

EMC TEST REPORT

Report No. : EME-030832

Model No. : SH50310

Issued Date : Aug. 14, 2003

Applicant : SENTON Enterprises Limited
Flat 10, 17/F., Fotan Ind. Centre, 26-28 Au Pui Wan St.,
Fo Tan Shatin, N.T. Hong Kong

Test By : Intertek Testing Services Taiwan Ltd.
No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li,
Shiang-Shan District, Hsinchu City, Taiwan

This test report consists of 19 pages in total. It may be duplicated completely for legal use with the allowance of the applicant. It shall not be reproduced except in full, without the written approval of ITS Laboratory. The test result in this report only applies to the tested sample.

Project Engineer



Jerry Liu

Reviewed By



Elton Chen

Table of Contents

Summary of Tests	3
1. General information.....	4
1.1 Identification of the EUT.....	4
1.2 Additional information about the EUT.....	4
1.3 Antenna description.....	5
1.4 Peripherals equipment	5
2. Test specifications.....	6
2.1 Test standard	6
2.2 Operation mode.....	6
2.4 Test equipment	7
3. Radiated emission test FCC 15.249 (C).....	8
3.1 Operating environment.....	8
3.2 Test setup & procedure	8
3.3 Emission limit	9
3.3.1 Fundamental and harmonics emission limits.....	9
3.3.2 General radiated emission limits.....	9
3.4 Radiated spurious emission test data.....	10
3.4.1 Measurement results: frequencies equal to or less than 1 GHz	10
3.4.2 Measurement results: frequency above 1GHz	11
4. Conducted emission test FCC 15.207.....	13
4.1 Operating environment.....	13
4.2 Test setup & procedure	13
4.3 Emission limit	14
4.4 Conducted emission data FCC 15.207	15
5. Radiated emission on the band edge FCC 15.249(C).....	18

Summary of Tests**Home Automation -Model: SH50310
FCC ID: PEGSH50310**

Test	Reference	Results
Conducted Emission of AC Power	15.207	Complies
Radiated Emission test	15.249(c), 15.209	Complies

1. General information

1.1 Identification of the EUT

Applicant	: SENTON Enterprises Limited
Product	: Home Automation
Model No.	: SH50310
FCC ID.	: PEGSH50310
Frequency Range	: 902MHz to 928MHz
Channel Number	: 1 channel
Frequency of Each Channel	: 908.42MHz
Type of Modulation	: FSK (TDD)
Power Supply	: 120Vac, 60Hz
Power Cord	: N/A
Sample Received	: July 14, 2003
Test Date(s)	: July 21, 2003 ~ Aug. 21, 2003

A DoC report has been generated for the client.

1.2 Additional information about the EUT

The EUT is Home Automation, and it can control user's lights wirelessly from the sofa, the bed, the kitchen, or wherever. It has been designed and tested to offer safe service provided it is installed, operated, maintained and tested in strict accordance with the instructions and warnings contained in instruction manual.

For more detail features, please refer to User's manual as file name "Installation guide.pdf"

1.3 Antenna description

The EUT uses a permanently connected antenna.

Antenna Gain : -4dBi

Antenna Type : Internal, wire (whip) antenna

Connector Type : N/A

1.4 Peripherals equipment

Peripherals	Manufacturer	Product No.	Serial No.	FCC ID
Remote control	SENTON	SH50201	N/A	PEGSH50201

Load: Lamp (330W)

2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart C Paragraph 15.249 for non-spread spectrum devices.

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of this frequency band were all meet limit requirement, thus we evaluate the EUT pass the specified test.

2.2 Operation mode

The EUT was operated at normal mode during conducted emission test.

The EUT was transmitted continuously during the other test.

2.4 Test equipment

Equipment	Brand	Frequency range	Model No.	Series No.	Last Cal.Date
EMI Test Receiver	Rohde & Schwarz	9kHz~2.75GHz	ESCS 30	825788/014	Feb. 18, 2003
Spectrum Analyzer	Rohde & Schwarz	9kHz~30GHz	FSP 30	100137	July 10, 2003
Spectrum Analyzer	Rohde & Schwarz	20Hz~40GHz	FSEK 30	100186	Oct. 9, 2002
Horn Antenna	EMCO	1GHz~18GHz	3115	9906-5890	Sep. 19, 2002
Horn Antenna	SCHWARZBECK	14GHz~40GHz	BBHA 9170	159	June 20, 2003
Bilog Antenna	SCHWARZBECK	25MHz~1.7GHz	VULB 9160	3133	Feb. 21, 2003
Turn Table	HDGmbH	N/A	DS 420S	420/669/01	N/A
Antenna Tower	HDGmbH	N/A	MA 240	240/573	N/A
Microwave Amplifier	Agilent	2GHz~26.5GHz	8348A	3111A00567	Dec. 20, 2002

Note:

1. The calibration interval of the above instruments is 12 months.

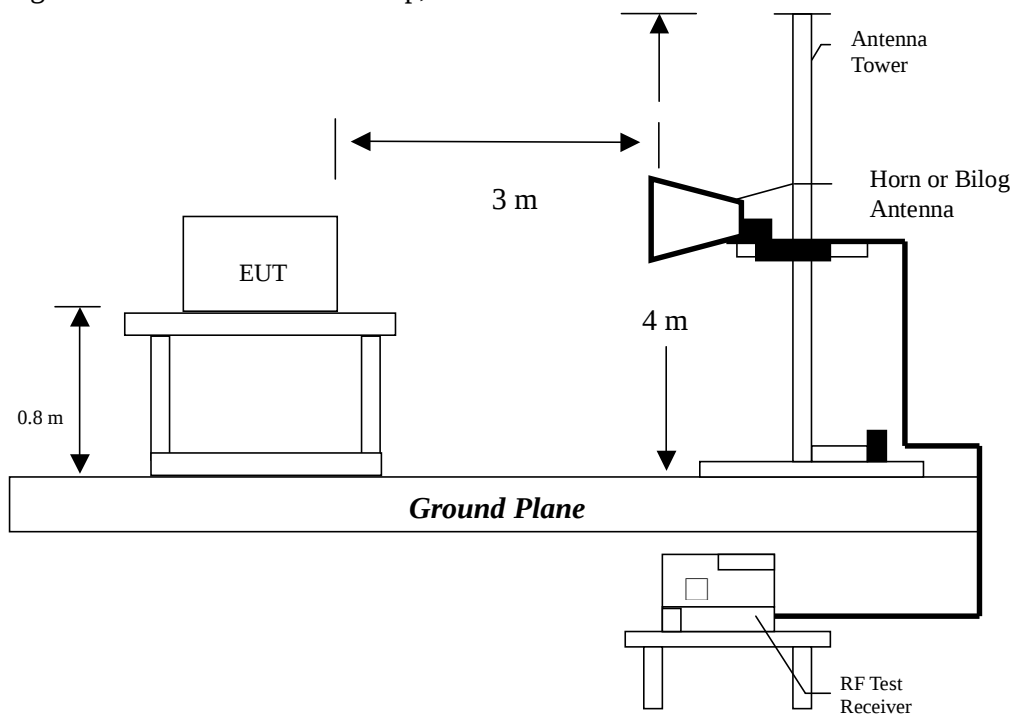
3. Radiated emission test FCC 15.249 (C)

3.1 Operating environment

Temperature:	25	°C	(10-40°C)
Relative Humidity:	57	%	(10-90%)
Atmospheric Pressure	1023	hPa	(860-1060hPa)

3.2 Test setup & procedure

The Diagram below shows the test setup, which is utilized to make these measurements.



Radiated emissions were investigated cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1MHz RBW/VBW) recorded also on the report. The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

The EUT configuration please refer to the “Spurious set-up photo.pdf”.

3.3 Emission limit

3.3.1 Fundamental and harmonics emission limits

Frequency (MHz)	Field Strength of Fundamental		Field Strength of Harmonics	
	(mV/m@3m)	(dBuV/m@3m)	(uV/m@3m)	(dBuV/m@3m)
908.42	50	94	500	54

3.3.2 General radiated emission limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

Frequency MHz	15.209 Limits (dB μ V/m@3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remark:

1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

Uncertainty was calculated in accordance with NAMAS NIS 81.

Expanded uncertainty (k=2) of radiated emission measurement is ± 4.98 dB.

Expanded uncertainty (k=2) of conducted emission measurement is ± 2.02 dB.

3.4 Radiated spurious emission test data

3.4.1 Measurement results: frequencies equal to or less than 1 GHz

EUT : SH50310

Test Condition : Transmitted mode

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
36.88	QP	V	12.89	23.81	36.70	40.00	-3.30	100	275
47.2	QP	V	12.91	17.59	30.50	40.00	-9.50	100	35
59.17	QP	V	13.13	12.07	25.20	40.00	-14.80	100	143
128.9	QP	V	12.89	8.61	21.50	43.50	-22.00	100	186
144.5	QP	V	14.29	14.41	28.70	43.50	-14.80	100	27
557.7	QP	V	19.65	13.65	33.30	46.00	-12.70	100	105
36.4	QP	H	12.89	11.51	24.40	40.00	-15.60	100	34
72.04	QP	H	11.00	10.30	21.30	40.00	-18.70	100	120
150.3	QP	H	14.76	7.64	22.40	43.50	-21.10	146	230
398.328	QP	H	16.67	11.53	28.20	46.00	-17.80	120	27
443.2	QP	H	17.86	13.24	31.10	46.00	-14.90	100	140
499.5	QP	H	18.90	16.10	35.00	46.00	-11.00	100	110

Remark:

1. Corrected Level = Reading Level + Correction Factor
2. Correction Factor = Antenna Factor + Cable Loss

3.4.2 Measurement results: frequency above 1GHz

EUT : SH50310

Test Condition : Transmitted mode

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Average Factor (dB)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
908.42	PK	V	0	27.51	0	31.26	58.77	114	-55.23	103	18
908.42	AV	V	0	27.51	-11.49	31.26	47.28	94	-46.72	103	18
1816.84	PK	V	0	27.35	0	-	-	74	-	-	-
1816.84	AV	V	0	27.35	-11.49	-	-	54	-	-	-
2725.26	PK	V	33.182	30.77	0	-	-	74	-	-	-
2725.26	AV	V	33.182	30.77	-11.49	-	-	54	-	-	-
3633.68	PK	V	32.252	33.46	0	-	-	74	-	-	-
3633.68	AV	V	32.252	33.46	-11.49	-	-	54	-	-	-
4542.1	PK	V	32.188	35.35	0	-	-	74	-	-	-
4542.1	AV	V	32.188	35.35	-11.49	-	-	54	-	-	-
5450.52	PK	V	32.958	36.5	0	-	-	74	-	-	-
5450.52	AV	V	32.958	36.5	-11.49	-	-	54	-	-	-
6358.94	PK	V	33.57	37.74	0	-	-	74	-	-	-
6358.94	AV	V	33.57	37.74	-11.49	-	-	54	-	-	-
7267.36	PK	V	34.32	38.42	0	-	-	74	-	-	-
7267.36	AV	V	34.32	38.42	-11.49	-	-	54	-	-	-
8175.78	PK	V	34.92	40.05	0	-	-	74	-	-	-
8175.78	AV	V	34.92	40.05	-11.49	-	-	54	-	-	-
9084.2	PK	V	35.475	41.34	0	-	-	74	-	-	-
9084.2	AV	V	35.475	41.34	-11.49	-	-	54	-	-	-

Remark:

1. Corrected Level = Reading Level + Correction Factor + Average Factor – Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. “-” means the emission is below the noise floor, the noise floor is:

For PK:

1GHz-3GHz: 50dBuV

3GHz-14GHz: 54dBuV

14GHz-26.5GHz: 60dBuV

For AV:

1GHz-3GHz: 41.5dBuV

3GHz-14GHz: 46dBuV

14GHz-26.5GHz: 46.5dBuV

EUT : SH50310

Test Condition : Transmitted mode

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Average Factor (dB)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
908.42	PK	H	0	27.51	0	31.81	59.32	114	-54.68	100	215
908.42	AV	H	0	27.51	-11.49	31.81	47.83	94	-46.17	100	215
1816.84	PK	H	0	27.35	0	-	-	74	-		
1816.84	AV	H	0	27.35	-11.49	-	-	54	-		
2725.26	PK	H	33.182	30.77	0	-	-	74	-		
2725.26	AV	H	33.182	30.77	-11.49	-	-	54	-		
3633.68	PK	H	32.252	33.46	0	-	-	74	-		
3633.68	AV	H	32.252	33.46	-11.49	-	-	54	-		
4542.1	PK	H	32.188	35.35	0	-	-	74	-		
4542.1	AV	H	32.188	35.35	-11.49	-	-	54	-		
5450.52	PK	H	32.958	36.5	0	-	-	74	-		
5450.52	AV	H	32.958	36.5	-11.49	-	-	54	-		
6358.94	PK	H	33.57	37.74	0	-	-	74	-		
6358.94	AV	H	33.57	37.74	-11.49	-	-	54	-		
7267.36	PK	H	34.32	38.42	0	-	-	74	-		
7267.36	AV	H	34.32	38.42	-11.49	-	-	54	-		
8175.78	PK	H	34.92	40.05	0	-	-	74	-		
8175.78	AV	H	34.92	40.05	-11.49	-	-	54	-		
9084.2	PK	H	35.475	41.34	0	-	-	74	-		
9084.2	AV	H	35.475	41.34	-11.49	-	-	54	-		

Remark:

1. Corrected Level = Reading Level + Correction Factor + Average Factor – Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. “-” means the emission is below the noise floor, the noise floor is:

For PK:

1GHz-3GHz: 50dBuV

3GHz-14GHz: 54dBuV

14GHz-26.5GHz: 60dBuV

For AV:

1GHz-3GHz: 41.5dBuV

3GHz-14GHz: 46dBuV

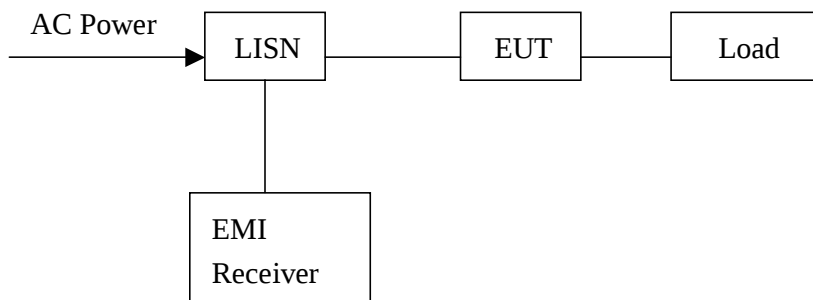
14GHz-26.5GHz: 46.5dBuV

4. Conducted emission test FCC 15.207

4.1 Operating environment

Temperature:	26	°C	(10-40°C)
Relative Humidity:	64	%	(10-90%)
Atmospheric Pressure	1023	hPa	(860-1061hPa)

4.2 Test setup & procedure



The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50 ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4/1992 on conducted measurement.

The bandwidth of the field strength meter (R & S Test Receiver ESCS 30) is set at 9kHz.

The EUT configuration please refer to the “Conducted set-up photo.pdf”.

4.3 Emission limit

Freq. (MHz)	Conducted Limit (dBuV)	
	Q.P.	Ave.
0.15~0.50	66 – 56*	56 – 46*
0.50~5.00	56	46
5.00~30.0	60	50

*Decreases with the logarithm of the frequency.

4.4 Conducted emission data FCC 15.207

(1) Line

EUT : SH50310

Test Condition : Transmitted mode

Freq. (MHz)	Reading (dB μ V) QP	Limit (dB μ V) QP	Reading (dB μ V) AV	Limit (dB μ V) AV	Margin (dB)	
					QP	AV
0.15000	44.90	66.00	23.70	56.00	-21.10	-32.30
1.21500	30.40	56.00	14.60	46.00	-25.60	-31.40
1.94000	22.70	56.00	10.30	46.00	-33.30	-35.70
2.76000	20.10	56.00	9.90	46.00	-35.90	-36.10
3.59500	19.80	56.00	9.70	46.00	-36.20	-36.30
4.33000	18.20	56.00	10.80	46.00	-37.80	-35.20

(2) Neutral

EUT : SH50310

Test Condition : Transmitted mode

Freq. (MHz)	Reading (dB μ V) QP	Limit (dB μ V) QP	Reading (dB μ V) AV	Limit (dB μ V) AV	Margin (dB)	
					QP	AV
0.15000	44.70	66.00	24.70	56.00	-21.30	-31.30
1.17000	28.70	56.00	23.50	46.00	-27.30	-22.50
2.85000	24.60	56.00	19.50	46.00	-31.40	-26.50
3.68000	28.60	56.00	21.90	46.00	-27.40	-24.10
4.18000	24.80	56.00	20.40	46.00	-31.20	-25.60
21.70000	23.50	60.00	19.20	50.00	-36.50	-30.80

Remark:

1. The reading value included cable loss and LISN factor.
2. Uncertainty was calculated in accordance with NAMAS NIS 81.
Expanded uncertainty (k=2) of conducted emission measurement is ± 2.6 dB.
3. Please see the plot below.

Intertek Testing Services

RF Voltage

EUT:

Manuf:

Op Cond:

Operator:

Test Spec:

Comment:

Date:

SH50310

Senton

LISN-L

Jerry

FCC P15 CLASS B

EMI Rx:EC318

120V 60Hz 26'C 64%RH

07. Aug 03 15:37

LISN:EC320

Scan Settings (1 Range)

----- Frequencies -----

Start

Stop

Step

150k

30M

5k

----- Receiver Settings -----

IF BW

Detector

M-Time

Atten

Preamp

9k

PK

20ms

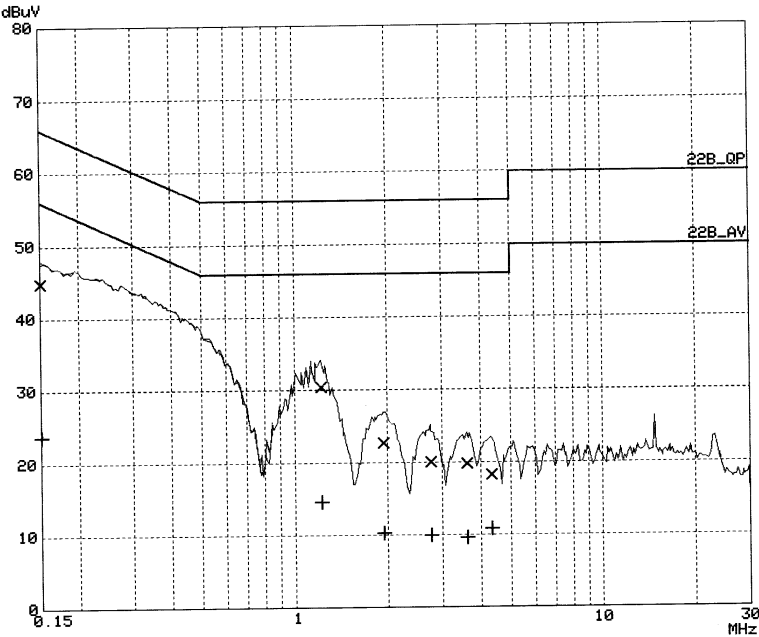
AUTO

LN

OFF

Final Measurement: x QP / + AV

Meas Time: 1 s



Intertek Testing Services

RF Voltage

EUT:

SH50310

Manuf:

Senton

Op Cond:

LISN-N

Operator:

Jerry

Test Spec:

FCC P15 CLASS B

Comment:

EMI Rx:EC318 LISN:EC320

Date:

07. Aug 03 15:50

Scan Settings (1 Range)

----- Frequencies -----

Start

Stop

Step

150k

30M

5k

----- Receiver Settings -----

IF BW

Detector

M-Time

Atten

Preamp

9k

PK

20ms

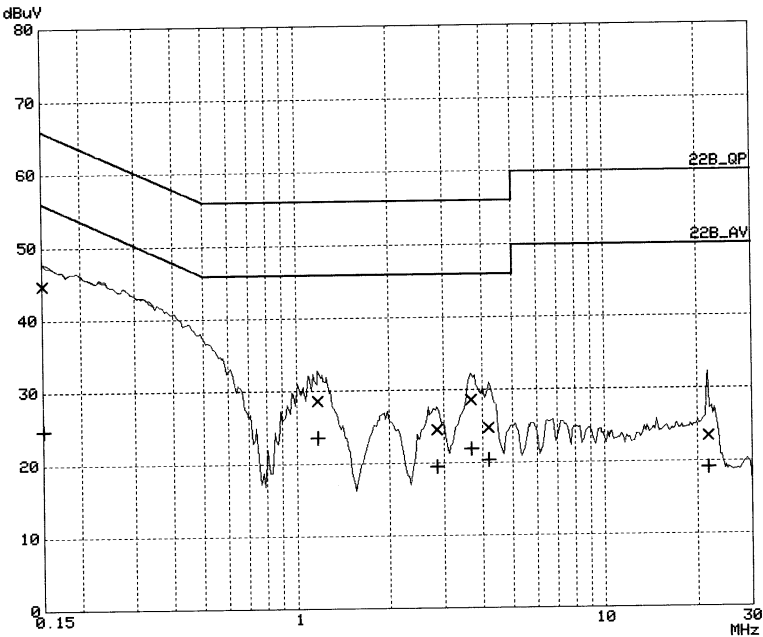
AUTO

LN

OFF

Final Measurement: x QP / + AV

Meas Time: 1 s



5. Radiated emission on the band edge FCC 15.249(C)

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental (902~928MHz) or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

Please see the plot below.

