

FCC RADIO TEST REPORT

according to

47 CFR FCC Part 15 Subpart C § 15.247

Equipment	: Portable Data Collection Terminal
Model No.	: RH767
Brand Name	: unitech
Filing Type	: New Application
Applicant	: Unitech Electronics Co., Ltd. 3F, No.236, Sinhu 2 nd Rd., Neihu Chiu, Taipei, Taiwan114, R.O.C.
FCC ID	: HLERH767BTGD
Manufacturer	: Unitech Electronics Co., Ltd. 5F, No.136, Lan 235, Pao-Chiao Rd., Hsin-Tien City, Taipei Hsien, Taiwan, R.O.C.
Received Date	: May 18, 2007
Final Test Date	: Jul. 02, 2007

Statement

Test result included is only for the RFID of the product.

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

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

The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.4-2003** and **47 CFR FCC Part 15 Subpart C**.

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



SPORTON International Inc.

6F, No. 106, Sec. 1, Hsin Tai Wu Rd., Hsi Chih, Taipei Hsien, Taiwan, R.O.C.

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History of This Test Report

Original Issue Date: Jul. 02, 2007

Report No.: FR751105ZC

☒ No additional attachment.

☐ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

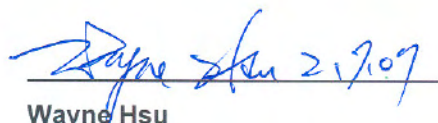
CERTIFICATE OF COMPLIANCE

according to

47 CFR FCC Part 15 Subpart C § 15.247

Equipment : Portable Data Collection Terminal
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3F, No.236, Sinhu 2nd Rd., Neihsu Chiu, Taipei, Taiwan114,
R.O.C.

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on May 18, 2007 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

SPORTON International Inc.

6F, No.106, Sec. 1, Hsin Tai Wu Rd., Hsi Chih, Taipei Hsien, Taiwan, R.O.C.

1. SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart C				
Part	Rule Section	Description of Test	Result	Under Limit
3.1	15.207	AC Power Line Conducted Emissions	Complies	5.81 dB
3.2	15.247(b)(2)	Maximum Peak Conducted Output Power	Complies	7.91 dB
3.3	15.247(a)(1)	Hopping Channel Separation	Complies	-
3.4	15.247(a)(1)	Number of Hopping Frequency	Complies	-
3.5	15.247(a)(1)	Dwell Time	Complies	-
3.6	15.247(d)	Radiated Emissions	Complies	1.05 dB
3.7	15.247(d)	Band Edge Emissions	Complies	-
3.8	15.203	Antenna Requirements	Complies	-

Test Items	Uncertainty	Remark
AC Power Line Conducted Emissions	$\pm 2.3\text{dB}$	Confidence levels of 95%
Maximum Peak Conducted Output Power	$\pm 0.8\text{dB}$	Confidence levels of 95%
Hopping Channel Separation	$\pm 8.5 \times 10^{-8}$	Confidence levels of 95%
Radiated Emissions (9kHz~30MHz)	$\pm 0.8\text{dB}$	Confidence levels of 95%
Radiated Emissions (30MHz~1000MHz)	$\pm 1.9\text{dB}$	Confidence levels of 95%
Radiated / Band Edge Emissions (1GHz~18GHz)	$\pm 1.9\text{dB}$	Confidence levels of 95%
Radiated Emissions (18GHz~40GHz)	$\pm 1.9\text{dB}$	Confidence levels of 95%
Temperature	$\pm 0.7^{\circ}\text{C}$	Confidence levels of 95%
Humidity	$\pm 3.2\%$	Confidence levels of 95%
DC / AC Power Source	$\pm 1.4\%$	Confidence levels of 95%

2. GENERAL INFORMATION

2.1. Product Details

EUT is a Portable Data Collection Terminal with IEEE 802.11b/g, Bluetooth and RFID radio functions. Only the radio detail of Bluetooth is shown in the table below. For more detailed features description, please refer to the manufacturer's specifications or user's manual.

Items	Description
Power Type	12VDC from adapter ; 7.4VDC from Li-ion battery
Modulation	FHSS (ASK)
Frequency Range	902 ~ 928MHz
Channel Number	129
Channel Band Width (99%)	325 kHz
Conducted Output Power	22.09 dBm

2.2. Accessories

Power	Brand	Model	Rating
Adapter 1	ENG	3A-251DA12	INPUT: 100-240VAC~50-60Hz, 0.8A OUTPUT: 12VDC 2.1A
Li-ion Battery	-	-	7.4VDC
Others			
Power Adapter Cable/ Battery Pack / Stylus / Synchronization and Power Cable / CD-ROM/ Quick Reference Guide			

2.3. Table for Filed Antenna

Ant.	Antenna Type	Connector	Gain (dBi)	Remark
1	Patch Antenna	MMCX	0.11	RFID

2.4. Table for Carrier Frequencies

Frequency Band	Channel No.	Frequency
902 ~ 928MHz	1	902.2 MHz
	2	902.4 MHz
	:	:
	64	914.8 MHz
	65	915 MHz
	66	915.2 MHz
	:	:
	127	927.6 MHz
	129	927.8 MHz

2.5. Table for Test Modes

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

Test Items	Mode	Channel	Antenna
AC Power Conducted Emissions	Adapter Mode	Hopping 1~129	1
Max. Conducted Output Power	RFID	1/65/129	NA
Hopping Channel Separation	RFID	1~2/64~65/128~129	NA
Number of Hopping Frequency	RFID	1~129	NA
Dwell Time	Hopping	1/65/129	NA
Radiated Emissions Below 1GHz	Normal+RFID Mode	Hopping 1~129	1
Radiated Emissions Above 1GHz	RFID	1/65/129	1
Band Edge Emissions	RFID	1/129	1

2.6. 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).

2.7. Table for Supporting Units

Support Unit	Brand	Model	FCC ID
Notebook	DELL	D400	DoC
Notebook	DELL	PP01L	DoC
Modem	ACEEX	DM1414	IFAXDM1414
Mouse (USB)	Microsoft	1004	DoC

2.8. Table for Parameters of Test Software Setting

During testing, Channel & Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Power Parameters of Bluetooth

Test Software Version	SkyeM9Demo		
Frequency	902.2 MHz	915 MHz	927.8 MHz
Power Parameters	20	20	20

2.9. EUT Operation during Test

An executive program, EMCTEST.EXE under WIN XP, which generates a complete line of continuously repeating “ H “ pattern was used as the test software.

The program was executed as follows :

Turn on the power of all equipment.

The NB reads the test program from the hard disk drive and runs it.

The NB sends “ H “ messages to the panel, and the panel displays “ H “ patterns on the screen.

The NB sends “ H “ messages to the modem.

At the same time, the following programs were executed:

Executed "Active Sync" to link with the EUT to receive and transmit data by USB cable.

Executed “BTHOST.EXE” to display the status of linking with the Bluetooth Tester.

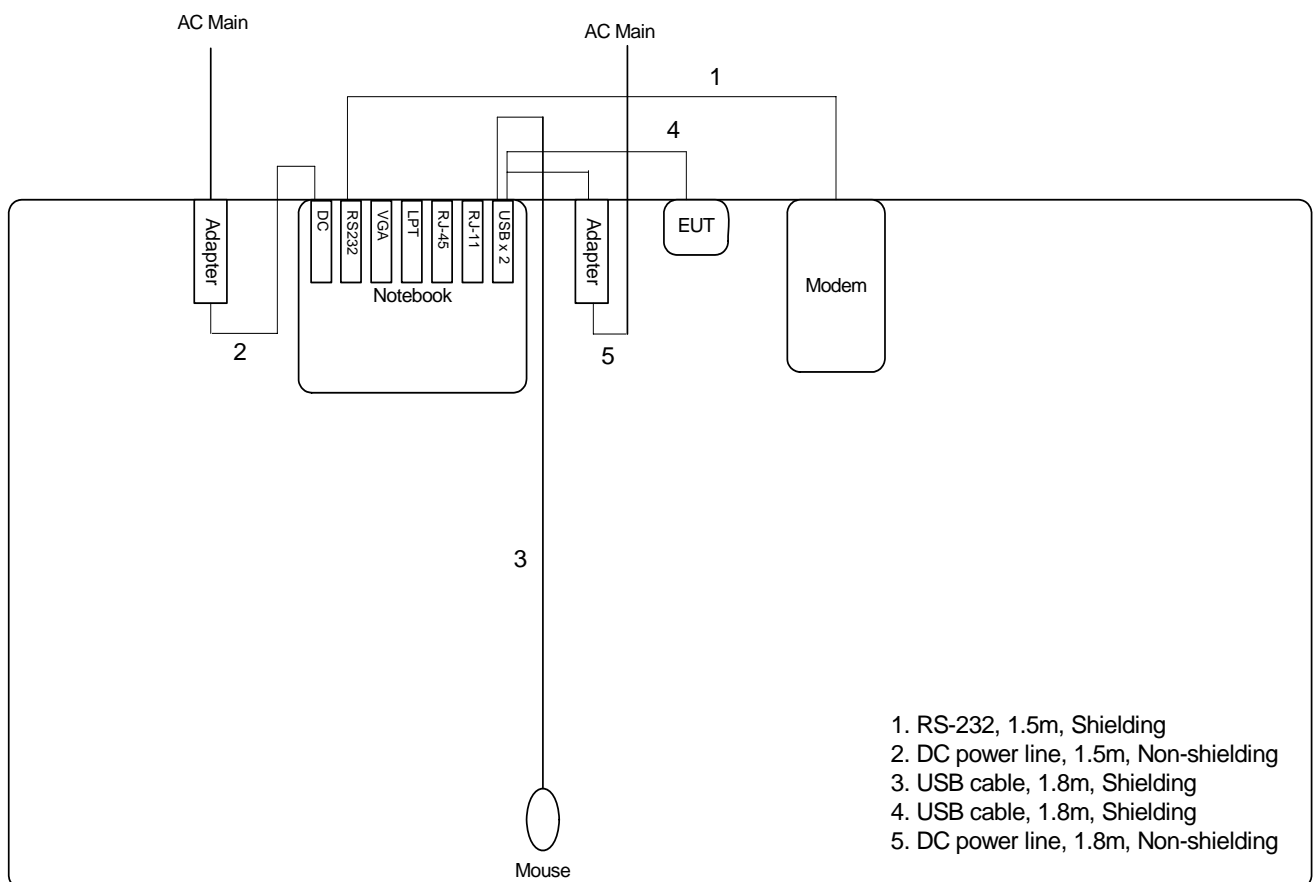
Executed "Scanner Settings Control Panel" to scan the barcode and transmit the barcode to Notebook.

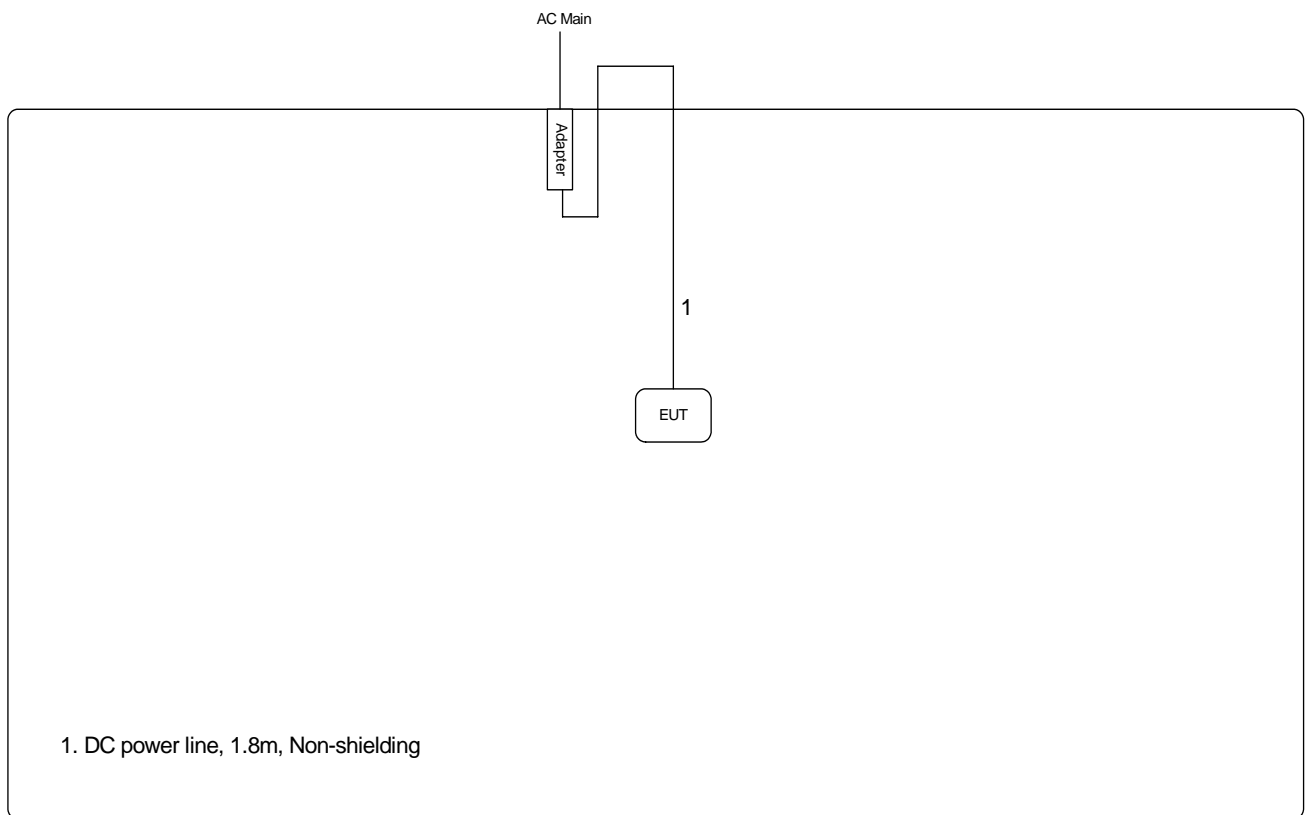
Executed “SDC Test, SKYM9DEMO” to keep transmitting signals at fixed frequency.

2.10. Test Configurations

2.10.1. Radiation Emissions Test Configuration

For radiated emissions above 30MHz



For radiated emissions above 1GHz

3. TEST RESULT

3.1. AC Power Line Conducted Emissions Measurement

3.1.1. 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

3.1.2. Measuring Instruments and Setting

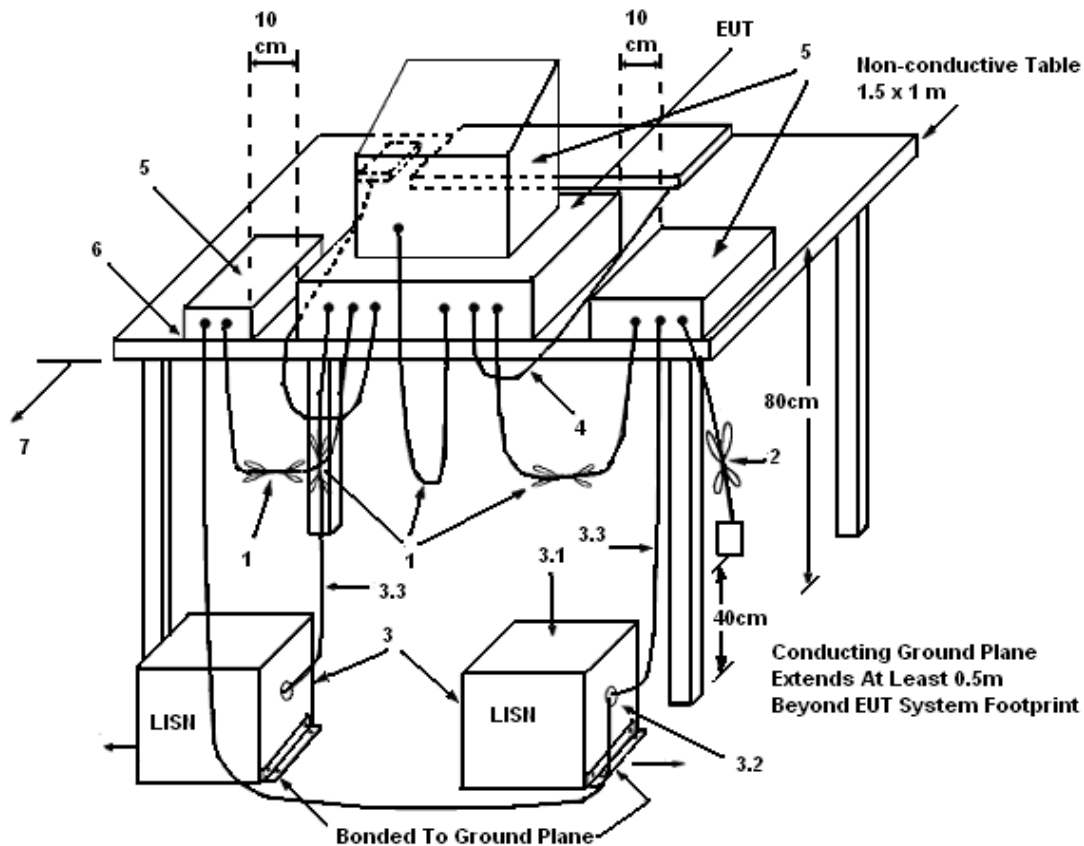
Please refer to section 4 of equipments list in this report. The following table is the setting of the receiver.

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

3.1.3. 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.

3.1.4. 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.

3.1.5. Test Deviation

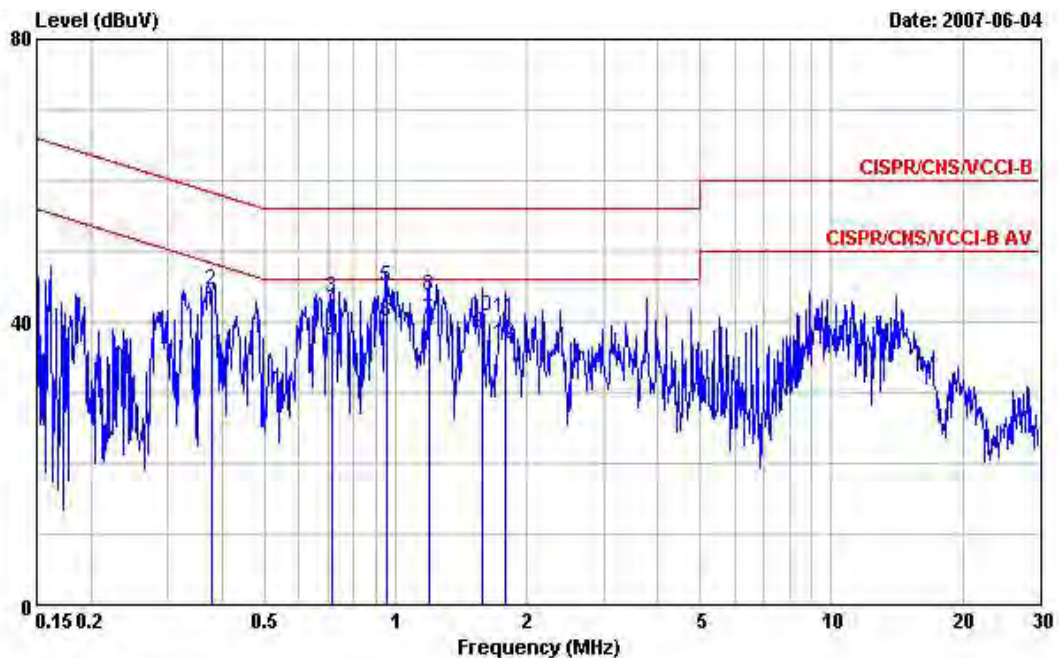
There is no deviation with the original standard.

3.1.6. EUT Operation during Test

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

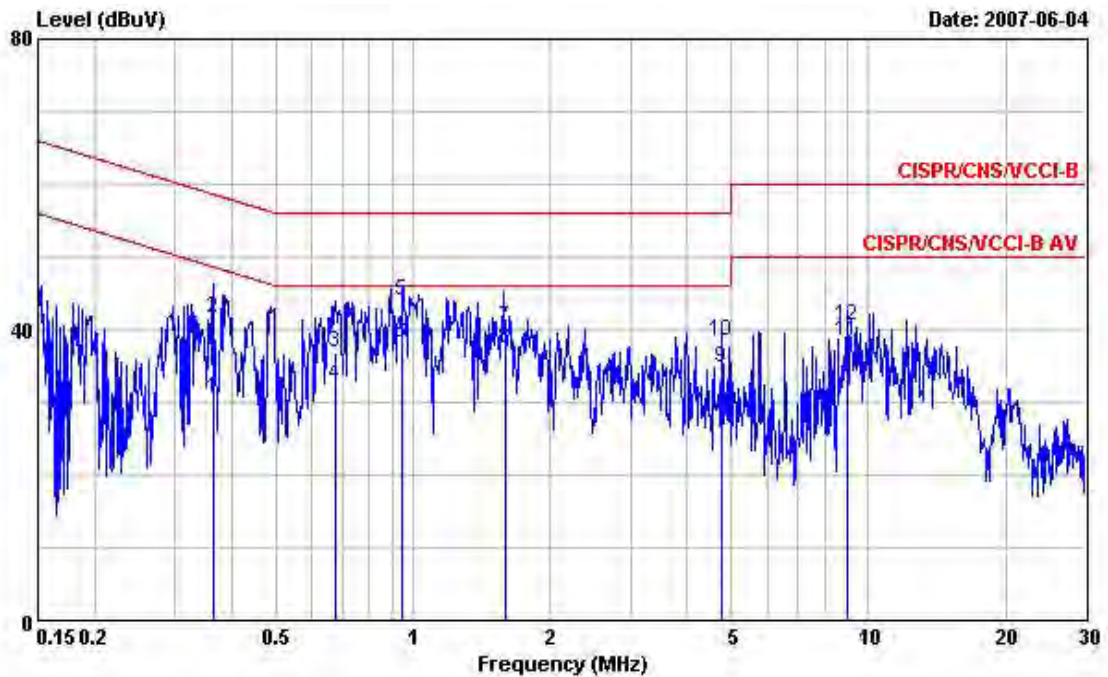
3.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	27°C	Humidity	46%
Test Engineer	Ted Chiu	Phase	Line
Configuration	Adapter Mode		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.3779650	41.53	-6.79	48.32	40.75	0.10	0.68	Average
2	0.3779650	44.50	-13.82	58.32	43.72	0.10	0.68	QP
3	0.7131940	43.30	-12.70	56.00	42.65	0.10	0.55	QP
4	0.7131940	36.89	-9.11	46.00	36.24	0.10	0.55	Average
5	0.9498700	45.02	-10.98	56.00	44.46	0.10	0.46	QP
6	0.9498700	39.97	-6.03	46.00	39.41	0.10	0.46	Average
7	1.190	40.19	-5.81	46.00	39.65	0.10	0.44	Average
8	1.190	43.72	-12.28	56.00	43.18	0.10	0.44	QP
9	1.587	38.38	-7.62	46.00	37.85	0.10	0.43	Average
10	1.587	40.87	-15.13	56.00	40.34	0.10	0.43	QP
11	1.786	40.41	-15.59	56.00	39.88	0.10	0.43	QP
12	1.786	36.72	-9.28	46.00	36.19	0.10	0.43	Average

Temperature	27°C	Humidity	46%
Test Engineer	Ted Chiu	Phase	Neutral
Configuration	Adapter Mode		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.3633820	30.56	-18.09	48.65	29.81	0.10	0.65	Average
2	0.3633820	41.54	-17.11	58.65	40.79	0.10	0.65	QP
3	0.6754350	36.97	-19.03	56.00	36.30	0.10	0.57	QP
4	0.6754350	32.47	-13.53	46.00	31.80	0.10	0.57	Average
5	0.9480900	43.92	-12.08	56.00	43.36	0.10	0.46	QP
6	0.9480900	38.16	-7.84	46.00	37.60	0.10	0.46	Average
7	1.590	40.36	-15.64	56.00	39.83	0.10	0.43	QP
8	1.590	37.35	-8.65	46.00	36.82	0.10	0.43	Average
9	4.764	34.65	-11.35	46.00	34.13	0.22	0.30	Average
10	4.764	38.30	-17.70	56.00	37.78	0.22	0.30	QP
11	9.010	38.44	-11.56	50.00	37.92	0.29	0.23	Average
12	9.010	40.54	-19.46	60.00	40.02	0.29	0.23	QP

Note:

Level = Read Level + LISN Factor + Cable Loss.

3.2. Maximum Peak Output Power Measurement

3.2.1. Limit

For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels. The limit has to be reduced by the amount in dB that the gain of the antenna exceeds 6dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

3.2.2. Measuring Instruments and Setting

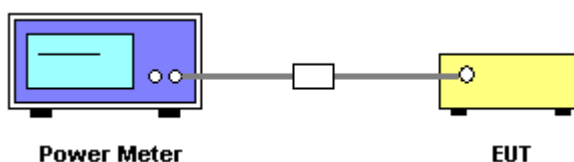
Please refer to section 4 of equipments list in this report. The following table is the setting of the power meter.

Power Meter Parameter	Setting
Filter No.	Auto
Measurement time	0.135 s ~ 26 s
Used Peak Sensor	NRV-Z32 (model 04)

3.2.3. Test Procedures

1. The transmitter output (antenna port) was connected to the power meter.
2. Turn on the EUT and power meter and then record the peak power value.
3. Repeat above procedures on all channels needed to be tested.

3.2.4. Test Setup Layout



3.2.5. Test Deviation

There is no deviation with the original standard.

3.2.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.2.7. Test Result of Maximum Peak Output Power

Temperature	26.8℃	Humidity	54%
Test Engineer	Murphy Lin	Configurations	RFID

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	902.2 MHz	22.09	30.00	Complies
65	915 MHz	22.05	30.00	Complies
129	927.8 MHz	22.03	30.00	Complies

3.3. Hopping Channel Separation Measurement

3.3.1. Limit

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

3.3.2. Measuring Instruments and Setting

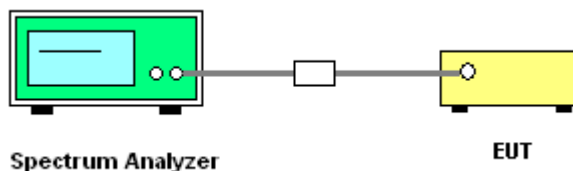
Please refer to section 4 of equipments list in this report. The following table is the setting of spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RB	10 kHz (20dB Bandwidth) / 100 kHz (Channel Separation)
VB	10 kHz (20dB Bandwidth) / 100 kHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

3.3.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
2. The resolution bandwidth of 10 kHz and the video bandwidth of 10 kHz were utilised for 20 dB bandwidth measurement.
3. The resolution bandwidth of 100 kHz and the video bandwidth of 100 kHz were utilised for channel separation measurement.

3.3.4. Test Setup Layout



3.3.5. Test Deviation

There is no deviation with the original standard.

3.3.6. EUT Operation during Test

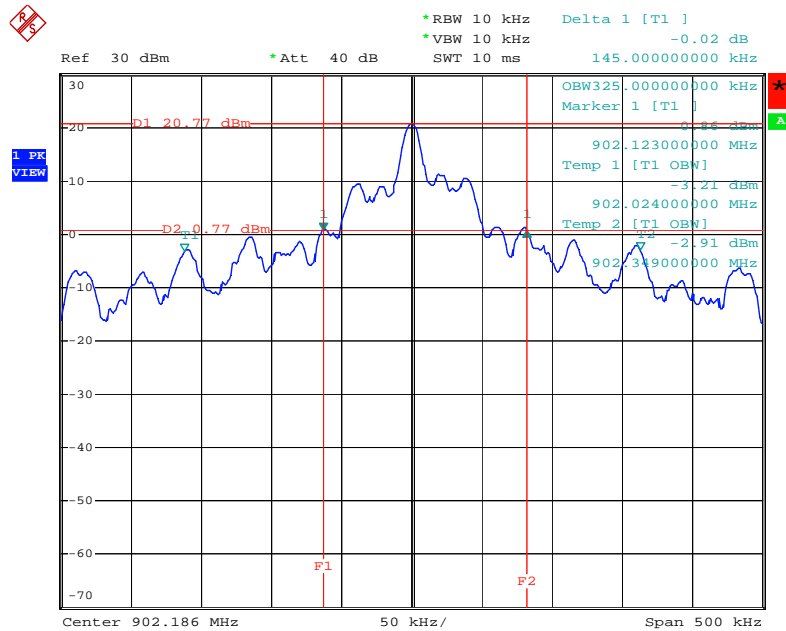
The EUT was programmed to be in continuously transmitting mode.

3.3.7. Test Result of Hopping Channel Separation

Temperature	26.8°C	Humidity	54%
Test Engineer	Murphy Lin	Configurations	RFID

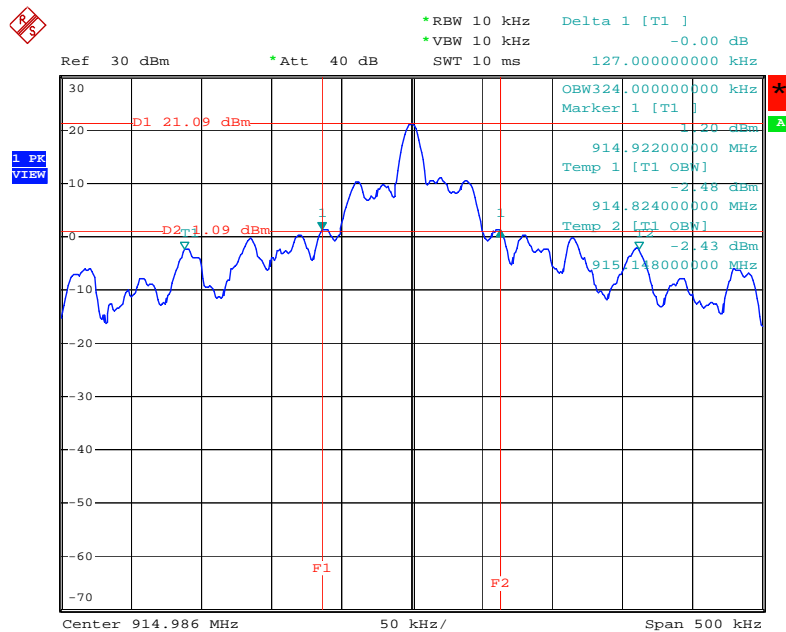
Frequency	Ch. Separation (kHz)	20dB Bandwidth (kHz)	99% Occupied Bandwidth (kHz)	Result
902.2 MHz	200.00	145.00	325.00	Complies
915 MHz	200.00	127.00	324.00	Complies
927.8 MHz	200.00	127.00	325.00	Complies

20 dB Bandwidth Plot on Channel 1 / 902.2 MHz



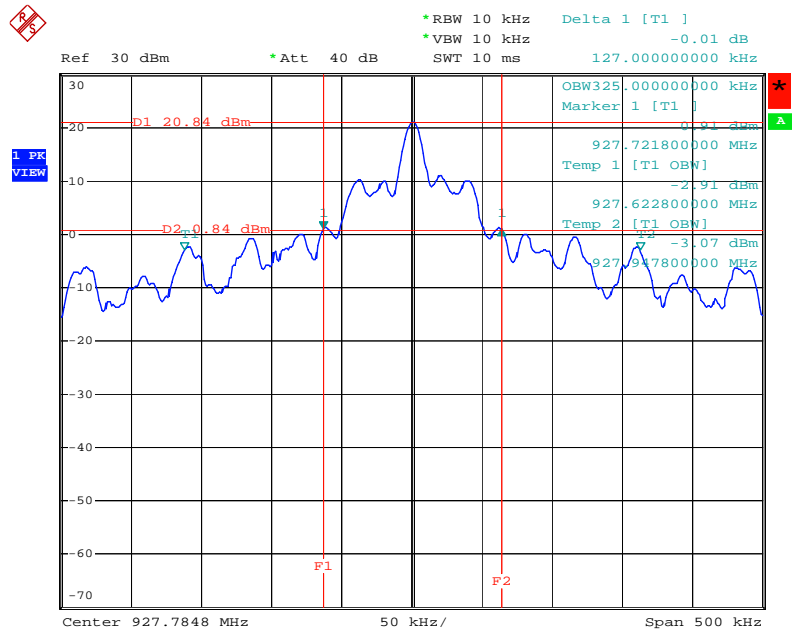
Date: 29.JUN.2007 11:48:57

20 dB Bandwidth Plot on Channel 65 / 915 MHz



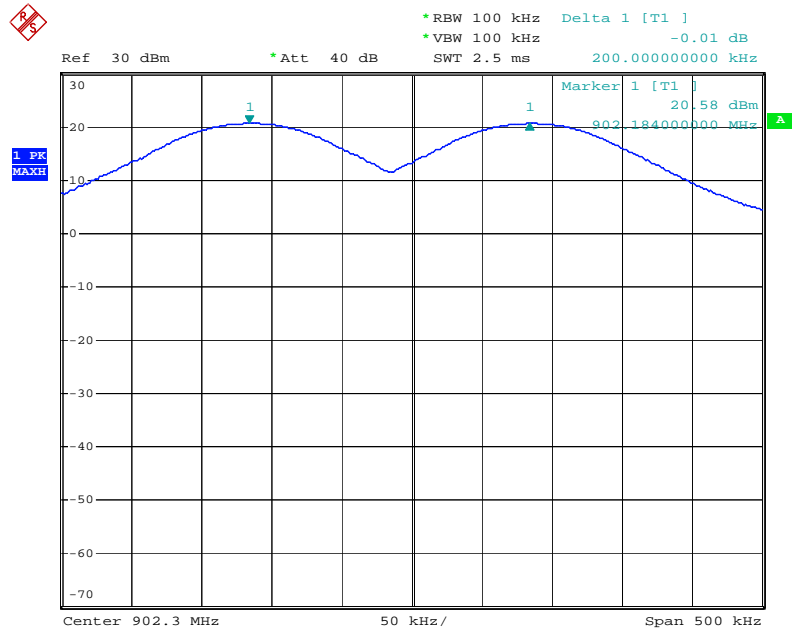
Date: 29.JUN.2007 11:41:29

20 dB Bandwidth Plot on Channel 129 / 927.8 MHz



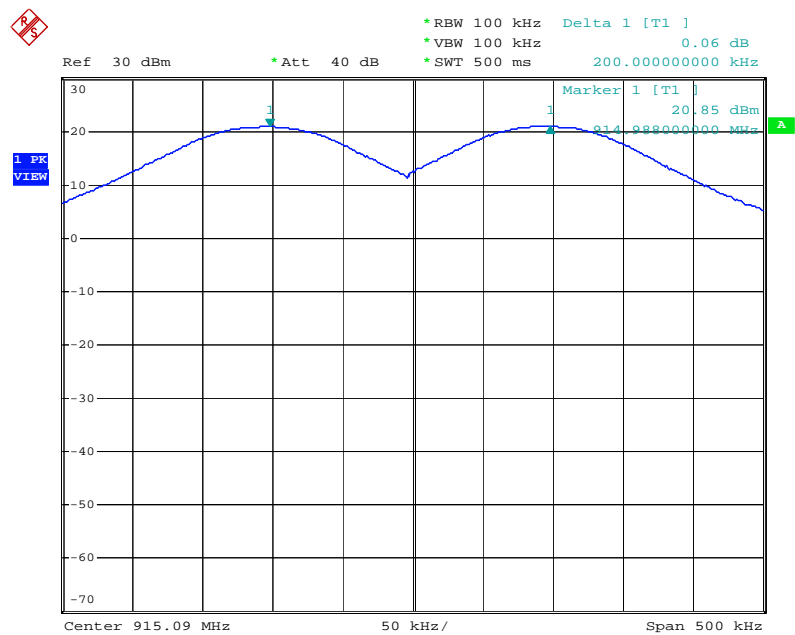
Date: 29.JUN.2007 11:34:58

Channel Separation Plot on Channel 1~2 / 902.2 MHz ~ 902.4 MHz



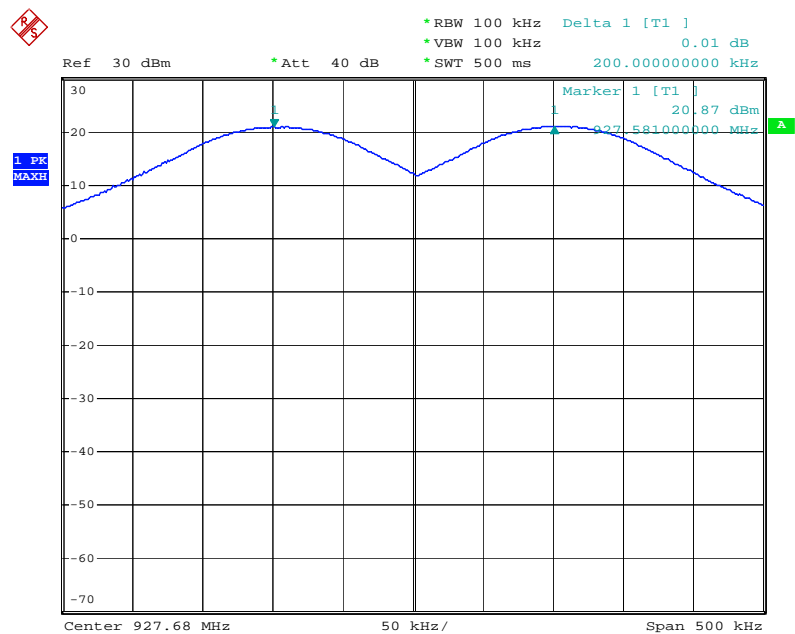
Date: 2.JUL.2007 04:41:51

Channel Separation Plot on Channel 65~66 / 915 MHz ~ 915.2 MHz



Date: 2.JUL.2007 06:38:21

Channel Separation Plot on Channel 128~129 / 927.6 MHz ~ 927.8 MHz



Date: 2.JUL.2007 06:45:59

3.4. Number of Hopping Frequency Measurement

3.4.1. Limit

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

3.4.2. Measuring Instruments and Setting

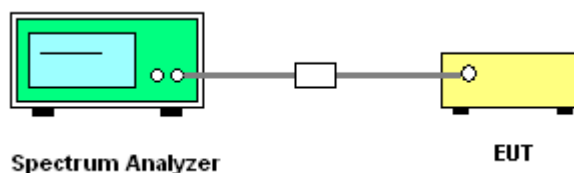
Please refer to section 4 of equipments list in this report. The following table is the setting of spectrum analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> Operating Frequency Range
RB	10 kHz
VB	10 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

3.4.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
2. The resolution bandwidth of 10 kHz and the video bandwidth of 10 kHz were utilised.
3. Observe frequency hopping in 902-928 MHz, there are at least 50 non-overlapping channels.

3.4.4. Test Setup Layout



3.4.5. Test Deviation

There is no deviation with the original standard.

3.4.6. EUT Operation during Test

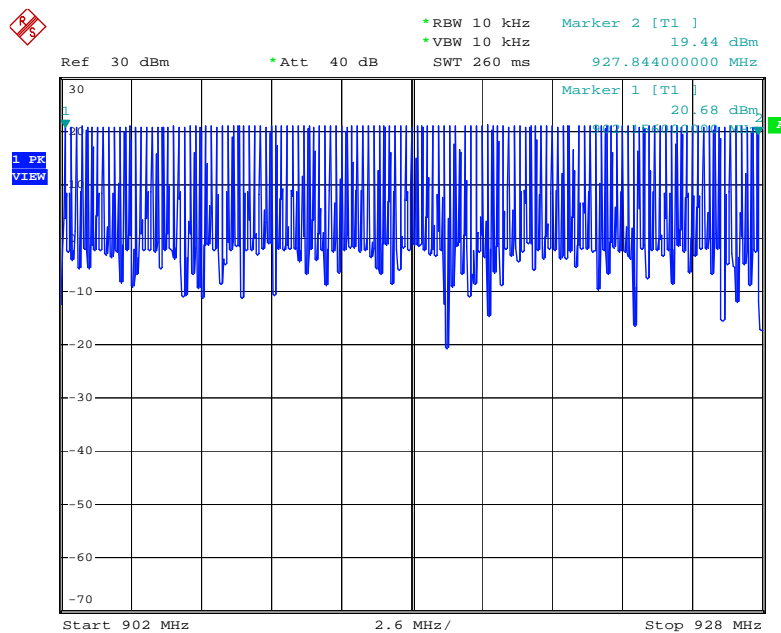
The EUT was programmed to be in continuously transmitting mode.

3.4.7. Test Result of Number of Hopping Frequency

Temperature	26.8°C	Humidity	54%
Test Engineer	Murphy Lin	Configurations	RFID

Modulation Type	Channel No.	Frequency (MHz)	Hopping Ch. (Channels)	Min. Limit (Channels)	Test Result
ASK	1~129	902.2 ~ 927.8	129	50	Complies

Number of Hopping Channel Plot on Channel 1~129 / 902.2 MHz ~ 927.8 MHz



Date: 22.JUN.2007 09:47:09

3.5. Dwell Time Measurement

3.5.1. Limit

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

3.5.2. Measuring Instruments and Setting

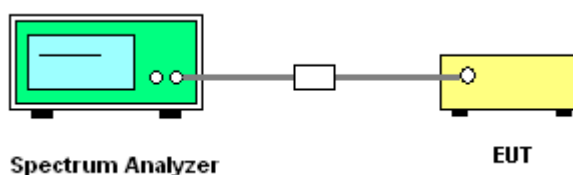
Please refer to section 4 of equipments list in this report. The following table is the setting of spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	0 MHz
RB	100 kHz
VB	300 kHz
Detector	Peak
Trace	Single Trigger

3.5.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyser
2. Set RBW of spectrum analyzer to 100kHz and VBW to 300kHz.
3. Use a video trigger with the trigger level set to enable triggering only on full pulses.
4. Sweep Time is more than once pulse time.
5. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
6. Measure the maximum time duration of one single pulse.
7. Count the number of pulses in the dwell time duration.
8. $\text{Dwell time} = \text{pulse duration} \times \text{number of pulses} / \text{measure time} \times \text{dwell time duration}$.

3.5.4. Test Setup Layout



3.5.5. Test Deviation

There is no deviation with the original standard.

3.5.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

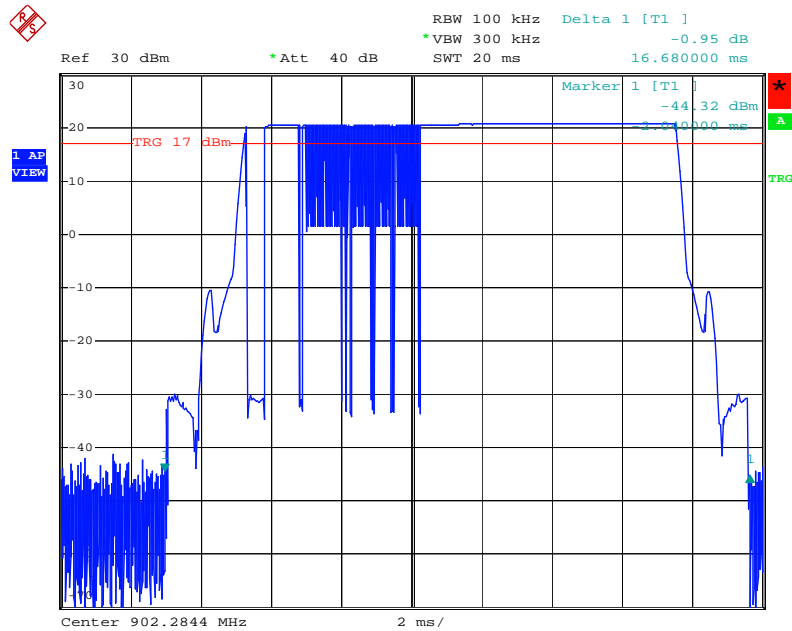
3.5.7. Test Result of Dwell Time

Temperature	26.8°C	Humidity	54%
Test Engineer	Murphy Lin	Configurations	Hopping

Frequency	Pulse Duration (ms)	Number of Pulses	Measure Time (s)	Dwell time duration (s)	Dwell Time (s)	Limits (s)	Test\ Result
902.2 MHz	16.6800	9	20	20	0.1501	0.4000	Complies
915 MHz	14.8800	13	20	20	0.1934	0.4000	Complies
927.8 MHz	16.6600	9	20	20	0.1499	0.4000	Complies

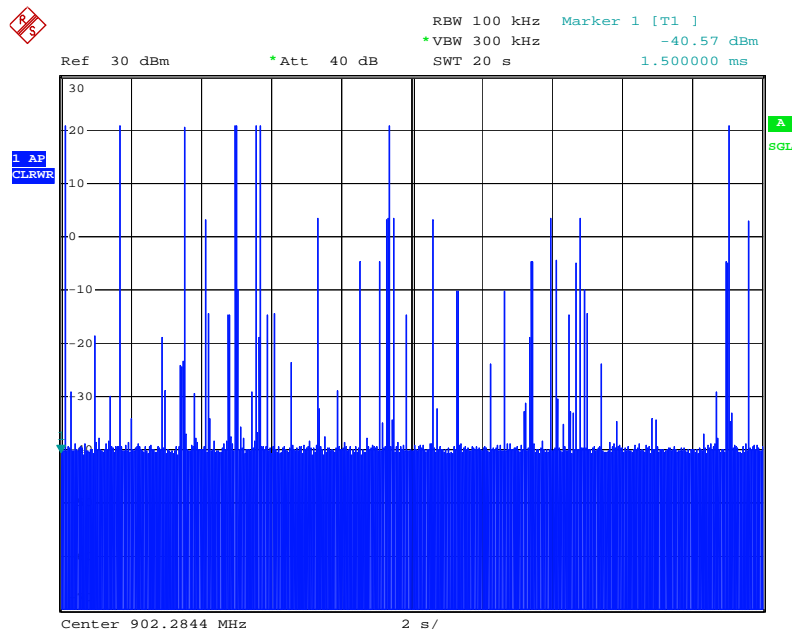
Note: Dwell time=pulse duration x number of pulses / measure time x dwell time duration

Single Pulse Plot on Channel 1 / 902.2 MHz



Date: 29.JUN.2007 08:06:12

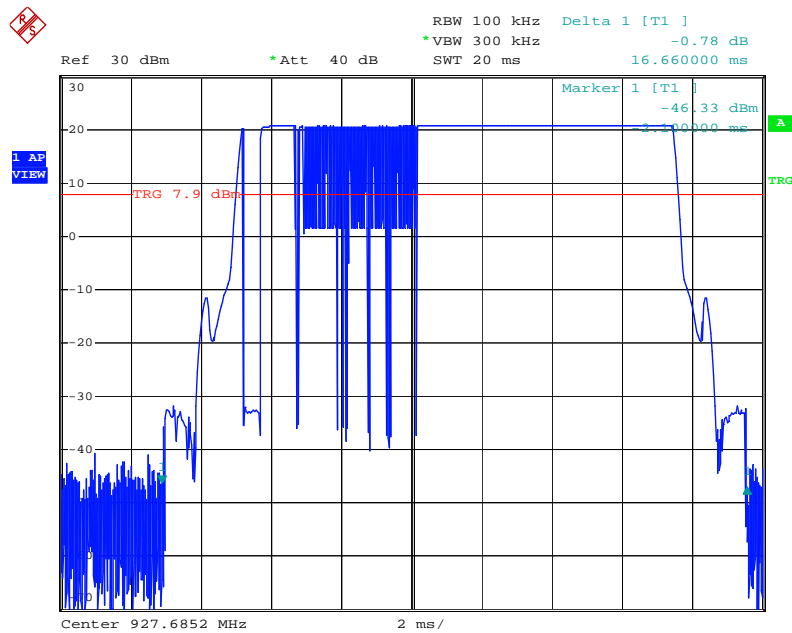
Number of Pulses Plot on Channel 1 / 902.2 MHz



Date: 29.JUN.2007 08:02:35

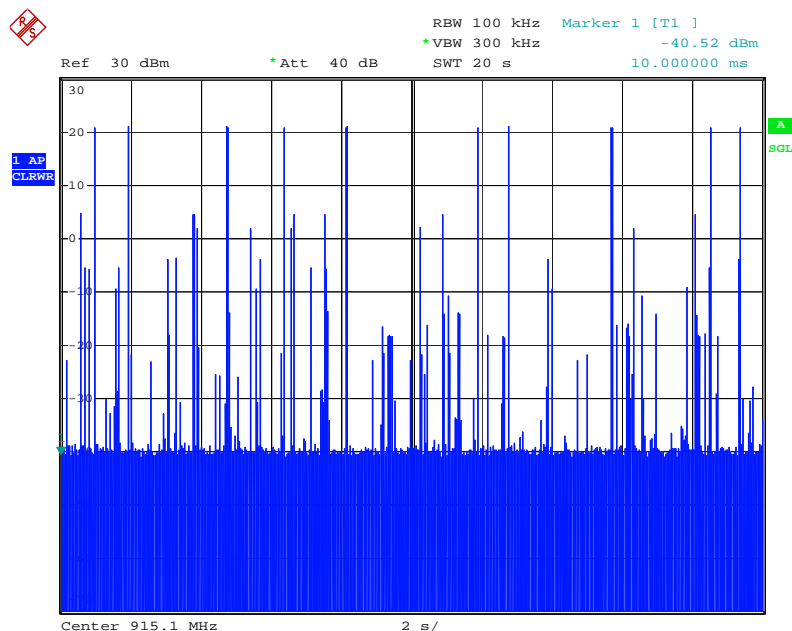
Note: Below 10dBm of the pulse emissions were adjacent channel emission.

Single Pulse Plot on Channel 65 / 915 MHz



Date: 29.JUN.2007 08:13:07

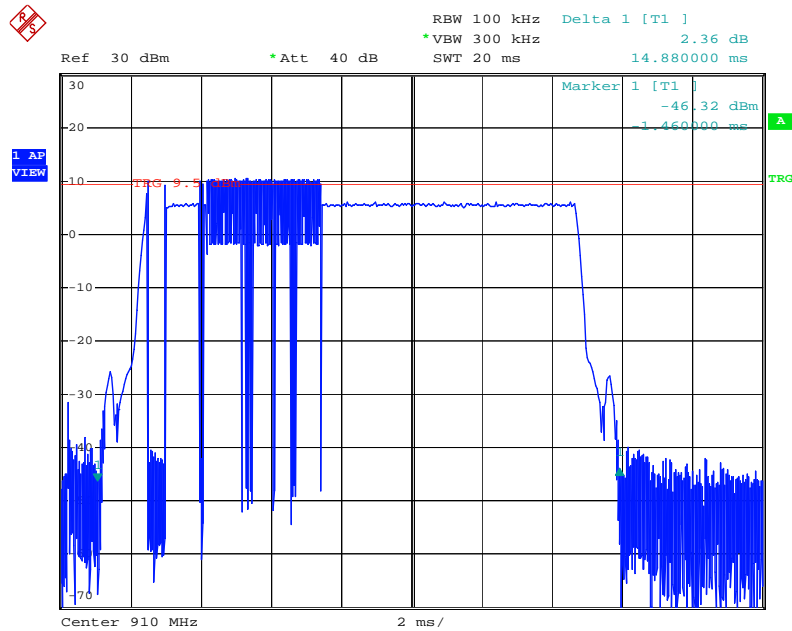
Number of Pulses Plot on Channel 65 / 915 MHz



Date: 28.JUN.2007 12:20:19

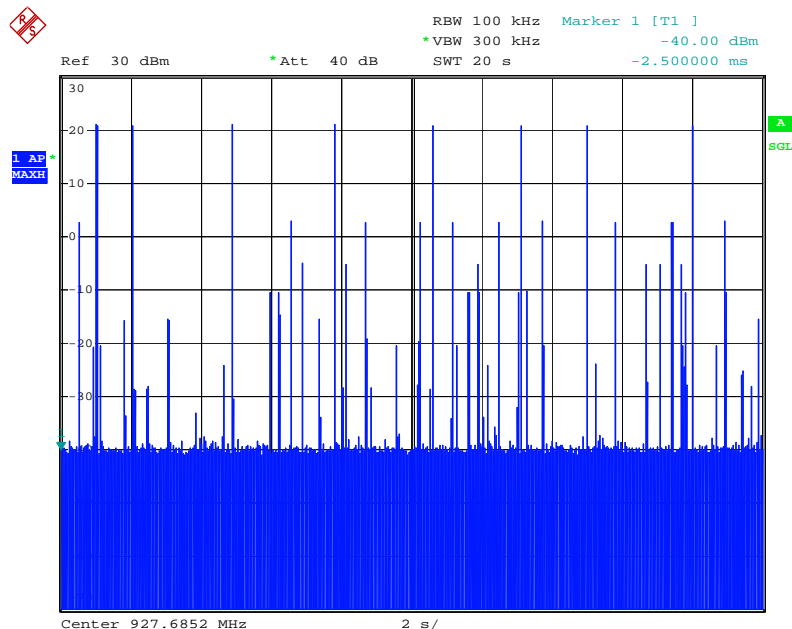
Note: Below 10dBm of the pulse emissions were adjacent channel emission.

Single Pulse Plot on Channel 129 / 927.8 MHz



Date: 28.JUN.2007 13:40:59

Number of Pulses Plot on Channel 129 / 927.8 MHz



Date: 29.JUN.2007 08:11:17

Note: Below 10dBm of the pulse emissions were adjacent channel emission.

3.6. Radiated Emissions Measurement

3.6.1. Limit

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on , then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

3.6.2. Measuring Instruments and Setting

Please refer to section 4 of equipments list in this report. The following table is the setting of spectrum analyzer and receiver.

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

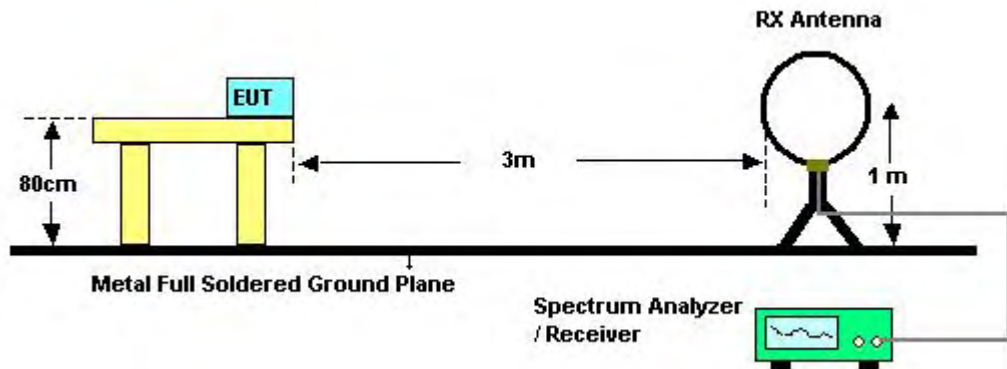
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.6.3. Test Procedures

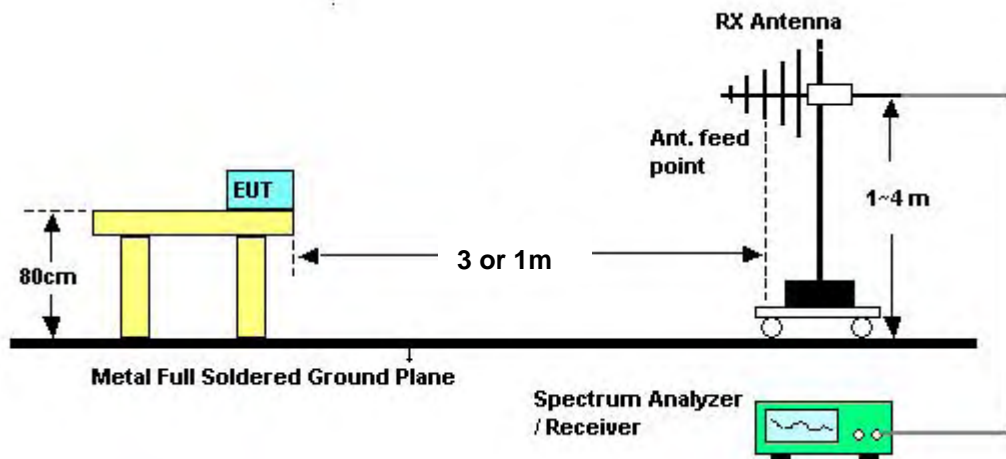
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting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

3.6.4. 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].

3.6.5. Test Deviation

There is no deviation with the original standard.

3.6.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

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

Temperature	26°C	Humidity	54%
Test Engineer	Vic Hsiao		

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

Note:

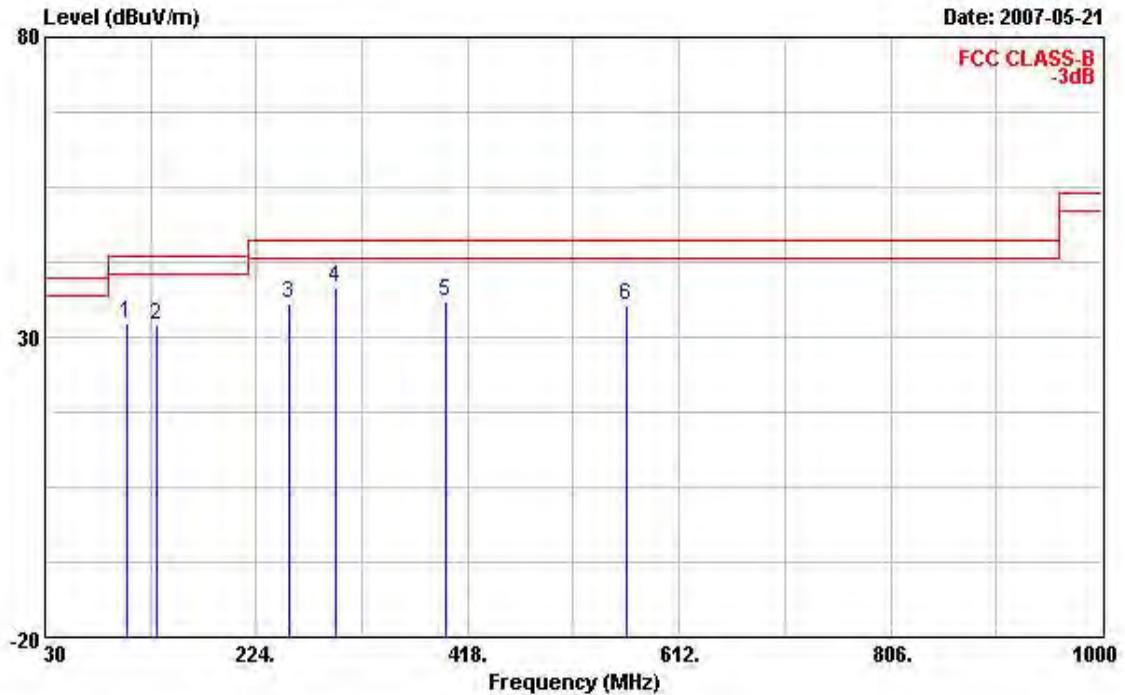
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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

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

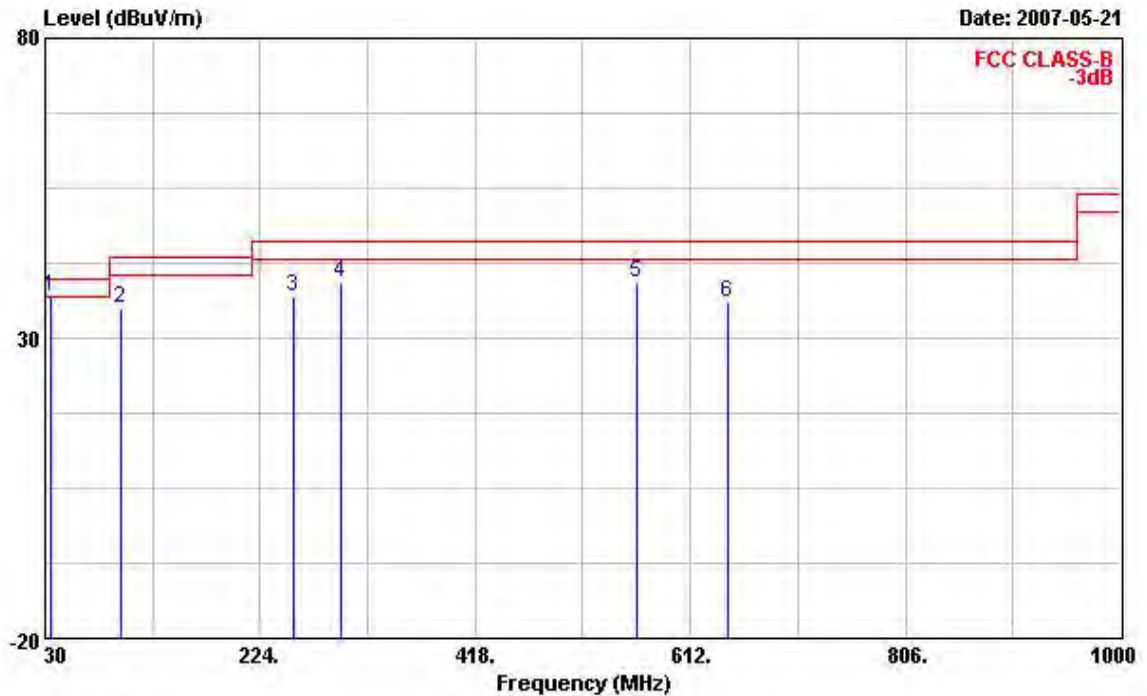
3.6.8. Results of Radiated Emissions (30MHz~1GHz)

Temperature	26°C	Humidity	54%
Test Engineer	Vic Hsiao	Configurations	Normal+RFID Mode

Horizontal

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamp Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 @	105.660	32.17	-11.33	43.50	45.25	11.92	2.77	27.77	Peak	---	---
2 @	132.820	32.11	-11.39	43.50	44.98	12.10	2.96	27.93	Peak	---	---
3 @	254.070	35.45	-10.55	46.00	46.79	13.08	3.74	28.16	Peak	---	---
4 @	296.750	38.20	-7.80	46.00	49.49	13.53	3.71	28.53	Peak	---	---
5 @	397.630	35.86	-10.14	46.00	44.23	16.38	4.29	29.04	Peak	---	---
6 @	564.470	35.42	-10.58	46.00	40.92	19.30	4.77	29.57	Peak	---	---

Vertical



	Freq	Level	Over Limit	Limit Line	ReadAntenna 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 @	35.820	36.86	-3.14	40.00	47.12	14.94	2.50	27.70	QP	---	---
2 @	98.870	34.86	-8.64	43.50	48.68	11.03	2.86	27.71	Peak	---	---
3 @	254.070	36.76	-9.24	46.00	48.10	13.08	3.74	28.16	Peak	---	---
4 @	296.750	39.15	-6.85	46.00	50.44	13.53	3.71	28.53	Peak	---	---
5 @	564.470	39.23	-6.77	46.00	44.73	19.30	4.77	29.57	Peak	---	---
6 @	645.950	36.07	-9.93	46.00	41.26	19.60	5.02	29.81	Peak	---	---

Note:

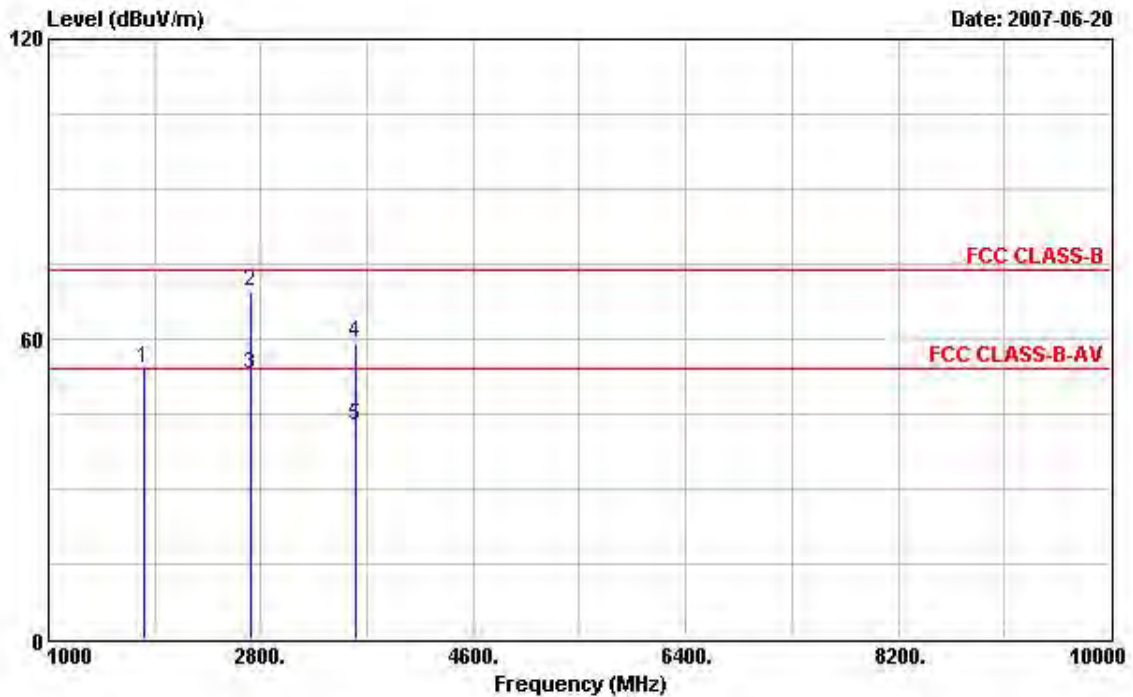
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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

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

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

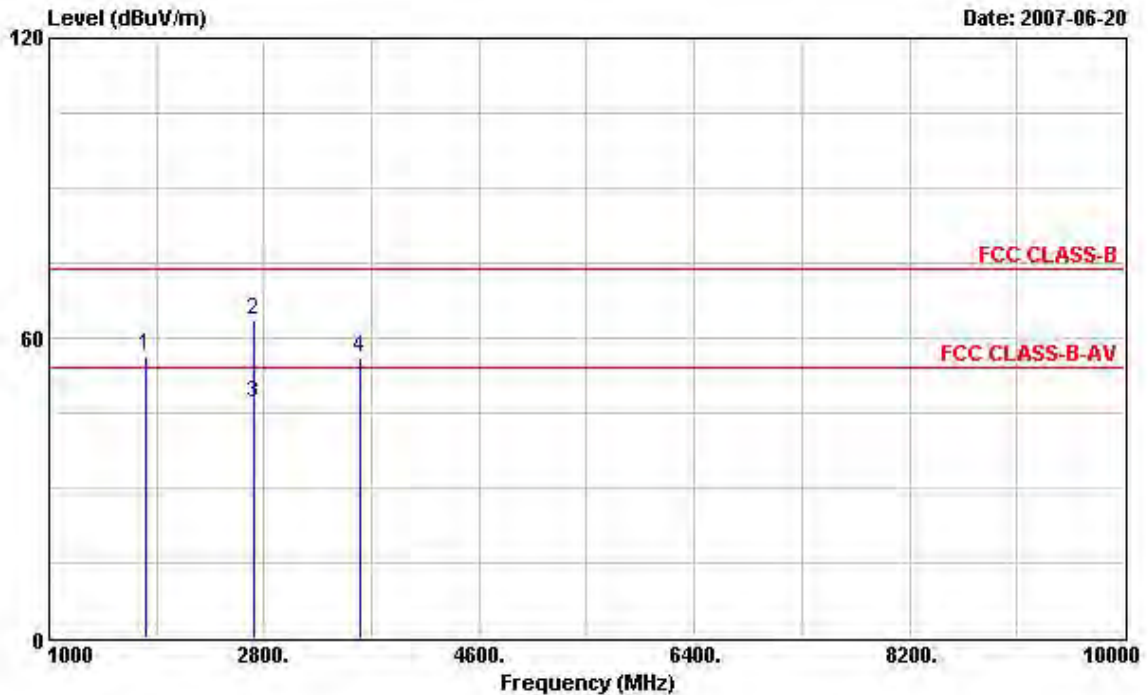
Temperature	26°C	Humidity	54%
Test Engineer	Vic Hsiao	Configurations	Channel 1

Horizontal

	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	1804.000	53.98			57.66	26.66	2.44	32.78 Peak	---	---
2 @	2708.000	69.51	-4.49	74.00	70.36	29.14	3.04	33.03 Peak	---	---
3 @	2708.000	52.95	-1.05	54.00	53.80	29.14	3.04	33.03 Average	---	---
4	3608.000	59.37	-14.63	74.00	56.95	31.39	3.69	32.66 PEAK	---	---
5 @	3608.000	42.81	-11.19	54.00	40.39	31.39	3.69	32.66 Average	---	---

Note: Items 1 is on un-restricted band, so the limit is -20dBc for the field strength of the fundamental emissions (see section 3.7.7).

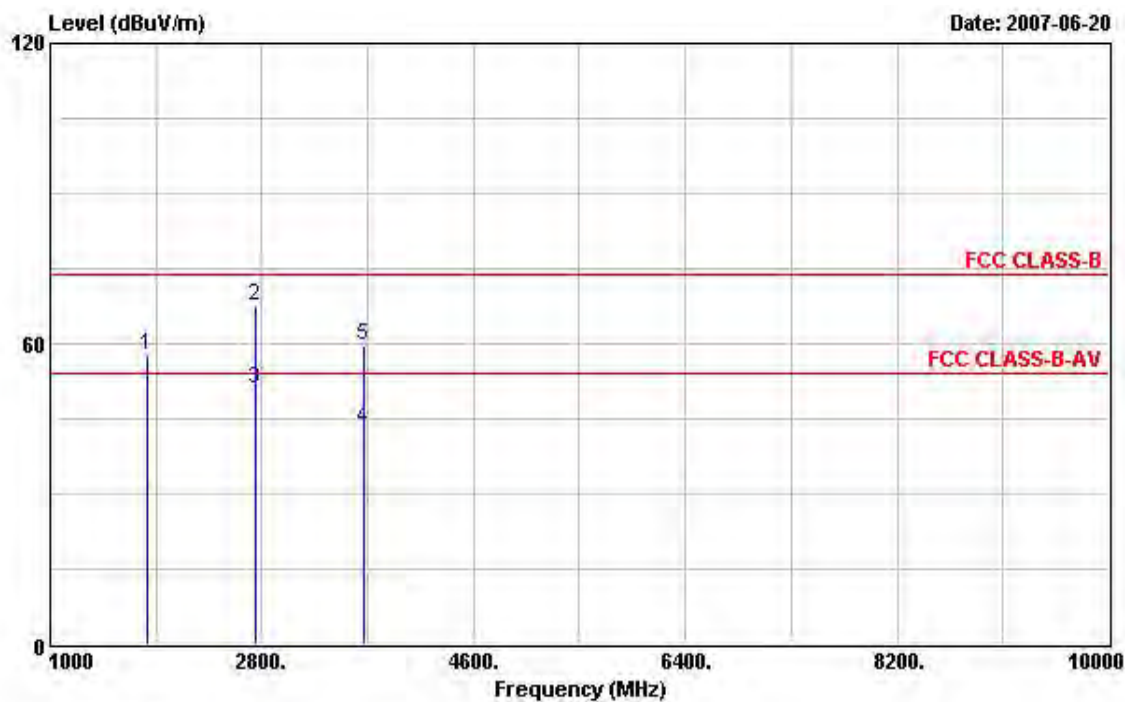
Vertical



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pos
			dB	dBuV/m	dBuV	dB/m	dB	dB		deg
1	1804.000	56.29			59.97	26.66	2.44	32.78	Peak	---
2 @	2708.000	63.39	-10.61	74.00	64.24	29.14	3.04	33.03	Peak	---
3 @	2708.000	46.83	-7.17	54.00	47.68	29.14	3.04	33.03	Average	---
4	3608.000	55.95			53.54	31.39	3.69	32.66	PEAK	---

Note: Items 1 and 4 are on un-restricted band, so the limit is -20dBc for the field strength of the fundamental emissions (see section 3.7.7).

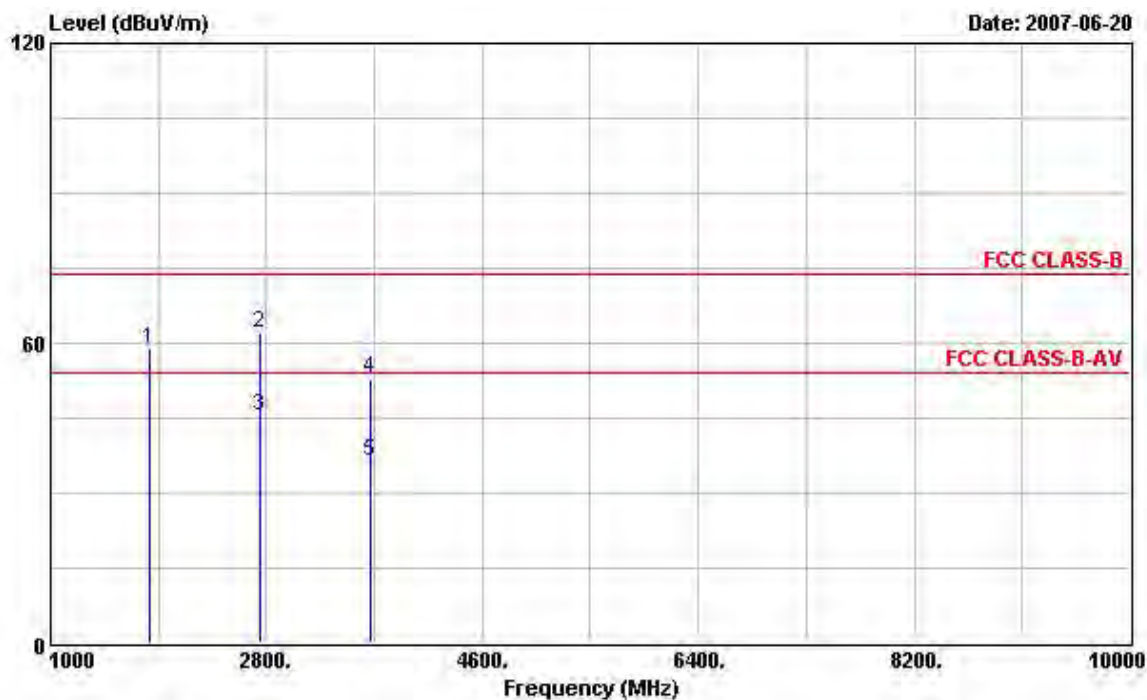
Temperature	26°C	Humidity	54%
Test Engineer	Vic Hsiao	Configurations	Channel 65

Horizontal

	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Remark	Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor		Pos	Pos
			dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	1828.000	57.63			61.17	26.80	2.44	32.78	PEAK	---	---
2 @	2748.000	67.64	-6.36	74.00	68.25	29.30	3.06	32.97	PEAK	---	---
3 @	2748.000	51.08	-2.92	54.00	51.69	29.30	3.06	32.97	Average	---	---
4 @	3660.000	42.85	-11.15	54.00	40.23	31.53	3.73	32.65	Average	---	---
5	3660.000	59.41	-14.59	74.00	56.79	31.53	3.73	32.65	PEAK	---	---

Note: Items 1 is on un-restricted band, so the limit is -20dBc for the field strength of the fundamental emissions (see section 3.7.7).

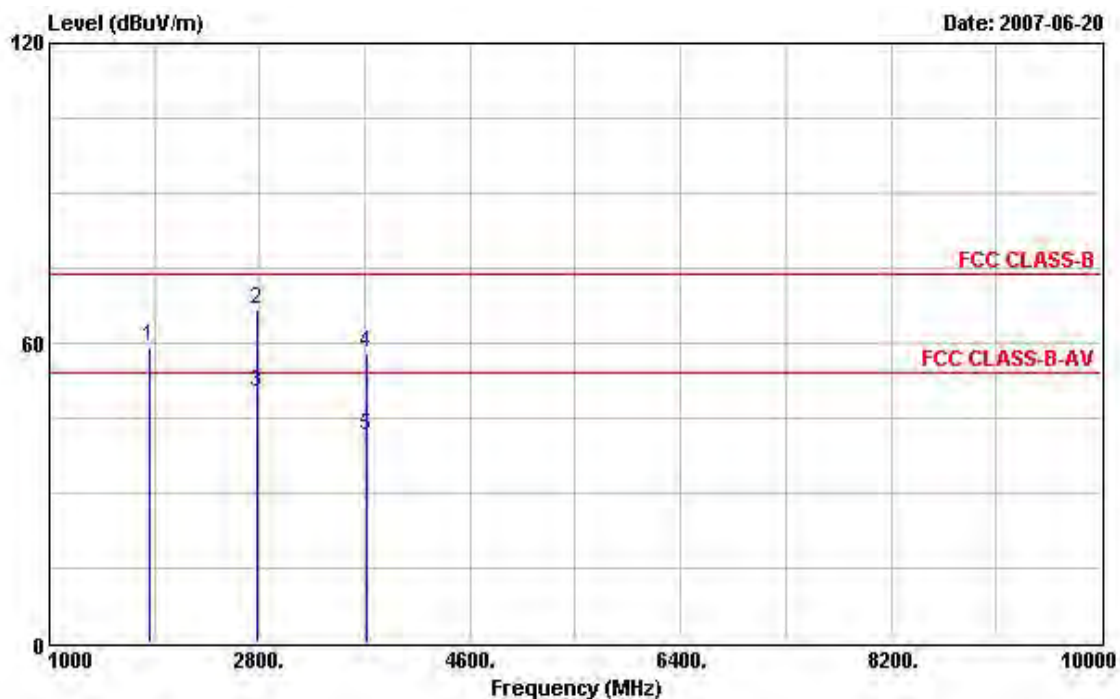
Vertical



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		deg
1	1828.000	58.69			62.23	26.80	2.44	32.78	Peak	---
2	2748.000	61.78	-12.22	74.00	62.39	29.30	3.06	32.97	Peak	---
3 @	2748.000	45.22	-8.78	54.00	45.83	29.30	3.06	32.97	Average	---
4	3660.000	52.81	-21.19	74.00	50.19	31.53	3.73	32.65	Peak	---
5	3660.000	36.25	-17.75	54.00	33.63	31.53	3.73	32.65	Average	---

Note: Items 1 is on un-restricted band, so the limit is -20dBc for the field strength of the fundamental emissions (see section 3.7.7).

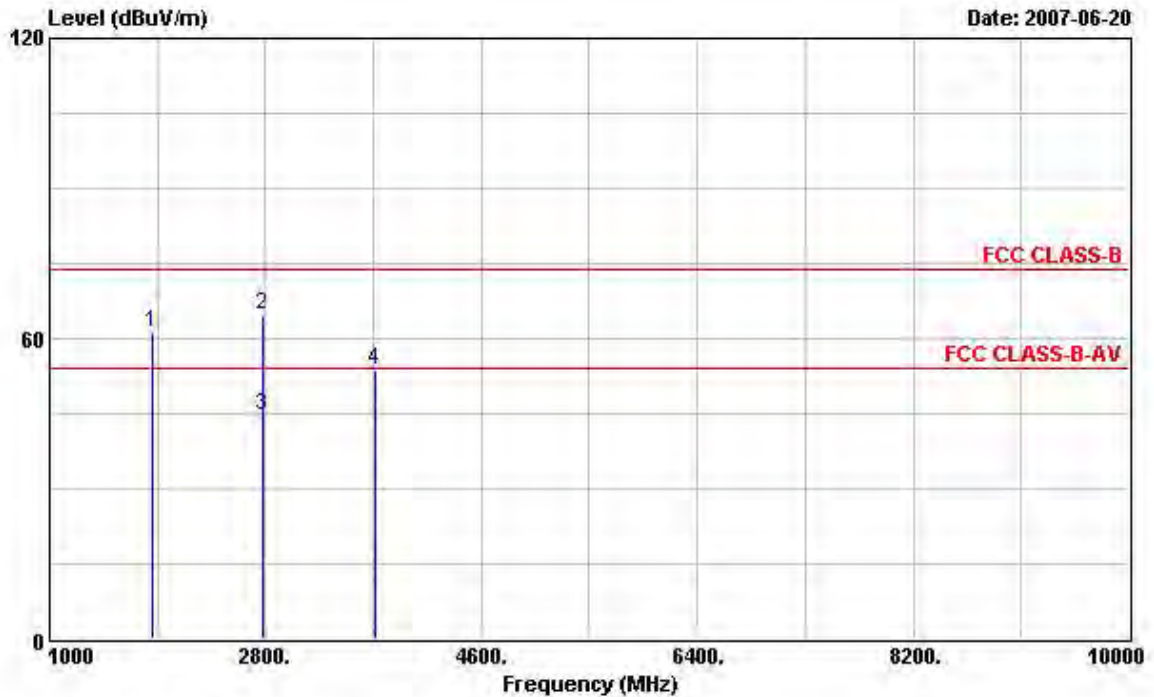
Temperature	26°C	Humidity	54%
Test Engineer	Vic Hsiao	Configurations	Channel 129

Horizontal

	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Pos	Pos
			dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1	1856.000	59.20			62.58	26.87	2.47	32.72	---	---
2 @	2784.000	66.67	-7.33	74.00	67.11	29.41	3.09	32.94	---	---
3 @	2784.000	50.11	-3.89	54.00	50.55	29.41	3.09	32.94	---	---
4	3712.000	57.98	-16.02	74.00	55.06	31.73	3.82	32.63	---	---
5	3712.000	41.42	-12.58	54.00	38.50	31.73	3.82	32.63	---	---

Note: Items 1 is on un-restricted band, so the limit is -20dBc for the field strength of the fundamental emissions (see section 3.7.7).

Vertical



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Pos	Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1	1856.000	61.01			64.40	26.87	2.47	32.72	PEAK	---
2 @	2784.000	64.88	-9.12	74.00	65.33	29.41	3.09	32.94	PEAK	---
3 @	2784.000	44.45	-9.55	54.00	44.89	29.41	3.09	32.94	Average	---
4	3712.000	53.53			50.61	31.73	3.82	32.63	PEAK	---

Note:

Items 1 and 4 are on un-restricted band, so the limit is -20dBc for the field strength of the fundamental emissions (see section 3.7.7).

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.

3.7. Band Edge Emissions Measurement

3.7.1. Limit

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on , then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

3.7.2. Measuring Instruments and Setting

Please refer to section 4 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
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	100 KHz /100 KHz for Peak

3.7.3. Test Procedures

1. The test procedure is the same as section 3.5.3, only the frequency range investigated is limited to 100MHz around bandedges.
2. 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.

3.7.4. Test Setup Layout

This test setup layout is the same as that shown in section 3.6.4.

3.7.5. Test Deviation

There is no deviation with the original standard.

3.7.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.7.7. Test Result of Fundamental Emissions

Temperature	26°C	Humidity	54%
Test Engineer	Vic Hsiao	Configurations	Channel 1, 65, 129

Channel 1

	Freq	Level	Over Limit	Limit Line	ReadAntenna 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 @	902.180	117.53			120.24	21.05	6.16	29.92	Peak	---	---

Channel 65

	Freq	Level	Over Limit	Limit Line	ReadAntenna 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 @	914.980	119.14			121.78	21.12	6.08	29.85	Peak	---	---

Channel 65

	Freq	Level	Over Limit	Limit Line	ReadAntenna 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 @	927.780	116.27			118.65	21.20	6.19	29.77	Peak	---	---

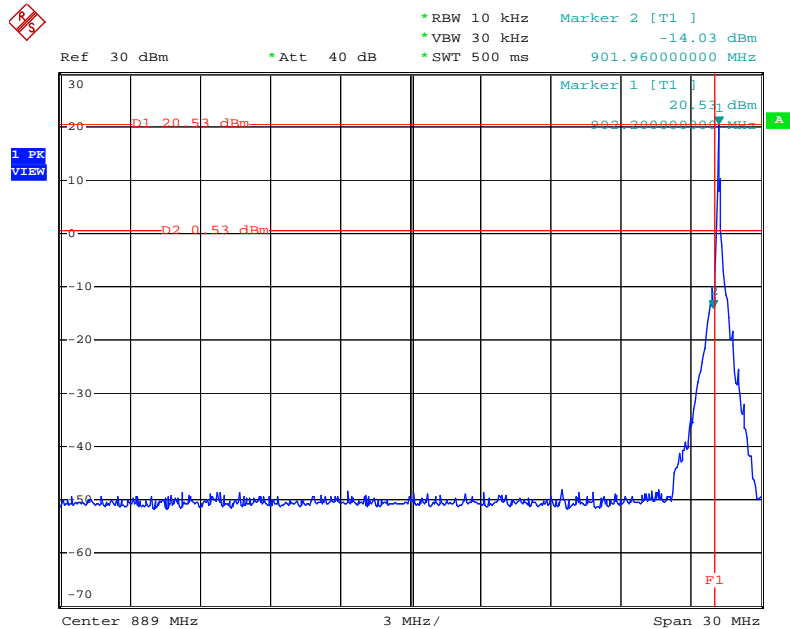
Note:

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

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

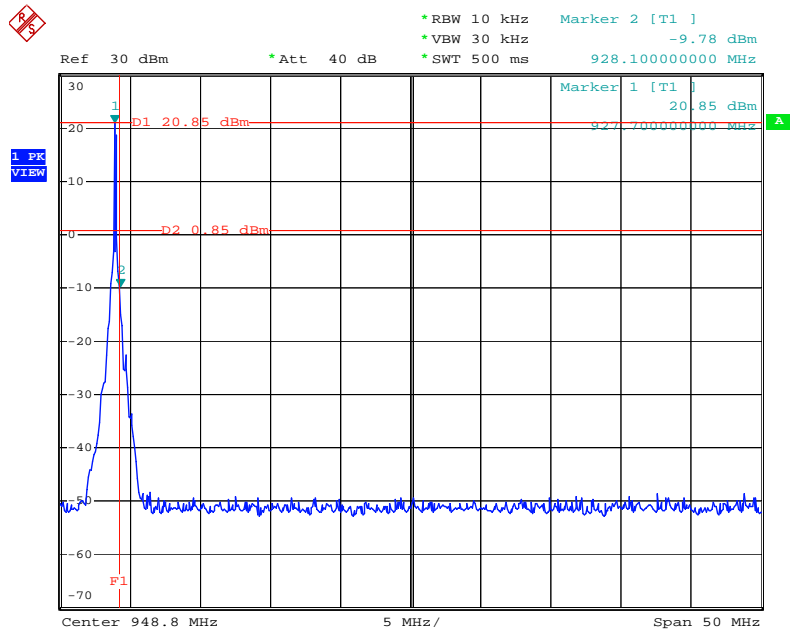
For Emission not in Restricted Band

Low Band Edge Plot on Channel 1 / 902.2 MHz



Date: 2.JUL.2007 05:48:49

High Band Edge Plot on Channel 129 / 927.8 MHz



Date: 2.JUL.2007 05:57:27

3.8. Antenna Requirements

3.8.1. 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.

3.8.2. Antenna Connector Construction

Please refer to section 2.3 in this test report, antenna connector complied with the requirements.

4. LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100359	9kHz – 2.75GHz	Mar. 01, 2007	Conduction (CO04-HY)
LISN	MessTec	NNB-2/16Z	99079	9kHz – 30MHz	Mar. 31, 2007	Conduction (CO04-HY)
LISN (Support Unit)	EMCO	3810/2NM	9703-1839	9kHz – 30MHz	Mar. 22, 2007	Conduction (CO04-HY)
RF Cable-CON	UTIFLEX	3102-26886-4	CB049	9kHz – 30MHz	Apr. 20, 2007	Conduction (CO04-HY)
EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	N/A	Conduction (CO04-HY)
Isolation Transformer	Erika Fiedler OHG	D-65396 Walluf	58	45MHz-2.15GHz	N/A	Conduction (CO04-HY)
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30 MHz - 1 GHz 3m	Jun. 14, 2007	Radiation (03CH03-HY)
Amplifier	SCHAFFNER	CPA9231A	1886	9 kHz - 2 GHz	Jan. 22, 2007	Radiation (03CH03-HY)
Amplifier	Agilent	8449B	3008A02120	1 GHz - 26.5 GHz	Jun.07, 2007	Radiation (03CH03-HY)
Spectrum Analyzer	R&S	FSP40	100004/040	9 kHz - 40 GHz	Sep. 21, 2006	Radiation (03CH03-HY)
Bilog Antenna	SCHAFFNER	CBL 6112D	22237	30 MHz – 1 GHz	Jul. 24, 2006	Radiation (03CH03-HY)
Horn Antenna	EMCO	3115	6741	1GHz ~ 18GHz	MAY 04, 2007	Radiation (03CH03-HY)
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15 GHz - 40 GHz	NCR	Radiation (03CH03-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	30 MHz - 1 GHz	Dec. 02, 2006	Radiation (03CH03-HY)
RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	1 GHz - 40 GHz	Dec. 02, 2006	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	Dec. 17, 2006	Conducted (TH01-HY)
Power Meter	R&S	NRVS	100764	DC ~ 40GHz	Jul. 20, 2006	Conducted (TH01-HY)
Power Sensor	R&S	NRV-Z51	100666	DC ~ 40GHz	Jul. 20, 2006	Conducted (TH01-HY)
Power Sensor	R&S	NRV-Z32	100057	30MHz ~ 6GHz	Jun. 09, 2007	Conducted (TH01-HY)
DC Power Source	G.W.	GPC-6030D	C671845	DC 1V ~ 60V	Mar. 03, 2007	Conducted (TH01-HY)
Temp. and Humidity Chamber	KSON	THS-C3L	612	N/A	Oct. 02, 2006	Conducted (TH01-HY)
RF CABLE-1m	Jye Bao	RG142	CB034-1m	20MHz ~ 7GHz	Dec. 01, 2006	Conducted (TH01-HY)
RF CABLE-2m	Jye Bao	RG142	CB035-2m	20MHz ~ 1GHz	Dec. 01, 2006	Conducted (TH01-HY)
Oscilloscope	Tektronix	TDS1012	CO38515	100MHz / 1GS/s	Jun. 19, 2007	Conducted (TH01-HY)
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Mar. 07, 2007	Conducted (TH01-HY)
Data Generator	Tektronix	DG2030	063-2920-50	0.1Hz~400MHz	Jun. 15, 2007	Conducted (TH01-HY)

Note: Calibration Interval of instruments listed above is one year. NCR: Non-Calibration required.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Amplifier	MITEQ	AMF-6F-260400	923364	26.5 GHz - 40 GHz	Jan. 22, 2007*	Radiation (03CH03-HY)
Loop Antenna	R&S	HFH2-Z2	860004/001	9 kHz - 30 MHz	May 23, 2006*	Radiation (03CH03-HY)
AC Power Source	HPC	HPA-500W	HPA-9100024	AC 0 ~ 300V	May. 4, 2007*	Conducted (TH01-HY)

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

5. 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 2 nd Rd., Taipei 114, Taiwan, R.O.C. TEL : 886-2-2794-8886 FAX : 886-2-2794-9777
JHUBEI	ADD : No.8, Lane 728, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C. TEL : 886-3-656-9065 FAX : 886-3-656-9085

6. TAF CERTIFICATE OF ACCREDITATION


Certificate No.: L1190-070110
財團法人全國認證基金會
Taiwan Accreditation Foundation

Certificate of Accreditation

This is to certify that

Sporton International Inc.
EMC & Wireless Communications Laboratory
No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien,
Taiwan, R.O.C.

is accredited in respect of laboratory

Accreditation Criteria	: ISO/IEC 17025:2005
Accreditation Number	: 1190
Originally Accredited	: December 15, 2003
Effective Period	: January 10, 2007 to January 09, 2010
Accredited Scope	: Testing Field, see described in the Appendix
Specific Accreditation Program	: Accreditation Program for Designated Testing Laboratory for Commodities Inspection Accreditation Program for Telecommunication Equipment Testing Laboratory


Jay-San Chen
President, Taiwan Accreditation Foundation
Date : January 10, 2007

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The Appendix forms an integral part of this Certificate, which shall be invalid when used without the Appendix.