

HYUNDAI CALIBRATION & CERTIFICATION TECH. CO., LTD.

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CERTIFICATION

Manufacture;
C&TT Co., Ltd.

#1003 Geumbok Bldg, 45-2 Bang-I Dong
Song-Pa Gu, Seoul, Korea

C&TT FRN : 0012268108

Date of Issue: DECEMBER 07, 2004

Test Report No.: HCT-F04-1202

Test Site: HYUNDAI CALIBRATION & CERTIFICATION
TECHNOLOGIES CO., LTD.

HCT FRN : 0005-8664-21

FCC ID :

SR3WCS-211

MODEL :

WCS-211

Rule Part(s): FCC PART 15 Subpart C(2001)
Equipment Class: Part 15 Security/Remote Control Transmitter
EUT TYPE: Wellbeing Call System

This equipment has been shown to be in compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2001 (Grant Notes: #19, #28).

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.



Report prepared by : Ki-Soo Kim
Manager of EMC Tech. Part

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MEASUREMENT REPORT

1.1 Scope

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.

Applicant Name:	C&TT Co., Ltd.
Address:	#1003 Geumbok Bldg, 45-2 Bang-I Dong Song-Pa Gu, Seoul, Korea

- **Equipment Class:** Part 15 Security/Remote Control Transmitter
- **EUT Type:** Wellbeing Call System
- **Model(s):** WCS-211
- **Usable Frequencies :** 311.0625 MHz
- **Input audio Frequencies :** 50 Hz ~ 15 KHz
- **Channel Space :** 12.5KHz (signal channel)
- **Working voltage :** DC 3V
- **Size :** 62mm X 73mm X 20mm
- **Operation humidity:** -10% ~ 50%

Place of Tests : 254-1,MAEKOK-RI,HOBUP-MYUN,ICHON-SI KYOUNGKI-DO,467-701,KOREA

2.1 INTRODUCTION(Site Information)

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C63.4-1992) was used in determining radiated and conducted emissions emanating from C&TT Co., Ltd. Wellbeing Call System. **FCC ID : SR3WCS-211**

The open area test site and conducted measurement facility used to collect the radiated data are located at the 254-1, MAEKOK-RI, HOBUP-MYUN, ICHON-SI, KYOUNGKI-DO, 467-701, KOREA. The site is constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated July 24, 2000 (Registration Number: EA90661)

3.1 PRODUCT INFORMATION

3.1.1 Equipment Description

Equipment Under Test (EUT) is C&TT Co., Ltd. **Wellbeing Call System.** FCC ID : SR3WCS-211

- **Equipment Class:** Part 15 Security/Remote Control Transmitter
- **EUT Type:** Wellbeing Call System
- **Model(s):** WCS-211
- **Usable Frequencies :** 311.0625 MHz
- **Input audio Frequencies :** 50 Hz ~ 15 KHz
- **Channel Space :** 12.5KHz (signal channel)
- **Working voltage :** DC 3V
- **Size :** 62mm X 73mm X 20mm
- **Operation humidity :** -10% ~ 50%
- **Generating power of transmission :** under 500uv/m at 3m away
- **Frequency stability :** ± 7 ppm
- **Occupied bandwidth :** 8.5 KHz

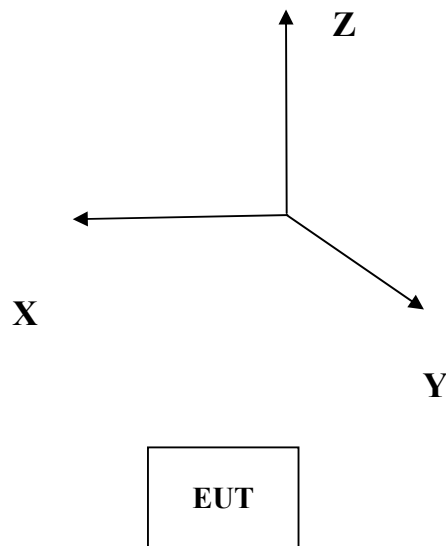
4.1 PRELIMINARY TESTS

4.1.1 Radiated Emission Test

During Tests, the following operating conditions were investigated

Axes	The worst operating condition
X	
Y	
Z	O

Note : This transmitter has been investigated with three axes and the reported readings are the worse case.



5.1 List of Support Equipment

5.1.1 Support Equipment used

DEVICE TYPE	MANUFACTURER	MODEL NUMBER	FCC ID / DoC	CONNECTED TO
Wellbeing Call System (EUT)	C&TT Co., Ltd.	WCS-211	SR3WCS-211	-

5.1.2 Cable Description

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (M)
Wellbeing Call System (EUT)	-	-	-	-

The EUT was tested as stand alone device.

5.1.3 Noise Suppression Parts on Cable (I/O CABLE)

Product Name	Port	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
Wellbeing Call System (EUT)	-	-	-	-	-

None

6. TEST AND MEASUREMENTS

Summary of Test Results

Requirement	CFR Section	Report Section	Test Result
Antenna Requirement	15.203	5.1	PASS
Radiated Spurious Emissions	15.231(b), 15.205, 15.209	5.2	PASS
Field Strength (Fundamental)	15.231(b)	5.2	PASS
Periodic Operation Characteristics	15.231(a)	5.4	PASS
Occupied bandwidth	15.231(c)	5.5	PASS
Conducted Emissions	15.207	*	*

** Not required, the EUT is battery powered.*

6.1 ANTENNA REQUIREMENT

6.1.1 Regulation

FCC section 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. 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 Part 15C. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31 (d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

6.1.2 Result: **PASS**

The transmitter has an integral pattern antenna and meets the requirements of this section.

6.2 RADIATED EMISSIONS

6.2.1 Regulation

According to §15.231(b), the field strength of emissions from intentional radiators operated under this frequency band shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (uV/m @ 3m)	Field strength of spurious emissions (uV/m @ 3m)
260.470	3,750 to 12,500	375 to 1,250

<Use quasi-peak or average detector function>

Any emissions that fall within the restricted bands specified in FCC Section 15.205 shall not exceed the following limits according to §15.209:

Frequency (MHz)	Field strength (uV/m @ 3m)	Field strength (dBuV/m @ 3m)
30.88	100	40.0
88.216	150	43.5
216.960	200	46.0
Above 960	500	54.0

6.2.2 Measurement Procedure

Preliminary radiated measurements were performed to determine the frequency producing the maximum emissions in an anechoic chamber at a distance of 3 meters. The EUT was placed on the top of the 0.8 meter high, 1 x 1.5 meter non-metallic table. To find the maximum emission levels, the height of a measuring antenna was changed and the turntable was rotated 360°. The antenna polarization was also changed from vertical to horizontal. The spectrum was scanned from 30 to 300 MHz using the biconical antenna and from 300 to 1000 MHz using the log-periodic antenna. Above 1GHz, linearly polarized double ridge horn antenna was used.

To obtain the final test data, the EUT was arranged on a turntable situated on a 4x4 meter at the Open Area Test Site. The EUT was tested at a 3-meter test distance. Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average and peak detector function with specified bandwidth. The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT.

6.2.3 Calculation of the field strength limits by linear interpolation (F=311MHz)

Field strength limit of the fundamental frequency:

$$\text{Limit} = (F-260) * (12500-3750) / (470-260) + 3750 = 5875 \mu\text{V/m} = 75.3 \text{ dBuV/m}$$

Field strength limit of spurious emissions:

$$\text{Limit} = (F-260) * (1250-375) / (470-260) + 375 = 587.5 \mu\text{V/m} = 55.3 \text{ dBuV/m}$$

6.2.4 Calculation of Average Correction Factor

The average correction factor is computed by analyzing the "worst case" on time in any 100 msec time period and using the formula:

Corrections Factor = $20 \log (\text{worst case on time} / 100 \text{ msec})$.

The maximum correction factor to be applied is 20 dB per section 15.35 of the FCC rules.

All following emission measurements were performed using the test receiver's average and peak detectors and .Max Hold. mode; the average and peak values were measured directly without the necessity of additional average correction factor.

6.2.5 Test Results:

PASS

The results of the field strength of the fundamental and spurious/harmonic emissions are shown in Table 1. The worst-case emission level is 66.1 dBuV/m @ 3m at 311.1 MHz, This is 29.2 dB below the specified limit.

Radiated Emissions Peak Data 15.231 Bands

Frequency MHz	Reading dBuV	Ant. Factor dB/m	Cable Loss dB	ANT POL (H/V)	Peak Total dBuV/m	A/V Limit dBuV/m	Margin dB
311.1	48.8	13.2	4.1	H	66.1	75.3	-9.2
207.3	16.1	9.8	3.3	H	29.2	55.3	-26.1
362.9	13.3	14.2	4.4	H	31.9	55.3	-23.4
466.5	11.9	16.9	4.9	H	33.7	55.3	-21.6

Radiated Measurements at 3-meters.

NOTE:

1. The radiated limits are listed on Page 9.

Radiated Emissions Average Data 15.231 Bands

Frequency MHz	Reading dBuV	Ant. Factor dB/m	Cable Loss dB	ANT POL (H/V)	A/V Total dBuV/m	A/V Limit dBuV/m	Margin dB
311.1	40.2	13.2	4.1	H	57.5	75.3	-17.8
207.3	7.5	9.8	3.3	H	20.6	55.3	-34.7
362.9	4.7	14.2	4.4	H	23.3	55.3	-32.0
466.5	3.3	16.9	4.9	H	25.1	55.3	-30.2

NOTE:

1. A/V Total = Peak Measurement -8.6

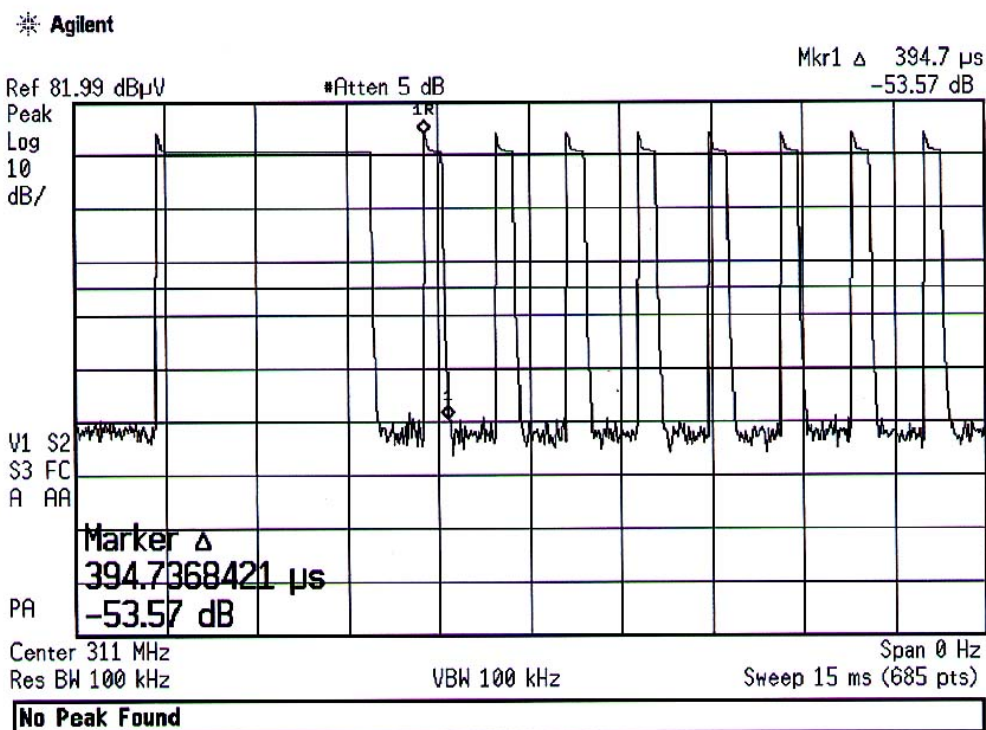
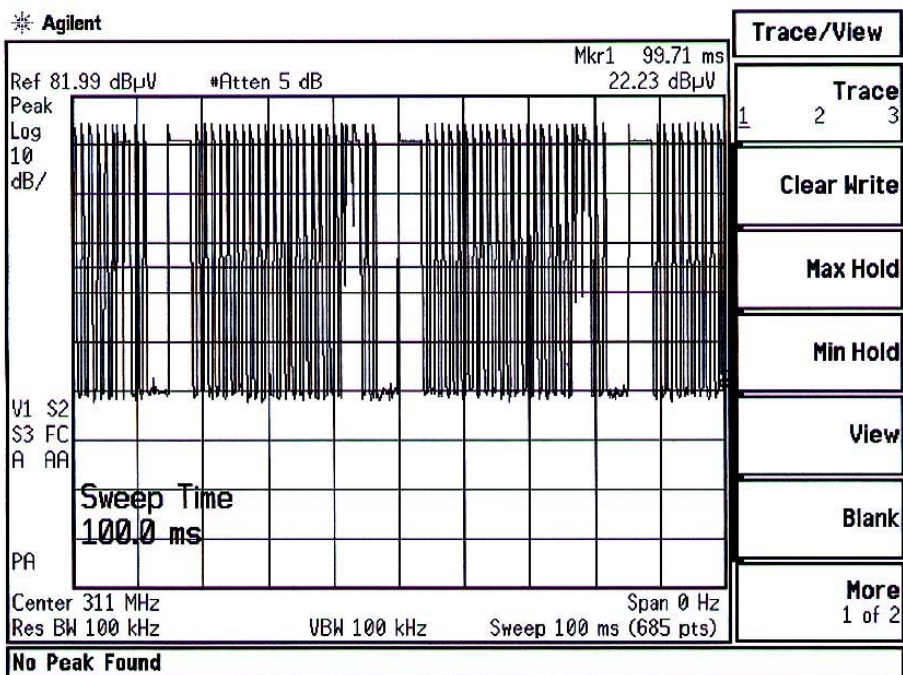
Duty Cycle Correction During 100msec

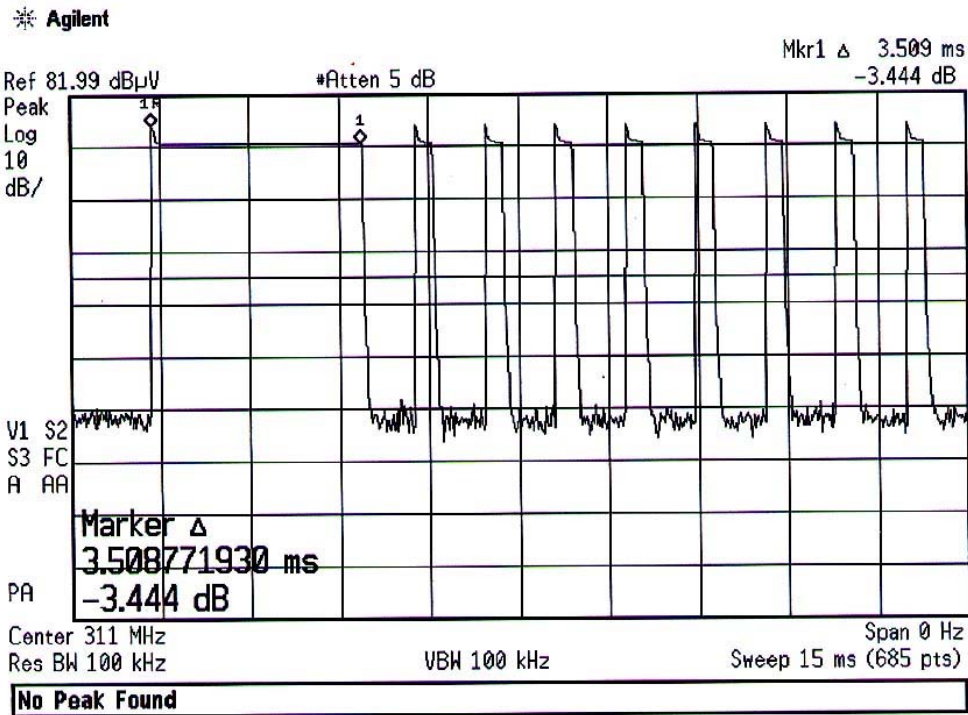
Each function key sends a different series of characters, but each packet period (100msec) never exceeds a series of 3 long (3.059msec) and 67 short (394.7sec) pulses. Assuming any combination of short and long pulses may be obtained due to encoding the worst case transmit duty cycle would be considered $3 \times 3.059\text{msec} + 67 \times 394.7\text{sec}$ per 100msec = 0.37% duty cycle.

Figure A through C show the characteristics of the pulses train for one of these functions.

Remarks:

1. Duty Cycle Correction = $20\text{Log}(0.37) = -8.6\text{dB}$
2. Peak level complies with the average limit.





Radiated Emissions 15.205 Restricted Bands

Frequency MHz	Reading dBuV	Ant. Factor dB/m	Cable Loss dB	ANT POL (H/V)	Total dBuV/m	Limit dBuV/m	Margin dB
259.2	14.7	11.6	3.7	H	30.0	46	-16.0

Radiated Measurements at 3-meters.

*** Measurements using CISPR quasi-peak mode. Above 1GHz, peak detector function mode is used using a resolution bandwidth of 1MHz and a video bandwidth of 3MHz. The peak level complies with the average limit. Peak mode is used with linearly polarized horn antenna and low-loss microwave cable.

6.3 PERIODIC OPERATION CHARACTERISTICS

6.3.1 Periodic Operation

FCC 15.231 (a), The provisions of this section are restricted to periodic operation within the band 40.66, 40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Radio control of toys is not permitted.

Continuous transmissions, such as voice or video, and data transmissions are not permitted.

The prohibition against data transmissions does not preclude the use of recognition codes.

Those codes are used to identify the sensor that is activated or to identify the particular component as being part of the system.

6.3.2 Manually Operated Transmitter Deactivation

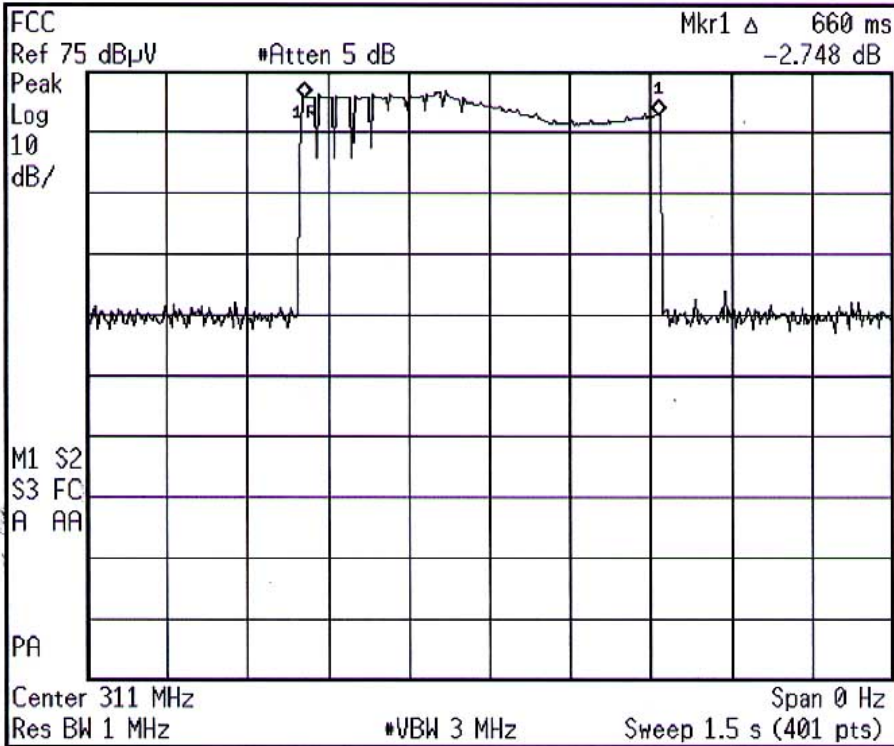
FCC 15.231 (a1), A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

6.3.3 Result : PASS

The EUT is intended to transmit activation code to the receiver.

The EUT is manually operated and deactivated automatically after transmitting the preprogrammed activation code. The result of the transmission duration is shown in Figure 1. The worst-case transmission duration is 660msec when .Lock. button is pressed.

Agilent 09:33:22 Nov 17, 2004



Limit 1

Type
Upper Lower

Limit
On Off

Test
On Off

Margin
0.00 dB
On Off

Edit

Delete Limit

More
1 of 2

6.4 OCCUPIED BANDWIDTH

6.4.1 Regulation

FCC 15.231 (c), The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

6.4.2 Calculation of 20 dB Bandwidth Limit (F=315MHz)

The 20 dB bandwidth limit = $F \times 0.0025 = 311 \text{ MHz} \times 0.0025 = 777.5 \text{ kHz}$

6.4.3 Test Procedure

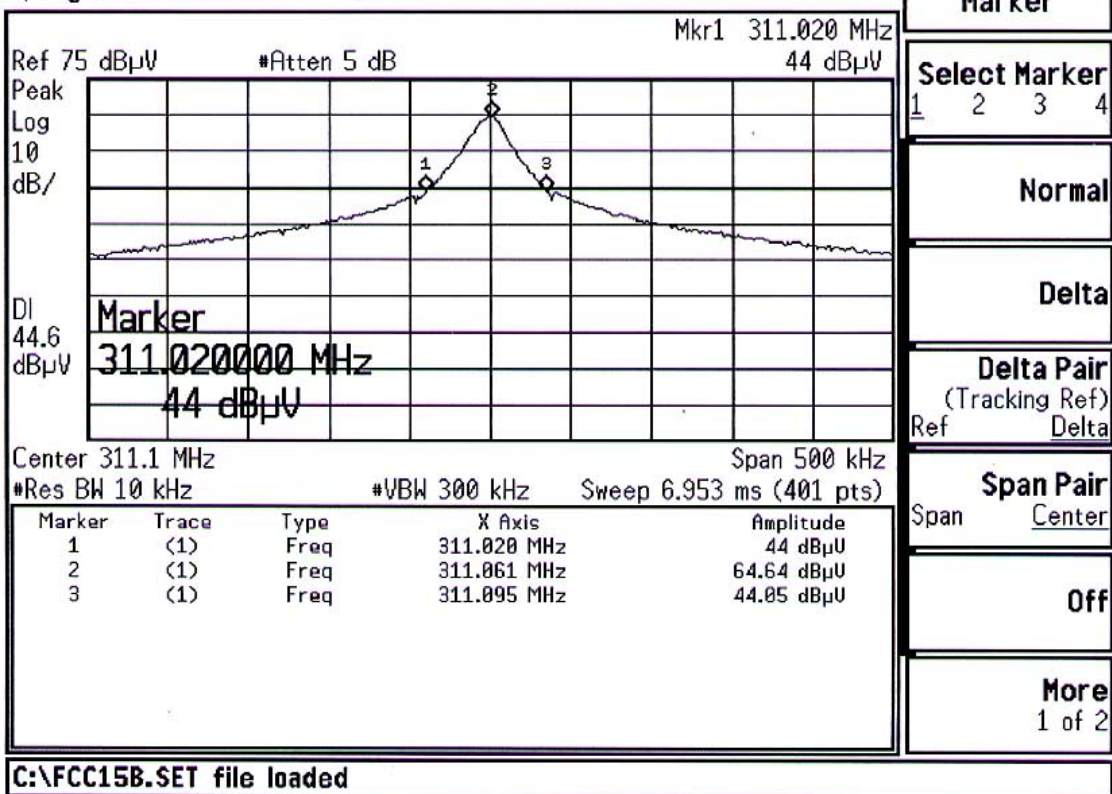
ANSI C63.4-2001 Section 13.1.7, Occupied Bandwidth Measurements. The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or first-order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical. Once the reference level is established, the equipment is conditioned with typical modulating signals to produce worstcase (i.e., the widest) bandwidth.

The measurement was performed at the operating frequency, 315MHz. The spectrum trace data around fundamental frequency of the EUT was obtained with the spectrum analyzer in .Max Hold. mode. The bandwidth value was determined between the two points of 20dB down from the modulated carrier.

6.4.4. Test Results: PASS

The measured spectrum of the signal is shown in Figure 2. From the plot, we can see that in the worst case, the occupied bandwidth is 75 KHz.

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7.1 Test Equipment

<u>Type</u>	<u>Manufacture</u>	<u>Model Number</u>	<u>CAL Due Date</u>
EMI Test Receiver	Rohde & Schwarz	ESI40	2005.11.16
EMI Test Receiver	Rohde & Schwarz	ESVS30	2005.07.16
LISN	Rohde & Schwarz	ESH2-Z5	2005.07.28
LISN	EMCO	ESH3-Z5	2005.07.28
Attenuator	Rohde & Schwarz	ESH3-Z2	2005.11.16
Amplifier	Hewlett-Packard	8447E	2005.08.23
TRILOG Antenna	Schwarzbeck	9160	2005.04.06
Antenna Position Tower	EMCO	1051-12	N/A
Turn Table	EMCO	1060-06	N/A
Power Analyzer	Voltech	PM 3300	2005.02.15
Reference Network Impedance	Voltech	IEC 555	N/A
AC Power Source	PACIFIC	Magnetic Module	N/A
AC Power Source	PACIFIC	360-AMX	2005.11.25
Controller	HD GmbH	HD 100	N/A
SlideBar	HD GmbH	KMS 560	N/A

8.1 Test Mode

The EUT was acted standby mode during radiated testing.

NOTE: This is a sample of the basic program used during the test.

9.1 Conclusion

The data collected shows that **C&TT Co., Ltd. Wellbeing Call System. FCC ID : SR3WCS-211** complies with §15.203, §15.205, §15.209, §15.207, § 15.231(a),(b),(c) of the FCC Rules.