

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

for

**Security Device
Model: LP-GB01-345**

Prepared for

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

Prepared by: _____

SAM KERCKHOFF

Reviewed by: _____

JOEY MADLANGBAYAN

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

DATE: MAY 28, 2019

	REPORT BODY	APPENDICES					TOTAL
		A	B	C	D	E	
PAGES	20	2	2	2	11	23	60

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**Headquarters
114 Olinda Drive
Brea, CA 92823
(714) 579-0500**

**Brea Division
102 Olinda Drive
Brea, CA 92823
(714) 579-0500**

**Newbury Park Division
1050 Lawrence Drive
Newbury Park, CA 91320
(949) 480-4044**

**Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400**

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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 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: Security Device
Model: LP-GB01-345
S/N: 0028673

Product Description: The Security Device (LP-GB01-345) is a wireless glass break sensor transmitter operating at 345MHz in the equipment class DSC – Part 15 Security/Remote Control Transmitter. The modulation used is On/Off keying (OOK) and the unit transmits on a single frequency of 345MHz. (6.5cm x 6.5cm x 2.1cm)

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

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

Test Dates: June 4, 2019

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



Headquarters
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Brea Division
102 Olinda Drive
Brea, CA 92823
(714) 579-0500

Newbury Park Division
1050 Lawrence Drive
Newbury Park, CA 91320
(949) 480-4044

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

SUMMARY OF TEST RESULTS

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

TABLE 1
SIX HIGHEST RADIATED EMISSIONS READINGS

	Reading Type (PK / QP / AV)	Polarization (Vert / Horz)	Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Delta (dB)	Test Distance
1	PK	V – Z axis	2070.00	72.57	77.25	-4.68	3-Meter
2	PK	V – Y axis	2070.00	72.14	77.25	-5.11	3-Meter
3	PK	H – Z axis	345.00	90.39	97.25	-6.86	3-Meter
4	PK	H – Y axis	345.00	90.22	97.25	-7.03	3-Meter
5	PK	H – X axis	2070.00	70.10	77.25	-7.15	3-Meter
6	PK	V – X axis	2070.00	69.51	77.25	-7.74	3-Meter



1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the Security Device Model: LP-GB01-345. The EMI measurements were performed according to the measurement procedure described in ANSI C63.10. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT (equipment under test) hereafter, are within the specification limits defined by the Code of Federal Regulations Title 47, Part 15 Subpart B section 15.109, Subpart C sections 15.205, 15.209, 15.231, RSS GEN, & RSS 210.



2. ADMINISTRATIVE DATA

2.1 Location of Testing

The tests described herein were performed at the test facility of Compatible Electronics, 20621 Pascal Way Lake Forest, California 92630.

2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The calibration is traceable to the National Institute of Standards and Technology (NIST).

2.3 Cognizant Personnel

Luna Products, LLC

Robert Reichert

Sr. Regulatory, Test and Customer Service Engineer

Compatible Electronics, Inc.

Sam Kerckhoff

Test Technician

Joey Madlangbayan

Product Safety Manager

2.4 Date Test Sample was Received

The test sample was received on June 4, 2019.

2.5 Disposition of the Test Sample

The test sample remains at Compatible Electronics, Inc. as of the date of this test report.

2.6 Abbreviations and Acronyms

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

RF	Radio Frequency
EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
HP	Hewlett Packard
ITE	Information Technology Equipment
CML	Corrected Meter Limit
NCR	No Calibration Required
LISN	Line Impedance Stabilization Network
NVLAP	National Voluntary Laboratory Accreditation Program
CFR	Code of Federal Regulations
PCB	Printed Circuit Board
TX	Transmit
RX	Receive



3. APPLICABLE DOCUMENTS

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

SPEC	TITLE
CFR Title 47, Part 15	FCC Rules – Radio frequency devices (including digital devices)
ANSI C63.4 2014	Methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz.
ANSI C63.10: 2013	American National Standard for Testing Unlicensed Wireless Devices
RSS GEN Issue 5 (April 2018)	General Requirements for Compliance of Radio Apparatus
RSS 210 Issue 9 (Aug 2016) + A1 (Nov. 2017)	License-exempt Radio Apparatus (All Frequency Bands): Category I Equipment



4. DESCRIPTION OF TEST CONFIGURATION

4.1 Description of Test Configuration

The Security Device Model: LP-GB01-345 (EUT) was setup in a standalone tabletop configuration. The EUT was checked in all 3 axes. The worst case was found to be the Z-Axis. The EUT was continuously transmitting during the transmit tests and in standby mode for standby tests.

The EUT was tested with new batteries.

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

4.1.1 Photograph Test Configuration (X-Axis Shown)



4.1.2 Cable Construction and Termination

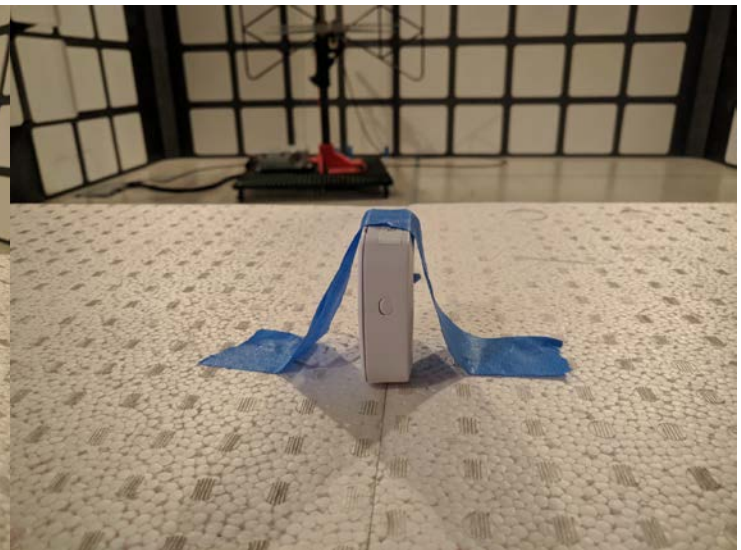
The EUT had no interconnecting cables.

4.1.3 Axis Orientation

Z-Axis



Y-Axis



X-Axis



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

#	EQUIPMENT TYPE	MANU- FACTURE	MODEL	FCC ID	SERIAL NUMBER
1	Security Device (EUT)	Luna Products	LP-GB01-345	2ATK4LPGB01345	0028673
2	Battery	Vinnic	AM3	None	None



5.2 EMI Test Equipment

EQUIPMENT TYPE	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
Thermometer & Hygrometer	Control Company	4088	97080656	2/20/2019	2/20/2020
Computer	Compatible Electronics	NONE	NONE	NCR	NCR
EMI Receiver	Rohde & Schwarz	ESIB40	100218	09/20/2018	09/20/2019
EMI Receiver	Keysight	N9038A	MY55330012	02/05/2019	02/05/2020
Antenna, Loop	Com Power	AL-130	121049	03/21/2019	03/21/2021
Antenna, CombiLog	Com Power	AC-220	061123	03/12/2019	03/12/2020
Antenna, Horn 1-18GHz	Com Power	AH-118	071225	07/05/2018	07/05/2019
Preamplifier, 0.5-18GHz	Com Power	PAM-118A	551034	01/28/2019	01/28/2020
Mast, Antenna Positioner	Sunol Science Corporation	TWR 95-4	020808-3	NCR	NCR
Turntable	Sunol Science Corporation	FM 2001	NCR	NCR	NCR
Mast and Turntable Controller	Sunol Science Corporation	SC104V	020808-1	NCR	NCR

5.4 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.

6.2 EUT Mounting, Bonding and Grounding

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

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

The EUT was not grounded.

6.3 Facility Environmental Characteristics

When applicable refer to the data sheets in Appendix E for the relative humidity, air temperature, and barometric pressure.

6.4 Measurement Uncertainty

“Compatible Electronics’ U_{lab} value is less than U_{cispr} , thus based on this – compliance is deemed to occur if no measured disturbance exceeds the disturbance limit

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

Measurement		U_{cispr}	$U_{lab} = 2 u_c(y)$
Conducted disturbance (mains port)	(150 kHz – 30 MHz)	3,6 dB	2.88
Radiated disturbance (electric field strength on an open area test site or alternative test site)	(30 MHz – 1 000 MHz)	5,2 dB	3.53



7. CHARACTERISTICS OF THE TRANSMITTER

7.1 Channel Number and Frequencies

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

7.2 Antenna

The antenna is a short wire loop with length less than 1/10 wavelength.

7.3 EUT Test Software

Firmware v1.48



8. TEST PROCEDURES

The following sections describe the test methods and the specifications for the tests. Test results are also included in this section.

8.1 RF Emissions

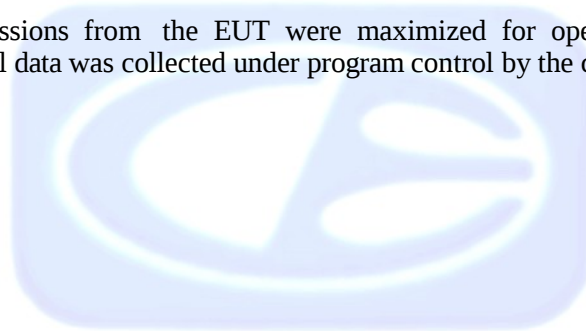
8.1.1 Conducted Emissions Test

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

The EMI receiver was used as a measuring meter. A quasi-peak and/or average reading was taken only where indicated in the data sheets. The LISN output was measured using the EMI receiver. The output of the second LISN was terminated by a 50-ohm termination. The effective measurement bandwidth used for this test was 9 kHz.

Please see section 6.2 of this report for mounting, bonding, and grounding of the EUT. The EUT received its power through the LISN, which was bonded to the ground plane. The EUT was set up with the minimum distances from any conductive surfaces as specified in ANSI 63.4. The excess power cord was wrapped in a figure eight pattern to form a bundle not exceeding 0.4 meters in length.

The conducted emissions from the EUT were maximized for operating mode as well as cable placement. The final data was collected under program control by the computer software.



8.1.2 Radiated Emissions (Spurious and Harmonics) Test

The EMI receiver was used as a measuring meter. The receiver was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the receiver records the highest measured reading over all the sweeps.

For spurious emissions the quasi-peak detector was used for frequencies below 1GHz and the average detector was used for frequencies above 1 GHz.

For the Fundamental & Harmonic emissions a duty cycle average was used.

The measurement bandwidths and transducers used for the radiated emissions test were:

FREQUENCY RANGE (MHz)	TRANSDUCER	EFFECTIVE MEASUREMENT BANDWIDTH
.009 to .150	Active Loop Antenna	200 Hz
.150 to 30	Active Loop Antenna	9 kHz
30 to 1000	Combilog Antenna	100 kHz (120kHz for QP Measurements)
1000 to 3450	Horn Antenna	1 MHz

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

Test Results:

The EUT complies with the limits of CFR Title 47 Part 15 Subpart B section 15.109, Subpart C sections 15.205, 15.209, 15.231, RSS GEN & RSS 210. The six highest emissions are listed in table 1.



8.1.3 Peak radiated EMI

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

$$\delta(\text{dB}) = 20 \log \left[\frac{\sum (nt_1 + mt_2 + \dots + \xi t_x)}{T} \right]$$

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 t_x

T is the period of the pulse train or 100 ms if the pulse train length is greater than 100ms

$$\text{Pulse Type 1} = 7 * 56.11\mu\text{s} = 392.77\mu\text{s}$$

$$\text{Pulse Type 2} = 50 * 29.66\mu\text{s} = 1483.00\mu\text{s}$$

$$392.77\mu\text{s} + 1483.00\mu\text{s} = 1875.77\mu\text{s}$$

$$\text{Total ON Time} = 1.88\text{ms}$$

$$\text{Duty Cycle} = 1.88\text{ms} / 100\text{ms} = 0.0188$$

$$20 \log (0.0188) = -34.54\text{dB correction factor}$$

Duty Cycle Correction Factor Used = -20.00dB

Test Results:

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



8.1.4 Bandwidth of the Fundamental

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

Test Results:

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

8.1.5 Occupied Bandwidth

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

Test Results:

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

8.1.6 Transmit Timeout

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

Test Results:

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



8.1.7 Sample Calculations

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

The equation can be derived in the following manner:

Specification limit ($\mu\text{V/m}$) $\log \times 20$ = Specification Limit in dBuV

(Specification distance / test distance) $\log \times 40$ = distance factor

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

OR

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

where:

F = antenna factor

A= amplifier gain

C = cable loss

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

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



9. TEST PROCEDURE DEVIATIONS

The test procedures were not deviated from throughout all tests.

10. CONCLUSIONS

The Security Device Model: LP-GB01-345 meets all relevant specification requirements defined in the Code of Federal Regulations Title 47, Part 15 Subpart C sections 15.205, 15.207, 15.209, 15.231, RSS GEN, & RSS 210.



APPENDIX A
***LABORATORY ACCREDITATIONS AND
RECOGNITIONS***

Headquarters
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Brea Division
102 Olinda Drive
Brea, CA 92823
(714) 579-0500

Newbury Park Division
1050 Lawrence Drive
Newbury Park, CA 91320
(949) 480-4044

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

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."

ISED#: 2154C



Headquarters
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Brea Division
102 Olinda Drive
Brea, CA 92823
(714) 579-0500

Newbury Park Division
1050 Lawrence Drive
Newbury Park, CA 91320
(949) 480-4044

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

APPENDIX B***MODIFICATIONS TO THE EUT***

Headquarters
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Brea Division
102 Olinda Drive
Brea, CA 92823
(714) 579-0500

Newbury Park Division
1050 Lawrence Drive
Newbury Park, CA 91320
(949) 480-4044

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

MODIFICATIONS TO THE EUT

There were no modifications were made during testing.



Headquarters
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Brea Division
102 Olinda Drive
Brea, CA 92823
(714) 579-0500

Newbury Park Division
1050 Lawrence Drive
Newbury Park, CA 91320
(949) 480-4044

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

APPENDIX C
***ADDITIONAL MODELS COVERED
UNDER THIS REPORT***

Headquarters
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Brea Division
102 Olinda Drive
Brea, CA 92823
(714) 579-0500

Newbury Park Division
1050 Lawrence Drive
Newbury Park, CA 91320
(949) 480-4044

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST

SECURITY DEVICE
MODEL: LP-GB01-345
S/N: 0028673

No additional models were tested.



Headquarters
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Brea Division
102 Olinda Drive
Brea, CA 92823
(714) 579-0500

Newbury Park Division
1050 Lawrence Drive
Newbury Park, CA 91320
(949) 480-4044

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

APPENDIX D***DIAGRAMS, CHARTS, AND PHOTOS***

Headquarters
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Brea Division
102 Olinda Drive
Brea, CA 92823
(714) 579-0500

Newbury Park Division
1050 Lawrence Drive
Newbury Park, CA 91320
(949) 480-4044

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

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

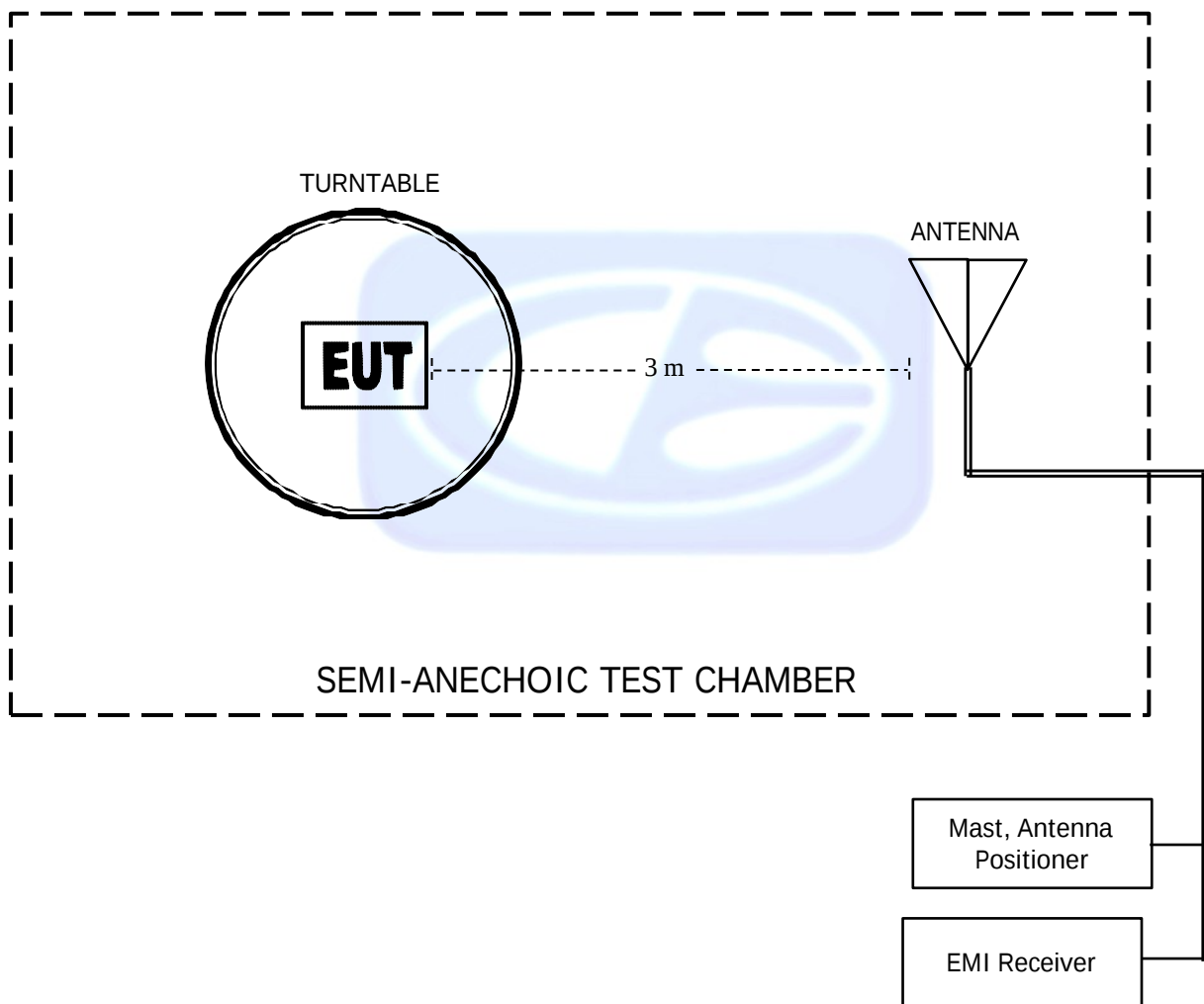
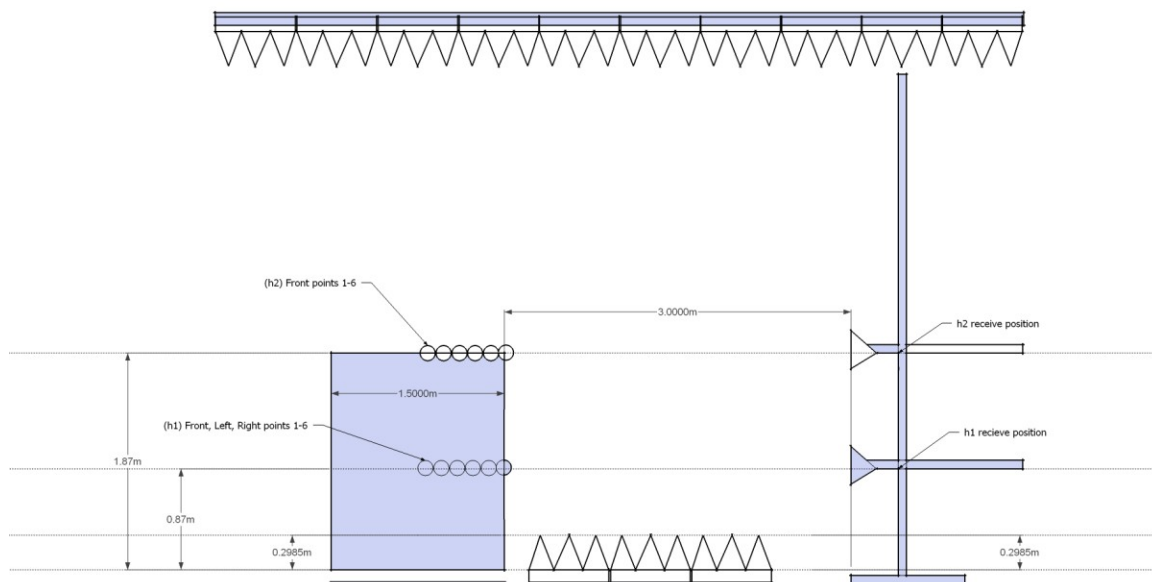


FIGURE 2: PLOT MAP AND LAYOUT OF TEST SITE ABOVE 1GHZ



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

FREQUENCY (MHz)	MAGNETIC (dB/m)	ELECTRIC (dB/m)	FREQUENCY (MHz)	MAGNETIC (dB/m)	ELECTRIC (dB/m)
0.009	-34.64	16.86	0.8	-36.32	15.18
0.01	-34.78	16.72	0.9	-36.22	15.28
0.02	-35.91	15.59	1.0	-36.22	15.28
0.03	-35.48	16.02	2.0	-35.91	15.59
0.04	-35.82	15.68	3.0	-35.91	15.59
0.05	-36.49	15.01	4.0	-36.01	15.49
0.06	-36.30	15.20	5.0	-35.80	15.70
0.07	-36.43	15.07	6.0	-36.00	15.50
0.08	-36.30	15.20	7.0	-35.90	15.60
0.09	-36.39	15.11	8.0	-35.70	15.80
0.1	-36.41	15.09	9.0	-35.70	15.80
0.2	-36.61	14.89	10.0	-35.60	15.90
0.3	-36.63	14.87	15.0	-36.52	14.98
0.4	-36.52	14.99	20.0	-35.75	15.75
0.5	-36.63	14.87	25.0	-37.78	13.72
0.6	-36.62	14.88	30.0	-38.62	12.88
0.7	-36.53	14.97			



COM-POWER AC-220 LAB R**COMBILOG ANTENNA****S/N: 061123****CALIBRATION DUE: MARCH 12, 2020**

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	24.96	160	13.75
35	23.67	180	14.77
40	19.85	200	14.70
45	17.30	250	16.92
50	16.08	300	19.00
60	13.19	400	20.78
70	11.45	500	21.78
80	11.87	600	23.50
90	14.17	700	23.91
100	14.94	800	26.05
120	15.98	900	26.60
140	14.68	1000	27.55



COM-POWER AH-118**HORN ANTENNA****S/N: 071225****CALIBRATION DUE: JULY 5, 2019**

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



COM-POWER PAM-118A**PREAMPLIFIER****S/N: 550134****CALIBRATION DUE: JANUARY 28, 2019**

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
0.5	39.68	6	41.31
0.6	39.94	6.5	41.35
0.7	39.99	7	41.61
0.8	40.24	7.5	41.72
0.9	39.93	8	41.73
1	40.44	8.5	40.82
1.25	40.63	9	40.78
1.5	40.80	9.5	42.10
1.75	41.00	10	42.62
2	41.35	10.5	41.43
2.25	41.60	11	41.00
2.5	41.82	11.5	41.26
2.75	42.08	12	41.50
3	42.33	12.5	41.01
3.25	42.50	13	40.50
3.5	42.59	13.5	40.28
3.75	42.64	14	40.32
4	42.60	14.5	40.55





FRONT VIEW

LUNA PRODUCTS LLC

SECURITY DEVICE

MODEL: LP-GB01-345

FCC SUBPART C - RADIATED EMISSIONS < 1GHz

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**

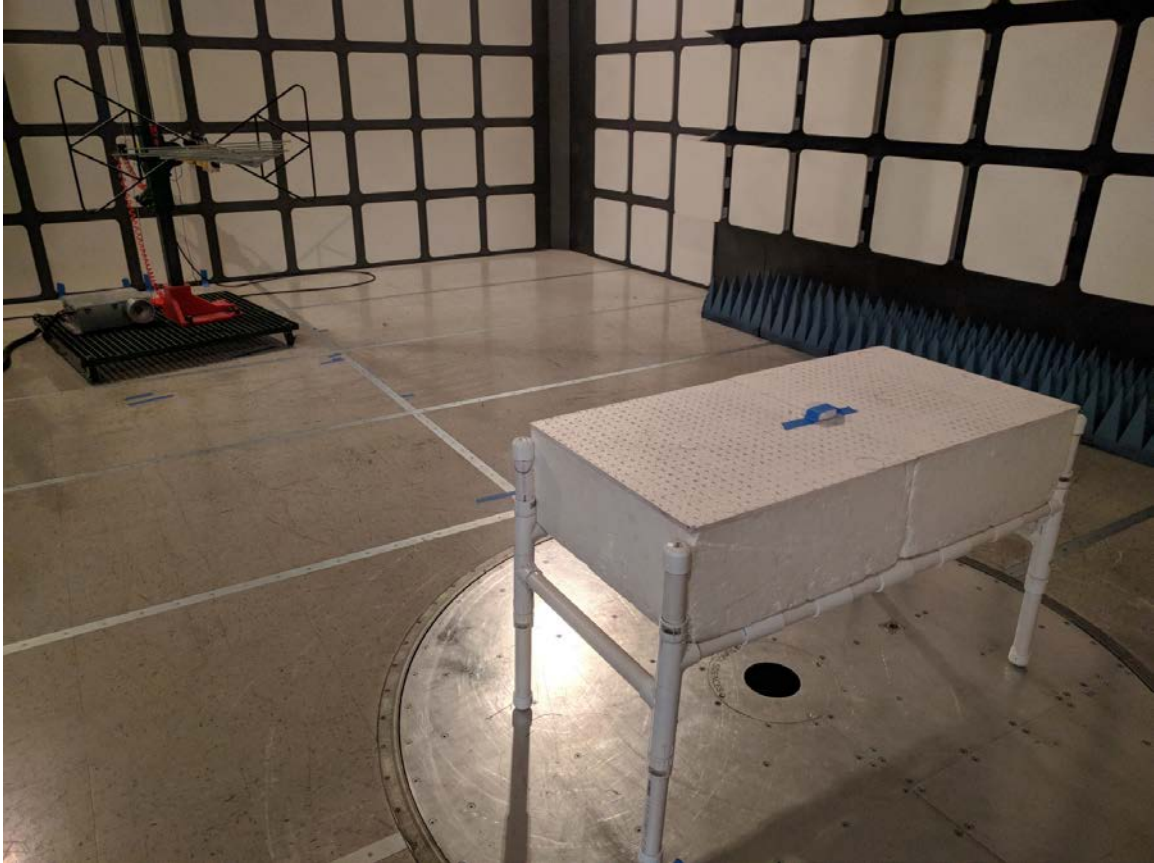


Headquarters
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Brea Division
102 Olinda Drive
Brea, CA 92823
(714) 579-0500

Newbury Park Division
1050 Lawrence Drive
Newbury Park, CA 91320
(949) 480-4044

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400



REAR VIEW

LUNA PRODUCTS LLC

SECURITY DEVICE

MODEL: LP-GB01-345

FCC SUBPART C - RADIATED EMISSIONS < 1GHZ

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**

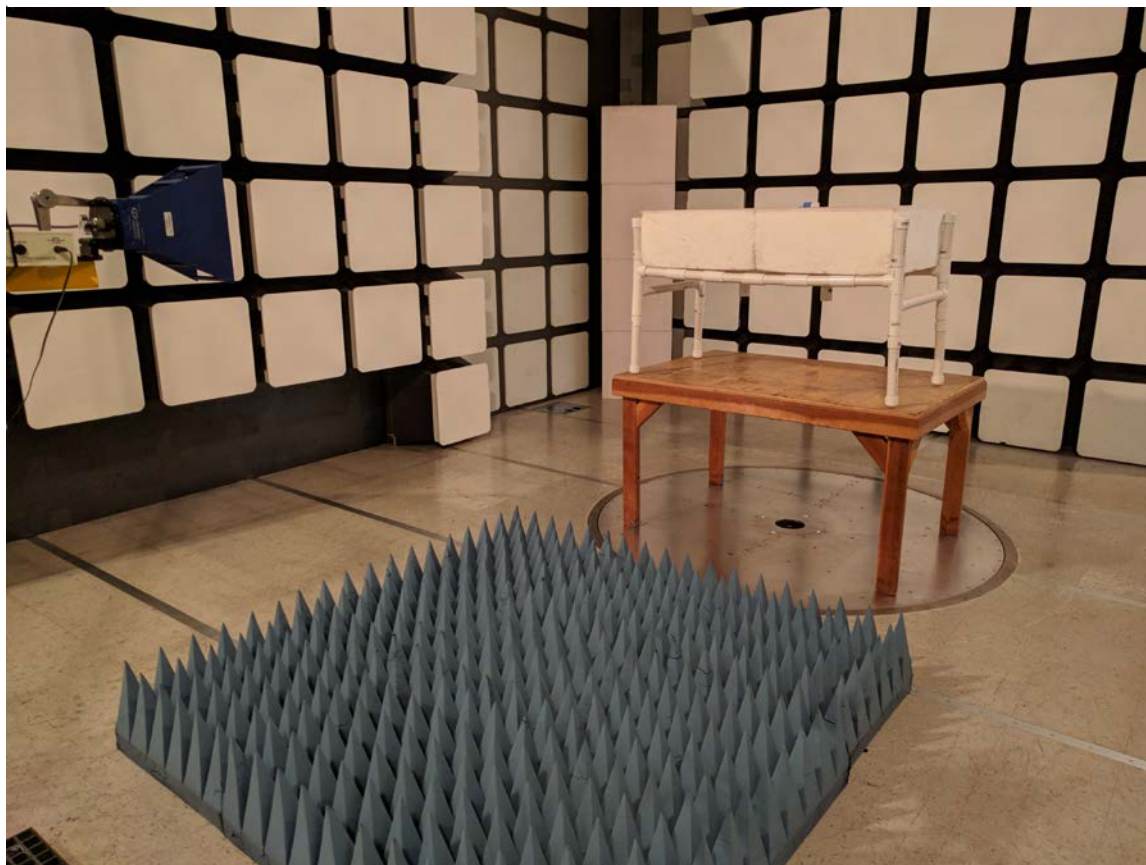


Headquarters
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

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102 Olinda Drive
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(714) 579-0500

Newbury Park Division
1050 Lawrence Drive
Newbury Park, CA 91320
(949) 480-4044

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
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FRONT VIEW

LUNA PRODUCTS LLC

SECURITY DEVICE

MODEL: LP-GB01-345

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**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**



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Brea, CA 92823
(714) 579-0500

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1050 Lawrence Drive
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REAR VIEW

LUNA PRODUCTS LLC

SECURITY DEVICE

MODEL: LP-GB01-345

FCC SUBPART C - RADIATED EMISSIONS > 1GHZ

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**



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114 Olinda Drive
Brea, CA 92823
(714) 579-0500

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(714) 579-0500

Newbury Park Division
1050 Lawrence Drive
Newbury Park, CA 91320
(949) 480-4044

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

APPENDIX E
RADIATED EMISSIONS DATA SHEETS

Headquarters
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Brea Division
102 Olinda Drive
Brea, CA 92823
(714) 579-0500

Newbury Park Division
1050 Lawrence Drive
Newbury Park, CA 91320
(949) 480-4044

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

Title: FCC 15.209

File: Radiated Pre-Scan 30-1000Mhz

Operator: Sam Kerckhoff

EUT Type: Security Device

EUT Condition: The EUT is constantly transmitting

Comments: Spurious/ Z-axis

Temp: 68f

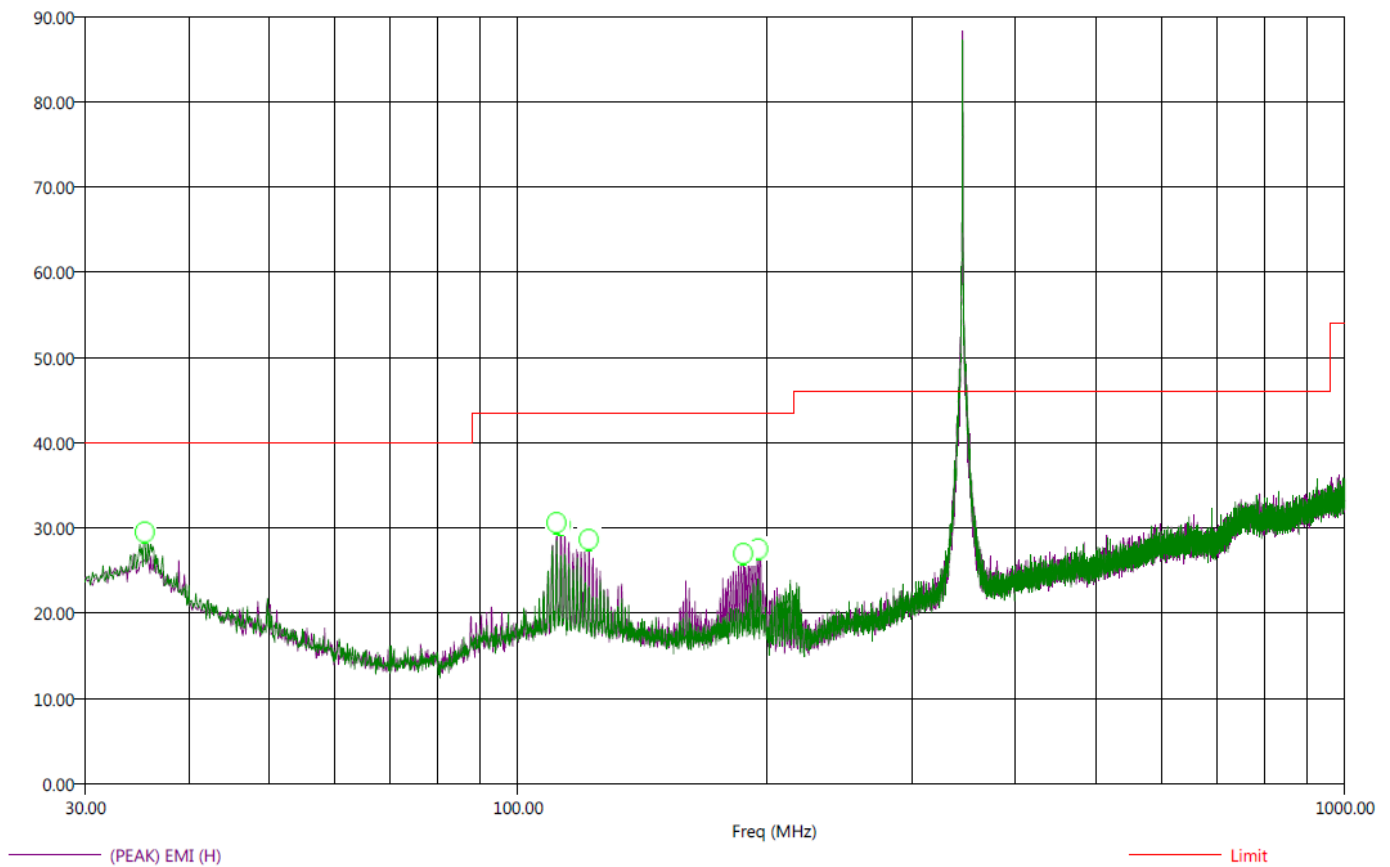
Hum: 47%

Battery

6/4/2019 9:16:56 AM

Sequence: Preliminary Scan

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

Electric Field Strength (dB μ V/m)

There were no emissions found below 30 MHz or emissions other than harmonics above 1GHz.



Headquarters
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Brea Division
102 Olinda Drive
Brea, CA 92823
(714) 579-0500

Newbury Park Division
1050 Lawrence Drive
Newbury Park, CA 91320
(949) 480-4044

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

Title: FCC 15.209

File: Radiated Final 30-1000Mhz

Operator: Sam Kerckhoff

EUT Type: Security Device

EUT Condition: The EUT is constantly transmitting.

Comments: Spurious / Z-axis

Temp: 68f

Hum: 47%

Battery

6/4/2019 9:42:32 AM

Sequence: Final Measurements

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

Freq (MHz)	(QP) Margin (dB)	(QP) EMI (dBuV/m)	(PEAK) EMI (dBuV/m)	Limit (dBuV/m)	Pol	Ttbl Agl (deg)	Twr Ht (cm)	Transducer (dB)	Cable (dB)
35.40	-18.15	21.85	28.17	40.00	V	91.00	124.83	23.25	0.47
111.40	-15.29	28.23	30.89	43.52	H	95.25	312.65	15.56	0.92
112.70	-15.60	27.92	30.60	43.52	H	98.25	317.19	15.62	0.92
121.90	-16.74	26.78	29.54	43.52	H	139.25	356.00	15.85	0.97
187.40	-17.53	25.99	29.36	43.52	H	20.50	171.52	14.74	1.18
195.40	-17.79	25.73	29.28	43.52	H	138.75	260.89	14.72	1.20

There were no emissions other than harmonics found below 30 MHz or emissions other than harmonics above 1GHz.



Headquarters
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Brea Division
102 Olinda Drive
Brea, CA 92823
(714) 579-0500

Newbury Park Division
1050 Lawrence Drive
Newbury Park, CA 91320
(949) 480-4044

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

Title: FCC 15.209

File: Radiated Pre-scan 1-4GHz

Operator: Sam Kerckhoff

EUT Type: Security Device

EUT Condition: The EUT is constantly transmitting.

Comments: Spurious / Z-Axis

Temp: 68f

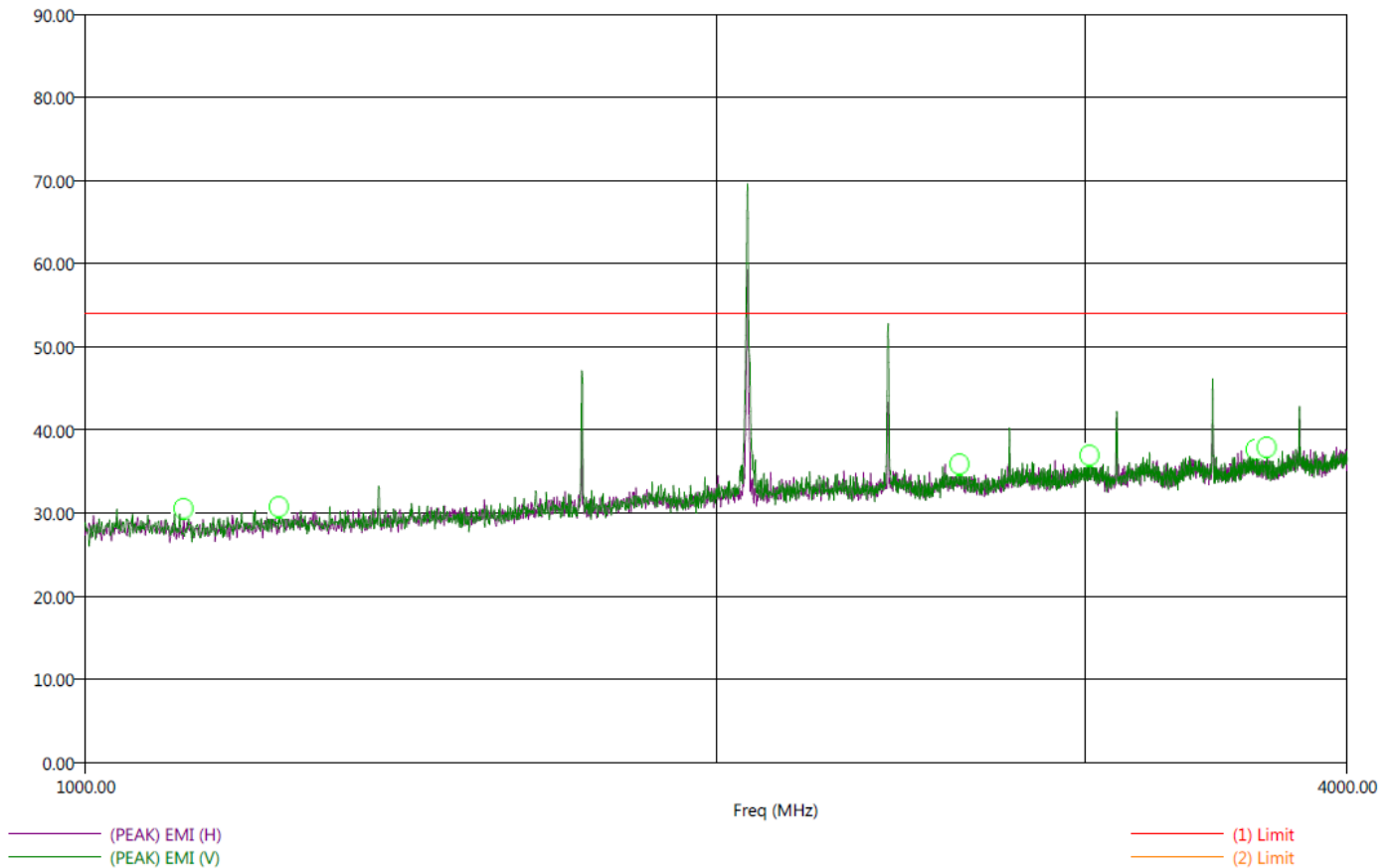
Hum: 56%

Battery

6/4/2019 12:15:02 PM

Sequence: Preliminary Scan

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

Electric Field Strength (dB μ V/m)

Harmonics of the fundamental are not spurious emissions therefore amplitudes at those frequencies were ignored.



Headquarters
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Brea Division
102 Olinda Drive
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(714) 579-0500

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1050 Lawrence Drive
Newbury Park, CA 91320
(949) 480-4044

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

Title: FCC 15.209

File: Radiated Final 1-4GHz

Operator: Sam Kerckhoff

EUT Type: Security Device

EUT Condition: The EUT is constantly transmitting.

Comments: Spurious / Z-Axis

Temp: 68f

Hum: 56%

Battery

6/4/2019 12:23:50 PM

Sequence: Final Measurements

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

Freq (MHz)	(AVG) Margin (dB)	(AVG) EMI (dBuV/m)	(PEAK) EMI (dBuV/m)	Limit (dBuV/m)	Pol	Ttbl Agl (deg)	Twr Ht (cm)	Transducer (dB)	Cable (dB)	Preamp (dB)
1114.00	-35.85	18.13	31.31	53.98	H	228.00	145.13	24.24	3.11	40.34
1237.00	-35.05	18.93	31.72	53.98	V	356.00	137.85	24.63	3.27	40.61
2613.00	-30.10	23.88	36.85	53.98	V	288.00	221.43	29.14	4.84	41.94
3014.00	-29.10	24.88	38.11	53.98	V	199.50	364.71	30.03	5.21	42.33
3618.00	-28.20	25.78	38.77	53.98	H	175.50	366.62	30.94	5.74	42.59
3662.00	-28.62	25.36	38.63	53.98	V	108.00	385.97	31.02	5.78	42.59

There were no radiated emissions other than harmonics found below 30MHz.

Headquarters
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Brea Division
102 Olinda Drive
Brea, CA 92823
(714) 579-0500

Newbury Park Division
1050 Lawrence Drive
Newbury Park, CA 91320
(949) 480-4044

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

FUNDAMENTAL & HARMONICS



DATA SHEETS



Headquarters
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Brea Division
102 Olinda Drive
Brea, CA 92823
(714) 579-0500

Newbury Park Division
1050 Lawrence Drive
Newbury Park, CA 91320
(949) 480-4044

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

FUNDAMENTAL FIELD STRENGTH

FCC 15.231

Company: Luna Products, LLC

EUT: Security Device

Model: LP-GB01-345

Duty Cycle Correction Factor: -20.00

Date: 06/04/2019

Lab: R

Tested By: Sam K.

Compatible Electronics, Inc. FAC-3

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table	Tower	Comments
345.00	89.18	V	97.25	-8.07	Peak	249.50	100.00	X-Axis
345.00	69.18	V	77.25	-8.07	Avg	249.50	100.00	X-Axis
345.00	87.67	V	97.25	-9.58	Peak	253.00	100.35	Y-Axis
345.00	67.67	V	77.25	-9.58	Avg	253.00	100.35	Y-Axis
345.00	87.38	V	97.25	-9.87	Peak	174.00	207.52	Z-Axis
345.00	67.38	V	77.25	-9.87	Avg	174.00	207.52	Z-Axis
345.00	89.23	H	97.25	-8.02	Peak	134.50	126.44	X-Axis
345.00	69.23	H	77.25	-8.02	Avg	134.50	126.44	X-Axis
345.00	90.22	H	97.25	-7.03	Peak	182.00	127.00	Y-Axis
345.00	70.22	H	77.25	-7.03	Avg	182.00	127.00	Y-Axis
345.00	90.39	H	97.25	-6.86	Peak	261.00	133.25	Z-Axis
345.00	70.39	H	77.25	-6.86	Avg	261.00	133.25	Z-Axis



HARMONICS – HORIZONTAL

FCC 15.231

Company: Luna Products, LLC

EUT: Security Device

Model: LP-GB01-345

Duty Cycle Correction Factor: -20.00

Date: 06/04/2019

Lab: R

Tested By: Sam K.

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
690.00	49.69	H	77.25	-27.56	Peak			Unrestricted/Floor
690.00	29.69	H	57.25	-27.56	Avg			Unrestricted/Floor
1035.00	31.02	H	73.97	-42.95	Peak			Restricted/Floor
1035.00	11.02	H	53.97	-42.95	Avg			Restricted/Floor
1380.00	33.35	H	73.97	-40.62	Peak			Restricted/Floor
1380.00	13.35	H	53.97	-40.62	Avg			Restricted/Floor
1725.00	46.86	H	77.25	-30.39	Peak	61.50	141.25	Unrestricted
1725.00	26.86	H	57.25	-30.39	Avg	61.50	141.25	Unrestricted
2070.00	70.10	H	77.25	-7.15	Peak	49.00	141.91	Unrestricted
2070.00	50.10	H	57.25	-7.15	Avg	49.00	141.91	Unrestricted
2415.00	52.27	H	77.25	-24.98	Peak	54.00	140.65	Unrestricted
2415.00	32.27	H	57.25	-24.98	Avg	54.00	140.65	Unrestricted
2760.00	42.10	H	73.97	-31.87	Peak	47.00	144.77	Restricted
2760.00	22.10	H	53.97	-31.87	Avg	47.00	144.77	Restricted
3105.00	45.37	H	77.25	-31.88	Peak	54.25	144.77	Unrestricted
3105.00	25.37	H	57.25	-31.88	Avg	54.25	144.77	Unrestricted
3450.00	45.69	H	77.25	-31.56	Peak	54.25	144.77	Unrestricted
3450.00	25.69	H	57.25	-31.56	Avg	54.25	144.77	Unrestricted

Test distance:

3 meter

Orientation:

X-axis


Headquarters
114 Olinda Drive
Brea, CA 92823
(714) 579-0500
Brea Division
102 Olinda Drive
Brea, CA 92823
(714) 579-0500
Newbury Park Division
1050 Lawrence Drive
Newbury Park, CA 91320
(949) 480-4044
Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

HARMONICS - VERTICAL

FCC 15.231

Company: Luna Products, LLC

EUT: Security Device

Model: LP-GB01-345

Duty Cycle Correction Factor: -20.00

Date: 06/04/2019

Lab: R

Tested By: Sam K.

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
690.00	49.05	V	77.25	-28.20	Peak			Unrestricted/Floor
690.00	29.05	V	57.25	-28.20	Avg			Unrestricted/Floor
1035.00	30.94	V	73.97	-43.03	Peak			Restricted/Floor
1035.00	10.94	V	53.97	-43.03	Avg			Restricted/Floor
1380.00	32.23	V	73.97	-41.74	Peak			Restricted/Floor
1380.00	12.23	V	53.97	-41.74	Avg			Restricted/Floor
1725.00	46.83	V	77.25	-30.42	Peak	12.50	135.04	Unrestricted
1725.00	26.83	V	57.25	-30.42	Avg	12.50	135.04	Unrestricted
2070.00	69.51	V	77.25	-7.74	Peak	17.25	147.10	Unrestricted
2070.00	49.51	V	57.25	-7.74	Avg	17.25	147.10	Unrestricted
2415.00	55.88	V	77.25	-21.37	Peak	166.00	147.88	Unrestricted
2415.00	35.88	V	57.25	-21.37	Avg	166.00	147.88	Unrestricted
2760.00	47.17	V	73.97	-26.80	Peak	164.50	161.85	Restricted
2760.00	27.17	V	53.97	-26.80	Avg	164.50	161.85	Restricted
3105.00	48.49	V	77.25	-28.76	Peak	155.50	161.07	Unrestricted
3105.00	28.49	V	57.25	-28.76	Avg	155.50	161.07	Unrestricted
3450.00	45.96	V	77.25	-31.29	Peak	135.00	150.68	Unrestricted
3450.00	25.96	V	57.25	-31.29	Avg	135.00	150.68	Unrestricted

Test distance

3 meters

Orientation:

X-axis



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114 Olinda Drive
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HARMONICS - HORIZONTAL

FCC 15.231

Company: Luna Products, LLC

EUT: Security Device

Model: LP-GB01-345

Duty Cycle Correction Factor: -20.00

Date: 06/04/2019

Lab: R

Tested By: Sam K.

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
690.00	49.56	H	77.25	-27.69	Peak			Unrestricted/Floor
690.00	29.56	H	57.25	-27.69	Avg			Unrestricted/Floor
1035.00	34.02	H	73.97	-39.95	Peak			Restricted/Floor
1035.00	14.02	H	53.97	-39.95	Avg			Restricted/Floor
1380.00	34.95	H	73.97	-39.02	Peak			Restricted/Floor
1380.00	14.95	H	53.97	-39.02	Avg			Restricted/Floor
1725.00	43.77	H	77.25	-33.48	Peak	282.00	186.92	Unrestricted
1725.00	23.77	H	57.25	-33.48	Avg	282.00	186.92	Unrestricted
2070.00	62.34	H	77.25	-14.91	Peak	38.50	144.00	Unrestricted
2070.00	42.34	H	57.25	-14.91	Avg	38.50	144.00	Unrestricted
2415.00	48.42	H	77.25	-28.83	Peak	82.00	136.41	Unrestricted
2415.00	28.42	H	57.25	-28.83	Avg	82.00	136.41	Unrestricted
2760.00	39.82	H	73.97	-25.55	Peak			Restricted/Floor
2760.00	19.82	H	53.97	-34.15	Avg			Restricted/Floor
3105.00	41.71	H	77.25	-35.54	Peak			Unrestricted/Floor
3105.00	21.71	H	57.25	-35.54	Avg			Unrestricted/Floor
3450.00	46.17	H	77.25	-31.08	Peak	92.00	316.00	Unrestricted
3450.00	26.17	H	57.25	-31.08	Avg	92.00	316.00	Unrestricted

Test distance:

3 meter

Orientation:

Y-axis


Headquarters
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Brea Division
102 Olinda Drive
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Newbury Park Division
1050 Lawrence Drive
Newbury Park, CA 91320
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Lake Forest Division
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(949) 587-0400

HARMONICS - VERTICAL

FCC 15.231

Company: Luna Products, LLC

EUT: Security Device

Model: LP-GB01-345

Duty Cycle Correction Factor: -20.00

Date: 06/04/2019

Lab: R

Tested By: Sam K.

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
690.00	49.05	V	77.25	-28.20	Peak			Unrestricted/Floor
690.00	29.05	V	57.25	-28.20	Avg			Unrestricted/Floor
1035.00	33.25	V	73.97	-40.72	Peak			Restricted/Floor
1035.00	13.25	V	53.97	-40.72	Avg			Restricted/Floor
1380.00	36.81	V	73.97	-37.16	Peak			Restricted/Floor
1380.00	16.81	V	53.97	-37.16	Avg			Restricted/Floor
1725.00	49.22	V	77.25	-28.03	Peak	0.00	181.07	Unrestricted
1725.00	29.22	V	57.25	-28.03	Avg	0.00	181.07	Unrestricted
2070.00	72.14	V	77.25	-5.11	Peak	0.00	171.04	Unrestricted
2070.00	52.14	V	57.25	-5.11	Avg	0.00	171.04	Unrestricted
2415.00	57.52	V	77.25	-19.73	Peak	182.25	180.77	Unrestricted
2415.00	37.52	V	57.25	-19.73	Avg	182.25	180.77	Unrestricted
2760.00	44.76	V	73.97	-29.21	Peak	182.00	180.77	Restricted
2760.00	24.76	V	53.97	-29.21	Avg	182.00	180.77	Restricted
3105.00	45.20	V	77.25	-32.05	Peak	184.25	180.41	Unrestricted
3105.00	25.20	V	57.25	-32.05	Avg	184.25	180.41	Unrestricted
3450.00	45.87	V	77.25	-31.38	Peak	331.00	181.37	Unrestricted
3450.00	25.87	V	57.25	-31.38	Avg	331.00	181.37	Unrestricted

Test distance: 3
meter

Orientation:

Y-axis


Headquarters
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Brea Division
102 Olinda Drive
Brea, CA 92823
(714) 579-0500

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Lake Forest, CA 92630
(949) 587-0400

HARMONICS - HORIZONTAL

FCC 15.231

Company: Luna Products, LLC

EUT: Security Device

Model: LP-GB01-345

Duty Cycle Correction Factor: -20.00

Date: 06/04/2019

Lab: R

Tested By: Sam K.

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
690.00	48.88	H	77.25	-28.37	Peak			Unrestricted/Floor
690.00	28.88	H	57.25	-28.37	Avg			Unrestricted/Floor
1035.00	31.86	H	73.97	-42.11	Peak			Restricted/Floor
1035.00	11.86	H	53.97	-42.11	Avg			Restricted/Floor
1380.00	33.44	H	73.97	-40.53	Peak			Restricted/Floor
1380.00	13.44	H	53.97	-40.53	Avg			Restricted/Floor
1725.00	43.04	H	77.25	-34.21	Peak	20.25	169.00	Unrestricted
1725.00	23.04	H	57.25	-34.21	Avg	20.25	169.00	Unrestricted
2070.00	62.08	H	77.25	-15.17	Peak	158.00	169.19	Unrestricted
2070.00	42.08	H	57.25	-15.17	Avg	158.00	169.19	Unrestricted
2415.00	47.60	H	77.25	-29.65	Peak	156.00	169.19	Unrestricted
2415.00	27.60	H	57.25	-29.65	Avg	156.00	169.19	Unrestricted
2760.00	40.56	H	73.97	-33.41	Peak			Restricted/Floor
2760.00	20.56	H	53.97	-33.41	Avg			Restricted/Floor
3105.00	42.11	H	77.25	-35.14	Peak	155.00	141.49	Unrestricted
3105.00	22.11	H	57.25	-35.14	Avg	155.00	141.49	Unrestricted
3450.00	45.74	H	77.25	-31.51	Peak	155.00	141.49	Unrestricted
3450.00	25.74	H	57.25	-31.51	Avg	155.00	141.49	Unrestricted

Test distance: 3

meter

Orientation:

Z-axis



Headquarters
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Brea Division
102 Olinda Drive
Brea, CA 92823
(714) 579-0500

Newbury Park Division
1050 Lawrence Drive
Newbury Park, CA 91320
(949) 480-4044

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

HARMONICS - VERTICAL

FCC 15.231

Company: Luna Products, LLC

EUT: Security Device

Model: LP-GB01-345

Duty Cycle Correction Factor: -20.00

Date: 06/04/2018

Lab: R

Tested By: Sam K.

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
690.00	51.58	V	77.25	-25.67	Peak			Unrestricted/Floor
690.00	31.58	V	57.25	-25.67	Avg			Unrestricted/Floor
1035.00	30.90	V	73.97	-43.07	Peak			Restricted/Floor
1035.00	10.90	V	53.97	-43.07	Avg			Restricted/Floor
1380.00	32.97	V	73.97	-41.00	Peak			Restricted/Floor
1380.00	12.97	V	53.97	-41.00	Avg			Restricted/Floor
1725.00	49.84	V	77.25	-27.41	Peak	88.75	181.85	Unrestricted
1725.00	29.84	V	57.25	-27.41	Avg	88.75	181.85	Unrestricted
2070.00	72.57	V	77.25	-4.68	Peak	88.75	180.00	Unrestricted
2070.00	52.57	V	57.25	-4.68	Avg	88.75	180.00	Unrestricted
2415.00	57.02	V	77.25	-20.23	Peak	273.00	123.58	Unrestricted
2415.00	37.02	V	57.25	-20.23	Avg	273.00	123.58	Unrestricted
2760.00	43.53	V	73.97	-30.44	Peak	273.25	127.16	Restricted
2760.00	23.53	V	53.97	-30.44	Avg	273.25	127.16	Restricted
3105.00	43.86	V	77.25	-33.39	Peak	273.25	127.16	Unrestricted
3105.00	23.86	V	57.25	-33.39	Avg	273.25	127.16	Unrestricted
3450.00	45.88	V	77.25	-31.37	Peak	273.25	169.91	Unrestricted
3450.00	25.88	V	57.25	-31.37	Avg	273.25	169.91	Unrestricted

Test distance: 3
meter

Orientation:

Z-axis



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20dB & 99% BANDWIDTH

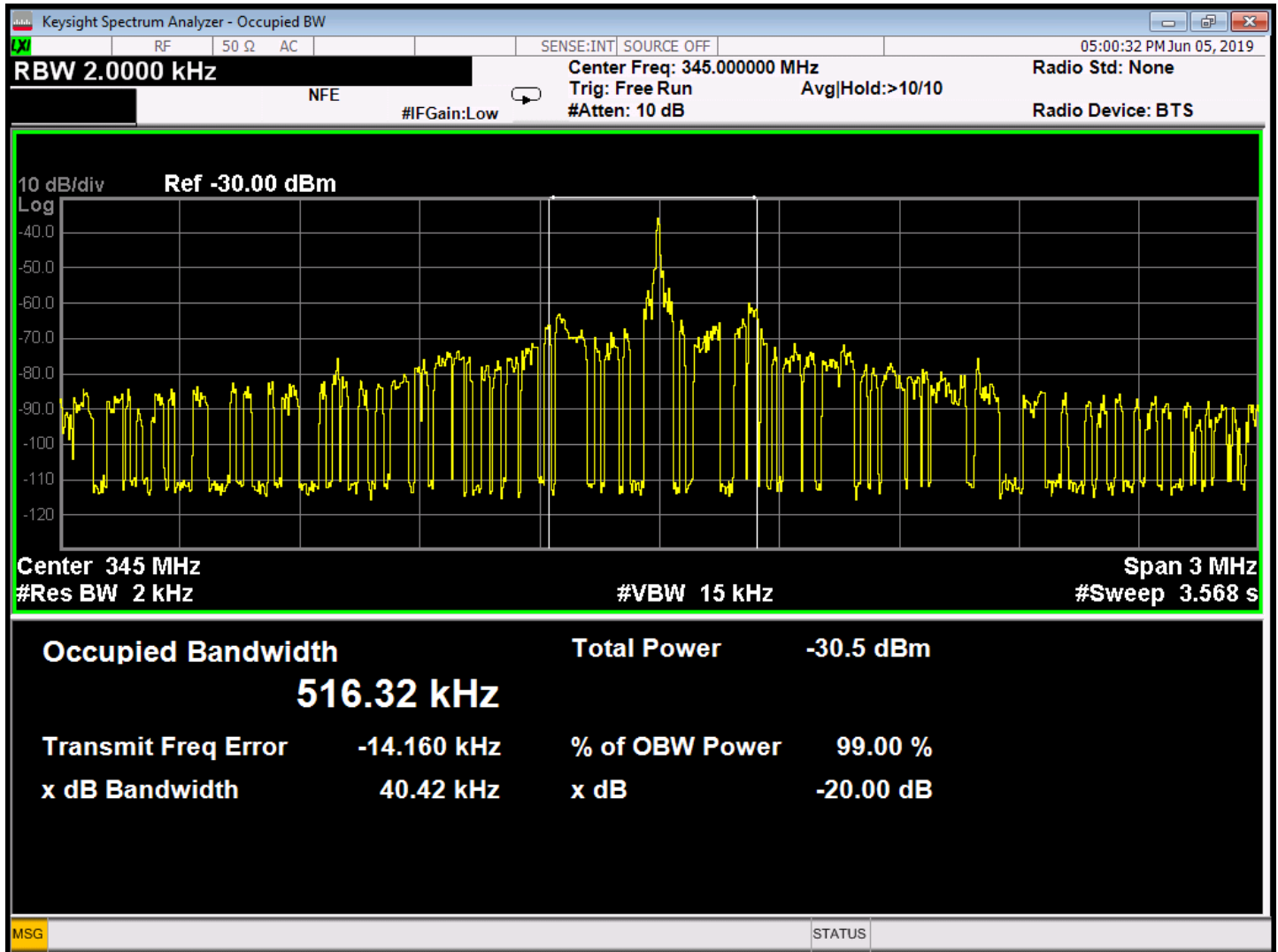


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(714) 579-0500

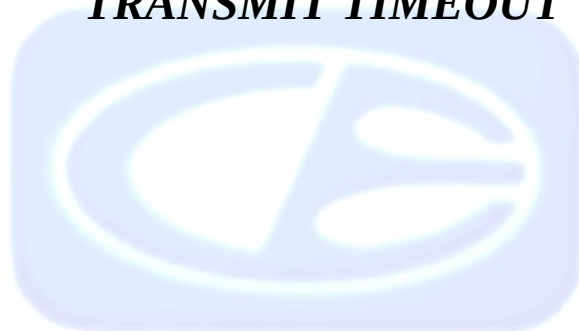
Brea Division
102 Olinda Drive
Brea, CA 92823
(714) 579-0500

Newbury Park Division
1050 Lawrence Drive
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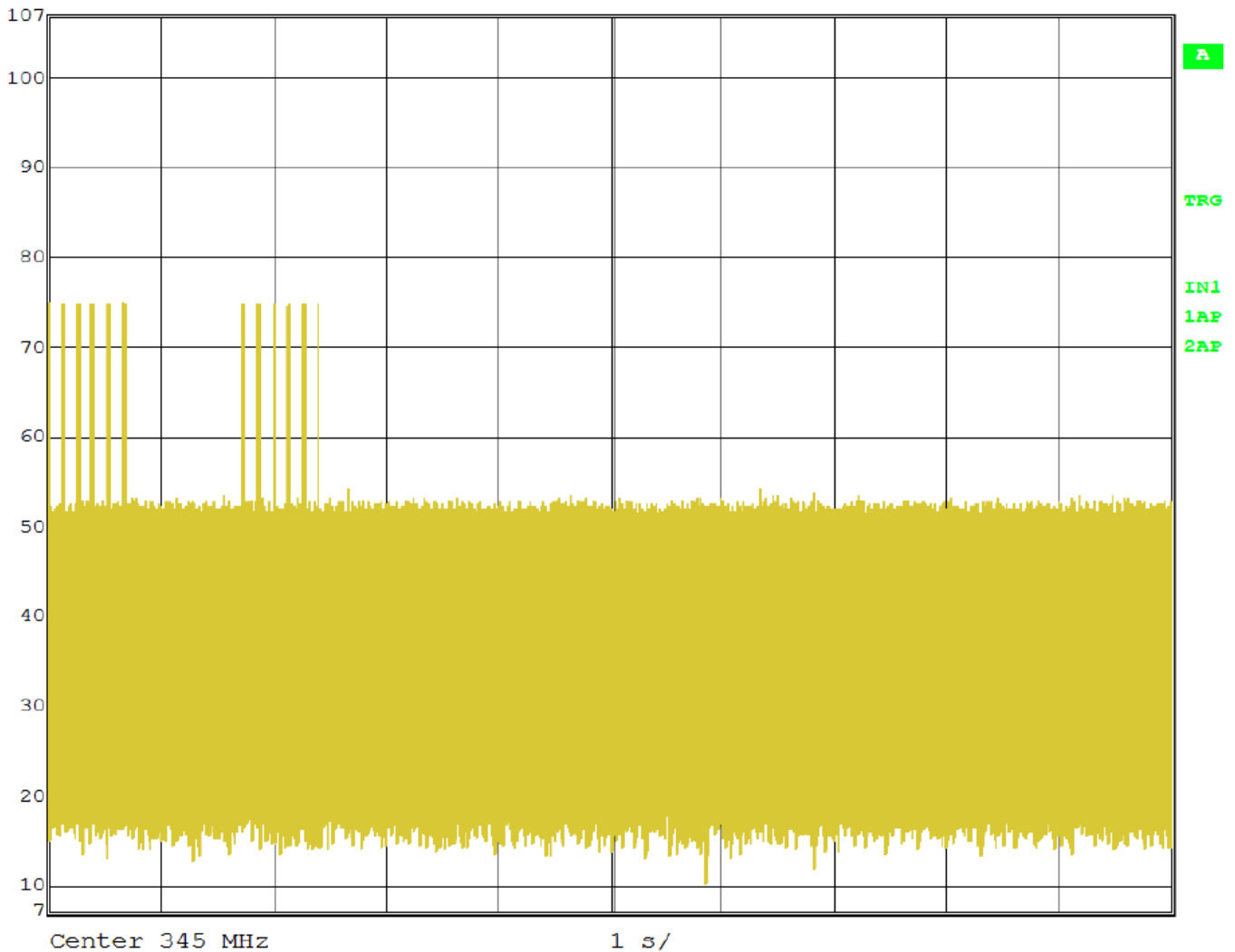
Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400



TRANSMIT TIMEOUT




Ref Lvl
107 dBμV

RBW 1 MHz RF Att 30 dB
VBW 1 MHz
SWT 10 s Unit dBμV


Date: 4.JUN.2019 18:25:33


Headquarters
114 Olinda Drive
Brea, CA 92823
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102 Olinda Drive
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DUTY CYCLE



Headquarters
114 Olinda Drive
Brea, CA 92823
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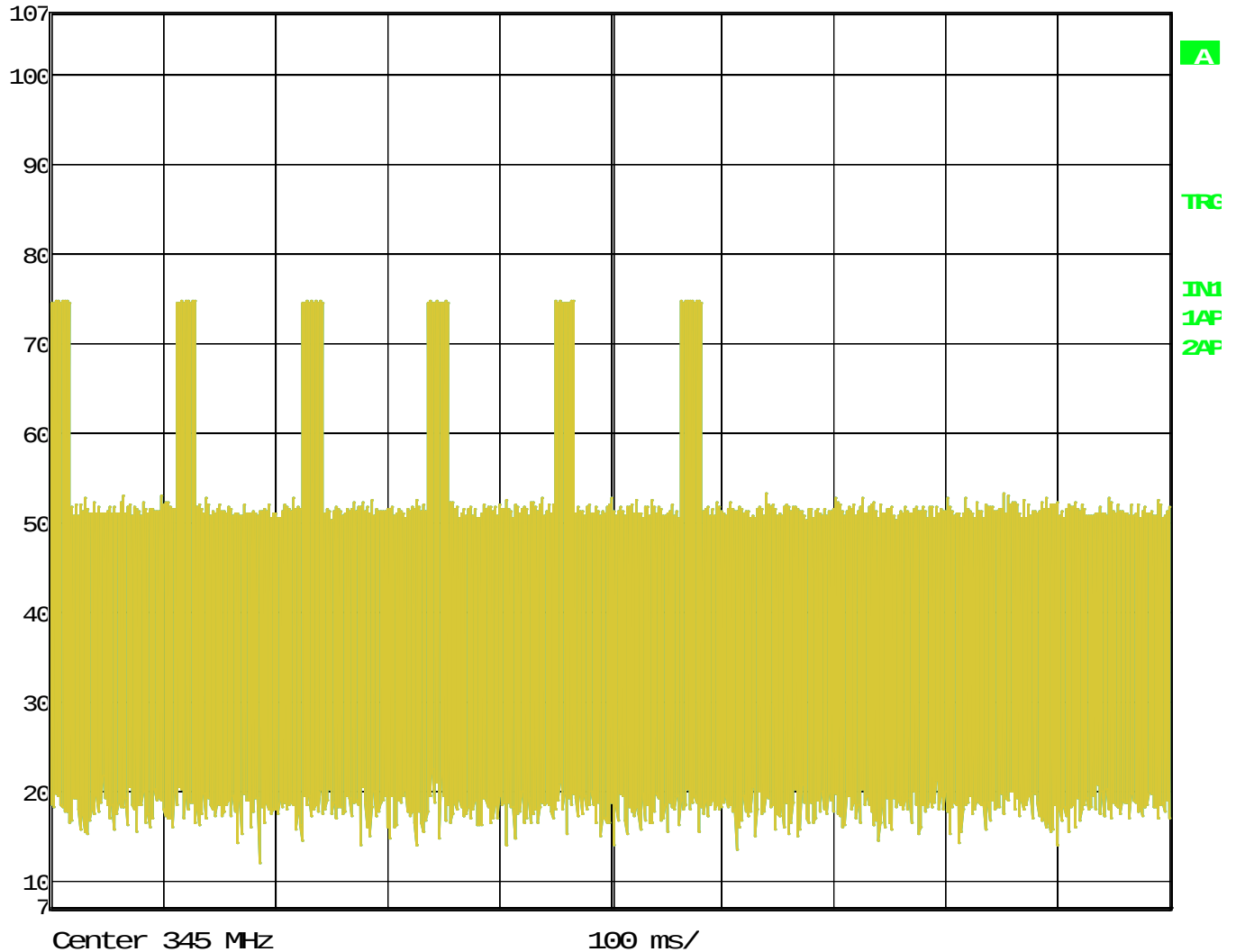
Brea Division
102 Olinda Drive
Brea, CA 92823
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DUTY CYCLE


Ref Lvl
107 dB μ V

RBW 1 MHz RF Att 30 dB
VBW 1 MHz
SWT 1 s Unit dB μ V


Date: 4. JUN. 2019 18:28:07



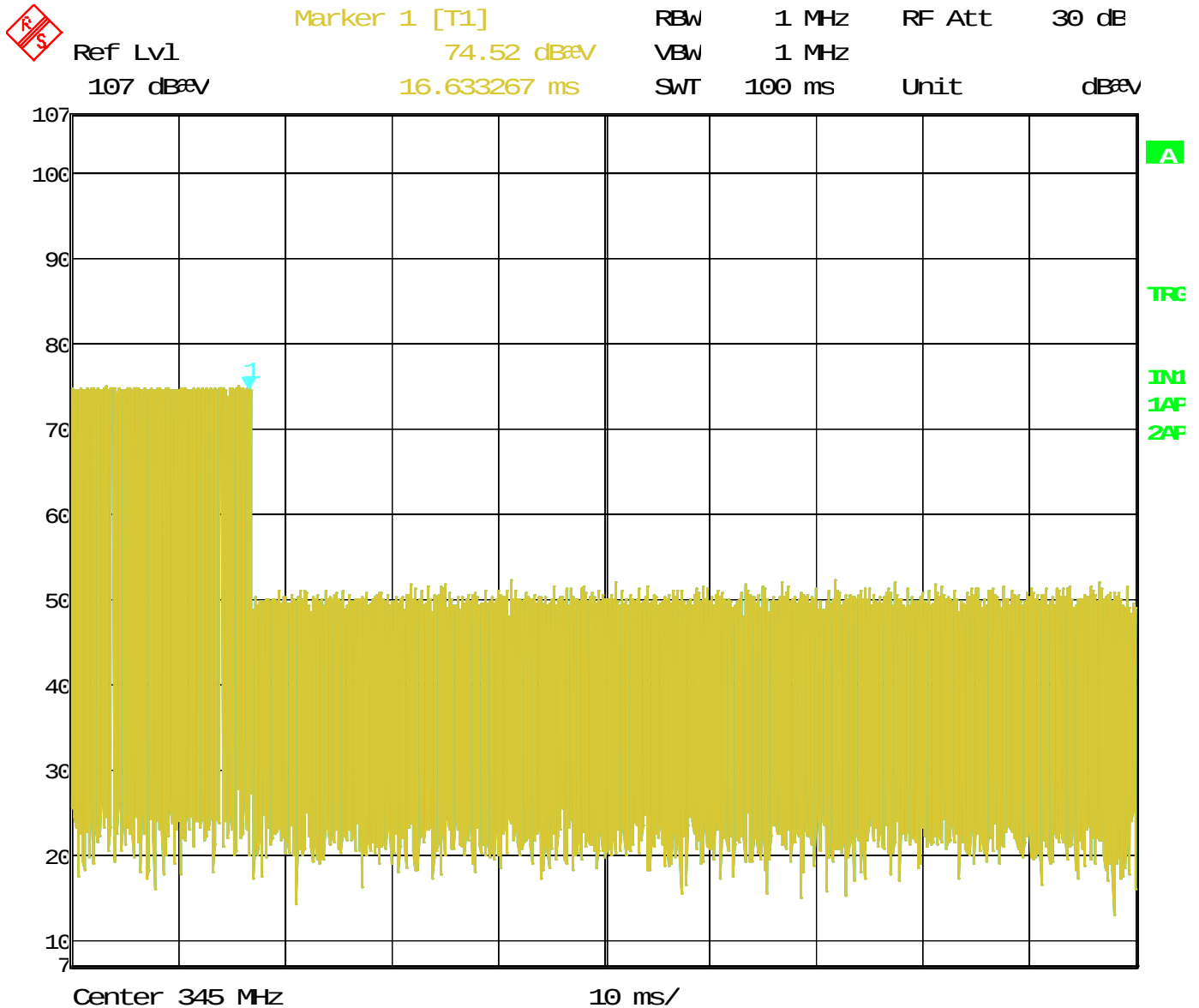
Headquarters
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Brea Division
102 Olinda Drive
Brea, CA 92823
(714) 579-0500

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DUTY CYCLE



Date: 4. JUN. 2019 18:31:24



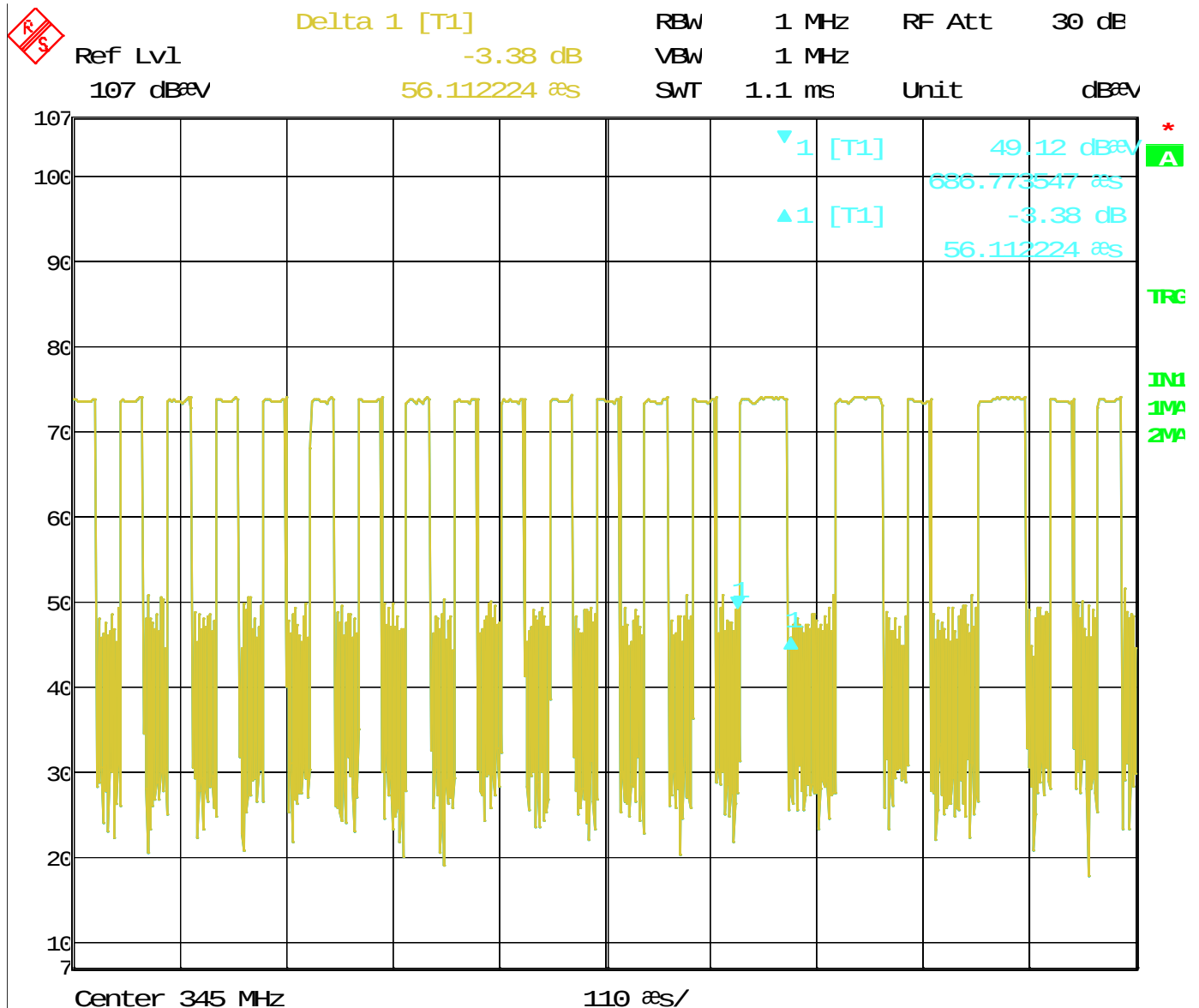
Headquarters
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Brea Division
102 Olinda Drive
Brea, CA 92823
(714) 579-0500

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DUTY CYCLE



Date: 4. JUN. 2019 18:48:25

Time of Pulse Type 1 = 56.112224μs



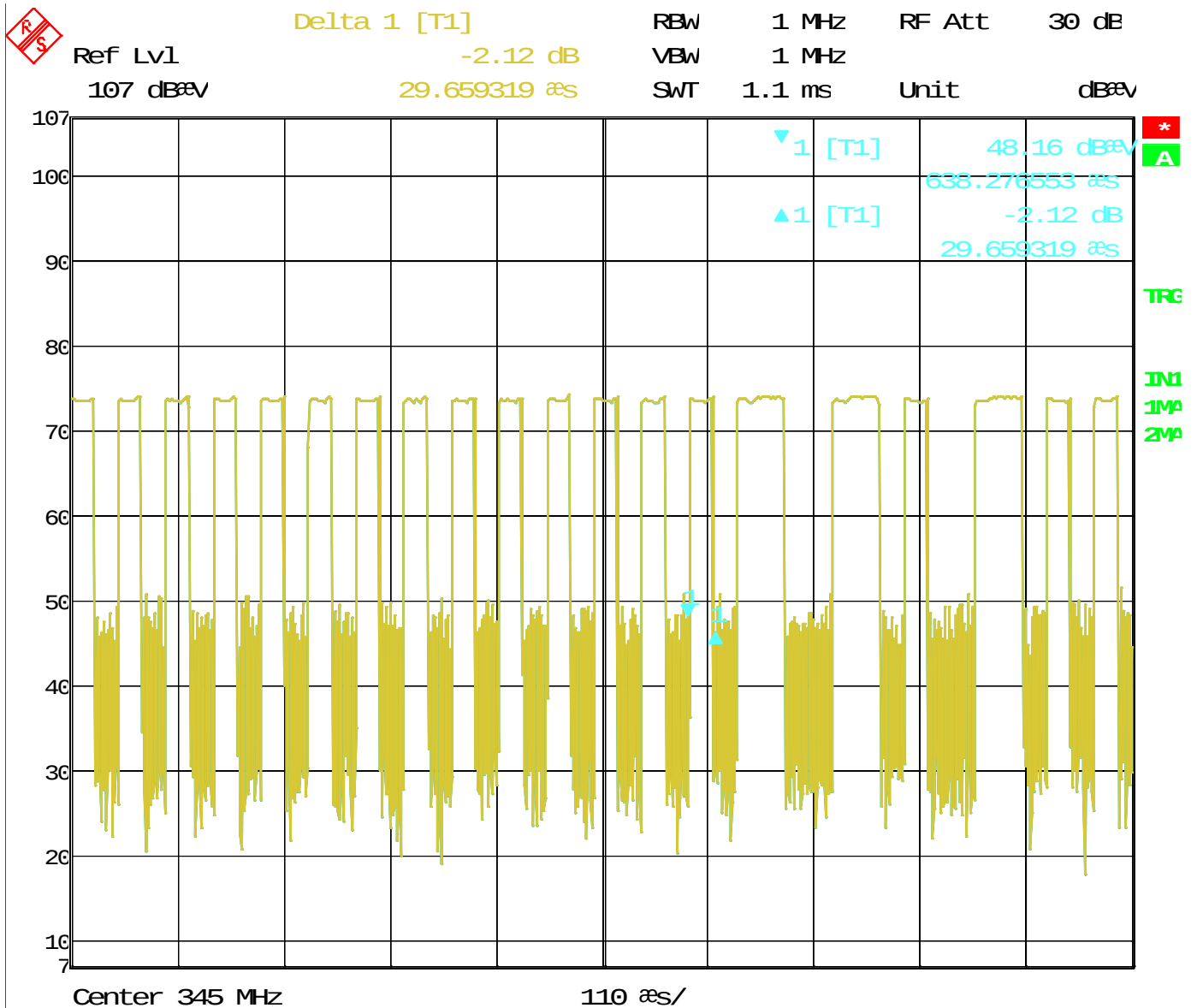
Headquarters
 114 Olinda Drive
 Brea, CA 92823
 (714) 579-0500

Brea Division
 102 Olinda Drive
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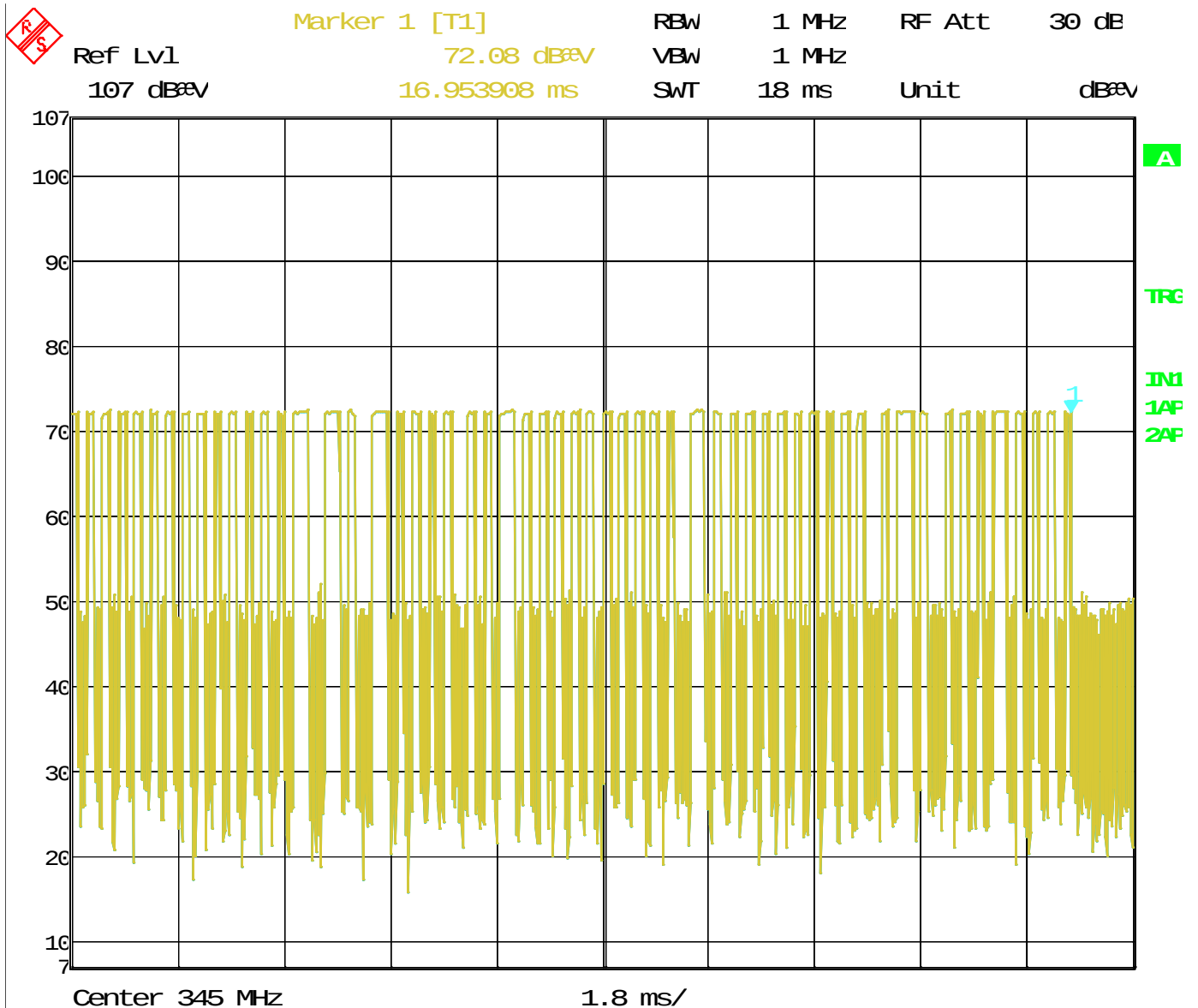
DUTY CYCLE



Time of Pulse Type 2 = 29.659319μs



DUTY CYCLE



Number of Pulses in Worst Case 100 mS = 57
 Pulse Type 1 On Time = $56.11\mu\text{s} \times 7 = 392.77\mu\text{s}$ Pulse
 Type 2 On Time = $29.659319\mu\text{s} \times 50 = 1483.00\mu\text{s}$
 $392.77\mu\text{s} + 1483.00\mu\text{s} = 1875.77\mu\text{s}$
 Duty Cycle = $1.88\text{ms} / 100\text{ms} = 0.0188$
 The Peak to Average Duty Cycle Correction = -34.54 dB
 Maximum Duty Cycle Correction Allowed = -20.00 dB

