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TESTING Cert No.1152.01

DATE: 06 September 2018

I.T.L. (PRODUCT TESTING) LTD.

FCC Radio Test Report

For

Motorola Solutions, Inc.

Equipment under test:

MC-EDGE 700/800

F0016A (VA00713AA)

FCC ID: AZ492FT7115
IC: 109U-92FT7115

Emission Designator: 8K10F1D (Digital Data, 12.5kHz channel)
Emission Designator: 8K10F1W (Digital TDMA, 12.5kHz channel)

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

Tested by: _____
M. Zohar

Approved by: _____
D. Shidlowsky

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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 700/800
Equipment Model No.:	F0016A (VA00713AA)
Equipment Serial No.:	2758UAOO4C
Date of Receipt of E.U.T:	March 5, 2018
Start of Test:	March 5, 2018
End of Test:	June 28, 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
VA00713AA	APX4000 700/800 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

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 700/800MHz.
2. Testing was performed with 2 modulations: digital data and 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 700/800
Model Name	F0016A (VA00713AA)
Working voltage	nominal:12VDC via AC/DC power supply 115VAC input
Mode of operation	Transceiver
Modulations	TDMA, digital data
Assigned Frequency Range	764-775MHz, 799-805MHz, 806-824MHz, 851-869MHz,
Transmit power	~35.6 dBm
Antenna Gain	3 dBi
DATA rate	N/A
Modulation BW	12.5kHz

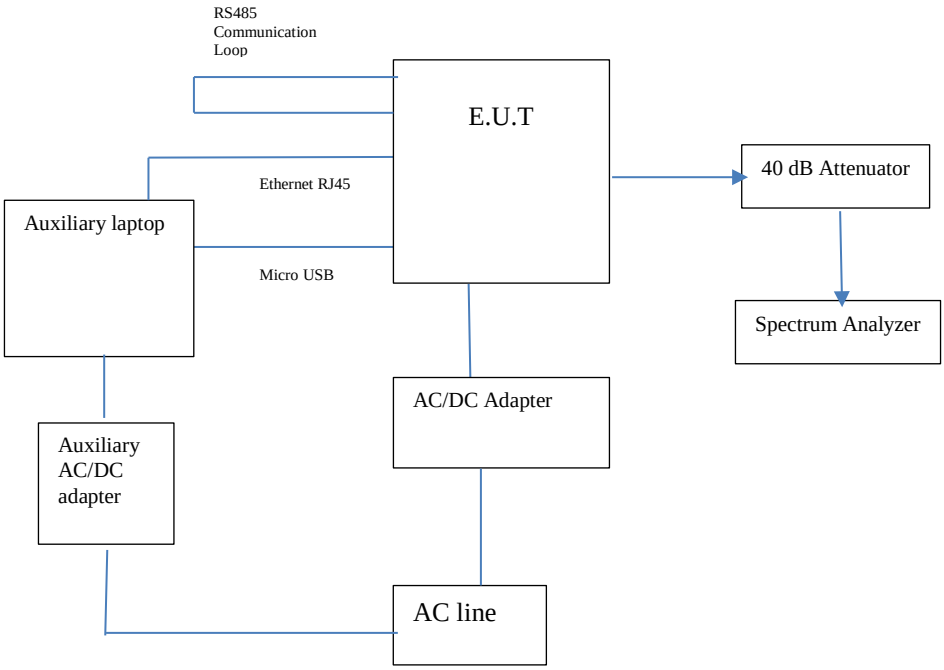


Figure 1. Conducted Test Set-Up

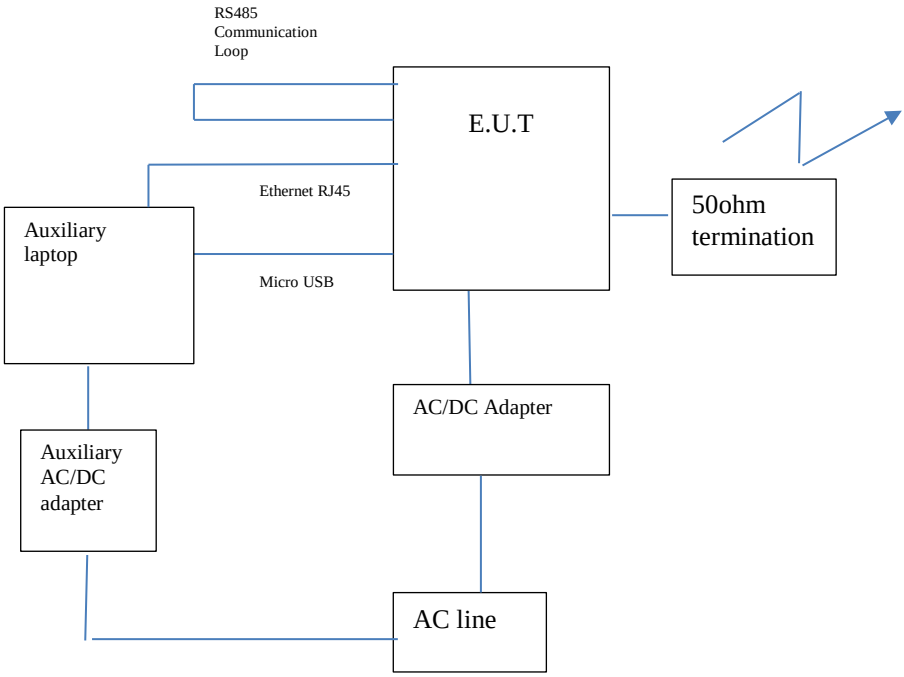


Figure 2. Radiated Test Set-Up

3. Test Set-Up Photos

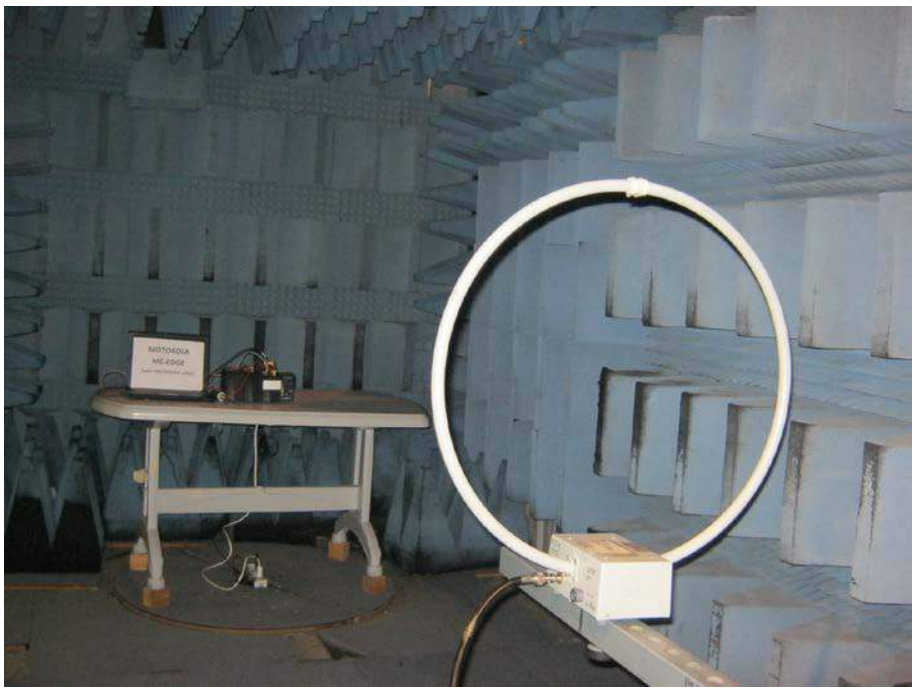


Figure 3. Radiated Emission Test, 0.009-30MHz

Figure 4. Radiated Emission Test, 30-200MHz

Figure 5. Radiated Emission Test, 200-1000MHz

Figure 6. Radiated Emission Test, 1-10GHz

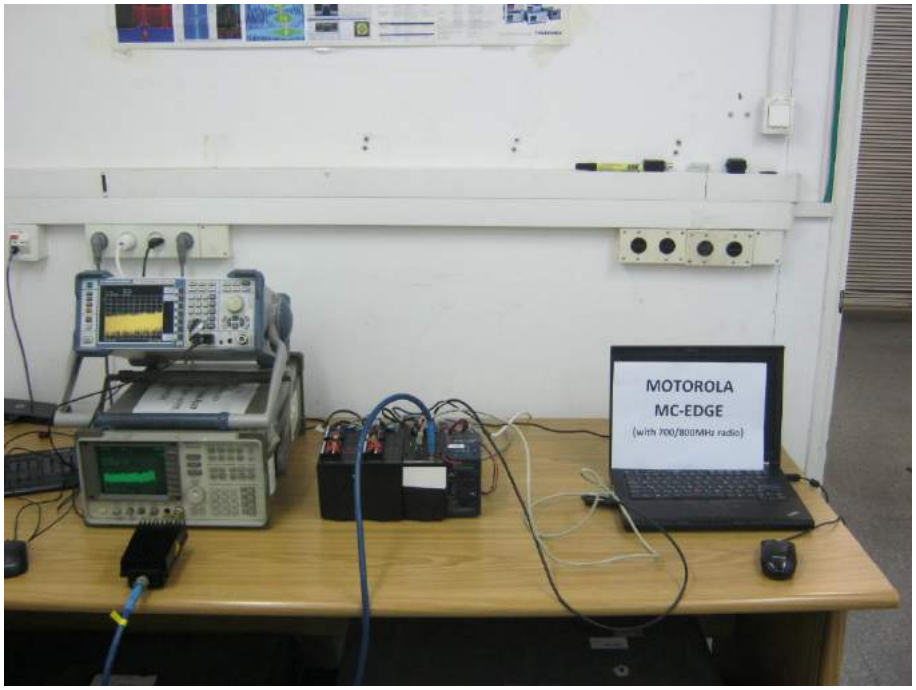


Figure 7. Conducted Emission Terminal Port Test

Figure 8. Frequency Stability Test

4. RF Power Output Pursuant to 47 CFR 2.1046(a), 2.1033(c)(6), 2.1033(c)(7), 2.1033(c)(8) & RSS-Gen

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 and an appropriate coaxial cable (total loss 40.3 dB). 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 3.6W (35.5dBm) for 806-869MHz band and not exceed 2.99W (34.7dBm) for 764-805MHz band.

4.3 Test Results

Modulation	Operation Frequency (MHz)	Reading (dBm)	Limit (dBm)	Margin (dB)
TDMA	764.0125*	33.5	34.7	-1.2
	769.0125	34.2	34.7	-0.5
	774.9875	34.2	34.7	-0.5
	799.0125	34.1	34.7	-0.6
	804.0125	34.0	34.7	-0.7
	823.9875	35.0	35.5	-0.5
	851.0125	35.4	35.5	-0.1
	869.8875*	35.1	-	-
Digital	764.0125*	33.6	34.7	-1.1
	769.0125	34.1	34.7	-0.6
	774.9875	34.1	34.7	-0.6
	799.0125	34.0	34.7	-0.7
	804.0125	34.0	34.7	-0.7
	823.9875	34.9	35.5	-0.6
	851.0125	35.0	35.5	-0.5
	869.8875*	35.0	-	-

*__NOTE__: NOT FOR FCC REVIEW

Figure 9 RF Power Output

JUDGEMENT: Passed

See additional information in *Figure 10* to *Figure 24.*

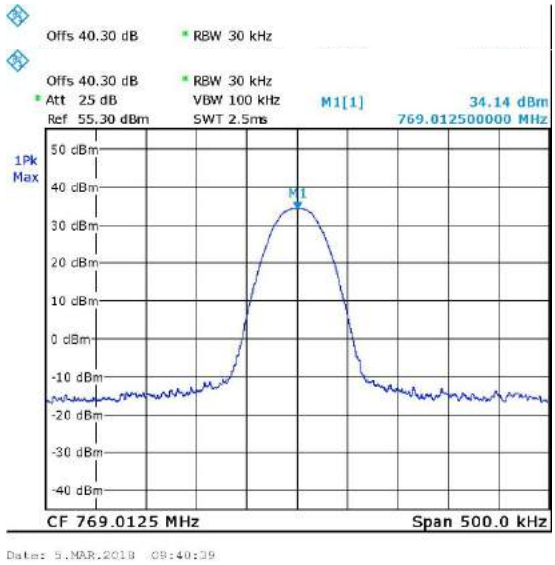


Figure 10. 769.0125MHz, Digital

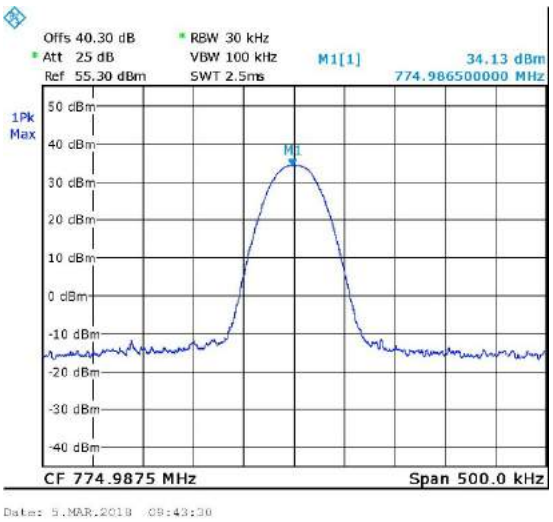


Figure 11. 774.9875MHz, Digital

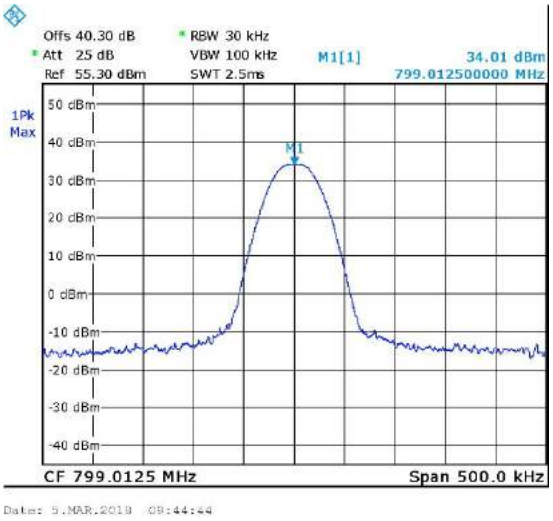


Figure 12. 799.0125MHz, Digital

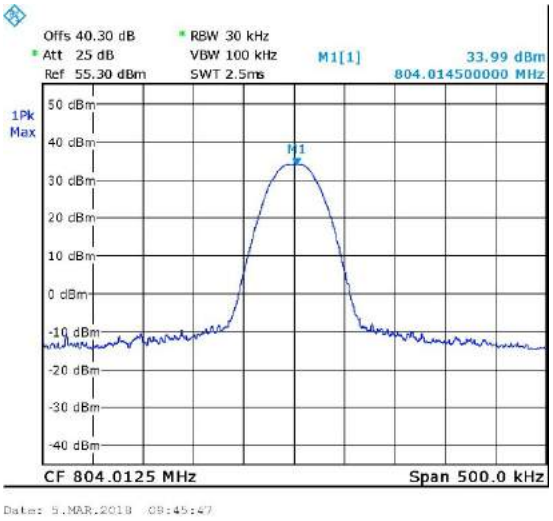


Figure 13. 804.0125MHz, Digital

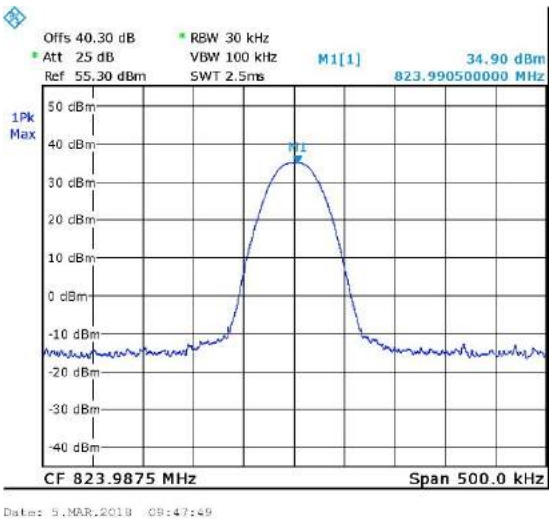


Figure 14. 823.9875MHz, Digital

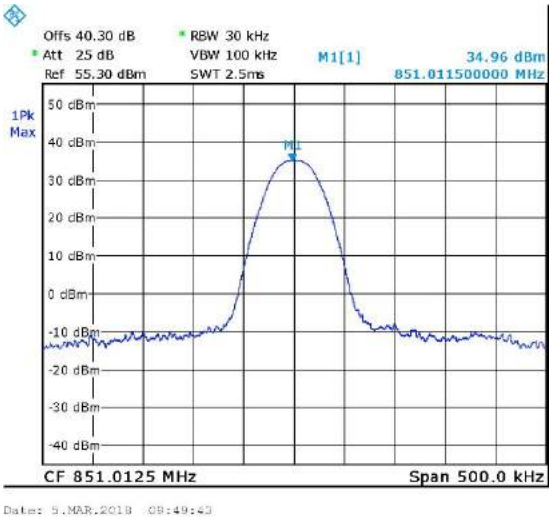


Figure 15. 851.0125MHz, Digital

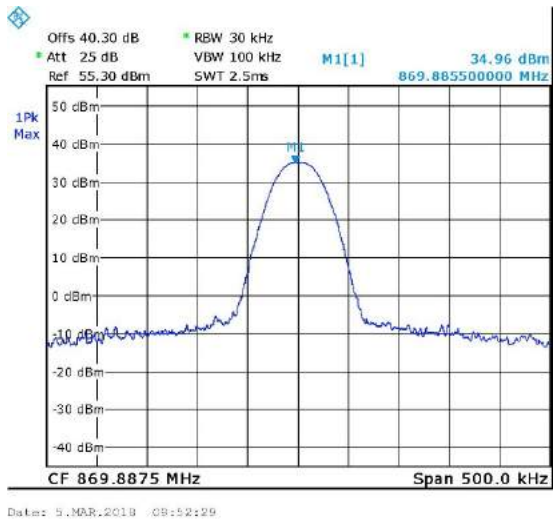


Figure 16. 869.8875MHz, Digital

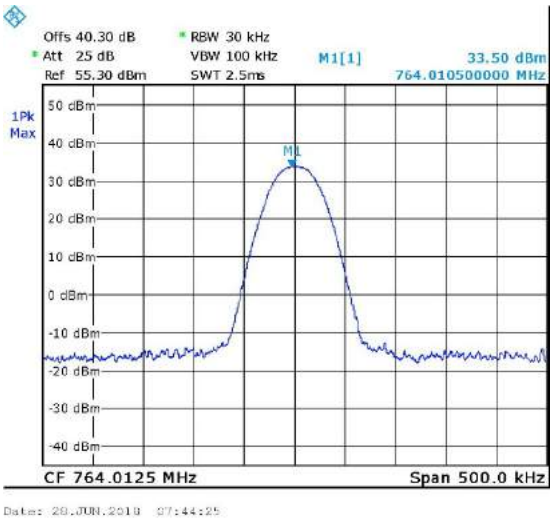


Figure 17. 764.0125MHz, TDMA

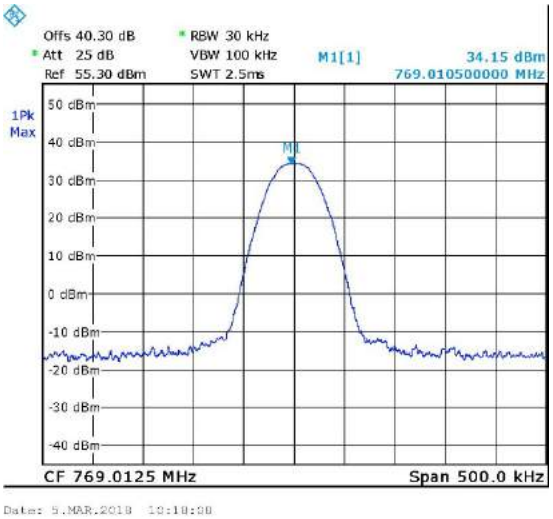


Figure 18. 769.0125MHz, TDMA

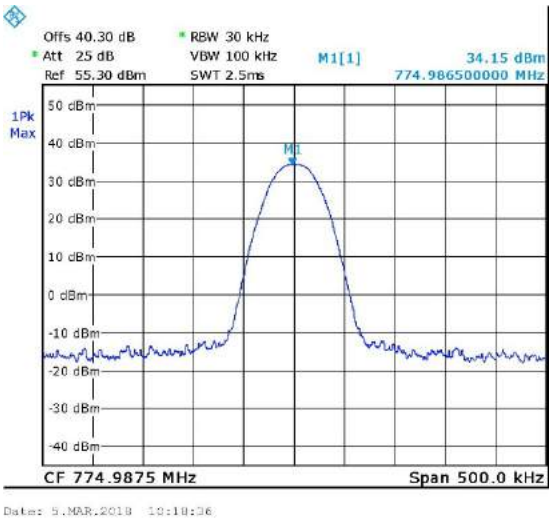


Figure 19. 774.9875MHz, TDMA

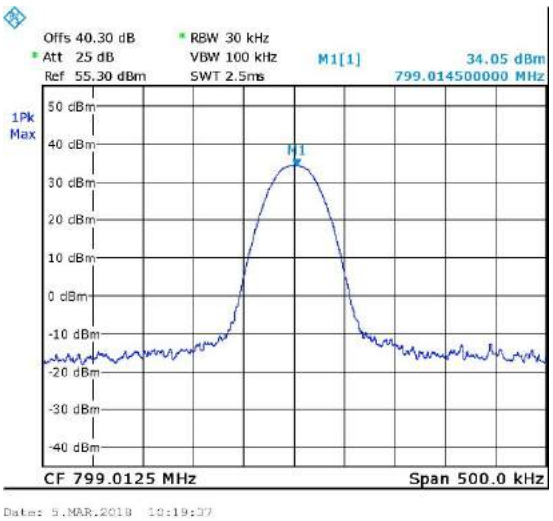


Figure 20. 799.0125MHz, TDMA

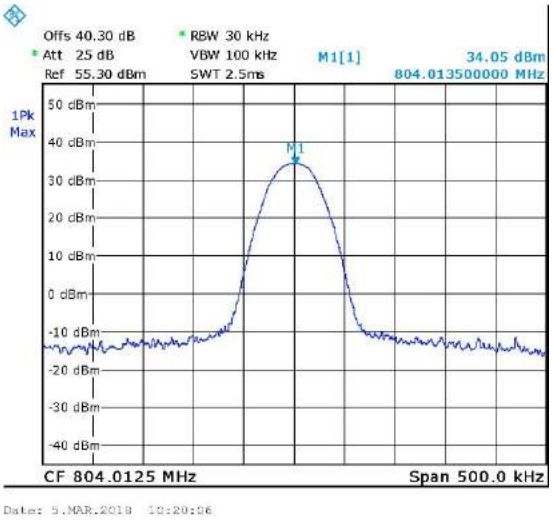


Figure 21. 804.0125MHz, TDMA

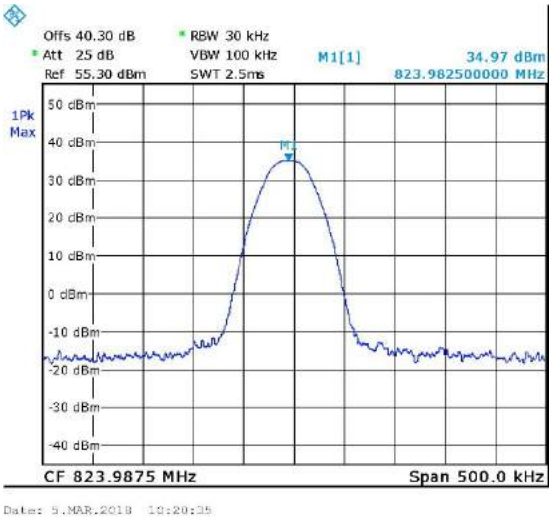


Figure 22. 823.9875MHz, TDMA

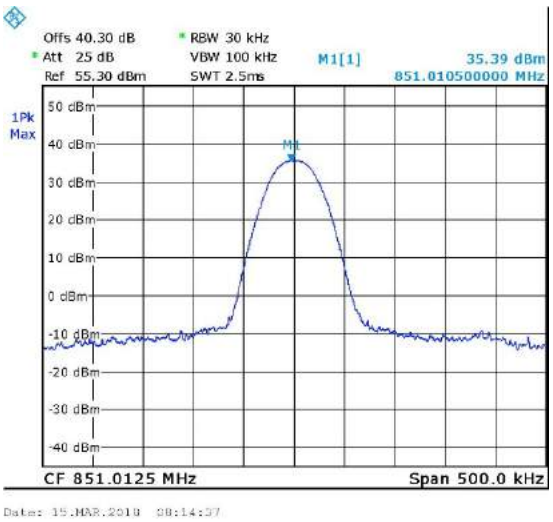


Figure 23. 851.0125MHz, TDMA

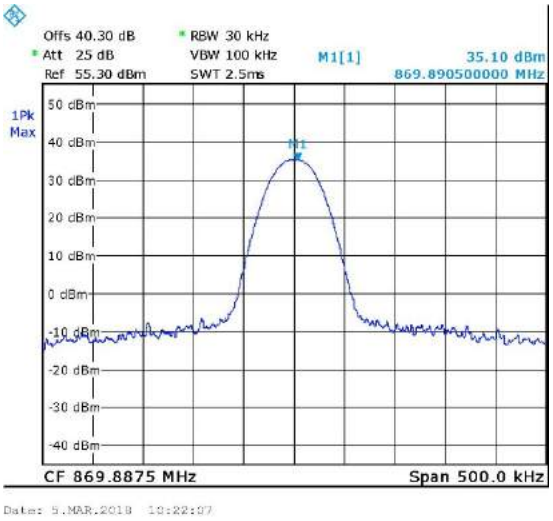


Figure 24. 869.8875MHz, TDMA

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 25 Test Equipment Used

5. Occupied Bandwidth Pursuant to 47 CFR 2.1049, 90.210(g), 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=40.3 dB).
For Mask B measurements, RBW of 300Hz was used.
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

For FCC: MASK B
For IC: MASK D

5.3 Test Results

JUDGEMENT: Passed

See additional information in *Figure 26* to *Figure 55*.

MASK B Results:

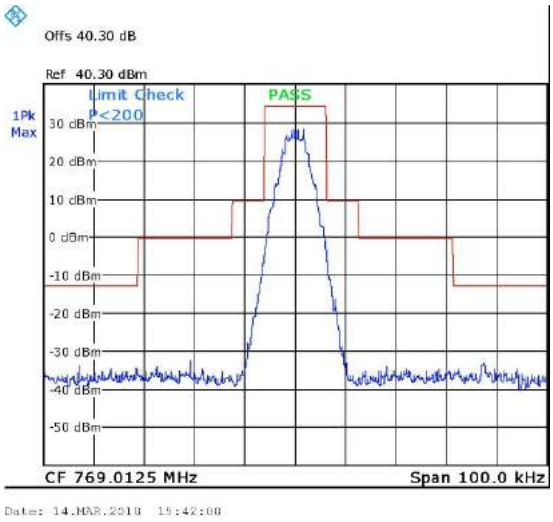


Figure 26. 769.0125MHz, Digital

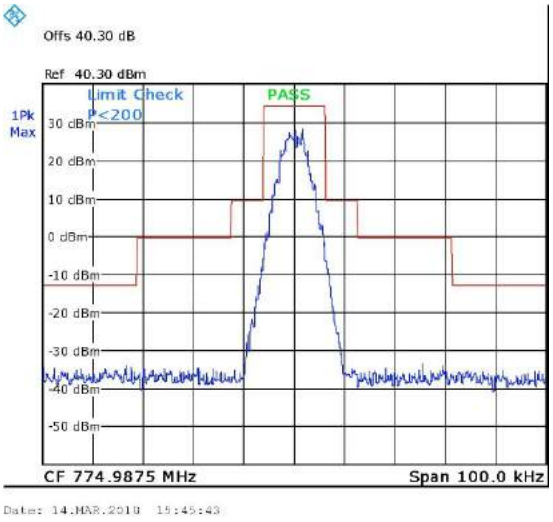


Figure 27. 774.9875MHz, Digital

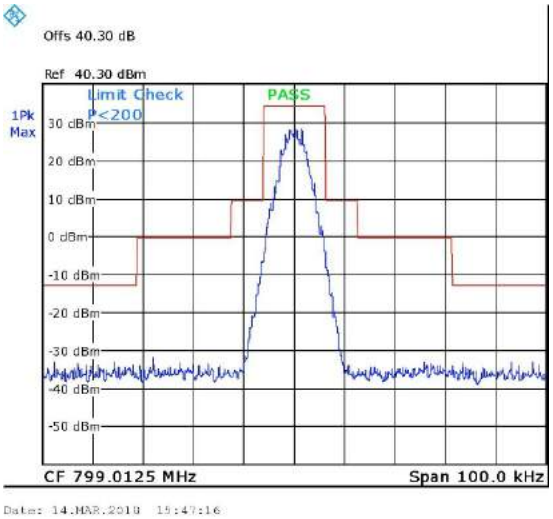


Figure 28. 799.0125MHz, Digital

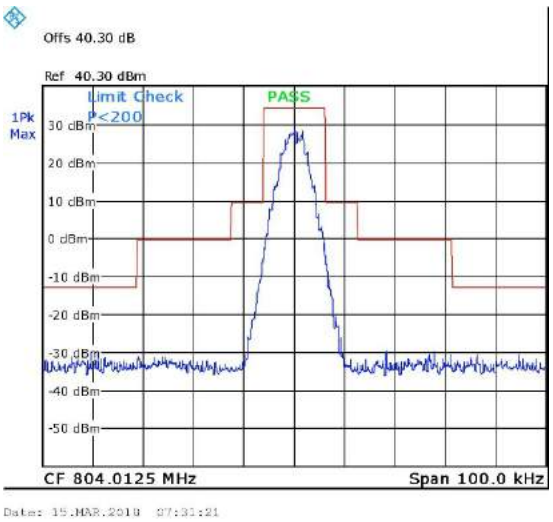


Figure 29. 804.0125MHz, Digital

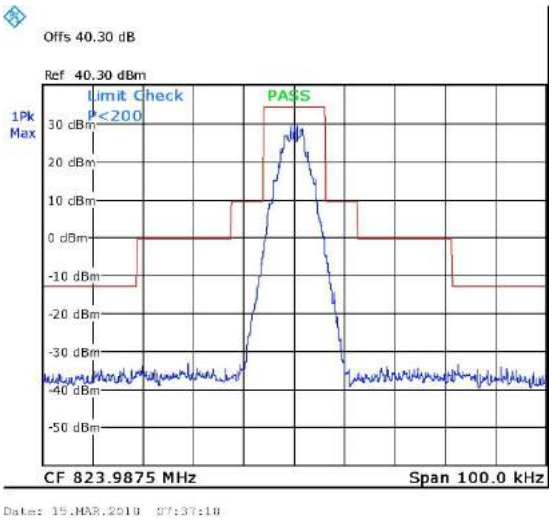


Figure 30. 823.9875MHz, Digital

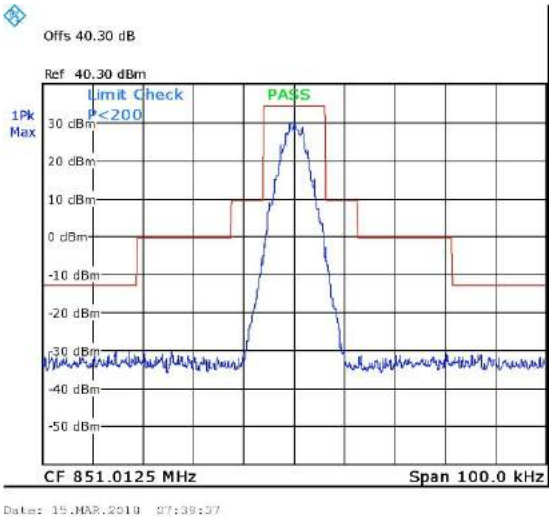


Figure 31. 851.0125MHz, Digital

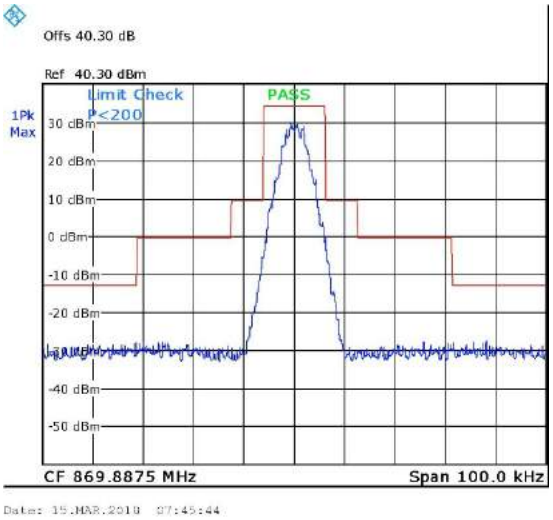


Figure 32. 869.8875MHz, Digital

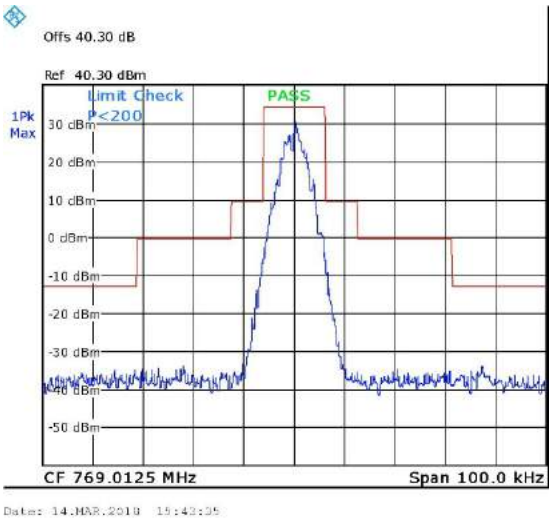


Figure 33. 769.0125MHz, TDMA

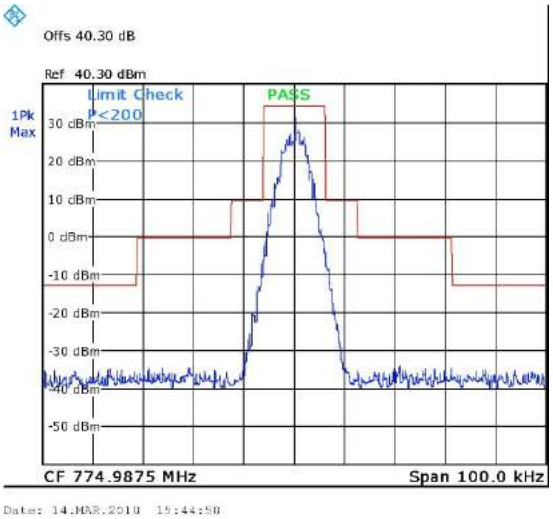


Figure 34. 774.9875MHz, TDMA

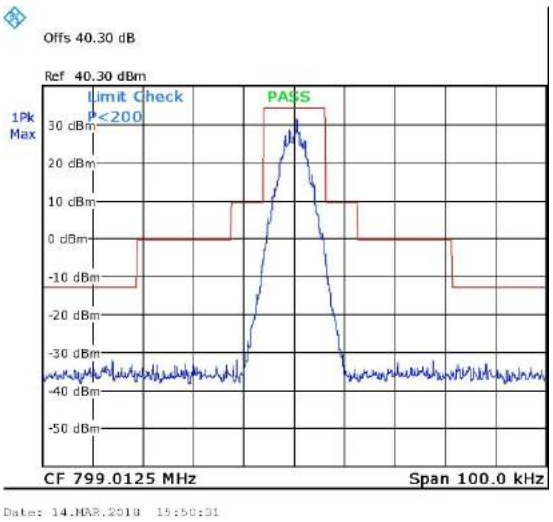


Figure 35. 799.0125MHz, TDMA

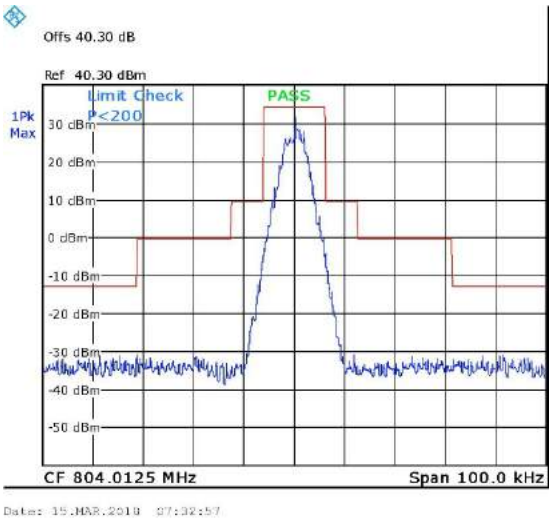


Figure 36. 804.0125MHz, TDMA

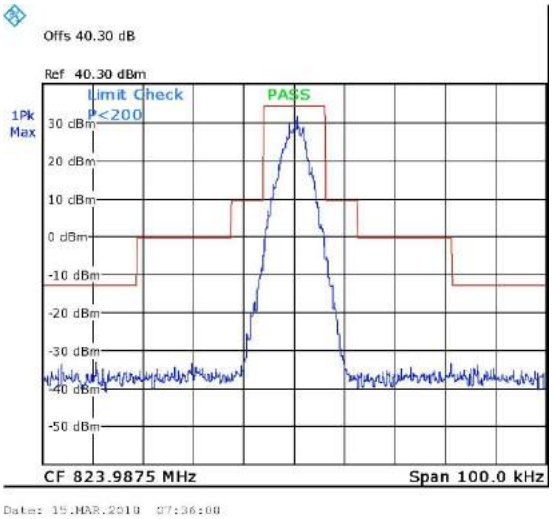


Figure 37. 823.9875MHz, TDMA

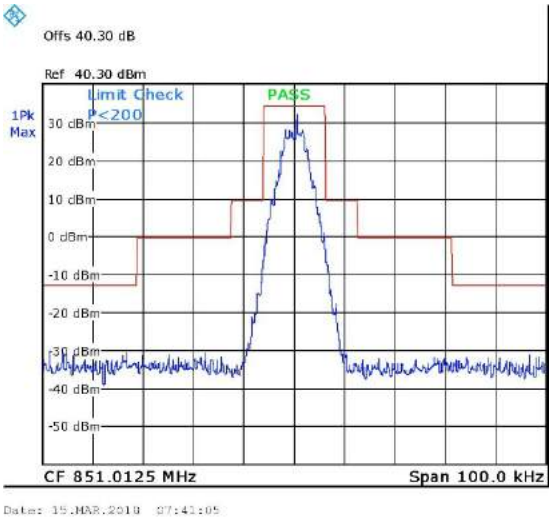


Figure 38. 851.0125MHz, TDMA

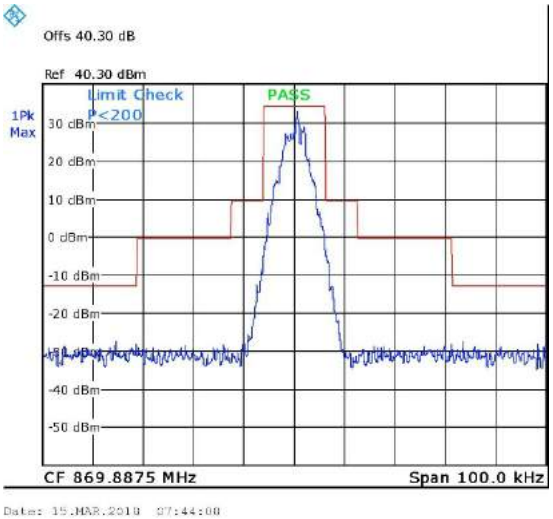


Figure 39. 869.8875MHz, TDMA

MASK D Results:

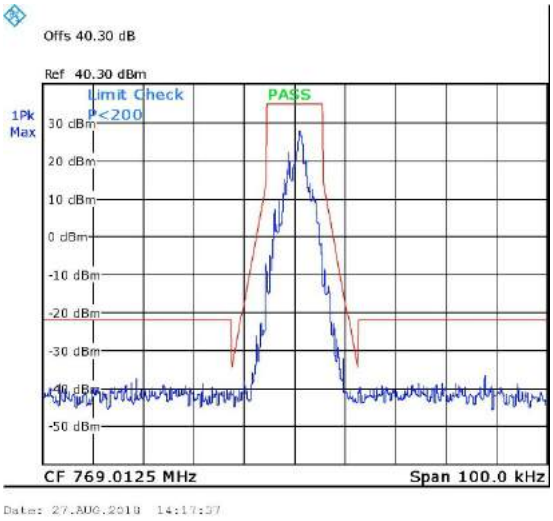


Figure 40. 769.0125MHz, Digital

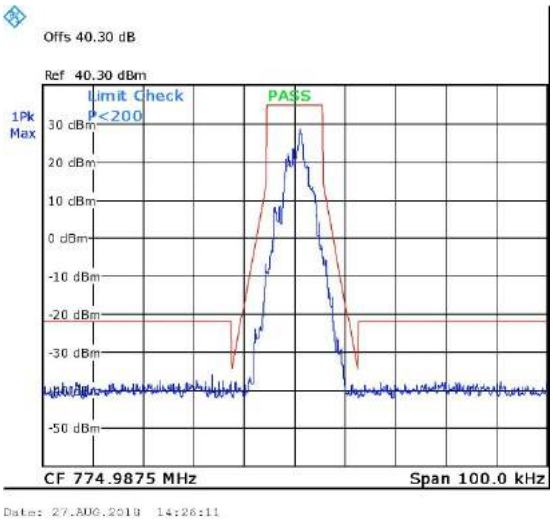


Figure 41. 774.9875MHz, Digital

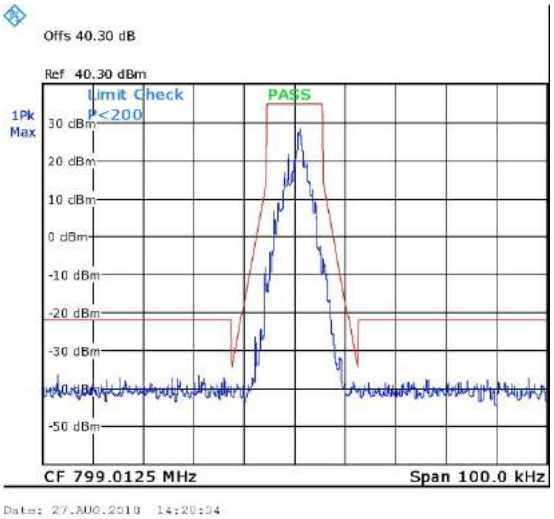


Figure 42. 799.0125MHz, Digital

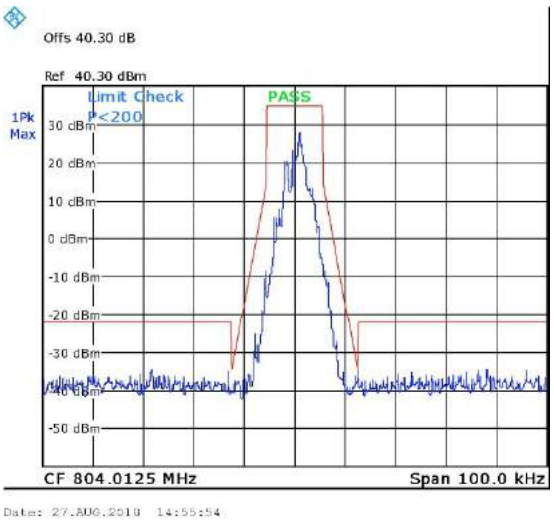


Figure 43. 804.0125MHz, Digital

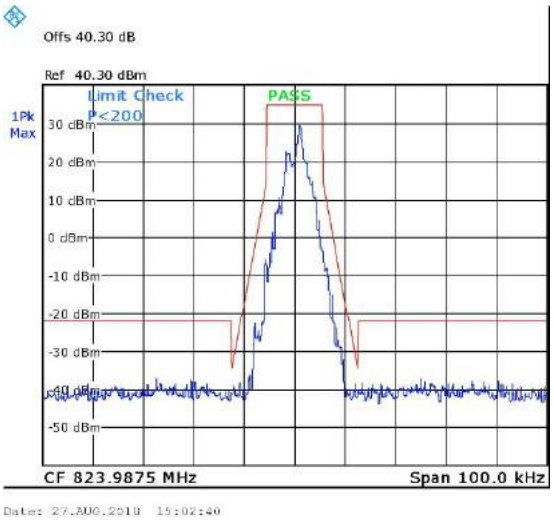


Figure 44. 823.9875MHz, Digital

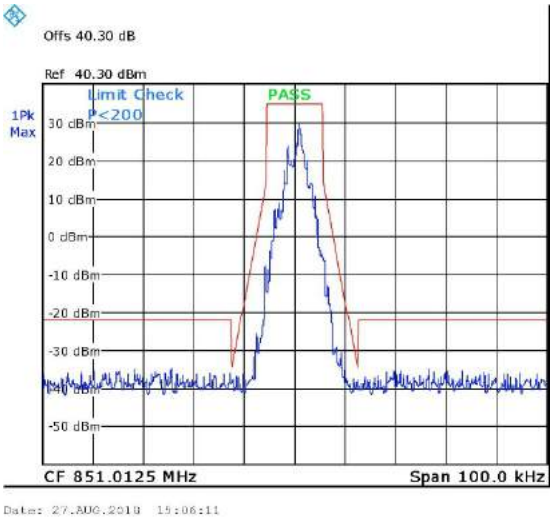


Figure 45. 851.0125MHz, Digital

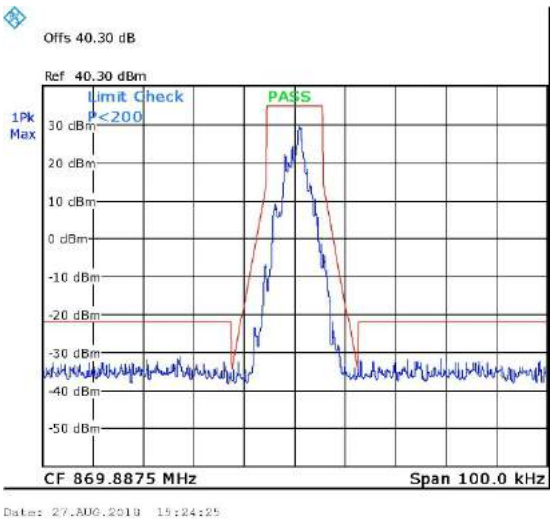


Figure 46. 869.8875MHz, Digital

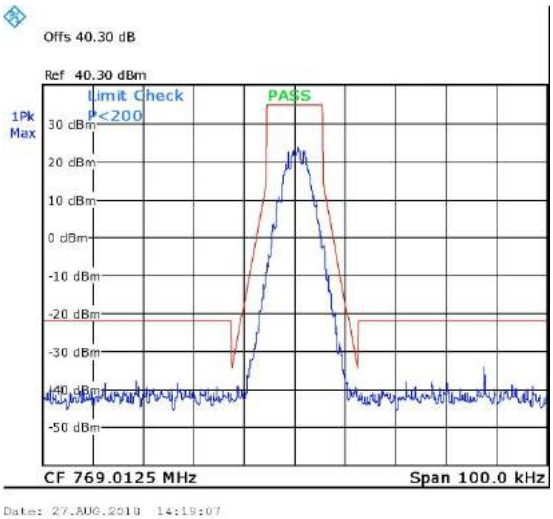


Figure 47. 769.0125MHz, TDMA

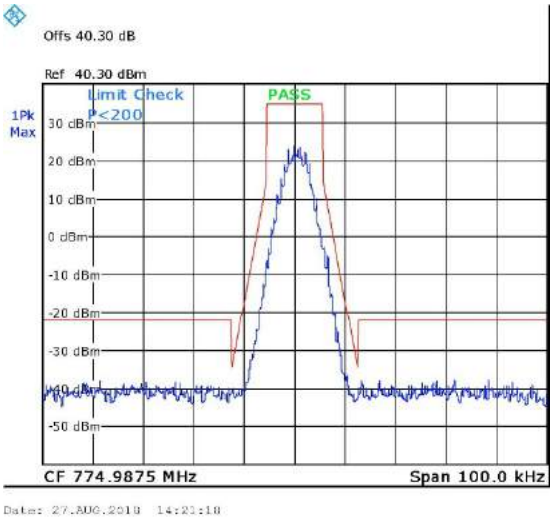


Figure 48. 774.9875MHz, TDMA

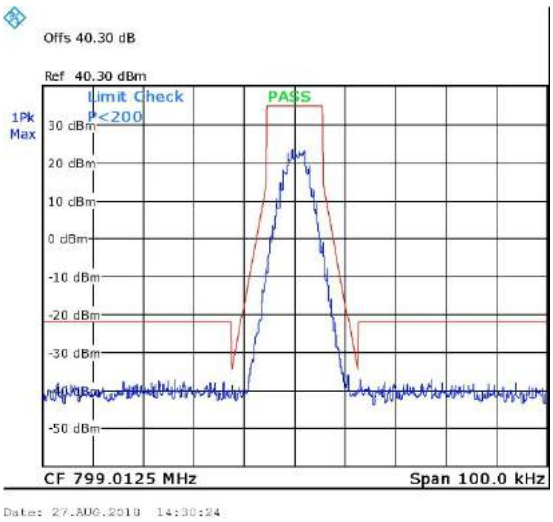


Figure 49. 799.0125MHz, TDMA

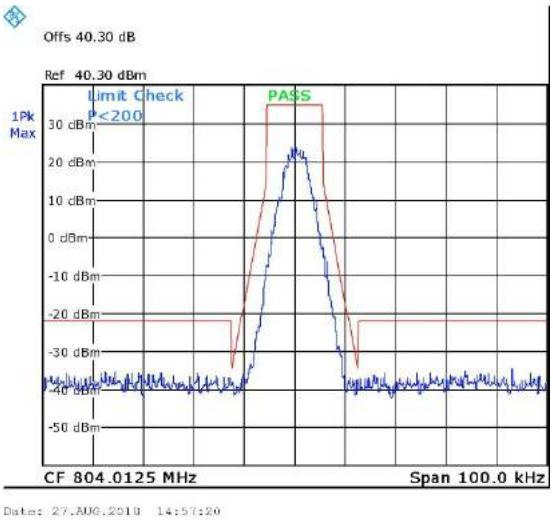


Figure 50. 804.0125MHz, TDMA

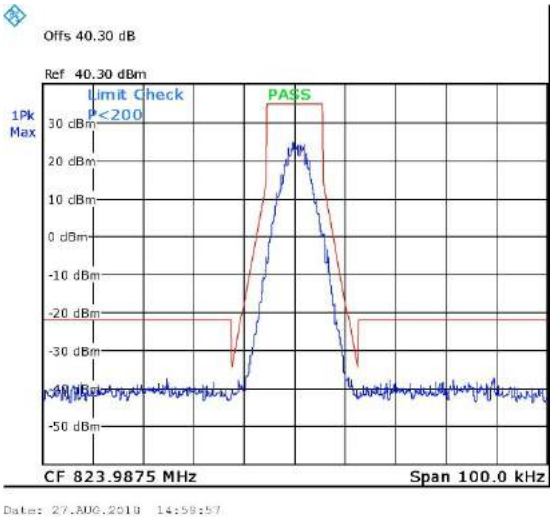


Figure 51. 823.9875MHz, TDMA

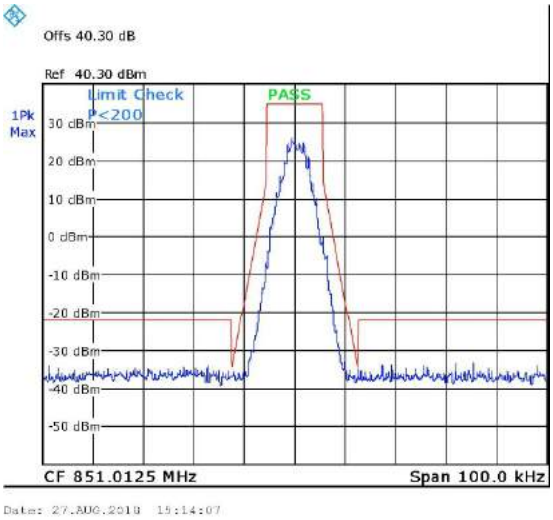


Figure 52. 851.0125MHz, TDMA

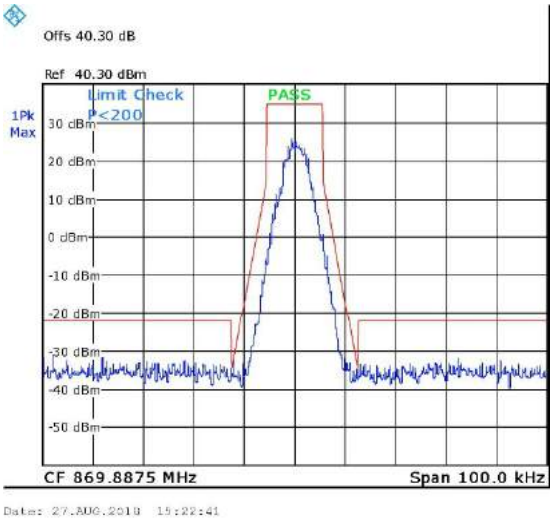


Figure 53. 869.8875MHz, TDMA

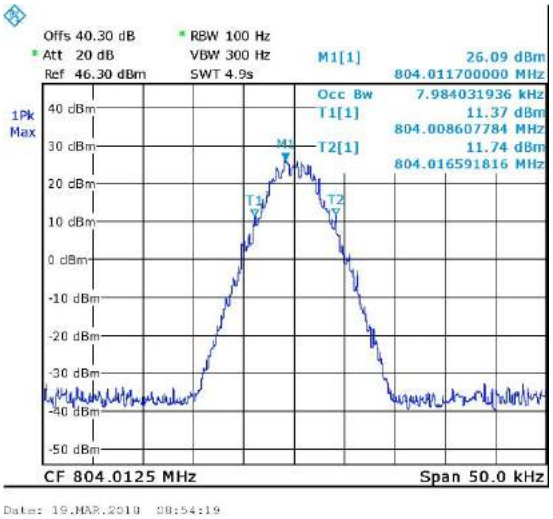


Figure 54. 99% Occupied BW, digital

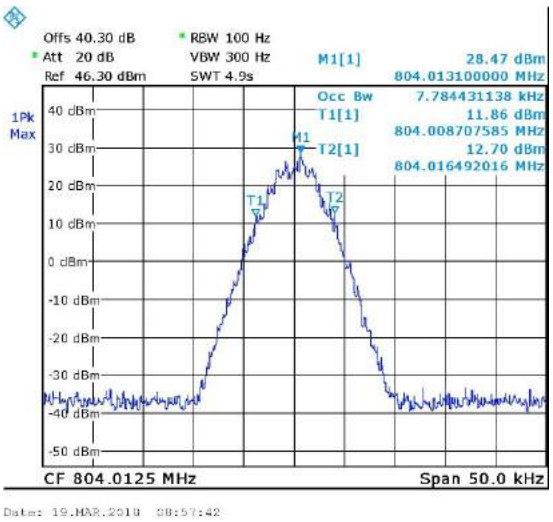


Figure 55. 99% Occupied BW, TDMA

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 56 Test Equipment Used

6. ACP Emission Mask Pursuant to FCC Part 90.543(a) and RSS 119, Section 5.8.9.1

6.1 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=40 dB).
Evaluation was performed at transmission frequency of 914.0125MHz.

6.2 Test Limit

12.5 kHz Base Transmitter ACP table Requirements.

6.3 Test Results

JUDGEMENT: Passed
See additional information in *Figure 57* to *Figure 58.*

Offset from Center Frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACP (dBc)	Low Offset Level (dBc)	High Offset Level (dBc)
9.375	6.25	-40.0	-49.1	-52.5
15.625	6.25	-60.0	-72.7	-71.2
21.875	6.25	-60.0	-74.0	-74.7
37.5	25.0	-60.0	-70.5	-70.1
62.5	25.0	-65.0	-71.9	-72.4
87.5	25.0	-65.0	-73.1	-72.7
150.0	100.0	-65.0	-69.5	-70.0
250.0	100.0	-65.0	-71.4	-72.0
350.0	100.0	-65.0	-72.3	-74.0
>400 kHz to 12 MHz	30(S)	-80.0	-93.8	-93.8
12 MHz to paired receive band	30(S)	-80.0	-100.4	-100.4
In the paired receive band	30(S)	-85.0	-98.3	-98.3

Figure 57 Tabular Results for Carrier Frequency 794.0125MHz, Digital Modulation

Offset from Center Frequency (kHz)	Measurement Bandwidth (kHz)	Maximum ACP (dBc)	Low Offset Level (dBc)	High Offset Level (dBc)
9.375	6.25	-40.0	-43.4	-44.4
15.625	6.25	-60.0	-71.6	-73.5
21.875	6.25	-60.0	-74.3	-73.2
37.5	25.0	-60.0	-70.0	-69.8
62.5	25.0	-65.0	-71.6	-71.5
87.5	25.0	-65.0	-73.3	-72.9
150.0	100.0	-65.0	-69.8	-69.9
250.0	100.0	-65.0	-71.7	-71.7
350.0	100.0	-65.0	-72.1	-72.5
>400 kHz to 12 MHz	30(S)	-80.0	-93.4	-93.4
12 MHz to paired receive band	30(S)	-80.0	-104.0	-104.0
In the paired receive band	30(S)	-85.0	-98.4	-98.4

Figure 58 Tabular Results for Carrier Frequency 794.0125MHz, TDMA Modulation

6.4 Test Equipment Used; Occupied Bandwidth

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
Spectrum Analyzer	Anritsu	MS2721B	1122024	January 17, 2018	January 17, 2019
40 dB Attenuator	Weinschel	WA 39-40-33	A1323	October 1, 2017	October 1, 2018

Figure 59 Test Equipment Used

7. Spurious Emissions at Antenna Terminals Pursuant to 47 CFR 2.1047, 2.1033(c) (13) & RSS Gen

7.1 Test Procedure

(Temperature (21°C)/ Humidity (54%RH))

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (max loss =41.0dB). 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- 10.0 GHz.

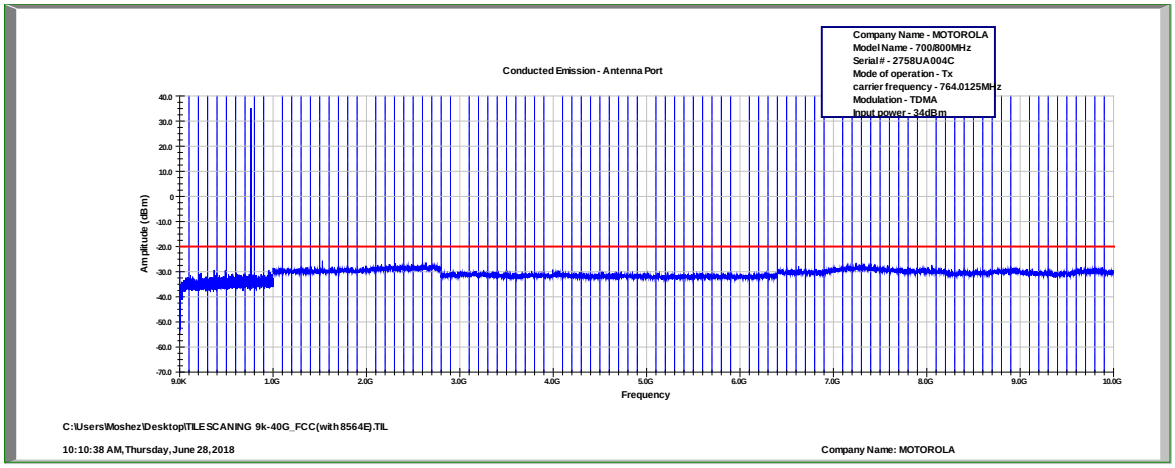
7.2 Test Limit

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

7.3 Test Results

JUDGEMENT: Passed

See additional information in *Figure 60* to *Figure 75*.



*NOTE: NOT FOR FCC REVIEW

Figure 60 Spurious Emissions at Antenna Terminals, TDMA, 764.0125MHz*

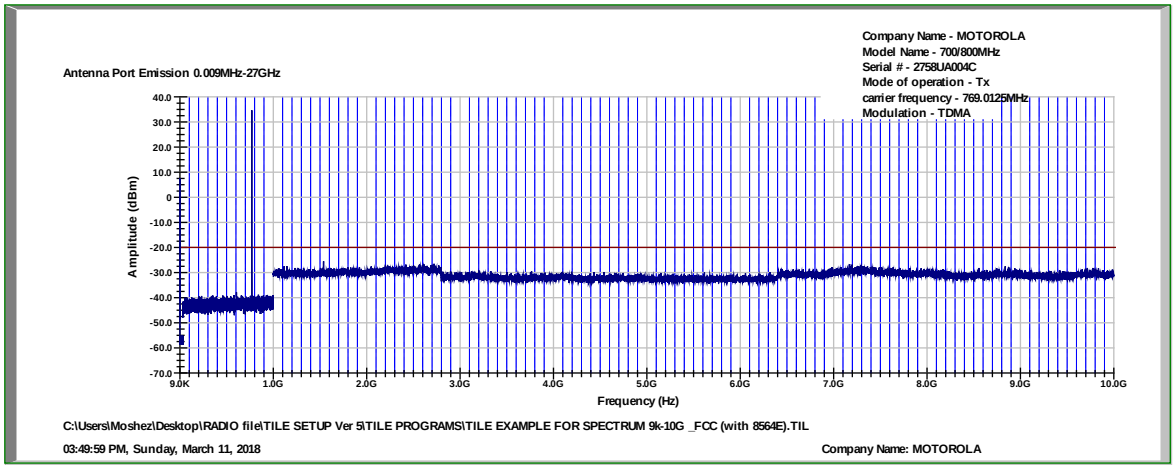


Figure 61 Spurious Emissions at Antenna Terminals, TDMA, 769.0125MHz

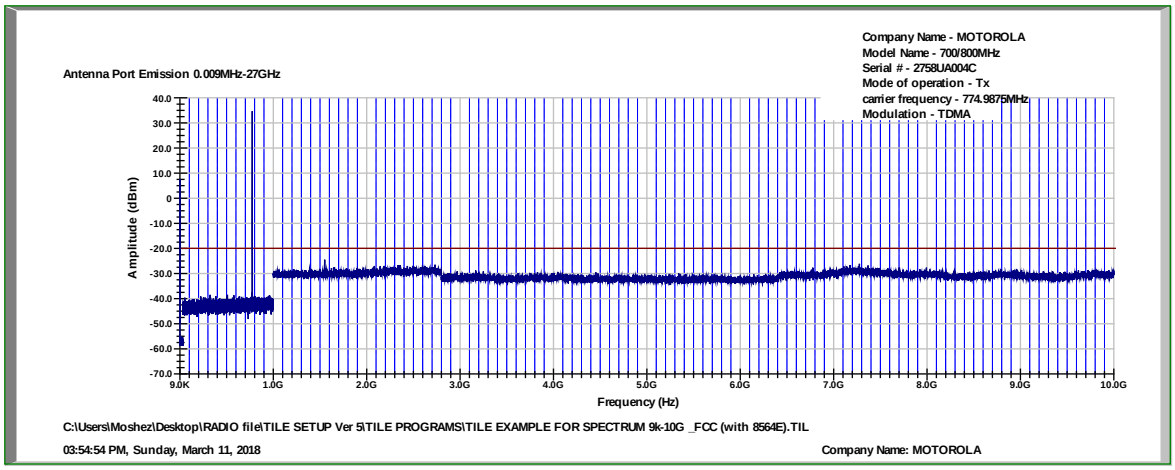


Figure 62 Spurious Emissions at Antenna Terminals, TDMA, 774.9875MHz

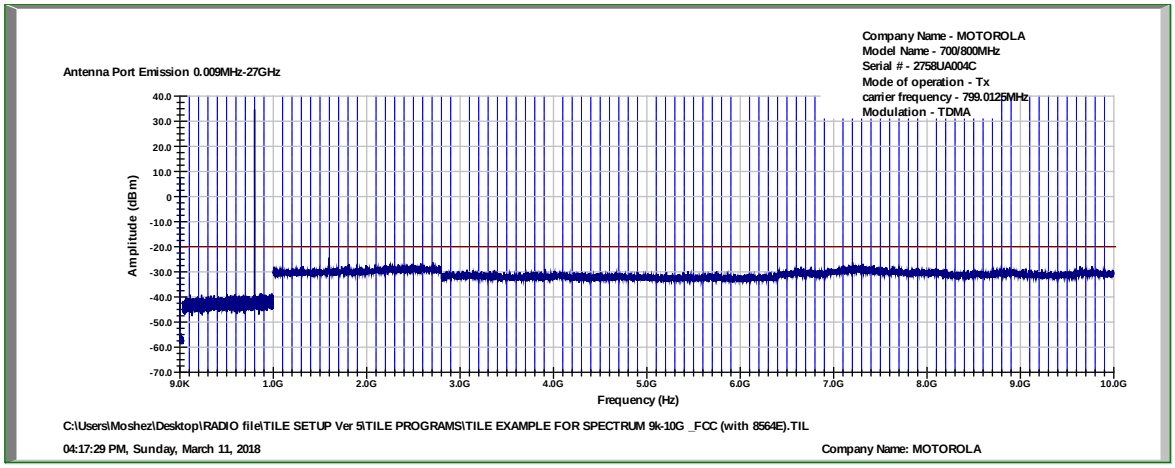


Figure 63 Spurious Emissions at Antenna Terminals, TDMA, 799.0125MHz

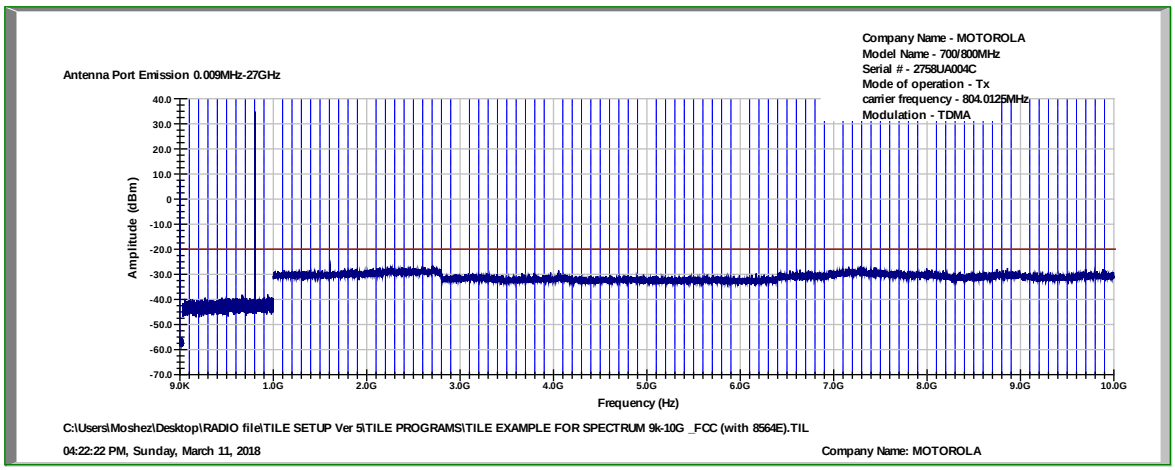


Figure 64 Spurious Emissions at Antenna Terminals, TDMA, 804.0125MHz

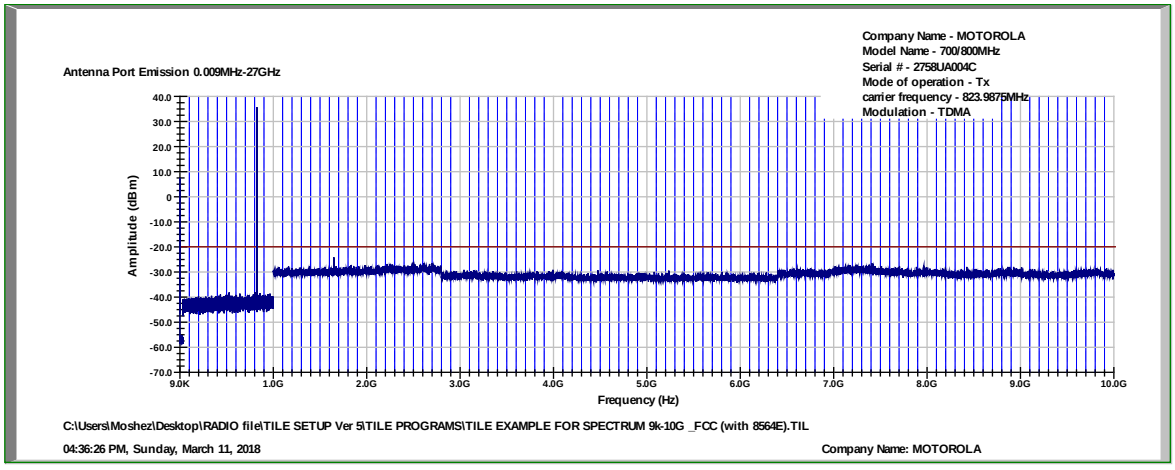


Figure 65 Spurious Emissions at Antenna Terminals, TDMA, 823.9875MHz

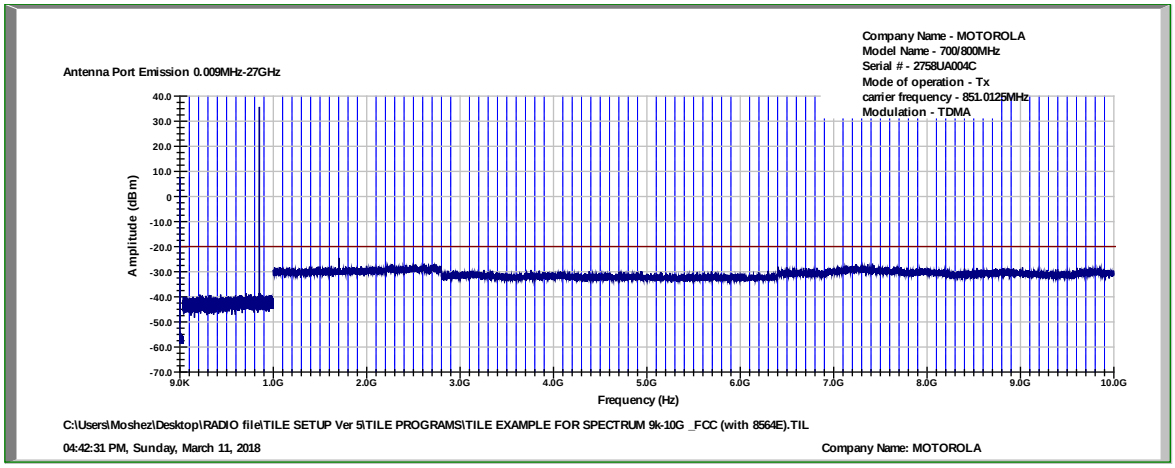
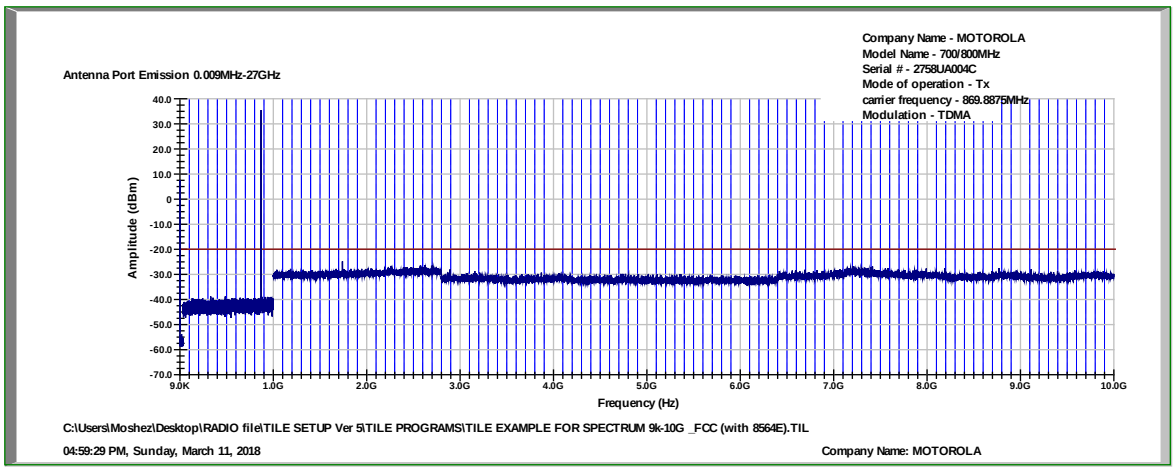
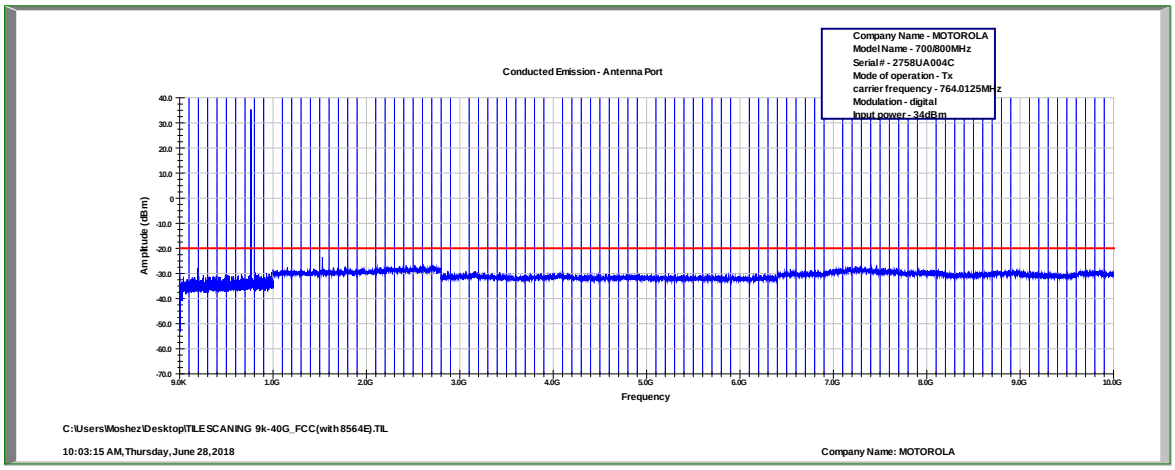


Figure 66 Spurious Emissions at Antenna Terminals, TDMA, 851.0125MHz



*NOTE: NOT FOR FCC REVIEW

Figure 67 Spurious Emissions at Antenna Terminals, TDMA, 869.8875MHz*



*NOTE: NOT FOR FCC REVIEW

Figure 68 Spurious Emissions at Antenna Terminals, digital, 764.0125MHz*

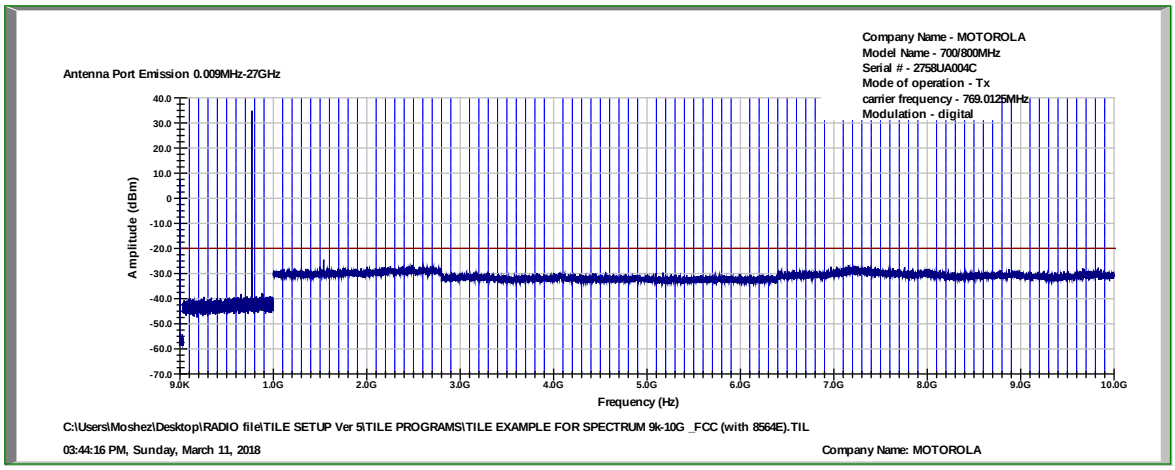


Figure 69 Spurious Emissions at Antenna Terminals, Digital, 769.0125MHz

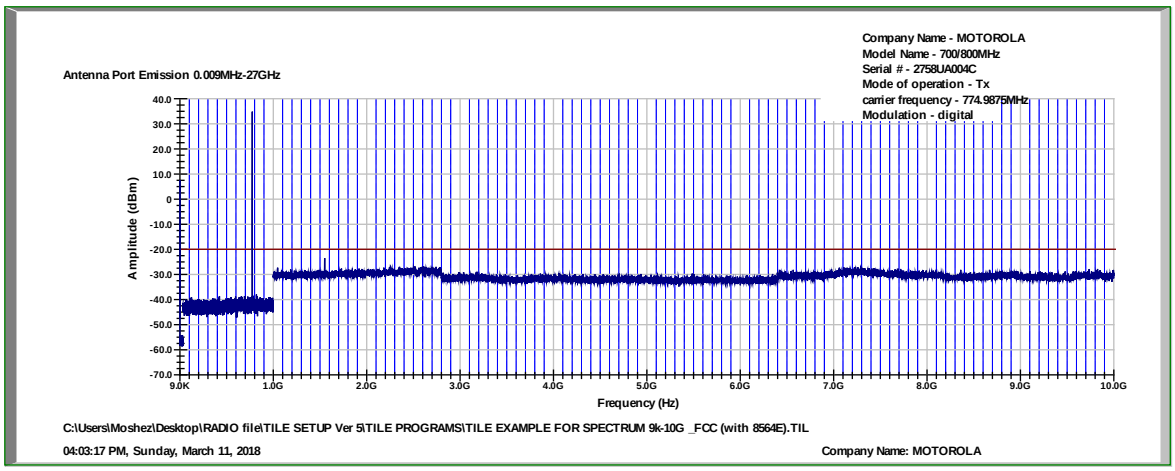


Figure 70 Spurious Emissions at Antenna Terminals, Digital, 774.9875MHz

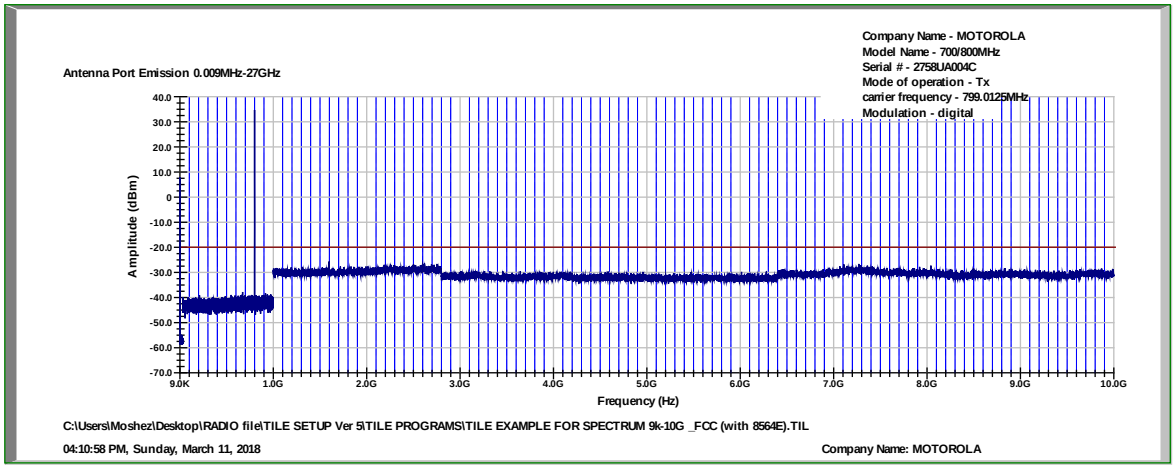


Figure 71 Spurious Emissions at Antenna Terminals, Digital, 799.0125MHz

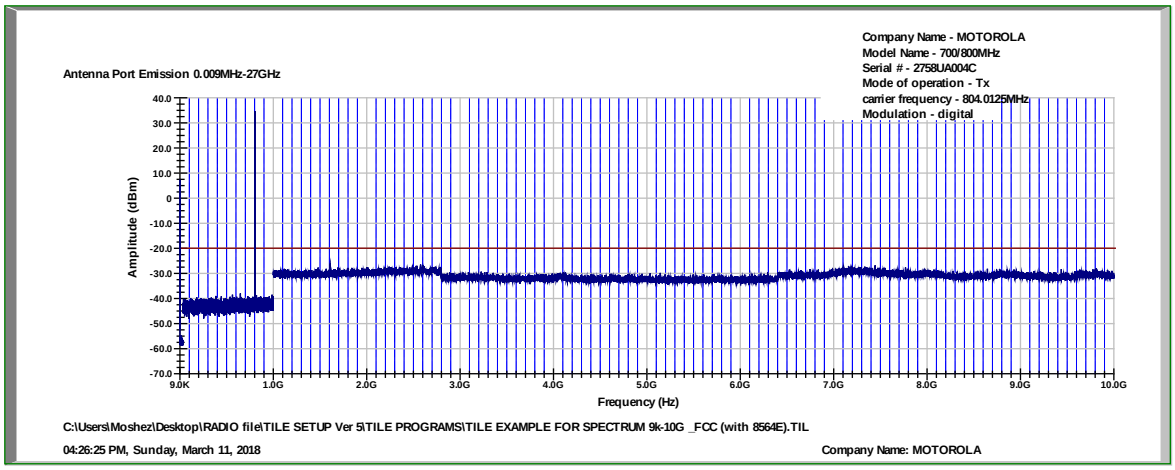


Figure 72 Spurious Emissions at Antenna Terminals, Digital, 804.0125MHz

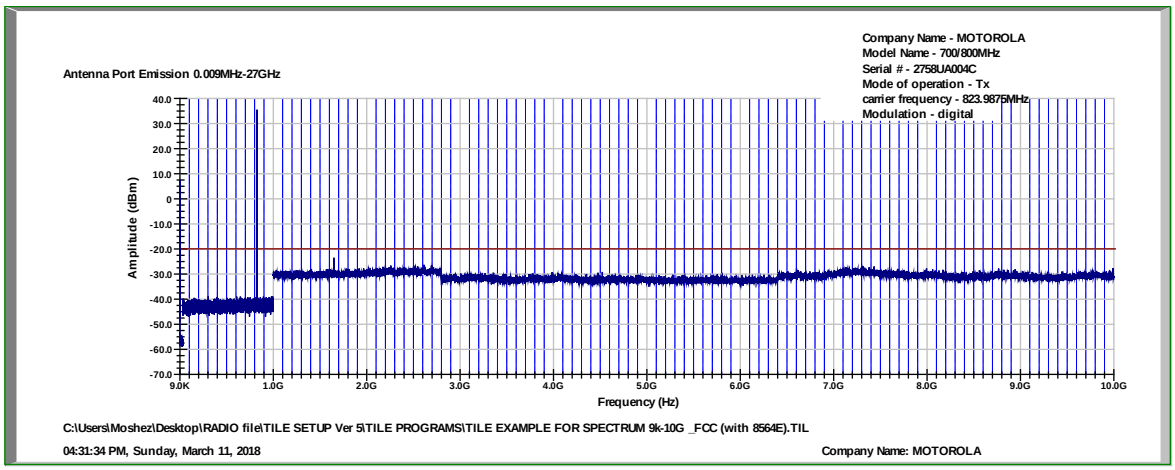


Figure 73 Spurious Emissions at Antenna Terminals, Digital, 823.9875MHz

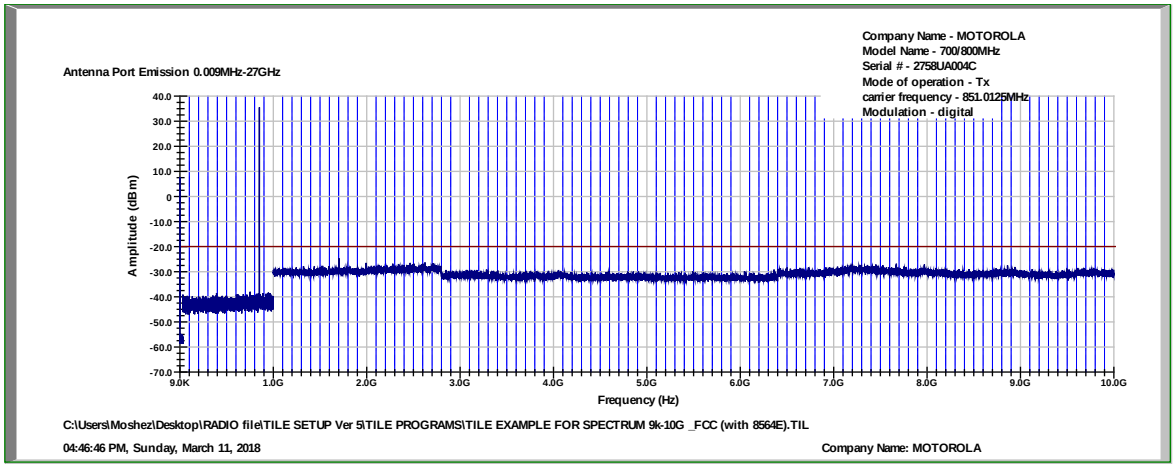
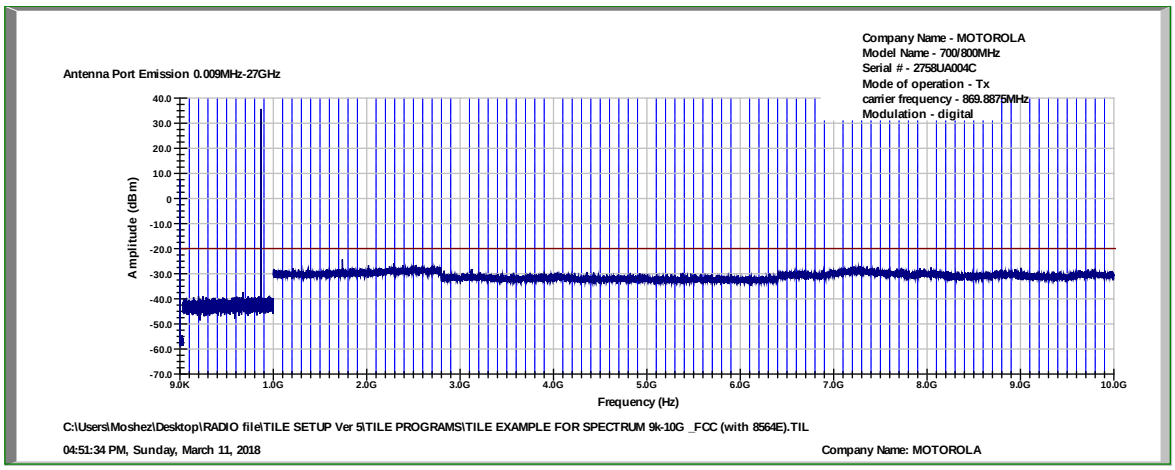


Figure 74 Spurious Emissions at Antenna Terminals, Digital, 851.0125MHz



*NOTE: NOT FOR FCC REVIEW

Figure 75 Spurious Emissions at Antenna Terminals, Digital, 869.8875MHz*

7.4 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 76 Test Equipment Used

8. Spurious Radiated Emission Pursuant to 47 CFR 2.1047, 2.1033(c)(13) & RSS Gen

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-10.0GHz:

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 -10.0GHz 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:

$P_d(dBm) = P_g(dBm) – Cable\ Loss\ (dB) + Substitution\ Antenna\ Gain\ (dBd)$

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*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)
764.0125	1528.025	V	51.8	-50.6	0.5	4.9	-46.2	-20.0	-26.2
	1528.025	H	52.2	-51.2	0.5	4.9	-46.8	-20.0	-26.8
769.0125	1538.025	V	52.0	-50.6	0.5	4.9	-46.2	-20.0	-26.2
	1538.025	H	52.1	-51.2	0.5	4.9	-46.8	-20.0	-26.8
799.0125	1598.025	V	51.3	-50.6	0.5	4.9	-46.2	-20.0	-26.2
	1598.025	H	49.1	-53.8	0.5	4.9	-49.4	-20.0	-29.4
823.9875	1647.975	V	52.5	-51.0	0.5	4.9	-46.6	-20.0	-26.6
	1647.975	H	52.3	-51.2	0.5	4.9	-46.8	-20.0	-26.8
851.0125	1702.025	V	53.2	-49.6	0.5	4.9	-45.2	-20.0	-25.2
	1702.025	H	51.6	-51.2	0.5	4.9	-46.8	-20.0	-26.8
869.8875	1739.775	V	52.4	-51.0	0.5	4.9	-46.6	-20.0	-26.6
	1739.775	H	52.9	-50.5	0.5	4.9	-46.1	-20.0	-26.1

Figure 77 Spurious Radiated Emission

JUDGEMENT: Passed by 25.2 dB

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 78 Test Equipment Used

9. 1559-1610 (GNSS) Spurious Radiated Emission Pursuant to FCC 90.543(f), RSS 119 & Section 5.8.9.2

9.1 Test Procedure

(Temperature (22°C)/ Humidity (62%RH))

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

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 1.559GHz -1.610GHz 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.

Testing was performed when the E.U.T connected to antenna that is representative of the type that will be used in normal operation

The table below describe only results with the highest radiation.

9.2 Test Limit

For operations in the bands 768-776 MHz and 798-806 MHz, all emissions (including harmonics) in the band 1559-1610 MHz, shall not exceed:
−70 dBW/MHz(-40dBm/MHz) (e.i.r.p.) for wideband emissions and
−80dBW/kHz (-50dBm/kHz)(e.i.r.p.) for discrete emissions of less than 700 Hz bandwidth.

9.3 Test Results

Carrier Channel	Freq.	Antenna Pol.	Maximum Peak Level	Signal Generator RF Output	Cable Loss	Antenna Gain	EIRP Level	Limit	Margin
(MHz)	(MHz)	(V/H)	(dBµV/m)	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
794.0125	1588.025	V	52.0	-50.6	0.5	7.0	-44.1	-40.0	-4.1
	1588.025	H	47.6	-55.2	0.5	7.0	-48.7	-40.0	-8.7
805.0000	1610.000	V	49.3	-53.3	0.5	7.0	-46.8	-40.0	-6.8
	1610.000	H	49.5	-53.3	0.5	7.0	-46.8	-40.0	-6.8

Figure 79 Spurious Radiated Emission

JUDGEMENT: Passed by 4.1dB

9.4 Test Instrumentation Used; GNNS Spurious Emissions

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 19, 2018	March 19, 2019
Spectrum Analyzer	HP	8593EM	3536A00120ADI	February 20, 2018	March 20, 2019
Horn Antenna 1G-18G	ETS	3115	29845	May 19, 2015	May 19, 2018
Band Pass Filter	Meuro	MFL010040H50	902251	October 1, 2017	October 1, 2018
Semi Anechoic Civil Chamber	ETS	S81	SL 11643	N/A	N/A

Figure 80 Test Equipment Used

10. Transmitter Frequency Stability Pursuant to 47 CFR 2.1047, 2.1033(c)(13) & RSS Gen

10.1 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 769.0125MHz and 851.0125MHz

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.

10.2 Test Limit

1.5 ppm.

10.3 Test Results

JUDGEMENT: Passed

The details of the results are given in *Figure 81* to *Figure 82.*

Temperature	Voltage	Frequency	Drift	Limit
(°C)	(VAC)	(MHz)	(Hz)	(Hz)
+20.0	97.7	769.012580	+15.0	1153.5
	115.0	769.012565	-	1153.5
	132.2	769.012570	+5.0	1153.5
-30.0	115.0	769.012660	+95.0	1153.5
-20.0	115.0	769.012712	+147.0	1153.5
-10.0	115.0	769.012738	+173.0	1153.5
0.0	115.0	769.012740	+175.0	1153.5
+10.0	115.0	769.012740	+175.0	1153.5
+30.0	115.0	769.012732	+167.0	1153.5
+40.0	115.0	769.012620	+55.0	1153.5
+50.0	115.0	769.012664	+99.0	1153.5
+60.0	115.0	769.012718	+153.0	1153.5

Figure 81. Frequency Stability Test Results, Fc=769.0125MHz

Temperature	Voltage	Frequency	Drift	Limit
(°C)	(VAC)	(MHz)	(Hz)	(Hz)
+20.0	97.7	851.012533	-7.0	1276.5
	115.0	851.012540	-	1276.5
	132.2	851.012530	-10.0	1276.5
-30.0	115.0	851.012673	+133.0	1276.5
-20.0	115.0	851.012757	+217.0	1276.5
-10.0	115.0	851.012753	+213.0	1276.5
0.0	115.0	851.012755	+215.0	1276.5
+10.0	115.0	851.012752	+212.0	1276.5
+30.0	115.0	851.012752	+212.0	1276.5
+40.0	115.0	851.012610	+70.0	1276.5
+50.0	115.0	851.012680	+140.0	1276.5
+60.0	115.0	851.012714	+174.0	1276.5

Figure 82. Frequency Stability Test Results, Fc=851.0125MHz

10.4 Test Equipment Used; Transmitter 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 83 Test Equipment Used

11. APPENDIX A - CORRECTION FACTORS

11.1 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 factor 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

12.3 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

12.4 Correction factors for biconical antenna – ITL # 1356

Model: EMCO 3110B

Serial No.:9912-3337

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

12.5 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

12.6 Correction factors for Double –Ridged Waveguide Horn ANTENNA

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

FREQUENCY (GHz)	AFE (dB/m)	FREQUENCY (GHz)	AFE (dB/m)
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