FCC PART 90 RF TEST REPORT

Test Report Number……	**SRF-18112801-LC-FCC-RF**
Applicant……	**SpotterRF, LLC**
Applicant Address……	**720 Timpanogos Parkway, Orem, UT 84097, USA**
Product Name……	Ground Surveillance Radar
Model Number……	A3000
FCC ID……	CO6-A30C105
Date of EUT received……	12/19/2018
Date of Test……	12/19/2018-01/07/2019
Report Issue Date……	01/14/2019
Test Standards……	**47CFR Part 90: 2018**

Issued By:

Vista Laboratories

1261 Puerta Del Sol, San Clemente, CA 92673 USA

www.vista-compliance.com

Tested by:	**Approved By:**
Sherwin Lee/Test Engineer	**David Zhang/Technical Manager**

Laboratory Introduction

Vista Labs is an A2LA accredited 17025 compliant regulatory compliance testing laboratories (Cert. number: 4848-01) strategically located in Orange County, providing services in the electrical and telecommunication industries. Vista labs is also recognized testing facility for Australia (ACMA), Chinese Taipei (BSMI), Chinese Taipei (NCC), Hong Kong (OFCA), Israel (MOC), Korea (RRA), Singapore (IMDA), Vietnam (MIC), etc.

Our comprehensive testing services include safety testing, EMC emission and susceptibility testing, RF and wireless testing (including DFS).
As your partner, Vista investigates appropriate test standards, develops test plans, performs troubleshooting & failure analysis, reviews documentation, and provides test reports for a complete compliance testing and certification package.

Accredited Laboratory

A2LA has accredited

VISTA LABORATORIES, INC.

San Clemente, CA

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 21st day of June 2018.

President and CEO
For the Accreditation Council
Certificate Number 4848.01
Valid to July 31, 2020

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

17025 Product Testing Accreditation Certificate

Accredited Product Certification Body

A2LA has accredited

VISTA LABORATORIES, INC.

San Clemente, CA

This product certification body is accredited in accordance with the recognized International Standard ISO/IEC 17065:2012 *Requirements for bodies certifying products, processes and services*. This product certification body also meets the A2LA R308 – Specific Requirements – ISO-IEC 17065 – Telecommunication Certification Body Accreditation Program and R322 – Specific Requirements – Notified Body Accreditation Requirements. This accreditation demonstrates technical competence for a defined scope and the operation of a management system.

Presented this 1st day of October 2018.

President and CEO
For the Accreditation Council
Certificate Number 4848.02
Valid to July 31, 2020

For the product certification schemes to which this accreditation applies, please refer to the organization's Product Certification Scope of Accreditation.

17065 Product Certification Accreditation Certificate

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REVISION HISTORY

Revision	Issue Date	Description	Note
Original	01/14/2019	Original release	N/A

1 General Information

1.1 Applicant

Applicant:	SpotterRF, LLC
Applicant address:	720 Timpanogos Parkway, Orem, UT 84097, USA
Manufacturer:	SpotterRF, LLC
Manufacturer Address:	720 Timpanogos Parkway, Orem, UT 84097, USA

1.2 Product information

Product Name	Ground Surveillance Radar
Model Number	A3000
Serial Number	23001
Frequency Band	10.00 GHz – 10.50 GHz
Type of modulation	Continuous Wave
Equipment Class/ Category	TNB - Licensed Non-Broadcast Station Transmitter
Maximum output power	33 dBm
Antenna Information	Patch antenna / 13 dBi Gain
Clock Frequencies	N/A
Input Power	20VDC
Power Adapter Manu/Model	V-INFINITY / EMSA200200
Power Adapter SN	EMSA200200-PSP-SZ
Hardware version	N/A
Software version	N/A
Simultaneous Transmission	N/A
Additional Info	N/A

1.3 Test standard and method

Test standard	47CFR Part 90: 2018
Test method	KDB 971168 D01 Power Meas License Digital Systems v03r01 ANSI C63.26-2015 TIA-603-E

1.4 Test purpose and statement

The purpose of this test report is intended to demonstrate the compliance of product listed in section 1.2, received from company listed in section 1.1, to the requirements of standard and method listed in section 1.3. Based on our test results, we conclude that the product tested complies with the requirements of the standards indicated.

2 Test site information

Lab performing tests	**Vista Laboratories**
Lab Address	1261 Puerta Del Sol, San Clemente, CA 92673 USA
Phone Number	+1 (949) 393-1123
Website	www.vista-compliance.com

Test condition	Test Engineer	Test Environment	Test Date
RF conducted	Sherwin Lee	23.5°C / 58.2%/996 mbar	12/19/2018-01/07/2019
Radiated	Sherwin Lee	23.5°C / 58.2%/996 mbar	12/19/2018-01/07/2019

3 Modification of EUT

N/A

4 Test configuration and operation

4.1 EUT test configuration

The EUT is powered by an external PoE injector. It is connected to a test laptop through a RJ45 cable and receives test commands for RF measurement.

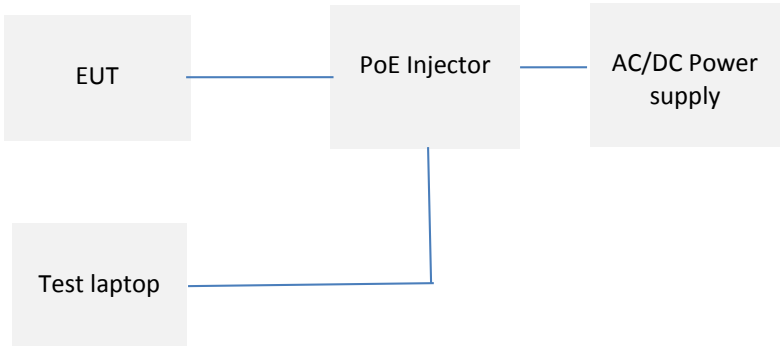
4.2 EUT test mode

Radio	Channel	Frequency (MHz)
10GHz Radar	Low	10025
10GHz Radar	Mid	10225
10GHz Radar	High	10475

4.3 Supporting Equipment

Index	Description	Model	S/N	Brand	Remark
1	Laptop	P29G003	G1H5102	Dell	N/A
2	PoE Injector	POE-IN-J01	N/A	SpotterRF	N/A
3	AC/DC Power supply	EMSA200200	EMSA200200-PSP-SZ	V-INFINITY	N/A

4.4 EUT setup diagram



4.5 EUT operation

Continuous transmission

4.6 Test software

Index	Description	Remark
1	Firefox	Use webpage to access EUT UI page to send command
2	EMISoft Vasona 6.0049	EMC/RF Spurious emission test software used during testing

5 EUT and test setup pictures

5.1 EUT pictures

See FCC filing

5.2 EUT test setup pictures

See FCC filing

6 Test Summary

FCC Rules	Test Item	Test standard	Section in report	Verdict
§2.1049	Occupied Bandwidth	47CFR Part 2, Part 90	8.1	Pass
§2.1046, §90.103 (c) §90.205 (s)	Maximum RF Power Output	47CFR Part 2, Part 90	8.2	Pass
§15.247(e)	Unwanted Emissions Measurement at Antenna Port	47CFR Part 2, Part 90	8.3	Pass
§2.1053, §90.210	Radiated Emissions & Unwanted Emissions	47CFR Part 2, Part 90	8.4	Pass
§2.1055, §90.213 (b)	Frequency Stability	47CFR Part 2, Part 90	8.5	Pass
§1.1310, §2.1091	RF Exposure	47CFR Part 1, Part 2	8.6	Pass

Note: N/A

7 Uncertainty of Measurement

Test item	Measurement Uncertainty (dB)
RF Output Power (Conducted)	±1.2 dB
Unwanted Emission (Conducted)	±2.6 dB
Occupied Channel Bandwidth	±5 %
Radiated Emission (9KHz-30MHz)	±3.5 dB
Radiated Emission (30MHz-1GHz)	±4.6 dB
Radiated Emission (1-18GHz)	±4.9 dB
Radiated Emission (18-40GHz)	±3.5 dB
Radiated Emission (40-60GHz)	±3.2 dB

8 Test summary and result

8.1 Occupied Bandwidth

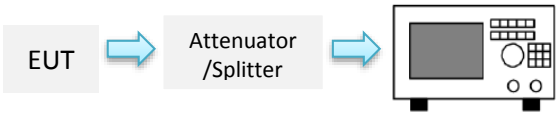
8.1.1 Requirement

Per § 2.1049, the occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

Per § 90.209 (a), each authorization issued to a station licensed under this part will show an emission designator representing the class of emission authorized. The designator will be prefixed by a specified necessary bandwidth. This number does not necessarily indicate the bandwidth occupied by the emission at any instant.

In those cases, where §2.202 of this chapter does not provide a formula for the computation of necessary bandwidth, the occupied bandwidth, as defined in part 2 of this chapter, may be used in lieu of the necessary bandwidth.

8.1.2 Test setup



8.1.3 Test Procedure

According to 971168 D01 Power Meas License Digital Systems v03r01 clause 9, ANSI C63.26-2015 clause 5.4.

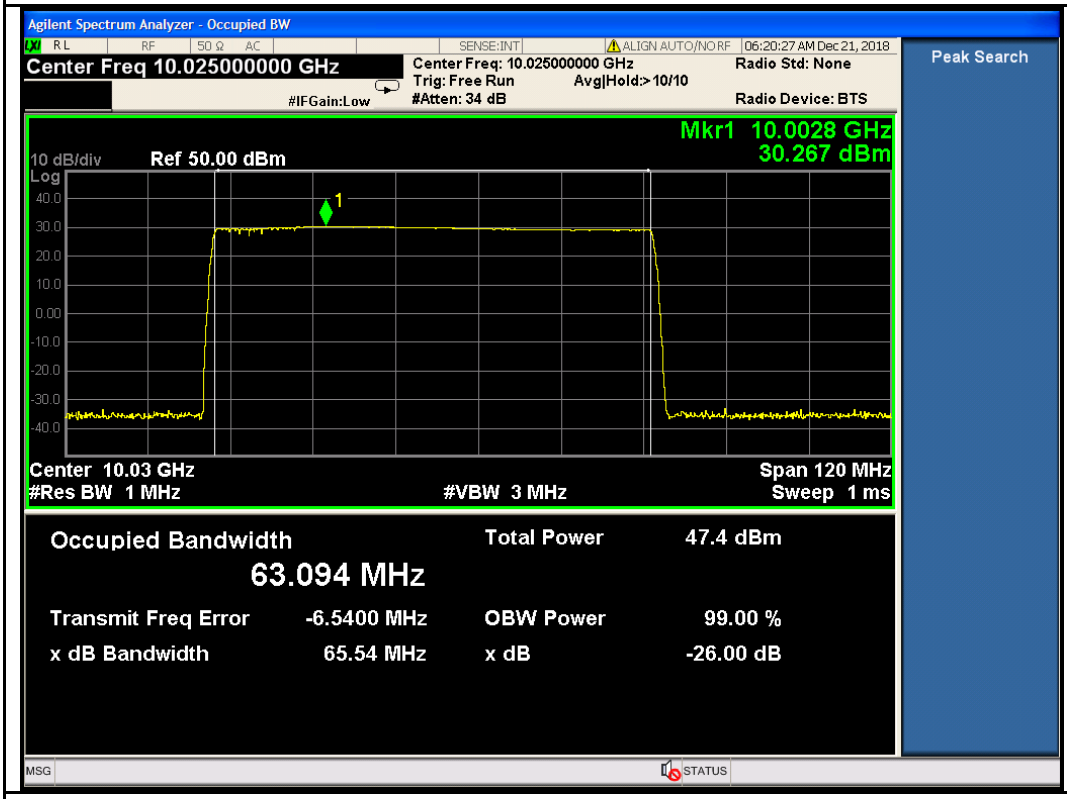
1. The spectrum analyser center frequency is set to the normal EUT channel center frequency. The frequency span for the spectrum analyser shall be set wide enough to capture all modulation products including the emission skirts (typically a span of 1.5 x OBW is sufficient)
2. the normal If filter 3 dB bandwidth shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set ≥3 x RBW.
3. Set the reference level of instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyser input mixer level for linear operation.
4. Set the detection mode to peak, and the trace to max-hold.
5. Use the spectrum analyser's measurement function to obtain 99% OBW result.

8.1.4 Test Result

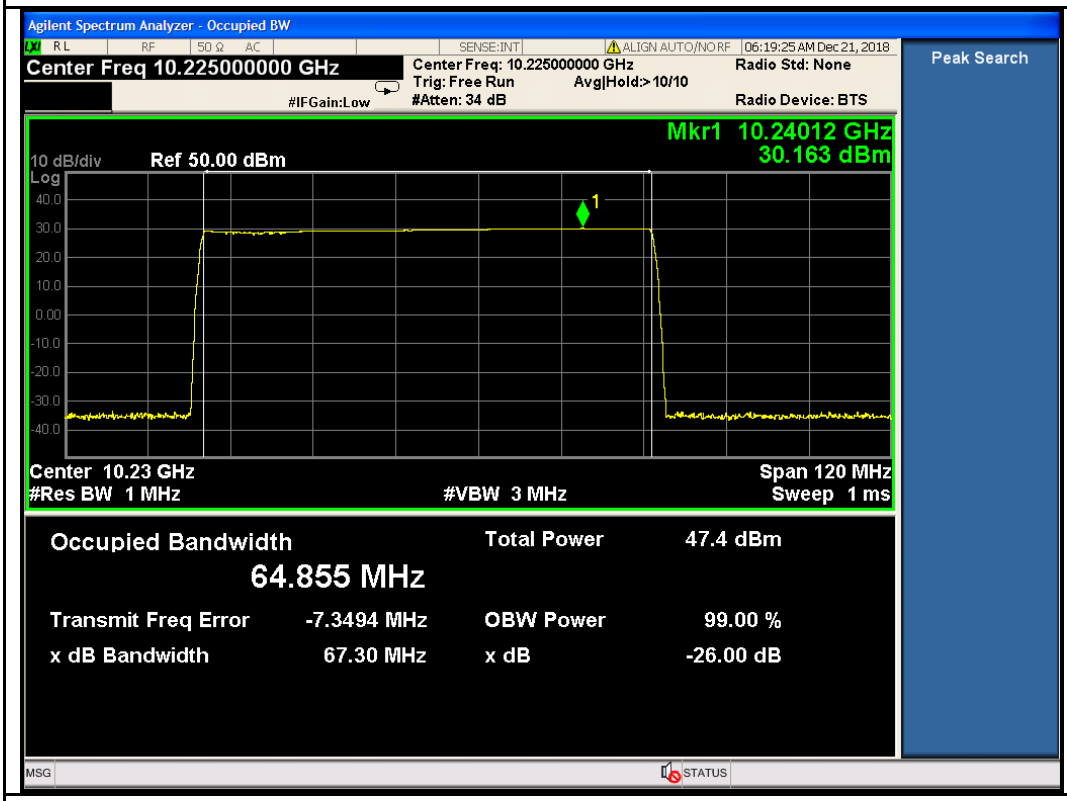
Radio	Test Frequency (MHz)	Measured 99% Bandwidth (MHz)	Measured 26 dB Bandwidth (MHz)	Result
10 GHz Radar	10025	63.094	65.54	N/A
	10225	64.855	67.30	N/A
	10475	67.434	69.95	N/A

8.1.5 Test Plots

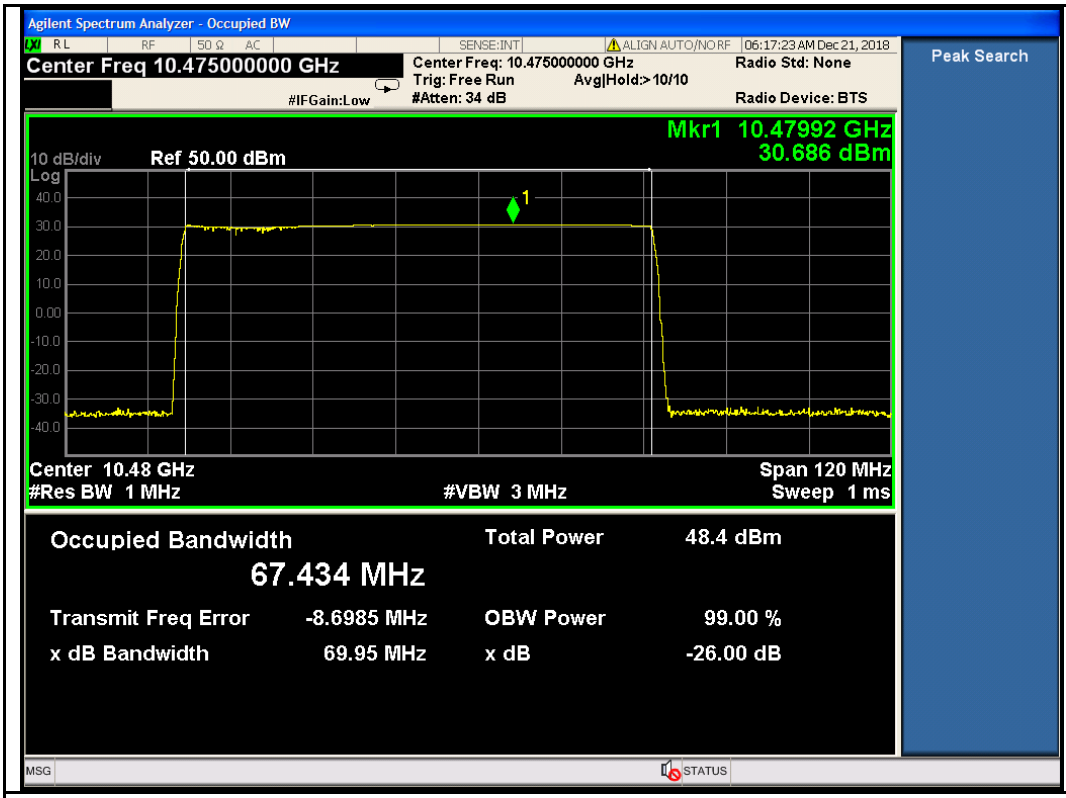
OBW Measurement



99% OBW Bandwidth – Low channel



99% OBW Bandwidth – Mid channel



99% OBW Bandwidth – High channel

8.2 Maximum RF Power Output

8.2.1 Requirement

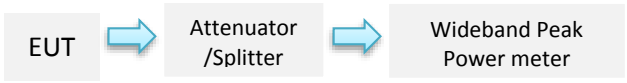
Per § 2.1046 RF power output measurement is required.

Per § 90.103 (b) and §90.103 (c). Frequency band of 10,000 to 10,500 MHz is available for assignment to stations in the Radiolocation Service, together with the class of station(s) to which they are normally assigned, and the following specific assignment limitations applies.

- §90.103 (c)(12): This frequency is shared with and is on a secondary basis to the Government Radiolocation Service.
- §90.103 (c)(12): Operations in this band are limited to survey operations using transmitters with a peak power not to exceed 5 watts into the antenna.
- §90.103 (c)(19): Operations in this band are on a secondary basis to the Amateur Radio Service (part 97). Pulsed emissions are prohibited.

Per § 90.205 (s), The output power shall not exceed by more than 20 percent either the output power shown in the Radio Equipment List [available in accordance with §90.203(a)(1)] for transmitters included in this list or when not so listed, the manufacturer's rated output power for the particular transmitter specifically listed on the authorization.

8.2.2 Test setup



8.2.3 Test Procedure

According to 971168 D01 Power Meas License Digital Systems v03r01 clause 5.1.3, ANSI C63.26-2015 clause 5.2.3.2.

1. Connect EUT through attenuator to wideband peak power meter.
2. the wideband peak power meter shall have a video bandwidth that is greater than or equal to the EUT OBW, and utilize a fast-responding diode detector.
3. Repeat power measurement on different EUT channel.

8.2.4 Test Result

Radio	Test Frequency (MHz)	Measured Output Power (dBm)	Maximum Output Power Limit (dBm)	Maximum Output Power Limit (W)	Result
10 GHz Radar	10025	30.641	37	5	Pass
	10225	30.455	37	5	Pass
	10475	30.737	37	5	Pass

8.3 Unwanted Emissions Measurement at Antenna Port

8.3.1 Requirement

Per §2.1053 Field strength of spurious radiation is required.

Per §90.210 Equipment shall meet the emission mask requirement defined under (c)

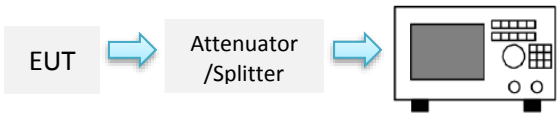
(c) Emission Mask C. For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier output power (P) as follows:

(1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5 kHz, but not more than 10 kHz: At least 83 log (fd/5) dB;

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 10 kHz, but not more than 250 percent of the authorized bandwidth: At least 29 log (fd2/11) dB or 50 dB, whichever is the lesser attenuation;

(3) 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.

8.3.2 Test setup



8.3.3 Test Procedure

According to 971168 D01 Power Meas License Digital Systems v03r01 clause 6, ANSI C63.26-2015 clause 5.7.

1. Set the frequency range to encompass frequency range to be measured.
2. For below 1GHz, RBW = 100 kHz, RBW = 300KHz; for above 1GHz, RBW = 1MHz, VBW = 3MHz.
3. Set Detector = peak
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.

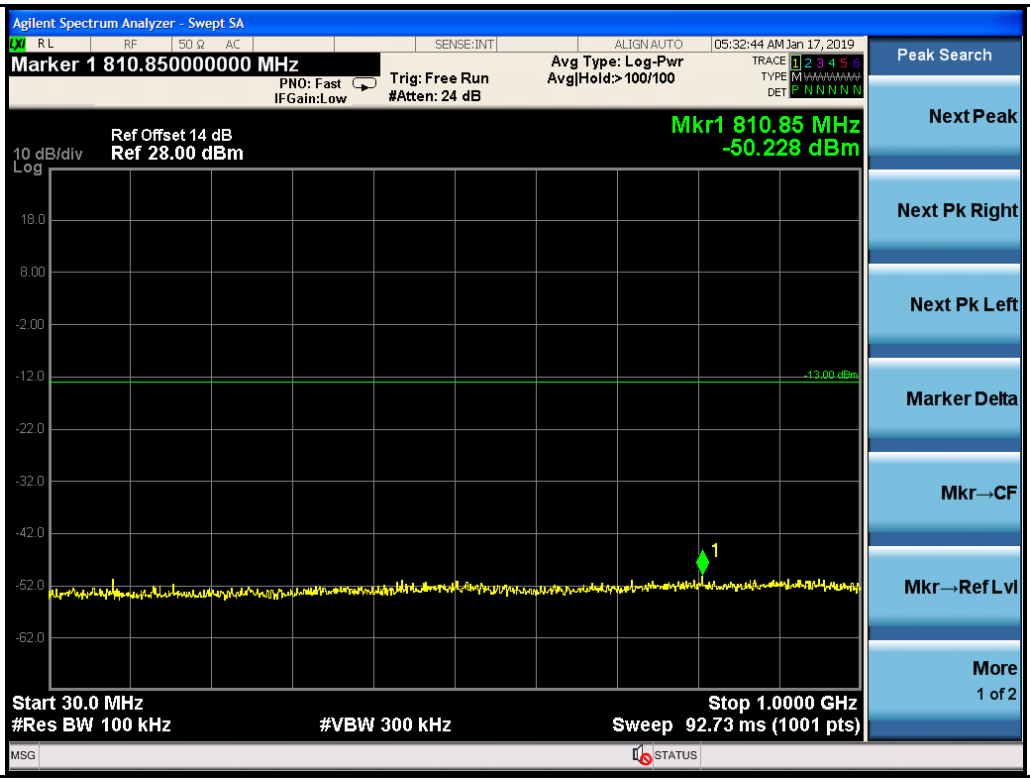
8. Use the peak marker function to determine the maximum amplitude level.

8.3.4 Test Result

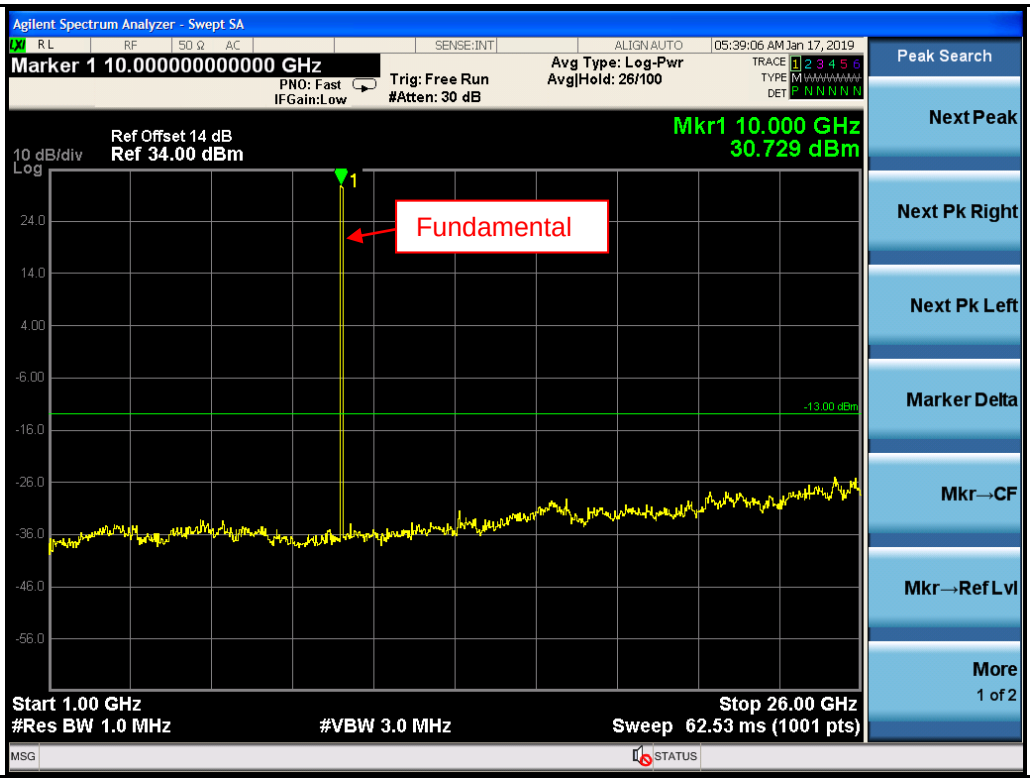
Pass. See test plots

8.3.5 Test Plots

Unwanted Emission at Antenna Port Measurement

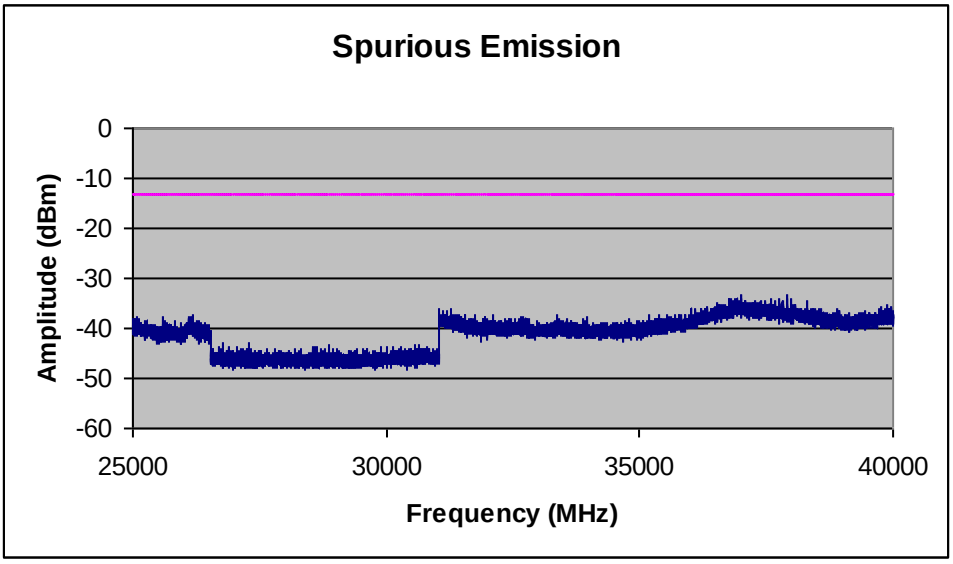


Unwanted Emission < 1GHz – Low channel

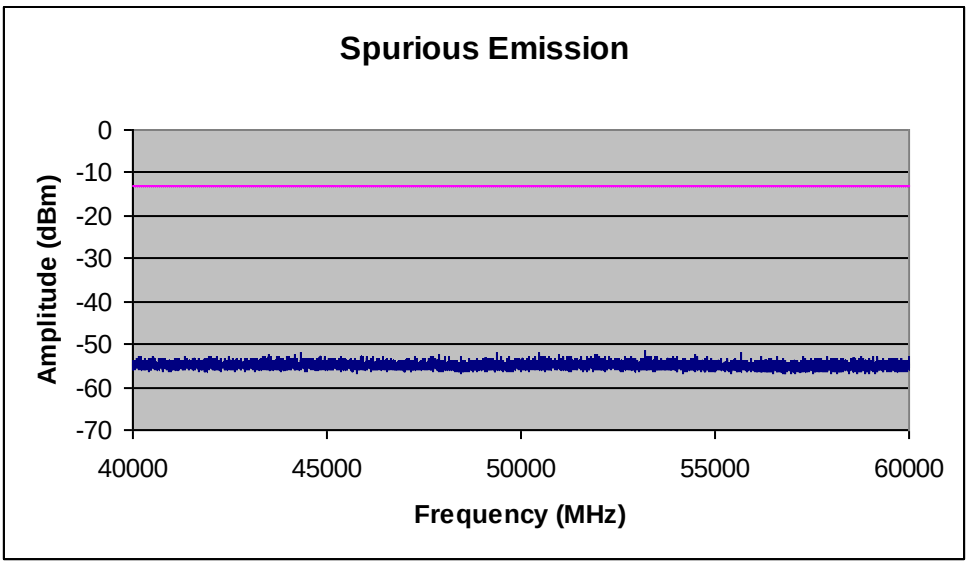


Unwanted Emission (1-26 GHz) – Low channel

Unwanted Emission at Antenna Port Measurement

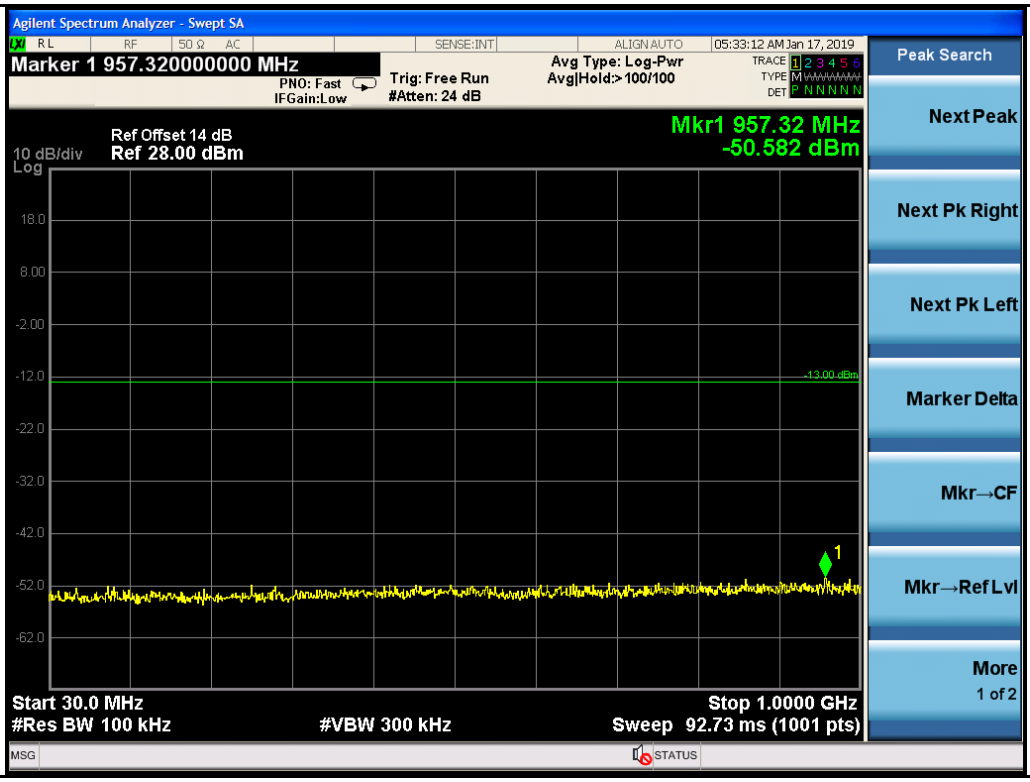


Unwanted Emission (26 -40 GHz) – Low channel

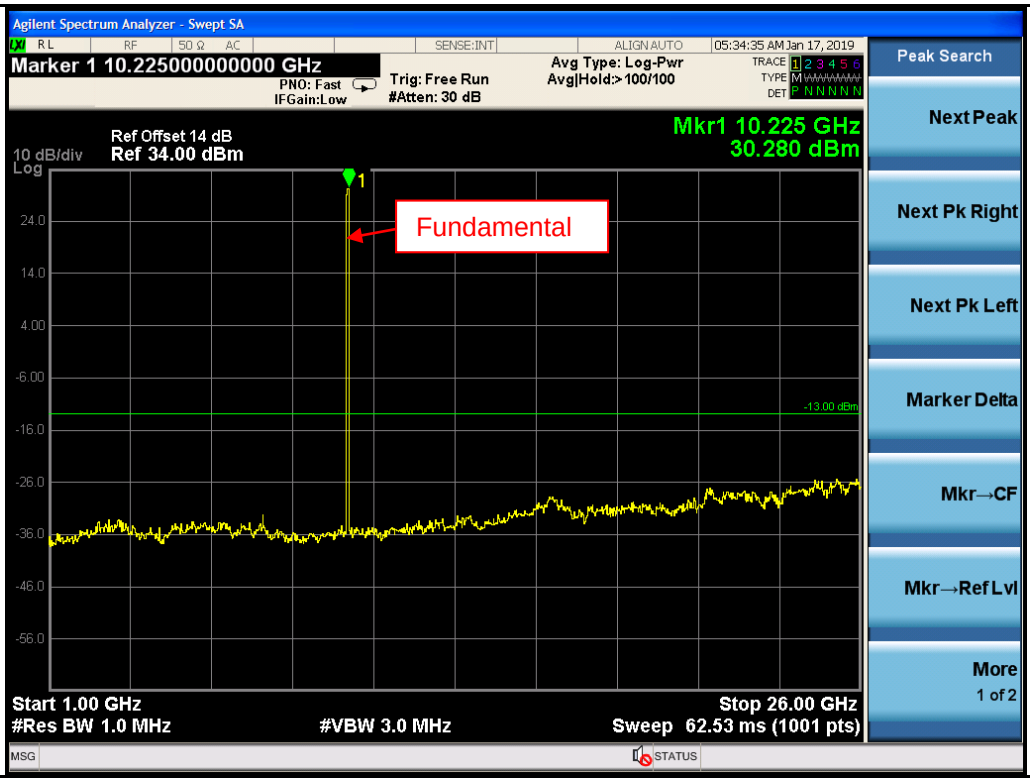


Unwanted Emission (40 -60 GHz) – Low channel

Unwanted Emission at Antenna Port Measurement

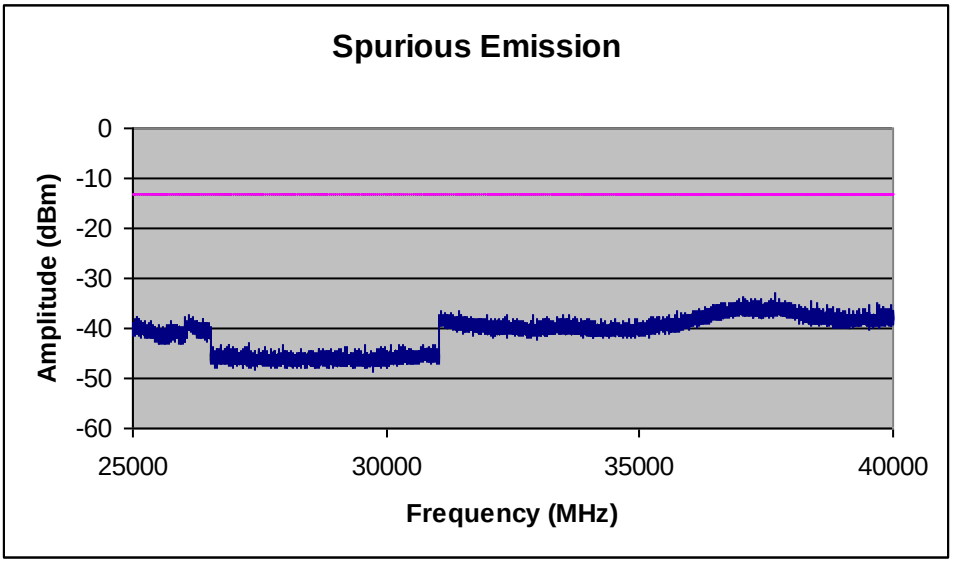


Unwanted Emission < 1GHz – Mid channel

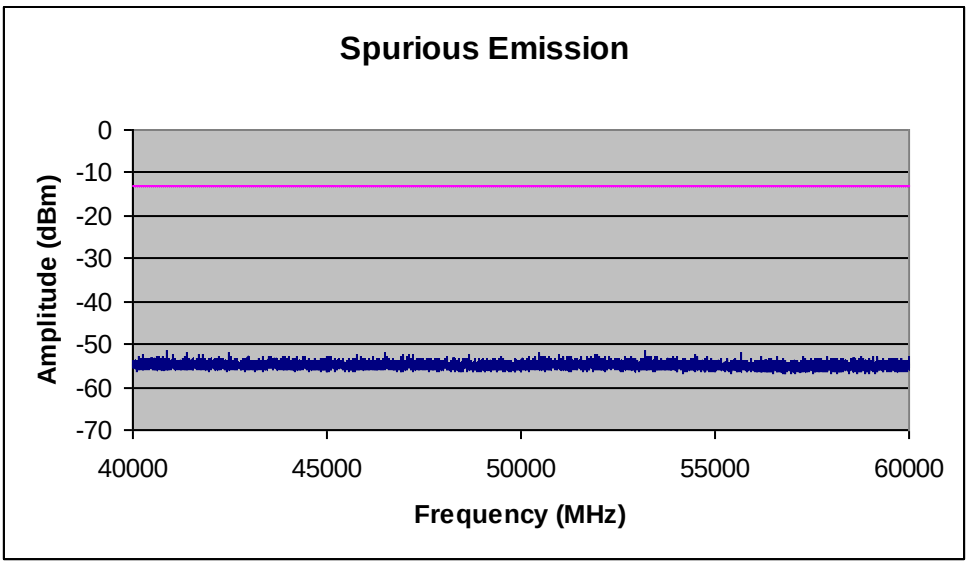


Unwanted Emission (1-26 GHz) – Mid channel

Unwanted Emission at Antenna Port Measurement

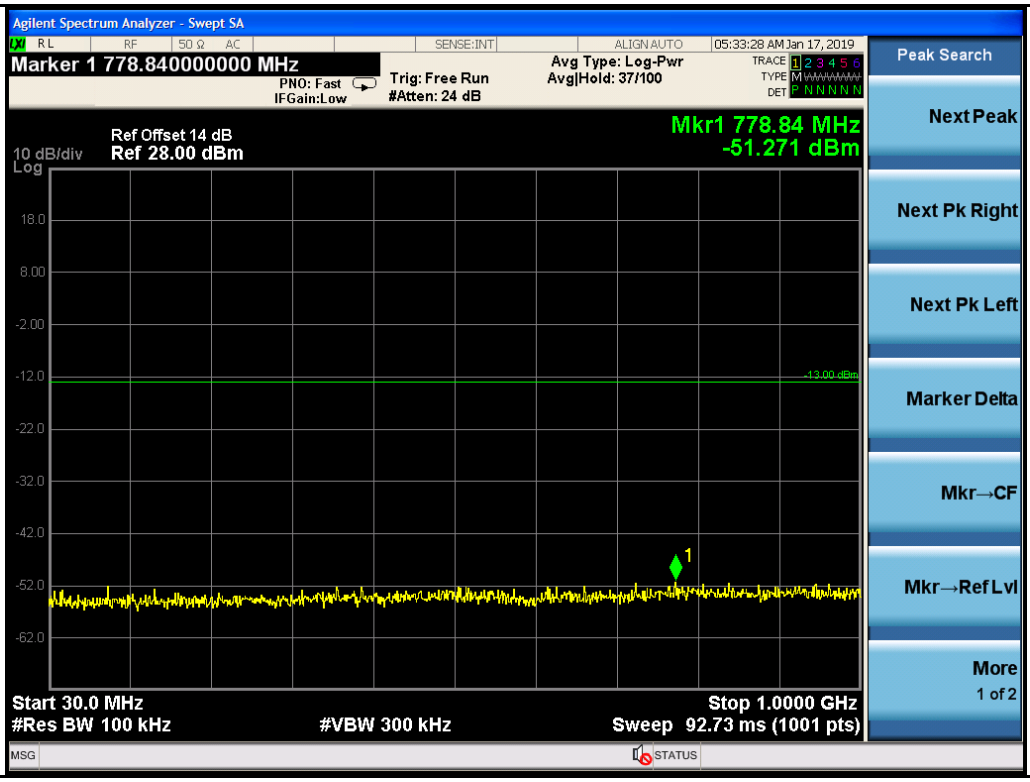


Unwanted Emission (26 -40 GHz) – Mid channel

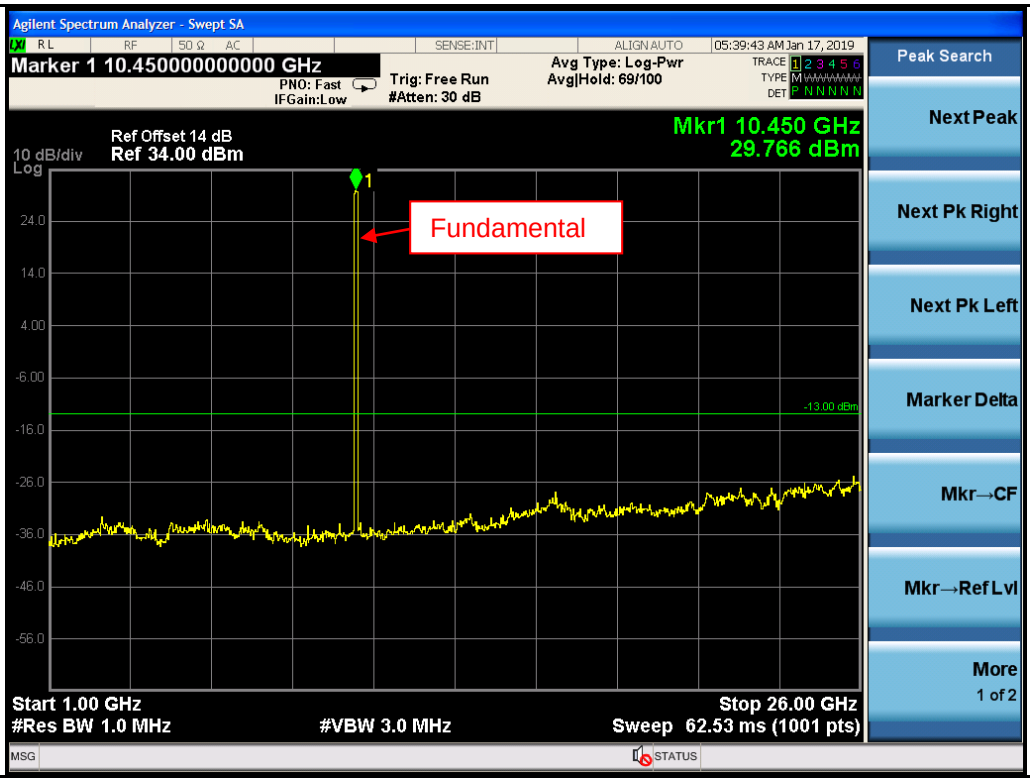


Unwanted Emission (40 -60 GHz) – Mid channel

Unwanted Emission at Antenna Port Measurement

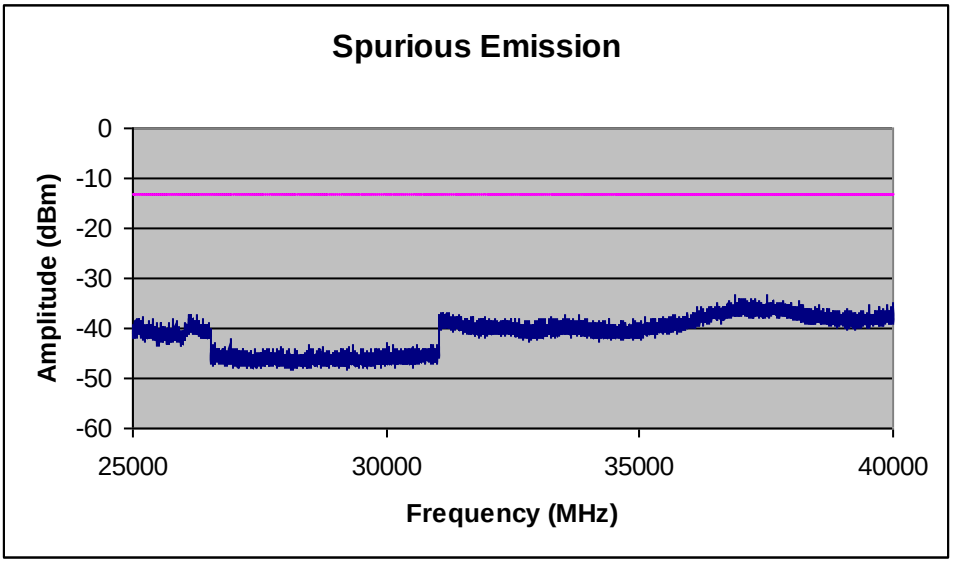


Unwanted Emission < 1GHz – High channel

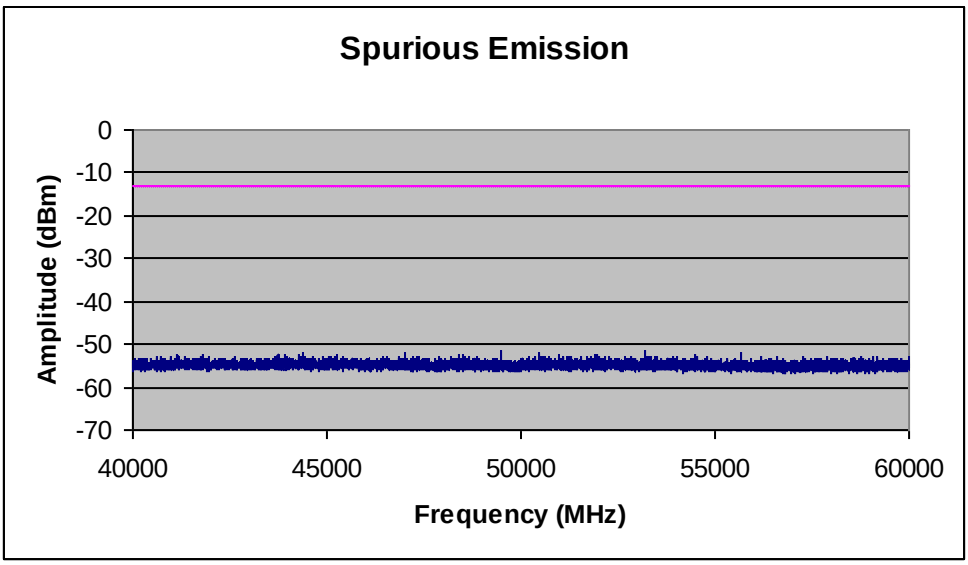


Unwanted Emission (1-26 GHz) – High channel

Unwanted Emission at Antenna Port Measurement



Unwanted Emission (26 -40 GHz) – High channel



Unwanted Emission (40 -60 GHz) – High channel

8.4 Radiated Spurious Emissions

8.4.1 Requirement

Per §2.1053 Field strength of spurious radiation is required.

Per §90.210 Equipment shall meet the emission mask requirement defined under (c)

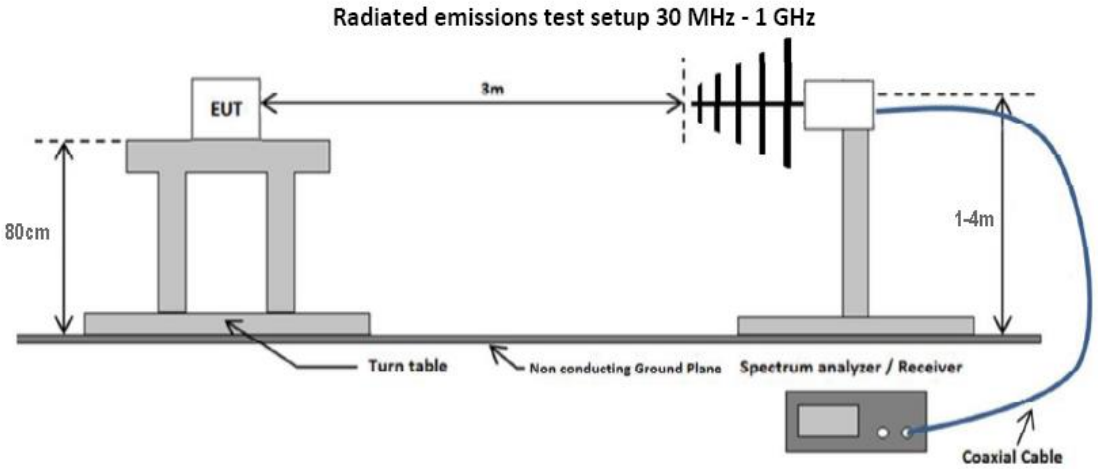
(c) Emission Mask C. For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier output power (P) as follows:

(1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5 kHz, but not more than 10 kHz: At least 83 log (fd/5) dB;

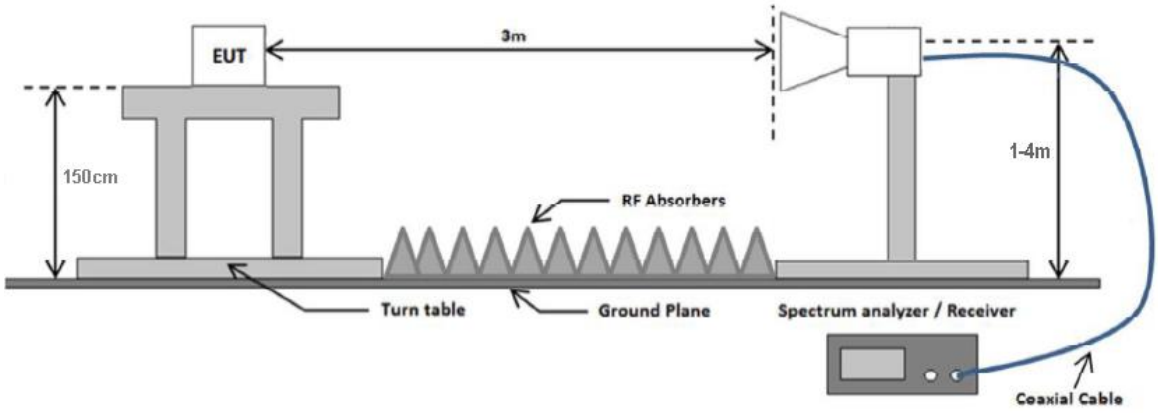
(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 10 kHz, but not more than 250 percent of the authorized bandwidth: At least 29 log (fd2/11) dB or 50 dB, whichever is the lesser attenuation;

(3) 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.

8.4.2 Test setup



Radiated emissions test setup above 1 GHz



8.4.3 Test Procedure

According to 971168 D01 Power Meas License Digital Systems v03r01 clause 7, ANSI C63.26-2015 clause 5.5.

Boresight antenna mast was used during the scanning to point to EUT to maximize the emission. The process will be repeated in 3 EUT orientations.

Prescan Measurement

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was carried out at the selected frequency points obtained from the EUT characterization. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
   a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
   b. The EUT was then rotated to the direction that gave the maximum emission.
   c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 300 Hz for frequency below 150KHz.
4. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 10 kHz for frequency between 150KHz – 30MHz.
5. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-Peak detection at frequency between 30MHz - 1GHz.
6. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak and average measurement at frequency above 1GHz.
7. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.

Final Measurement

1. Substitution method is used for final measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
2. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value “of step a.

   Record the power level of S.G
3. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.
4. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole,

   E.R.P power = E.I.P.R power - 2.15dBi.
5. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.

8.4.4 Test Result

Test Standard:	**47CFR Part 90**	**Mode:**	**Low CH – 10025MHz**
Frequency Range:	**30-60000MHz**	**Test Date:**	**12/22/2018**
Polarity:	**Hor & Ver**	**Test Personnel:**	**Sherwin Lee**
Remark:	**N/A**	**Test Result:**	**Pass**

Freq. MHz	Raw dBm	Correction factor	Level dBm	Meas. Type	Pol	Hgt cm	Limit dBm	Margin dB	Pass /Fail
211.12	-47.06	-16.33	-63.39	Peak	V	150	-13	-50.39	Pass
350.01	-37.92	-10.08	-48.00	Peak	H	150	-13	-35.00	Pass
383.56	-42.47	-8.00	-50.48	Peak	H	150	-13	-37.48	Pass
5026.87	-29.78	7.34	-22.44	Peak	H	150	-13	-9.44	Pass
14430.00	-57.79	28.75	-29.03	Peak	H	150	-13	-16.03	Pass
17606.88	-60.97	35.14	-25.83	Peak	V	150	-13	-12.83	Pass
20050.00	-21.03	2.70	-19.53	Peak	H	150	-13	-6.53	Pass

Test Standard:	**47CFR Part 90**	**Mode:**	**Mid CH – 10250MHz**
Frequency Range:	**30-60000MHz**	**Test Date:**	**12/22/2018**
Polarity:	**Hor & Ver**	**Test Personnel:**	**Sherwin Lee**
Remark:	**N/A**	**Test Result:**	**Pass**

Freq. MHz	Raw dBm	Correction factor	Level dBm	Meas. Type	Pol	Hgt cm	Limit dBm	Margin dB	Pass /Fail
350.1	-36.57	-10.07	-46.65	Peak	H	150	-13	-33.65	Pass
381.63	-40.95	-8.12	-49.07	Peak	H	150	-13	-36.07	Pass
393.27	-41.71	-7.44	-49.15	Peak	H	150	-13	-36.15	Pass
1000.00	-41.22	-13.23	-44.91	Peak	V	150	-13	-31.91	Pass
5101.25	-27.94	-5.72	-20.76	Peak	H	150	-13	-7.76	Pass
17585.63	-60.26	11.8	-25.19	Peak	V	150	-13	-12.19	Pass
20500.00	-23.43	2.8	-20.63	Peak	V	150	-13	-7.63	Pass

Test Standard:	**47CFR Part 90**	**Mode:**	**High CH – 10475MHz**
Frequency Range:	**30-60000MHz**	**Test Date:**	**12/22/2018**
Polarity:	**Hor & Ver**	**Test Personnel:**	**Sherwin Lee**
Remark:	**N/A**	**Test Result:**	**Pass**

Freq. MHz	Raw dBm	Correction factor	Level dBm	Meas. Type	Pol	Hgt cm	Limit dBm	Margin dB	Pass /Fail
52.55	-35.56	-21.91	-57.47	Peak	V	150	-13	-44.47	Pass
99.93	-35.42	-20.14	-55.56	Peak	V	150	-13	-42.56	Pass
207.02	-35.74	-16.60	-52.34	Peak	H	150	-13	-39.34	Pass
350.01	-39.08	-10.08	-49.15	Peak	H	150	-13	-36.15	Pass
5228.75	-28.68	-5.8	-21.59	Peak	H	150	-13	-8.59	Pass
14440.63	-58.55	7.97	-29.83	Peak	V	150	-13	-16.83	Pass
17617.50	-60.69	34.92	-25.76	Peak	V	150	-13	-12.76	Pass
20950.00	-18.23	1.70	-16.53	Peak	V	150	-13	-3.53	Pass

8.5 Frequency Stability

8.5.1 Requirement

Per § 2.1055
(a), the frequency stability shall be measured with variation of ambient temperature as follows: (1) From −30° to + 50° centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

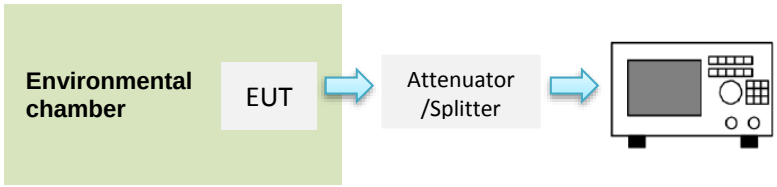
(b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10° centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

(d) The frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

Per § 90.213 (a), except for DSRCS equipment in the 5850-5925 MHz band, frequency stability is to be specified in the station authorization. Frequency stability for DSRCS equipment in the 5850-5925 MHz band is specified in subpart M of this part.

8.5.2 Test setup



8.5.3 Test Procedure

According to 971168 D01 Power Meas License Digital Systems v03r01 clause 9, ANSI C63.26-2015 clause 5.6 and TIA-603-E: 2016 clause 2.2.2

1. Connect the equipment as illustrated.
2. Set the equipment to transmit without modulation continuously.
3. Set the environmental chamber to required environmental condition.
4. Operate the equipment in standby conditions for 15 minutes before proceeding.
5. On spectrum analyser, set the RBW=1KHz, VBW=3KHz, Span = 50KHz.
6. Record the carrier frequency of the transmitter.
7. Calculate the ppm frequency error.
8. Repeat step 2 to step 5 for other required environmental condition.

8.5.4 Test Result

Test Freq. (MHz)	Test Voltage (V)	Temperature (°C)	Measured Freq. (KHz)	Freq. Drift (KHz)	Freq. Deviation (ppm)	Result
10250	120	50	10224.821	-0.010	0.978	Pass
10250	120	40	10224.817	-0.014	1.369	Pass
10250	120	30	10224.826	-0.005	0.489	Pass
10250	102	20	10224.831	0.000	0.000	Pass
10250	138	20	10224.830	-0.001	0.098	Pass
10250	120	20	10224.831	0.000	0.000	Pass
10250	120	10	10224.835	0.004	0.391	Pass
10250	120	0	10224.840	0.009	0.880	Pass
10250	120	-10	10224.839	0.008	0.782	Pass
10250	120	-20	10224.846	0.015	1.467	Pass
10250	120	-30	10224.852	0.021	2.054	Pass

8.6 Maximum Permissible RF Exposure

8.6.1 Requirement

Per §1.1307 (b) (1) EUT shall meet the following RF Exposure requirement.

Frequency range	Electric field strength	Magnetic field strength	Power density	Averaging time
(MHz)	**(V/m)**	**(A/m)**	**(mW/cm^2)**	**(minutes)**
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f^2	6
30-300	61.4	0.163	1	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f^2	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1	30

f = frequency in MHz * = Plane-wave equivalent power density

8.6.2 MPE Calculation

Equation: $S = PG / 4\pi R^2$ or $R = \sqrt{PG / 4\pi S}$

Where, S = Power Density

P = Power Input to Antenna

G = Antenna Gain

R = distance to the center of radiated antenna

Prediction distance 57 cm

Maximum RF Ouput Power = 30.737 dBm

Maximum tune up RF Output Power = 33 dBm

Internal Patch antenna gain = 13 dBi,

Power density = 0.975 mW/cm^2

Maximum MPE is 0.975 mW/cm^2 based on a separation minimum distanceof 57 cm, which is less than 1 mW/cm^2.

The above results show that the device complies with the MPE requirement.

9 Test instrument list

Equipment	Manufacturer	Model	Serial Number	Cal. Date	Cal. Due
Semi-Anechoic Chamber	ETS-Lindgren	10M	VL001	5/11/2018	5/11/2019
Shielding Control Room	ETS-Lindgren	Series 81	VL006	N/A	N/A
Spectrum Analyzer	Keysight	N9020A	MY50110074	5/4/2018	5/4/2019
EMC Test Receiver	R&S	FSP38	100630	5/10/2018	5/10/2019
EMC Test Receiver	R&S	ESL6	100230	5/7/2018	5/7/2019
LISN (9KHz – 30MHz)	EMCO	3816/2	9705-1066	5/4/2018	5/4/2019
Bi-Log Antenna	ETS-Lindgren	3142E	217921	11/15/2018	11/15/2019
Horn Antenna (1-18GHz)	Electro-Metrics	EM-6961	6292	5/2/2018	5/2/2019
Horn Antenna (18-40GHz)	Com-Power	AH-840	101109	5/2/2018	5/2/2019
Preamplifier	RF Bay, Inc.	LPA-10-20	11180621	5/10/2018	5/10/2019
True RMS Multi-meter	UNI-T	UT181A	C173014829	5/10/2018	5/10/2019
Temp / Humidity / Pressure Meter	PCE Instruments	PCE-THB 40	R062028	5/9/2018	5/9/2019
Wideband Peak Power meter	Booton	4540	VL102	5/9/2018	5/9/2019
RF Attenuator	Pasternack	PE7005-3	VL061	5/10/2018	5/10/2019
Preamplifier 100KHz - 40GHz	Aeroflex	33711-392-77150-11	064	5/10/2018	5/10/2019
EM Center Control	ETS-Lindgren	7006-001	160136	N/A	N/A
Turn Table	ETS-Lindgren	2181-3.03	VL002	N/A	N/A
Boresight Antenna Tower	ETS-Lindgren	2171B	VL003	N/A	N/A
Loop Antenna (9k-30MHz)	Com-Power	AL-130	121012	5/9/2018	5/9/2019
RE test cable(below 6GHz)	Vista	RE-6GHz-01	RE-6GHz-01	5/10/2018	5/10/2019
RE test cable (1-18GHz)	PhaseTrack	II-240	RE-18GHz-01	5/10/2018	5/10/2019
RE test cable (>18GHz)	Sucoflex	104	344903/4	5/10/2018	5/10/2019
Pulse limiter	Com-Power	LIT-930A	531727	5/15/2018	5/15/2019
CE test cable #1	FIRST RF	FRF-C-1002-001	CE-6GHz-01	5/10/2018	5/10/2019
CE test cable#2	FIRST RF	FRF-C-1002-001	CE-6GHz-02	5/9/2018	5/9/2019
Horn antenna (40-60GHz)	OML	M19RH	VL103	5/9/2018	5/9/2019
Harmonic Mixer	OML	M19HWD	VL104	5/9/2018	5/9/2019