

*FCC 15.231
TEST REPORT*
for
NIGHTHAWK TRANSMITTER
MODEL: 836685

Prepared for

PACIFIC SCIENTIFIC ENERGETIC MATERIALS COMPANY (CALIFORNIA) LLC
3601 UNION ROAD
HOLLISTER, CALIFORNIA 95023

Prepared by: _____

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Approved by: _____

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DATE: MARCH 18, 2013

	REPORT BODY	APPENDICES					TOTAL
		A	B	C	D	E	
PAGES	17	2	2	2	10	19	52

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FIGURE	TITLE
1	Plot Map And Layout of Radiated Site

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 without the written permission of Compatible Electronics, unless done so in full.

This report must not be used to claim product endorsement by NVLAP, NIST or any other agency of the U.S. Government.

Device Tested: Nighthawk Transmitter
Model: 836685
S/N: N/A

Product Description: Please see the Expository Statement.

Company Name: Pacific Scientific Energetic Materials Company (California), LLC
3601 Union Road
Hollister, California 95023

Modifications: The EUT was modified in order to meet the specifications. Please see the list located in Appendix B.

Test Dates: February 28, 2013; and March 1, 2013

Test Specifications: EMI requirements
CFR Title 47, Part 15 Subpart B; and Subpart C, Sections 15.205, 15.209 and 15.231

Test Procedure: ANSI C63.4

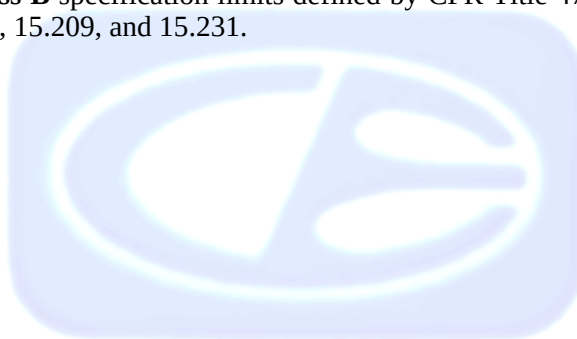
Test Deviations: The test procedure was not deviated from during the testing.

SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Conducted RF Emissions, 150 kHz – 30 MHz	This test was not performed because the EUT is battery powered only and does not connect to the AC public mains.
2	Radiated RF Emissions, 10 kHz – 4400 MHz	Complies with the Class B limits of CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.209, and 15.231.

1. PURPOSE

This document is a qualification test report based on the emission tests performed on the Nighthawk Transmitter, Model: 836685. The emission measurements were performed according to the measurement procedure described in ANSI C63.4. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the **Class B** specification limits defined by CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.209, and 15.231.



2. ADMINISTRATIVE DATA

2.1 Location of Testing

The EMI tests described herein were performed at the test facility of Compatible Electronics, 114 Olinda Drive, Brea, California 92823.

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

Pacific Scientific Energetic Materials Company (California), LLC

Michael Hathaway Electrical Engineer

Compatible Electronics, Inc.

Alex Benitez Test Technician
Kyle Fujimoto Test Engineer

2.4 Date Test Sample was Received

The test sample was received prior to the date of this test report.

2.5 Disposition of the Test Sample

The sample has not been returned to Universal Electronics as of the date of this test report.

2.6 Abbreviations and Acronyms

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

RF	Radio Frequency
EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
HP	Hewlett Packard
ITE	Information Technology Equipment
CML	Corrected Meter Limit
LISN	Line Impedance Stabilization Network

3. APPLICABLE DOCUMENTS

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

SPEC	TITLE
CFR Title 47, Part 15	FCC Rules – Radio frequency devices (including digital devices)
ANSI C63.4 2009	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

4. DESCRIPTION OF TEST CONFIGURATION

4.1 Description Of Test Configuration - Emissions

Setup and operation of the equipment under test.

Specifics of the EUT and Peripherals Tested

The Nighthawk Transmitter, Model: 836685 (EUT) was tested as a stand alone unit and continuously transmitting. The EUT's antenna is a Splat style antenna directly soldered to the PCB. The EUT was tested in three orthogonal axis.

The EUT ceases to transmit immediately after the button is released. The EUT had two separate buttons, one to transmit at 315 MHz and the other to transmit at 433.92 MHz.

The final radiated data was taken in the mode above. Please see Appendix E for the data sheets.

4.1.1 Cable Construction and Termination

There are no external cables connected to the EUT.



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

EQUIPMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID
NIGHTHAWK TRANSMITTER (EUT)	PACIFIC SCIENTIFIC ENERGETIC MATERIALS COMPANY (CALIFORNIA), LLC	836685	N/A	RSJNIGHTHAWK

5.2 Emissions Test Equipment

EQUIPMENT TYPE	MANU-FACTURER	MODEL NUMBER	SERIAL NUMBER	CALIBRATION DATE	CALIBRATION CYCLE
GENERAL TEST EQUIPMENT USED IN LAB B					
Computer	Compaq	CQ5210F	CNX9360CF9	N/A	N/A
Monitor	Hewlett Packard	HPs2031a	3CQ046N3MD	N/A	N/A
EMI Receiver	Rohde & Schwarz	ESIB40	100194	November 19, 2012	2 Year
GENERAL TEST EQUIPMENT USED IN LAB D					
Computer	Hewlett Packard	p6716f	MXX1030PX0	N/A	N/A
Monitor	Hewlett Packard	HPs2031a	3CQ046N3MG	N/A	N/A
Spectrum Analyzer – Main Section	Hewlett Packard	8568B	2517A01563	May 30, 2012	1 Year
Spectrum Analyzer – Display Section	Hewlett Packard	85662A	2648A15285	May 30, 2012	1 Year
Quasi-Peak Adapter	Hewlett Packard	85650A	2430A00424	May 30, 2012	1 Year
RF RADIATED EMISSIONS TEST EQUIPMENT					
Biconical Antenna	Com Power	AB-900	43028	May 24, 2012	1 Year
Log Periodic Antenna	Com Power	AL-100	16252	May 24, 2012	1 Year
Preamplifier	Com-Power	CPPA-102	1017	December 27, 2012	1 Year
Preamplifier	Com-Power	PA-118	181656	December 27, 2012	1 Year
Loop Antenna	Com-Power	AL-130	17089	January 29, 2013	2 Years
Horn Antenna	Com-Power	AH-118	071175	February 29, 2012	2 Years
Antenna Mast	Com Power	AM-100	N/A	N/A	N/A

6. TEST SITE DESCRIPTION

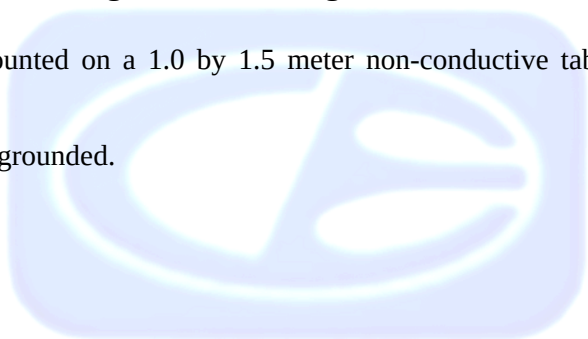
6.1 Test Facility Description

Please refer to section 2.1 and 7.1 of this report for EMI test location.

6.2 EUT Mounting, Bonding and Grounding

The EUT was mounted on a 1.0 by 1.5 meter non-conductive table 0.8 meters above the ground plane.

The EUT was not grounded.



7. TEST PROCEDURES

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

7.1 Radiated Emissions (Spurious and Harmonics) Test

The EMI Receiver was used as a measuring meter along with the spectrum analyzer. Amplifiers were used to increase the sensitivity of the instrument. The Com-Power Preamplifier Model: CPPA-102 was used for frequencies from 30 MHz to 1 GHz, and the Com-Power Microwave Preamplifier Model: PA-118 was used for frequencies from 1 GHz to 4.4 GHz. The EMI Receiver and spectrum analyzer were used in the peak detect mode with the "Max Hold" feature activated. In this mode, the EMI Receiver and spectrum analyzer record the highest measured reading over all the sweeps.

The readings were averaged by a "duty cycle correction factor", derived from $20 \log$ (dwell time / one pulse train with blanking interval).

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

FREQUENCY RANGE	EFFECTIVE MEASUREMENT BANDWIDTH	TRANSDUCER
9 kHz to 150 kHz	200 Hz	Active Loop Antenna
150 kHz to 30 MHz	9 kHz	Active Loop Antenna
30 MHz to 300 MHz	120 kHz	Biconical Antenna
300 MHz to 1 GHz	120 kHz	Log Periodic Antenna
1 GHz to 4.4 GHz	1 MHz	Horn Antenna

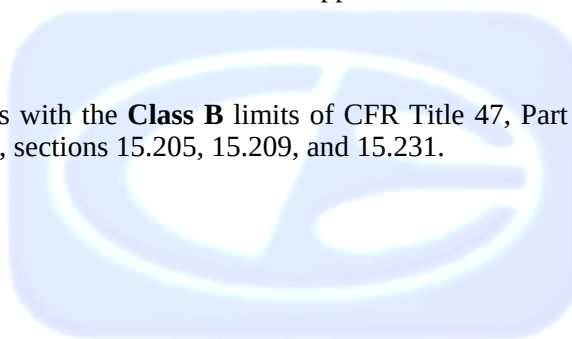
The open field test site of Compatible Electronics, Inc. was used for radiated emission testing. This test site is set up according to ANSI C63.4. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. 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 (for E field radiated field strength). The gunsight method was used when measuring with the horn antenna in order to ensure accurate results. The loop antenna was also rotated in the horizontal and vertical axis in order to ensure accurate results.

7.2 Radiated Emissions (Spurious and Harmonics) Test (continued)

The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT. The EUT was tested at a 3 meter test distance to obtain final test data. The final qualification data sheets are located in Appendix E.

Test Results:

The EUT complies with the **Class B** limits of CFR Title 47, Part 15, Subpart B; and CFR Title 47, Part 15, Subpart C, sections 15.205, 15.209, and 15.231.

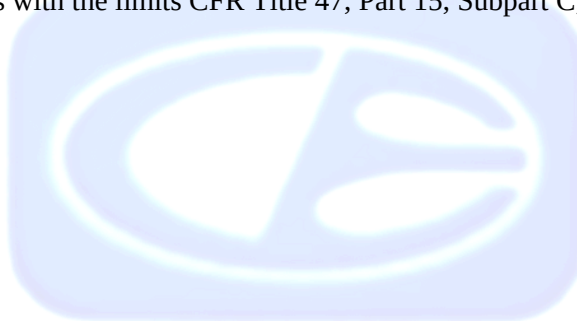


7.3 Bandwidth of the Fundamental

The -20 dB bandwidth was checked to see that it was within 0.25% of the fundamental frequency for the EUT. Plots of the -20 dB bandwidth are located in Appendix E.

Test Results:

The EUT complies with the limits CFR Title 47, Part 15, Subpart C, section 15.231[c].



7.4 RF Emissions Test Results

Table 1.0 RADIATED EMISSION RESULTS
Nighthawk Transmitter, Model: 836685

Frequency MHz	Corrected Reading* dBuV	Specification Limit dBuV	Delta (Cor. Reading – Spec. Limit) dB
315 (H) (X-Axis)	75.53 (A)	75.62	-0.09
433.92 (H) (Z-Axis)	80.27 (A)	80.82	-0.55
433.92 (H) (X-Axis)	79.87 (A)	80.82	-0.95
433.92 (V) (Y-Axis)	79.27 (A)	80.82	-1.55
1890 (H) (Z-Axis)	51.61 (A)	80.82	-4.01
315 (H) (Y-Axis)	70.43 (A)	75.62	-5.19

Notes:

- | | | |
|----|--|-------------------------|
| * | The complete emissions data is given in Appendix E of this report. | |
| QP | Quasi-Peak Reading | A Average Reading |
| H | Horizontal Polarization | V Vertical Polarization |

8. CONCLUSIONS

The Nighthawk Transmitter, Model: 836685 meets all of the **Class B** specification limits defined in CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.209, and 15.231.



APPENDIX A

LABORATORY ACCREDITATIONS AND RECOGNITIONS

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

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

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. Please follow the link to the NIST/NVLAP site for each of our facilities' NVLAP certificate and scope of accreditation

NVLAP listing links

[Agoura Division](#) / [Brea Division](#) / [Silverado/Lake Forest Division](#)

.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."



ANSI listing [CETCB](#)



Compatible Electronics has been nominated as a Conformity Assessment Body (CAB) for EMC under the US/EU Mutual Recognition Agreement (MRA).

US/EU MRA list [NIST MRA site](#)



Compatible Electronics has been nominated as a Conformity Assessment Body (CAB) for Taiwan/BSMI under the US/APEC (Asia-Pacific Economic Cooperation) Mutual Recognition Agreement (MRA).

APEC MRA list [NIST MRA site](#)

We are also listed for IT products by the following country/agency:



VCCI Support member: Please visit http://www.vcci.jp/vcci_e/



FCC Listing, from FCC OET site

[FCC test lab search](#) <https://fjallfoss.fcc.gov/oetcf/eas/reports/TestFirmSearch.cfm>



Compatible Electronics IC listing can be found at:

<http://www.ic.gc.ca/eic/site/ic1.nsf/eng/home>

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

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

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

APPENDIX B

MODIFICATIONS TO THE EUT

MODIFICATIONS TO THE EUT

The modifications listed below were made to the EUT to pass FCC 15.231 or FCC Class B specifications.

All the rework described below was implemented during the test in a method that could be reproduced in all the units by the manufacturer.

1. Change R1 from 620 ohms to 100 ohms
2. Change R4 from 620 ohms to 680 ohms





APPENDIX C

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

ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST

Nighthawk Transmitter
Model: 836685
S/N: N/A

There were no additional models covered under this report.

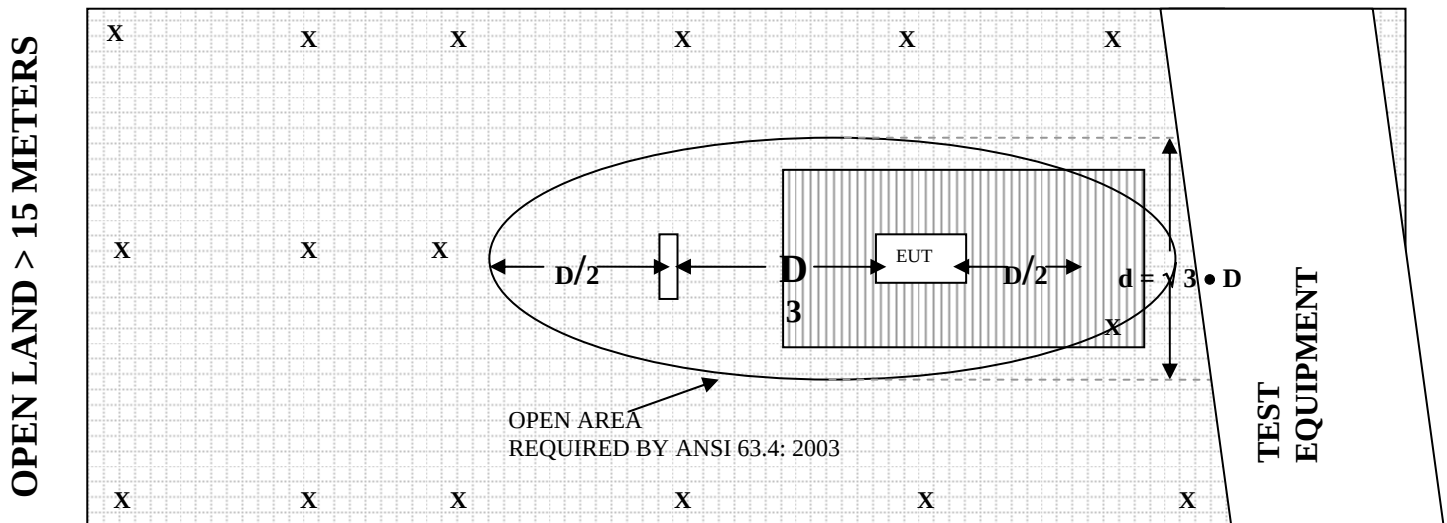


APPENDIX D

DIAGRAMS, CHARTS, AND PHOTOS

FIGURE 1: PLOT MAP AND LAYOUT OF RADIATED SITE

OPEN LAND > 15 METERS



OPEN LAND > 15 METERS

X	= GROUND RODS		= GROUND SCREEN
D	= TEST DISTANCE (meters)		= WOOD COVER

COM-POWER AB-900

BICONICAL ANTENNA

S/N: 43028

CALIBRATION DATE: MAY 24, 2012

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	11.80	120	13.20
35	11.20	125	13.30
40	11.90	140	11.60
45	10.70	150	11.80
50	11.40	160	12.70
60	10.30	175	14.80
70	7.60	180	15.70
80	5.70	200	15.80
90	7.90	250	14.80
100	10.70	300	19.80

COM-POWER AL-100

LOG PERIODIC ANTENNA

S/N: 16252

CALIBRATION DATE: MAY 24, 2012

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
300	13.00	700	20.30
350	13.20	750	20.80
400	14.50	800	21.00
450	15.40	850	23.30
500	15.80	900	21.70
550	16.60	950	24.20
600	18.90	1000	24.30
650	19.10		

COM POWER AH-118**HORN ANTENNA**

S/N: 071175

CALIBRATION DATE: FEBRUARY 29, 2012

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	23.6	10.0	37.7
1.5	22.0	10.5	38.4
2.0	28.7	11.0	38.0
2.5	29.3	11.5	38.2
3.0	30.6	12.0	39.0
3.5	30.4	12.5	42.4
4.0	31.1	13.0	40.8
4.5	33.4	13.5	40.0
5.0	35.3	14.0	39.7
5.5	35.1	14.5	43.5
6.0	36.9	15.0	42.7
6.5	37.4	15.5	39.7
7.0	37.6	16.0	39.2
7.5	36.2	16.5	39.7
8.0	38.4	17.0	42.2
8.5	39.3	17.5	47.6
9.0	37.4	18.0	51.2
9.5	38.0		

COM-POWER CPPA-102**PREAMPLIFIER**

S/N: 1017

CALIBRATION DATE: DECEMEBER 27, 2012

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
1	36.9	225	38.14
3	38.1	250	38.15
5	38.1	275	38.14
8	38.2	300	38.18
10	38.3	350	38.22
20	38.2	400	38.26
30	38.3	450	37.53
40	38.2	500	38.24
50	38.5	550	38.53
60	38.5	600	38.69
70	38.4	650	38.66
80	38.4	700	38.58
90	38.5	750	38.37
100	38.4	800	38.23
125	38.6	850	37.68
150	38.4	900	37.38
175	38.5	950	36.82
200	38.5	1000	36.14

COM-POWER PA-118**PREAMPLIFIER**

S/N: 181656

CALIBRATION DATE: DECEMBER 27, 2012

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	24.68	6.0	25.75
1.1	25.08	6.5	25.28
1.2	25.70	7.0	24.83
1.3	25.98	7.5	24.49
1.4	26.11	8.0	24.38
1.5	26.23	8.5	25.06
1.6	26.34	9.0	25.55
1.7	26.39	9.5	25.32
1.8	26.44	10.0	25.25
1.9	26.45	11.0	24.99
2.0	26.48	12.0	25.08
2.5	26.59	13.0	24.44
3.0	26.67	14.0	25.02
3.5	26.66	15.0	26.12
4.0	26.82	16.0	25.67
4.5	26.46	17.0	24.33
5.0	26.22	18.0	26.75
5.5	25.98		

COM-POWER AL-130**LOOP ANTENNA**

S/N: 17089

CALIBRATION DATE: JANUARY 29, 2013

FREQUENCY (MHz)	MAGNETIC (dB/m)	ELECTRIC (dB/m)
0.009	-42.5	9
0.01	-42.3	9.2
0.02	-42.1	9.4
0.03	-41.4	10.1
0.04	-41.8	9.7
0.05	-42.4	9.1
0.06	-42.3	9.2
0.07	-42.5	9
0.08	-42.4	9.1
0.09	-42.5	9
0.1	-42.5	9
0.2	-42.7	8.8
0.3	-42.6	8.9
0.4	-42.5	9
0.5	-42.7	8.8
0.6	-42.7	8.8
0.7	-42.5	9
0.8	-42.3	9.2
0.9	-42.2	9.3
1	-42.2	9.3
2	-41.8	9.7
3	-41.7	9.8
4	-41.7	9.8
5	-41.5	10
6	-41.6	9.9
7	-41.4	10.1
8	-41	10.5
9	-40.8	10.7
10	-41.3	10.2
15	-41.4	10.1
20	-41.2	10.3
25	-42.6	8.9
30	-41.7	9.8



FRONT VIEW

PACIFIC SCIENTIFIC ENERGETIC MATERIAL COMPANY (CALIFORNIA), LLC
NIGHTHAWK TRANSMITTER

MODEL: 836685

FCC SUBPART B AND FCC SUBPART C – RADIATED EMISSIONS

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

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

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
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(949) 589-0700

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



REAR VIEW

PACIFIC SCIENTIFIC ENERGETIC MATERIAL COMPANY (CALIFORNIA), LLC
NIGHTHAWK TRANSMITTER

MODEL: 836685

FCC SUBPART B AND FCC SUBPART C – RADIATED EMISSIONS

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

Brea Division
114 Olinda Drive
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20621 Pascal Way
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(949) 587-0400

APPENDIX E

DATA SHEETS

RADIATED EMISSIONS

DATA SHEETS

FCC 15.231

Pacific Scientific Energetic Materials Company (CA) LLC
Nighthawk Transmitter
Model: 836685

Date: 02/28/2013
Labs: B and D
Tested By: Alex Benitez

315 MHz Version - X Axis

Duty Cycle: 49.5881%
With 100 Ohm Resistor

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
315	66.1	V	95.62	-29.52	Peak	1	0	
315	60.01	V	75.62	-15.61	Avg	1	0	
630	38.57	V	75.62	-37.05	Peak	2	130	
630	32.48	V	55.62	-23.14	Avg	2	130	
945	41.07	V	75.62	-34.55	Peak	1.5	200	
945	34.98	V	55.62	-20.64	Avg	1.5	200	
1260	53.01	V	75.62	-22.61	Peak	1.29	135	
1260	46.92	V	55.62	-8.70	Avg	1.29	135	
1575	48	V	74	-26.00	Peak	2.84	135	
1575	41.91	V	54	-12.09	Avg	2.84	135	
1890	47.9	V	75.62	-27.72	Peak	1.42	135	
1890	41.81	V	55.62	-13.81	Avg	1.42	135	
2205	45.2	V	74	-28.80	Peak	1.15	135	
2205	39.11	V	54	-14.89	Avg	1.15	135	
2520	46.4	V	75.62	-29.22	Peak	1.86	270	
2520	40.31	V	55.62	-15.31	Avg	1.86	270	
2835	46.7	V	74	-27.30	Peak	2.89	315	
2835	40.61	V	54	-13.39	Avg	2.89	315	
3150	42.6	V	75.62	-33.02	Peak	1.61	315	
3150	36.51	V	55.62	-19.11	Avg	1.61	315	

FCC 15.231Pacific Scientific Energetic Materials Company (CA) LLC
Nighthawk Transmitter
Model: 836685Date: 02/28/2013
Labs: B and D
Tested By: Alex Benitez**315 MHz Version - X Axis**

Duty Cycle: 49.5881%

With 100 Ohm Resistor

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
315	81.62	H	95.62	-14.00	Peak	1	0	
315	75.53	H	75.62	-0.09	Avg	1	0	
630	44.87	H	75.62	-30.75	Peak	1.5	220	
630	38.78	H	55.62	-16.84	Avg	1.5	220	
945	47.27	H	75.62	-28.35	Peak	1.5	270	
945	41.18	H	55.62	-14.44	Avg	1.5	270	
1260	53.5	H	75.62	-22.12	Peak	2.51	135	
1260	47.41	H	55.62	-8.21	Avg	2.51	135	
1575	44.5	H	74	-29.50	Peak	1.23	135	
1575	38.41	H	54	-15.59	Avg	1.23	135	
1890	47.2	H	75.62	-28.42	Peak	2.41	135	
1890	41.11	H	55.62	-14.51	Avg	2.41	135	
2205	44.4	H	74	-29.60	Peak	2.39	135	
2205	38.31	H	54	-15.69	Avg	2.39	135	
2520	44.7	H	75.62	-30.92	Peak	1.48	135	
2520	38.61	H	55.62	-17.01	Avg	1.48	135	
2835	48.4	H	74	-25.60	Peak	2.11	135	
2835	42.31	H	54	-11.69	Avg	2.11	135	
3150	46.6	H	75.62	-29.02	Peak	2.07	135	
3150	40.51	H	55.62	-15.11	Avg	2.07	135	

FCC 15.231

Pacific Scientific Energetic Materials Company (CA) LLC
 Nighthawk Transmitter
 Model: 836685

Date: 02/28/2013
 Labs: B and D
 Tested By: Alex Benitez

315 MHz Version - Y Axis

Duty Cycle: 49.5881%

With 100 Ohm Resistor

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
315	76.32	V	95.62	-19.30	Peak	1.5	315	
315	70.23	V	75.62	-5.39	Avg	1.5	315	
630	44.97	V	75.62	-30.65	Peak	1	270	
630	38.88	V	55.62	-16.74	Avg	1	270	
945	45.27	V	75.62	-30.35	Peak	1	160	
945	39.18	V	55.62	-16.44	Avg	1	160	
1260	50.2	V	75.62	-25.42	Peak	2.64	180	
1260	44.11	V	55.62	-11.51	Avg	2.64	180	
1575	46.5	V	74	-27.50	Peak	1.79	135	
1575	40.41	V	54	-13.59	Avg	1.79	135	
1890	50.1	V	75.62	-25.52	Peak	2.41	0	
1890	44.01	V	55.62	-11.61	Avg	2.41	0	
2205	46.7	V	74	-27.30	Peak	2.56	180	
2205	40.61	V	54	-13.39	Avg	2.56	180	
2520	49.7	V	75.62	-25.92	Peak	1.49	45	
2520	43.61	V	55.62	-12.01	Avg	1.49	45	
2835	44.6	V	74	-29.40	Peak	2.52	180	
2835	38.51	V	54	-15.49	Avg	2.52	180	
3150	46	V	75.62	-29.62	Peak	2.43	315	
3150	39.91	V	55.62	-15.71	Avg	2.43	315	

FCC 15.231

Pacific Scientific Energetic Materials Company (CA) LLC
Nighthawk Transmitter
Model: 836685

Date: 02/28/2013
Labs: B and D
Tested By: Alex Benitez

315 MHz Version - Y Axis

Duty Cycle: 49.5881%

With 100 Ohm Resistor

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
315	76.52	H	95.62	-19.10	Peak	2	0	
315	70.43	H	75.62	-5.19	Avg	2	0	
630	37.27	H	75.62	-38.35	Peak	1.5	30	
630	31.18	H	55.62	-24.44	Avg	1.5	30	
945	35.77	H	75.62	-39.85	Peak	3	270	
945	29.68	H	55.62	-25.94	Avg	3	270	
1260	51.9	H	75.62	-23.72	Peak	2.23	180	
1260	45.81	H	55.62	-9.81	Avg	2.23	180	
1575	43.8	H	74	-30.20	Peak	2.56	180	
1575	37.71	H	54	-16.29	Avg	2.56	180	
1890	51.01	H	75.62	-24.61	Peak	2.79	135	
1890	44.92	H	55.62	-10.70	Avg	2.79	135	
2205	47.01	H	74	-26.99	Peak	2.73	135	
2205	40.92	H	54	-13.08	Avg	2.73	135	
2520	51.9	H	75.62	-23.72	Peak	2.59	315	
2520	45.81	H	55.62	-9.81	Avg	2.59	315	
2835	48.2	H	74	-25.80	Peak	1.54	135	
2835	42.11	H	54	-11.89	Avg	1.54	135	
3150	45.7	H	75.62	-29.92	Peak	2.66	135	
3150	39.61	H	55.62	-16.01	Avg	2.66	135	

FCC 15.231

Pacific Scientific Energetic Materials Company (CA) LLC
Nighthawk Transmitter
Model: 836685

Date: 02/28/2013
Labs: B and D
Tested By: Alex Benitez

315 MHz Version - Z Axis

Duty Cycle: 49.5881%

With 100 Ohm Resistor

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
315	73.42	V	95.62	-22.20	Peak	1.5	315	
315	67.33	V	75.62	-8.29	Avg	1.5	315	
630	34.97	V	75.62	-40.65	Peak	1	0	
630	28.88	V	55.62	-26.74	Avg	1	0	
945	40.87	V	75.62	-34.75	Peak	2.25	180	
945	34.78	V	55.62	-20.84	Avg	2.25	180	
1260	48.4	V	75.62	-27.22	Peak	2.43	135	
1260	42.31	V	55.62	-13.31	Avg	2.43	135	
1575	42.7	V	74	-31.30	Peak	1.46	135	
1575	36.61	V	54	-17.39	Avg	1.46	135	
1890	49.4	V	75.62	-26.22	Peak	2.71	180	
1890	43.31	V	55.62	-12.31	Avg	2.71	180	
2205	45.5	V	74	-28.50	Peak	2.12	315	
2205	39.41	V	54	-14.59	Avg	2.12	315	
2520	49.1	V	75.62	-26.52	Peak	1.57	135	
2520	43.01	V	55.62	-12.61	Avg	1.57	135	
2835	46.8	V	74	-27.20	Peak	1.63	135	
2835	40.71	V	54	-13.29	Avg	1.63	135	
3150	46.9	V	75.62	-28.72	Peak	3.05	180	
3150	40.81	V	55.62	-14.81	Avg	3.05	180	

FCC 15.231

Pacific Scientific Energetic Materials Company (CA) LLC
Nighthawk Transmitter
Model: 836685

Date: 02/28/2013
Labs: B and D
Tested By: Alex Benitez

315 MHz Version - Z Axis

Duty Cycle: 49.5881%

With 100 Ohm Resistor

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
315	73.52	H	95.62	-22.10	Peak	1	270	
315	67.43	H	75.62	-8.19	Avg	1	270	
630	45.87	H	75.62	-29.75	Peak	1	90	
630	39.78	H	55.62	-15.84	Avg	1	90	
945	48.37	H	75.62	-27.25	Peak	1.5	270	
945	42.28	H	55.62	-13.34	Avg	1.5	270	
1260	52	H	75.62	-23.62	Peak	2.35	135	
1260	45.91	H	55.62	-9.71	Avg	2.35	135	
1575	53.01	H	74	-20.99	Peak	2.21	135	
1575	46.92	H	54	-7.08	Avg	2.21	135	
1890	57.7	H	75.62	-17.92	Peak	2.25	135	
1890	51.61	H	55.62	-4.01	Avg	2.25	135	
2205	44.7	H	74	-29.30	Peak	1.65	270	
2205	38.61	H	54	-15.39	Avg	1.65	270	
2520	46.2	H	75.62	-29.42	Peak	2.83	135	
2520	40.11	H	55.62	-15.51	Avg	2.83	135	
2835	48.5	H	74	-25.50	Peak	2.69	135	
2835	42.41	H	54	-11.59	Avg	2.69	135	
3150	45.4	H	75.62	-30.22	Peak	1.82	270	
3150	39.31	H	55.62	-16.31	Avg	1.82	270	

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Pacific Scientific Energetic Materials Company (CA) LLC
Nighthawk Transmitter
Model: 836685

Date: 02/28/2013
Lab: B and D
Tested By: Alex Benitez

433.92 MHz Version - X Axis

Duty Cycle: 50.46%

With 680 Ohm Resistor

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
433.92	75.01	V	100.82	-25.81	Peak	2	275	
433.92	69.07	V	80.82	-11.75	Avg	2	275	
867.84	33.19	V	80.82	-47.63	Peak	1	90	
867.84	27.25	V	60.82	-33.57	Avg	1	90	
1301.76	42.01	V	74	-31.99	Peak	1.62	225	
1301.76	36.07	V	54	-17.93	Avg	1.62	225	
1735.7	51.3	V	80.82	-29.52	Peak	2.37	225	
1735.7	45.36	V	60.82	-15.46	Avg	2.37	225	
2169.6	50.2	V	80.82	-30.62	Peak	1.47	180	
2169.6	44.26	V	60.82	-16.56	Avg	1.47	180	
2603.52	47.7	V	80.82	-33.12	Peak	2.54	315	
2603.52	41.76	V	60.82	-19.06	Avg	2.54	315	
3037.44	47.7	V	80.82	-33.12	Peak	1.75	315	
3037.44	41.76	V	60.82	-19.06	Avg	1.75	315	
3471.36	44.7	V	80.82	-36.12	Peak	2.21	180	
3471.36	38.76	V	60.82	-22.06	Avg	2.21	180	
3905.28	48.2	V	74	-25.8	Peak	1.63	90	
3905.28	42.26	V	54	-11.74	Avg	1.63	90	
4339.2	51.8	V	74	-22.2	Peak	2.45	90	
4339.2	45.86	V	54	-8.14	Avg	2.45	90	

FCC 15.231

Pacific Scientific Energetic Materials Company (CA) LLC
 Nighthawk Transmitter
 Model: 836685

Date: 02/28/2013
 Lab: B and D
 Tested By: Alex Benitez

433.92 MHz Version - X Axis

Duty Cycle: 50.46%

With 680 Ohm Resistor

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
433.92	85.81	H	100.82	-15.01	Peak	1	90	
433.92	79.87	H	80.82	-0.95	Avg	1	90	
867.84	41.59	H	80.82	-39.23	Peak	2.5	80	
867.84	35.65	H	60.82	-25.17	Avg	2.5	80	
1301.76	40.3	H	74	-33.7	Peak	2.31	180	
1301.76	34.36	H	54	-19.64	Avg	2.31	180	
1735.7	55.2	H	80.82	-25.62	Peak	2.6	270	
1735.7	49.26	H	60.82	-11.56	Avg	2.6	270	
2169.6	49.7	H	80.82	-31.12	Peak	2.91	90	
2169.6	43.76	H	60.82	-17.06	Avg	2.91	90	
2603.52	53.8	H	80.82	-27.02	Peak	2.51	90	
2603.52	47.86	H	60.82	-12.96	Avg	2.51	90	
3037.44	53.7	H	80.82	-27.12	Peak	2.25	45	
3037.44	47.76	H	60.82	-13.06	Avg	2.25	45	
3471.36	46.9	H	80.82	-33.92	Peak	2.79	180	
3471.36	40.96	H	60.82	-19.86	Avg	2.79	180	
3905.28	47.8	H	74	-26.2	Peak	1.88	315	
3905.28	41.86	H	54	-12.14	Avg	1.88	315	
4339.2	51.6	H	74	-22.4	Peak	1.88	315	
4339.2	45.66	H	54	-8.34	Avg	1.88	315	

FCC 15.231

Pacific Scientific Energetic Materials Company (CA) LLC
Nighthawk Transmitter
Model: 836685

Date: 02/28/2013
Lab: B and D
Tested By: Alex Benitez

433.92 MHz Version - Y Axis

Duty Cycle: 50.46%

With 680 Ohm Resistor

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
433.92	85.21	V	100.82	-15.61	Peak	1.5	110	
433.92	79.27	V	80.82	-1.55	Avg	1.5	110	
867.84	45.99	V	80.82	-34.83	Peak	1	90	
867.84	40.05	V	60.82	-20.77	Avg	1	90	
1301.76	42.5	V	74	-31.5	Peak	1.86	180	
1301.76	36.56	V	54	-17.44	Avg	1.86	180	
1735.7	56.4	V	80.82	-24.42	Peak	2.88	135	
1735.7	50.46	V	60.82	-10.36	Avg	2.88	135	
2169.6	49.5	V	80.82	-31.32	Peak	2.74	0	
2169.6	43.56	V	60.82	-17.26	Avg	2.74	0	
2603.52	47.9	V	80.82	-32.92	Peak	2.46	135	
2603.52	41.96	V	60.82	-18.86	Avg	2.46	135	
3037.44	51.6	V	80.82	-29.22	Peak	1.93	135	
3037.44	45.66	V	60.82	-15.16	Avg	1.93	135	
3471.36	48.3	V	80.82	-32.52	Peak	1.91	0	
3471.36	42.36	V	60.82	-18.46	Avg	1.91	0	
3905.28	49.8	V	74	-24.2	Peak	1.37	180	
3905.28	43.86	V	54	-10.14	Avg	1.37	180	
4339.2	49.01	V	74	-24.99	Peak	2.75	180	
4339.2	43.07	V	54	-10.93	Avg	2.75	180	

FCC 15.231

Pacific Scientific Energetic Materials Company (CA) LLC
Nighthawk Transmitter
Model: 836685

Date: 02/28/2013
Lab: B and D
Tested By: Alex Benitez

433.92 MHz Version - Y Axis

Duty Cycle: 50.46%

With 680 Ohm Resistor

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
433.92	75.31	H	100.82	-25.51	Peak	1	225	
433.92	69.37	H	80.82	-11.45	Avg	1	225	
867.84	33.99	H	80.82	-46.83	Peak	2.25	90	
867.84	28.05	H	60.82	-32.77	Avg	2.25	90	
1301.76	40.01	H	74	-33.99	Peak	2.16	135	
1301.76	34.07	H	54	-19.93	Avg	2.16	135	
1735.7	51.21	H	80.82	-29.61	Peak	2.64	135	
1735.7	45.27	H	60.82	-15.55	Avg	2.64	135	
2169.6	52.11	H	80.82	-28.71	Peak	2.66	135	
2169.6	46.17	H	60.82	-14.65	Avg	2.66	135	
2603.52	55.8	H	80.82	-25.02	Peak	2.56	180	
2603.52	49.86	H	60.82	-10.96	Avg	2.56	180	
3037.44	53.21	H	80.82	-27.61	Peak	1.49	225	
3037.44	47.27	H	60.82	-13.55	Avg	1.49	225	
3471.36	46.1	H	80.82	-34.72	Peak	1.44	135	
3471.36	40.16	H	60.82	-20.66	Avg	1.44	135	
3905.28	46.01	H	74	-27.99	Peak	2.22	90	
3905.28	40.07	H	54	-13.93	Avg	2.22	90	
4339.2	50.8	H	74	-23.2	Peak	2.42	90	
4339.2	44.86	H	54	-9.14	Avg	2.42	90	

FCC 15.231

Pacific Scientific Energetic Materials Company (CA) LLC
Nighthawk Transmitter
Model: 836685

Date: 02/28/2013
Lab: B and D
Tested By: Alex Benitez

433.92 MHz Version - Z Axis

Duty Cycle: 50.46%

With 680 Ohm Resistor

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
433.92	77.31	V	100.82	-23.51	Peak	1	0	
433.92	71.37	V	80.82	-9.45	Avg	1	0	
867.84	35.79	V	80.82	-45.03	Peak	1.5	240	
867.84	29.85	V	60.82	-30.97	Avg	1.5	240	
1301.76	39.7	V	74	-34.3	Peak	2.33	90	
1301.76	33.76	V	54	-20.24	Avg	2.33	90	
1735.7	55.6	V	80.82	-25.22	Peak	2.47	90	
1735.7	49.66	V	60.82	-11.16	Avg	2.47	90	
2169.6	51.21	V	80.82	-29.61	Peak	2.2	135	
2169.6	45.27	V	60.82	-15.55	Avg	2.2	135	
2603.52	52.01	V	80.82	-28.81	Peak	1.68	90	
2603.52	46.07	V	60.82	-14.75	Avg	1.68	90	
3037.44	51.8	V	80.82	-29.02	Peak	1.46	90	
3037.44	45.86	V	60.82	-14.96	Avg	1.46	90	
3471.36	46.6	V	80.82	-34.22	Peak	1.89	135	
3471.36	40.66	V	60.82	-20.16	Avg	1.89	135	
3905.28	48.4	V	74	-25.6	Peak	2.67	135	
3905.28	42.46	V	54	-11.54	Avg	2.67	135	
4339.2	49.7	V	74	-24.3	Peak	2.43	225	
4339.2	43.76	V	54	-10.24	Avg	2.43	225	

FCC 15.231

Pacific Scientific Energetic Materials Company (CA) LLC
 Nighthawk Transmitter
 Model: 836685

Date: 02/28/2013
 Lab: B and D
 Tested By: Alex Benitez

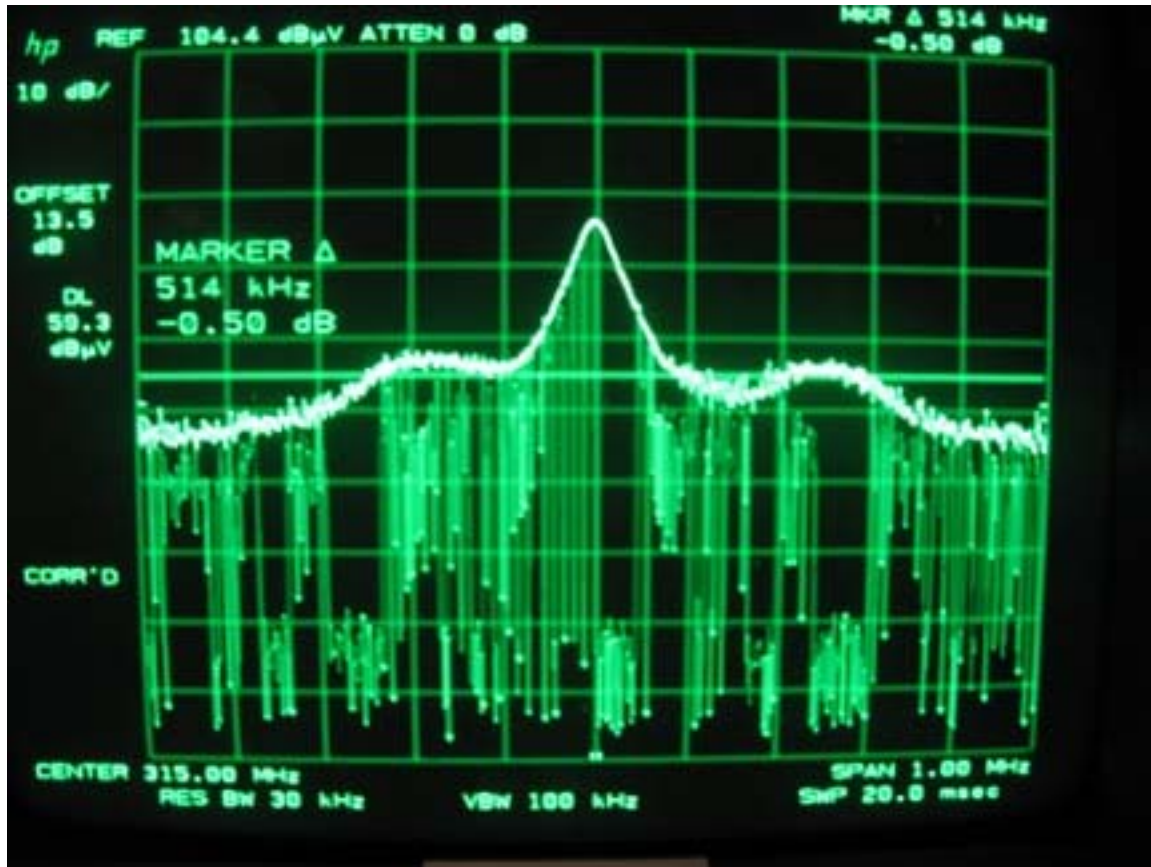
433.92 MHz Version - Z Axis

Duty Cycle: 50.46%
 With 680 Ohm Resistor

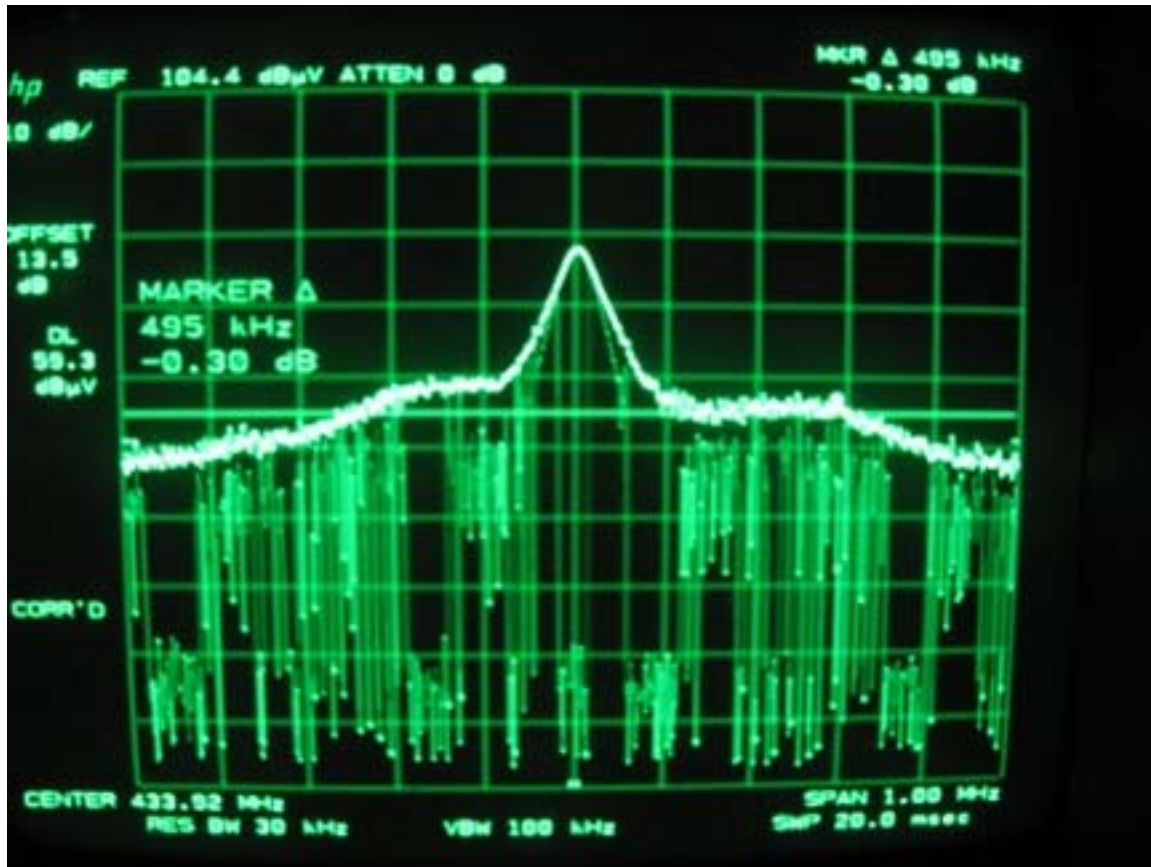
Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
433.92	86.21	H	100.82	-14.61	Peak	1	225	
433.92	80.27	H	80.82	-0.55	Avg	1	225	
867.84	42.29	H	80.82	-38.53	Peak	3	270	
867.84	36.35	H	60.82	-24.47	Avg	3	270	
1301.76	41.1	H	74	-32.9	Peak	1.48	90	
1301.76	35.16	H	54	-18.84	Avg	1.48	90	
1735.7	53.25	H	80.82	-27.57	Peak	2.76	135	
1735.7	47.31	H	60.82	-13.51	Avg	2.76	135	
2169.6	47.69	H	80.82	-33.13	Peak	1.83	135	
2169.6	41.75	H	60.82	-19.07	Avg	1.83	135	
2603.52	46.3	H	80.82	-34.52	Peak	1.32	225	
2603.52	40.36	H	60.82	-20.46	Avg	1.32	225	
3037.44	46.1	H	80.82	-34.72	Peak	2.09	180	
3037.44	40.16	H	60.82	-20.66	Avg	2.09	180	
3471.36	45.9	H	80.82	-34.92	Peak	2.7	90	
3471.36	39.96	H	60.82	-20.86	Avg	2.7	90	
3905.28	50.01	H	74	-23.99	Peak	1.99	90	
3905.28	44.07	H	54	-9.93	Avg	1.99	90	
4339.2	52.01	H	74	-21.99	Peak	2.82	225	
4339.2	46.07	H	54	-7.93	Avg	2.82	225	

-20 dB BANDWIDTH

DATA SHEETS



-20 dB Bandwidth of the Fundamental at 315 MHz



-20 dB Bandwidth of the Fundamental at 433.92MHz