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

For

WIRELESS SECURITY SENSOR
MODEL:PIR MOTION DETECTOR
FCC ID: 2ATK4LPPIR02345

Prepared for

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

Prepared by: _____

HOWARD HUANG

Approved by: _____

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DATE: FEBRUARY 4, 2021

	REPORT BODY	APPENDICES					TOTAL
		A	*B*	*C*	*D*	*E*	
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NVLAP® TESTING
NVLAP LAB CODE 200527-0

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GENERAL REPORT SUMMARY

This electromagnetic emission 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: PIR Motion Detector FCC ID: 2ATK4LPPIR02345
Product Description:	The EUT is Wireless Security Sensor. Clock Frequencies: 32.768 kHz and 16 MHz (Dimensions: 3.15” x 2.45” x 1.85”)
Modifications:	The EUT was not modified during the testing in order to comply with the specifications.
Manufacturer:	Luna Products 3145 Tiger Run Court #110 Carlsbad, CA 92010
Test Date:	February 3, 2021

Test Specifications Covered by Accreditation:

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Test Specifications: EMI requirements
FCC CFR Title 47, Part 15 Subpart B, Subpart C Section 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	Spurious RF Emissions, 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	Fundamental and Harmonics Emissions produced by the Intentional Radiator	Complies with the limits of CFR Title 47 Part 15 Subpart C Sections 15.205, 15.209, & 15.231, RSS-210, RSS-GEN
4	99% and 20dB Bandwidth	Complies with the limits of CFR Title 47 Part 15 Subpart C Sections 15.205, 15.209, & 15.231, RSS-210, RSS-GEN
5	Duty Cycle Plot	Complies with the limits of CFR Title 47 Part 15 Subpart C Sections 15.205, 15.209, & 15.231, RSS-210, RSS-GEN
6	Transmission Timeout	Complies with the limits of CFR Title 47 Part 15 Subpart C Sections 15.205, 15.209, & 15.231, RSS-210, RSS-GEN

1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the Wireless Security Sensor Model: PIR Motion Detector. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4 and 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 RSS 210 Issue 10, RSS Gen Issue 5 Amendment 1, 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

Robert Reichert	Sr Regulatory, Test & Customer Service Engineer

Compatible Electronics, Inc.

Howard Huang	Test Engineer
Joey Madlangbayan	Safety Manager

2.4 Date Test Sample was Received

The test sample was received on February 3, 2021. Received as described in product description.

2.5 Disposition of the Test Sample

The test sample was returned to Luna Products

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
NVLAP	National Voluntary Laboratory Accreditation Program
CML	Corrected Meter Limit
LISN	Line Impedance Stabilization Network
NCR	No Calibration Required
RX	Receive
TX	Transmit
PCB	Printed Circuit Board
PIR	Passive Infrared

3. APPLICABLE DOCUMENTS

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

SPEC	TITLE
FCC CFR Title 47, Part 15, Subpart B	FCC Rules – Radio frequency devices (including digital devices) – Unintentional Radiators
FCC CFR Title 47, Part 15, Subpart C	FCC Rules – Radio frequency devices (including digital devices) – Intentional Radiators
ANSI C63.10: 2013	American National Standard for Testing Unlicensed Wireless 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.
RSS GEN, Issue 5 Amendment 1 (March 2019)	General Requirements for Compliance of Radio Apparatus
RSS 210, Issue 10 (December 2019)	License-Exempt Radio Apparatus: Category I Equipment

4. DESCRIPTION OF TEST CONFIGURATION

4.1 Description of Test Configuration - EMI

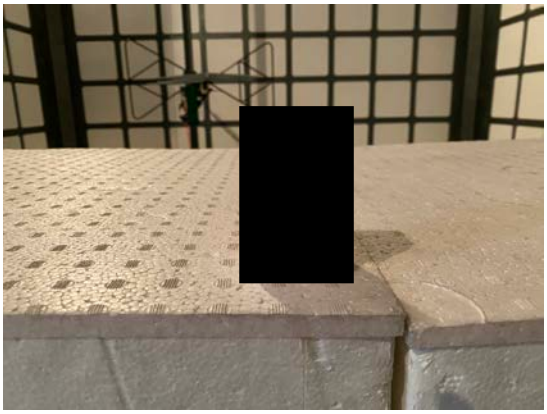
The Wireless Security Sensor, Model: PIR Motion Detector (EUT) was set up in a standalone table-top configuration, where the EUT is constantly transmitting at the declared channel. The EUT is set to transmit approximately every 5 seconds. The EUT was tested with a full battery. All axes and modes were checked. The worst-case orientation was deemed to be the Y-axis.

4.1.1 Photograph of Test Configuration – EMI

ANSI C63.4 (box indicates EUT)

ANSI C63.10 (box indicates EUT)

4.1.1.1 Photograph of Test Configuration (Continued)


X Axis


Y Axis


Z Axis

4.1.2 Cable Construction and Termination

The EUT had no external cables.

5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

5.1 EUT and Accessory List

#	EQUIPMENT TYPE	MANUFACTURER	MODEL	P/N
EUT	WIRELESS SECURITY SENSOR	LUNA PRODUCTS	PIR MOTION DETECTOR	LP.PIR02.345

5.2 EMI Test Equipment

EQUIPMENT TYPE	MANU-FACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
Barometer & Thermometer	Control Company	4088	97080656	01/17/2020	01/17/2023
Computer	Compatible Electronics	NONE	NONE	NCR	NCR
EMI Receiver	Keysight Technologies	N9038A	MY56400077	06/13/2020	09/01/2021
Antenna, Active Loop	Com-Power	AL-130	121049	03/21/2019	03/21/2021
Antenna, CombiLog	Com-Power	AC-220	10030000	04/05/2019	09/01/2021
Antenna, Horn	Com-Power	AH-118	10050074	07/19/2019	07/19/2021
Mast, Antenna Positioner	Sunol Science Corporation	SC104V	020808-1	NCR	NCR
Antenna Mast	Sunol Science Corporation	TWR 95-4	020808-3	NCR	NCR
Turntable	Sunol Science Corporation	FM2011VS	NONE	NCR	NCR

5.3 Test Software

LAB(S)	SOFTWARE TITLE	MANUFACTURER	VERSION
P, R	Measurement and Automation Software	TDK TestLab	11.24

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-meter by 0.8 meters high non-conductive table for below 1 GHz which was placed on the ground plane. For above 1 GHz, the EUT was mounted 1.5 meters 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)	3.6 dB	2.88 dB
Radiated disturbance (electric field strength on an open area test site or alternative test site)	(30 MHz – 1000 MHz)	6.3 dB	3.67 dB
Radiated disturbance (electric field strength on an open area test site or alternative test site)	(1 GHz - 18 GHz)	5.2 dB	3.59 dB

7. CHARACTERISTICS OF THE TRANSMITTER

7.1 Channel Number and Frequencies

The Wireless Security Sensor, PIR Motion Detector operates on 345 MHz.

7.2 Antenna

The Antenna is a loop antenna printed to the PCB.

7.3 Software

The EUT is operated using Firmware Version 1.21.

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 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 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 10000	Horn Antenna	1 MHz

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

Test Results:

The EUT complies with the limits of CFR Title 47 Part 15 Subpart C sections 15.205, 15.209 and 15.231; and RSS-210, RSS-GEN. The six highest emissions are listed in Table 1.

8.1.3 RF Emissions Test Results

Table 1 SPURIOUS EMISSION RESULTS
WIRELESS SECURITY SENSOR, MODEL: PIR MOTION DETECTOR

Frequency MHz	Corrected Reading* dBuV/m	Specification Limit dBuV/m	Delta (Cor. Reading – Spec. Limit) dB
926.80 **H**	35.06 **#**	46.00	-10.94
2070.0 **V**	46.10 **A**	57.26	-11.16
817.40 **H**	33.74 **#**	46.00	-12.26
758.80 **V**	33.59 **#**	46.00	-12.41
742.70 **H**	33.58 **#**	46.00	-12.42
2070.0 **V**	43.65 **A**	57.26	-13.61

Notes:

*	The complete emissions data is given in Appendix E of this report.
**	The factors for the antenna are attached in Appendix D of this report.
#	Quasi-Peak Reading
A	Average Reading
V	Vertical Reading
H	Horizontal Reading

8.1.4 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.

Conversion to logarithmic terms: Specification limit (μ V/m) log x 20 = Specification Limit in dBuV/m

To correct for distance when measuring at a distance other than the specification

For measurements below 30 MHz: (Specification distance / test distance) log x 40 = distance factor

For measurements above 30 MHz: (Specification distance / test distance) log x 20 = 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.

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.

8.2 Occupied 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 relevant requirements as specified in the Summary of Test Results starting on Page 5.

8.3 Duty Cycle Plot

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.

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

where

n is the number of pulses of duration t1

m is the number of pulses of duration t2

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 * 180 µs = 8,280 µs

Pulse Type 2 = 9 * 320 µs = 2,880 µs

8,280 µs + 2,880 µs = 11160 µs

Total On Time = 11.16 ms

11.16 ms / 100ms = 0.1116

20log(0.1116) = -19.046716 dB

Test Results:

The EUT complies with the relevant requirements as specified in the Summary of Test Results starting on Page 5.

8.4 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 relevant requirements as specified in the Summary of Test Results starting on Page 5.

9. TEST PROCEDURE DEVIATIONS

There were no deviations from the test procedures.

10. CONCLUSIONS

The Wireless Security Sensor Model: PIR Motion Detector as tested, meets all of the relevant specification requirements defined in the Code of Federal Regulations Title 47, Part 15 Subpart B section, 15.109, & Subpart C sections 15.205, 15.209 and 15.231, RSS 210 Issue 10, and RSS Gen, Issue 5 Amendment 1.

APPENDIX A

LABORATORY ACCREDITATIONS

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."

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.

APPENDIX C

ADDITIONAL MODELS

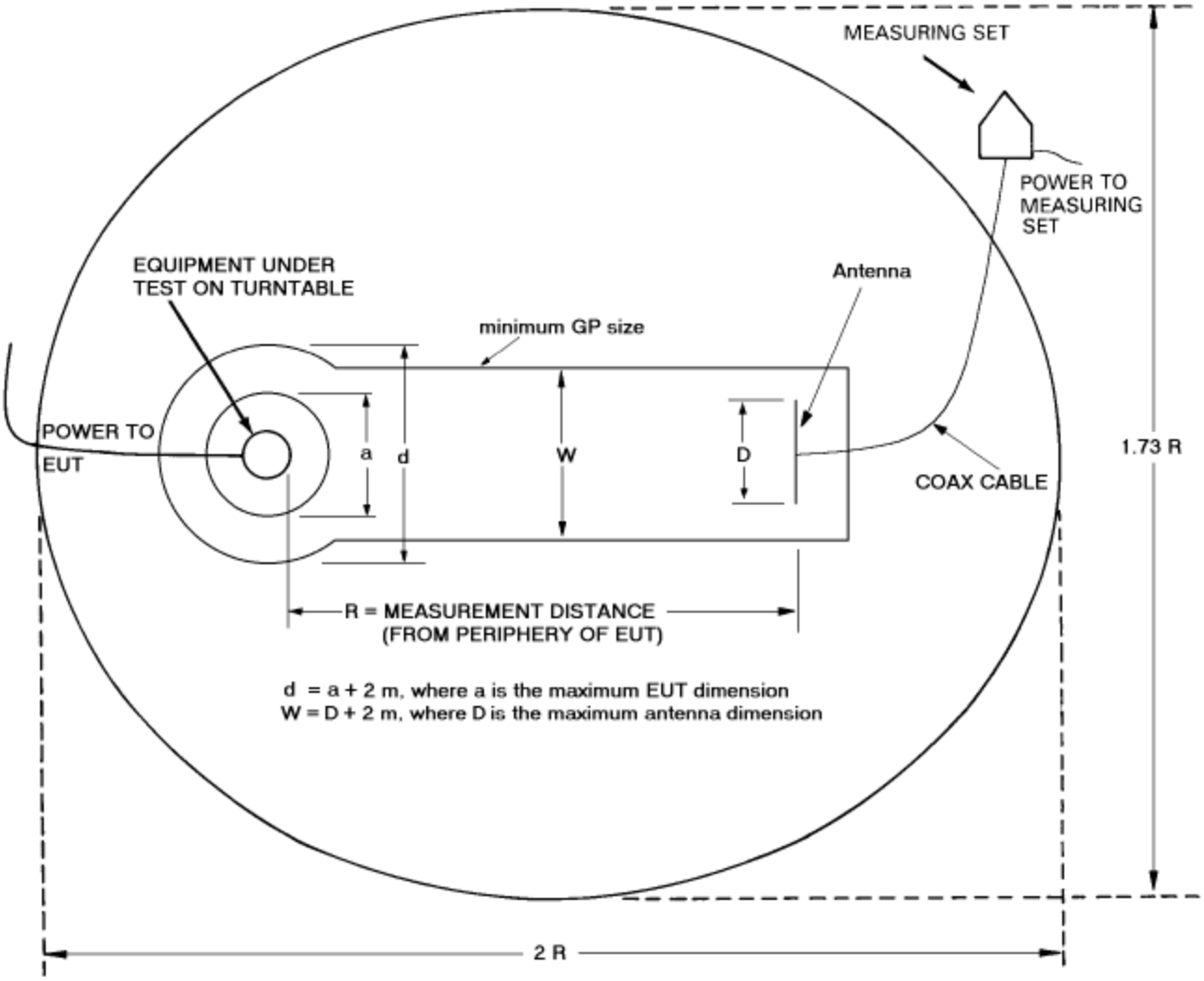
Used for the Primary Tests	Wireless Security Sensor Model: PIR Motion Detector FCC ID: 2ATK4LPPIR02345

No additional models.

APPENDIX D

DIAGRAMS, CHARTS AND PHOTOS

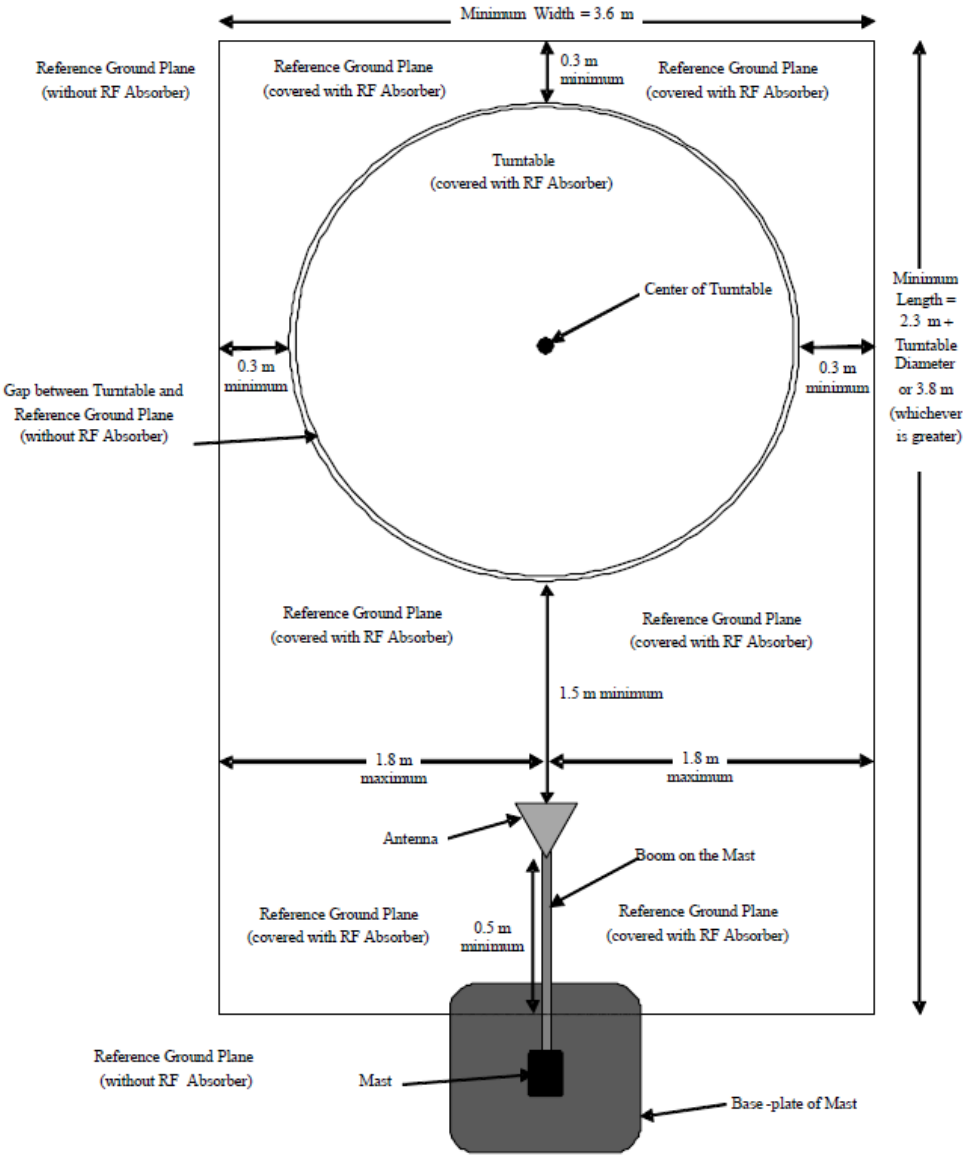
FIGURE 1: RADIATED EMISSIONS 3-METER SEMI -ANECHOIC TEST CHAMBER



AREA DIMENSIONS =

R = 3m	R = 10 m	R = 30 m
6 m x 5.2 m	20 m x 17.3 m	60 m x 52 m

FIGURE 2: HIGH FREQUENCY TEST VOLUME



COM-POWER AL-130

LOOP ANTENNA

S/N: 121049

CALIBRATION DATE: MARCH 21, 2019

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

LAB R - COMBILOG ANTENNA

S/N: 10030000

CALIBRATION DATE: APRIL 5, 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

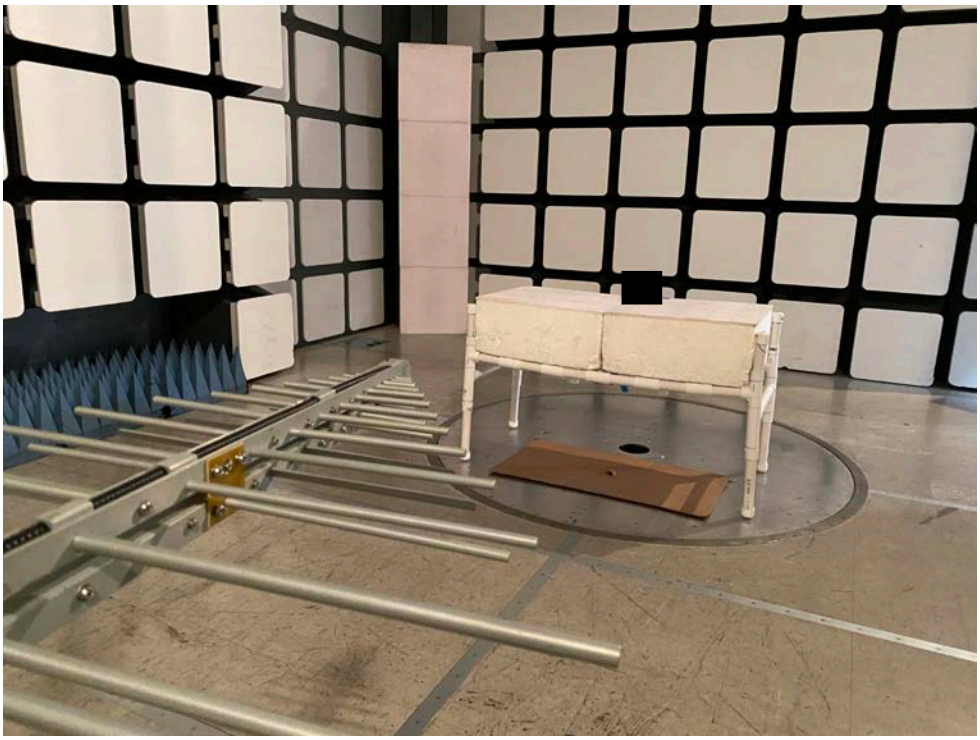
COM-POWER AH-118

HORN ANTENNA

S/N: 10050074

CALIBRATION DATE: JULY 19, 2019

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



FRONT VIEW

LUNA PRODUCTS
WIRELESS SECURITY SENSOR
MODEL: PIR MOTION DETECTOR
FCC SUBPART C - RADIATED EMISSIONS UNDER 1 GHz

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

REAR VIEW

LUNA PRODUCTS
WIRELESS SECURITY SENSOR
MODEL: PIR MOTION DETECTOR
FCC SUBPART C - RADIATED EMISSIONS UNDER 1 GHz

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

FRONT VIEW

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PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

REAR VIEW

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MODEL: PIR MOTION DETECTOR
FCC SUBPART C - RADIATED EMISSIONS ABOVE 1 GHz

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

APPENDIX E

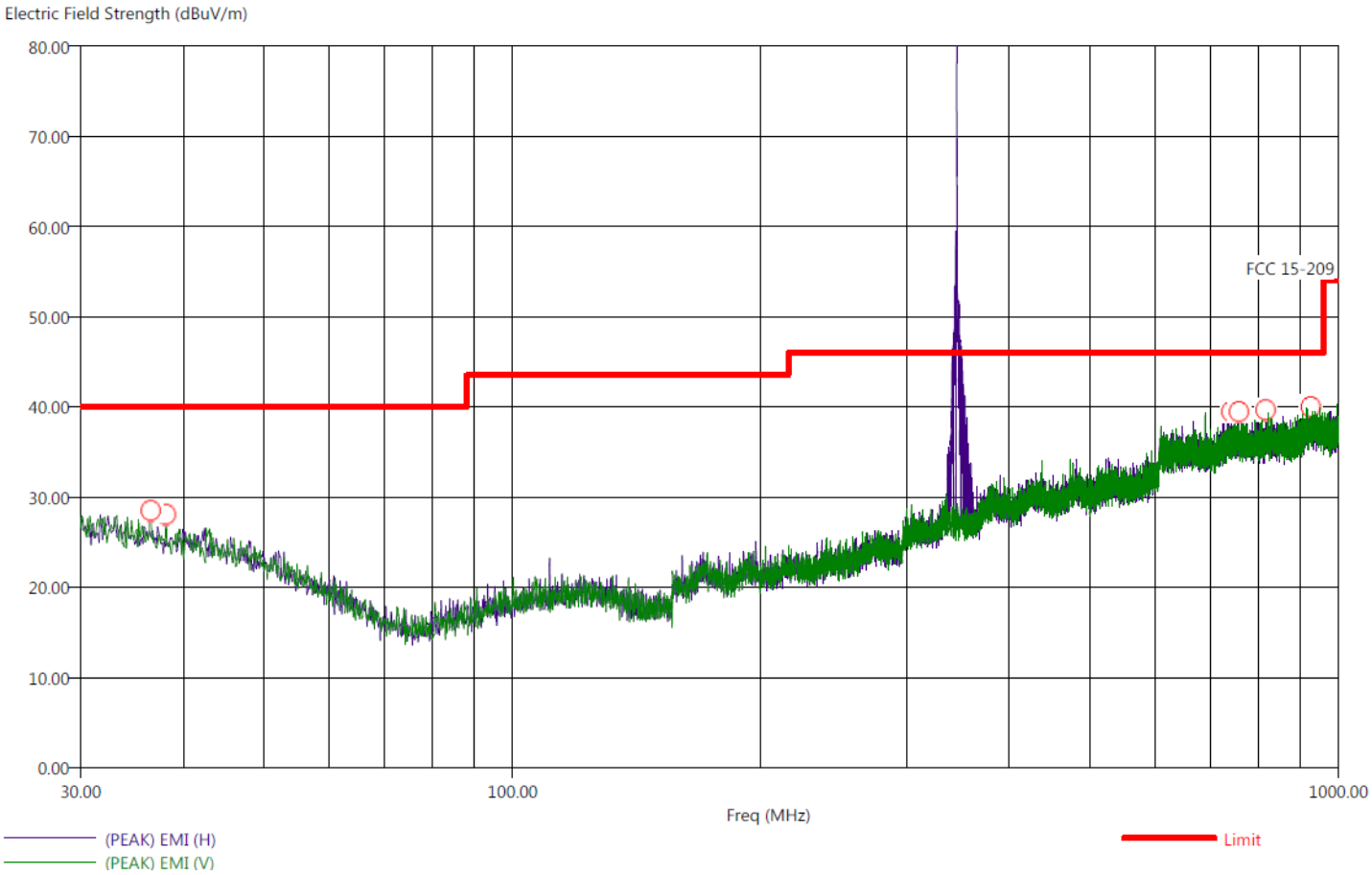
DATA SHEETS

SPURIOUS EMISSIONS
DATA SHEETS

Test title: FCC 15.209
File: Radiated Pre - Scan 30 - 1000MHz
Operator name: Howard Huang
EUT type: Wireless Security Device/LP.PIR02.345
EUT condition: The EUT is constantly transmitting at 345MHz
Notes: Company: Luna Products
Temp:70f
Hum:36%
Battery Powered

2/3/2021 11:58:58 AM
Sequence: Preliminary Scan

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



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
File: Radiated Final - Scan 30 - 1000MHz
Operator name: Howard Huang
EUT type: Wireless Security Device/LP.PIR02.345
EUT condition: The EUT is constantly transmitting at 345MHz
Notes: Company: Luna Products
Temp:70f
Hum:36%
Battery Powered

2/3/2021 12:36:11 PM
Sequence: Final Measurements

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)
36.50	V	28.93	23.20	-16.80	40.00	232.97	111.25	0.61	20.89
38.10	V	28.52	23.00	-17.00	40.00	328.43	179.75	0.63	20.67
742.70	H	39.37	33.58	-12.42	46.00	210.94	179.75	3.09	26.00
758.80	V	39.30	33.59	-12.41	46.00	315.71	66.75	3.13	26.13
817.40	H	38.77	33.74	-12.26	46.00	182.10	238.50	3.29	26.40
926.80	H	40.25	35.06	-10.94	46.00	126.34	13.25	3.59	28.00

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 RSS210
Company: Luna Products Date:2/3/2021
EUT: Wireless Security Sensor Lab:R
Model: PIR Motion Detector Tested By: Howard Huang
Duty Cycle Correction Factor: -19.05

Compatible Electronics, Inc. FAC-3

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Detector	Table (deg)	Tower (m)	Comments
345.00	92.96	H	97.26	-4.30	Peak	0.00	105.00	X Axis
345.00	73.91	H	77.26	-3.35	Avg			X Axis
345.00	89.66	V	97.26	-7.60	Peak	45.00	140.00	X Axis
345.00	70.61	V	77.26	-6.65	Avg			X Axis
345.00	93.87	H	97.26	-3.39	Peak	85.00	100.00	Y Axis
345.00	74.82	H	77.26	-2.44	Avg			Y Axis
345.00	90.89	V	97.26	-6.37	Peak	100.00	140.00	Y Axis
345.00	71.84	V	77.26	-5.42	Avg			Y Axis
345.00	93.86	H	97.26	-3.40	Peak	323.00	100.00	Z Axis
345.00	74.81	H	77.26	-2.45	Avg			Z Axis
345.00	92.42	V	97.26	-4.84	Peak	16.00	150.00	Z Axis
345.00	73.37	V	77.26	-3.89	Avg			Z Axis

Test distance
3 meter

HARMONICS HORIZONTAL

FCC 15.231
Company: Luna Products
EUT: Wireless Security Sensor
Model: PIR Motion Detector
Duty Cycle Correction Factor: -19.05

Date: 2/3/2021
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	44.54	77.26	-32.72	Peak	124.00	100	X-Axis
690.0	25.49	57.26	-31.77	Avg			X-Axis
690.0	44.85	77.26	-32.41	Peak	222.00	100	Y-Axis
690.0	25.80	57.26	-31.46	Avg			Y-Axis
690.0	45.58	77.26	-31.68	Peak	327.00	125	Z-Axis
690.0	26.53	57.26	-30.73	Avg			Z-Axis
1035.0							No Emissions Found
1035.0							No Emissions Found
1380.0							No Emissions Found
1380.0							X-Axis
1380.0							No Emissions Found
1380.0							Y-Axis
1380.0	49.74	73.98	-24.24	Peak	0.00	185	Z-Axis
1380.0	30.69	53.98	-23.29	Avg			Z-Axis
1725.0	56.98	77.26	-20.28	Peak	0.00	123	X-Axis
1725.0	37.93	57.26	-19.33	Avg			X-Axis
1725.0	58.77	77.26	-18.49	Peak	138.00	131	Y-Axis
1725.0	39.72	57.26	-17.54	Avg			Y-Axis
1725.0	60.32	77.26	-16.94	Peak	0.00	185	Z-Axis
1725.0	41.27	57.26	-15.99	Avg			Z-Axis
2070.0	60.93	77.26	-16.33	Peak	103.00	120	X-Axis
2070.0	41.88	57.26	-15.38	Avg			X-Axis
2070.0	60.72	77.26	-16.54	Peak	266.00	130	Y-Axis
2070.0	41.67	57.26	-15.59	Avg			Y-Axis
2070.0	62.64	77.26	-14.62	Peak	260.00	185	Z-Axis
2070.0	43.59	57.26	-13.67	Avg			Z-Axis

Test distance
3 meters

Freq. (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Table Angle (deg)	Ant. Height (m)	Comments
2415.0	49.69	77.26	-27.57	Peak	0.00	121	X-Axis
2415.0	30.64	57.26	-26.62	Avg			X-Axis
2415.0	51.84	77.26	-25.42	Peak	157.00	131	Y-Axis
2415.0	32.79	57.26	-24.47	Avg			Y-Axis
2415.0	53.47	77.26	-23.79	Peak	266.00	185	Z-Axis
2415.0	34.42	57.26	-22.84	Avg			Z-Axis
2760.0							No Emissions Found
2760.0							No Emissions Found
3105.0	53.17	77.26	-24.09	Peak	0.00	136	X-Axis
3105.0	34.12	57.26	-23.14	Avg			X-Axis
3105.0	53.11	77.26	-24.15	Peak	183.00	150	Y-Axis
3105.0	34.06	57.26	-23.20	Avg			Y-Axis
3105.0	51.84	77.26	-25.42	Peak	270.00	185	Z-Axis
3105.0	32.79	57.26	-24.47	Avg			Z-Axis
3450.0	53.24	77.26	-24.02	Peak	0.00	146	X-Axis
3450.0	34.19	57.26	-23.07	Avg			X-Axis
3450.0	52.22	77.26	-25.04	Peak	0.00	150	Y-Axis
3450.0	33.17	57.26	-24.09	Avg			Y-Axis
3450.0	52.75	77.26	-24.51	Peak	270.00	185	Z-Axis
3450.0	33.70	57.26	-23.56	Avg			Z-Axis

HARMONICS VERTICAL

FCC 15.231
Company: Luna Products
EUT: Wireless Security Sensor
Model: PIR Motion Detector
Duty Cycle Correction Factor: -19.05

Date: 2/3/2021
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	43.55	77.26	-33.71	Peak	0.00	140	X-Axis
690.0	24.50	57.26	-32.76	Avg			X-Axis
690.0	44.84	77.26	-32.42	Peak	200.00	100	Y-Axis
690.0	25.79	57.26	-31.47	Avg			Y-Axis
690.0	44.48	77.26	-32.78	Peak	18.00	154	Z-Axis
690.0	25.43	57.26	-31.83	Avg			Z-Axis
1035.0							No Emissions Found
1035.0							No Emissions Found
1380.0	48.78	73.98	-25.20	Peak	180.00	159	X-Axis
1380.0	29.73	53.98	-24.25	Avg			X-Axis
1380.0							No Emissions Found
1380.0							Y-Axis
1380.0							No Emissions Found
1380.0							Z-Axis
1725.0	60.96	77.26	-16.30	Peak	0.00	150	X-Axis
1725.0	41.91	57.26	-15.35	Avg			X-Axis
1725.0	59.06	77.26	-18.20	Peak	20.00	180	Y-Axis
1725.0	40.01	57.26	-17.25	Avg			Y-Axis
1725.0	56.59	77.26	-20.67	Peak	0.00	177	Z-Axis
1725.0	37.54	57.26	-19.72	Avg			Z-Axis
2070.0	62.70	77.26	-14.56	Peak	0.00	145	X-Axis
2070.0	43.65	57.26	-13.61	Avg			X-Axis
2070.0	65.15	77.26	-12.11	Peak	0.00	180	Y-Axis
2070.0	46.10	57.26	-11.16	Avg			Y-Axis
2070.0	62.38	77.26	-14.88	Peak	0.00	180	Z-Axis
2070.0	43.33	57.26	-13.93	Avg			Z-Axis

Test distance
3 meters

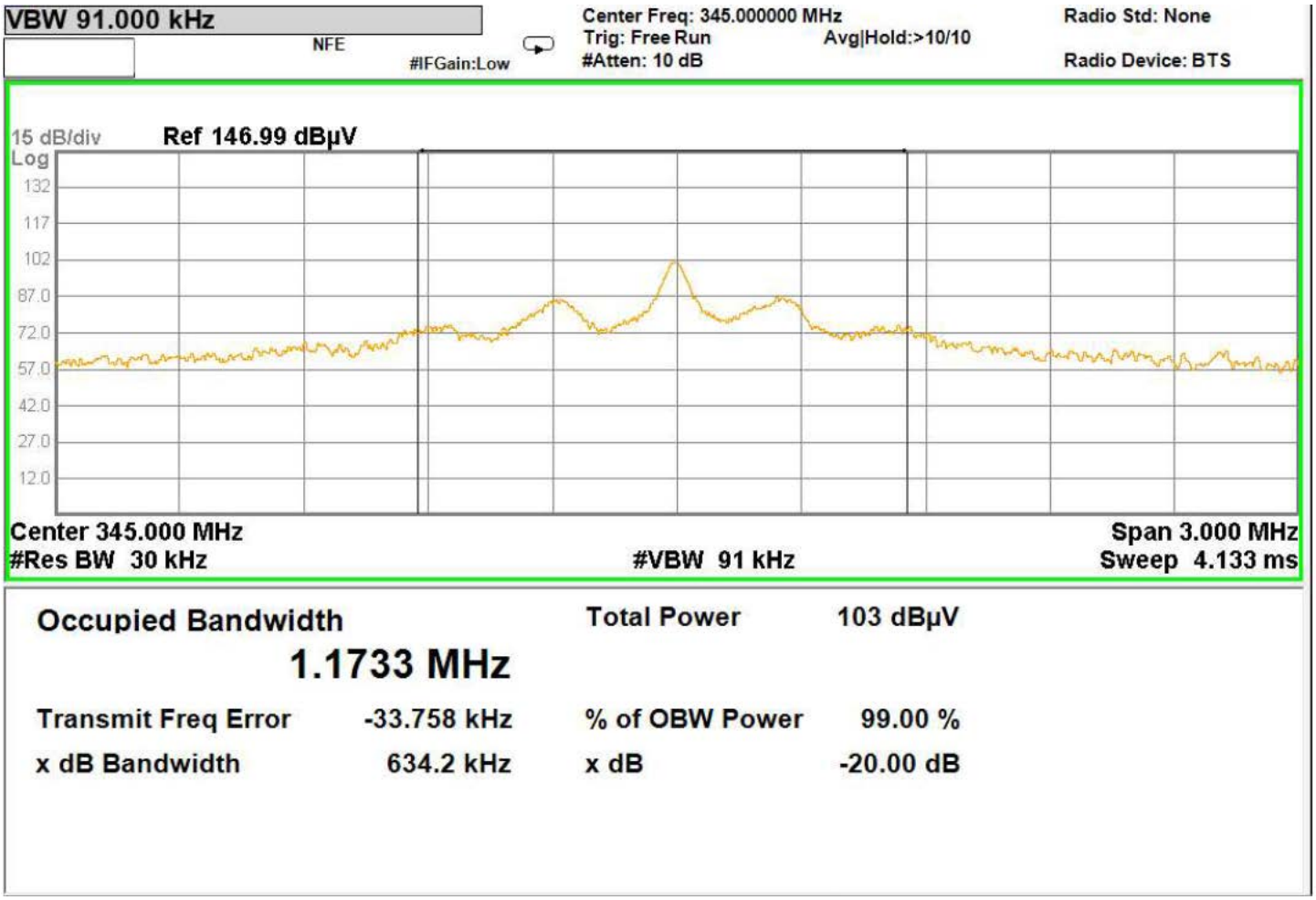
Freq. (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Table Angle (deg)	Ant. Height (m)	Comments
2415.0	51.83	77.26	-25.43	Peak	335.00	145	X-Axis
2415.0	32.78	57.26	-24.48	Avg			X-Axis
2415.0	52.34	77.26	-24.92	Peak	0.00	180	Y-Axis
2415.0	33.29	57.26	-23.97	Avg			Y-Axis
2415.0	52.13	77.26	-25.13	Peak	90.00	177	Z-Axis
2415.0	33.08	57.26	-24.18	Avg			Z-Axis
2760.0							No Emissions Found
2760.0							No Emissions Found
3105.0	53.49	77.26	-23.77	Peak	0.00	153	X-Axis
3105.0	34.44	57.26	-22.82	Avg			X-Axis
3105.0	52.32	77.26	-24.94	Peak	315.00	180	Y-Axis
3105.0	33.27	57.26	-23.99	Avg			Y-Axis
3105.0	53.44	77.26	-23.82	Peak	0.00	170	Z-Axis
3105.0	34.39	57.26	-22.87	Avg			Z-Axis
3450.0	52.28	77.26	-24.98	Peak	0.00	150	X-Axis
3450.0	33.23	57.26	-24.03	Avg			X-Axis
3450.0	52.00	77.26	-25.26	Peak	0.00	180	Y-Axis
3450.0	32.95	57.26	-24.31	Avg			Y-Axis
3450.0	52.82	77.26	-24.44	Peak	70.00	170	Z-Axis
3450.0	33.77	57.26	-23.49	Avg			Z-Axis

99% OCCUPIED AND 20 dB BANDWIDTH
DATA SHEETS

99% BANDWIDTH

FCC 15.231

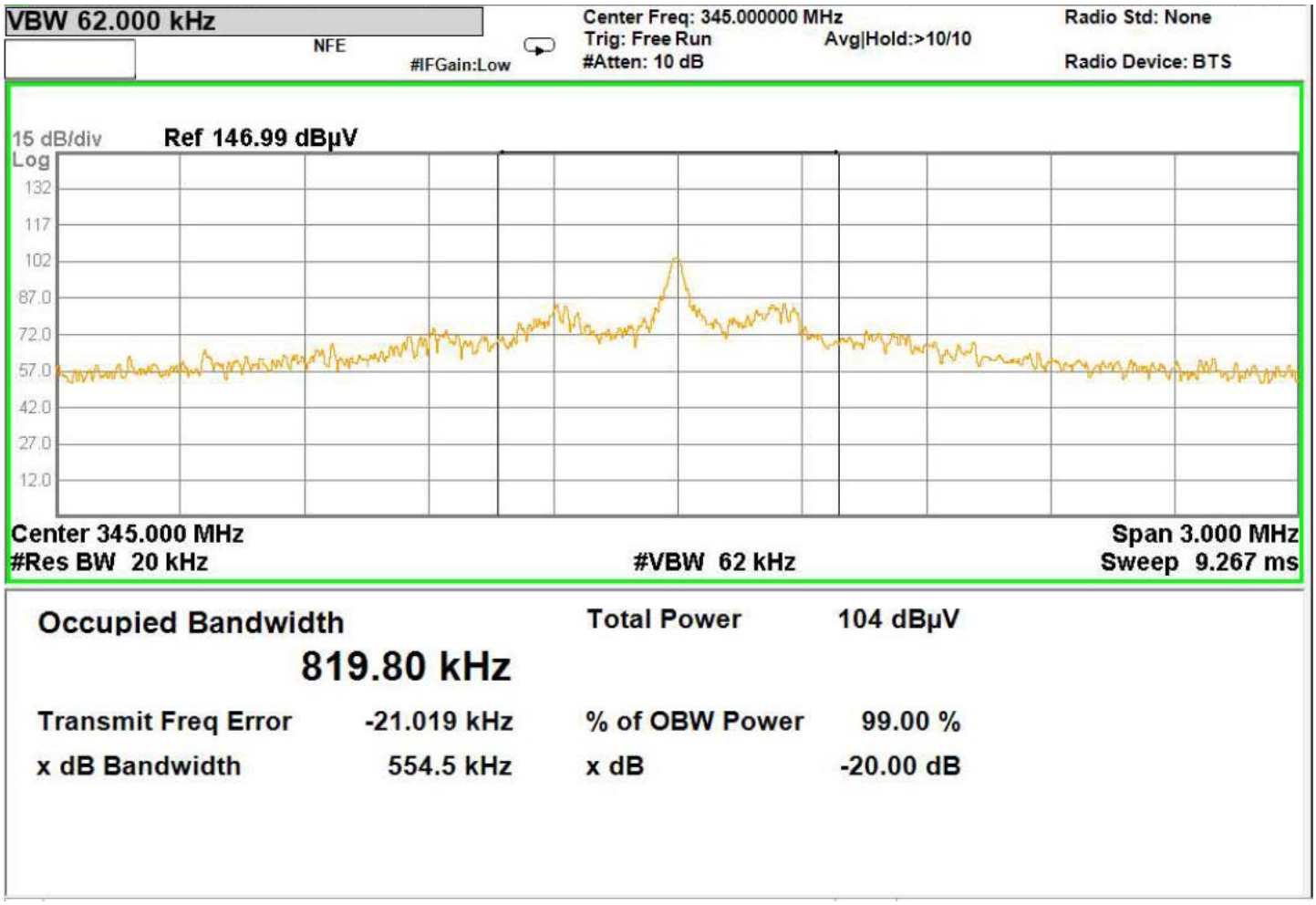
Company:	Luna Products	Date:	2/3/2021
EUT:	Wireless Security Sensor	Lab:	R
Model:	PIR Motion Detector	Tested By:	Howard Huang



20dB BANDWIDTH

FCC 15.231

Company:	Luna Products	Date:	2/3/2021
EUT:	Wireless Security Sensor	Lab:	R
Model:	PIR Motion Detector	Tested By:	Howard Huang

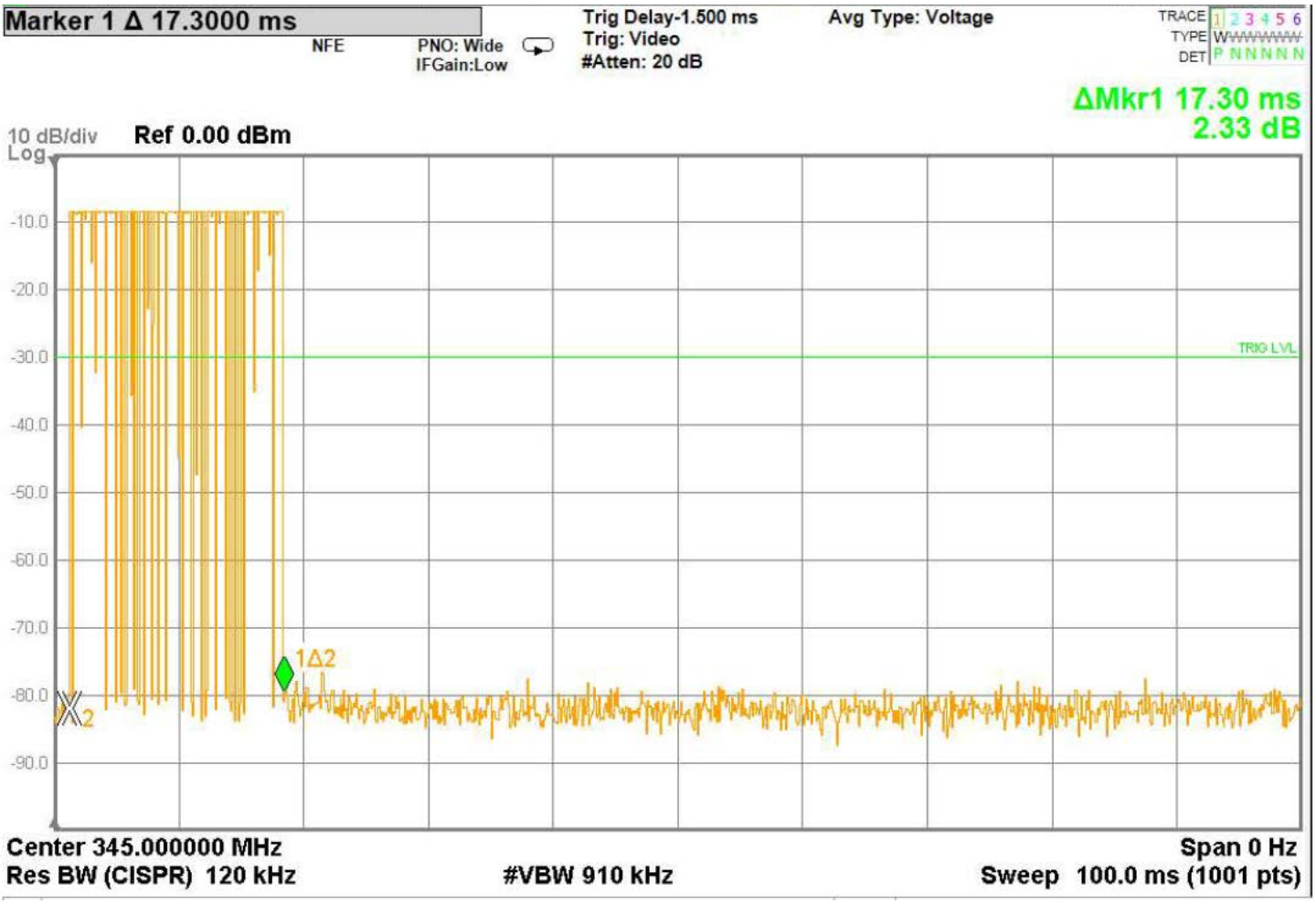


DUTY CYCLE PLOTS
DATA SHEETS

DUTY CYCLE PLOT

FCC 15.231

Company:	Luna Products	Date:	2/3/2021
EUT:	Wireless Security Sensor	Lab:	R
Model:	PIR Motion Detector	Tested By:	Howard Huang



DUTY CYCLE CORRECTION

FCC 15.231

Company: Luna Products
EUT: Wireless Security Sensor
Model: PIR Motion Detector

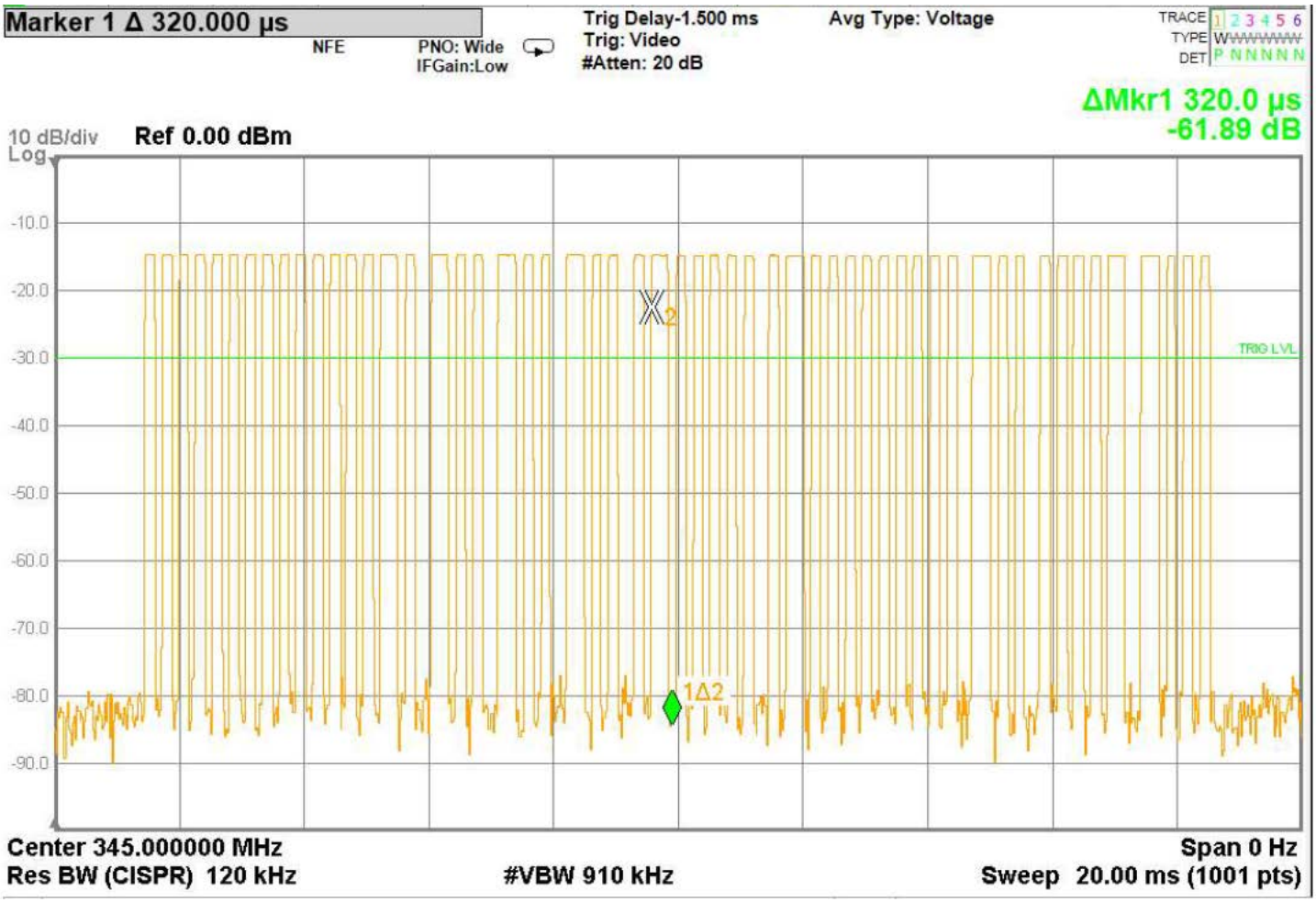
Date: 2/3/2021
Lab: R
Tested By: Howard Huang

One Period (ms)	Pulse 1 (ms)	Pulse 1 (count)	Pulse 2 (ms)	Pulse 2 (count)	Duty Cycle	correction
100	0.32	9	0.18	46	11.16%	-19.05

LONG PULSE

FCC 15.231

Company:	Luna Products	Date:	2/3/2021
EUT:	Wireless Security Sensor	Lab:	R
Model:	PIR Motion Detector	Tested By:	Howard Huang



SHORT PULSE

FCC 15.231

Company:	Luna Products	Date:	2/3/2021
EUT:	Wireless Security Sensor	Lab:	R
Model:	PIR Motion Detector	Tested By:	Howard Huang

TRANSMISSION TIMEOUT
DATA SHEETS

TRANSMISSION TIMEOUT

FCC 15.231

Company:	Luna Products	Date:	2/3/2021
EUT:	Wireless Security Sensor	Lab:	R
Model:	PIR Motion Detector	Tested By:	Howard Huang