Electromagnetic Compatibility Test Report

Tests Performed on a Mier Products, Inc.

315 MHz Transmitter, Model DA-066MP

Radiometrics Document RP-8125

Product Detail:
FCC ID: SGXMPIDA066 IC: 5583A-DA066MP Equipment type: Momentarily Operated Transmitter 315 MHz
Test Standards:
US CFR Title 47, Chapter I, FCC Part 15 Subpart C FCC Part 15 CFR Title 47: 2015 Industry Canada RSS-210, Issue 8: 2010 + Amd 1 2015 as required for Category I Equipment This report concerns: Original Grant for Certification FCC Part 15.231

Tests Performed For:	*Test Facility:*
Mier Products, Inc. 1500 Ann St. Kokomo, IN 46901	**Radiometrics Midwest Corporation** 12 Devonwood Avenue Romeoville, IL 60446-1349 (815) 293-0772

Test Date(s): (Month-Day-Year)
December 4 and 11, 2015 Thru February 16, 2016

Document RP-8125 Revisions:

Rev.	Issue Date	Affected Sections	Revised By
0	February 3, 2016		
1	February 8, 2016	Cover, 3.1	Joseph Strzelecki
2	February 16, 2016	Cover, 10.4	Joseph Strzelecki
3	February 25, 2016	10.2.2	Joseph Strzelecki

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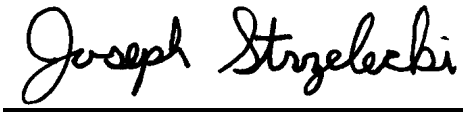
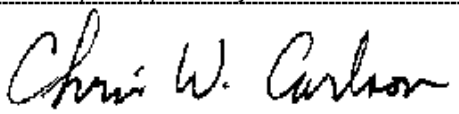
1 ADMINISTRATIVE DATA

Equipment Under Test:	
A Mier Products, Inc., 315 MHz Transmitter Model: DA-066MP Serial Number: Sample A This will be referred to as the EUT in this Report	
Date EUT Received at Radiometrics: (Month-Day-Year)	*Test Date(s): (Month-Day-Year)*
Dec. 3, 2015	Dec 4, 2015 thru February 16, 2016
Test Report Written By:	*Test Witnessed By:*
Joseph Strzelecki Senior EMC Engineer	The tests were not witnessed by Mier Products, Inc.
Radiometrics' Personnel Responsible for Test:	*Test Report Approved By*
 Joseph Strzelecki Senior EMC Engineer NARTE EMC-000877-NE	 Chris W. Carlson Director of Engineering NARTE EMC-000921-NE

2 TEST SUMMARY AND RESULTS

The EUT (Equipment Under Test) is a 315 MHz Transmitter, Model DA-066MP, manufactured by Mier Products, Inc. The detailed test results are presented in a separate section. The product is not an RF receiver, so receive mode was not tested. The following is a summary of the test results.

Emissions Tests Results

Environmental Phenomena	Frequency Range	Basic Standard	Test Result
RF Radiated Emissions	30-3400 MHz	RSS-210 & FCC Part 15	Pass
Conducted Emissions, AC Mains	0.15 - 30 MHz	RSS-210 & FCC Part 15	Pass
Occupied Bandwidth Test	Fundamental Freq.	RSS-210 & FCC Part 15	Pass

Note: The RSS-210 specification is not currently covered in Radiometrics' Scope of Accreditation. This is technically very similar to FCC, CFR 47 Part 15 which is on Radiometrics' scope.

2.1 RF Exposure Compliance Requirements

Since the power output is less than 1 mW, the EUT meets the FCC requirement for RF exposure and it is exempt from RSS-102 SAR and RF exposure evaluations. There are no power level adjustments available to the end user. The antenna is permanently attached. The detailed calculations for RF Exposure are presented in a separate document.

3 EQUIPMENT UNDER TEST (EUT) DETAILS

3.1 EUT Description

The EUT is a 315 MHz Transmitter, Model DA-066MP, manufactured by Mier Products, Inc. The EUT was in good working condition during the tests, with no known defects. The product is not an RF receiver.

This transmitter is automatically controlled by the Drive-Alert control panel that has a 1-2 second alarm time only. There is a Manual test button that shuts off immediately (within 0.5 sec.) after it is released. The Drive-Alert control panel is designed to activate for only 1-2 seconds per event. This unit does not transmit until activated by the control panel. There are no periodic transmissions. There is no setup data needed for this transmitter.

3.1.1 FCC Section 15.203 & RSS-GEN Antenna Requirements

The antenna is permanently attached to the printed circuit board. Therefore, it meets the 15.203 Requirements.

3.2 Related Submittals

Mier Products, Inc. is not submitting any other products simultaneously for equipment authorization related to the EUT.

4 TESTED SYSTEM DETAILS

4.1 Tested System Configuration

The system was configured for testing in a typical fashion. The EUT was placed on an 80-cm high, nonconductive test stand. The testing was performed in conditions as close as possible to installed conditions. Wiring was consistent with manufacturer's recommendations. The EUT was tested in a constant transmit mode while connected to its normal control panel that provides power. Power was supplied to the Control Panel at 120 VAC 60 Hz.

The identification for all equipment, plus descriptions of all cables used in the tested system, are:

Tested System Configuration List

Item	Description	Type*	Manufacturer	Model Number	Serial Number
1	315 MHz Transmitter	E	Mier Products, Inc.	DA-066MP	Sample A
2	Control Panel	S	Mier Products, Inc.	DA-500CP	61221201023
3	Power Supply	S	Triad	WDU24-300	None

* Type: E = EUT, P = Peripheral, S = Support Equipment;

List of System Cables

QTY	Length (m)	Cable Description	Connected to	Shielded?
1	1.8	AC Cord	Power supply to Control panel	No
1	1.0	3 conductor power and Control cable	From control panel to EUT (transmitter)	No
1	1.0	5 conductor unterminated relay wiring	Control Panel	No

4.2 Special Accessories

No special accessories were used during the tests in order to achieve compliance.

4.3 Equipment Modifications

No modifications were made to the EUT at Radiometrics' test facility in order to comply with the standards listed in this report.

5 TEST SPECIFICATIONS AND RELATED DOCUMENTS

Document	Date	Title
FCC CFR Title 47	2015	Code of Federal Regulations Title 47, Chapter 1, Federal Communications Commission, Part 15 - Radio Frequency Devices
ANSI C63.4-2009	2009	Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10-2009	2009	American National Standard for Testing Unlicensed Wireless Devices
IC RSS-210 Issue 8	2010	Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands) Category I Equipment
IC RSS-Gen Issue 4	2014	General Requirements and Information for the Certification of Radiocommunication Equipment (RSS-Gen)

The test procedures used are in accordance with the Industry Canada RSS-GEN and ANSI document C63.10. Radiated testing was performed at an antenna to EUT distance of 3 meters.

6 RADIOMETRICS' TEST FACILITIES

The results of these tests were obtained at Radiometrics Midwest Corp. in Romeoville, Illinois, USA. Radiometrics is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025: 2005 "General Requirements for the Competence of Calibration and Testing Laboratories". Radiometrics' Lab Code is 121191 and Certification Number is 1495.01. Radiometrics' scope of accreditation includes all of the test methods listed herein. A copy of the accreditation can be accessed on our web site (www.radiomet.com). Radiometrics accreditation status can be verified at A2LA's web site (www.a2la2.org).

The following is a list of shielded enclosures located in Romeoville, Illinois used during the tests:

Chamber E: Is a custom made anechoic chamber that measures 52' L X 30' W X 18' H. The walls and ceiling are fully lined with RF absorber. Pro-shield of Collinsville, Oklahoma manufactured the chamber. The floor has a 9' x 9' section of microwave absorber for testing above 1 GHz.

Test Station F: Is an area that measures 10' D X 12' W X 10' H. The floor and back wall are metal shielded. This area is used for conducted emissions measurements.

A separate ten-foot long, brass plated, steel ground rod attached via a 6 inch copper braid grounds each of the above chambers. Each enclosure is also equipped with low-pass power line filters.

The FCC has accepted these sites as test site number US1065. The FCC test site Registration Number is 732175. Details of the site characteristics are on file with the Industry Canada as site number IC 8727A-1.

A complete list of the test equipment is provided herein. The calibration due dates are indicated on the equipment list. The equipment is calibrated in accordance to ANSI/NCSL Z540-1 with traceability to the National Institute of Standards and Technology (NIST).

7 DEVIATIONS AND EXCLUSIONS FROM THE TEST SPECIFICATIONS

There were no deviations or exclusions from the test specifications.

8 CERTIFICATION

Radiometrics Midwest Corporation certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specification and the data contained herein was taken with calibrated test equipment. The results relate only to the EUT listed herein.

9 TEST EQUIPMENT TABLE

RMC ID	Manufacturer	Description	Model No.	Serial No.	Frequency Range	Cal Period	Cal Date
AMP-05	RMC/Celeritek	Pre-amplifier	MW110G	1001	1.0-12GHz	12 Mo.	10/06/15
AMP-22	Anritsu	Pre-amplifier	MH648A	M23969	0.1-1200MHz	12 Mo.	01/07/15 01/05/16
ANT-13	EMCO	Horn Antenna	3115	2502	1.0-18GHz	24 Mo.	12/01/14
ANT-44	Imp Machine	Super Log Antenna	SL-20M2G	1002	20-2000MHz	24 Mo.	12/15/15
HPF-01	Solar	High Pass Filter	7930-100	HPF-1	0.15-30MHz	24 Mo.	02/24/14
LSN-01	Electrometrics	50 uH LISN	FCC/VDE 50/2	1001	0.01-30MHz	24 Mo.	06/23/15
REC-20	HP / Agilent	Spectrum Analyzer	85460A/84562A	33330A00135 3410A00178	30Hz-6GHz	24 Mo.	06/26/15
REC-11	HP / Agilent	Spectrum Analyzer	E7405A	US39110103	9Hz-26.5GHz	12 Mo	06/23/15
THM-02	Fluke	Temp/Humid Meter	971	93490471	N/A	24 Mo.	08/03/15

Note: All calibrated equipment is subject to periodic checks.

10 TEST SECTIONS

10.1 AC Conducted Emissions

The tests and limits are in accordance with FCC section 15.207 and RSS Gen section 7.2.2.

A computer-controlled analyzer was used to perform the conducted emissions measurements. The frequency range was divided into 500 subranges equally spaced on a logarithmic scale. The computer recorded the peak of each subrange. This data was then plotted on a semi-log graph generated by the computer. Adjusting the positions of the cables and orientation of the test system then maximizes the highest emissions.

Mains Conducted emission measurements were performed using a 50 Ohm/50 uH Line Impedance Stabilization Network (LISN) as the pick-up device. Measurements were repeated on both leads within the power cord. If the EUT power cord exceeded 80 cm in length, the excess length of the power cord was made into a 30 to 40 cm bundle near the center of the cord. The LISN was placed on the floor at the base of the test platform and electrically bonded to the ground plane.

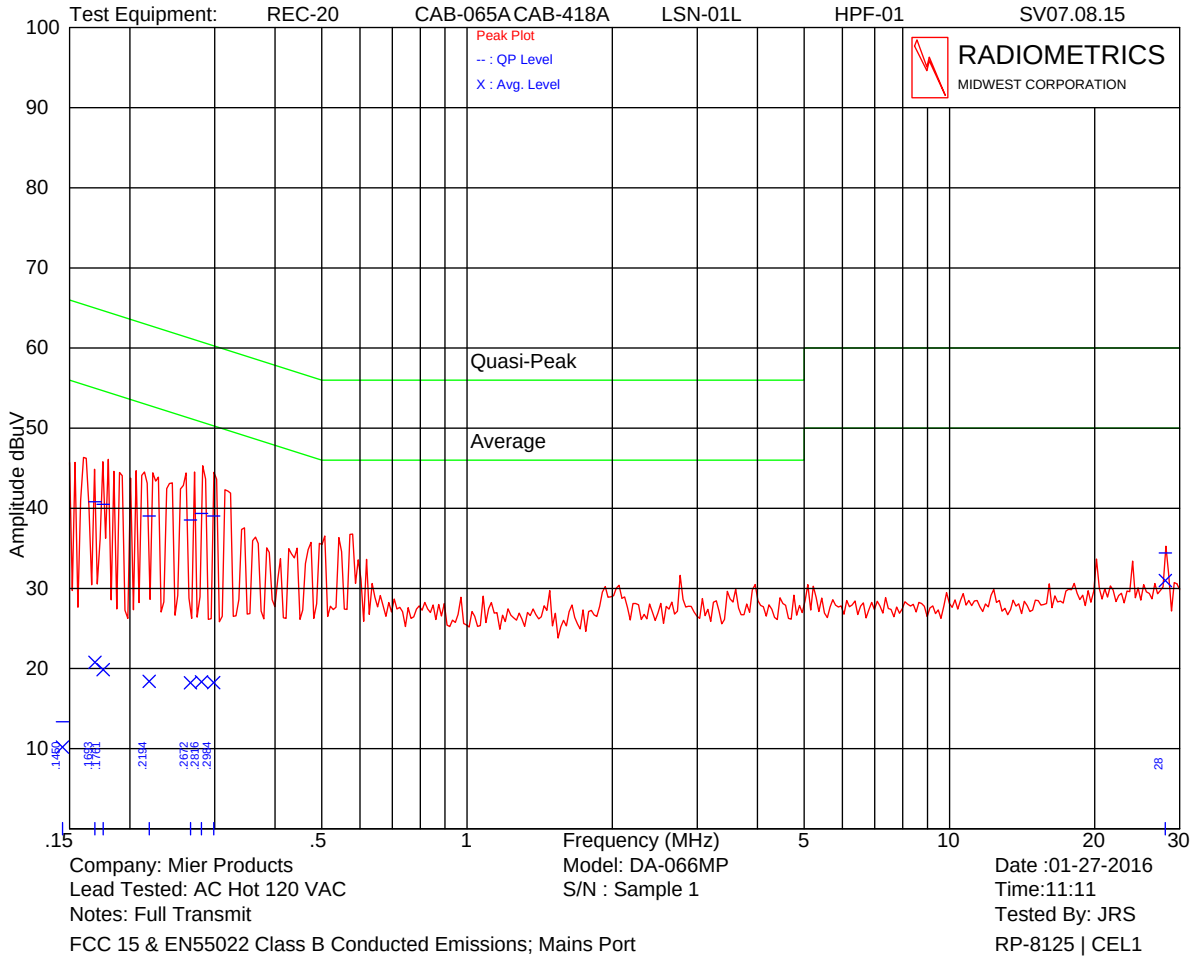
FCC Limits of Conducted Emissions at the AC Mains Ports

Frequency Range (MHz)	Class B Limits (dBuV)	
	Quasi-Peak	Average
0.150 - 0.50*	66 - 56	56 - 46
0.5 – 5.0	56	46
5.0 - 30	60	50
* The limit decreases linearly with the logarithm of the frequency in this range.		

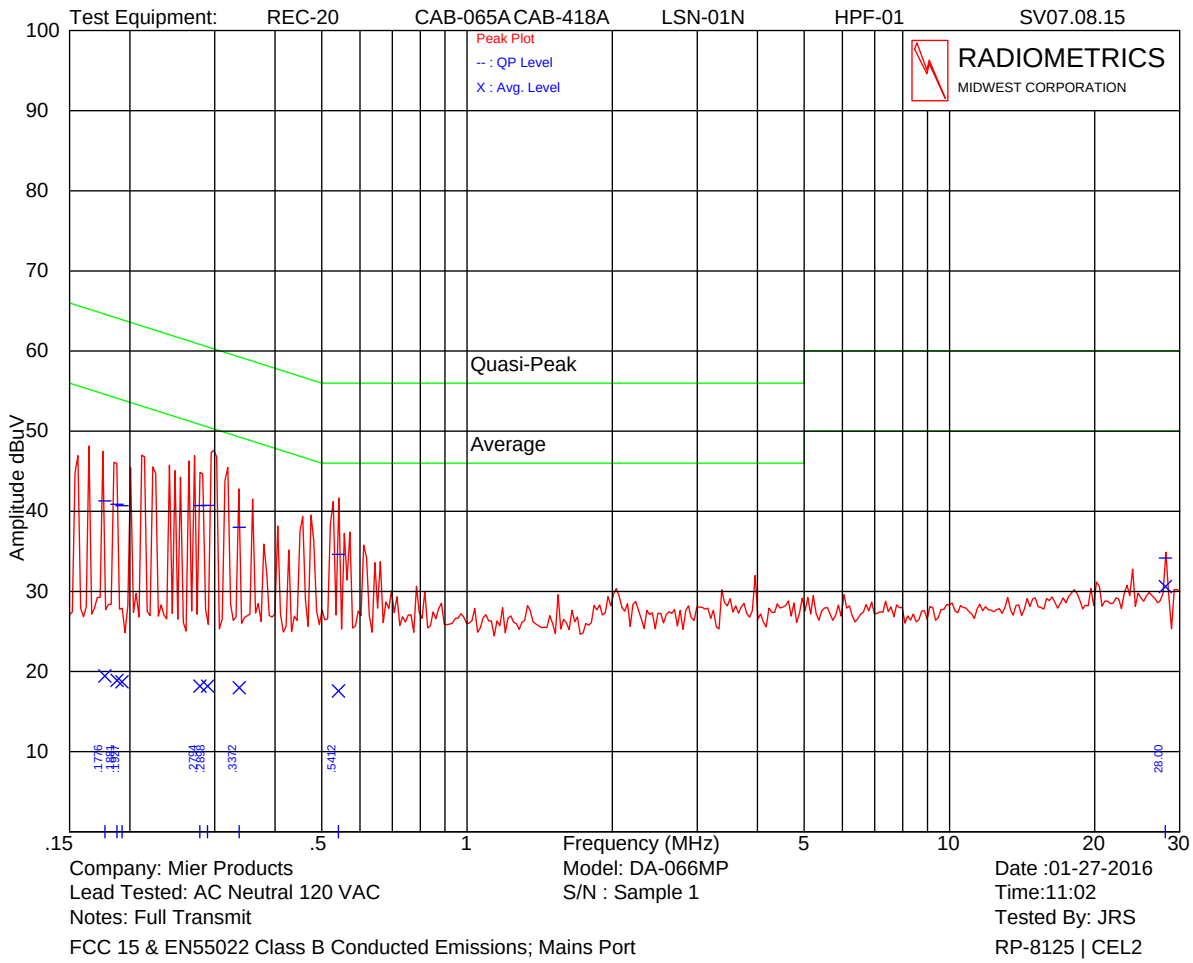
The initial step in collecting conducted data is a peak detector scan and the plotting of the measurement range. Significant peaks are then marked as shown on the following table, and these signals are then measured with the quasi-peak detector. The following represents the worst case emissions from the Control Panel (with the EUT connected) power cord, after testing all modes of operation. QP readings are quasi-peak with a 9 kHz bandwidth and no video filter

Test Date : January 27, 2016
The Amplitude is the final corrected value with cable and LISN Loss.

Testing of the Mier Products, Inc., Model DA-066MP, 315 MHz Transmitter



Frequency MHz	QP Amplitude	QP Limit	Avg. Amplitude	Avg. Limit	Margin dB
0.145	13.4	66.3	10.2	56.3	46.1
0.169	40.8	65.0	20.8	55.0	24.2
0.176	40.5	64.7	19.9	54.7	24.2
0.219	39.0	62.8	18.4	52.8	23.8
0.267	38.5	61.2	18.2	51.2	22.7
0.282	39.4	60.8	18.3	50.8	21.4
0.298	39.0	60.3	18.2	50.3	21.3
28.000	34.4	60.0	31.0	50.0	19.0

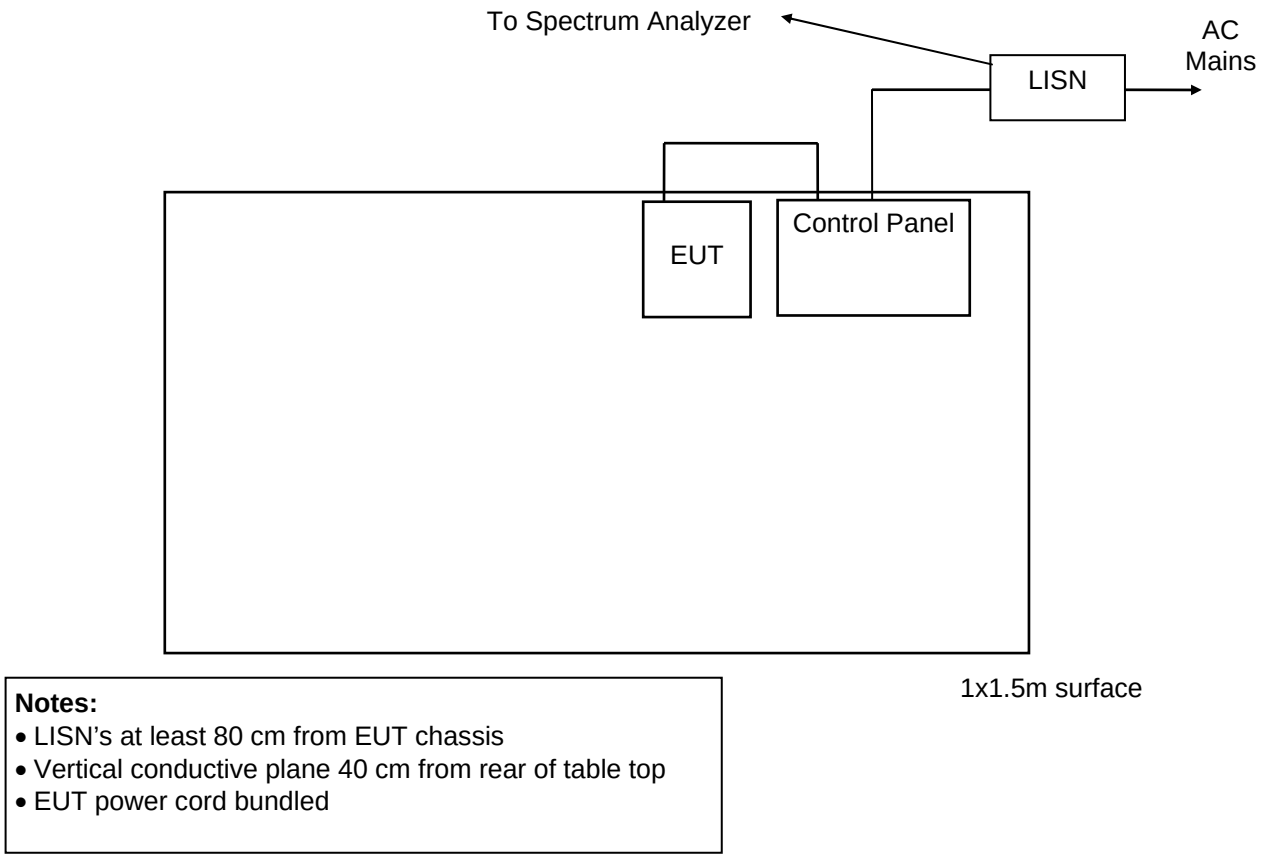


Frequency MHz	QP Amplitude	QP Limit	Avg. Amplitude	Avg. Limit	Margin dB
0.169	40.8	65.0	20.8	55.0	24.2
0.176	40.5	64.7	19.9	54.7	24.2
0.219	39.0	62.8	18.4	52.8	23.8
0.267	38.5	61.2	18.2	51.2	22.7
0.282	39.4	60.8	18.3	50.8	21.4
0.298	39.0	60.3	18.2	50.3	21.3
28.000	34.4	60.0	31.0	50.0	19.0

* QP readings are quasi-peak with a 9 kHz bandwidth and no video filter.

Judgment: Passed by at least 6 dB

Figure 1. Conducted Emissions Test Setup



10.2 Radiated RF Emissions

Radiated emission measurements were performed with linearly polarized broadband antennas. The results obtained with these antennas can be correlated with results obtained with a tuned dipole antenna. The radiated emission measurements were performed with a spectrum analyzer. The bandwidth used from 150 kHz to 30 MHz is 9 or 10 kHz and the bandwidth from 30 MHz to 1000 MHz is 100 or 120 kHz. Above 1 GHz, a 1 MHz bandwidth is used. A 10 dB linearity check is performed prior to start of testing in order to determine if an overload condition exists. Figure 4 herein lists the details of the test equipment used during radiated emissions tests. The EUT was rotated through three orthogonal axis as per of ANSI C63.10 during the radiated tests.

Final radiated emissions measurements were performed inside of an anechoic chamber at a test distance of 3 meters. The anechoic chamber is designated as Chamber E. This Chamber meets the Site Attenuation requirements of ANSI C63.4 and CISPR 16-1. Chamber E is located at 12 East Devonwood Ave. Romeoville, Illinois EMI test lab.

The entire frequency range from 30 to 3200 MHz was slowly scanned with particular attention paid to those frequency ranges which appeared high. Measurements were performed using two antenna polarizations, (vertical and horizontal). The worst case emissions were recorded. All measurements may be performed using either the peak, average or quasi-peak detector functions. If the peak detector data exceeds or is marginally close to the limits, the measurements are repeated using a quasi-peak detector or average function as required by the specification for final determination of compliance.

The detected emission levels were maximized by rotating the EUT, adjusting the positions of all cables, and by scanning the measurement antenna from 1 to 4 meters above the ground.

10.2.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and by subtracting the Amplifier Gain from the measured reading. The basic equation is as follows:

FS = RA + AF + CF - AG + PKA

Where: FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Amplifier Gain
PKA = Peak to Average Factor (This is zero for non-average measurements)

The Peak to average factor is used when average measurements are required. It is calculated by the highest duty cycle in percent over any 100mS transmission. The factor in dB is 20 * Log(Duty cycle/100).

10.2.2 Radiated Emissions Test Results

Test Date	12-4-2015
Test Distance	3 Meters
Specification	FCC Part 15.231 Subpart C & RSS-210
Abbreviations	Pol = Antenna Polarization; V = Vertical; H = Horizontal; P = peak; Q = QP
Configuration	Transmitting continously at 315 MHz

The Limits at frequencies below 315 MHz are set to the FCC 15.209 limits. Since it passed in Peak, QP readings are not requred.

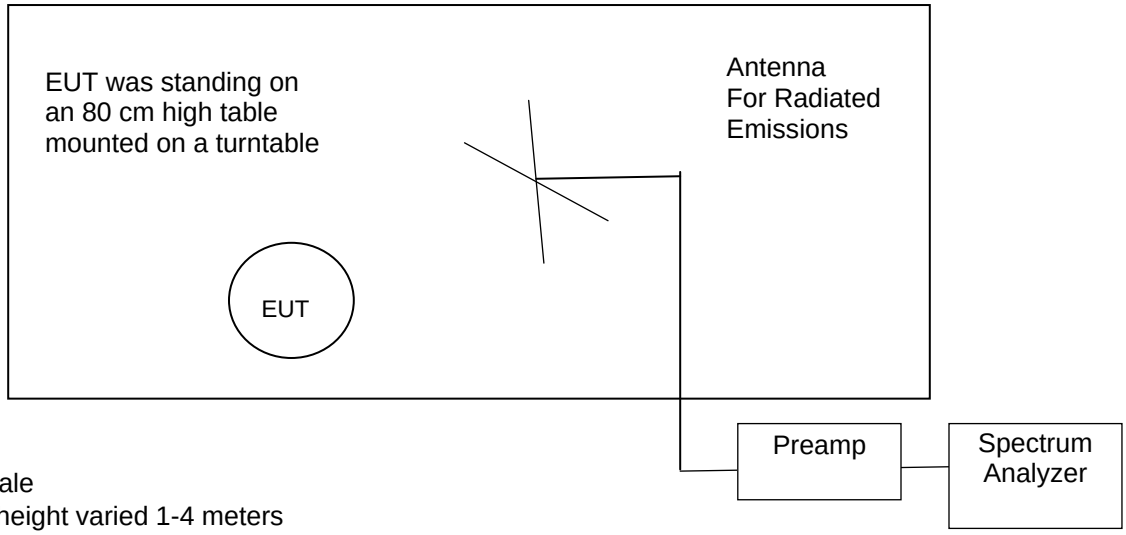
Freq. MHz	Meter Reading dBuV	Ant. Pol.	Ant, Cable & Amp Factor	Peak EUT FS dBuV/m	Peak Limit dBuV/m	Average EUT FS dBuV/m	Average Limit dBuV/m	Margin Under Limit dB	Note
57.0	37.2	H	-6.3	30.9	40.0	21.3	40.0	9.1	
165.3	36.1	H	-7.5	28.6	43.5	19.0	43.5	14.9	
207.6	37.2	H	-6.9	30.3	43.5	20.7	43.5	13.2	
315.3	82.5	H	-3.2	79.3	95.6	69.7	75.6	5.9	
631.3	54.6	H	2.8	57.4	75.6	47.8	55.6	7.8	
946.3	46.1	H	7.3	53.4	75.6	43.8	55.6	11.8	
1262.5	66.9	H	-7.8	59.1	75.6	49.5	55.6	6.1	
1577.5	67.4	H	-7.3	60.1	75.6	50.5	55.6	5.1	
1892.5	63.3	H	-5.2	58.1	75.6	48.5	55.6	7.1	
2207.5	56.1	H	-5.0	51.1	75.6	41.5	55.6	14.1	
2522.5	57.3	H	-3.7	53.6	75.6	44.0	55.6	11.6	
2837.5	61.1	H	-2.8	58.3	75.6	48.7	55.6	6.9	
3152.5	50.4	H	-0.4	50.0	75.6	40.4	55.6	15.2	
57.5	40.2	V	-6.5	33.7	40.0	24.1	40.0	6.3	
226.4	39.1	V	-5.3	33.8	46.0	24.2	46.0	12.2	
315.3	75.5	V	-3.2	72.3	95.6	62.7	75.6	12.9	
631.3	51.0	V	2.8	53.8	75.6	44.2	55.6	11.4	
946.3	43.1	V	7.3	50.4	75.6	40.8	55.6	14.8	
1262.5	66.7	V	-7.8	58.9	75.6	49.3	55.6	6.3	
1577.5	67.3	V	-7.3	60.0	75.6	50.4	55.6	5.2	
1892.5	62.3	V	-5.2	57.1	75.6	47.5	55.6	8.1	
2207.5	56.6	V	-5.0	51.6	75.6	42.0	55.6	13.6	
2522.5	55.0	V	-3.7	51.3	75.6	41.7	55.6	13.9	
2837.5	55.6	V	-2.8	52.8	75.6	43.2	55.6	12.4	
3152.5	51.6	V	-0.4	51.2	75.6	41.6	55.6	14.0	
1	2	3	4	5	6	7	8	9	

Notes on Columns:
Column #1. Frequency of Tested Emission.
Column #2. Uncorrected readings from the spectrum analyzer
Column #3. Antenna Polarization
Column #4. Corr. Factors = Cable Loss – Preamp Gain + Antenna Factor
Column #5. Peak reading of emission
Column #6. Peak Limit.
Column #7. Average Reading of emission.
Column #8. Average Limit.
Column #9. The margin is the worst case margin under the peak or average limits for that row.

Judgment: Pass fundamental limits by 5.9 dB. Pass spurious limits by 5.1 dB.

Figure 2. Drawing of Radiated Emissions Setup

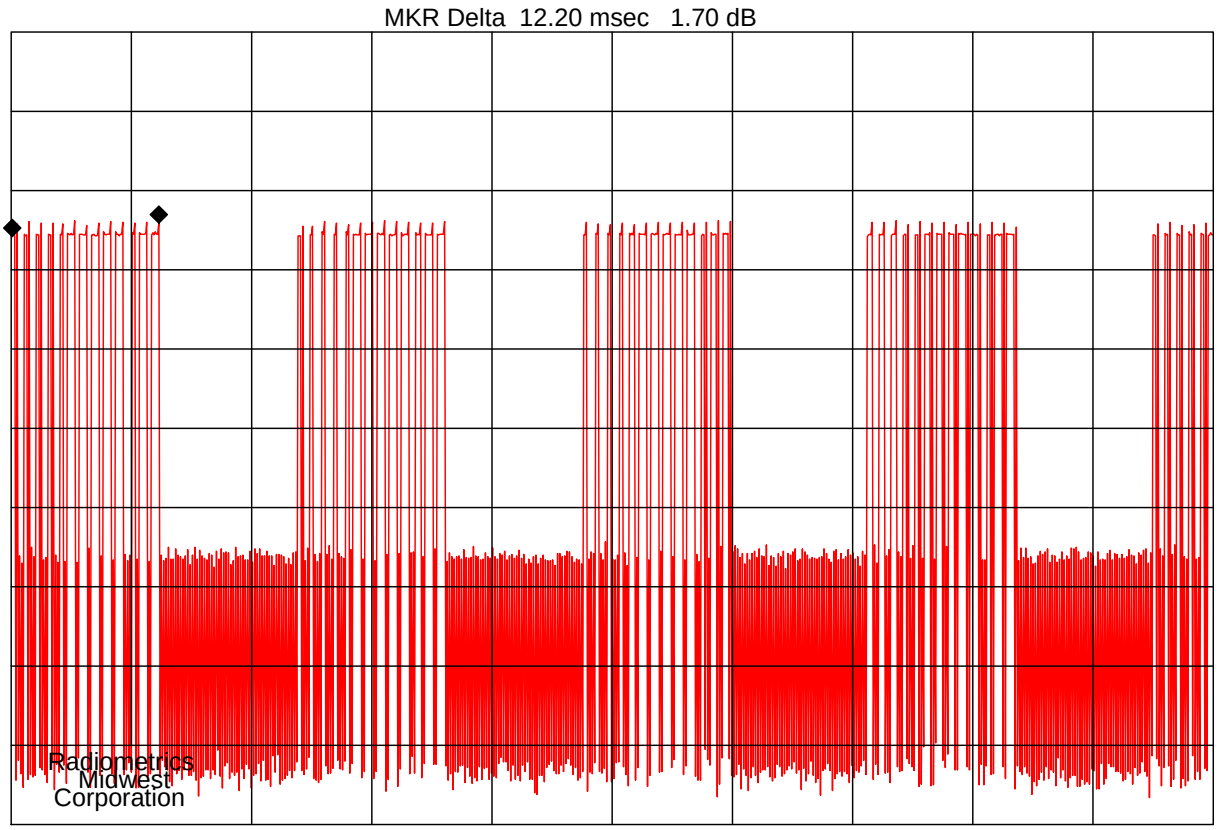
Chamber E, anechoic

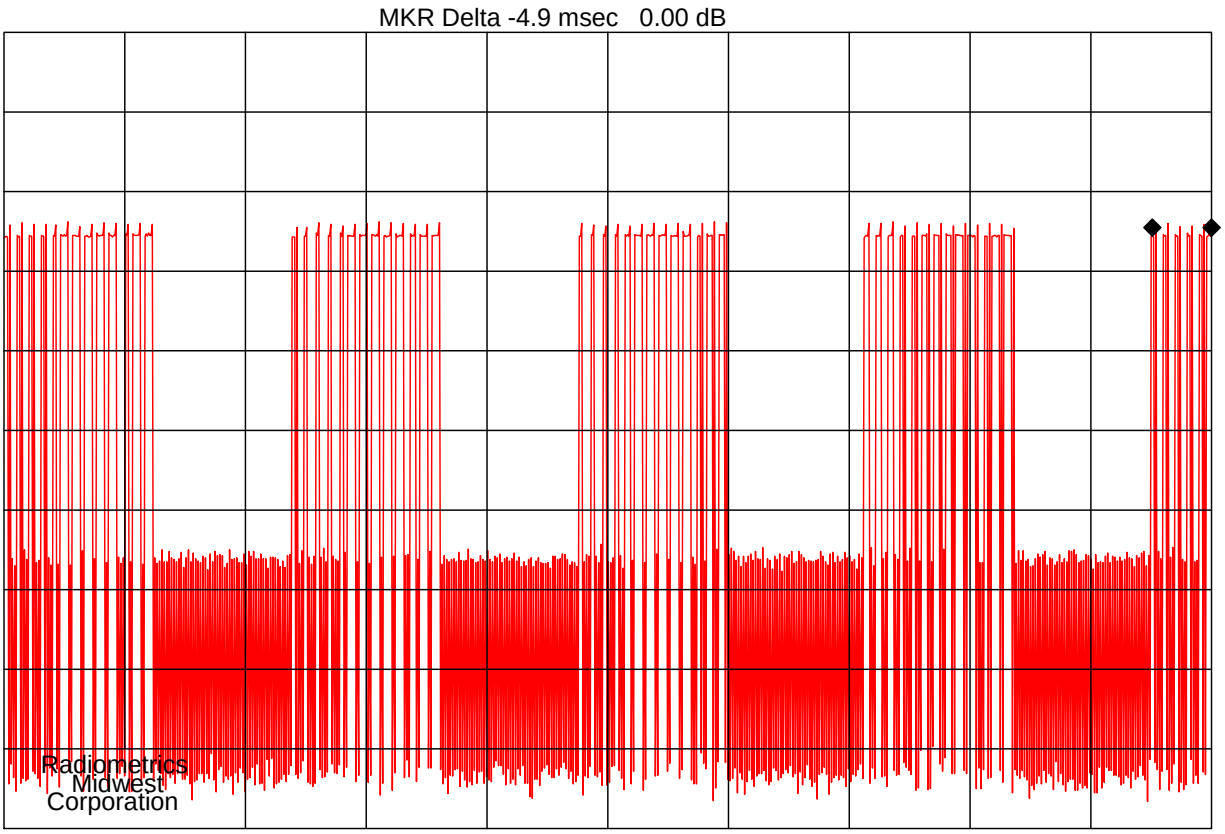


Notes:
- Not to Scale
- Antenna height varied 1-4 meters
- Distance from antenna to tested system is 3 meters
- AC cords not shown. They are connected to AC outlet with low-pass filter on turntable

Frequency Range	Receive Antenna	Pre-Amplifier	Spectrum Analyzer
0.01 to 30 MHz	ANT-53	None	REC-11
30 to 1000 MHz	ANT-44	AMP-22	REC-11
1 to 10 GHz	ANT-13	AMP-05	REC-11

* A high pass filter was not needed since the fundamental frequency was outside of the amplifiers pass band.


MKR Delta 12.20 msec 1.70 dB
Radiometrics
Midwest
Corporation
Company: Mier Products Inc.
CENTER 315.300 000 MHz
RES BW 3 MHz(i)
10 dB/
Notes: Duty Cycle,
ITEM : DA-066MP
REF 0.0 dBm
VBW 3 MHz
Time: 13:24
Date : 12-11-2015
SPAN 0 Hz
ATTEN 10 dB
SWP 100 msec
File: DC-1



The pulse train is on for (12.2 x 4) + 4.9 =53.7 ms.
The duty cycle within the pulse train is 62% or less.
The on time per 100 mSec is 53.7x0.62 = 33.3 mSec.
The Duty cycle correction is 20xLog(33.3/100) = 9.6 dB.

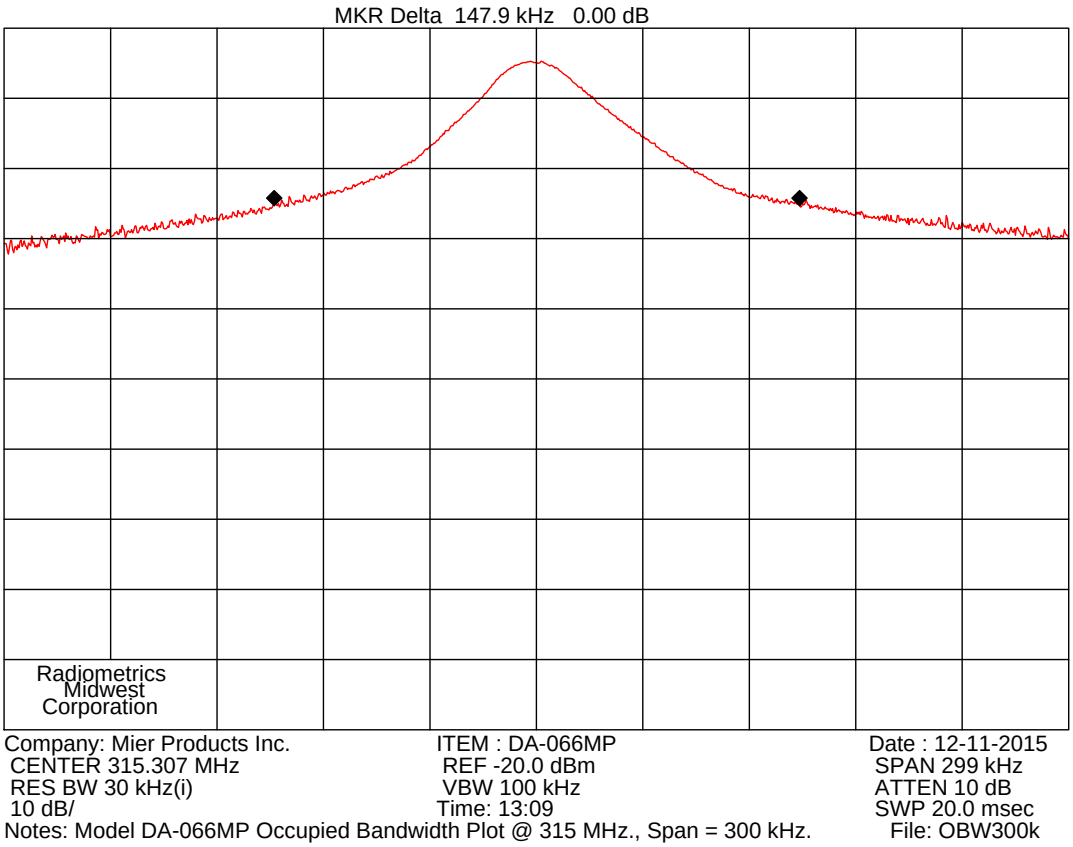
10.3 Occupied Bandwidth Data

The occupied bandwidth of the RF output was measured using a spectrum analyzer. The bandwidth was measured using the peak detector function and a narrow resolution bandwidth.

A broadband antenna was used to receive the modulated signal. The spectrum analyzer was set to the MAX HOLD mode to record the worst case of the modulation. The spectrum analyzer display was digitized and plotted. A limit was drawn on the plots based on the level of the modulated carrier. The plots of the occupied bandwidth for the EUT are supplied on the following page.

The bandwidth of the emission shall be no wider than 0.25% of the center frequency. It was measured at the 20 dB down points.

Figure 3. Occupied Bandwidth Plot



Occupied Bandwidth = 147.9 kHz
Limit = 315.3 * 0.0025 = 0.7883 MHz = 788.3 kHz
Judgement: Pass

10.4 FCC Section 15.231 Timing Requirements

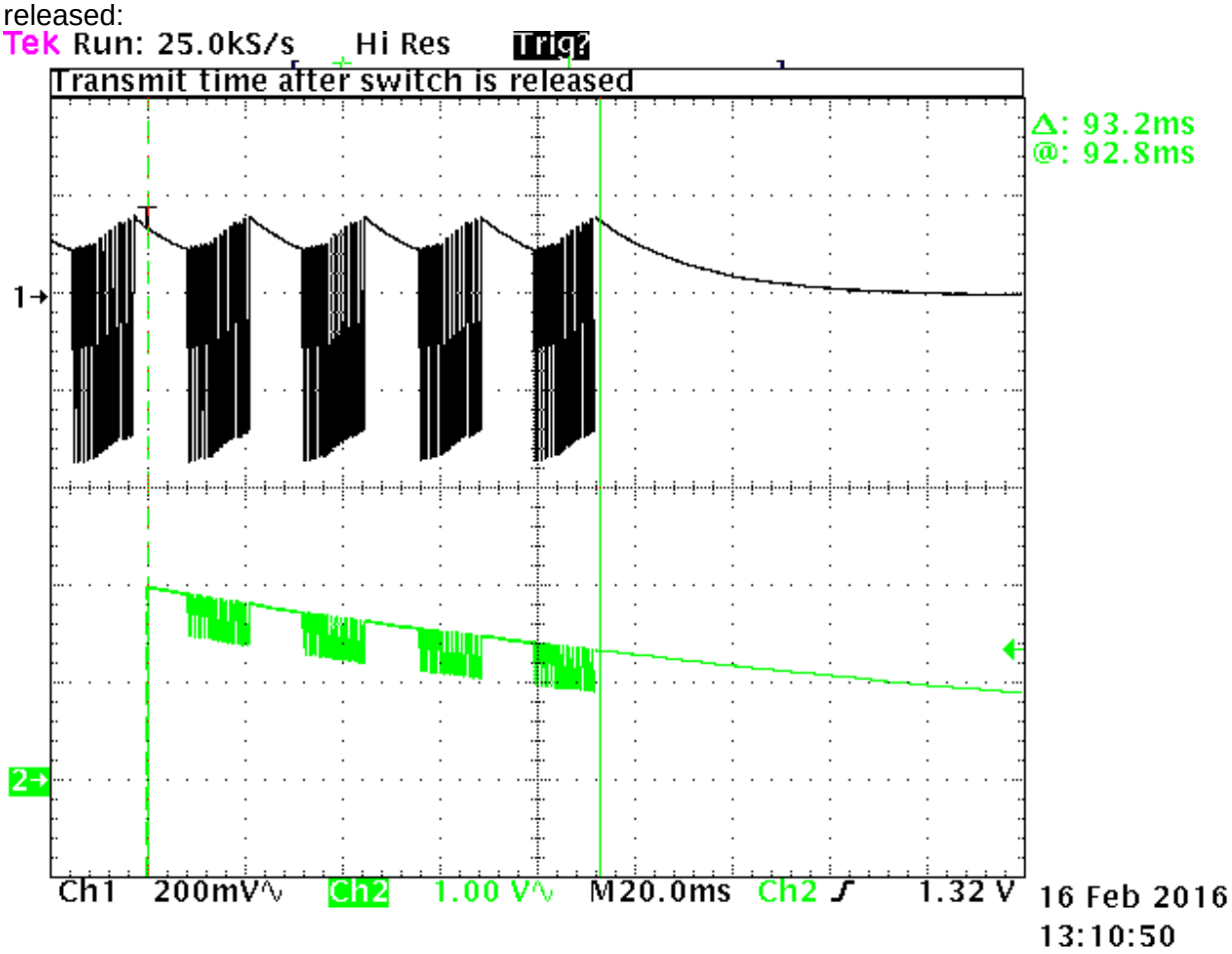
10.4.1 Test Requirement:

(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within, and not more, than 5 seconds of being released.

10.4.2 Test Result

The test was performed 10 times and the longest results are presented

The following shows the amount of time that it takes for the transmitter to deactivate after the switch is released:



The green trace is triggered when the switch is released.

Time for the transmitter to deactivate after the switch is released: 93.2 mSec.

Judgement: Pass

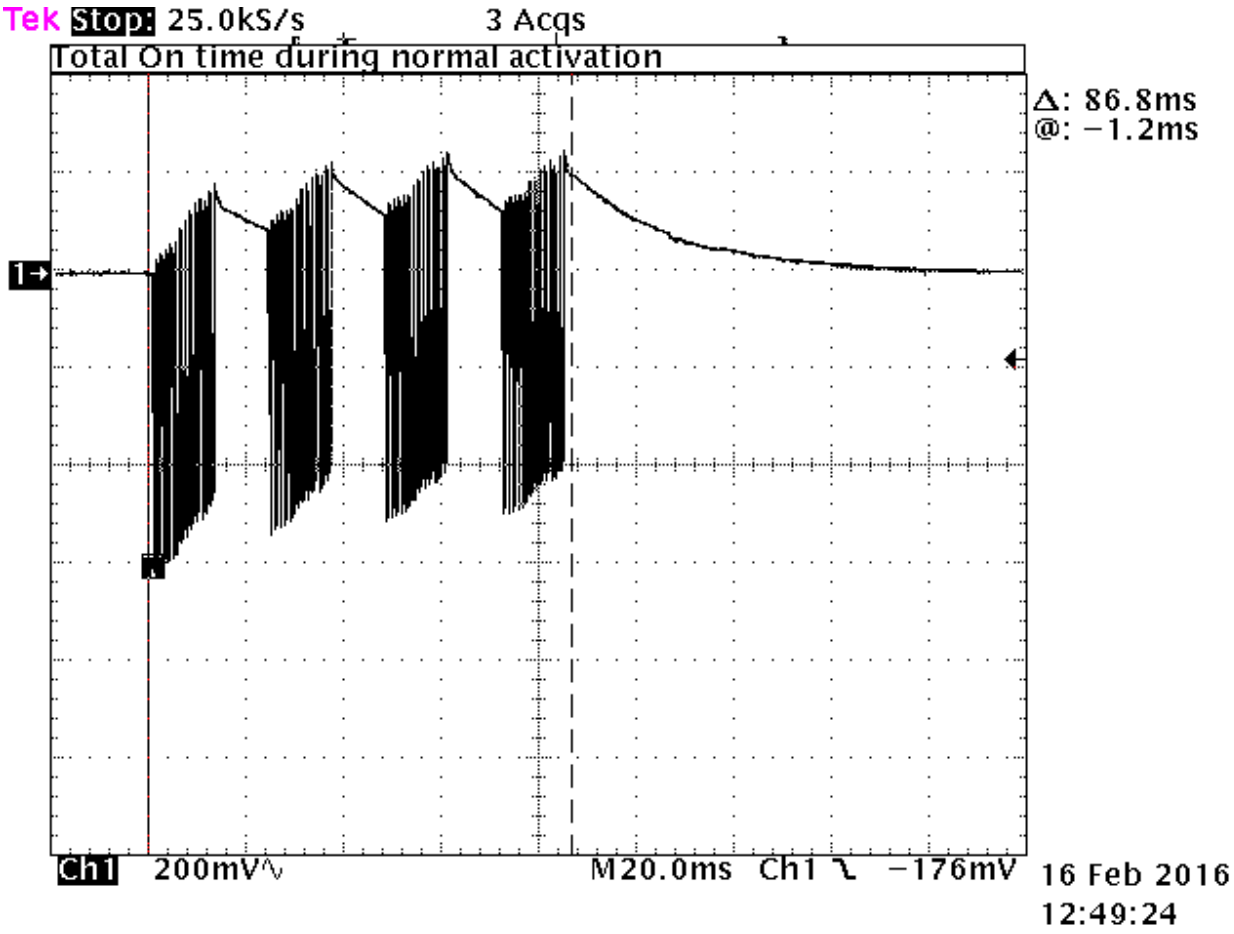
10.4.3 Test Requirement:

(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

10.4.4 Test Result

The test was performed 10 times, and the longest results is presented

The following shows the total transmit time during the automatic Driveway alert, that is



Total transmit time: 86.8 mSec.

Judgement: Pass