FCC PART 15 SUBPART B & SUBPART C SECTION 15.247

&

RSS 247, RSS GEN TEST REPORT

for

2GIG Z-Wave-Zigbee Module

Model: 2GIG-ZWZB-500

Prepared for

NORTEK SECURITY & CONTROL, LLC.
1950 CAMINO VIDA ROBLE, SUITE 150
CARLSBAD, CA 92008

Prepared by: _____

TOREY OLIVER

Reviewed by: _____

MATT HARRISON

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

DATE: MAY 27, 2017

	REPORT BODY	APPENDICES					TOTAL
		A	*B*	*C*	*D*	*E*	
PAGES	20	2	2	2	15	55	**96**

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TABLE OF CONTENTS

Section / Title	PAGE
GENERAL REPORT SUMMARY	*4*
1. PURPOSE	*6*
2. ADMINISTRATIVE DATA	*7*
2.1 Location of Testing	7
2.2 Traceability Statement	7
2.3 Cognizant Personnel	7
2.4 Date Test Sample was Received	7
2.5 Disposition of the Test Sample	7
2.6 Abbreviations and Acronyms	7
3. APPLICABLE DOCUMENTS	**8**
4. DESCRIPTION OF TEST CONFIGURATION	**9**
4.1 Description of Test Configuration	9
5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT	**12**
5.1 EUT and Accessory List	12
5.2 EMI Test Equipment	13
6. TEST SITE DESCRIPTION	**14**
6.1 Test Facility Description	14
6.2 EUT Mounting, Bonding and Grounding	14
6.3 Facility Environmental Characteristics	14
6.4 Measurement Uncertainty	14
7. CHARACTERISTICS OF THE TRANSMITTER	**15**
7.1 Channel Number and Frequencies	15
7.2 Antenna	15
7.3 Software	15
8. TEST PROCEDURES	**16**
8.1 RF Emissions	16
9. TEST PROCEDURE DEVIATIONS	**20**
10. CONCLUSIONS	**20**

LIST OF APPENDICES

APPENDIX	TITLE
A	Laboratory Accreditations and Recognitions
B	Modifications to the EUT
C	Additional Models Covered Under This Report
D	Diagrams, Factors, Charts, and Photos • Test Setup Diagrams • Antenna and Amplifier Factors • Radiated and Conducted Emissions Photos
E	Data Sheets

LIST OF FIGURES

FIGURE	TITLE
1	Conducted Emissions Test Setup
2	Plot Map and Layout of Test Site Below 1GHz
3	Plot Map and Layout of Test Site Above 1GHz

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: 2GIG Z-Wave-Zigbee Module
Model: 2GIG-ZWZB-500
S/N: None

Product Description: The 2GIG Z-Wave-ZigBee Module (2GIG-ZWZB-500) provides the system with the ability to communicate with up to 232 smart home devices using the Z-Wave wireless communication protocol.

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

Manufacturer: Nortek Security & Control, LLC.
1950 Camino Vida Roble, Suite 150
Carlsbad, CA 92008

Test Dates: April 24, 2017

May 22, 26, & 27, 2017

June 1, 2017

Test Specifications Covered by Accreditation:

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EMI requirements

CFR Title 47, Part 15 Subpart B Sections 15.107, 15.109, & Subpart C Sections 15.205, 15.207, 15.209, & 15.247.
RSS 247 & RSS GEN

Test Procedure: ANSI C63.4 & C63.10, and KDB 558074 D01 v04.

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, and RSS GEN
2	Radiated RF Emissions & Harmonics, 9 kHz – 25,000 MHz	Complies with the limits of CFR Title 47 Part 15 Subpart B Section 15.109 and Subpart C Sections 15.205, 15.209, and RSS GEN
3	DTS Bandwidth	Complies with CFR Title 47 Part 15 Subpart C Section 15.247 and RSS 247
4	Maximum Peak Conducted Output Power	Complies with CFR Title 47 Part 15 Subpart C Section 15.247 and RSS 247
5	Maximum Peak Power Spectral Density Level In The Fundamental Emission	Complies with CFR Title 47 Part 15 Subpart C Section 15.247 and RSS 247
6	Emissions in Non-Restricted Frequency Bands (in 100kHz Bandwidth)	Complies with CFR Title 47 Part 15 Subpart C Section 15.247 and RSS 247
7	Emissions in the Restricted Bands	Complies with CFR Title 47 Part 15 Subpart C Section 15.205, 15.247 and RSS 247

1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the 2GIG Z-Wave-Zigbee Module Model: 2GIG-ZWZB-500. The EMI measurements were performed according to the measurement procedure described in ANSI C63.10 & C63.4. 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, 15.247, RSS GEN, and RSS 247.

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

Nortek Security & Control, LLC.

Josh Hansen

Compatible Electronics Inc.

Torey Oliver	Test Engineer
Shayan Aminmadani	Test Technician
Matt Harrison	Lab Manager

2.4 Date Test Sample was Received

The test sample was received on May 10, 2017.

2.5 Disposition of the Test Sample

The test sample remains at Compatible Electronics 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 2014	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: 2013	American National Standard for Testing Unlicensed Wireless Devices
KDB 558074 D01 v04	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247
RSS 247	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
RSS GEN	General Requirements for Compliance of Radio Apparatus

4. DESCRIPTION OF TEST CONFIGURATION

4.1 Description of Test Configuration

The 2GIG Z-Wave-Zigbee Module Model: 2GIG-ZWZB-500 (EUT) was setup in a tabletop configuration. The EUT was connected to a representative power supply. The EUT was continuously transmitting a data stream during transmit tests and continuously receiving during receiver tests. The EUT was checked in all axes.

The voltage was varied ± 15% and the transmitting signal amplitude and frequency did not vary.

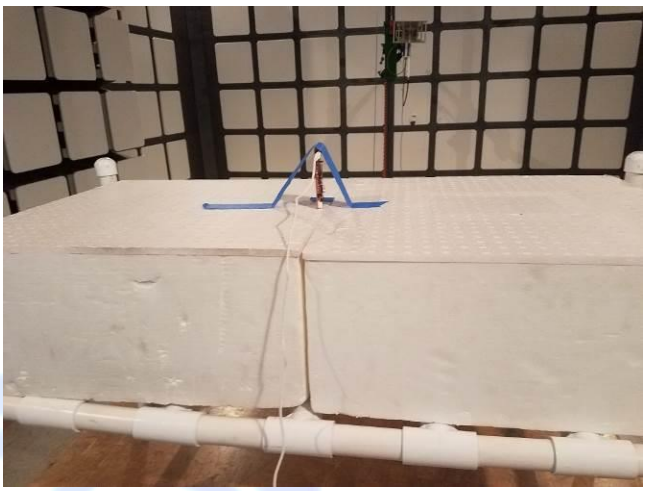
It was determined that the emissions were at their highest level when the EUT was transmitting in the configuration described above for Radiated Emissions. The final radiated data was taken in the above configuration. Please see Appendix E for the test data.

4.1.1 Photograph Test Configuration (X-Axis Shown)

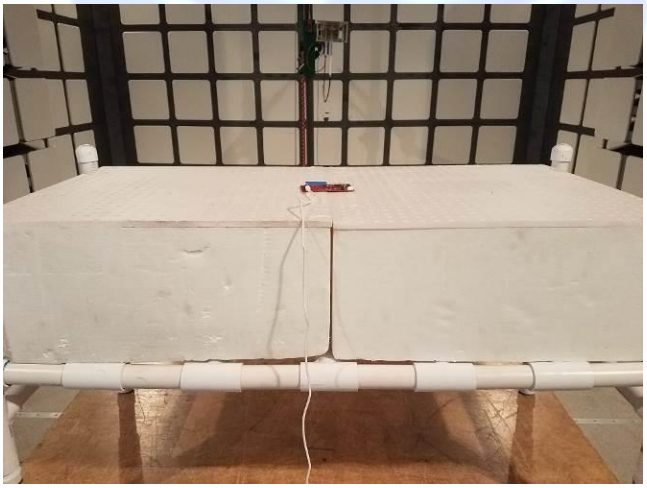
4.1.2 Axis Determination

Y Axis

Z Axis



X Axis



4.1.3 Cable Construction and Termination

Cable 1

This is a 2 meter, foil shielded, USB cable that connect the EUT to the Laptop (for programming only). The cable has a USB Type-A connector at the Laptop end and has an 8-pin plastic ribbon cable connector at the EUT end of the cable. The cable was not bundled. The shield of the cable was terminated at the Laptop end of the cable only.

Cable 2

This is a 2 meter, unshielded, cable that connects the EUT to the power supply. The cable was hardwired into the power supply end and a barrel connector at the EUT end of the cable. The cable was not bundled.

5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

5.1 EUT and Accessory List

#	EQUIPMENT TYPE	MANU-FACTURER	MODEL	SERIAL NUMBER
1	2GIG Z-WAVE-ZIGBEE MODULE(EUT)	NORTEK	2GIG-ZWZB-500	NONE
2	POWER SUPPLY	HON-KWANG	HK-AX-140A170-CP	NONE
3	Z-WAVE AND ZIGBEE TEST BOARD	NORTEK	10015531	NONE
4	LAPTOP (PROGRAMMING ONLY)	LENOVO	THINKPAD T430	101-2037
5	LAPTOP POWER SUPPLY	LENOVO	92P1156	11S92P1156Z1ZDXN01L1ND

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	100172	3/15/2017	3/15/2018
EMI Receiver	Rohde & Schwarz	ESIB40	100218	3/14/2017	3/14/2018
Antenna, Loop	Com Power	AL-130	121049	2/9/2017	2/9/2018
Antenna, CombiLog	Com Power	AC-220	25857	5/19/2016	5/19/2018
Antenna, Horn 1-18GHz	Com Power	AH-118	071250	5/16/2016	5/16/2018
Antenna, Horn 18-26 GHz	Com Power	AH-826	081033	NCR	NCR
Pre-Amp, 1-18GHz	Com Power	PAM-118A	551033	5/17/2016	5/17/2018
Pre-Amp, 18-40GHz	Com Power	PA-840	181289	6/16/2016	6/16/2018
High Pass Filter	AMTI Microwave Circuits	H3G020G4	481230	6/4/2016	6/4/2018
LISN (EUT)	Com Power	LI-215	191937	5/18/2017	5/18/2018
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
Variable Power Supply	Chroma	61511	615114800078	2/8/2016	2/8/2018

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

For testing below 1 GHz the EUT was mounted on a 1.0 by 1.5 by 0.8 meters high non-conductive table, which was placed on the ground plane.

For testing above 1 GHz the EUT was mounted 1.5 meter above 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.

6.4 Measurement Uncertainty

"Compatible Electronics' U_{lab} value is less than U_{cispr}, thus based on this − compliance is deemed to occur if no measured disturbance exceeds the disturbance limit.

$$u_c(y) = \sqrt{\sum_i c_i^2 \; u^2(x_i)}$$

Measurement		U_{cispr}	$U_{lab} = 2\,uc\,(y)$
Conducted disturbance (mains port)	(150 kHz – 30 MHz)	4,0 dB	2.88
Radiated disturbance (electric field strength on an open area test site or alternative test site)	(30 MHz – 1 000 MHz)	5,2 dB	4.04

7. CHARACTERISTICS OF THE TRANSMITTER

7.1 Channel Number and Frequencies

The EUT was programmed to be in the ZigBee Mode. There is a total of 16 channels. The low channel is at 2405 MHz, mid channel is at 2445 MHz, and the high channel is at 2475 MHz. There is approximately 5 MHz separation between channels and the EUT uses OQPSK, DSSS modulation.

Channel 11	2405 MHz
Channel 12	2410 MHz
Channel 13	2415 MHz
Channel 14	2420 MHz
Channel 15	2425 MHz
Channel 16	2430 MHz
Channel 17	2435 MHz
Channel 18	2440 MHz
Channel 19	2445 MHz
Channel 20	2450 MHz
Channel 21	2455 MHz
Channel 22	2460 MHz
Channel 23	2465 MHz
Channel 24	2470 MHz
Channel 25	2475 MHz

7.2 Antenna

The antenna is a microstrip PCB antenna.

7.3 Software

10016717 Ver. F013 Stored on a local Server, located at NSC headquarters.

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. 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 sections 15.207 and RSS GEN.

8.1.2 Radiated Emissions (Spurious and Harmonics) Test

The R&S 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 were two 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 radiated 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 (120kHz for QP Measurements)
1000 to 25000	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, EN 50147-2, and CISPR 22. 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 & Subpart C sections 15.205, 15.209, 15.247, RSS 247, and RSS GEN.

8.1.3 DTS Bandwidth

The DTS Bandwidth was measured directly connected to the EMI Receiver using a RBW of 100 kHz and a VBW of 300 kHz. A peak detector and a max hold trace were used with auto sweep time. The trace was allowed to fully maximize. We measured the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. The automatic bandwidth measurement capability of the EMI Receiver was employed using the n dB bandwidth mode with n set to 6 dB. The final qualification data sheets are located in Appendix E.

Test Results:

The EUT complies with Part 15, Subpart C, Section 15.247 and RSS 247.

8.1.4 Maximum Peak Conducted Output Power

The maximum peak conducted output power was measured using a spectrum analyzer. The spectrum analyzer used a resolution bandwidth of 2 MHz that is greater than the DTS bandwidth and a video bandwidth greater than 3 x RBW. The final qualification data sheets are located in Appendix E.

Test Results:

The EUT complies with Part 15, Subpart C, Section 15.247 and RSS 247.

8.1.5 Maximum Peak Power Spectral Density Level in The Fundamental Emission

The Maximum Peak Power Spectral Density Level in the Fundamental Emission was measured directly connected to the EMI Receiver. Tuned to the center frequency of the DTS channel and set the span to 1.5 times the DTS bandwidth. RBW was set to minimum of 3 kHz but not greater than 100kHz and VBW 3 * RBW. A peak detector was used with the sweep time set to auto. A max hold trace was used and allowed to fully stabilize. The peak marker function was used to determine the maximum amplitude level within the RBW. The final qualification data sheets are located in Appendix E.

Test Results:

The EUT complies with Part 15, Subpart C, Section 15.247 and RSS 247.

8.1.6 Emissions in Non-Restricted Frequency Bands (in 100kHz Bandwidth)

The Emissions in Non-Restricted Frequency Bands (in 100kHz Bandwidth) measurements were performed using the EMI Receiver directly connected to the EUT. A reference level was established by setting the instrument center frequency to DTS channel center frequency. The span was set to ≥ 1.5 times the DTS bandwidth. The RBW was 100 kHz and VBW 300 kHz. A peak detector was used with a sweep time set to auto. A max hold trace was used and allowed to fully stabilize. The peak marker function was used to determine the level and 20dB below that was the reference level. For Emission Level Measurement, the center frequency and span were set to encompass the frequency range to be measured. RBW was set to 100 kHz and VBW to 300 kHz. A peak detector was used with a sweep time set to auto. The number of measurement points were greater than span/RBW. A max hold trace was used and allowed to fully stabilize. The peak marker function was used to determine the maximum amplitude level. The final qualification data sheets are located in Appendix E.

Test Results:

The EUT complies with Part 15, Subpart C, Section 15.247 and RSS 247.

8.1.7 Emissions in the Restricted Bands (Radiated)

The Emissions in the Restricted Bands measurement was performed using the EMI Receiver at a 3-meter test distance 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 15.205 and RSS GEN.

8.1.8 Emissions Radiated Outside of the Fundamental Frequency Band

The Band Edge measurement was performed using the EMI Receiver at a 3-meter test distance to obtain the final test data. The low and high channels were tuned to 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 15.247 and RSS 247.

9. TEST PROCEDURE DEVIATIONS

There were no deviations from the test procedure.

10. CONCLUSIONS

The 2GIG Z-Wave-Zigbee Module Model: 2GIG-ZWZB-500 meets all of the relevant specification requirements defined in the Code of Federal Regulations Title 47, Part 15 Subpart B sections 15.107, 15.109, & Subpart C sections 15.205, 15.207, 15.209, 15.247, RSS GEN & RSS 247.

APPENDIX A

LABORATORY ACCREDITATIONS AND RECOGNITIONS

LABORATORY ACCREDITATIONS AND RECOGNITIONS

NVLAP TESTING
NVLAP LAB CODE 200527-0

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For US, Canada, Australia/New Zealand, Japan, Taiwan, Korea, and the European Union, Compatible Electronics is currently accredited by NVLAP to ISO/IEC 17025.

For the most up-to-date version of our scopes and certificates please visit

http://celectronics.com/quality/scope/

Quote from ISO-ILAC-IAF Communiqué on 17025:

"A laboratory's fulfilment of the requirements of ISO/IEC 17025:2005 means the laboratory meets both the technical competence requirements and management system requirements that are necessary for it to consistently deliver technically valid test results and calibrations. The management system requirements in ISO/IEC 17025:2005 (Section 4) are written in language relevant to laboratory operations and meet the principles of ISO 9001:2008 Quality Management Systems — Requirements."

IC OAT's Test Site Registration Numbers: 2154C-1 & 2154C-5

APPENDIX B

MODIFICATIONS TO THE EUT

MODIFICATIONS TO THE EUT

There were no modifications made during testing.

APPENDIX C

ADDITIONAL MODELS COVERED UNDER THIS REPORT

ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST	2GIG Z-Wave-Zigbee Module Model: 2GIG-ZWZB-500 S/N: None

No additional models were tested.

APPENDIX D

DIAGRAMS, FACTORS, CHARTS, AND PHOTOS

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

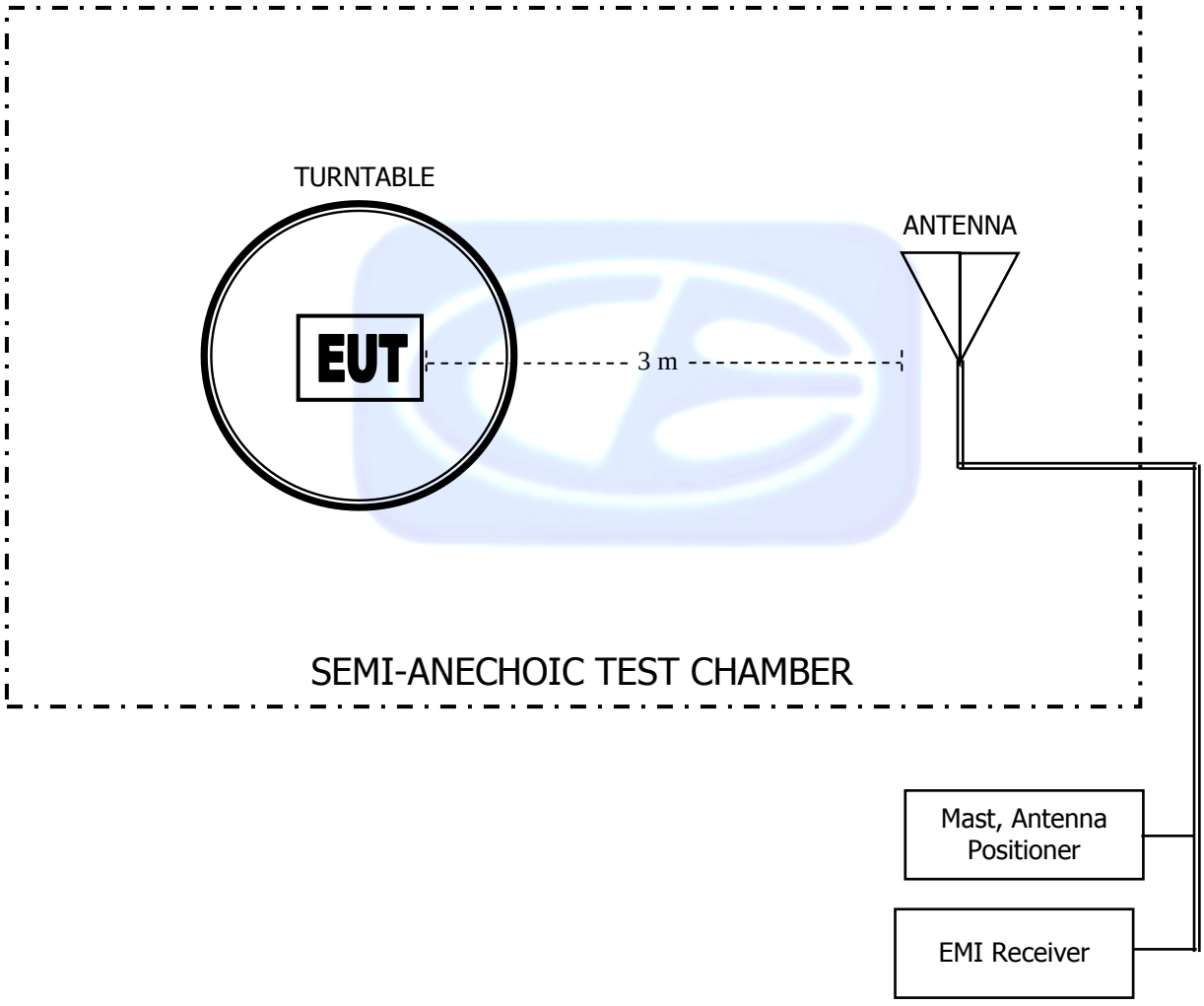


FIGURE 2: PLOT MAP AND LAYOUT OF TEST SITE ABOVE 1GHZ

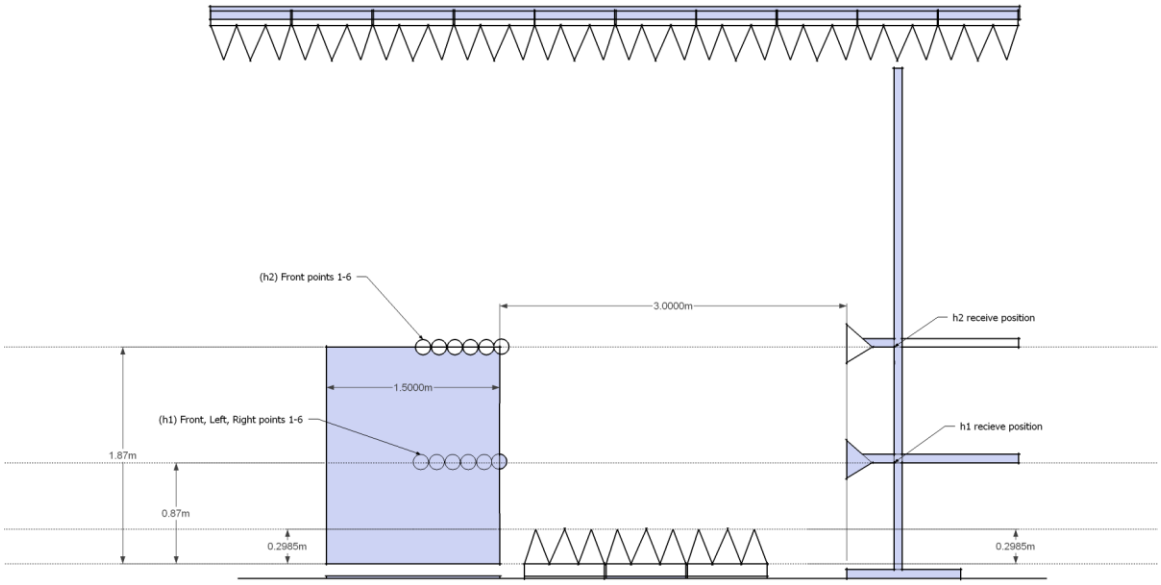
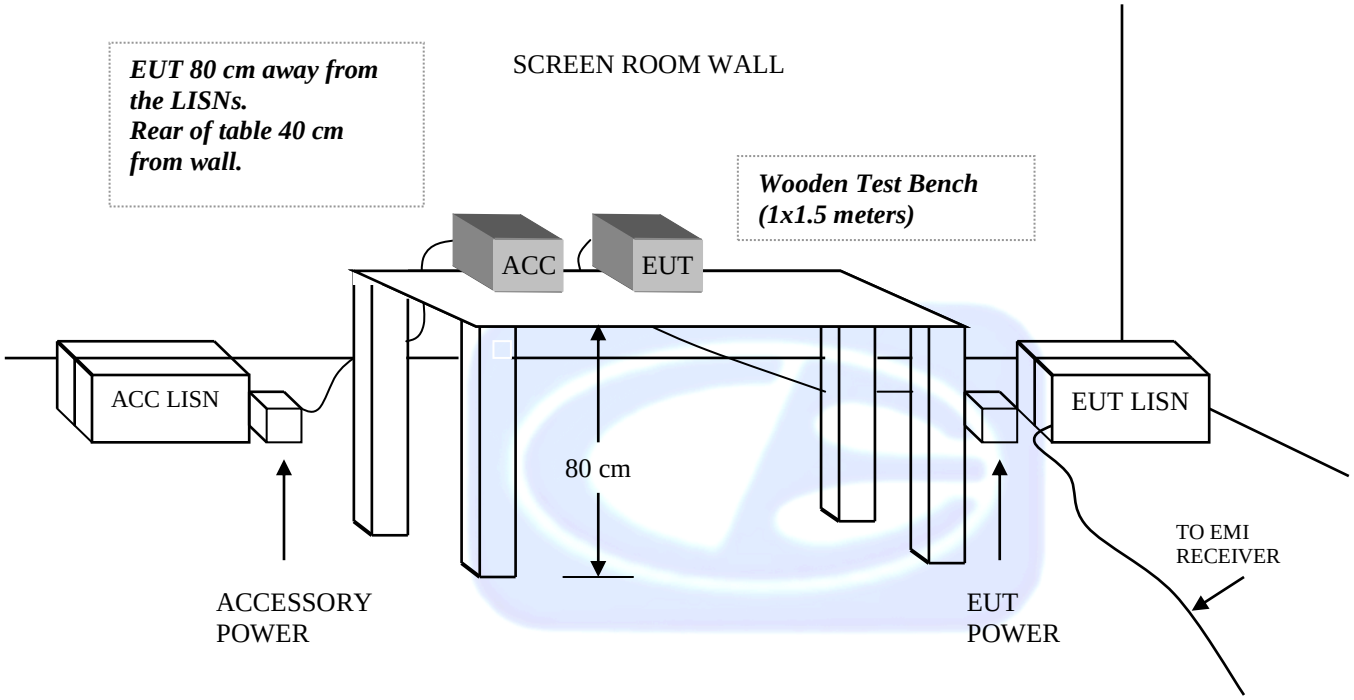


FIGURE 3: CONDUCTED EMISSIONS TEST SETUP



COM-POWER AL-130

LOOP ANTENNA

S/N: 121049

CALIBRATION DUE: FEBRUARY 9, 2018

FREQUENCY (MHz)	MAGNETIC (dB/m)	ELECTRIC (dB/m)	FREQUENCY (MHz)	MAGNETIC (dB/m)	ELECTRIC (dB/m)
0.009	-34.68	16.82	**0.8**	-37.44	14.06
0.01	-35.54	15.96	**0.9**	-37.34	14.16
0.02	-37.22	14.28	**1.0**	-37.34	14.16
0.03	-36.44	15.06	**2.0**	-37.03	14.47
0.04	-36.90	14.60	**3.0**	-37.02	14.48
0.05	-37.56	13.94	**4.0**	-37.12	14.38
0.06	-37.45	14.05	**5.0**	-36.92	14.58
0.07	-37.55	13.95	**6.0**	-37.12	14.38
0.08	-37.46	14.04	**7.0**	-37.02	14.48
0.09	-37.56	13.94	**8.0**	-36.81	14.69
0.1	-37.56	13.94	**9.0**	-36.81	14.69
0.2	-37.75	13.75	**10.0**	-36.70	14.80
0.3	-37.75	13.75	**15.0**	-37.08	14.42
0.4	-37.65	13.85	**20.0**	-36.60	14.90
0.5	-37.75	13.75	**25.0**	-38.62	12.88
0.6	-37.75	13.75	**30.0**	-38.92	12.58
0.7	-37.64	13.86			

COM-POWER AC-220

LAB P - COMBILOG ANTENNA

S/N: 003

CALIBRATION DUE: MAY 19, 2018

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	23.6	**160**	13.5
35	23.6	**180**	14.4
40	23.7	**200**	14.5
45	23.9	**250**	15.7
50	24.2	**300**	18.1
60	22.6	**400**	19.9
70	19.1	**500**	22.3
80	13.8	**600**	24.4
90	12.9	**700**	26.6
100	14.6	**800**	26.2
120	14.4	**900**	27.5
140	16.2	**1000**	28.9

COM-POWER AH-118

HORN ANTENNA

S/N: 071225

CALIBRATION DUE: MAY 17, 2018

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
1000	24.40	**9500**	39.11
1500	25.61	**10000**	39.38
2000	28.71	**10500**	39.55
2500	29.09	**11000**	39.66
3000	30.24	**11500**	40.28
3500	30.94	**12000**	40.26
4000	31.77	**12500**	40.64
4500	32.29	**13000**	41.33
5000	33.70	**13500**	41.74
5500	34.28	**14000**	41.52
6000	34.83	**14500**	41.80
6500	35.07	**15000**	43.51
7000	36.79	**15500**	41.03
7500	37.45	**16000**	40.88
8000	37.67	**16500**	40.18
8500	37.75	**17000**	42.59
9000	38.15	**17500**	44.49
		18000	45.27

COM-POWER PAM-118A

1-18GHz - PREAMPLIFIER

S/N: 551033

CALIBRATION DUE: MAY 16, 2018

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
500	41.06	**5500**	40.63
1000	41.06	**6000**	40.18
1100	41.12	**6500**	40.33
1200	41.09	**7000**	39.97
1300	41.20	**7500**	40.45
1400	41.28	**8000**	39.83
1500	41.34	**8500**	39.79
1600	41.37	**9000**	39.71
1700	41.43	**9500**	39.80
1800	41.47	**10000**	41.07
1900	41.53	**11000**	40.05
2000	41.59	**12000**	40.21
2500	41.87	**13000**	40.61
3000	42.13	**14000**	39.09
3500	42.21	**15000**	39.36
4000	42.22	**16000**	38.32
4500	41.53	**17000**	38.32
5000	41.16	**18000**	36.85

COM-POWER PA-840

18-40 GHz PREAMPLIFIER

S/N: 181289

CALIBRATION DUE: JUNE 16, 2018

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
18000	29.4	**31500**	28.2
19000	28.8	**32000**	28.6
20000	30.5	**32500**	28.8
21000	31.4	**33000**	28.2
22000	31.2	**33500**	27.7
23000	30.1	**34000**	27.2
24000	30.3	**34500**	28.2
25000	29.8	**35000**	27.3
26000	30.5	**35500**	27.2
26500	30.7	**36000**	27.2
27000	30.8	**36500**	27.5
27500	30.2	**37000**	27.0
28000	30.1	**37500**	26.7
28500	30.2	**38000**	26.2
29000	30.1	**38500**	26.5
29500	29.8	**39000**	26.3
30000	29.2	**39500**	26.9
30500	28.4	**40000**	27.6
31000	29.8		

FRONT VIEW

NORTEK
2GIG Z-Wave-Zigbee Module
Model: 2GIG-ZWZB-500
FCC SUBPART C - RADIATED EMISSIONS < 1GHz

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

REAR VIEW

NORTEK
2GIG Z-Wave-Zigbee Module
Model: 2GIG-ZWZB-500
FCC SUBPART C - RADIATED EMISSIONS < 1GHz

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

FRONT VIEW

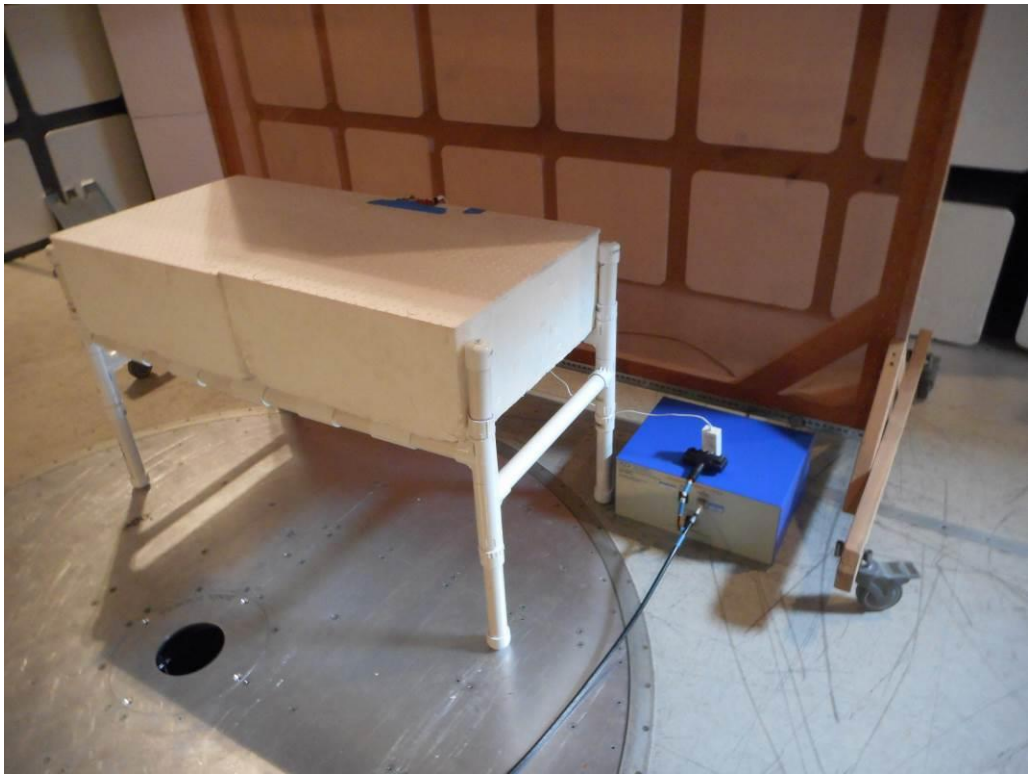
NORTEK
2GIG Z-Wave-Zigbee Module
Model: 2GIG-ZWZB-500
FCC SUBPART C - RADIATED EMISSIONS > 1GHz

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

REAR VIEW

NORTEK
2GIG Z-Wave-Zigbee Module
Model: 2GIG-ZWZB-500
FCC SUBPART C - RADIATED EMISSIONS > 1GHz

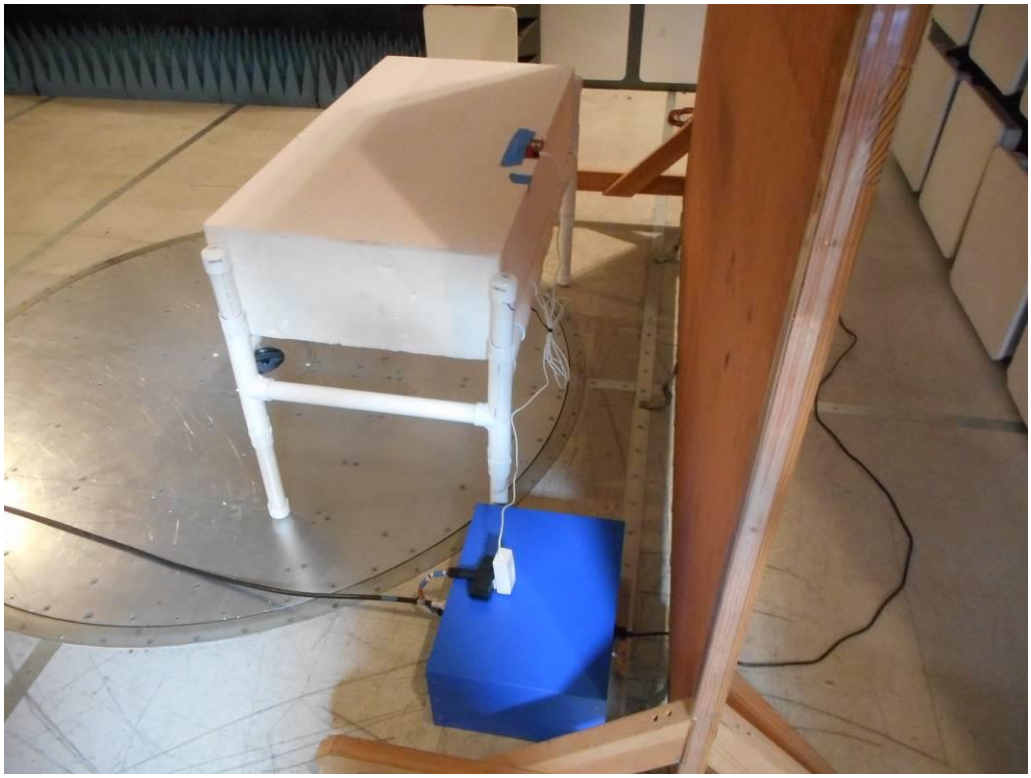
PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



FRONT VIEW

NORTEK
2GIG Z-Wave-Zigbee Module
Model: 2GIG-ZWZB-500
FCC SUBPART C - CONDUCTED EMISSIONS

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



REAR VIEW

NORTEK
2GIG Z-Wave-Zigbee Module
Model: 2GIG-ZWZB-500
FCC SUBPART C - CONDUCTED EMISSIONS

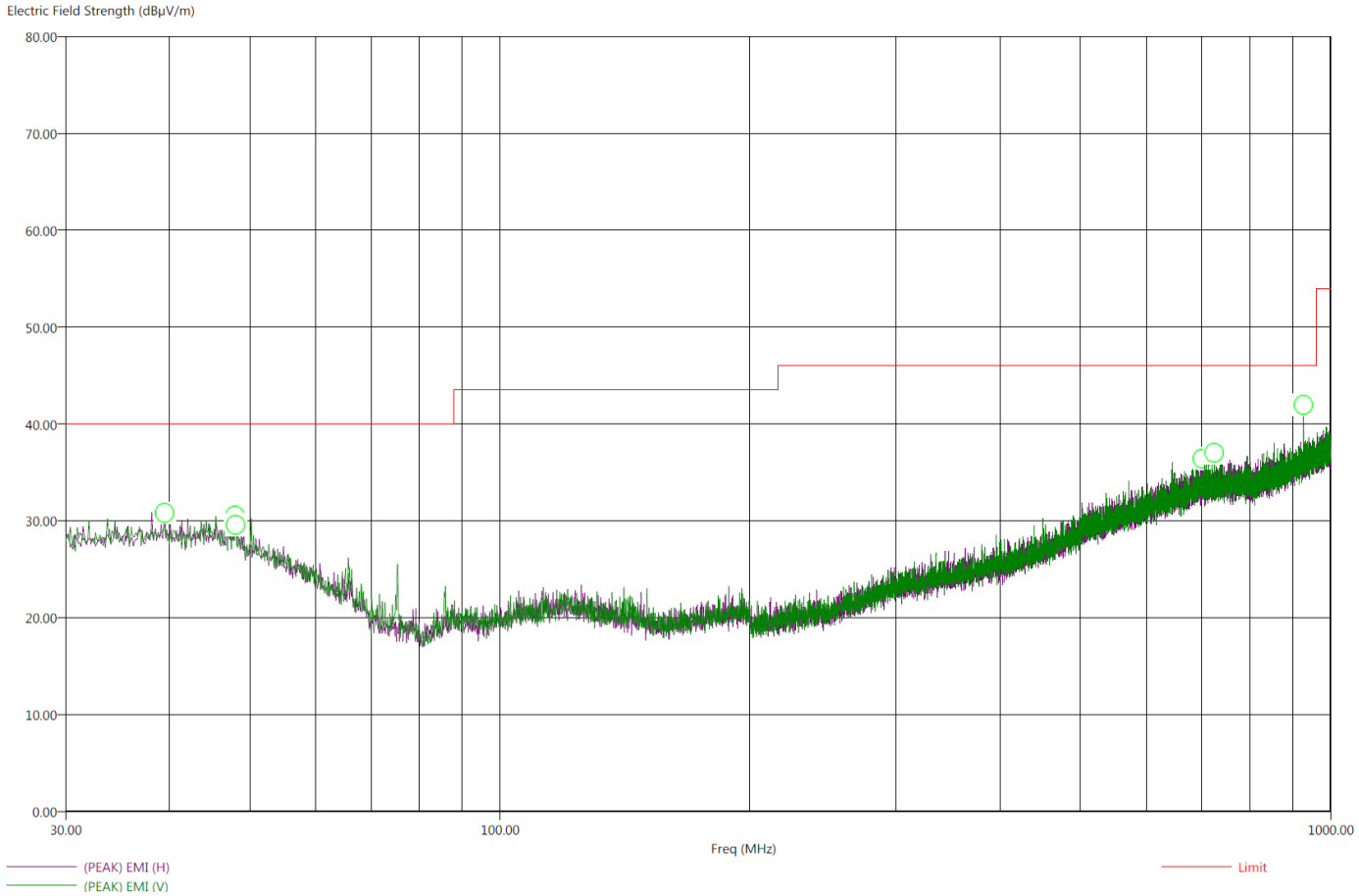
PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

APPENDIX E

RADIATED EMISSIONS DATA SHEETS

Title: FCC 15.209 4/24/2017 8:29:01 AM
File: Radiated Pre-Scan 30-1000Mhz.set Sequence: Preliminary Scan
Operator: Torey Oliver
EUT Type: 2GIG-ZWZB-500
EUT Condition: Transmitting Zigbee @ 2475MHz.
Comments: X-Axis.
Temp: 73f
Hum: 49%
120V 60Hz

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



This was worst case for all modes and channels
There were no radiated emissions besides harmonics found between 9kHz-30 MHz or 1GHz-25GHz.

Title: FCC 15.209 4/24/2017 10:30:10 AM
File: Radiated Final 30-1000Mhz.set Sequence: Final Measurements
Operator: Torey Oliver
EUT Type: 2GIG-ZWZB-500
EUT Condition: Transmitting Zigbee @ 2475MHz.
Comments: X-Axis.
Temp: 73f
Hum: 49%
120V 60Hz

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

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)
39.30	-17.44	22.56	27.38	40.00	H	263.00	280.47	23.88	0.50
48.00	-13.75	26.25	29.90	40.00	H	322.25	382.29	23.22	0.61
48.00	-14.25	25.75	29.71	40.00	V	81.50	244.47	23.21	0.61
692.20	-17.26	28.74	34.46	46.00	V	183.25	270.17	26.44	2.52
738.20	-16.55	29.45	34.36	46.00	H	254.75	343.11	26.44	2.60
918.70	-15.01	30.99	36.73	46.00	V	175.25	152.00	27.77	2.89

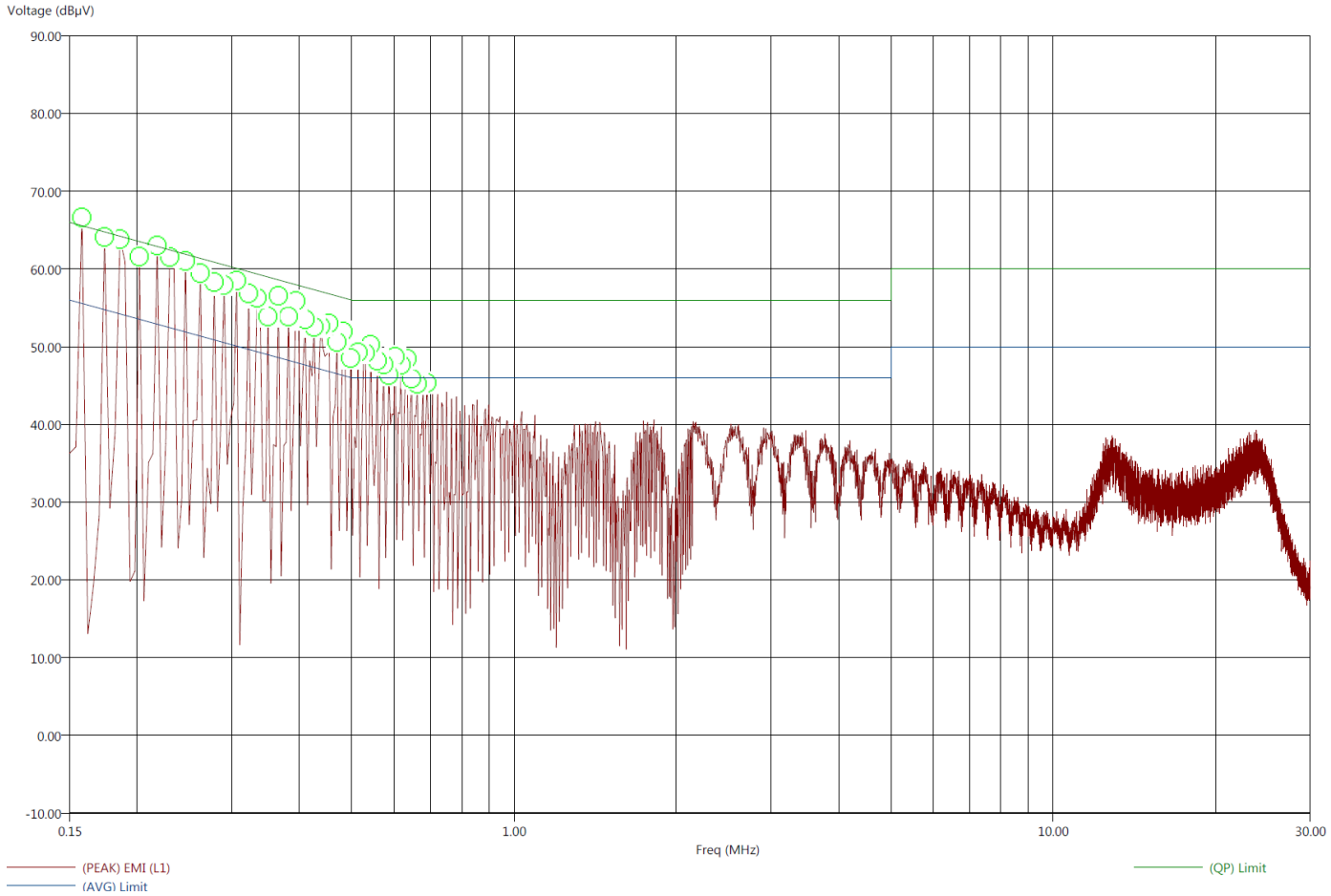
This was worst case for all modes and channels
There were no radiated emissions besides harmonics found between 9kHz-30 MHz or 1GHz-25GHz.

CONDUCTED AC SPURIOUS EMISSIONS DATA SHEETS

Title: FCC 15.207
File: Conducted Pre-Line.set
Operator: Shayan Aminmadani
EUT Type: 2GIG-ZWZB-500
EUT Condition: Transmitting on channel 2445MHz
Comments: Temp: 72f
Hum: 48%
120V 60Hz

5/26/2017 9:04:05 AM
Sequence: Preliminary Scan

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



This was worst case for all modes and channels

Title: FCC 15.207 5/26/2017 9:10:22 AM
File: Conducted Final-Line.set Sequence: Final Measurements
Operator: Shayan Aminmadani
EUT Type: 2GIG-ZWZB-500
EUT Condition: Transmitting on channel 2445MHz
Comments: Temp: 72f
Hum: 48%
120V 60Hz

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

Freq (MHz)	(AVG) Margin (dB)	(QP) Margin (dB)	(AVG) EMI (dBµV)	(QP) EMI (dBµV)	(PEAK) EMI (dBµV)	(AVG) Limit (dBµV)	(QP) Limit (dBµV)	Transducer(dB)	Cable(dB)
0.16	-21.22	-5.95	34.35	59.61	66.62	55.57	65.57	0.41	0.01
0.17	-20.57	-6.35	34.20	58.42	65.84	54.77	64.77	0.37	0.01
0.19	-18.46	-6.31	35.76	57.90	65.00	54.21	64.21	0.34	0.01
0.20	-20.14	-6.83	33.39	56.70	64.27	53.53	63.53	0.30	0.01
0.22	-18.05	-7.01	34.85	55.88	63.40	52.89	62.89	0.26	0.01
0.23	-18.80	-7.48	33.65	54.97	62.44	52.45	62.45	0.24	0.01
0.25	-18.47	-7.64	33.42	54.25	61.55	51.89	61.89	0.21	0.01
0.26	-16.28	-8.15	35.09	53.22	61.27	51.37	61.37	0.18	0.01
0.28	-18.49	-8.46	32.38	52.41	60.05	50.88	60.88	0.15	0.01
0.29	-15.58	-8.49	34.94	52.03	59.82	50.52	60.52	0.13	0.01
0.31	-17.37	-9.04	32.71	51.03	58.83	50.08	60.08	0.10	0.01
0.32	-16.79	-9.02	32.87	50.63	58.06	49.66	59.66	0.08	0.01
0.33	-15.22	-9.41	34.14	49.94	58.02	49.35	59.35	0.06	0.01
0.35	-19.02	-10.08	29.94	48.89	56.53	48.96	58.96	0.04	0.01
0.37	-18.16	-10.36	30.43	48.23	56.12	48.59	58.59	0.04	0.01
0.38	-19.14	-10.59	29.10	47.65	55.02	48.24	58.24	0.03	0.01
0.39	-15.50	-10.64	32.48	47.34	56.01	47.98	57.98	0.03	0.01
0.41	-12.06	-9.48	35.59	48.17	56.25	47.65	57.65	0.03	0.01
0.43	-14.62	-9.87	32.71	47.46	55.75	47.33	57.33	0.03	0.01
0.45	-12.76	-9.22	34.04	47.58	53.87	46.80	56.80	0.03	0.01
0.47	-15.52	-11.78	30.99	44.73	53.58	46.51	56.51	0.03	0.01
0.48	-15.95	-11.92	30.36	44.39	52.48	46.30	56.30	0.03	0.01
0.50	-17.39	-12.38	28.64	43.66	52.19	46.03	56.03	0.03	0.01
0.51	-18.61	-12.93	27.39	43.07	51.10	46.00	56.00	0.03	0.01
0.53	-18.48	-13.35	27.52	42.65	50.65	46.00	56.00	0.03	0.01

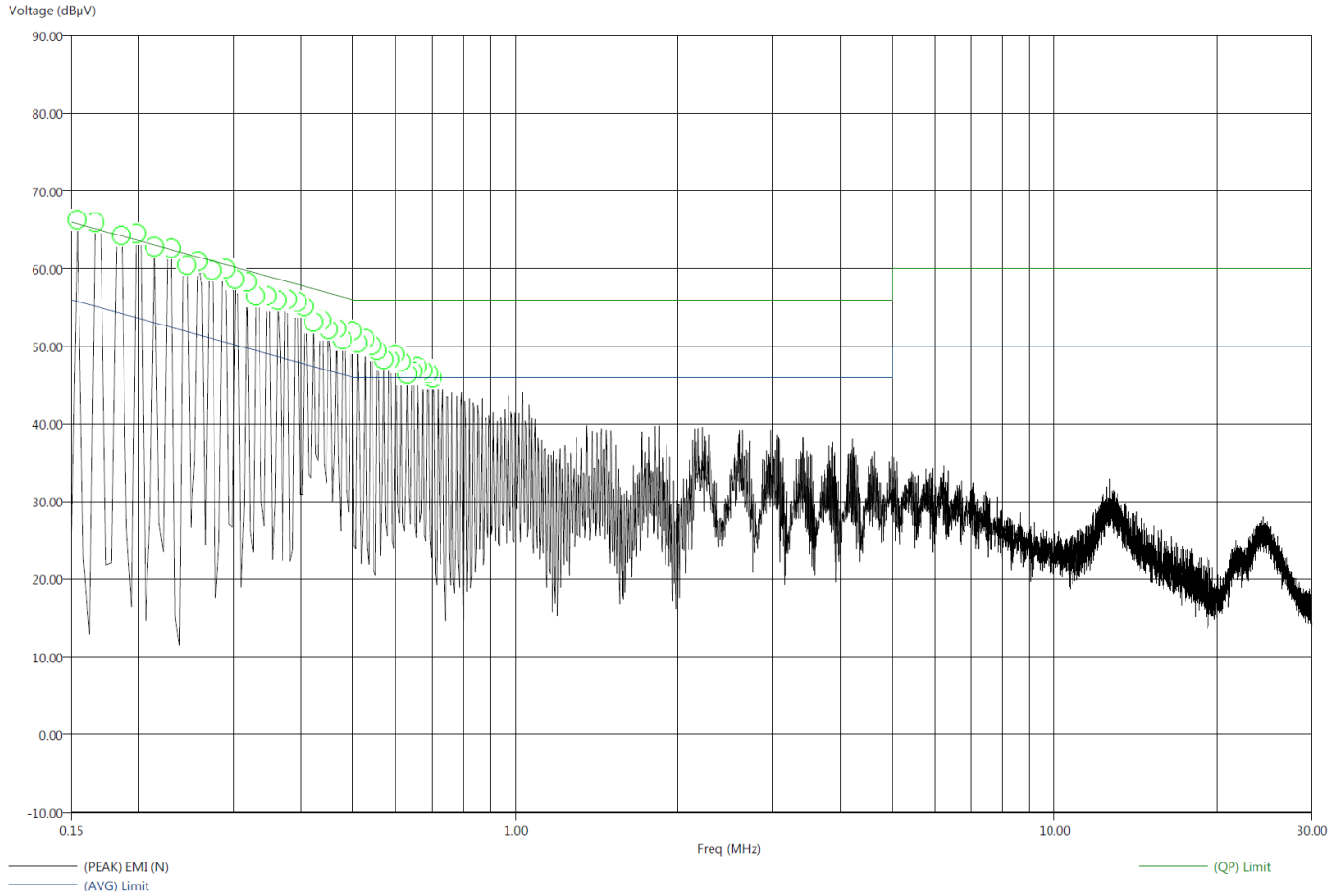
Freq (MHz)	(AVG) Margin (dB)	(QP) Margin (dB)	(AVG) EMI (dBµV)	(QP) EMI (dBµV)	(PEAK) EMI (dBµV)	(AVG) Limit (dBµV)	(QP) Limit (dBµV)	Transducer(dB)	Cable(dB)
0.54	-19.40	-14.02	26.60	41.98	50.06	46.00	56.00	0.03	0.02
0.56	-18.90	-14.37	27.10	41.63	49.90	46.00	56.00	0.03	0.02
0.57	-17.49	-14.61	28.51	41.39	50.01	46.00	56.00	0.03	0.02
0.59	-17.97	-14.86	28.03	41.14	49.34	46.00	56.00	0.03	0.02
0.60	-16.59	-14.37	29.41	41.63	49.33	46.00	56.00	0.03	0.02
0.62	-17.10	-14.99	28.90	41.01	49.28	46.00	56.00	0.03	0.03
0.63	-17.56	-15.12	28.44	40.88	49.29	46.00	56.00	0.03	0.03
0.65	-15.68	-14.60	30.32	41.40	49.33	46.00	56.00	0.03	0.03
0.66	-18.59	-16.54	27.41	39.46	48.21	46.00	56.00	0.03	0.03
0.69	-17.02	-17.35	28.98	38.65	48.08	46.00	56.00	0.03	0.03

This was worst case for all modes and channels

Title: FCC 15.207
File: Conducted Pre-Neutral.set
Operator: Shayan Aminmadani
EUT Type: ZigBee Transmitter
EUT Condition: Transmitting on channel 2445MHz
Comments: Temp: 72f
Hum: 48%
120V 60Hz

5/26/2017 9:21:38 AM
Sequence: Preliminary Scan

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



This was worst case for all modes and channels

Title: FCC 15.207 5/26/2017 9:26:56 AM
File: Conducted Final-Neutral.set Sequence: Final Measurements
Operator: Shayan Aminmadani
EUT Type: Zigbee Transmitter
EUT Condition: Transmitting on channel 2445MHz
Comments: Temp: 72f
Hum: 48%
120V 60Hz

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

Freq (MHz)	(AVG) Margin (dB)	(QP) Margin (dB)	(AVG) EMI (dBµV)	(QP) EMI (dBµV)	(PEAK) EMI (dBµV)	(AVG) Limit (dBµV)	(QP) Limit (dBµV)	Transducer(dB)	Cable(dB)
0.15	-21.10	-5.86	34.69	59.93	67.15	55.78	65.78	0.43	0.01
0.17	-21.07	-5.72	34.09	59.43	66.43	55.16	65.16	0.39	0.01
0.19	-19.97	-6.33	34.25	57.88	64.97	54.21	64.21	0.34	0.01
0.20	-20.12	-6.42	33.58	57.28	64.67	53.69	63.69	0.31	0.01
0.21	-19.27	-6.92	33.78	56.12	63.83	53.05	63.05	0.27	0.01
0.23	-19.10	-7.02	33.35	55.43	62.85	52.45	62.45	0.23	0.01
0.25	-18.61	-7.53	33.29	54.36	62.15	51.89	61.89	0.20	0.01
0.26	-18.13	-7.93	33.36	53.57	61.75	51.50	61.50	0.18	0.01
0.27	-18.44	-8.41	32.55	52.59	60.64	51.00	61.00	0.15	0.01
0.29	-17.81	-8.46	32.71	52.06	60.06	50.52	60.52	0.12	0.01
0.30	-18.12	-9.03	32.07	51.15	59.10	50.19	60.19	0.10	0.01
0.32	-18.74	-9.62	31.02	50.14	58.57	49.76	59.76	0.08	0.01
0.33	-17.90	-9.84	31.55	49.61	57.80	49.45	59.45	0.06	0.01
0.35	-18.00	-10.02	31.06	49.04	56.91	49.06	59.06	0.04	0.01
0.36	-19.33	-10.17	29.35	48.51	56.34	48.68	58.68	0.04	0.01
0.38	-19.75	-10.55	28.57	47.77	56.77	48.32	58.32	0.04	0.01
0.39	-18.53	-10.50	29.45	47.48	55.68	47.98	57.98	0.05	0.01
0.41	-17.52	-10.38	30.21	47.35	55.89	47.73	57.73	0.05	0.01
0.42	-19.18	-11.06	28.23	46.35	55.24	47.41	57.41	0.04	0.01
0.44	-15.55	-10.48	31.55	46.62	55.67	47.10	57.10	0.03	0.01
0.45	-16.67	-10.68	30.20	46.19	55.59	46.88	56.88	0.02	0.01
0.47	-18.61	-11.77	27.97	44.81	53.10	46.58	56.58	0.03	0.01
0.48	-19.20	-12.07	27.17	44.30	52.84	46.37	56.37	0.03	0.01
0.50	-19.64	-12.96	26.39	43.07	51.78	46.03	56.03	0.04	0.01
0.51	-20.20	-13.24	25.80	42.76	51.17	46.00	56.00	0.04	0.01

Freq (MHz)	(AVG) Margin (dB)	(QP) Margin (dB)	(AVG) EMI (dBµV)	(QP) EMI (dBµV)	(PEAK) EMI (dBµV)	(AVG) Limit (dBµV)	(QP) Limit (dBµV)	Transducer(dB)	Cable(dB)
0.53	-20.41	-14.01	25.59	41.99	51.02	46.00	56.00	0.04	0.01
0.54	-20.97	-14.49	25.03	41.51	49.92	46.00	56.00	0.04	0.02
0.55	-21.15	-15.12	24.85	40.88	49.84	46.00	56.00	0.04	0.02
0.57	-20.23	-14.99	25.77	41.01	49.10	46.00	56.00	0.04	0.02
0.59	-20.82	-15.66	25.18	40.34	48.68	46.00	56.00	0.04	0.02
0.60	-20.46	-15.80	25.54	40.20	48.35	46.00	56.00	0.04	0.02
0.61	-20.25	-16.54	25.75	39.46	48.52	46.00	56.00	0.03	0.02
0.63	-20.84	-16.70	25.16	39.30	48.64	46.00	56.00	0.03	0.03
0.65	-20.08	-17.02	25.92	38.98	47.88	46.00	56.00	0.03	0.03
0.66	-21.05	-17.35	24.95	38.65	47.40	46.00	56.00	0.03	0.03
0.67	-17.16	-17.02	28.84	38.98	48.33	46.00	56.00	0.03	0.03
0.69	-19.13	-18.06	26.87	37.94	47.02	46.00	56.00	0.03	0.03
0.70	-21.91	-18.63	24.09	37.37	46.38	46.00	56.00	0.03	0.03

This was worst case for all modes and channels

DTS BANDWIDTH

DATA SHEETS

DTS BANDWIDTH

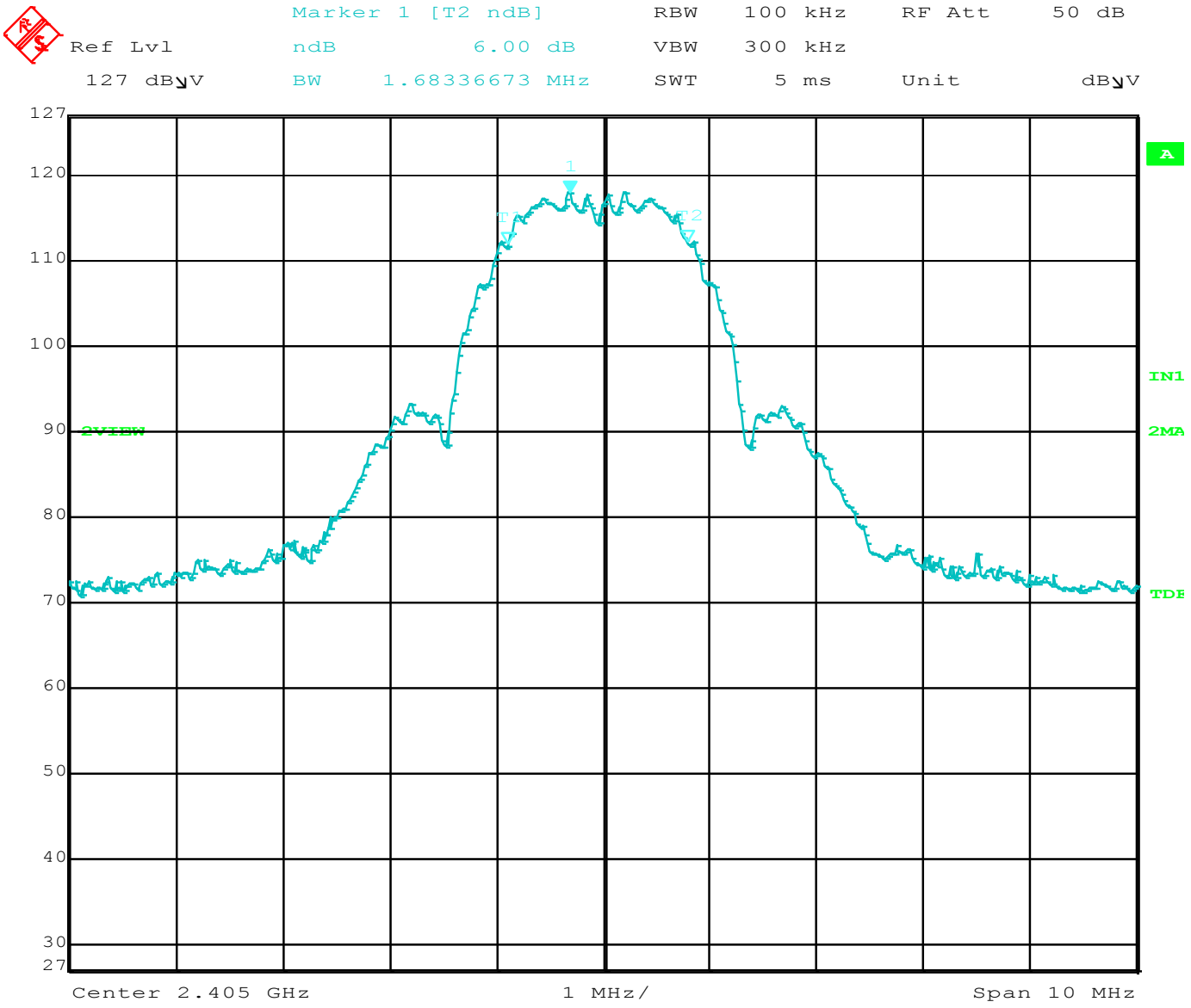
FCC 15.247

Company:	Nortek	Date:	5/27/2017
EUT:	2GIG Z-Wave-ZigBee Module	Lab:	R
Model:	2GIG-ZWZB-500	Test Eng.:	Torey Oliver

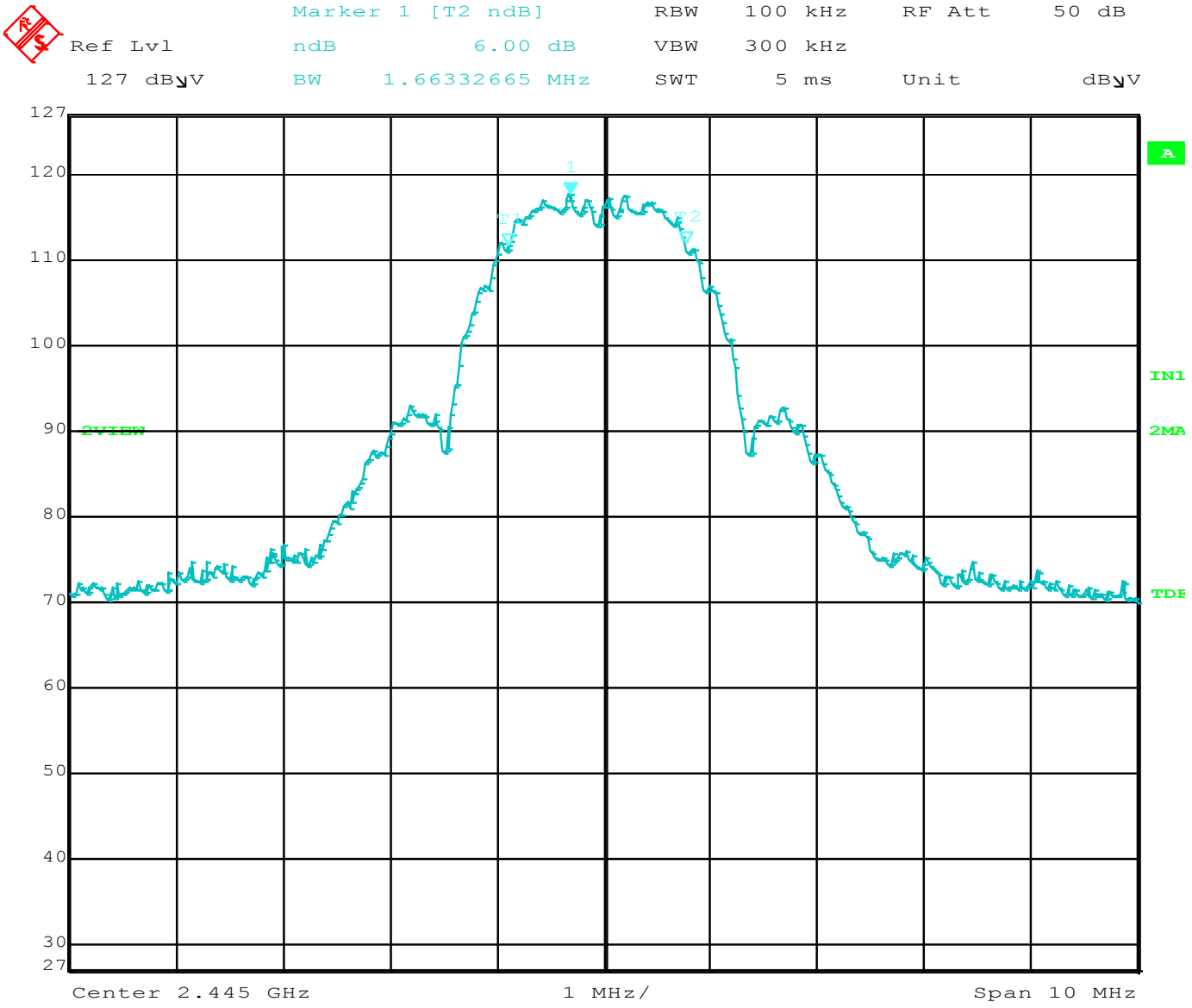
Compatible Electronics, Inc. FAC-3 (Lab R)

DTS Bandwidth

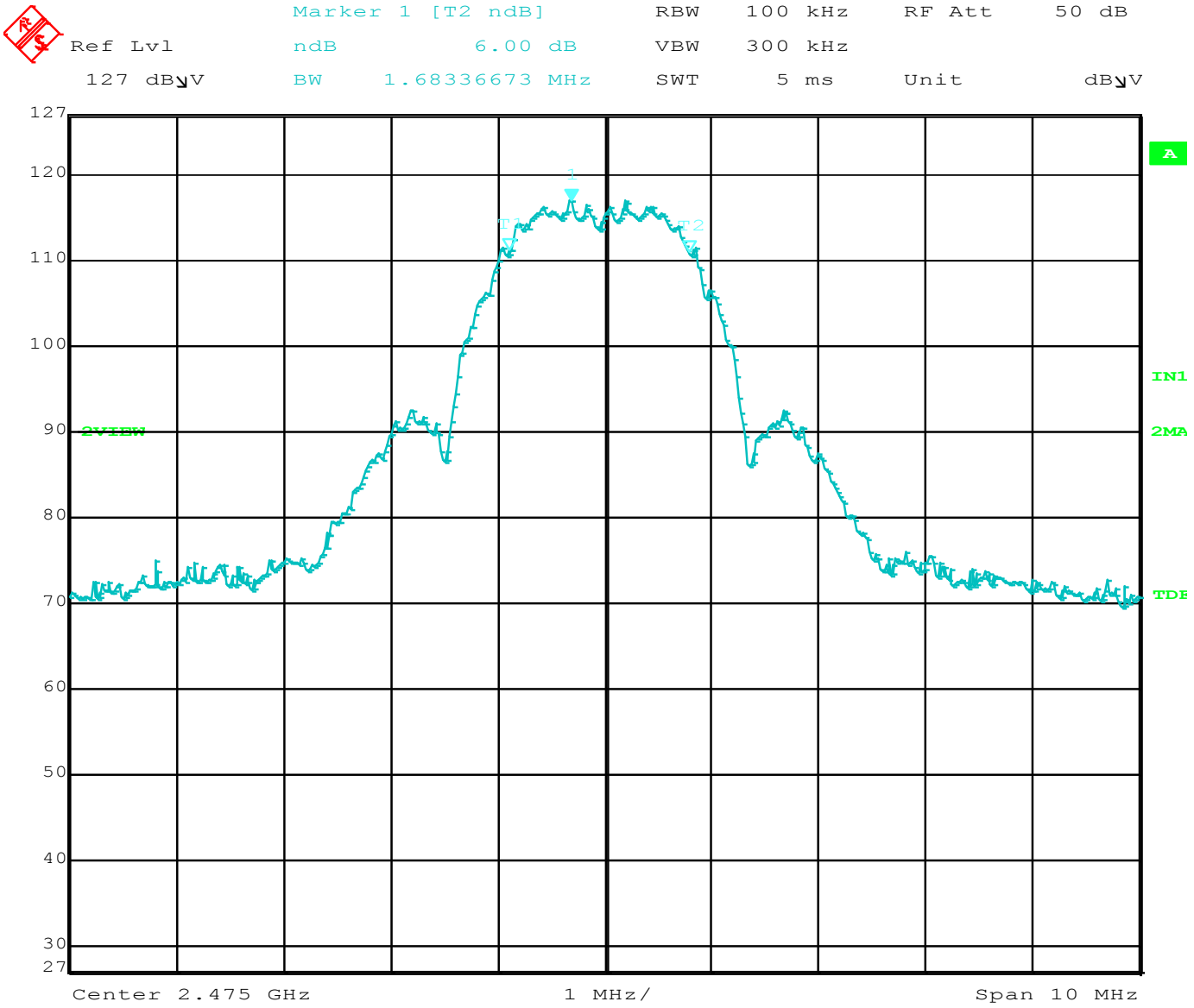
Freq. (MHz)	Measured BW (kHz)	Limit (Min) (kHz)	Margin (kHz)	Peak / QP / Avg	Comments
2405	1683.3667	500.00	1183.3667	Peak	
2445	1663.3267	500.00	1163.3267	Peak	
2475	1683.3667	500.00	1183.3667	Peak	



Comment A: dts bandwidth 2405MHz



Comment A: dts bandwidth 2445MHz



Comment A: dts bandwidth 2475MHz

MAXIMUM PEAK CONDUCTED OUTPUT POWER

DATA SHEETS

MAXIMUM PEAK CONDUCTED OUTPUT POWER

FCC 15.247

Company:	Nortek	Date:	5/27/2017
EUT:	2GIG Z-Wave-ZigBee Module	Lab:	R
Model:	2GIG-ZWZB-500	Test ENG:	Torey Oliver

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

Freq. (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Peak / QP / Avg	Comments
2405	15.57	30.00	-14.43	Peak	
2445	15.18	30.00	-14.82	Peak	
2475	14.74	30.00	-15.26	Peak	

MAXIMUM PEAK POWER SPECTRAL DENSITY LEVEL IN THE FUNDAMENTAL EMISSION

DATA SHEETS

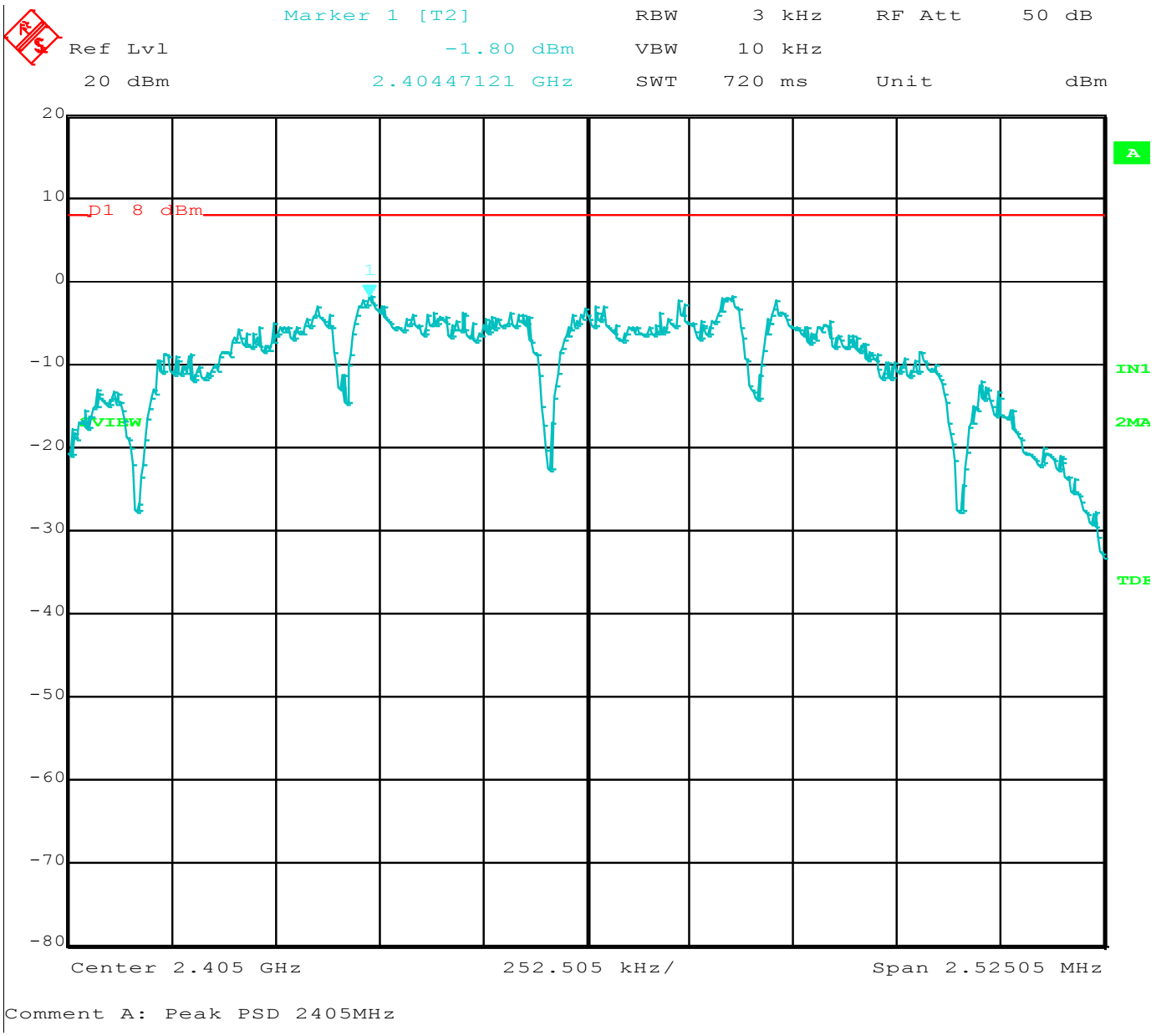
POWER SPECTRAL DENSITY

FCC 15.247

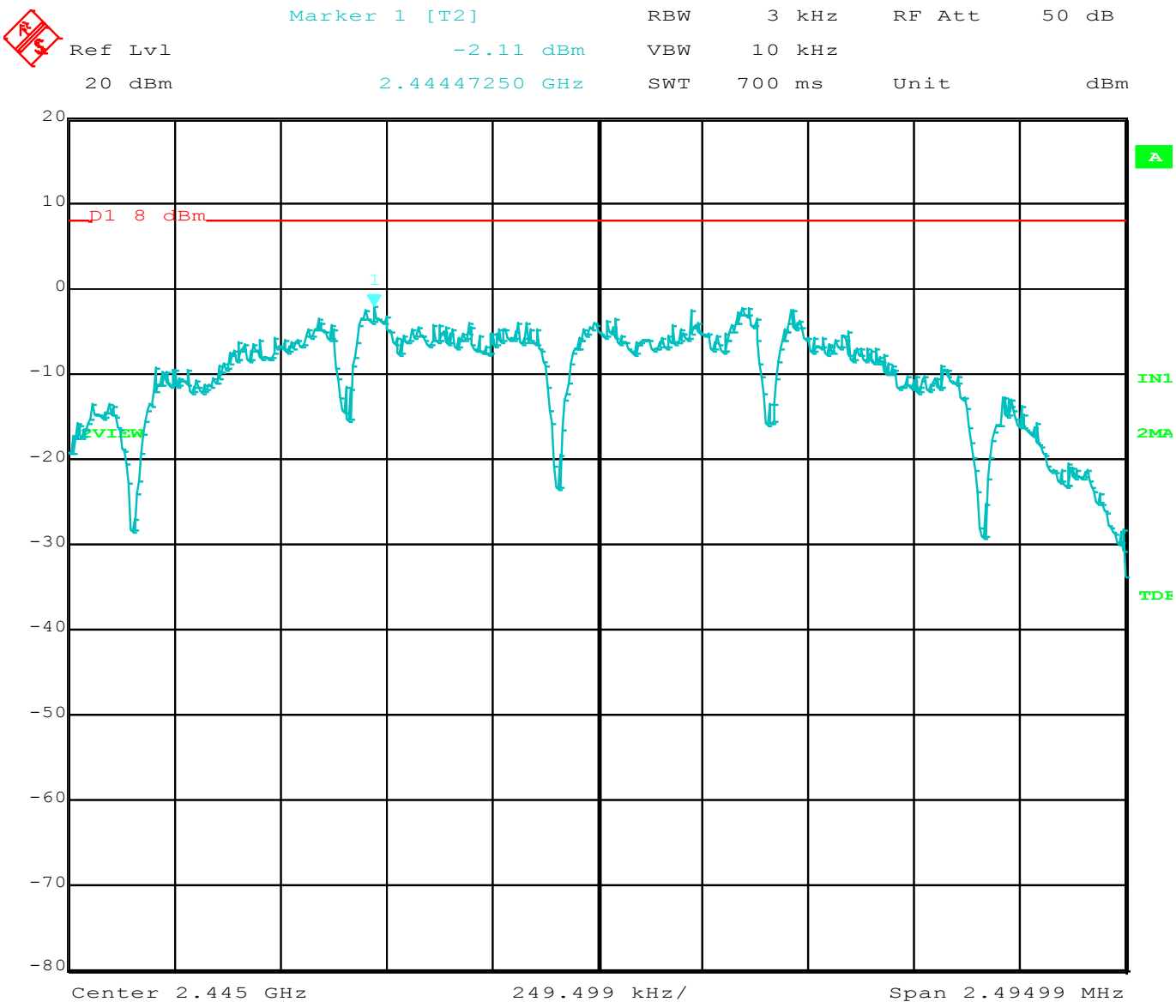
Company:	Nortek	Date:	5/27/2017
EUT:	2GIG Z-Wave-Zigbee Module	Lab:	R
Model:	2GIG-ZWZB-500	Test ENG:	Torey Oliver

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

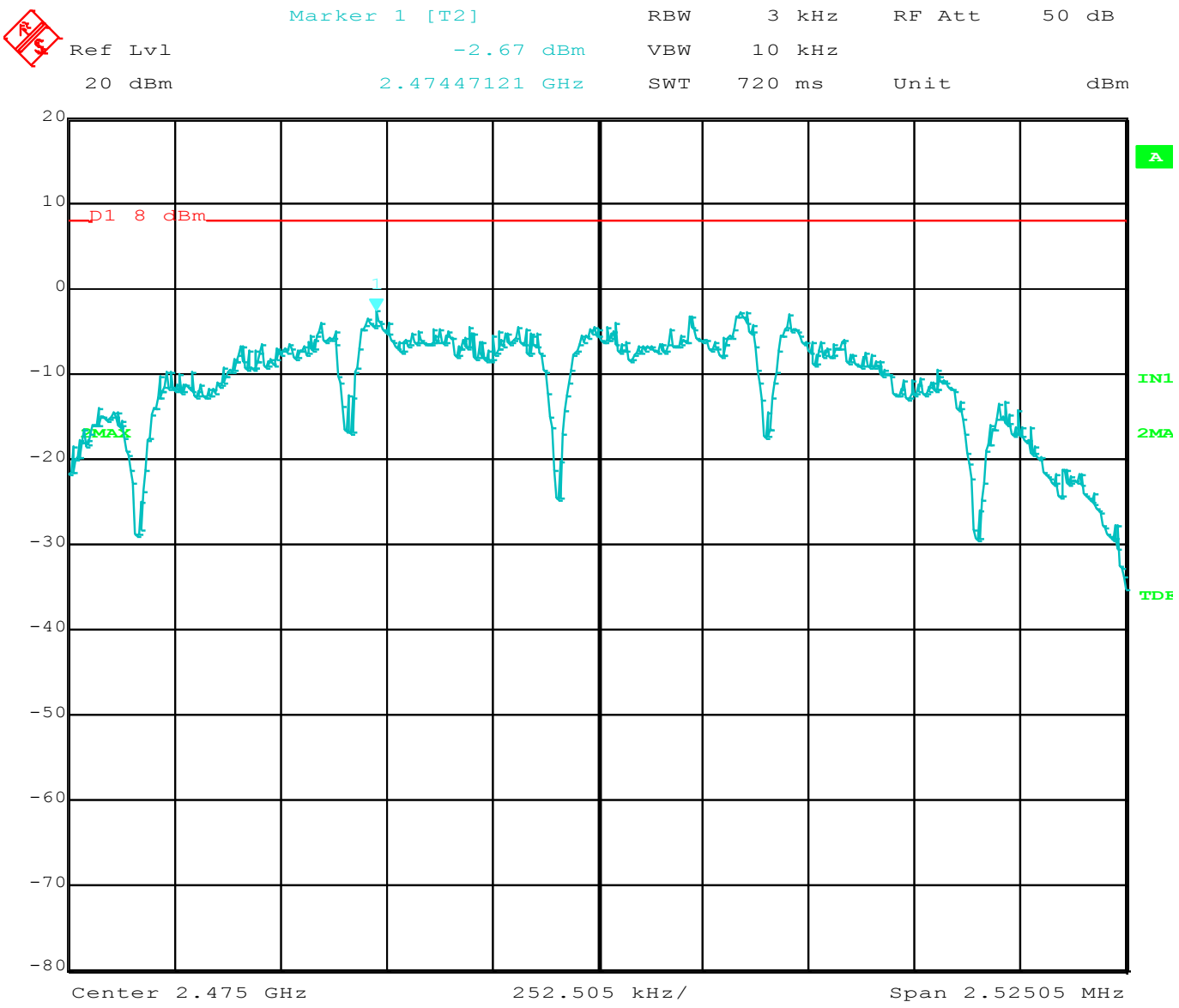
Freq. (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Peak / QP / Avg	Comments
2405	-1.80	8.00	-9.80	Peak	
2445	-2.11	8.00	-10.11	Peak	
2475	-2.67	8.00	-10.67	Peak	



Comment A: Peak PSD 2405MHz



Comment A: Peak PSD 2445MHz



Comment A: Peak PSD 2475MHz

HARMONIC EMISSIONS IN NON-RESTRICTED FREQUENCY BANDS (IN 100KHZ BANDWIDTH) / CONDUCTED

DATA SHEETS

HARMONIC EMISSIONS IN NON-RESTRICTED FREQUENCY BANDS

FCC 15.247

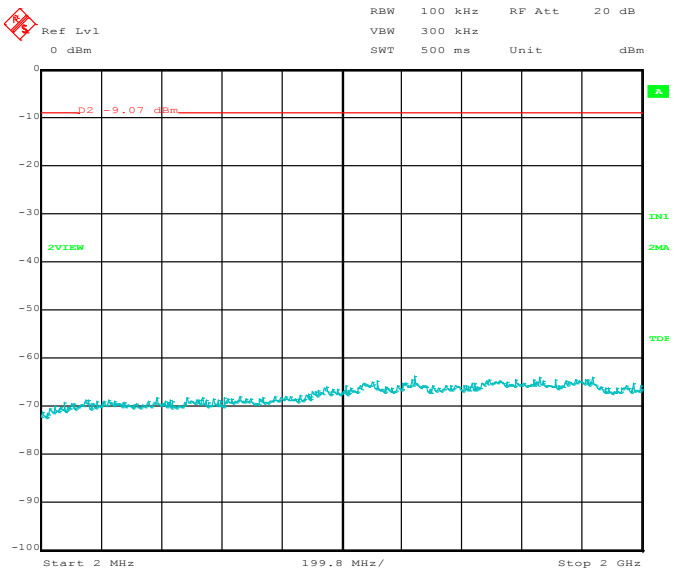
Company:	Nortek	Date:	5/27/2017
EUT:	2GIG Z-Wave-Zigbee Module	Lab:	R
Model:	2GIG-ZWZB-500	Test ENG:	Torey Oliver

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

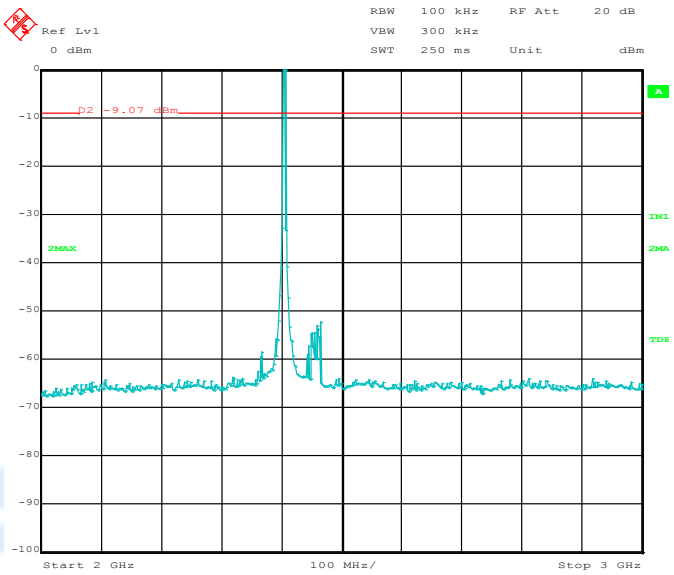
Freq. (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Peak / QP / Avg	Comments
4810.00	-47.59	-9.07	-38.52	Peak	Low Channel
4890.00	-48.81	-9.48	-39.33	Peak	Mid Channel
4950.00	-49.50	-10.21	-39.29	Peak	High Channel

The Limits were found using a 100kHz RBW on Power Spectral Density.

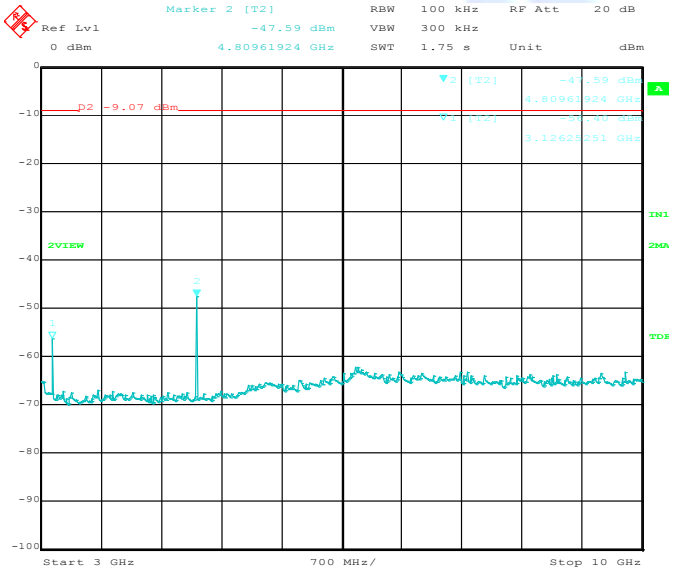
HARMONIC EMISSIONS IN NON-RESTRICTED FREQUENCY BANDS LOW CHANNEL



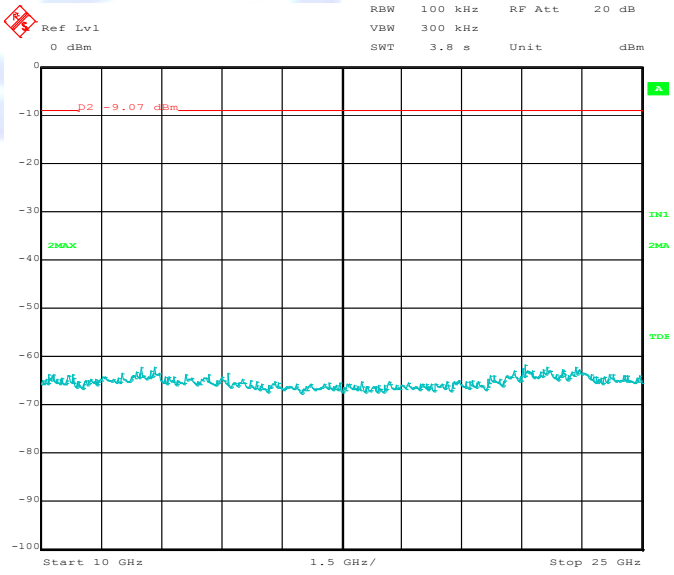
Comment A: Conducted Spurious 2405MHz



Comment A: Conducted Spurious 2405MHz

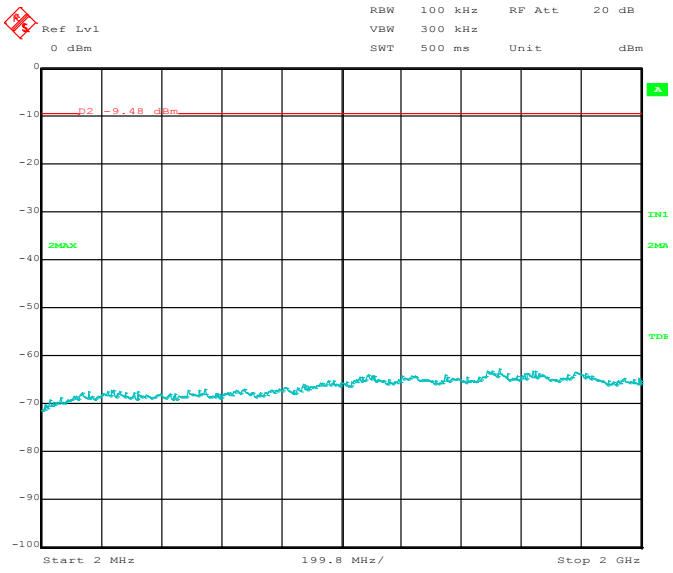


Comment A: Conducted Spurious 2405MHz

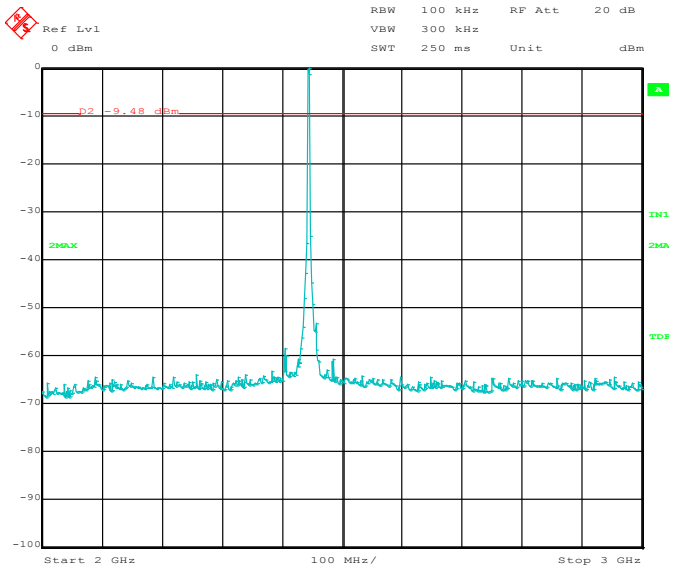


Comment A: Conducted Spurious 2405MHz

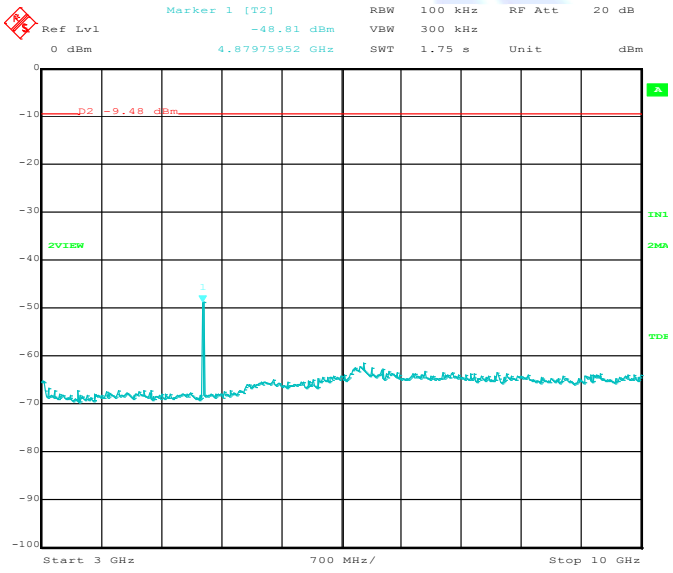
HARMONIC EMISSIONS IN NON-RESTRICTED FREQUENCY BANDS MID CHANNEL



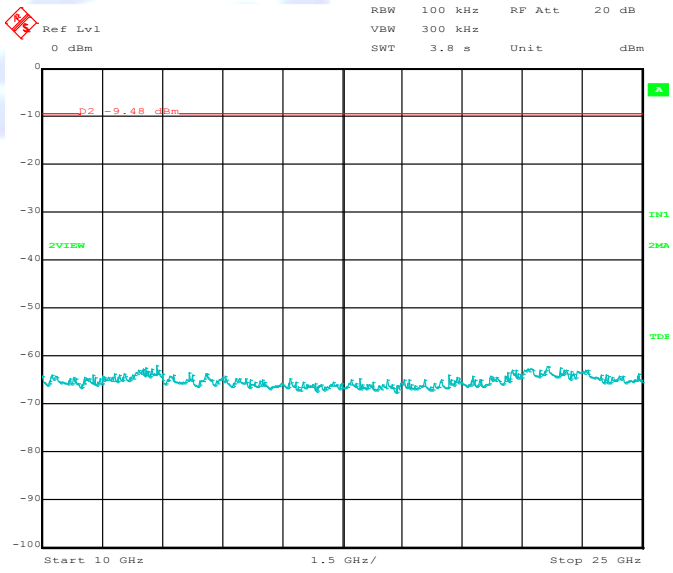
Comment A: Conducted Spurious 2445MHz



Comment A: Conducted Spurious 2445MHz

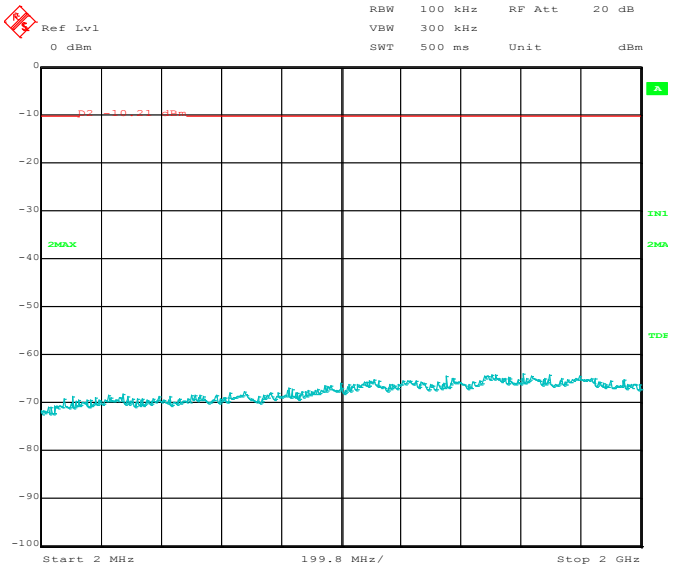


Comment A: Conducted Spurious 2445MHz

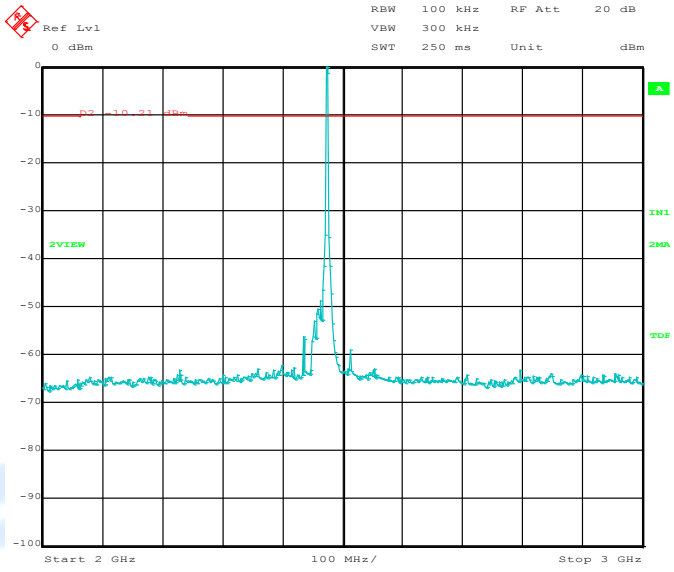


Comment A: Conducted Spurious 2445MHz

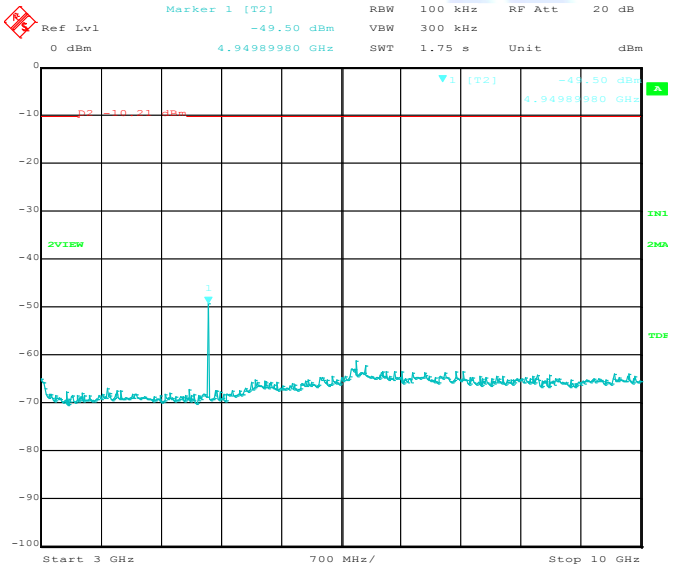
HARMONIC EMISSIONS IN NON-RESTRICTED FREQUENCY BANDS HIGH CHANNEL



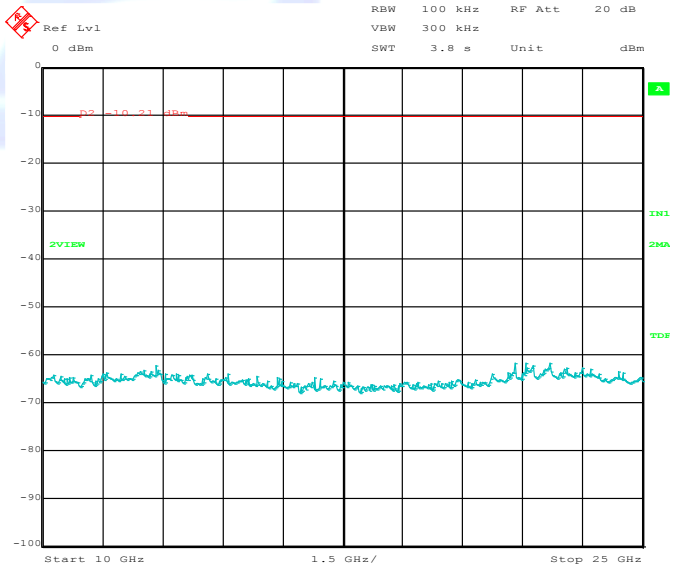
Comment A: Conducted Spurious 2475MHz



Comment A: Conducted Spurious 2475MHz



Comment A: Conducted Spurious 2475MHz



Comment A: Conducted Spurious 2475MHz

EMISSIONS IN RESTRICTED FREQUENCY BANDS (RADIATED FIELD STRENGTH)

DATA SHEETS

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
Low Channel, Horizontal, X-Axis

FCC 15.247

Company: Nortek
EUT: 2GIG Z-Wave-Zigbee Module
Model: 2GIG-ZWZB-500

Date: 5/22/2017
Lab: P
Test ENG: T. Oliver

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

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4810.00	49.71	H	73.98	-24.27	Peak	1.29	300	**In Restricted Band**
4810.00	41.86	H	53.98	-12.12	Avg	1.29	300	
12025.00	--	H	73.98	--	Peak	--	--	**In Restricted Band**
12025.00	--	H	53.98	--	Avg	--	--	**No emissions found**
19240.00	--	H	74.93	--	Peak	--	--	**In Restricted Band**
19240.00	--	H	54.93	--	Avg	--	--	**No Emissions Found**

Test distance
3 meter

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
Low Channel, Vertical, X-Axis

FCC 15.247

Company: Nortek
EUT: 2GIG Z-Wave-Zigbee Module
Model: 2GIG-ZWZB-500

Date: 5/22/2017
Lab: P
Test ENG: T. Oliver

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

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4810.00	47.40	V	73.98	-26.58	Peak	1.01	59	**In Restricted Band**
4810.00	38.68	V	53.98	-15.30	Avg	1.01	59	
12025.00	--	V	73.98	--	Peak	--	--	**In Restricted Band**
12025.00	--	V	53.98	--	Avg	--	--	**No emissions found**
19240.00	--	V	74.93	--	Peak	--	--	**In Restricted Band**
19240.00	--	V	54.93	--	Avg	--	--	**No Emissions Found**

Test distance
3 meter

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
Low Channel, Horizontal, Y-Axis

FCC 15.247

Company: Nortek
EUT: 2GIG Z-Wave-Zigbee Module
Model: 2GIG-ZWZB-500

Date: 5/22/2017
Lab: P
Test ENG: T. Oliver

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

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4810.00	52.32	H	73.98	-21.66	Peak	1.31	62	**In Restricted Band**
4810.00	44.63	H	53.98	-9.35	Avg	1.31	62	
12025.00	--	H	73.98	--	Peak	--	--	**In Restricted Band**
12025.00	--	H	53.98	--	Avg	--	--	**No emissions found**
19240.00	--	H	74.93	--	Peak	--	--	**In Restricted Band**
19240.00	--	H	54.93	--	Avg	--	--	**No Emissions Found**

Test distance
3 meter

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
Low Channel, Vertical, Y-Axis

FCC 15.247

Company: Nortek
EUT: 2GIG Z-Wave-Zigbee Module
Model: 2GIG-ZWZB-500

Date: 5/22/2017
Lab: P
Test ENG: T. Oliver

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

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4810.00	51.81	V	73.98	-22.17	Peak	1.00	40.5	**In Restricted Band**
4810.00	43.97	V	53.98	-10.01	Avg	1.00	40.5	
12025.00	--	V	73.98	--	Peak	--	--	**In Restricted Band**
12025.00	--	V	53.98	--	Avg	--	--	**No emissions found**
19240.00	--	V	74.93	--	Peak	--	--	**In Restricted Band**
19240.00	--	V	54.93	--	Avg	--	--	**No Emissions Found**

Test distance
3 meter

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
Low Channel, Horizontal, Z-Axis

FCC 15.247

Company: Nortek
EUT: 2GIG Z-Wave-Zigbee Module
Model: 2GIG-ZWZB-500

Date: 5/22/2017
Lab: P
Test ENG: T. Oliver

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

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4810.00	54.50	H	73.98	-19.48	Peak	0.99	266	**In Restricted Band**
4810.00	47.47	H	53.98	-6.51	Avg	0.99	266	
12025.00	--	H	73.98	--	Peak	--	--	**In Restricted Band**
12025.00	--	H	53.98	--	Avg	--	--	**No emissions found**
19240.00	--	H	74.93	--	Peak	--	--	**In Restricted Band**
19240.00	--	H	54.93	--	Avg	--	--	**No Emissions Found**

Test distance
3 meter

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
Low Channel, Vertical, Z-Axis

FCC 15.247

Company: Nortek
EUT: 2GIG Z-Wave-Zigbee Module
Model: 2GIG-ZWZB-500

Date: 5/22/2017
Lab: P
Test ENG: T. Oliver

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

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4810.00	51.36	V	73.98	-22.62	Peak	1.09	335	**In Restricted Band**
4810.00	43.85	V	53.98	-10.13	Avg	1.09	335	
12025.00	--	V	73.98	--	Peak	--	--	**In Restricted Band**
12025.00	--	V	53.98	--	Avg	--	--	**No emissions found**
19240.00	--	V	74.93	--	Peak	--	--	**In Restricted Band**
19240.00	--	V	54.93	--	Avg	--	--	**No Emissions Found**

Test distance
3 meter

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
Mid Channel, Horizontal, X-Axis

FCC 15.247

Company: Nortek
EUT: 2GIG Z-Wave-Zigbee Module
Model: 2GIG-ZWZB-500

Date: 5/22/2017
Lab: P
Test ENG: T. Oliver

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

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4890.00	48.04	H	73.98	-25.94	Peak	1.34	267	**In Restricted Band**
4890.00	38.81	H	53.98	-15.17	Avg	1.34	267	
7335.00	--	H	73.98	--	Peak	--	--	**In Restricted Band**
7335.00	--	H	53.98	--	Avg	--	--	**No emissions found**
12225.00	--	H	73.98	--	Peak	--	--	**In Restricted Band**
12225.00	--	H	53.98	--	Avg	--	--	**No emissions found**
19560.00		H	73.98	--	Peak	--	--	**In Restricted Band**
19560.00	--	H	53.98	--	Avg	--	--	**No Emissions Found**

Test distance
3 meter

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
Mid Channel, Vertical, X-Axis

FCC 15.247

Company: Nortek
EUT: 2GIG Z-Wave-Zigbee Module X
Model: 2GIG-ZWZB-500

Date: 5/22/2017
Lab: P
Test ENG: T. Oliver

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

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4890.00	47.92	V	73.98	-26.06	Peak	1.55	335	**In Restricted Band**
4890.00	38.63	V	53.98	-15.35	Avg	1.55	335	
7335.00	--	V	73.98	--	Peak	--	--	**In Restricted Band**
7335.00	--	V	53.98	--	Avg	--	--	**No Emissions Found**
12225.00	--	V	73.98	--	Peak	--	--	**In Restricted Band**
12225.00	--	V	53.98	--	Avg	--	--	**No emissions found**
19560.00	--	V	73.98	--	Peak	--	--	**In Restricted Band**
19560.00	--	V	53.98	--	Avg	--	--	**No Emissions Found**

Test distance
3 meter

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
Mid Channel, Horizontal, Y-Axis

FCC 15.247

Company: Nortek
EUT: 2GIG Z-Wave-Zigbee Module
Model: 2GIG-ZWZB-500

Date: 5/22/2017
Lab: P
Test ENG: T. Oliver

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

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4890.00	46.23	H	73.98	-27.75	Peak	1.06	193.75	**In Restricted Band**
4890.00	36.04	H	53.98	-17.94	Avg	1.06	193.75	
7335.00	--	H	73.98	--	Peak	--	--	**In Restricted Band**
7335.00	--	H	53.98	--	Avg	--	--	**No emissions found**
12225.00	--	H	73.98	--	Peak	--	--	**In Restricted Band**
12225.00	--	H	53.98	--	Avg	--	--	**No emissions found**
19560.00		H	73.98	--	Peak	--	--	**In Restricted Band**
19560.00	--	H	53.98	--	Avg	--	--	**No Emissions Found**

Test distance
3 meter

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
Mid Channel, Vertical, Y-Axis

FCC 15.247

Company: Nortek
EUT: 2GIG Z-Wave-Zigbee Module X
Model: 2GIG-ZWZB-500

Date: 5/22/2017
Lab: P
Test ENG: T. Oliver

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

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4890.00	49.06	V	73.98	-24.92	Peak	1.46	88.25	**In Restricted Band**
4890.00	40.14	V	53.98	-13.84	Avg	1.46	88.25	
7335.00	--	V	73.98	--	Peak	--	--	**In Restricted Band**
7335.00	--	V	53.98	--	Avg	--	--	**No Emissions Found**
12225.00	--	V	73.98	--	Peak	--	--	**In Restricted Band**
12225.00	--	V	53.98	--	Avg	--	--	**No emissions found**
19560.00	--	V	73.98	--	Peak	--	--	**In Restricted Band**
19560.00	--	V	53.98	--	Avg	--	--	**No Emissions Found**

Test distance
3 meter

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
Mid Channel, Horizontal, Z-Axis

FCC 15.247

Company: Nortek
EUT: 2GIG Z-Wave-Zigbee Module
Model: 2GIG-ZWZB-500

Date: 5/22/2017
Lab: P
Test ENG: T. Oliver

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

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4890.00	48.68	H	73.98	-25.30	Peak	1.70	93.75	**In Restricted Band**
4890.00	39.74	H	53.98	-14.24	Avg	1.70	93.75	
7335.00	--	H	73.98	--	Peak	--	--	**In Restricted Band**
7335.00	--	H	53.98	--	Avg	--	--	**No emissions found**
12225.00	--	H	73.98	--	Peak	--	--	**In Restricted Band**
12225.00	--	H	53.98	--	Avg	--	--	**No emissions found**
19560.00		H	73.98	--	Peak	--	--	**In Restricted Band**
19560.00	--	H	53.98	--	Avg	--	--	**No Emissions Found**

Test distance
3 meter

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
Mid Channel, Vertical, Z-Axis

FCC 15.247

Company: Nortek
EUT: 2GIG Z-Wave-Zigbee Module X
Model: 2GIG-ZWZB-500

Date: 5/22/2017
Lab: P
Test ENG: T. Oliver

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

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4890.00	47.02	V	73.98	-26.96	Peak	2.47	2	**In Restricted Band**
4890.00	37.66	V	53.98	-16.32	Avg	2.47	2	
7335.00	--	V	73.98	--	Peak	--	--	**In Restricted Band**
7335.00	--	V	53.98	--	Avg	--	--	**No Emissions Found**
12225.00	--	V	73.98	--	Peak	--	--	**In Restricted Band**
12225.00	--	V	53.98	--	Avg	--	--	**No emissions found**
19560.00	--	V	73.98	--	Peak	--	--	**In Restricted Band**
19560.00	--	V	53.98	--	Avg	--	--	**No Emissions Found**

Test distance
3 meter

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
High Channel, Horizontal, X-Axis

FCC 15.247

Company: Nortek
EUT: 2GIG Z-Wave-Zigbee Module
Model: 2GIG-ZWZB-500

Date: 5/22/2017
Lab: P
Test ENG: T. Oliver

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

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4950.00	45.99	H	73.98	-27.99	Peak	1.69	347	**In Restricted Band**
4950.00	35.19	H	53.98	-18.79	Avg	1.69	347	
7425.00	--	H	73.98	--	Peak	--	--	**In Restricted Band**
7425.00	--	H	53.98	--	Avg	--	--	**No emissions found**
12375.00	--	H	73.98	--	Peak	--	--	**In Restricted Band**
12375.00	--	H	53.98	--	Avg	--	--	**No emissions found**
19800.00	--	H	73.98	--	Peak	--	--	**In Restricted Band**
19800.00	--	H	53.98	--	Avg	--	--	**No Emissions Found**
22275.00	--	H	73.98	--	Peak	--	--	**In Restricted Band**
22275.00	--	H	53.98	--	Avg	--	--	**No Emissions Found**

Test distance
3 meter

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
High Channel, Vertical, X-Axis

FCC 15.247

Company: Nortek
EUT: 2GIG Z-Wave-Zigbee Module
Model: 2GIG-ZWZB-500

Date: 5/22/2017
Lab: P
Test ENG: T. Oliver

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

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4950.00	44.73	V	73.98	-29.25	Peak	2.19	345.5	**In Restricted Band**
4950.00	33.41	V	53.98	-20.57	Avg	2.19	345.5	
7425.00	--	V	73.98	--	Peak	--	--	**In Restricted Band**
7425.00	--	V	53.98	--	Avg	--	--	**No emissions found**
12375.00	--	V	73.98	--	Peak	--	--	**In Restricted Band**
12375.00	--	V	53.98	--	Avg	--	--	**No emissions found**
19800.00	--	V	73.98	--	Peak	--	--	**In Restricted Band**
19800.00	--	V	53.98	--	Avg	--	--	**No Emissions Found**
22275.00	--	V	73.98	--	Peak	--	--	**In Restricted Band**
22275.00	--	V	53.98	--	Avg	--	--	**No Emissions Found**

Test distance
3 meter

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
High Channel, Horizontal, Y-Axis

FCC 15.247

Company: Nortek
EUT: 2GIG Z-Wave-Zigbee Module
Model: 2GIG-ZWZB-500

Date: 5/22/2017
Lab: P
Test ENG: T. Oliver

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

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4950.00	44.96	H	73.98	-29.02	Peak	1.08	335	**In Restricted Band**
4950.00	33.81	H	53.98	-20.17	Avg	1.08	335	
7425.00	--	H	73.98	--	Peak	--	--	**In Restricted Band**
7425.00	--	H	53.98	--	Avg	--	--	**No emissions found**
12375.00	--	H	73.98	--	Peak	--	--	**In Restricted Band**
12375.00	--	H	53.98	--	Avg	--	--	**No emissions found**
19800.00	--	H	73.98	--	Peak	--	--	**In Restricted Band**
19800.00	--	H	53.98	--	Avg	--	--	**No Emissions Found**
22275.00	--	H	73.98	--	Peak	--	--	**In Restricted Band**
22275.00	--	H	53.98	--	Avg	--	--	**No Emissions Found**

Test distance
3 meter

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
High Channel, Vertical, Y-Axis

FCC 15.247

Company: Nortek
EUT: 2GIG Z-Wave-Zigbee Module
Model: 2GIG-ZWZB-500

Date: 5/22/2017
Lab: P
Test ENG: T. Oliver

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

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4950.00	47.54	V	73.98	-26.44	Peak	1.32	51	**In Restricted Band**
4950.00	37.51	V	53.98	-16.47	Avg	1.32	51	
7425.00	--	V	73.98	--	Peak	--	--	**In Restricted Band**
7425.00	--	V	53.98	--	Avg	--	--	**No emissions found**
12375.00	--	V	73.98	--	Peak	--	--	**In Restricted Band**
12375.00	--	V	53.98	--	Avg	--	--	**No emissions found**
19800.00	--	V	73.98	--	Peak	--	--	**In Restricted Band**
19800.00	--	V	53.98	--	Avg	--	--	**No Emissions Found**
22275.00	--	V	73.98	--	Peak	--	--	**In Restricted Band**
22275.00	--	V	53.98	--	Avg	--	--	**No Emissions Found**

Test distance
3 meter

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
High Channel, Horizontal, Z-Axis

FCC 15.247

Company: Nortek
EUT: 2GIG Z-Wave-Zigbee Module
Model: 2GIG-ZWZB-500

Date: 5/22/2017
Lab: P
Test ENG: T. Oliver

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

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4950.00	50.75	H	73.98	-23.23	Peak	1.81	96	**In Restricted Band**
4950.00	42.76	H	53.98	-11.22	Avg	1.81	96	
7425.00	--	H	73.98	--	Peak	--	--	**In Restricted Band**
7425.00	--	H	53.98	--	Avg	--	--	**No emissions found**
12375.00	--	H	73.98	--	Peak	--	--	**In Restricted Band**
12375.00	--	H	53.98	--	Avg	--	--	**No emissions found**
19800.00	--	H	73.98	--	Peak	--	--	**In Restricted Band**
19800.00	--	H	53.98	--	Avg	--	--	**No Emissions Found**
22275.00	--	H	73.98	--	Peak	--	--	**In Restricted Band**
22275.00	--	H	53.98	--	Avg	--	--	**No Emissions Found**

Test distance
3 meter

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
High Channel, Vertical, Z-Axis

FCC 15.247

Company: Nortek
EUT: 2GIG Z-Wave-Zigbee Module
Model: 2GIG-ZWZB-500

Date: 5/22/2017
Lab: P
Test ENG: T. Oliver

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

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4950.00	47.81	V	73.98	-26.17	Peak	2.22	89.25	**In Restricted Band**
4950.00	38.34	V	53.98	-15.64	Avg	2.22	89.25	
7425.00	--	V	73.98	--	Peak	--	--	**In Restricted Band**
7425.00	--	V	53.98	--	Avg	--	--	**No emissions found**
12375.00	--	V	73.98	--	Peak	--	--	**In Restricted Band**
12375.00	--	V	53.98	--	Avg	--	--	**No emissions found**
19800.00	--	V	73.98	--	Peak	--	--	**In Restricted Band**
19800.00	--	V	53.98	--	Avg	--	--	**No Emissions Found**
22275.00	--	V	73.98	--	Peak	--	--	**In Restricted Band**
22275.00	--	V	53.98	--	Avg	--	--	**No Emissions Found**

Test distance
3 meter

EMISSIONS RADIATED OUTSIDE OF THE FUNDAMENTAL FREQUENCY BAND AT BAND EDGES

DATA SHEETS

BAND EDGES- HORIZONTAL

FCC 15.247

Company:	Nortek	Date:	6/1/2017
EUT:	2GIG Z-Wave-Zigbee Module	Lab:	P
Model:	2GIG-ZWZB-500	Test ENG:	Torey Oliver

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

Freq. (MHz)	Level (dBµV/m)	Pol	Limit (dBµV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
2405.00	112.41	H	--	--	Peak	1.00	95	Fundamental of Low Channel
2399.84	66.46	H	92.41	-25.95	Delta	1.00	95	From Peak
2389.36	51.60	H	73.98	-22.38	Peak	1.00	95	**No** Marker Delta Method Used
2389.36	38.93	H	53.98	-15.05	Avg	1.00	95	
2475.00	112.58	H	--	--	Peak	1.13	102	Fundamental of High Channel
2483.50	58.10	H	73.98	-15.88	Peak	1.13	102	**No** Marker Delta Method Used
2483.50	46.43	H	53.98	-7.55	Avg	1.13	102	

Test Distance
3 Meters

BAND EDGES- VERTICAL

FCC 15.247

Company: Nortek
EUT: 2GIG Z-Wave-Zigbee Module
Model: 2GIG-ZWZB-500

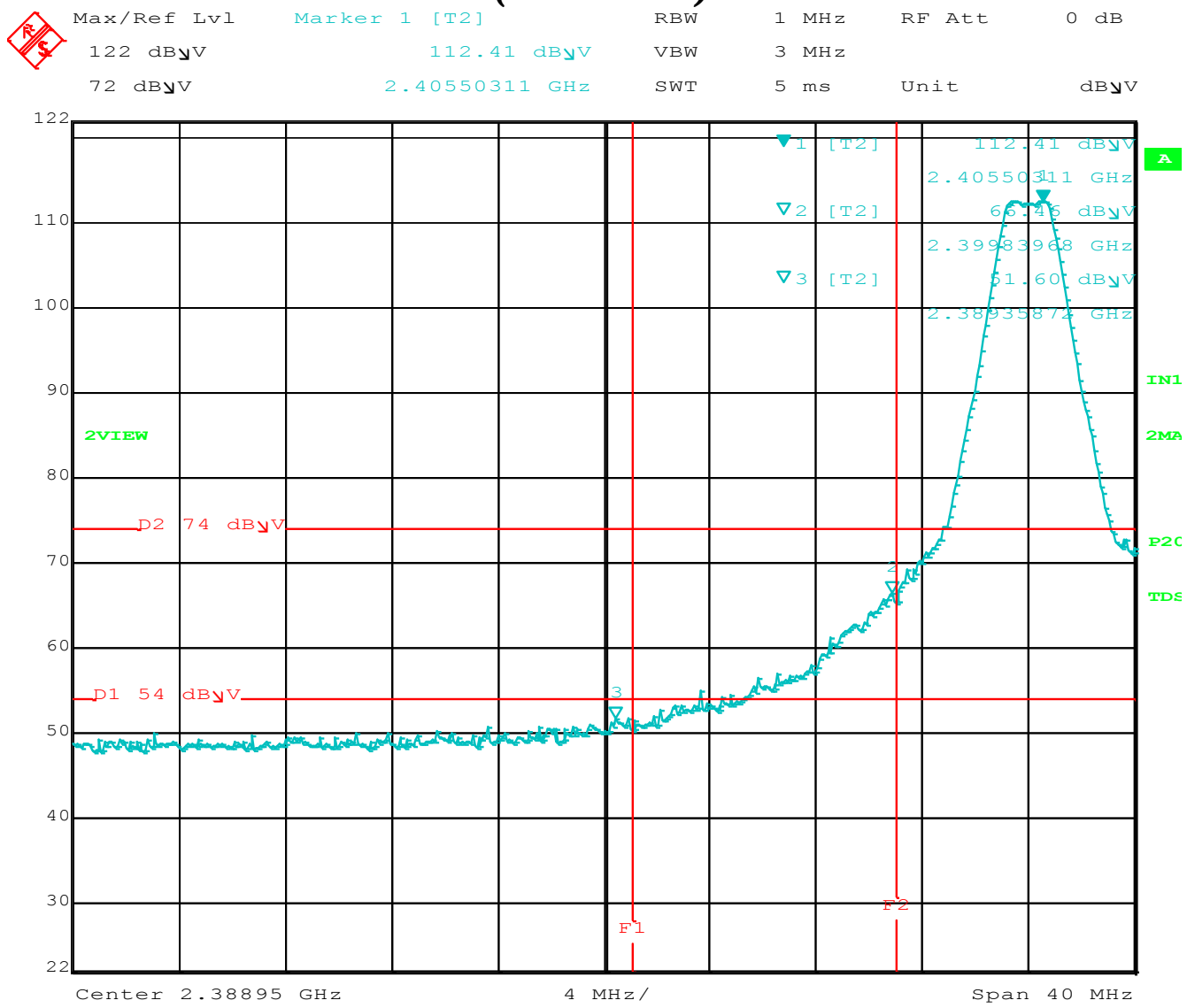
Date: 6/1/2017
Lab: P
Test ENG: Torey Oliver

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

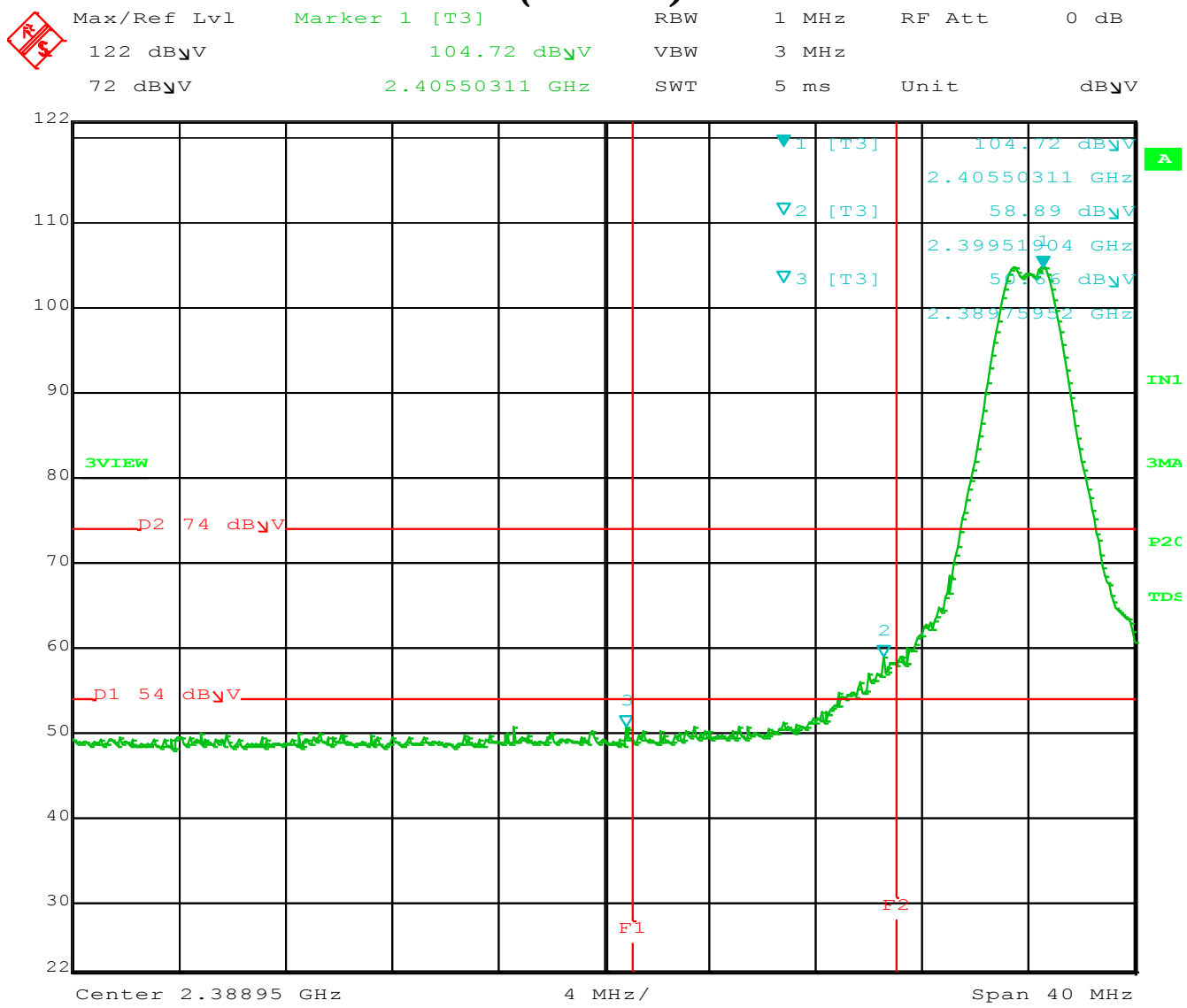
Freq. (MHz)	Level (dBµV/m)	Pol	Limit (dBµV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
2405.00	104.72	V	--	--	Peak	1.07	193	Fundamental of Low Channel
2399.52	58.89	V	84.72	-25.83	Delta	1.07	193	From Peak
2389.76	50.66	V	73.98	-23.32	Peak	1.07	193	**No** Marker Delta Method Used
2389.76	37.11	V	53.98	-16.87	Avg	1.07	193	
2475.00	105.53	V	--	--	Peak	1.03	190	Fundamental of High Channel
2483.58	52.74	V	73.98	-21.24	Peak	1.03	190	**No** Marker Delta Method Used
2483.58	40.81	V	53.98	-13.17	Avg	1.03	190	

Test Distance
3 Meters

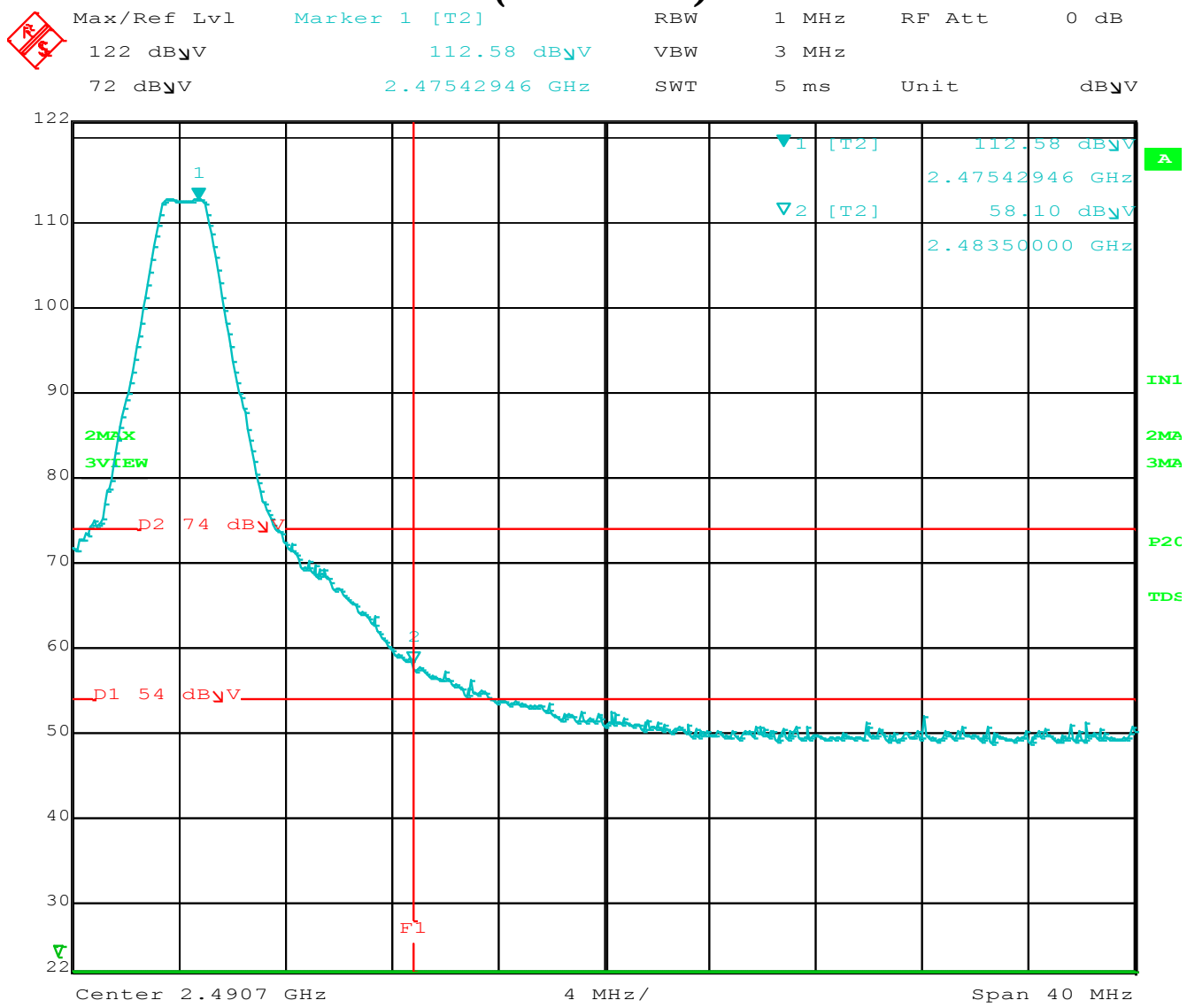
LOWER BAND EDGE
(Horizontal)



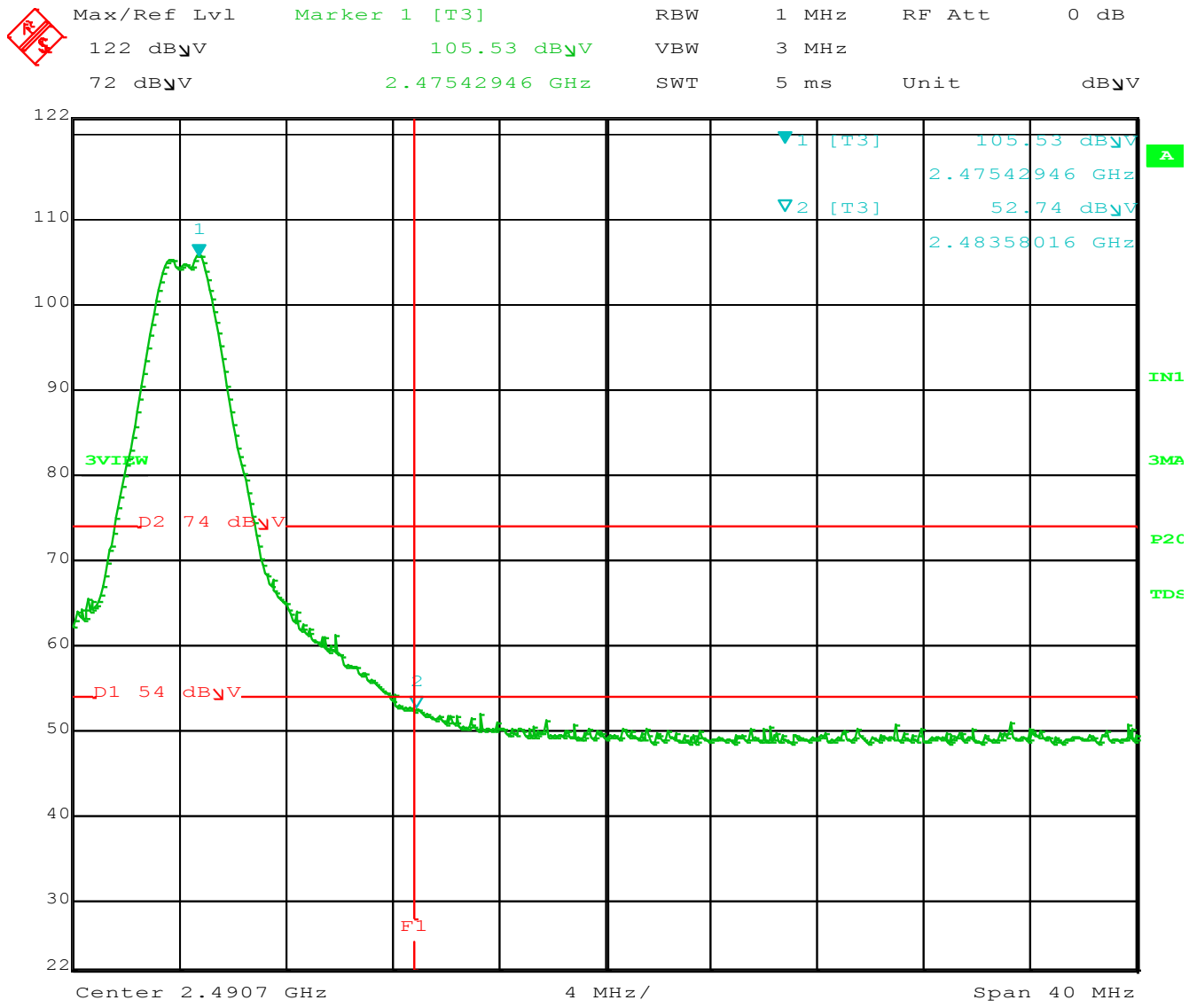
LOWER BAND EDGE
(Vertical)



UPPER BAND EDGE
(Horizontal)



UPPER BAND EDGE
(Vertical)



OCCUPIED BANDWIDTH

IC BANDWIDTH

RSS GEN

Company:	Nortek	Date:	5/27/2017
EUT:	2GIG Z-Wave-Zigbee Module	Lab:	R
Model:	2GIG-ZWZB-500	Test ENG:	Torey Oliver

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

Freq. (MHz)	Measured BW (kHz)	Comments
2405	1935.87	99%
2445	1947.89	99%
2475	1935.87	99%