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FCC PART 15.249 TEST REPORT UNLICENSED INTENTIONAL RADIATOR

Applicant	ELK PRODUCTS, INC.
Address	3266 HIGHWAY 70 WEST
	HILDEBRAN NC 28637 USA
FCC ID	TMAELK-6023
Model Number	ELK-6023
Product Description	RECESSED DOOR SENSOR
FCC Standard Applied	47 CFR §15.249
Date Sample Received	3/4/2014
Date Tested	3/11/2014
Tested By	Cory Leverett
Approved By	Cory Leverett
Report Number	304AUT14TestReport
Test Results	☒ PASS ☐ FAIL

THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.
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GENERAL REMARKS

The attached report shall not be reproduced except in full without the written permission of Timco Engineering Inc.

Summary

The device under test does:

- ☒ fulfill the general approval requirements as identified in this test report
☐ not fulfill the general approval requirements as identified in this test report

Attestations

This equipment has been tested in accordance with the standards identified in this test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025: 2005 requirements.

I attest that the necessary measurements were made, under my supervision, at:

Timco Engineering Inc.
849 NW State Road 45
Newberry, FL 32669

Authorized Signatory Name:

Cory Leverett

Engineering Project Manager
Date: March 11, 2014



APPLICANT: ELK PRODUCTS, INC.
FCC ID: TMAELK-6023
REPORT #: E\ELK_TMA\304AUT14\304AUT14TestReport

GENERAL INFORMATION

EUT Specification

The test results relate only to the items tested.			
Applicable Standard	Part 15.249		
EUT Description	RECESSED DOOR SENSOR		
FCC ID	TMAELK-6023		
Model Number	ELK-6023		
Operating Frequency	TX: 903.03-927.03	RX: Same	
No. of Channels	25		
Modulations	GFSK		
EUT Power Source	☐ 110-120Vac/50- 60Hz		
	☐ DC Power		
	☒ Battery Operated Exclusively		
Test Item	☐ Prototype	☒ Pre-Production	☐ Production
Type of Equipment	☐ Fixed	☐ Mobile	☒ Portable
Antenna Connector	FCC Rules require that the antenna connector be unique.		
Test Facility	Timco Engineering Inc. located at 849 NW State Road 45 Newberry, FL 32669 USA.		
Conditions in the Test laboratory	Temperature: 26°C		
	Relative humidity: 50%		
Test Exercise	The EUT was placed in continuous transmit mode of operation.		
Revision History of EUT			

Test Supporting Equipment

No supporting equipment required all samples were programed to transmit continually once battery is inserted into the equipment under test..

Supporting Device	Manufacturer	Model / FCC ID	Serial Number
N/A			

EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Antenna: Passive Loop	EMC Test Systems	EMCO 6512	9706-1211	06/14/12	06/14/14
Antenna: Double-Ridged Horn	Electro-Metrics	RGA-180	2319	06/19/12	06/19/14
EMI Test Receiver	Rhode & Schwarz	*ESIB 40	100274	03/13/12	03/16/14
Software: Field Strength Program	Timco	N/A	Version 4.0	NA	NA
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	12/31/11	03/31/14
Antenna: Biconnical	Eaton	94455-1	1057	06/14/13	06/14/15
Antenna: Log-Periodic	Eaton	96005	1243	05/31/13	05/31/15

*EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3

TEST PROCEDURES

Radiation Interference: ANSI C63.4-2003 using a spectrum analyzer, a preselector, a quasi-peak adapter, and an appropriate antenna. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100 kHz with an appropriate sweep speed and the video bandwidth was 300 kHz up to 1 GHz and 1 MHz with a video BW of 3 MHz above 1 GHz. When an emission was found, the table was rotated to produce the maximum signal strength. The antenna was placed in both the horizontal and vertical planes and the worst case emissions were reported. The spectrum was searched to at least the tenth (10) harmonic of the fundamental.

Formula Of Conversion Factors: The field strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the preselector was accounted for in the spectrum analyzer meter reading.

Example:

Freq (MHz)	Meter Reading	+ ACF	+ CL = FS
33	20 dBuV	+ 10.36 dB	+ 0.5 = 30.86 dBuV/m @ 3m

Power Line Conducted Interference: The procedure used was ANSI C63.4-2003 using a 50uH LISN. Both lines were observed. The bandwidth of the spectrum analyzer was 10kHz with an appropriate sweep speed. The spectrum was scanned from 0.15 to 30 MHz.

Occupied Bandwidth: A small sample of the transmitter output was fed into the spectrum analyzer and the attached plot was printed. The vertical scale is set to -10 dBm per division.

ANSI C63.4-2003 10.1 Measurement Procedures: The EUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The EUT was placed in the center of the table (1.5m side). The table used for radiated measurements is capable of continuous rotation.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes. Emissions attenuated more than 20 dB below the permissible value are not reported.

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RADIATION INTERFERENCE

Rules Part No.: 15.249, 15.209

Requirements:

Frequency	Limits
Part 15.209	
9 to 490 kHz	2400/F (kHz) μ V/m @ 300 meters
490 to 1705 kHz	24000/F (kHz) μ V/m @ 30 meters
1705 kHz to 30 MHz	29.54 dB μ V/m @ 30 meters
30 – 88	40.0 dB μ V/m @ 3 meters
80 – 216	43.5 dB μ V/m @ 3 meters
216 – 960	46.0 dB μ V/m @ 3 meters
Above 960	54.0 dB μ V/m @ 3 meters
Part 15.249	
Fundamental 902 – 928 MHz	94.0 dB μ V/m @ 3 meters
Fundamental 2.4 – 2.4835 GHz	94.0 dB μ V/m @ 3 meters
Harmonics	54.0 dB μ V/m @ 3 meters

Test Data:

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity	Coax Loss dB	Correction Factor dB/m	Duty Cycle dB	Field Strength dBuV/m	Margin dB
903	902.96	61.7	V	1.95	23.3	17.31	69.64	24.36
903	903.09	71.5	H	1.95	23.3	17.31	79.44	14.56
903	1,806.00	18.8	V	2.74	30.55	17.31	34.78	19.22
903	1,806.00	23.2	H	2.74	30.55	17.31	39.18	14.82
903	2,709.00	23.9	V	3.4	33.03	17.31	43.02	10.98
903	2,709.00	26.9	H	3.4	33.03	17.31	46.02	7.98
903	3,611.00	26.2	V	4.15	33.36	17.31	46.4	7.6
903	3,611.00	30.3	H	4.15	33.36	17.31	50.5	3.5
903	4,495.00	17.5	V	4.75	34.1	17.31	39.04	14.96
903	4,514.00	17.6	H	4.76	34.1	17.31	39.15	14.85
903	5,402.00	19.2	V	5.12	34.58	17.31	41.59	12.41
903	5,412.00	19.1	H	5.12	34.59	17.31	41.5	12.5

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Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity	Coax Loss dB	Correction Factor dB/m	Duty Cycle dB	Field Strength dBuV/m	Margin dB
915	914.96	69.1	H	1.97	23.35	17.31	77.11	16.89
915	915.06	56.1	V	1.97	23.35	17.31	64.11	29.89
915	1,830.00	20.1	H	2.76	30.68	17.31	36.23	17.77
915	1,830.00	24.1	V	2.76	30.68	17.31	40.23	13.77
915	2,745.00	22.5	H	3.42	33.09	17.31	41.7	12.3
915	2,745.00	22.6	V	3.42	33.09	17.31	41.8	12.2
915	3,659.00	19.1	H	4.19	33.42	17.31	39.4	14.6
915	3,659.00	22.3	V	4.19	33.42	17.31	42.6	11.4
915	4,575.00	16.3	H	4.79	34.1	17.31	37.88	16.12
915	4,575.00	17.6	V	4.79	34.1	17.31	39.18	14.82
915	5,510.00	18.8	V	5.15	34.72	17.31	41.36	12.64
915	5,513.00	16.3	H	5.15	34.72	17.31	38.86	15.14

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity	Coax Loss dB	Correction Factor dB/m	Duty Cycle dB	Field Strength dBuV/m	Margin dB
927	926.96	56.3	V	1.99	23.47	17.31	64.45	29.55
927	926.96	69.7	H	1.99	23.47	17.31	77.85	16.15
927	1,854.00	20.5	V	2.78	30.81	17.31	36.78	17.22
927	1,854.00	21.7	H	2.78	30.81	17.31	37.98	16.02
927	2,781.00	23.3	H	3.45	33.15	17.31	42.59	11.41
927	2,781.00	24.4	V	3.45	33.15	17.31	43.69	10.31
927	3,708.00	19.4	H	4.24	33.49	17.31	39.82	14.18
927	3,708.00	19.8	V	4.24	33.49	17.31	40.22	13.78
927	4,635.00	17.4	V	4.82	34.1	17.31	39.01	14.99
927	4,635.00	18	H	4.82	34.1	17.31	39.61	14.39
927	5,539.00	20.1	V	5.16	34.76	17.31	42.71	11.29
927	5,557.00	20.3	H	5.17	34.79	17.31	42.95	11.05

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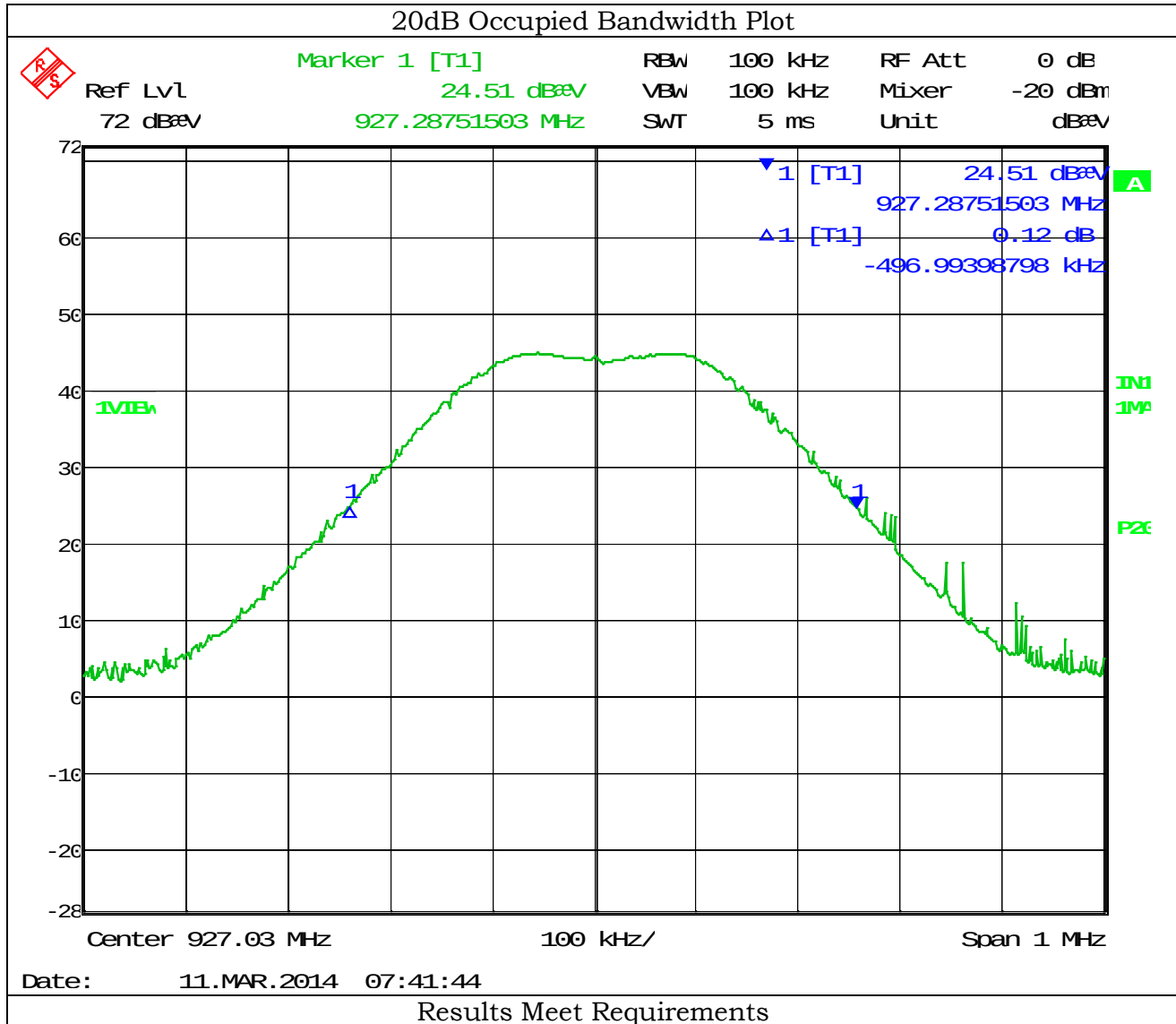
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OCCUPIED BANDWIDTH

Rules Part No.: 15.249 (d)

Requirements: The field strength of any emissions appearing outside the bandedges and up to 10 kHz above and below the band edges shall be attenuated at least 50 dB below the level of the carrier or to the general limits of 15.249.

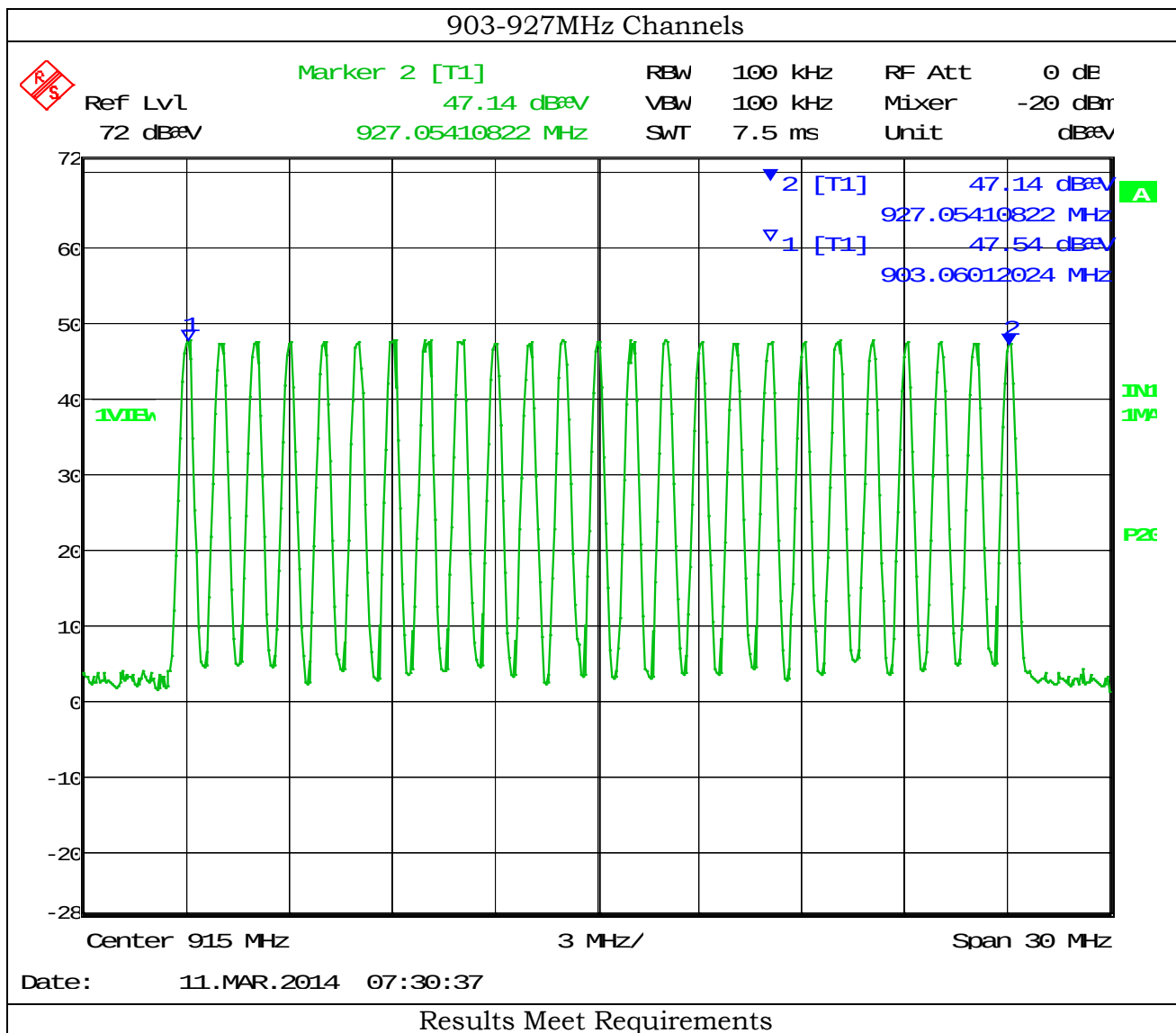
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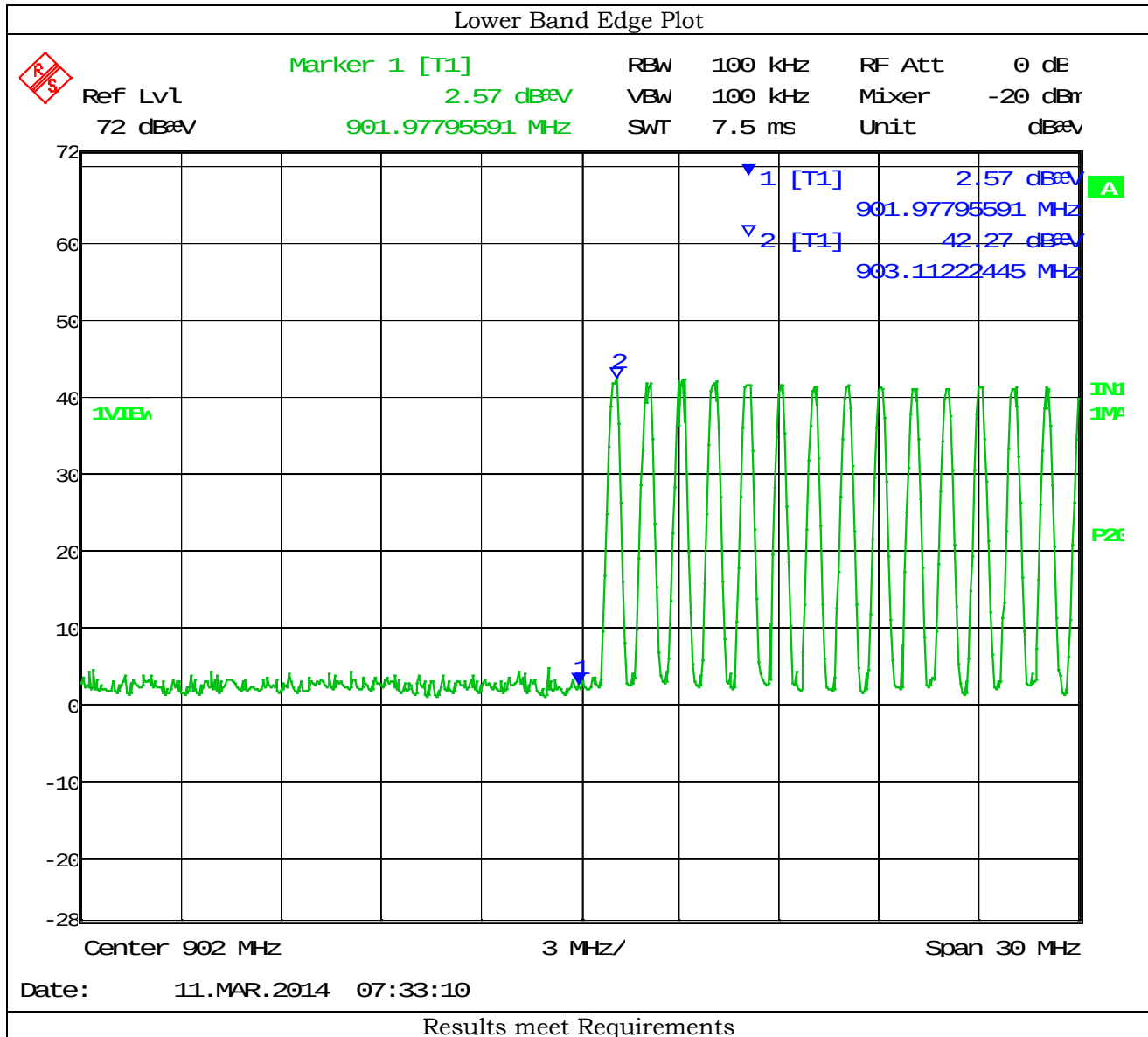
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BAND EDGE COMPLIANCE

Rules Part No.: 15.249 (d)

Requirements: 40 dBc or in the case of restricted bands 54 dBuV/m.

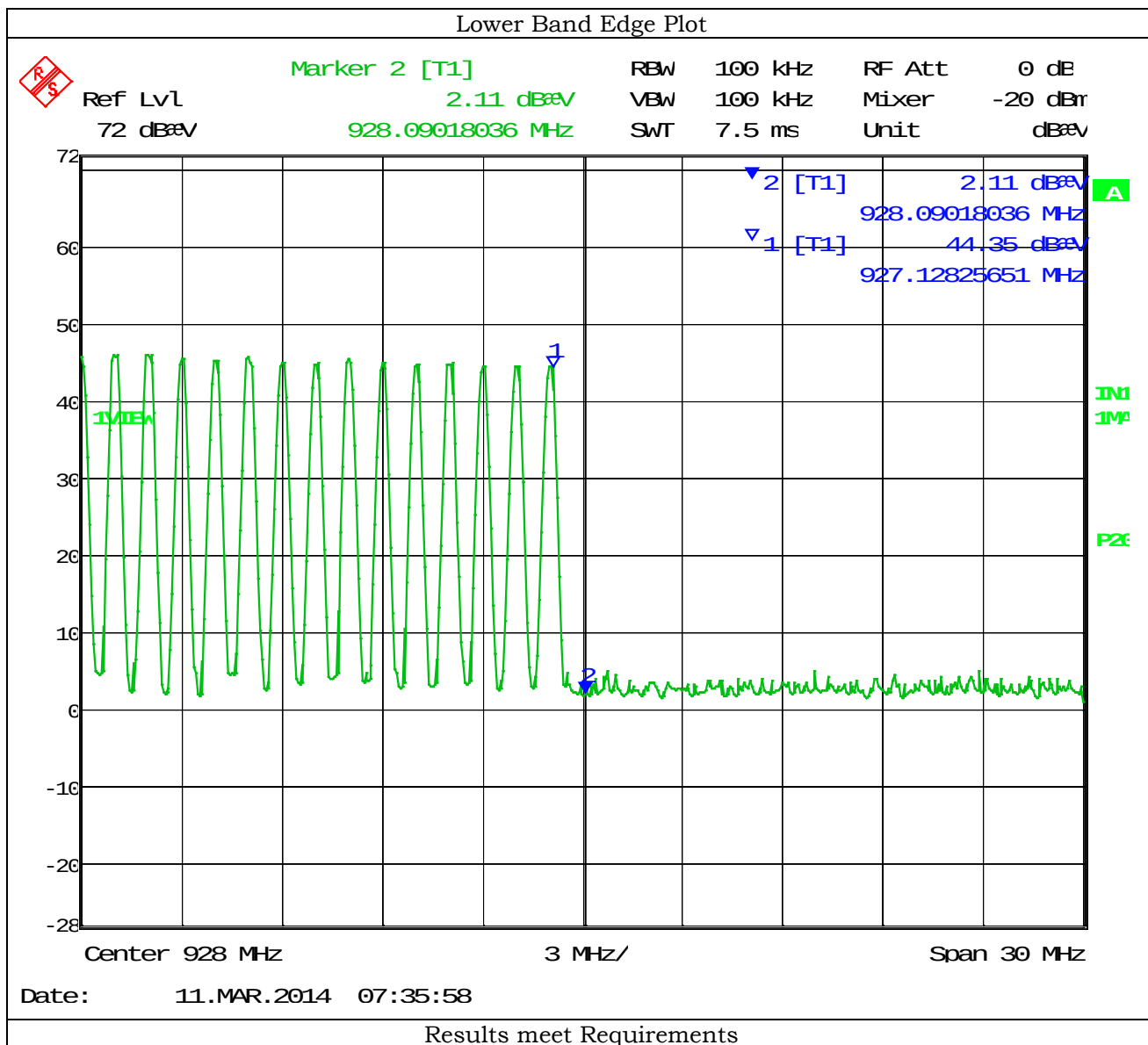
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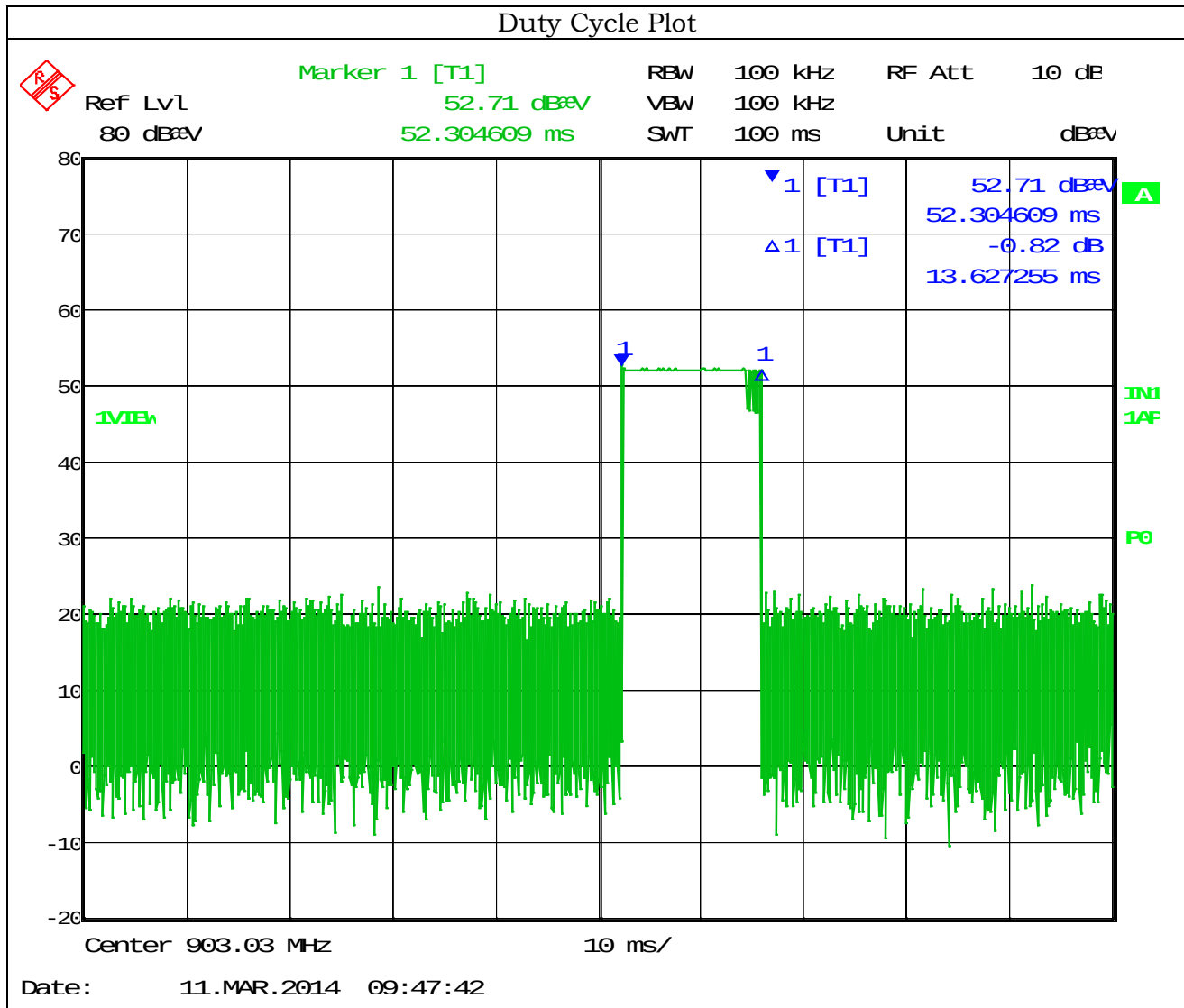
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DUTY CYCLE

Total # of pulses: 1 in 100 ms

Duration of pulse: 13.62 ms maximum duration of pulse according to manufacturer.

$20 \cdot \log((13.62)/100) = 20 \cdot \log(.1362) = -17.31 \text{ dB}$



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POWER LINE CONDUCTED INTERFERENCE

Rules Part No.: 15.207

Requirements:

Frequency (MHz)	Quasi Peak Limits (dBuV)	Average Limits (dBuV)
0.15 – 0.5	66 – 56	56 – 46
0.5 – 5.0	56	46
5.0 – 30	60	50

Test Data: The attached graphs represent the emissions read for power line conducted for this device. Both lines were observed.

N/A
Battery or vehicle powered EUT.