



**DATE: 28 August 2018**

# **I.T.L. (PRODUCT TESTING) LTD. FCC Radio Test Report**

**For**

**Motorola Solutions, Inc.**

**Equipment under test:**

**MC-EDGE VHF**

**F0016A (VA00710AA)**

**VHF 136-174MHz**

**FCC ID: AZ492FT7112**

**IC: 109U-92FT7112**

**Emission Designator: 8K10F1D (Digital Data, 12.5kHz channel)**

**Emission Designator: 8K10F1W (Digital TDMA, 12.5kHz channel)**

VA00715AA	FCC ID: N7NHL7588	C: 2417C-HL7588
VA00726AA	FCC ID: SQG-1001	C: 3147A-1001

Tested by: \_\_\_\_\_

M. Zohar

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

D. Shidlovsky

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This report relates only to items tested.



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# 1. General Information

## 1.1 Administrative Information

Manufacturer:	Motorola Solutions, Inc.
Manufacturer's Address:	2 Negev St. Airport City, 7019900 Israel Tel: +972-3-565-8888
Manufacturer's Representative:	Alex Babaladze
Equipment Under Test (E.U.T):	MC-EDGE VHF
Equipment Model No.:	F0016A (VA00710AA)
Equipment Serial No.:	2758UA004D
Date of Receipt of E.U.T:	March 5, 2018
Start of Test:	March 5, 2018
End of Test:	May 13, 2018
Test Laboratory Location:	I.T.L (Product Testing) Ltd. 1 Batsheva St, Lod, Israel 7120101



## **1.2 List of Accreditations**

The EMC laboratory of I.T.L. is accredited by/registered with the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), FCC Designation Number is IL1005.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. Industry Canada (Canada), IC File No.: 46405-4025; Site No. IC 4025A-1, IC 4025A-2.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.



### 1.3 **Test Methodology**

Radiated and conducted testing was performed according to the procedures in ANSI C63.26: 2015 and ANSI/TIA-603-E: 2016, Section 2.2.12.

### 1.4 **Product Description**

The IoT Mission Critical EDGE is a part of MSI mission critical IoT portfolio which provides an ecosystem for IoT developers, integrators and users to build out an IoT base solutions.

The MC EDGE is a highly secured communication agnostic versatile IoT Gateway which uses LoRaWAN for Wireless Sensor Connectivity, extensive Physical I/O suite of interfaces.

The MC EDGE provides a suite of tools for edge analytics creation and data manipulation creation which varies from easy /intuitive Codeless web based tools to an highly suffictated C based SDK. The MC EDGE utilize an inherited LTE CAT- 4 and ASTRO (P25) connectivity capabilities

This solution is targeting two main markets: Mission critical with public safety oriented solution e.g. smart early warning, Safe city, Perimeter security etc. and critical infrastructure e.g. Smart water and electricity management.

On the mission critical side, highly secured mission critical IoT ecosystem will create a major differentiation points as well as migration path between LMR to PS LTE infrastructure. On the Critical infrastructure side, Communication agnosticism, highly reliable Industrial Gateway will provide a market differentiation and superiority.

#### Main

F0016A	Main Model
VA00710AA	APX4000 VHF FOR MC-EDGE
VA00715AA	LTE VERIZON USA/CANADA MODEM FOR MC-EDGE
VA00726AA	LORA 902 - 928 MHZ USA/CANADA MODEM FOR MC-EDGE

#### I/Os

FLN0050A	12DI/8AI MODULE 0-20MA
FLN0051A	12DI/8AI MODULE 0-5V
FLN0052A	8DO/2AO MODULE 0-20MA, 0-10V
FLN0116A	Mixed I/O



VA00007AA	12DI/8AI 0- 20mA
VA00008AA	8DO/2AO 0-20mA / 0-10V
VA00047AA	12DI/8AI 0-5V
VA00149AA (VA00008AA)	8DO/2AO HW ONLY NO LIC
VA00150AA	12DI/8AI HW ONLY NO LIC
VA00151AA (VA00047AA)	0 - 5V DI/AI
VA00152AA (VA00007AA)	0 - 20MA DI/AI
VA00291AA	IOT MC-EDGE CPU PACKAGE
VA00290AA	IOT MC-EDGE PLUG-IN BOARD
VA00598AA	MIXED IO 7DI/6DO/1AO/4AI 0- 20MA
VA00599AA(VA00598AA)	MIXED IO 7DI/6DO/1AO/4AI HW ONLY NO LIC

#### Power Supply

FLN0096A	AC POWER SUPPLY 12V/120W DC OUT
FLN0101A	AC POWER SUPPLY 24V/120W DC OUT
VA00009AA	AC POWER SUPPLY 12V/120W DC OUT
VA00130AA	AC POWER ;SUPPLY 24V / 120W DC OUTPUT

#### Antennas

BMLPVMBLTENGP-VP	MLPV Low-Profile Vertical Antennas
MWV1365S	WIDEBAND VHF NO TUNE ANTENNA





## 2. System Test Configuration

### 2.1 Justification

1. The E.U.T contains the following 3 transceivers:
  - a) LTE cellular modular approved under FCC ID: N7NHL7588 and IC: 2417C-HL7588.
  - b) LoRa WAN modular approved under FCC ID: SQG-1001 and IC: 3147A-1001.
  - c) APX4000 (LMR) radio main board VHF.
2. Testing was performed with 2 modulations: digital data & digital TDMA each with 12.5kHz bandwidth.
3. The E.U.T can consist of 3 I/O configurations external modules: DI (data input), DO (data output), mixed I/O. Per customer declaration mixed I/O modular was chosen as the “worst case”.
4. The E.U.T can be used powered via the 2 below ac/dc adapters:

Manufacturer:	Part Number:	Serial Number:
Emerson	ADN5-24-1PM-C	1679N2000TAEC
TDK Lambda	APP120-12-1	130958 9601431300353

5. Exploratory AC line conducted emission testing was performed to find the worst case power supply. The worst case was with the TDK Lambda power supply. See ITL Test Report no. E185051.00
6. Testing was therefore performed on the E.U.T. with the TDK Lambda adapter.

### 2.2 EUT Exercise Software

No special exercise software was required.

### 2.3 Special Accessories

1. AC/DC optional adapter:  
Manufacturer: EMERSON  
Part number: ADN5-24-1PM-C  
Serial number: 1679N2000TAEC
2. AC/DC optional adapter:  
Manufacturer: TDK Lambda  
Part number: APP120-12-1  
Serial number: 130958 9601431300353
3. Laptop  
Manufacturer: Lenovo  
Part number: 2519-A43  
Serial number: R8-W3PZ8

### 2.4 Equipment Modifications

No modifications were necessary in order to achieve compliance.



## 2.5 Configuration of Tested System

Product Name	MC-EDGE VHF
Model Name	F0016A (VA00710AA)
Working voltage	Nominal: 12VDC via AC/DC power supply 115VAC input
Mode of operation	Transceiver
Modulations	TDMA , digital data
Operating Frequency Range	136MHz-174MHz
Transmit power	~38.2 dBm
Antenna Gain	0dBi
DATA rate	N/A
Modulation BW	12.5kHz
DC Voltage and DC current applied to the final amplifying device	2.11A @ 7.5VDC

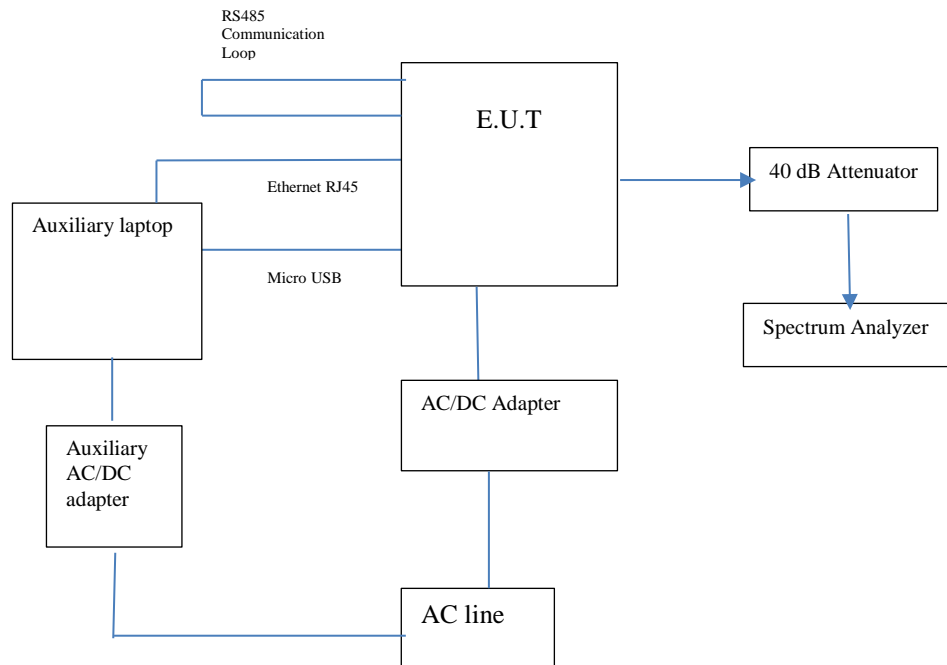
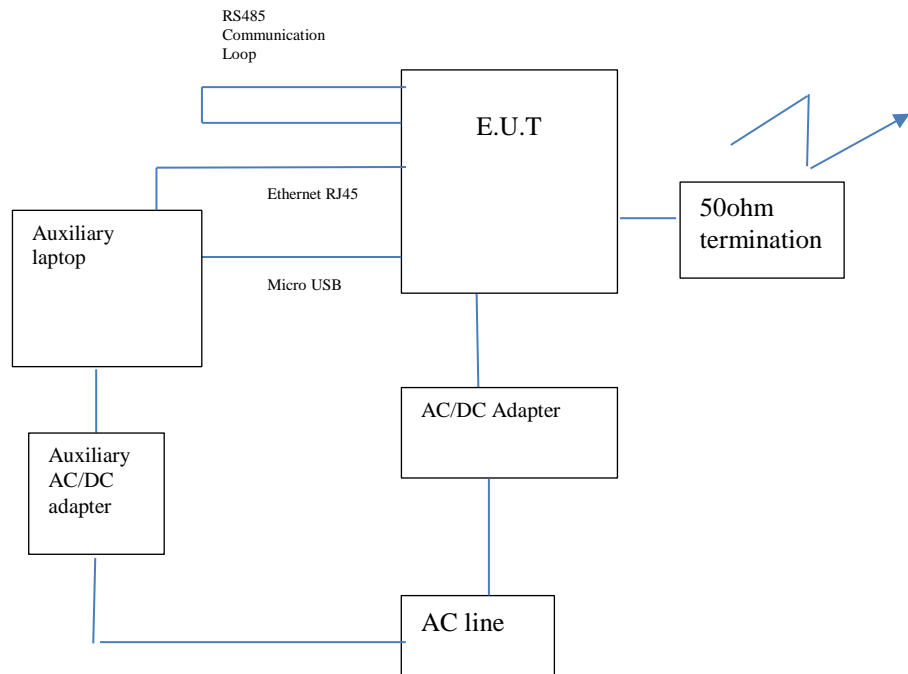
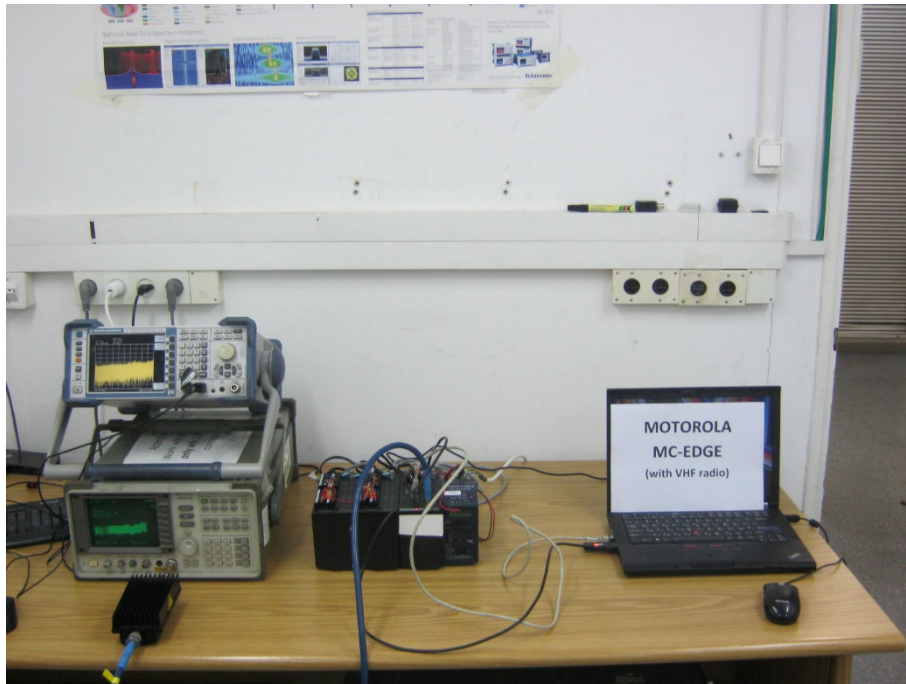


Figure 1. Conducted Test Set-Up

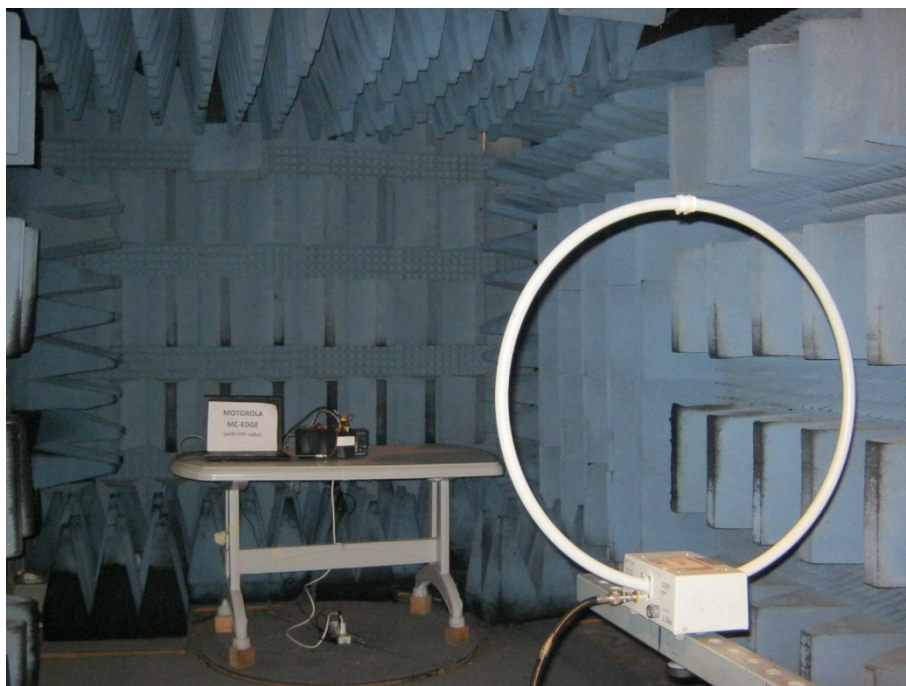


**Figure 2. Radiated Test Set-Up**

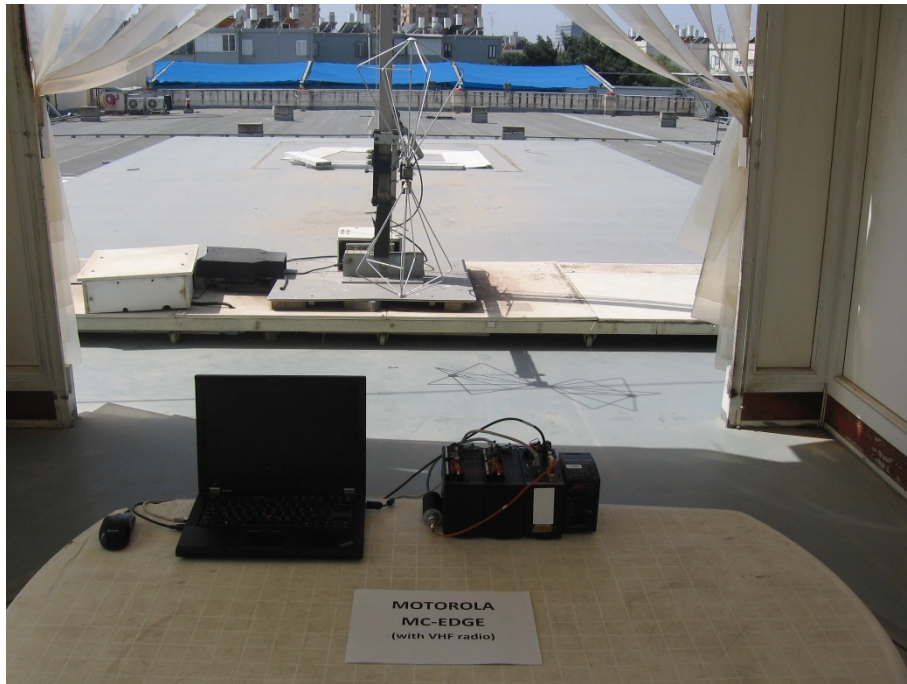
### 3. Test Set-Up Photos



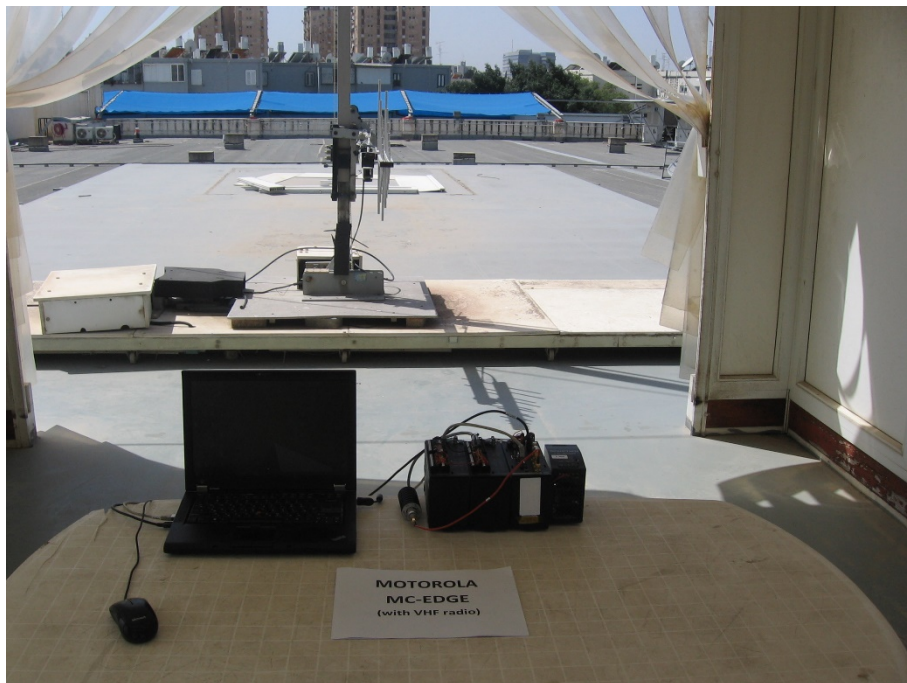
**Figure 3. Conducted Emission From Antenna Port Test**



**Figure 4. Radiated Emission Test, 0.009-30MHz**



**Figure 5. Radiated Emission Test, 30-200MHz**



**Figure 6. Radiated Emission Test, 200-1000MHz**



**Figure 7. Radiated Emission Test, 1000-2000MHz**



## 4. RF Power Output Pursuant to 47 CFR 2.1046, 22.565, 74.461 & RSS Gen, RSS 119

### 4.1 Test Procedure

(Temperature (22°C)/ Humidity (52% RH))

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator (total loss 39.8 dB) and an appropriate coaxial cable. Special attention was taken to prevent Spectrum Analyzer RF input overload. The Spectrum Analyzer was set to 30 kHz RBW.

### 4.2 Test Limit

Peak Power Output must not exceed 5.9W (37.7dBm).

### 4.3 Test Results

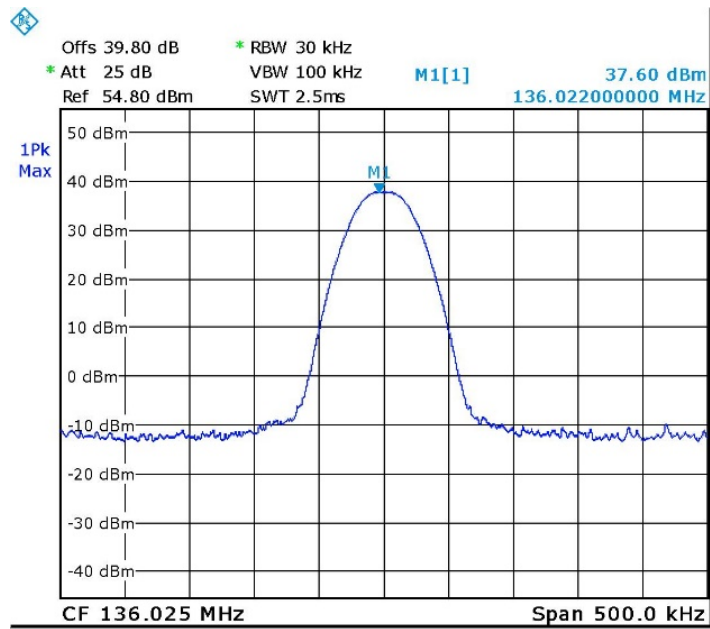
Modulation	Operation Frequency	Reading	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
TDMA	136.025*	37.6	37.7	-0.1
	154.225	37.6	37.7	-0.1
	173.975	37.5	37.7	-0.2
DIGITAL	136.025*	37.6	37.7	-0.1
	154.225	37.6	37.7	-0.1
	173.975	37.5	37.7	-0.2

**\*NOTE:** NOT FOR FCC REVIEW

**Figure 8 RF Power Output**

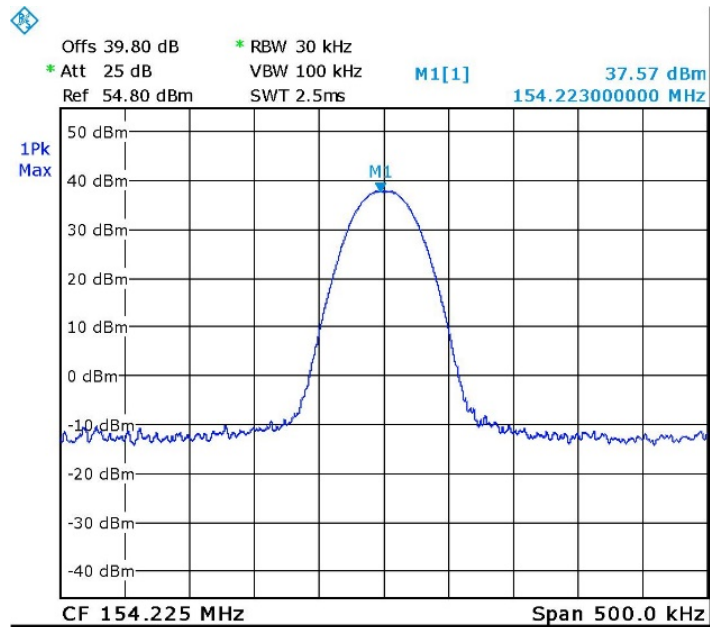
JUDGEMENT:                      Passed

See additional information in *Figure 9* to *Figure 14*.



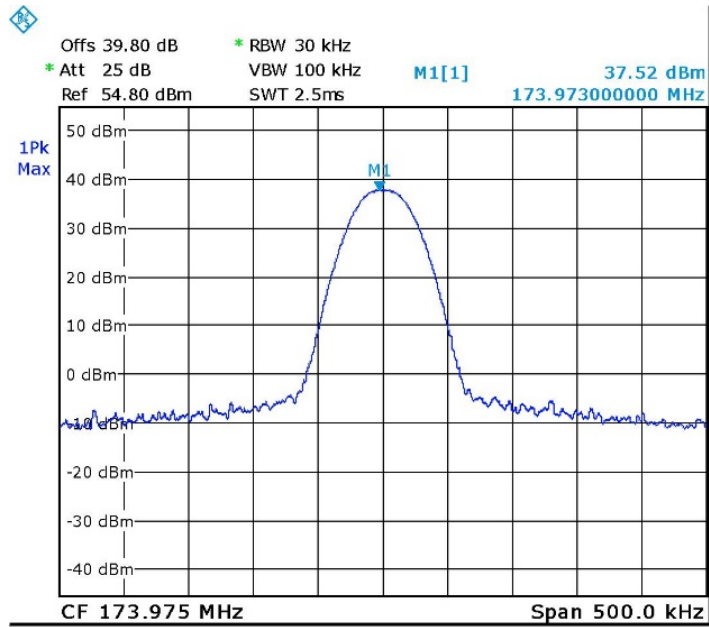
Date: 5.MAR.2018 08:34:51

Figure 9. 136.025MHz, Digital



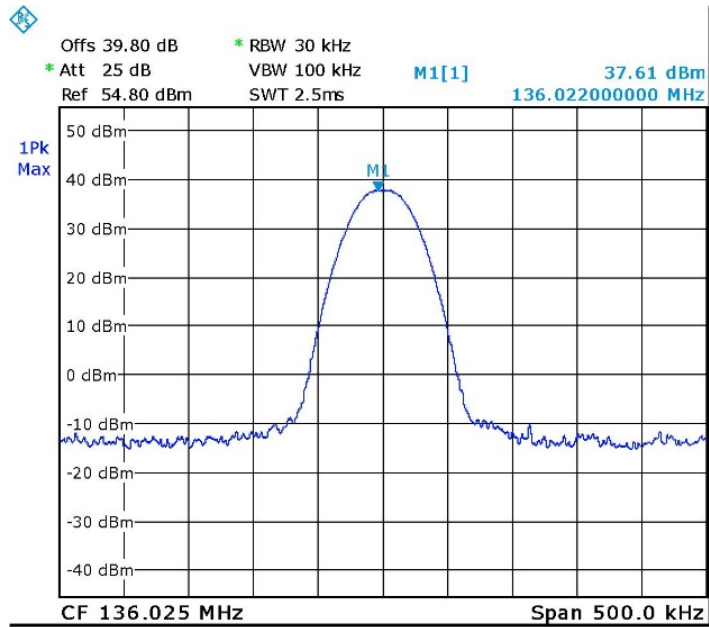
Date: 5.MAR.2018 08:37:50

Figure 10. 154.225MHz, Digital



Date: 5.MAR.2018 08:39:43

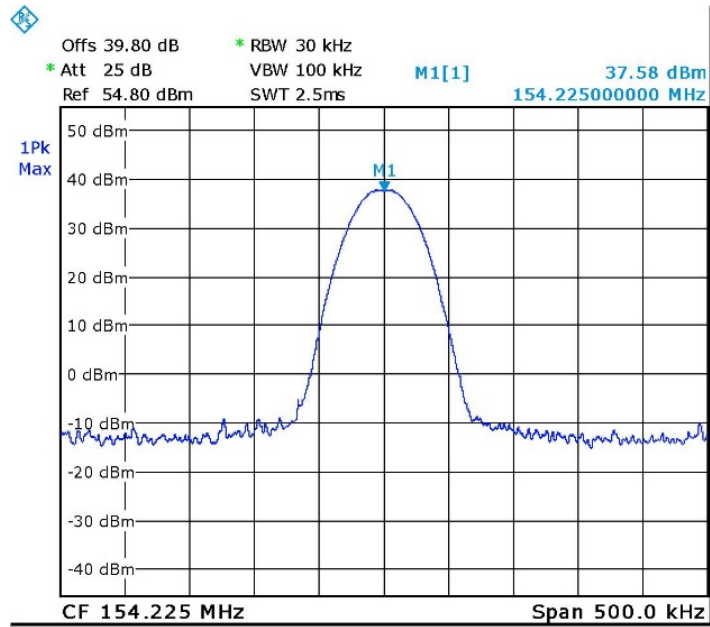
Figure 11. 173.975MHz, Digital



Date: 5.MAR.2018 08:45:13

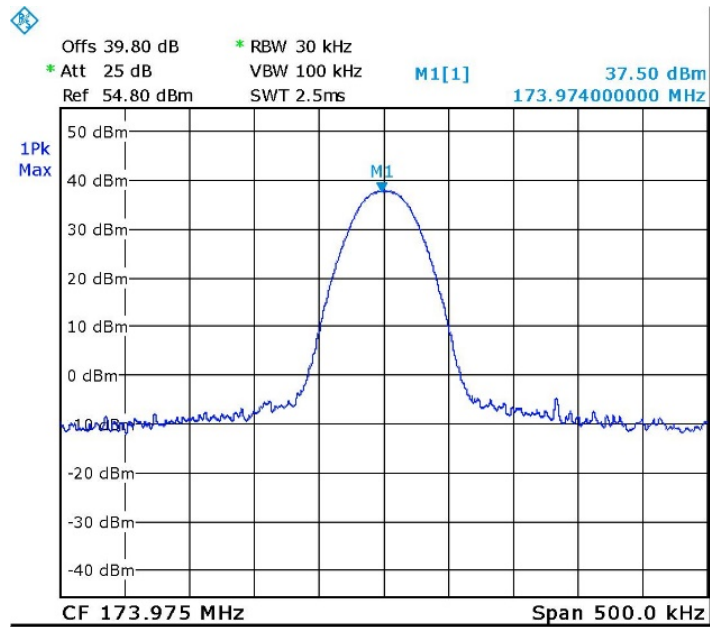
Figure 12. 136.025MHz, TDMA





Date: 5.MAR.2018 08:44:28

Figure 13. 154.225MHz, TDMA



Date: 5.MAR.2018 08:41:16

Figure 14. 173.975MHz, TDMA



**4.4 Test Equipment Used; RF Power Output**

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
Spectrum Analyzer	R&S	FSL6	100194	February 19, 2018	February 19, 2019
40 dB Attenuator	Weinschel	WA 39-40-33	A1323	October 1, 2017	October 1, 2018

**Figure 15 Test Equipment Used**



## 5. Occupied Bandwidth Pursuant to 47 CFR 2.1049, 22.359, 74.462, 90.210, RSS Gen & RSS 119

### 5.1 Test Procedure

(Temperature (22°C)/ Humidity (53% RH))

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (total loss=39.8 dB).

For Mask D measurements, RBW of 100Hz was used.

For 99% occupied bandwidth measurements, RBW set to at least 1% from the OBW.

Occupied Bandwidth Data Designators:

For Digital Data, 12.5kHz channel: 8K10F1D;

For Digital TDMA, 12.5kHz channel: 8K10F1W

### 5.2 Test Limit

MASK D

### 5.3 Test Results

JUDGEMENT: Passed

See additional information in *Figure 16* to *Figure 23*.

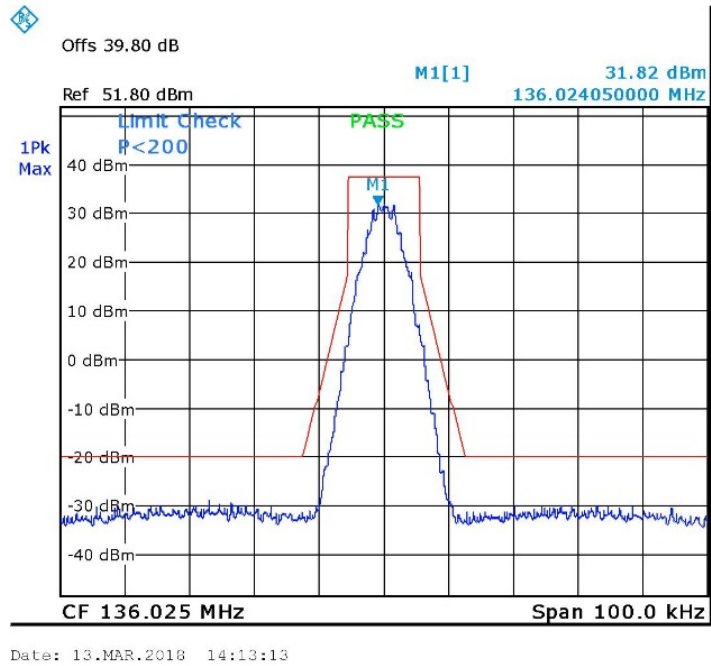


Figure 16. 136.025MHz, Digital

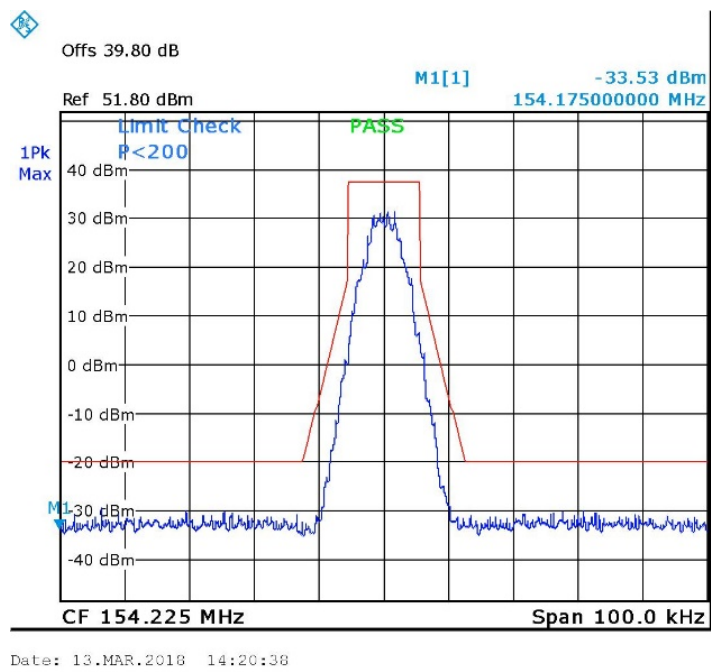


Figure 17. 154.225MHz, Digital

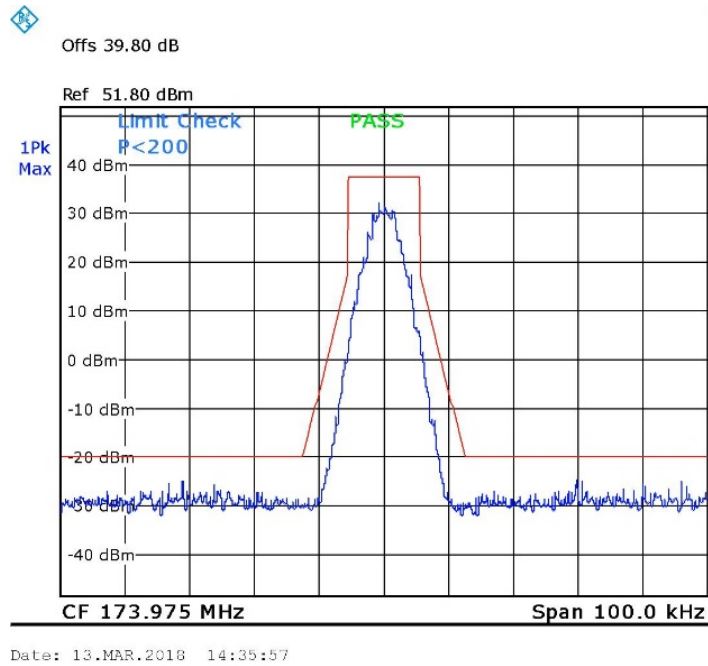


Figure 18. 173.975MHz, Digital

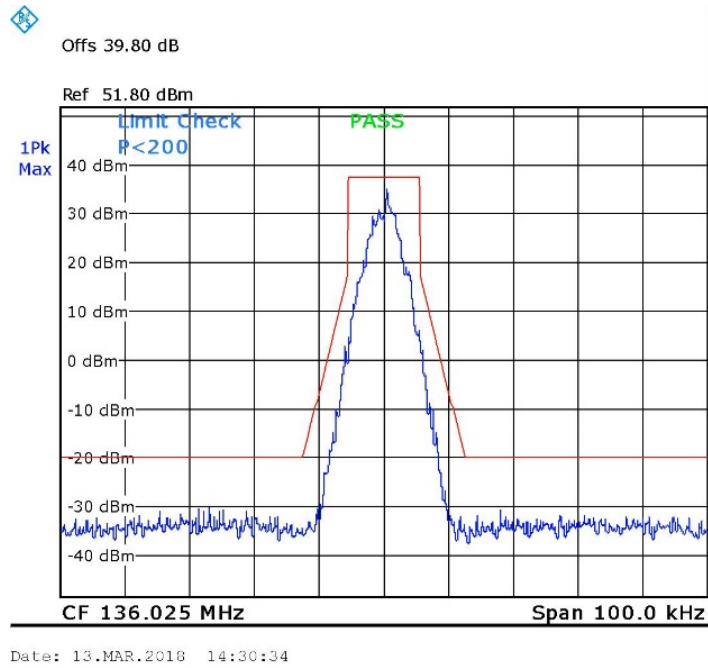


Figure 19. 136.025MHz, TDMA

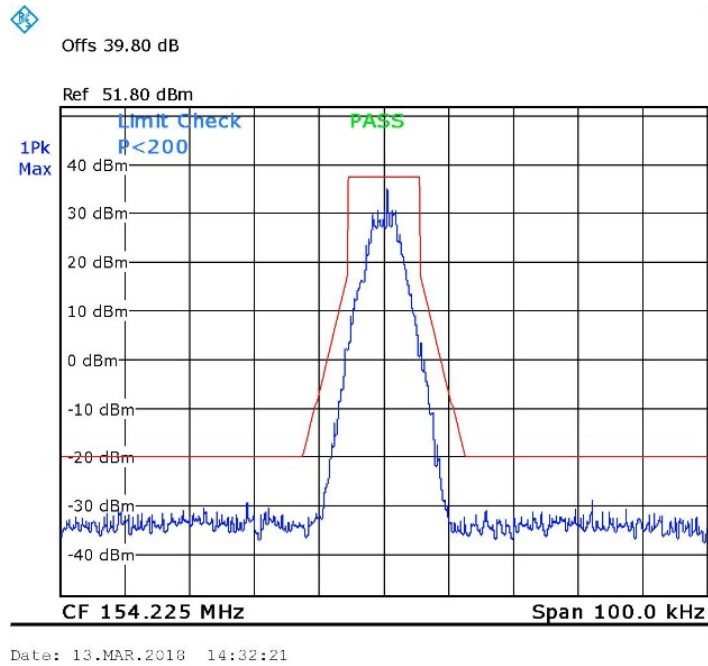


Figure 20. 154.225MHz, TDMA

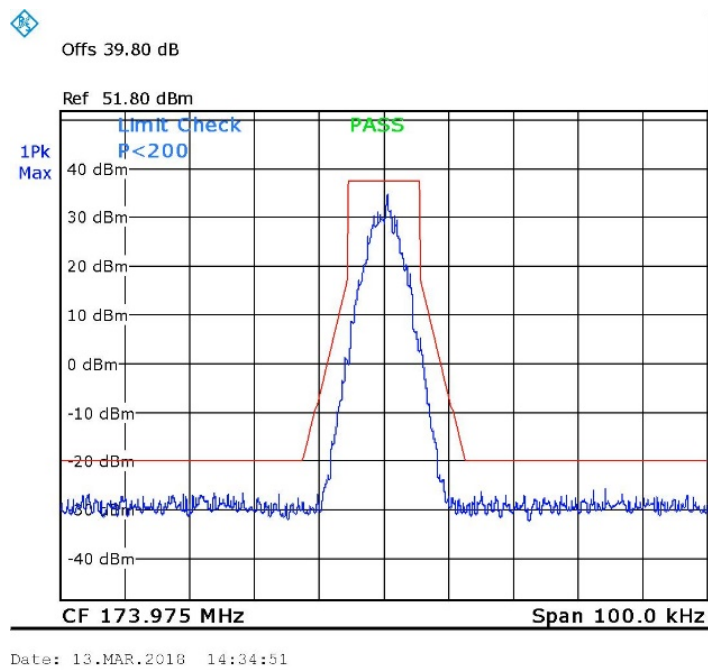
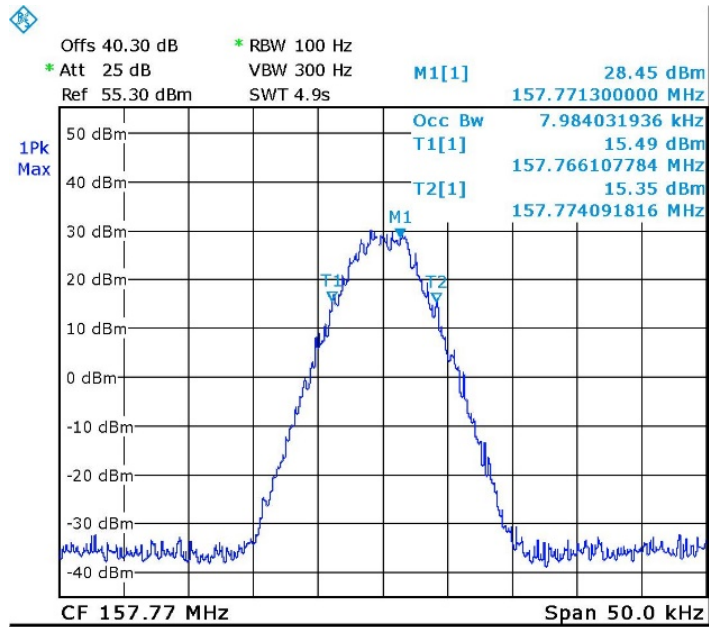
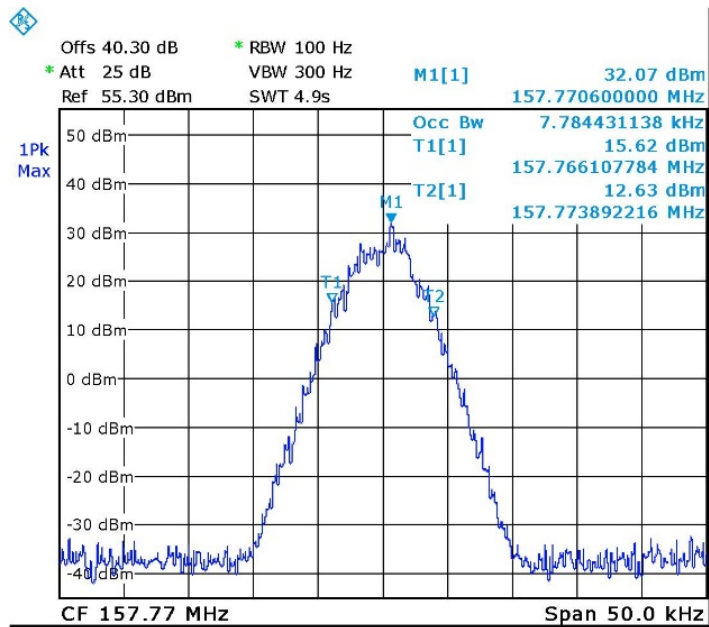


Figure 21. 173.975MHz, TDMA



Date: 5.MAR.2018 10:45:43

Figure 22. 99% OBW, Digital



Date: 5.MAR.2018 10:47:06

Figure 23. 99% OBW, TDMA



**5.4 Test Equipment Used; Occupied Bandwidth**

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
Spectrum Analyzer	R&S	FSL6	100194	February 19, 2018	February 19, 2019
40 dB Attenuator	Weinschel	WA 39-40-33	A1323	October 1, 2017	October 1, 2018

**Figure 24 Test Equipment Used**





## 6. Spurious Emissions at Antenna Terminals Pursuant to 47 CFR 2.1051 & RSS Gen

### 6.1 Test Procedure

(Temperature (22°C)/ Humidity (50%RH))

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (max loss =40.5 dB). The spectrum analyzer was set to 300Hz RBW for the frequency range 9.0-150.0 kHz, 10kHz for the frequency range 150.0kHz–30.0MHz, 100kHz for the frequency range 30.0–1000.0MHz, and 1MHz for the frequency range 1.0- 2.0 GHz.

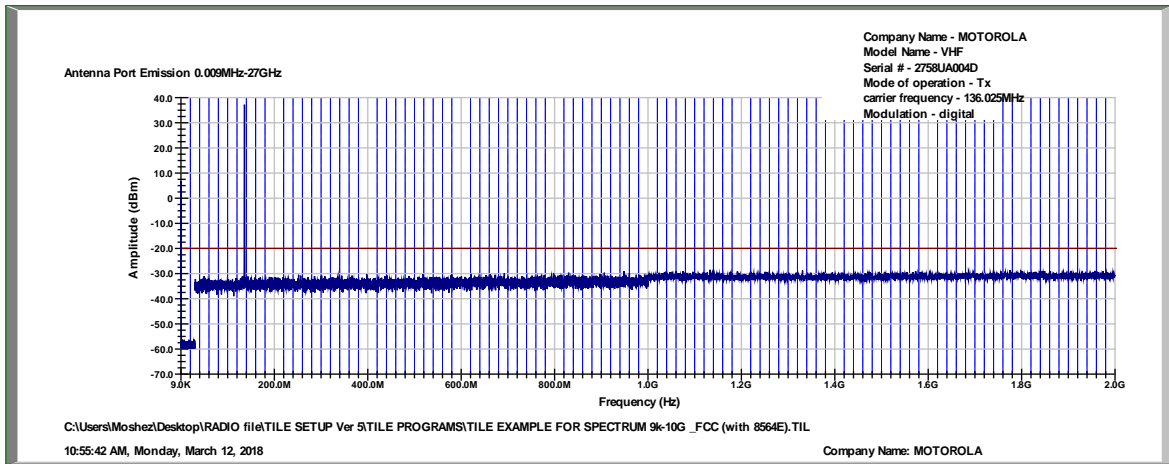
### 6.2 Test Limit

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of  $50 + 10 \cdot \log(P)$  dB, yielding -20dBm.

### 6.3 Test Results

JUDGEMENT: Passed

See additional information in *\*NOTE: NOT FOR FCC REVIEW*  
Figure 25 to Figure 30.



\*NOTE: NOT FOR FCC REVIEW

Figure 25 Spurious Emissions at Antenna Terminals, 136.025MHz, Digital

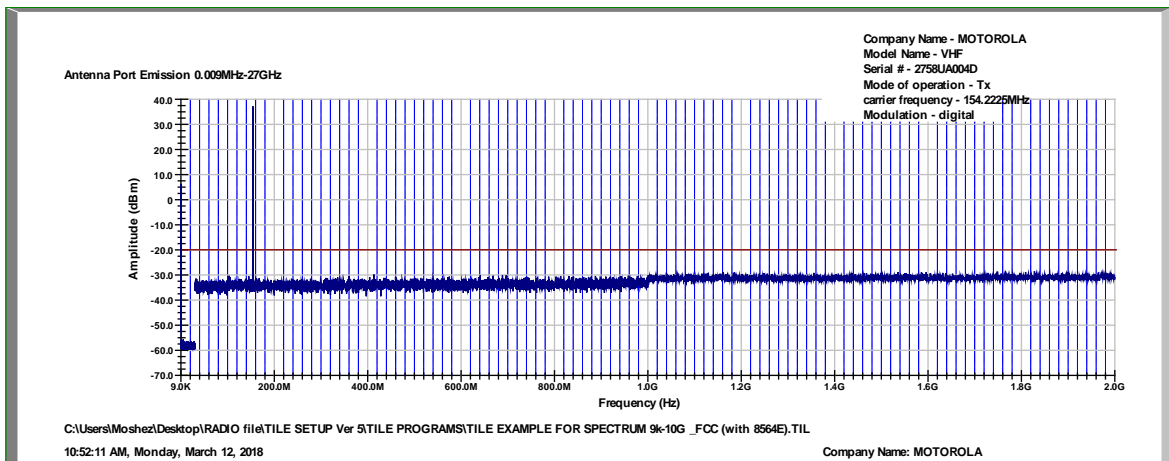


Figure 26 Spurious Emissions at Antenna Terminals, 154.225MHz, Digital

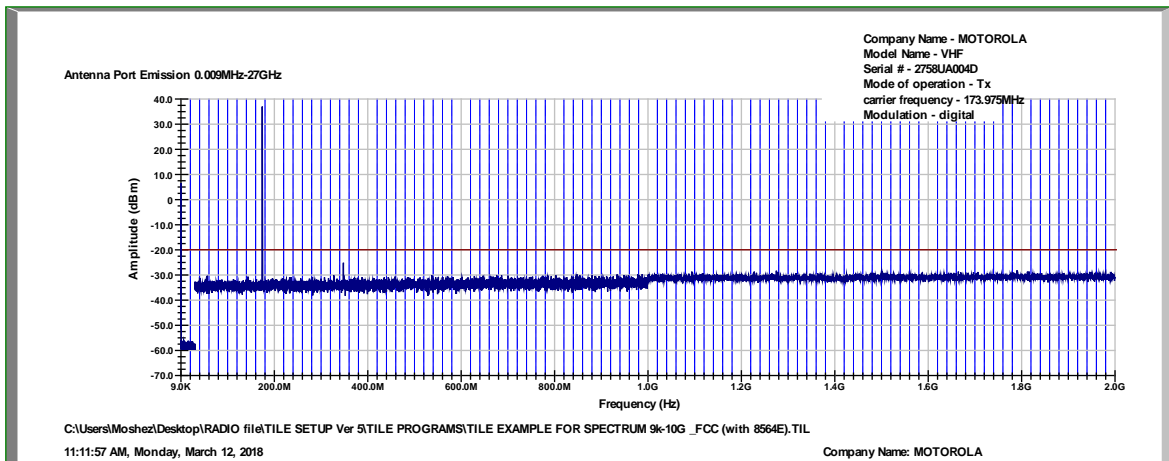
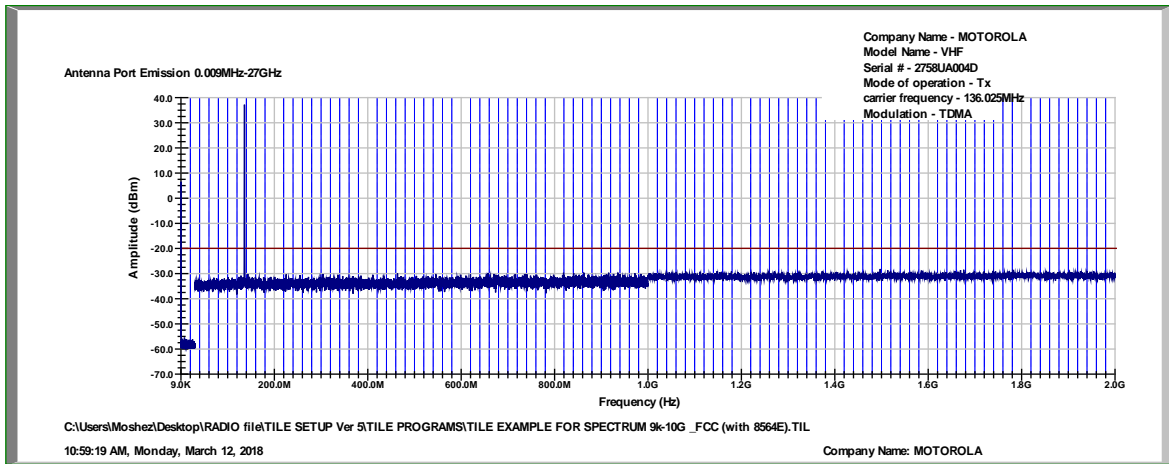


Figure 27 Spurious Emissions at Antenna Terminals, 173.975MHz, Digital



\*NOTE: NOT FOR FCC REVIEW

Figure 28 Spurious Emissions at Antenna Terminals, 136.025MHz, TDMA

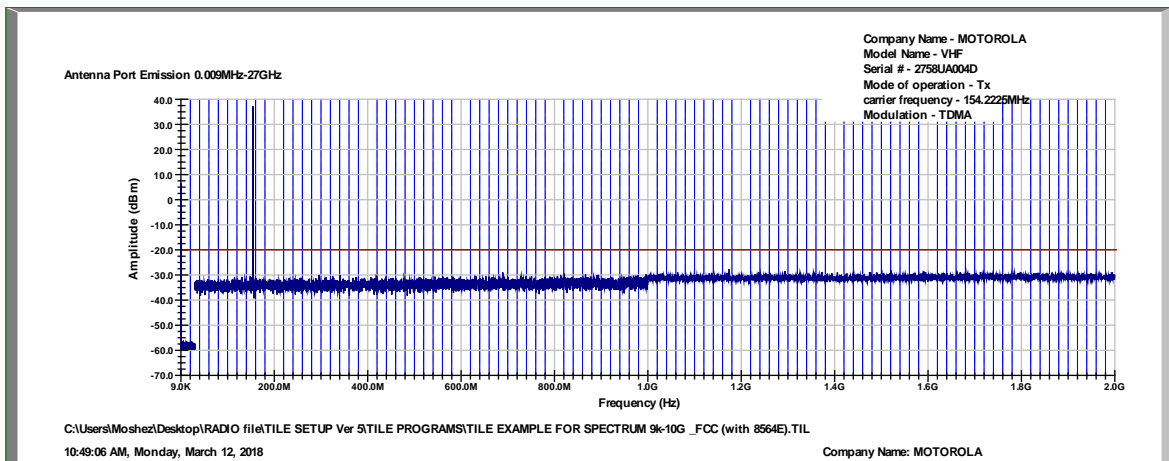


Figure 29 Spurious Emissions at Antenna Terminals, 154.225MHz, TDMA

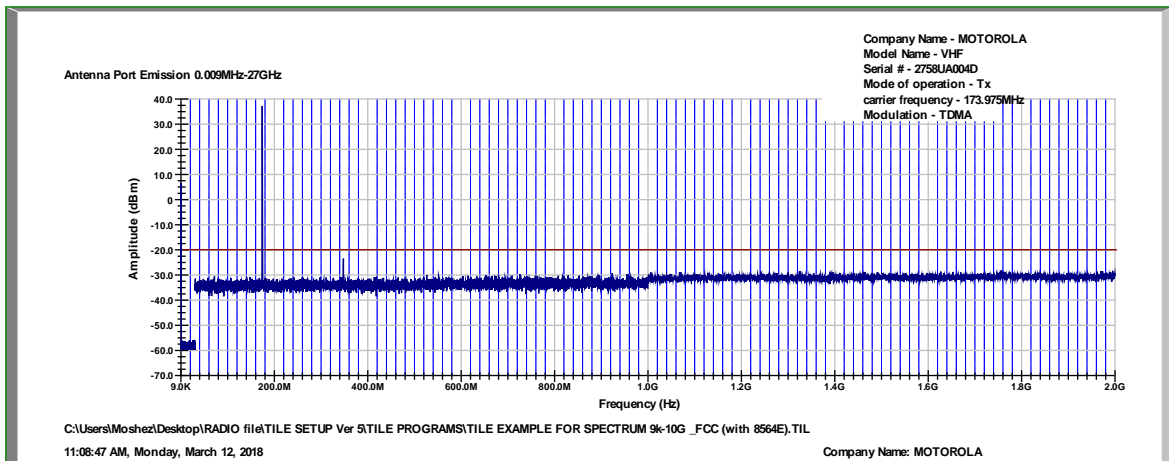


Figure 30 Spurious Emissions at Antenna Terminals, 173.975MHz, TDMA



**6.4 Test Equipment Used; Spurious Emissions at Antenna Terminals**

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
Spectrum Analyzer	HP	8564E	3442A00275	February 28, 2018	February 28, 2019
40 dB Attenuator	Weinschel	WA 39-40-33	A1323	October 1, 2017	October 1, 2018

**Figure 31 Test Equipment Used**



## 7. Band Edge Spectrum Pursuant to 47 CFR 22.359 & RSS Gen, RSS 119

### 7.1 Test Procedure

(Temperature (22°C)/ Humidity (52%RH))

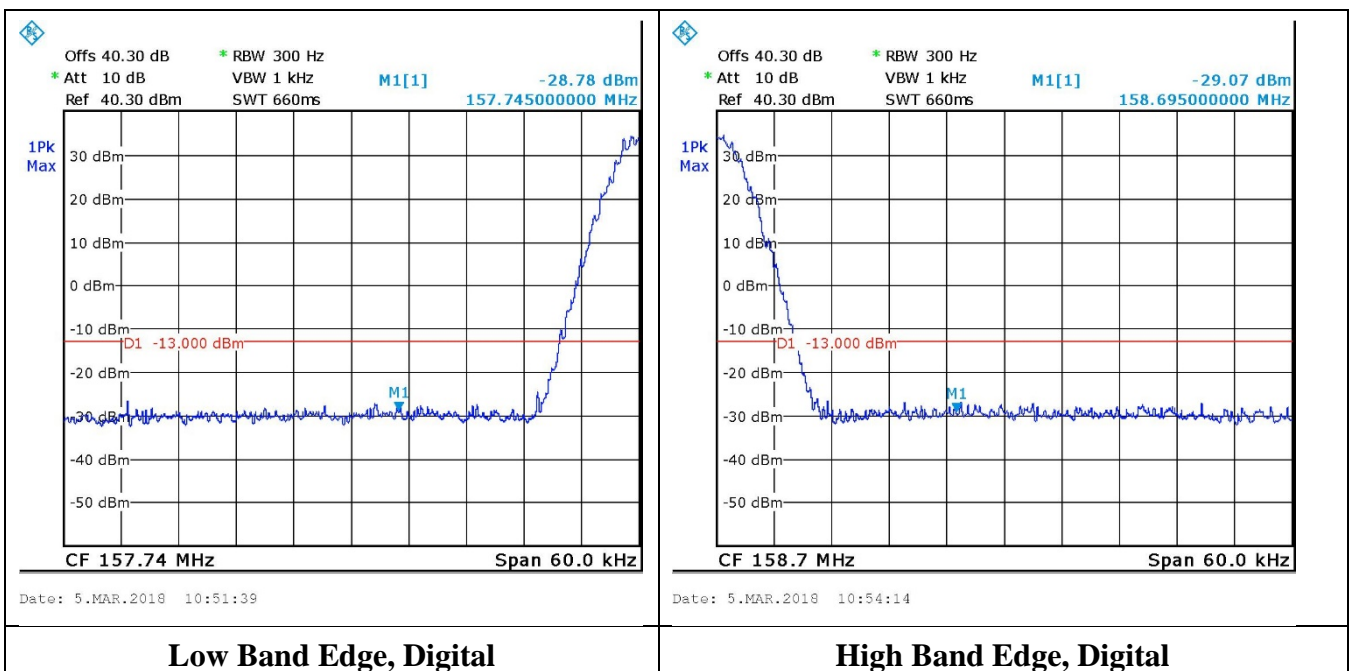
The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (total loss=40.3 dB).

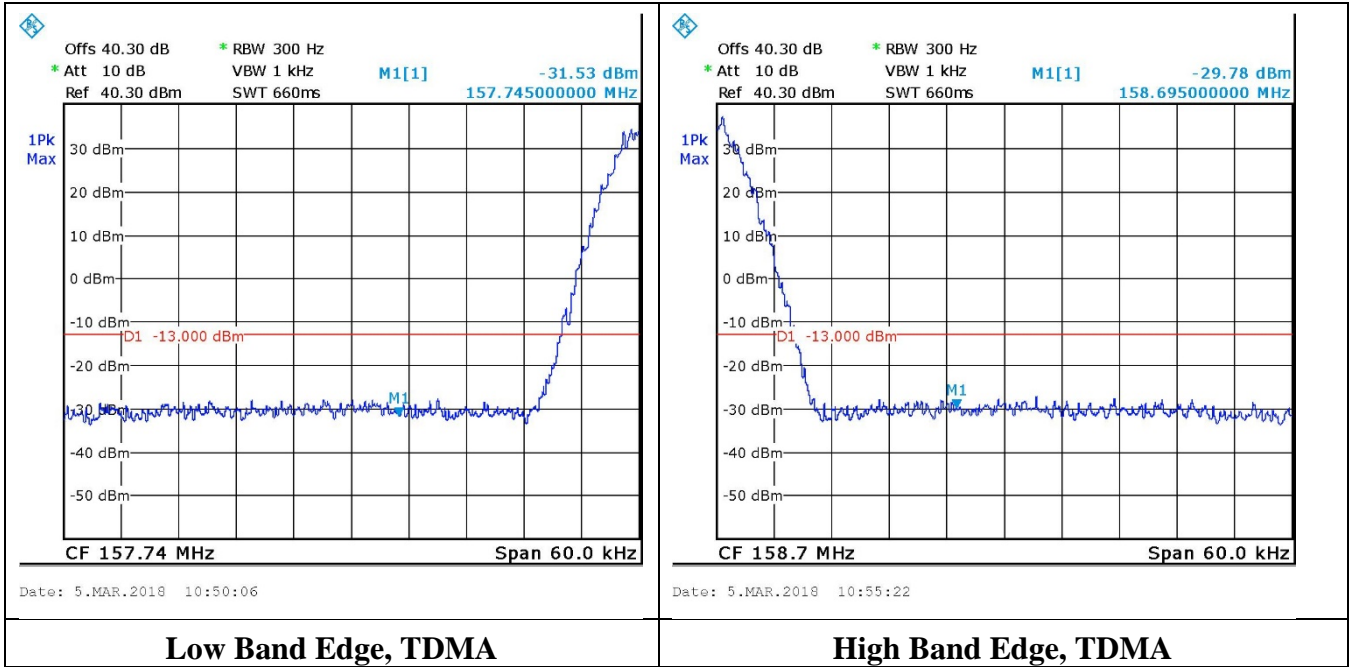
The RBW was set to at least 1% from the OBW.

### 7.2 Test Limit

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  $43 + 10 \cdot \log(P)$  dB, yielding -13dBm.

### 7.3 Test Results





#### 7.4 Test Equipment Used; Band Edge

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
Spectrum Analyzer	R&S	FSL6	100194	February 19, 2018	February 19, 2019
40 dB Attenuator	Weinschel	WA 39-40-33	A1323	October 1, 2017	October 1, 2018

Figure 32 Test Equipment Used



## 8. Spurious Radiated Emission Pursuant to 47 CFR 2.1053, 22.359, 74.462 & RSS Gen, RSS 119

### 8.1 Test Procedure

(Temperature (27°C)/ Humidity (68% RH))

The test method was based on ANSI C63.26: 2015.

#### **For measurements between 0.009MHz-30.0MHz:**

The E.U.T was tested inside the shielded room and placed on a non-metallic table, 0.8 meters above the ground. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization. The emissions were measured at a distance of 3 meters.

The frequency range 0.009MHz-30MHz was scanned.

#### **For measurements between 30.0MHz-1.0GHz:**

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground, at a distance of 3 meters. The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

The frequency range 30.0MHz -1.0GHz was scanned and the list of the highest emissions was verified and updated accordingly.

#### **For measurements between 1.0GHz-2.0GHz:**

The E.U.T was tested inside the shielded room and placed on a non-metallic table, 1.5 meters above the ground. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization. The emissions were measured at a distance of 3 meters.

The frequency range 1.0GHz -2.0GHz was scanned.

The E.U.T. was replaced by a substitution antenna driven by a signal generator. The height was readjusted for maximum reading. The signal generator level was adjusted to obtain the same reading on the EMI receiver

The signals observed were converted to radiated power using:

$$P_d(\text{dBm}) = P_g(\text{dBm}) - \text{Cable Loss (dB)} + \text{Substitution Antenna Gain (dBd)}$$

$P_d$  = Dipole equivalent power (result).

$P_g$  = Signal generator output level.

A Peak detector was using for this test.

The test was performed with all the modulations.

Testing was performed when the RF port was connected to 50 Ω termination.

The table below describe only results with the highest radiation.



**8.2 Test Limit**

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  $50 + 10 \cdot \log(P)$  dB, yielding -20dBm.

**8.3 Test Results**

Carrier Channel	Freq.	Antenna Pol.	Maximum Peak Level	Signal Generator RF Output	Cable Loss	Antenna Gain	Effective Radiated Power Level	Limit	Margin
(MHz)	(MHz)	(V/H)	(dBμV/m)	(dBm)	(dB)	(dBd)	(dBm)	(dBm)	(dB)
136.025	408.075	V	41.2	-59.6	0.3	4.8	-55.1	-20.0	-35.1
	408.075	H	37.1	-65.5	0.3	4.8	-61.0	-20.0	-41.0
154.225	462.675	V	40.3	-60.2	0.5	4.1	-56.6	-20.0	-36.6
	462.675	H	41.8	-61.8	0.5	4.1	-58.2	-20.0	-38.2
173.975	521.925	V	42.2	-58.3	0.5	4.1	-54.7	-20.0	-34.7
	521.925	H	41.2	-62.6	0.5	4.1	-59.0	-20.0	-39.0

**Figure 33 Spurious Radiated Emission**

JUDGEMENT:

Passed by 34.7dB





### 8.4 Test Instrumentation Used; Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
EMI Receiver	HP	85422E	3906A00276	February 19, 2018	February 19, 2019
RF Filter Section	HP	85420E	3705A00248	February 19, 2018	February 19, 2019
EMI Receiver	R&S	ESCI7	100724	February 19, 2018	March 19, 2019
Spectrum Analyzer	HP	8593EM	3536A00120ADI	February 20, 2018	March 20, 2019
Active Loop Antenna	EMCO	6502	9506-2950	October 19, 2017	October 19, 2018
Antenna Biconical	EMCO	3110B	9912-3337	March 24, 2016	March 24, 2018
Antenna Log Periodic	EMCO	3146	9505-4081	May 15, 2017	May 15, 2018
Horn Antenna 1G-18G	ETS	3115	29845	May 19, 2015	May 19, 2018
Low Noise Amplifier	Narda	LNA-DBS-0411N313	013	October 1, 2017	October 1, 2018
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	October 1, 2017	October 1, 2018
Semi Anechoic Civil Chamber	ETS	S81	SL 11643	N/A	N/A
Antenna Mast	ETS	2070-2	-	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

Figure 34 Test Equipment Used



## 9. Transmitter Frequency Stability Pursuant to 47 CFR 2.1055, 22.355, 74.464 & RSS Gen, RSS 119

### 9.1 Test Procedure

(Temperature (27°C)/ Humidity (68%RH))

The E.U.T operation mode and test setup are as described in Section 2 of this report.

The E.U.T. was operated with a CW signal at 154.225MHz.

The E.U.T. was placed inside a temperature chamber.

The spectrum analyzer was set to 20.0 kHz span and 1.0 kHz RBW, 3.0 kHz VBW.

Counter function was set for this evaluation.

The E.U.T. was operated from external VAC at nominal temperature (+25.0°C).

The carrier frequency was measured and recorded (reference frequency reading).

The carrier frequency was measured and recorded after at least 20 minutes of exposing the E.U.T. to the temperature.

### 9.2 Test Limit

2.5 ppm

### 9.3 Test Results

JUDGEMENT: Passed

The details of the results are given in *Figure 35*.



Temperature	Voltage	Frequency	Drift	Limit
(°C)	(VAC)	(MHz)	(Hz)	(Hz)
<b>+20.0</b>	97.7	154.225036	-8.0	385.5
	<b>115.0</b>	154.225044	-	385.5
	132.2	154.225040	-4.0	385.5
-30.0	115.0	154.225082	+38.0	385.5
-20.0	115.0	154.225056	+12.0	385.5
-10.0	115.0	154.225050	+6.0	385.5
0.0	115.0	154.225038	-6.0	385.5
+10.0	115.0	154.225038	-6.0	385.5
+30.0	115.0	154.225043	-1.0	385.5
+40.0	115.0	154.225068	+24.0	385.5
+50.0	115.0	154.225080	+36.0	385.5
+60.0	115.0	154.225089	+45.0	385.5

Figure 35. Frequency Stability Test Results

#### 9.4 Test Equipment Used; Frequency Stability

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
Spectrum Analyzer	R&S	FSL6	100194	February 19, 2018	February 19, 2019
Climatic Chamber	Thermotron	SM-32C	251030	February 26, 2018	February 26, 2019
40dB Attenuator	Weinschel	WA 39-40-33	A1323	October 1, 2017	October 1, 2018

Figure 36 Test Equipment Used



## 10. APPENDIX A - CORRECTION FACTORS

### 10.1 Correction factors for *RF OATS Cable 35m* *ITL #1879*

Frequency (MHz)	Cable loss (dB)
30.0	1.1
50.0	1.1
100.0	1.7
150.0	2.1
200.0	2.5
250.0	2.7
300.0	2.9
350.0	3.1
400.0	3.5
450.0	3.7
500.0	3.9
550.0	4.0
600.0	4.2
650.0	4.4
700.0	4.9
750.0	5.0
800.0	5.0
850.0	4.9
900.0	5.0
950.0	5.1
1000.0	5.4



## 11.2 Correction factors for RF CABLE for Semi Anechoic Chamber

ITL # 1841

FREQ (MHz)	LOSS (dB)
1000.0	1.5
2000.0	2.1
3000.0	2.7
4000.0	3.1
5000.0	3.5
6000.0	4.1
7000.0	4.6
8000.0	4.9
9000.0	5.7
10000.0	5.7
11000.0	6.1
12000.0	6.1
13000.0	6.2
14000.0	6.7
15000.0	7.4
16000.0	7.5
17000.0	7.9
18000.0	8.1
19000.0	8.8
20000.0	9.1

**NOTES:**

1. The cable is manufactured by Commscope
2. The cable type is 0623 WBC-400, serial # G020132 and 10m long



**11.3 Correction factors for**

**Active Loop Antenna  
Model 6502 S/N 9506-2950  
ITL # 1075:**

f(MHz)	MAF(dBs/m)	AF(dB/m)
0.01	-33.1	18.4
0.02	-37.2	14.3
0.03	-38.2	13.3
0.05	-39.8	11.7
0.1	-40.1	11.4
0.2	-40.3	11.2
0.3	-40.3	11.2
0.5	-40.3	11.2
0.7	-40.3	11.2
1	-40.1	11.4
2	-40	11.5
3	-40	11.5
4	-40.1	11.4
5	-40.2	11.3
6	-40.4	11.1
7	-40.4	11.1
8	-40.4	11.1
9	-40.5	11
10	-40.5	11
20	-41.5	10
30	-43.5	8



**11.4 Correction factors for biconical antenna – ITL # 1356**

**Model: EMCO 3110B**

**Serial No.:9912-3337**

<b>Frequency</b>	<b>ITL 1356 AF</b>
<b>[MHz]</b>	<b>[dB/m]</b>
<b>30</b>	13.00
<b>35</b>	10.89
<b>40</b>	10.59
<b>45</b>	10.63
<b>50</b>	10.12
<b>60</b>	9.26
<b>70</b>	7.74
<b>80</b>	6.63
<b>90</b>	8.23
<b>100</b>	11.12
<b>120</b>	13.16
<b>140</b>	13.07
<b>160</b>	14.80
<b>180</b>	16.95
<b>200</b>	17.17



**11.5 Correction factors for log periodic antenna – ITL # 1349**  
**Model: EMCO 3146**  
**Serial No.:9505-4081**

Frequency [MHz]	ITL 1349 AF [dB/m]
200	11.58
250	12.04
300	14.76
400	15.55
500	17.85
600	18.66
700	20.87
800	21.15
900	22.32
1000	24.22





**11.6 Correction factors for Double –Ridged Waveguide Horn ANTENNA**

**Model: 3115**  
**Serial number:29845**  
**3 meter range; ITL # 1352**

<b>FREQUENCY</b>	<b>AFE</b>	<b>FREQUENCY</b>	<b>AFE</b>
<b>(GHz)</b>	<b>(dB/m)</b>	<b>(GHz)</b>	<b>(dB/m)</b>
0.75	25	9.5	38
1.0	23.5	10.0	38.5
1.5	26.0	10.5	38.5
2.0	29.0	11.0	38.5
2.5	27.5	11.5	38.5
3.0	30.0	12.0	38.0
3.5	31.5	12.5	38.5
4.0	32.5	13.0	40.0
4.5	32.5	13.5	41.0
5.0	33.0	14.0	40.0
5.5	35.0	14.5	39.0
6.0	36.5	15.0	38.0
6.5	36.5	15.5	37.5
7.0	37.5	16.0	37.5
7.5	37.5	16.5	39.0
8.0	37.5	17.0	40.0
8.5	38.0	17.5	42.0
9.0	37.5	18.0	42.5