MHz)	Frequency range (MHz) $f_L > 2400\text{MHz}$	Frequency range (MHz) $f_H < 2483.5\text{MHz}$	Test Result
2405 MHz	1.07	0.92	2361.4000	-	Complies
2432 MHz	1.07	0.95	-	-	Complies
2468 MHz	1.36	1.16	-	2499.8000	Complies

20 dB/99% Bandwidth Plot on 2405 MHz



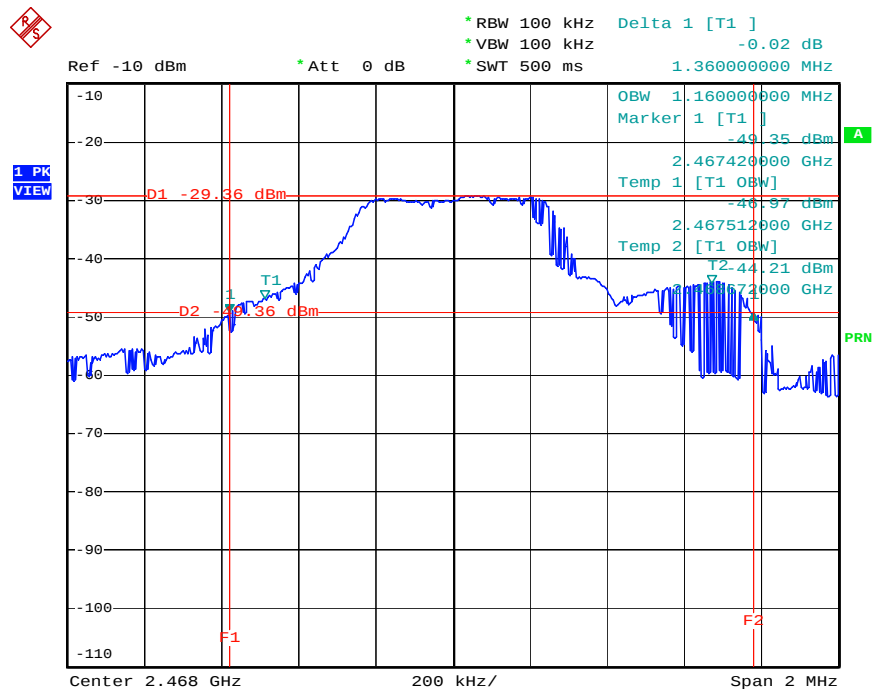
Date: 9. JAN. 2006 10:42:29

20 dB/99% Bandwidth Plot on 2432 MHz



Date: 9. JAN. 2006 10:43:51

20 dB/99% Bandwidth Plot on 2468 MHz



Date: 9. JAN. 2006 10:45:39

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 in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (other emission)	100KHz / 100KHz for peak

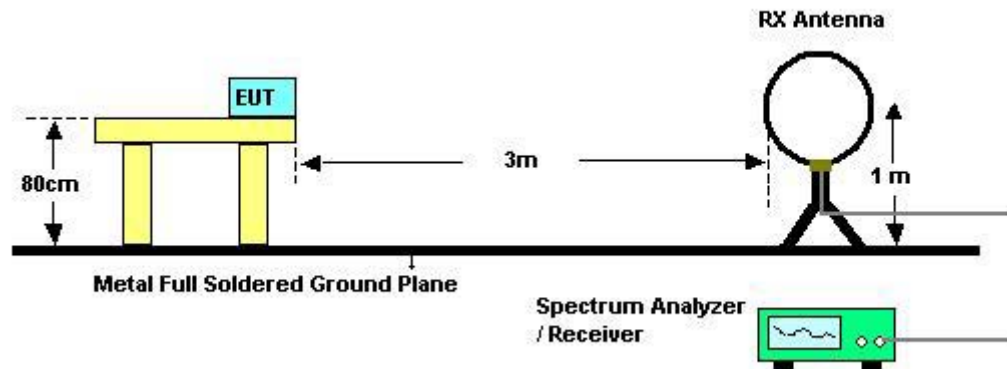
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz ~ 150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz ~ 30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz ~ 1000MHz / RB 120kHz for QP

4.4.3. Test Procedures

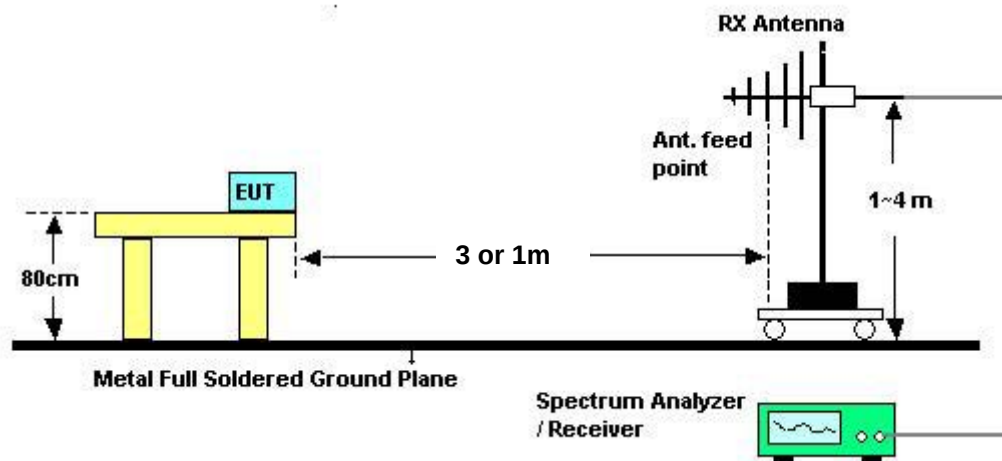
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting 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 below 30MHz



For radiated emissions above 30MHz



Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m.

Distance extrapolation factor = $20 \log (\text{specific distance [3m]} / \text{test distance [1m]})$ (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [9.54 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 (9kHz~30MHz)

Temperature	28°C	Humidity	59%
Test Engineer	Vic Xiao	Configurations	2432 MHz

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

Note:

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

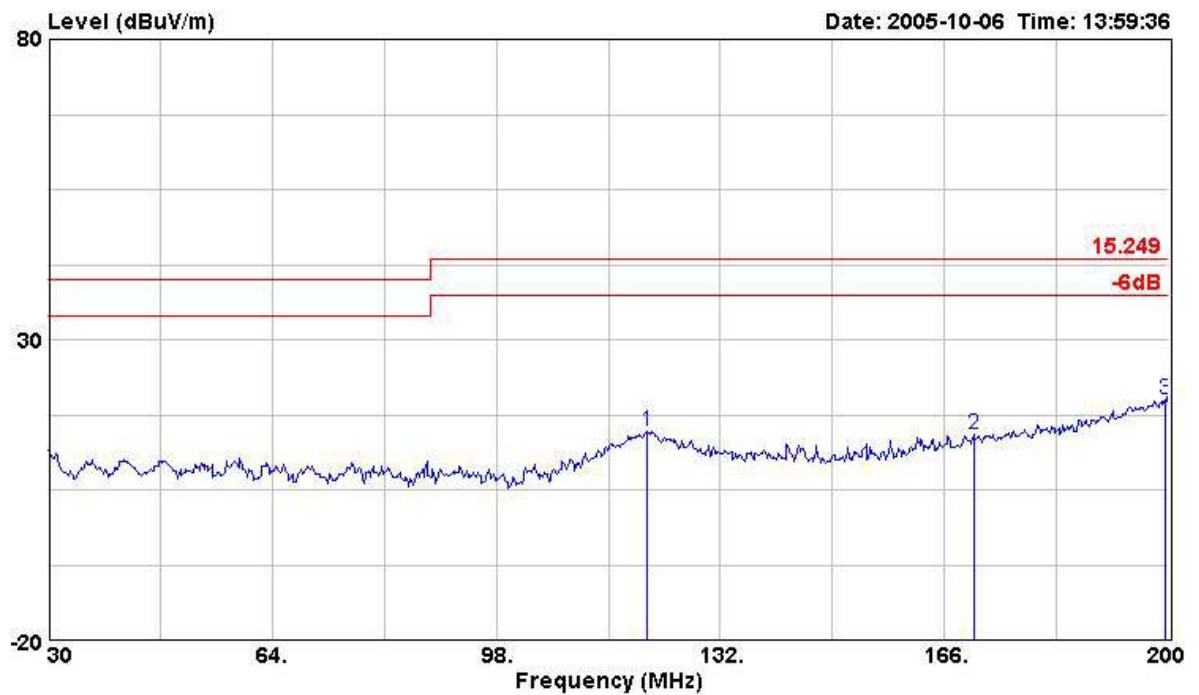
Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB);

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

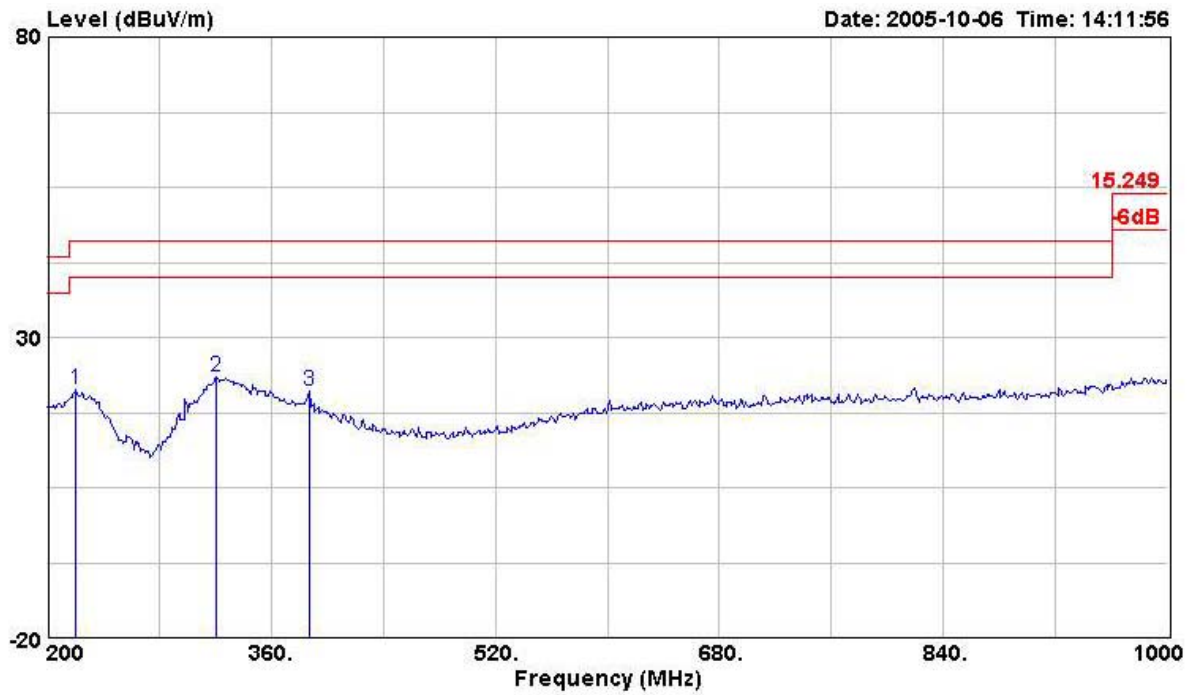
4.4.8. Results of Radiated Emissions (30MHz~1GHz)

Temperature	28°C	Humidity	59%
Test Engineer	Vic Xiao	Configurations	2405 MHz

Horizontal

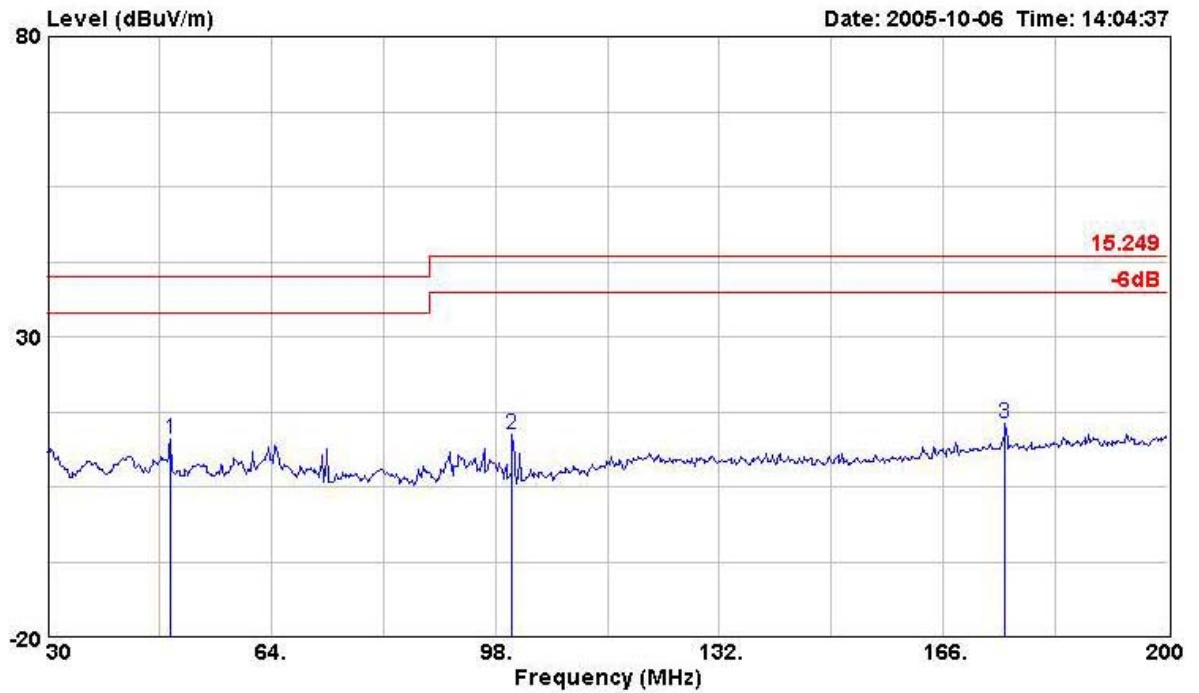


	Freq	Level	Over	Read	Limit	Cable	Antenna	Preamp		Table	Ant
	MHz	dBuV/m	Limit	Level	Line	Loss	Factor	Factor	Remark	Pos	Pos
			dB	dBuV	dBuV/m	dB	dB/m	dB		deg	cm
1	120.780	14.78	-28.72	32.07	43.50	1.09	11.94	30.32	Peak	---	---
2	170.420	14.29	-29.21	29.19	43.50	1.28	13.72	29.90	Peak	---	---
3	199.490	20.06	-23.44	33.99	43.50	1.32	15.76	31.01	Peak	---	---

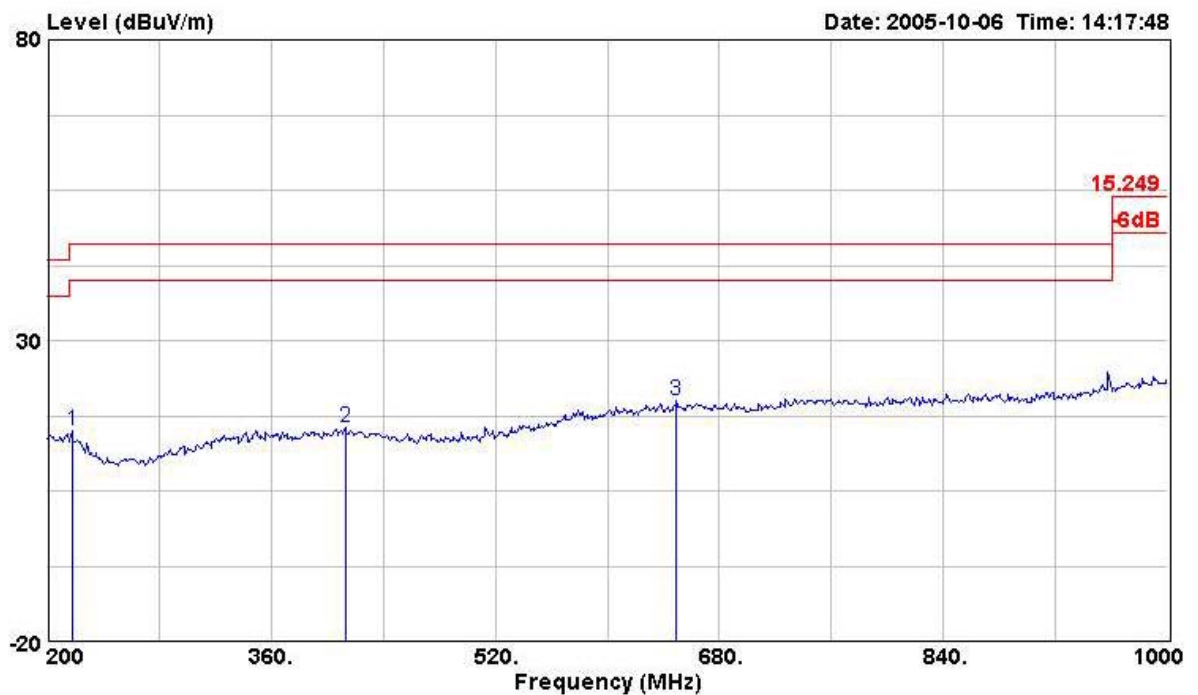


	Freq	Level	Over	Read	Limit	Cable	Antenna	Preamp		Table	Ant
	MHz	dBuV/m	Limit	Level	Line	Loss	Factor	Factor	Remark	Pos	Pos
			dB	dBuV	dBuV/m	dB	dB/m	dB		deg	cm
1	220.800	21.26	-24.74	35.45	46.00	1.42	14.54	30.15	Peak	---	---
2	320.800	23.55	-22.45	37.94	46.00	1.75	14.44	30.58	Peak	---	---
3	387.200	20.97	-25.03	33.81	46.00	1.92	16.43	31.19	Peak	---	---

Vertical



	Freq	Level	Over	Read	Limit	CableAntenna	Preamp		Table	Ant
	MHz	dBuV/m	Limit	Level	Line	Loss	Factor	Factor	Pos	Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB	deg	cm
1	48.700	12.79	-27.21	30.55	40.00	0.67	11.68	30.10	Peak	---
2	100.550	13.68	-29.82	34.30	43.50	0.95	9.08	30.65	Peak	---
3	175.350	15.46	-28.04	29.95	43.50	1.28	14.20	29.96	Peak	---



	Freq	Level	Over	Read	Limit	Cable	Antenna	Preamp		Table	Ant
	MHz	dBuV/m	Limit	Level	Line	Loss	Factor	Factor	Remark	Pos	Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		deg	cm
1	217.600	14.88	-31.12	28.85	46.00	1.36	14.79	30.12	Peak	---	---
2	412.800	15.62	-30.38	27.74	46.00	1.95	16.70	30.77	Peak	---	---
3	649.600	19.93	-26.07	27.38	46.00	2.49	20.55	30.49	Peak	---	---

Note:

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

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

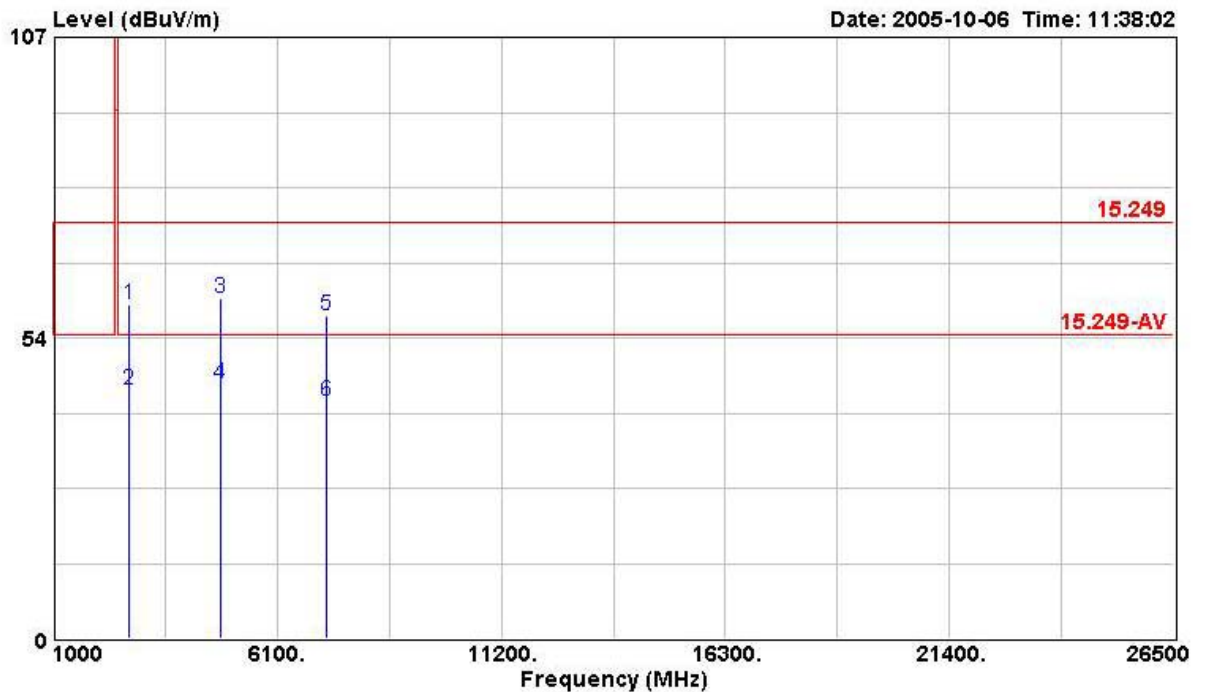
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

Pol. : V is Vertical Polarization ; H is Horizontal Polarization.

4.4.9. Results for Radiated Emissions (1GHz~10th Harmonic)

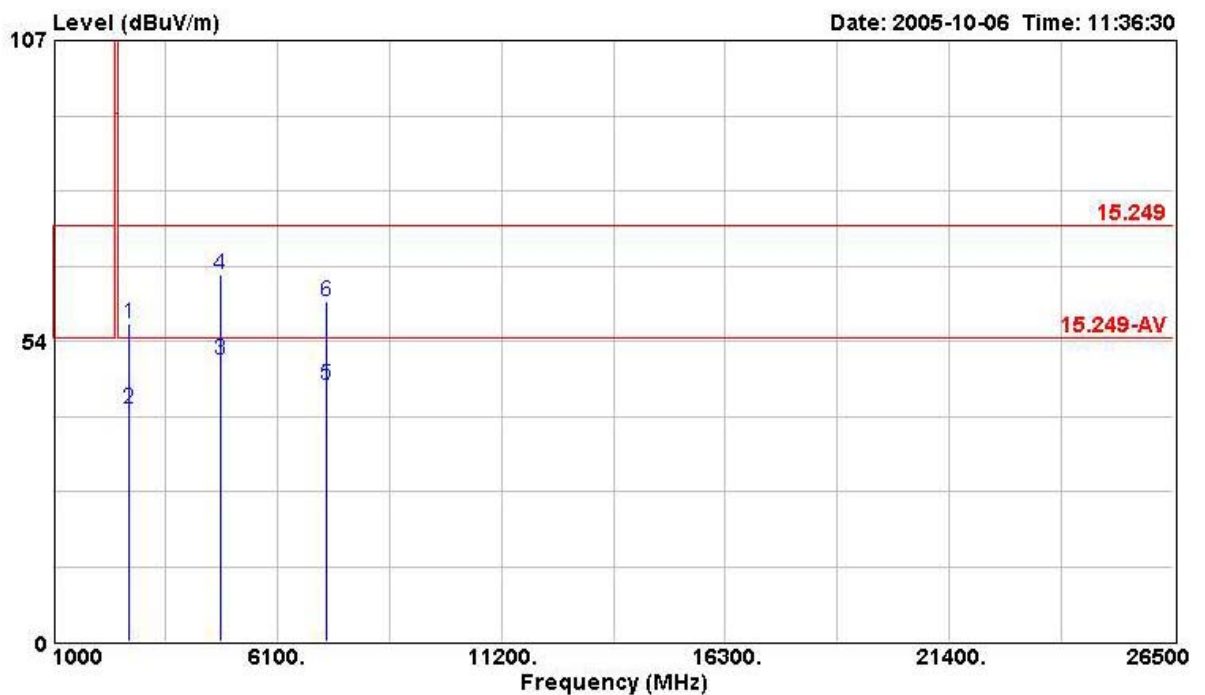
Temperature	28°C	Humidity	59%
Test Engineer	Vic Xiao	Configurations	Channel 1

Horizontal



	Freq	Level	Over	Read	Limit	Cable	Antenna	Preamp		Table	Ant
	MHz	dBuV/m	Limit	Level	Line	Loss	Factor	Factor	Remark	Pos	Pos
			dB	dBuV	dBuV/m	dB	dB/m	dB		deg	cm
1	2710.000	59.34	-14.66	60.72	74.00	2.47	29.14	32.99	Peak	---	---
2	2710.000	44.24	-9.76	45.62	54.00	2.47	29.14	32.99	Average	---	---
3	4812.000	60.57	-13.43	56.91	74.00	3.10	33.10	32.54	PEAK	---	---
4	4812.000	45.47	-8.53	41.82	54.00	3.10	33.10	32.54	Average	---	---
5	7216.000	57.47	-16.53	49.84	74.00	4.10	35.94	32.40	PEAK	---	---
6	7216.000	42.37	-11.63	34.73	54.00	4.10	35.94	32.40	Average	---	---

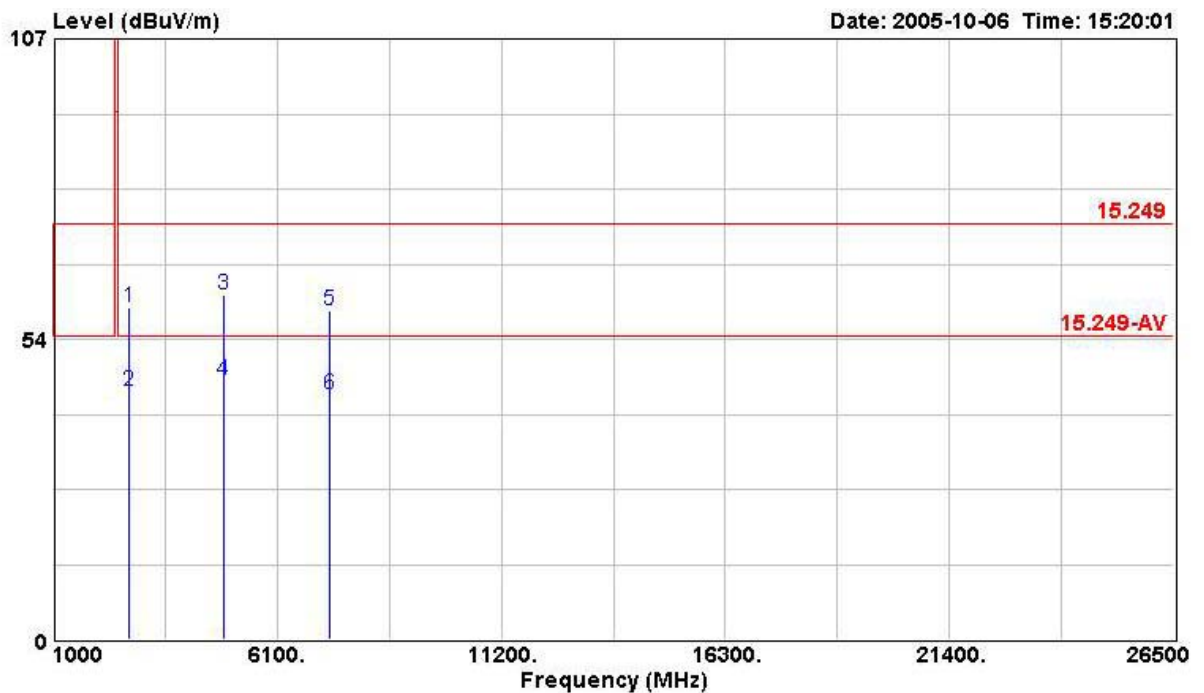
Vertical



	Freq	Level	Over	Read	Limit	CableAntenna	Preamp		Table	Ant
	MHz	dBuV/m	Limit	Level	Line	Loss Factor	Factor	Remark	Pos	Pos
			dB	dBuV	dBuV/m	dB	dB/m	dB	deg	cm
1	2710.000	56.59	-17.41	57.97	74.00	2.47	29.14	32.99	Peak	---
2 @	2710.000	41.49	-12.51	42.87	54.00	2.47	29.14	32.99	Average	---
3 @	4812.000	50.19	-3.81	46.54	54.00	3.10	33.10	32.54	Average	---
4 @	4812.000	65.29	-8.71	61.64	74.00	3.10	33.10	32.54	PEAK	---
5 @	7212.000	45.49	-8.51	37.90	54.00	4.10	35.90	32.40	Average	---
6 @	7212.000	60.59	-13.41	52.99	74.00	4.10	35.90	32.40	PEAK	---

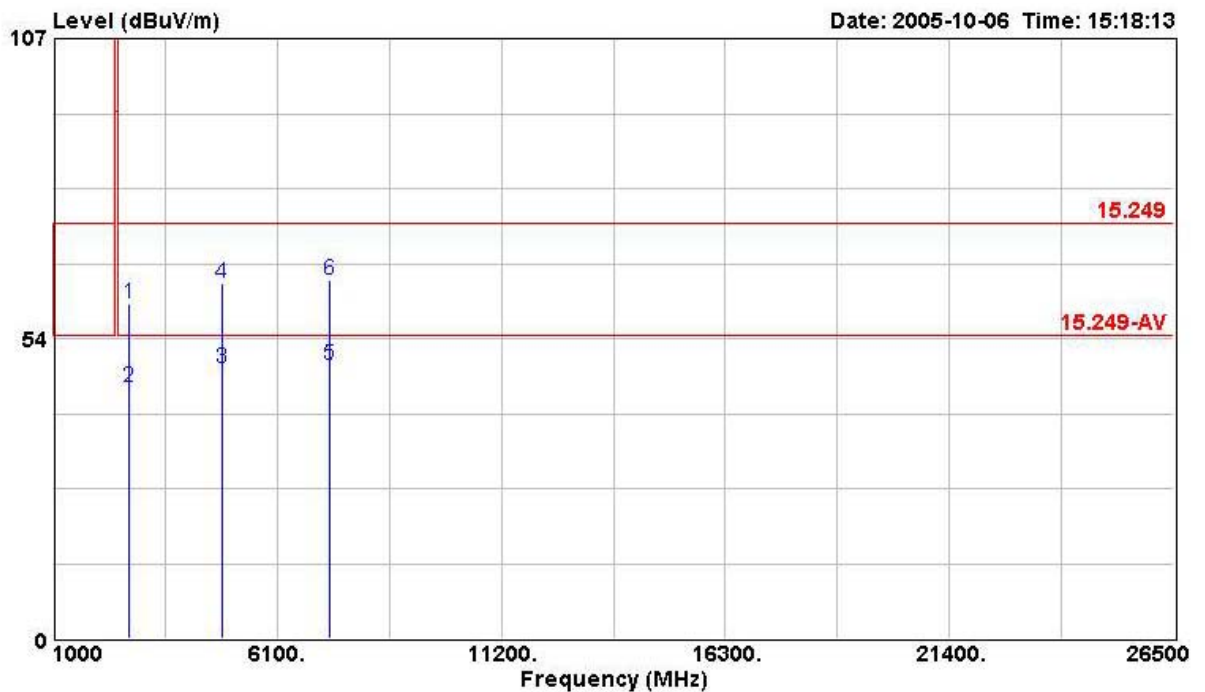
Temperature	28°C	Humidity	59%
Test Engineer	Vic Xiao	Configurations	Channel 4

Horizontal



	Freq	Level	Over	Read	Limit	Cable	Antenna	Preamp		Table	Ant
	MHz	dBuV/m	Limit	Level	Line	Loss	Factor	Factor	Remark	Pos	Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		deg	cm
1	2712.000	59.18	-14.82	60.56	74.00	2.47	29.14	32.99	PEAK	---	---
2	2712.000	44.08	-9.92	45.46	54.00	2.47	29.14	32.99	Average	---	---
3	4868.000	61.39	-12.61	57.62	74.00	3.11	33.21	32.55	PEAK	---	---
4	4868.000	46.29	-7.71	42.52	54.00	3.11	33.21	32.55	Average	---	---
5	7296.000	58.63	-15.37	51.02	74.00	4.06	36.10	32.56	PEAK	---	---
6	7296.000	43.53	-10.47	35.93	54.00	4.06	36.10	32.56	Average	---	---

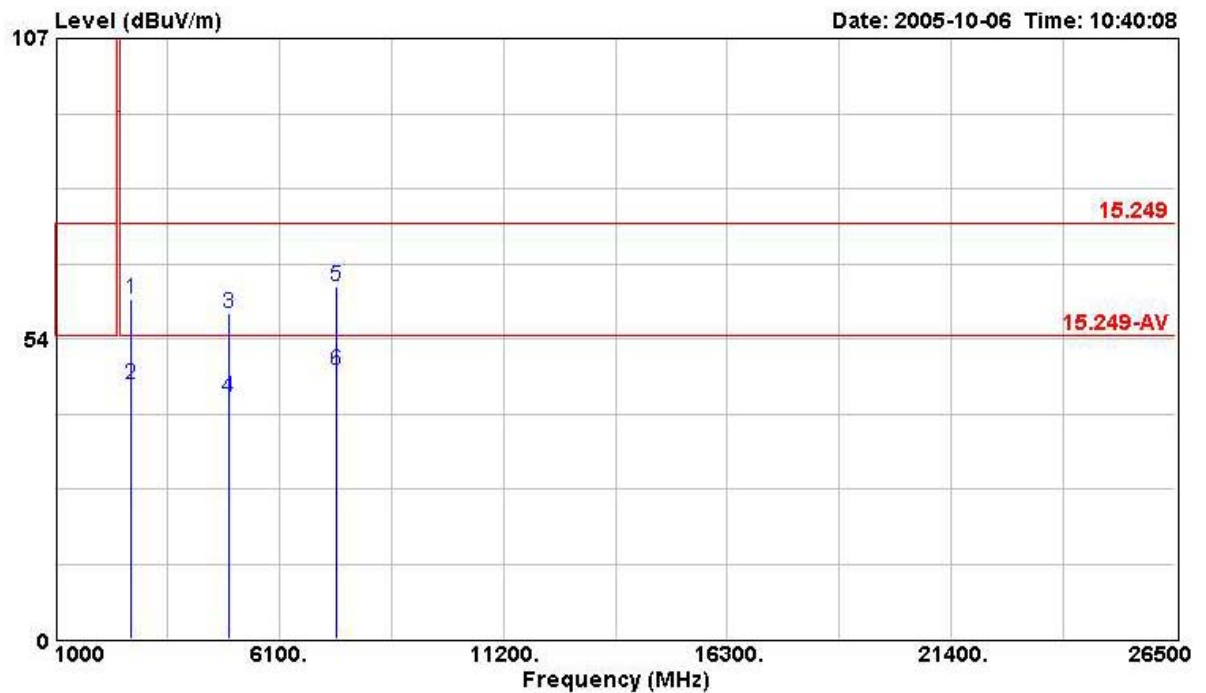
Vertical



	Freq	Level	Over	Read	Limit	CableAntenna	Preamp		Table	Ant
	MHz	dBuV/m	Limit	Level	Line	Loss	Factor	Factor	Pos	Pos
			dB	dBuV	dBuV/m	dB	dB/m	dB	deg	cm
1	2712.000	59.77	-14.23	61.15	74.00	2.47	29.14	32.99	PEAK	---
2 @	2712.000	44.67	-9.33	46.05	54.00	2.47	29.14	32.99	Average	---
3 @	4864.000	48.24	-5.76	44.50	54.00	3.11	33.18	32.55	Average	---
4 @	4864.000	63.34	-10.66	59.60	74.00	3.11	33.18	32.55	PEAK	---
5 @	7296.000	48.70	-5.30	41.10	54.00	4.06	36.10	32.56	Average	---
6 @	7296.000	63.80	-10.20	56.19	74.00	4.06	36.10	32.56	PEAK	---

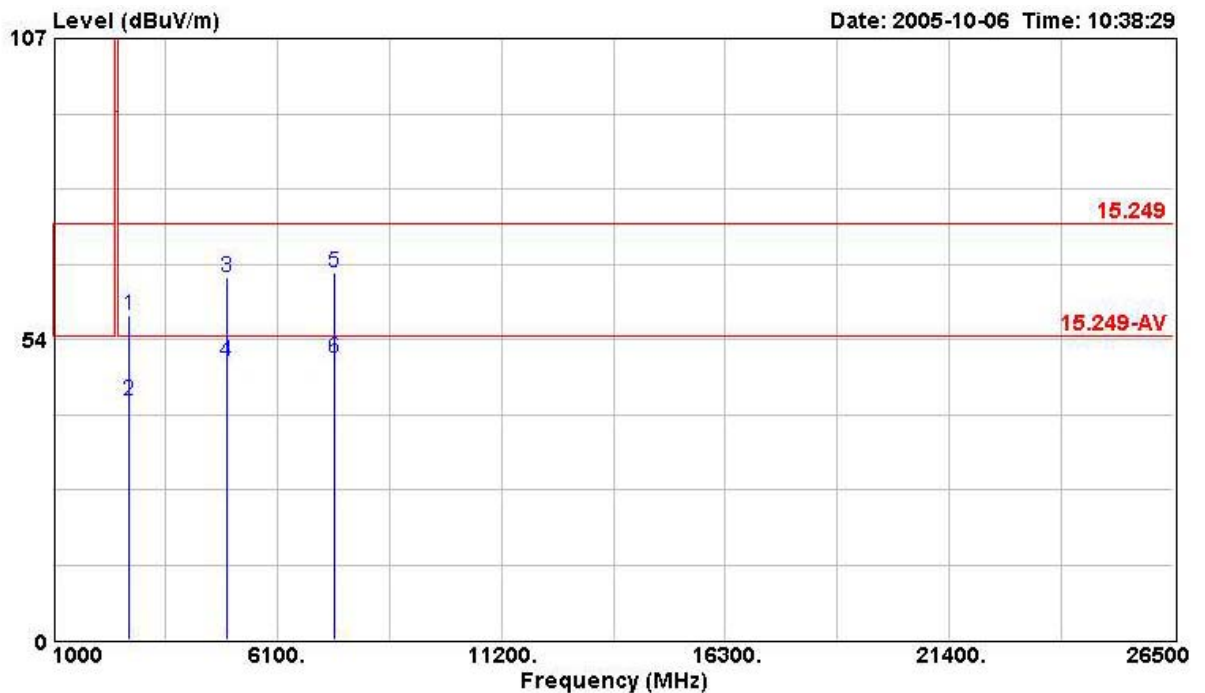
Temperature	28°C	Humidity	59%
Test Engineer	Vic Xiao	Configurations	Channel 8

Horizontal



		Freq	Level	Over	Read	Limit	CableAntenna	Preamp		Table	Ant
		MHz	dBuV/m	Limit	Level	Line	Loss	Factor	Factor	Pos	Pos
		MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB	deg	cm
1	0	2710.000	60.48	-13.52	61.86	74.00	2.47	29.14	32.99	Peak	---
2	0	2710.000	45.38	-8.62	46.76	54.00	2.47	29.14	32.99	Average	---
3		4940.000	58.08	-15.92	54.19	74.00	3.12	33.32	32.56	PEAK	---
4	0	4940.000	42.98	-11.02	39.09	54.00	3.12	33.32	32.56	Average	---
5	0	7404.000	62.92	-11.08	55.26	74.00	4.03	36.39	32.76	PEAK	---
6	0	7404.000	47.82	-6.18	40.16	54.00	4.03	36.39	32.76	Average	---

Vertical



	Freq	Level	Over	Read	Limit	Cable	Antenna	Preamp	Remark	Table	Ant
	MHz	dBuV/m	Limit	Level	Line	Loss	Factor	Factor		Pos	Pos
			dB	dBuV	dBuV/m	dB	dB/m	dB		deg	cm
1	2710.000	57.77	-16.23	59.15	74.00	2.47	29.14	32.99	Peak	---	---
2 @	2710.000	42.67	-11.33	44.05	54.00	2.47	29.14	32.99	Average	---	---
3 @	4940.000	64.54	-9.46	60.65	74.00	3.12	33.32	32.56	PEAK	---	---
4 @	4940.000	49.44	-4.56	45.55	54.00	3.12	33.32	32.56	Average	---	---
5 @	7404.000	65.37	-8.63	57.71	74.00	4.03	36.39	32.76	PEAK	---	---
6 @	7404.000	50.27	-3.73	42.61	54.00	4.03	36.39	32.76	Average	---	---

Note:

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

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

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

Pol.: V is Vertical Polarization ; H is Horizontal Polarization.

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 in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	100 MHz
RB / VB (emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (other emission)	100 KHz /100 KHz for Peak

4.5.3. Test Procedures

- The test procedure is the same as section 4.2.3, only the frequency range investigated is limited to 2MHz around bandedges.
- In case the emission is fail due to the used RB/VB is too wide, marker-delta method of FCC Public Notice DA00-705 will be followed.

4.5.4. Test Setup Layout

This test setup layout is the same as that shown in section 4.2.4.

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 Emissions

Temperature	28°C	Humidity	59%
Test Engineer	Vic Xiao	Configurations	Channel 1

	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Table Pos	Ant Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		deg	cm
2 0	2400.000	63.16	-10.84	32.67	74.00	2.28	28.21	0.00	Peak	200	200
2 0	2400.000	48.06	-5.94	17.57	54.00	2.28	28.21	0.00	Average	---	---

Temperature	28°C	Humidity	59%
Test Engineer	Vic Xiao	Configurations	Channel 8

	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Table Pos	Ant Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		deg	cm
	2494.300	62.98	-11.02	32.24	74.00	2.34	28.40	0.00	Peak	---	---
	2494.300	47.88	-6.12	17.14	54.00	2.34	28.40	0.00	Average	---	---

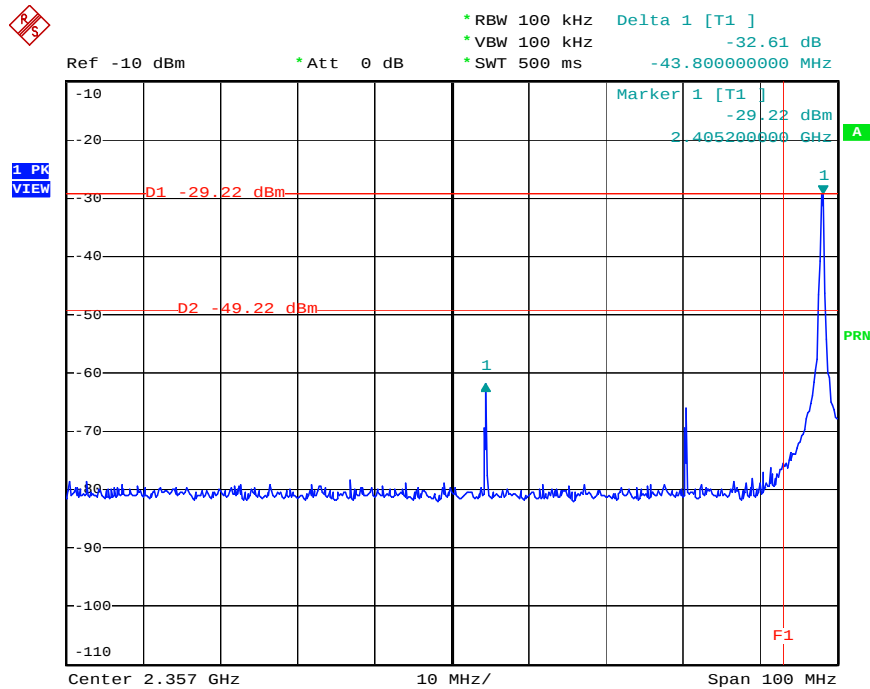
Note:

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

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

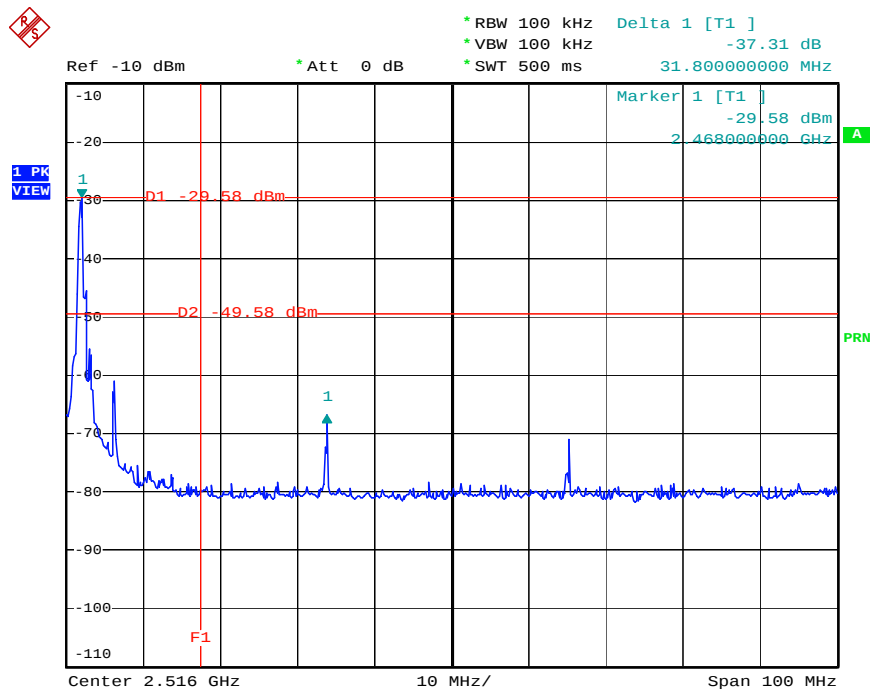
Receiving maximum band edge emissions are Vertical Polarization.

Low Band Edge Plot on 2405 MHz



Date: 9.JAN.2006 10:48:11

High Band Edge Plot on 2468 MHz



Date: 9.JAN.2006 10:47:17

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. Further, this requirement does not apply to intentional radiators that must be professionally installed.

4.6.2. Antenna Connector Construction

Please refer to section 3.3 in this test report, all antenna connectors comply with the requirements.

5. LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100174	9kHz – 2.75GHz	Oct. 19, 2005	Conduction (CO01-HY)
LISN	MessTec	NNB-2/16Z	2001/009	9kHz – 30MHz	Apr. 26, 2005	Conduction (CO01-HY)
LISN (Support Unit)	MessTec	NNB-2/16Z	2001/004	9kHz – 30MHz	Apr. 20, 2005	Conduction (CO01-HY)
EMI Filter	LINDGREN	LRE-2060	1004	< 450Hz	N/A	Conduction (CO01-HY)
EMI Filter	LINDGREN	N6006	201052	0 – 60Hz	N/A	Conduction (CO01-HY)
RF Cable-CON	Suhner Switzerland	RG223/U	CB029	9kHz – 30MHz	Dec. 22, 2005	Conduction (CO01-HY)
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30 MHz - 1 GHz 3m	Jun. 16, 2005	Radiation (03CH03-HY)
Amplifier	SCHAFFNER	CPA9231A	18667	9 kHz - 2 GHz	Jan. 10, 2005	Radiation (03CH03-HY)
Amplifier	Agilent	8449B	3008A02120	1 GHz - 26.5 GHz	May 31, 2005	Radiation (03CH03-HY)
Amplifier	MITEQ	AMF-6F-260400	923364	26.5 GHz - 40 GHz	Jan. 05, 2004*	Radiation (03CH03-HY)
Spectrum Analyzer	R&S	FSP40	100004/040	9 kHz - 40 GHz	Sep. 30, 2005	Radiation (03CH03-HY)
Loop Antenna	R&S	HFH2-Z2	860004/001	9 kHz - 30 MHz	May 24, 2004*	Radiation (03CH03-HY)
Biconical Antenna	SCHWARZBECK	VHBB 9124	301	30 MHz - 200 MHz	Jul. 22, 2005	Radiation (03CH03-HY)
Log Antenna	SCHWARZBECK	VUSLP 9111	221	200 MHz - 1 GHz	Jul. 22, 2005	Radiation (03CH03-HY)
Horn Antenna	EMCO	3115	6741	1 GHz - 18 GHz	Apr. 22, 2005	Radiation (03CH03-HY)
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15 GHz - 40 GHz	Jun. 09, 2004*	Radiation (03CH03-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	30 MHz - 1 GHz	Feb. 22, 2005	Radiation (03CH03-HY)
RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	1 GHz - 40 GHz	Dec.01, 2005	Radiation (03CH03-HY)
Turn Table	HD	DS 420	420/650/00	0 - 360 degree	N/A	Radiation (03CH03-HY)
Antenna Mast	HD	MA 240	240/560/00	1 m - 4 m	N/A	Radiation (03CH03-HY)
Spectrum analyzer	R&S	FSP30	100023	9kHz ~ 30GHz	Nov. 26, 2005	Conducted (TH01-HY)
Power meter	R&S	NRVS	100444	DC ~ 40GHz	Jul. 06, 2005	Conducted (TH01-HY)
Power sensor	R&S	NRV-Z55	100049	DC ~ 40GHz	Jul. 06, 2005	Conducted (TH01-HY)
Power Sensor	R&S	NRV-Z32	100057	30MHz ~ 6GHz	Apr. 28, 2005	Conducted (TH01-HY)
AC power source	HPC	HPA-500W	HPA-9100024	AC 0 ~ 300V	Apr. 21, 2005	Conducted (TH01-HY)
DC power source	G.W.	GPC-6030D	C671845	DC 1V ~ 60V	Dec. 28, 2005	Conducted (TH01-HY)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Temp. and Humidity Chamber	KSON	THS-C3L	612	N/A	Oct. 01, 2005	Conducted (TH01-HY)
RF CABLE-1m	Jye Bao	RG142	CB034-1m	20MHz ~ 7GHz	Dec. 30, 2005	Conducted (TH01-HY)
RF CABLE-2m	Jye Bao	RG142	CB035-2m	20MHz ~ 1GHz	Dec. 30, 2005	Conducted (TH01-HY)
Oscilloscope	Tektronix	TDS1012	CO38515	100MHz / 1GS/s	Apr. 15, 2005	Conducted (TH01-HY)
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Dec. 30, 2005	Conducted (TH01-HY)
Data Generator	Tektronix	DG2030	063-2920-50	0.1Hz ~ 400MHz	Jun. 02, 2005	Conducted (TH01-HY)

※ Calibration Interval of instruments listed above is one year.

* Calibration Interval of instruments listed above is two year.

6. SPORTON COMPANY PROFILE

SPORTON Lab. was established in 1986 with one shielded room: the first private EMI test facility, offering local manufacturers an alternative EMI test facility apart from ERSO. In 1988, one 3M and 10M/3M open area test site were setup and also obtained official accreditation from FCC, VCCI and NEMKO. In 1993, a Safety laboratory was founded and obtained accreditation from UL of USA, CSA of Canada and TUV (Rhineland & PS) of Germany. In 1995, one EMC lab, including EMI and EMS test facilities was setup. In 1997, SPORTON Group has provided financial expense to relocate the headquarter to Orient Scientific Park in Taipei Hsien to offer more comprehensive, more qualified and better service to local suppliers and manufactures. In 1999, Safety Group and Component Group were setup. In 2001, SPORTON has established 3M/10M chamber in Hwa Ya Technology Park.

6.1. Test Location

SHIJR	ADD : 6Fl., No. 106, Sec. 1, Shintai 5th Rd., Shijr City, Taipei, Taiwan 221, R.O.C. TEL : 02-2696-2468 FAX : 02-2696-2255
HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL : 03-327-3456 FAX : 03-318-0055
LINKOU	ADD : No. 30-2, Dingfu Tsuen, Linkou Shiang, Taipei, Taiwan 244, R.O.C TEL : 02-2601-1640 FAX : 02-2601-1695
DUNGHU	ADD : No. 3, Lane 238, Kangle St., Neihsu Chiu, Taipei, Taiwan 114, R.O.C. TEL : 02-2631-4739 FAX : 02-2631-9740
JUNGHE	ADD : 7Fl., No. 758, Jungjeng Rd., Junghe City, Taipei, Taiwan 235, R.O.C. TEL : 02-8227-2020 FAX : 02-8227-2626
NEIHU	ADD : 4Fl., No. 339, Hsin Hu 2 nd Rd., Taipei 114, Taiwan, R.O.C. TEL : 02-2794-8886 FAX : 02-2794-9777
JHUBEI	ADD : No.8, Lane 728, Bo-ai St., Jhubei City, Hsinchu County 302, Taiwan, R.O.C. TEL : 03-656-9065 FAX : 03-656-9085

7. CERTIFICATE OF NVLAP ACCREDITATION

United States Department of Commerce National Institute of Standards and Technology	
	
ISO/IEC 17025:1999 ISO 9002:1994	
Certificate of Accreditation	
SPORTON INTERNATIONAL, INC. TAIPEI HSIEN 221 TAIWAN	
<i>is recognized by the National Voluntary Laboratory Accreditation Program for satisfactory compliance with criteria set forth in NIST Handbook 150:2001, all requirements of ISO/IEC 17025:1999, and relevant requirements of ISO 9002:1994. Accreditation is awarded for specific services, listed on the Scope of Accreditation, for:</i>	
ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS	
December 31, 2005 <i>Effective through</i>	 For the National Institute of Standards and Technology NVLAP Lab Code: 200079-0

NVLAP-01C (06-01)