LTA
Laboratory for Test & Approval Co.,Ltd.

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http://www.ltalab.com

Dates of Tests: Nov 18 ~ Dec 15, 2016
Test Report S/N: LR500111612A
Test Site : LTA CO., Ltd.

RF TEST REPORT

FCC ID **O25PT-1500GD**

APPLICANT **UNIMO Technology Co., Ltd.**

Device Category	**:**	**Private Land Mobile Radio Service**
Manufacturing Description	**:**	**TETRA Hand Portable Radio**
Manufacturer	**:**	**Unimo Technology Co., Ltd.**
Model name	**:**	**PT-1500GD**
Variant Model		**PT-1580GD**
Serial number	**:**	**Identical prototype**
FCC Rule Part(s)	**:**	**§2, §90**
Frequency Range	**:**	**809.0000 ~ 824.0000 MHz & 854.0000 ~ 869.0000 MHz**
RF Output Power	**:**	**1.8 W**
Channel Separation	**:**	**25 kHz**
Emission Designators:	**:**	**20K1DXW**
Data of issue	**:**	**Dec 15, 2016**

This test report is issued under the authority of:

Yong-Cheol Wang, Manager

The test was supervised by:

Hee-Cheon Kwon, Test Engineer

This test result only responds to the tested sample. It is not allowed to copy this report even partly without the allowance of the test laboratory. This report must not be used by the applicant to claim product endorsement by NVLAP or any agency of the U.S. Government.

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1. General information

1-1 Test Performed

Company name : LTA Co., Ltd.

Address : 243, Jubug-ri,Yangji-Myeon,Youngin-Si, Kyunggi-Do, Korea. 449-822

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E-mail : chahn@ltalab.com

Telephone : +82-31-323-6008

Facsimile +82-31-323-6010

Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the “General requirements for the competent of calibration and testing laboratory”.

1-2 Accredited agencies

LTA Co., Ltd. is approved to perform EMC testing by the following agencies:

Agency	Country	Accreditation No.	Validity	Reference
NVLAP	U.S.A	200723-0	2016-09-30	ECT accredited Lab.
RRL	KOREA	KR0049	-	EMC accredited Lab.
FCC	U.S.A	610755	2017-04-21	FCC filing
FCC	U.S.A	649054	2017-04-13	FCC CAB
VCCI	JAPAN	R2133(10m), C2307	2017-06-21	VCCI registration
VCCI	JAPAN	T-2009	2016-12-23	VCCI registration
VCCI	JAPAN	G-563	2018-12-13	VCCI registration
IC	CANADA	5799A-1	2019-11-07	IC filing
KOLAS	KOREA	NO.551	2017-01-08	KOLAS accredited Lab.

2. Information about test item

2-1 Client & Manufacturer

Company name	:	Unimo Technology Co., Ltd.
Address	:	2145, Nambusunhwan-ro, Seocho-gu, Seoul, Korea
TEL / FAX	:	+82-2-6710-7040 / +82-2-6710-7004

2-2 Equipment Under Test (EUT)

Model name	:	PT-1500GD
Date of receipt	:	Dec 15, 2016
EUT condition	:	Identical prototype
Frequency Range	:	809. 0000 ~ 824.0000 MHz & 854.0000 ~ 869.0000 MHz
RF output power	:	1.8 W
Channel Separation	:	25 kHz
Power Source	:	DC 7.4 V by battery (Li-ion)
Firmware version	:	V1.0

2-3 Tested frequency

Frequency (MHz)	LOW	MID	HIGH
TMO	809	817	824
DMO	854	862	869

3. Test Report

3.1 Summary of tests

FCC Rules	Description of Test	Results
§1.1307(b); §2.1093	RF Exposure	C
§2.1046; §90.205	RF Output Power	C
§2.1046; §90.210; §90.221	Adjacent Channel Power	C
§2.1049; §90.209; §90.210; §90.691	Occupied Bandwidth & Emission Mask	C
§2.1051; §90.210	Spurious Emission at Antenna Terminal	C
§2.1053; §90.210	Radiated Spurious Emissions	C
§2.1055; §90.213	Frequency Stability	C
§90.214	Transient Frequency Behavior	NA
Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable		
Note 2: The data in this test report are traceable to the national or international standards.		

The sample was tested according to the following specification :

- FCC Part2, Part 90
- ANCI C 63.4-2014
- TIA/EIA-603-D

3.2 TEST RESULTS

3.2.1 RF EXPOSURE

Applicable Standard :

According to FCC §1.1310 and §2.1093, protable device operates Part 90 should be subjected to rountine environmental evaluation for RF exposure prior or equipment authorization or use.

Result : Complies

Please refer to SAR Report Number : LR500111612L

3.2.2 RF OUTPUT POWER

Applicable Standard : FCC §2.1046 and §90.205

Test Procedure

Conducted RF Output Power:

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

The spectrum analyzer is setting:

Center frequency = the highest, middle and the lowest channels

RBW = 100 kHz

VBW = 300 kHz

Trace = max hold

Sweep = auto

Detector function = peak

Test Result : Compliance.

Measurement Data: Transmitting

Modulation	Channel Separation (kHz)	Frequency (MHz)	Output Power (dBm)	Output Power (w)	Result
TMO	25	809.0000	29.81	0.96	Pass
		817.0000	30.04	1.01	Pass
		824.0000	29.84	0.96	Pass
DMO	25	854.0000	30.21	1.05	Pass
		862.0000	29.70	0.93	Pass
		869.0000	30.66	1.16	Pass

Note : The rated Power is 1.8 W. The limit of the high output power is 0.9 W ~ 1.8 W

3.2.3 ADJACENT CHANNEL POWER

Applicable Standard : FCC§2.1046 and §90.210 and §90.221:

According to FCC §90.221 (c) (1), Maximum adjacent power levels for frequencies in the 809-824/854-869 MHz band:

Frequency offset	Maximum ACP (dBc) for devices less than 15 watts	Maximum ACP (dBc) for devices 15 watts and above
25 kHz	-55 dBc	-55 dBc
50 kHz	-65 dBc	-65 dBc
75 kHz	-65 dBc	-70 dBc

(2) In any case, no requirement in excess -36 dBm shall apply

Test Procedure

Test Method : TIA -603-D 2.2.14

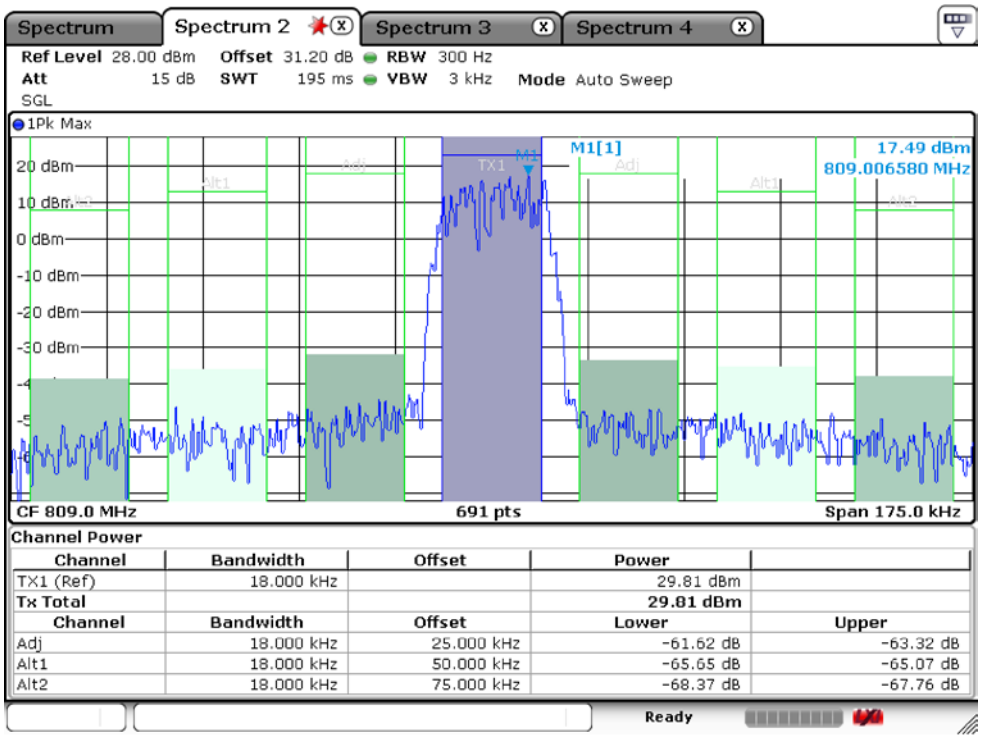
Test Result : Compliance.

Measurement Data:

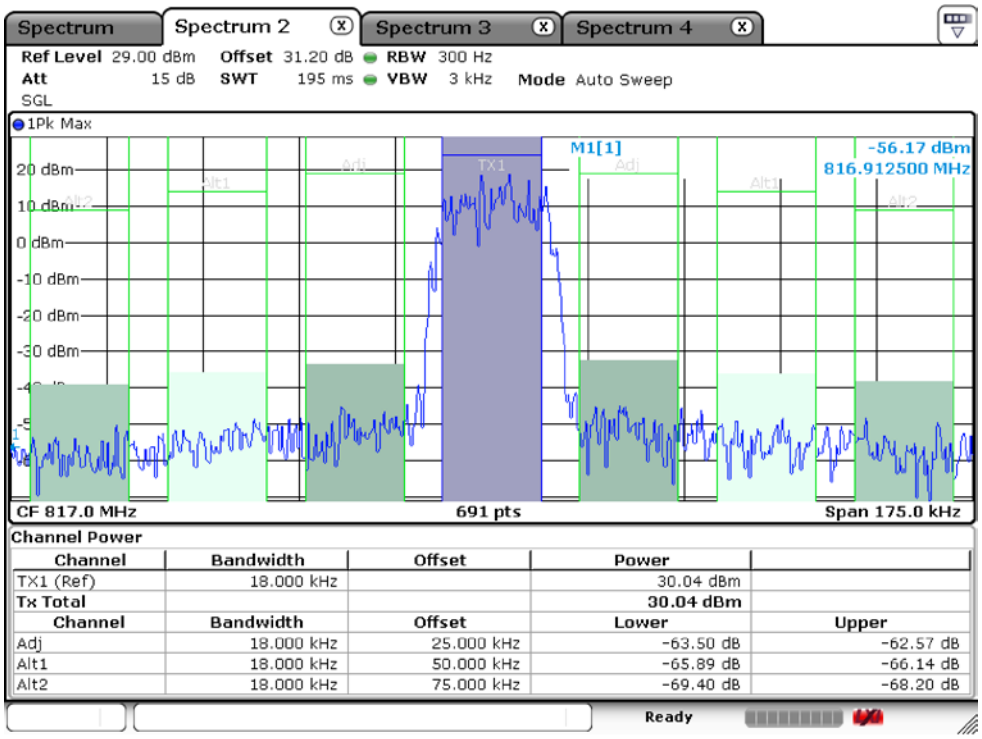
Modulation Mode	Channel Separation	Modulation Type	Frequnecy [MHz]	Frequency offset [kHz]	Adjacent Channel Power Ratio (dB)	Limit (dB)
TMO	25 kHz	π/4-DQPSK	809.0000	±25	62.62	55
				±50	65.07	65
				±75	67.76	65
			817.0000	±25	62.57	55
				±50	65.89	65
				±75	68.20	65
			824.0000	±25	60.90	55
				±50	65.76	65
				±75	69.00	65

Modulation Mode	Channel Separation	Modulation Type	Frequnecy [MHz]	Frequency offset [kHz]	Adjacent Channel Power Ratio (dB)	Limit (dB)
DMO	25 kHz	π/4-DQPSK	854.0000	±25	61.04	55
				±50	65.44	65
				±75	68.79	65
			862.0000	±25	60.93	55
				±50	65.13	65
				±75	66.95	65
			869.0000	±25	60.87	55
				±50	65.90	65
				±75	68.97	65

TMO for Frequency 809.0000 MHz

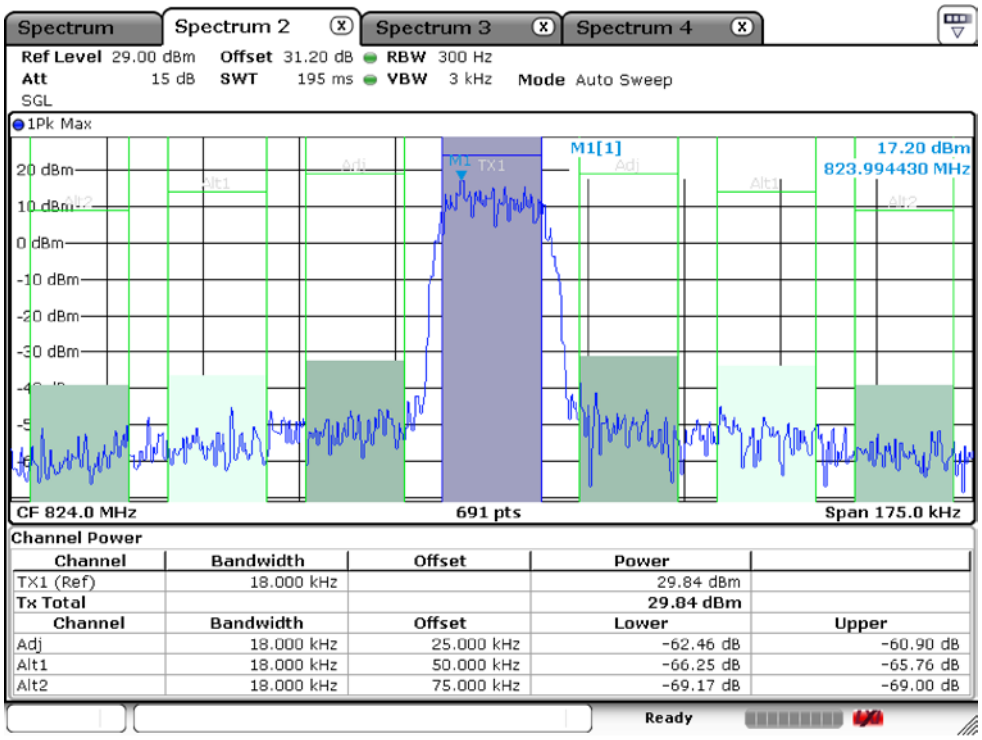


TMO for Frequency 817.0000 MHz



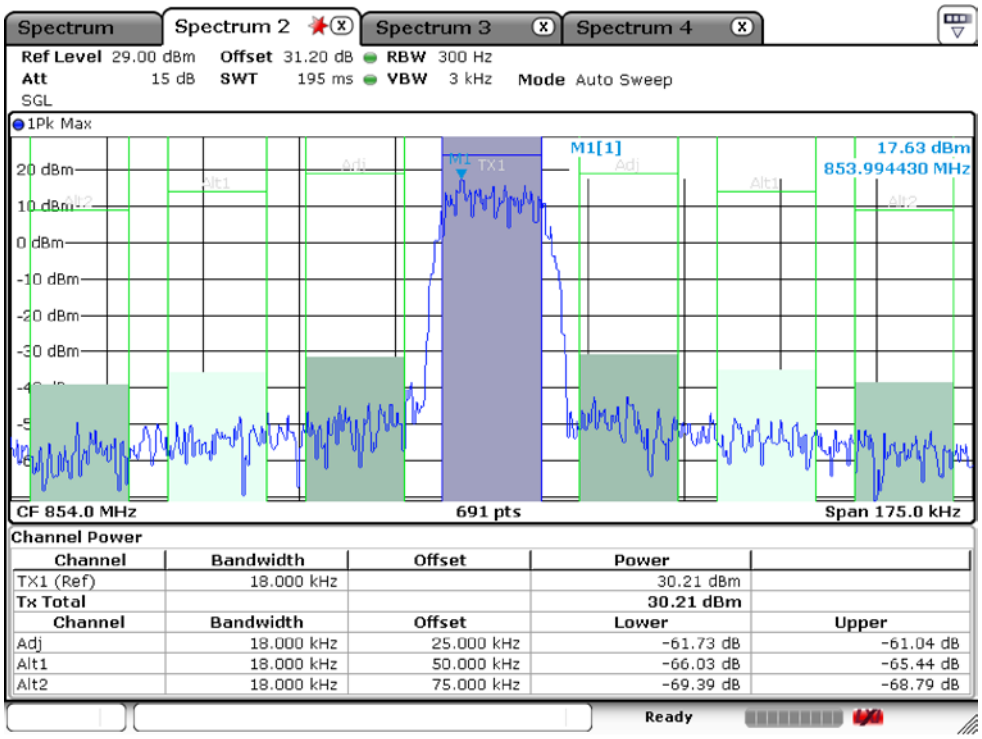
Channel	Bandwidth	Offset	Power	
TX1 (Ref)	18.000 kHz		30.04 dBm	
Tx Total			**30.04 dBm**	
Channel	**Bandwidth**	**Offset**	**Lower**	**Upper**
Adj	18.000 kHz	25.000 kHz	-63.50 dB	-62.57 dB
Alt1	18.000 kHz	50.000 kHz	-65.89 dB	-66.14 dB
Alt2	18.000 kHz	75.000 kHz	-69.40 dB	-68.20 dB

TMO for Frequency 824.0000 MHz

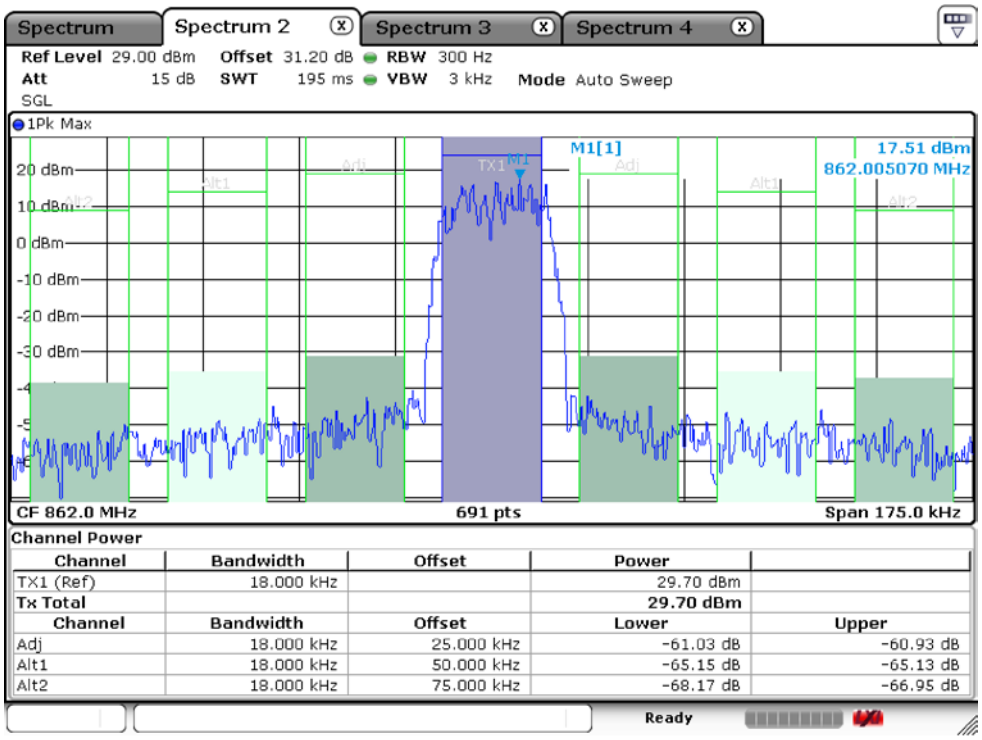


Channel	Bandwidth	Offset	Power	
TX1 (Ref)	18.000 kHz		29.84 dBm	
Tx Total			**29.84 dBm**	
Channel	**Bandwidth**	**Offset**	**Lower**	**Upper**
Adj	18.000 kHz	25.000 kHz	-62.46 dB	-60.90 dB
Alt1	18.000 kHz	50.000 kHz	-66.25 dB	-65.76 dB
Alt2	18.000 kHz	75.000 kHz	-69.17 dB	-69.00 dB

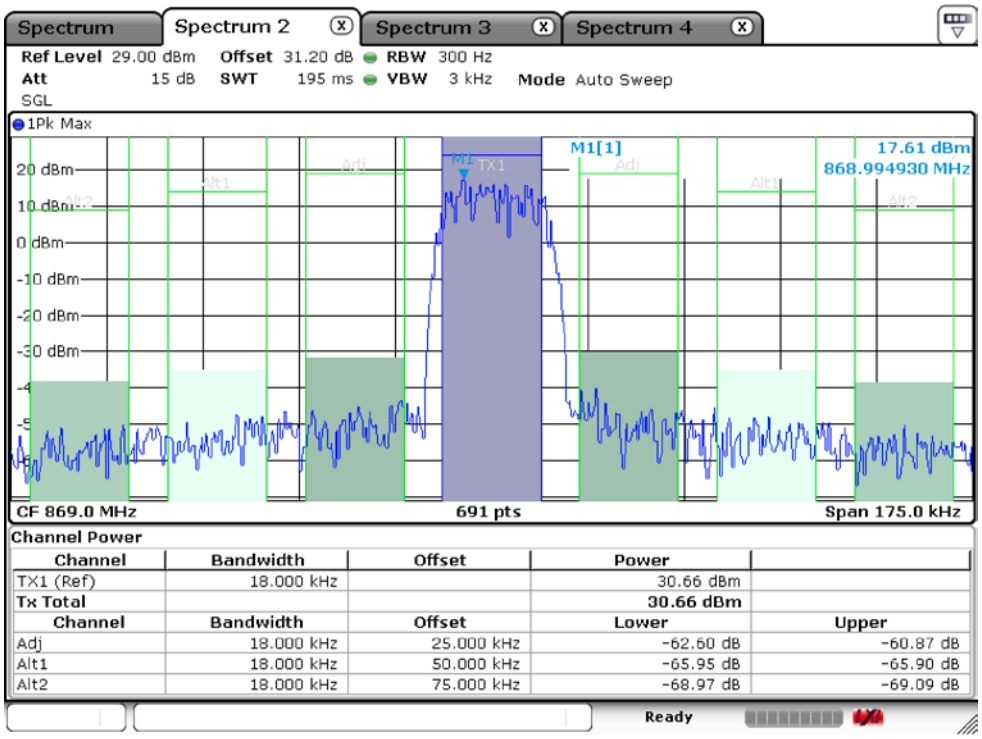
DMO for Frequency 854.0000 MHz



DMO for Frequency 862.0000 MHz



DMO for Frequency 869.0000 MHz



3.2.4 OCCUPIED BANDWIDTH & EMISSION MASK

Applicable Standard : FCC §2.1049, §90.210 and §90.691

Emission Mask B. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.

2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.

3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + log (P) dB.

Emission Mask I. For transmitters that are equipped with an audio low pass filter, the power of any emission must be attenuated below the unmodulated carrier power of the transmitter (P) as follows:

1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency of more than 6.8 kHz, but no more than 9.0 kHz: At least 25 dB;

2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency of more than 9.0 kHz, but no more than 15 kHz: At leat 35 dB;

3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency of more than 15 kHz: At least 43+10 log (P) dB, or 70 dB, whichever is the lesser attenuation.

Emission mast requirements for EA-based systems.

(a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee’s frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 $Log_{10}(f/6.1)$ decibels or $50+10Log_{10}(P)$

decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $43+10\log_{10}(P)$ dicibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

The 99% energy rule (title 47CFR 2.989) was used for digital mode and is more accurate than Carson's rule. It basically states that 99% of the modulation energy falls within X kHz, in this case, 22 kHz
Measurements were performed in accordance with TIA/EIA. The emission mask was obtained from 47CFR 90.210(d).

- Bandwidth: 22.0 kHz
- Modulation Type: [D] Carrier is amplitude and angle modulated
- Modulation Nature: [X] Unknown
- Information Type: [W] Multiple Formats of Data Transmitted
- DXW portion of the designator indicates digital data.

Test Procedure

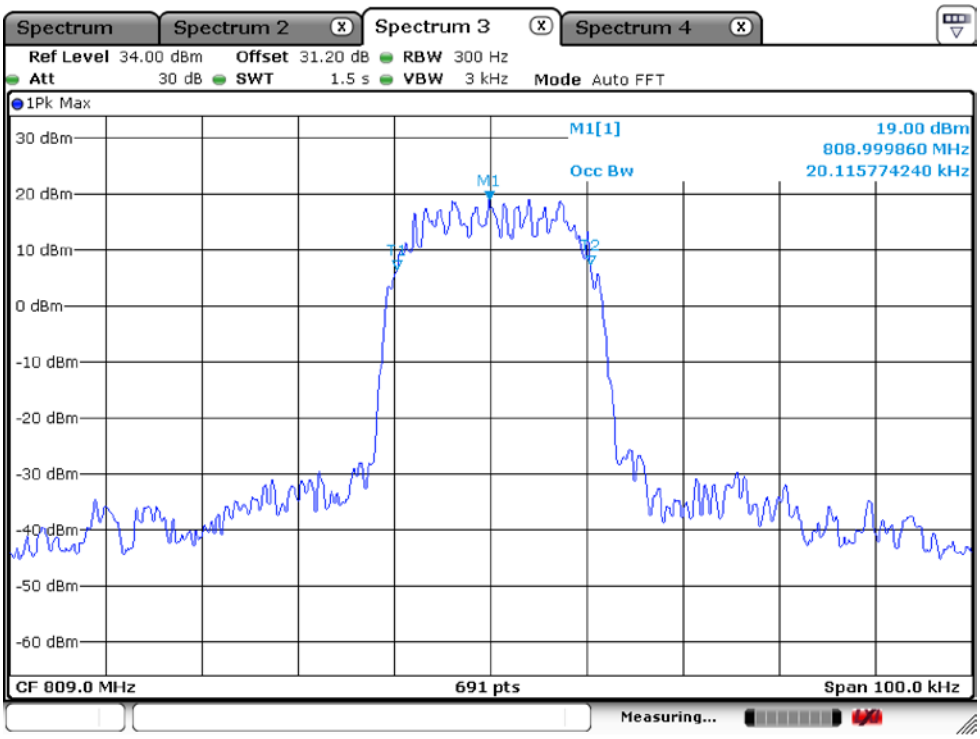
The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.
The resolution bandwidth of the spectrum analyzer was set at 100 Hz and the spectrum was recorded in the frequency band ±50 kHz from the carrier frequency.

Test Result : Compliance.

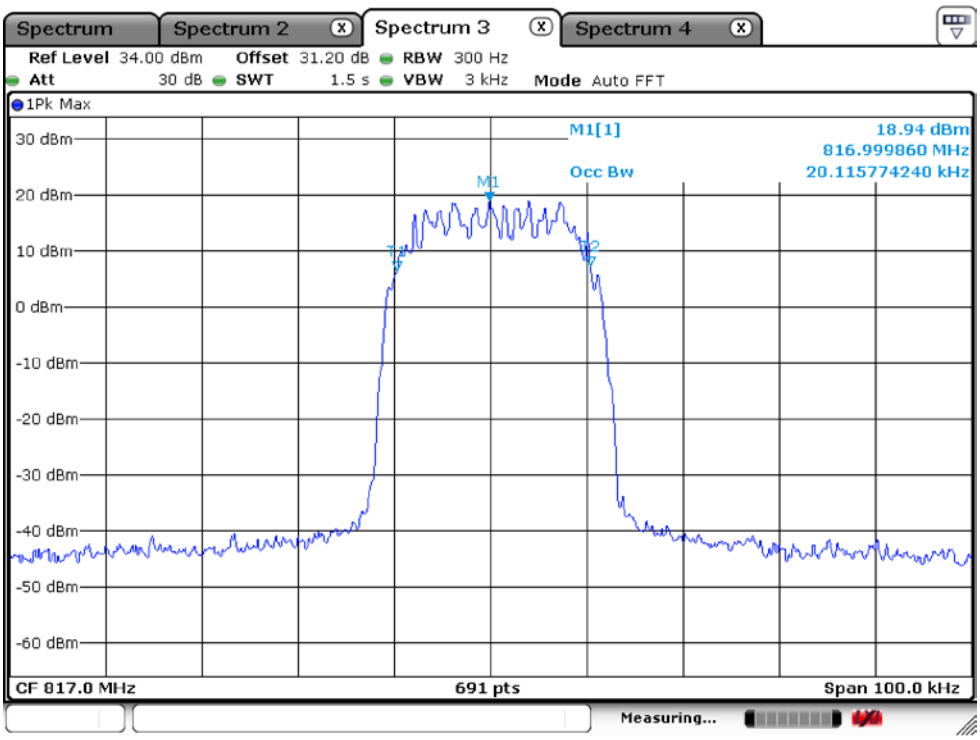
Measurement Data: Transmitting

Modulation	Modulation Type	Channel Space	Frequency (MHz)	99%Occupied Bandwidth (kHz)	FCC Limit (kHz)
TMO	π/4−DQPSK	25 kHz	809.0000	20.12	22
			817.0000	20.12	22
			824.0000	20.12	22
DMO			854.0000	20.12	22
			862.0000	20.12	22
			869.0000	20.12	22

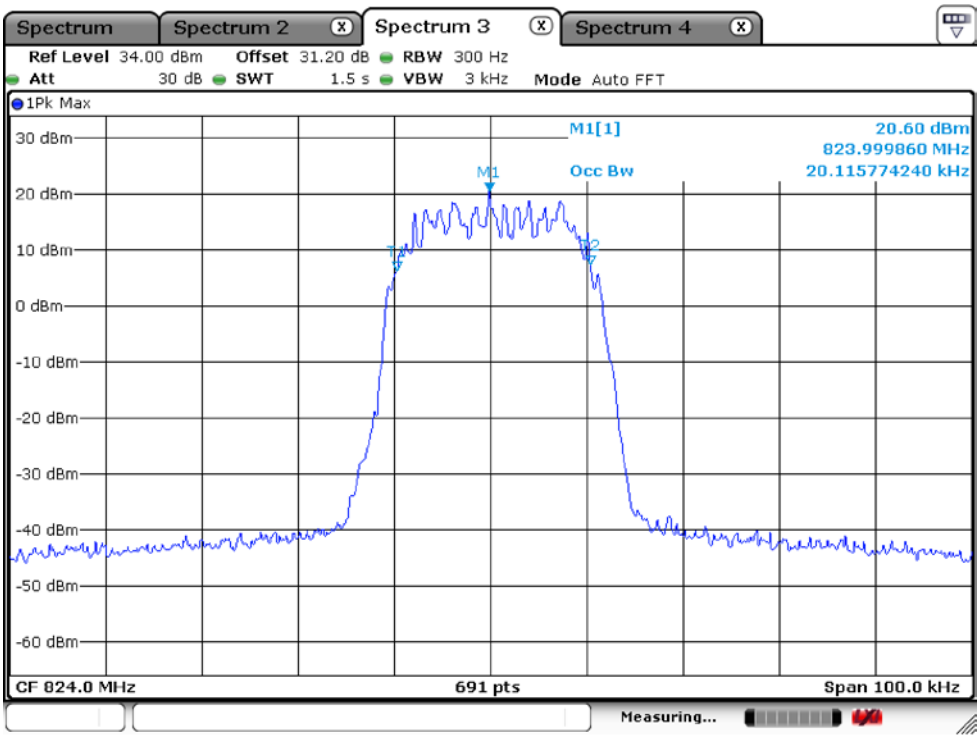
99% Occupied Bandwidth – TMO, 809.0000 MHz



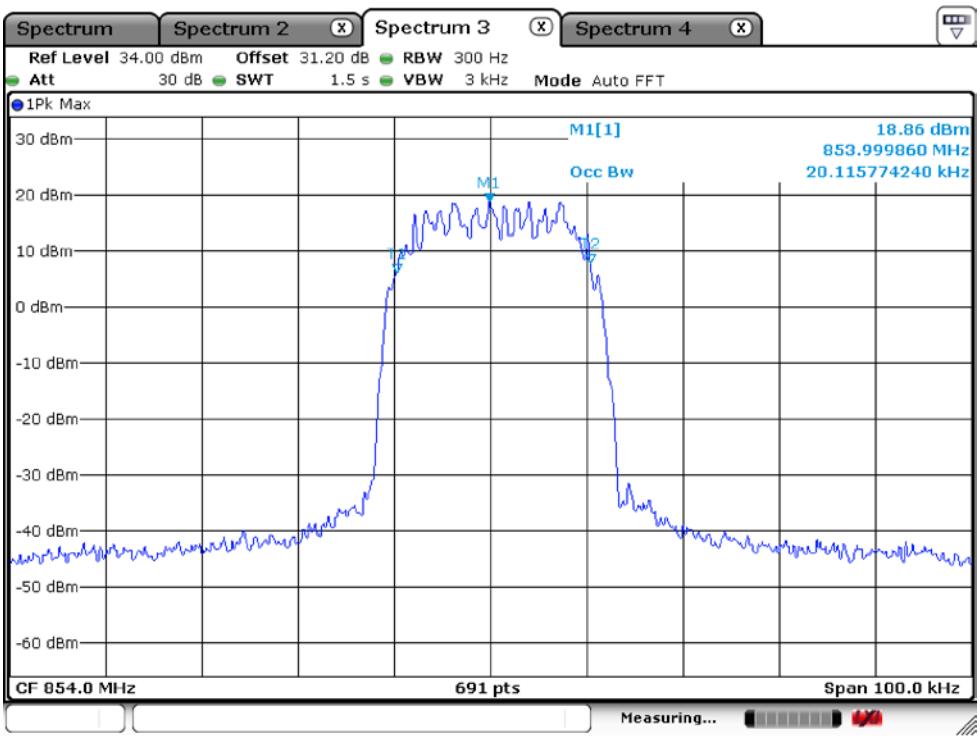
99% Occupied Bandwidth – TMO, 817.0000 MHz



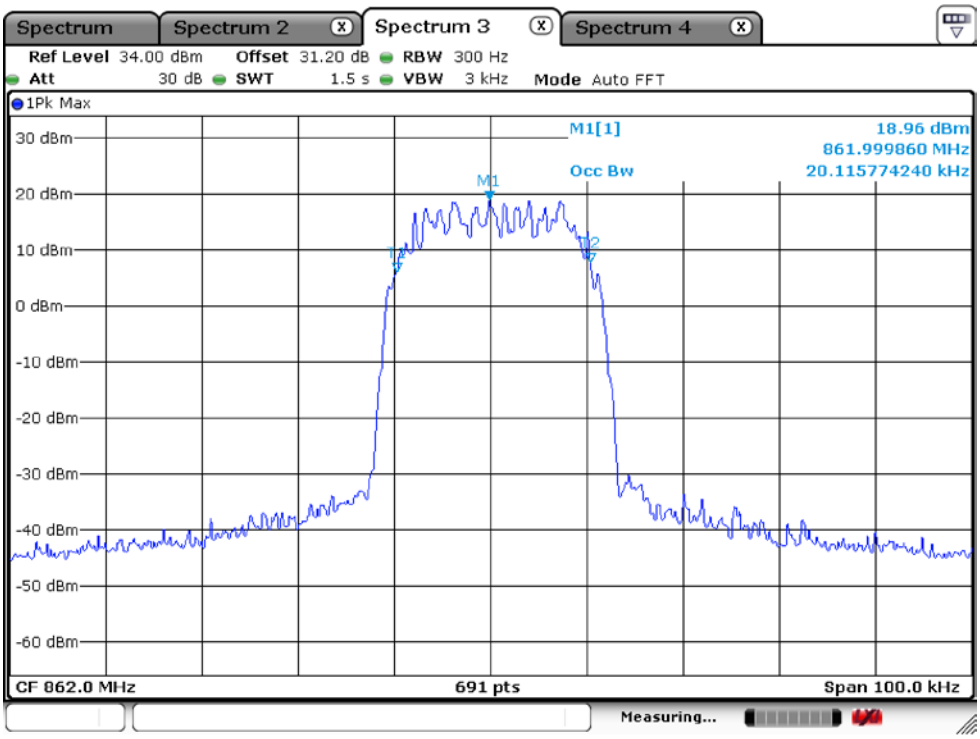
99% Occupied Bandwidth – TMO, 824.0000 MHz



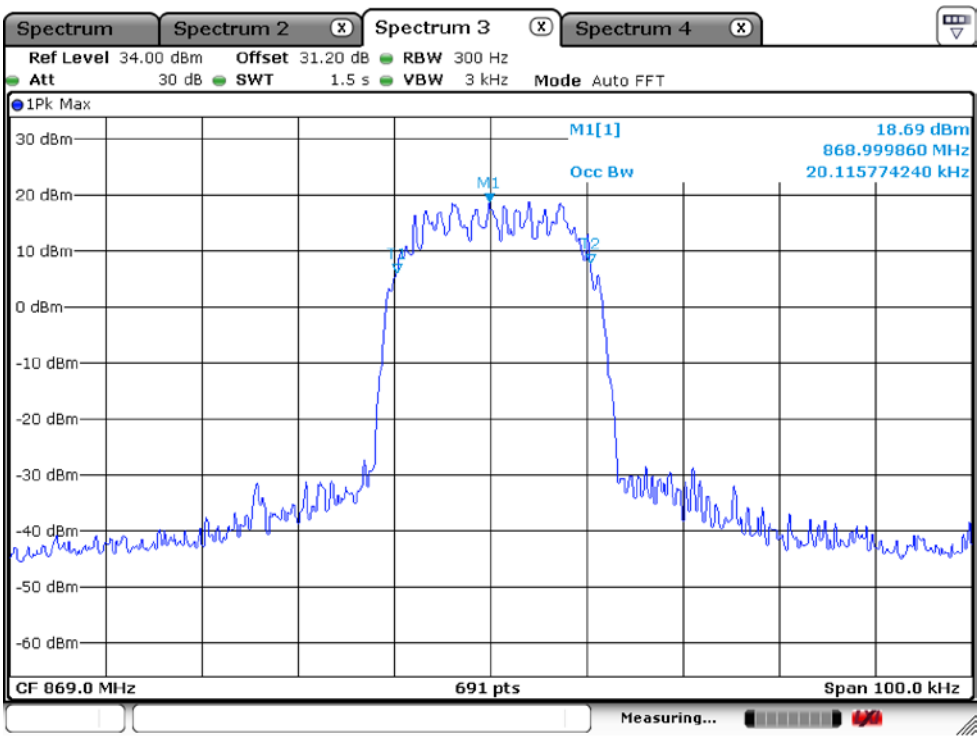
99% Occupied Bandwidth – DMO, 854.0000 MHz



99% Occupied Bandwidth – DMO, 862.0000 MHz



99% Occupied Bandwidth – DMO, 869.0000 MHz



3.2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINAL

Applicable Standard : FCC §2.1051 & §90.210

Emission Mask G. For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodullated carrier power (P) as follows :

1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 10 kHz, but no more than 250 percent of the authorized bandwidth: At least 116 log (fd/6.1) dB, or 50 + 10 log (P) dB, or 70 dB, whichever is the lesser attenuation;

2) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

Emission Mask EA-based systems : Out-of-band emission requirement shall apply only to the "outer" channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log10(f/6.1) decibels or 50 + 10 Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

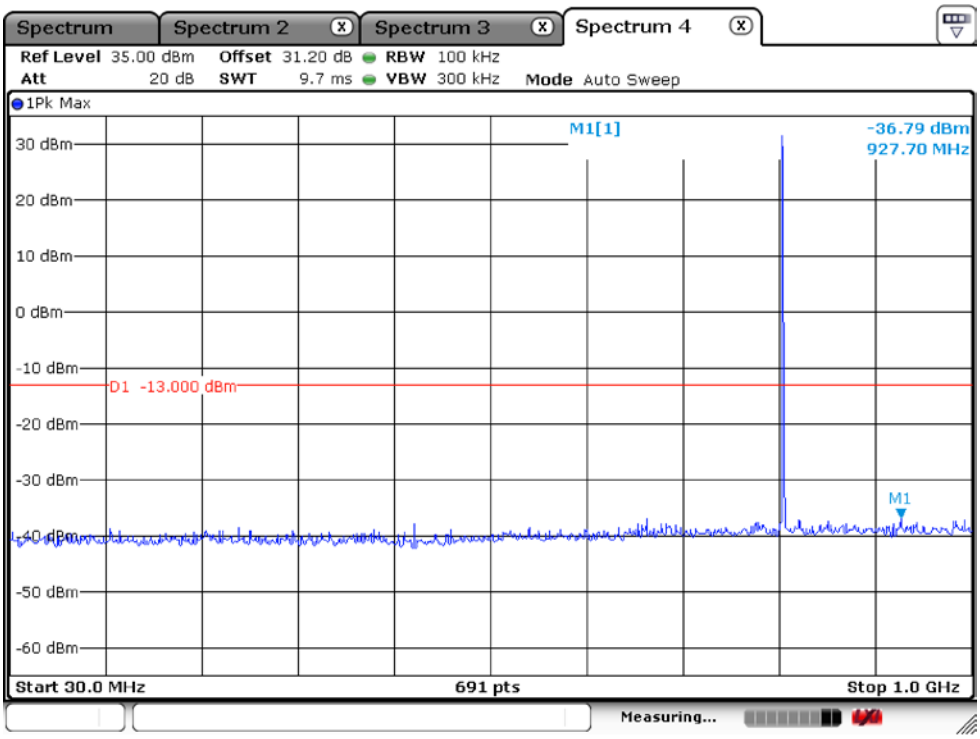
2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

Test Procedure

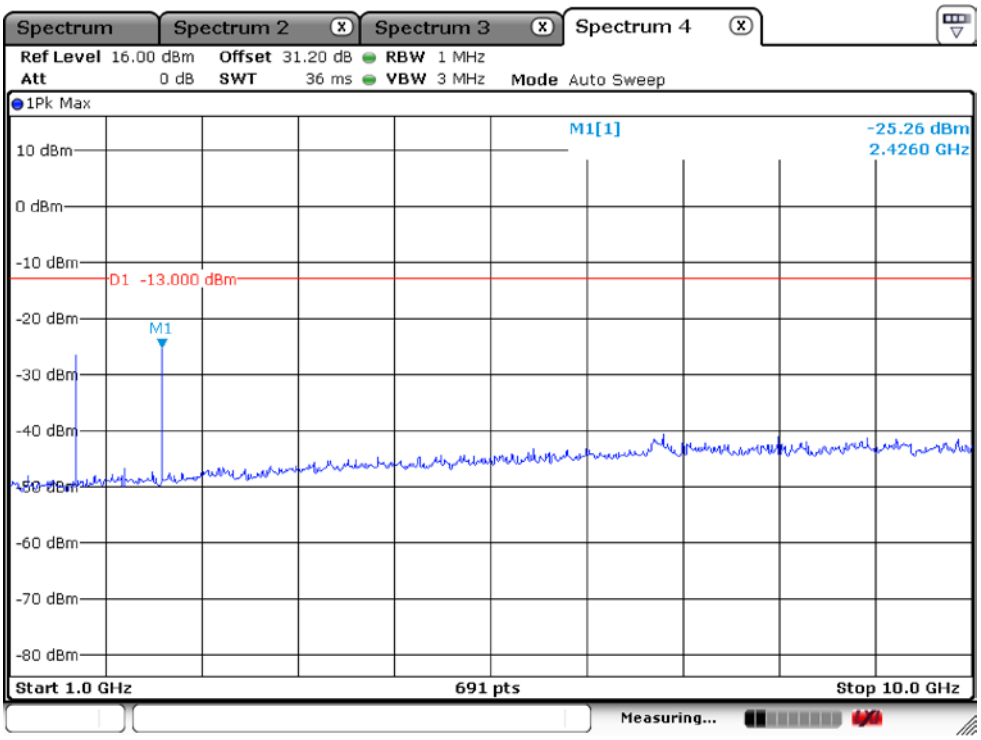
The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz for below 1 GHz, and 1 MHz for above 1 GHz. sufficient scans were taken to show any out of band emissions up to 10^{th} harmonic.

Test Result : Compliance.

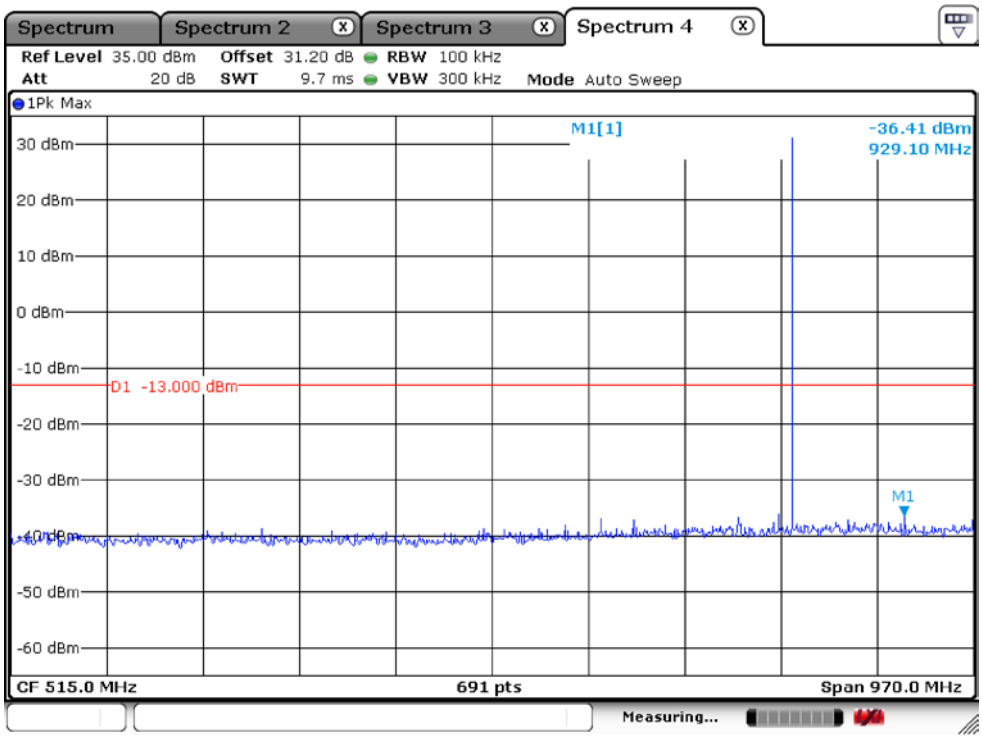
30 MHz – 1 GHz, TMO, 809.0000 MHz



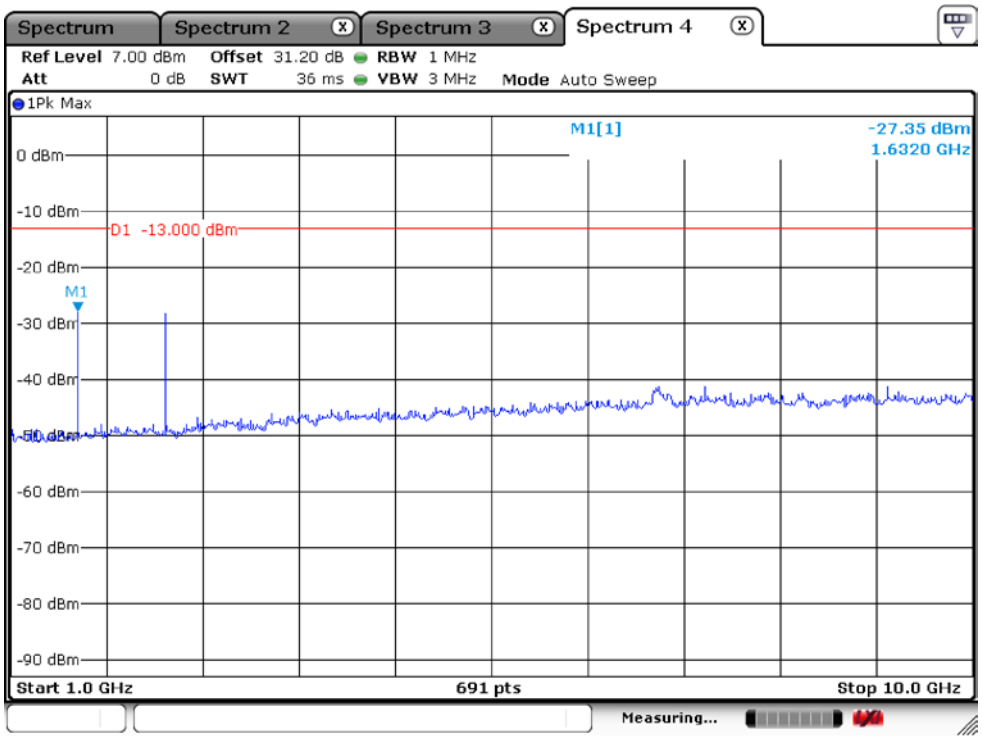
1 GHz – 10 GHz, TMO, 809.0000 MHz



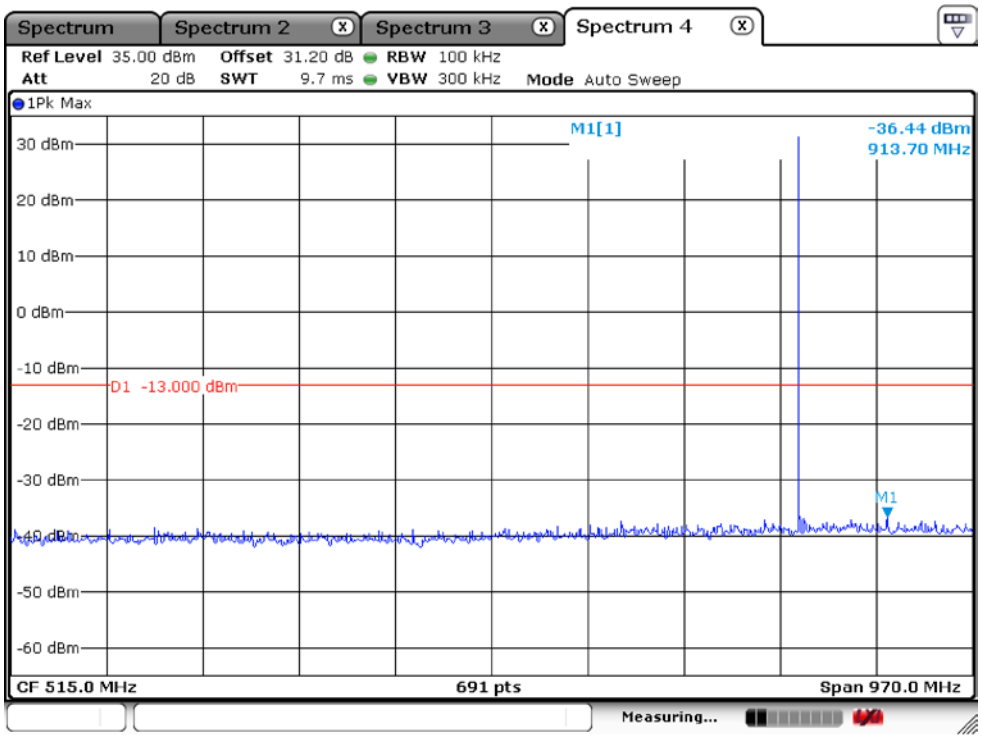
30 MHz – 1 GHz, TMO, 817.0000 MHz



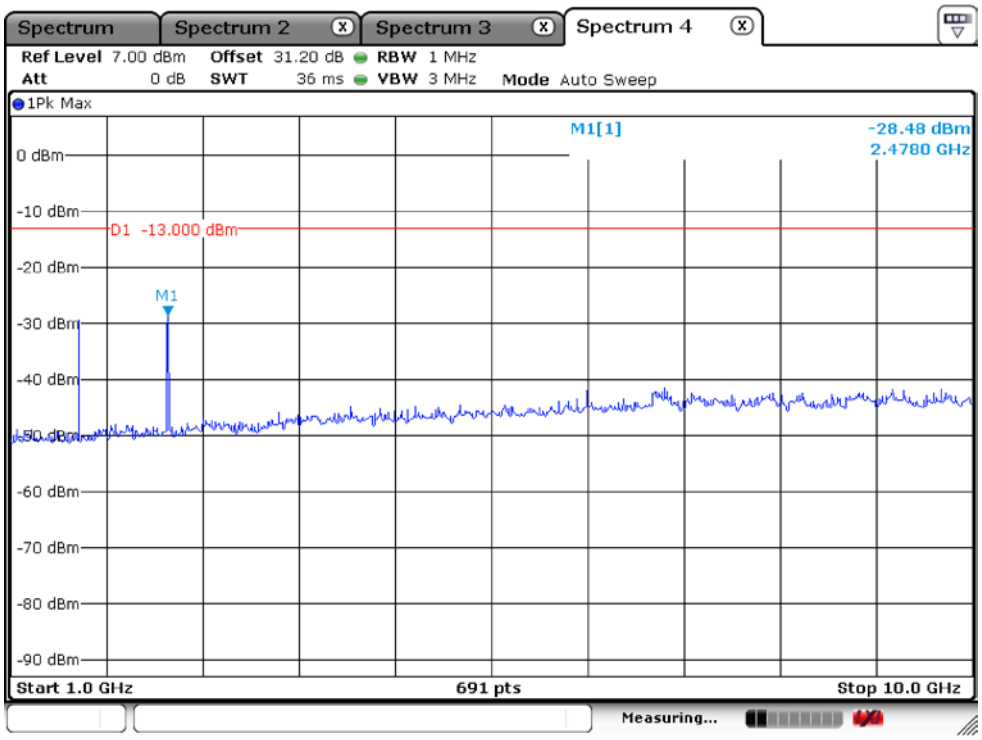
1 GHz – 10 GHz, TMO, 817.0000 MHz



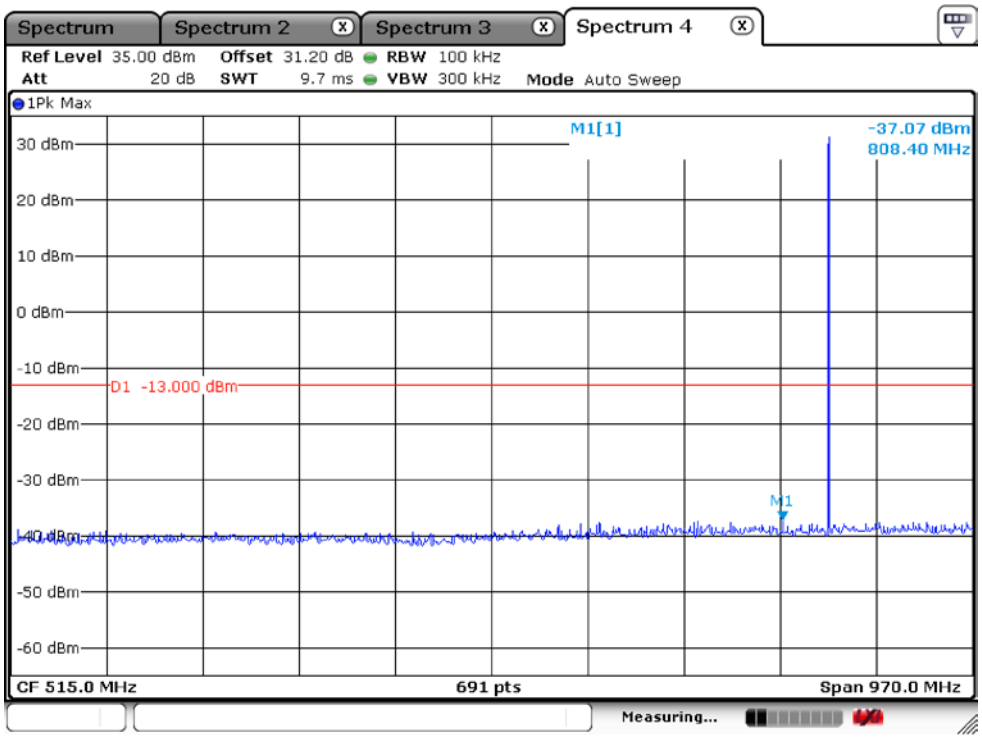
30 MHz – 1 GHz, TMO, 824.0000 MHz



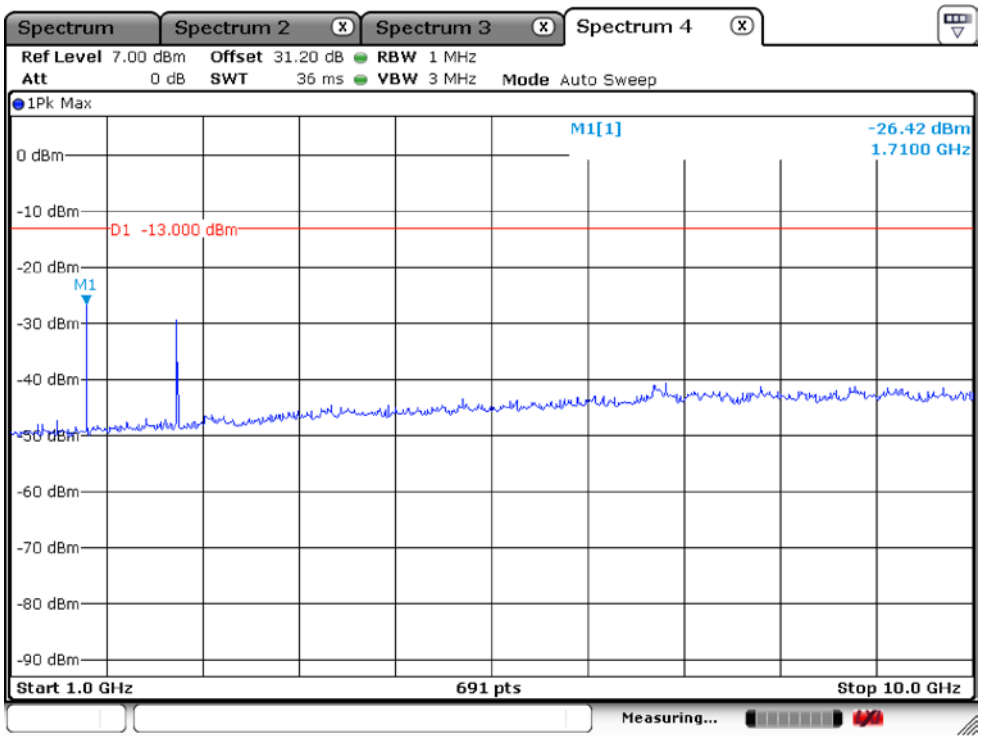
1 GHz – 10 GHz, TMO, 824.0000 MHz



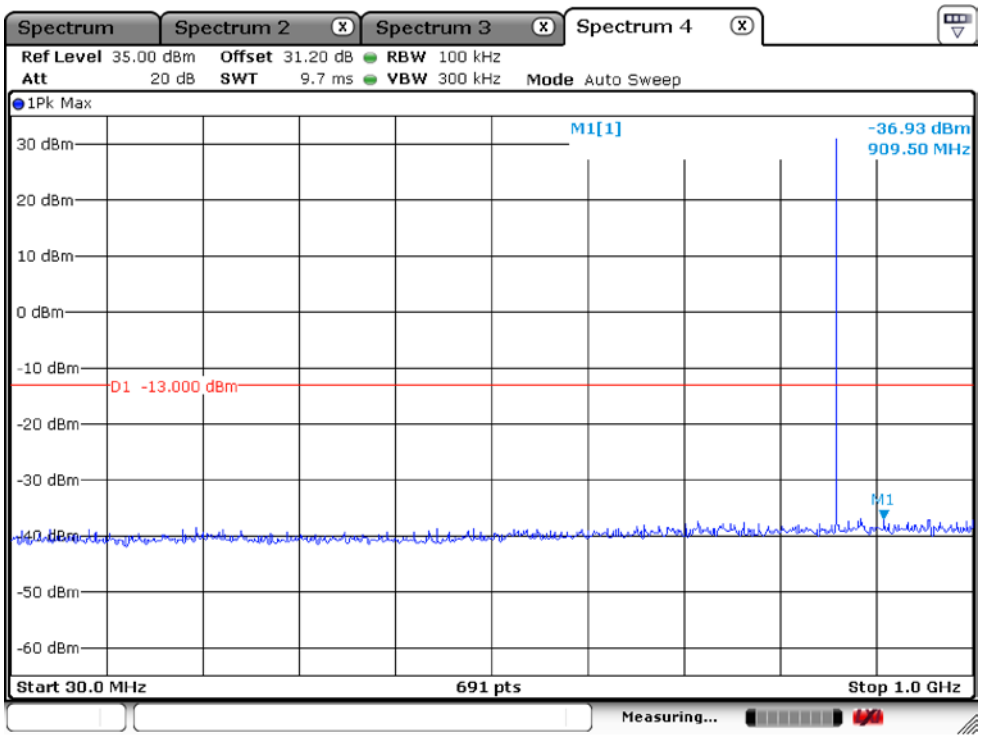
30 MHz – 1 GHz, DMO, 854.0000 MHz



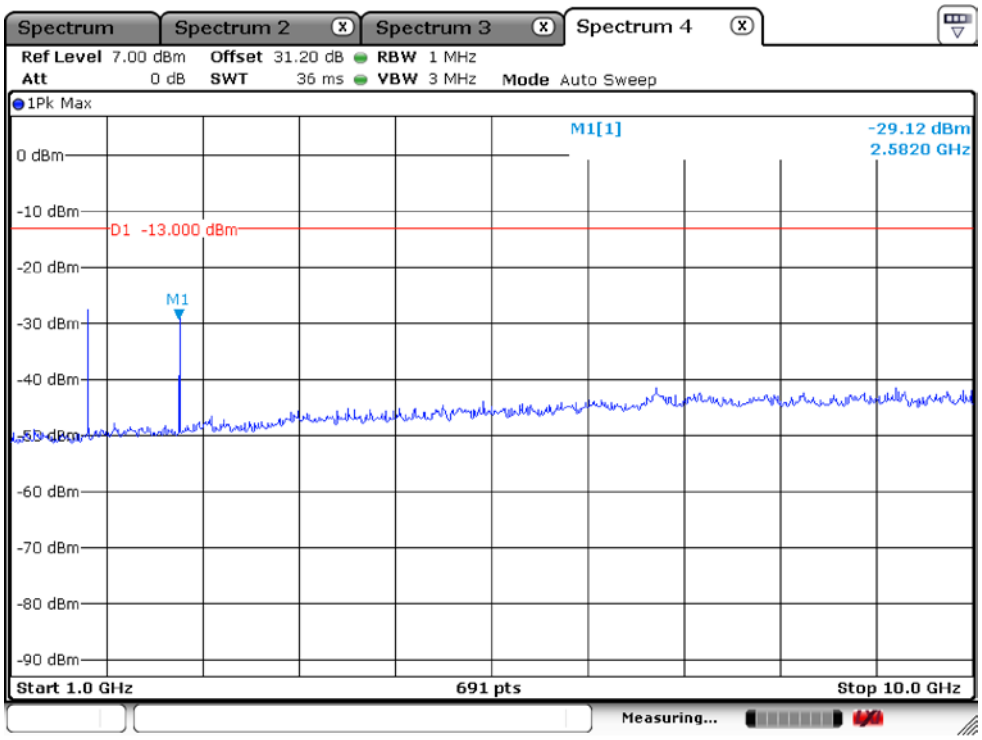
1 GHz – 10 GHz, DMO, 854.0000 MHz



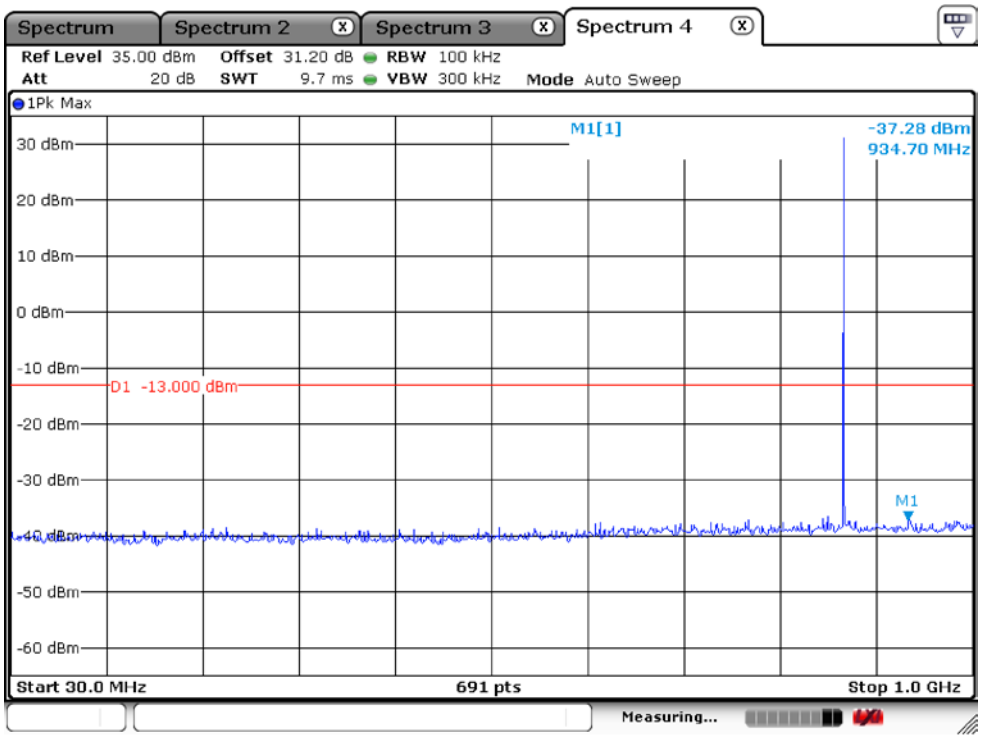
30 MHz – 1 GHz, DMO, 862.0000 MHz



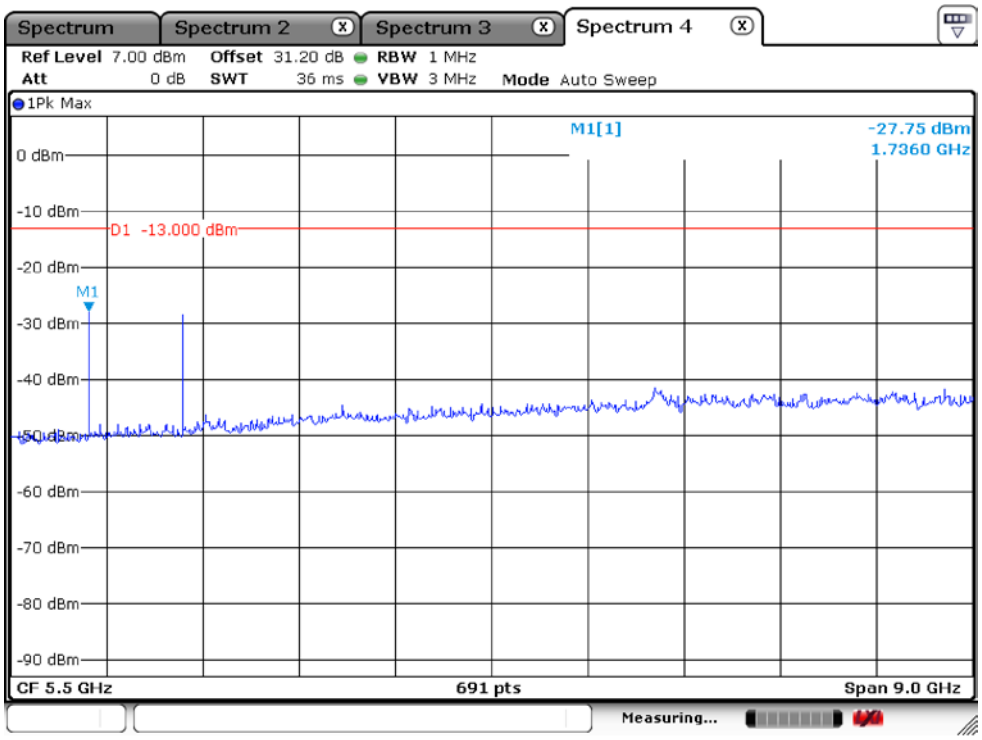
1 GHz – 10 GHz, DMO, 862.0000 MHz



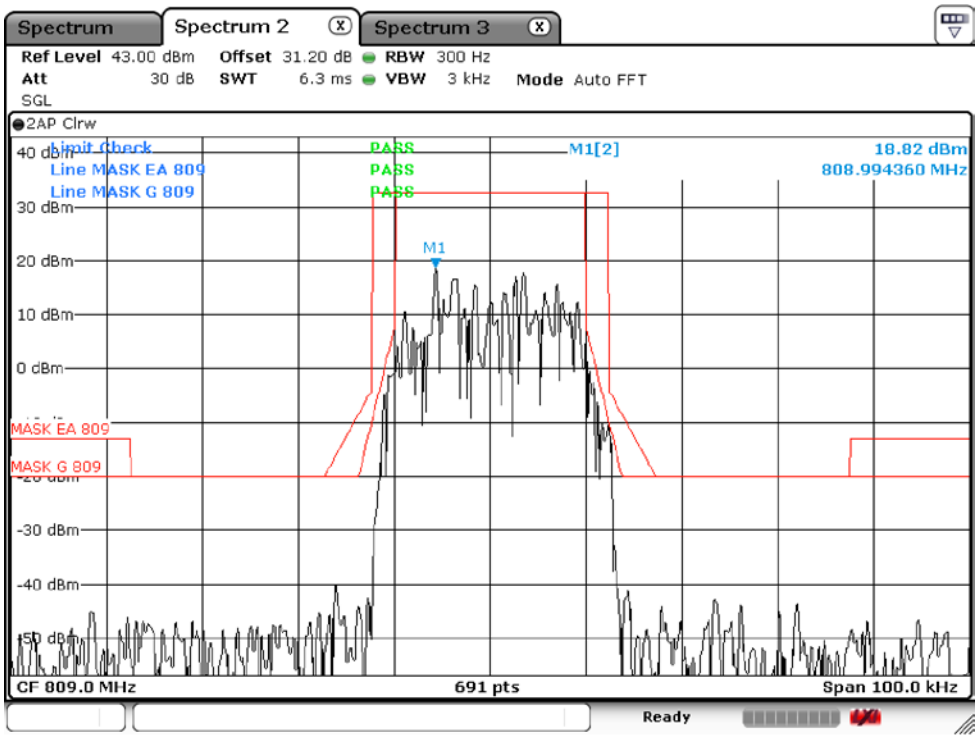
30 MHz – 1 GHz, DMO, 869.0000 MHz



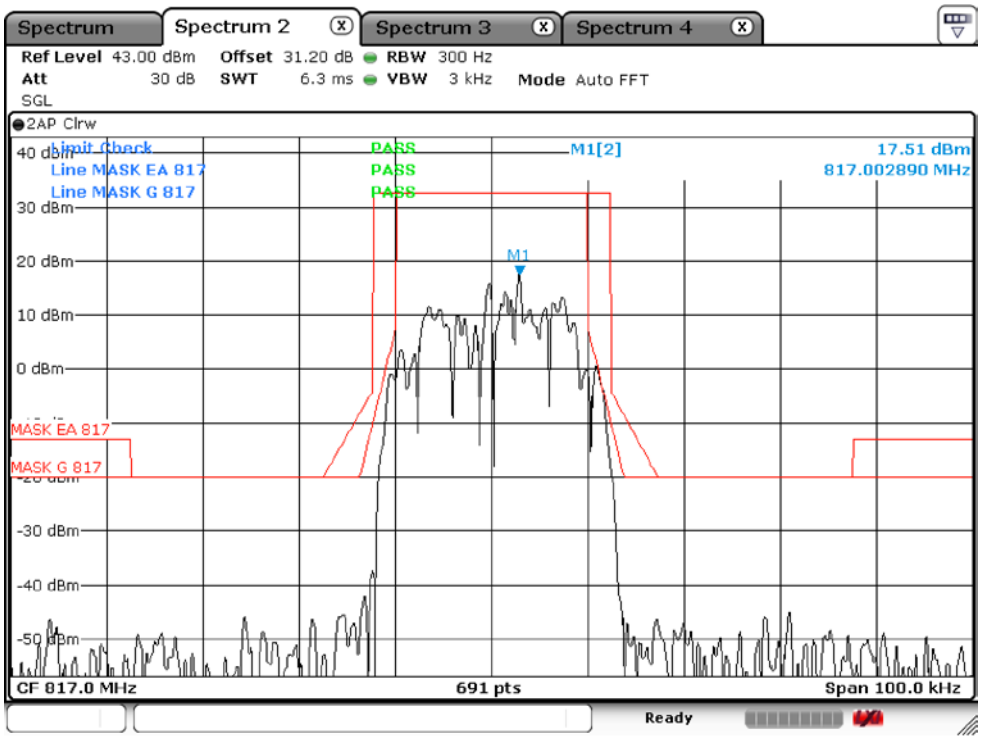
1 GHz – 10 GHz, DMO, 869.0000 MHz



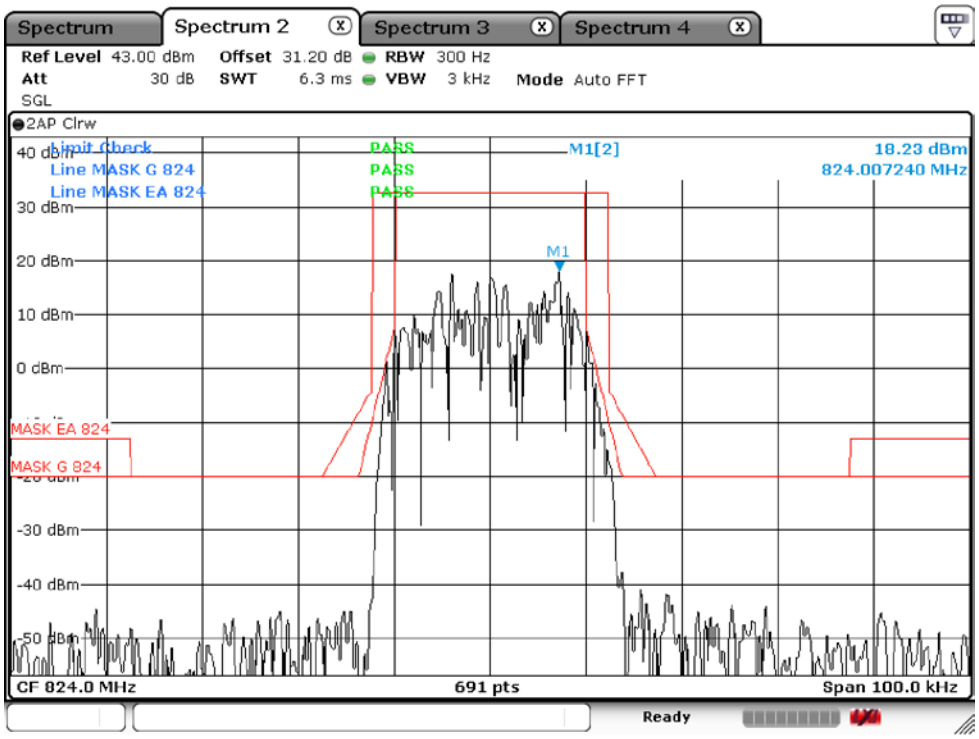
EMISSION MASK : TMO, 809.0000 MHz



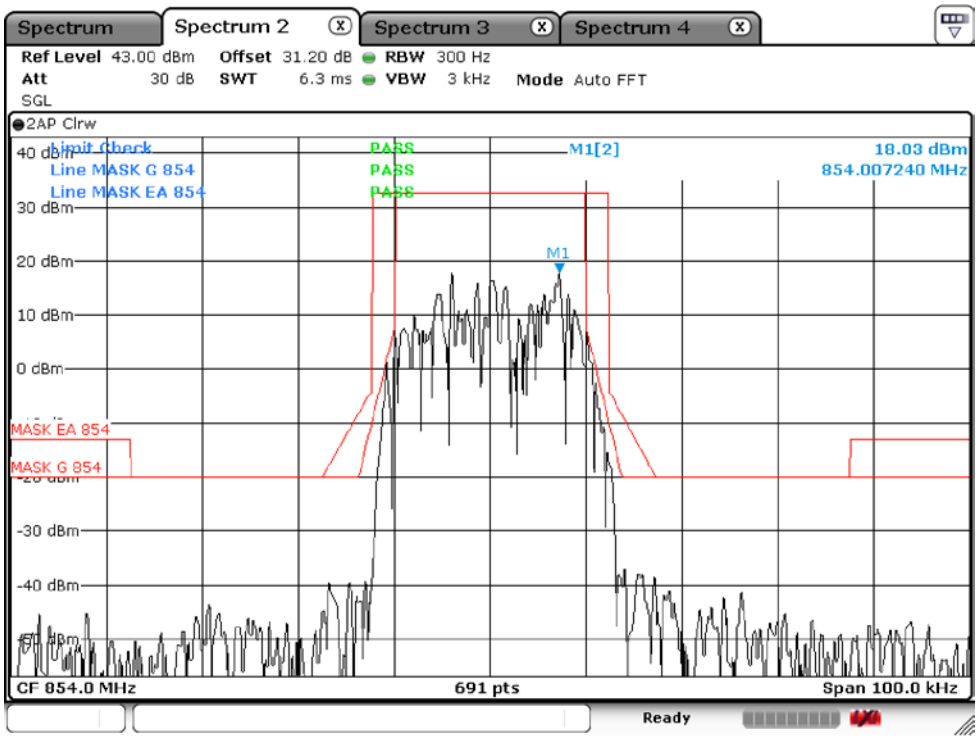
EMISSION MASK : TMO, 817.0000 MHz



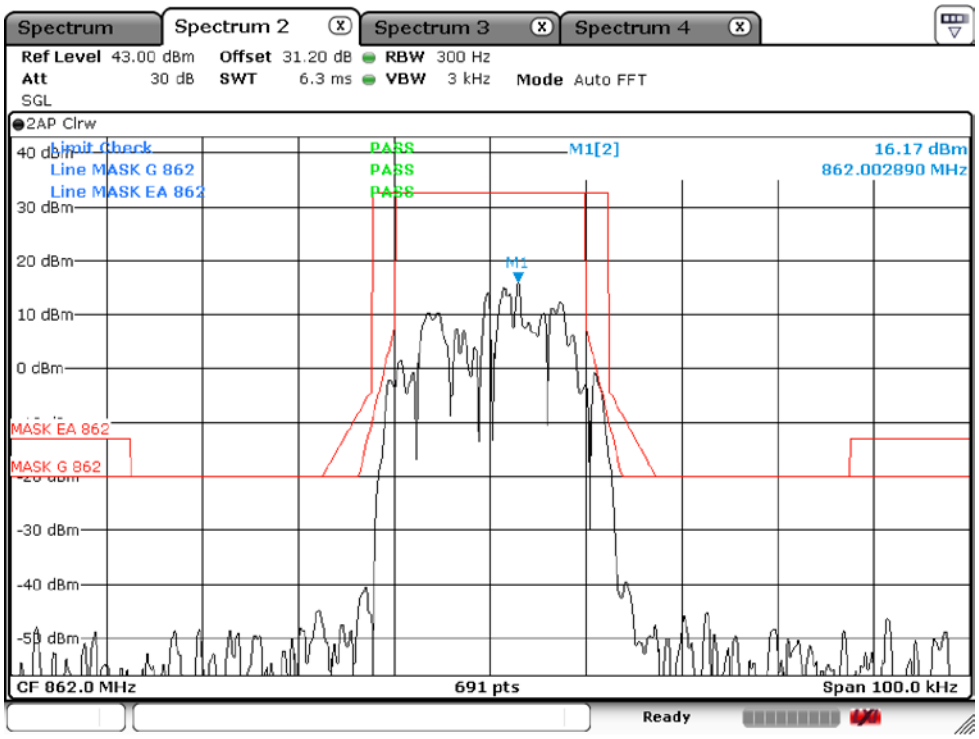
EMISSION MASK : TMO, 824.0000 MHz



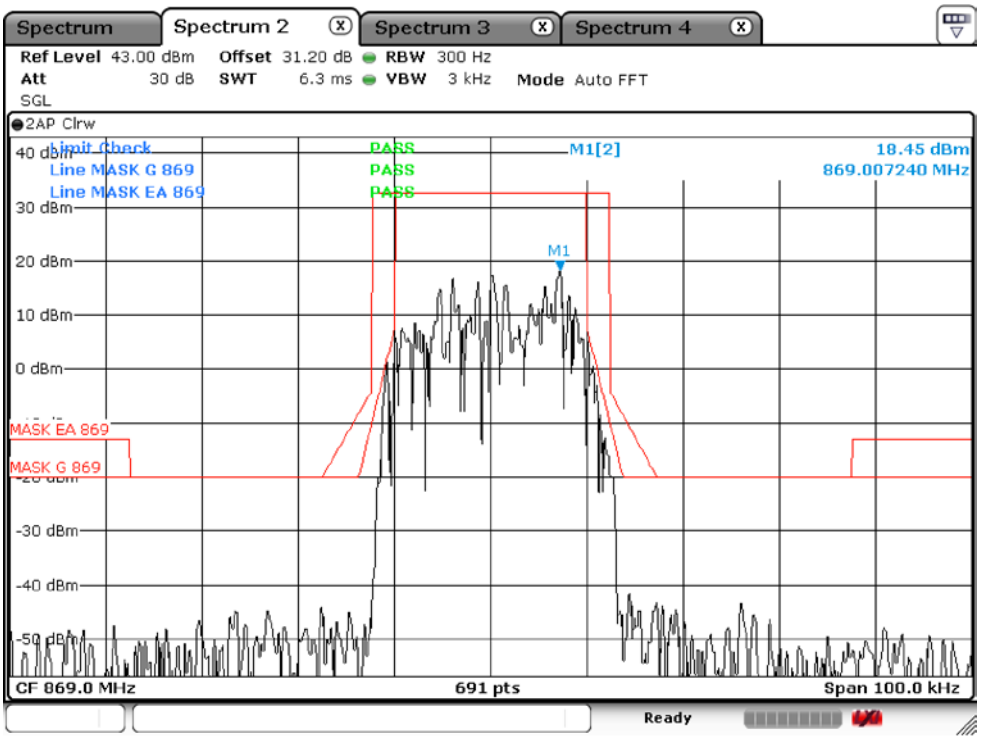
EMISSION MASK : DMO, 854.0000 MHz



EMISSION MASK : DMO, 862.0000 MHz



EMISSION MASK : DMO, 869.0000 MHz



3.2.6 RADIATED SPURIOUS EMISSIONS

Applicable Standard

FCC §2.1053 and §90.210

Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load, which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT .The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to teeth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB =10, 1g (TXpwr in Watts/0.001)-the absolute level

Spurious attenuation limit in dB =43+10 Log_{10} (power out in Watts) for EUT with a 12.5 kHz channel bandwidth.

Test Result : Compliance.

Measurement Data: Transmitting

30 MHz – 10 GHz

Frequency (MHz)	Receiver Reading (dBµV	Polar (H/V)	SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)	Absoluted Level (dBm)	Limit (dBm)	Margin (dB)
TMO. Frequency : 809.0000 MHz								
1616.17	46.45	H	-64.12	1.7	7.09	-58.73	-20	38.73
1616.17	40.34	V	-71.60	1.7	7.09	-66.21	-20	46.21
2447.65	63.12	H	-46.81	2.9	5.95	-43.66	-20	23.66
2447.65	68.73	V	-42.05	2.9	5.95	-39.00	-20	19.00
4865.70	53.46	H	-56.04	2.5	4.04	-54.50	-20	34.50
4865.70	49.35	V	-44.26	2.5	4.04	-56.80	-20	36.80
5751.42	58.70	H	-51.29	2.7	4.16	-49.15	-20	29.15
5751.42	52.12	V	-57.37	2.7	4.16	-55.91	-20	35.91
6080.82	48.17	H	-60.28	2.8	4.16	-58.92	-20	38.92
6080.82	42.59	V	-66.04	2.8	4.16	-64.68	-20	44.68
TMO. Frequency : 817.0000 MHz								
1632.72	46.78	H	-63.53	1.7	7.09	-58.14	-20	38.14
1632.72	40.56	V	-70.12	1.7	7.09	-64.73	-20	44.73
2451.23	63.66	H	-45.77	2.9	5.95	-42.72	-20	22.72
2451.23	68.71	V	-40.81	2.9	5.95	-37.76	-20	17.76
4891.05	53.49	H	-54.99	2.5	4.04	-53.45	-20	33.45
4891.05	49.48	V	-43.56	2.5	4.04	-42.02	-20	22.02
5775.40	58.79	H	-49.80	2.7	4.16	-48.34	-20	28.34
5775.40	52.35	V	-56.01	2.7	4.16	-54.55	-20	34.55
6101.11	48.26	H	-58.83	2.8	4.16	-57.47	-20	37.47
6101.11	42.71	V	-64.27	2.8	4.16	-62.91	-20	42.91

Frequency (MHz)	Receiver Reading (dBµV	Polar (H/V)	SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)	Absoluted Level (dBm)	Limit (dBm)	Margin (dB)
TMO. Frequency : 824.0000 MHz								
1635.02	46.52	H	-64.12	1.7	7.09	-58.73	-20	38.73
1635.02	40.37	V	-71.60	1.7	7.09	-66.21	-20	46.21
2453.14	63.19	H	-46.81	2.9	5.95	-43.66	-20	23.66
2453.14	68.81	V	-42.05	2.9	5.95	-39.00	-20	19.00
4883.22	53.54	H	-56.04	2.5	4.04	-54.50	-20	34.50
4883.22	49.42	V	-44.26	2.5	4.04	-56.80	-20	36.80
5762.35	58.79	H	-51.29	2.7	4.16	-49.15	-20	29.15
5762.35	52.21	V	-57.37	2.7	4.16	-55.91	-20	35.91
6092.24	48.26	H	-60.28	2.8	4.16	-58.92	-20	38.92
6092.24	42.70	V	-66.04	2.8	4.16	-64.68	-20	44.68
DMO. Frequency : 854.0000 MHz								
1710.34	47.24	H	-63.53	1.7	7.09	-58.14	-20	38.14
1710.34	40.98	V	-70.12	1.7	7.09	-64.73	-20	44.73
2533.72	63.78	H	-45.77	2.9	5.95	-42.72	-20	22.72
2533.72	68.80	V	-40.81	2.9	5.95	-37.76	-20	17.76
4971.12	53.62	H	-54.99	2.5	4.04	-53.45	-20	33.45
4971.12	49.59	V	-43.56	2.5	4.04	-42.02	-20	22.02
5857.40	58.93	H	-49.80	2.7	4.16	-48.34	-20	28.34
5857.40	52.44	V	-56.01	2.7	4.16	-54.55	-20	34.55
6183.95	48.39	H	-58.83	2.8	4.16	-57.47	-20	37.47
6183.95	42.86	V	-64.27	2.8	4.16	-62.91	-20	42.91

Frequency (MHz)	Receiver Reading (dBµV	Polar (H/V)	SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)	Absoluted Level (dBm)	Limit (dBm)	Margin (dB)
DMO. Frequency : 862.0000 MHz								
1727.32	46.53	H	-64.12	1.7	7.09	-58.73	-20	38.73
1727.32	40.42	V	-71.60	1.7	7.09	-66.21	-20	46.21
2532.41	63.24	H	-46.81	2.9	5.95	-43.76	-20	23.76
2532.41	68.81	V	-42.05	2.9	5.95	-39.00	-20	19.00
4948.13	53.53	H	-56.04	2.5	4.04	-54.50	-20	34.50
4948.13	49.49	V	-44.26	2.5	4.04	-42.72	-20	22.72
5837.03	58.79	H	-51.29	2.7	4.16	-49.83	-20	29.83
5837.03	52.26	V	-57.37	2.7	4.16	-55.91	-20	35.91
6164.70	48.28	H	-60.28	2.8	4.16	-58.92	-20	38.92
6164.70	42.64	V	-66.04	2.8	4.16	-64.68	-20	44.68
DMO. Frequency : 869.0000 MHz								
1739.38	46.78	H	-63.53	1.7	7.09	-58.14	-20	38.14
1739.38	40.69	V	-70.12	1.7	7.09	-64.73	-20	44.73
2556.40	63.82	H	-45.77	2.9	5.95	-42.72	-20	22.72
2556.40	68.81	V	-40.81	2.9	5.95	-37.76	-20	17.76
4994.14	53.58	H	-54.99	2.5	4.04	-53.45	-20	33.45
4994.14	49.59	V	-43.56	2.5	4.04	-42.02	-20	22.02
5878.05	58.84	H	-49.80	2.7	4.16	-48.34	-20	28.34
5878.05	52.43	V	-56.01	2.7	4.16	-54.55	-20	34.55
6204.12	48.38	H	-58.83	2.8	4.16	-57.47	-20	37.47
6204.12	42.80	V	-64.27	2.8	4.16	-62.91	-20	42.91

Note : Absolute Level = SG Level-Cable loss + Antenna Gain

Margin = Limit – Absolute Level

3.2.7 FREQUENCY STABILITY

Applicable Standard

FCC §2.1055 and §90.213

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the counter.

Reference Frequency : 809.0000 MHz, Limit : ±2.5 ppm, 25 kHz			
Test Environment		Frequency Measure with Time Elapsed	
Temperature (℃)	Power Supplied (V_{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
Frequency Stability versus Input Temperature			
50	7.4	808.999944	-0.07
40	7.4	808.999952	-0.06
30	7.4	808.999968	-0.04
20	7.4	809.000021	0.03
10	7.4	809.000035	0.04
0	7.4	809.000054	0.07
-10	7.4	809.000088	0.11
-20	7.4	809.000130	0.16
-30	7.4	809.000142	0.18
Frequency Stability versus Input Voltage			
20	7.4	809.000021	0.03

Reference Frequency : 814.0000 MHz, Limit : ±2.5 ppm, 25 kHz			
Test Environment		Frequency Measure with Time Elapsed	
Temperature (℃)	Power Supplied (V_{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
Frequency Stability versus Input Temperature			
50	7.4	813.999984	-0.02
40	7.4	813.999990	-0.01
30	7.4	814.000027	0.03
20	7.4	814.000033	0.04
10	7.4	814.000051	0.06
0	7.4	814.000068	0.08
-10	7.4	814.000084	0.10
-20	7.4	814.000126	0.15
-30	7.4	814.000131	0.16
Frequency Stability versus Input Voltage			
20	7.4	814.000033	0.04

Reference Frequency : 824.0000 MHz, Limit : ±2.5 ppm, 25 kHz			
Test Environment		Frequency Measure with Time Elapsed	
Temperature (℃)	Power Supplied (V_{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
Frequency Stability versus Input Temperature			
50	7.4	823.999989	-0.01
40	7.4	823.999992	-0.01
30	7.4	824.000015	0.02
20	7.4	824.000027	0.03
10	7.4	824.000055	0.07
0	7.4	824.000082	0.10
-10	7.4	824.000110	0.13
-20	7.4	824.000132	0.16
-30	7.4	824.000140	0.17
Frequency Stability versus Input Voltage			
20	7.4	824.000027	0.03

Reference Frequency : 854.0000 MHz, Limit : ±2.5 ppm, 25 kHz			
Test Environment		Frequency Measure with Time Elapsed	
Temperature (℃)	Power Supplied (V_{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
Frequency Stability versus Input Temperature			
50	7.4	853.999957	-0.05
40	7.4	853.999981	-0.02
30	7.4	854.000008	0.01
20	7.4	854.000012	0.01
10	7.4	854.000048	0.06
0	7.4	854.000072	0.08
-10	7.4	854.000105	0.12
-20	7.4	854.000144	0.17
-30	7.4	854.000152	0.18
Frequency Stability versus Input Voltage			
20	7.4	854.000012	0.01

Reference Frequency : 862.0000 MHz, Limit : ±2.5 ppm, 25 kHz			
Test Environment		Frequency Measure with Time Elapsed	
Temperature (℃)	Power Supplied (V_{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
Frequency Stability versus Input Temperature			
50	7.4	861.999954	-0.05
40	7.4	861.999978	-0.03
30	7.4	861.999992	-0.01
20	7.4	862.000015	0.02
10	7.4	862.000034	0.04
0	7.4	862.000069	0.08
-10	7.4	862.000091	0.11
-20	7.4	862.000114	0.13
-30	7.4	862.000123	0.14
Frequency Stability versus Input Voltage			
20	7.4	862.000015	0.02

Reference Frequency : 869.0000 MHz, Limit : ±2.5 ppm, 25 kHz			
Test Environment		Frequency Measure with Time Elapsed	
Temperature (℃)	Power Supplied (V_{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
Frequency Stability versus Input Temperature			
50	7.4	868.999965	-0.04
40	7.4	868.999977	-0.03
30	7.4	868.999994	-0.01
20	7.4	869.000006	0.01
10	7.4	869.000022	0.03
0	7.4	869.000060	0.07
-10	7.4	869.000083	0.10
-20	7.4	869.000118	0.14
-30	7.4	869.000126	0.14
Frequency Stability versus Input Voltage			
20	7.4	869.000006	0.01

APPENDIX

TEST EQUIPMENT USED FOR TESTS

	Description	Model No.	Serial No.	Manufacturer	Interval	Last Cal. Date
1	Signal Analyzer (9 kHz ~ 30 GHz)	FSV30	100757	R&S	1 year	2016-10-11
2	Signal Generator (~ 3.2 GHz)	8648C	3623A02597	HP	1 year	2016-03-21
3	SYNTHESIZED CW GENERATOR	83711B	US34490456	HP	1 year	2016-03-21
4	Attenuator (3 dB)	8491A	37822	HP	1 year	2016-09-12
5	Attenuator (10 dB)	8491A	63196	HP	1 year	2016-09-12
6	Test Receiver (~ 30 MHz)	ESHS10	828404/009	R&S	1 year	2016-03-21
7	EMI Test Receiver (~ 7 GHz)	ESCI7	100722	R&S	1 year	2016-09-12
8	RF Amplifier (~ 1.3 GHz)	8447D	2944A07974	HP	1 year	2016-09-12
9	RF Amplifier (1 ~ 26.5 GHz)	8449B	3008A02126	HP	1 year	2016-03-21
10	Horn Antenna (1 ~ 18 GHz)	3115	00114105	ETS	1 year	2016-04-21
11	DRG Horn (Small)(18GHz ~40GHz)	3116B	81109	ETS-Lindgren	1 year	2016-05-03
12	DRG Horn (Small) (18GHz ~40GHz)	3116B	133350	ETS-Lindgren	1 year	2016-05-03
13	TRILOG Antenna	VULB 9160	9160-3237	SCHWARZBECK	2 year	2015-04-21
14	Temp. Humidity Data Logger	SK-L200TH II A	00801	SATO	1 year	2016-03-22
15	Splitter	1580	SL769	WEINSCHEL	1 year	2016-03-22
16	Power Divider	11636A	06243	HP	1 year	2016-09-12
17	DC Power Supply	6674A	3637A01657	Agilent	-	-
18	Frequency Counter	5342A	2826A12411	HP	1 year	2016-03-21
19	Power Meter	EPM-441A	GB32481702	HP	1 year	2016-03-22
20	Power Sensor	8481A	3318A94972	HP	1 year	2016-01-05
21	Audio Analyzer	8903B	3729A18901	HP	1 year	2016-09-12
22	Modulation Analyzer	8901B	3749A05878	HP	1 year	2016-09-12
23	TEMP & HUMIDITY Chamber	YJ-500	LTAS06041	JinYoung Tech	1 year	2016-09-12
24	Stop Watch	HS-3	812Q08R	CASIO	2 year	2016-03-22
25	LISN	KNW-407	8-1430-1	Kyoritsu	1 year	2016-09-12
26	Two-Lime V-Network	ESH3-Z5	893045/017	R&S	1 year	2016-03-21
27	UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	106243	R&S	1 year	2016-03-21
28	Highpass Filter	WHKX1.5/15G-10SS	74	Wainwright Instruments	1 year	2016-03-21
29	Highpass Filter	WHKX3.0/18G-10SS	118	Wainwright Instruments	1 year	2016-03-21
30	Active Loop Antenna	FMZB1519	1519-031	SCHWARZBECK	2 year	2016-01-12
31	OSP120 BASE UNIT	OSP120	101230	R&S	1 year	2016-03-22
32	Signal Generator(100 kHz ~ 40 GHz)	SMB100A	177621	R&S	1 year	2016-03-22
33	Signal Analyzer (10 Hz ~ 40 GHz)	FSV40	101367	R&S	1 year	2016-03-22