TESTING LABORATORY
CERTIFICATE#4323.01

FCC PART 15.247

TEST REPORT

For

Espen Technology, Inc.

12257 Florence Ave. Santa Fe Springs, California, 90670 United States

FCC ID: 2AXJVVRF-DR

Report Type:	**Product Type:**
Original Report	Remote Control

Test Engineer:	Chao Gao
Report Number:	RSHB191227003-00A
Report Date:	2020-11-04
Reviewed By:	Oscar Ye EMC Manager
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan) No.248 Chenghu Road, Kunshan, Jiangsu province, China Tel: +86-0512-86175000 Fax: +86-0512-88934268 www.baclcorp.com.cn

TABLE OF CONTENTS

GENERAL INFORMATION **3**
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) 3
OBJECTIVE 3
RELATED SUBMITTAL(S)/GRANT(S) 3
TEST METHODOLOGY 4
MEASUREMENT UNCERTAINTY 4
TEST FACILITY 4
SYSTEM TEST CONFIGURATION **5**
DESCRIPTION OF TEST CONFIGURATION 5
EQUIPMENT MODIFICATIONS 5
EUT EXERCISE SOFTWARE 5
SUPPORT EQUIPMENT LIST AND DETAILS 6
EXTERNAL I/O CABLE 6
BLOCK DIAGRAM OF TEST SETUP 7
SUMMARY OF TEST RESULTS **8**
TEST EQUIPMENT LIST **9**
FCC§15.247 (I), §1.1310 &§2.1093 –RF EXPOSURE **10**
FCC §15.203 - ANTENNA REQUIREMENT **11**
APPLICABLE STANDARD 11
ANTENNA CONNECTOR CONSTRUCTION 11
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS **12**
APPLICABLE STANDARD 12
EUT SETUP 12
EMI TEST RECEIVER SETUP 13
TEST PROCEDURE 13
CORRECTED AMPLITUDE & MARGIN CALCULATION 13
TEST RESULTS SUMMARY 13
TEST DATA 14
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH **22**
APPLICABLE STANDARD 22
TEST PROCEDURE 22
TEST DATA 22
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER **25**
APPLICABLE STANDARD 25
TEST PROCEDURE 25
TEST DATA 26
FCC §15.247(d) – BAND EDGE **29**
APPLICABLE STANDARD 29
TEST PROCEDURE 29
TEST DATA 29
FCC §15.247(e) - POWER SPECTRAL DENSITY **31**
APPLICABLE STANDARD 31
TEST PROCEDURE 31
TEST DATA 31

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant:	Espen Technology, Inc.
Tested Model:	VRF-DR
Product Type:	Remote Control
Power Supply:	DC 3.8V from battery
RF Function:	SRD
Operating Band/Frequency:	2426~2470 MHz
Channel Number:	45
Channel Separation:	1 MHz
Modulation Type	GFSK
Antenna Type:	PCB antenna
*Maximum Antenna Gain:	0 dBi

**Maximum Antenna Gain was declared by the applicant.*

All measurement and test data in this report was gathered from production sample serial number: 20191227003. (Assigned by the BACL. The EUT supplied by the applicant was received on 2019-12-27)

Objective

This report is prepared on behalf of *Espen Technology, Inc.* in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission's rules.

The tests were performed in order to determine Compliant with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

No Related Submittal(s)/Grant(s)

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliant Testing of Unlicensed Wireless Devices and FCC 558074 D01 15.247 Meas Guidance v05r02.

All emissions measurement was performed at Bay Area Compliant Laboratories Corp. (Kunshan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Item		Uncertainty
AC Power Lines Conducted Emissions		3.19dB
RF conducted test with spectrum		0.9dB
RF Output Power with Power meter		0.5dB
Radiated emission	30MHz~1GHz	6.11dB
	1GHz~6GHz	4.45dB
	6GHz~18GHz	5.23dB
	18GHz~40GHz	5.65dB
Occupied Bandwidth		0.5kHz
Temperature		1.0℃
Humidity		6%

Test Facility

The Test site used by Bay Area Compliant Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliant Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01), the FCC designation No. CN1185 under the FCC KDB 974614 D01 and CAB identifier CN0004 under the ISED requirement. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

Channel list:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2426	24	2449
2	2427	…	…
…	…	…	…
…	…	…	…
…	…	44	2469
22	2447	45	2470
23	2448	…	…

EUT was tested with Channel 1, 23 and 45.

Equipment Modifications

EUT has four key that changes the switches and dimmers, and their RF characteristics is the same.

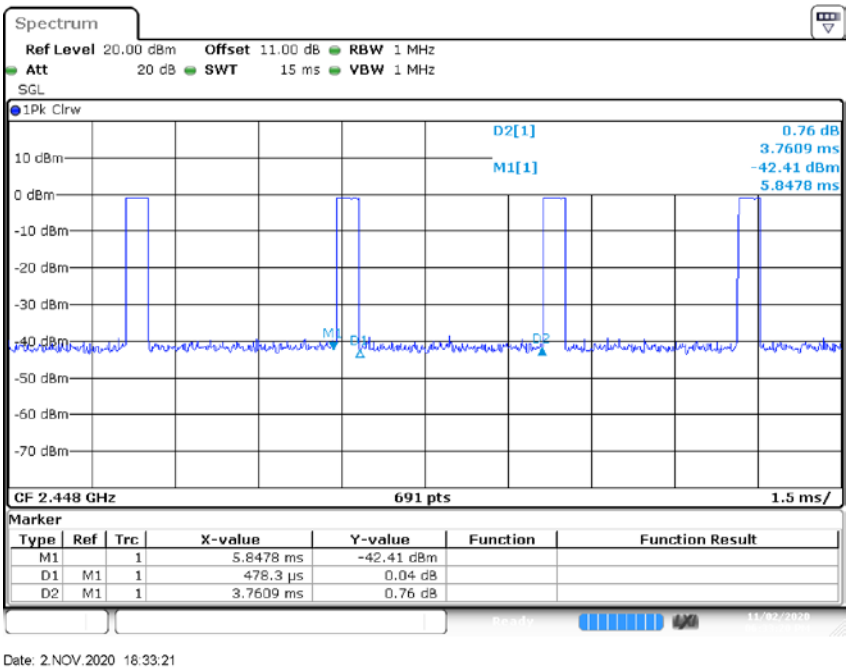
EUT Exercise Software

RF test tool: Engineering mode

Power Level Setting: Default

Duty Cycle:

Middle Channel



Channel	Duty Cycle (%)	T(ms)	1/T(kHz)	10log(1/x)
2426-2470	12.72	0.478	2.09	8.96

Note: “x” means the Duty Cycle.

Support Equipment List and Details

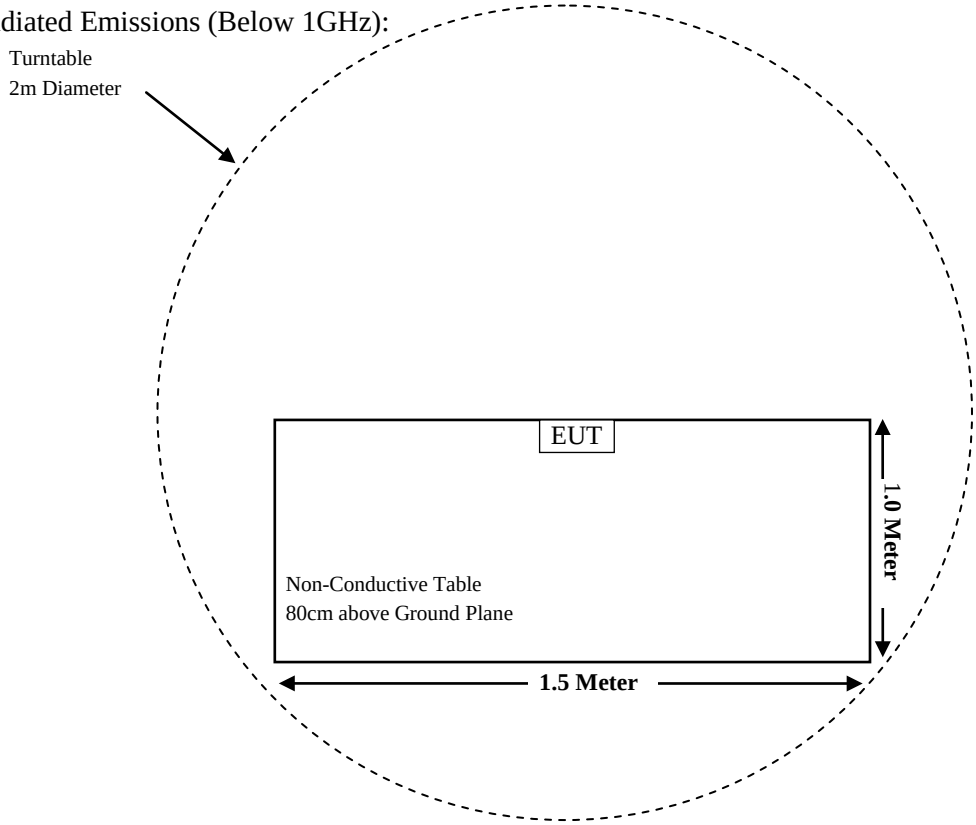
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

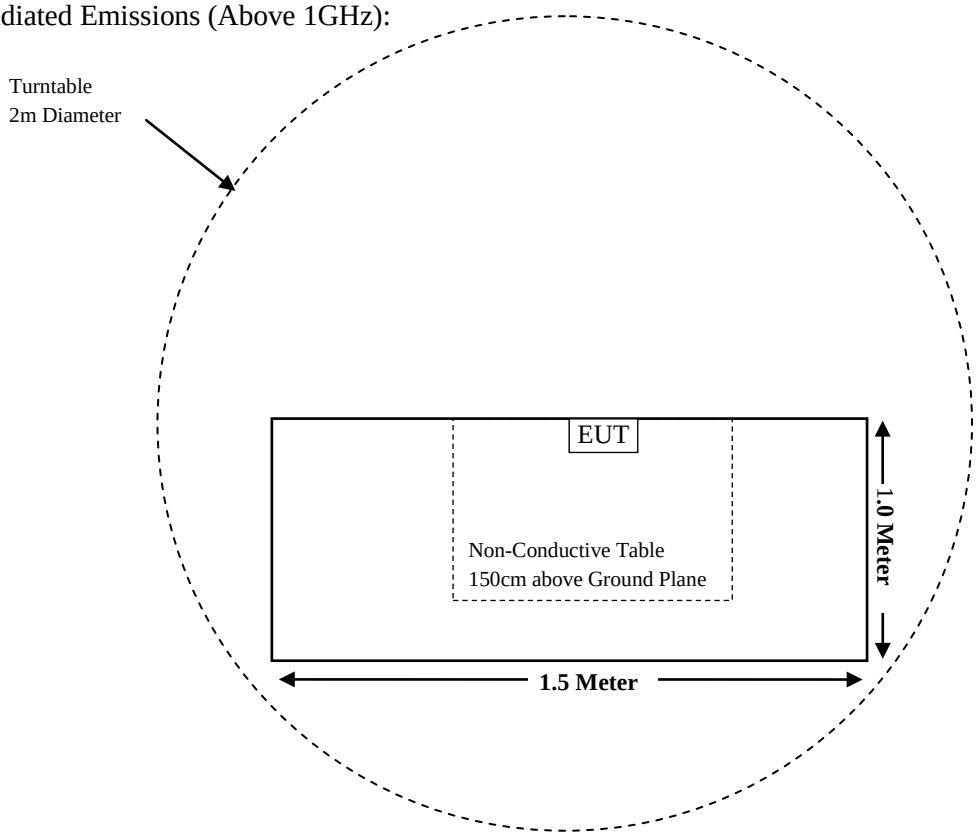
Cable Description	Length (m)	From Port	To
/	/	/	/

Block Diagram of Test Setup

For Radiated Emissions (Below 1GHz):



For Radiated Emissions (Above 1GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC§15.247 (I), §1.1310 &§2.1093	RF Exposure	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 (a)	AC Line Conducted Emissions	Not Applicable (See Note)
§15.247(d)	Spurious Emissions at Antenna Port	Compliant
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliant
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliant
§15.247(b)(3)	Maximum Conducted Output Power	Compliant
§15.247(d)	Band Edge	Compliant
§15.247(e)	Power Spectral Density	Compliant

Note: The EUT powered by battery.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test（Chamber 1#）					
Rohde & Schwarz	EMI Test receiver	ESCI	100195	2019-12-14	2020-12-13
Sunol Sciences	Broadband Antenna	JB3	A090413-1	2017-12-26	2020-12-25
Sonoma Instrument	Pre-amplifier	310N	171205	2020-08-14	2021-08-13
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-8	008	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2020-08-15	2021-08-14
Radiated Emission Test（Chamber 2#）					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2020-04-01	2021-03-31
ETS-LINDGREN	Horn Antenna	3115	9207-3900	2020-07-15	2023-07-14
ETS-LINDGREN	Horn Antenna	3116	2516	2020-01-17	2023-01-16
A.H.Systems, inc	Amplifier	PAM-0118P	512	2020-02-20	2021-02-19
SELECTOR	Amplifier	EM18G40G	060726	2020-03-22	2021-03-21
MICRO-TRONICS	Band Reject Filter	BRM50702	G024	2020-08-05	2021-08-04
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2019-12-12	2020-12-11
MICRO-COAX	Coaxial Cable	Cable-11	011	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2020-08-15	2021-08-14
RF Conducted Test					
Rohde & Schwarz	Signal Analyzer	FSV40	101116	2020-07-28	2021-07-27
Narda	Attenuator	10dB	010	2020-08-15	2021-08-14
Espen Technology	RF Cable	Espen Technology C01	C01	Each Time	/

*** Statement of Traceability:** Bay Area Compliant Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC§15.247 (I), §1.1310 &§2.1093 –RF EXPOSURE

Applicable Standard

According to§2.1093and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D01 General RF Exposure Guidance

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

1. f(GHz) is the RF channel transmit frequency in GHz.
2. Power and distance are rounded to the nearest mW and mm before calculation.
3. The result is rounded to one decimal place for comparison.
4. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test Exclusion.

Measurement Result

Frequency Range (MHz)	Max Tune-up Conducted Power		Calculated Distance (mm)	Calculated Value	Threshold (10-g extremity SAR)	SAR Test Exclusion
	(dBm)	(mW)				
2426-2470	0	1	5.00	0.314	7.5	Yes

Note: 1) For the above tune up power were declared by the manufacturer.
2) The EUT is a handheld device.

Result: No SAR test is required.

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine Compliant with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.
And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has a PCB antenna and the antenna gain is 0 dBi, the antenna is permanently attached, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliant.

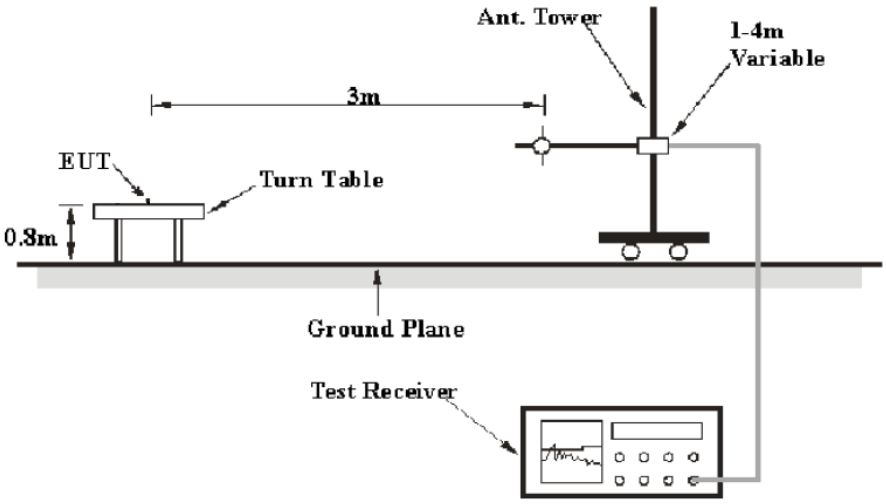
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

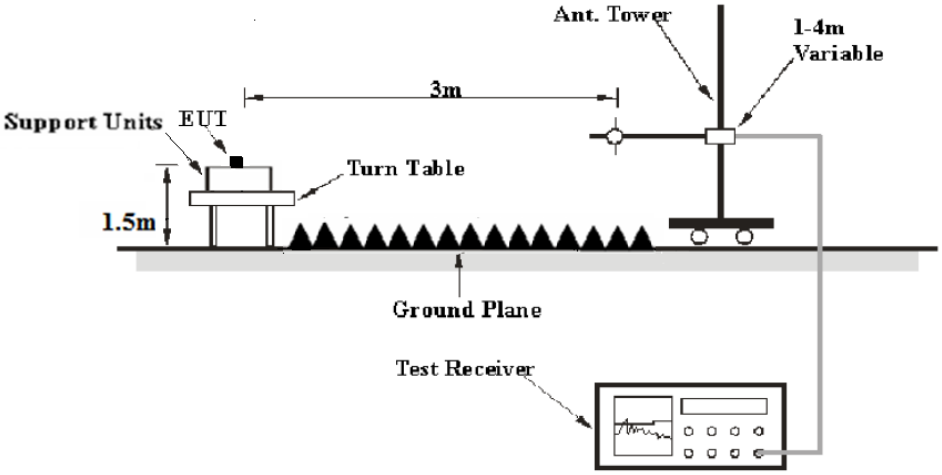
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1 GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

EMI Test Receiver Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver setup was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1GHz	1MHz	3 MHz	/	PK
	1MHz	3 MHz	/	AVG

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection mode for frequencies above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude (dBμV/m) = Meter Reading (dBμV) + Antenna Factor (dB/m) + Cable Loss (dB) - Amplifier Gain (dB)

The "**Margin**" column of the following data tables indicates the degree of Compliant with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin (dB) = Limit (dBμV/m) - Corrected Amplitude (dBμV/m)

Test Results Summary

According to the recorded data in following table, the EUT is compliant with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247.

Test Data

Environmental Conditions

Temperature:	23.1~24.9 ℃
Relative Humidity:	50~52 %
ATM Pressure:	101.1~102.9 kPa

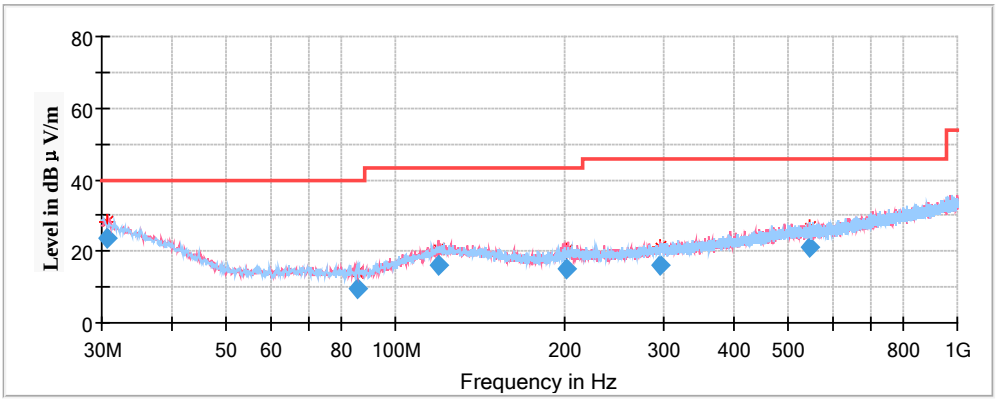
The testing was performed by Chao Gao from 2020-10-23 to 2020-11-02.

EUT operation mode: Transmitting

Spurious Emission Test:

30MHz-1GHz

(Pre-scan with Low channel, Middle channel, High channel of operation in the X,Y and Z axes of orientation, the worst case ***low channel of operation in Z-axis of orientation*** *was recorded)*



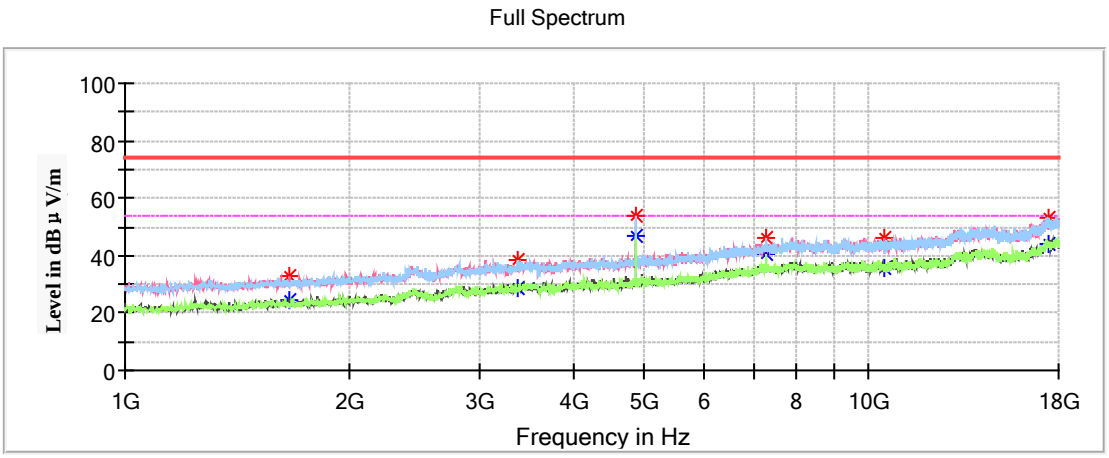
Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	QuasiPeak (dBµV/m)	Height (cm)	Polar (H/V)				
30.574295	23.54	200.0	H	169.0	-4.8	40.00	16.46
85.743600	9.64	200.0	H	158.0	-18.0	40.00	30.36
119.286050	15.91	100.0	V	234.0	-11.8	43.50	27.59
201.815000	15.33	100.0	V	276.0	-12.8	43.50	28.17
296.077250	15.97	200.0	V	119.0	-11.1	46.00	30.03
545.670450	21.33	200.0	H	17.0	-5.8	46.00	24.67

1GHz-18GHz

*(Pre-scan in the X,Y and Z axes of orientation, the worst case **Z-axis of orientation** was recorded.)*

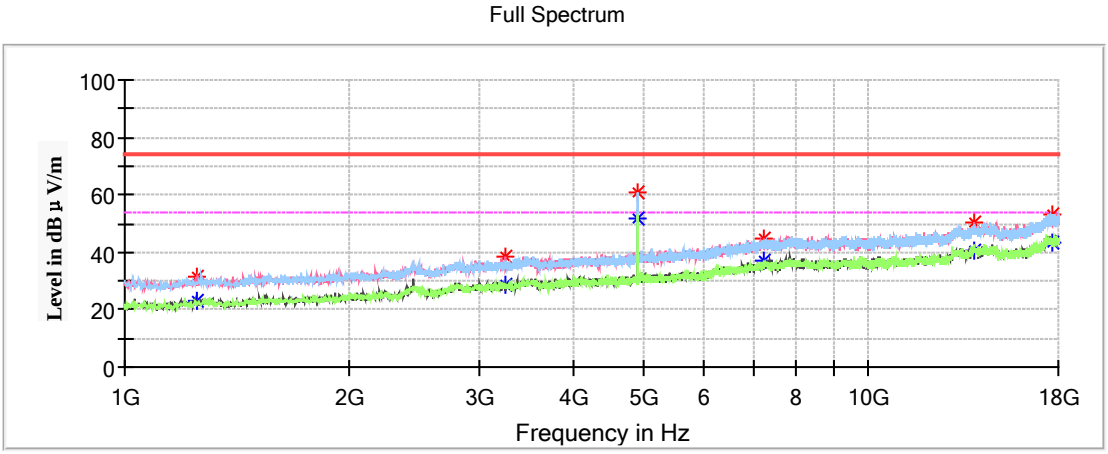
Note:
1. This test was performed with the 2.4 - 2.5GHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) - Amplifier Factor (dB)
   Corrected Amplitude (dBμV/m) = Corrected Factor (dB/m) + Reading (dBμV)
   Margin (dB) = Limit (dBμV/m) - Corrected Amplitude (dBμV/m)

2426 MHz



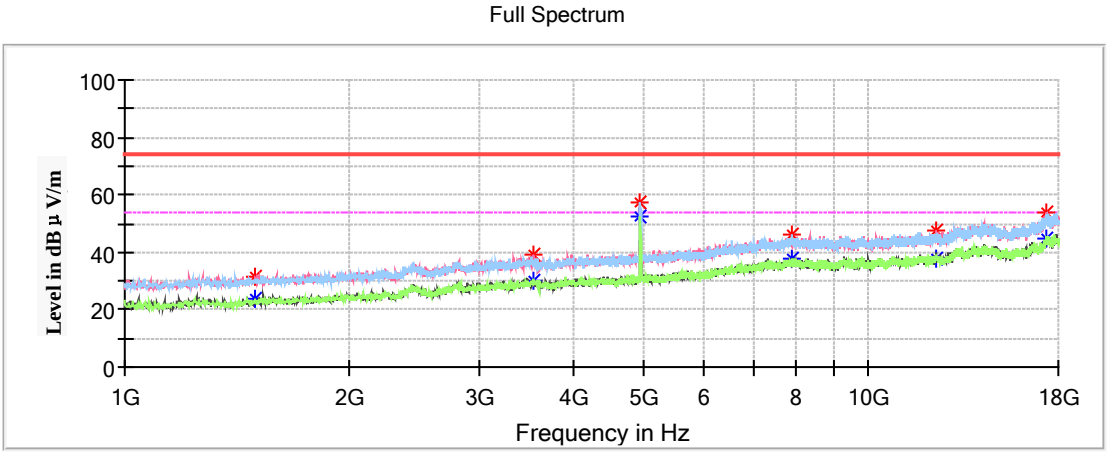
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
1668.100000	---	24.18	150.0	V	356.0	-15.7	54.00	29.82
1668.100000	32.87	---	150.0	V	356.0	-15.7	74.00	41.13
3369.800000	---	28.95	200.0	H	218.0	-9.2	54.00	25.05
3369.800000	38.46	---	200.0	H	218.0	-9.2	74.00	35.54
4852.000000	---	46.66	150.0	H	194.0	-5.5	54.00	7.34
4852.000000	53.56	---	150.0	H	194.0	-5.5	74.00	20.44
7278.000000	---	40.45	200.0	H	21.0	0.5	54.00	13.55
7278.000000	46.42	---	200.0	H	21.0	0.5	74.00	27.58
10506.400000	---	35.90	150.0	V	288.0	2.3	54.00	18.10
10506.400000	45.97	---	150.0	V	288.0	2.3	74.00	28.03
17488.300000	---	43.77	200.0	V	192.0	8.8	54.00	10.23
17488.300000	53.11	---	200.0	V	192.0	8.8	74.00	20.89

2448 MHz



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
1246.500000	31.35	---	150.0	V	260.0	-17.7	74.00	42.65
1246.500000	---	23.05	150.0	V	260.0	-17.7	54.00	30.95
3240.600000	38.53	---	150.0	V	84.0	-9.5	74.00	35.47
3240.600000	---	28.63	150.0	V	84.0	-9.5	54.00	25.37
4896.000000	---	51.72	150.0	H	182.0	-5.4	54.00	2.28
4896.000000	60.98	---	150.0	H	182.0	-5.4	74.00	13.02
7227.100000	45.08	---	200.0	V	272.0	0.4	74.00	28.92
7227.100000	---	36.79	200.0	V	272.0	0.4	54.00	17.21
13886.000000	50.55	---	200.0	H	359.0	6.0	74.00	23.45
13886.000000	---	40.66	200.0	H	359.0	6.0	54.00	13.34
17620.900000	53.36	---	150.0	H	352.0	8.9	74.00	20.64
17620.900000	---	43.36	150.0	H	352.0	8.9	54.00	10.64

2470 MHz

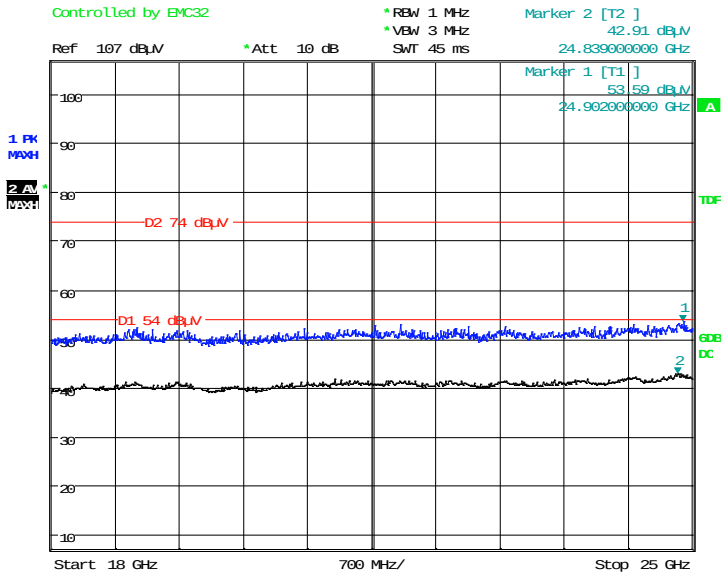


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
1496.400000	---	23.48	200.0	H	123.0	-16.4	54.00	30.52
1496.400000	31.76	---	200.0	H	123.0	-16.4	74.00	42.24
3551.700000	---	30.15	150.0	V	72.0	-8.6	54.00	23.85
3551.700000	38.94	---	150.0	V	72.0	-8.6	74.00	35.06
4940.000000	---	52.31	150.0	H	116.0	-5.3	54.00	1.69
4940.000000	57.57	---	150.0	H	116.0	-5.3	74.00	16.43
7908.800000	---	37.70	200.0	H	356.0	1.7	54.00	16.30
7908.800000	46.14	---	200.0	H	356.0	1.7	74.00	27.86
12339.000000	---	37.71	200.0	V	168.0	3.2	54.00	16.29
12339.000000	47.23	---	200.0	V	168.0	3.2	74.00	26.77
17365.900000	---	44.89	150.0	V	283.0	8.4	54.00	9.11
17365.900000	53.58	---	150.0	V	283.0	8.4	74.00	20.42

18GHz - 25GHz

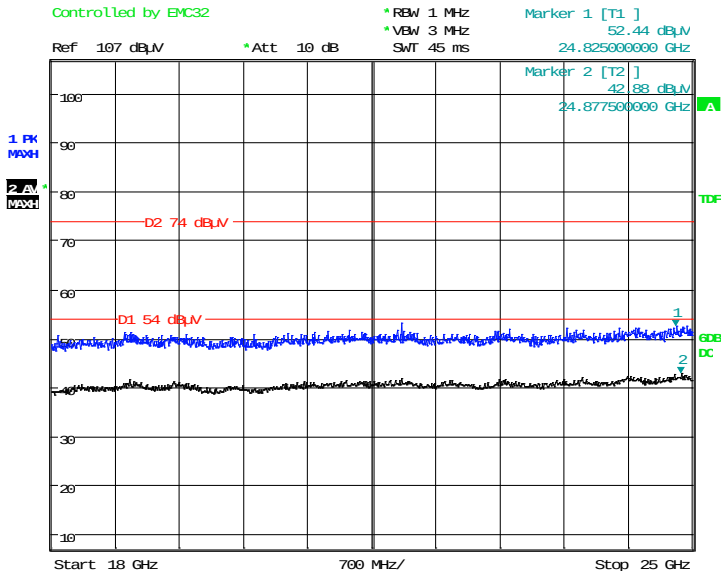
*(Pre-scan with low, middle and high channels of operation in the X,Y and Z axes of orientation, the worst case **low channel of operation in Z-axis of orientation** was recorded)*

Horizontal



Date: 23.OCT.2020 21:46:36

Vertical



Date: 23.OCT.2020 23:35:55

Restricted Bands Emissions Test:

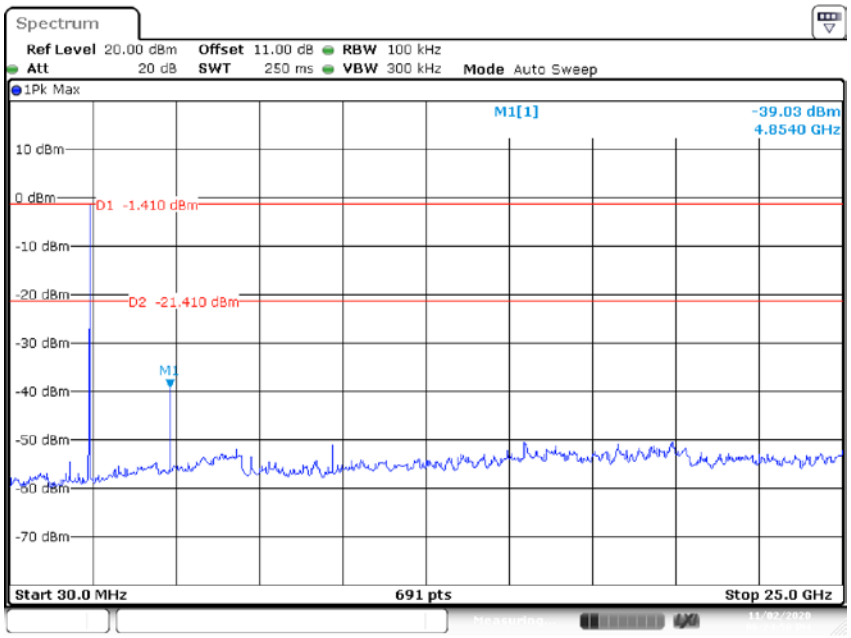
*(Pre-scan in the X, Y and Z axes of orientation, the worst case **Z-axis of orientation** was recorded.)*

Note:
1. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) - Amplifier Factor (dB)
   Corrected Amplitude (dBμV/m) = Corrected Factor (dB/m) + Reading (dBμV)
   Margin (dB) = Limit (dBμV/m) - Corrected Amplitude (dBμV/m)

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
2426 MHz								
2390.00	---	41.88	200.0	H	148.0	-2.9	54.00	12.12
2390.00	46.34	---	200.0	H	148.0	-2.9	74.00	27.66
2470 MHz								
2483.50	50.25	---	150.0	H	116.0	-2.5	74.00	23.75
2483.50	---	45.95	150.0	H	1162.0	-2.5	54.00	8.05

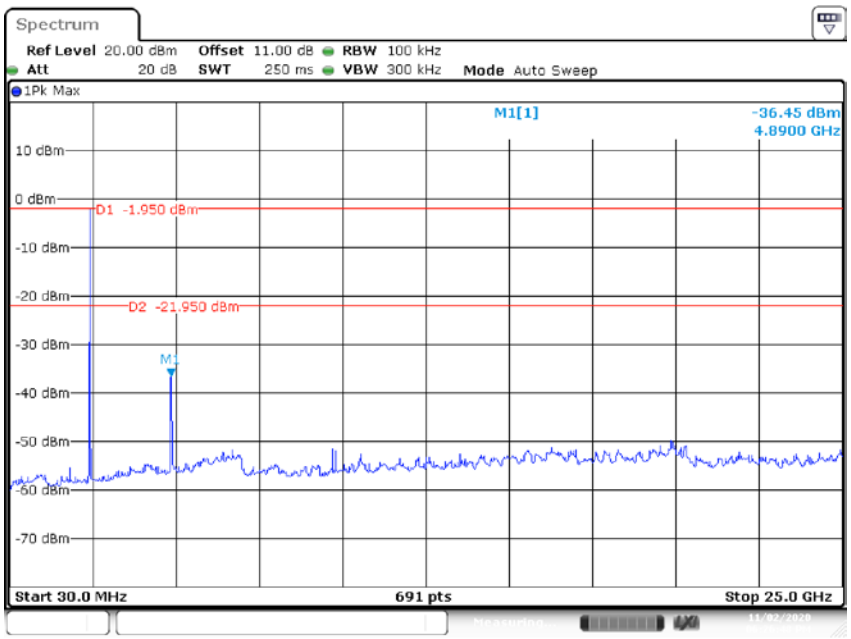
Conducted Spurious Emissions at Antenna Port

2426 MHz



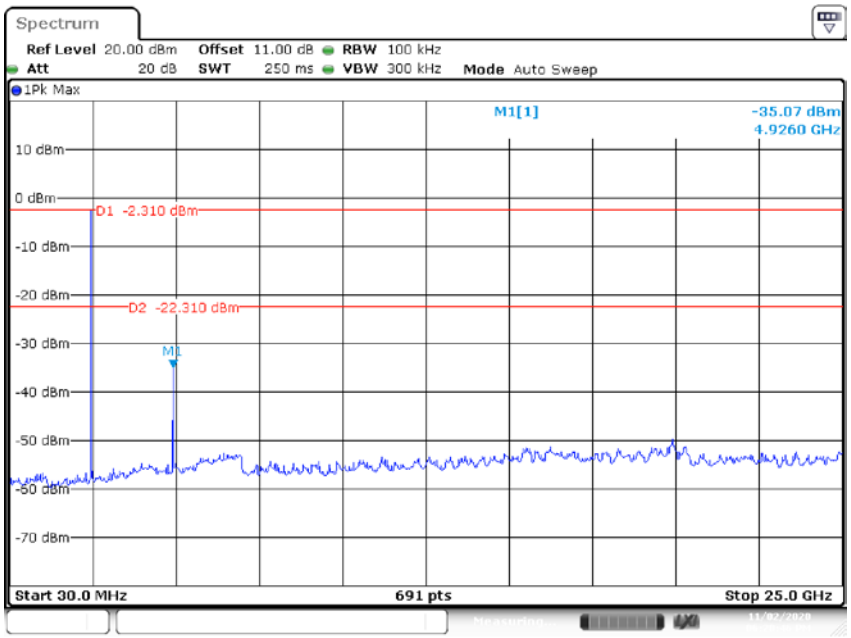
Date: 2.NOV.2020 18:24:50

2448 MHz



Date: 2.NOV.2020 18:26:48

2470 MHz



Date: 2.NOV.2020 18:28:47

FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

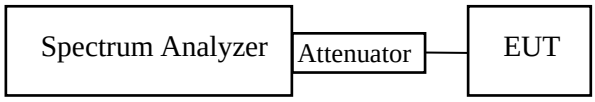
Applicable Standard

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Procedure

According to ANSI C63.10-2013 sub-clause 11.8.1

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



Test Data

Environmental Conditions

Temperature:	23.1 ℃
Relative Humidity:	53 %
ATM Pressure:	101.3 kPa

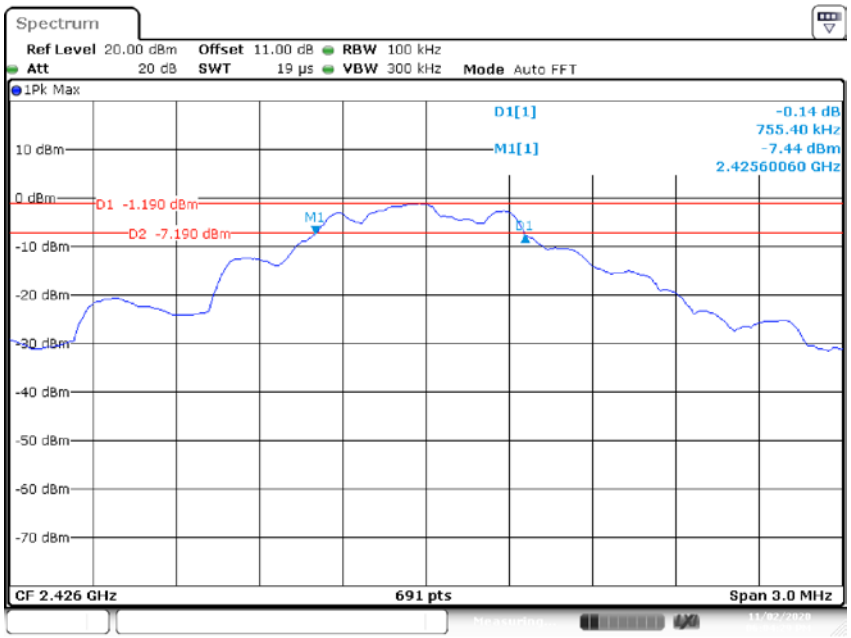
The testing was performed by Chao Gao on 2020-11-02.

EUT operation mode: Transmitting

Test Result: Compliant

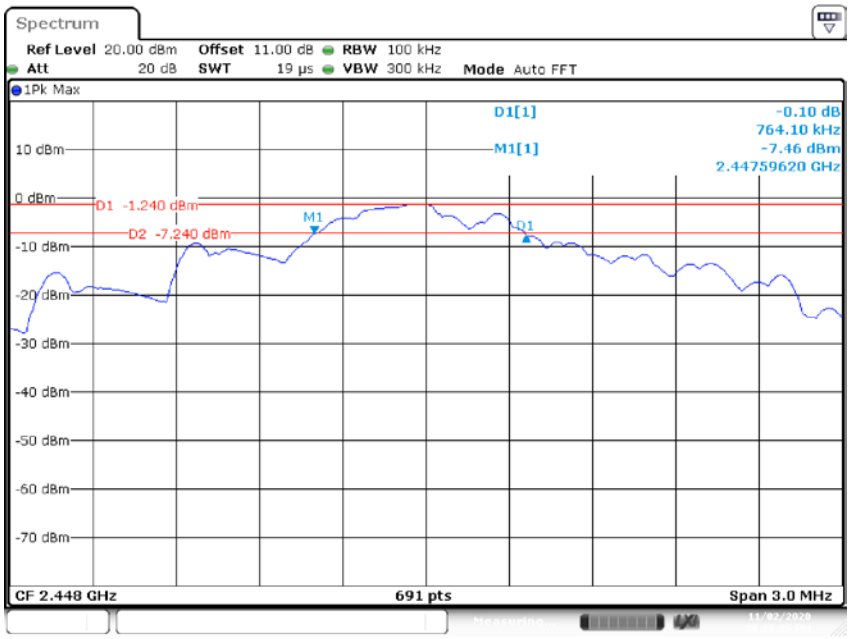
Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (MHz)
2426	0.755	≥0.5
2448	0.764	≥0.5
2470	0.725	≥0.5

2426 MHz



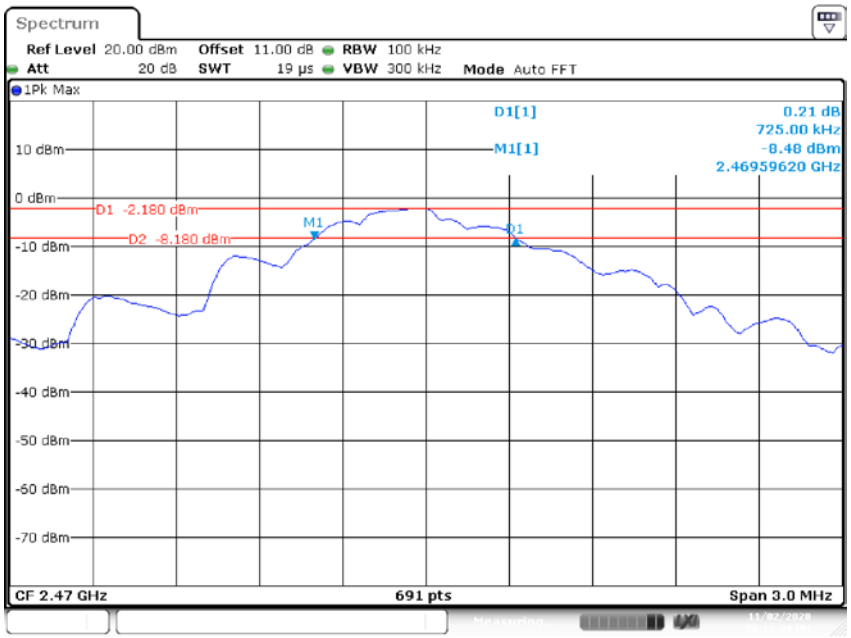
Date: 2.NOV.2020 18:04:29

2448 MHz



Date: 2.NOV.2020 18:06:07

2470 MHz



Date: 2.NOV.2020 18:12:24

FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

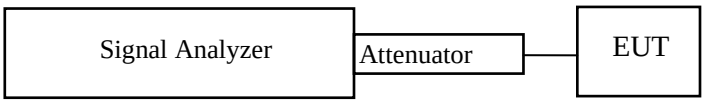
Applicable Standard

According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, Compliant with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

Test Procedure

According to ANSI C63.10-2013 sub-clause 11.9.1.3

1. Set the RBW ≥ DTS bandwidth.
2. Set VBW ≥ 3 x RBW.
3. Set span ≥ 3 x RBW
4. Sweep time = auto couple.
5. Detector = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use peak marker function to determine the peak amplitude level.



Test Data

Environmental Conditions

Temperature:	23.1 ℃
Relative Humidity:	52 %
ATM Pressure:	101.3 kPa

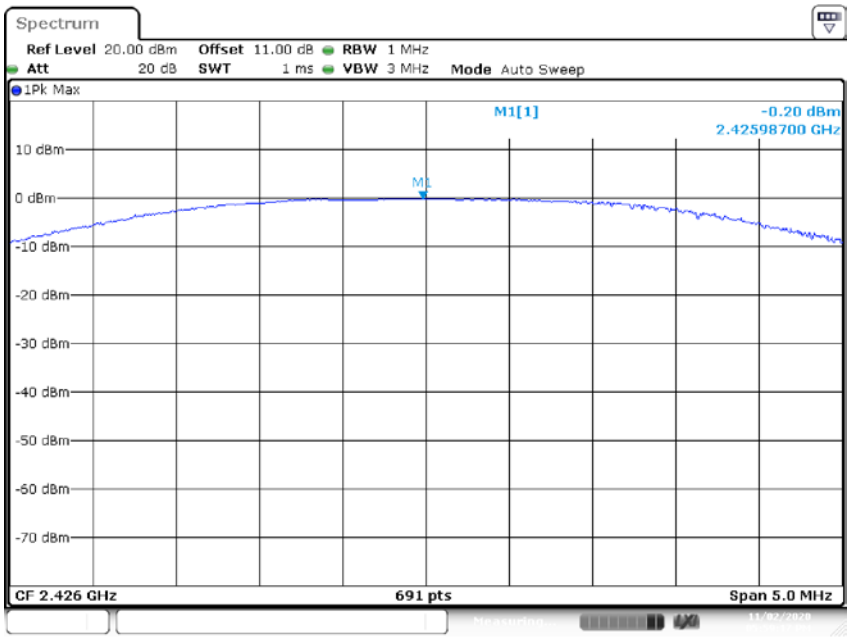
The testing was performed by Chao Gao on 2020-11-02.

EUT operation mode: Transmitting

Test Result: Compliant

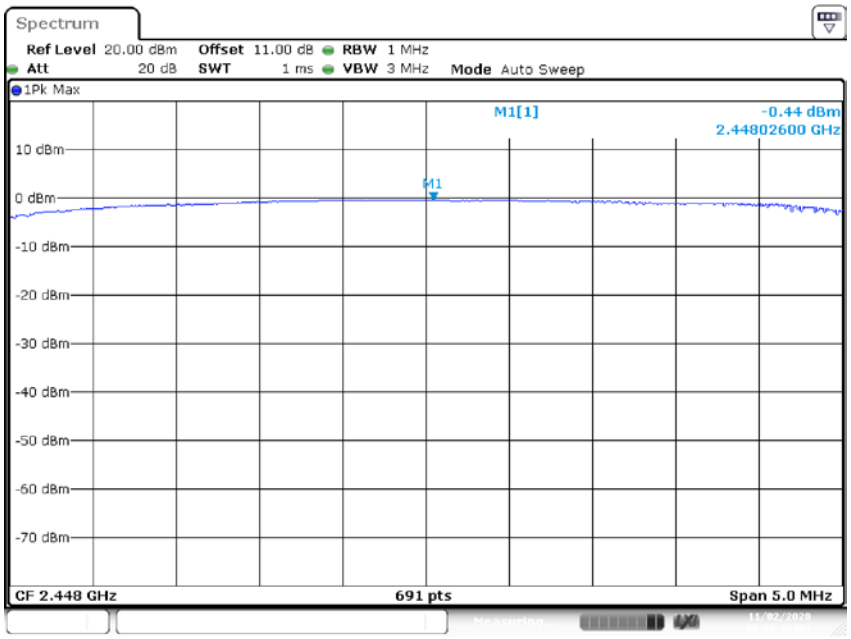
Frequency (MHz)	Max Conducted Peak Output Power (dBm)	Limit (dBm)	Result
2426	-0.20	30	Pass
2448	-0.44	30	Pass
2470	-0.69	30	Pass

2426 MHz



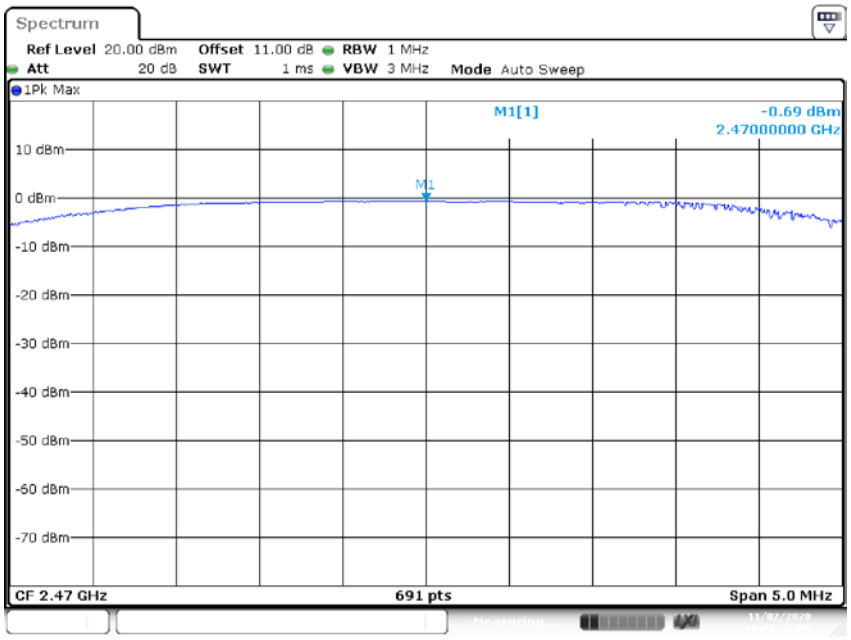
Date: 2.NOV.2020 17:59:17

2448 MHz



Date: 2.NOV.2020 18:00:50

2470 MHz



Date: 2.NOV.2020 18:01:51

FCC §15.247(d) – BAND EDGE

Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates Compliant with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

According to ANSI C63.10-2013 sub-clause 6.10.

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Data

Environmental Conditions

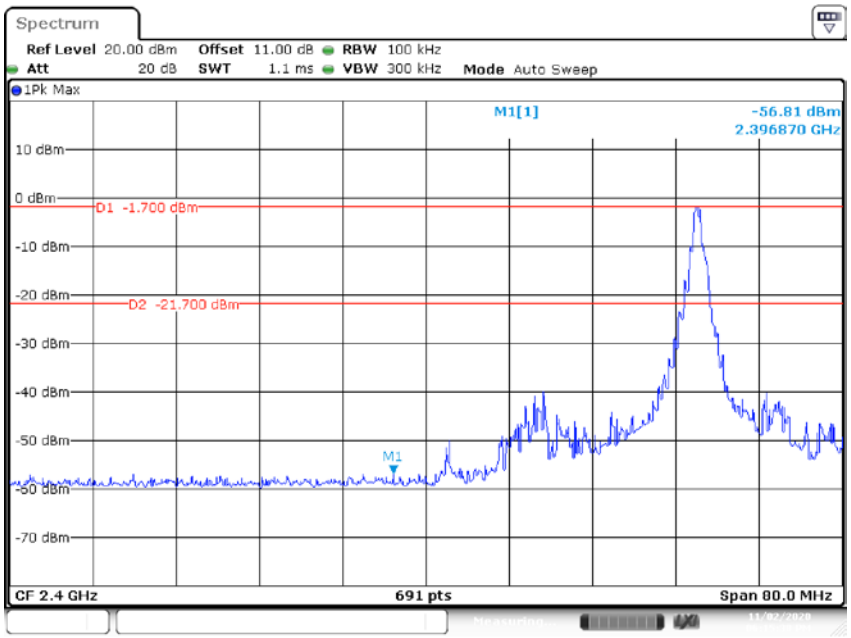
Temperature:	23.1 ℃
Relative Humidity:	52 %
ATM Pressure:	101.3 kPa

The testing was performed by Chao Gao on 2020-11-02.

EUT operation mode: Transmitting

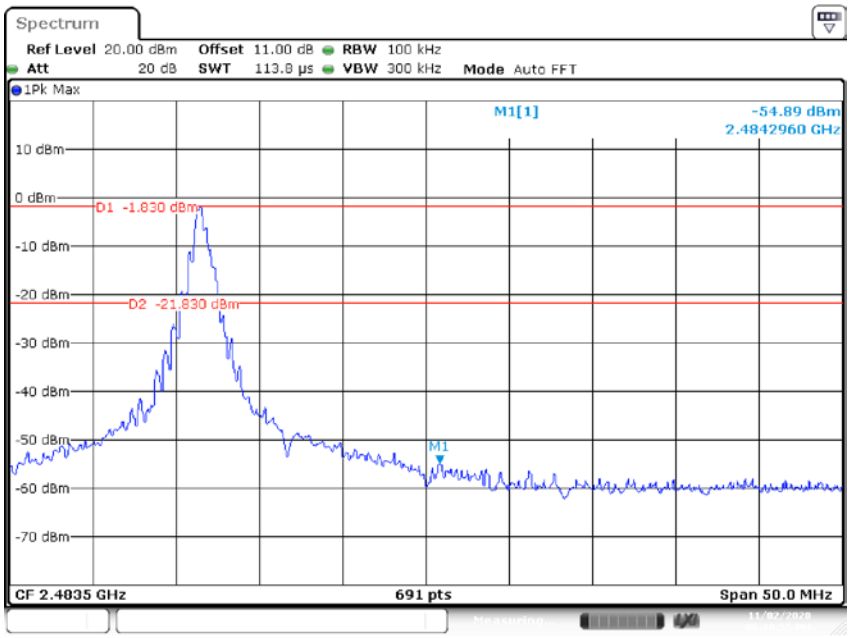
Test Result: Compliant

Left Side-2426 MHz



Date: 2.NOV.2020 18:15:39

Right Side-2470 MHz



Date: 2.NOV.2020 18:18:55

FCC §15.247(e) - POWER SPECTRAL DENSITY

Applicable Standard

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Test Procedure

According to ANSI C63.10-2013 sub-clause 11.10.2

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate Compliant.
2. Set the RBW to: 3kHz≤ RBW≤100 kHz.
3. Set the VBW ≥ 3×RBW.
4. Set the span to 1.5 times the DTS bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Test Data

Environmental Conditions

Temperature:	23.1 ℃
Relative Humidity:	52 %
ATM Pressure:	101.3 kPa

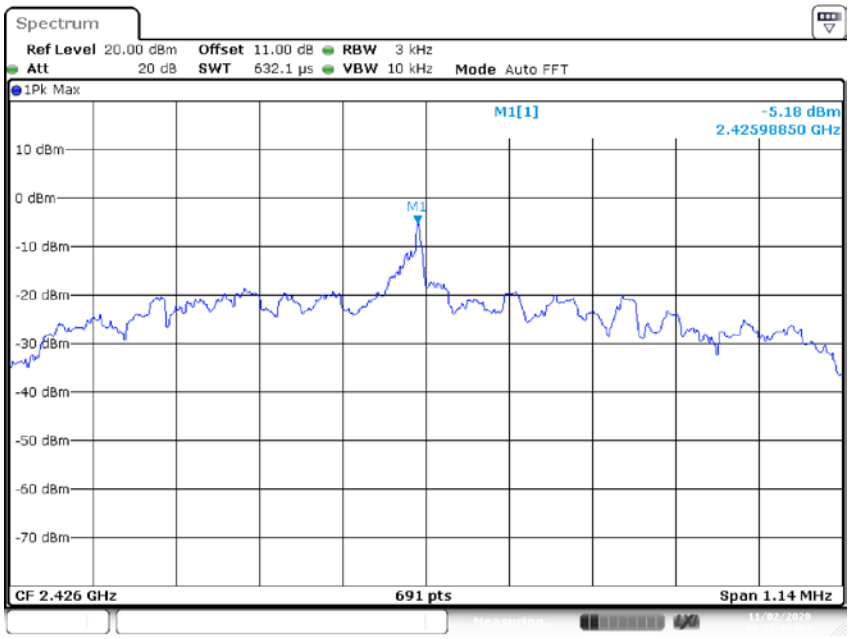
The testing was performed by Chao Gao on 2020-11-02.

EUT operation mode: Transmitting

Test Result: Compliant

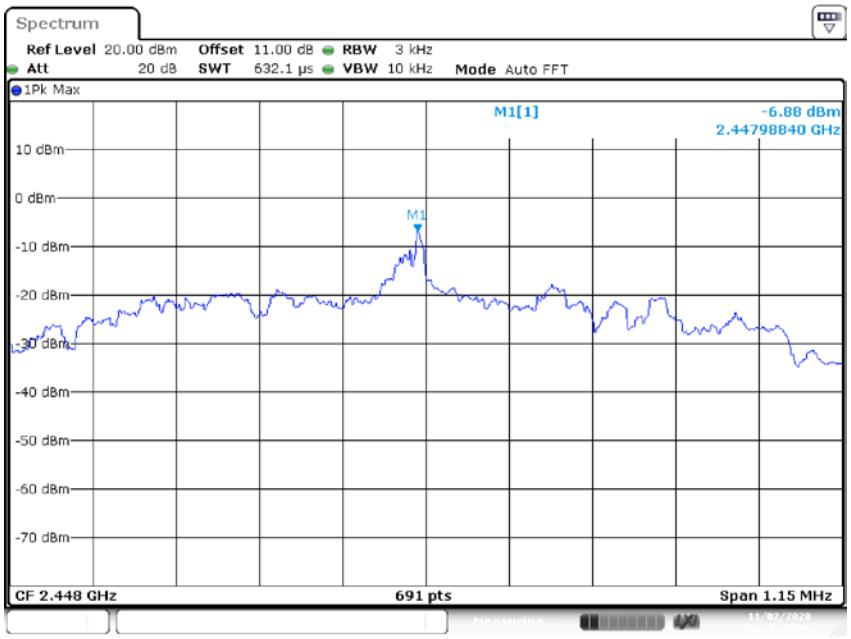
Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
2426	-5.18	≤8
2448	-6.88	≤8
2470	-6.96	≤8

2426 MHz



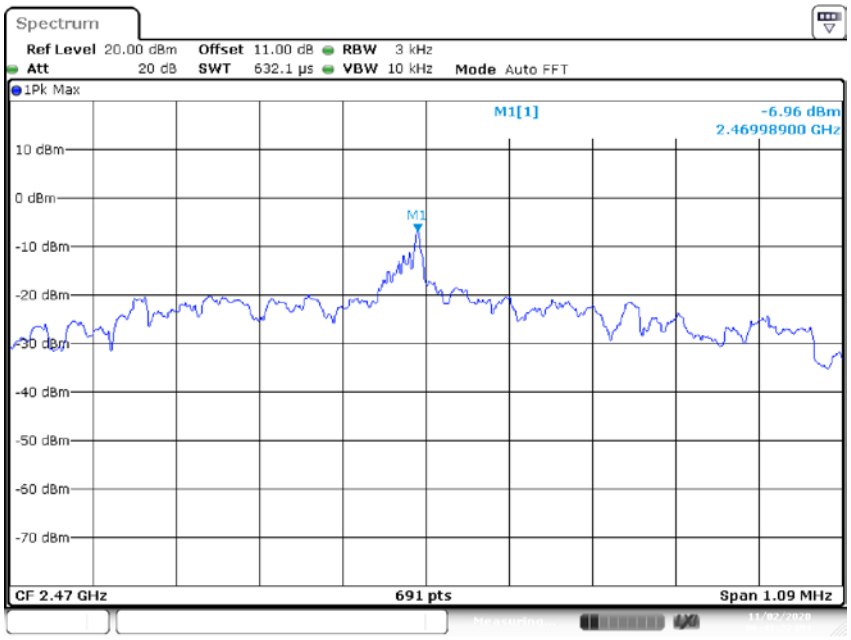
Date: 2.NOV.2020 18:37:43

2448 MHz



Date: 2.NOV.2020 18:39:30

2470 MHz



Date: 2.NOV.2020 18:41:22

Declarations

1: BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with an asterisk '*'. Customer model name, addresses, names, trademarks etc. are not considered data.

2: Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

3: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

4: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

5: This report cannot be reproduced except in full, without prior written approval of the Company.

6: This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

******* END OF REPORT *******