



FCC ID:2AW9D-HUB

# FCC Verification Test Report

Client Information:

Applicant:Skylo Technologies

Applicant add.:268, Lambert Avenue, Palo Alto, CA, 94306, USA

Manufacturer:VVDN Technologies Pvt. Ltd.

Manufacturer add.:D-22, Infocity-II, Sector 33, Gurgaon-122001, Haryana, India

Product Information:

Product Name:IoT Hub

Model No.:S-111 Mk I

Derivative Model No.:S-101 Mk I , S-121 MK I

Brand Name:Skylo Technologies

Applied Standard:

FCC Part25

Prepared By:

Abhinav Kumar

Laboratory Details:

AA Electro Magnetic Test Laboratory Private Limited

PlotNo174, Udyog Vihar-Phase4, Sector18, Gurgaon, Haryana, India

Date of Receipt: May 11, 2020

Date of Test: May 15-Sep. 04, 2020

Date of Issue: Sep. 04, 2020

Test Result: **In Compliance/Pass**

This device has been tested and found to comply with the stated standard(s), which is(are) required by the council directive of 2014/53/EU and indicated in the test report and are applicable only to the tested sample identified in the report.

Note: This report shall not be reproduced except in full, without the written approval of AA Electro Magnetic Test Laboratory Private Limited, this document may be altered or revised by AA Electro Magnetic Test Laboratory Private Limited, personal only, and shall be noted in the revision of the document. This test report must not be used by the client to claim product endorsement.

**Reviewed by:** \_\_\_\_\_

(Dr R Lenin Raja) (Authorized Representative) (/ lenin83/)

**Approved by:** \_\_\_\_\_

(Steven Wu)





Table of Contents

Description	Page
1 Contents.....	2
2 Test Summary.....	3
2.1 Measurement Uncertainty.....	4
3 Test Facility.....	5
3.1 Deviation from standard.....	5
3.2 Abnormalities from standard conditions.....	5
4 General Information.....	6
4.1 General Description of EUT.....	6
4.2 EUT Test Mode.....	7
4.3 Description of Test setup.....	7
4.4 Test Peripheral List.....	8
4.5 EUT Peripheral List.....	8
5 Equipments List for All Test Items.....	9
6 Test and Measurement data.....	11
6.1 Power Limits.....	12
6.2 Emissions Limitations.....	13
6.3 Occupied Bandwidth.....	17
6.4 Emissions Mask.....	18
6.5 Frequency Tolerance.....	19
7. Test Set up Photograph.....	22



**2 Test Summary**

FCC Clause Requirements	Test Requirement	Result
25.204	Power Limits	PASS
25.202(f)	Emissions Mask	PASS
25.216	Emissions Limits for Mobile Earth Stations	PASS
25.202(d)	Frequency Tolerance	PASS
2.1049	Occupied Bandwidth	PASS

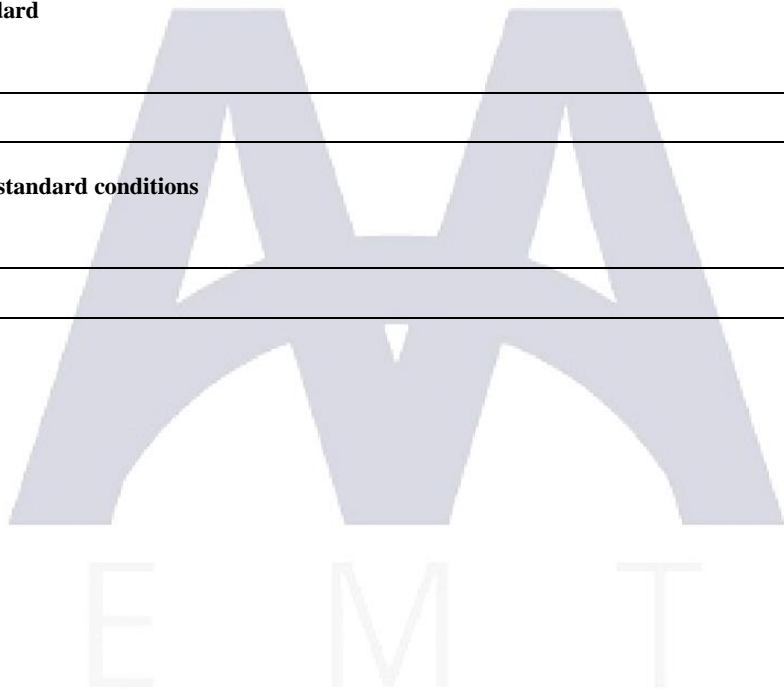
**2.1 Measurement Uncertainty**

The report uncertainty of measurement  $y \pm U$ , where expanded uncertainty  $U$  is based on a standard uncertainty Multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95%.

No.	Item	Frequency Range	U , Value
3	Radiated Emission Test	1GHz~18GHz	2.80 dB



<p><b>3 Test Facility</b></p>
<p>AA Electro Magnetic Test Laboratory is an ISO 17025:2017 certified lab by NABL, Certification No.TC-8597, CE Marking Certificate from Phoenix Germany #800058_00 and ILAC-MRA #0366. We are also accredited ISO17025:2017 by A2LA(American association for laboratory accreditation) #5593.0I ,FCC Recognized #137777, ISED recognized for wireless product #26046, VCCI(Japan) supporting member #4053..</p>
<p><b>3.1 Deviation from standard</b></p>
<p>None</p>
<p><b>3.2 Abnormalities from standard conditions</b></p>
<p>None</p>



#### 4 General Information

##### 4.1 General Description of EUT

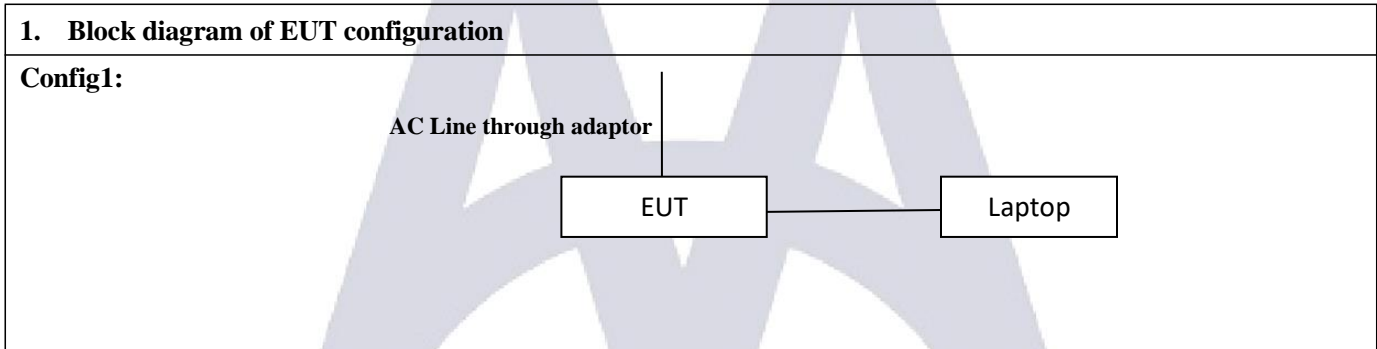
Manufacturer:	VVDN Technologies Pvt. Ltd.
Manufacturer Address:	D-22, Infocity-II, Sector 33, Gurgaon-122001, Haryana, India
EUT Name:	IoT Hub
Model No:	S-111 Mk I
Serial Model:	S-101 Mk I , S-121 MK I
Serial Number:	N/A
Brand Name:	Skylo Technologies
Operating Frequency:	1626.5-1660.5MHz
Channels:	N/A
Modulation:	SC-FDMA
H/W No.:	901-1-00624 (Rev B1)
S/W No.:	1.4.1
Power Supply Range:	Input : 9-36VDC, 2.5A <b>Adapter:</b> Input: 100-240VAC, 50/60Hz Output: 24VDC
Battery:	3.7V / 12000mAh

**4.2 EUT Test Mode**

Mode1	The EUT in full transmitting Mode.
-------	------------------------------------

**4.3 Description of Test setup**

EUT was tested in normal configuration (Please See following Block diagrams)



**4.4 Test Peripheral List**

No.	Equipment	Manufacturer	EMC Compliance	Model No.	Serial No.	Power cord	Signal cable
1	Laptop	DELL	Latitude 3490	5M2Z1W2	2m unshielded	N/A	1

**4.5 EUT Peripheral List**

No.	Equipment	Manufacturer	EMC Compliance	Model No.	Serial No.	Power cord	Signal cable
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**5 Equipments List for All Test Items**

No	Test Equipment	Manufacturer	Model No	Serial No	Cal. Date	Cal. Due Date
1	EMI TEST Receiver	Rohde and Schwarz	ESIB26	838786/010	2020/01/28	2021/01/27
2	Loop antenna	DAZE Beijing	ZN30900C	18052	2020/01/29	2021/01/28
3	Hi power horn antenna	DAZE Beijing	ZN30700	18012	2020/01/30	2021/01/29
4	Horn antenna	DAZE Beijing	ZN30702	18006	2020/01/30	2021/01/29
5	Horn antenna	DAZE Beijing	ZN30703	18005	2020/01/30	2021/01/29
6	Preamplifier	KELIANDA	LNA-0009295	-	2020/01/28	2021/01/29
7	Preamplifier	KELIANDA	CF-00218	-	2020/01/28	2021/01/27
8	Bi conical Antenna	DAZE Beijing	ZN30505C	17038	2020/01/28	2021/01/29
9	EMI-RECEIVER	Schwarzbeck	FCKL	1528194	2020/01/28	2021/01/27
10	Spectrum Analyzer	ADVANTEST	R3361	-	2020/05/15	2021/05/14
11	LISN	Kyoritsu	KNW-407	8-1789-5	2020/01/28	2021/01/27
12	Network-LISN	Schwarzbeck	NNBM8125	81251314	2020/01/28	2021/01/27
13	Network-LISN	Schwarzbeck	NNBM8125	81251315	2020/01/28	2021/01/27
14	PULSELIMITER	Rohde and Schwarz	ESH3-Z2	100681	2020/05/13	2021/05/12
15	50ΩCoaxialSwitch	DAIWA	1565157	-	2020/05/13	2021/05/12
16	50ΩCoaxialSwitch	-	-	-	2020/05/13	2021/05/12



17	Wireless signal power meter	DARE!!	RPR3006W	RFSW190220	2020/01/29	2021/01/28
18	Signal Generator	KEYSIGHT	N5181A	512071	2020/01/29	2021/01/28
19	RF Vector Signal Generator	Keysight	N5182B	512094	2020/01/29	2021/01/28
20	Spectrum analyzer	R&S	FSV-40N	101385	2020/01/29	2021/01/28
21	Radio Communication Tester	R&S	CMW 500	124589	2020/5/15	2021/5/14
22	Signal Generator	R&S	SMP02	837017/004 836593/005	2020/5/15	2021/5/14
23	DC Power Supply	Guanker	JK15040K	TNC/ET/C/0 01/15	2020/2/2	2021/2/1
24	Pro. Temp & Humi. chamber	MENTEK	MHP-150-1C	MAA081125 01	2020/2/2	2021/2/1
25	Attenuators	AGILENT	8494B	-	-	-
26	Attenuators	AGILENT	8495B	-	-	-



### 6 Test and Measurement Data

All test and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II; Part 2 and the following individual parts: FCC 25 Satellite Communications.

Prior to testing the EUT was tuned up in accordance with the manufacturer's alignment procedures. All external gain controls were maintained at the position of maximum and/or optimum gain throughout the testing.

Measurement results, unless otherwise noted, are worst case measurement.



**6.1 Power Limits**

**Test Procedure:**

The EUT was connected to a Spectrum Analyzer. Cable losses were input into the analyzer as a reference level offset to ensure accurate measurements were obtained. The EIRP is a summation of conducted power and the antenna gain.

**Test Setup**



Tuned Frequency (MHz)	Output power (dBm)	Antenna Gain (dBi)	Cable Loss (dB)	EIRP OUTPUT POWER (dBm)	Limit
1654.8	27.01	8	1	34.01	No Limit For Mobile Earth Station

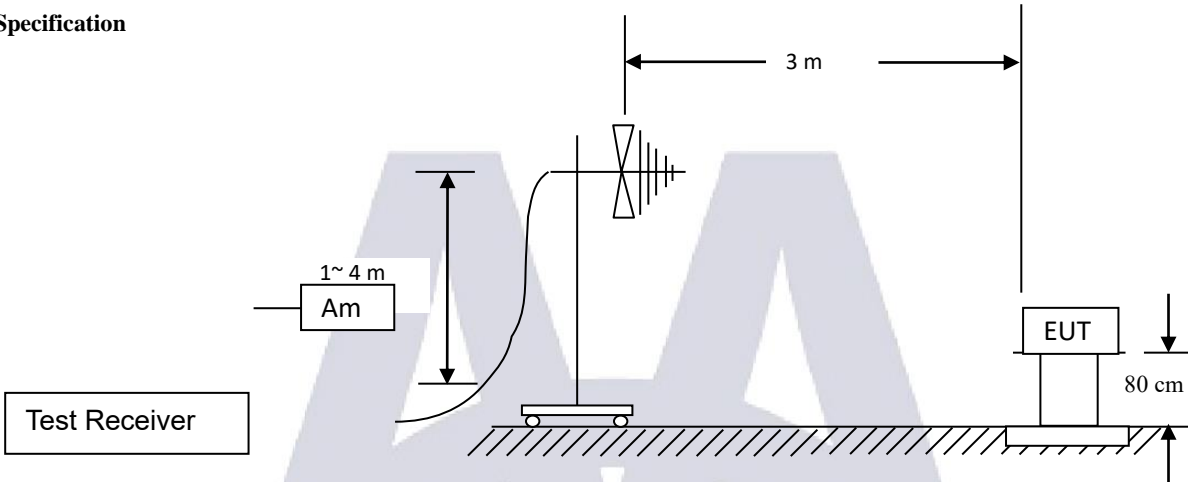
Note: e.i.r.p = conducted power + antenna gain – cable loss

1. Antenna Gain = 8 dBi.

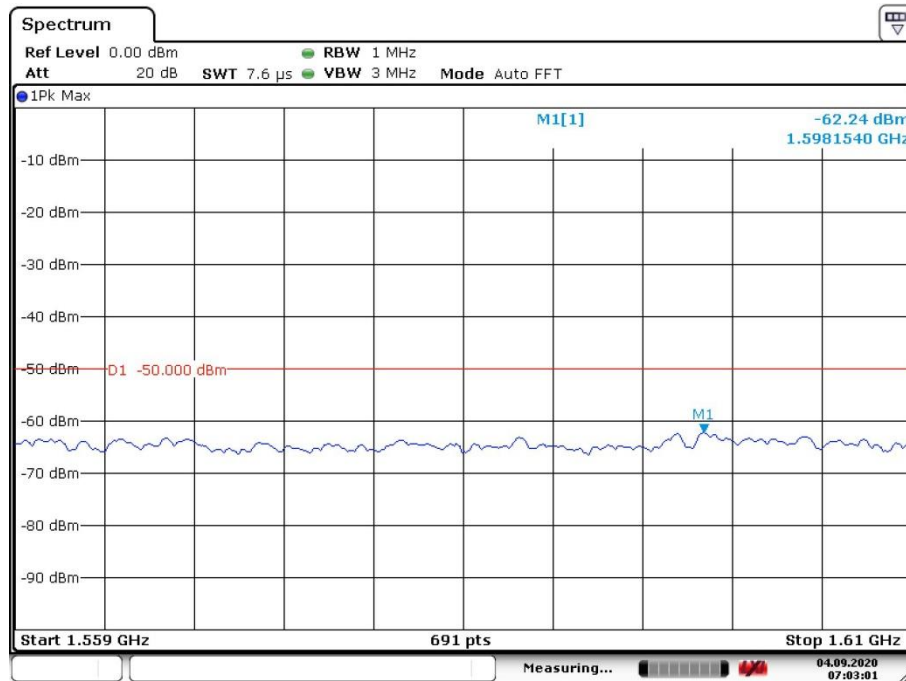
6.2 Emissions Limitations

Test Setup

Test Specification

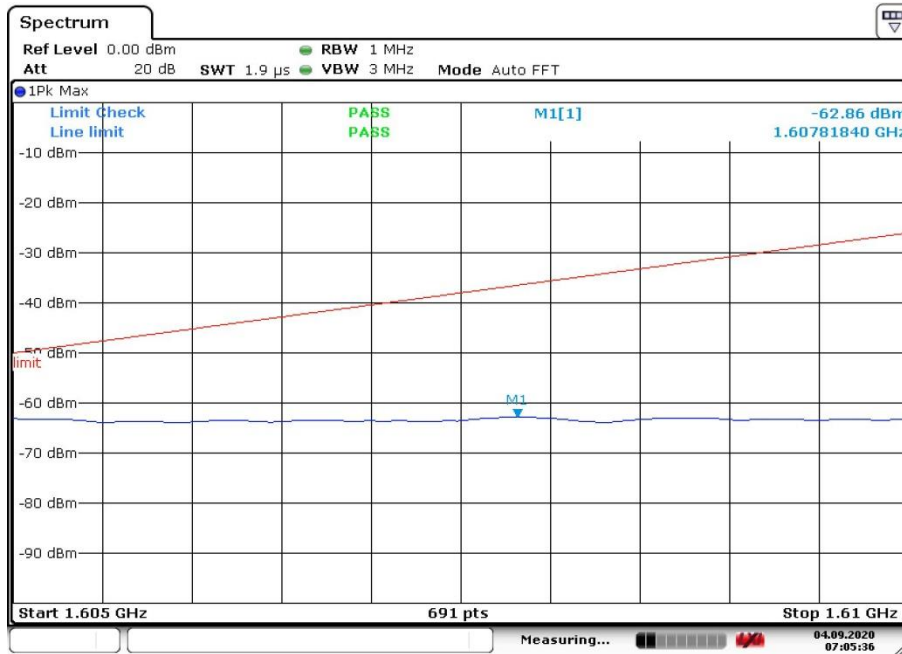


EUT was placed upon a Polyester Fibre top test table which was placed on the turn table 0.8m above the horizontal metal ground plane, and operating in the mode as mentioned above. A receiving antenna was placed 3m away from the EUT. During testing, turn around the turn table and move the antenna from 1m to 4m to find the maximum field-strength reading. All peripherals were placed at a distance of 10cm between each other. Both horizontal and vertical antenna polarities were tested.



Date: 4.SEP.2020 07:03:01





Date: 4.SEP.2020 07:05:36

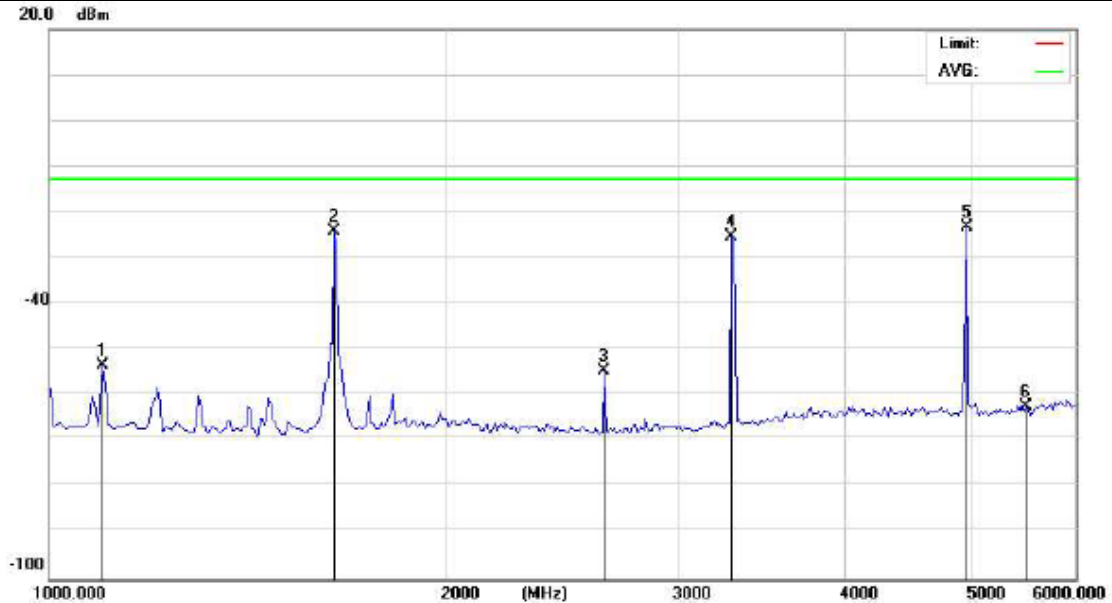
Tuned Frequency: 1654.8MHz



Date: 4.SEP.2020 07:06:45

Tuned Frequency: 1654.8MHz

Mode:	Mode 1	Test Date :	2020-05-15
Test Voltage:	AC 120V/60Hz	Polarization :	Horizontal

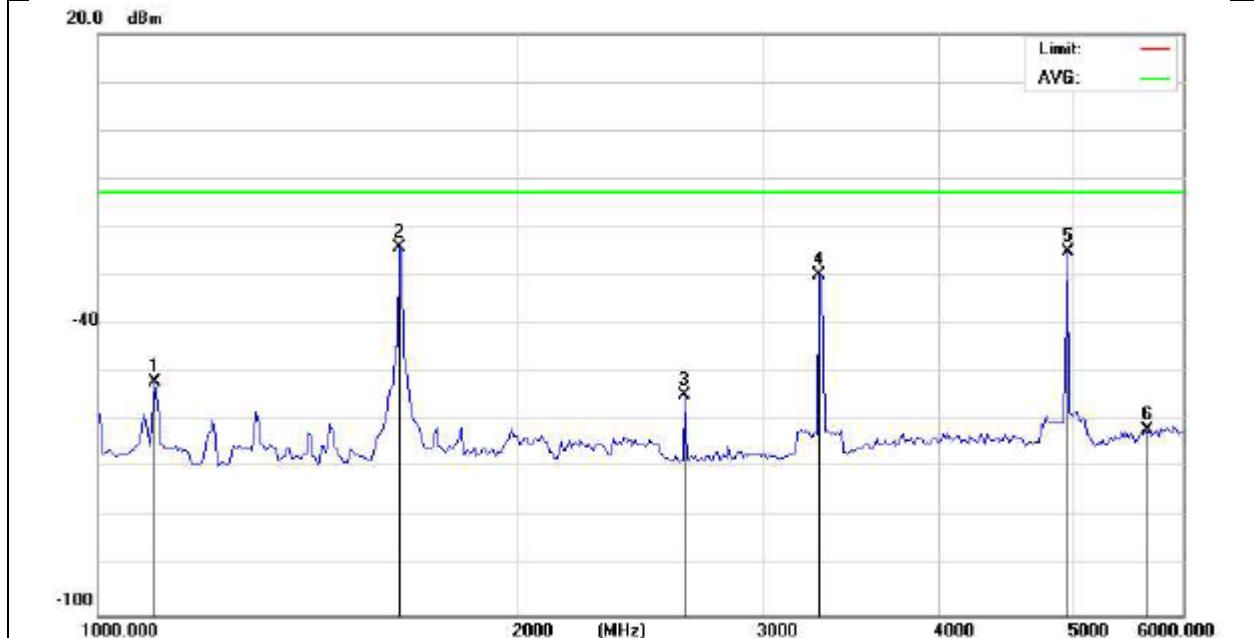


Remark: Factor =

No. Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measurement dBm	Limit dB	Over dB	Detector
1	1100.200	-62.88	9.12	-53.76	-13.00	-40.76	peak
2	1651.303	-30.93	6.57	-24.36	-13.00	-11.36	peak
3	2643.287	-59.29	4.31	-54.98	-13.00	-41.98	peak
4	3304.609	-30.94	5.45	-25.49	-13.00	-12.49	peak
5 *	4967.936	-30.98	7.73	-23.25	-13.00	-10.25	peak
6	5509.018	-70.88	8.20	-62.68	-13.00	-49.68	peak

\*Maximum Data

Mode:	Mode 1	Test Date :	2020-05-15
Test Voltage:	AC 120V/60Hz	Polarization :	Vertical



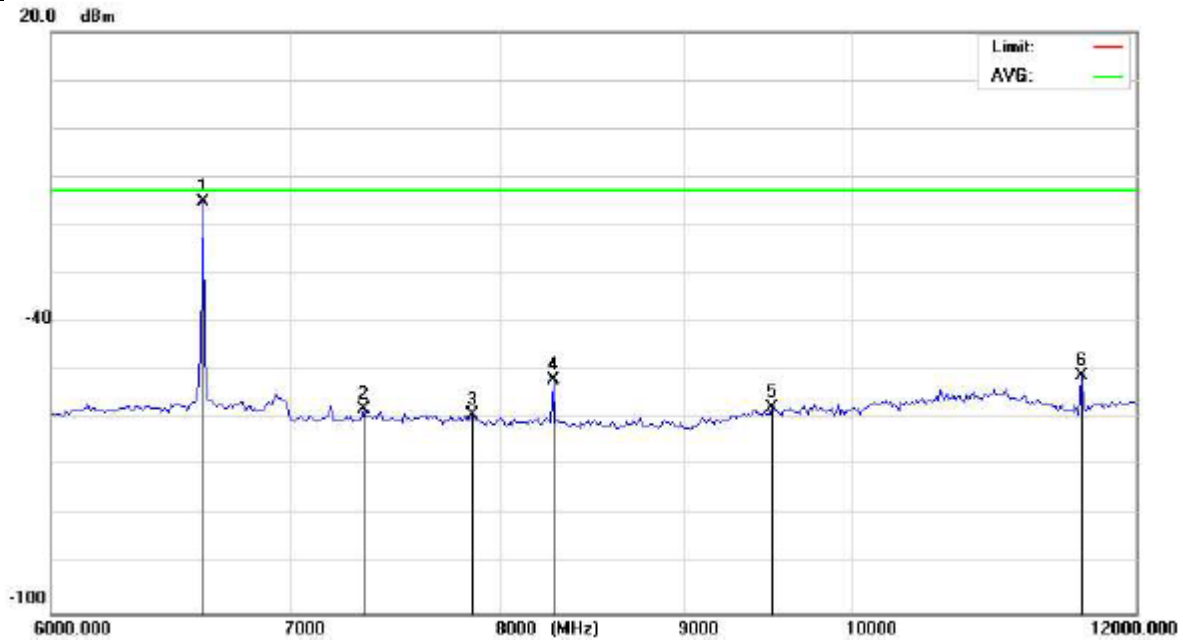
Remark: Factor

No. Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measurement dBm	Limit dB	Over dB	Detector
1	1100.200	-61.38	9.12	-52.26	-13.00	-39.26	peak
2 *	1651.303	-30.93	6.57	-24.36	-13.00	-11.36	peak
3	2643.287	-59.29	4.31	-54.98	-13.00	-41.98	peak
4	3304.609	-35.44	5.45	-29.99	-13.00	-16.99	peak
5	4967.936	-32.98	7.73	-25.25	-13.00	-12.25	peak
6	5669.339	-70.64	8.66	-61.98	-13.00	-48.98	peak

\*Maximum Data



Mode:	Mode 1	Test Date :	2020-05-15
Test Voltage:	AC 120V/60Hz	Polarization :	Vertical

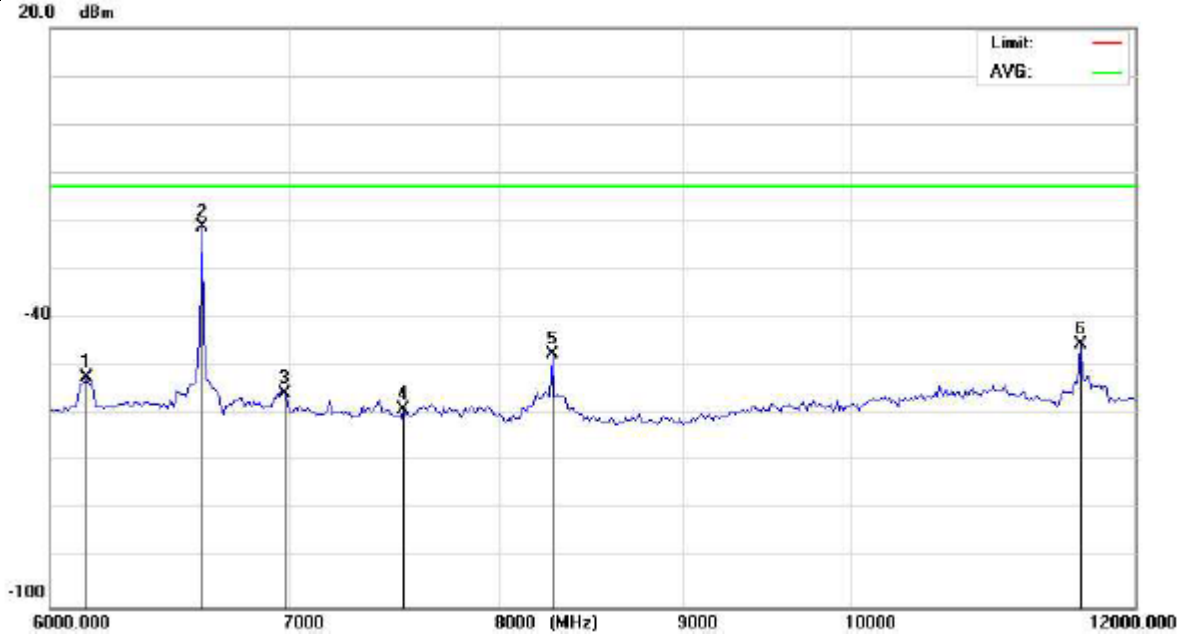


Remark: Factor = LISN factor + Cable Loss + Pulse limiter factor.

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector
		MHz	dBm	dB	dBm	dB	dB	
1	*	6613.226	-25.97	10.65	-15.32	-13.00	-2.32	peak
2		7334.669	-69.24	11.01	-58.23	-13.00	-45.23	peak
3		7863.727	-70.33	10.97	-59.36	-13.00	-46.36	peak
4		8272.545	-62.85	10.74	-52.11	-13.00	-39.11	peak
5		9523.046	-71.83	14.09	-57.74	-13.00	-44.74	peak
6		11591.18	-65.58	14.41	-51.17	-13.00	-38.17	peak

\*Maximum Data

Mode:	Mode 1	Test Date :	2020-05-15
Test Voltage:	AC 120V/60Hz	Polarization :	Horizontal

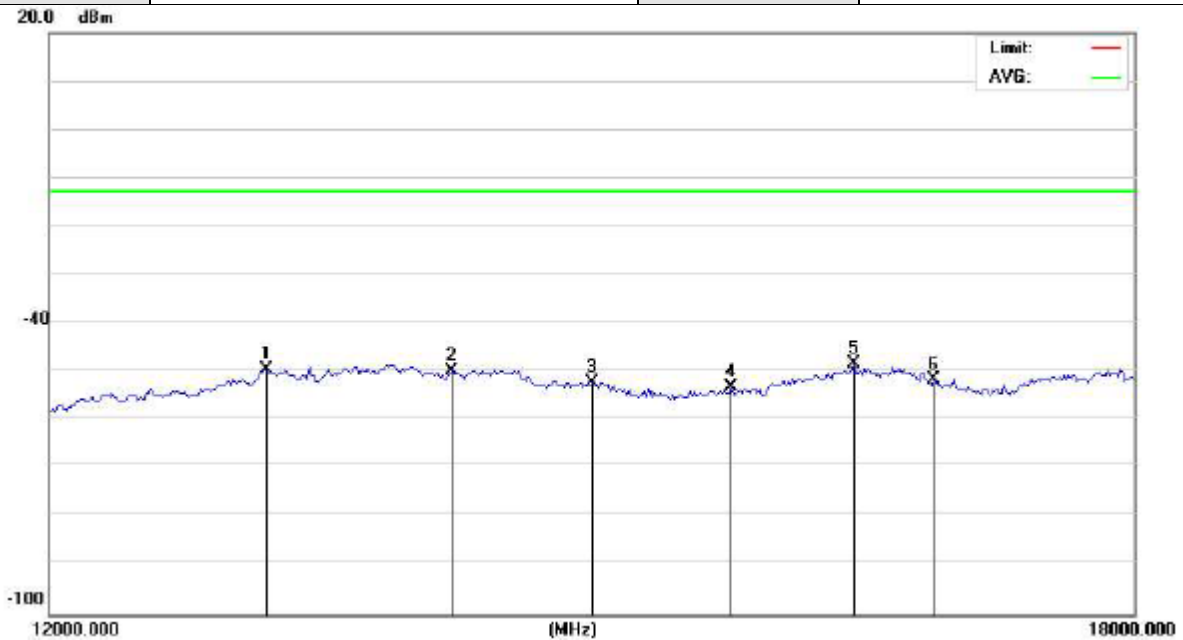


Remark: Factor = LISN factor + Cable Loss + Pulse limiter factor.

No. Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measurement dBm	Limit dB	Over dB	Detector
1	6144.288	-62.46	9.91	-52.55	-13.00	-39.55	peak
2 *	6613.226	-31.97	10.65	-21.32	-13.00	-8.32	peak
3	6973.948	-66.47	10.83	-55.64	-13.00	-42.64	peak
4	7527.054	-70.03	11.09	-58.94	-13.00	-45.94	peak
5	8272.545	-58.35	10.74	-47.61	-13.00	-34.61	peak
6	11591.18	-60.08	14.41	-45.67	-13.00	-32.67	peak

\*Maximum Data

Mode:	Mode 1	Test Date :	2020-05-15
Test Voltage:	AC 120V/60Hz	Polarization :	Vertical

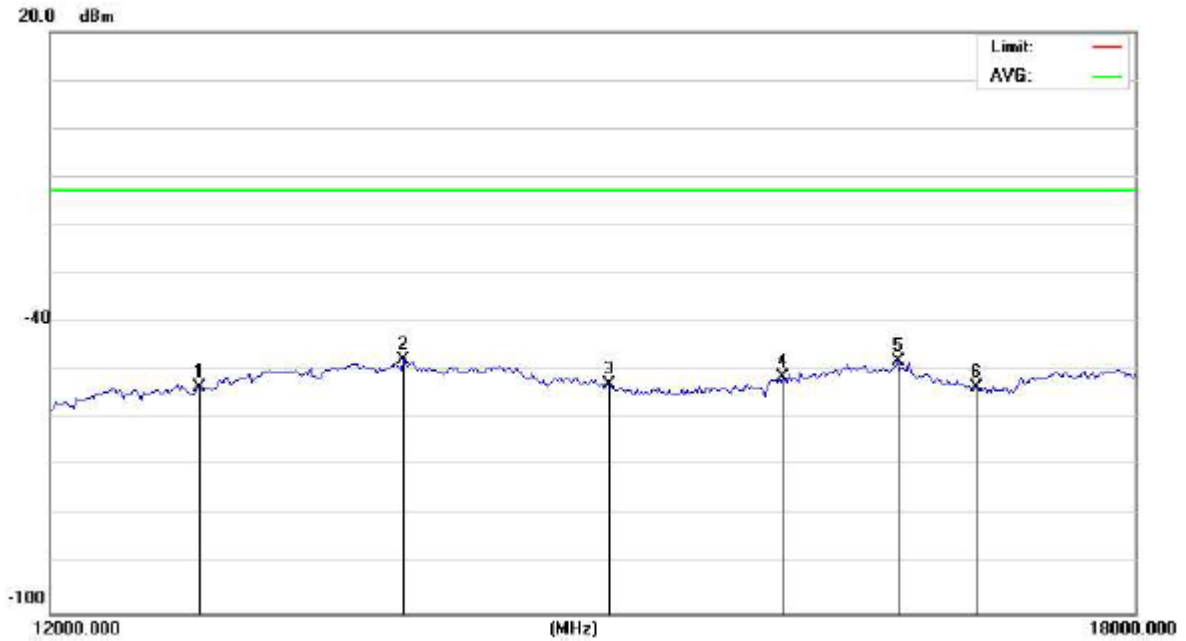


Remark: Factor = LISN factor + Cable Loss + Pulse limiter factor.

No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dB	Over dB	Detector
1		13022.04	-72.12	22.43	-49.69	-13.00	-36.69	peak
2		13947.89	-74.08	23.98	-50.10	-13.00	-37.10	peak
3		14705.41	-72.18	19.86	-52.32	-13.00	-39.32	peak
4		15498.99	-72.10	18.76	-53.34	-13.00	-40.34	peak
5	*	16220.44	-70.76	22.10	-48.66	-13.00	-35.66	peak
6		16713.42	-72.11	20.39	-51.72	-13.00	-38.72	peak

\*Maximum Data

Mode:	Mode 1	Test Date :	2020-05-15
Test Voltage:	AC 120V/60Hz	Polarization :	Horizontal



Remark: Factor = LISN factor + Cable Loss + Pulse limiter factor.

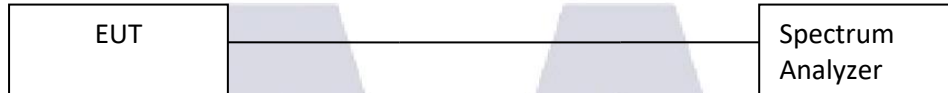
No. Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measurement dBm	Limit dB	Over dB	Detector
1	12697.39	-73.22	19.49	-53.73	-13.00	-40.73	peak
2 *	13707.41	-71.99	24.12	-47.87	-13.00	-34.87	peak
3	14789.57	-72.53	19.34	-53.19	-13.00	-40.19	peak
4	15787.57	-72.10	20.47	-51.63	-13.00	-38.63	peak
5	16484.97	-70.86	22.52	-48.34	-13.00	-35.34	peak
6	16965.93	-71.39	17.85	-53.54	-13.00	-40.54	peak

\*Maximum Data

6.3 Occupied Bandwidth

Test Procedure:

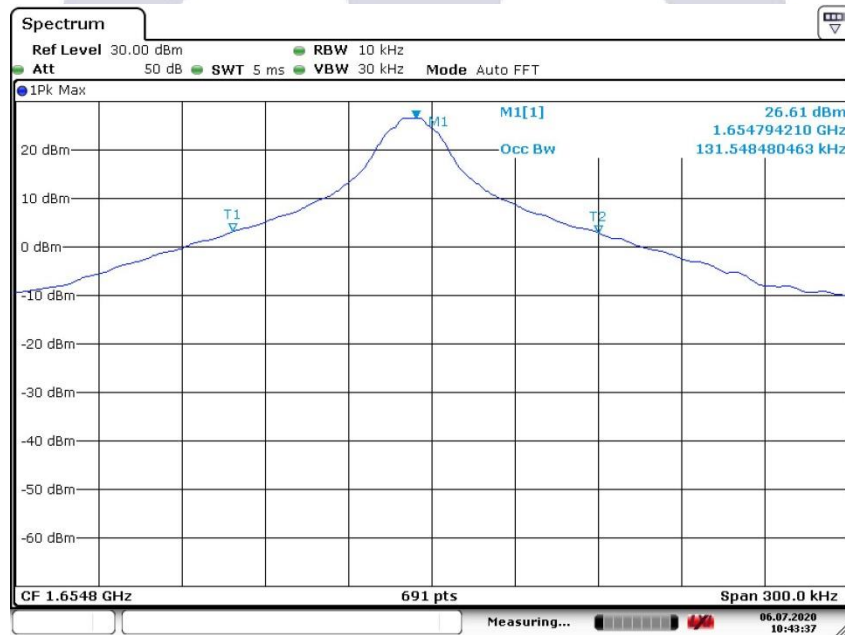
The EUT was connected directly to a spectrum analyzer. The occupied bandwidth of the modulated output was measured and plotted. Attenuator and cable losses were input into the analyzer as a reference level offset to ensure accurate measurements were obtained. ANSI C63.26 2015 section 5.4.4 was followed to obtain results.



Note: There is no requirement for occupied bandwidth in Part 25 for Mobile Earth Stations. However, the emissions masks are based upon the occupied bandwidth. This information is reported for reference only.

Test Results

Tuned Frequency (MHz)	Measured Bandwidth (KHz)
1654.8	131.54



Date: 6.JUL.2020 10:43:37

6.4 Emissions Mask

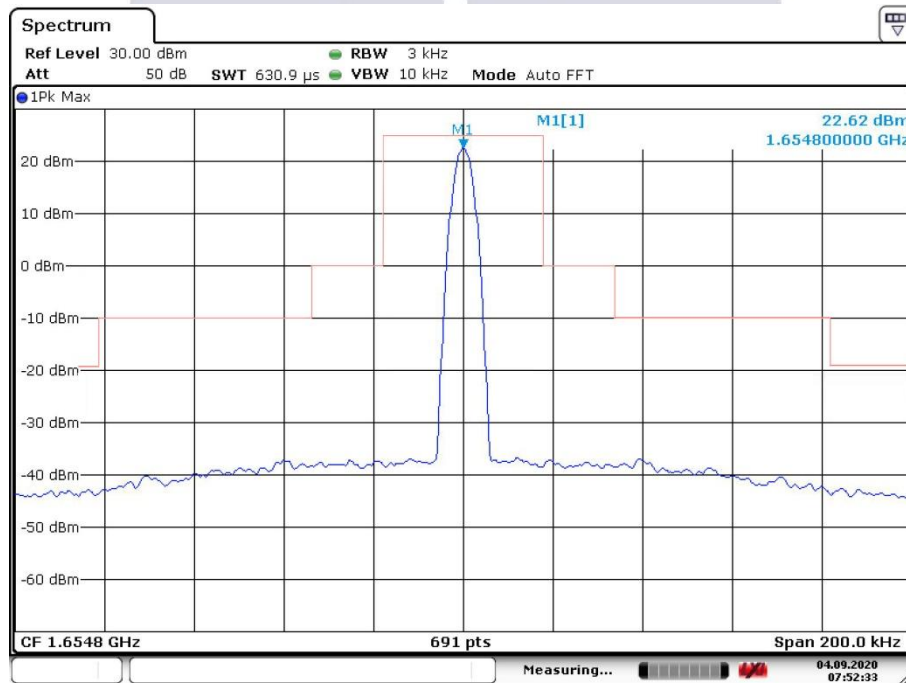
Test Procedure

The EUT was connected directly to a spectrum analyzer to verify that the EUT met the requirements for emission mask. Attenuator and cable losses were input into the analyzer as a reference level offset to ensure accurate measurements were obtained.

Test Setup



Tuned Frequency (MHz)	Result
1654.8	PASS



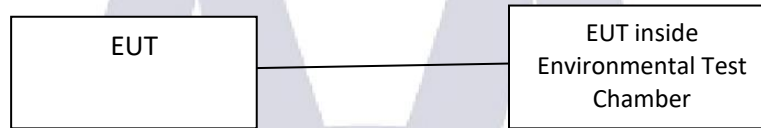
Date: 4.SEP.2020 07:52:33

**6.5 Frequency Tolerance**

**Test Procedure**

The EUT was placed inside an environmental test chamber, and connected to a spectrum analyzer. The span and RBW was adjusted for narrowband operation to ensure an accurate measurement of the Modulated signal. The temperature was varied from – 30 to +50°C in 10°C increments. After a 30-minute soak time the output frequency was measured. At 20°C the voltage was varied +/- 15% from the nominal voltage.

**Test Setup**



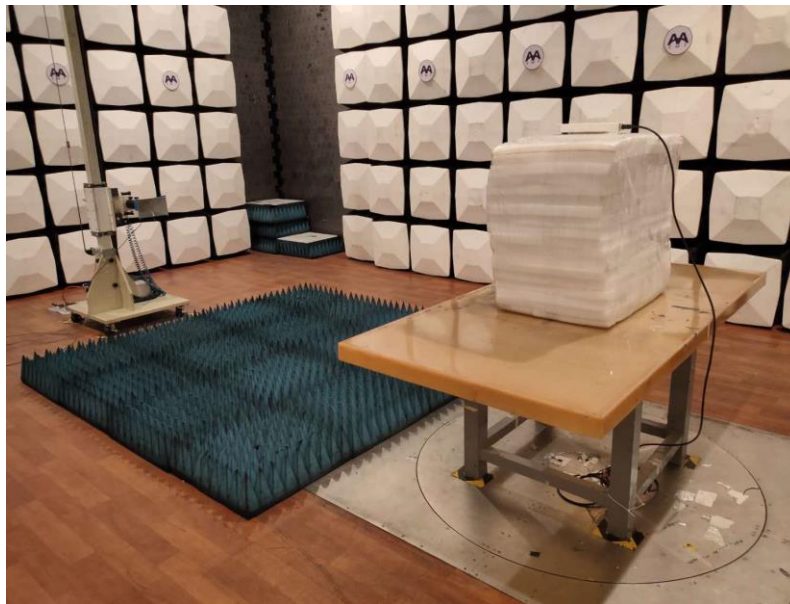
**Frequency versus Temperature**

Tuned Frequency (MHz)	Frequency Tolerance Limit %	Upper Limit (MHz)	Lower Limit (MHz)	Temp. (Centigrade)	Measured Frequency (MHz)	Upper Margin (MHz)	Lower Margin (MHz)
1654.8	0.0010	1654.816548	1654.783452	-30	1654.805400	0.011148	0.021948
		1654.816548	1654.783452	-20	1654.805220	0.011328	0.021768
		1654.816548	1654.783452	-10	1654.804400	0.012148	0.020948
		1654.816548	1654.783452	0	1654.803300	0.013248	0.019848
		1654.816548	1654.783452	10	1654.804100	0.012448	0.020648
		1654.816548	1654.783452	20	1654.802600	0.013948	0.019148
		1654.816548	1654.783452	30	1654.802900	0.013648	0.019448
		1654.816548	1654.783452	40	1654.803100	0.013448	0.019648
		1654.816548	1654.783452	50	1654.804800	0.011748	0.021348

**Frequency versus Voltage**

Tuned Frequency (MHz)	Frequency Tolerance Limit %	Upper Limit (MHz)	Lower Limit (MHz)	Nominal Voltage	Voltage	Measured Frequency (MHz)	Upper Margin (MHz)	Lower Margin (MHz)
1654.8	0.0010	1654.816548	1654.783452	24.00	22.50	1654.7971160	-0.019432	-0.013664
		1654.816548	1654.783452		24.00	1654.7973560	-0.019144	-0.013904
		1654.816548	1654.783452		35.30	1654.7971160	-0.019432	-0.013664

## 7. Test Set up Photograph



**“End of Report”**