

COMPLIANCE WORLDWIDE INC. TEST REPORT 150-20R1

In Accordance with the Requirements of
Federal Communications Commission CFR Title 47 Part 15.225, Subpart C
Innovation, Science and Economic Development Canada
RSS 210, Issue 10
Low Power License-Exempt Radio Communication Devices
Intentional Radiators

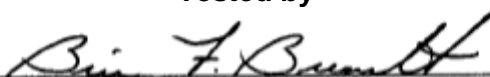
Issued to
Medica Corporation
5 Oak Park Drive
Bedford MA 01730

for the
EasyRA
13.56 MHz RFID Reader Module

FCC ID: 2AVUL-EASYRA
IC: 26013-EASYRA

Report Issued on March 6, 2020
Revision R1 Issued on March 31, 2022

Tested by



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EMC Test Engineer

Reviewed By



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1. Scope

This test report certifies that the Medica EasyRA 13.56 MHz RFID Reader, as tested, meets the FCC Part 15.225 Subpart C, and ISED Canada RSS 210 requirements. The scope of this test report is limited to the test samples provided by the client, only in as much as those samples represent other production units. If any significant changes are made to the units, the changes shall be evaluated, and a retest may be required. Revision R1 added the 2nd footnote description on page 8 and measurement uncertainty for radiated emissions (page 11) and conducted emissions (page 18).

2. Product Details

2.1. Manufacturer:	Medica Corporation
2.2. Model Number:	EasyRA RFID Reader Module
2.3. Serial Numbers:	AD19470110
2.4. Description:	Automated clinical chemistry analyzer that accommodates the diverse needs of small laboratories.
2.5. Power Source:	100-240 VAC, 50/60 Hz
2.6. Hardware Revision:	N/A
2.7. Software Revision:	N/A
2.8. Modulation Type:	Pulse Modulation
2.9. Operating Frequencies:	13.56 MHz
2.10. EMC Modifications:	None

3. Product Configuration

3.1. Operational Characteristics & Software

The Medica Corporation EasyRA was configured to transmit continuously to the RFID tags once the control software is configured using the following steps:

1. Power up the EasyRA.
2. Power up the laptop provided by Medica for configuring the test process.
 - a. Select 'Earlier version of windows' to load Windows XP.
3. When prompted, press Ctrl-Alt-Delete to begin.
4. Press 'Enter' for the password.
5. Start the TeraTerm Pro app. Press OK when the Cannot open COM2 error appears.
6. Select Setup>Serial Port.
 - a. Set Port to COM4
 - b. Set Baud rate to 19200.
 - c. Press OK
7. Select Setup>Terminal.
 - a. Set Receive CR+LF
 - b. Set Transmit CR+LF
 - c. Press OK
8. In the Tera Term VT window, enter the following four commands:
 - a. <SYS ALL>
 - b. <VER ALL>
 - c. <REA INV>
 - d. <INV STRT>

Once the fourth command has been entered, the EASYRA will begin operation.

3. Product Configuration (continued)

3.2. EUT Hardware

Manufacturer	Model/Part # / Options	Serial Number	Volts	Freq (Hz)	Description/Function
Medica Corporation	EasyRA RFID Reader Module	AD19470110	100-240	50/60	Automated clinical chemistry analyzer

3.3. EUT Connected Hardware

Manufacturer	Model/Part # / Options	Serial Number	Input Voltage	Freq (Hz)	Description/Function
None					

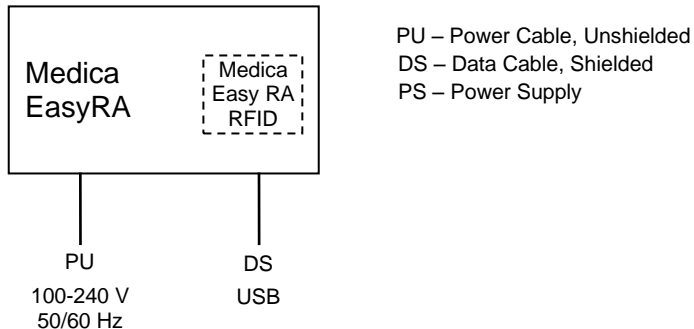
3.4. EUT Cables/Transducers

Cable Type	Length	Shield	From	To
USB	1 Meter	Yes	EasyRA	Unterminated

3.5. Support Equipment

Manufacturer	Model/Part # / Options	Serial Number	Input Voltage	Freq (Hz)	Description/Function
N/A					

3.6. Block Diagram



4. Measurements Parameters

4.1. Measurement Equipment and Software Used to Perform Test

Device	Manufacturer	Model No.	Serial No.	Cal Due	Interval
EMI Test Receiver, 9kHz - 7GHz ¹	Rohde & Schwarz	ESR7	101156	9/10/2020	2 Years
EMI Test Receiver, 10 Hz - 7GHz ¹	Rohde & Schwarz	ESR7	101770	10/3/2020	2 Years
Spectrum Analyzer, 2 Hz to 26.5 GHz ²	Rohde & Schwarz	FSW26	102057	9/13/2020	2 Years
Spectrum Analyzer, 9 kHz to 40 GHz ³	Rohde & Schwarz	FSV40	100899	9/10/2020	2 Years
EMI Receiver 9 kHz - 1 GHz	Hewlett Packard	8546A	3650A00360	9/11/2020	2 Years
Loop Antenna 9 kHz - 30 MHz	EMCO	6512	9309-1139	1/28/2022	3 Years
Biconilog Antenna, 30 MHz - 2 GHz	Sunol Sciences	JB1	A050913	6/5/2022	2 Years
Horn Antenna, 960 MHz to 18 GHz	Electro-Metrics	EM-6961	6337	10/3/2020	2 Years
Horn Antenna, 18 to 40 GHz	Com-Power	AH-840	101032	9/28/2020	2 Years
Preamplifier, 1 GHz to 26.5 GHz	Hewlett Packard	8449B	3008A01323	9/11/2020	2 Years
Digital Barometer	Control Company	4195	ID236	4/3/2020	2 Years
Temperature Chamber ⁴	Associated Environmental	SD-308	10782	CNR	

¹ ESR7 Firmware revision: V3.48, Date installed: 10/17/2019

² FSW26 Firmware revision: V4.30 SP1, Date installed: 02/22/2019

³ FSV40 Firmware revision: V2.30 SP4, Date installed: 05/04/2016

⁴ Used with calibrated measurement equipment.

Previous V3.46 SP1, installed 12/22/2018.

Previous V3.36 SP2, installed 10/26/2018.

Previous V2.30 SP1, installed 10/22/2014.

Manufacturer	Software Description	Title or Model #	Rev.	Report Sections
Compliance Worldwide	Test Report Generation Software	Test Report Generator	1.0	Used to process conducted emissions data

4.2. Measurement & Equipment Setup

Test Dates:	Feb 19 th - Mar 6 th , 2020
Test Engineer:	Brian Breault
Normal Site Temperature (15 - 35°C):	24.0
Relative Humidity (20 -75%RH):	33%
Frequency Range:	10 kHz to 1 GHz
Measurement Distance:	3 Meters
EMI Receiver IF Bandwidth:	200 Hz – 9 kHz to 150 kHz 9 kHz – 150 kHz to 30 MHz 120 kHz - 30 MHz to 1 GHz
EMI Receiver Avg Bandwidth:	≥ 3 * RBW or IF(BW)
Detector Function:	Peak, QP - 10 kHz to 1 GHz Unless otherwise specified.

4. Measurements Parameters (continued)

4.3 Measurement Procedure

The test measurements contained in this report are based on the requirements detailed in FCC Part 15, Subpart C - Intentional Radiators, notably Section 15.225, Operation within the band 13.110 – 14.010 MHz. The test procedures for these measurements are detailed in ANSI C63.10-2013.

5. Choice of Equipment for Test Suits

5.1. Choice of Model

This test report is based on the test samples supplied by the manufacturer and are reported by the manufacturer to be equivalent to the production units.

5.2. Presentation

The test sample was tested complete with all required ancillary equipment. Refer to Section 3 of this report for the product equipment configuration.

5.3. Choice of Operating Frequencies

The transmitter in the unit under test utilizes a single operating frequency at approximately 13.56 MHz

6. Measurement Summary

Test Requirement	FCC Part 15 Reference	RSS Reference	Test Report Section	Result	Comment
Antenna Requirement	15.203	RSS-GEN Section 7.1.2	7.1	Compliant	
Operation within the Band 13.110 MHz – 14.010 MHz (Radiated Field Strength)	15.225 (a), (b), (c)	RSS-210 Section B6	7.2	Compliant	
Spurious Radiated Emissions	15.209		7.3	Compliant	
Operation within the Band 13.110 MHz – 14.010 MHz (Frequency Stability)	15.225 (e)	RSS-210 Section B6	7.4	Compliant	
Occupied Bandwidth/ Lower and Upper Band Edges	15.215(c) C63.10	N/A	7.5	Compliant	
99% Power Bandwidth	N/A	RSS-GEN Section 4.6.1	7.6	Compliant	
Power Line Conducted Emissions	15.207	RSS-GEN Section 7.2.4	7.7	Compliant	
Public Exposure to Radio Frequency Energy Levels.	1.1307 (b)(1)	RSS 102, Issue 5	7.8	Compliant	

7. Measurement Data

7.1. Antenna Requirement (Section 15.203, RSS-GEN 7.1.2)

Requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section.

Status: Compliant - The RFID antenna utilized by the device under test is a PCB antenna contained inside a non-user accessible enclosure.

7. Measurement Data (continued)

7.2. Operation within the Band 13.110 MHz – 14.010 MHz (15.225 (a), (b) and (c))

Radiated Field Strength of Fundamental (15.225 (a), (b) and (c))

- Requirement: (a) The field strength of any emissions within the band 13.553 - 13.567 MHz shall not exceed 15,848 microvolts/meter (84 dBμV/m) at 30 meters.
- (b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter (50.5 dBμV/m) at 30 meters.
- (c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter (40.5 dBμV/m) at 30 meters.

Test Note: Reference ANSI C63.10-2013 sections 5.3.2 and 6.4.4.2. The following formula was used to extrapolate the measurement distance to the limit distance:

$$FS_{\text{limit}} = FS_{\text{max}} - 40 \log \left(\frac{d_{\text{near field}}}{d_{\text{measure}}} \right) - 20 \log \left(\frac{d_{\text{limit}}}{d_{\text{near field}}} \right) \quad \text{Equation 1}$$

FS _{limit} is the calculation of field strength at the limit distance (dBμV/m)	29.09
FS _{max} is the measured field strength, expressed in (dBμV/m QP @ 3M)	50.48
d _{measure} is the distance of the measurement point from the EUT (Meters)	3.52
d _{near field} is the λ / 2p distance (Meters)	3.00
d _{limit} is the reference limit distance (Meters)	30.00

The screen captures on the following pages display the value measured at a distance of 3 meters. This distance value was adjusted to the limit distance using the formula detailed in Equation 1.

Result: Compliant - The fundamental frequency radiated field strength of the device under test complies with the requirements detailed in FCC Part 15.225, Section (a).

The peak field strength of the device under test met the average requirement. For this reason, the quasi-peak field strength was not factored using a duty cycle correction factor.

Freq. (MHz)	Ampl. ¹ (dBμV/m) Peak	Corr. Ampl. ² (dBμV/m) (3M) QP	Corr. Ampl. ² (dBμV/m) (30M) QP	FCC 15.225 Limit (dBμV/m) QP 30M	Margin (dB)	Ant Pos. Par/Per Gnd Par	Ant Height (cm)	Turntable Azimuth (Deg)	Result
13.56	52.55	50.48	29.09	84.00	-54.92	Per	100	284	Compliant

¹ Measurement has been extrapolated from 3 meters to 30 meters using Equation 1 on this page.

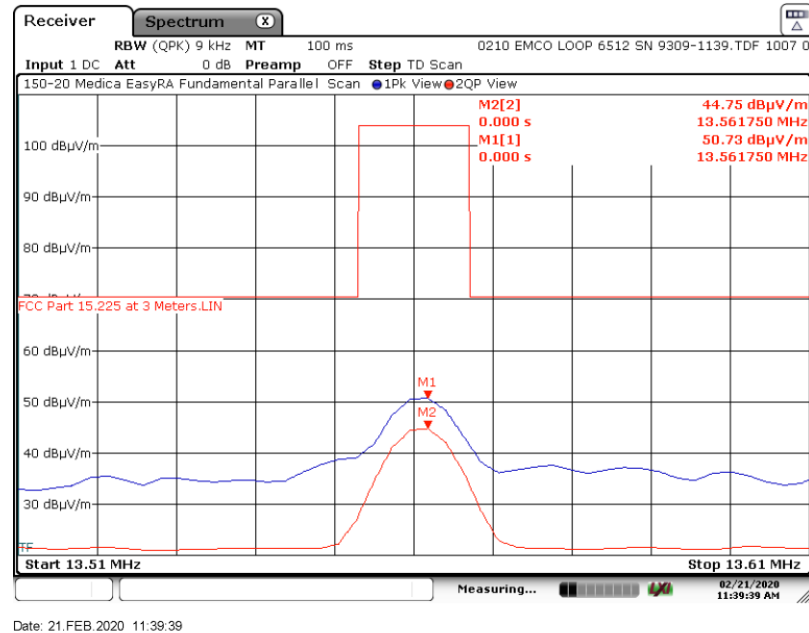
² Analyzer contains Antenna Factor and cable loss tables/transducers to provide corrected values.

7. Measurement Data (continued)

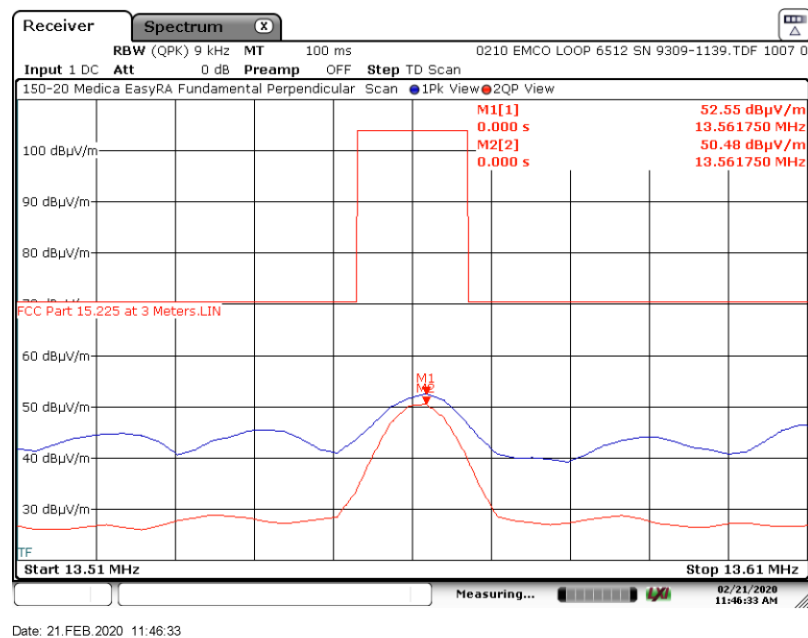
7.2. Operation within the Band 13.110 MHz – 14.010 MHz (15.225 (a), (b) and (c))

Radiated Field Strength of Fundamental (15.225 (a), (b) and (c)) (continued)

7.2.1. Worst Case Field Strength of the Fundamental – Parallel Antenna



7.2.2. Worst Case Field Strength of the Fundamental – Perpendicular Antenna

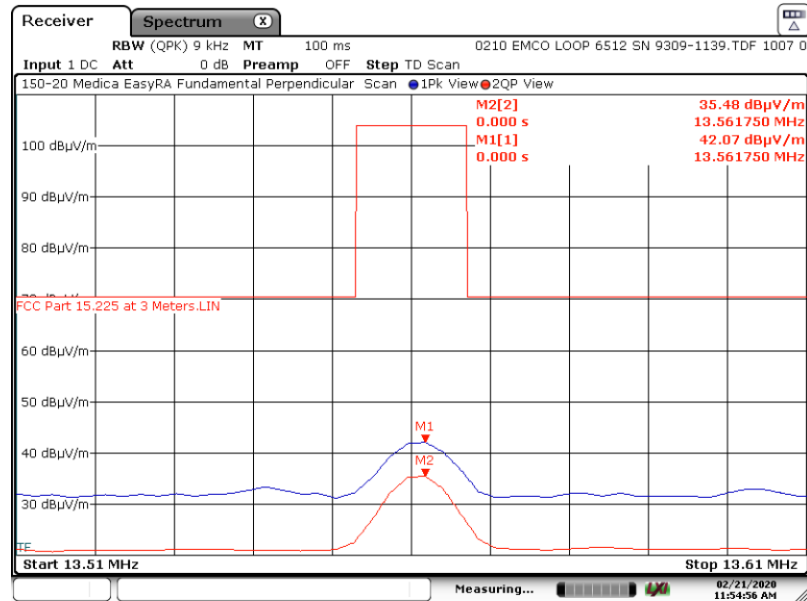


7. Measurement Data (continued)

7.2. Operation within the Band 13.110 MHz – 14.010 MHz (15.225 (a), (b) and (c))

Radiated Field Strength of Fundamental (15.225 (a), (b) and (c)) (continued)

7.2.3. Worst Case Field Strength of the Fundamental – Ground Parallel Antenna



7. Measurement Data (continued)

7.3. Transmitter Spurious Radiated Emissions (15.225 (d), 15.209)

Requirement: The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table (Reference FCC 15.209):

Frequency (MHz)	Field Strength (μV/m)	Meas. Dist. (meters)	Field Strength (dBμV/m)	Distance (Meters)
0.009–0.490	2400/F(kHz)	300	128.5 to 93.8	3
0.490–1.705	24000/F(kHz)	30	73.8 to 63.0	3
1.705–30.0	30	30	69.5	3
30–88	100	3	40	3
88–216	150	3	43.5	3
216–960	200	3	46	3
Above 960	500	3	54	3

¹ Measurements in the 9 to 90 kHz, 110 to 490 kHz and above 1000 MHz ranges employ an average detector. Otherwise a quasi-peak detector is used.

² Extrapolation below 30 MHz is calculated at 40 dB/decade.

Procedure: Test measurements were made in accordance with ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices, Section 6.5.

Test Notes: 1. The marked emissions cursors in scans 7.3.2.1, 7.3.2.2 and 7.3.3.3 are the fundamental frequency for the device under test.

2. The Medica EasyRA RFID module spurious emissions data from 30 MHz to 1 GHz (Section 7.3.3) was tabled and not plotted due to intermittent peak signals generated by the host device. Peak mode plots of this data would have misrepresented the actual RFID module spurious emissions. The host device, including the RFID module, was tested and found to meet the FCC Part 15, Class A requirements.

Results: Compliant - The transmitter installed in the unit under test meet the FCC Part 15.209 emissions requirements.

Measurement Uncertainty

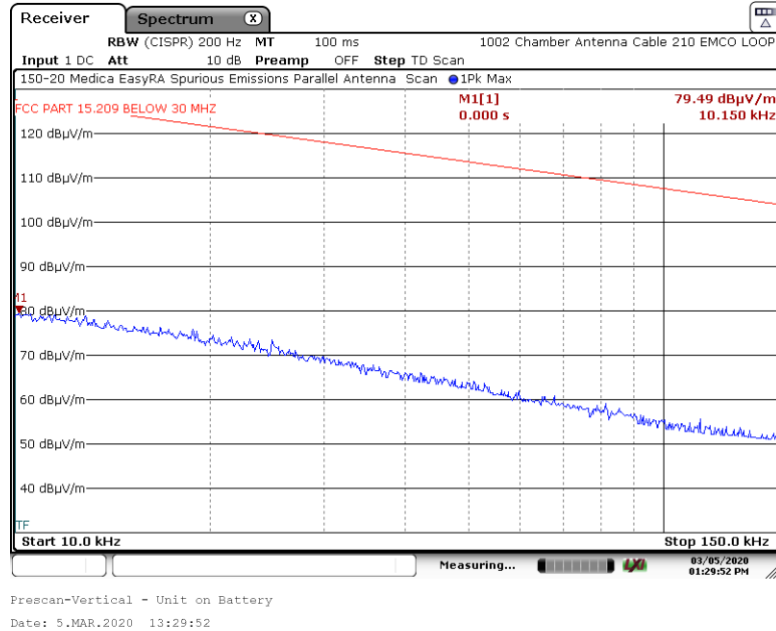
Horizontal Polarized Radiated Emissions	± 4.76 dB
Vertical Polarized Radiated Emissions	± 4.88 dB
Frequency Range:	30 MHz to 200 MHz
Horizontal Polarized Radiated Emissions	± 5.01 dB
Vertical Polarized Radiated Emissions	± 5.00 dB
Frequency Range:	200 MHz to 1000 MHz
Measurement Distance:	3 Meters

7. Measurement Data (continued)

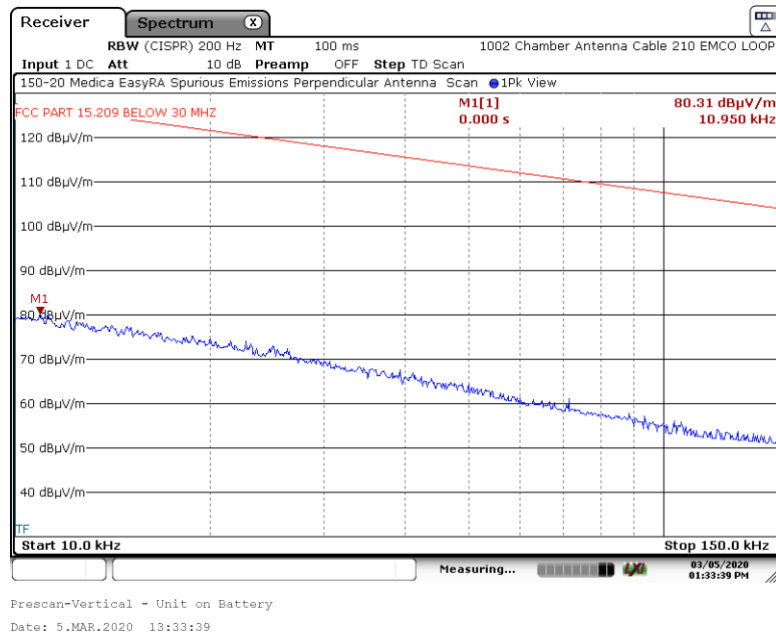
7.3. Spurious Radiated Emissions, 10 kHz to 1 GHz (15.225, § (d), 15.209) (cont'd)

7.3.1. Spurious Radiated Emissions, 10 kHz to 150 kHz Test Results

7.3.1.1. Parallel Antenna



7.3.1.2. Perpendicular Antenna

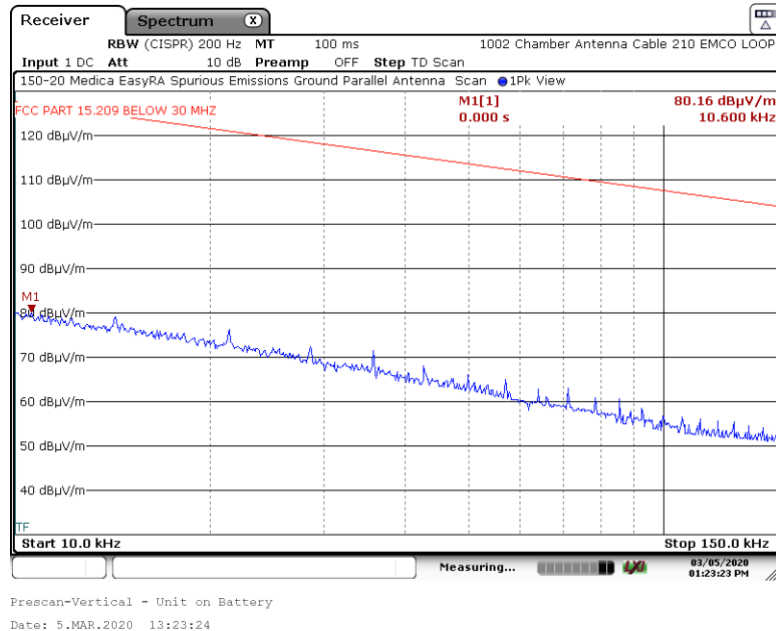


7. Measurement Data (continued)

7.3. Spurious Radiated Emissions, 10 kHz to 1 GHz (15.225, § (d), 15.209) (cont'd)

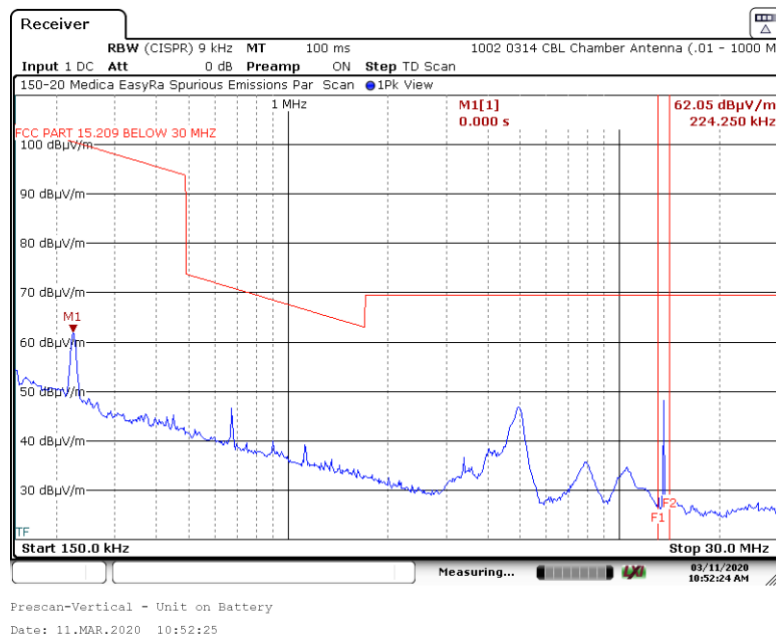
7.3.1. Spurious Radiated Emissions, 10 kHz to 150 kHz Test Results

7.3.1.3. Ground Parallel Antenna



7.3.2. Spurious Radiated Emissions, 150 kHz to 30 MHz Test Results

7.3.2.1. Parallel Antenna

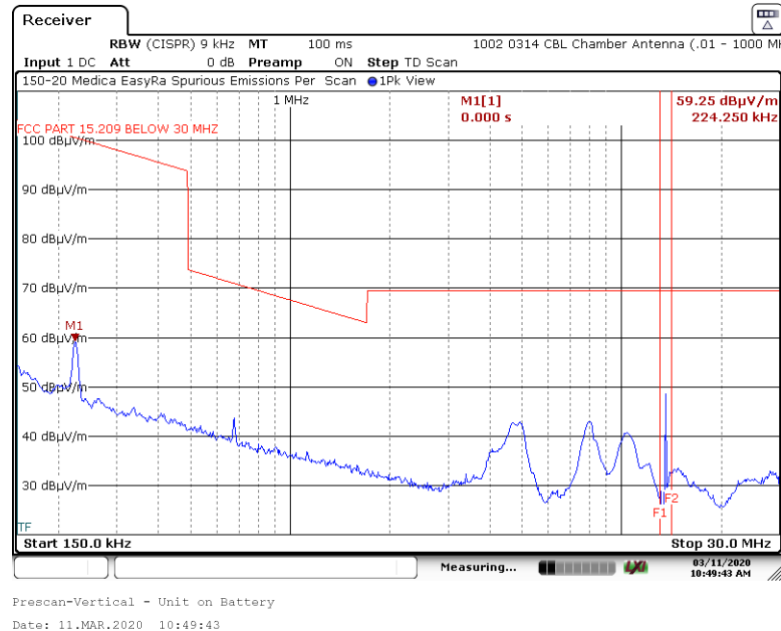


7. Measurement Data (continued)

7.3. Spurious Radiated Emissions, 10 kHz to 1 GHz (15.225, § (d), 15.209) (cont'd)

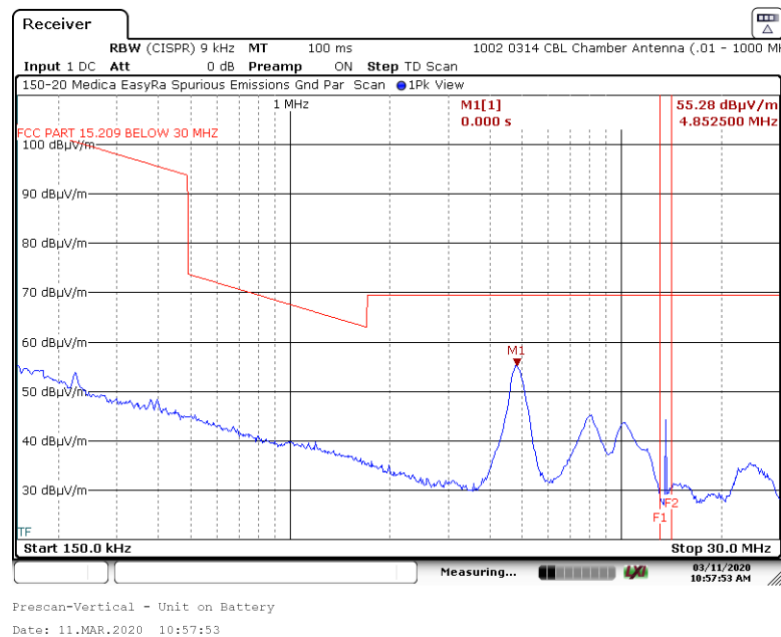
7.3.2. Spurious Radiated Emissions, 150 kHz to 30 MHz Test Results

7.3.2.2. Perpendicular Antenna



7.3.2. Spurious Radiated Emissions, 150 kHz to 30 MHz Test Results

7.3.2.3. Ground Parallel Antenna



7. Measurement Data (continued)

7.3. Spurious Radiated Emissions, 10 kHz to 1 GHz (15.225, § (d), 15.209) (cont'd)

7.3.3. Spurious Radiated Emissions, 30 MHz to 1 GHz Test Results

Notes: The highest operating frequency in the Medica EasyRA is the USB to UART IC which runs at 48 MHz.

Emissions observed above 200 MHz had margins of >6 dB.

Frequency (MHz)	Pk Amp (dBμV/m)	QP Amp (dBμV/m)	QP Limit (dBμV/m)	Margin (dB)	Pol (H/V)	Comments
45.9300	41.04	35.48	40.00	-4.52	V	
46.8900	42.37	36.86	40.00	-3.14	H	
52.6200	41.36	36.60	40.00	-3.40	H	
54.0000	40.60	35.03	40.00	-4.97	V	
68.6100	41.98	36.24	40.00	-3.76	H	
68.8500	38.55	33.31	40.00	-6.69	V	
110.5800	46.56	41.01	43.50	-2.49	H	
131.7900	41.93	39.52	43.50	-3.98	H	
195.9900	44.38	40.88	43.50	-2.62	H	

7.3.4. Worst Case Harmonic Emissions

Frequency (MHz)	Amplitude (dBμV/m)		Limit (dBμV/m)	Margin (dB) Quasi-Peak	Polarity (H/V)	Antenna Height (cm)	Azimuth (Deg.)
	Peak	Quasi Peak	Quasi-Peak				
27.12	37.22	28.56	60.69	-32.13	Gnd Par	100	0
40.68	42.41	36.29	40.00	-3.71	V	100	354
54.24	43.93	36.52	40.00	-3.48	H	351	10
67.80	41.12	35.32	40.00	-4.68	H	250	208
81.36	47.37	36.98	40.00	-3.02	H	335	54
94.92	44.11	41.72	43.50	-43.50	V	108	354
108.48	41.17	37.67	43.50	-5.83	H	278	230
122.04	37.89	33.40	43.50	-10.10	H	236	354
135.60	35.22	30.98	43.50	-12.52	H	221	210

Sample Calculation: Final Result (dBμV/m) = Measurement Value (dBμV) + Antenna Factor (dB/m) + Cable Loss (dB) – Pre-amplifier Gain (dB) Internal or External.

Note: All correction factors are loaded into the measurement instrument prior to testing to determine the final result.

7. Measurement Data (continued)

7.4. Frequency Stability (§ 15.225 (e))

Requirement: The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Test Notes: The size of the host device that houses the device under test exceeds the volume of the site environmental chamber. In order to test the RFID transmitter and antenna assembly, it was necessary to remove the assembly from the host device and test it in the environmental chamber. In order to do this, a custom cable capable of carrying all power and signal lines to the DUT was constructed. By doing so, the DUT was subjected to the required temperature variations while maintaining operational communications with the host device.

The manufacturer's specifications for operating temperature range is 15°C to 30°C (59°F to 86°F). However, the RFID transmitter and antenna assembly was tested from -20°C to +50°C in accordance with FCC Part 15.225 (e).

Result: Compliant - The unit under test complies with the requirements detailed in FCC Part 15.225 (e).

7.4.1. Temperature and Voltage Variation

Temp °C	Supply Voltage	Meas Freq.	Limit			Offset (%)	Result
		(MHz)	F _{MIN} (MHz)	F _{MAX} (MHz)	%		
Ambient (20.1°C)	120 VAC	13.5607809	N/A			N/A	
-20		13.5609054	13.559425	13.562137	± 0.01	0.00091830	Compliant
-10		13.5609093	13.559425	13.562137	± 0.01	0.00094706	Compliant
0		13.5609094	13.559425	13.562137	± 0.01	0.00094755	Compliant
+10		13.5608757	13.559425	13.562137	± 0.01	0.00069929	Compliant
+20		13.5608246	13.559425	13.562137	± 0.01	0.00032199	Compliant
+30		13.5607747	13.559425	13.562137	± 0.01	0.0004597	Compliant
+40		13.5607237	13.559425	13.562137	± 0.01	0.00042180	Compliant
+50		13.5606868	13.559425	13.562137	± 0.01	0.00069365	Compliant
+20	102 VAC	13.5608064	13.559553	13.562265	± 0.01	0.00075902	Compliant
	138 VAC	13.5608187	13.559553	13.562265	± 0.01	0.00066832	Compliant

7. Measurement Data (continued)

7.5. Occupied Bandwidth (Section 15.215 (c) and ANSI C63.10, Section 6.9)

Requirement: Intentional radiators operating under the alternative provisions to the general emission limits, as contained in Sections 15.217 through 15.255 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule. The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW

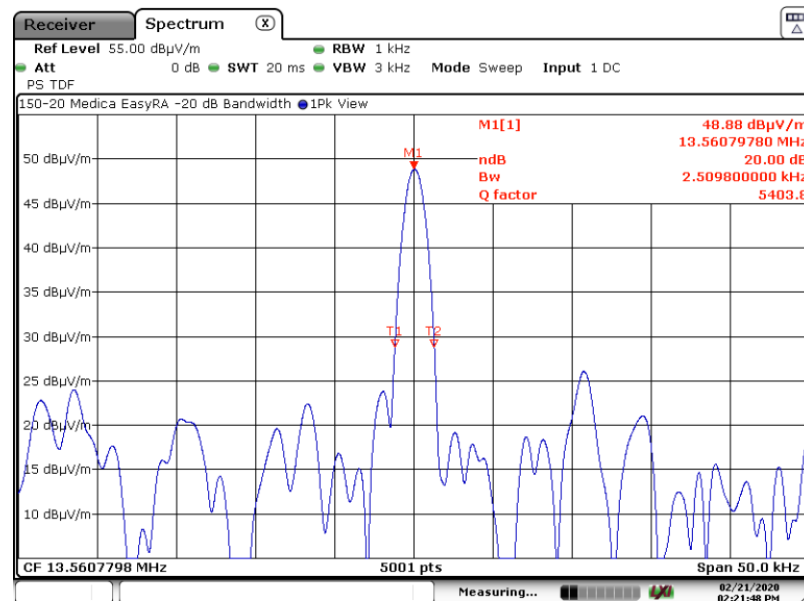
Frequency Band: $F_{MIN} = 13.110 \text{ MHz}$

$F_{MAX} = 14.010 \text{ MHz}$

Result: Compliant.

-20 dB Frequency Measured		Lower & Upper Band Edge		Result
(F _{LO} & F _{HI})		(F _{MIN} & F _{Max})		
MHz		MHz		
F _{LO}	13.5595	F _{MIN}	13.11	Compliant (F _{LO} > F _{MIN})
F _{HI}	13.5621	F _{MAX}	14.01	Compliant (F _{HI} < F _{Max})

7.5.1. Plot of 20 dB Bandwidth vs. Frequency Band



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7. Measurement Data (continued)

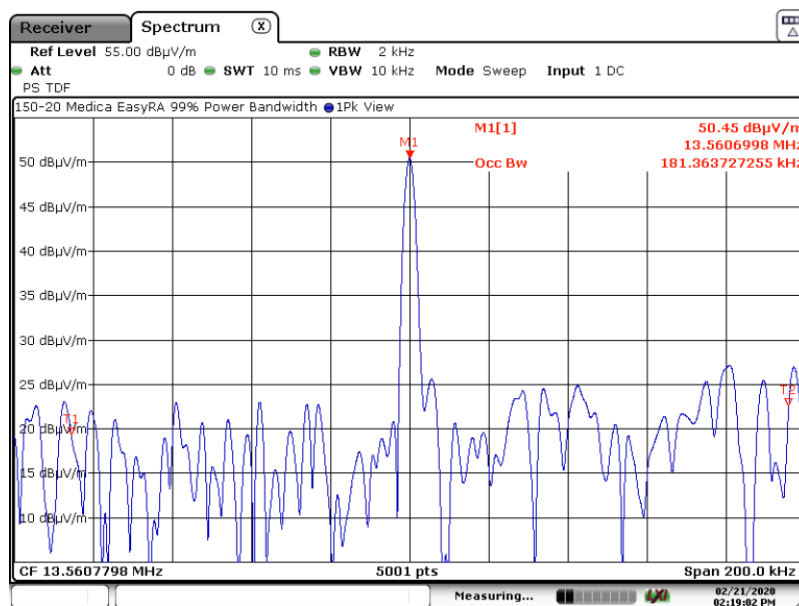
7.6. 99% Power Bandwidth (RSS-GEN Section 4.6.1)

Requirement: When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual.

Procedure: This test was performed utilizing the automated 99% bandwidth function of the spectrum analyzer.

Frequency (MHz)	99% Power Bandwidth (kHz)
13.561	181.364



Date: 21.FEB.2020 14:19:01

7. Measurement Data (continued)

7.7. Power Line Conducted Emissions (FCC Part 15.207)

Requirement: For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

Frequency Range (MHz)	Limits (dB μ V)	
	Quasi-Peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5.0	56	46
5.0 to 30.0	60	50

* Decreases with the logarithm of the frequency.

Measurement Uncertainty ± 3.56 dB

Procedure: Test measurements were made in accordance with ANSI C63.10-2013, Section 6.2: Standard test method for ac power-line conducted emissions from unlicensed wireless devices.

Results: The device under test meets the FCC Part 15.207 conducted emissions requirements.

Sample Calculation: Final Result (dB μ V) = Measurement Value (dB μ V) + LISN Factor (dB) + Cable Loss (dB).

Note: All correction factors are loaded into the measurement instrument prior to testing to determine the final result

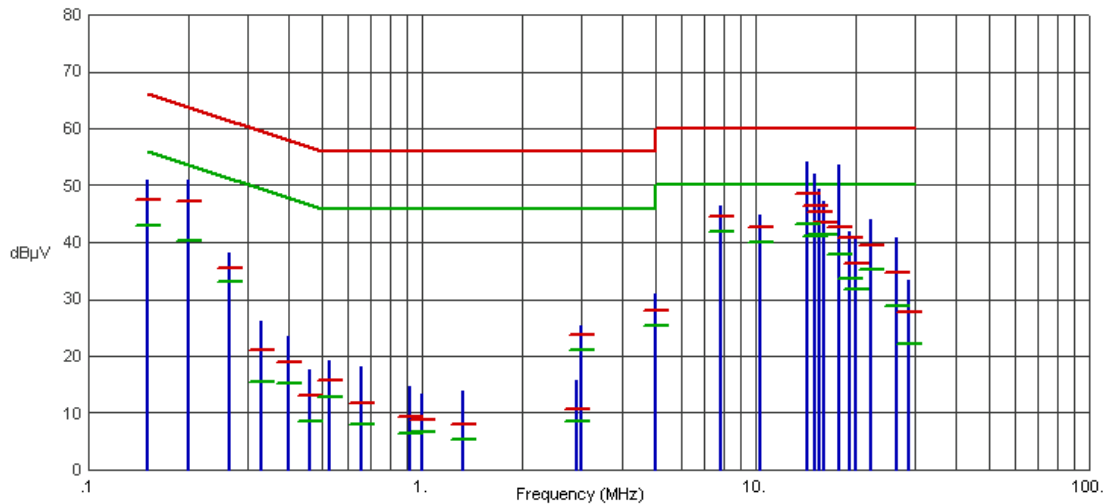
7. Conducted Emissions Test Results

7.7. Power Line Conducted Emissions (15.207)

7.7.1. 120 Volts, 60 Hz Phase

Test No.: 150-20, 120 Volts, 60 Hz Phase

FCC Part 15.207



Frequency (MHz)	Pk Amp (dBμV)	QP Amp (dBμV)	QP Limit (dBμV)	QP Margin (dB)	Avg Amp (dBμV)	Avg Limit (dBμV)	Avg Margin (dB)	Comments
.1500	50.93	47.49	66.00	-18.51	42.90	56.00	-13.10	
.1995	50.97	47.29	63.63	-16.34	40.23	53.63	-13.40	
.2648	38.06	35.57	61.28	-25.71	33.08	51.28	-18.20	
.3300	26.04	21.19	59.45	-38.26	15.60	49.45	-33.85	
.3975	23.50	19.03	57.91	-38.88	15.08	47.91	-32.83	
.4628	17.49	13.03	56.64	-43.61	8.66	46.64	-37.98	
.5280	19.32	15.85	56.00	-40.15	12.93	46.00	-33.07	
.6608	18.14	11.81	56.00	-44.19	8.10	46.00	-37.90	
.9240	14.59	9.45	56.00	-46.55	6.49	46.00	-39.51	
1.0050	13.35	8.67	56.00	-47.33	6.64	46.00	-39.36	
1.3223	13.99	8.06	56.00	-47.94	5.27	46.00	-40.73	
2.9220	15.86	10.71	56.00	-45.29	8.56	46.00	-37.44	
2.9963	25.32	23.79	56.00	-32.21	21.17	46.00	-24.83	
5.0033	30.81	28.02	60.00	-31.98	25.37	50.00	-24.63	
7.8855	46.40	44.59	60.00	-15.41	41.82	50.00	-8.18	
10.3560	44.76	42.70	60.00	-17.30	39.92	50.00	-10.08	
14.2868	54.02	48.55	60.00	-11.45	43.22	50.00	-6.78	
15.0720	51.90	46.36	60.00	-13.64	40.97	50.00	-9.03	
15.4928	49.46	45.29	60.00	-14.71	41.32	50.00	-8.68	
16.0845	47.22	43.52	60.00	-16.48	41.29	50.00	-8.71	
17.6955	53.51	42.64	60.00	-17.36	37.82	50.00	-12.18	
19.0658	41.94	40.76	60.00	-19.24	33.65	50.00	-16.35	
19.8870	41.16	36.21	60.00	-23.79	31.73	50.00	-18.27	
22.1888	43.90	39.54	60.00	-20.46	35.10	50.00	-14.90	
26.5470	40.75	34.57	60.00	-25.43	28.91	50.00	-21.09	
28.8645	33.22	27.66	60.00	-32.34	22.04	50.00	-27.96	

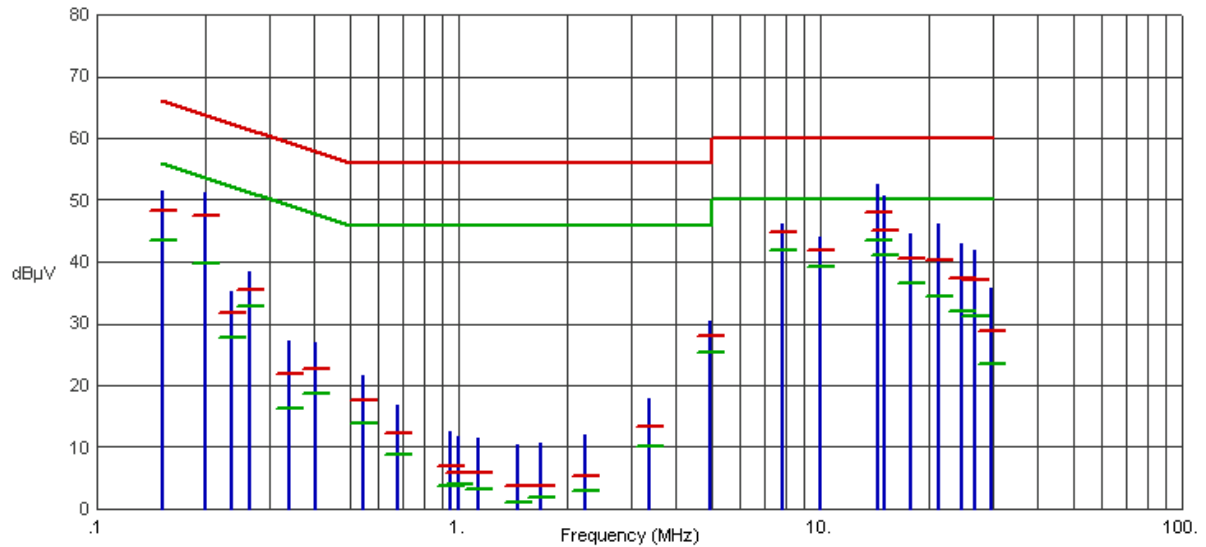
7. Conducted Emissions Test Results

7.7. Power Line Conducted Emissions (15.207)

7.7.2. 120 Volts, 60 Hz Neutral

Test No.: 150-20, 120 Volts, 60 Hz Neutral

FCC Part 15.207



Frequency (MHz)	Pk Amp (dBμV)	QP Amp (dBμV)	QP Limit (dBμV)	QP Margin (dB)	Avg Amp (dBμV)	Avg Limit (dBμV)	Avg Margin (dB)	Comments
.1523	51.44	48.23	65.87	-17.64	43.41	55.87	-12.46	
.1995	51.11	47.34	63.63	-16.29	39.73	53.63	-13.90	
.2355	35.07	31.82	62.25	-30.43	27.85	52.25	-24.40	
.2648	38.39	35.54	61.28	-25.74	32.67	51.28	-18.61	
.3390	27.28	21.87	59.23	-37.36	16.37	49.23	-32.86	
.4043	26.93	22.76	57.76	-35.00	18.61	47.76	-29.15	
.5438	21.48	17.67	56.00	-38.33	13.87	46.00	-32.13	
.6765	16.87	12.30	56.00	-43.70	8.93	46.00	-37.07	
.9510	12.50	6.91	56.00	-49.09	3.67	46.00	-42.33	
1.0050	11.75	5.99	56.00	-50.01	4.13	46.00	-41.87	
1.1288	11.37	5.78	56.00	-50.22	3.19	46.00	-42.81	
1.4573	10.37	3.76	56.00	-52.24	.96	46.00	-45.04	
1.6823	10.61	3.70	56.00	-52.30	1.81	46.00	-44.19	
2.2425	11.93	5.46	56.00	-50.54	2.94	46.00	-43.06	
3.3810	17.97	13.33	56.00	-42.67	10.05	46.00	-35.95	
4.9808	30.36	28.05	56.00	-27.95	25.44	46.00	-20.56	
7.8878	46.18	44.71	60.00	-15.29	41.97	50.00	-8.03	
10.0140	43.91	41.74	60.00	-18.26	39.15	50.00	-10.85	
14.4218	52.59	48.00	60.00	-12.00	43.37	50.00	-6.63	
15.0180	50.55	45.09	60.00	-14.91	41.05	50.00	-8.95	
17.6933	44.63	40.62	60.00	-19.38	36.51	50.00	-13.49	
21.2460	46.02	40.37	60.00	-19.63	34.39	50.00	-15.61	
24.4883	42.84	37.43	60.00	-22.57	32.07	50.00	-17.93	
26.8035	41.76	37.11	60.00	-22.89	31.13	50.00	-18.87	
29.8028	35.65	28.80	60.00	-31.20	23.51	50.00	-26.49	

7. Measurement Data (continued)

7.8. Public Exposure to Radio Frequency Energy Levels ((FCC KDB 447498 D01 v06, 1.1307 (b)(1), 2.1091(b)) RSS-GEN, RSS 102, Issue 5

7.8.1 SAR Test Exclusion (FCC KDB 447498 D01 v06, Clause 4.3.1.c)2))

Frequency (MHz)	MPE Distance (mm)	DUT Output Power (mW)	SAR Test Exclusion (mW)	Result
	(1)	(2)	(3)	
13.56	≤50	0.00003373	442.9735	Compliant

- (1) FCC KDB 447498 D01 v06, Clause 4.3.1.(c)(2)
- (2) Converted from 3M field strength measurement ($FS_{(dB\mu V/m)} - 95.2$)
Reference Section 7.2, Measured Field Strength
- (3) $\frac{1}{2}(1 + \log(100/f_{(MHz)}))$
Formula detailed in KDB 447498 D01 v06, Clause 4.3.1.(c)(2)

7.8.2 Exemption Limits for Routine Evaluation – SAR Evaluation (RSS-102 Clause 2.5.1)

Frequency (MHz)	MPE Distance (mm)	DUT Output Power (mW)	SAR Test Exclusion (mW)	Result
	(1)	(2)	(3)	
13.56	≤5 mm	0.00003373	71	Compliant

- (1) RSS-102, Clause 2.5.1
- (2) Converted from 3M field strength measurement ($FS_{(dB\mu V/m)} - 95.2$)
Reference Section 7.2, Measured Field Strength
- (3) RSS-102, Clause 2.5.1, Table 1 $1 \leq 300$ MHz = 71 mW at ≤ 5 mm

8. Test Setup Photographs

8.1. Radiated Emissions Front View



8. Test Setup Photographs

8.2. Radiated Emissions Rear View – Fundamental & Spurious Emissions < 30 MHz



8. Test Setup Photographs

8.3. Radiated Emissions Rear View Emissions > 30 MHz



8. Test Setup Photographs

8.4. Radiated Emissions Rear View Voltage Stability



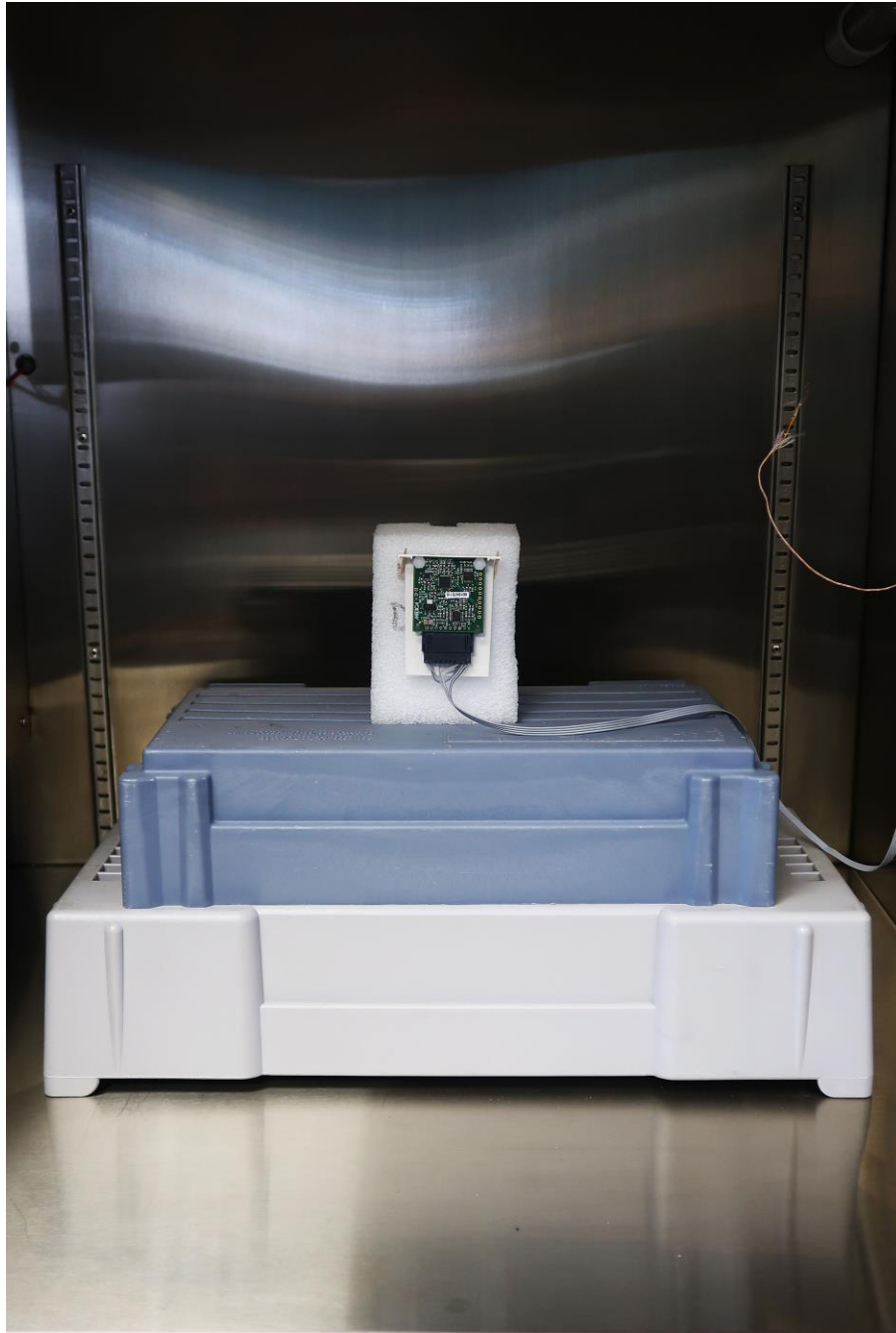
8. Test Setup Photographs

8.5. Frequency Stability – Setup



8. Test Setup Photographs

8.6. Frequency Stability – Device Under Test



8. Test Setup Photographs

8.8. Power Line Conducted Emissions – Back



9. Test Site Description

Compliance Worldwide is located at 357 Main Street in Sandown, New Hampshire. The test sites at Compliance Worldwide are used for conducted and radiated emissions testing in accordance with the Federal Communications Commission (FCC) and Industry Canada standards. Through our American Association for Laboratory Accreditation (A2LA) ISO Guide 17025 Accreditation our test sites are designated with the FCC (designation number **US1091**), Industry Canada (file number **IC 3023A-1**) and VCCI (Member number 3168) under registration number A-0274.

Compliance Worldwide is also designated as a Phase 1 CAB under APEC-MRA (US0132) for Australia/New Zealand AS/NZS CISPR 32, Chinese-Taipei (Taiwan) BSMI CNS 13438 and Korea (RRA) KN 11, KN 13, KN 14-1, KN 22, KN 32, KN 61000-6-3, KN 61000-6-4.

The radiated emissions test site is a 3 and 10 meter enclosed open area test site (OATS). Personnel, support equipment and test equipment are located in the basement beneath the OATS ground plane.

The conducted emissions site is part of a 16' x 20' x 12' ferrite tile chamber and uses one of the walls for the vertical ground plane. A second conducted emissions site is also located in the basement of the OATS site with a 2.3 x 2.5 meter ground plane and a 2.4 x 2.4 meter vertical wall.

The radiated emissions test site for measurements above 1GHz is a 3 Meter open area test site (OATS) with a 3.6 by 3.6 meter anechoic absorber floor patch to achieve a quasi-free space measurement environment per ANSI C63.4/C63.10 and CISPR 16-1-4 standards.

The sites are designed to test products or systems 1.5 meters W x 1.5 meters L x 2.0 meters H, floor standing or table top.