EMC TEST REPORT
for
FCC part 15 CERTIFICATION

No. JSH0312294-002A

Summary

The equipment comply with the requirements according to the following standard(s):

47CFR Part 15:2003: RADIO FREQUENCY DEVICES

ANSI C63.4 : 2001 : 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.

Description

The appliances were tested by and found compliance with relevant requirements described in FCC Part 15: 2003: RADIO FREQUENCY DEVICES.

Test results are contained in this test report and Intertek Testing Services ETL SEMKO Shanghai Limited is assumed full responsibility for the accuracy and completeness of these measurements.

Date of Test: June 26-28, 2004

Date of Issue: June 28, 2004

Prepared by: Report Reviewed by:

Tino Pan *(Projector Engineer)* Steve Li *(EMC Manager)*

FCC ID: RUMCL2

Description of Test Facility

Name of Firm :	QuieTek (Shanghai) Corporation
Site Location :	716 Yishan Road, Shanghai, 200233, P.R. China
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FCC Registration number:	142171

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1. Applicant Information

Applicant:	Geemarc Telecom International Ltd. 19F Mass Mutual Tower 38 Gloucester Road Wanchai Hong Kong
Name of contact:	Ms. Chen Qingruan
Telephone:	86 592 6036442
Telefax:	86 592 6037860
Manufacturer:	Xiamen Xinglian Electronics Co., Ltd. 6-7 F No.2 Bldg 2nd Stage Tian An Industrial District, Xiamen, Fujian, P.R.C

2.Information of Equipment Under Test (EUT)

2.1 Identification of the EUT

Equipment:	ClearSounds Phone/Dooorbell Signaler
Type of EUT:	☑ Production ☐ Pre-product ☐ Pro-type
Type/model:	CL2, CS-CL2, BT-CL2
Serial number:	0312294-001 ~ 0312294-003
Date of sample receipt	2004-6-6
Date of test	2004-6-26~2004-6-27
Sample tested	serial number 0312294-001
EUT operation mode	EUT has only " transmission" mode (Door Bell Mode)
Test condition	during the whole test, 1 new d.c. battery was used
Rating:	DC 12V Transmitter Operation frequency : 433.92MHz

Trademark:

Model Number	Trademark
CL2	Geemarc
CS-CL2	Hitec
BT-CL2	Beltone

2.2 Additional information about the EUT

Description:	There are three models mentioned in the report. And they are all the same in schematics diagram. The difference among them is their different trade mark. Therefore the model CL2 was chose to be tested as a representative. The integral antenna is used.
FCC Rule part(s):	FCC Part 15 C 15.231

2.3 Peripheral equipment

None

3. Conducted Powerline Measurement

Conclusion: The product was powered by battery, without external power supply from power network, therefore, conducted powerline measurement is not applicable.

4. Radiated emission measurement

4.1 Radiated emission limit

the limit for transmitter part

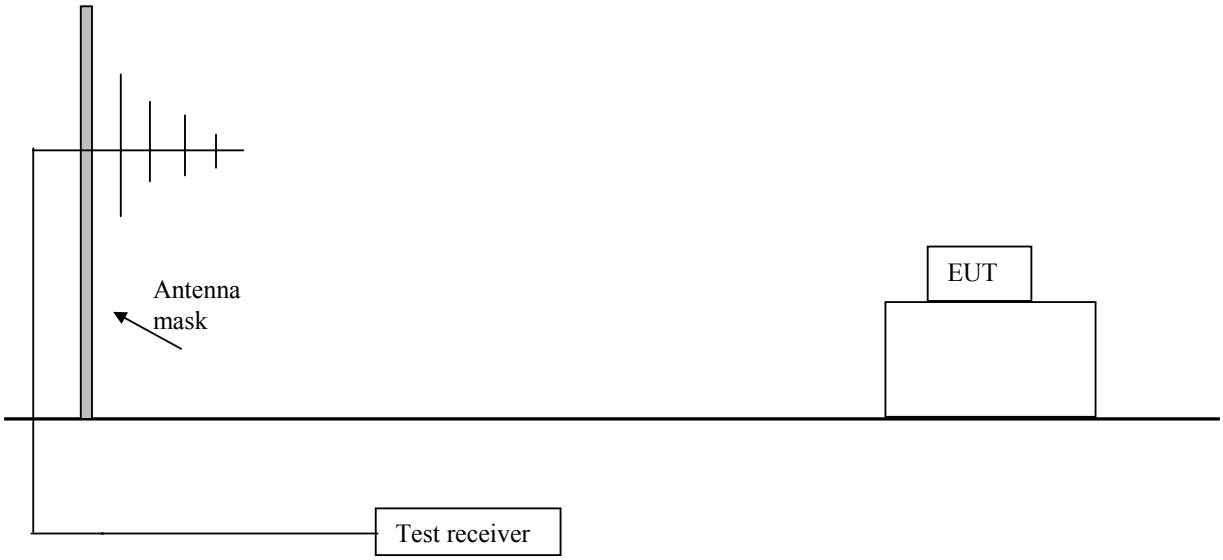
Frequency of emission (MHz)	Field strength of fundamental (μ V/m)	Field strength of fundamental (dB μ V/m)	Field strength of spurious emission (μ V/m)	Field strength of spurious emission (dB μ V/m)
40.66-40.70	2,250	67.04	225	47.04
70-130	1,250	61.94	125	41.94
130-174	1,250 to 3,750*	61.94 to 71.48*	125 to 375*	41.94-51.48*
174-260	3,750	71.48	375	51.48
260-470	3,750 to 12,500*	71.48 to 81.9*	375 to 1,250*	51.48 to 61.9*
Above 470	12,500	81.9	1,250	61.9

Note: 1. "*" means linear interpolation
2. 20lg Field strength (μ V/m)=Field strength (dB μ V/m) such as follows:
20lg2,250(μ V/m)=67.04(dB μ V/m)

4.2 Instruments list

Item	Equipment	Manu.	Type	Serials no.	Last Cal.	Cal. Interval
1	EMI Test Receiver	Rohde & Schwarz	ESI 26	838786/011	2004-2-8	1 Year
2	Log Periodic Antenna	Rohde & Schwarz	HL 562	100019	2004-4-15	1 Year
3	Horn Antenna	SCHWARZBECK	BBHA9120D	249	2004 -5-25	1 Year
4	Spectrum Analyzer	Agilent	E7402A	US40240228	2004 -5-25	1 Year
5	Digital Phosphor Oscilloscope	Tektronix	TDS 5104	B020899	2004 -2-25	1 Year

4.3 Test setup



4.4 Test configuration

The measurement was applied in Semi- anechoic Chamber.
At frequency range 30MHz –1000MHz, logical periodic antenna was used to get the field strength emitted from EUT. At frequency range 1GHz – 5GHz, Horn antenna was used to get the field strength emitted from EUT. Both antenna was moved up and down from 1m to 4m to find the maximum emission level.
The bandwidth setting on R&S Test Receiver ESI 26 was 120kHz for measurement from 30-1000MHz, and 1MHz for measurement 1-5GHz. Test distance is 3m.
The mode (transmission) was checked and test results are listed in the sec.4.6.

The transmitter was rotated through three orthogonal axes (X, Y, Z). The antenna was placed two polarizations (Horizontal & Vertical).

For measurement above 1GHz, average value was used by calculate the average factor according to section 15.35.

4.5 Test procedure

4.5.1 Establish the test setup as sec. 4.3.
4.5.2 Set the ClearSounds Phone/Doorbell Signaler to “Transmission” mode.
4.5.3 Proceed the measurement (both for frequency below 1GHz and above 1GHz)

4.6 Test Results

■ Pass ☐ Fail

4.6.1 Measurement environment

Temperature : 25.2 °C Relative Humidity : 41 %

4.6.2 Average factor measurement and calculation

For measurement frequency above 1GHz, average value was used to evaluate the emission level, average factor calculation is as follow:

Average Factor = 20 lg (wanted signal duration/complete pulse train)
= 20 lg (5.16/14.83)
= -9.16 dB

4.6.3 Data table

All emissions not listed below are too low against the prescribed limits.
For measurement below 1GHz
Emission level = Reading level + Cable loss + Antenna factor
For measurement above 1GHz
Emission level = Reading level + Cable loss + Antenna factor + Average factor

The protocol for transmitter part (fundamental)
Orthogonal axe: X

Polarization	Frequency (MHz)	Reading level (dBuV)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV /m)	Margin (dB)
Horizontal	433.987679	55.60	3.71	14.26	73.57	80.80	7.23
Vertical	433.987679	55.35	3.71	14.26	73.32	80.80	7.48

Orthogonal axe: Y

Polarization	Frequency (MHz)	Reading level (dBuV)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV /m)	Margin (dB)
Horizontal	433.987679	55.38	3.71	14.26	73.35	80.80	7.45
Vertical	***433.987679***	***56.94***	***3.71***	***14.26***	***74.91***	***80.80***	***5.89***

Orthogonal axe: Z

Polarization	Frequency (MHz)	Reading level (dBuV)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV /m)	Margin (dB)
Horizontal	434.028567	53.70	3.71	14.26	71.67	80.80	9.13
Vertical	434.028567	55.38	3.71	14.26	73.35	80.80	7.45

Note:
1. Emission level = Reading level + Antenna factor + Cable loss
2. Margin = Limit – Emission level
3. The worst fundamental emission level was found at 433.987679MHz/vertical with 5.89dB margin, Y axe.

The protocol for transmitter part (spurious emission) below 1 GHz

Orthogonal axe: X

Polarization	Frequency (MHz)	Reading level (dBuV)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV /m)	Margin (dB)
Horizontal	867.975357	29.53	5.33	20.23	55.09	60.80	5.91
Vertical	867.975357	28.00	5.33	20.23	53.56	60.80	7.24

Orthogonal axe: Y

Polarization	Frequency (MHz)	Reading level (dBuV)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV /m)	Margin (dB)
Horizontal	867.759357	30.15	5.33	20.23	55.71	60.80	5.71
Vertical	***867.759357***	***30.35***	***5.33***	***20.23***	***55.91***	***60.80***	***4.89***

Orthogonal axe: Z

Polarization	Frequency (MHz)	Reading level (dBuV)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV /m)	Margin (dB)
Horizontal	867.675593	26.49	5.33	20.23	52.05	60.80	8.75
Vertical	867.675593	25.62	5.33	20.23	51.18	60.80	9.62

Note:

1. Emission level = Reading level + Antenna factor + Cable loss
2. Margin = Limit – Emission level
3. The worst spurious emission below l GHz was found at 867.759357MHz/vertical with 4.89dB margin, Y axe.

The protocol for transmitter part (spurious emission) above 1 GHz

Orthogonal axe: X

Polarization	Frequency (MHz)	Reading level (dBuV)	Cable Loss (dB)	Antenna Factor (dB/m)	Average factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)
Horizontal	1296.592819	32.99	4.30	23.30	-9.16	51.43	60.80	9.37
	1737.473952	27.81	5.00	24.50	-9.16	48.15	60.80	12.65
	1937.876091	32.10	5.20	26.90	-9.16	55.04	60.80	5.76
	2170.340177	29.10	5.60	28.20	-9.16	53.74	60.80	7.06
	2370.741375	18.03	5.80	29.60	-9.16	44.27	60.80	16.53
	3877.755195	***22.70***	***7.60***	***31.90***	***-9.16***	***53.04***	***54.00***	***0.96***
Vertical	1296.592819	37.72	4.30	23.30	-9.16	56.16	60.80	4.64
	1737.474950	31.38	5.00	24.50	-9.16	51.72	60.80	9.08
	2170.339816	33.64	5.60	26.90	-9.16	56.98	60.80	3.82
	2603.213564	26.61	5.80	28.20	-9.16	51.45	60.80	9.35
	3476.953908	23.58	7.10	30.70	-9.16	52.22	60.80	8.58
	3909.779194	21.61	7.60	31.90	-9.16	51.95	54.00	2.05

Orthogonal axe: Y

Polarization	Frequency (MHz)	Reading level (dBuV)	Cable Loss (dB)	Antenna Factor (dB/m)	Average factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)
Horizontal	1296.594863	38.49	4.30	23.30	-9.16	56.93	60.80	3.87
	1737.474950	26.57	5.00	24.50	-9.16	46.91	60.80	13.89
	2170.340681	30.99	5.60	26.90	-9.16	54.33	60.80	6.47
	2603.206413	24.01	5.80	28.20	-9.16	48.85	60.80	11.95
	3476.953908	14.57	7.10	30.70	-9.16	43.21	60.80	17.59
	3909.807588	18.16	7.60	31.90	-9.16	48.50	54.00	5.50
Vertical	1296.593177	38.80	4.30	23.30	-9.16	57.24	60.80	3.56
	1737.474905	27.59	5.00	24.50	-9.16	47.93	60.80	12.87
	2170.340681	30.82	5.60	26.90	-9.16	54.16	60.80	6.64
	2603.206444	22.86	5.80	28.20	-9.16	47.70	60.80	13.10
	3476.953899	21.57	7.10	30.70	-9.16	50.21	60.80	10.59
	3909.819577	21.24	7.60	31.90	-9.16	51.58	54.00	2.42

Orthogonal axe: Z

Polarization	Frequency (MHz)	Reading level (dBuV)	Cable Loss (dB)	Antenna Factor (dB/m)	Average factor (dB)	Emission Level (dBuV/m)	Limits (dBuV /m)	Margin (dB)
Horizontal	1296.593177	31.61	4.30	23.30	-9.16	50.05	60.80	10.75
	1737.474905	19.88	5.00	24.50	-9.16	40.22	60.80	20.58
	2170.340681	23.35	5.60	26.90	-9.16	46.69	60.80	14.11
	2603.206444	18.96	5.80	28.20	-9.16	43.80	60.80	17.00
	3476.953899	15.63	7.10	30.70	-9.16	44.27	60.80	16.53
	3909.819577	17.81	7.60	31.90	-9.16	48.15	54.00	5.85
Vertical	1296.593186	38.80	4.30	23.30	-9.16	57.24	60.80	3.56
	1737.474950	21.61	5.00	24.50	-9.16	41.95	60.80	18.85
	2170.340681	27.81	5.60	26.90	-9.16	51.16	60.80	9.64
	2603.206413	13.86	5.80	28.20	-9.16	38.70	60.80	22.10
	3476.953908	8.57	7.10	30.70	-9.16	37.21	60.80	23.59
	3909.819639	10.75	7.60	31.90	-9.16	41.09	54.00	12.91

Note:
1. Emission level = Reading level + Antenna factor + Cable loss + Average factor
2. Margin = Limit – Emission level
3. The worst spurious emission was found at 3877.755195MHz/Horizontal with margin 0.96dB, X axe.

Test Engineer: Ji kai Xu JiKai Xu Date of test: 2004-06-27~28

4.6.4. Automatic shut off function test

This device is manually operated, and will be automatically deactivate within 5 seconds after button being released.

4.7 Measurement Uncertainty

Measurement uncertainty of radiated emission test is ±3.92dB
The measurement uncertainty is given with a confidence of 95%, k=2

5. The bandwidth of the emission

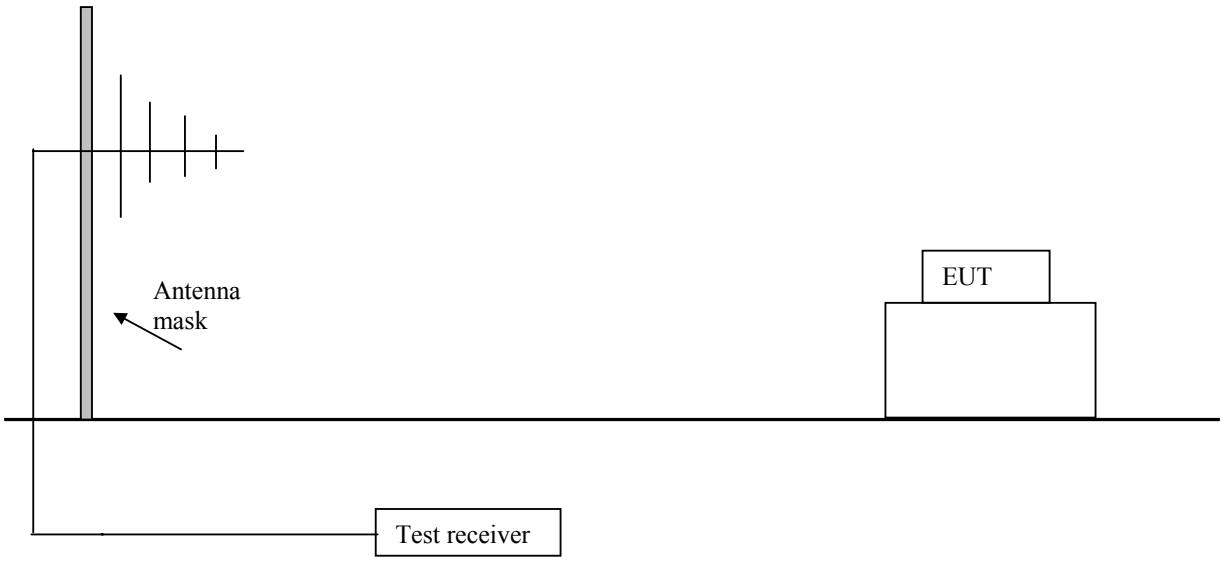
5.1 the limit of the bandwidth of the emission

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

5.2 Instruments list

Item	Equipment	Manu.	Type	Serials no.	Last Cal.	Cal. Interval
1	EMI Test Receiver	Rohde & Schwarz	ESI 26	838786/011	2004-2-8	1 Year
2	Log Periodic Antenna	Rohde & Schwarz	HL 562	100019	2004-4-15	1 Year

5.3 Test setup



5.4 Test configuration

The measurement was applied in Semi- anechoic Chamber.
Logical periodic antenna was used to get the center frequency of the EUT.
The bandwidth setting on R&S Test Receiver ESI 26 was 100kHz. Test distance is 3m.
The mode (Transmission) was checked during test and all the test results are listed in the sec.5.6.
Bandwidth is determined at the points 20dB down from the modulated carrier.

5.5 Test procedure

5.5.1 Establish the test setup as sec. 5.3.
5.5.2 Set the transmitter to emit the emission.
5.5.3 Proceed the measurement

5.6 Test Results

■ Pass □ Fail

5.6.1 Measurement environment

Temperature : 25.3 °C Relative Humidity : 41.5 %

5.6.2 Data table

Center Frequency (MHz)	Low Frequency (MHz)	High Frequency (MHz)	Bandwidth (MHz)	Bandwidth Limit (MHz)	Margin (MHz)
433.981964	433.627275	434.328657	0.701382	1.08495491	0.38357291

Note:
1. Bandwidth = High Frequency – Low Frequency
2. Margin =Bandwidth Limit – Bandwidth

Test Engineer: Jikai Xu Date of test: 2004-06-27
JiKai Xu

5.7 Measurement Uncertainty

Measurement uncertainty of bandwidth test is ± 0.01%.
The measurement uncertainty is given with a confidence of 95%, k=2

6. Sample field strength calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and average factor for frequency above 1GHz.

The sample calculation is as follow:

dB(μV/m) = 20lg(μV/m)

For measurement at frequency below 1GHz

FS = RL + AF + CL

Where FS = Field strength
RL= Reading Level
AF = Antenna factor
CL = Cable loss

Example 1: @ 433.987679MHz

Part 15 subpart C limit = 80.80 dBμV/m
Reading level = 56.94 dBμV
Cable loss = 3.71 dB
Antenna factor = 14.26 dB/m

FS (Emission level) = 56.94+3.71+14.26 = 74.91 dBμV/m
Margin = 80.80 – 74.91 = 5.89dB

Emission level is 5.89dB below the limit.

For measurement frequency above 1GHz

FS = RL + AF + CL + Ave.F

Where FS = Field strength
RL = Reading Level
AF = Antenna factor
CL = Cable loss
Ave.F = Average factor

Example 2 @ 3877.755195 MHz

Part 15 subpart C limit = 54.00 dBµV/m (according to 15.205)
Reading level = 22.70 dBµV
Cable loss = 7.60 dB
Antenna factor = 31.90 dB/m
Average factor = -9.16 dB
FS (Emission level) = 22.70+31.90+7.60-9.16 = 53.04 dBµV/m
Margin = 54.00 – 53.04 = 0.96dB

Emission level is 0.96dB below the limit.