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

for

PANIC BUTTON REMOTE
Model: 2GIG-PANIC1e-345

Prepared for

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DATE: July 12th, 2019

	REPORT BODY	APPENDICES					TOTAL
		A	*B*	*C*	*D*	*E*	
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GENERAL REPORT SUMMARY

This test report is pursuant to a class 2 permissive change on the subject device. Full re-testing was not performed, only those tests that were impacted by the change have been run in their entirety. See C2PC request exhibit regarding the details of the change.

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:	Panic Button Remote Model: 2GIG-PANIC1e-345 S/N: None
Product Description:	The Panic Button Remote is a compact, battery powered, wireless panic button that transmits an Emergency signal from any location within radio frequency (RF) range of the control panel. The signal can be transmitted to the control panel, whether the security system is armed or disarmed.
Modifications:	The EUT was not modified to comply with specifications.
Manufacturer:	Nortek Security & Control LLC 5919 Sea Otter Place Carlsbad, California 92010
Test Dates:	March 22, April 3, June 14 and 20, 2019

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Test Specifications Covered by Accreditation:

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	Duty Cycle	Recorded
2	Fundamental and harmonics, field strength measurements.	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.
These testes were the only tests performed as the change would not impact results of other tests. No Spurious emissions were found during investigation, new data was not collected as original data remains valid.		

1. PURPOSE

This document is a qualification test report based on the tests performed on the Panic Button Remote Model: 2GIG-PANIC1e-345. The measurements were performed according to the measurement procedure described in ANSI C63.10. The tests were performed in order to determine whether the results 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 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

Josh Hansen	Engineering Manager, Regulatory

Compatible Electronics, Inc.

Sam Kerckhoff	Test Engineer
Joey Madlangbayan	Product Safety Manager

2.4 Date Test Sample was Received

The test sample was received on March 22, 2019.

2.5 Disposition of the Test Sample

The test sample remains at the location of testing listed above.

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
FAR	Fully Anechoic Room
SAC	Semi-Anechoic Chamber
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	American National Standard for 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 of Procedures for Compliance Testing of Unlicensed Wireless Devices
RSS-GEN, Issue 5	General Requirements for Compliance of Radio Apparatus
RSS-210, Issue 9	Licence-Exempt Radio Apparatus: Category I Equipment

4. DESCRIPTION OF TEST CONFIGURATION

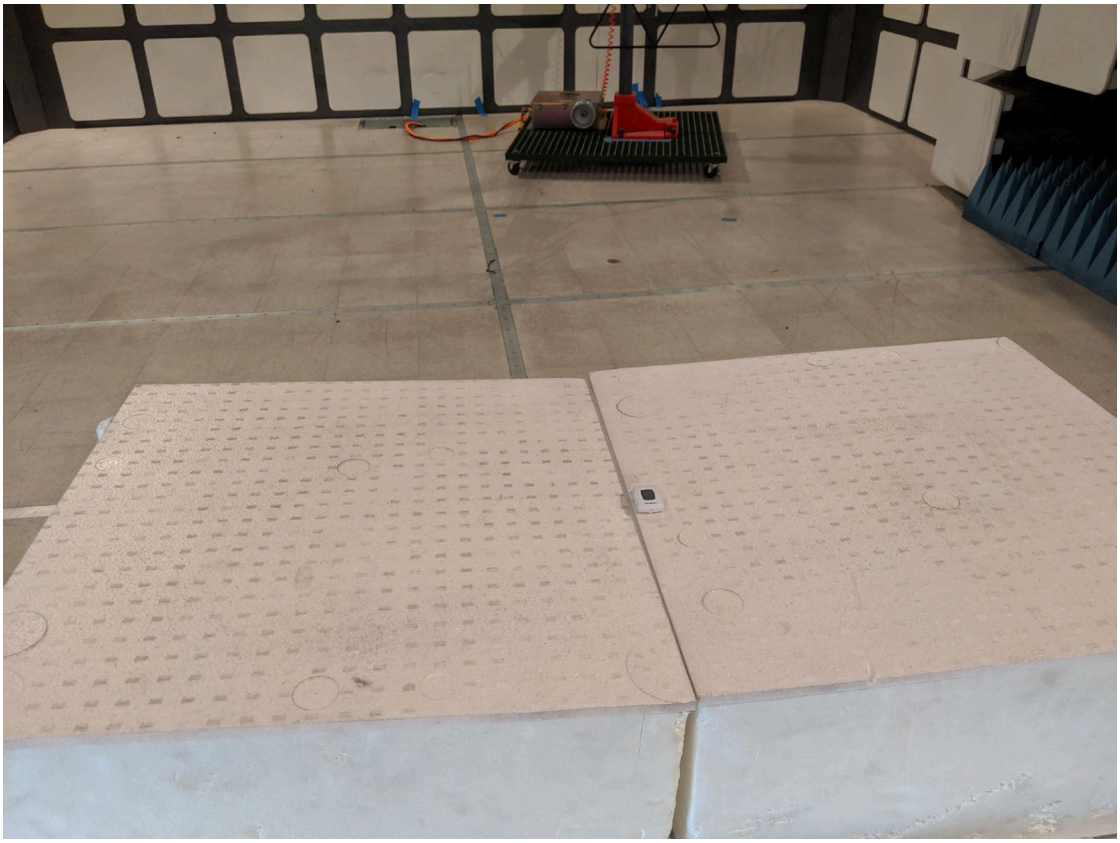
4.1 Description of Test Configuration

The Panic Button Remote Model: 2GIG-PANIC1e-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.

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)

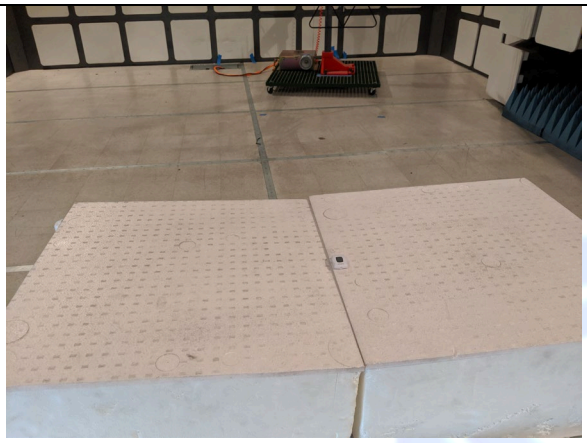
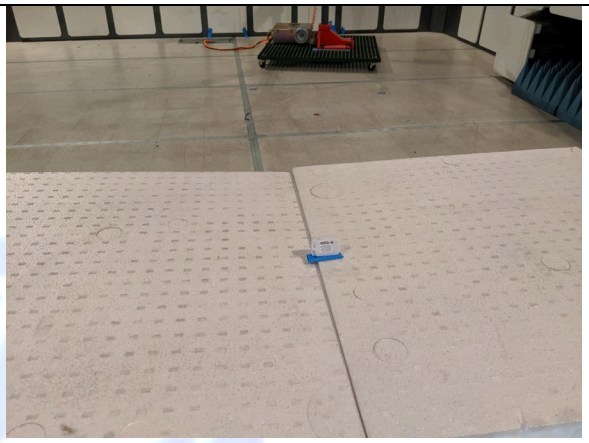
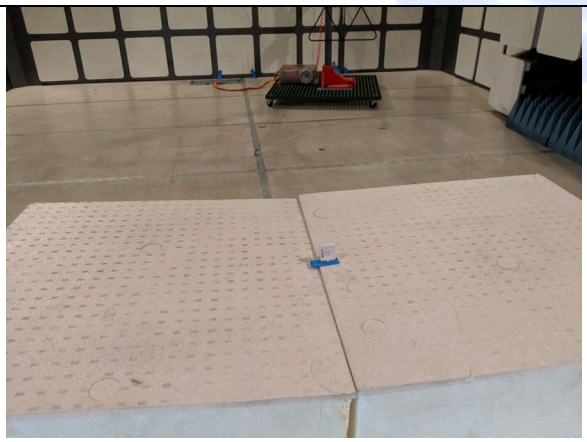


4.1.2 Cable Construction and Termination

The EUT has no cables.

4.1.3 Axis Orientation

A check was made to confirm that the emissions are at the highest when oriented in the X axis. Final data was taken in the X axis.

 X	 Y
 Z	

5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

5.1 EUT and Accessory List

#	EQUIPMENT TYPE	MANU-FACTURER	MODEL	S/N
1	PANIC BUTTON REMOTE (EUT)	Nortek Security & Control LLC	2GIG-PANIC1e-345	None

5.2 EMI Test Equipment

INSTRUMENTS USED	MANUFACTURER	MODEL NUMBER	ASSET#	CALIBRATION DATE	CALIBRATION CYCLE
Thermometer & Hygrometer	Control Company	4088	2741	2/20/2019	1 YEAR
Receiver, 20hz-40ghz	Rohde & Schwarz	ESIB40	5050	09/20/2018	1 YEAR
EMI Receiver	Keysight	N9038A	5551	02/05/2019	1 YEAR
Controller, Mast and Turntable	Sunol Sciences Corporation	SC104V	5032	N.C.R.	
Mast, Antenna Positioner	Sunol Sciences Corporation	TWR95.4	5033	N.C.R.	
Turntable	Sunol Sciences Corporation	FM2011VS	5034	N.C.R.	
Antenna, Active Loop	Com-Power	AL-130	5496	03/21/2019	2 YEARS
Antenna, CombiLog	Com-Power	AC-220	5511	03/12/2018	2 YEARS
Antenna, Horn Double Ridge	Com-Power	AH-118	5561	01/25/2019	2 YEARS
Pre-amp, Hi-Frequency	Com-Power	PAM-118A	5466	01/28/2019	1 YEAR
LISN, 15A 10kHz-30MHz	Com-Power	LI-215	5494	06/26/2018	1 YEAR
LISN, 15A, 10kHz-30MHz	Com-Power	LI-215	5554	06/26/2018	1 YEAR
Attenuator	Aeroflex/Weinschel	2-10	5211	10/03/2018	1 YEAR

5.3 Test Software

LAB(S)	SOFTWARE TITLE	MANUFACTURER	VERSION
P, R	Measurement and Automation Software	TDK TestLab	5.53

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 and facility diagrams.

6.2 EUT Mounting, Bonding and Grounding

For measurements up to 1GHz the EUT was mounted on a non-conductive surface 80 cm above the ground plane.

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. For FCC compliance the uncertainty is not considered only reported. U_{lab} is the expanded uncertainty of the lab

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

Measurement		U_{cispr}	$U_{lab} = 2\,u_c(y)$
Conducted disturbance (mains port)	(150 kHz – 30 MHz)	3.4 dB	2.88
Radiated disturbance (electric field strength on an open area test site or SAC)	(30 MHz – 1 000 MHz)	6.3 dB	4.04
Radiated disturbance (electric field strength in a FAR)	(1 GHz – 6 GHz)	5.2	3.67
Radiated disturbance (electric field strength in a FAR)	(6 GHz – 18 GHz)	5.5	3.67

7. CHARACTERISTICS OF THE TRANSMITTER

7.1 Channel Number and Frequencies

The EUT has one operating channel and the EUT has OOK modulation. The EUT has a fixed output power.

1 == 345 MHz

7.2 Antenna

The antenna is a trace antenna.

7.3 EUT Test Software

PN: unspecified

Date: 09/07/2016

Location: Nortek Security & Control LLC5919 Sea Otter Place, Carlsbad, California 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 test was not performed, The EUT is battery powered only.*

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 (Fundamental 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:

No emissions found.

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 in Appendix E. This data also shows compliance at the band edges. A duty cycle correction factor was applied to the fundamental and any harmonic above 1 GHz, see Appendix E for plots.

Duty Cycle Correction Factor = -18.61

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

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 = 21 * 0.2645 mS = 5.555 mS

Pulse Type 2 = 46 * 0.1343 mS = 6.178 mS

5.555 mS + 6.178 mS = 11.73 mS

Total on Time = 11.73 mS

11.73 / 100 mS = 0.1173

20 log (0.117) = **-18.61 dB correction factor**

Max Duty Cycle Correction Factor = -20.00 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 (Occupied) bandwidth was checked using the EMI Receiver in the spectrum analyzer mode to see that the emissions were wholly within 0.25% of the operating frequency centered on the fundamental frequency. The RBW was set to 1-5% of the -20dB bandwidth and the VBW was set to approximately three times the RBW. The span was set to between two and five times the occupied bandwidth. A Plot of the -20 dB bandwidth is located in Appendix E.

Test Results:

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 the 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 set to between two and five times the occupied bandwidth. A Plot of the Occupied Bandwidth is in Appendix E.

Test Results:

The EUT complies with the requirements of RSS-210 for the 99% bandwidth of the fundamental. The EUT has a 99% bandwidth that is wholly within the 0.25% of the operating frequency centered on the fundamental frequency.

9. TEST PROCEDURE DEVIATIONS

The test procedures were not deviated from the standards throughout all tests.

10. CONCLUSIONS

The Panic Button Remote Model: 2GIG-PANIC1e-345 meets all of the 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."

ISED# 2154C

APPENDIX B

MODIFICATIONS TO THE EUT

MODIFICATIONS TO THE EUT

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	PANIC BUTTON REMOTE MODEL: 2GIG-PANIC1e-345 FCC ID: WDQ-PAN1345

No additional models were tested.

APPENDIX D

DIAGRAMS, CHARTS, AND PHOTOS

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

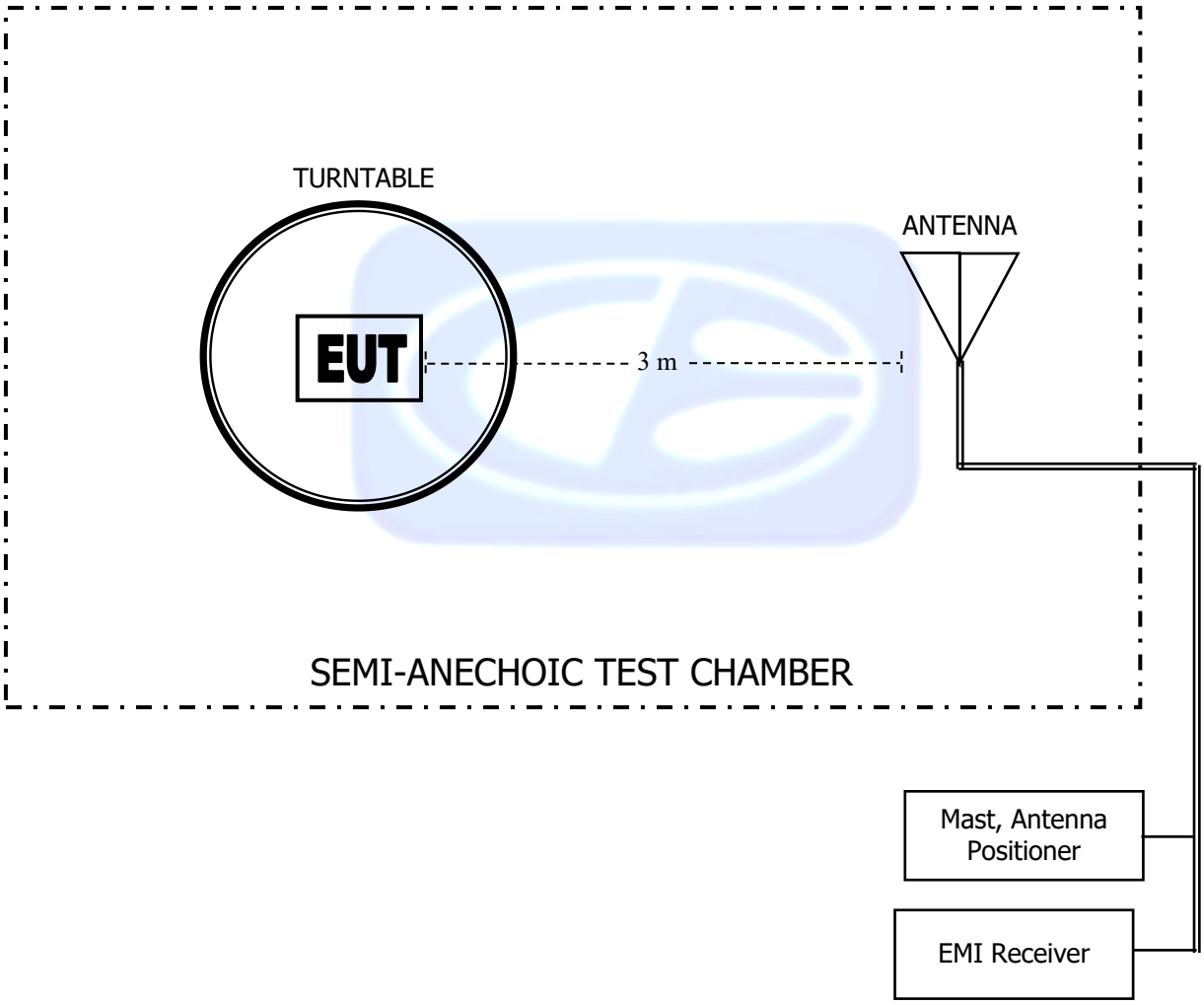
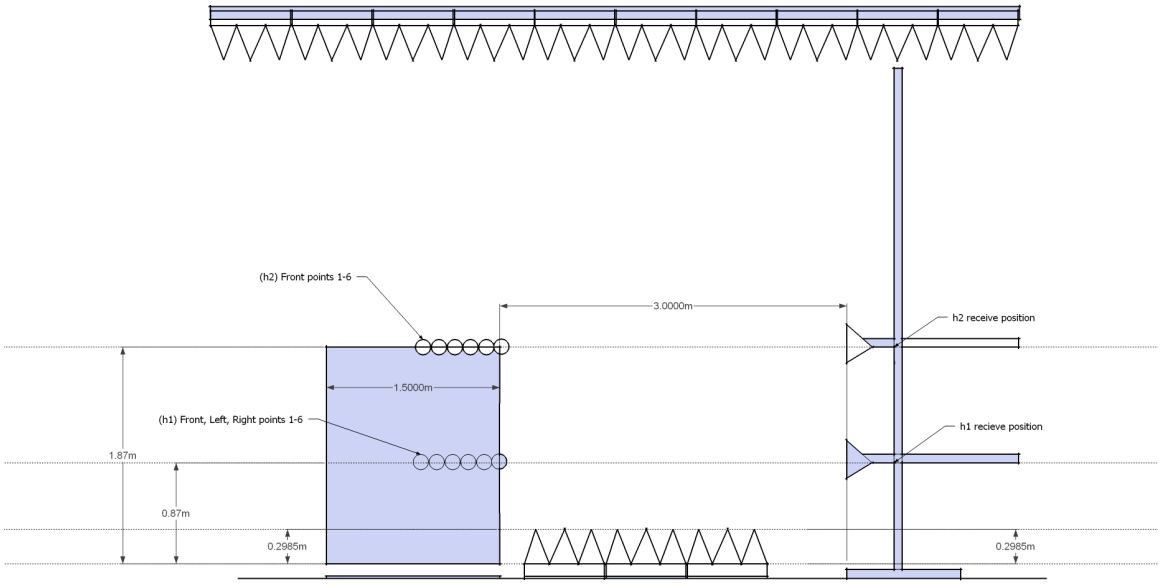


FIGURE 2: PLOT MAP AND LAYOUT OF TEST SITE ABOVE 1GHZ



COM-POWER AL-130

ACTIVE LOOP ANTENNA

ASSET# 5496

CALIBRATION DUE: MARCH 21, 2021

FREQUENCY (MHz)	FACTOR E FIELD (dB)	FACTOR H FIELD (dB)	FREQUENCY (MHz)	FACTOR E FIELD (dB)	FACTOR H FIELD (dB)
0.10	14.1	-37.3	11.00	14.9	-36.5
0.20	14.1	-37.3	12.00	14.9	-36.5
0.30	14.0	-37.4	13.00	14.8	-36.7
0.40	14.0	-37.4	14.00	14.7	-36.8
0.50	14.2	-37.2	15.00	14.6	-36.9
0.60	14.2	-37.2	16.00	14.6	-36.9
0.70	14.2	-37.2	17.00	14.6	-36.8
0.80	14.2	-37.2	18.00	14.8	-36.7
0.90	14.3	-37.2	19.00	14.9	-36.5
1.00	14.5	-36.9	20.00	14.9	-36.5
2.00	14.6	-36.9	21.00	14.7	-36.8
3.00	14.6	-36.9	22.00	14.3	-37.2
4.00	14.7	-36.8	23.00	13.8	-37.6
5.00	14.6	-36.8	24.00	13.4	-38.1
6.00	14.6	-36.9	25.00	13.1	-38.4
7.00	14.6	-36.9	26.00	13.0	-38.5
8.00	14.6	-36.8	27.00	13.1	-38.4
9.00	14.6	-36.9	28.00	13.2	-38.3
10.00	14.9	-36.6	30.00	13.0	-38.4

COM-POWER AC-220

LAB R - COMBILOG ANTENNA

ASSET#: 5511

CALIBRATION DUE: MARCH 12, 2020

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	22.5	**180**	15.0
35	22.5	**200**	14.6
40	23.0	**250**	16.5
45	21.5	**300**	18.1
50	21.3	**350**	15.6
60	18.2	**400**	19.4
70	13.2	**500**	20.6
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	15.2	**1000**	28.5
160	13.3		

COM-POWER AH-118

HORN ANTENNA

ASSET #: 5561

CALIBRATION DUE JANUARY 25, 2021

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
1000	23.85	**9500**	38.75
1500	25.34	**10000**	38.85
2000	28.02	**10500**	38.84
2500	28.87	**11000**	39.05
3000	30.01	**11500**	39.60
3500	30.70	**12000**	39.87
4000	31.64	**12500**	40.16
4500	32.85	**13000**	40.17
5000	34.25	**13500**	40.59
5500	34.61	**14000**	40.63
6000	35.02	**14500**	40.55
6500	35.43	**15000**	42.53
7000	36.68	**15500**	40.85
7500	37.52	**16000**	41.28
8000	37.91	**16500**	41.35
8500	37.60	**17000**	41.43
9000	37.91	**17500**	42.50
		18000	43.51

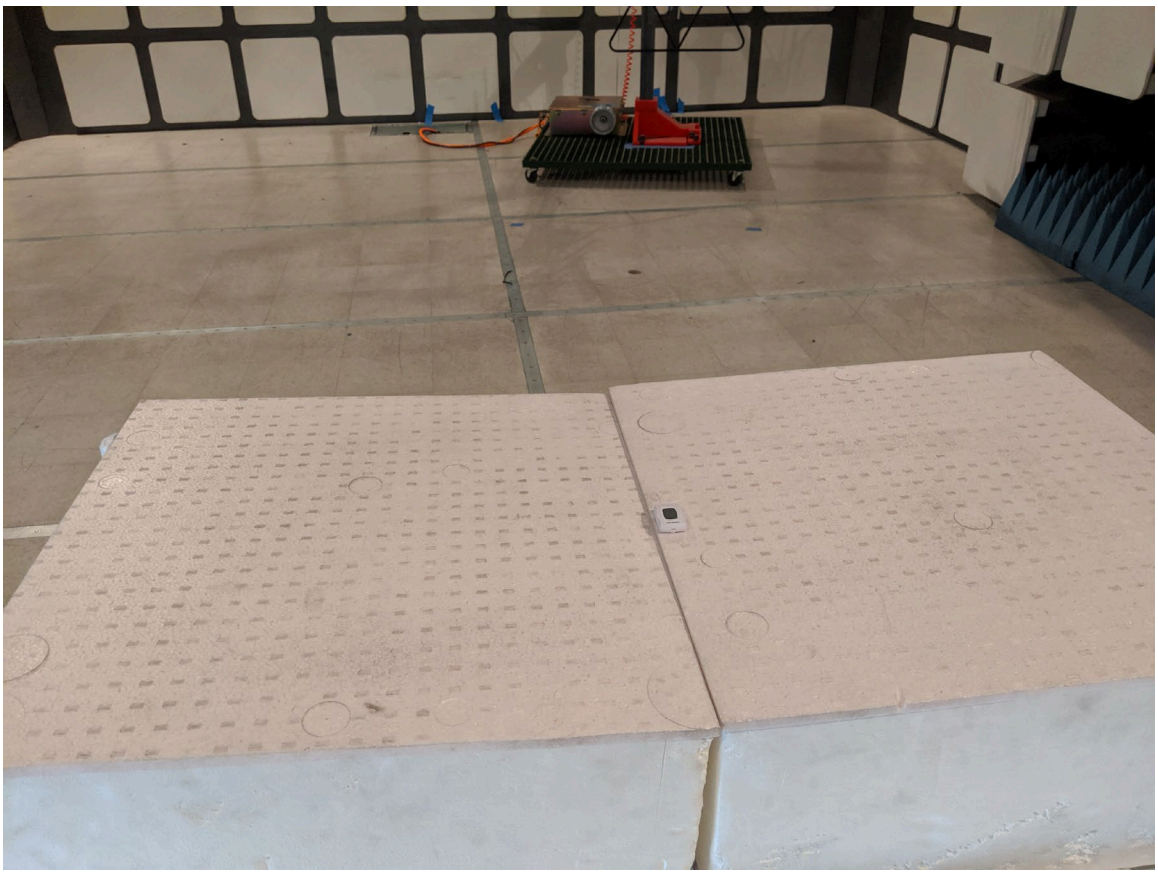
COM-POWER PAM-118A

1-18GHz - PREAMPLIFIER

Asset# 5466

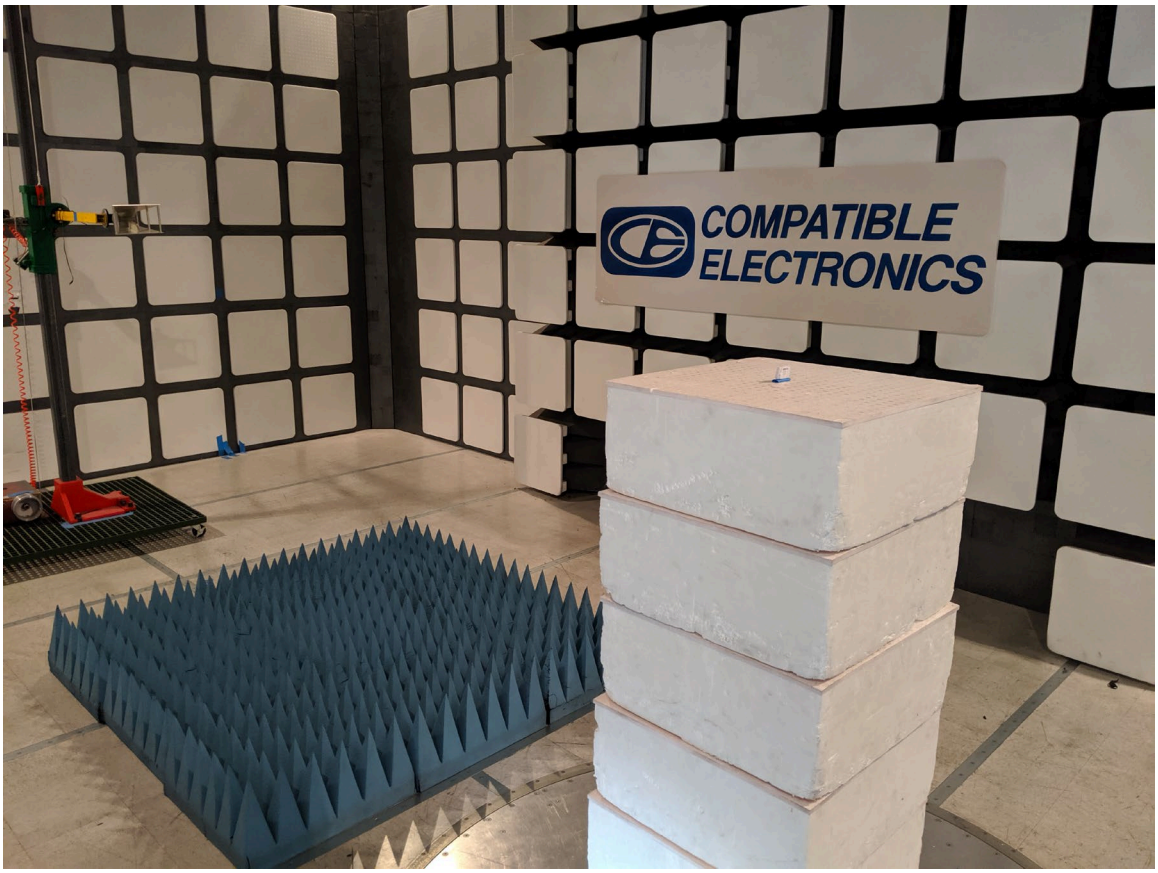
CALIBRATION DUE: JANUARY 28, 2020

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
500	39.72	**6000**	41.30
600	39.79	**6500**	41.26
700	40.15	**7000**	41.64
800	40.21	**7500**	42.12
900	39.96	**8000**	42.05
1000	40.36	**8500**	41.23
1250	40.62	**9000**	41.24
1500	40.79	**9500**	42.67
1750	41.02	**10000**	42.51
2000	41.33	**10500**	41.48
2250	41.51	**11000**	41.26
2500	41.72	**11500**	41.37
2750	42.00	**12000**	41.45
3000	42.29	**12500**	40.97
3250	42.47	**13000**	40.60
3500	42.58	**13500**	40.32
3750	42.65	**14000**	40.44
4000	42.66	**14500**	40.79
4250	42.51	**15000**	40.89
4500	42.31	**15500**	41.36
4750	42.16	**16000**	41.39
5000	42.01	**16500**	41.09
5250	41.84	**17000**	40.37
5500	41.72	**17500**	39.70
5750	41.53	**18000**	39.63



NORTEK SECURITY & CONTROL LLC
PANIC BUTTON REMOTE
MODEL: 2GIG-PANIC1e-345
FCC SUBPART C - RADIATED EMISSIONS < 1GHZ

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



NORTEK SECURITY & CONTROL LLC
PANIC BUTTON REMOTE
MODEL: 2GIG-PANIC1e-345
FCC SUBPART C - RADIATED EMISSIONS > 1GHZ

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

APPENDIX E

RADIATED EMISSIONS DATA SHEETS

FUNDAMENTAL & HARMONICS

DATA SHEETS

FUNDAMENTAL & HARMONIC FIELD STRENGTH

FCC 15.231								
					Date: 6/14/19			
Wireless Sensor								
Model: 2GIG-PANIC1-345					DC %		11.73%	
FCC ID: WDQ-PAN1345					DC Correction		-18.61	
Harmonics - Low Channel								
Transmit Mode - X-Axis								
Freq. (MHz)	**pk Level (dBuV/m)**	**Avg. Level (dBuV/m)**	**Pol (v/h)**	**pk Limit**	**Avg. Limit**	**pk Margin**	**Avg. Margin**	**Comments**
345.00	72.01	53.40	V	97.26	77.26	-25.25	-23.86	**X-axis**
345.00	90.40	71.79	H	97.26	77.26	-6.86	-5.47	**(dBuV/m original peak)**
345.00	87.04	68.43	V	97.26	77.26	-10.22	-8.83	**Y-axis**
345.00	84.42	65.81	H	97.26	77.26	-12.84	-11.45	**(dBuV/m original peak)**
345.00	87.43	68.82	V	97.26	77.26	-9.83	-8.44	**Z-axis**
345.00	85.01	66.40	H	97.26	77.26	-12.25	-10.86	**(dBuV/m original peak)**
690.00	38.15	19.54	V	77.26	57.26	-39.11	-37.72	**X-axis worst case**
690.00	50.24	31.63	H	77.26	57.26	-27.02	-25.63	**(dBuV/m original peak)**
								No Emissions found
								above 1 GHz

DUTY CYCLE PLOTS

DUTY CYCLE

FCC 15.231

Company:	Nortek Security & Control	Date:	6/14/2019
EUT:	2GIG-PANIC1e-345	Lab:	R
FCC ID:	WDQ-PAN1345	Test ENG:	Sam Kerckhoff

One Period (ms)	Pulse 1 (ms)	Pulse 1 (count)	Pulse 2 (ms)	Pulse 2 (count)	Duty Cycle	correction
100	0.2645	21	0.1343	46	11.73%	-18.61

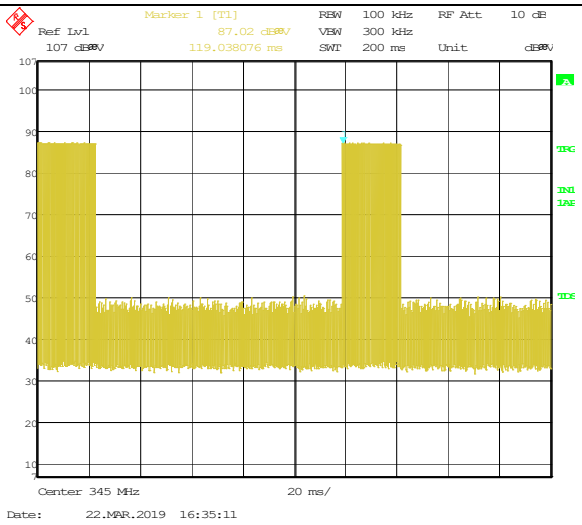


Figure 1 Pulse Train >100ms

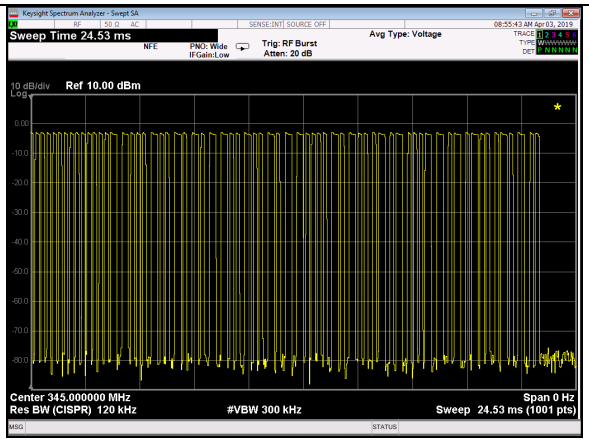


Figure 2 Sum by Pulse Type

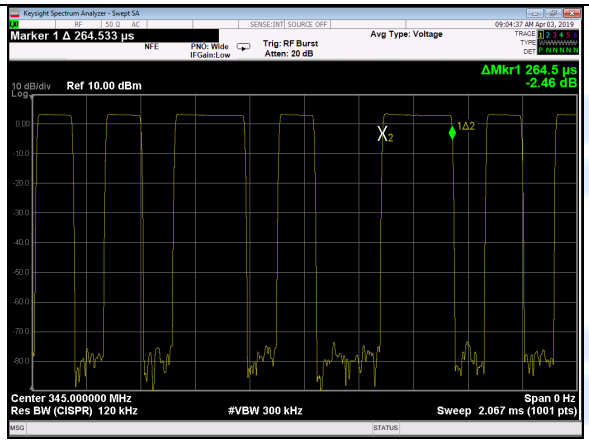


Figure 3 Large Pulse Duration

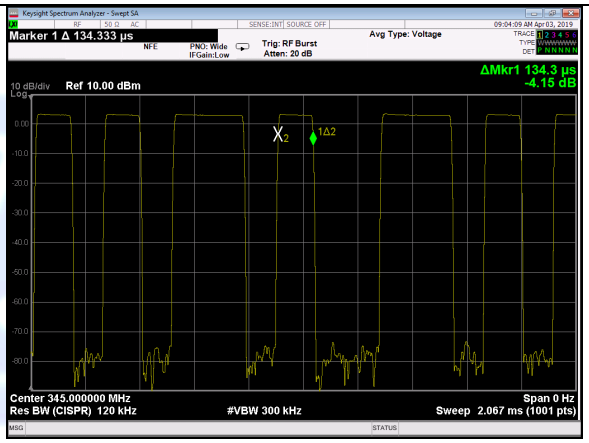
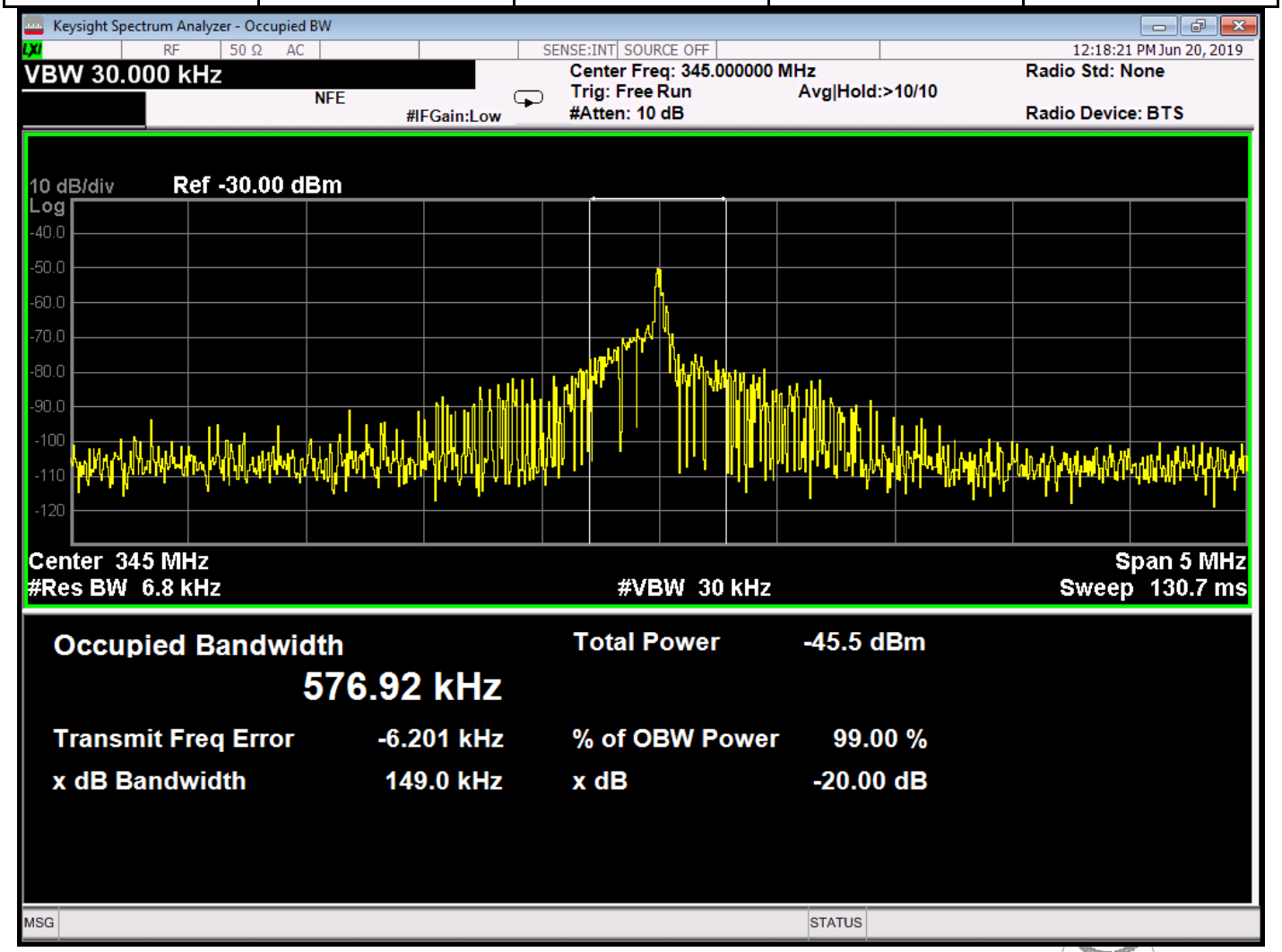


Figure 4 Small Pulse Duration

-20 dB & Occupied Bandwidth DATA

-20dB & 99% BANDWIDTHS

FCC 15.231

Company:	Nortek	Date:	6/20/19
EUT:	Panic Button Remote	Lab:	R
Model:	2GIG-PANIC1e-345	Tested By:	Sam Kerckhoff

Freq. (MHz)	Bandwidth (kHz)	Limit (kHz)		Comments
345.00	149	862.50		-20dB
345.00	576.92	862.50		99%