



849 NW STATE ROAD 45  
NEWBERRY, FL 32669 USA  
PH: 888.472.2424 OR  
352.472.5500  
FAX: 352.472.2030  
EMAIL: [INFO@TIMCOENGR.COM](mailto:INFO@TIMCOENGR.COM)  
[HTTP://WWW.TIMCOENGR.COM](http://WWW.TIMCOENGR.COM)

**FCC PART 15.231(a) &  
RSS-210 (i8) ANNEX 1  
MOMENTARILY OPERATED TRANSMITTER  
COMBO TEST REPORT**

<b>Applicant</b>	<b>ENTERPRISE ELECTRONICS, L.L.C.</b>
<b>Address</b>	<b>1577 STAR-BATT DRIVE ROCHESTER HILLS MI 48309 USA</b>
<b>Product Model Number</b>	23473339
<b>Product Description</b>	AUTOMOTIVE RF KEYPAD
<b>FCC ID</b>	QV4-LRL0543
<b>IC</b>	4545A-LRL0543
<b>Date Sample Received</b>	3/17/2016
<b>Final Test Date</b>	4/8/2016
<b>Tested By</b>	Tim Royer
<b>Approved By</b>	Cory Leverett

Report Number	Version Number	Description	Issue Date
522AUT16TestReport	Rev.1	Initial Issue	4/21/2016
522AUT16TestReport	Rev.2	Administrative Updates	4/21/2016
522AUT16TestReport	Rev.3	Updated Operating Frequency	5/6/2016

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

## TABLE OF CONTENTS

GENERAL REMARKS .....	3
GENERAL INFORMATION.....	4
TEST RESULTS SUMMARY .....	5
TEST SETUP .....	5
PERIODIC OPERATION.....	6
MANUFACTURE DECLARATION OF COMPLIANCE WITH PART 15.231(A).....	7
Test Data: Transmitter Deactivation Plot .....	8
DUTY CYCLE.....	9
Test Data: Calculation of Duty Cycle .....	9
Test Data: 100 ms Number of Pulses Plot .....	10
RADIATION EMISSIONS: .....	12
Test Data: Emissions from 9 KHz to the 10th harmonic of the Fundamental.....	14
OCCUPIED BANDWIDTH .....	15
Test Data: Occupied Bandwidth Measurement Table .....	15
Test Data: 20 dB Occupied Bandwidth Plot .....	16
Test Data: 99% Occupied Bandwidth Plot .....	17
TEST EQUIPMENT LIST .....	18

## 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 requirements.

I attest that the necessary measurements were made at:

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

**Authorized Signatory Name:**

A handwritten signature in blue ink is written over a circular purple stamp. The stamp contains the text 'TIMCO ENGINEERING, INC.' around the perimeter.

**Tim Royer  
Project Manager**

**Date: 4/8/2016**

Applicant: ENTERPRISE ELECTRONICS, L.L.C.  
FCC ID: QV4-LRL0543  
IC: 4545A-LRL0543  
Report: 522AUT16TestReport\_Rev1

[Table of Contents](#)

## GENERAL INFORMATION

<b>EUT Description</b>	AUTOMOTIVE RF KEYPAD
<b>FCC ID</b>	QV4-LRL0543
<b>IC:</b>	4545A-LRL0543
<b>Model Number</b>	23473339
<b>Operating Frequency</b>	314.90MHz
<b>Test Frequencies</b>	314.90MHz
<b>Type of Emission</b>	A1D
<b>Modulation</b>	AFSK
<b>EUT Power Source</b>	<input type="checkbox"/> 110–120Vac/50– 60Hz
	<input type="checkbox"/> DC Power 12V
	<input checked="" type="checkbox"/> Battery Operated Exclusively
<b>Test Item</b>	<input type="checkbox"/> Prototype
	<input checked="" type="checkbox"/> Pre-Production
	<input type="checkbox"/> Production
<b>Type of Equipment</b>	<input type="checkbox"/> Fixed
	<input checked="" type="checkbox"/> Mobile
	<input type="checkbox"/> Portable
<b>Test Conditions</b>	Temperature: 24-26°C Relative humidity: 50-65% Barometric Pressure:
<b>Modification to the EUT</b>	None
<b>Test Exercise</b>	The EUT was placed in continuous transmit mode of operation for the Radiated Emissions test. The EUT was placed in normal transmit mode of operation for the duty cycle and deactivation tests.
<b>Regulatory Standards</b>	FCC CFR Title 47 Part 15C IC RSS-210 (i8) Annex 1
<b>Measurement Standards</b>	ANSI C63.10: 2013 FCC CFR Title 47 Part 15.31, 15.33, 15.35 RSS-GEN (i4)

## TEST RESULTS SUMMARY

Requirement	FCC Rules Part No.	IC RSS §	RESULTS Pass/Fail/NA
Types of Momentary Signals	15.231(a)	210 A1.1.1	Pass
Fundamental Output Power	15.231(b)	210 A1.1.2 GEN 6.12	Pass
Spurious Emissions and Harmonics	15.231(b) 15.209(a) 15.205(a)(b)	210 A1.1.2 GEN 8.9 GEN 8.10	Pass
Occupied Bandwidth	15.231(c) 15.215(c)	210 A1.1.3 GEN 6.6	Pass

## TEST SETUP

Test Exercise(e.g software description, test signal, etc.):	N/A
Deviation from the standard(s)	No deviation from the standard
Modification to the DUT:	No modification was made to the DUT.
Supporting Peripheral Equipment	N/A

## PERIODIC OPERATION

**FCC Rule Part No:** 15.231(a)

**IC RSS:** 210 A1.1.1

### Requirements:

The intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:

- (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
- (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.
- (3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.
- (4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition
- (5) Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (1) and (2) of this section, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

**Procedure:** ANSI C63.10 § 7.4(e) Compliance for periodic operation

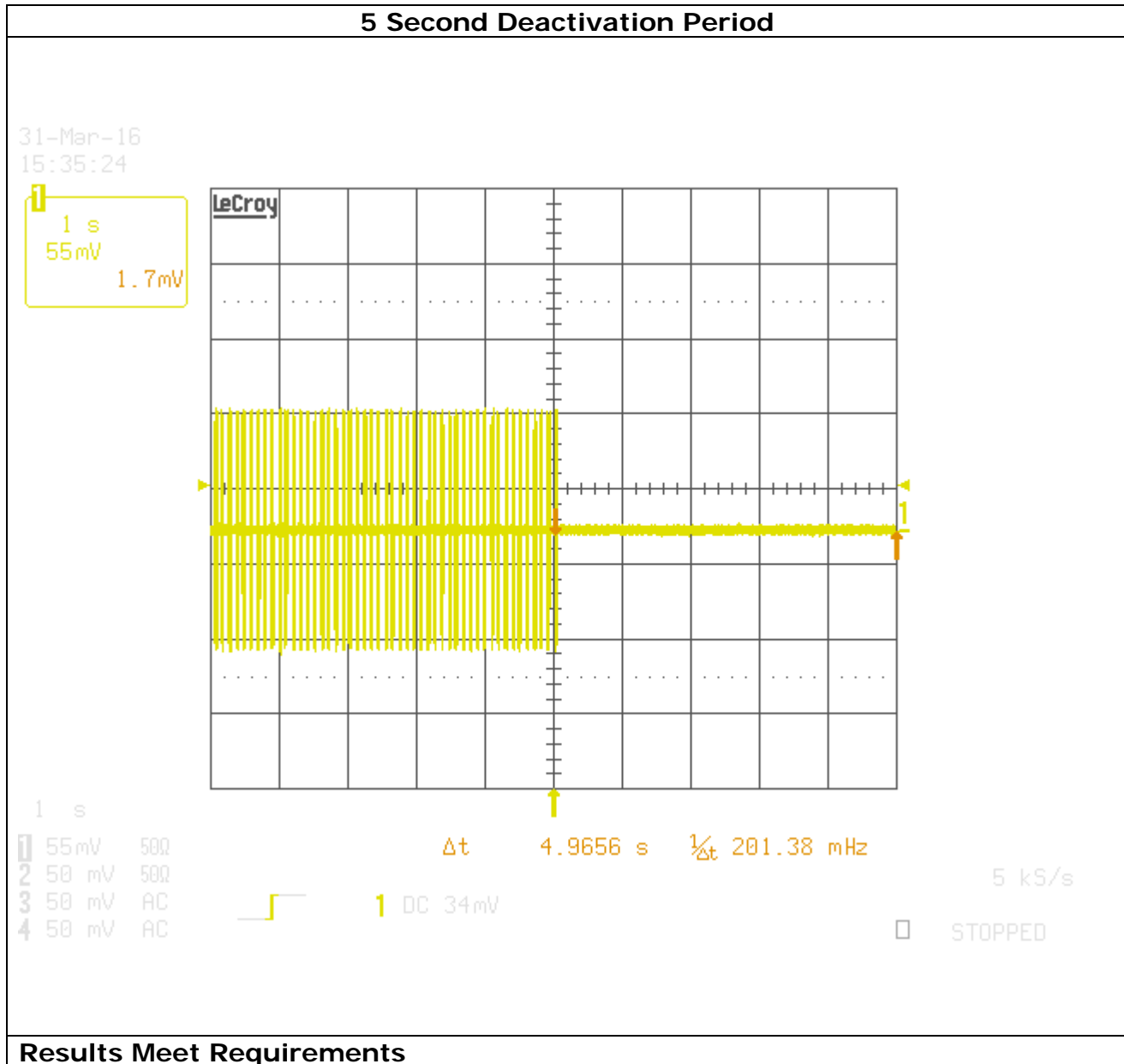
## PERIODIC OPERATION

### MANUFACTURE DECLARATION OF COMPLIANCE WITH PART 15.231(A)

Item	Description	Yes	No
1	Does this device transmit a signal that is only used to control another device?	X	
2	Does this device send data with this control signal?		X
3	Does this device send data? Data is, things like: temperature, wind direction, fluid amount, rate of flow, etc.		X
4	Does this device transmit continuously or automatically?		X
5	If manually operated does this device stop transmitting within 5 seconds of releasing the button?	X	
6	If automatically operated does it deactivate 5 seconds after activation?	X	
7	Does it transmit at regular predetermined intervals?		X
8	Does it poll or send supervisory information?		X
	If yes does it do a system integrity check? How often?		NA
9	Is this a fire, security or safety of life device?		X
	If YES does the device stop transmitting after the alarm condition is satisfied?		NA
10	Duty cycle: Maximum on-time?	34.3	
	If YES, on-time in 100 ms? If Other, please specify here	X	
	On time in		NA
11	Modulation technique: Please specify the modulation of the test sample, FM, or AFSK, or FSK, or on-off keying, or others?	AFSK	

## PERIODIC OPERATION

Test Data: Transmitter Deactivation Plot



Applicant: ENTERPRISE ELECTRONICS, L.L.C.  
FCC ID: QV4-LRL0543  
IC: 4545A-LRL0543  
Report: 522AUT16TestReport\_Rev1

[Table of Contents](#)



## DUTY CYCLE

**Requirements:** There are no requirements for the duty cycle; it is measured to determine compliance with the periodic operation average emission limits and the automatic transmission on time requirement.

**Procedure:** ANSI C63.10 § 7.5 Average value of pulsed emissions

**Formula:**  $\delta \text{ (dB)} = 20 \log (n_1 t_1 + n_2 t_2 + n_3 t_3) / T$

Where:

$\delta$  is the duty cycle correction factor (dB)

T is the pulse width (100 ms period)

t<sub>1</sub> is the pulse width of subpulse 1

t<sub>2</sub> is the pulse width of subpulse 2

t<sub>3</sub> is the pulse width of subpulse 3

n<sub>1</sub> is the number of t<sub>1</sub> pulses

n<sub>2</sub> is the number of t<sub>2</sub> pulses

n<sub>3</sub> is the number of t<sub>3</sub> pulses

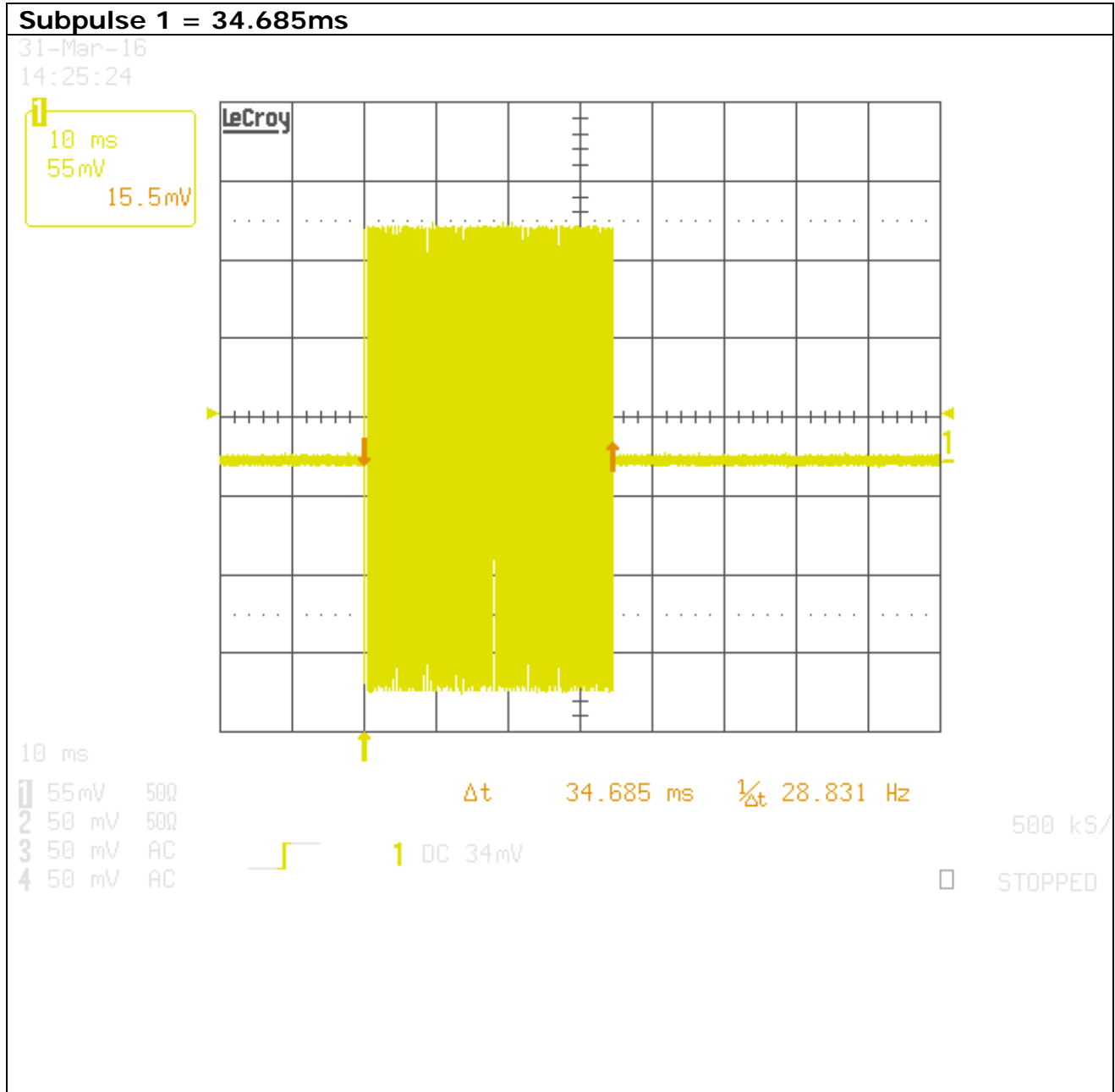
**Test Data:** Calculation of Duty Cycle

Sub Pulse	Duration (ms)	Number (n)	On Time (ms)
1	34.685	1	34.685
Total On Time (ms)			34.685
Period (ms)			100
Duty Cycle (%)			35%
Cor Factor (dB)			-9.20

See the following plots.

## DUTY CYCLE

Test Data: 100 ms Number of Pulses Plot



Applicant: ENTERPRISE ELECTRONICS, L.L.C.  
FCC ID: QV4-LRL0543  
IC: 4545A-LRL0543  
Report: 522AUT16TestReport\_Rev1

[Table of Contents](#)

## RADIATION EMISSIONS:

**FCC Rules Part No.:** 15.231(b), 15.209 (a), 15.205(a)(b)

**IC RSS:** 210 § A1.1 Table A, RSS-Gen § 8.9, & 8.10

## Requirements:

<b>Fundamental and Harmonics not in Restricted Bands</b>		
Fundamental Frequency (MHz)	Field Strength of Fundamental (dB $\mu$ V/m)	Field Strength of Harmonics and Spurious Emissions (dB $\mu$ V/m @ 3m)
40.66 to 40.70	67.04	47.04
70 to 130	61.94	41.94
130 to 174	61.94 to 71.48	41.94 to 51.48
174 to 260	71.48	51.48
260 to 470	71.48 to 81.94	51.48 to 61.94
470 and above	81.94(12500)	61.94

<b>Restricted Band Emissions</b>	
Frequency (MHz)	Limits
9 – 490 kHz	2400/F (kHz) $\mu$ V/m @ 300 meters
490 – 1705 kHz	24000/F (kHz) $\mu$ V/m @ 30 meters
1705 – 30 MHz	29.54 dB $\mu$ V/m measured @ 30 meters
30 – 88	40.0 dB $\mu$ V/m measured @ 3 meters
88 – 216	43.5 dB $\mu$ V/m measured @ 3 meters
216 – 960	46.0 dB $\mu$ V/m measured @ 3 meters
Above 960	54.0 dB $\mu$ V/m measured @ 3 meters

No fundamental frequency is allowed in the restricted bands.

No harmonic or spurious emissions may exceed the level of the fundamental carrier frequency.

## RADIATION EMISSIONS:

### Fundamental Emission Limit Formula:

- 1) For the band 130-174 MHz,  $\mu\text{V/m}$  at 3 meters =  $56.81818(F)-6136.3636$ ;
- 2) For the band 260-470 MHz,  $\mu\text{V/m}$  at 3 meters =  $41.6667(F)-7083.3333$ .

Where F is the fundamental emission frequency in MHz

Example Calculation of limit @ 433.92 MHz:

$$41.6667 (433.9) - 7083.3333 = 10,995.85 \text{ } \mu\text{V/m}$$

$$20\log (10,995.85) = 80.82 \text{ dBuV/m}$$

### Harmonics and Spurious Emissions Limit:

- 1) 20 dBc for all emissions outside of restricted bands
- 2) General limits of 15.209(a) & RSS-Gen for emissions inside restricted bands

### 3 Meter Field Strength Limit for this EUT:

Fund Freq (MHz)	Fund Limit (dBuV/m)	Harm & Spur (dBuV/m)	Restricted Bands
314.9	75.62	55.62	Limit of 15.209

## **RADIATION EMISSIONS:**

**Test Method:** ANSI C63.10 § 6.3 – 6.6 Radiated Emissions Unlicensed Devices

The EUT was placed on a table with dimensions of 1m by 1.5m, 80 cm high below 1 GHz and 150 cm high above 1 GHz. The EUT was placed in the center of the table. The table used for radiated measurements is capable of continuous rotation. The spectrum was scanned from 9 KHz or the lowest frequency generated to the 10th harmonic of the fundamental.

Peak readings were taken in three (3) orthogonal planes when necessary and the highest readings were converted to average readings based on the duty cycle.

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.

### **Formula of Conversion Factors:**

The field strength at 3m was established by adding the meter reading of the spectrum analyzer to the antenna correction factor supplied by the antenna manufacturer plus the coax loss. The antenna correction factors are stated in terms of dB/m. The gain of the preselector was accounted for in the spectrum analyzer reading.

Example:

Freq. MHz	Meter Reading dB $\mu$ V	ACF dB/m	Cable Loss dB	Field Strength dB $\mu$ V/m @ 3 m
33	20	+10.36	+1.2	= 31.56

## RADIATION EMISSIONS:

### Test Data: Emissions from 9 KHz to the 10th harmonic of the Fundamental

Tuned Freq (MHz)	Emission Frequency (MHz)		Meter Reading (dBuV)	Antenna Polarity (H/V)	Coax Loss (dB)	Ant Cor Factor (dB)	Duty Cycle Factor (dB)	Field Strength (dBuV/m)	Margin (dB)
314.90	116.53	*	26.54	V	1.25	10.35	0.00	38.14	5.36
314.90	162.85	*	25.33	H	1.46	16.40	0.00	43.19	0.31
314.90	315.00		50.69	H	2.07	13.50	9.20	57.06	18.56
314.90	483.76		25.50	H	2.54	17.15	9.20	35.99	19.63
314.90	554.30		24.67	H	2.71	17.83	9.20	36.01	19.61
314.90	629.80		25.03	H	2.89	18.90	9.20	37.62	18.00
314.90	879.75		27.10	V	3.40	21.92	9.20	43.22	12.40
314.90	944.70		26.68	H	3.53	22.80	9.20	43.81	11.81

\* -Denotes restricted bands which must comply with limits 15.209

Note: Emissions that are 20 dB below the limit are not required to be reported, however a minimum of 6 emissions are reported for each frequency tested.

## OCCUPIED BANDWIDTH

**FCC Rules Part No.:** 15.231(C), & 15.215(c)

**IC RSS:** 210 § A1.1.3, & GEN § 6.6

**Requirements:**

The bandwidth of the emission shall fall completely inside the band of operation, and be no wider than .25% of the center frequency for devices operating between 70 and 900 MHz.

For FCC compliance the Bandwidth is determined at the points 20 dB down from the modulated carrier.

For IC compliance the Bandwidth is determined as the 99% power bandwidth.

**Test Method:** ANSI C63.10 § 6.9.2 Occupied bandwidth Relative procedure  
ANSI C63.10 § 6.9.3 Occupied bandwidth 99% Power

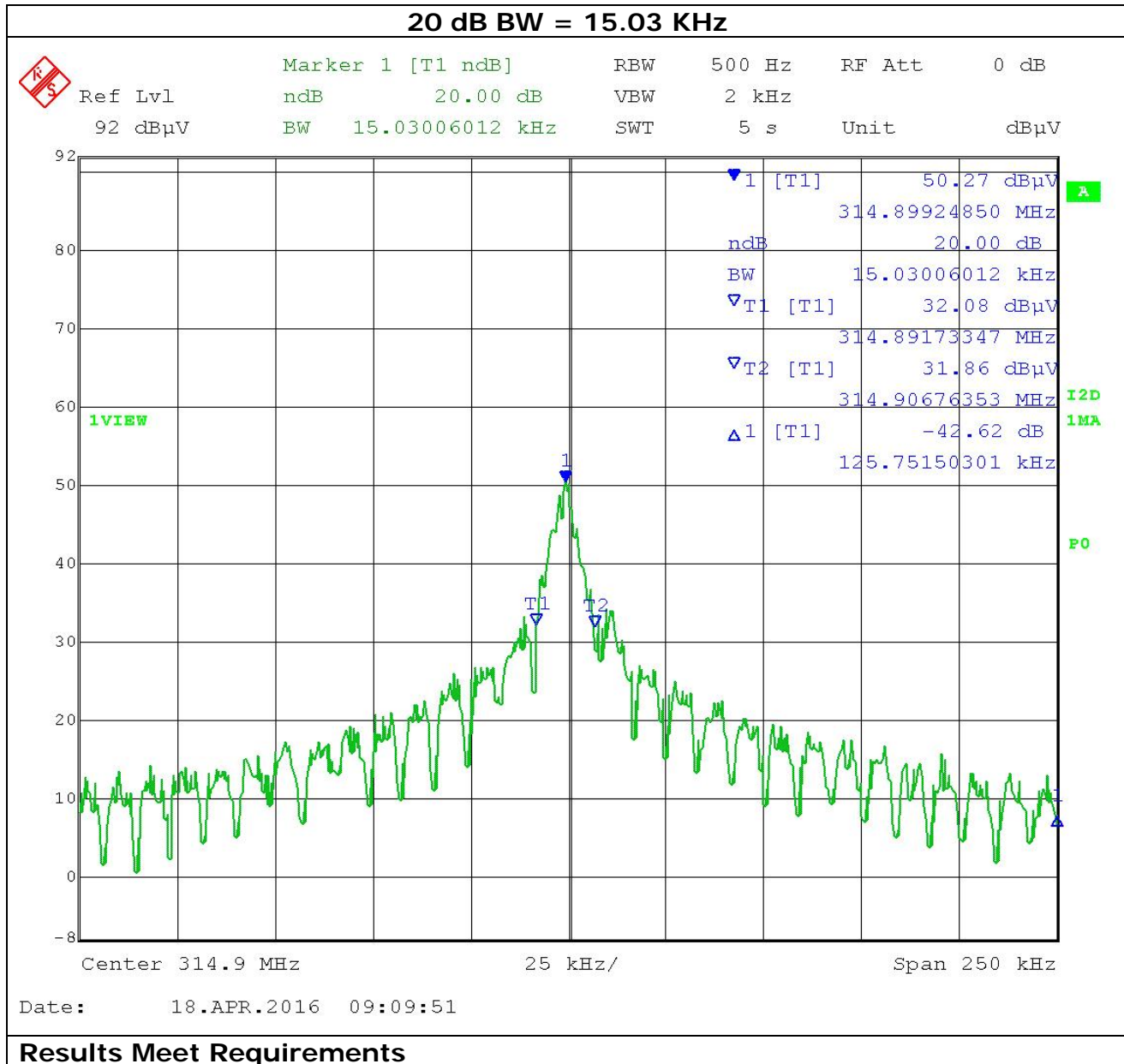
**Test Data:** **Occupied Bandwidth Measurement Table**

Tuned Frequency (MHz)	Limit (KHz)	Measured 20 dB BW (KHz)	Measured 99% BW (KHz)
314.9	787.25	15.03	84.17
Margin (KHz)		772.22	703.08

**Results Meet Requirements**

## OCCUPIED BANDWIDTH

**Test Data:** 20 dB Occupied Bandwidth Plot



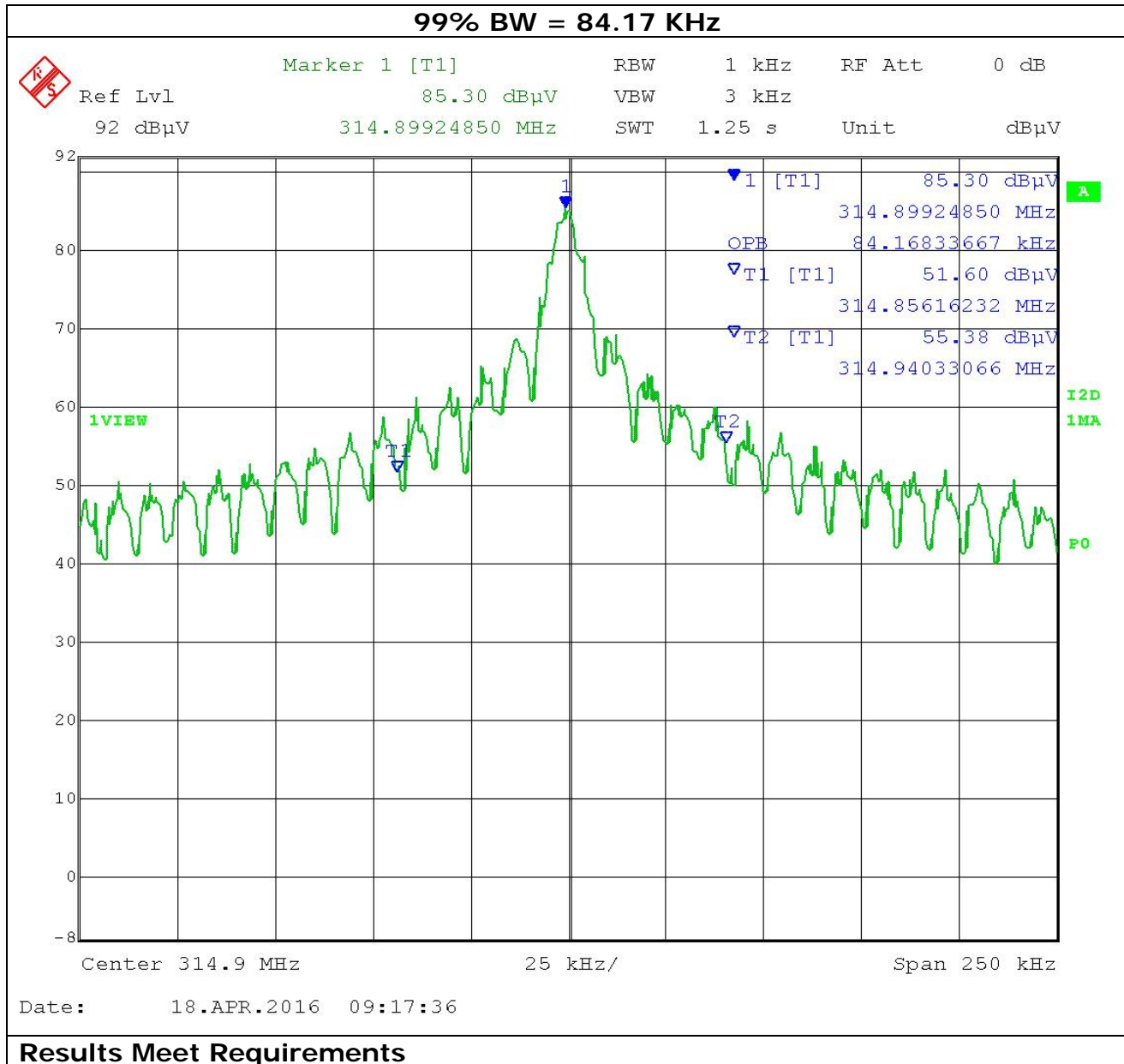
Applicant: ENTERPRISE ELECTRONICS, L.L.C.  
 FCC ID: QV4-LRL0543  
 IC: 4545A-LRL0543  
 Report: 522AUT16TestReport\_Rev1

[Table of Contents](#)



## OCCUPIED BANDWIDTH

**Test Data:** 99% Occupied Bandwidth Plot



Applicant: ENTERPRISE ELECTRONICS, L.L.C.  
 FCC ID: QV4-LRL0543  
 IC: 4545A-LRL0543  
 Report: 522AUT16TestReport\_Rev1

[Table of Contents](#)

## TEST EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Antenna: Biconnical	Eaton	94455-1	1057	11/18/15	11/18/17
Antenna: Log-Periodic	Eaton	96005	1243	02/09/16	02/09/18
Antenna: Active Loop	ETS Lindgren	6502	00062529	11/18/15	11/18/17
CHAMBER	Panashield	3M	N/A	02/18/16	08/18/18
Antenna: Double-Ridged Horn/ETS Horn 2	ETS-Lindgren	3117	00041534	02/25/15	02/25/17
EMI Test Receiver R & S ESIB 40 Screen Room	Rohde & Schwarz	ESIB 40	100274	08/12/14	08/12/16
Software: EMI Test Receiver	Rohde & Schwarz	EMC 32	Version 4.30.0	N/A	N/A
EMI Test Receiver R & S ESU 40 Chamber	Rohde & Schwarz	ESU 40	100320	12/15/14	12/15/17
Oscilloscope	Lecroy	LT364	00414	01/26/16	01/26/18

### \*EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3