

**FCC PART 15 SUBPART B & SUBPART C SECTION 15.231, RSS 210 and RSS GEN
TEST REPORT***for***WIRELESS SECURITY SENSOR
Model: Door/Window**

Prepared for

LUNA PRODUCTS, LLC
3145 TIGER RUN COURT #110
CARLSBAD, CA 92010

Prepared by: _____

HOWARD HUANG

Approved by: _____

JOEY MADLANGBAYAN

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

DATE: FEBRUARY 28, 2020

	REPORT BODY	APPENDICES					TOTAL
		A	B	C	D	E	
PAGES	21	2	2	2	10	17	54

This report shall not be reproduced except in full, without the written approval of
Compatible Electronics, Inc



TABLE OF CONTENTS

Section / Title	PAGE
GENERAL REPORT SUMMARY	4
SUMMARY OF TEST RESULTS	5
1. PURPOSE	6
1.1 Decision Rule & Risk	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
4.1.1 Photograph Test Configuration	9
4.1.1.1 Photograph Test Configuration (continued)	10
4.1.1.2 Photograph Test Configuration (continued)	11
4.1.1.3 Photograph Test Configuration (continued)	12
4.1.2 Cable Construction and Termination	13
5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT	14
5.1 EUT and Accessory List	14
5.2 Emissions Test Equipment	15
6. TEST SITE DESCRIPTION	16
6.1 Test Facility Description	16
6.2 EUT Mounting, Bonding and Grounding	16
6.3 Facility Environmental Characteristics	16
6.4 Measurement Uncertainty	16
7. CHARACTERISTICS OF THE TRANSMITTER	17
7.1 Channel Number and Frequencies	17
7.2 Antenna	17
7.3 Software	17
8. TEST PROCEDURES	18
8.1 RF Emissions	18
8.1.1 Conducted Emissions Test	18
8.1.2 Radiated Emissions (Spurious and Harmonics) Test	19
8.1.3 Fundamental Field Strength	20
8.1.4 Transmission Timeout	20
8.1.5 99% Occupied and 20 dB Bandwidth	20
9. TEST PROCEDURE DEVIATIONS	21
10. CONCLUSIONS	21

LIST OF APPENDICES

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

LIST OF FIGURES

FIGURE	TITLE
1	Plot Map and Layout of Test Site Below 1GHz
2	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 except in full, without the written permission of Compatible Electronics.

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

Device Tested: Wireless Security Sensor
Model: Door/Window
S/N: None

Product Description: The EUT is a battery-powered wireless door/window sensor.
(Clock frequencies are 32.768 kHz and 16 MHz
Dimensions: 2.1" x 1" x 0.41",)

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

Manufacturer: Luna Products, LLC
3145 Tiger Run Court #110
Carlsbad, CA 92010

Test Dates: February 26-27 and April 29, 2020



Test Specifications Covered by Accreditation:

EMI requirements

CFR Title 47, Part 15 Subpart B Sections 15.109, Subpart C Sections 15.205, 15.209, 15.231, RSS 210, Issue 10 (December 2019), and RSS Gen, Issue 5 Amendment 1 (March 2019)

Test Procedure: ANSI C63.4: 2014 & C63.10: 2013

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 – 3.45 GHz.	Complies with the limits of RSS-210, RSS-GEN, CFR Title 47 Part 15 Subpart B Section 15.109 & Subpart C Section 15.205, 15.209, & 15.231
3	99% and 20 dB Bandwidths	Complies with the limits of RSS-210, RSS-GEN, CFR Title 47 Part 15 Subpart C Section 15.231
4	Duty Cycle Plot	Complies with the limits of RSS-210, RSS-GEN, CFR Title 47 Part 15 Subpart C Section 15.231
5	Transmission Time Out	Complies with the limits of RSS-210, RSS-GEN, CFR Title 47 Part 15 Subpart C Section 15.231

1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the Wireless Security Sensor Model: Door/Window. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4: 2014 and C63.10: 2013. 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 RSS 210, Issue 10 (December 2019), and RSS Gen, Issue 5 Amendment 1 (March 2019), and the Code of Federal Regulations Title 47, Part 15 Subpart B sections, 15.109, & Part 15 Subpart C sections 15.205, 15.209 and 15.231.

1.1 Decision Rule & Risk

If a measured value exceeds a specification limit it implies non-compliance. If the value is below a specification limit it implies compliance. Measurement uncertainty of the laboratory is reported with all measurement results but generally not taken into consideration unless a standard, rule or law requires it to be considered.

Qualification test reports are only produced for products that are in compliance with the test requirements, therefore results are always in conformity. Otherwise, an engineering report or just the data is provided to the customer.

When performing a measurement and making a statement of conformity, in or out-of-specification to manufacturer's specifications or Pass/Fail against a requirement, there are two possible outcomes:

- The result is reported as conforming with the specification
- The result is reported as not conforming with the specification

The decision rule is defined below.

When the test result is found to be below the limit but within our measurement uncertainty of the limit, it is our policy that the final acceptance decision is left to the customer, after discussing the implications and potential risks of the decision.

When the test result is found to be exactly on the specification, it is our policy, in the case of unwanted emissions measurements to consider the result non-compliant, however, the final decision is left to the customer, after discussing the implications and potential risks of the decision.

When the test result is found to be over the specification limit under any condition, it is our policy to consider the result non-compliant.

In terms of uncertainty of measurement, the laboratory is a calibrated and tightly controlled environment and generally exceptionally stable, the measurement uncertainties are evaluated without the consideration of the test sample. When it comes to the test sample however, as most testing is performed on a single sample rather than a sample population, and that sample is often a pre-production representation of the final product, that test sample represents a significantly higher source of measurement uncertainty. We advise our customers of this and that when in doubt (small test to limit margins), they may wish to perform statistical sampling on a population to gain a higher confidence in the results. All lab reported results are that of a single sample in any event.

2. ADMINISTRATIVE DATA

2.1 Location of Testing

The emissions 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

Luna Products, LLC

Robert Reichert

Sr. Regulatory & Test Engineer

Compatible Electronics, Inc.

Joey Madlangbayan

Product Safety Manager

Howard Huang

Test Technician

2.4 Date Test Sample was Received

The test sample was received on February 26, 2020 as described in the Product Description.

2.5 Disposition of the Test Sample

The test sample remains at Compatible Electronics, Inc. during testing.

2.6 Abbreviations and Acronyms

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

RF	Radio Frequency
EMI	Electromagnetic Interference
EMC	Electromagnetic Compatibility
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
NCR	No Calibration Required
PSU	Power Supply Unit

3. APPLICABLE DOCUMENTS

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

SPEC	TITLE
RSS 210, Issue 10 (December 2019)	License-exempt Radio Apparatus (All Frequency Bands): Category I Equipment
RSS GEN, Issue 5 Amendment 1 (March 2019)	General Requirements for Compliance of Radio Apparatus
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

4. DESCRIPTION OF TEST CONFIGURATION

4.1 Description of Test Configuration

The Wireless Security Sensor Model: Door/Window (EUT) was setup in a tabletop configuration. The EUT was tested in a standalone and in the NC input configurations. The EUT was setup in the following configuration seen in the image below.

The EUT was checked in the x-axis, y-axis, and z-axis. The EUT was tested with a full battery. The worst case orientation was deemed to be the y-axis in the NC input configuration. The EUT was continuously transmitting a data stream during testing and it was determined to be the worst case operating mode for emissions.

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



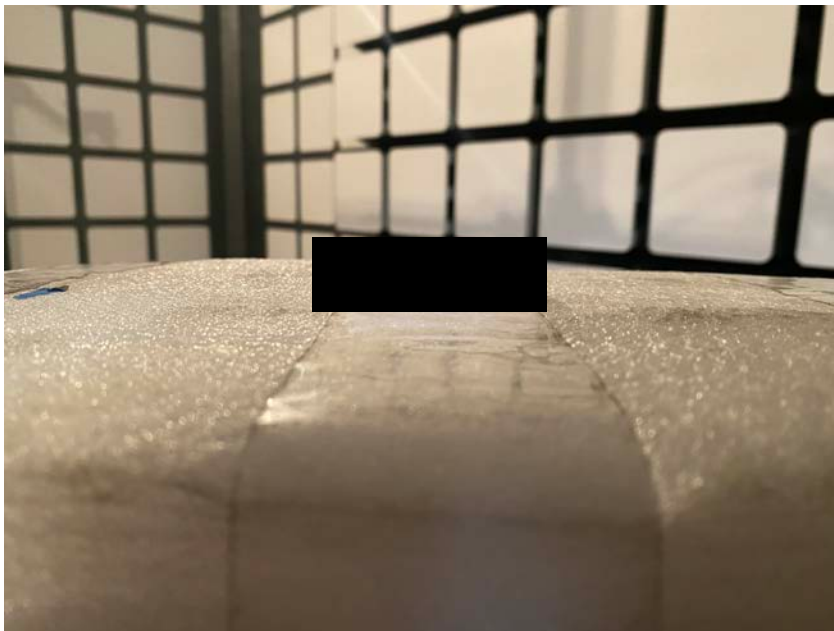
ANSI C63.4 (Box indicates position of EUT)

4.1.1.1 Photograph Test Configuration (continued)

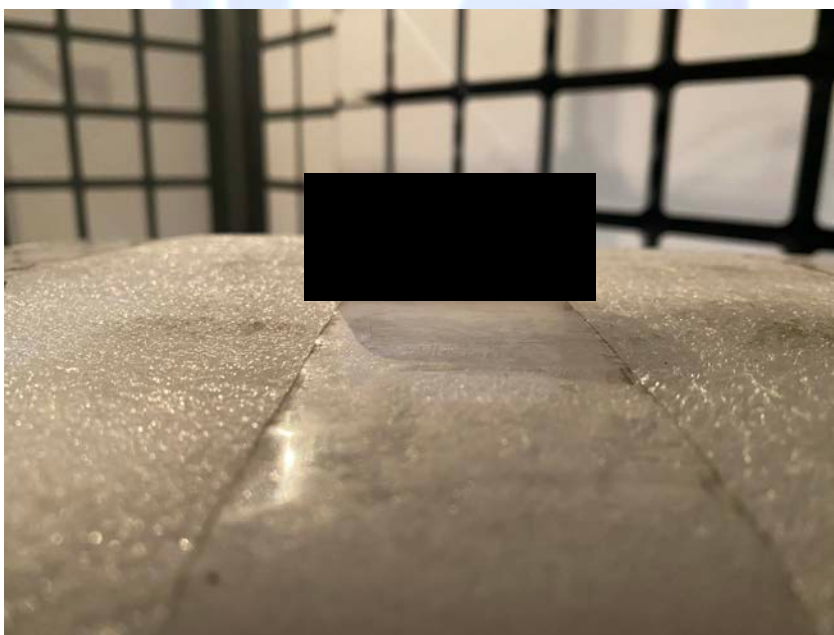


ANSI C63.10 (Box indicates position of EUT)

4.1.1.2 Photograph Test Configuration (continued)

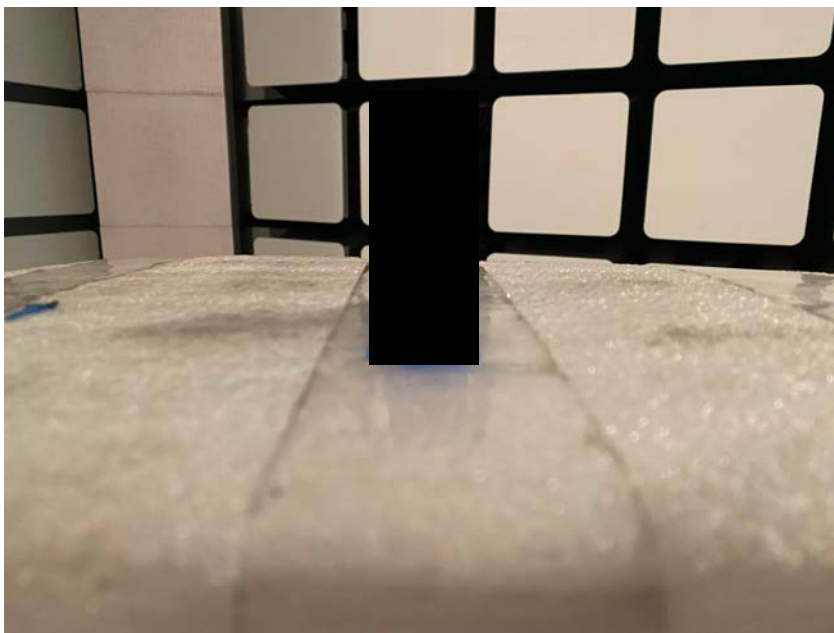


x-axis



y-axis

4.1.1.3 Photograph Test Configuration (continued)



z-axis

4.1.2 Cable Construction and Termination

Cables 1-2

These are 1 meter, unshielded, round cables that connect the EUT to an External Switch. The cables are hardwired at both ends.



5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT**5.1 EUT and Accessory List**

#	EQUIPMENT TYPE	MANUFACTURER	MODEL	SERIAL NUMBER
1	WIRELESS SECURITY SENSOR	LUNA PRODUCTS, LLC	DOOR/WINDOW	P/N: LP.DW02.345
2	EXTERNAL SWITCH	GENERIC	GENERIC	S/N: NONE



5.2 Emissions Test Equipment

EQUIPMENT TYPE	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
Thermometer & Hygrometer	Davis Instruments	6312C	NONE	09/20/2018	09/20/2021
Computer	Compatible Electronics	NONE	NONE	NCR	NCR
EMI Receiver	Rohde & Schwarz	ESIB40	100172	03/22/2019	03/22/2020
EMI Receiver	Keysight Technologies	N9038A	MY56400077	06/20/2019	06/20/2020
Antenna, Loop	Com-Power	AL-130	121049	03/21/2019	03/21/2021
Antenna, CombiLog	Com-Power	AC-220	10030000	04/05/2019	04/05/2021
Antenna, Horn 1-18GHz	Com-Power	AH-118	10050074	07/19/2019	07/19/2021
Mast, Antenna Positioner	Sunol Science Corporation	TWR 95-4	081309-3	NCR	NCR
Turntable	Sunol Science Corporation	FM 2001VS	N/A	NCR	NCR
Mast and Turntable Controller	Sunol Science Corporation	SC104V	081309-1	NCR	NCR



6. TEST SITE DESCRIPTION

6.1 Test Facility Description

All the radiated emissions measurements were performed in a semi-anechoic chamber.

6.2 EUT Mounting, Bonding and Grounding

The EUT was mounted on a 0.6 by 1.2 by 0.8-meter-high non-conductive table for below 1GHz which was placed on the ground plane. For above 1 GHz the EUT was mounted 1.5 meters high.

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}	$U_{lab} = 2 u_c(y)$
Conducted disturbance (mains port)	(150 kHz – 30 MHz)	3,4 dB	2.88 dB
Radiated disturbance (electric field strength on an open area test site or alternative test site)	(30 MHz – 1 000 MHz)	6.3 dB	3.67 dB
Radiated disturbance (electric field strength on an open area test site or alternative test site)	(1 GHz – 6 GHz)	5,2 dB	3.59 dB

7. CHARACTERISTICS OF THE TRANSMITTER

7.1 Channel Number and Frequencies

The Door/Window operates on one channel at 345 MHz.

7.2 Antenna

The Antenna is a loop Antenna printed to the PCB.

7.3 Software

The EUT is operated using internal firmware v1.11.



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 is battery powered; therefore, this test was deemed unnecessary and thus was not performed. Had this test been deemed applicable, it would have been performed as described below.

The EMI Receiver was used as a measuring meter. A 10-dB attenuation pad was used for the protection of the EMI Receiver input stage. All factors associated with attenuator and cables were recorded into the EMI Software Program accordingly to display the actual corrected measured level. The LISN output was connected to the input of the EMI Receiver. The output of the second LISN was terminated with 50-ohm termination. The effective measurement bandwidth used for the conducted emissions 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 initial test data was taken in manual mode while scanning the frequency ranges of 0.15 MHz to 30 MHz. The conducted emissions from the EUT were maximized for operating mode as well as cable placement. Once a predominant frequency (within 12 dB of the limit) was found, it was more closely examined with the spectrum analyzer span adjusted to 1 MHz.

The final data was collected under program control by the computer in several overlapping sweeps by running the EMI Receiver at a minimum scan rate of 10 seconds per octave.

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 Harmonic emissions, duty cycle correction 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 RSS-210, RSS-GEN, CFR Title 47 Part 15 Subpart B section 15.109, & Part 15 Subpart C sections 15.205, 15.209 and 15.231. The NC input configuration was deemed to be the worst case configuration.



8.1.3 Fundamental Field Strength

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

Test Results:

The EUT complies with RSS-210 & Part 15 Subpart C, Section 15.231. The NC input configuration was deemed to be the worst case configuration.

8.1.4 Transmission 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 EUT complies with the requirements of CFR Title 47, Part 15, Subpart C, section 15.231 (a) or transmission times out within 5 seconds after activation.

8.1.5 99% Occupied and 20 dB Bandwidth

The 99% occupied and 20 dB bandwidth was checked using EMI Receiver. The RBW was set to 1-5% of the occupied or 20 dB bandwidth and the VBW was set to approximately three times the RBW. The span was to approximately between 1.5-5 times the occupied or 20 dB bandwidth. The plots of the Occupied and 20 dB Bandwidth are located in Appendix E.

Test Results:

The EUT complies with the requirements of RSS GEN for the 99% occupied bandwidth of the fundamental.

9. TEST PROCEDURE DEVIATIONS

There were no deviations from the test procedure.

10. CONCLUSIONS

The Wireless Security Sensor Model: Door/Window meets all of the relevant specification requirements defined in RSS 210, Issue 10 (December 2019), and RSS Gen, Issue 5 Amendment 1 (March 2019), and the Code of Federal Regulations Title 47, Part 15 Subpart B section, 15.109, & Subpart C sections 15.205, 15.209 and 15.231.





APPENDIX A

LABORATORY ACCREDITATIONS AND RECOGNITIONS

LABORATORY ACCREDITATIONS AND RECOGNITIONS



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."

Innovation, Science and Economic Development Canada Lab Code 2154C

APPENDIX B

MODIFICATIONS TO THE EUT

MODIFICATIONS TO THE EUT

There were no modifications made to the EUT during the testing.





APPENDIX C

***ADDITIONAL MODELS COVERED
UNDER THIS REPORT***



ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST

Wireless Security Sensor
Model: Door/Window
S/N: None

No additional models were tested.



APPENDIX D

DIAGRAMS, CHARTS, AND PHOTOS

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

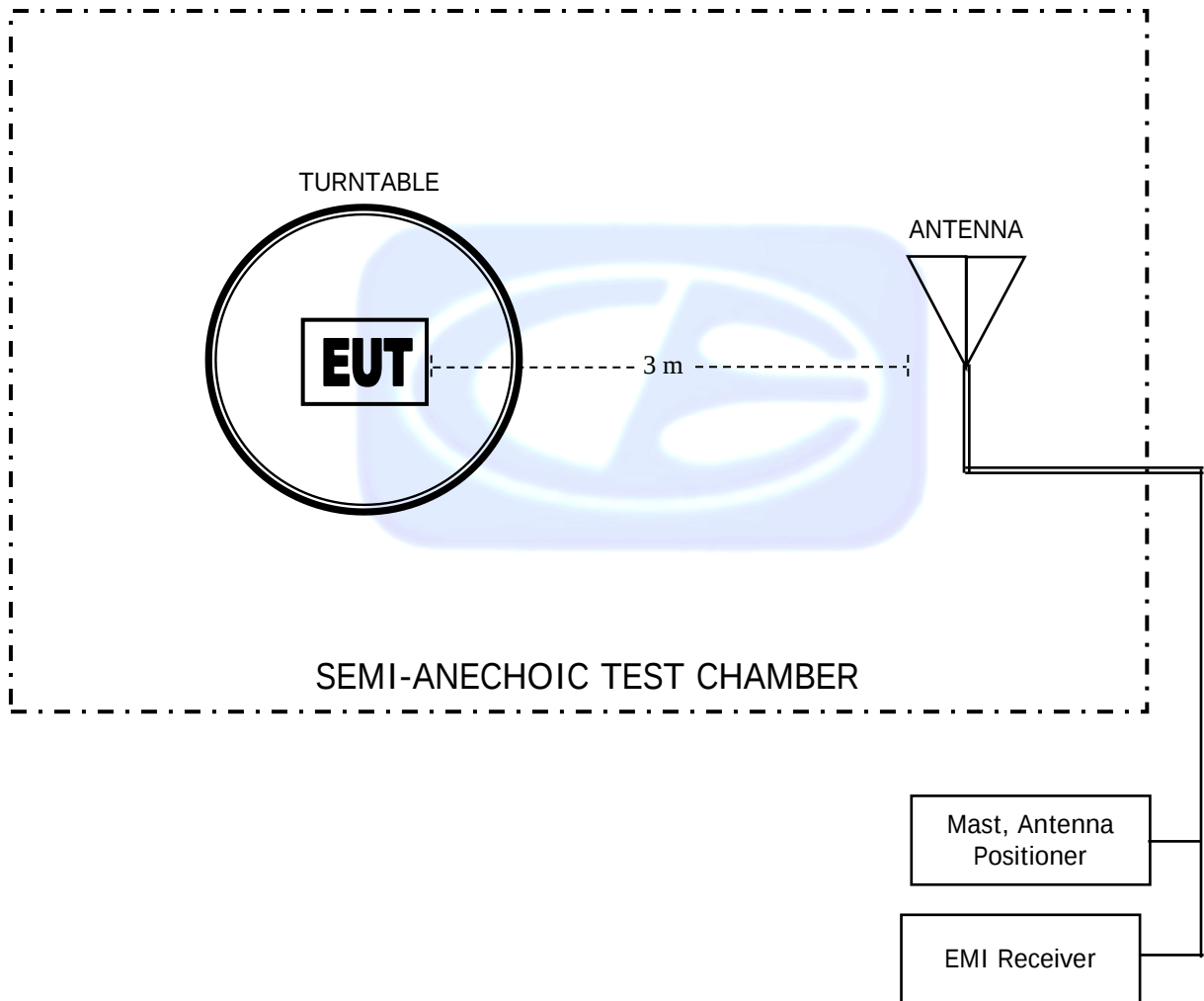
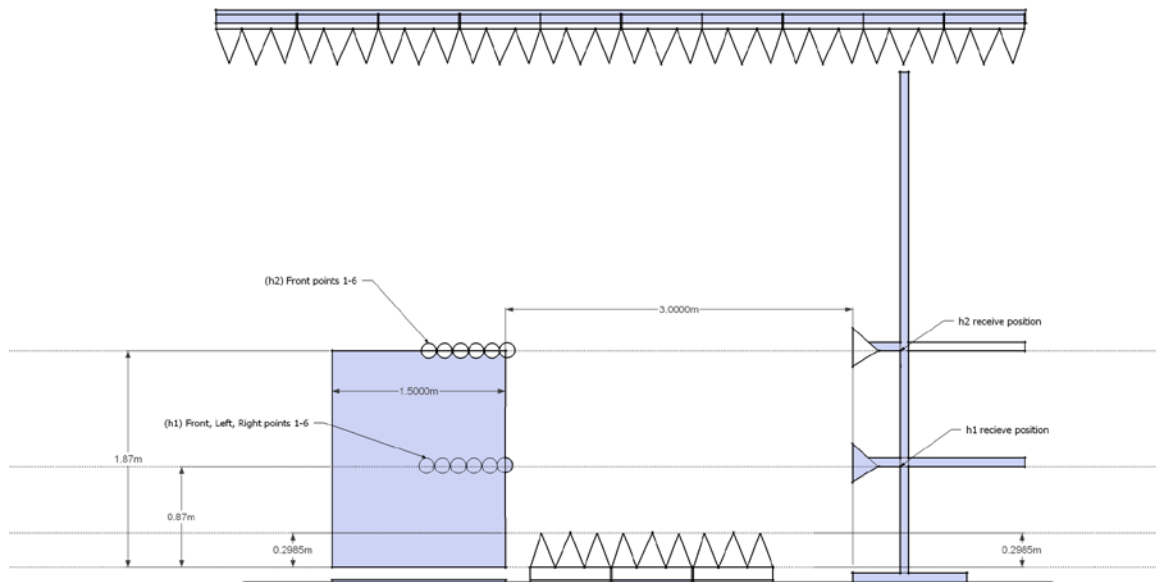


FIGURE 2: PLOT MAP AND LAYOUT OF TEST SITE ABOVE 1GHZ



COM-POWER AL-130**LOOP ANTENNA****S/N: 121049****CALIBRATION DUE: 03/21/2021**

FREQUENCY (MHz)	MAGNETIC (dB/m)	ELECTRIC (dB/m)	FREQUENCY (MHz)	MAGNETIC (dB/m)	ELECTRIC (dB/m)
0.009	-35.2	16.3	7.0	-36.9	14.6
0.01	-35.7	15.7	8.0	-36.8	14.6
0.02	-36.6	14.8	9.0	-36.9	14.6
0.03	-35.8	15.6	10.0	-36.6	14.9
0.04	-36.4	15.1	11.0	-36.5	14.9
0.05	-37.0	14.5	12.0	-36.5	14.9
0.06	-36.8	14.7	13.0	-36.7	14.8
0.07	-37.0	14.4	14.0	-36.8	14.7
0.08	-37.1	14.4	15.0	-36.9	14.6
0.09	-36.9	14.5	16.0	-36.9	14.6
0.1	-37.3	14.1	17.0	-36.8	14.6
0.2	-37.3	14.1	18.0	-36.7	14.8
0.3	-37.4	14.0	19.0	-36.5	14.9
0.4	-37.4	14.0	20.0	-36.5	14.9
0.5	-37.2	14.2	21.0	-36.8	14.7
0.6	-37.2	14.2	22.0	-37.2	14.3
0.7	-37.2	14.2	23.0	-37.6	13.8
0.8	-37.2	14.2	24.0	-38.1	13.4
0.9	-37.2	14.3	25.0	-38.4	13.1
1.0	-36.9	14.5	26.0	-38.5	13.0
2.0	-36.9	14.6	27.0	-38.4	13.1
3.0	-36.9	14.6	28.0	-38.3	13.2
4.0	-36.8	14.7	29.0	-38.3	13.2
5.0	-36.8	14.6	30.0	-38.4	13.0
6.0	-36.9	14.6			

COM-POWER AC-220

COMBILOG ANTENNA

S/N: 10030000

CALIBRATION DUE: APRIL 5, 2021

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	22.0	180	14.7
35	21.0	200	15.1
40	20.4	250	16.7
45	19.6	300	18.2
50	18.4	350	19.1
60	14.9	400	20.7
70	11.7	500	22.0
80	11.6	600	24.5
90	13.2	700	24.5
100	14.3	800	26.1
120	15.6	900	27.0
140	14.3	1000	27.6
160	14.0		

COM-POWER AH-118**HORN ANTENNA****S/N: 10050074****CALIBRATION DUE: JULY 19, 2021**

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
700	25.84	7500	37.73
750	25.46	8000	38.05
800	24.96	8500	38.29
850	24.51	9000	38.93
900	24.01	9500	39.64
950	23.73	10000	39.12
1000	23.83	10500	39.16
1250	24.81	11000	39.18
1500	25.32	11500	39.85
1750	26.30	12000	40.27
2000	27.94	12500	40.91
2250	28.16	13000	40.50
2500	29.07	13500	40.59
3000	30.07	14000	40.44
3500	30.81	14500	40.62
4000	31.68	15000	43.35
4500	32.64	15500	40.76
5000	33.79	16000	41.61
5500	34.20	16500	40.38
6000	35.24	17000	40.88
6500	35.74	17500	42.79
7000	37.17	18000	43.86



Box indicates position of EUT

FRONT VIEW

LUNA PRODUCTS, LLC
WIRELESS SECURITY SENSOR
MODEL: DOOR/WINDOW
FCC SUBPART C - RADIATED EMISSIONS < 1GHz

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

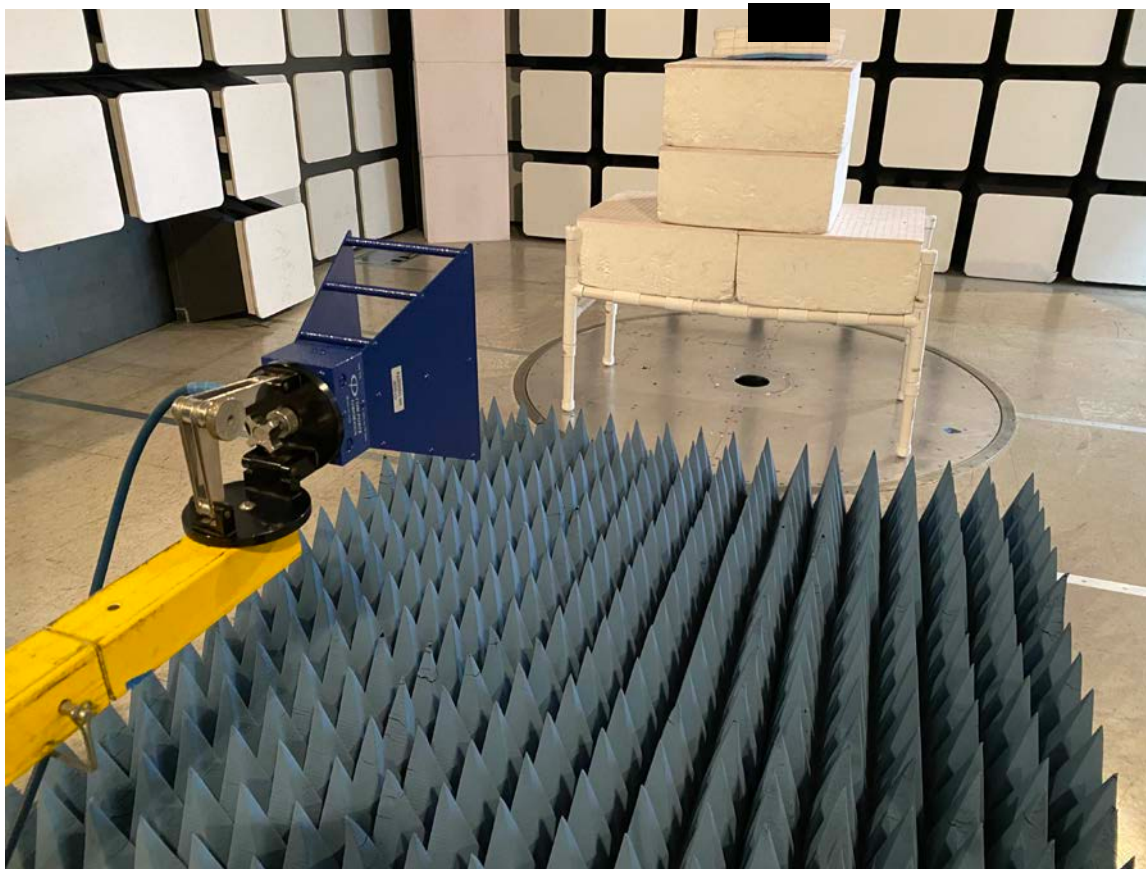


Box indicates position of EUT

REAR VIEW

LUNA PRODUCTS, LLC
WIRELESS SECURITY SENSOR
MODEL: DOOR/WINDOW
FCC SUBPART C - RADIATED EMISSIONS < 1GHz

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

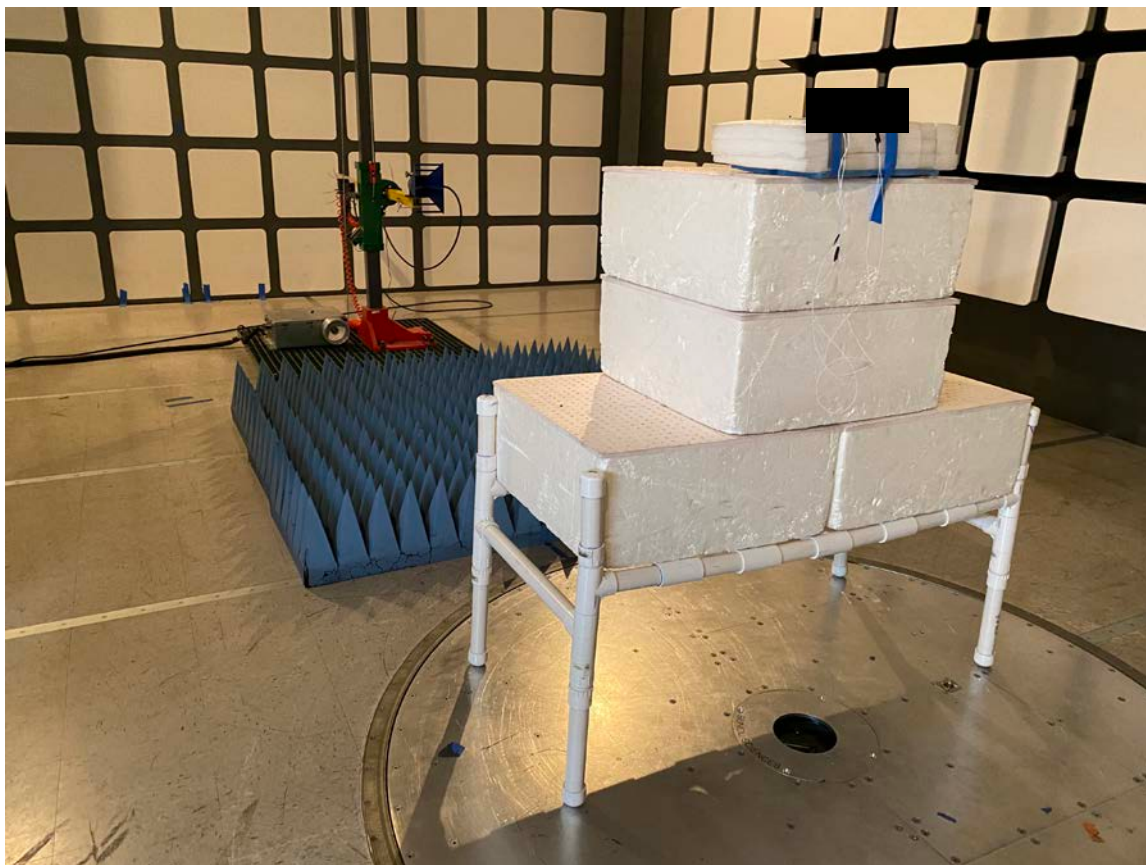


Box indicates position of EUT

FRONT VIEW

LUNA PRODUCTS, LLC
WIRELESS SECURITY SENSOR
MODEL: DOOR/WINDOW
FCC SUBPART C - RADIATED EMISSIONS > 1GHz

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

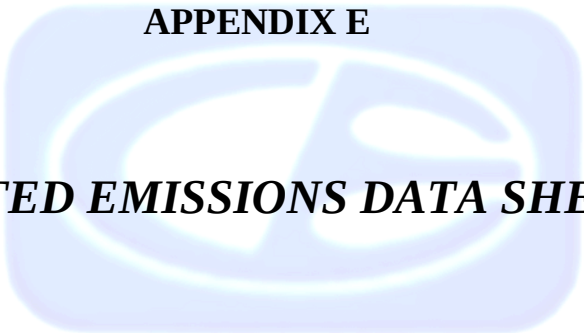


Box indicates position of EUT

REAR VIEW

LUNA PRODUCTS, LLC
WIRELESS SECURITY SENSOR
MODEL: DOOR/WINDOW
FCC SUBPART C - RADIATED EMISSIONS > 1GHz

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



APPENDIX E

RADIATED EMISSIONS DATA SHEETS

Test title: FCC 15.209

File: Radiated Pre-Scan 30-1000Mhz

Operator name: Howard Huang

EUT type: Wireless Security Sensor

EUT condition: The EUT is constantly transmitting at 345 MHz on Y axis

Notes: Company: Luna Products

Temp: 70f

Hum: 47%

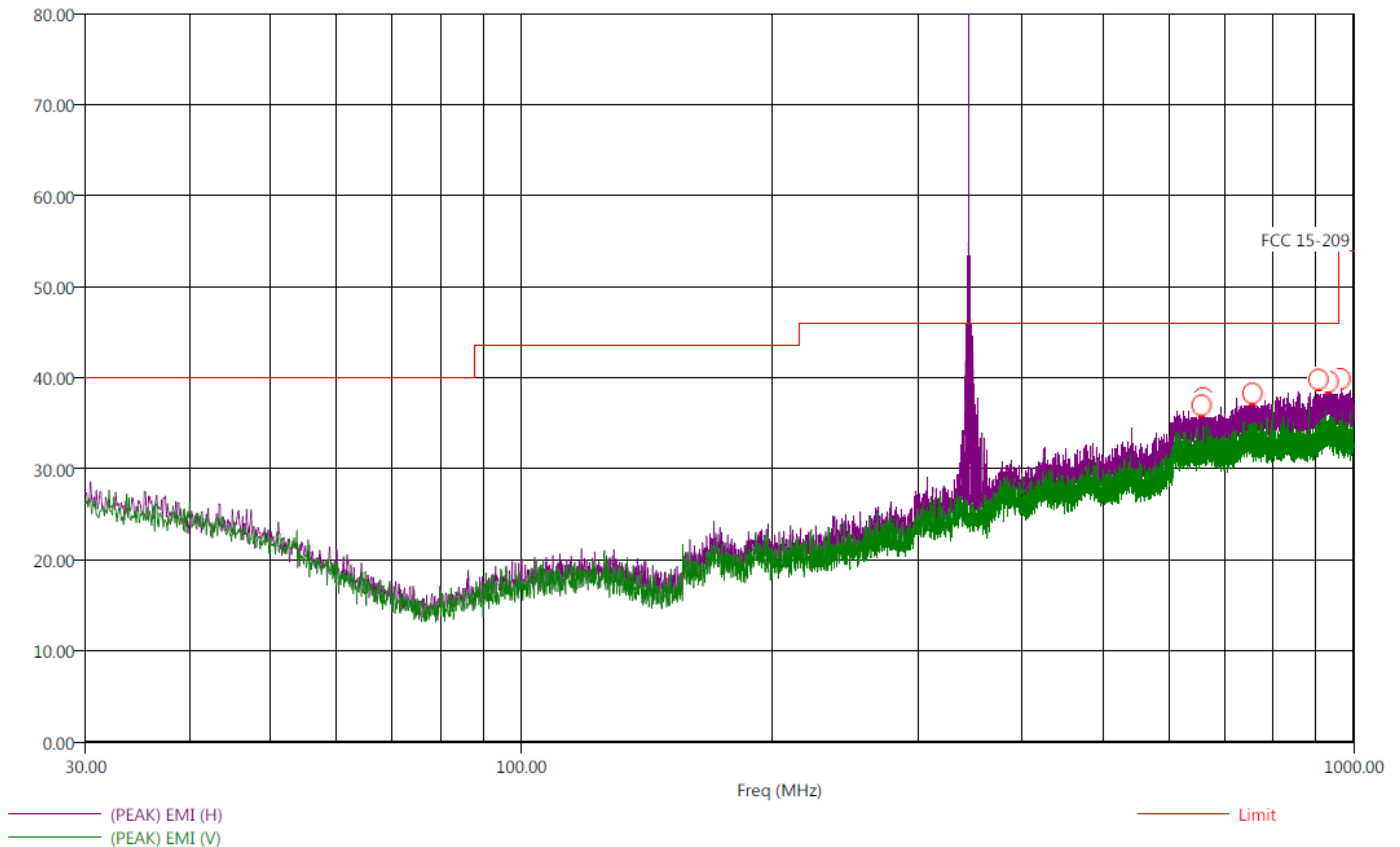
Battery Powered

4/29/2020 10:50:19 AM

Sequence: Preliminary Scan

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

Electric Field Strength (dBuV/m)



There were no radiated emissions from 9 kHz to 30 MHz or from 1 to 3.45 GHz except fundamental and harmonics . This is worst case axis and configuration.

Test title: FCC 15.209

4/29/2020 11:00:19 AM

File: Radiated Final-Scan 30-1000MHz

Sequence: Final Measurements

Operator name: Howard Huang

EUT type: Wireless Security Sensor/DoorWindow

EUT condition: The EUT is constantly transmitting at 345 MHz on Y axis

Notes: Company: Luna Products

Temp: 70f

Hum: 47%

Battery Powered

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

Freq (MHz)	Pol	(PEAK) EMI (dBuV/m)	(QP) EMI (dBuV/m)	(QP) Margin (dB)	Limit (dBuV/m)	Twr Ht (cm)	Ttbl Ang (deg)	Cable (dB)	Transducer (dB)
656.70	H	36.85	32.08	-13.92	46.00	233.80	326.25	2.49	24.50
659.60	H	37.37	32.10	-13.90	46.00	225.32	0.75	2.49	24.56
756.00	H	38.47	33.39	-12.61	46.00	328.25	52.75	2.78	26.20
907.70	H	38.89	33.99	-12.01	46.00	300.67	287.25	3.07	27.27
933.90	H	39.64	34.75	-11.25	46.00	145.38	232.00	3.10	28.12
965.00	H	39.64	34.29	-19.69	53.98	316.79	309.00	3.16	27.80

There were no radiated emissions from 9 kHz to 30 MHz or from 1 to 3.45 GHz except fundamental and harmonics . This is worst case axis and configuration.

FUNDAMENTAL & HARMONICS
DATA SHEETS

FUNDAMENTAL FIELD STRENGTH

FCC 15.231

Company: Luna Products, LLC
EUT: Wireless Security Sensor
Model: Door/Window
Duty Cycle Correction Factor: -19.69

Date: 04/29/2020

Lab:R

Tested By: Howard Huang

Compatible Electronics, Inc. FAC-3

Freq. (MHz)	Corrected Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Detector	Table (deg)	Tower (m)	Comments
345.00	93.21	H	97.26	-4.05	Peak	344.00	100.00	Y Axis
345.00	73.52	H	77.26	-3.74	Avg			Y Axis
345.00	96.47	V	97.26	-0.79	Peak	55.00	124.00	Y Axis
345.00	76.78	V	77.26	-0.48	Avg			Y Axis

Test distance
3 meters



HARMONICS HORIZONTAL

FCC 15.231

Company: Luna Products, LLC
EUT: WIRELESS SECURITY SENSOR
Model: DOOR/WINDOW
Duty Cycle Correction Factor: -19.69

Date: 04/29/2020
Lab: R
Tested By: Howard Huang

Freq. (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Table Angle (deg)	Ant. Height (m)	Comments
690.0	48.00	77.26	-29.26	Peak	0.00	117	X-Axis
690.0	28.31	57.26	-28.95	Avg			X-Axis
690.0	46.93	77.26	-30.33	Peak	330.00	115	Y-Axis
690.0	27.24	57.26	-30.02	Avg			Y-Axis
690.0	45.37	77.26	-31.89	Peak	312.00	100	Z-Axis
690.0	25.68	57.26	-31.58	Avg			Z-Axis
1035.0							No Emission Found
1035.0							No Emission Found
1380.0							No Emission Found
1380.0							No Emission Found
1725.0	50.15	77.26	-27.11	Peak	230.00	149	X-Axis
1725.0	30.46	57.26	-26.80	Avg			X-Axis
1725.0	51.56	77.26	-25.70	Peak	106.00	164	Y-Axis
1725.0	31.87	57.26	-25.39	Avg			Y-Axis
1725.0	51.98	77.26	-25.28	Peak	69.00	162	Z-Axis
1725.0	32.29	57.26	-24.97	Avg			Z-Axis
2070.0	62.95	77.26	-14.31	Peak	150.00	167	X-Axis
2070.0	43.26	57.26	-14.00	Avg			X-Axis
2070.0	60.97	73.98	-16.29	Peak	160.00	163	Y-Axis
2070.0	41.28	57.26	-15.98	Avg			Y-Axis
2070.0	59.61	73.98	-17.65	Peak	65.00	165	Z-Axis
2070.0	39.92	57.26	-17.34	Avg			Z-Axis
2415.0	50.12	77.26	-27.14	Peak	165.00	160	X-Axis
2415.0	30.43	57.26	-26.83	Avg			X-Axis
2415.0	54.05	77.26	-23.21	Peak	37.00	175	Y-Axis
2415.0	34.36	57.26	-22.90	Avg			Y-Axis
2415.0	50.75	77.26	-26.51	Peak	38.00	165	Z-Axis
2415.0	31.06	57.26	-26.20	Avg			Z-Axis

Freq. (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Peak /Avg	Table Angle (deg)	Ant. Height (m)	Comments
2760.0	53.69	73.98	-20.29	Peak	232.00	154	X-Axis
2760.0	34.00	53.98	-19.98	Avg			X-Axis
2760.0	52.38	73.98	-21.60	Peak	80.00	166	Y-Axis
2760.0	32.69	53.98	-21.29	Avg			Y-Axis
2760.0							No Emission Found
2760.0							No Emission Found
3105.0	57.67	77.26	-19.59	Peak	198.00	150	X-Axis
3105.0	37.98	57.26	-19.28	Avg			X-Axis
3105.0	57.01	77.26	-20.25	Peak	206.00	160	Y-Axis
3105.0	37.32	57.26	-19.94	Avg			Y-Axis
3105.0							No Emission Found
3105.0							No Emission Found
3450.0	55.07	77.26	-22.19	Peak	206.00	168	X-Axis
3450.0	35.38	57.26	-21.88	Avg			X-Axis
3450.0	54.86	77.26	-22.40	Peak	205.00	168	Y-Axis
3450.0	35.17	57.26	-22.09	Avg			Y-Axis
3450.0							No Emission Found
3450.0							No Emission Found

Test distance
3 meters

HARMONICS VERTICAL

FCC 15.231

Company: Luna Products, LLC
EUT: Wireless Security Sensor
Model: Door/Window
Duty Cycle Correction Factor: -19.69

Date: 04/29/2020
Lab: R
Tested By: Howard Huang

Freq. (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Peak /Avg	Table Angle (deg)	Ant. Height (m)	Comments
690.0	42.16	77.26	-35.10	Peak	120.00	165	X-Axis
690.0	22.47	57.26	-34.79	Avg			X-Axis
690.0							No Emissions Found
690.0							No Emissions Found
690.0	43.04	77.26	-34.22	Peak	132.00	142	Z-Axis
690.0	23.35	57.26	-33.91	Avg			Z-Axis
1035.0							No Emissions Found
1035.0							No Emissions Found
1380.0							No Emissions Found
1380.0							No Emissions Found
1725.0	51.04	77.26	-26.22	Peak	222.00	183	X-Axis
1725.0	31.35	57.26	-25.91	Avg			X-Axis
1725.0	52.20	77.26	-25.06	Peak	191.00	167	Y-Axis
1725.0	32.51	57.26	-24.75	Avg			Y-Axis
1725.0	50.22	77.26	-27.04	Peak	31.00	154	Z-Axis
1725.0	30.53	57.26	-26.73	Avg			Z-Axis
2070.0	61.47	77.26	-15.79	Peak	17.00	132	X-Axis
2070.0	41.78	57.26	-15.48	Avg			X-Axis
2070.0	61.79	77.26	-15.47	Peak	173.00	168	Y-Axis
2070.0	42.10	57.26	-15.16	Avg			Y-Axis
2070.0	61.32	77.26	-15.94	Peak	40.00	170	Z-Axis
2070.0	41.63	57.26	-15.63	Avg			Z-Axis
2415.0							No Emissions Found
2415.0							X-Axis
2415.0							No Emissions Found
2415.0							Y-Axis
2415.0	54.64	77.26	-23.60	Peak	175.00	150	Z-Axis
2415.0	34.95	57.26	-23.29	Avg			Z-Axis



Freq. (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Peak /Avg	Table Angle (deg)	Ant. Height (m)	Comments
2760.0							No Emission Found
2760.0							X-Axis
2760.0	52.53	73.98	-21.45	Peak	183.00	170	No Emission Found
2760.0	32.84	53.98	-21.14	Avg			Y-Axis
2760.0	52.18	73.98	-21.80	Peak	95.00	170	Z-Axis
2760.0	32.49	53.98	-21.49	Avg			Z-Axis
3105.0							No Emission Found
3105.0							X-Axis
3105.0	54.95	77.26	-22.31	Peak	171.00	154	Y-Axis
3105.0	35.26	57.26	-22.00	Avg			Y-Axis
3105.0	53.43	77.26	-23.83	Peak	130.00	170	Z-Axis
3105.0	33.74	57.26	-23.52	Avg			Z-Axis
3450.0							No Emission Found
3450.0							No Emission Found

Test distance
3 meters



99% OCCUPIED AND 20 dB BANDWIDTH

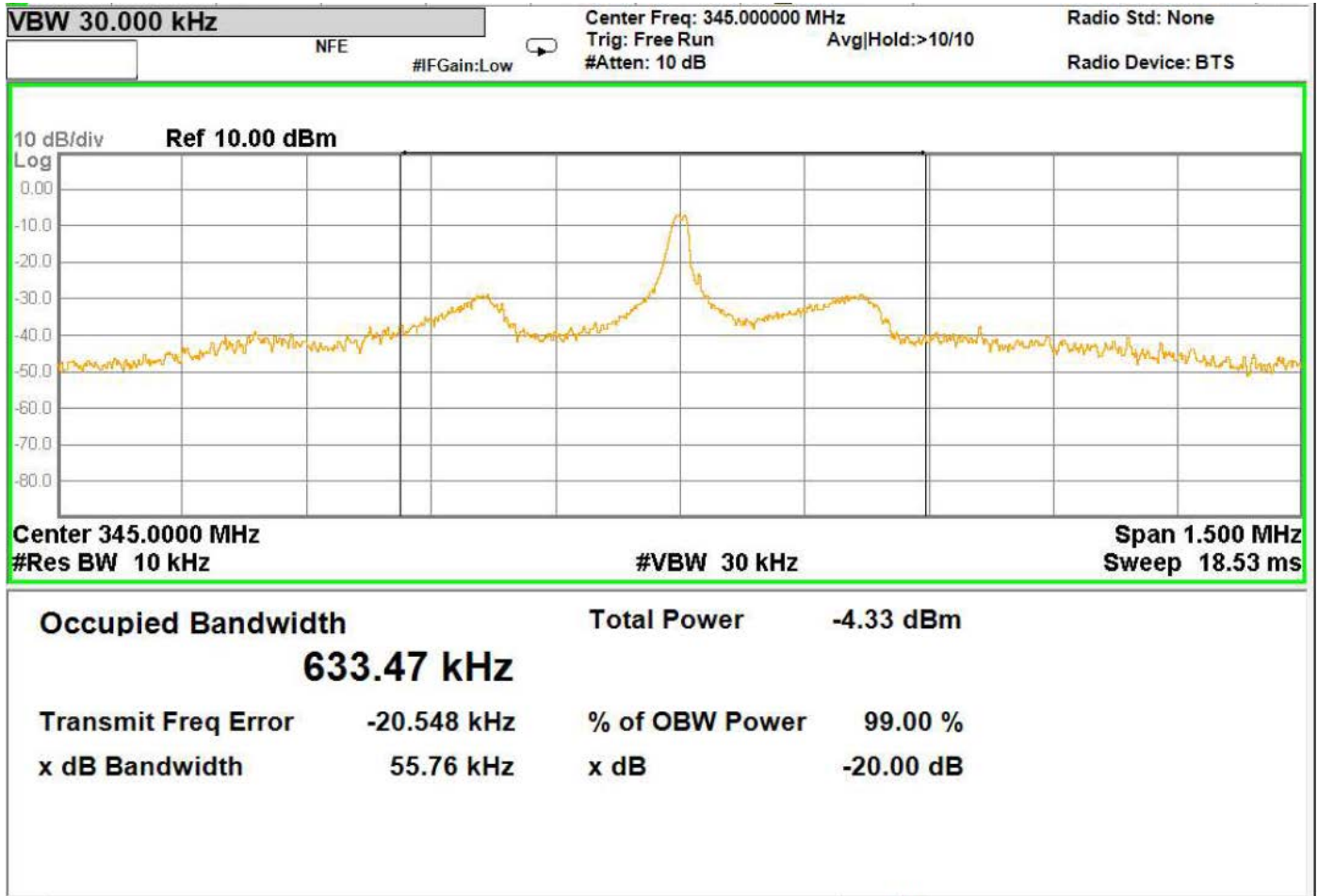
DATA SHEETS

99% BANDWIDTH

RSS-GEN & RSS210

Company: Luna Products, LLC
 EUT: WIRELESS SECURITY SENSOR
 Model: DOOR/WINDOW

Date: 02/27/2020
 Lab: R
 Tested By: Howard Huang

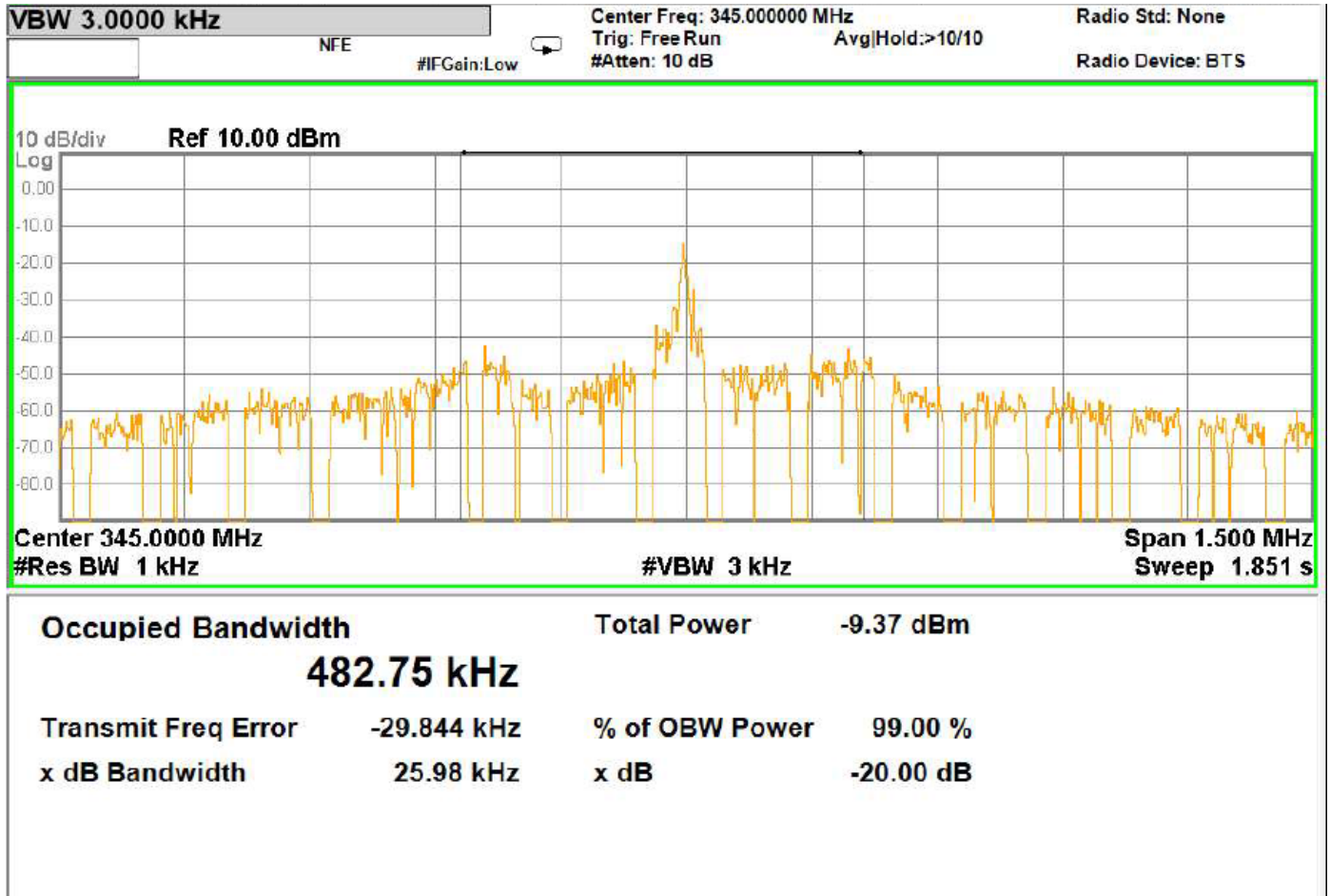


20 dB BANDWIDTH

FCC 15.231

Company: Luna Products, LLC
EUT: WIRELESS SECURITY SENSOR
Model: DOOR/WINDOW

Date: 02/27/2020
Lab: R
Tested By: Howard Huang





DUTY CYCLE AND TRANSMISSION TIMEOUT

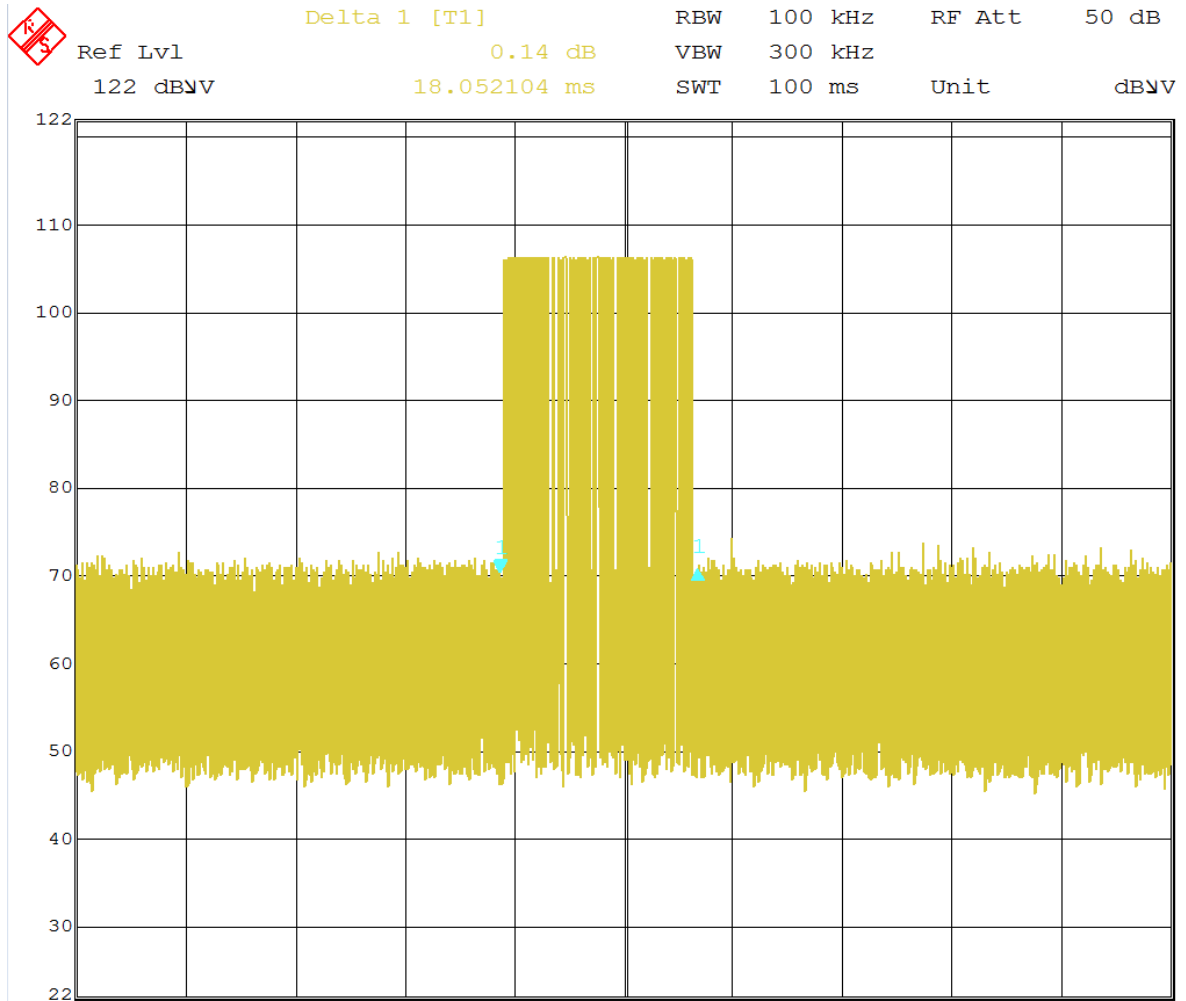
DATA SHEETS

DUTY CYCLE PLOT

FCC 15.231

Company: Luna Products, LLC
EUT: WIRELESS SECURITY SENSOR
Model: DOOR/WINDOW

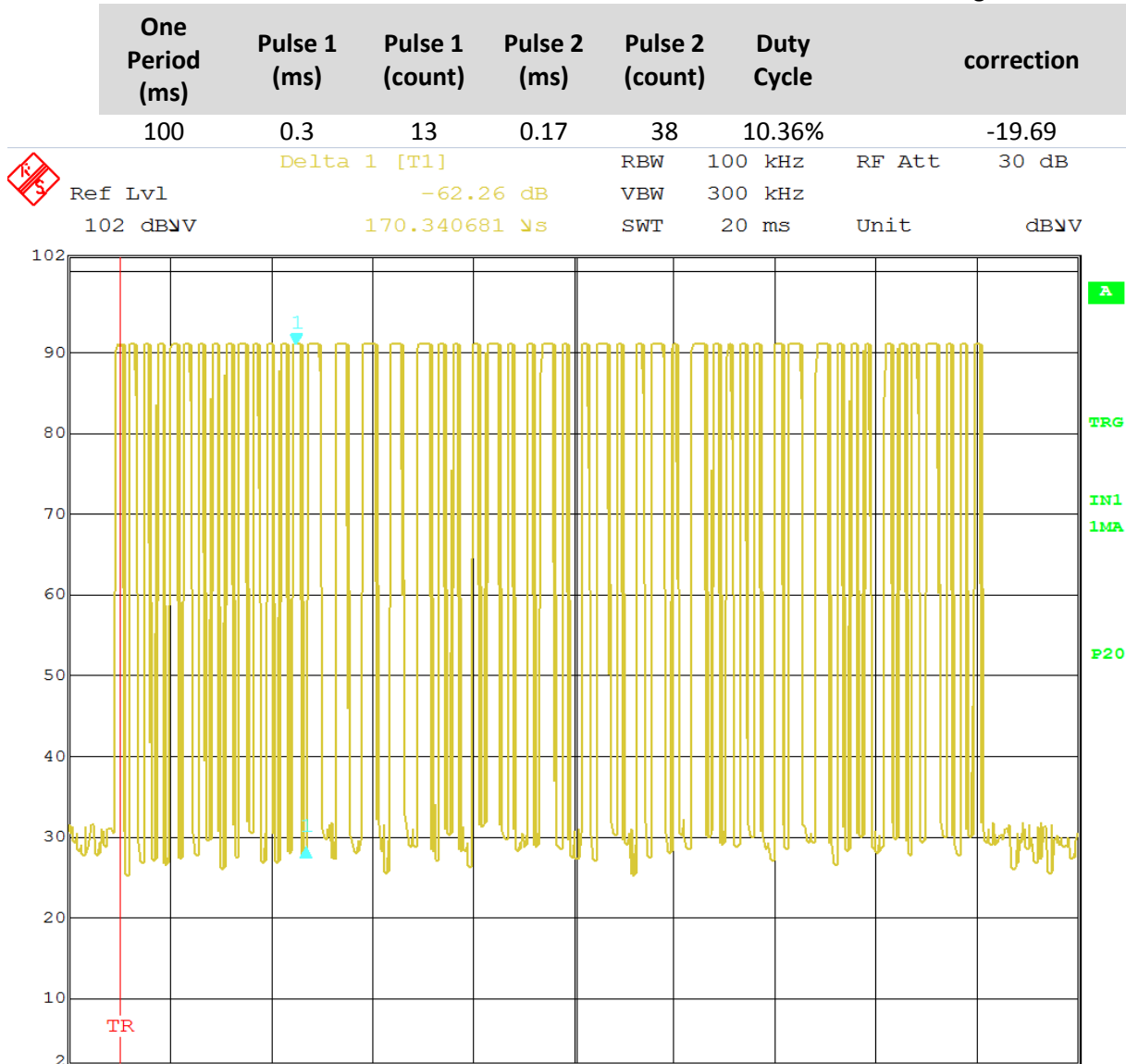
Date: 02/27/2020
Lab: R
Tested By: Howard Huang



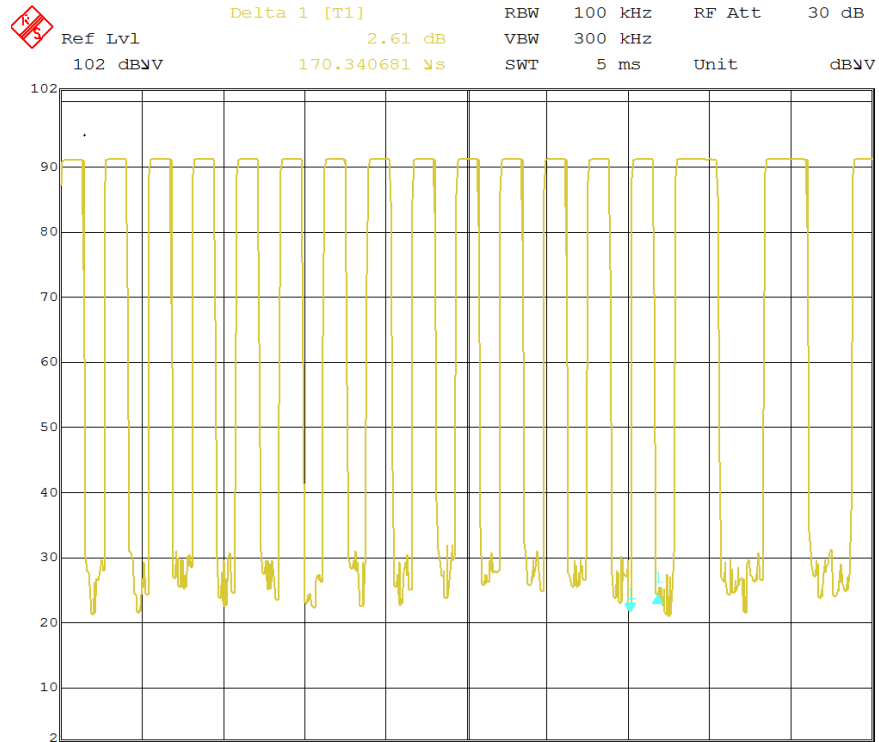
DUTY CYCLE CORRECTION

FCC 15.231

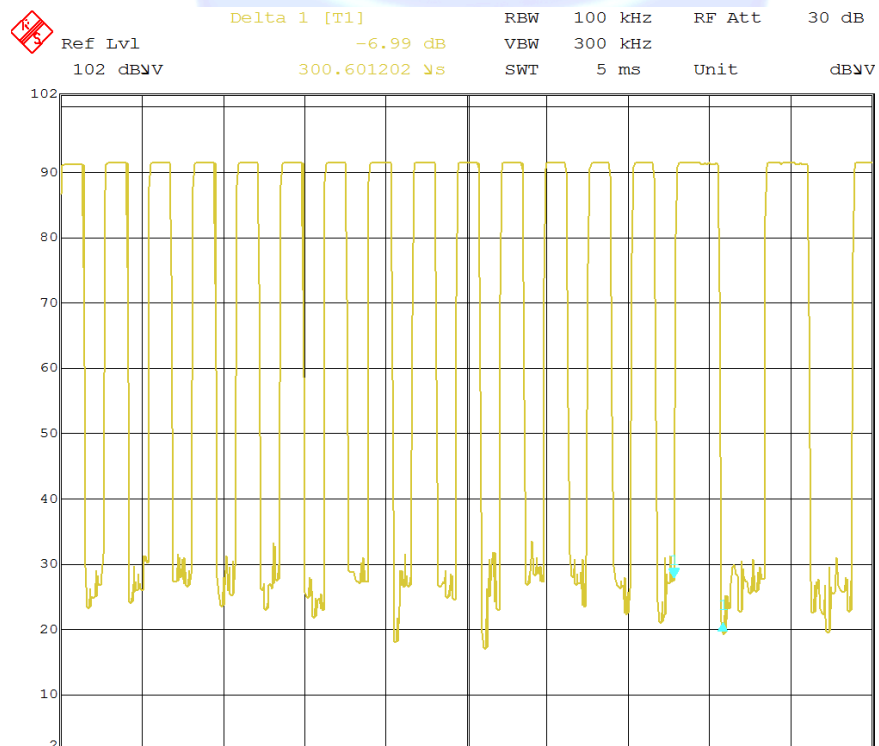
Company:	Luna Products	Date:	2/26/2020
	Wireless Security		
EUT:	Sensor/DoorWindow	Lab:	Lab R
		Test	
FCC ID:	2ATK4LPDW02345	ENG:	Howard Huang



SHORT PULSE



LONG PULSE



TRANSMISSION TIMEOUT

FCC 15.231

Company: Luna Products, LLC
EUT: WIRELESS SECURITY SENSOR
Model: DOOR/WINDOW

Date: 02/27/2020
Lab: R
Tested By: Howard Huang

