FCC/ISED Test Report

FOR:
Vibrissa Inc.

Model Name:
Waggit

Product Description:
Dog collar takes subject's vitals and reports them to cloud via cellular modem. Bluetooth connectivity to configure device and read status.

FCC ID: 2ASDSWAG100
IC ID: N/A

Per:
47 CFR: Part 27
RSS-139 Issue 3

REPORT #: EMC_ VBRSA_001_18001_FCC_27_ISED

DATE: 02/22/2019

A2LA Accredited

IC recognized # 3462B-1

***CETECOM* Inc.**
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TABLE OF CONTENTS

1 Assessment

The following device as further described in section 3 of this report was evaluated for radiated spurious emissions in simultaneous transmission of cellular and unlicensed radios according to criteria specified in the Code of Federal Regulations Title 47 parts 27 and Industry Canada Radio Standard Specifications RSS 139 Issue3.

Company	Description	Model
Vibrissa Inc.	Dog collar takes subject's vitals and reports them to cloud via cellular modem. Bluetooth connectivity to configure device and read status.	Waggit

No deficiencies were ascertained.

Responsible for Testing Laboratory:

Date	Section	Name	Signature
02/22/2019	Compliance	Cindy 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: 2019.02.22 15:30:03 -08'00'

Responsible for the Report:

Date	Section	Name	Signature
02/22/2019	Compliance	Yuchan Lu (Test Engineer)	Yuchan Lu Digitally signed by: Yuchan Lu DN: CN = Yuchan Lu email = Yuchan.Lu@cetecom.com C = US O = CETECOM Inc. OU = EMC Date: 2019.02.22 15:17:27 -08'00'

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
Lab Manager:	Cindy Li
Responsible Project Leader:	Rami Saman

2.2 Identification of the Client

Applicant's Name:	Vibrissa Inc.
Street Address:	5311 Waterstone Drive
City/Zip Code	Boulder, CO, 80301
Country	USA

2.3 Identification of the Manufacturer

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

3 Equipment Under Test (EUT)

3.1 EUT Specifications

Firmware Version Identification Number (FVIN):	Rev1.0.0
Hardware Version Identification Number (HVIN):	Rev1.0.0
Product Marketing Name (PMN):	Waggit
Antenna Information as declared:	• Module name: Telit LE866SV1 • Model number: LE866SV1304T001000 • FCC/IC ID: RI7LE866SV1
Other Radios included in the device:	❖ Bluetooth LE: • Module name: STMicro BLUENRG • Model number: BLUENRG-MSCSP • PIFA 2.72dBi ❖ GPS: • Module name: Jupiter SE873 • Model number: SE873Q5F577R001
Power Supply/ Rated Operating Voltage Range:	Low 3.4 VDC, Nominal 3.7 VDC, High 4.2 VDC
Operating Temperature Range:	Low 10° C, Nominal 25° C, High 55° C
Sample Revision	☐Prototype Unit; ☐Production Unit; ■Pre-Production
EUT Dimensions(mm):	160 x 90 x 33
Weight(grams):	75
EUT Diameter	■ < 60 cm ☐ Other _____

Module Information	
Module Name:	Telit LE866SV1
Model Number:	LE866SV1304T001000
FCC/IC ID:	RI7LE866SV1

3.2 EUT Sample details

EUT #	Unit number	HW Version	SW Version	Notes/Comments
1	V1_3-17	Rev1.0.0	Rev1.0.0	Radiated Measurement

3.3 Test Sample Configuration

EUT Set-up #	Combination of AE used for test set up	Comments
1	EUT# 1	-

3.4 Mode of Operation details

Mode of Operation	Description of Operating modes	Additional Information
Op. 1	Cellular and BLE Co-Transmission	Cellular was tested on fixed Mid Channel at the maximum power in a co-transmission mode. Tera Term terminal tool and special commands provided by the customer used to configure the BLE radio to Mid channel. The commands will not be available to the end user. For radiated measurements: The internal antenna was connected and the EUT is powered by internal battery.

3.5 Justification for Worst Case Mode of Operation

During the testing process the EUT was tested with transmitter sets on fixed mid channel at the maximum power simultaneous transmission with BLE radio, mid channel.

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.

4 Subject of Investigation

The objective of the evaluation conducted by CETECOM Inc. is to support a request for new equipment authorization under **FCC ID:** 2ASDSWAG100 / **IC ID**: N/A

The pre-certified module to be integrated (Telit LE866SV1) as described in Section 3, Radiated Spurious Emissions test was performed. Results have been checked to meet limits per Code of Federal Regulations Title 47 parts 27 and Industry Canada Radio Standard Specifications RSS: 130, 132 Issue 3, 133 Issue 6 and 139 Issue 3.

The conducted module test data that can be obtained under the **FCC Filing ID:** RI7LE866SV1 is applicable for the host described in section 3.

4.1 Dates of Testing:

01/28/2019

4.2 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 30MHz	±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)

4.3 Environmental Conditions during Testing:

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

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

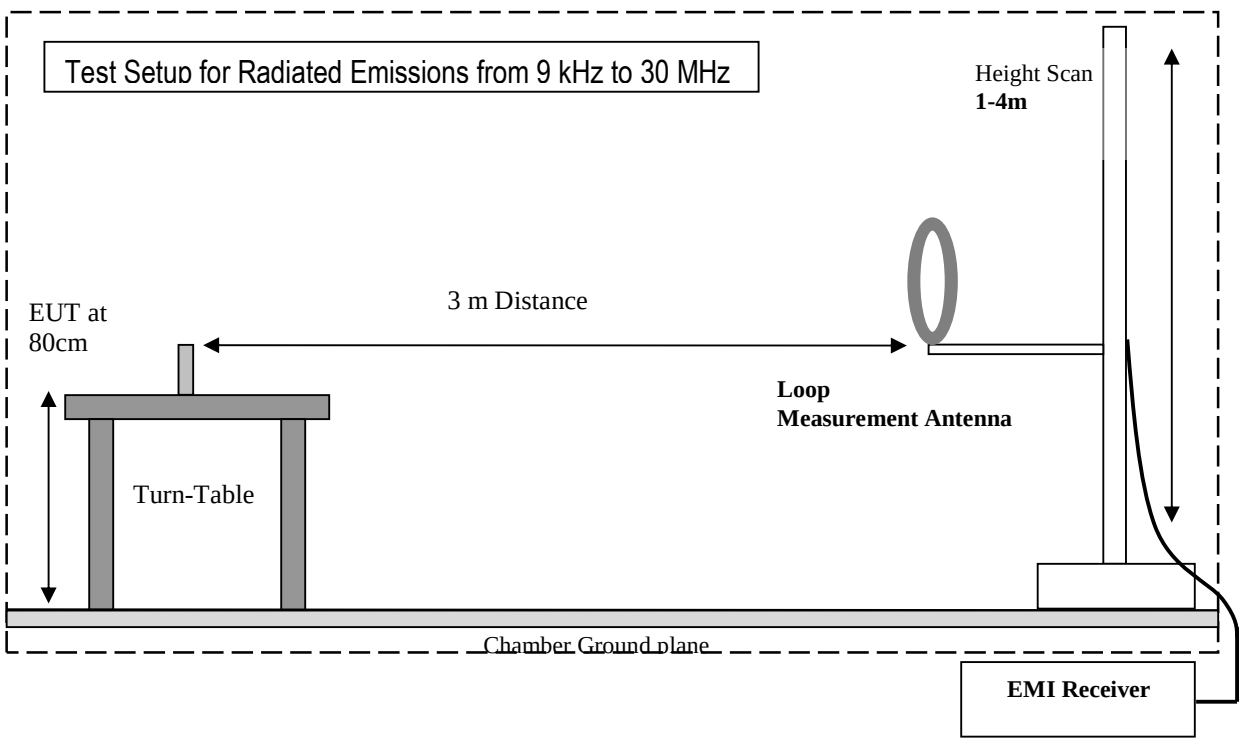
Deviating test conditions are indicated at individual test description where applicable.

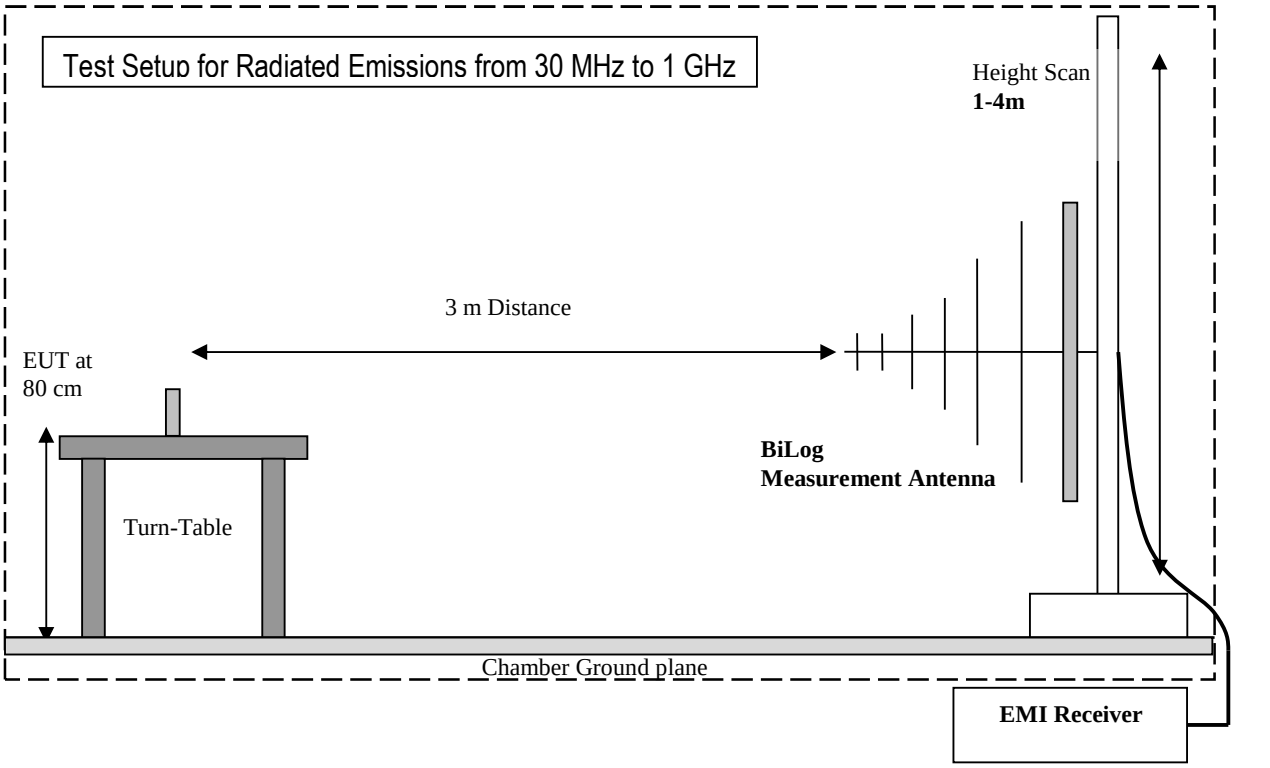
5 Measurement Procedures

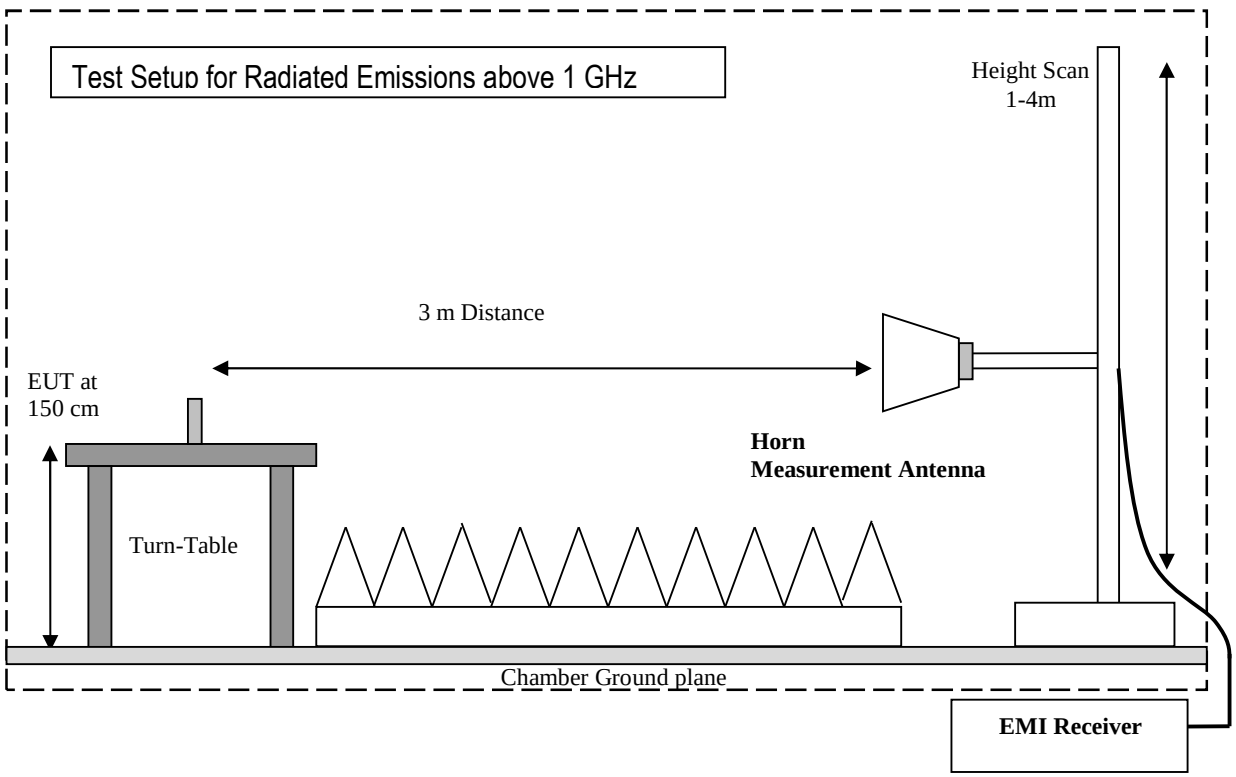
Testing is performed according to the guidelines provided in FCC publication (KDB) 971168 D01 v03 – "Measurement Guidance for Certification of Licensed Digital Transmitters" and according to ANSI C63.26 as detailed below.

5.1 Radiated Measurement

- 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.




Test Setup for Radiated Emissions from 30 MHz to 1 GHz
Height Scan
1-4m
3 m Distance
EUT at
80 cm
BiLog
Measurement Antenna
Turn-Table
Chamber Ground plane
EMI Receiver


Test Setup for Radiated Emissions above 1 GHz
Height Scan
1-4m
3 m Distance
EUT at
150 cm
Horn
Measurement Antenna
Turn-Table
Chamber Ground plane
EMI Receiver

5.2 Sample Calculations for Field Strength Measurements

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

- Measured reading in dBµV
- Cable Loss between the receiving antenna and SA in dB and
- 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)	Field Strength Result (dBµV/m)
1000	80.5	3.5	14	98.0

6 Measurement Results Summary

6.1 FCC 27, RSS-130, RSS-139:

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046; §27.50 (d)	RF Output Power	Nominal	-	■	☐	☐	☐	Complies
§2.1055; §27.54	Frequency Stability	Nominal	-	☐	☐	☐	■	Complies Note 1 Note 2
§2.1049; §27.53	Occupied Bandwidth	Nominal	-	☐	☐	☐	■	Complies Note 1 Note 2
§2.1051; §27.53	Band Edge Compliance	Nominal	-	☐	☐	☐	■	Complies Note 1 Note 2
§2.1051; §27.53	Conducted Spurious Emissions	Nominal	-	☐	☐	☐	■	Complies Note 1 Note 2
§2.1053; §27.53(g); §27.53(h); RSS-130 Issue 1-4.6; RSS-139 Issue 3-6.6;	Radiated Spurious Emissions	Nominal	Op.1	■	☐	☐	☐	Complies

Note 1: NA= Not Applicable; NP= Not Performed.
Note 2: Leveraged from module certification FCC ID: RI7LE866SV1

7 Test Result Data

7.1 ERP

Frequency Range MHz	Power conducted W	Gain dBi	gain linear	ERP	Frequency deviation	Limit ERP W	Emission Designator
779.5 - 784.5	**0.23**	**0**	**1**	**0.14**	**0.33 PM**	**3**	**4M46G7D**
782.0 - 782.0	**0.16**	**0**	**1**	**0.10**	**0.33 PM**	**3**	**8M94G7D**

Note: ERP are calculated from maximum power in grant of cellular module Telit LE866SV1 adding the maximum gain of the utilized cellular antenna per operational descritption.

7.2 Radiated Spurious Emissions

7.2.1 Measurement according to FCC: CFR 47 Part 2.1053; Part 27.53 utilizing KDB 971168 D01 Power Meas License Digital Systems v03, and according to ANSI C63.26 2017

Spectrum Analyzer Settings for FCC 27

Frequency Range	30MHz – 1 GHz	1 – 2.7 GHz	2.7 – 18 GHz	18 – 19.1 GHz
Resolution Bandwidth	100 kHz	1 MHz	1 MHz	1 MHz
Video Bandwidth	300 kHz	3 MHz	3 MHz	3 MHz
Detector	Peak	Peak	Peak	Peak
Trace Mode	Max Hold	Max Hold	Max Hold	Max Hold
Sweep Time	Auto	Auto	Auto	Auto

7.2.2 Limits:

- **FCC Part 27.53 (g), and Part 27.53 (h)**
- **RSS-130-4.6, RSS-132 Issue 3 5.5, RSS-133 Issue 6 6.5.1, RSS-139 Issue 3 6.6**

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB = (-13dBm)

7.2.3 Test conditions and setup:

Ambient Temperature (C)	EUT operating mode	Power Input
22	Op. 1	3.7 VDC

7.2.4 Measurement result:

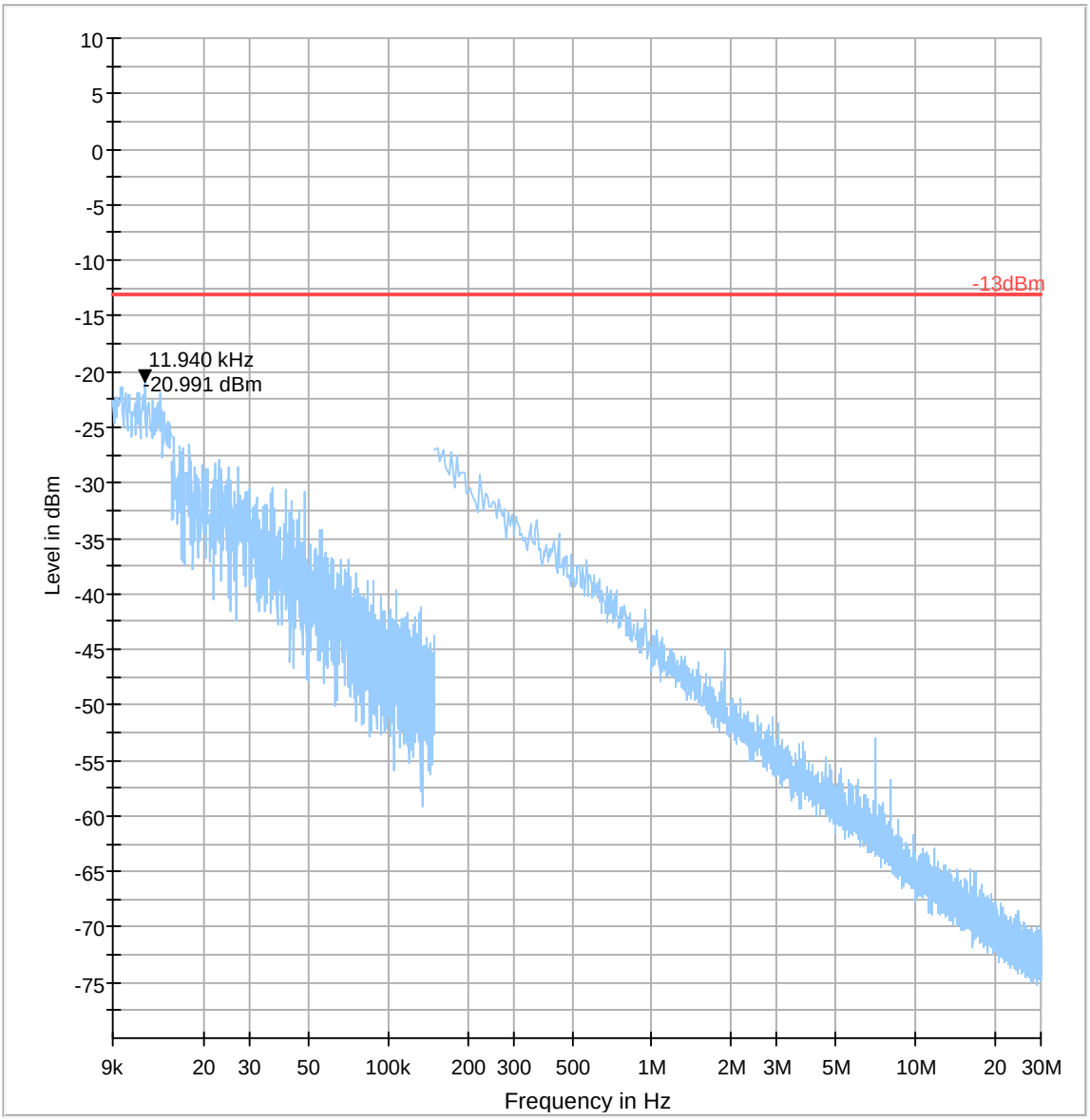
Plot #	Cellular Channel	EUT operating mode	Scan Frequency	Frequency of highest emission [MHz]	Highest emission [dBm]	Limit [dBm]	Result
1 – 4	Mid	LTE 13	9 kHz – 18 GHz	0.01194	-20.991	-13	Pass

7.2.5 Measurement Plots:

LTE Band 13

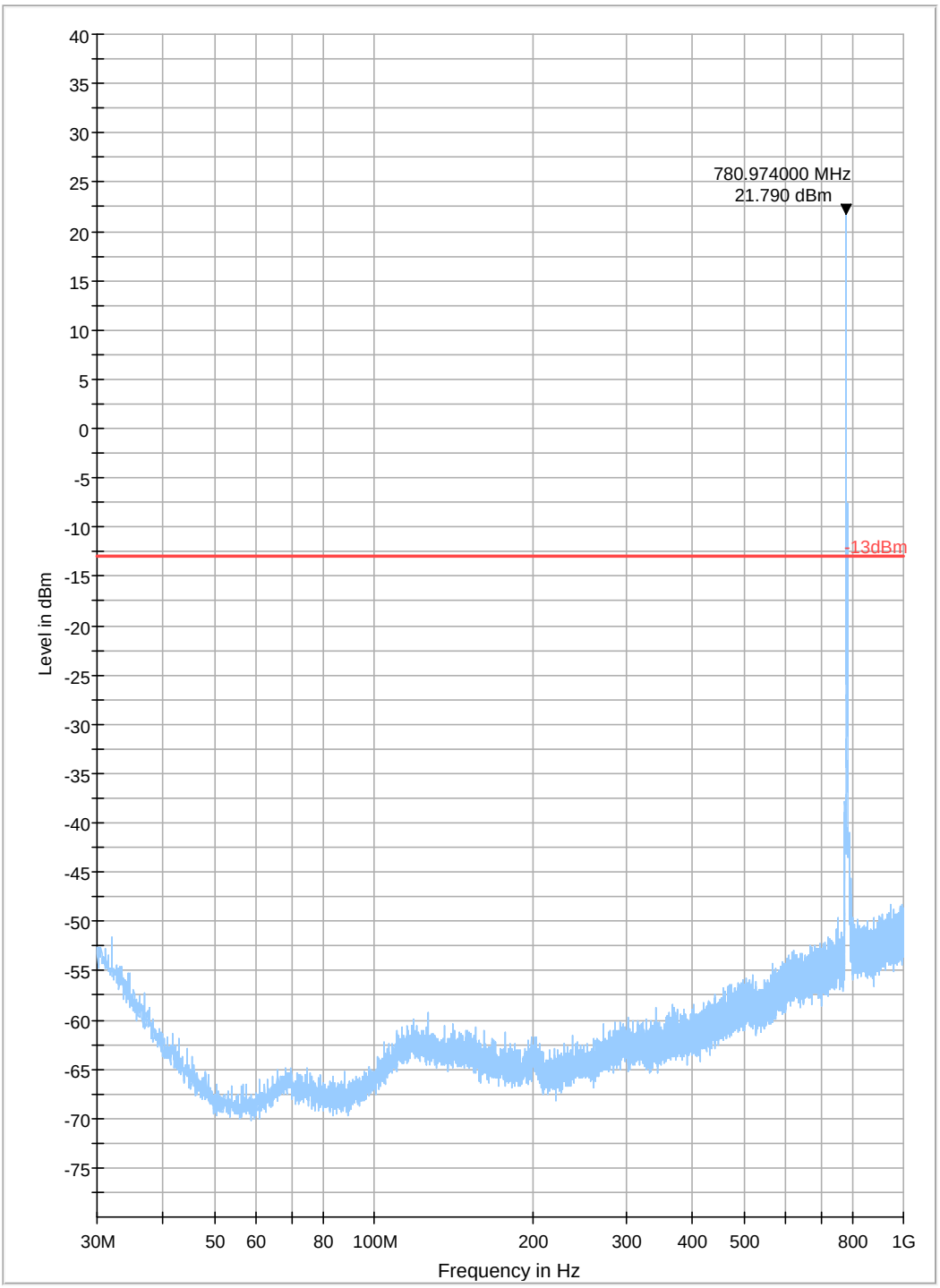
Plot # 1 Radiated Emissions: 9 kHz - 30 MHz

Channel: Mid



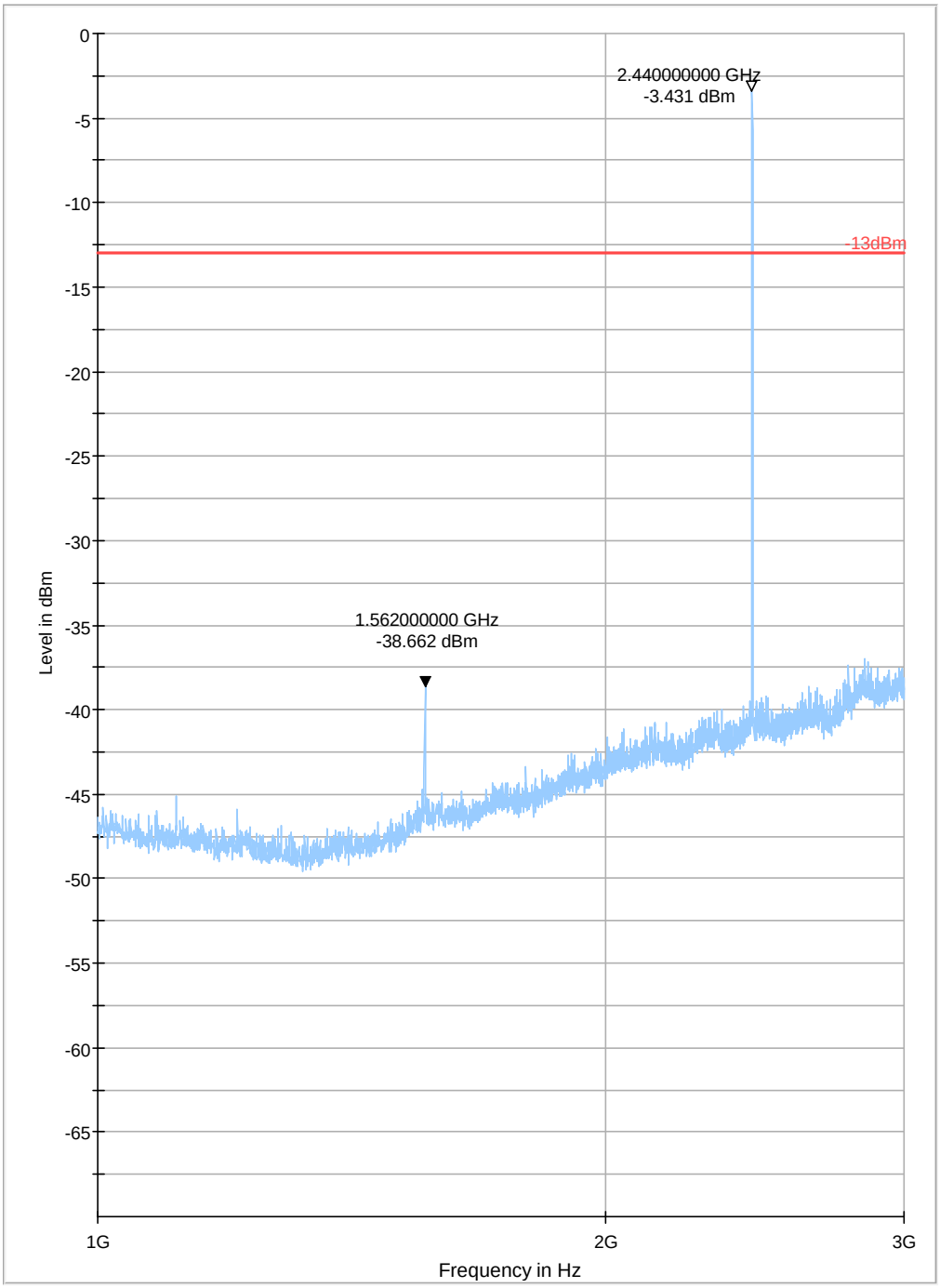
Plot # 2 Radiated Emissions: 30 MHz – 1 GHz

Channel: Mid



Plot # 3 Radiated Emissions: 1 GHz - 3 GHz

Channel: Mid

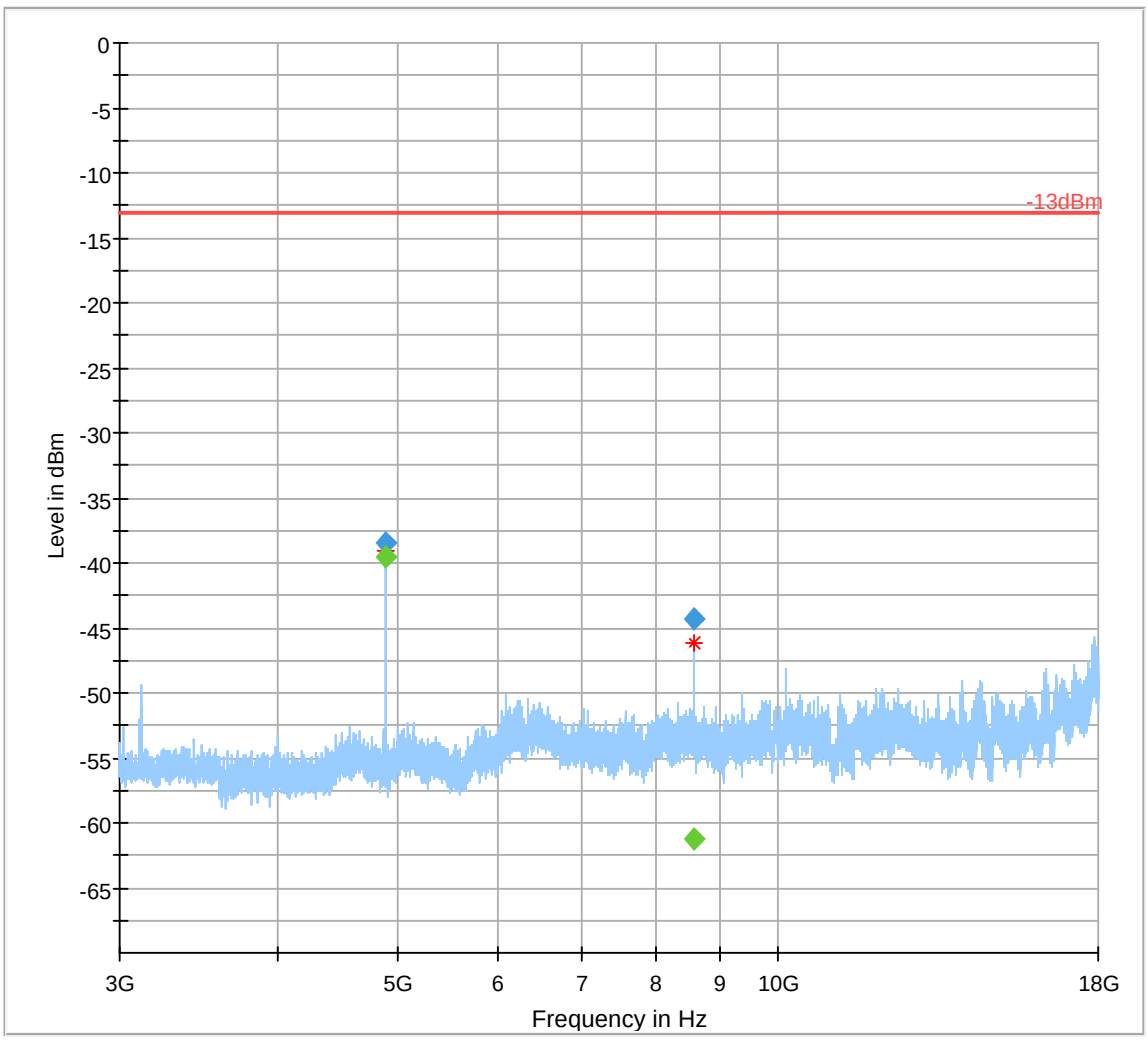


Plot # 4 Radiated Emissions: 3 GHz – 9 GHz

Channel: Mid

Final_Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
4879.30566	-38.40	---	-13.00	25.40	100.0	1000.000	291.0	H	245.0	-100.6	1:48:55 PM - 1/28/2019
4879.30566	---	-39.54	---	---	100.0	1000.000	291.0	H	245.0	-100.6	1:48:55 PM - 1/28/2019
8591.02016	-44.36	---	-13.00	31.36	100.0	1000.000	140.0	V	181.0	-94.0	1:47:05 PM - 1/28/2019
8591.02016	---	-61.18	---	---	100.0	1000.000	140.0	V	181.0	-94.0	1:47:05 PM - 1/28/2019



8 Test setup photos

Setup photos are included in supporting file name: "EMC_VBRSA_001_18001_FCC_ISED_Setup_Photos.pdf"

9 Test Equipment And Ancillaries Used For Testing

Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
PASSIVE LOOP ANTENNA	ETS LINDGREN	6512	00164698	3 YEARS	08/08/2017
BILOG ANTENNA	TESEO	CBL 6141B	41106	3 YEARS	11/01/2017
HORN ANTENNA	EMCO	3115	00035114	3 YEARS	07/31/2017
HORN ANTENNA	ETS LINDGREN	3117	00167061	3 YEARS	08/08/2017
HORN ANTENNA	ETS LINDGREN	3116C	00166821	3 YEARS	09/24/2017
UNIVERSAL RADIO COMMUNICATION TESTER	R&S	CMU 200	101821	2 YEARS	07/06/2017
WIDEBAND RADIO COMMUNICATION	R&S	CMW500	127068	2 YEARS	07/01/2017
SIGNAL ANALYZER	R&S	FSV 40	101022	2 YEARS	07/05/2017
COMPACT DIGITAL BAROMETER	CONTROL COMPANY	35519-055	91119547	2 YEARS	06/20/2017
THRMOMETER HUMIDIY	DICKSON	TM320	16253639	3 YEARS	11/02/2017

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 Revision History

Date	Report Name	Changes to report	Report prepared by
02/05/2019	EMC_VBRSA_001_18001_FCC_27_ISED	Initial Version	Yuchan Lu