FCC Part 15
EMI TEST REPORT

of

E.U.T. ：Indoor Cordless Telephone

Model ：WDCT45-A2

FCC ID. ：S9AWDCT45-A2

for

APPLICANT ： Suncorp Communications Limited

ADDRESS ： Room 1907-08, Harcourt House, 39 Gloucester Road, Wanchai, Hong Kong

Test Performed by

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Report Number : ET94R-03-140

TEST REPORT CERTIFICATION

Applicant	:	Suncorp Communications Limited
	:	Room 1907-08, Harcourt House, 39 Gloucester Road, Wanchai, Hong Kong
Manufacturer	:	Suncorp Communications Limited
	:	Room 1907-08, Harcourt House, 39 Gloucester Road, Wanchai, Hong Kong

Description of EUT	:	
a) Type of EUT	:	Indoor Cordless Telephone
b) Trade Name	:	SunCorp
c) Model No.	:	WDCT45-A2
d) Power Supply	:	Model:4116-A40848 I/P: AC 110/230V, 50/60Hz, 50mA O/P: DC 6.5V, 180mA/150mA
e) Frequency Range	:	2401.056MHz-2480.544MHz

Regulation Applied : FCC Rules and Regulations Part 15 Subpart C (2003)

I HEREBY CERTIFY THAT: The data shown in this report were made in accordance with the procedures given in ANSI C63.4, and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

Note: 1. The result of the testing report relate only to the item tested.
2. The testing report shall not be reproduced expect in full, without the written approval of ETC.

Issued Date : May 02, 2005

Test Engineer : Kevin Lee

(Kevin Lee)

Approve & Authorized Signer : Will Yauo

Will Yauo, Manager
EMC Dept. II of ELECTRONICS
TESTING CENTER, TAIWAN

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1 GENERAL INFORMATION

1.1 Product Description

a) Type of EUT	: Indoor Cordless Telephone
b) Trade Name	: SunCorp
c) Model No.	: WDCT45-A2
d) Power Supply	: Model:4116-A40848 I/P: AC 110/230V, 50/60Hz, 50mA O/P: DC 6.5V, 180mA/150mA

1.2 Characteristics of Device

The WDCT45-A2 Cordless Telephone operates in the ISM (Industrisl Scientific and Medical) band (2400-2483.5 MHz). The 20dB bandwidth of the hopping channels used in WDCT45-A2 is less than 1MHz. And the number of channels used in WDCT45-A2 is 93. The WDCT45-A2 is a Digital spresad spectrum, it uses the full available frequencies in the ISM band for for operation and can make it difficult for other 2400MHz devices to operate correctly. Optional handset Model WDCT45-A2 and charger, that operates from 2400-2483.5 MHz. The antenna used for the base and the handset are permanently attached to the EUT.
Note: The base and handset use 93 channels.

Channel	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**
00	2401.056	32	2428.704	64	2456.352
01	2401.920	33	2429.568	65	2457.216
02	2402.784	34	2430.432	66	2458.080
03	2403.648	35	2431.296	67	2458.944
04	2404.512	36	2432.160	68	2459.808
05	2405.376	37	2433.024	69	2460.672
06	2406.240	38	2433.888	70	2461.536
07	2407.104	39	2434.752	71	2462.400
08	2407.968	40	2435.616	72	2463.264
09	2408.832	41	2436.480	73	2464.128
10	2409.696	42	2437.344	74	2464.992
11	2410.560	43	2438.208	75	2465.856
12	2411.424	44	2439.072	76	2466.720
13	2412.288	45	2439.936	77	2467.584
14	2413.152	46	2440.800	78	2468.448
15	2414.016	47	2441.664	79	2469.312
16	2414.880	48	2442.528	80	2470.176
17	2415.744	49	2443.392	81	2471.040
18	2416.608	50	2444.256	82	2471.904
19	2417.472	51	2445.120	83	2472.768
20	2418.336	52	2445.984	84	2473.632
21	2419.200	53	2446.848	85	2474.496
22	2420.064	54	2447.712	86	2475.360
23	2420.928	55	2448.576	87	2476.224
24	2421.792	56	2449.440	88	2477.088
25	2422.656	57	2450.304	89	2477.952
26	2423.520	58	2451.168	90	2478.816
27	2424.384	59	2452.032	91	2479.680
28	2425.248	60	2452.896	92	2480.544
29	2426.112	61	2453.760		
30	2426.976	62	2454.624		
31	2427.840	63	2455.488		

1.3 Test Methodology

For Indoor Cordless Telephone, both conducted and radiated emissions were performed according to the procedures illustrated in ANSI C63.4 (2001). Other required measurements were illustrated in separate sections of this test report for details.

1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the roof top of Building at No.34, Lin 5, Ding Fu Tsun, Linkou Hsiang, Taipei Hsien, Taiwan, R.O.C.

This site has been fully described in a report submitted to your office, and accepted in a letter dated Feb. 10, 2000.

2 PROVISIONS APPLICABLE

2.1 Definition

Unintentional radiator:
A device that intentionally generates and radio frequency energy for use within the device, or that sends radio frequency signals by conduction to associated equipment via connecting wiring, but which is not intended to emit RF energy by radiation or induction.

Class A Digital Device:
A digital device which is marketed for use in commercial or business environment; exclusive of a device which is market for use by the general public, or which is intended to be used in the home.

Class B Digital Device :
A digital device which is marketed for use in a residential environment notwithstanding use in a commercial, business of industrial environment. Example of such devices that are marketed for the general public.

Note : A manufacturer may also qualify a device intended to be marketed in a commercial, business, or industrial environment as a Class B digital device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B Digital Device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B Digital Device, Regardless of its intended use.

Intentional radiator:
A device that intentionally generates and emits radio frequency energy by radiation or induction.

2.2 Requirement for Compliance

(1) Conducted Emission Requirement

Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency MHz	Quasi Peak dBµV	Average dBµV
0.15 - 0.5	66-56*	56-46*
0.5 - 5.0	56	46
5.0 - 30.0	60	50

* Decreases with the logarithm of the frequency

For intentional device, according to §15.207(a) Line Conducted Emission Limits is same as above table.

(2) Radiated Emission Requirement

For unintentional device, according to §15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency MHz	Distance Meters	Radiated dBµV/m	Radiated µV/m
30 - 88	3	40.0	100
88 - 216	3	43.5	150
216 - 960	3	46.0	200
Above 960	3	54.0	500

For intentional device, according to §15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

(3) Antenna Requirement

For intentional device, according to §15.203, 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.

(4) Hopping Channel Separation

According to 15.247(a)(1), frequency hopping system shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

(5) Number of Hopping frequencies used

According to 15.247(a)(1)(iii), frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 non-overlapping channels.

(6) Hopping Channel Bandwidth

According to 15.247(a)(1)(ii), for frequency hopping system operating in the 5725-5850 MHz band, the maximum 20dB bandwidth of the hopping channel is 1MHz.

(7) Dwell Time of each frequency

According to 15.247(a)(1)(iii), for frequency hopping system operating in the 2400-2483.5 band, the average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

(8) Output Power Requirement

According to 15.247(b)(1), for frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt.

For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

(9) 100 kHz Bandwidth of Frequency Band Edges Requirement

According to 15.247(c), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

(10) Out-of-Band Conducted Emission Requirement

According to 15.247(c), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

(11) Peak Power Spectral Density Requirement

According to 15.247(d), for digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

2.3 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below :

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42-16.423	399.9-410	4.5-5.15
0.495 - 0.505 **	16.69475 - 16.69525	608-614	5.35-5.46
2.1735 - 2.1905	16.80425 - 16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475 - 156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3360-4400	Above 38.6
13.36-13.41			

** : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

2.4 Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device :

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions : (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

2.5 User Information

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual.

The Federal Communications Commission Radio Frequency Interference Statement includes the following paragraph.

This equipment has been tested and found to comply with the limits for a Class B Digital Device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio / TV technician for help.

3 SYSTEM TEST CONFIGURATION

3.1 Justification

For both radiated and conducted emissions below 1 GHz, the system was configured for testing in a typical fashion as a customer would normally use it. The peripherals other than EUT were connected in normally standing by situation. Measurement was performed under the condition that a computer program was exercised to simulate data communication of EUT, and the transmission rate was set to maximum allowed by EUT. Three highest emissions were verified with varying placement of the transmitting antenna connected to EUT to maximize the emission from EUT.

For conducted emissions, only measured on TX and RX operation, for the digital circuits portion also function normally whenever TX or RX is operated. For radiated emissions, whichever RF channel is operated, the digital circuits' function identically. As the reason, measurement of radiated emissions from digital circuits is only performed with channel 11 by transmitting mode.

3.2 Devices for Tested System

Device	Manufacture	Model / FCC ID.	Description
Indoor Cordless Telephone *	Suncorp Communications Limited	WDCT45-A2 S9AWDCT45-A2	2.0m RJ-11 Unshielded Cable x 2 1.0m AC Adaptor x 1 (Handset Unit Charager)

Remark "*" means equipment under test.

4 RADIATED EMISSION MEASUREMENT

4.1 Applicable Standard

For periodic operation intentional radiator, the radiated emission shall comply with 15.231(b).

4.2 Measurement Procedure

A. Preliminary Measurement For Portable Devices

For portable devices, the following procedure was performed to determine the maximum emission axis of EUT:

1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antenna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. So, the axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.

B. Final Measurement

1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively. Turn on EUT and make sure that it is in normal function.
2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on an open test site. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.
3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0° to 360° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.
5. Repeat step 4 until all frequencies need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.
7. Check the three frequencies of highest emission with varying the placement of cables (if any) associated with EUT to obtain the worse case and record the result.

Figure 1 : Frequencies measured below 1 GHz configuration

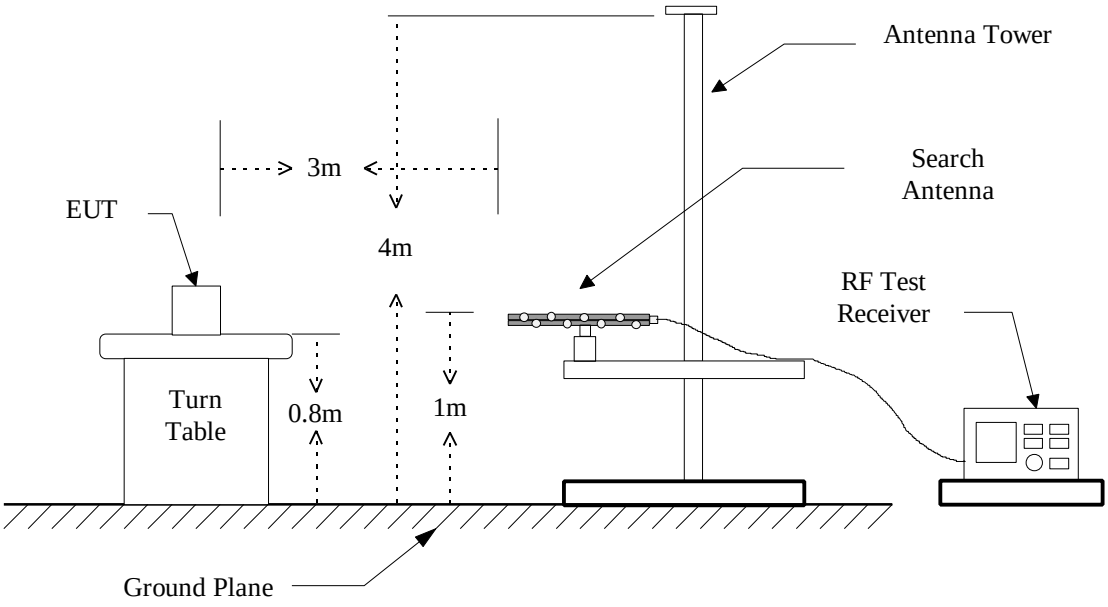
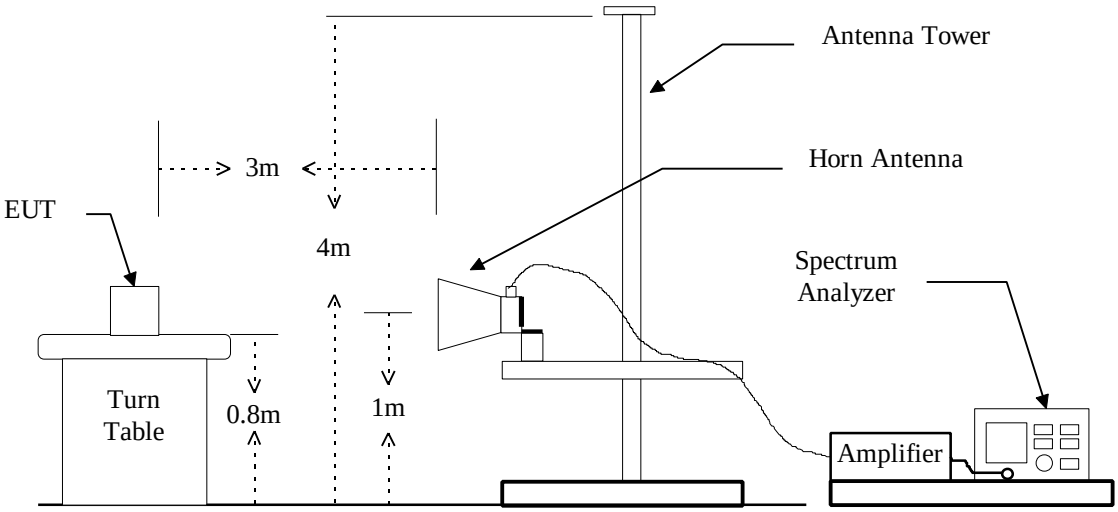


Figure 2 : Frequencies measured above 1 GHz configuration



4.3 Measuring Instrument

The following instrument are used for radiated emissions measurement:

Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	R&S	FSP	05/31/2005
RF Test Receiver	Rohde & Schwarz	ESVS 30	09/05/2005
RF Test Receiver	Rohde & Schwarz	ESBI	05/31/2005
Horn Antenna	EMCO	3115	08/26/2005
Log periodic Antenna	EMCO	3146	10/05/2005
Biconical Antenna	EMCO	3110B	10/05/2005
Horn Antenna	EMCO	3116	05/02/2005
Preamplifier	Hewlett-Packard	8449B	09/07/2005
Preamplifier	Hewlett-Packard	8447D	10/17/2005

Measuring instrument setup in measured frequency band when specified detector function is used :

Frequency Band (MHz)	Instrument	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	RF Test Receiver	Quasi-Peak	120 kHz	N/A
	Spectrum Analyzer	Peak	100 kHz	100 kHz
Above 1000	Spectrum Analyzer	Peak	1 MHz	1 MHz
	Spectrum Analyzer	Average	1 MHz	10 Hz

4.4 Radiated Emission Data

4.4.1 Tx Portion

Mode : Base Unit

A. CH Low

Operation Mode : Receiving / Transmitting

Fundamental Frequency : 2401.056 MHz (Local Frequency : 2401.056 MHz)

Test Date : Apr. 06, 2005 Temperature : 25°C Humidity : 60%

Frequency (MHz)	Reading (dBuV) H Peak	H Ave	V Peak	V Ave	Factor (dB) Corr.	Result @3m (dBuV/m) Peak	Result Ave	Limit @3m (dBuV/m) Peak	Limit Ave.	Margin (dB)	Table Deg. (Deg.)	Ant. High (m)
* 2401.056	---	---	---	---	-31.0	---	---	74.0	54.0	---	---	---
* 4802.112	---	---	---	---	-24.2	---	---	74.0	54.0	---	---	---
* 7203.168	---	---	---	---	-18.1	---	---	74.0	54.0	---	---	---
* 9604.224	---	---	---	---	-14.7	---	---	74.0	54.0	---	---	---
* 12005.280	---	---	---	---	-14.7	---	---	74.0	54.0	---	---	---
4802.112	80.3	53.5	78.6	51.6	-24.2	56.1	29.3	74.0	54.0	-17.9	74	1.2
7203.168	71.5	---	67.2	---	-18.1	53.4	---	74.0	54.0	-20.6	28	1.5
9604.224	54.2	---	51.7	---	-14.7	39.5	---	74.0	54.0	-34.5	125	1.1
12005.280	58.6	---	62.8	---	-14.7	48.1	---	74.0	54.0	-25.9	144	1.2
14406.336	61.5	---	61.8	---	-13.3	48.5	---	74.0	54.0	-25.5	136	1.1
16807.392	---	---	---	---	-13.3	---	---	74.0	54.0	---	---	---
19208.448	---	---	---	---	8.9	---	---	74.0	54.0	---	---	---
21609.504	---	---	---	---	9.7	---	---	74.0	54.0	---	---	---
24010.560	---	---	---	---	10.3	---	---	74.0	54.0	---	---	---

Note :

1. *Item of margin shown in above table refer to average limit.*
2. *It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark "***" means that Peak result is meet average limit.*
3. *Remark "---" means that the emissions level is too low to be measured.*
4. *Item "Margin" referred to Average limit while there is only peak result.*
5. *The expanded uncertainty of the radiated emission tests is 3.53 dB.*

B. CH Mid

Operation Mode : Receiving / Transmitting

Fundamental Frequency : 2440.800 MHz (Local Frequency : 2440.800 MHz)

Test Date : Apr. 06, 2005 Temperature : 25°C Humidity : 60%

Frequency (MHz)	Reading (dBuV) H Peak	Reading (dBuV) H Ave	Reading (dBuV) V Peak	Reading (dBuV) V Ave	Factor (dB) Corr.	Result @3m (dBuV/m) Peak	Result @3m (dBuV/m) Ave	Limit @3m (dBuV/m) Peak	Limit @3m (dBuV/m) Ave.	Margin (dB)	Table Deg. (Deg.)	Ant. High (m)
* 2440.800	---	---	---	---	-30.9	---	---	74.0	54.0	---	---	---
* 4881.600	---	---	---	---	-23.8	---	---	74.0	54.0	---	---	---
* 7322.400	---	---	---	---	-17.4	---	---	74.0	54.0	---	---	---
* 9763.200	---	---	---	---	-14.7	---	---	74.0	54.0	---	---	---
* 12204.000	---	---	---	---	-14.6	---	---	74.0	54.0	---	---	---
4881.600	79.2	53.0	78.6	51.2	-23.8	55.4	29.2	74.0	54.0	-18.6	74	1
7322.400	70.2	---	67.0	---	-17.4	52.8	---	74.0	54.0	-21.2	28	1
9763.200	53.1	---	51.0	---	-14.7	38.4	---	74.0	54.0	-35.6	245	1.2
12204.000	57.6	---	62.3	---	-14.6	47.7	---	74.0	54.0	-26.3	235	1.3
14644.800	60.5	---	61.5	---	-14.0	47.5	---	74.0	54.0	-26.5	165	1.5
17085.600	---	---	---	---	-11.6	---	---	74.0	54.0	---	---	---
19526.400	---	---	---	---	8.5	---	---	74.0	54.0	---	---	---
21967.200	---	---	---	---	9.9	---	---	74.0	54.0	---	---	---
24408.000	---	---	---	---	10.7	---	---	74.0	54.0	---	---	---

Note :

1. *Item of margin shown in above table refer to average limit.*
2. *It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark "***" means that Peak result is meet average limit.*
3. *Remark "---" means that the emissions level is too low to be measured.*
4. *Item "Margin" referred to Average limit while there is only peak result.*
5. *The expanded uncertainty of the radiated emission tests is 3.53 dB.*

C. CH High

Operation Mode : Receiving / Transmitting

Fundamental Frequency : 2480.544 MHz (Local Frequency : 2480.544 MHz)

Test Date : Apr. 06, 2005 Temperature : 25°C Humidity : 60%

Frequency (MHz)	Reading (dBuV) H Peak	Reading (dBuV) H Ave	Reading (dBuV) V Peak	Reading (dBuV) V Ave	Factor (dB) Corr.	Result @3m (dBuV/m) Peak	Result @3m (dBuV/m) Ave	Limit @3m (dBuV/m) Peak	Limit @3m (dBuV/m) Ave.	Margin (dB)	Table Deg. (Deg.)	Ant. High (m)
* 2480.544	---	---	---	---	-30.7	---	---	74.0	54.0	---	---	---
* 4961.088	---	---	---	---	-23.4	---	---	74.0	54.0	---	---	---
* 7441.632	---	---	---	---	-16.7	---	---	74.0	54.0	---	---	---
* 9922.176	---	---	---	---	-14.7	---	---	74.0	54.0	---	---	---
* 12402.720	---	---	---	---	-14.4	---	---	74.0	54.0	---	---	---
4961.088	80.2	53.0	78.1	50.9	-23.4	56.8	29.6	74.0	54.0	-17.2	321	1.5
7441.632	70.5	---	65.2	---	-16.7	53.8	---	74.0	54.0	-20.2	314	1.5
9922.176	55.6	---	62.0	---	-14.7	47.3	---	74.0	54.0	-26.7	125	1.3
12402.720	59.6	---	62.8	---	-14.4	48.4	---	74.0	54.0	-25.6	147	1.2
14883.264	61.3	---	61.4	---	-15.0	46.4	---	74.0	54.0	-27.6	159	1.1
17363.808	---	---	---	---	-9.9	---	---	74.0	54.0	---	---	---
19844.352	---	---	---	---	8.6	---	---	74.0	54.0	---	---	---
22324.896	---	---	---	---	10.2	---	---	74.0	54.0	---	---	---
24805.440	---	---	---	---	11.0	---	---	74.0	54.0	---	---	---

Note :

1. *Item of margin shown in above table refer to average limit.*
2. *It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark "***" means that Peak result is meet average limit.*
3. *Remark "---" means that the emissions level is too low to be measured.*
4. *Item "Margin" referred to Average limit while there is only peak result.*
5. *The expanded uncertainty of the radiated emission tests is 3.53 dB.*

Mode : Handset

A. CH Low

Operation Mode : Receiving / Transmitting

Fundamental Frequency : 2401.056 MHz (Local Frequency : 2401.056 MHz)

Test Date : Apr. 06, 2005 Temperature : 25°C Humidity : 60%

Frequency (MHz)	Reading (dBuV) H Peak	H Ave	V Peak	V Ave	Factor (dB) Corr.	Result @3m (dBuV/m) Peak	Result Ave	Limit @3m (dBuV/m) Peak	Limit Ave.	Margin (dB)	Table Deg. (Deg.)	Ant. High (m)
* 2401.056	---	---	---	---	-31.0	---	---	74.0	54.0	---	---	---
* 4802.112	52.0	---	54.0	---	-24.2	29.8	---	74.0	54.0	-44.2	24	1.5
* 7203.168	---	---	---	---	-18.1	---	---	74.0	54.0	---	---	---
* 9604.224	---	---	---	---	-14.7	---	---	74.0	54.0	---	---	---
* 12005.280	---	---	---	---	-14.7	---	---	74.0	54.0	---	---	---
4802.112	59.3	---	58.2	---	-24.2	35.1	---	74.0	54.0	-38.9	73	1.2
7203.168	55.0	---	56.7	---	-18.1	38.6	---	74.0	54.0	-35.4	157	1.3
9604.224	56.2	---	57.0	---	-14.7	42.3	---	74.0	54.0	-31.7	14	1.4
12005.280	54.0	---	52.5	---	-14.7	39.3	---	74.0	54.0	-34.7	58	1.1
14406.336	54.2	---	59.8	---	-13.3	46.5	---	74.0	54.0	-27.5	65	1.1
16807.392	---	---	---	---	-13.3	---	---	74.0	54.0	---	---	---
19208.448	---	---	---	---	8.9	---	---	74.0	54.0	---	---	---
21609.504	---	---	---	---	9.7	---	---	74.0	54.0	---	---	---
24010.560	---	---	---	---	10.3	---	---	74.0	54.0	---	---	---

Note :

1. *Item of margin shown in above table refer to average limit.*
2. *It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark "***" means that Peak result is meet average limit.*
3. *Remark "---" means that the emissions level is too low to be measured.*
4. *Item "Margin" referred to Average limit while there is only peak result.*
5. *The expanded uncertainty of the radiated emission tests is 3.53 dB.*

B. CH Mid

Operation Mode : Receiving / Transmitting

Fundamental Frequency : 2440.800 MHz (Local Frequency : 2440.800 MHz)

Test Date : Apr. 06, 2005 Temperature : 25°C Humidity : 60%

Frequency (MHz)	Reading (dBuV) H Peak	H Ave	V Peak	V Ave	Factor (dB) Corr.	Result @3m (dBuV/m) Peak	Result Ave	Limit @3m (dBuV/m) Peak	Limit Ave.	Margin (dB)	Table Deg. (Deg.)	Ant. High (m)
* 2440.800	---	---	---	---	-30.9	---	---	74.0	54.0	---	---	---
* 4881.600	51.5	---	53.4	---	-23.8	29.6	---	74.0	54.0	-44.4	57	1.2
* 7322.400	---	---	---	---	-17.4	---	---	74.0	54.0	---	---	---
* 9763.200	---	---	---	---	-14.7	---	---	74.0	54.0	---	---	---
* 12204.000	---	---	---	---	-14.6	---	---	74.0	54.0	---	---	---
4881.600	59.2	---	57.9	---	-23.8	35.4	---	74.0	54.0	-38.6	133	1.3
7322.400	55.0	---	56.0	---	-17.4	38.6	---	74.0	54.0	-35.4	125	1.3
9763.200	55.4	---	56.4	---	-14.7	41.7	---	74.0	54.0	-32.3	111	1.2
12204.000	53.6	---	52.6	---	-14.6	39.0	---	74.0	54.0	-35.0	147	1.4
14644.800	52.4	---	58.6	---	-14.0	44.6	---	74.0	54.0	-29.4	23	1.1
17085.600	---	---	---	---	-11.6	---	---	74.0	54.0	---	---	---
19526.400	---	---	---	---	8.5	---	---	74.0	54.0	---	---	---
21967.200	---	---	---	---	9.9	---	---	74.0	54.0	---	---	---
24408.000	---	---	---	---	10.7	---	---	74.0	54.0	---	---	---

Note :

1. *Item of margin shown in above table refer to average limit.*
2. *It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark "***" means that Peak result is meet average limit.*
3. *Remark "---" means that the emissions level is too low to be measured.*
4. *Item "Margin" referred to Average limit while there is only peak result.*
5. *The expanded uncertainty of the radiated emission tests is 3.53 dB.*

C. CH High

Operation Mode : Receiving / Transmitting

Fundamental Frequency : 2480.544 MHz (Local Frequency : 2480.544 MHz)

Test Date : Apr. 06, 2005 Temperature : 25°C Humidity : 60%

Frequency (MHz)	Reading (dBuV) H Peak	Reading (dBuV) H Ave	Reading (dBuV) V Peak	Reading (dBuV) V Ave	Factor (dB) Corr.	Result @3m (dBuV/m) Peak	Result @3m (dBuV/m) Ave	Limit @3m (dBuV/m) Peak	Limit @3m (dBuV/m) Ave.	Margin (dB)	Table Deg. (Deg.)	Ant. High (m)
* 2480.544	---	---	---	---	-30.7	---	---	74.0	54.0	---	---	---
* 4961.088	51.5	---	53.2	---	-23.4	29.8	---	74.0	54.0	-44.2	74	1.5
* 7441.632	---	---	---	---	-16.7	---	---	74.0	54.0	---	---	---
* 9922.176	---	---	---	---	-14.7	---	---	74.0	54.0	---	---	---
* 12402.720	---	---	---	---	-14.4	---	---	74.0	54.0	---	---	---
4961.088	59.0	---	57.6	---	-23.4	35.6	---	74.0	54.0	-38.4	65	1.1
7441.632	54.2	---	56.4	---	-16.7	39.7	---	74.0	54.0	-34.3	32	1.1
9922.176	56.0	---	56.3	---	-14.7	41.6	---	74.0	54.0	-32.4	157	1.1
12402.720	54.0	---	52.6	---	-14.4	39.6	---	74.0	54.0	-34.4	47	1.0
14883.264	54.6	---	59.0	---	-15.0	44.0	---	74.0	54.0	-30.0	135	1.0
17363.808	---	---	---	---	-9.9	---	---	74.0	54.0	---	---	---
19844.352	---	---	---	---	8.6	---	---	74.0	54.0	---	---	---
22324.896	---	---	---	---	10.2	---	---	74.0	54.0	---	---	---
24805.440	---	---	---	---	11.0	---	---	74.0	54.0	---	---	---

Note :

1. *Item of margin shown in above table refer to average limit.*
2. *It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark "***" means that Peak result is meet average limit.*
3. *Remark "---" means that the emissions level is too low to be measured.*
4. *Item "Margin" referred to Average limit while there is only peak result.*
5. *The expanded uncertainty of the radiated emission tests is 3.53 dB.*

4.4.2 Radiated Emissions in Restricted Bands

Operation Mode : Receiving /Transmitting
Test Date : Apr. 06, 2005 Temperature : 25°C Humidity : 60 %

a) Mode : Base Unit Talk

Operation Mode : TX : CH Low Restricted Frequency band : 2310MHz-2390MHz

Frequency (MHz)	Reading (dBuV) H Peak	H Ave	V Peak	V Ave	Factor (dB) Corr.	Result @3m (dBuV/m) Peak	Ave	Limit @3m (dBuV/m) Peak	Ave.	Margin (dB)	Table Deg. (Deg.)	Ant. High (m)
2345.880	40.2	28.7	39.4	26.3	-3.3	36.9	25.4	74.0	54.0	-28.6	185	1.5
2386.700	41.0	28.9	38.9	27.1	-3.1	37.9	25.8	74.0	54.0	-28.2	194	1.5

Operation Mode : TX : CH High Restricted Frequency band : 2483.5MHz-2500MHz

Frequency (MHz)	Reading (dBuV) H Peak	H Ave	V Peak	V Ave	Factor (dB) Corr.	Result @3m (dBuV/m) Peak	Ave	Limit @3m (dBuV/m) Peak	Ave.	Margin (dB)	Table Deg. (Deg.)	Ant. High (m)
2484.710	40.3	28.5	40.4	25.9	-2.8	37.5	25.7	74.0	54.0	-28.3	175	1.5
2493.170	41.5	28.2	38.9	26.8	-2.7	38.8	26.1	74.0	54.0	-27.9	193	1.5

b) Mode : Handset Unit Talk

Operation Mode : TX : CH Low Restricted Frequency band : 2310MHz-2390MHz

Frequency (MHz)	Reading (dBuV) H Peak	H Ave	V Peak	V Ave	Factor (dB) Corr.	Result @3m (dBuV/m) Peak	Ave	Limit @3m (dBuV/m) Peak	Ave.	Margin (dB)	Table Deg. (Deg.)	Ant. High (m)
2335.170	40.3	28.9	39.5	26.5	-3.4	36.9	25.5	74.0	54.0	-28.5	185	1.5
2389.015	41.2	28.7	40.8	25.3	-3.1	38.1	25.6	74.0	54.0	-28.4	192	1.5

Operation Mode : TX : CH High Restricted Frequency band : 2483.5MHz-2500MHz

Frequency (MHz)	Reading (dBuV) H Peak	H Ave	V Peak	V Ave	Factor (dB) Corr.	Result @3m (dBuV/m) Peak	Ave	Limit @3m (dBuV/m) Peak	Ave.	Margin (dB)	Table Deg. (Deg.)	Ant. High (m)
2485.170	40.5	27.6	40.1	25.4	-2.8	37.7	24.8	74.0	54.0	-29.2	179	1.5
2496.180	41.8	38.6	39.9	26.9	-2.7	39.1	25.9	74.0	54.0	-28.1	194	1.5

Note :

1. *Item of margin shown in above table refer to average limit.*
2. *It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark "***" means that Peak result is meet average limit.*
3. *Remark "---" means that the emissions level is too low to be measured.*
4. *Item "Margin" referred to Average limit while there is only peak result.*
5. *The expanded uncertainty of the radiated emission tests is 3.53 dB.*

4.4.3 Other Emissions

Mode : Base Unit Talk

a) Emission frequencies below 1 GHz

Operation Mode : Receiving / Transmitting

Test Date : Apr. 06, 2005 Temperature : 25°C Humidity : 60 %

Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (m)
49.170	V	52.9	-13.9	39.0	40.0	-1.0	162	1.0
56.190	V	53.8	-15.4	38.4	40.0	-1.6	28	1.1
59.700	V	53.4	-16.1	37.3	40.0	-2.7	73	1.3
67.800	V	54.9	-16.4	38.5	40.0	-1.5	26	1.1
705.700	H	42.3	-1.0	41.3	46.0	-4.7	152	1.1
924.300	V	35.7	2.5	38.2	46.0	-7.8	54	1.0

Note :

1. Remark "---" means that the emissions level is too low to be measured.

2. The expanded uncertainty of the radiated emission tests is 3.53 dB.

b) Emission frequencies above 1 GHz

Radiated emission frequencies above 1 GHz to 25 GHz were too low to be measured with a pre-amplifier of 35 dB.

Mode : Handset Unit Talk

a) Emission frequencies below 1 GHz

Operation Mode : Receiving / Transmitting

Test Date : Apr. 06, 2005 Temperature : 25°C Humidity : 60 %

Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (m)
135.570	H	53.7	-11.1	42.6	43.5	-0.9	74	1.3
166.350	H	52.0	-9.2	42.8	43.5	-0.7	28	1.0
194.700	H	50.3	-7.8	42.5	43.5	-1.0	33	1.3
563.200	V	50.4	-5.3	45.1	46.0	-0.9	216	1.2
704.600	V	42.1	-1.0	41.1	46.0	-4.9	36	1.0
934.900	V	37.2	2.8	40.0	46.0	-6.0	14	1.0

Note :

1. Remark "---" means that the emissions level is too low to be measured.

2. The expanded uncertainty of the radiated emission tests is 3.53 dB.

b) Emission frequencies above 1 GHz

Radiated emission frequencies above 1 GHz to 25 GHz were too low to be measured with a pre-amplifier of 35 dB.

Mode : Handset Unit Charging with Base Unit

a) Emission frequencies below 1 GHz

Operation Mode : Charging

Test Date : Apr. 06, 2005 Temperature : 25°C Humidity : 60 %

Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (m)
95.070	H	56.9	-13.9	43.0	43.5	-0.5	74	1.0
104.520	H	55.6	-12.9	42.7	43.5	-0.8	33	1.3
179.580	H	51.7	-9.1	42.6	43.5	-0.9	182	1.5
561.800	V	49.6	-5.2	44.4	46.0	-1.6	56	1.0
703.900	V	43.6	-1.0	42.6	46.0	-3.4	132	1.0
769.700	H	41.5	-0.3	41.2	46.0	-4.8	28	1.0

Note :

1. *Remark "---" means that the emissions level is too low to be measured.*
2. *The expanded uncertainty of the radiated emission tests is 3.53 dB.*

b) Emission frequencies above 1 GHz

Radiated emission frequencies above 1 GHz to 25 GHz were too low to be measured with a pre-amplifier of 35 dB.

Mode : Handset Unit Charging with Charger

c) Emission frequencies below 1 GHz

Operation Mode : Charger

Test Date : May 16, 2005 Temperature : 25°C Humidity : 60 %

Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (m)
102.360	V	44.5	-13.4	31.1	43.5	-12.4	215	1.5
235.470	H	34.2	-4.8	29.4	46.0	-16.6	133	1.3
262.740	H	31.6	-3.8	27.8	46.0	-18.2	33	1.3
349.700	V	41.9	-10.5	31.4	46.0	-14.6	24	1.0
719.300	H	34.6	-0.8	33.8	46.0	-12.2	25	1.1
752.200	H	33.5	-0.3	33.2	46.0	-12.8	125	1.2

Note :

1. *Remark "---" means that the emissions level is too low to be measured.*
2. *The expanded uncertainty of the radiated emission tests is 3.53 dB.*

d) Emission frequencies above 1 GHz

Radiated emission frequencies above 1 GHz to 25 GHz were too low to be measured with a pre-amplifier of 35 dB.

4.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor, High Pass Filter Loss (if used) and Cable Loss, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation calculation is as follows:

Result = Reading + Corrected Factor

where Corrected Factor

= Antenna FACTOR + Cable Loss + High Pass Filter Loss - Amplifier Gain

4.6 Photos of Radiation Measuring Setup

Mode : Base Unit Talk

Mode : Handset Unit Talk

Mode : Handset Unit Charging with Base Unit

Mode : Handset Unit Charging with Charger

5 CONDUCTED EMISSION MEASUREMENT

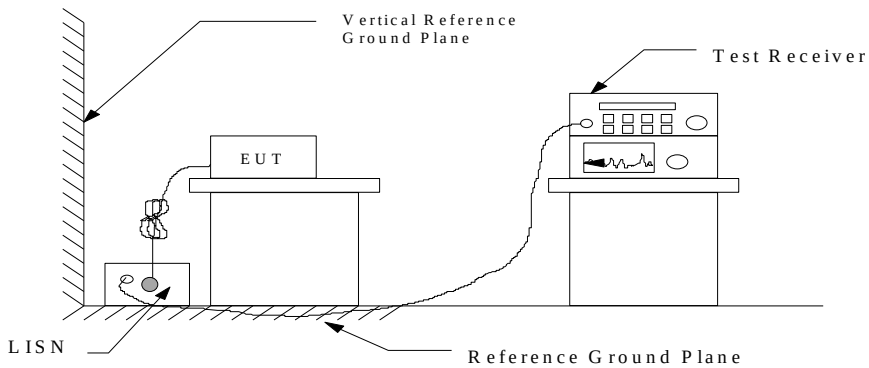
5.1 Standard Applicable

For unintentional and intentional device, Line Conducted Emission Limits are in accordance to 15.107(a) and 15.207(a) respectively.

5.2 Measurement Procedure

1. Setup the configuration per figure 3.
2. A preliminary scan with a spectrum monitor is performed to identify the frequency of emission that has the highest amplitude relative to the limit by operating the EUT in selected modes of operation, typical cable positions, and with a typical system configuration.
3. Record the 6 or 8 highest emissions relative to the limit.
4. Measure each frequency obtained from step 3 by a test receiver set on quasi peak detector function, and then record the accuracy frequency and emission level. If all emissions measured in the specified band are attenuated more than 20 dB from the limit, this step would be ignored, and the peak detector function would be used.
5. Confirm the highest three emissions with variation of the EUT cable configuration and record the final data.
6. Repeat all above procedures on measuring each operation mode of EUT.

Figure 3 : Conducted emissions measurement configuration



5.3 Conducted Emission Data

Mode : Base Unit Link

Operation Mode : Link

Test Date : Apr. 06, 2005 Temperature : 25 °C Humidity : 60 %

Frequency (MHz)	**Meter Reading** (dBuV)				**Factor** (dB)	**Result** (dBuV)				**Limit** (dBuV)		**Margins** (dBuV)	
	Q.P. Value		AVG. Value			Q.P. Value		AVG. Value		Q.P. Value	AVG. Value	Q.P.	AVG.
	N	L1	N	L1		N	L1	N	L1				
1.140	10.6	10.5	----	----	0.3	10.9	10.8	----	----	56.0	46.0	-45.1	----
1.746	11.2	11.1	----	----	0.4	11.6	11.5	----	----	56.0	46.0	-44.4	----
4.472	11.4	11.3	----	----	0.6	12.0	11.9	----	----	56.0	46.0	-44.0	----
7.671	12.3	12.4	----	----	0.7	13.0	13.1	----	----	60.0	50.0	-46.9	----
7.988	12.4	12.5	----	----	0.7	13.1	13.2	----	----	60.0	50.0	-46.8	----
19.351	12.6	12.7	----	----	1.4	14.0	14.1	----	----	60.0	50.0	-45.9	----

Note : 1. Please see appendix 1 for Plotted Data

2. The expanded uncertainty of the conducted emission tests is 2.45 dB.

Handset Unit Charging with Base Unit

Operation Mode : Charging

Test Date : Apr. 06, 2005 Temperature : 25 °C Humidity : 60 %

Frequency (MHz)	**Meter Reading** (dBuV)				**Factor** (dB)	**Result** (dBuV)				**Limit** (dBuV)		**Margins** (dBuV)	
	Q.P. Value		AVG. Value			Q.P. Value		AVG. Value		Q.P. Value	AVG. Value	Q.P.	AVG.
	N	L1	N	L1		N	L1	N	L1				
0.192	15.5	15.3	----	----	0.2	15.7	15.5	----	----	63.9	53.9	-48.2	----
0.435	10.5	10.6	----	----	0.3	10.8	10.9	----	----	57.2	47.2	-46.3	----
1.023	10.3	10.5	----	----	0.3	10.6	10.8	----	----	56.0	46.0	-45.2	----
1.429	10.5	10.4	----	----	0.4	10.9	10.8	----	----	56.0	46.0	-45.1	----
7.175	12.3	12.1	----	----	0.7	13.0	12.8	----	----	60.0	50.0	-47.0	----
21.671	12.7	12.9	----	----	1.4	14.1	14.3	----	----	60.0	50.0	-45.7	----

Note : 1. Please see appendix 1 for Plotted Data

2. The expanded uncertainty of the conducted emission tests is 2.45 dB.

Handset Unit Charging with Charger

Operation Mode : Charger

Test Date : May 16, 2005 Temperature : 25 °C Humidity : 60 %

Frequency (MHz)	Meter Reading (dBuV)				Factor (dB)	Result (dBuV)				Limit (dBuV)		Margins (dBuV)	
	Q.P. Value		AVG. Value			Q.P. Value		AVG. Value		Q.P. Value	AVG. Value	Q.P.	AVG.
	N	L1	N	L1		N	L1	N	L1				
0.1920	15.3	15.5	----	----	0.2	15.5	15.7	----	----	63.9	53.9	-48.2	----
0.4350	12.1	12.4	----	----	0.3	12.4	12.7	----	----	57.2	47.2	-44.5	----
1.0230	12.5	13.2	----	----	0.3	12.8	13.5	----	----	56.0	46.0	-42.5	----
1.4290	12.4	10.4	----	----	0.4	12.8	10.8	----	----	56.0	46.0	-43.2	----
7.1750	14.1	13.1	----	----	0.7	14.8	13.8	----	----	60.0	50.0	-45.2	----
21.6710	13.8	14.2	----	----	1.4	15.2	15.6	----	----	60.0	50.0	-44.4	----

Note : 1. Please see appendix 1 for Plotted Data

2. The expanded uncertainty of the conducted emission tests is 2.45 dB.

5.4 Result Data Calculation

The result data is calculated by adding the LISN Factor to the measured reading. The basic equation with a sample calculation is as follows:

RESULT = READING + LISN FACTOR

Assume a receiver reading of 22.5 dBμV is obtained, and LISN Factor is 0.1 dB, then the total of disturbance voltage is 22.6 dBμV.

RESULT = 22.5 + 0.1 = 22.6 dBμV

Level in μV = Common Antilogarithm[(22.6 dBμV)/20]

= 13.48 μV

5.5 Conducted Measurement Equipment

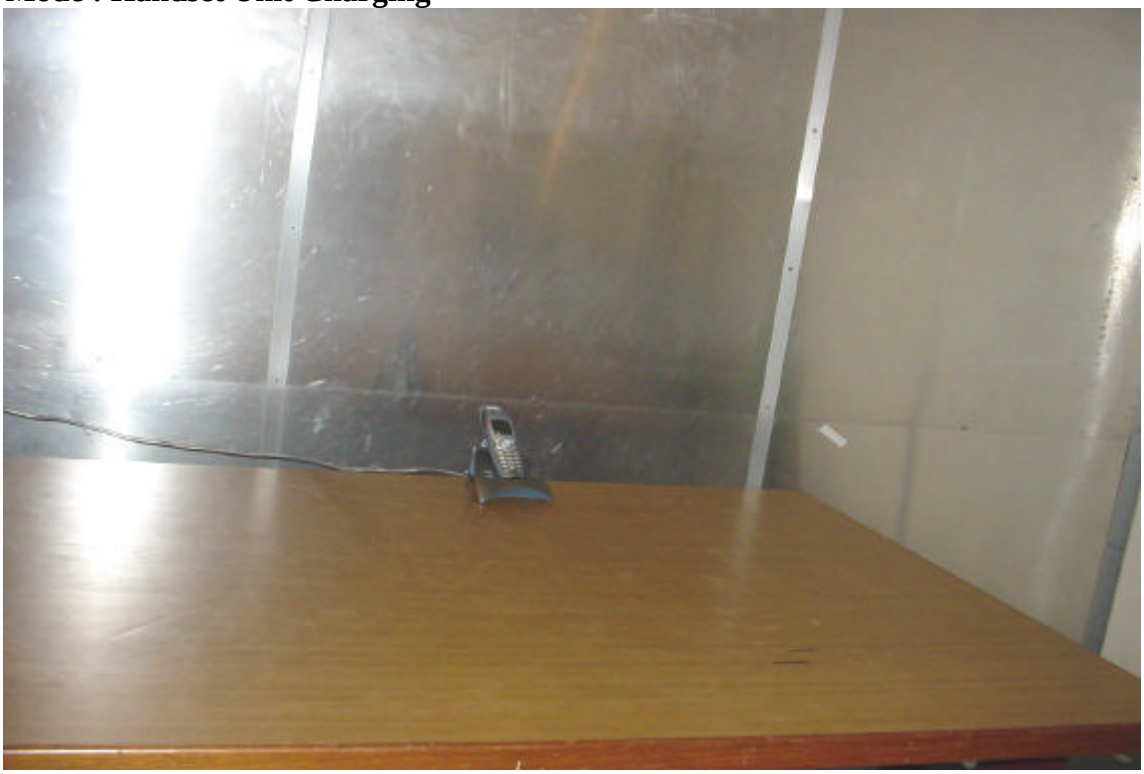
The following test equipment are used during the conducted test.

Equipment	Manufacturer	Model No.	Serial No.	Nest Cal. Date
EMI Test Receiver	Rohde and Schwarz	ESCS30	830986/026	12/06/2005
Line Impedance Stabilization network	Rohde and Schwarz	ESH2-Z5	881362/009	08/10/2005
Line Impedance Stabilization network	Kyoritsu	KNW-407	8-823-6	12/25/2005
Shielded Room	Riken	----	----	N/A
Monitor	IBM	E54	----	N/A
Printer	HP	LASERJET 1000	----	N/A
Computer	ACER	Veriton 7500G	----	N/A

5.6 Photos of Conduction Measuring Setup

Mode : Base Unit Link

Mode : Handset Unit Charging



Handset Unit Charging with Charger

6 ANTENNA REQUIREMENT

6.1 Standard Applicable

For intentional device, according to 15.203, 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.

6.2 Antenna Construction

The antenna of base and handset unit is permanently attached, no consideration of replacement.

Antenna Type	Model	Antenna Gain
SHORT Antenna 2.45GHz CASIO Base (For Base Unit)	671-000393	-1dBi
STD 2.45GHz Dipole Antenna (For Handset Unit)	671-000461	0dBi

7 HOPPING CHANNEL SEPARATION

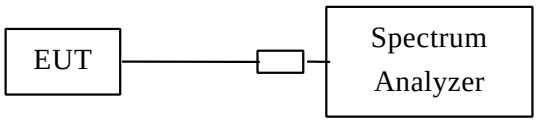
7.1 Standard Applicable

According to 15.247(a)(1), frequency hopping system shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

7.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. The EUT must have its hopping function enabled. Then set it to any one convenient frequency within its operating range.
3. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peaks of two adjacent channels
   Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span
   Video (or Average) Bandwidth (VBW) ≥ RBW
   Sweep = auto
   Detector function = peak
   Trace = max hold
4. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Plot the result on the screen of spectrum analyzer.
5. Repeat above procedures until all frequencies measured were complete.

Figure 4 : Measurement configuration.



7.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Rohde & Schwarz	FSP	05/31/2005
Attenuator	Weinschel Engineering	1	N/A
Plotter	Hewlett-Packard	7440A	N/A

7.4 Measurement Data

Test Date : Apr. 01, 2005 Temperature : 25°C Humidity : 60 %

Mode : Base Unit

1) CH Low(2401.056MHz) : Adjacent Hopping Channel Separation is 860 KHz
2) CH Mid(2440.800MHz) : Adjacent Hopping Channel Separation is 860 KHz
3) CH High(2480.544MHz) : Adjacent Hopping Channel Separation is 860 KHz

Mode : Handset

1) CH Low(2401.056MHz) : Adjacent Hopping Channel Separation is 860 KHz
2) CH Mid(2440.800MHz) : Adjacent Hopping Channel Separation is 860 KHz
3) CH High(2480.544MHz) : Adjacent Hopping Channel Separation is 860 KHz

Note : 1. Please see appendix 2 for Plotted Data
2. The expanded uncertainty of the hopping channel separation tests is 2dB.

8 NUMBER OF HOPPING FREQUENCY USED

8.1 Standard Applicable

According to 15.247(a)(1)(iii), frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 non-overlapping channels.

8.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. The EUT must have its hopping function enabled.
3. Use the following spectrum analyzer settings:
   Span = the frequency band of operation
   RBW ≥ 1% of the span
   VBW ≥ RBW
   Sweep = auto
   Detector function = peak
   Trace = max hold
4. Allow the trace to stabilize. Plot the result on the screen of spectrum analyzer.
5. Repeat above procedures until all frequencies measured were complete.

8.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Rohde & Schwarz	FSP	05/31/2005
Attenuator	Weinschel Engineering	1	N/A
Plotter	Hewlett-Packard	7440A	N/A

8.4 Measurement Data

Test Date : Apr. 01, 2005 Temperature : 25°C Humidity : 60 %

Mode : Base Unit

There are 93 hopping frequencies used.

Mode : Handset

There are 93 hopping frequencies used.

Note : 1. Please see appendix 3 for Plotted Data
2. The expanded uncertainty of umber of hopping frequency used tests is 2dB.

9 CHANNEL BANDWIDTH

9.1 Standard Applicable

According to 15.247(a)(1)(ii), for frequency hopping system operating in the 5725-5850 MHz band, the maximum 20dB bandwidth of the hopping channel is 1MHz.

9.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
3. Use the following spectrum analyzer settings:
   Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
   RBW ≥ 1% of the 20 dB bandwidth
   VBW ≥ RBW
   Sweep = auto
   Detector function = peak
   Trace = max hold
4. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. Plot the result on the screen of spectrum analyzer.
   5. Repeat above procedures until all frequencies measured were complete.

9.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Rohde & Schwarz	FSP	05/31/2005
Attenuator	Weinschel Engineering	1	N/A
Plotter	Hewlett-Packard	7440A	N/A

9.4 Measurement Data

Test Date : Apr. 01, 2005 Temperature : 25°C Humidity : 60 %

Mode : Base Unit

1) CH Low(2401.056MHz) : Channel Bandwidth is 720 KHz
2) CH Mid(2440.800MHz) : Channel Bandwidth is 720 KHz
3) CH High(2480.544MHz) : Channel Bandwidth is 730 KHz

Mode : Handset

1) CH Low(2401.056MHz) : Channel Bandwidth is 740 KHz
2) CH Mid(2440.800MHz) : Channel Bandwidth is 750 KHz
3) CH High(2480.544MHz) : Channel Bandwidth is 750 KHz

Note : 1. Please see appendix 4 for Plotted Data
2. The expanded uncertainty ofchannel bandwidth tests is 2dB.

10 DWELL TIME ON EACH CHANNEL

10.1 Standard Applicable

According to 15.247(a)(1)(iii), for frequency hopping system operating in the 2400-2483.5 band, the average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

10.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. The EUT must have its hopping function enabled.
3. Use the following spectrum analyzer settings:
   Span = zero span, centered on a hopping channel
   RBW = 1 MHz
   VBW ≥ RBW
   Sweep = as necessary to capture the entire dwell time per hopping channel
   Detector function = peak
   Trace = max hold
4. Use the marker-delta function to determine the dwell time. Plot the result on the screen of spectrum analyzer.
5. Repeat above procedures until all frequencies measured were complete.

10.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Rohde & Schwarz	FSP	05/31/2005
Attenuator	Weinschel Engineering	1	N/A
Plotter	Hewlett-Packard	7440A	N/A

10.4 Measurement Data

Test Date : Apr. 01, 2005 Temperature : 25°C Humidity : 60 %

Period = 0.4(seconds) x 93(channels) = 37.2 seconds

Mode : Base Unit

1) CH Low(2401.056MHz) : the dwell time is 0.360msx39＝14.04 ms
2) CH Mid(2440.800MHz) : the dwell time is 0.360 ms x39＝14.04 ms
3) CH High(2480.544MHz) : the dwell time is 0.360 ms x40＝14.40 ms

Mode : Handset

1) CH Low(2401.056MHz) : the dwell time is 0.360msx40＝14.40 ms
2) CH Mid(2440.800MHz) : the dwell time is 0.360msx39＝14.04 ms
3) CH High(2480.544MHz) : the dwell time is 0.360msx39＝14.04 ms

The maximum time of occupancy for a particular channel is 39.312 msec in any 37.2 second period, which is less than the 400 msec allowed by the rules; therefore, it meets the requirements of this section.

Note : 1. Please see appendix 5 for Plotted Data
2. The expanded uncertainty of dwell time on each channel tests is 2dB.

11 OUTPUT POWER MEASUREMENT

11.1 Standard Applicable

According to 15.247(b)(1), for frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt.
For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

11.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Use the following spectrum analyzer settings:
   Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
   RBW > the 20 dB bandwidth of the emission being measured
   VBW ≥ RBW
   Sweep = auto
   Detector function = peak
   Trace = max hold
4. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power. Plot the result on the screen of spectrum analyzer.
5. Repeat above procedures until all frequencies measured were complete.

11.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Rohde & Schwarz	FSP	05/31/2005
Attenuator	Weinschel Engineering	1	N/A
Plotter	Hewlett-Packard	7440A	N/A

11.4 Measurement Data

Test Date : Apr. 01, 2005 Temperature : 25°C Humidity : 60 %

Mode : Base Unit

1) CH Low(2401.056MHz) : Output Peak Power is 22.86 dBm = **193.20**mW
2) CH Mid(2440.800MHz) : Output Peak Power is 23.17 dBm = **207.49**mW
3) CH High(2480.544MHz) : Output Peak Power is 23.13 dBm = **205.59**mW

Mode : Handset

1) CH Low(2401.056MHz) : Output Peak Power is 21.81 dBm = **151.71**mW
2) CH Mid(2440.800MHz) : Output Peak Power is 23.14 dBm = **206.06**mW
3) CH High(2480.544MHz) : Output Peak Power is 22.47 dBm = **176.60**mW

Note : 1. Please see appendix 6 for Plotted Data

2. The expanded uncertainty of output power measurement tests is 2dB.

12 100 kHz BANDWIDTH OF BAND EDGES MEASUREMENT

12.1 Standard Applicable

According to 15.247(c), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

12.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Use the following spectrum analyzer settings:

   Span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation

   RBW ≥ 1% of the span

   VBW ≥ RBW

   Sweep = auto

   Detector function = peak

   Trace = max hold
4. Allow the trace to stabilize. Set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. Plot the result on the screen of spectrum analyzer.
5. Repeat above procedures until all measured frequencies were complete.

12.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Rohde & Schwarz	FSP	05/31/2005
Attenuator	Weinschel Engineering	1	N/A
Plotter	Hewlett-Packard	7440A	N/A

12.4 Measurement Data

Test Date : Apr. 01, 2005 Temperature : 25°C Humidity : 60 %

Mode : Base Unit & Handset

a) Lower Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.
b) Upper Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.

Note : 1. Please see appendix 7 for Plotted Data
2. The expanded uncertainty of the 100 KHz bandwidth of band edges tests is 1000Hz.

13 OUT-OF-BAND CONDUCTED EMISSION MEASUREMENT

13.1 Standard Applicable

According to 15.247(c), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

13.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
   RBW = 100 kHz
   VBW ≥ RBW
   Sweep = auto
   Detector function = peak
   Trace = max hold.
4. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded. Plot the result on the screen of spectrum analyzer.
5. Repeat above procedures until all measured frequencies were complete.

13.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Rohde & Schwarz	FSP	05/31/2005
Attenuator	Weinschel Engineering	1	N/A
Plotter	Hewlett-Packard	7440A	N/A

13.4 Measurement Data

Mode : Base Unit & Handset

Test Date : Apr. 01, 2005 Temperature : 25°C Humidity : 60 %

Mode : Low Channel

a) 1 GHz to 3 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.
b) 3 GHz to 26.5 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.

Mode : Mid Channel

a) 1 GHz to 3 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.
b) 3 GHz to 26.5 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.

Mode : High Channel

a) 1 GHz to 3 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.
b) 3 GHz to 26.5 GHz frequency band: All emissions are attenuated more than 20dB from the carrier

Note : 1. Please see appendix 8 for Plotted Data

2. The expanded uncertainty of the out-of-band conducted emission tests is 2dB.