

Product Name	Z-wave Series
Model No.	AN128-1, AD126-1
FCC ID.	FU5TR003-01

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	Mar. 04, 2009
Issued Date	Apr. 24, 2009
Report No.	093085R-RFUSP07V01
Version	V1.0

The Test Results relate only to the samples tested.

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Test Report Certification

Issued Date: Apr. 24, 2009 Report No. : 093085R-RFUSP07V01



Product Name	Z-wave Series
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.	AN128-1, AD126-1
FCC ID.	FU5TR003-01
Rated Voltage	AC 120V/60Hz
Working Voltage	AC 120V/60Hz
Trade Name	EVERSPRING
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2007
	ANSI C63.4: 2003
Test Result	Complied

The Test Results relate only to the samples tested.

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Documented By :

Rita uan



(Engineering Adm. Specialist / Rita Huang)

Tested By

Dino Chen

(Engineer / Dino Chen)

Approved By

(Manager / Vincent Lin)



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Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Z-wave Series
Trade Name	EVERSPRING
FCC ID.	FU5TR003-01
Model No.	AN128-1, AD126-1
Frequency Range	908.42MHz
Type of Modulation	FSK
Number of Channels	1
Channel Control	Auto
Antenna Type	Monopole
Antenna Gain	Refer to the table "Antenna List"

Antenna List

No.	Manufacturer	Part No.	Peak Gain
1	EVERSPRING	N/A	-5.98dBi for 908-909MHz

Center Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 1:	908.42MHz				

Note:

1. The EUT is a Z-wave Series with a built-in Z-Wave transceiver module.

2. The different of the each model is shown as below:

Model Number	Description
AD126-1	TRIAC CIRCUIT
AN128-1	RELAY CIRCUIT

- 3. These tests are conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.249.
- 4. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
- 5. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.
- 6. The Fundamental Radiated Emission pre-test AD126-1 and AN128-1, the Final mode is AD126-1.

EMI Test Mode	Iode 1: Transmitter
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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.

Together with the patented Z-Wave Protocol the Z-Wave Module delivers a complete highly reliable RF communication solution. The Z-Wave Protocol uses Flood Detector, Temperature/Humidity Detector, illumination Sensor and sophisticated Routing to assure reliable full home coverage.

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) Open the EUT power.
- (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 : <u>http://tw.quietek.com/modules/myalbum/</u> The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site : <u>http://www.quietek.com/</u>

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	KNV (LA)₽
Site Name:	Quietek Corporation	NVLAP Lab Code: 200533-0
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 F-Mail : service@quietek.com	
	E-mail: service@quietek.com	

FCC Accreditation Number: TW1014



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, 2008	
2	L.I.S.N.	R & S	ESH3-Z5/825016/6	May, 2008	EUT
3	L.I.S.N.	Kyoritsu	KNW-407/8-1420-3	May, 2008	Peripherals
4	Pulse Limiter	R & S	ESH3-Z2	May, 2008	
5	No.1 Shielded Room	n		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	Limits				
MHz	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

:	Z-wave Series
:	Conducted Emission Test
:	Line 1
:	Mode 1: Transmitter(AD126-1)
	: : :

Frequency	Correct	Reading	Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dBuV	dBuV	dB	dBuV
Line 1					
Quasi-Peak					
0.373	9.650	44.140	53.790	-5.839	59.629
0.744	9.639	41.720	51.359	-4.641	56.000
1.111	9.670	38.520	48.190	-7.810	56.000
1.482	9.671	38.130	47.801	-8.199	56.000
2.224	9.680	35.340	45.020	-10.980	56.000
6.306	9.740	26.080	35.820	-24.180	60.000
Average					
0.373	9.650	37.370	47.020	-2.609	49.629
0.744	9.639	32.990	42.629	-3.371	46.000
1.111	9.670	33.310	42.980	-3.020	46.000
1.482	9.671	33.290	42.961	-3.039	46.000
2.224	9.680	30.850	40.530	-5.470	46.000
6.306	9.740	14.230	23.970	-26.030	50.000

- 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: Tr	cansmitter(AD1	26-1)				
Frequency	Correct	Reading	Measurement	Margin	Limit		
	Factor	Level	Level				
MHz	dB	dBuV	dBuV	dB	dBuV		
Line 2							
Quasi-Peak							
0.373	9.650	44.120	53.770	-5.859	59.629		
0.744	9.659	41.680	51.339	-4.661	56.000		
1.111	9.670	38.700	48.370	-7.630	56.000		
1.482	9.671	38.420	48.091	-7.909	56.000		
2.224	9.680	35.480	45.160	-10.840	56.000		
5.564	9.720	26.610	36.330	-23.670	60.000		
Average							
0.373	9.650	37.370	47.020	-2.609	49.629		
0.744	9.659	32.990	42.649	-3.351	46.000		
1.111	9.670	33.630	43.300	-2.700	46.000		
1.482	9.671	33.550	43.221	-2.779	46.000		
2.224	9.680	30.850	40.530	-5.470	46.000		
5.564	9.720	16.560	26.280	-23.720	50.000		

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**

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

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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

FCC Part 15 Subpart C Paragraph 15.249 Limits						
Frequency	Field Strength	of Fundamental	Field Strength of Harmonics			
MHz	(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		

> Fundamental and Harmonics Emission Limits

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
- \pm 3.8 dB below 1GHz

3.6. Test Result of Radiated Emission

Product	:	Z-wave Series							
Test Item	:	Fundamenta	Fundamental Radiated Emission						
Test Site	:	No.3OATS							
Test Mode	:	Mode 1: Tra	Mode 1: Transmitter (AN128-1)						
Frequency		Correct	Reading	Measurement	Margin	Limit			
		Factor	Level	Level					
MHz		dB	dBuV	dBuV/m	dB	dBuV/m			
Horizontal									
Peak Detector:									
908.408		4.234	88.370	92.603	-21.397	114.000			

Horizontal

Average Detector:

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

Product	:	Z-wave Series					
Test Item	:	Fundamenta	al Radiated Emi	ssion			
Test Site	:	No.3OATS					
Test Mode	:	Mode 1: Tra	ansmitter (AN12	28-1)			
Frequency		Correct	Reading	Measurement	Margin	Limit	
		Factor	Level	Level			
MHz		dB	dBuV	dBuV/m	dB	dBuV/m	
Vertical							
Peak Detector:							
908.384		5.344	80.081	85.424	-28.576	114.000	

Vertical

Average Detector:

--

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

Product	:	Z-wave Ser	Z-wave Series							
Test Item	:	Fundamenta	Fundamental Radiated Emission							
Test Site	:	No.3OATS								
Test Mode	:	Mode 1: Tra	ansmitter (AD12	26-1)						
Frequency		Correct	Reading	Measurement	Margin	Limit				
		Factor	Level	Level						
MHz		dB	dBuV	dBuV/m	dB	dBuV/m				
Horizontal										
Peak Detector:										
908.396		4.234	84.440	88.673	-25.327	114.000				

Horizontal

Average Detector:

--

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

Product	:	Z-wave Ser	Z-wave Series					
Test Item	:	Fundament	al Radiated Emi	ssion				
Test Site	:	No.3OATS						
Test Mode	:	Mode 1: Tr	ansmitter (AD12	26-1)				
Frequency		Correct	Reading	Measurement	Margin	Limit		
		Factor	Level	Level				
MHz		dB	dBuV	dBuV/m	dB	dBuV/m		
Vertical								
Peak Detector:								
908.392		5.344	73.813	79.156	-34.844	114.000		

Vertical

Average Detector:

--

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

Product	: Z-wave Series					
Test Item	: Harmon	ic Radiated Emiss	sion Data			
Test Site	: No.3 O	ATS				
Test Mode	: Mode 1	: Transmitter (AD	126-1)			
Frequency	Correct	Reading	Measurement	Margin	Limit	
	Factor	Level	Level			
MHz	dB	dBuV	dBuV/m	dB	dBuV/m	
Horizontal						
Peak Detector:						
1816.000	0.343	44.170	44.513	-29.487	74.000	
2724.000	1.226	38.310	39.536	-34.464	74.000	
3632.000	1.970	39.510	41.481	-32.519	74.000	
4540.000	2.752	37.280	40.033	-33.967	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	e Radiated Emiss	sion Data			
Test Site	: No.3 OA	ГS				
Test Mode	: Mode 1: '	Transmitter (AD	126-1)			
Frequency	Correct	Reading	Measurement	Margin	Limit	
	Factor	Level	Level			
MHz	dB	dBuV	dBuV/m	dB	dBuV/m	
Vertical						
Peak Detector:						
1816.000	1.850	41.700	43.550	-30.450	74.000	
2724.000	2.733	38.010	40.743	-33.257	74.000	
3632.000	3.477	39.230	42.708	-31.292	74.000	
4540.000	4.259	36.400	40.660	-33.340	74.000	

Average

Detector:

- 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.
- The average measurement was not performed when the peak measured data under the limit of average 6. 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 (AD126-1)

Frequency	Correct	Reading	Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
433.520	-1.061	23.433	22.372	-23.628	46.000
635.280	4.090	23.001	27.091	-18.909	46.000
699.300	3.060	23.260	26.320	-19.680	46.000
786.600	4.597	22.082	26.679	-19.321	46.000
875.840	4.298	22.983	27.281	-18.719	46.000
939.860	4.870	23.942	28.812	-17.188	46.000
Vertical					
400.540	-2.230	23.251	21.021	-24.979	46.000
443.220	-1.930	22.784	20.854	-25.146	46.000
555.740	-0.320	23.074	22.754	-23.246	46.000
654.680	1.520	23.500	25.020	-20.980	46.000
802.120	3.080	22.692	25.772	-20.228	46.000
947.620	5.870	23.068	28.938	-17.062	46.000

- 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.
Х	Test Receiver	R & S	ESI 26 / 838786/004	May, 2008
Х	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2008
Х	Bilog Antenna	SCHAFFNER	CBL6112B / 2697	May, 2008
Х	Horn Antenna	Schwarzbeck	BBHA9120D / 305, 306	July, 2008
Х	Horn Antenna	Schwarzbeck	BBHA9170 / 208, 209	July, 2008
Х	Pre-Amplifier	QTK	QTK-AMP-01 / 0001	July, 2008
Х	Pre-Amplifier	QTK	QTK-AMP-03 / 0003	May, 2008
Х	Pre-Amplifier	HP	8449B / 3008A01123	July, 2008
OAT	S 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 (AD126-1)

RF Radiated Measurement (Horizontal):

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Quasi-Peak Limit (dBuV/m)	Result
01(Quasi-Peak)	908.000	4.228	20.490	24.718	54.000	Pass
02(Quasi-Peak)	928.000	4.622	18.080	22.701	54.000	Pass
03(Quasi-Peak)	975.320	5.366	17.930	23.296	54.000	Pass

Figure Channel 01:

Horizontal (Quasi-Peak)



- 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 (AD126-1)

RF Radiated Measurement (Vertical):

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Quasi-Peak Limit (dBuV/m)	Result
01(Quasi-Peak)	908.000	5.338	18.370	23.708	54.000	Pass
02(Quasi-Peak)	928.000	5.602	18.160	23.761	54.000	Pass
03(Quasi-Peak)	988.440	6.067	17.970	24.037	54.000	Pass

Figure Channel 01:

Vertical (Quasi-Peak)



- 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.