TÜV TUV Rheinland of North America

Report of Measurements
for
Guide Light 911, Pulse-modulated Transmitter, Model TMT03

Manufactured by
Emergency Safety Systems, Inc.
80 Turnpike Drive
Middlebury, CT 06762

Tested by
TUV Rheinland of North America, Inc.
Newtown, CT 06470

Mark Ryan
Senior Specialist, EMC

Date of Test: 6-7 May 2003
Date of Report: 12 May 2003

TÜV Rheinland of North America

Test Report Number: 30361189.001
Prübericht Nr.

Test Report Summary

Applicant: Auftraggeber	**Emergency Safety Systems, Inc.** **80 Turnpike Drive** **Middlebury, CT 0676**	Tel: (203) 577-4042 Fax: (203) 598-0068 Web page: http://www.guidelight911.com
Type of Equipment: Gegenstand der Prüfung	**Guide Light 911, Pulse-modulated Transmitter**	
Model Number: Bezeichnung:	TMT03	**Trademark:** Ursprungszeichen: guidelight 911
Standards: Prufgrundlage	FCC Part 15 Subpart C	**Date of Test:** 6-7 May, 2003

Standard Number	Description	Severity Level or Limit	Minimum Acceptable Performance Criteria	Summary Result
FCC part 15, Subpart C	Radiated Emissions	Sections 15.33, 15.209 and 15.231	NA	**Complies**
FCC part 15, Subpart C	Emission Bandwidth	Sections 15.35	NA	**Complies**
FCC part 15, Subpart C	Conducted Emissions	Connection to AC Mains not possible	NA	NA

Place of Test: Prüfort
TUV Rheinland of North America
12 Commerce Road,
Newtown, CT 06470 USA
E-mail: info-new@tuv.com
Web: http://www.tuv.com
Phone: (203) 426-0888 Fax: (203) 270-8883

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FOR THE SCOPE OF ACCREDITATION UNDER NVLAP LAB CODE 200111-0

Test Result: Prüfergebnis
The unit presented for testing complied with criteria shown above. Additional Information is contained in the following pages.

Tested By: Der Sachverständige **Mark Ryan**	**Checked By:** geprüft **Bruce Fagley**
11 June 2003,	11 June 2003,
Date, Signature Datum, Unterschrift	**Date, Signature** Datum, Unterschrift

TABLE OF CONTENTS

1. GENERAL

1.1 EQUIPMENT TESTED

Guide Light 911, Pulse-modulated Transmitter Unit
Model TMT03

1.2 APPLICANT / MANUFACTURER

Emergency Safety Systems, Inc.
80 Turnpike Drive
Middlebury, CT 06762

1.3 FCCID

FCC ID#: Q3Y 890625000017

1.4 DESCRIPTION

The Guide Light 911 Model TMT03 unit is a pulse-modulated transmitter that provides a wireless link to a remote strobe flasher receiver (the receiver is not covered in this report). The front of the transmitter has the battery compartment, a battery indicator LED (red), and a “Reset” button. The top of the transmitter has a telephone input jack, and the bottom has a wire that connects to a standard telephone jack. The unit is battery powered and has no provisions for AC Power input.
For more information refer to product’s web page at: http://www.guidelight911.com/home.asp

1.4.1 Physical:

The transmitter is in a plastic enclosure that measures 4.75” x 3” x 0.875” and weighs 1.5 lb with batteries installed.

1.4.2 Functional:

The Model TMT03 is intended for operation at 433.92MHz in accordance with the provisions of FCC part §15.231(a).

1.4.3 Electrical and EMC Related:

The TMT03 is battery operated and no means is provided for connection of external power. The Unit is powered from four (4) AAA type cells.

1.5 DESCRIPTION of CIRCUIT FUNCTION

Refer to “Operational Description” Folder.

1.6 BLOCK DIAGRAM SHOWING OSCILLATORS

Refer to “Block Diagram” Folder.

2. MEASUREMENT EQUIPMENT USED

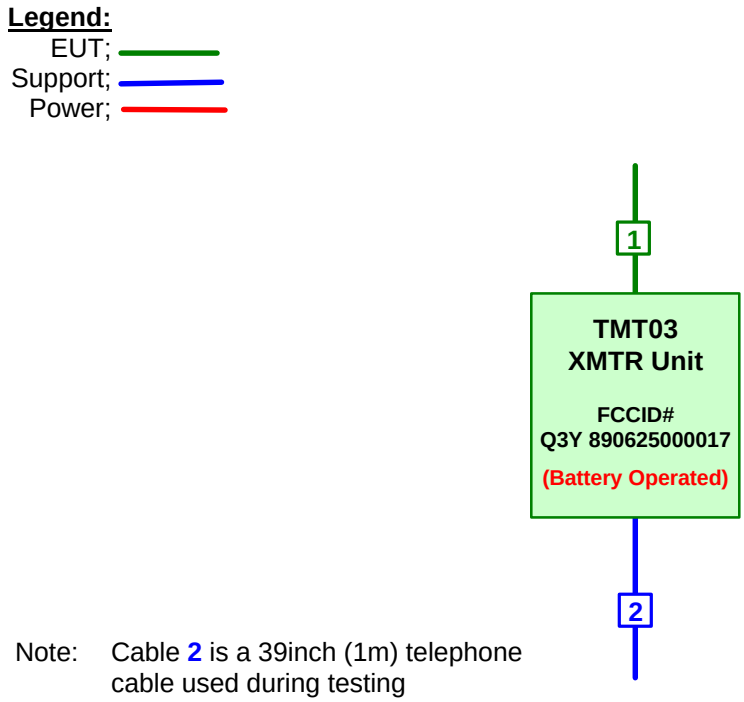
The measuring equipment used for signal measurement is shown in the following table.

Equipment	Frequency Range of Measurements Performed	Manufacturer and Model	Calibration Last/Next
EMI Receiver	30 - 5000 MHz	HP85462A[1]	Dec 02/Dec 03
RF Filter/pre-amp	30 - 5000 MHz	HP85460A[1]	Dec 02/Dec 03
Spectrum Analyzer	1 - 5 GHz	HP8593E	Aug 02/Aug 03
Pre-Amp	1 – 5 GHz	HP8449A	Aug 02/Aug 03
Bi-Conical Antenna	30 – 300 MHz	EMCO 3109	Oct 02/Oct 03
Log-Periodic Antenna	300 – 1000 GHz	EMCO 3146	Sep 02/Sep 03
Bi-Log Antenna	30 – 2000 MHz	Schaffner CBL6112B	Oct 02/Oct 03
Ridged Horn Antenna	1000 - 5000 MHz	EMCO 3115	Sep 02/Sep 03

[1]Note: The HP85462A Receiver and the HP85469A Filter/pre-amp are also known collectively as the **HP8546A**.

3. REPORT OF MEASUREMENTS

3.1 TEST CONFIGURATION BLOCK DIAGRAM



Note: Cable **2** is a 39inch (1m) telephone cable used during testing

Cable #	Cable Description	Fixed or Detachable	Length	Shielding
1	4 Conductor Phone cord w/ RJ11	Fixed to EUT	7 inches	Unshielded
2	4 Conductor Phone cord w/ RJ11	Detachable	39 inches (1m)	Unshielded

3.2 CONDUCTED EMISSIONS

Conducted emissions measurements were not performed, as the Guide Light 911 has no provision for connection to the AC mains.

3.3 RADIATED EMISSIONS

3.3.1 Mode of Operation

Per manufacturer's instruction, the Guide Light 911 was set to continuous transmission by adding a jumper wire on the circuit board, See photograph in the "Photos Product Internal" folder, page 2.

3.3.2 Test Procedure

Preliminary radiated measurements were made at a distance of 3 meters in a semi-anechoic chamber. The preliminary plots are included in the test data section. Final radiated measurements were performed on an Open Area Test Site (OATS) at measurement distances of 3 meters for all frequencies measured. The OATS plots are also included in the test data section.

Radiated emissions measurements were performed using the ANSI C63.4-1992 measurement procedures as specified in paragraph 15.31(a)(6).

Date of Test:	6-7 May 2003
Frequency Range:	30 - 5000 MHz
Detector:	Peak, Quasi Peak and Average
Peak Measurement Bandwidth:	120 kHz
Quasi-Peak Measurement Bandwidth:	120 kHz
Average Measurement Bandwidth:	300 kHz
Avg. BW for spurious emissions above 1GHz:	1MHz (See **NOTE 1** of measurement data, Page 8.)

3.3.3 Frequency Range Investigated

Per §15.33(a)(1), the frequency range investigated will be to the tenth harmonic of the highest fundamental frequency. The highest fundamental frequency of the equipment tested is 433.92MHz. The tenth harmonic is 4.3392GHz. The frequency range investigated will be from 30MHz to 5GHz.

3.3.4 Criteria

CFR 47 (FCC) Section 15.231

3.3.5 Measurement Data

Radiated Emissions ***Final OATS Measurements*** **D= 3 m** **Antenna = *Schaffner CBL6112B***

Device Tested: Guide Light 911, Pulse Modulated Transmitter, Model TMT03

Meas. # See Note 1	Freq	Measured Levels			FCC Limit with type detector used	Δ	Antenna + Cable Correction Factor (included in measured levels)	Result	Antenna Polarization	Antenna Height	Turntable Angle	Comment
		Peak	Quasi-Peak	Average								
	(MHz)	(dBµV/m)	(dBµV/m)	(dBµV/m)	(dBµV/m)	(dB)	(dB)		V or H	(m)	(°)	
1	379.766	31.09	29.51	20.11	60.80 QP	-31.29	15.21	Complied	V	1.0	0.0	§15.231(b)(2)
2	406.896	37.47	36.34	26.49	60.80 QP	-24.46	16.01	Complied	V	1.0	0.0	§15.231(b)(2)
3	420.458	37.02	35.49	25.07	60.80 QP	-25.31	16.60	Complied	V	1.0	25.0	§15.231(b)(2)
4	434.016	81.74	81.55	71.67	80.80 QP	0.75	16.83	See Note 2	V	1.0	225.0	Fundamental §15.231(b)
5	434.016	77.64	77.45	67.57	80.80 pk	-3.16	16.83	See Note 2	V	1.0	225.0	Averaging §15.35(c)
6	447.557	23.75	18.03	9.01	60.80 QP	-42.77	16.89	Complied	V	1.0	25.0	§15.231(b)(2)
7	461.144	26.42	23.27	14.50	60.80 QP	-37.53	16.99	Complied	H	1.0	25.0	§15.231(b)(2)
8	474.715	22.01	16.95	9.44	60.80 QP	-43.85	17.09	Complied	H	1.0	25.0	§15.231(b)(2)
9	868.032	49.92	49.40	39.27	60.80 QP	-11.40	20.35	Complied	H	1.0	25.0	§15.231(b)(2)
10	1302.048	55.33	53.37	42.74	54.00 avg	-11.26	24.11	Complied	H	1.8	0.0	§15.205(b) - 1MHz BW

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Note 1: Per §15.231(a), the maximum permitted fundamental field strength is 80.8dBµV/m (11,000µV/m). This limit is used for measurement numbers **4** and **5** in above table. The formula for calculating the maximum permitted fundamental field strengths for the 260-470 MHz band at 3 meters is:
Limit in µV/m = 41.6667(F in MHz) – 7083.3333, where F is the operating frequency of 434MHz.
Or: (41.6667x434) - 7083.3333 = 11,000 µV/m. Therefore, 20 x log(11,000 µV/m) = 80.8dBµV/m.
The maximum permitted unwanted emissions level is 20 dB below the maximum permitted fundamental level, or 60.8dBµV/m (1,100µV/m). This limit is used for measurement numbers **1**, **2**, **3**, **6**, **7**, **8**, and **9** in above table. See Plot on page 15 for fundamental bandwidth measurement.

Measurement number **10** in the above table is located within the restricted band of 1300 – 1427MHz. Per §15.205(b), the emission shall therefore be in compliance with the limits of Section15.209. Since the frequency is above 1000MHz, the provisions in §15.35(b) for employing an average detector function with a minimum resolution bandwidth of 1MHz will apply. Limit = 500µV/m (54.0dBµV/m).

Note 2: Per §15.35(c), "…when the radiated emission limits are expressed in terms of average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds…"

Refer to the plot on page 13. The pulse train of the device tested is 8.3mS in length, with 5.1mS of "ON" time, and 3.15mS of "OFF" time. This equals to 62% (5.1mS / 8.3mS x 100) of average "ON" emission. The maximum signal from measurement number **4** in above table is 81.7dBµV/m peak (0.8dB over the limit). When the 62% averaged value is applied, the measured emissions were reduced by 4.1dBµV/m. The resulting 77.5dBµV/m peak emission (measurement in line number **5**) is therefore **compliant**, and has a 3.2dB margin to the limit. The 4.1dBµV/m correction factor used in the above was calculated at by taking 62% of the emissions in number **4** of the above table:
62% of 12218 µV/m (81.7dBµV/m) = 7575 µV/m (77.6dBµV/m).
And, 77.6dBµV/m – 81.7dBµV/m = -4.1dBµV/m correction value.

3.3.6 Signal Bandwidth

Per §15.231(c), the maximum allowed bandwidth is 0.25% of 434MHz = 1.085MHz.
Bandwidth is determined at the points 20 dB down from the modulated carrier. Refer to plot on page 15.

3.3.7 Signal Level Calculation

Refer to the table on the previous page.

The values in the table on the previous page were calculated using the following:

Measured Level (dBµV) + Cable Loss (dB)+ Antenna Factor dB = Field Strength (dBµV/m)

These calculations are included in the values.

3.3.8 Test Results

Refer to the results column in the table on previous page.

All of the radiated emissions of the Guide Light 911 were within their respective limits, as reflected in the comments column in the table and in the notes on the previous page.

4. MODIFICATIONS to EQUIPMENT TESTED

One minor modification of the Guide Light 911 was required for testing. Since the unit is designed to be in stand-my mode until it receives and decodes a “9-1-1”sequence from the telephone line, a way was required to force the pulse-modulated transmitter into a continuous transmit loop for signal measurement. One jumper wire was added to the circuit board to facilitate this requirement.

Refer to photograph on page 2 in the “Photos Product Internal” folder.

5. MEASUREMENT DATA SHEETS

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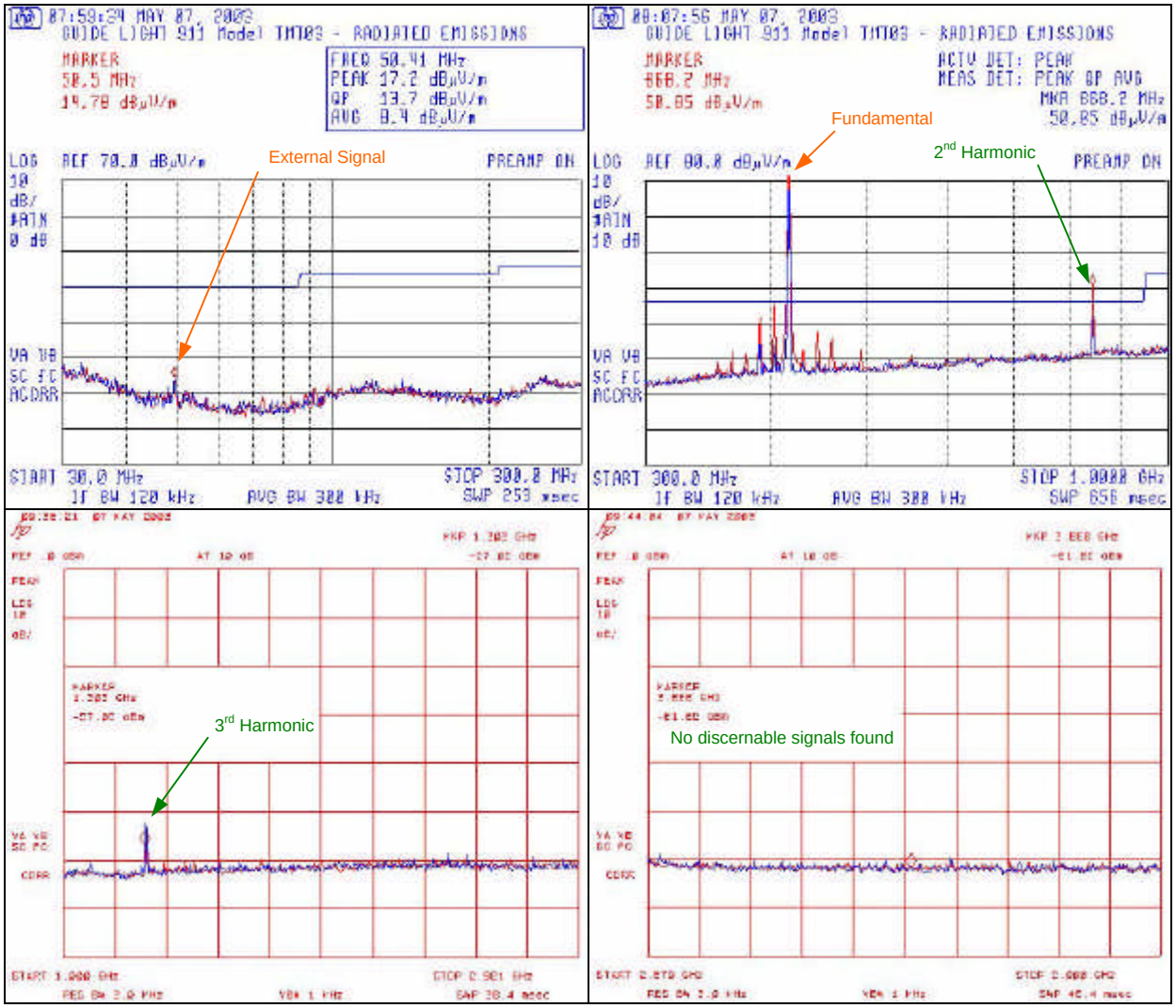
5.1 PRELIMINARY EMISSIONS (SAR) 30-5000 MHz

NOTES: Guide Light 911 Transmitter – Radiated Emissions Prescan
HP8546A EMI Receiver used form 30MHz to 1000MHz and used for all final measurements.
HP8593E Spectrum Analyzer used from 1000MHz to 5000MHz (Prescan only)



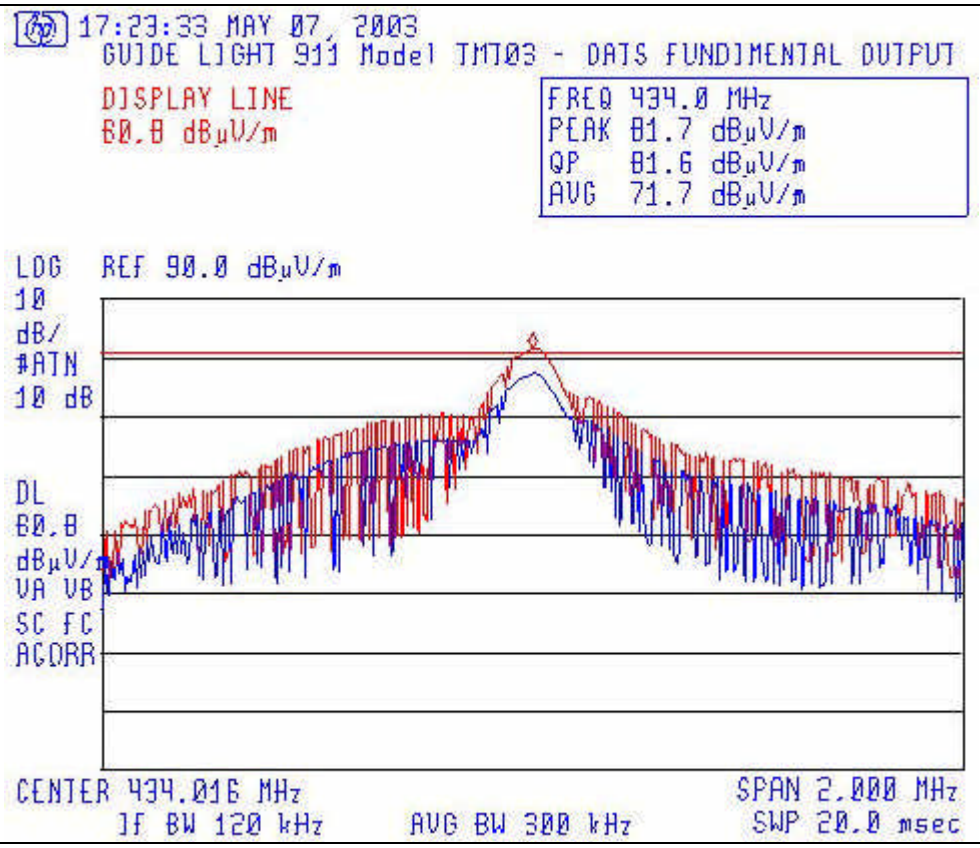
ANTENNA/COUPLER:

☐ 9124 Bicon (30 - 1000 MHz)	☒ 3109 Bicon (30 - 1000 MHz)	☐ CBL6140 X-Wing	☐ NNB-4/63TL LISN
☒ 3146 Log Per (300-1000 MHz)	☒ 3115 Horn (1 – 5 GHz)	☐ MDS–21 Clamp	☐ NNB-4/200X LISN
☐ 3106 Horn	☐ CBL6112B Bilog	☐ NSLK 8126 LISN	☐ Other_____

MEAS TYPE:	POLARIZATION:	DISTANCE:	LOCATION:
☒ Radiated Prescan	☒ Vertical	☒ 3 Meter	☐ OATS
☐ Radiated Final	☒ Horizontal	☐ 10 Meter	☒ Semi-Anechoic
☐ Conducted	☐ Line	☐ ____Meter	☐ Shielded Room
☐ Disturbance Power	☐ Neutral	☐ NA	☐ Factory Floor
☐ Other_____	☐ NA		☐ Other_____

5.2 FINAL EMISSIONS (OATS 3 m) at 435 MHz - §§15.231(b) & 15.35(c)

NOTES: Guide Light 911 Transmitter – OATS measurement, Worst Case (All data Bits set to "1")
HP8546A EMI Receiver used.
(Refer to Table and **Note 2** of Measurement data on page 8.)



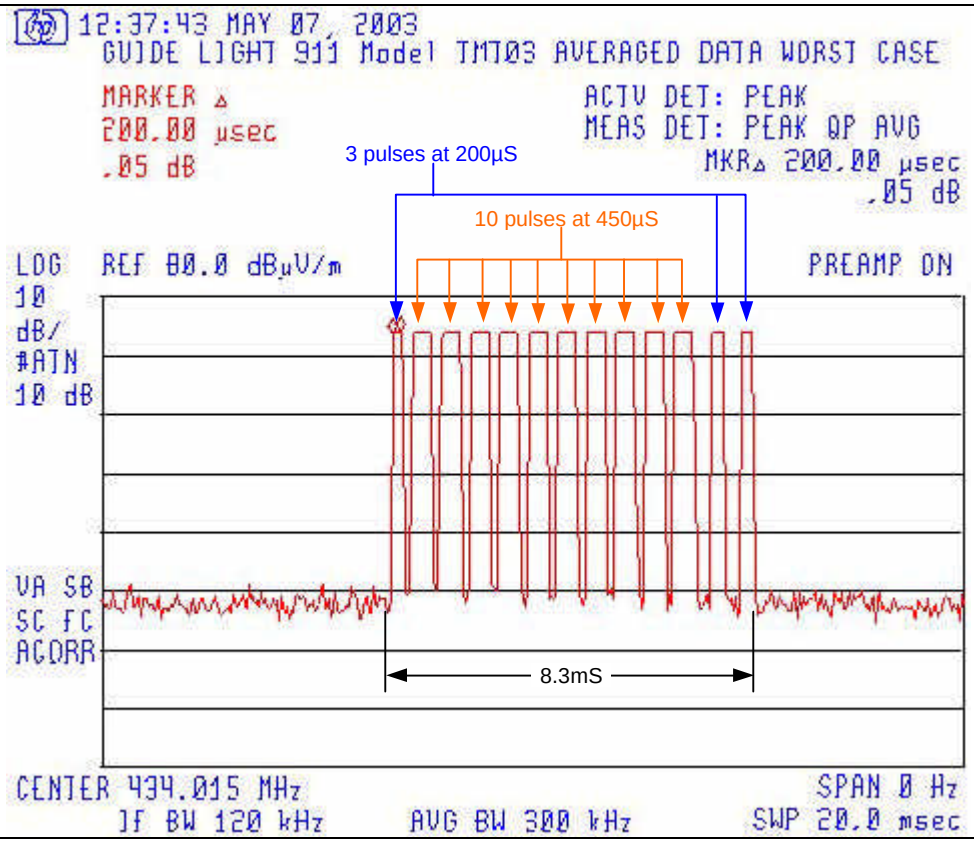
ANTENNA/COUPLER:

☐ 9124 Bicon	☐ 3109 Bicon	☐ CBL6140 X-Wing	☐ NNB-4/63TL LISN
☐ 3146 Log Per	☐ 3115 Horn	☐ MDS–21 Clamp	☐ NNB-4/200X LISN
☐ 3106 Horn	☒ CBL6112B Bilog	☐ NSLK 8126 LISN	☐ Other_____

MEAS TYPE:	POLARIZATION:	DISTANCE:	LOCATION:
☒ Radiated Prescan	☒ Vertical	☒ 3 Meter	☒ OATS
☐ Radiated Final	☒ Horizontal	☐ 10 Meter	☐ Semi-Anechoic
☐ Conducted	☐ Line	☐ ____Meter	☐ Shielded Room
☐ Disturbance Power	☐ Neutral	☐ NA	☐ Factory Floor
☐ Other_____	☐ NA		☐ Other_____

5.3 AVERAGED PULSE TRAIN - §15.35(c)

NOTES: Guide Light 911 Transmitter – Averaged pulse train, Worst Case (All data Bits set to "1")
HP8546A EMI Receiver used.
Total "ON" time: (10x450µS) + (3 x 200µS) = 5.1mS
Per §15.35(c), Averaged pulse train signal: 8.3mS / 5.1mS = 62% (Rounded up)
(Refer to Table and **Note 2** of Measurement data on page 8.)



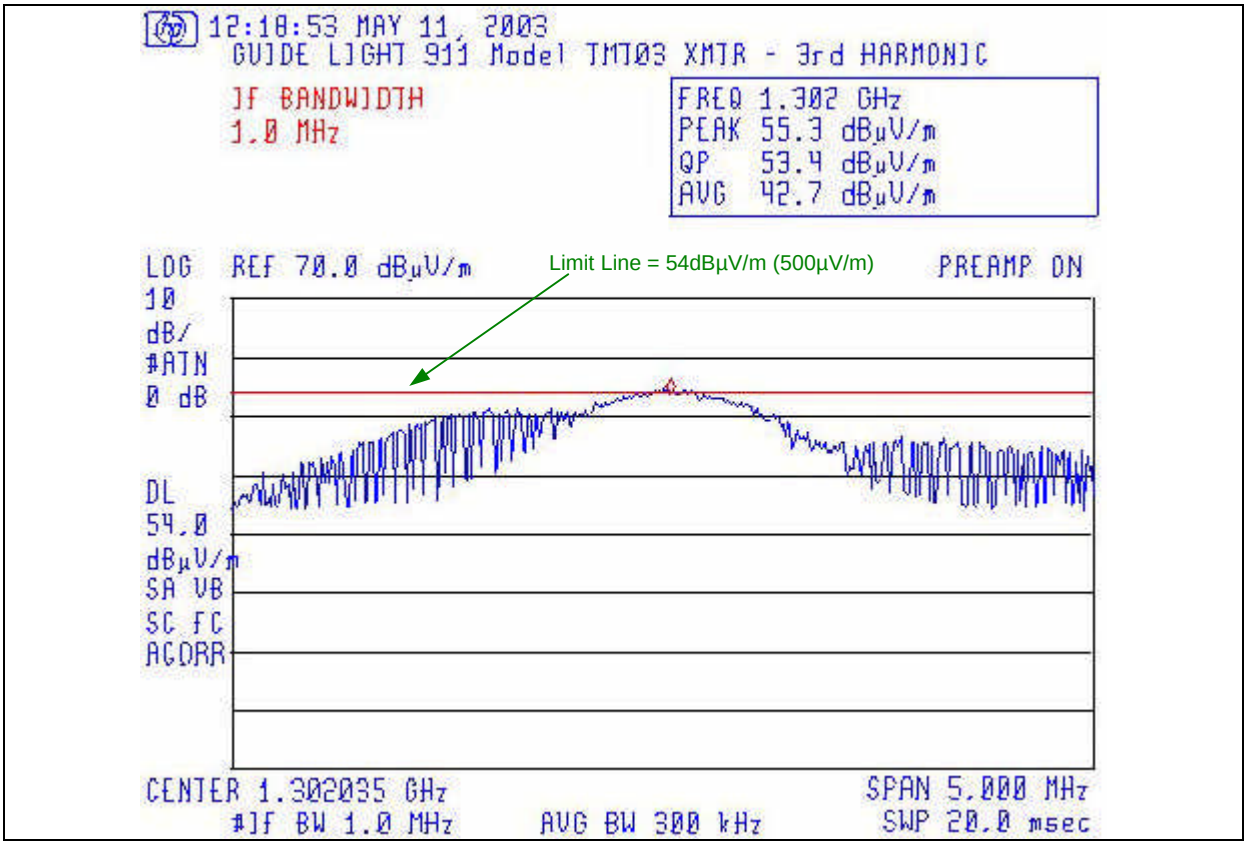
ANTENNA/COUPLER:

☐ 9124 Bicon (30 - 1000 MHz)	☐ 3109 Bicon (30 - 1000 MHz)	☐ CBL6140 X-Wing	☐ NNB-4/63TL LISN
☒ 3146 Log Per (300-1000 MHz)	☐ 3115 Horn (1 – 5 GHz)	☐ MDS–21 Clamp	☐ NNB-4/200X LISN
☐ 3106 Horn	☐ CBL6112B Bilog	☐ NSLK 8126 LISN	☐ Other_____

MEAS TYPE:	POLARIZATION:	DISTANCE:	LOCATION:
☒ Radiated Prescan	☒ Vertical	☒ 3 Meter	☐ OATS
☐ Radiated Final	☒ Horizontal	☐ 10 Meter	☒ Semi-Anechoic
☐ Conducted	☐ Line	☐ ____Meter	☐ Shielded Room
☐ Disturbance Power	☐ Neutral	☐ NA	☐ Factory Floor
☐ Other_____	☐ NA		☐ Other_____

5.4 3rd HARMONIC - FINAL EMISSIONS (OATS 3 m) at 1302 MHz - §15.35(b)

NOTES: Guide Light 911 Transmitter – OATS measurement, Worst Case (All data Bits set to "1")
HP8546A EMI Receiver used, w/ Average detector with a 1MHz resolution Band Width per §15.35(b).
Signal is located within the 1300-1427MHz restricted band, therefore limits of Section 15.209 apply.
Average level measured = 42.7dBµV/m. (Refer to **Note 1** of Measurement data on page 8.)



ANTENNA/COUPLER:

☐ 9124 Bicon	☐ 3109 Bicon	☐ CBL6140 X-Wing	☐ NNB-4/63TL LISN
☐ 3146 Log Per	☐ 3115 Horn	☐ MDS–21 Clamp	☐ NNB-4/200X LISN
☐ 3106 Horn	☒ CBL6112B Bilog	☐ NSLK 8126 LISN	☐ Other_____

MEAS TYPE:	POLARIZATION:	DISTANCE:	LOCATION:
☐ Radiated Prescan	☐ Vertical	☒ 3 Meter	☒ OATS
☒ Radiated Final	☒ Horizontal	☐ 10 Meter	☐ Semi-Anechoic
☐ Conducted	☐ Line	☐ ____Meter	☐ Shielded Room
☐ Disturbance Power	☐ Neutral	☐ NA	☐ Factory Floor
☐ Other_____	☐ NA		☐ Other_____

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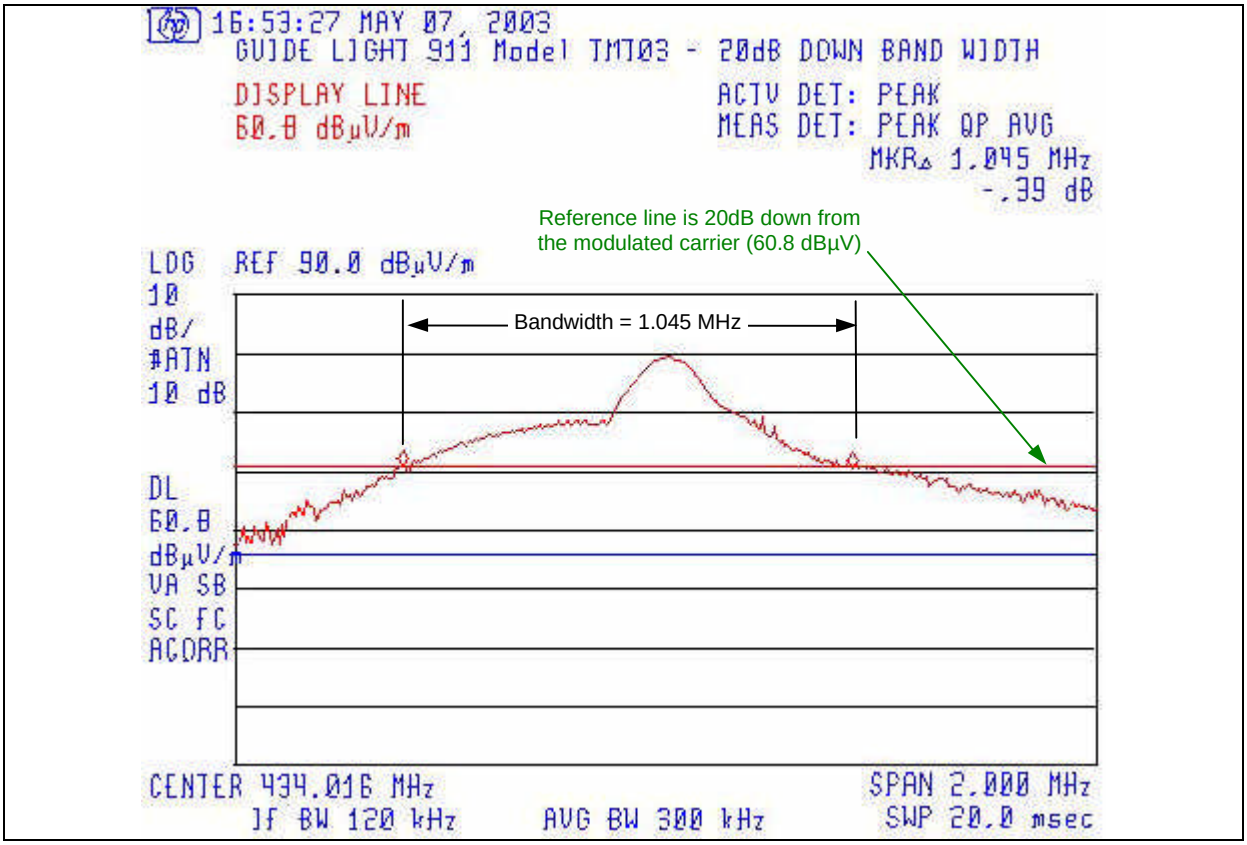
5.5 EMISSION BANDWIDTH (OATS 3 m) at 434 MHz - §15.231(c)

NOTES: Guide Light 911 Transmitter – OATS measurement, Worst Case (All data Bits set to "1")
HP8546A EMI Receiver used (using Max. Hold for 30 Seconds, and peak detector).
Per §15.231(c), the maximum Allowed Bandwidth is 0.25% of 434MHz = 1.085MHz.
Bandwidth is determined at the points 20 dB down from the modulated carrier.



ANTENNA/COUPLER:			
☐ 9124 Bicon	☐ 3109 Bicon	☐ CBL6140 X-Wing	☐ NNB-4/63TL LISN
☐ 3146 Log Per	☐ 3115 Horn	☐ MDS–21 Clamp	☐ NNB-4/200X LISN
☐ 3106 Horn	☒ CBL6112B Bilog	☐ NSLK 8126 LISN	☐ Other_____

MEAS TYPE:	POLARIZATION:	DISTANCE:	LOCATION:
☐ Radiated Prescan	☒ Vertical	☒ 3 Meter	☒ OATS
☒ Radiated Final	☐ Horizontal	☐ 10 Meter	☐ Semi-Anechoic
☐ Conducted	☐ Line	☐ ____Meter	☐ Shielded Room
☐ Disturbance Power	☐ Neutral	☐ NA	☐ Factory Floor
☐ Other_____	☐ NA		☐ Other_____