FCC / ISED RSE Report

FOR:

FARPOINTE DATA INC.

Model Name:

WRT-2M

Product Description:

Secure Entry Access Transmitter

FCC ID: T8I-RANGER2
IC ID: 6504A-RANGER

Applied Rules and Standards:
47 CFR Part: 15.231
RSS-210 & RSS-Gen Issue 5

REPORT #: EMC_FARPO_002_19001_15.231

DATE: 2019-06-11

A2LA Accredited

IC recognized # 3462B-1

***CETECOM* Inc.**
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1 Assessment

The following device was evaluated against the applicable RSE criteria specified in FCC rules Parts 15.231 of Title 47 of the Code of Federal Regulations and the relevant ISED Canada standard RSS-210 & RSS-Gen Issue 5.

No deviations were ascertained.

Company	Description	Model #
FARPOINTE DATA INC.	Secure Entry Access Transmitter	WRT-2M

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2019-05-07	Compliance	Cindi Li (Lab Manager)	Cindy Li Digitally signed by Cindy Li DN: cn=Cindy Li, o=Cetecom Inc., ou=EMC, email=cindy.li@cetecom.com, c=US Date: 2019.06.12 12:04:07 -07'00'

Responsible for the Report:

Date	Section	Name	Signature
2019-05-07	Compliance	Kris Lazarov (Senior EMC Engineer)	Digitally signed by Kris Lazarov Date: 2019.06.12 12:00:48 -07'00'

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Compliance Manager:	Cindi Li
Responsible Project Leader:	Kris Lazarov

2.2 Identification of the Client

Applicant's Name:	FARPOINTE DATA INC.
Street Address:	2195 Zanker Rd
City/Zip Code	San Jose, CA 95131
Country	USA

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as applicant
Manufacturers Address:	
City/Zip Code	
Country	

3 Equipment Under Test (EUT)

3.1 EUT Specifications

Model No:	WRT-2M
HW Version :	04811-001
SW Version :	02206-001
FCC-ID :	T8I-RANGER2
IC-ID:	6504A-RANGER
FVIN:	02206-001
HVIN:	WRT-2M
PMN:	WRT-2M
Product Description:	Secure Entry Access Transmitter
Frequency Range / number of channels:	Button press: 433 MHz
Type(s) of Modulation:	ASK
Modes of Operation:	Transmit two packets upon keypress, Off
Antenna Information as declared:	Internal PCB
Power Supply/ Rated Operating Voltage Range:	Vmin: 2.7 VDC/ Vnom: 3 VDC / Vmax: 3.3VDC
Operating Temperature Range	-40 ºC to 50 ºC
Other Radios included in the device:	N/A
Sample Revision	☐Prototype Unit; ■Production Unit; ☐Pre-Production

3.2 EUT Sample details

EUT #	Serial Number	HW Version	SW Version	Notes/Comments
1	PIC16LF1503-I/ST	04811-001	02206-001	Radiated Measurements

3.3 Test Sample Configuration

Set-up #	EUT / AE used for set-up	Comments
1	EUT #1	Normal Battery

3.4 Mode of Operation

Mode of Operation #	Description	Comments
1	CM	Continuous modulated transmission triggered manually

3.5 Justification for Worst Case Mode of Operation

During the testing process, the EUT was tested with transmitter sets on low and high channels, and highest possible duty cycle. For radiated measurements, all data in this report shows the worst case between horizontal and vertical antenna polarizations and for all orientations of the EUT.

3.6 Duty Cycle Correction Factor

This transmitter uses ASK modulation. 169 bits are transmitted in each packet, and the “on” time for each bit is 125 usec. The resulting “on” time per packet is 21.1 ms. The transmitted packets are limited to one packet in a 200 ms period. The transmitter duty cycle over a 100 ms time period is therefore 21.1/100 = 21.1%.

Calculating the allowed duty cycle correction factor as given in §15.35(c): 20*log10(21.1/100) = -13.5dB

This transmitter therefore qualifies for 13.5 dB duty cycle correction factor allowed per §15.35(c).

4 Subject of Investigation

The objective of the measurements done by CETECOM Inc. was to assess the RSE performance of the EUT according to the relevant requirements specified in FCC rules Part 15.231 of Title 47 of the Code of Federal Regulations and Radio Standard Specification RSS-210 & RSS-Gen Issue 5 of ISED Canada.

This test report is to support a request for FCC/ISED Class 2 Permissive change under the FCC ID: T8I-RANGER2, and IC ID: 6504A-RANGER

5 Measurement Results Summary

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	NA	NP	Result
§15.231(c) RSS-210 A1.1.3	Emission Bandwidth	Nominal	ASK FSK	☐	☐	■	See Note 2
§15.231(b) RSS-210 A1.1	Field strength	Nominal	ASK FSK	☐	☐	■	See Note 2
§15.231(b); §15.205 RSS-210 A1.1	TX Spurious emissions-Radiated	Nominal	ASK FSK	■	☐	☐	Complies
§15.231(a,2) RSS Gen 210 A1.1.1	5 s Periodic Operation	Nominal	Auto/Manual Trigger	☐	☐	■	See Note 2
§2.1055; RSS-133 6.3	Frequency Stability	Extreme	CW	☐	☐	■	See Note 2
§15.207(a) RSS Gen 8.8	AC Conducted Emissions	Nominal	NA	☐	■	☐	See Note 3

Note1: NA= Not Applicable; NP= Not Performed.
Note2: This evaluation is only for the radiated spurious emissions in regard to FCC/ISED Class 2 Permissive change
Note3: This device does not connect to AC network; hence the test is not applicable.

6 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus, with 95% confidence interval (in dB delta to result), based on a coverage factor k=1.

Radiated measurement

9 kHz to 30 MHz	±2.5 dB (Magnetic Loop Antenna)
30 MHz to 1000 MHz	±2.0 dB (Biconilog Antenna)
1 GHz to 40 GHz	±2.3 dB (Horn Antenna)

Conducted measurement

150 kHz to 30 MHz	±0.7 dB (LISN)

RF conducted measurement	±0.5 dB

According to TR 102 273 a multiplicative propagation of error is assumed for RF measurement systems. For this reason the RMS method is applied to dB values and not to linear values as appropriate for additive propagation of error. Also used: http://physics.nist.gov/cuu/Uncertainty/typeb.html. The above calculated uncertainties apply to direct application of the Substitution method. The Substitution method is always used when the EUT comes closer than 3 dB to the limit.

6.1 Environmental Conditions During Testing:

The following environmental conditions were maintained during the course of testing:

- Ambient Temperature: 20-25° C
- Relative humidity: 40-60%

6.2 Dates of Testing:

06/03/2019 - 06/08/2019

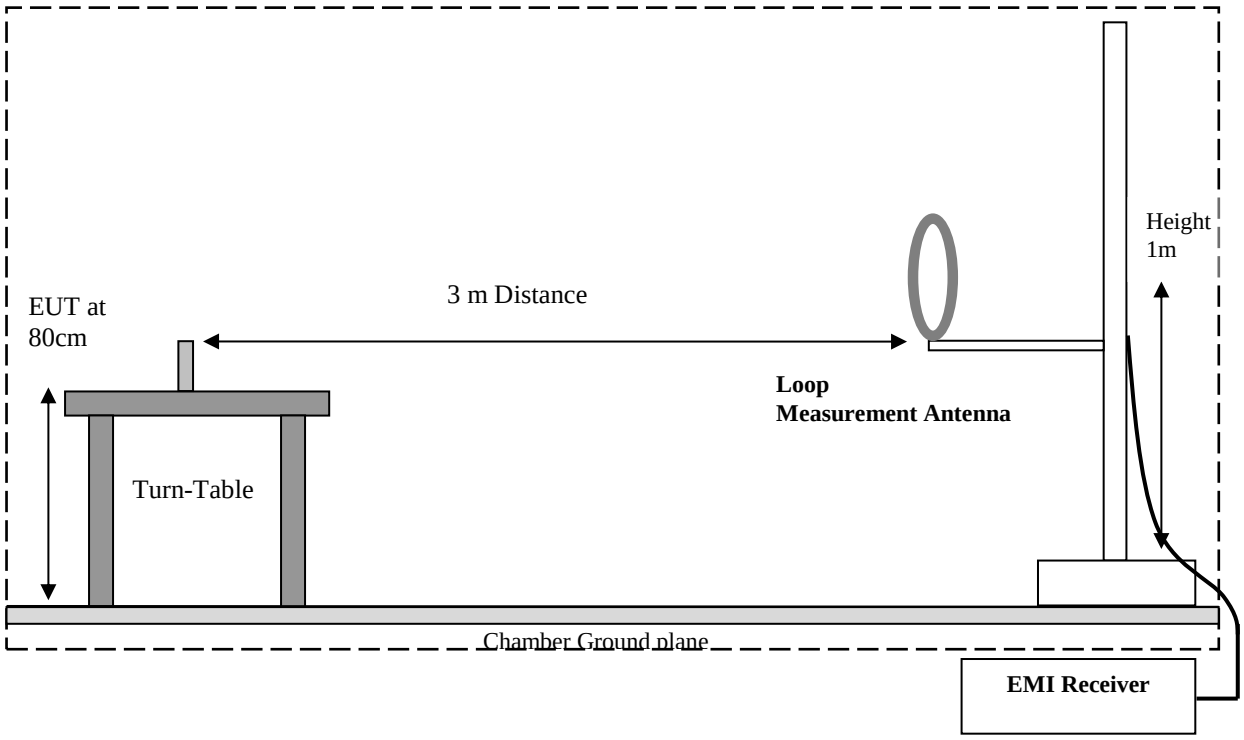
7 Measurement Procedures

7.1 Radiated Measurement

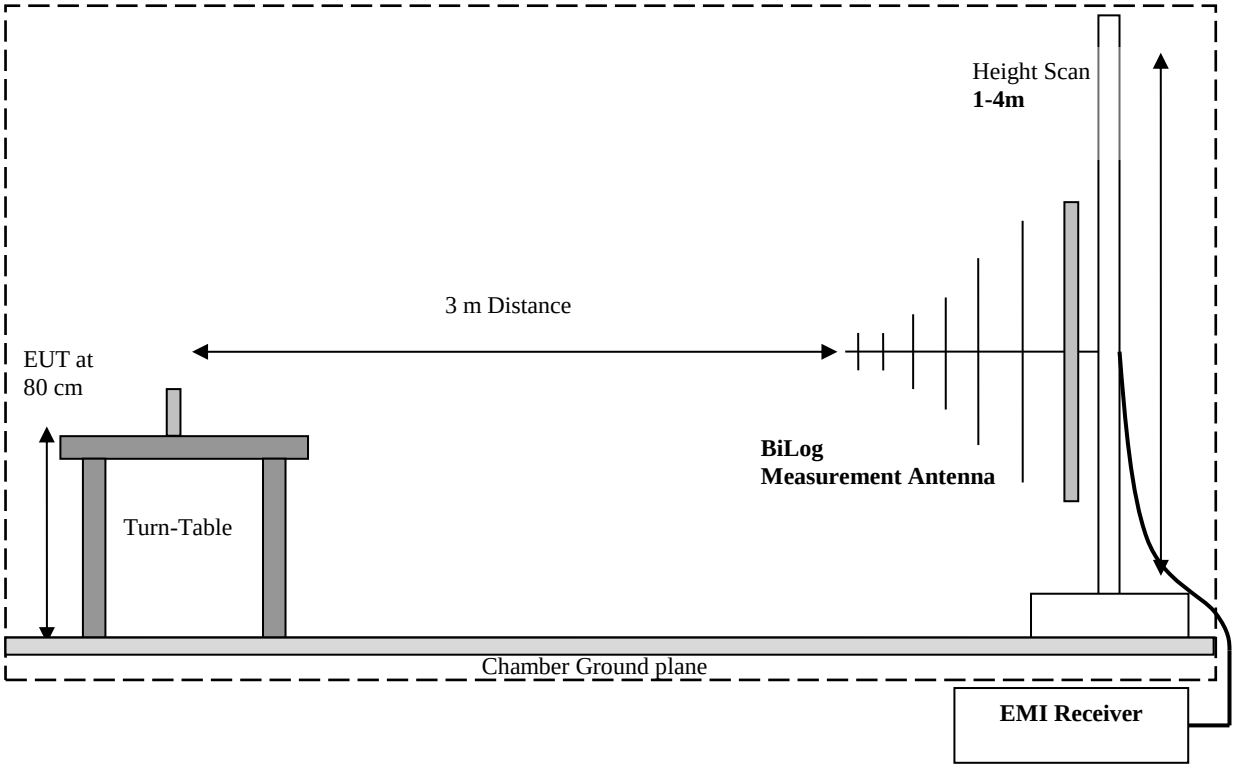
The radiated measurement is performed according to ANSI C63.10 (2013)

- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to cover the 3 orthogonal axis of the EUT. A max peak detector is utilized during the exploratory measurement. The Test-SW creates an overall maximum trace for all 12 sweeps and saves the settings for each point of this trace. The maximum trace is part of the test report.
- The 10 highest emissions are selected with an automatic algorithm of EMC32 searching for peaks in the noise floor and ensuring that broadband signals are not selected multiple times.
- The maxima are then put through the final measurement and again maximized in a 90deg range of the turntable, fine search in frequency domain and height scan between 1m and 4m.
- The above procedure is repeated for all possible ways of power supply to EUT and for all supported modulations.
- In case there are no emissions above noise floor level only the maximum trace is reported as described above.
- The results are split up into up to 4 frequency ranges due to antenna bandwidth restrictions. A magnetic loop is used from 9 kHz to 30 MHz, a Biconilog antenna is used from 30 MHz to 1 GHz, and two different horn antennas are used to cover frequencies up to 40 GHz.

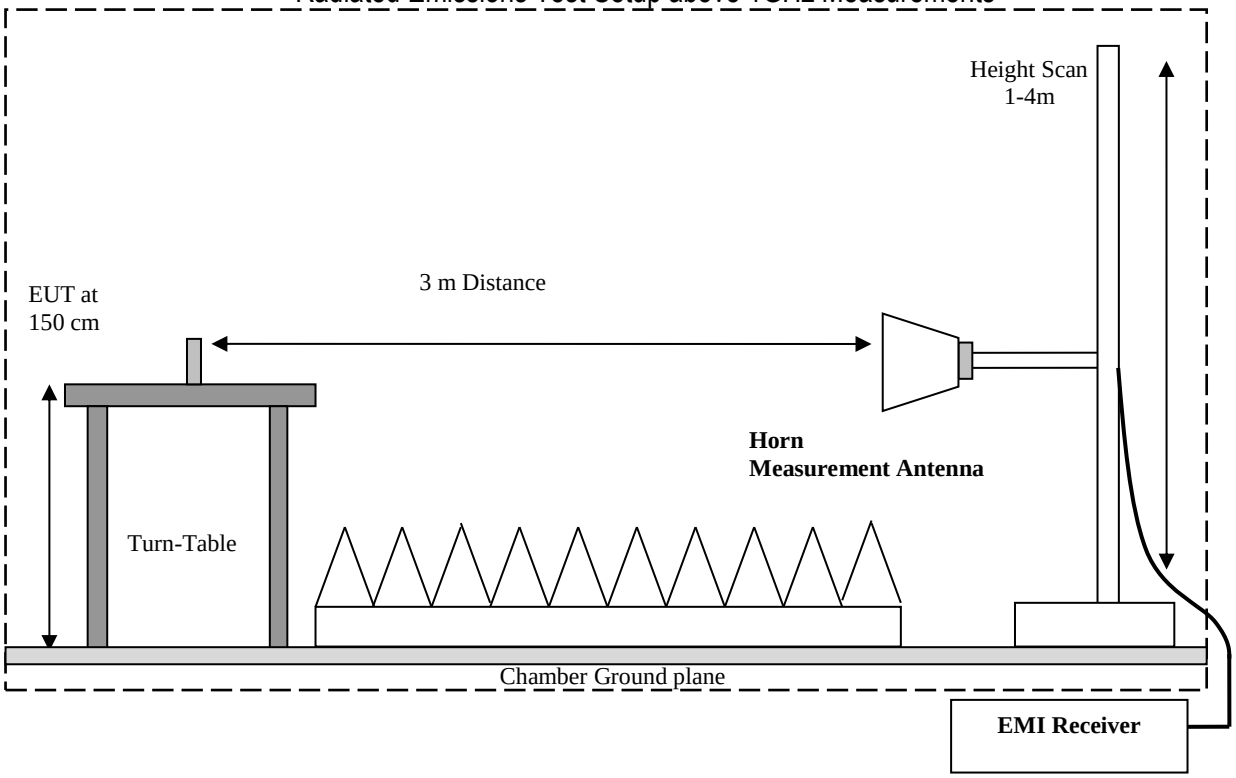
Radiated Emissions Test Setup below 30MHz Measurements



Radiated Emissions Test Setup 30MHz-1GHz Measurements



Radiated Emissions Test Setup above 1GHz Measurements



7.1.1 Sample Calculations for Field Strength Measurements

Field Strength is calculated from the Spectrum Analyzer/ Receiver readings, taking into account the following parameters:

1. Measured reading in dBµV
2. Cable Loss between the receiving antenna and SA in dB and
3. Antenna Factor in dB/m

All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the following equation:

FS (dBµV/m) = Measured Value on SA (dBµV) + Cable Loss (dB) + Antenna Factor (dB/m)

Example:

Frequency (MHz)	Measured SA (dBµV)	Cable Loss (dB)	Antenna Factor Correction (dB/m)	Field Strength Result (dBµV/m)
1000	80.5	3.5	14	98.0

7.2 Radiated Transmitter Spurious Emissions and Restricted Bands

7.2.1 Measurement according to ANSI C63.10 (2013)

Spectrum Analyzer Settings:

- Frequency = 9 KHz – 30 MHz
- RBW = 9 KHz
- Detector: Peak

- Frequency = 30 MHz – 1 GHz
- Detector = Peak / Quasi-Peak
- RBW= 120 KHz (<1GHz)

- Frequency > 1 GHz
- Detector = Peak / Average
- RBW = 1 MHz

- Radiated spurious emissions shall be measured for the transmit frequencies, transmit power, and data rate for the lowest, middle and highest channel in each frequency band of operation and for the highest gain antenna for each antenna type, and using the appropriate parameters and test requirements.
- The highest (or worst-case) data rate shall be recorded for each measurement.
- For testing at distance other than the specified in the standard, the limit conversion is calculated by using 40 dB/decade extrapolation factor as follow: Conversion factor (CF) = 40 log (D/d) = 40 log (300m / 3m) = 80dB

7.2.2 Limits:

- §15.231(b) and RSS 210 A1.1: 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

- FCC §15.205 & RSS-Gen 8.10: 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	Above 38.6
13.36-13.41			

- Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209 (see §15.205(b)).

7.2.3 Test conditions and setup:

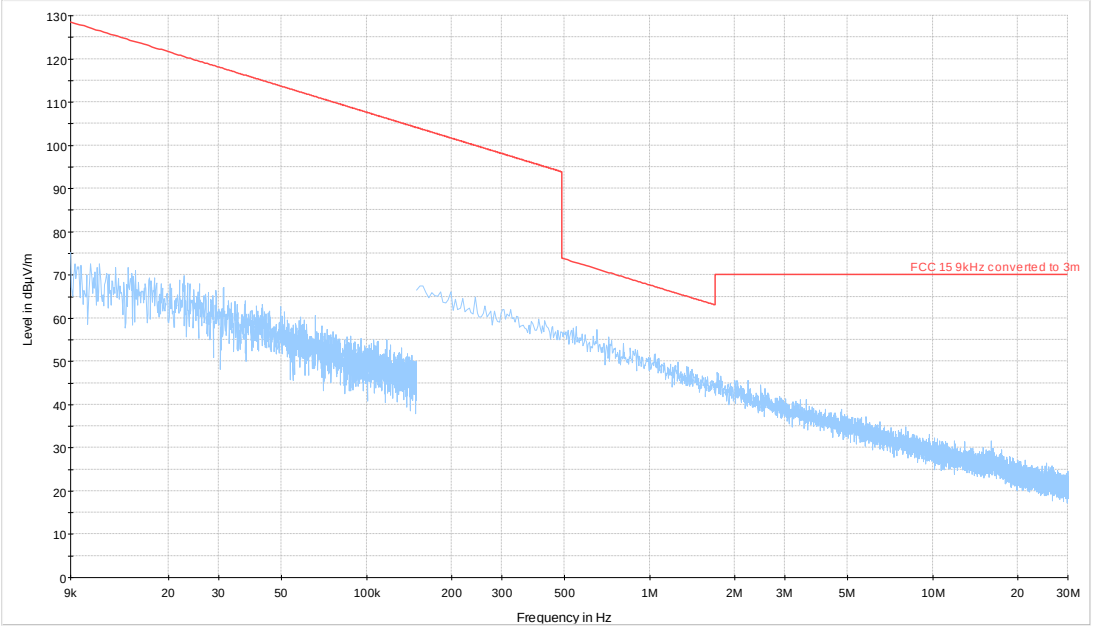
Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
23° C	1	433.92 MHz	3 V Battery

7.2.4 Measurement result:

Plot #	Frequency (MHz)	Modulation	Scan Frequency	Limit	Result
1-8	433.92	ASK	9 kHz – 18 GHz	See section 7.2..2	Pass

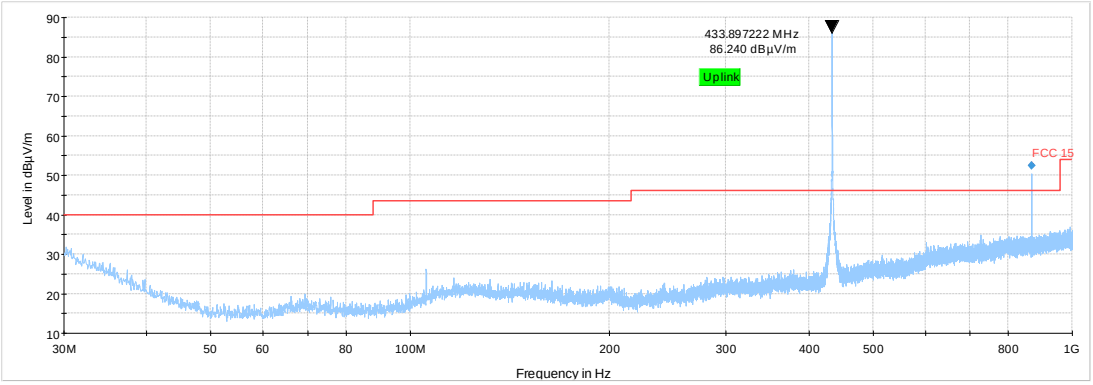
Note 1: The second harmonic field strength results were corrected for the maximum duty cycle of 21.1% for the device by applying an offset of -13.5 dB calculated using the following formula: 20 * log (Duty Cycle) = 20 * log(21.1/100) = (-13.5 dB)

Plot # 1 Radiated Emissions: 9 KHz – 30 MHz		
Modulation: ASK	**Fundamental @ 433.92 MHz**	**EUT Horizontal**



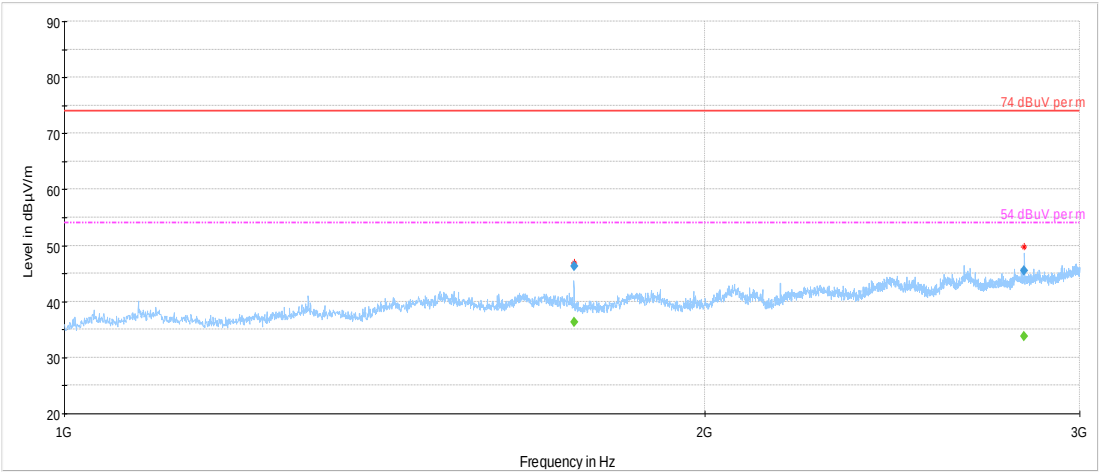
Plot # 2 Radiated Emissions: 30 MHz – 1GHz		
Modulation: ASK	**Fundamental @ 433.92 MHz**	**EUT Horizontal**

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
867.831171	39.01	46.02	7.01	200.0	100.000	181.0	H	131.0	32.3



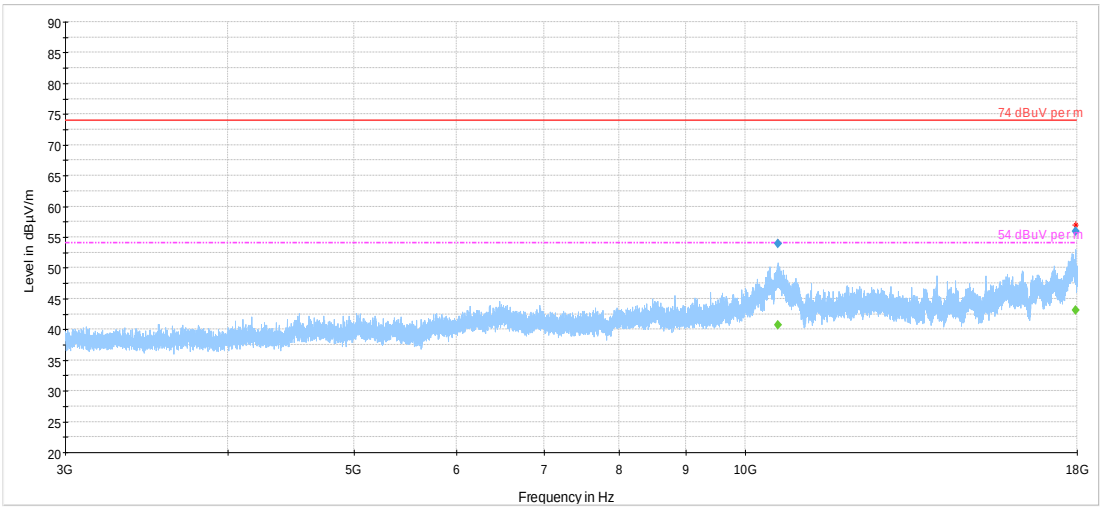
Plot # 3 Radiated Emissions: 1GHz - 3 GHz

Modulation: ASK		Fundamental @ 433.92 MHz			EUT Horizontal			
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol
1735.733000	46.27	---	74.00	27.73	200.0	1000.000	325.0	H
1735.733000	---	36.32	54.00	17.68	200.0	1000.000	325.0	H
2825.710000	45.55	---	74.00	28.45	200.0	1000.000	202.0	H
2825.710000	---	33.73	54.00	20.27	200.0	1000.000	202.0	H

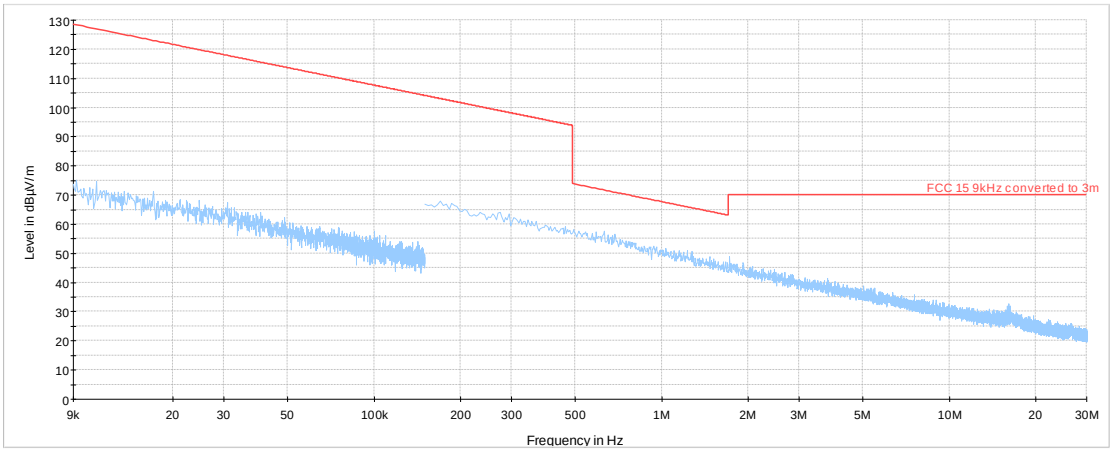


Plot # 4 Radiated Emissions: 3 GHz - 18 GHz

Modulation: ASK		Fundamental @ 433.92 MHz			EUT Horizontal			
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol
10595.470333	53.89	---	74.00	20.11	200.0	1000.000	242.0	V
10595.470333	---	40.73	54.00	13.27	200.0	1000.000	242.0	V
17942.410667	55.90	---	74.00	18.10	200.0	1000.000	207.0	H
17942.410667	---	43.12	54.00	10.88	200.0	1000.000	207.0	H

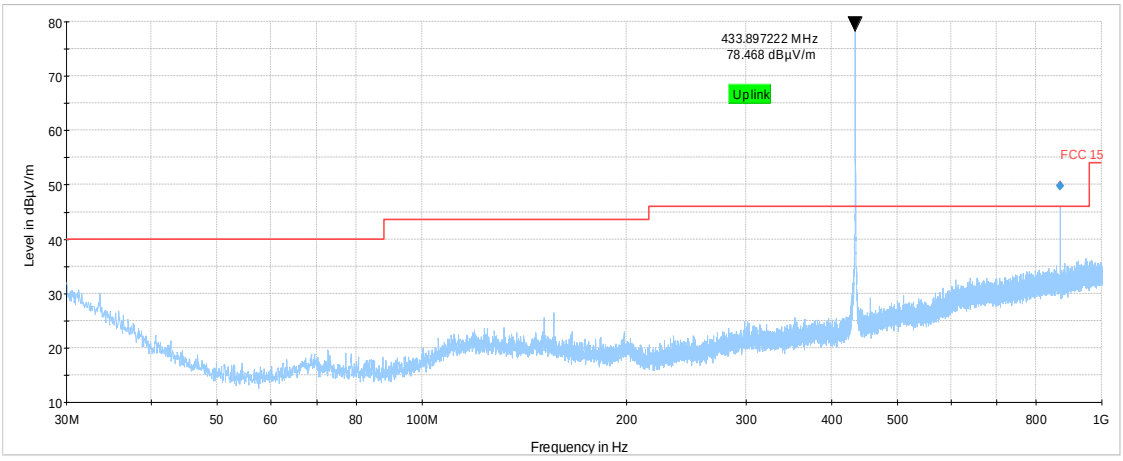


Plot # 5 Radiated Emissions: 9 KHz – 30 MHz		
Modulation: ASK	**Fundamental @ 433.92 MHz**	**EUT Vertical**

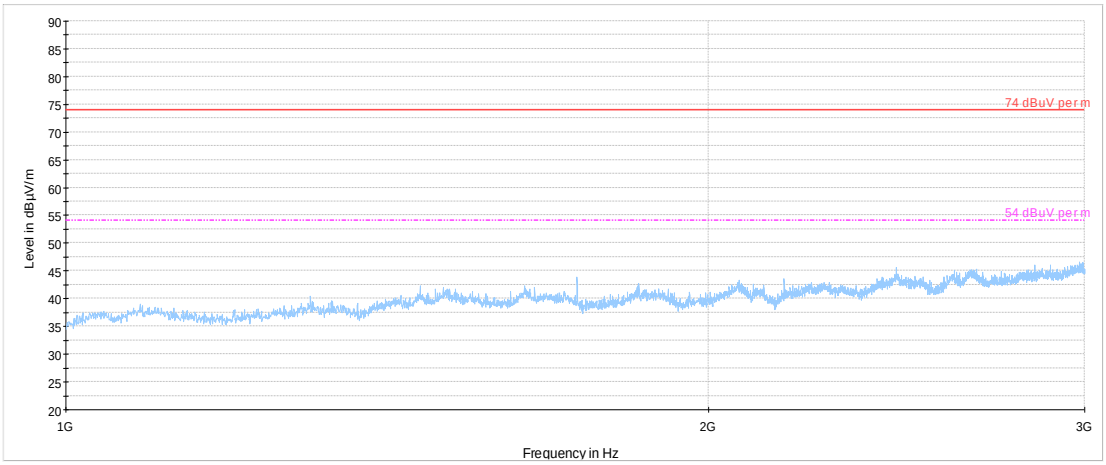


Plot # 6 Radiated Emissions: 30 MHz – 1GHz		
Modulation: ASK	**Fundamental @ 433.92 MHz**	**EUT Vertical**

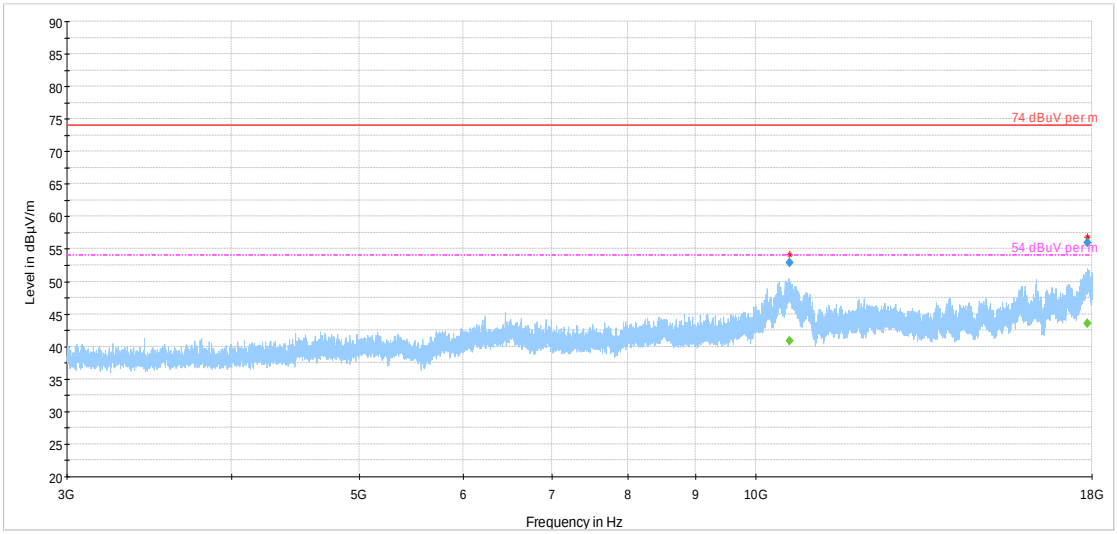
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
867.824177	37.29	46.02	8.73	200.0	100.000	185.0	H	220.0	32.3



Plot # 7 Radiated Emissions: 1GHz - 3 GHz		
Modulation: ASK	**Fundamental @ 433.92 MHz**	**EUT Vertical**



Plot # 8 Radiated Emissions: 3 GHz - 18 GHz								
Modulation: ASK		**Fundamental @ 433.92 MHz**			**EUT Vertical**			
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol
10607.765000	52.93	---	74.00	21.07	200.0	1000.000	153.0	H
10607.765000	---	40.87	54.00	13.13	200.0	1000.000	153.0	H
17847.529000	55.90	---	74.00	18.10	200.0	1000.000	225.0	H
17847.529000	---	43.61	54.00	10.39	200.0	1000.000	225.0	H



8 Test setup photos

Setup photos are included in supporting file name: "EMC_FARPO_002_19001_15.231_Setup_Photos.pdf"

9 Test Equipment And Ancillaries Used For Testing

Item Name	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
Antenna Biconilog 3142E	EMCO	3142E	166067	3 years	6/27/2017
Magnetic Loop Antenna	ETS Lindgren	6512	164698	3 years	7/8/2017
Antenna Horn 3115	ETS Lindgren	3115	35114	3 years	31/6/2017
Antenna Horn 3117-PA	ETS Lindgren	3117-PA	169547	3 years	8/8/2017
Digital Barometer	Control Company	35519-055	91119547	2 Years	6/8/2017
FSU40	R&S	FSU40	101022	2 years	7/5/2017
Digital Thermometer	Control Company	36934-164	221197993	2 Years	4/27/2018

Note: Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels.
Calibration due dates, unless defined specifically, falls on the last day of the month. Items indicated "N/A" for cal status either do not specifically require calibration or is internally characterized before use.

10 History

Date	Report Name	Changes to report	Report prepared by
2019-06-11	EMC_FARPO_002_19001_15.231	Initial Version	Kris Lazarov