



EMC

TEST REPORT

Report No. : EME-021449

Model No. : SH50330

Issued Date : Mar. 3, 2003

Applicant : SENTON Enterprises Limited
Flat 10, 17/F., Fotan Ind. Centre, 25-28 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

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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
2.3 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 emission test data FCC 15.249.....	10
3.4.1 Measurement results: frequencies equal to or less than 1 GHz.....	10
3.4.2 Fundamental & Harmonics Radiated Emission Data	11
4. Conducted emission test FCC 15.207	12
4.1 Operating environment.....	12
4.2 Test setup & procedure	12
4.3 Emission limit.....	12
4.4 Conducted emission data FCC 15.207	13
5. Radiated emission on the band edge FCC 15.249(C).....	14



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FCC ID. : PEGSH50330

Report No.: EME-021449

Page 3 of 14

Summary of Tests

Home Automation -Model: SH50330

FCC ID: PEGSH50330

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



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FCC ID. : PEGSH50330

Report No.: EME-021449

Page 4 of 14

1. General information

1.1 Identification of the EUT

Applicant	: SENTON Enterprises Limited
Product	: Home Automation
Model No.	: SH50330
FCC ID.	: PEGSH50330
Operating Frequency	: 908.42MHz
Channel Number	: 1 channels
Type of Modulation	: FSK (TDD)
Power Supply	: 120Vac, 60Hz
Power Cord	: N/A
Sample Received	: Nov. 14, 2002
Test Date(s)	: Dec. 18, 2002 to Jan. 9, 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

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 AC power conducted emissions was investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz. (15.207 paragraph)

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 recorded also on the report.

The test of radiated measurements according to FCC Part 15 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.

Radiated testing was performed at an antenna to EUT distance of 3 meters.

The EUT setup configurations please refer to the photo of test configuration in item.

2.2 Operation mode

The EUT was transmitted continuously during radiated test. And it's Not for normal use.

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



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FCC ID. : PEGSH50330

Report No.: EME-021449

Page 7 of 14

2.3 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	May 24, 2002
EMI Test Receiver	Rohde & Schwarz	20Hz~26.5GHz	ESMI	825428/005	June 10, 2002
Spectrum Analyzer	Rohde & Schwarz	9kHz~30GHz	FSP 30	100137	July 10, 2002
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, 2002
Bilog Antenna	SCHWARZBECK	25MHz~1.7GHz	VULB 9160	3111	June 20, 2002
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
RF Power Meter	Boonton	10kHz~100GHz	4231A	79401	May 22, 2002
Power Sensor	Boonton	30MHz~8GHz	51011-EMC	32482	May 25, 2002

Note:

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

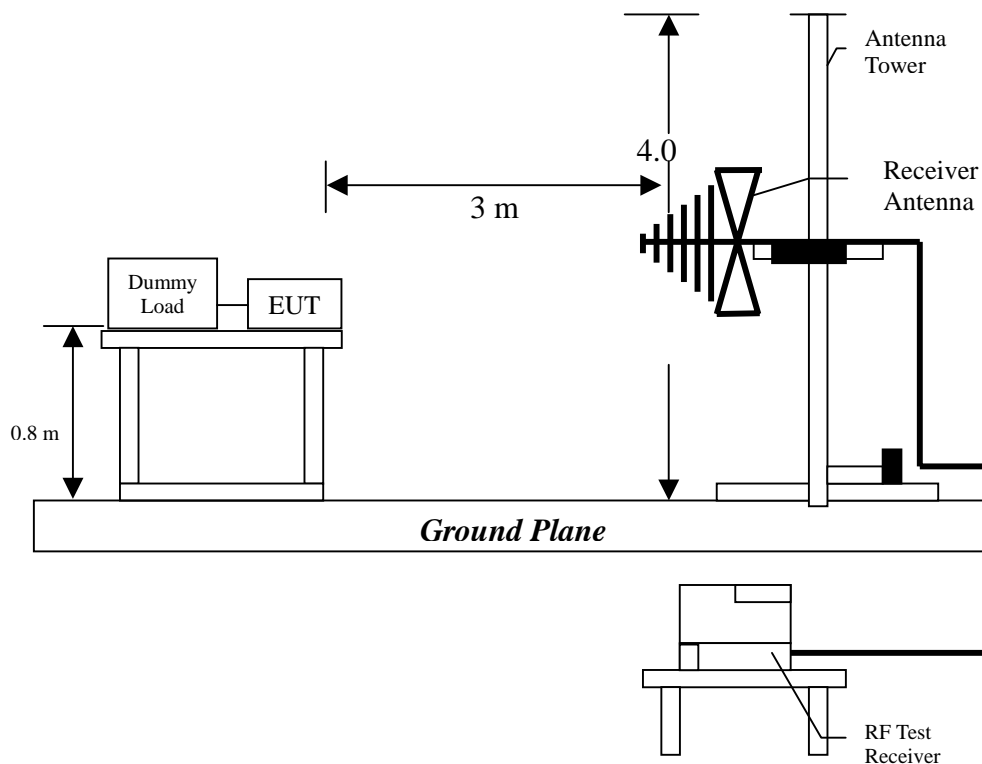
3. Radiated emission test FCC 15.249 (C)

3.1 Operating environment

Temperature: 23
 Relative Humidity: 58 %
 Atmospheric Pressure 1023 hPa

3.2 Test setup & procedure

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



The signal is maximized through rotation and placement in the three orthogonal axes. Radiated emission measurements were performed from 30MHz to 25GHz. Spectrum Analyzer Resolution Bandwidth is 100kHz or greater for frequencies 30MHz to 1GHz, 1MHz – for frequencies above 1GHz.

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.



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 emission test data FCC 15.249

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

EUT : SH50330

Worst Case Condition : Level position

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)
31.90000	QP	V	17.67	16.83	34.50	40.00	-5.50
59.10000	QP	V	11.91	16.09	28.00	40.00	-12.00
88.20000	QP	V	7.94	16.06	24.00	43.50	-19.50
103.70000	QP	V	10.64	14.36	25.00	43.50	-18.50
214.30000	QP	V	13.62	13.78	27.40	43.50	-16.10
313.20000	QP	V	16.99	3.81	20.80	46.00	-25.20
33.90000	QP	H	18.00	7.20	25.20	40.00	-14.80
39.70000	QP	H	16.33	6.97	23.30	40.00	-16.70
59.10000	QP	H	11.91	7.99	19.90	40.00	-20.10
66.90000	QP	H	10.80	10.40	21.20	40.00	-18.80
214.30000	QP	H	13.62	3.88	17.50	43.50	-26.00
827.30000	QP	H	26.83	1.07	27.90	46.00	-18.10

Remark:

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



3.4.2 Fundamental & Harmonics Radiated Emission Data

EUT : SH50330

Worst Case Condition : Level position

Freq. (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading Level (dBuV)	Corrected Level (dBuV/m)	Limit At 3m (dBuV/m)	Margin (dB)
908	PK	V	0	27.51	27.66	55.17	94	-38.83
1816.84	PK	V	0	27.35	15.41	42.76	54	-11.24
2725.26	PK	V	0	30.77	13.58	44.35	54	-9.65
3633.68	PK	V	0	33.46	-	-	54	-
908	PK	H	0	27.51	35.24	62.75	94	-31.25
1816.84	PK	H	0	27.35	11.84	39.19	54	-14.81
2725.26	PK	H	0	30.77	17.23	48	54	-6
3633.68	PK	H	0	33.46	-	-	54	-

Remark:

1. Corrected Level = Reading Level + Correction Factor - Preamp

2. Correction Factor = Antenna Factor + Cable Loss

3. “-” means the emission is below the noise floor.

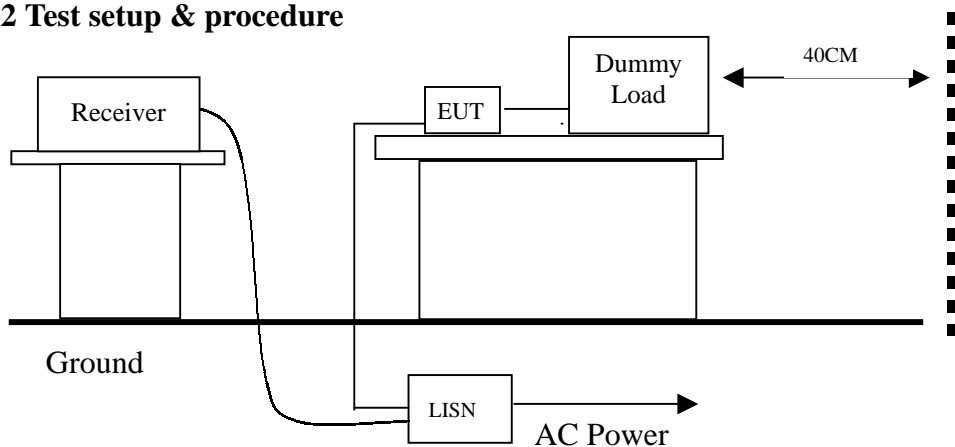


4. Conducted emission test FCC 15.207

4.1 Operating environment

Temperature: 23
Relative Humidity: 55 %
Atmospheric Pressure 1023 hPa

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.

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

: SH50330

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
0.47000	40.0	56.52	34.4	46.52	-16.52	-12.12
0.57400	38.9	56.00	34.9	46.00	-17.10	-11.10
0.66200	36.5	56.00	33.0	46.00	-19.50	-13.00
1.34200	44.3	56.00	40.6	46.00	-11.70	-5.40
1.95000	39.9	56.00	36.8	46.00	-16.10	-9.20
2.95800	34.9	56.00	29.4	46.00	-21.10	-16.60

(2) Neutral

EUT

: SH50330

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
0.47000	38.7	56.52	33.1	46.52	-17.82	-13.42
0.57400	37.3	56.00	33.1	46.00	-18.70	-12.90
0.66200	35.0	56.00	31.4	46.00	-21.00	-14.60
0.95800	36.4	56.00	33.1	46.00	-19.60	-12.90
1.33400	42.0	56.00	38.1	46.00	-14.00	-7.90
1.84600	38.3	56.00	32.7	46.00	-17.70	-13.30

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.



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.

See band-edge plot as file name “band-edge plot.pdf”.