Test Report

Product Name	Z-wave Series
Model No.	AN145-1
FCC ID.	FU5TR003-04

Applicant	EVERSPRING INDUSTRY CO., LTD
Address	7th fl. 609 Wan Shou Road Sec. 1,Kweishan, Taoyuan Hsien 333,Taiwan, R.O.C.

Date of Receipt	June 24, 2009
Issued Date	Aug. 10, 2009
Report No.	096372R-RFUSP07V01
Report Version	V1.0

Test Report Certification

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Applicant	EVERSPRING INDUSTRY CO., LTD
Address	7th fl. 609 Wan Shou Road Sec. 1,Kweishan, Taoyuan Hsien 333,Taiwan, R.O.C.
Manufacturer	Dong-Guan Li Yuan Electronics Co., Ltd
Model No.	AN145-1
FCC ID.	FU5TR003-04
EUT Rated Voltage	AC 120V/60Hz
EUT Test Voltage	AC 120V/60Hz
Trade Name	EVERSPRING
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2008
	ANSI C63.4: 2003
Test Result	Complied

NVLAP Lab Code: 200533-0

The Test Results relate only to the samples tested.
The test report shall not be reproduced except in full without the written approval of QuieTek Corporation.
This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

Documented By : Rita Huang
(Engineering Adm. Specialist / Rita Huang)

Tested By : Dino Chen
(Engineer / Dino Chen)

Approved By :
(Manager / Vincent Lin)

Testing Laboratory
0914

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Z-wave Series
Trade Name	EVERSPRING
FCC ID.	FU5TR003-04
Model No.	AN145-1
Frequency Range	908.42MHz
Type of Modulation	FSK
Number of Channels	1
Channel Control	Auto
Antenna Type	Monopole

Center Frequency of Each Channel:

Channel	Frequency
Channel 1:	908.42MHz

Note:

1. The EUT is a Z-wave Series with a built-in Z-Wave transceiver module.
2. These tests are conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.249.
3. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

EMI Test Mode	Mode 1: Transmitter

1.2. Operation Description

The EUT is a Z-wave Series with a built-in Z-Wave transceiver module. The EUT operation frequency is 908.42MHz. The signals modulated by FSK are transmitted from the Monopole Antenna of the EUT.

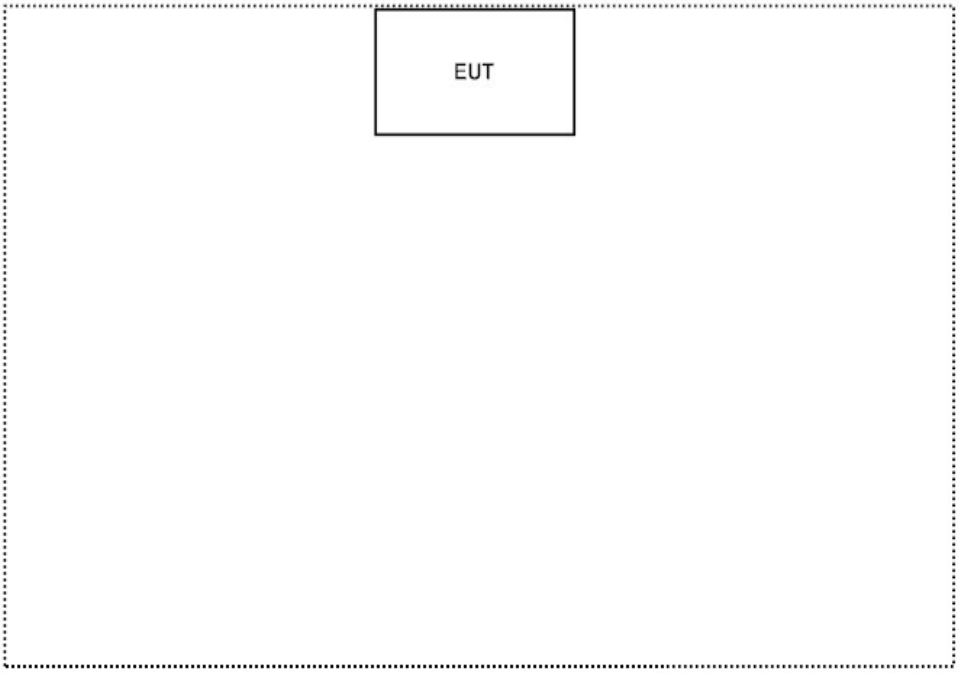
1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model No.	Serial No.	Power Cord
N/A				

Signal Cable Type	Signal cable Description
N/A	

1.4. Configuration of Test System



1.5. EUT Exercise Software

(1) Setup the EUT as shown in section 1.4.
(2) Provide the EUT power source.
(3) Starts the continuous transmit.
(4) Verify that the EUT works correctly.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from QuieTek Corporation's Web Site : http://tw.quietek.com/modules/myalbum/
The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site : http://www.quietek.com/

Site Description: File on
Federal Communications Commission
FCC Engineering Laboratory
7435 Oakland Mills Road
Columbia, MD 21046
Registration Number: 92195

Accreditation on NVLAP
NVLAP Lab Code: 200533-0

Site Name: Quietek Corporation

Site Address: No. 5-22, Ruei-Shu Valley, Ruei-Ping Tsuen,
Lin-Kou Shiang, Taipei,
Taiwan, R.O.C.
TEL: 886-2-8601-3788 / FAX : 886-2-8601-3789
E-Mail : service@quietek.com

FCC Accreditation Number: TW1014

Testing Laboratory
0914

2. Conducted Emission

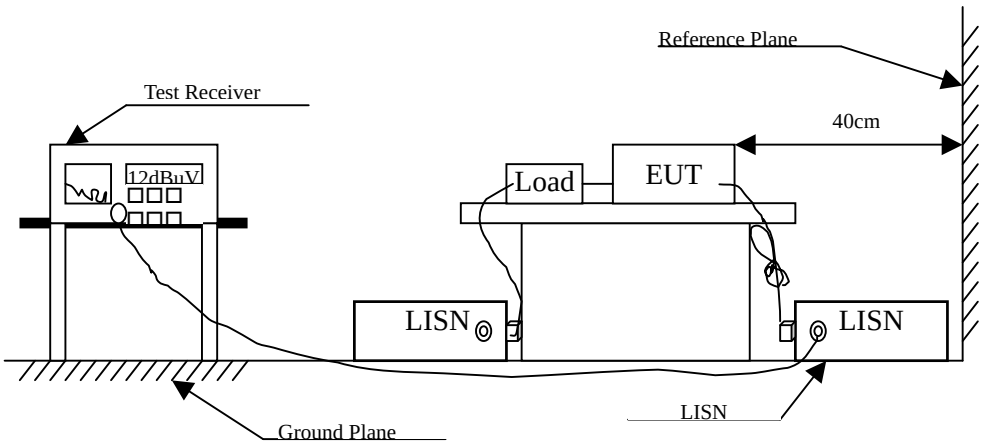
2.1. Test Equipment

The following test equipment are used during the conducted emission test:

Item	Instrument	Manufacturer	Type No./Serial No	Last Cal.	Remark
1	Test Receiver	R & S	ESCS 30/825442/17	May, 2009	
2	L.I.S.N.	R & S	ESH3-Z5/825016/6	May, 2009	EUT
3	L.I.S.N.	Kyoritsu	KNW-407/8-1420-3	May, 2009	Peripherals
4	Pulse Limiter	R & S	ESH3-Z2	May, 2009	
5	No.1 Shielded Room			N/A	

Note: All instruments are calibrated every one year.

2.2. Test Setup



2.3. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

Remarks: In the above table, the tighter limit applies at the band edges.

2.4. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). 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. (Please refers to the block diagram of the test setup and photographs.)
Both sides of A.C. 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: 2003 on conducted measurement.
Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

2.5. Uncertainty

± 2.26 dB

2.6. Test Result of Conducted Emission

Product : Z-wave Series
Test Item : Conducted Emission Test
Power Line : Line 1
Test Mode : Mode 1: Transmitter

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
Line 1					
Quasi-Peak					
0.166	9.746	16.630	26.375	-39.168	65.543
0.283	9.656	19.990	29.646	-32.554	62.200
0.361	9.650	27.620	37.270	-22.701	59.971
0.427	9.641	19.270	28.911	-29.175	58.086
0.865	9.664	29.880	39.545	-16.455	56.000
1.447	9.670	19.700	29.370	-26.630	56.000
Average					
0.166	9.746	2.660	12.405	-43.138	55.543
0.283	9.656	12.840	22.496	-29.704	52.200
0.361	9.650	24.800	34.450	-15.521	49.971
0.427	9.641	12.830	22.471	-25.615	48.086
0.865	9.664	18.540	28.205	-17.795	46.000
1.447	9.670	14.770	24.440	-21.560	46.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " " means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Z-wave Series
Test Item : Conducted Emission Test
Power Line : Line 2
Test Mode : Mode 1: Transmitter

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
Line 2					
Quasi-Peak					
0.205	9.713	9.920	19.633	-44.796	64.429
0.298	9.660	17.180	26.840	-34.931	61.771
0.361	9.653	23.970	33.623	-26.348	59.971
0.431	9.649	14.760	24.409	-33.562	57.971
0.845	9.673	25.010	34.683	-21.317	56.000
1.455	9.670	18.590	28.260	-27.740	56.000
Average					
0.205	9.713	2.510	12.223	-42.206	54.429
0.298	9.660	11.170	20.830	-30.941	51.771
0.361	9.653	19.970	29.623	-20.348	49.971
0.431	9.649	5.520	15.169	-32.802	47.971
0.845	9.673	18.410	28.083	-17.917	46.000
1.455	9.670	17.060	26.730	-19.270	46.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " " means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

3. Radiated Emission

3.1. Test Equipment

The following test equipment are used during the radiated emission test:

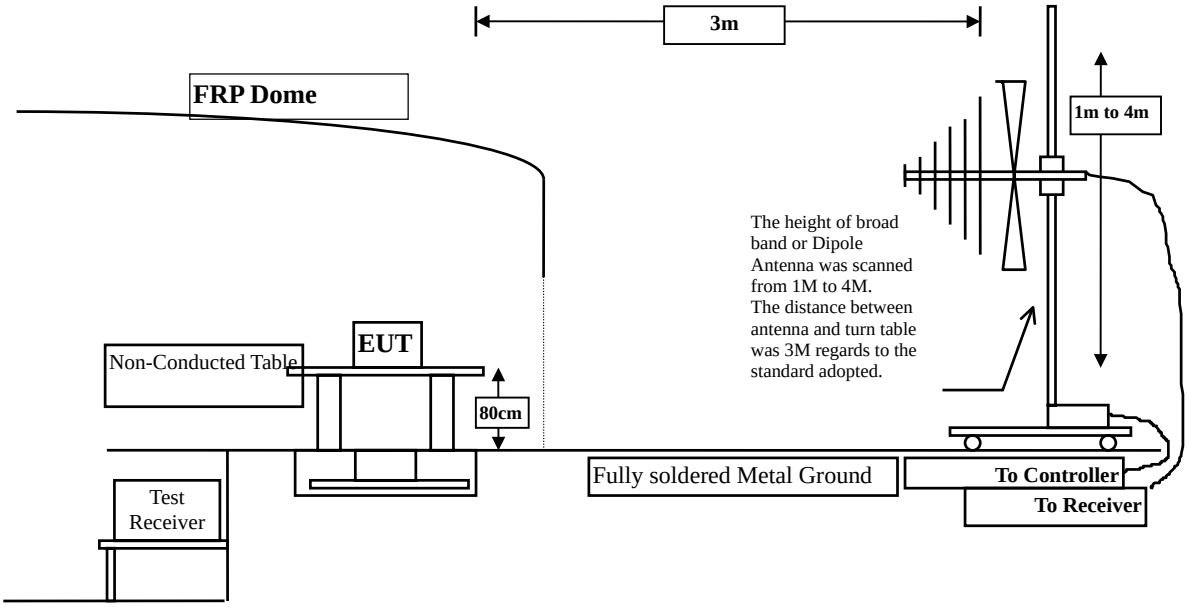
Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☐Site # 1		Test Receiver	R & S	ESVS 10 / 834468/003	May, 2009
		Spectrum Analyzer	Advantest	R3162/ 00803480	May, 2009
		Pre-Amplifier	Advantest	BB525C/ 3307A01812	May, 2009
		Bilog Antenna	SCHAFFNER	CBL6112B / 2697	Sep., 2008
☐Site # 2		Test Receiver	R & S	ESCS 30 / 836858 / 022	May, 2009
		Spectrum Analyzer	Advantest	R3162 / 100803466	May, 2009
		Pre-Amplifier	Advantest	BB525C/3307A01814	May, 2009
		Bilog Antenna	SCHAFFNER	CBL6112B / 2705	May, 2009
		Horn Antenna	ETS	3115 / 0005-6160	Sep., 2008
		Pre-Amplifier	QTK	QTK-AMP-01/ 0001	May, 2009
☒Site # 3	X	Test Receiver	R & S	ESI 26 / 838786/004	May, 2009
	X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2009
	X	Bilog Antenna	SCHAFFNER	CBL6112B / 2697	May, 2009
	X	Horn Antenna	Schwarzbeck	BBHA9120D / 305, 306	July, 2009
	X	Horn Antenna	Schwarzbeck	BBHA9170 / 208, 209	July, 2009
	X	Pre-Amplifier	QTK	QTK-AMP-01 / 0001	July, 2009
	X	Pre-Amplifier	QTK	QTK-AMP-03 / 0003	May, 2009
	X	Pre-Amplifier	HP	8449B / 3008A01123	July, 2009

Note: 1. All equipments are calibrated every one year.

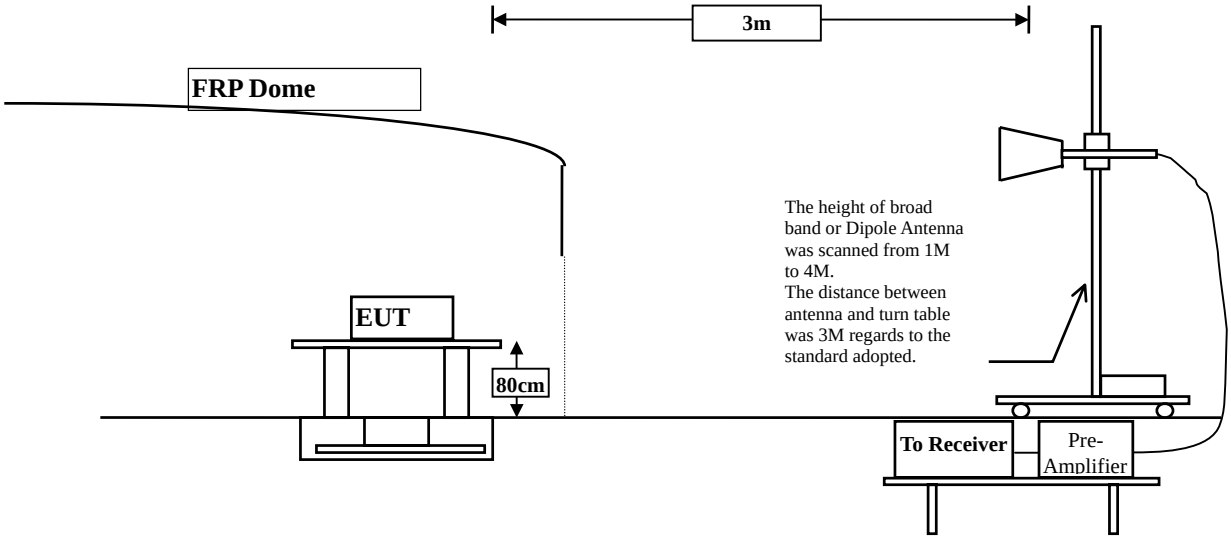
2. Test equipments marked by “X” are used to measure the final test results.

3.2. Test Setup

Below 1GHz



Above 1GHz



3.3. Limits

➢ **Fundamental and Harmonics Emission Limits**

FCC Part 15 Subpart C Paragraph 15.249 Limits				
Frequency MHz	Field Strength of Fundamental		Field Strength of Harmonics	
	(mV/m @3m)	(dBuV/m @3m)	(uV/m @3m)	(dBuV/m @3m)
902-928	50	94	500	54
2400-2483.5	50	94	500	54
5725-5875	50	94	500	54

Remarks : 1. RF Voltage (dBuV/m) = 20 log RF Voltage (uV/m)
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.

➢ **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.

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency MHz	uV/m @3m	dBuV/m@3m
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Remarks : 1. RF Voltage (dBuV/m) = 20 log RF Voltage (uV/m)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3.4. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4: 2003 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

Radiated emission measurements below 1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The worst radiated emission is measured on the Final Measurement.

The measurement frequency range form 30MHz - 10th Harmonic of fundamental was investigated.

3.5. Uncertainty

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz

3.6. Test Result of Radiated Emission

Product : Z-wave Series
Test Item : Fundamental Radiated Emission
Test Site : No.3OATS
Test Mode : Mode 1: Transmitter

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
908.420	6.054	82.230	88.284	-25.716	114.000
Horizontal					
Average Detector:					
--					

Note:

1. Measurement Level = Reading Level + Correct Factor.
2. Correct Factor = Antenna Factor + Cable Loss – PreAMP.

Product : Z-wave Series
Test Item : Fundamental Radiated Emission
Test Site : No.3OATS
Test Mode : Mode 1: Transmitter

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Vertical					
Peak Detector:					
908.420	0.507	90.640	91.147	-22.853	114.000
Vertical					
Average Detector:					
--					

Note:

1. Measurement Level = Reading Level + Correct Factor.
2. Correct Factor = Antenna Factor + Cable Loss – PreAMP.

Product : Z-wave Series
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
1816.840	-4.025	49.860	45.835	-28.165	74.000
2725.260	0.525	43.380	43.905	-30.095	74.000
3633.680	0.488	44.450	44.938	-29.062	74.000
4542.100	3.020	43.490	46.509	-27.491	74.000
Average Detector:					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the too weak instrument of signal is unable to test.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Z-wave Series
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Vertical					
Peak Detector:					
1816.840	-3.025	50.530	47.505	-26.495	74.000
2725.260	-0.018	44.960	44.942	-29.058	74.000
3633.680	0.617	44.160	44.777	-29.223	74.000
4542.100	3.765	43.200	46.965	-27.035	74.000
Average Detector:					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the too weak instrument of signal is unable to test.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Z-wave Series
Test Item : General Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
41.640	-6.267	34.255	27.988	-12.012	40.000
107.600	-7.700	30.996	23.296	-20.204	43.500
319.060	-4.653	29.005	24.352	-21.648	46.000
352.040	-1.342	28.358	27.016	-18.984	46.000
472.320	2.790	28.070	30.860	-15.140	46.000
511.120	2.961	27.674	30.635	-15.365	46.000
Vertical					
49.400	-12.362	41.587	29.225	-10.775	40.000
88.200	-3.976	32.038	28.062	-15.438	43.500
179.380	-1.048	23.717	22.669	-20.831	43.500
383.080	-0.100	25.526	25.426	-20.574	46.000
511.120	0.571	28.734	29.305	-16.695	46.000
544.100	1.281	26.323	27.604	-18.396	46.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. “ ” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

4. Band Edge

4.1. Test Equipment

The following test equipments are used during the band edge tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Test Receiver	R & S	ESI 26 / 838786/004	May, 2009
X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2009
X	Bilog Antenna	SCHAFFNER	CBL6112B / 2697	May, 2009
X	Horn Antenna	Schwarzbeck	BBHA9120D / 305, 306	July, 2009
X	Horn Antenna	Schwarzbeck	BBHA9170 / 208, 209	July, 2009
X	Pre-Amplifier	QTK	QTK-AMP-01 / 0001	July, 2009
X	Pre-Amplifier	QTK	QTK-AMP-03 / 0003	May, 2009
X	Pre-Amplifier	HP	8449B / 3008A01123	July, 2009

OATS No.3

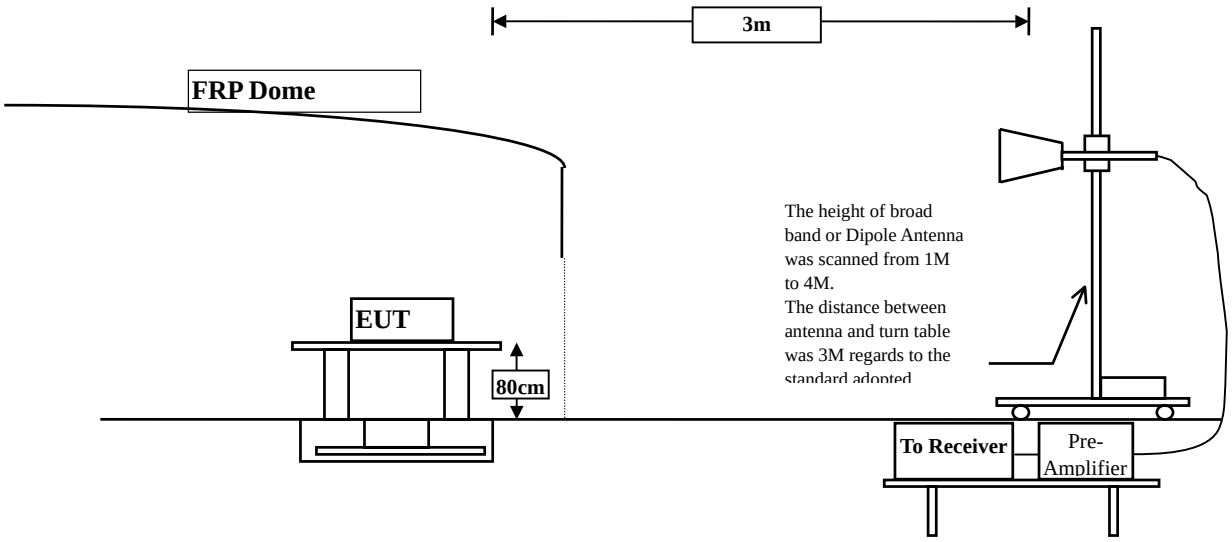
Note: 1. All equipments are calibrated every one year.

2. The test equipments marked by “X” are used to measure the final test results.

4.2. Test Setup

RF Radiated Measurement:

Above 1GHz



4.3. Limit

Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

4.4. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.
Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4:2003 on radiated measurement.
The bandwidth below 1GHz setting on the field strength meter (R&S Test Receiver ESCS 30)is 120 kHz, above 1GHz are 1 MHz.

4.5. Uncertainty

Conducted is ± 1.27 dB
Radiated is ± 3.9 dB.

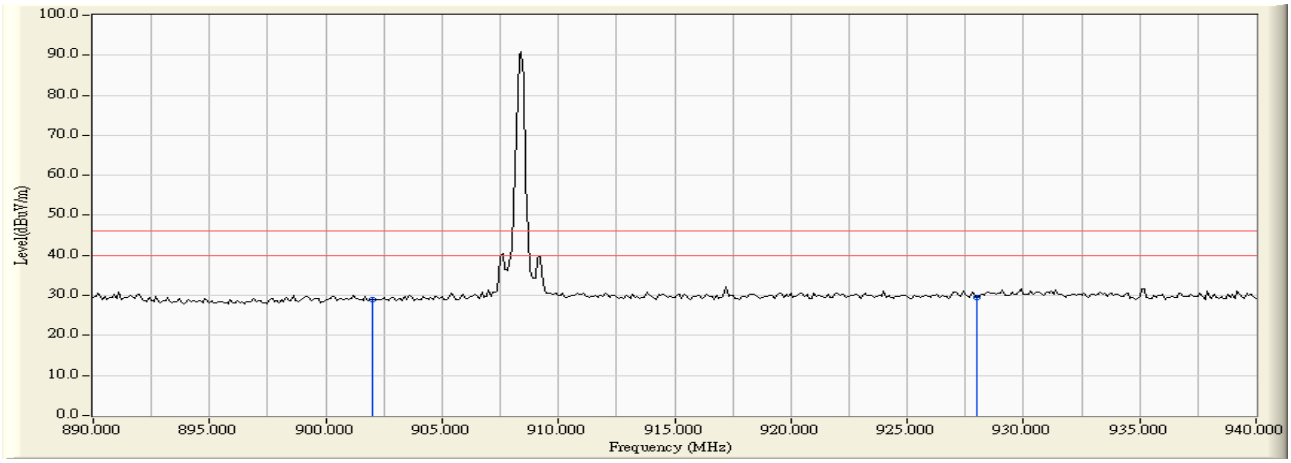
4.6. Test Result of Band Edge

Product : Z-wave Series
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Quasi-Peak Limit (dBuV/m)	Result
01(Quasi-Peak)	902.000	5.169	23.797	28.966	54.000	Pass
01(Quasi-Peak)	928.000	6.365	23.177	29.542	54.000	Pass

Figure Channel 01: Horizontal (Quasi-Peak)



Note:

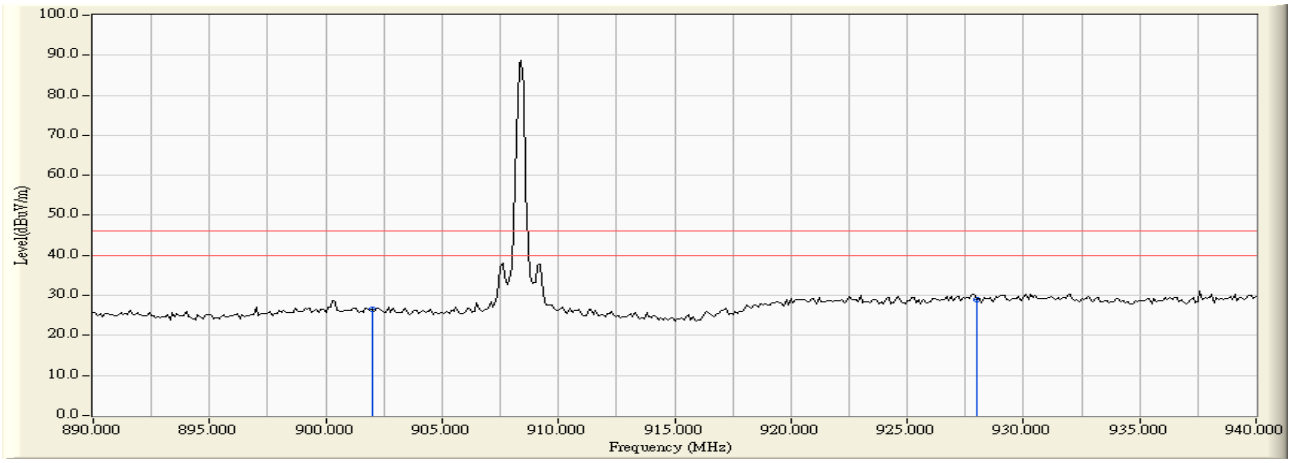
1. Quasi-Peak measurements: RBW=100kHz,VBW=1MHz,Sweep: Auto.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Product : Z-wave Series
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Quasi-Peak Limit (dBuV/m)	Result
01(Quasi-Peak)	902.000	2.696	23.763	26.459	54.000	Pass
01(Quasi-Peak)	928.000	5.677	23.267	28.944	54.000	Pass

Figure Channel 01: Vertical (Quasi-Peak)



Note:

1. Quasi-Peak measurements: RBW=100kHz,VBW=1MHz,Sweep: Auto.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

5. EMI Reduction Method During Compliance Testing

No modification was made during testing.