FCC PART 15 SUBPART B, SUBPART C SECTION 15.231,
RSS GEN, & RSS 210
TEST REPORT

for

4-Button Key FOB remote
Model: 2GIG-KEY2E-345

Prepared for

NORTEK SECURITY & CONTROL LLC
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CARLSBAD, CA 92010

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DATE: OCTOBER 16, 2018

	REPORT BODY	APPENDICES					TOTAL
		A	*B*	*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:	4-Button Key FOB Remote Model: 2GIG-KEY2E-345 S/N: 1708220003313155
Product Description:	The 4-Button Key FOB Remote (2GIG-KEY2E-345) is a battery-powered, wireless key FOB designed to fit on a key chain, in a pocket, or in a purse giving users the ability to turn the security system ON and OFF before entering the home or after exiting. It is one of the e-Series devices from Nortek Security and Control providing enhanced security with encrypted communications to the control panel using the 345MHz frequency. It can also be used is in an emergency to turn on the siren and automatically call the central monitoring station and be programmed to operate the programmable output in the Control Panel.
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:	October 15th, 2018

Test Specifications Covered by Accreditation:

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EMI requirements

CFR Title 47, Part 15 Subpart C Sections 15.205, 15.207, 15.209 and 15.231
RSS GEN & RSS 210

Test Procedure: ANSI C63.4 & C63.10

SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Conducted RF Emissions, 150 kHz - 30 MHz.	The EUT is battery powered; therefore, this test was deemed unnecessary and thus was not performed.
2	Radiated RF Emissions & Harmonics, 9 kHz – 3,450 MHz.	Complies with the limits of CFR Title 47, Part 15 Subpart C Section 15.209, 15.231, & RSS GEN.
3	-20 dB Occupied Bandwidth of the Emission	Complies with the limits of CFR Title 47, Part 15, Subpart C, section 15.231 & RSS 210.
4	Peak Radiated EMI	Complies with the limits of CFR Title 47, Part 15, Subpart C, section 15.231 & RSS 210.
5	Transmit Timeout	Complies with the limits of CFR Title 47, Part 15, Subpart C, section 15.231 & RSS 210.

TABLE 1
SIX HIGHEST RADIATED EMISSIONS READINGS

	Reading Type (PK / QP / AV)	Polarization (Vert / Horz)	Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Delta (dB)	Test Distance
1	AV	H	345.00	74.09	77.26	-3.17	3-Meter
2	PK	H	345.00	91.32	97.26	-5.94	3-Meter
3	AV	V	345.00	71.30	77.26	-5.96	3-Meter
4	PK	V	345.00	88.53	97.26	-8.73	3-Meter
5	AV	V	345.00	70.16	77.26	-7.10	3-Meter
6	PK	V	345.00	87.39	97.26	-9.87	3-Meter

Readings were compared to previous test readings and were found to be consistent.

1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the 4-Button Key FOB Remote Model: 2GIG-KEY2E-345. The EMI measurements were performed according to the measurement procedure described in ANSI 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 section 15.109, Subpart C sections 15.205, 15.209. 15.231, RSS GEN, & RSS 210.

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

David Shephard	Regulatory Compliance Engineer
Josh Hansen	Regulatory & Compliance Engineering Manager

Compatible Electronics, Inc.

Sam Kerckhoff	Test Technician
Torey Oliver	Sr. Test Engineer
Matt Harrison	Lab Manager
Joey Madlangbayan	Product Safety Manager

2.4 Date Test Sample was Received

The test sample was received on October 15th, 2018.

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 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
RSS GEN	General Requirements for Compliance of Radio Apparatus
RSS 210	License-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

4. DESCRIPTION OF TEST CONFIGURATION

4.1 Description of Test Configuration

The 4-Button Key FOB Remote Model: 2GIG-KEY2E-345 (EUT) was setup in a standalone tabletop configuration. The EUT was checked in all 3 axes. The worst case was found to be the X-Axis. The EUT was continuously transmitting during the transmit tests and in standby mode for standby tests.

The EUT was tested with new batteries.

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.

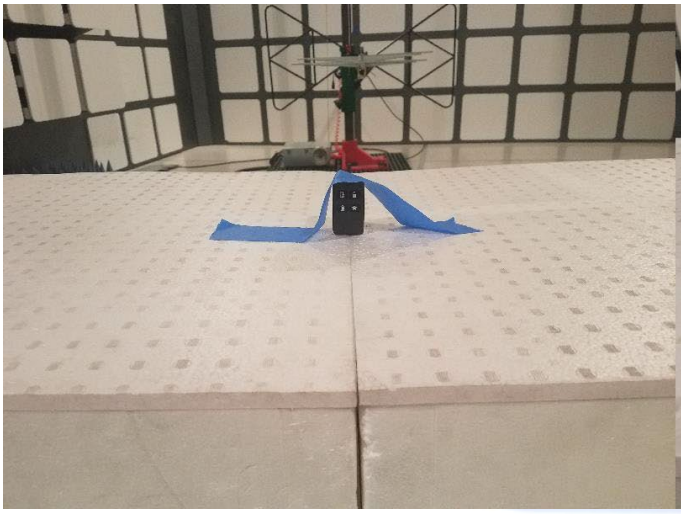
4.1.1 Photograph Test Configuration (X-Axis Shown)

4.1.2 Cable Construction and Termination

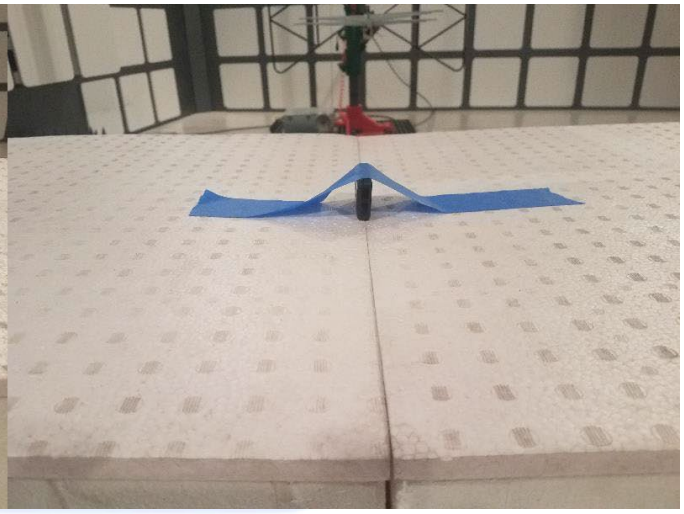
The EUT had no interconnecting cables.

4.1.3 Axis Orientation

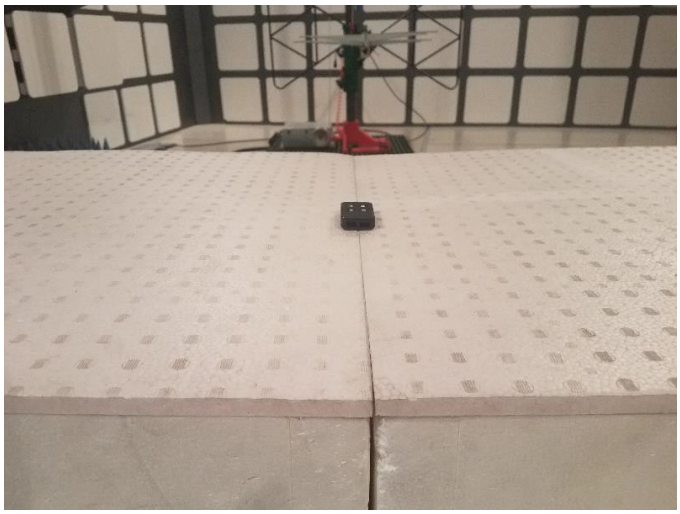
Z-Axis



Y-Axis



X-Axis



5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

5.1 EUT and Accessory List

#	EQUIPMENT TYPE	MANU-FACTURER	MODEL	FCC ID	SERIAL NUMBER
1	Key FOB (EUT)	Nortek Security & Control	2GIG-KEY2E-345	WDQ-KEY1345	1708220003313155
2	Battery	Maxwell	CR2025	None	None

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	100218	03/05/2018	03/05/2019
Antenna, Loop	Com Power	AL-130	121049	02/09/2017	02/09/2019
Antenna, CombiLog	Com Power	AC-220	061105	03/12/2018	03/12/2019
Antenna, Horn 1-18GHz	Com Power	AH-118	071225	07/05/2018	07/05/2019
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

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 below 1GHz the EUT was mounted 0.8-meter-high on a non-conductive surface, which was placed above the ground plane for below 1GHz.

For above 1GHz the EUT was mounted on a 1.5-meter-high non-conductive tabletop, 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.

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)	3,6 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	3.53

7. CHARACTERISTICS OF THE TRANSMITTER

7.1 Channel Number and Frequencies

The EUT has one operating channel which channels a 345MHz signal. The modulation type of the transmitter is OOK and the EUT has a fixed power output.

7.2 Antenna

The antenna is made up of an etched trace on the PCB.

7.3 EUT Test Software

Date: N/A

Location: Nortek Security & Control LLC. / Nortek Security & Control LLC 5919 Sea Otter Place, Suite 100, Carlsbad, CA 92010

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

Test Results: *The EUT was battery operated; therefore, this test was deemed unnecessary and thus was not performed. If this test had been performed it would have been as below.*

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.

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.

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 Fundamental & Harmonic emissions a duty cycle average 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 3450	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, Subpart C sections 15.205, 15.209, 15.231, RSS GEN & RSS 210. The six highest emissions are listed in table 1.

8.1.3 Peak radiated EMI

The EUT was tested at a 3-meter test distance to obtain the final test data. The final qualification data sheets are located in Appendix E. This data also shows compliance at the band edges.

$$\delta(\mathrm{dB}) = 20\log\left[\sum\left(nt_1 + mt_2 + \ldots + \xi t_x\right)/T\right]$$

where

n is the number of pulses of duration *t*1
m is the number of pulses of duration *t*2
ξ is the number of pulses of duration *tx*
T is the period of the pulse train or 100 ms if the pulse train length is greater than 100 ms

Pulse Type 1 = 46 * 160.32µs = 7374.75µs

Pulse Type 2 = 21 * 303.61µs = 6375.75µs

7374.75µS + 6375.75µs = 13750.50µs

Total ON Time = 13.75ms

Duty Cycle =13.75 ms / 100 mS = 0.1375

20 log (0.1375) = -17.23 dB correction factor

Duty Cycle Correction Factor Used = -17.23 dB

Test Results:

The EUT complies with Part 15, Subpart C, section 15.231 & RSS 210.

8.1.4 Bandwidth of the Fundamental

The -20 dB bandwidth was checked using the EMI Receiver in the spectrum analyzer mode to see that the emissions were wholly within the 0.25% of the operating frequency centered on the fundamental frequency. The RBW was set to 1-5% of the occupied bandwidth and the VBW was set to approximately three times the RBW. The span was to between two and five times the occupied bandwidth. A Plot of the -20 dB bandwidth is located in Appendix E.

Test Results:

The results are the same as those included in a previous report therefore, for purposes of a FCC class 2 permissive change, the plots were not included in this report.

The EUT complies with the requirements of CFR Title 47, Part 15, Subpart C, section 15.231 (c) for the -20 dB bandwidth of the fundamental. The EUT has a -20 dB bandwidth that is lies wholly within the 0.25% of the operating frequency centered on the fundamental frequency.

8.1.5 Occupied Bandwidth

The 99% occupied bandwidth was checked using EMI Receiver. The RBW was set to 1-5% of the occupied bandwidth and the VBW was set to approximately three times the RBW. The span was to between two and five times the occupied bandwidth. A Plot of the Occupied Bandwidth is located in Appendix E.

Test Results:

The results are the same as those included in a previous report therefore, for purposes of an FCC class 2 permissive change, the plots were not included in this report.

The EUT complies with the requirements of RSS GEN for the -20 dB bandwidth of the fundamental. The EUT has a -20 dB bandwidth that is lies wholly within the 0.25% of the operating frequency centered on the fundamental frequency.

8.1.6 Transmit Timeout

The Transmit timeout test was performed using the EMI Receiver to make sure the transmission coming from the transmitter would cease within 5 seconds after the activation. A plot of the transmission duration is located in Appendix E.

Test Results:

The results are the same as those included in a previous report therefore, for purposes of a FCC class 2 permissive change, the plots were not included in this report.

The EUT complies with the requirements of CFR Title 47, Part 15, Subpart C, section 15.231 (c) & RSS 210 for Transmit Timeout less than 5 seconds.

8.1.7 Sample Calculations

A correction factor for the antenna, cable and a distance factor (if any) must be applied to the meter reading before a true field strength reading can be obtained. This Corrected Meter Reading is then compared to the specification limit in order to determine compliance with the limits.

The equation can be derived in the following manner:

Specification limit (µV/m) log x 20 = Specification Limit in dBuV

(Specification distance / test distance) log x 40 = distance factor

Note: When using an Active Antenna, the Antenna factor shall be subtracted due to the combination of the internal amplification and antenna loss. At lower frequencies the cable loss is negligible.

OR

Corrected Meter Reading = meter reading + F – A + C

where:

F = antenna factor

A= amplifier gain

C = cable loss

The correction factors for the antenna and the amplifier gain are attached in Appendix D of this report. The data sheets are attached in Appendix E.

The distance factor D is 0 when the test is performed at the required specification distance.

9. TEST PROCEDURE DEVIATIONS

The test procedures were not deviated from throughout all tests.

10. CONCLUSIONS

The 4-Button Key FOB Remote Model: 2GIG-KEY2E-345 meets all relevant specification requirements defined in the Code of Federal Regulations Title 47, Part 15 Subpart C sections 15.205, 15.207, 15.209, 15.231, RSS GEN, & RSS 210.

APPENDIX A

LABORATORY ACCREDITATIONS AND RECOGNITIONS

LABORATORY ACCREDITATIONS AND RECOGNITIONS

NVLAP TESTING
NVLAP LAB CODE 200527-0

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 Number: 2154C-1

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	4-BUTTON KEY FOB REMOTE MODEL: 2GIG-KEY2E-345 S/N: 1708220003313155

No additional models were tested.

APPENDIX D

DIAGRAMS, CHARTS, AND PHOTOS

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

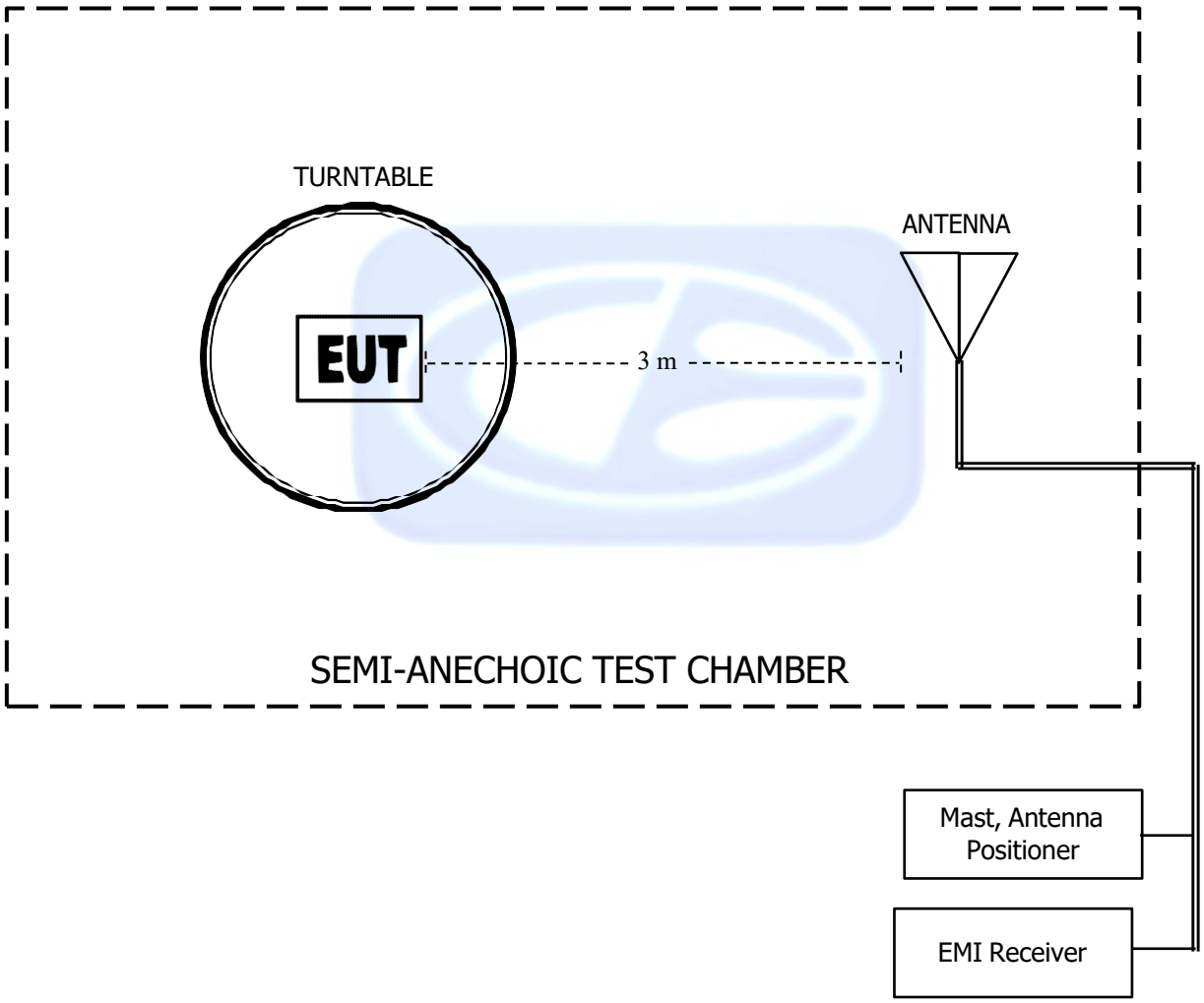
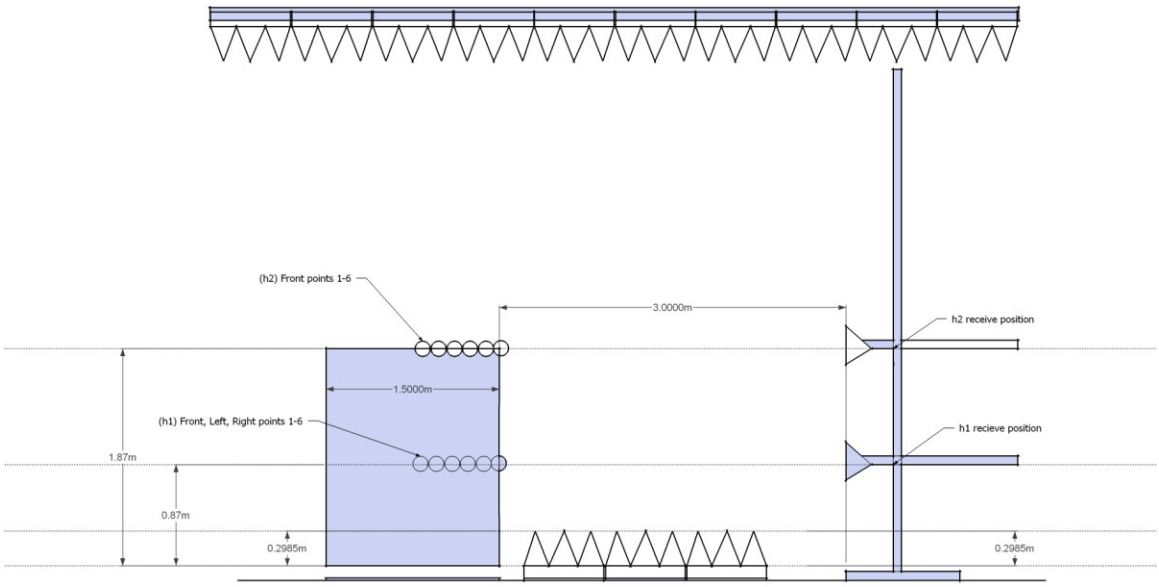


FIGURE 2: PLOT MAP AND LAYOUT OF TEST SITE ABOVE 1GHZ



COM-POWER AL-130

LOOP ANTENNA

S/N: 121049

CALIBRATION DUE: FEBRUARY 9, 2019

FREQUENCY (MHz)	MAGNETIC (dB/m)	ELECTRIC (dB/m)	FREQUENCY (MHz)	MAGNETIC (dB/m)	ELECTRIC (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

P - COMBILOG ANTENNA

S/N: 061105

CALIBRATION DUE: MARCH 12, 2019

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	24.05	**160**	13.57
35	22.46	**180**	14.07
40	19.36	**200**	14.72
45	17.42	**250**	18.27
50	15.77	**300**	20.95
60	12.86	**400**	23.16
70	11.22	**500**	21.86
80	11.84	**600**	23.54
90	13.48	**700**	23.85
100	14.80	**800**	25.91
120	16.38	**900**	26.71
140	14.41	**1000**	27.60

COM-POWER AH-118

HORN ANTENNA

S/N: 071225

CALIBRATION DUE: JULY 5, 2019

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
1000	24.45	**9500**	38.91
1500	25.34	**10000**	39.38
2000	28.06	**10500**	39.64
2500	28.82	**11000**	39.42
3000	29.80	**11500**	39.84
3500	30.65	**12000**	39.66
4000	31.28	**12500**	40.12
4500	32.24	**13000**	40.27
5000	33.09	**13500**	40.42
5500	33.55	**14000**	40.85
6000	34.45	**14500**	42.06
6500	35.37	**15000**	42.33
7000	36.91	**15500**	39.45
7500	37.39	**16000**	39.54
8000	37.62	**16500**	39.57
8500	37.40	**17000**	41.79
9000	37.39	**17500**	43.87
		18000	44.53

FRONT VIEW

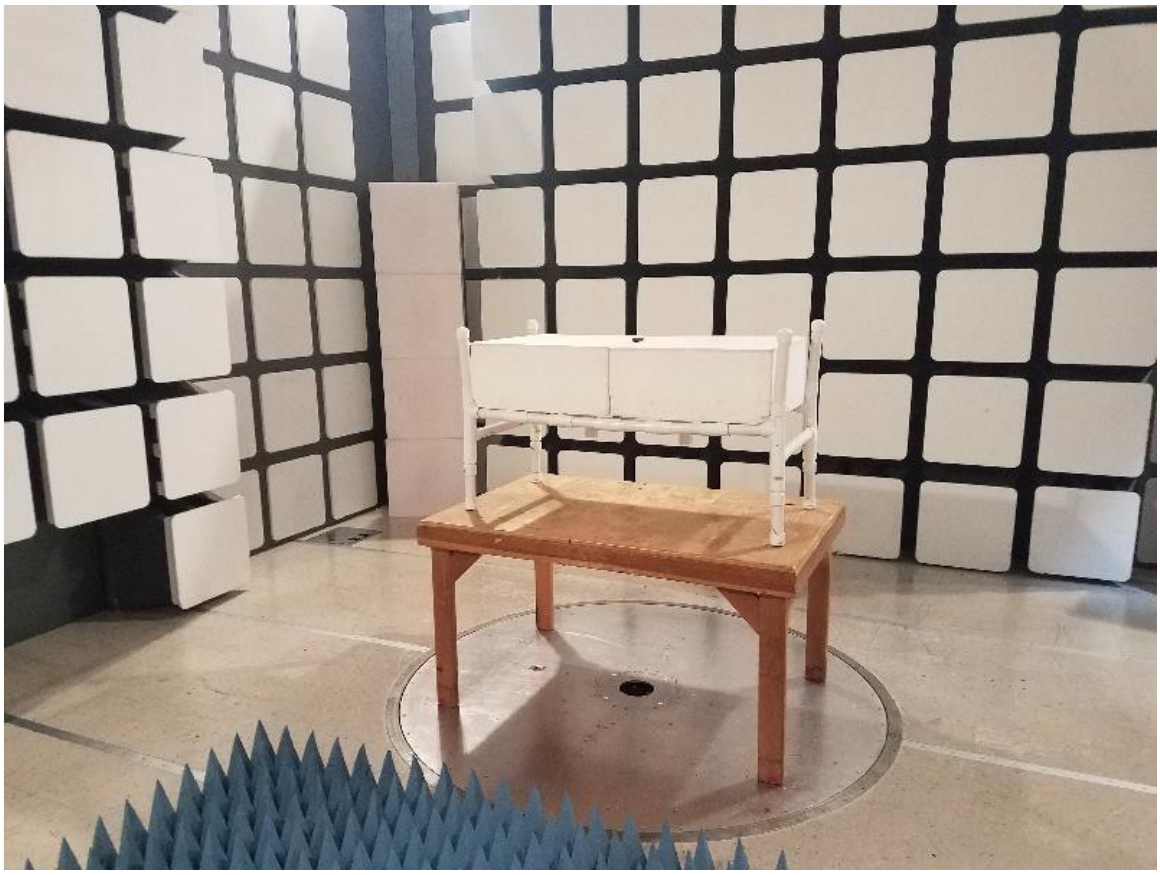
NORTEK SECURITY & CONTROL LLC
4-BUTTON KEY FOB REMOTE
MODEL: 2GIG-KEY2E-345
FCC SUBPART C - RADIATED EMISSIONS < 1GHz

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

REAR VIEW

NORTEK SECURITY & CONTROL LLC
4-BUTTON KEY FOB REMOTE
MODEL: 2GIG-KEY2E-345
FCC SUBPART C - RADIATED EMISSIONS < 1GHZ

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



FRONT VIEW

NORTEK SECURITY & CONTROL LLC
4-BUTTON KEY FOB REMOTE
MODEL: 2GIG-KEY2E-345
FCC SUBPART C - RADIATED EMISSIONS > 1GHZ

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

REAR VIEW

NORTEK SECURITY & CONTROL LLC
4-BUTTON KEY FOB REMOTE
MODEL: 2GIG-KEY2E-345
FCC SUBPART C - RADIATED EMISSIONS > 1GHZ

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

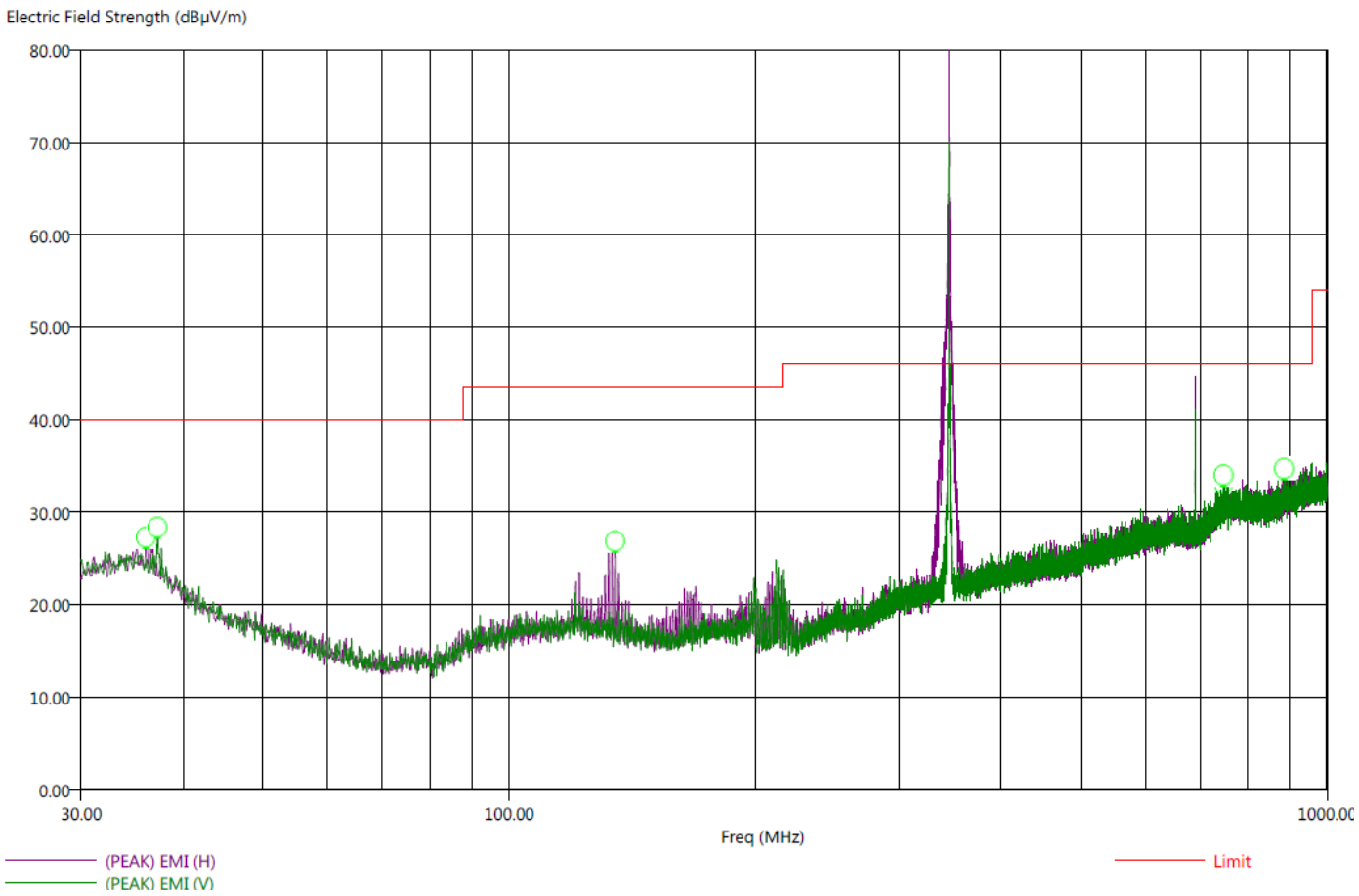
APPENDIX E

RADIATED EMISSIONS DATA SHEETS

Title: FCC 15.209
File: Radiated Pre-Scan 30-1000Mhz
Operator: Torey Oliver
EUT Type: 4-Button Key FOB Remote / 2GIG-KEY2E-345
EUT Condition: The EUT is constantly transmitting 345MHz.
Comments: Standalone Device
Temp: 71f
Hum: 36%
3VDC
Battery Powered

10/15/2018 10:45:37 AM
Sequence: Preliminary Scan

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



There were no radiated emissions other than harmonics found below 30 MHz or above 1GHz.
No additional emissions were found in standby mode.

Title: FCC 15.209 10/15/2018 1:24:15 PM
File: Radiated Final 30-1000Mhz Sequence: Final Measurements
Operator: Torey Oliver
EUT Type: 4-Button Key FOB Remote / 2GIG-KEY2E-345
EUT Condition: The EUT is constantly transmitting 345MHz.
Comments: Standalone Device
Temp: 71f
Hum: 36%
3VDC
Battery Powered

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

Freq (MHz)	Margin (dB)	(PEAK) EMI (dBµV/m)	Limit (dBµV/m)	Pol	Ttbl Agl (deg)	Twr Ht (cm)
36.00	-12.65	27.35	40	H	123.00	374.92
37.20	-11.56	28.44	40	V	336.25	400.05
134.90	-13.05	26.95	40	H	41.25	245.37
747.80	-11.91	34.09	46	V	211.50	304.05
747.90	-12.8	33.2	46	H	250.50	399.94
886.4	-11.3	34.7	46	V	360.00	390.26

There were no radiated emissions other than harmonics found below 30 MHz or above 1GHz.
No additional emissions were found in standby mode.

FUNDAMENTAL & HARMONICS

DATA SHEETS

FUNDAMENTAL FIELD STRENGTH

FCC 15.231

Company: Nortek Security & Control, LLC
EUT: 4-Button Key FOB Remote
Model: 2GIG-KEY2E-345
Duty Cycle Correction Factor: -17.23

Date: 10/16/2018
Lab: R
Tested By: Torey O.

Compatible Electronics, Inc. FAC-3

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table	Tower	Comments
345.00	91.32	H	97.26	-5.94	Peak	154.00	1.00	X-Axis
345.00	74.09	H	77.26	-3.17	Avg	154.00	1.00	X-Axis
345.00	72.15	V	97.26	-25.11	Peak	229.00	1.00	X-Axis
345.00	54.92	V	77.26	-22.34	Avg	229.00	1.00	X-Axis
345.00	84.30	H	97.26	-12.96	Peak	261.00	1.31	Z-Axis
345.00	67.07	H	77.26	-10.19	Avg	261.00	1.31	Z-Axis
345.00	87.39	V	97.26	-9.87	Peak	28.00	1.69	Z-Axis
345.00	70.16	V	77.26	-7.10	Avg	28.00	1.69	Z-Axis
345.00	85.28	H	97.26	-11.98	Peak	355.00	2.38	Y-Axis
345.00	68.05	H	77.26	-9.21	Avg	355.00	2.38	Y-Axis
345.00	88.53	V	97.26	-8.73	Peak	270.00	1.87	Y-Axis
345.00	71.30	V	77.26	-5.96	Avg	270.00	1.87	Y-Axis

HARMONICS - HORIZONTAL

FCC 15.231

Company: Nortek Security & Control, LLC
EUT: 4-Button Key FOB Remote
Model: 2GIG-KEY2E-345
Duty Cycle Correction Factor: -17.23

Date: 10/16/2018
Lab: R
Tested By: Torey O.

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
690.00	51.99	H	77.26	-25.27	Peak	1.32	301.00	
690.00	34.76	H	57.26	-22.50	Avg	1.32	301.00	
1035.00	47.95	H	73.97	-26.02	Peak	1.58	310.00	
1035.00	30.72	H	53.97	-23.25	Avg	1.58	310.00	
1380.00	--	H	73.97	--	Peak	--	--	No emissions found
1380.00	--	H	53.97	--	Avg	--	--	No emissions found
1725.00	60.74	H	77.26	-16.52	Peak	1.47	93.00	
1725.00	43.51	H	57.26	-13.75	Avg	1.47	93.00	
2070.00	64.99	H	77.26	-12.27	Peak	1.00	79.00	
2070.00	47.76	H	57.26	-9.50	Avg	1.00	79.00	
2415.00	65.06	H	77.26	-12.20	Peak	2.40	46.00	
2415.00	47.83	H	57.26	-9.43	Avg	2.40	46.00	
2760.00	54.60	H	73.97	-19.37	Peak	1.33	56.00	
2760.00	37.37	H	53.97	-16.60	Avg	1.33	56.00	
3105.00	65.14	H	77.26	-12.12	Peak	1.00	59.00	
3105.00	47.91	H	57.26	-9.35	Avg	1.00	59.00	
3450.00	67.00	H	77.26	-10.26	Peak	1.20	284.00	
3450.00	49.77	H	57.26	-7.49	Avg	1.20	284.00	

Test distance
3 meter

HARMONICS - VERTICAL

FCC 15.231

Company: Nortek Security & Control, LLC
EUT: 4-Button Key FOB Remote
Model: 2GIG-KEY2E-345
Duty Cycle Correction Factor: -17.23

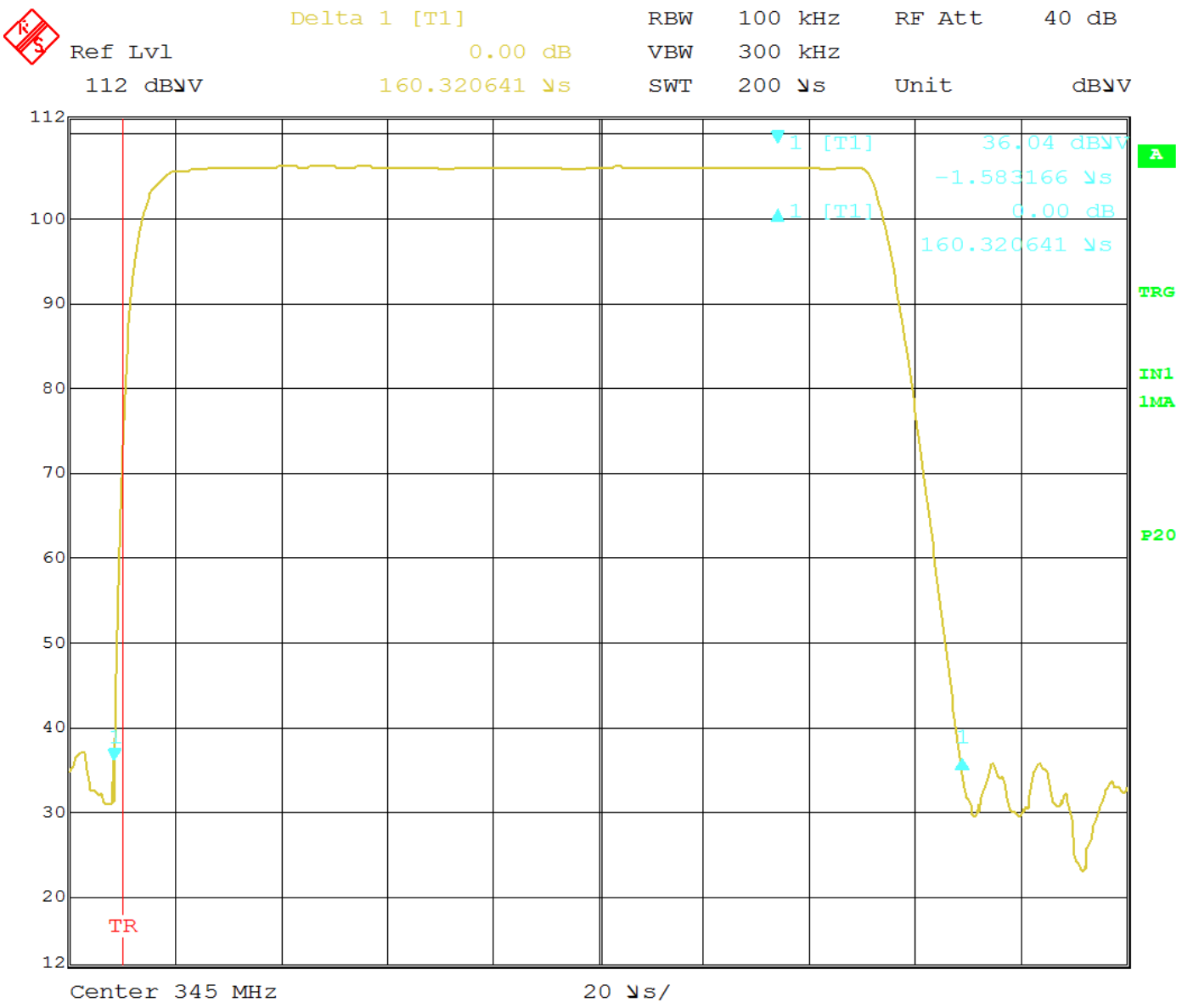
Date: 10/16/2018
Lab: R
Tested By: Torey O.

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
690.00	41.45	V	66.00	-24.55	Peak	2.43	201.00	
690.00	24.22	V	46.00	-21.78	Avg	2.43	201.00	
1035.00	42.77	V	73.98	-31.21	Peak	3.36	206.00	
1035.00	25.54	V	53.98	-28.44	Avg	3.36	206.00	
1380.00	--	V	73.98	--	Peak	--	--	No emissions found
1380.00	--	V	53.98	--	Avg	--	--	No emissions found
1725.00	51.13	V	77.26	-26.13	Peak	3.54	158.00	
1725.00	33.90	V	57.26	-23.36	Avg	3.54	158.00	
2070.00	56.62	V	77.26	-20.64	Peak	1.29	182.00	
2070.00	39.39	V	57.26	-17.87	Avg	1.29	182.00	
2415.00	54.78	V	77.26	-22.48	Peak	2.23	183.00	
2415.00	37.55	V	57.26	-19.71	Avg	2.23	183.00	
2760.00	51.65	V	73.98	-22.33	Peak	1.09	228.00	
2760.00	34.42	V	53.98	-19.56	Avg	1.09	228.00	
3105.00	55.45	V	77.26	-21.81	Peak	1.67	178.00	
3105.00	38.22	V	57.26	-19.04	Avg	1.67	178.00	
3450.00	59.46	V	77.26	-17.80	Peak	1.08	103.00	
3450.00	42.23	V	57.26	-15.03	Avg	1.08	103.00	

Test distance
3 meter

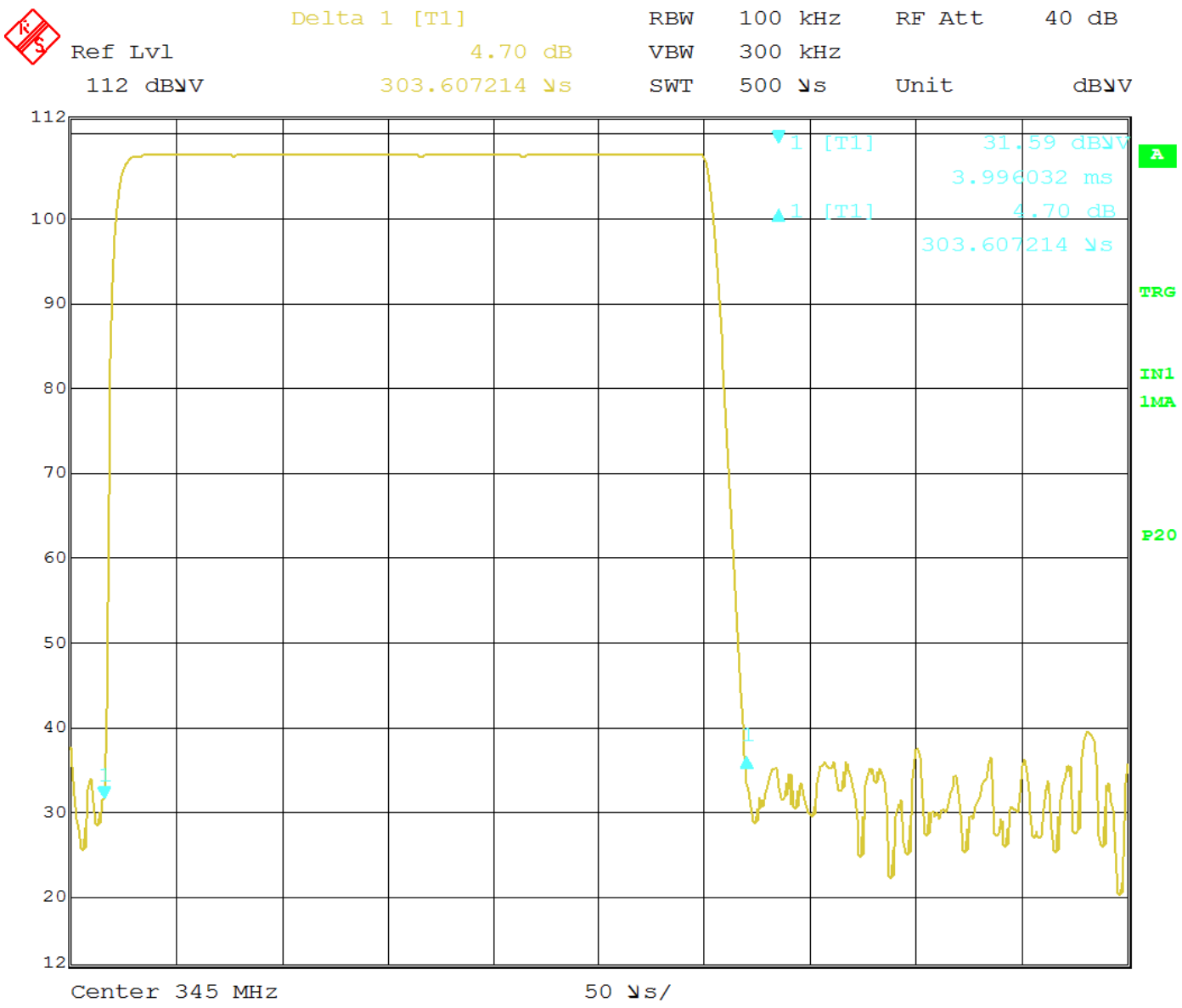
DUTY CYCLE PLOTS

DUTY CYCLE



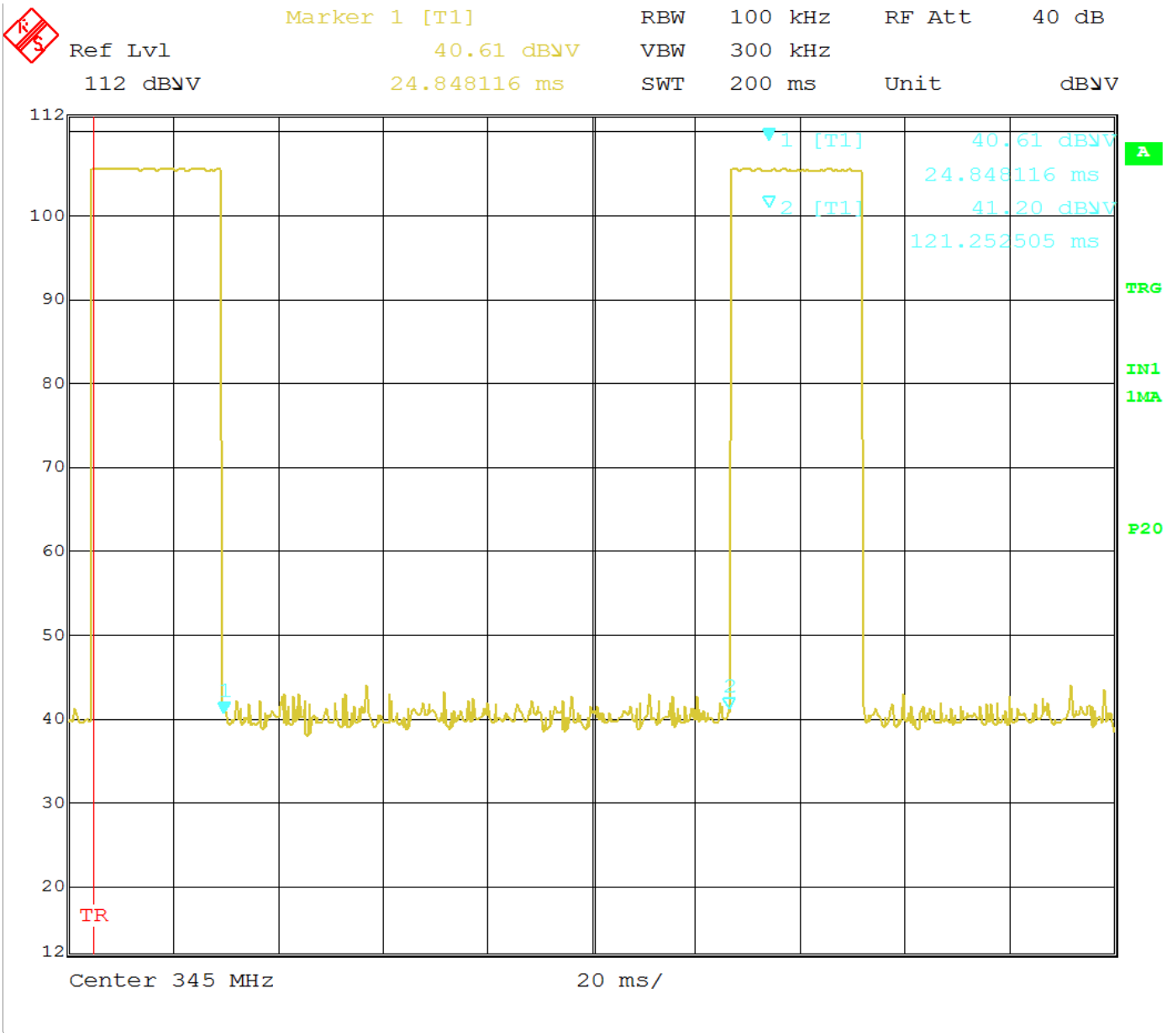
Time of Pulse Type 1 = 160.320641µs

DUTY CYCLE



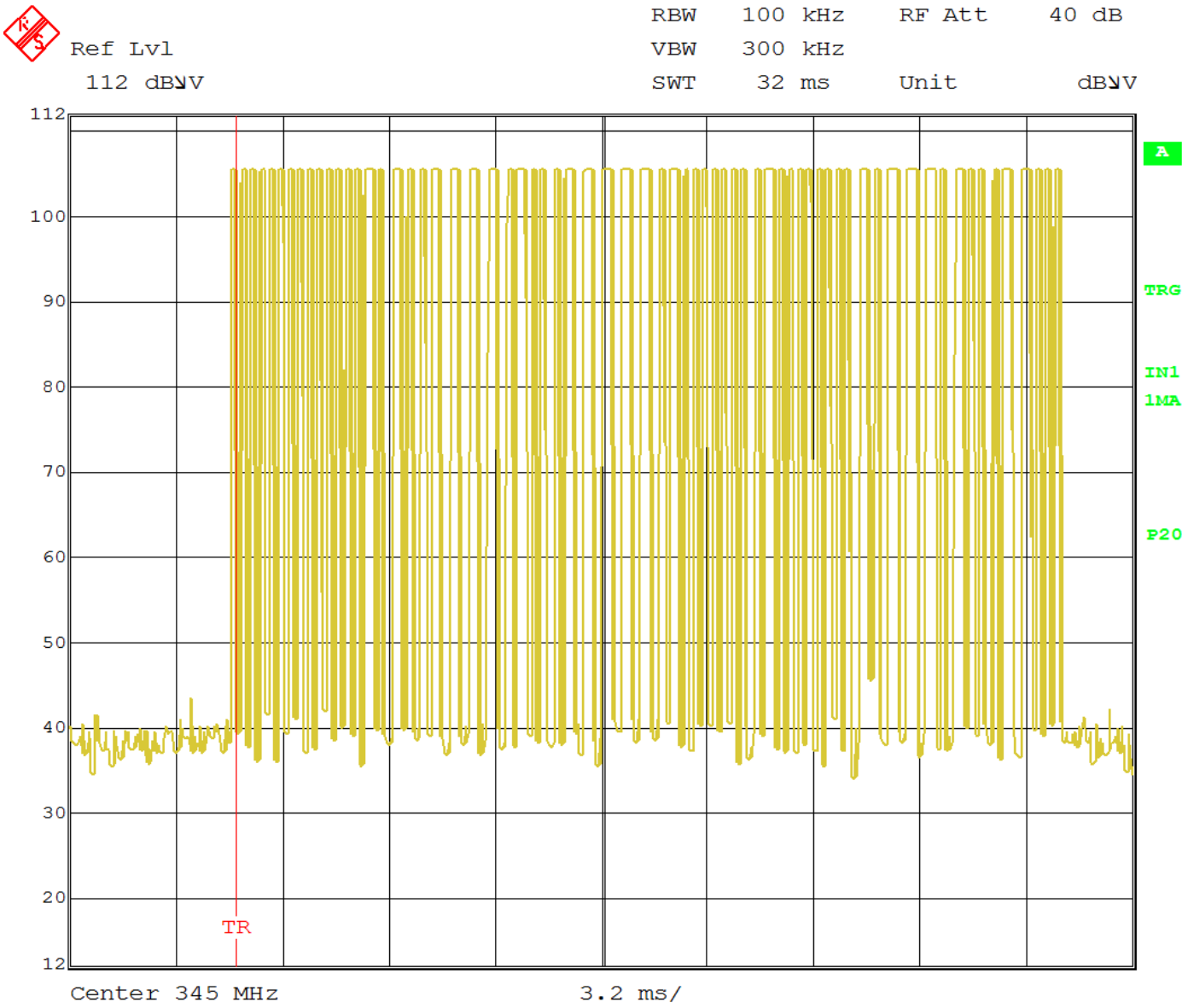
Time of Pulse Type 2 = 303.607214µs

DUTY CYCLE



Total On Time in a 100ms Span = 24.848116ms

DUTY CYCLE



Number of Pulses in Worst Case 100 mS = 67
Pulse Type 1 On Time = 160.320641µs*46 = 7374.749µs
Pulse Type 2 On Time = 303.607214µs*21 = 6375.751µs
7374.749µs+6375.751µs = 13.750ms
Duty Cycle = 13.750ms / 100ms = 0.1375
The Peak to Average Duty Cycle Correction = -17.23 dB
Maximum Duty Cycle Correction Allowed = -20.00 dB