



FCC PART 15.231 & IC RSS-210 Momentary Transmitter Test Report

APPLICANT	ADEMCO INC.
ADDRESS	2 Corporate Center Drive Melville NY 11747 USA
FCC ID	CFS8DL5819SV
IC	573F-5819SV
MODEL NUMBER	5819S
PRODUCT DESCRIPTION	WIRELESS SHOCK SENSOR
DATE SAMPLE RECEIVED	08/01/2019
FINAL TEST DATE	08/12/2019
TESTED BY	Tim Royer
APPROVED BY	Franklin Rose
TEST RESULTS	☒ PASS ☐ FAIL

Report Number	Report Version	Description	Issue Date
1987UT19TestReport_	Rev1	Initial Issue	08/12/2019
	Rev2	Updated DC correction	09/23/2019
	Rev3	Updated Model #, FCC & IC ID, added plots	10/3/2019

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

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GENERAL REMARKS

Summary

The device under test does:

- ☒ Fulfill the general approval requirements as identified in this test report and was selected by the customer.
- ☐ 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

Tested by:



Sr. EMC Engineer
EMC-003838-NE



Name and Title: Tim Royer, Project Manager/Testing Engineer

Date: 09/07/2019



Reviewed and approved by:

Name and Title: Franklin Rose, Project Manager/EMC Specialist

Date: 09/13/2019

Applicant: ADEMCO INC.
FCC ID: CFS8DL5819SV
IC: 573F-5819SV
Report: 1987UT19TestReport_Rev3

GENERAL INFORMATION

EUT Information

EUT Description	WIRELESS SHOCK SENSOR		
FCC ID	CFS8DL5819SV		
IC	573F-5819SV		
Model Number	5819S		
EUT Power Source	☐ 110–120Vac, 50–60Hz	☐ DC Power (12V)	☒ Battery Operated
Test Item	☐ Prototype	☒ Pre-Production	☐ Production
Type of Equipment	☒ Fixed	☐ Mobile	☐ Portable
Antenna Connector	No Antenna Connector		
Test Conditions	The temperature was 26°C Relative humidity of 50%.		
Modification to the EUT	EUT was modified to include a BNC antenna connector.		
Applicable Standards	FCC CFR 47 Part 2, Part 15, RSS-GEN Issue 5, RSS-210, Issue 9 August 2016 Referring to ANSI C63.10-2013 for Test Procedures		
Test Facility	Timco Engineering Inc. at 849 NW State Road 45 Newberry, FL 32669 USA. Designation #: US1070 IC Test Site: 2056A		

Peripherals Used in Testing

Description	Type	Connector	Length
NA			

Frequency Range of EUT

Test Frequencies	345 MHz
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Definition of EUT

FCC RULE PART NO.: FCC PART 15.3

§15.3 Definitions.

(i) *Class B digital device.* A digital device that is marketed for use in a residential environment notwithstanding use in commercial, business and industrial environments. Examples of such devices include, but are not limited to, personal computers, calculators, and similar electronic devices that are marketed for use by the general public.

NOTE: The responsible party may also qualify a device intended to be marketed in a commercial, business or industrial environment as a Class B device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B digital device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B digital device, regardless of its intended use.

(o) *Intentional radiator.* A device that intentionally generates and emits radio frequency energy by radiation or induction.

IC RULE PART NO.: RSS-GEN, Section 2.6.1

2.6.1 Category I equipment

Category I equipment consists of radio apparatus that require a technical acceptance certificate (TAC), issued by the Certification and Engineering Bureau of ISED, or a certificate issued by a recognized CB, pursuant to subsections 4(2) of the [Radiocommunication Act](#) and 21(1) of the [Radiocommunication Regulations](#), respectively.

Certified Category I equipment shall be listed in ISED's [radio equipment list](#) (REL).

No person shall import, distribute, lease, offer for sale, or sell Category I radio apparatus in Canada unless they are listed on ISED's REL. [3](#)

Note: The device is a momentarily operated transmitter.

MEASUREMENT STANDARDS

FCC RULE PART NO.: FCC PART 15.31

§15.31 Measurement standards.

(a) The following measurement procedures are used by the Commission to determine compliance with the technical requirements in this part. Except where noted, copies of these procedures are available from the Commission's current duplicating contractor whose name and address are available from the Commission's Consumer and Governmental Affairs Bureau at 1-888-CALL-FCC (1-888-225-5322).

(2) Unlicensed Personal Communications Service (UPCS) devices are to be measured for compliance using ANSI C63.17-2013: "American National Standard Methods of Measurement of the Electromagnetic and Operational Compatibility of Unlicensed Personal Communications Services (UPCS) Devices" (incorporated by reference, see §15.38).

(3) Other intentional radiators are to be measured for compliance using the following procedure: ANSI C63.10-2013 (incorporated by reference, see §15.38).

(e) For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

(l) Measurements of radio frequency emissions conducted to the public utility power lines shall be performed using a 50 ohm/50 uH line-impedance stabilization network (LISN).

(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:

Frequency range over which device operates	Number of frequencies	Location in the range of operation
1 MHz or less	1	Middle.
1 to 10 MHz	2	1 near top and 1 near bottom.
More than 10 MHz	3	1 near top, 1 near middle and 1 near bottom.

(o) The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.

IC RULE PART NO.: RSS-GEN 3.2

3.2 Measurement methods, measurement instrumentation and test site validation

The requirements stated in RSS-Gen and in the applicable RSS shall take precedence if there are discrepancies between the requirements stated in these standards and those stated in the publications referenced in this section. The [adopted editions of the ANSI standards](#) listed below will be posted on the Certification and Engineering Bureau's (CEB) website.

The methods in ANSI C63.26, *American National Standard of Procedures for Compliance Testing of Licensed Transmitters*, and ANSI C63.10, *American National Standard for Testing Unlicensed Wireless Devices*, shall be used for measurement methods applicable to licensed and licence-exempt radio apparatus, respectively.

METHOD OF MEASUREMENT

FCC RULE PART NO.: FCC PART 15.35

§15.35 Measurement detector functions and bandwidths.

The conducted and radiated emission limits shown in this part are based on the following, unless otherwise specified in this part:

(a) On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified. The specifications for the measuring instrumentation using the CISPR quasi-peak detector can be found in ANSI C63.4-2014, clause 4 (incorporated by reference, see §15.38). As an alternative to CISPR quasi-peak measurements, the responsible party, at its option, may demonstrate compliance with the emission limits using measuring equipment employing a peak detector function as long as the same bandwidth as indicated for CISPR quasi-peak measurements are employed.

(b) Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz. When average radiated emission measurements are specified in this part, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. Unless otherwise specified, *e.g.*, see §§15.250, 15.252, 15.253(d), 15.255, 15.256, and 15.509 through 15.519, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device, *e.g.*, the total peak power level. Note that the use of a pulse desensitization correction factor may be needed to determine the total peak emission level. The instruction manual or application note for the measurement instrument should be consulted for determining pulse desensitization factors, as necessary.

(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 Supplier's Declaration of Conformity.

IC RULE PART NO.: RSS-GEN Section 8.1

8.1 Measurement bandwidths and detector functions

Unless otherwise specified, for all frequencies equal to or less than 1 GHz, the emission limits for licence-exempt radio apparatus stated in applicable RSSs (including RSS-Gen) are based on measurements using a CISPR quasi-peak detector function, with the exception of the frequency ranges 9-90 kHz and 110-490 kHz, where the emission limits are based on measurements employing a linear average detector. The measurement bandwidth to be used depends on the measured frequency and shall be as specified in CAN/CSA-CISPR 16-1-1:15 for the required type of detector to be used for measurements.

If an average limit is specified for the EUT, then the peak emission shall also be measured with instrumentation properly adjusted for factors such as pulse desensitization to ensure that the peak emission is less than 20 dB above the average limit.

If an average measurement is specified for wanted emissions, a linear average detector having a bandwidth equal to or greater than the occupied bandwidth shall be used to make the measurement.

Applicant: ADEMCO INC.
FCC ID: CFS8DL5819SV
IC: 573F-5819SV
Report: 1987UT19TestReport_Rev3

SUMMARY OF TESTING

Requirement	FCC Rule Part No.	IC Rule Part No.	Test Item	Result
FCC PT 2.1053, RSS-GEN 6.7	15.231(b), 15.209(a), 15.205(a), (b)	RSS-GEN 8.9, 8.10, RSS-210 4.1, RSS-210 Annex 1, 1.2	Radiated Field Strength of Spurious Emissions	Pass

FIELD STRENGTH OF EMISSIONS

Requirements: FCC PT 2.1046, 2.1053, RSS-GEN 6.12, 6.7

FCC RULE PART NO.: 15.231(b), 15.35(c), 15.205(a)(b), 15.209 (a)

§15.231 Periodic operation in the band 40.66-40.70 MHz and above 70 MHz.

(b) In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	¹ 1,250 to 3,750	¹ 125 to 375
174-260	3,750	375
260-470	¹ 3,750 to 12,500	¹ 375 to 1,250
Above 470	12,500	1,250

¹Linear interpolations.

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

FIELD STRENGTH OF EMISSIONS

§15.205 Restricted bands of operation.

(a) Except as shown in paragraph (d) of this section, 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
¹ 0.495-0.505	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			

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

²Above 38.6

(b) Except as provided in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

§15.209 Radiated emission limits; general requirements.

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

Applicant: ADEMCO INC.
 FCC ID: CFS8DL5819SV
 IC: 573F-5819SV
 Report: 1987UT19TestReport_Rev3

FIELD STRENGTH OF EMISSIONS

IC RULE PART NO.: , RSS-210 Annex 1, A.1.2, RSS-GEN Section 8.2, 8.9, 8.10

A.1.2 Field Strengths

Following are the requirements for field strength of emissions:

- a. The field strength of emissions from momentarily operated intentional radiators shall not exceed the limits outlined in [Table A1](#), based on the average value of the measured emissions. The requirements of the Pulsed Operation section of RSS-Gen apply for averaging pulsed emissions and limiting peak emissions.

Alternatively, compliance with the limits in Table A1 may be demonstrated using an International Special Committee on Radio Interference (CISPR) quasi-peak detector.

- b. Unwanted emissions shall be 10 times below the fundamental emissions field strength limits in Table A1 or comply with the limits specified in RSS-Gen, whichever is less stringent.

Table A1— Permissible Field Strength Limits for Momentarily Operated Devices

Fundamental Frequency (MHz), Excluding Restricted Frequency Bands Specified in RSS-Gen	Field Strength of the Fundamental Emissions ($\mu\text{V/m}$ at 3 m)
70-130	1,250
130-174	1,250 to 3,750*
174-260 (Note 1)	3,750
260-470 (Note 1)	3,750 to 12,500*
Above 470	12,500

* Linear interpolation with frequency, f , in MHz:

For 130-174 MHz: Field Strength ($\mu\text{V/m}$) = $(56.82 \times f) - 6136$

For 260-470 MHz: Field Strength ($\mu\text{V/m}$) = $(41.67 \times f) - 7083$

8.2 Pulsed operation

When the field strength or envelope power is not constant or it is in pulses, and an average detector is specified to be used, the value of field strength or power shall be determined by averaging over one complete pulse train during which the field strength or power is at its maximum value, including blanking intervals within the pulse train, provided that the pulse train does not exceed 0.1 seconds. In cases where the pulse train exceeds 0.1 seconds, the average value of field strength or output power shall be determined during a 0.1 seconds interval during which the field strength or power is at its maximum value.

The exact method of calculating the average field strength shall be described in the test report.

For pulse modulated devices with a pulse-repetition frequency of 20 Hz or less and for which CISPR quasi-peak measurements are specified, compliance shall be demonstrated using measuring instrumentation employing a peak detector function, properly adjusted for such factors as pulse desensitization, using the same measurement bandwidths that are indicated for CISPR quasi-peak measurements.

FIELD STRENGTH OF EMISSIONS

8.10 Restricted frequency bands

Restricted frequency bands, identified in [table 7](#), are designated primarily for safety-of-life services (distress calling and certain aeronautical activities), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following conditions related to the restricted frequency bands apply:

- The transmit frequency, including fundamental components of modulation, of licence-exempt radio apparatus shall not fall within the restricted frequency bands listed in [table 7](#) except for apparatus compliant with RSS-287, [*Emergency Position Indicating Radio Beacons \(EPIRB\)*](#), [*Emergency Locator Transmitters \(ELT\)*](#), [*Personal Locator Beacons \(PLB\)*](#), and [*Maritime Survivor Locator Devices \(MSLD\)*](#).
- Unwanted emissions that fall into restricted frequency bands listed in table 7 shall comply with the limits specified in [table 5](#) and [table 6](#).
- Unwanted emissions that do not fall within the restricted frequency bands listed in table 7 shall comply either with the limits specified in the applicable RSS or with those specified in table 5 and table 6.

MHz	MHz	GHz
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.52525	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.026	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 - 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4
5.677 - 5.683	399.9 - 410	22.01 - 23.12
6.215 - 6.218	608 - 614	23.6 - 24.0
6.26775 - 6.26825	960 - 1427	31.2 - 31.8
6.31175 - 6.31225	1435 - 1626.5	36.43 - 36.5
8.291 - 8.294	1645.5 - 1646.5	Above 38.6
8.362 - 8.366	1660 - 1710	
8.37625 - 8.38675	1718.8 - 1722.2	
8.41425 - 8.41475	2200 - 2300	
12.29 - 12.293	2310 - 2390	
12.51975 - 12.52025	2483.5 - 2500	
12.57675 - 12.57725	2655 - 2900	
13.36 - 13.41	3260 - 3267	
16.42 - 16.423	3332 - 3339	
16.69475 - 16.69525	3345.8 - 3358	
16.80425 - 16.80475	3500 - 4400	
25.5 - 25.67	4500 - 5150	
37.5 - 38.25	5350 - 5460	
73 - 74.6	7250 - 7750	
74.8 - 75.2	8025 - 8500	
108 - 138		

Note 1: Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

FIELD STRENGTH OF EMISSIONS

8.9 Transmitter emission limits

Except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.

Table 5 – General field strength limits at frequencies above 30 MHz

Frequency (MHz)	Field strength ($\mu\text{V/m}$ at 3 m)
30 – 88	100
88 – 216	150
216 – 960	200
Above 960	500

Table 6 – General field strength limits at frequencies below 30 MHz

Frequency	Magnetic field strength (H-Field) ($\mu\text{A/m}$)	Measurement distance (m)
9 - 490 kHz ^{Note 1}	$6.37/F$ (F in kHz)	300
490 - 1705 kHz	$63.7/F$ (F in kHz)	30
1.705 - 30 MHz	0.08	30

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

FIELD STRENGTH OF EMISSIONS

Measurement Range

Requirements: Part 15.33(b)(1), RSS-GEN Section 6.13.2

§15.33 Frequency range of radiated measurements.

(b) For unintentional radiators:

(1) Except as otherwise indicated in paragraphs (b)(2) or (b)(3) of this section, for an unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a radiated emission limit is specified, up to the frequency shown in the following table:

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30.
1.705-108	1000.
108-500	2000.
500-1000	5000.
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower.

RSS-GEN Section 6.13.2:

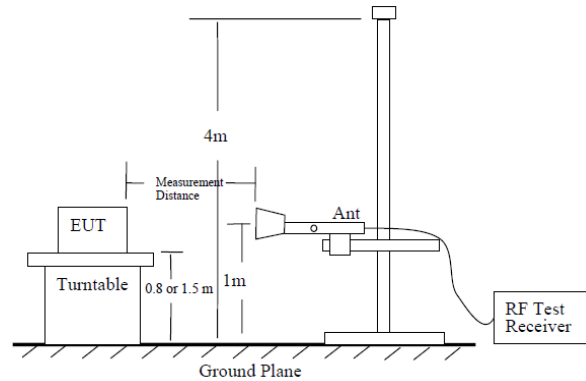
Table 2 – Frequency range for radiated measurement for equipment with a digital device

Highest frequency generated, operated or used in the equipment (MHz)	Upper frequency limit of measurement range (MHz)
< 1.705	30
1.705-108	1000
108-500	2000
500-1000	5000
> 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

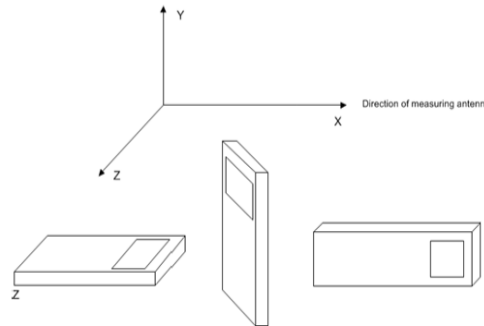
FIELD STRENGTH OF EMISSIONS

Method of Measurement: ANSI C63.10, 6.3 – 6.6 “Radiated Emissions”

Test Site Setup:



EUT Orientation(s):



Note: The measurements below represent the worst case of all the frequencies tested. The six (6) highest emissions or more of each worst-case operational modes of the EUT are represented below. Emissions 20 dB below the limit are not required to be reported, but may be shown for informational purposes.

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 internally in the spectrum analyzer reading. An example is given below:

Freq. MHz	Meter Reading dBμV	ACF dB/m	Cable Loss dB	Duty Cycle dB	Field Strength dBμV/m @ 3 m
33	20	+10.36	+1.2	-20	= 31.56

Note: -20dB Duty cycle is derived from a 10% duty cycle provided by Resideo.

FIELD STRENGTH OF EMISSIONS

Limit Calculations

Method of Calculation: ANSI C63.10, 7.6.2

Step 1: Limit Interpolation Formula:

$$\text{Limit } (\mu\text{V/m}) = L_l + (f - f_l) * ((L_h - L_l) / (f_h - f_l))$$

Where:

f = fundamental emission frequency (MHz)

f_l = Low-End frequency of the linear interpolation band (MHz)

f_h = High-End frequency of the linear interpolation band (MHz)

L_l = Low-End Limit of the linear interpolation band ($\mu\text{V/m}$)

L_h = High-End Limit of the linear interpolation band ($\mu\text{V/m}$)

Step 2: Limit Conversion Formula:

$$\text{Limit (dB}\mu\text{V/m)} = 20 \log (\mu\text{V/m})$$

15.231(b), RSS-210 A.1.2 - Limit Lookup Chart		
Fundamental Frequency (MHz)	345	
Limit Frequency (MHz)	Fundamental Field Strength (dBuV/m)	Spurious Field Strength (dBuV/m)
345.00	77.26	57.26

FIELD STRENGTH OF EMISSIONS

Test Data: Radiated Field Strength of the Fundamental

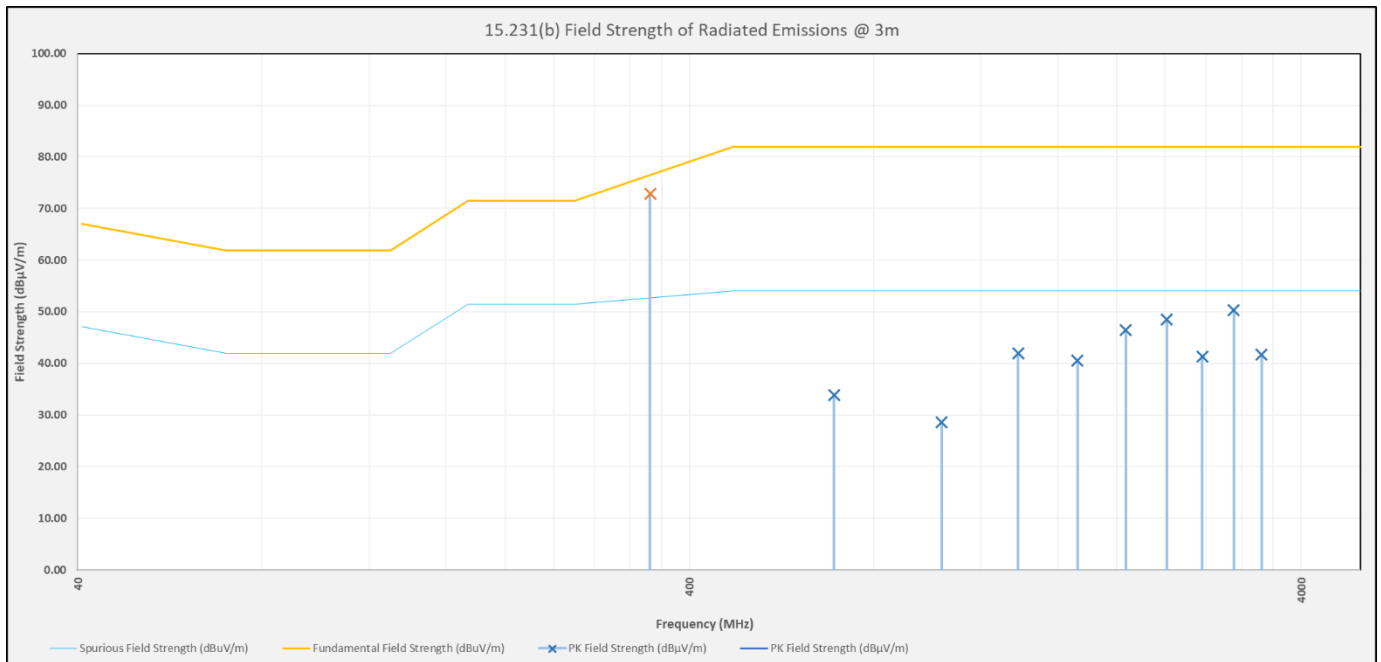
Tuned Freq MHz	Emission Frequency MHz	Meter Reading dBu V	Antenna Polarity	Coax Loss Db	Correction Factor dB/M	Field Strength dBu V/M	Margin
345.00	345.00	77.09	H	2.12	13.70	72.90	4.35
345.00	345.00	69.69	V	2.12	13.70	65.51	11.75

Test Data: Radiated Field Strength of Spurious Emissions

Tuned Freq MHz	Emission Frequency MHz		Meter Reading dBu V	Antenna Polarity	Coax Loss Db	Correction Factor dB/M	Field Strength dBu V/M	Margin
345.00	690.00		30.35	H	3.07	20.40	33.82	23.44
345.00	690.00		28.04	V	3.07	20.40	31.51	25.75
345.00	1035.00	*	17.94	H	3.75	26.86	28.55	25.45
345.00	1035.00	*	17.92	V	3.75	26.86	28.53	25.47
345.00	1380.00	*	25.46	V	4.31	28.58	38.35	15.65
345.00	1380.00	*	29.04	H	4.31	28.58	41.93	12.07
345.00	1725.00		26.37	H	4.81	29.40	40.58	16.68
345.00	1725.00		25.48	V	4.81	29.40	39.69	17.57
345.00	2070.00		30.14	V	5.27	31.00	46.41	10.85
345.00	2070.00		24.11	H	5.27	31.00	40.38	16.88
345.00	2415.00		30.58	H	5.62	31.87	48.07	9.19
345.00	2415.00		30.99	V	5.62	31.87	48.48	8.78
345.00	2760.00	*	18.29	V	6.10	32.41	36.80	17.20
345.00	2760.00	*	22.74	H	6.10	32.41	41.25	12.75
345.00	3105.00		31.12	H	6.44	32.77	50.33	6.93
345.00	3105.00		27.82	V	6.44	32.77	47.03	10.23
345.00	3450.00		18.03	V	6.84	32.59	37.46	19.80
345.00	3450.00		22.22	H	6.84	32.59	41.65	15.61

FIELD STRENGTH OF EMISSIONS

Test Data: Radiated Field Strength of Spurious Emissions Plots



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TEST EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Antenna: Biconical 1096	Eaton	94455-1	1096	08/01/17	08/01/20
Antenna: Log-Periodic 1243	Electro-Metrics	LPA-25	1243	03/29/18	03/29/20
CHAMBER	Panashield	3M	N/A	12/31/17	12/31/19
Antenna: Double- Ridged Horn/ETS Horn 2	ETS-Lindgren	3117	00041534	03/01/17	03/01/20
Software: Field Strength Program	Timco	N/A	Version 4.10.7.0	N/A	N/A
Antenna: Active Loop	ETS-Lindgren	6502	00062529	12/11/17	12/11/19
EMI Test Receiver R & S ESU 40 Chamber	Rohde & Schwarz	ESU 40	100320	08/28/18	08/28/21
Coaxial Cable - Chamber 3 cable set (Primary)	Micro-Coax	Chamber 3 cable set (Primary)	KMKM-0244- 01; KMKM- 0670-00; KFKF-0198- 01	02/29/19	02/29/21
Bore-sight Antenna Positioning Tower	Sunol Sciences	TLT2	N/A	N/A	N/A

*EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3

MEASUREMENT UNCERTAINTY

The data and results referenced in this document are true and accurate. The measurement uncertainty was calculated for all measurements listed in this test report according To CISPR 16-4 or ENTR 100-028 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: "Uncertainty in EMC Measurements" and is documented in the Timco Engineering, Inc. quality system according to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Timco Engineering, Inc. is reported:

Test Items	Measurement Uncertainty	Notes
RF Frequency Accuracy	$\pm 49.5 \text{ Hz}$	(1)
RF Conducted Power	$\pm 0.93 \text{ dB}$	(1)
Conducted spurious emission of transmitter valid up to 40GHz	$\pm 1.86 \text{ dB}$	
Occupied Bandwidth	$\pm 2.65 \%$	
Radiated RF Power	$\pm 1.4 \text{ dB}$	
Maximum frequency deviation: Within 300 Hz and 6kHz of audio freq. Within 6kHz and 25kHz of audio Freq.	$\pm 1.88 \%$ $\pm 2.04 \%$	
Transient Frequency Response	$\pm 1.88 \%$	
Temperature	$\pm 1.0^\circ \text{C}$	(1)
Humidity	$\pm 5.0 \%$	

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=1.96$.

END OF REPORT

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Report Template Revision History

Document Name	Description of Change	Revision Date	Approved By
PT 15231a TX Rpt	Initial Issue	160415	SS Sanders
	Added Document History to Template	160920	G Greene
	Added Uc Tab & Note about Quality Check.	170524	SS Sanders
_15.231_TestReport_	Revised Template to new company standards	180720	FROSE

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Radiated Emissions Test Setup Photographs

Radiated Emissions Scan 200 MHz to 1 GHz (Log-Periodic Antenna)

