

Electromagnetic Compatibility

Test Report

**FCC CFR47 Part 15 Subpart B, Subpart C 15.231;
 RSS Gen issue 4, ICES-003 Issue 5 & RSS 210 issue 8, Annex 1**

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Accreditations (ISO 17025):



Standard Council of Canada: Accredited Laboratory No. 743

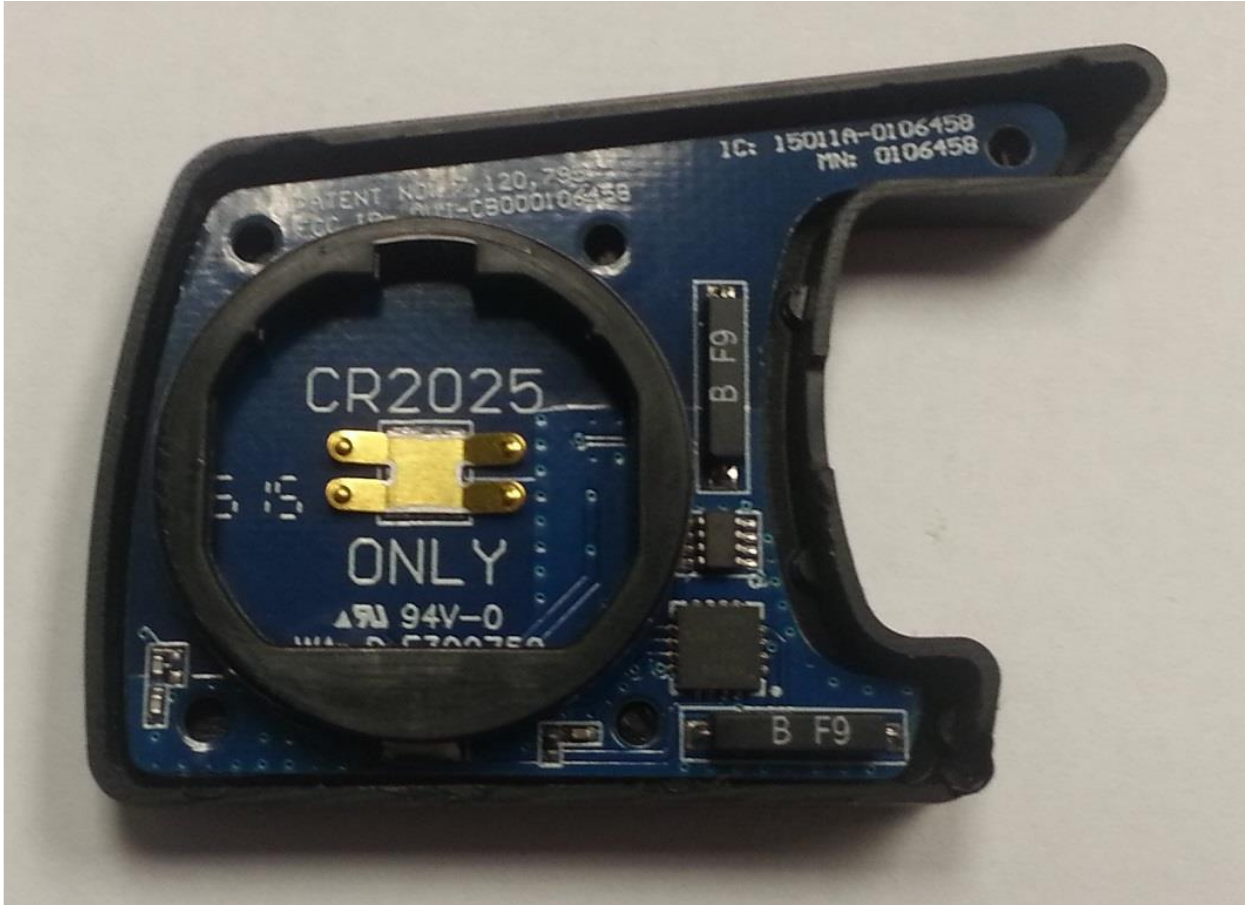
International Accreditation Service Inc: Accredited Laboratory: No. TL-239

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Applicant's name: Ion Security Products
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Phone.....: (800) 407-4389

Test Standard.....: FCC CFR47 Part 15 Subpart B, Subpart C 15.231 ,15.205; RSS Gen issue 4 & RSS-210 Issue 8 Annex 1

Test item description.....: A-DH Sensor - Verilock
Manufacturer.....: Ion Security Products
Model Number.....: 0106458
FCC ID: WVJ-CB000106458
IC Certification No.: 15011A-0106458



A-DH Sensor – Verilock, M/N: 0106458 (EUT)

Revision History

Date	Report Number	Rev #	Details	Authors Initials
Feb-27-2016	E10379-1601_Ion-ADH	0.0	Draft Test Report	JQ
Mar-09-2016	E10379-1601_Ion-ADH	1.0	Final Report	JQ

All previous versions of this Report have been superseded by the latest dated Revision as listed in the above table. Please dispose of all previous electronic and paper printed revisions accordingly.

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EMC TEST SUMMARY

The following tests demonstrate the testimony to “FCC & IC” Mark Electromagnetic compatibility testing for “A-DH Sensor – Verilock, M/N: 0106458” manufactured by Ion Security Products. The testing was performed pursuant to FCC CFR47 Part 15 Subpart B, Subpart C 15.231; RSS Gen issue 4, ICES-003 Issue 5 & RSS 210 issue 8, Annex 1

Test Item		Applicable Standard	Description	Performance Criteria
Part 1	Radiated Emissions	FCC CFR47 Part 15 Subpart B; RSS Gen issue 4, ICES-003 Issue 5	The emission are measured when the transmitter is not activated.	Complies
Part 2	Transmitter Radiated Emission	FCC CFR47 Part 15 Subpart C 15.231; RSS Gen issue 4 & RSS 210 issue 8, Annex 1	Field strength of fundamental and spurious emission are measured in the 30MHz-3.3Hz range	Complies
Part 3	Duty Cycle	FCC Part 15.35	Duty cycle correction factor	Complies
Part 4	20 dB Bandwidth	FCC CFR47 Part 15 Subpart C 15.231; RSS Gen issue 4 & RSS 210 issue 8, Annex 1	The bandwidth of the emission shall be no wider than 0.25% of the center frequency	Complies
Part 5	Transmitter Timing	FCC CFR47 Part 15 Subpart C 15.231; RSS Gen issue 4 & RSS 210 issue 8, Annex 1	transmitter shall cease transmission within 5 seconds after activation	Complies

Tests were conducted on a sample of the equipment as requested by Ion Security Products for the purpose of demonstrating compliance with FCC CFR47 Part 15 Subpart B, Subpart C 15.231; RSS Gen issue 4, ICES-003 Issue 5 & RSS 210 issue 8, Annex 1. Ion Security Products is responsible for the tested product configuration, continued product compliance with these standards listed, and for the appropriate auditing of subsequent products, as required. Please note that this list of tests may only comprise a partial list of the tests that are required before a FCC or IC label can be produced by the manufacturer.

This is to certify that the following report is true and correct to the best of our knowledge.

X



Written by Jack Qin
 RF/EMC Test Engineer/Technical Writer

X



Reviewed by Aman Jathaul,
 EMC Project Manager

PRODUCT DESCRIPTION

Equipment Under Test (EUT):	A-DH Sensor – Verilock
Model Number	0106458
FRN	0002644193
FCC ID	WVJ-CB000106458
IC Certification No.	15011A-0106458
Model No.	0106458
Manufacturer	Ion Security Products
Transmitter Type	Short range device
Transmitter Frequency	345MHz
Worst Transmit Power	67.6dBµV/m @ 3m distance at 345MHz
Antenna Type	loop antenna
Antenna Gain	-25dBi
EUT Power	3Vdc, Coin cell, CR2025

FACILITIES AND ACCREDITATION

<p>Main Laboratory Headquarters: Quality Auditing Institute</p> <p>Headquarters Location/Address: 3980 North Fraser Way Burnaby BC Canada V5J 5K5</p> <p>FCC Designation Number: CA9543</p> <p>Industry Canada Test Site Registration Number (3m SAC) : 21146-1</p> <p>Industry Canada Test Site Registration Number (OATS) :9543C-1</p> <p>Standard Council of Canada: ISO/IEC 17025:2005 Accredited Laboratory No. 743</p> <p>International Accreditation Service Inc.: ISO/IEC 17025:2005 Accredited Laboratory: No. TL-239</p>

ENVIROMENTAL CONDITIONS:

INDOORS, Temperature: 22-28°C, R.H.: 39.7 - 54.4%

TESTING METHODOLOGY

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC CFR47, Part 15, Subpart C Section 15.231, 15.205, RSS Gen issue 4 & RSS 210 issue 8, Annex 1. Radiated tests were conducted in accordance with ANSI C63.4-2014 and ANSI C63.10:2013

EUT TESTING CONFIGURATION

EUT was powered up by 3Vdc of Coin cell CR2032 and set up to transmit continuously in modulated modes of operation.

WORST TEST CASE

Worst-case orientation was determined by rotating the EUT on three axes, during the pre-compliance test and final radiated emissions tests were performed in that orientation.

GENERAL TEST PROCEDURES

Radiated Emissions

The EUT is placed on the turntable 0.8m above a ground plane 3m away from a receiving antenna. Height of receiving antenna varied from 1m to 4m, its polarity changes from vertical to horizontal. Turntable rotates 360 degrees. Motion of turntable and receiving antenna allows determining position of maximum emission level. Quasi-peak detector applies for measurements of emissions with frequency range of 30 to 1000MHz. and average/peak detector otherwise.

AC Mains Conducted Emissions

No applicable, as the EUT is powered by a coin cell battery.

MEASUREMENT UNCERTAINTY

Radio Frequency	: $\pm 1,5 \times 10^{-5}$
Total RF power, conducted.....	: ± 1 dB
RF power density, conducted.....	: ± 2.75 dB
Spurious emissions, conducted.....	: ± 3 dB
All emissions, radiated.....	: ± 3.5 dB
Temperature.....	: $\pm 1^{\circ}\text{C}$
Humidity.....	: ± 5 %
DC and low frequency voltages.....	: ± 3 %

TEST EQUIPMENT LIST

Emission Testing Equipment

Manufacturer	Model	Description	Serial No.	Last Cal	Cal Due Date
Sunol Sciences	SM46C	Turntable	051204-2	N/A	N/A
Sunol Sciences	TWR95	Mast	TREML0001	N/A	N/A
Sunol Sciences	JB3	Biconilog Antenna 30MHz – 3GHz	A042004	31-Oct-2012	31-Oct-2016
ETS Lindgren	2165	Turntable	00043677	N/A	N/A
ETS Lindgren	2125	Mast	00077487	N/A	N/A
Rohde & Schwarz	ESU40	EMI Receiver	100011	2014-11-20	2017-11-20
ETS Lindgren	S201	5 meter Semi-Anechoic Chamber	1030	N/A	N/A
ETS Lindgren	3117	Dual Ridge Horn Antenna 1G-18GHz	00075944	29-Aug-13	29-Aug-16
AH Systems	PAM118	Amplifier 100KHz-18GHz	189	Conditional Use	Conditional Use
Electro-Mechanics	6502	Loop Antenna 10k-30MHz	2178	8/21/2014	8/21/2017

Measurement Software List

Manufacturer	Model	Version	Description
Rhode & Schwarz	EMC 32	6.20.0	Emissions Pre-scan Test Software

Part 1 - Radiated Emissions Testing (Unintentional Mode)

DATE: February 11, 2016

TEST STANDARD: FCC CFR47 Part 15 Subpart B; RSS Gen issue 4, ICES-003 Issue 5

MINIMUM STANDARD: Except as provided elsewhere in FCC CFR47, Part 15, Subpart C & RSS 210 issue 8, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Field Strength (dBµV/m) at 3m
30 – 88	40
88 – 216	43.5
216 - 960	46
960 – above	54

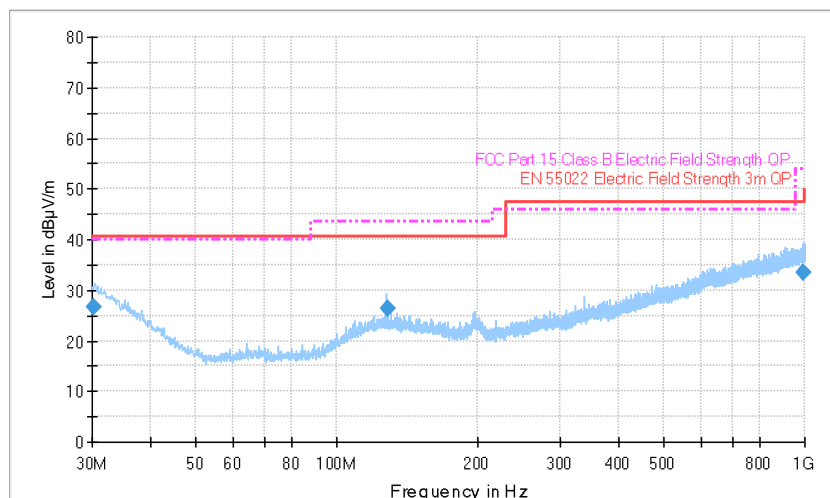
Note: In the above emission table, the tighter limit applies at the band edges.

TEST SETUP: The EUT was placed on a turntable, which is 0.8 m above ground plane. Emissions in both horizontal and vertical polarizations were measured while rotating the EUT on a turntable and moving the receiving antenna from 1m to 4 m high to maximize the emissions signal strength. The equipment was set up in a 3-meter Semi Anechoic Chamber for preliminary measurements and finals were completed in 3m/10m Open Air Test Site at 3 meters.

MODIFICATIONS: No modification is required to comply for this test.

PERFORMANCE: Complies with standard.

MEASUREMENT DATA & PLOT:



Note: All radiated emissions were at least 20 dB below the required limit line.

Part 2 - Transmitter Radiated Emissions Testing

DATE: February 11, 2016

TEST STANDARD: FCC CFR47 Part 15 Subpart C 15.231 15.205; RSS Gen issue 4 & RSS 210 issue 8, Annex 1

MINIMUM STANDARD: The radiated emissions of fundamental and spurious frequency from the DUT shall meet the limits below:

Fundamental Frequency (MHz)	Field Strength of Fundamental ($\mu\text{V/m}$)	Field Strength of Spurious Emission ($\mu\text{V/m}$)
40.66 - 40.70	2250	225
70 - 130	1250	125
130 - 174	1250 - 3750**	125-375**
174 - 260	3750	375
260 - 470	3750 - 12500**	375-1250**
Above 470	12500	1250

Note: 1) In the above emission table, the tighter limit applies at the band edges.
 2) ** Linear interpolations.

Except as otherwise described in the standards, only spurious emissions are permitted in any of the Frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

If there is field strength of spurious emissions appearing within these restricted bands, it shall not exceed the limits shown in the below table

Frequency (MHz)	Field Strength (dB $\mu\text{V/m}$) at 3m
30 - 88	40
88 - 216	43.5
216 - 960	46
960 - above	54

Note: In the above emission table, the tighter limit applies at the band edges.

TEST SETUP:

The EUT was placed on a turntable, which is 0.8 m above ground plane. Emissions in both horizontal and vertical polarizations were measured while rotating the EUT on a turntable and moving the receiving antenna from 1m to 4 m high to maximize the emissions signal strength. The equipment was set up in a 3-meter Semi Anechoic Chamber for preliminary measurements and finals were completed in 3m/10m Open Air Test Site at 3 meters. Measurements were also performed from 9 kHz to 30 MHz with active loop antenna, but no emissions were found in that range.

During pre-compliance test, Worst-case orientation was determined by rotating the EUT on three axes and final radiated emissions tests were performed in that orientation. Radiated emissions testing was performed separately when the EUT was set to transmit at 319.5MHz, 345MHz and 433.9MHz

DEVICE DESCRIPTIONS:

Refer to the Equipment Under Test Section.

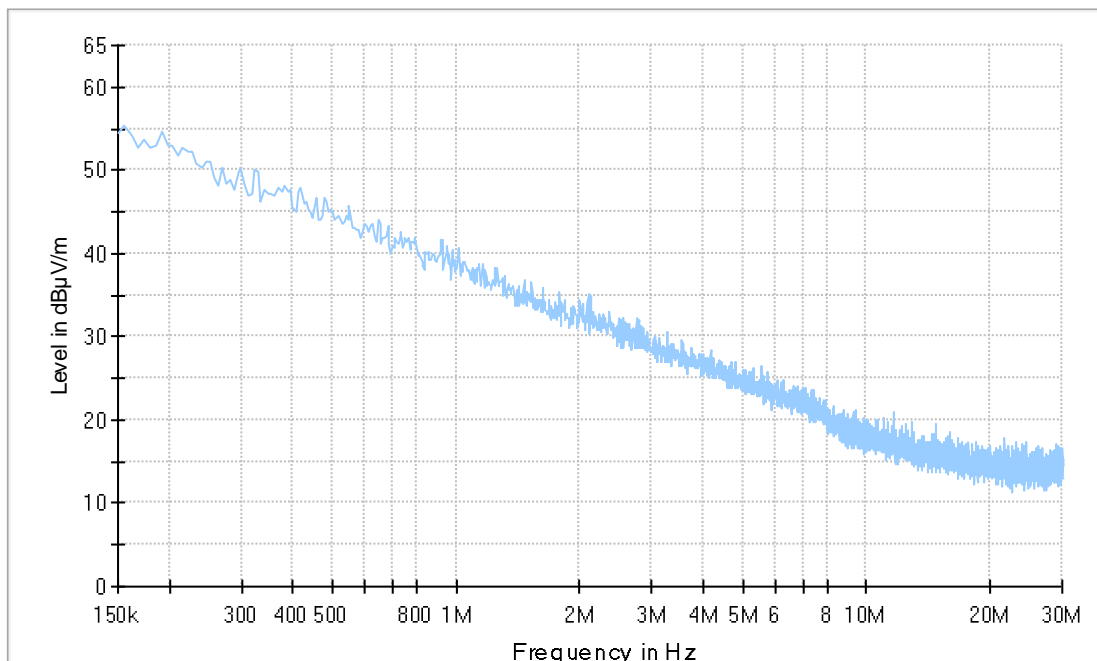
MODIFICATIONS:

No modification is required to comply for this test.

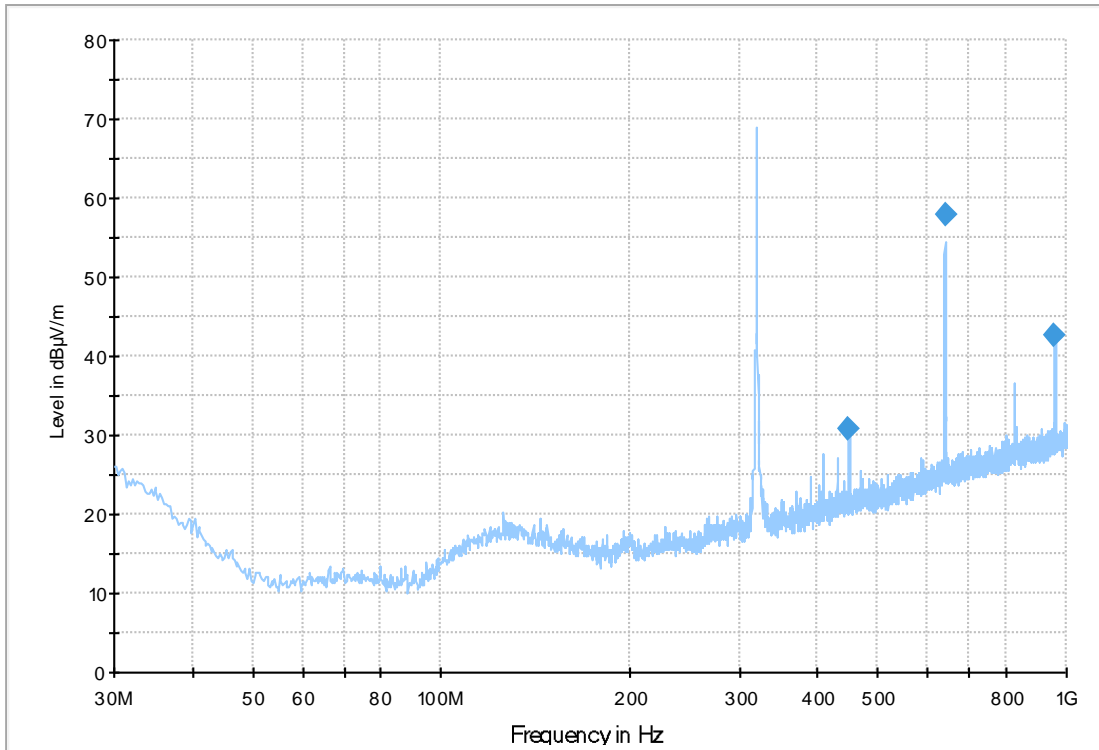
PERFORMANCE:

Complies with standard.

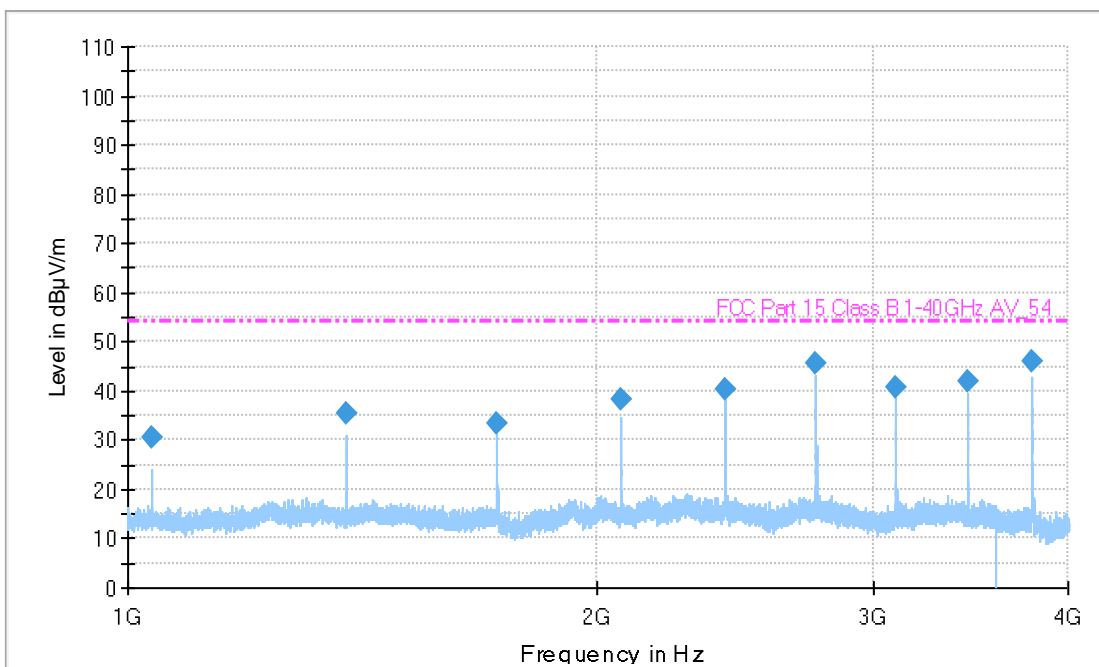
MEASUREMENT DATA:



Radiated Emissions 150kHz-30MHz at 3m SAC



Radiated Emissions 30MHz-1GHz at 3m SAC



Radiated Emissions 1GHz-4GHz at 3m SAC

Freq.	Raw MaxPk	C.F.	Corr. MaxPk	Duty Cycle	Avg.	Pol.	Antenna height	Turntable position	Margin	Limit	comment	EUT Position
MHz	dBµV/m	dB	dBµVm	dB	dBµV/m		cm	deg	dB	dBµV/m		
344.94	51.25	22.5	73.75	21	52.75	V	121.1	68	24.5	77.25		Lay Flat
344.94	64.77	22.5	87.27	21	66.27	H	100	315.6	10.98	77.25		
344.94	65.86	22.5	88.36	21	67.36	V	138.3	264.4	9.89	77.25		Vertical
344.94	61.2	22.5	83.7	21	62.7	H	188.2	176	14.55	77.25		
344.94	66.1	22.5	88.6	21	67.6	V	139.3	263.6	9.65	77.25	Worst	Sideway
344.94	60.62	22.5	83.12	21	62.12	H	128.5	175.1	15.13	77.25		
689.88	15.08	29	44.08	21	23.08	V	155.4	127.5	34.17	57.25		
1034.82	39.96	0.2	40.16	21	19.16	V	191.2	325.3	34.84	54	Restricted Band	
1379.76	42.72	1.99	44.71	21	23.71	V	394.9	237.4	30.29	54	Restricted Band	
1724.7	48.36	9.43	57.79	21	36.79	V	110.1	183.8	20.46	57.25		
2069.64	44.47	5.09	49.56	21	28.56	V	134.2	163.2	28.69	57.25		
2414.58	47.55	8.76	56.31	21	35.31	V	111.8	199.7	21.94	57.25		
2759.52	49.68	7.18	56.86	21	35.86	V	100	1.6	18.14	54	Restricted Band	
3104.46	50.9	8.69	59.59	21	38.59	V	100	359	18.66	57.25		
3449.4	47.4	11.44	58.84	21	37.84	V	100	165.2	19.41	57.25		

Part 3 - Duty Cycle Correction Factor

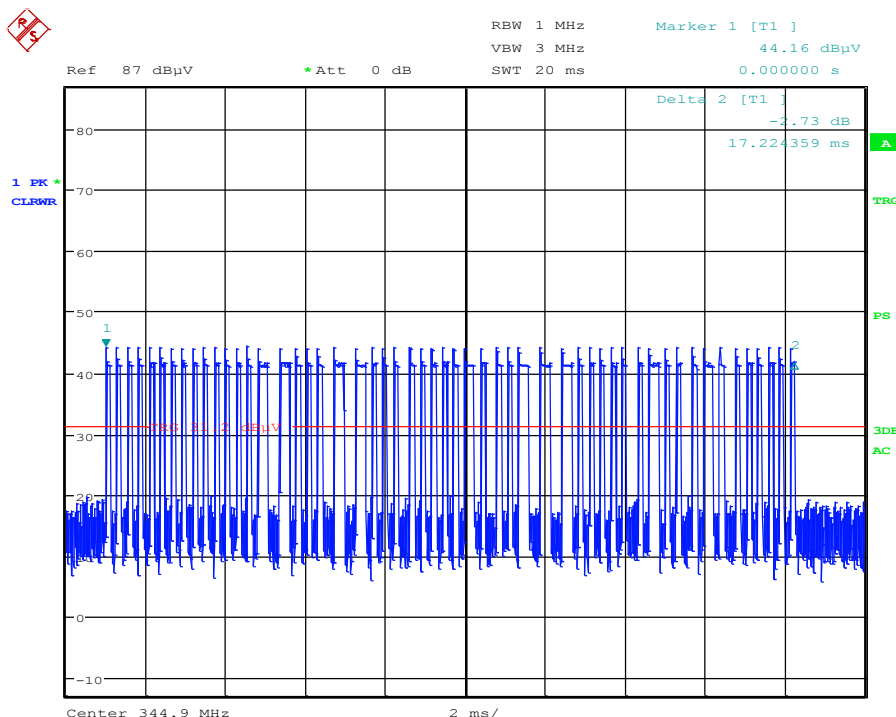
DATE: February 18, 2016

TEST STANDARD: FCC Part 15.35

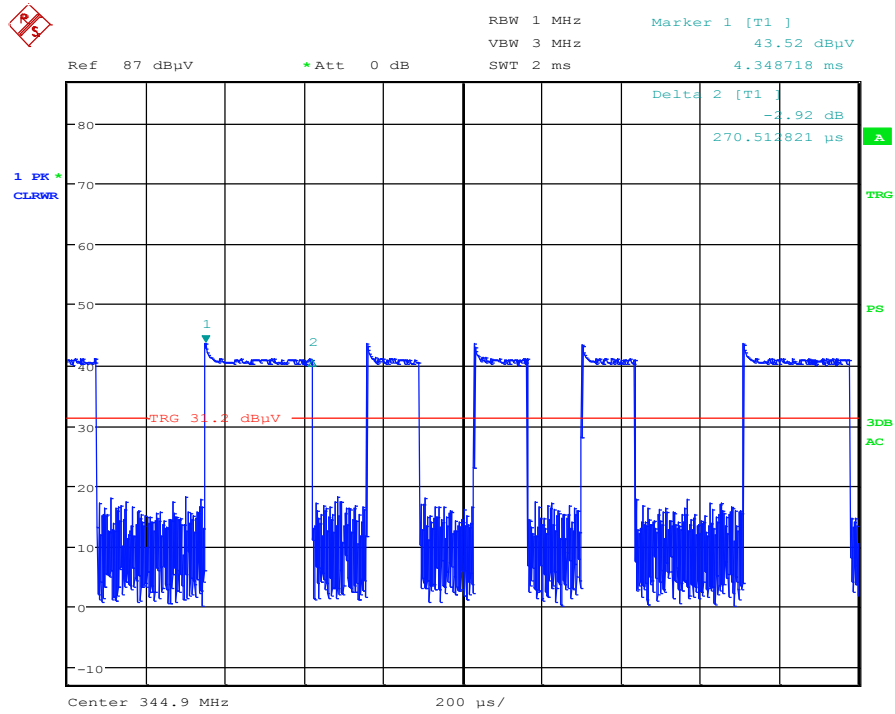
MINIMUM STANDARD: (c) Unless otherwise specified, e.g., §§15.255(b), and 15.256(l)(5), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

DUTY CYCLE CORRECTION MEASUREMENT – 344.9MHz

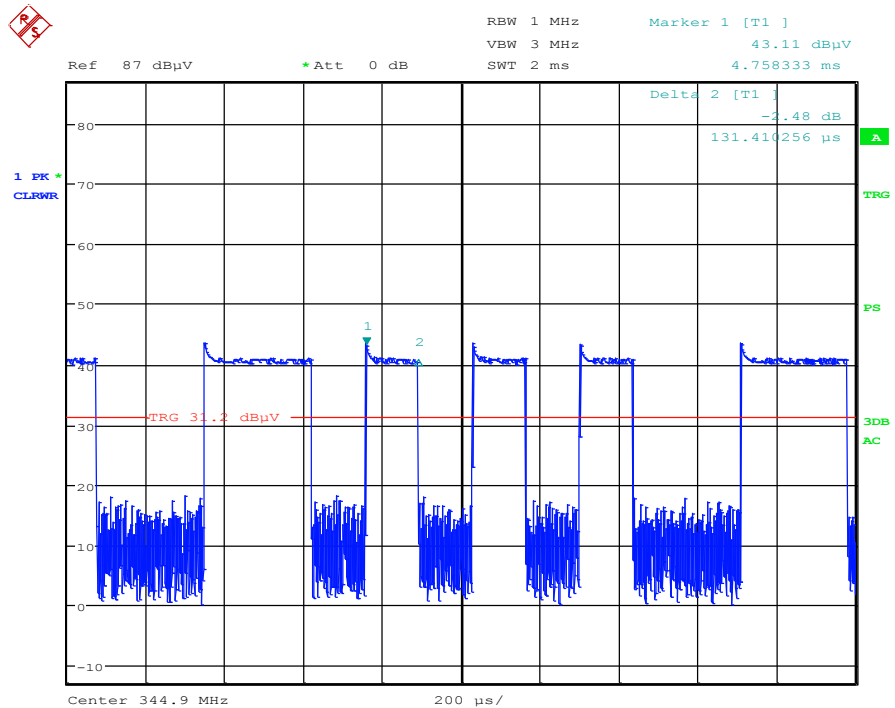
Data Transmissions		Number of pulses
Transmissions Burst Duration	17.2 msec	
Long Pulse Duration	0.271msec	10
Short pulse Duration	0.131 msec	44
Total Transmissions Duration	$(44 \times 0.131) + (10 \times 0.271) = 8.474 \text{msec}$	
On Time within 100 msec	8.474 msec	
Duty Cycle Correction factor	$20 \log (8.508/100) = -21.4 \text{dB}$	



Transmissions Burst Duration



Long Pulse Duration



Short Pulse Duration

Part 4 - 20 dB Bandwidth

DATE: Feb-17-2015

TEST STANDARD: FCC CFR47 Part 15 Subpart C 15.231; RSS Gen issue 4 & RSS 210 issue 8, Annex 1

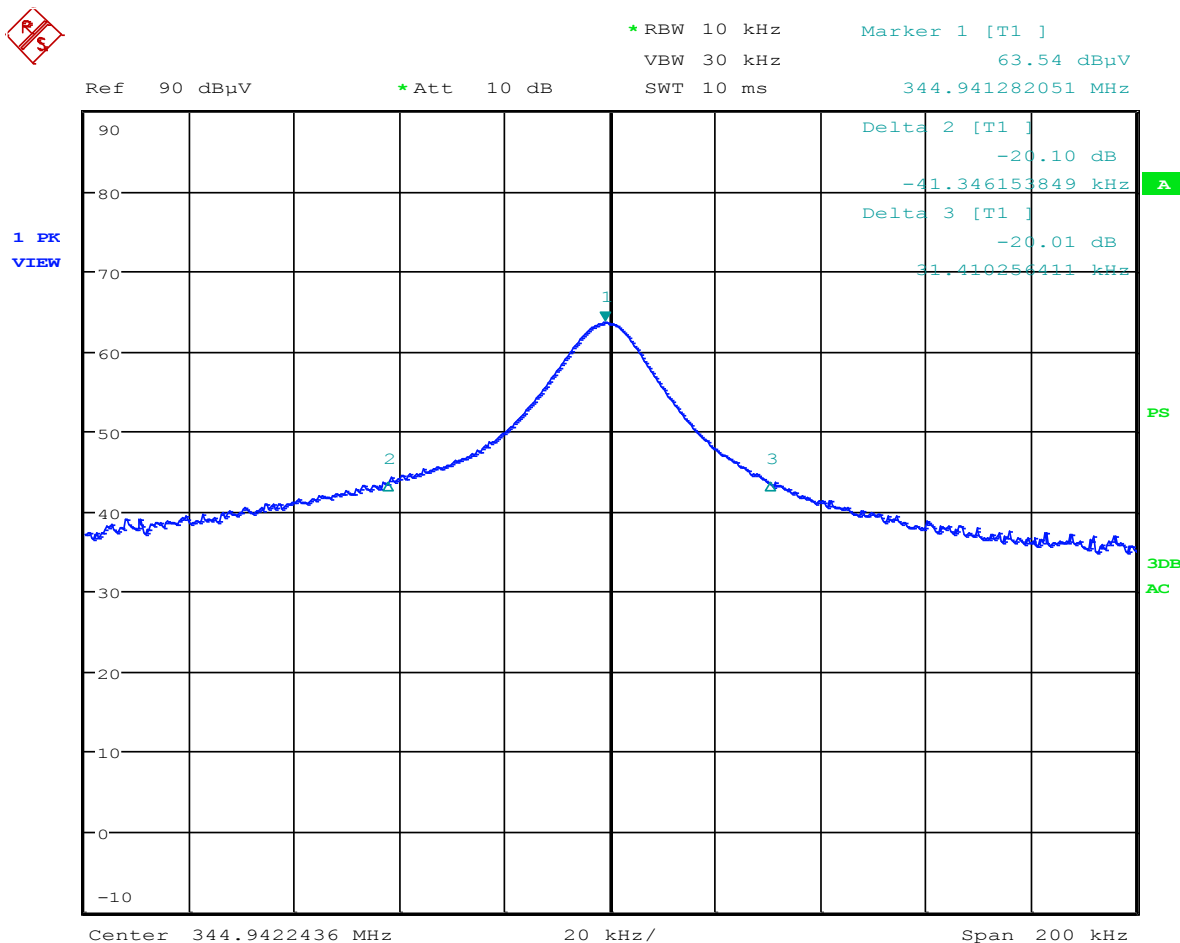
MINIMUM STANDARD: The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz; Bandwidth is determined at the points 20 dB down from the modulated carrier.

MODIFICATIONS: No modification is required to comply for this test.

PERFORMANCE: Complies with standard.

DATA & PLOT:

Frequency (MHz)	20dB Bandwidth (kHz)	Limit (kHz)
344.94	73	862.4



Part 5 - Transmitter Time Testing

DATE: February 23,2016

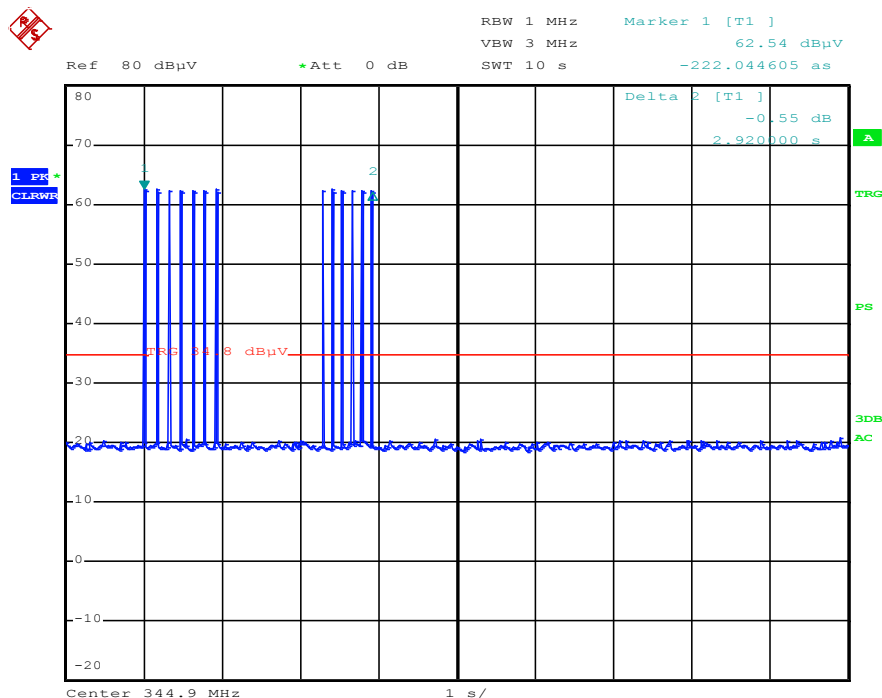
TEST STANDARD: FCC CFR47 Part 15 Subpart C 15.231; RSS Gen issue 4 & RSS 210 issue 8, Annex 1

MINIMUM STANDARD: (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.

MODIFICATIONS: No modification is required to comply for this test.

PERFORMANCE: Complies with standard. Transmission automatically deactivated within 3 seconds

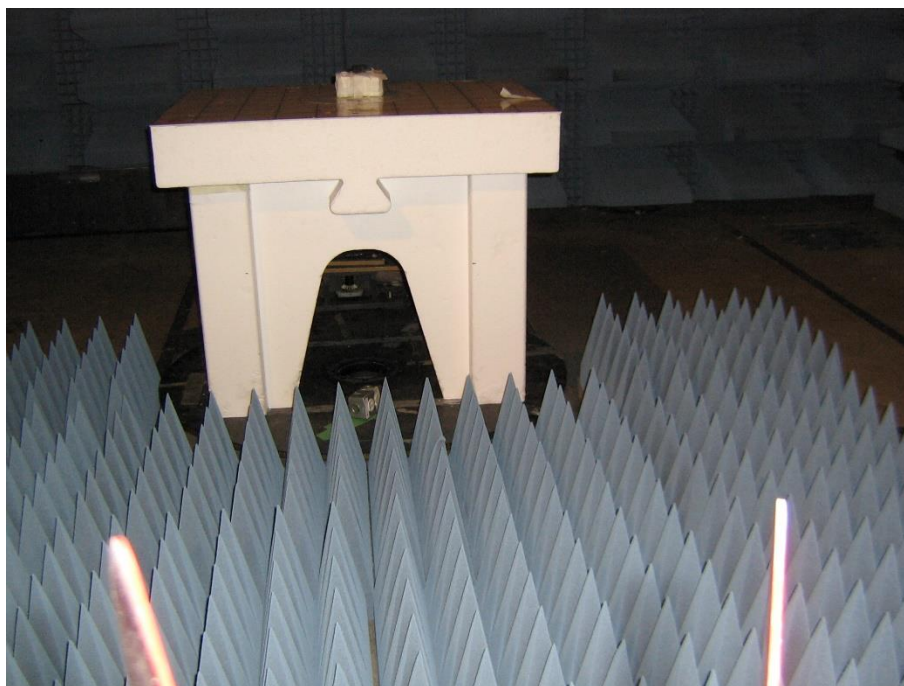
DATA & PLOT:



Appendix A: Test Setup Pictures



Radiated Emission test setup in Semi Anechoic Chamber



Radiated Emission test setup in Semi Anechoic Chamber – above 1GHz