

FCC PART 15 SUBPART B & SUBPART C SECTION 15.249 TEST REPORT

for

Z-WAVE MODULE Model: 2GIG-ZWM-500

Prepared for

2GIG SECURITY & CONTROL 1950 CAMINO VIDA ROBLE, SUITE 150 CARLSBAD, CA 92008

Prepared by:	
	TOREY OLIVER
Approved by:_	
	MATT HARRISON

COMPATIBLE ELECTRONICS INC. 20621 PASCAL WAY LAKE FOREST, CALIFORNIA 92630 (949) 587-0400

DATE: MARCH 3, 2015

	REPORT		APPENDICES			TOTAL	
	BODY	\boldsymbol{A}	В	C	D	E	
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GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Compatible Electronics Inc., which is an independent testing and consulting firm. The test report is based on testing performed by Compatible Electronics personnel according to the measurement procedures described in the test specifications given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced in any form unless done so in full with the written permission of Compatible Electronics.

This report must not be used to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the federal government.

Device Tested: Z-Wave Module

Model: 2GIG-ZWM-500

S/N: None

Product Description: The Z-wave module is used for home automation, it works in the frequency range of 908

MHz to 916MHz.

Modifications: The EUT was not modified in order to comply with specifications.

Manufacturer: 2GIG Technologies, Inc.

1950 Camino Vida Roble, Suite 150

Carlsbad, CA 92008

Test Date: March 3, 2015

Test Specifications: EMI requirements

CFR Title 47, Part 15 Subpart B Sections 15.107, 15.109, Subpart C Sections 15.205, 15.207,

15.209 and 15.249

Test Procedure: ANSI C63.4 & C63.10





SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Conducted RF Emissions, 150 kHz - 30 MHz.	Complies with the limits of CFR Title 47 Part 15 Subpart B, Section 15.107 and Subpart C Sections 15.207
2	Radiated RF Emissions & Harmonics, 9 kHz – 10,000 MHz.	Complies with the limits of CFR Title 47 Part 15Subpart B Section 15.109 & Subpart C Section 15.205, 15.209, & 15.249





FCC Part 15 Subpart B & C Section 15.249 Test Report

PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the Z-Wave Module Model: 2GIG-ZWM-500. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4 & C63.10. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT (equipment under test) hereafter, are within the specification limits defined by the Code of Federal Regulations Title 47, Part 15 Subpart B sections 15.107, 15.109, & Part 15 Subpart C sections 15.205, 15.207, 15.209 and 15.249.





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2. ADMINISTRATIVE DATA

2.1 Location of Testing

The tests described herein were performed at the test facility of Compatible Electronics, 20621 Pascal Way Lake Forest, California 92630.

2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The calibration is traceable to the National Institute of Standards and Technology (NIST).

2.3 Cognizant Personnel

2GIG

Verdin Orozco Sr. Regulatory Compliance Engineer

Compatible Electronics, Inc.

Torey Oliver Test Technician Matt Harrison Test Technician

Jeff Klinger Director of Engineering

2.4 Date Test Sample was Received

The test sample was received on March 3, 2015.

2.5 Disposition of the Test Sample

The test sample remains at Compatible Electronics, Inc. as of the date of this test report.

2.6 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

RF Radio Frequency

EMI Electromagnetic Interference EUT Equipment Under Test

P/N Part Number S/N Serial Number HP Hewlett Packard

ITE Information Technology Equipment

CML Corrected Meter Limit

LISN Line Impedance Stabilization Network

NVLAP National Voluntary Laboratory Accreditation Program

CFR Code of Federal Regulations

PCB Printed Circuit Board

TX Transmit RX Receive





3. APPLICABLE DOCUMENTS

The following documents are referenced or used in the preparation of this Test Report.

SPEC	TITLE
CFR Title 47, Part 15	FCC Rules – Radio frequency devices (including digital devices)
ANSI C63.4 2009	Methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz.
ANSI C63.10: 2009	American National Standard for Testing Unlicensed Wireless Devices







4. DESCRIPTION OF TEST CONFIGURATION

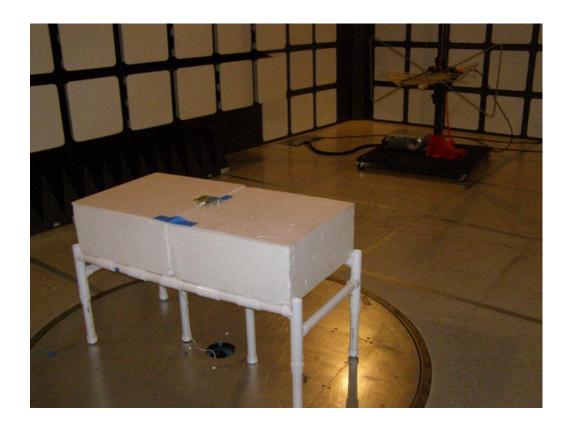
4.1 Description of Test Configuration

The Z-Wave Module Model: 2GIG-ZWM-500 (EUT) was setup in a tabletop configuration. The EUT was connected to the EUT PSU and the Laptop Computer USB port. The EUT was only connected to the laptop for programming then was disconnected for the duration of the testing. The EUT was checked all 3 axis. The worst case was found to be the X-Axis. The EUT was continuously transmitting a data stream during transmit tests and continuously receiving during receive tests.

The voltage was varied $\pm 15\%$; the transmitting signal amplitude and frequency did not vary.

It was determined that the emissions were at their highest level when the EUT was transmitting in the configuration described above for Radiated Emissions. The final radiated data was taken in the above configuration. Please see Appendix E for the test data.

4.1.1 Photograph Test Configuration







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4.1.2 Cable Construction and Termination

Cable 1

This is a 2-meter, unshielded cable. It is connecting the EUT to the power supply. It has a barrel connector at the EUT end of the cable and is hardwired into the power supply. The cable was bundled to a length of 1 meter.

Cable 2

This is a 2-meter, unshielded cable. It is connecting the Laptop to the Laptop Power Supply. It is hardwired at the EUT end. The cable was not bundled.







LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT 5.

5.1 EUT and Accessory List

#	EQUIPMENT TYPE	MANU- FACTURER	MODEL	SERIAL NUMBER
1	Z-WAVE MODULE (EUT)	2GIG	2GIG-ZWM-500	NONE
2	EUT POWER SUPPLY	2GIG	HK-AX-140A170-CP	NONE
3	LAPTOP	LENOVO	W530	R9-WRFYR 13/01
4	LAPTOP POWER SUPPLY	LENOVO	45N0113	11S45M0113Z1ZHX82CB1M9





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5.2 EMI Test Equipment

EQUIPMENT TYPE	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
Computer	Compatible Electronics	NONE	NONE	N/A	N/A
EMI Receiver	Rohde & Schwarz	ESIB40	100219	09/5/2014	09/5/2015
Antenna, Loop	Com Power	AL-130	121049	12/06/2013	12/06/2015
Antenna, CombiLog	Com Power	AC-220	25857	05/21/2014	05/21/2015
Antenna, Horn 1-	Com Power	AH-118	071250	07/01/2014	07/01/2016
Pre-Amp, 1-18GHz	Com Power	PAM-118	443011	4/24/2014	4/24/2015
Notch Filter	AMTI Microwave Circuits	N03019-01	3709-01 DC0415	01/06/2015	01/06/2016
Mast, Antenna Positioner	Sunol Science Corporation	TWR 95-4	020808-3	N/A	N/A
Antenna Mast	Sunol Science Corporation	TWR 95-4	020808-3	N/A	N/A
Turntable	Sunol Science Corporation	FM 2001	N/A	N/A	N/A
Mast and Turntable Controller	Sunol Science Corporation	SC104V	020808-1	N/A	N/A
LISN	Com-Power	LI-150	191937	4/18/2014	4/18/2015





6. TEST SITE DESCRIPTION

6.1 Test Facility Description

Please refer to section 2.1 and the figures in Appendix D of this report for test location.

6.2 EUT Mounting, Bonding and Grounding

The EUT was mounted on a 1.0 by 1.5 by 0.8 meter high non-conductive table, which was placed on the ground plane.

The EUT was not grounded.

6.3 Facility Environmental Characteristics

When applicable refer to the data sheets in Appendix E for the relative humidity, air temperature, and barometric pressure.





7. CHARACTERISTICS OF THE TRANSMITTER

7.1 Channel Number and Frequencies

There 2 operating channels and the EUT uses 2FSK & 2GFSK modulation. For both channels, the output power was set to 31.

1 == 908.4 MHz 2 == 916.0 MHz

7.2 Antenna

The antenna is made up of a trace located on the PCB.





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8. TEST PROCEDURES

The following sections describe the test methods and the specifications for the tests. Test results are also included in this section.

8.1 RF Emissions

8.1.1 **Conducted Emissions Test**

The EMI receiver was used as a measuring meter. A quasi-peak and/or average reading was taken only where indicated in the data sheets. The LISN output was measured using the EMI receiver. The output of the second LISN was terminated by a 50-ohm termination. The effective measurement bandwidth used for this test was 9 kHz.

Please see section 6.2 of this report for mounting, bonding, and grounding of the EUT. The EUT received its power through the LISN, which was bonded to the ground plane. The EUT was set up with the minimum distances from any conductive surfaces as specified in ANSI 63.4. The excess power cord was wrapped in a figure eight pattern to form a bundle not exceeding 0.4 meters in length.

The conducted emissions from the EUT were maximized for operating mode as well as cable placement. The final data was collected under program control by the computer software. The final qualification data is located in Appendix E.

Test Results:

The EUT complies with the limits of CFR Title 47 Part 15 Subpart B section 15.107, & Subpart C section 15.207.



8.1.2 Radiated Emissions (Spurious and Harmonics) Test

The EMI receiver was used as a measuring meter. The receiver was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the receiver records the highest measured reading over all the sweeps. Amplifiers were used to increase the sensitivity of the instrument. There was one Microwave Preamplifier used for frequencies above 1 GHz.

For spurious emissions the quasi-peak detector was used for frequencies below 1GHz and the average detector was used for frequencies above 1 GHz.

For the Harmonic emissions a linear average detector was used.

The measurement bandwidths and transducers used for the radiated emissions test were:

FREQUENCY RANGE (MHz)	TRANSDUCER	EFFECTIVE MEASUREMENT BANDWIDTH
.009 to .150	Active Loop Antenna	200 Hz
.150 to 30	Active Loop Antenna	9 kHz
30 to 1000	Combilog Antenna	100 kHz
1000 to 10000	Horn Antenna	1 MHz

The TDK FAC-3 shielded test chamber of Compatible Electronics, Inc. was used for radiated emissions testing. This test site is in full compliance with ANSI C63.4 & ANSI C63.10. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters in both vertical and horizontal polarizations (for E field radiated field strength).

Test Results:

The EUT complies with the limits of CFR Title 47 Part 15 Subpart B section 15.109, & Part 15 Subpart C sections 15.205, 15.209 and 15.249.



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8.1.3 Fundamental Field Strength

The Peak Transmit Radiated Field Strength was measured at a 3-meter test distance. The EMI Receiver was used to obtain the final test data. The final qualification data sheets are located in Appendix E.

Test Results:

The EUT complies with Part 15 Subpart C, Section 15.249.

8.1.4 Emissions Radiated Outside of the Fundamental Frequency Band

The Band Edge measurement was measured using the EMI Receiver at a 3-meter test distance to obtain the final test data. The lower and upper channels were tuned during the low and high band edge tests. The final qualification data sheets are located in Appendix E.

Test Results:

The EUT complies with Part 15 Subpart C, Section 15.205 & 15.249.





9. TEST PROCEDURE DEVIATIONS

The test procedures were not deviated from throughout all tests.

10. CONCLUSIONS

The Z-Wave Module Model: 2GIG-ZWM-500 meets all of the relevant specification requirements defined in the Code of Federal Regulations Title 47, Part 15 Subpart B section 15.107, 15.109, & Subpart C sections 15.205, 15.207, 15.209 and 15.249.







APPENDIX A

LABORATORY ACCREDITATIONS AND RECOGNITIONS





LABORATORY ACCREDITATIONS AND RECOGNITIONS



For US, Canada, Australia/New Zealand, Taiwan and the European Union, Compatible Electronics is currently accredited by NVLAP to ISO/IEC 17025 an ISO 9002 equivalent. Please follow the link to the NIST site for each of our facilities NVLAP certificate and scope of accreditation.

NVLAP listing links

Agoura Division - http://ts.nist.gov/Standards/scopes/200630.htm
Brea Division - http://ts.nist.gov/Standards/scopes/2005280.htm
Silverado/Lake Forest Division - http://ts.nist.gov/Standards/scopes/2005270.htm



ANSI listing

https://www.ansica.org/wwwversion2/outside/ALLdirectoryDetails.asp?menuID=1&prqID=3&orqID=123&status=4



Compatible Electronics has been nominated as a Conformity Assessment Body (CAB) for EMC under the US/EU Mutual Recognition Agreement (MRA).



Compatible Electronics has been nominated as a Conformity Assessment Body (CAB) for Taiwan/BSMI under the US/APEC (Asia-Pacific Economic Cooperation) Mutual Recognition Agreement (MRA).

We are also certified/listed for IT products by the following country/agency:



VCCI Listing, from VCCI site

Enter "Compatible" in search form http://www.vcci.or.jp/vcci_e/activity/registration/setsubi.html



FCC Listing, from FCC OET site

FCC test lab search https://fjallfoss.fcc.gov/oetcf/eas/reports/TestFirmSearch.cfm



Compatible Electronics IC listing can be found at: http://www.ic.gc.ca/eic/site/ic1.nsf/eng/home



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APPENDIX B

MODIFICATIONS TO THE EUT





MODIFICATIONS TO THE EUT

There were no modifications were made during testing.







APPENDIX C

ADDITIONAL MODELS COVERED UNDER THIS REPORT





ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST

Z-WAVE MODULE Model: 2GIG-ZWM-500

S/N: None

No additional models were tested.







APPENDIX D

DIAGRAMS, CHARTS, AND PHOTOS





FIGURE 1: PLOT MAP AND LAYOUT OF TEST SITE BELOW 1GHZ

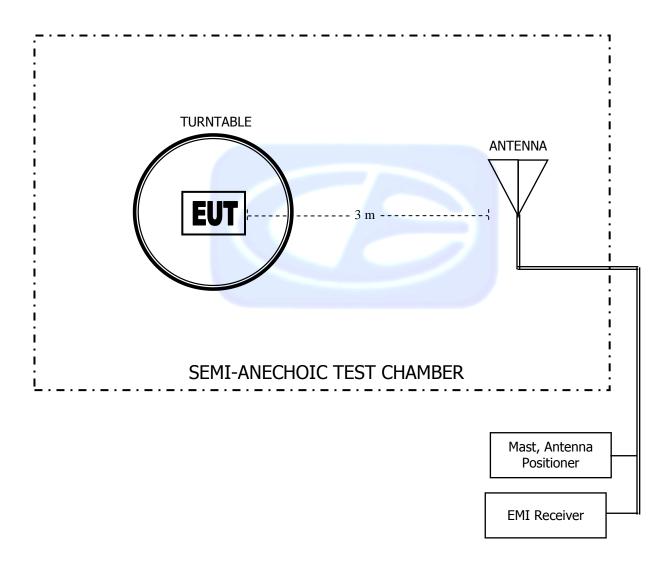




FIGURE 2: PLOT MAP AND LAYOUT OF TEST SITE ABOVE 1GHZ

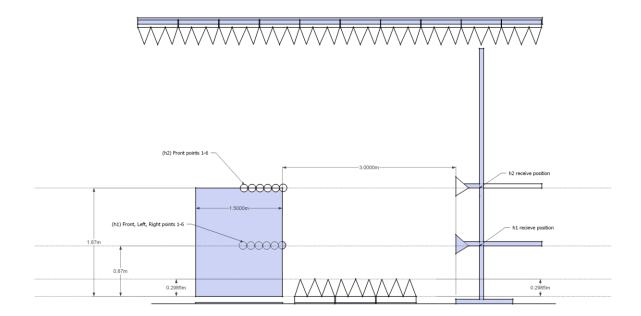
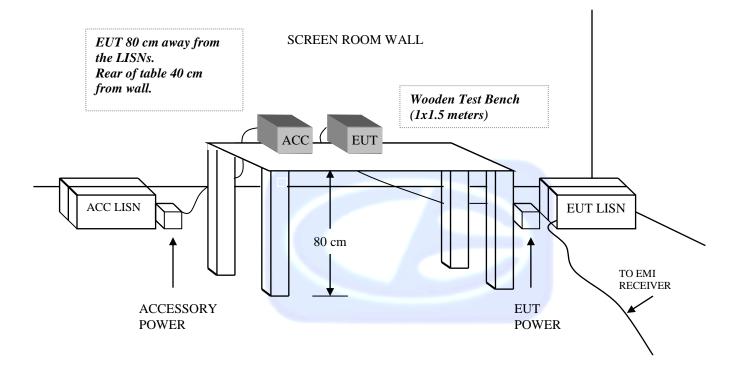




FIGURE 3: CONDUCTED EMISSIONS TEST SETUP







COM-POWER AL-130

LOOP ANTENNA

S/N: 121049

CALIBRATION DUE: DECEMBER 6, 2015

FREQUENCY	MAGNETIC	ELECTRIC	FREQUENCY	MAGNETIC	ELECTRIC
(MHz)	(dB/m)	(dB/m)	(MHz)	(dB/m)	(dB/m)
0.009	-34.64	16.86	0.8	-36.32	15.18
0.01	-34.78	16.72	0.9	-36.22	15.28
0.02	-35.91	15.59	1.0	-36.22	15.28
0.03	-35.48	16.02	2.0	-35.91	15.59
0.04	-35.82	15.68	3.0	-35.91	15.59
0.05	-36.49	15.01	4.0	-36.01	15.49
0.06	-36.30	15.20	5.0	-35.80	15.70
0.07	-36.43	15.07	6.0	-36.00	15.50
0.08	-36.30	15.20	7.0	-35.90	15.60
0.09	-36.39	15.11	8.0	-35.70	15.80
0.1	-36.41	15.09	9.0	-35.70	15.80
0.2	-36.61	14.89	10.0	-35.60	15.90
0.3	-36.63	14.87	15.0	-36.52	14.98
0.4	-36.52	14.99	20.0	-35.75	15.75
0.5	-36.63	14.87	25.0	-37.78	13.72
0.6	-36.62	14.88	30.0	-38.62	12.88
0.7	-36.53	14.97			





COM-POWER AC-220

LAB R - COMBILOG ANTENNA

S/N: 25857

CALIBRATION DUE: MAY 21, 2015

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	22.5	160	13.3
35	22.5	180	15.0
40	23.0	200	14.6
45	21.5	250	16.5
50	21.3	300	18.1
60	18.2	400	19.4
70	13.2	500	21.4
80	11.6	600	21.6
90	11.9	700	23.7
100	12.6	800	26.0
120	15.1	900	26.6
140	13.6	1000	28.5





COM-POWER AH-118

HORN ANTENNA

S/N: 071250

CALIBRATION DUE: JULY 1, 2016

FREQUENCY (MHz)	FACTOR	FREQUENCY (MHz)	FACTOR
	(dB)	, ,	(dB)
1000	30.1	9500	44.2
1500	29.2	10000	43.4
2000	31.6	10500	44.6
2500	35.5	11000	45.1
3000	33.7	11500	45.7
3500	36.0	12000	46.2
4000	35.4	12500	45.4
4500	35.5	13000	44.8
5000	40.1	13500	46.7
5500	37.8	14000	47.8
6000	39.0	14500	46.4
6500	39.9	15000	47.2
7000	40.4	15500	45.5
7500	44.4	16000	45.0
8000	44.1	16500	44.5
8500	43.1	17000	47.0
9000	43.0	17500	47.8
		18000	44.2





COM-POWER PAM-118

1-18GHz - PREAMPLIFIER

S/N: 443011

CALIBRATION DUE: April 24, 2015

FREQUENCY	FACTOR	FREQUENCY	FACTOR
(GHz)	(dB)	(GHz)	(dB)
0.500	27.2	7.000	23.8
1.000	26.6	7.500	23.9
1.500	27.0	8.000	24.4
2.000	27.0	8.500	25.2
2.500	27.4	9.500	26.2
3.000	27.6	10.000	25.8
3.500	27.5	11.000	25.5
4.000	27.3	12.000	25.4
4.500	27.3	13.000	25.1
5.000	27.5	14.000	24.6
5.500	26.3	15.000	24.1
6.000	26.1	16.000	25.1
6.500	25.4	17.000	25.2
		18.000	24.4



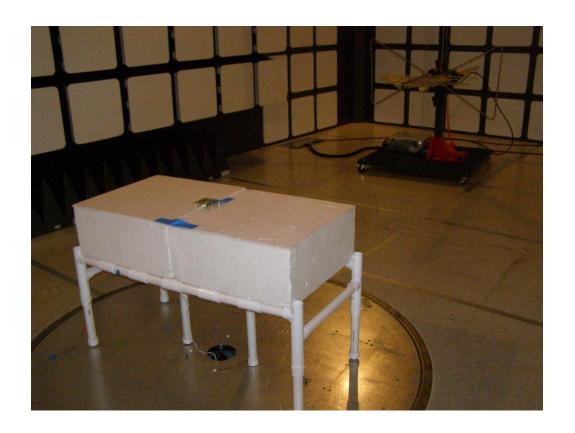




FRONT VIEW

2GIG Z-WAVE MODULE Model: 2GIG-ZWM-500 FCC SUBPART B & C - RADIATED EMISSIONS < 1GHz





REAR VIEW

2GIG Z-WAVE MODULE Model: 2GIG-ZWM-500 FCC SUBPART B & C - RADIATED EMISSIONS < 1GHz





FRONT VIEW

 $\begin{tabular}{ll} 2GIG\\ Z-WAVE\ MODULE\\ Model:\ 2GIG-ZWM-500\\ FCC\ SUBPART\ B\ \&\ C\ -\ RADIATED\ EMISSIONS > 1GHz\\ \end{tabular}$





REAR VIEW

 $\begin{tabular}{ll} 2GIG\\ Z-WAVE\ MODULE\\ Model:\ 2GIG-ZWM-500\\ FCC\ SUBPART\ B\ \&\ C\ -\ RADIATED\ EMISSIONS > 1GHz\\ \end{tabular}$





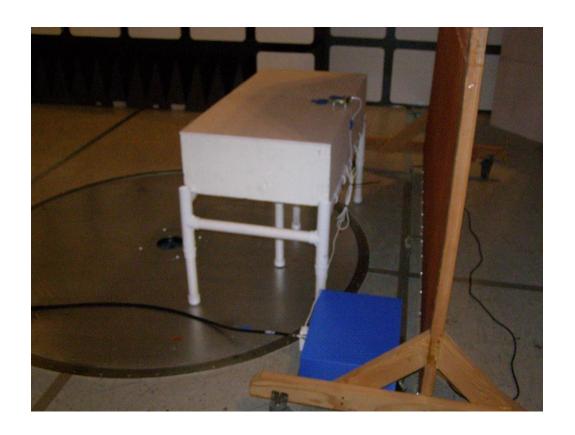
FRONT VIEW

2GIG
Z-WAVE MODULE
Model: 2GIG-ZWM-500
FCC SUBPART B & C - CONDUCTED EMISSIONS

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS







REAR VIEW

2GIG
Z-WAVE MODULE
Model: 2GIG-ZWM-500
FCC SUBPART B & C - CONDUCTED EMISSIONS

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



APPENDIX E

RADIATED EMISSIONS DATA SHEETS



Page E2



Title: FCC 15.209

3/3/2015 10:17:33 AM File: Radiated Pre-Scan 30-1000Mhz 908.4.set Sequence: Preliminary Scan

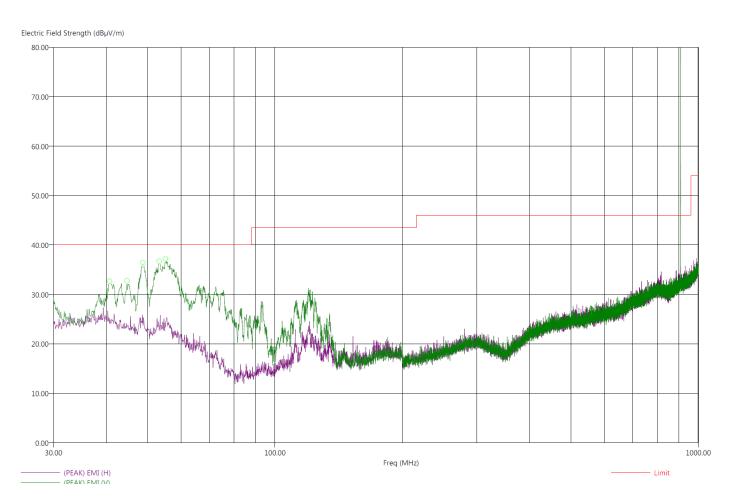
Operator: Matt Harrison EUT Type: 2GIG-ZWM-500

EUT Condition: Transmitting @ 908.4MHz.

Comments: Connected to PSU

Temp: 68f Hum: 43% 120V 60Hz

Compatible Electronics, Inc. FAC-3 (Lab R)



There were no radiated emissions other than harmonics found below 30 MHz or above 1GHz. This is worst case channel and mode.







Title: FCC 15.209 3/3/2015 10:43:31 AM Sequence: Final Measurements

File: Radiated Final 30-1000Mhz 908.4.set

Operator: Matt Harrison EUT Type: 2GIG-ZWM-500.

EUT Condition: Transmitting @ 908.4MHz.

Comments: Connected to PSU

Temp: 68f Hum: 43% 120V 60Hz

Compatible Electronics, Inc. FAC-3 (Lab R)

Freq (MHz)	(QP) Margin (dB)	(QP) EMI (dBµV/m)	(PEAK) EMI (dBµV/m)	Limit (dBµV/m)	Pol	Ttbl Agl (deg)	Twr Ht (cm)	Transducer(dB)	Cable(dB)
40.70	-11.39	28.61	33.44	40.00	V	25.75	119.52	22.77	1.20
44.80	-11.83	28.17	32.54	40.00	V	236.25	118.86	21.56	0.69
48.80	-6.37	33.63	38.08	40.00	V	27.75	99.40	21.35	0.24
53.30	-6.70	33.30	37.82	40.00	V	84.00	99.82	20.21	0.42
55.20	-6.47	33.53	37.83	40.00	V	27.00	110.14	19.60	0.59
55.50	-5.82	34.18	38.24	40.00	V	8.00	99.88	19.55	0.61

There were no radiated emissions other than harmonics found below 30 MHz or above 1GHz. This is worst case channel and mode.







DATA SHEETS





Title: FCC 15.207 3/3/2015 2:28:35 PM File: Conducted Pre-Line.set Sequence: Preliminary Scan

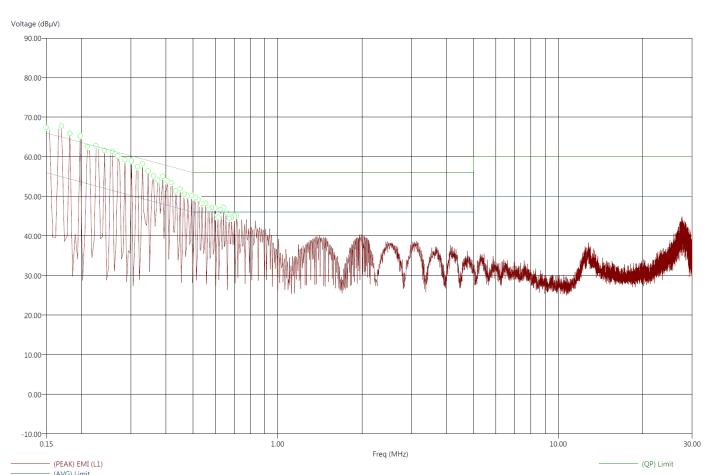
Operator: Matt Harrison EUT Type: 2GIG-ZWM-500.

EUT Condition: Transmitting @ 908.40MHz

Comments: Connected to PSU.

Temp: 70f Hum: 38% 120V 60Hz

Compatible Electronics, Inc. FAC-3 (LAB R)



This is worst case channel and mode.





Title: FCC 15.207 3/3/2015 2:32:03 PM File: Conducted Final-Line.set Sequence: Final Measurements

Operator: Matt Harrison EUT Type: 2GIG-ZWM-500.

EUT Condition: Transmitting @ 908.40MHz

Comments: Connected to PSU.

Temp: 70f Hum: 38% 120V 60Hz

Compatible Electronics, Inc. FAC-3 (LAB R)

Freq	(AVG) Margin AVL	(QP) Margin QPL	(AVG) EMI	(QP) EMI	(PEAK) EMI	(AVG) Limit	(QP) Limit	Transducer	Cable
(MHz)	(dB)	(dB)	(dB V)	(dBµV)	(dBµV)	(dBµV)	(dB _µ V	(dB)	(dB)
0.15	-24.56	-4.87	31.44	61.13	68.67	56.00	66.00	0.62	0.18
0.17	-25.04	-5.21	29.92	59.75	67.30	54.96	64.96	0.56	0.23
0.18	-20.31	-5.47	34.08	58.92	67.31	54.39	64.39	0.53	0.26
0.20	-25.31	-5.96	28.39	57.73	65.42	53.69	63.69	0.49	0.30
0.21	-19.37	-6.36	33.83	56.85	65.50	53.21	63.21	0.46	0.28
0.23	-25.06	-6.72	27.54	55.87	64.99	52.60	62.60	0.43	0.26
0.24	-20.31	-7.14	31.72	54.89	63.10	52.03	62.03	0.40	0.24
0.26	-22.75	-7.59	28.75	53.91	62.56	51.50	61.50	0.37	0.22
0.27	-22.11	-8.10	29.01	53.02	62.11	51.12	61.12	0.35	0.20
0.29	-22.67	-8.46	27.97	52.18	60.54	50.64	60.64	0.32	0.18
0.30	-25.36	-8.78	24.82	51.41	59.47	50.19	60.19	0.30	0.17
0.32	-19.99	-9.15	29.77	50.61	59.41	49.76	59.76	0.27	0.15
0.33	-23.14	-9.47	26.31	49.99	58.55	49.45	59.45	0.26	0.14
0.35	-16.64	-9.74	32.42	49.32	57.83	49.06	59.06	0.24	0.12
0.36	-15.65	-9.90	33.04	48.78	57.62	48.68	58.68	0.23	0.11
0.37	-12.76	-9.85	35.65	48.56	56.57	48.41	58.41	0.23	0.10
0.39	-10.17	-8.14	37.89	49.92	57.73	48.06	58.06	0.23	0.08
0.41	-10.43	-7.27	37.30	50.46	56.21	47.73	57.73	0.23	0.07
0.42	-12.54	-9.80	34.95	47.69	55.31	47.49	57.49	0.23	0.06
0.43	-20.52	-11.98	26.66	45.19	53.83	47.18	57.18	0.23	0.05
0.45	-21.34	-12.18	25.54	44.69	53.21	46.88	56.88	0.23	0.03
0.47	-20.72	-12.44	25.87	44.15	53.71	46.58	56.58	0.24	0.02
0.48	-20.56	-12.49	25.82	43.88	51.73	46.37	56.37	0.24	0.01
0.49	-19.96	-12.96	26.14	43.14	52.20	46.10	56.10	0.25	0.00
0.51	-21.00	-13.53	25.00	42.47	51.24	46.00	56.00	0.25	0.00



Freq	(AVG) Margin AVL	(QP) Margin QPL	(AVG) EMI	(QP) EMI	(PEAK) EMI	(AVG) Limit	(QP) Limit	Transducer	Cable
(MHz)	(dB)	(dB)	(dB V)	(dBµV)	(dBµV)	(dBµV)	(dB _µ V	(dB)	(dB)
0.52	-21.16	-13.82	24.84	42.18	51.19	46	56	0.25	0
0.54	-22.55	-14.68	23.45	41.32	50.46	46	56	0.25	0
0.55	-23.5	-15.4	22.5	40.6	49.61	46	56	0.24	0
0.57	-22.2	-15.9	23.8	40.1	48.71	46	56	0.24	0
0.58	-23.7	-16.34	22.3	39.66	48.55	46	56	0.24	0
0.6	-21.66	-16.77	24.34	39.23	47.64	46	56	0.24	0
0.61	-22.48	-17.38	23.52	38.62	47.99	46	56	0.24	0
0.63	-20.99	-17.5	25.01	38.5	46.9	46	56	0.24	0
0.64	-21.08	-17.92	24.92	38.08	47.04	46	56	0.24	0
0.66	-21.32	-17.89	24.68	38.11	46.81	46	56	0.24	0
0.67	-19.39	-18.06	26.61	37.94	47.19	46	56	0.24	0
0.69	-21.39	-18.4	24.61	37.6	46.33	46	56	0.23	0
0.7	-19.44	-18.27	26.56	37.73	46.76	46	56	0.23	0
0.71	-21.56	-18.7	24.44	37.3	45.96	46	56	0.23	0

This is worst case channel and mode.





FCC Part 15 Subpart B & C Section 15.249 Test Report

Title: FCC 15.207 3/3/2015 2:41:49 PM File: Conducted Pre-Neutral.set Sequence: Preliminary Scan

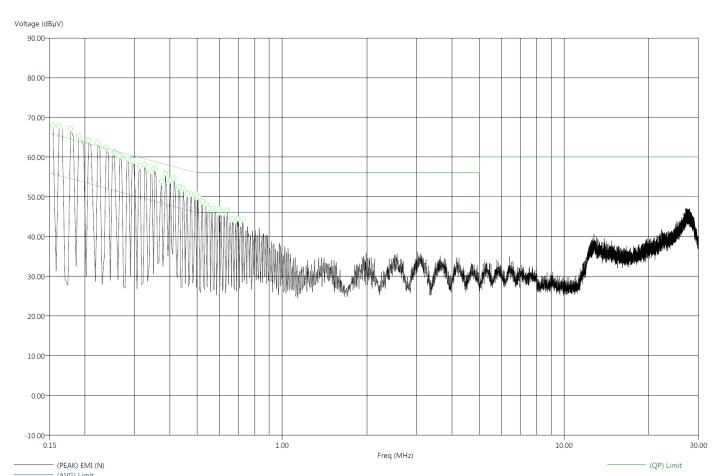
Operator: Matt Harrison EUT Type: 2GIG-ZWM-500.

EUT Condition: Transmitting @ 908.40MHz

Comments: Connected to PSU.

Temp: 70f Hum: 38% 120V 60Hz

Compatible Electronics, Inc. FAC-3 (LAB R)



This is worst case channel and mode.





Title: FCC 15.207 3/3/2015 2:45:35 PM File: Conducted Final-Neutral.set Sequence: Final Measurements

Operator: Matt Harrison EUT Type: 2GIG-ZWM-500.

EUT Condition: Transmitting @ 908.40MHz

Comments: Connected to PSU.

Temp: 70f Hum: 38% 120V 60Hz

Compatible Electronics, Inc. FAC-3 (LAB R)

Freq	(AVG) Margin AVL	(QP) Margin QPL	(AVG) EMI	(QP) EMI	(PEAK) EMI	(AVG) Limit	(QP) Limit	Transducer	Cable
(MHz)	(dB)	(dB)	(dB V)	(dBµV)	$(dB\mu V)$	$(dB\mu V)$	(dB _µ V	(dB)	(dB)
0.15	-24.77	-5.29	31.01	60.49	68.90	55.78	65.78	0.39	0.19
0.16	-24.29	-5.44	31.07	59.92	67.75	55.36	65.36	0.37	0.21
0.18	-25.39	-5.68	29.19	58.90	66.74	54.58	64.58	0.32	0.25
0.19	-24.39	-5.97	29.64	58.06	66.06	54.04	64.04	0.30	0.28
0.21	-24.99	-6.37	28.37	57.00	65.48	53.37	63.37	0.26	0.29
0.22	-26.47	-6.90	26.28	55.84	64.12	52.74	62.74	0.23	0.27
0.24	-24.60	-7.39	27.57	54.77	63.21	52.17	62.17	0.19	0.24
0.25	-27.01	-7.77	24.62	53.85	62.23	51.63	61.63	0.16	0.22
0.27	-25.84	-8.09	25.40	53.15	61.88	51.24	61.24	0.14	0.21
0.28	-27.51	-7.90	23.25	52.86	60.34	50.76	60.76	0.12	0.19
0.29	-26.99	-9.05	23.42	51.36	59.80	50.41	60.41	0.10	0.17
0.31	-26.23	-9.48	23.64	50.38	58.33	49.86	59.86	0.07	0.15
0.33	-26.76	-9.78	22.79	49.77	58.30	49.55	59.55	0.05	0.14
0.34	-24.15	-10.15	25.00	49.00	57.11	49.15	59.15	0.03	0.12
0.35	-25.14	-10.48	23.73	48.39	56.28	48.87	58.87	0.02	0.11
0.37	-21.09	-10.94	27.32	47.47	56.55	48.41	58.41	0.02	0.10
0.39	-21.07	-11.13	27.08	47.02	56.16	48.15	58.15	0.02	0.08
0.40	-17.75	-11.25	30.06	46.56	55.37	47.81	57.81	0.02	0.07
0.41	-20.14	-11.51	27.42	46.06	54.38	47.57	57.57	0.02	0.06
0.43	-25.12	-12.17	22.13	45.08	53.93	47.25	57.25	0.02	0.05
0.45	-27.36	-12.55	19.59	44.40	53.68	46.95	56.95	0.02	0.04
0.46	-27.21	-12.95	19.45	43.70	52.22	46.66	56.66	0.02	0.03



Freq	(AVG) Margin AVL	(QP) Margin QPL	(AVG) EMI	(QP) EMI	(PEAK) EMI	(AVG) Limit	(QP) Limit	Transducer	Cable
(MHz)	(dB)	(dB)	(dB V)	(dBµV)	(dBµV)	(dBµV)	(dB _µ V	(dB)	(dB)
0.47	-27.59	-13.33	18.85	43.12	51.91	46.44	56.44	0.02	0.02
0.49	-27.07	-13.68	19.03	42.42	51.33	46.10	56.10	0.03	0.00
0.51	-27.88	-14.09	18.12	41.91	50.64	46.00	56.00	0.03	0.00
0.52	-28.09	-14.70	17.91	41.30	50.07	46.00	56.00	0.03	0.00
0.54	-29.38	-15.25	16.62	40.75	48.94	46.00	56.00	0.03	0.00
0.55	-29.88	-15.24	16.12	40.76	48.98	46.00	56.00	0.03	0.00
0.57	-29.78	-15.82	16.22	40.18	48.98	46.00	56.00	0.03	0.00
0.58	-30.36	-16.42	15.64	39.58	47.95	46.00	56.00	0.03	0.00
0.60	-28.64	-16.80	17.36	39.2	47.49	46.00	56.00	0.03	0.00
0.61	-29.80	-16.84	16.20	39.16	47.04	46.00	56.00	0.03	0.00
0.62	-28.46	-17.29	17.54	38.71	47.65	46.00	56.00	0.02	0.00
0.64	-29.36	-18.04	16.64	37.96	46.49	46.00	56.00	0.02	0.00
0.67	-28.95	-18.75	17.05	37.25	46.21	46.00	56.00	0.02	0.00
0.69	-28.59	-19.61	17.41	36.39	44.67	46.00	56.00	0.02	0.00
0.73	-27.50	-20.54	18.50	35.46	44.17	46.00	56.00	0.02	0.00

This is worst case channel and mode.





FUNDAMENTAL & HARMONICS

DATA SHEETS





FUNDAMENTAL FIELD STRENGTH

FCC 15.249

Company: 2GIG Date: 3/3/2015

EUT: Z-Wave Module Lab: R

Model: 2GIG-ZWM-500 Tested By: Matt Harrison

Compatible Electronics, Inc. FAC-3

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table	Tower	Comments
908.40	88.39	Н	93.97	-5.58	Peak	30.00	1.67	X-Axis
908.40	81.36	V	93.97	-12.61	Peak	204.00	1.00	X-Axis
916.00	93.48	Н	113.97	-20.49	Peak	30.00	1.55	X-Axis
916.00	89.21	Н	93.97	-4.76	QP	30.00	1.55	X-Axis
916.00	84.76	V	113.97	-29.21	Peak	210.00	1.00	X-Axis
916.00	80.58	V	93.97	-13.39	QP	210.00	1.00	X-Axis

Test distance

3 meter



HARMONICS LOW CHANNEL HORIZONTAL

FCC 15.249

Company: 2GIG Date: 3/3/2015

EUT: Z-Wave Module Lab: R

Model: 2GIG-ZWM-500 Tested By: Matt Harrison

	Level				Peak /	Ant. Height	Table Angle	
Freq. (MHz)	(dBuV)	Pol (v/h)	Limit	Margin	QP / Avg	(m)	(deg)	Comments
1816.8		Н	73.98		Peak			No Emissions Found
1816.8		Н	53.98		Avg			No Emissions Found
2725.2		Н	73.98		Peak			No Emissions Found
2725.2		Н	53.98		Avg			No Emissions Found
3633.6		Н	73.98		Peak			No Emissions Found
3633.6		Н	53.98		Avg			No Emissions Found
4542.0		Н	73.98		Peak			No Emissions Found
4542.0		Н	53.98		Avg			No Emissions Found
5450.4		Н	73.98		Peak			No Emissions Found
5450.4		Н	53.98		Avg			No Emissions Found
6358.8		Н	73.98		Peak			No Emissions Found
6358.8		Н	53.98		Avg			No Emissions Found
7267.2		Н	73.98		Peak			No Emissions Found
7267.2		Н	53.98		Avg			No Emissions Found
8175.6		H	73.98		Peak			No Emissions Found
8175.6		Н	53.98		Avg			No Emissions Found
9084.0		H	73.98		Peak			No Emissions Found
9084.0		Н	53.98		Avg			No Emissions Found





HARMONICS LOW CHANNEL VERTICAL

FCC 15.249

Company: 2GIG Date: 3/3/2015

EUT: Z-Wave Module Lab: R

Model: 2GIG-ZWM-500 Tested By: Matt Harrison

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
1816.8		V	73.98		Peak			No Emissions Found
1816.8		V	53.98		Avg			No Emissions Found
2725.2		V	73.98		Peak			No Emissions Found
2725.2		V	53.98		Avg			No Emissions Found
3633.6		V	73.98		Peak			No Emissions Found
3633.6		V	53.98		Avg			No Emissions Found
4542.0		V	73.98		Peak			No Emissions Found
4542.0		V	53.98		Avg			No Emissions Found
5450.4		V	73.98		Peak			No Emissions Found
5450.4		V	53.98		Avg			No Emissions Found
6358.8		V	73.98		Peak			No Emissions Found
6358.8		V	53.98		Avg			No Emissions Found
7267.2		V	73.98		Peak			No Emissions Found
7267.2		V	53.98		Avg			No Emissions Found
8175.6		V	73.98		Peak			No Emissions Found
8175.6		V	53.98		Avg			No Emissions Found
9084.0		V	73.98		Peak			No Emissions Found
9084.0		V	53.98		Avg			No Emissions Found

Test distance 3 meter





FCC Part 15 Subpart B & C Section 15.249 Test Report

HARMONICS HIGH CHANNEL HORIZONTAL

FCC 15.249

Company: 2GIG Date: 3/3/2015

EUT: Z-Wave Module Lab: R

Model: 2GIG-ZWM-500 Tested By: Matt Harrison

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
1832.0		H			Peak		, ,,	No Emissions Found
1832.0		Н			Avg			No Emissions Found
					_			
2748.0	63.75	Н	73.98	-10.23	Peak	1.10	295	
2748.0	45.15	Н	53.98	-8.83	Avg	1.10	295	
3664.0	53.11	Н	73.98	-20.87	Peak	1.42	17	
3664.0	36.38	Н	53.98	-17.60	Peak	1.42	17	
4580.0	70.29	Н	73.98	-3.69	Peak	1.00	210	
4580.0	50.94	Н	53.98	-3.04	Avg	1.00	210	
					40.0			
5496.0	54.61	Н	73.98	-19.37	Peak	1.00	348	
5496.0	37.51	Н	53.98	-16.47	Avg	1.00	348	
6412.0	59.27	Н	73.98	-14.71	Peak	1.00	275	
6412.0	41.91	Н	53.98	-12.07	Avg	1.00	275	
7328.0	58.95	Н	73.98	-15.03	Peak	1.17	45	
7328.0	41.99	Н	53.98	-11.99	Avg	1.17	45	
8244.0	58.52	Н	73.98	-15.46	Peak	1.00	325	
8244.0	43.60	Н	53.98	-10.38	Avg	1.00	325	
9160.0		Н			Peak			No Emissions Found
9160.0		Н			Avg			No Emissions Found
Took distance								

Test distance





HARMONICS HIGH CHANNEL VERTICAL

FCC 15.249

Company: 2GIG Date: 3/3/2015

EUT: Z-Wave Module Lab: R

Model: 2GIG-ZWM-500 Tested By: Matt Harrison

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
1832.0		V	73.98		Peak			No Emissions Found
1832.0		V	53.98		Avg			No Emissions Found
2748.0	58.62	V	73.98	-15.36	Peak	1.00	5	
2748.0	40.56	V	53.98	-13.42	Avg	1.00	5	
3664.0	50.65	V	73.98	-23.33	Peak	2.00	306	
3664.0	34.13	V	53.98	-19.85	Avg	2.00	306	
4580.0	65.77	V	73.98	-8.21	Peak	1.45	8	
4580.0	46.96	V	53.98	-7.02	Avg	1.45	8	
5496.0	49.65	V	73.98	-24.33	Peak	1.00	85	
5496.0	33.70	V	53.98	-20.28	Avg	1.00	85	
6412.0	59.27	V	73.98	-14.71	Peak	1.00	275	
6412.0	41.91	V	53.98	-12.07	Avg	1.00	275	
7328.0	57.12	V	73.98	-16.86	Peak	1.71	45	
7328.0	40.14	V	53.98	-13.84	Avg	1.71	45	
8244.0	57.69	V	73.98	-16.29	Peak	1.66	157	
8244.0	42.22	V	53.98	-11.76	Avg	1.66	157	
9160.0		V	73.98		Peak			No Emissions Found
9160.0		V	53.98		Avg			No Emissions Found
Tool								

Test distance 3 meter





EMISSIONS RADIATED OUTSIDE OF THE FUNDAMENTAL FREQUENCY BAND

DATA SHEETS





BAND EDGES LOW CHANNEL

FCC 15.249

Company: 2GIG Date: 3/3/2015

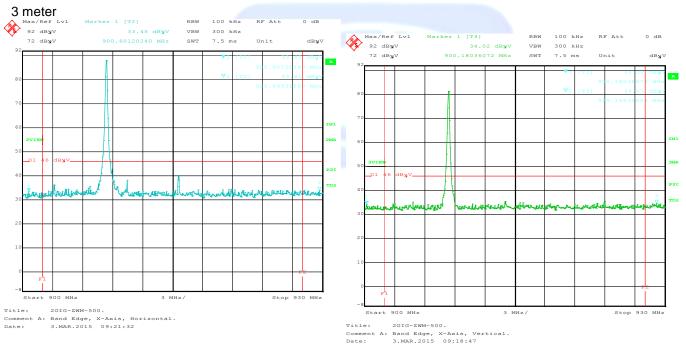
EUT: Z-Wave Module Lab: R

Model: 2GIG-ZWM-500 Test ENG: Matt Harrison

Compatible Electronics, Inc. FAC-3 (Lab R)

Freq. (MHz)	Level (dBµV/m)	Pol	Limit (dBµV)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
900.60	33.45	Н	46.00	-12.55	Peak	1.67	30	No Marker Delta
929.69	33.81	Н	46.00	-12.19	Peak	1.67	30	No Marker Delta
900.18	34.02	V	46.00	-11.98	Peak	1	204	No Marker Delta
929.15	34.61	V	46.00	-11.39	Peak	1	204	No Marker Delta

Test distance





FCC Part 15 Subpart B & C Section 15.249 Test Report

BAND EDGES HIGH CHANNEL

FCC 15.249

Company: 2GIG Date: 3/3/2015

EUT: Z-Wave Module Lab: R

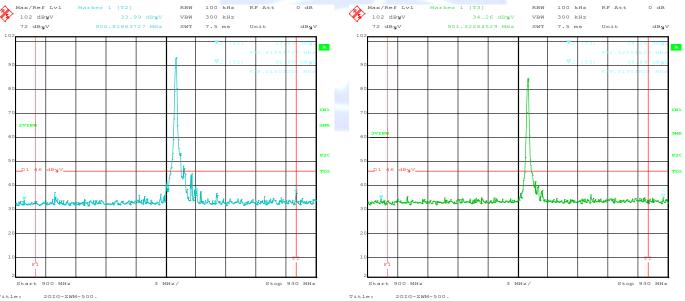
Model: 2GIG-ZWM-500 Test ENG: Matt Harrison

Compatible Electronics, Inc. FAC-3 (Lab R)

Freq. (MHz)	Level (dBµV/m)	Pol	Limit (dBµV)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
900.82	33.99	Ι	46.00	-12.01	Peak	1.55	30	No Marker Delta
928.01	36.80	Η	46.00	-9.20	Peak	1.55	30	No Marker Delta
901.32	34.26	V	46.00	-11.74	Peak	1	210	No Marker Delta
929.52	34.84	V	46.00	-11.16	Peak	1	210	No Marker Delta

Test distance

3 meter



Comment A: Band Edges, Horzontal.
Date: 4.MAR.2015 08:28:44



